GENERAL INFORMATION SECTION

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This service manual has been prepared to provide SUBARU service personnel with the necessary information and data for the correct maintenance and repair of SUBARU vehicles.
This manual includes the procedures for maintenance, disassembling, reassembling, inspection and adjustment of components and diagnostics for guidance of experienced mechanics.
Please peruse and utilize this manual fully to ensure complete repair work for satisfying our customers by keeping their vehicle in optimum condition. When replacement of parts during repair work is needed, be sure to use SUBARU genuine parts.

All information, illustration and specifications contained in this manual are based on the latest product information available at the time of publication approval.

FUJI HEAVY INDUSTRIES LTD. G8160BE1

FOREWORD

FW

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1. Foreword

A: FOREWORD

These manuals are used when performing maintenance, repair or diagnosis of Subaru Forester.
Applicable model: 2011 MY SH*****
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

HU

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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.

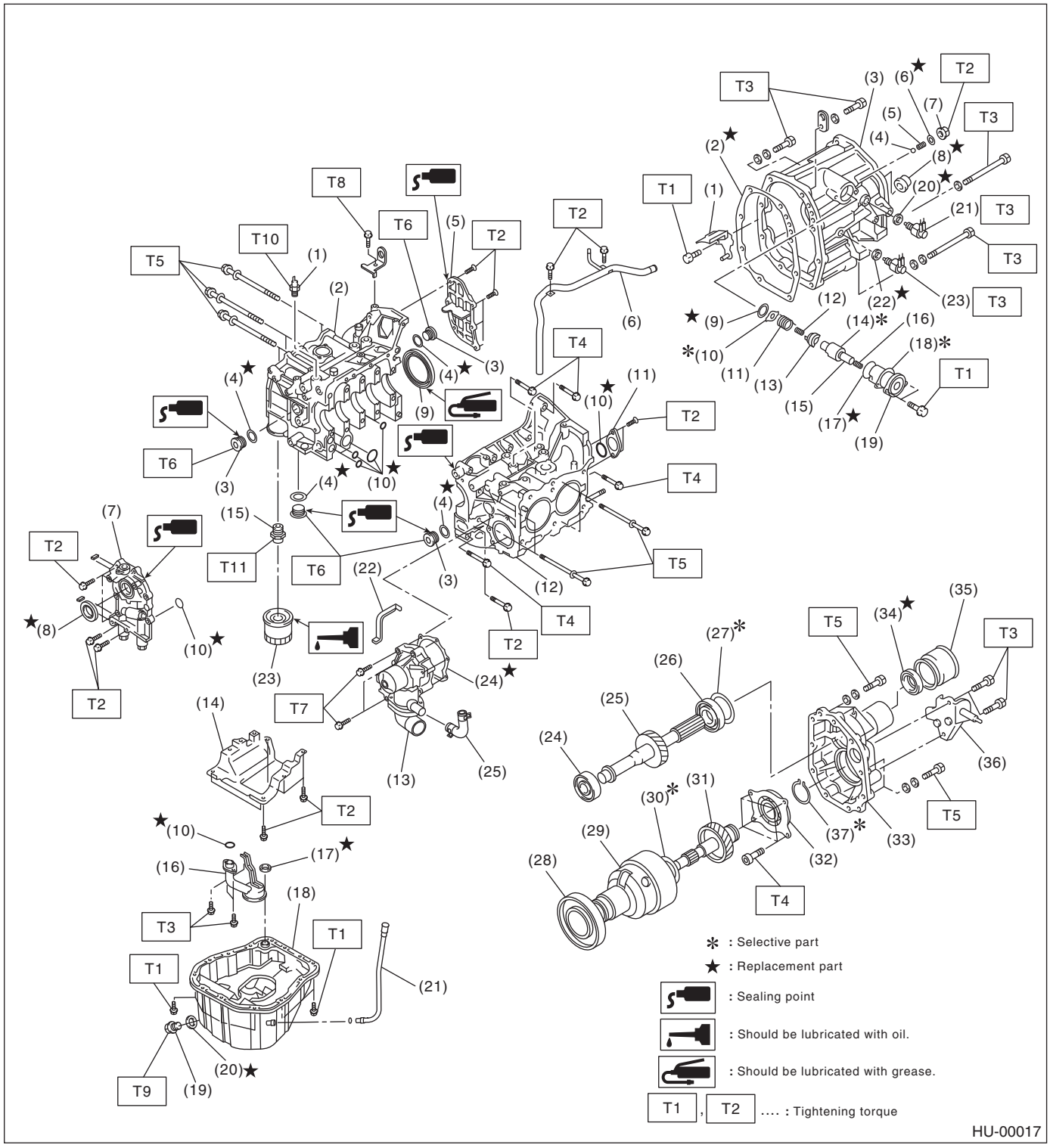
2. CONTENTS

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:



4. DEFINITIONS OF “NOTE”, “CAUTION” AND “WARNING”

- Note:

Describes additional information to make works easier.

- CAUTION:

Describes prohibited matters to prevent vehicle or parts damage, or matters that requires special attention during work.

- WARNING:

Describes matters that may cause serious damage to the operator or other person, or that may cause damage or accident.

5. SPECIFICATION

If necessary, specifications are also included.

6. INSPECTION

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

7. 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 ← (A)

A: REMOVAL ← (B)

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

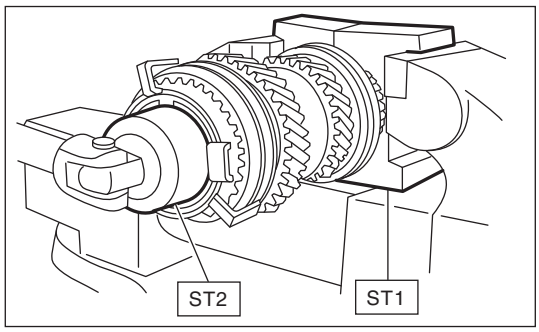
---

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)



← (H)

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

8. DIAGNOSIS

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

9. 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)

List of SI unit

Item	SI units	Conventional unit	Remarks
Force	N (Newton)	kgf	1 kgf = 9.80655 N
Mass (Weight)	kg, g	kg, g	
Capacity	ℓ , m ℓ or cm^3	ℓ or cc	1 cc = 1 cm^3 = 1 m ℓ
Torque	N·m	kgf-m, kgf-cm	1 kgf-m = 9.80655 N·m
Rotating speed	rpm	rpm	
Pressure	kPa (kilopascal)	kgf/cm^2	1 kgf/cm^2 = 98.0655 kPa
		mmHg	1 mmHg = 0.133322 kPa
Power	W	PS	1 PS = 0.735499 kW
Calorie	W·h	cal	1 kcal = 1.16279 W·h
Fuel consumption rate	g/kW·h	g/PS·h	1 g/PS·h = 1.3596 g/kW·h

The figure used in these manuals are described in the SI units and conventional units are described in ( ).

10.EXPLANATION OF TERMINOLOGY

List

2ndr	Secondary
AAI	Air Assist Injection
AAR	Angular Adjusted Roller
A/B	Airbag
ABS	Anti-lock Brake System
A/C	Air Conditioner
AC	Angular Contact
ACC	Accessory
A/F	Air Fuel Ratio
ALT	Generator
APS	Accessory Power Supply Socket
ASSY	Assembly
AT	Automatic Transmission
ATF	Automatic Transmission Fluid
AUX	Auxiliary Storage Unit (External storage)
AVCS	Active Valve Control System
AWD	All Wheel Drive
BATT	Battery
BCU	Brake Control Unit
BJ	Bell Joint
CAN	Controller Area Network
CD	Compact Disc
CD-R/RW	CD Recordable/Rewritable
COMPL	Complete
CPU	Central Processing Unit
DCCD	Driver's Control Center Differential

DOHC	Double Overhead Camshaft
DOJ	Double Offset Joint
DTC	Diagnosis Trouble Code
DVD	Digital Versatile Disc or Digital Video Disc
EBD	Electronic Brake Distribution
EBJ	High-efficiency Compact Ball Fixed Joint
ECM	Engine Control Module
EDJ	High-efficiency Compact Double Offset Joint
E/G	Engine
EGI	Electronic Gasoline Injection
EGR	Exhaust Gas Recirculation
ELR	Emergency Locking Retractor
ETC	Electronic Throttle Control
EX	Exhaust
F/B	Fuse & Joint Box
FL	Fusible Link
Ft	Front
FWD	Front Wheel Drive
GPS	Global Positioning System
HI	High
HID	High-Intensity Discharge
H/L	Headlight
H/U	Hydraulic Unit
HVAC	Heater, Ventilator and Air Conditioner
I/F	Interface

IG	Ignition
IN	Intake
INT	Intermittent
I/O	Input / Output
ISC	Idle Speed Control
LAN	Local Area Network
LCD	Liquid Crystal Display
LED	Light Emitting Diode
LH	LH (Left Hand)
LSD	Limited Slip Differential
M/B	Main Fuse & Relay Box
MD	Mini Disc
MID	Multi Information Display
MFI	Multi-Point Fuel Injection
MP-T	Multi-Plate Transfer
MT	Manual Transmission
NA	Natural Aspiration
NC	Normal Close (Relay)
NO	Normal Open (Relay)
OBD	On-Board Diagnosis
OP	Option Parts
PC	Personal Computer
PCD	Pitch Circle Diameter
PCV	Positive Crankcase Ventilation
PID	Parameter Identification
Pr	Primary
P/S	Power Steering
PTJ	Pillow Tripod Joint
P/W	Power Window
RAM	Random Access Memory
RH	RH (Right Hand)
ROM	Read Only Memory
rpm	Revolution Per Minute
Rr	Rear
SDI	Subaru Diagnostic Interface
SI	Subaru Intelligent
SOHC	Single Overhead Camshaft
SRS	Supplemental Restraint System
SSM	Subaru Select Monitor
ST	Special Tool
STD	Standard
SW	Switch
T/B	Turbocharger
TCS	Traction Control System
TCM	Transmission Control Module
TGV	Tumble Generator Valve
T/M	Transmission
TPMS	Tire Pressure Monitoring System
UJ	Universal Joint
UV	Ultraviolet
VDC	Vehicle Dynamics Control
V.I.N.	Vehicle Identification Number
ViS-C	Viscous Coupling
VSV	Vacuum Switching Valve
VTD	Variable Torque Distribution
W/H	Wiring Harness

SPECIFICATIONS

SPC

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1. Forester

A: DIMENSION

Model				2.5 L	
				AWD	
				Non-turbo	Turbo
Overall length			mm (in)	4,560 (179.5)	
Overall width			mm (in)	1,780 (70.1)	
Total height (at C.W.)			mm (in)	Models without roof rail: 1,675 (65.9) Models with roof rail: 1,700 (66.9)	1,700 (66.9)
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)	2,615 (103.0)	
Tread	Front		mm (in)	1,530 (60.2)	
	Rear		mm (in)	1,530 (60.2)	
Minimum road clearance			mm (in)	220 (8.7)	225 (8.9)

*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	DOHC	DOHC
	Number of valves	Intake 2/Exhaust 2	
Bore × stroke	mm (in)	94.0 × 90.0 (3.70 × 3.54)	99.5 × 79 (3.92 × 3.11)
Displacement	cm^3 (cu in)	2,498 (152.43)	2,457 (149.93)
Compression ratio		10.0	8.4
Ignition order		1 — 3 — 2 — 4	
Idling speed [at neutral position on MT, or “P” or “N” position on AT]	rpm	AT: 675 MT: 650	700
Maximum output	kW (HP)/rpm	126 (170)/5,800	167 (224)/5,200
Maximum torque	N·m (kgf-m, ft-lb)/rpm	235 (24.0, 174)/4,100	307 (31.3, 226)/2,800

C: ELECTRICAL

Model			2.5 L non-turbo	2.5 L turbo
Ignition timing/Idle speed		BTDC/rpm	AT: 16°/675, MT: 16°/650	17°/700
Spark plug			NGK: SILZKAR7B11	NGK: SILFR6A
Generator			12 V — 110 A	12 V — 110 A
Battery	Type and capacity (5HR)		MT: 12 V — 48 AH (55D23L) AT: 12 V — 52 AH (65D23L)	
	CCA		390 A (55D23L) 430 A (65D23L)	

D: TRANSMISSION

1. MT

Model			2.5 L non-turbo
Transmission			5MT
Clutch type			DSPD
Gear ratio		1st	3.454
		2nd	2.062
		3rd	1.448
		4th	1.088
		5th	0.780
		Rev.	3.333
Reduction gear (Front)	Final deceleration	Type	Hypoid
		Gear ratio	4.111
Reduction gear (Rear)	Transfer reduction	Type	Helical
		Gear ratio	1.000
	Final deceleration	Type	Hypoid
		Gear ratio	4.111

5MT: 5-forward speeds and 1-reverse with synchromesh
DSPD: Dry Single Plate Diaphragm

2. AT

Model			2.5 L non-turbo	2.5 L turbo
Transmission			4AT	4AT
Clutch type			TCC	TCC
Gear ratio		1st	2.785	2.785
		2nd	1.545	1.545
		3rd	1.000	1.000
		4th	0.694	0.694
		Rev.	2.272	2.272
Reduction gear (Front)	First deceleration	Type	Helical	
		Gear ratio	1.000	1.000
	Final deceleration	Type	Hypoid	
		Gear ratio	4.444	4.111
Reduction gear (Rear)	Final deceleration	Type	Hypoid	
		Gear ratio	4.444	4.111

4AT: Electronically controlled fully-automatic, 4-forward speeds and 1-reverse
TCC: Torque Converter Clutch

E: STEERING

Type		Rack and Pinion, Integral
Turns, lock to lock		3.2
Minimum turning diameter m (ft)	Curb to curb	10.6 (34.8)
	Wall to wall	11.4 (37.4)

F: SUSPENSION

Front	Macpherson strut type independent suspension
Rear	Double-wishbone type independent suspension

G: BRAKE

Service brake system	Dual circuit hydraulic with vacuum suspended power unit
Front	Ventilated disc brake
Rear	Disc brake
Parking brake	Mechanical on rear brakes

H: TIRE

Model	2.5X, 2.5X Plus, 2.5X PREMIUM, 2.5X LIMITED, 2.5X LIMITED Plus	2.5XT, 2.5XT LIMITED, 2.5XT LIMITED Plus
Wheel size	16 × 6 1/2JJ, 16 × 6 1/2J, 17 × 7JJ 17 × 7J	17 × 7JJ 17 × 7J
Tire size	P215/65R16 96H P225/55R17 95H	P225/55R17 95H
Type	Steel belted radial, tubeless	

I: CAPACITY

Model			2.5 L non-turbo		2.5 L turbo
Transmission			5MT	4AT	4AT
Fuel tank ℓ (US gal, Imp gal)			64 (16.9, 14.1)		
Engine oil ℓ (US qt, Imp qt)	Total capacity (at overhaul)		6.1 (6.4, 5.4)		5.0 (5.3, 4.4)
	Filling amount of engine oil	When replacing engine oil and oil filter	5.2 (5.5, 4.6)		4.2 (4.4, 3.7)
		When replacing engine oil only	5.0 (5.3, 4.4)		4.0 (4.2, 3.5)
Transmission oil ℓ (US qt, Imp qt)			3.5 (3.7, 3.1)	—	
ATF ℓ (US qt, Imp qt)			—	9.3 — 9.6 (9.8 — 10.1, 8.2 — 8.4)	
Front differential gear oil ℓ (US qt, Imp qt)			—	1.1 — 1.3 (1.2 — 1.4, 1.0 — 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)			7.1 (7.5, 6.2)	7.0 (7.4, 6.2)	8.0 (8.5, 7.0)

J: WEIGHT

1. NON-TURBO MODEL

Option code*1			4 X	3O	IO	3 I	OX	DF	BS	UF	UI	61
Engine type			2.5 L non-turbo									
Grade			X	X Plus				X PREMIUM				
Transmission			5MT									
Vehicle weight (C.W.)	Front axle	kg (lb)	810 (1,785)	810 (1,785)	810 (1,785)	820 (1,810)	810 (1,785)	820 (1,810)	815 (1,795)	820 (1,810)	820 (1,810)	820 (1,810)
	Rear axle	kg (lb)	665 (1,465)	670 (1,475)	665 (1,465)	680 (1,500)	665 (1,465)	675 (1,490)	675 (1,490)	675 (1,490)	675 (1,490)	675 (1,490)
	Total	kg (lb)	1,475 (3,250)	1,480 (3,260)	1,475 (3,250)	1,500 (3,310)	1,475 (3,250)	1,495 (3,300)	1490 (3,285)	1,495 (3,300)	1,495 (3,300)	1,495 (3,300)
Total axle weight (G.A.W.)	Front axle	kg (lb)	1,050 (2,310)	1,050 (2,310)	1,050 (2,310)	1,050 (2,310)	1,050 (2,310)	1,050 (2,310)	1,050 (2,310)	1,050 (2,310)	1,050 (2,310)	1,050 (2,310)
	Rear axle	kg (lb)	1,095 (2,410)	1,095 (2,410)	1,095 (2,410)	1,095 (2,410)	1,095 (2,410)	1,095 (2,410)	1,095 (2,410)	1,095 (2,410)	1,095 (2,410)	1,095 (2,410)
Gross vehicle weight (G.V.W.)		kg (lb)	2,035 (4,480)	2,035 (4,480)	2,035 (4,480)	2,035 (4,480)	2,035 (4,480)	2,035 (4,480)	2,035 (4,480)	2,035 (4,480)	2,035 (4,480)	2,035 (4,480)
Option	Aluminum wheel (16-inch)		—	—	○	—	○	—	○	—	—	○
	Aluminum wheel (17-inch)		—	—	—	—	—	○	—	○	○	—
	Leather seat and leather door trim center ornament		—	—	—	—	—	—	—	—	—	—
	Power seat		—	—	○	—	—	○	—	○	○	○
	Cruise control		○	○	○	○	○	○	○	○	○	○
	Front fog light		—	—	—	—	—	○	○	—	—	—
	HID headlight		—	—	—	—	—	—	—	—	—	—
	Dark colored glass		—	○	○	○	—	○	○	○	○	○
	Sunroof		—	—	—	○	—	○	○	○	○	○
	High grade audio		—	—	—	—	—	—	○	—	—	—
	High grade audio display		—	—	—	—	—	—	—	—	—	—
	Navigation system		—	—	—	—	—	—	—	—	—	—
	Seat heater		—	○	○	—	—	○	—	○	—	○
	Front wiper deicer		—	—	—	—	—	○	○	○	—	○
	Heated mirror		—	○	○	—	—	○	○	○	—	○
	Roof rail		—	○	○	○	○	○	○	○	○	○
	Air Conditioner		○	○	○	○	○	○	○	○	○	○
	Side airbag		○	○	○	○	○	○	○	○	○	○
	Curtain airbag		○	○	○	○	○	○	○	○	○	○
	Spoiler		—	—	—	—	—	—	—	—	—	—

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

Option code*1			4X	3O	3I	IO	62	OX	DF	BS	UF	UI	61
Engine type			2.5 L non-turbo										
Grade			X	X Plus					X PREMIUM				
Transmission			4AT										
Vehicle weight (C.W.)	Front axle	kg (lb)	820 (1,810)	820 (1,810)	830 (1,830)	820 (1,810)	820 (1,810)	820 (1,810)	830 (1,830)	825 (1,820)	830 (1,830)	830 (1,830)	830 (1,830)
	Rear axle	kg (lb)	675 (1,490)	680 (1,500)	690 (1,520)	675 (1,490)	675 (1,490)	675 (1,490)	685 (1,510)	685 (1,510)	685 (1,510)	685 (1,510)	685 (1,510)
	Total	kg (lb)	1,495 (3,300)	1,500 (3,310)	1,520 (3,350)	1,495 (3,300)	1,495 (3,300)	1,495 (3,285)	1,515 (3,340)	1,510 (3,330)	1,515 (3,340)	1,515 (3,340)	1,515 (3,340)
Total axle weight (G.A.W.)	Front axle	kg (lb)	1,050 (2,310)	1,050 (2,310)	1,050 (2,310)	1,050 (2,310)	1,050 (2,310)	1,050 (2,310)	1,050 (2,310)	1,050 (2,310)	1,050 (2,310)	1,050 (2,310)	1,050 (2,310)
	Rear axle	kg (lb)	1,095 (2,410)	1,095 (2,410)	1,095 (2,410)	1,095 (2,410)	1,095 (2,410)	1,095 (2,410)	1,095 (2,410)	1,095 (2,410)	1,095 (2,410)	1,095 (2,410)	1,095 (2,410)
Gross vehicle weight (G.V.W.)		kg (lb)	2,035 (4,480)	2,035 (4,480)	2,035 (4,480)	2,035 (4,480)	2,035 (4,480)	2,035 (4,480)	2,035 (4,480)	2,035 (4,480)	2,035 (4,480)	2,035 (4,480)	2,035 (4,480)
Option	Aluminum wheel (16-inch)		—	—	—	○	○	○	—	○	—	—	—
	Aluminum wheel (17-inch)		—	—	—	—	—	—	○	—	○	○	○
	Leather seat and leather door trim center ornament		—	—	—	—	—	—	—	—	—	—	—
	Power seat		—	—	—	○	○	—	○	—	○	○	○
	Cruise control		○	○	○	○	○	○	○	○	○	○	○
	Front fog light		—	—	—	—	—	—	○	○	—	—	—
	HID headlight		—	—	—	—	—	—	—	—	—	—	—
	Dark colored glass		—	○	○	○	○	—	○	○	○	○	○
	Sunroof		—	—	○	—	—	—	○	○	○	○	○
	High grade audio		—	—	—	—	—	—	—	○	—	—	—
	High grade audio display		—	—	—	—	—	—	—	—	—	—	—
	Navigation system		—	—	—	—	—	—	—	—	—	—	—
	Seat heater		—	○	—	○	○	—	○	—	○	—	○
	Front wiper deicer		—	—	—	—	—	—	○	○	○	—	○
	Heated mirror		—	○	—	○	○	—	○	○	○	—	○
	Roof rail		—	○	○	○	○	○	○	○	○	○	○
	Air Conditioner		○	○	○	○	○	○	○	○	○	○	○
	Side airbag		○	○	○	○	○	○	○	○	○	○	○
	Curtain airbag		○	○	○	○	○	○	○	○	○	○	○
	Spoiler		—	—	—	—	—	—	—	—	—	—	—

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

Option code*1			MD	75	MF	NB	TF	ND	NT	MF	MD	MT
Engine type			2.5 L non-turbo									
Grade			X LIMITED							X LIMITED Plus		
Transmission			4AT									
Vehicle weight (C.W.)	Front axle	kg (lb)	835 (1,840)	835 (1,840)	835 (1,840)	835 (1,840)	835 (1,840)	835 (1,840)	835 (1,840)	835 (1,840)	835 (1,840)	835 (1,840)
	Rear axle	kg (lb)	690 (1,520)	690 (1,520)	690 (1,520)	690 (1,520)	690 (1,520)	690 (1,520)	690 (1,520)	690 (1,520)	690 (1,520)	690 (1,520)
	Total	kg (lb)	1,525 (3,360)	1,525 (3,360)	1,525 (3,360)	1,525 (3,360)	1,525 (3,360)	1,525 (3,360)	1,525 (3,360)	1,525 (3,360)	1,525 (3,360)	1,525 (3,360)
Total axle weight (G.A.W.)	Front axle	kg (lb)	1,050 (2,310)	1,050 (2,310)	1,050 (2,310)	1,050 (2,310)	1,050 (2,310)	1,050 (2,310)	1,050 (2,310)	1,050 (2,310)	1,050 (2,310)	1,050 (2,310)
	Rear axle	kg (lb)	1,095 (2,410)	1,095 (2,410)	1,095 (2,410)	1,095 (2,410)	1,095 (2,410)	1,095 (2,410)	1,095 (2,410)	1,095 (2,410)	1,095 (2,410)	1,095 (2,410)
Gross vehicle weight (G.V.W.)		kg (lb)	2,035 (4,480)	2,035 (4,480)	2,035 (4,480)	2,035 (4,480)	2,035 (4,480)	2,035 (4,480)	2,035 (4,480)	2,035 (4,480)	2,035 (4,480)	2,035 (4,480)
Option	Aluminum wheel (16-inch)		—	—	—	—	—	—	—	—	—	—
	Aluminum wheel (17-inch)		○	○	○	○	○	○	○	○	○	○
	Leather seat and leather door trim center ornament		○	○	○	○	○	○	○	○	○	○
	Power seat		○	○	○	○	○	○	○	○	○	○
	Cruise control		○	○	○	○	○	○	○	○	○	○
	Front fog light		○	○	○	○	○	○	○	○	○	○
	HID headlight		○	○	○	—	○	—	—	○	○	○
	Dark colored glass		○	○	○	○	—	○	○	○	○	○
	Sunroof		○	○	○	○	○	○	○	○	○	○
	High grade audio		—	—	—	○	—	—	—	—	—	—
	High grade audio display		—	—	—	—	—	—	○	—	—	○
	Navigation system		○	—	—	—	—	○	—	—	○	—
	Seat heater		○	○	○	○	○	○	○	○	○	○
	Front wiper deicer		○	○	○	○	○	○	○	○	○	○
	Heated mirror		○	○	○	○	○	○	○	○	○	○
	Roof rail		○	○	○	○	○	○	○	○	○	○
	Air Conditioner		○	○	○	○	○	○	○	○	○	○
	Side airbag		○	○	○	○	○	○	○	○	○	○
	Curtain airbag		○	○	○	○	○	○	○	○	○	○
	Spoiler		—	—	—	—	—	—	—	—	—	—

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

2. TURBO MODEL

Option code*1			UI	MD	75	MF	NB	MD	MT
Engine type			2.5 L turbo						
Grade			XT	XT LIMITED				XT LIMITED Plus	
Transmission			4AT						
Vehicle weight (C.W.)	Front axle	kg (lb)	855 (1,885)	860 (1,895)	860 (1,895)	860 (1,895)	860 (1,895)	860 (1,895)	860 (1,895)
	Rear axle	kg (lb)	710 (1,565)	710 (1,565)	710 (1,565)	710 (1,565)	710 (1,565)	710 (1,565)	710 (1,565)
	Total	kg (lb)	1,565 (3,450)	1,570 (3,460)	1,570 (3,460)	1,570 (3,460)	1,570 (3,460)	1,570 (3,460)	1,570 (3,460)
Total axle weight (G.A.W.)	Front axle	kg (lb)	1,050 (2,310)	1,050 (2,310)	1,050 (2,310)	1,050 (2,310)	1,050 (2,310)	1,050 (2,310)	1,050 (2,310)
	Rear axle	kg (lb)	1,095 (2,410)	1,095 (2,410)	1,095 (2,410)	1,095 (2,410)	1,095 (2,410)	1,095 (2,410)	1,095 (2,410)
Gross vehicle weight (G.V.W.)		kg (lb)	2,055 (4,525)	2,055 (4,525)	2,055 (4,525)	2,055 (4,525)	2,055 (4,525)	2,055 (4,525)	2,055 (4,525)
Option	Aluminum wheel (16-inch)		—	—	—	—	—	—	—
	Aluminum wheel (17-inch)		○	○	○	○	○	○	○
	Leather seat and leather door trim center ornament		—	○	○	○	○	○	○
	Power seat		○	○	○	○	○	○	○
	Cruise control		○	○	○	○	○	○	○
	Front fog light		—	○	○	○	○	○	○
	HID headlight		—	○	○	○	—	○	○
	Dark colored glass		○	○	○	○	○	○	○
	Sunroof		○	○	○	○	○	○	○
	High grade audio		—	—	—	—	○	—	—
	High grade audio display		○	—	—	—	—	—	○
	Navigation system		—	○	—	—	—	○	—
	Seat heater		—	○	○	○	○	○	○
	Front wiper deicer		—	○	○	○	○	○	○
	Heated mirror		—	○	○	○	○	○	○
	Roof rail		○	○	○	○	○	○	○
	Air conditioner		○	○	○	○	○	○	○
	Side airbag		○	○	○	○	○	○	○
	Curtain airbag		○	○	○	○	○	○	○
	Spoiler		○	○	○	○	○	○	○

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

PRECAUTION

PC

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1. Precaution 2

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. VEHICLE DYNAMICS CONTROL (VDC)

Handle the VDC as a total system. Do not disassemble or attempt to repair individual parts. Follow the directions in this manual when performing maintenance on the VDCCM&H/U. When parts other than those specified are disassembled, it is possible that the VDC system will not operate when needed or cause it to operate incorrectly and result in injury.

2. BRAKE FLUID

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

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

3. 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.

4. ROAD TEST

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

5. 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, front fender), around side of the vehicle (front door, rear door, center pillar, rear fender, side sill, rear wheel apron), around rear of the vehicle (rear seat cushion, rear floor, rear crossmember) 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 60 seconds to discharge backup power supply before starting work.

6. 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.

7. AIRBAG MODULE

Adhere to the following when handing 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.

8. AIRBAG SPECIAL TOOL

To prevent unexpected deployment, only use special tools.

9. WINDOW

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

10.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.

11.OIL

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

- Prepare a container and cloth to prevent scattering of oil when performing work where oil 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.

12.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.

13.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.

14.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 recycle it.

15.REMOVAL AND INSTALLATION OPERATION OF HOSES, ETC.

1. Before the removal and installation operation of hoses, etc.

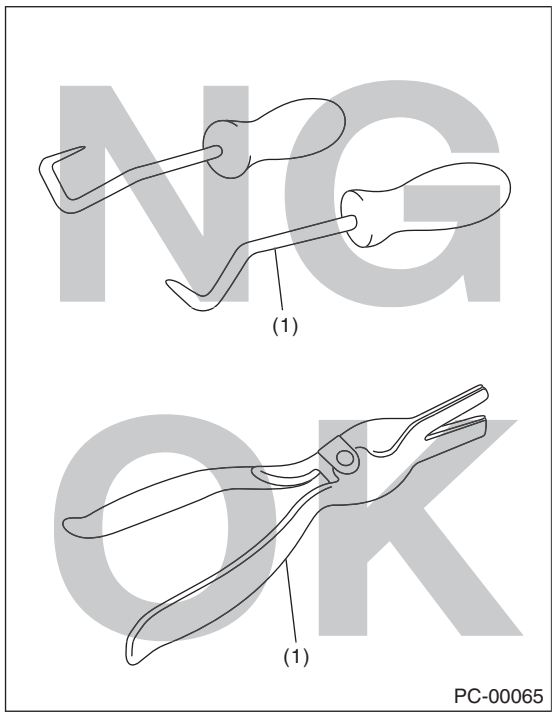
• If you keep using the damaged or deformed hose, it results bleeds or leakage of the fat adheres or disconnection of the hose. Be careful not to spill fat adheres on exhaust pipes, etc. during maintenance to prevent emitting smoke or causing fires.

• Perform the operation with the hose removed. If the operation is performed without removing the hose, it may damage inner surface of the hose.

2. Removal and installation operation of hoses, etc. during the inspection

• Follow the instructions below when removing hose.

• Do not use a pointed hose remover (hose plucker) when using a general hose remover. It may damage the pipe surface or the hose.

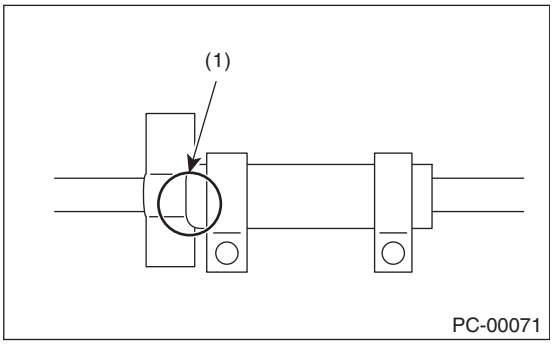


(1) Hose remover

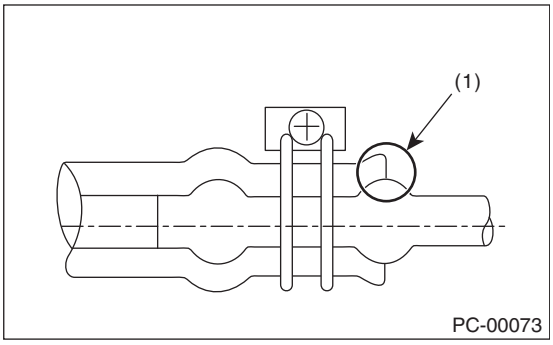
• When draining hose using pliers, be sure to cover the hose with cloth and rotate the hose slightly to extract straight.

• If you keep using the hose, perform the inspection below and replace the hose with a new part if faulty.

• Replace the hose with a new part if it rides over the stay or spool.



(1) Hose rides over the stay



(1) Hose rides over the spool

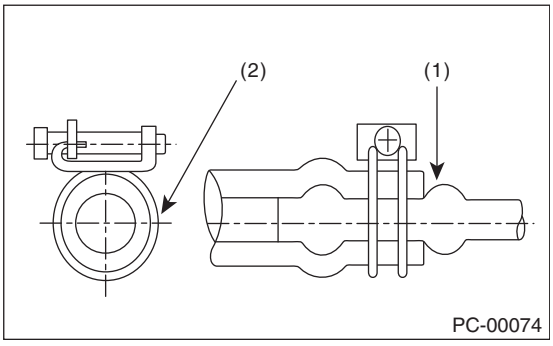
• Check if the surface and the inner surface of the hose are damaged, cracked, bend, hardened, softened, swelled, peeled or deformed due to the adherence or the entry of the foreign matter by bending the hose. Replace with the new part if faulty.

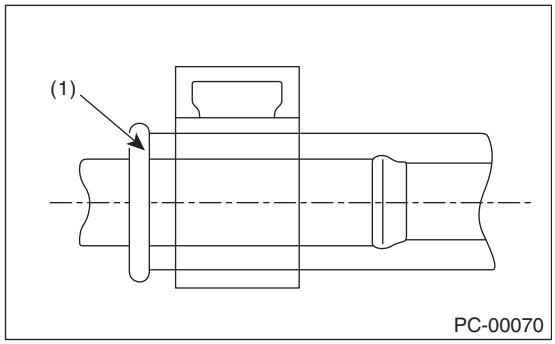
• Follow the instructions below during installation.

• Check carefully for assembling position.

• Never use lubricants.

• Insert the hose to the specified position (stopper or spool) securely.





(1) Push against the spool. (Insert the hose and prevent it from becoming wrinkled.)

(2) Tighten the hose outwards and apply force thoroughly.

• Check if the position, direction and hose layout of the hose clamp are correct. (Check if the position, direction, length and the gap around are correct, or if it is different from the condition before the work)

• After the installation, check that the hose is installed securely and there is no leakage. (Check if it is fixed securely with the clamp)

• For hose clips and hose clamps, perform the inspection below and replace them with a new part if faulty.

• Check for deformation, rust, damage or foreign matters.

• For hose clip, check if it works and has clamping force.

• For hose clamp, check if it can tighten screw, not ovalized or the screw is not damaged.

• For hose pipes, perform the inspection below and replace with a new part if faulty.

Check if the pipe is not damaged, rusted, peeled (peeled plates included), covered with foreign matter, bent, compressed or cracked.

• For the parts below, replaces with a new part when the hose is removed or the installation position is changed.

ATF cooler hose, power steering suction hose, power steering return hose, fuel hose (delivery/return)

NOTE

NT

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1. Note 2

1. Note

A: NOTE

This information will improve the efficiency of maintenance and assure the sound work.

1. FASTENERS 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 SECURITY DURING WORK

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

7. LIFT AND JACK

When using a lift or shop jack to raise a vehicle or using rigid rack 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.

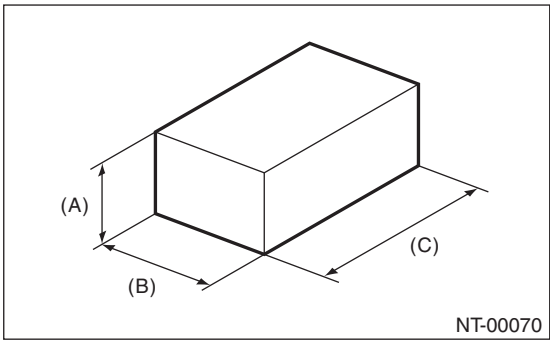
CAUTION:

• When the side sill spoiler interferes with the lift arm, a grooveless attachment can be used. In this case, perform the operation carefully because the dislocation from the side sill flange may occur.

• Make sure to use the spacer or attachment and jack up at the jack-up point so that the lift does not contact the side sill spoiler.

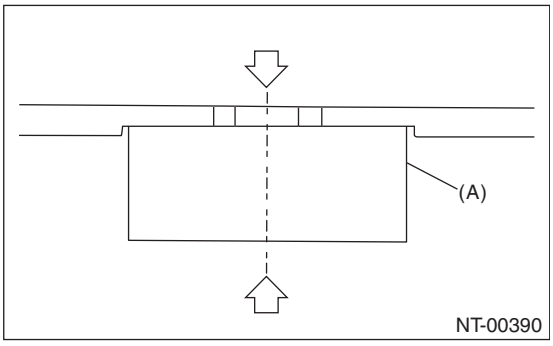
NOTE:

- When using a lift, follow its operation manual.
- When using, insert the body flange to the attachment groove.
- When the side sill spoiler contacts the lift arm, use a lift attachment.
- Do not work or leave unattended while the vehicle is supported with jack, support it with rigid racks.
- Be sure to use the rigid racks with rubber attached to cradle to support the vehicle.
- When using a plate lift, use a rubber attachment.



(A) 80 mm (3.1 in) or more
(B) 100 — 150 mm (3.94 — 5.91 in)
(C) 120 — 180 mm (4.72 — 7.09 in)

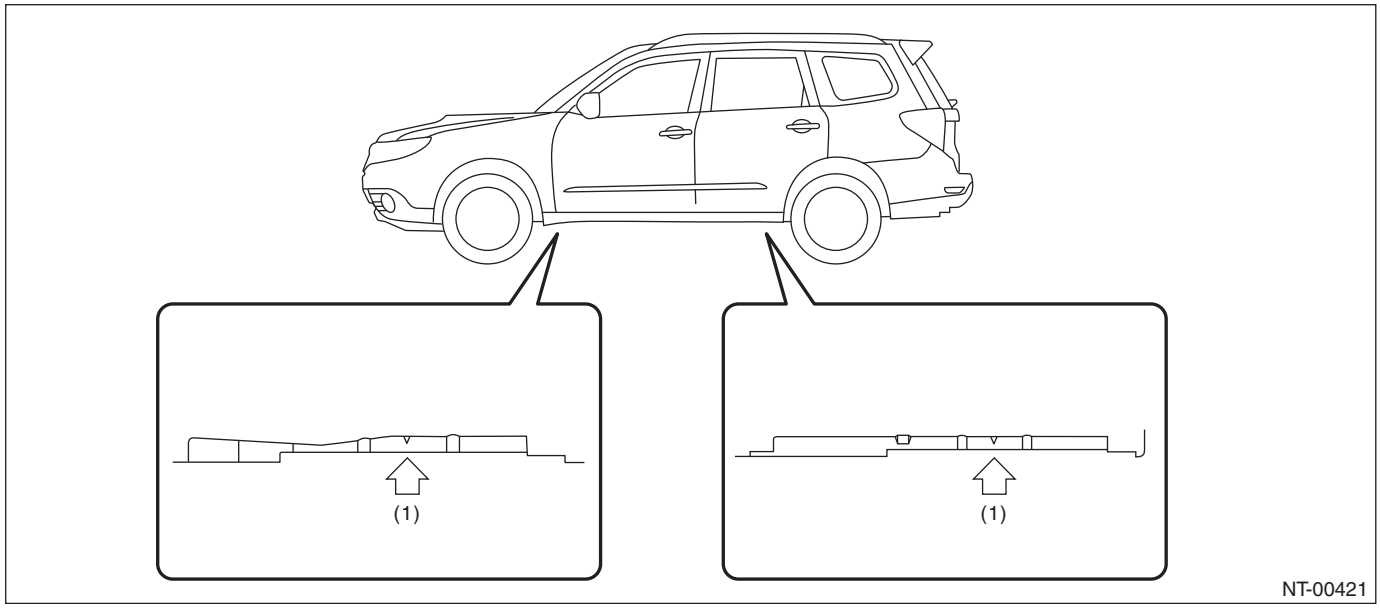
• When using an attachment, align the center of attachment (A) with the center of vehicle cutout portion (the center of spoiler cutout portion).



- Do not use the plate lift whose attachment does not reach the supporting locations.

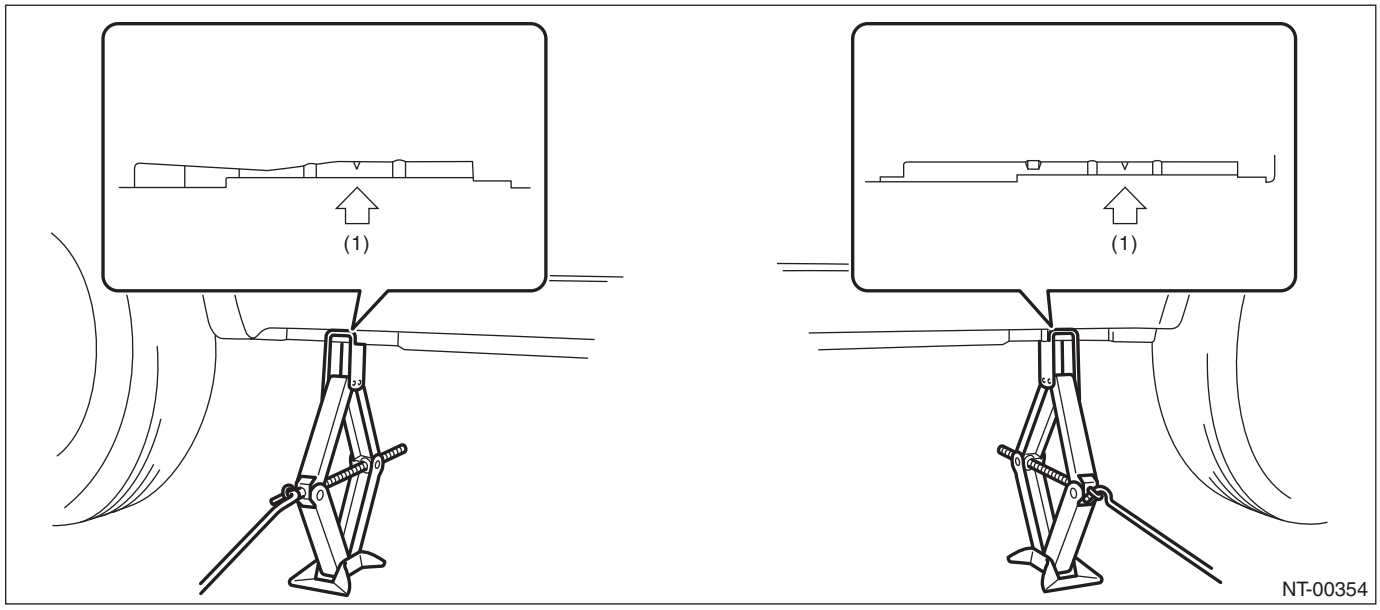
NOTE

Support locations



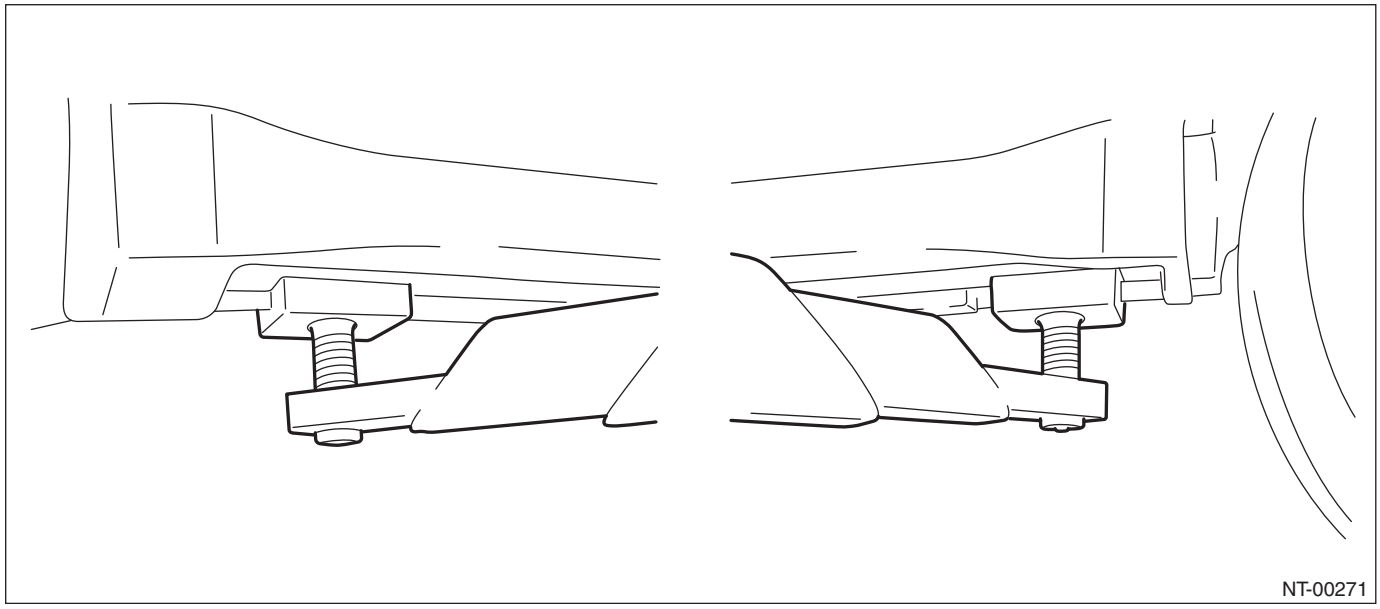
(1) Jack-up point

Pantograph jack

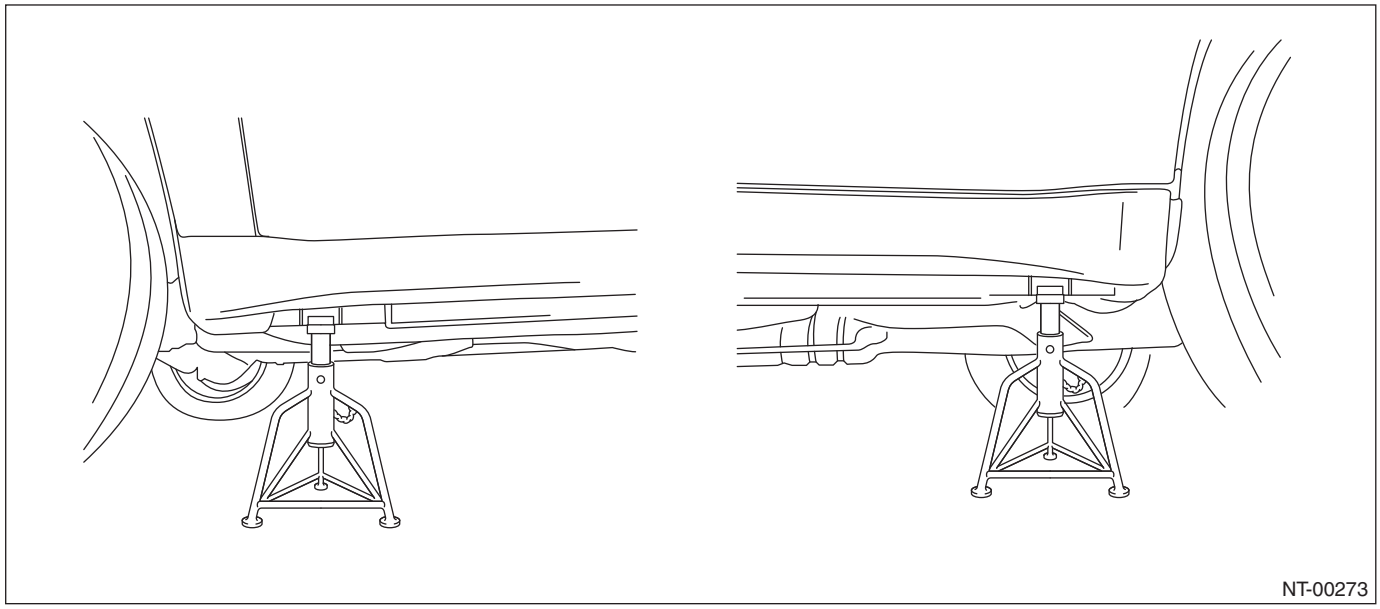


(1) Jack-up point

Lift

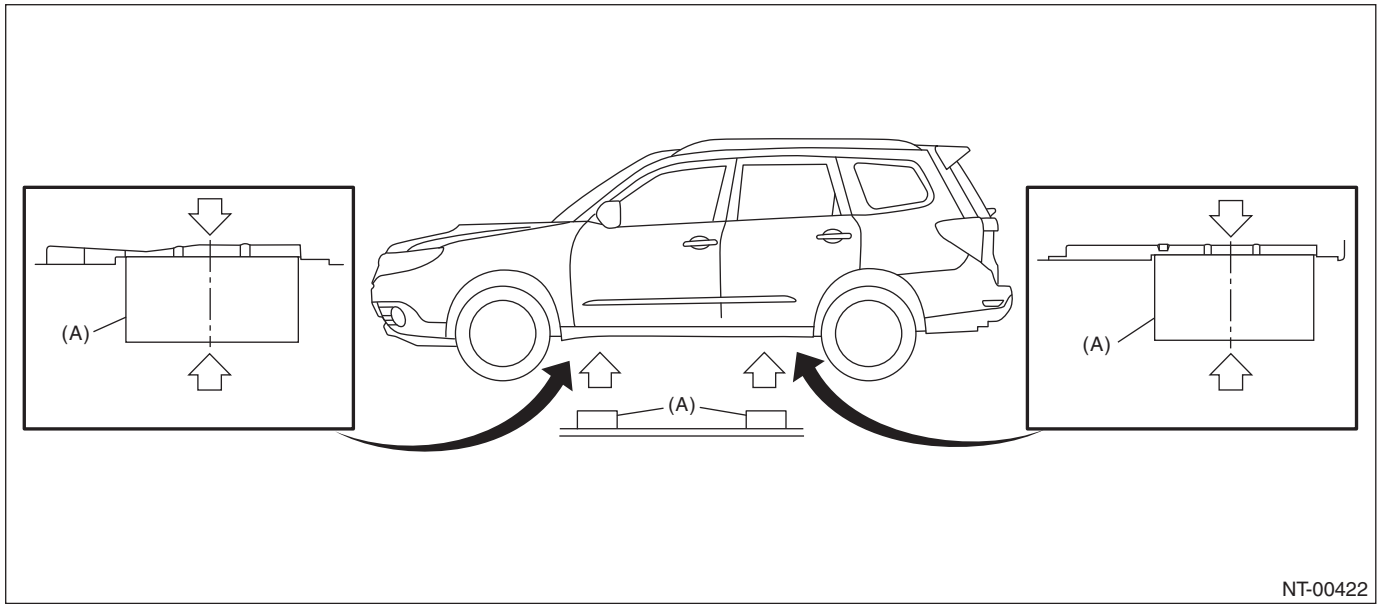


Rigid rack



NOTE

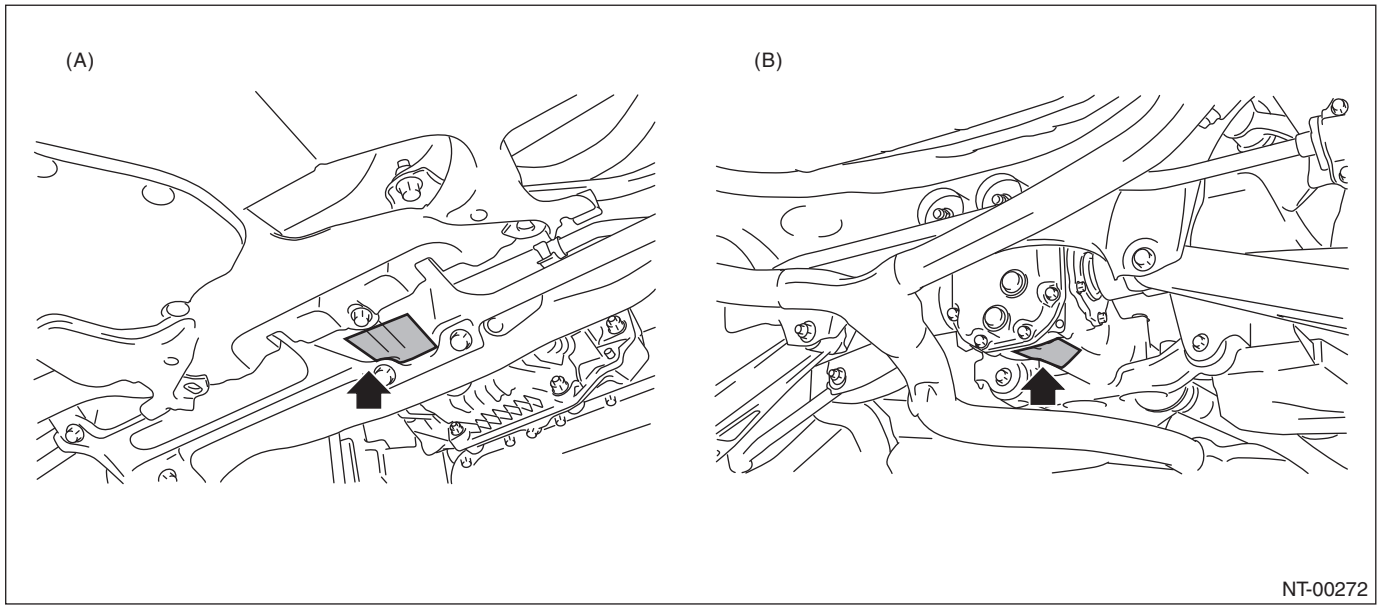
Plate lift



(A) Attachment

Jack-up point

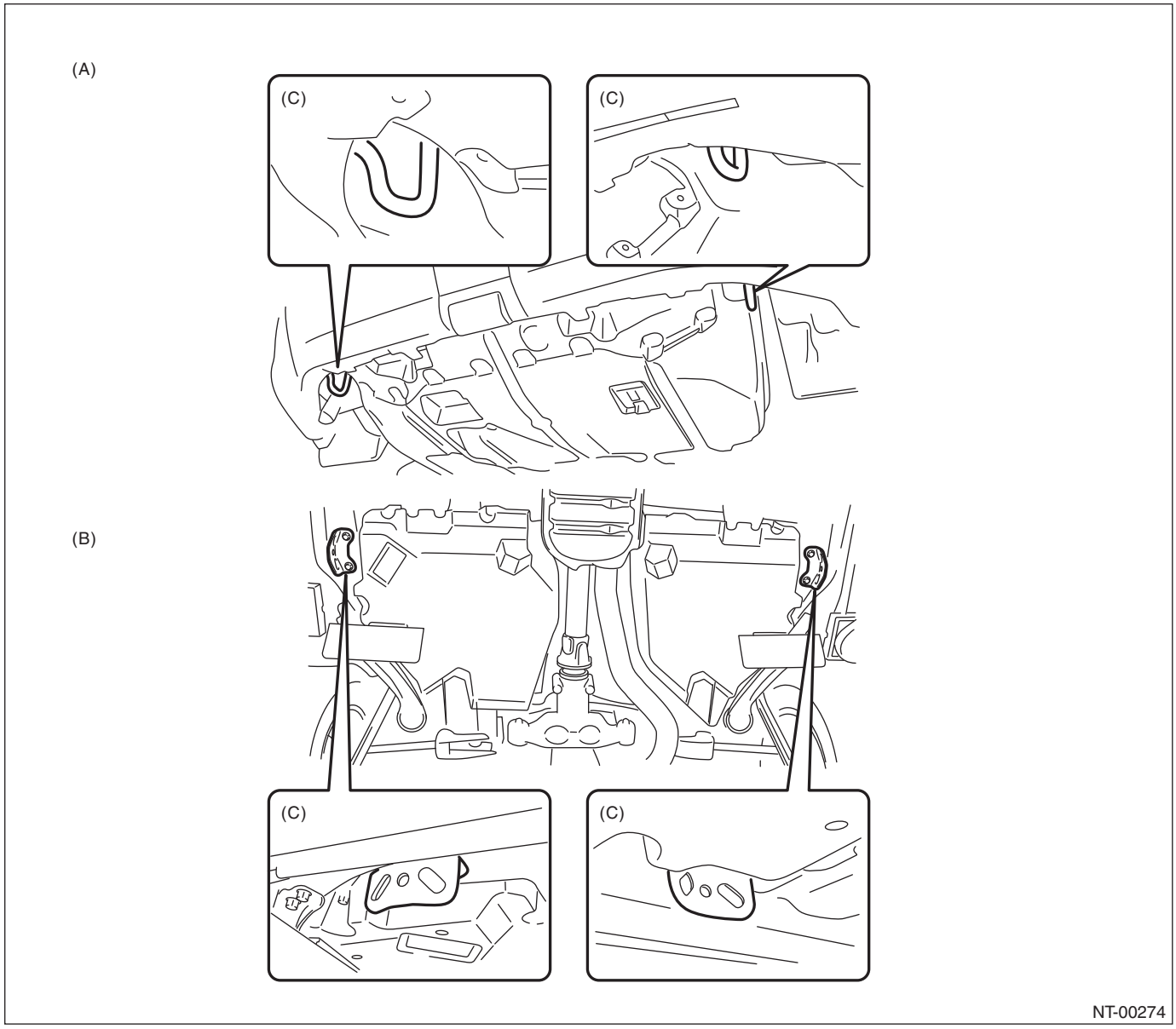
CAUTION:
If jacking up the front side of the vehicle, make sure that the jack is attached at the center of the jack-up plate not at the sides.



(A) Front (B) Rear

8. TIE-DOWNS

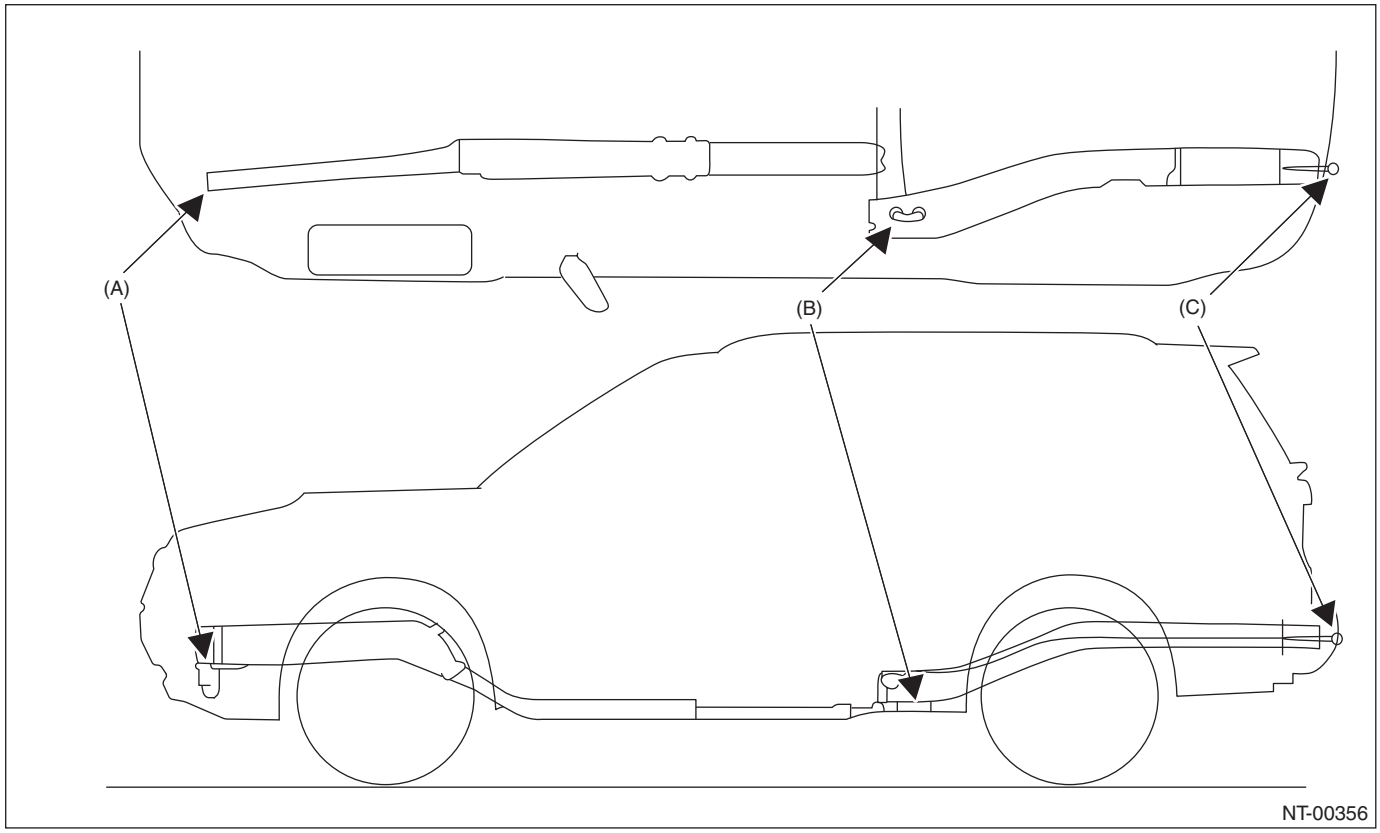
Tie-downs are used when transporting vehicles and when using the chassis dynamo. Attach tie-down only to the specified place on the vehicle.



(A) Front (B) Rear (C) Hook for tie-down

NOTE

- **TIE-DOWN HOOK & EYE BOLT**



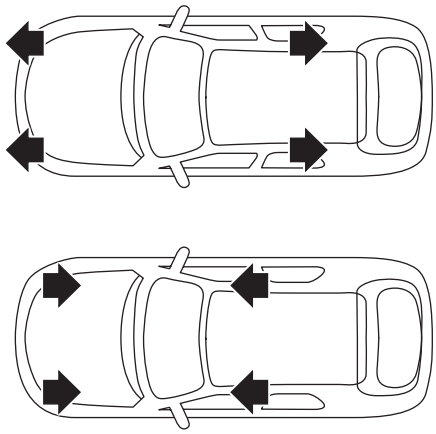
(A) Front tie-down hook (B) Rear tie-down hook (C) Eye bolt

• TIE-DOWN DIRECTION

CAUTION:

• Pull the tie-down chains LH and RH in the same direction, but front and rear side in the counter direction.

• Directions except the followings (recommended) are not allowed.

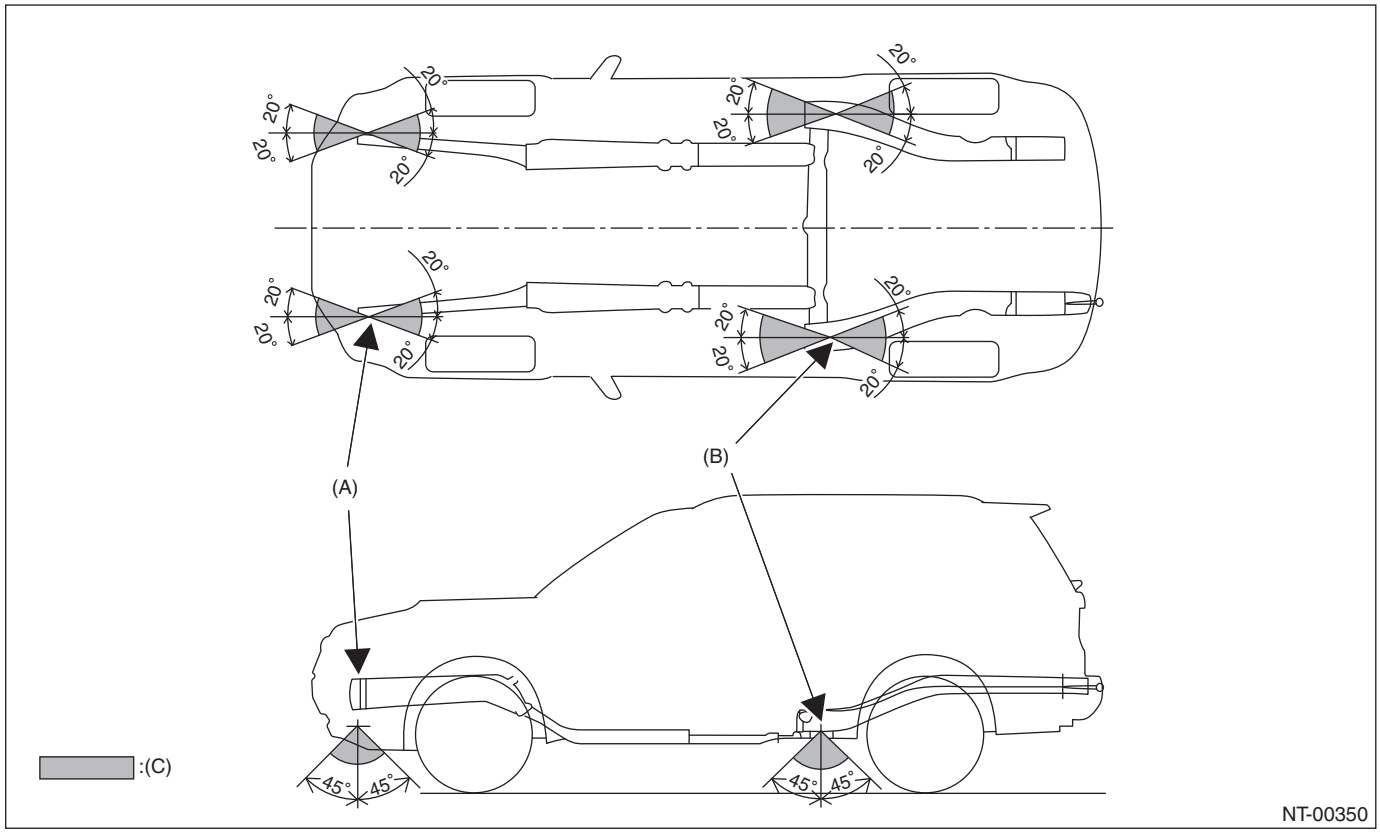
	Recommended
Tie-down direction	 NT-00214

NOTE

- **TIE-DOWN RANGE**

For ground transportation

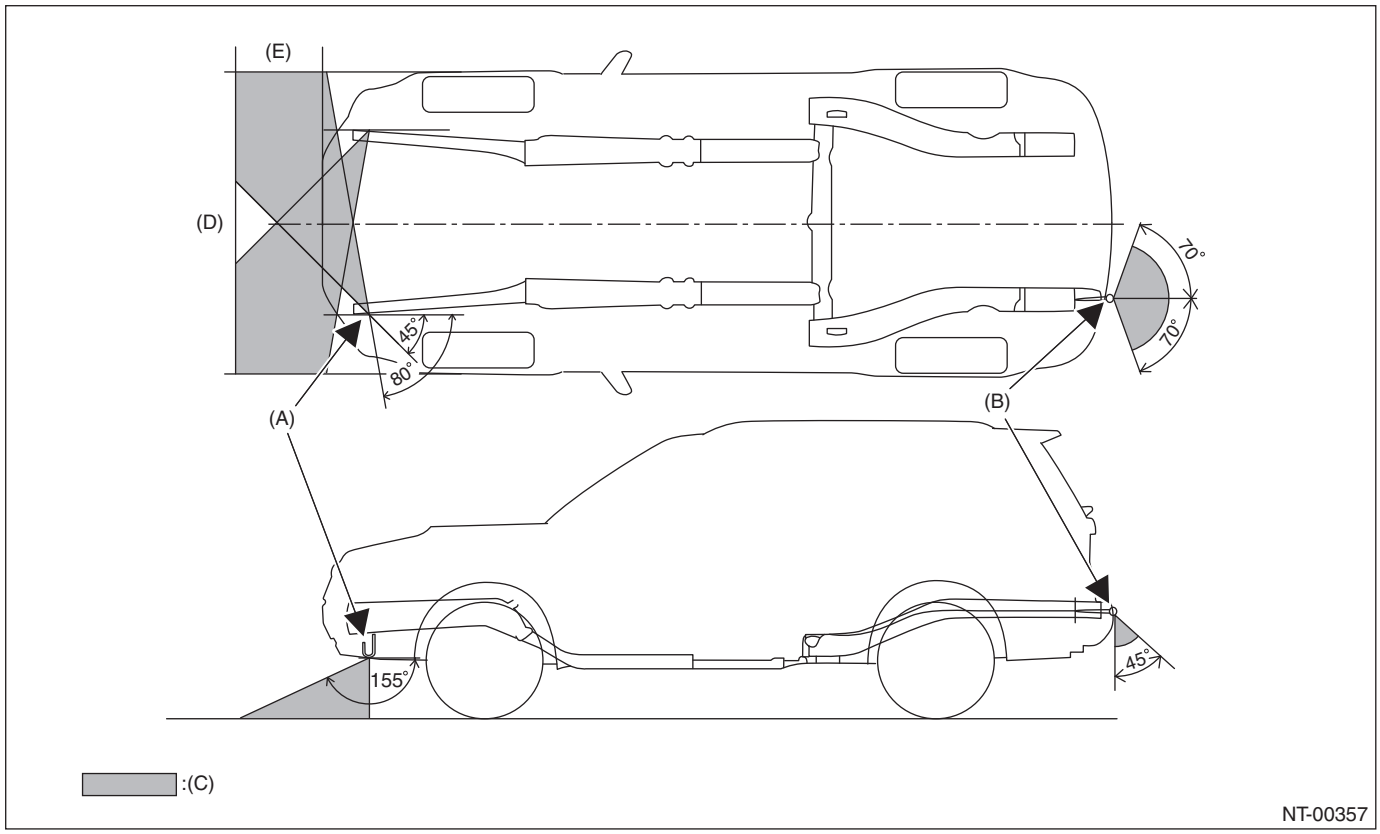
CAUTION:
When the vehicle is tied down from vehicle inside, hook the hooks of tie-down chain on the rear tie-down hooks from vehicle inside. When the vehicle is tied down from vehicle outside, hook the hooks of tie-down chain on the rear tie-down hooks from vehicle outside.



(A) Front tie-down hook
(B) Rear tie-down hook
(C) Chain pulling range at tie-down condition

For sea transportation

CAUTION:
The eye bolts are exclusively used for towing and sea transportation tie-down, and do not use them for ground and freight transportation.

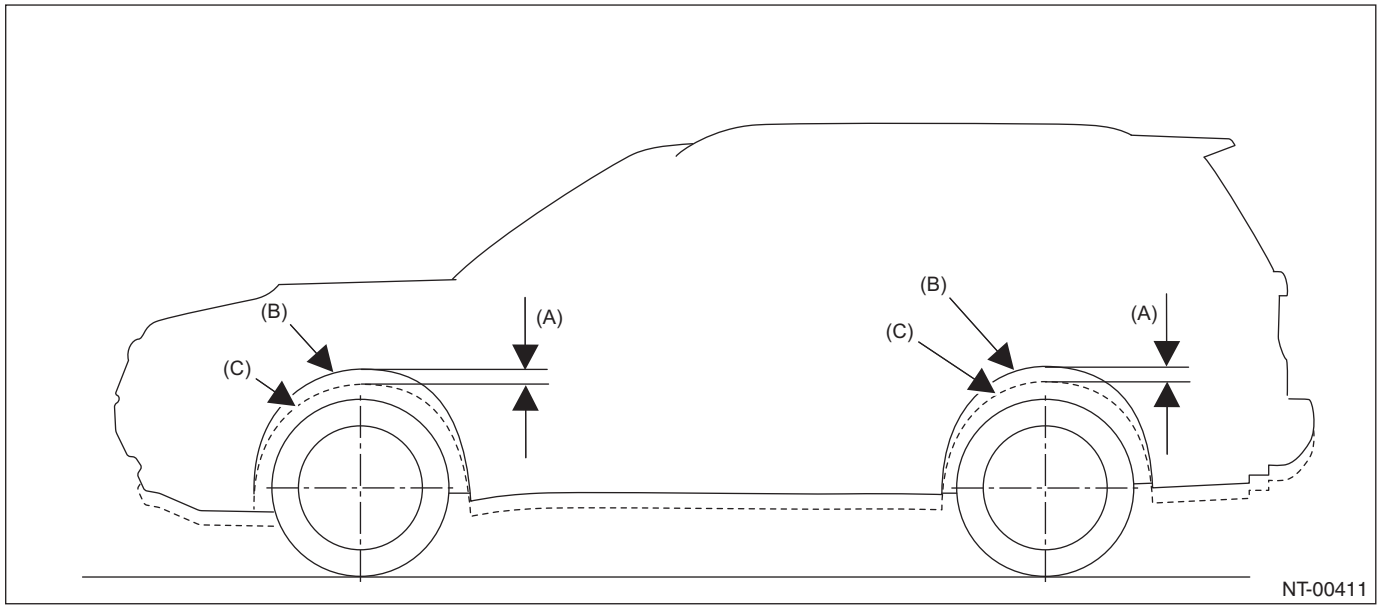


(A) Front tie-down hook
(B) Eye bolt
(C) Chain pulling range at tie-down condition
(D) Vehicle width
(E) 400 mm (15.7 in)

NOTE

- **VEHICLE SINKING VOLUME AT TIE-DOWN CONDITION**

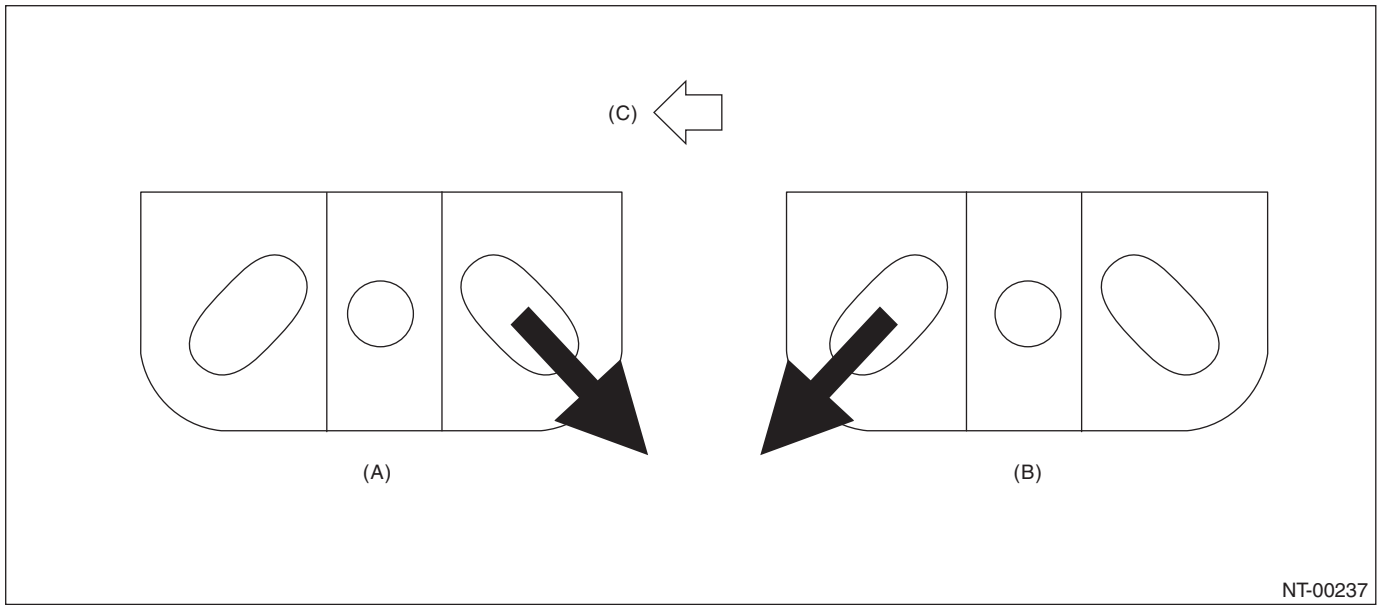
CAUTION:
The vehicle sinking volume at tie-down condition should be less than 50 mm (1.97 in) and make sure to fix the vehicle securely.
Check to see if the tensions of chains or belts at tie-down condition are appropriate in the following procedures.
1) Before tie-down, measure the distance between the highest tire point and highest arch point at the center of wheel.
2) After tie-down, measure the distance between the highest tire point and highest arch point at the center of wheel.
3) If the distance (A) between the measured value of 1) and 2) above, is less than 50 mm (1.97 in), it is judged as OK. If the distance is 50 mm (1.97 in) or more, it is judged as NG because the tension is too high.



(B) Arch position before tie-down (C) Arch position after tie-down

• NOTES FOR THE USE OF TIE-DOWN HOOK

When the vehicle is tied down from the rear side, use the holes at the rear side, and when the vehicle is tied down from the front side, use the holes at the front side.
When the vehicle is tied down from vehicle inside, hook the hooks of tie-down chain from vehicle inside, and when the vehicle is tied down from vehicle outside, hook the hooks of tie-down chain from vehicle outside.



(A) When the vehicle is tied down towards the rear side

(B) When the vehicle is tied down towards the front side

(C) Vehicle front

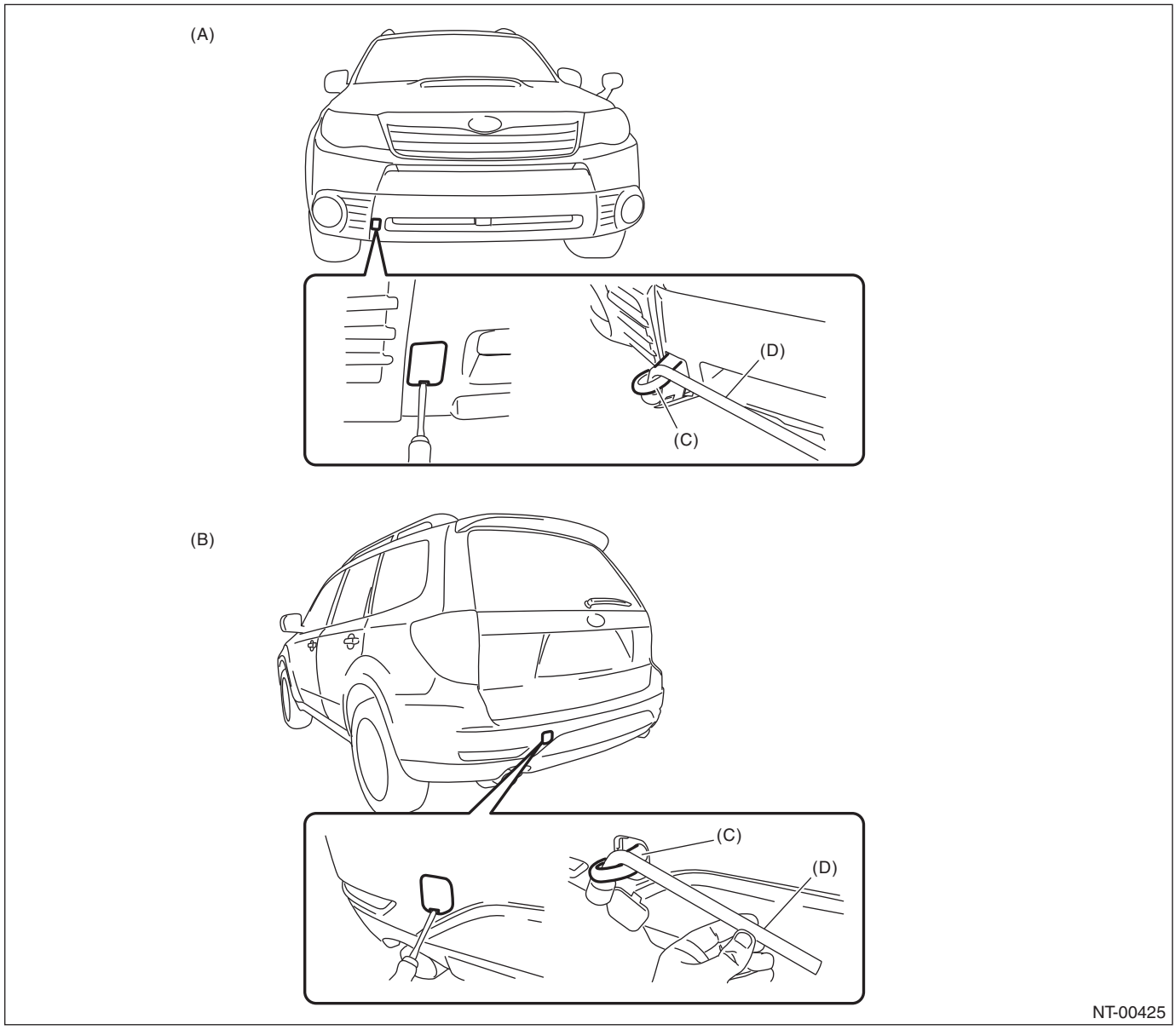
NOTE

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.

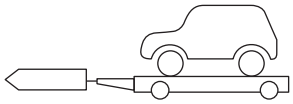
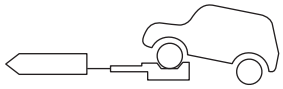
- Do not tow other vehicles with a front tie-down hook.
- Make sure the vehicle towing is heavier than the vehicle being towed.
- When towing the vehicle, install the towing hook (eye bolt).

CAUTION:
When tightening the eye bolt using a wheel wrench, be careful not to scratch the bumper.



(A) Front (B) Rear (C) Towing hook (eyebolt)
(D) Wheel wrench

- Precautions

Towing	Precautions	MT	AT
Lifting up four wheels (On a trailer)  NT-00023	Towing the vehicle after lifting up all four wheels is a basic rule for AWD model.	○	○
Rope NT-00024	• Check if both front and rear wheels are rotated normally. • AT model driving conditions: Driving speed of 30 km/h (19 MPH) or less Allow driving distance 50 km (31 miles) or less	○	▲
Raising the front wheels  NT-00025	Prohibited for full-time AWD model.	×	×
Lifting up the front wheels NT-00026	• Prohibited, due to damage on bumper, front grille, etc. • Do not raise the vehicle with bumper.	×	×

Marked ○ : OK, Marked × : Prohibited, Marked ▲ : Conditionally OK.

Note

NOTE

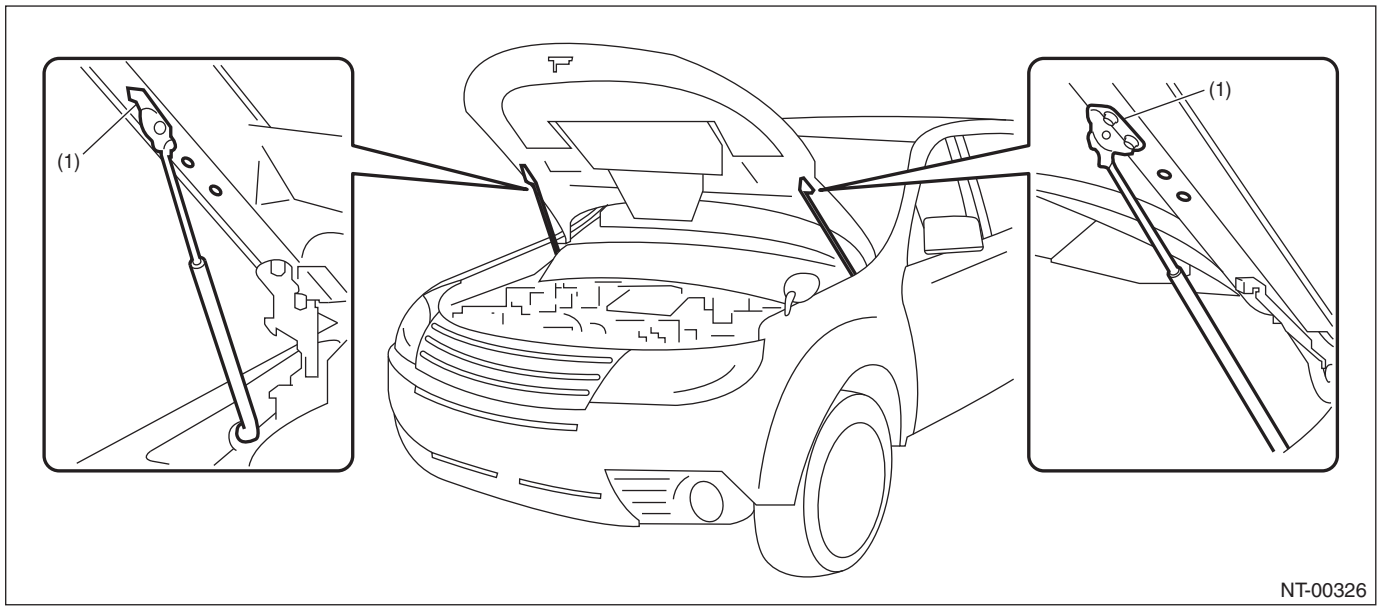
- Place the shift lever in “N” position during towing.
- Do not lift up the rear wheels to avoid unsteady rotation.
- Turn the ignition key to “ACC”, then check the steering wheel moves freely.
- Release the parking brake to avoid tire dragging.
- Since the power steering does not work, be careful for the heavy steering effort. (When engine is stopped)
- Since the servo brake does not work, be careful that the brake is not applied effectively. (When engine is stopped)
- In case of the malfunction of internal transmission or drive system, lift up four wheels (on a trailer) for towing.
- Make sure to detach the towing hook (eye bolt) after towing. If the hook remains attached, airbag may not operate properly when receiving a shock. And it may also affect the crash performance of the vehicle.

10.FRONT HOOD DAMPER STAY INSTALLATION

1) Always perform works such as inspections and maintenance with both damper stays attached.

CAUTION:

- **At the inspection and general maintenance, do not detach the damper stays.**

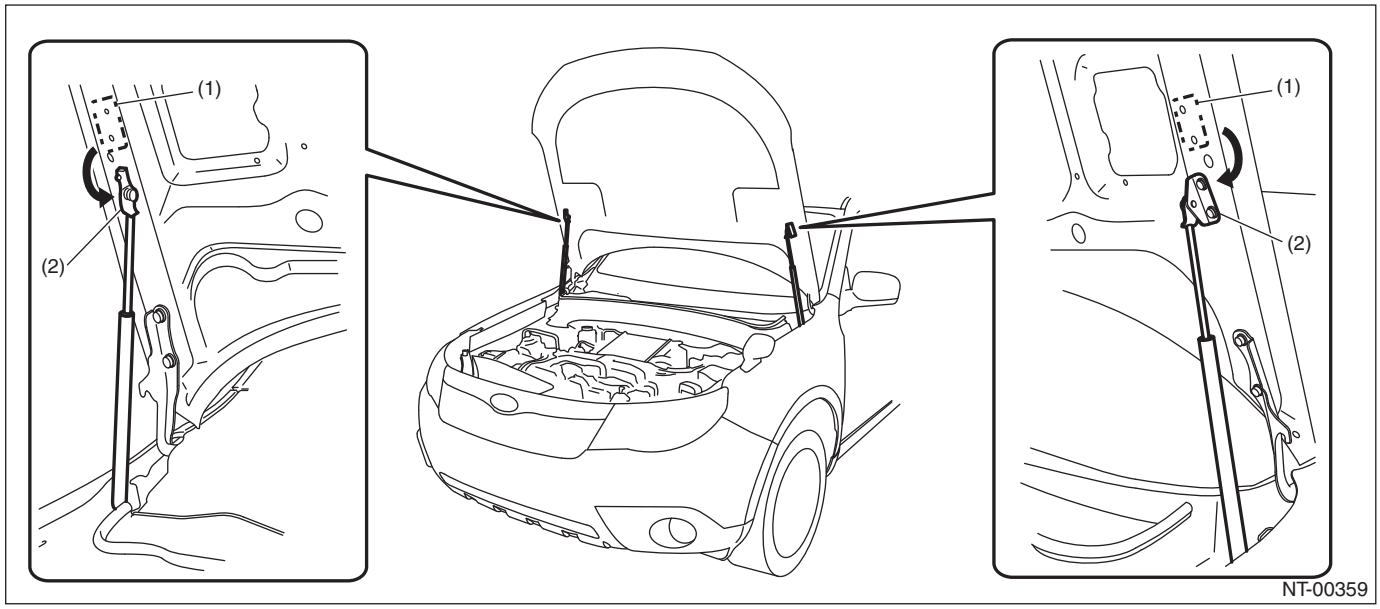


(1) Normal attached position

2) When wider hood opening is necessary, set the damper stay below as shown in the figure.

Tightening torque:
<Ref. to EB-6, FRONT HOOD, COMPONENT, General Description.>

CAUTION:
• Do not leave one side of damper stay removed.
• Always perform works such as inspections and maintenance with both damper stays attached.
• The hood cannot be closed with the damper stay on the full open side. When it is necessary to close, tie the hood striker and the radiator panel with a string etc. to fix them.
• After work, set the damper stays back to the normal position and tighten the bolts to the specified torque.



(1) Normal attached position
(2) Damper stay attachment position to open the front hood more widely

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, VDC, air conditioner and other electrically controlled parts.

NOTE

IDENTIFICATION

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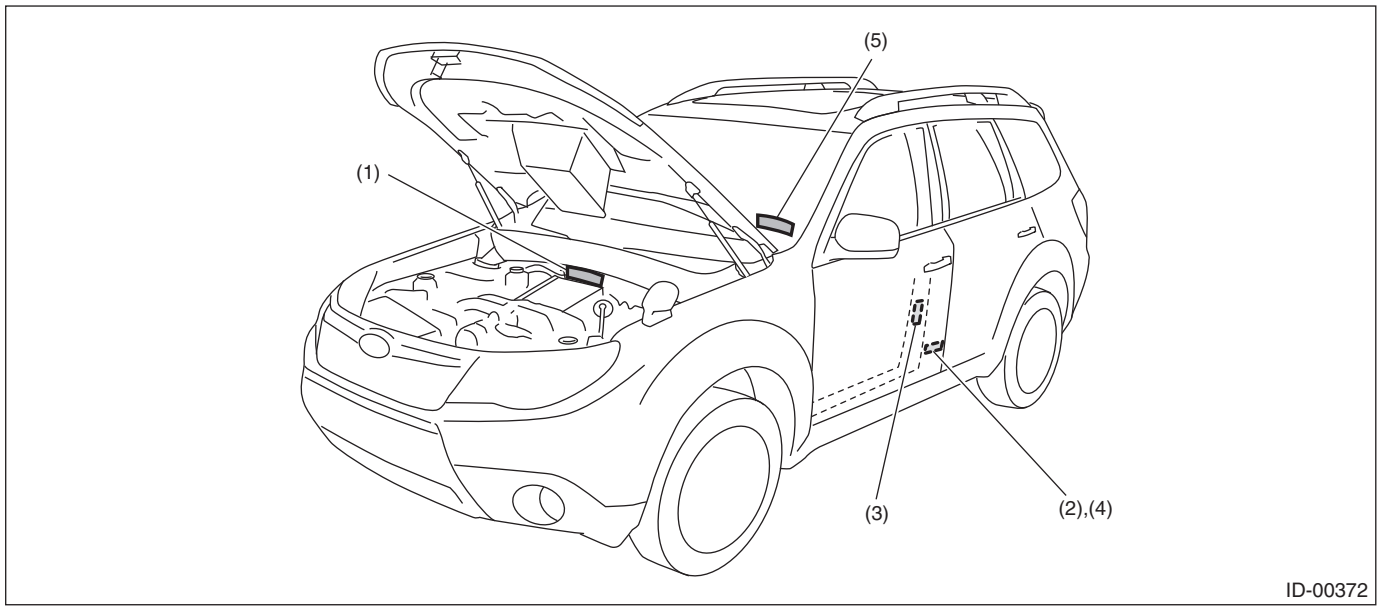
1. Identification

A: IDENTIFICATION

1. IDENTIFICATION NUMBER AND LABEL LOCATIONS

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

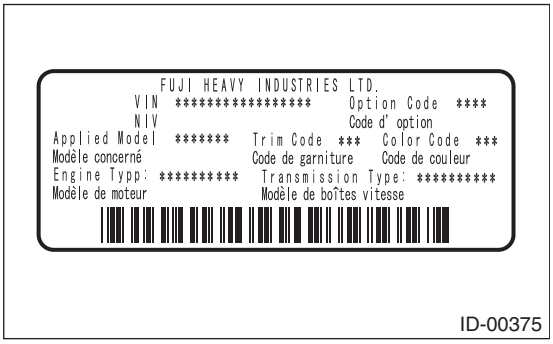
- **POSITIONING OF THE PLATE LABEL FOR IDENTIFICATION**



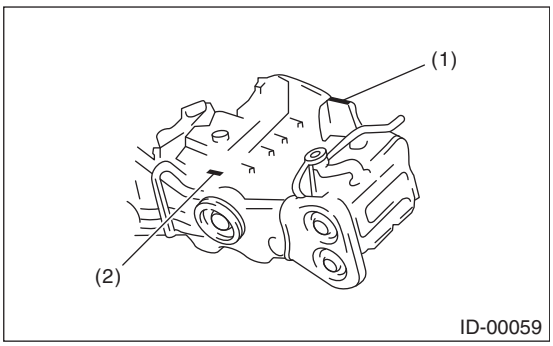
(1) Vehicle identification number (V.I.N.)
(2) MVSS label (attached to left side of vehicle)
(3) Tire inflation pressure label
(4) Model number label (attached to right side of vehicle)
(5) Vehicle identification number (V.I.N.) plate

- **MVSS LABEL**

- **MODEL NUMBER LABEL**

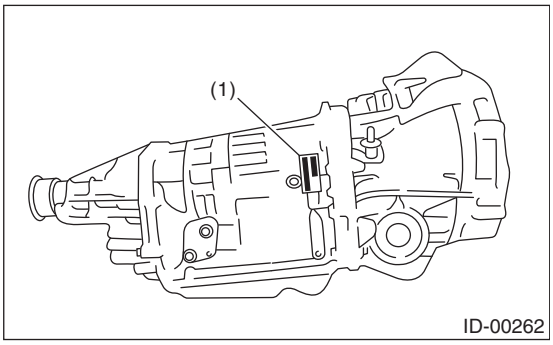


- **ENGINE**



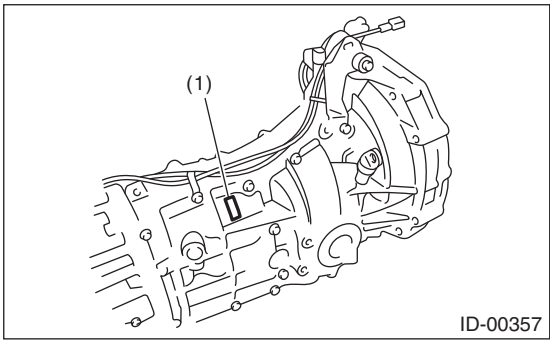
(1) Engine serial number (punch mark)
(2) Engine type (casting) crankcase upper side

- **AUTOMATIC TRANSMISSION**



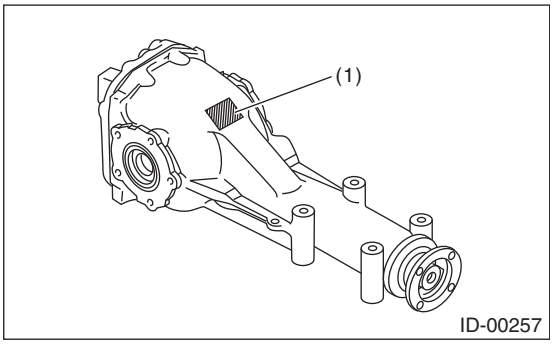
(1) AT type and transmission serial number label

- **MANUAL TRANSMISSION**



(1) MT type and transmission serial number label

- **REAR DIFFERENTIAL**



(1) Type (white paint)

2. MEANING OF V.I.N.

The meaning of the V.I.N. is as follows:
]JF2SHAACXBG700001[
The starting and ending brackets ( ] [ ) are stop marks.

Digits	Code	Meaning	Details
1 — 3	JF2	Manufacturer body area	JF2: FHI manufactured passenger car
4	S	Car line	S: Forester
5	H	Body type	H: Wagon
6	A	Displacement class	A: 2.5 L non-turbo U5 B: 2.5 L non-turbo U6 C: 2.5 L non-turbo C0 D: 2.5 L non-turbo C4 E: 2.5 L non-turbo C5 F: 2.5 L non-turbo C6 G: 2.5 L turbo U4 H: 2.5 L turbo C0 J: 2.5 L turbo C4
7	A	Grade	A: Base (X) B: X Plus C: PREMIUM D: PREMIUM All Weather Pack E: LIMITED F: LIMITED Navi G: LIMITED Plus H: LIMITED Plus Navi
8	C	Restraint or GVWR class	C: Manual belt, dual airbags, side airbags+curtain airbags, Class C (GVWR 4001 — 5000 lb)
9	X	Check numbers	X or 0 — 9
10	B	Model year	B: 2011MY
11	G	Transmission type	G: Full-time AWD 5MT single range H: Full-time AWD 4AT
12 — 17	700001	Serial number	700001 —

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.
SHMCY3F

Digits	Code	Meaning	Details
1	S	Series	S: Forester
2	H	Body type	H: Wagon
3	M	Total engine displacement Drive system	9: 2.5 L AWD (turbo) M: 2.5 L AWD (non-turbo)
4	C	Model year	C: 2011MY
5	Y	Destination	Y: U.S.A., Canada
6	3	Grade	3: X 5: X Plus 6: X PREMIUM 7: X LIMITED 8: X LIMITED Plus E: XT H: XT LIMITED L: XT LIMITED Plus
7	F	Transmission, fuel feed system	F: DOHC MFI 5MT S: DOHC MFI 4AT T: DOHC MFI turbo 4AT

The engine and transmission type are as follows.

ENGINE

- 2.5 L turbo

EJ255BPXMB

Digits	Code	Meaning	Details
1 and 2	EJ	Engine type symbol	EJ: 4 cylinder
3 and 4	25	Displacement	25: 2.5 L
5	5	Fuel feed device	5: MFI DOHC turbo
6	B	Exhaust regulations	B: For all states
7	P	Mounted transmission	P: 4AT
8 — 10	XMB	Detailed specifications	Used when ordering parts. For details, refer to the parts catalog.

- 2.5 L non-turbo

FB25BAYNXB

Digits	Code	Meaning	Details
1 and 2	FB	Engine type symbol	FB: 4 cylinder
3 and 4	25	Displacement	25: 2.5 L
5	B	Fuel feed device	B: MFI DOHC
6	A	Exhaust regulations	A: For states not using California emission standards C: For states using California emission standards
7	Y	Intake/exhaust system	Y: Intake AVCS, TGV, EGR
8	N	Mounted transmission	A: 5MT N: 4AT
9 and 10	XB	Detailed specifications	Used when ordering parts. For details, refer to the parts catalog.

Transmission

1. MT

TY758VCZAA

Digits	Code	Meaning	Details
1	T	Transmission	T: Transmission
2	Y	Transmission system	Y: Full-time AWD MT center differential
3 and 4	75	Distance between gear center	75: Between main shaft and drive pinion
5	8	Classification	8: 5MT
6	V	Transmission specifications	V: Full-time AWD single range 5MT with viscous coupling center differential
7	C	Mounted engine	C: 2.5 L DOHC
8 — 10	ZAA	Detailed specifications	Used when ordering parts. For details, refer to the parts catalog.

2. AT

TZ1B8LCXAA

Digits	Code	Meaning	Details
1	T	Transmission	T: Transmission
2	Z	Transmission system	Z: Full-time AWD AT MPT
3 and 4	1B	Identification	1B: 4AT
5	8	Classification	8: 4AT
6	L	Transmission specifications	L: MP-T type full-time AWD direct 4AT
7	C	Mounted engine	B: 2.5 L DOHC turbo C: 2.5 L DOHC
8 — 10	XAA	Detailed specifications	Used when ordering parts. For details, refer to the parts catalog.

REAR DIFFERENTIAL

T2

Code	Reduction gear ratio	LSD
B1	4.111	None
T2	4.111	None
TP	4.444	None

Option code

4X

- 1-digit number

OP code	B	D	I	M	N	O	T	U	V	3	4
Aluminum wheel (16-inch)	○	—	○	—	—	○	—	—	—	—	—
Aluminum wheel (17-inch)	—	○	—	○	○	—	○	○	○	—	—
Leather seats and leather door trim center decoration	—	—	—	○	○	—	○	—	—	—	—
Power seat	—	○	○	○	○	—	○	○	—	—	—
Cruise control	○	○	○	○	○	○	○	○	○	○	○
Front fog light	○	○	—	○	○	—	○	—	○	—	—
HID headlight	—	—	—	○	—	—	○	—	—	—	—
Dark colored glass	○	○	○	○	○	—	—	○	○	○	—
Side airbag	○	○	○	○	○	○	○	○	○	○	○
Curtain airbag	○	○	○	○	○	○	○	○	○	○	○

- 2-digit number

OP code	B	D	F	I	O	S	T	X
Sunroof	○	○	○	○	—	○	○	—
High grade audio	○	—	—	—	—	○	—	—
High grade audio display	—	—	—	—	—	—	○	—
Navigation system	—	○	—	—	—	—	—	—
Seat heater	○	○	○	—	○	—	○	—
Front wiper deicer	○	○	○	—	—	○	○	—
Heated mirror	○	○	○	—	○	○	○	—

RECOMMENDED MATERIALS

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1. Recommended Materials

A: RECOMMENDED MATERIALS

1. GENERAL

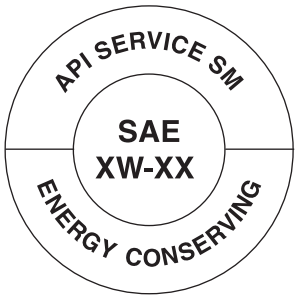
To insure the best performance, always use the specified oil, gasoline, adhesive, sealant, etc. or a substitute of equivalent quality.

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.

3. LUBRICANTS

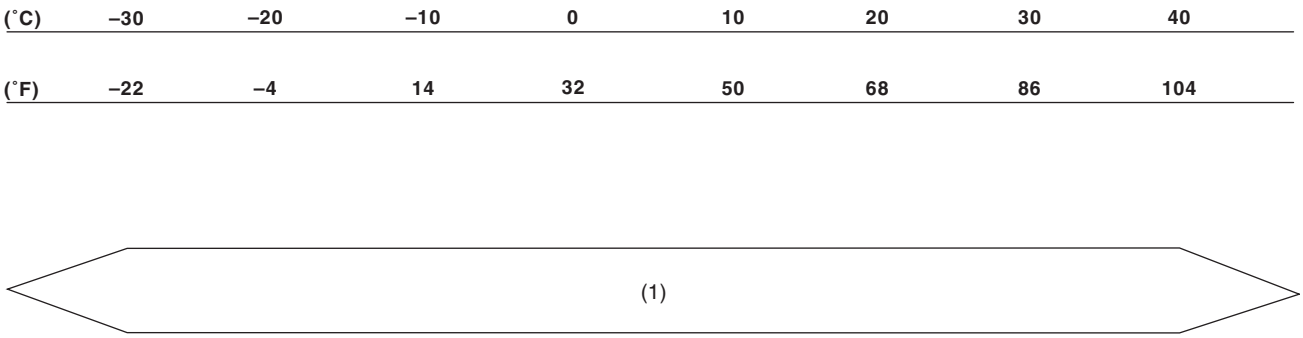
Use the lubricants shown in the table below, or equivalent. See the table below to choose the correct SAE viscosity.

Lubricant	Recommended materials	
	API standard	ILSAC standard
Engine oil Choose oil suitable for the standard from the right.	SN or SM grade “Resource conserving” or “Energy conserving”  RM-00076 Those with the above API service labels	GF-5 or GF-4 RM-00002 Those with the above ILSAC certification mark (Starburst mark)
Manual transmission gear oil	GL-5	—
Front differential gear oil	GL-5	—
Rear differential gear oil	GL-5	—

SAE viscosity No. and applicable temperature

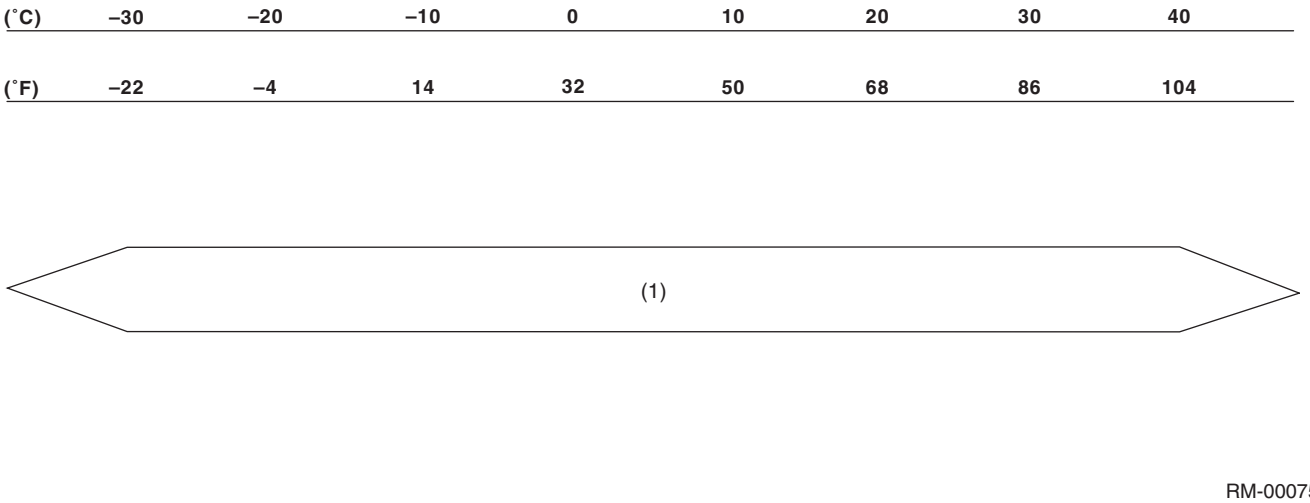
Engine oil

Non-turbo model



(1) 0W-20 (synthetic oil) Required

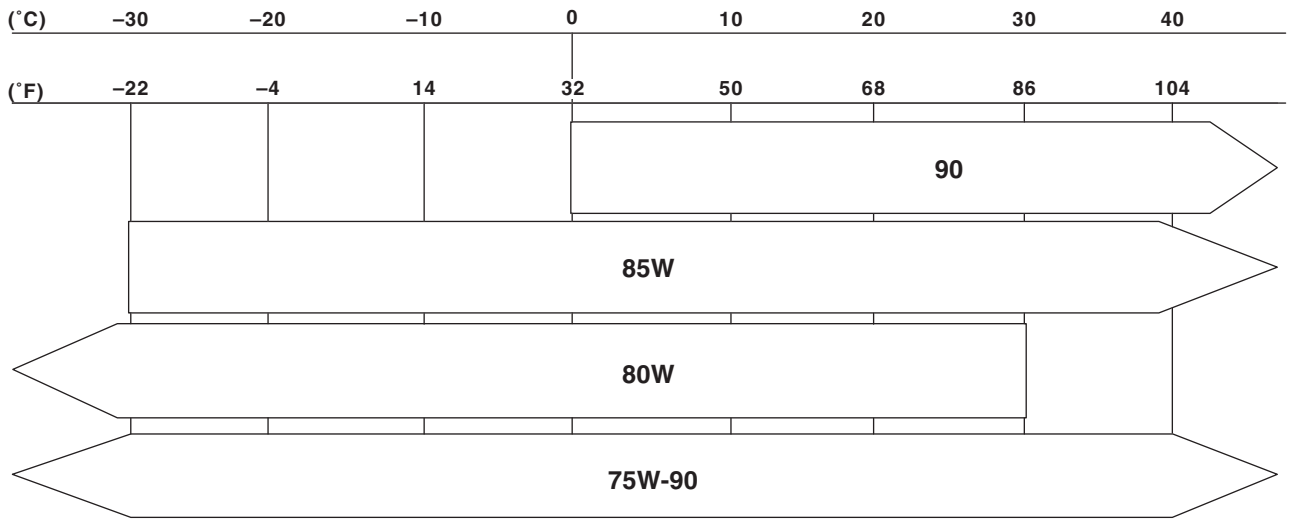
Turbo model



(1) 5W-30 (synthetic oil) Required

SAE viscosity No. and applicable temperature

Manual transmission gear oil, rear differential gear oil and AT front differential gear oil



RM-00004

4. FLUID

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

CAUTION:
For AT model, be sure to use the recommended ATF or equivalent. Otherwise it will cause trouble.

Fluid	Recommended materials	Item number	Alternative
Automatic transmission fluid	SUBARU ATF	—	IDEMITSU: ATF HP
Power steering fluid	SUBARU ATF	—	DEXRON III
Brake fluid	FMVSS No. 116 DOT3, or DOT4	—	—
Clutch fluid	FMVSS No. 116 DOT3	—	FMVSS No. 116 DOT4

5. ENGINE COOLANT

Use genuine engine coolant to protect the engine.

Engine coolant	Recommended materials	Item number	Alternative
Coolant	SUBARU SUPER COOLANT (Concentrated type)	—	—
	SUBARU SUPER COOLANT (Diluted type)	K0670Y0001	
Water for dilution	Distilled water	—	Soft water or tap water
Cooling system protective agent	Cooling system conditioner	SOA345001	—

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 except for DH-PR.

Air conditioner	Recommended materials	Item number	Alternative
Refrigerant	HFC134a	—	—
Compressor oil	DH-PR	—	—

7. GREASE

Use grease and supplementary lubricants shown in the table below.

Grease	Application point	Recommended materials	Item number	Alternative
Supplementary lubricants	Oxygen sensor	Spray type lubricant	—	—
Grease	• MT main shaft (spline parts) • MT main shaft (oil seal lip) • Clutch release lever • Clutch release bearing (inner circumference) • Clutch operating cylinder	NICHIMOLY N-130	—	—
	Clutch master cylinder push rod	SILICONE GREASE G-40M	—	—
	• Gear shift lever • Select lever (except shift lock) • Clutch pedal • Brake pedal	NIGTIGHT LYW No. 2	—	—
	Select lever (shift lock)	SANKOL	—	—
	• Door latch • Door striker	SILICONE GREASE G-30M	004404002	—
	Steering gearbox	VALIANT GREASE M2	003608001	ONE LUBER SG
	Disc brake (Lock pin, guide pin, piston boot)	Brake grease (NIGLUBE RX-2)	000041000	—
	Between brake pad and shim	Molykote AS-880N	K0777YA010	—
	Brake shoe (Parking brake)	Molykote M7439	K0770YA000	—
	Front axle PTJ	NKG302	—	—
	Front axle EBJ	NKG814	—	—
	Rear axle EBJ	NKG814	—	—
	Rear axle DOJ	NKG814	—	—

8. ADHESIVE

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

Adhesive	Application point	Recommended materials	Item number	Alternative
Adhesive	Windshield glass, rear quarter glass, rear gate glass and body	Dow Automotive Adhesive: ESSEX U-400HV or equivalent Glass primer: U-401 and U-402 Paint surface primer: U-413	—	—
	Bottom of rear gate molding	Cemedine 3000 (jelly type)	—	—
	Rearview mirror base	REPAIR KIT IN MR	65029FC000	—

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	• AT converter case • MT transmission case • MT extension case	THREE BOND 1215	004403007	DOW CORNING No. 7038
	Transmission oil pan (AT model)	THREE BOND 1217B	K0877YA020	—
	• Rear differential • Oil pressure switch • PCV valve (non-turbo model)	THREE BOND 1324	004403042	—
	• Rear differential • Service hole plug • PCV nipple (turbo model)	THREE BOND 1105	004403010	DOW CORNING No. 7038
	Steering adjusting screw	THREE BOND 1102	004403006	—
	• Front sealing cover • Rear sealing cover	3M Butyl Rubber 8626	—	—
	• Engine oil pan • Separator cover • Camshaft cap • Cylinder block • Oil pump (turbo model) • Rocker cover • Chain cover (non-turbo model) • Oil pan upper (non-turbo model) • Cylinder head (non-turbo model) • Camshaft carrier (non-turbo model) • Camshaft bearing cap (non-turbo model)	THREE BOND 1217G	K0877Y0100	—
	Rear differential	THREE BOND 1110B	K0879Y0020	—

PRE-DELIVERY INSPECTION

PI

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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 the vehicle before delivery 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 provide 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

Perform the procedures indicated in the table below.

Static Checks Just After Vehicle Receipt

Step	Check point
1. Appearance	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 check the painted body surfaces in detail for damage or rust. 2. Visually check the glass and light lenses for any damage, cracks or excessive gaps between body panels. 3. Visually check the exterior parts for any damage. 4. Check the instrument panel, console and trim for stains or dirt.
2. Tire	1. Check the tires for damage, defective, and dents on wheels. 2. Check the tire air pressure.
3. Fuses	If the vehicle is about to be delivered to customer, attach the room light fuse.
4. Lock/unlock and open/close operation checks of doors.	1. Using the key, check the door can be locked or unlocked normally. 2. Open and close all doors to check that there are no problems. 3. Operate the power door lock switch to check that all doors and the rear gate lock and unlock normally.
5. Child safety lock	Check the child safety lock system operates normally.
6. Rear gate Lock/Unlock and open/close operations	1. Open and close the rear gate to check that there are no problems. 2. Check if the rear gate can be unlocked normally through the emergency hole. 3. Operate the power door lock switch to check that all doors and the rear gate lock and unlock normally.
7. Fuel filler lid opener lever	Operate the fuel filler lid opener to check that the fuel filler lid unlocks normally.
8. Accessory	Check that the following accessories are equipped. • Owner's manual • Warranty booklet • Maintenance note • Spare key • Key No. plate • Jack • Tool set • Spare tire • Towing hook (eyebolt) • Security ID plate
9. Front hood lock release system	Operate the front hood lock release lever to check that the front hood opens normally.
10. Battery	Check the battery for any abnormal conditions such as rust or traces of battery fluid leaks.
11. Brake fluid	Check the brake fluid amount.
12. Engine oil	Check the engine oil amount.
13. Transmission gear oil	Check that the transmission gear oil level is normal.
14. AT front differential gear oil	Check for leakage of AT front differential gear oil.
15. Rear differential gear oil	Check for leakage of gear oil from the rear differential.
16. Engine coolant	Check the engine coolant level.
17. Clutch fluid	Check the clutch fluid amount.
18. Window washer fluid	Check the window washer fluid amount.
19. Front hood latch	Check that the front hood is closed normally and locked securely.
20. Keyless entry system	Check that the keyless entry system operates normally.
21. Security system (Alarm system)	Check that the security system (alarm system) operates normally.
22. Seat	1. Check the seat surfaces for stains or dirt. 2. Check the seat installation conditions and functionality. 3. Check that the occupant detection system for passenger's seat operates normally.

Step	Check point
23. Seat belt	1. Check the seat belt installation conditions and functionality. 2. Check the seat belt warning system operates normally.
24. TPMS (U.S. model)	1. Turn the TPMS transmitter power supply to ON. 2. If the display of TPMS warning light does not operate normally, perform the diagnosis by referring to TPMS (Diagnosis).
25. ECM protector	For Canada model, check the ECM protector installation conditions.

Checks with the Engine Running

Step	Check point
26. Delivery (test) mode connector	Check that the delivery (test) mode connector is separated.
27. Immobilizer system	1. Check that the engine starts with all keys that are equipped on vehicle. 2. 60 seconds after turning ignition switch from ON to ACC or OFF, or immediately after removing the key, check that the security indicator light is blinking.
28. Starting condition	Start the engine and check that the engine starts smoothly.
29. Exhaust system	Check that the exhaust noise is normal and no leaks are found.
30. Indicator and warning lights	Check that all indicator lights and warning lights are operating correctly.
31. Heater & ventilation	Check that the heater & ventilation system operates normally.
32. Air conditioner	Check that the air conditioner operates normally.
33. Clock	Check that the clock operates normally.
34. Antenna	Install the antenna.
35. Audio	Check the radio and AUX operate normally.
36. Accessory power supply socket	Check that the accessory power supply socket operates normally.
37. Lighting system	Check that the lighting system operates normally.
38. Window washer	Check that the window washer system operates normally.
39. Navigation system	1. Check all display functions for normal operation. 2. Check that the navigation and AUX systems operate normally.
40. Wiper	Check that the wiper system operates normally.
41. Power window operation check	Check that the power window operates normally.
42. Sunroof	Check that the sunroof operates normally.
43. Rear defogger system	Check that the rear defogger system operates normally.
44. Door mirror	Check that the remote control door mirror operates normally.
45. Parking brake	Check the parking brake for normal operations.

Dynamic Test with the Vehicle Running

Step	Check point
46. Brake test	Check the foot brake for normal operations.
47. Shift control	Check that the AT and MT shift normally.
48. Cruise control	Check that the cruise control system operates normally.

Checks after Dynamic Test

Step	Check point
49. ATF level	Check that the ATF level is correct.
50. Power steering fluid level	Check that the power steering fluid level is normal.
51. Fluid leakage	Check for fluid/oil leaks.
52. Water leakage	Spray the vehicle with water and check for water leaks.
53. Appearance 2	1. Remove the protective coat. (If attached) 2. Check the body paints for damage and stain. 3. Visually check the exterior parts for any damage and rust.

1. APPEARANCE

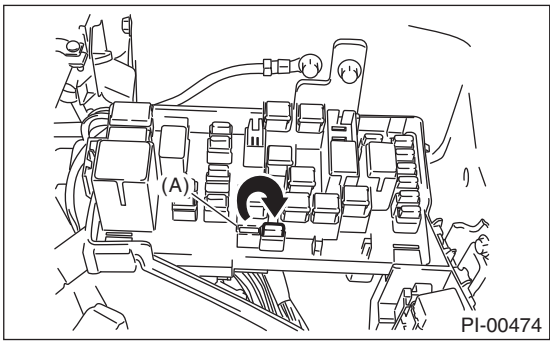
1) If the vehicle is covered with protective coating, visually check the vehicle body for damage and dents.
2) When there is no protective coating, check the body paints for damage or stains in detail and repair as necessary.
3) Check the window glass, door glass, and lights for any cracks or damage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

2. TIRE

- Check for damage on the outside surface of the tires.
- Check and correct the tire size, spare tire and tire air pressure described on the tire air pressure label (driver's side).

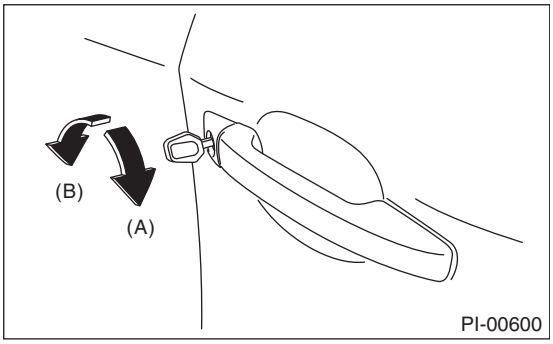
3. FUSE

Fuses for the room light circuit on initially delivered vehicles are removed to prevent battery discharge. Attach the 20 A fuse (A) as shown in the figure.



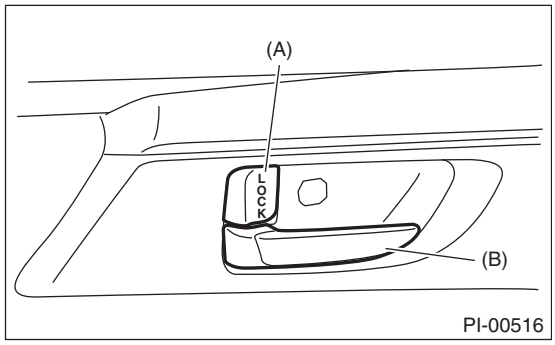
4. DOOR LOCK/UNLOCK AND OPEN/ CLOSE OPERATIONS

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.



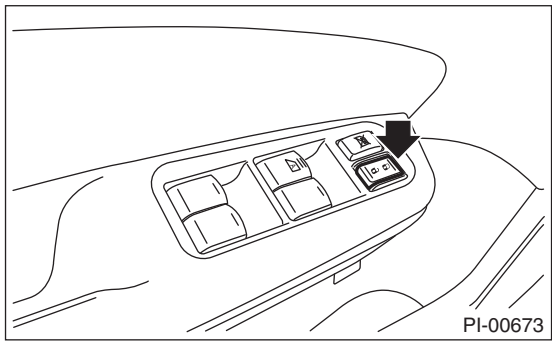
(A) Unlock
(B) Lock

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.

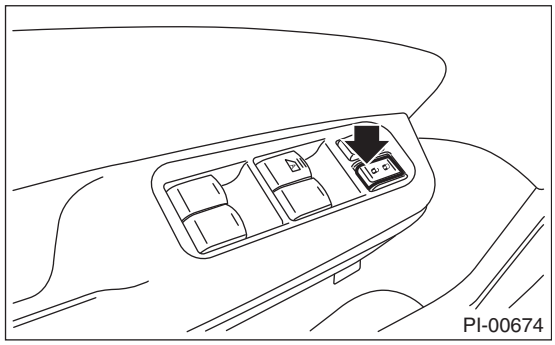


(A) Door lock knob
(B) Inner remote

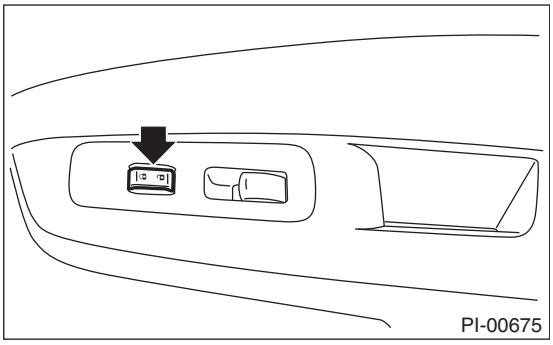
3) Press the driver's power door lock switch to the lock side. Check that all doors (including the rear gate) lock.



4) Press the driver's power door lock switch to the unlock side. Check that all doors (including the rear gate) unlock.

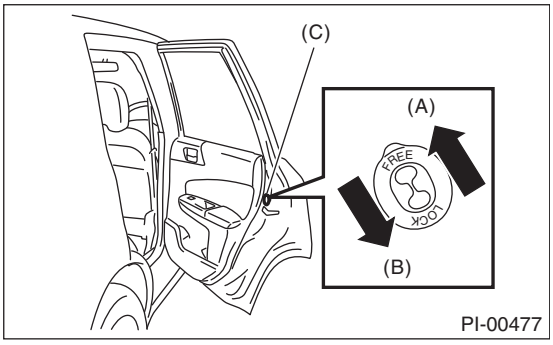


5) Check that the passenger' power door lock switch locks and unlocks normally in the same manner.



5. CHILD SAFETY LOCK

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.

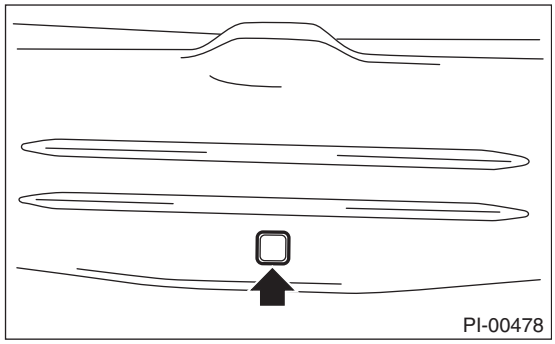


(A) Unlock
(B) Lock
(C) Child safety lock

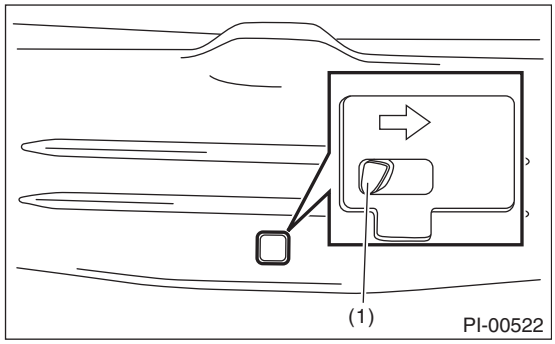
6. REAR GATE LOCK/UNLOCK AND OPEN/CLOSE OPERATIONS

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 unlocks normally.

(1) Remove the cover inside the rear gate.

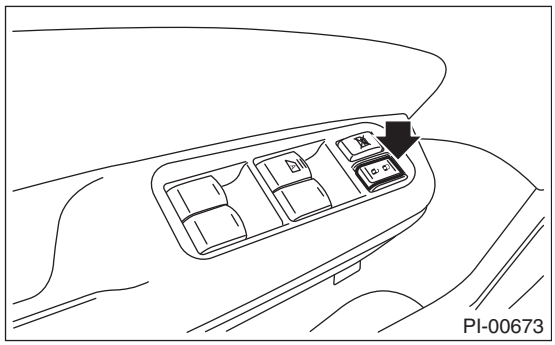


(2) Using a screwdriver, check that the rear gate locks normally.

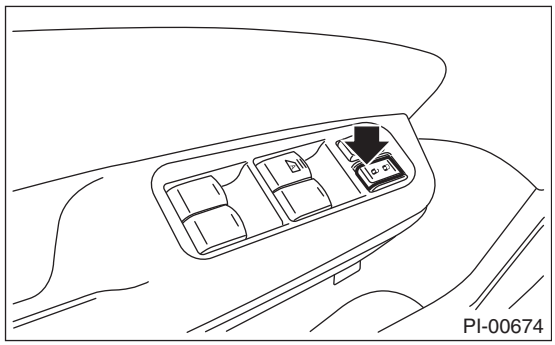


(1) Lever

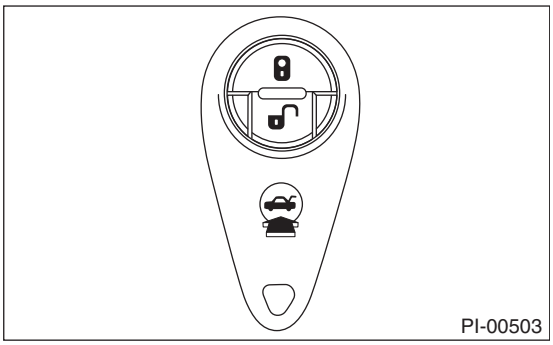
3) Press the driver's power door lock switch to the lock side. Check that all doors (including the rear gate) lock.



4) Press the driver's power door lock switch to the unlock side. Check that all doors (including the rear gate) unlock.



5) Lock all the doors including rear gate. Press the rear gate unlock button to unlock the rear gate. Check that the buzzer sounds twice, and the hazard lights flash twice. Press the release button to open the rear gate.


PI-00503

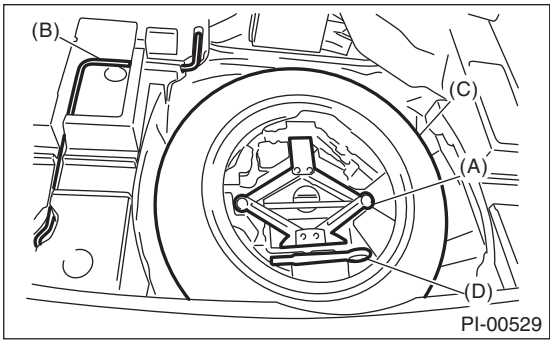
7. FUEL FILLER LID OPENER LEVER

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

8. ACCESSORY

Check that the following accessories are provided.

- Owner's manual
- Warranty booklet
- Maintenance note
- Spare key
- Key number plate
- Jack
- Tool set
- Spare tire
- Towing hook (Eye bolt)



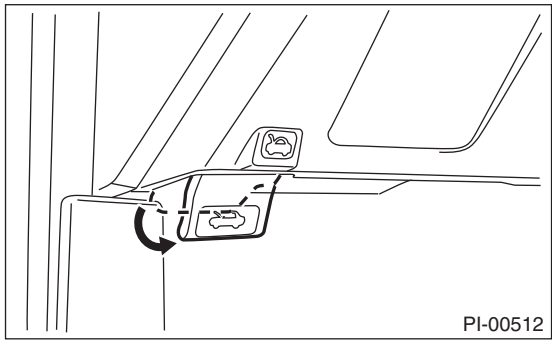
PI-00529

(A) Jack
(B) Jack handle
(C) Spare tire
(D) Towing hook (Eye bolt)

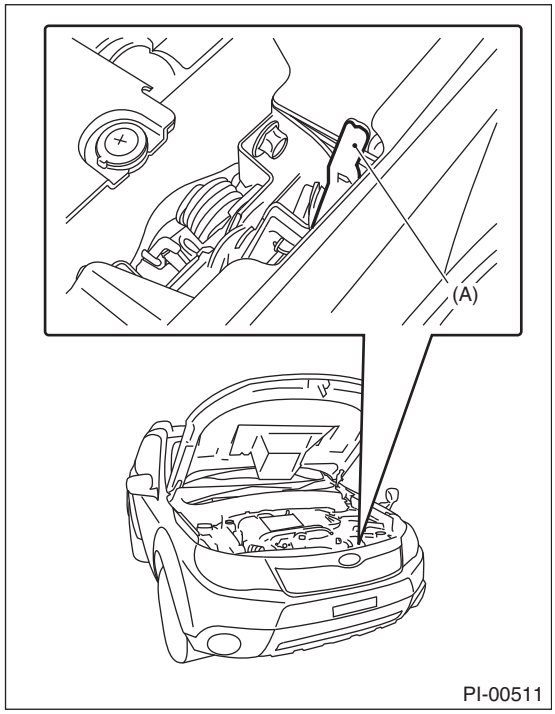
- Security ID plate

9. FRONT HOOD LOCK RELEASE SYSTEM

Operate the front hood release knob to check that the front hood will unlock properly.


PI-00512

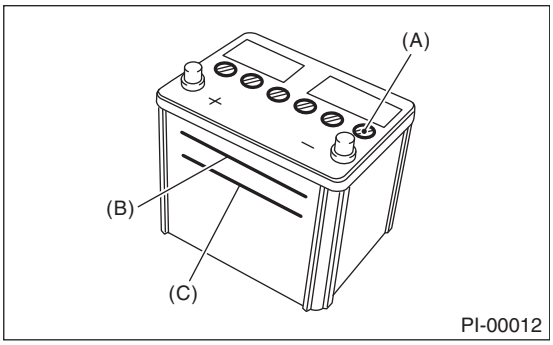
Operate the lever (A) and check that the front hood is opened normally.



PI-00511

10.BATTERY

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



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

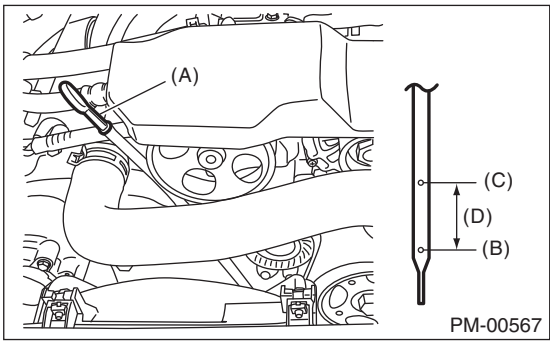
11.BRAKE FLUID

CAUTION:
If the brake fluid is spilt over exhaust pipe, wipe it off with cloth to avoid emitting smoke or causing a fire.
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.

12.ENGINE OIL

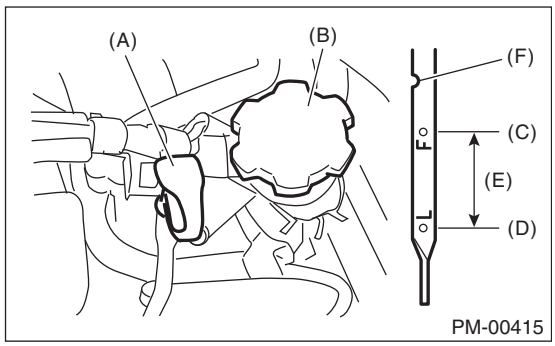
CAUTION:
If engine oil is spilt onto the exhaust pipe, wipe it off with cloth to avoid emission of smoke or causing a fire.
Check the engine oil amount. If the amount of oil is insufficient, check that no leaks are found. Then, add the necessary amount of the specified engine oil.

- Non-turbo model



(A) Engine oil level gauge
(B) "L" line
(C) "F" line
(D) Approx. 1 ℓ (1.1 US qt, 0.9 Imp qt)

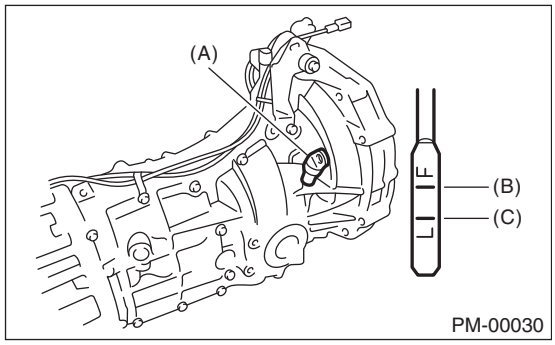
- Turbo model



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

13.TRANSMISSION GEAR OIL

CAUTION:
If transmission gear oil is spilt over the exhaust pipe, wipe it off with a cloth to avoid emitting smoke or causing a fire.
Check the transmission gear oil amount. If the amount of gear oil is inappropriate, check that no leaks are found. Then, add the necessary amount of the specified gear oil.



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

14.AT FRONT DIFFERENTIAL GEAR OIL

CAUTION:
If the AT front differential gear oil is spilt over exhaust pipe, wipe it off with cloth to avoid emitting smoke or causing a fire.
Check for leakage of AT front differential gear oil.

15.REAR DIFFERENTIAL GEAR OIL

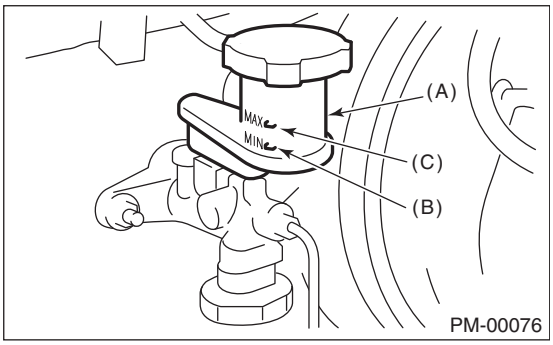
CAUTION:
If the rear differential gear oil is spilt over exhaust pipe, wipe it off with cloth to avoid emitting smoke or causing a fire.
Check for leakage of gear oil from the rear differential.

16.ENGINE COOLANT

CAUTION:
If engine coolant is spilt onto the exhaust pipe, wipe it off with cloth to avoid emission of smoke or causing a fire.
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

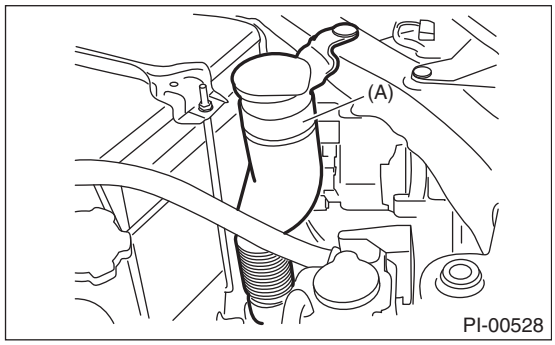
CAUTION:
If the clutch fluid is spilt over the exhaust pipe, wipe it off with cloth to avoid emitting smoke or causing a fire.
Check the clutch fluid amount. If the amount of clutch fluid is insufficient, check that no leaks are found. Then, add the necessary amount of specified fluid.



(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.



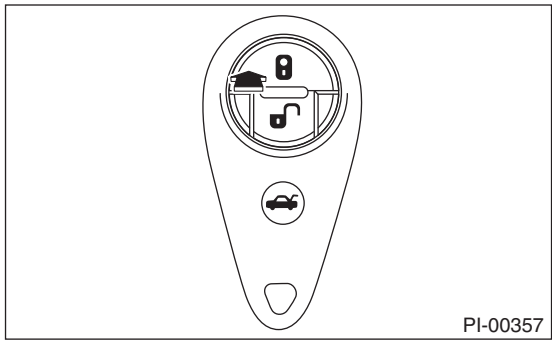
(A) Window washer tank

19.FRONT HOOD LATCH

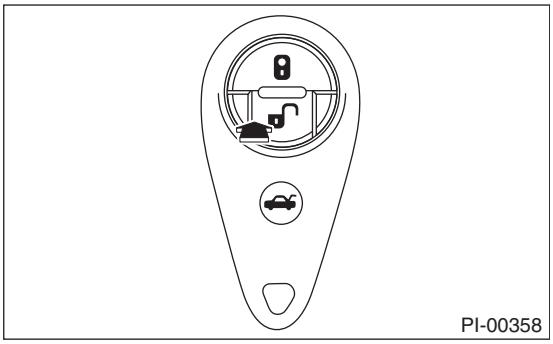
Close the front hood. Check that the front hood is completely latched.

20.KEYLESS ENTRY SYSTEM

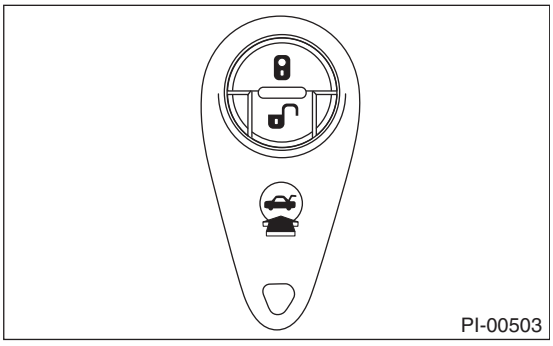
Check the keyless entry system operations as follows:
- Fully open all the door windows.
- Remove the key from the ignition switch and close all the doors including rear gate.
- Briefly press the "🔒" button on the keyless transmitter. Check that all the doors become locked, the buzzer sounds once, and the hazard lights flash once.



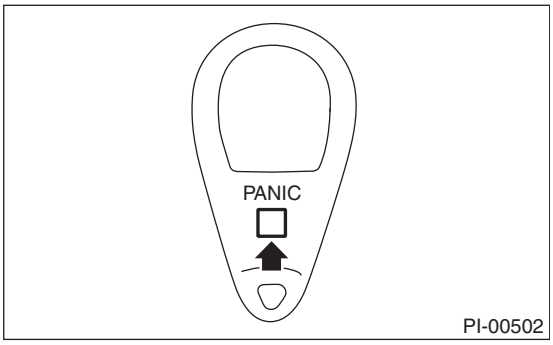
• Briefly press the "🔓" button on the keyless transmitter. Check that the driver's door is unlocked, the buzzer sounds twice, and the hazard lights flash twice.


PI-00358

• Within five seconds, briefly press the "🔓" button on the keyless transmitter. Check that all doors (including rear gate) are unlocked.
• Lock all the doors including rear gate. Press the rear gate unlock button to unlock the rear gate. Press the release button to open the rear gate. Check that the buzzer sounds twice, and the hazard lights flash twice.

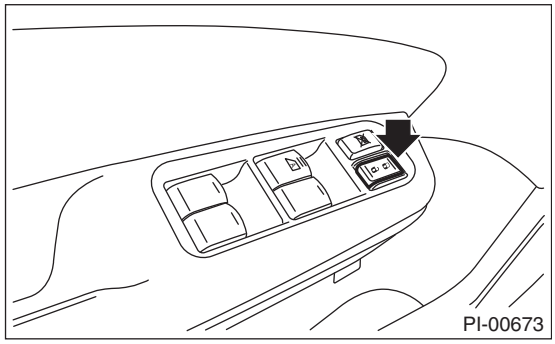

PI-00503

• Press the "PANIC" button of the keyless transmitter. Check that the panic mode (the horn keeps sounding) is initiated. Also, check that this condition continues for 30 seconds or until when any of the buttons on the keyless transmitter are pressed.

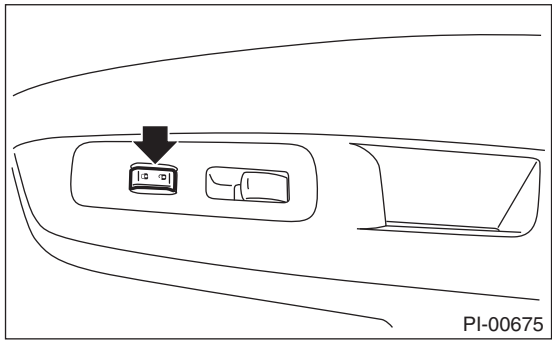


PI-00502

• Briefly press the "🔒" button once on the keyless transmitter with one door (including the rear gate) open. Check that the buzzer sounds 5 times, and the hazard light flashes 5 times to notify the door not being fully closed. Next, close all the doors including rear gate. Check if all doors are locked and buzzer sounds once and the hazard light flashes once.
• With one of the doors open (including the rear gate), press the "LOCK" side of the power door lock switch. Next, close all the doors including rear gate. Check if all doors are locked and buzzer sounds once and the hazard light flashes once.
  • Driver's side


PI-00673

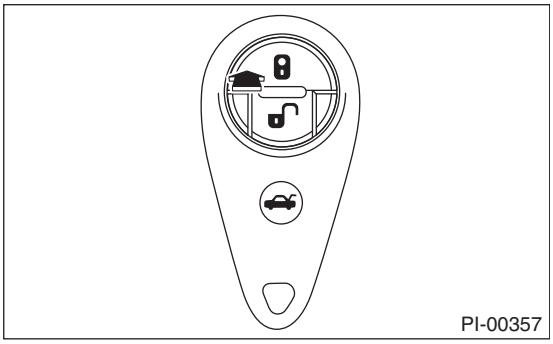
  • Passenger's side


PI-00675

CHECK ANSWER BACK SOUND OPERATION.
• The system uses a buzzer to sound an answer back when the doors are locked or unlocked. The answer back sound can be turned off if desired. To turn the answer back sound from ON to OFF, with all doors closed (the key is not in the key cylinder), insert the key into the key cylinder while pressing the "UNLOCK" side of the power door lock switch. Within 10 seconds, insert and take out the key for 5 times or more, and within 10 seconds after that, open and close the driver's door. After the door is closed, the hazard lights flash three times indicating that the answer back sound is now OFF. Perform this same procedure to turn the answer back sound from OFF to ON. The hazard lights flash three times indicating that the answer back sound is now ON.

21.SECURITY SYSTEM

Check that the security system operates as indicated 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 "🔒" button on the keyless transmitter momentarily.

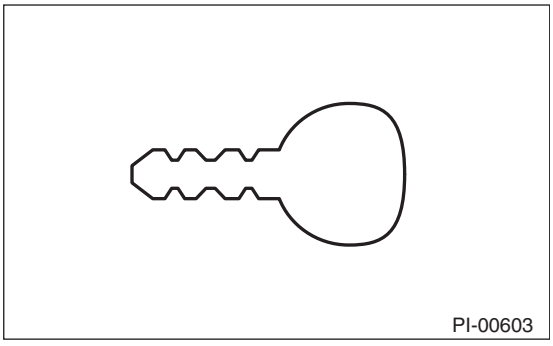

PI-00357

4) If all doors lock, buzzer sounds once, the hazard light flashes once, and the security display light flashes as indicated below, the alarm system is in the monitoring condition.

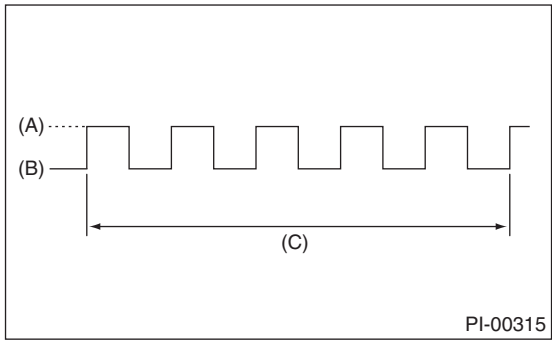
- Except for C6

PI-00504

- For C6


PI-00603

- Alarm system monitoring prepared condition

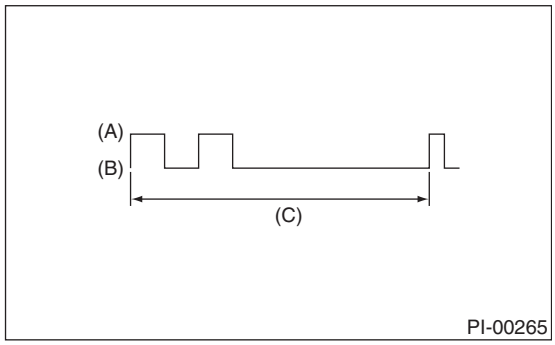


PI-00315

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

5) Check that the system enters monitoring condition 30 seconds after the condition in 4).

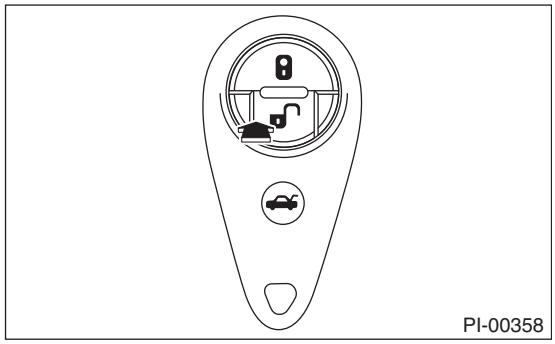
- Alarm system monitoring condition (all models)



PI-00265

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

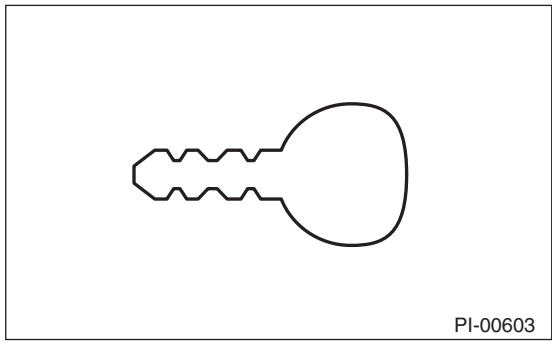
6) Press the "🔓" button on the keyless transmitter momentarily.


PI-00358

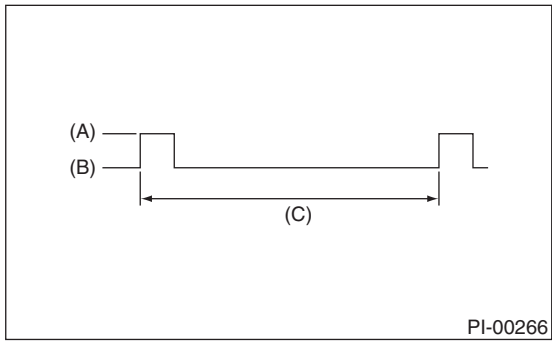
7) The alarm system is in the non-monitoring condition if the driver's door is unlocked, the buzzer sounds twice, the hazard light flashes twice, the room light turns on, and the security display light flashes according to the following figure.

- Except for C6

- For C6

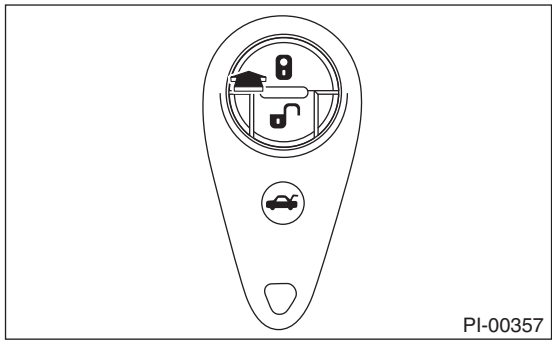


- Alarm system non-monitoring condition



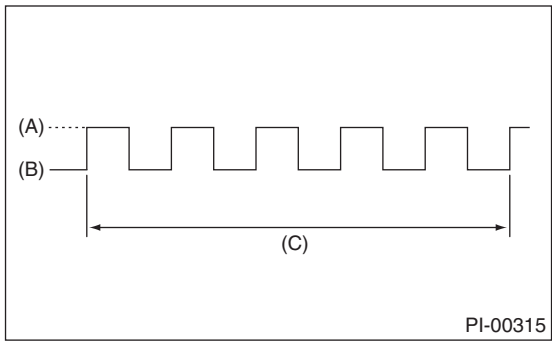
(A) Light ON
(B) Light OFF
(C) 3 seconds

8) Press the "🔒" button once on the keyless transmitter with one door (including the rear gate) open.



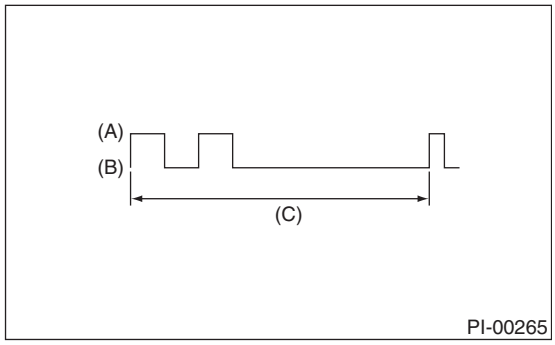
9) Check that the buzzer sounds 5 times to give the door not fully closed warning.
10) Close all the doors including rear gate.
11) Check that the system is in the monitoring condition (all the doors become locked and the buzzer sounds once, and the hazard light flashes once).

- Alarm system monitoring prepared condition



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

12) Check that the system enters monitoring condition 30 seconds after the condition in 11).

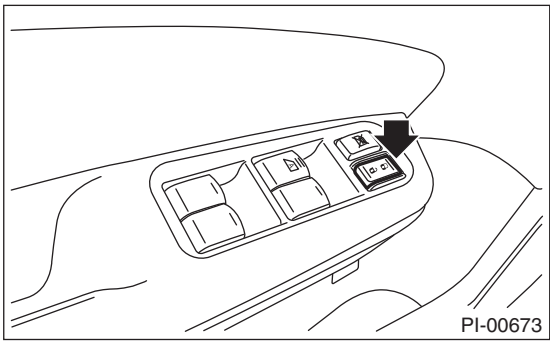


(A) Light ON
(B) Light OFF
(C) 2 seconds

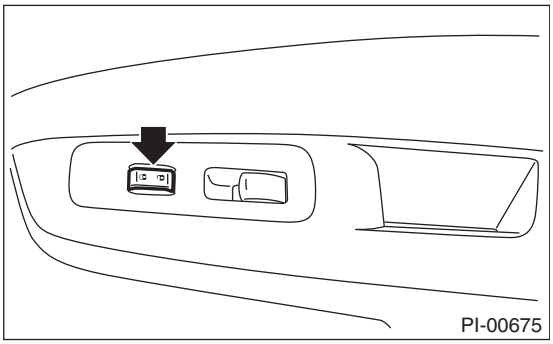
13) Press the "🔓" button on the keyless transmitter once to disarm the system.

14) With one of all the doors open (including the rear gate), press the “LOCK” side of the power door lock switch.

- Driver’s side

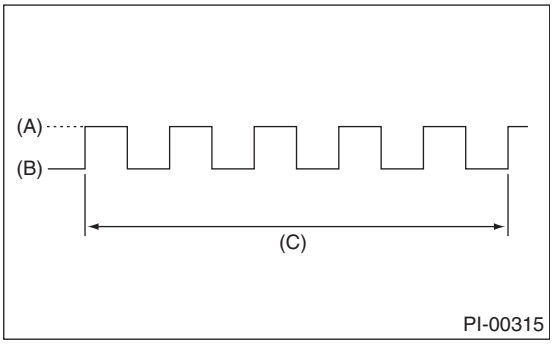


- Passenger’s side



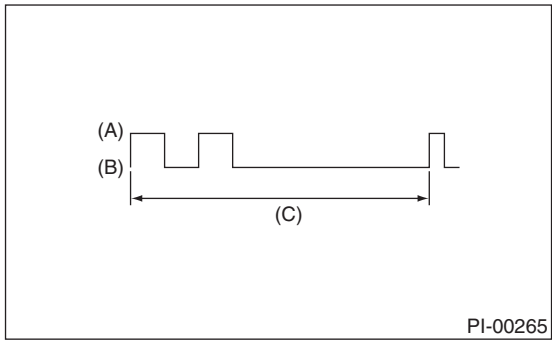
15) Close all the doors including rear gate.
16) If all doors become locked, the buzzer sounds once, and the hazard light flashes once, the alarm system is in the monitoring prepared condition.

- Alarm system monitoring prepared condition



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

17) Check that the system enters monitoring condition 30 seconds after the condition in 16).

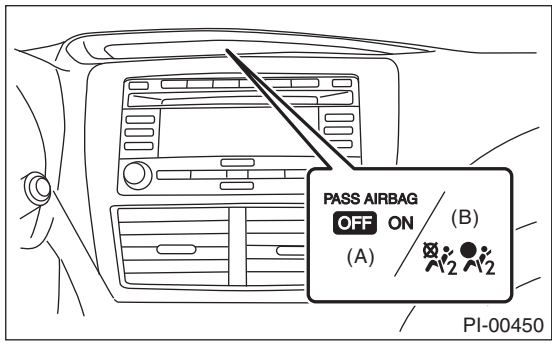


(A) Light ON
(B) Light OFF
(C) 2 seconds

18) When the alarm system is in the monitoring condition, use the inner lock knob or the key to unlock the door, and open the door.
19) Check that the alarm condition occurs (horn sounds continuously, hazard light flashes, security indicator illuminates).
20) Check that the state described in 19) continues until one of the following condition is met: 1. 30 seconds or more has elapsed; 2. The keyless transmitter button “🔓” is pressed; 3. The ignition switch is turned ON using the proper ignition key.
21) On models equipped with an impact sensor, hit the windshield glass with your hand with the alarm system in the monitoring condition, to check that the alarm condition occurs.
22) When none of above is applicable, perform troubleshooting for the security system. <Ref. to SL-26, 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 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 illuminates again.



(A) Airbag ON/OFF indicator light (U.S. model)
(B) Airbag ON/OFF indicator light (except for U.S. model)

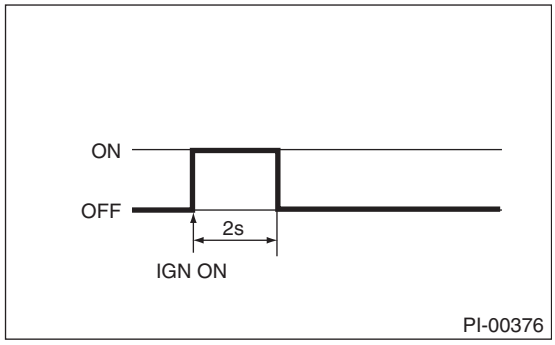
(3) Have a person with weight of approx. 70 kg (155 lb) sit down in the passenger's seat, and check if the passenger's airbag indicator light lights after about 4 seconds.
(4) Empty the passenger's seat and check if the OFF of passenger's airbag indicator light comes on in about 2 seconds.

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 six seconds and the buzzer beeps intermittently.
(3) Then, check that the seat belt warning light comes on and blinks in approximately 15 seconds cycles. (If the passengers seat is empty, seat belt warning light for passengers side does not operate.)

24.TPMS (U.S. MODELS)

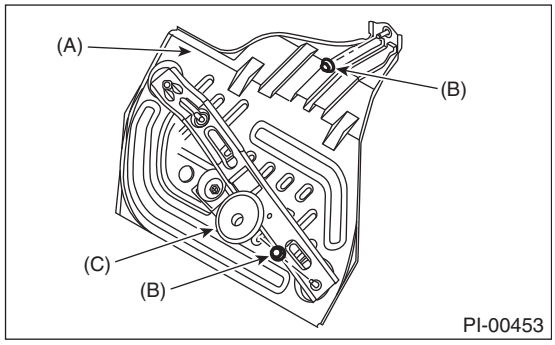
1) Turn the ignition switch to ON, and check TPMS warning light for normal operation.
- Normal operation (IG ON (Light check))



2) If the TPMS warning light display does not operate normally, check and repair the system. <Ref. to TPM(diag)-2, PROCEDURE, Basic Diagnostic Procedure.>

25.ECM PROTECTOR

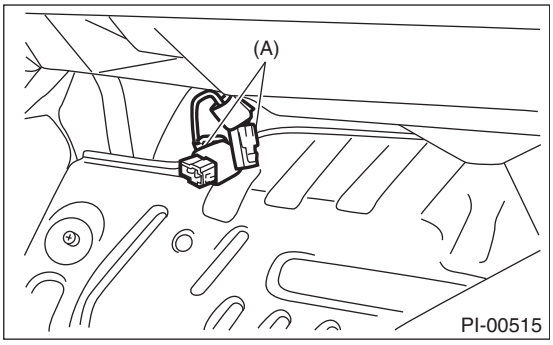
Check the install condition of the ECM protector is installed for vehicles for Canada models. Check the special nuts and plastic cover of the ECM protector are firmly installed.



(A) ECM protector
(B) Special nut
(C) Plastic cover

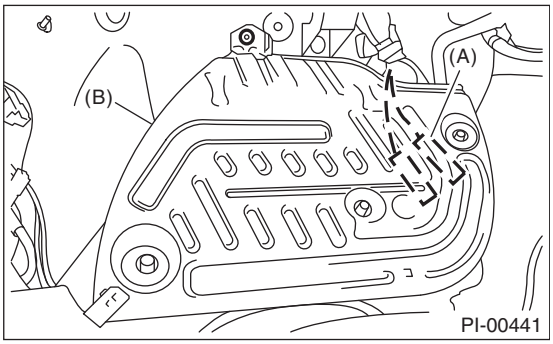
26.DELIVERY (TEST) MODE CONNECTOR

1) Turn the ignition switch to ON and check that the malfunction indicator light starts blinking.
2) If the light blinks, return the ignition key to LOCK.



(A) Delivery (test) mode connector (green)

3) Disconnect the delivery (test) mode connector under the passenger's seat.
4) Then, turn the ignition key to ON again.
5) If the malfunction indicator light blinks even though the delivery (test) mode connector is disconnected, carry out an engine diagnosis.
6) Put the disconnected delivery (test) mode connector behind the ECM protector.



(A) Delivery (test) mode connector
(B) ECM protector

27.IMMOBILIZER SYSTEM

1) Check that the engine starts with all keys that are equipped on vehicle.
2) 60 seconds after turning ignition switch from ON to ACC or OFF, or immediately after removing the key, check that the security indicator light is blinking.

NOTE:
If malfunctions occur, refer to "IMMOBILIZER (DIAGNOSIS)". <Ref. to CC(diag)-2, Basic Diagnostic Procedure.>

28.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.

29.EXHAUST SYSTEM

Listen to the exhaust noise to see if no exhaust gas leak or abnormal noises are observed.

30.INDICATOR AND WARNING LIGHTS

Check that all indicator lights and warning lights operate normally.

31.HEATER & VENTILATION

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

32.AIR CONDITIONER

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

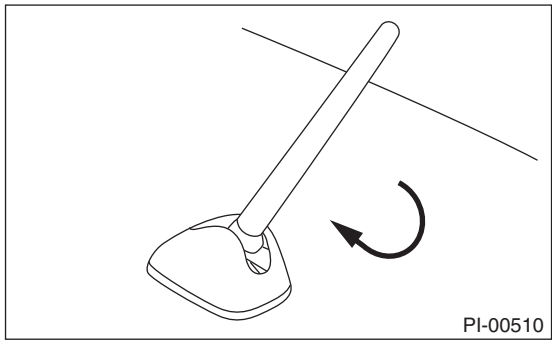
NOTE:
To prevent the insufficient lubrication of the air conditioner, operate the air conditioner for five minutes at idling.

33.CLOCK

Check the clock for normal operations and enough accuracy.

34.ANTENNA

Install the antenna.
1) Remove the cap from the antenna base.
2) Tighten the antenna rod on the rear seat by hand in the direction indicated by the arrow to install.



3) Make sure that radio reception operates correctly after installation.

35.AUDIO

1) Check if the AM/FM radio broadcasting can be heard.
2) Check that all the radio functions work properly and the noise level is normal.
3) Check the CD and AUX for normal operation.
4) Check that the AUX is installed into the console without looseness.

36.ACCESSORY POWER SUPPLY SOCKET

1) Check operation of the accessory power supply socket in console box.
2) Check operation of the accessory power supply socket in luggage room.

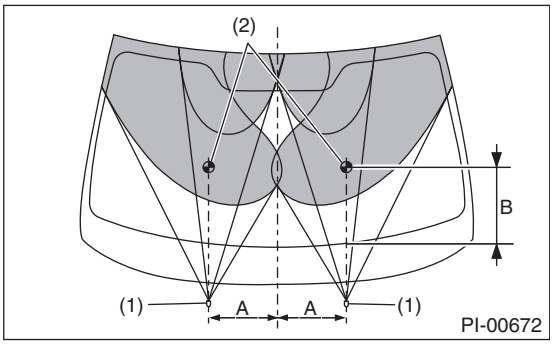
37.LIGHTING SYSTEM

1) Check the headlight operations.
2) Check the stop light operation.
3) Check other lights for normal operations.

38.WINDOW WASHER

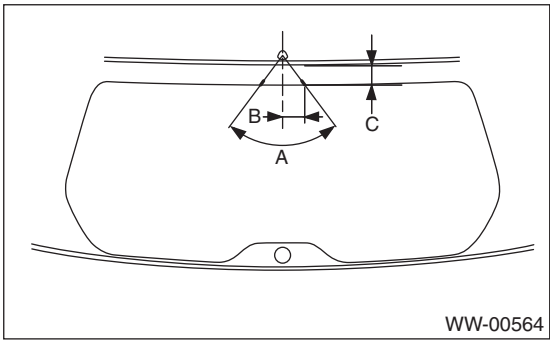
Check that the window washer system injects washer fluid to the specified area of the windshield and rear window glass shown in the figure.

Front injection position:
A: 250 mm (9.84 in)
B: 279 mm (10.99 in)



(1) Washer nozzle
(2) Center of lower nozzle

Rear injection position:
A: 72°
B: 45 mm (1.8 in)
C: 36 mm (1.4 in)



39.NAVIGATION SYSTEM

1) Check all display functions for normal operation. (Refer to the owner's manual for the operation procedures.)
2) Check that the navigation and audio systems operate normally.
3) Check that the noise level is acceptable and the CD/HDD and AUX units operate normally.
4) Check that the AUX is installed into the console without looseness.

40.WIPER

Check the front and rear wipers for normal operations.

41.POWER WINDOW

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

42.SUNROOF

Check that the sunroof operates normally.

43.REAR DEFOGGER SYSTEM

Check that the rear defogger system operates normally.

44.DOOR MIRROR

Check that the remote control door mirror operates normally.

45.PARKING BRAKE

Check the parking brake for normal operations. When pulling the parking brake lever with a force of 196 N (20 kgf, 44 lb), check that the lever stroke of parking brake lever is 7 to 8 notches.

46.BRAKE TEST

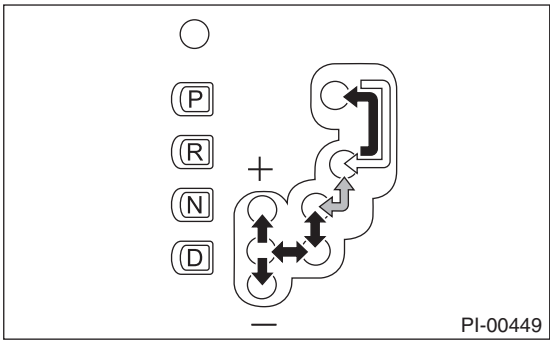
Check the foot brake for normal operations.

47.SHIFT CONTROL

• AT MODEL

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 to 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
Manual mode	OK	OK	OK	OK

• MT MODEL

Check for smooth operation to each position.

48.CRUISE CONTROL

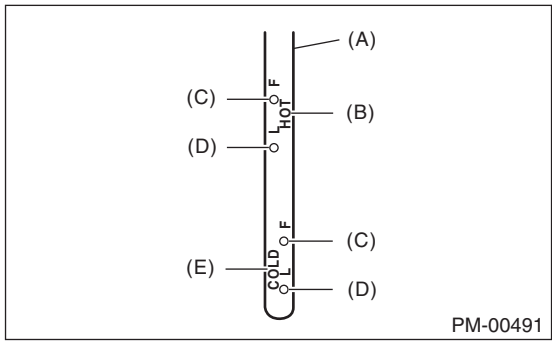
Operate the cruise control system. Check that the system is activated and deactivated correctly.

49.ATF LEVEL

CAUTION:
If the ATF is spilt over exhaust pipe, wipe it off with cloth to avoid emitting smoke or causing a fire.

After selecting all positions (P, R, N, D), set the select lever in P range. Idle the engine for one or two minutes, and measure the ATF level. If the amount of ATF is insufficient, check that no leaks are found. Then, add the necessary amount of recommended ATF.

CAUTION:
Fill completely with the recommended ATF. <Ref. to RM-4, FLUID, RECOMMENDED MATERIALS, Recommended Materials.>

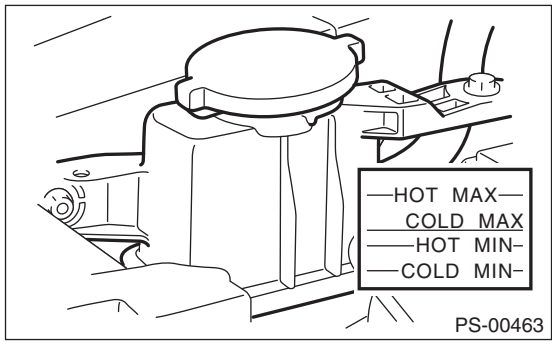


(A) Level gauge
(B) Inspection position when “HOT” (70 — 80°C (158 — 176°F))
(C) Upper level
(D) Lower level
(E) Inspection position when “COLD” (20 — 30°C (68 — 86°F))

50.POWER STEERING FLUID LEVEL

CAUTION:
If any power steering fluid is spilt over the exhaust pipe, wipe it off with a cloth to avoid emitting smoke or causing a fire.

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.



51.FLUID LEAKAGE

Check entire areas of the vehicle for any trace of coolant/oil (such as engine and gear oil)/fluid (such as transmission and brake) leaks.

52.WATER LEAKAGE

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 front 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) away 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.

53.APPEARANCE 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 exist 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 much 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.

6) Peel off the identification label attached to the following places.

• Rear combination light

• High-mounted stop light

• Fog light

PERIODIC MAINTENANCE SERVICES

PM

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1. General Description

A: GENERAL DESCRIPTION

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

2. Schedule

A: MAINTENANCE SCHEDULE

1. FOR U.S. MODEL

		Maintenance interval [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	132	Remarks
	× 1,000 km	4.8	12	24	36	48	60	72	84	96	108	120	132	144	156	168	180	192	220	
	× 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	132	
1	Engine oil	(R)	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	R	
3	Spark plug									R								R		
4	Drive belt(s)					I				I				I				I		Non-turbo Model
						I				I				I		R				Turbo Model
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	Replace after the first 11 years or 220,000 km (137,500 miles), and every six years or 120,000 km (75,000 miles) thereafter																		
11	Clutch system			I		I		I		I		I		I		I		I		
12	Transmission gear 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 pad and disc			I		I		I		I		I		I		I		I		
18	Brake linings and drums			I		I		I		I		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	I	Note (3)
24	Steering system (Power steering)			I		I		I		I		I		I		I		I		
25	Air conditioner filter	Replace every 12 months or 12,000 km (7,500 miles)																		

Symbol
R: Replace
I: Inspection
(R): Recommended service for maintaining the better vehicle performance
(I): Inspections recommended for vehicle safety

PERIODIC MAINTENANCE SERVICES

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

2. FOR CANADA MODEL

• Non-turbo model

		Maintenance interval [Number of months or km (miles), whichever occurs first]																	
	Months	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	Remarks
	× 1,000 km	8	16	24	32	40	48	56	64	72	80	88	96	104	112	120	128	136	
	× 1,000 miles	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	
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						
4	Drive belt(s)	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	
5	Emission-related hoses								I								I		
6	PCV valve								I								I		
7	Fuel line						I						I						
8	Air cleaner element				I				I				I				I		
9	Cooling system		I		I		I		I		I		I		I		I		Note (1)
10	Engine coolant	Replace after the first 11 years or 220,000 km (137,500 miles), and every six years or 120,000 km (75,000 miles) thereafter																	
11	Clutch system								I								I		
12	Clutch fluid	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	
13	Transmission gear oil	I	I	I	I	I	I	I	I	I	I	I	R	I	I	I	I	I	
14	ATF	I	I	I	I	I	I	I	I	I	I	I	R	I	I	I	I	I	
15	Front & rear differential gear oil	I	I	I	I	I	I	I	I	I	I	I	R	I	I	I	I	I	
16	Brake line								I								I		
17	Brake fluid	I	I	I	I	I	I	I	R	I	I	I	I	I	I	I	R	I	
18	Disc brake pad and disc		I		I		I		I		I		I		I		I		
19	Brake linings and drums		I		I		I		I		I		I		I		I		
20	Parking brake								I								I		
21	Suspension	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	
22	Axle boot	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	
23	Tires	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	
24	Tire rotation		P		P		P		P		P		P		P		P		
25	Steering system (Power steering)	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	
26	Battery								I								I		
27	SRS airbag	Inspect every 10 years																	
28	Air conditioner filter				I				I				I				I		

Symbol
R: Replace
I: Inspection
P: Perform

NOTE:
1. Test engine coolant for strength (-35°C (-95°F)) and inspect hoses and clamps.

PERIODIC MAINTENANCE SERVICES

		Maintenance interval [Number of months or km (miles), whichever occurs first]							
	Months	108	114	120	126	132	138	144	Remarks
	× 1,000 km	144	152	160	168	176	184	192	
	× 1,000 miles	89	94	99	104	109	114	119	
1	Engine oil	R	R	R	R	R	R	R	
2	Engine oil filter	R	R	R	R	R	R	R	
3	Spark plug	R						R	
4	Drive belt(s)	I	I	I	I	I	I	I	
5	Emission-related hoses							I	
6	PCV valve							I	
7	Fuel line	I						I	
8	Air cleaner element			I				I	
9	Cooling system	I		I		I		I	Note (1)
10	Engine coolant	Replace after the first 11 years or 220,000 km (137,500 miles), and every six years or 120,000 km (75,000 miles) thereafter							
11	Clutch system							I	
12	Clutch fluid	I	I	I	I	I	I	I	
13	Transmission gear oil	I	I	I	I	I	I	R	
14	ATF	I	I	I	I	I	I	R	
15	Front & rear differential gear oil	I	I	I	I	I	I	R	
16	Brake line							I	
17	Brake fluid	I	I	I	I	I	I	R	
18	Disc brake pad and disc	I		I		I		I	
19	Brake linings and drums	I		I		I		I	
20	Parking brake							I	
21	Suspension	I	I	I	I	I	I	I	
22	Axle boot	I	I	I	I	I	I	I	
23	Tires	I	I	I	I	I	I	I	
24	Tire rotation	P		P		P		P	
25	Steering system (Power steering)	I	I	I	I	I	I	I	
26	Battery							I	
27	SRS airbag	Inspect every 10 years							
28	Air conditioner filter			I				I	

Symbol
R: Replace
I: Inspection
P: Perform

NOTE:
1. Test engine coolant for strength (-35°C (-95°F)) and inspect hoses and clamps.

• Turbo model

		Maintenance interval [Number of months or km (miles), whichever occurs first]																	
	Months	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	Remarks
	× 1,000 km	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	
	× 1,000 miles	4	7	11	15	19	22	26	30	34	37	41	45	48	52	56	60	63	
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		
4	Drive belt(s)	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	
5	Emission-related hoses										I								
6	PCV valve										I								
7	Timing belt	Replace every 10 years or 168,000 km (104,400 miles)																	
8	Fuel line								I								I		
9	Air cleaner element						I						I						
10	Cooling system		I		I		I		I		I		I		I		I		Note (1)
11	Engine coolant	Replace after the first 11 years or 220,000 km (137,500 miles), and every six years or 120,000 km (75,000 miles) thereafter																	
12	ATF	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	R	I	
13	Front & rear differential gear oil	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	R	I	
14	Brake line										I								
15	Brake fluid	I	I	I	I	I	I	I	I	I	R	I	I	I	I	I	I	I	
16	Disc brake pad and disc		I		I		I		I		I		I		I		I		
17	Brake linings and drums		I		I		I		I		I		I		I		I		
18	Parking brake										I								
19	Suspension	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	
20	Axle boot	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	
21	Tires	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	
22	Tire rotation		P		P		P		P		P		P		P		P		
23	Steering system (Power steering)	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	
24	Battery										I								
25	SRS airbag	Inspect every 10 years																	
26	Air conditioner filter						I						I						

Symbol
R: Replace
I: Inspection
P: Perform

NOTE:
1. Test engine coolant for strength (-35°C (-95°F)) and inspect hoses and clamps.

PERIODIC MAINTENANCE SERVICES

		Maintenance interval [Number of months or km (miles), whichever occurs first]															
	Months	108	114	120	126	132	138	144	150	156	162	168	174	180	186	192	Remarks
	× 1,000 km	108	114	120	126	132	138	144	150	156	162	168	174	180	186	192	
	× 1,000 miles	67	71	75	78	82	86	89	93	97	101	104	108	112	116	119	
1	Engine oil	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	
3	Spark plug															R	
4	Drive belt(s)	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	
5	Emission-related hoses			I										I			
6	PCV valve			I										I			
7	Timing belt	Replace every 10 years or 168,000 km (104,400 miles)															
8	Fuel line							I								I	
9	Air cleaner element	I						I						I			
10	Cooling system	Replace after the first 11 years or 220,000 km (137,500 miles), and every six years or 120,000 km (75,000 miles) thereafter															
11	Engine coolant	I		I		I		I		I		I		I		I	Note (1)
12	ATF	I	I	I	I	I	I	I	I	I	I	I	I	I	I	R	
13	Front & rear differential gear oil	I	I	I	I	I	I	I	I	I	I	I	I	I	I	R	
14	Brake line			I										I			
15	Brake fluid	I	I	R	I	I	I	I	I	I	I	I	I	R	I	I	
16	Disc brake pad and disc	I		I		I		I		I		I		I		I	
17	Brake linings and drums	I		I		I		I		I		I		I		I	
18	Parking brake			I										I			
19	Suspension	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	
20	Axle boot	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	
21	Tires	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	
22	Tire rotation	P		P		P		P		P		P		P		P	
23	Steering system (Power steering)	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	
24	Battery			I										I			
25	SRS airbag	Inspect every 10 years															
26	Air conditioner filter	I						I						I			

Symbol
R: Replace
I: Inspection
P: Perform

NOTE:
1. Test engine coolant for strength (-35°C (-95°F)) and inspect hoses and clamps.

B: PERIODIC REPLACEMENT PARTS

Item	Maintenance interval	Repeat short distance driving	Repeat driving on bumpy muddy road	Driving in extremely cold weather	Area where salt or other corrosive substance used, or coastal area	High humidity or mountain area	Repeat towing trailer
Engine oil	Every 3.75 months	R		R			R
	6,000 km						
	3,750 miles						
Engine oil filter	Every 3.75 months	R		R			R
	6,000 km						
	3,750 miles						
Fuel filter	Every 15 months				I		
	Every 24,000 km						
	Every 15,000 miles						
Fuel line	Every 15 months				I		
	Every 24,000 km						
	Every 15,000 miles						
Transmission gear oil	Every 15 months						R
	Every 24,000 km						
	Every 15,000 miles						
ATF	Every 15 months						R
	Every 24,000 km						
	Every 15,000 miles						
Front & rear differential gear oil	Every 15 months						R
	Every 24,000 km						
	Every 15,000 miles						
Brake line	Every 15 months	I	I		I		I
	Every 24,000 km						
	Every 15,000 miles						
Brake fluid	Every 15 months					R	
	Every 24,000 km						
	Every 15,000 miles						
Disc brake pad and disc	Every 15 months	I	I		I		I
	Every 24,000 km						
	Every 15,000 miles						
Brake linings and drums	Every 15 months	I	I		I		I
	Every 24,000 km						
	Every 15,000 miles						
Parking brake	Every 15 months	I	I		I		I
	Every 24,000 km						
	Every 15,000 miles						
Suspension	Every 7.5 months		I	I	I		I
	Every 12,000 km						
	Every 7,500 miles						
Axle boots and joints	Every 7.5 months	I	I	I	I		I
	Every 12,000 km						
	Every 7,500 miles						
Steering system (Power steering)	Every 7.5 months	I	I	I	I		I
	Every 12,000 km						
	Every 7,500 miles						

3. Engine Oil

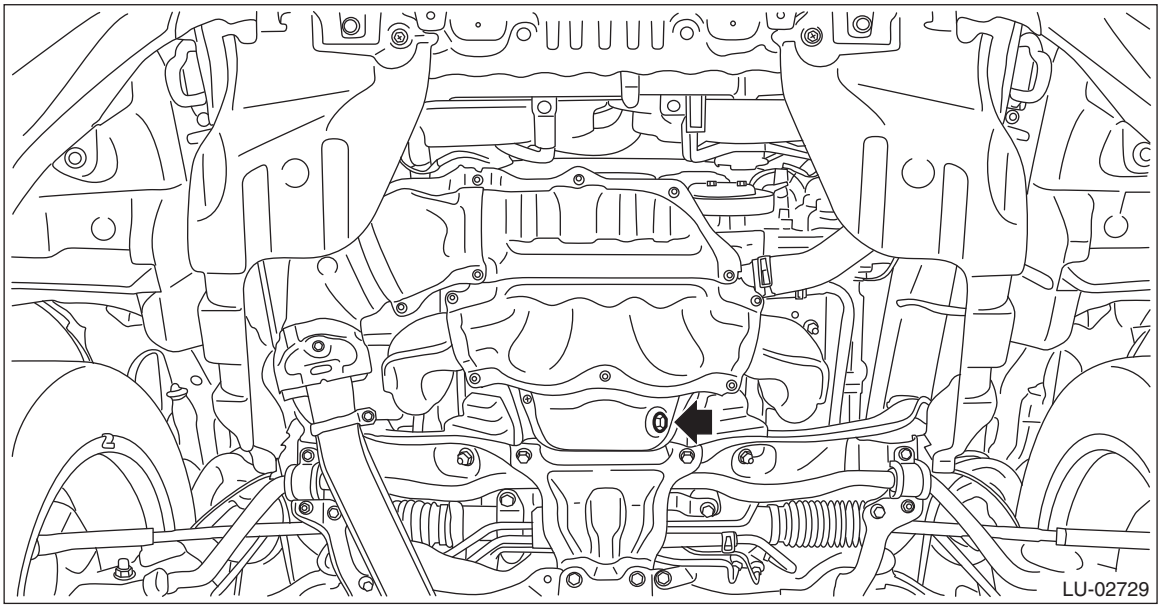
A: REPLACEMENT

CAUTION:
If the engine oil is spilt over exhaust pipe or the under cover, wipe it off with cloth to avoid emitting smoke or causing a fire.

1. NON-TURBO MODEL

1) Open the oil filler cap for quick draining of engine oil.
2) Lift up the vehicle.
3) Drain engine oil by loosening the engine oil drain plug.

NOTE:
Prepare the container for draining of engine oil.



4) After draining the engine oil, tighten the engine oil drain plug.

NOTE:
Use a new drain plug gasket.

Tightening torque:
41.7 N·m (4.3 kgf-m, 30.8 ft-lb)
5) Lower the vehicle.
6) Select engine oil of adequate quality and viscosity and fill it through the oil filler duct to the “F” line on the oil level gauge. Make sure that the vehicle is parked on a level surface when checking oil level.

Recommended oil:
Refer to the “RM” section for the recommended oil. <Ref. to RM-2, LUBRICANTS, RECOMMENDED MATERIALS, Recommended Materials.>

Engine oil capacity:
Refer to “SPC” section for engine oil capacity. <Ref. to SPC-4, CAPACITY, Forester.>

CAUTION:
It is acceptable to fill an engine with oil of another brand when replacing the oil, but make sure to use an oil with an API standard and SAE viscosity number specified by Subaru.

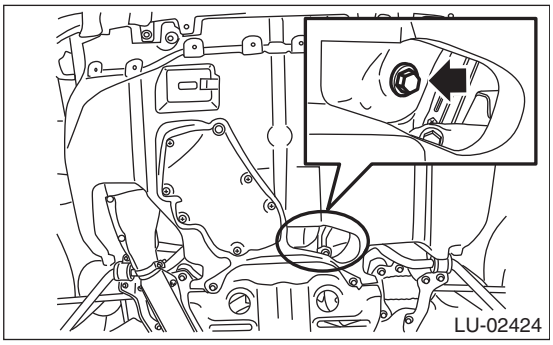
NOTE:
The proper viscosity oil helps the engine maintain its ideal temperature, and cranking speed increased by reducing viscosity friction in hot condition.
7) Close the oil filler cap.
8) Start the engine to circulate the oil in engine room.

9) After stopping the engine, recheck the oil level.

2. TURBO MODEL

1) Open the engine oil filler cap for quick draining of engine oil.
2) Lift up the vehicle.
3) Drain engine oil by loosening the engine oil drain plug.

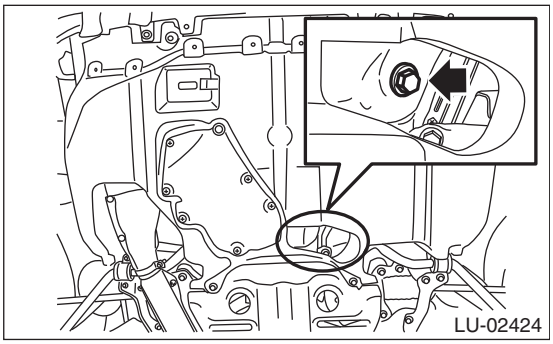
NOTE:
Prepare the container for draining of engine oil.



4) 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)



5) Lower the vehicle.
6) Using engine oil of proper quality and viscosity, fill engine oil through the filler duct to the “F” line on the oil level gauge. Make sure that the vehicle is parked on a level surface when checking oil level.

Recommended oil:
Refer to the “RM” section for the recommended oil. <Ref. to RM-2, LUBRICANTS, RECOMMENDED MATERIALS, Recommended Materials.>

Engine oil capacity:
Refer to “SPC” section for engine oil capacity. <Ref. to SPC-4, CAPACITY, Forester.>
7) Close the engine oil filler cap.
8) Start the engine to circulate the oil in engine room.
9) After stopping the engine, recheck the oil level. If necessary, add engine oil up to the “F” line on oil level gauge.

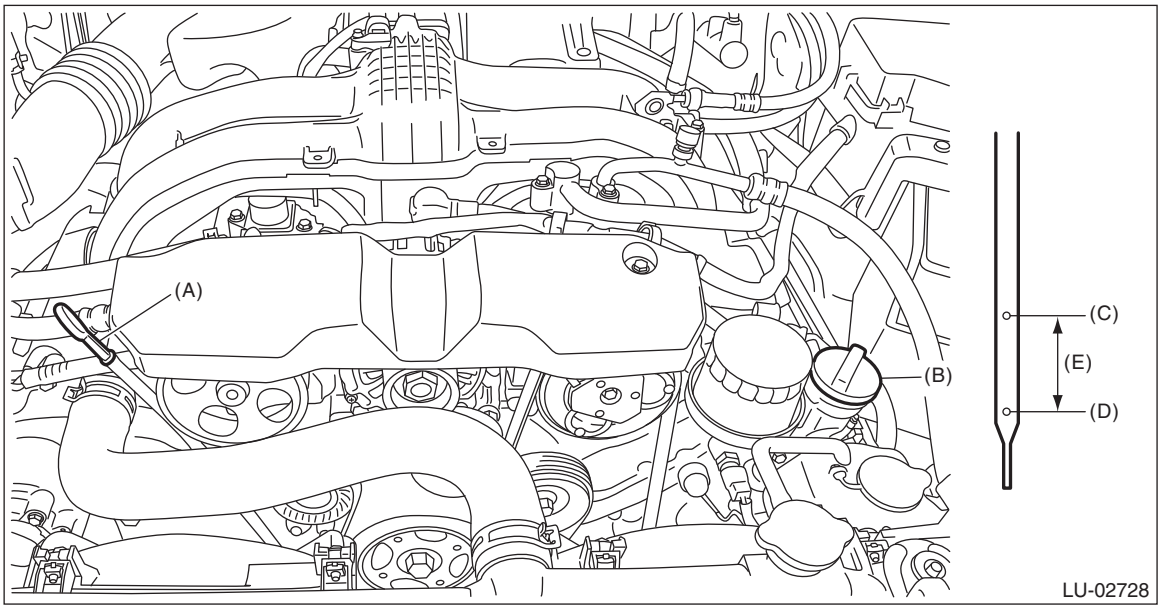
B: INSPECTION

CAUTION:
If the engine oil is spilt over exhaust pipe or the under cover, wipe it off with cloth to avoid emitting smoke or causing a fire.

1. NON-TURBO MODEL

1) Park the vehicle on a level surface.
2) Remove the oil level gauge and wipe away the oil.
3) Reinsert the oil level gauge all the way. Be sure that the oil level gauge is correctly inserted and properly orientated.
4) Pull out the oil level gauge again, and check the oil level. If the engine oil level is below “L” line, check for oil leakage from engine and add oil to bring the level up to “F” line.
5) Start the engine to circulate the oil in engine room.
6) After turning off the engine, wait a few minutes for the oil to return to the oil pan before checking the level.

NOTE:
- To prevent overfilling of engine oil, do not add oil above “F” line when the engine is cold.
- As the oil level gauge is used for daily maintenance, “F” line and “L” line is set assuming that the engine is cold.

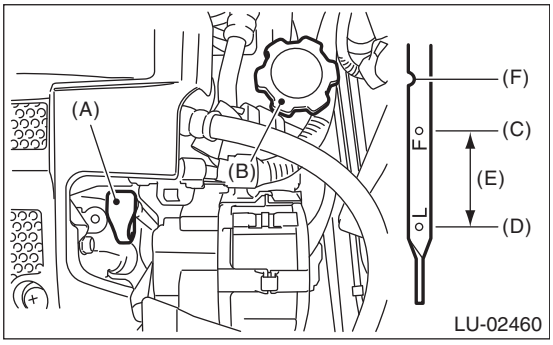


(A) Oil level gauge
(B) Oil filler cap
(C) “F” line
(D) “L” line
(E) Approx. 1.0 ℓ (1.1 US qt, 0.9 Imp qt)

2. TURBO MODEL

1) Park the vehicle on a level surface.
2) Remove the oil level gauge and wipe away the oil.
3) Reinsert the oil level gauge all the way. Be sure that the oil level gauge is correctly inserted and properly orientated.
4) Pull out the oil level gauge again, and check the oil level. If the engine oil level is below “L” line, check for oil leakage from engine and add oil to bring the level up to “F” line.
5) Start the engine to circulate the oil in engine room.
6) After turning off the engine, wait a few minutes for the oil to return to the oil pan before checking the level.

NOTE:
• Just after driving or while the engine is warm, engine oil level shows in the range between the “F” line and the notch mark. This is caused by thermal expansion of engine oil.
• To prevent overfilling of engine oil, do not add oil above “F” line when the engine is cold.
• As the oil level gauge is used for daily maintenance, “F” line and “L” line is set assuming that the engine is cold.



(A) Oil level gauge
(B) Engine oil filler cap
(C) “F” line
(D) “L” line
(E) Approx. 1.0 ℓ (1.1 US qt, 0.9 Imp qt)
(F) Notch mark

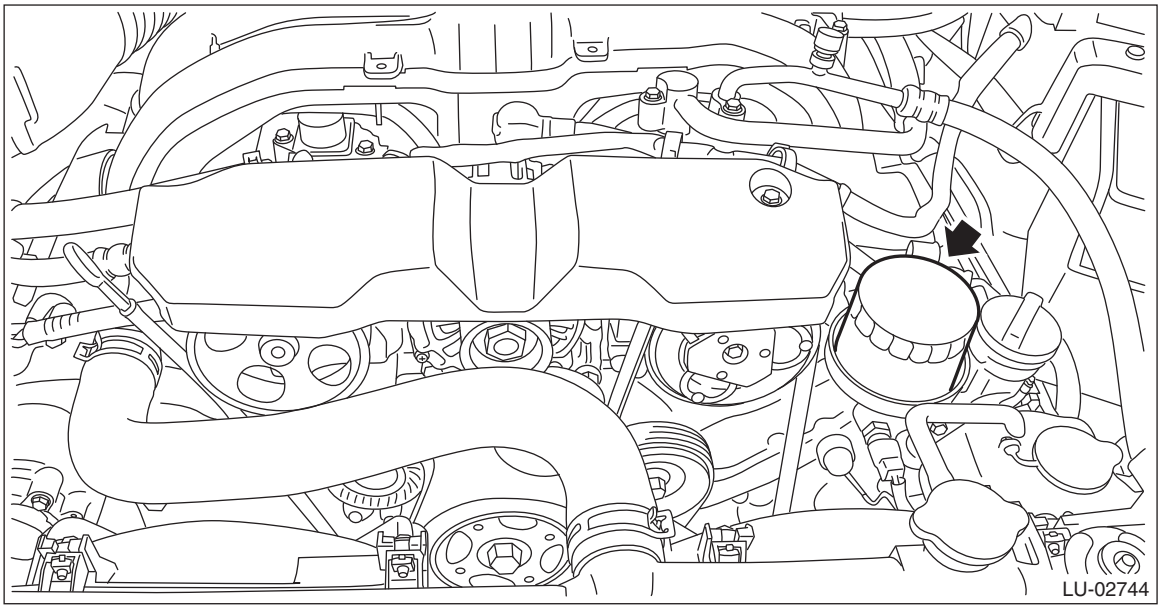
4. Engine Oil Filter

A: REPLACEMENT

CAUTION:
If the engine oil is spilt over exhaust pipe or the under cover, wipe it off with cloth to avoid emitting smoke or causing a fire.

1. NON-TURBO MODEL

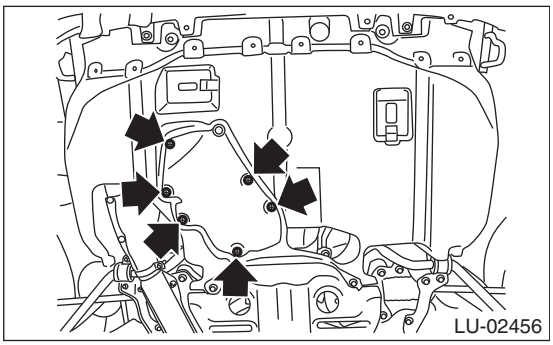
1) When there is water or dirt on the oil filter installation portion, clean the relevant area by applying air.
2) Remove the oil filter using ST.
ST 498547000 OIL FILTER WRENCH



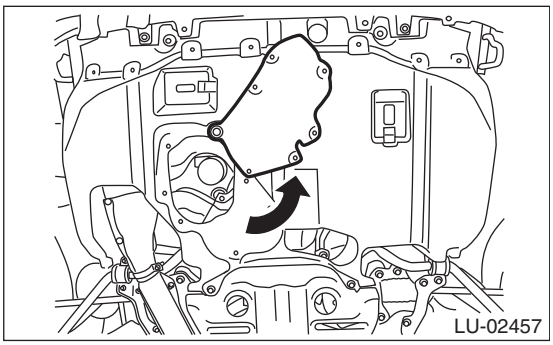
3) Clean the oil filter installing surface of chain cover.
4) Obtain a new oil filter and apply a thin coat of engine oil to the seal rubber.
5) Install the oil filter turning it by hand, being careful not to damage the seal rubber of the oil filter.
6) Tighten more (approx. 3/4 turn) after the seal rubber contacts the chain cover. When using a torque wrench, tighten to 14 N·m (1.4 kgf-m, 10.3 ft-lb).
7) After installation, check the engine oil level, and check there is no leakage. <Ref. to PM-12, INSPECTION, Engine Oil.>

2. TURBO MODEL

1) Set the vehicle on a lift.
2) Lift up the vehicle.
3) Remove the service hole cover clip located on the under cover.



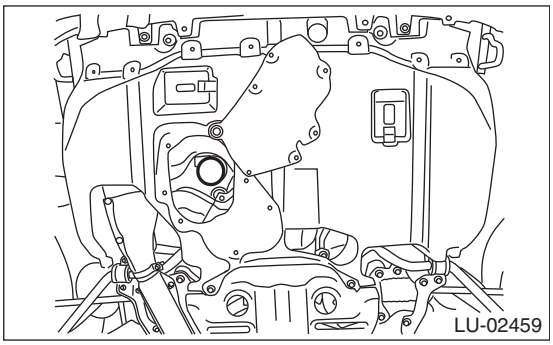
4) Rotate the service hole cover in the arrow direction.



5) Remove the oil filter.
• Oil filter (Black)
Remove using the ST.

ST 18332AA000 OIL FILTER WRENCH (OUTER DIAMETER: 68 MM (2.68 IN) FOR OIL FILTER)

• Oil filter (Blue)
Remove using a general tool (65/67 mm 14 Flutes).



6) Clean the oil filter installing surface of cylinder block.
7) Obtain a new oil filter and apply a thin coat of engine oil to the seal rubber.
8) Install the oil filter turning it by hand, being careful not to damage the seal rubber of the oil filter.

CAUTION:
Do not tighten excessively, or oil may leak.

• Tighten the oil filter (Black) with an outer diameter of 68 mm (2.68 in) (approx. 1 rotation) after the seal rubber of the oil filter comes in contact with cylinder block. When using a torque wrench, tighten to 14 N·m (1.4 kgf-m, 10.3 ft-lb).
• Tighten the oil filter (Blue) with an outer diameter of 67.4 mm (2.65 in) (approx. 7/8 rotation) after the seal rubber of the oil filter comes in contact with cylinder block. When using a torque wrench, tighten to 12 N·m (1.2 kgf-m, 8.9 ft-lb).
9) Return the service hole cover to its original position.
10) Check the engine oil level. <Ref. to PM-12, INSPECTION, Engine Oil.>
11) Lower the vehicle.

B: INSPECTION

1) Start 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 PM-12, INSPECTION, Engine Oil.>

5. Spark Plug

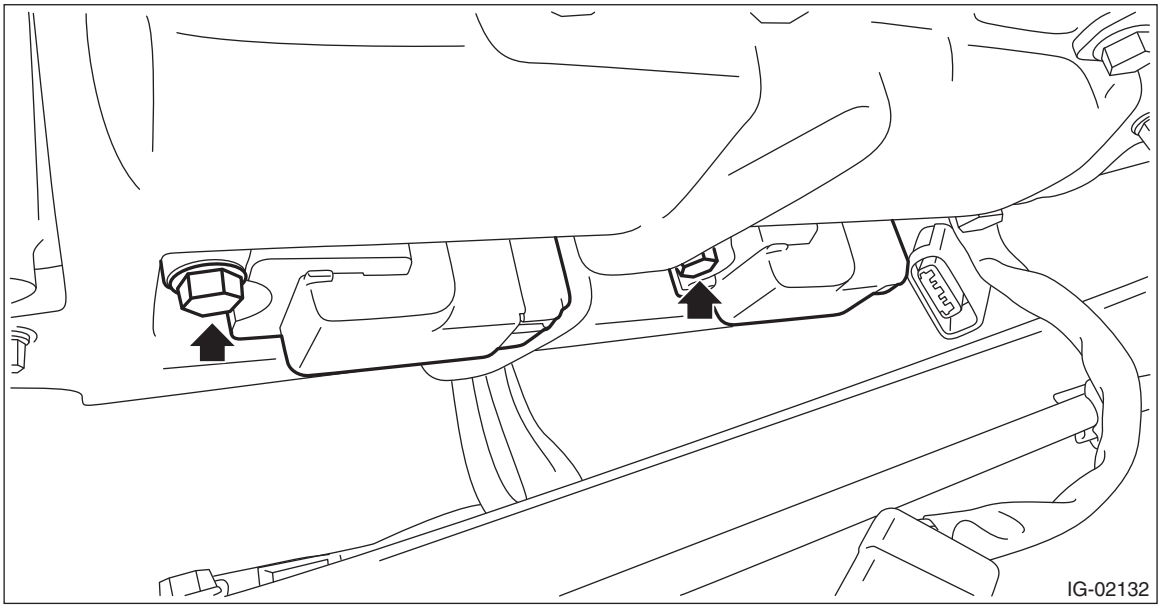
A: REPLACEMENT

1. NON-TURBO MODEL

Recommended spark plug:
<Ref. to SPC-2, ELECTRICAL, Forester.>

• RH side

1) Disconnect the ground cable from battery.
2) Remove the air cleaner case. <Ref. to IN(H4DO)-7, REMOVAL, Air Cleaner Case.>
3) Disconnect the connector from ignition coil.
4) Remove the ignition coil.



5) Remove the spark plug with a spark plug socket.
6) Install in the reverse order of removal.

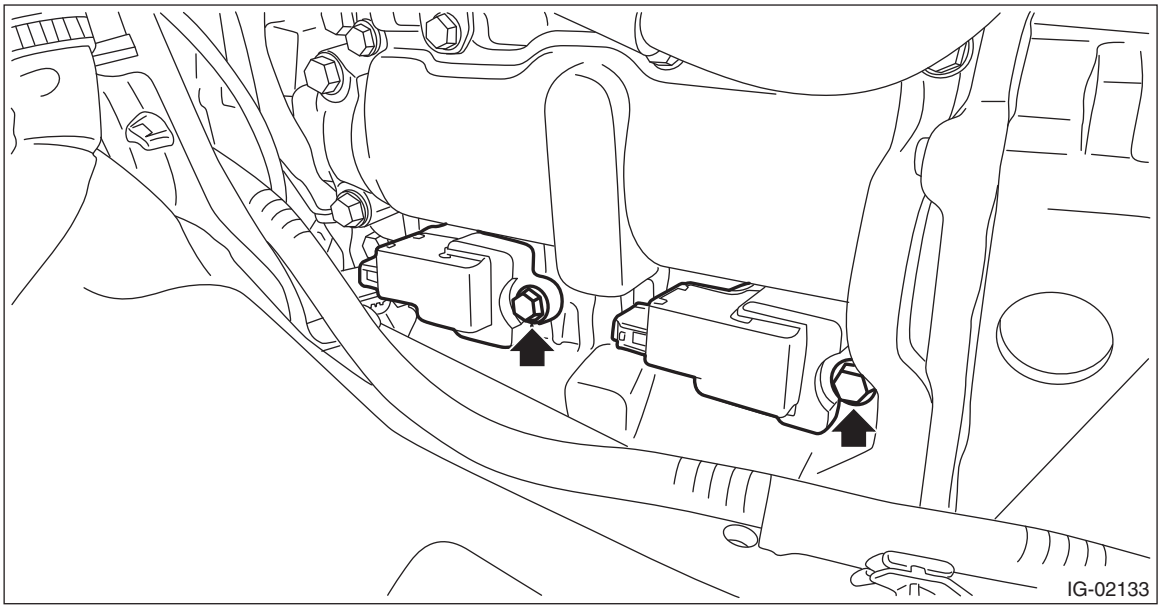
CAUTION:
Degrease the installing portion and mounting bolt of the ignition coil.

Tightening torque (Spark plug):
17 N·m (1.7 kgf-m, 12.5 ft-lb)

Tightening torque (Ignition coil):
12 N·m (1.2 kgf-m, 8.9 ft-lb)

• LH side

1) Remove the battery. <Ref. to SC(H4DO)-59, REMOVAL, Battery.>
2) Disconnect the connector from ignition coil.
3) Remove the ignition coil.



4) Remove the spark plug with a spark plug socket.
5) Install in the reverse order of removal.

CAUTION:
Degrease the installing portion and mounting bolt of the ignition coil.

Tightening torque (Spark plug):
17 N·m (1.7 kgf-m, 12.5 ft-lb)

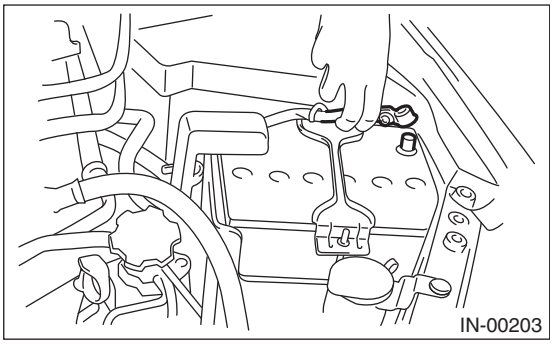
Tightening torque (Ignition coil):
12 N·m (1.2 kgf-m, 8.9 ft-lb)

2. TURBO MODEL

Recommended spark plug:
<Ref. to SPC-2, ELECTRICAL, Forester.>

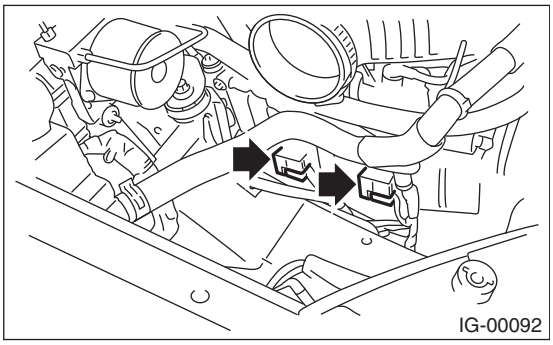
RH SIDE

1) Remove the collector cover.
2) Disconnect the ground cable from battery.


IN-00203

3) Remove the air cleaner case. <Ref. to IN(H4DOTC)-8, REMOVAL, Air Cleaner Case.>
4) Disconnect the connector from ignition coil.
5) Remove the ignition coil.

NOTE:
Turn #3 ignition coil by 180° to remove it.


IG-00092

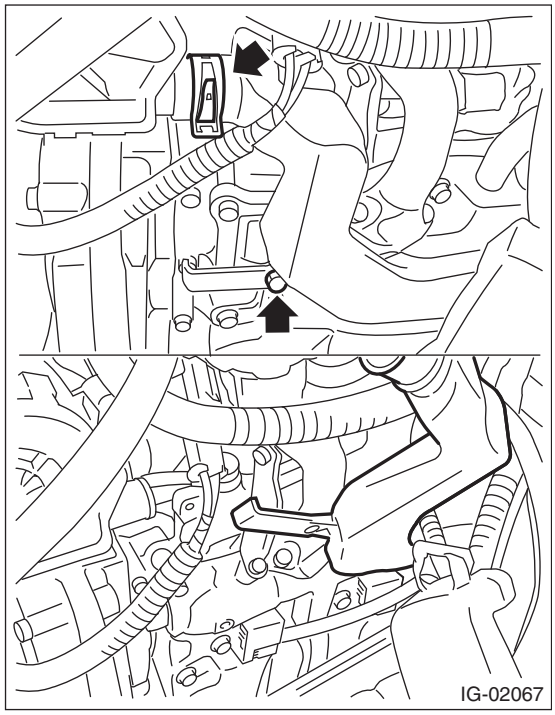
6) Remove the spark plug with a spark plug socket.
7) Install in the reverse order of removal.

Tightening torque (Spark plug):
21 N·m (2.1 kgf-m, 15.5 ft-lb)

Tightening torque (Ignition coil):
16 N·m (1.6 kgf-m, 11.8 ft-lb)

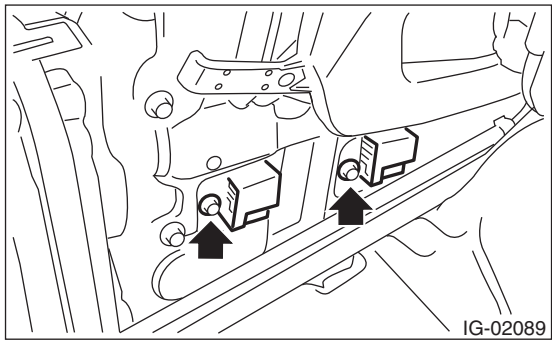
LH SIDE

1) Remove the collector cover.
2) Remove the battery and battery carrier.
3) Disconnect the air duct from the secondary air pump.


IG-02067

4) Remove the bolts that attach the air pump duct to the rocker cover LH, and raise the air pump duct.
5) Disconnect the connector from ignition coil.
(1) Install in the reverse order of removal.
6) Remove the ignition coil.

NOTE:
Turn #4 ignition coil by 180° to remove it.


IG-02089

7) Remove the spark plug with a spark plug socket.
8) Install in the reverse order of removal.

Tightening torque (Spark plug):
21 N·m (2.1 kgf-m, 15.5 ft-lb)

Tightening torque (Ignition coil):
16 N·m (1.6 kgf-m, 11.8 ft-lb)

Tightening torque (Air duct):
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)

6. V-belt

A: INSPECTION

1. NON-TURBO MODEL

1) Replace the belts if cracks, fraying or wear are found.
2) Make sure that the belt tension adjuster assembly is not stuck.

2. TURBO MODEL

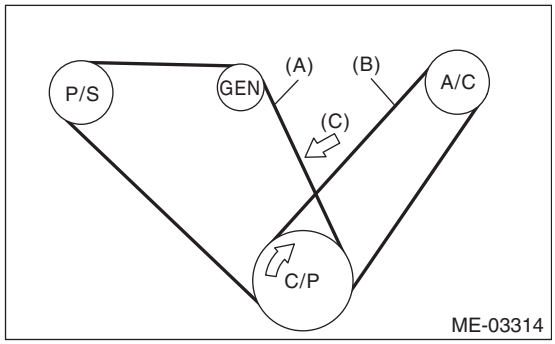
CAUTION:
Check and adjust the front side belt tension so that it is within the specified range. Using the belt with a tension out of the specified range may result in a fault such as the following:
• If the front side belt tension is higher, unexpected force is generated at the power steering oil pump, generator and crankshaft bearing, causing abnormal noise due to abnormal wear of the bearing.
• If the front side belt tension is lower, the front side belt and crank pulley slip, causing abnormally high temperature on the crank pulley due to frictional heat. If this condition repeatedly occurs, the front side belt may abnormally wear, causing abnormal noise, front side belt damage or crank pulley damage.

NOTE:
Since the rear belt is a stretch type belt, it does not require tension check and adjustment.

• Procedure (without belt tension gauge)

1) Replace the belts if cracks, fraying or wear are 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-20, REPLACEMENT, V-belt.>

When pressing with belt tension 98 N (10 kgf, 22 lbf)
When replacing: 7 — 9 mm (0.276 — 0.354 in)
When reusing: 9 — 11 mm (0.354 — 0.433 in)

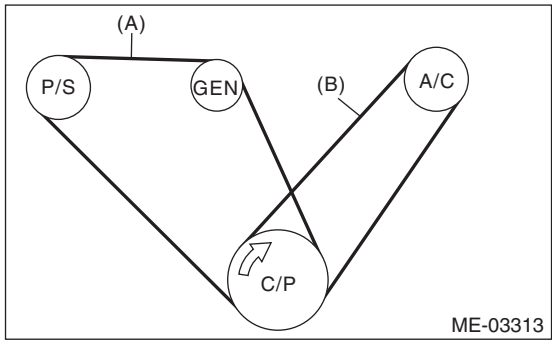


(A) Front side belt
(B) Rear side belt
(C) 98 N (10 kgf, 22 lbf)
C/P Crank pulley
GEN Generator pulley
P/S Power steering oil pump pulley
A/C A/C compressor pulley

• Procedure (with belt tension gauge)

1) Replace the belts if cracks, fraying or wear are found.
2) Remove the V-belt covers and radiator reservoir tank.
3) Check the belt tension, using the belt tension gauge. Adjust the tension, if necessary by changing the generator installing position or idler pulley installing position.

Belt tension
When installing new parts:
640 — 780 N (65 — 80 kgf, 144 — 175 lbf)
At inspection:
490 — 640 N (50 — 65 kgf, 110 — 144 lbf)

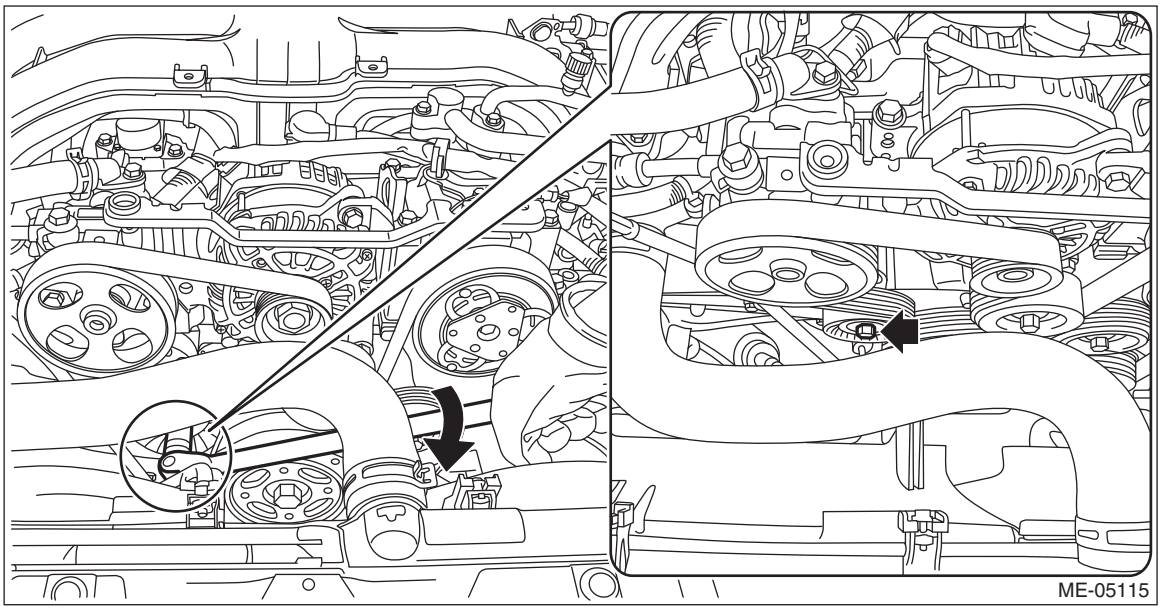


(A) Front side belt
(B) Rear side belt
C/P Crank pulley
GEN Generator pulley
P/S Power steering oil pump pulley
A/C A/C compressor pulley

B: REPLACEMENT

1. NON-TURBO MODEL

1) Remove the V-belt covers.
2) Remove the air intake duct (Rear). <Ref. to IN(H4DO)-14, REMOVAL, Air Intake Duct.>
3) Install the tool to belt tension adjuster assembly installation bolt.
4) Rotate the tool clockwise and loosen the V-belt to remove.



5) Install in the reverse order of removal.

CAUTION:
- **Be sure the V-belt is free from oil, grease and coolant.**
- **Wipe off any dust, oil or water on the groove of each pulley with cloth.**

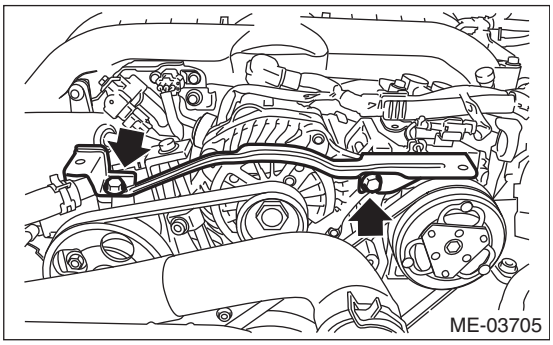
Tightening torque:
V-belt cover
13 N·m (1.3 kgf-m, 1.6 ft-lb)

2. TURBO MODEL

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

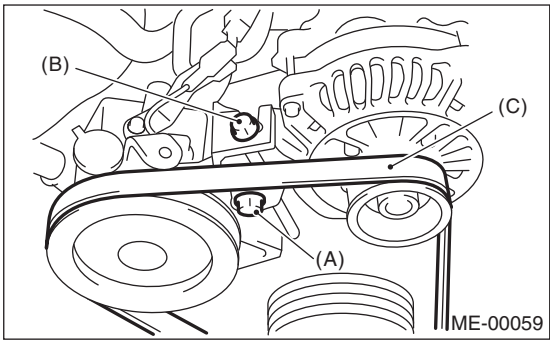
CAUTION:
- **Do not use the front side belt if there is any oil, grease or coolant on the belt.**
- **Be careful not to rub the belt end surface with bare hands; exposed core may cause injury.**

1) Remove the collector cover.
2) Remove the air intake duct (Rear). <Ref. to IN(H4DOTC)-10, REMOVAL, Air Intake Duct.>
3) Remove the collector cover bracket.



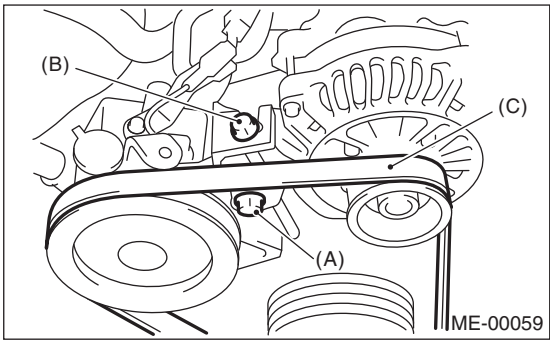
4) Loosen the bolt (A).
5) Loosen the slider bolt (B).

6) Remove the front side belt (C).



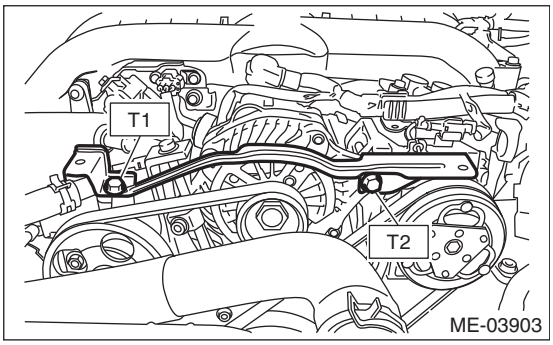
7) Install the front side belt (C), and adjust the slider bolt (B) so as to obtain the specified belt tension. <Ref. to ME(H4DOTC)-44, INSPECTION, V-belt.>
8) Tighten the bolt (A).
9) Tighten the slider bolt (B).

Tightening torque:
Bolt (A)
25 N·m (2.5 kgf-m, 18.4 ft-lb)
Slider bolt (B)
8 N·m (0.8 kgf-m, 5.9 ft-lb)



10) Install the collector cover bracket.

Tightening torque:
T1: 8.5 N·m (0.9 kgf-m, 6.3 ft-lb)
T2: 25 N·m (2.5 kgf-m, 18.4 ft-lb)



11) Install the air intake duct (rear). <Ref. to IN(H4DOTC)-10, INSTALLATION, Air Intake Duct.>
12) Install the collector cover.
13) Start and run the engine for approximately five minutes to allow the V-belt to become fitted. (When using the gauge)
14) Stop the engine, check the belt tension and adjust as necessary. (When using the gauge)
15) Start and run the engine for approximately one minute to allow the V-belt to become fitted. (When using the gauge)
16) Stop the engine and check that the belt tension is within the specification. (When using the gauge)
17) Adjust until the specified belt tension is obtained. (When using the gauge)

• REAR SIDE BELT (FOR A/C)

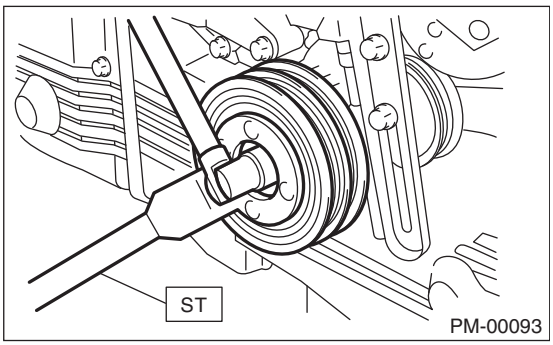
CAUTION:
• Do not re-use the rear side belt.
• Be careful not to let oil, grease or coolant contact a new rear side belt.
• Be careful not to rub the belt end surface with bare hands; exposed core may cause injury.
• To install the rear side belt, always use the provided tools (belt stopper, belt guide, belt guide holder, and bolt).
1) Remove the front side belts.
2) Cut the rear side belt.
3) Install a new belt using an installation jig. <Ref. to ME(H4DOTC)-38, INSTALLATION, V-belt.>
4) Install the front side belt.
<Ref. to ME(H4DOTC)-38, FRONT SIDE BELT, INSTALLATION, V-belt.>

7. Timing Belt

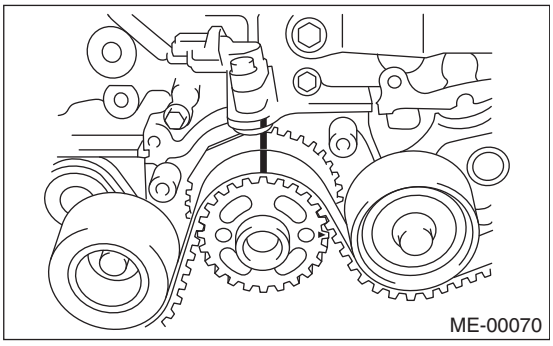
A: REPLACEMENT

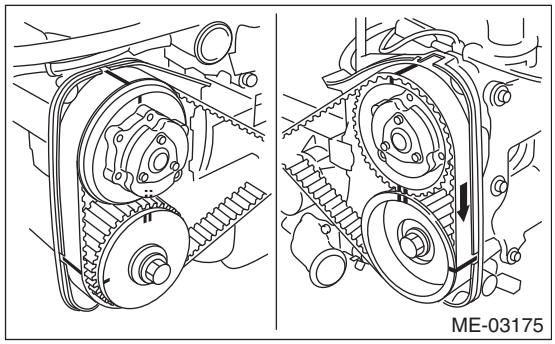
1. TURBO MODEL

1) Remove the radiator fan and air conditioner fan. <Ref. to CO(H4DOTC)-24, REMOVAL, Radiator Main Fan and Fan Motor.> <Ref. to CO(H4DOTC)-26, REMOVAL, Radiator Sub Fan and Fan Motor.>
2) Protect the radiator with cardboard and blanket.
3) Remove the V-belts. <Ref. to ME(H4DOTC)-38, REMOVAL, V-belt.>
4) Remove the A/C compressor V-belt tensioner.
5) Remove the pulley bolt. Using the ST, lock the crankshaft.
ST 499977400 CRANK PULLEY WRENCH

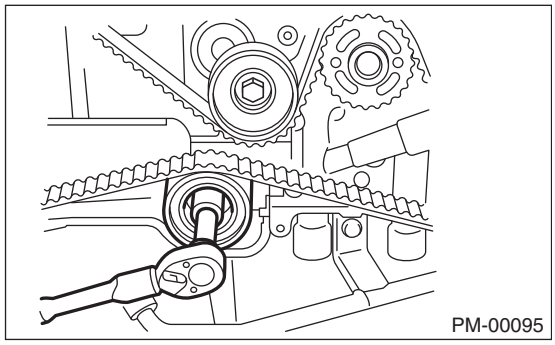


6) Remove the crank pulley.
7) Remove the A/C compressor V-belt tensioner.
8) Remove the belt cover (LH).
9) Remove the belt cover (RH).
10) Remove the front belt cover.
11) Turn the crankshaft and align the alignment marks on crankshaft, and left and right cam sprockets with notches of belt cover and cylinder block. Use the ST to turn crankshaft.
ST 499987500 CRANKSHAFT SOCKET

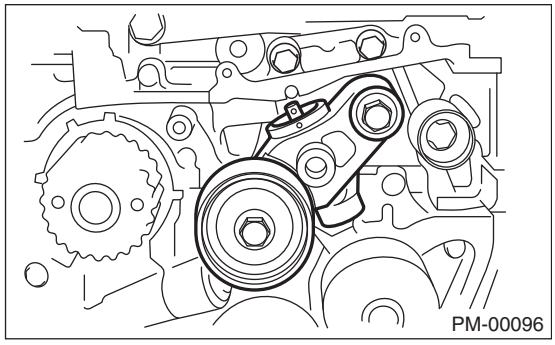




12) Remove the belt idler.



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)-50, 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.

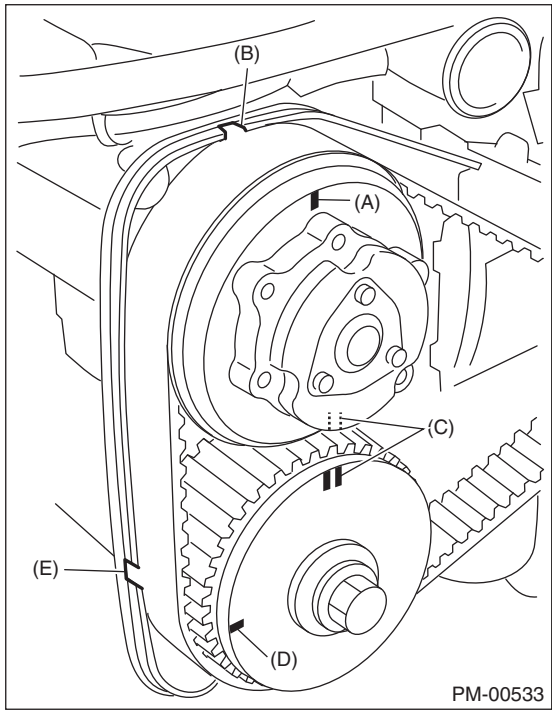
B: INSPECTION

1. TURBO MODEL (CHECK TIMING BELT POSITION)

1) Remove the timing belt covers (LH) and (RH).
2) Rotate the crank pulley to align the 1 line mark (A) on the RH intake camshaft pulley to the notch (B) on the timing belt cover and check the following points.

(1) Check that the 2 line marks (C) on the RH intake camshaft pulley and the exhaust camshaft pulley are aligned with each other.

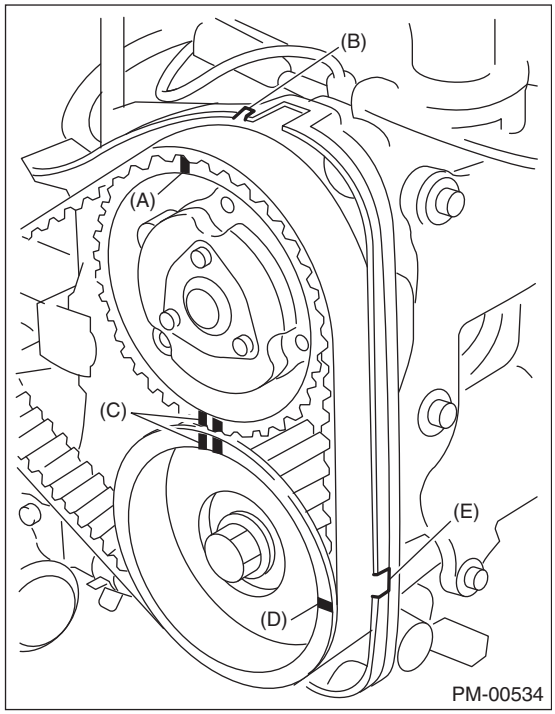
(2) Check that the 1 line mark (D) on the RH exhaust camshaft pulley aligns with the notch (E) on the timing belt cover.



(3) Check that the 1 line mark (A) on the LH intake camshaft pulley aligns with the notch (B) on the timing belt cover.

(4) Check that the 2 line marks (C) on the LH intake camshaft pulley and the exhaust camshaft pulley are aligned with each other.

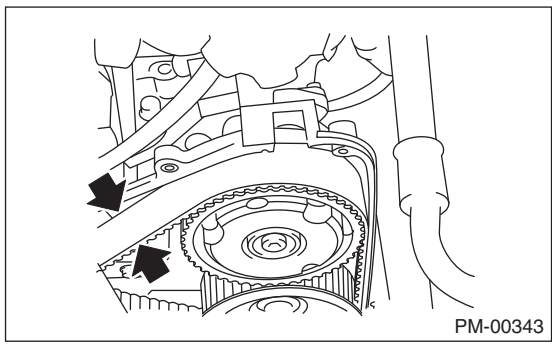
(5) Check that the 1 line mark (D) on the LH exhaust camshaft pulley aligns with the notch (E) on the timing belt cover.



3) If the camshaft pulley position is inappropriate, check the defective point and repair or replace parts as necessary.

2. TURBO MODEL (OTHER INSPECTIONS)

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 any faulty timing belt with a new part 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 any worn timing belt with a new part.



4) Install the timing belt cover (LH).

8. Fuel Line

A: INSPECTION

For fuel line, check pipes, areas near pipes, and engine compartment piping for rust, hose damage, loose band, etc. If faulty parts are found, repair or replace them.

- Non-turbo model

<Ref. to FU(H4DO)-158, Fuel Delivery and Evaporation Lines.>

- Turbo model

<Ref. to FU(H4DOTC)-88, Fuel Delivery, Return and Evaporation Lines.>

9. Fuel Filter

A: REPLACEMENT

For fuel filter replacement procedure, refer to “FU” section.

- Non-turbo model

<Ref. to FU(H4DO)-152, Fuel Filter.>

- Turbo model

<Ref. to FU(H4DOTC)-82, Fuel Filter.>

B: INSPECTION

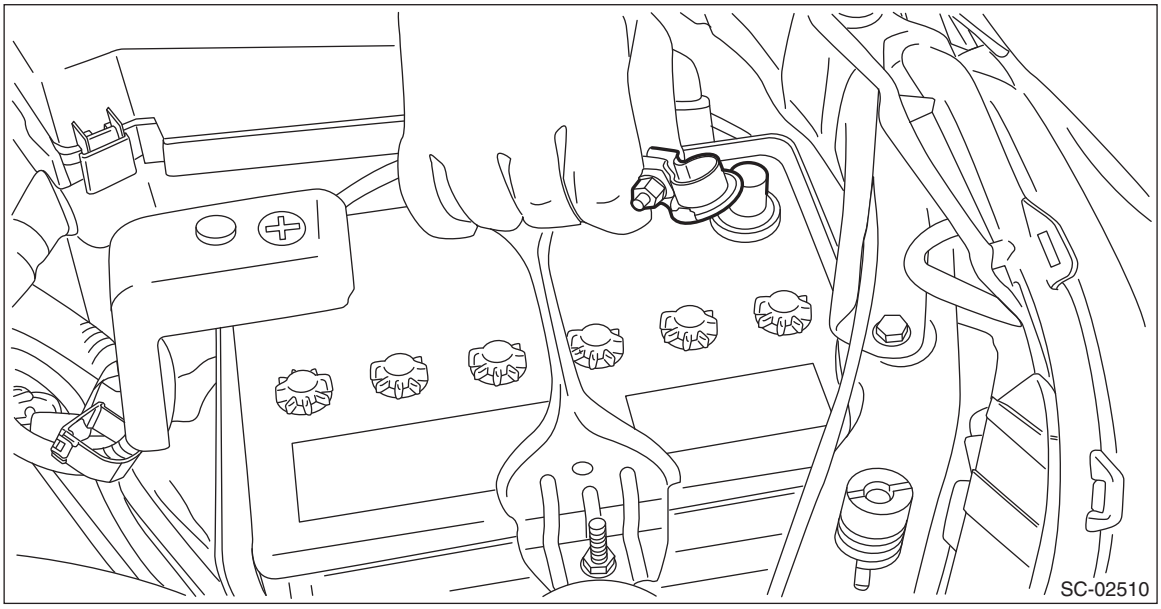
If the filter is clogged, or if the replacement interval has been reached, replace it.

10.Air Cleaner Element

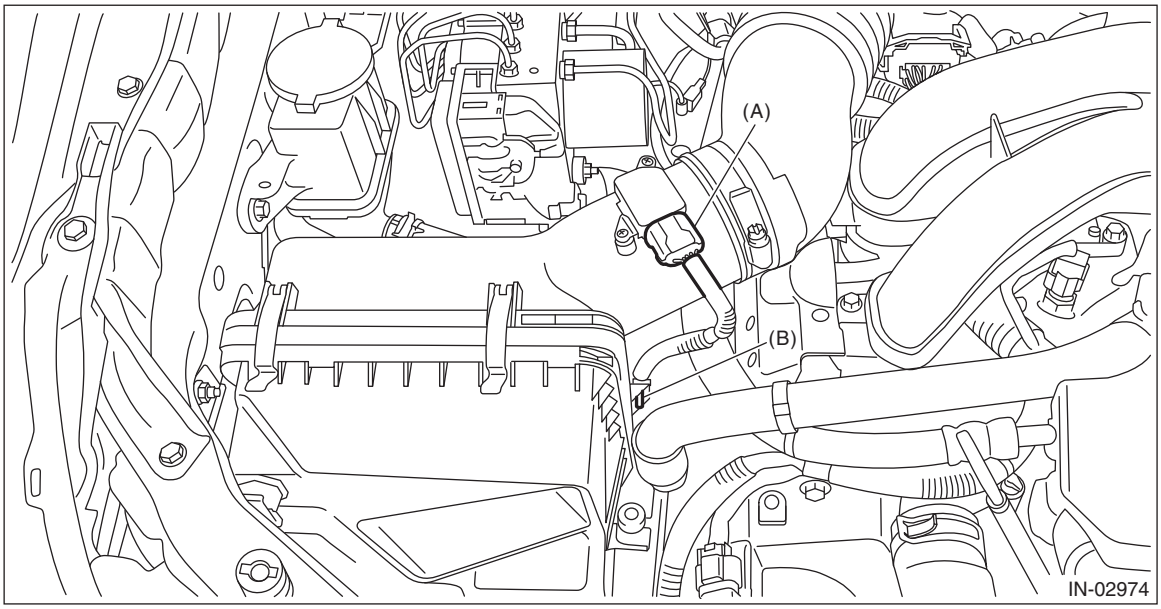
A: REPLACEMENT

1. NON-TURBO MODEL

1) Disconnect the ground cable from battery.

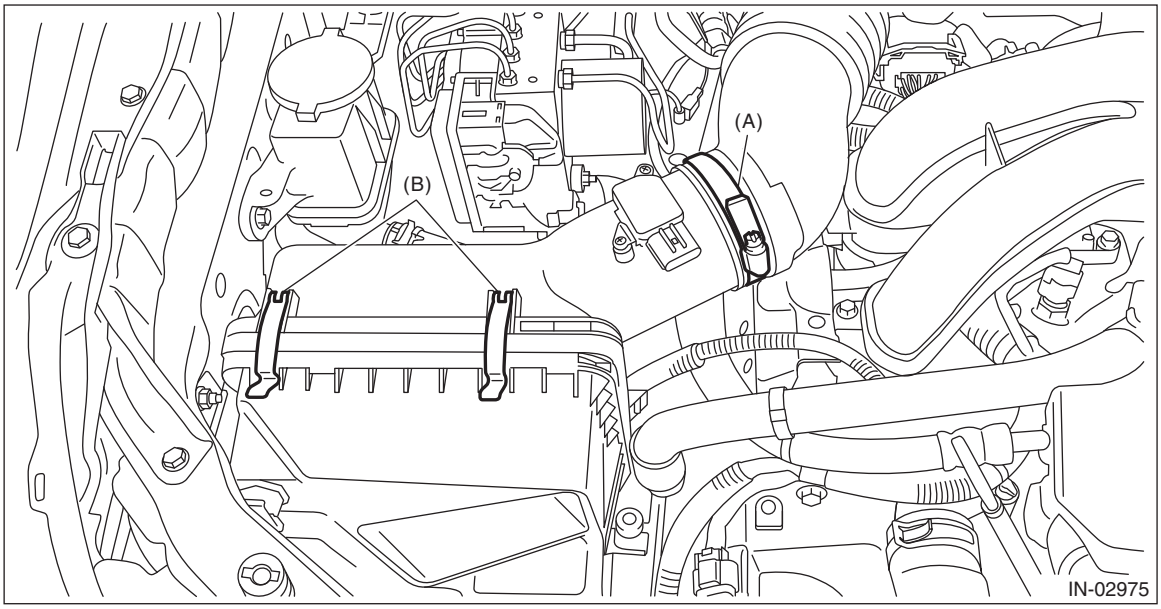


2) Disconnect the connector (A) from the mass air flow and intake air temperature sensor, and remove the clip (B).

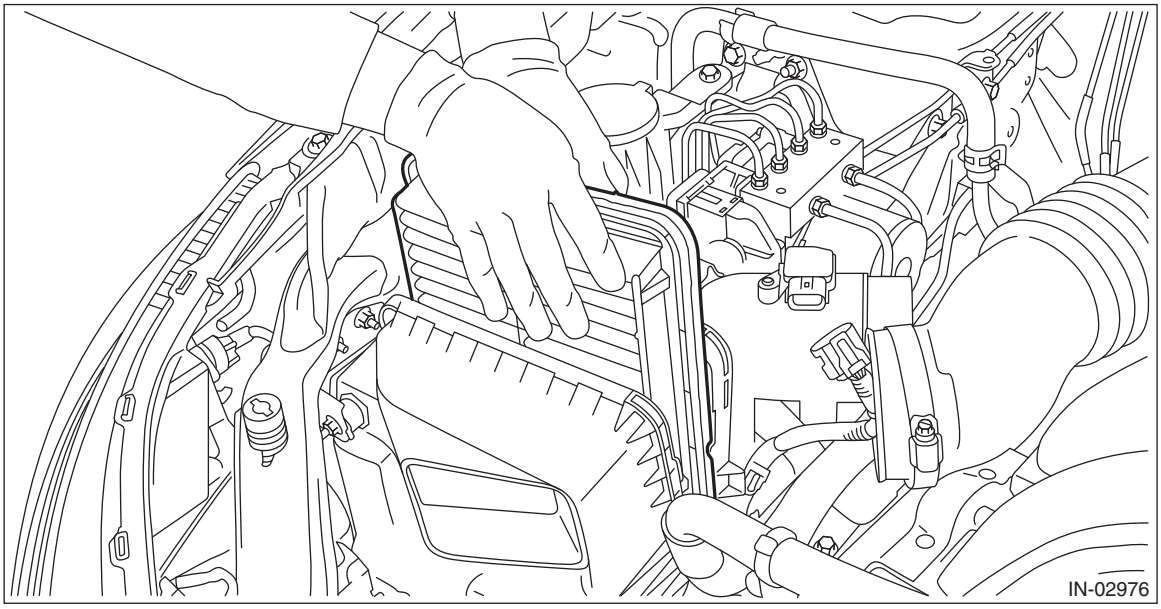


3) Loosen the clamp (A) which connects the air cleaner case to intake boot.

4) Remove the clips (B) securing the upper side of the air cleaner case.



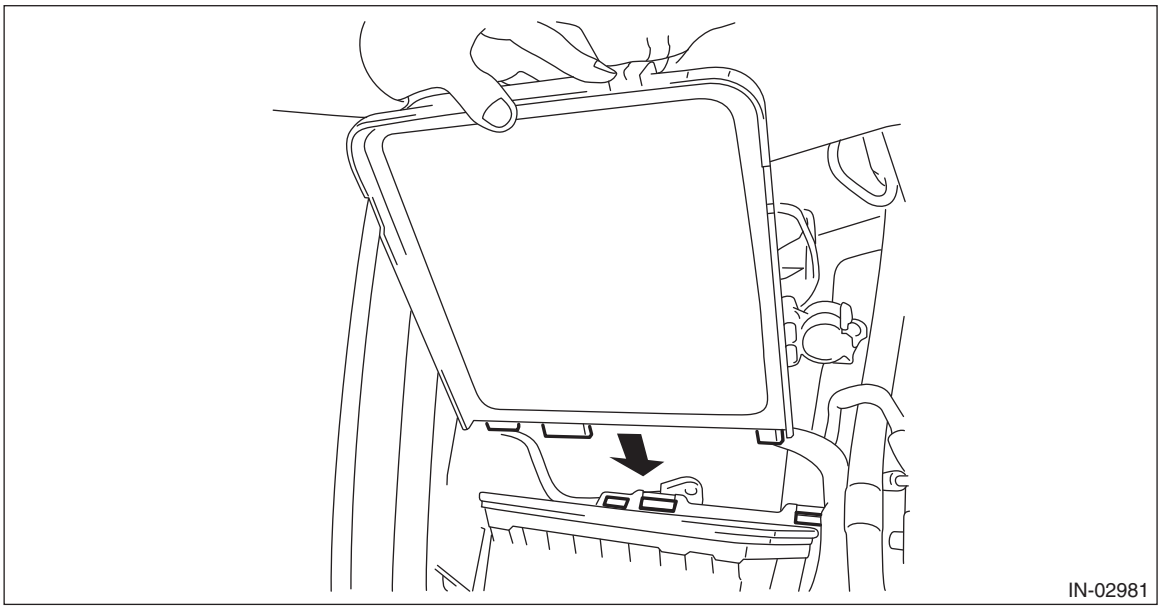
5) Remove the air cleaner case (rear) and air cleaner element.



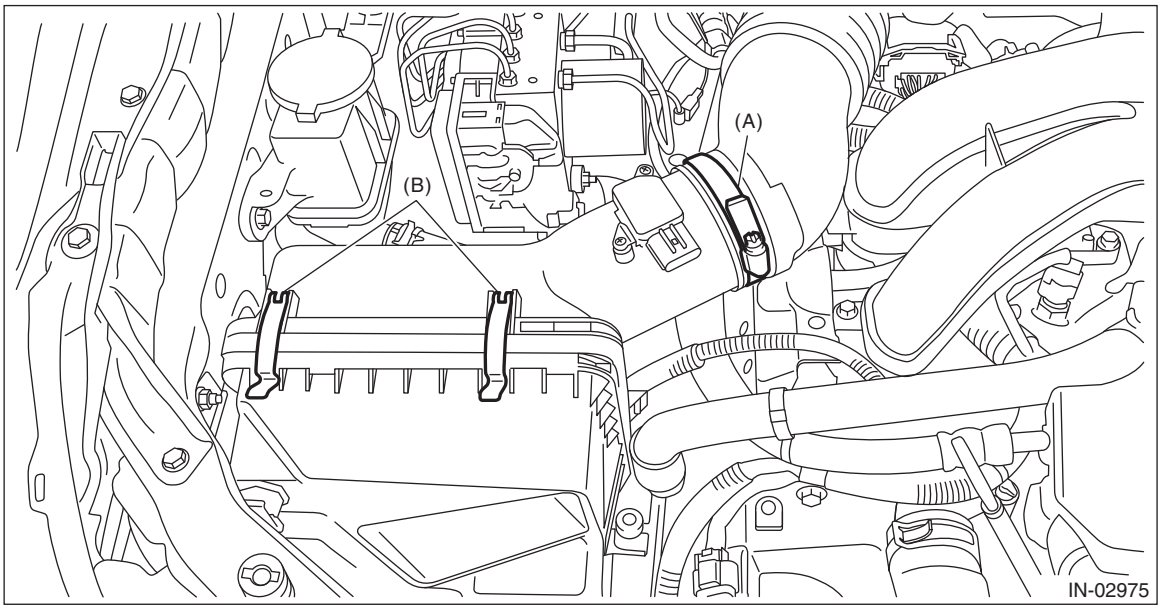
6) Install in the reverse order of removal.

CAUTION:
Be sure to use SUBARU genuine air cleaner element depending on the engine type when replacing the air cleaner elements. Using other air cleaner element may affect the engine performance.

NOTE:
- Check that there are no foreign objects in the air cleaner case.
- When installing the air cleaner case (rear), align the protrusion of the air cleaner case (rear) to the hole on the air cleaner case (front) to install.

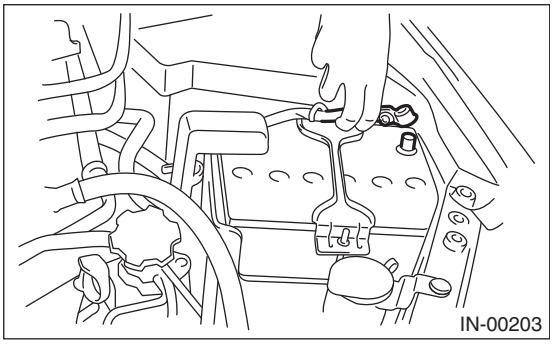


Tightening torque:
Clamp (A)
3 N·m (0.3 kgf-m, 2.2 ft-lb)

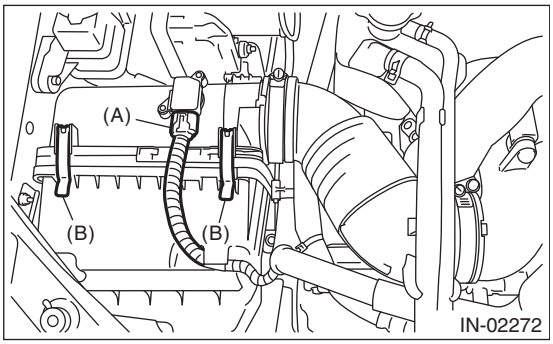


2. TURBO MODEL

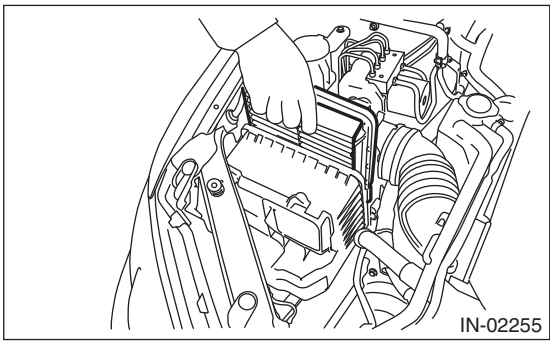
1) Disconnect the ground cable from battery.



2) Remove the air intake duct. <Ref. to IN(H4DOTC)-10, REMOVAL, Air Intake Duct.>
3) Disconnect the connector (A) from mass air flow and intake air temperature sensor.
4) Remove the clip (B) from the air cleaner case.



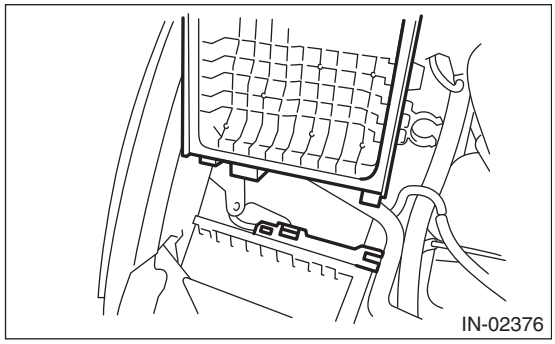
5) Open the air cleaner case, and remove the air cleaner element.



6) Install in the reverse order of removal.

CAUTION:
Be sure to use SUBARU genuine air cleaner element suitable to the engine type. Using other air cleaner element may affect the engine performance.

NOTE:
• Check that there are no foreign objects in the air cleaner case.
• If the protrusion of the air cleaner case (rear) is removed when removing the air cleaner element, align the protrusion of the air cleaner case (rear) to the hole on the air cleaner case (front) to install.



11.Cooling System

A: INSPECTION

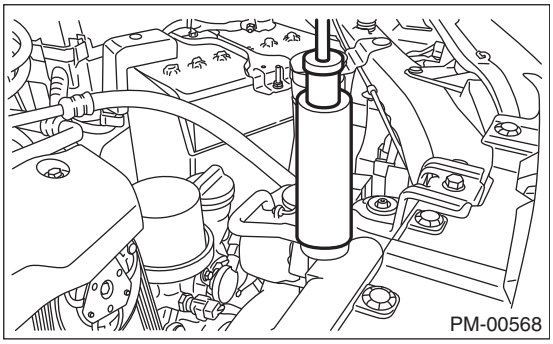
1) To check the radiator for leakage, fill it with engine coolant, and attach the radiator cap tester to the filler neck, and apply pressure.

Pressure:
Non-turbo model
157 kPa (1.6 kg/cm^2, 23 psi)
Turbo model
122 kPa (1.2 kg/cm^2, 18 psi)

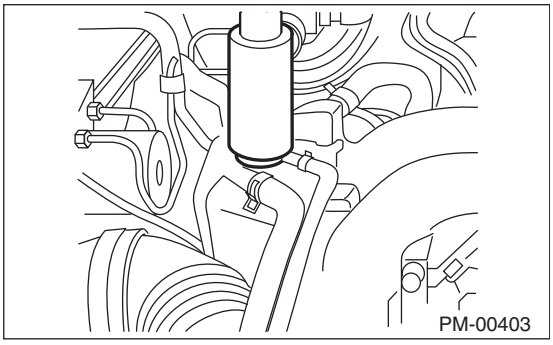
2) Inspect the items below applying a pressure.
- Leak from radiator
- Hose joints and other connections for leakage

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.
• Be careful not to spill coolant when detaching tester from radiator.
• Do not remove the radiator cap. (turbo model)

- Non-turbo model


PM-00568

- Turbo model

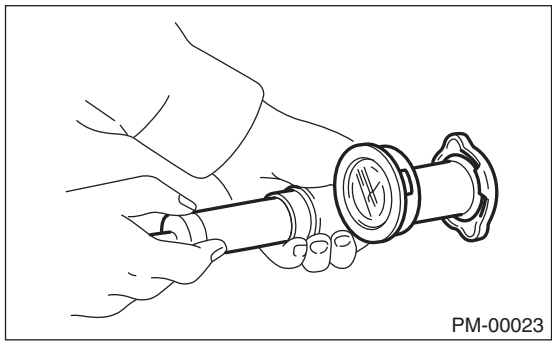

PM-00403

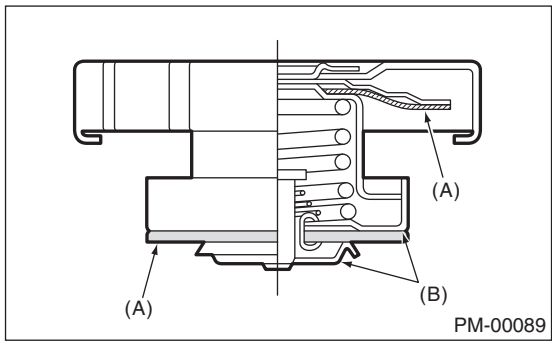
3) Check the radiator cap valve open pressure using radiator cap tester.
Raise the pressure until the needle of gauge stops and see if the pressure can be retained for five to six seconds. The radiator cap is normal if a pressure above the limit value has been maintained for this period. If the valve opened at the service limit or less, replace the radiator cap.

NOTE:
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/cm^2, 14 — 18 psi)
Service limit:
83 kPa (0.85 kg/cm^2, 12 psi)

Radiator side on turbo models
Specification:
122 — 152 kPa (1.24 — 1.55 kg/cm^2, 18 — 22 psi)
Service limit:
112 kPa (1.14 kg/cm^2, 16 psi)


PM-00023



PM-00089

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

4) Start the engine, and then inspect that it does not overheat or it is not cooled excessively. If it overheats or it is cooled excessively, check the cooling system. <Ref. to CO(H4DO)-18, INSPECTION, Water Pump.> <Ref. to CO(H4DO)-22, INSPECTION, Thermostat.> <Ref. to CO(H4DO)-23, Radiator.> <Ref. to CO(H4DO)-33, Radiator Cap.> <Ref. to CO(H4DOTC)-18, INSPECTION, Thermostat.> <Ref. to CO(H4DOTC)-19, Radiator.> <Ref. to CO(H4DOTC)-23, Radiator Cap.>

5) Check the radiator fan operates using Subaru Select Monitor, when the coolant temperature exceeds the specified value. If it does not operate, check the radiator fan system. <Ref. to CO(H4DO)-7, Radiator Fan System.> <Ref. to CO(H4DOTC)-7, Radiator Fan System.>

Engine coolant temperature
Non-turbo model
<Ref. to CO(H4DO)-7, Radiator Fan System.>
Turbo model
<Ref. to CO(H4DOTC)-7, Radiator Fan System.>

12.Engine Coolant

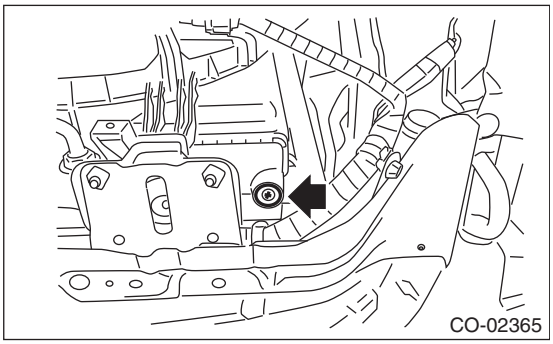
A: REPLACEMENT

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.

CAUTION:
If engine coolant is spilt onto the exhaust pipe, wipe it off with cloth to avoid emission of smoke or causing a fire.

1) Lift up the vehicle.
2) Remove the under cover.
3) Place a container under drain pipe.
4) Remove the drain plug to drain engine coolant into container.



5) For quick draining, remove the radiator cap.

CAUTION:
- **Be careful not to spill coolant on the floor.**
- **For turbo model, always open the radiator cap on the filler tank side.**

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 protective agent:
Cooling system conditioner (Part No. SOA635071)

9) Add the engine coolant into the coolant filler tank (turbo model) or radiator (non-turbo model) up to the filler neck position.

Engine coolant:

<Ref. to RM-4, ENGINE COOLANT, RECOMMENDED MATERIALS, Recommended Materials.>

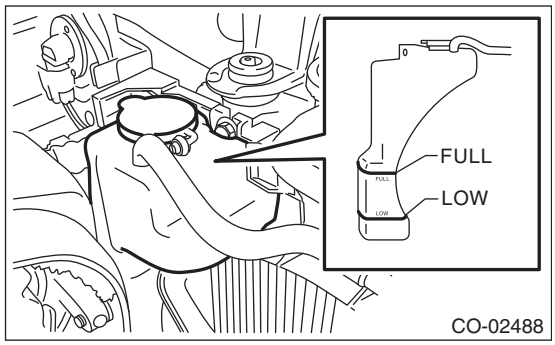
Coolant level:

<Ref. to SPC-4, CAPACITY, Forester.>

Engine coolant concentration:

<Ref. to CO(H4DO)-14, ADJUSTMENT, Engine Coolant.> <Ref. to CO(H4DOTC)-14, ADJUSTMENT, Engine Coolant.>

NOTE:
The SUBARU Super Coolant contains anti-freeze and anti-rust agents, and is especially made for Subaru engines with an aluminum cylinder block. Always use SUBARU Super Coolant since other engine coolant may cause corrosion.
10) Fill engine coolant into the reservoir tank up to "FULL" level.



11) 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.)
12) 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.
13) Perform the procedures 11) and 12) again.
14) Close the radiator cap (on non-turbo models) or the coolant filler tank cap (on turbo models), and the reservoir tank cap.
15) Start the engine and operate the heater at maximum hot position and the blower speed setting to "LO".
16) Run the engine at 2,000 rpm or less until radiator fan starts and stops.

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

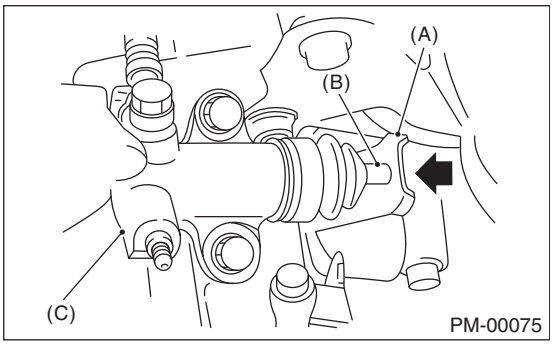
NOTE:
If the radiator hose becomes hardened with the pressure of engine coolant, air bleeding operation is considered almost completed.
17) Stop the engine and wait until the engine coolant temperature lowers to 30°C (86°F) or less.

18) 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.
19) Close the radiator cap (on non-turbo models) or the coolant filler tank cap (on turbo models), and the reservoir tank cap.
20) Set the heater setting to maximum hot position and the blower speed setting to “LO” and start the engine. Perform racing at 3,000 rpm or less. If the flowing sound is heard from heater core, repeat the procedures from step 15).

13.Clutch System

A: INSPECTION AND ADJUSTMENT

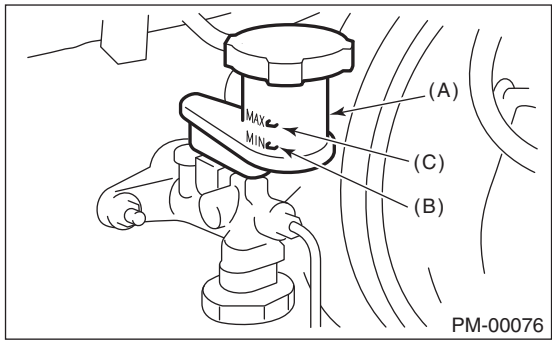
1) Push the release lever to retract the push rod of the operating cylinder and check if the fluid level in the clutch reservoir tank rises.



(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-22, 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. <Ref. to RM-4, FLUID, RECOMMENDED MATERIALS, Recommended Materials.>

CAUTION:
• Prevent the clutch fluid from being splashed over vehicle body. If clutch fluid is splashed over vehicle body, flush it, and then wipe it up.
• If the fluid is spilt on exhaust pipe, wipe it off with a clean cloth to avoid emitting smoke or causing a fire.
• Avoid mixing brake fluid of different brands to prevent fluid performance from degrading.
• Be careful not to allow dirt or dust to get into the reservoir tank.

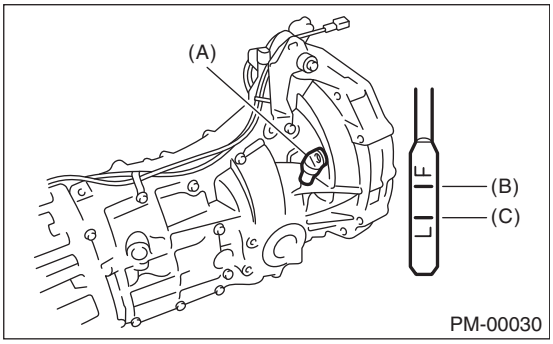


(A) Reservoir tank
(B) MIN. level
(C) MAX. level

14.Transmission Gear Oil

A: INSPECTION

CAUTION:
If transmission gear oil is spilt over the exhaust pipe, wipe it off with a cloth to avoid emitting smoke or causing a fire.
Check the transmission gear oil amount. If the amount of gear oil is inappropriate, check that no leaks are found. Then, add the necessary amount of the specified gear oil.



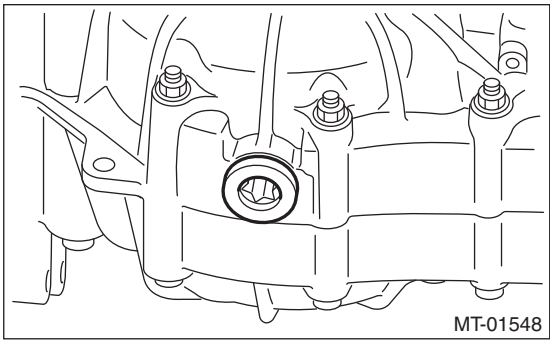
(A) Oil level gauge
(B) Upper level
(C) Lower level

B: REPLACEMENT

1. MANUAL TRANSMISSION

CAUTION:
If transmission gear oil is spilt over the exhaust pipe, wipe it off with a cloth to avoid emitting smoke or causing a fire.
1) Remove the drain plug using TORX® bit T70, and then drain gear oil.

NOTE:
Before starting work, cool off the transmission gear oil well.



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

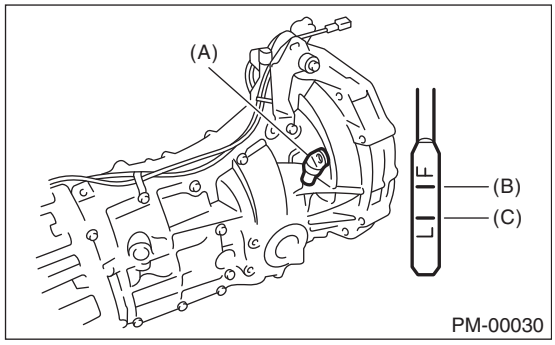
Tightening torque:
44 N·m (4.5 kgf-m, 32.5 ft-lb) (Aluminum gasket silver)
70 N·m (7.1 kgf-m, 51.6 ft-lb) (Copper gasket brown)
70 N·m (7.1 kgf-m, 51.6 ft-lb) (Metal gasket black)

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

Recommended gear oil:
Refer to "RM" section. <Ref. to RM-2, LUBRICANTS, RECOMMENDED MATERIALS, Recommended Materials.>

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

Gear oil capacity:
<Ref. to SPC-4, CAPACITY, Forester.>

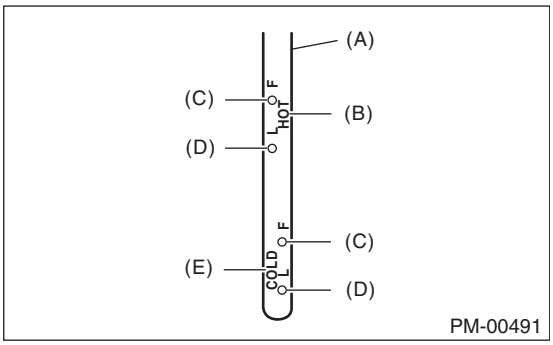


(A) Oil level gauge
(B) Upper level
(C) Lower level

15. Automatic Transmission Fluid

A: INSPECTION

CAUTION:
• The level of ATF varies with fluid temperature. Pay attention to the ATF temperature when checking ATF level.
• If the ATF is spilt over exhaust pipe, wipe it off with cloth to avoid emitting smoke or causing a fire.
1) Raise the ATF temperature by driving a distance of 5 to 10 km (3 to 6 miles). Otherwise, idle the engine to raise ATF temperature to 70 — 80°C (158 — 176°F) on Subaru Select Monitor. <Ref. to 4AT(diag)-16, OPERATION, Read Current Data.>
2) Make sure the vehicle is level.
3) After selecting all positions (P, R, N, D), 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 the center of upper and lower level at "HOT" side.

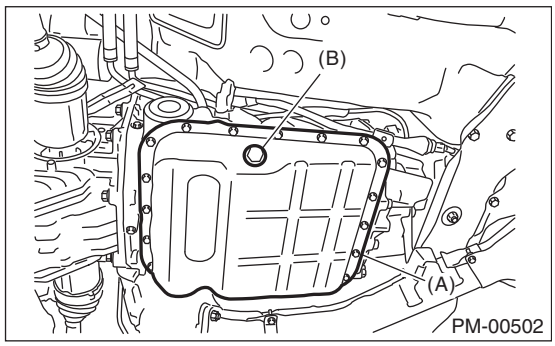
NOTE:
The level is above the middle point between upper and lower when the transmission is hot, or below the middle point when the transmission is cool.
5) If the ATF level is below the center between upper and lower level, add the recommended ATF until the fluid level is found above the center between upper and lower level.

CAUTION:
• Be careful not to exceed the upper level limit.
• Adding ATF to the upper limit mark on "HOT" side when the ATF temperature is less than 70°C (158°F) will overfill of ATF and cause a transmission failure.
6) Check ATF level after raising ATF temperature to 70 — 80°C (158 — 176°F) by driving the vehicle for 5 — 10 km (3 — 6 miles) or by idling the engine.
7) Check the ATF for leaks.
If there are leaks, it is necessary to repair or replace gaskets, oil seals, plugs or other parts.

B: REPLACEMENT

CAUTION:
If the ATF is spilt over exhaust pipe, wipe it off with cloth to avoid emitting smoke or causing a fire.
1) Lift up the vehicle.
2) Drain the ATF (Automatic Transmission Fluid) by removing drain plug.

NOTE:
Before starting work, cool off the ATF well.
3) Check the condition of ATF drained. <Ref. to 4AT-28, CONDITION CHECK, Automatic Transmission Fluid.>



(A) Oil pan
(B) Drain plug (ATF)

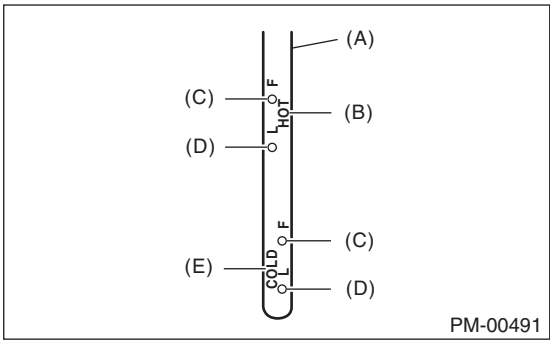
4) Replace the gasket with new part, and then tighten the drain plug to specified torque.

Tightening torque:
25 N·m (2.5 kgf-m, 18.4 ft-lb)
5) Lower the vehicle.
6) Pour ATF from the oil charge pipe.

Recommended fluid:
<Ref. to RM-4, FLUID, RECOMMENDED MATERIALS, Recommended Materials.>

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

7) Check the level and leaks of the ATF. <Ref. to PM-36, INSPECTION, Automatic Transmission Fluid.>



(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)]

16. Front & Rear Differential Gear Oil

A: REPLACEMENT

1. FRONT DIFFERENTIAL (MT MODEL)

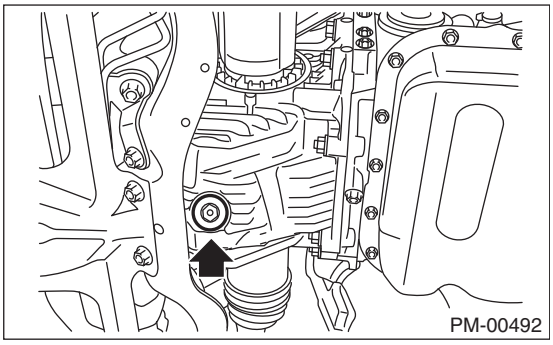
For MT model, differential oil works as manual transmission oil to lubricate differential. Refer to "Transmission Oil". <Ref. to PM-35, Transmission Gear Oil.>

2. FRONT DIFFERENTIAL (AT MODEL)

CAUTION:
If differential gear oil is spilt over the exhaust pipe, wipe it off with a cloth to avoid emitting smoke or causing a fire.

1) Lift up the vehicle.
2) Remove the drain plug using TORX® bit T70, and then drain differential gear oil.

NOTE:
Before starting work, cool off the differential gear oil well.



3) Replace the gasket with a new part and tighten the differential gear oil drain plug to the specified torque using the TORX® bit T70.

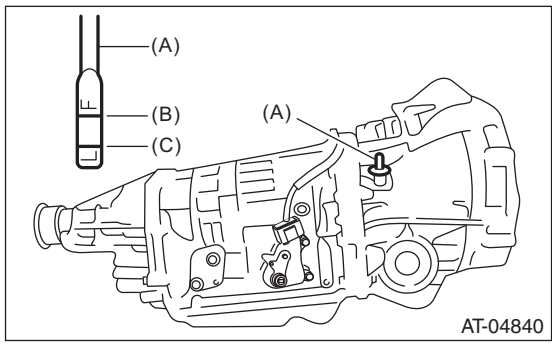
Tightening torque:
44 N·m (4.5 kgf-m, 32.5 ft-lb) (Aluminum gasket silver)
70 N·m (7.1 kgf-m, 51.6 ft-lb) (Copper gasket brown)
70 N·m (7.1 kgf-m, 51.6 ft-lb) (Metal gasket black)

4) Lower the vehicle.
5) Fill differential gear oil from the oil level gauge hole.

Recommended fluid:
<Ref. to RM-2, LUBRICANTS, RECOMMENDED MATERIALS, Recommended Materials.>

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

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

6) Check the level of differential gear oil.
<Ref. to 4AT-29, INSPECTION, Differential Gear Oil.>

3. REAR DIFFERENTIAL

CAUTION:
If gear oil is spilt over the exhaust pipe, wipe it off with a cloth to avoid emitting smoke or causing a fire.

1) Drain the oil by removing oil drain plug.
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) or equivalent

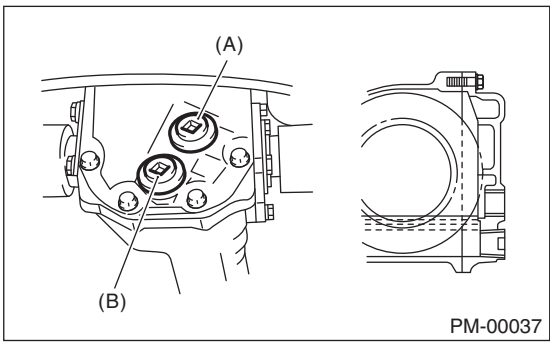
Tightening torque:
49 N·m (5.0 kgf-m, 36.2 ft-lb)

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

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

Recommended gear oil:
GL-5 (75W-90) or equivalent

Oil capacity:
0.8 ℓ (0.8 US qt, 0.7 Imp qt)



(A) Filler plug
(B) Drain plug

5) Attach the filler plug to the rear differential case securely.

NOTE:
Apply liquid gasket to the filler plug threads.

Liquid gasket:
THREE BOND 1105 (Part No. 004403010) or equivalent

Tightening torque:
49 N·m (5.0 kgf-m, 36.2 ft-lb)

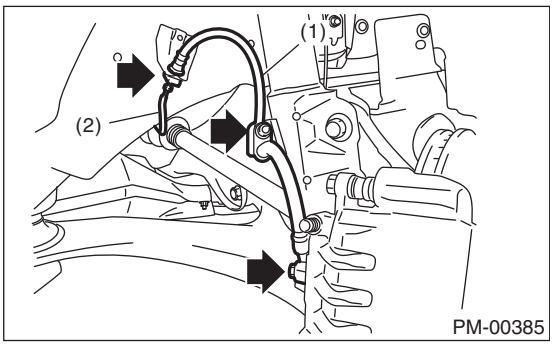
17.Brake Line

A: INSPECTION

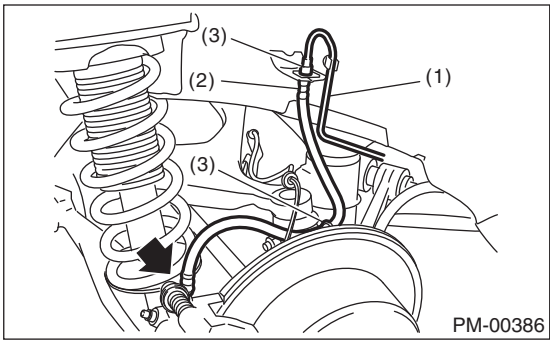
1. BRAKE LINE

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 and wheel cylinder.

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

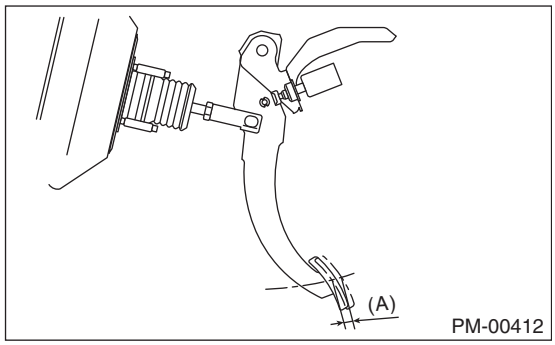


(1) Rear brake pipe
(2) Rear brake hose
(3) Clamp

2. SERVICE BRAKE

1) Move to the pull-up direction with the force of 10 N (1 kgf, 2 lbf) or less and check the free play.

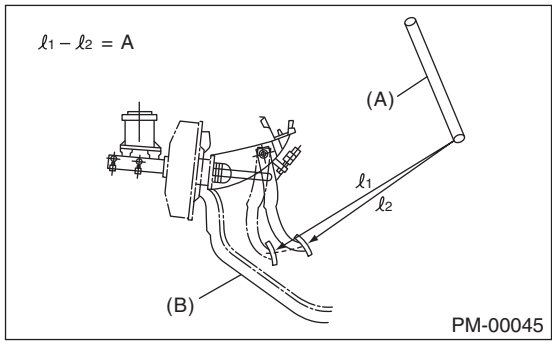
Brake pedal play
0.5 — 2.0 mm (0.02 — 0.08 in)



(A) Pedal free play

2) If the free play is out of specifications above, adjust the brake pedal. <Ref. to BR-39, INSPECTION, Brake Pedal.>
3) Check the pedal stroke.
While the engine is idling, depress the brake pedal with a 500 N (51 kgf, 112 lbf) 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 the specified value or less. If the measured value is specification or more, there is possibility of entering air in hydraulic unit.

Brake pedal stroke A:
95 mm (3.74 in)/ 500 N (51 kgf, 112 lbf) or less



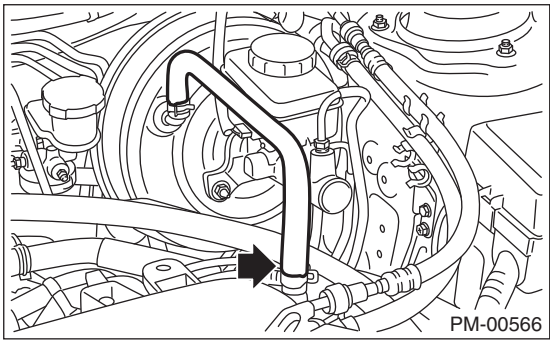
(A) Steering wheel
(B) Toe board

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.

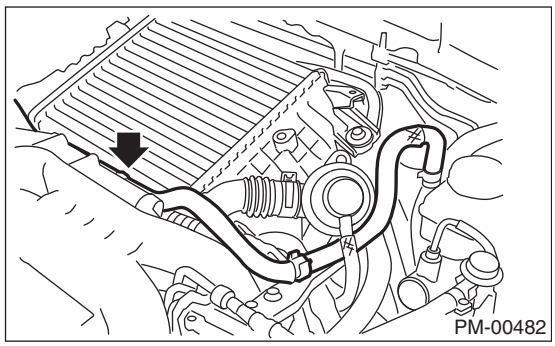
3. BRAKE SERVO SYSTEM

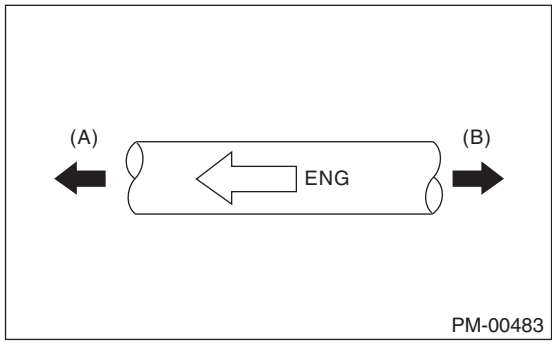
1) With the engine off, depress the brake pedal several times applying the same pedal force. Make sure the travel distance should not change.
2) With the brake pedal depressed, start the engine. Make sure the pedal should move slightly toward the floor.
3) With the brake pedal depressed, stop the engine and keep the pedal depressed for 30 seconds. Make sure the pedal height should not change.
4) A check valve is built into the vacuum hose. Disconnect the vacuum hose to inspect function of check valve.
Blow compressed air into vacuum hose from the end of brake booster side. Check that the air flows from the air hose on engine side. Next blow air into the hose from the engine side. Check that the air does not flow from the hose.
Replace both of the check valve and vacuum hose if the check valve is faulty. Engine side of vacuum hose is indicated by marking “ENG” as shown.

- Non-turbo model



- Turbo model





(A) Engine side
(B) Brake booster side

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 the vacuum hose to make sure it is tightly secured.

18.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.

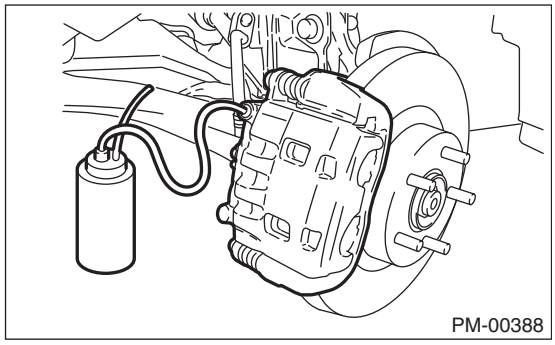
B: REPLACEMENT

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 the reservoir tank.
• If any brake fluid is spilt over the exhaust pipe, wipe it off with a cloth to avoid emitting smoke or causing a fire.
• During the operation, keep the reservoir tank filled with brake fluid to prevent entry of air.
• Operate the brake pedal slowly.
• For convenience and safety, two people should do the work.

NOTE:
The required amount of brake fluid is approximately 500 m ℓ (16.9 US fl oz, 17.6 Imp fl oz) for the entire brake system.
1) Either jack-up the vehicle and place a rigid rack under it, or have the vehicle lifted.
2) Remove all the wheels.
3) Drain brake fluid from the reservoir tank.
4) Refill the reservoir tank with recommended brake fluid.

Recommended brake fluid
Refer to "RM" section. <Ref. to RM-4, FLUID, RECOMMENDED MATERIALS, Recommended Materials.>

5) Install one end of a vinyl tube onto the air bleeder and insert the other end of the tube into a container to collect the brake fluid.



6) Instruct your co-worker to depress the brake pedal slowly two or three times and then hold it depressed.
7) Loosen the bleeder screw approximately 1/4 turn until a small amount of brake fluid drains into the container, and then quickly tighten the screw.
8) Repeat steps 6) and 7) until there are no air bubbles in drained brake fluid and new fluid flows through vinyl tube.

NOTE:
Add brake fluid as necessary while performing the air bleed operation, in order to prevent the tank from running short of brake fluid.
9) After completing the bleeding operation, hold the brake pedal depressed and tighten the screw and install bleeder cap.

Tightening torque:
8 N·m (0.8 kgf-m, 5.9 ft-lb)

10) Bleed air from each wheel cylinder by following steps from 5) to 9).
11) Start the engine and depress the brake pedal with a pedal force of approximately 294 N (30 kgf, 66 lbf) and maintain for approximately 20 seconds. At this time check the pedal to see if it makes any unusual movement. Visually inspect the bleeder screws and brake pipe joints to confirm there is no fluid leakage.

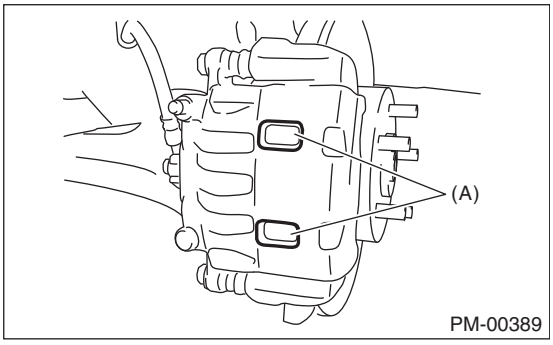
19.Disc Brake Pad and Disc

A: INSPECTION

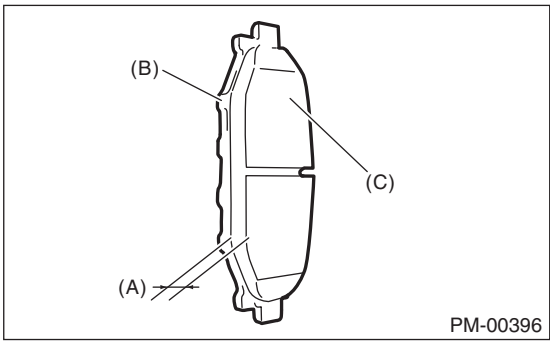
1. DISC BRAKE PAD AND DISC

1) Jack up the vehicle and support it with rigid racks. Remove the wheels.
2) Visually check the pad thickness through inspection hole of disc brake assembly. Replace the pad if necessary.

NOTE:
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



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

- Front (except for back metal)

Pad thickness	mm (in)
Standard	11 (0.43)
Wear limit	1.5 (0.059)

- Rear (except for back metal)

Pad thickness	mm (in)
Standard	9.0 (0.354)
Wear limit	1.5 (0.059)

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

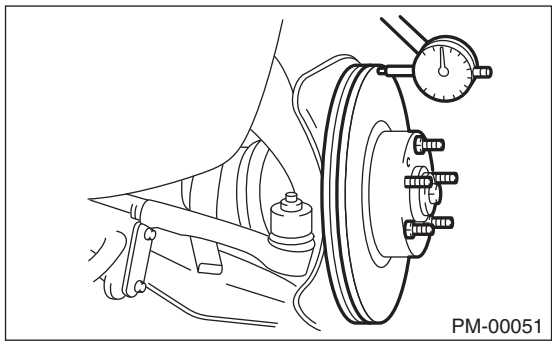
Disc rotor thickness	mm (in)
Standard	24 (0.94)
Wear limit	22 (0.87)

- Rear

Disc rotor thickness	mm (in)
Standard	10 (0.39)
Wear limit	8.5 (0.33)

4) Remove the caliper body. <Ref. to BR-15, Front Disc Brake Assembly.> <Ref. to BR-23, Rear Disc Brake Assembly.>
5) Tighten the wheel nuts to secure disc rotor.
6) Set a dial gauge at a point of 10 mm (0.39 in) or less from outer periphery of the rotor, and then measure the disc rotor runout.

Disc rotor runout limit:
Front: 0.050 mm (0.0020 in)
Rear: 0.050 mm (0.0020 in)



20.Parking Brake

A: 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:
190 mm (7.48 in)
Service limit:
191 mm (7.52 in)

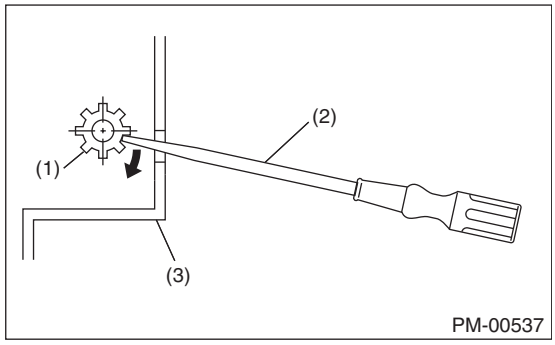
2) Measure the lining thickness. If it exceeds the limit, replace the brake shoes.

Lining thickness:
Standard:
2.8 mm (0.11 in)
Service limit:
1.5 mm (0.059 in)

CAUTION:
Replace the right and left brake shoe as a set.

B: ADJUSTMENT

Adjust the parking brake after bleeding air.
1) Return the parking brake lever fully.
2) Loosen the adjusting nut, and make the cable free.
3) Remove the adjusting hole cover from the disc rotor.
4) Using a flat tip screwdriver as shown in the figure, rotate the adjusting screw towards the arrow mark (shoe extension direction) until it is locked (until disk brake does not rotate further using both hands).



(1) Adjusting screw
(2) Flat tip screwdriver
(3) Disc rotor

5) Turn back the adjusting screw 5 notches to opposite direction of arrow.

CAUTION:
- **Check there is no brake drag.**
- **If the amount that the adjusting screw is turned back is little, securely turn back 5 notches to avoid dragging.**

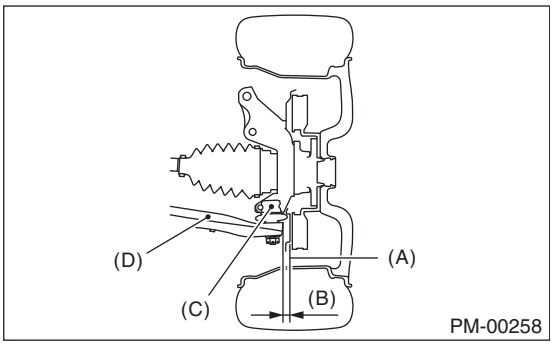
6) Install the adjusting hole cover to the disc rotor.
7) Adjust the parking lever stroke. <Ref. to PB-8, LEVER STROKE, ADJUSTMENT, Parking Brake Assembly (Rear Disc Brake).>

21.Suspension

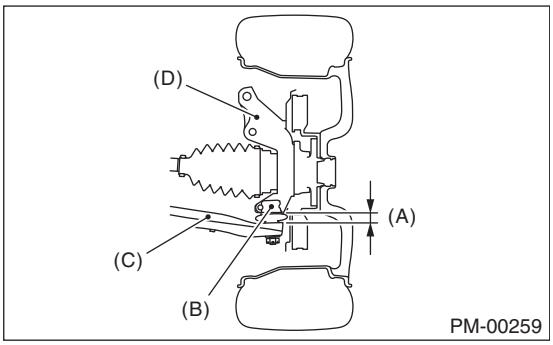
A: INSPECTION

1. SUSPENSION BALL JOINT

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



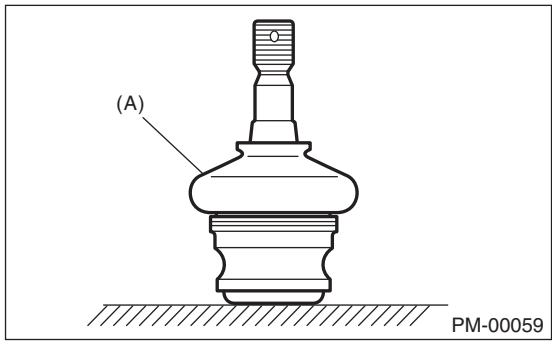
3) Grasp the end of front arm and move it up and down. If relative movement (A) is observed between the housing (D) and front arm (C) boss, ball joint (B) may be excessively worn.



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-15, Front Ball Joint.>
5) Damage of dust cover
Visually inspect the ball joint dust cover. If it is damaged, remove the front arm. <Ref. to FS-17, Front Arm.> Measure the play of the ball joint. <Ref. to FS-15, Front Ball Joint.>

(1) If the free play exceeds standard value, replace the ball joint.
(2) If the dust cover is damaged, replace with a new ball joint.

NOTE:
When the front arm ball joint has been removed or replaced, check the toe of front wheel. If the front wheel toe is outside the specified range, <Ref. to FS-6, Wheel Alignment.> adjust toe-in.



(A) Dust cover

2. FRONT/REAR SUSPENSION BUSHING

Apply pressure using the tire lever, and check the bushing for abnormal fatigue or damage. Replace the bushing if there is any damage.

3. WHEEL ARCH HEIGHT

1) Unload the cargoes and set the vehicle in curb weight (empty) condition.
2) Check the wheel arch height of the front and rear suspensions to ensure that they are within tolerance. <Ref. to FS-6, Wheel Alignment.>
3) When the wheel arch height is out of the tolerance value, visually inspect the following components and replace deformed parts.
- Suspension components [Front strut assembly and rear shock absorber assembly]
- Parts connecting suspension and body

4) When no components are deformed, adjust the wheel arch height by replacing the suspension for which the wheel arch height is not within tolerance. <Ref. to FS-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 (Referential Value)
- 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, front arm, etc.]
- Parts connecting suspension and body

3) When the toe-in and camber are outside of the tolerance value, adjust each one so that they conform to the specified value. <Ref. to FS-6, Wheel Alignment.>

4) When the rotating angles of the right and left tires are not within tolerance, adjust them to standard.

5. WHEEL ALIGNMENT OF REAR SUSPENSION

1) Inspect the alignment of the rear suspension and check the following items are within the specified range.
- Toe-in
- Camber
- Thrust angle

<Ref. to RS-8, Wheel Alignment.>

2) If camber is out of the specification, visually check the items listed below. If the deformation is found, replace the damaged part.
- Suspension component [shock absorber, front lateral link, rear lateral link, upper arm, trailing link, sub frame etc.]
- Parts connecting suspension and body

3) If the toe-in or thrust angle is out of the specification, adjust to the standard value. <Ref. to FS-6, Wheel Alignment.>

6. OIL LEAKAGE OF STRUT AND SHOCK ABSORBER

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

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
  - Front arm
  - Crossmember
  - Strut
- Rear suspension
  - Sub frame
  - Front lateral link
  - Rear lateral link
  - Upper arm
  - Trailing link
  - Shock absorber
- 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. Take rust prevention measures as necessary.

22.Wheel Bearing

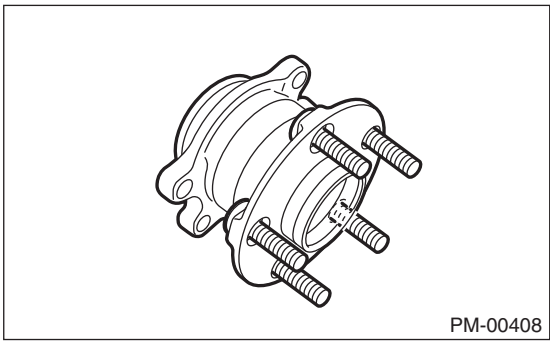
A: INSPECTION

1. FRONT HUB UNIT

1) Jack-up the front of the vehicle.
2) While holding the front wheel by hand, swing it in and out to check if there is any 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:
From the straight-ahead position: Max. of 0.05 mm (0.0020 in)

5) Remove the bolts and self-locking nuts, and extract transverse link from the front crossmember.
6) Remove the PTJ of the front drive shaft from the transmission. <Ref. to DS-13, 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.
Replace the front hub unit if there is any abnormal noise from the hub or if it drags.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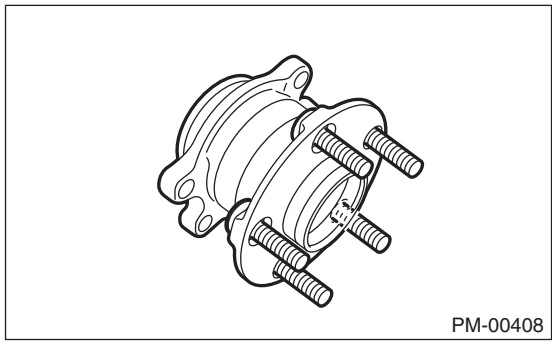
2. REAR HUB UNIT

1) Jack-up the rear of the vehicle.
2) While holding the rear wheel by hand, swing it in and out to check if there is any 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 and measure the looseness in the axial direction.

Service limit:
From the straight-ahead position: Max. of 0.05 mm (0.0020 in)

5) Remove the DOJ of the rear drive shaft from the rear differential. <Ref. to DS-32, Rear Drive Shaft.>
6) While supporting the rear drive shaft horizontally with one hand, turn the hub with the other hand to check for noise or dragging/catching.
Replace the front hub unit if there is any abnormal noise from the hub or dragging/catching.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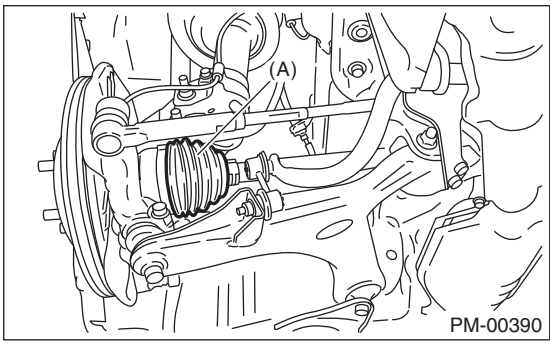
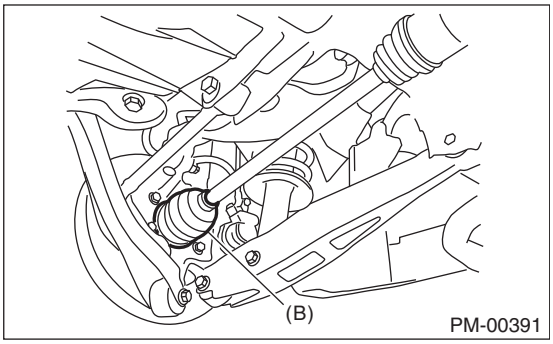
23.Axle Boots & Joints

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-27, Front Drive Shaft.> <Ref. to DS-32, Rear Drive Shaft.>





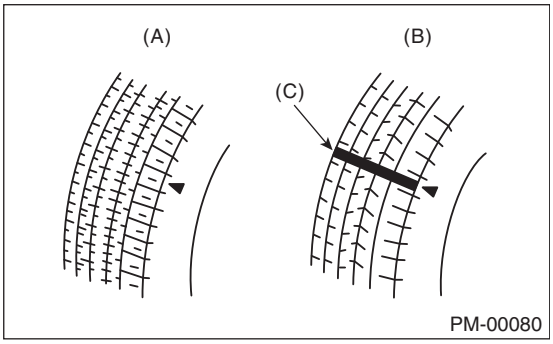
2. PROPELLER SHAFT

Inspect the propeller shaft for damage or failure. If faulty, replace with new part. <Ref. to DS-10, Propeller Shaft.>

24.Tire Rotation

A: INSPECTION

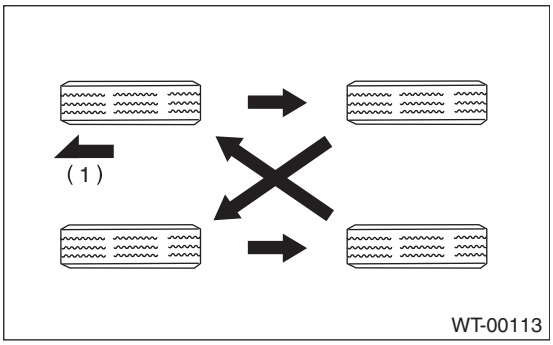
1) When the tread has worn down to less than 1.6 mm (0.063 in) or the wear indicator appears across the tread, replace the tire. (Replace the right and left tire as a set.)



(A) New tread
(B) Damaged tread
(C) Tread wear indicator

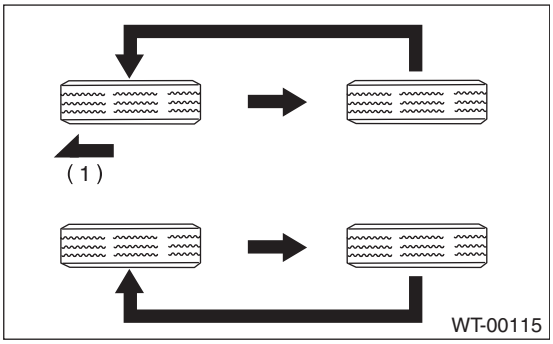
2) If the tire appears to be worn unevenly, adjust the wheel alignment.
3) Next, make a tire rotation between front and rear as shown in the figure, make sure tires are worn evenly.

- When the direction of tire rotation is not specified



(1) Front

- When the direction of tire rotation is specified



(1) Front

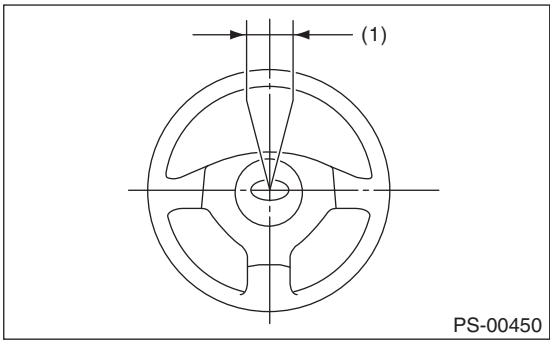
25.Steering System (Power Steering)

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.

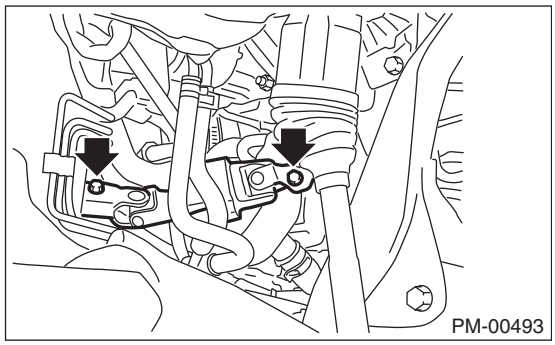
Limit of play:
0.5 mm (0.020 in)

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.

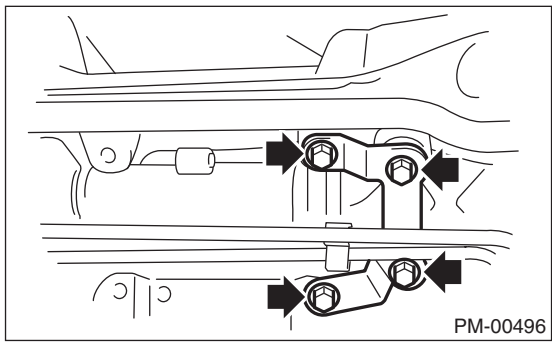
Tightening torque:
24 N·m (2.4 kgf-m, 17.4 ft-lb)

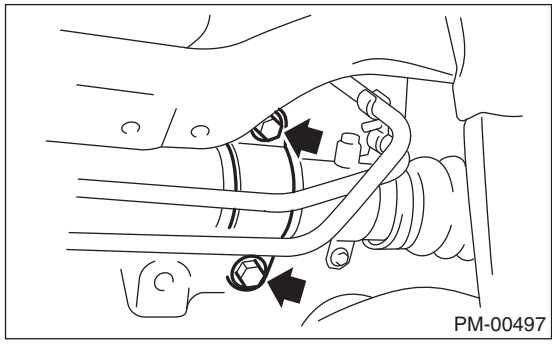


3. GEARBOX

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 gearbox.

Tightening torque:
60 N·m (6.1 kgf-m, 44.3 ft-lb)



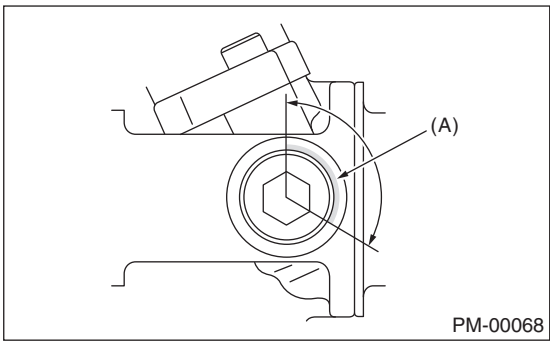


2) Check the boot for damage, cracks or deterioration.

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) Apply liquid gasket to at least 1/3 of entire perimeter of adjusting screw thread.

Liquid gasket:
THREE BOND 1102 or equivalent



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

(2) Tighten the adjusting screw to 9.8 N·m (0.99 kgf-m, 7.2 ft-lb) and then loosen.
(3) Tighten the adjusting screw to 4.9 N·m (0.49 kgf-m, 3.6 ft-lb) and then loosen.
(4) Tighten the adjusting screw to 4.9 N·m (0.49 kgf-m, 3.6 ft-lb) and then loosen approx. 30°.
(5) Install the lock nut. While holding the adjusting screw with a wrench, tighten the lock nut using ST.

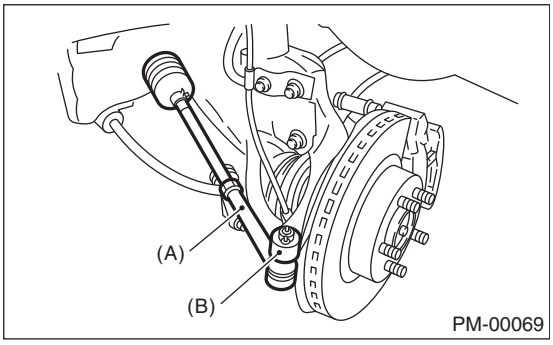
ST 926230000 SPANNER

Tightening torque (lock nut):
40 N·m (4.1 kgf-m, 29.5 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.

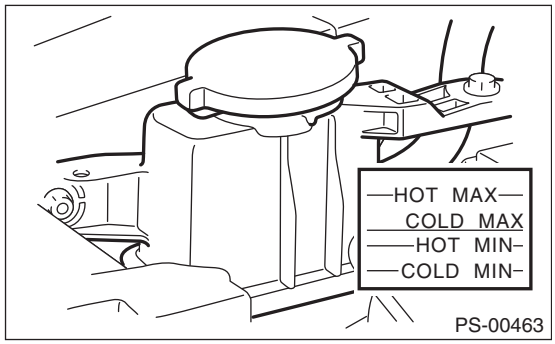
Tightening torque:
85 N·m (8.7 kgf-m, 62.7 ft-lb)

5. POWER STEERING FLUID LEVEL

CAUTION:
If any power steering fluid is spilt over the exhaust pipe, wipe it off with a cloth to avoid emitting smoke or causing a fire.

NOTE:
• Check at power steering fluid temperature 20°C (68°F); read the fluid level on the “COLD” side.
• Check at power steering fluid temperature 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. If the level is below “MIN”, fill fluid up to “MAX” level.



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

Fluid capacity:
<Ref. to SPC-4, CAPACITY, Forester.>

6. POWER STEERING FLUID FOR LEAKS

CAUTION:
• Wipe the leaked fluid off after correcting fluid leaks.
• Also pay attention to interference between hoses or pipes and other parts when inspecting fluid leaks.
• If any power steering fluid is spilt over the exhaust pipe, wipe it off with a cloth to avoid emitting smoke or causing a fire.

Check the underside of oil pump, gearbox of power steering system, hoses, pipes and their couplings for fluid leaks.
If fluid leakage is found, tighten the mounting bolt (or nut) again or replace with a new part.

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:
When installing the hose, do not twist or bend.

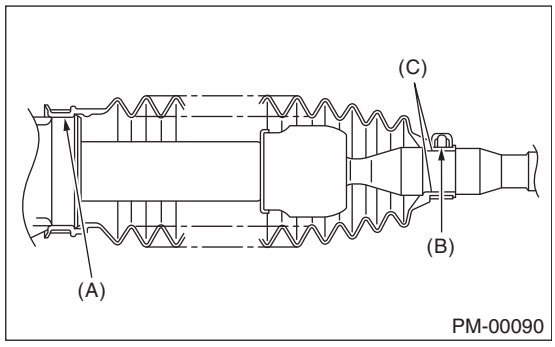
8. POWER STEERING PIPES FOR DAMAGES

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

9. GEARBOX BOOTS

Inspect the gearbox boot as follows, and correct the defects.
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 to positions (A) and (B) of boot.
3) Make sure 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.

26.A/C Filter

A: REPLACEMENT

<Ref. to AC-52, REPLACEMENT, A/C Filter.>

ENGINE 1 SECTION

This service manual has been prepared to provide SUBARU service personnel with the necessary information and data for the correct maintenance and repair of SUBARU vehicles.
This manual includes the procedures for maintenance, disassembling, reassembling, inspection and adjustment of components and diagnostics for guidance of experienced mechanics.
Please peruse and utilize this manual fully to ensure complete repair work for satisfying our customers by keeping their vehicle in optimum condition. When replacement of parts during repair work is needed, be sure to use SUBARU genuine parts.

All information, illustration and specifications contained in this manual are based on the latest product information available at the time of publication approval.

FUEL INJECTION (FUEL SYSTEMS)	FU(H4DO)
EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)	EC(H4DO)
INTAKE (INDUCTION)	IN(H4DO)
MECHANICAL	ME(H4DO)
EXHAUST	EX(H4DO)
COOLING	CO(H4DO)
LUBRICATION	LU(H4DO)
SPEED CONTROL SYSTEMS	SP(H4DO)
IGNITION	IG(H4DO)
STARTING/CHARGING SYSTEMS	SC(H4DO)
ENGINE (DIAGNOSTICS)	EN(H4DO)(diag)
GENERAL DESCRIPTION	GD(H4DO)

FUJI HEAVY INDUSTRIES LTD.

FUEL INJECTION (FUEL SYSTEMS)

FU(H4DO)

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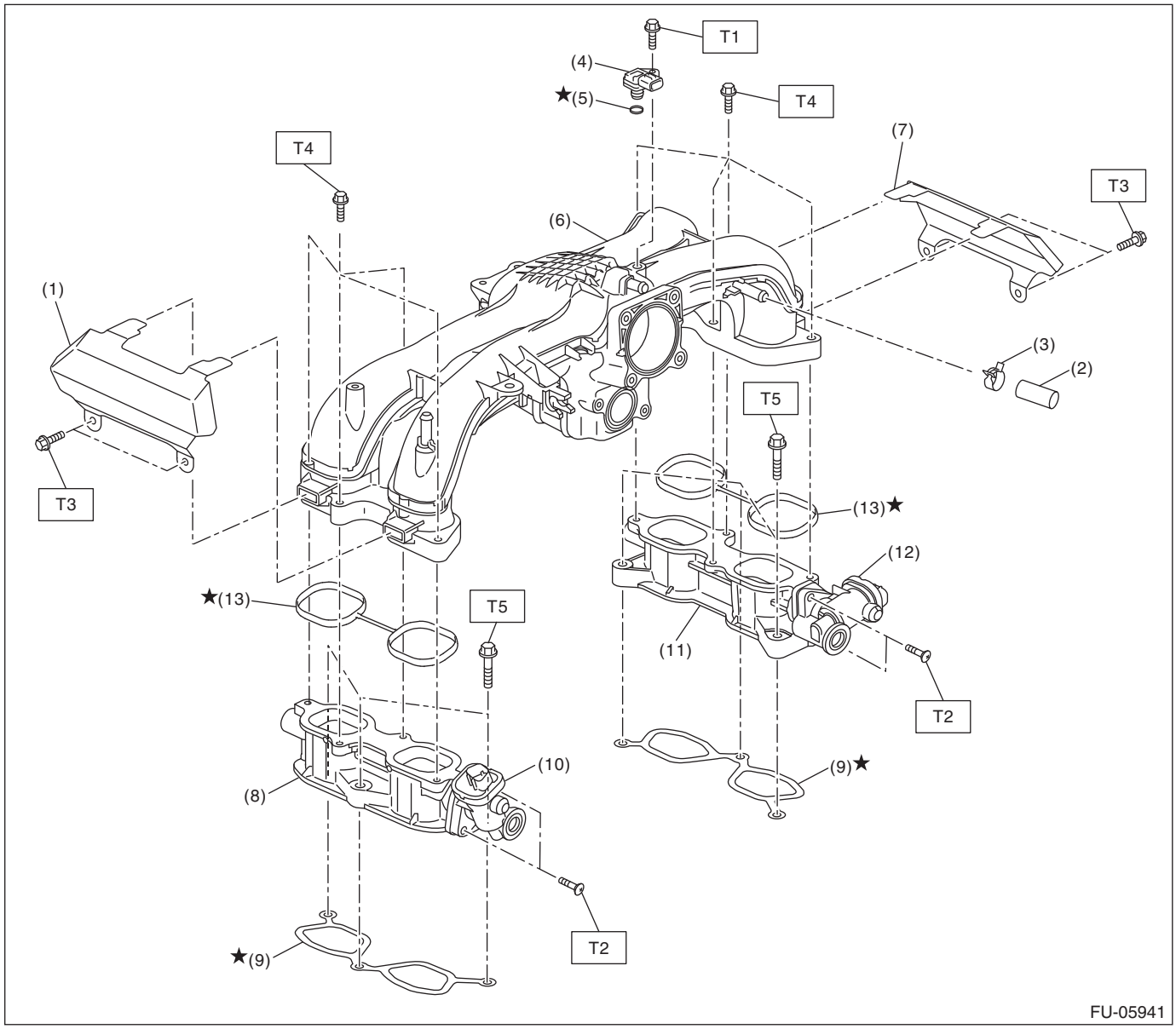
1. General Description

A: SPECIFICATION

Fuel tank	Capacity	64 ℓ (16.9 US gal, 14.1 Imp gal)
	Location	Under rear seat
Fuel pump	Type	Impeller
	Shutoff discharge pressure	677 kPa (6.9 kgf/cm^2, 98.2 psi) or less
	Discharge rate	105 ℓ (27.7 US gal, 23.1 Imp gal)/h or more [12 V at 300 kPa (3.06 kgf/cm^2, 43.5 psi)]
Fuel filter		In-tank type

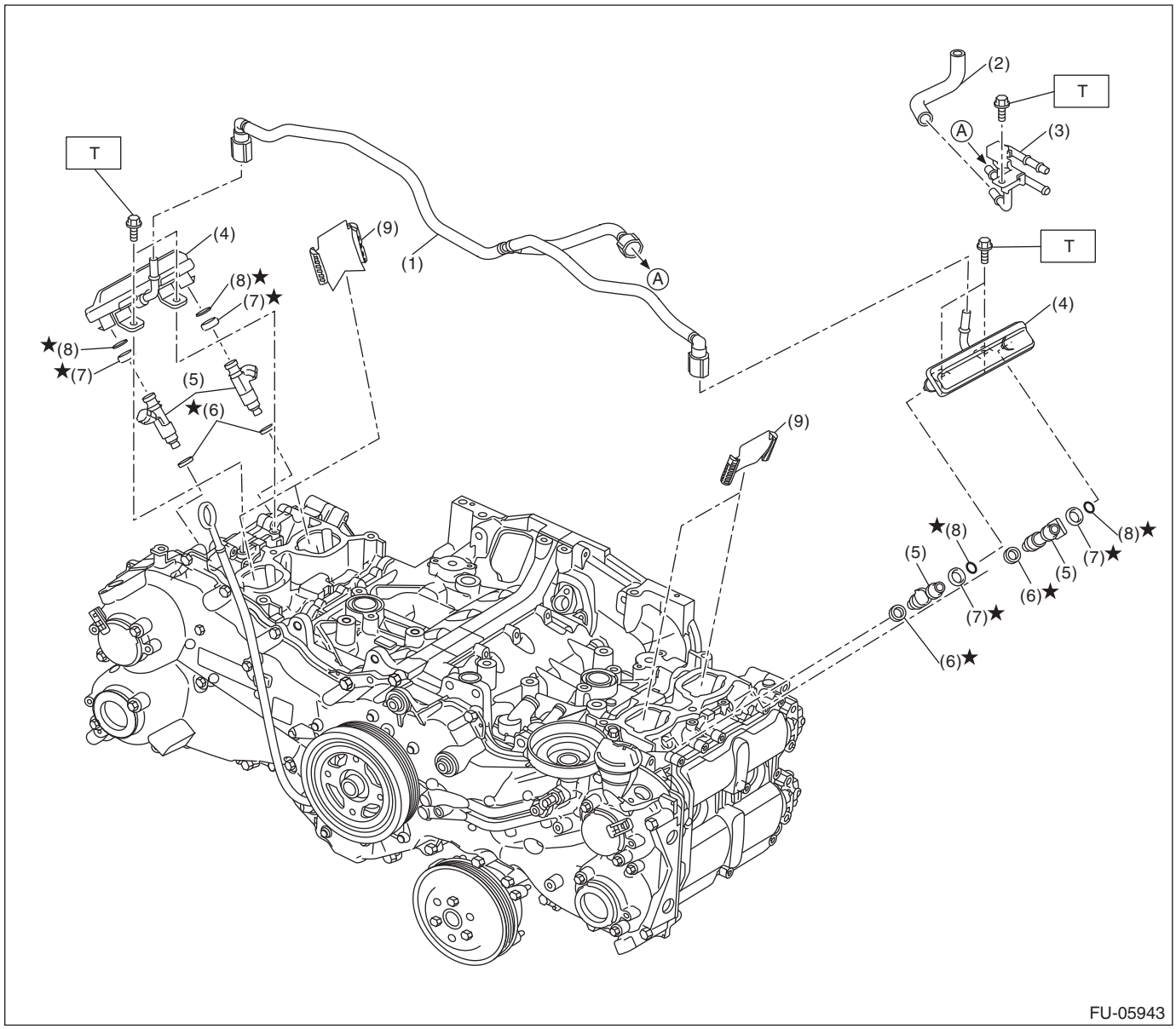
B: COMPONENT

1. INTAKE MANIFOLD 1



(1)	Intake manifold protector LH	(8)	Tumble generator valve LH	***Tightening torque:N·m (kgf-m, ft-lb)***
(2)	Cap	(9)	Gasket	***T1: 2 (0.2, 1.5)***
(3)	Clip	(10)	Tumble generator valve actuator LH	***T2: 6 (0.6, 4.4)***
(4)	Manifold absolute pressure sensor	(11)	Tumble generator valve RH	***T3: 6.4 (0.7, 4.7)***
(5)	O-ring	(12)	Tumble generator valve actuator RH	***T4: 8.3 (0.8, 6.1)***
(6)	Intake manifold	(13)	Gasket	***T5: 25 (2.5, 18.4)***
(7)	Intake manifold protector RH			

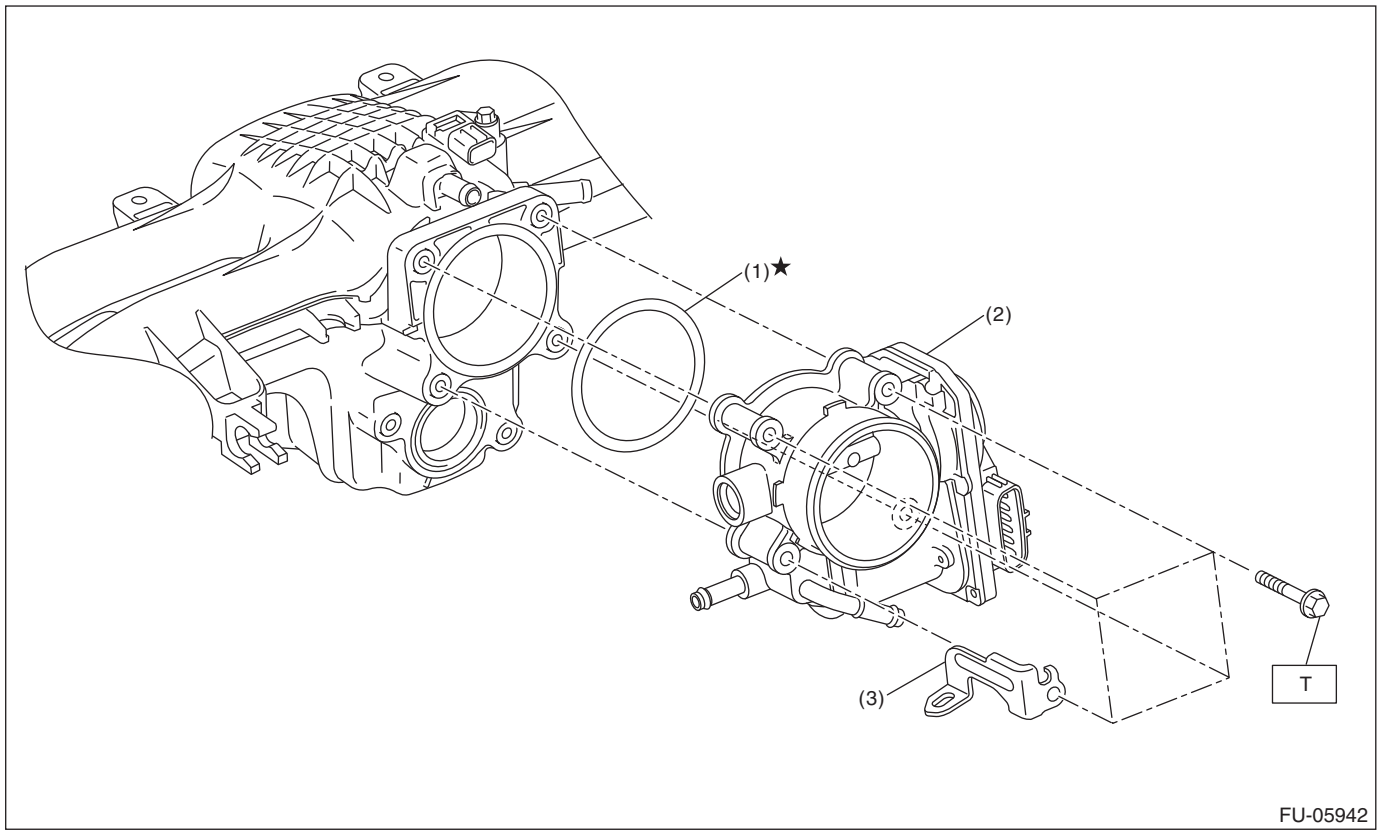
2. INTAKE MANIFOLD 2



(1) Fuel delivery pipe
(2) Vacuum hose
(3) Fuel pipe A
(4) Fuel pipe B
(5) Injector
(6) Seal ring
(7) Rubber
(8) O-ring
(9) Cylinder head plate

Tightening torque:N·m (kgf-m, ft-lb)
T: 6.4 (0.7, 4.7)

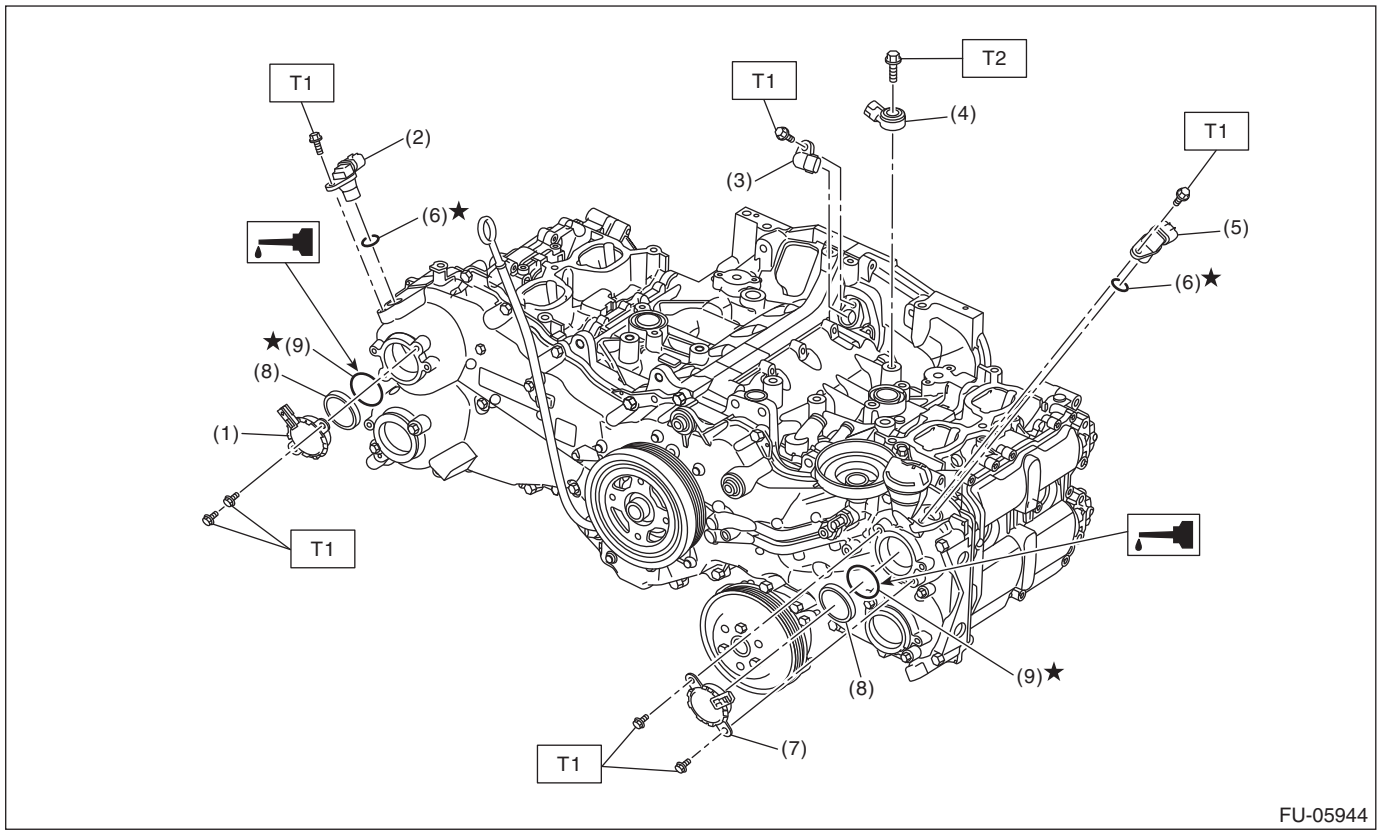
3. THROTTLE BODY



(1) Gasket
(2) Throttle body
(3) Blow-by hose stay

Tightening torque:N·m (kgf-m, ft-lb)
T: 8.3 (0.8, 6.1)

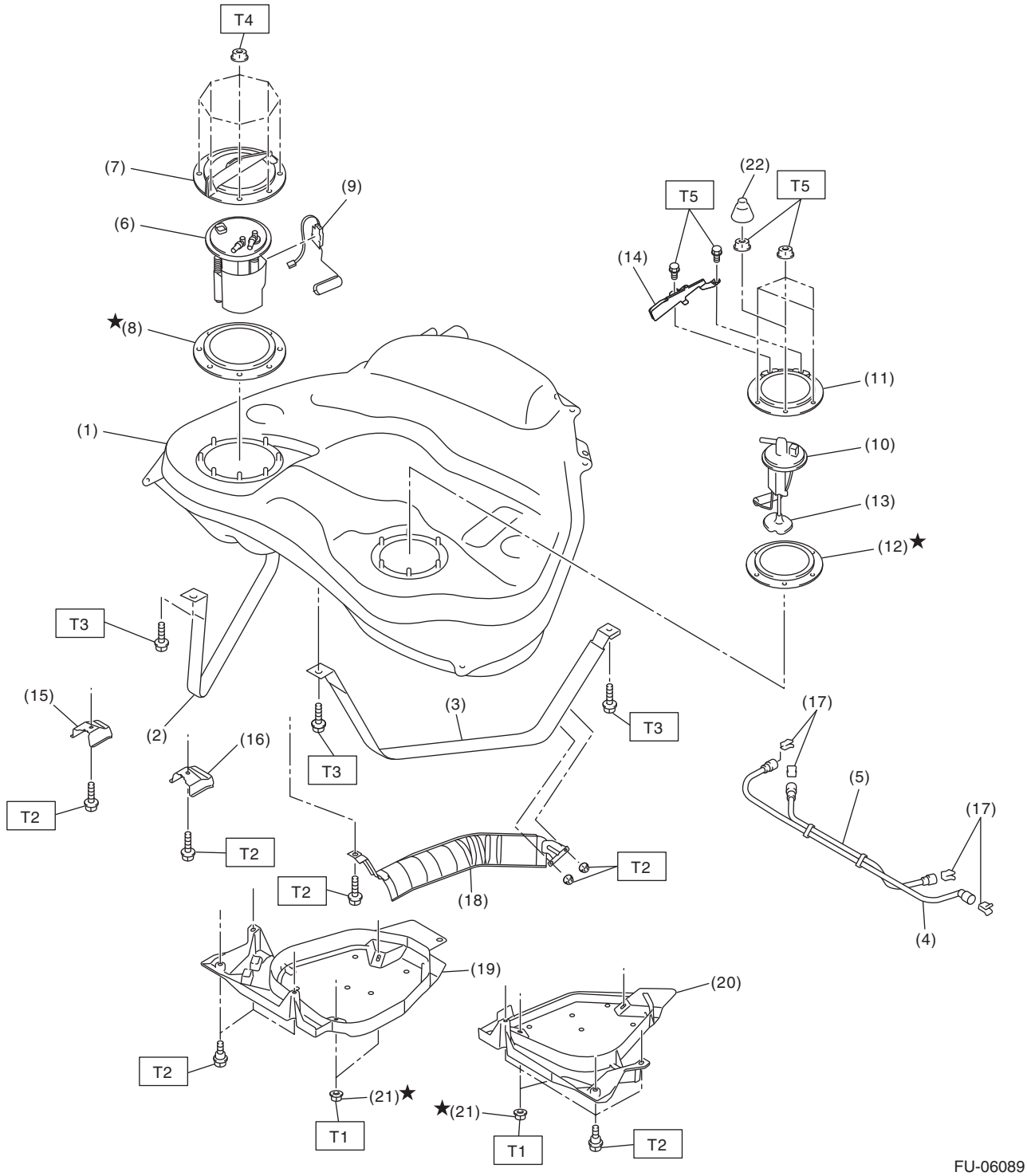
4. CRANKSHAFT POSITION, CAMSHAFT POSITION AND KNOCK SENSORS



(1) Oil control solenoid RH
(2) Camshaft position sensor RH
(3) Crankshaft position sensor
(4) Knock sensor
(5) Camshaft position sensor LH
(6) O-ring
(7) Oil control solenoid LH
(8) Back-up ring
(9) O-ring

Tightening torque:N·m (kgf-m, ft-lb)
T1: 6.4 (0.7, 4.7)
T2: 24 (2.4, 17.7)

5. FUEL TANK



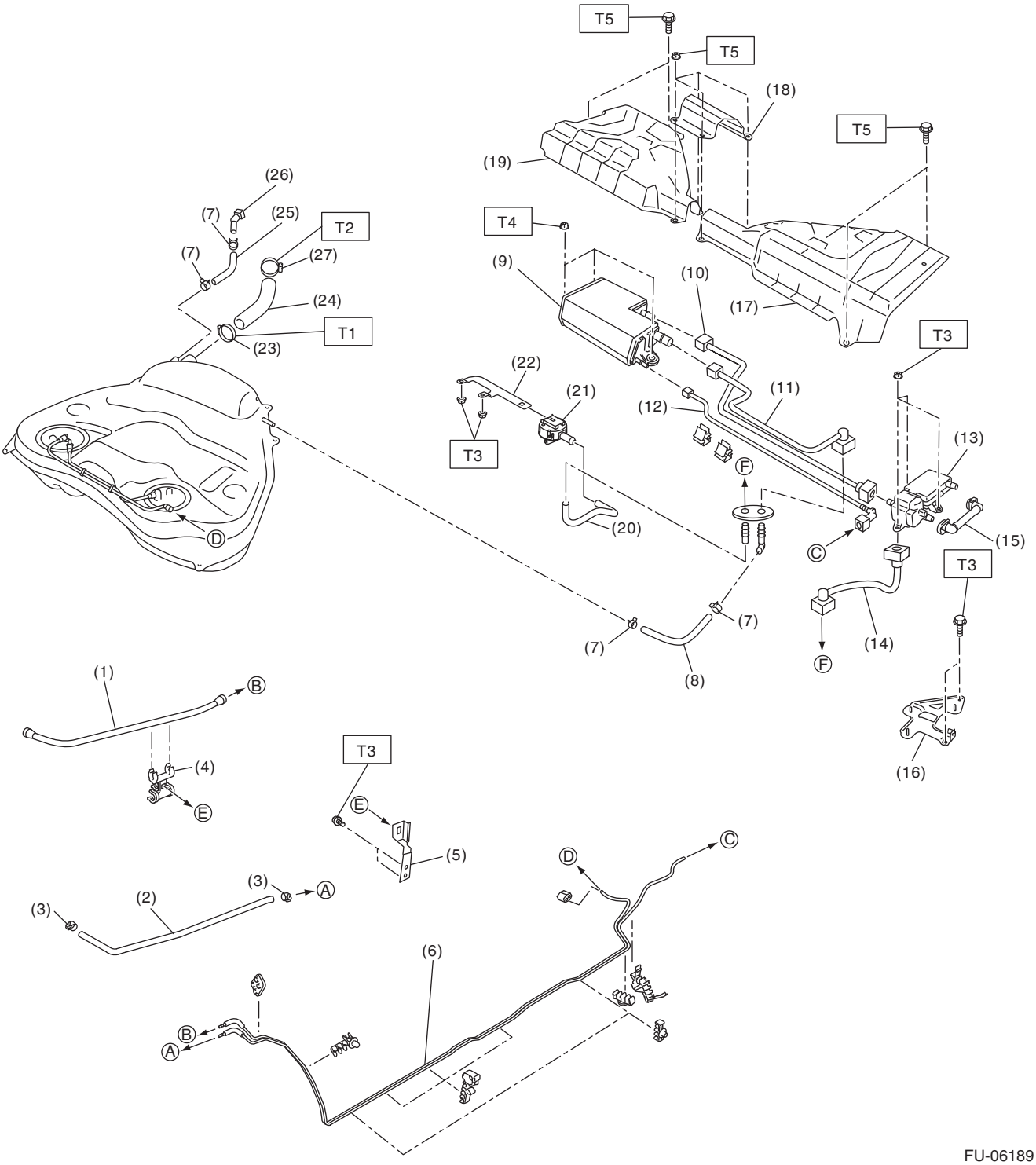
FU-06089

(1) Fuel tank
(2) Fuel tank band RH
(3) Fuel tank band LH
(4) Delivery tube
(5) Jet pump tube
(6) Fuel pump ASSY
(7) Fuel pump upper plate
(8) Fuel pump gasket
(9) Fuel level sensor
(10) Fuel sub level sensor
(11) Fuel sub level sensor upper plate
(12) Fuel sub level sensor gasket
(13) Fuel sub level sensor filter
(14) Fuel sub level sensor protector
(15) Stopper RH
(16) Stopper LH
(17) Retainer
(18) Heat shield cover
(19) Fuel tank protector RH
(20) Fuel tank protector LH
(21) Self-locking nut
(22) Rubber cap

Tightening torque:N·m (kgf-m, ft-lb)

T1: 9 (0.9, 6.6)
T2: 18 (1.8, 13.3)
T3: 33 (3.4, 24.3)
T4: <Ref. to FU(H4DO)-141, INSTALLATION, Fuel Pump.>
T5: <Ref. to FU(H4DO)-150, INSTALLATION, Fuel Sub Level Sensor.>

6. FUEL LINE

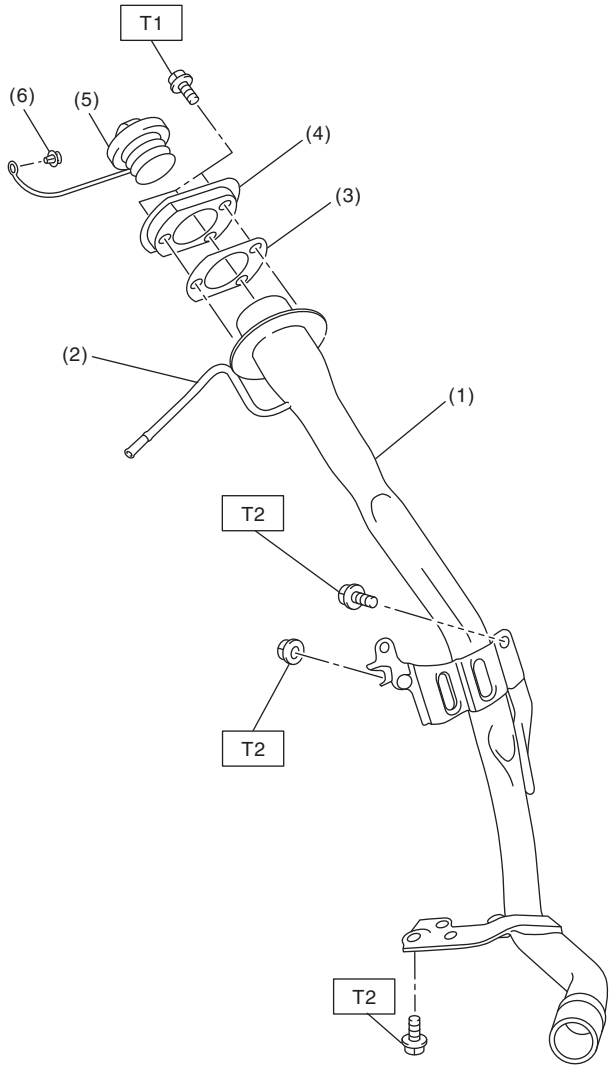


FU-06189

(1) Fuel delivery hose
(2) Evaporation hose A
(3) Clip
(4) Hose clamp
(5) Hose clamp bracket
(6) Fuel pipe ASSY
(7) Clip
(8) Evaporation hose B
(9) Canister
(10) Drain tube A
(11) Vent tube
(12) Purge tube
(13) Leak check valve
(14) Drain tube B
(15) Drain tube C
(16) Leak check valve bracket
(17) Canister cover LH
(18) Center canister cover
(19) Canister cover RH
(20) Drain hose
(21) Drain separator
(22) Drain separator bracket
(23) Clamp
(24) Fuel filler hose
(25) Evaporation hose C
(26) Quick connector
(27) Clamp

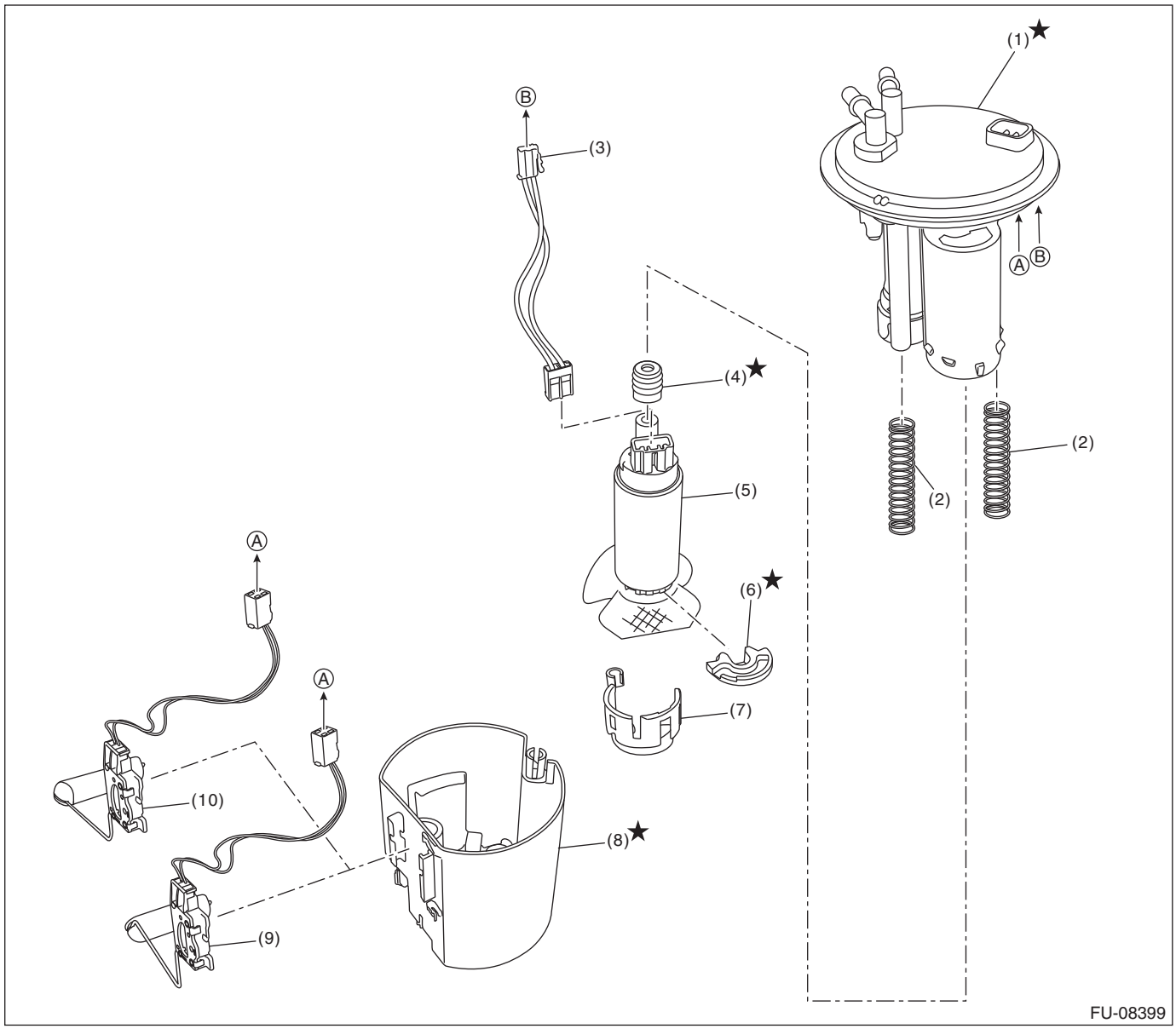
Tightening torque:N·m (kgf-m, ft-lb)
T1: 2 (0.2, 1.5)
T2: 2.5 (0.3, 1.8)
T3: 7.5 (0.8, 5.5)
T4: 8 (0.8, 5.9)
T5: 18 (1.8, 13.3)

7. FUEL FILLER PIPE



(1)	Fuel filler pipe ASSY	(4)	Fuel filler ring	***Tightening torque:N·m (kgf-m, ft-lb)***
(2)	Air vent pipe	(5)	Fuel filler cap	***T1: 4.4 (0.4, 3.2)***
(3)	Fuel filler pipe gasket	(6)	Clip	***T2: 7.5 (0.8, 5.5)***

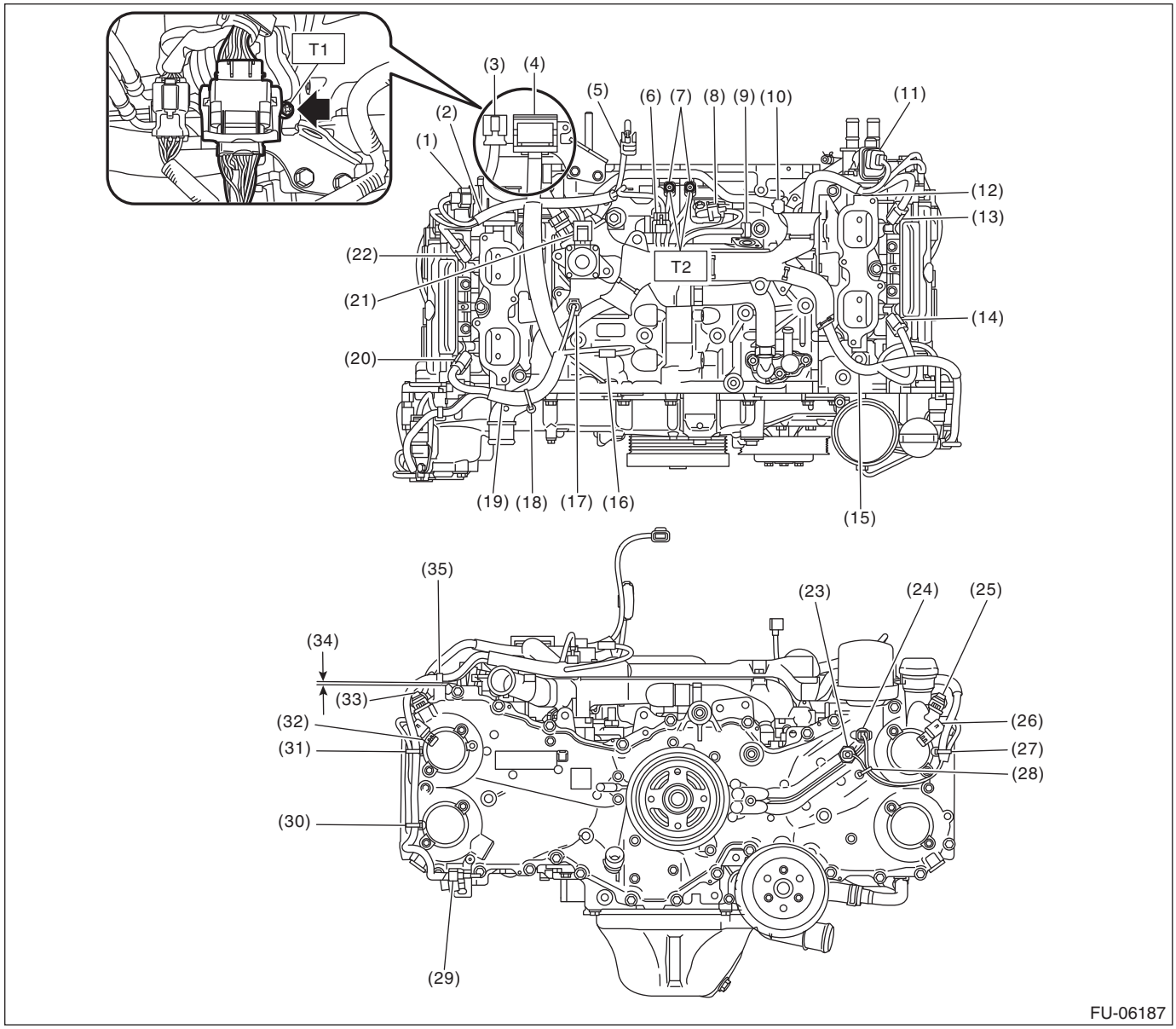
8. FUEL PUMP



(1) Fuel filter ASSY
(2) Pump module spring
(3) Fuel pump harness
(4) Gasket spacer
(5) Fuel pump
(6) Support rubber cushion
(7) Fuel pump holder
(8) Fuel chamber ASSY
(9) Fuel level sensor (model with fuel level sensor bent in 3 locations)
(10) Fuel level sensor (model with fuel level sensor bent in 2 locations)

9. ENGINE HARNESS

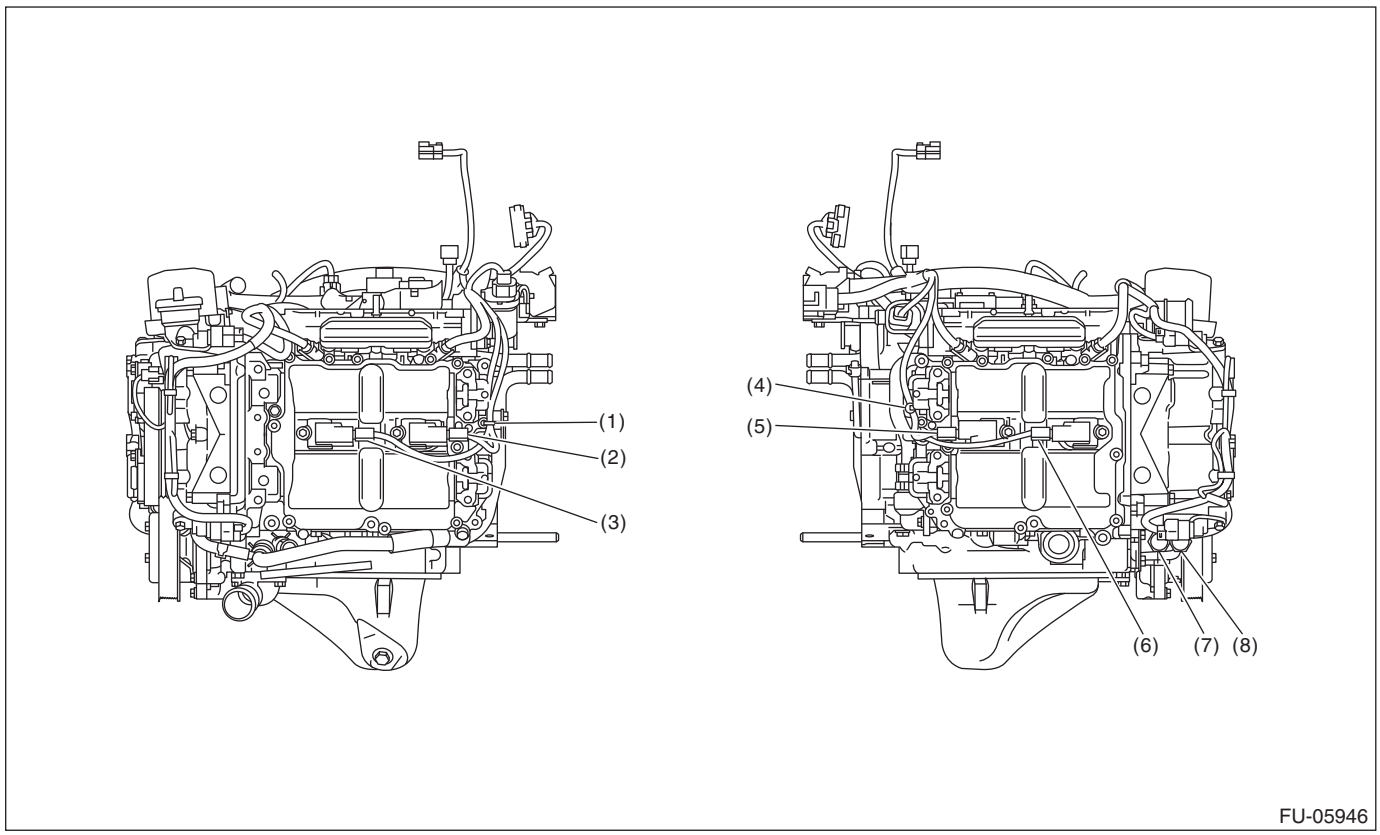
- Structural diagram 1



(1) Tumble generator valve actuator RH
(2) Be careful of pinching when installing the intake manifold.
(3) Engine harness connector (16P)
(4) Engine harness connector (54P)
(5) Throttle position sensor connector
(6) Manifold pressure sensor connector
(7) Engine ground (2 locations)
(8) Crankshaft position sensor
(9) Knock sensor
(10) Purge control solenoid valve connector
(11) Tumble generator valve actuator LH
(12) Be careful of pinching when installing the intake manifold.
(13) Fuel injector (#4)
(14) Fuel injector (#2)
(15) Be careful of pinching when installing the intake manifold and A/C bracket.
(16) Power steering switch connector
(17) Engine coolant temperature sensor
(18) Secure the clip to the screw hole.
(19) Be careful of pinching when installing the intake manifold.
(20) Fuel injector (#1)
(21) EGR valve
(22) Fuel injector (#3)
(23) Oil pressure switch
(24) Engine Oil Temperature Sensor
(25) Camshaft position sensor LH
(26) Oil control solenoid LH
(27) Secure the clip to the screw hole.
(28) Secure the clip to the screw hole.
(29) Secure the clip to the oval hole.
(30) Secure the clip to the screw hole.
(31) Secure the clip to the screw hole.
(32) Oil control solenoid RH
(33) Camshaft position sensor RH
(34) Maximum of 0 — 2 mm (0 — 0.079 in) gap is allowed.
(35) Secure the clip to the screw hole.

Tightening torque:N·m (kgf-m, ft-lb)
T1: 7.5 (0.8, 5.5)
T2: 19 (1.9, 14.0)

- Structural diagram 2



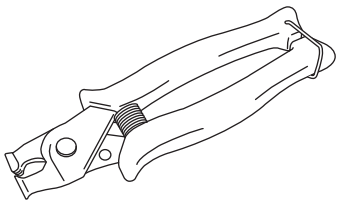
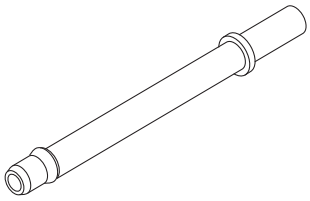
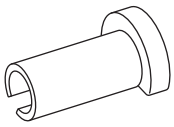
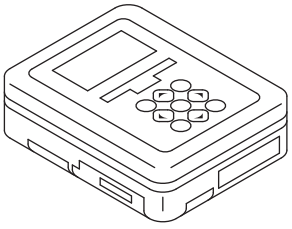
(1) Secure the clip to the screw hole.
(2) Ignition coil No. 4
(3) Ignition coil No. 2
(4) Secure the clip to the screw hole.
(5) Ignition coil No. 3
(6) Ignition coil No. 1
(7) Front oxygen (A/F) sensor
(8) Rear oxygen sensor

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 battery.
- Place “NO OPEN FLAMES” 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 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 fuel.

D: PREPARATION TOOL

1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18353AA000	18353AA000	CLAMP PLIERS	• Used for removing and installing the PCV hose. • This tool is made by the French company CAILLAU. (code) 54.0.000.205 To make it easier to obtain, it has been provided with a tool number.
 ST18471AA000	18471AA000	FUEL PIPE ADAPTER	Used for draining fuel.
 ST42099AE000	42099AE000	QUICK CONNECTOR RELEASE	Used for removing the quick connector.
 ST1B022XU0	1B022XU0	SUBARU SELECT MONITOR III KIT	Used for draining fuel and each inspection.

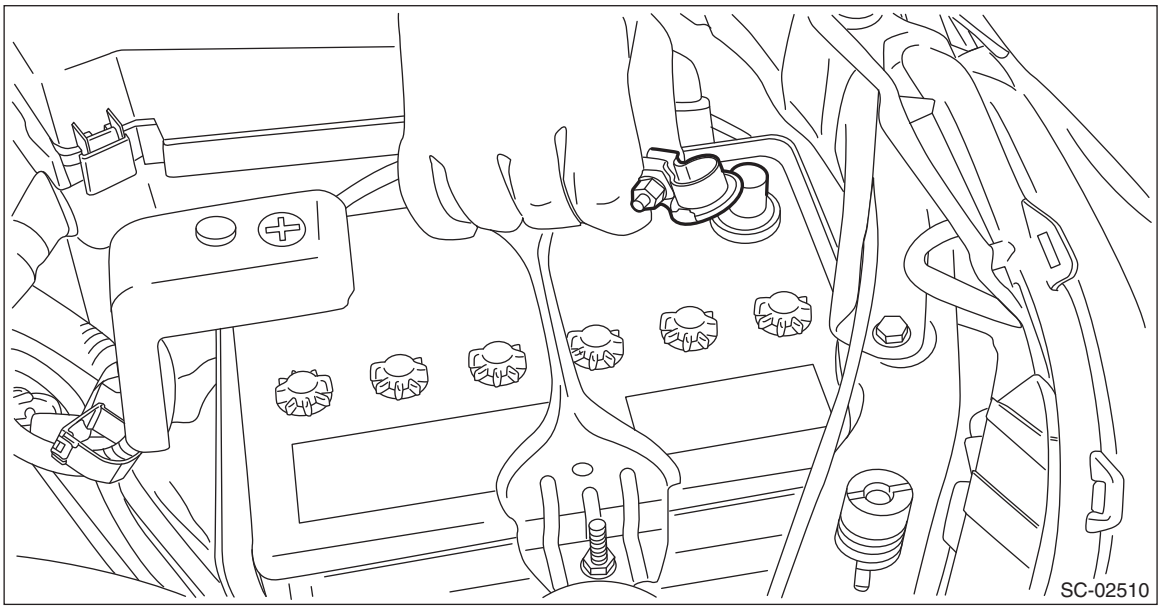
2. GENERAL TOOL

TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance and voltage.
Oscilloscope	Used for inspecting the waveform of each sensor.

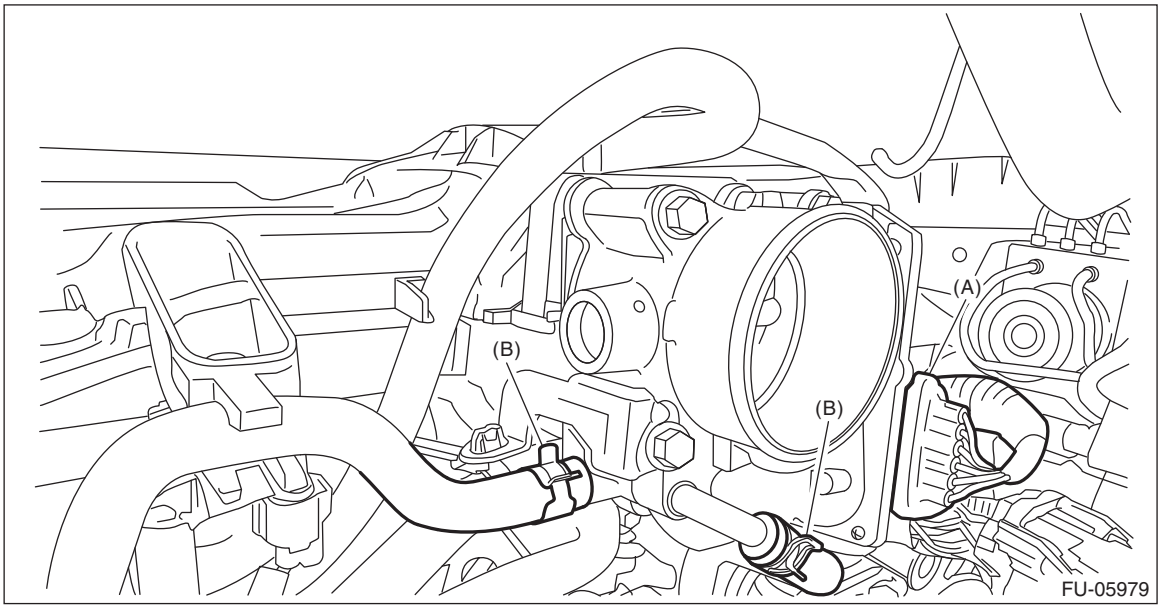
2. Throttle Body

A: REMOVAL

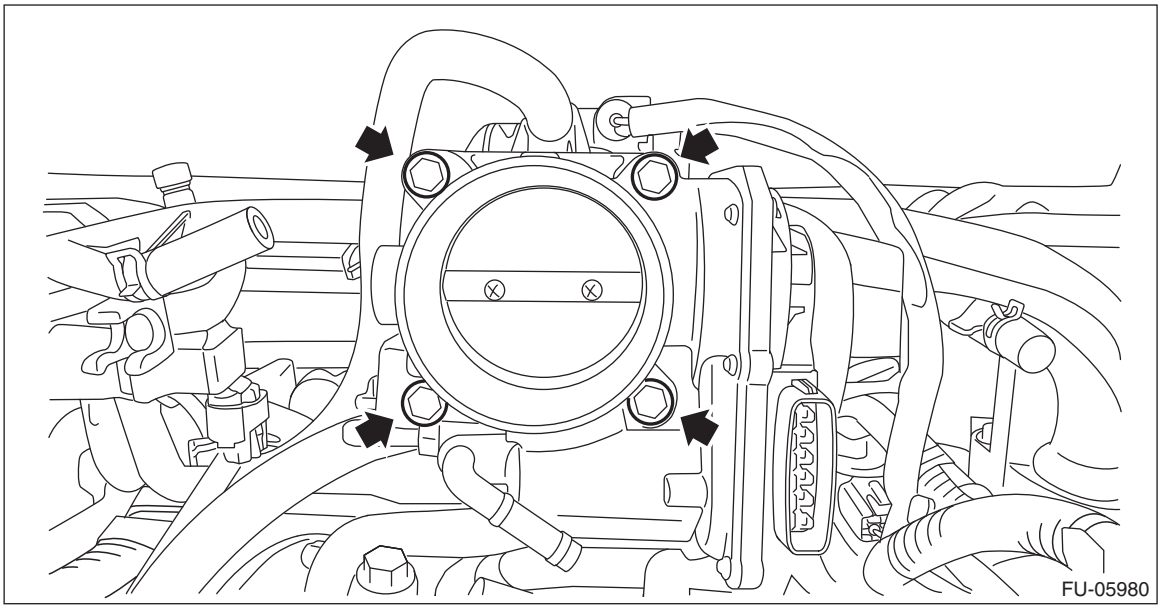
1) Disconnect the ground cable from battery.



2) Lift up the vehicle.
3) Remove the under cover RH. <Ref. to EI-26, REMOVAL, Front Under Cover.>
4) Drain approximately 3.0 ℓ (3.2 US qt, 2.6 Imp qt) of coolant. <Ref. to CO(H4DO)-13, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
5) Remove the air intake boot. <Ref. to IN(H4DO)-13, REMOVAL, Air Intake Boot.>
6) Disconnect the connectors (A) from the throttle position sensor.
7) Disconnect the preheater hose (B).



8) Remove the throttle body from the intake manifold.



B: INSTALLATION

Install in the reverse order of removal.

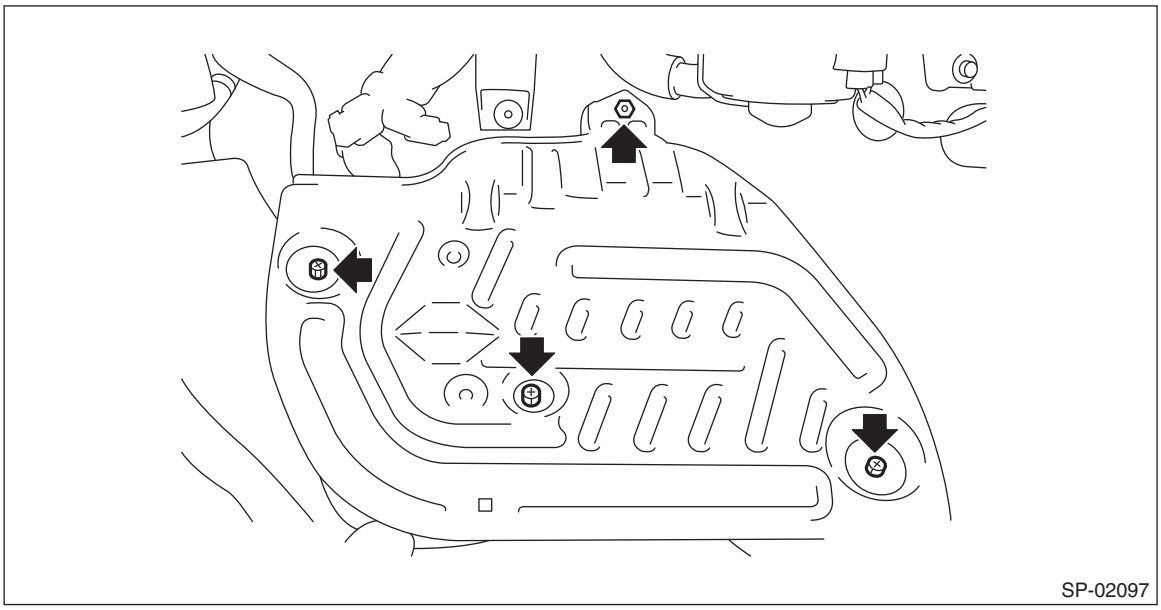
NOTE:
Use a new gasket.

Tightening torque:
8.3 N·m (0.8 kgf-m, 6.1 ft-lb)

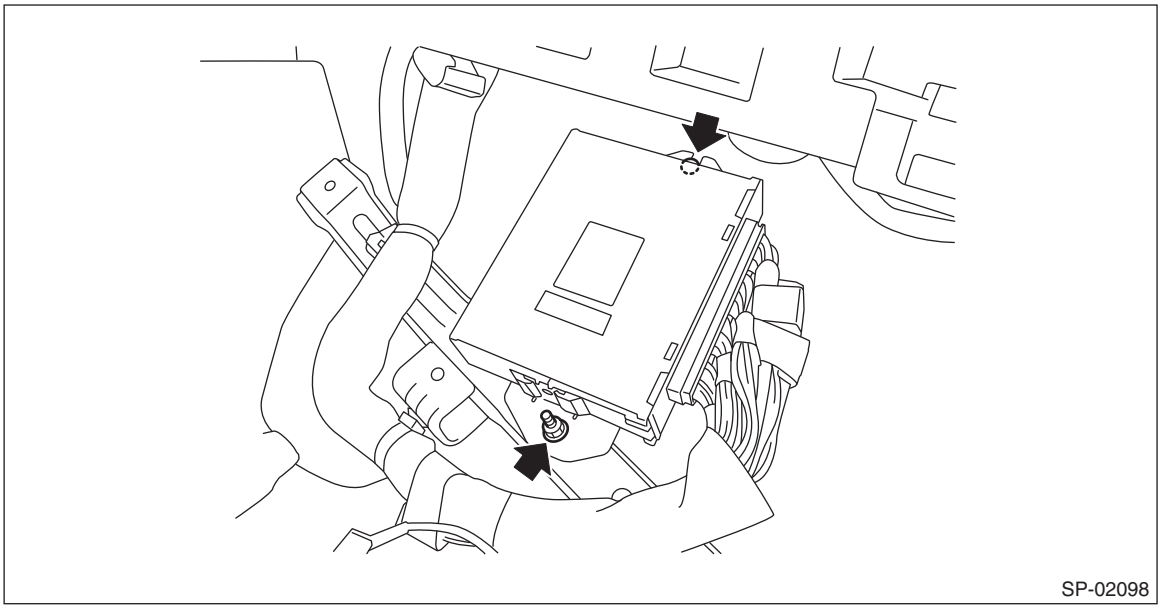
C: INSPECTION

1. THROTTLE SENSOR (METHOD WITH CIRCUIT TESTER)

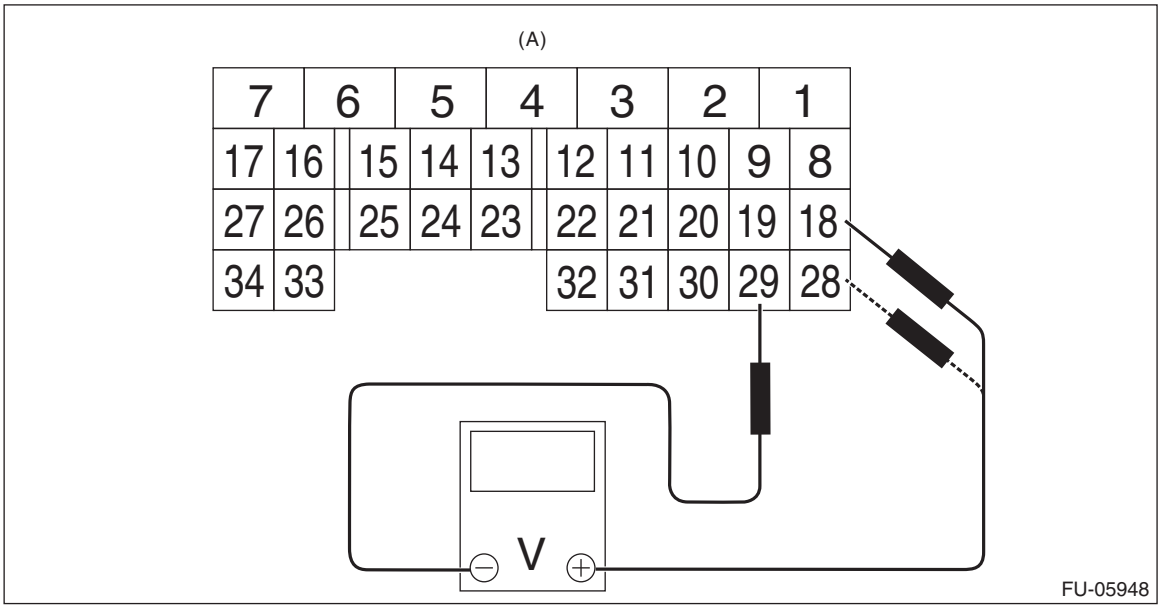
1) Remove the glove box lower cover. <Ref. to EI-48, REMOVAL, Glove Box.>
2) Remove the lower inner trim of passenger's side. <Ref. to EI-56, REMOVAL, Lower Inner Trim.>
3) Turn over the floor mat of passenger's seat.
4) Remove the protect cover.



5) Remove the nuts and bolts which hold the ECM to the bracket.



6) Turn the ignition switch to ON. (engine OFF)
7) Measure the voltage between ECM connector terminals.



(A) To ECM connector

Throttle sensor	Accelerator pedal	Terminal No.	Standard
Main	Not depressed (Full closed)	18 (+) and 29 (–)	Approx. 0.6 V
	Depressed (Full opened)		Approx. 4.0 V
Sub	Not depressed (Full closed)	28 (+) and 29 (–)	Approx. 1.5 V
	Depressed (Full opened)		Approx. 4.2 V

8) After inspection, install the related parts in the reverse order of removal.

Tightening torque:
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)

2. THROTTLE SENSOR (METHOD WITH SUBARU SELECT MONITOR)

1) Turn the ignition switch to ON. (engine OFF)
2) Read the throttle opening angle signal and voltage of throttle sensor using Subaru Select Monitor. <Ref. to EN(H4DO)(diag)-36, READ CURRENT DATA FOR ENGINE (NORMAL MODE), OPERATION, Subaru Select Monitor.>

Throttle sensor	Throttle opening angle signal	Standard
Main	0.0%	Approx. 0.6 V
	100.0%	Approx. 4.0 V
Sub	0.0%	Approx. 1.5 V
	100.0%	Approx. 4.2 V

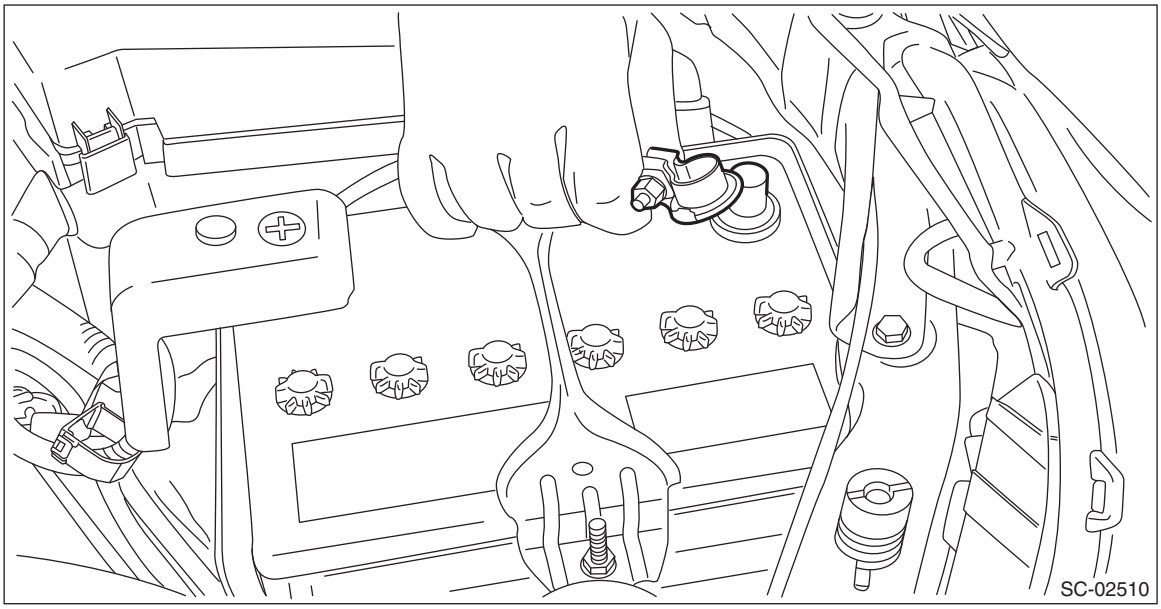
3. OTHER INSPECTIONS

1) Check that the throttle body has no deformation, cracks or other damages.
2) Check that the preheater hose has no cracks, damage or loose part.

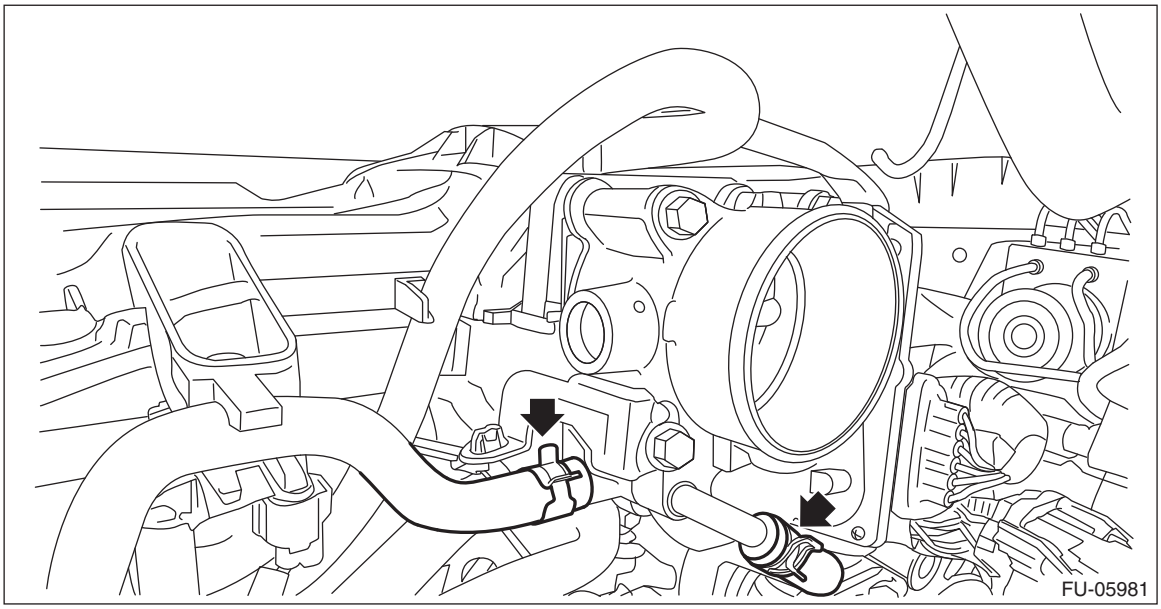
3. Intake Manifold

A: REMOVAL

1) Release the fuel pressure. <Ref. to FU(H4DO)-109, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Disconnect the ground cable from battery.

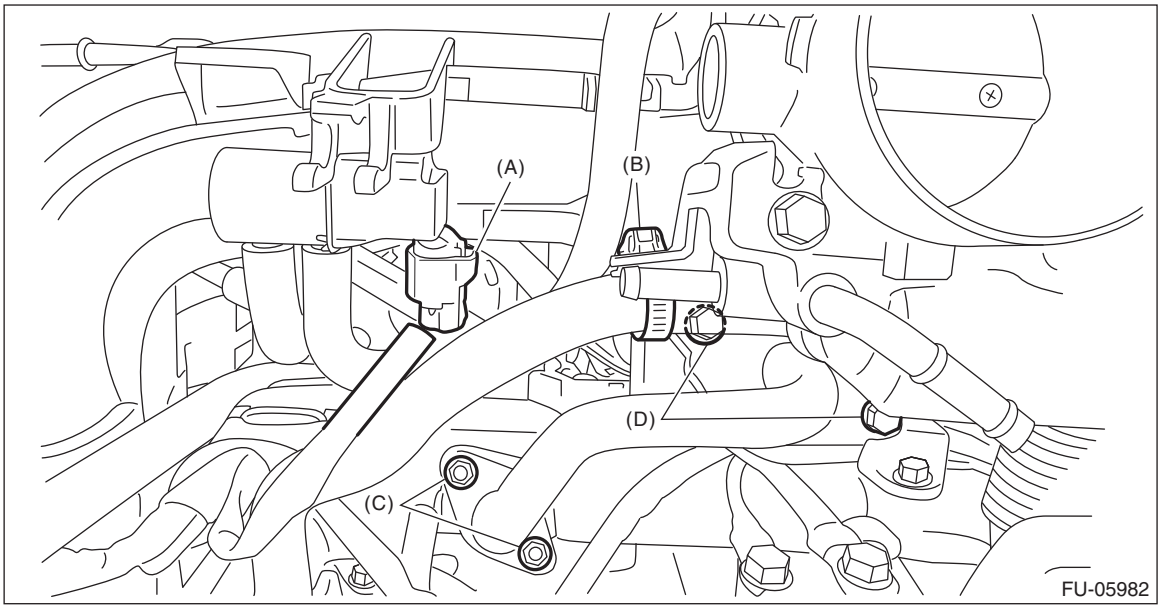


3) Open the fuel filler lid and remove the fuel filler cap.
4) Lift up the vehicle.
5) Remove the under cover RH. <Ref. to EI-26, REMOVAL, Front Under Cover.>
6) Drain approximately 3.0 ℓ (3.2 US qt, 2.6 Imp qt) of coolant. <Ref. to CO(H4DO)-13, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
7) Remove the air intake boot. <Ref. to IN(H4DO)-13, REMOVAL, Air Intake Boot.>
8) Disconnect the preheater hose from throttle body.

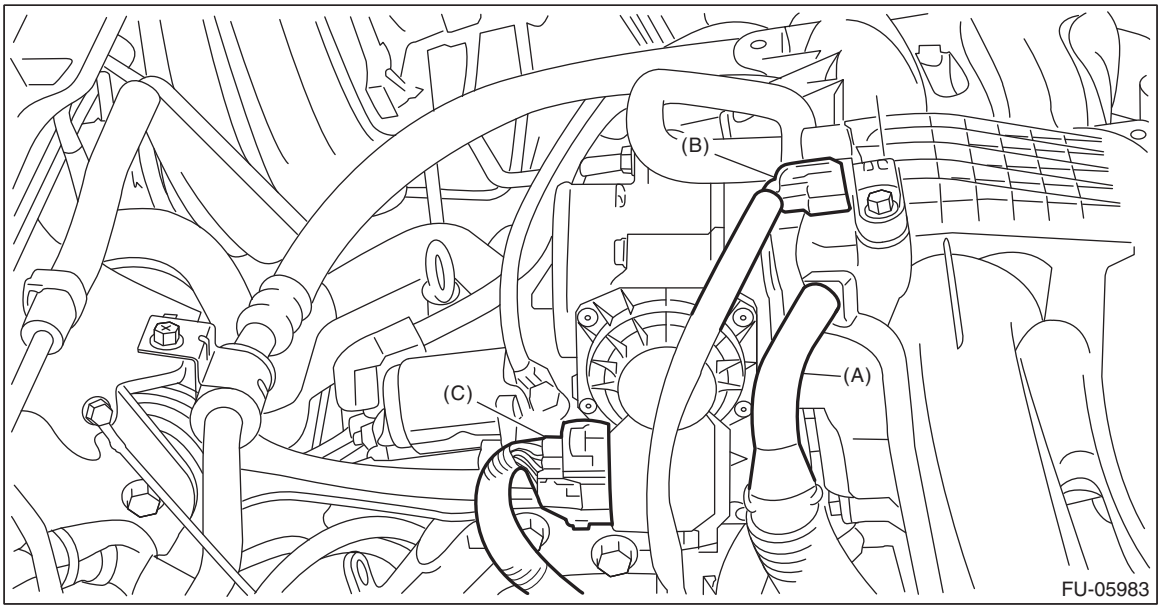


9) Disconnect the connector (A) from the purge control solenoid valve.
10) Disconnect the clip (B) which holds the PCV hose.
11) Remove the nut (C) which holds EGR pipe from the water pipe assembly.

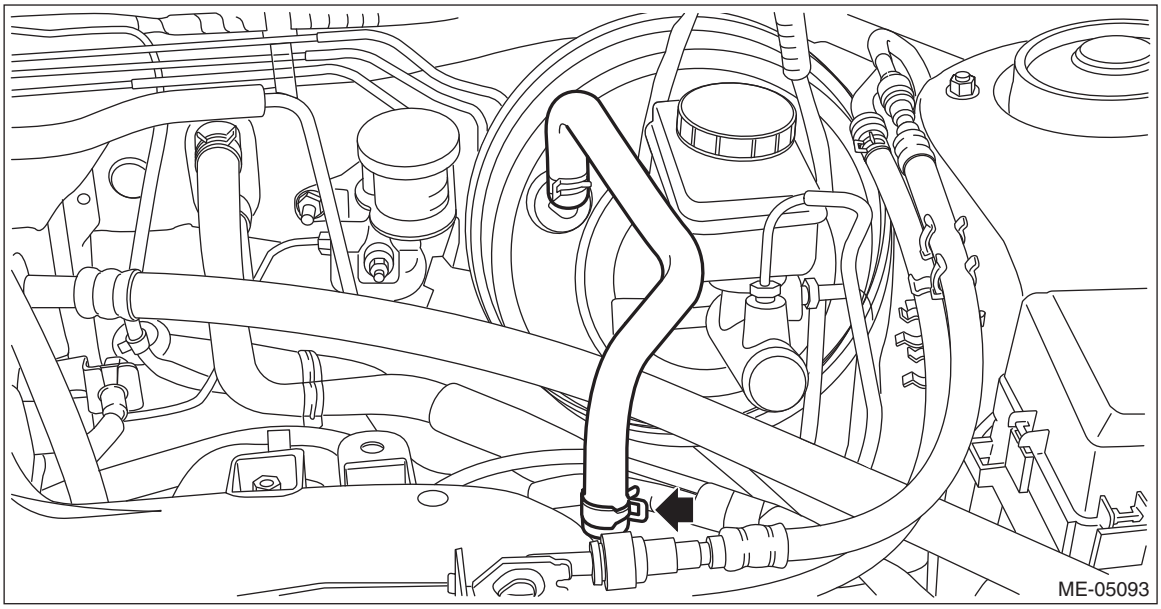
12) Loosen the bolt (D) which secures the EGR pipe to the intake manifold.



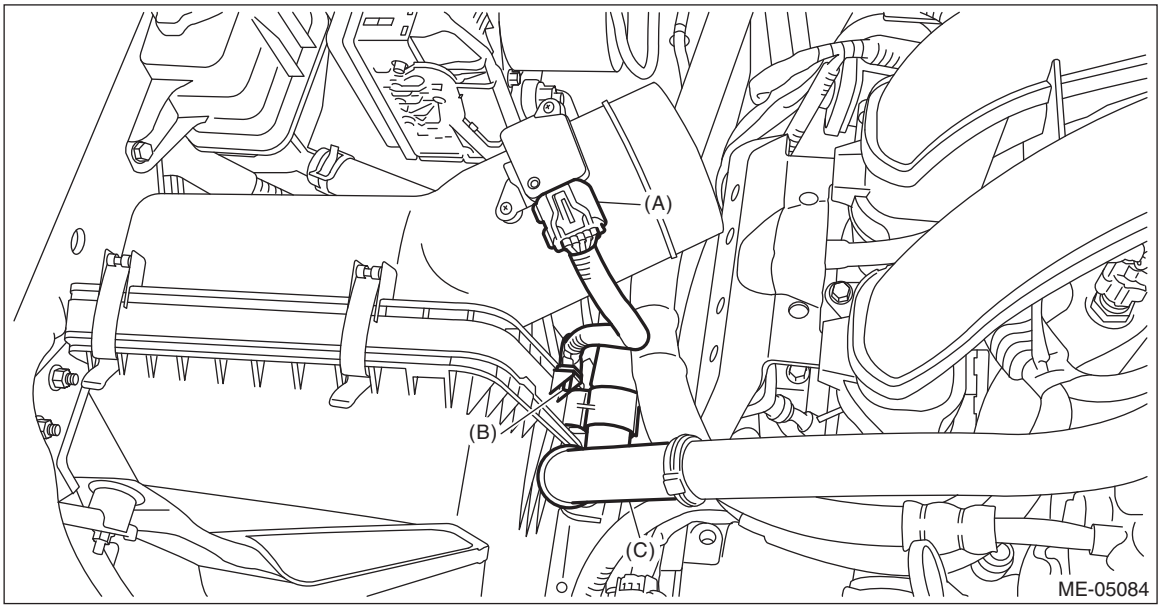
13) Disconnect the vacuum hose (A) from intake manifold.
14) Disconnect the connector (B) from manifold absolute pressure sensor.
15) Disconnect the connector (C) from the throttle position sensor.



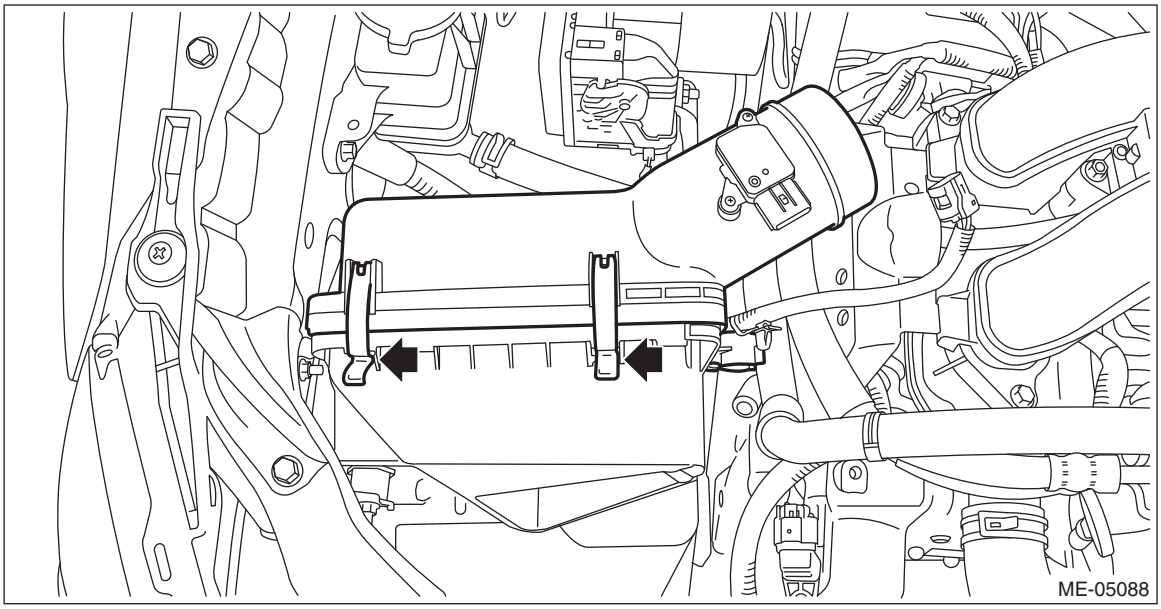
16) Disconnect the brake booster vacuum hose from the intake manifold.



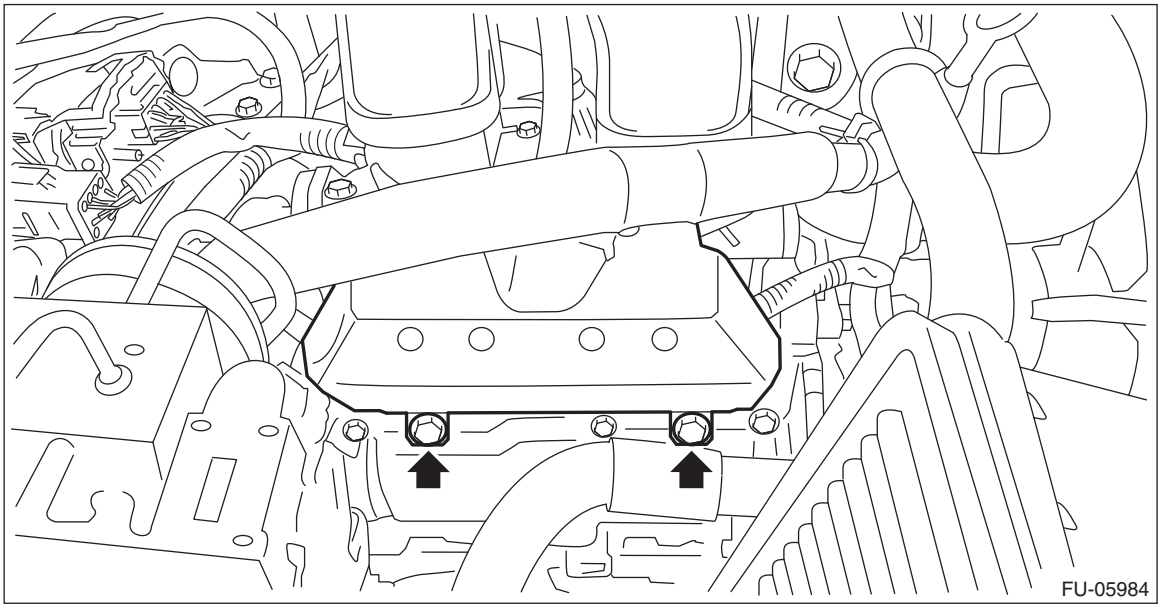
17) Disconnect the connector (A) from the mass air flow and intake air temperature sensor, and remove the clip (B) which holds the mass air flow and intake air temperature sensor harness.
18) Remove the suction hose (C) from the air cleaner case (rear).



19) Remove the air cleaner case (rear).

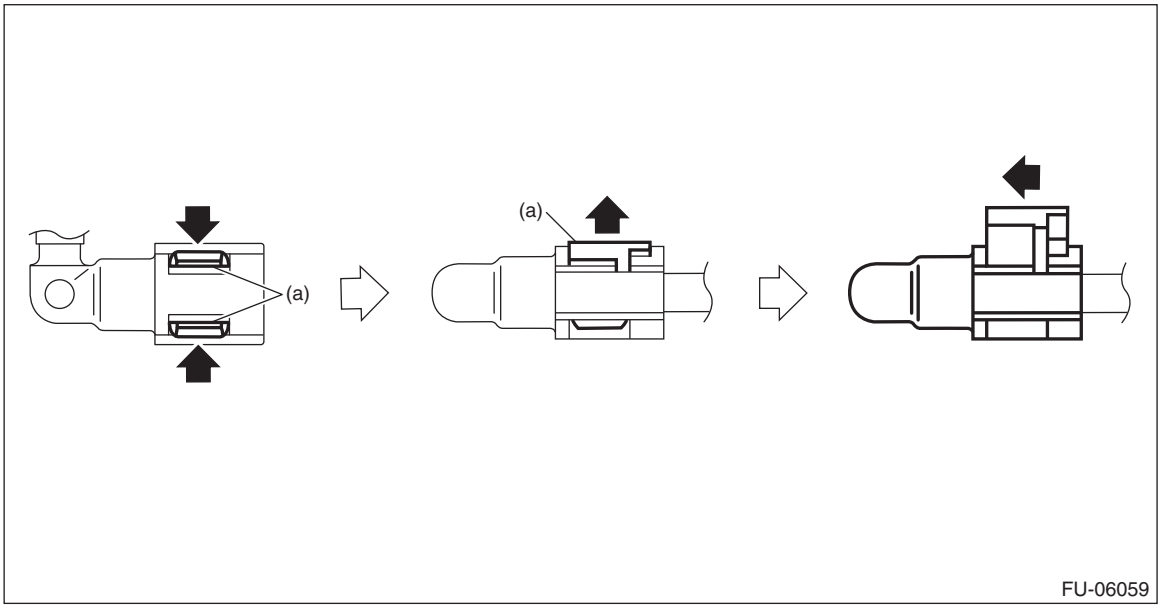


20) Remove the intake manifold protector RH.

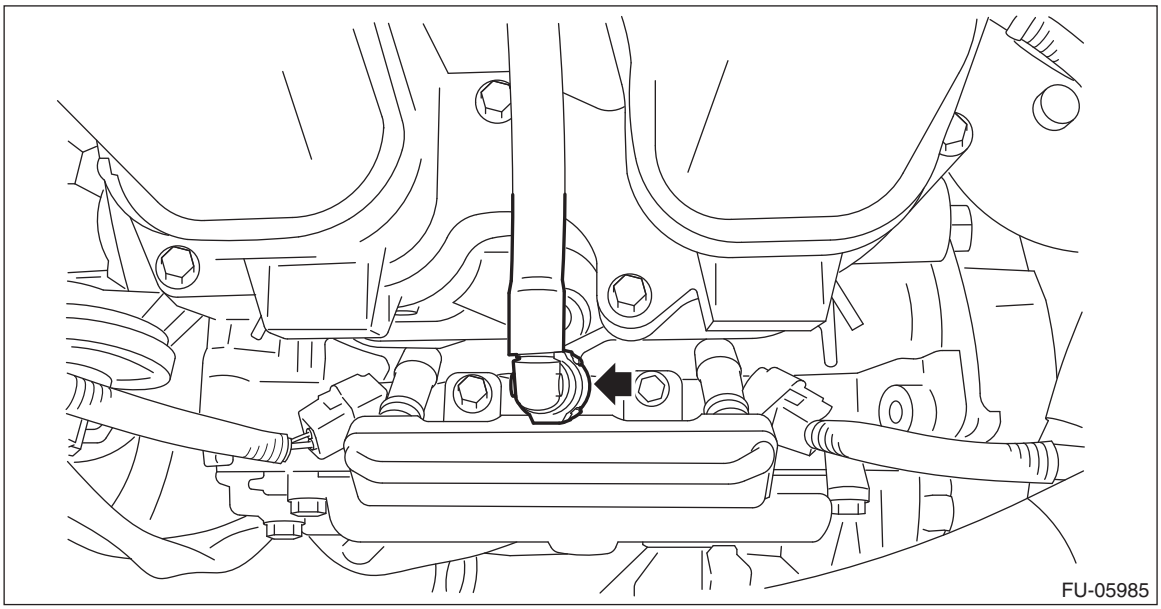


21) Disconnect the fuel delivery pipe from the fuel pipe RH.

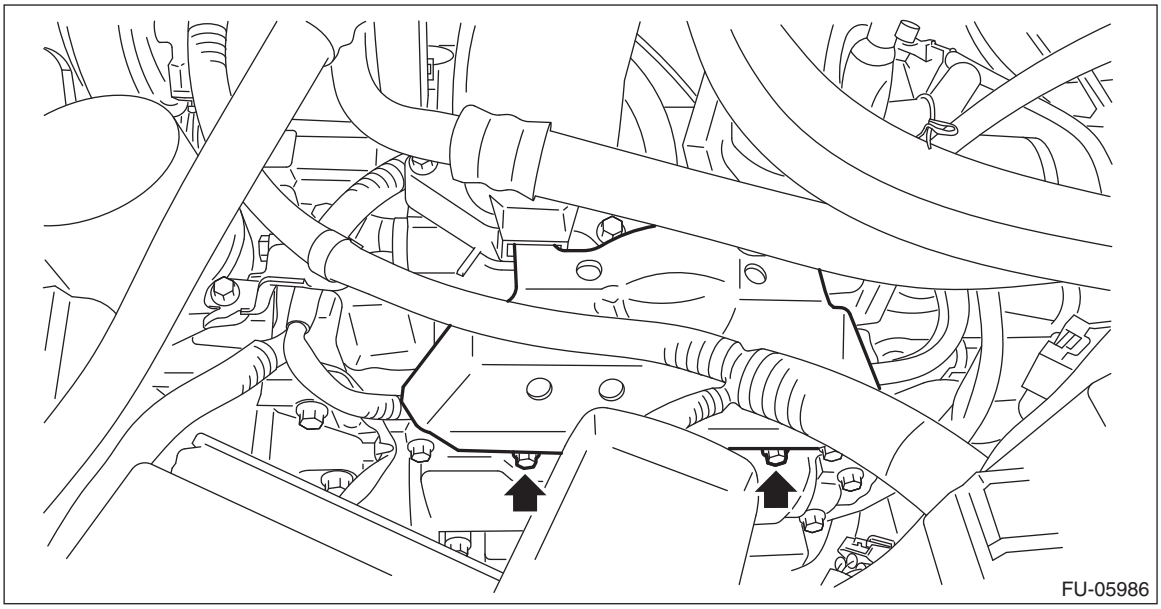
NOTE:
Disconnect the quick connector as shown in the figure.



(a) Slider

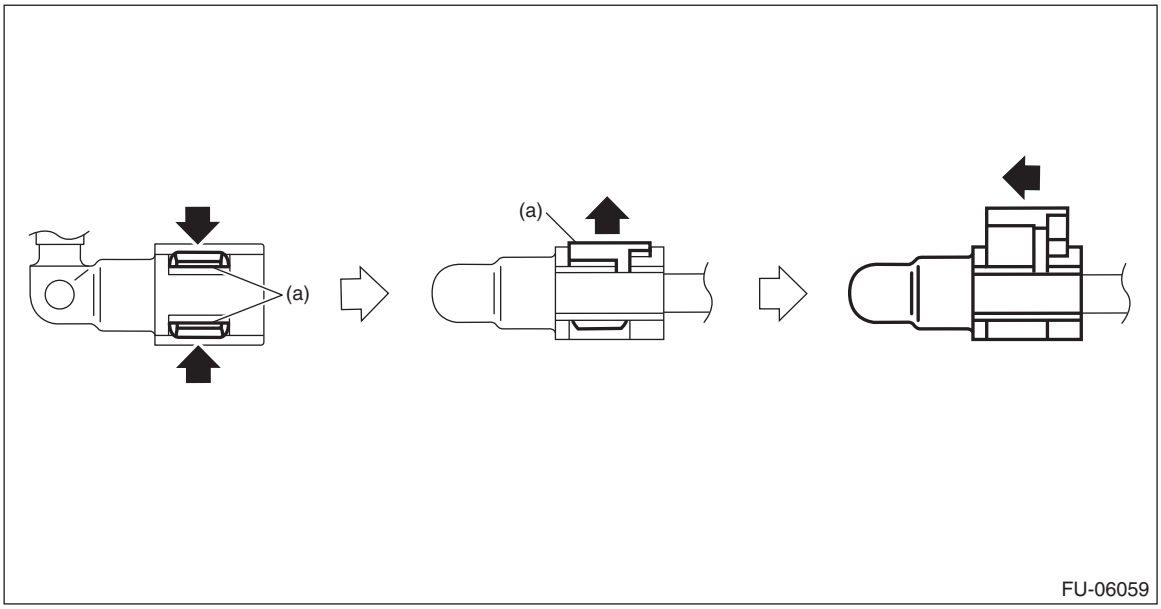


22) Remove the intake manifold protector LH.

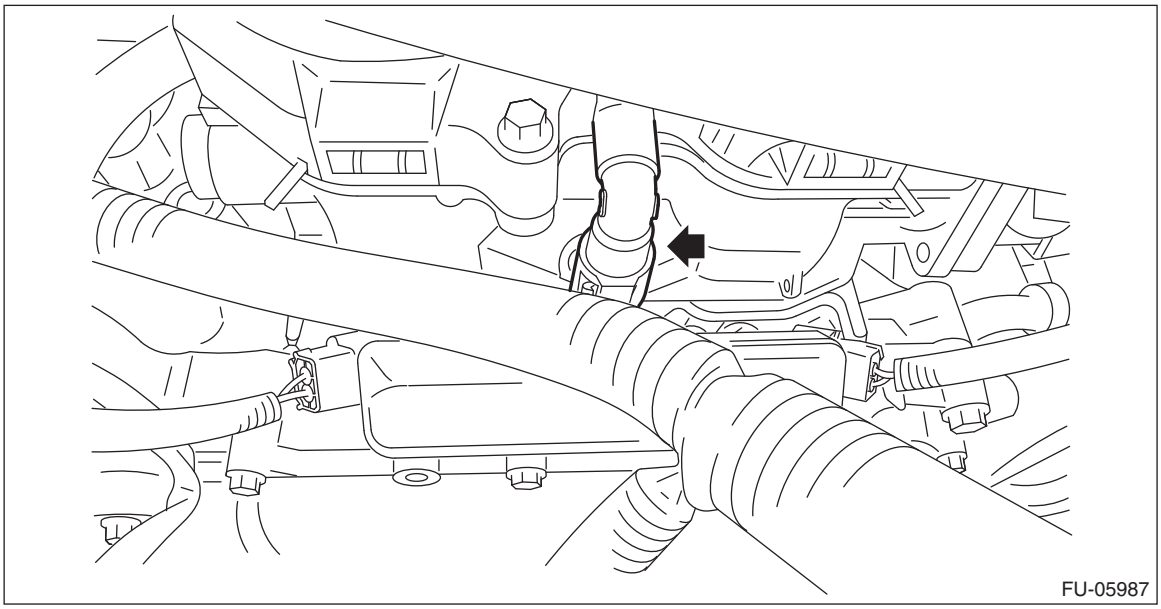


23) Disconnect the fuel delivery pipe from the fuel pipe LH.

NOTE:
Disconnect the quick connector as shown in the figure.



(a) Slider



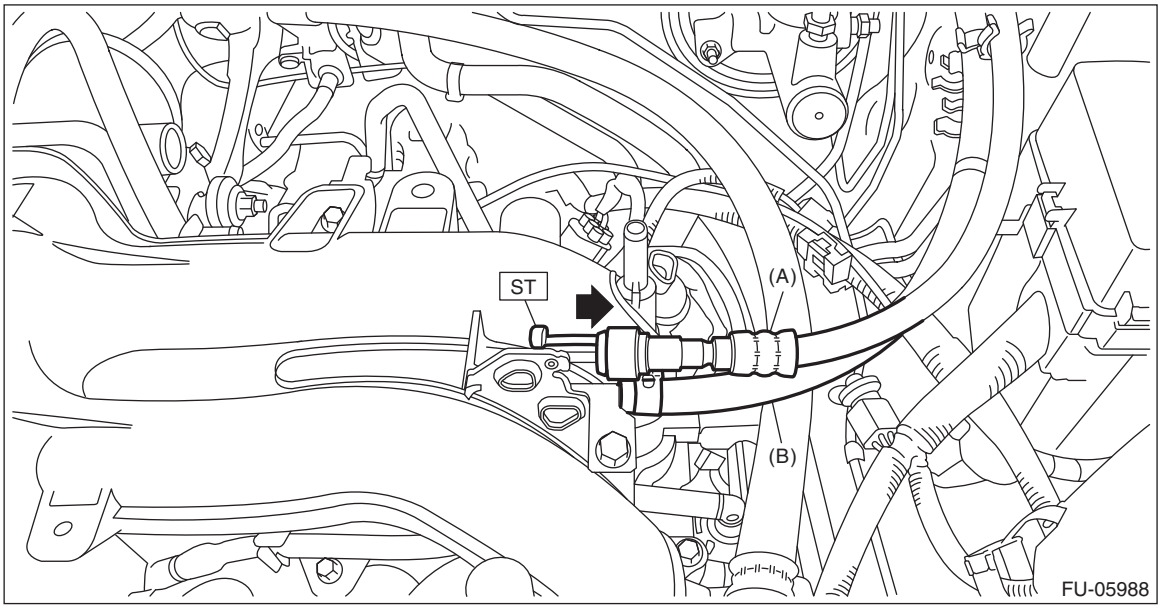
24) Disconnect the fuel delivery hose (A) and evaporation hose (B).

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

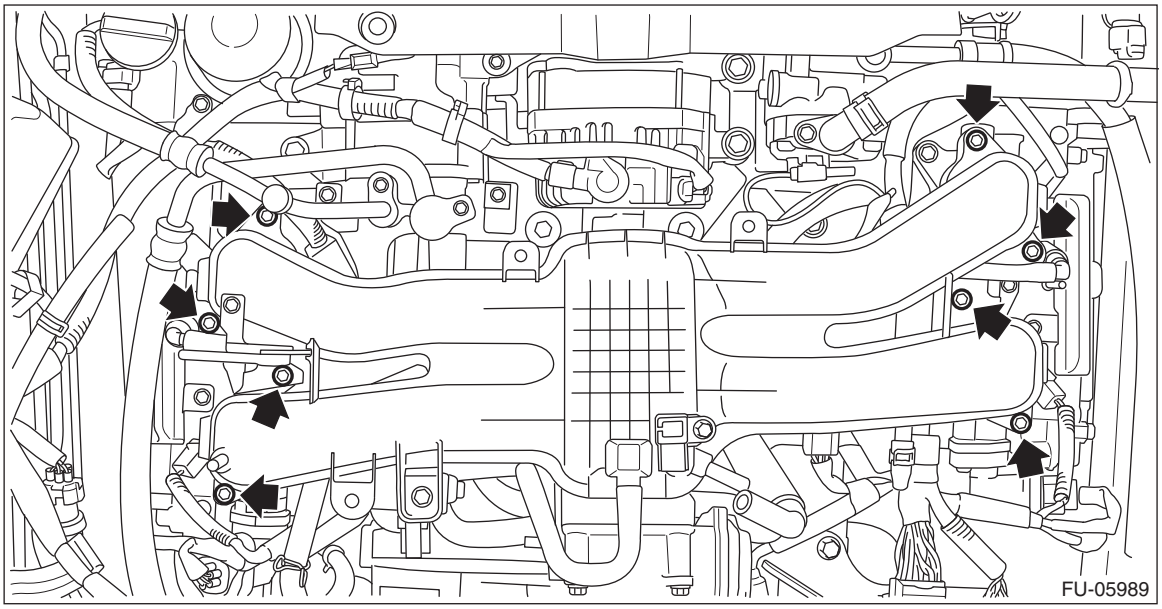
(1) Attach ST to the fuel delivery pipe and push ST in the direction of arrow mark to disconnect the quick connector of the fuel delivery hose (A).

ST 42099AE000 QUICK CONNECTOR RELEASE

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

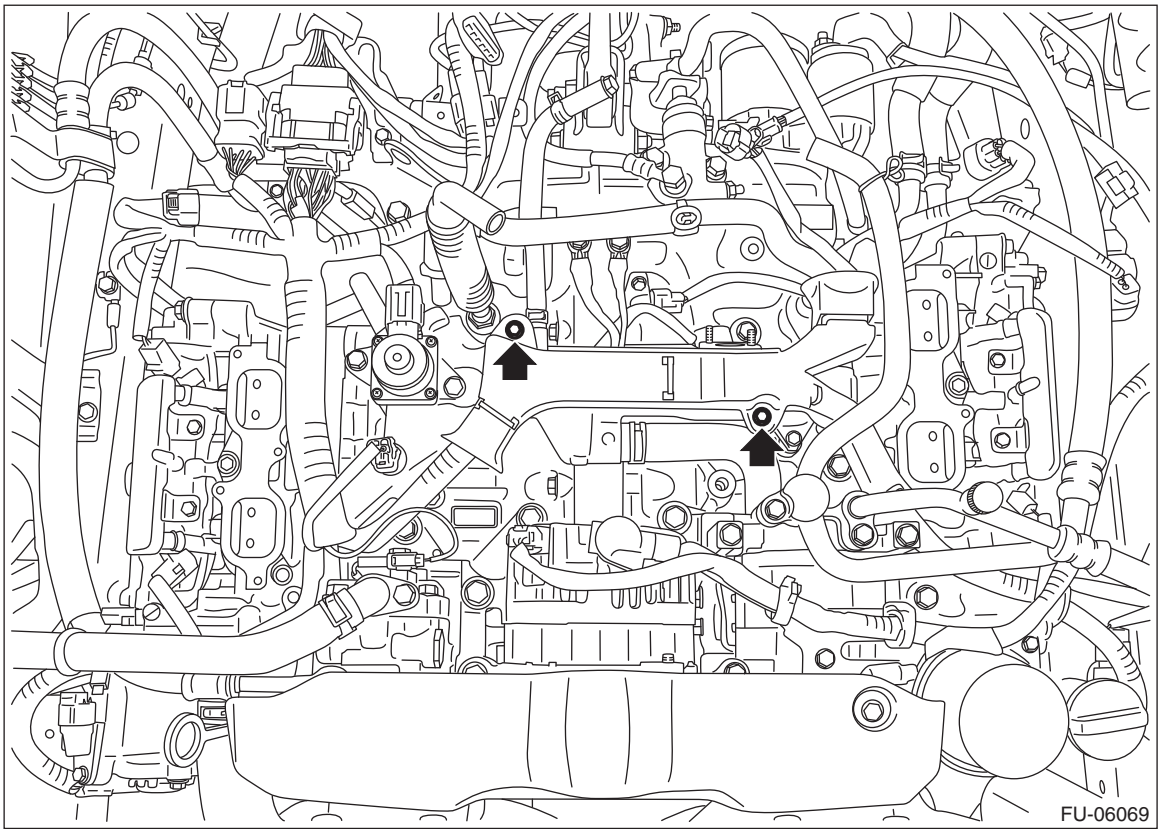


25) Remove the intake manifold from the tumble generator valve assembly.



26) Disconnect the connector from the engine, and then remove the engine harness.

NOTE:
Refer to “COMPONENT” of “General Description” for how to disconnect the engine harness connectors. <Ref. to FU(H4DO)-13, ENGINE HARNESS, COMPONENT, General Description.>

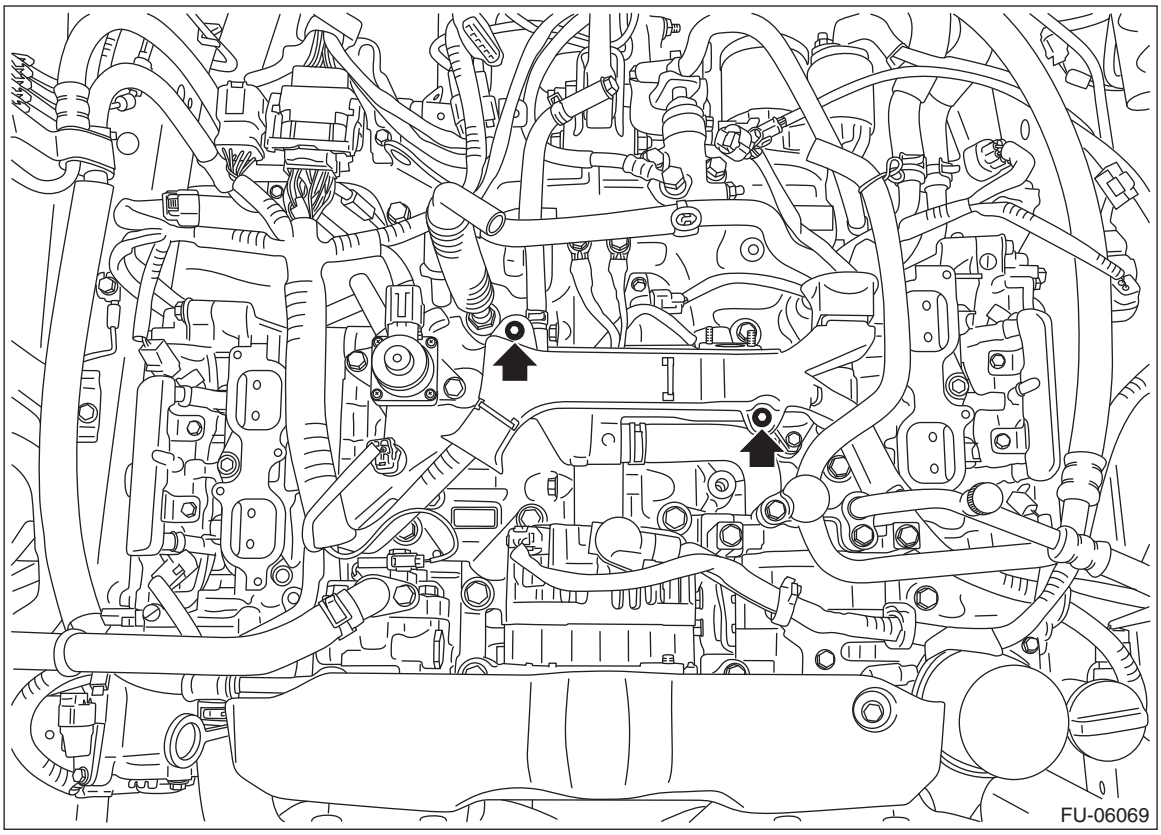


B: INSTALLATION

1) Connect the connectors to the engine, and install the engine harness.

NOTE:
Refer to “COMPONENT” of “General Description” for how to connect the engine harness connectors. <Ref. to FU(H4DO)-13, ENGINE HARNESS, COMPONENT, General Description.>

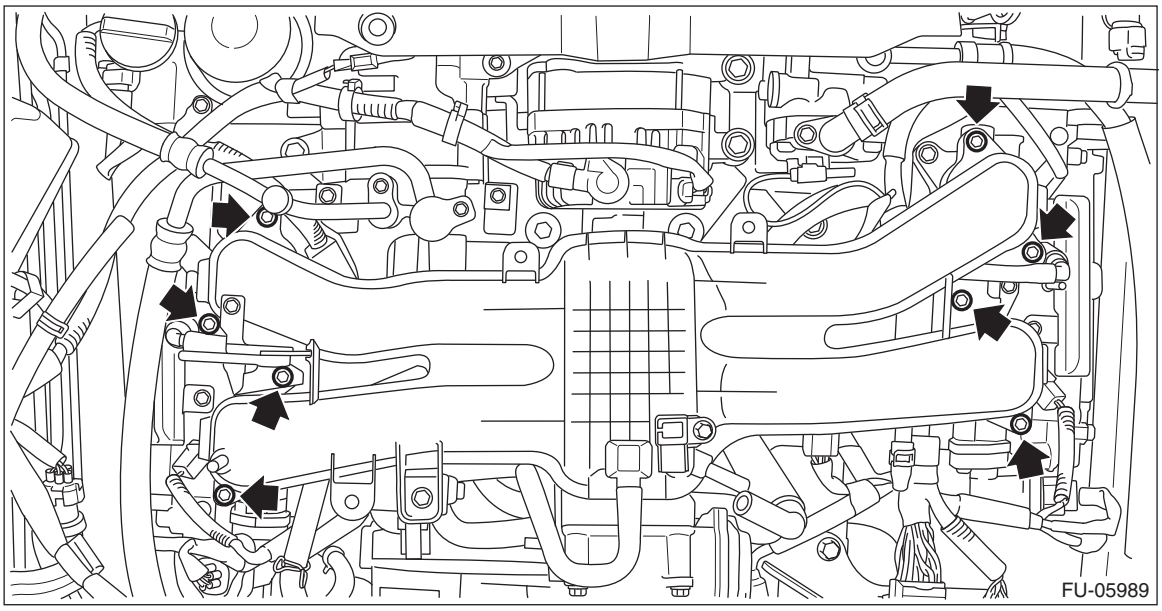
Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)



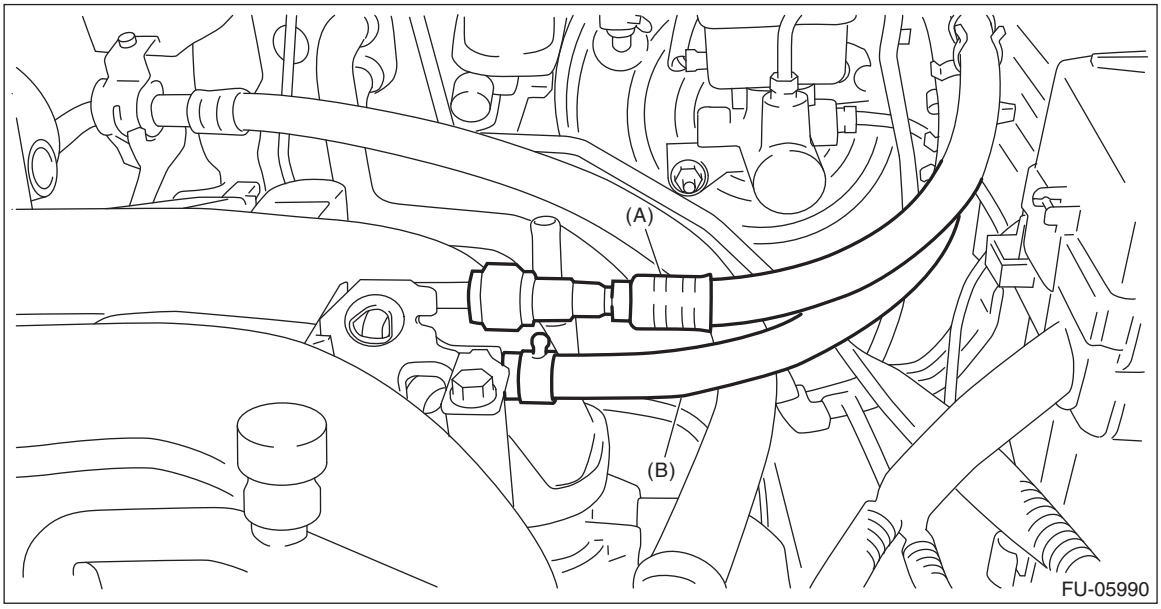
2) Install the intake manifold to the tumble generator valve assembly.

NOTE:
Use a new gasket.

Tightening torque:
8.3 N·m (0.8 kgf-m, 6.1 ft-lb)

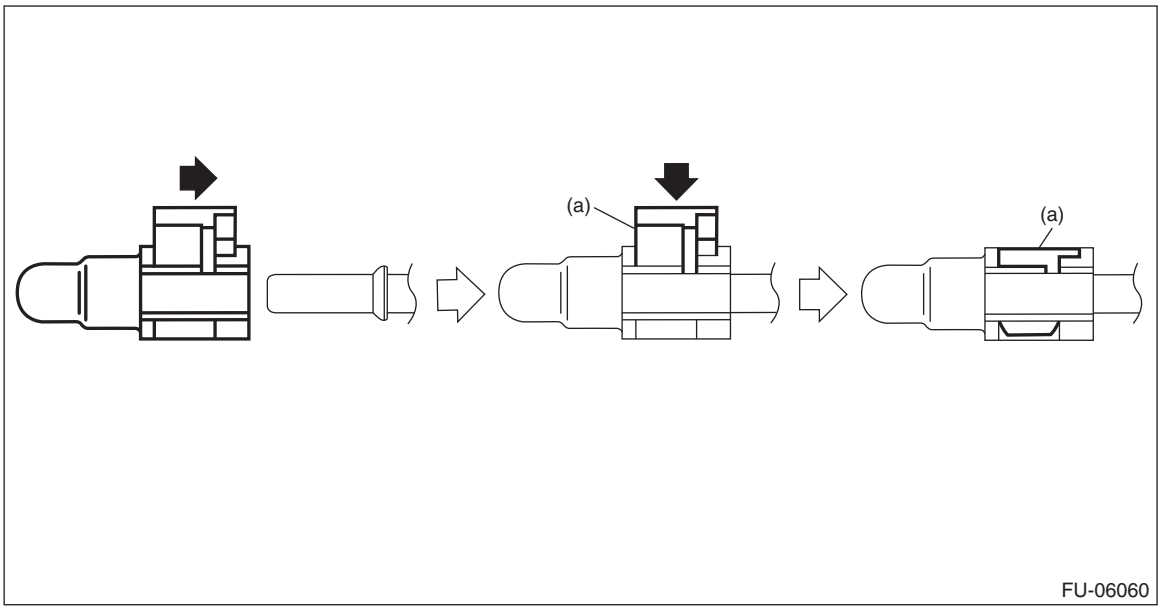


3) Connect the fuel delivery hose (A) and evaporation hose (B).

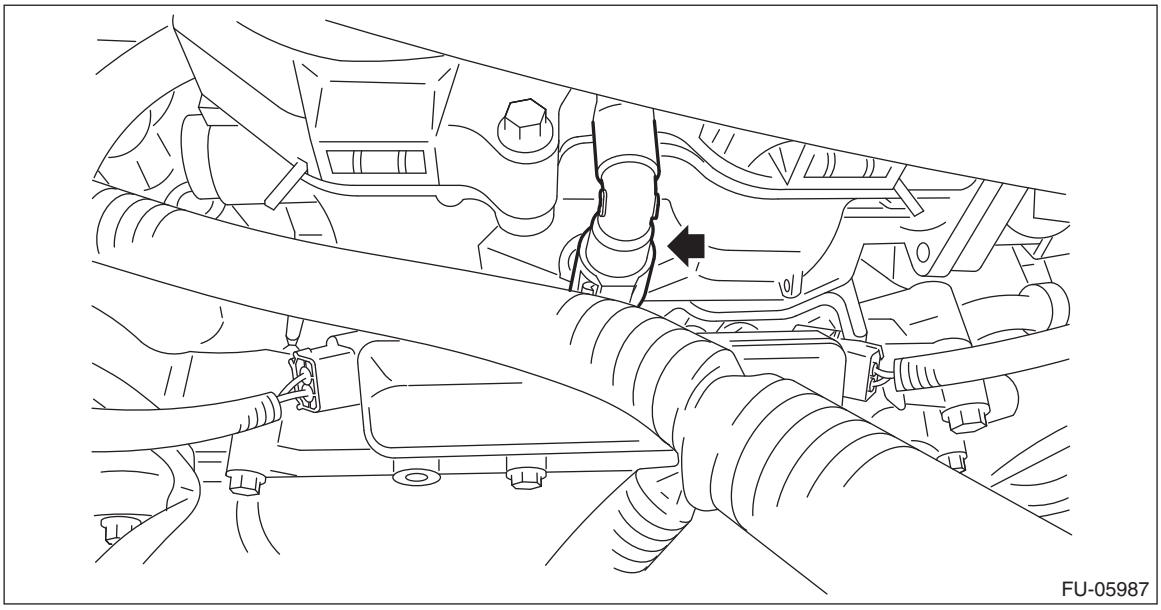


4) Connect the fuel delivery pipe to the fuel pipe LH.
• Connect the quick connector as shown in the figure.

CAUTION:
• Check that there is no damage or dust on the quick connector. If necessary, clean the seal surface of the pipe.
• When connecting the quick connector, make sure to insert the pipe all the way in before locking the slider.
• When it is difficult to lock the slider, check that the pipe is fully inserted.
• Make sure that the quick connector is securely connected.

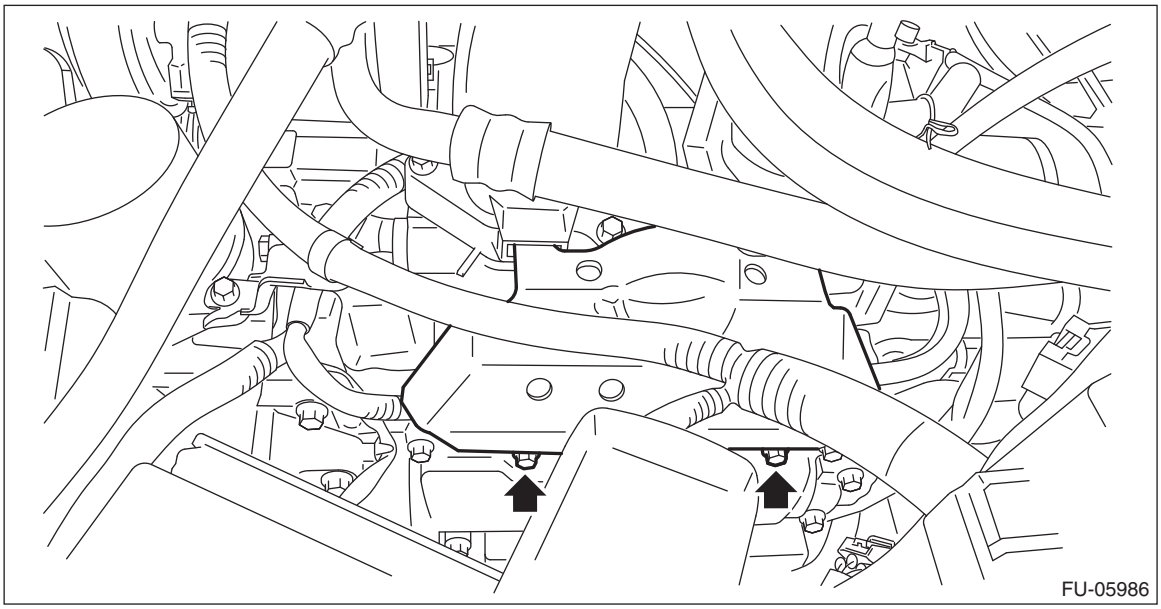


(a) Slider



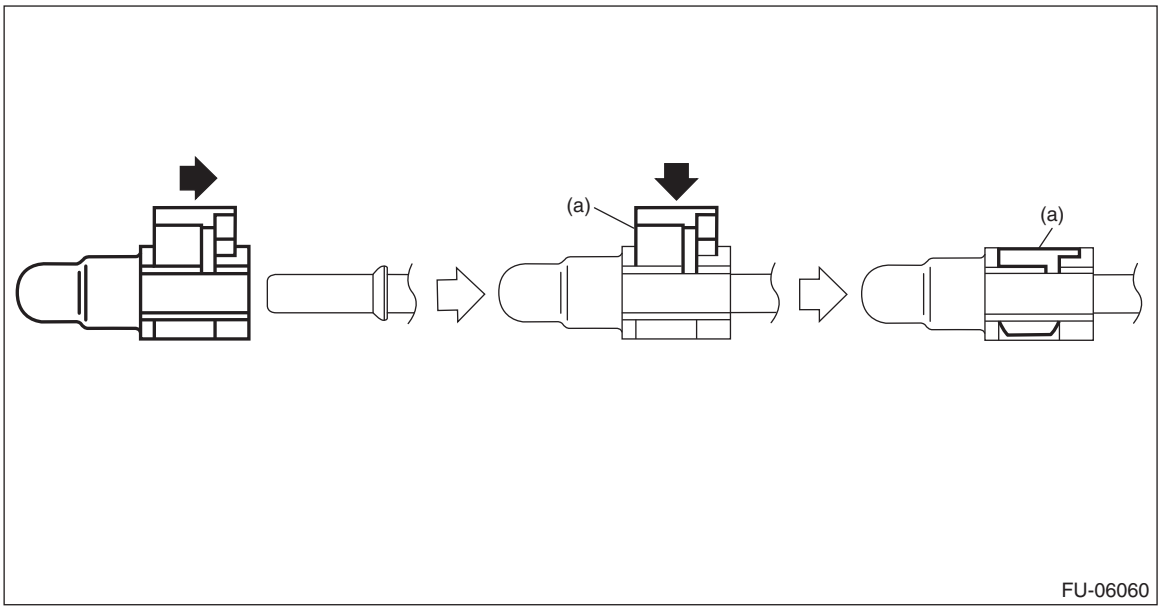
5) Install the intake manifold protector LH.

Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)

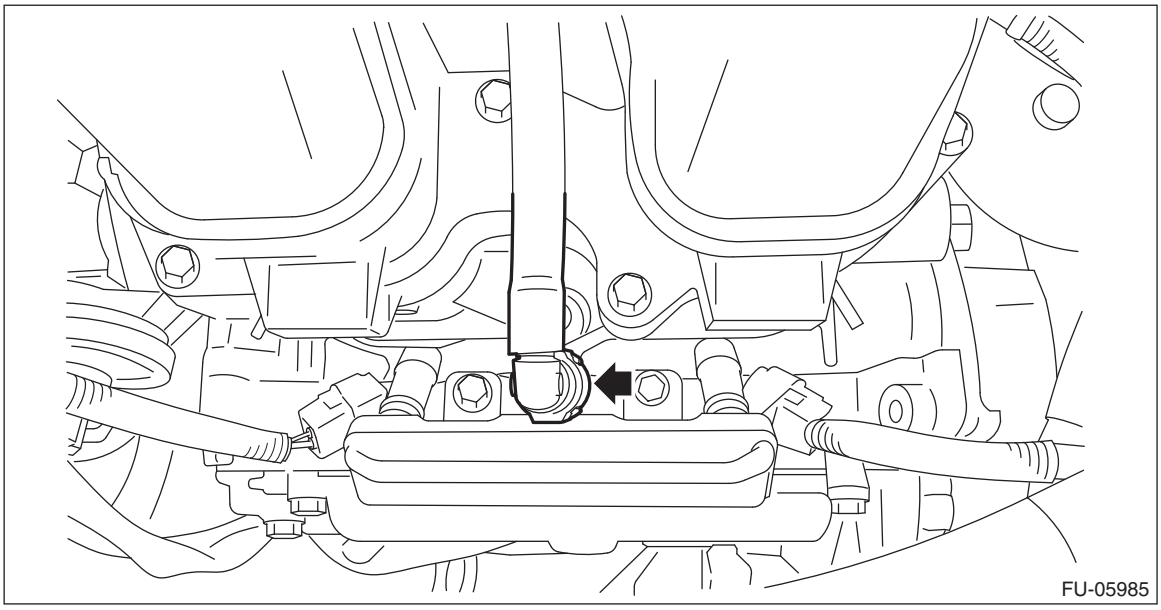


6) Connect the fuel delivery pipe to the fuel pipe RH.
- Connect the quick connector as shown in the figure.

CAUTION:
- **Check that there is no damage or dust on the quick connector. If necessary, clean the seal surface of the pipe.**
- **When connecting the quick connector, make sure to insert the pipe all the way in before locking the slider.**
- **When it is difficult to lock the slider, check that the pipe is fully inserted.**
- **Make sure that the quick connector is securely connected.**

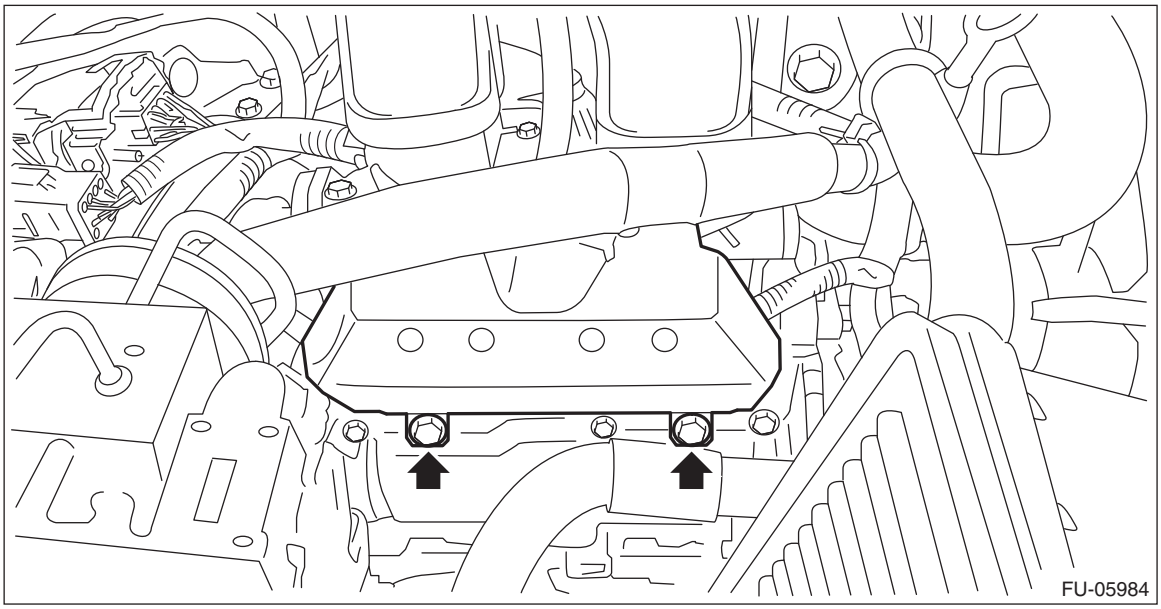


(a) Slider

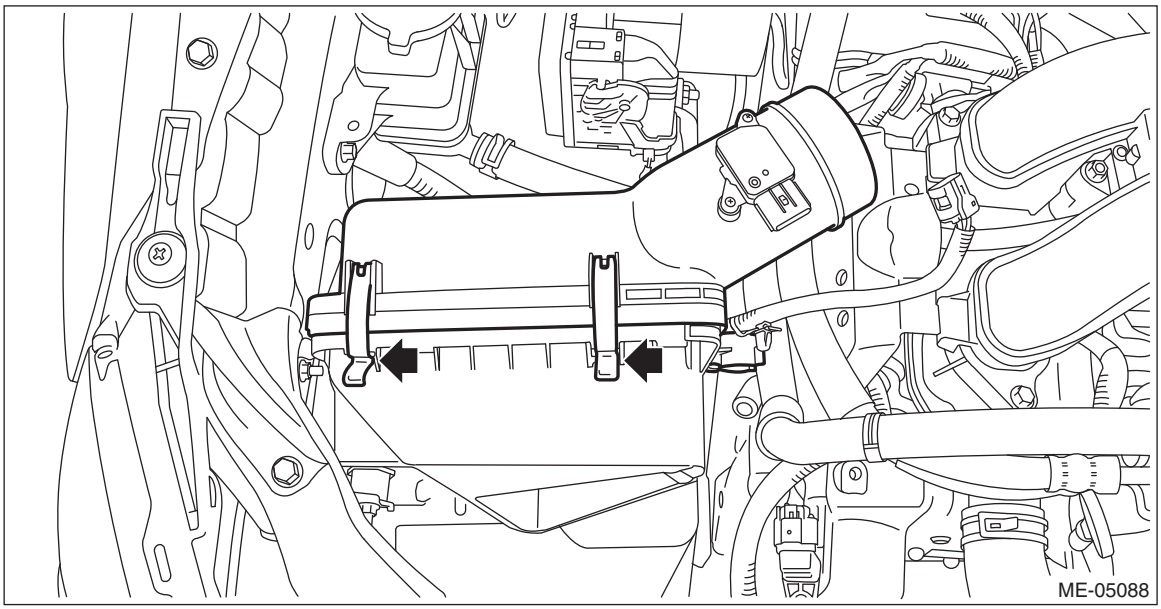


7) Install the intake manifold protector RH.

Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)

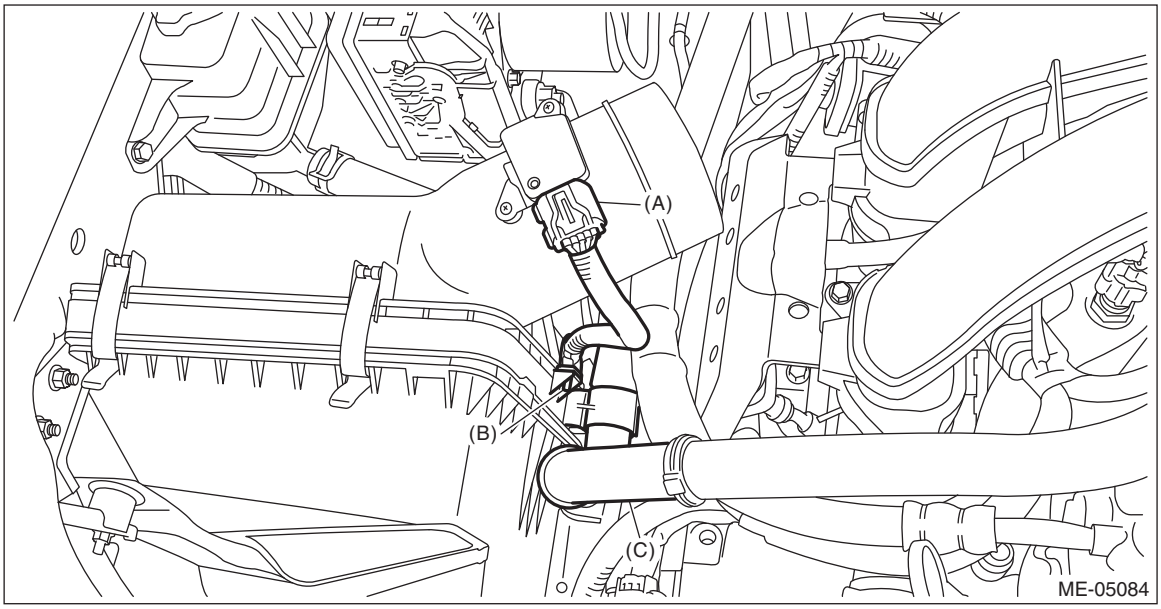


8) Install the air intake case (rear).

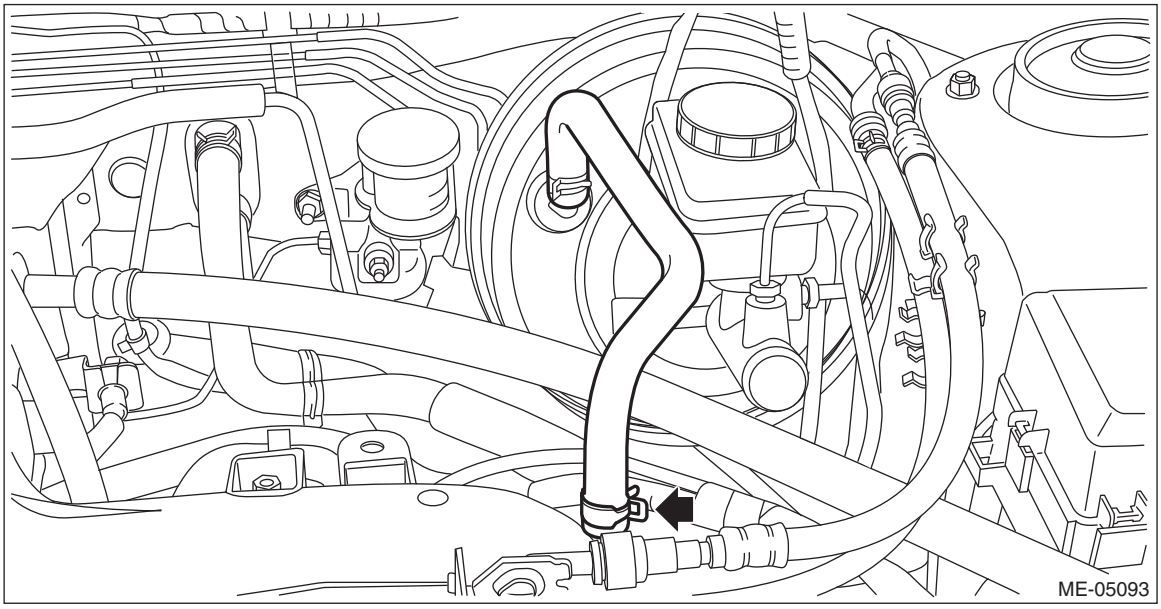


9) Install the clip (B) which secures the air flow and intake air temperature sensor harness, and connect the connector (A) to the air flow and intake air temperature sensor.

10) Install the suction hose (C) to the air cleaner case (rear).

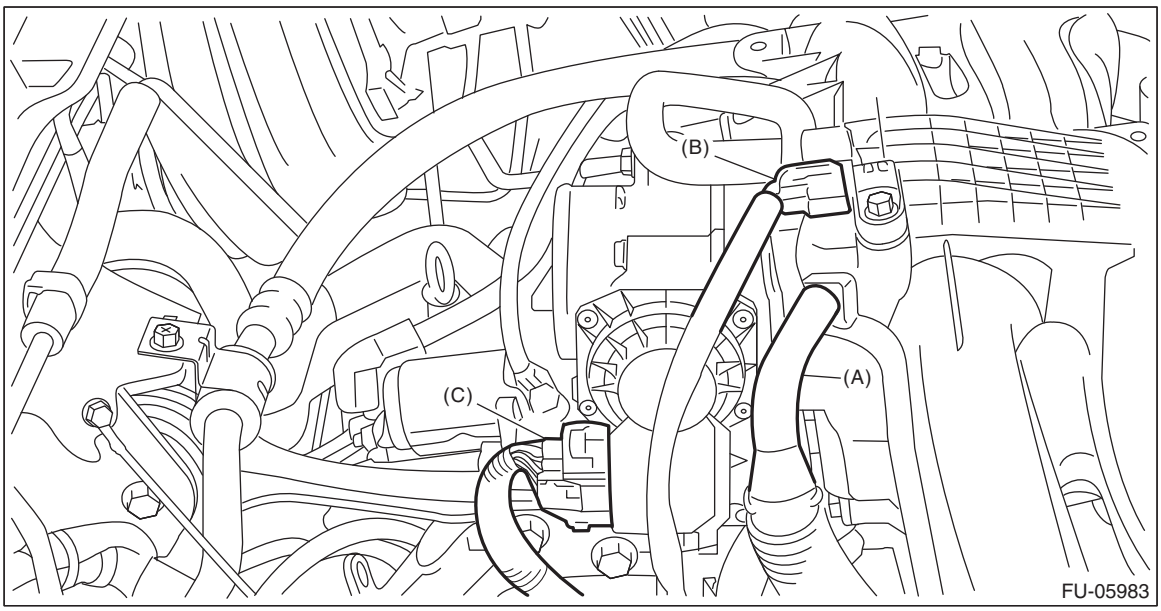


11) Connect the brake booster vacuum hose to the intake manifold.



12) Connect the vacuum hose (A) to the intake manifold.
13) Connect the connector (B) to the manifold absolute pressure sensor.

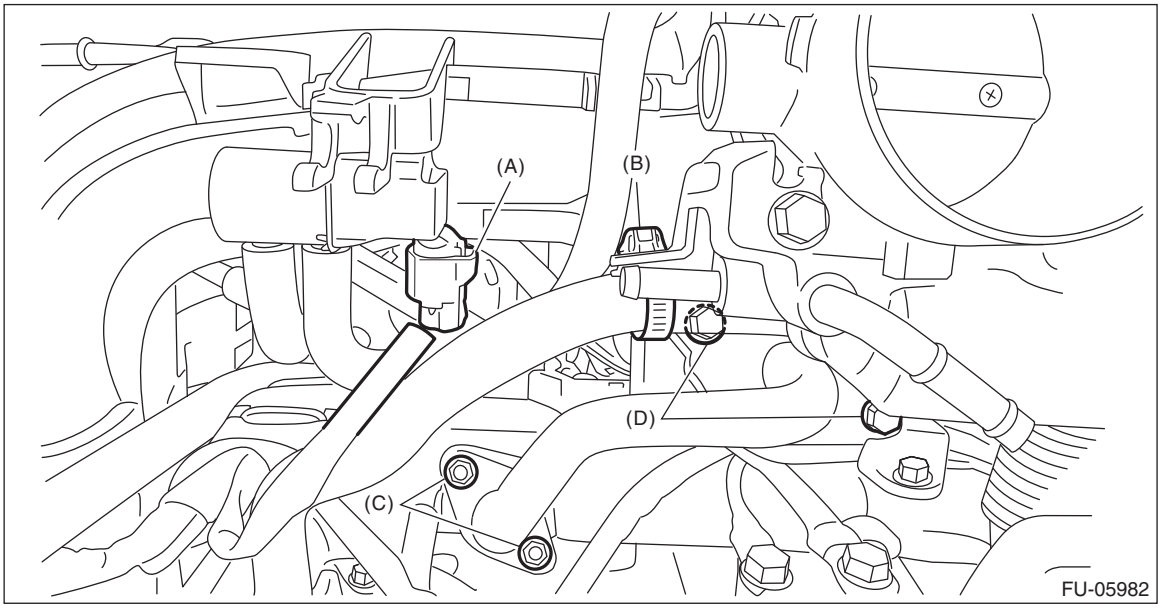
14) Connect the connector (C) to the throttle position sensor.



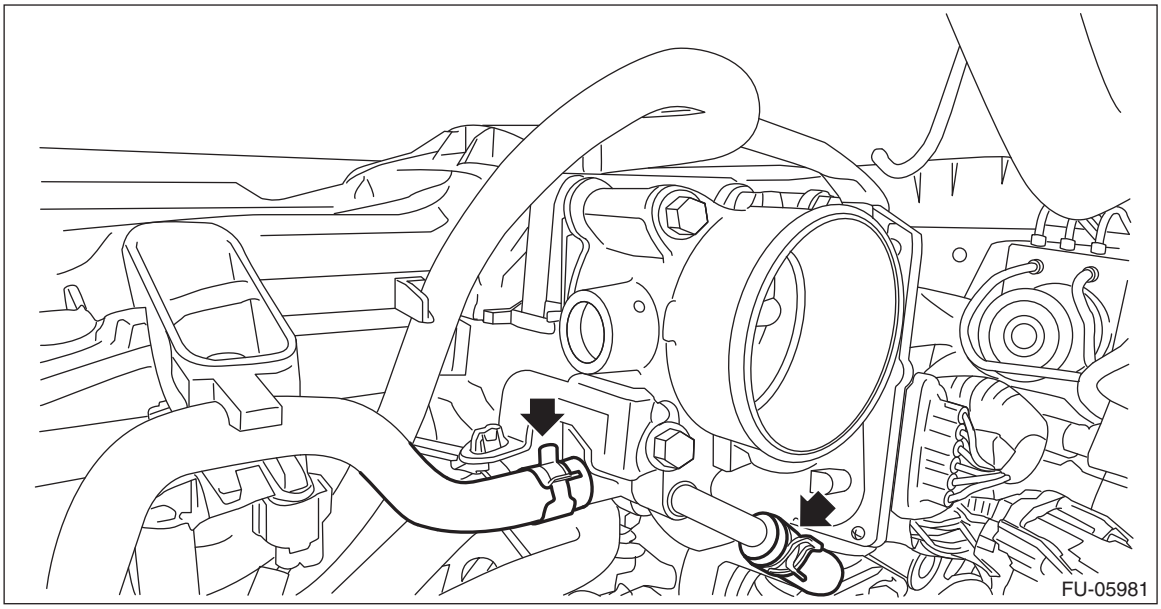
15) Connect the connector (A) to the purge control solenoid valve.
16) Hold the PCV hose assembly with clip (B).
17) Tighten the nut (C) and bolt (D) which hold EGR pipe to the water pipe assembly.

NOTE:
- Use a new gasket.
- Always tighten the EGR pipe at (C) first, and then (D).

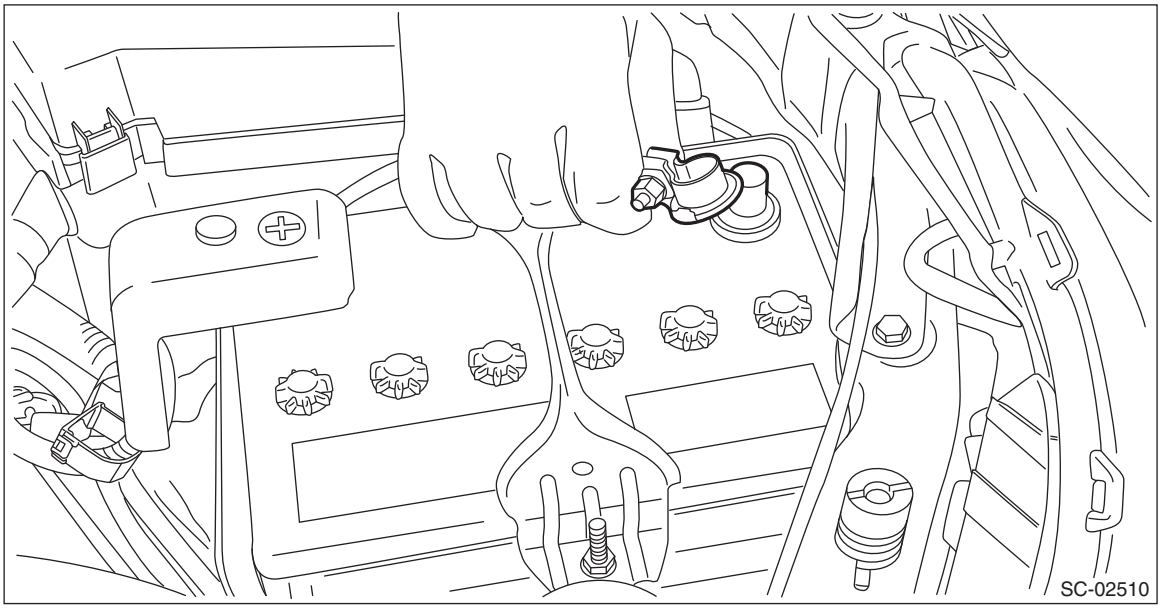
Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)



18) Install the preheater hose.



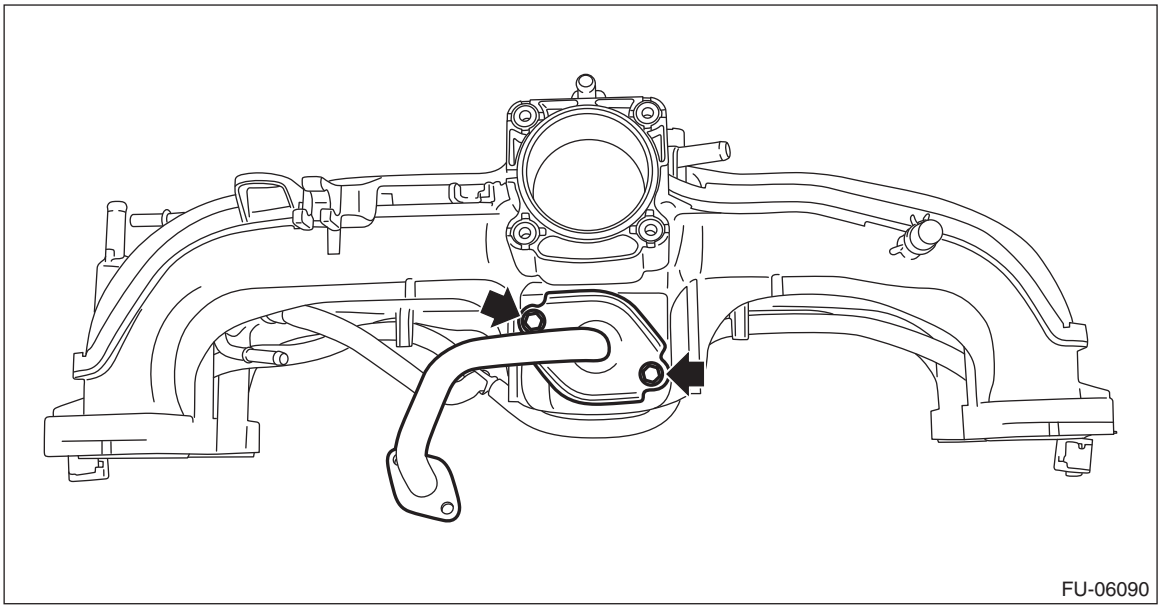
19) Install the air intake boot. <Ref. to IN(H4DO)-13, INSTALLATION, Air Intake Boot.>
20) Lift up the vehicle.
21) Install the under cover RH. <Ref. to EI-26, INSTALLATION, Front Under Cover.>
22) Lower the vehicle.
23) Connect the battery ground terminal.



24) Fill engine coolant. <Ref. to CO(H4DO)-13, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

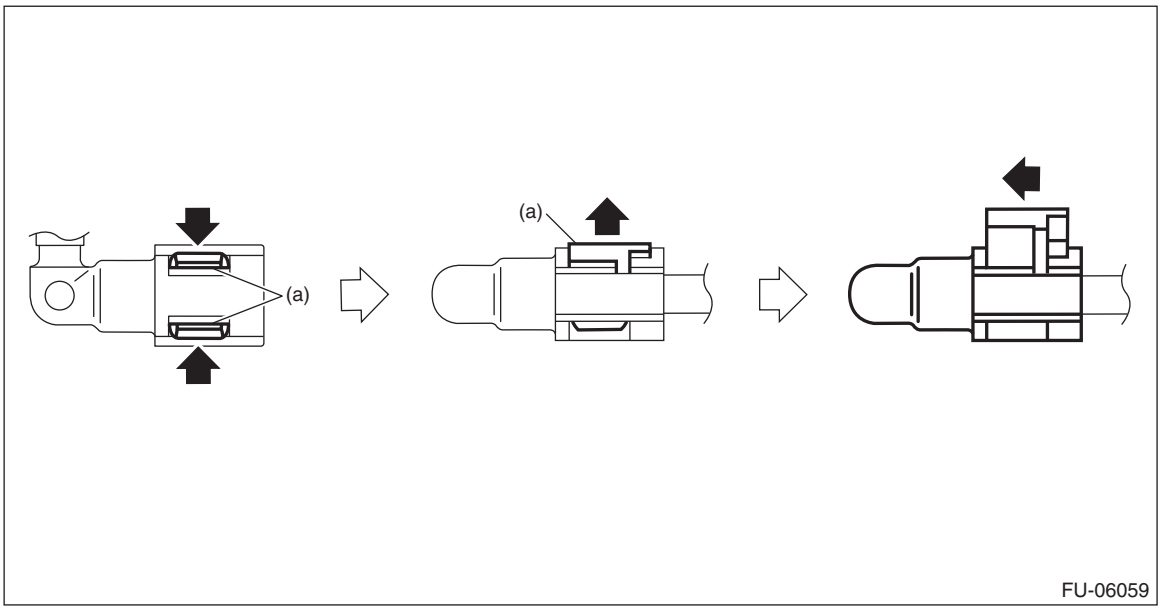
C: DISASSEMBLY

1) Remove the throttle body. <Ref. to FU(H4DO)-17, REMOVAL, Throttle Body.>
2) Remove the purge control solenoid valve. <Ref. to EC(H4DO)-21, REMOVAL, Purge Control Solenoid Valve.>
3) Remove the manifold absolute pressure sensor. <Ref. to FU(H4DO)-74, REMOVAL, Manifold Absolute Pressure Sensor.>
4) Remove the EGR pipe.


FU-06090

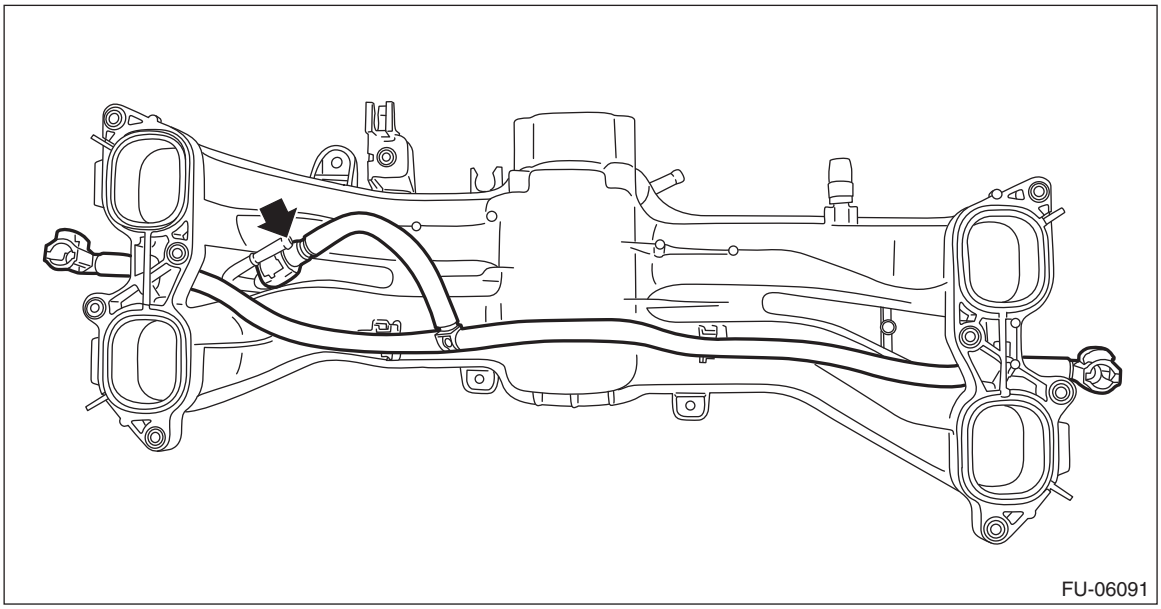
5) Remove the fuel delivery pipes.

NOTE:
Disconnect the quick connector as shown in the figure.

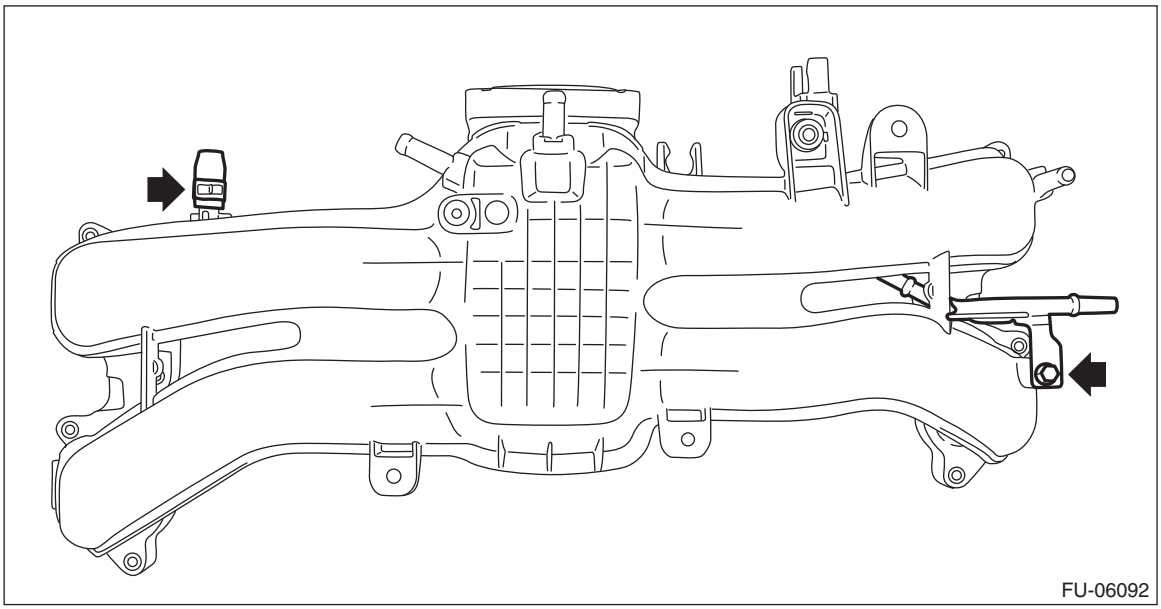


FU-06059

(a) Slider



6) Remove the fuel pipe and cap.

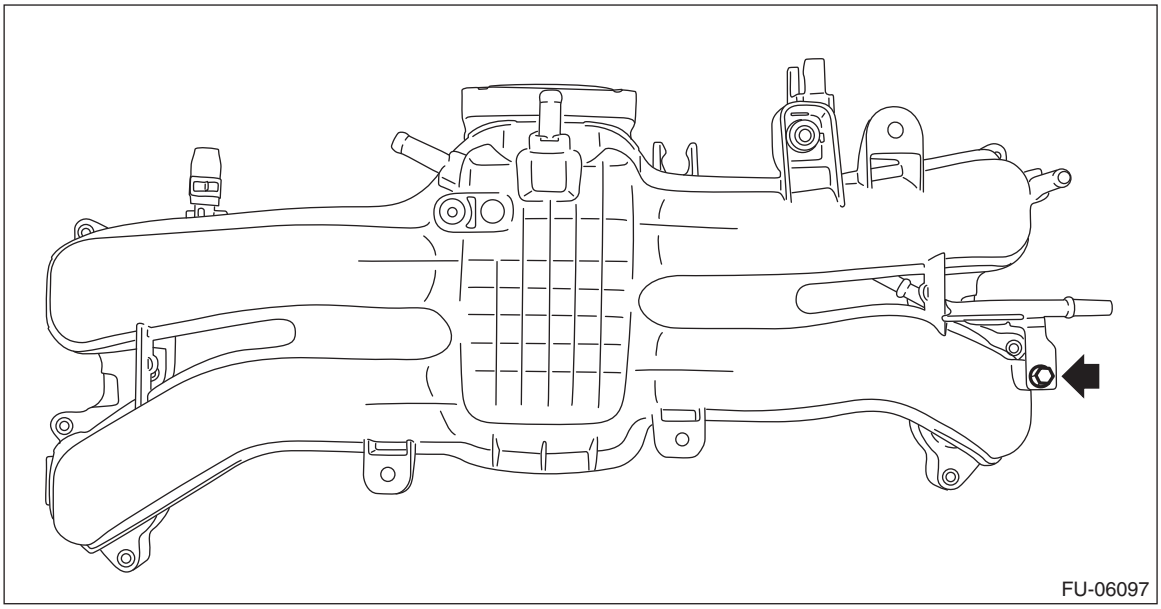


D: ASSEMBLY

Assemble in the reverse order of disassembly.

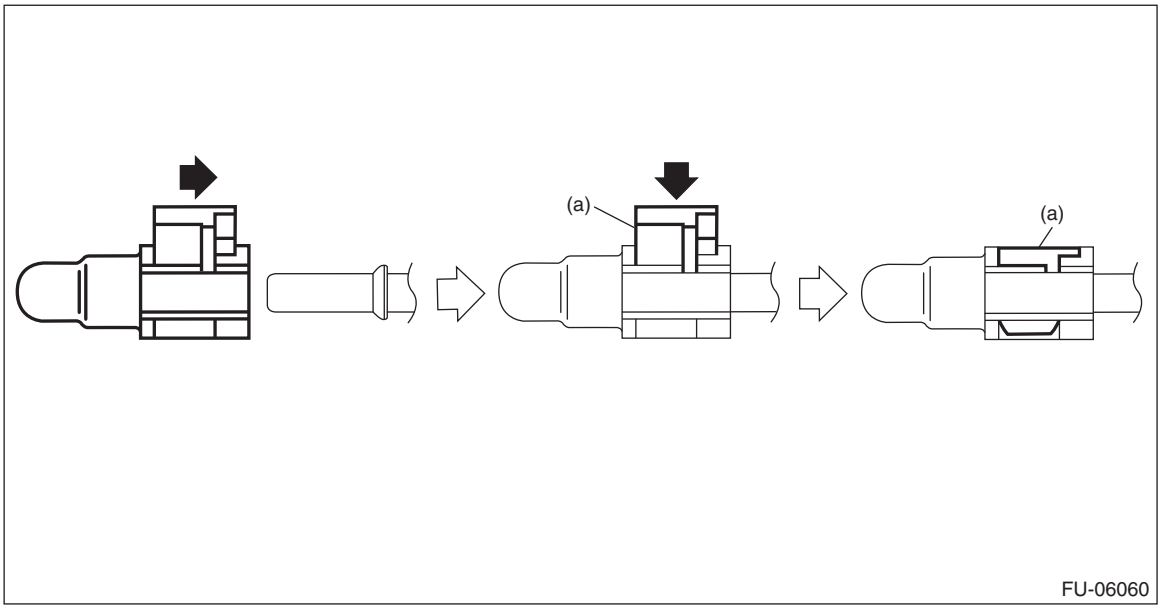
NOTE:
Use a new gasket.

Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)


FU-06097

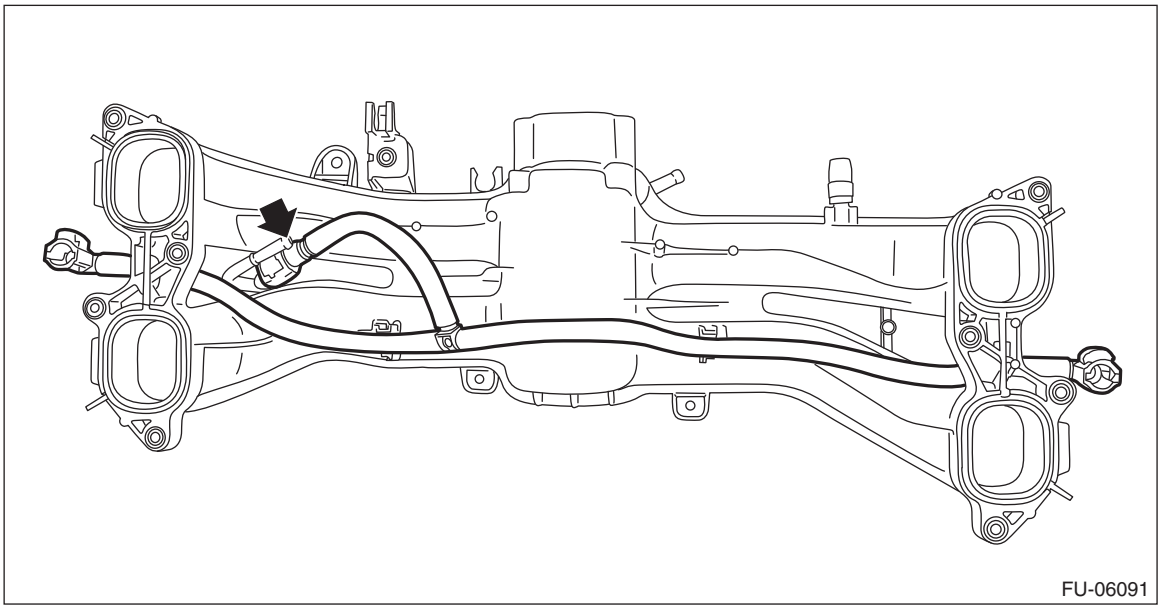
- Connect the quick connector as shown in the figure.

CAUTION:
• Check that there is no damage or dust on the quick connector. If necessary, clean the seal surface of the pipe.
• When connecting the quick connector, make sure to insert the pipe all the way in before locking the slider.
• When it is difficult to lock the slider, check that the pipe is fully inserted.
• Make sure that the quick connector is securely connected.

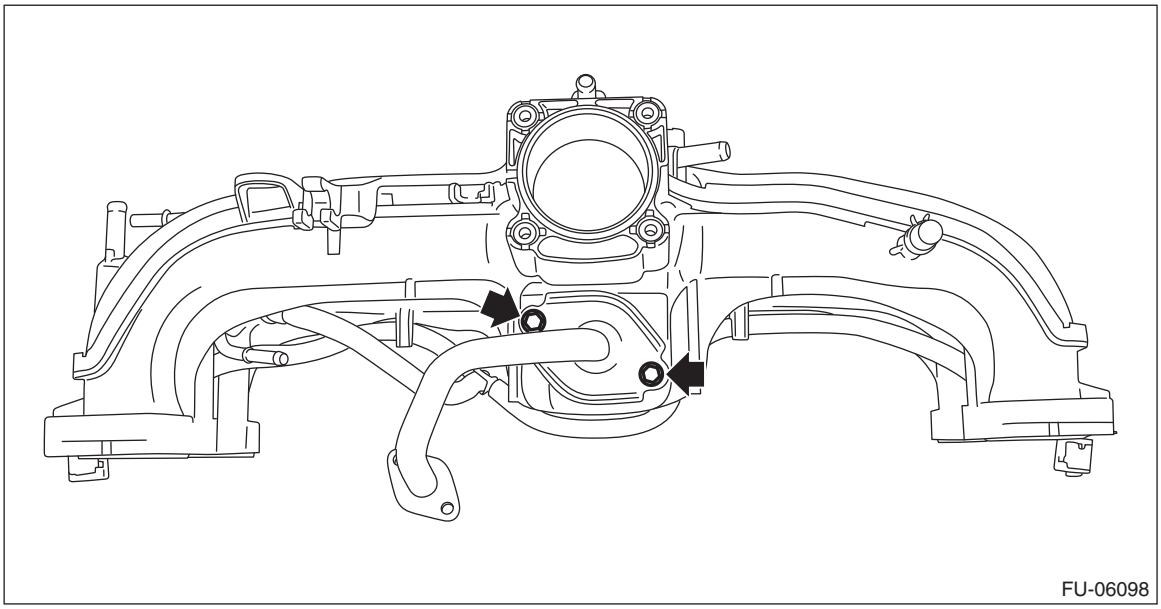


FU-06060

(a) Slider



NOTE:
Temporarily install the EGR pipe, and tighten it when installing the intake manifold.



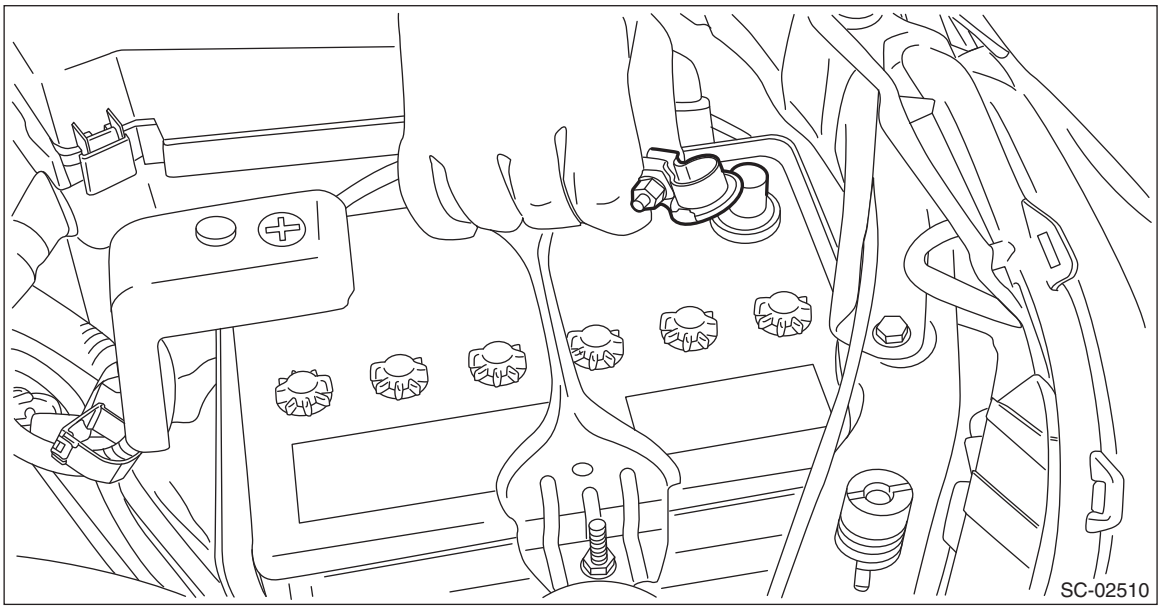
E: INSPECTION

1) Check that the intake manifold and fuel pipe have no deformation, cracks and other damages.
2) Check that the hose has no cracks, damage or loose part.

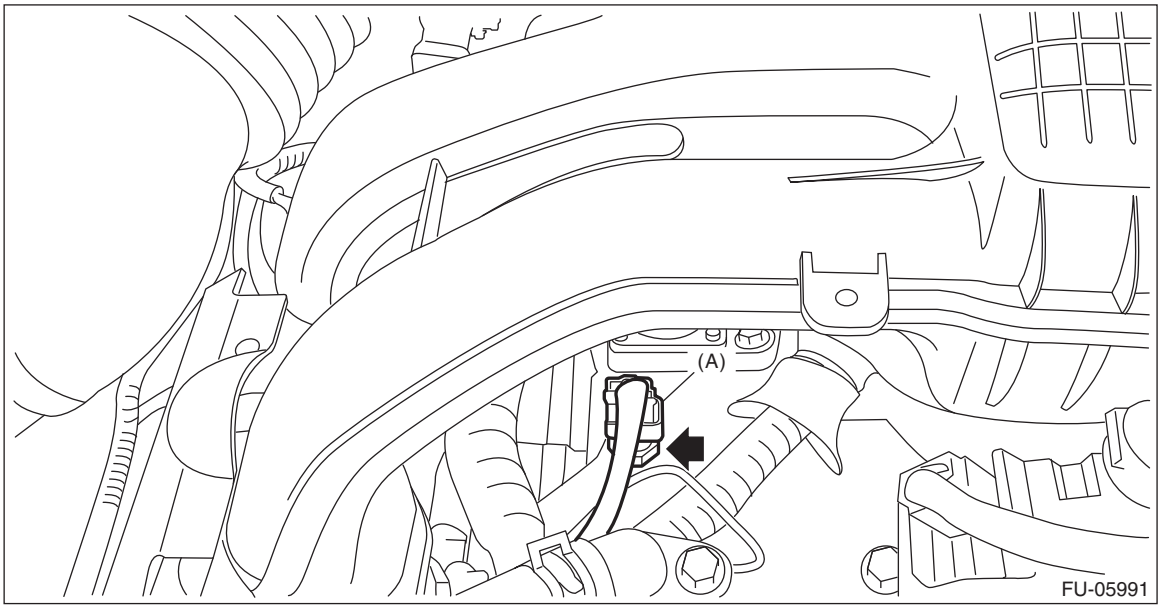
4. Engine Coolant Temperature Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.



2) Drain engine coolant. <Ref. to CO(H4DO)-13, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
3) Remove the air intake boot. <Ref. to IN(H4DO)-13, REMOVAL, Air Intake Boot.>
4) Disconnect the connector (A) from the engine coolant temperature sensor, and remove the engine coolant temperature sensor.



B: INSTALLATION

Install in the reverse order of removal.

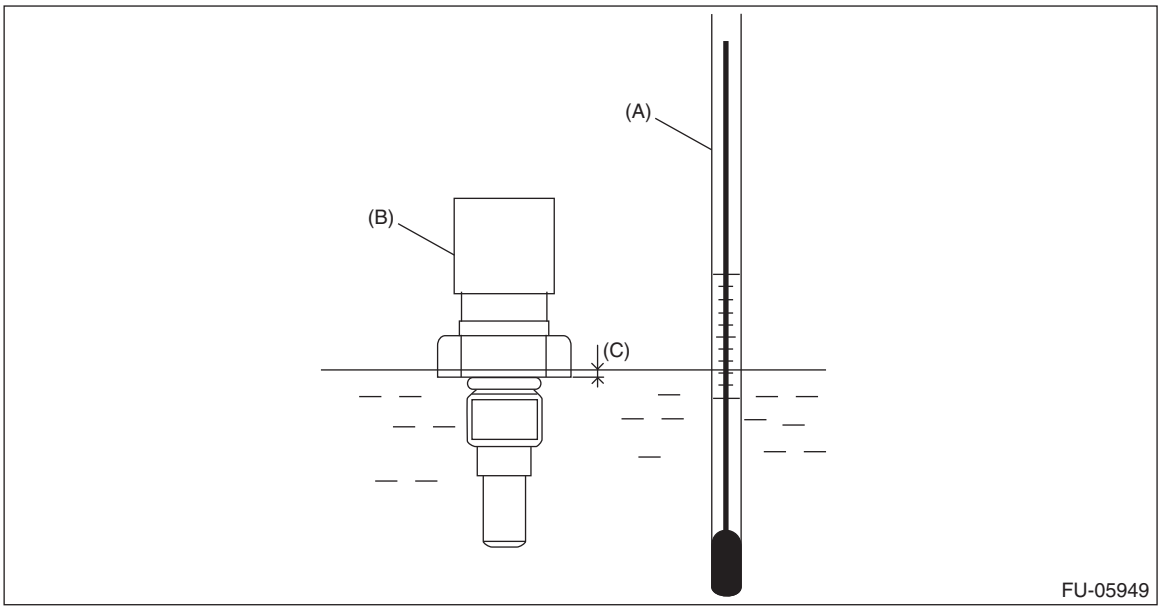
NOTE:
Use a new gasket.

Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)

C: INSPECTION

1) Check that the engine coolant temperature sensor has no deformation, cracks or other damages.
2) Immerse the engine coolant temperature sensor and a thermometer in water.

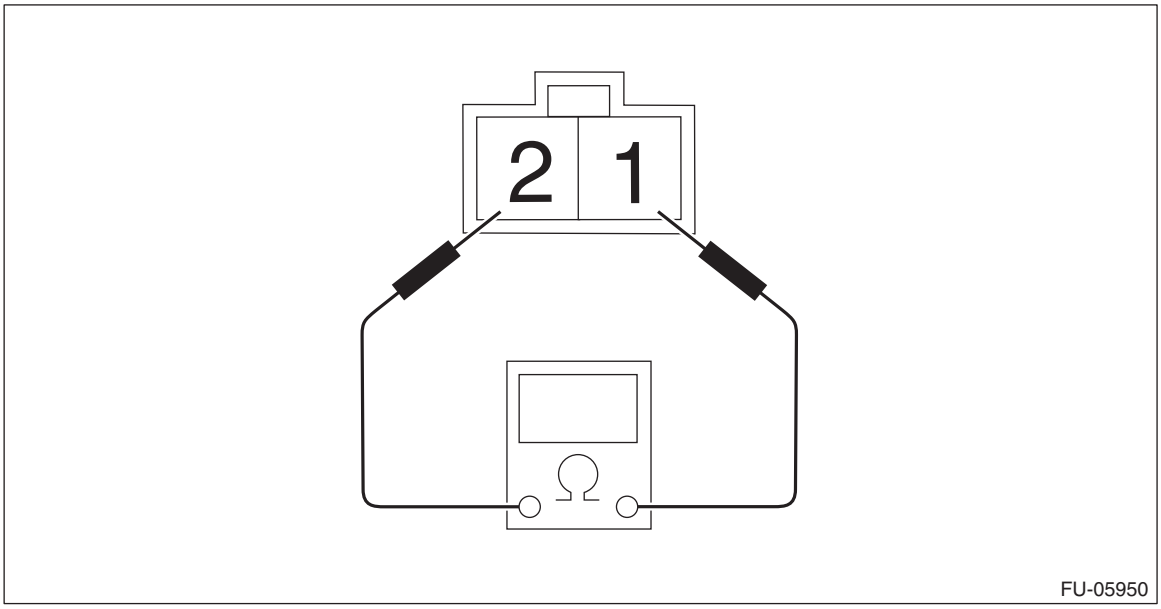
CAUTION:
Take care not to allow water to get into the engine coolant temperature sensor connector. Completely remove any water inside.



(A) Thermometer
(B) Engine coolant temperature sensor
(C) Hexagonal part height: To approx. $^1/_3$

3) Raise water temperature gradually, measure the resistance between the engine coolant temperature sensor terminals when the temperature is 20°C (68°F) and 80°C (176°F).

NOTE:
Agitate the water for even temperature distribution.

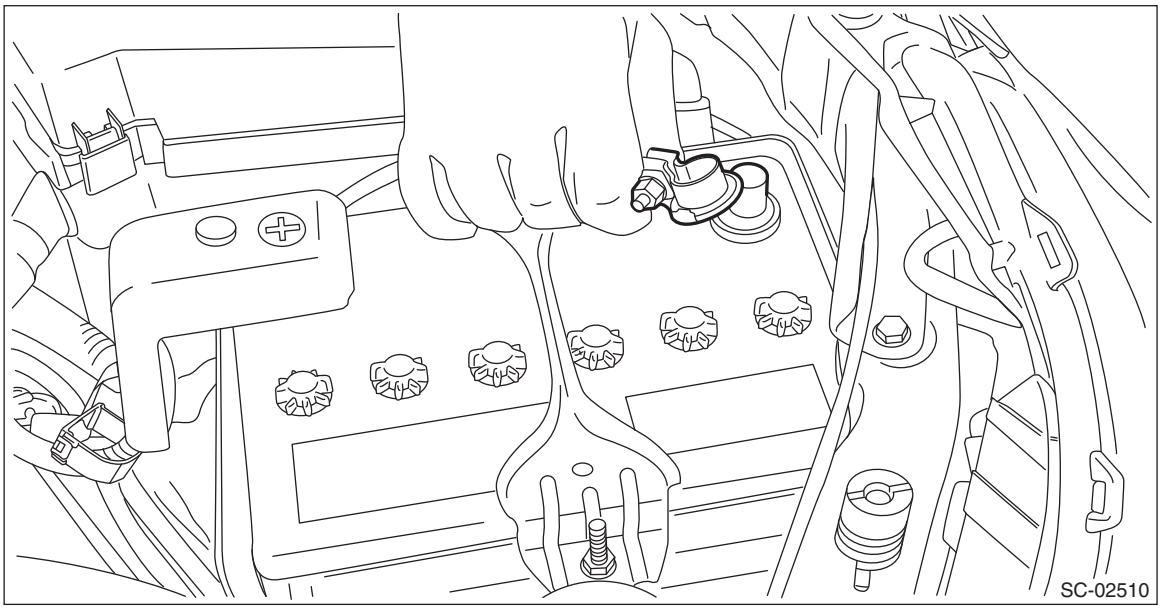


Water temperature	Terminal No.	Standard
20°C (68°F)	1 and 2	Approx. 2.45±0.2 kΩ
80°C (176°F)		Approx. 0.318±0.013 kΩ

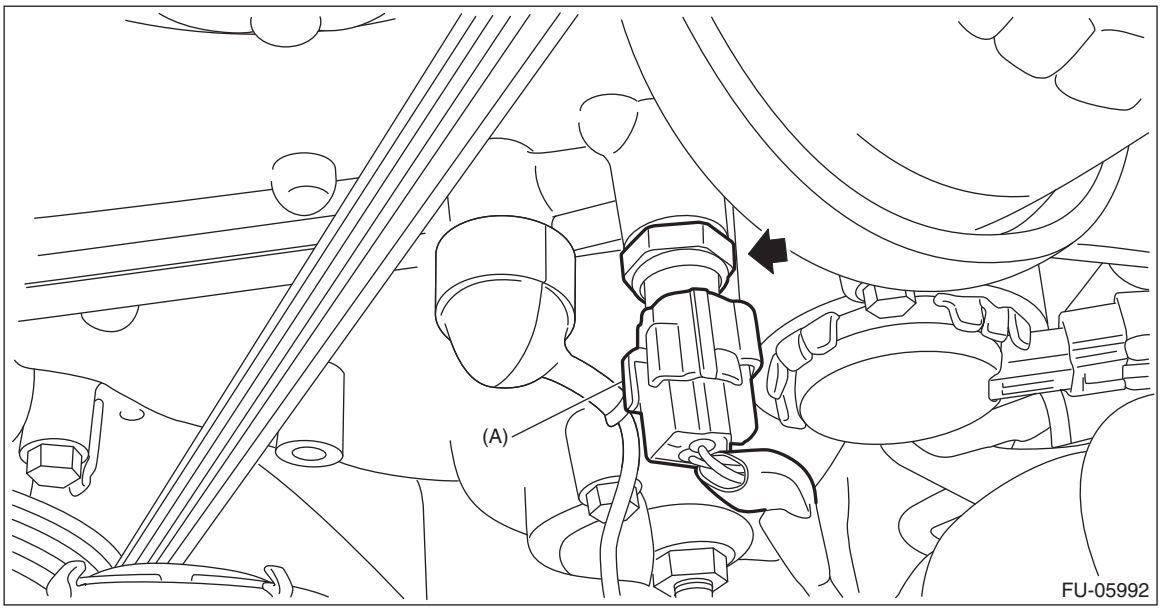
5. Engine Oil Temperature Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.



2) Disconnect the connector (A) from the engine oil temperature sensor, and remove the engine coolant temperature sensor from the chain cover.



B: INSTALLATION

Install in the reverse order of removal.

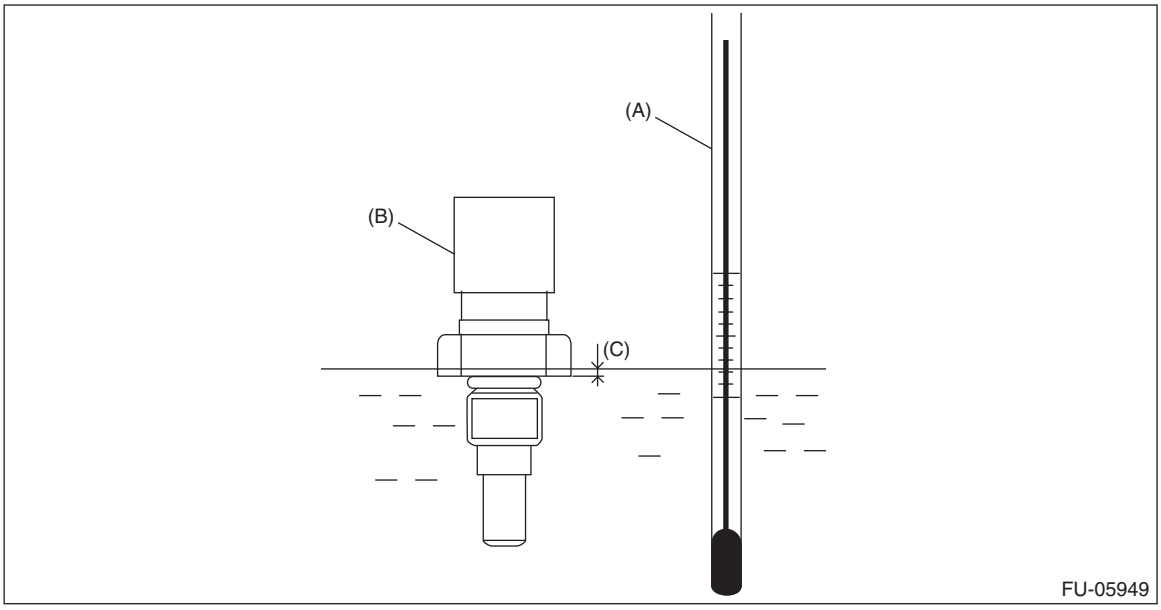
NOTE:
Use a new gasket.

Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)

C: INSPECTION

1) Check that the engine oil temperature sensor has no deformation, cracks or other damages.
2) Immerse the engine oil temperature sensor and a thermometer in water.

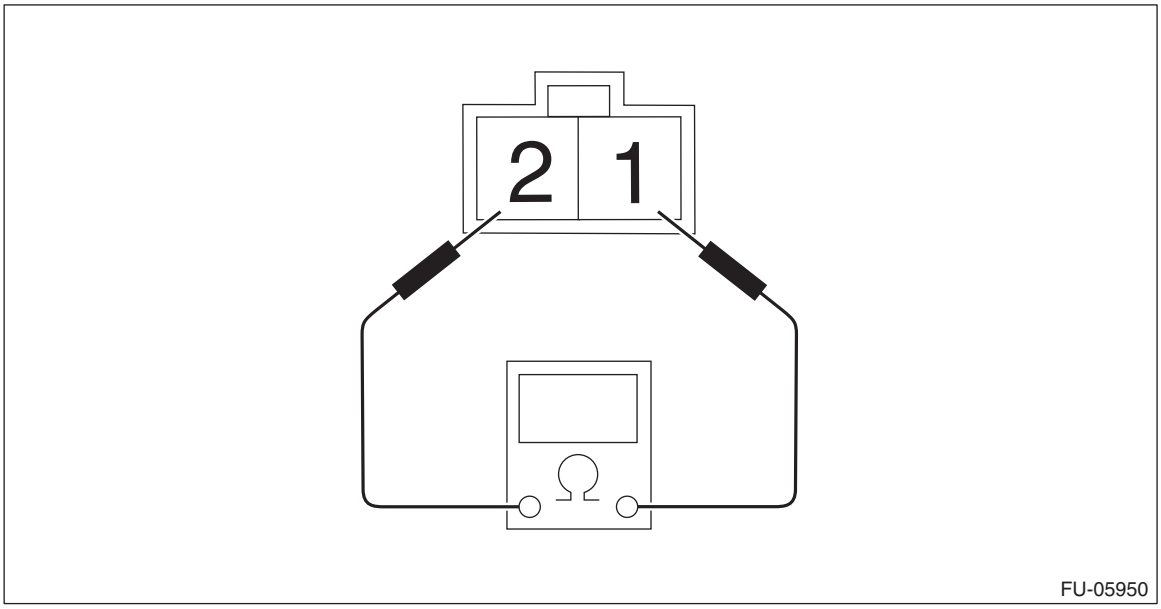
CAUTION:
Take care not to allow water to get into the engine oil temperature sensor connector. Completely remove any water inside.



(A) Thermometer
(B) Engine oil temperature sensor
(C) Hexagonal part height: To approx. $^1/_3$

3) Raise water temperature gradually, measure the resistance between the engine oil temperature sensor terminals when the temperature is 20°C (68°F) and 80°C (176°F).

NOTE:
Agitate the water for even temperature distribution.

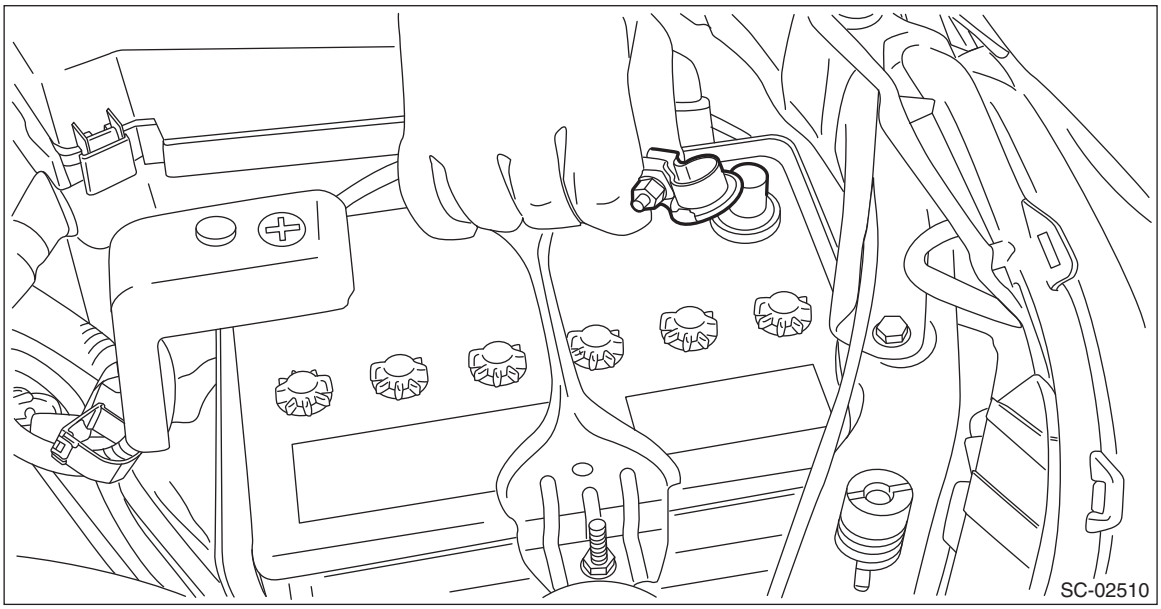


Water temperature	Terminal No.	Standard
20°C (68°F)	1 and 2	Approx. 2.45±0.2 kΩ
80°C (176°F)		Approx. 0.318±0.013 kΩ

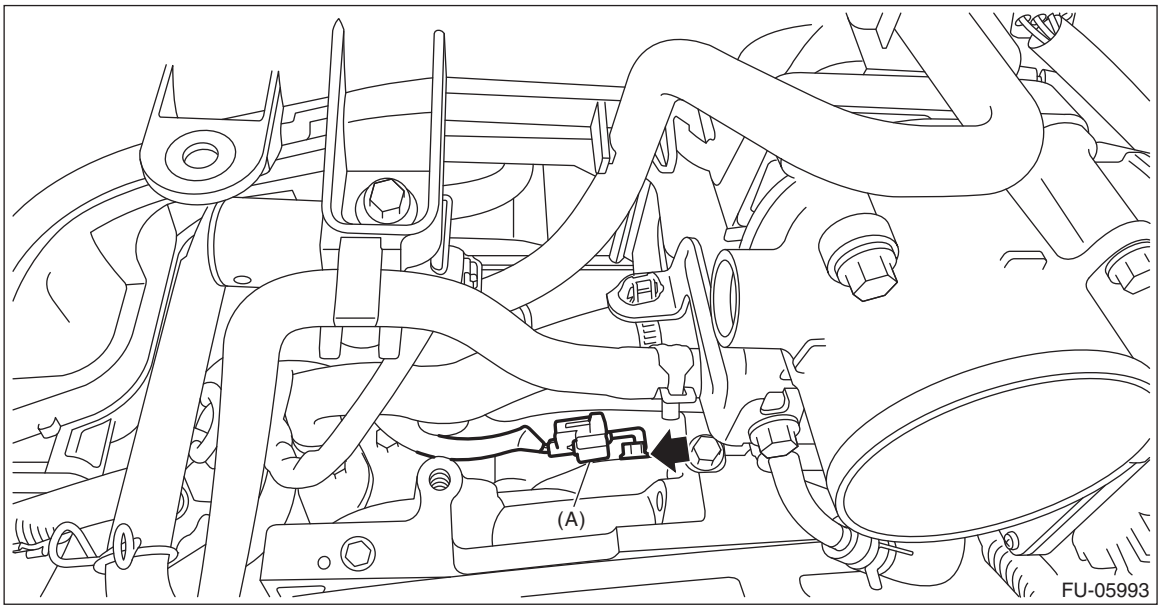
6. Crankshaft Position Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.



2) Remove the air intake boot. <Ref. to IN(H4DO)-13, REMOVAL, Air Intake Boot.>
3) Disconnect the connector (A) from the crankshaft position sensor, and remove the crankshaft position sensor from the cylinder block.



B: INSTALLATION

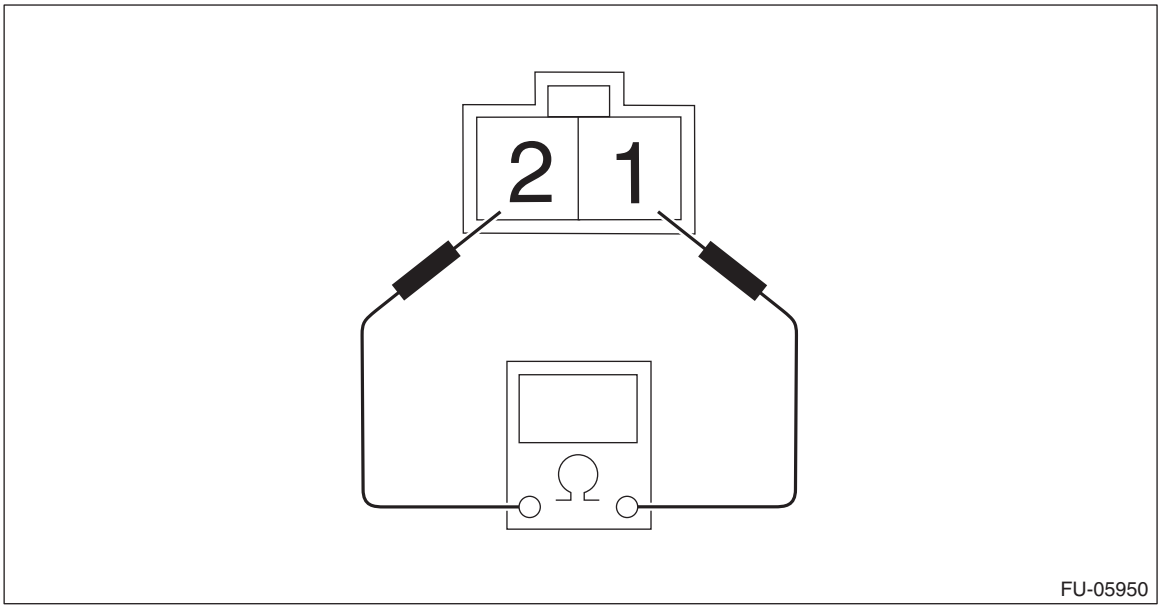
Install in the reverse order of removal.

Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)

C: INSPECTION

1. CRANKSHAFT POSITION SENSOR (METHOD WITH CIRCUIT TESTER)

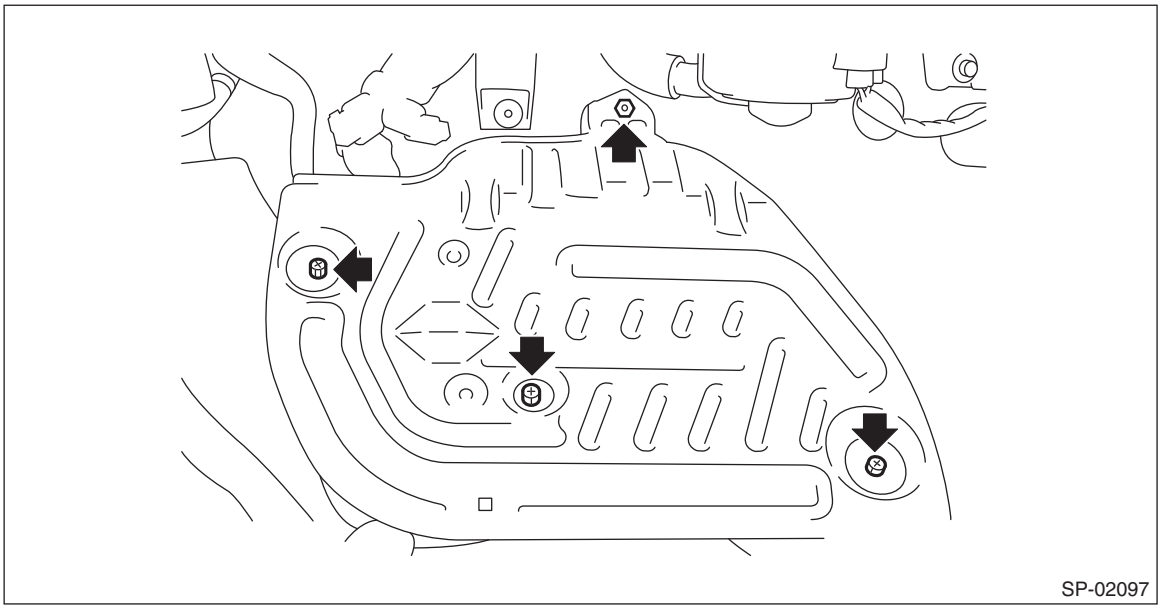
Measure the resistance between crankshaft position sensor terminals.



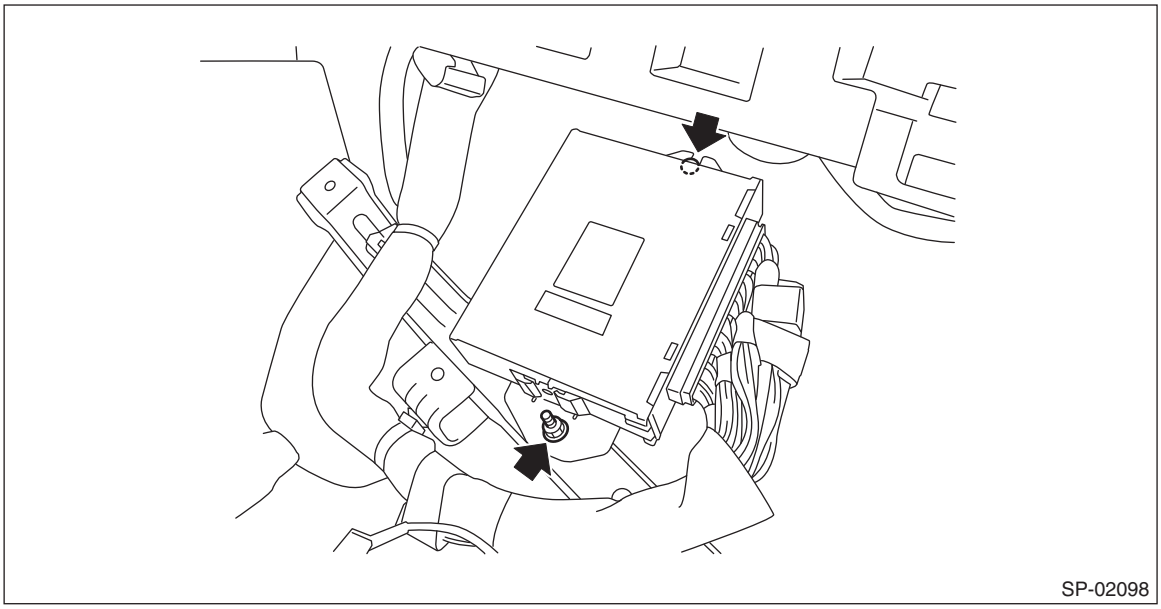
Terminal No.	Standard
1 and 2	2.04±0.204 kΩ

2. CRANKSHAFT POSITION SENSOR (METHOD WITH OSCILLOSCOPE)

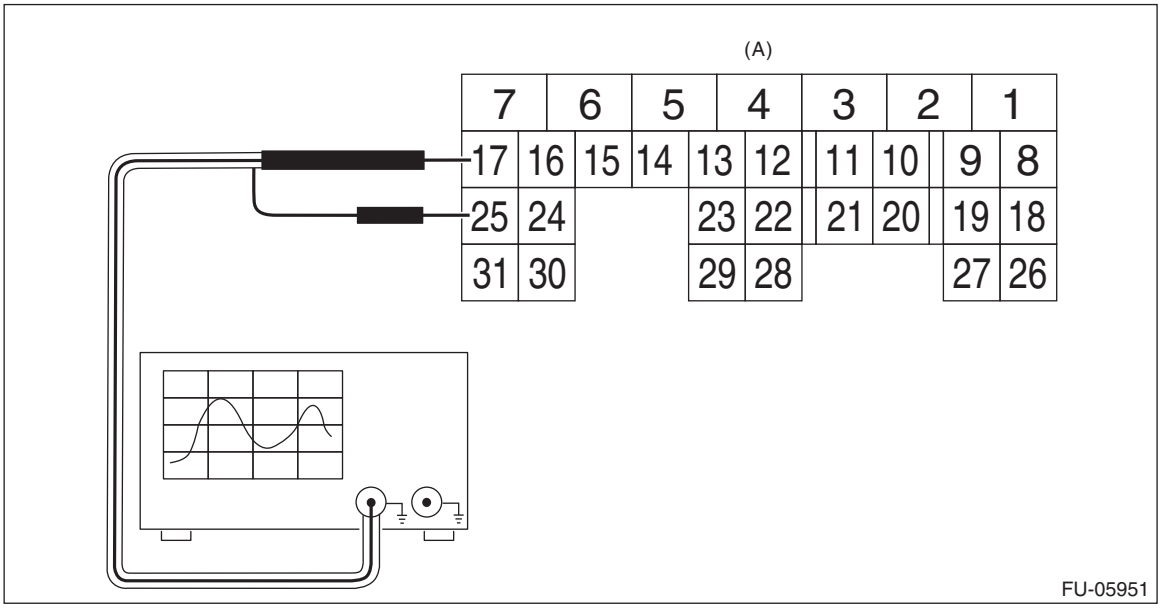
1) Prepare an oscilloscope.
2) Remove the glove box lower cover. <Ref. to EI-48, REMOVAL, Glove Box.>
3) Remove the lower inner trim of passenger's side. <Ref. to EI-56, REMOVAL, Lower Inner Trim.>
4) Turn over the floor mat of passenger's seat.
5) Remove the protect cover.



6) Remove the nuts and bolts which hold the ECM to the bracket.



7) Connect the probe to ECM connector.

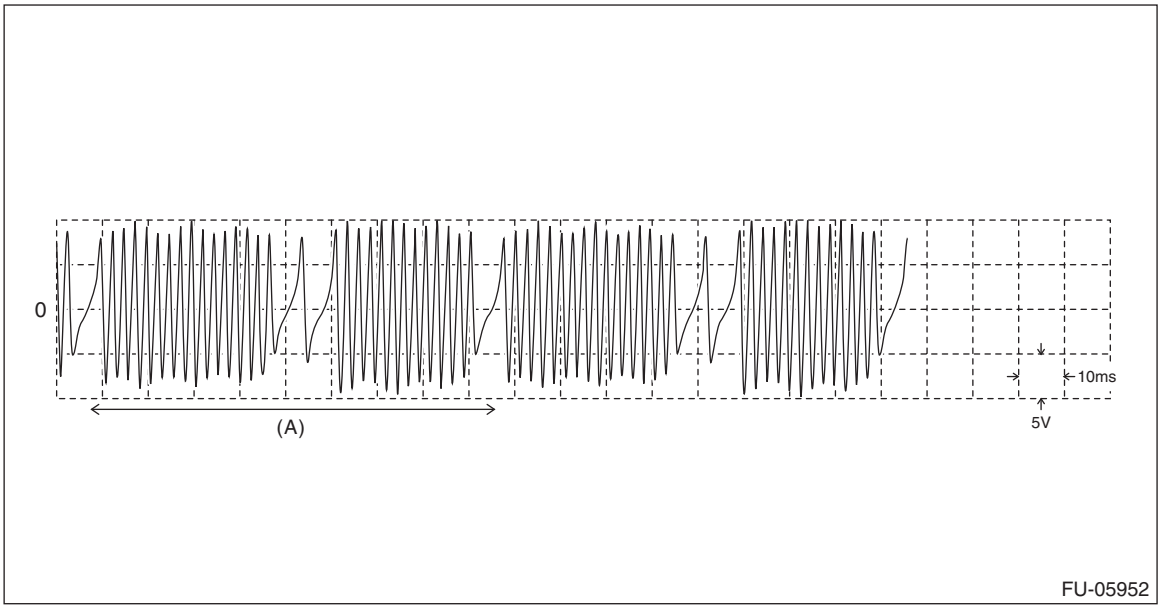


(A) To ECM connector

Terminal No.	Probe
17	+
25	–

8) Start the engine and let it idle.

9) Check the pattern is the same as the waveform and voltage shown below.



(A) One crankshaft rotation

10) After inspection, install the related parts in the reverse order of removal.

Tightening torque:
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)

3. OTHER INSPECTIONS

Check that the crankshaft position sensor has no deformation, cracks or other damages.

7. Crankshaft Position Sensor Plate

A: REMOVAL

The crankshaft position sensor plate is tightened together with the drive plate or flywheel; therefore, refer to “Drive Plate” or “Flywheel” for removal procedure. <Ref. to 4AT-73, REMOVAL, Drive Plate.> <Ref. to CL-12, REMOVAL, Flywheel.>

B: INSTALLATION

The crankshaft position sensor plate is tightened together with the drive plate or flywheel; therefore, refer to “Drive Plate” or “Flywheel” for installation procedure. <Ref. to 4AT-73, INSTALLATION, Drive Plate.> <Ref. to CL-12, INSTALLATION, Flywheel.>

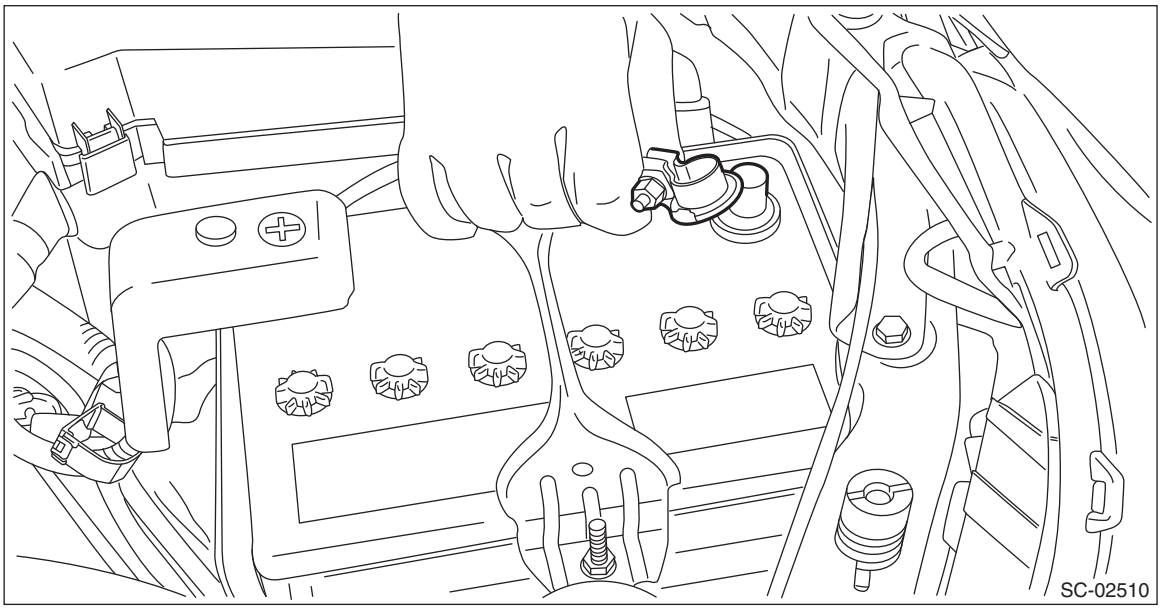
C: INSPECTION

Check that the crankshaft position sensor plate has no deformation, cracks or other damages.

8. Camshaft Position Sensor

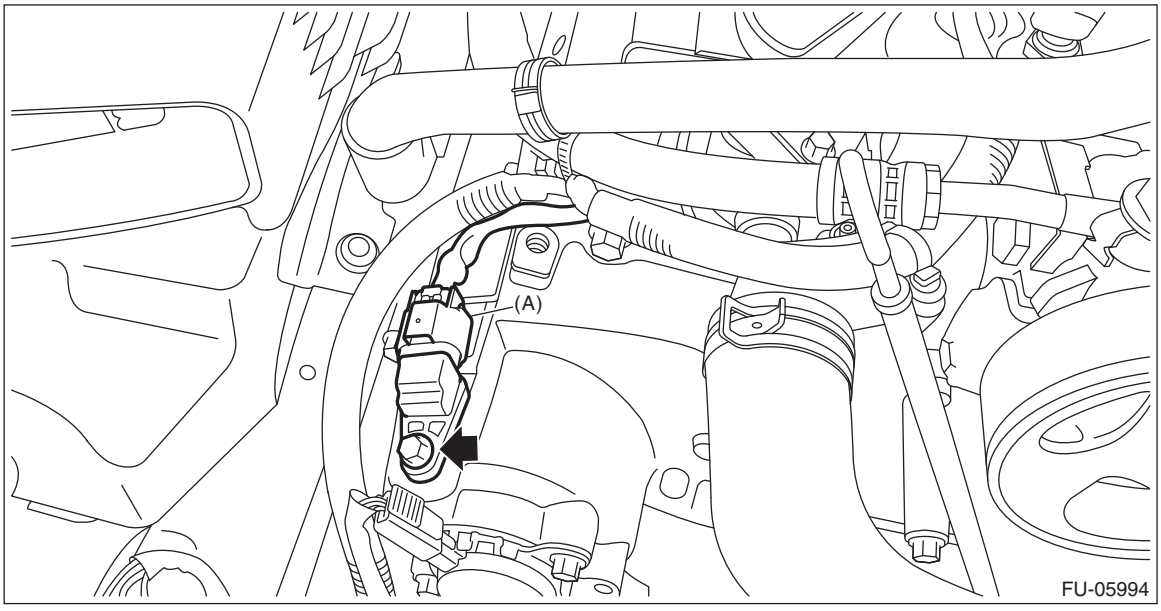
A: REMOVAL

1) Disconnect the ground cable from battery.

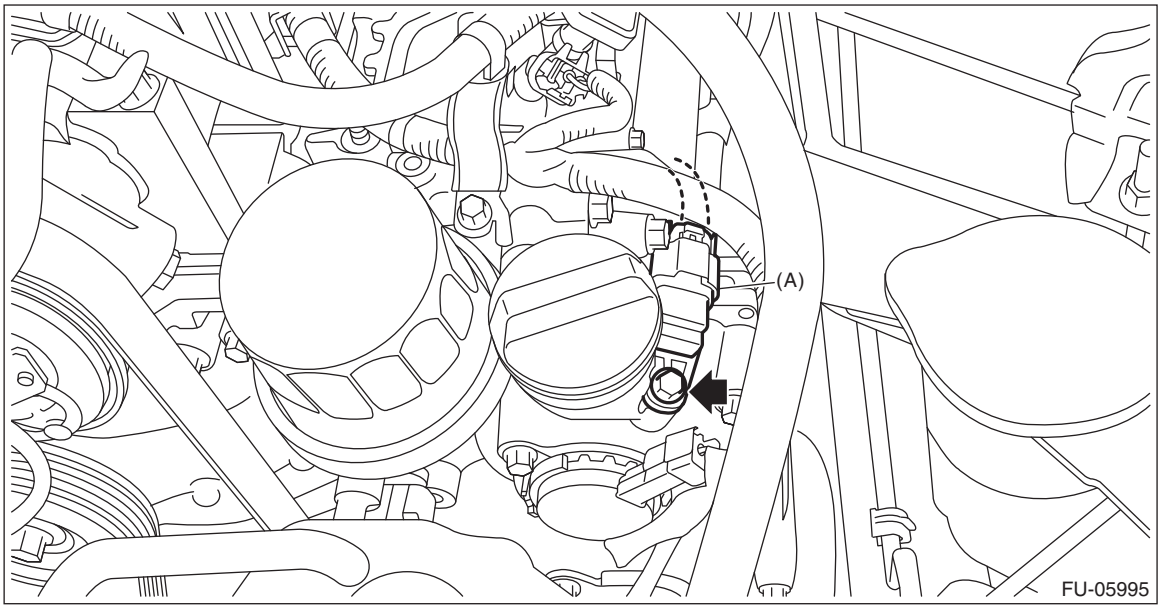


2) Remove the air intake duct (Rear). (RH side only) <Ref. to IN(H4DO)-14, REMOVAL, Air Intake Duct.>
3) Disconnect the connector (A) from the camshaft position sensor, and remove the camshaft position sensor from the chain cover.

- RH side



- LH side



B: INSTALLATION

Install in the reverse order of removal.

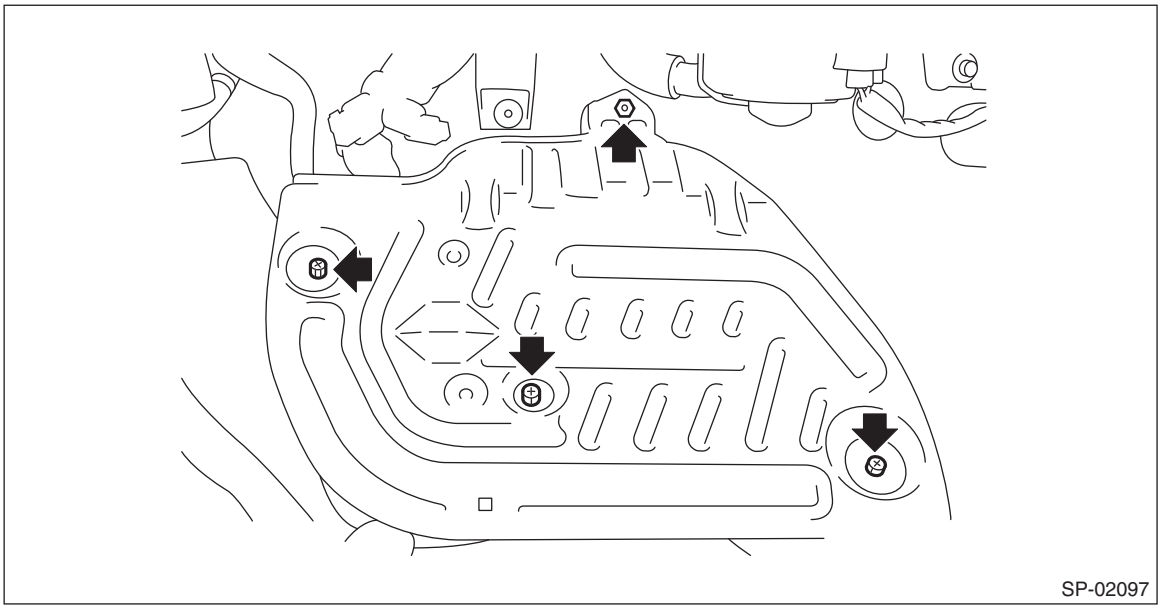
NOTE:
Use new O-rings.

Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)

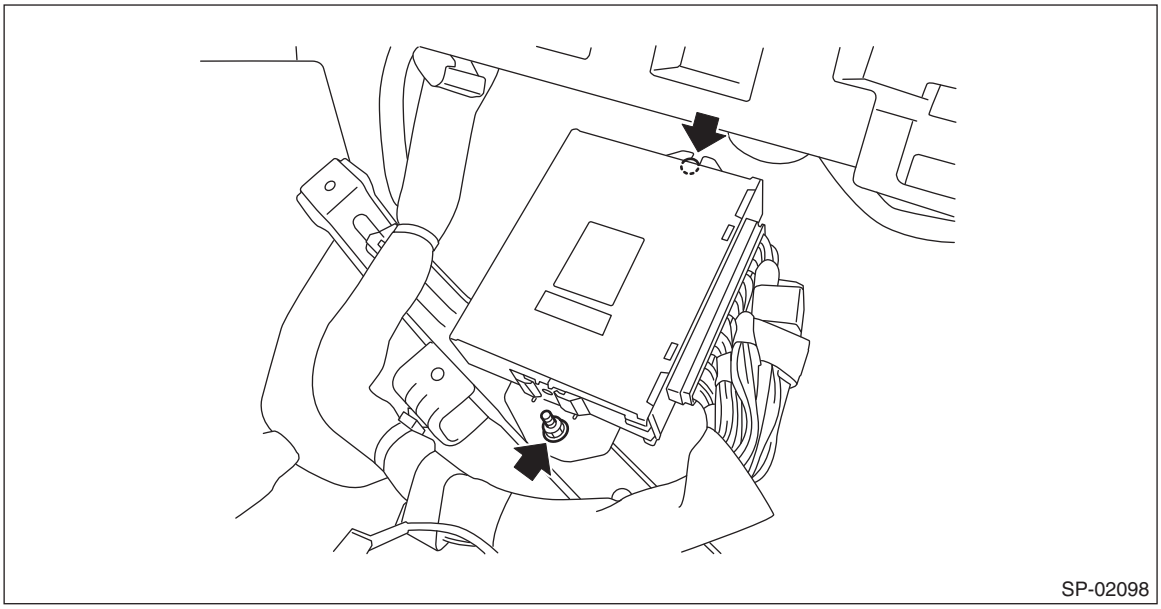
C: INSPECTION

1. CAMSHAFT POSITION SENSOR (METHOD WITH OSCILLOSCOPE)

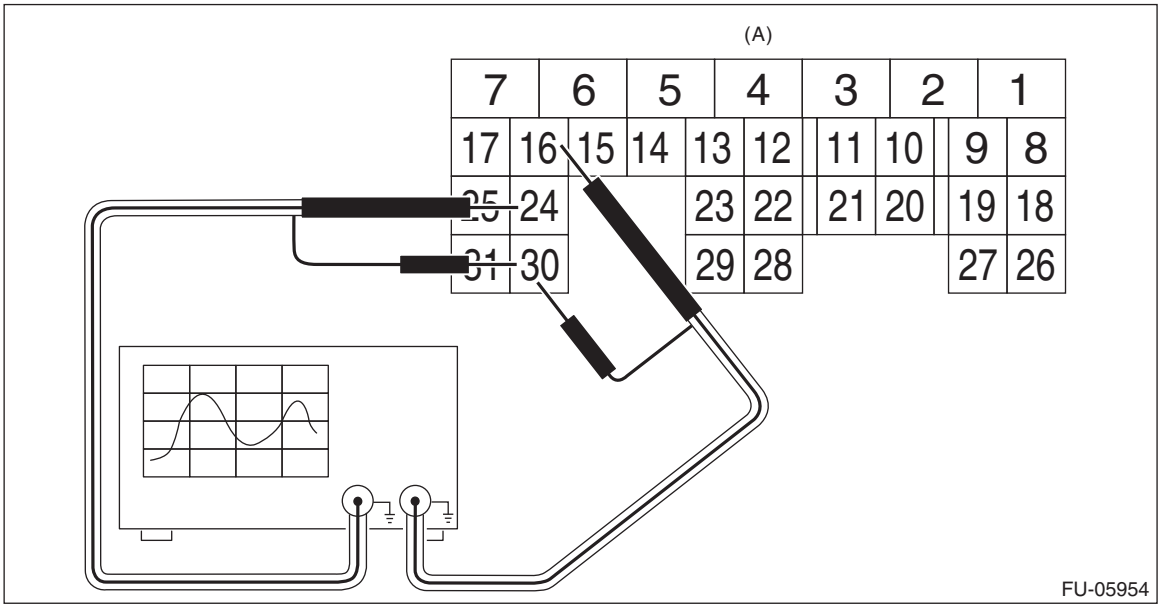
1) Prepare an oscilloscope.
2) Remove the glove box lower cover. <Ref. to EI-48, REMOVAL, Glove Box.>
3) Remove the lower inner trim of passenger's side. <Ref. to EI-56, REMOVAL, Lower Inner Trim.>
4) Turn over the floor mat of passenger's seat.
5) Remove the protect cover.



6) Remove the nuts and bolts which hold the ECM to the bracket.



7) Connect the probe to ECM connector.

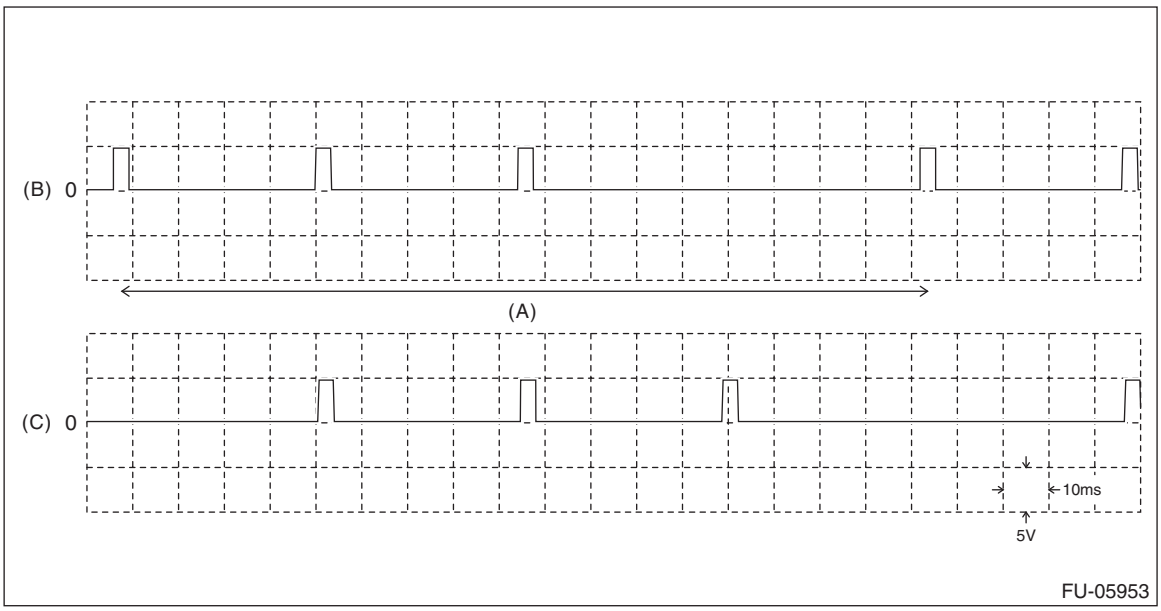


(A) To ECM connector

Camshaft position sensor	Terminal No.	Probe
RH	24	+
LH	16	+
RH and LH	30	–

8) Start the engine and let it idle.

9) Check the pattern is the same as the waveform and voltage shown below.



(A) One camshaft rotation
(B) Intake camshaft position sensor RH
(C) Intake camshaft position sensor LH

10) If necessary, adjust the air gap. <Ref. to FU(H4DO)-55, ADJUSTMENT, Camshaft Position Sensor.>
11) After inspection, install the related parts in the reverse order of removal.

Tightening torque:
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)

2. OTHER INSPECTIONS

Check that the camshaft position sensor has no deformation, cracks or other damages.

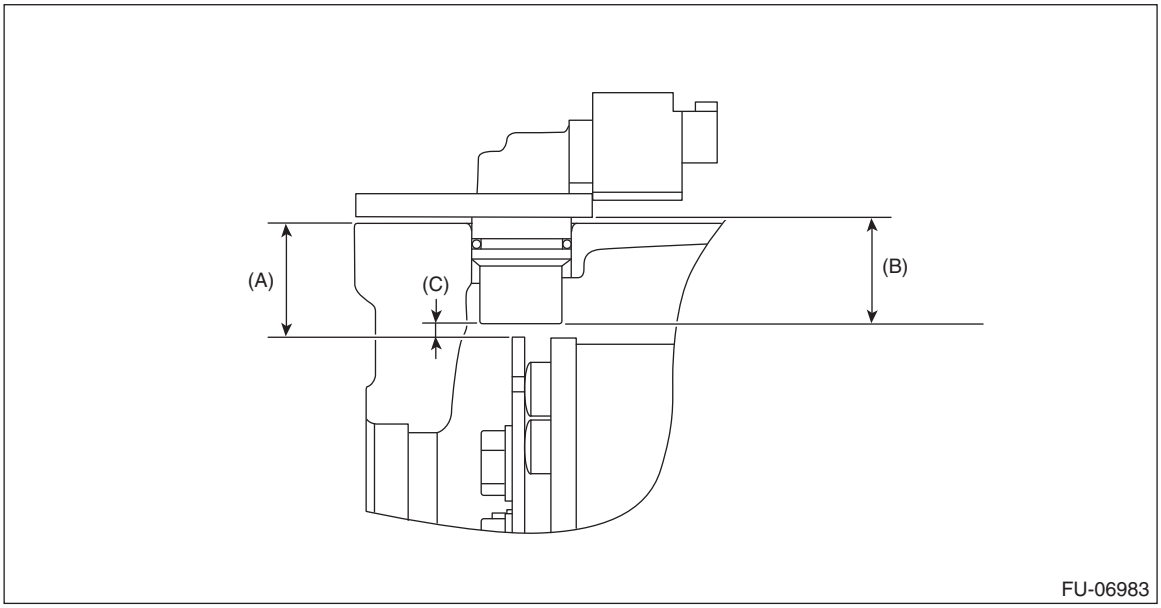
D: ADJUSTMENT

Measure depth (A) from the timing chain cover top surface to the camshaft sensor plate upper part, and measure height (B) from the camshaft position sensor mating surface to the camshaft position sensor bottom part. If the air gap (C) is out of standard, adjust it by using shims.

Air gap:

Standard

1.3±0.05 mm (0.0051±0.0012 in)



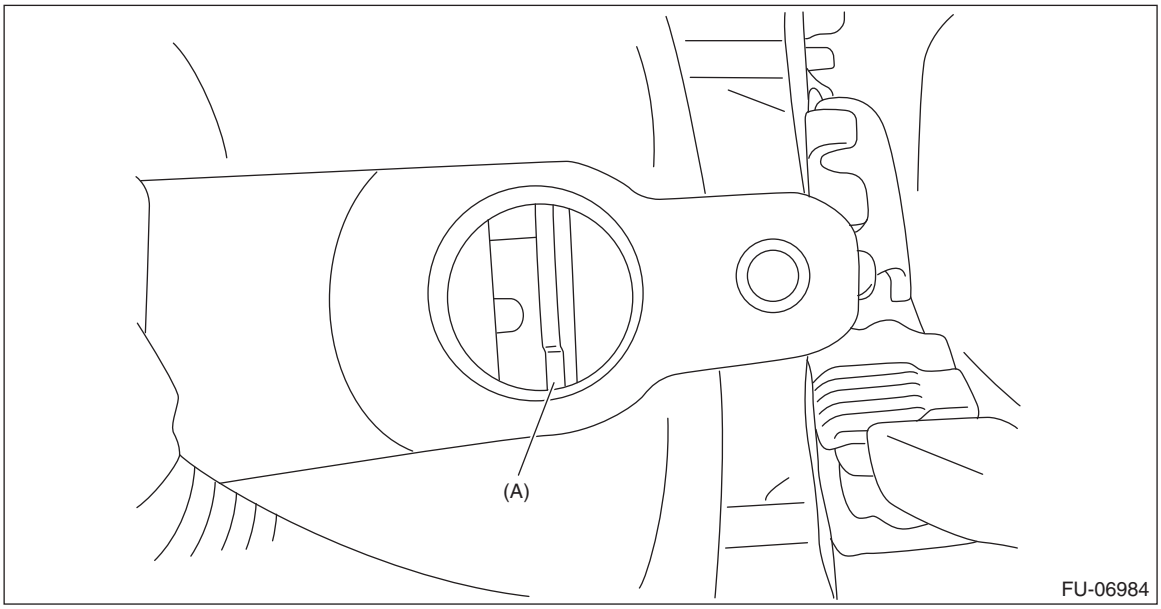
(A) Camshaft position sensor (B) Timing chain cover (C) Air gap

Air gap mm (in)	Shim thickness mm (in)	Target gap mm (in)
0.45 — 0.55 (0.0177 — 0.0217)	0.8 (0.031)	1.25 — 1.35 (0.0492 — 0.0531)
0.56 — 0.65 (0.0220 — 0.0256)	0.7 (0.028)	1.26 — 1.35 (0.0496 — 0.0531)
0.66 — 0.75 (0.0260 — 0.0295)	0.6 (0.024)	1.26 — 1.35 (0.0496 — 0.0531)
0.76 — 0.85 (0.0299 — 0.0335)	0.5 (0.020)	1.26 — 1.35 (0.0496 — 0.0531)
0.86 — 0.95 (0.0339 — 0.0374)	0.4 (0.016)	1.26 — 1.35 (0.0496 — 0.0531)
0.96 — 1.05 (0.0378 — 0.0413)	0.3 (0.012)	1.26 — 1.35 (0.0496 — 0.0531)
1.06 — 1.15 (0.0417 — 0.0453)	0.2 (0.008)	1.26 — 1.35 (0.0496 — 0.0531)
1.16 — 1.25 (0.0457 — 0.0492)	0.1 (0.004)	1.26 — 1.35 (0.0496 — 0.0531)

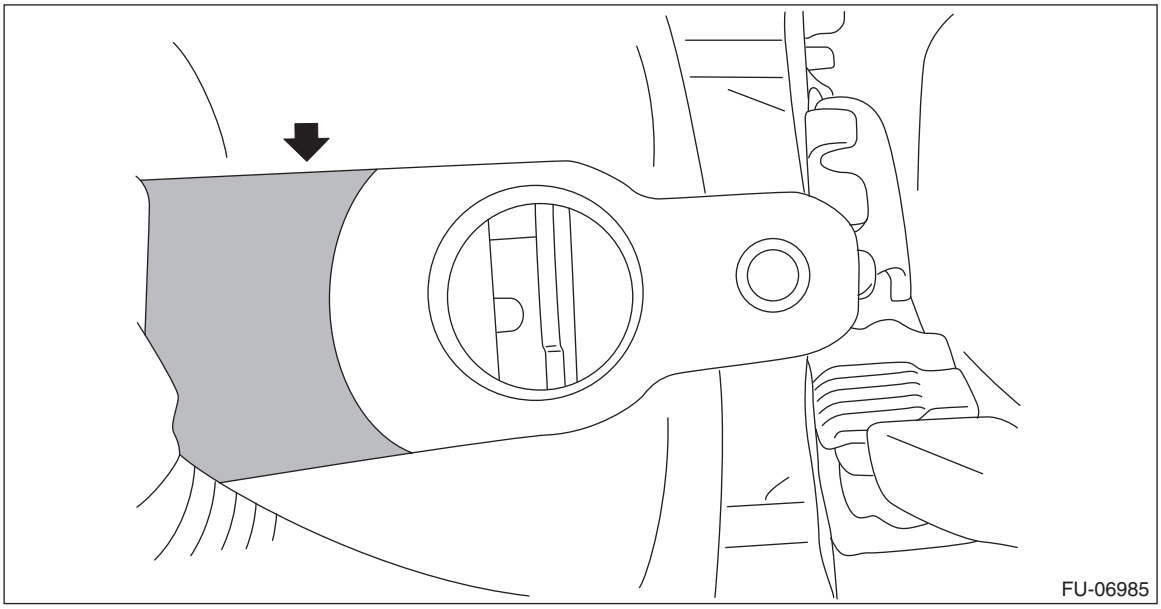
1. MEASUREMENT USING DIGITAL CALIPER GAUGE (WITH A DEPTH MEASURING ATTACHMENT)

1) Remove the camshaft position sensor RH from the engine. <Ref. to FU(H4DO)-51, REMOVAL, Camshaft Position Sensor.>
2) Measure the depth from the timing chain cover top surface to the camshaft sensor plate upper part.

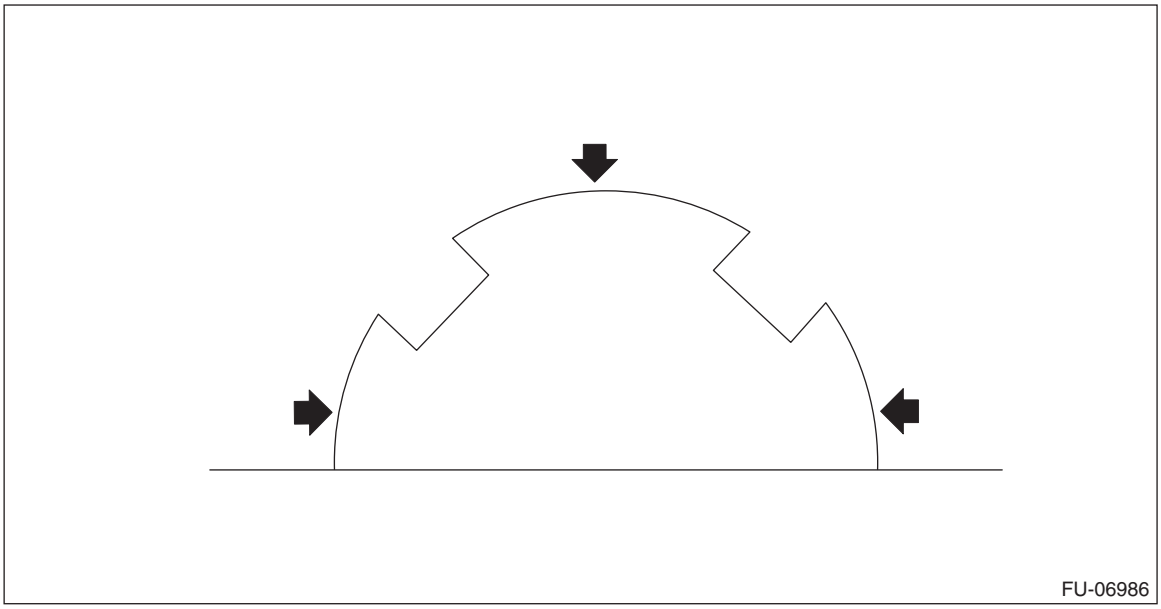
CAUTION:
- **Do not measure to the notch (A) of the camshaft position sensor plate.**

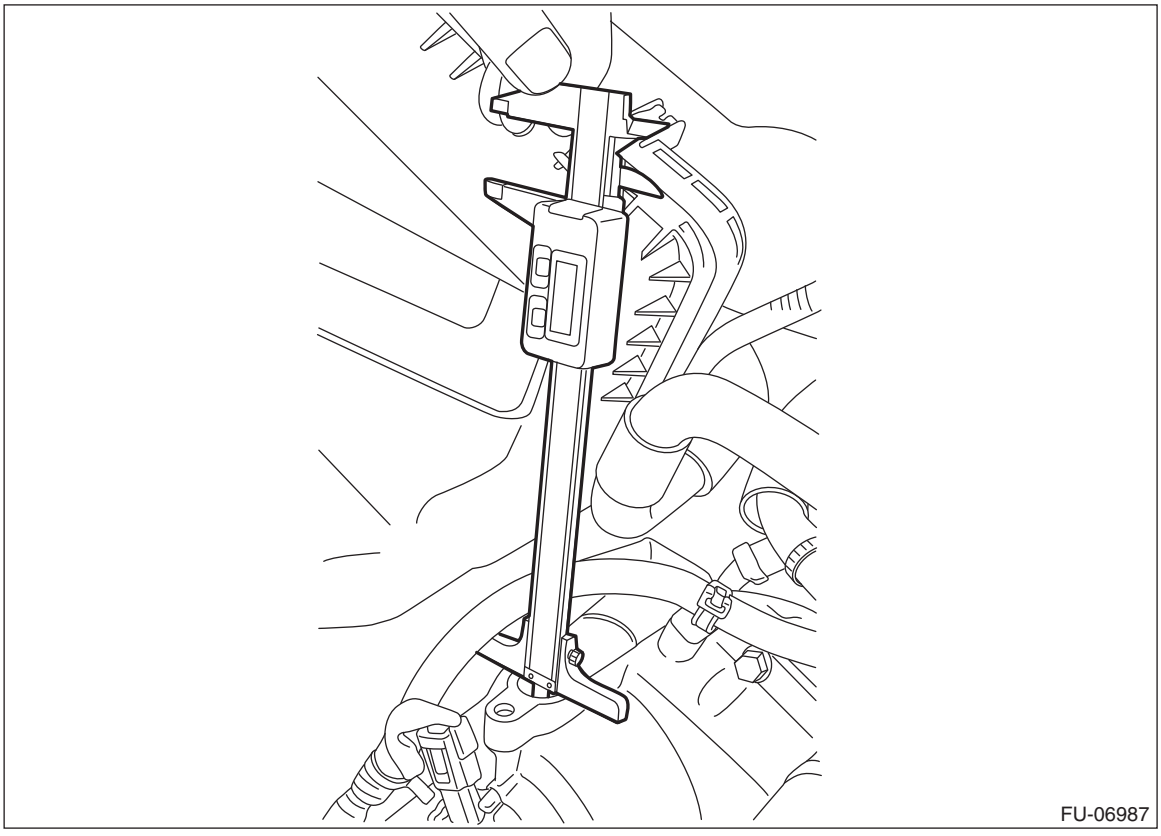


- **Measure the depth while taking care that the depth measuring attachment does not rest on the bulged section of chain cover.**

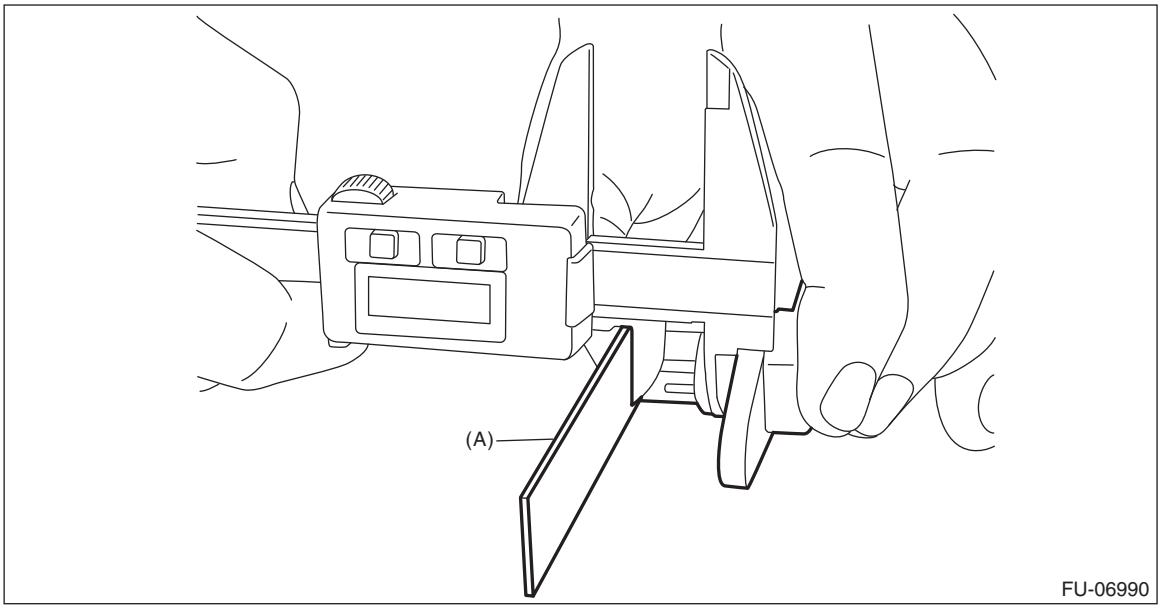


• **Measure in three different top surfaces of the camshaft position sensor plate, and record the smallest value.**


FU-06986


FU-06987

3) Using a steel scale or equivalent (A), measure the height from the camshaft position sensor mating surface to the camshaft position sensor bottom part.



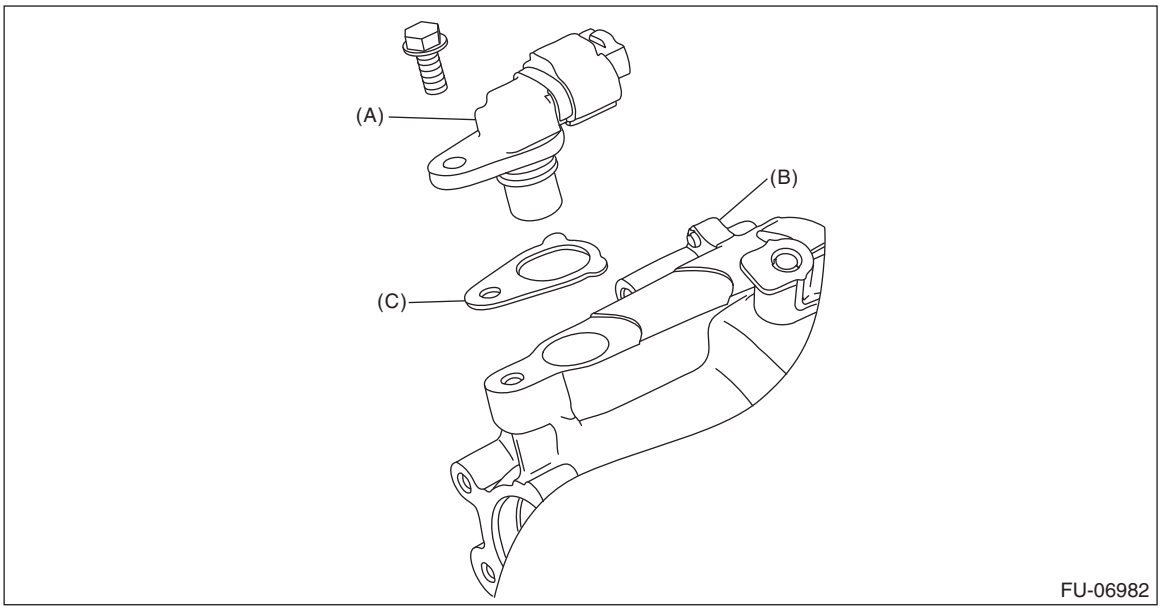
4) Calculate the air gap by subtracting “height from the camshaft position sensor mating surface to the camshaft position sensor bottom part” from “depth from the timing chain cover top surface to the camshaft sensor plate upper part”.

Air gap mm (in)	Shim thickness mm (in)	Target gap mm (in)
0.45 — 0.55 (0.0177 — 0.0217)	0.8 (0.031)	1.25 — 1.35 (0.0492 — 0.0531)
0.56 — 0.65 (0.0220 — 0.0256)	0.7 (0.028)	1.26 — 1.35 (0.0496 — 0.0531)
0.66 — 0.75 (0.0260 — 0.0295)	0.6 (0.024)	1.26 — 1.35 (0.0496 — 0.0531)
0.76 — 0.85 (0.0299 — 0.0335)	0.5 (0.020)	1.26 — 1.35 (0.0496 — 0.0531)
0.86 — 0.95 (0.0339 — 0.0374)	0.4 (0.016)	1.26 — 1.35 (0.0496 — 0.0531)
0.96 — 1.05 (0.0378 — 0.0413)	0.3 (0.012)	1.26 — 1.35 (0.0496 — 0.0531)
1.06 — 1.15 (0.0417 — 0.0453)	0.2 (0.008)	1.26 — 1.35 (0.0496 — 0.0531)
1.16 — 1.25 (0.0457 — 0.0492)	0.1 (0.004)	1.26 — 1.35 (0.0496 — 0.0531)

5) Select a shim of suitable thickness using the measured air gap, and install the camshaft position sensor.

NOTE:
Use a new shim.

Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)



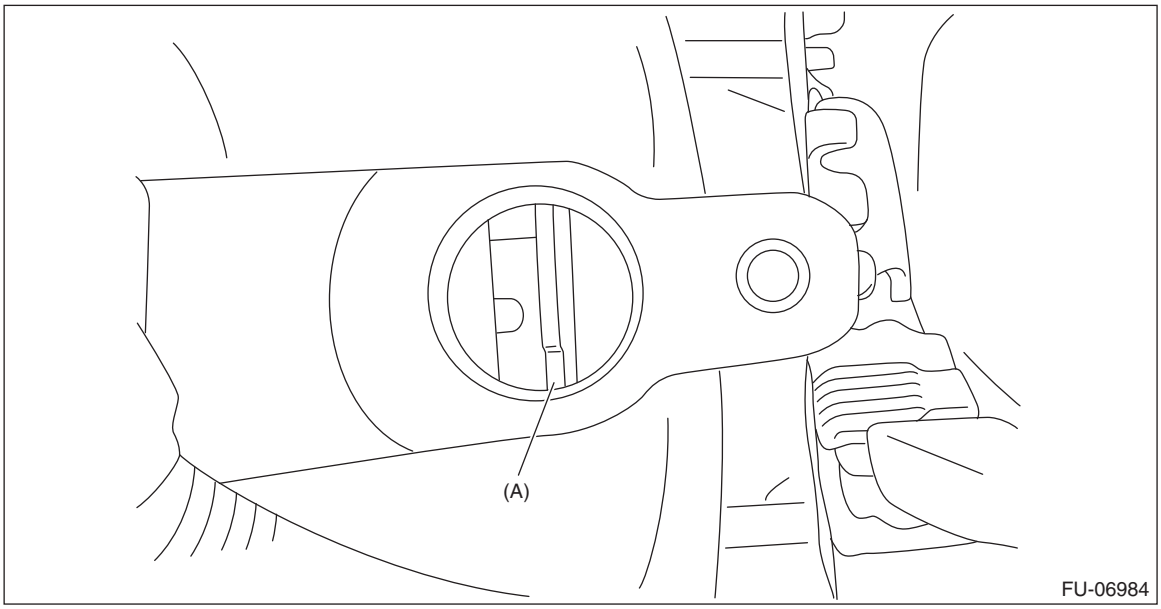
(A) Camshaft position sensor (B) Timing chain cover (C) Shim

6) After adjustment, install the related parts in the reverse order of removal.

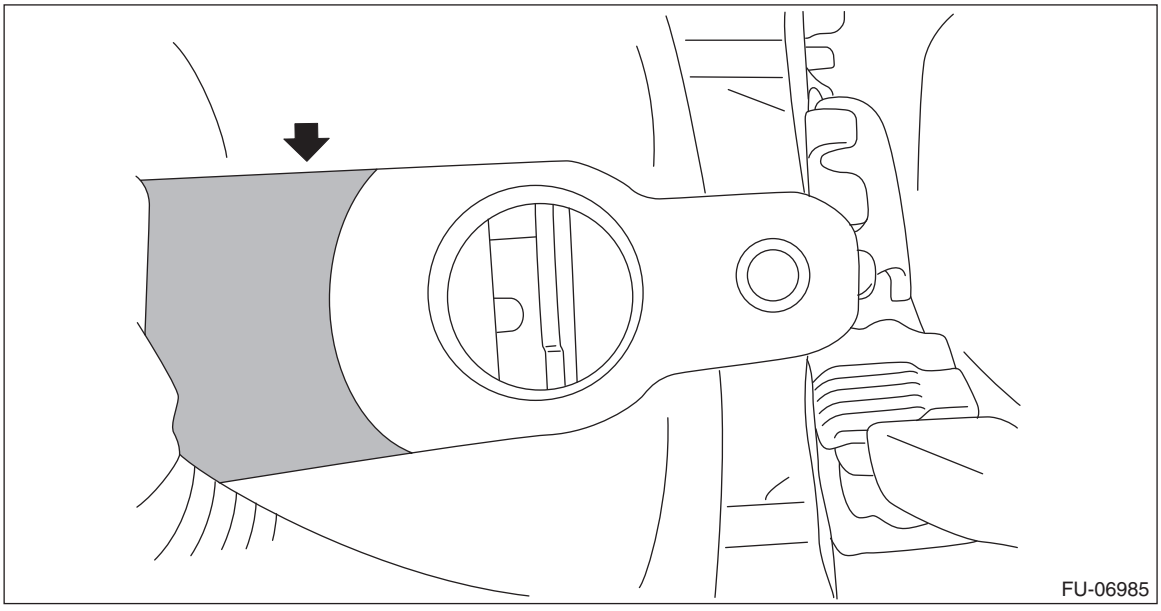
2. MEASUREMENT USING DIGITAL CALIPER GAUGE (WITHOUT A DEPTH MEASURING ATTACHMENT)

1) Remove the camshaft position sensor from the engine. <Ref. to FU(H4DO)-51, REMOVAL, Camshaft Position Sensor.>
2) Place a washer over the camshaft position sensor installation hole of timing chain cover, and measure the depth to the camshaft sensor plate.

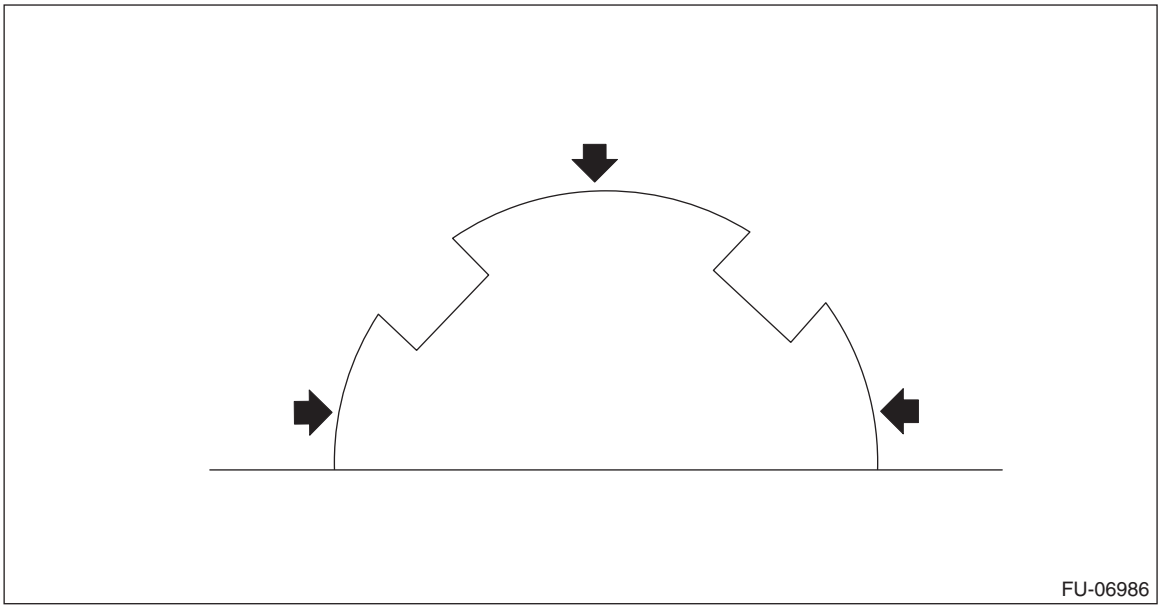
CAUTION:
- **Do not measure to the notch (A) of the camshaft position sensor plate.**

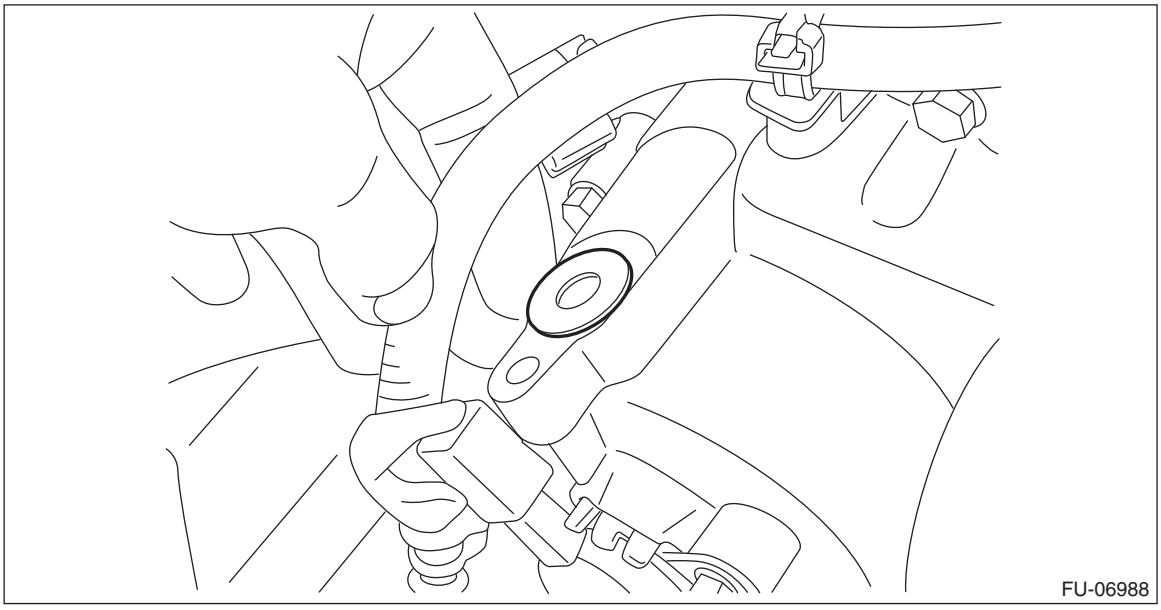


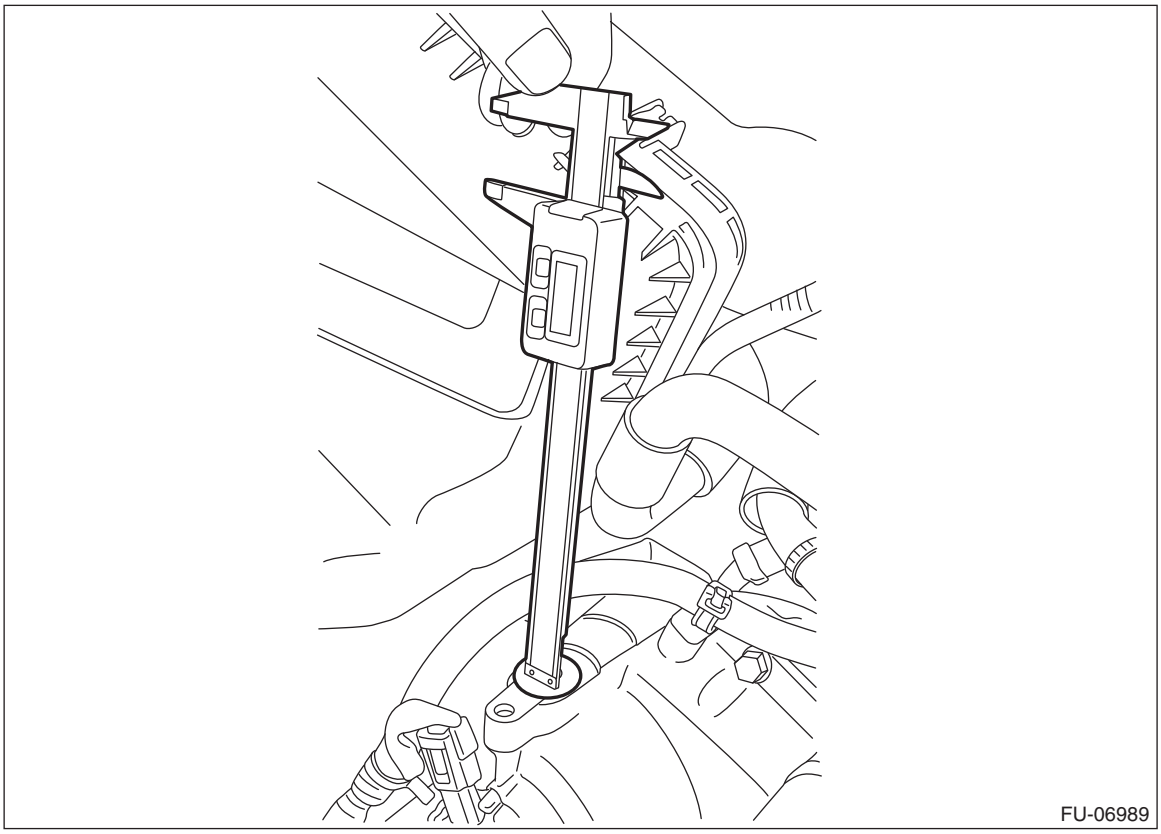
- **Measure the depth while taking care that the washer does not rest on the bulged section of chain cover.**



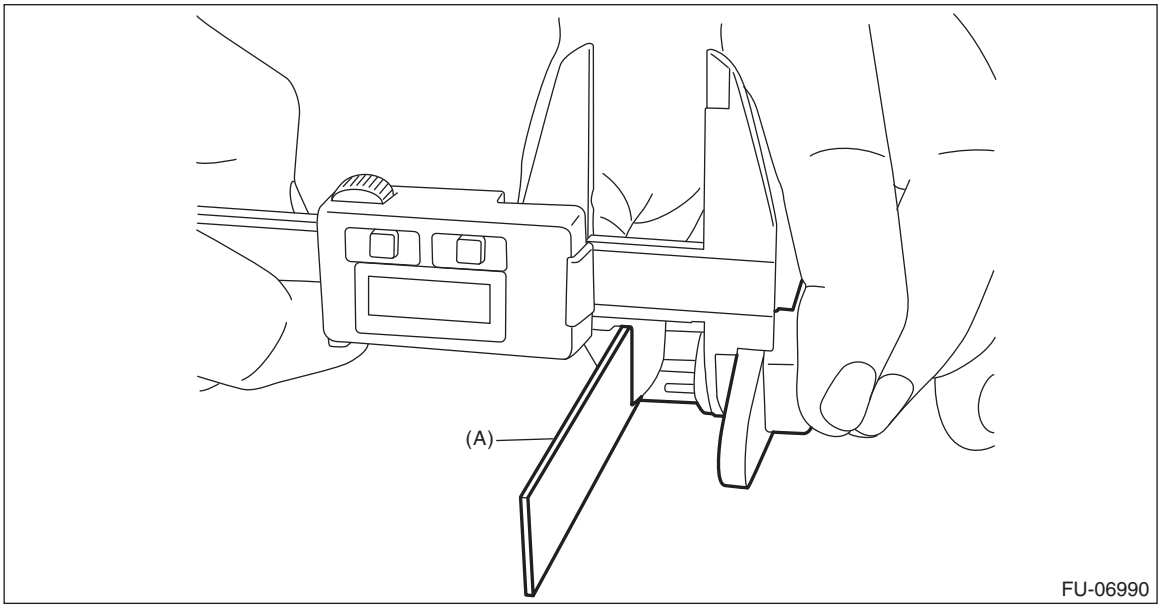
• **Measure in three different top surfaces of the camshaft position sensor plate, and record the smallest value.**


FU-06986

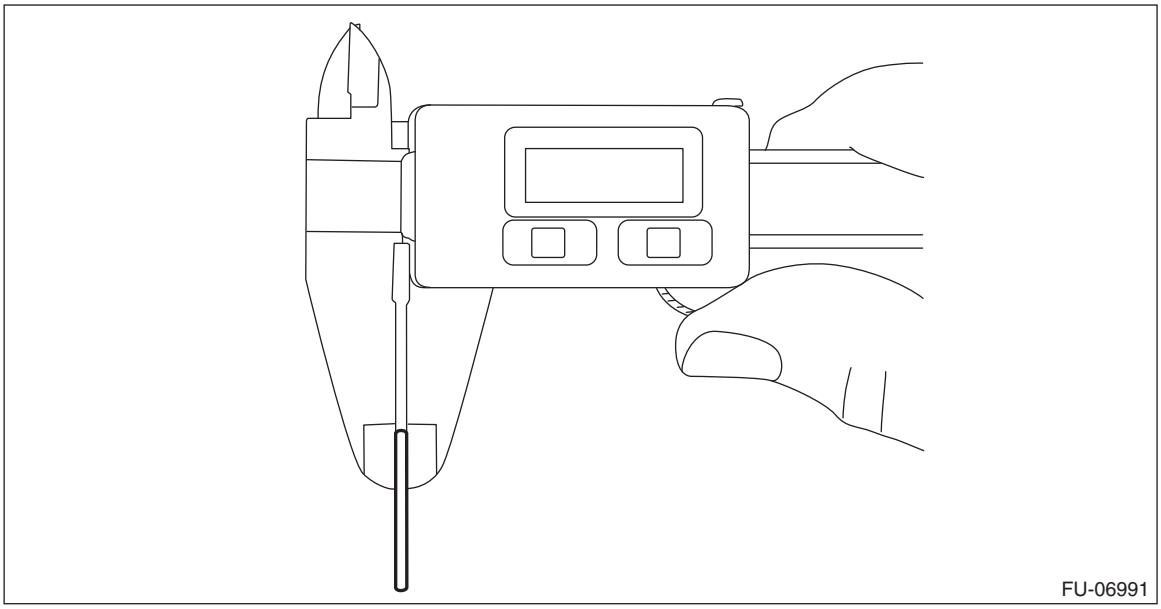

FU-06988



3) Using a steel scale or equivalent (A), measure the height from the camshaft position sensor mating surface to the camshaft position sensor bottom part.



4) Measure the washer thickness.



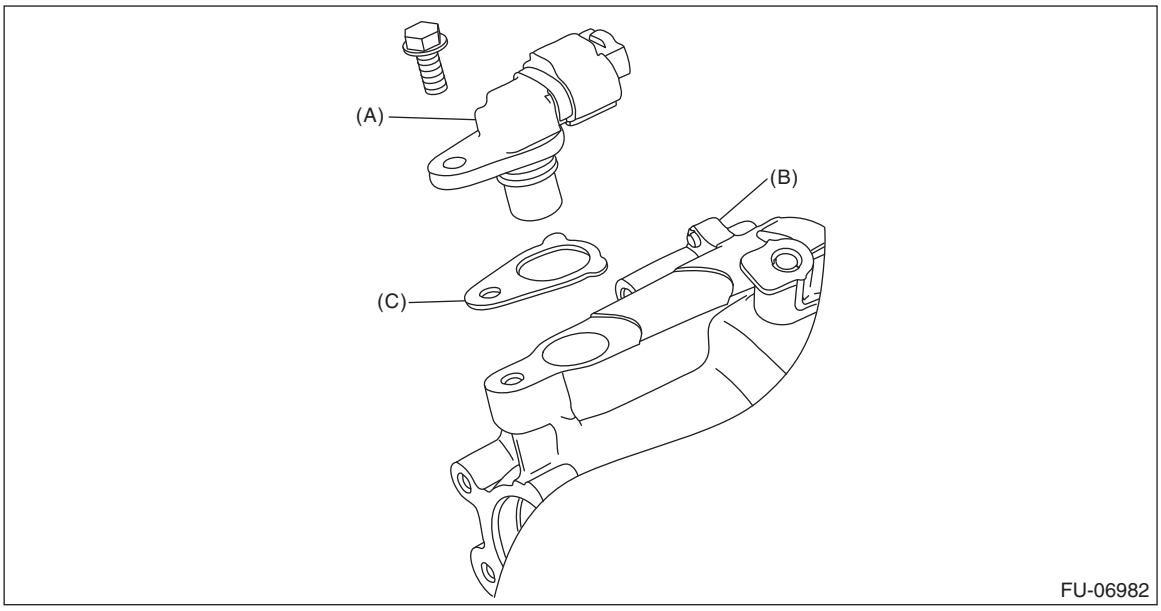
5) Calculate the air gap by subtracting “height from the camshaft position sensor mating surface to the camshaft position sensor bottom part” and “washer thickness” from “depth from the timing chain cover top surface to the camshaft sensor plate upper part”.

Air gap mm (in)	Shim thickness mm (in)	Target gap mm (in)
0.45 — 0.55 (0.0177 — 0.0217)	0.8 (0.031)	1.25 — 1.35 (0.0492 — 0.0531)
0.56 — 0.65 (0.0220 — 0.0256)	0.7 (0.028)	1.26 — 1.35 (0.0496 — 0.0531)
0.66 — 0.75 (0.0260 — 0.0295)	0.6 (0.024)	1.26 — 1.35 (0.0496 — 0.0531)
0.76 — 0.85 (0.0299 — 0.0335)	0.5 (0.020)	1.26 — 1.35 (0.0496 — 0.0531)
0.86 — 0.95 (0.0339 — 0.0374)	0.4 (0.016)	1.26 — 1.35 (0.0496 — 0.0531)
0.96 — 1.05 (0.0378 — 0.0413)	0.3 (0.012)	1.26 — 1.35 (0.0496 — 0.0531)
1.06 — 1.15 (0.0417 — 0.0453)	0.2 (0.008)	1.26 — 1.35 (0.0496 — 0.0531)
1.16 — 1.25 (0.0457 — 0.0492)	0.1 (0.004)	1.26 — 1.35 (0.0496 — 0.0531)

6) Select a shim of suitable thickness using the measured air gap, and install the camshaft position sensor.

NOTE:
Use a new shim.

Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)



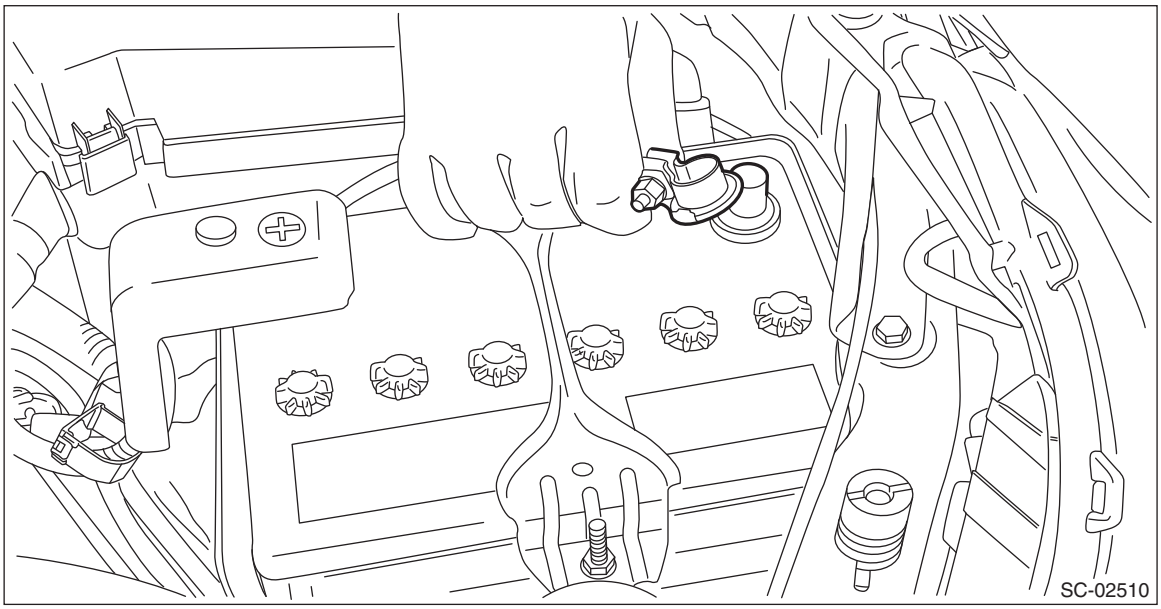
(A) Camshaft position sensor (B) Timing chain cover (C) Shim

7) After adjustment, install the related parts in the reverse order of removal.

9. Oil Control Valve

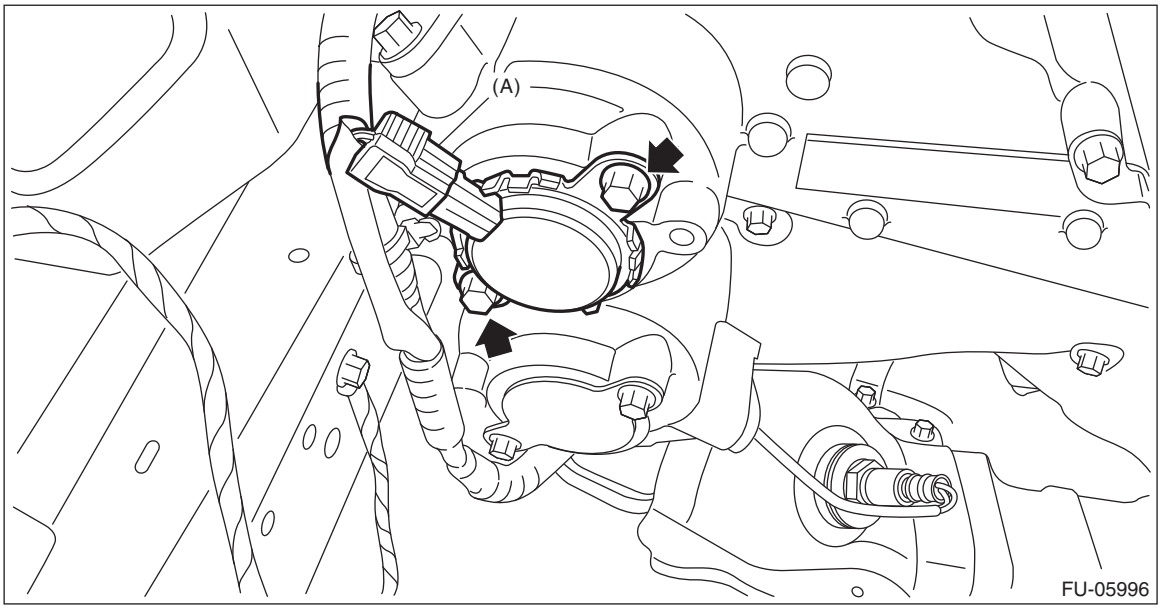
A: REMOVAL

1) Disconnect the ground cable from battery.

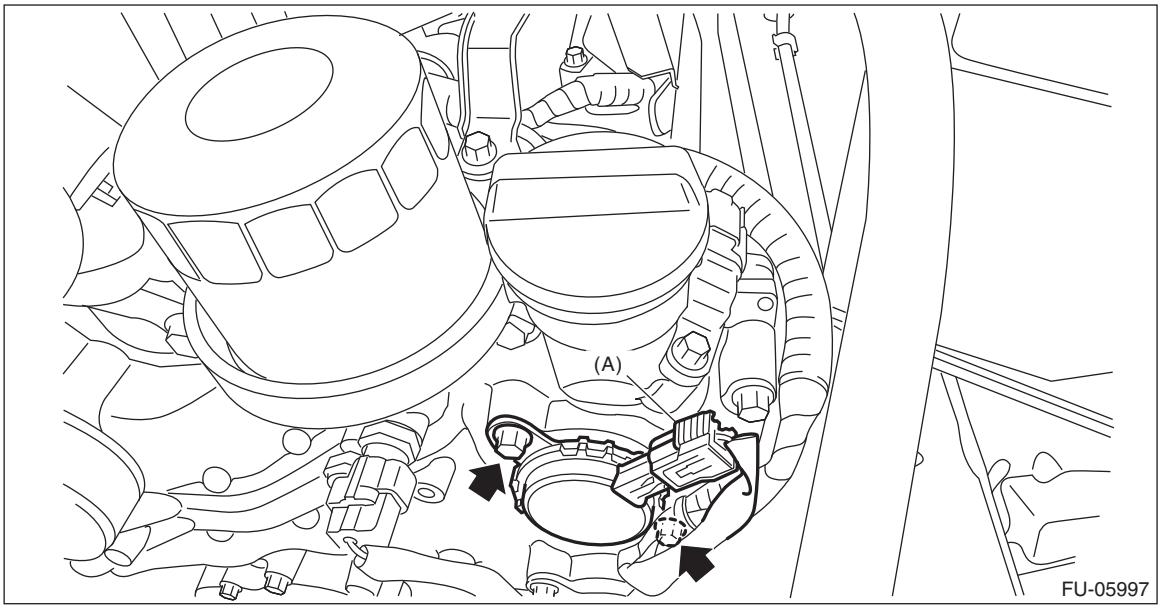


2) Remove the air intake duct (Rear). (RH side only) <Ref. to IN(H4DO)-14, REMOVAL, Air Intake Duct.>
3) Remove the reservoir tank. (LH side only) <Ref. to CO(H4DO)-40, REMOVAL, Reservoir Tank.>
4) Disconnect the connector (A) from the oil control solenoid, and remove the oil control solenoid from the chain cover.

- RH side



- LH side



B: INSTALLATION

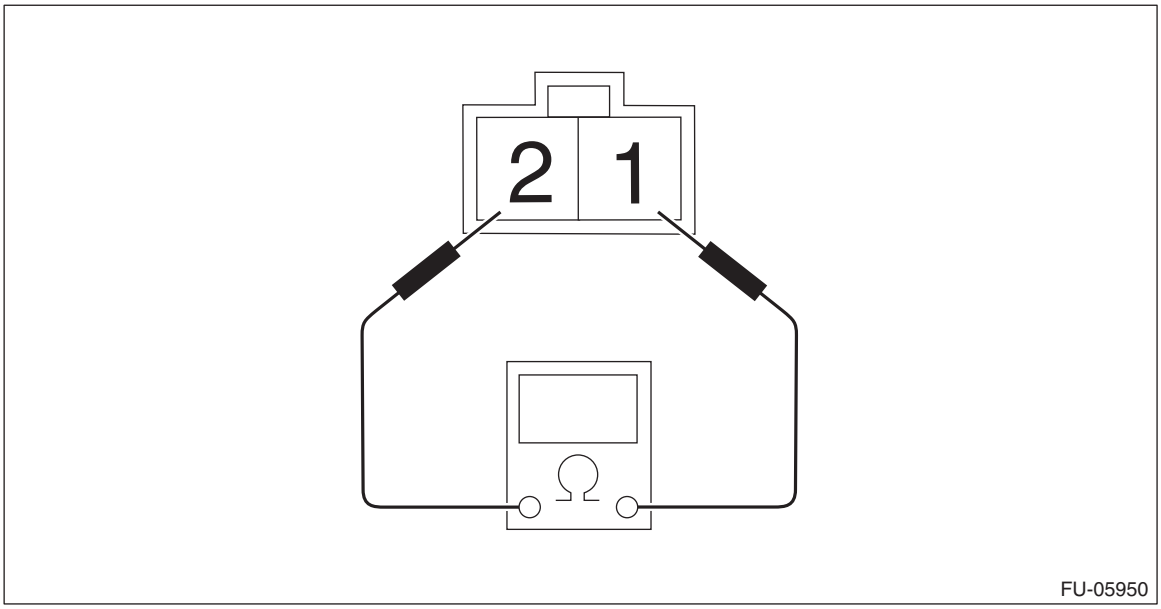
Install in the reverse order of removal.

NOTE:
Use new O-rings.

Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)

C: INSPECTION

1) Check that the oil control solenoid has no deformation, cracks or other damages.
2) Measure the resistance between the oil control solenoid terminals.

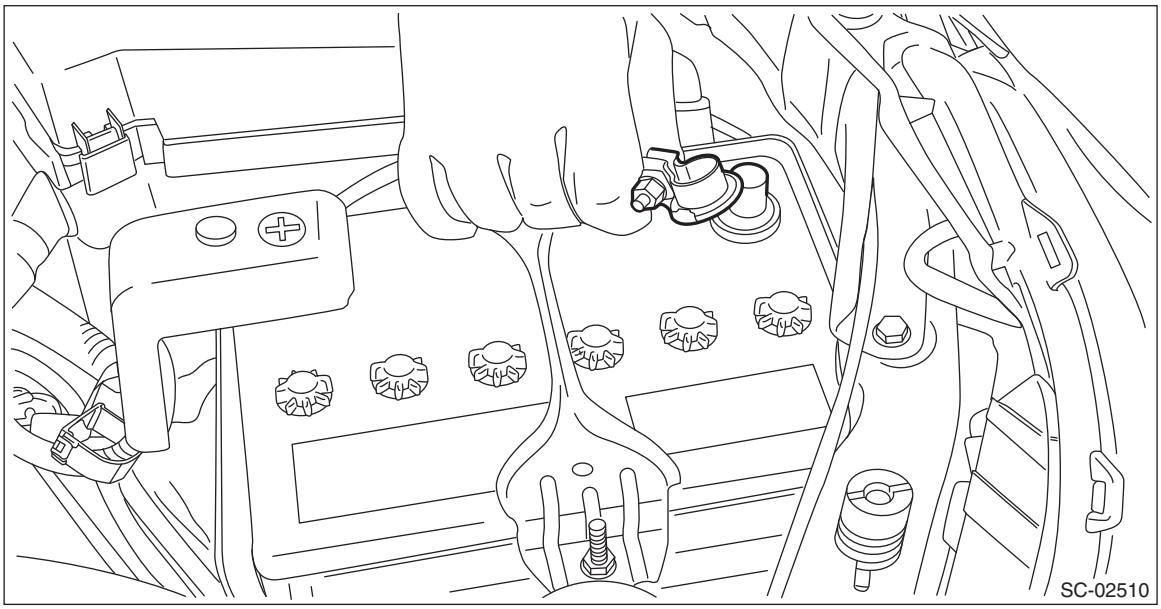


Terminal No.	Standard
1 and 2	7.25±0.4 Ω (when 20°C (68°F))

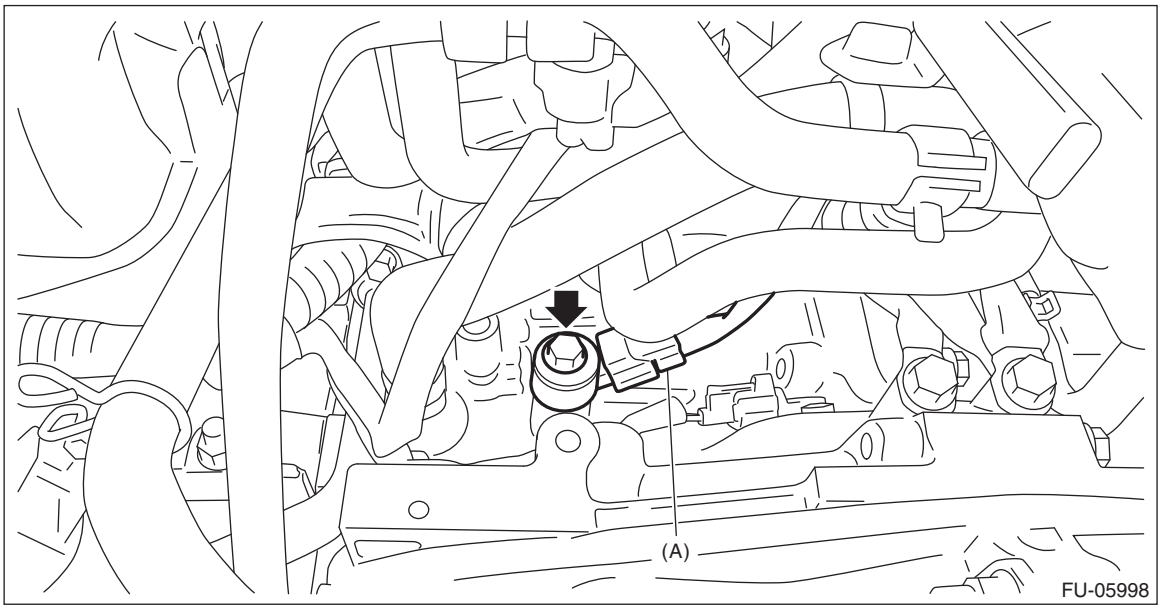
10.Knock Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.



2) Remove the air intake boot. <Ref. to IN(H4DO)-13, REMOVAL, Air Intake Boot.>
3) Disconnect the connector (A) from the knock sensor, and remove the knock sensor from the cylinder block.

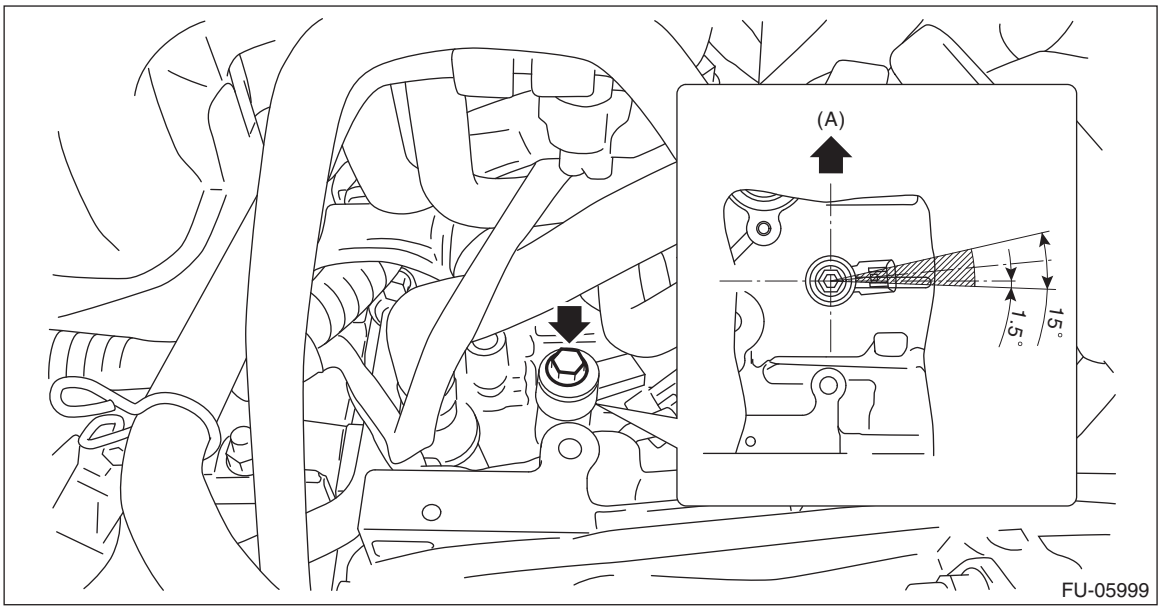


B: INSTALLATION

1) Install the knock sensor to the cylinder block.

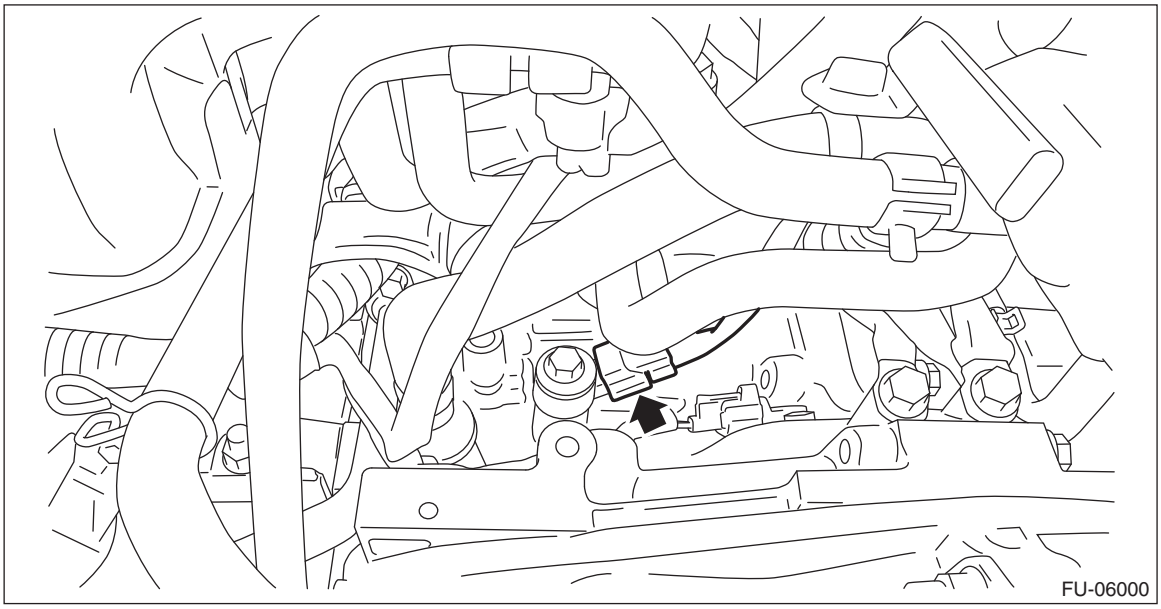
NOTE:
The knock sensor should be installed so that the center of the connector is positioned at a 76.5 — 91.5° angle relative to the front of engine.

Tightening torque:
24 N·m (2.4 kgf-m, 17.7 ft-lb)



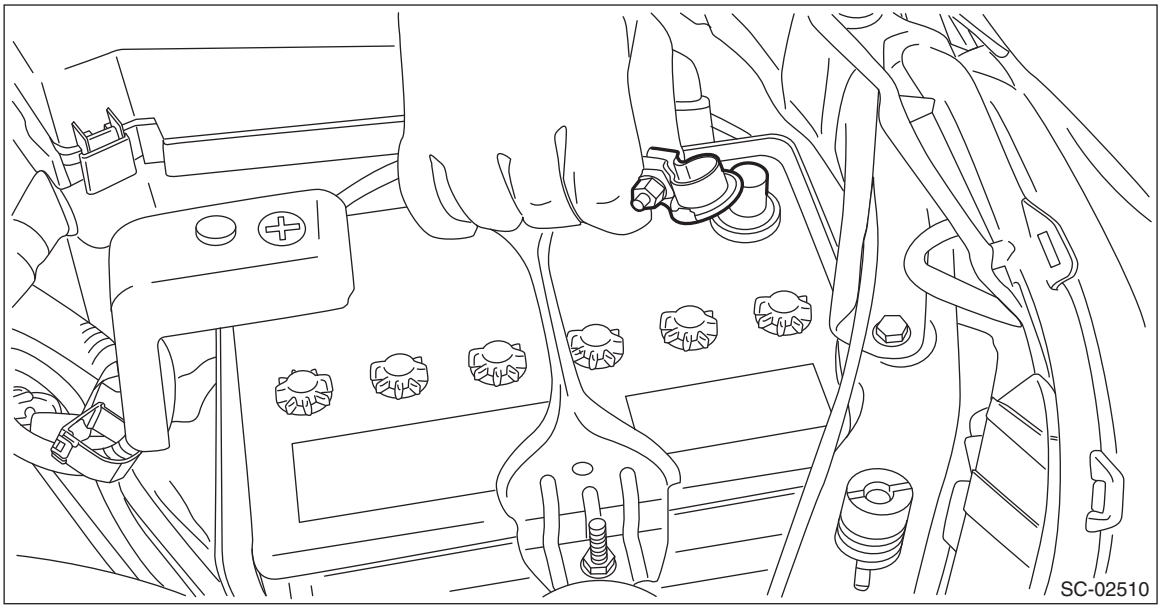
(A) Front of engine

2) Connect the connector to the knock sensor.



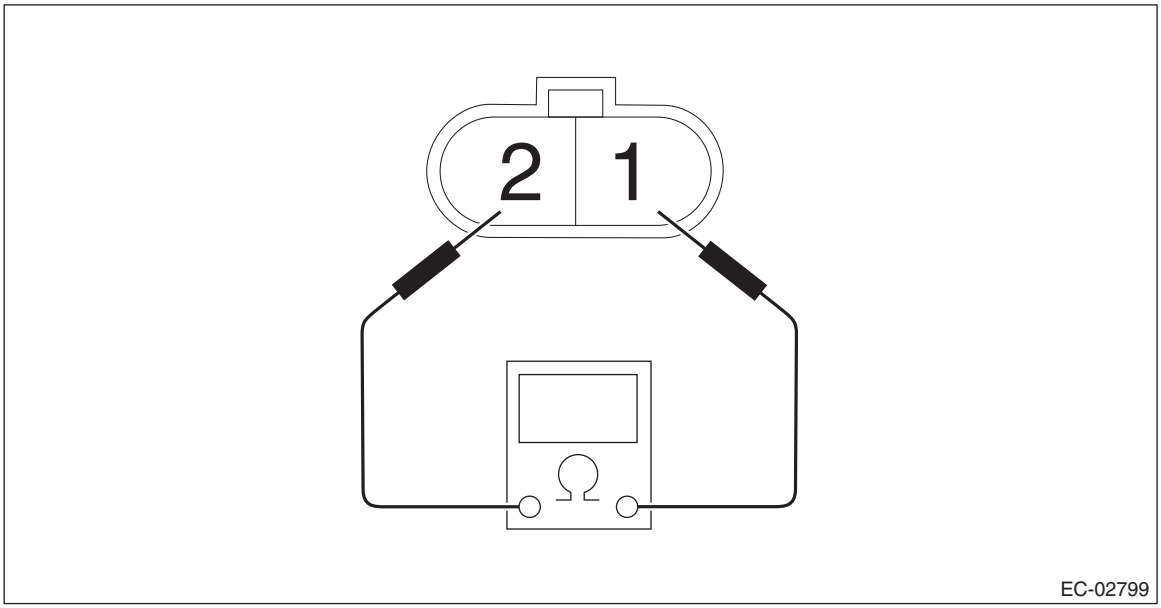
3) Install the air intake boot. <Ref. to IN(H4DO)-13, INSTALLATION, Air Intake Boot.>

4) Connect the battery ground terminal.



C: INSPECTION

1) Check that the knock sensor has no deformation, cracks or other damages.
2) Measure the resistance between knock sensor terminals.



Terminal No.	Standard
1 and 2	560±28 kΩ

11.Throttle Position Sensor

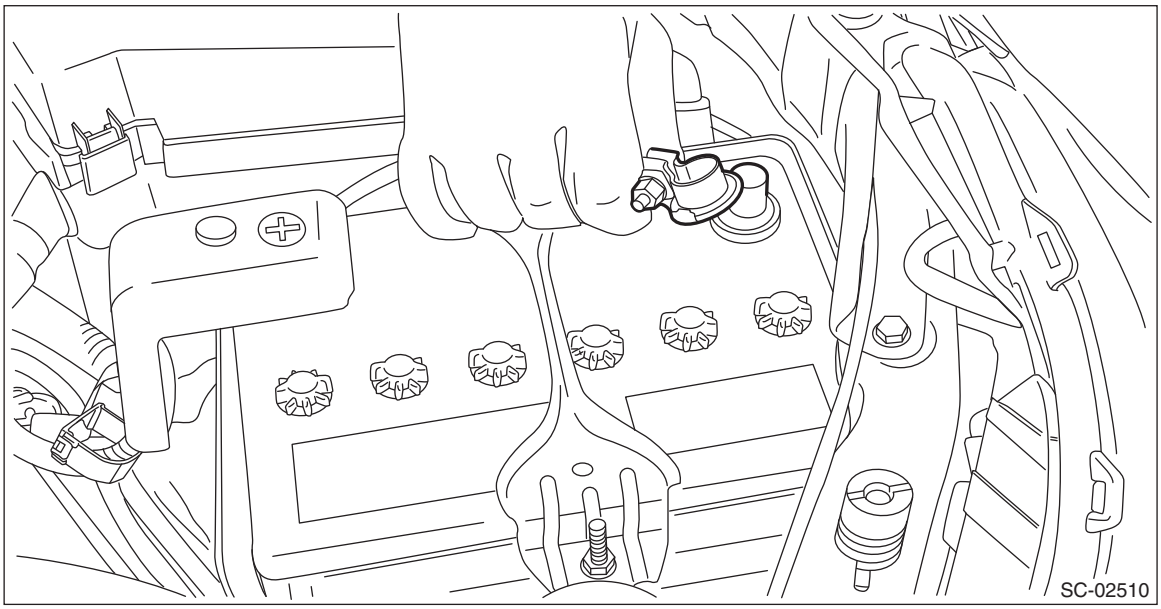
A: SPECIFICATION

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 procedure. <Ref. to FU(H4DO)-17, REMOVAL, Throttle Body.> <Ref. to FU(H4DO)-18, INSTALLATION, Throttle Body.>

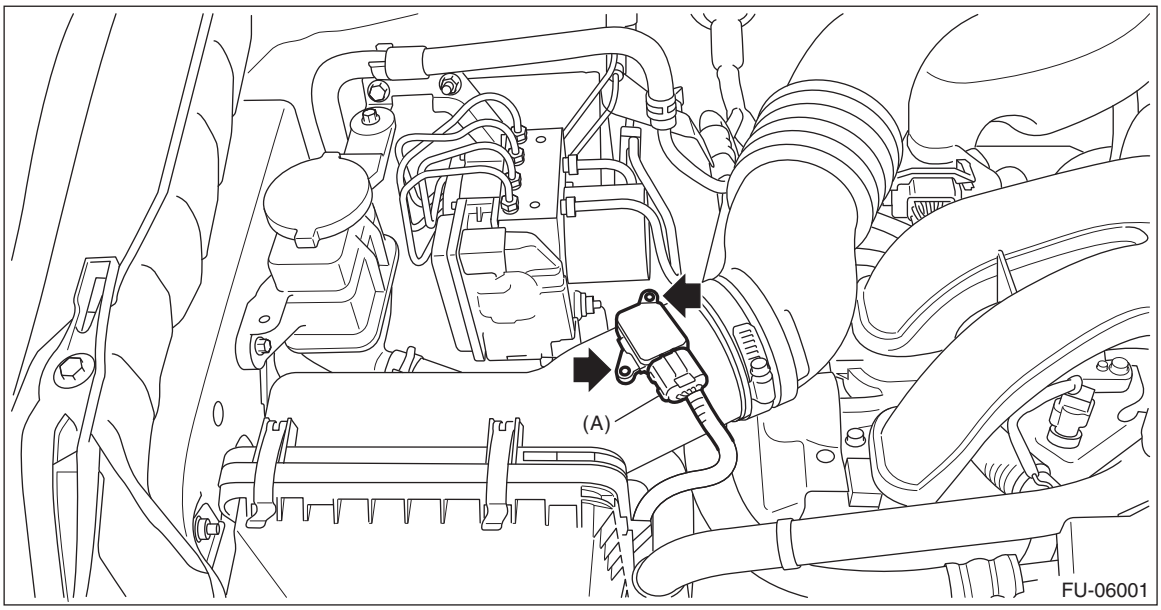
12.Mass Air Flow and Intake Air Temperature Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.



2) Disconnect the connector (A) from the mass air flow and intake air temperature sensor, and remove the mass air flow and intake air temperature sensor.



B: INSTALLATION

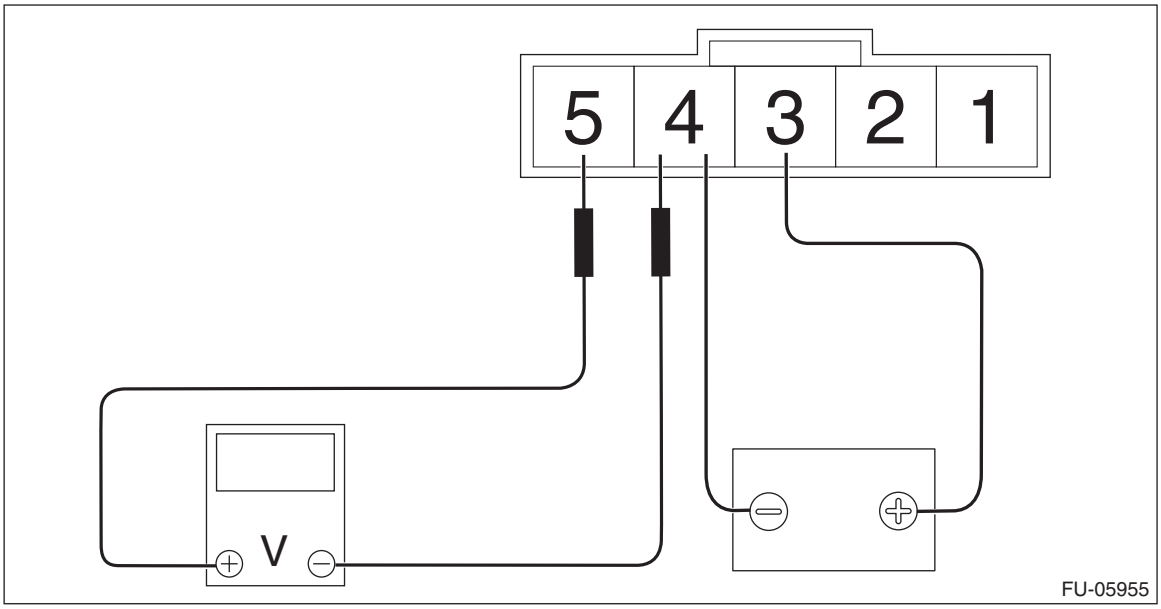
Install in the reverse order of removal.

Tightening torque:
1 N·m (0.1 kgf-m, 0.7 ft-lb)

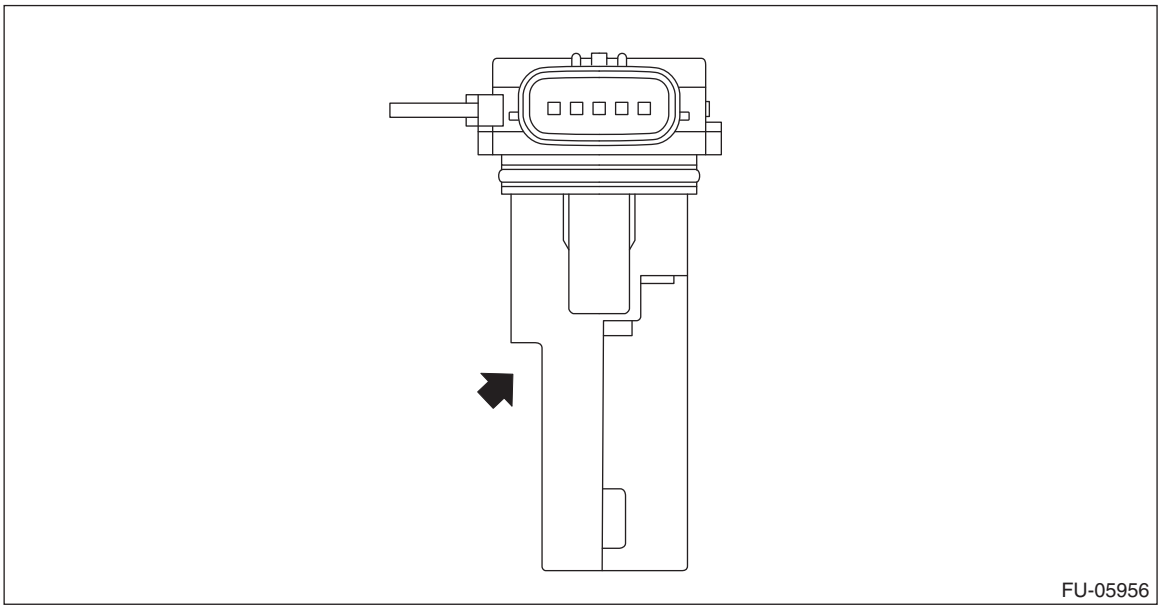
C: INSPECTION

1. CHECK THE MASS AIR FLOW SENSOR UNIT

1) Connect the battery positive terminal to terminal No. 3 and the battery ground terminal to terminal No. 4, the circuit tester positive terminal to terminal No. 5 and the circuit tester ground terminal to terminal No. 4.

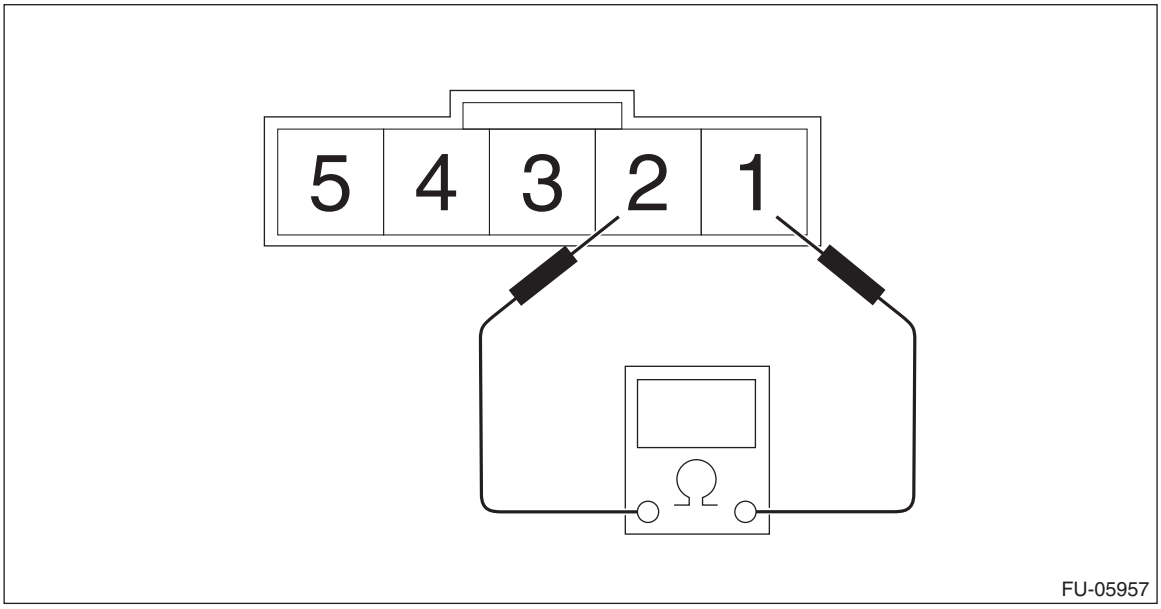


2) Check the voltage changes when air is blown to the mass air flow sensor unit in arrow direction.



2. CHECK THE INTAKE AIR TEMPERATURE SENSOR UNIT

Measure the resistance between intake air temperature sensor terminals.



Temperature	Terminal No.	Standard
–20°C (–4°F)	1 and 2	16.0±2.4 kΩ
20°C (68°F)		2.45±0.24 kΩ
60°C (140°F)		0.58±0.087 kΩ

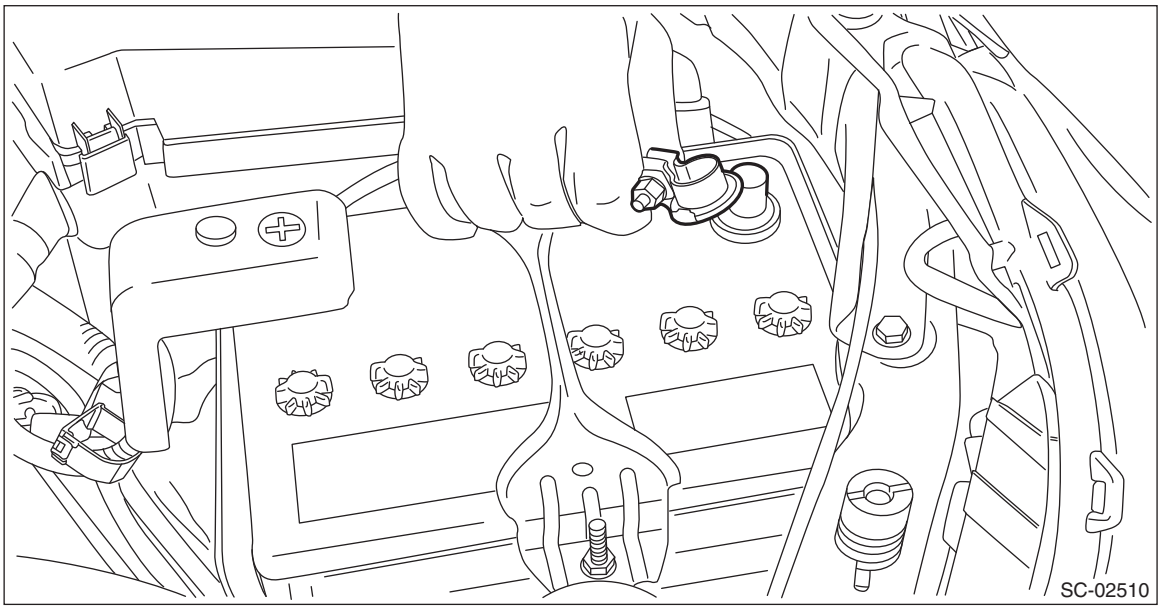
3. OTHER INSPECTIONS

1) Check that the mass air flow and intake air temperature sensor has no deformation, cracks or other damages.
2) Check that the mass air flow and intake air temperature sensor has no dirt.

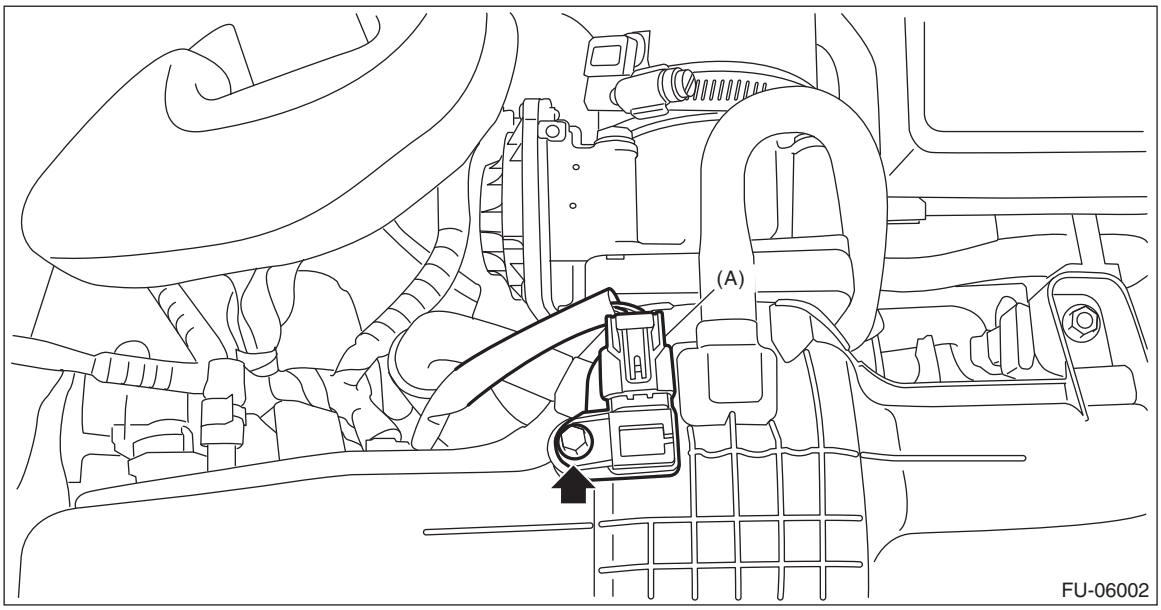
13.Manifold Absolute Pressure Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.



2) Disconnect the connector (A) from the manifold absolute pressure sensor, and remove the manifold absolute pressure sensor from intake manifold.



B: INSTALLATION

Install in the reverse order of removal.

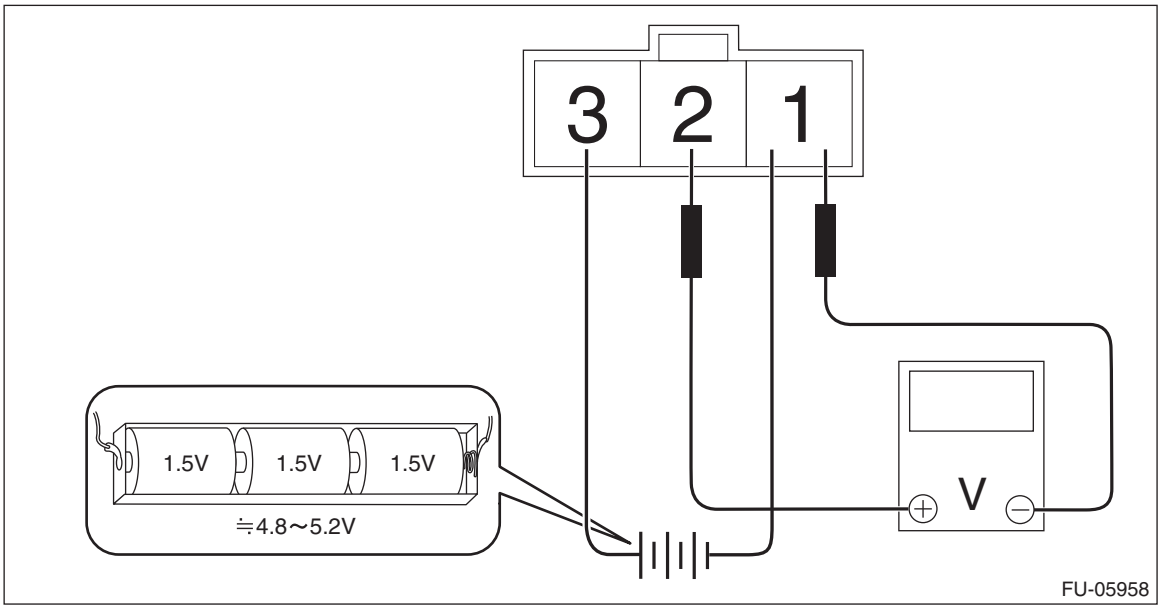
NOTE:
Use new O-rings.

Tightening torque:
2 N·m (0.2 kgf-m, 1.5 ft-lb)

C: INSPECTION

1) Check that the manifold absolute pressure sensor has no deformation, cracks or other damages.
2) Connect dry-cell battery positive terminal to terminal No. 3 and dry-cell battery ground terminal to terminal No. 1, circuit tester positive terminal to terminal No. 2 and the circuit tester negative terminal to terminal No. 1.

NOTE:
- Use new dry-cell batteries.
- Using circuit tester, check the voltage of a single dry-cell battery is 1.6 V or more. And also check the voltage of three batteries in series is between 4.8 V and 5.2 V.

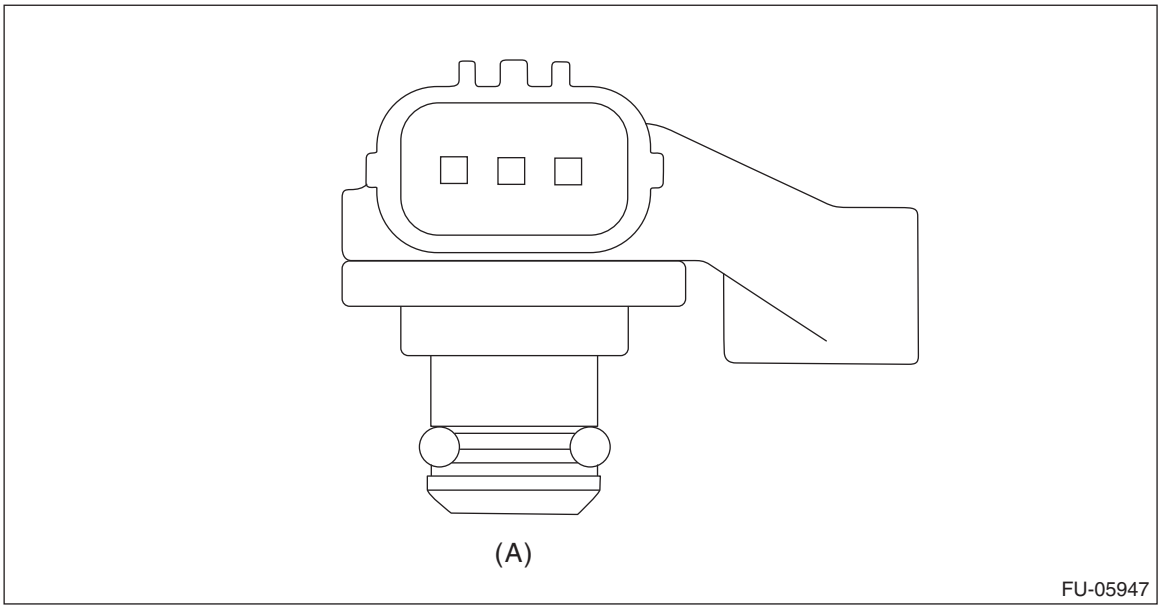


3) Check the voltage at a normal atmospheric pressure.

NOTE:
The atmospheric pressure at higher altitude is lower than normal. Therefore, the voltage is lower than the standard value.

Terminal No.	Standard
2 (+) and 1 (–)	Approx. 4.2 V (when 25°C (77°F))

4) Connect the Mighty Vac to the pressure port (A) of manifold absolute pressure sensor.



5) Check the voltage when generating vacuum and positive pressure using Mighty Vac.

CAUTION:
Do not apply vacuum of less than –88 kPa (–0.9 kgf/cm^2, –12.8 psi). Doing so may damage the manifold absolute pressure sensor.

NOTE:
When vacuum occurs at the pressure port of manifold absolute pressure sensor, the voltage will drop from the value as in step 3). When positive pressure occurs, on the other hand, the voltage will rise.

Pressure	Terminal No.	Standard
–88 kPa (–0.9 kgf/cm^2, –12.8 psi)	2 (+) and 1 (–)	Approx. 1 V (when 25°C (77°F))

14.EGR Control Valve

A: REMOVAL

For removal procedures of EGR control valve, refer to the “EC (H4DO)” section. <Ref. to EC(H4DO)-26, REMOVAL, EGR Control Valve.>

B: INSTALLATION

For installation procedures of EGR control valve, refer to the “EC (H4DO)” section. <Ref. to EC(H4DO)-27, INSTALLATION, EGR Control Valve.>

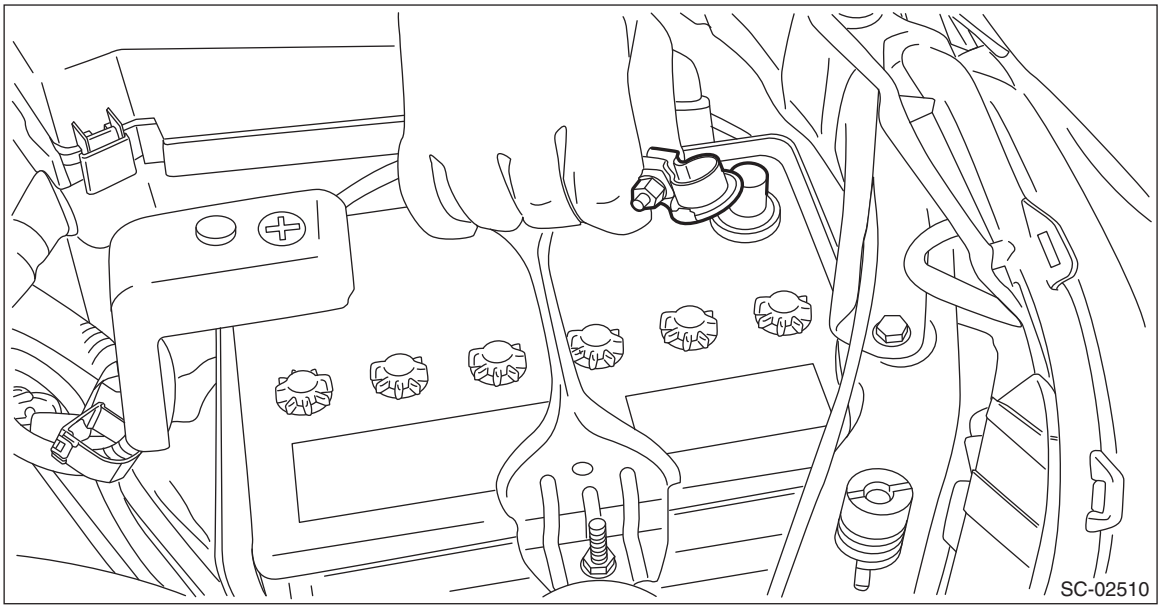
C: INSPECTION

For inspection procedures of EGR control valve, refer to the “EC (H4DO)” section. <Ref. to EC(H4DO)-27, INSPECTION, EGR Control Valve.>

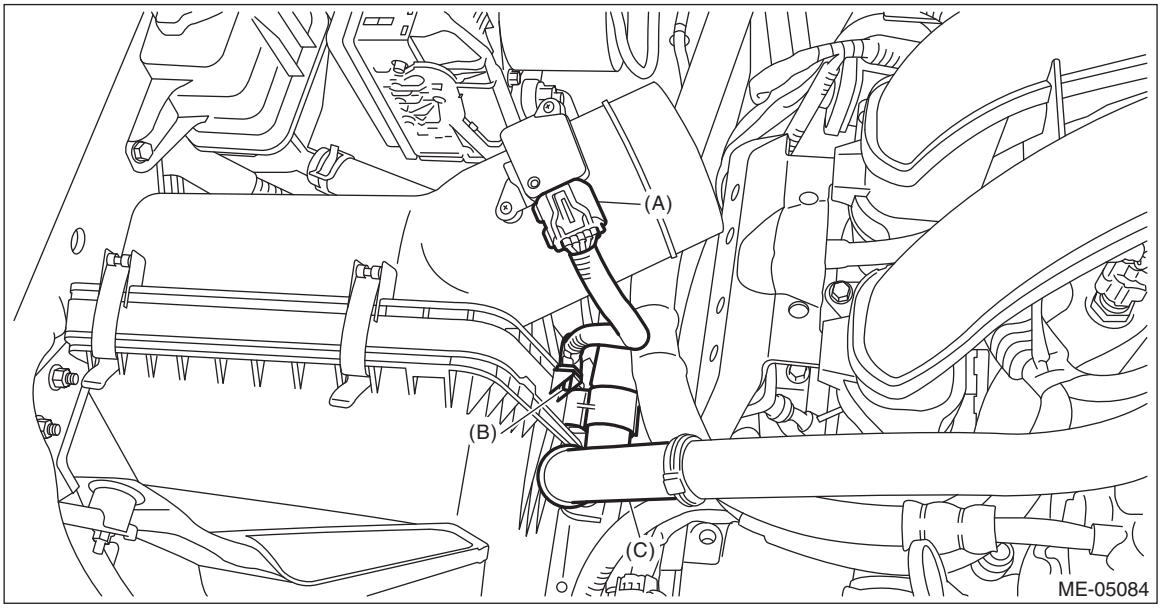
15.Fuel Injector

A: REMOVAL

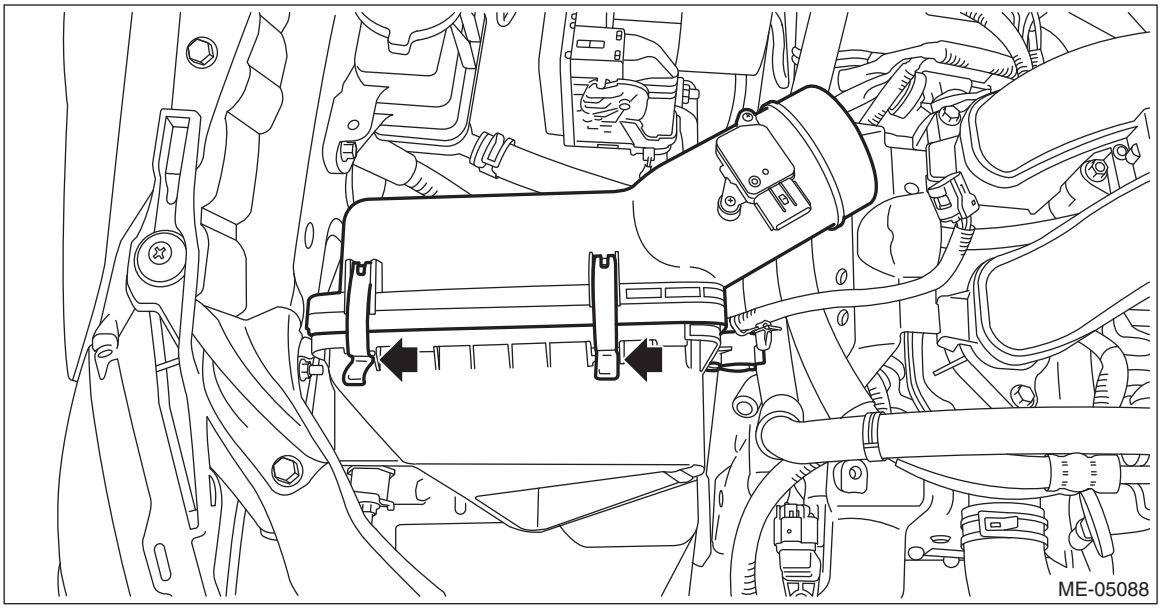
1) Release the fuel pressure. <Ref. to FU(H4DO)-109, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Disconnect the ground cable from battery.



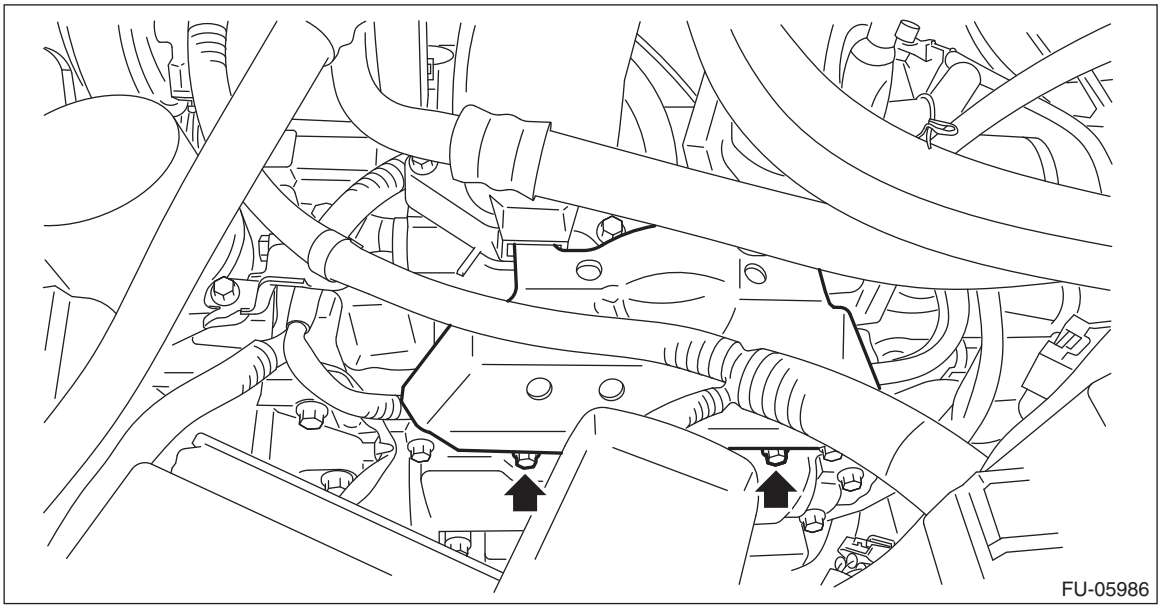
3) Open the fuel filler lid and remove the fuel filler cap.
4) Remove the air intake boot. (RH side only) <Ref. to IN(H4DO)-13, REMOVAL, Air Intake Boot.>
5) Disconnect the connector (A) from the mass air flow and intake air temperature sensor, and remove the clip (B) which holds the mass air flow and intake air temperature sensor harness. (RH side only)
6) Remove the suction hose (C) from the air cleaner case (rear). (RH side only)



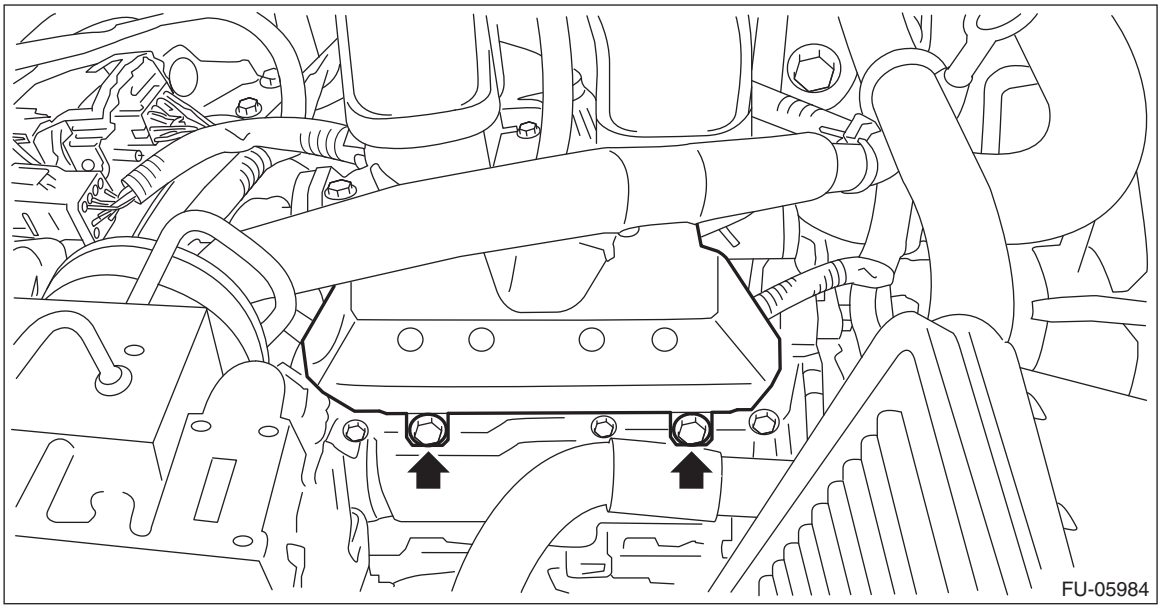
7) Remove the air cleaner case (rear). (RH side only)



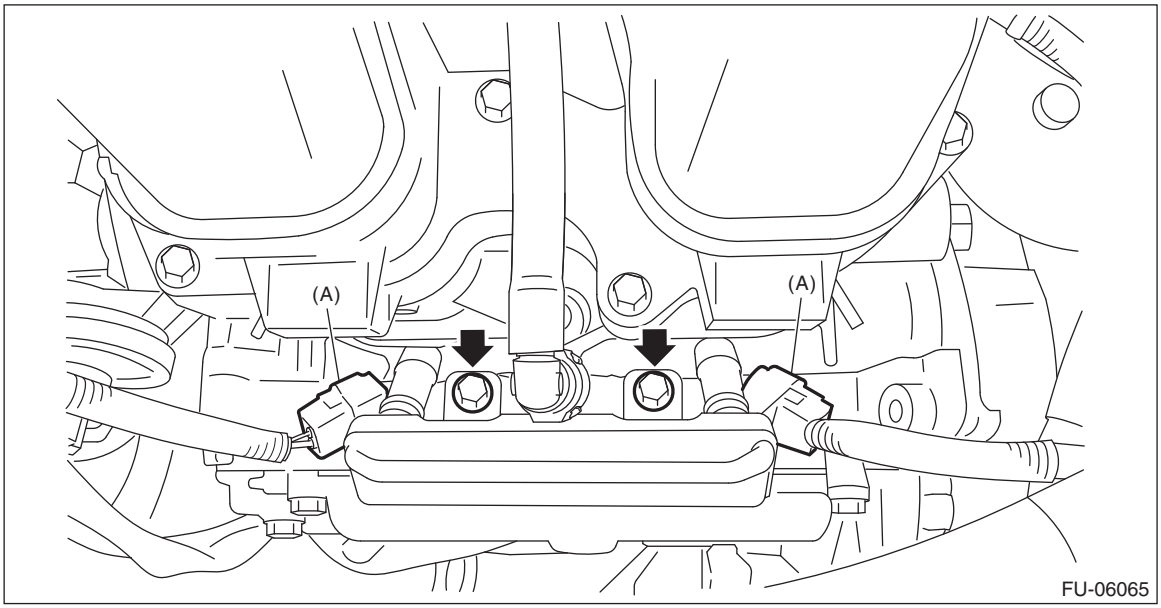
8) Remove the intake manifold protector.
- LH side



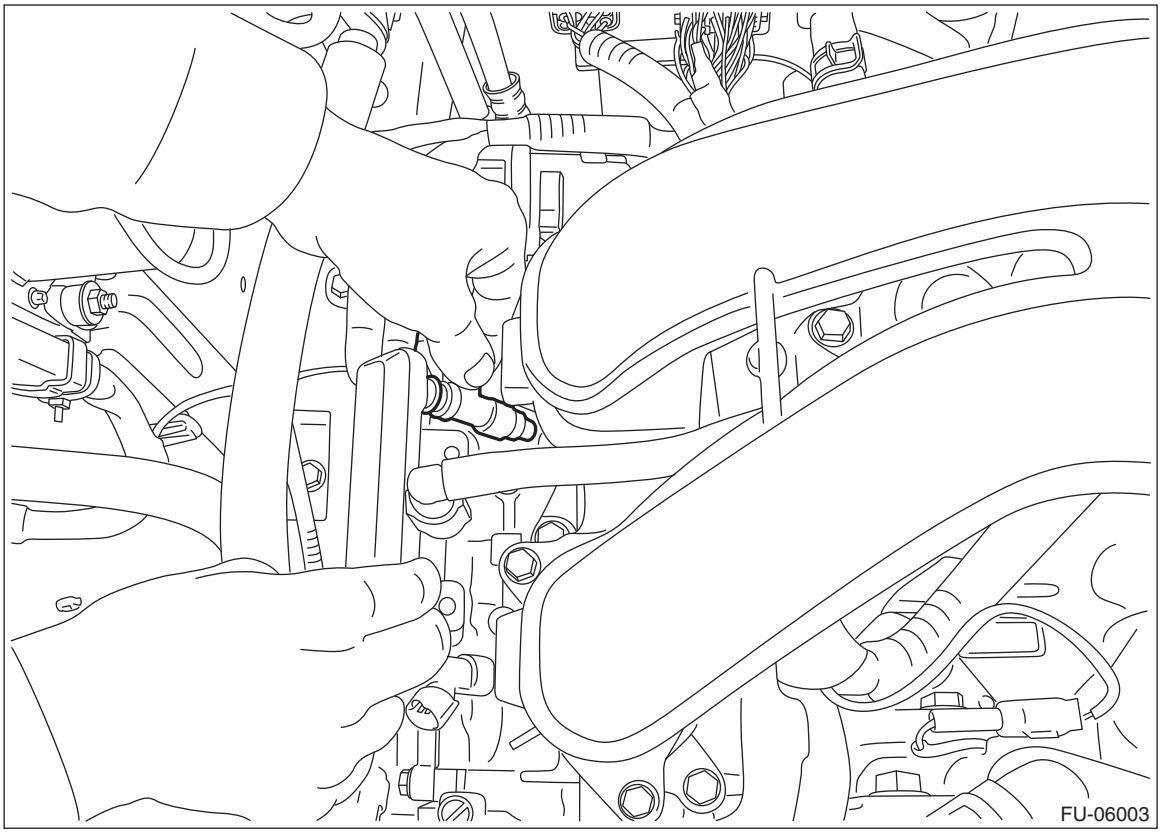
- RH side



9) Disconnect the connectors (A) from fuel injector.
10) Remove the bolts which hold fuel pipe onto the cam carrier.



11) Remove the fuel injector.

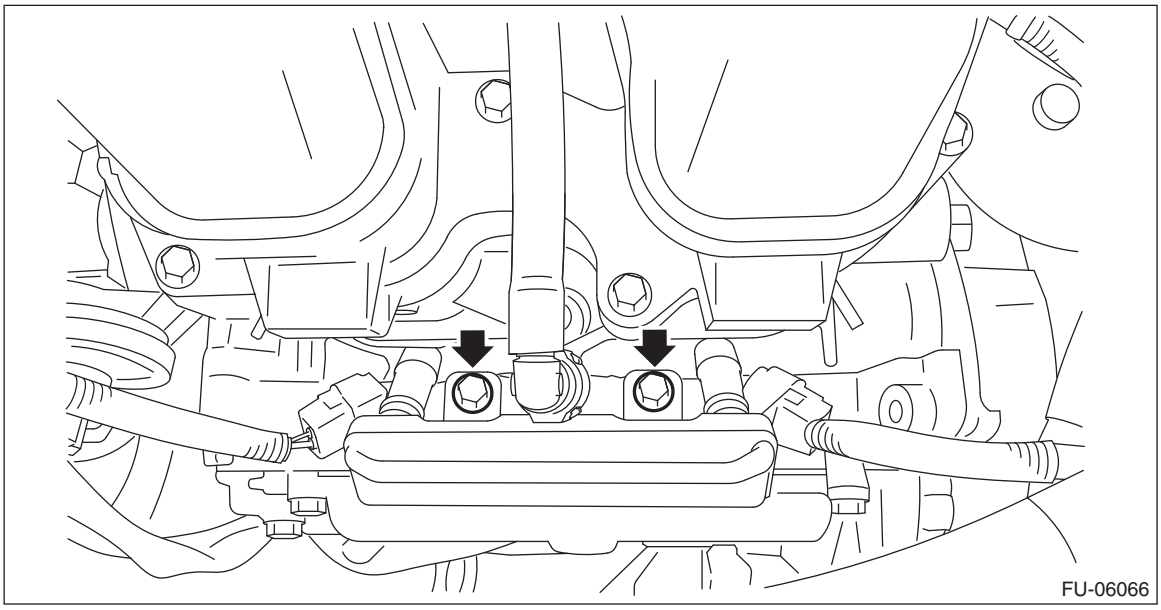


B: INSTALLATION

Install in the reverse order of removal.

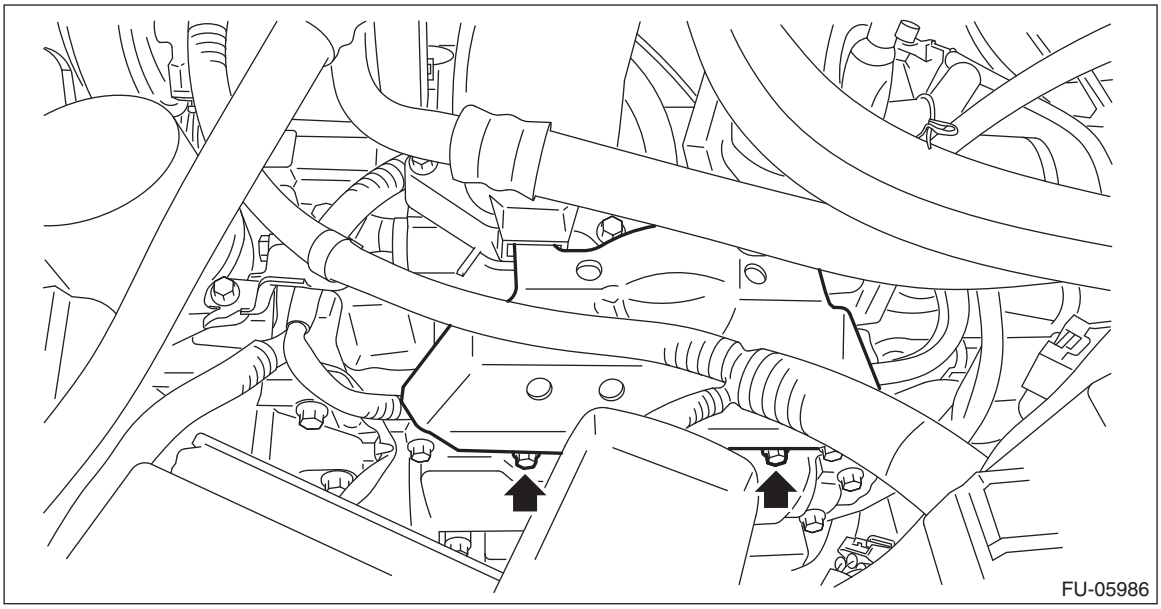
NOTE:
Use new O-rings, rubbers and seal rings.

Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)

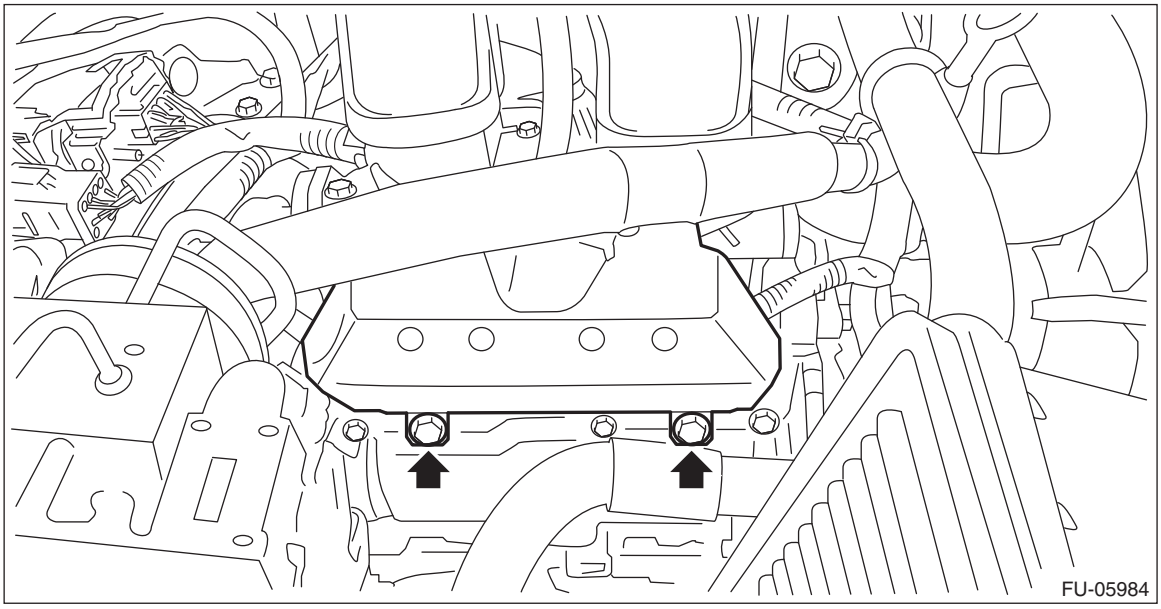


Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)

- LH side

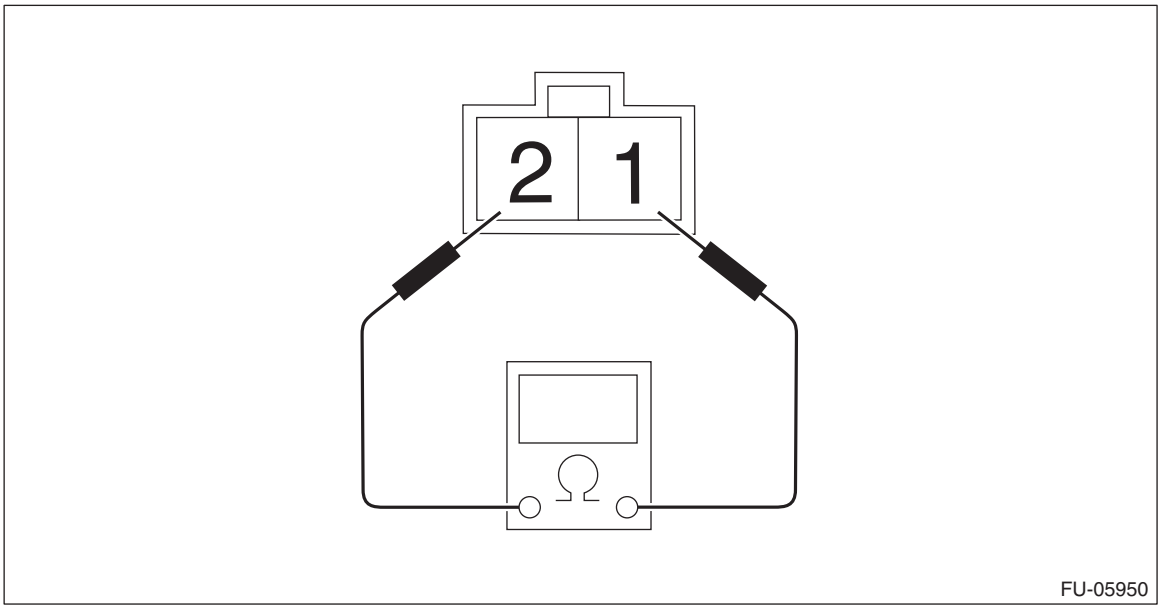


- RH side



C: INSPECTION

1) Check that the fuel injector has no deformation, cracks or other damages.
2) Measure the resistance between fuel injector terminals.

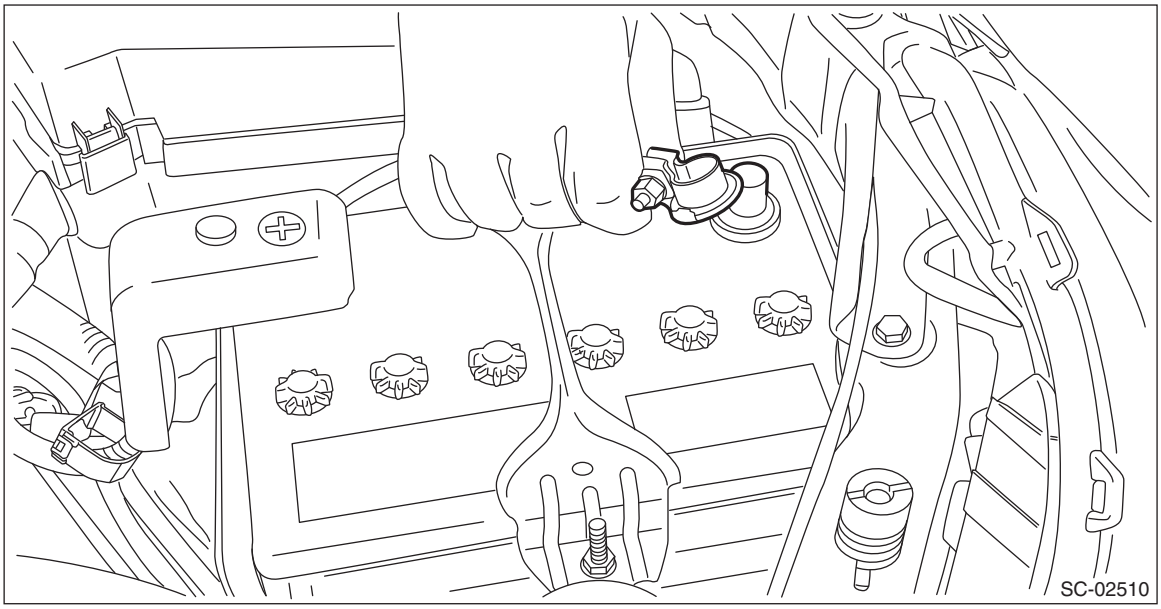


Terminal No.	Standard
1 and 2	Approx. 12.0 Ω (when 20°C (68°F))

16.Tumble Generator Valve Assembly

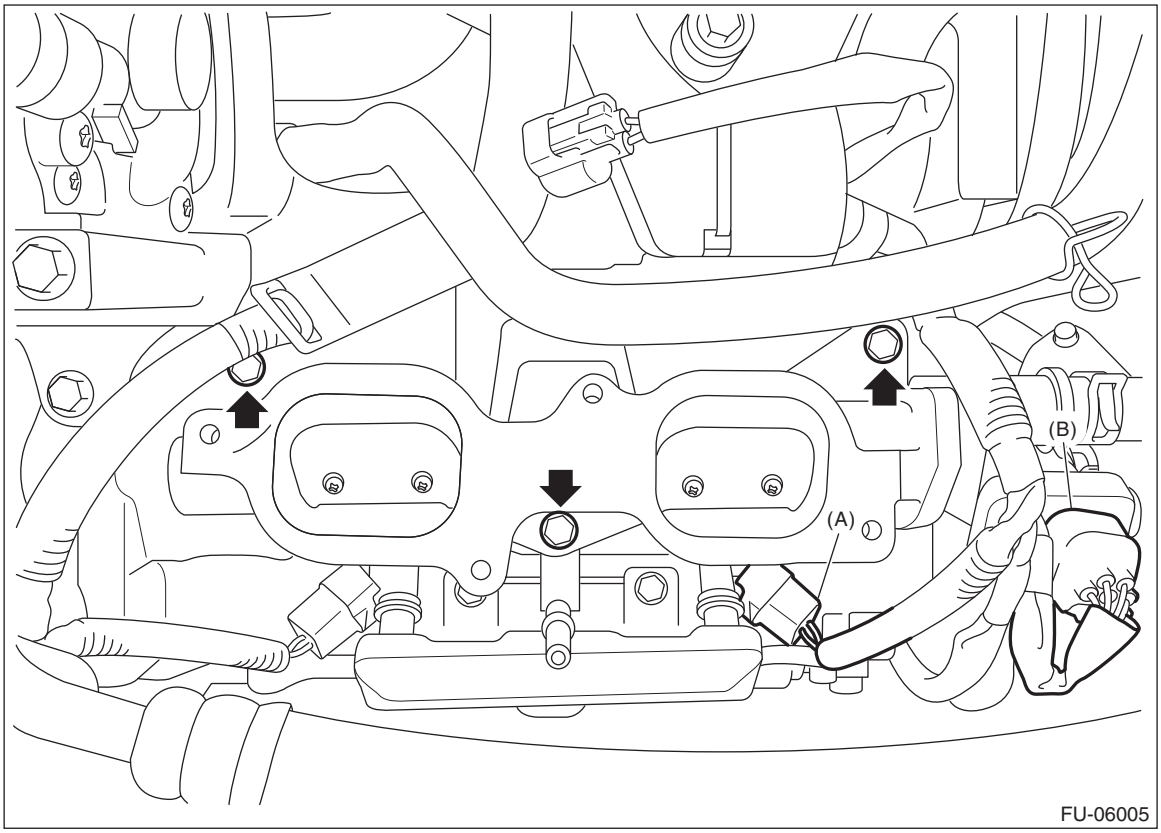
A: REMOVAL

1) Release the fuel pressure. <Ref. to FU(H4DO)-109, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Disconnect the ground cable from battery.

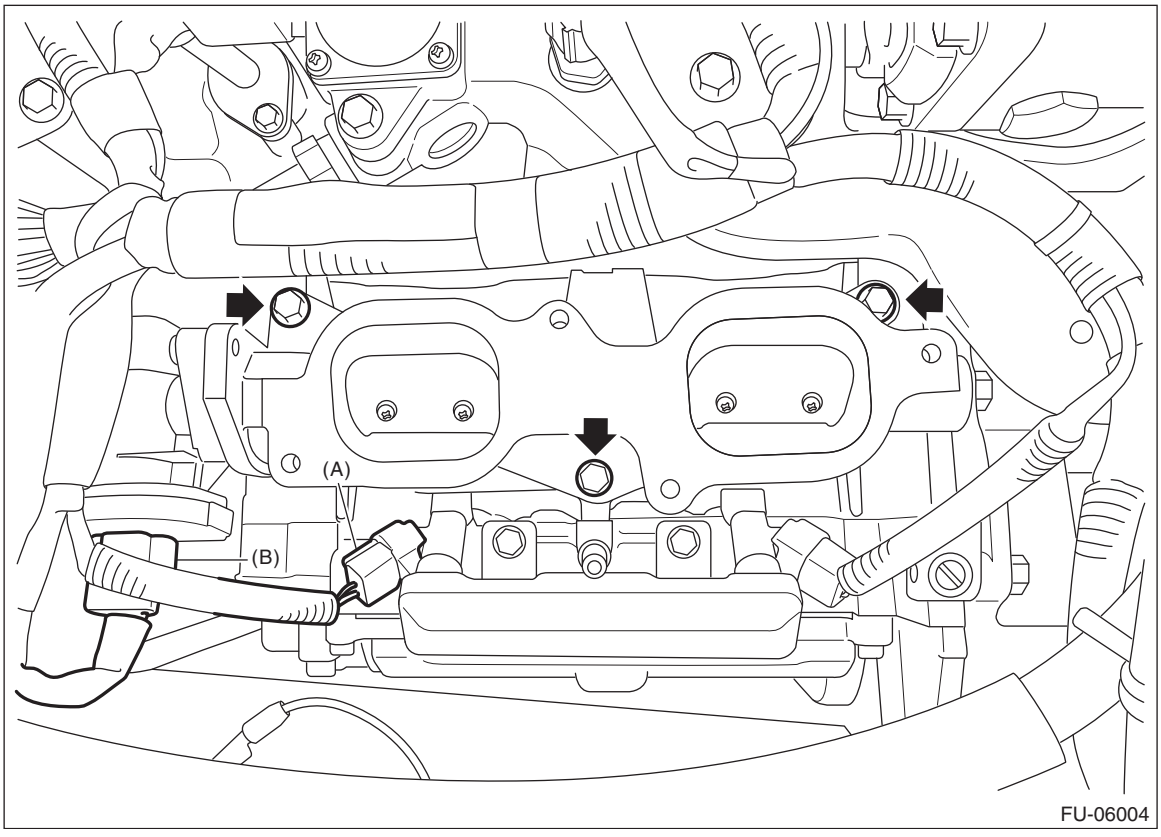


3) Open the fuel filler lid and remove the fuel filler cap.
4) Remove the intake manifold. <Ref. to FU(H4DO)-21, REMOVAL, Intake Manifold.>
5) Disconnect the connectors (A) from fuel injector.
6) Disconnect the connector (B) from the tumble generator valve assembly.
7) Remove the tumble generator valve assembly from the cylinder head.

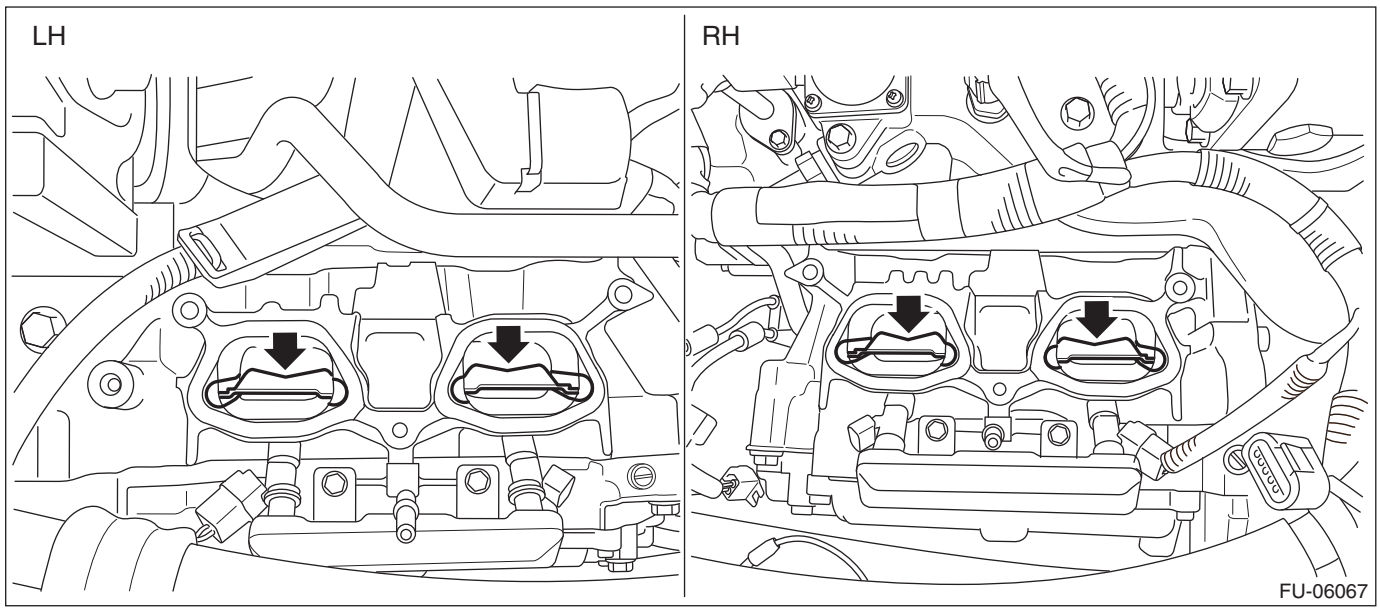
- LH side



- RH side



8) Remove the cylinder head plate from cylinder head.



B: INSTALLATION

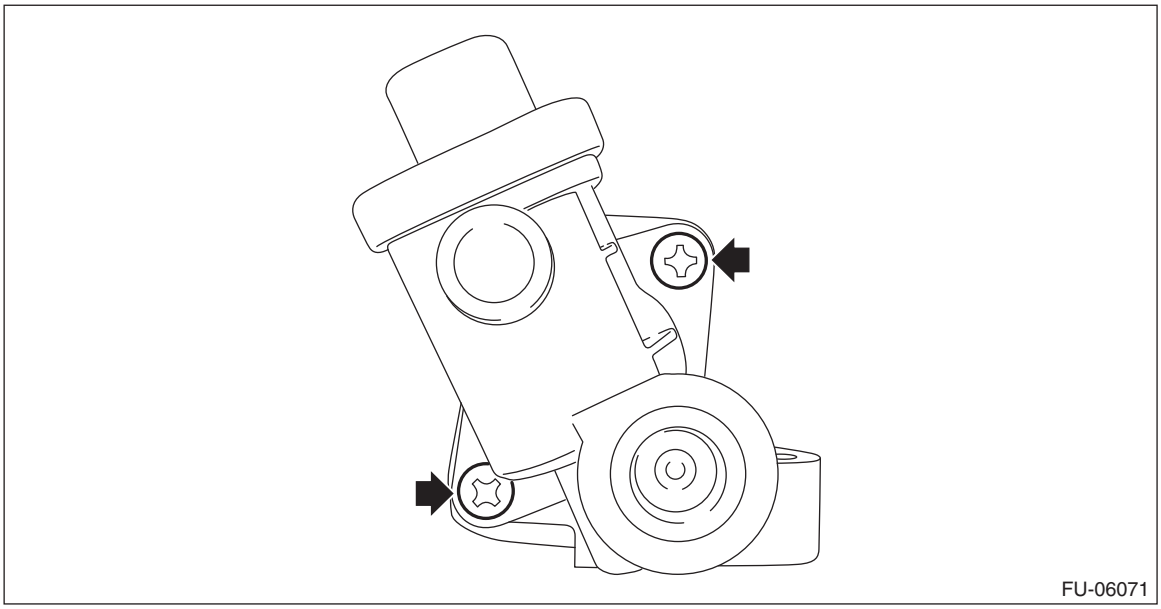
Install in the reverse order of removal.

NOTE:
Use a new gasket.

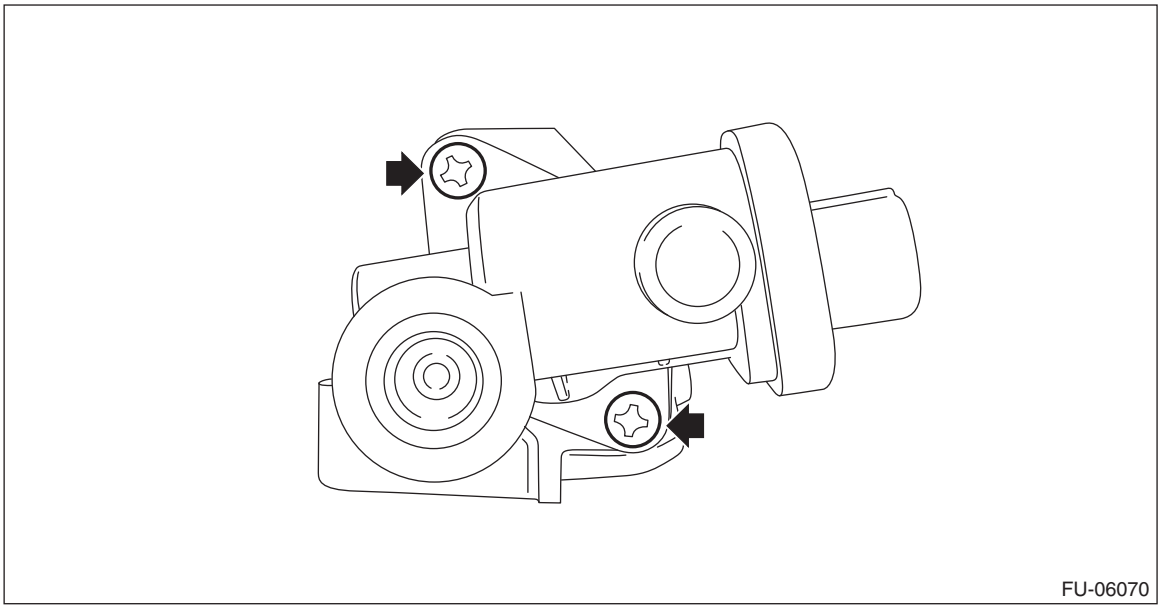
Tightening torque:
25 N·m (2.5 kgf-m, 18.4 ft-lb)

C: DISASSEMBLY

1) Remove the tumble generator valve actuator from the tumble generator valve.
- LH side



- RH side



D: ASSEMBLY

Assemble in the reverse order of disassembly.

NOTE:
Use a new gasket.

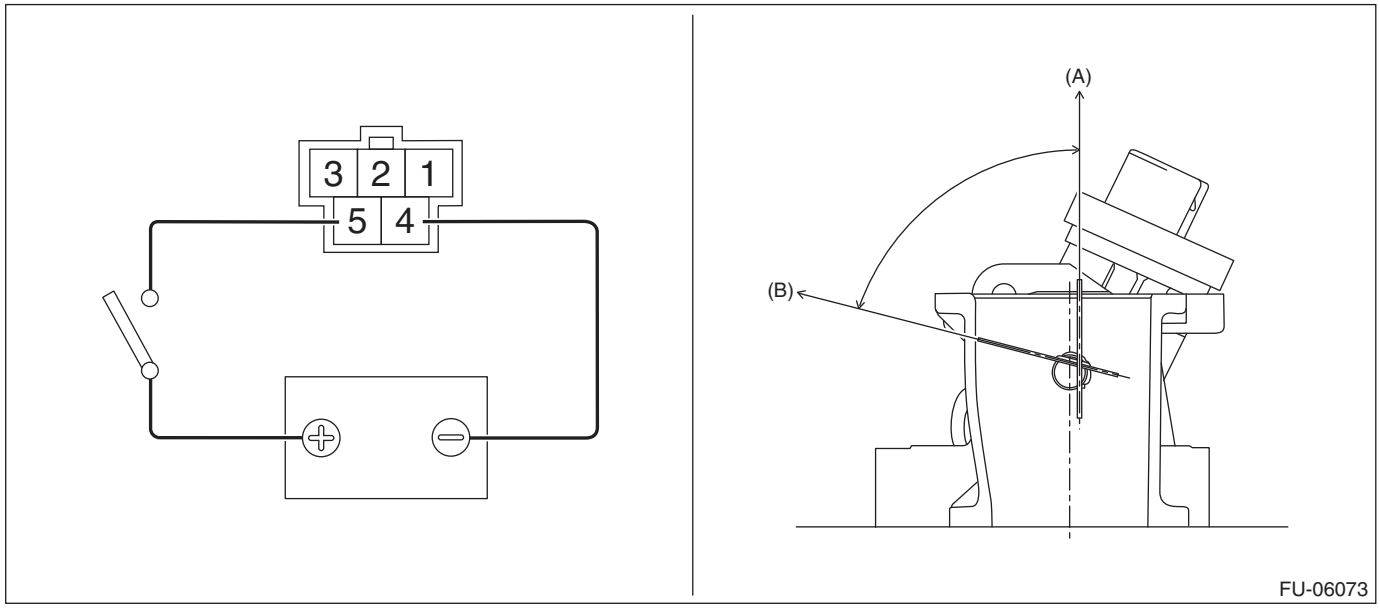
Tightening torque:
6 N·m (0.6 kgf-m, 4.4 ft-lb)

E: INSPECTION

1. CHECK MOTOR

1) Connect the battery positive terminal to terminal No. 5 and the battery ground terminal to terminal No. 4, and check that the valve is fully opened on LH side and the valve is fully closed on RH side.

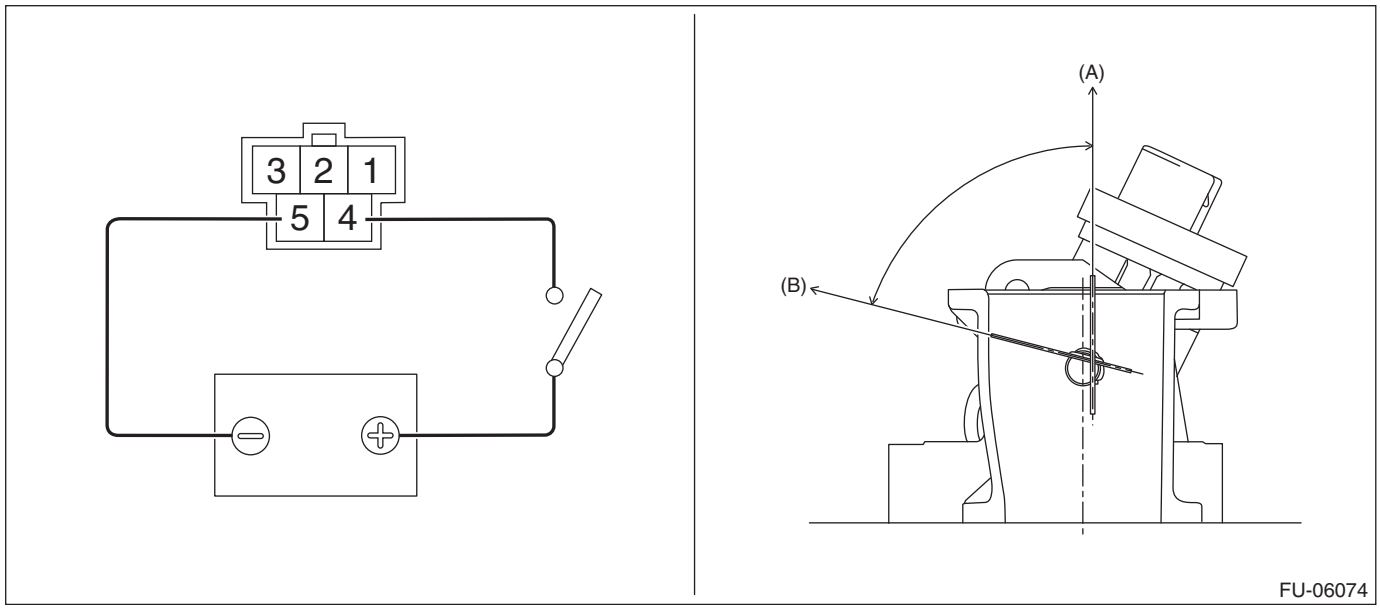
CAUTION:
Do not power the motor for more than 10 seconds.



(A) Full open (B) Full closed

2) Connect the battery positive terminal to terminal No. 4 and the battery ground terminal to terminal No. 5, and check that the valve is fully closed on LH side and the valve is fully opened on RH side.

CAUTION:
Do not power the motor for more than 10 seconds.



(A) Full open (B) Full closed

2. CHECK SENSORS

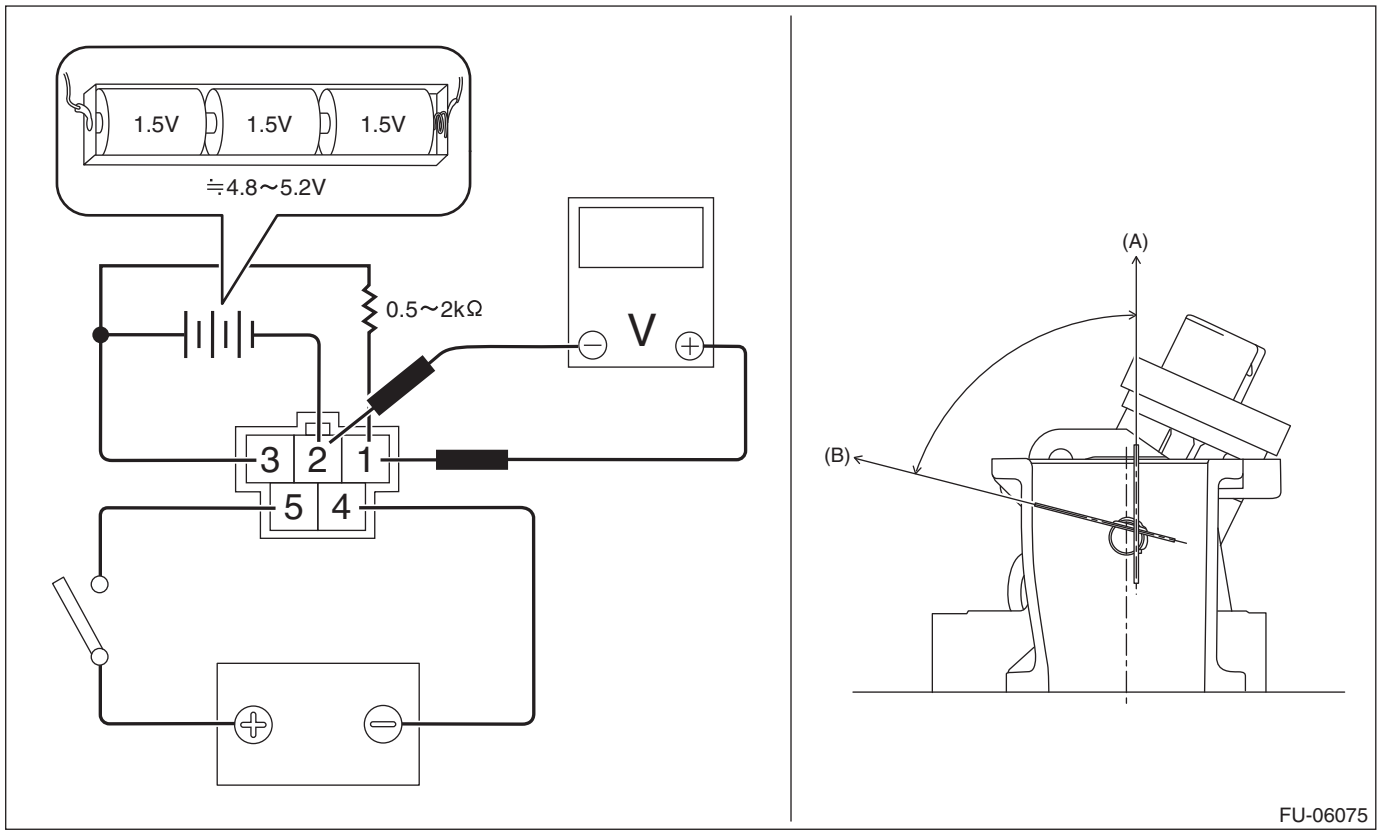
1) Connect dry-cell battery positive terminal to terminal No. 3 and dry-cell battery ground terminal to terminal No. 2, and connect the resistance (0.5 — 2 kΩ) between dry-cell battery positive terminal and terminal No. 1.

NOTE:
- Use new dry-cell batteries.
- Using circuit tester, check the voltage of a single dry-cell battery is 1.6 V or more. And also check the voltage of three batteries in series is between 4.8 V and 5.2 V.

2) Connect the circuit tester positive terminal to terminal No. 1, and the circuit tester negative terminal to terminal No. 2.

3) Connect the battery positive terminal to terminal No. 5 and the battery ground terminal to terminal No. 4, and measure the voltages with the valve fully opened on LH side and with the valve fully closed on RH side.

CAUTION:
Do not power the motor for more than 10 seconds.



(A) Full open (B) Full closed

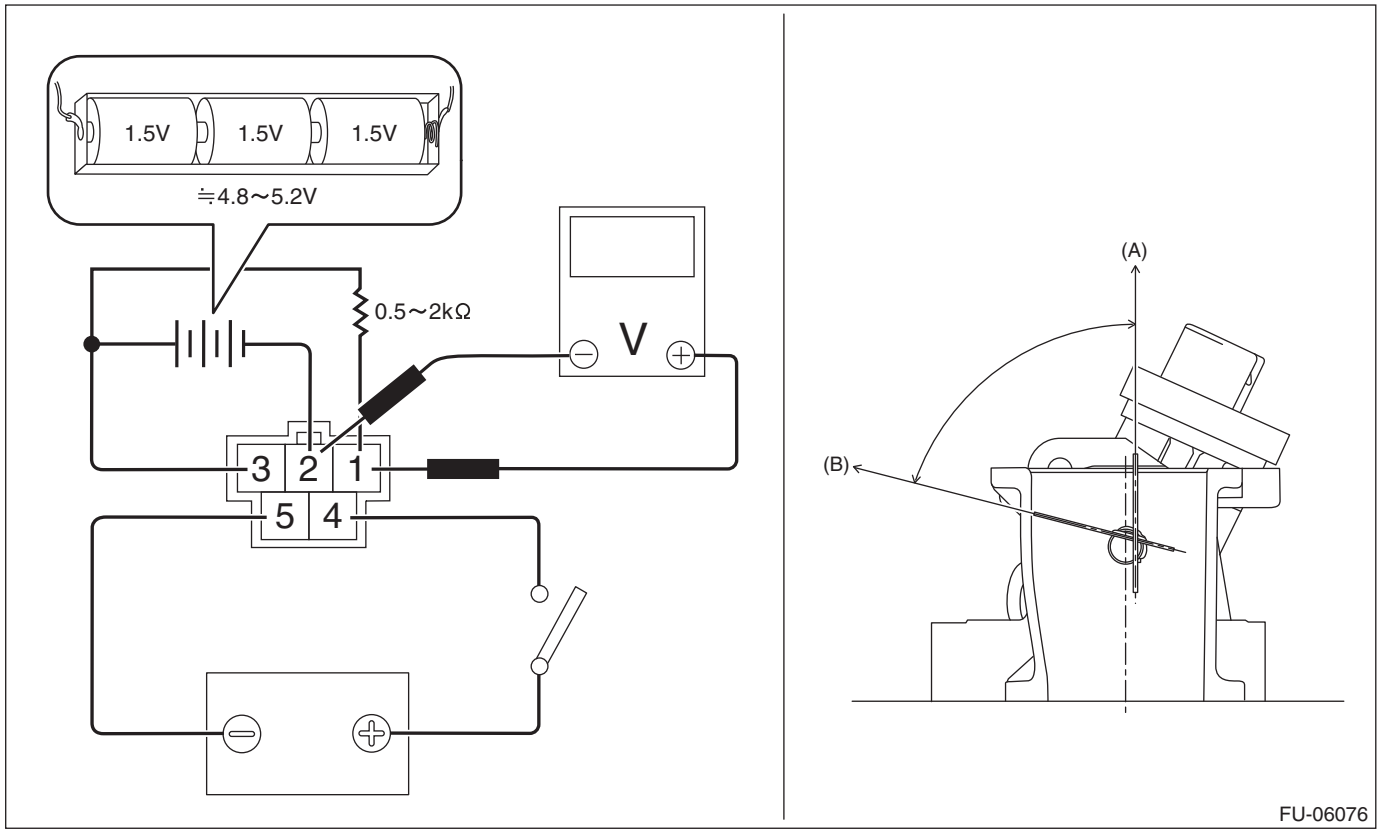
Terminal No.	Standard
1 (+) and 2 (–)	LH side: Approx. 5 V (when 25°C (77°F)) RH side: Approx. 0 — 0.5 V (when 25°C (77°F))

4) Connect dry-cell battery positive terminal to terminal No. 3 and dry-cell battery ground terminal to terminal No. 2, and connect the resistance (0.5 — 2 kΩ) between dry-cell battery positive terminal and terminal No. 1.

NOTE:
- Use new dry-cell batteries.
- Using circuit tester, check the voltage of a single dry-cell battery is 1.6 V or more. And also check the voltage of three batteries in series is between 4.8 V and 5.2 V.

5) Connect the circuit tester positive terminal to terminal No. 1, and the circuit tester negative terminal to terminal No. 2.
6) Connect the battery positive terminal to terminal No. 4 and the battery ground terminal to terminal No. 5, and measure the voltages with the valve fully closed on LH side and with the valve fully opened on RH side.

CAUTION:
Do not power the motor for more than 10 seconds.



(A) Full open (B) Full closed

Terminal No.	Standard
1 (+) and 2 (–)	LH side: Approx. 0 — 0.5 V (when 25°C (77°F)) RH side: Approx. 5 V (when 25°C (77°F))

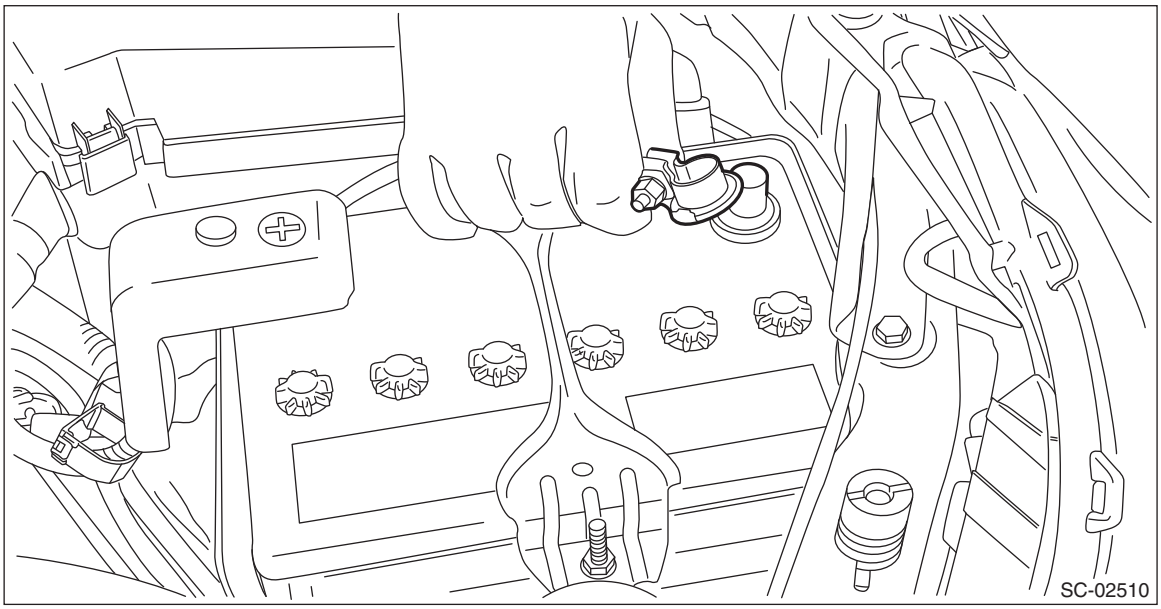
3. OTHER INSPECTIONS

1) Check that the tumble generator valve assembly has no deformation, cracks or other damages.
2) Check tumble generator valve assembly for contamination or clogging.

17.Tumble Generator Valve Actuator

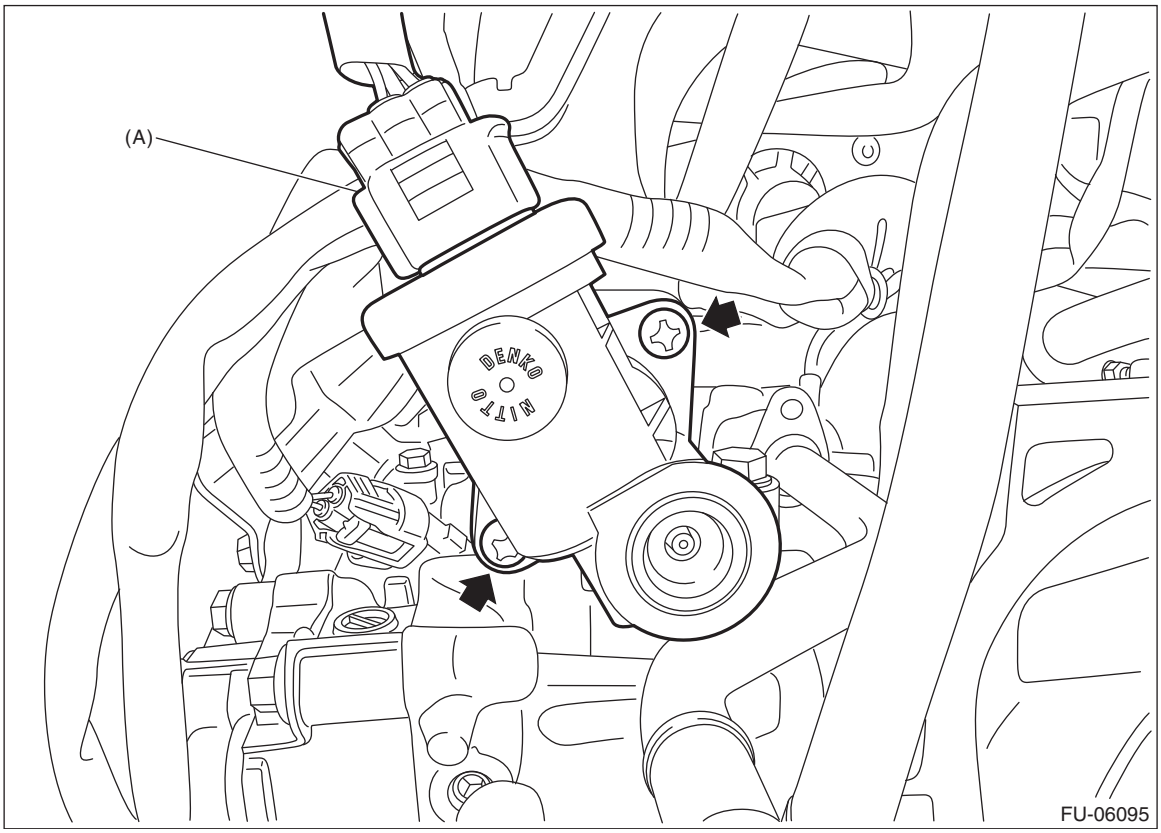
A: REMOVAL

1) Disconnect the ground cable from battery.

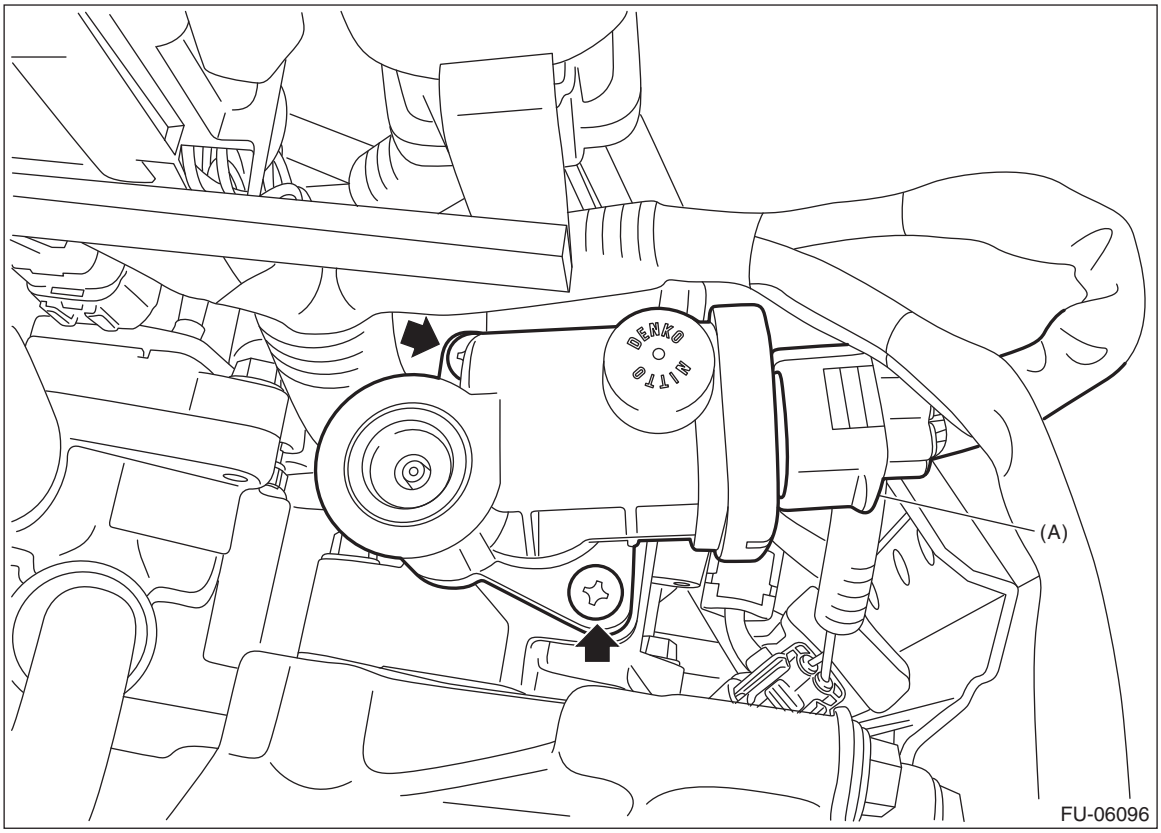


2) Disconnect the connector (A) from tumble generator valve assembly, and remove the tumble generator valve actuator.

- LH side



- RH side



B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Use a new gasket.

Tightening torque:
6 N·m (0.6 kgf-m, 4.4 ft-lb)

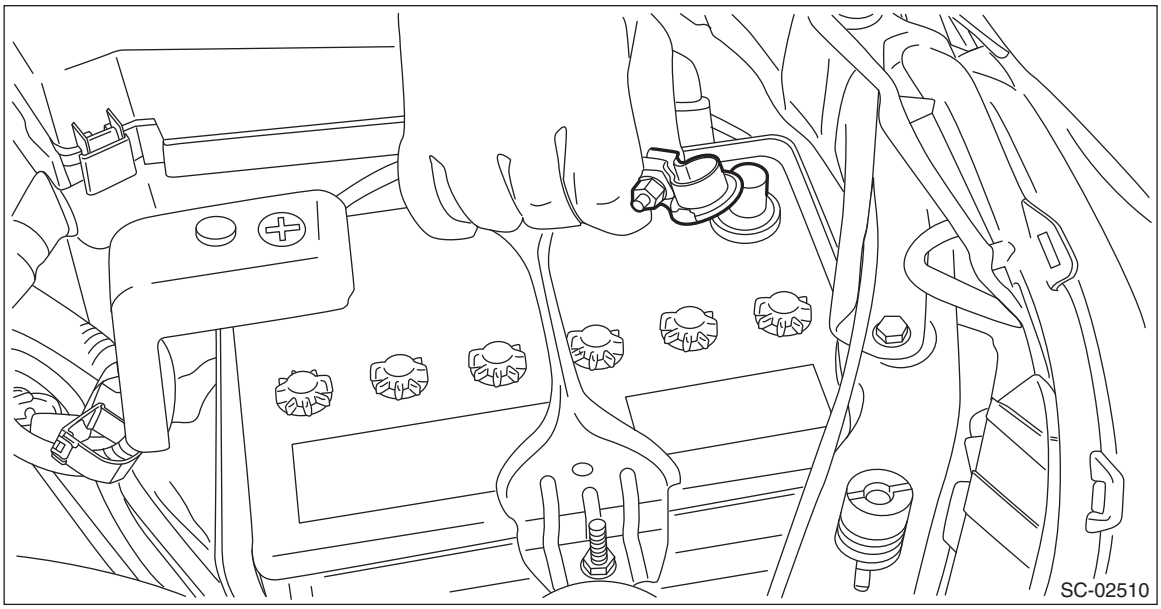
C: INSPECTION

1) Check that the tumble generator valve actuator has no deformation, cracks or other damages.
2) Check tumble generator valve actuator for contamination or clogging.

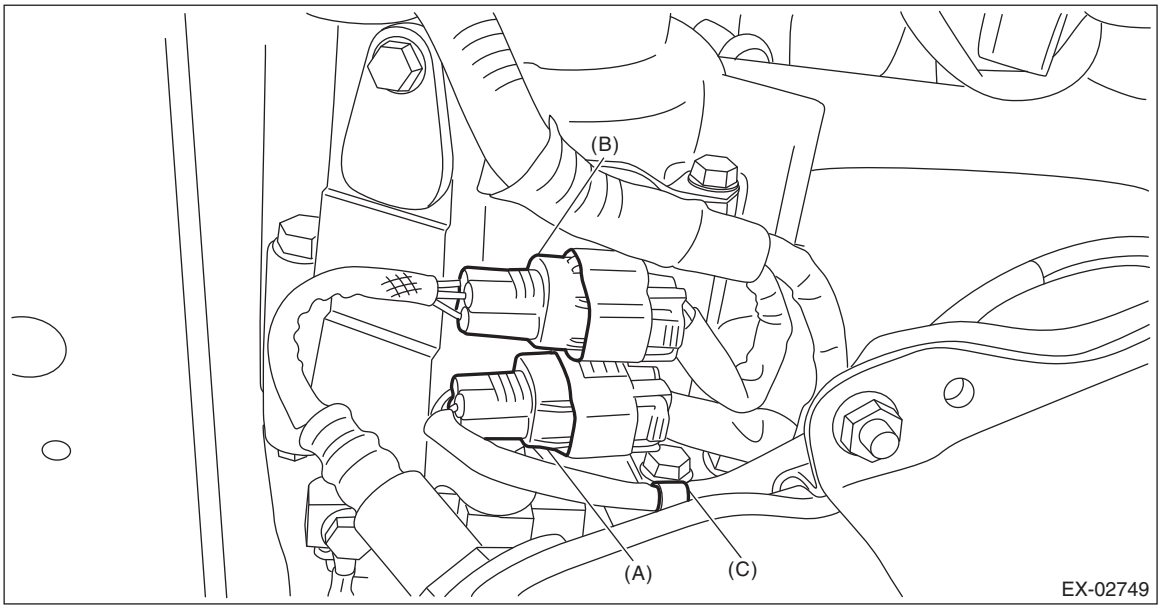
18.Front Oxygen (A/F) Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.



2) Remove the radiator sub fan. <Ref. to CO(H4DO)-37, REMOVAL, Radiator Sub Fan and Fan Motor.>
3) Lift up the vehicle.
4) Remove the under cover RH. <Ref. to EI-26, REMOVAL, Front Under Cover.>
5) Disconnect the front oxygen (A/F) sensor connector, and remove the clip holding the front oxygen (A/F) sensor harness.

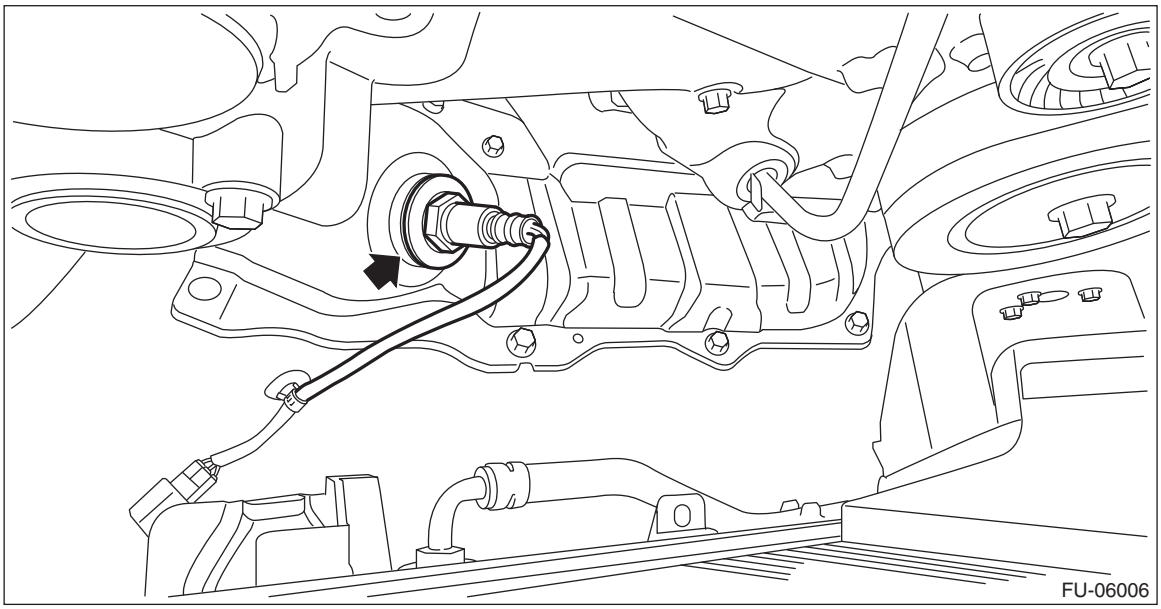


(A) Front oxygen (A/F) sensor connector
(B) Rear oxygen sensor connector
(C) Clip

6) Lower the vehicle.
7) Apply spray-type lubricant to the threaded portion of front oxygen (A/F) sensor, and leave it for one minute or more.

8) Remove the front oxygen (A/F) sensor.

CAUTION:
When removing the front oxygen (A/F) sensor, wait until exhaust pipe cools, otherwise it will damage the exhaust pipe.



B: INSTALLATION

CAUTION:
If lubricant is spilt over the exhaust pipe, wipe it off with cloth to avoid emission of smoke or causing a fire.

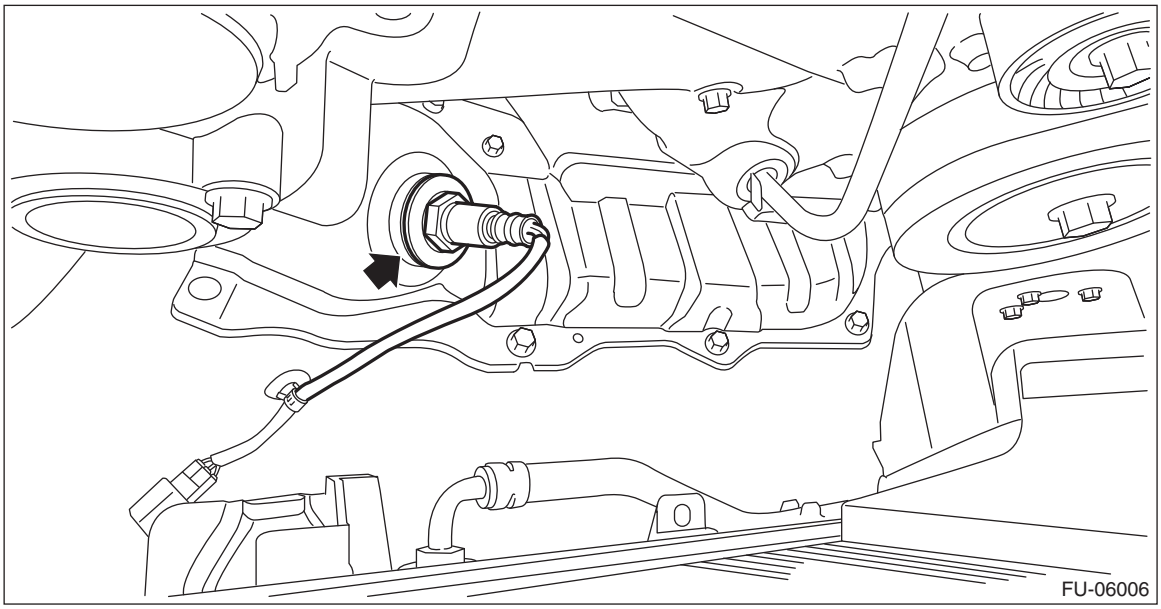
1) Before installing front oxygen (A/F) sensor, apply anti-seize compound only to the threaded portion of front oxygen (A/F) sensor to make the next removal easier.

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

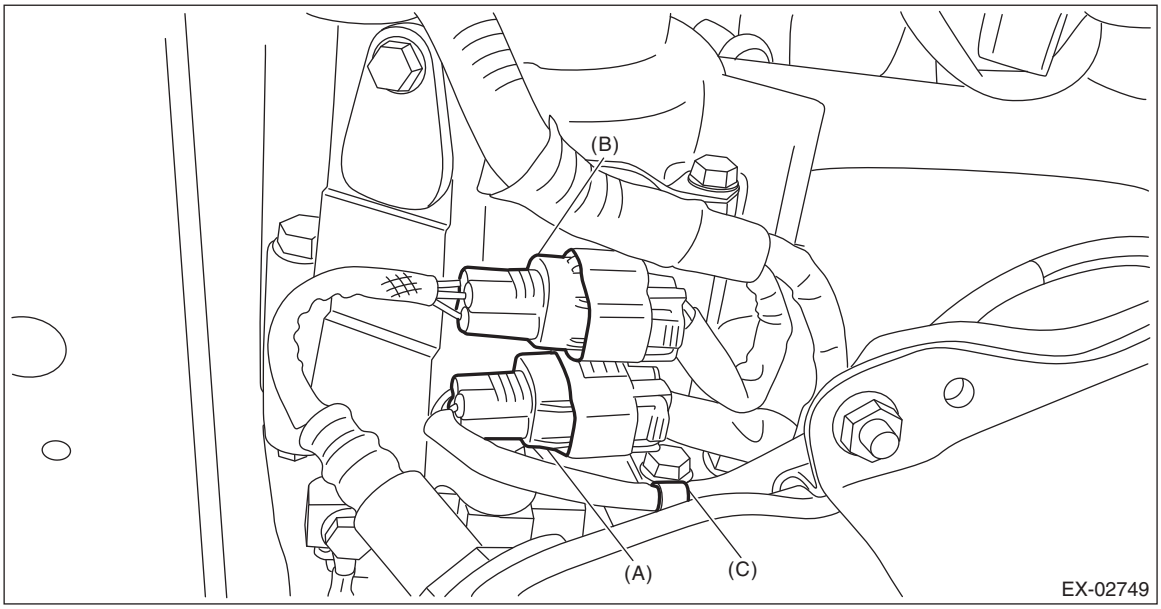
Anti-seize compound:
NEVER-SEEZ NSN, JET LUBE SS-30 or equivalent

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

Tightening torque:
21 N·m (2.1 kgf-m, 15.5 ft-lb)



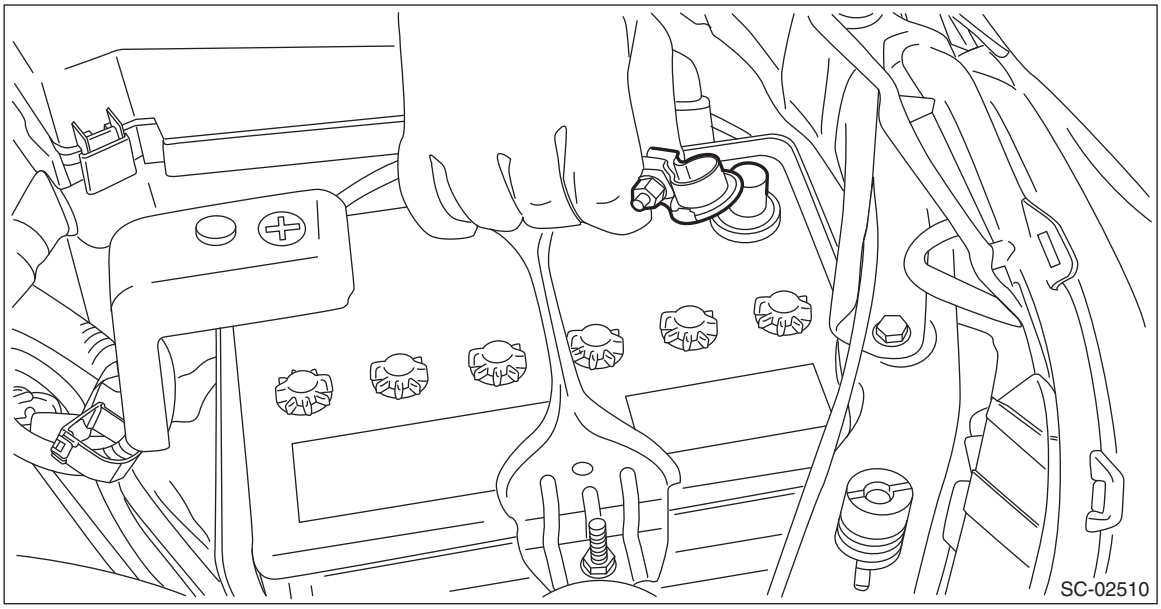
3) Lift up the vehicle.
4) Connect the front oxygen (A/F) sensor connector, and secure the front oxygen (A/F) sensor harness by using the clip.



(A) Front oxygen (A/F) sensor connector
(B) Rear oxygen sensor connector
(C) Clip

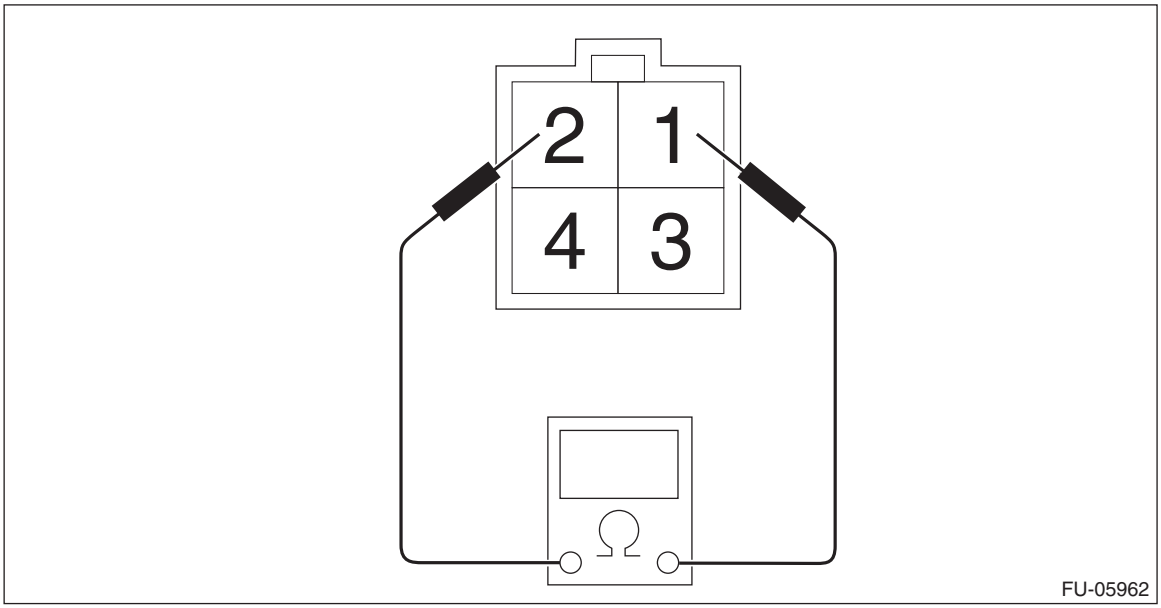
5) Install the under cover RH. <Ref. to EI-26, INSTALLATION, Front Under Cover.>
6) Lower the vehicle.
7) Install the radiator sub fan. <Ref. to CO(H4DO)-38, INSTALLATION, Radiator Sub Fan and Fan Motor.>

8) Connect the battery ground terminal.



C: INSPECTION

1) Check that the front oxygen (A/F) sensor has no deformation, cracks or other damages.
2) Measure the resistance between front oxygen (A/F) sensor terminals.

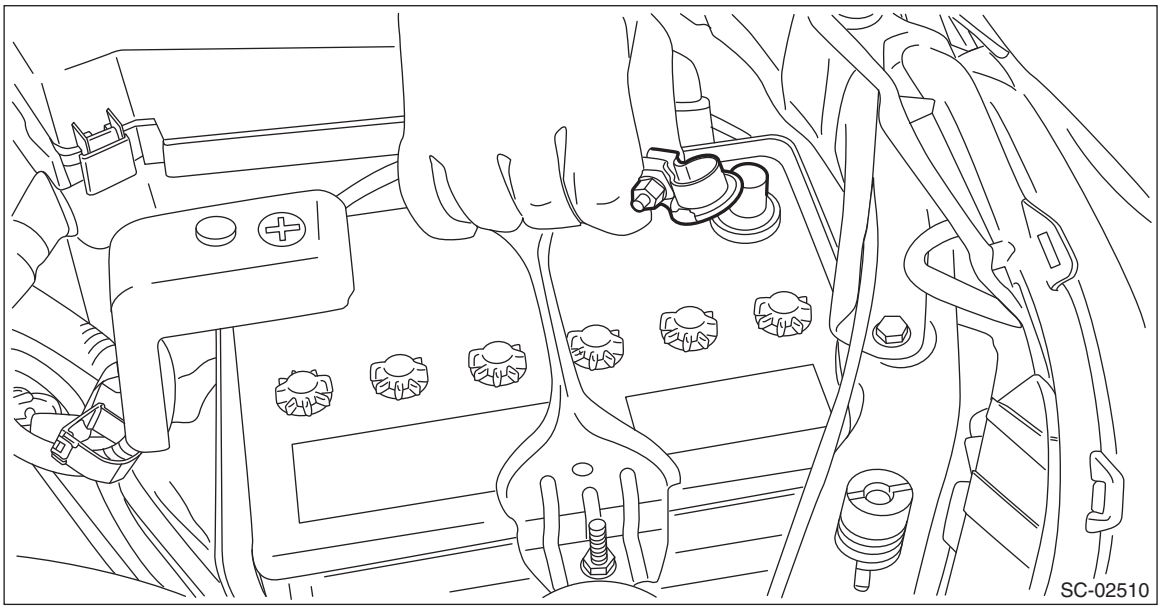


Terminal No.	Standard
1 and 2	$2.2^{+0.45}_{-0.22}$ Ω (when 20°C (68°F))

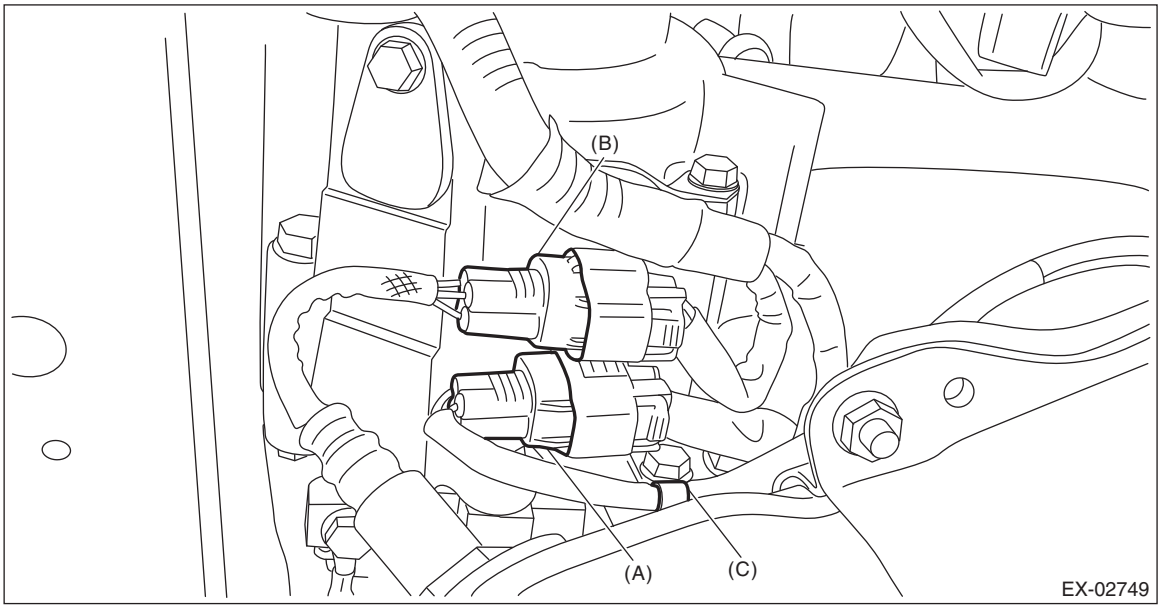
19.Rear Oxygen Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.



2) Lift up the vehicle.
3) Remove the under cover RH. <Ref. to EI-26, REMOVAL, Front Under Cover.>
4) Disconnect the rear oxygen sensor connector.

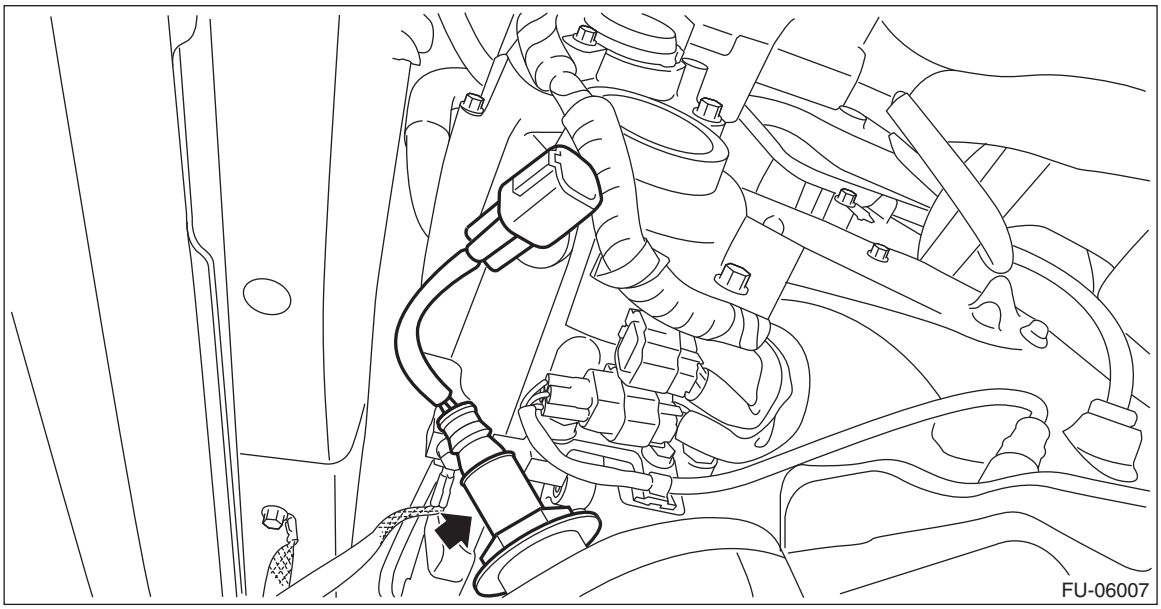


(A) Front oxygen (A/F) sensor connector
(B) Rear oxygen sensor connector
(C) Clip

5) Apply spray-type lubricant to the threaded portion of rear oxygen sensor, and leave it for one minute or more.

6) Remove the rear oxygen sensor.

CAUTION:
When removing the rear oxygen sensor, wait until exhaust pipe cools, otherwise it will damage the exhaust pipe.



B: INSTALLATION

CAUTION:
If lubricant is spilt over the exhaust pipe, wipe it off with cloth to avoid emission of smoke or causing a fire.

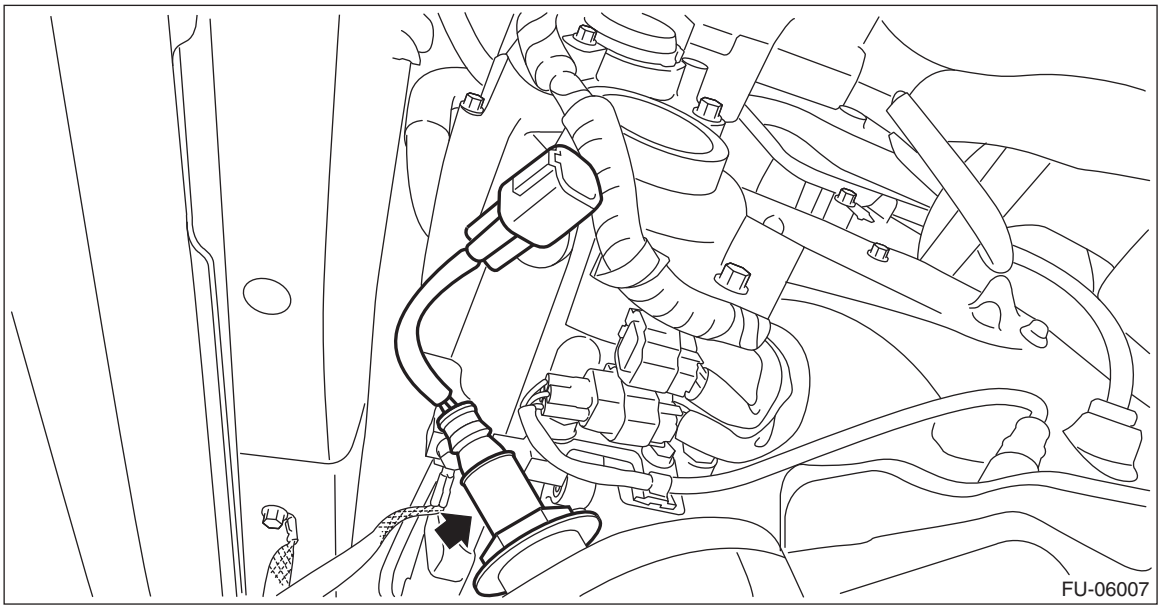
1) Before installing rear oxygen sensor, apply the anti-seize compound only to the threaded portion of rear oxygen sensor to make the next removal easier.

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

Anti-seize compound:
NEVER-SEEZ NSN, JET LUBE SS-30 or equivalent

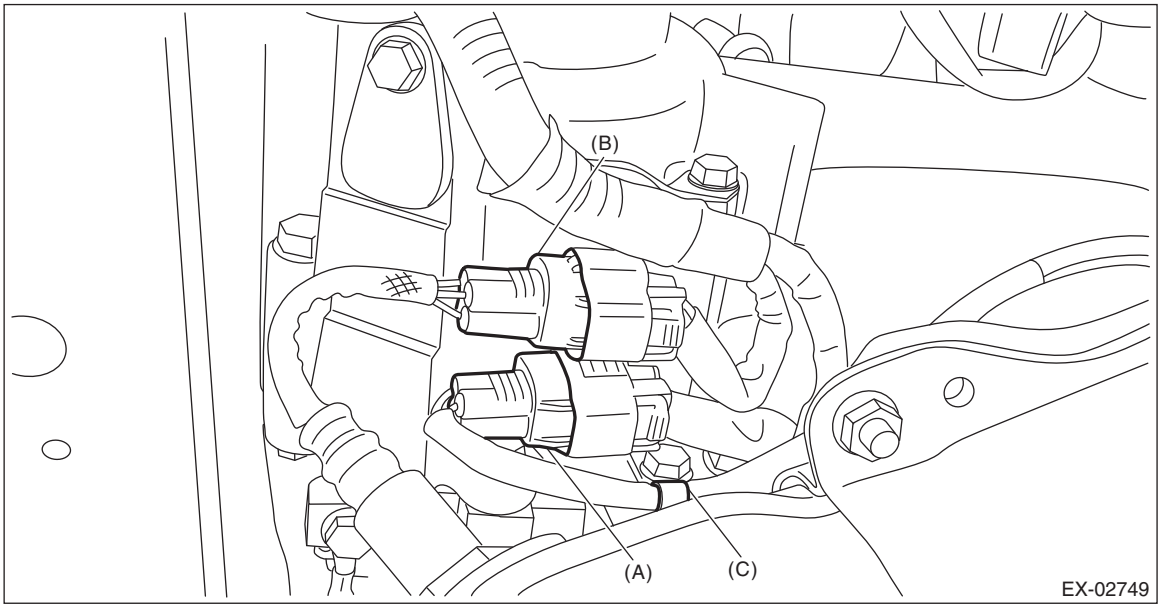
2) Install the rear oxygen sensor.

Tightening torque:
21 N·m (2.1 kgf-m, 15.5 ft-lb)



3) Connect the rear oxygen sensor connector.

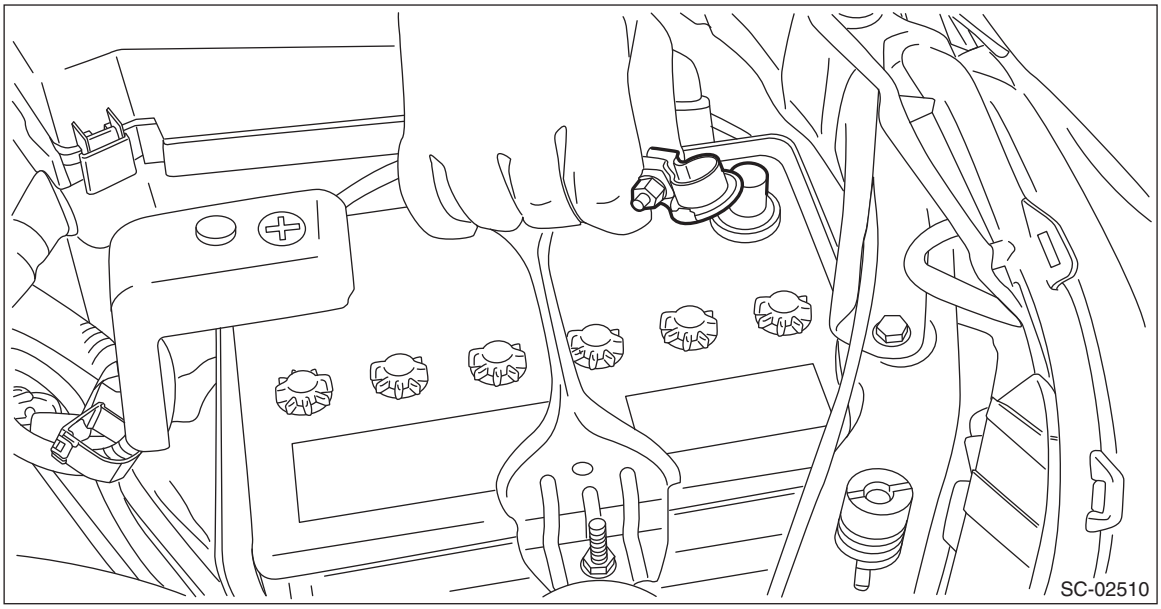
NOTE:
Be careful not to allow the rear oxygen sensor harness to interfere with the sensor unit and the front oxygen (A/F) sensor harness.



(A) Front oxygen (A/F) sensor connector
(B) Rear oxygen sensor connector
(C) Clip

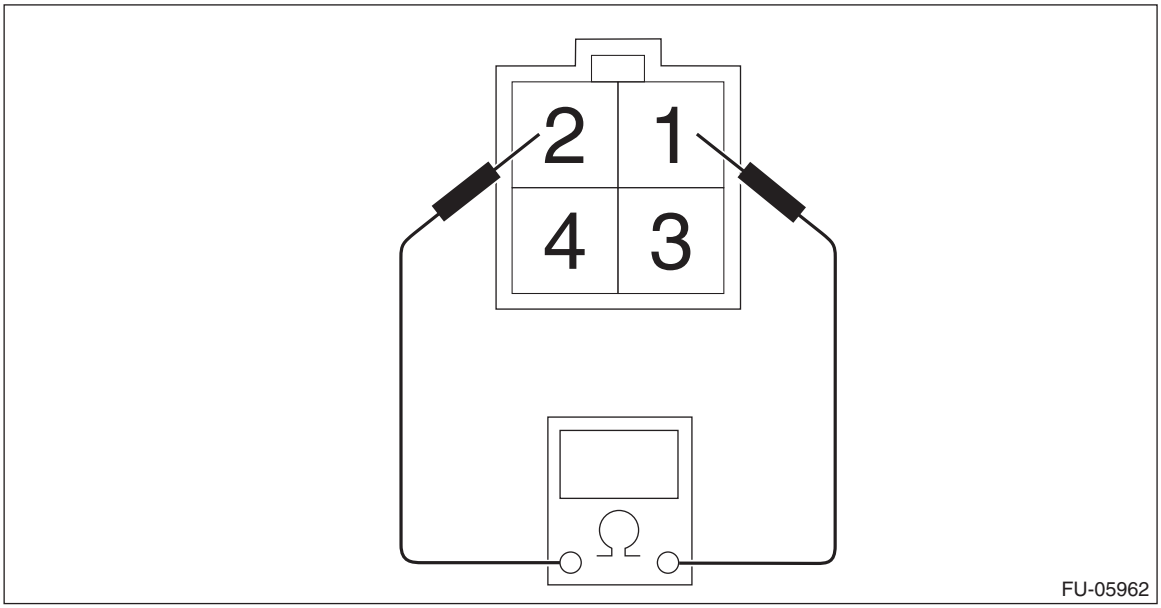
4) Install the under cover RH. <Ref. to EI-26, INSTALLATION, Front Under Cover.>
5) Lower the vehicle.

6) Connect the battery ground terminal.



C: INSPECTION

1) Check that the rear oxygen sensor has no deformation, cracks or other damages.
2) Measure the resistance between rear oxygen sensor terminals.

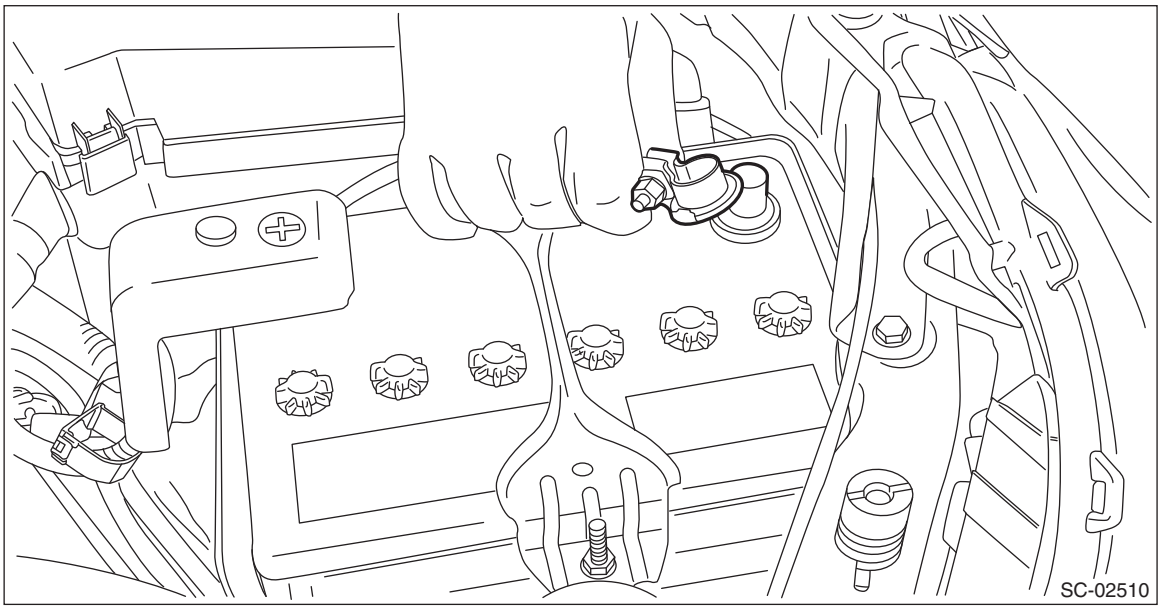


Terminal No.	Standard
1 and 2	Approx. 5.6 Ω (when 20°C (68°F))

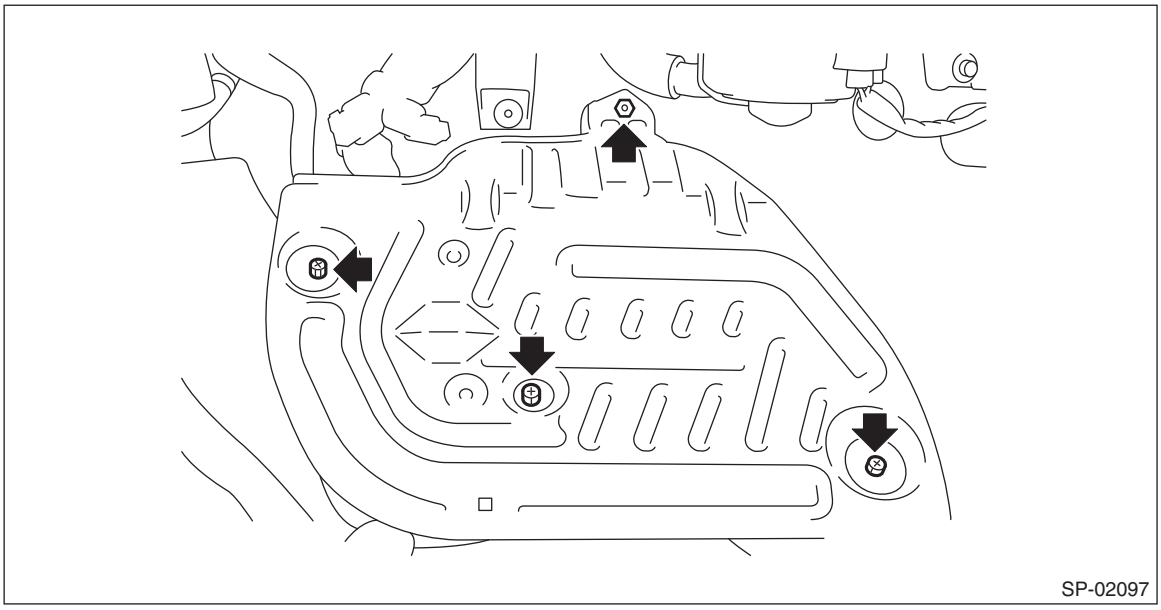
20.Engine Control Module (ECM)

A: REMOVAL

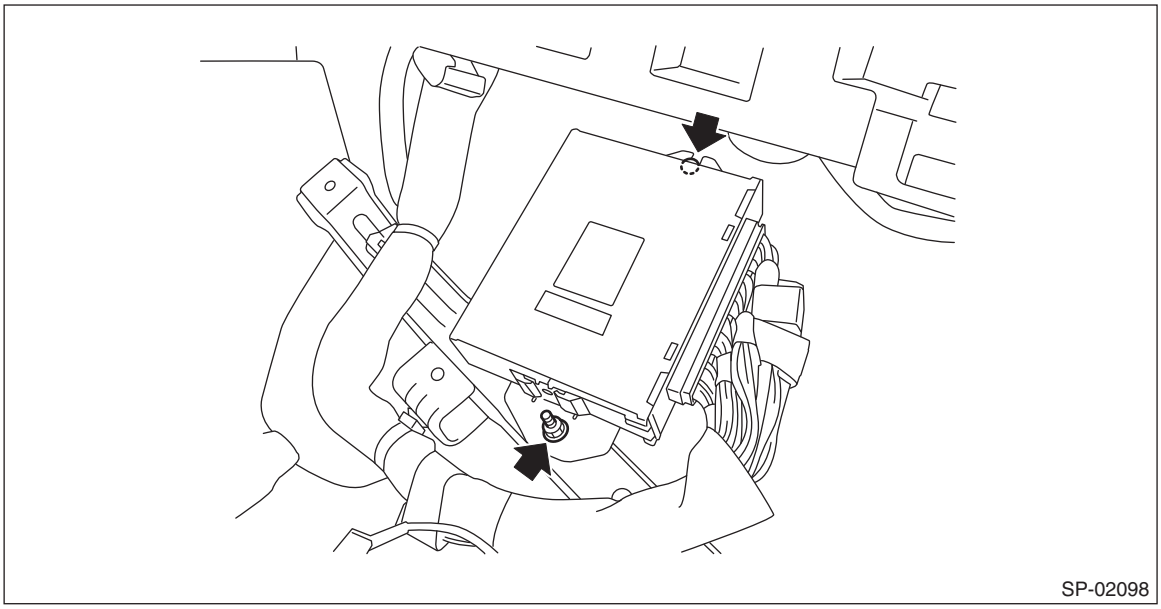
1) Disconnect the ground cable from battery.



2) Remove the glove box lower cover. <Ref. to EI-48, REMOVAL, Glove Box.>
3) Remove the lower inner trim of passenger's side. <Ref. to EI-56, REMOVAL, Lower Inner Trim.>
4) Turn over the floor mat of passenger's seat.
5) Remove the protect cover.



6) Remove the nuts and bolts which hold the ECM to the bracket.



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

B: INSTALLATION

Install in the reverse order of removal.

CAUTION:
- **When the ECM of model with immobilizer has been replaced, be sure to perform the registration of immobilizer system. (Refer to "PC application help for Subaru Select Monitor".)**
- **If replacing ECM or the bracket, replace both parts with new parts at a time.**
- **After installing the bracket to ECM, do not separate the bracket.**
- **If the bracket has been installed to ECM in the wrong direction, replace both parts to new parts.**

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 (0.8 kgf-m, 5.5 ft-lb)

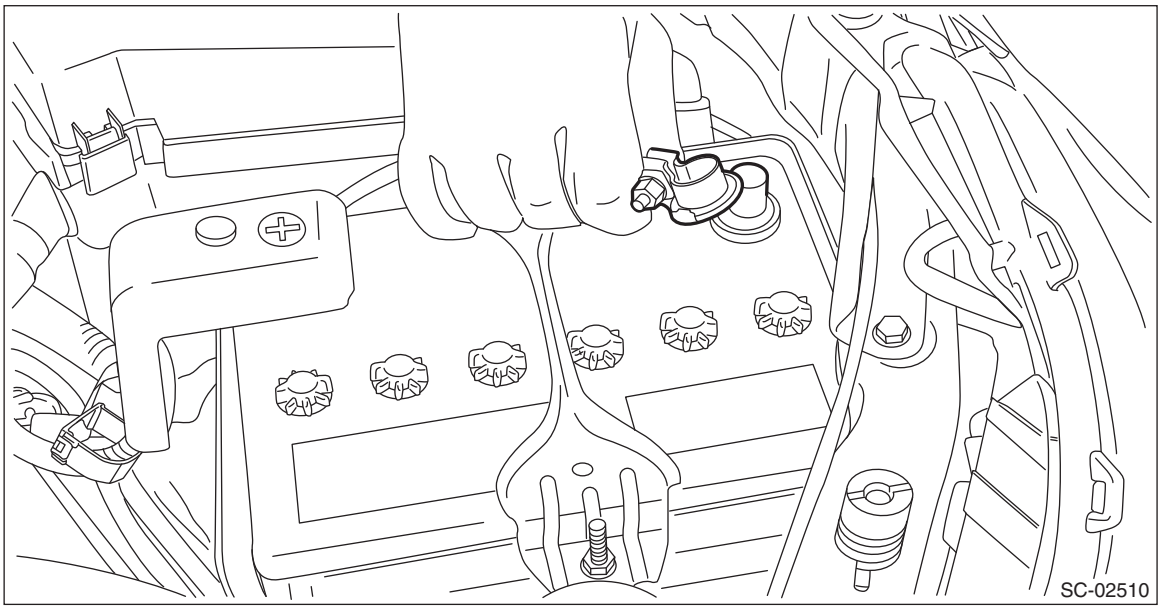
C: INSPECTION

Check that the ECM has no deformation, cracks or other damages.

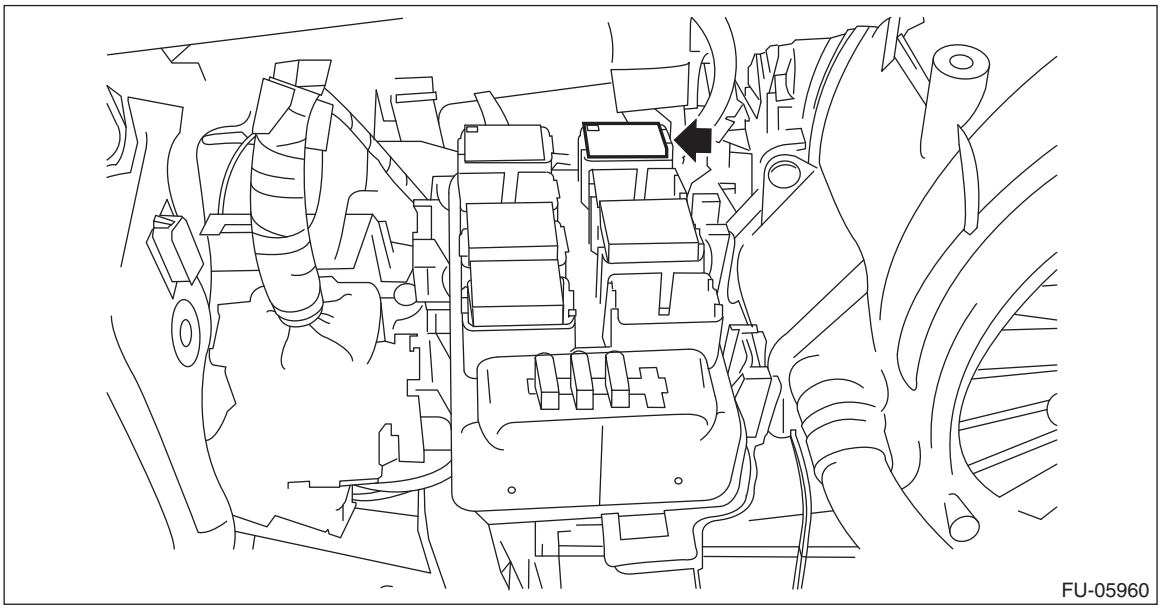
21.Main Relay

A: REMOVAL

1) Disconnect the ground cable from battery.



2) Remove the glove box lower cover. <Ref. to EI-48, REMOVAL, Glove Box.>
3) Remove the main relay from the relay block on the back side of the glove box.

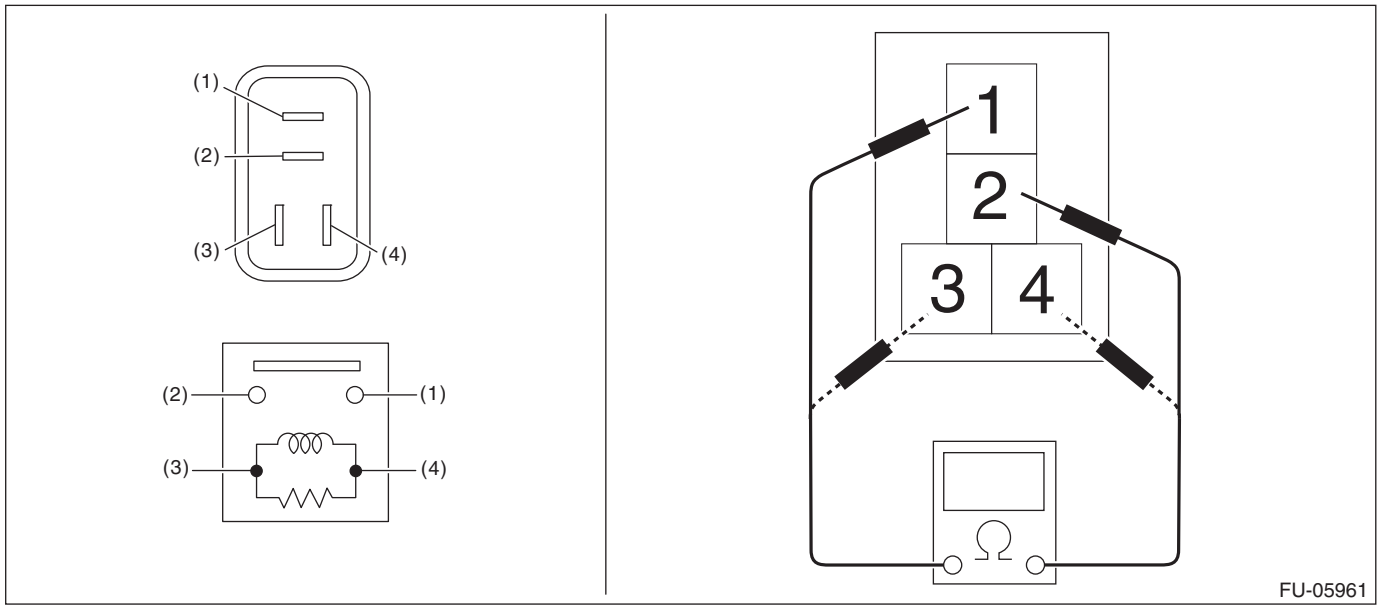


B: INSTALLATION

Install in the reverse order of removal.

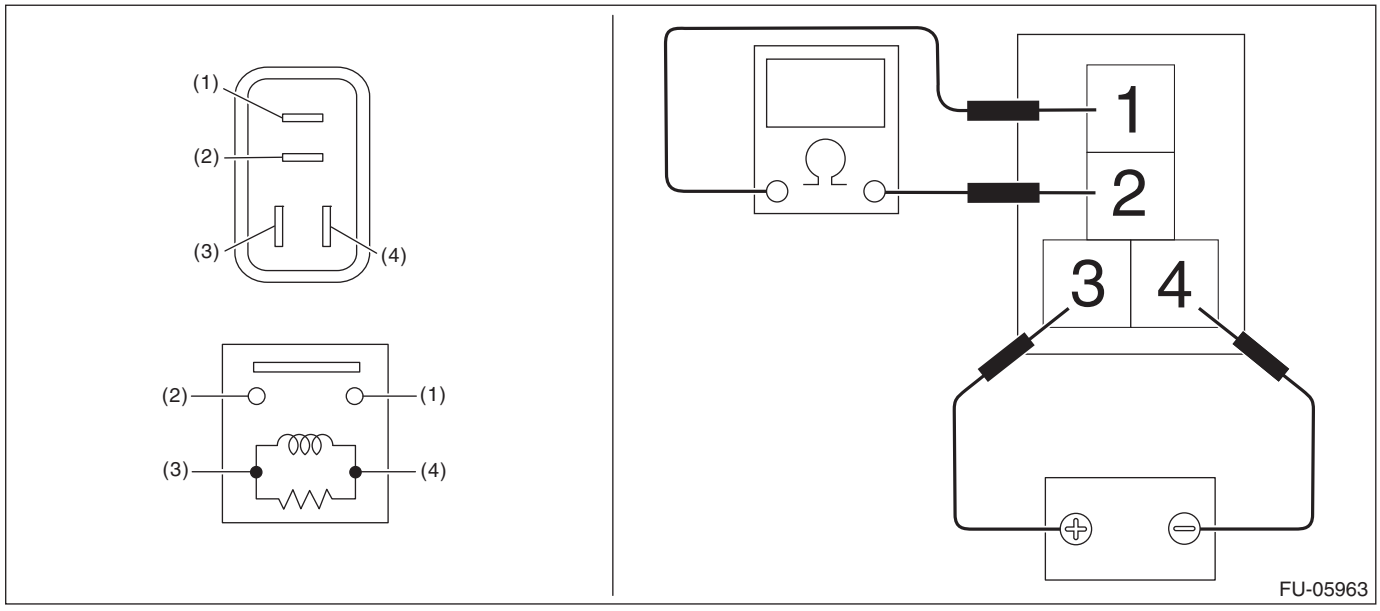
C: INSPECTION

1) Check that the main relay has no deformation, cracks or other damages.
2) Measure the resistance between main relay terminals.



Terminal No.	Standard
1 and 2	1 MΩ or more
3 and 4	130.4 — 230.8 Ω (when 20°C (68°F))

3) Connect battery positive terminal to terminal No. 3 and battery ground terminal to terminal No. 4, and measure the resistance between the main relay terminals.

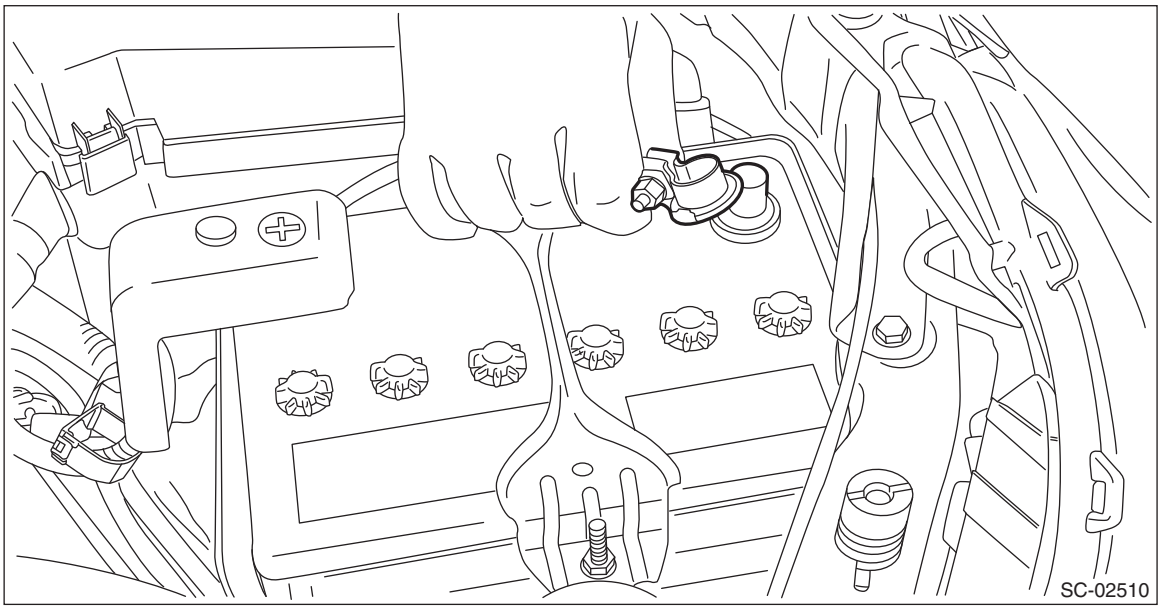


Terminal No.	Standard
1 and 2	Less than 1 Ω

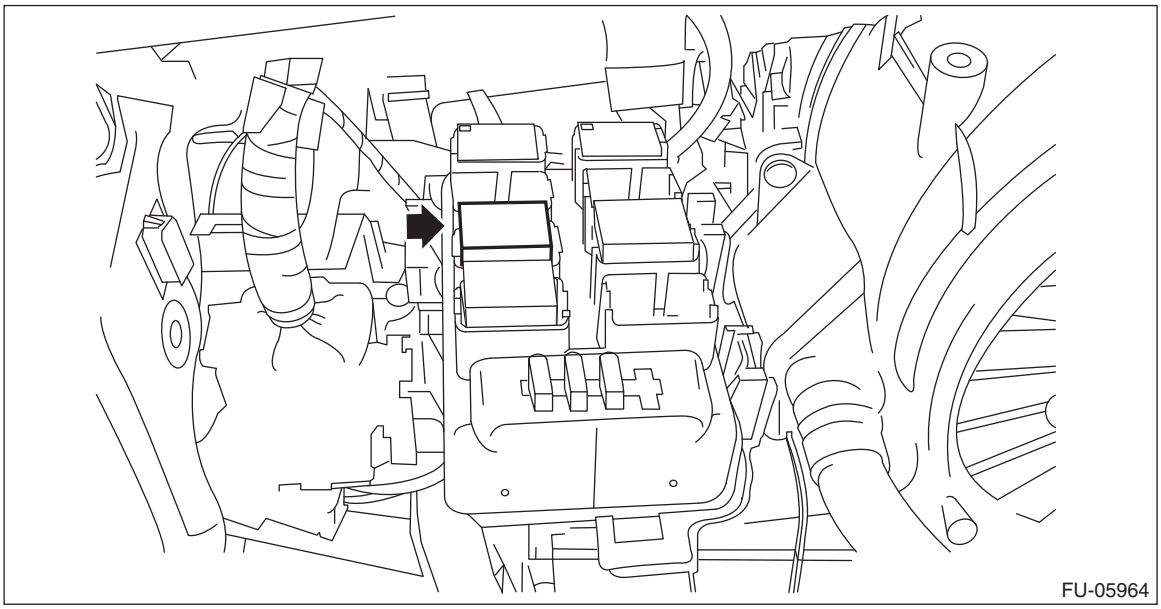
22.Fuel Pump Relay

A: REMOVAL

1) Disconnect the ground cable from battery.



2) Remove the glove box lower cover. <Ref. to EI-48, REMOVAL, Glove Box.>
3) Remove the fuel pump relay from the relay block on the back side of the glove box.

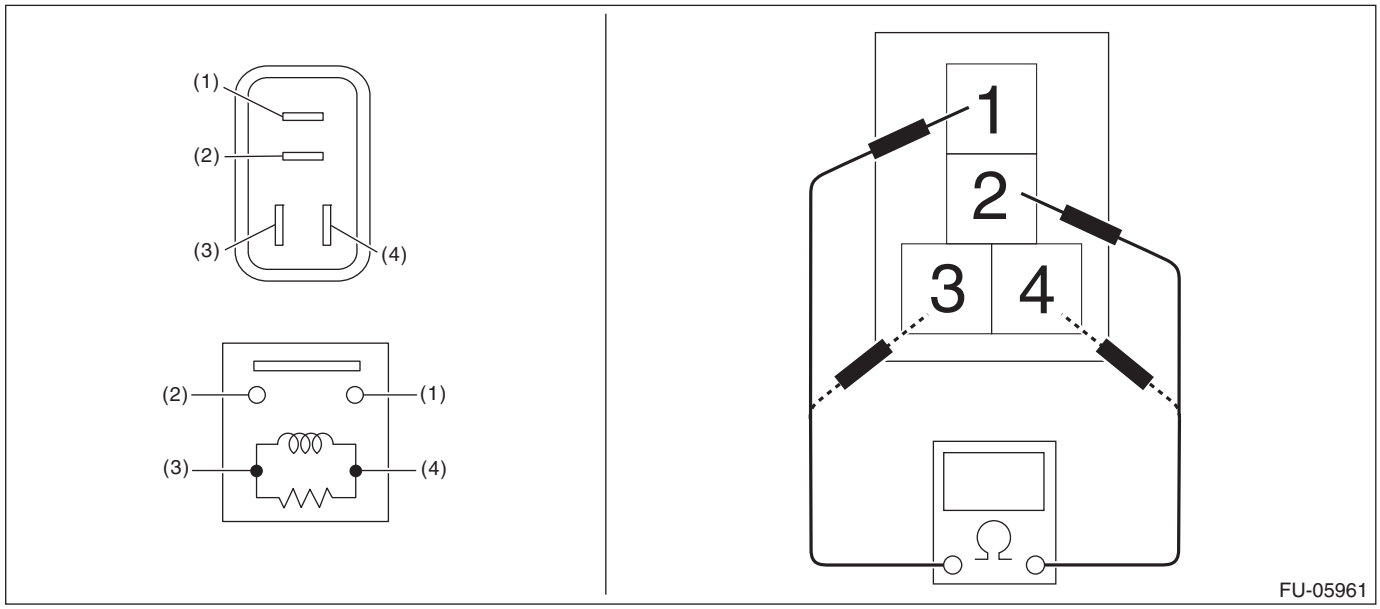


B: INSTALLATION

Install in the reverse order of removal.

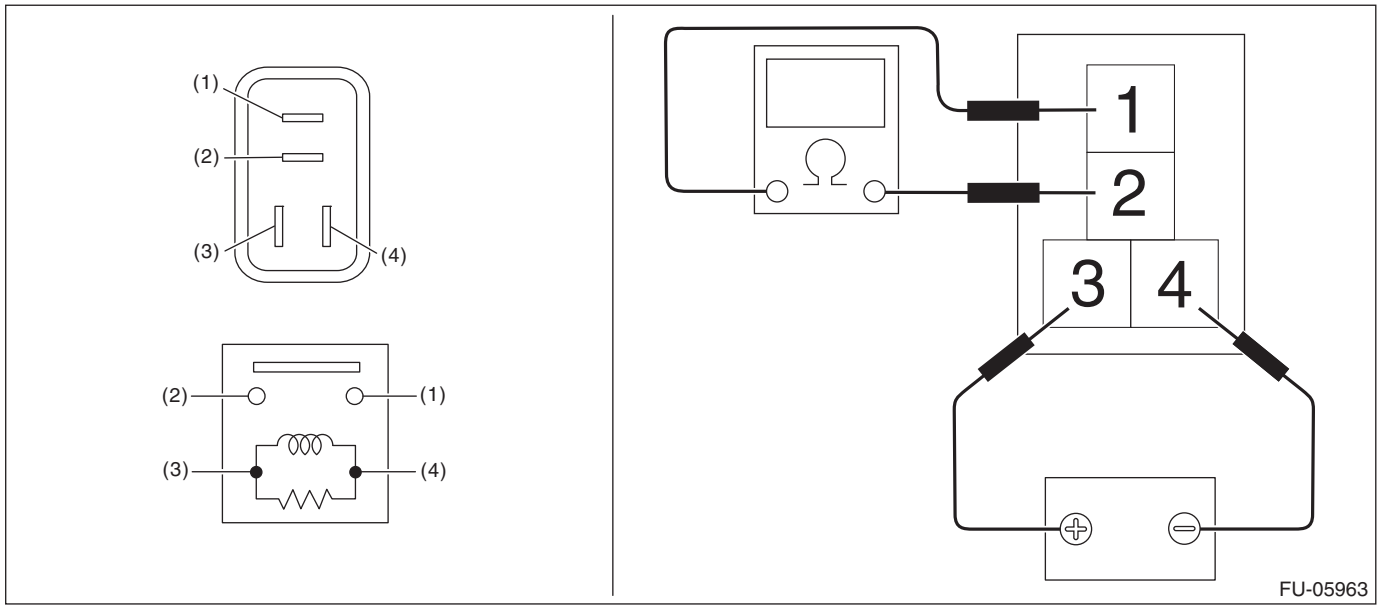
C: INSPECTION

1) Check that the fuel pump relay has no deformation, cracks or other damages.
2) Measure the resistance between fuel pump relay terminals.



Terminal No.	Standard
1 and 2	1 MΩ or more
3 and 4	93.8 — 136.4 Ω (when 20°C (68°F))

3) Connect battery positive terminal to terminal No. 3 and battery ground terminal to terminal No. 4, and measure the resistance between the fuel pump relay terminals.

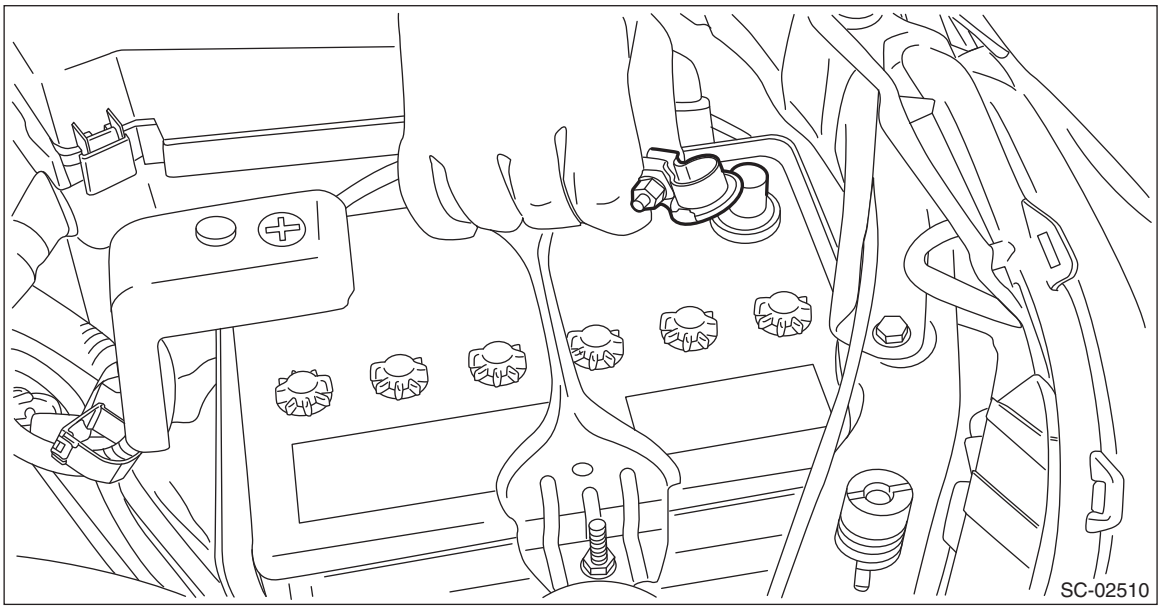


Terminal No.	Standard
1 and 2	Less than 1 Ω

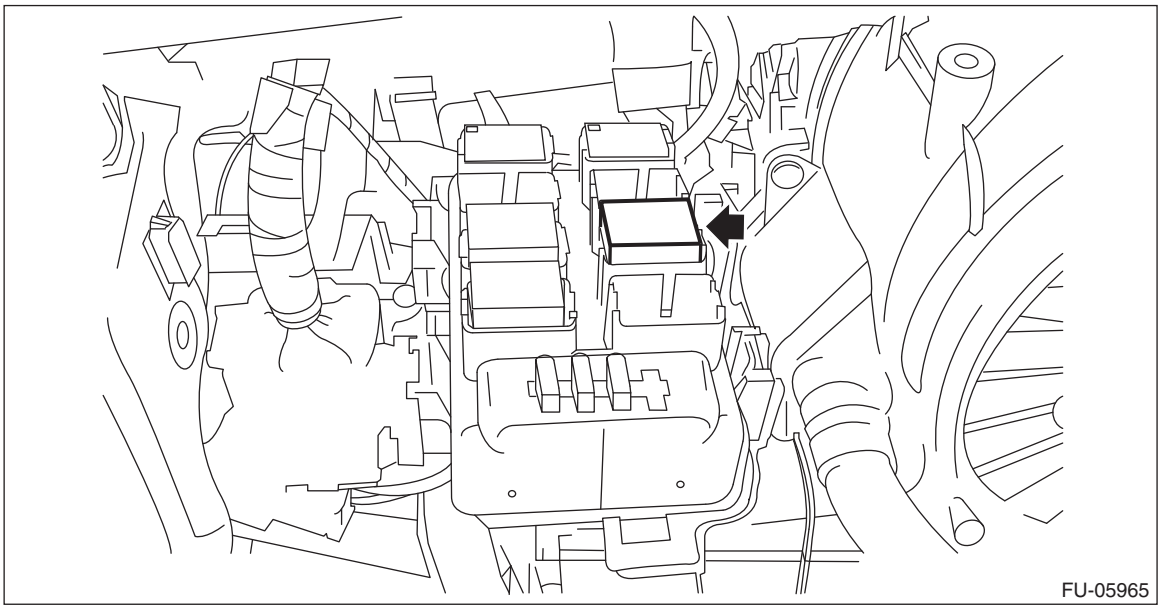
23.Electronic Throttle Control Relay

A: REMOVAL

1) Disconnect the ground cable from battery.



2) Remove the glove box lower cover. <Ref. to EI-48, REMOVAL, Glove Box.>
3) Remove the electronic throttle control relay from the relay block on the back side of the glove box.

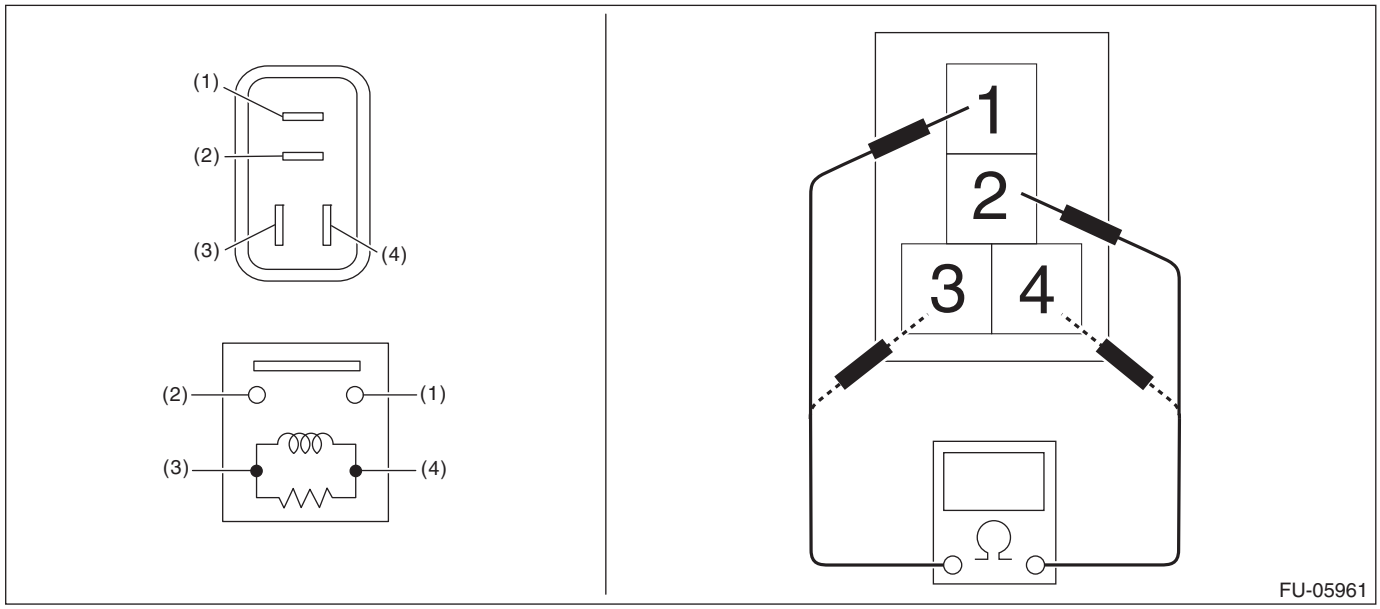


B: INSTALLATION

Install in the reverse order of removal.

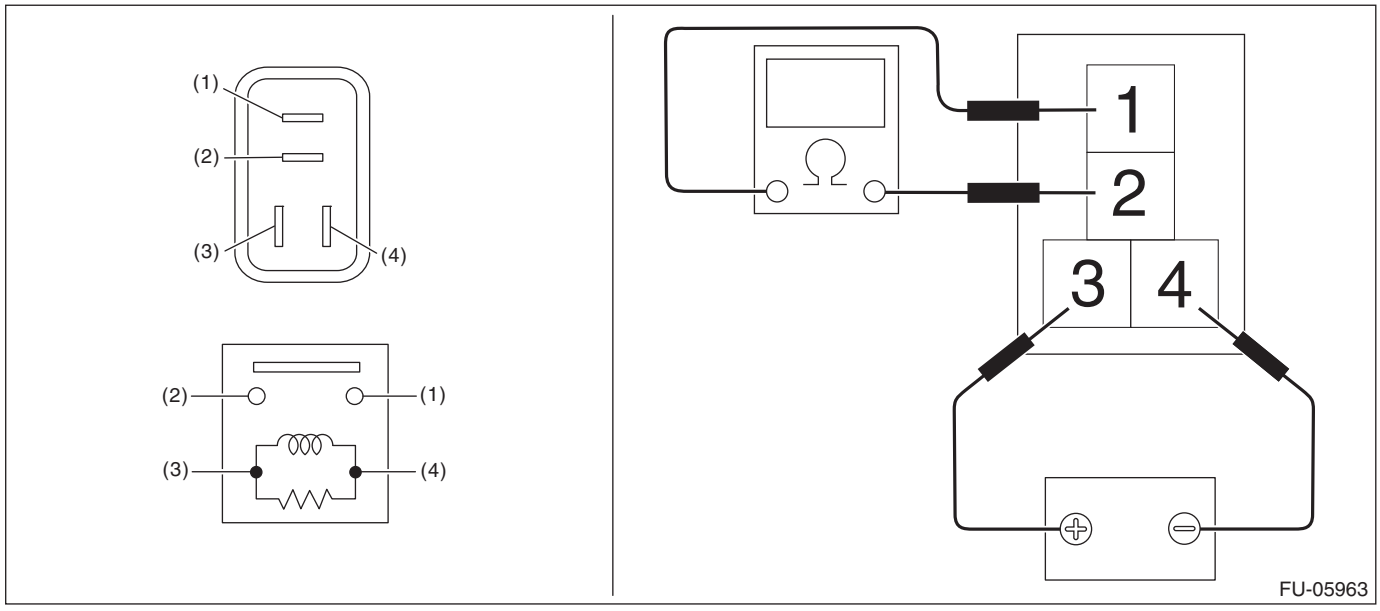
C: INSPECTION

1) Check that the electronic throttle control relay has no deformation, cracks or other damages.
2) Measure the resistance between electronic throttle control relay terminals.



Terminal No.	Standard
1 and 2	1 MΩ or more
3 and 4	93.8 — 136.4 Ω (when 20°C (68°F))

3) Connect battery positive terminal to terminal No. 3 and battery ground terminal to terminal No. 4, and measure the resistance between the electronic throttle control relay terminals.



Terminal No.	Standard
1 and 2	Less than 1 Ω

24.Fuel

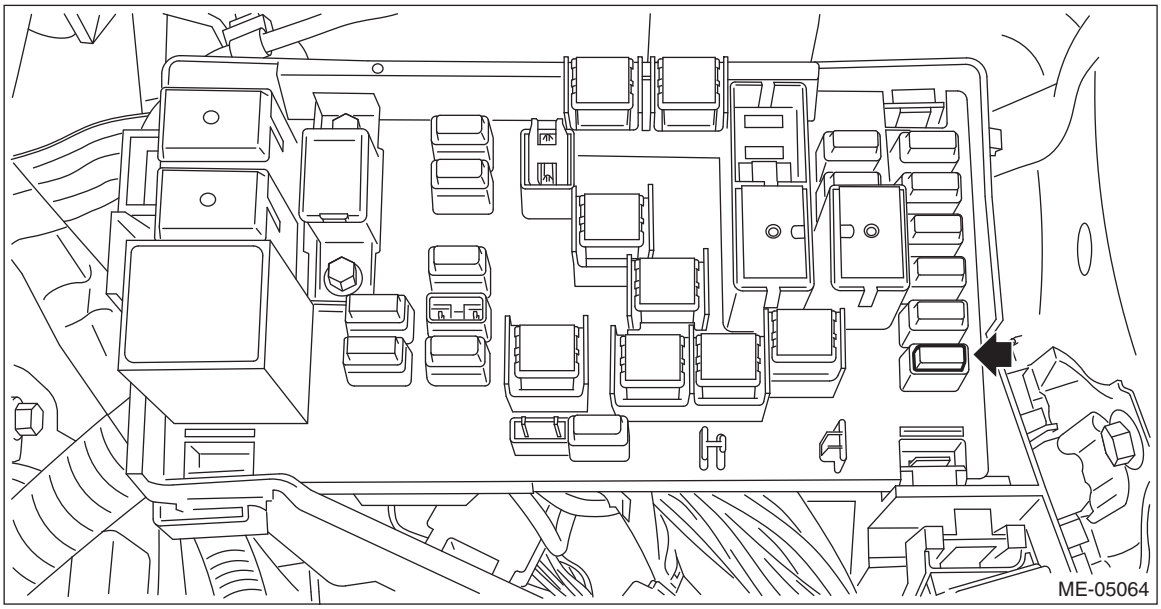
A: PROCEDURE

1. RELEASING OF FUEL PRESSURE

WARNING:
Place “NO OPEN FLAMES” signs near the working area.

CAUTION:
Be careful not to spill fuel.

1) Remove the fuse of fuel pump from main fuse box.



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.
5) Install the fuse of fuel pump to the main fuse box.

2. DRAINING FUEL (WITH SUBARU SELECT MONITOR)

WARNING:
Place “NO OPEN FLAMES” signs near the working area.

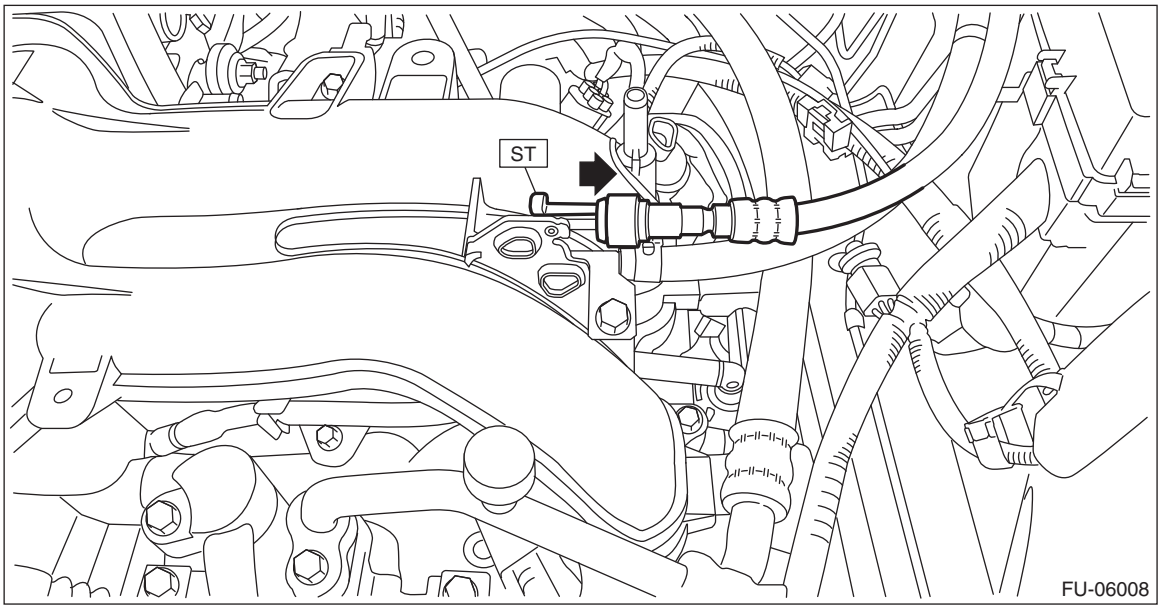
CAUTION:
Be careful not to spill fuel.

NOTE:
• If the fuel pump cannot be driven, refer to the procedures for draining from the fuel filler hose. <Ref. to FU(H4DO)-110, DRAINING FUEL (THROUGH THE FUEL FILLER HOSE), PROCEDURE, Fuel.>
• Be careful not to let the battery run-out.

1) Release the fuel pressure. <Ref. to FU(H4DO)-109, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>

2) Attach ST to the fuel delivery pipe and push ST in the direction of arrow mark to disconnect the fuel delivery hose.
ST 42099AE000 QUICK CONNECTOR RELEASE

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



3) Connect ST to the fuel delivery hose.
ST 18471AA000 FUEL PIPE ADAPTER
4) Connect the gasoline proof hose to ST and put the end of the hose in the container.
5) Drive the fuel pump and drain the fuel using Subaru Select Monitor. <Ref. to EN(H4DO)(diag)-58, FUEL PUMP CONTROL (ON/OFF DRIVE), OPERATION, System Operation Check Mode.>

CAUTION:
Be careful not to spill fuel.
6) Install the related parts in the reverse order after draining the fuel.

3. DRAINING FUEL (THROUGH THE FUEL FILLER HOSE)

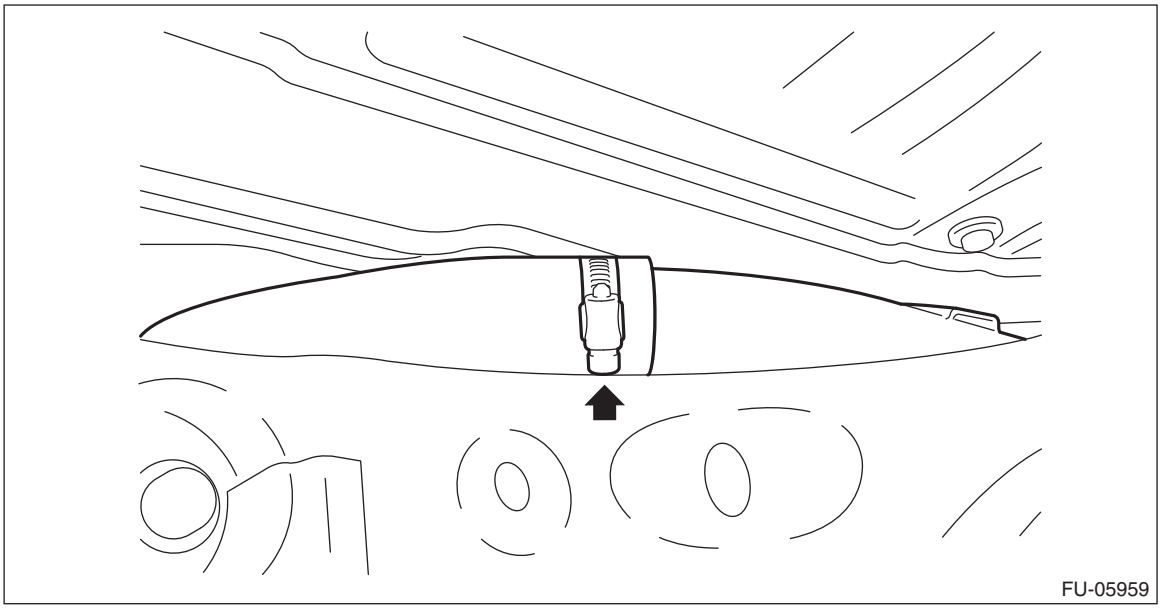
WARNING:
Place "NO OPEN FLAMES" signs near the working area.

CAUTION:
- **Be careful not to spill fuel.**
- **Fuel may remain in the fuel filler pipe. Draining the fuel from the fuel filler pipe through the fill opening using the gasoline proof pump and the gasoline proof hose (ø10 or less) before the operation.**

1) Lift up the vehicle.
2) Remove the rear exhaust pipe and muffler. <Ref. to EX(H4DO)-13, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4DO)-16, REMOVAL, Muffler.>
3) Open the fuel filler lid and remove the fuel filler cap.
4) Drain the fuel from the fuel filler pipe through the filler opening using the gasoline proof pump and the gasoline proof hose (ø10 or less).

5) Disconnect the fuel filler hose from the fuel filler pipe assembly.

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



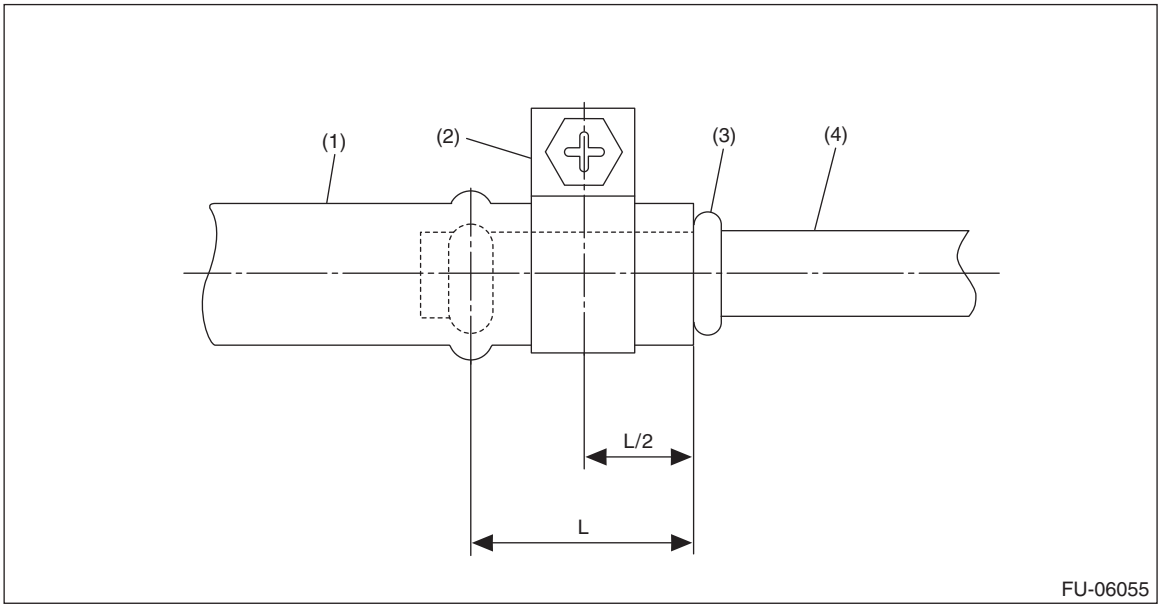
6) Set the container under the vehicle and insert the gasoline proof hose (ø10 or less) into the fuel filler hose to drain the fuel.

CAUTION:
Be careful not to spill fuel.

7) Install the related parts in the reverse order after draining the fuel.

NOTE:
Correctly insert the fuel filler hose to the spool, and then install the clamp as shown.

Tightening torque:
2.5 N·m (0.3 kgf-m, 1.8 ft-lb)



(1) Fuel filler hose
(2) Clamp
(3) Spool
(4) Fuel filler pipe

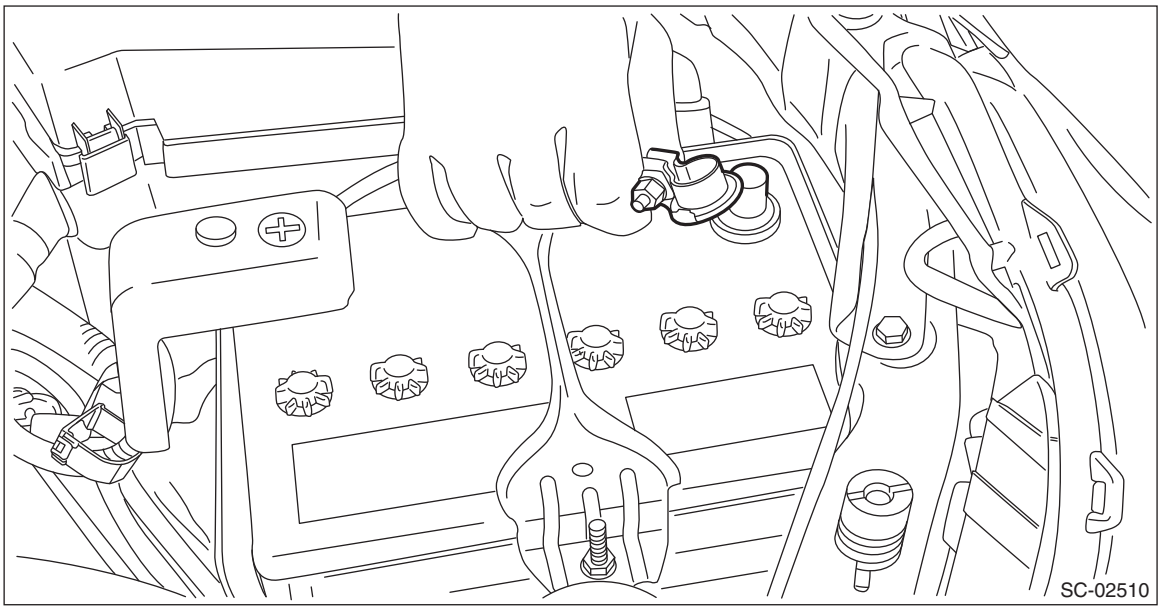
25.Fuel Tank

A: REMOVAL

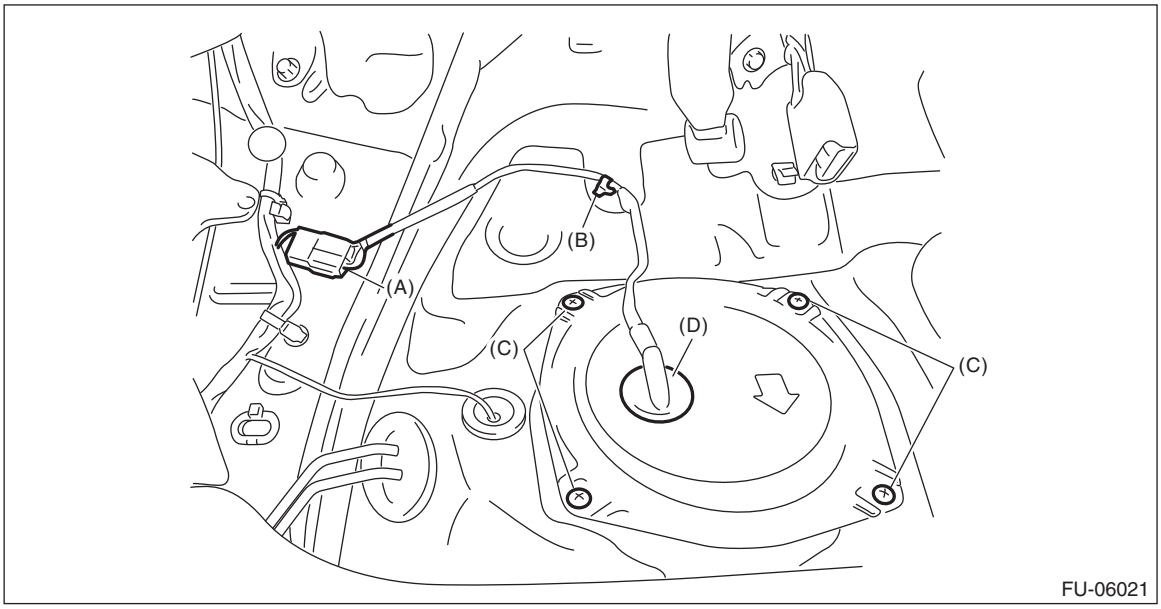
WARNING:
Place “NO OPEN FLAMES” signs near the working area.

CAUTION:
Be careful not to spill fuel.

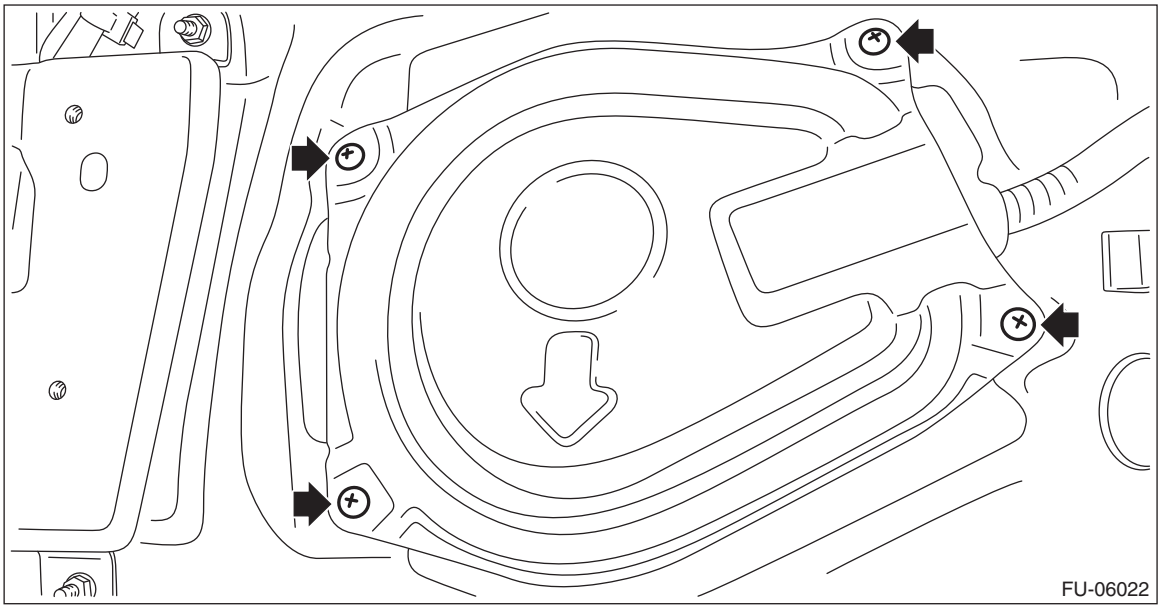
1) Release the fuel pressure. <Ref. to FU(H4DO)-109, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Drain fuel. <Ref. to FU(H4DO)-109, DRAINING FUEL (WITH SUBARU SELECT MONITOR), PROCEDURE, Fuel.>
3) Disconnect the ground cable from battery.



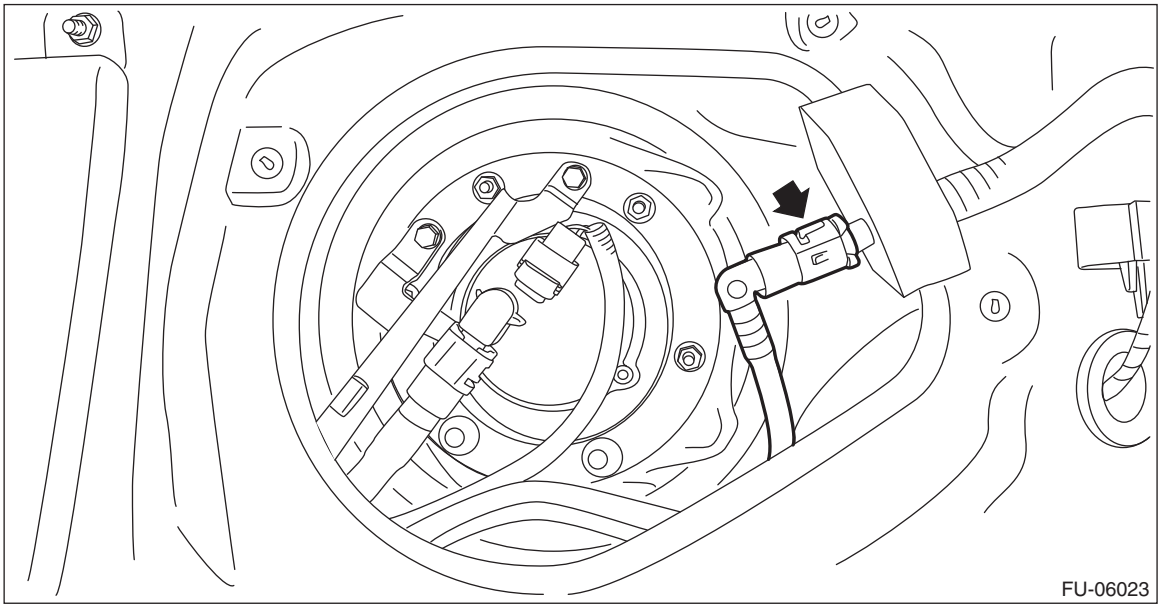
4) Remove the rear seat cushion. <Ref. to SE-16, REMOVAL, Rear Seat.>
5) Remove the service hole cover of fuel pump.
   (1) Disconnect fuel pump connector (A), and remove clip (B).
   (2) Remove the screw (C).
   (3) Push the grommet (D) down and remove the service hole cover.



6) Remove the service hole cover of fuel sub level sensor.

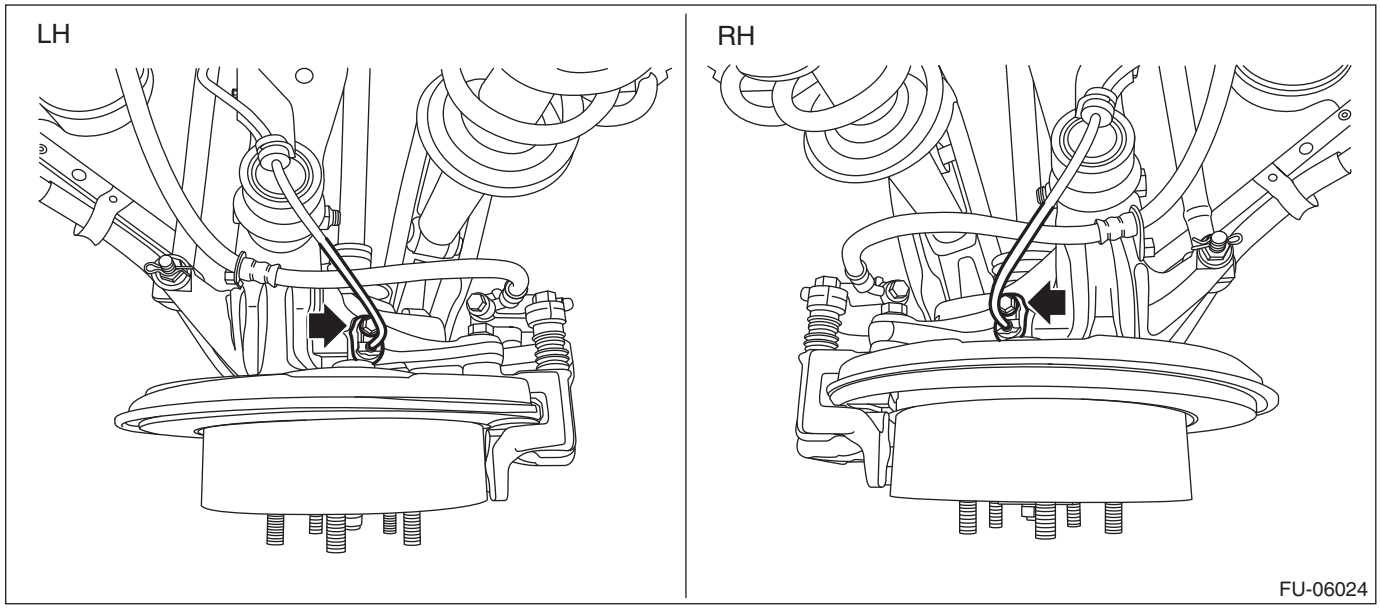


7) Disconnect the quick connector on the fuel delivery tube. <Ref. to FU(H4DO)-158, REMOVAL, Fuel Delivery and Evaporation Lines.>

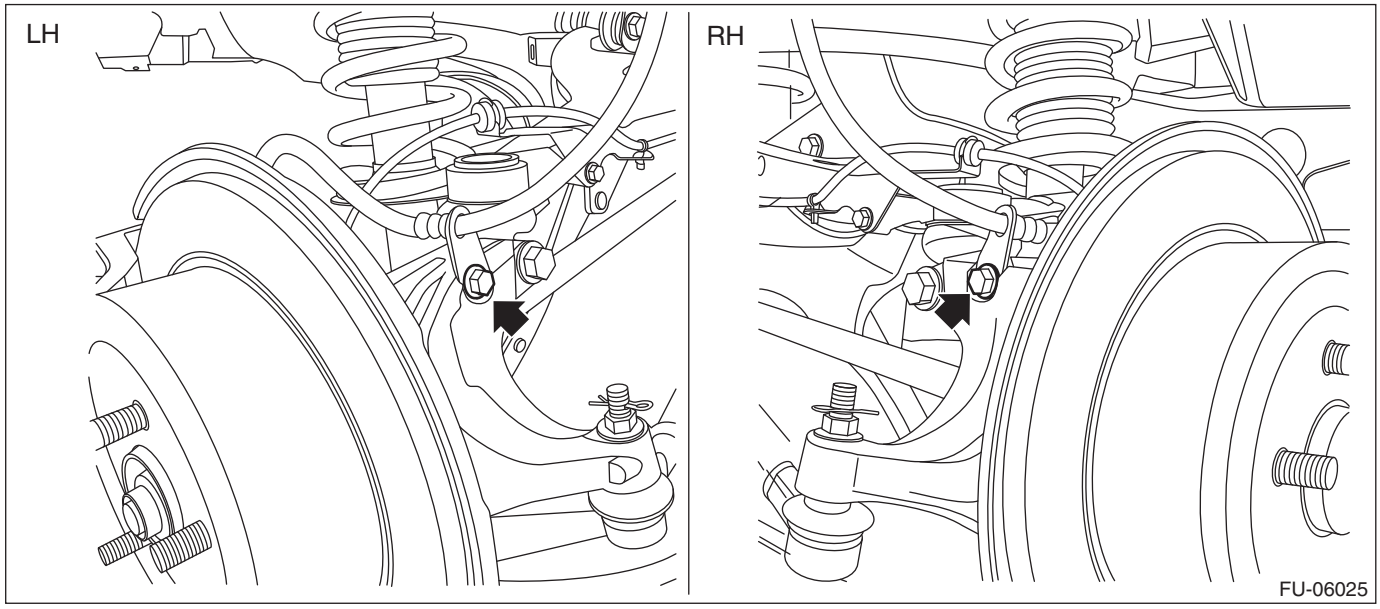


8) Remove the rear wheels.
9) Lift up the vehicle.

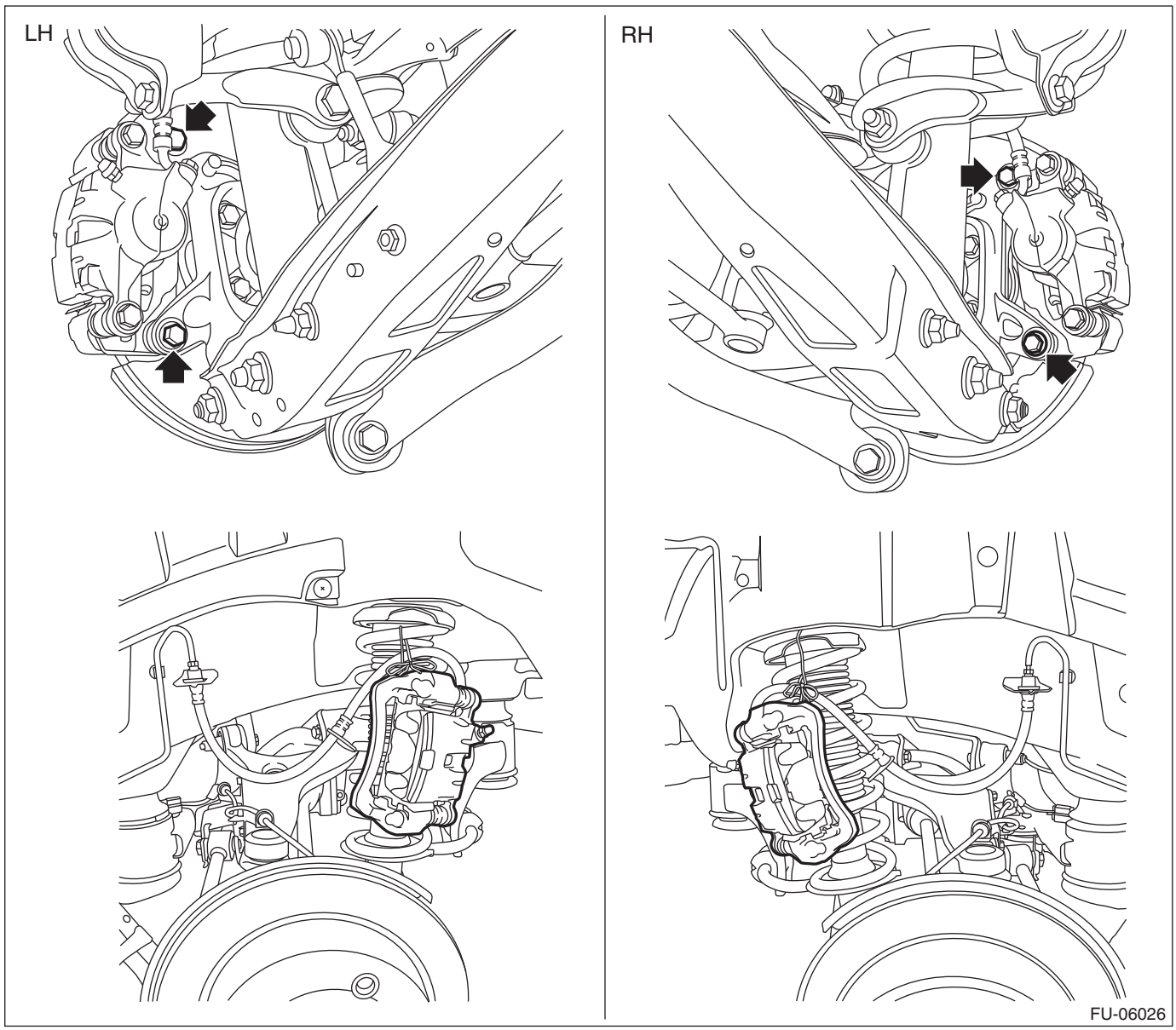
10) Remove the rear ABS wheel speed sensor from the rear housing.



11) Remove the rear brake hose bracket from rear housing.

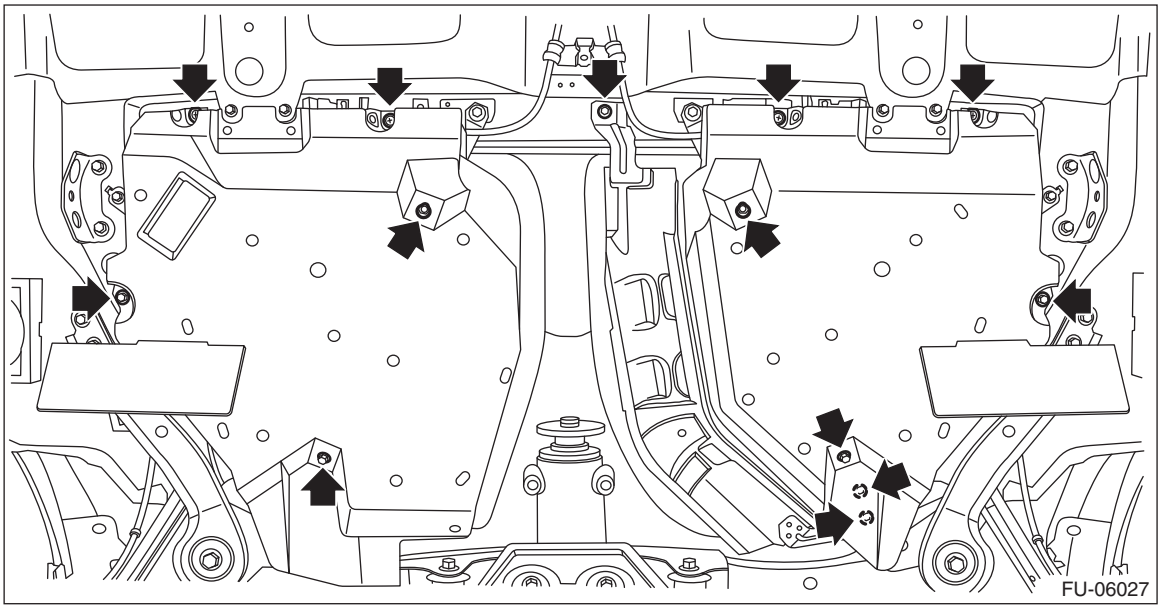


12) Remove the rear disc brake assembly and tie it to the body side of the vehicle.

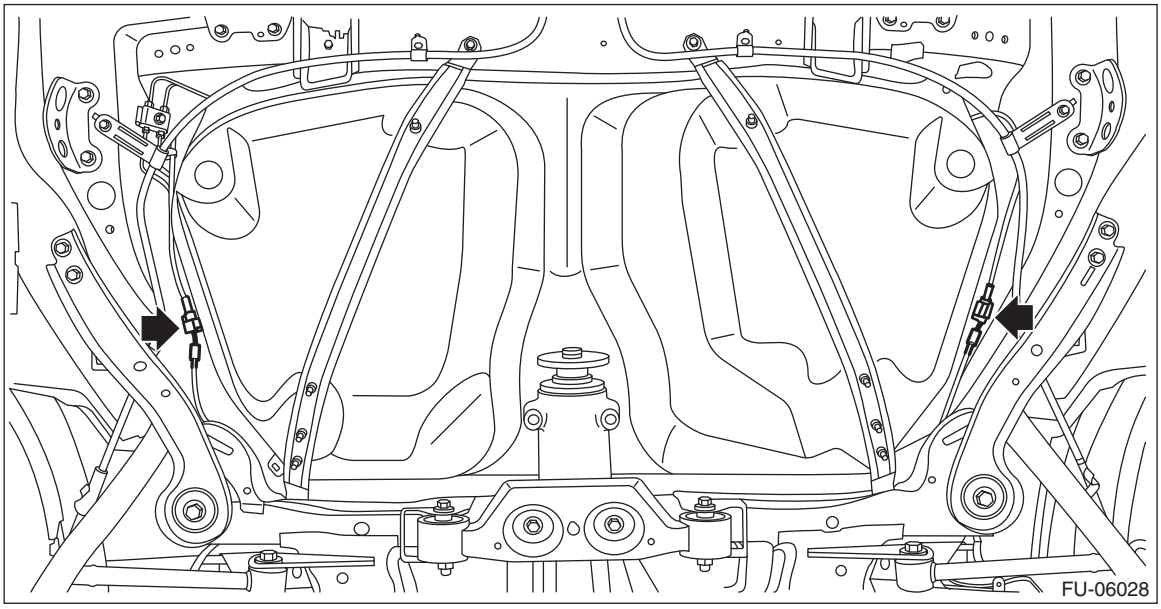


13) Remove the parking brake cable from parking brake assembly. <Ref. to PB-6, REMOVAL, Parking Brake Assembly (Rear Disc Brake).>
14) Remove the rear exhaust pipe and muffler. <Ref. to EX(H4DO)-13, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4DO)-16, REMOVAL, Muffler.>
15) Remove the propeller shaft. <Ref. to DS-10, REMOVAL, Propeller Shaft.>

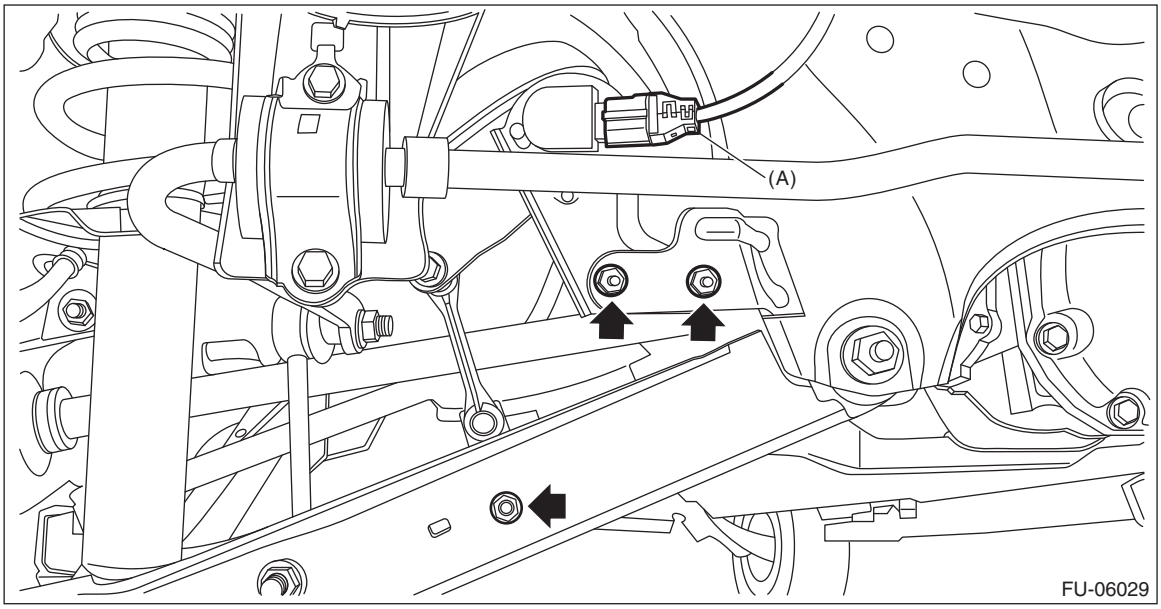
16) Remove the heat shield cover and fuel tank protector.



17) Disconnect the connector from the rear ABS wheel speed sensor.



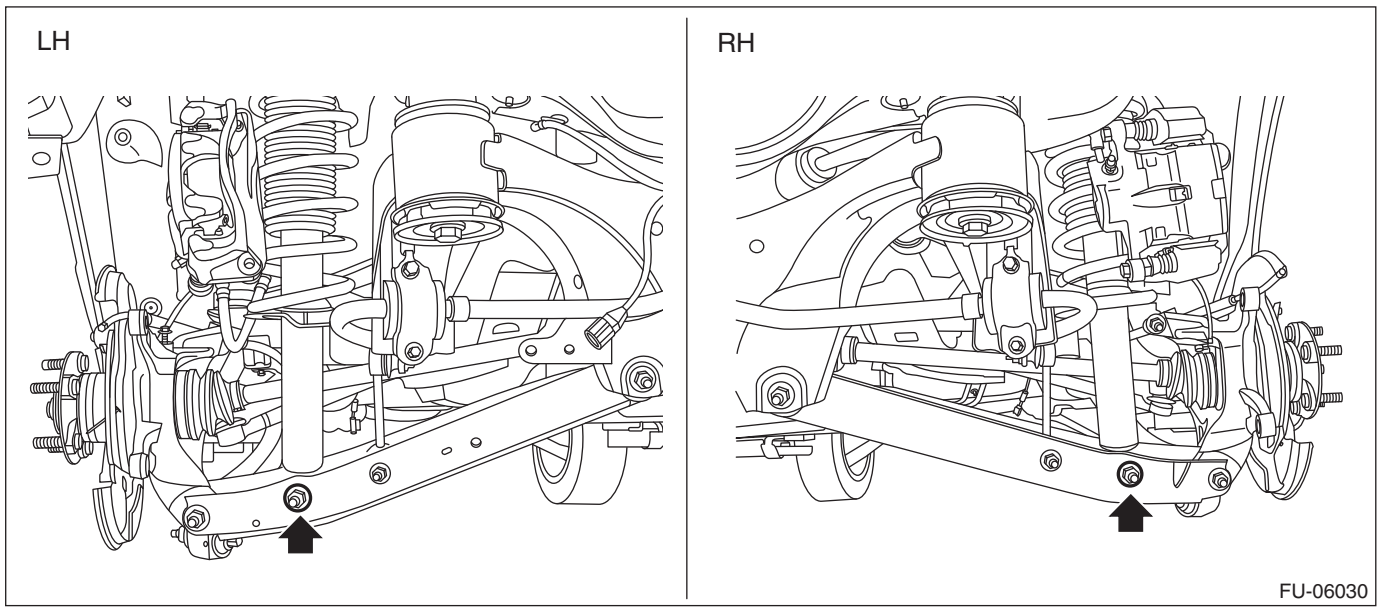
18) Disconnect the connector (A) from the rear vehicle height sensor, and remove the rear vehicle height sensor. (model with auto headlight beam leveler, left side only)



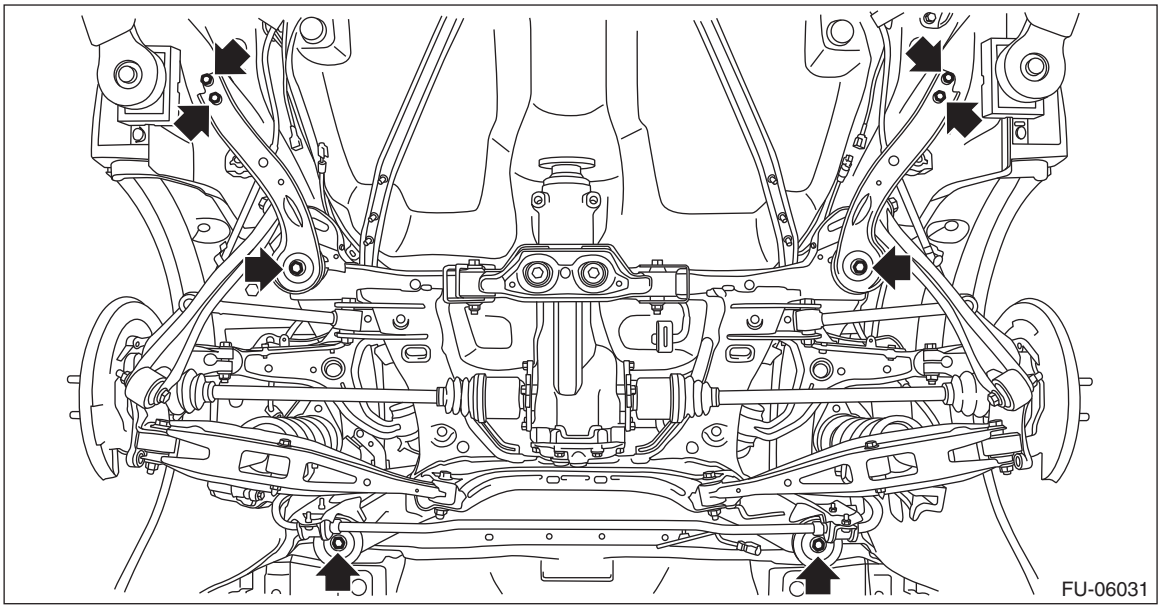
19) Remove the rear suspension assembly.

WARNING:
A helper is required to perform this work.

(1) Support the rear suspension assembly with a transmission jack.
(2) Remove the bolt and nut which secures rear shock absorber to rear suspension arm.

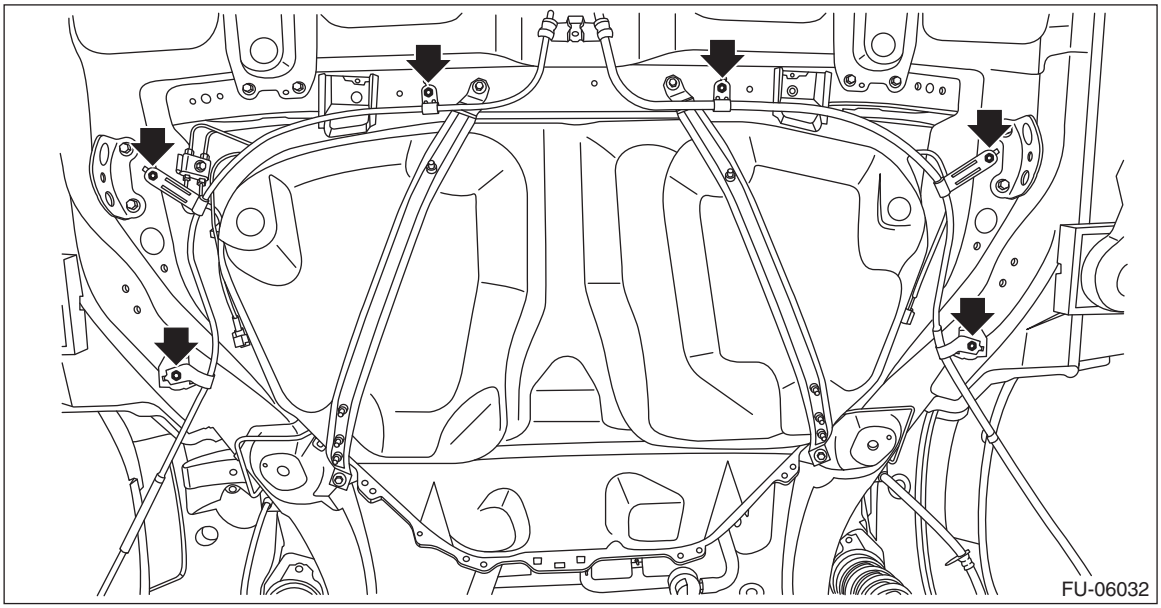


(3) Remove the bolts which secure the rear suspension assembly to the body.

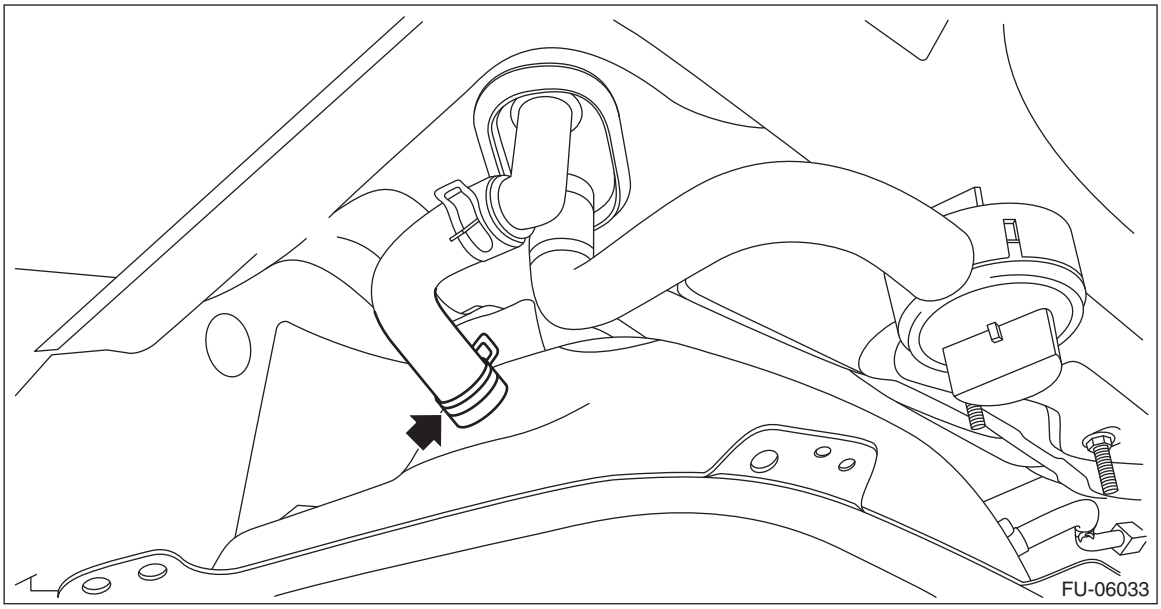


(4) Remove the rear suspension assembly.

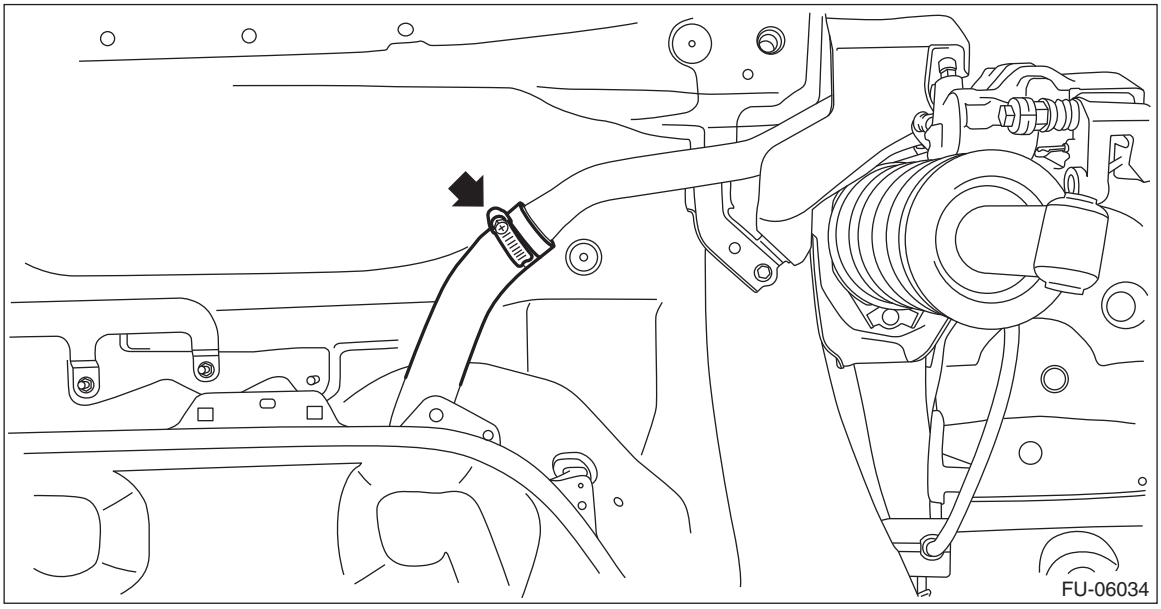
20) Remove the parking brake cable clamp from the body.



21) Disconnect the evaporation hose from the fuel tank.

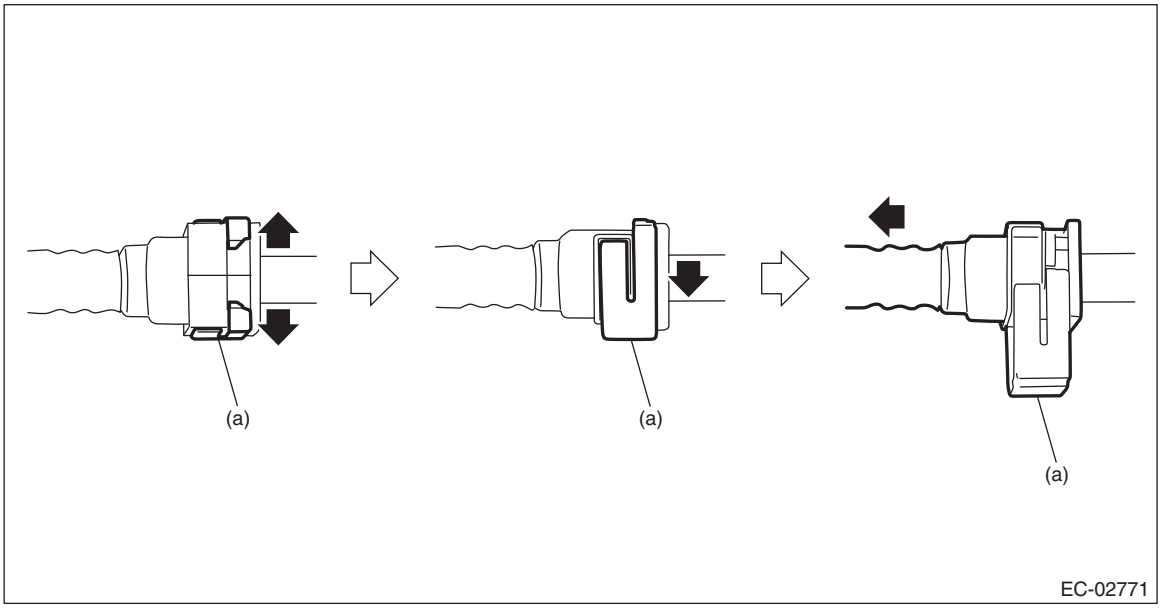


22) Disconnect the fuel filler hose from the fuel filler pipe assembly.

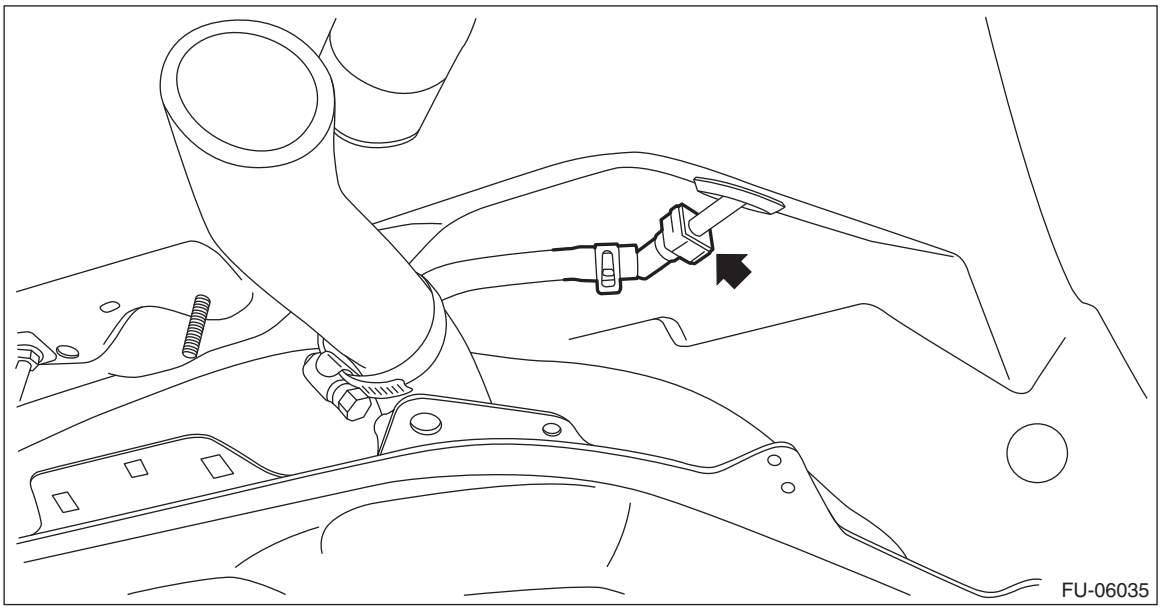


23) Disconnect the quick connector of the evaporation hose from the evaporation pipe.

NOTE:
Disconnect the quick connector as shown in the figure.

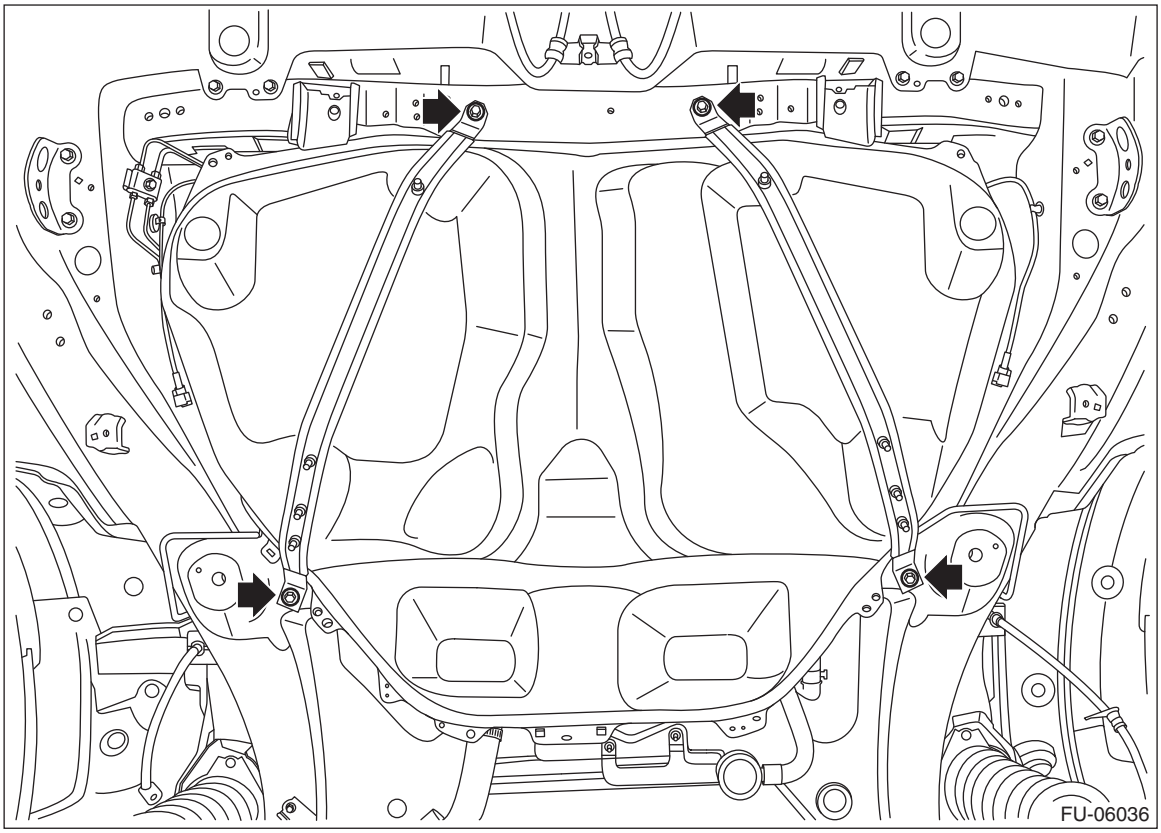


(a) Retainer



24) Support the fuel tank with a transmission jack, remove the bolts from the fuel tank band, and remove the fuel tank from the vehicle.

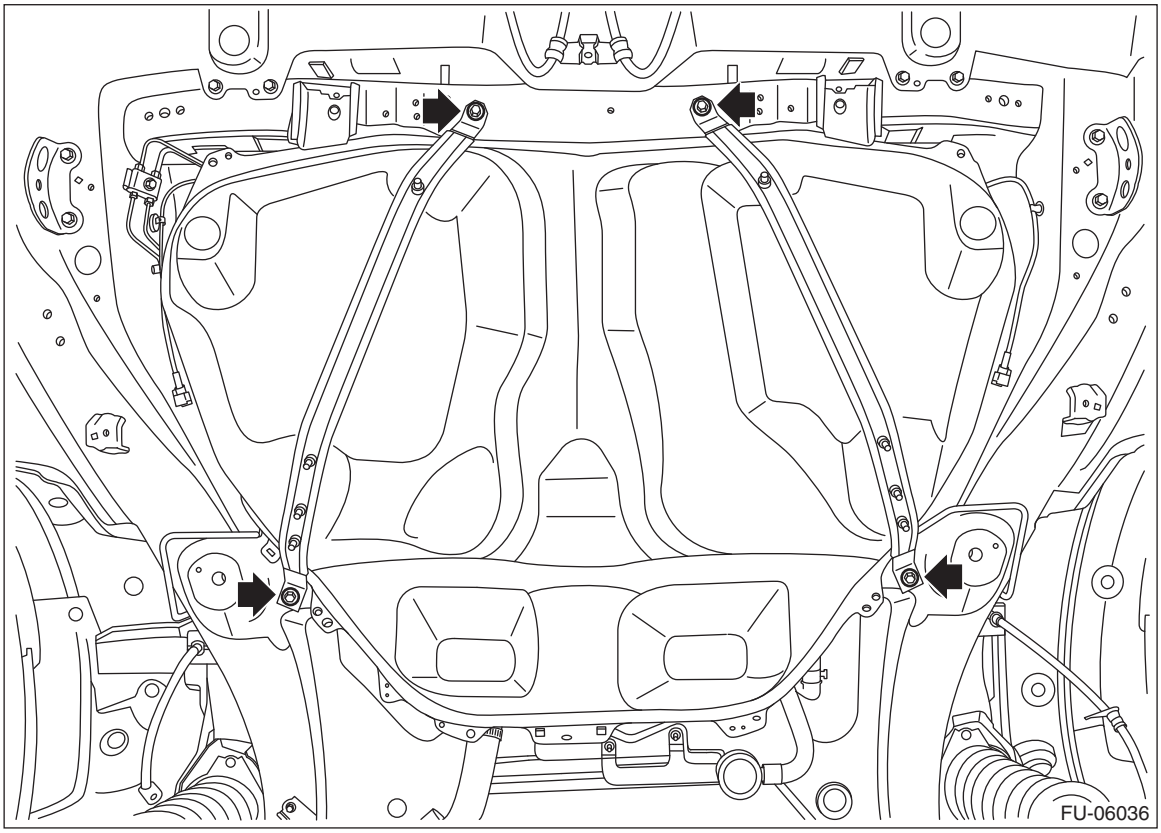
WARNING:
- **A helper is required to perform this work.**
- **Fuel may remain in the fuel tank. This will cause the left and right sides to be unbalanced. Be careful not to drop the fuel tank.**



B: INSTALLATION

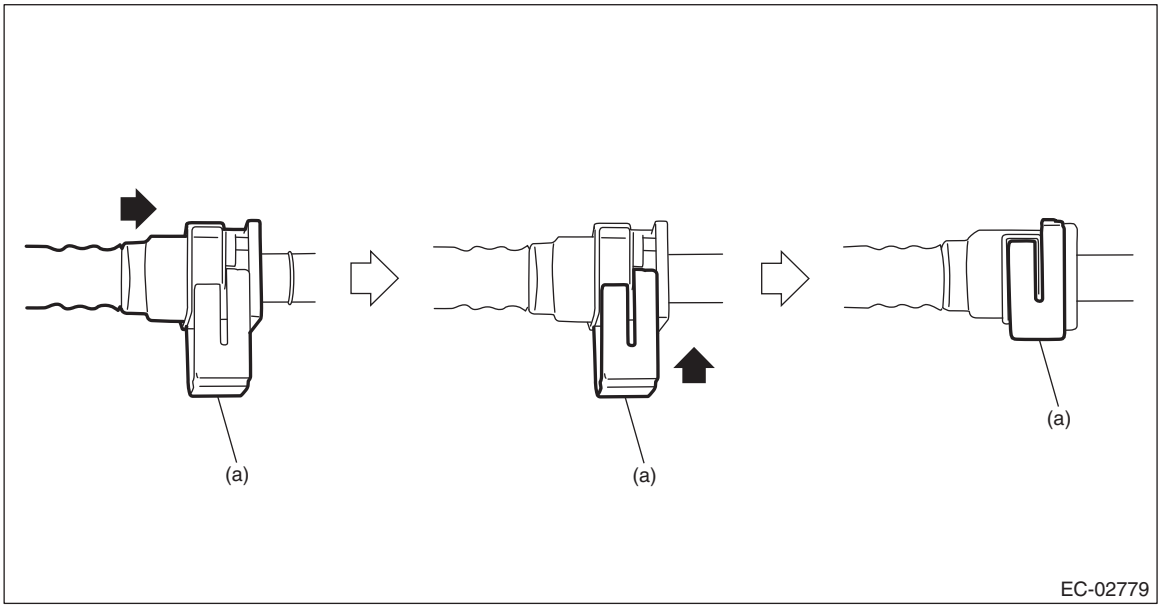
1) Support the fuel tank with a transmission jack, set the fuel tank in place, and temporarily tighten the bolts of the fuel tank band.

WARNING:
A helper is required to perform this work.

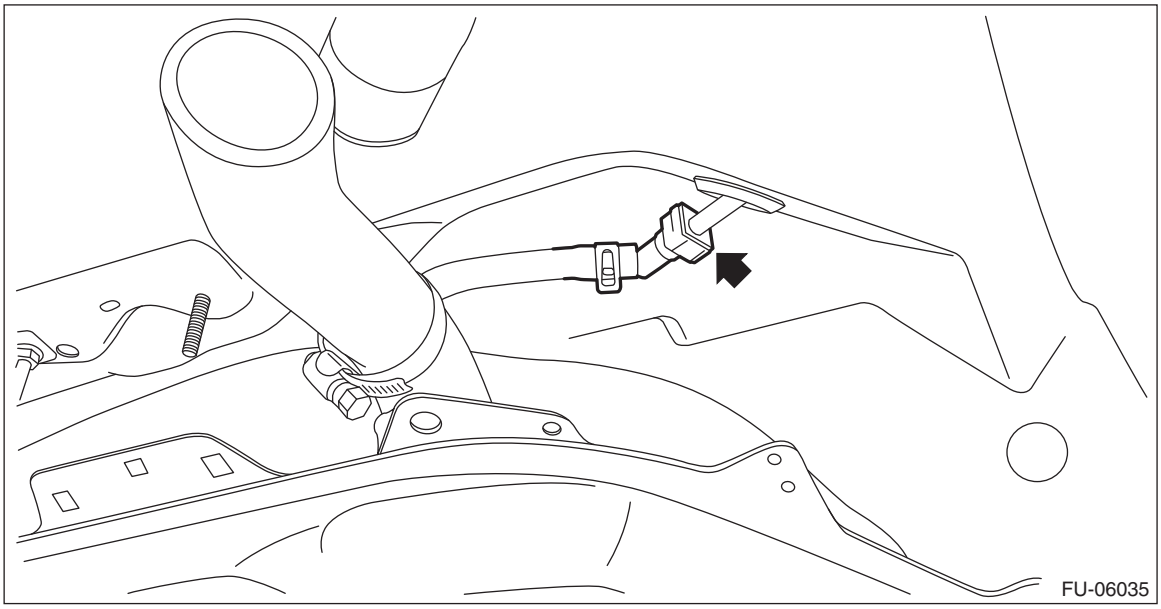


2) Connect the quick connector of the evaporation hose to the evaporation pipe.

CAUTION:
• Check that there is no damage or dust on the quick connector. If necessary, clean the seal surface of the pipe.
• When connecting the quick connector, securely insert the pipe all the way before locking the retainer.
• When it is difficult to lock the retainer, make sure that the pipe is securely inserted.
• Make sure that the quick connector is securely connected.

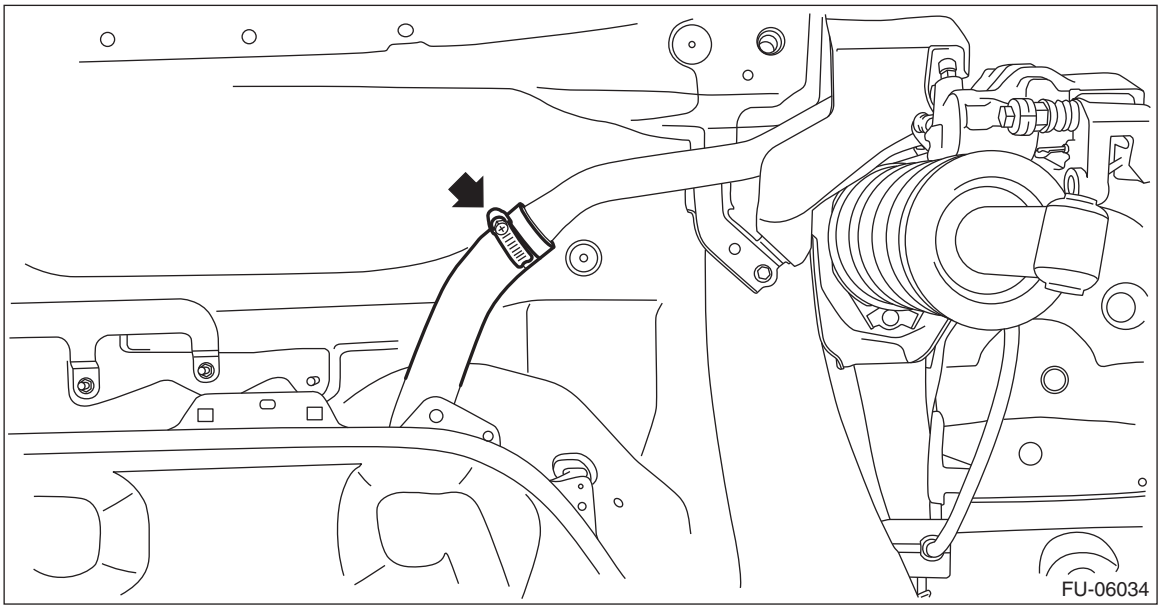


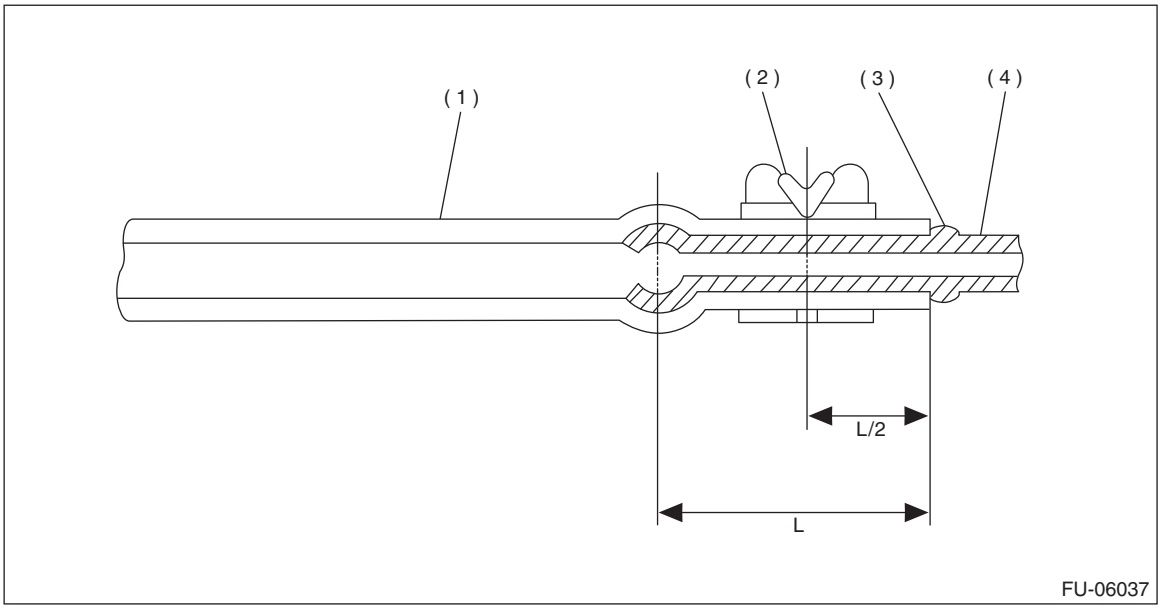
(a) Retainer



3) Securely insert the fuel filler hose to the spool, and then install a clamp or clip as shown.

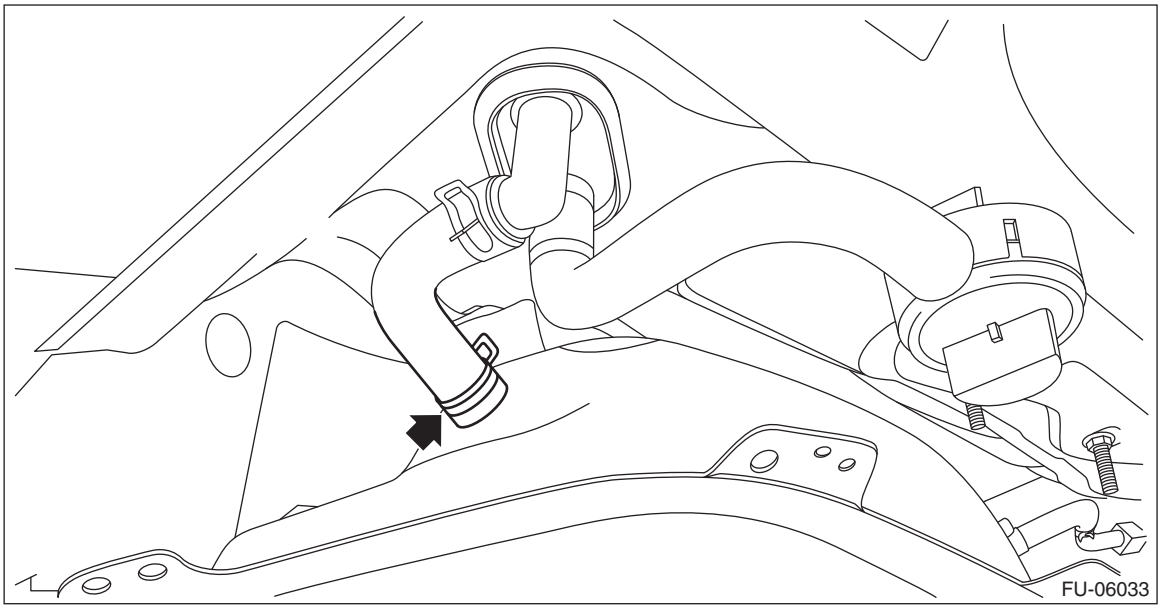
Tightening torque:
2.5 N·m (0.3 kgf-m, 1.8 ft-lb)





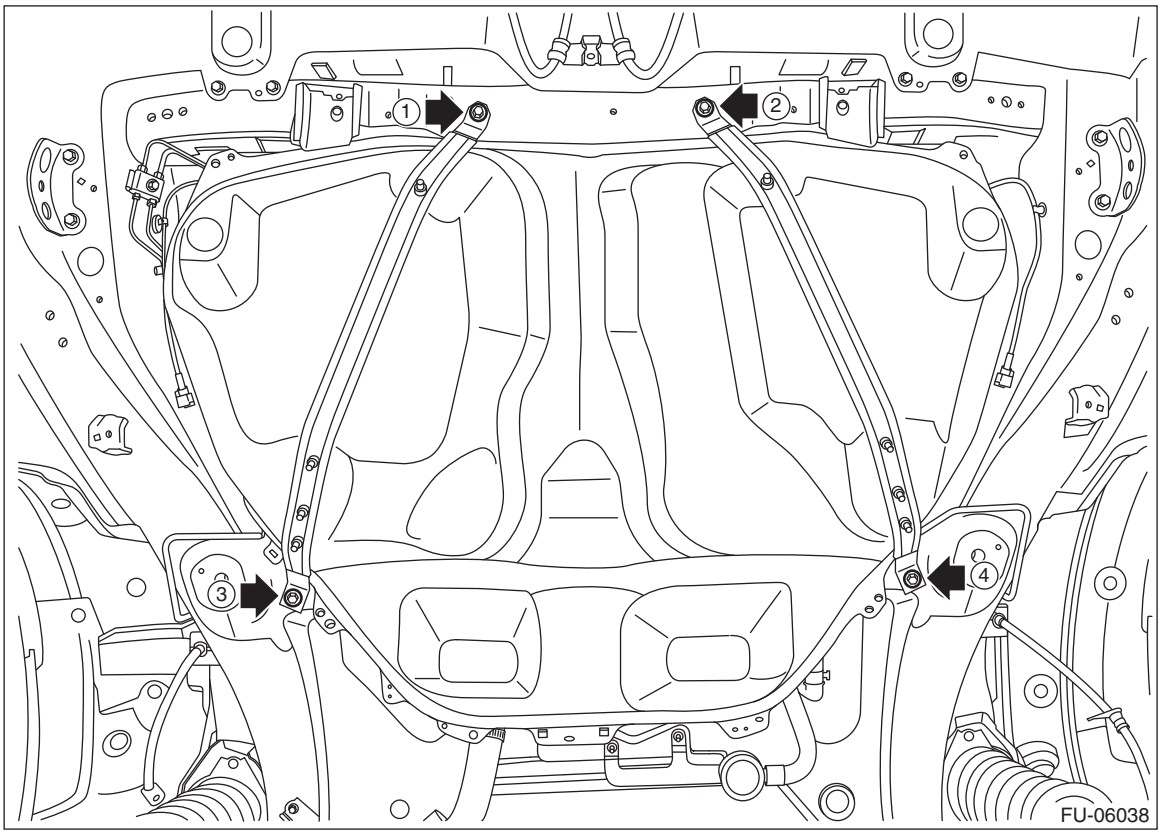
(1) Hose
(2) Clamp or clip
(3) Spool
(4) Pipe

4) Connect the evaporation hose to fuel tank.



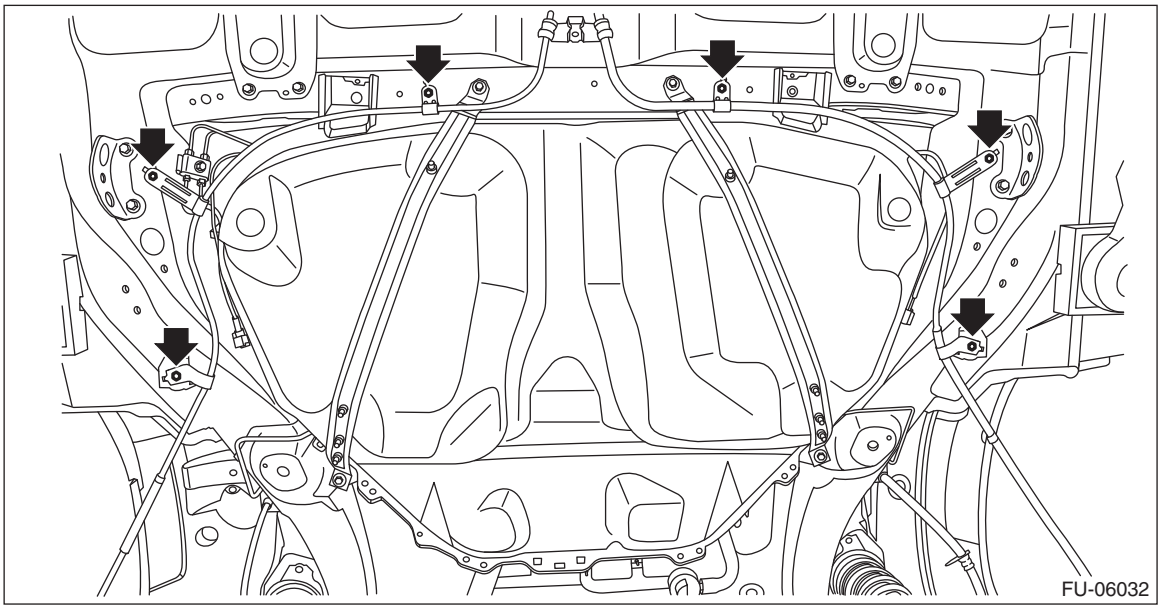
5) Tighten the bolts of the fuel tank band in the order shown in the figure.

Tightening torque:
33 N·m (3.4 kgf-m, 24.3 ft-lb)



6) Install the parking brake cable clamp to the body.

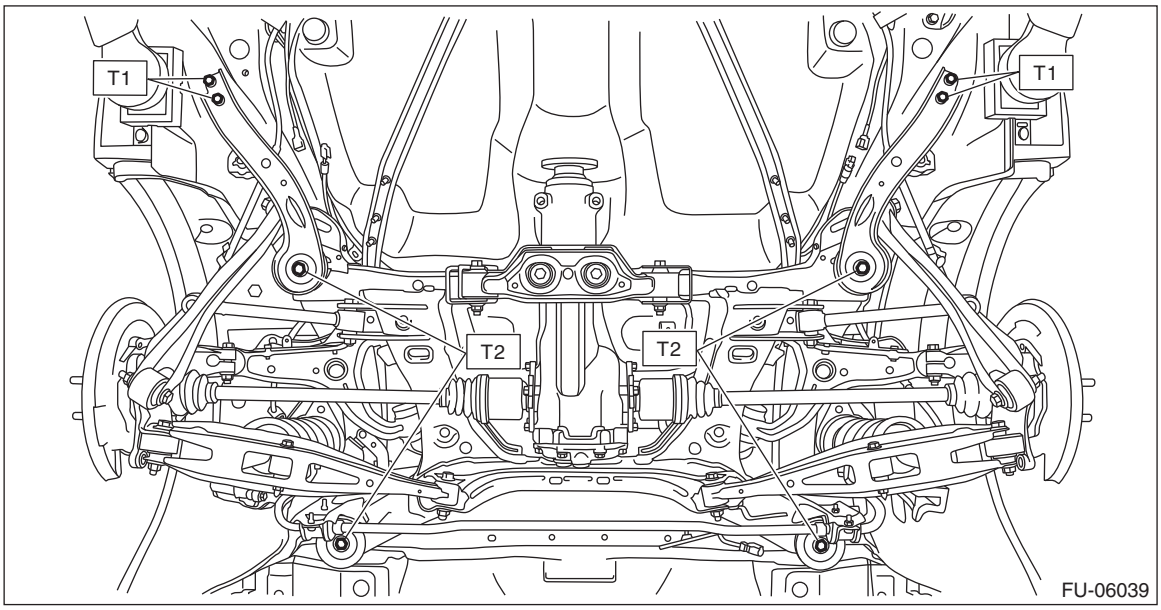
Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)



7) Install the rear suspension assembly.

WARNING:
A helper is required to perform this work.
(1) Support the rear suspension assembly with a transmission jack.
(2) Support the rear suspension assembly and install the rear suspension assembly to the body.

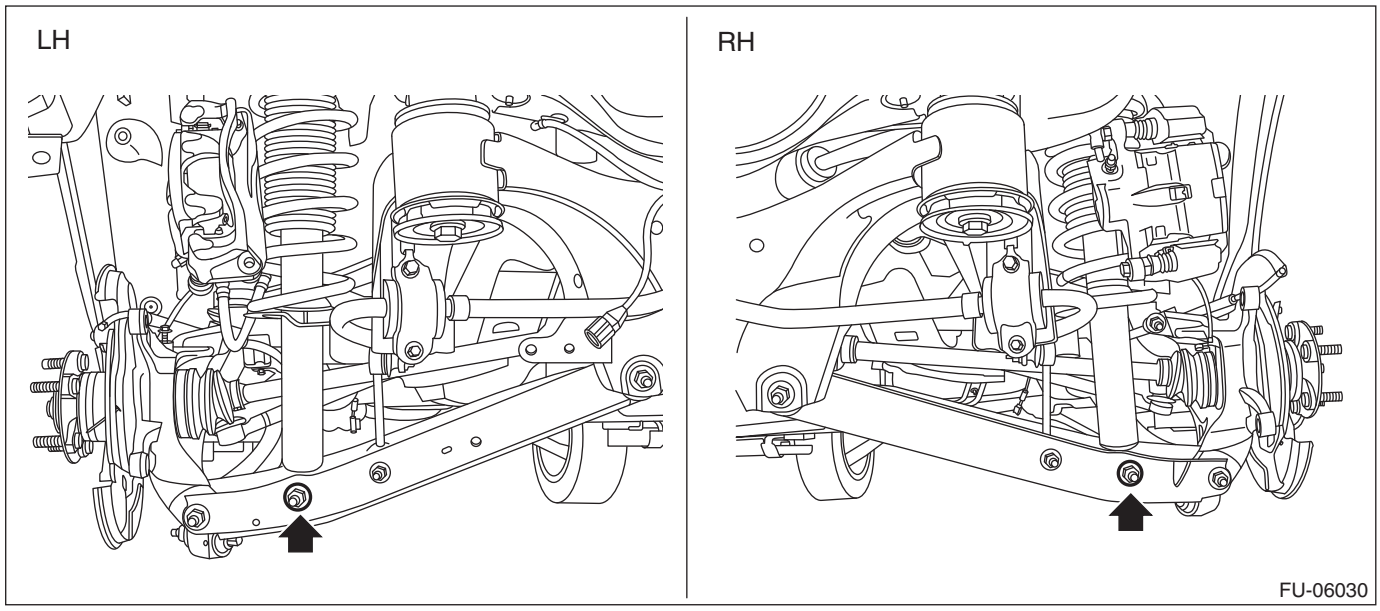
Tightening torque:
T1: 70 N·m (7.1 kgf-m, 51.6 ft-lb)
T2: 145 N·m (14.8 kgf-m, 106.9 ft-lb)



(3) Install the rear shock absorber to the rear suspension arm.

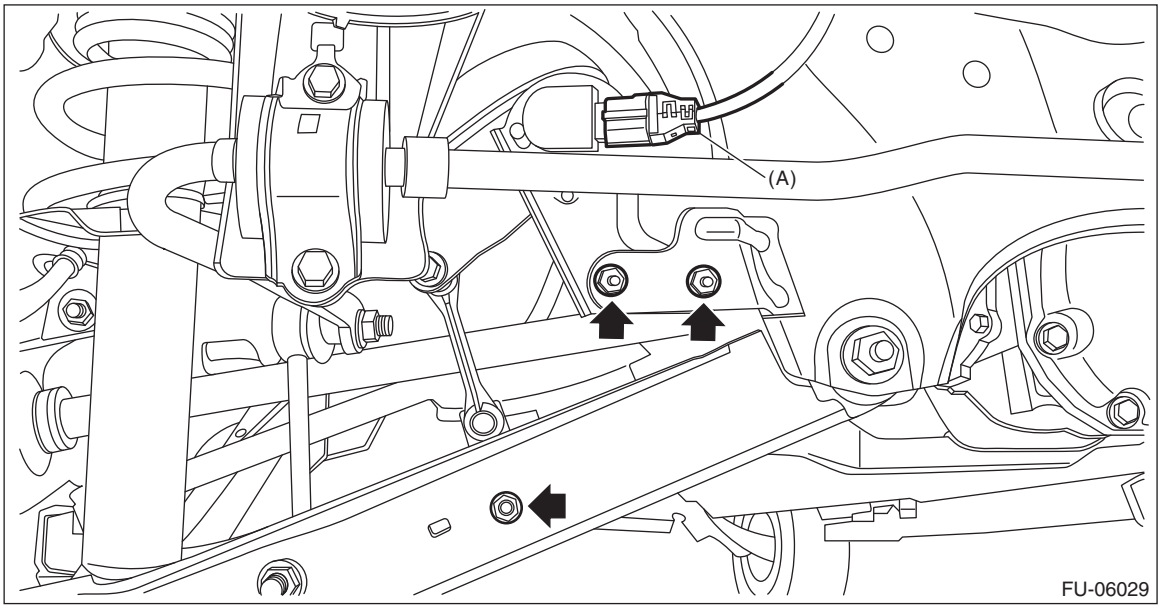
NOTE:
Use a new self-locking nut.

Tightening torque:
120 N·m (12.2 kgf-m, 88.5 ft-lb)

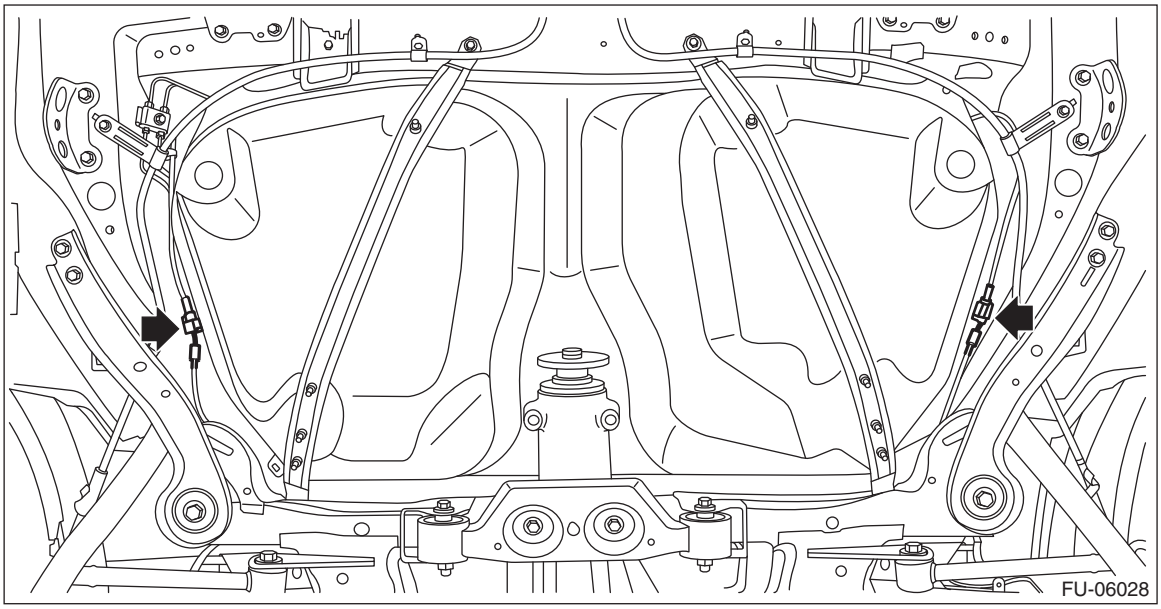


8) Install the rear vehicle height sensor and connect the connector (A) to the rear vehicle height sensor. (model with auto headlight beam leveler, left side only)

Tightening torque:
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)



9) Connect the connector to the rear ABS wheel speed sensor.



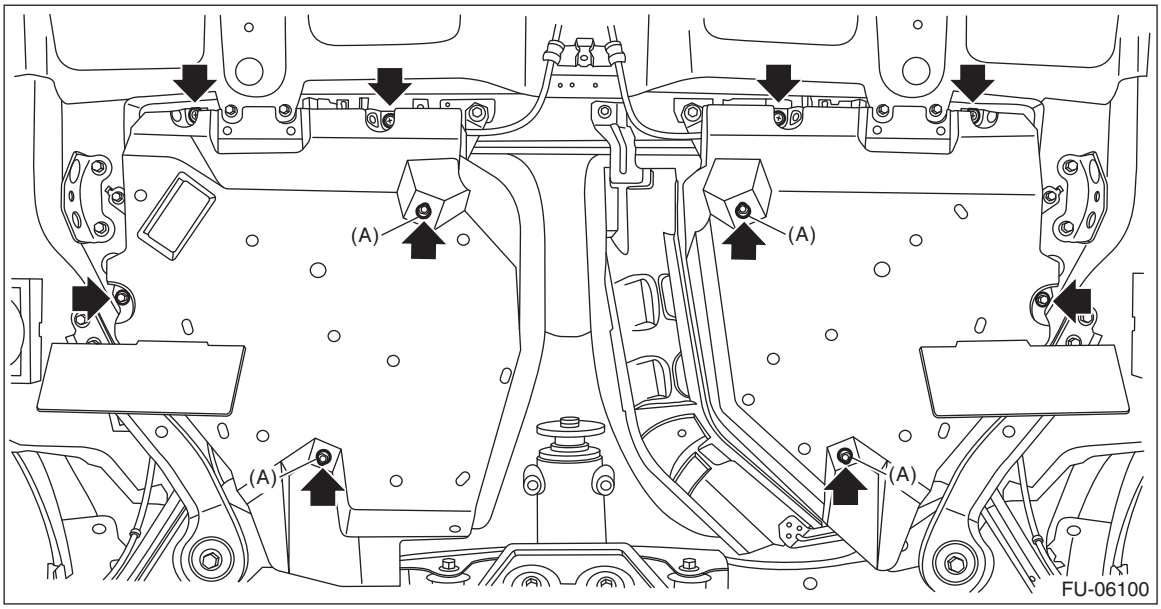
10) Install the heat shield cover.

Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)

11) Install the fuel tank protector.

NOTE:
Use a new self-locking nut.

Tightening torque:
Nut: 9 N·m (0.9 kgf-m, 6.6 ft-lb)
Bolt: 18 N·m (1.8 kgf-m, 13.3 ft-lb)

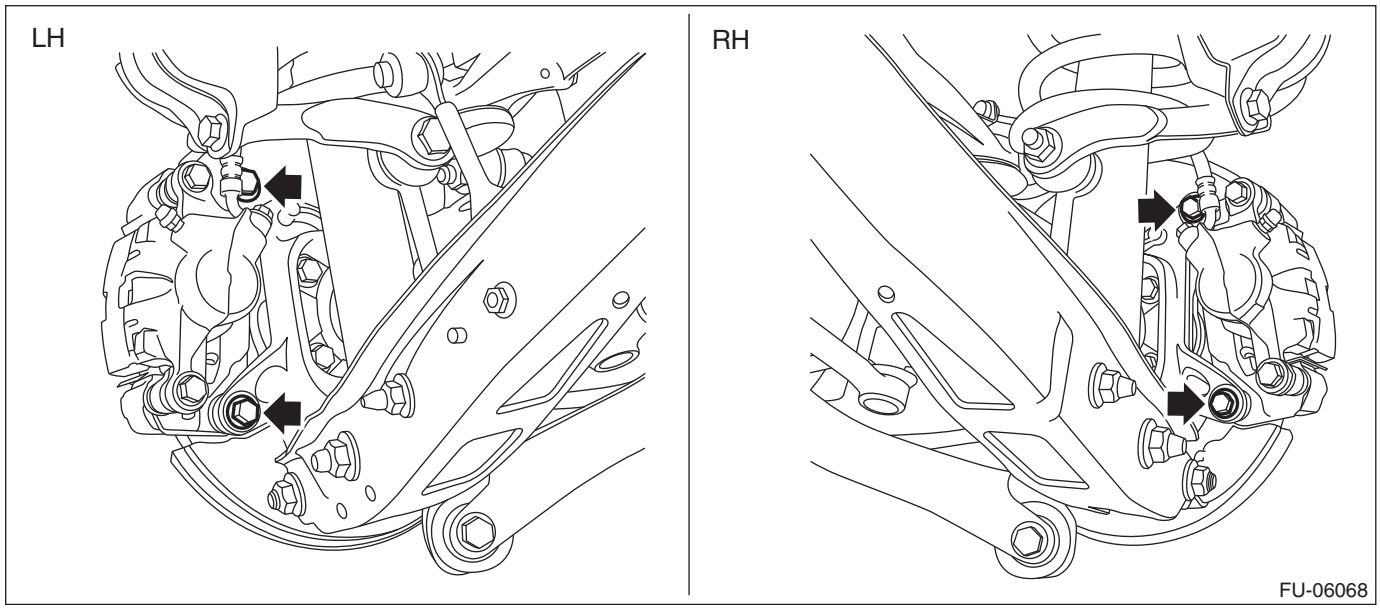


(A) Self-locking nut

12) Install the propeller shaft. <Ref. to DS-11, INSTALLATION, Propeller Shaft.>
13) Install the rear exhaust pipe and muffler. <Ref. to EX(H4DO)-14, INSTALLATION, Rear Exhaust Pipe.> <Ref. to EX(H4DO)-17, INSTALLATION, Muffler.>
14) Lower the vehicle.

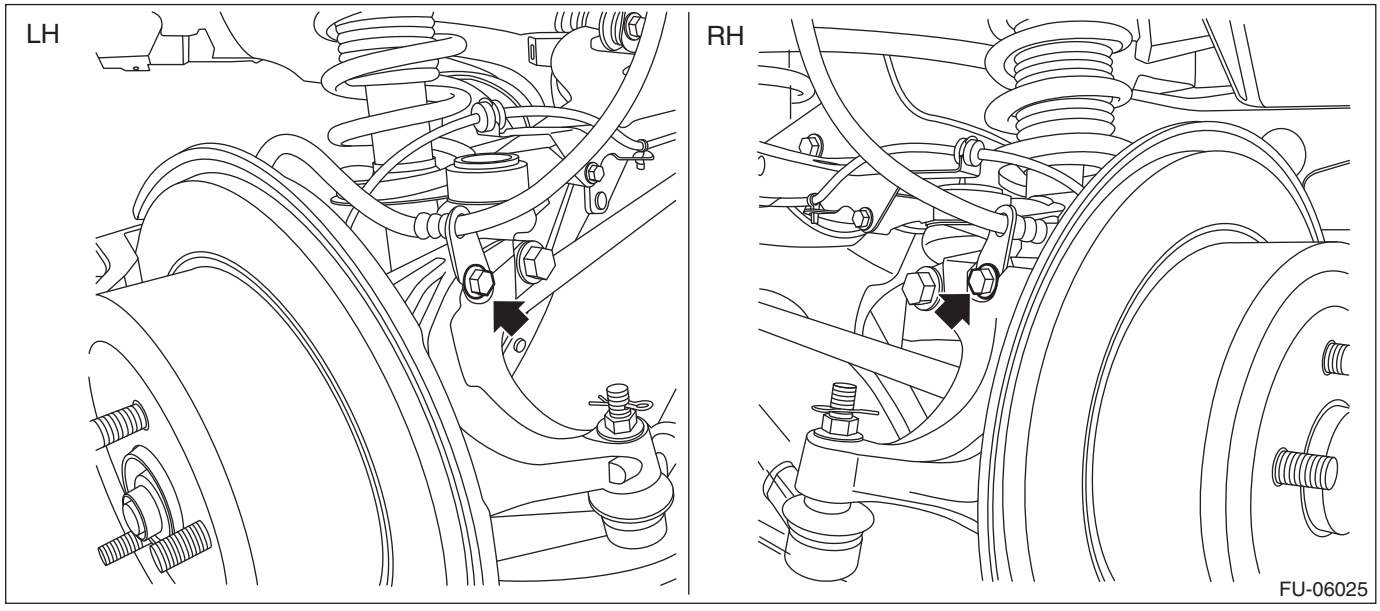
15) Connect the parking brake cable to the parking brake assembly. <Ref. to PB-7, INSTALLATION, Parking Brake Assembly (Rear Disc Brake).>
16) Install the rear disc brake assembly.

Tightening torque:
66 N·m (6.7 kgf-m, 48.7 ft-lb)



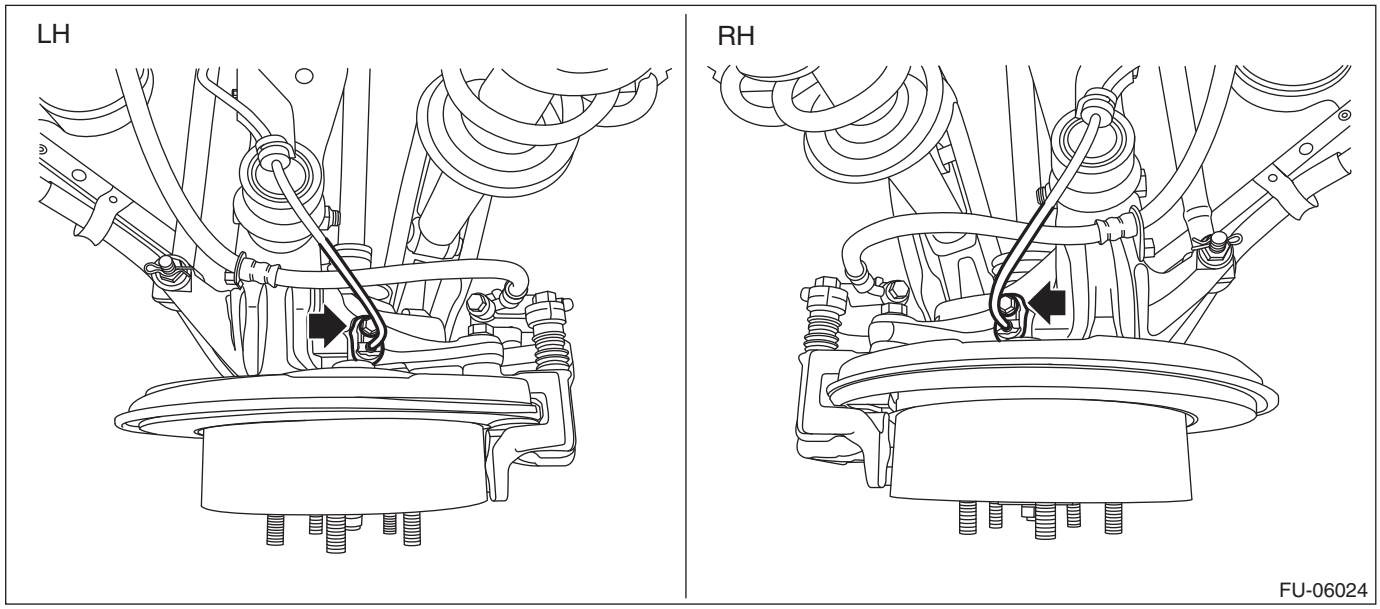
17) Install the rear brake hose bracket to the rear housing.

Tightening torque:
33 N·m (3.4 kgf-m, 24.3 ft-lb)



18) Attach the rear ABS wheel speed sensor to the rear housing.

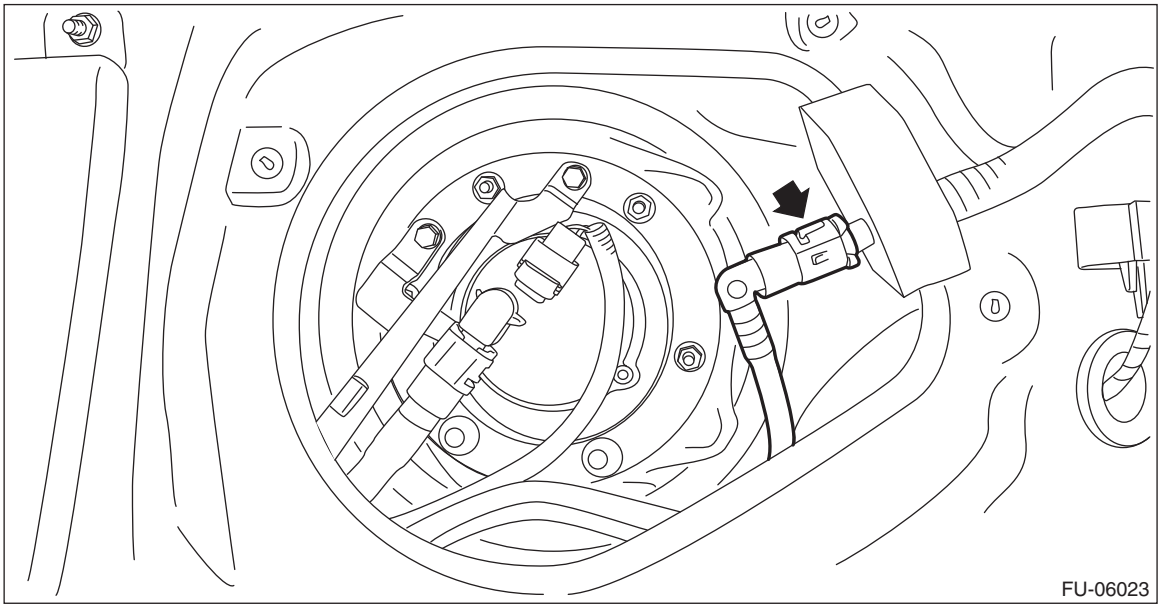
Tightening torque:
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)



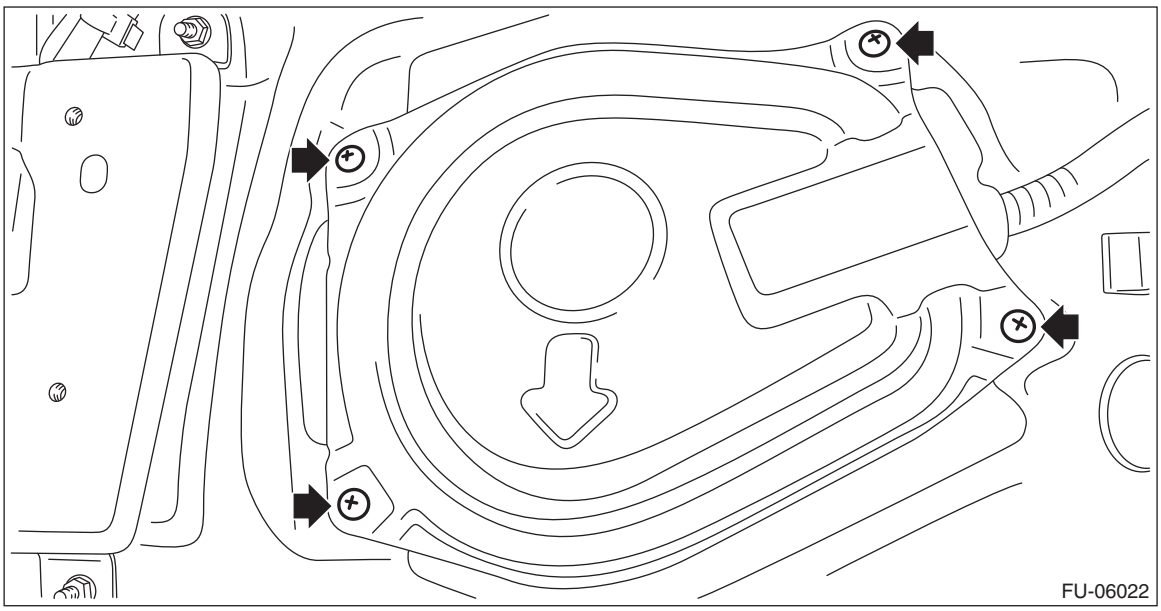
19) Install the rear wheels.

Tightening torque:
100 N·m (10.2 kgf-m, 73.8 ft-lb)

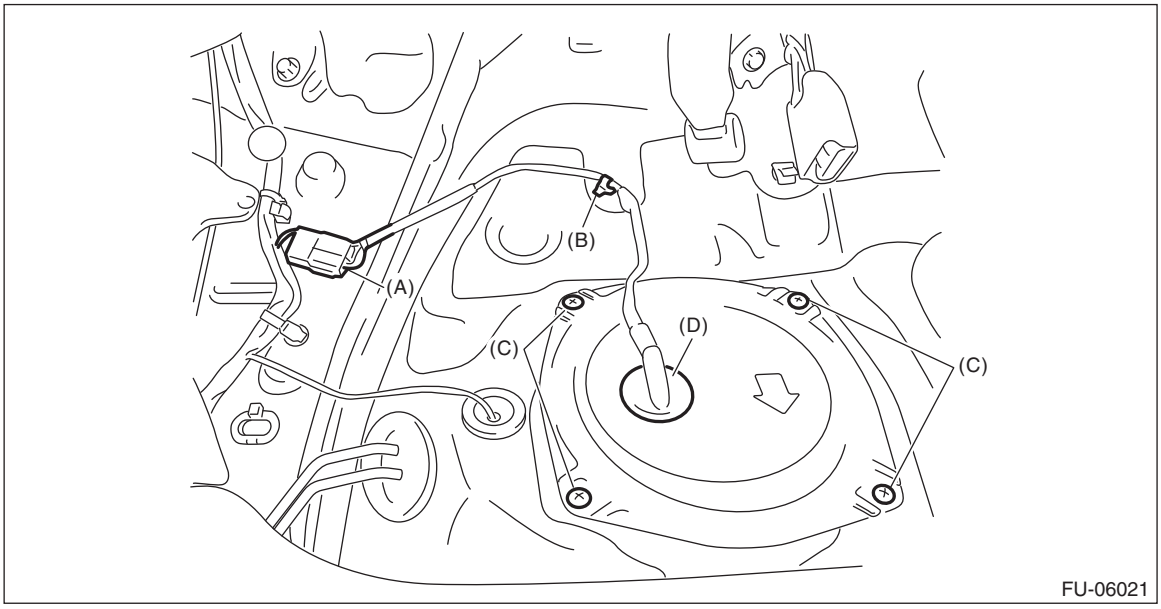
20) Connect the quick connector of the fuel delivery tube. <Ref. to FU(H4DO)-165, INSTALLATION, Fuel Delivery and Evaporation Lines.>



21) Install the service hole cover of fuel sub level sensor.



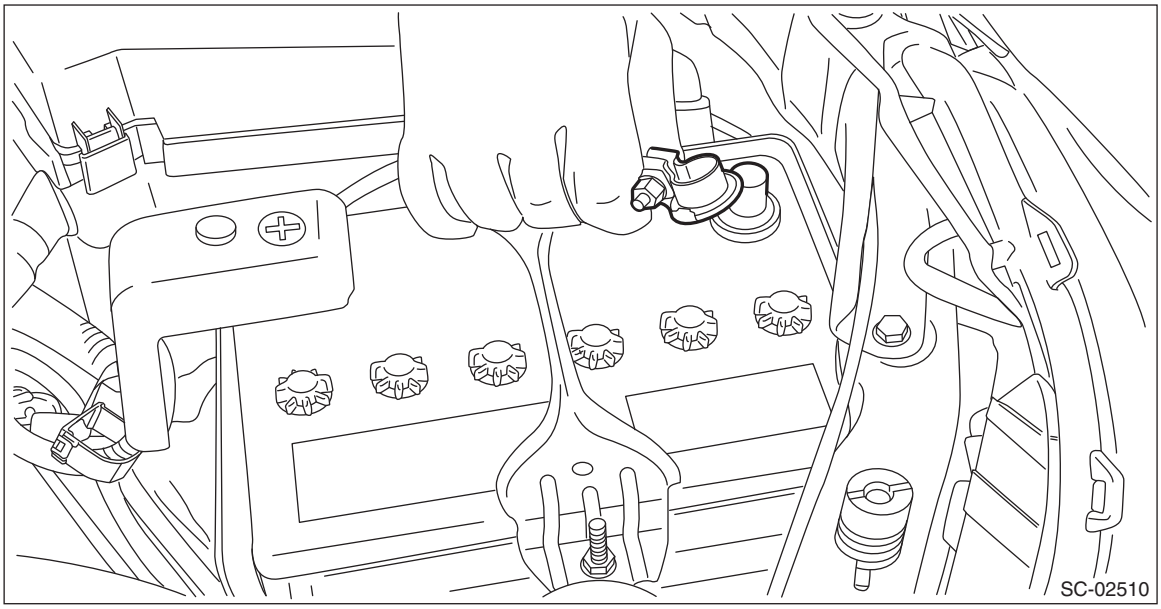
22) Attach the service hole cover of the fuel pump, and attach the connector and clip.



(A) Connector
(B) Clip
(C) Screw
(D) Grommet

23) Install the rear seat cushion. <Ref. to SE-18, INSTALLATION, Rear Seat.>

24) Connect the battery ground terminal.



25) Inspect the wheel alignment and adjust if necessary.
26) Perform reinitialization of the auto headlight beam leveler system. (model with auto headlight beam leveler) <Ref. to LI-16, PROCEDURE, Auto Headlight Beam Leveler System.>

C: INSPECTION

1) Check that the fuel tank and fuel pipe have no deformation, cracks and other damages.
2) Check that the fuel hose has no cracks, damage or loose part.

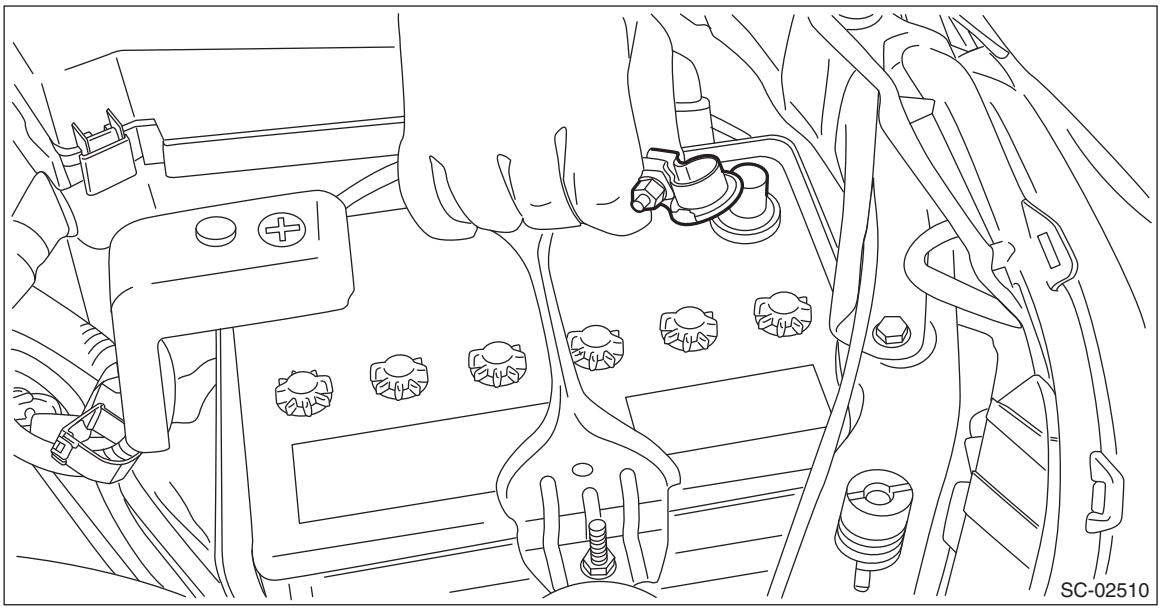
26.Fuel Filler Pipe

A: REMOVAL

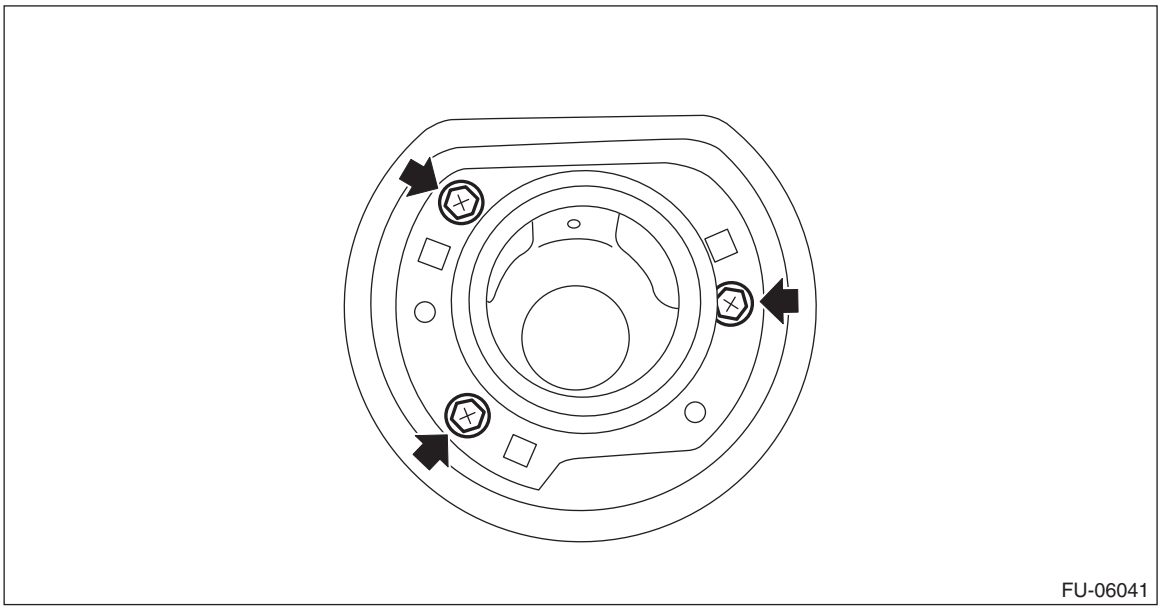
WARNING:
Place "NO OPEN FLAMES" signs near the working area.

CAUTION:
Be careful not to spill fuel.

1) Release the fuel pressure. <Ref. to FU(H4DO)-109, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Drain fuel. <Ref. to FU(H4DO)-109, DRAINING FUEL (WITH SUBARU SELECT MONITOR), PROCEDURE, Fuel.>
3) Disconnect the ground cable from battery.

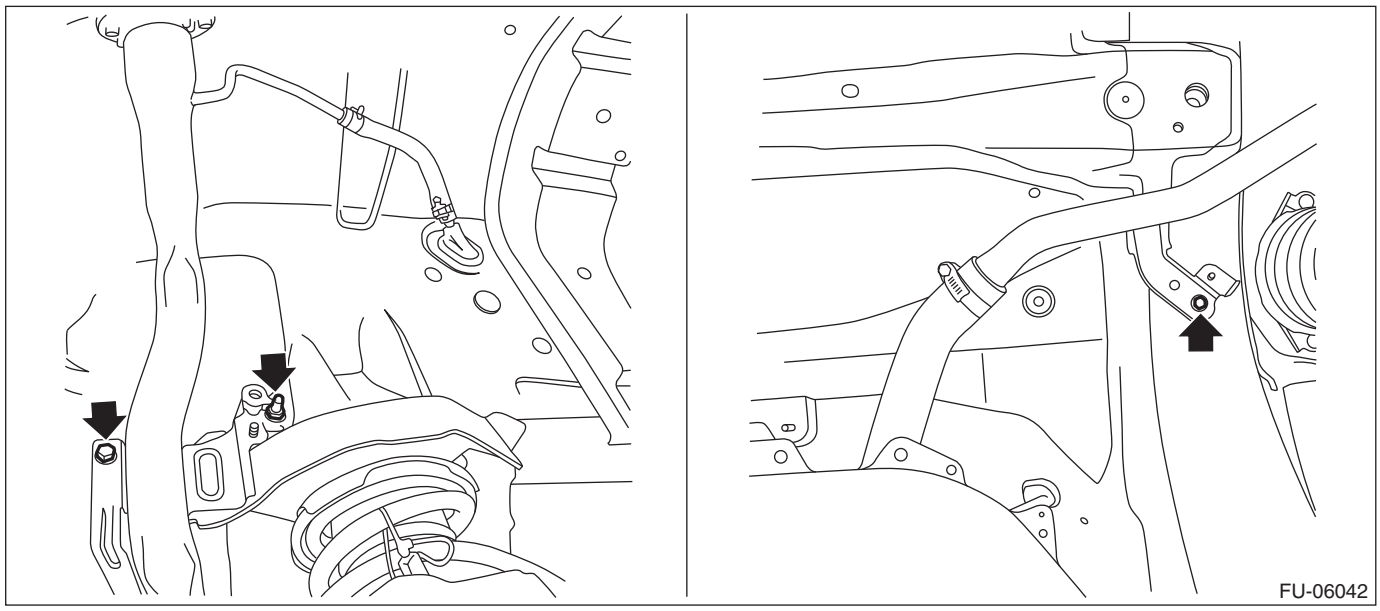


4) Open the fuel filler lid and remove the fuel filler cap.
5) Remove the screws which secure the fuel filler ring, and then remove the fuel filler ring.

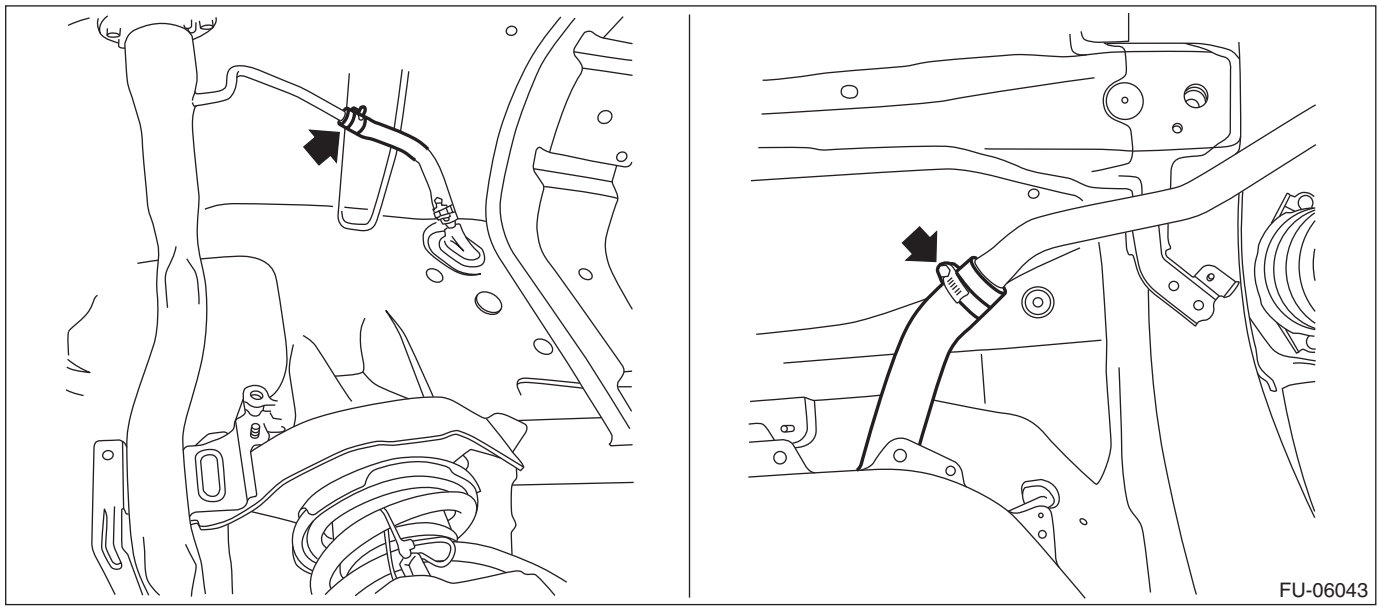


6) Remove the rear wheel RH.
7) Lift up the vehicle.
8) Remove the rear mud guard RH. <Ref. to EI-28, REAR MUD GUARD, REMOVAL, Mud Guard.>

9) Remove the rear sub frame. <Ref. to RS-18, REMOVAL, Rear Sub Frame.>
10) Remove the bolts and nuts which secure fuel filler pipe assembly onto the vehicle body.



11) Disconnect the fuel filler hose and air vent hose from the fuel filler pipe assembly.

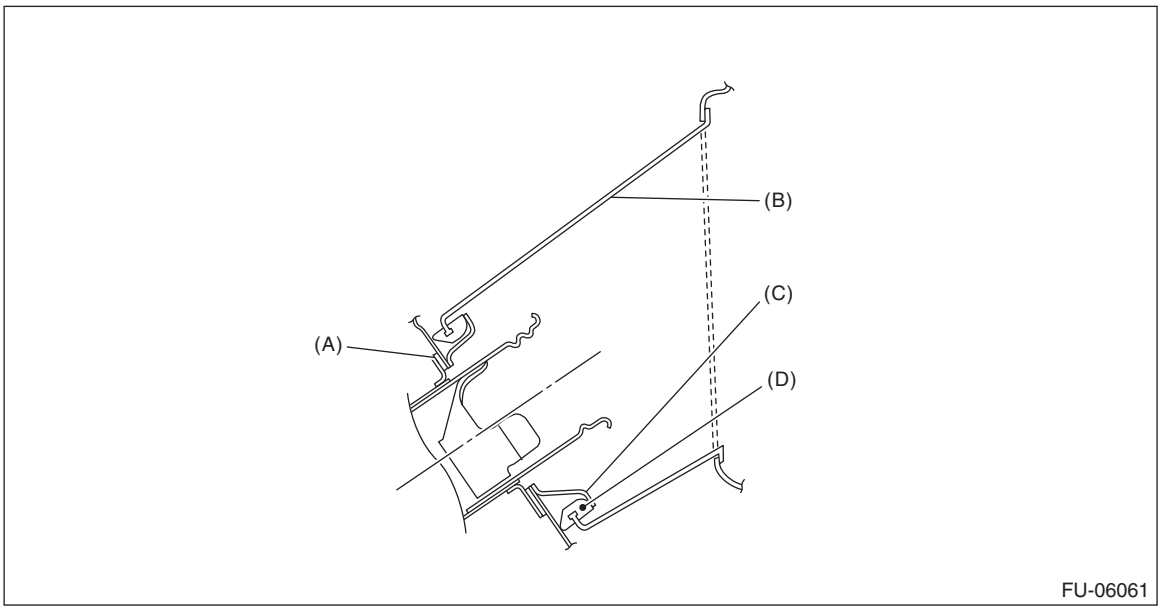


12) Remove the fuel filler pipe assembly from the underside of the vehicle.

B: INSTALLATION

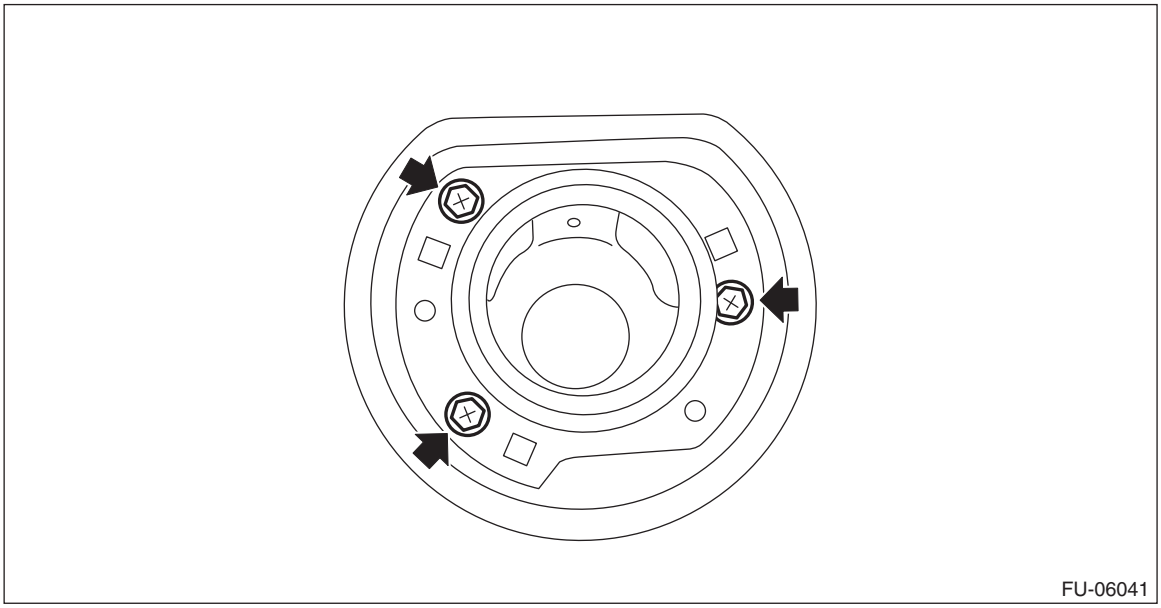
1) Open the fuel filler lid.
2) Attach the fuel filler pipe gasket to the fuel filler pipe assembly, and insert the fuel filler pipe assembly from inside of the rear fender.
3) Install the fuel filler ring to the fuel filler pipe assembly.

NOTE:
If the edges of rubber gasket are folded toward inside, straighten it with a flat tip screwdriver.



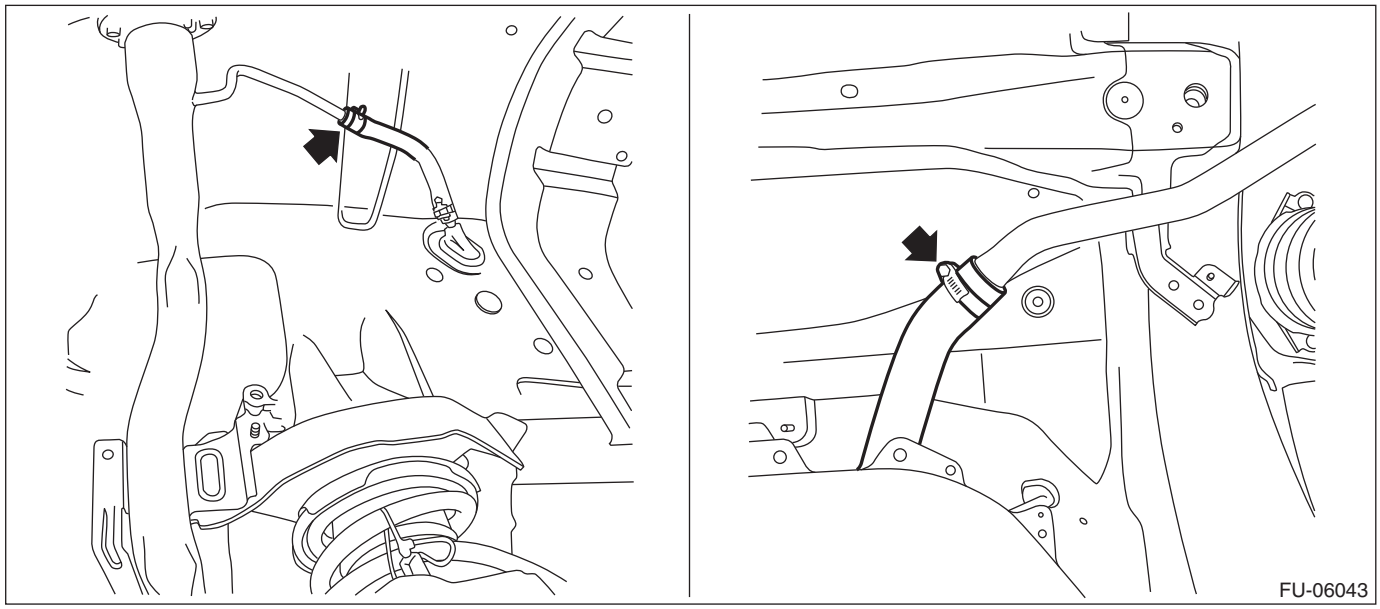
(A) Fuel filler pipe gasket
(B) Fuel saucer
(C) Fuel filler ring
(D) Rubber gasket

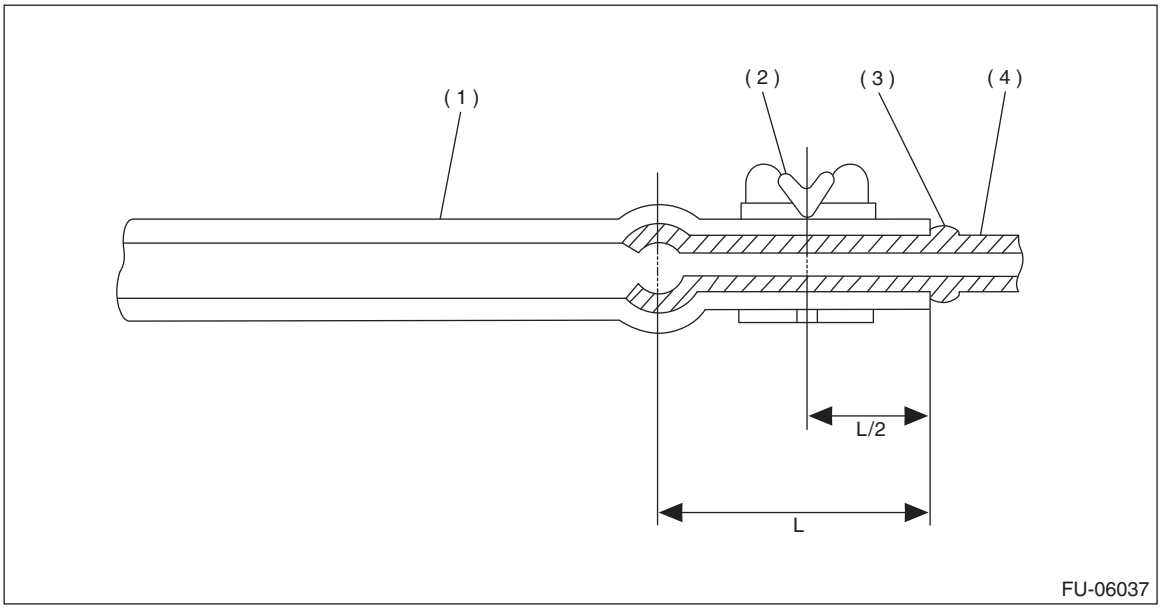
Tightening torque:
4.4 N·m (0.4 kgf-m, 3.2 ft-lb)



4) Securely insert the fuel filler hose and air vent hose to the spool, and then install a clamp or clip as shown.

Tightening torque:
2.5 N·m (0.3 kgf-m, 1.8 ft-lb)

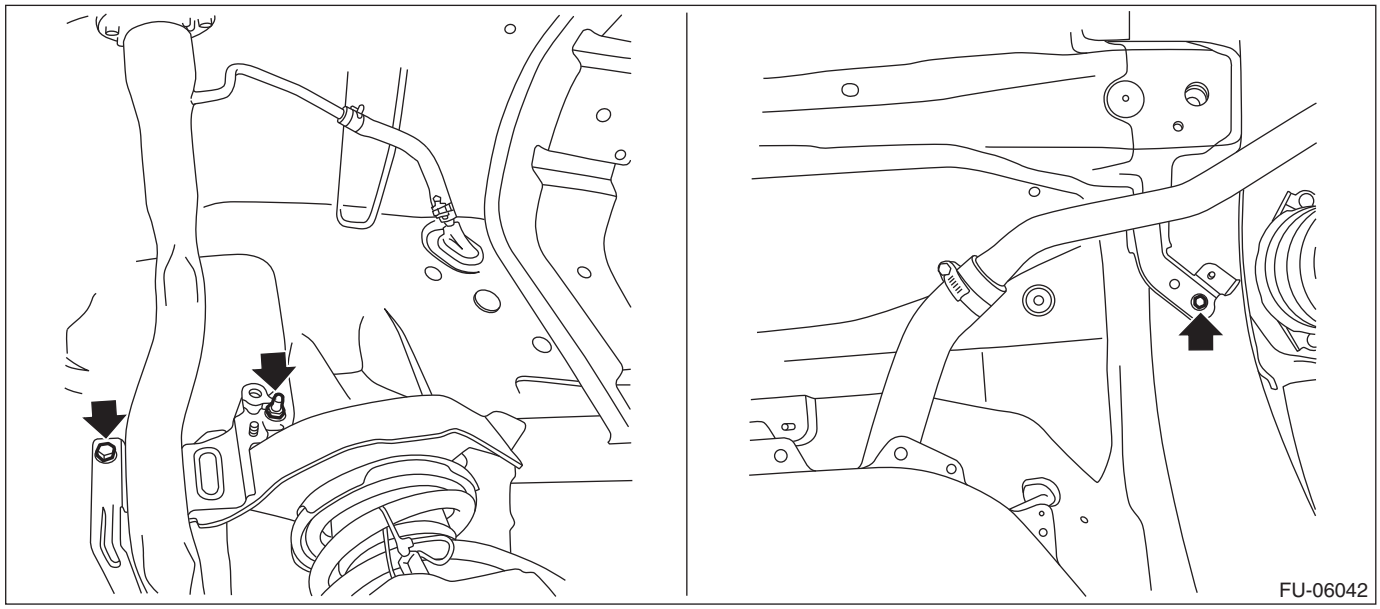




(1) Hose
(2) Clamp or clip
(3) Spool
(4) Pipe

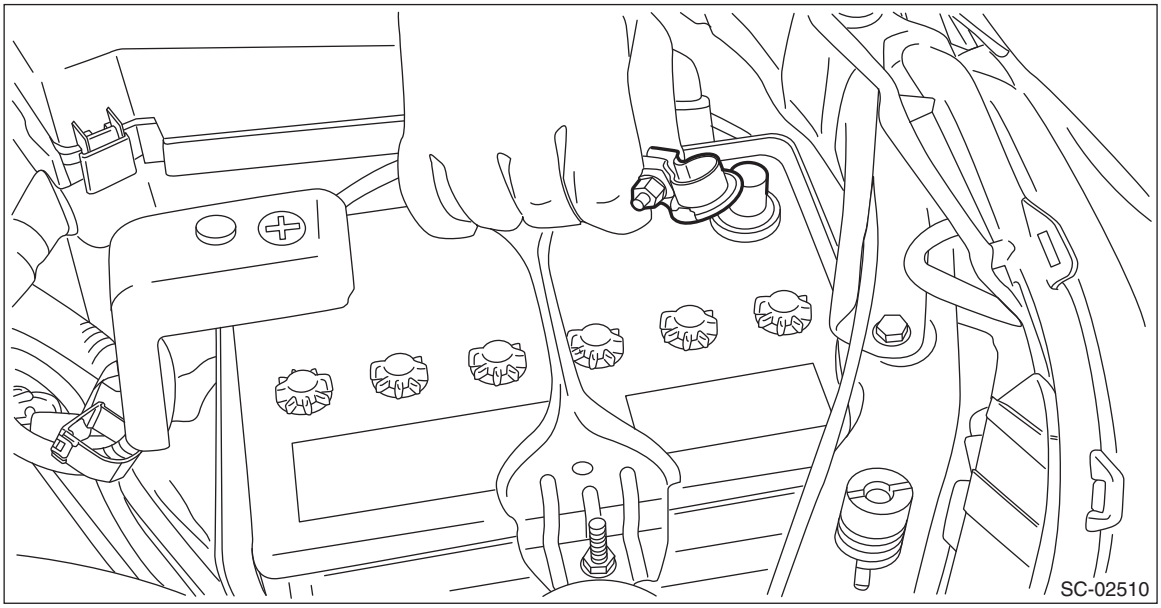
5) Install the fuel filler pipe assembly to vehicle body.

Tightening torque:
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)



6) Install the rear sub frame. <Ref. to RS-19, INSTALLATION, Rear Sub Frame.>
7) Install the rear mud guard RH. <Ref. to EI-28, INSTALLATION, Mud Guard.>
8) Lower the vehicle.
9) Install the rear wheel RH.

Tightening torque:
100 N·m (10.2 kgf-m, 73.8 ft-lb)
10) Connect the battery ground terminal.



11) Inspect the wheel alignment and adjust if necessary.
12) Perform reinitialization of the auto headlight beam leveler system. (model with auto headlight beam leveler) <Ref. to LI-16, PROCEDURE, Auto Headlight Beam Leveler System.>

C: INSPECTION

1) Check that the fuel filler pipe assembly has no deformation, cracks or other damages.
2) Check that the fuel hose has no cracks, damage or loose part.

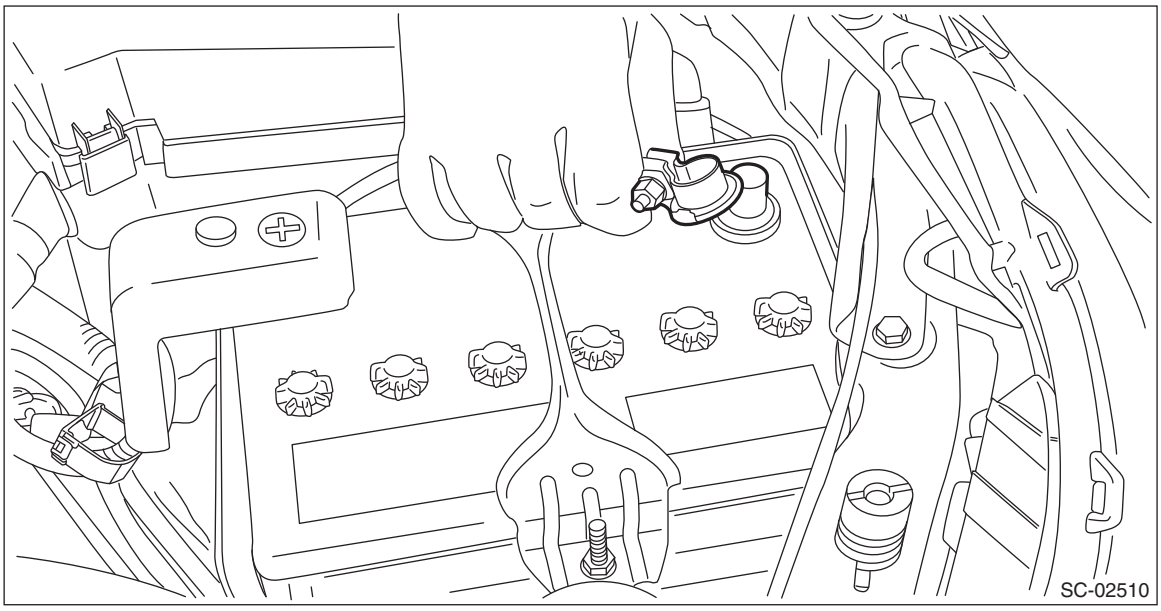
27.Fuel Pump

A: REMOVAL

WARNING:
Place “NO OPEN FLAMES” signs near the working area.

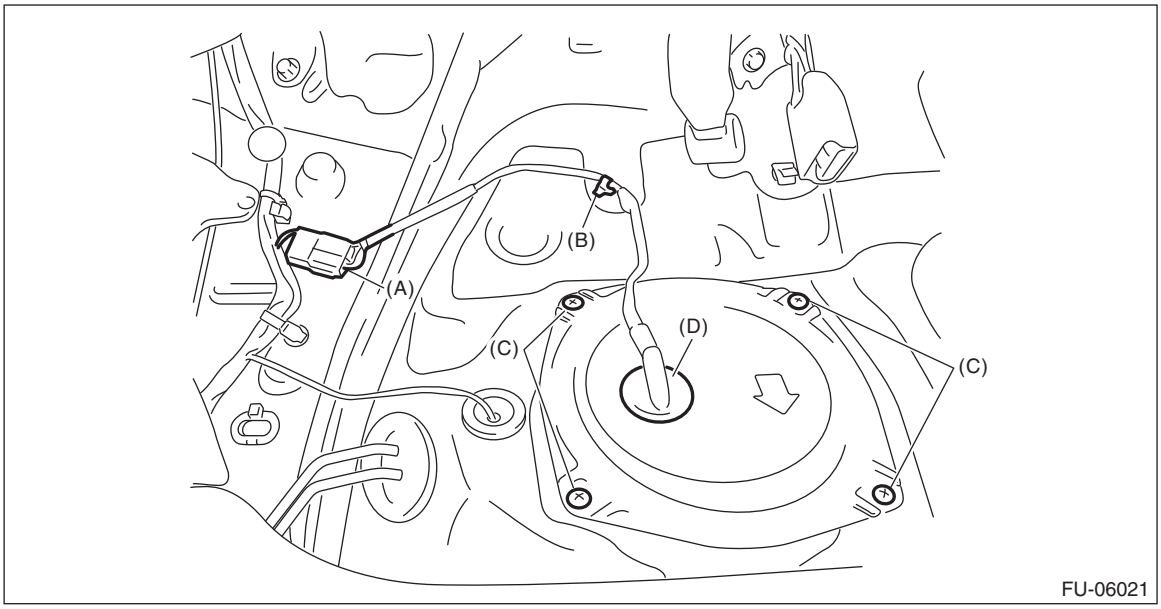
CAUTION:
- **Be careful not to spill fuel.**
- **If the fuel gauge indicates that two thirds or more of the fuel is remaining, be sure to drain fuel before starting work to avoid the fuel to spill.**

NOTE:
Fuel pump assembly consists of fuel pump, fuel filter and fuel level sensor.
1) Release the fuel pressure. <Ref. to FU(H4DO)-109, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Drain fuel. <Ref. to FU(H4DO)-109, DRAINING FUEL (WITH SUBARU SELECT MONITOR), PROCEDURE, Fuel.>
3) Disconnect the ground cable from battery.

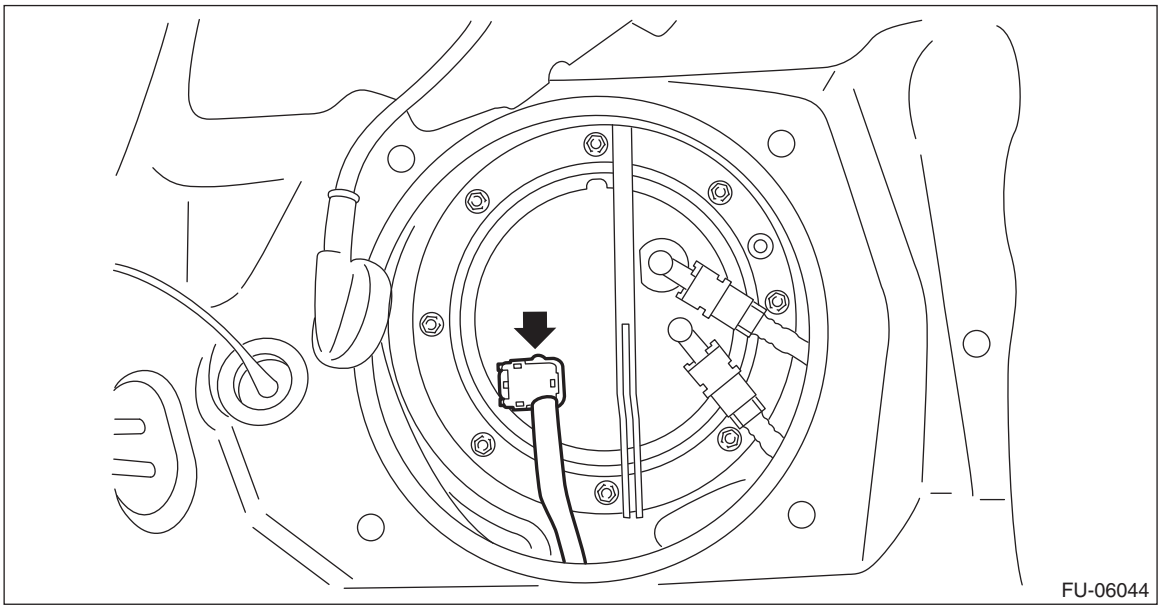


4) Remove the rear seat cushion. <Ref. to SE-16, REMOVAL, Rear Seat.>

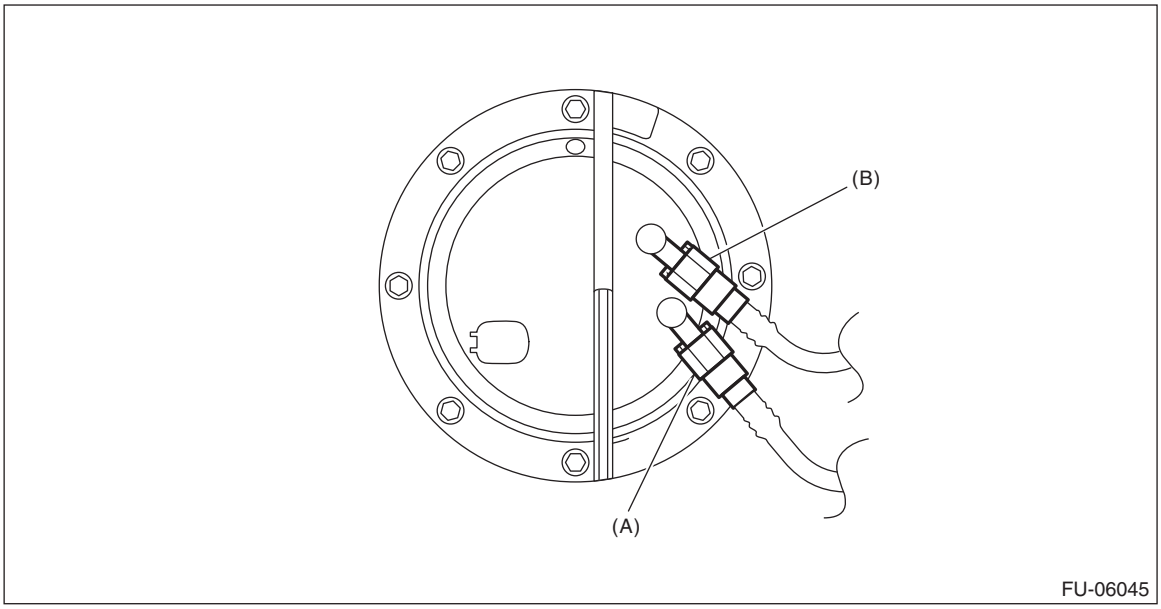
5) Remove the service hole cover of fuel pump.
   (1) Disconnect fuel pump connector (A), and remove clip (B).
   (2) Remove the screw (C).
   (3) Push the grommet (D) down and remove the service hole cover.



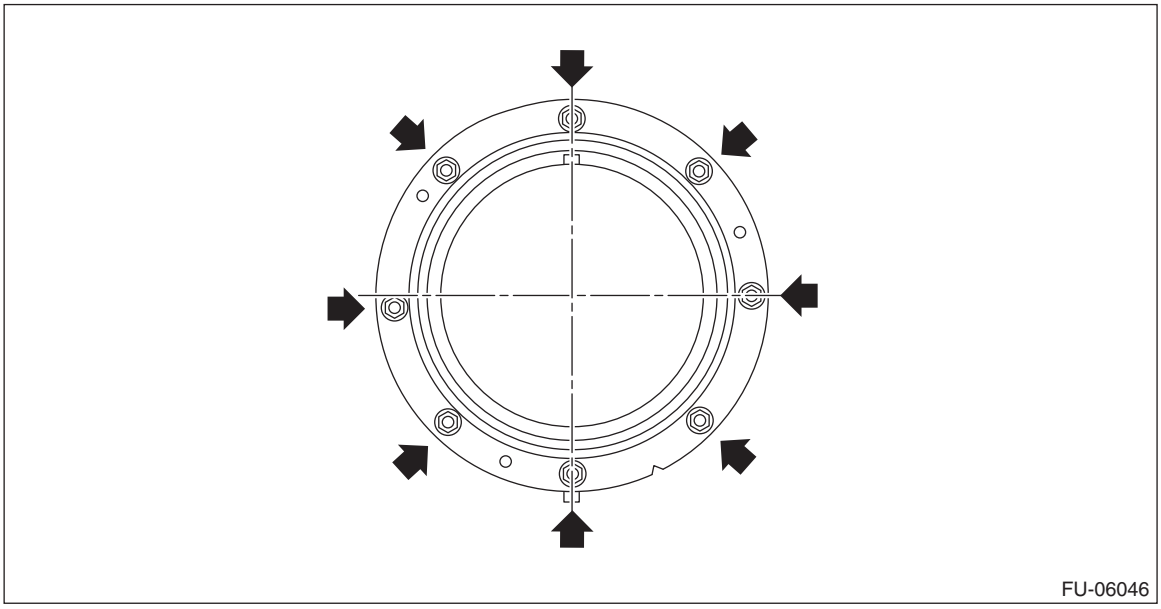
6) Disconnect the connector from fuel pump.



7) Disconnect the quick connector of fuel delivery tube (A) and jet pump tube (B). <Ref. to FU(H4DO)-158, REMOVAL, Fuel Delivery and Evaporation Lines.>



8) Remove the nuts which hold the fuel pump upper plate to the fuel tank.



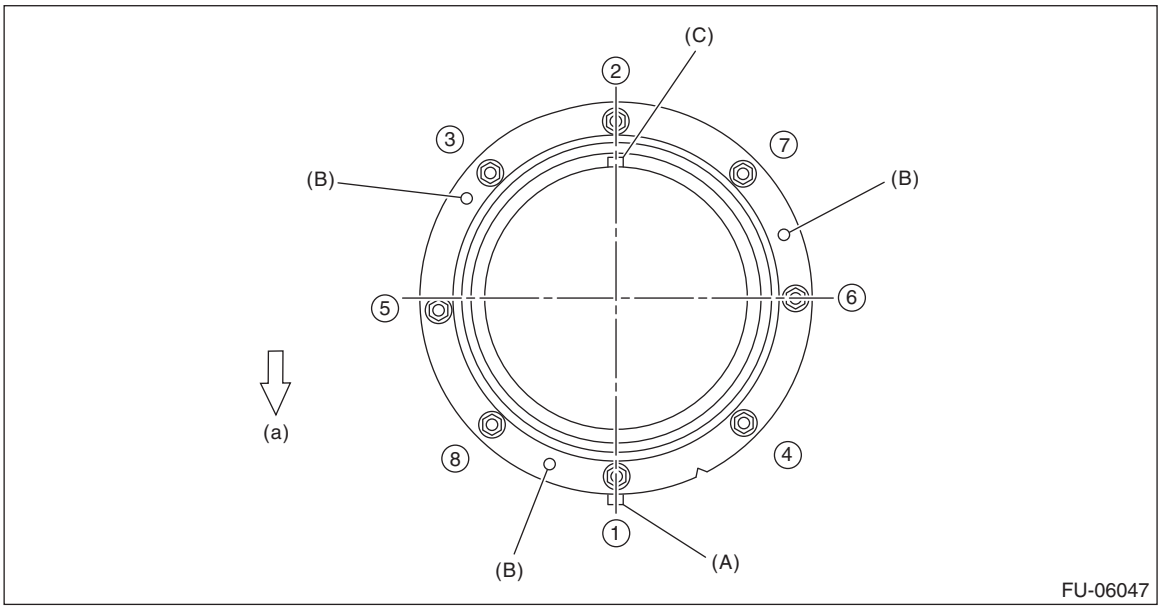
9) Remove the fuel pump assembly from the fuel tank.

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.
- Align protrusion (A) of the gasket to the position shown in the figure.
- Insert the protrusion (B) of gasket to the fuel pump upper plate. (3 places)
- Align the protrusion (C) of fuel pump assembly with the cutout on the fuel pump upper plate.
- 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 (0.4 kgf-m, 3.2 ft-lb)

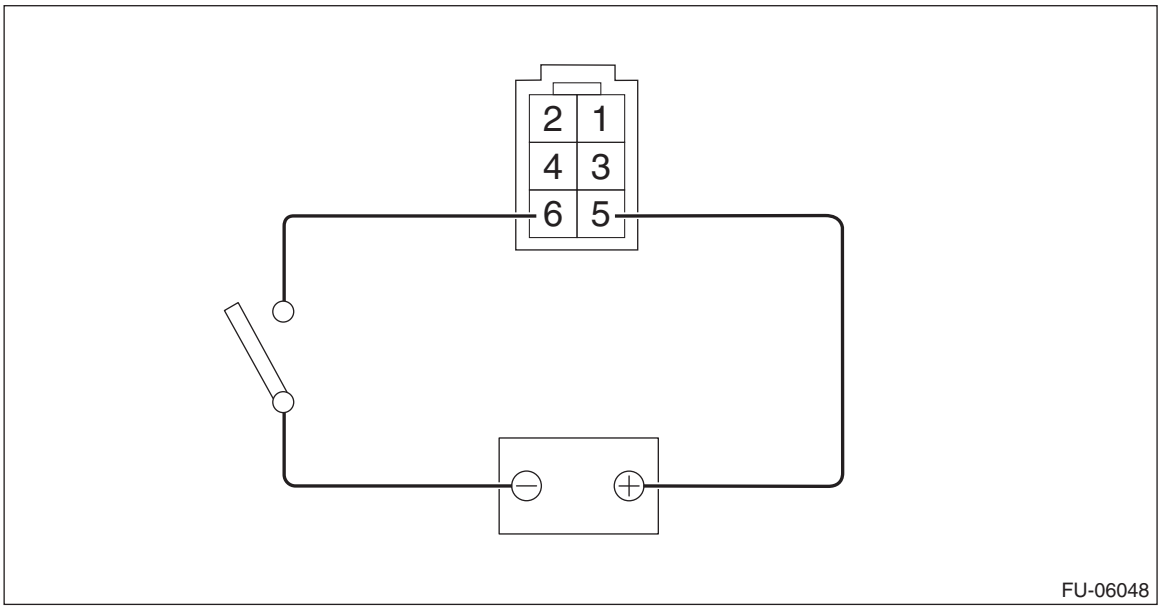


(a) Front side of vehicle

C: INSPECTION

1) Check that the fuel pump has no deformation, cracks or other damages.
2) Connect the battery positive terminal to terminal No. 5 and the battery ground terminal to terminal No. 6, and inspect the fuel pump operation.

WARNING:
- **Wipe off fuel completely.**
- **Keep the battery as far apart from fuel pump as possible.**
- **Do not run the fuel pump for a long time under non-load condition.**



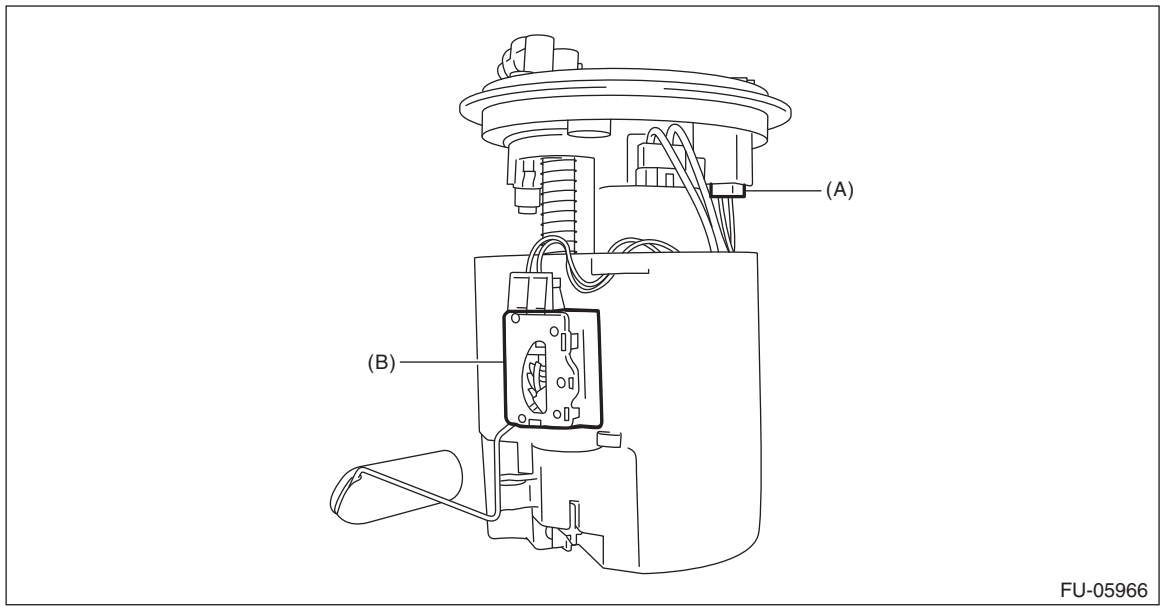
28.Fuel Level Sensor

A: REMOVAL

WARNING:
Place “NO OPEN FLAMES” signs near the working area.

CAUTION:
- **Be careful not to spill fuel.**
- **If the fuel gauge indicates that two thirds or more of the fuel is remaining, be sure to drain fuel before starting work to avoid the fuel to spill.**

NOTE:
The fuel level sensor is built in fuel pump assembly.
1) Remove the fuel pump assembly. <Ref. to FU(H4DO)-138, REMOVAL, Fuel Pump.>
2) Disconnect the connector (A) from fuel level sensor.
3) Remove the fuel level sensor (B).



B: INSTALLATION

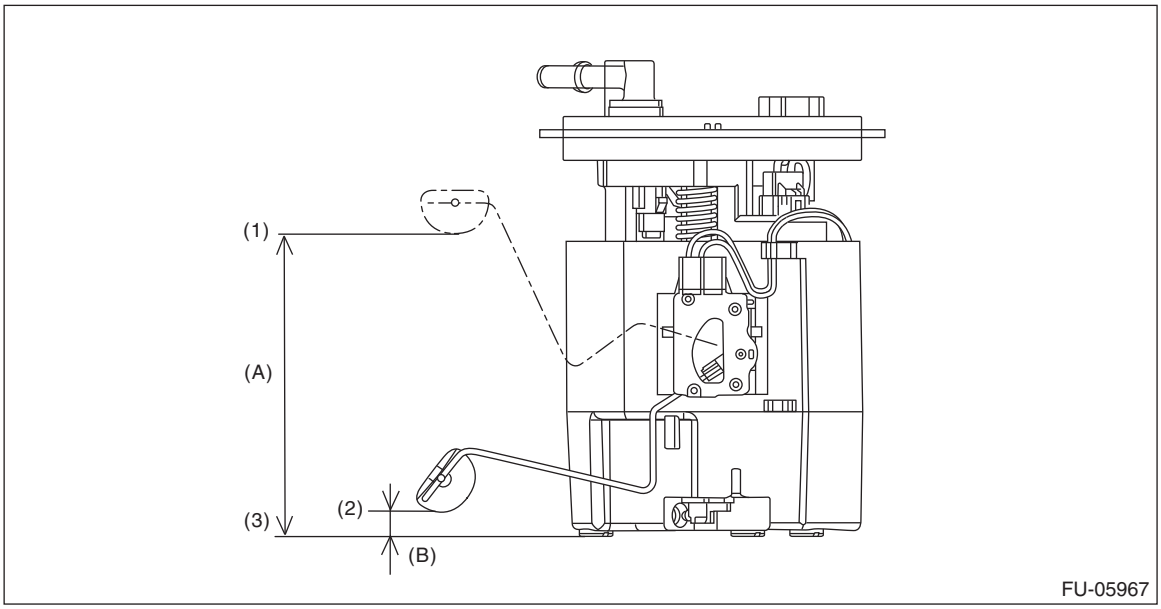
Install in the reverse order of removal.

C: INSPECTION

1) Check that the fuel level sensor has no damage.
2) Measure the fuel level sensor float position.

NOTE:
When inspecting the fuel level sensor, perform the work with the sensor installed to the fuel pump.

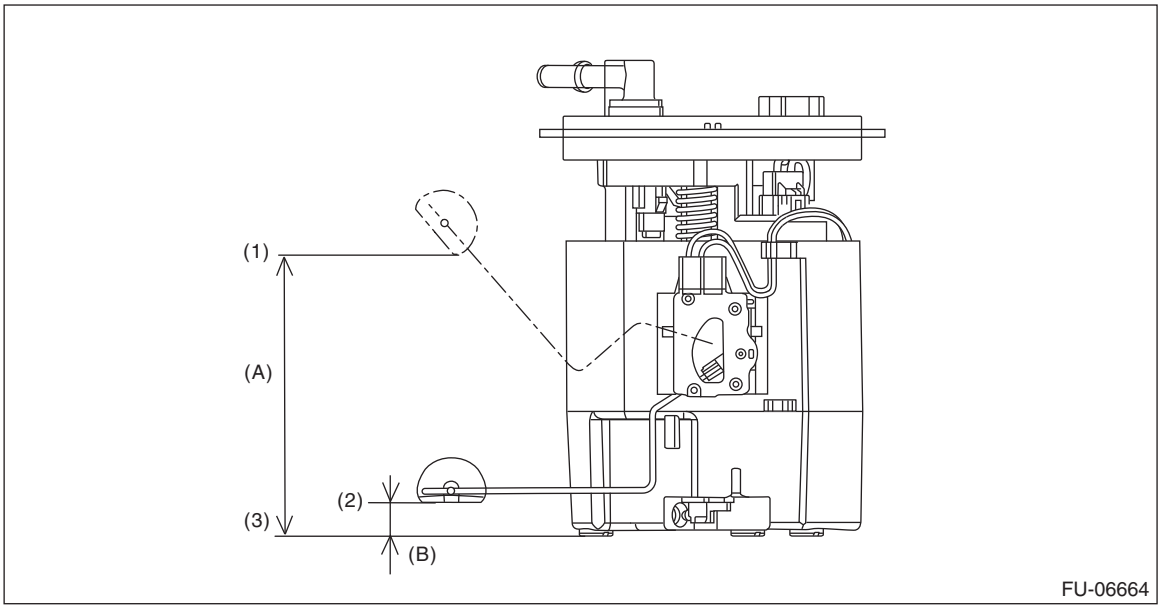
- Model with fuel level sensor bent in 3 locations



(1) FULL (2) EMPTY (3) Fuel tank seating surface

Float position	Standard
FULL to Fuel tank seating surface (A)	126.4±4 mm (4.976±0.157 in)
EMPTY to Fuel tank seating surface (B)	11.0±4 mm (0.433±0.157 in)

- Model with fuel level sensor bent in 2 locations

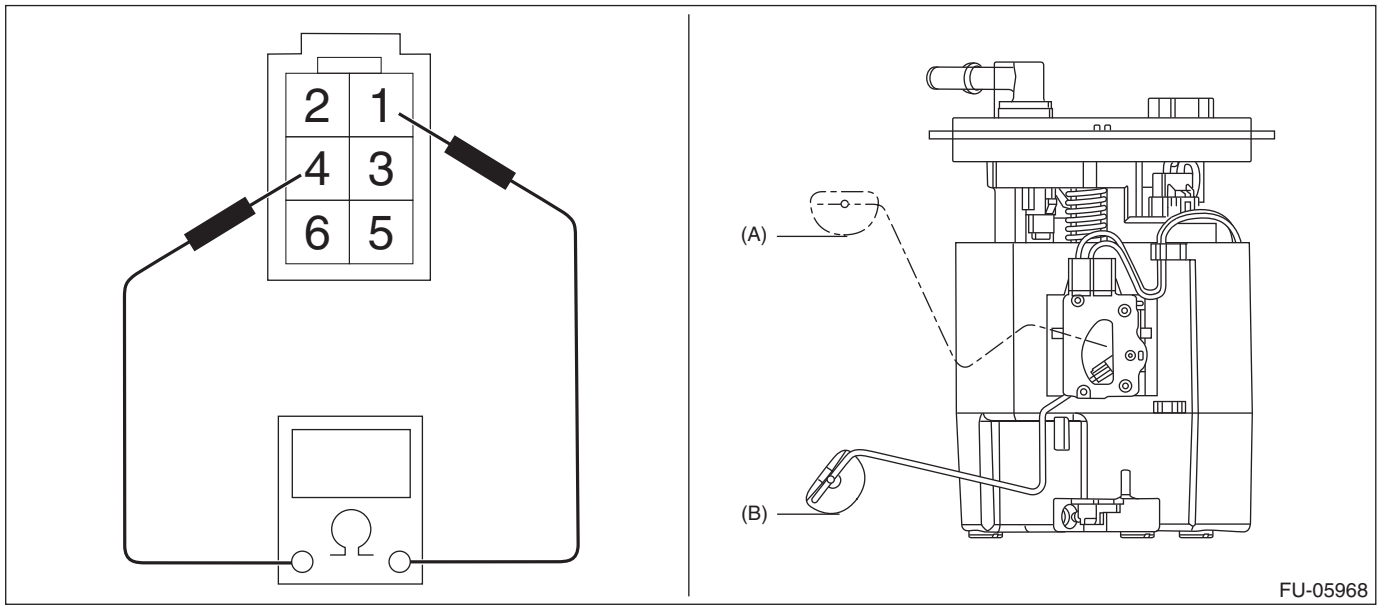


(1) FULL (2) EMPTY (3) Fuel tank seating surface

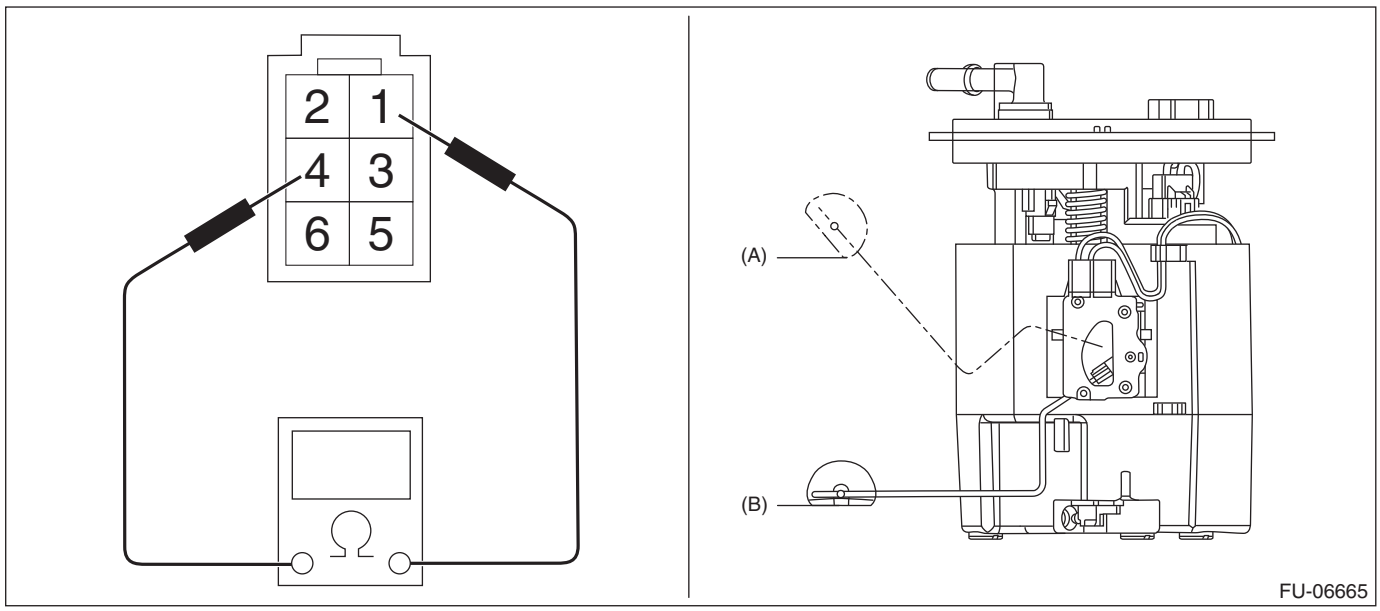
Float position	Standard
FULL to Fuel tank seating surface (A)	120.9±4 mm (4.759±0.157 in)
EMPTY to Fuel tank seating surface (B)	14.8±4 mm (0.582±0.157 in)

3) Measure the resistance between fuel level sensor terminals.

- Model with fuel level sensor bent in 3 locations



- Model with fuel level sensor bent in 2 locations



Float position	Terminal No.	Standard
FULL (A)	1 and 4	$2.0^{+0.5}_{-1.0}\ \Omega$
EMPTY (B)		$31.9 \pm 1.0\ \Omega$

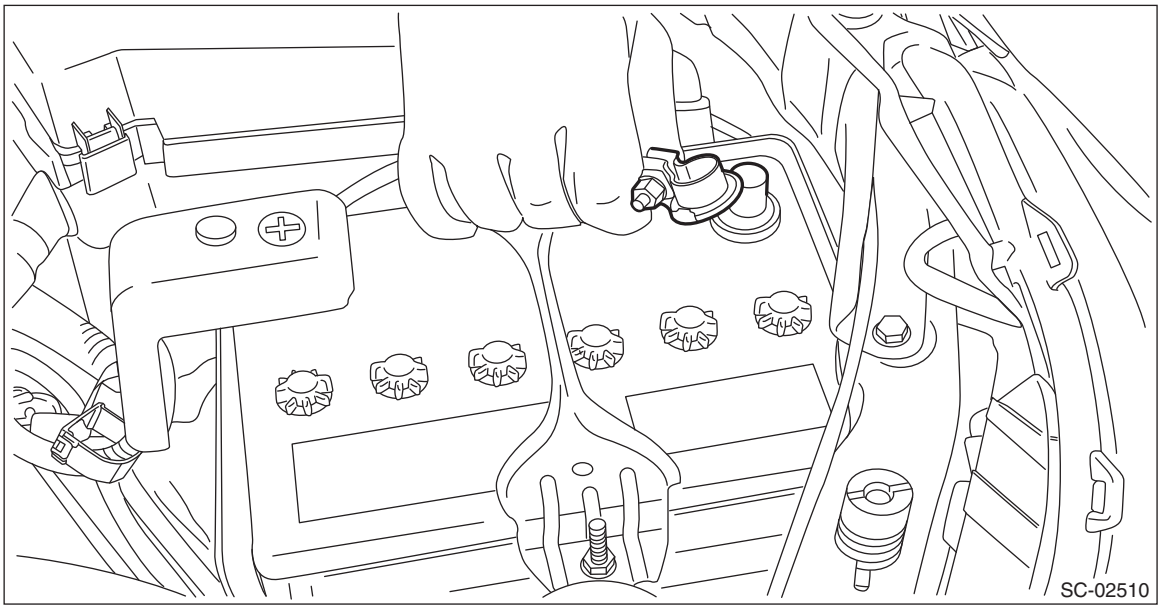
29.Fuel Sub Level Sensor

A: REMOVAL

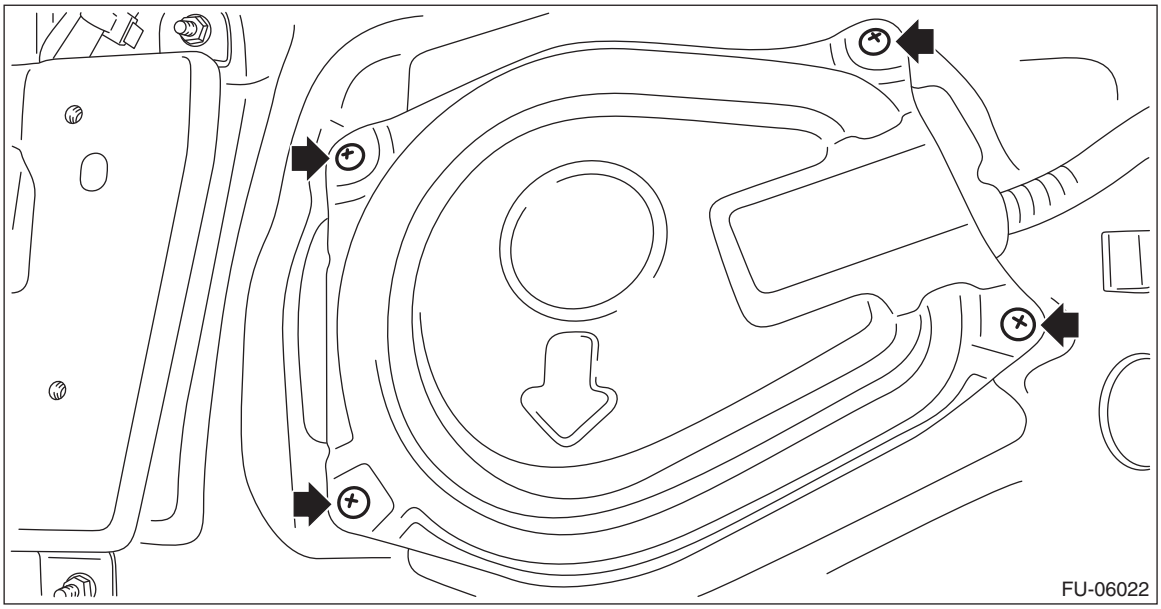
WARNING:
Place "NO OPEN FLAMES" signs near the working area.

CAUTION:
- **Be careful not to spill fuel.**
- **If the fuel gauge indicates that two thirds or more of the fuel is remaining, be sure to drain fuel before starting work to avoid the fuel to spill.**

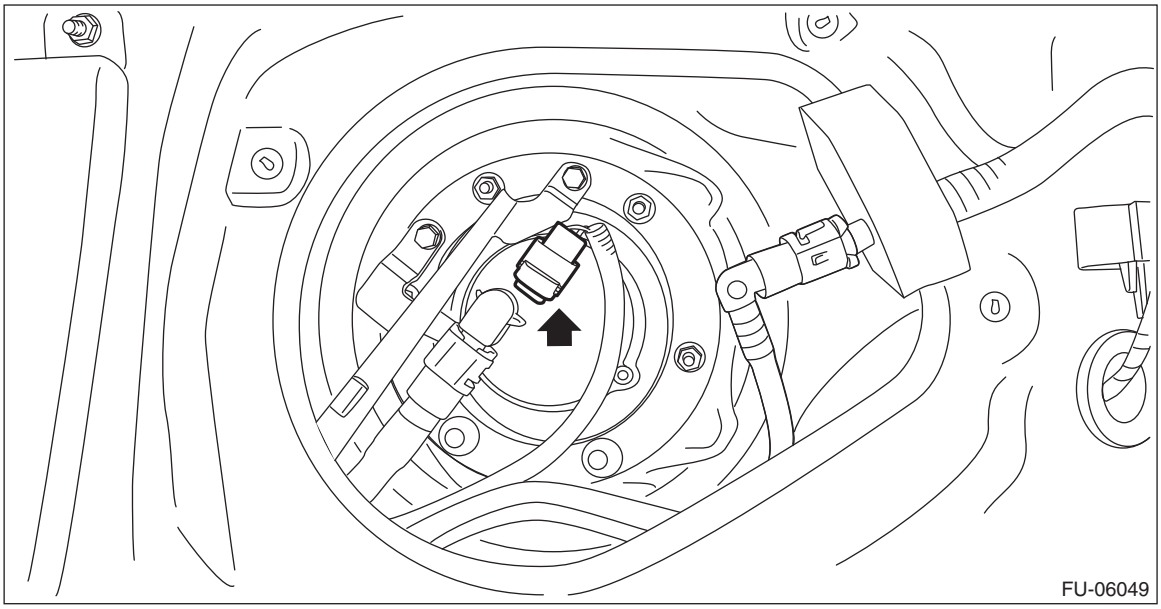
1) Release the fuel pressure. <Ref. to FU(H4DO)-109, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Drain fuel. <Ref. to FU(H4DO)-109, DRAINING FUEL (WITH SUBARU SELECT MONITOR), PROCEDURE, Fuel.>
3) Disconnect the ground cable from battery.



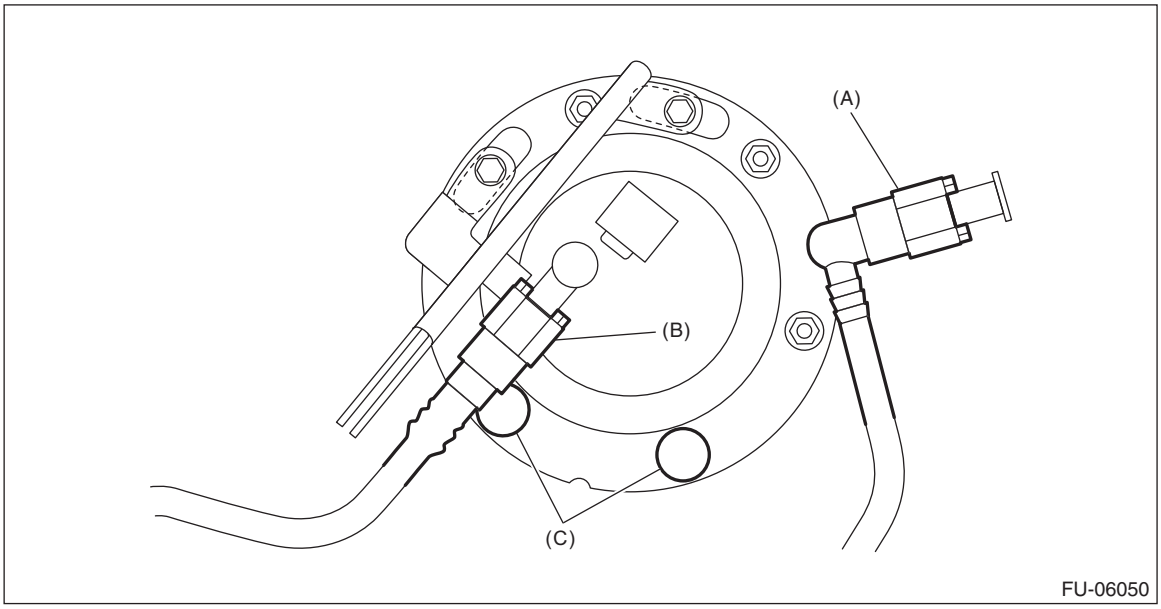
4) Remove the rear seat cushion. <Ref. to SE-16, REMOVAL, Rear Seat.>
5) Remove the service hole cover of fuel sub level sensor.



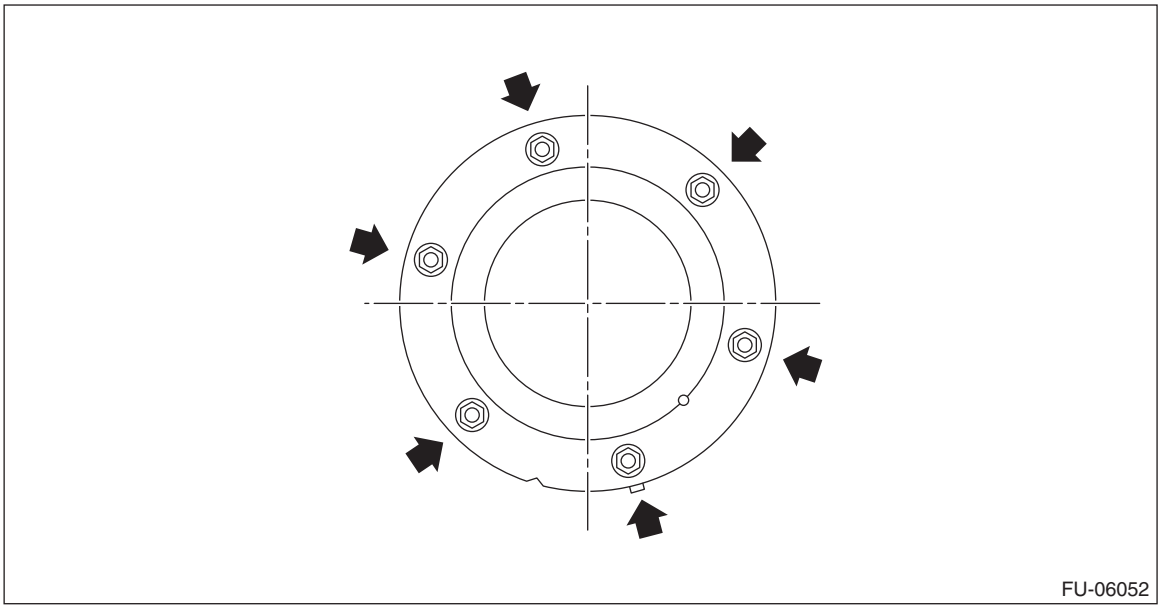
6) Disconnect the connector from the fuel sub level sensor.



7) Disconnect the quick connector of fuel delivery tube (A) and jet pump tube (B). <Ref. to FU(H4DO)-158, REMOVAL, Fuel Delivery and Evaporation Lines.>
8) Remove the rubber cap (C) from the nut.



9) Remove the bolts and nuts which hold fuel sub level sensor protector and fuel sub level sensor upper plate to the fuel tank.



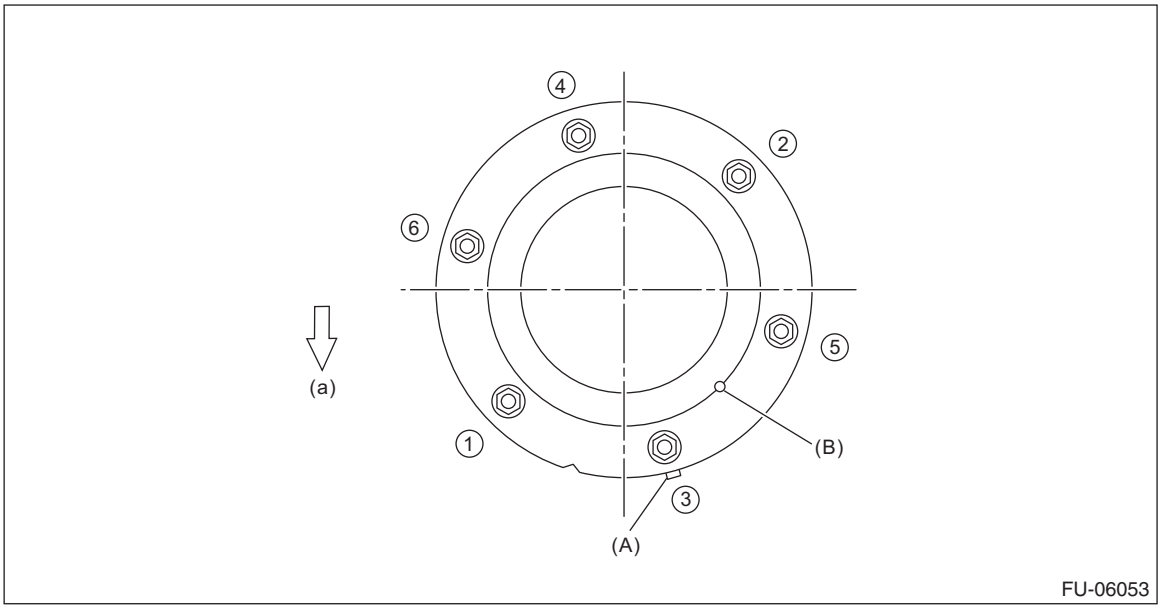
10) Remove the fuel sub level sensor from the fuel tank.

B: INSTALLATION

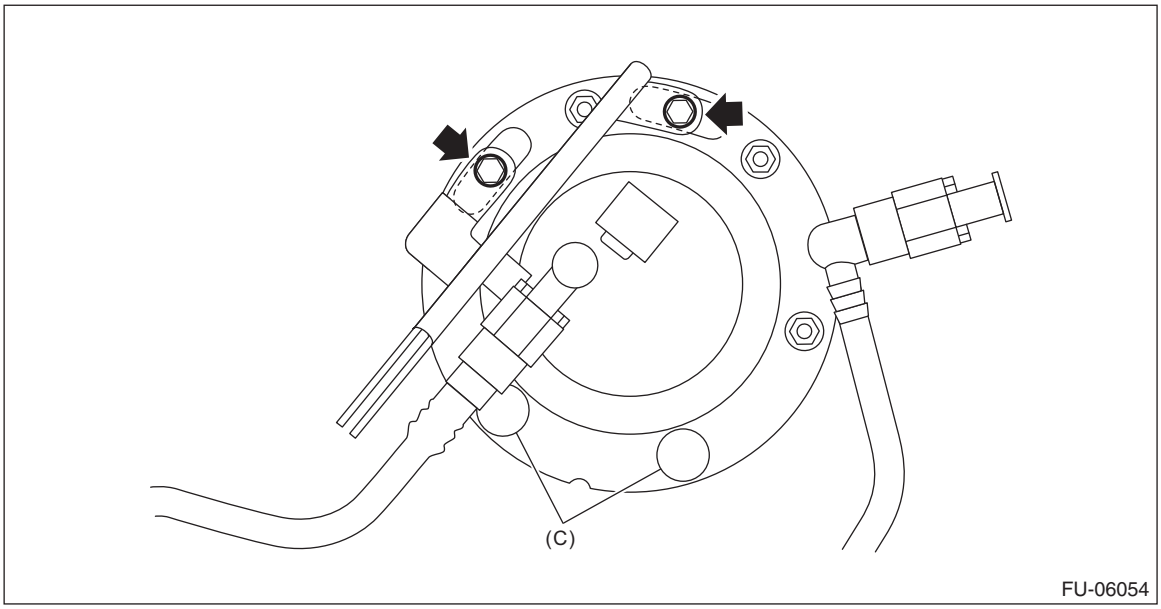
Install in the reverse order of removal while being careful of the following.
- Make sure the sealing portion is free from fuel or foreign matter before installation.
- Align protrusion (A) of the gasket to the position shown in the figure.
- Align protrusion (B) of the fuel sub level sensor to the cutout in the fuel sub level sensor upper plate.
- Tighten the nuts and bolts to the specified torque in the order as shown in the figure.
- After tightening, install the rubber cap (C) at the position shown in the figure.

NOTE:
- Use a new gasket.
- Do not forget to install rubber cap (C).

Tightening torque:
4.4 N·m (0.4 kgf-m, 3.2 ft-lb)

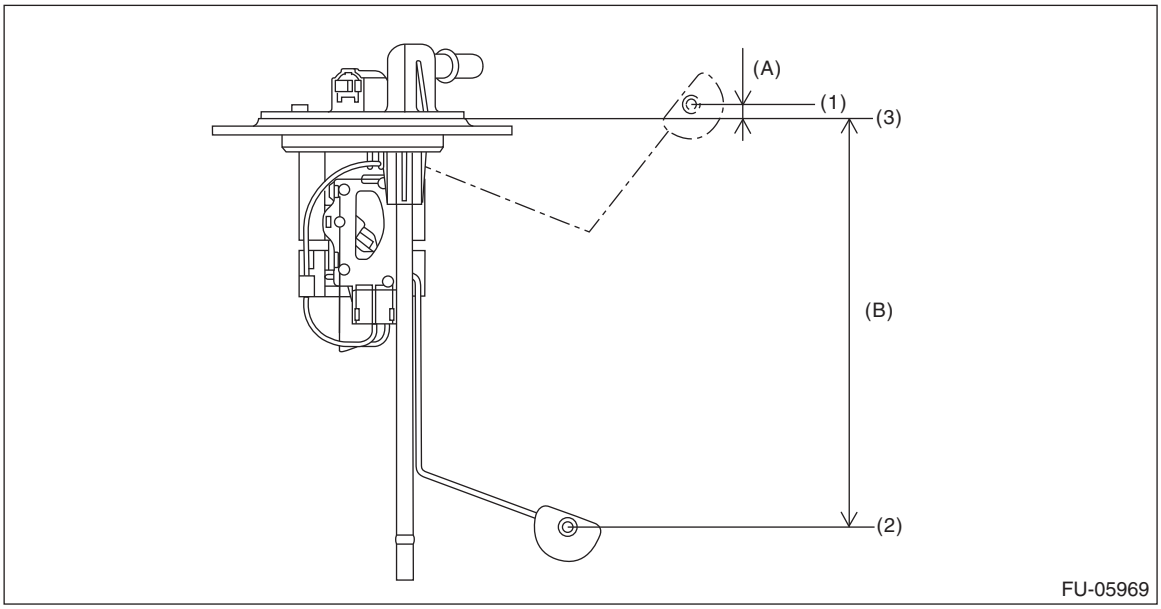


(a) Front side of vehicle



C: INSPECTION

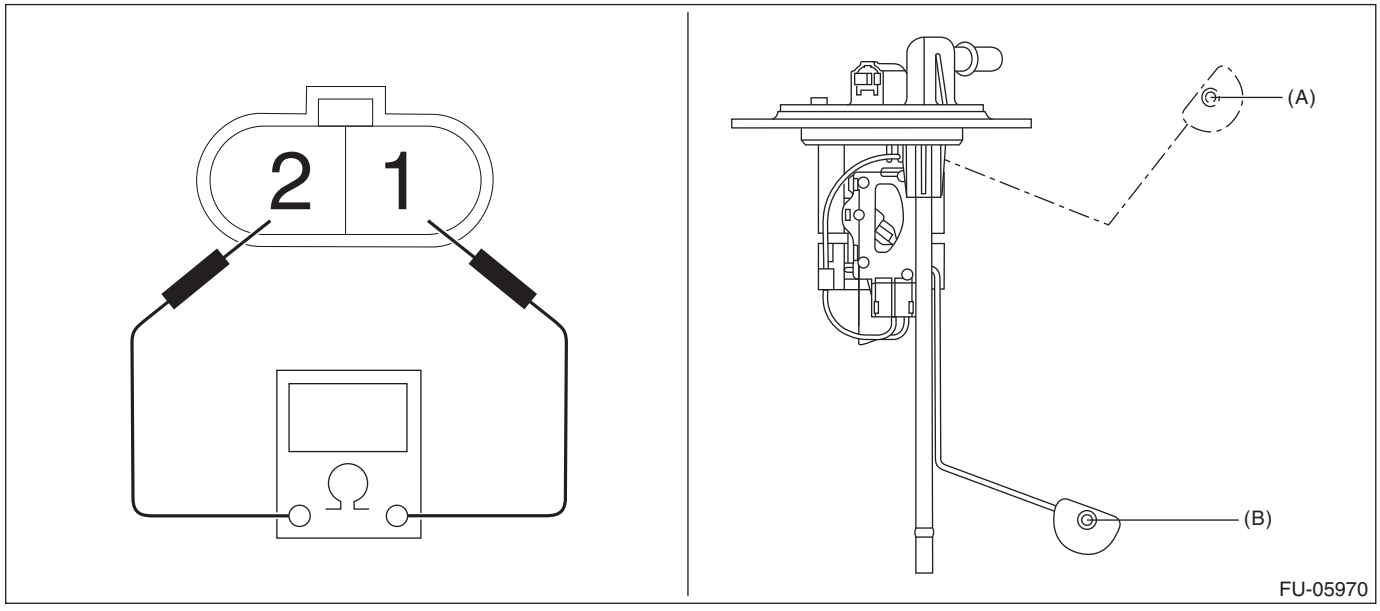
1) Check that the fuel sub level sensor has no damage.
2) Measure the fuel sub level sensor float position.



(1) FULL (2) EMPTY (3) Datum points

Float position	Standard
FULL to Datum point (A)	5.31±3.5 mm (0.209±0.138 in)
EMPTY to Datum point (B)	160.6±3.5 mm (6.32±0.138 in)

3) Measure the resistance between fuel sub level sensor terminals.



Float position	Terminal No.	Standard
FULL (A)	1 and 2	$2.0^{+0.5}_{-1.0}$ Ω
EMPTY (B)		62.1±1.0 Ω

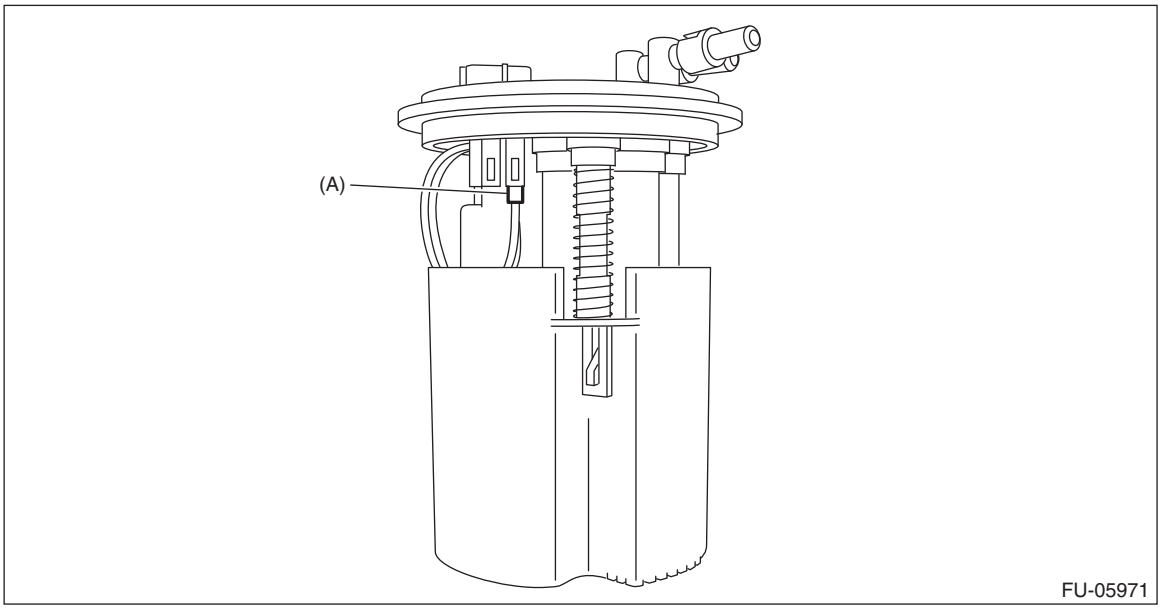
30.Fuel Filter

A: REMOVAL

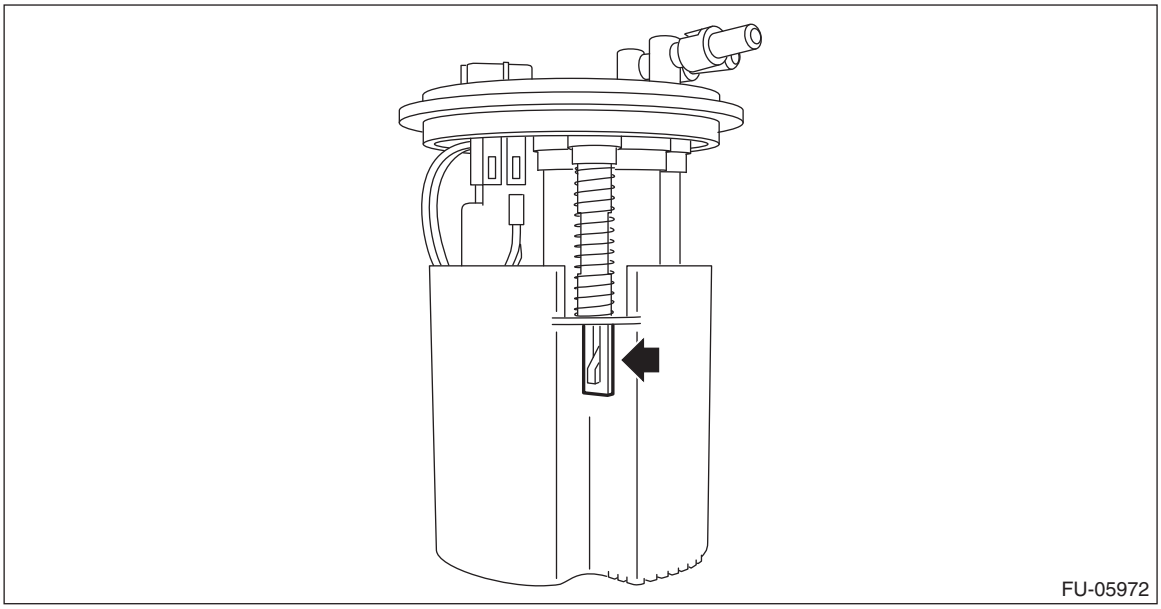
WARNING:
Place “NO OPEN FLAMES” signs near the working area.

CAUTION:
- **Be careful not to spill fuel.**
- **If the fuel gauge indicates that two thirds or more of the fuel is remaining, be sure to drain fuel before starting work to avoid the fuel to spill.**
- **Be careful not to drop or apply any impact to the fuel pump during work. This may deteriorate its performance.**

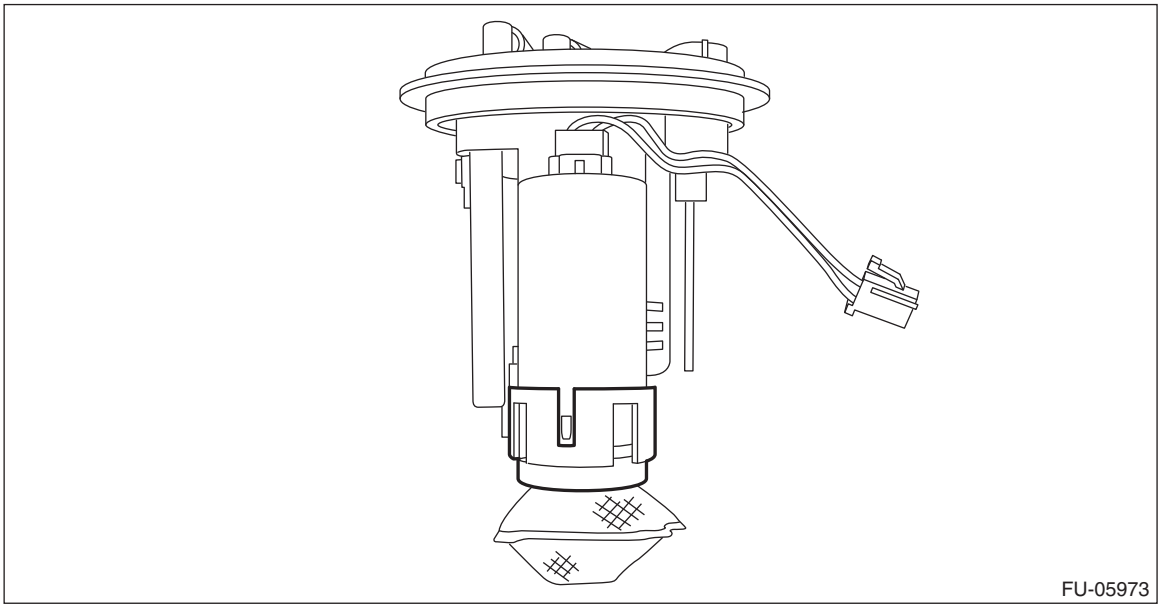
NOTE:
The fuel filter is built in fuel pump assembly.
1) Remove the fuel pump assembly. <Ref. to FU(H4DO)-138, REMOVAL, Fuel Pump.>
2) Remove the fuel level sensor. <Ref. to FU(H4DO)-143, REMOVAL, Fuel Level Sensor.>
3) Disconnect the fuel pump connector (A).



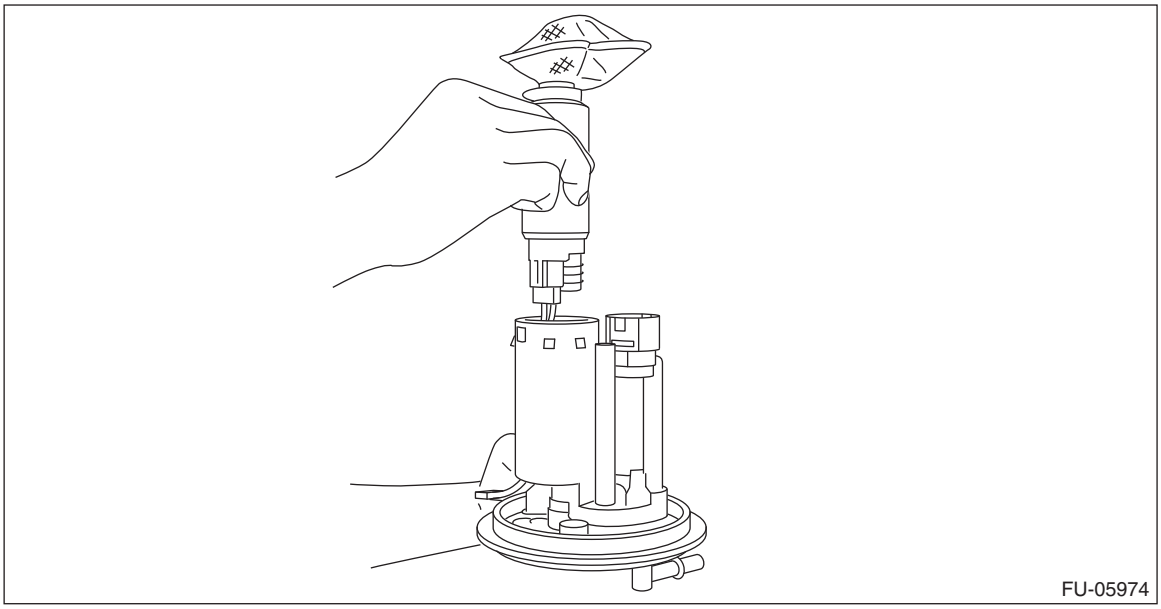
4) Remove the claw connecting the fuel filter assembly and fuel chamber assembly in order to separate the fuel filter assembly and fuel chamber assembly.



5) Remove the fuel pump holder from the fuel filter assembly.



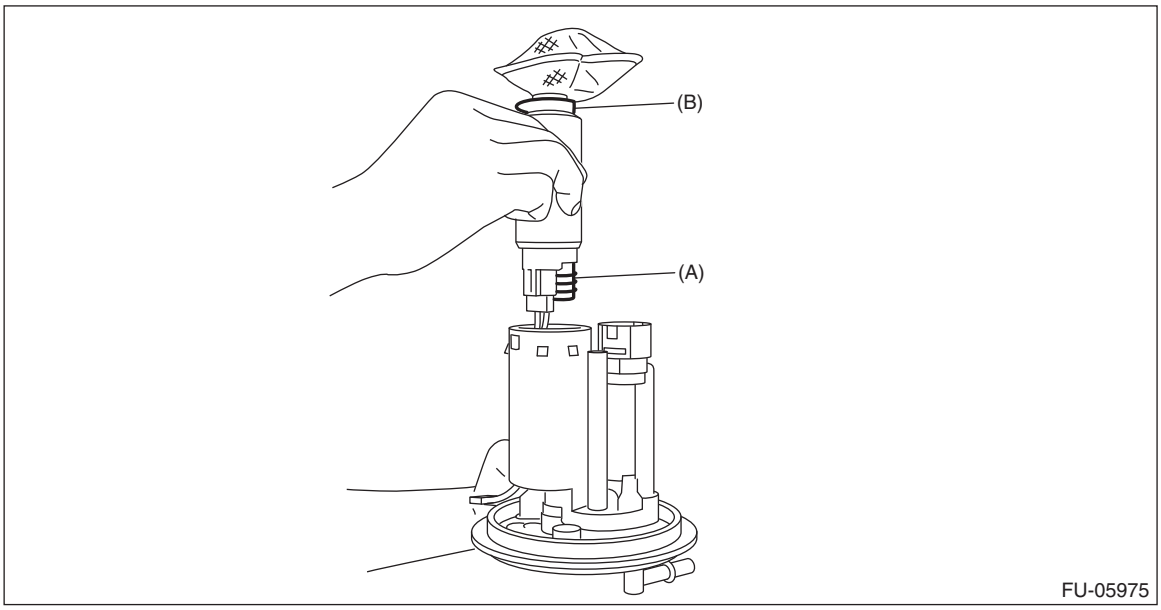
6) Remove the fuel pump from the fuel filter assembly.


FU-05974

B: INSTALLATION

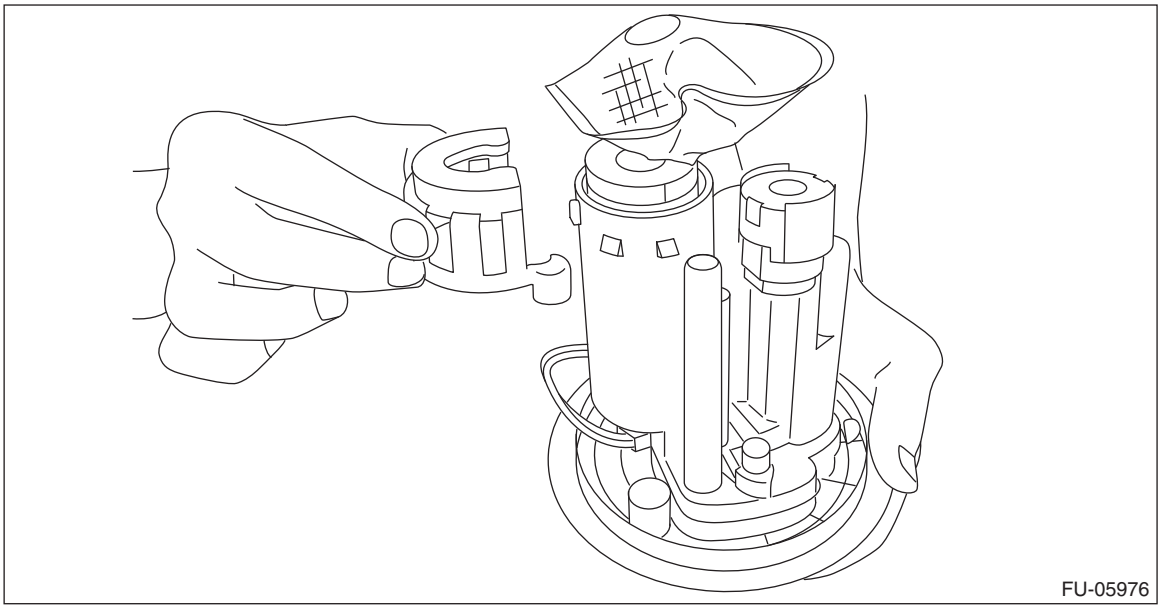
1) Assemble the gasket spacer (A) and support rubber cushion (B) to the fuel pump, and install the fuel pump to the fuel filter assembly.

NOTE:
- Use a new gasket spacer.
- Use a new support rubber cushion.
- Apply gasoline to the surface of gasket spacer and support rubber cushion.



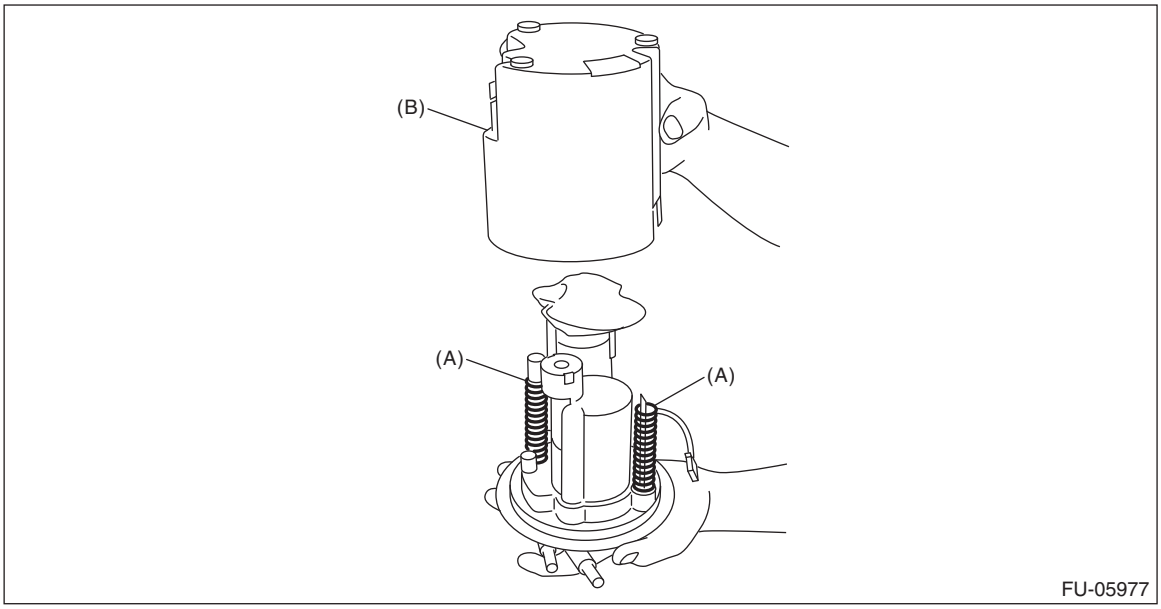
FU-05975

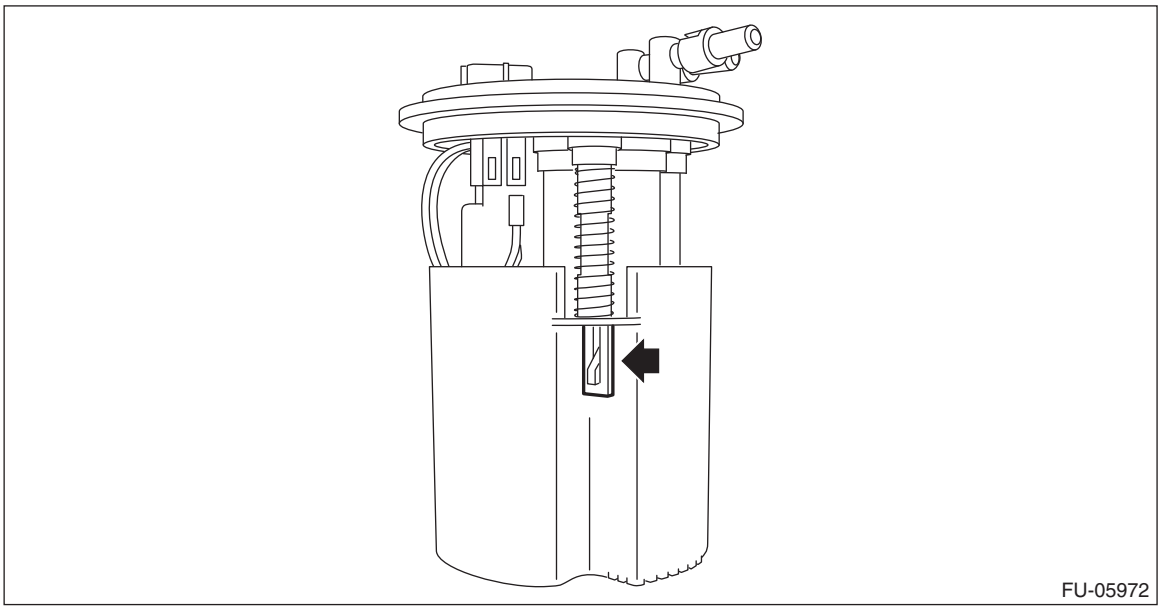
2) Install the fuel pump holder to the fuel filter assembly.



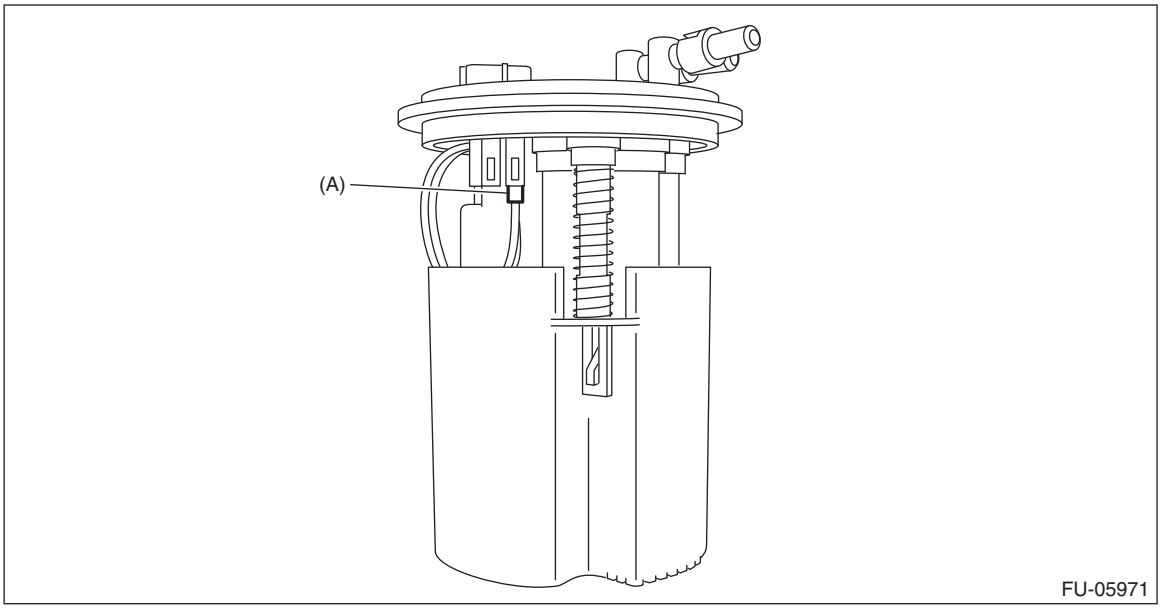
3) Install the pump module spring (A) to fuel filter assembly, and install the fuel chamber assembly (B).

NOTE:
- Use a new fuel chamber assembly.
- Check that the claw connecting the fuel filter assembly and fuel chamber assembly is securely fastened.





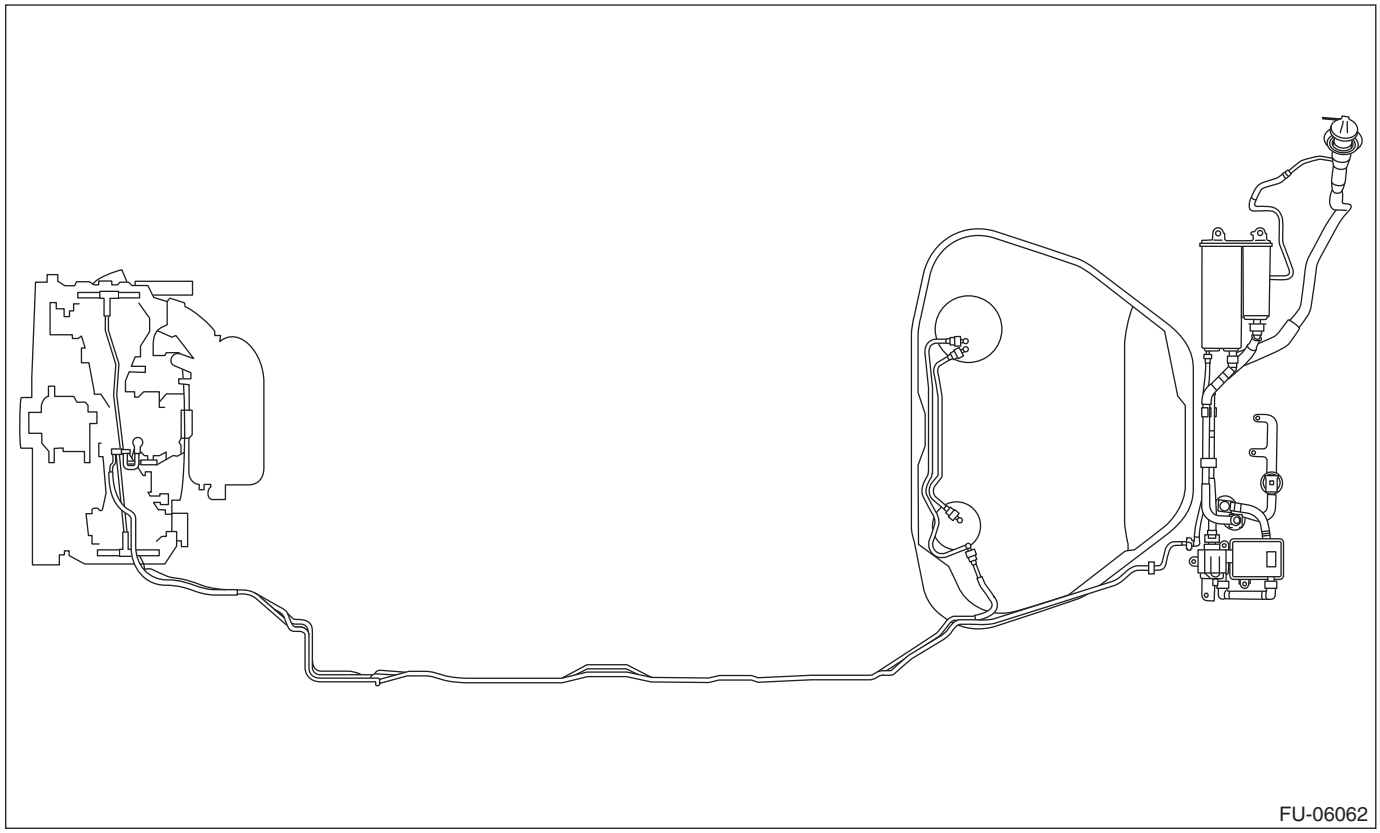
4) Connect the connector (A) of fuel pump.



5) Install the fuel level sensor. <Ref. to FU(H4DO)-143, INSTALLATION, Fuel Level Sensor.>
6) Inspect the fuel level sensor. <Ref. to FU(H4DO)-144, INSPECTION, Fuel Level Sensor.>
7) Install the fuel pump assembly. <Ref. to FU(H4DO)-141, INSTALLATION, Fuel Pump.>

31.Fuel Delivery and Evaporation Lines

A: REMOVAL



WARNING:
Place “NO OPEN FLAMES” signs near the working area.

CAUTION:
Be careful not to spill fuel.

1) Release the fuel pressure. <Ref. to FU(H4DO)-109, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Open the fuel filler lid and remove the fuel filler cap.
3) Remove the floor mat. <Ref. to EI-68, REMOVAL, Floor Mat.>

4) In the engine compartment, disconnect the fuel delivery hoses and evaporation hose.

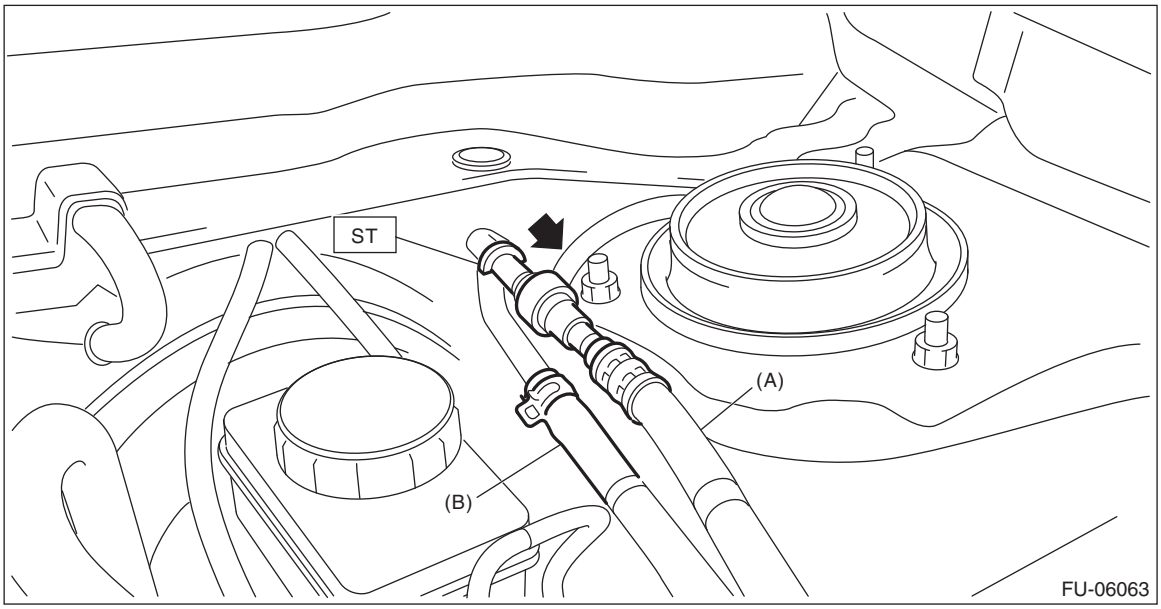
CAUTION:
- **Be careful not to spill fuel.**
- **Catch the fuel from hoses using a container or cloth.**

(1) Set the ST to the fuel pipe.

ST 42099AE000 QUICK CONNECTOR RELEASE

(2) Disconnect the quick connector of the fuel delivery hose by pushing the ST in the direction of the arrow.

(3) Remove the clip and disconnect the evaporation hose from the fuel pipe.



(A) Fuel delivery hose (B) Evaporation hose

5) Remove the canister. <Ref. to EC(H4DO)-9, REMOVAL, Canister.>
6) Remove the fuel tank. <Ref. to FU(H4DO)-112, REMOVAL, Fuel Tank.>
7) Remove the fuel pipe assembly from vehicle.

8) Disconnect the quick connector, and disconnect the fuel delivery tube and jet pump tube from the fuel tank.

- When using ST

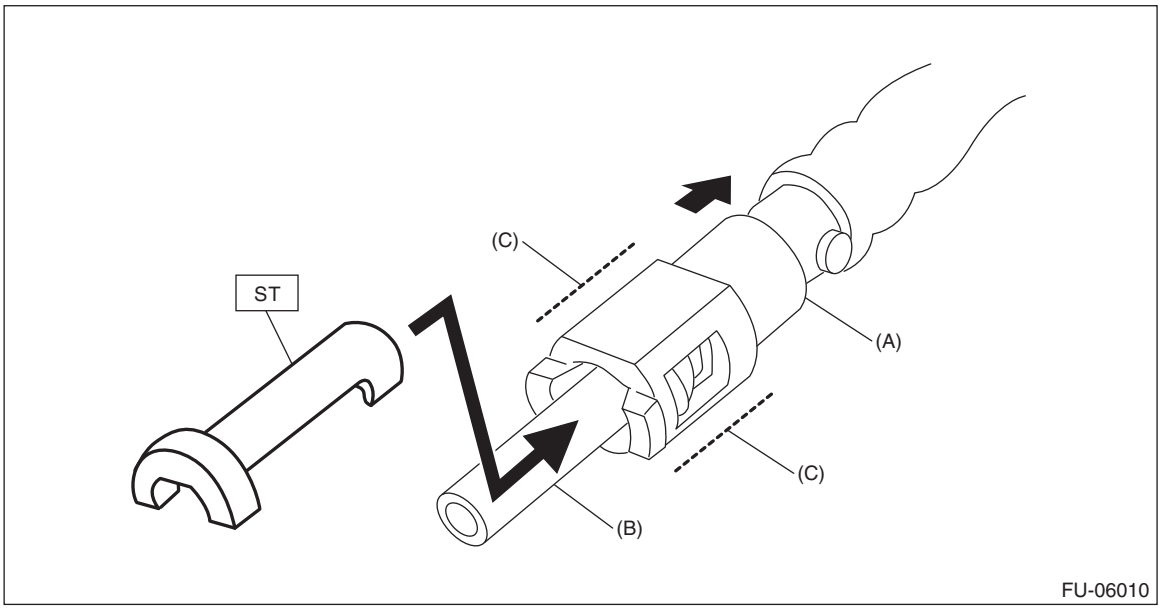
1. Attach ST to the pipe and push ST in the direction of arrow mark to disconnect the quick connector.

ST 42099AE000 QUICK CONNECTOR RELEASE

CAUTION:

- **Be careful not to spill fuel.**
- **Catch the fuel from hoses using a container or cloth.**
- **To disconnect the connector, hold (C) shown in the figure and pull in axial direction.**
- **If the connector and pipe are sticking to each other, push and pull the connector with ST pushed, and then pull the connector after it starts moving freely.**
- **When disconnecting the connector, do not bend or twist the tube forcibly. If the tube is bent, replace with a new part.**

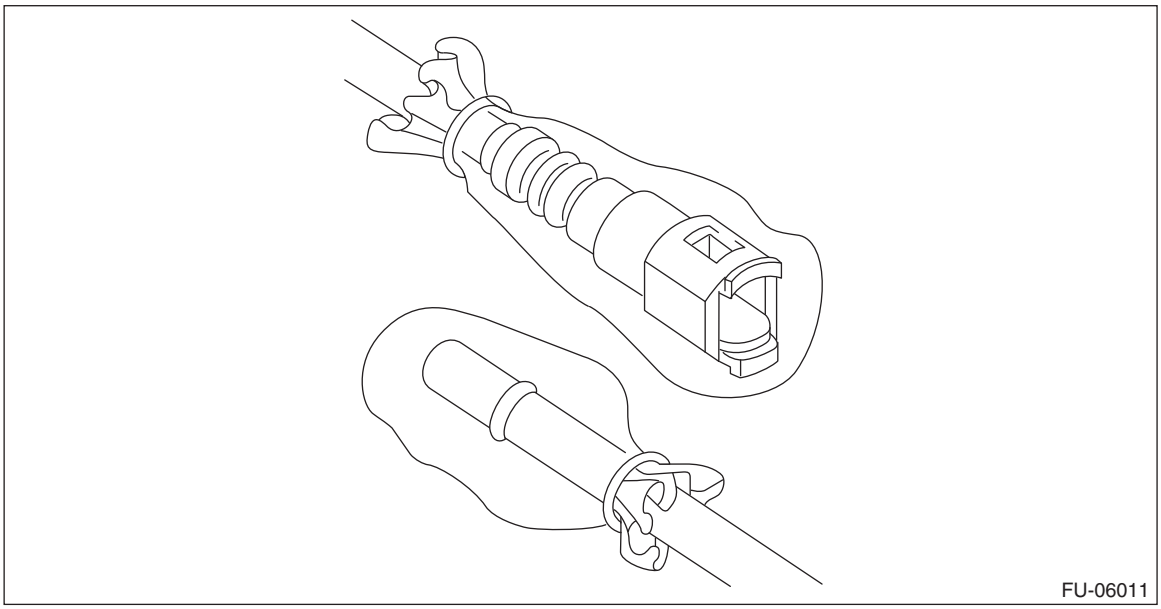
NOTE:
Clean the pipe and quick connector, if they are covered with dust.



(A) Quick connector (B) Pipe (C) Connector holding position

2. To prevent from damaging or entering foreign matter, wrap the pipes and quick connectors with plastic bag etc.

CAUTION:
When reusing the retainer, do not disconnect the retainer from the connector.



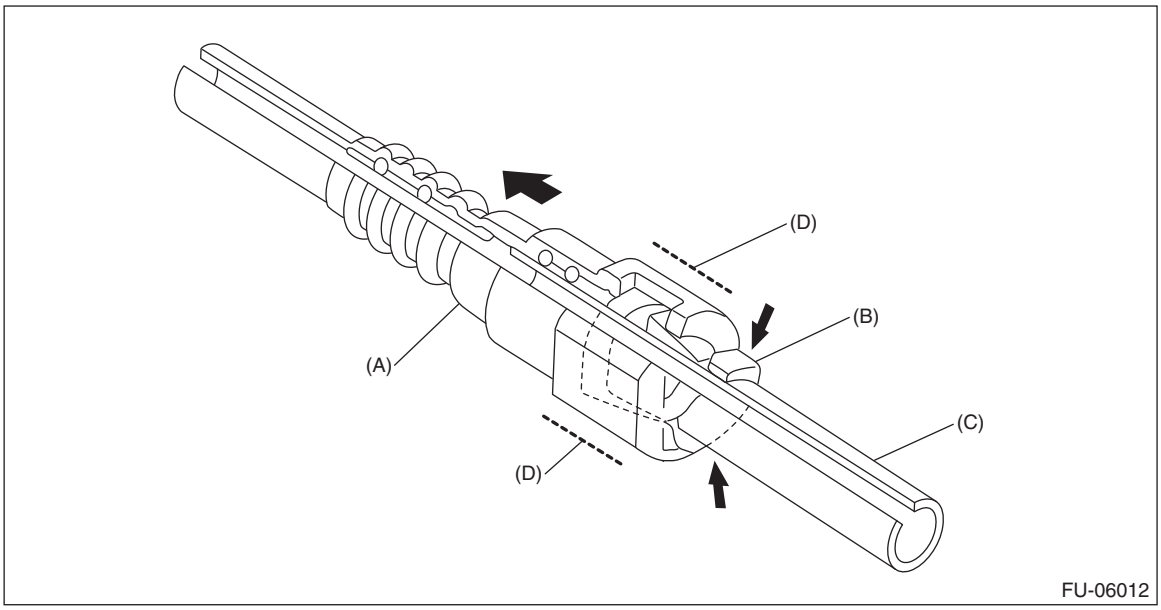
- When not using ST

1. Push the retainer in the direction of the arrow, disconnect the quick connector from pipe.

CAUTION:

- **Be careful not to spill fuel.**
- **Catch the fuel from hoses using a container or cloth.**
- **To disconnect the connector, hold (D) shown in the figure and pull in axial direction.**
- **If the connector and pipe are sticking to each other, push and pull the connector with the retainer pushed in the direction of the arrow, and then pull the connector after it starts moving freely.**
- **When disconnecting the connector, do not bend or twist the tube forcibly. If the tube is bent, replace with a new part.**

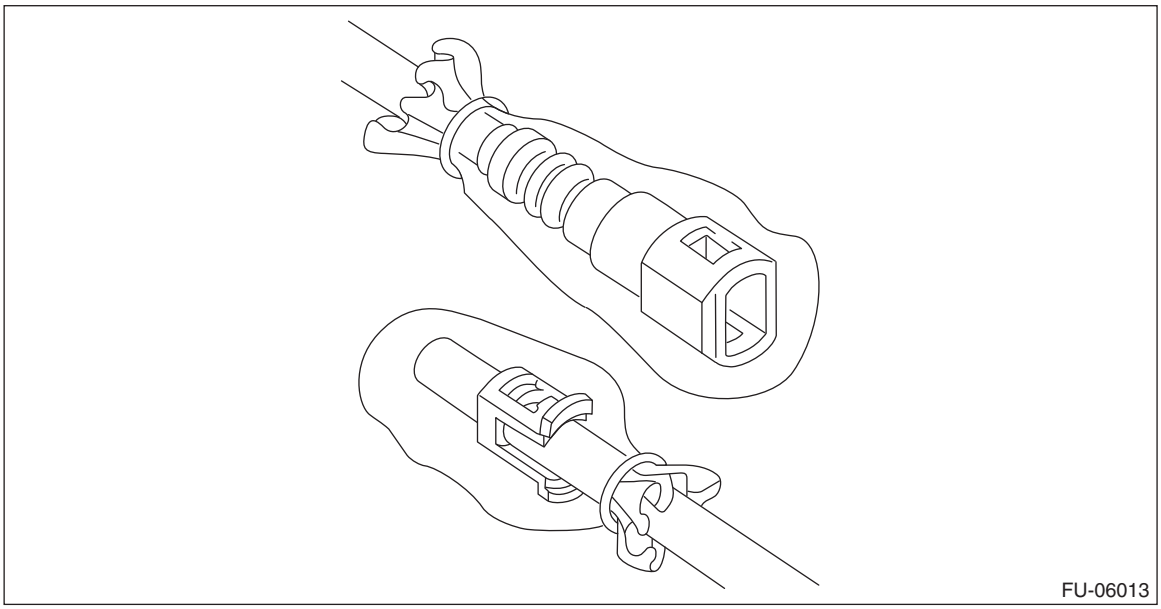
NOTE:
Clean the pipe and quick connector, if they are covered with dust.



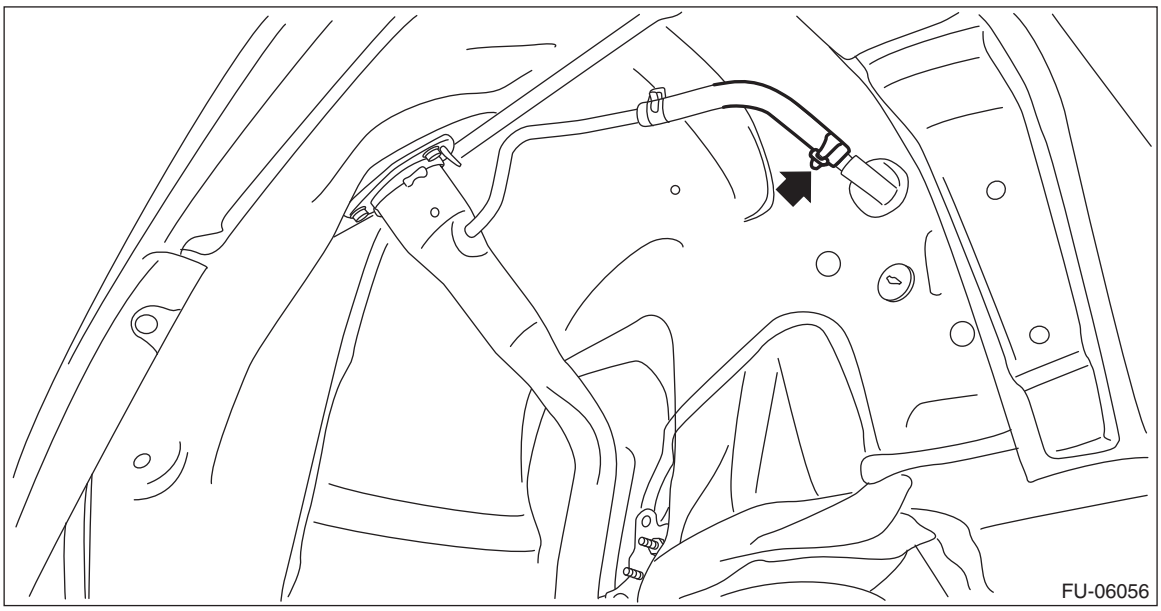
(A) Quick connector
(B) Retainer
(C) Pipe
(D) Connector holding position

2. To prevent from damaging or entering foreign matter, wrap the pipes and quick connectors with plastic bag etc.

CAUTION:
When reusing the retainer, do not disconnect the retainer from the pipe.

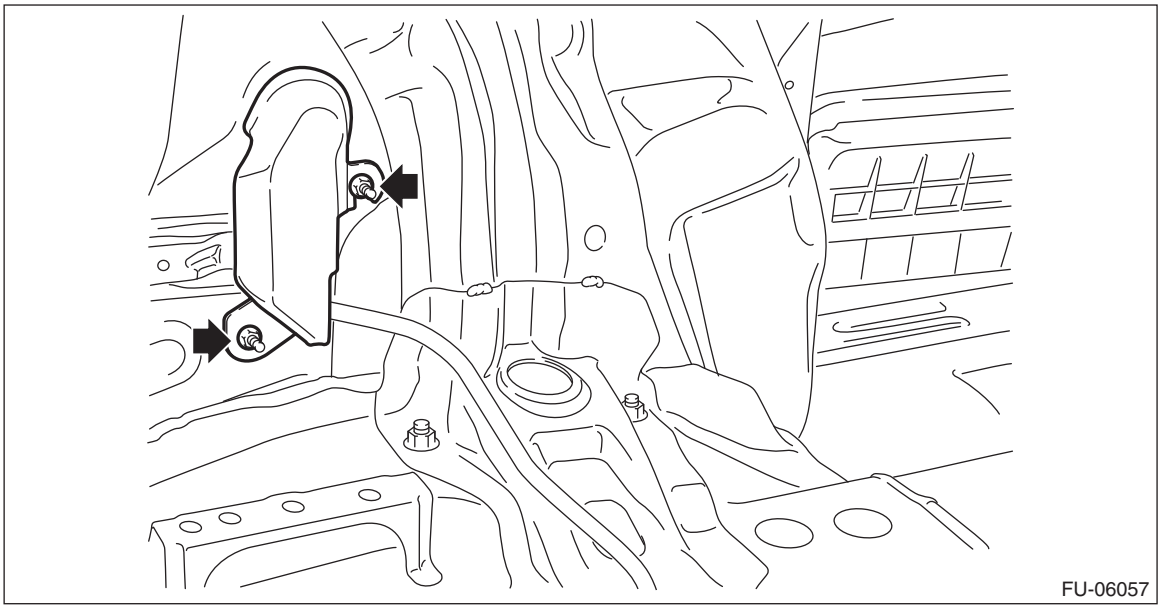


9) Remove the evaporation pipe.
(1) Remove the rear mud guard RH. <Ref. to EI-28, REMOVAL, Mud Guard.>
(2) Disconnect the evaporation hose.

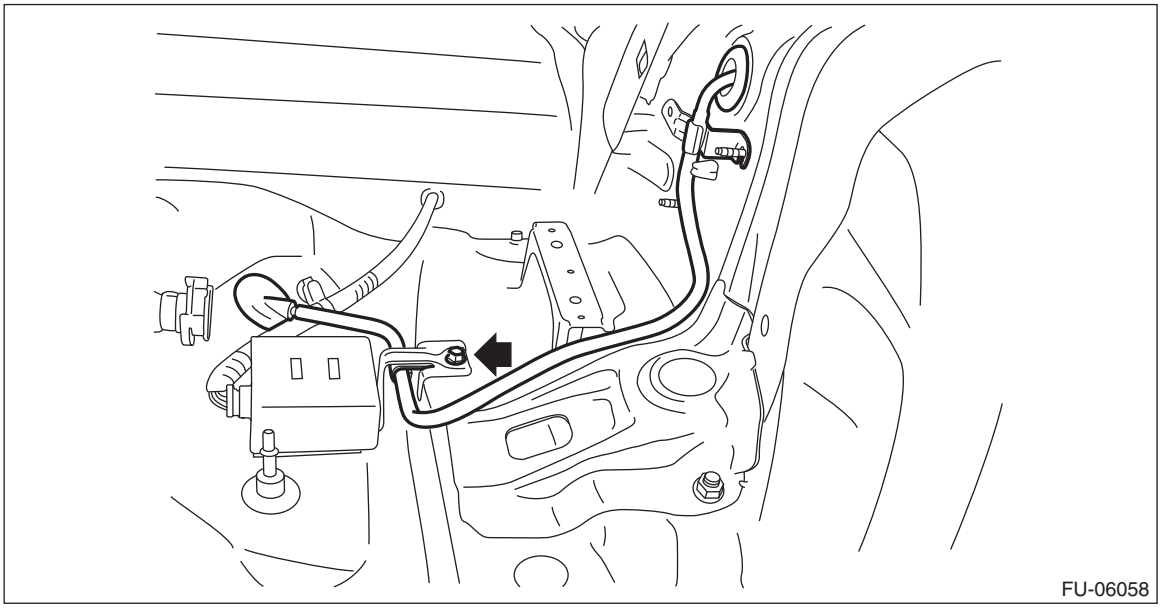


(3) Remove the right side rear quarter trim. <Ref. to EI-60, REMOVAL, Rear Quarter Trim.>

(4) Remove the evaporation pipe protector.



(5) Remove the evaporation pipe from vehicle.



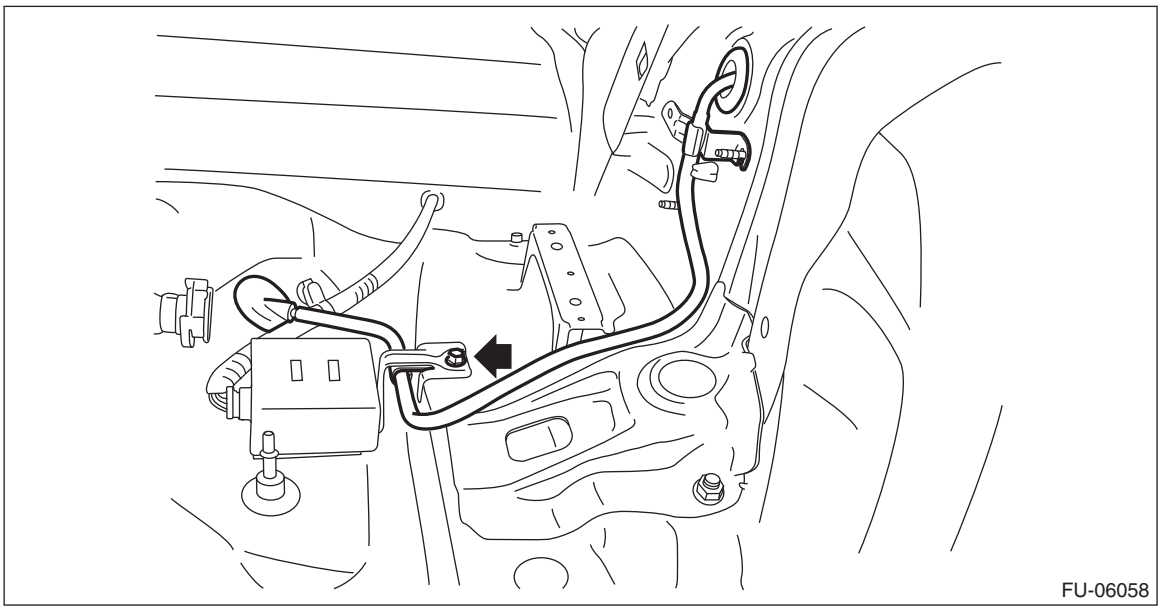
B: INSTALLATION

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

1. EVAPORATION PIPE INSTALLATION

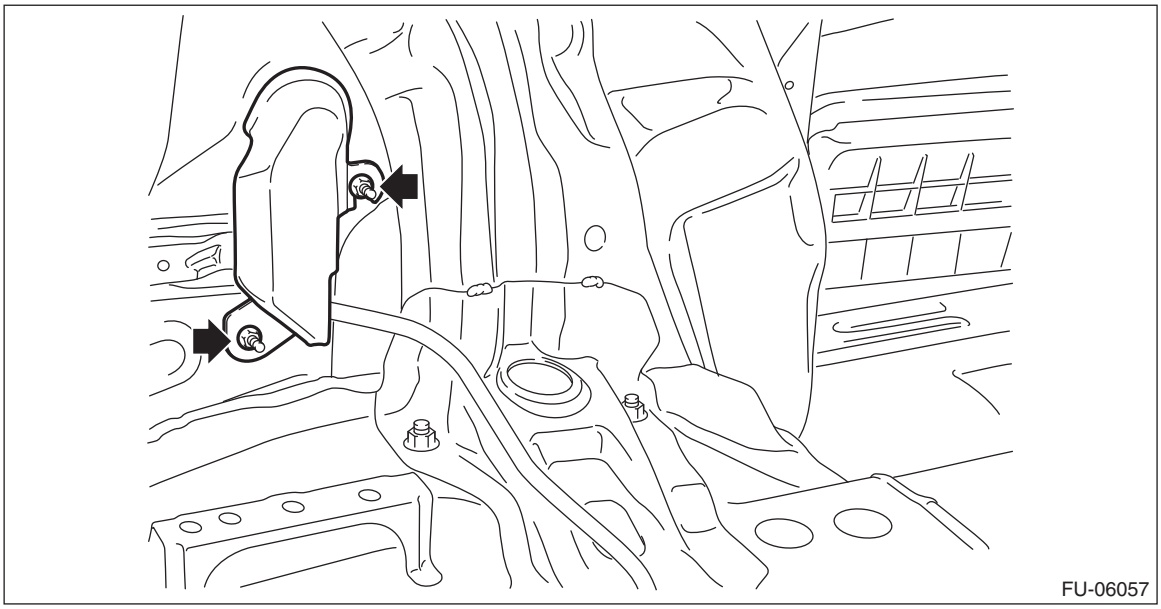
1) Install the evaporation pipe to the vehicle.

Tightening torque:
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)



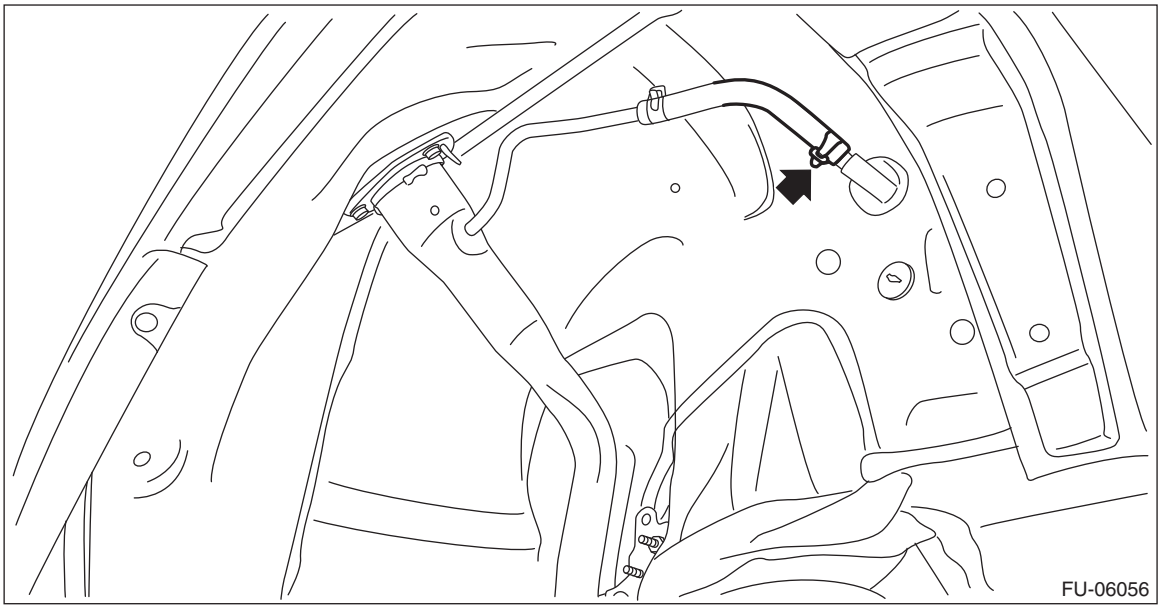
2) Install the evaporation pipe protector.

Tightening torque:
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)



3) Install the right side rear quarter trim. <Ref. to EI-61, INSTALLATION, Rear Quarter Trim.>

4) Connect the evaporation hose.

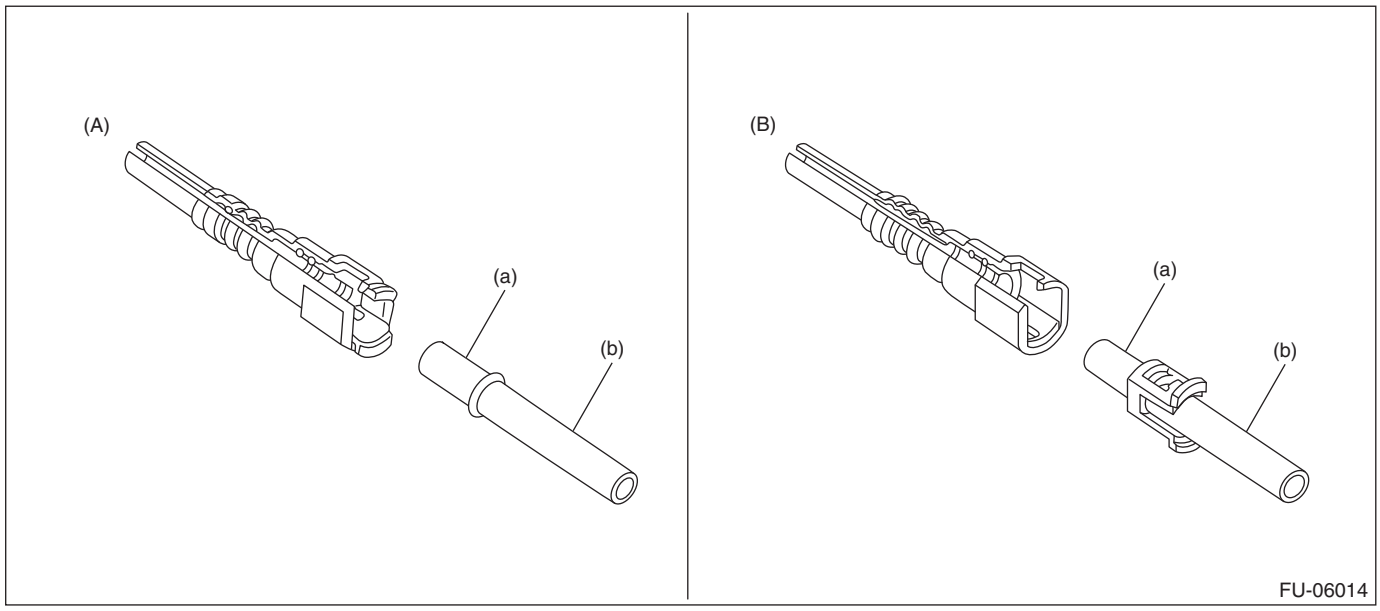


5) Install the rear mud guard RH. <Ref. to EI-28, INSTALLATION, Mud Guard.>

2. CONNECTING THE FUEL LINE QUICK CONNECTOR

CAUTION:

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



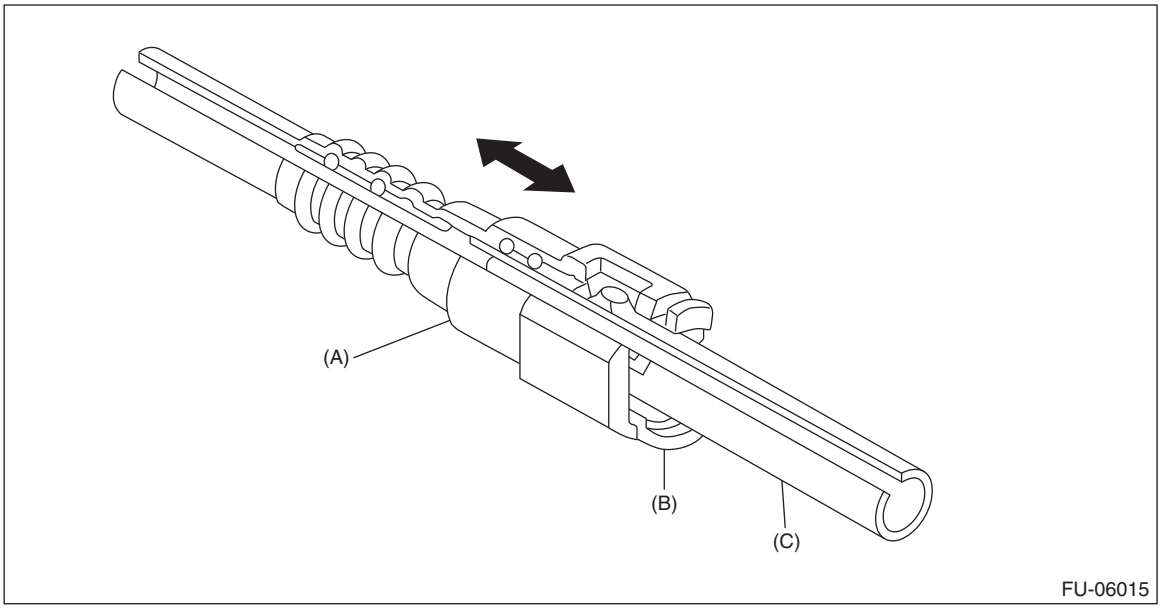
(A) When removed using the ST
(B) When removed without using the ST
(a) Seal surface
(b) Pipe

• When reusing the retainer, make sure that neither scratches nor deformation exist on the retainer. If it is faulty, use a new part.

1) Connect the quick connector to pipe.

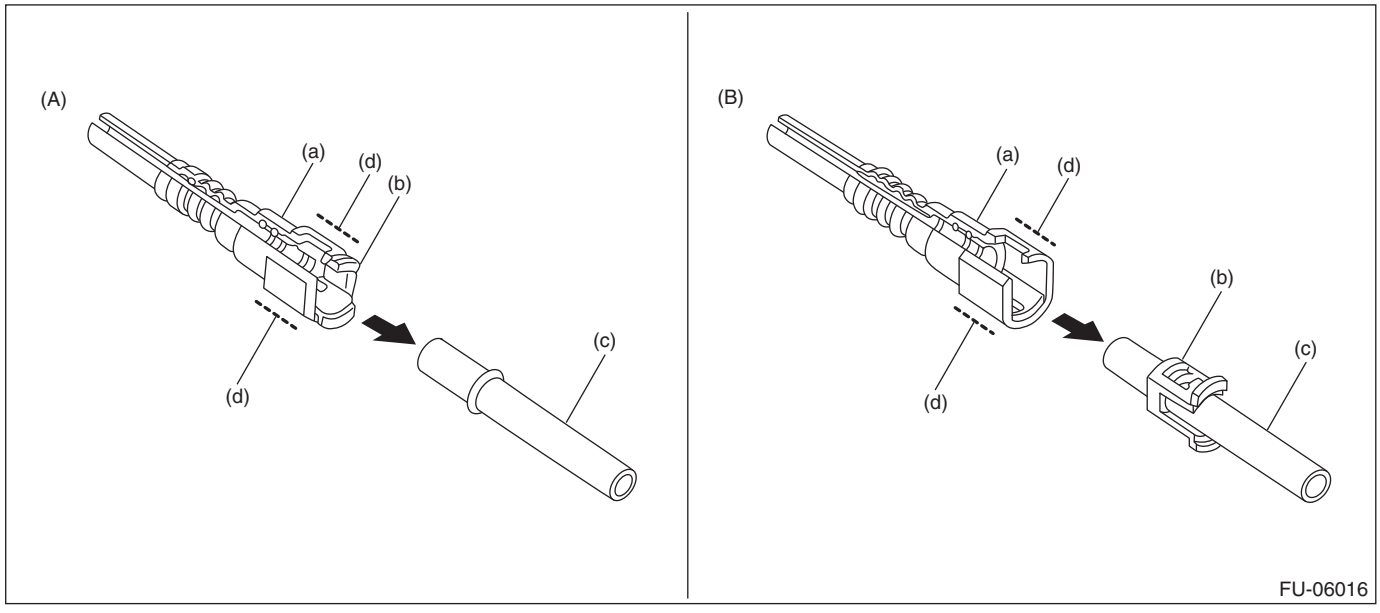
CAUTION:

• Make sure that the quick connector is securely connected.



(A) Quick connector (B) Retainer (C) Pipe

• Make sure the two retainer pawls are engaged in their mating positions in the quick connector.
• Be sure to inspect tubes and their connections for any leakage of fuel.
• To connect the connector, hold (d) shown in the figure and push in axial direction.
• When connecting the connector, do not bend or twist the tube forcibly. If the tube is bent, replace with a new part.

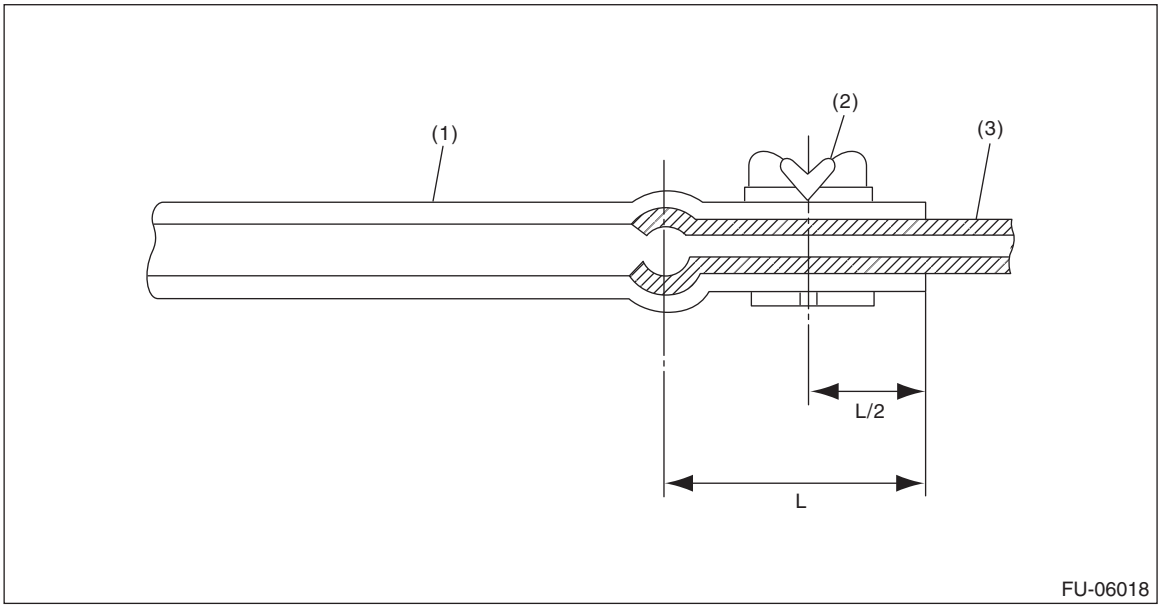


(A) When removed using the ST
(B) When removed without using the ST
(a) Quick connector
(b) Retainer
(c) Pipe
(d) Connector holding position

3. EVAPORATION HOSE CONNECTION

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

L = 17.5±2.5 mm (0.689±0.098 in)



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

C: INSPECTION

1) Check that the fuel pipe has no deformation, cracks or other damages.
2) Check that the hose and tube have no cracks, damage or loose part.

32.Fuel System Trouble in General

A: INSPECTION

Trouble	Possible cause	Corrective action
Insufficient fuel supply to injector	a. 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 parts.
	b. Decline of fuel pump function	Replace the fuel pump.
	c. Clogged fuel filter	Replace the fuel filter. Clean or replace the fuel tank if necessary.
	d. Clogged or bent fuel line pipe, hose or tube	Clean, correct or replace the fuel line pipe, hose or tube.
	e. Air is mixed in fuel system.	Check the fuel line connections, correct or replace the defective part.
	f. Damaged diaphragm of pressure regulator	Replace the fuel filter assembly.
Leakage or blow out of fuel	a. Loose connections of fuel line pipe, hose or tube	Check the fuel line connections, correct or replace the defective part.
	b. Cracked fuel line pipe, hose or tube	Replace the fuel line pipe, hose or tube.
	c. Cracked fuel tank or defective welding part	Replace the fuel tank.
	d. Clogged or bent fuel line pipe, hose or tube	Clean, correct or replace the fuel line pipe, hose or tube.
Gasoline smell inside of compartment	a. Loose connections of fuel line pipe, hose or tube	Check the fuel line connections, correct or replace the defective part.
	b. Defective gasket of fuel saucer or fuel filler pipe assembly	Correct or replace the gasket.
	c. Defective canister	Replace the canister.
Defective fuel gauge	a. Defective operation of fuel level sensor	Replace the fuel level sensor.
	b. Defective operation of combination meter	Replace the combination meter.
Noise	a. Large operation noise or vibration of fuel pump	Replace the fuel pump.

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 to 0°C (32°F) or less 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.

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

EC(H4DO)

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8.	Fuel Level Sensor	34
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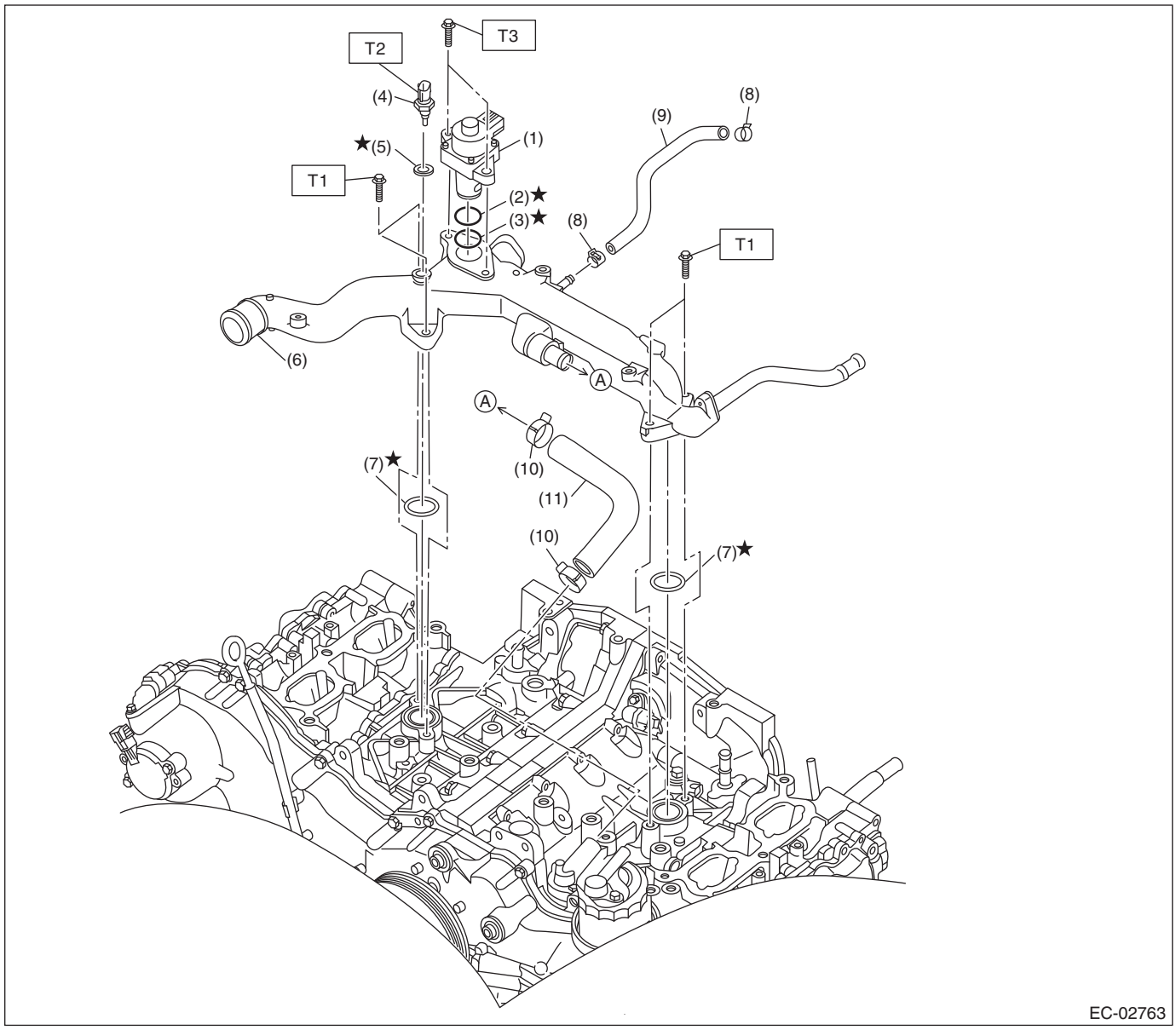
13.	PCV Hose Assembly	45
14.	PCV Valve	47

1. General Description

A: COMPONENT

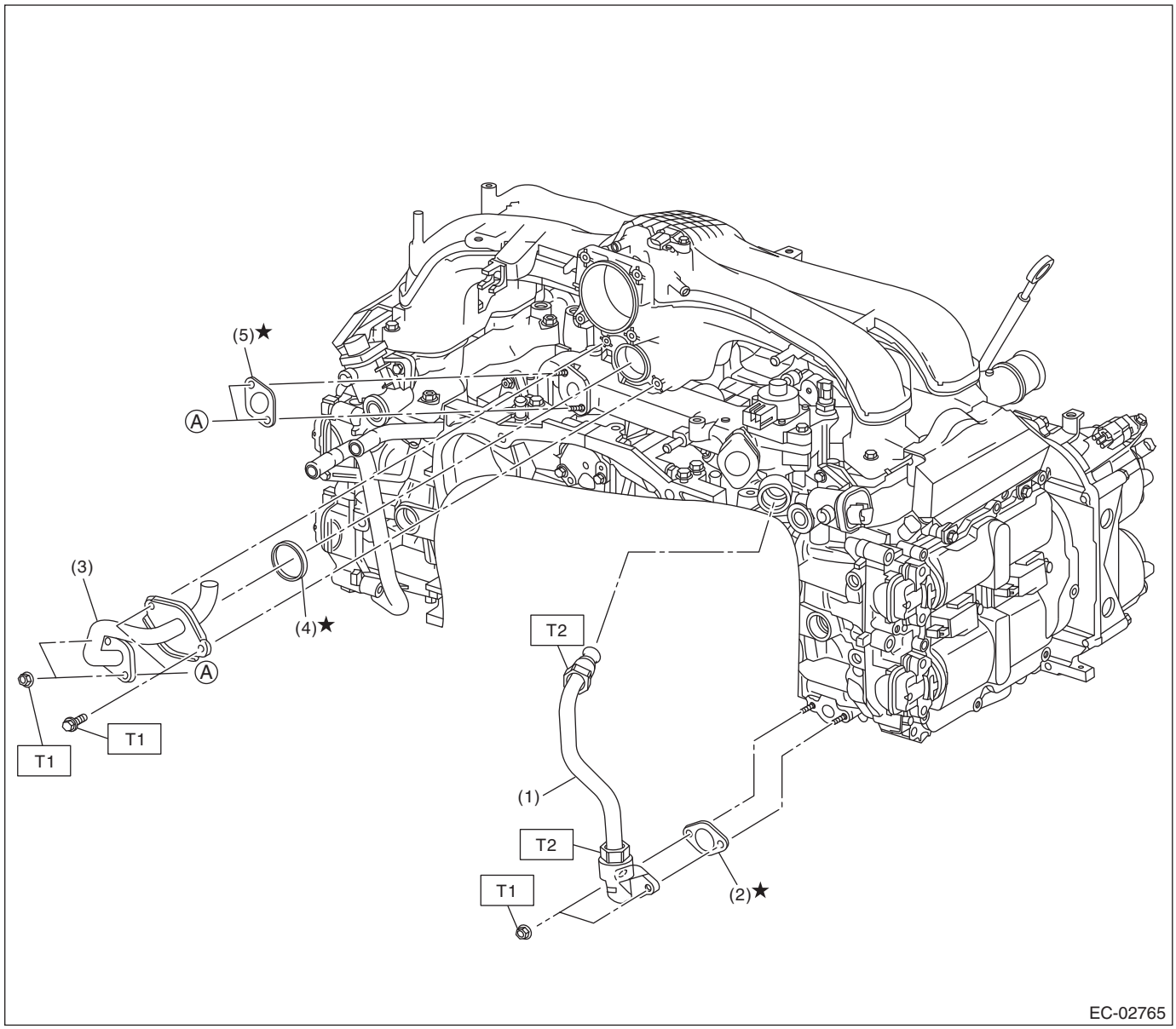
1. EGR SYSTEM 1



(1)	EGR control valve	(7)	O-ring
(2)	O-ring	(8)	Clip
(3)	Gasket	(9)	Preheater hose A
(4)	Engine coolant temperature sensor	(10)	Clip
(5)	Gasket	(11)	Preheater hose B
(6)	Water pipe ASSY		

Tightening torque:N·m (kgf-m, ft-lb)
T1: 6.4 (0.7, 4.7)
T2: 18 (1.8, 13.3)
T3: 22 (2.2, 16.2)

2. EGR SYSTEM 2



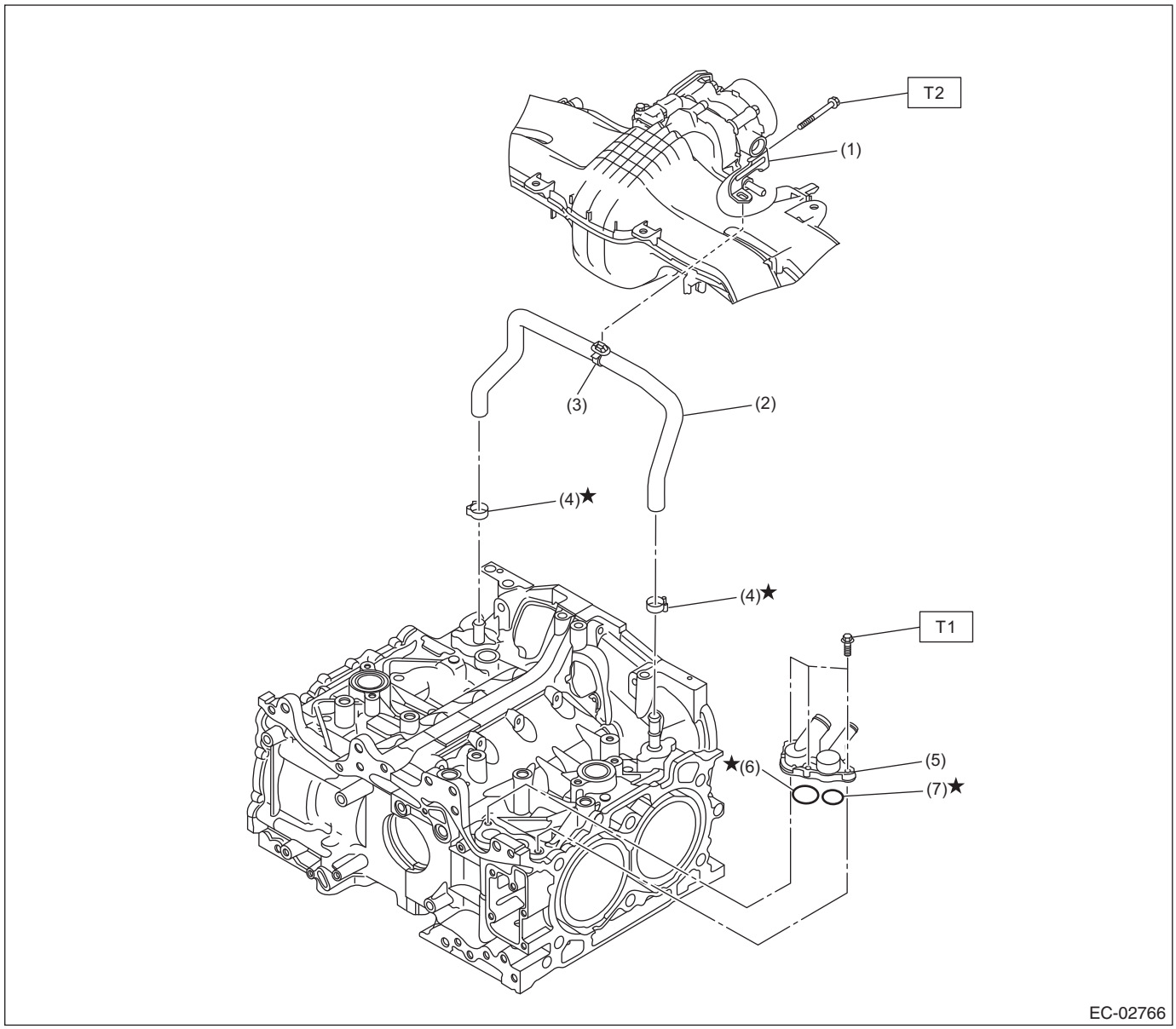
(1) EGR pipe ASSY
(2) Gasket
(3) EGR pipe
(4) Gasket
(5) Gasket

Tightening torque:N·m (kgf-m, ft-lb)

T1: <Ref. to EC(H4DO)-31, INSTALLATION, EGR Pipe.>

T2: <Ref. to EC(H4DO)-31, INSTALLATION, EGR Pipe.>

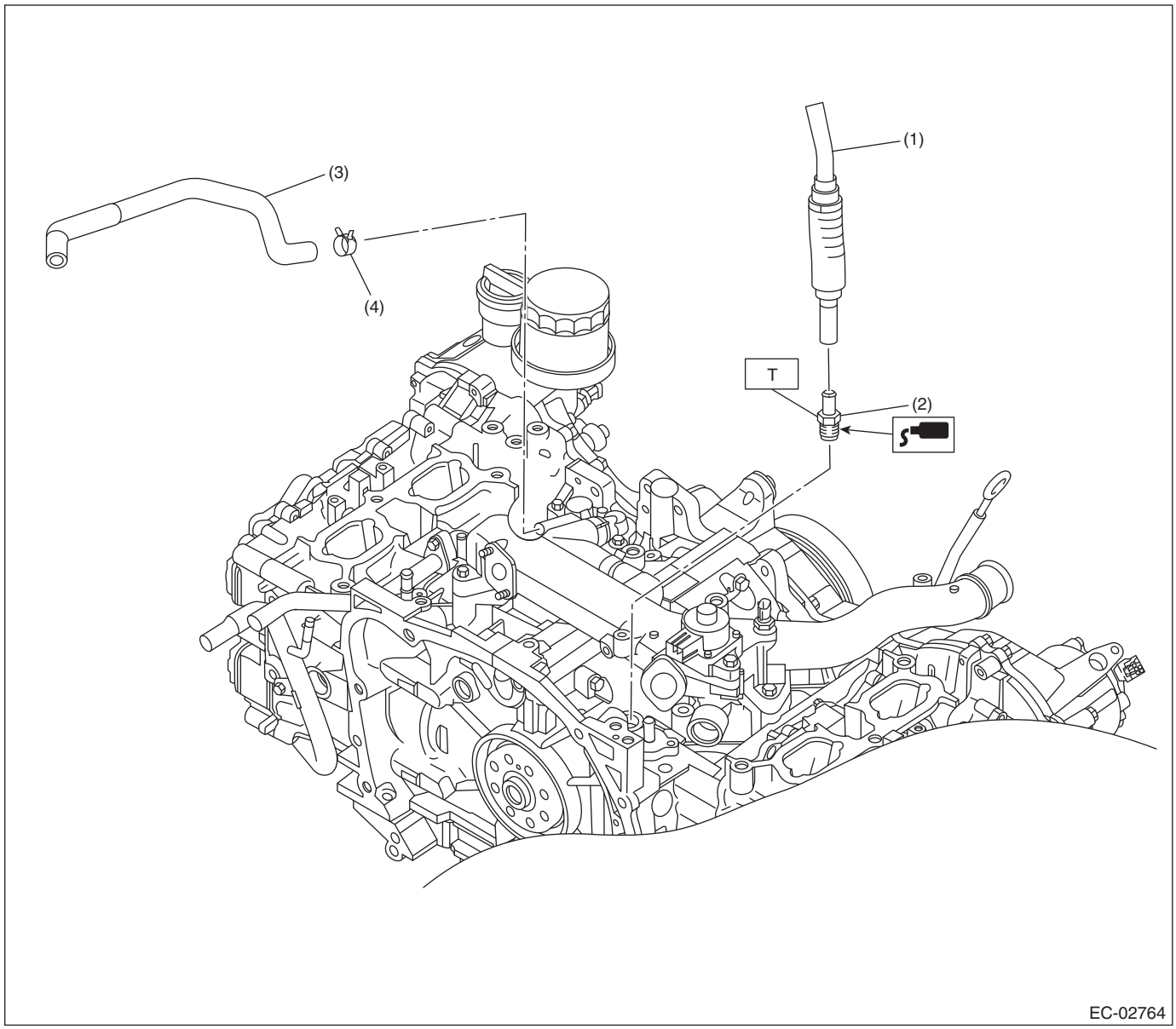
3. PCV SYSTEM 1



(1) Blow-by hose stay
(2) PCV hose ASSY
(3) Clip
(4) Clamp
(5) PCV connector
(6) O-ring
(7) O-ring

Tightening torque:N·m (kgf-m, ft-lb)
T1: 6.4 (0.7, 4.7)
T2: 8.3 (0.8, 6.1)

4. PCV SYSTEM 2



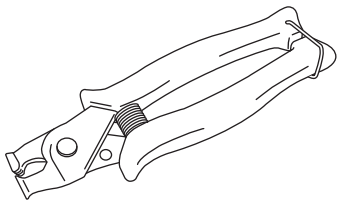
(1)	Vacuum hose	(3)	PCV hose ASSY	***Tightening torque:N·m (kgf-m, ft-lb)***
(2)	PCV valve	(4)	Clip	***T: 23 (2.3, 17.0)***

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 battery.

C: PREPARATION TOOL

1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18353AA000	18353AA000	CLAMP PLIERS	• Used for removing and installing the PCV hose. • This tool is made by the French company CAILLAU. (code) 54.0.000.205 To make it easier to obtain, it has been provided with a tool number.

2. GENERAL TOOL

TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance and voltage.

2. Front Catalytic Converter

A: REMOVAL

The front catalytic converter is integrated into the front exhaust pipe; therefore, refer to “Front Exhaust Pipe” for the removal procedure. <Ref. to EX(H4DO)-5, REMOVAL, Front Exhaust Pipe.>

B: INSTALLATION

The front catalytic converter is integrated into the front exhaust pipe; therefore, refer to “Front Exhaust Pipe” for the installation procedure. <Ref. to EX(H4DO)-8, INSTALLATION, Front Exhaust Pipe.>

C: INSPECTION

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

3. Rear Catalytic Converter

A: REMOVAL

The rear catalytic converter is integrated into the center exhaust pipe; therefore, refer to “Center Exhaust Pipe” for the removal procedure. <Ref. to EX(H4DO)-12, REMOVAL, Center Exhaust Pipe.>

B: INSTALLATION

The rear catalytic converter is integrated into the center exhaust pipe; therefore, refer to “Center Exhaust Pipe” for the installation procedure. <Ref. to EX(H4DO)-12, INSTALLATION, Center Exhaust Pipe.>

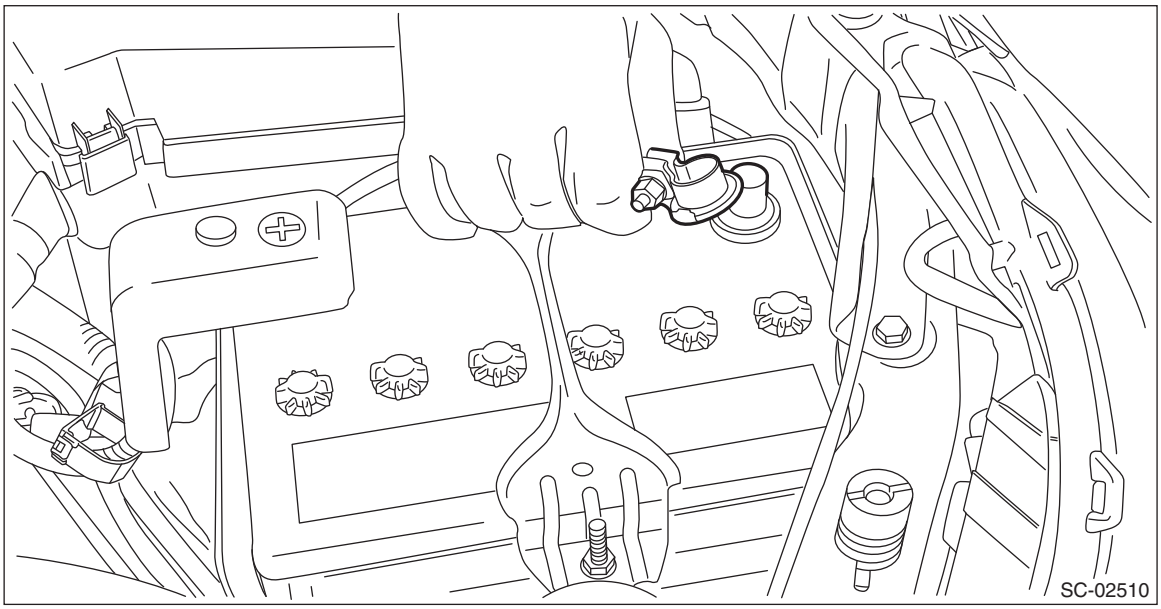
C: INSPECTION

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

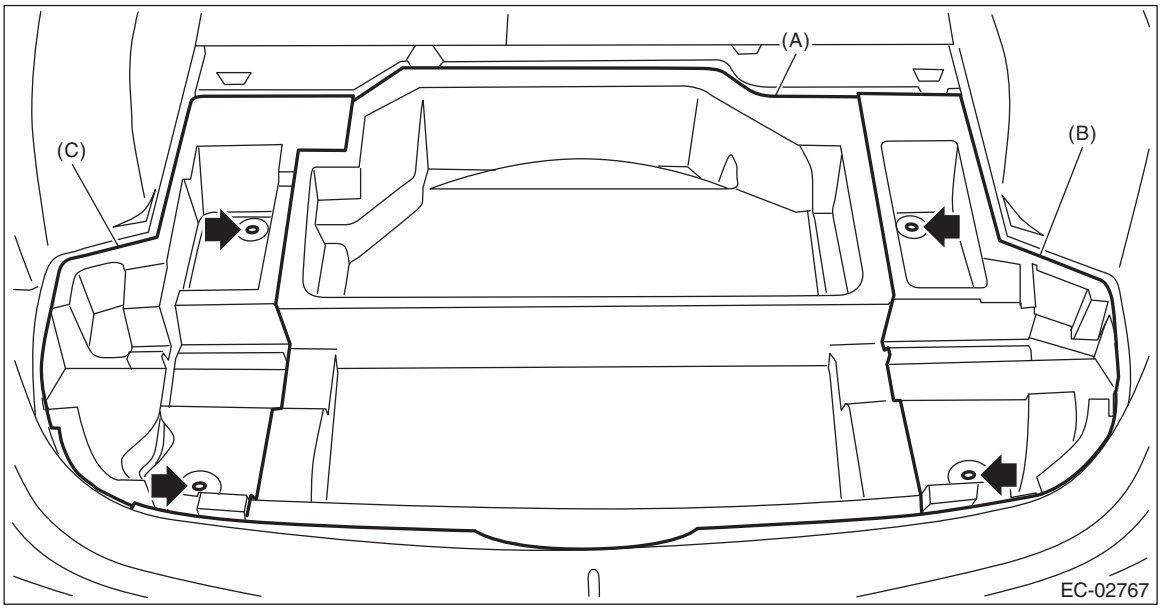
4. Canister

A: REMOVAL

1) Disconnect the ground cable from battery.

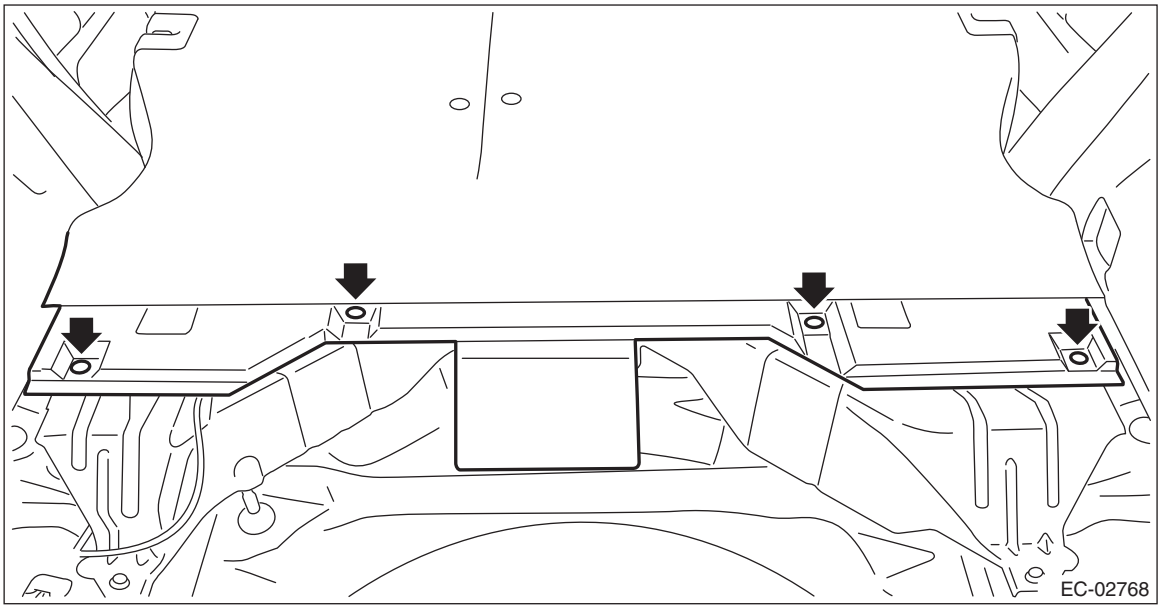


2) Open the rear gate, and remove the luggage floor mat.
3) Remove the center sub trunk (A) (model with center sub trunk), and remove the sub trunk RH (B) and sub trunk LH (C) fixed by clips.

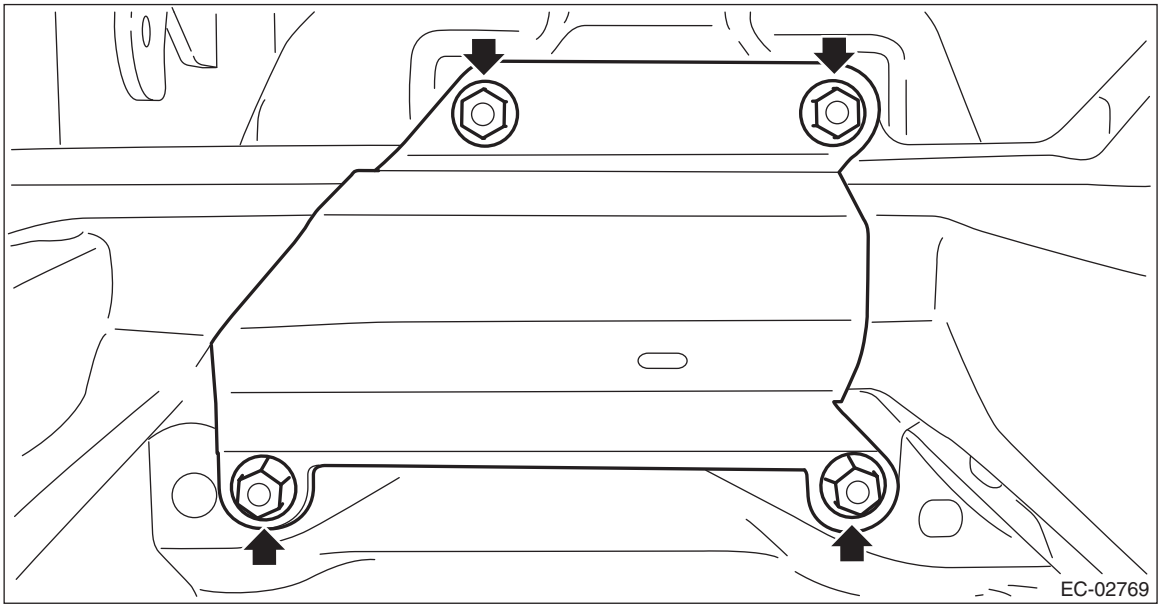


4) Tilt the rear seat backrest forward.

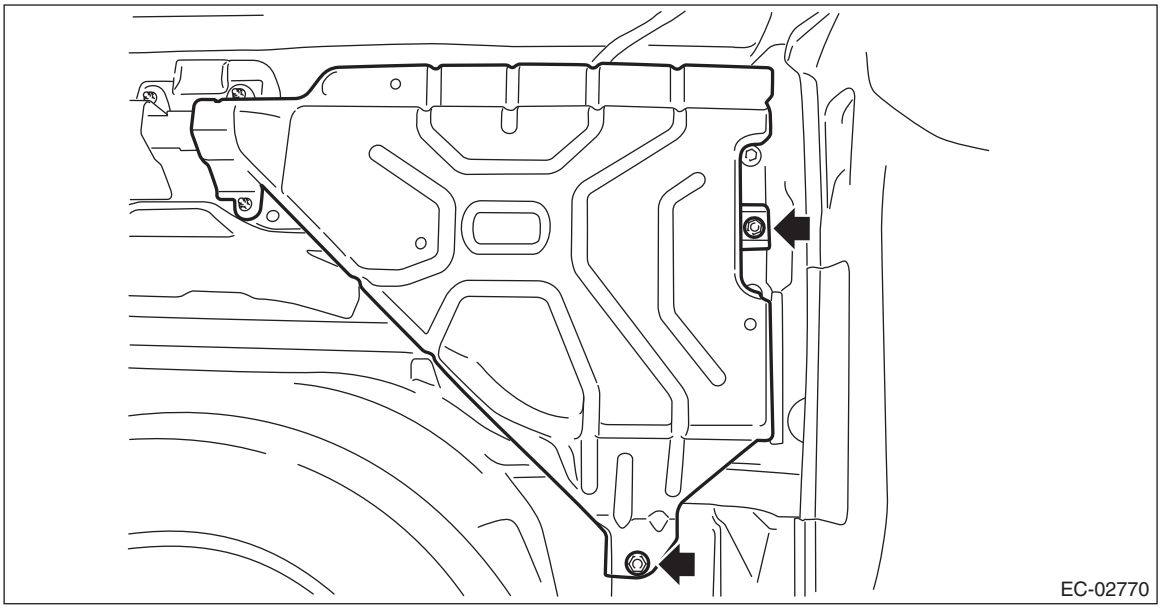
5) Remove the clips that is holding the rear seat backrest cover on the canister cover, and turn over the rear seat backrest cover toward the front side of the vehicle.



6) Remove the center canister cover.

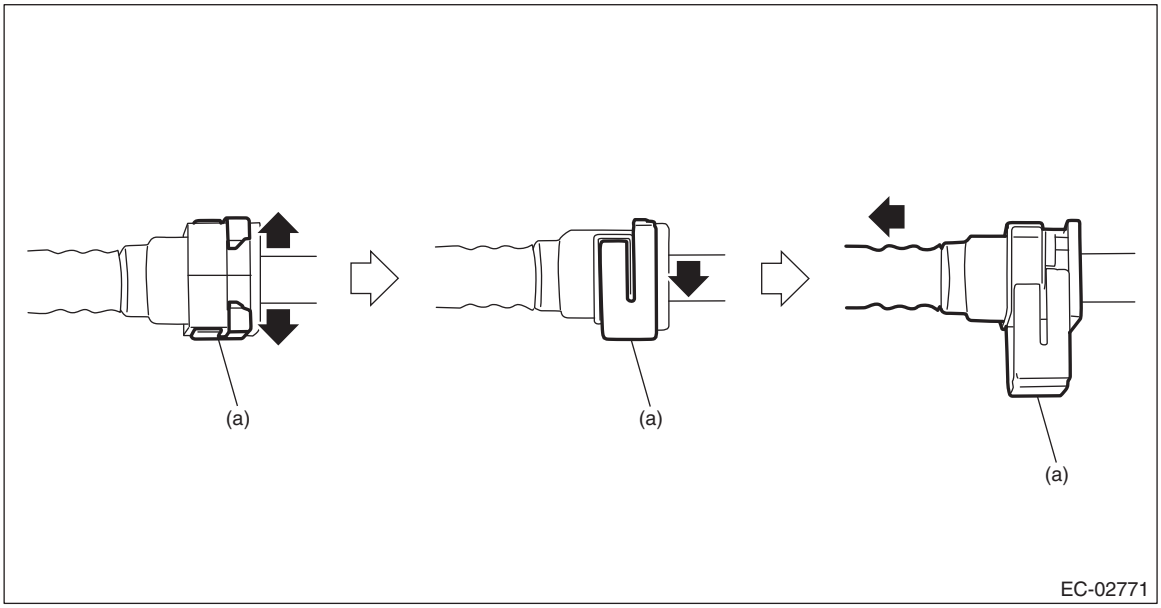


7) Remove the canister cover RH.

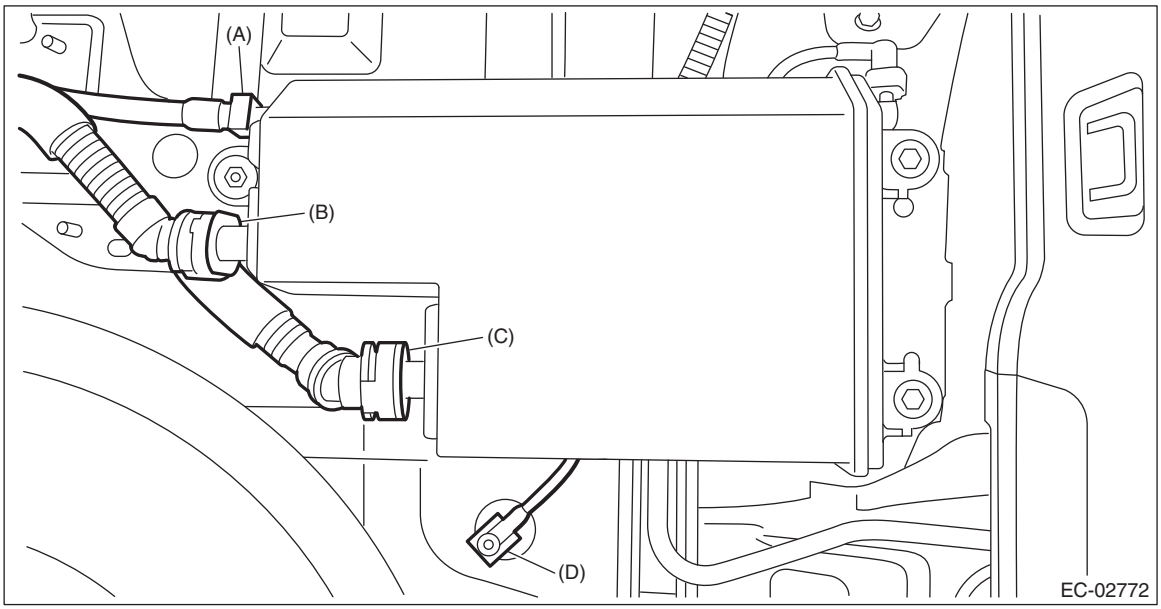


8) Disconnect the purge tube (A), vent tube (B), drain tube A (C) and PCV drain tube (D).

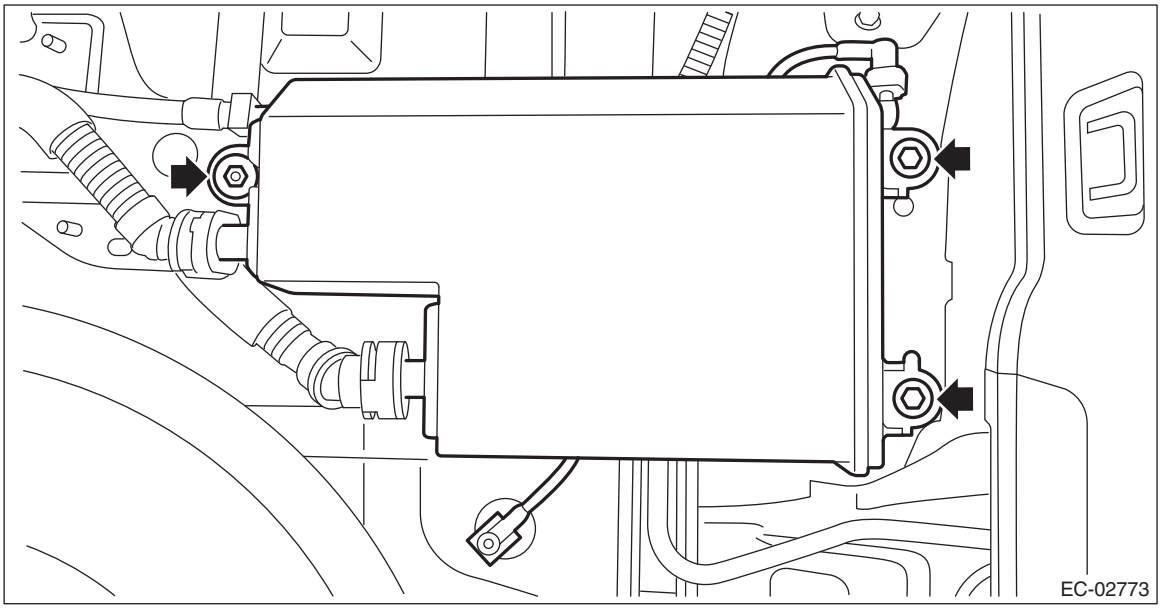
NOTE:
Disconnect the quick connector as shown in the figure.



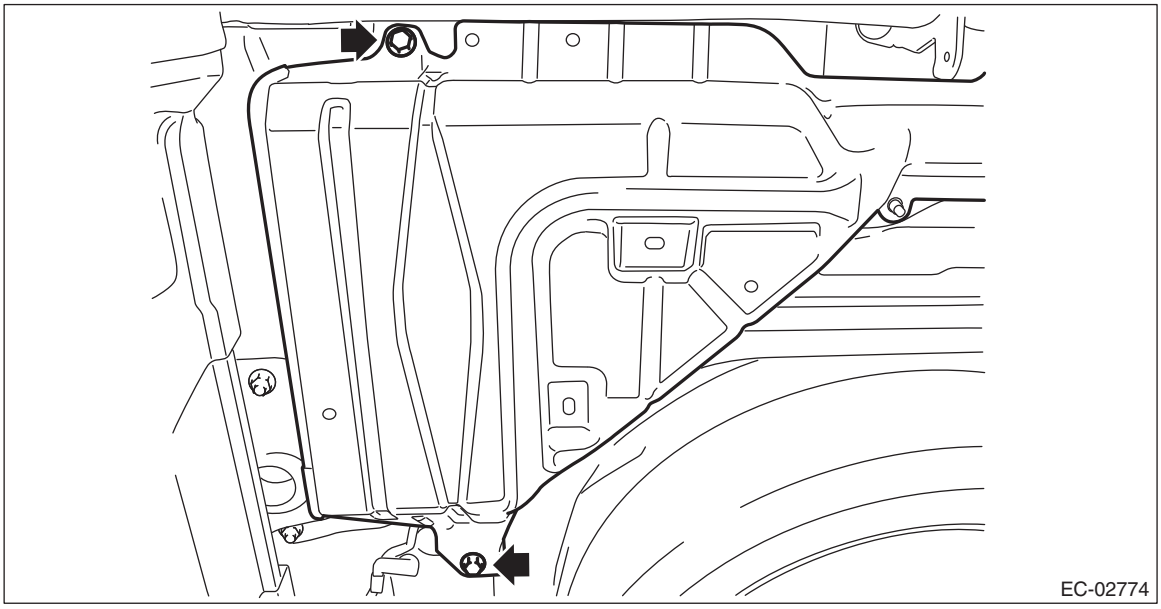
(a) Retainer



9) Remove the canister.

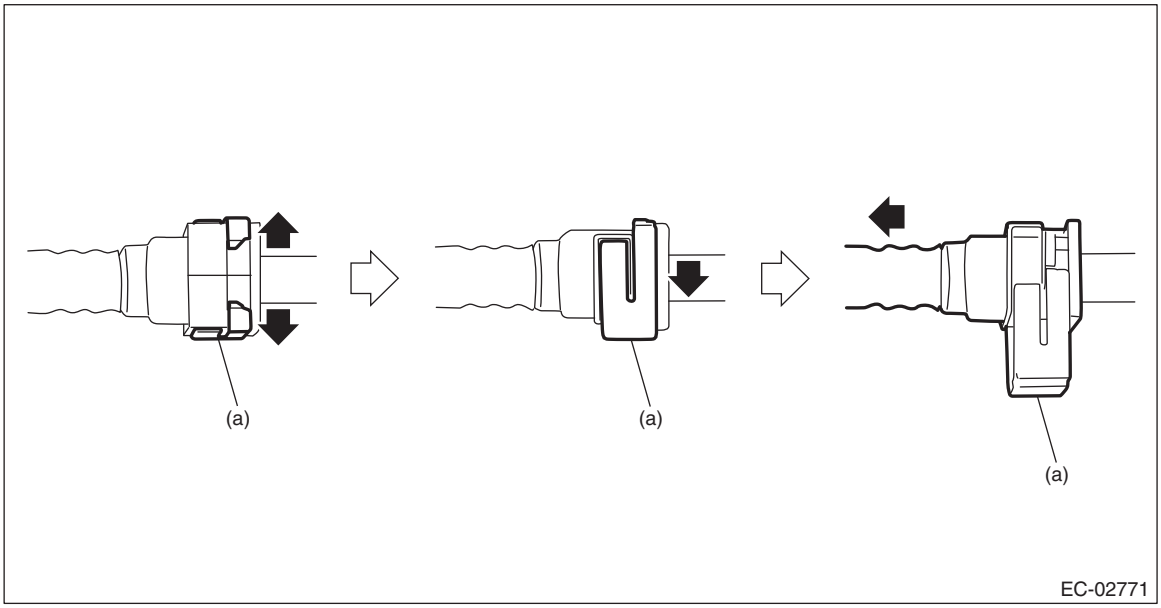


10) Remove the canister cover LH.

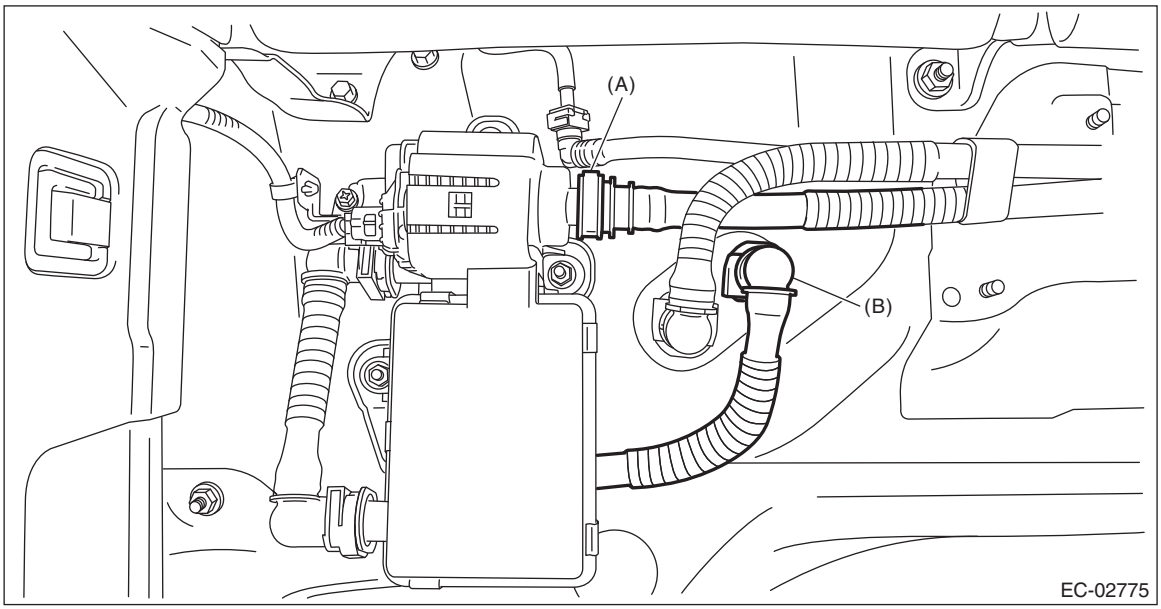


11) Disconnect drain tube A (A) and drain tube B (B).

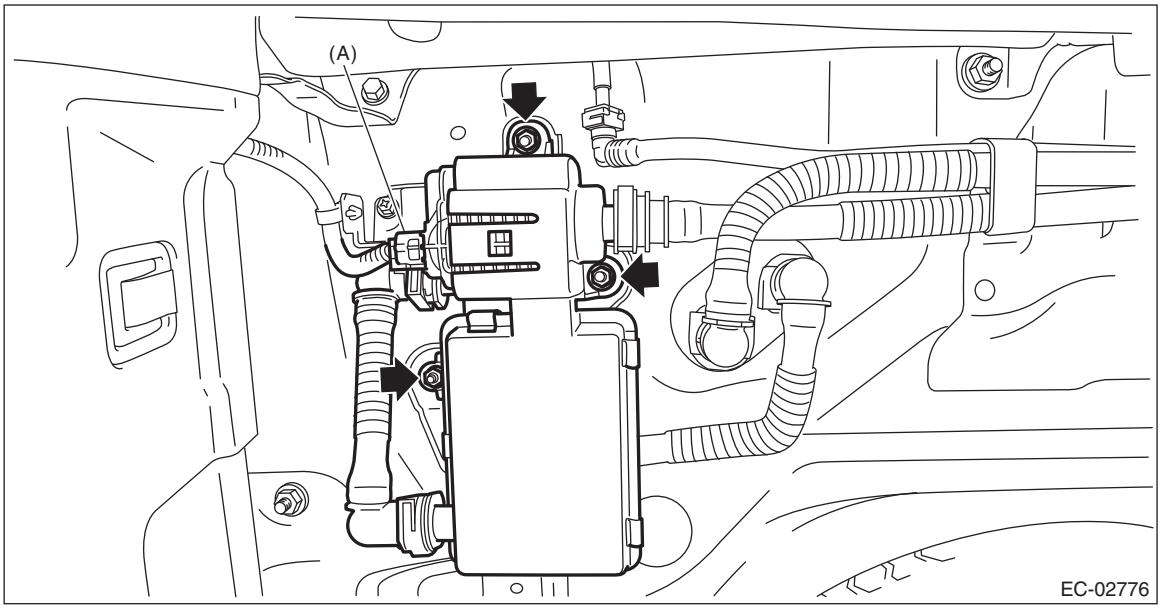
NOTE:
Disconnect the quick connector as shown in the figure.



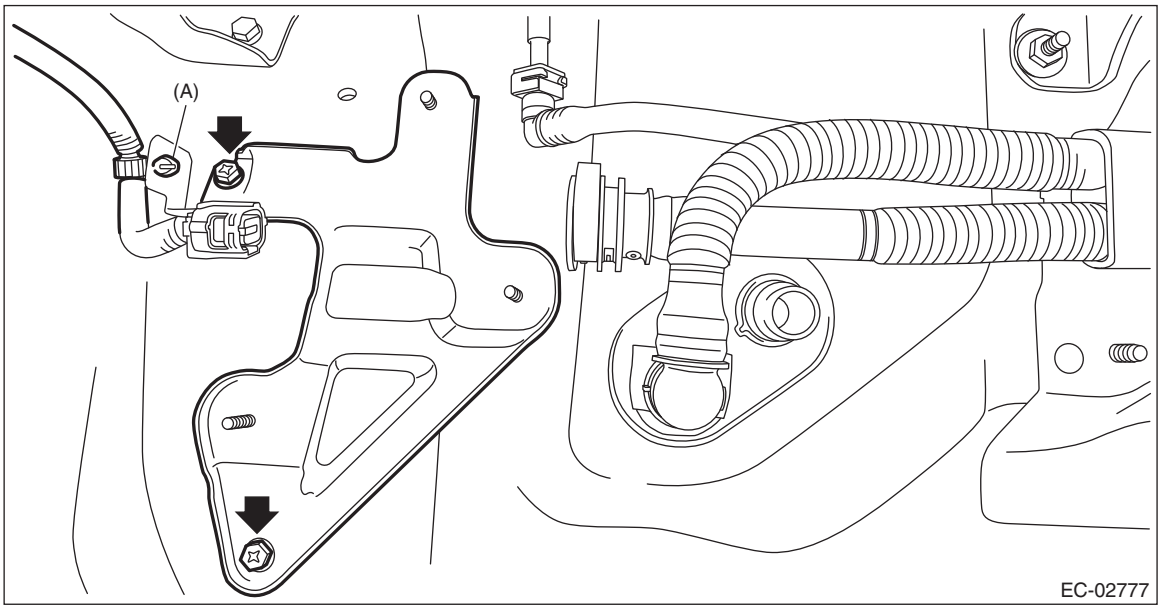
(a) Retainer



12) Disconnect the connector (A) from leak check valve assembly, and remove the leak check valve assembly.

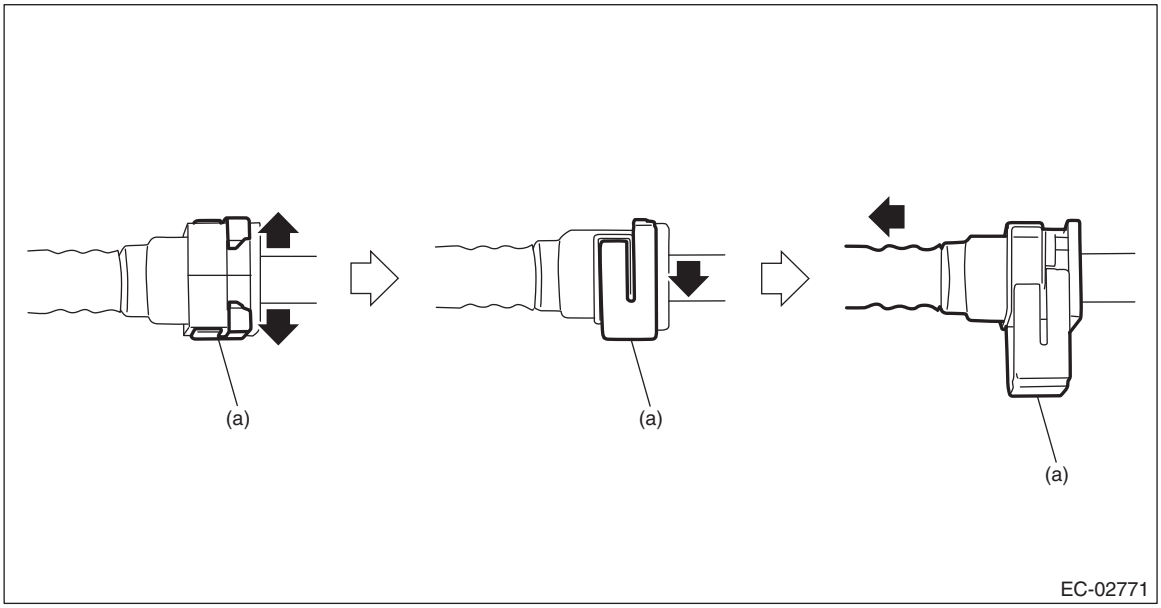


13) Remove the clip (A) which secures the leak check valve harness to the bracket, and remove the valve bracket.

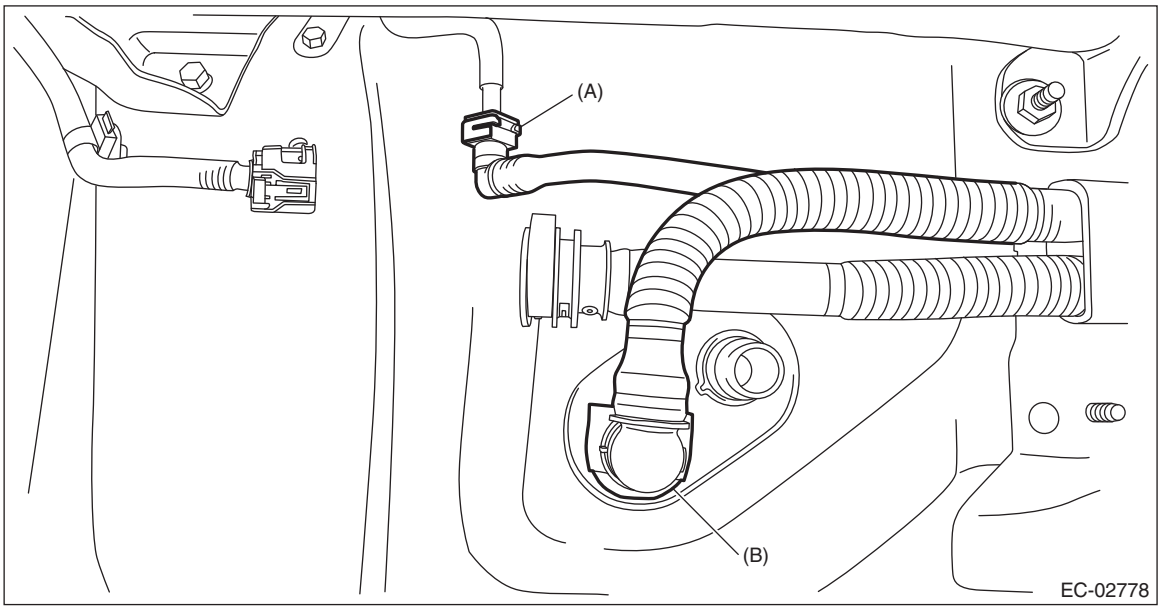


14) Disconnect purge tube (A) and vent tube (B).

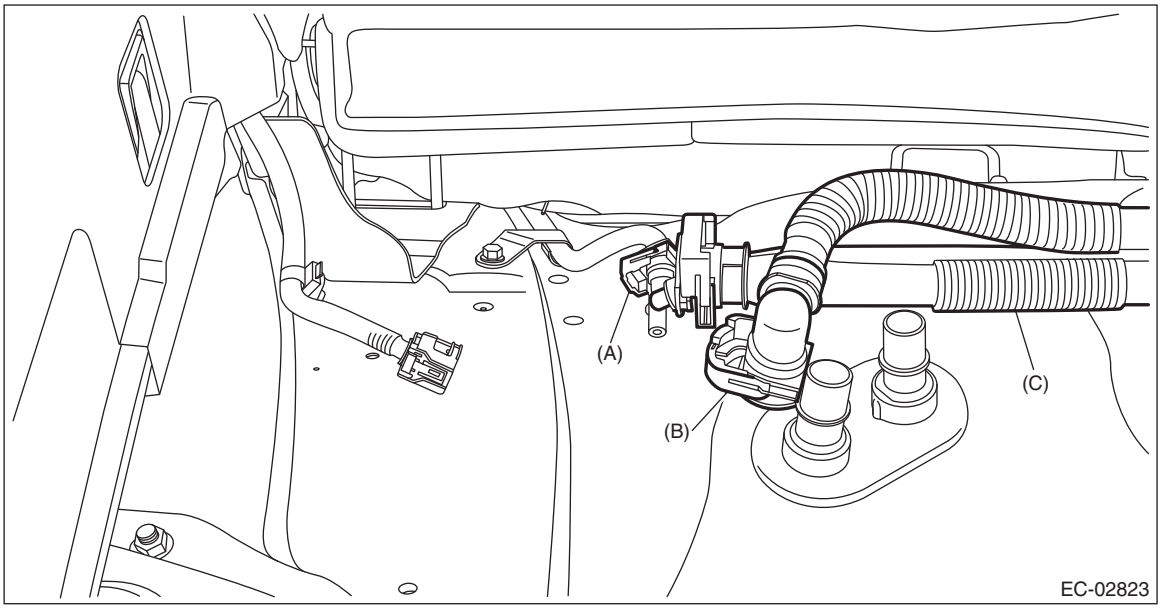
NOTE:
Disconnect the quick connector as shown in the figure.



(a) Retainer



15) Remove purge tube (A), vent tube (B), and drain tube A (C).



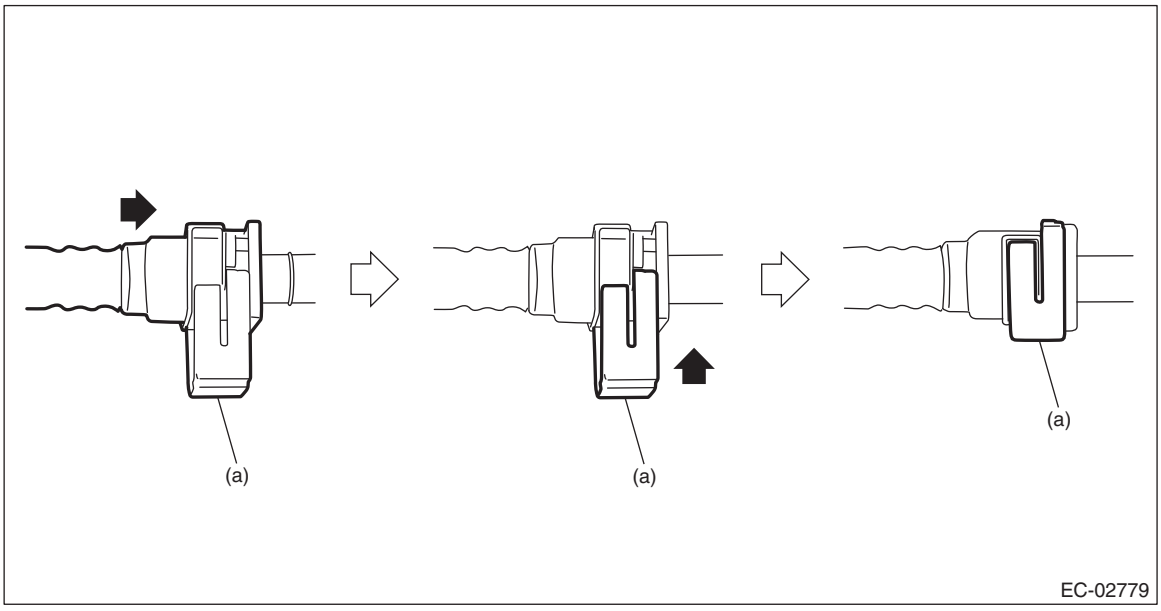
B: INSTALLATION

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

- Connect the quick connector as shown in the figure.

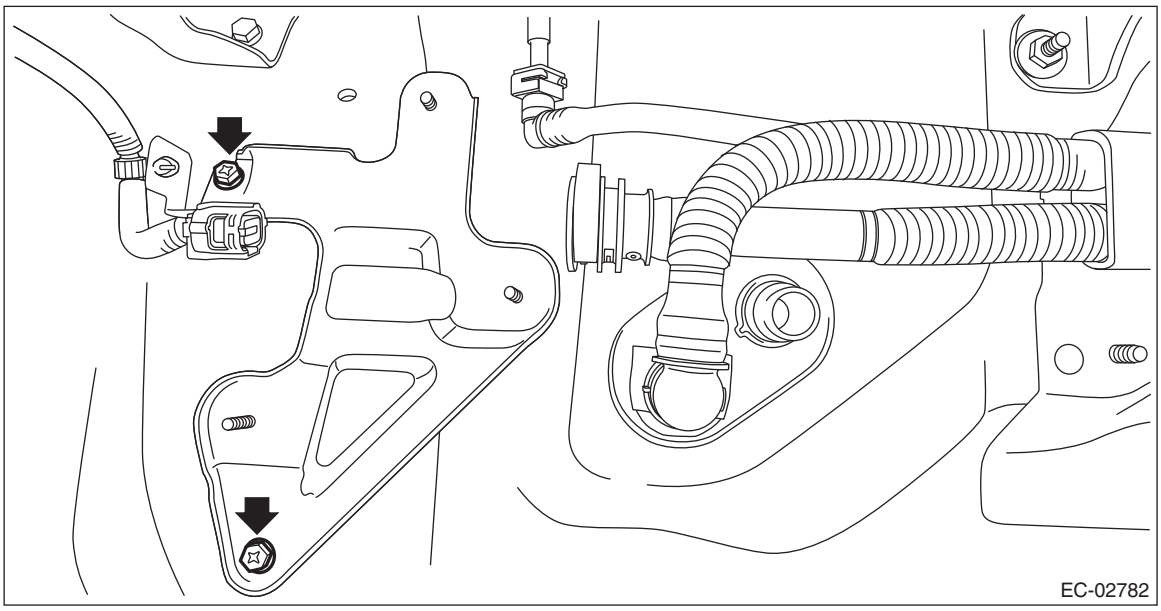
CAUTION:

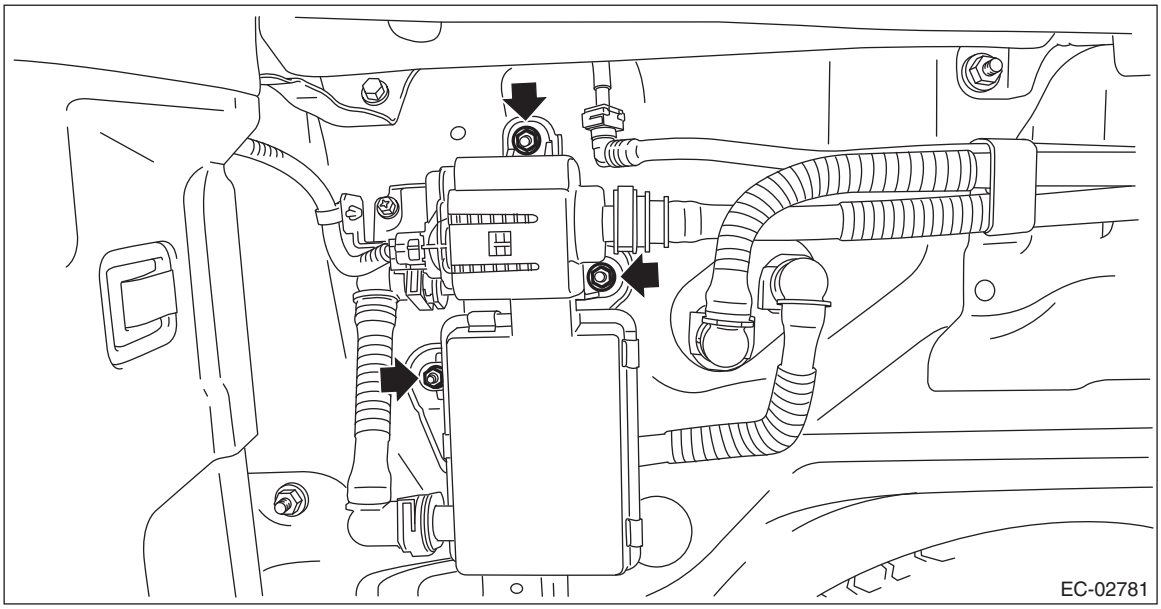
- **Check that there is no damage or dust on the quick connector. If necessary, clean the seal surface of the pipe.**
- **When connecting the quick connector, securely insert the pipe all the way before locking the retainer.**
- **If it is not possible to perform the push lock operation of the retainer, recheck whether the pipe is securely inserted.**
- **Make sure that the quick connector is securely connected.**



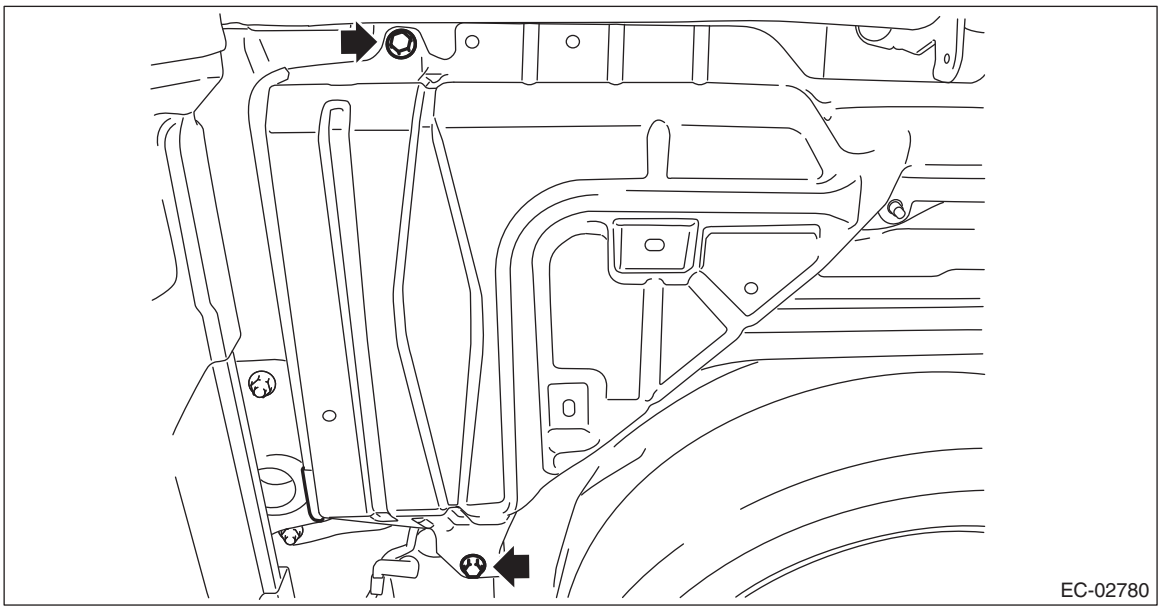
(a) Retainer

Tightening torque:
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)

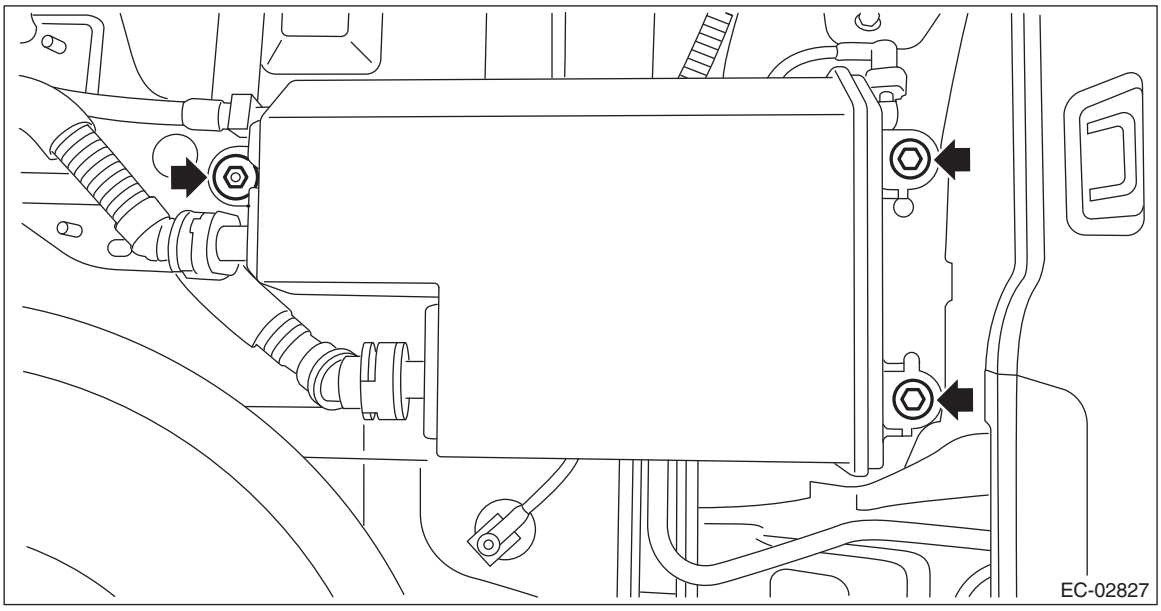




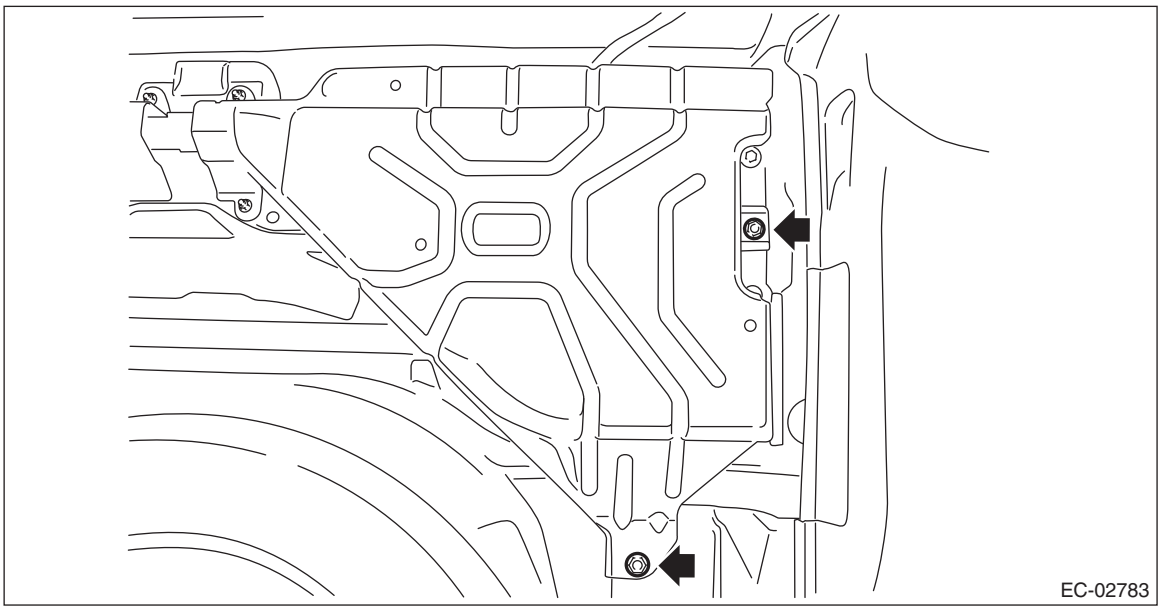
Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)

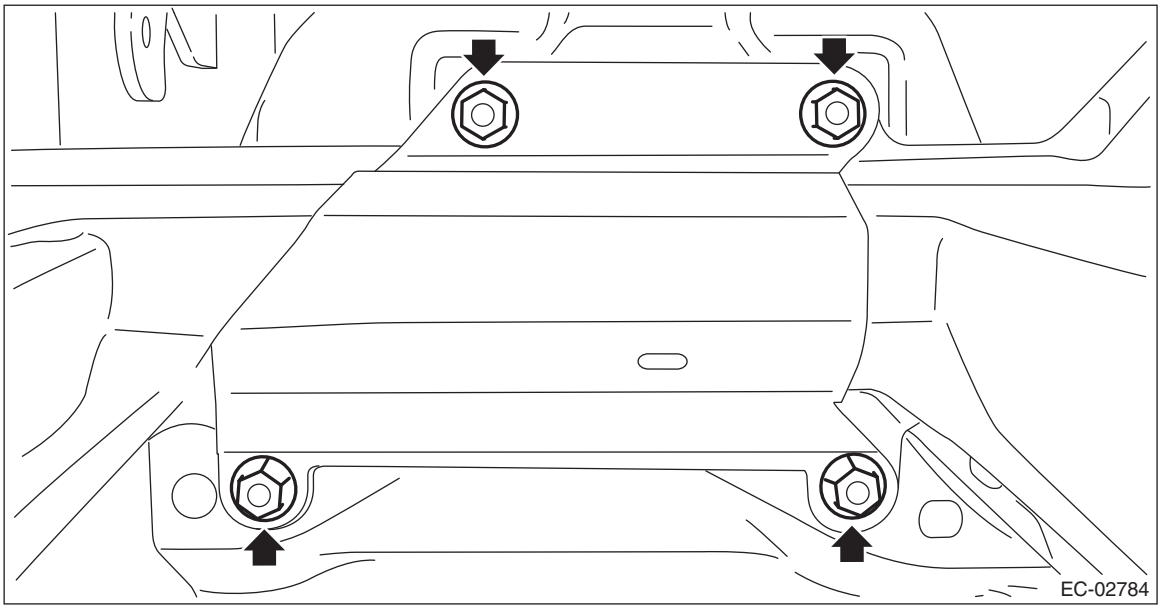


Tightening torque:
8 N·m (0.8 kgf-m, 5.9 ft-lb)



Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)





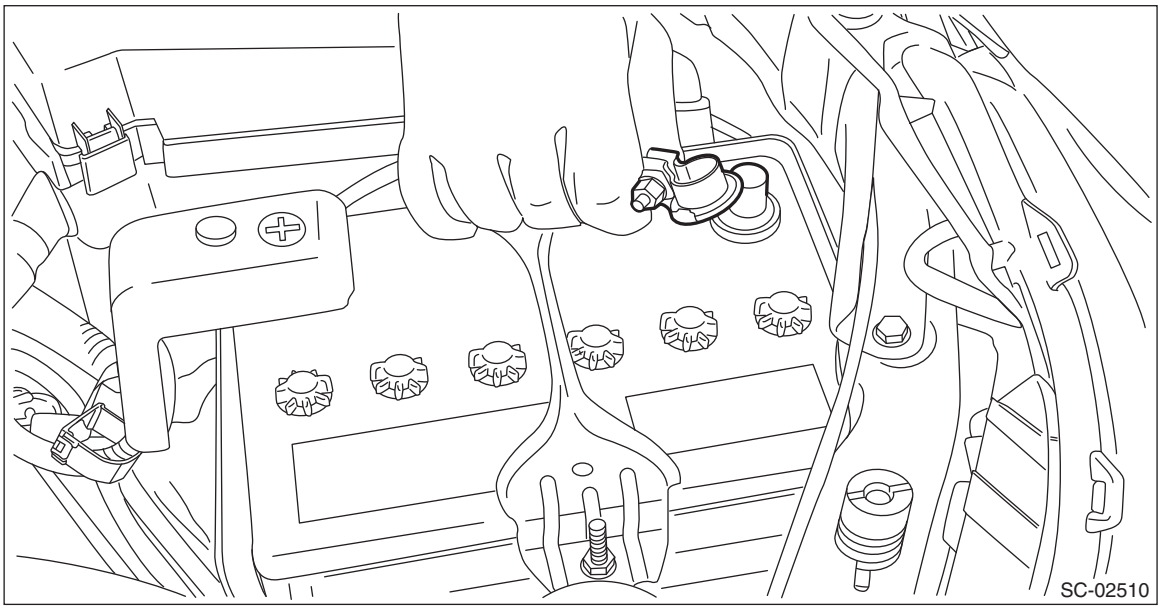
C: INSPECTION

1) Check that the canister and leak check valve assembly have no deformation, cracks or other damages.
2) Check that the tube has no cracks, damage or loose part.

5. Purge Control Solenoid Valve

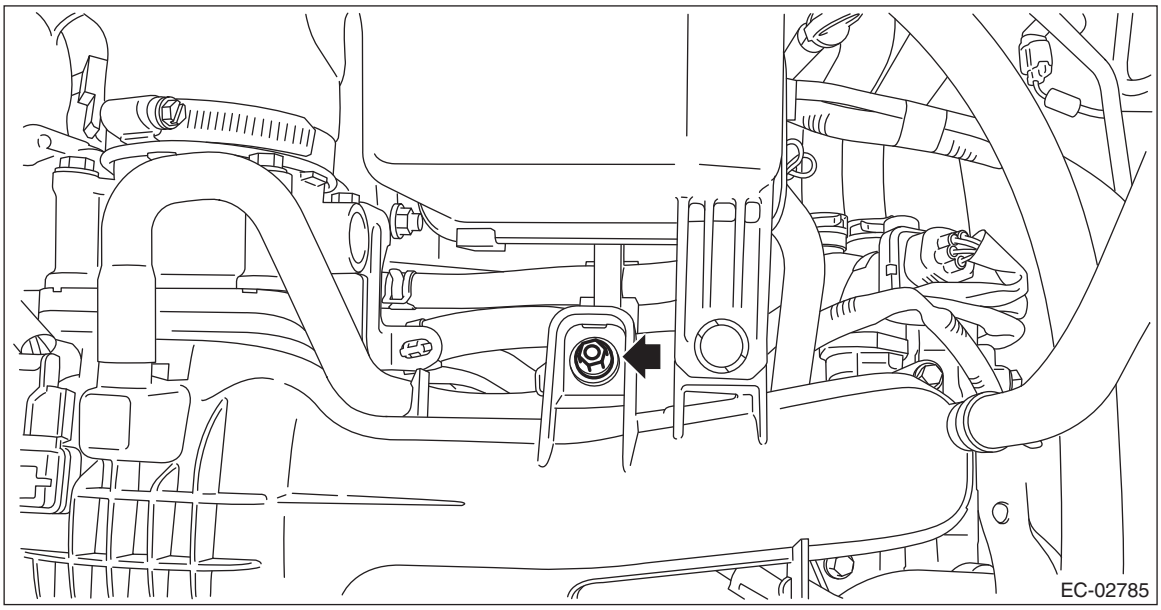
A: REMOVAL

1) Disconnect the ground cable from battery.

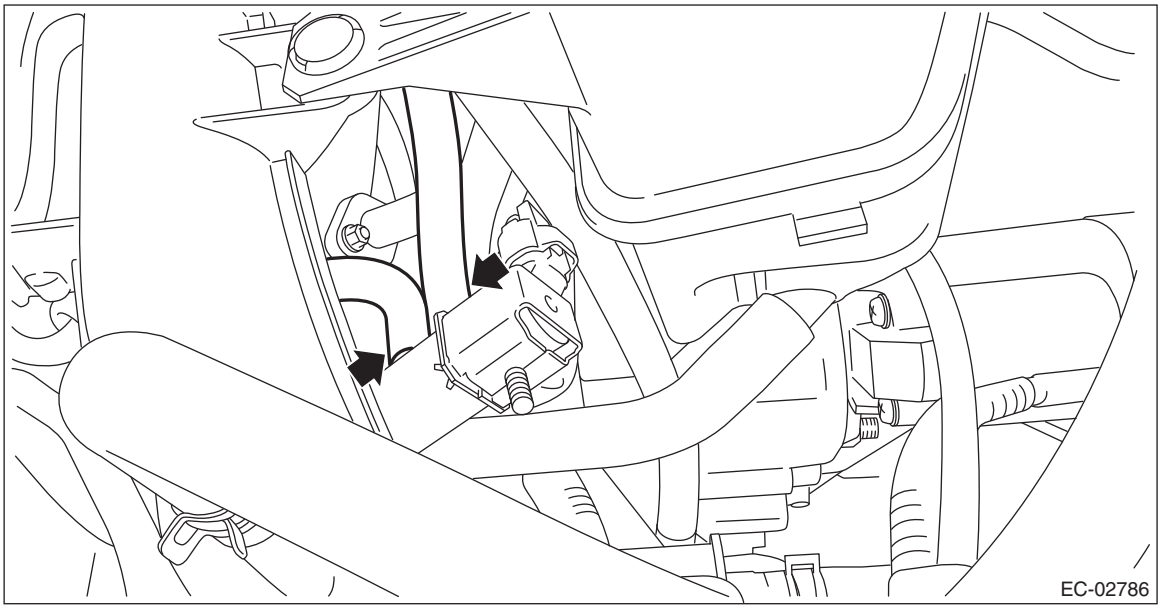


2) Remove the nut which holds the purge control solenoid valve onto intake manifold.

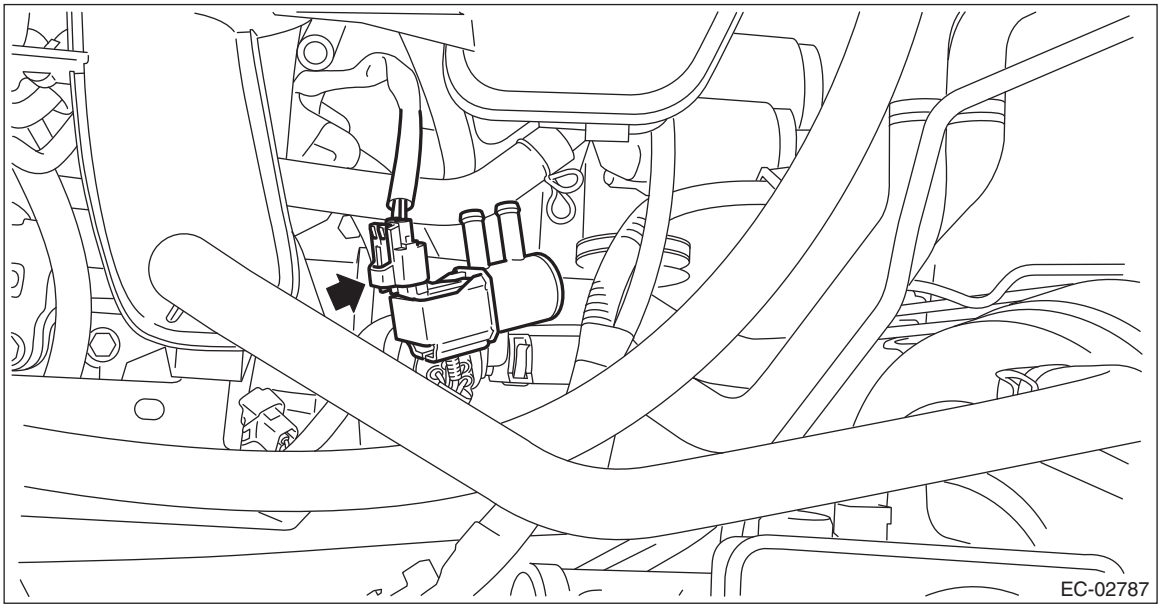
NOTE:
Hold the purge control solenoid valve unit by hand to prevent it from rotating together.



3) Disconnect the vacuum hose from purge control solenoid valve.



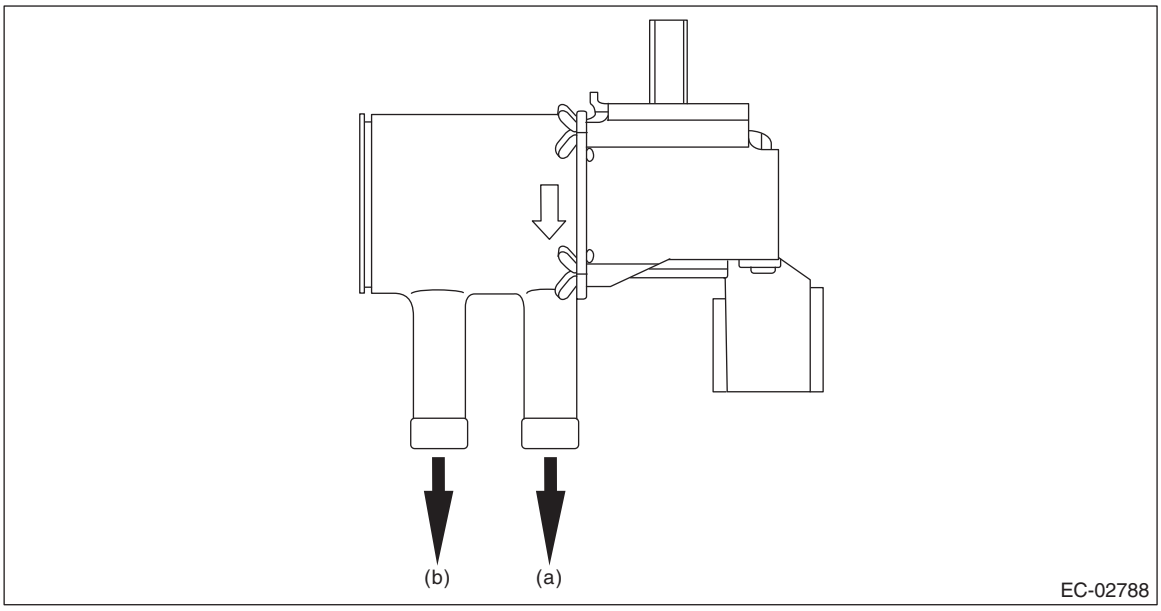
4) Disconnect the connector from the purge control solenoid valve, and then remove the purge control solenoid valve.



B: INSTALLATION

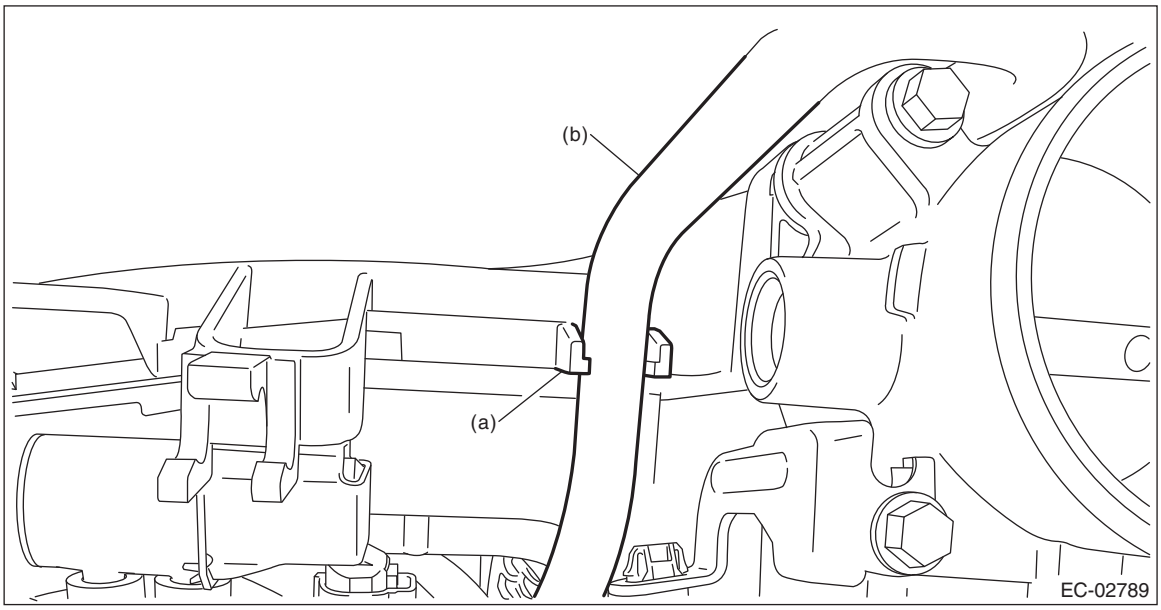
Install in the reverse order of removal.

NOTE:
- Hold the purge control solenoid valve unit by hand to prevent it from rotating together.
- Connect the vacuum hose as shown in the figure.



(a) To intake manifold (b) To fuel pipe

- Check that the vacuum hose (b) is securely held to the clip (a) of the intake manifold.

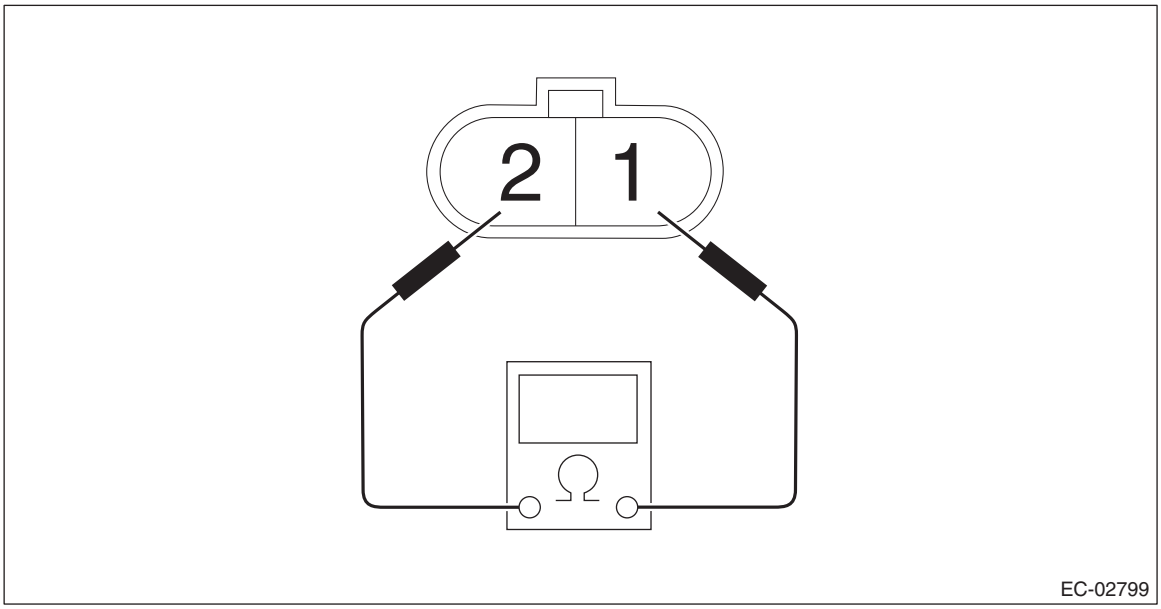


Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)

C: INSPECTION

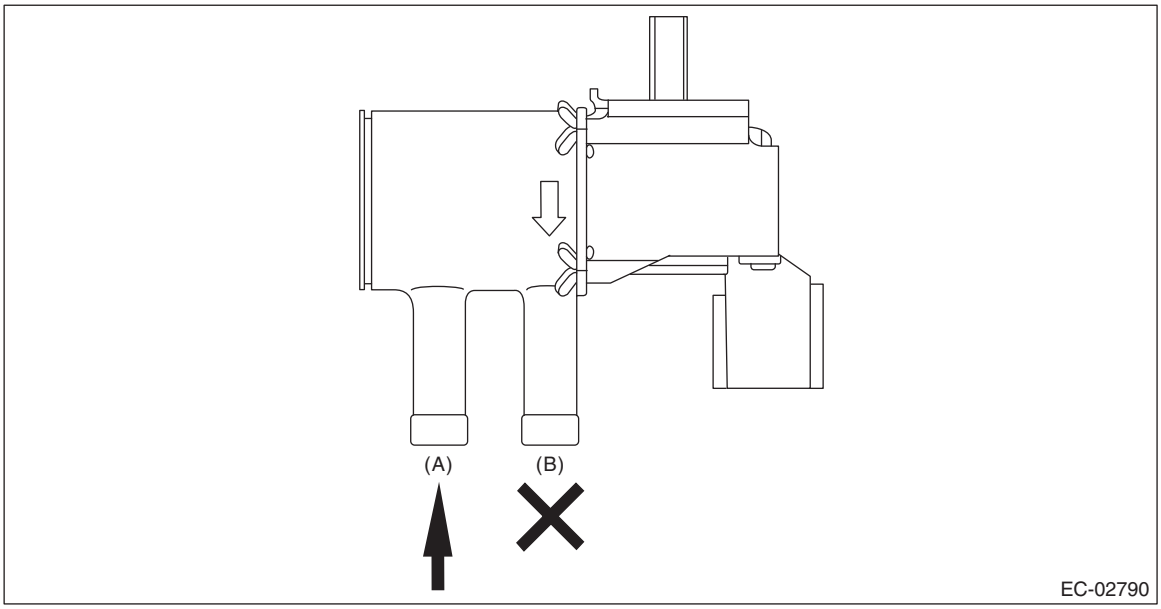
1. PURGE CONTROL SOLENOID VALVE

1) Check that the purge control solenoid valve has no deformation, cracks or other damages.
2) Measure the resistance between the purge control solenoid valve terminals.

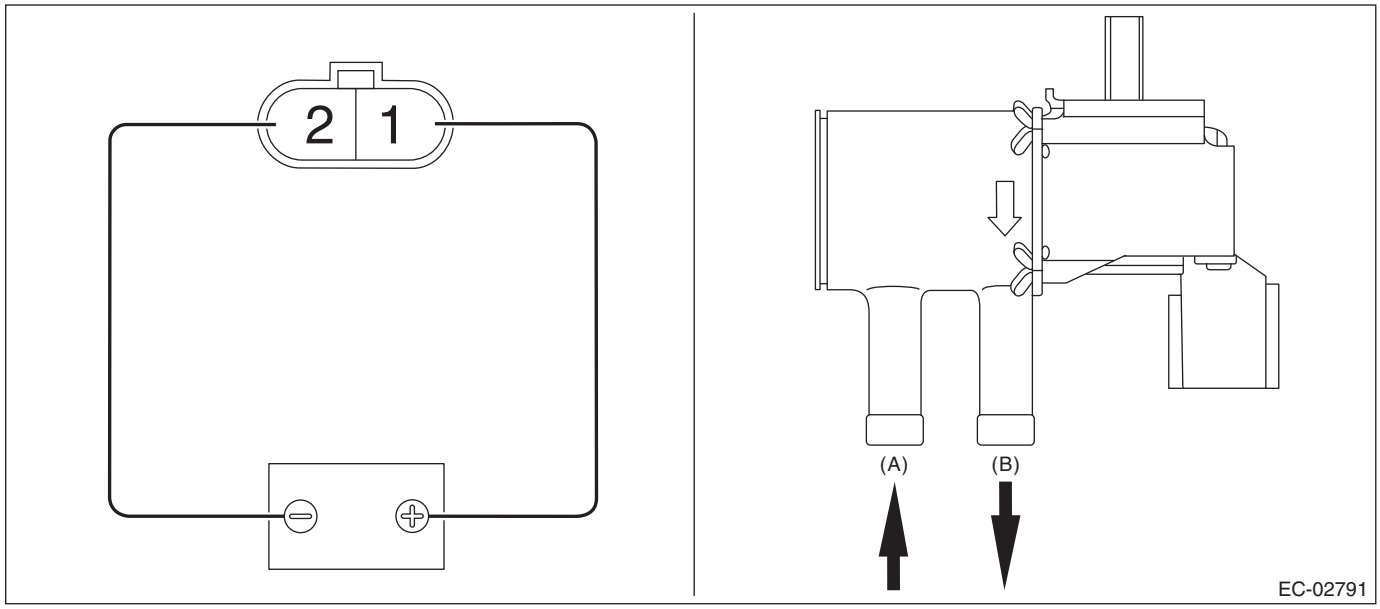


Terminal No.	Standard
1 and 2	24±3 Ω (20°C (68°F))

3) Check that air does not come out from (B) when air is blown into (A).



4) Connect the battery positive terminal to the terminal No. 1 and the battery negative terminal to the terminal No. 2. Check that air is discharged from (B), when supplying air to (A).



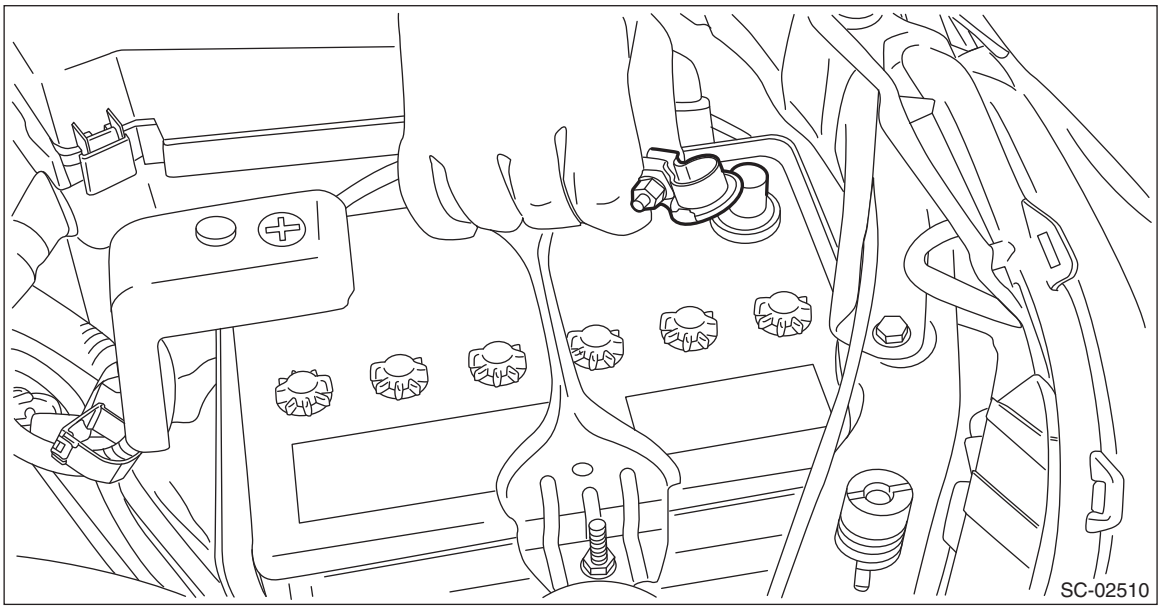
2. OTHER INSPECTIONS

Check the vacuum hose for cracks, damage or looseness.

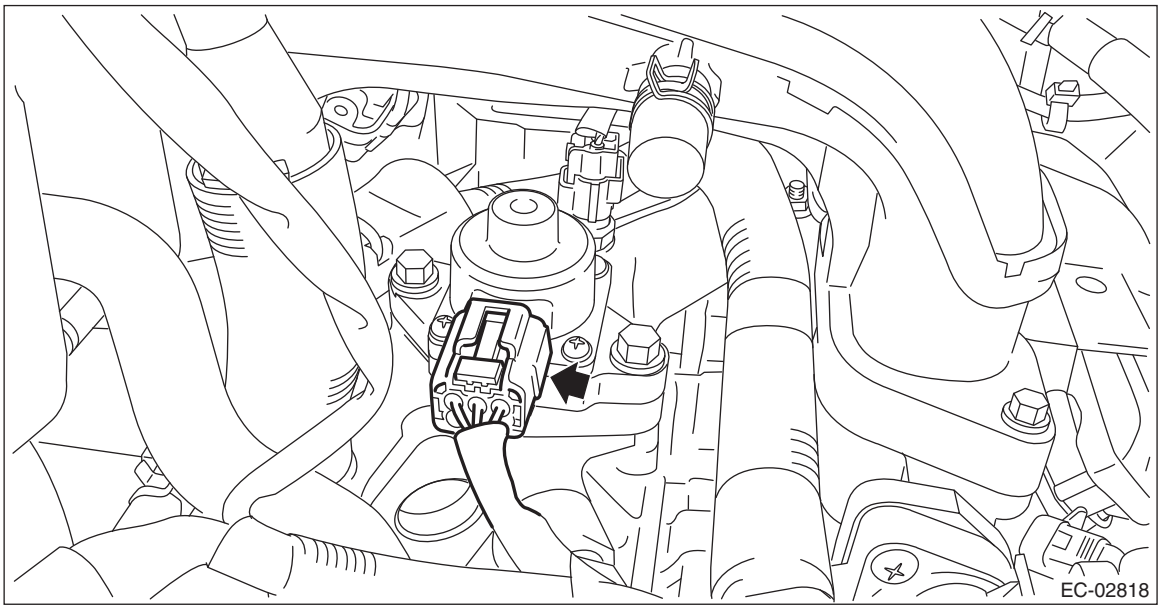
6. EGR Control Valve

A: REMOVAL

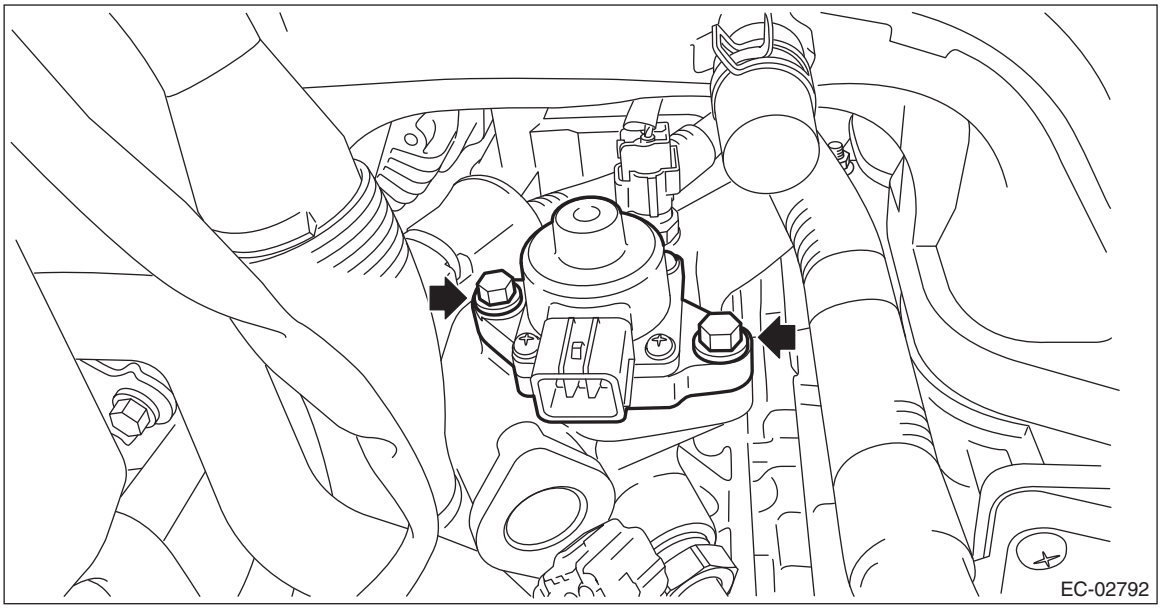
1) Disconnect the ground cable from battery.



2) Remove the air intake boot. <Ref. to IN(H4DO)-13, REMOVAL, Air Intake Boot.>
3) Disconnect the connector from the EGR control valve.



4) Remove the EGR control valve from the water pipe assembly.



B: INSTALLATION

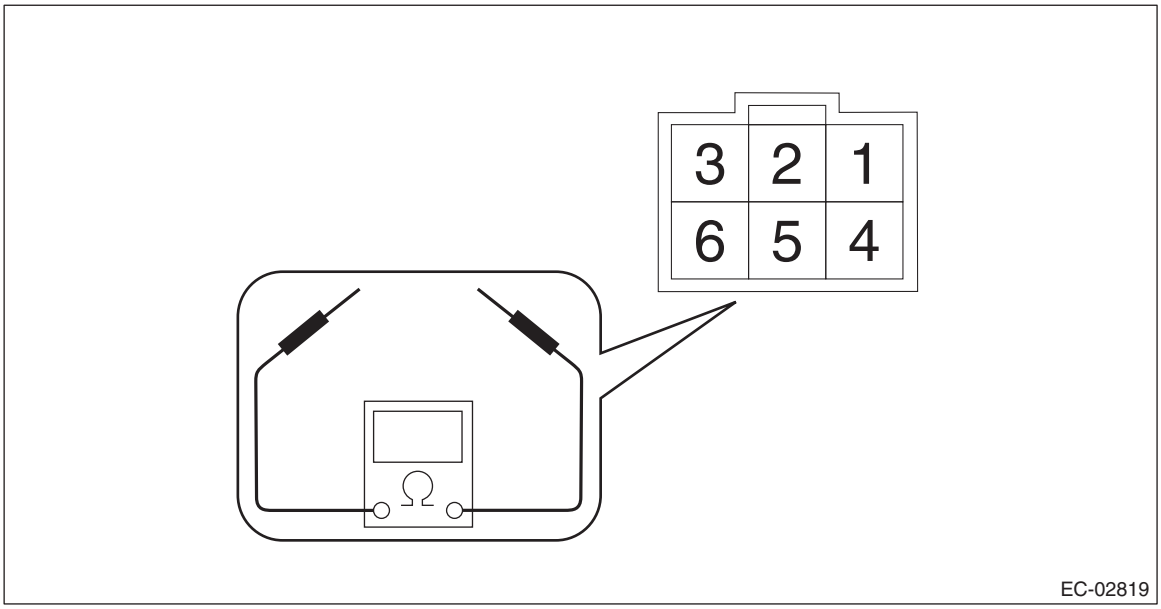
Install in the reverse order of removal.

NOTE:
Use new O-rings and gaskets.

Tightening torque:
22 N·m (2.2 kgf-m, 16.2 ft-lb)

C: INSPECTION

1) Check that the EGR control valve has no deformation, cracks or other damages.
2) Measure the resistance between EGR control valve terminals.

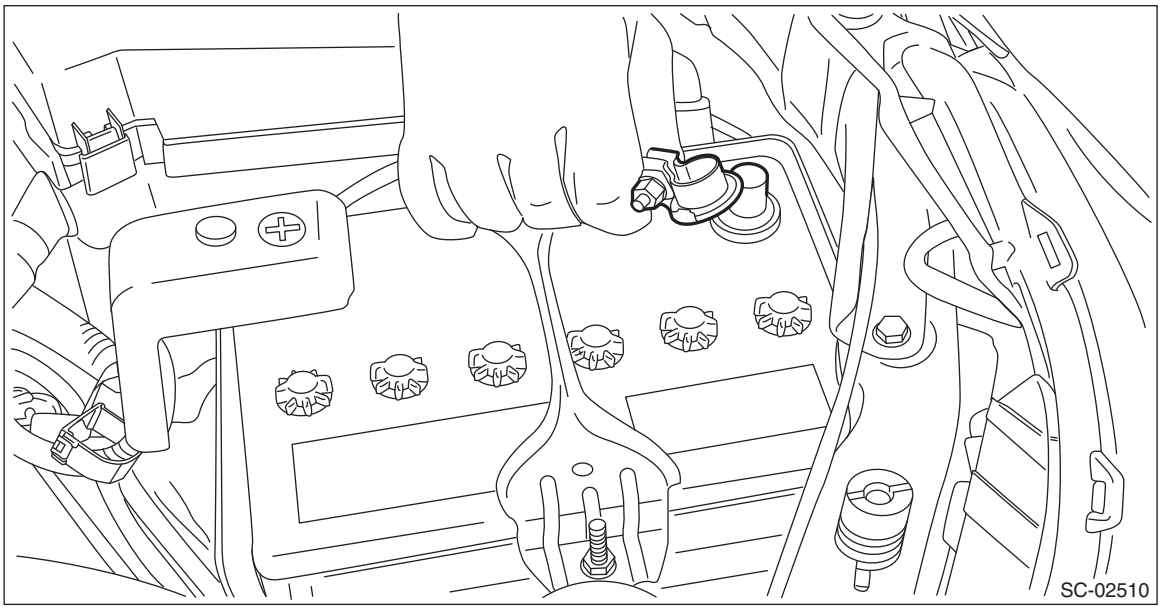


Terminal No.	Standard
2 and 1	22±2 Ω
2 and 3	22±2 Ω
5 and 4	22±2 Ω
5 and 6	22±2 Ω

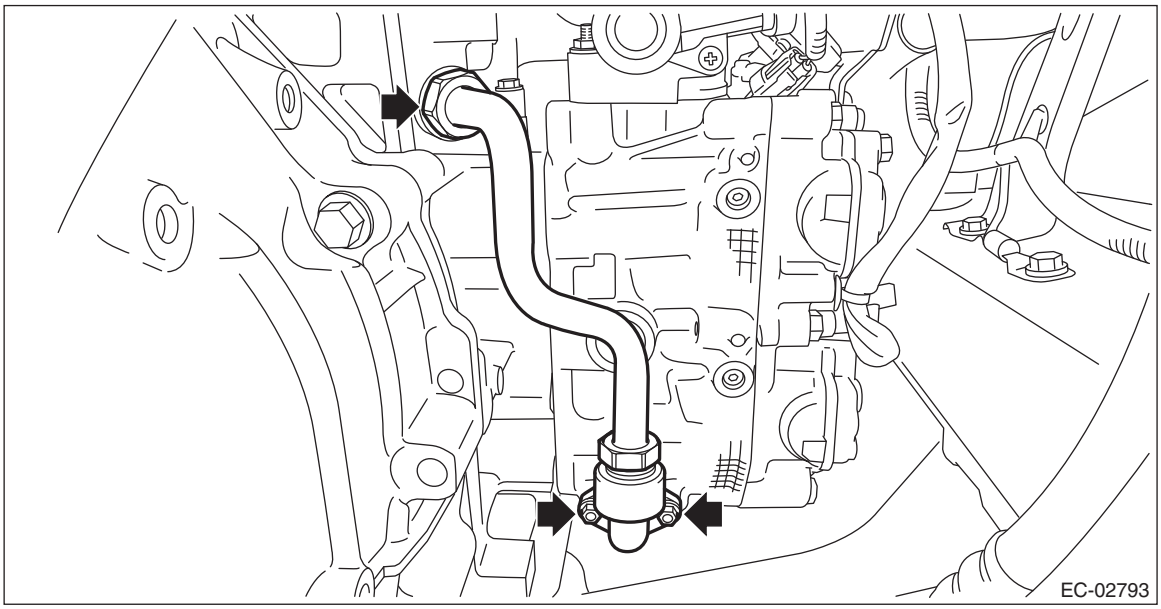
7. EGR Pipe

A: REMOVAL

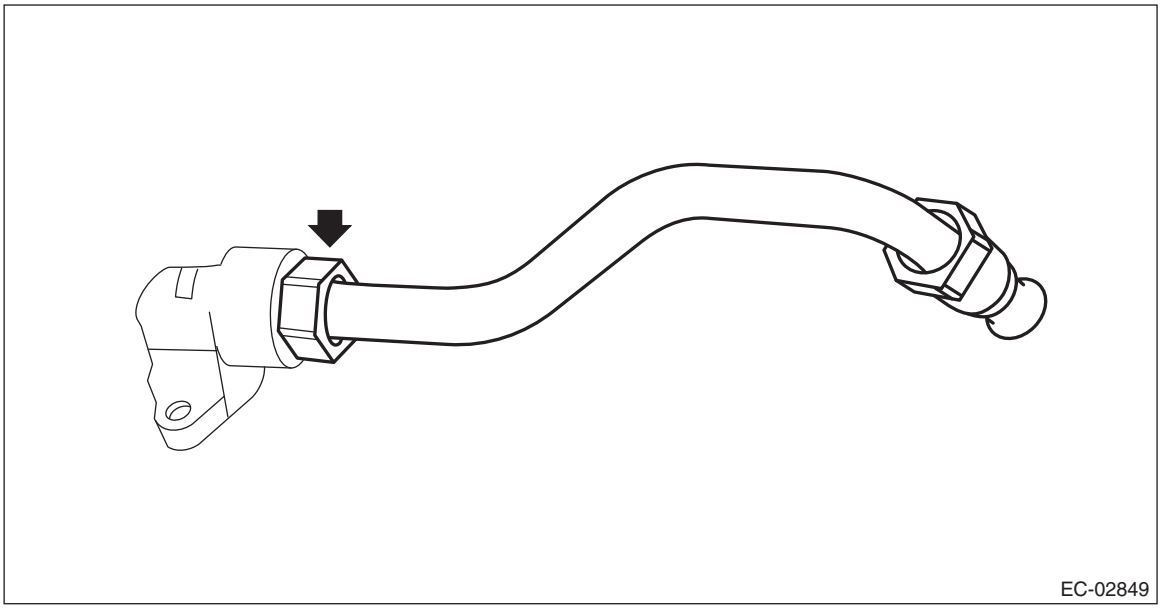
1) Disconnect the ground cable from battery.



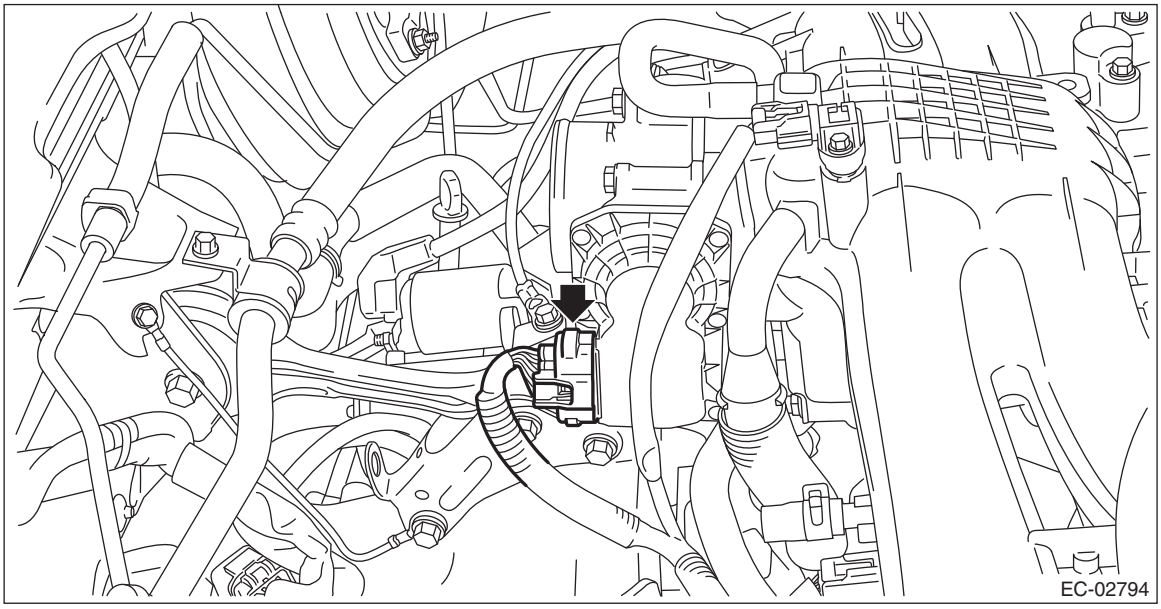
2) Remove the air intake boot. <Ref. to IN(H4DO)-13, REMOVAL, Air Intake Boot.>
3) Remove the EGR pipe assembly from the water pipe assembly and the cylinder head RH.



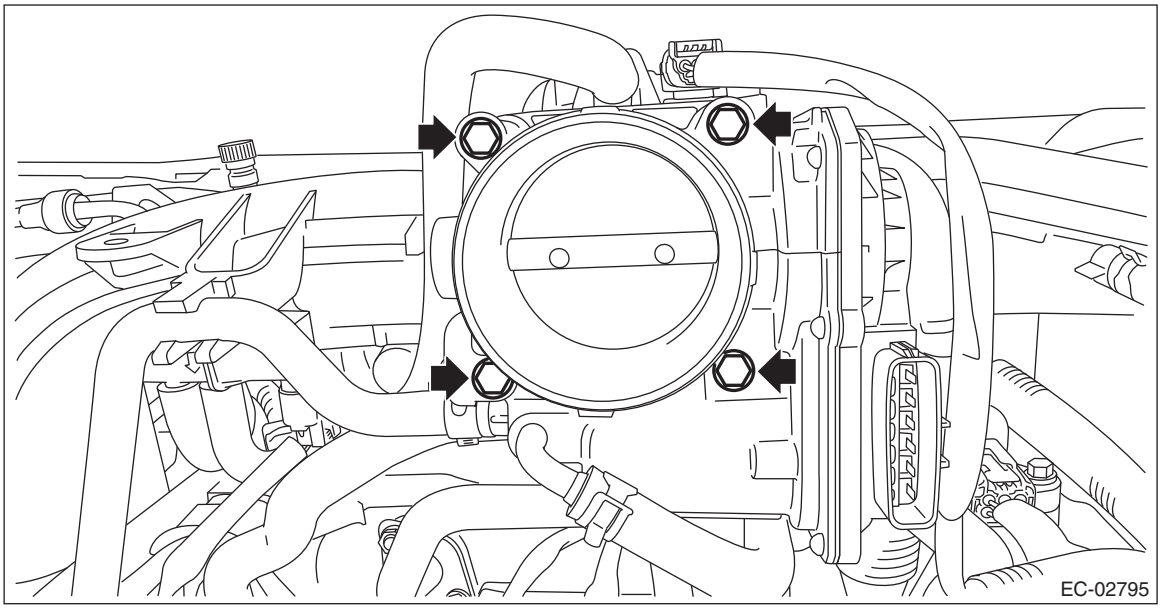
4) Remove the EGR pipe from EGR pipe adapter.



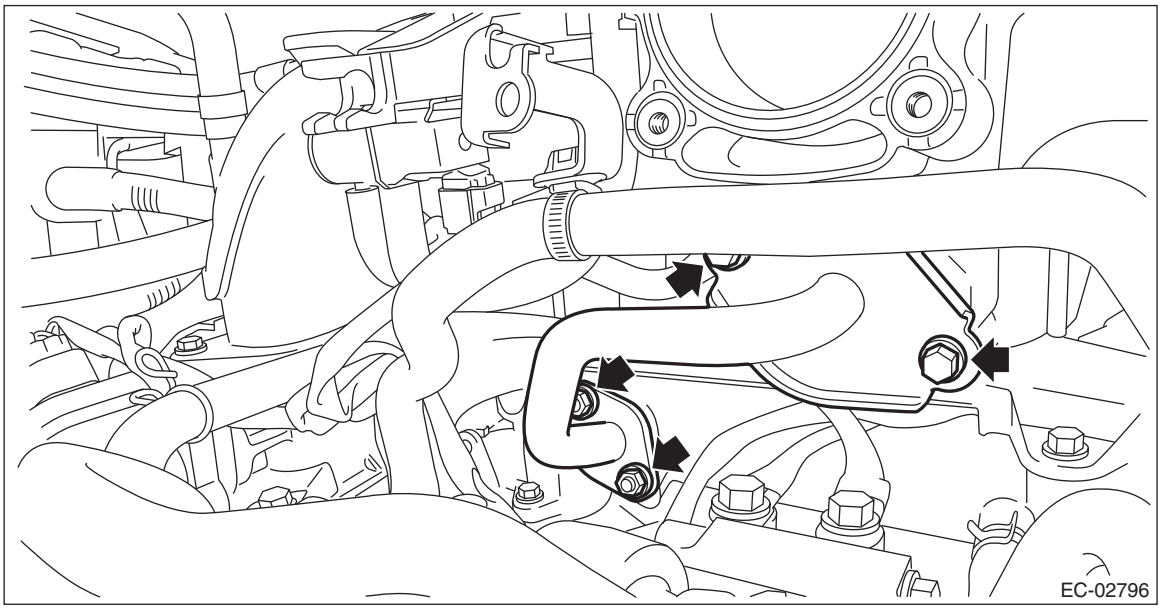
5) Disconnect the connector from the throttle body.



6) Remove the bolts which secure the throttle body and the blow-by hose stay to the intake manifold, and tilt the throttle body to the rear side of vehicle.



7) Remove the bolts and nuts that hold the EGR pipe to the intake manifold and the water pipe assembly, and remove the EGR pipe.

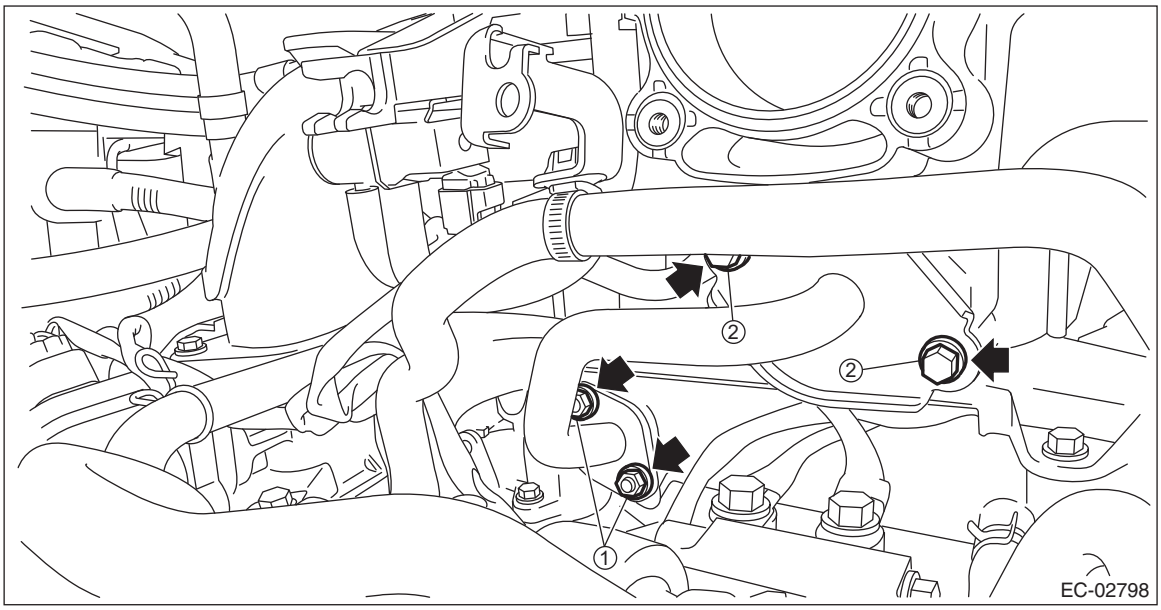


B: INSTALLATION

1) Temporarily install the EGR pipe to the intake manifold and water pipe assembly, and tighten the EGR pipe in numerical order as shown in the figure.

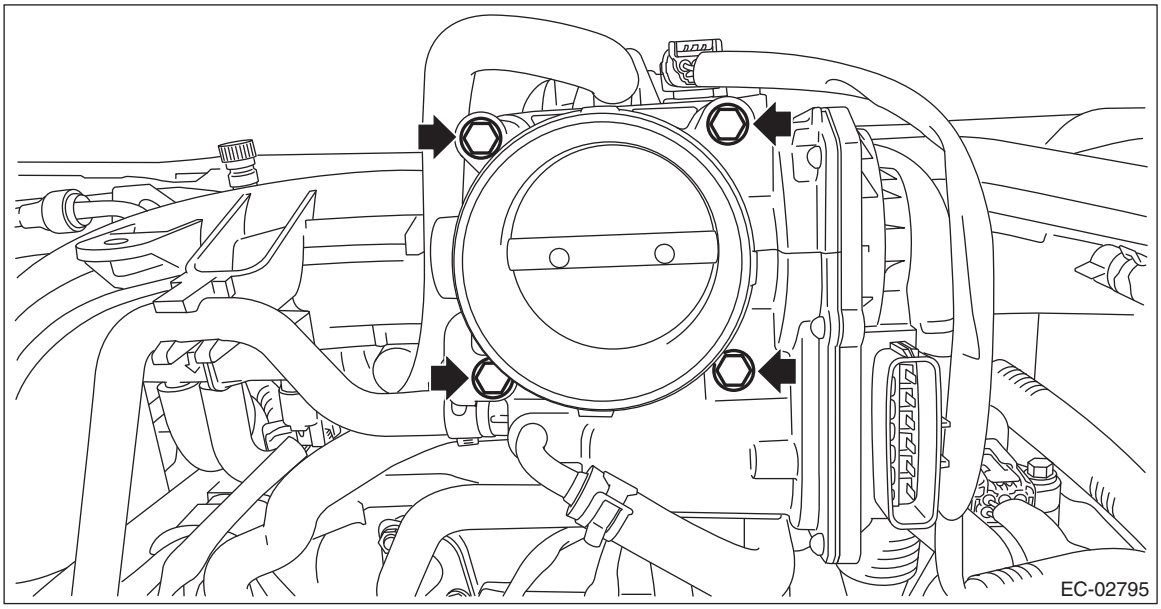
NOTE:
Use a new gasket.

Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)

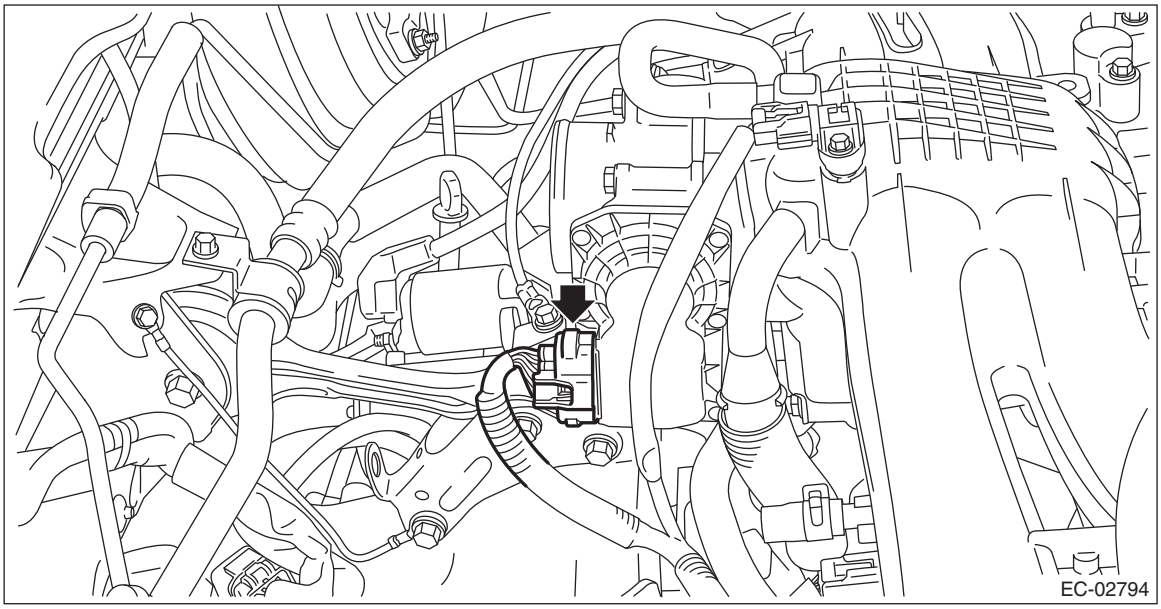


2) Install the throttle body to the intake manifold together with the blow-by hose stay.

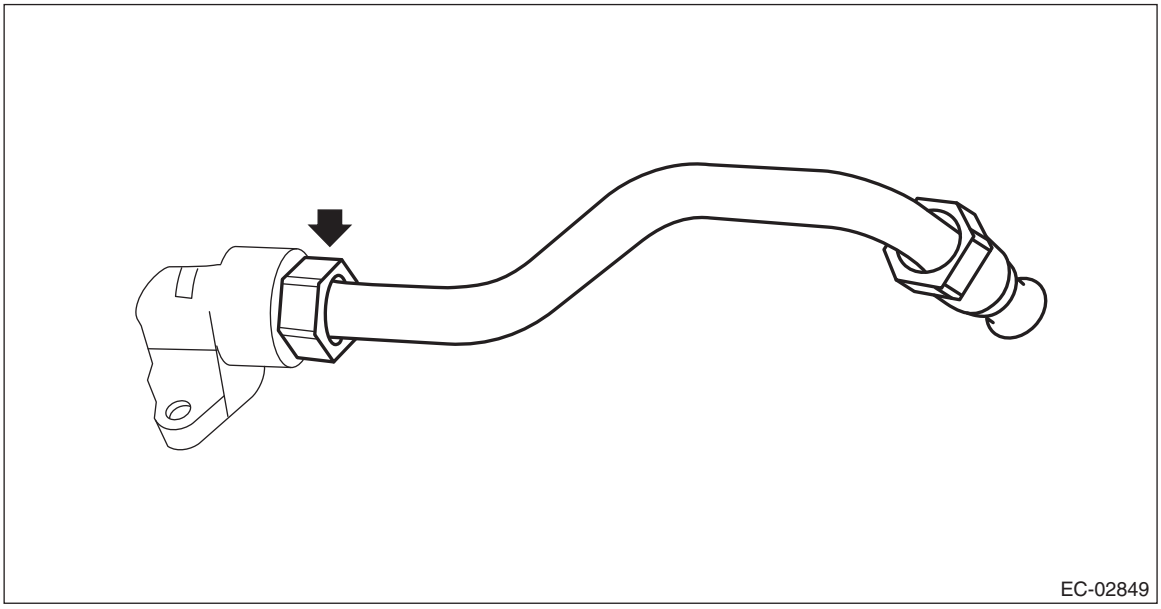
Tightening torque:
8.3 N·m (0.8 kgf-m, 6.1 ft-lb)



3) Connect the connector to the throttle body.

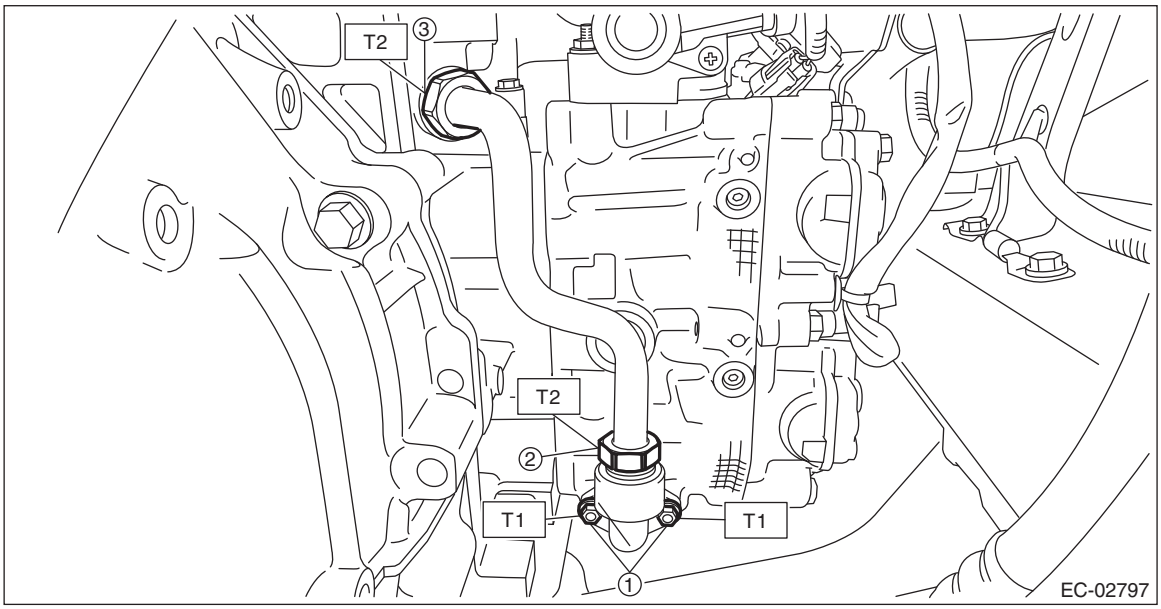


4) Temporarily install the EGR pipe to EGR pipe adapter.

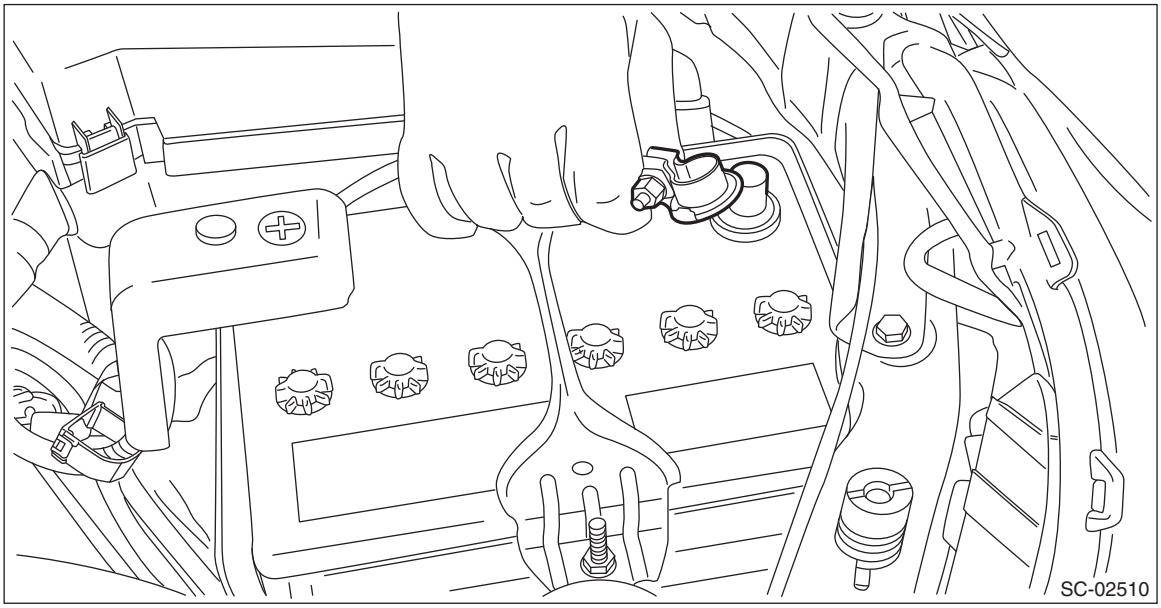


5) Temporarily install the EGR pipe assembly to the water pipe assembly and cylinder head assembly, and tighten the EGR pipe assembly in numerical order as shown in the figure.

Tightening torque:
T1: 6.4 N·m (0.7 kgf-m, 4.7 ft-lb)
T2: 51 N·m (5.2 kgf-m, 37.6 ft-lb)



6) Install the air intake boot. <Ref. to IN(H4DO)-13, INSTALLATION, Air Intake Boot.>
7) Connect the battery ground terminal.



C: INSPECTION

Check that the EGR pipe assembly and EGR pipe have no deformation, cracks or other damages.

8. Fuel Level Sensor

A: REMOVAL

For removal procedures, refer to the “FU(H4DO)” section. <Ref. to FU(H4DO)-143, REMOVAL, Fuel Level Sensor.>

B: INSTALLATION

For installation procedures, refer to the “FU(H4DO)” section. <Ref. to FU(H4DO)-143, INSTALLATION, Fuel Level Sensor.>

C: INSPECTION

For inspection procedures, refer to the “FU(H4DO)” section. <Ref. to FU(H4DO)-144, INSPECTION, Fuel Level Sensor.>

9. Fuel Sub Level Sensor

A: REMOVAL

For removal procedures, refer to the “FU(H4DO)” section. <Ref. to FU(H4DO)-147, REMOVAL, Fuel Sub Level Sensor.>

B: INSTALLATION

For installation procedures, refer to the “FU(H4DO)” section. <Ref. to FU(H4DO)-150, INSTALLATION, Fuel Sub Level Sensor.>

C: INSPECTION

For inspection procedures, refer to the “FU(H4DO)” section. <Ref. to FU(H4DO)-151, INSPECTION, Fuel Sub Level Sensor.>

10.Drain Filter

A: SPECIFICATION

The leak check valve assembly is a non-disassembled part. Do not remove the drain filter from the leak check valve assembly. Refer to “Canister” for removal and installation procedures. <Ref. to EC(H4DO)-9, REMOVAL, Canister.> <Ref. to EC(H4DO)-17, INSTALLATION, Canister.>

11.Leak Check Valve Assembly

A: REMOVAL

Refer to “Canister” for removal procedures. <Ref. to EC(H4DO)-9, REMOVAL, Canister.>

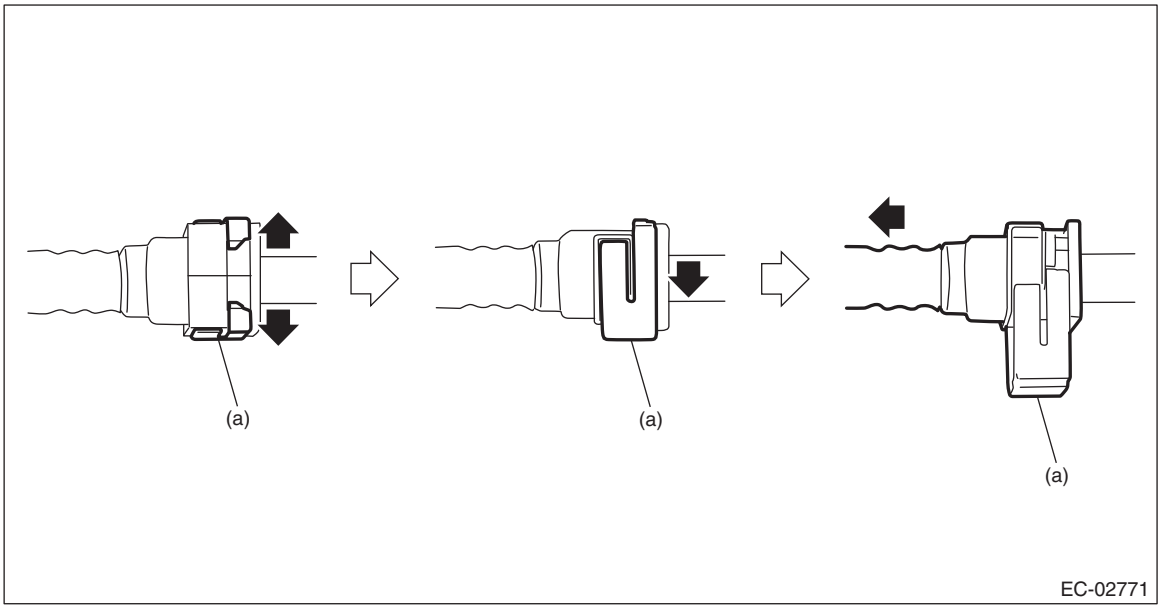
B: INSTALLATION

Refer to “Canister” for installation procedures. <Ref. to EC(H4DO)-17, INSTALLATION, Canister.>

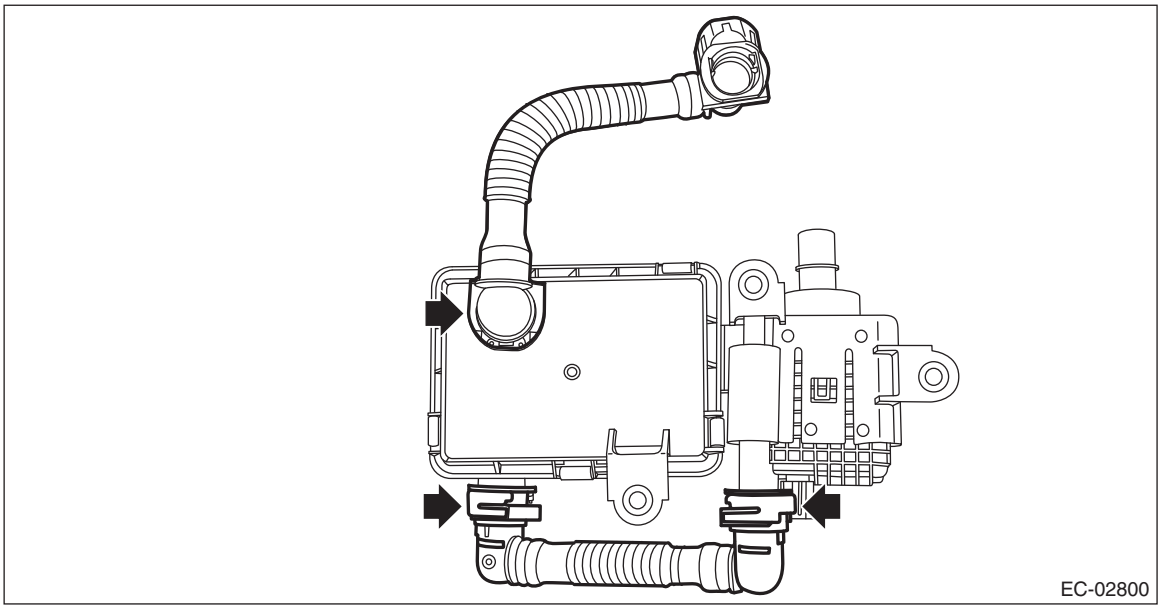
C: DISASSEMBLY

Disconnect the drain tube from the leak check valve assembly.

NOTE:
Disconnect the quick connector as shown in the figure.



(a) Retainer



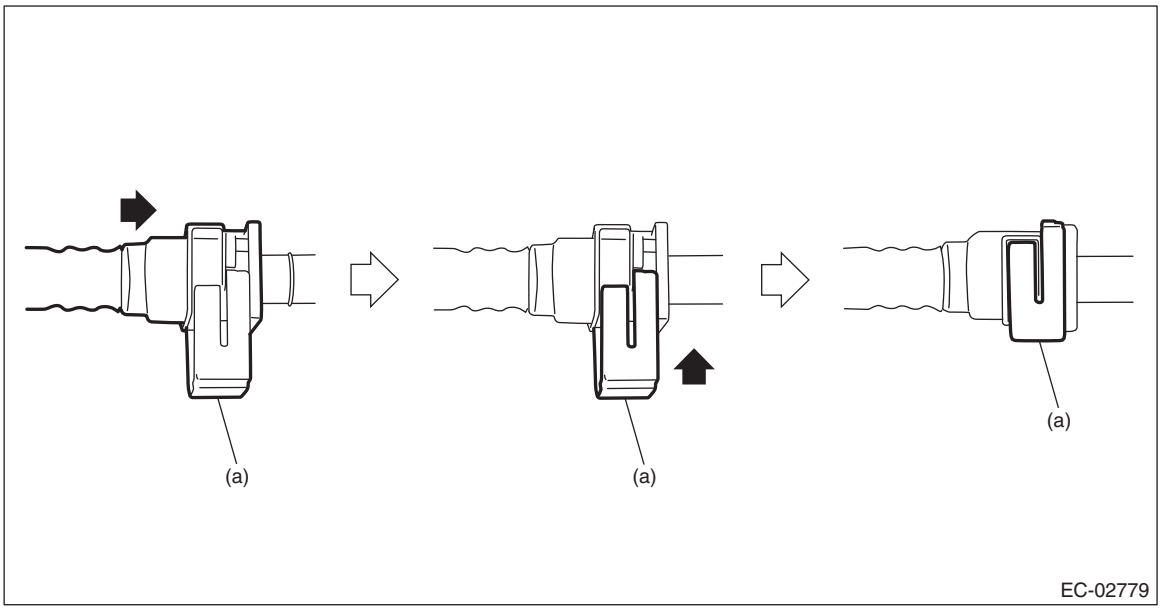
D: ASSEMBLY

Assemble the parts in the reverse order of disassembly while being careful of the following.

- Connect the quick connector as shown in the figure.

CAUTION:

- **Check that there is no damage or dust on the quick connector. If necessary, clean the seal surface of the pipe.**
- **When connecting the quick connector, securely insert the pipe all the way before locking the retainer.**
- **If it is not possible to perform the push lock operation of the retainer, recheck whether the pipe is securely inserted.**
- **Make sure that the quick connector is securely connected.**

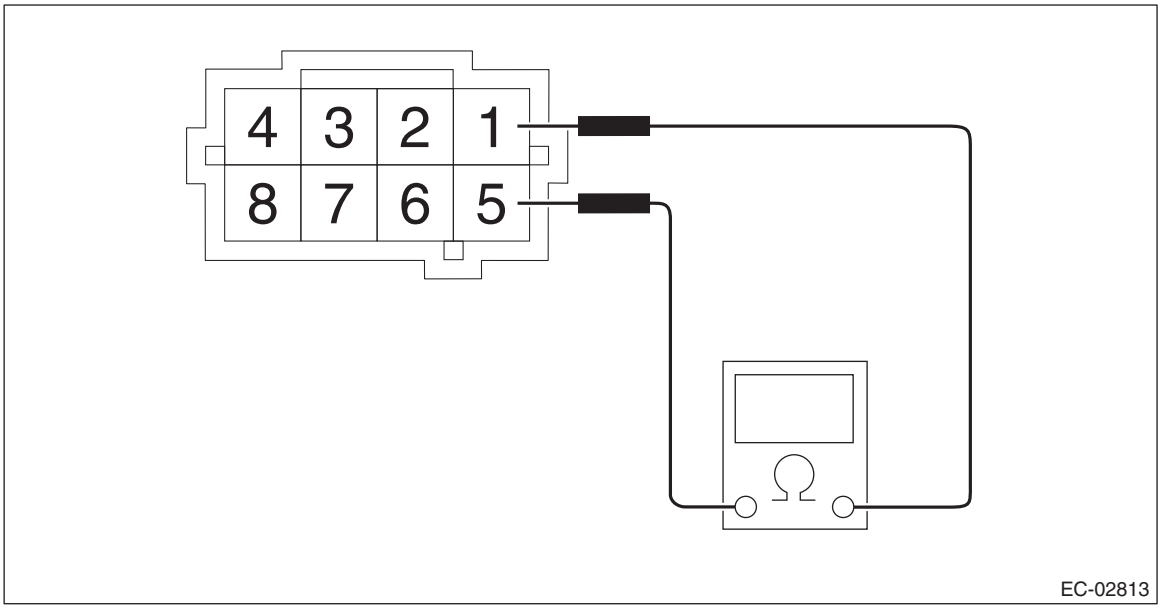


(a) Retainer

E: INSPECTION

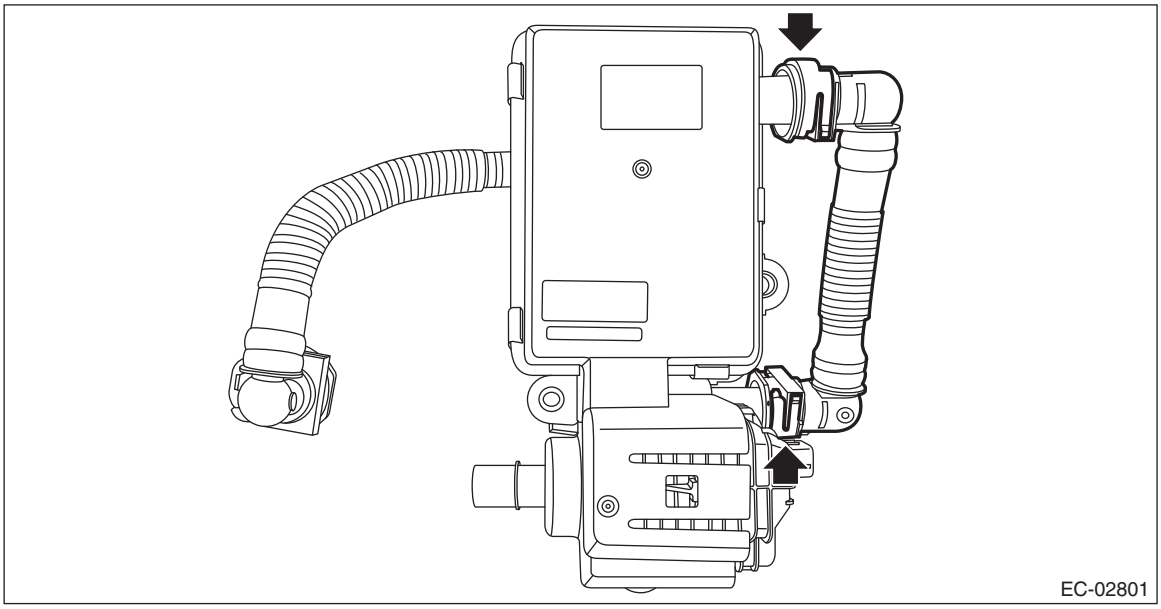
1. CHECK SWITCHING VALVE

1) Check the resistance between switching valve terminals.

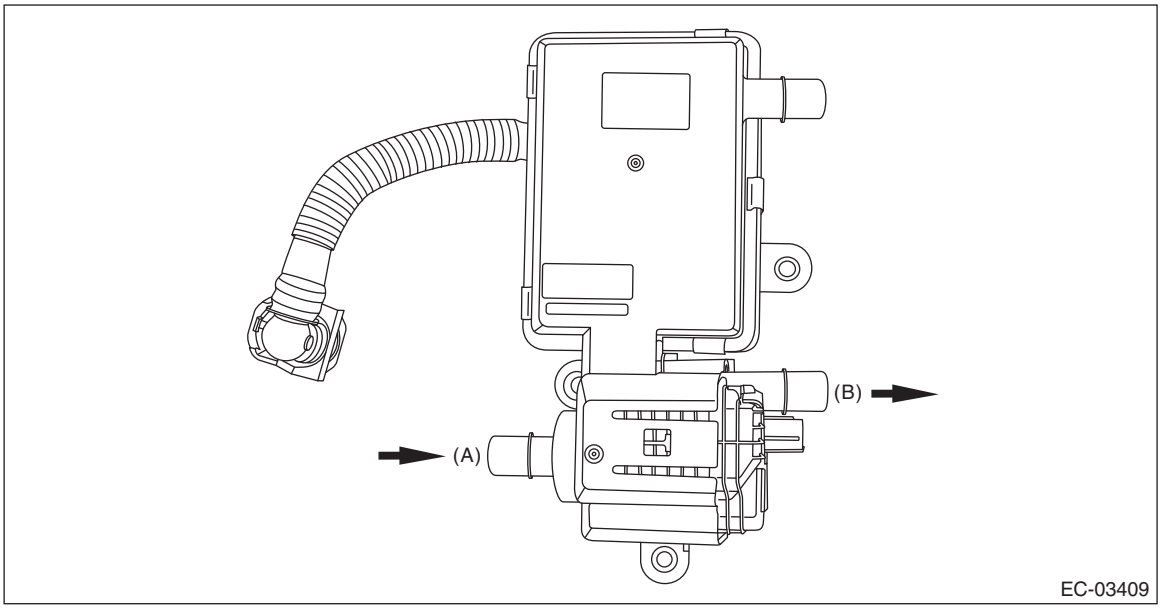


Terminal No.	Standard
1 and 5	27^{+3}_{-2} Ω (when 20°C (68°F))
	31±4 Ω (60°C (140°F))

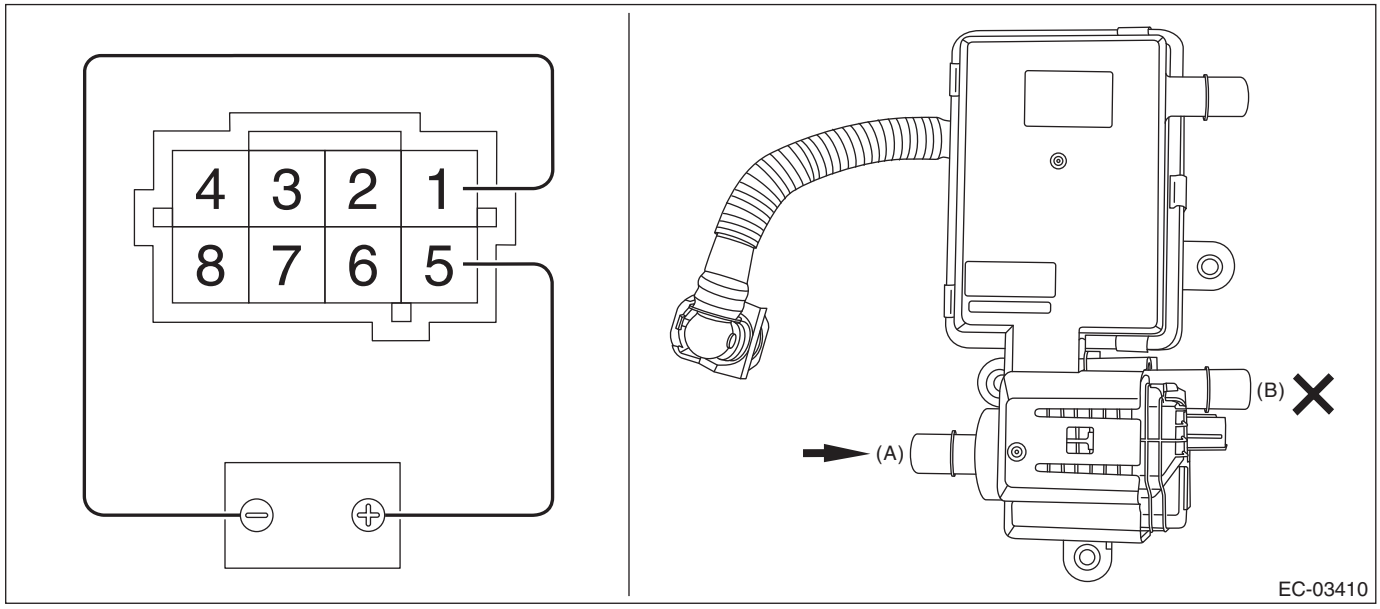
2) Disconnect the drain tube from the leak check valve assembly.



3) Check that air is discharged from (B) when air is blown into (A).



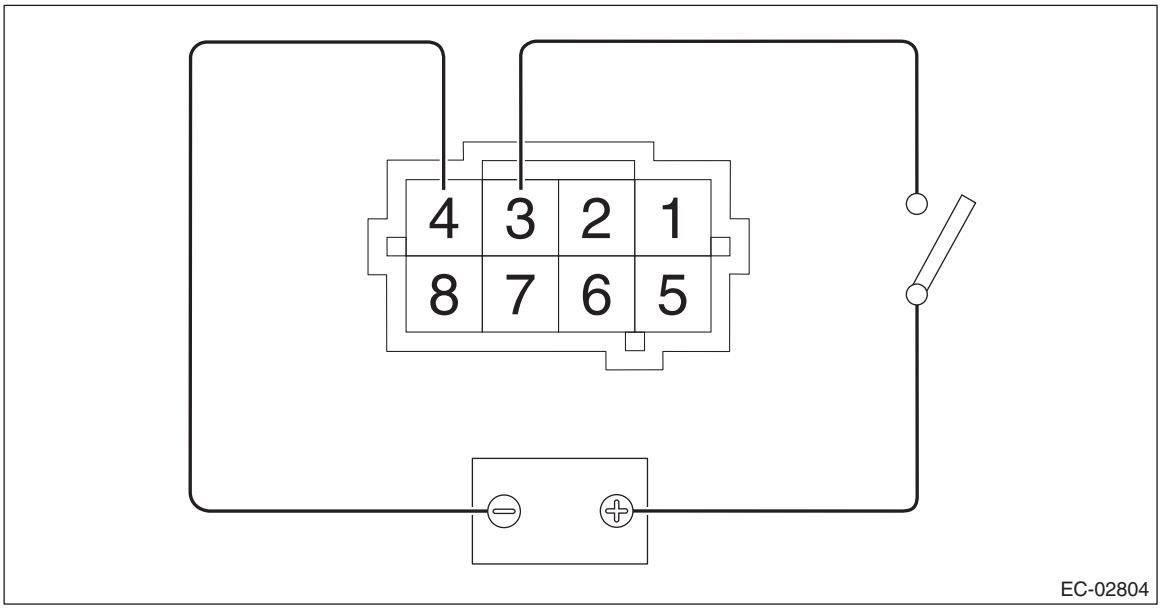
4) Connect the battery positive terminal to the terminal No. 5 and the battery negative terminal to the terminal No. 1. Check that air does not come out from (B) when air is blown into (A).



2. CHECK VACUUM PUMP

1) Connect the battery positive terminal to terminal No. 3 and the battery ground terminal to terminal No. 4, and inspect the vacuum pump operation.

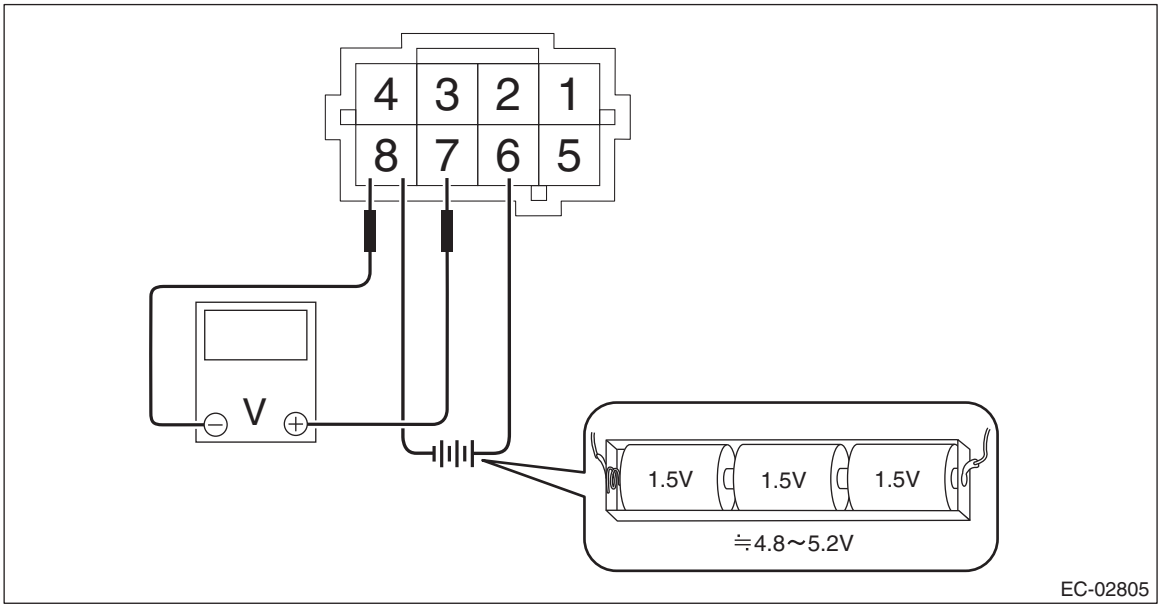
CAUTION:
Do not operate the vacuum pump for 5 minutes or more.



3. CHECK PRESSURE SENSOR

1) Connect dry-cell battery positive terminal to terminal No. 6 and dry-cell battery ground terminal to terminal No. 8, circuit tester positive terminal to terminal No. 7 and the circuit tester negative terminal to terminal No. 8.

NOTE:
- Use new dry-cell batteries.
- Using circuit tester, check the voltage of a single dry-cell battery is 1.6 V or more. And also check the voltage of three batteries in series is between 4.8 V and 5.2 V.

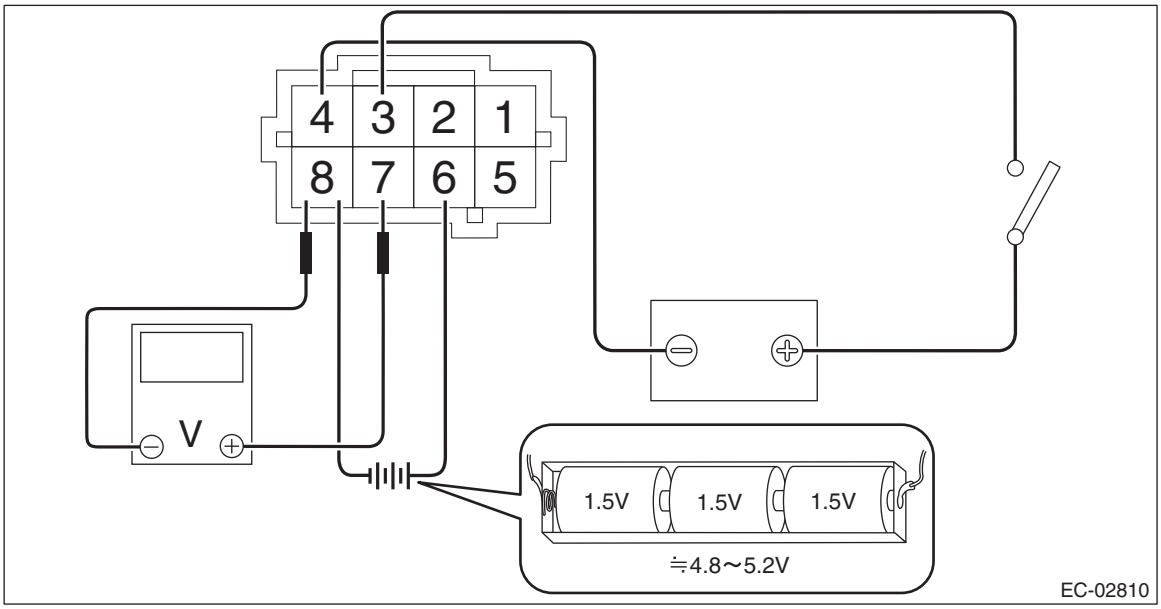


2) Check the voltage at a normal atmospheric pressure.

NOTE:
The atmospheric pressure at higher altitude is lower than normal. Therefore, the voltage is lower than the standard value.

Terminal No.	Standard
7 (+) and 8 (–)	Approx. 3.5 V (when 25°C (77°F))

3) Connect the battery positive terminal to terminal No. 3 and the battery ground terminal to terminal No. 4, and check that there is a voltage drop from the voltage measured in Step 2) when the vacuum pump is operated.



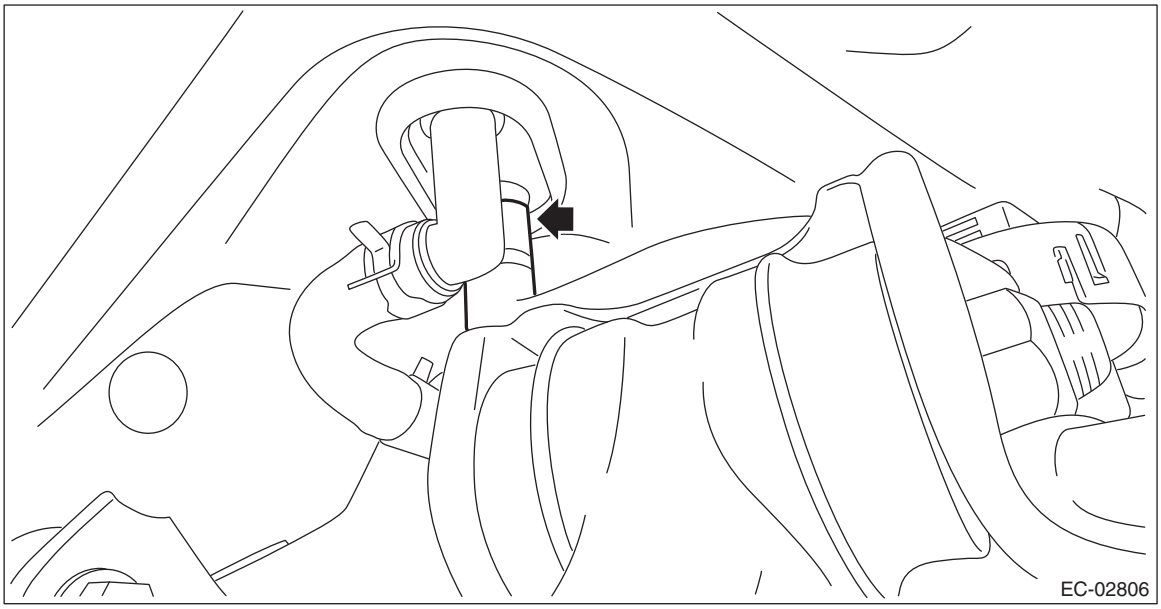
4. OTHER INSPECTIONS

Check that the drain tube has no cracks, damage or loose part.

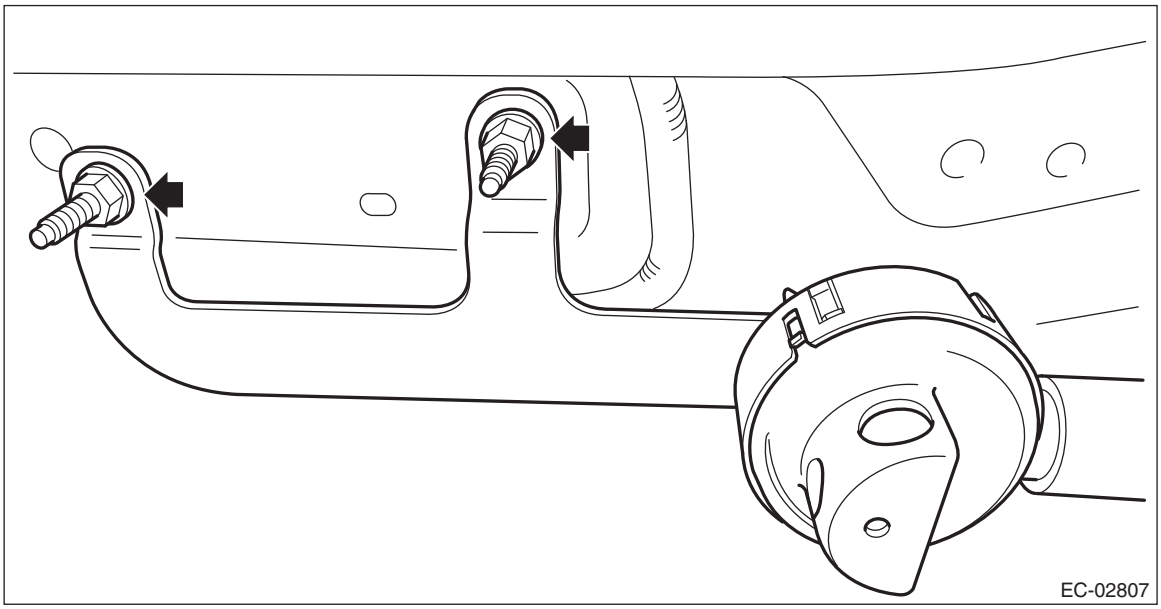
12.Drain Separator

A: REMOVAL

1) Lift up the vehicle.
2) Disconnect the drain hose from the connector.



3) Remove the drain separator from the vehicle.



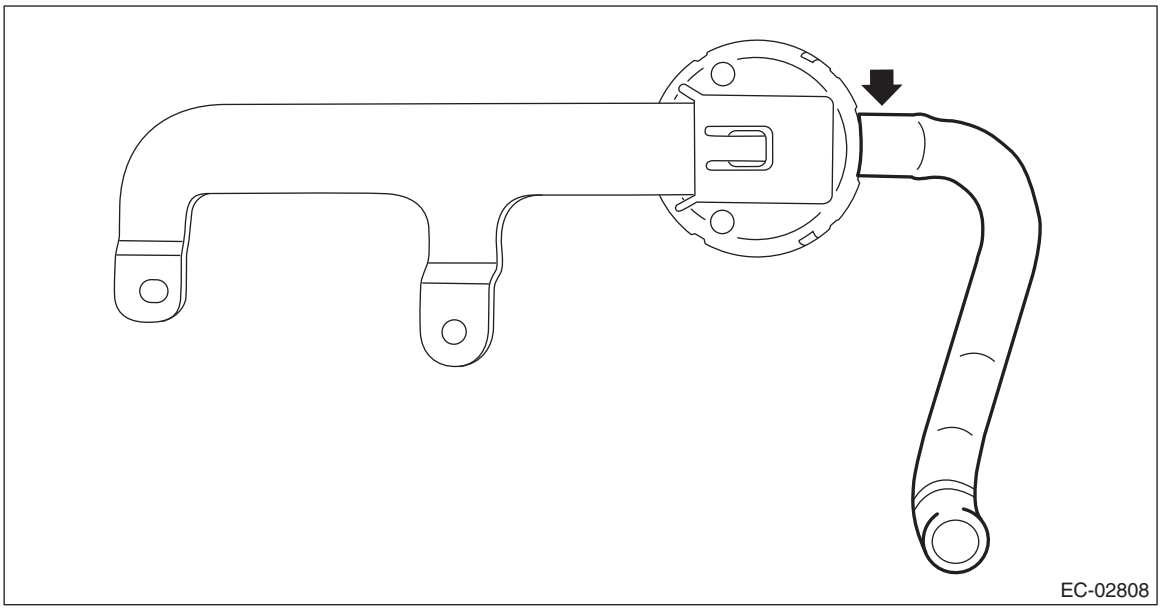
B: INSTALLATION

Install in the reverse order of removal.

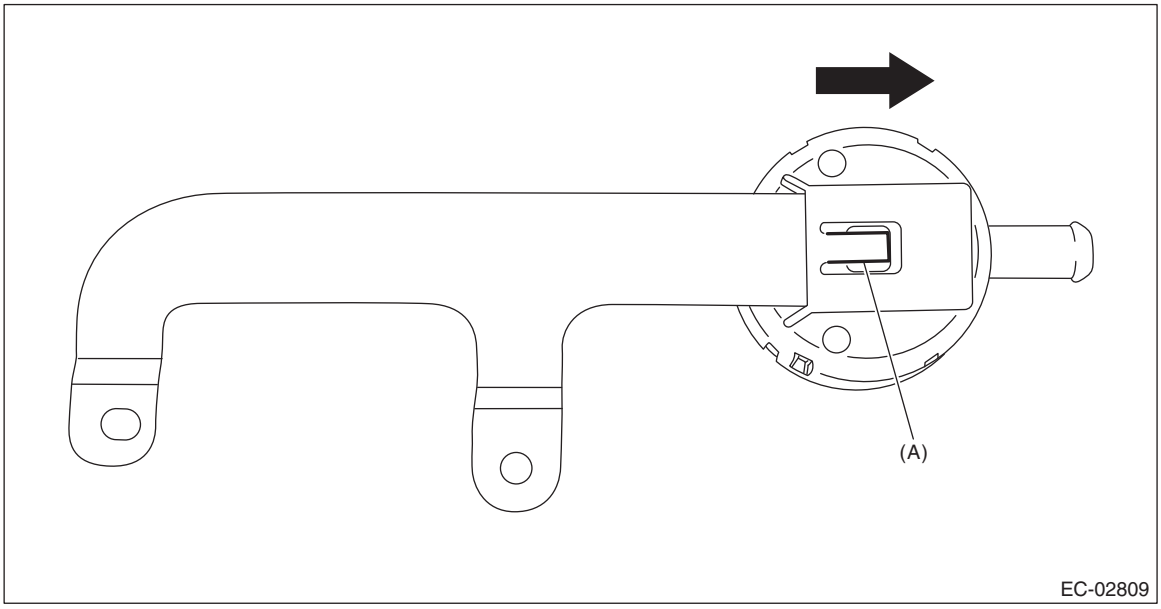
Tightening torque:
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)

C: DISASSEMBLY

1) Disconnect the drain hose from the drain separator.



2) Lift up the claw (A) of the drain separator and slide the drain separator in the direction of the arrow to remove the drain separator.



D: ASSEMBLY

Assemble in the reverse order of disassembly.

E: INSPECTION

1) Check that the drain separator and drain separator bracket have no deformation, crack, or other damage.
2) Check that the drain hose has no crack, damage, or looseness.
3) Check that no foreign substances are clogged in the drain separator.

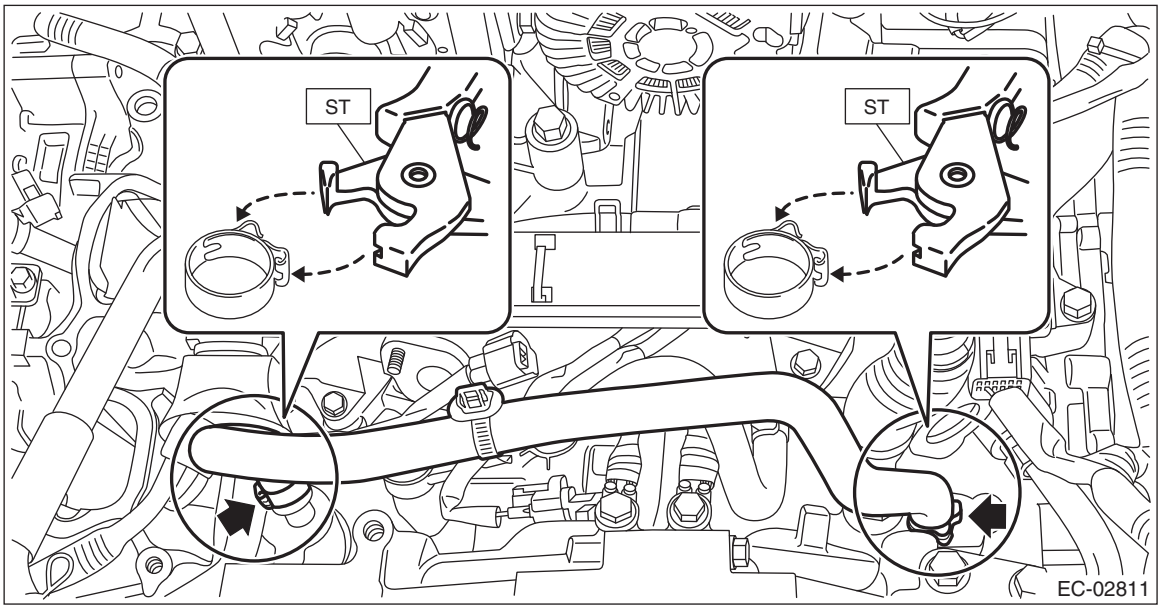
13.PCV Hose Assembly

A: REMOVAL

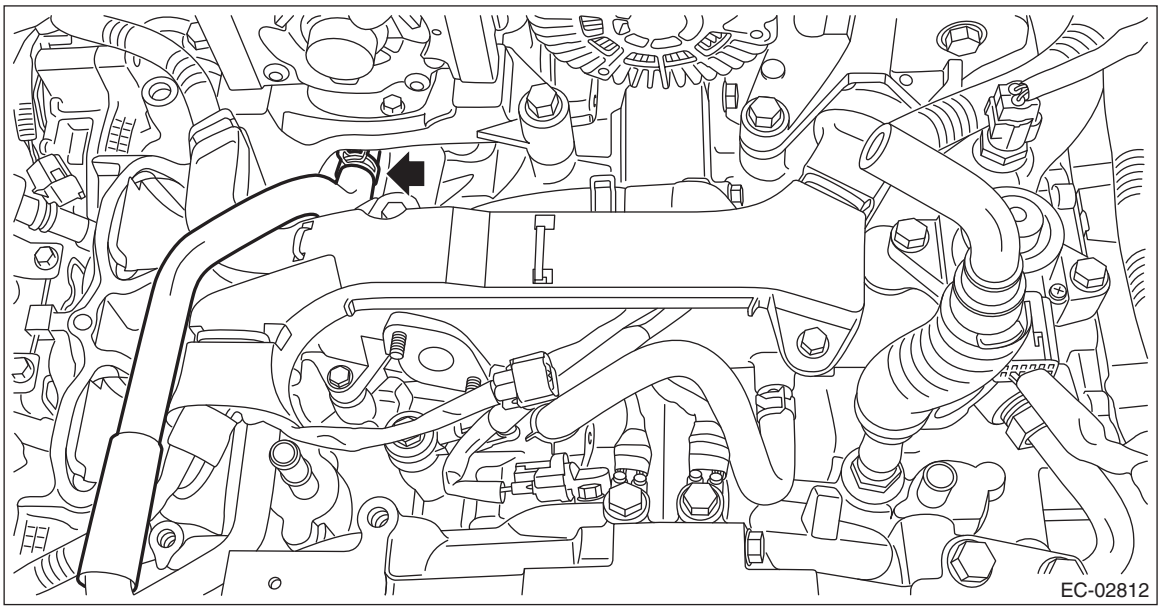
CAUTION:
Do not remove except when the PCV hose is broken.

1) Remove the intake manifold. <Ref. to FU(H4DO)-21, REMOVAL, Intake Manifold.>
2) Remove the tumble generator valve assembly. <Ref. to FU(H4DO)-84, REMOVAL, Tumble Generator Valve Assembly.>
3) Remove the PCV hose assembly from the cylinder block RH and cylinder block LH.

NOTE:
Pinch the clamp of the PCV hose assembly by fitting the cut out in the ST with the protrusion on the clamp as shown in the figure, and unlock the clamp.
ST 18353AA000 CLAMP PLIERS

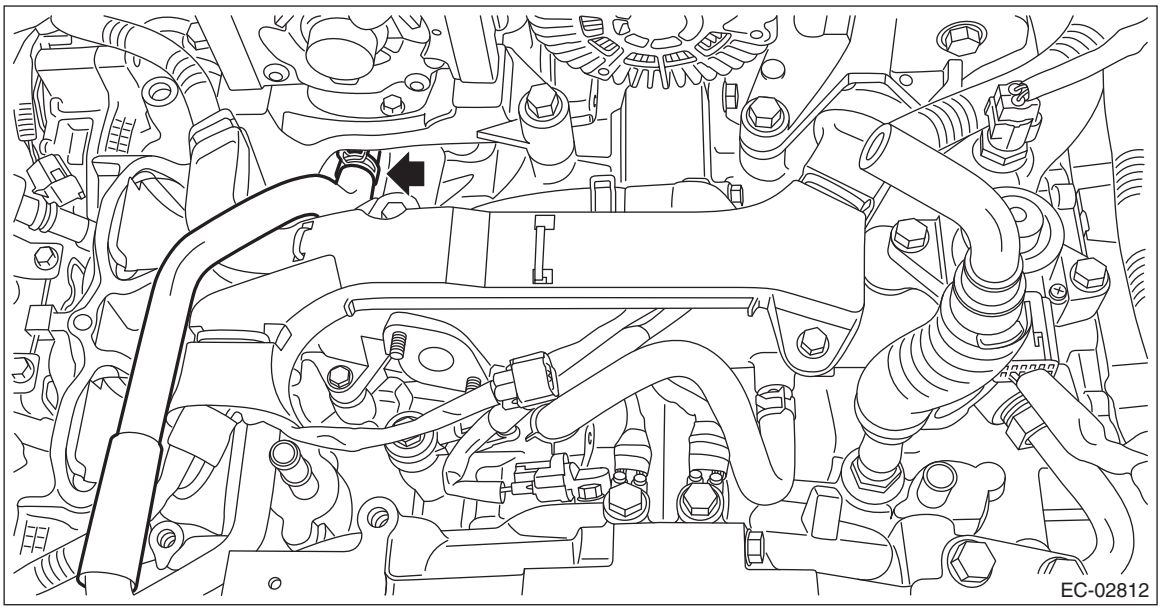


4) Remove the PCV hose assembly from the PCV connector.



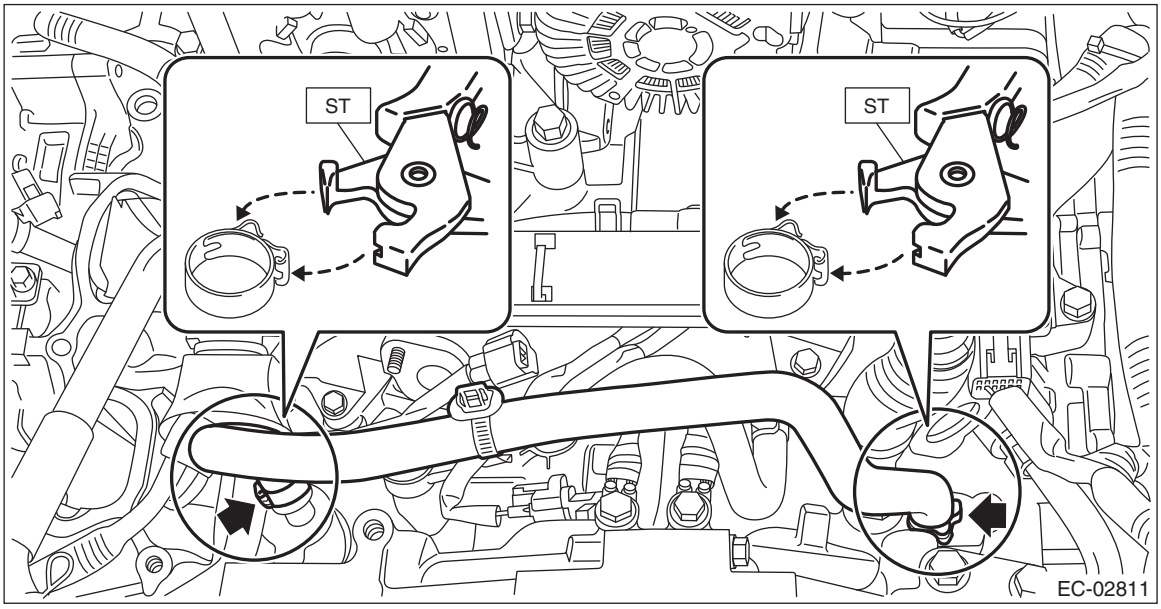
B: INSTALLATION

1) Attach the PCV hose assembly to the PCV connector.



2) Install the PCV hose assembly onto the cylinder block RH and cylinder block LH.

NOTE:
Use a new clamp for the PCV hose assembly, fit the cut out in the ST with the protrusion on the clamp as shown in the figure, and lock the clamp.
ST 18353AA000 CLAMP PLIERS



3) Install the tumble generator valve assembly. <Ref. to FU(H4DO)-86, INSTALLATION, Tumble Generator Valve Assembly.>
4) Install the intake manifold. <Ref. to FU(H4DO)-29, INSTALLATION, Intake Manifold.>

C: INSPECTION

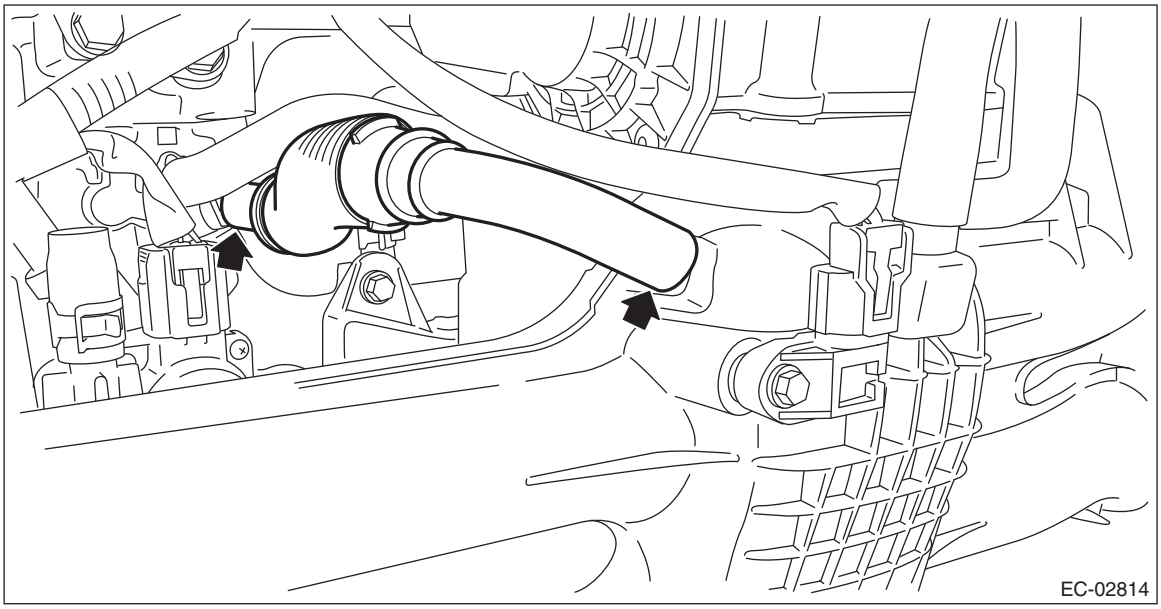
Check the PCV hose assembly for cracks, damage or looseness.

14.PCV Valve

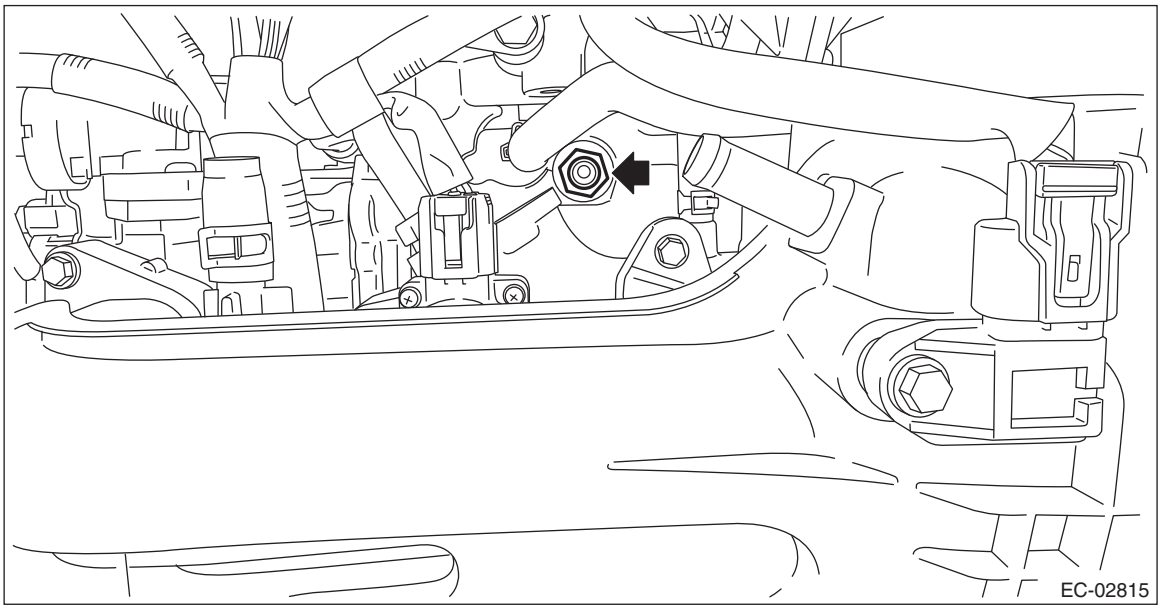
A: REMOVAL

CAUTION:
Do not remove unless the PCV valve is broken.

1) Remove the air intake boot. <Ref. to IN(H4DO)-13, REMOVAL, Air Intake Boot.>
2) Disconnect the vacuum hose from the intake manifold and the PCV valve.



3) Remove the PCV valve from the cylinder block RH.



B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Apply liquid gasket to the bolt threads of PCV valve.

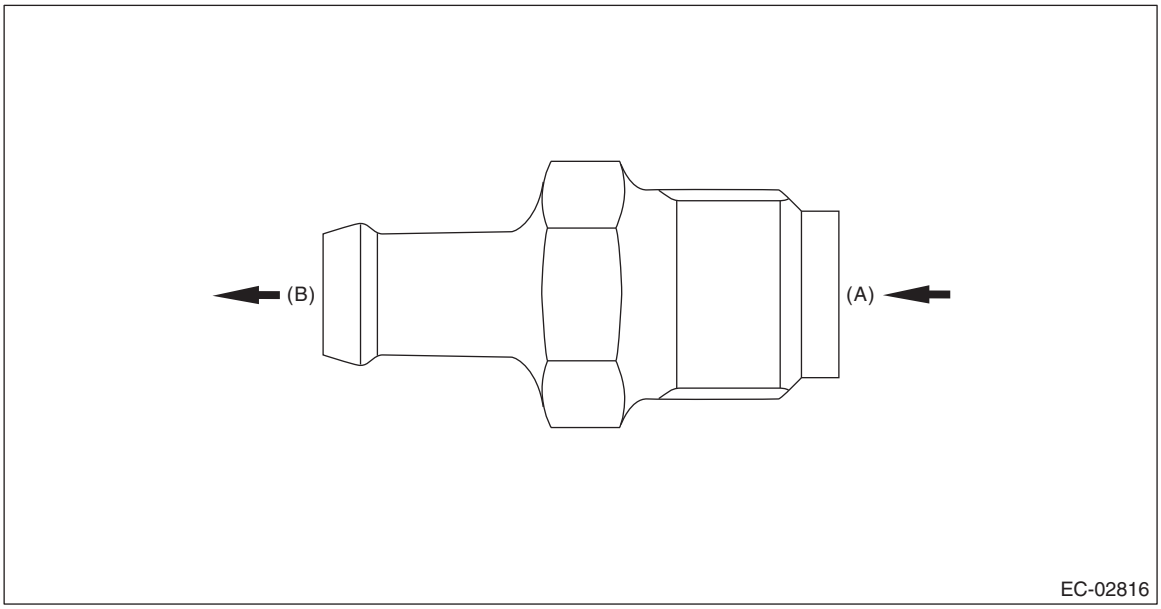
Liquid gasket:
THREE BOND 1324 or equivalent

Tightening torque:
23 N·m (2.3 kgf-m, 17.0 ft-lb)

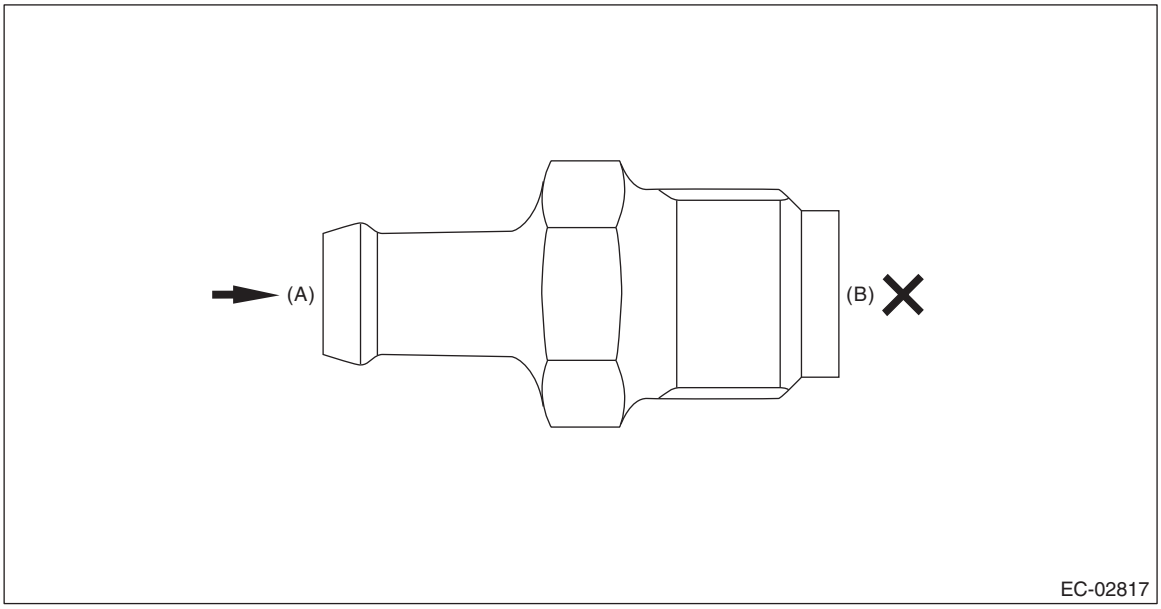
C: INSPECTION

1. PCV VALVE

1) Check that the PCV valve has no deformation, cracks or other damages.
2) Check that air is discharged from (B) when air is blown into (A).



3) Check that air does not come out from (B) when air is blown into (A).



2. OTHER INSPECTIONS

Check the vacuum hose for cracks, damage or looseness.

INTAKE (INDUCTION)

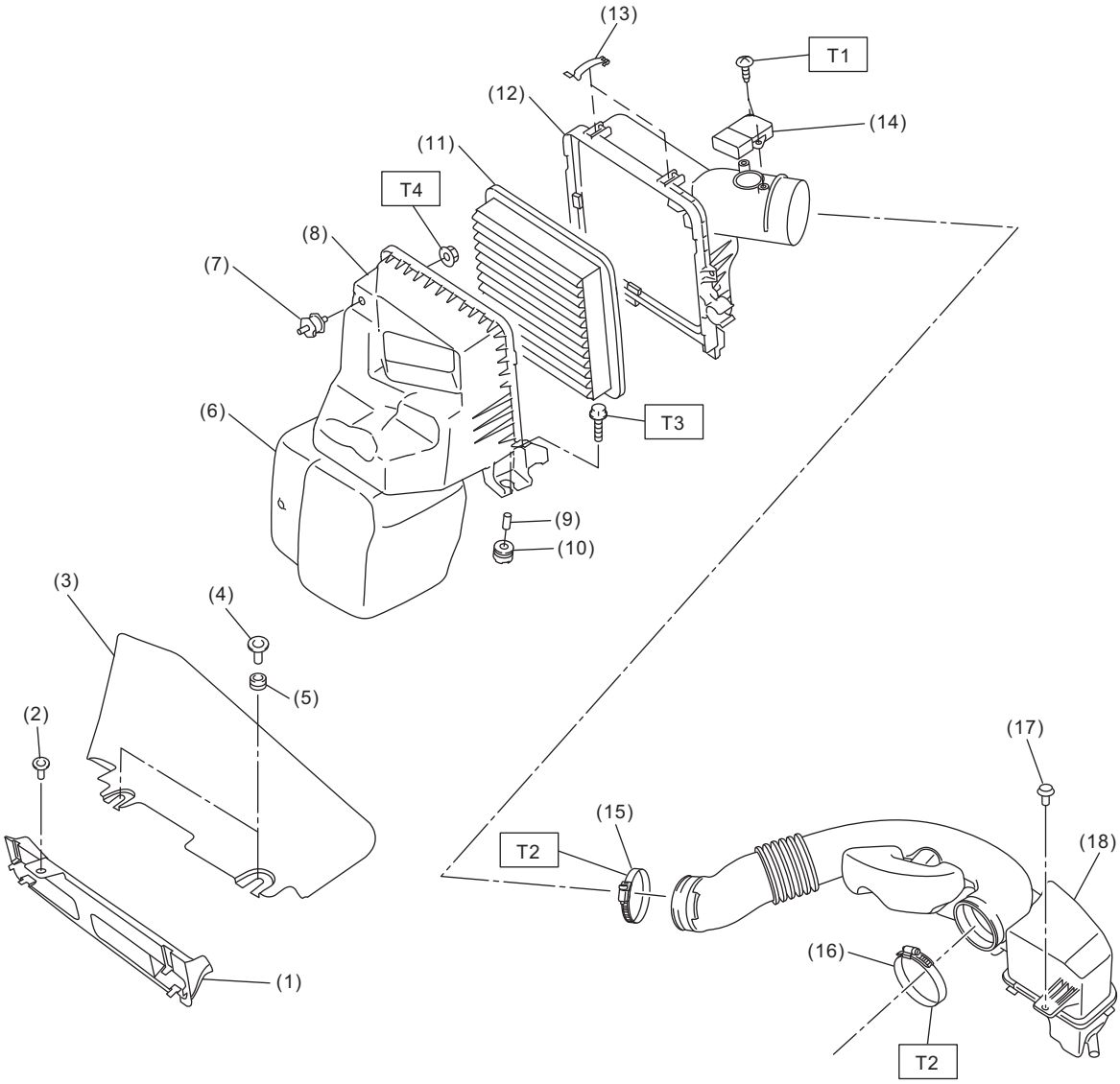
IN(H4DO)

Page

1. General Description 2
2. Air Cleaner Element 4
3. Air Cleaner Case 7
4. Air Intake Boot 13
5. Air Intake Duct 14
6. Resonator Chamber 15

1. General Description

A: COMPONENT



IN-02978

(1) Air intake duct (front)
(2) Clip
(3) Air intake duct (rear)
(4) Clip
(5) Cushion
(6) Resonator chamber
(7) Cushion
(8) Air cleaner case (Front)
(9) Spacer
(10) Cushion
(11) Air cleaner element
(12) Air cleaner case (Rear)
(13) Clip
(14) Mass air flow and intake air temperature sensor
(15) Clamp
(16) Clamp
(17) Clip
(18) Air intake boot ASSY

Tightening torque:N·m (kgf-m, ft-lb)
T1: 1 (0.1, 0.7)
T2: 3 (0.3, 2.2)
T3: 6 (0.6, 4.4)
T4: 7.5 (0.8, 5.5)

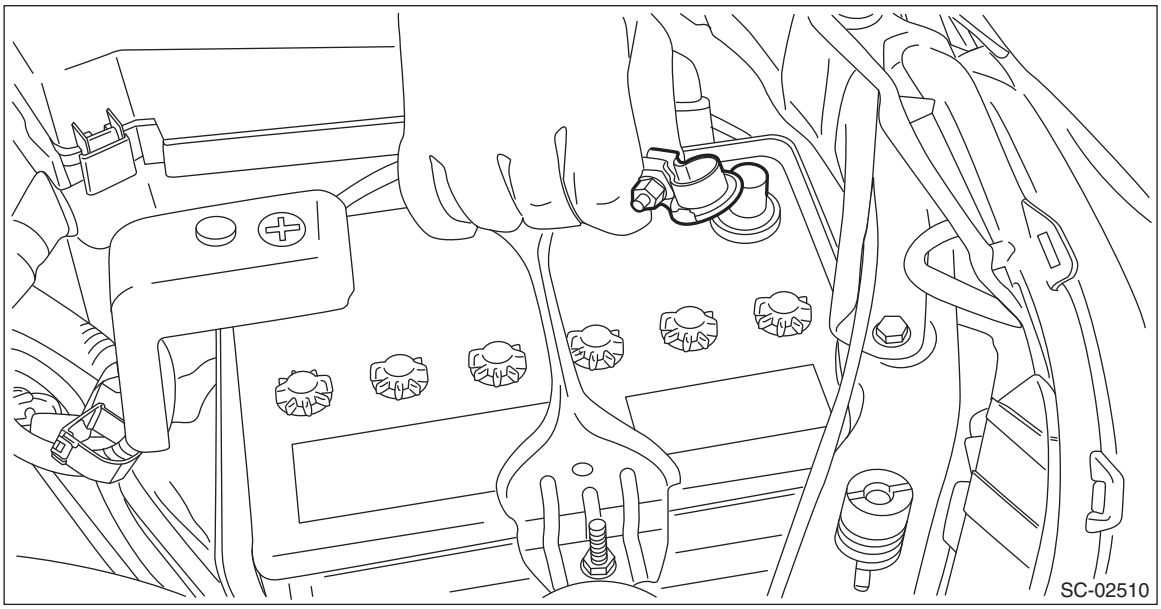
B: CAUTION

- 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 battery.

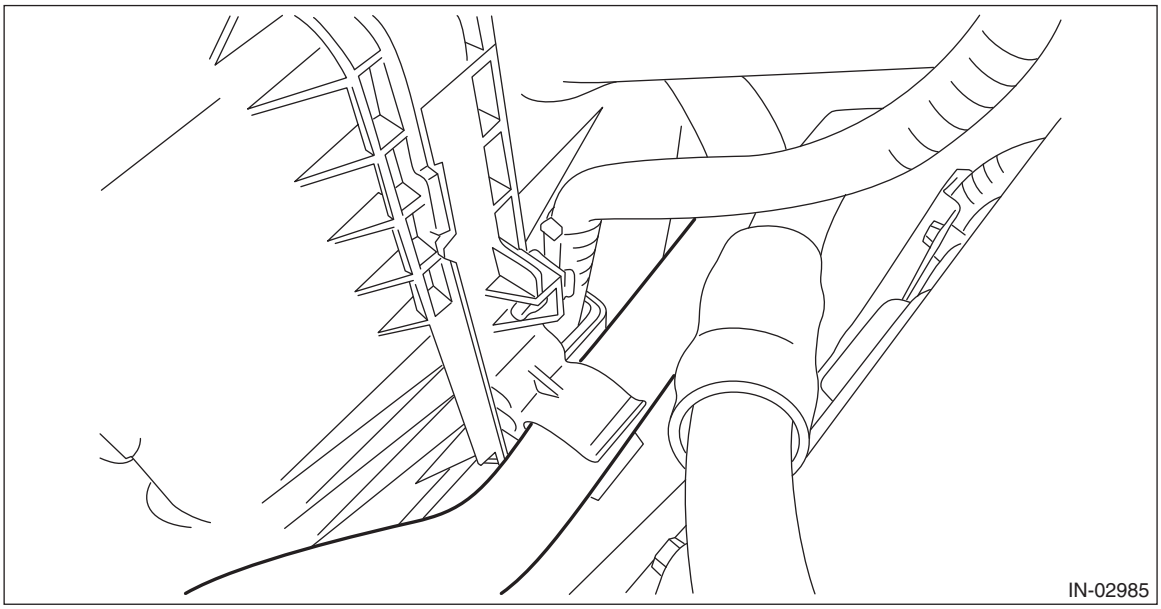
2. Air Cleaner Element

A: REMOVAL

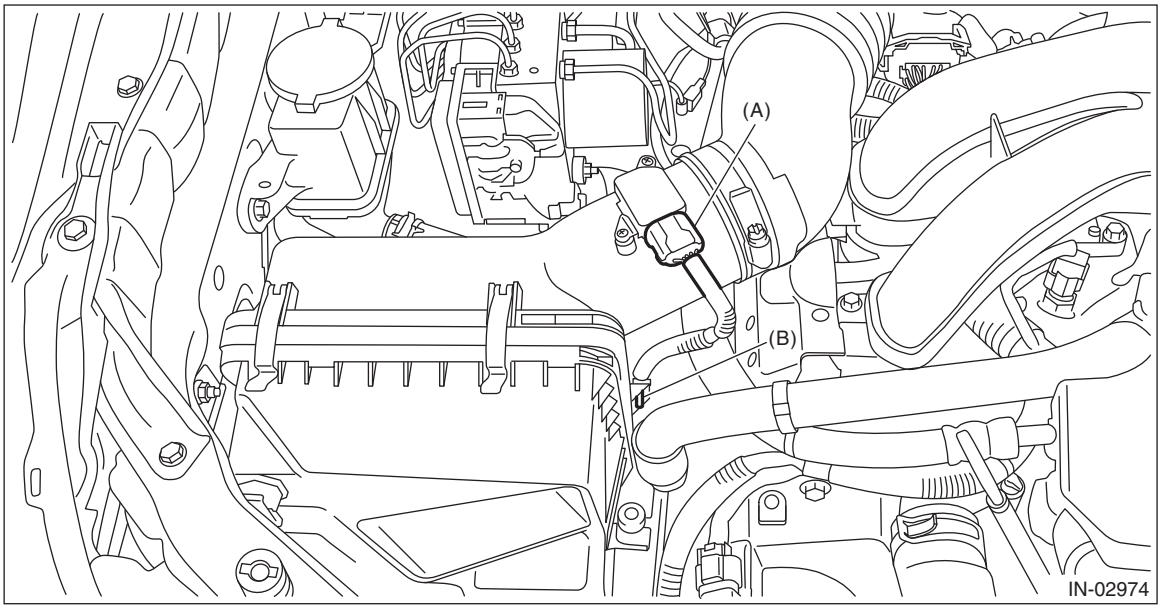
1) Disconnect the ground cable from battery.



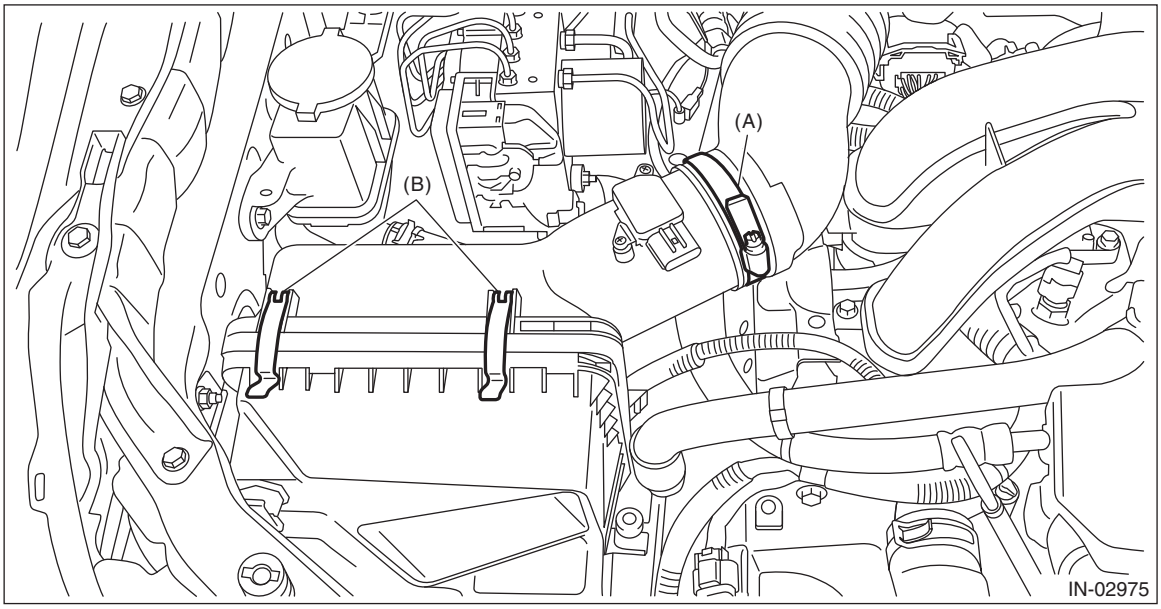
2) Remove the air intake duct (Rear). <Ref. to IN(H4DO)-14, REMOVAL, Air Intake Duct.>
3) Disconnect the power steering oil pressure hose (suction hose) from the clip on the side of air cleaner case (rear).



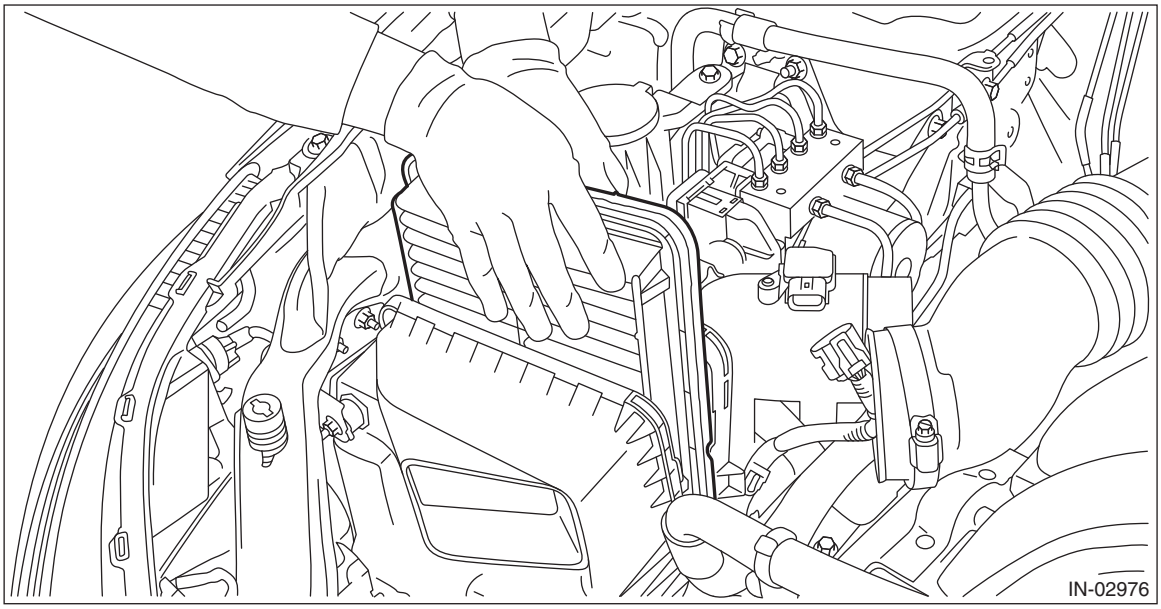
4) Disconnect the connector (A) from the mass air flow and intake air temperature sensor, and remove the clip (B).



5) Loosen the clamp (A) which connects the air cleaner case to intake boot.
6) Remove the clips (B) from the air cleaner case (front).



7) Remove the air cleaner case (rear) and air cleaner element.

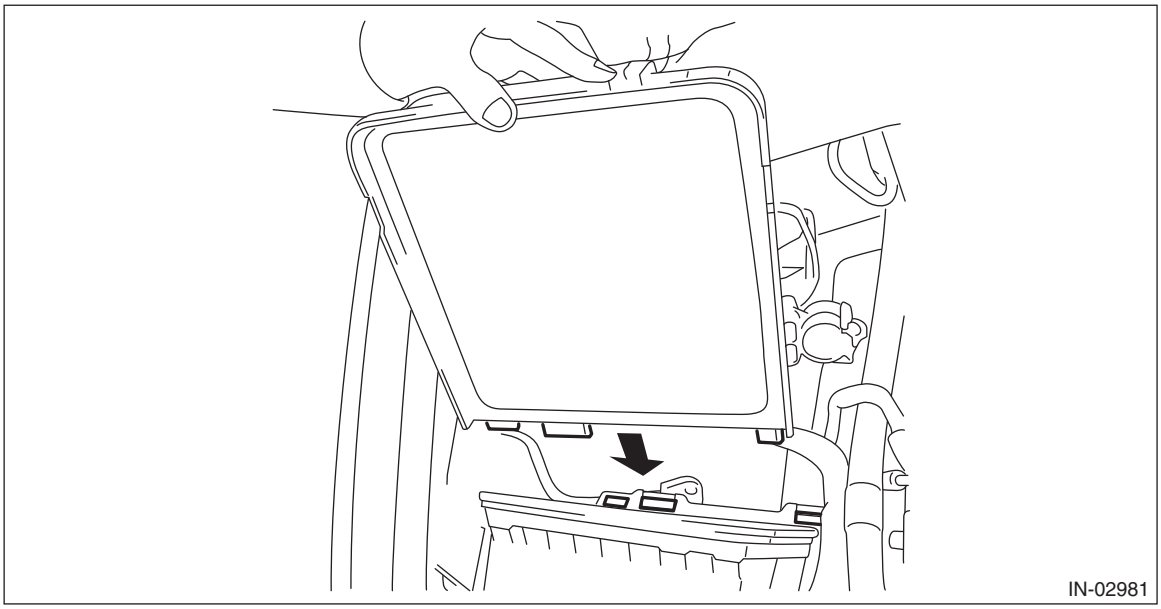


B: INSTALLATION

Install in the reverse order of removal.

CAUTION:
Be sure to use SUBARU genuine air cleaner element depending on the engine type when replacing the air cleaner elements. Using other air cleaner element may affect the engine performance.

NOTE:
- Check that there are no foreign objects in the air cleaner case.
- When installing the air cleaner case (rear), align the protrusion of the air cleaner case (rear) to the hole on the air cleaner case (front) to install.



Tightening torque:
3 N·m (0.3 kgf-m, 2.2 ft-lb)

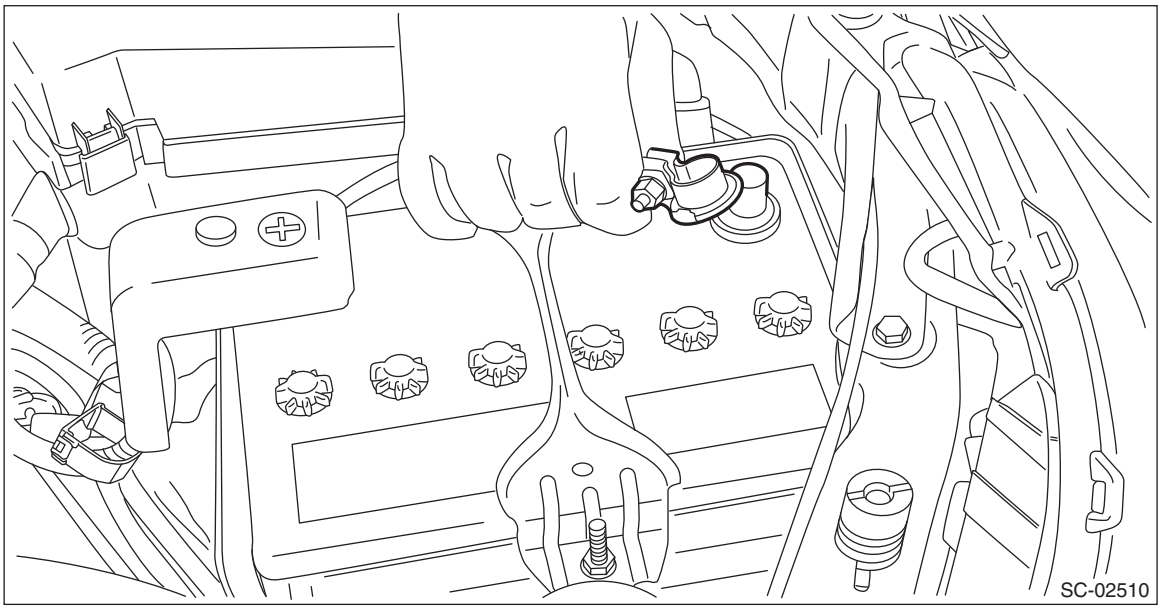
C: INSPECTION

1) Check that the air cleaner element has no deformation, cracks or other damages.
2) Check the air cleaner element for excessive dirt.
3) Replace the air cleaner case (rear) if the HC absorption filter is damaged.

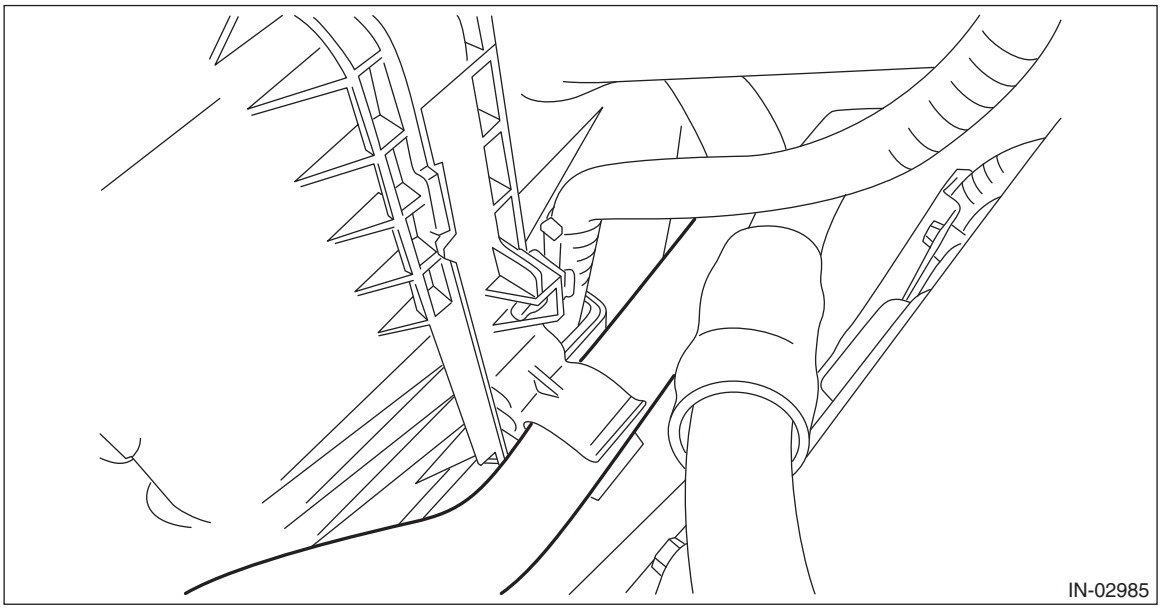
3. Air Cleaner Case

A: REMOVAL

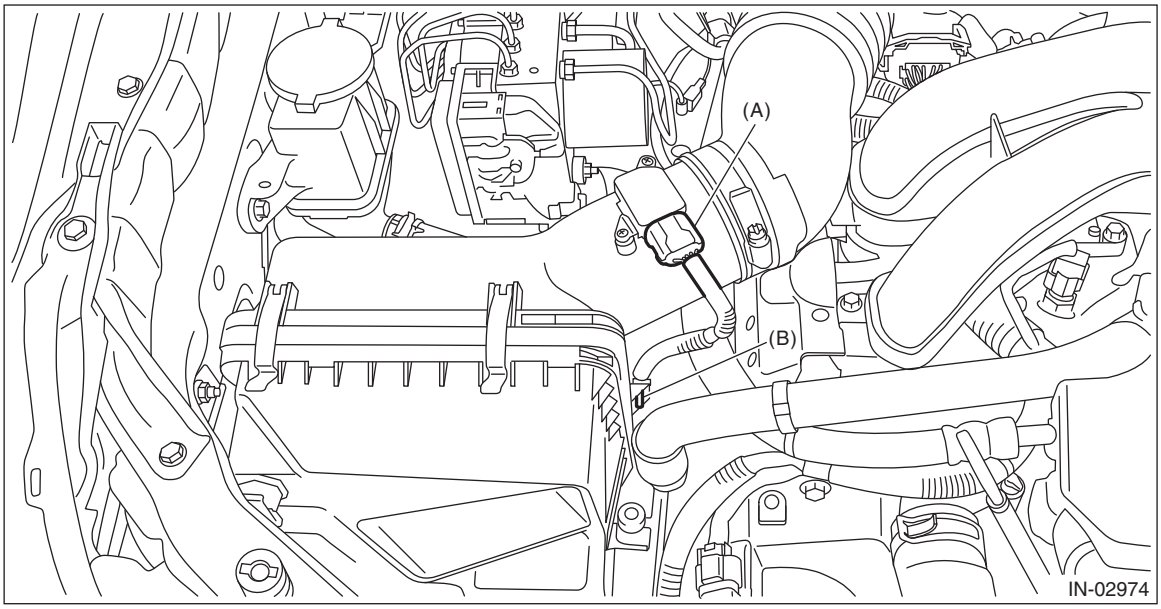
1) Disconnect the ground cable from battery.



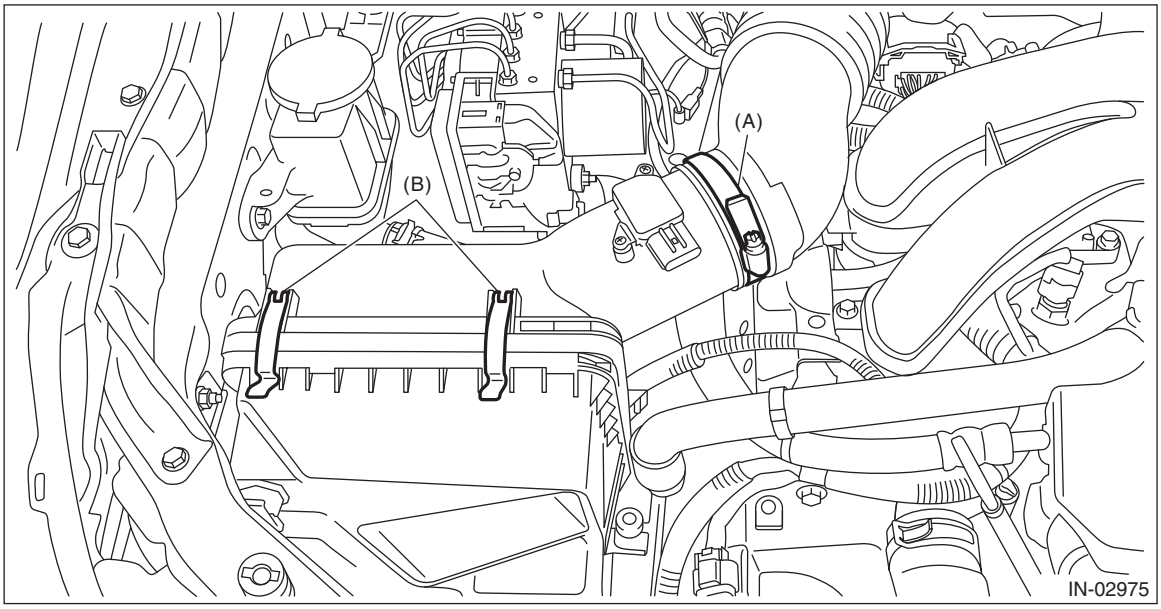
2) Remove the air intake duct (Rear). <Ref. to IN(H4DO)-14, REMOVAL, Air Intake Duct.>
3) Disconnect the power steering oil pressure hose (suction hose) from the clip on the side of air cleaner case (rear).



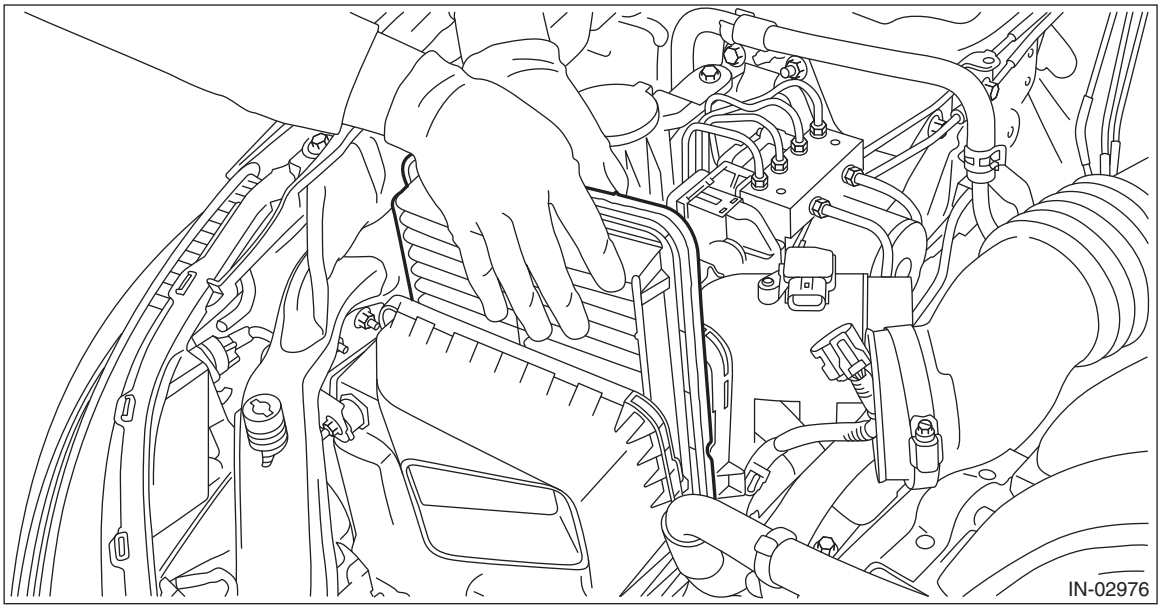
4) Disconnect the connector (A) from the mass air flow and intake air temperature sensor, and remove the clip (B).



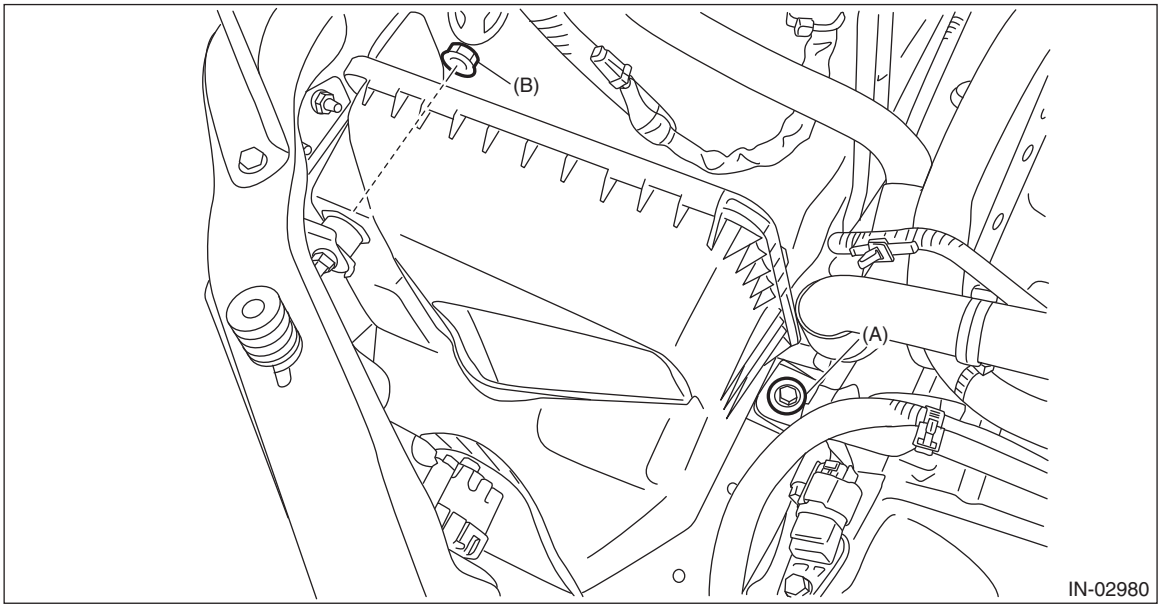
5) Loosen the clamp (A) which connects the air cleaner case to intake boot.
6) Remove the clips (B) from the air cleaner case (front).



7) Remove the air cleaner case (rear) and air cleaner element.



8) Remove the bolt (A) and nut (B) which secure the air cleaner case (front) to the body.

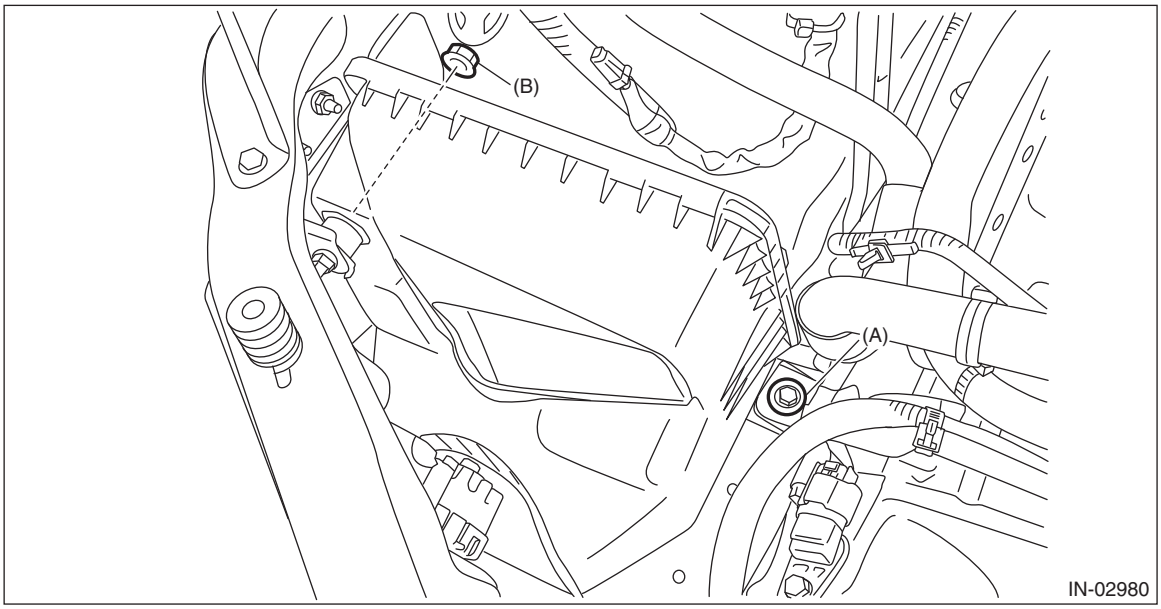


9) Remove the air cleaner case (front).

B: INSTALLATION

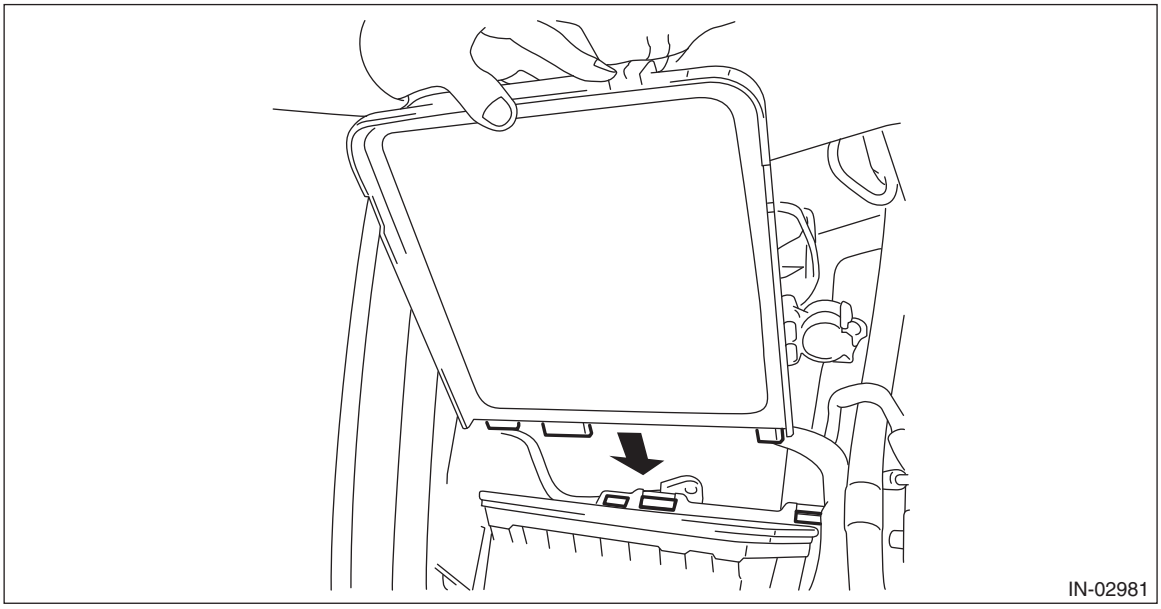
1) Install the bolt (A) and nut (B) which secure the air cleaner case (front) to the body.

Tightening torque:
Bolt (A)
6 N·m (0.6 kgf-m, 4.4 ft-lb)
Nut (B)
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)



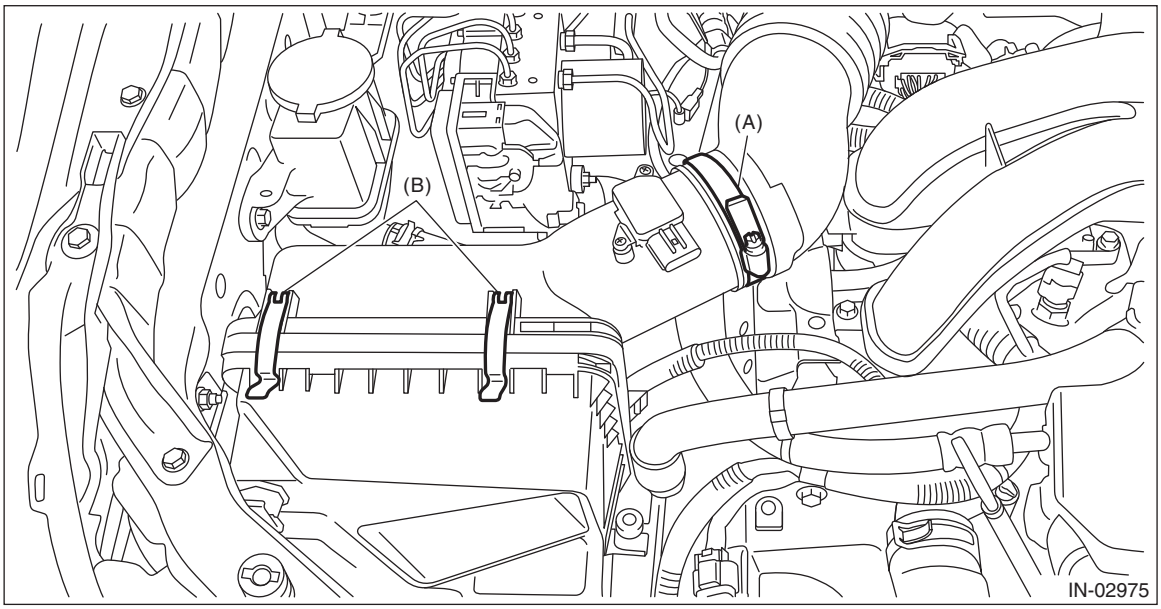
2) Install the air cleaner case (rear) and air cleaner element.

NOTE:
When installing the air cleaner case (rear), align the protrusion of the air cleaner case (rear) to the hole on the air cleaner case (front) to install.

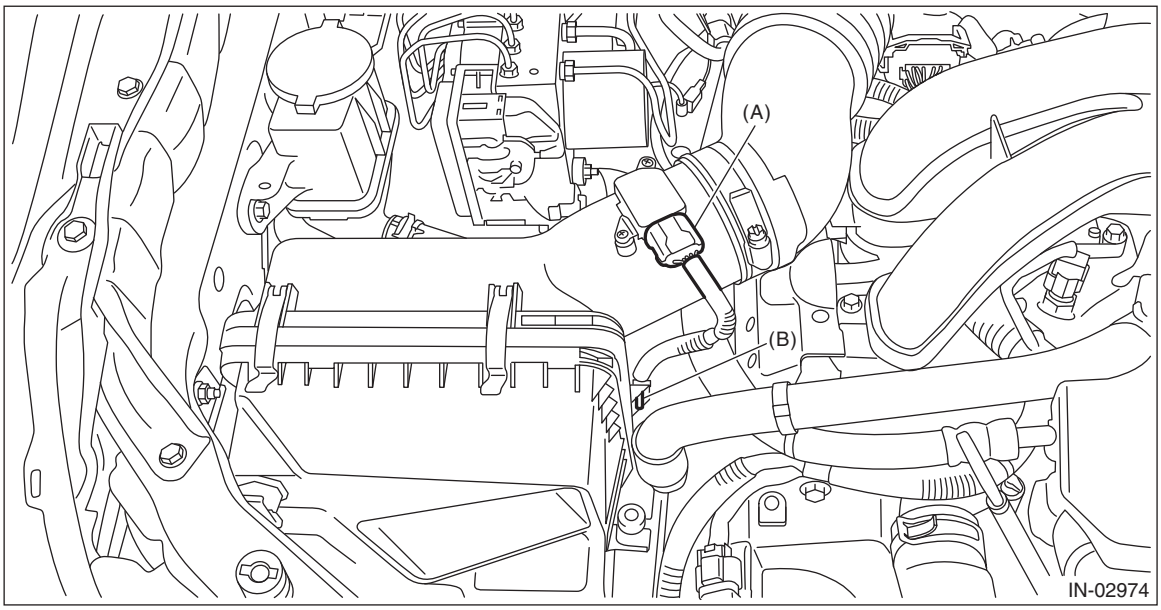


3) Install the clips (B) to the air cleaner case (front), then tighten the clamp (A) that connects the air cleaner case (rear) to the intake boot.

Tightening torque:
Clamp (A)
3 N·m (0.3 kgf-m, 2.2 ft-lb)

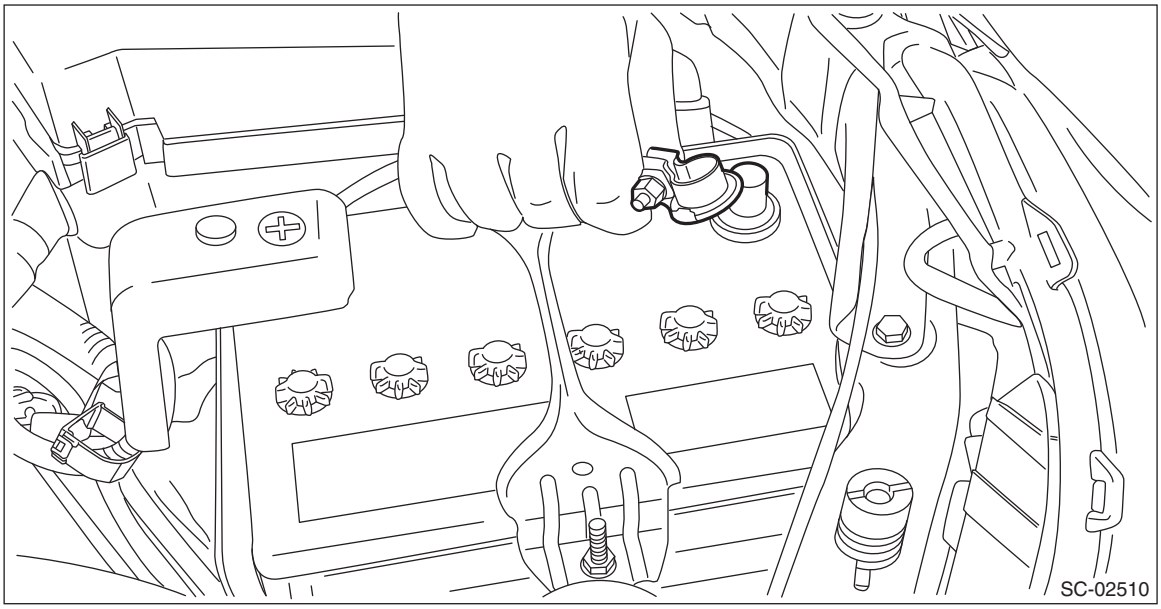


4) Connect the connector (A) to the mass air flow and intake air temperature sensor and secure the harness with clip (B).



5) Install the air intake duct (rear). <Ref. to IN(H4DO)-14, INSTALLATION, Air Intake Duct.>

6) Connect the battery ground terminal.



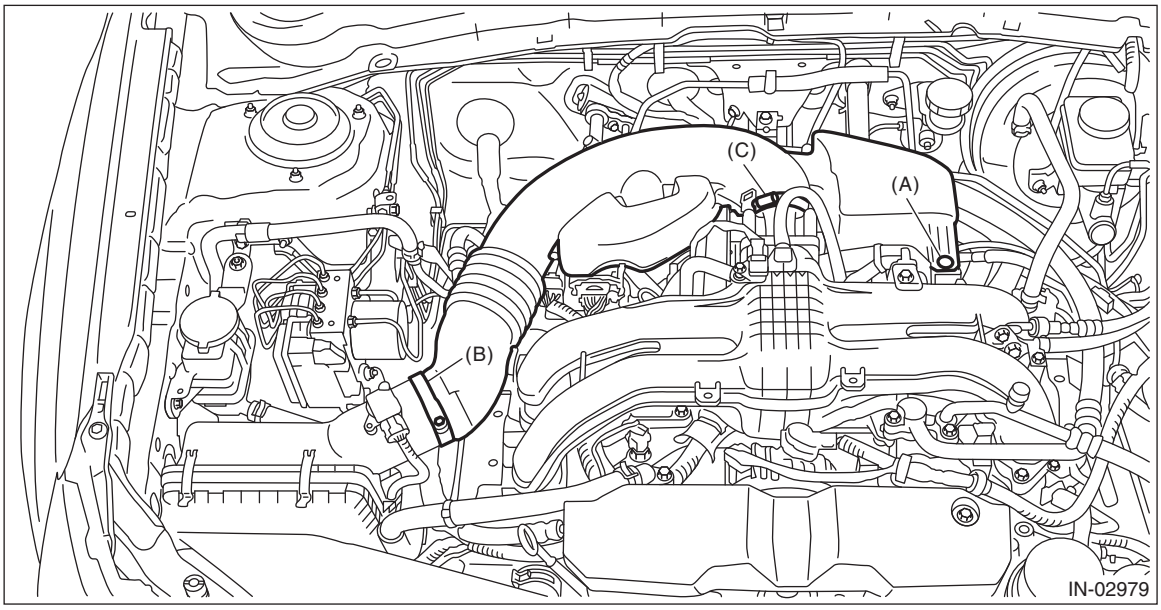
C: INSPECTION

1) Check that the air cleaner case has no deformation, cracks or other damages.
2) Check that the air intake boot has no cracks, damage or loose part.

4. Air Intake Boot

A: REMOVAL

1) Remove the clip (A) from the air intake boot assembly.
2) Loosen the clamp (B) which connects the air intake boot assembly and air cleaner case.
3) Loosen the clamp (C) which connects the air intake boot assembly and throttle body.



4) Disconnect the PCV hose assembly and remove the air intake boot assembly.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
3 N·m (0.3 kgf-m, 2.2 ft-lb)

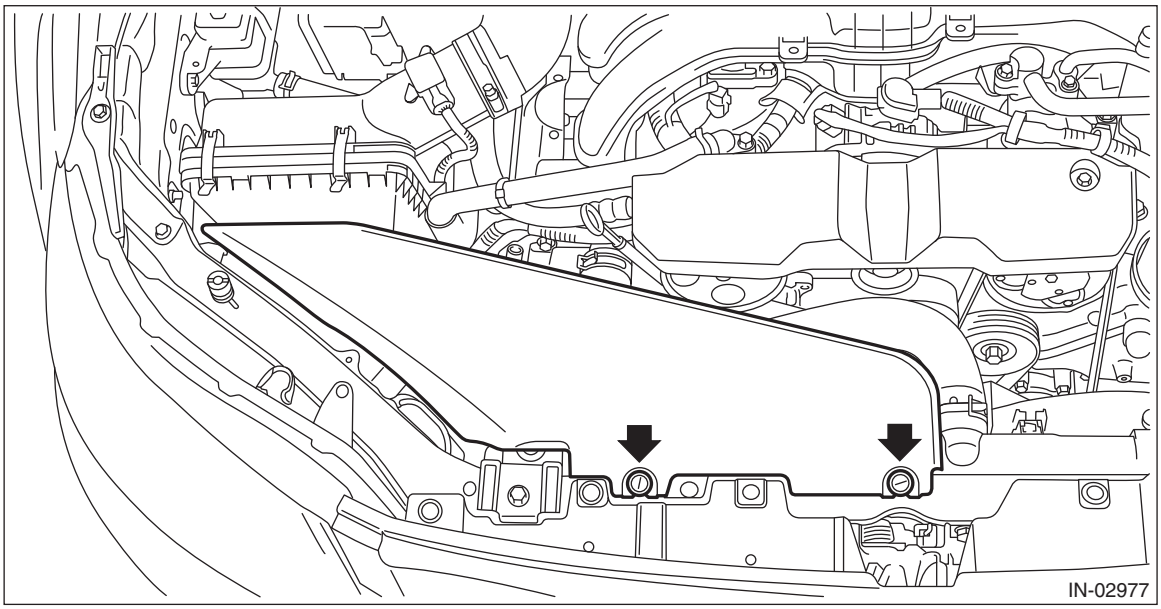
C: INSPECTION

1) Check that the air intake boot assembly does not have deformation, cracks or other damages.
2) Check there is no foreign matter in the air intake boot assembly.

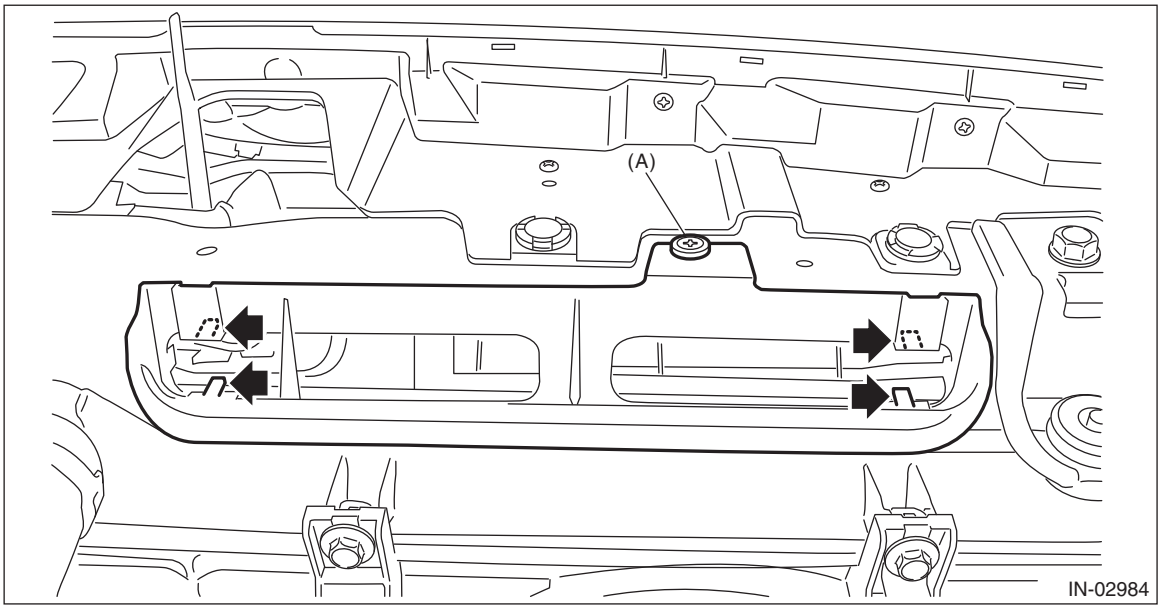
5. Air Intake Duct

A: REMOVAL

1) Remove the clip which secures air intake duct (rear), and remove the air intake duct (rear).



2) Remove the clip (A) and four claws and then remove the air intake duct (front).



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

1) Check that the air intake duct has no deformation, cracks or other damages.
2) Inspect that no foreign objects are mixed in the air intake duct.

6. Resonator Chamber

A: REMOVAL

The resonator chamber and air cleaner case are integrated into one unit; therefore, refer to “Air Cleaner Case” for removal procedure. <Ref. to IN(H4DO)-7, REMOVAL, Air Cleaner Case.>

B: INSTALLATION

The resonator chamber and air cleaner case are integrated into one unit; therefore, refer to “Air Cleaner Case” for installation procedure. <Ref. to IN(H4DO)-10, INSTALLATION, Air Cleaner Case.>

C: INSPECTION

Check that the resonator chamber has no deformation, cracks or other damages.

MECHANICAL

ME(H4DO)

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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			Chain driven, double overhead camshaft, 4-valve/cylinder
	Bore × Stroke mm (in)			94.0 × 90.0 (3.70 × 3.54)
	Displacement cm^3 (cu in)			2,498 (152.43)
	Compression ratio			10
	Compression pressure (at 200 — 300 rpm) kPa (kg/cm^2, psi)		Standard	1,050 — 1,400 (11 — 14, 152 — 203)
	Number of piston rings			Pressure ring: 2, Oil ring: 1
	Intake valve timing	Open	Max. retard	ATDC 12°
			Min. advance	BTDC 43°
		Close	Max. retard	ABDC 76°
			Min. advance	ABDC 21°
	Exhaust valve timing	Open		BBDC 37°
		Close		ATDC 11°
	Cam clearance mm (in)	Intake		0.13±0.03 (0.0051±0.0012)
		Exhaust		0.24±0.03 (0.0094±0.0012)
	Idling speed (Select lever is in “P” or “N” range on AT model; Gear shift lever is in neutral position on MT model.) rpm	No load	Standard	AT model: 675±100
				MT model: 650±100
		A/C ON	Standard	850±100
	Ignition order			1 → 3 → 2 → 4
	Ignition timing BTDC/rpm		Standard	AT model: 16°±10°/675
				MT model: 16°±10°/650

NOTE:
OS: Oversize US: Undersize

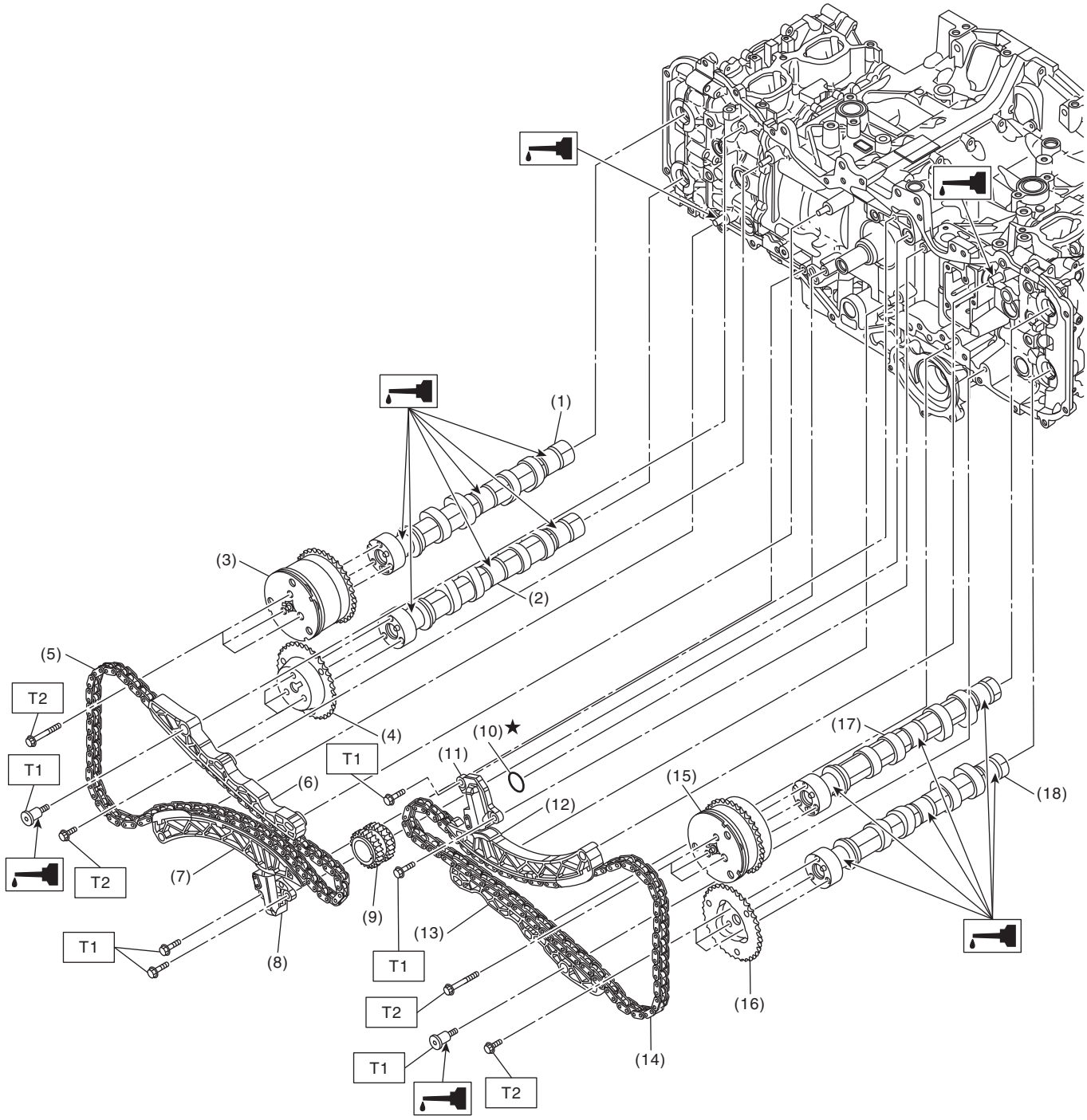
Camshaft	Bending limit mm (in)			0.020 (0.00079)
	Cam lobe height mm (in)	Intake	Standard	40.89 — 40.99 (1.610 — 1.614)
		Exhaust	Standard	40.15 — 40.25 (1.581 — 1.585)
	Cam base circle diameter mm (in)		Standard	34.0 (1.339)
	Journal O.D. mm (in)		Standard	25.946 — 25.963 (1.0215 — 1.0222)
	Oil clearance mm (in)		Standard	0.037 — 0.072 (0.0015 — 0.0028)
	Thrust clearance mm (in)		Standard	0.068 — 0.116 (0.0027 — 0.0047)
Cylinder head	Warping limit (Mating surface with cylinder block) mm (in)			0.020 (0.0008)
	Grinding limit mm (in)			0.1 (0.004)
	Standard height mm (in)			98.5 (3.878)
Valve seat	Seating angle between valve and valve seat			90°
	Contacting width between valve and valve seat mm (in)	Intake	Standard	0.8 — 1.6 (0.031 — 0.063)
		Exhaust	Standard	1.1 — 1.7 (0.043 — 0.067)

Valve guide	Clearance between the valve guide and valve stem mm (in)	Intake		Standard	0.030 — 0.057 (0.0012 — 0.0022)
		Exhaust		Standard	0.040 — 0.067 (0.0016 — 0.0026)
	Inside diameter mm (in)			Standard	5.500 — 5.512 (0.2165 — 0.2170)
	Valve stem outer diameters mm (in)	Intake		Standard	5.455 — 5.470 (0.2148 — 0.2154)
		Exhaust		Standard	5.445 — 5.460 (0.2144 — 0.2150)
	Valve guide protrusion amount mm (in)			Standard	11.4 — 11.8 (0.449 — 0.465)
Valve	Head edge thickness mm (in)	Intake		Standard	0.8 — 1.2 (0.031 — 0.047)
		Exhaust		Standard	1.0 — 1.4 (0.039 — 0.055)
	Overall length mm (in)	Intake			103.8 (4.087)
		Exhaust			94.1 (3.705)
Valve spring	Free length mm (in)	Two-stage unequal pitch type		Standard	41.06 (1.617)
		Equal pitch type		Standard	38.60 (1.520)
	Tension/spring height N (kgf, lb)/mm (in)	Set		Standard	182 — 210 (18.56 — 21.41, 40.92 — 47.22)/33.0 (1.299)
		Lift		Standard	552 — 610 (56.29 — 62.20, 124.11 — 137.15)/22.0 (0.866)
	Squareness	Two-stage unequal pitch type		Standard	2.5°, 1.8 mm (0.071 in) or less
		Equal pitch type		Standard	2.5°, 1.7 mm (0.067 in) or less
Valve shim	Inside diameter mm (in)			Standard	5.500 — 5.560 (0.2165 — 0.2189)
	Valve stem end outer diameters mm (in)			Standard	5.455 — 5.470 (0.2148 — 0.2154)
	Clearance between the valve shim and valve stem end mm (in)			Standard	0.030 — 0.105 (0.0012 — 0.0041)
Cylinder block	Warping limit (Mating surface with cylinder head) mm (in)				0.025 (0.00098)
	Grinding limit mm (in)				To 204.9 (8.067)
	Standard height mm (in)				205.0 (8.071)
	Cylindricality mm (in)			Standard	0.030 (0.0012)
	Out-of-roundness mm (in)			Standard	0.030 (0.0012)
	Clearance between cylinder and piston mm (in)			Standard	0.015 — 0.035 (0.00059 — 0.00138)
	Inner diameter of cylinder liner boring limit (diameter) mm (in)				To 94.505 (3.7207)
Piston	Piston grade point mm (in)				13.3 (0.52)
	Outer diameter mm (in)	Standard		A	93.980 — 93.990 (3.7000 — 3.7004)
				B	93.970 — 93.980 (3.6996 — 3.7000)
		0.25 (0.0098) OS			94.220 — 94.240 (3.7094 — 3.7102)
		0.50 (0.0197) OS			94.470 — 94.490 (3.7193 — 3.7201)
Piston pin	Degree of fit				Piston pin must be fitted into position with thumb at 20°C (68°F).
	Clearance between piston pin hole and piston pin mm (in)			Standard	0.004 — 0.008 (0.0002 — 0.0003)
Piston ring	Piston ring gap mm (in)	Top ring		Standard	0.20 — 0.30 (0.0079 — 0.0118)
		Second ring		Standard	0.30 — 0.45 (0.0118 — 0.0177)
		Oil ring		Standard	0.20 — 0.50 (0.0079 — 0.0197)
	Clearance between piston ring and piston ring groove mm (in)	Top ring		Standard	0.040 — 0.080 (0.0016 — 0.0031)
		Second ring		Standard	0.030 — 0.070 (0.0012 — 0.0028)

Connecting rod and connecting rod bearing	Bend or twist per 100 mm (3.94 in) in length		mm (in)	Limit	0.10 (0.0039)
	Thrust clearance		mm (in)	Standard	0.070 — 0.330 (0.0028 — 0.0130)
	Oil clearance		mm (in)	Standard	0.017 — 0.047 (0.0007 — 0.0019)
	Bearing size (Thickness at center)		mm (in)	Standard	1.492 — 1.508 (0.0587 — 0.0594)
				0.03 (0.0012) US	1.511 — 1.515 (0.0595 — 0.0596)
				0.05 (0.0020) US	1.521 — 1.525 (0.0599 — 0.0600)
				0.25 (0.0098) US	1.621 — 1.625 (0.0638 — 0.0640)
Bushing of small end	Clearance between piston pin and bushing at connecting rod small end		mm (in)	Standard	0.004 — 0.026 (0.0002 — 0.0010)
Crankshaft and crankshaft bearing	Bending limit			mm (in)	0.035 (0.0014)
	Crank pin	Out-of-roundness	mm (in)	Standard	0.005 (0.0002)
		Cylindricality	mm (in)	Standard	0.006 (0.0002)
		Grinding limit (dia.)		mm (in)	To 47.726 (1.8790)
	Crank journal	Out-of-roundness	mm (in)	Standard	0.005 (0.0002)
		Cylindricality	mm (in)	Standard	0.006 (0.0002)
		Grinding limit (dia.)		mm (in)	To 67.735 (2.6667)
	Crank pin outer diameter		mm (in)	Standard	47.976 — 48.000 (1.8888 — 1.8898)
				0.03 (0.0012) US	47.946 — 47.970 (1.8876 — 1.8886)
				0.05 (0.0020) US	47.926 — 47.950 (1.8868 — 1.8878)
				0.25 (0.0098) US	47.726 — 47.750 (1.8790 — 1.8799)
	Crank journal outer diameter		mm (in)	Standard	67.985 — 68.009 (2.6766 — 2.6775)
				0.03 (0.0012) US	67.955 — 67.979 (2.6754 — 2.6763)
				0.05 (0.0020) US	67.935 — 67.959 (2.6746 — 2.6755)
				0.25 (0.0098) US	67.735 — 67.759 (2.6667 — 2.6677)
	Bearing size (Thickness at center)	#1, #2, #3, #4	mm (in)	Standard	2.495 — 2.513 (0.0982 — 0.0989)
				0.03 (0.0012) US	2.519 — 2.522 (0.0992 — 0.0993)
				0.05 (0.0020) US	2.529 — 2.532 (0.0996 — 0.0997)
				0.25 (0.0098) US	2.629 — 2.632 (0.1035 — 0.1036)
		#5		Standard	2.493 — 2.511 (0.0981 — 0.0989)
				0.03 (0.0012) US	2.517 — 2.520 (0.0991 — 0.0992)
				0.05 (0.0020) US	2.527 — 2.530 (0.0995 — 0.0996)
				0.25 (0.0098) US	2.627 — 2.630 (0.1034 — 0.1035)
	Thrust clearance		mm (in)	Standard	0.130 — 0.308 (0.00512 — 0.01213)
	Oil clearance		mm (in)	Standard	0.013 — 0.031 (0.00051 — 0.00122)

B: COMPONENT

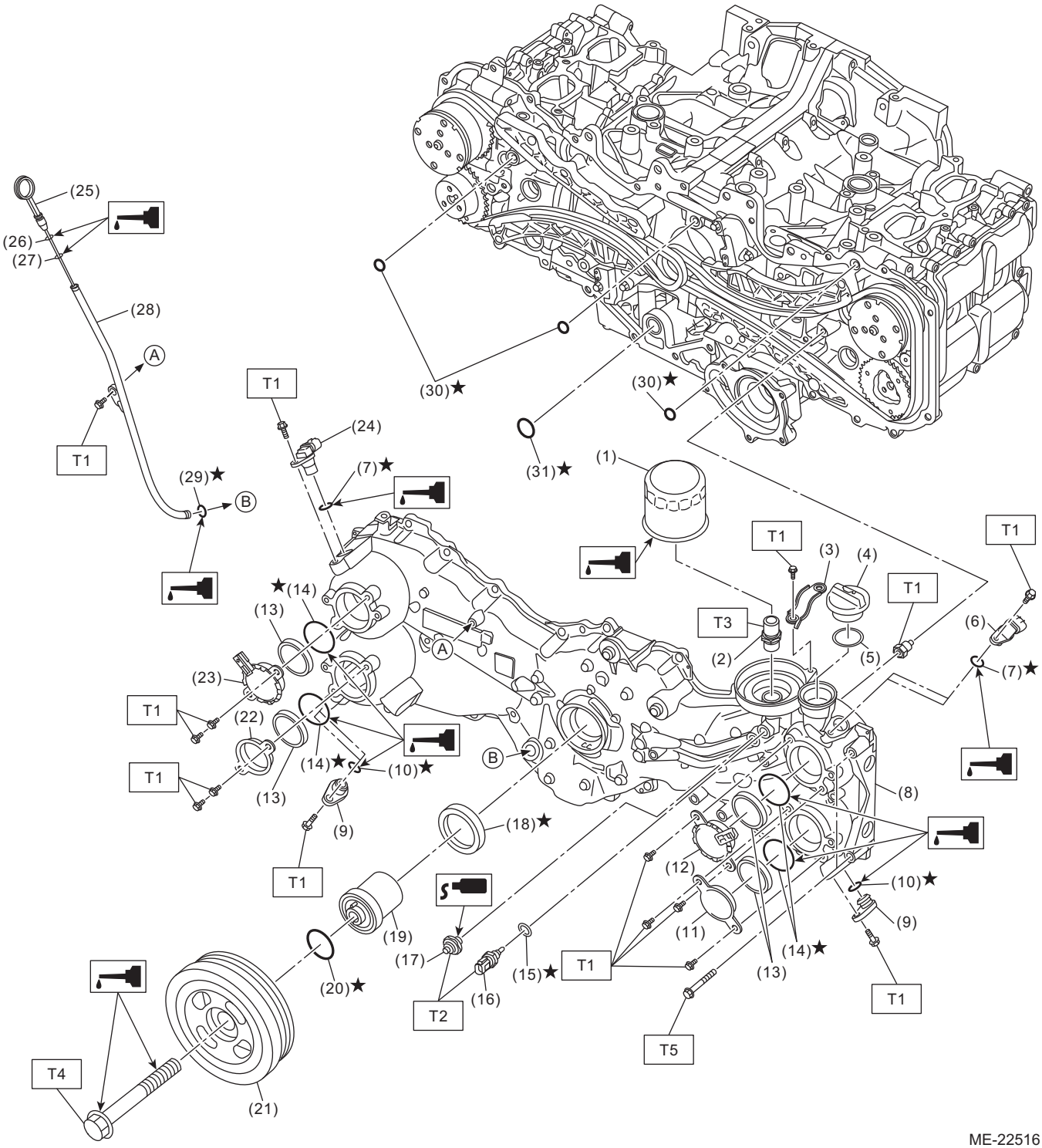
1. TIMING CHAIN



(1) Intake camshaft RH
(2) Exhaust camshaft RH
(3) Intake cam sprocket RH
(4) Exhaust cam sprocket RH
(5) Timing chain RH
(6) Chain guide
(7) Chain tensioner lever RH
(8) Chain tensioner RH
(9) Crank sprocket
(10) O-ring
(11) Chain tensioner LH
(12) Chain tensioner lever LH
(13) Chain guide
(14) Timing chain LH
(15) Intake cam sprocket LH
(16) Exhaust cam sprocket LH
(17) Intake camshaft LH
(18) Exhaust camshaft LH

Tightening torque:N·m (kgf-m, ft-lb)	
T1:	***6.4 (0.7, 4.7)***
T2:	***18 (1.8, 13.3)***

2. CHAIN COVER



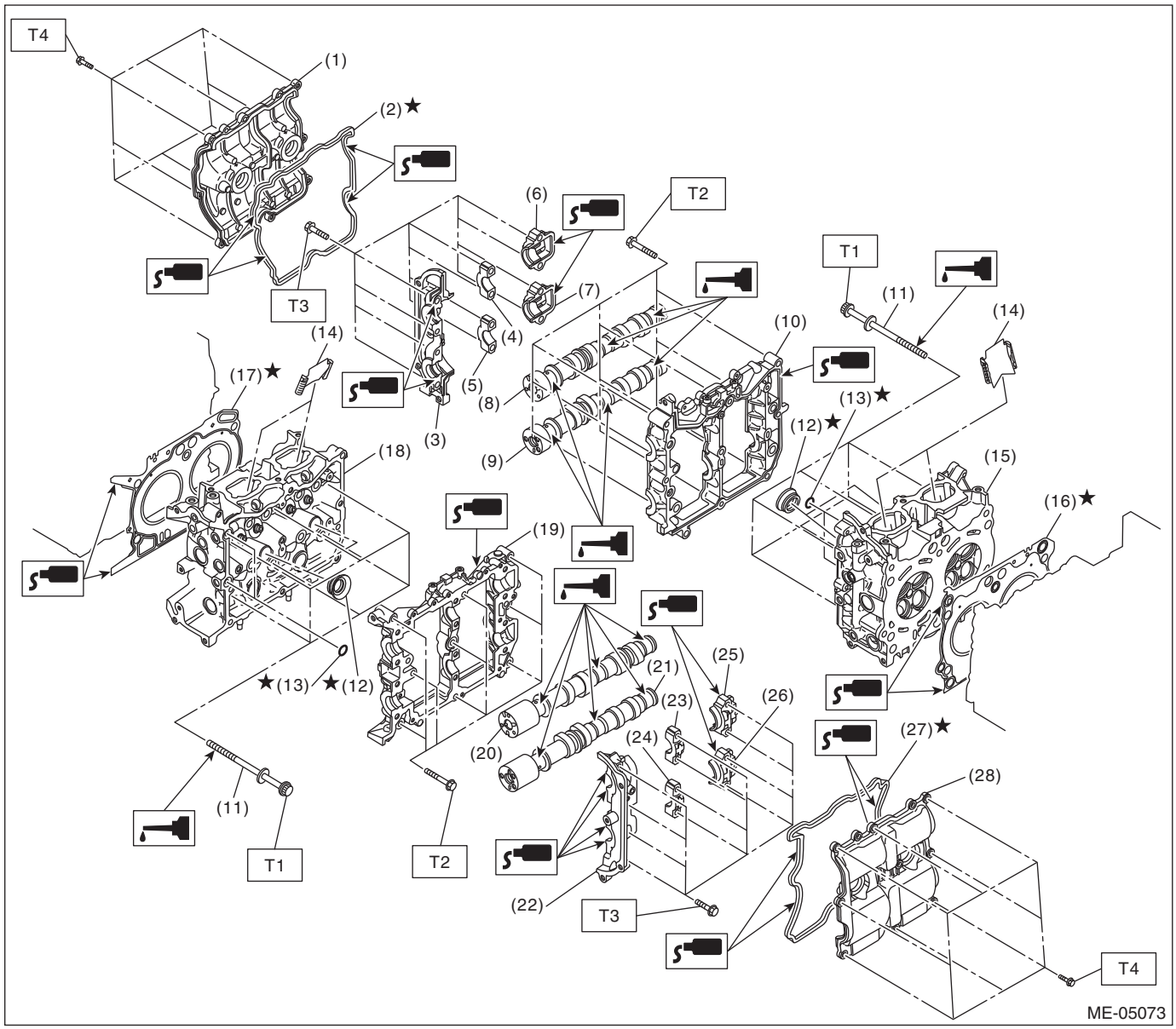
ME-22516

(1) Oil filter
(2) Oil pump union
(3) Generator code stay
(4) Oil filler cap
(5) O-ring
(6) Camshaft position sensor LH
(7) O-ring
(8) Chain cover
(9) Sensor cover
(10) O-ring
(11) Actuator cover LH
(12) Oil control solenoid LH
(13) Back-up ring
(14) O-ring
(15) O-ring
(16) Engine Oil Temperature Sensor
(17) Oil pressure switch
(18) Front oil seal
(19) Crank pulley boss
(20) O-ring
(21) Crank pulley
(22) Actuator cover RH
(23) Oil control solenoid RH
(24) Camshaft position sensor RH
(25) Oil level gauge
(26) O-ring
(27) O-ring
(28) Oil level gauge guide
(29) O-ring
(30) O-ring
(31) O-ring

Tightening torque:N·m (kgf-m, ft-lb)

T1: 6.4 (0.7, 4.7)
T2: 18 (1.8, 13.3)
T3: 45 (4.6, 33.2)
T4: <Ref. to ME(H4DO)-81, INSTALLATION, Crank Pulley.>
T5: <Ref. to ME(H4DO)-96, INSTALLATION, Chain Cover.>

3. CYLINDER HEAD AND CAMSHAFT

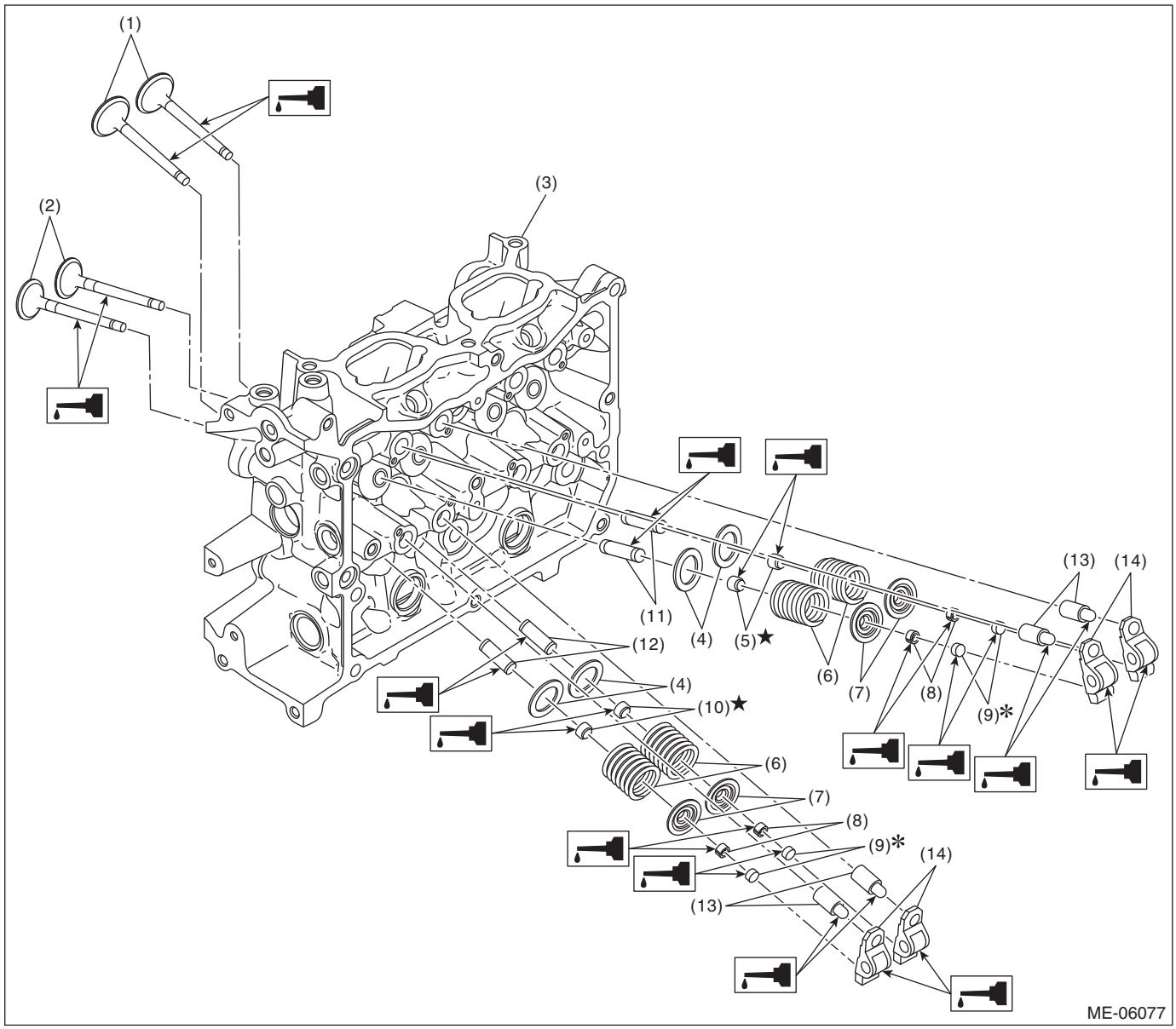


(1) Rocker cover RH
(2) Rocker cover gasket RH
(3) Front camshaft cap RH
(4) Intake center camshaft cap RH
(5) Exhaust center camshaft cap RH
(6) Intake camshaft cap RH
(7) Exhaust rear camshaft cap RH
(8) Intake camshaft RH
(9) Exhaust camshaft RH
(10) Cam carrier RH
(11) Cylinder head bolt
(12) Spark plug pipe gasket
(13) O-ring
(14) Cylinder head plate
(15) Cylinder head RH
(16) Cylinder head gasket RH
(17) Cylinder head gasket LH
(18) Cylinder head LH
(19) Cam carrier LH
(20) Intake camshaft LH
(21) Exhaust camshaft LH
(22) Front camshaft cap LH
(23) Intake center camshaft cap LH
(24) Exhaust center camshaft cap LH
(25) Intake rear camshaft cap LH
(26) Exhaust rear camshaft cap LH
(27) Rocker cover gasket LH
(28) Rocker cover LH

Tightening torque:N·m (kgf-m, ft-lb)

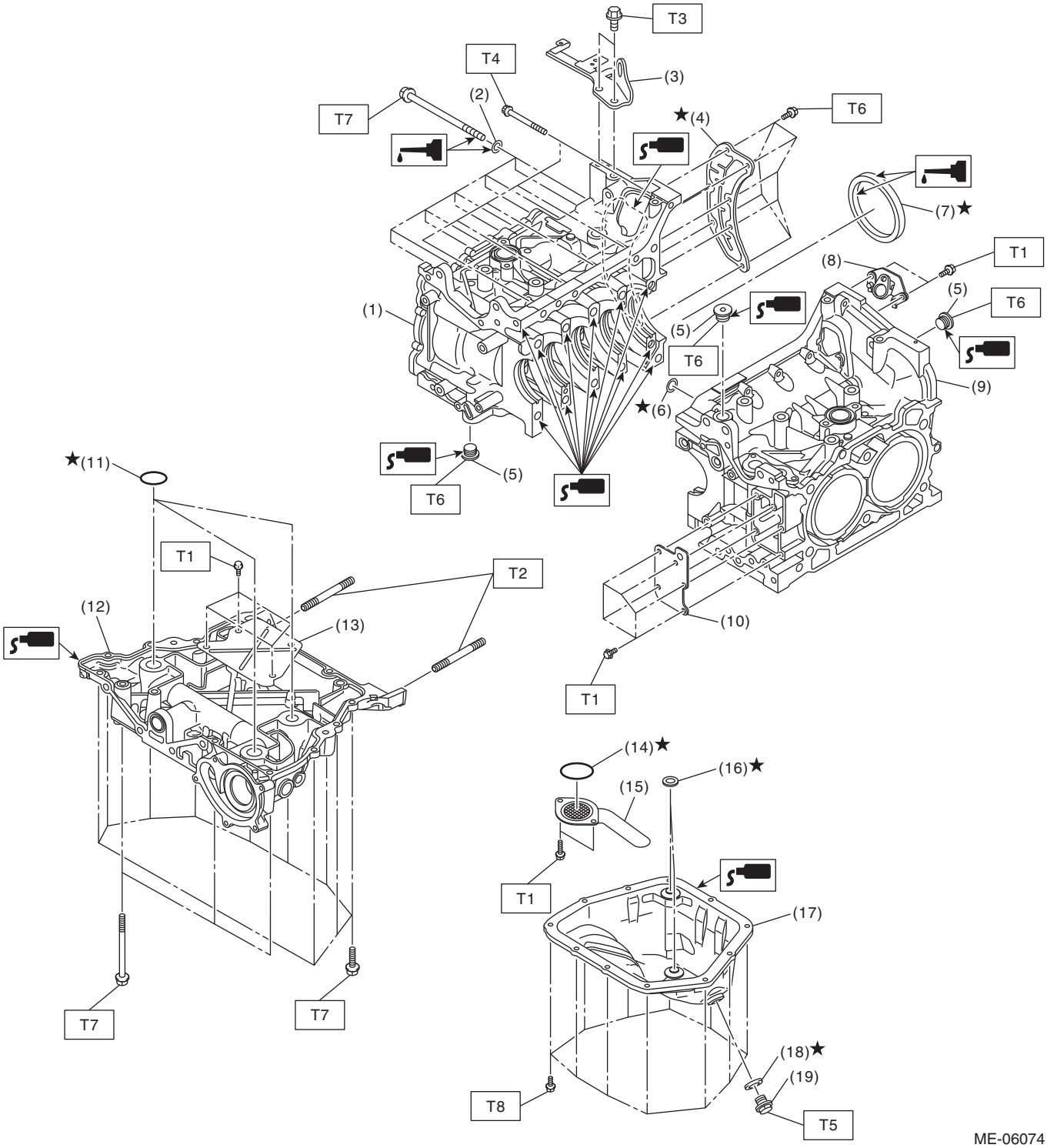
T1: ***<Ref. to ME(H4DO)-200, INSTALLATION, Cylinder Head.>***
T2: ***<Ref. to ME(H4DO)-162, INSTALLATION, Cam Carrier.>***
T3: ***<Ref. to ME(H4DO)-186, ASSEMBLY, Cam Carrier.>***
T4: ***<Ref. to ME(H4DO)-144, INSTALLATION, Rocker Cover.>***

4. CYLINDER HEAD AND VALVE ASSEMBLY



(1) Exhaust valve
(2) Intake valve
(3) Cylinder head
(4) Valve spring seat
(5) Intake valve oil seal
(6) Valve spring
(7) Valve spring retainer
(8) Valve collet
(9) Valve shim
(10) Exhaust valve oil seal
(11) Intake valve guide
(12) Exhaust valve guide
(13) Roller rocker arm pivot
(14) Roller rocker arm

5. CYLINDER BLOCK

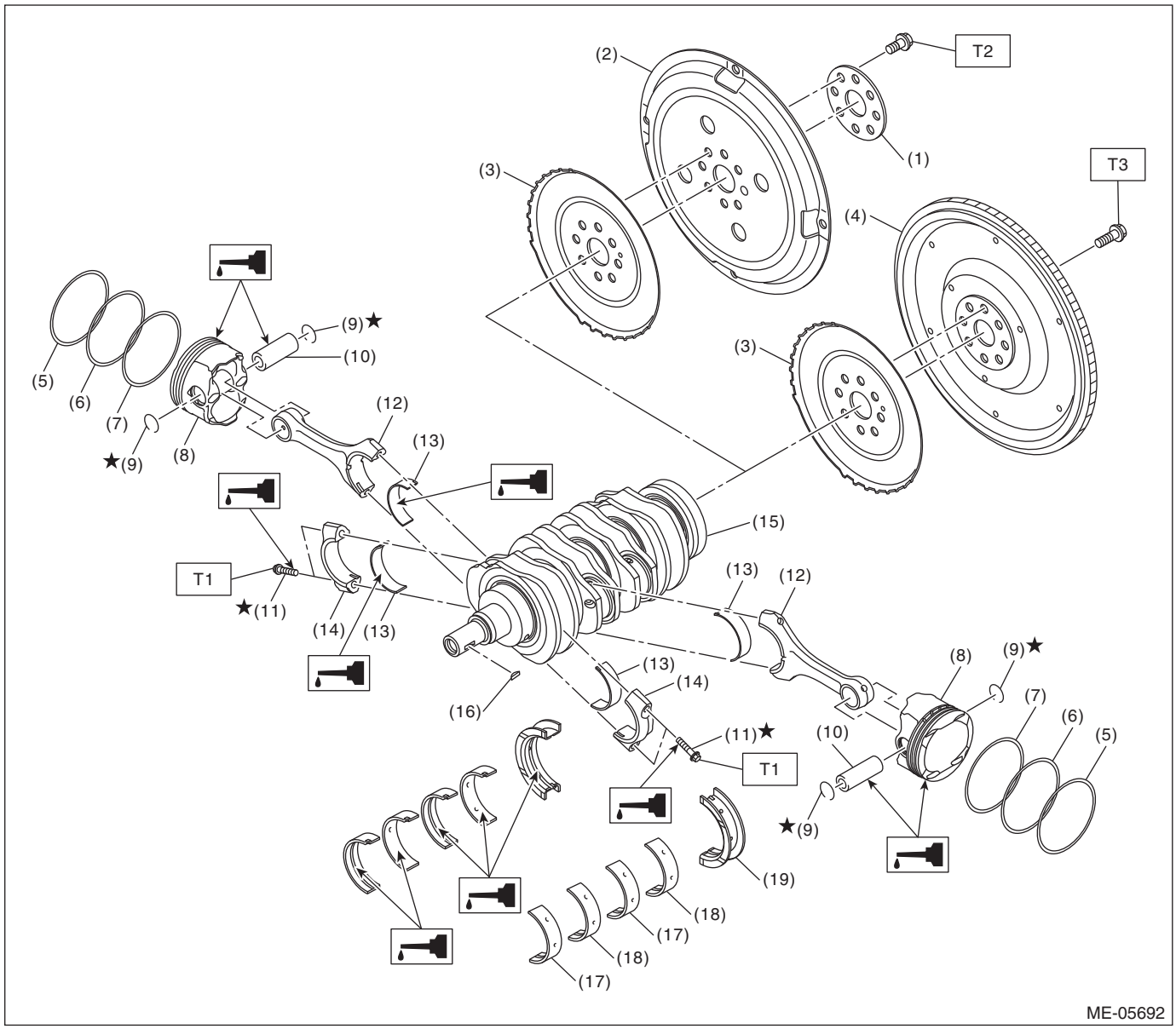


(1) Cylinder block RH
(2) Washer
(3) Engine rear hanger
(4) Oil separator cover
(5) Main gallery plug
(6) O-ring
(7) Rear oil seal
(8) Crankshaft position sensor holder
(9) Cylinder block LH
(10) Cylinder block plate
(11) O-ring
(12) Oil pan upper
(13) Baffle plate
(14) O-ring
(15) Oil strainer
(16) Oil pan seal ring
(17) Oil pan
(18) Drain plug gasket
(19) Drain plug

Tightening torque:N·m (kgf-m, ft-lb)

T1: 6.4 (0.7, 4.7)
T2: 18 (1.8, 13.3)
T3: 21 (2.1, 15.5)
T4: 25 (2.5, 18.4)
T5: 41.7 (4.3, 30.8)
T6: <Ref. to ME(H4DO)-298, CYLINDER BLOCK, ASSEMBLY, Cylinder Block.>
T7: <Ref. to ME(H4DO)-251, INSTALLATION, Cylinder Block.>
T8: <Ref. to LU(H4DO)-18, OIL PAN, INSTALLATION, Oil Pan and Strainer.>

6. CRANKSHAFT AND PISTON



(1)	Reinforcement (AT model)	(9)	Circlip	(17)	Crankshaft bearing #1, #3
(2)	Drive plate (AT model)	(10)	Piston pin	(18)	Crankshaft bearing #2, #4
(3)	Crankshaft position sensor plate	(11)	Connecting rod cap bolt	(19)	Crankshaft bearing #5
(4)	Flywheel (MT 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		

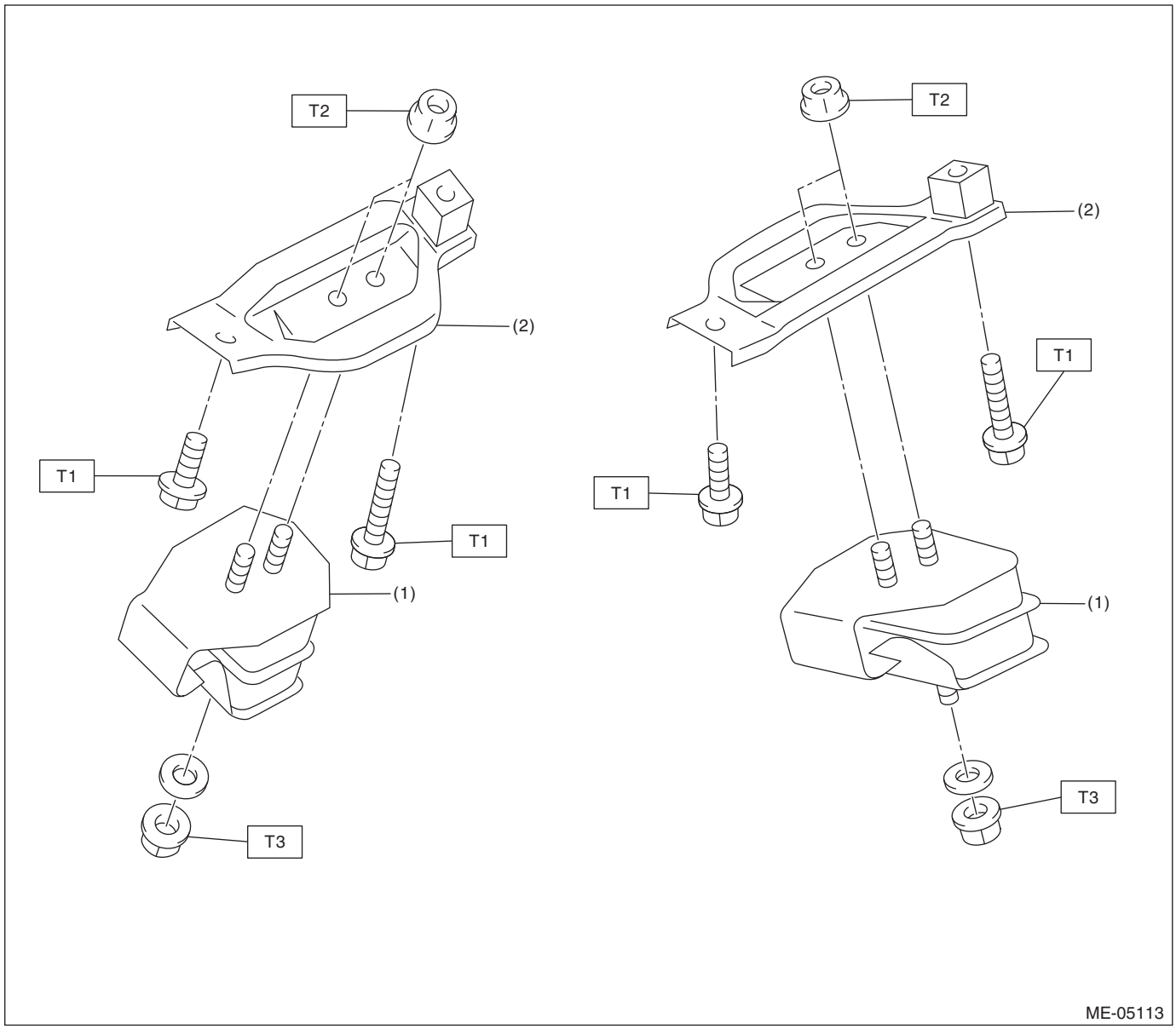
Tightening torque:N·m (kgf-m, ft-lb)

T1: ***<Ref. to ME(H4DO)-251, INSTALLATION, Cylinder Block.>***

T2: ***<Ref. to 4AT-73, INSTALLATION, Drive Plate.>***

T3: ***<Ref. to CL-12, INSTALLATION, Flywheel.>***

7. ENGINE MOUNTING



(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, 62.7)

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 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 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.

D: PREPARATION TOOL

1. SPECIAL TOOL

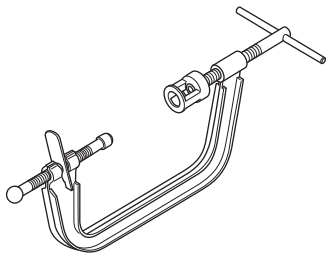
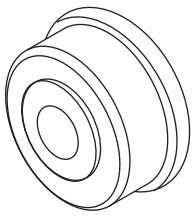
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST0920287002000	0920287002000 (Newly adopted tool)	REMOVER AND REPLACER	Used for removing and installing valve spring.
 ST41399FG020	41399FG020	SPECIAL TOOL B	Used for installing the front oil seal of engine.

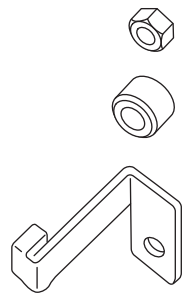
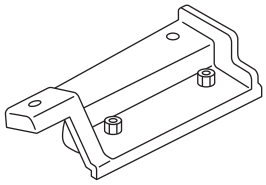
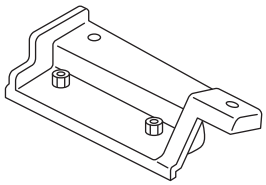
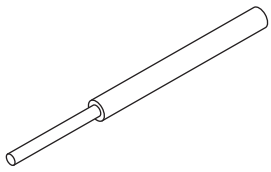
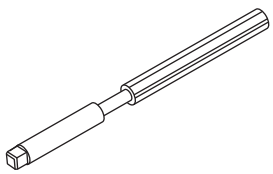
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498277200	498277200	STOPPER SET	Used for installing automatic transmission assembly to engine.
 ST-498457000	498457000	ENGINE STAND ADAPTER RH	• Used for disassembling and assembling engine. • Used together with ENGINE STAND (499817100) and ADAPTER (18362AA020).
 ST-498457100	498457100	ENGINE STAND ADAPTER LH	• Used for disassembling and assembling engine. • Used together with ENGINE STAND (499817100) and ADAPTER (18362AA020).
 ST-499765700	499765700	VALVE GUIDE REMOVER AND INSTALLER	Used for removing and installing valve guide.
 ST-499765900	499765900	VALVE GUIDE REAMER	Used for reaming valve guides.

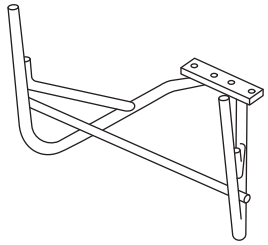
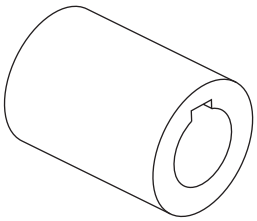
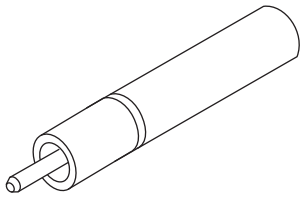
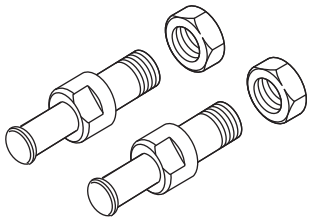
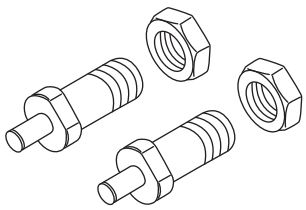
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499817100	499817100	ENGINE STAND	• Used for disassembling and assembling engine. • Used together with ADAPTER (18362AA020), ENGINE STAND ADAPTER RH (498457000) and LH (498457100).
 ST18252AA000	18252AA000	CRANKSHAFT SOCKET	Used for rotating crankshaft.
 ST18261AA010	18261AA010	VALVE OIL SEAL GUIDE	Used for press-fitting of intake valve guide stem seals and exhaust valve guide stem seals.
 ST18334AA000	18334AA000	PULLEY WRENCH PIN SET	• Used for removing and installing the crank pulley. • Used together with PULLEY WRENCH (18355AA000).
 ST18334AA020	18334AA020 (Newly adopted tool)	PULLEY WRENCH PIN SET	• Used for removing and installing exhaust cam sprocket LH. • Used together with PULLEY WRENCH (18355AA000).

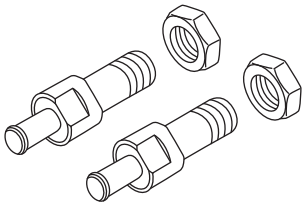
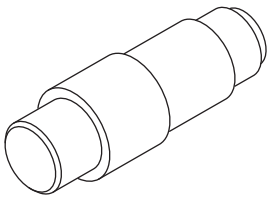
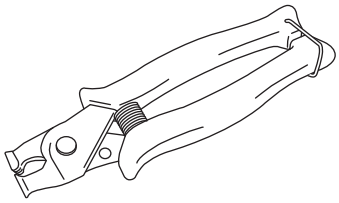
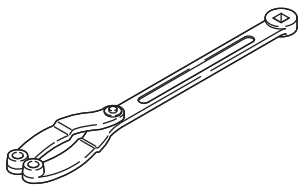
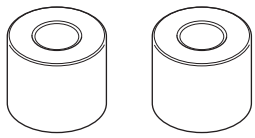
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18334AA030	18334AA030 (Newly adopted tool)	PULLEY WRENCH PIN SET	• Used for removing and installing water pump pulley and intake cam sprocket. • Used together with PULLEY WRENCH (18355AA000).
 ST18350AA000	18350AA000	CONNECTING ROD BUSHING REMOVER AND INSTALLER	Used for removing and installing bushing at connecting rod small end.
 ST18353AA000	18353AA000	CLAMP PLIERS	• Used for removing and installing the PCV hose. • This tool is made by the French company CAILLAU. (code) 54.0.000.205 To make it easier to obtain, it has been provided with a tool number.
 ST18355AA000	18355AA000	PULLEY WRENCH	• Used for installing and removing the water pump pulley. • Used for removing and installing the crank pulley. • Used for removing and installing intake cam sprocket and exhaust cam sprocket LH. • Used together with PULLEY WRENCH PIN SET (18334AA030), PULLEY WRENCH PIN SET (18334AA000) or PULLEY WRENCH PIN SET (18334AA020).
 ST18362AA020	18362AA020 (Newly adopted tool)	ADAPTER	• Used for disassembling and assembling engine. • Used together with STAND (499817100), ENGINE STAND ADAPTER RH (498457000) and LH (498457100). • Bolt used: M10 × 50 (SUBARU genuine Part No.: 010410500)

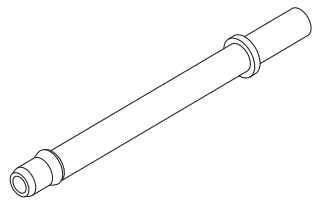
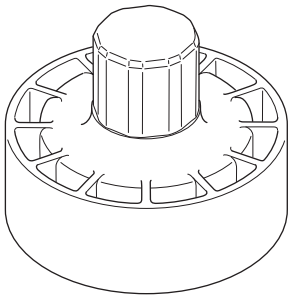
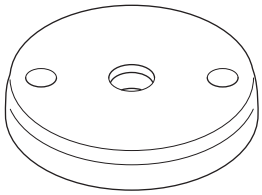
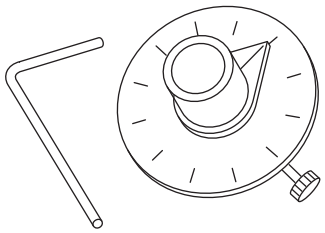
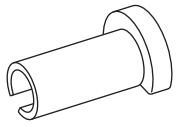
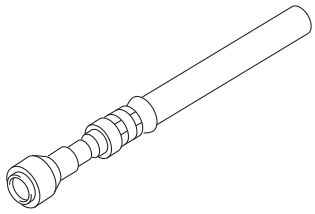
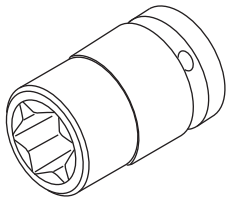
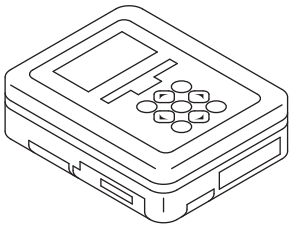
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18471AA000	18471AA000	FUEL PIPE ADAPTER	Used for inspecting the fuel pressure.
 ST18657AA030	18657AA030 (Newly adopted tool)	OIL SEAL INSTALLER	• Used for installing the rear oil seal of engine. • Used together with OIL SEAL GUIDE (18671AA020).
 ST18671AA020	18671AA020 (Newly adopted tool)	OIL SEAL GUIDE	• Used for installing the rear oil seal of engine. • Used together with OIL SEAL INSTALLER (18657AA030).
 ST18854AA000	18854AA000	ANGLE GAUGE	Used for angle tightening.
 ST42099AE000	42099AE000	QUICK CONNECTOR RELEASE	Used for removing the quick connector.

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST42075AG690	42075AG690	FUEL HOSE	Used for inspecting the fuel pressure. NOTE: This is the SUBARU genuine part.
 ST18270KA010	18270KA010 (Newly adopted tool)	SOCKET	Used for installing and removing intake cam sprocket and exhaust cam sprocket.
 ST1B022XU0	1B022XU0	SUBARU SELECT MONITOR III KIT	Used for various inspections.

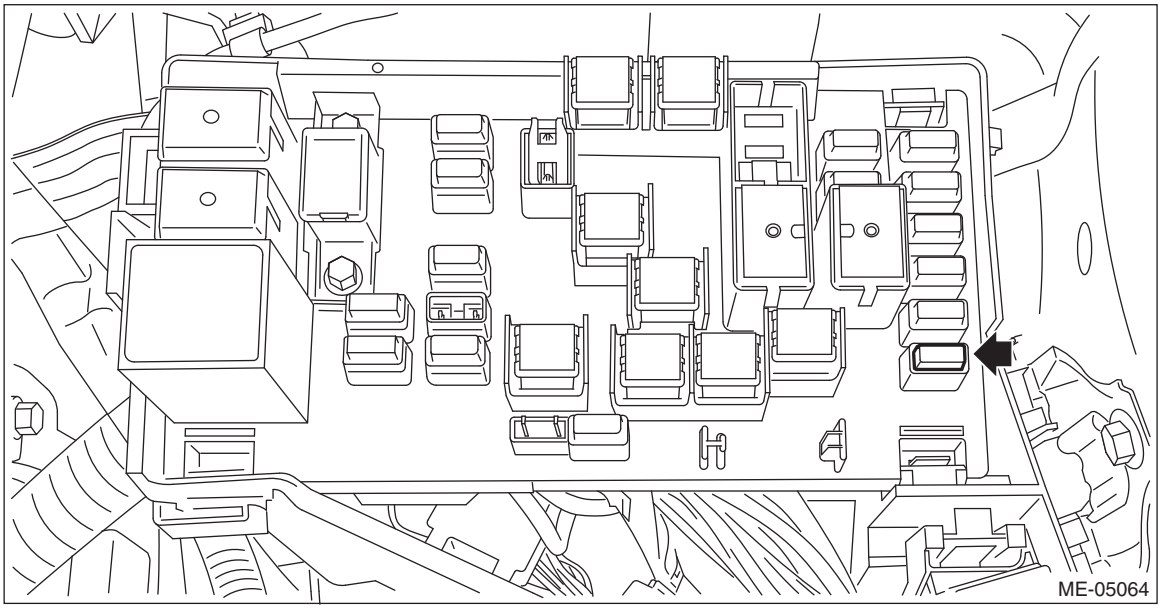
2. GENERAL TOOL

TOOL NAME	REMARKS
Compression gauge	Used for measuring compression.
Timing light	Used for measuring ignition timing.
Vacuum gauge	Used for measuring intake manifold vacuum.
Oil pressure gauge	Used for measuring engine oil pressure.
Fuel pressure gauge	Used for measuring fuel pressure.
TORX® socket E12	Used for removing and installing connecting rod cap bolt.
Piston ring compressor	Used for installing the piston into the cylinder block.
Thickness gauge	Used for various inspections.

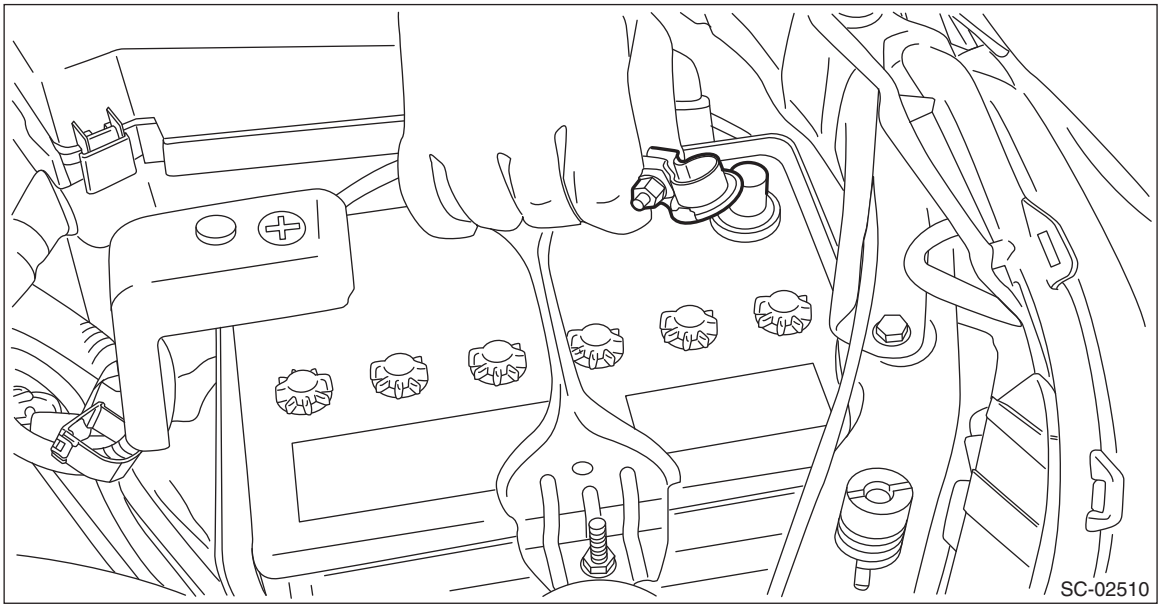
2. Compression

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) Check the starter motor for satisfactory performance and operation.
4) Remove the fuse of fuel pump from main fuse box.

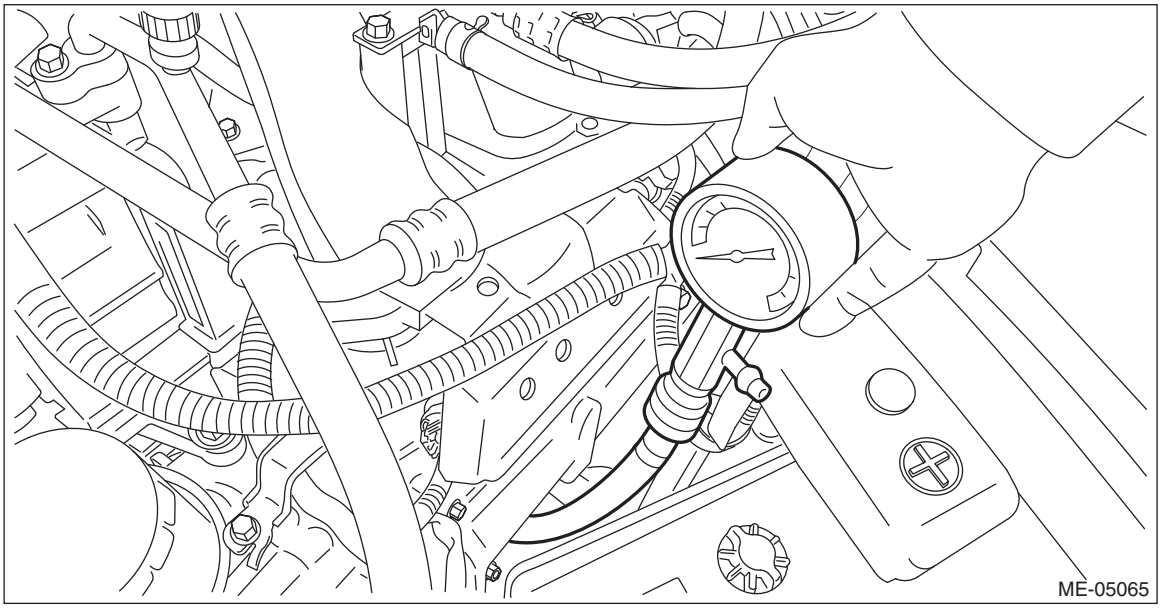


5) Start the engine and run it until it stalls.
6) After the engine stalls, crank it for five more seconds.
7) Turn the ignition switch to OFF.
8) Remove all spark plugs. <Ref. to IG(H4DO)-4, REMOVAL, Spark Plug.>
9) Connect the battery ground terminal.



10) Install the compression gauge to the spark plug hole.

NOTE:
When using a screw-in type compression gauge, the screw should be less than 25 mm (0.98 in) long.



11) Turn the ignition switch to ON.
12) Fully open the throttle valve.
13) Crank the engine by starter motor and read the value when the needle of the compression gauge becomes stable.

NOTE:
- Perform at least two measurements per cylinder, and make sure that the values are correct.
- If the compression pressure is out of standard, check or adjust the pistons, valves and cylinders.

Compression (fully open throttle):
Standard
1,050 — 1,400 kPa (11 — 14 kgf/cm^2, 152 — 203 psi)
Difference between cylinders
100 kPa (1 kgf/cm^2, 14 psi) or less

14) After inspection, install the related parts in the reverse order of removal.

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) Read the engine idle speed using Subaru Select Monitor. <Ref. to EN(H4DO)(diag)-36, READ CURRENT DATA FOR ENGINE (NORMAL MODE), OPERATION, Subaru Select Monitor.>

NOTE:
- Idle speed cannot be adjusted manually, because the idle speed is automatically adjusted.
- If idle speed is out of standard, refer to the General Diagnosis Table under “Engine Control System”. <Ref. to EN(H4DO)(diag)-2, Basic Diagnostic Procedure.>

   (1) Check the idle speed when no-loaded. (Headlight, heater fan, rear defroster, radiator fan, A/C and etc. are OFF)

Idling speed (At no load; Select lever is in “P” or “N” range on AT model; Gear shift lever is in neutral position on MT model.):

Standard

675±100 rpm (AT model)

650±100 rpm (MT model)

   (2) Check the idle speed when loaded. (Turn the A/C switch to “ON” and operate the compressor for at least one minute before measurement.)

Idling speed (With A/C ON; Select lever is in “P” or “N” range on AT model; Gear shift lever is in neutral position on MT model.):

Standard

850±100 rpm

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) Check the malfunction indicator light does not illuminate.
2) Warm up the engine.
3) Read the ignition timing using Subaru Select Monitor. <Ref. to EN(H4DO)(diag)-36, READ CURRENT DATA FOR ENGINE (NORMAL MODE), OPERATION, Subaru Select Monitor.>

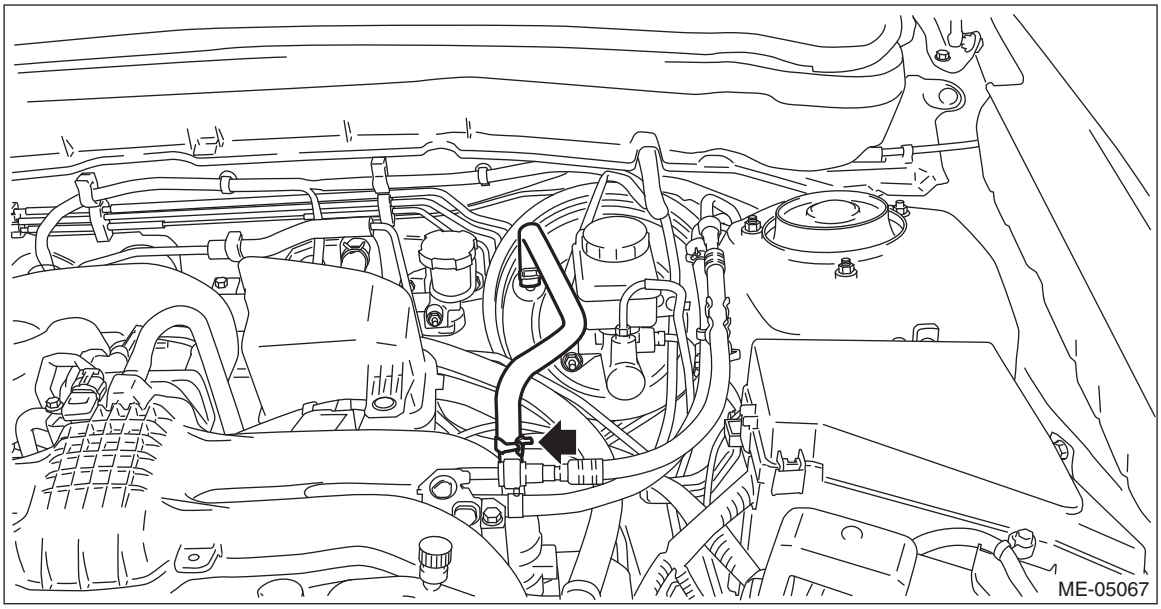
NOTE:
If ignition timing is out of standard, check the ignition control system. Refer to “Engine Control System”. <Ref. to EN(H4DO)(diag)-2, Basic Diagnostic Procedure.>

Ignition timing [BTDC/rpm]:
Standard
16°±10°/675 (AT model)
16°±10°/650 (MT model)

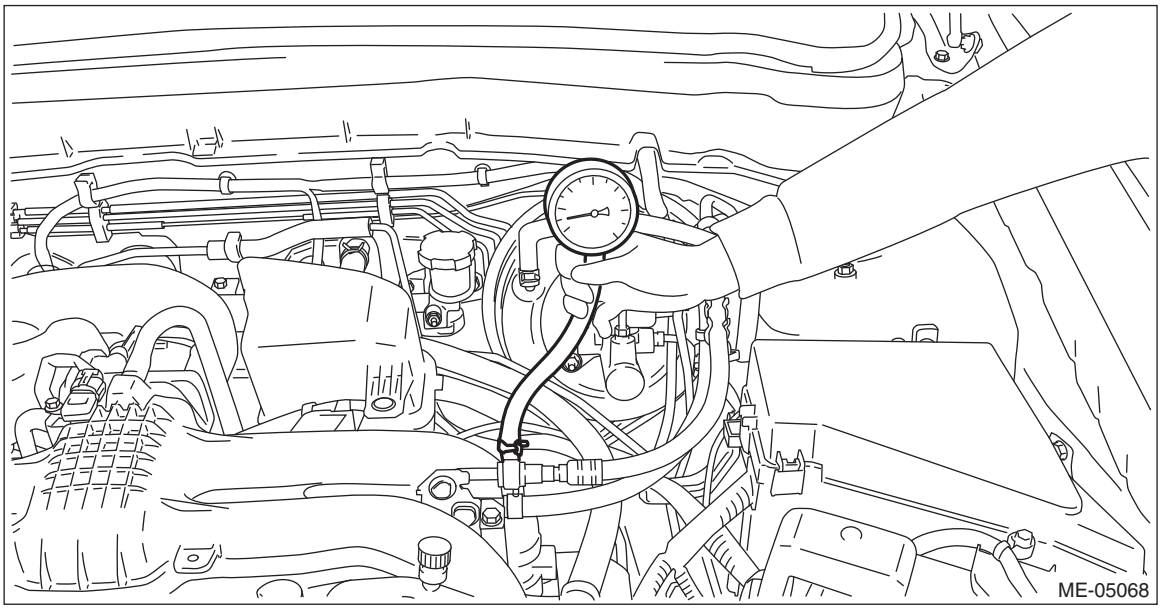
5. Intake Manifold Vacuum

A: INSPECTION

1) Warm up the engine.
2) Disconnect the brake booster vacuum hose from the intake manifold.



3) Connect the vacuum gauge to the intake manifold.



4) Keep the engine at idle speed and read the vacuum gauge indication.

NOTE:
Condition of engine inside can be diagnosed by observing the behavior of the vacuum gauge needle as described in table below.

Intake manifold vacuum (at idling, A/C OFF):
Standard
–60.0 kPa (–450 mmHg, –17.72 inHg) or more

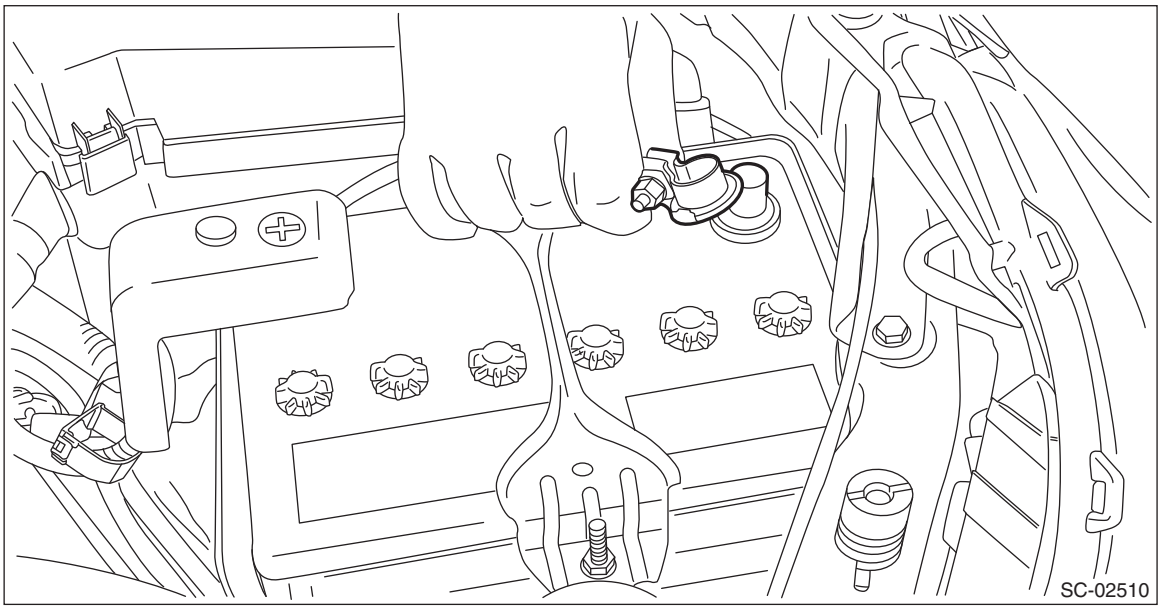
Diagnosis of engine condition by inspection of intake manifold vacuum	
Vacuum gauge needle behavior	Possible engine condition
1. Needle is steady but lower than standard value. This tendency becomes more evident as engine temperature rises.	Leakage around intake manifold gasket, or disconnected or damaged vacuum hose
2. Needle intermittently drops to position lower than standard value.	Leakage around cylinder
3. Needle drops suddenly and intermittently from standard value.	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 standard value in narrow range.	Defective ignition system

5) After inspection, install the related parts in the reverse order of removal.

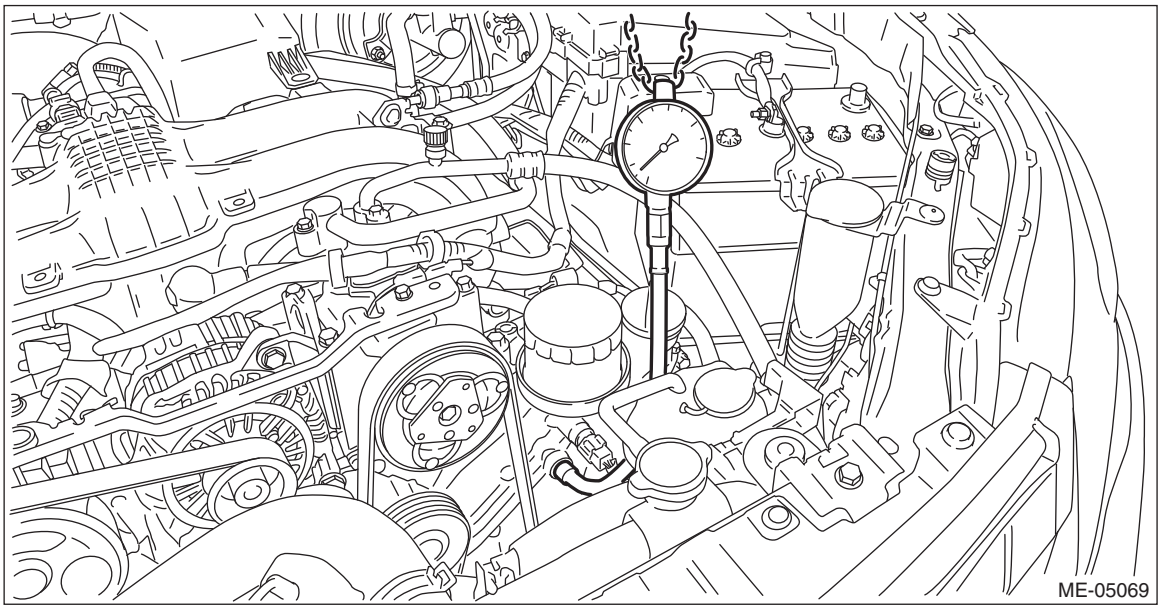
6. Engine Oil Pressure

A: INSPECTION

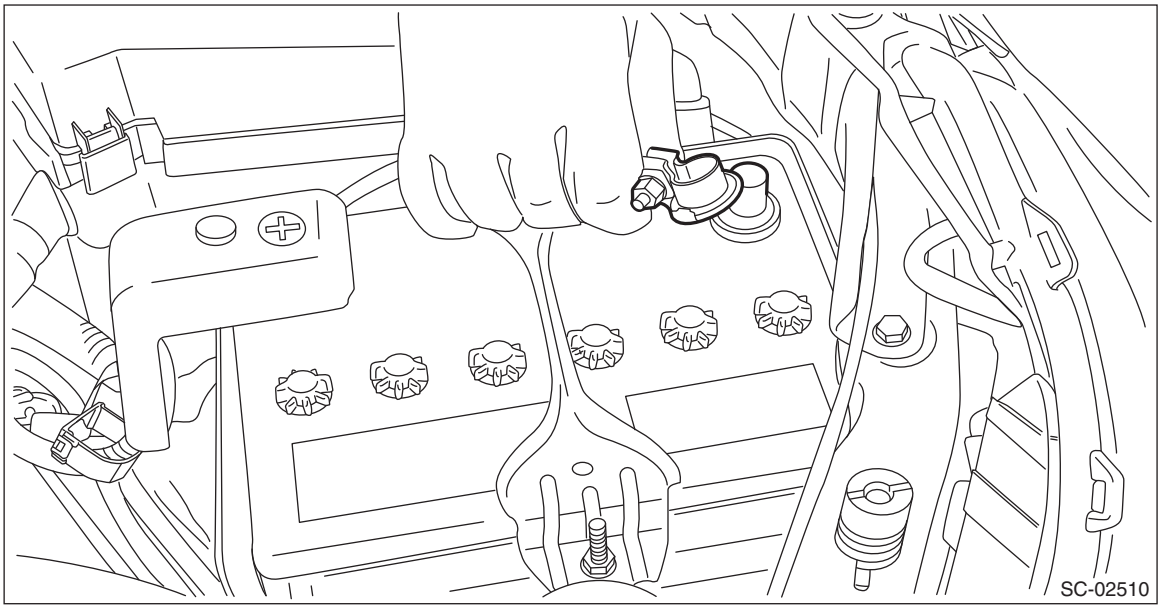
1) Disconnect the ground cable from battery.



2) Remove the oil pressure switch. <Ref. to LU(H4DO)-23, REMOVAL, Oil Pressure Switch.>
3) Install the oil pressure gauge to the chain cover.



4) Connect the battery ground terminal.



5) Start the engine, and check the oil pressure.

NOTE:
- Standard value is based on an engine oil temperature of 80°C (176°F).
- If the oil pressure is out of specification, check oil pump, oil filter and lubrication line. <Ref. to LU(H4DO)-30, INSPECTION, Engine Lubrication System Trouble in General.>
- If the oil pressure warning light is ON and oil pressure is within standard, check the oil pressure switch. <Ref. to LU(H4DO)-30, INSPECTION, Engine Lubrication System Trouble in General.>

Engine oil pressure:
Standard
50 kPa (0.5 kgf/cm^2, 7 psi) or more at 600 rpm
350 kPa (3.6 kgf/cm^2, 51 psi) or more at 6,000 rpm

6) After inspection, install the related parts in the reverse order of removal.

7. Fuel Pressure

A: INSPECTION

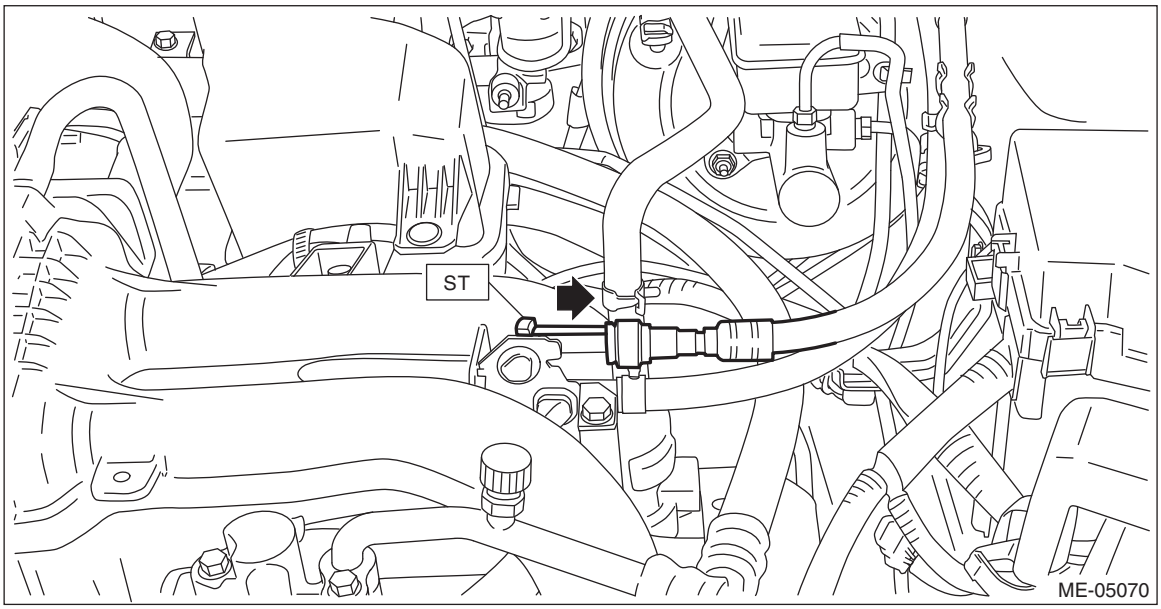
CAUTION:
- **Before removing the fuel pressure gauge, release the fuel pressure.**
- **Be careful not to spill fuel.**
- **Catch the fuel from hoses using a container or cloth.**

1) Release the fuel pressure. <Ref. to FU(H4DO)-109, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Open the fuel filler lid and remove the fuel filler cap.
3) Disconnect the fuel delivery hose from the fuel delivery pipe, and connect the fuel pressure gauge.

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

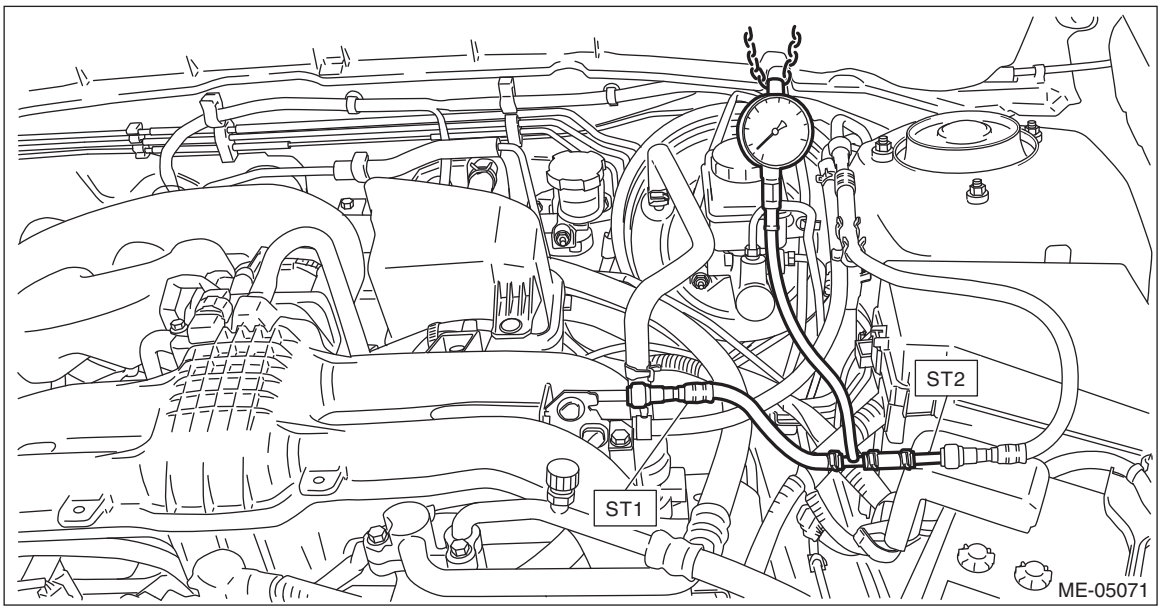
(1) Attach ST to the fuel delivery pipe and push ST in the direction of arrow mark to disconnect the quick connector of the fuel delivery hose.

ST 42099AE000 QUICK CONNECTOR RELEASE



(2) Connect the fuel pressure gauge with ST1 and ST2.

NOTE:
ST1 is a SUBARU genuine part.
ST1 42075AG690 FUEL HOSE
ST2 18471AA000 FUEL PIPE ADAPTER



4) Start the engine.
5) Check the fuel pressure after warming up the engine.

NOTE:
• The fuel pressure gauge registers 10 to 20 kPa (0.1 to 0.2 kgf/cm^2, 1 to 3 psi) higher than standard values during high-altitude operations.
• Check or replace the fuel pump and fuel delivery line if the fuel pressure is out of the standard.

Fuel pressure:
Standard
340 — 400 kPa (3.5 — 4.1 kgf/cm^2, 49 — 58 psi)

6) After inspection, install the related parts in the reverse order of removal.

8. Cam Clearance

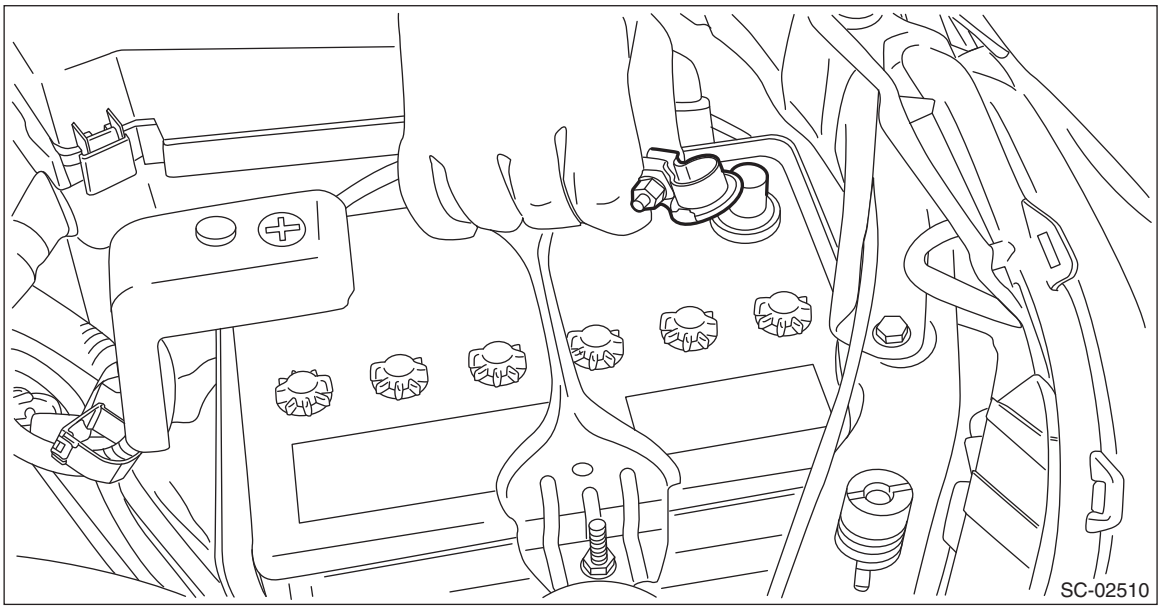
A: INSPECTION

1. WHEN TIMING CHAIN ASSEMBLY IS NOT REMOVED

CAUTION:
When working on the vehicle, if engine oil is spilt onto the exhaust pipe, wipe it off with cloth to avoid emission of smoke or causing a fire.

NOTE:
- Inspection of cam clearance should be performed while engine is cold.
- If the engine is removed from vehicle, performing the step 1) and 2) is not necessary.

1) Disconnect the ground cable from battery.



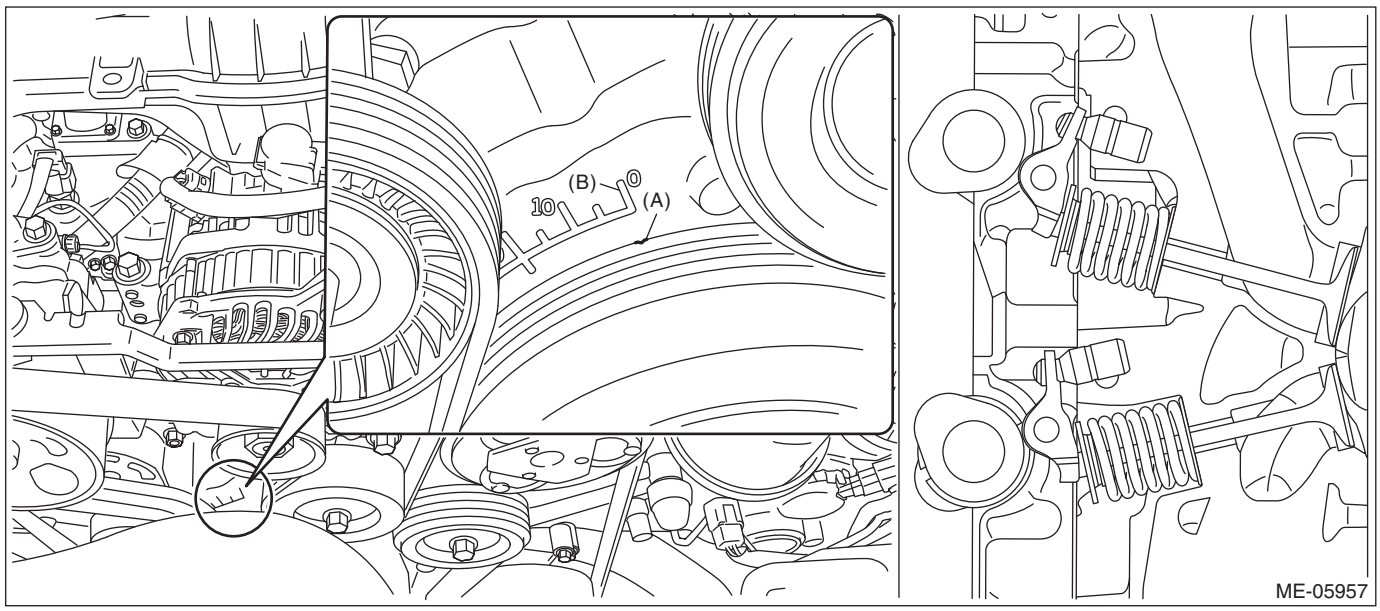
2) Remove the air intake duct (Rear). <Ref. to IN(H4DO)-14, REMOVAL, Air Intake Duct.>
3) When inspecting #1 and #3 cylinders
   (1) Remove the rocker cover RH. <Ref. to ME(H4DO)-139, ROCKER COVER RH, REMOVAL, Rocker Cover.>

NOTE:
When working on the vehicle, place a suitable container under the vehicle.

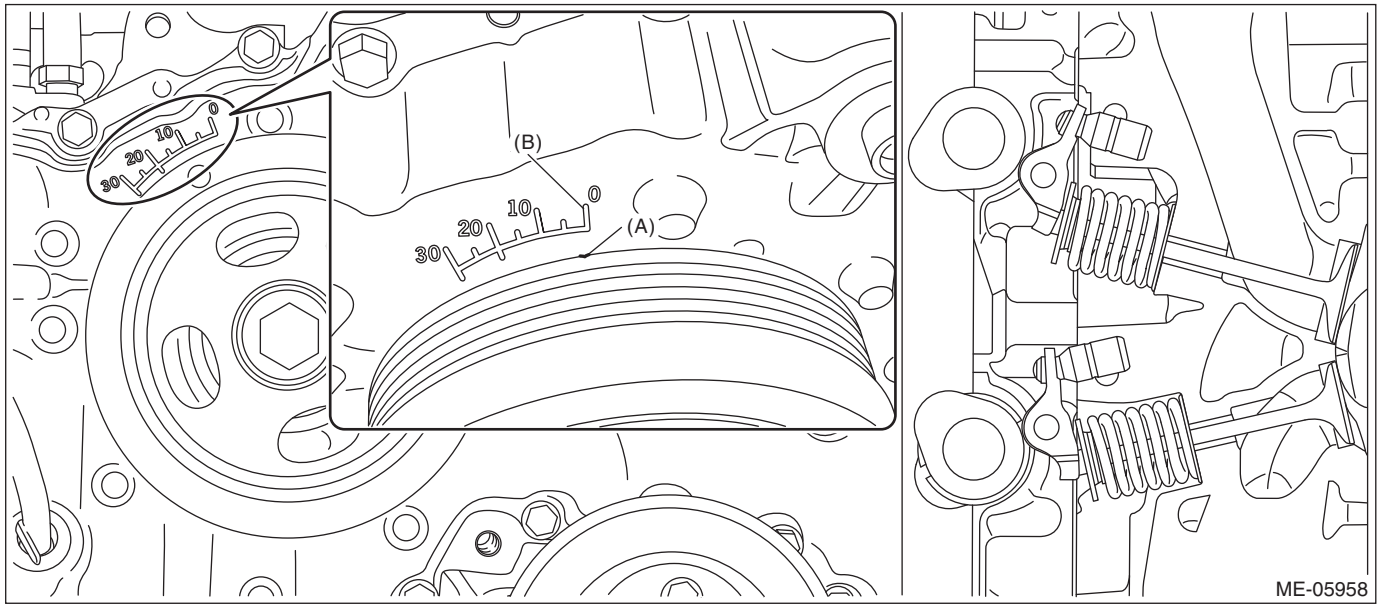
   (2) Set #1 cylinder piston to top dead center of compression stroke by rotating the crank pulley clockwise using the socket wrench.

NOTE:
When the timing mark (A) on crank pulley is aligned to the 0° in timing gauge (B) on chain cover as shown in the figure, the #1 cylinder piston is located at TDC of compression stroke if the intake camshaft and exhaust camshaft does not depress the #1 cylinder intake side roller rocker arm (intake valve) and exhaust side roller rocker arm (exhaust valve). If roller rocker arm (valve) is depressed, turn the crank pulley by 360° in order to make #1 cylinder piston at TDC of compression stroke.

- When working on the vehicle



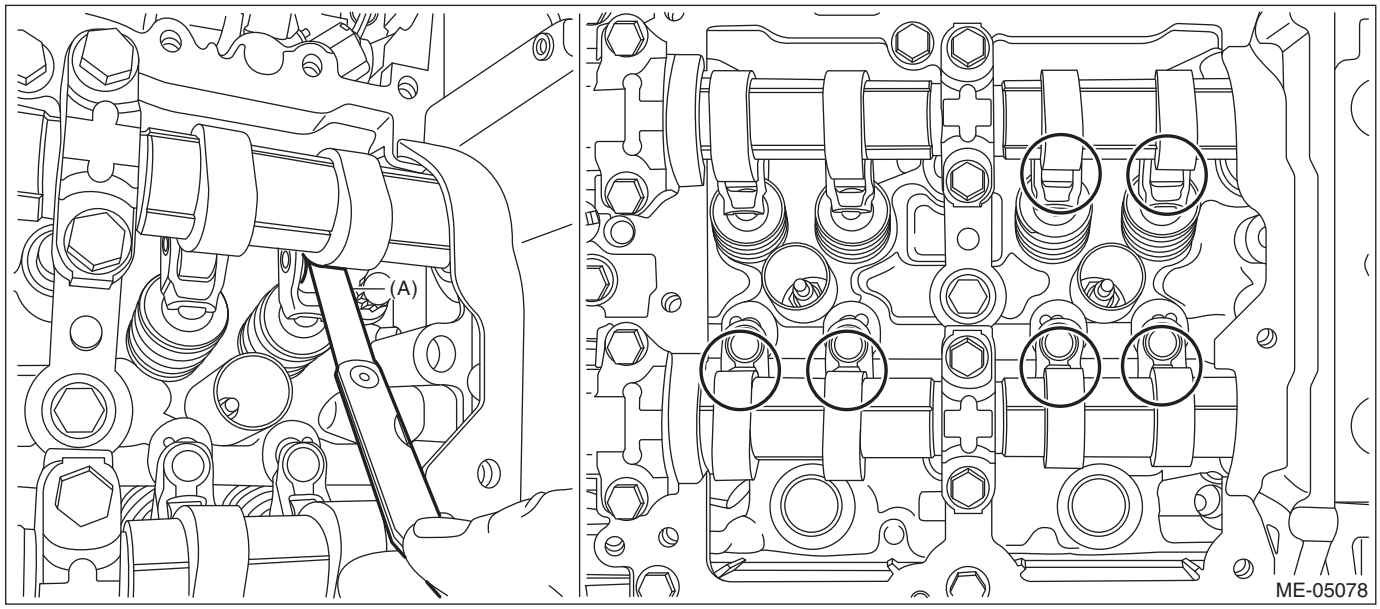
- When working on the engine unit only



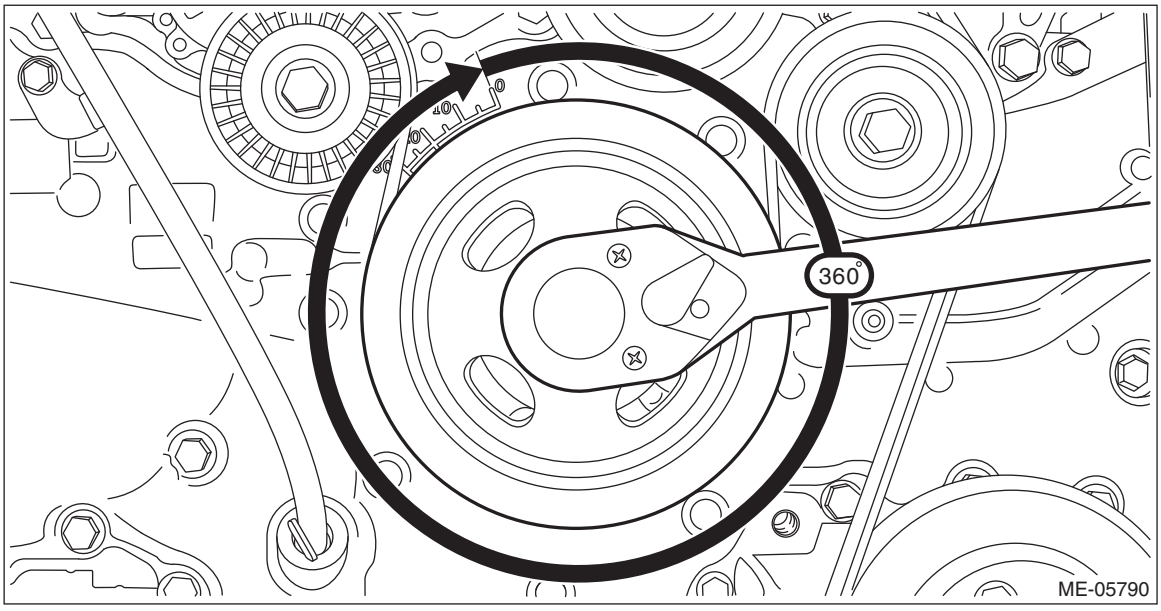
(3) Check the cam clearance for #1 cylinder intake, #1 cylinder exhaust and #3 cylinder exhaust.

NOTE:
- Measure the roller surface of cam base circle and roller rocker arm using thickness gauge (A).
- If the measured value is out of standard, take notes of the value in order to adjust the cam clearance later on.

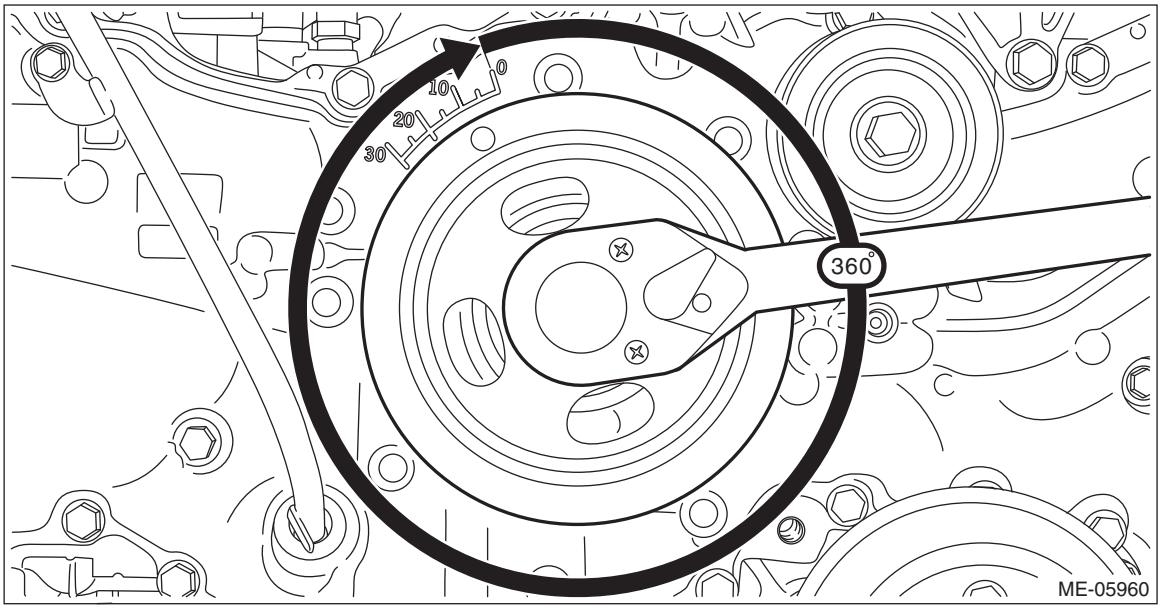
Cam clearance:
Intake
Standard
0.13±0.03 mm (0.0051±0.0012 in)
Exhaust
Standard
0.24±0.03 mm (0.0094±0.0012 in)



(4) Turn the crank pulley by 360°.
- When working on the vehicle



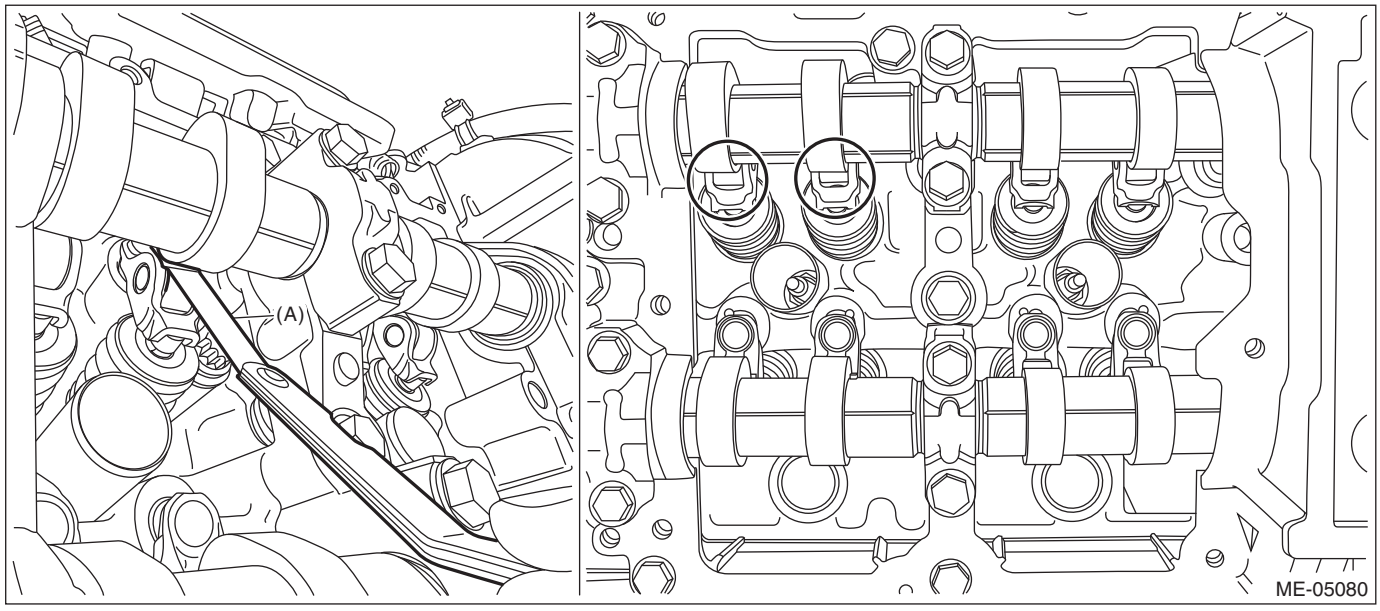
- When working on the engine unit only



(5) Check the clearance of #3 cylinder intake.

NOTE:
- Measure the roller surface of cam base circle and roller rocker arm using thickness gauge (A).
- If the measured value is out of standard, take notes of the value in order to adjust the cam clearance later on.

Cam clearance:
Standard
0.13±0.03 mm (0.0051±0.0012 in)

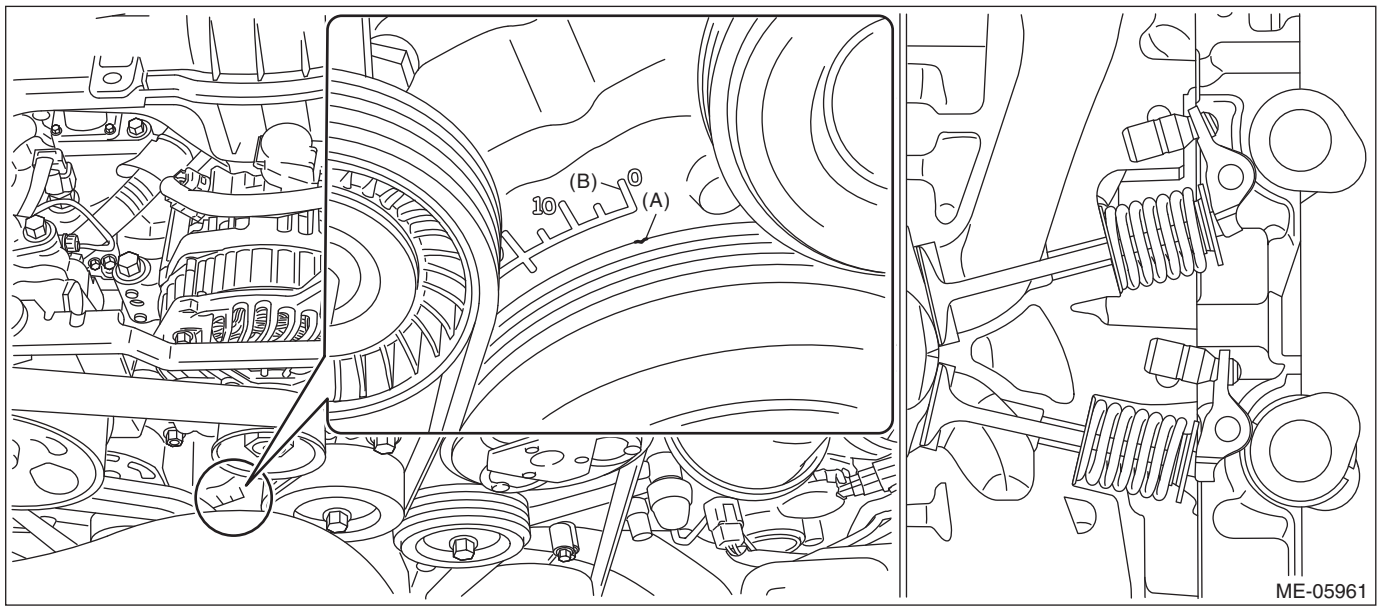


4) When inspecting #2 and #4 cylinders
(1) Remove the rocker cover LH. <Ref. to ME(H4DO)-141, ROCKER COVER LH, REMOVAL, Rocker Cover.>

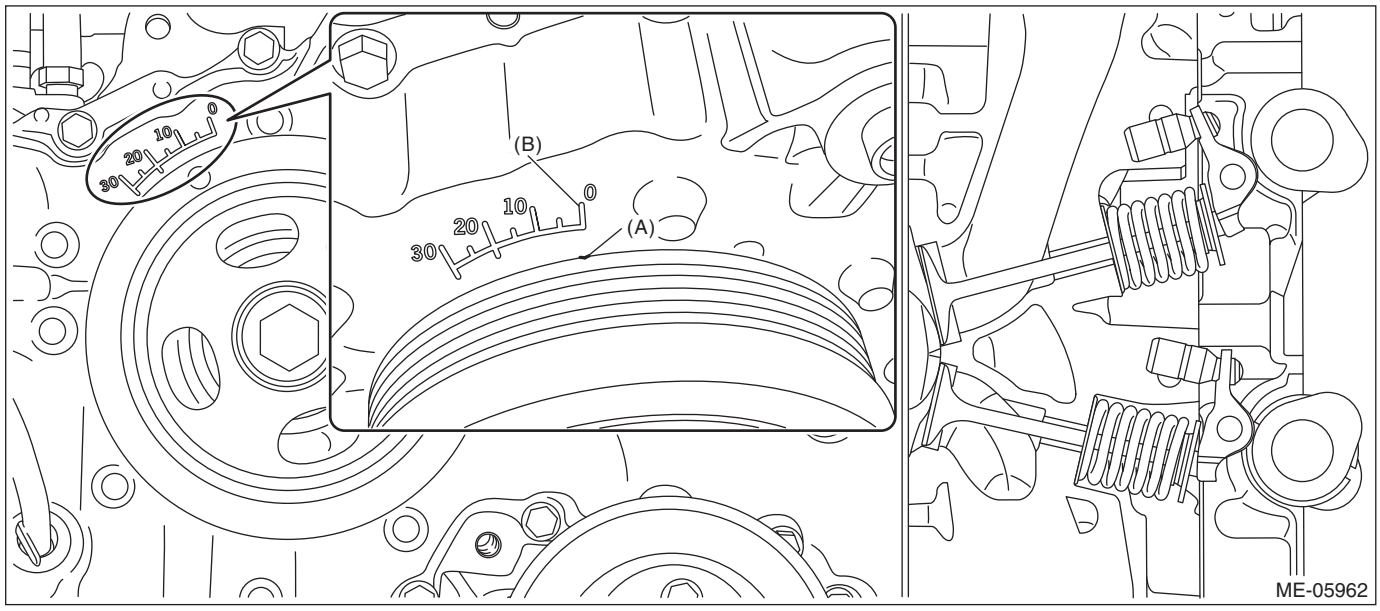
NOTE:
When working on the vehicle, place a suitable container under the vehicle.
(2) Set #2 cylinder piston to top dead center of compression stroke by rotating the crank pulley clockwise using the socket wrench.

NOTE:
When the timing mark (A) on crank pulley is aligned to the 0° in timing gauge (B) on chain cover as shown in the figure, the #2 cylinder piston is located at TDC of compression stroke if the intake camshaft and exhaust camshaft does not depress the #2 cylinder intake side roller rocker arm (intake valve) and exhaust side roller rocker arm (exhaust valve). If roller rocker arm (valve) is depressed, turn the crank pulley by 360° in order to make #2 cylinder piston at TDC of compression stroke.

- When working on the vehicle



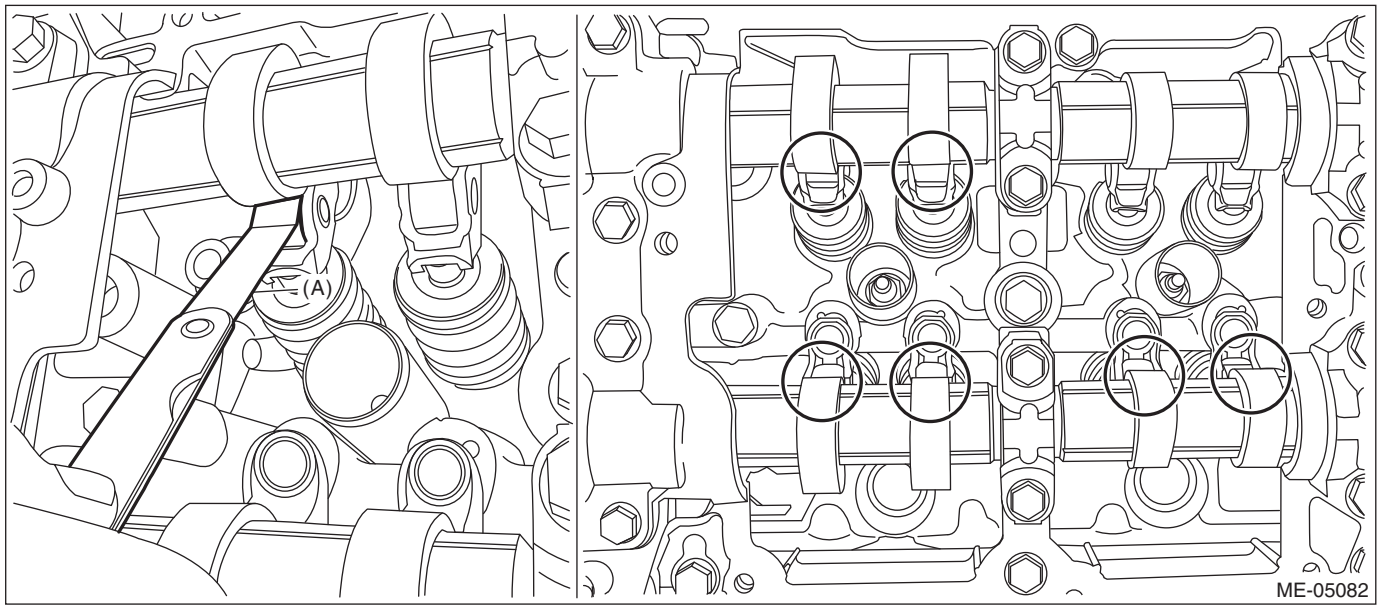
- When working on the engine unit only



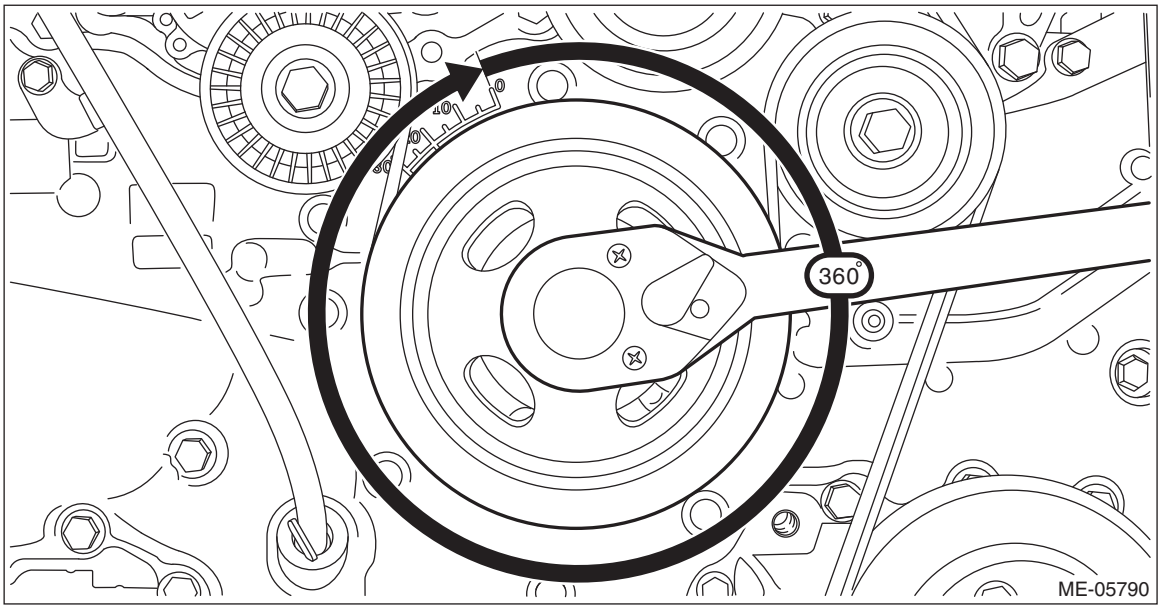
(3) Check the cam clearance for #2 cylinder intake, #2 cylinder exhaust and #4 cylinder exhaust.

NOTE:
- Measure the roller surface of cam base circle and roller rocker arm using thickness gauge (A).
- If the measured value is out of standard, take notes of the value in order to adjust the cam clearance later on.

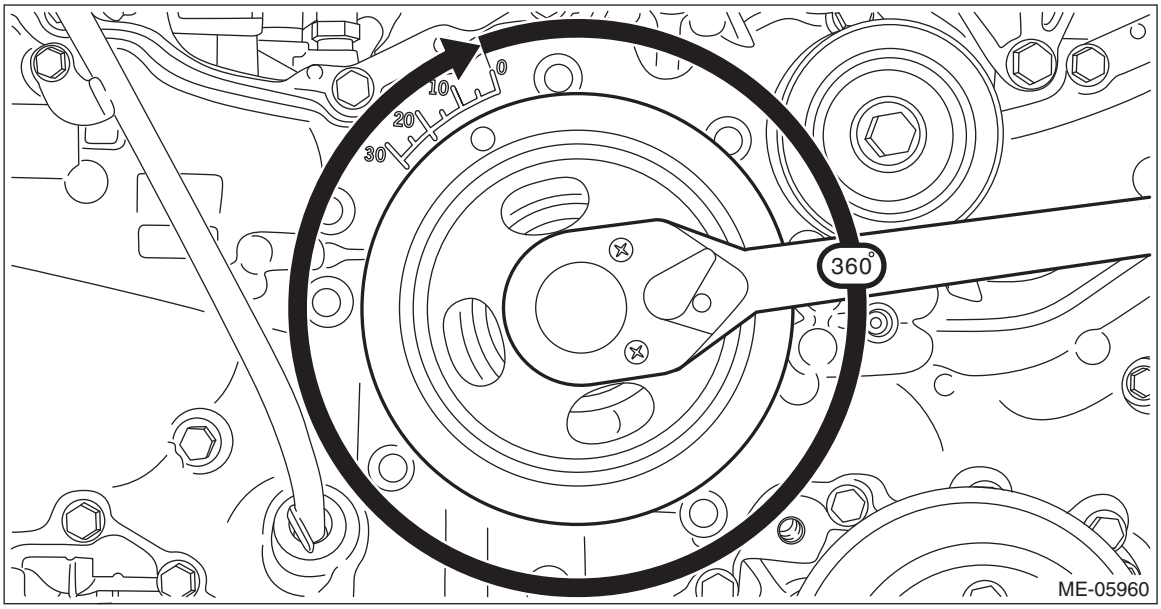
Cam clearance:
Intake
Standard
0.13±0.03 mm (0.0051±0.0012 in)
Exhaust
Standard
0.24±0.03 mm (0.0094±0.0012 in)



(4) Turn the crank pulley by 360°.
- When working on the vehicle



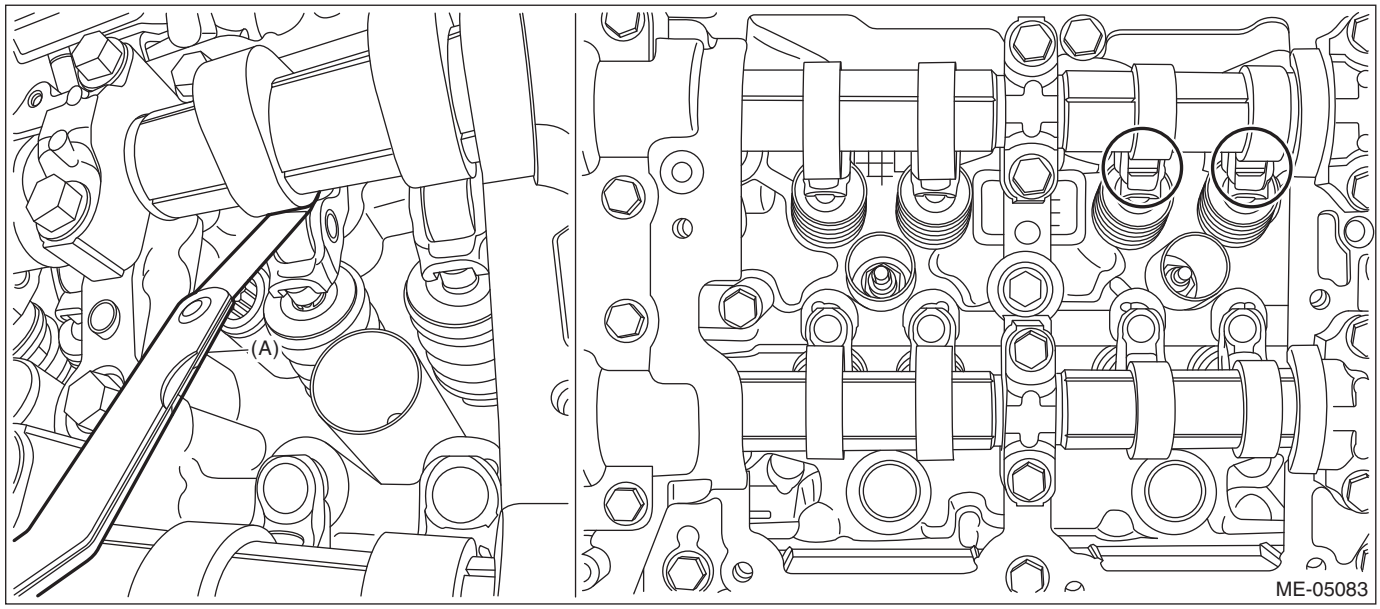
- When working on the engine unit only



(5) Check the clearance of #4 cylinder intake.

NOTE:
- Measure the roller surface of cam base circle and roller rocker arm using thickness gauge (A).
- If the measured value is out of standard, take notes of the value in order to adjust the cam clearance later on.

Cam clearance:
Standard
0.13±0.03 mm (0.0051±0.0012 in)



5) If necessary, adjust the cam clearance. <Ref. to ME(H4DO)-41, ADJUSTMENT, Cam Clearance.>
6) After inspection, install the related parts in the reverse order of removal.

2. WHEN TIMING CHAIN ASSEMBLY IS REMOVED

NOTE:
Inspection of cam clearance should be performed while engine is cold.

1) When inspecting #1 and #3 cylinders
   (1) Remove the rocker cover RH. <Ref. to ME(H4DO)-139, ROCKER COVER RH, REMOVAL, Rocker Cover.>

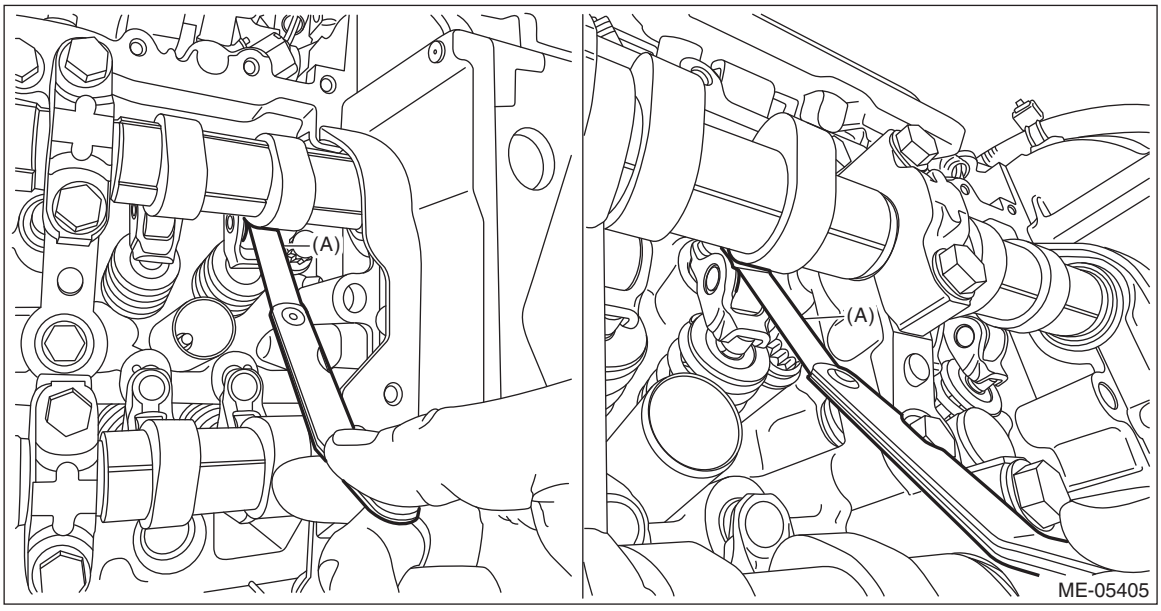
NOTE:
When working on the vehicle, place a suitable container under the vehicle.

   (2) Check the #1 and #3 cylinder cam clearance.

CAUTION:
Intake and exhaust camshafts can be independently rotated with the timing chain removed. When the intake valve and exhaust valve lift at the same time, the valve heads contact each other and valve stem may bend. Do not turn it to the outside of range of zero lift (cam base circle position) (in range where it can be turned lightly by hand).

NOTE:
- For cam clearance inspection, adjust the cam base circle position so that the thickness gauge (A) can be inserted easily by hand turning the camshaft (cam sprocket) to be measured.
- Measure the roller surface of cam base circle and roller rocker arm using thickness gauge (A).
- If the measured value is out of standard, take notes of the value in order to adjust the cam clearance later on.

Cam clearance:
Intake
Standard
0.13±0.03 mm (0.0051±0.0012 in)
Exhaust
Standard
0.24±0.03 mm (0.0094±0.0012 in)



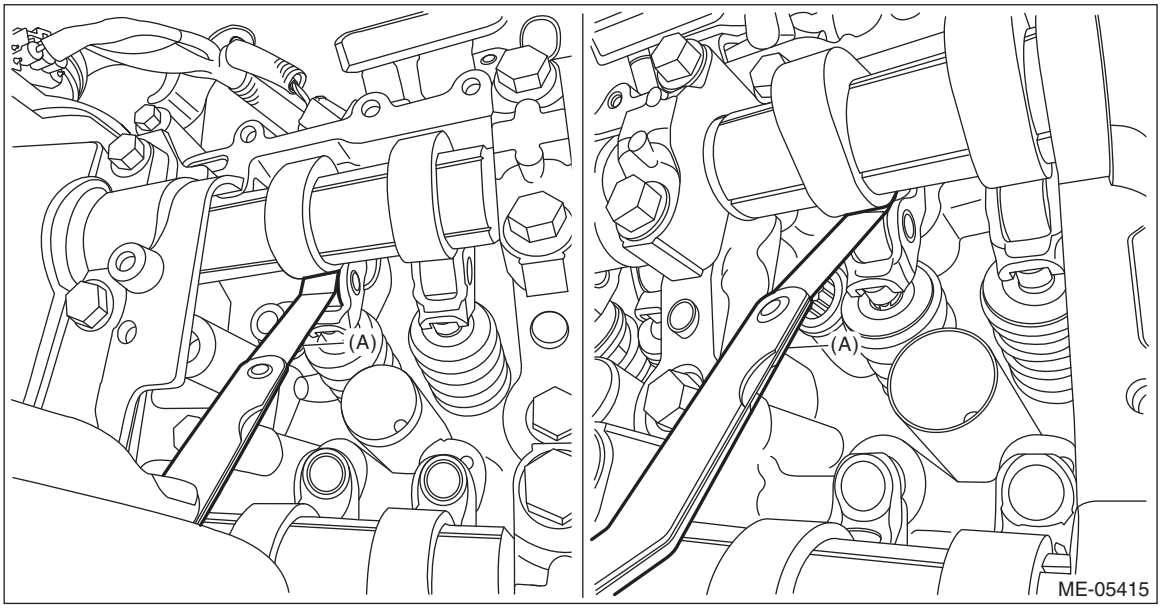
2) When inspecting #2 and #4 cylinders
(1) Remove the rocker cover LH. <Ref. to ME(H4DO)-141, ROCKER COVER LH, REMOVAL, Rocker Cover.>

NOTE:
When working on the vehicle, place a suitable container under the vehicle.
(2) Check the #2 and #4 cylinder cam clearance.

CAUTION:
Intake and exhaust camshafts can be independently rotated with the timing chain removed. When the intake valve and exhaust valve lift at the same time, the valve heads contact each other and valve stem may bend. Do not turn it to the outside of range of zero lift (cam base circle position) (in range where it can be turned lightly by hand).

NOTE:
• For cam clearance inspection, adjust the cam base circle position so that the thickness gauge (A) can be inserted easily by hand turning the camshaft (cam sprocket) to be measured.
• Measure the roller surface of cam base circle and roller rocker arm using thickness gauge (A).
• If the measured value is out of standard, take notes of the value in order to adjust the cam clearance later on.

Cam clearance:
Intake
Standard
0.13±0.03 mm (0.0051±0.0012 in)
Exhaust
Standard
0.24±0.03 mm (0.0094±0.0012 in)

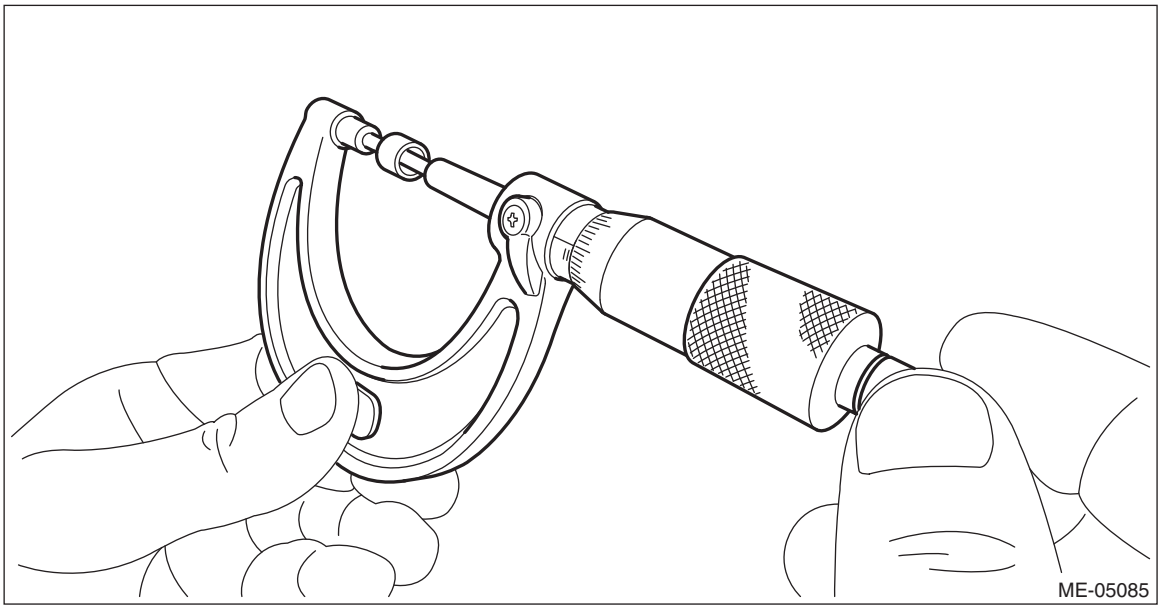


3) If necessary, adjust the cam clearance. <Ref. to ME(H4DO)-41, ADJUSTMENT, Cam Clearance.>
4) After inspection, install the related parts in the reverse order of removal.

B: ADJUSTMENT

1) Remove the engine from the vehicle. <Ref. to ME(H4DO)-44, REMOVAL, Engine Assembly.>
2) Remove the chain cover. <Ref. to ME(H4DO)-91, REMOVAL, Chain Cover.>
3) When adjusting #1 and #3 cylinders
   (1) Remove the timing chain RH. <Ref. to ME(H4DO)-109, TIMING CHAIN RH, REMOVAL, Timing Chain Assembly.>
   (2) Remove the cam carrier RH. <Ref. to ME(H4DO)-152, CAM CARRIER RH, REMOVAL, Cam Carrier.>
   (3) Measure the thickness of valve shim using micrometer.

NOTE:
Measurement should be performed at a temperature of 20°C (68°F).



   (4) Select a valve shim of suitable thickness using the measured cam clearance and valve shim thickness.

NOTE:
Use a new valve shim.

Formula
Intake side: S = T + 1.54 × (V – 0.13 mm (0.0051 in)) Exhaust side: S = T + 1.69 × (V – 0.24 mm (0.0094 in))
S: Valve shim thickness required V: Measured cam clearance T: Current valve shim thickness

   (5) Install the cam carrier RH. <Ref. to ME(H4DO)-162, CAM CARRIER RH, INSTALLATION, Cam Carrier.>

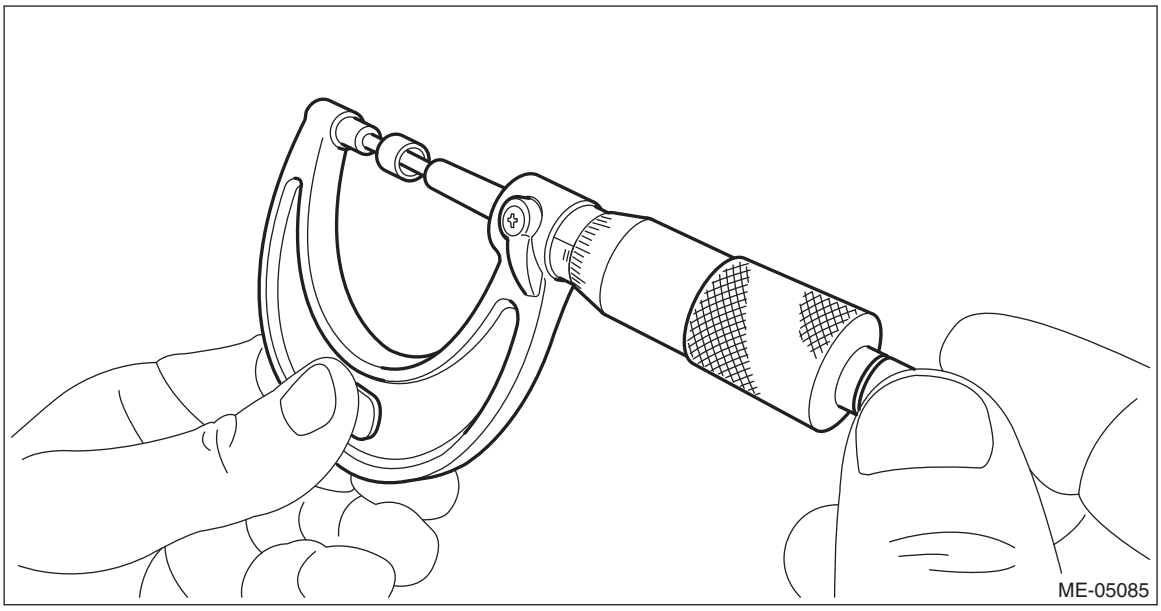
(6) Check all the cam clearance of RH side at this time. If the cam clearance is not within the standard value, repeat the procedure over again from step 2).

NOTE:
When the removing/installing of cam carrier RH has been performed, cam clearance may be outside the standard value. Checking of all cam clearance of RH side is necessary. Refer to INSPECTION of "Cam Clearance" for the cam clearance inspection. <Ref. to ME(H4DO)-39, WHEN TIMING CHAIN ASSEMBLY IS REMOVED, INSPECTION, Cam Clearance.>

Cam clearance:
Intake
Standard
0.13±0.03 mm (0.0051±0.0012 in)
Exhaust
Standard
0.24±0.03 mm (0.0094±0.0012 in)

4) When adjusting #2 and #4 cylinders
(1) Remove the timing chain LH. <Ref. to ME(H4DO)-111, TIMING CHAIN LH, REMOVAL, Timing Chain Assembly.>
(2) Remove the cam carrier LH. <Ref. to ME(H4DO)-156, CAM CARRIER LH, REMOVAL, Cam Carrier.>
(3) Measure the thickness of valve shim using micrometer.

NOTE:
Measurement should be performed at a temperature of 20°C (68°F).



(4) Select a valve shim of suitable thickness using the measured cam clearance and valve shim thickness.

NOTE:
Use a new valve shim.

Formula
Intake side: S = T + 1.54 × (V – 0.13 mm (0.0051 in)) Exhaust side: S = T + 1.69 × (V – 0.24 mm (0.0094 in))
S: Valve shim thickness required V: Measured cam clearance T: Current valve shim thickness

(5) Install the cam carrier LH. <Ref. to ME(H4DO)-172, CAM CARRIER LH, INSTALLATION, Cam Carrier.>

(6) Check all the cam clearance of LH side at this time. If the cam clearance is not within the standard value, repeat the procedure over again from step 2).

NOTE:
When the removing/installing of cam carrier LH has been performed, cam clearance may be outside the standard value. Checking of all cam clearance of LH side is necessary. Refer to INSPECTION of “Cam Clearance” for the cam clearance inspection. <Ref. to ME(H4DO)-39, WHEN TIMING CHAIN ASSEMBLY IS REMOVED, INSPECTION, Cam Clearance.>

Cam clearance:
Intake
Standard
0.13±0.03 mm (0.0051±0.0012 in)
Exhaust
Standard
0.24±0.03 mm (0.0094±0.0012 in)

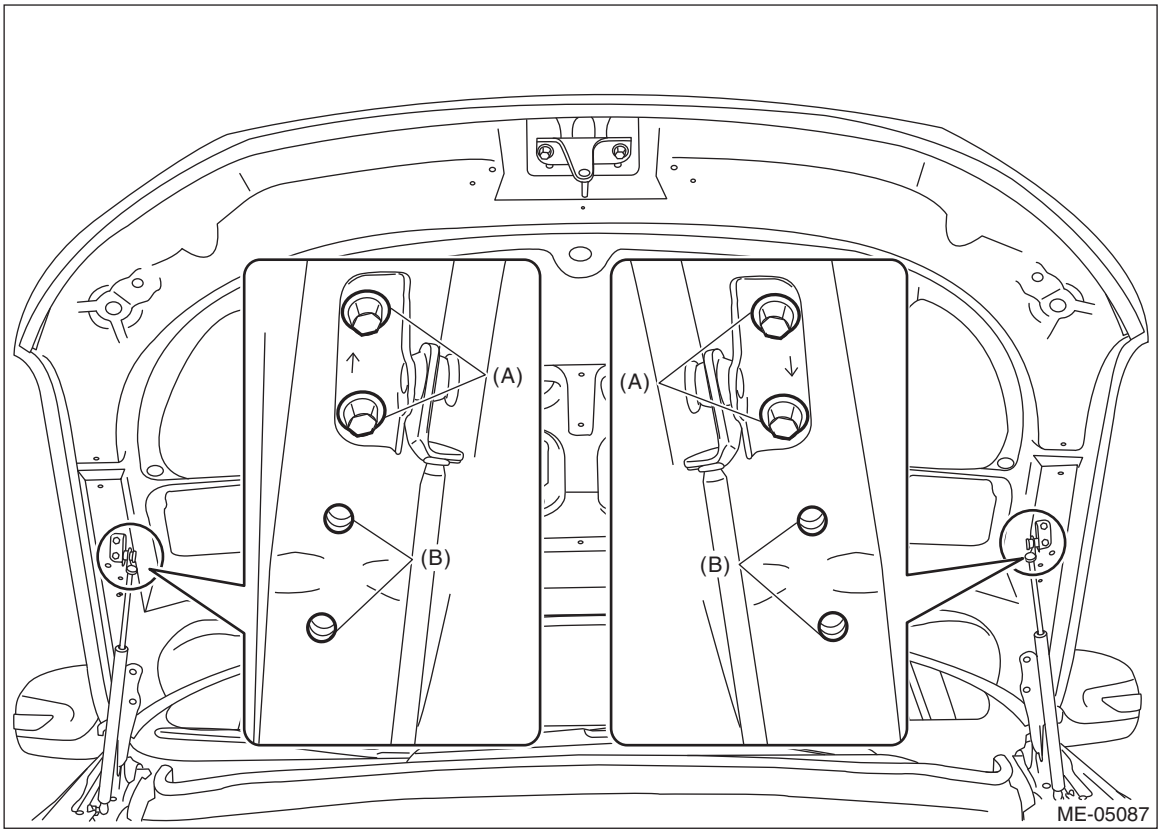
5) After adjustment, install the related parts in the reverse order of removal.

9. Engine Assembly

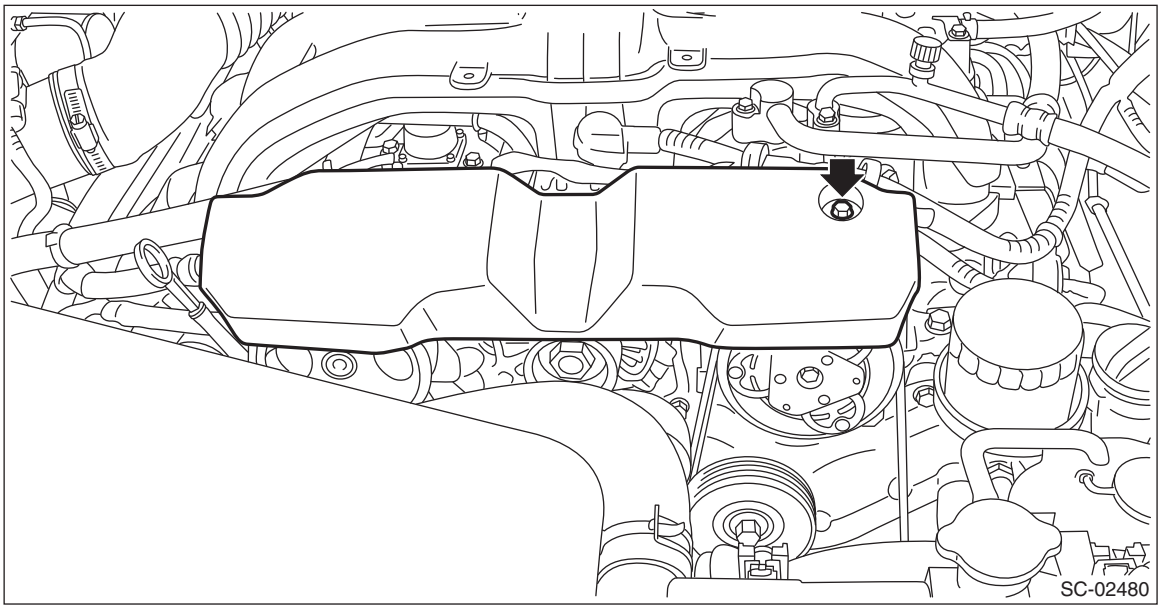
A: REMOVAL

1) Change the bolt installation position from (A) to (B), then open the front hood completely.

Tightening torque:
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)

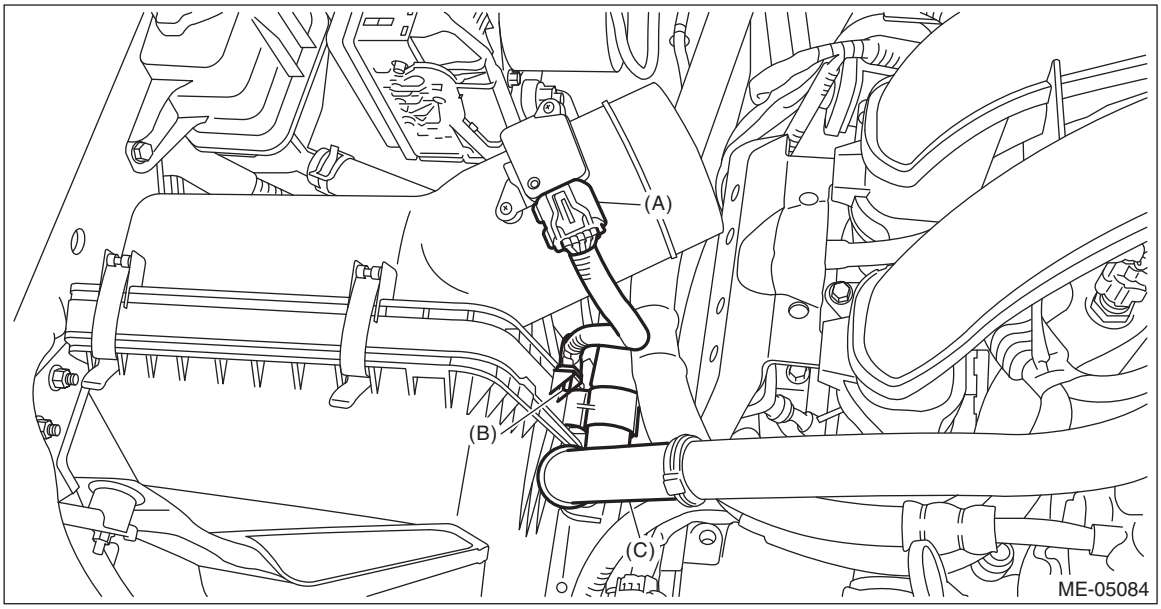


2) Remove the V-belt covers.

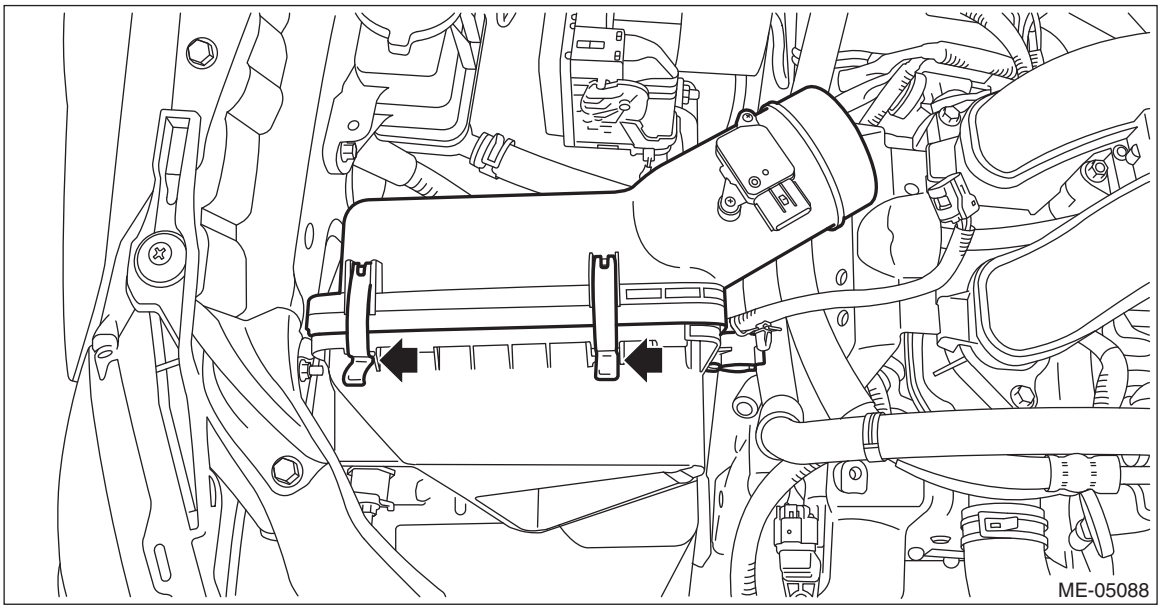


3) Collect the refrigerant from A/C system. <Ref. to AC-23, Refrigerant Recovery Procedure.>
4) Release the fuel pressure. <Ref. to FU(H4DO)-109, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
5) Remove the battery. <Ref. to SC(H4DO)-59, REMOVAL, Battery.>

6) Remove the air intake duct (Rear). <Ref. to IN(H4DO)-14, REMOVAL, Air Intake Duct.>
7) Remove the air intake boot. <Ref. to IN(H4DO)-13, REMOVAL, Air Intake Boot.>
8) Disconnect the connector (A) from the mass air flow and intake air temperature sensor, and remove the clip (B) which holds the mass air flow and intake air temperature sensor harness.
9) Remove the suction hose (C) from the air cleaner case (rear).

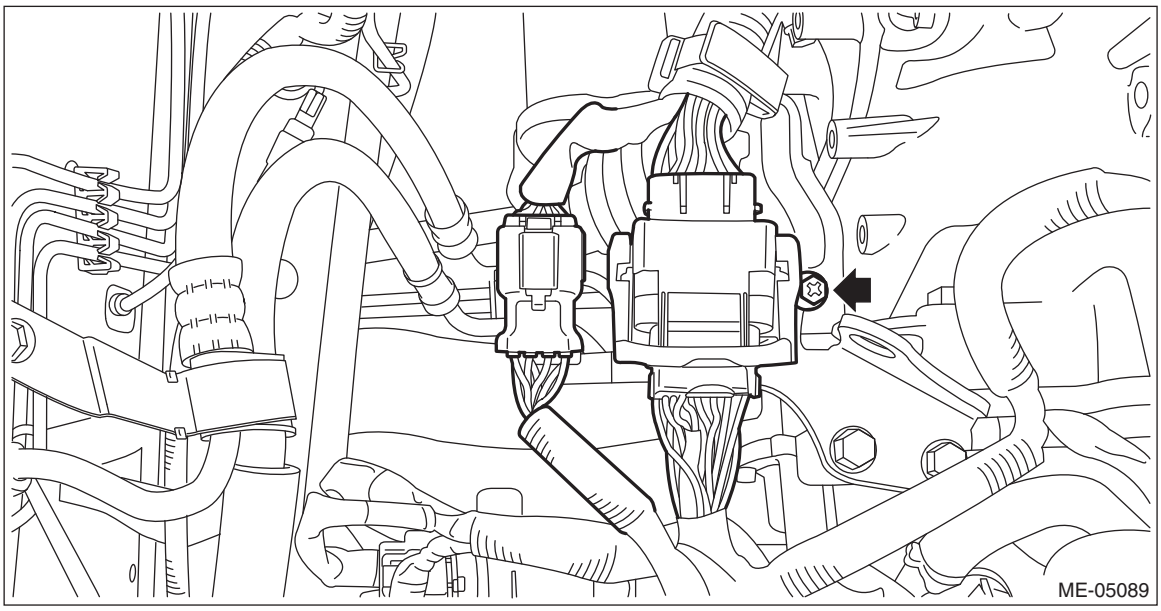


10) Remove the air cleaner case (rear).

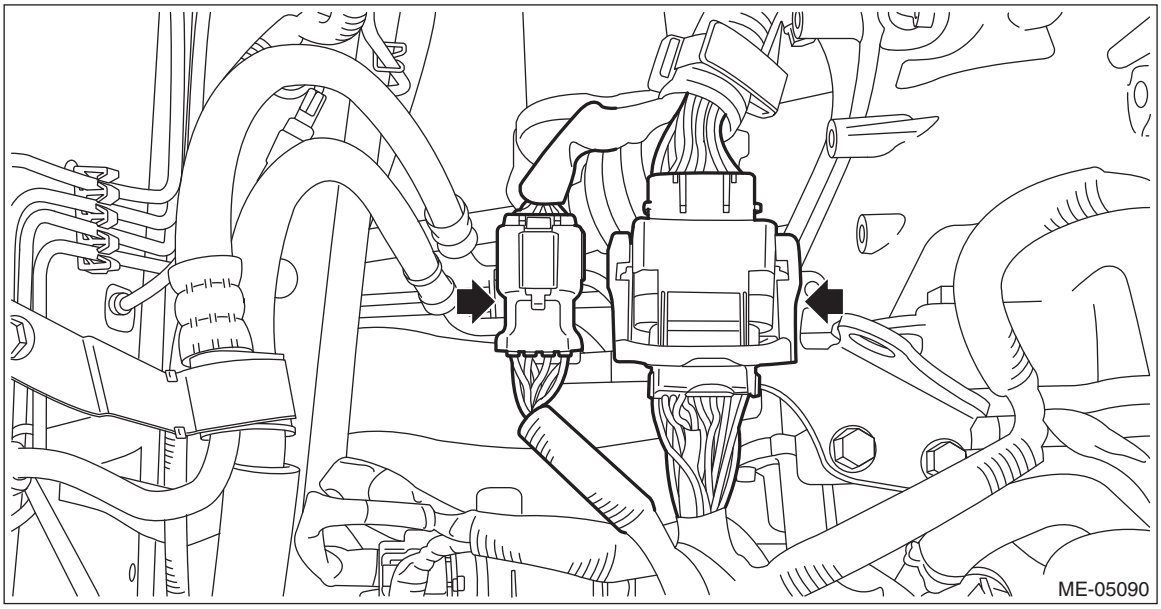


11) Remove the radiator. <Ref. to CO(H4DO)-23, REMOVAL, Radiator.>

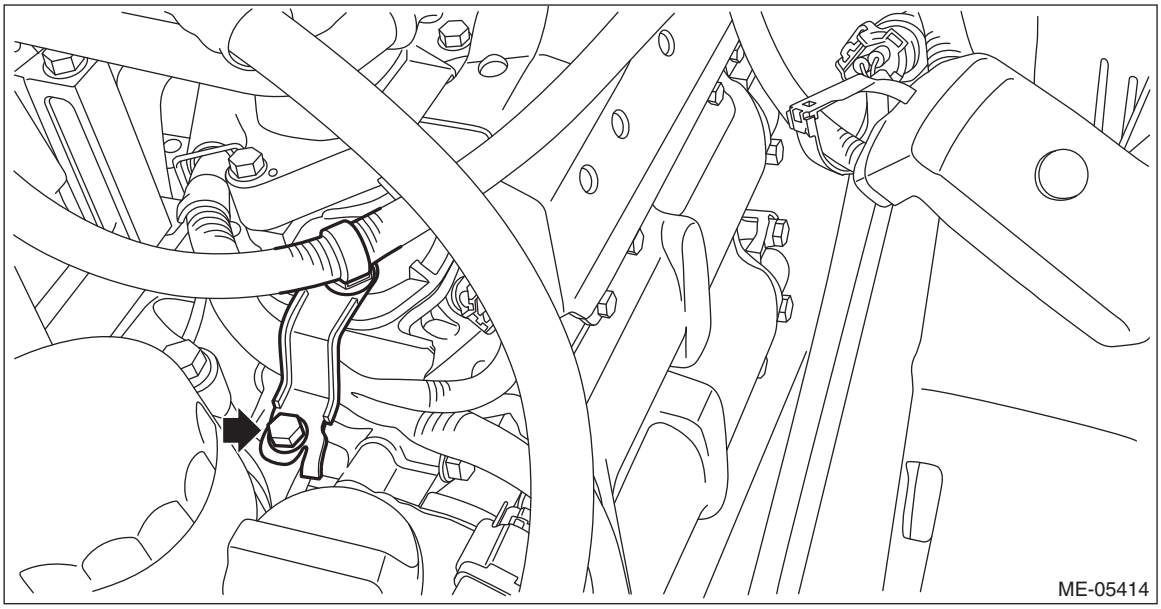
12) Disconnect the engine harness connector.
(1) Remove the bolt securing the bulkhead harness connector bracket.



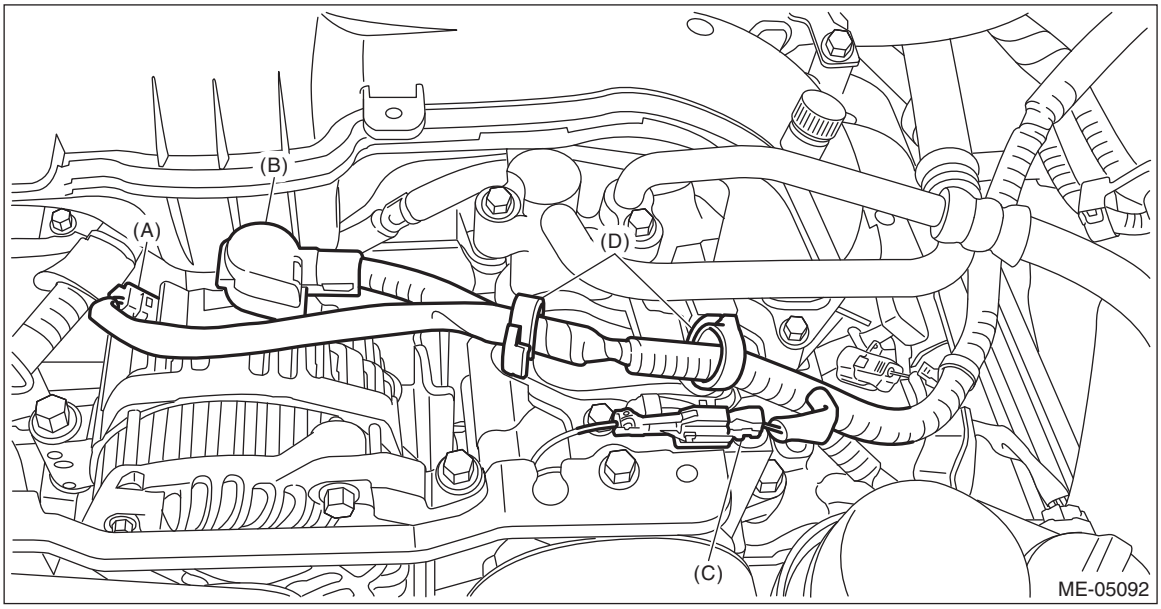
(2) Disconnect the bulkhead harness connector from the engine harness connector (black) and engine harness connector (brown).



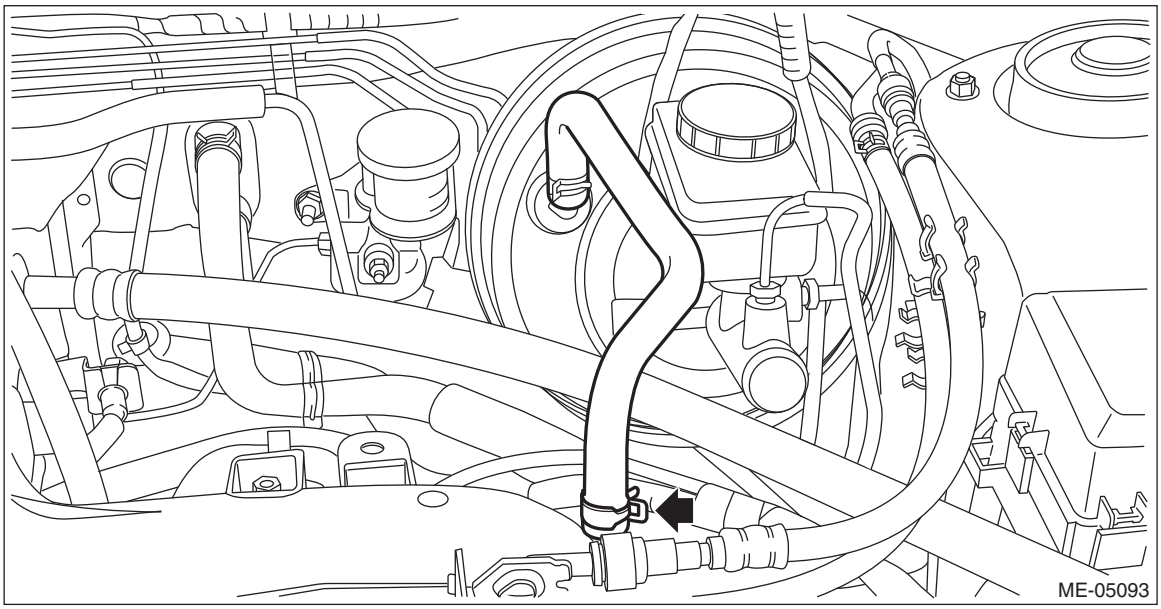
13) Remove the bolts which secure the generator cord stay to the chain cover.



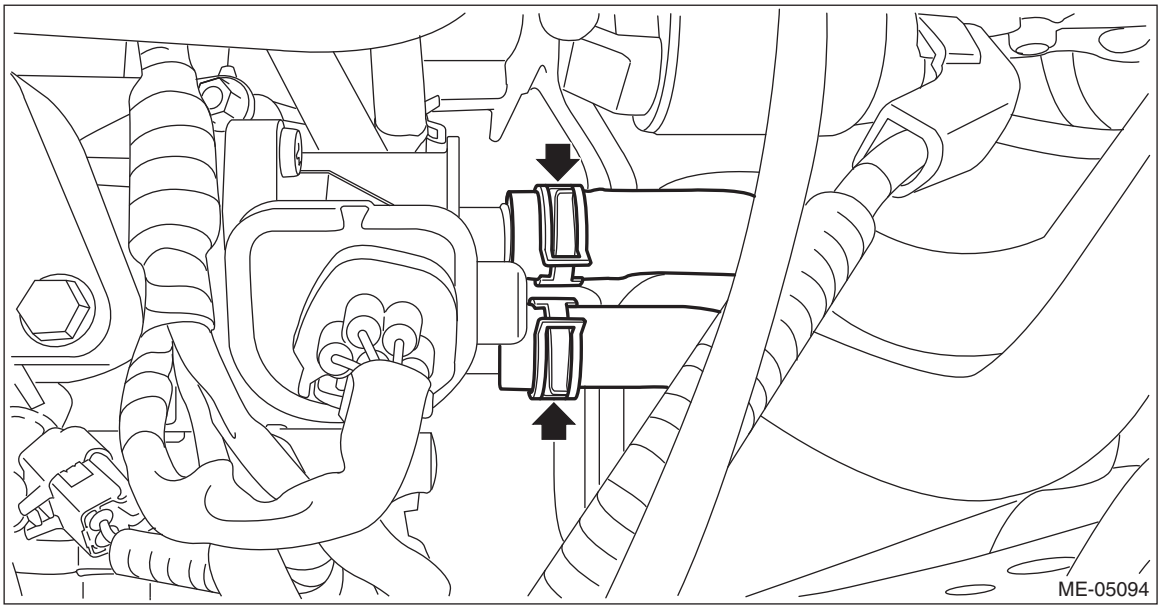
14) Disconnect connector (A) and terminal (B) from the generator, and disconnect connector (C) from A/C compressor.
15) Remove the generator cord from the clip (D) and move the generator cord to the left side wheel apron.



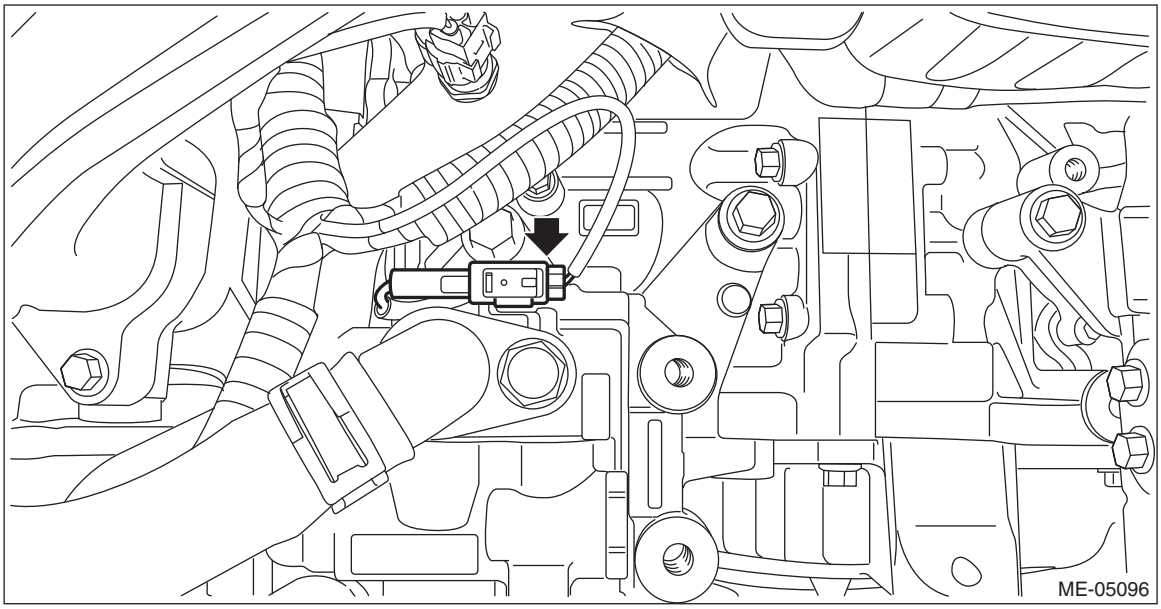
16) Disconnect the following hoses.
(1) A/C pressure hose <Ref. to AC-42, REMOVAL, Hose and Pipe.>
(2) Brake booster vacuum hose



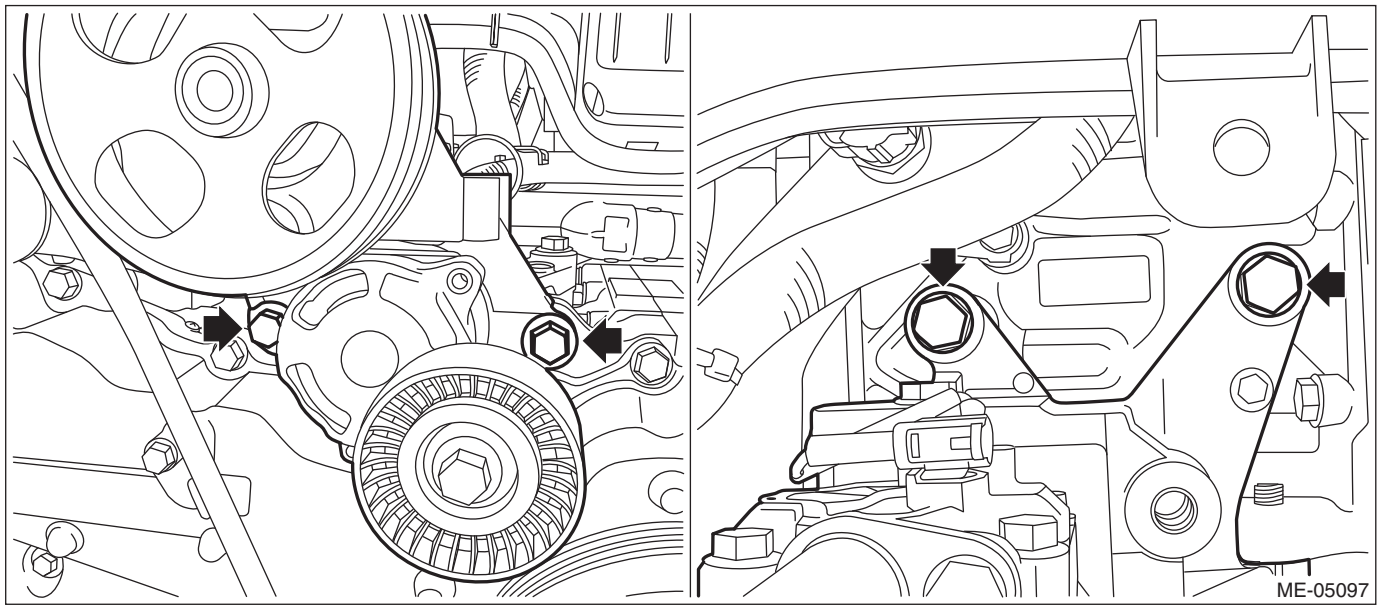
(3) Heater inlet hose and heater outlet hose



17) Remove the power steering pump.
(1) Remove the V-belts. <Ref. to ME(H4DO)-70, REMOVAL, V-belt.>
(2) Remove the generator. <Ref. to SC(H4DO)-33, REMOVAL, Generator.>
(3) Disconnect the connector from power steering pump switch.

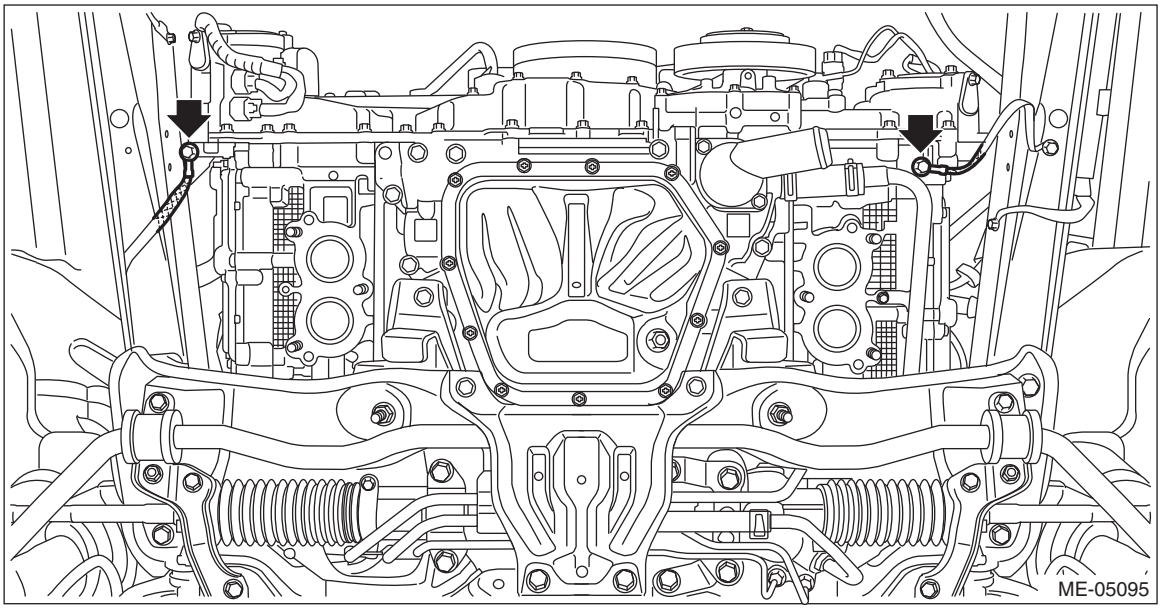


(4) Remove the power steering pump from the engine.



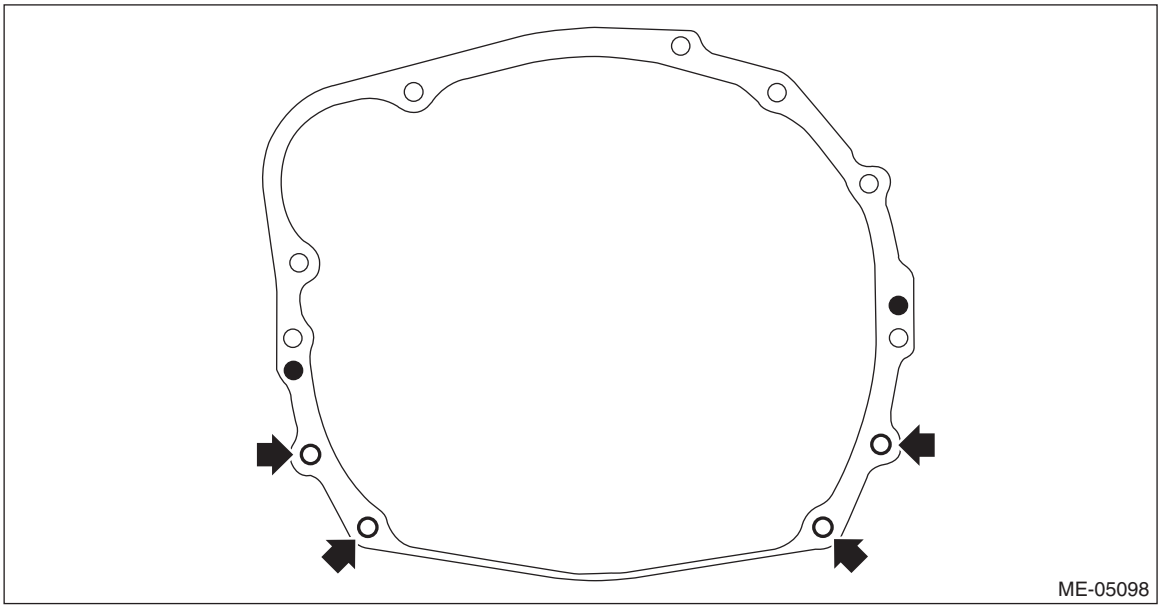
(5) Place the power steering pump on the right side wheel apron.
18) Lift up the vehicle.
19) Remove the front exhaust pipe. <Ref. to EX(H4DO)-5, REMOVAL, Front Exhaust Pipe.>

20) Disconnect the ground cable on the engine side.

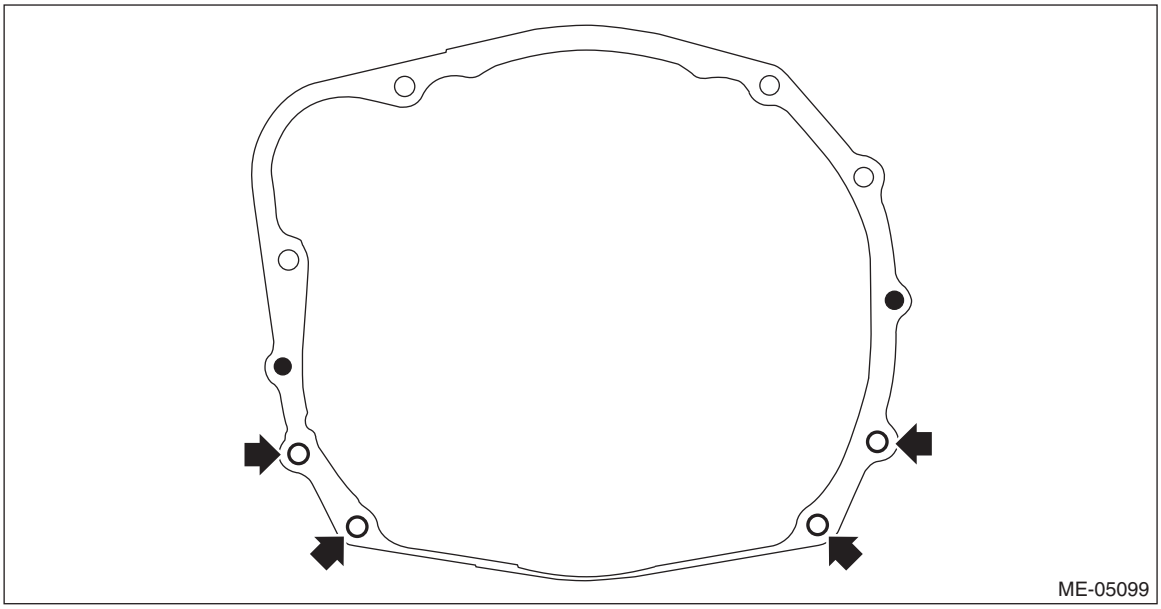


21) Remove the bolts and nuts which hold the lower side of transmission to the engine.

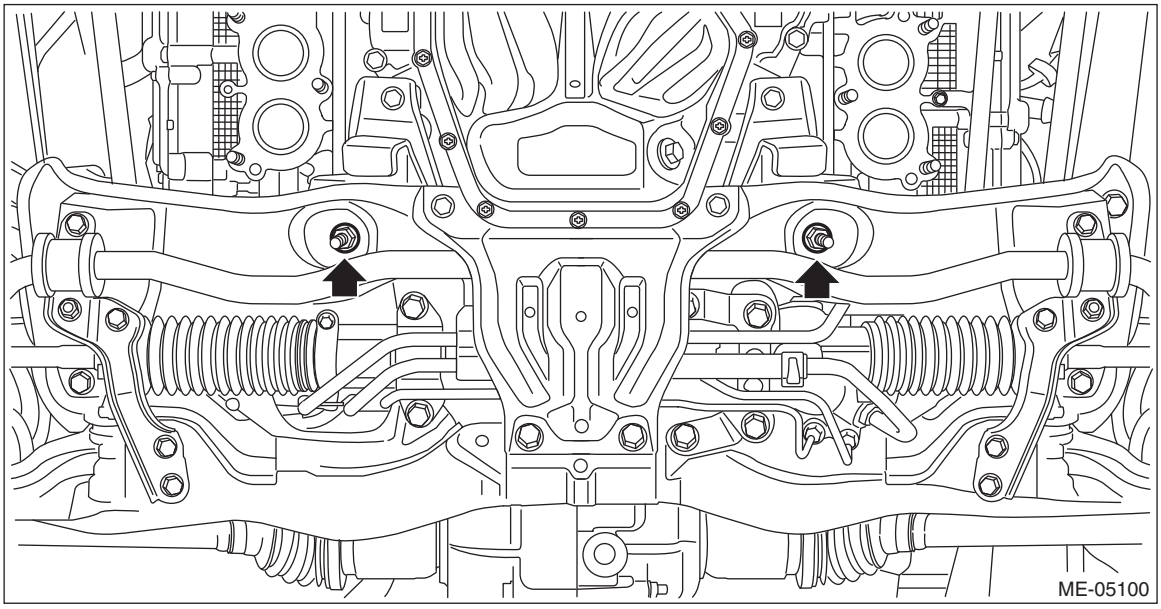
- AT model



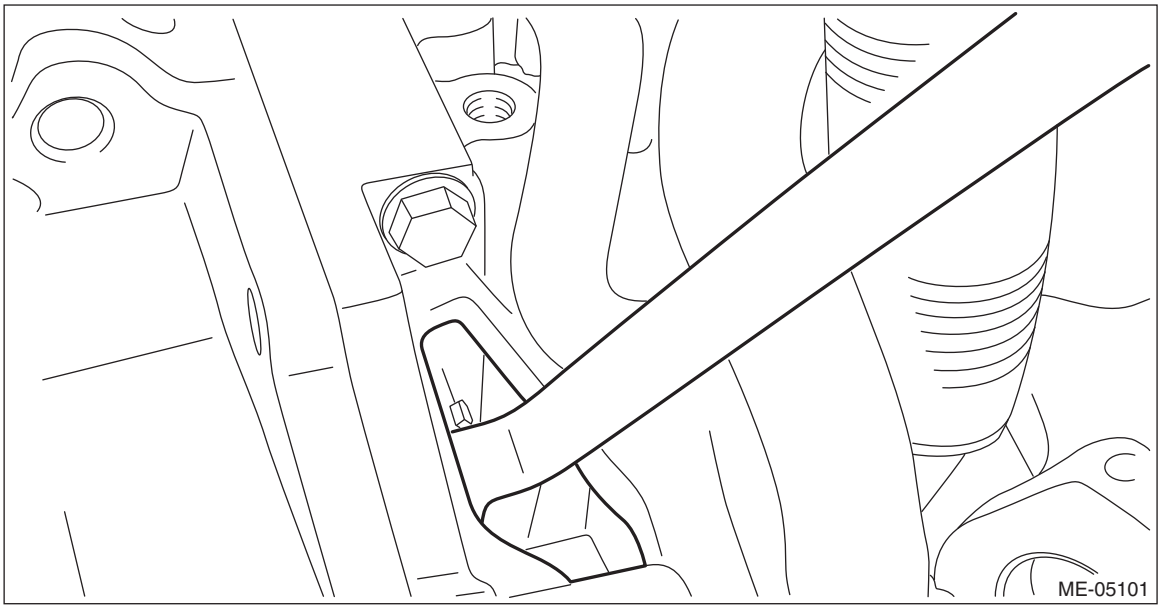
- MT model



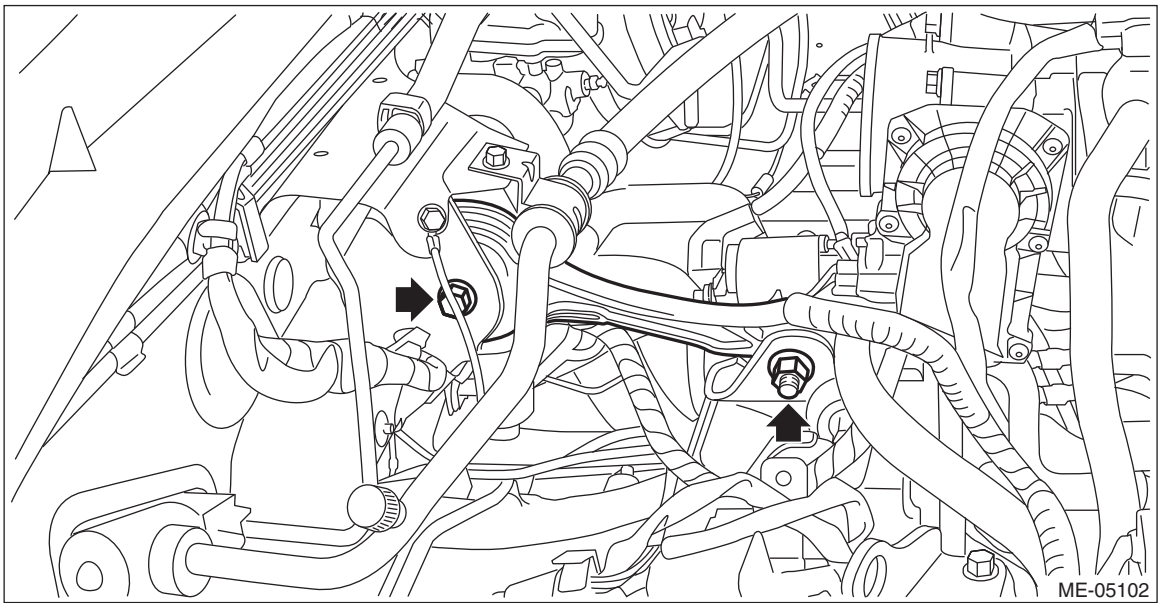
22) Remove the nuts which secure the engine mounting to the front crossmember.



23) Separate the torque converter clutch from the drive plate. (AT model)
(1) Lower the vehicle.
(2) Remove the service hole plug.
(3) Insert the wrench into the crank pulley bolt and rotate the crank pulley to remove the bolts which hold torque converter clutch to drive plate.



24) Remove the pitching stopper.

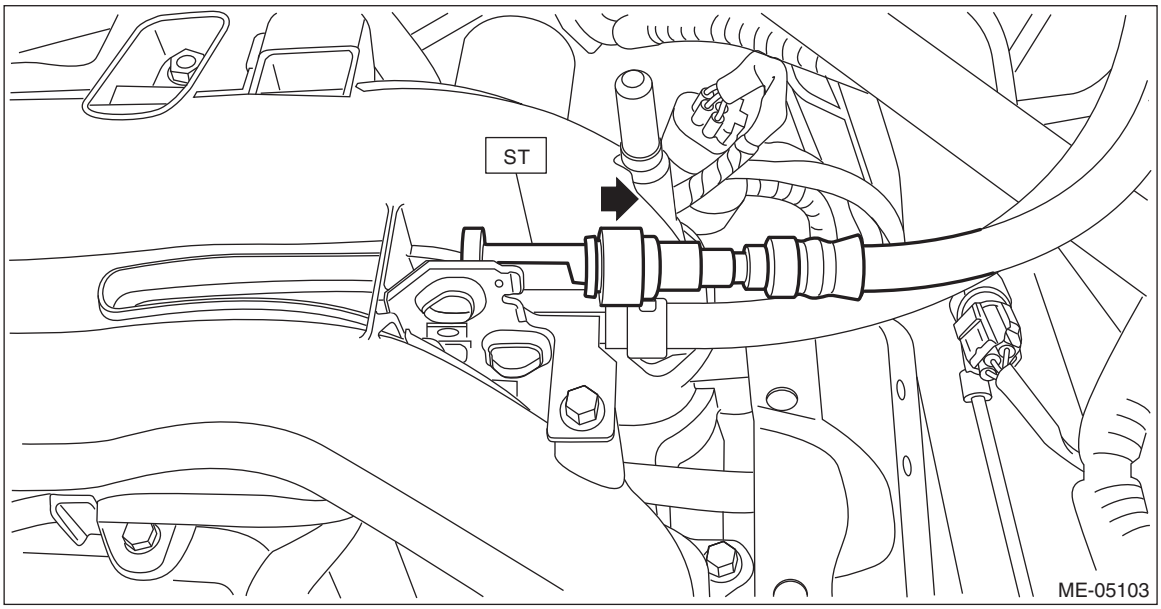


25) Disconnect the fuel delivery hose and evaporation hose.

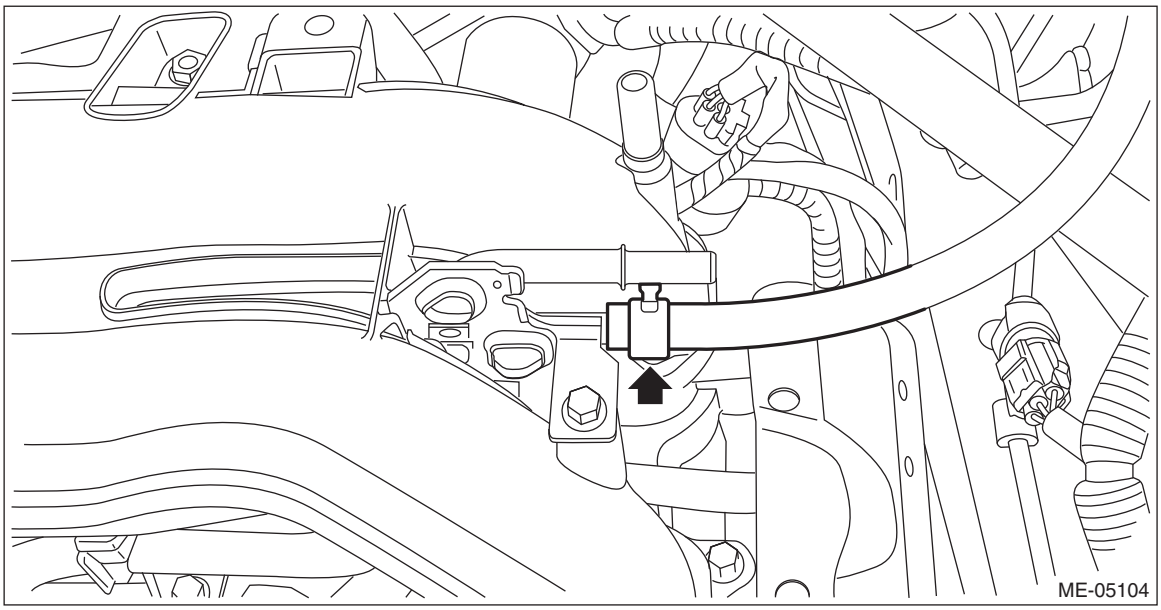
CAUTION:
- **Be careful not to spill fuel.**
- **Catch the fuel from hoses using a container or cloth.**

(1) Attach ST to the fuel delivery pipe and push ST in the direction of arrow mark to disconnect the quick connector of the fuel delivery hose.

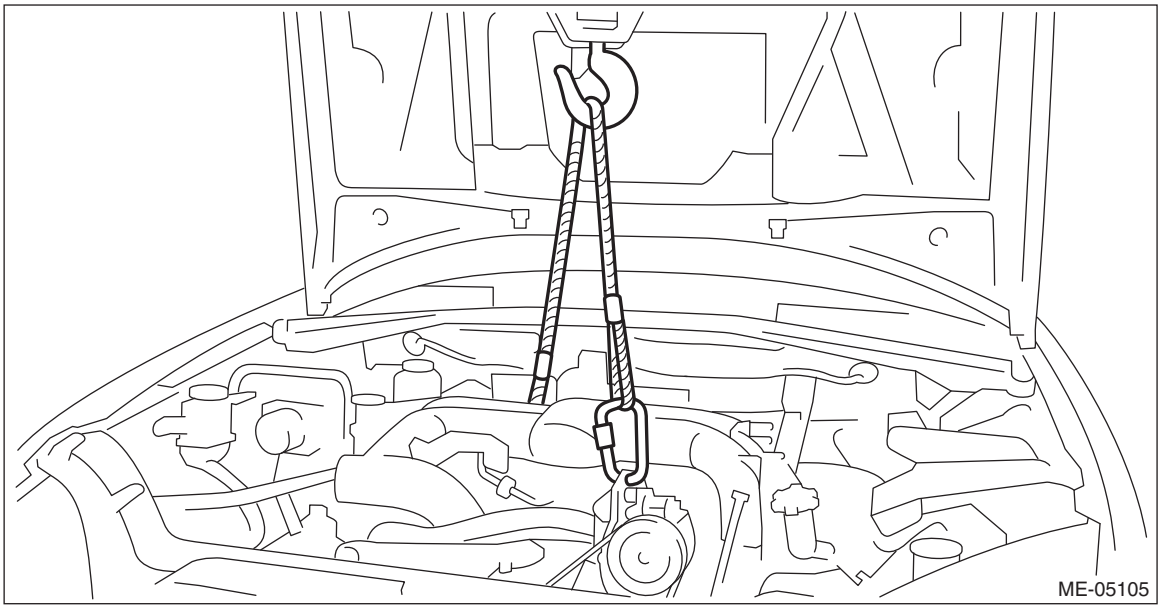
ST 42099AE000 QUICK CONNECTOR RELEASE



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

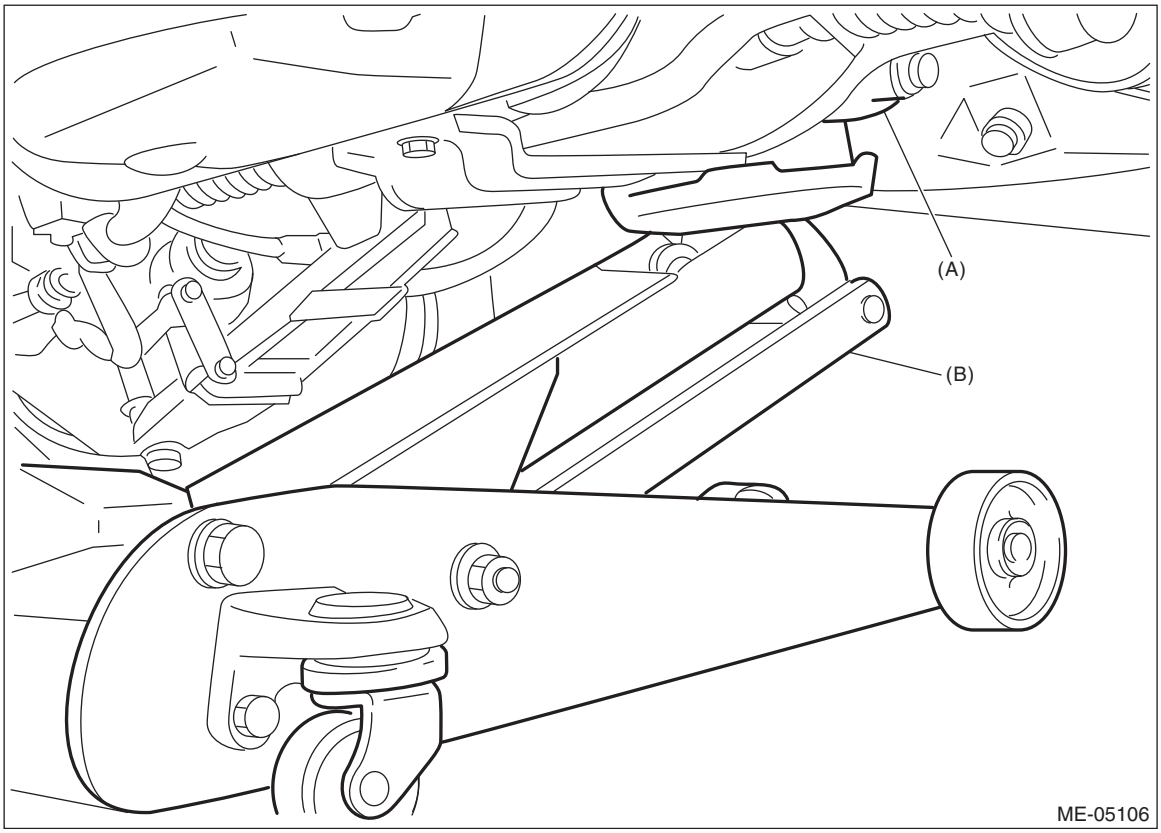


26) Support the engine with a lifting device and wire ropes.



27) Support the transmission with a garage jack.

CAUTION:
Be sure to perform this procedure to prevent the transmission from lowering by its own weight.



(A) Transmission (B) Garage jack

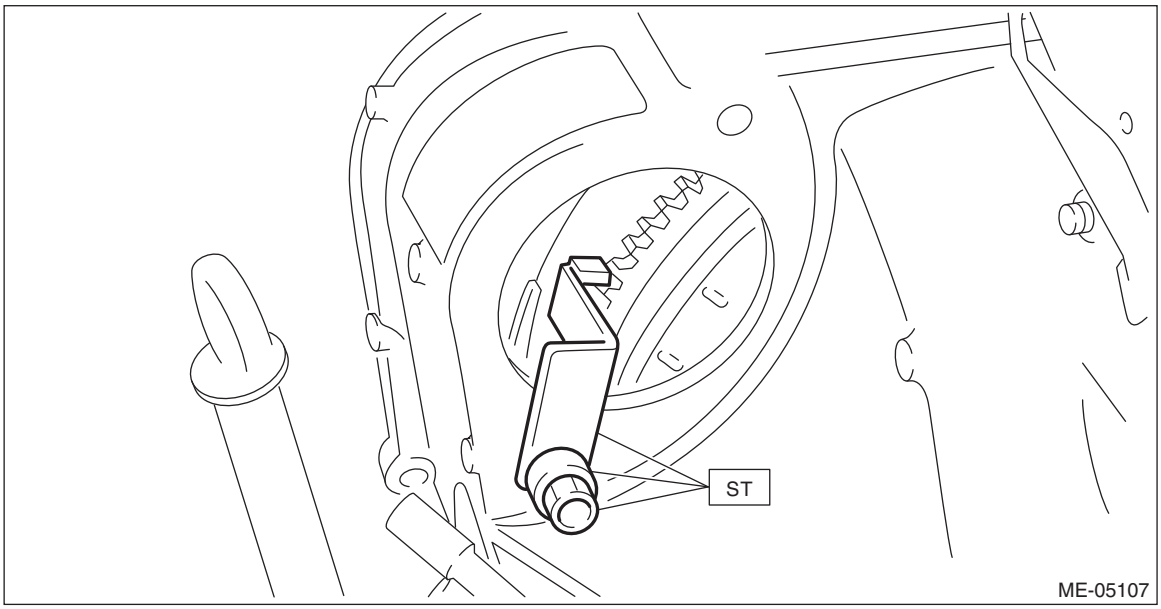
28) Separate the engine and transmission.

CAUTION:
Before removing the engine away from transmission, check to be sure no work has been overlooked.

(1) Remove the starter. <Ref. to SC(H4DO)-9, REMOVAL, Starter.>

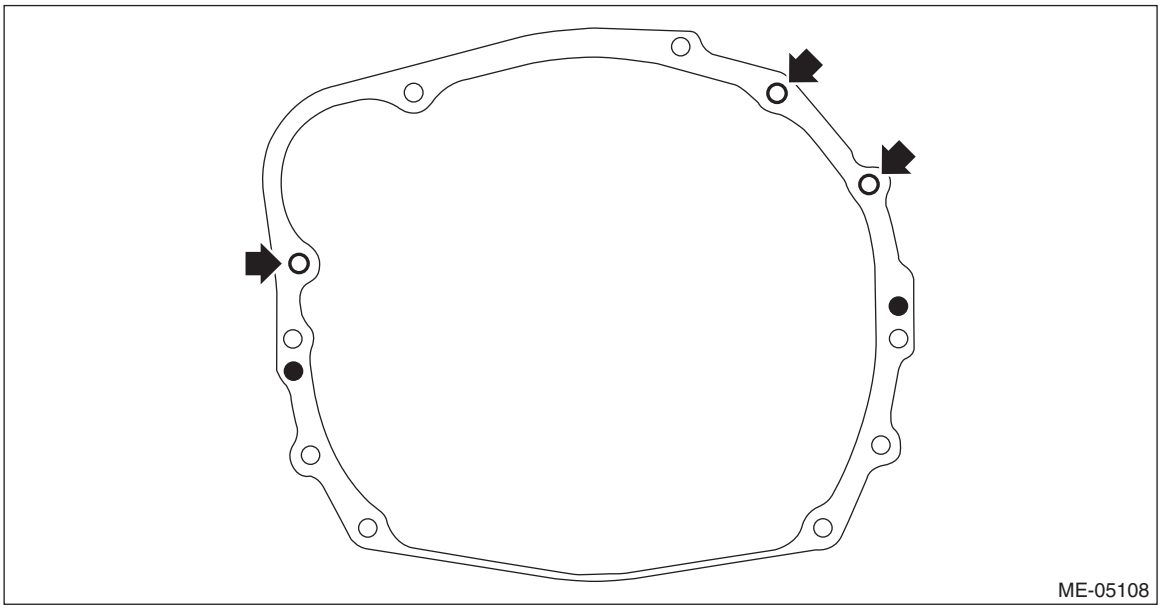
(2) Attach the ST to the torque converter clutch case. (AT model)

ST 498277200 STOPPER SET

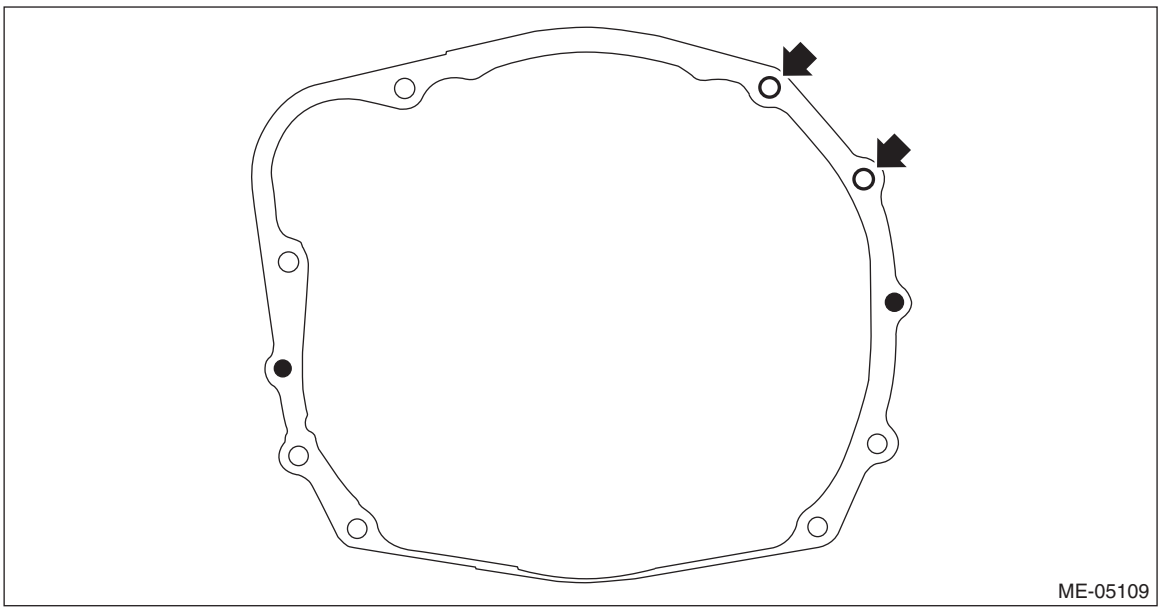


(3) Remove the bolts which hold the upper side of the transmission to the engine.

- AT model



- MT model



29) Remove the engine from vehicle.

NOTE:
Be careful not to damage adjacent parts or body panels with crank pulley, oil level gauge, etc.

(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. (MT model)
(4) Slowly move the engine away from engine compartment.

30) Remove the engine mounting from the engine.

B: INSTALLATION

1) Install the engine mounting onto the engine.

Tightening torque:
35 N·m (3.6 kgf-m, 25.8 ft-lb)

2) Apply a small amount of grease to splines of main shaft. (MT model)

Grease:
NICHIMOLY N-130 or equivalent

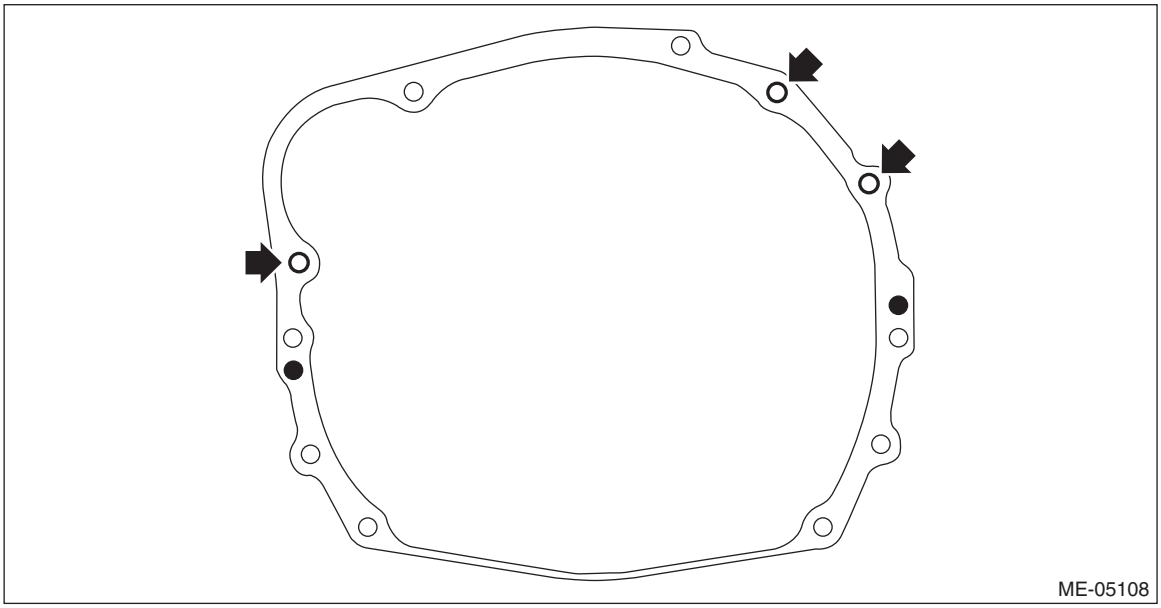
3) Position the engine in engine compartment and align it with transmission.

NOTE:
Be careful not to damage adjacent parts or body panels with crank pulley, oil level gauge, etc.

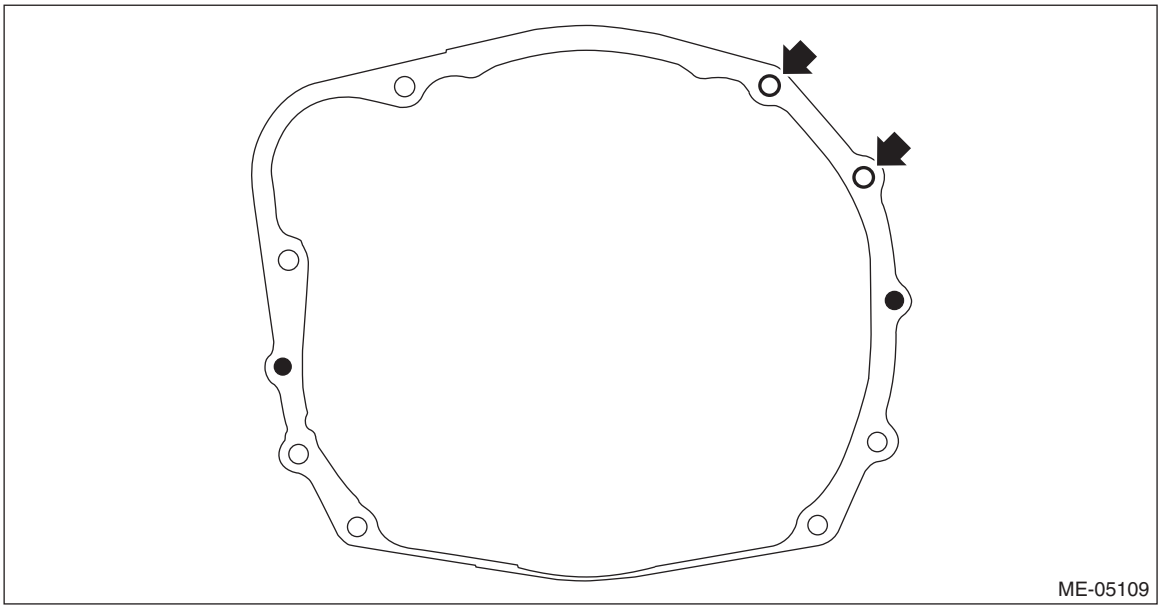
4) Tighten the bolts which hold upper side of transmission to engine.

Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)

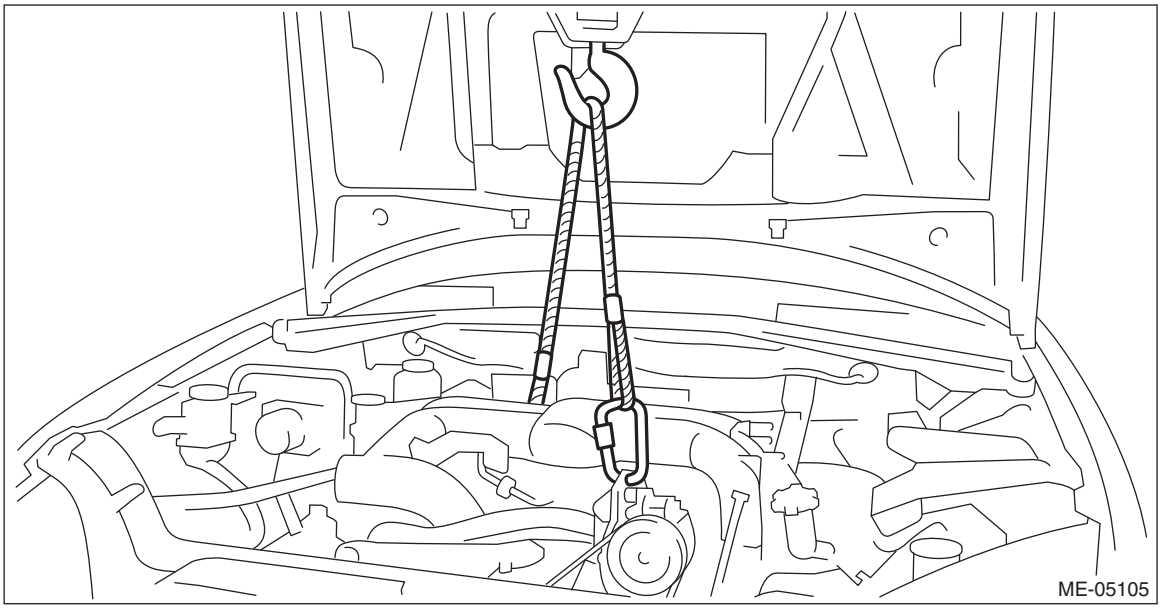
- AT model



- MT model

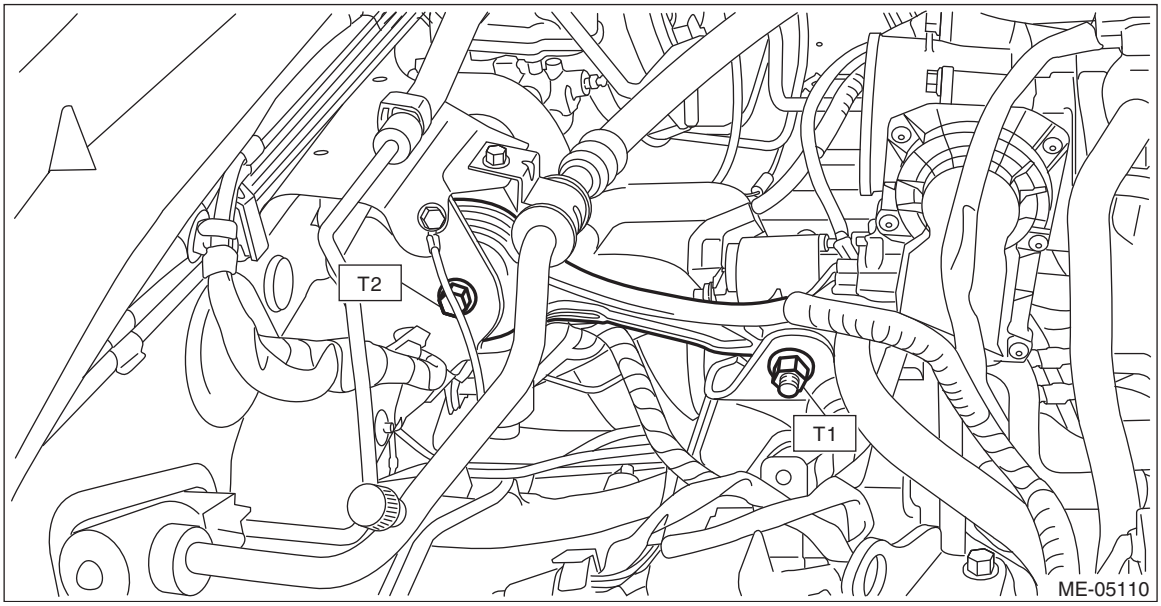


5) Remove the lifting device and wire ropes.



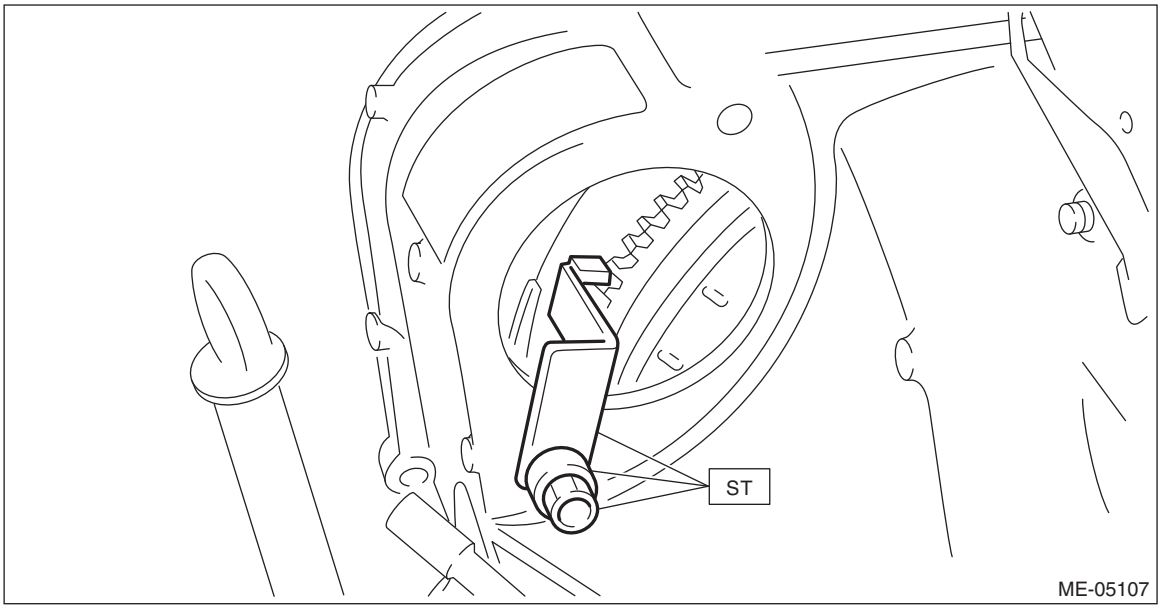
6) Remove the garage jack.
7) Install the pitching stopper.

Tightening torque:
T1: 50 N·m (5.1 kgf-m, 36.9 ft-lb)
T2: 58 N·m (5.9 kgf-m, 42.8 ft-lb)



8) Remove the ST from torque converter clutch case. (AT model)

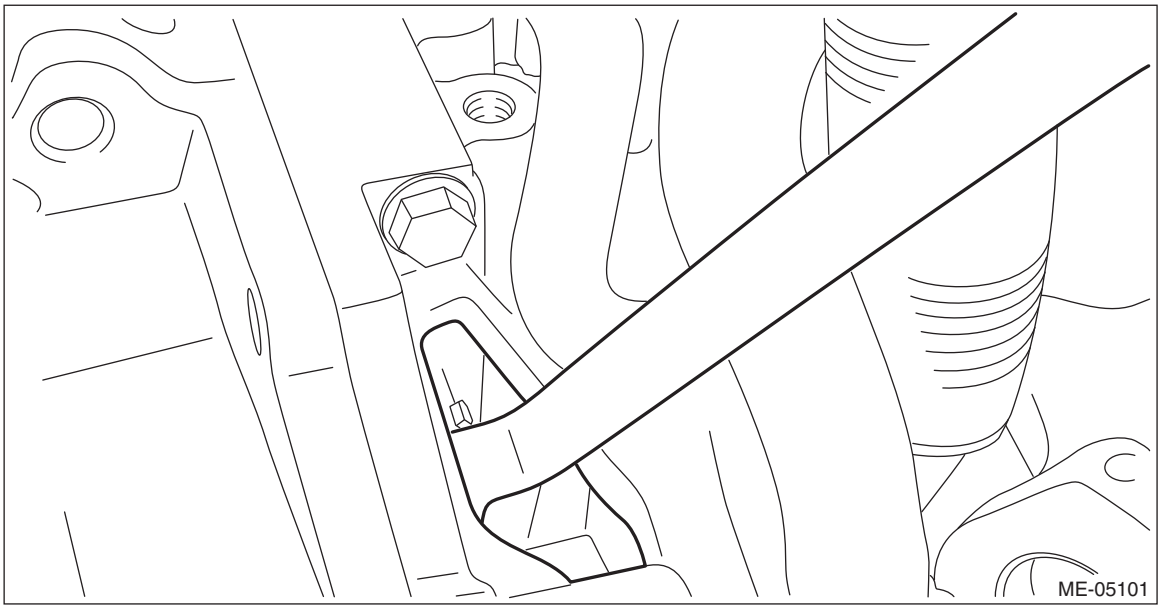
NOTE:
Be careful not to drop the ST into the torque converter clutch case when removing the ST.
ST 498277200 STOPPER SET



9) Install the starter. <Ref. to SC(H4DO)-10, INSTALLATION, Starter.>
10) Install the torque converter clutch to drive plate. (AT model)
(1) Insert the wrench into the crank pulley bolt and rotate the crank pulley to install the bolts which hold torque converter clutch to drive plate.

NOTE:
Be careful not to drop bolts into the torque converter clutch case.

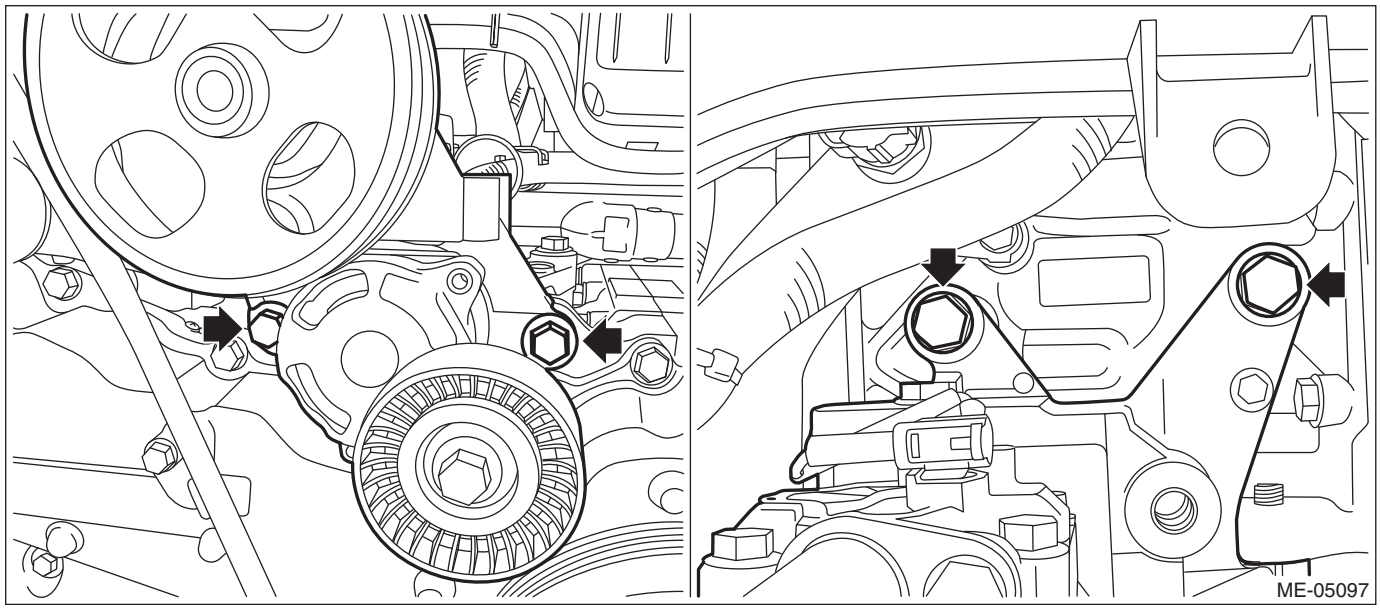
Tightening torque:
25 N·m (2.5 kgf-m, 18.4 ft-lb)



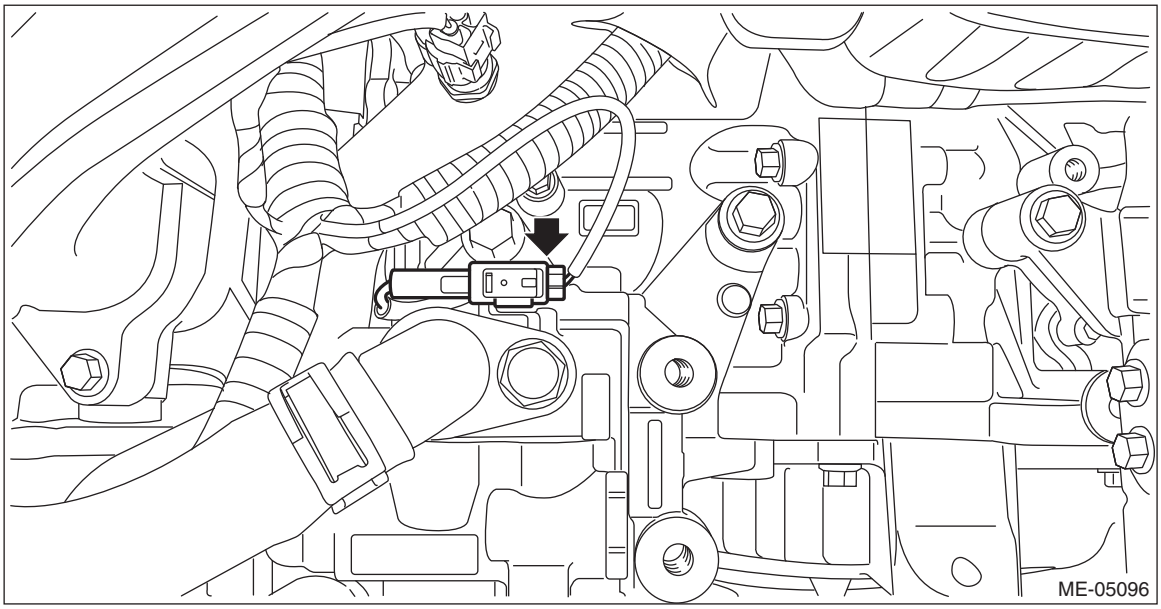
(2) Fit the plug to service hole.

11) Install the power steering pump.
(1) Install the power steering pump onto the engine.

Tightening torque:
Refer to "COMPONENT" of "Power Steering" for the tightening torque. <Ref. to PS-3, COMPONENT, General Description.>



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

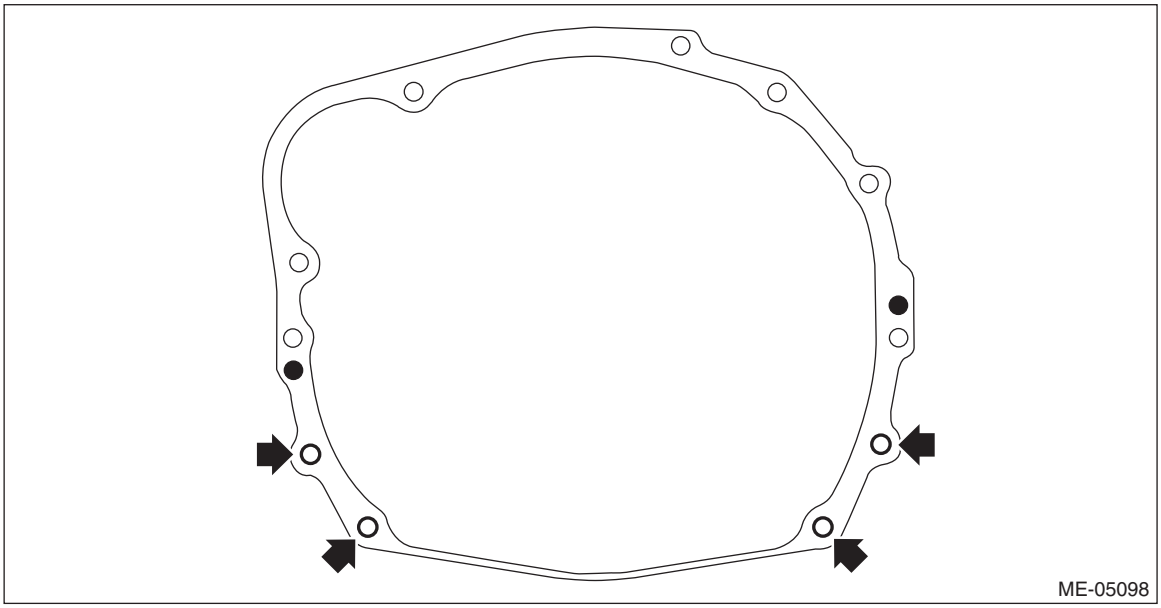


(3) Install the generator. <Ref. to SC(H4DO)-38, INSTALLATION, Generator.>
(4) Install the V-belts. <Ref. to ME(H4DO)-73, INSTALLATION, V-belt.>
12) Lift up the vehicle.

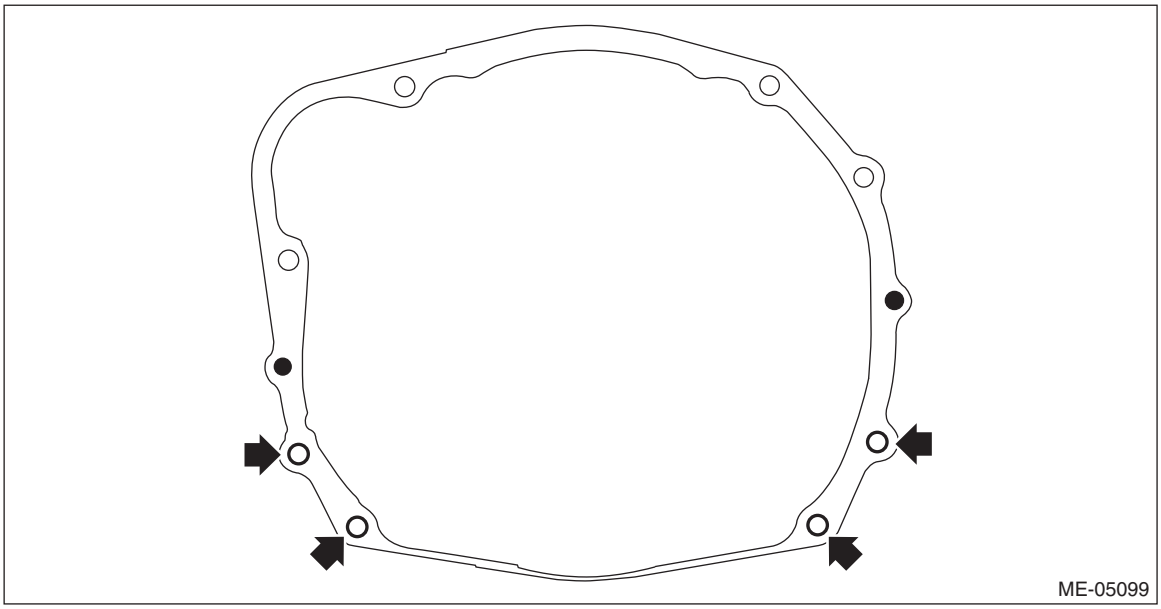
13) Install the bolts and nuts which hold lower side of the transmission to engine.

Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)

- AT model

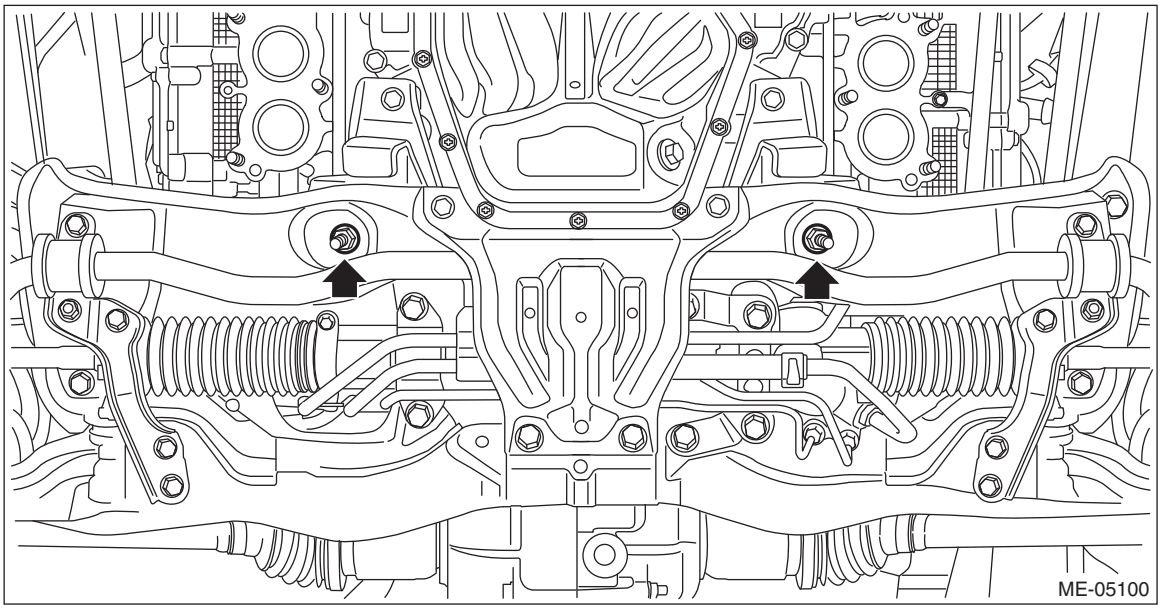


- MT model



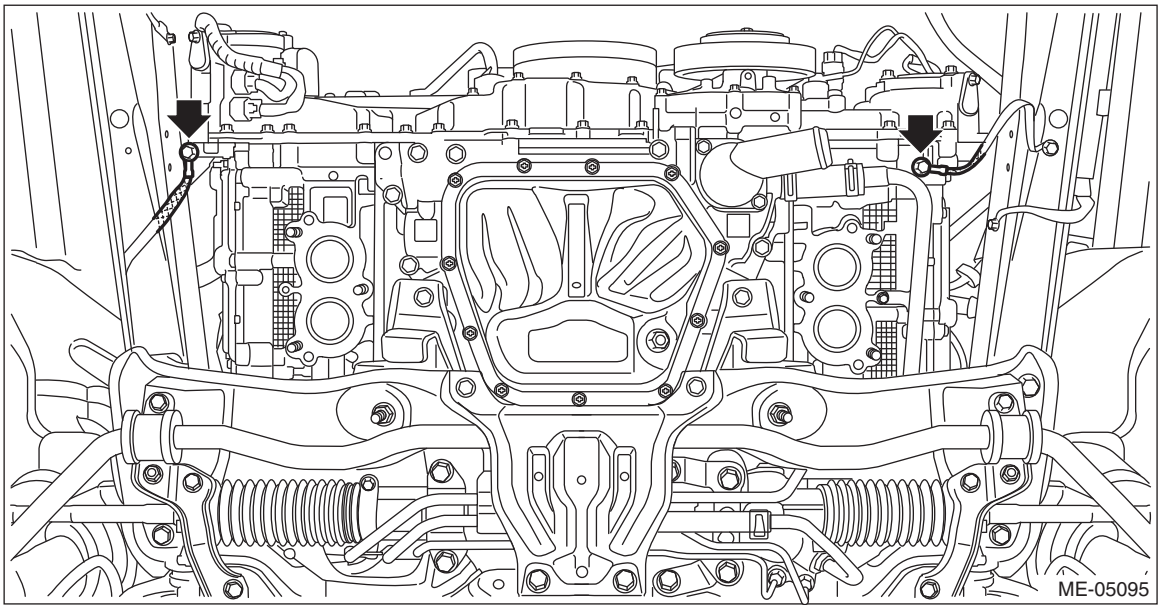
14) Install the nuts which hold the engine mounting to the crossmember.

Tightening torque:
85 N·m (8.7 kgf-m, 62.7 ft-lb)



15) Connect the ground cable.

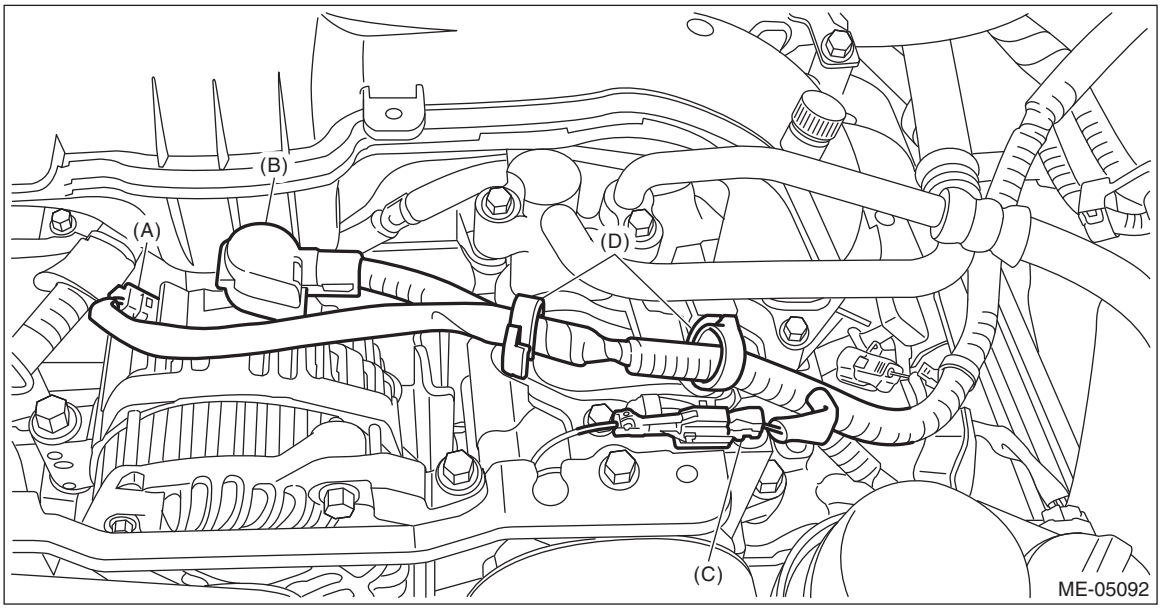
Tightening torque:
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)



16) Install the front exhaust pipe. <Ref. to EX(H4DO)-8, INSTALLATION, Front Exhaust Pipe.>
17) Lower the vehicle.
18) Connect the following hoses.
(1) Fuel delivery hose and evaporation hose
(2) Heater inlet hose and heater outlet hose
(3) Brake booster vacuum hose
(4) A/C pressure hose <Ref. to AC-42, INSTALLATION, Hose and Pipe.>
19) Place the generator code and install the generator cord to the clip (D).

20) Connect connector (A) and terminal (B) to the generator, and connect connector (C) to A/C compressor.

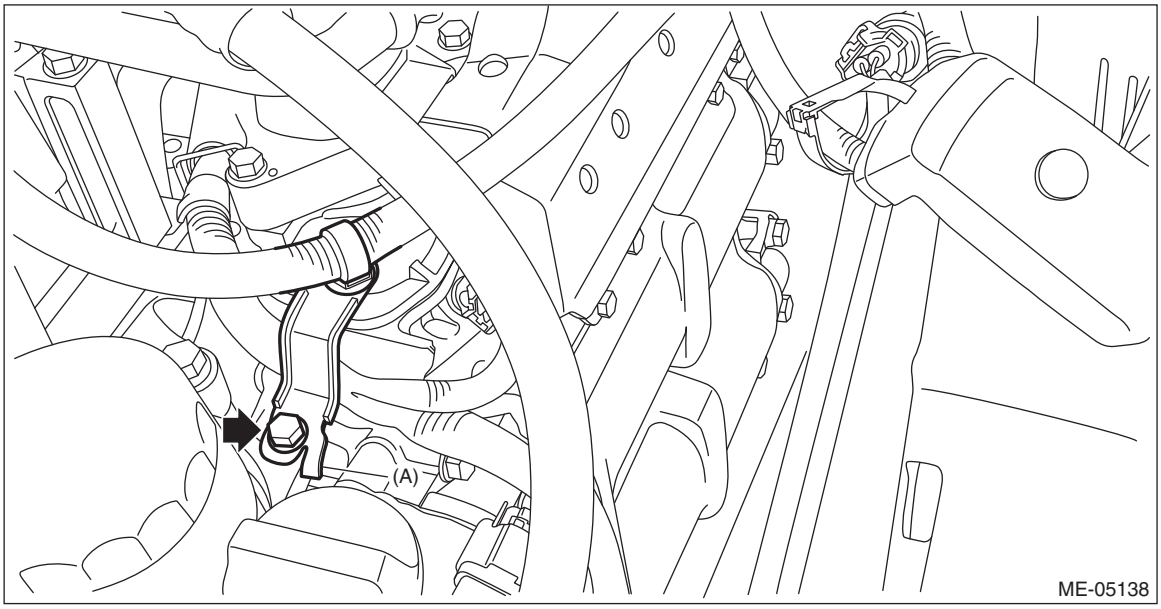
Tightening torque:
15 N·m (1.5 kgf-m, 11.1 ft-lb)



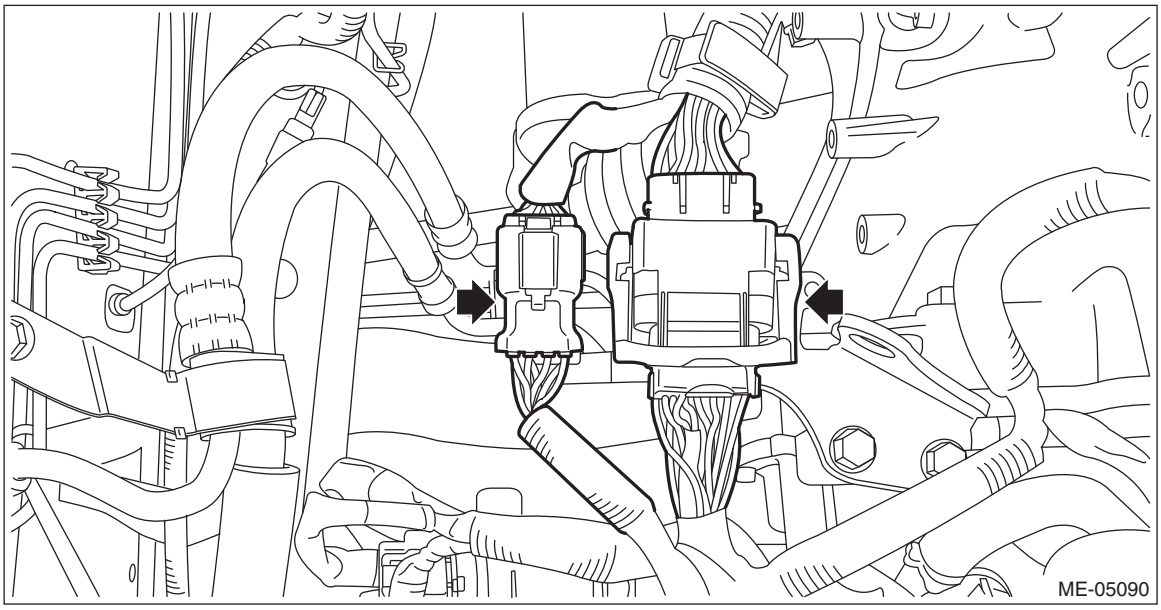
21) Install the generator cord stay to the chain cover.

NOTE:
Install the generator cord stay so that the folded end (A) touches at the chain cover boss.

Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)

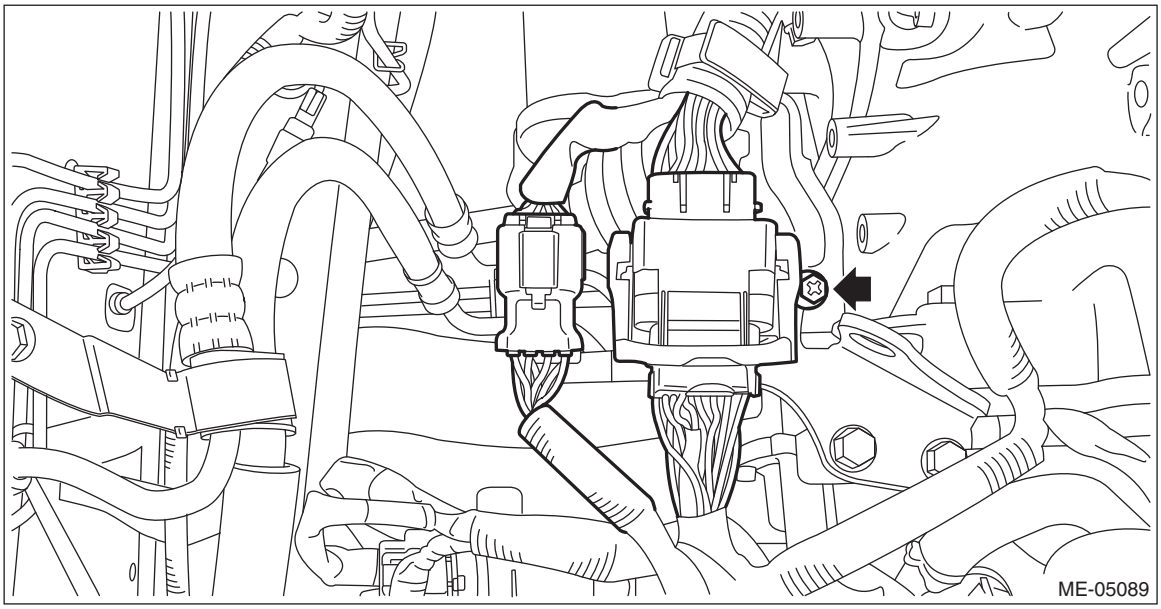


22) Connect the engine harness connector.
(1) Connect the bulkhead harness connector to the engine harness connector (black) and engine harness connector (brown).



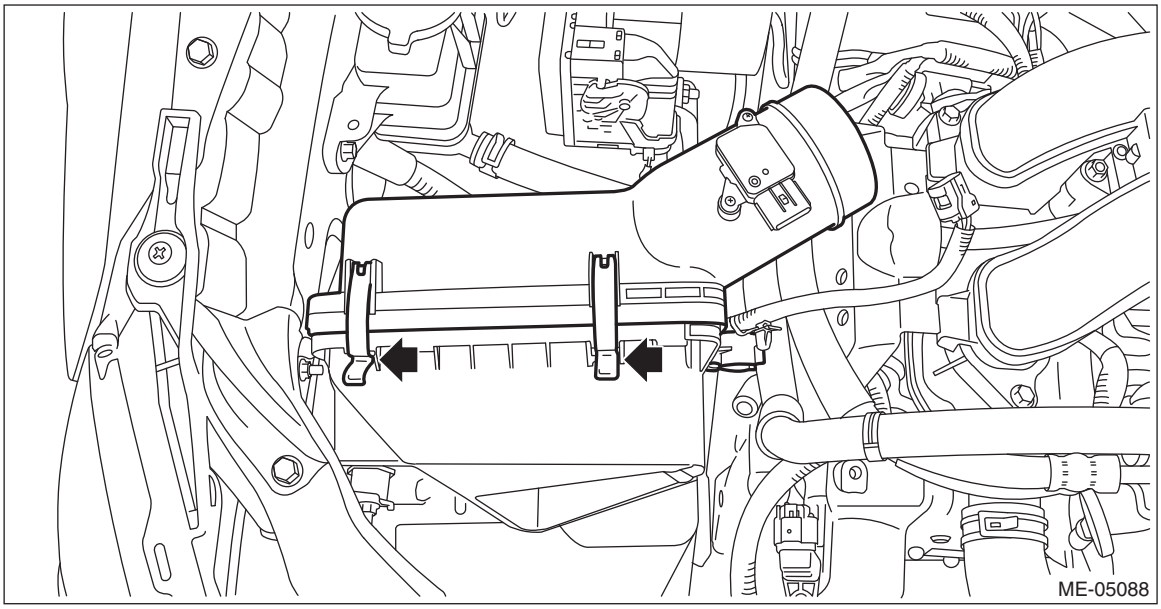
(2) Install the bolt which secures the bulkhead harness connector bracket.

Tightening torque:
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)

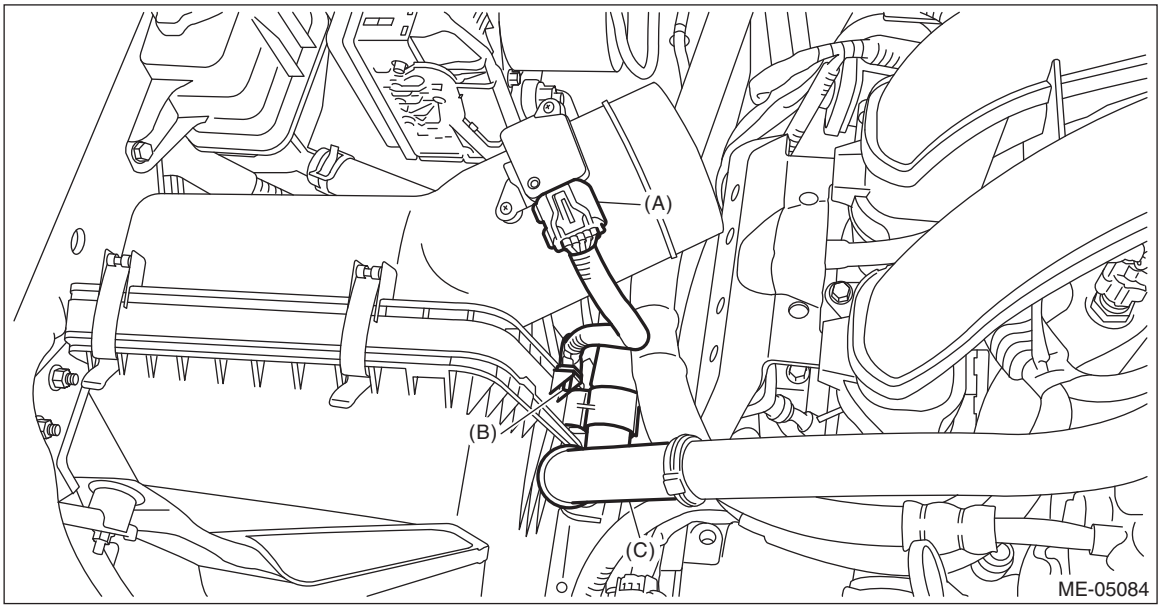


23) Install the radiator. <Ref. to CO(H4DO)-27, INSTALLATION, Radiator.>

24) Install the air intake case (rear).



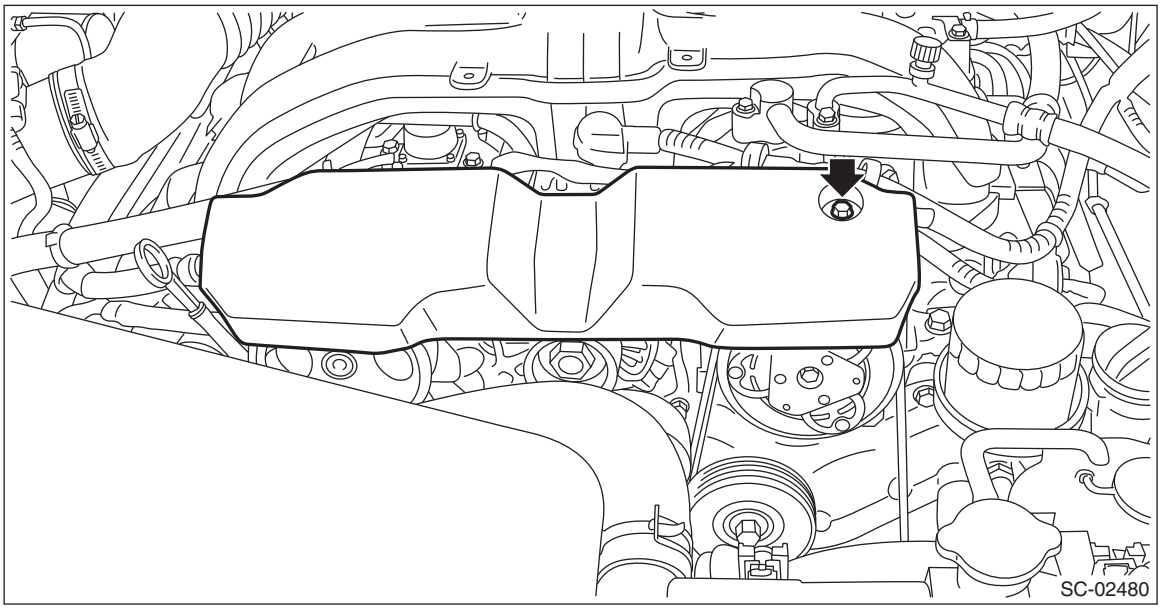
25) Install the clip (B) which secures the mass air flow and intake air temperature sensor harness, and connect the connector (A) to the mass air flow and intake air temperature sensor.
26) Install the suction hose (C) to the air cleaner case (rear).



27) Install the air intake boot. <Ref. to IN(H4DO)-13, INSTALLATION, Air Intake Boot.>
28) Install the air intake duct (rear). <Ref. to IN(H4DO)-14, INSTALLATION, Air Intake Duct.>
29) Install the battery. <Ref. to SC(H4DO)-59, INSTALLATION, Battery.>
30) Fill engine coolant. <Ref. to CO(H4DO)-13, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
31) Check the ATF level and replenish it if necessary. (AT model) <Ref. to 4AT-27, INSPECTION, Automatic Transmission Fluid.>
32) Charge the A/C system with refrigerant. <Ref. to AC-24, PROCEDURE, Refrigerant Charging Procedure.>

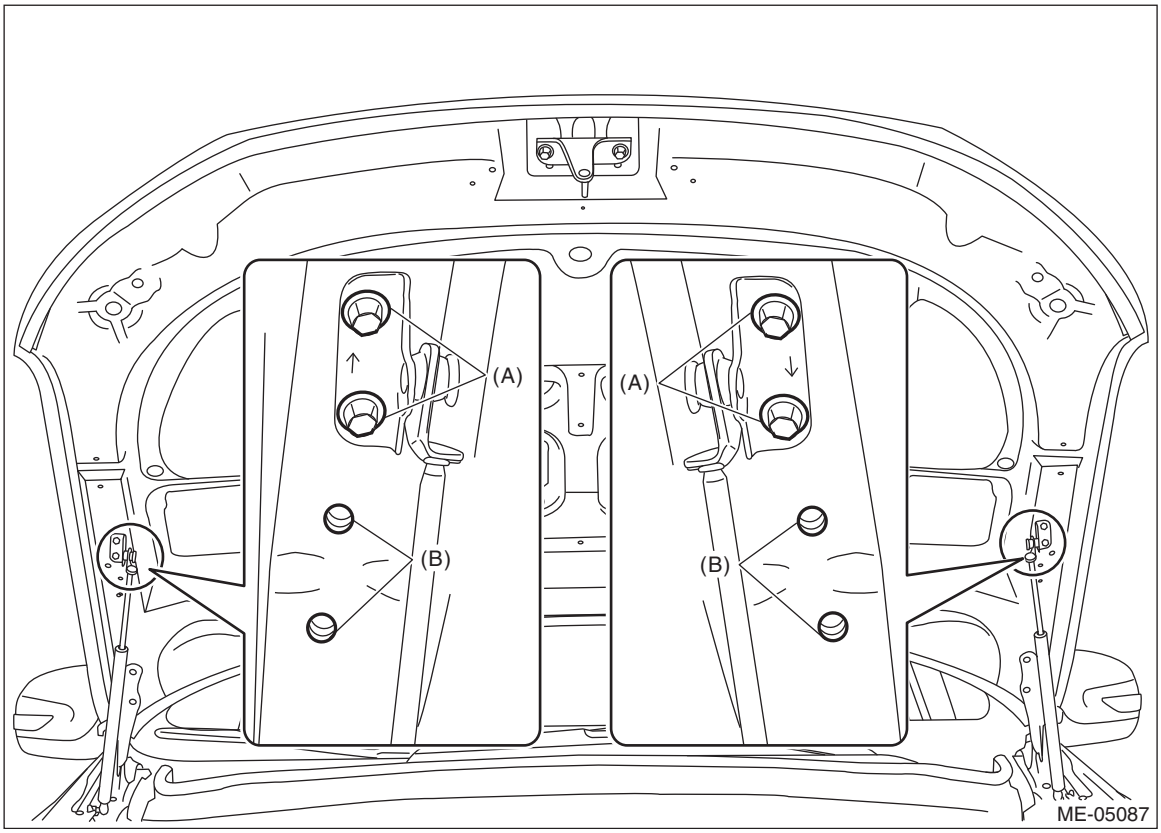
33) Install the V-belt cover.

Tightening torque:
13 N·m (1.3 kgf-m, 9.6 ft-lb)



34) Change the bolt installation position from (B) to (A), then close the front hood.

Tightening torque:
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)



C: INSPECTION

1) Check that pipes, hoses, connectors and clamps are installed firmly.
2) Check the engine coolant is at specified level.
3) Check that the ATF is at specified level. (AT model)
4) 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 from the vehicle. <Ref. to ME(H4DO)-44, REMOVAL, Engine Assembly.>
2) Remove the engine mounting from the engine assembly.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
35 N·m (3.6 kgf-m, 25.8 ft-lb)

C: INSPECTION

Make sure that there are no cracks or other damages.

11.Preparation for Overhaul

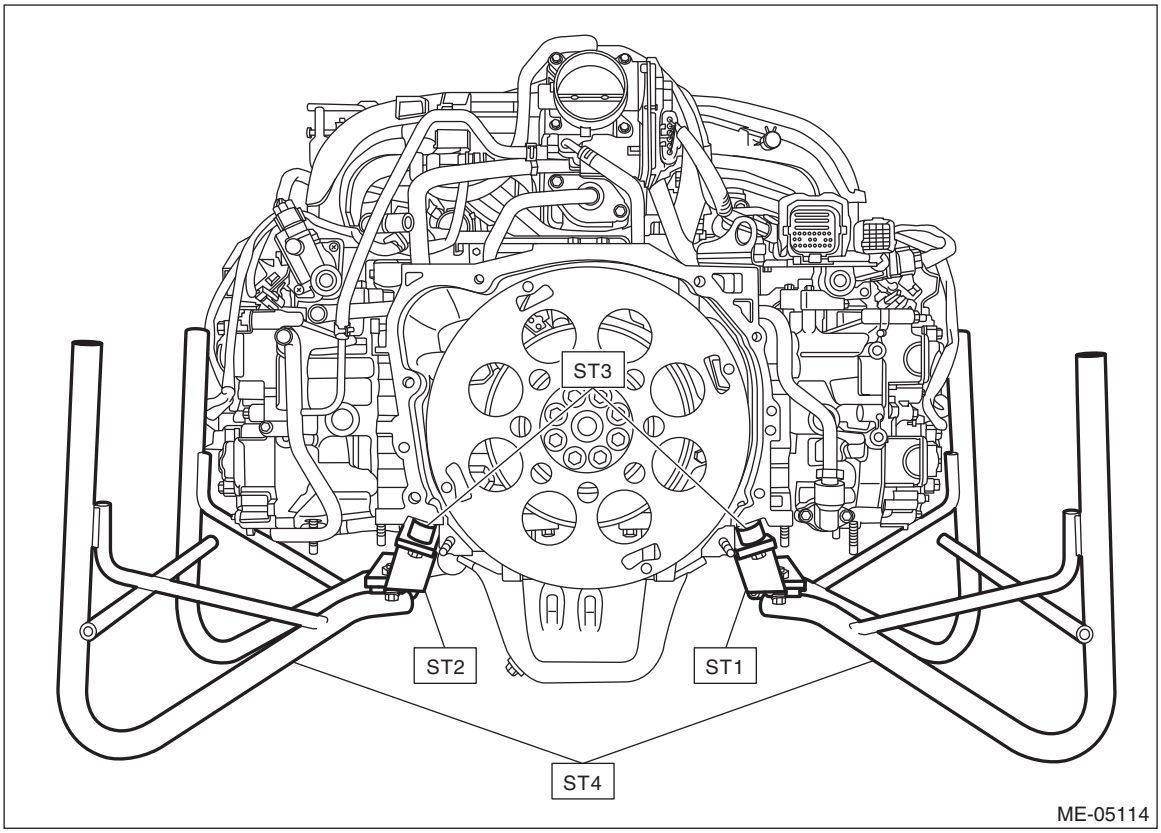
A: PROCEDURE

1) After removing the engine from vehicle body, attach the ST to the engine as shown in the figure.

NOTE:
When using a commercially sold engine stand, follow the instructions of engine stand used.

Tightening torque:
35 N·m (3.6 kgf-m, 25.8 ft-lb)

ST1 498457000 ENGINE STAND ADAPTER RH
ST2 498457100 ENGINE STAND ADAPTER LH
ST3 18362AA020 ADAPTER
ST4 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.

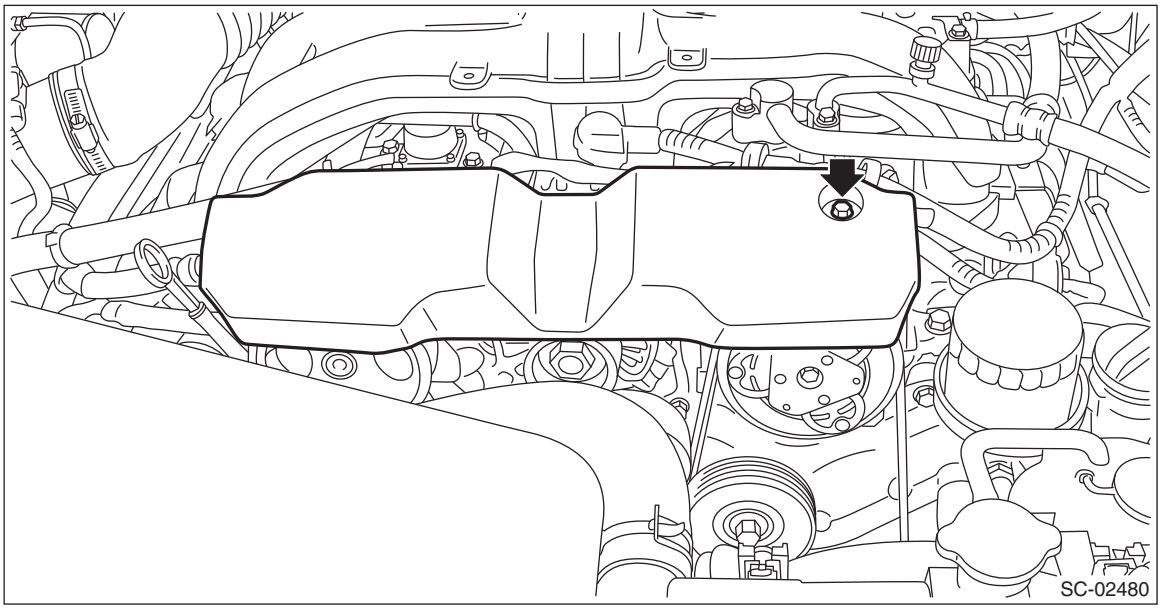
12.V-belt

A: REMOVAL

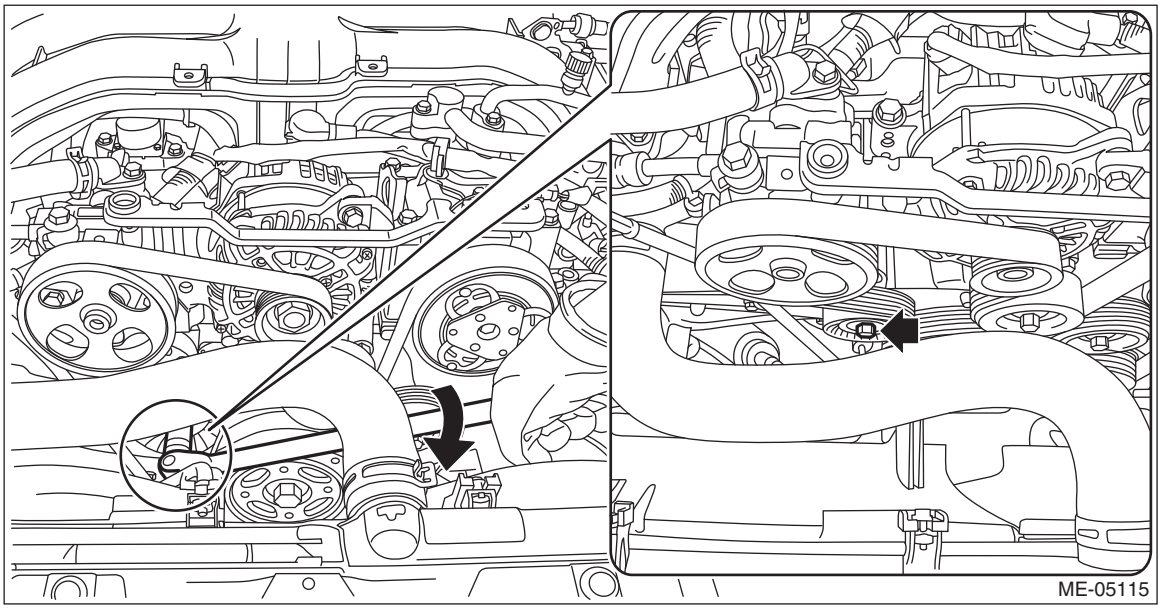
NOTE:
When replacing a single part, perform the work with the engine installed to body.

1. V-BELT

1) Remove the V-belt covers.

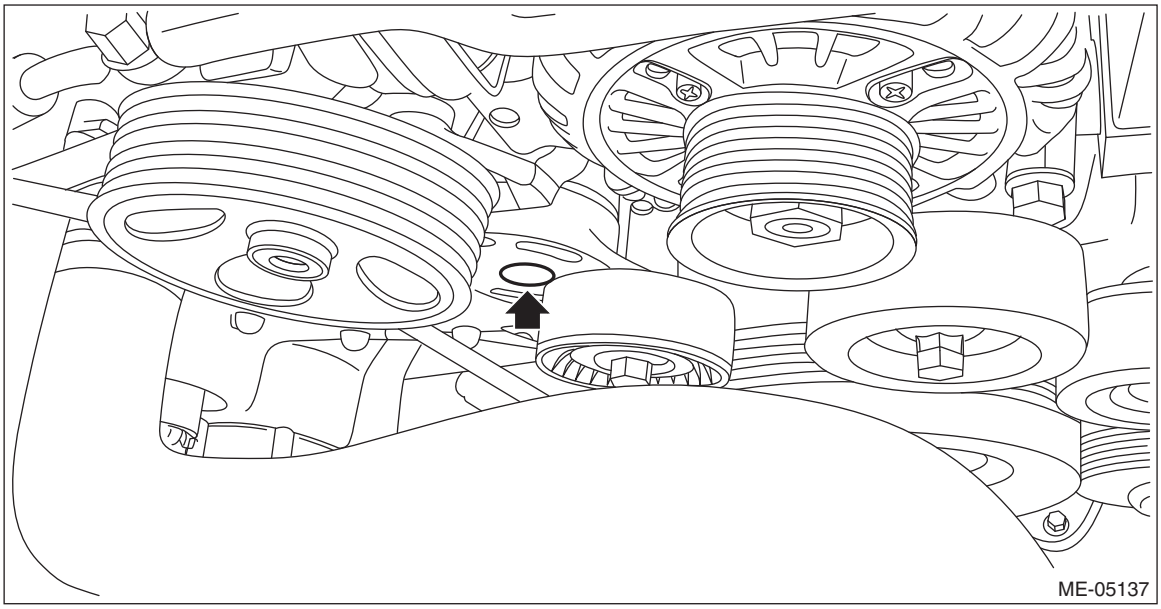


2) Remove the air intake duct (Rear). <Ref. to IN(H4DO)-14, REMOVAL, Air Intake Duct.>
3) Attach the tool to the V-belt tensioner assembly, and rotate the tool clockwise to loosen and remove the V-belt.

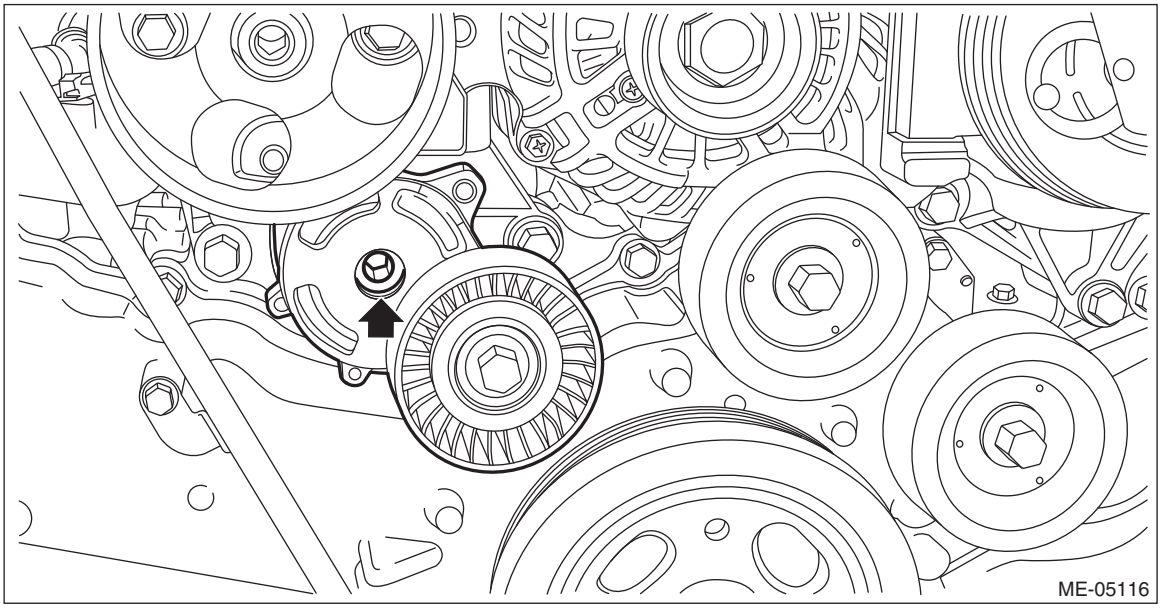


2. V-BELT TENSIONER ASSEMBLY AND IDLER PULLEY

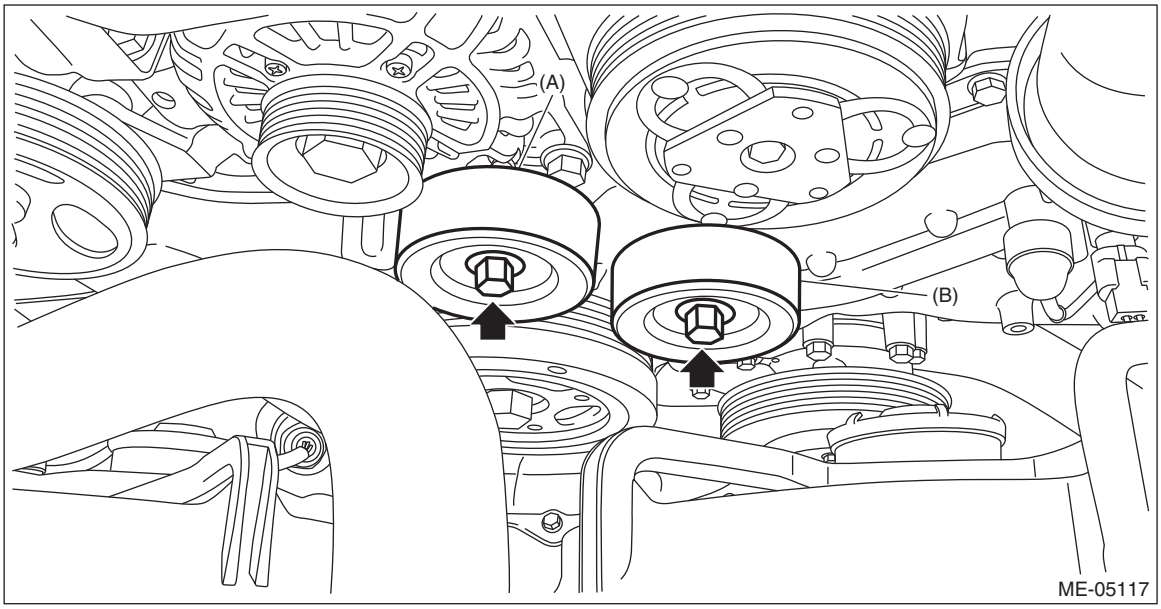
1) Remove the V-belts. <Ref. to ME(H4DO)-70, V-BELT, REMOVAL, V-belt.>
2) Remove the cap from V-belt tensioner assembly.



3) Remove the bolt securing the V-belt tensioner assembly to the power steering pump bracket, and remove the V-belt tensioner assembly.



4) Remove the bolts which secure the idler pulley to the chain cover, and remove the idler pulley.



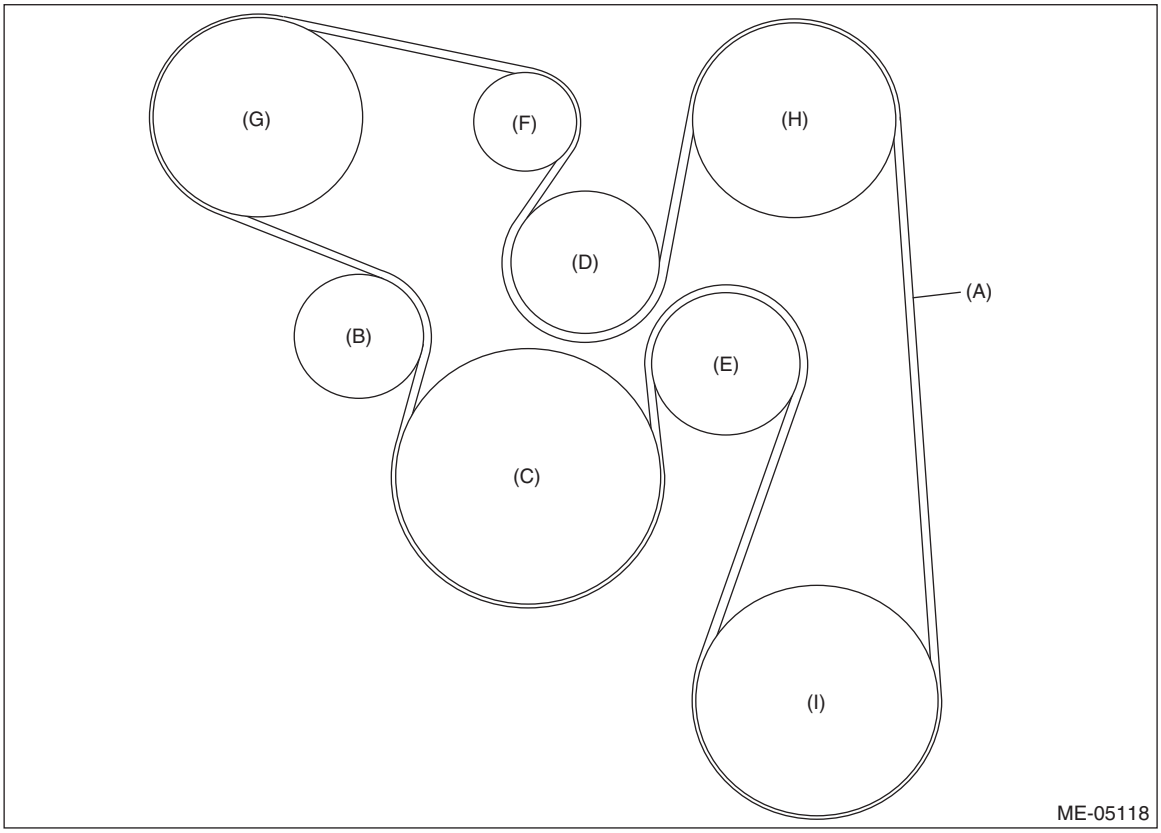
(A) Idler pulley A
(B) Idler pulley B

B: INSTALLATION

1. V-BELT

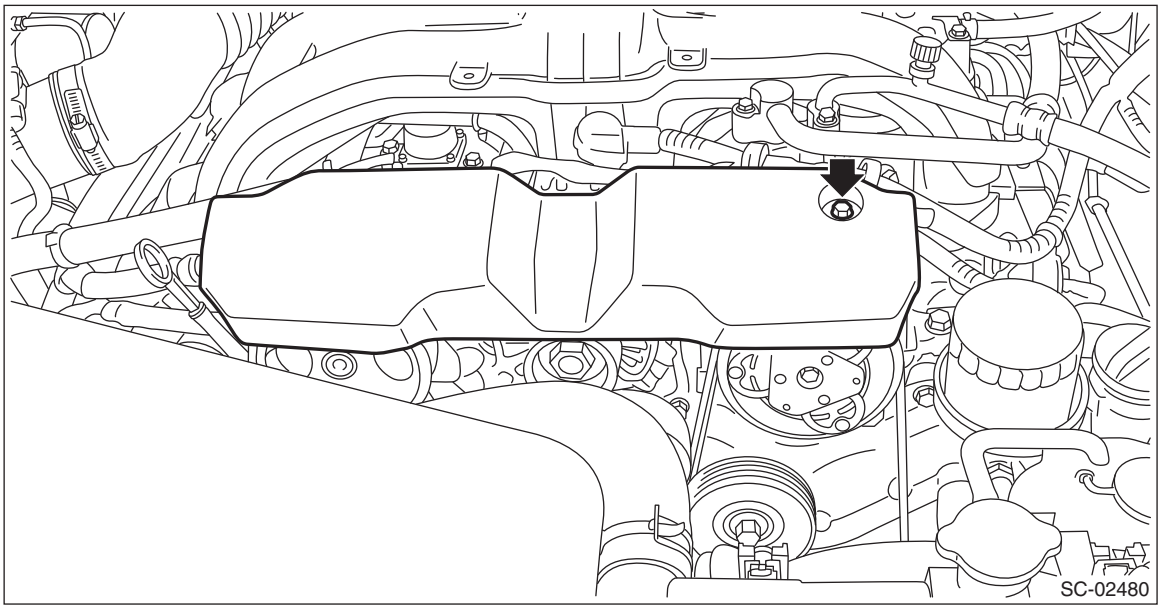
Install in the reverse order of removal.

CAUTION:
- **When reusing the V-belt, wipe off dust and water with cloth.**
- **Do not use the V-belt if there is any oil, grease or coolant on the belt.**
- **Be careful not to rub the V-belt end surface with bare hands; exposed core may cause injury.**
- **Wipe off any dust, oil and water on the groove of each pulley with cloth.**



(A) V-belt
(B) V-belt tensioner ASSY
(C) Crank pulley
(D) Idler pulley A
(E) Idler pulley B
(F) Generator pulley
(G) Power steering pump pulley
(H) A/C compressor pulley
(I) Water pump pulley

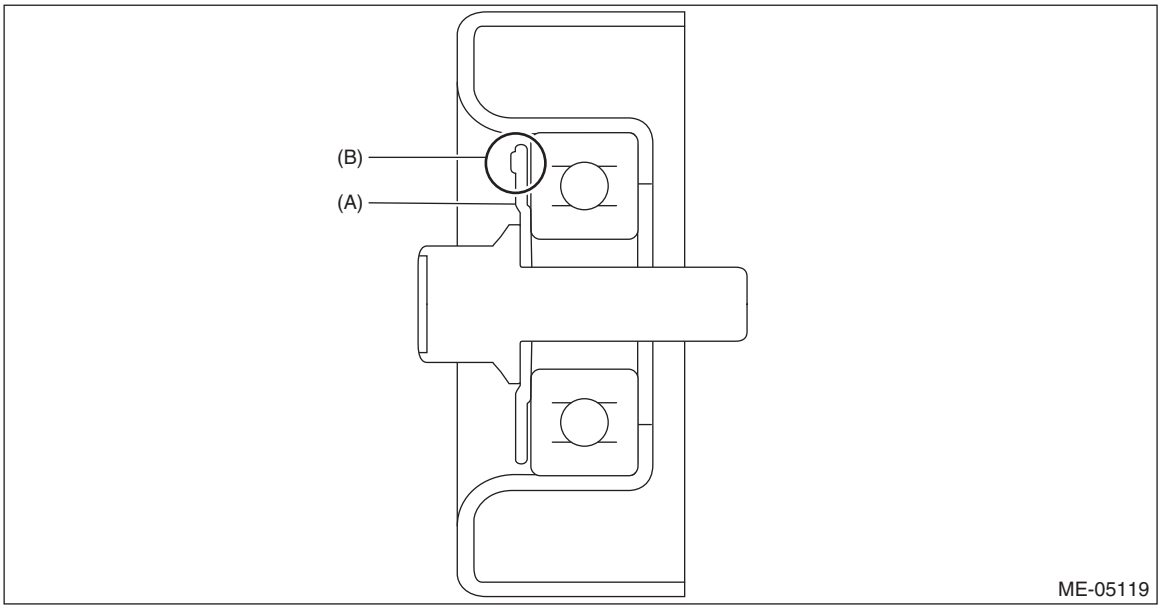
Tightening torque:
13 N·m (1.3 kgf-m, 9.6 ft-lb)



2. V-BELT TENSIONER ASSEMBLY AND IDLER PULLEY

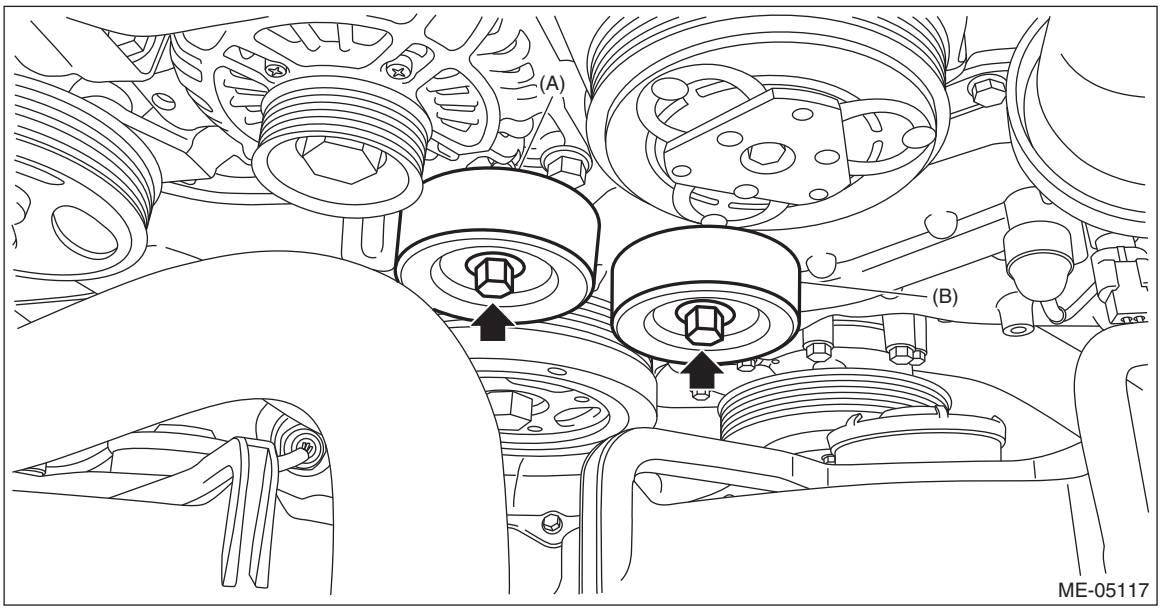
1) Install the idler pulley to the chain cover.

NOTE:
When installing the idler pulley, be careful of the idler pulley cover direction.



(A) Idler pulley cover
(B) Protrusion (3 places)

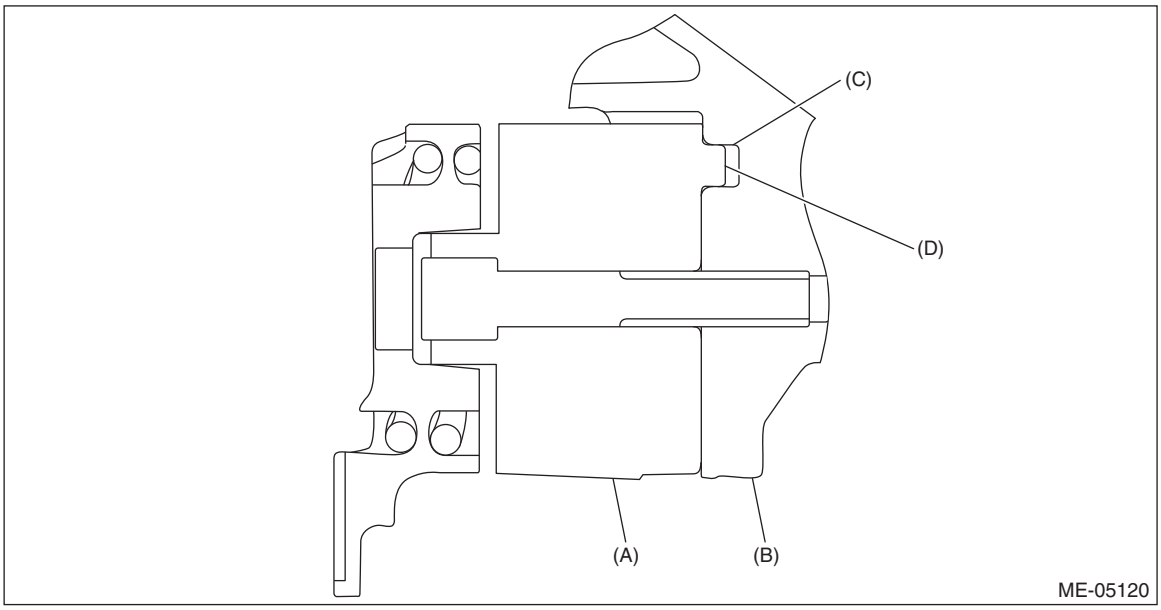
Tightening torque:
36 N·m (3.7 kgf-m, 26.6 ft-lb)



(A) Idler pulley A (B) Idler pulley B

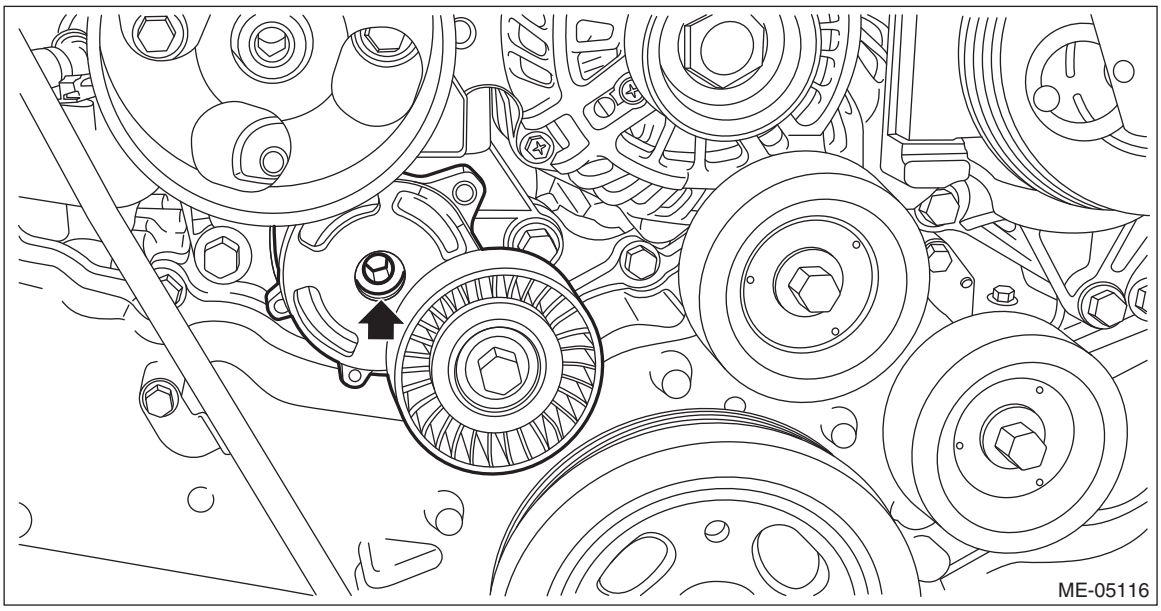
2) Install the V-belt tensioner assembly onto the power steering pump bracket.

NOTE:
When installing the V-belt tensioner assembly, insert the protrusion of V-belt tensioner assembly into the hole at the power steering pump bracket to prevent rotating.

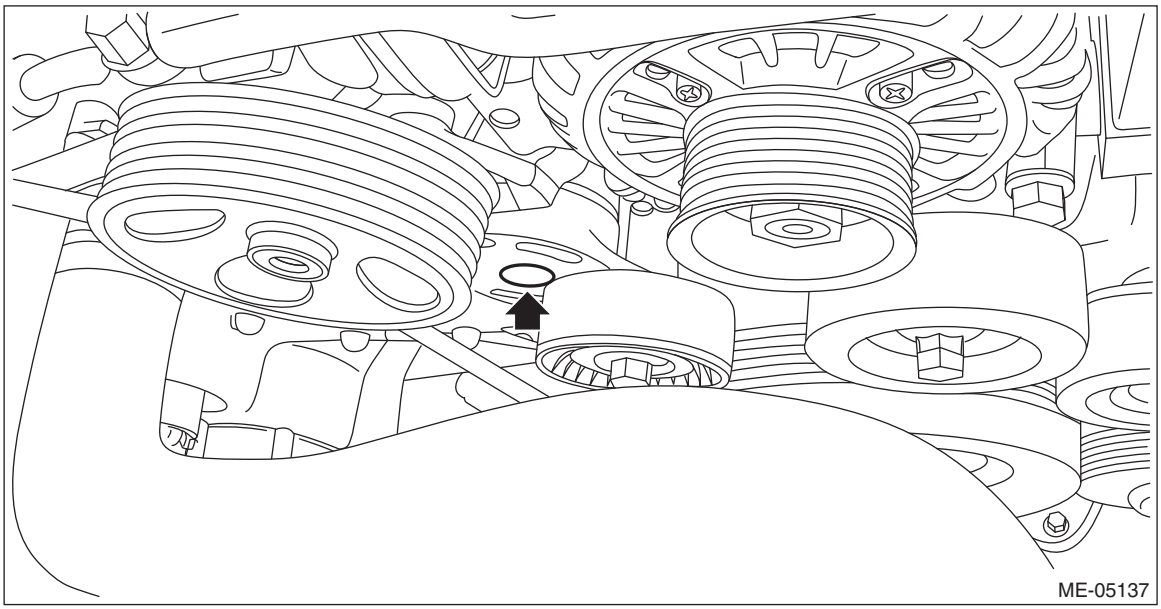


(A) V-belt tensioner ASSY (C) Hole to prevent rotation (D) Protrusion portion
(B) Power steering bracket

Tightening torque:
25 N·m (2.5 kgf-m, 18.4 ft-lb)



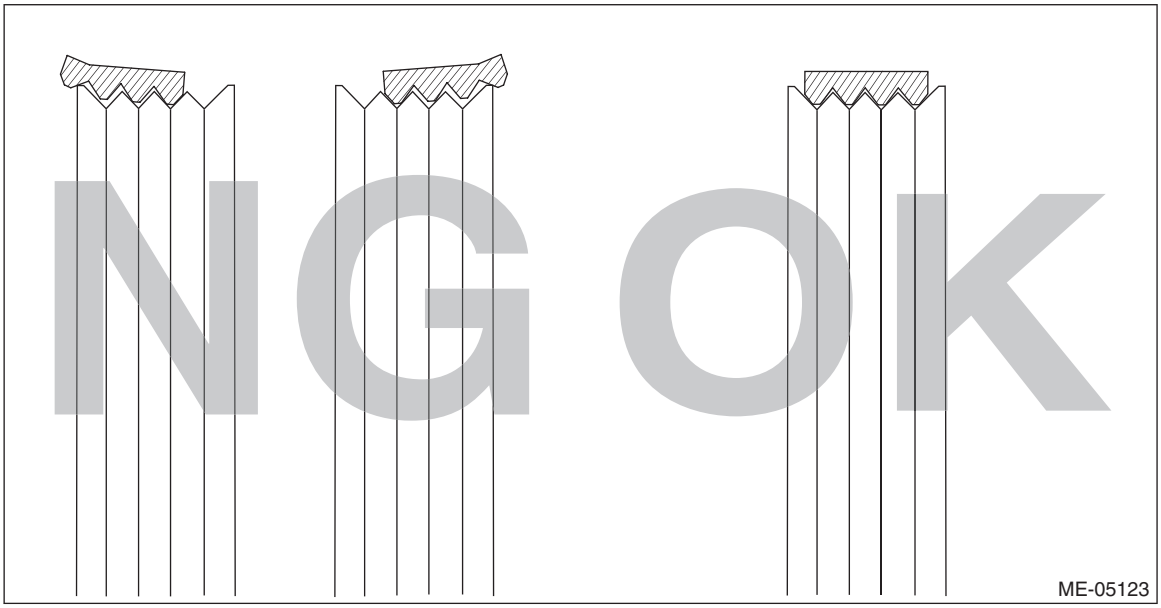
3) Install the cap to the V-belt tensioner assembly.



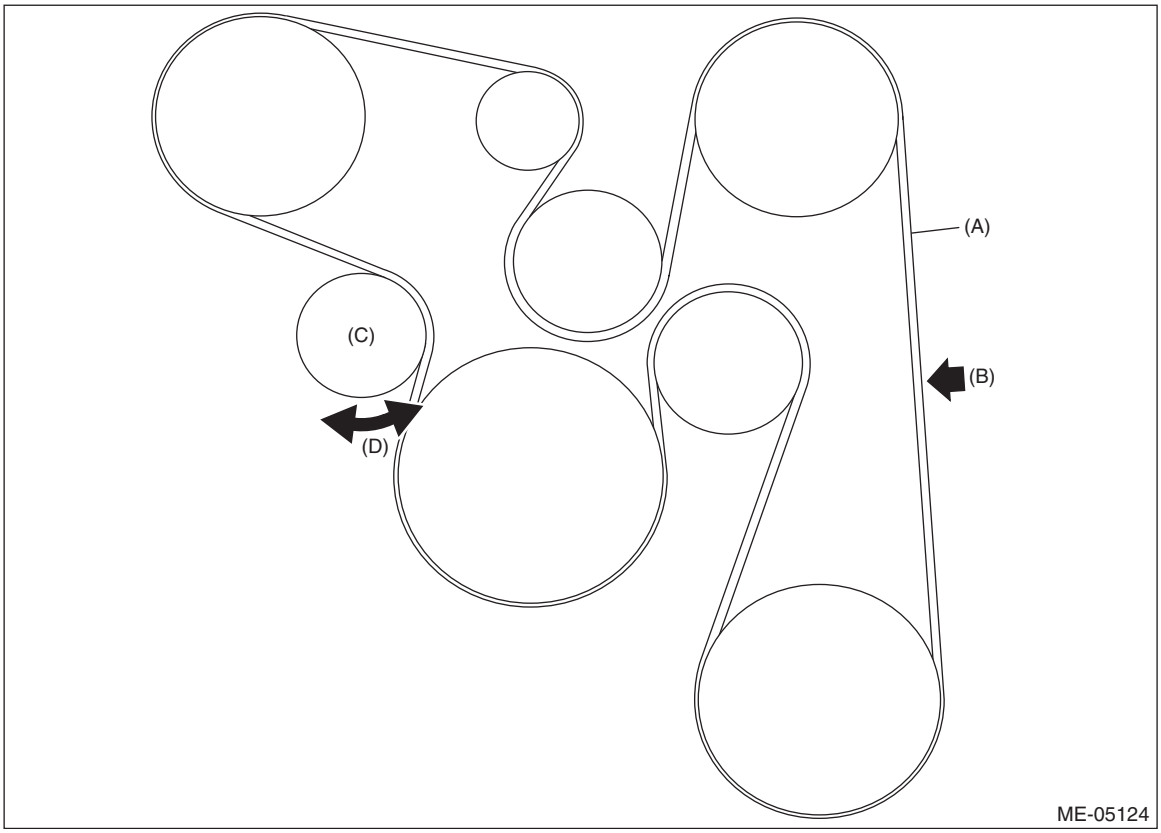
4) Install the V-belts. <Ref. to ME(H4DO)-73, V-BELT, INSTALLATION, V-belt.>

C: INSPECTION

1) Check the V-belt for cracks, tear or wear.
2) Check the V-belt tensioner assembly and idler pulley for deformation, cracks or other damages.
3) Check that the V-belt ribs are securely placed on the rib grooves for each pulleys.



4) Check that the V-belt tensioner assembly (C) moves in the direction of arrow (D), when the V-belt (A) is pushed in the direction of arrow (B) or released.

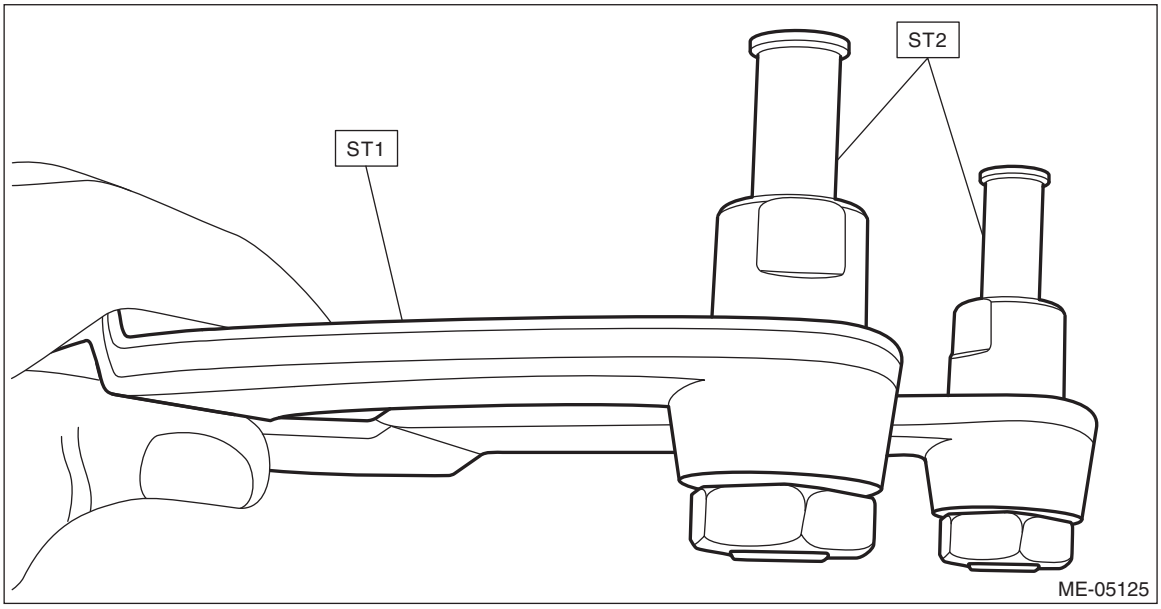


13.Crank Pulley

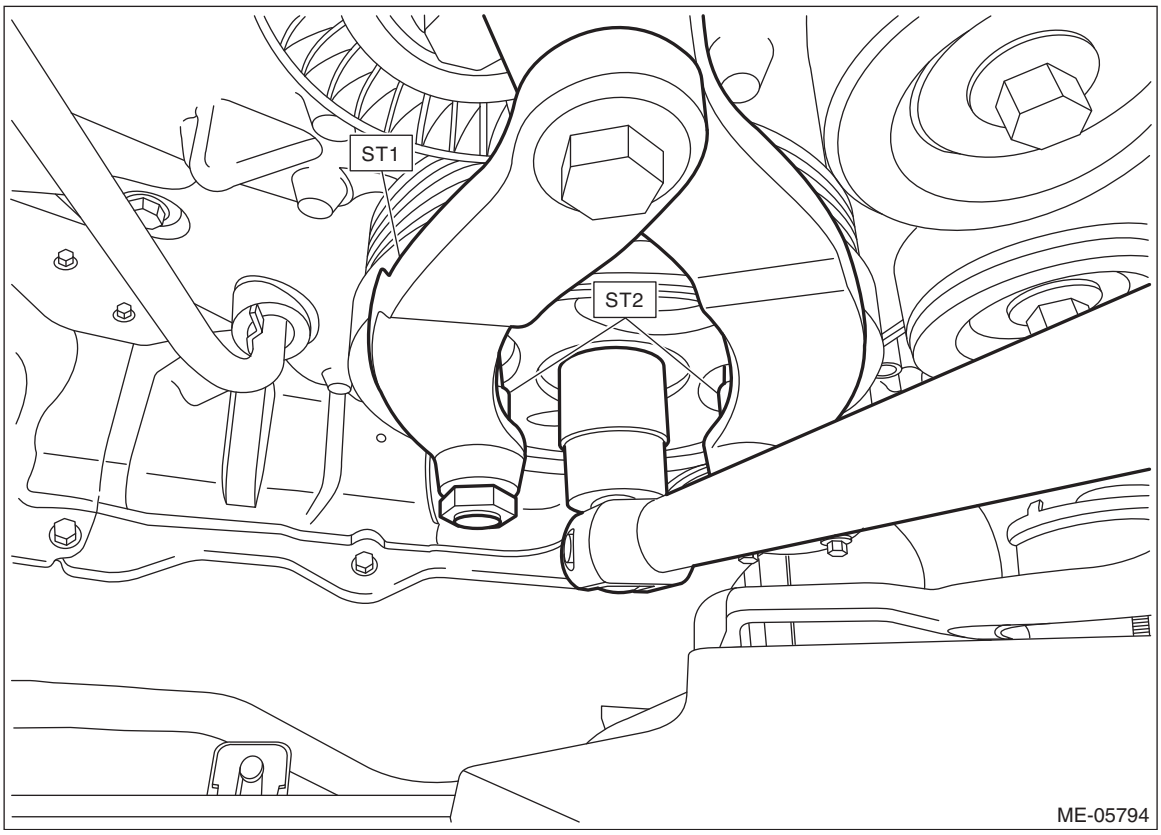
A: REMOVAL

NOTE:
When replacing a single part, perform the work with the engine installed to body.
1) Remove the V-belts. <Ref. to ME(H4DO)-70, REMOVAL, V-belt.>
2) Remove the radiator sub fan and fan motor. <Ref. to CO(H4DO)-37, REMOVAL, Radiator Sub Fan and Fan Motor.>
3) Use the ST to lock the crank pulley, and remove the crank pulley bolt.

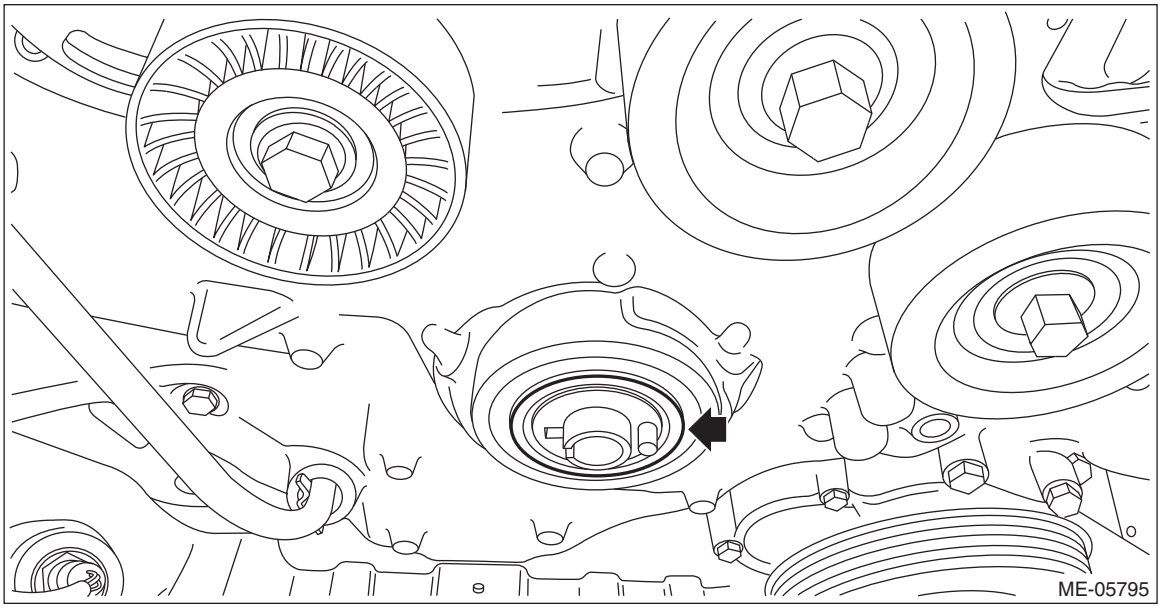
NOTE:
To prevent damaging ST1, attach the ST2 onto the ST1 as shown.
ST1 18355AA000 PULLEY WRENCH
ST2 18334AA000 PULLEY WRENCH PIN SET



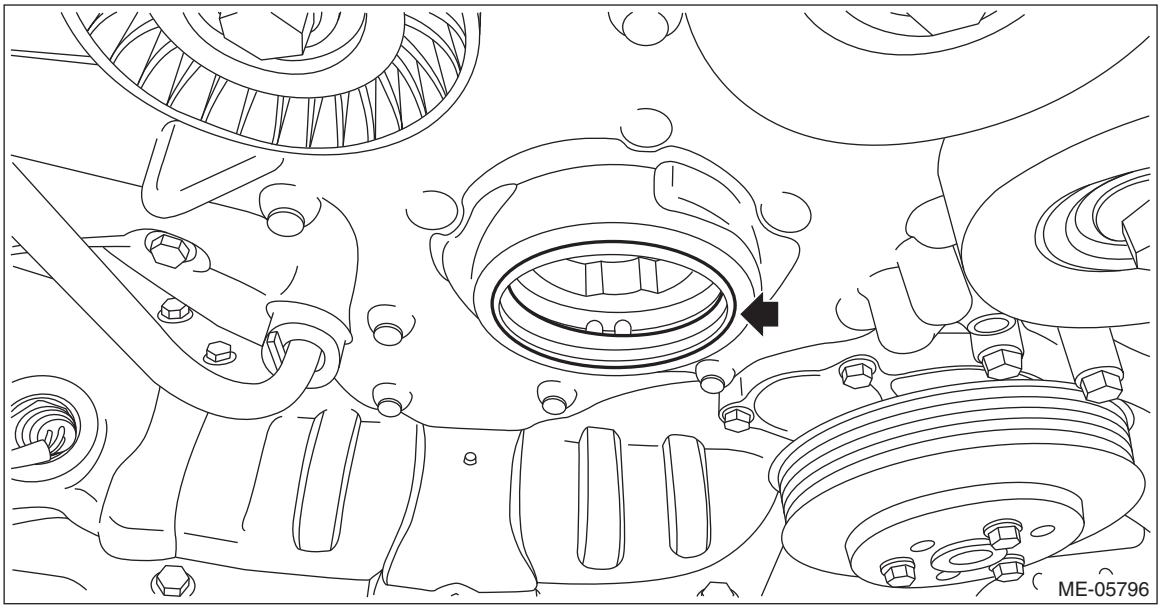
ST1 18355AA000 PULLEY WRENCH
ST2 18334AA000 PULLEY WRENCH PIN SET



4) Remove the crank pulley and remove the crank pulley boss.



5) Remove the front oil seal.



B: INSTALLATION

1. METHOD WITHOUT ANGLE GAUGE

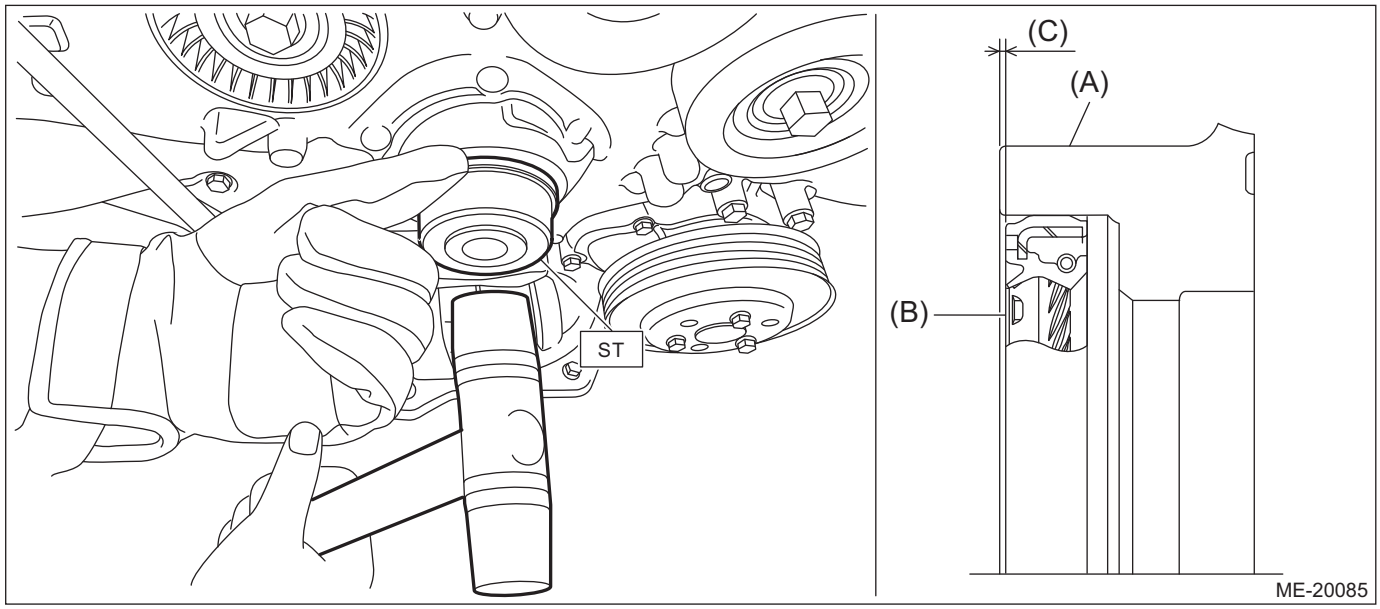
1) Degrease the press-fit section for the chain cover front oil seal, and install the front oil seal to the chain cover using ST.

CAUTION:
Do not apply fluid such as engine oil to the front oil seal and the chain cover; otherwise engine oil leakage may occur.

NOTE:
- Use a new front oil seal.
- When tapping the front oil seal in, protect the radiator fin with cardboards etc. so as not to damage the radiator fin by the plastic hammer.

ST 41399FG020 SPECIAL TOOL B

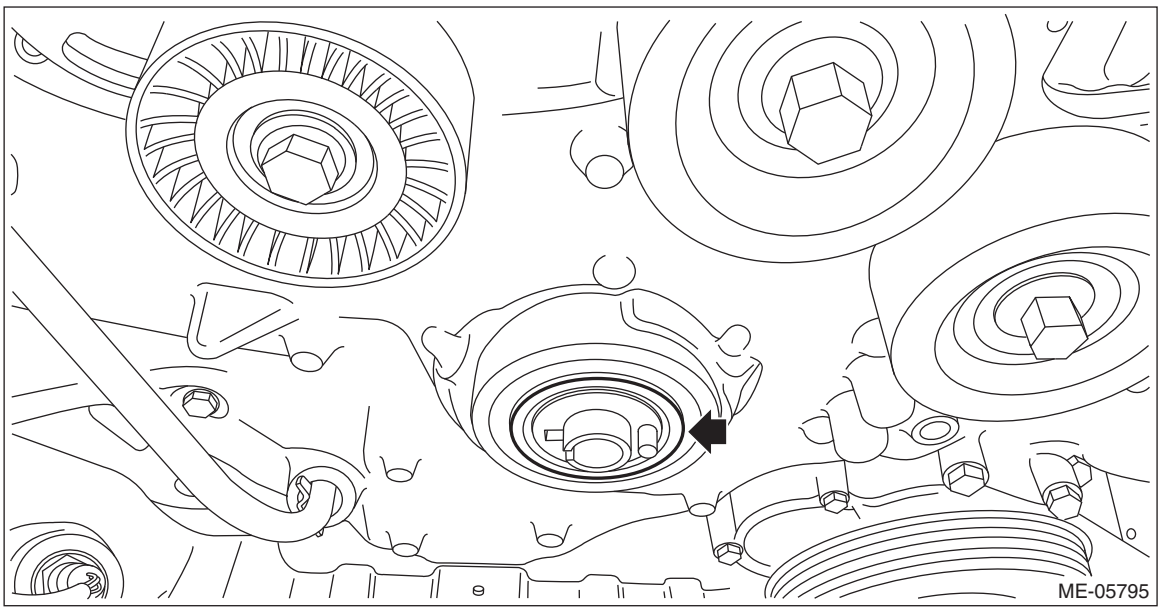
Front oil seal press-fit position:
1^{+0}_{-1} mm ($0.0394^{+0}_{-0.0394}$ in) position from chain cover end face



(A) Chain cover
(B) Oil seal
(C) Front oil seal press-fit position (1^{+0}_{-1} mm ($0.0394^{+0}_{-0.0394}$ in) position from chain cover end face)

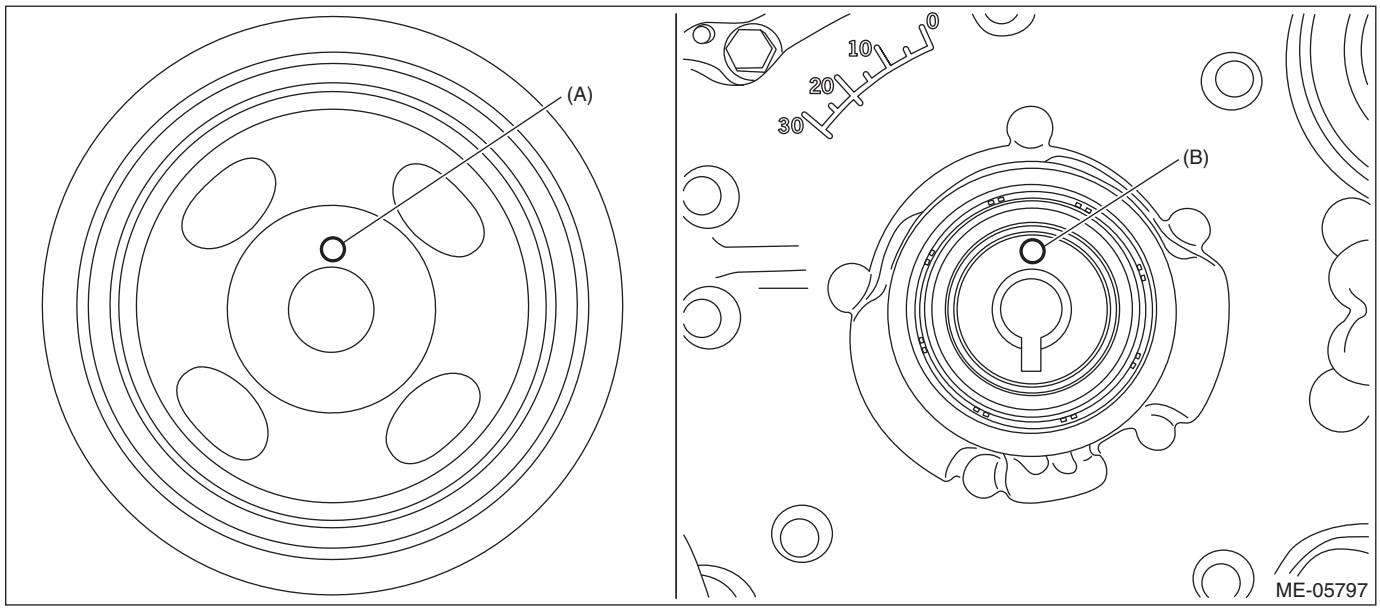
2) Clean the crankshaft thread using compressed air.

3) Install the crank pulley boss.



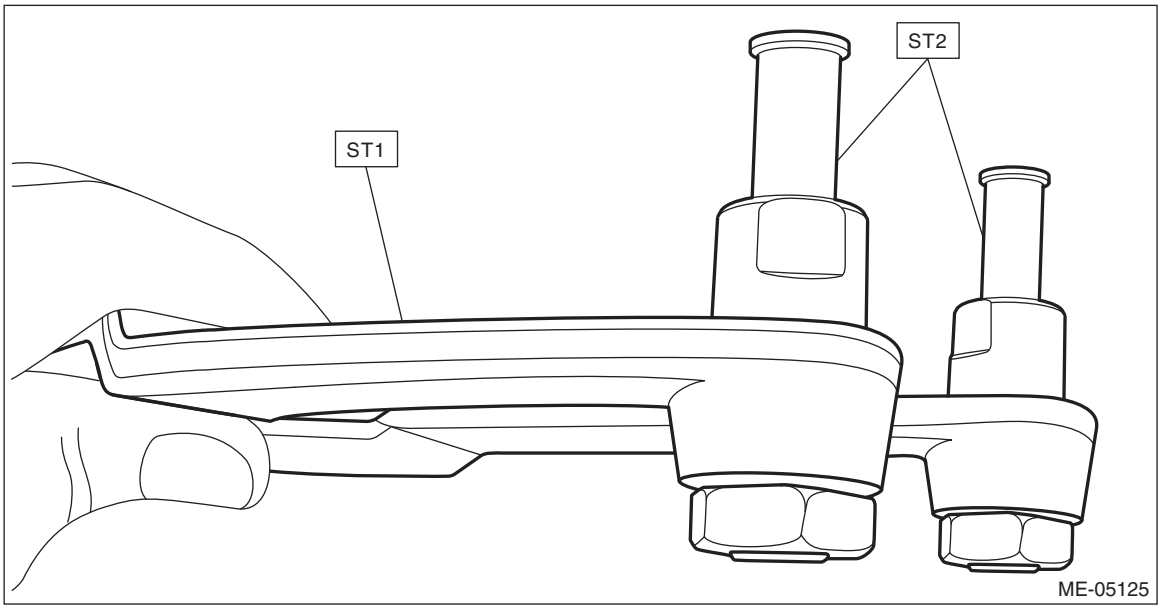
4) Apply engine oil to the crank pulley bolt seat and thread.
5) Install the crank pulley.
   (1) Install the crank pulley to the crank pulley boss.

NOTE:
- Use new O-rings.
- Install the crank pulley by aligning the crank pulley knock hole (A) and crank pulley boss knock pin (B).



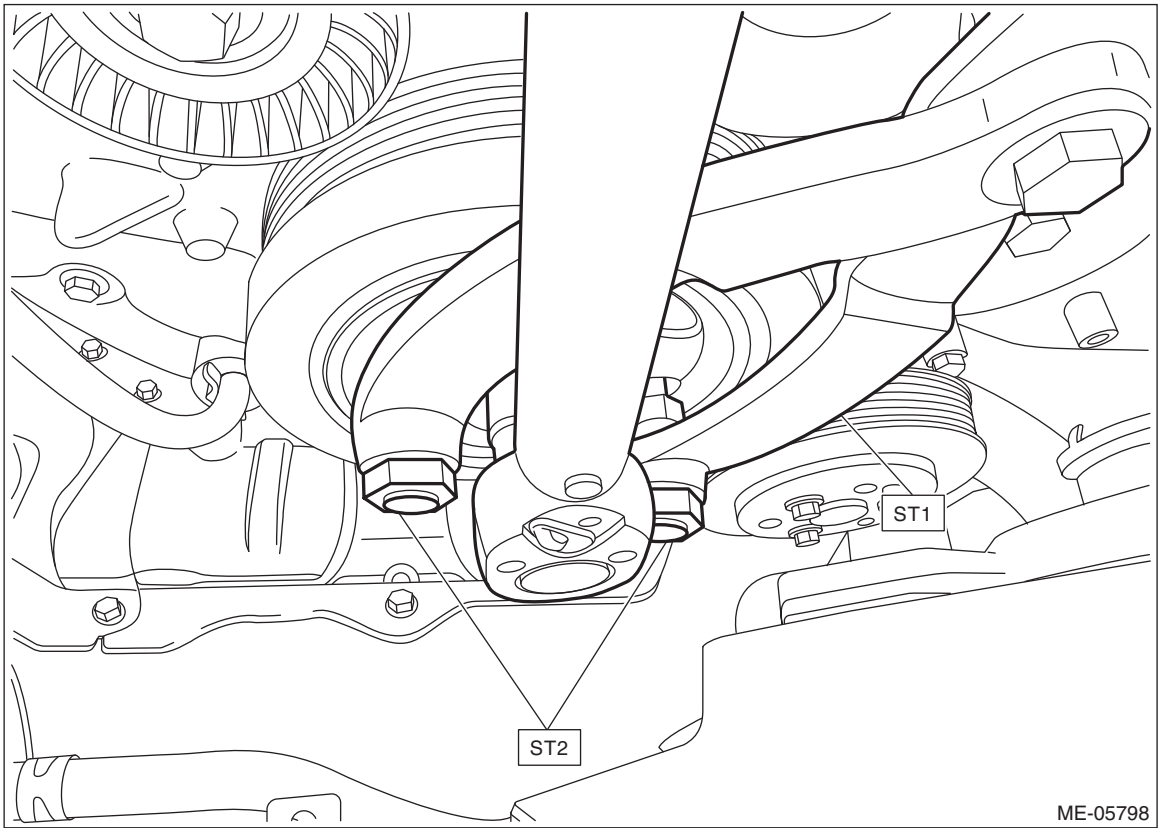
(2) Use the ST to lock the crank pulley, and temporarily tighten the crank pulley bolt.

NOTE:
To prevent damaging ST1, attach the ST2 onto the ST1 as shown.
ST1 18355AA000 PULLEY WRENCH
ST2 18334AA000 PULLEY WRENCH PIN SET



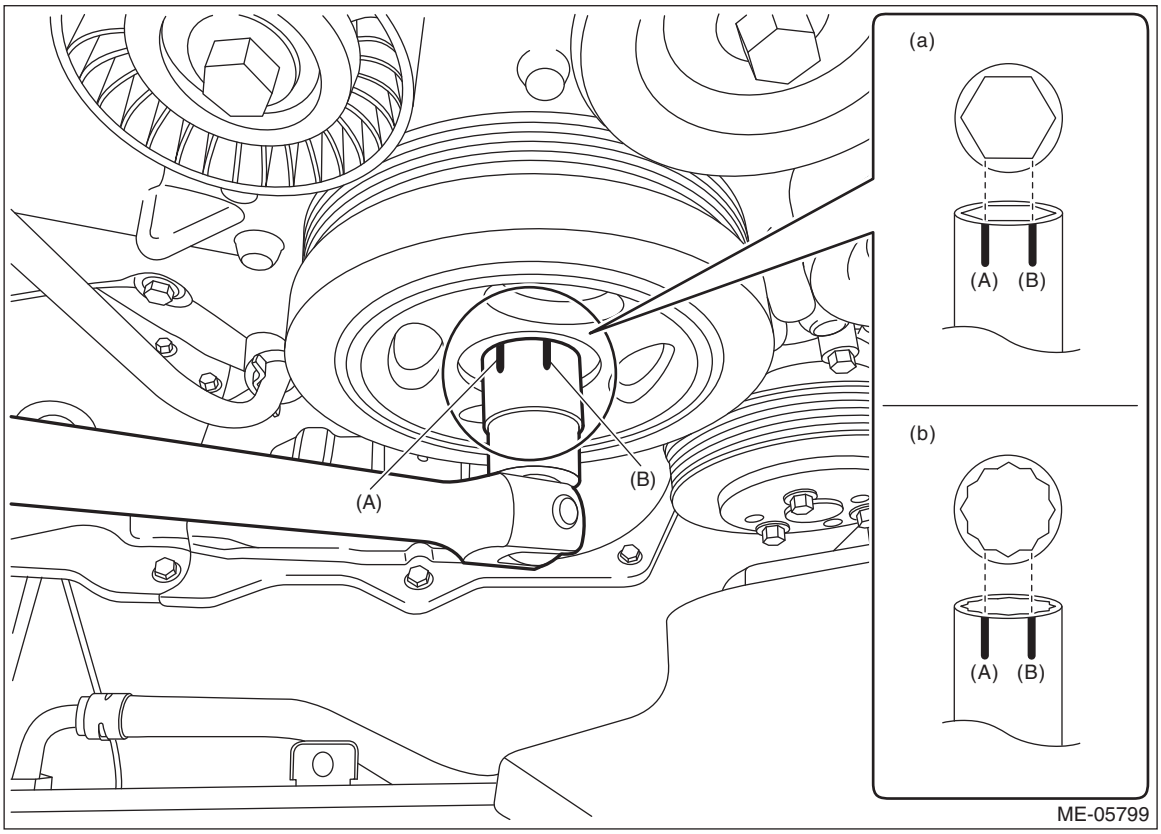
ST1 18355AA000 PULLEY WRENCH
ST2 18334AA000 PULLEY WRENCH PIN SET

Tightening torque:
60 N·m (6.1 kgf-m, 44.3 ft-lb)



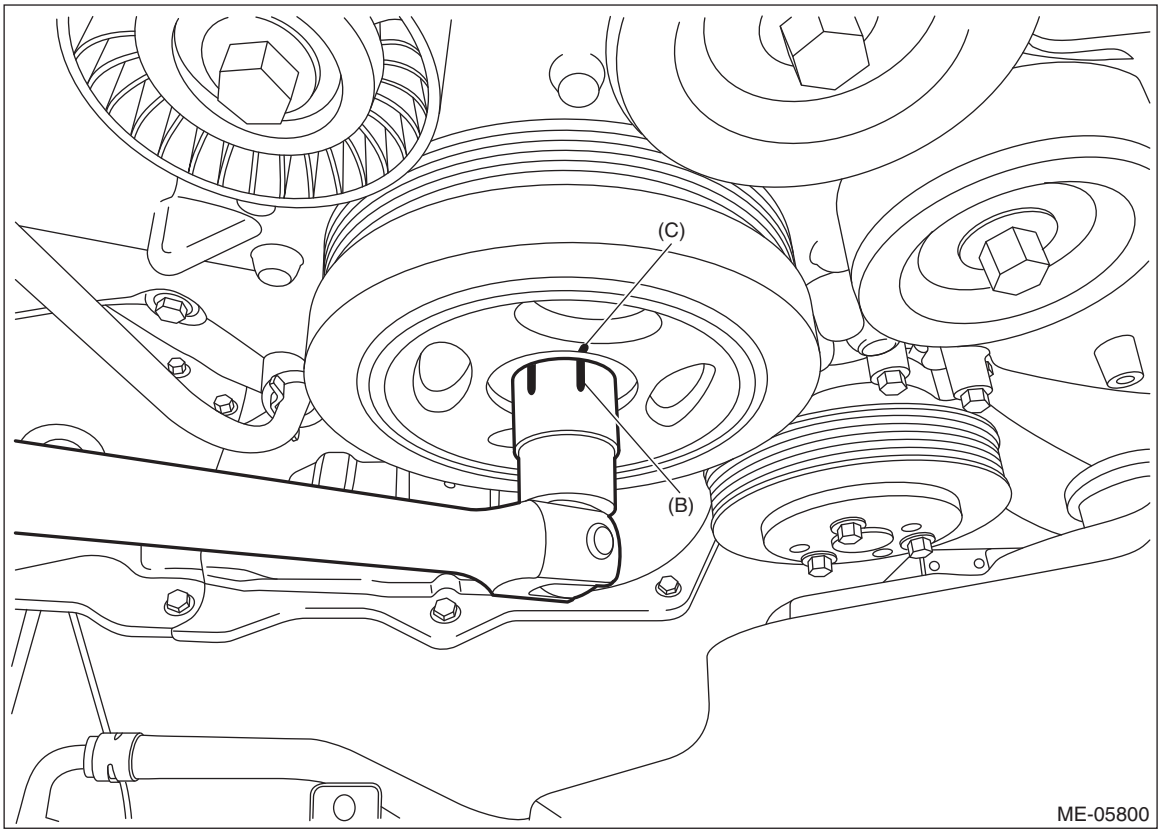
(3) Draw reference lines (A) and (B) using a marker to set the socket to the crank pulley bolt as shown in the figure.

NOTE:
Set the socket onto the crank pulley bolt so that reference lines (A) and (B) is visible.



(a) When using 6-point socket (b) When using 12-point socket

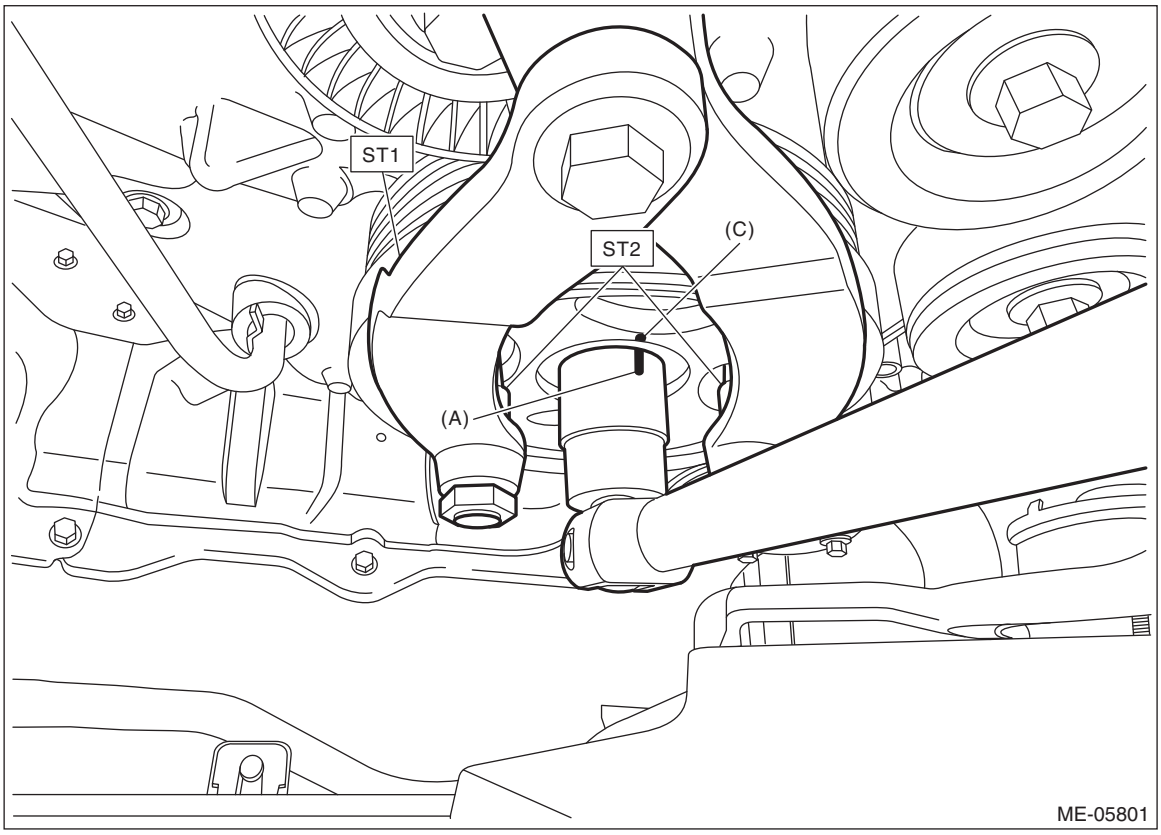
(4) Draw end line (C) on crank pulley using a marker at the same position as reference line (B) drawn on the socket in step (2).



(5) Use the ST to lock the crank pulley, and tighten the crank pulley bolt to the angle where reference line (A) and end line (C) are aligned.

NOTE:
It should be approx. 60° when reference line (A) and end line (C) are aligned.
ST1 18355AA000 PULLEY WRENCH
ST2 18334AA000 PULLEY WRENCH PIN SET

Tightening angle:
60°±5°



6) Install the radiator sub fan and fan motor. <Ref. to CO(H4DO)-38, INSTALLATION, Radiator Sub Fan and Fan Motor.>
7) Install the V-belts. <Ref. to ME(H4DO)-73, INSTALLATION, V-belt.>

2. METHOD WITH ANGLE GAUGE

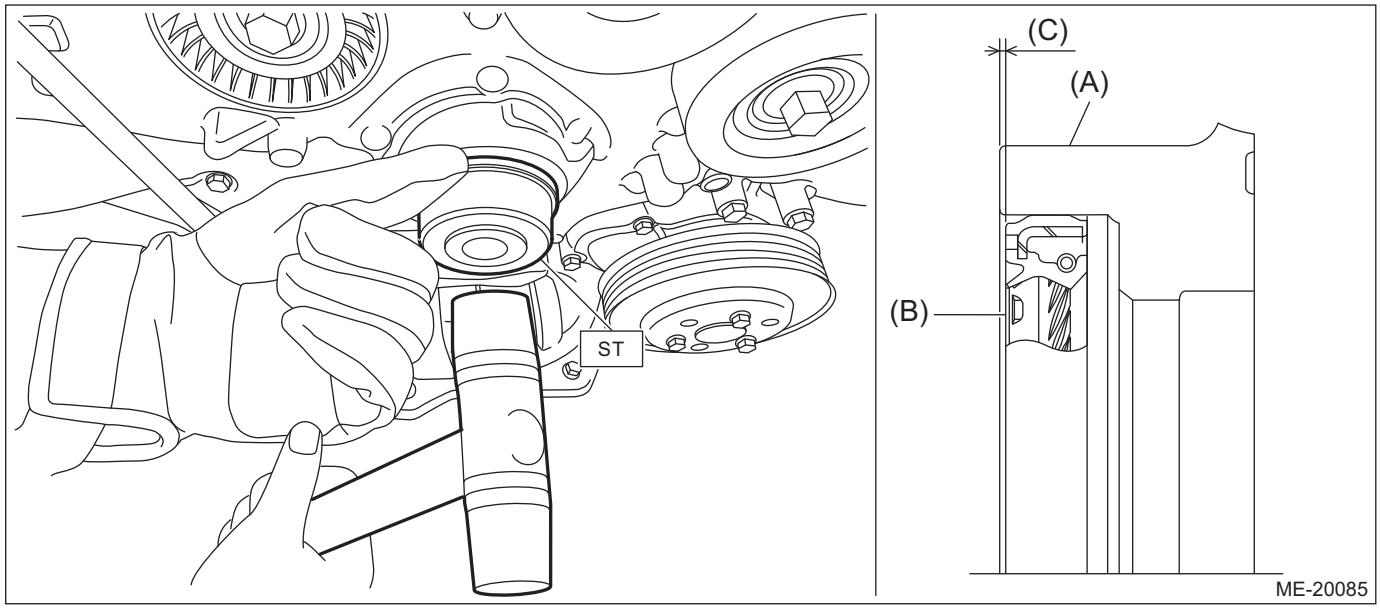
1) Degrease the press-fit section for the chain cover front oil seal, and install the front oil seal to the chain cover using ST.

CAUTION:
Do not apply fluid such as engine oil to the front oil seal and the chain cover; otherwise engine oil leakage may occur.

NOTE:
- Use a new front oil seal.
- When tapping the front oil seal in, protect the radiator fin with cardboards etc. so as not to damage the radiator fin by the plastic hammer.

ST 41399FG020 SPECIAL TOOL B

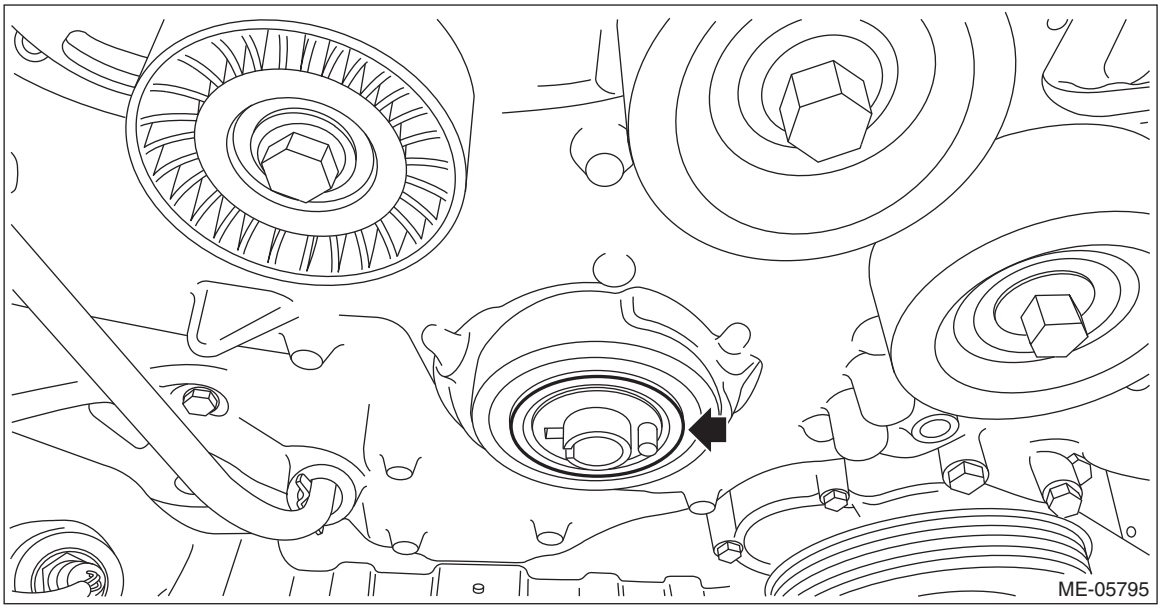
Front oil seal press-fit position:
1^{+0}_{-1} mm ($0.0394^{+0}_{-0.0394}$ in) position from chain cover end face



(A) Chain cover
(B) Oil seal
(C) Front oil seal press-fit position (1^{+0}_{-1} mm ($0.0394^{+0}_{-0.0394}$ in) position from chain cover end face)

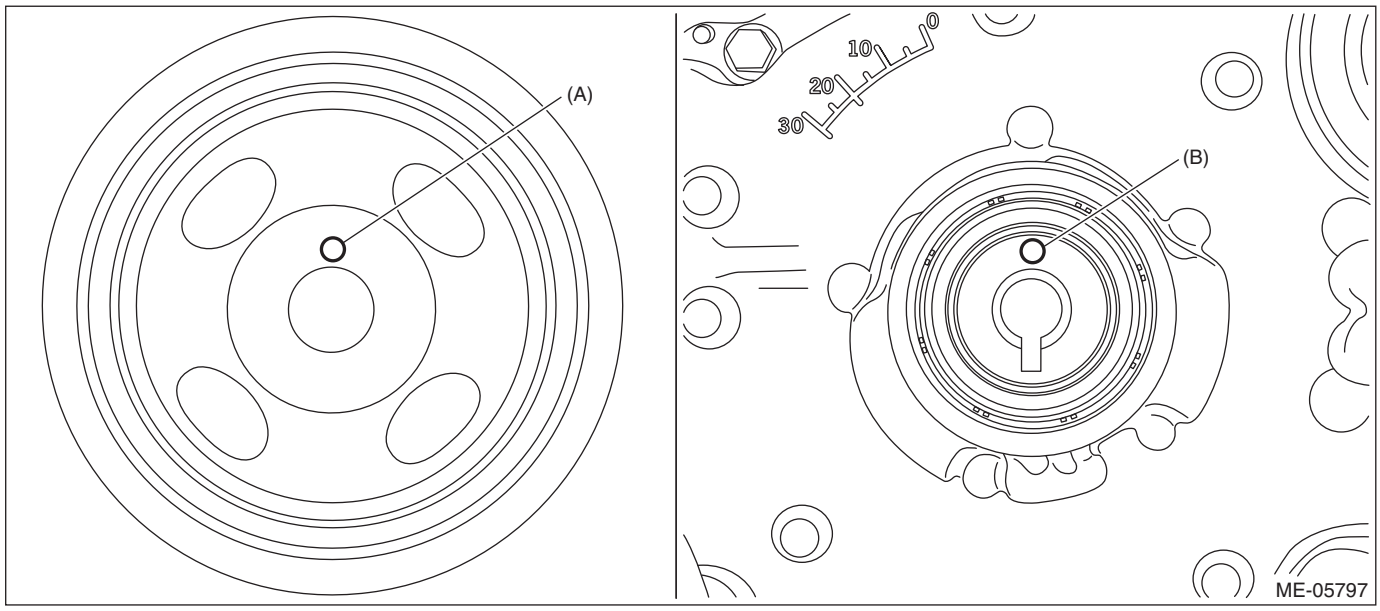
2) Clean the crankshaft thread using compressed air.

3) Install the crank pulley boss.



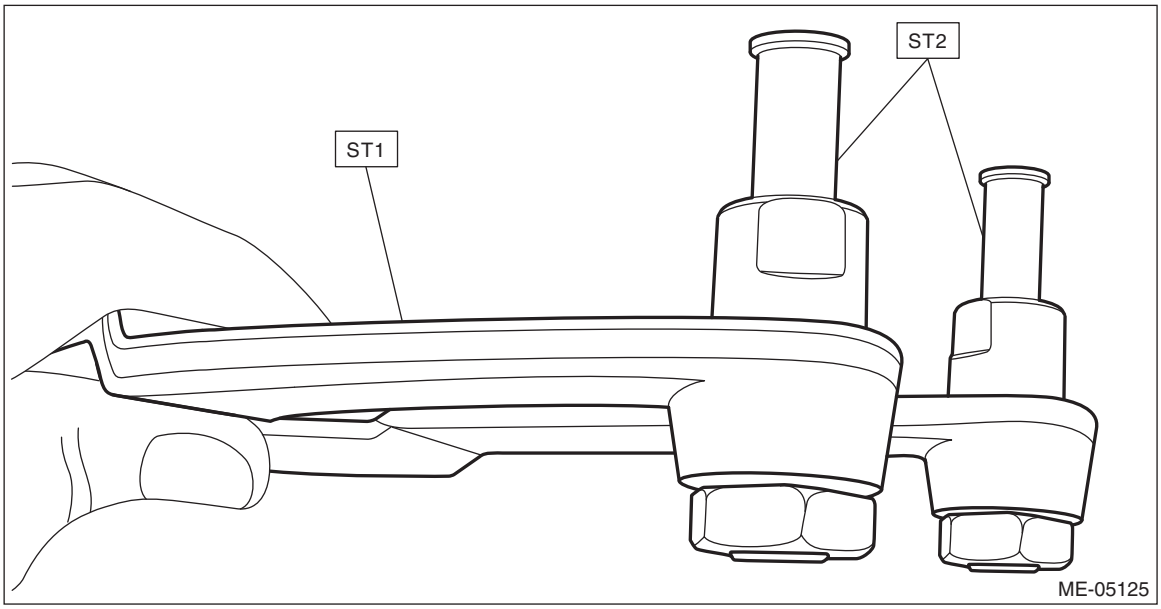
4) Apply engine oil to the crank pulley bolt seat and thread.
5) Install the crank pulley.
   (1) Install the crank pulley to the crank pulley boss.

NOTE:
- Use new O-rings.
- Install the crank pulley by aligning the crank pulley knock hole (A) and crank pulley boss knock pin (B).



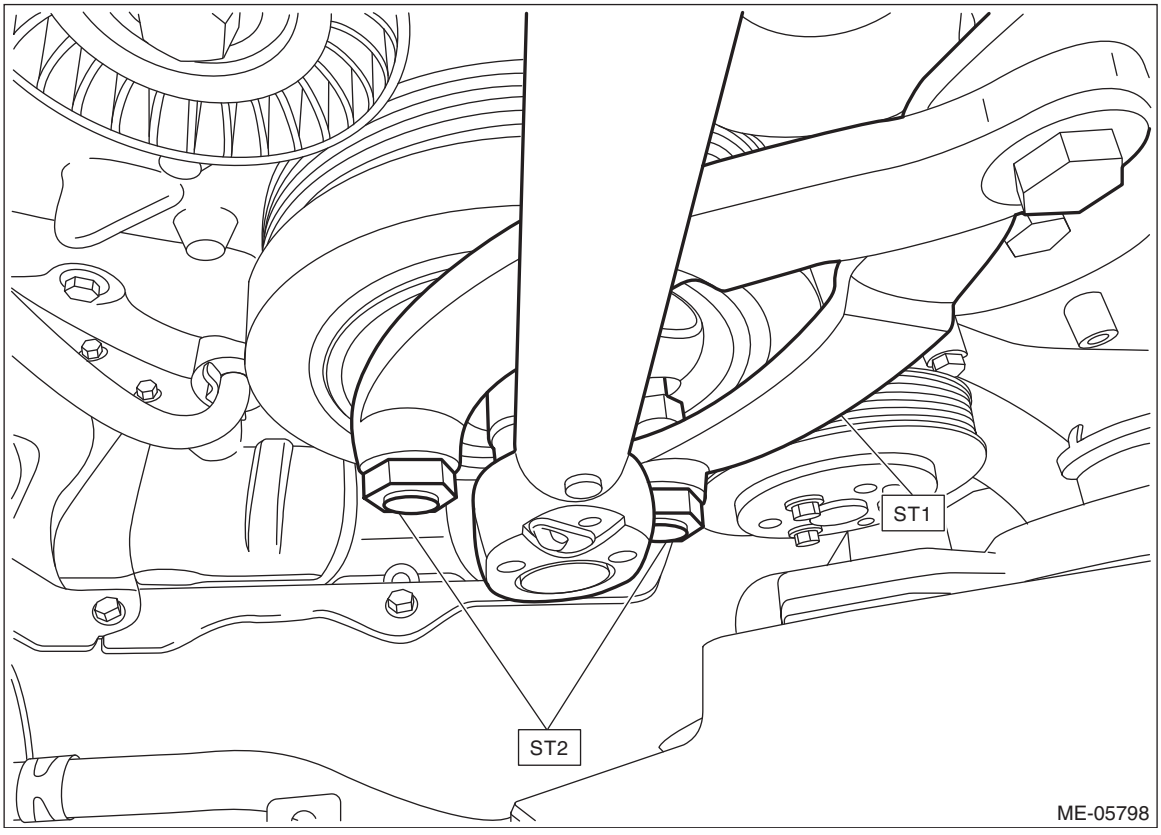
(2) Use the ST to lock the crank pulley, and temporarily tighten the crank pulley bolt.

NOTE:
To prevent damaging ST1, attach the ST2 onto the ST1 as shown.
ST1 18355AA000 PULLEY WRENCH
ST2 18334AA000 PULLEY WRENCH PIN SET



ST1 18355AA000 PULLEY WRENCH
ST2 18334AA000 PULLEY WRENCH PIN SET

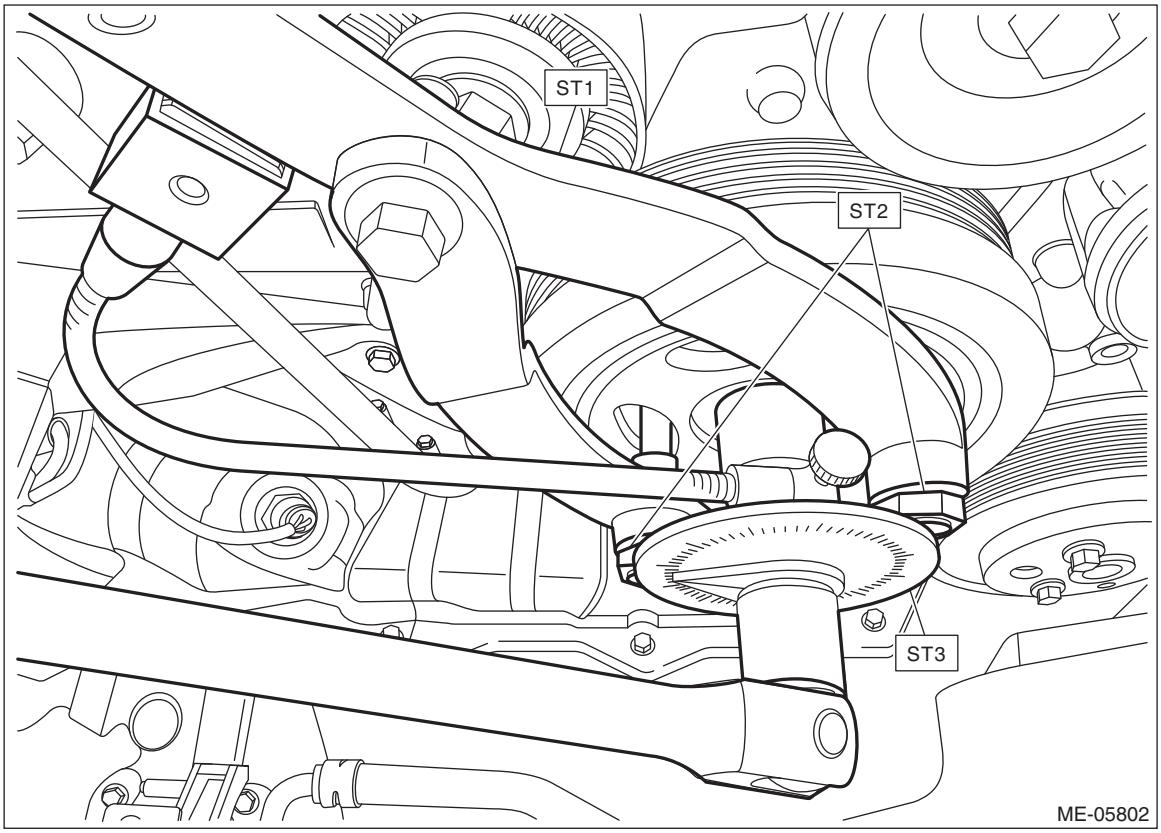
Tightening torque:
60 N·m (6.1 kgf-m, 44.3 ft-lb)



(3) Set the ST2, use the ST1 to lock the crank pulley, and tighten the crank pulley bolt to the specified angle.

NOTE:
Attach the magnet used for securing the ST3 (ANGLE GAUGE) to ST1.
ST1 18355AA000 PULLEY WRENCH
ST2 18334AA000 PULLEY WRENCH PIN SET
ST3 18854AA000 ANGLE GAUGE

Tightening angle:
60°±5°



6) Install the radiator sub fan and fan motor. <Ref. to CO(H4DO)-38, INSTALLATION, Radiator Sub Fan and Fan Motor.>
7) Install the V-belts. <Ref. to ME(H4DO)-73, INSTALLATION, V-belt.>

C: INSPECTION

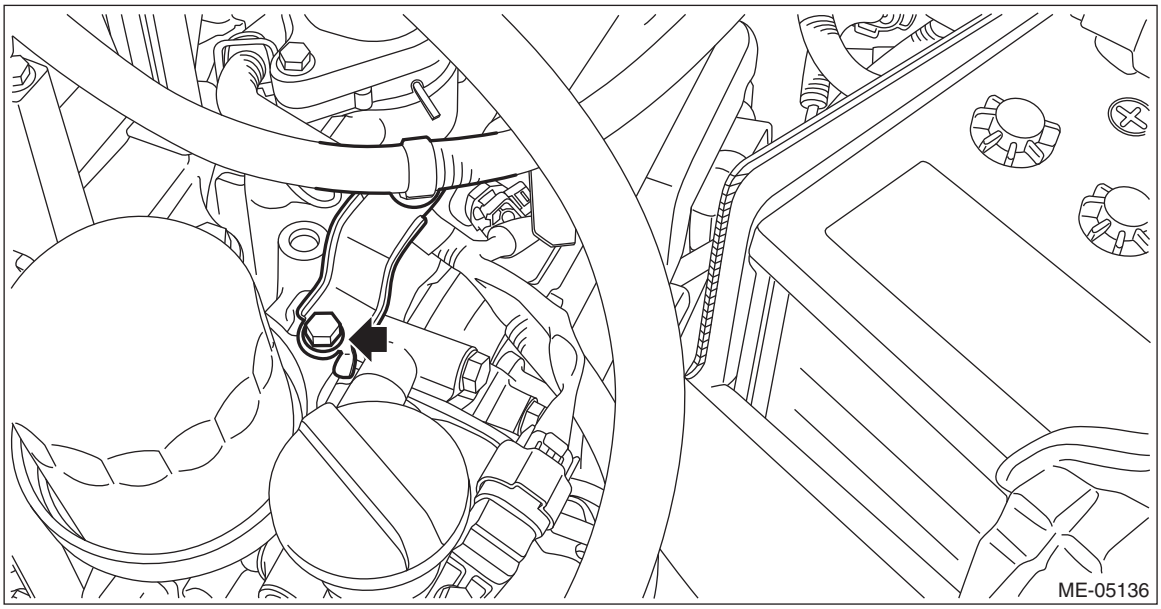
1) Check that the crank pulley has no deformation, cracks or other damages.
2) Inspect for oil leakage from the front oil seal. If there is an oil leak, replace the front oil seal with a new one. <Ref. to ME(H4DO)-78, REMOVAL, Crank Pulley.>

14.Chain Cover

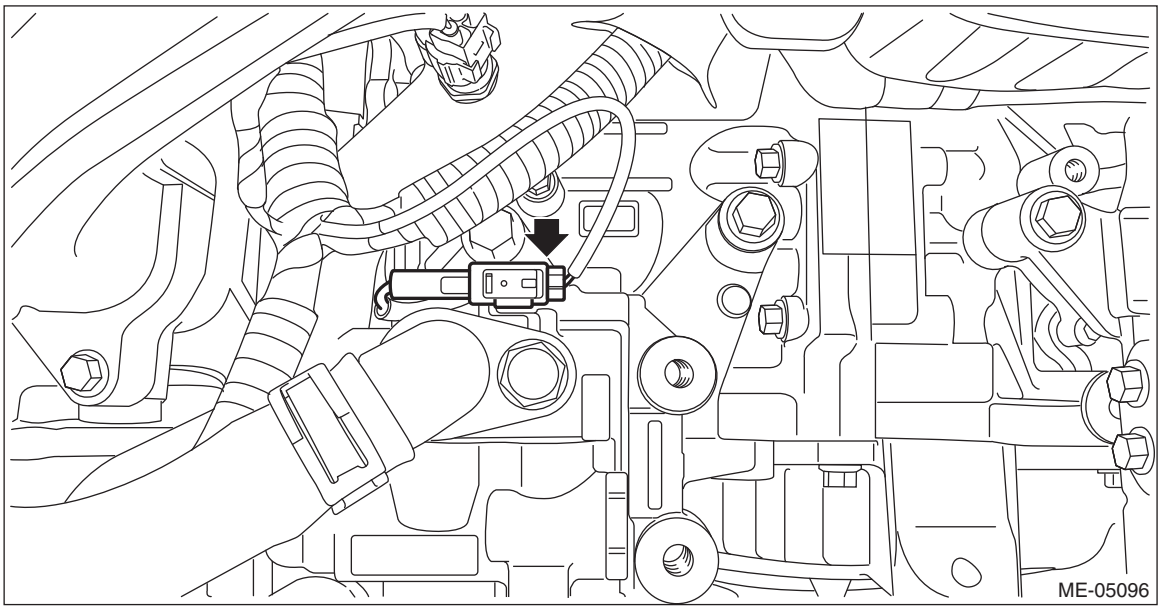
A: REMOVAL

NOTE:
When replacing a single part, perform the work with the engine installed to body.
1) When working on the vehicle

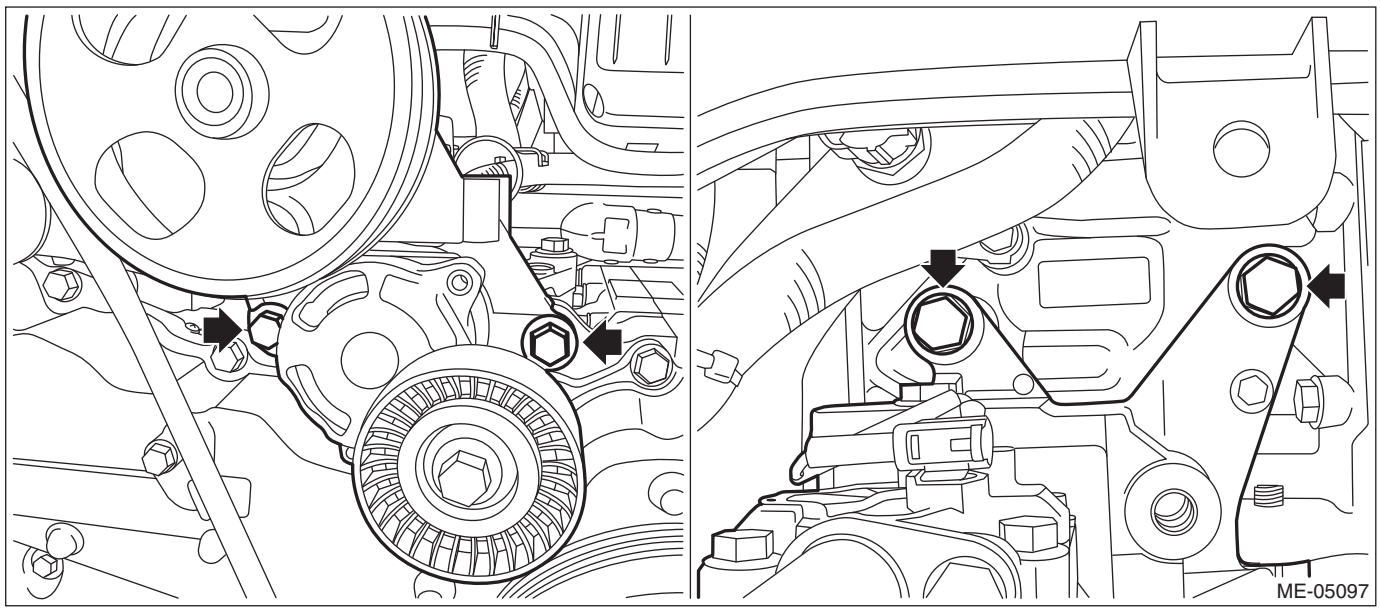
NOTE:
When working on the vehicle, perform the following steps also.
(1) Remove the radiator. <Ref. to CO(H4DO)-23, REMOVAL, Radiator.>
(2) Remove the front exhaust pipe. <Ref. to EX(H4DO)-5, REMOVAL, Front Exhaust Pipe.>
(3) Remove the bolts which secure the generator cord stay to the chain cover.



(4) Remove the power steering pump.
1. Remove the V-belts. <Ref. to ME(H4DO)-70, REMOVAL, V-belt.>
2. Remove the generator. <Ref. to SC(H4DO)-33, REMOVAL, Generator.>
3. Disconnect the connector from power steering pump switch.

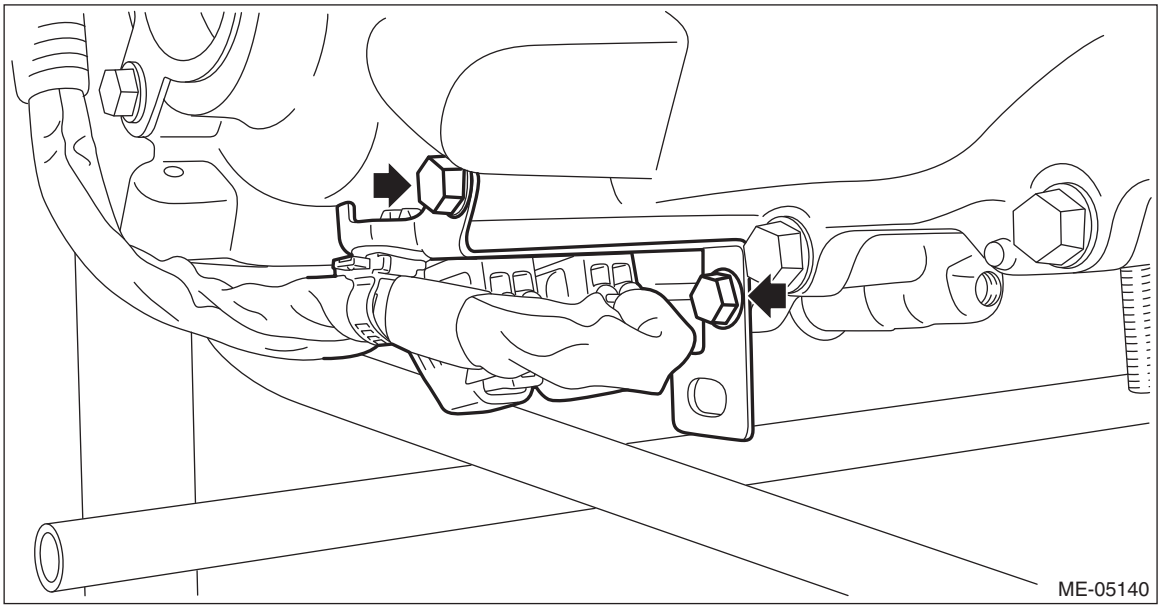


4. Remove the power steering pump from the engine.

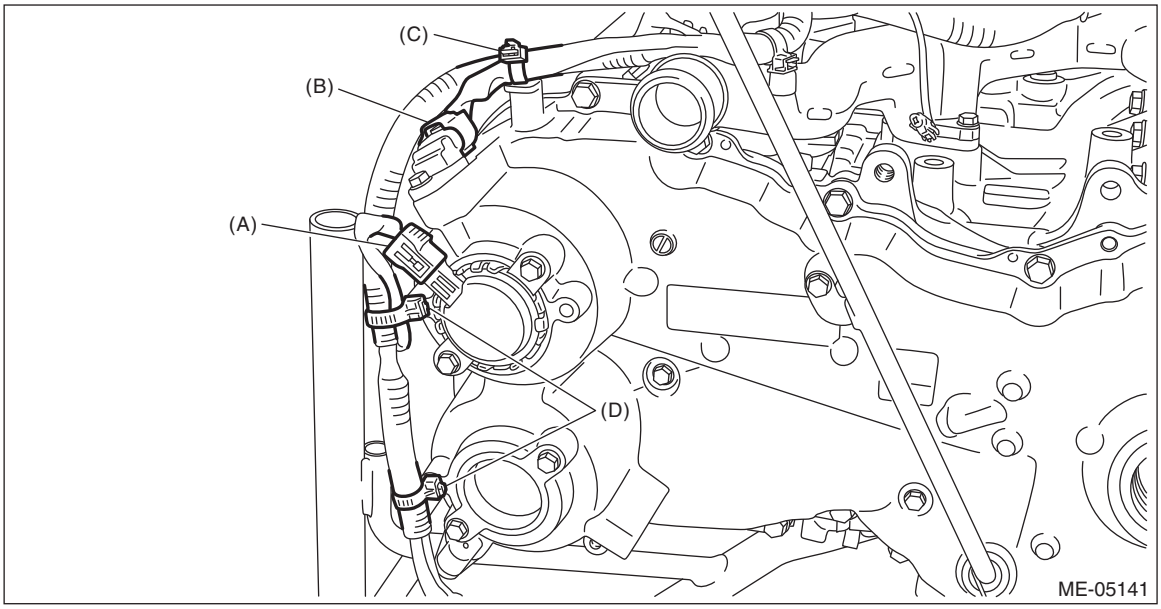


5. Place the power steering pump on the right side wheel apron.

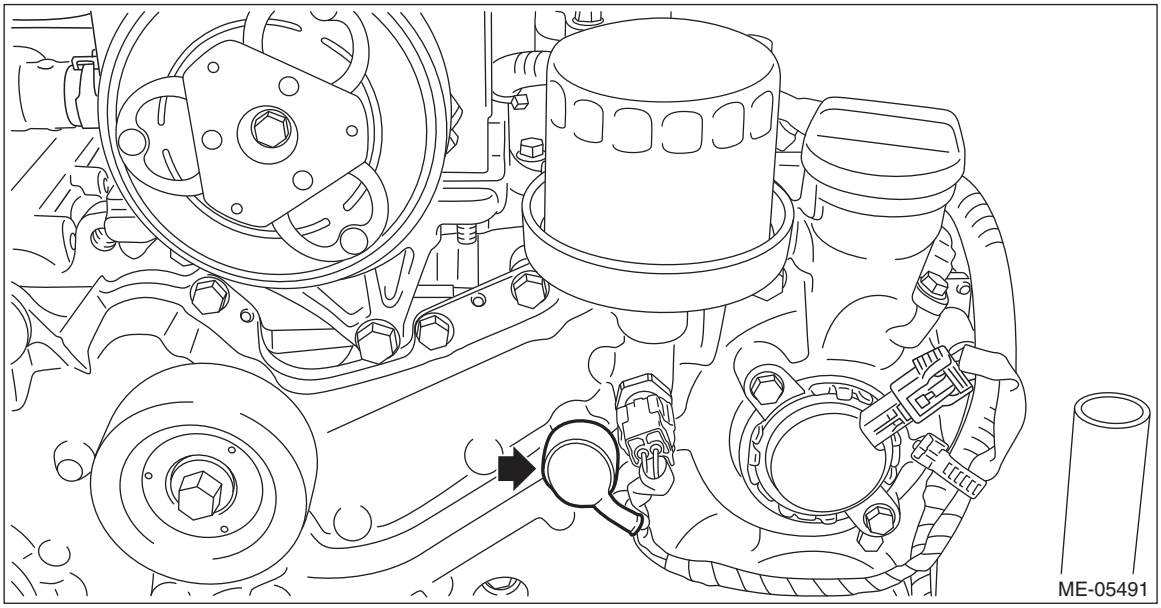
2) Drain the engine oil. <Ref. to LU(H4DO)-12, REPLACEMENT, Engine Oil.>
3) Remove the water pump pulley. <Ref. to CO(H4DO)-16, WATER PUMP, REMOVAL, Water Pump.>
4) Remove the crank pulley. <Ref. to ME(H4DO)-78, REMOVAL, Crank Pulley.>
5) Remove the engine harness stay from the chain cover.



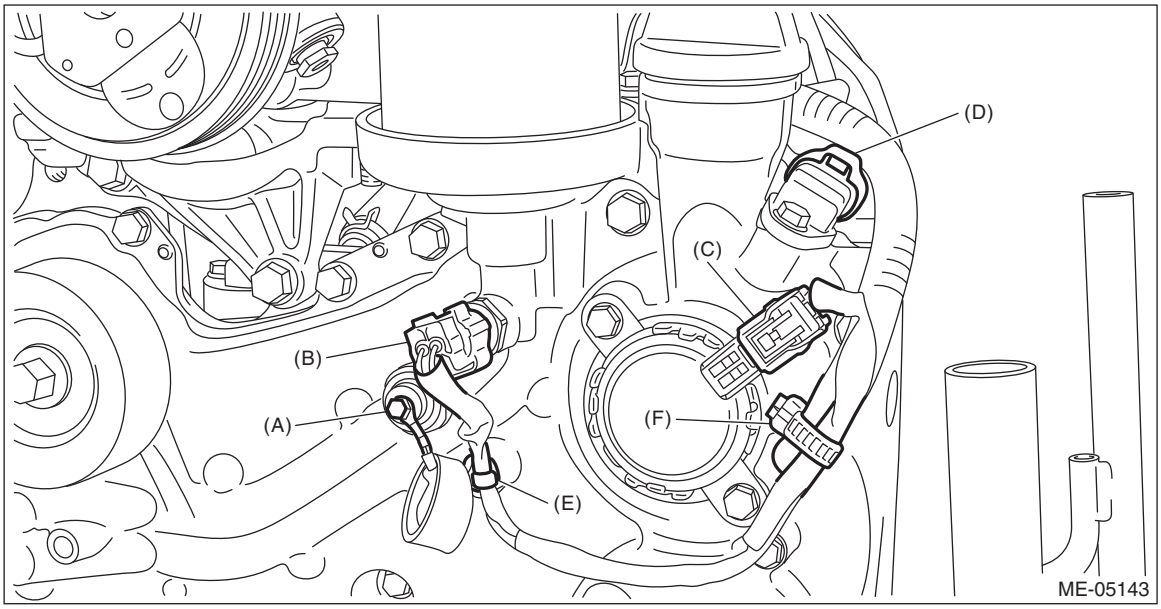
6) Disconnect the connector (A) from the oil control solenoid RH, and the connector (B) from the camshaft position sensor RH, and remove the clip (C) and clip (D) which secure the engine harness.



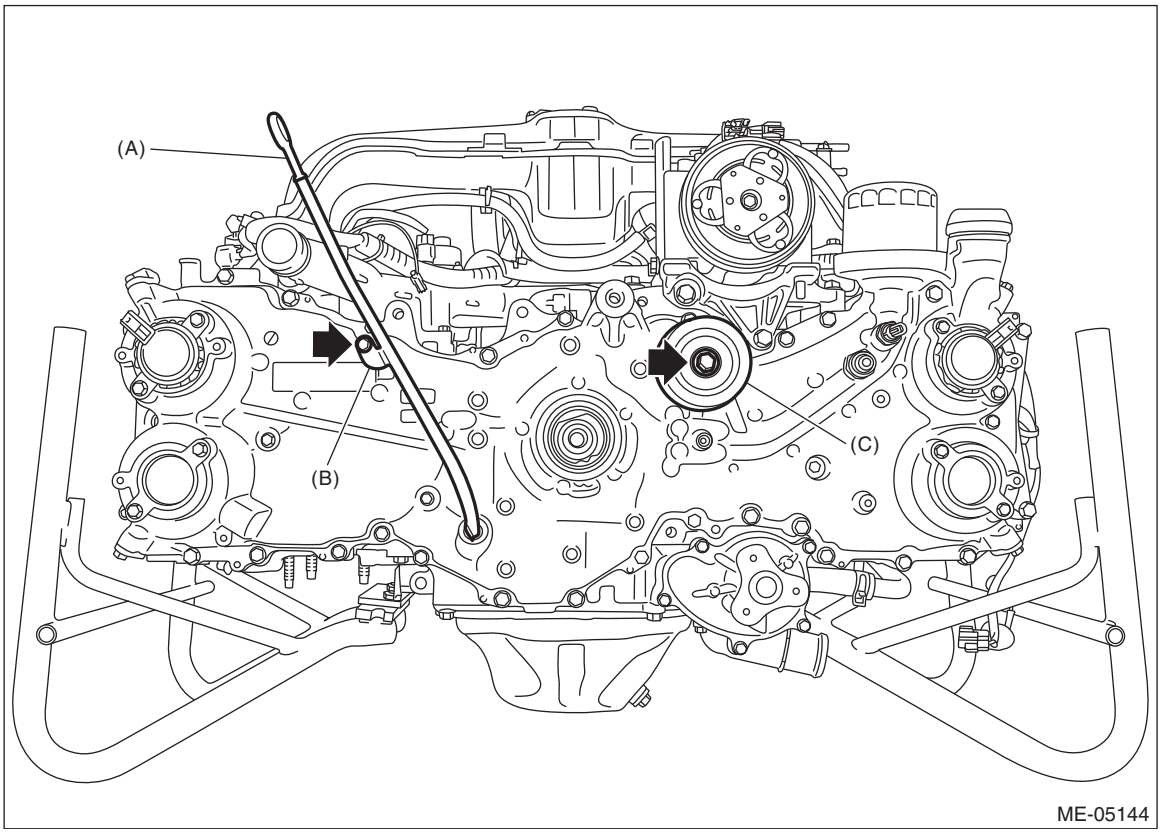
7) Remove the rubber cap from the oil pressure switch.



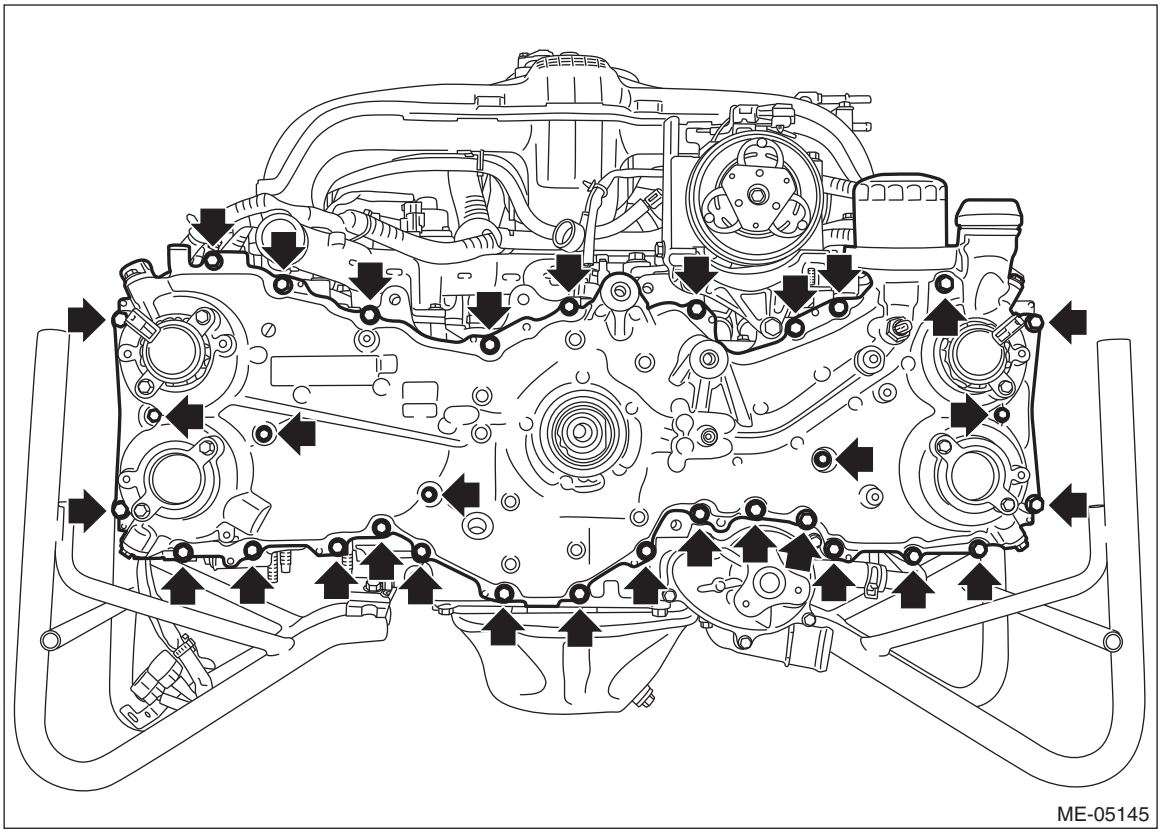
8) Disconnect the terminal (A) from the oil pressure switch, and connector (B) from the engine oil temperature sensor, and connector (C) from the oil control solenoid LH, and connector (D) from the camshaft position sensor LH, and remove the clip (E) and clip (F) which secure the engine harness.



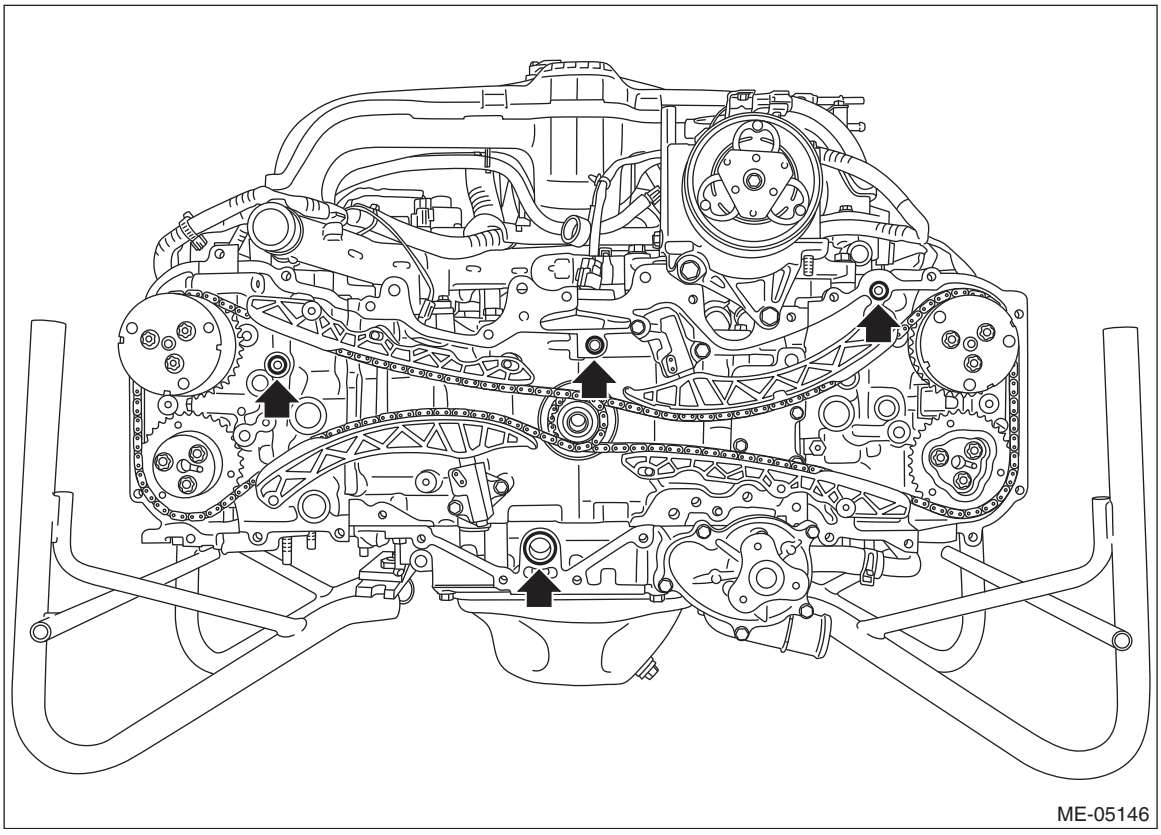
9) Pull out the oil level gauge (A), and remove the oil level gauge guide (B) and idler pulley (C).



10) Remove the chain cover.



11) Remove the O-rings from cylinder head RH, cylinder head LH, cylinder block LH and oil pan upper.

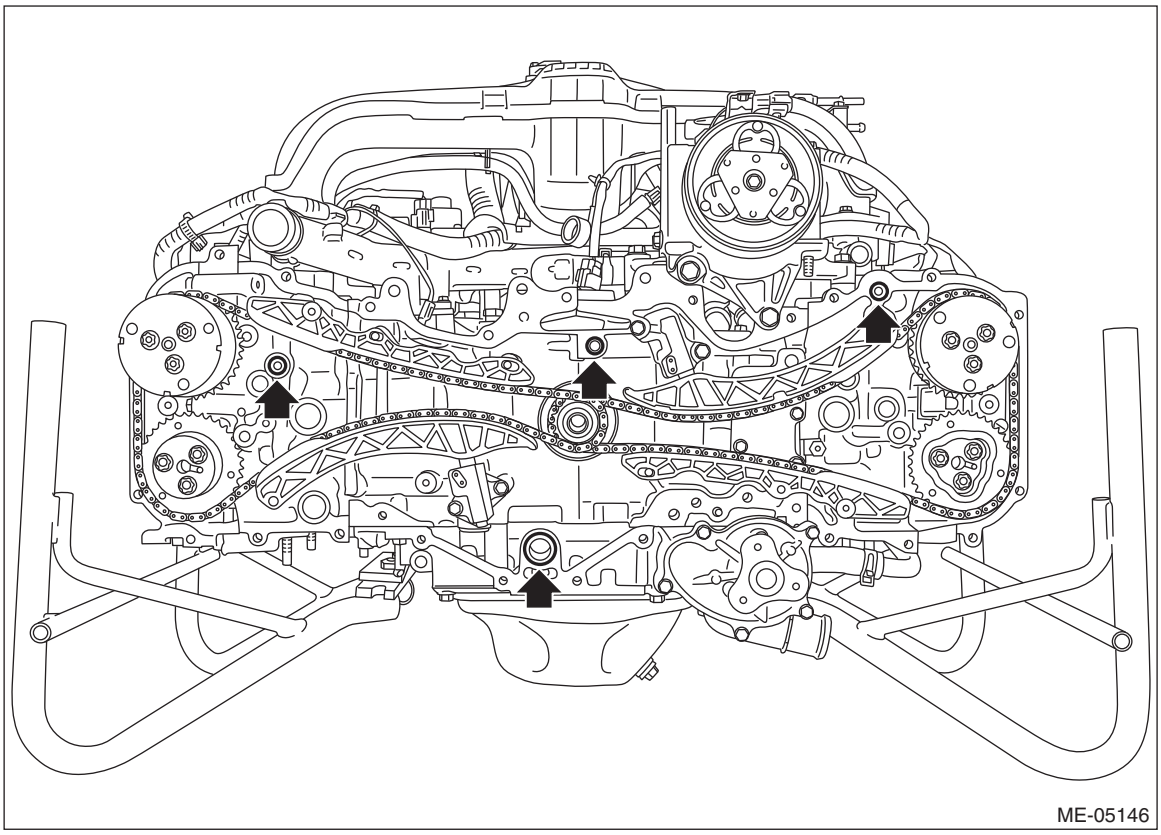


12) Remove the liquid gasket from the chain cover and engine unit.

B: INSTALLATION

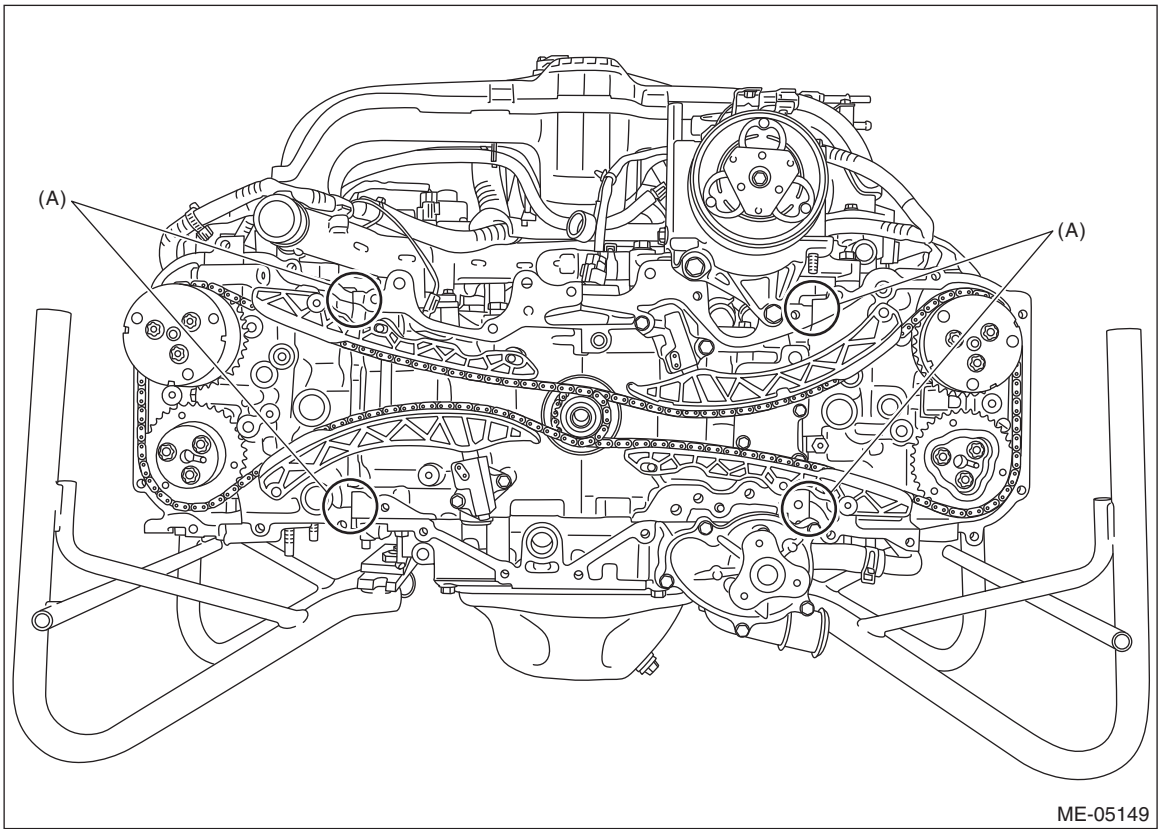
1) Install the O-rings to cylinder head RH, cylinder head LH, cylinder block LH and oil pan upper.

NOTE:
- Use new O-rings.
- Apply a coat of engine oil to the O-rings.



2) Apply liquid gasket if there are gaps between cylinder head and cylinder block (A) as shown.

Liquid gasket:
THREE BOND 1217G (Part No. K0877Y0100) or equivalent

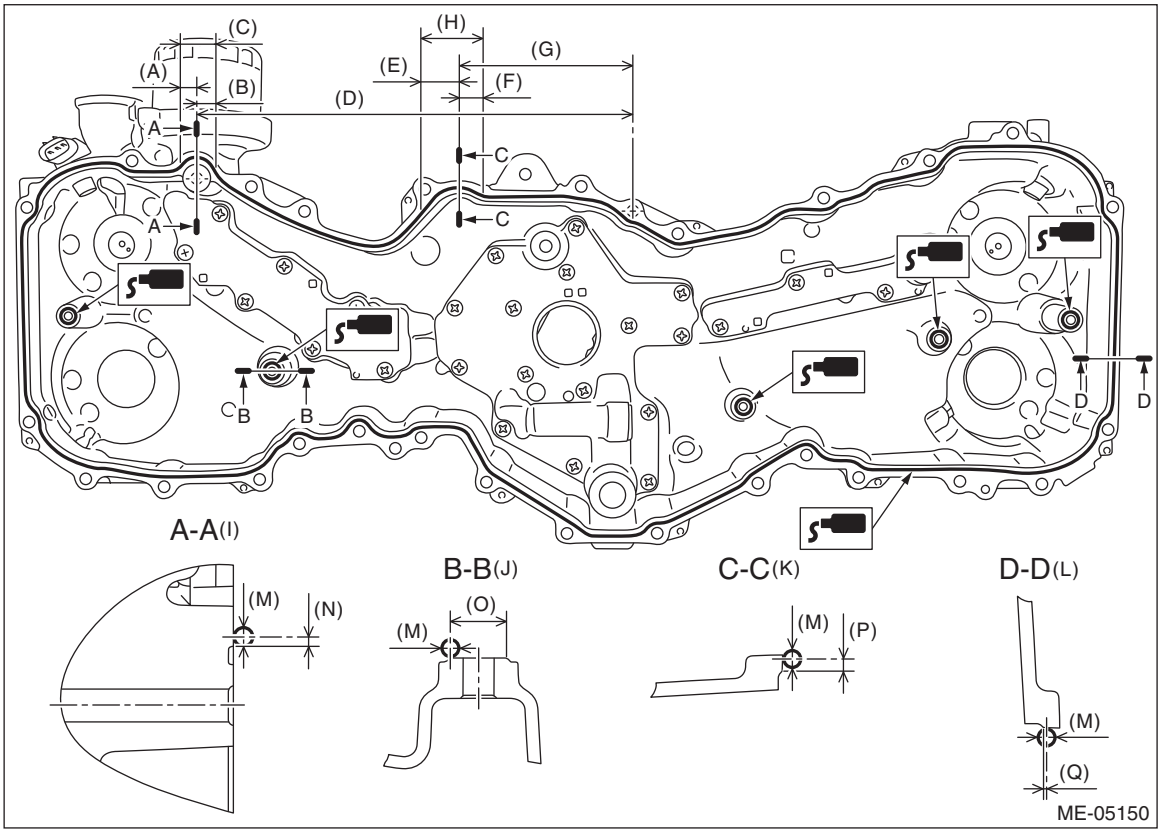


3) Apply liquid gasket to the chain cover mating surface and center boss (5 places) as shown in the figure.

NOTE:
- Before applying liquid gasket, remove oil from liquid gasket seal surface of the engine and the chain cover.
- Install within 5 min. after applying liquid gasket.

Liquid gasket:
THREE BOND 1217G (Part No. K0877Y0100) or equivalent

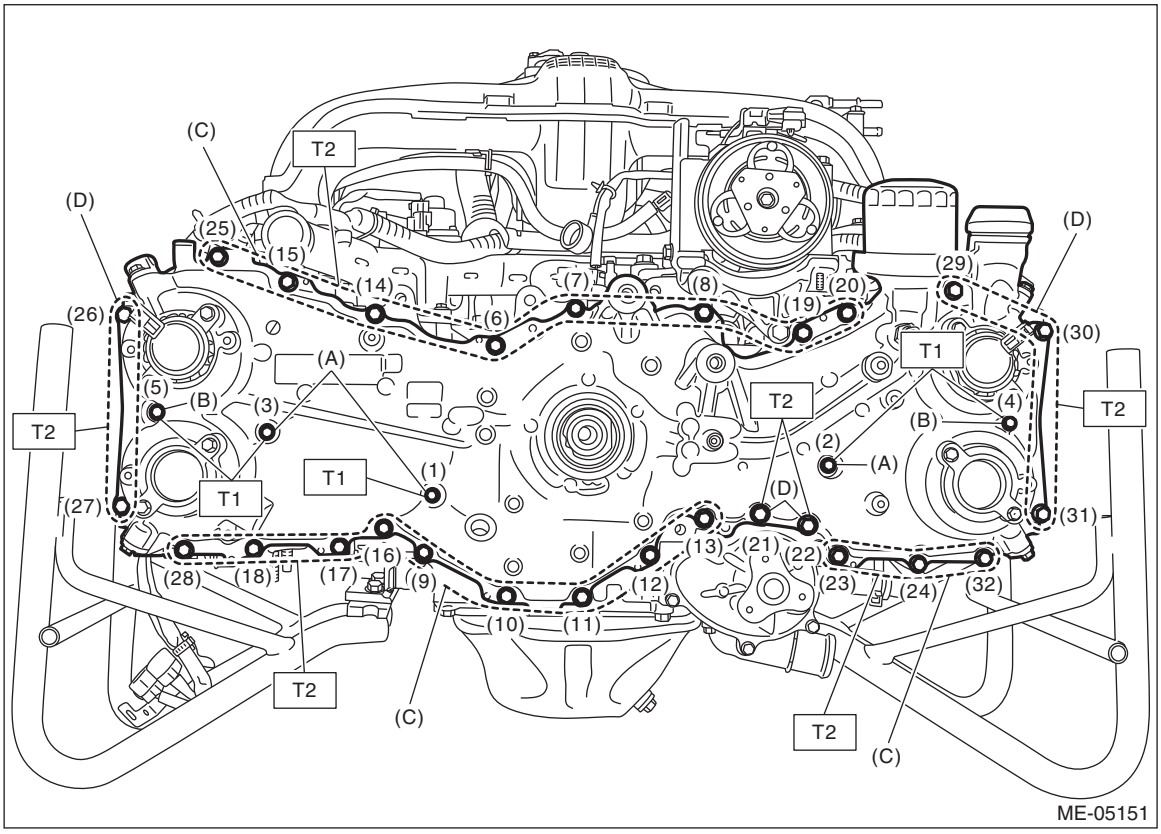
Liquid gasket applying diameter:
4±0.5 mm (0.1575±0.0197 in)



(A)	14.5 mm (0.5709 in)	(G)	127 mm (5.0000 in)	(M)	4±0.5 mm (0.1575±0.0197 in)
(B)	17.5 mm (0.6890 in)	(H)	Range B	(N)	2 mm (0.0787 in)
(C)	Range A	(I)	Liquid gasket applying position of mating surfaces of range A	(O)	ϕ12 mm (0.4724 in)
(D)	316.2 mm (12.4488 in)	(J)	Liquid gasket applying position of center boss (5 places)	(P)	2.5 mm (0.0984 in)
(E)	24.5 mm (0.9646 in)	(K)	Liquid gasket applying position of mating surfaces of range B	(Q)	0.5 mm (0.0197 in)
(F)	18.5 mm (0.7283 in)	(L)	Liquid gasket applying position of mating surfaces other than range A and range B		

4) Set the chain cover, and tighten the bolts in numerical order as shown in the figure.

Tightening torque:
T1: 10 N·m (1.0 kgf-m, 7.4 ft-lb)
T2: 25 N·m (2.5 kgf-m, 18.4 ft-lb)

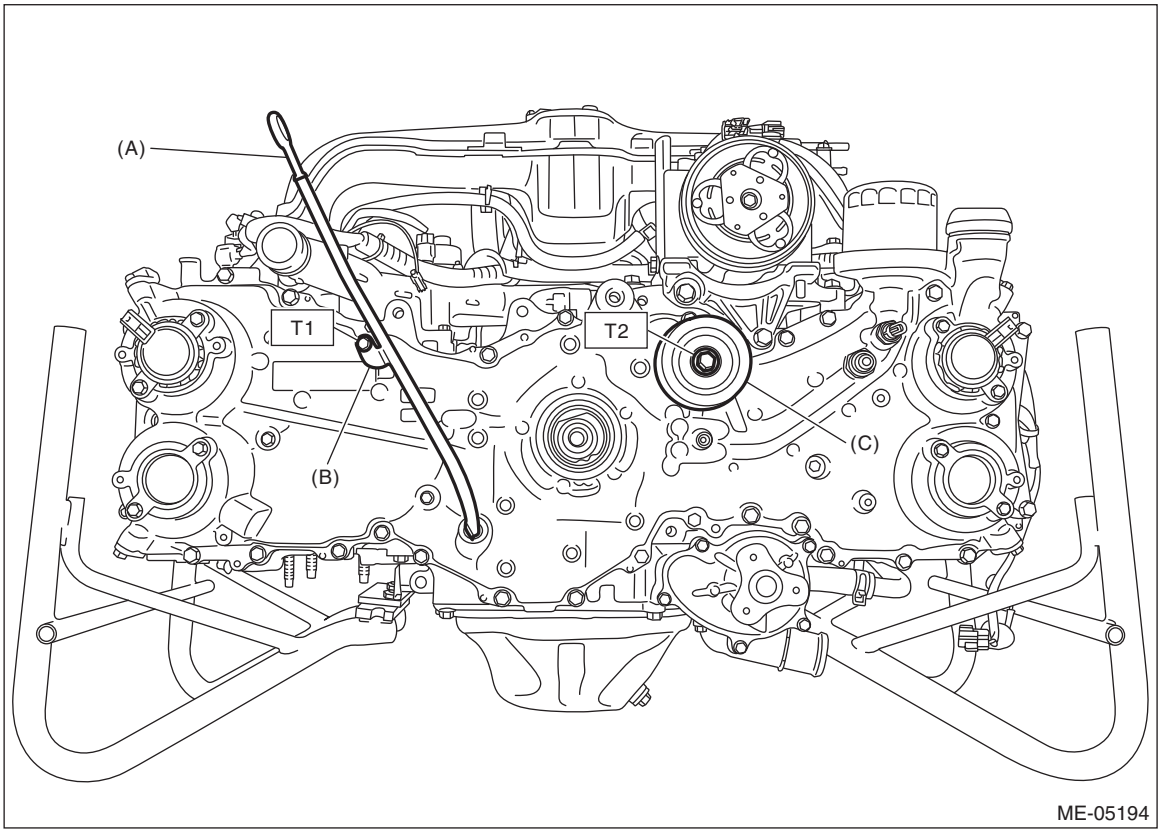


(A) M6 × 20
(B) M6 × 50
(C) M8 × 25
(D) M8 × 60

5) Install the idler pulley (C) and oil level gauge guide (B), and insert the oil level gauge (A).

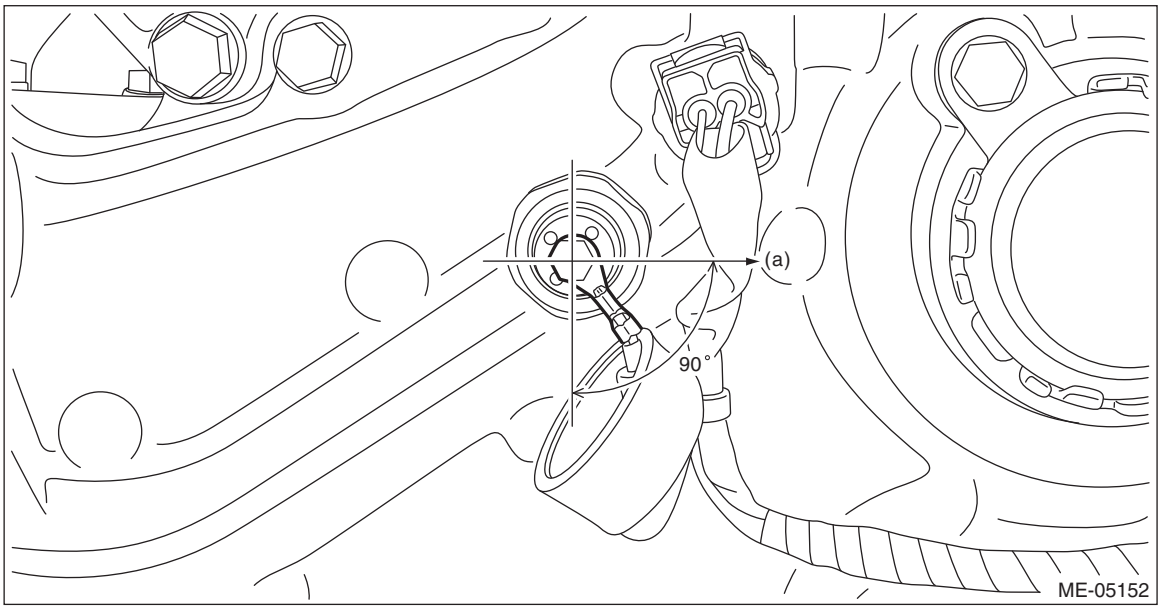
NOTE:
- Use a new O-ring to the oil level gauge guide.
- Apply a light coat of engine oil to the O-rings of the oil level gauge guide and the oil level gauge.

Tightening torque:
T1: 6.4 N·m (0.7 kgf-m, 4.7 ft-lb)
T2: 36 N·m (3.7 kgf-m, 26.6 ft-lb)



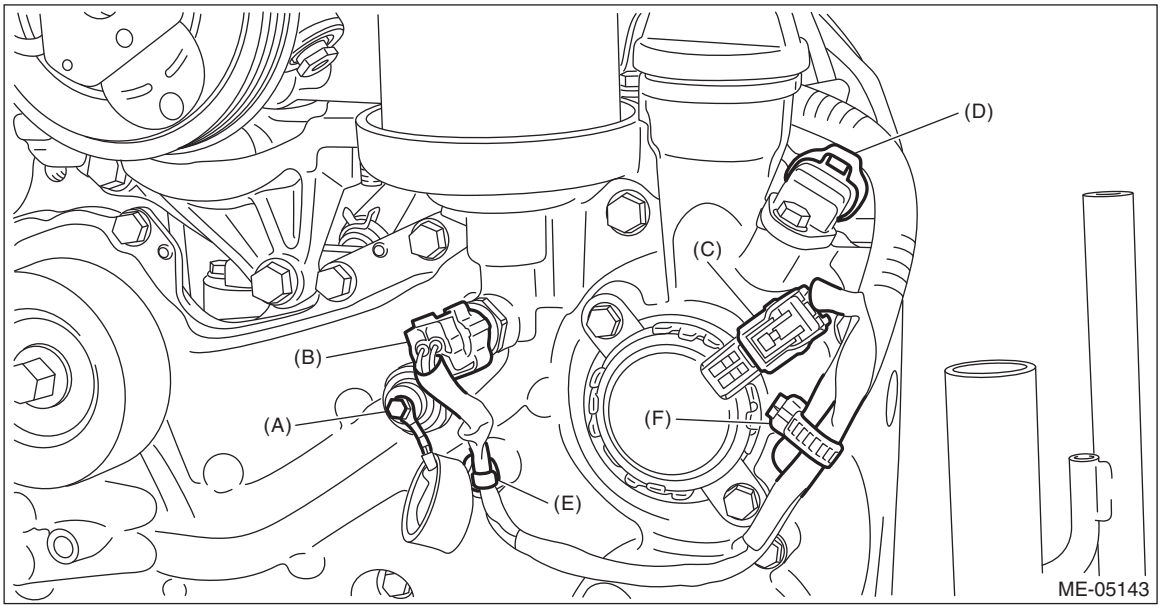
6) Connect the terminal (A) to the oil pressure switch, and connector (B) to the engine oil temperature sensor, and connector (C) to the oil control solenoid LH, and connector (D) to the camshaft position sensor LH, and secure the engine harness with clip (E) and clip (F).

NOTE:
The oil pressure switch harness must be positioned toward the left lower side of the vehicle within the range of 90°.

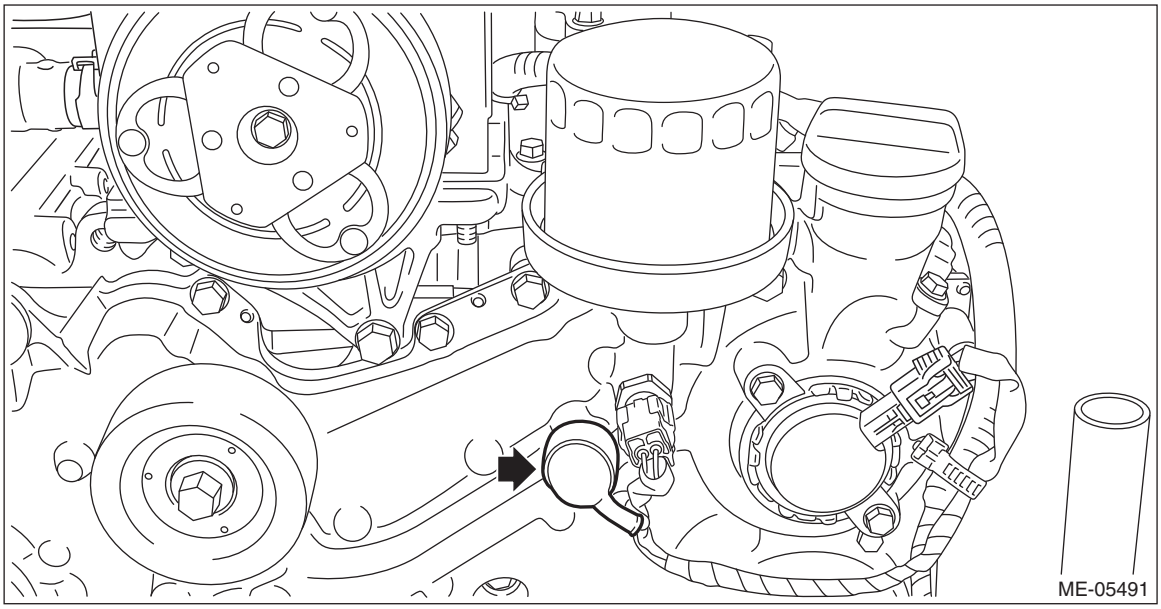


(a) Left side of vehicle

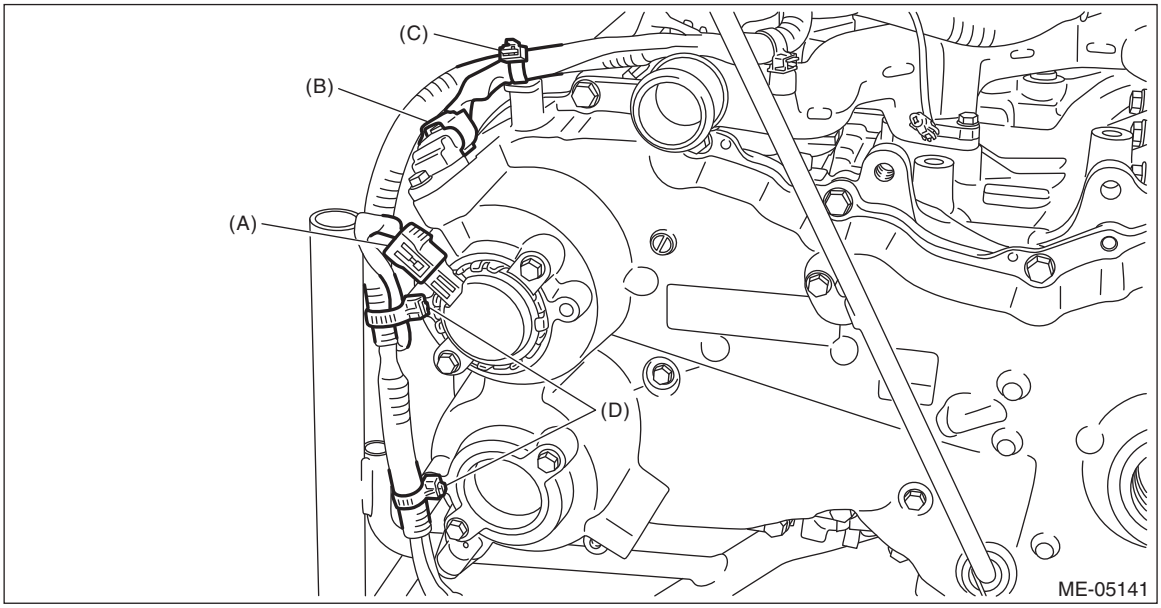
Tightening torque:
1.5 N·m (0.2 kgf-m, 1.1 ft-lb)



7) Attach the rubber cap to the oil pressure switch.

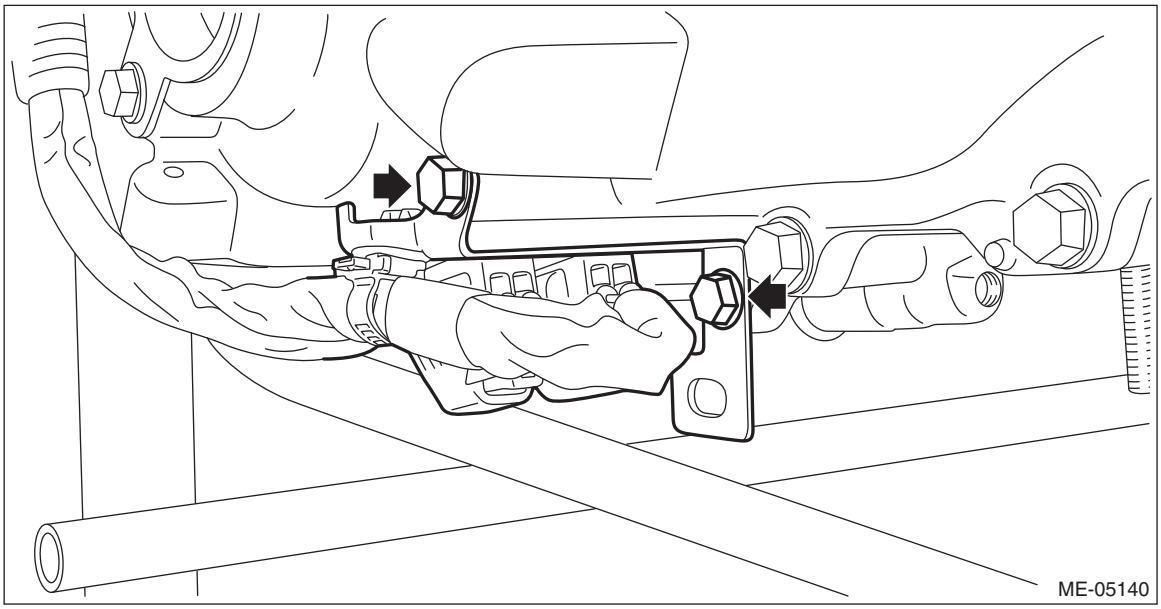


8) Connect the connector (A) to the oil control solenoid RH, and the connector (B) to the camshaft position sensor RH, and secure the engine harness with clip (C) and clip (D).



9) Install the engine harness stay to the chain cover.

Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)



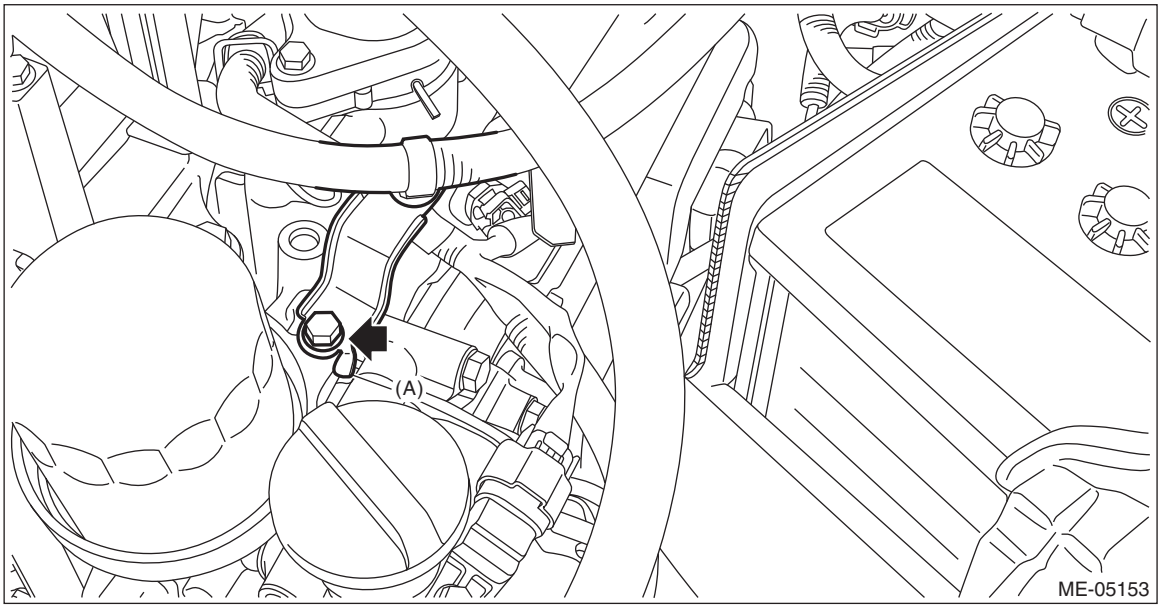
10) Install the crank pulley. <Ref. to ME(H4DO)-81, INSTALLATION, Crank Pulley.>
11) Install the water pump pulley. <Ref. to CO(H4DO)-17, WATER PUMP, INSTALLATION, Water Pump.>
12) Fill engine oil. <Ref. to LU(H4DO)-12, REPLACEMENT, Engine Oil.>

13) When working on the vehicle

NOTE:
When working on the vehicle, perform the following steps also.
(1) Install the radiator. <Ref. to CO(H4DO)-27, INSTALLATION, Radiator.>
(2) Install the front exhaust pipe. <Ref. to EX(H4DO)-8, INSTALLATION, Front Exhaust Pipe.>
(3) Install the generator cord stay to the chain cover.

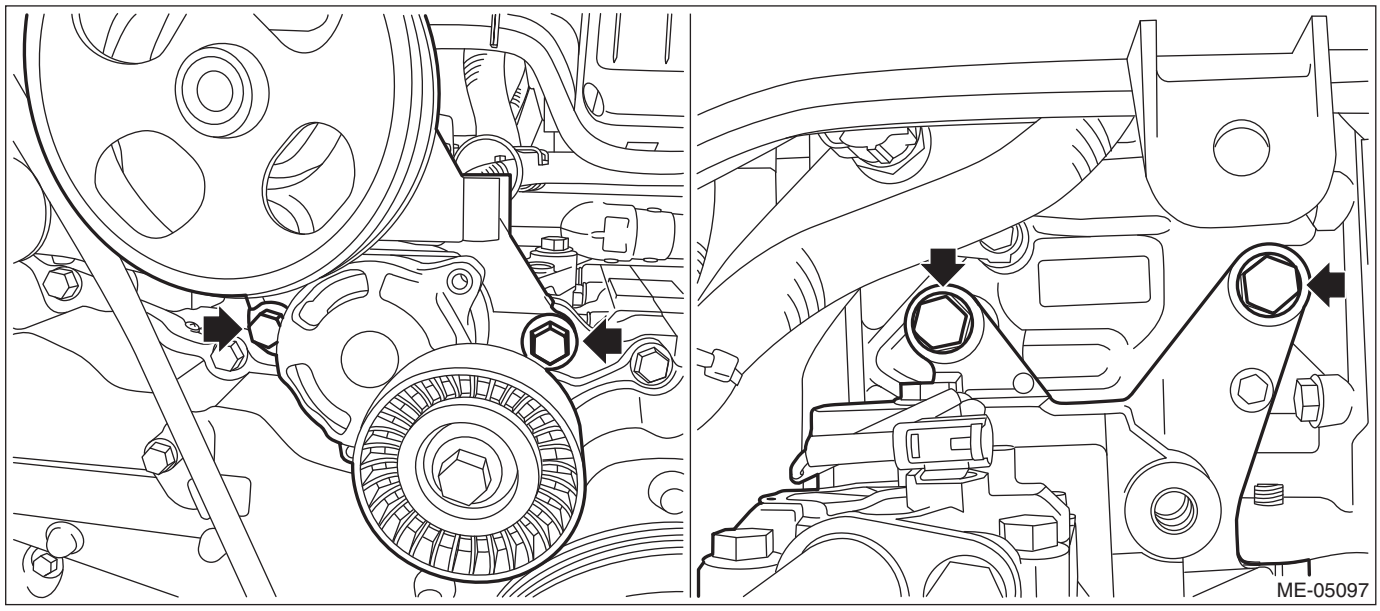
NOTE:
Install the generator cord stay so that the folded end (A) touches at the chain cover boss.

Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)

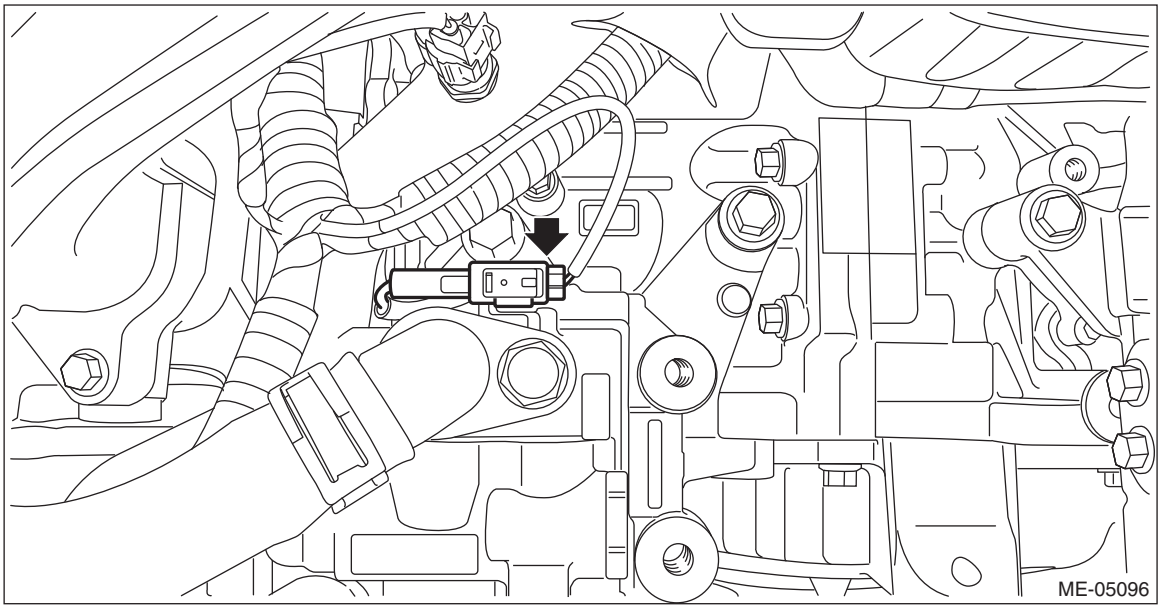


(4) Install the power steering pump.
1. Install the power steering pump onto the engine.

Tightening torque:
Refer to "COMPONENT" of "Power Steering" for the tightening torque. <Ref. to PS-3, COMPONENT, General Description.>



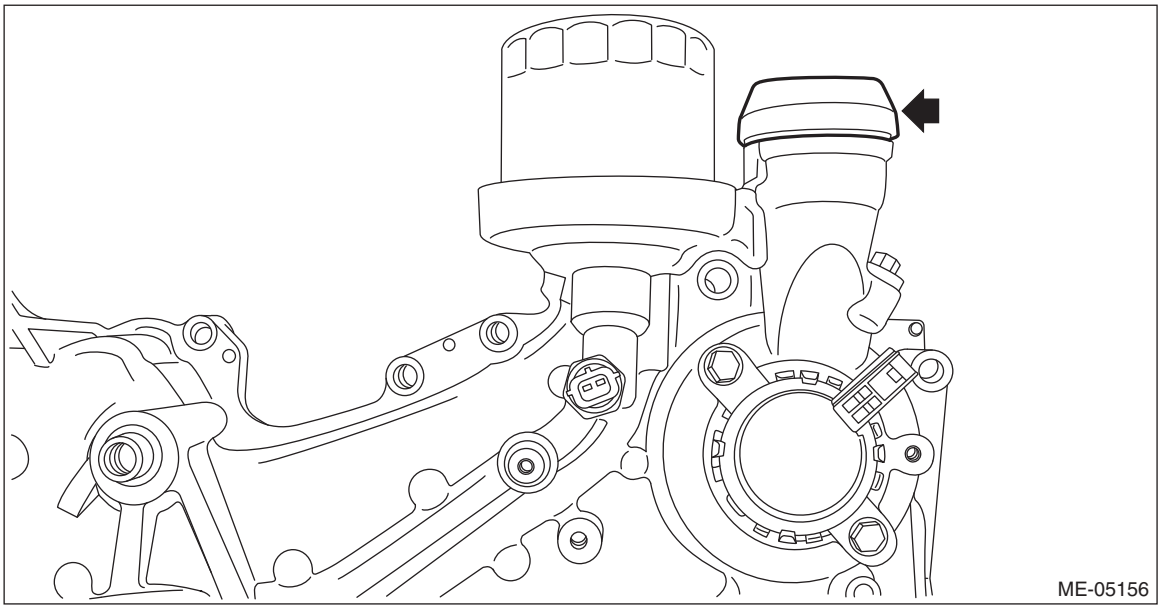
2. Connect the connector to the power steering pump switch.



3. Install the generator. <Ref. to SC(H4DO)-38, INSTALLATION, Generator.>
4. Install the V-belts. <Ref. to ME(H4DO)-73, INSTALLATION, V-belt.>

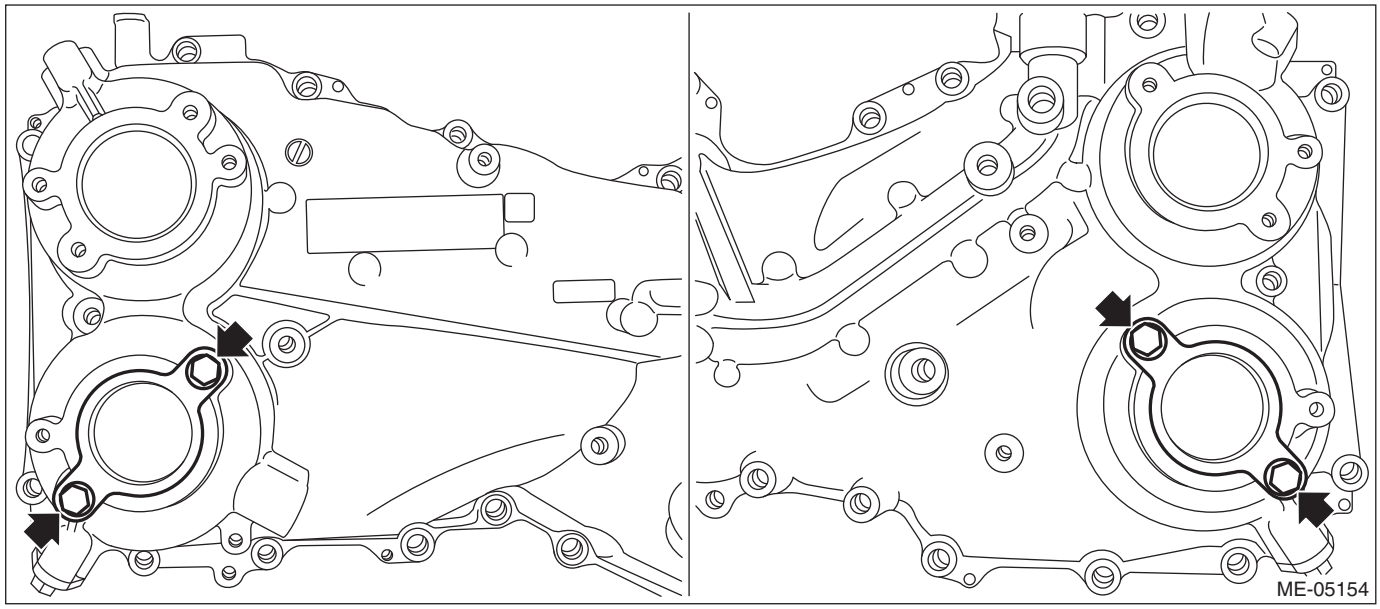
C: DISASSEMBLY

1) Remove the oil filler cap.

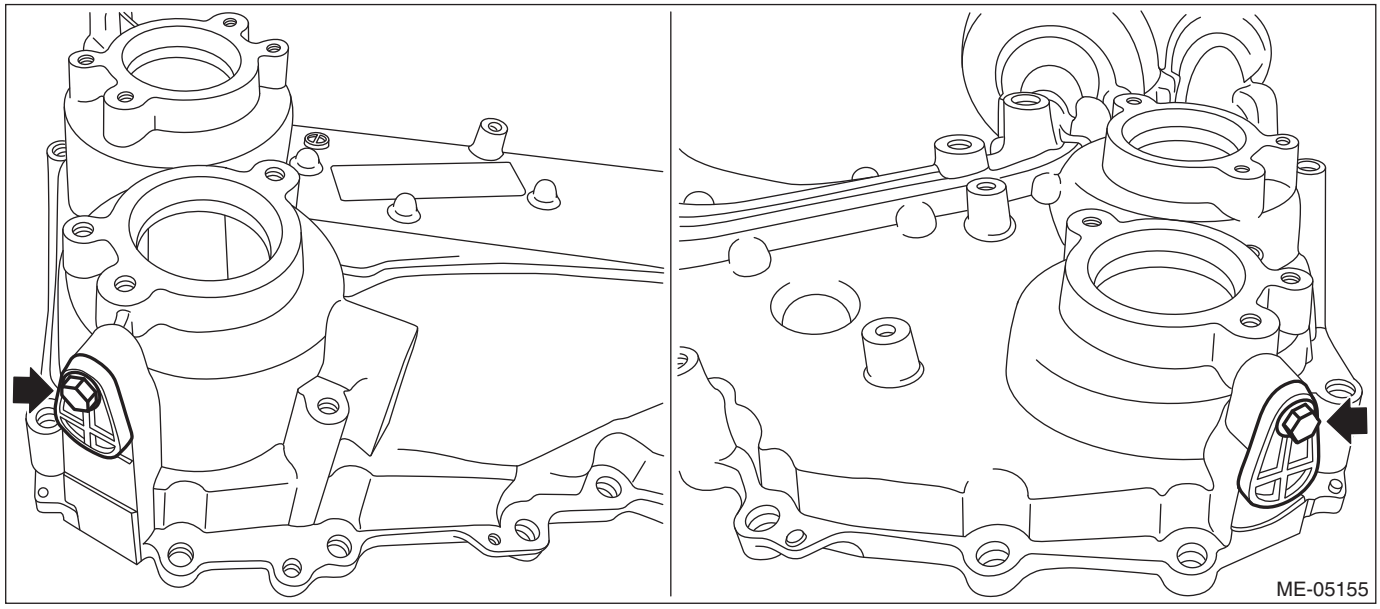


2) Remove the engine oil filter and the oil pump union. <Ref. to LU(H4DO)-28, REMOVAL, Engine Oil Filter.>
3) Remove the oil pressure switch. <Ref. to LU(H4DO)-23, REMOVAL, Oil Pressure Switch.>
4) Remove the engine oil temperature sensor. <Ref. to FU(H4DO)-44, REMOVAL, Engine Oil Temperature Sensor.>
5) Remove the oil control solenoid. <Ref. to FU(H4DO)-65, REMOVAL, Oil Control Valve.>
6) Remove the camshaft position sensor. <Ref. to FU(H4DO)-51, REMOVAL, Camshaft Position Sensor.>

7) Remove the actuator cover from chain cover.



8) Remove the sensor cover from chain cover.

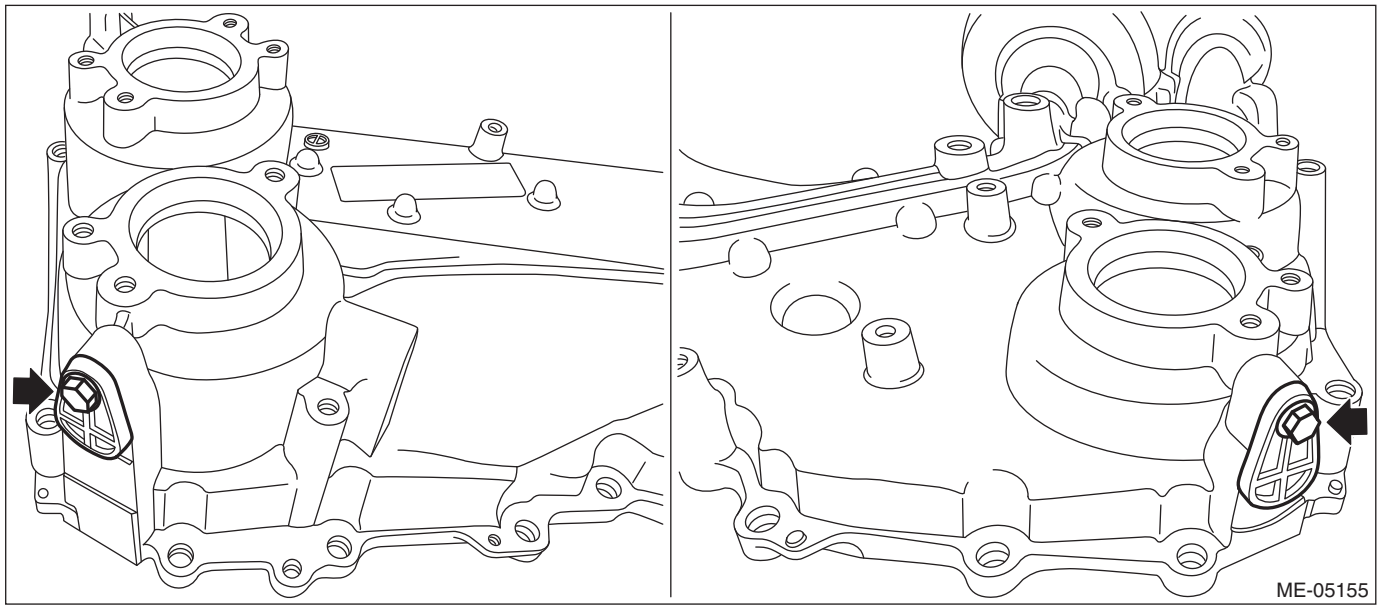


D: ASSEMBLY

1) Install the sensor cover to the chain cover.

NOTE:
- Use new O-rings.
- Apply a coat of engine oil to the O-rings.

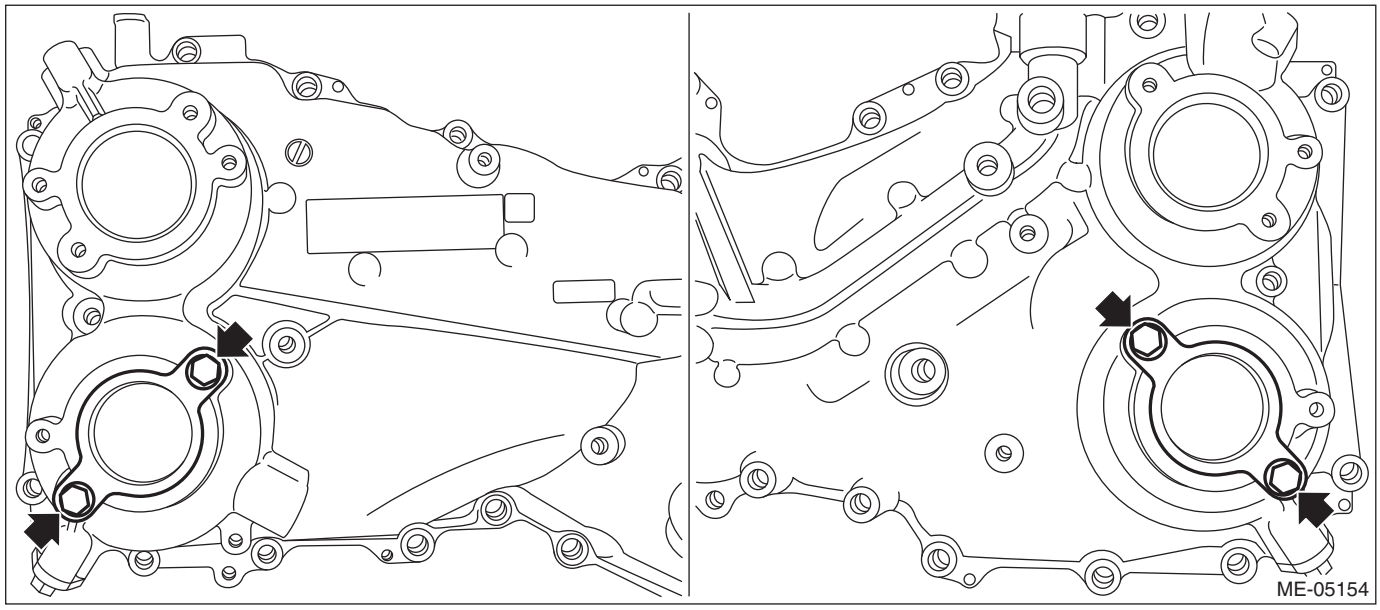
Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)



2) Install the actuator cover to chain cover.

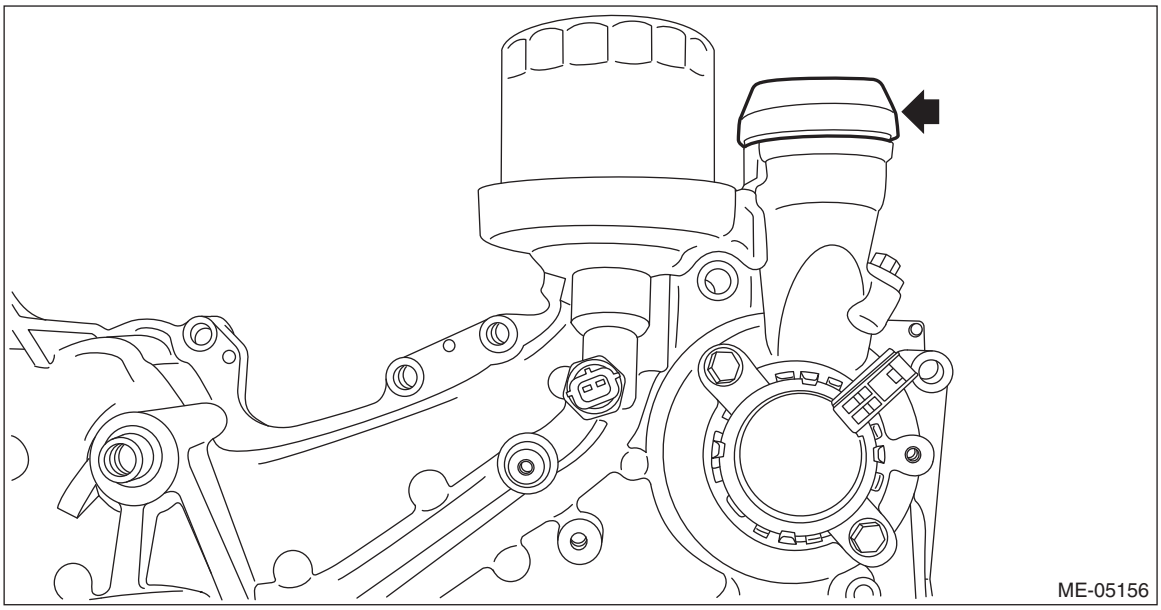
NOTE:
- Use new O-rings.
- Apply a coat of engine oil to the O-rings.

Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)



3) Install the camshaft position sensor. <Ref. to FU(H4DO)-52, INSTALLATION, Camshaft Position Sensor.>
4) Install the oil control solenoid. <Ref. to FU(H4DO)-66, INSTALLATION, Oil Control Valve.>

5) Install the engine oil temperature sensor. <Ref. to FU(H4DO)-44, INSTALLATION, Engine Oil Temperature Sensor.>
6) Install the oil pressure switch. <Ref. to LU(H4DO)-25, INSTALLATION, Oil Pressure Switch.>
7) Install the engine oil filter and the oil pump union. <Ref. to LU(H4DO)-29, INSTALLATION, Engine Oil Filter.>
8) Install the oil filler cap.



E: INSPECTION

Check that the chain cover does not have deformation, cracks and any other damage.

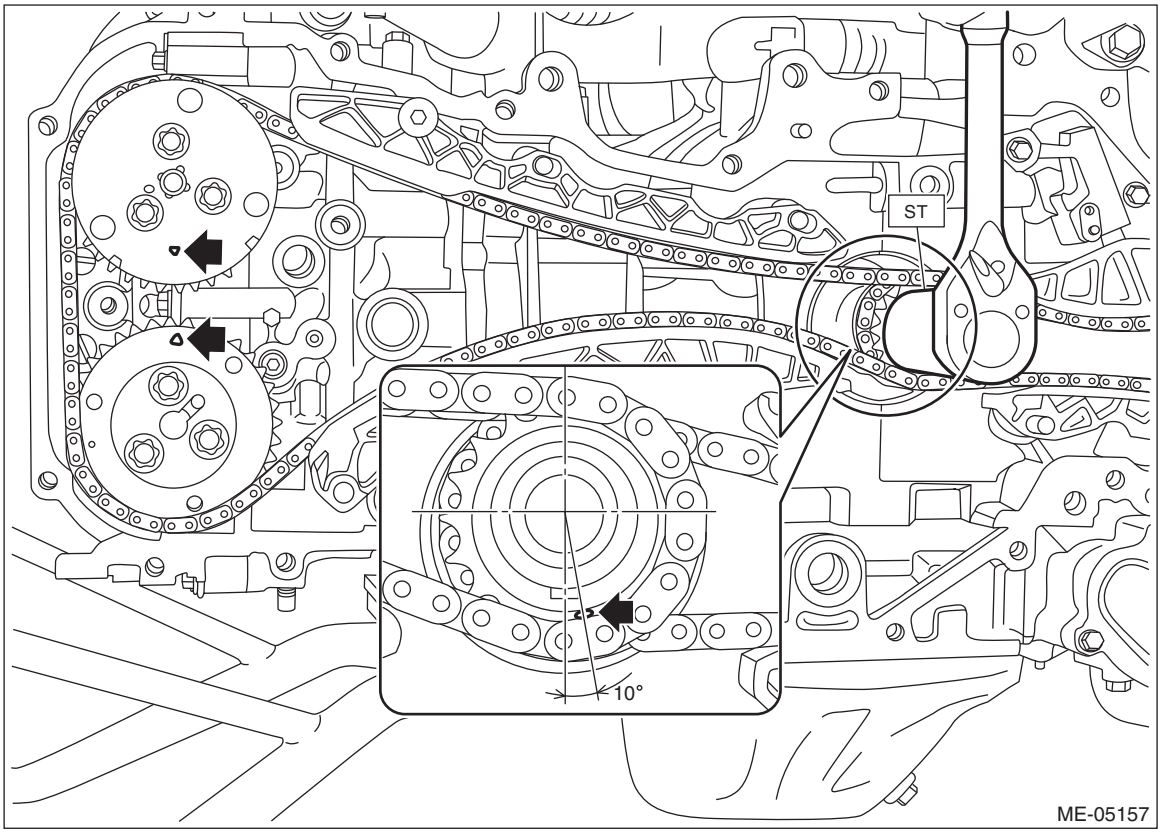
15.Timing Chain Assembly

A: REMOVAL

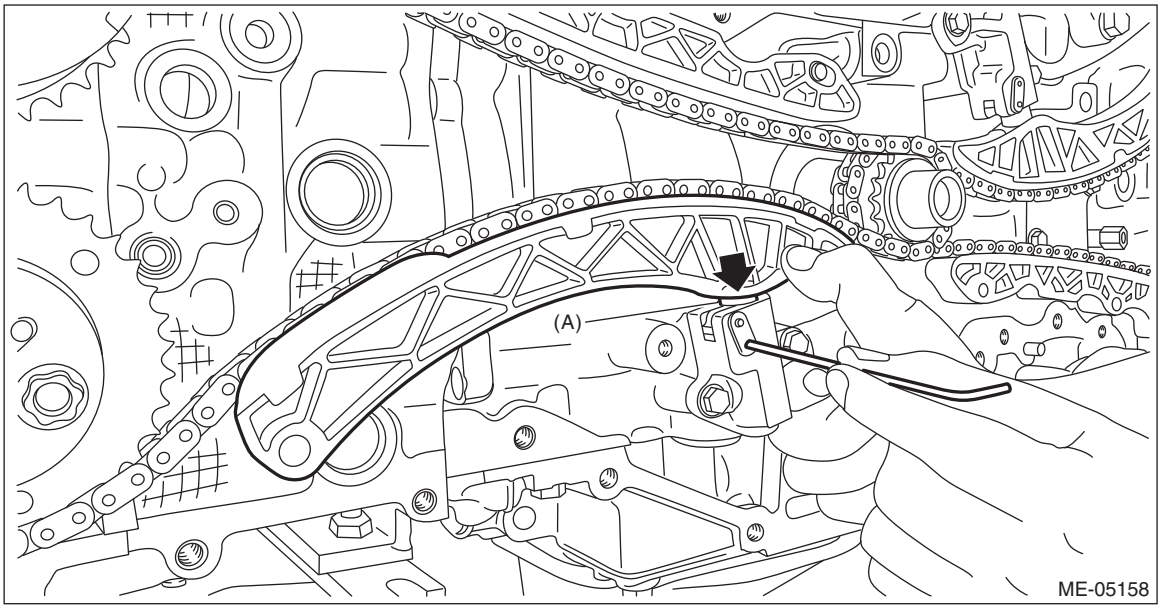
1. TIMING CHAIN RH

NOTE:
When replacing a single part, perform the work with the engine installed to body.
1) Remove the chain cover. <Ref. to ME(H4DO)-91, REMOVAL, Chain Cover.>
2) Using ST and by turning the crankshaft, align the alignment marks of crank sprocket, intake cam sprocket RH and exhaust cam sprocket RH to the positions as shown in the figure.

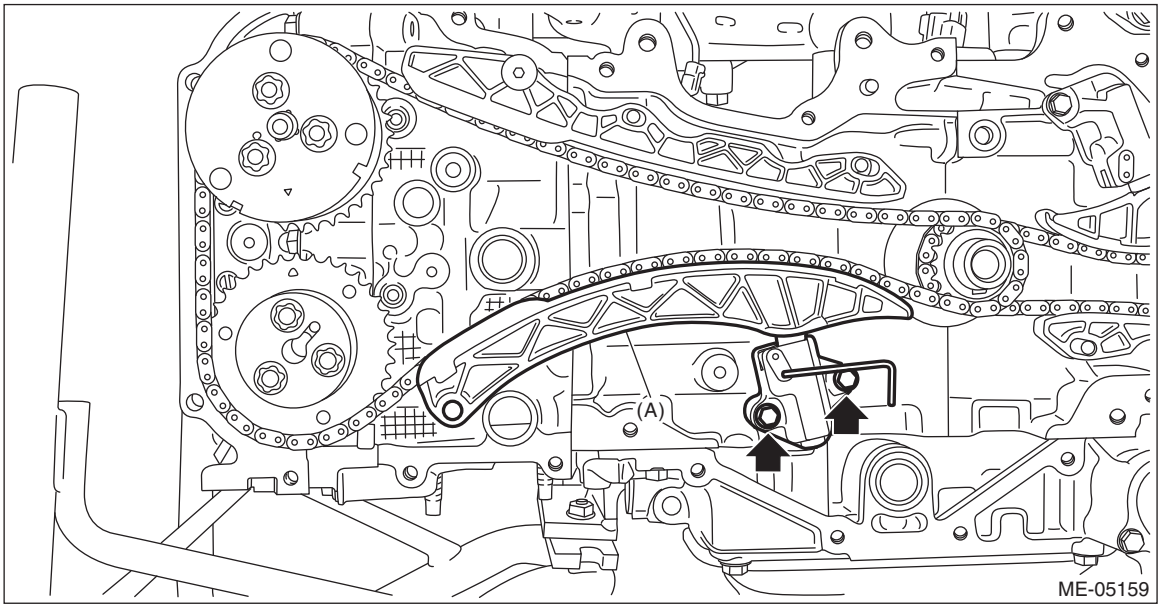
NOTE:
If the alignment marks are aligned to the positions as shown in the figure, the crankshaft key is located at six o'clock position.
ST 18252AA000 CRANKSHAFT SOCKET



3) Push down the chain lever tensioner RH, and with a 2.5 mm (0.98 in) dia. stopper pin or a 2.5 mm (0.98 in) dia. hex wrench inserted into the stopper pin hole in the chain tensioner RH, secure the plunger (A).



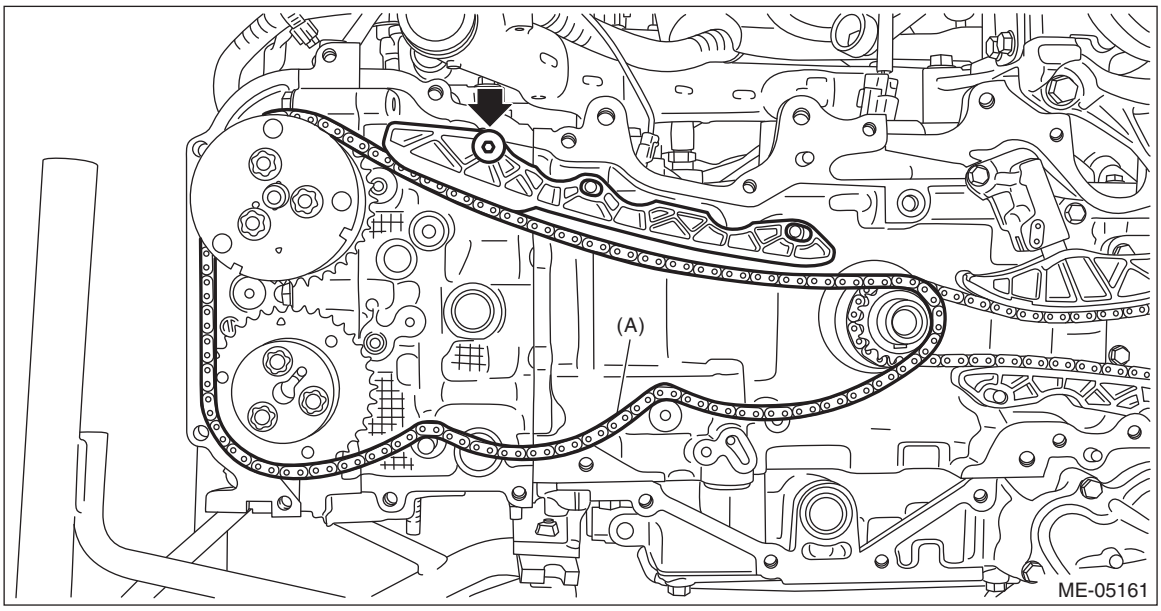
4) Remove the chain tensioner RH, and remove the chain tensioner lever RH (A).



5) Remove the chain guide RH, and remove the timing chain RH (A).

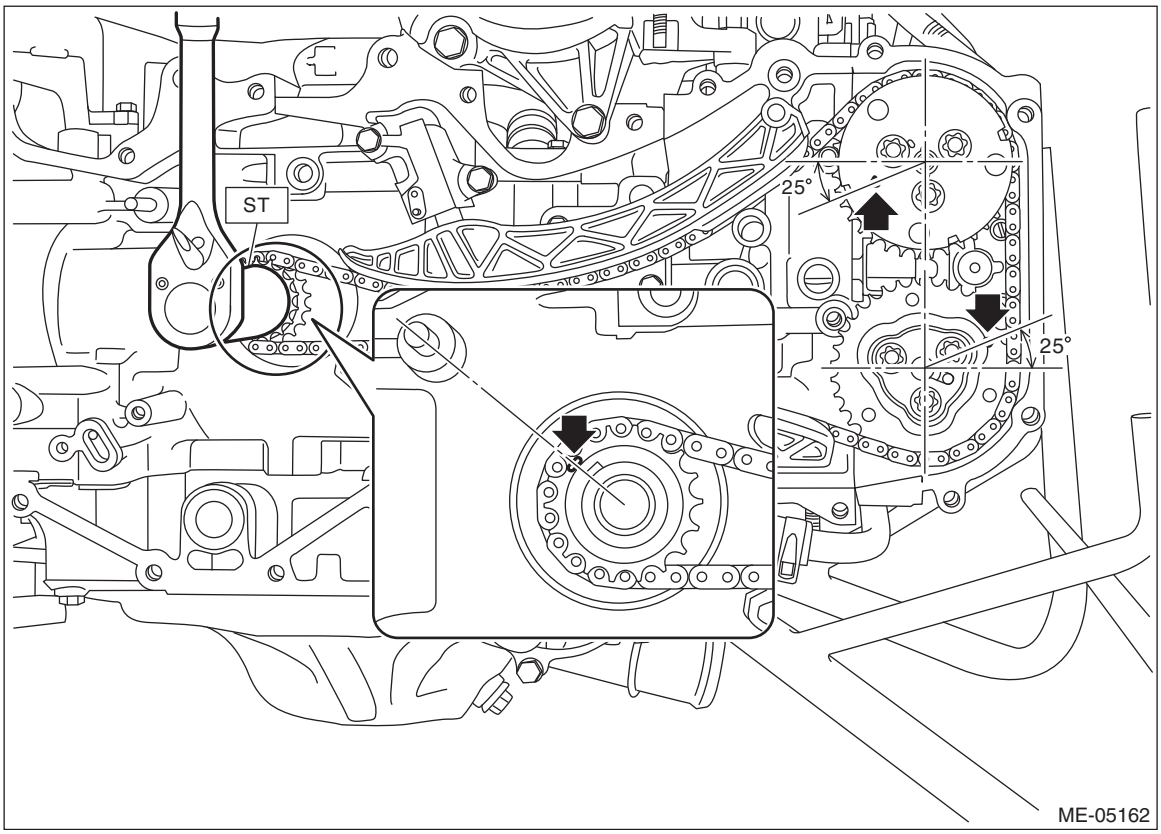
CAUTION:
• If the timing chain RH is not installed, the intake camshaft RH and exhaust camshaft RH are kept at zero-lift position. All cams on the camshaft are not pressing down the roller rocker arm (intake valve and exhaust valve). (Under this condition, all valves remain unlifted.)
• Intake camshaft RH and exhaust camshaft RH can be independently rotated with the timing chain RH removed. When the intake valve and exhaust valve lift at the same time, the valve heads contact each other and valve stem may bend. Do not turn it to the outside of range of zero-lift (in range where it can be turned lightly by hand).

NOTE:
To avoid mixing with LH side, keep the removed part in order.

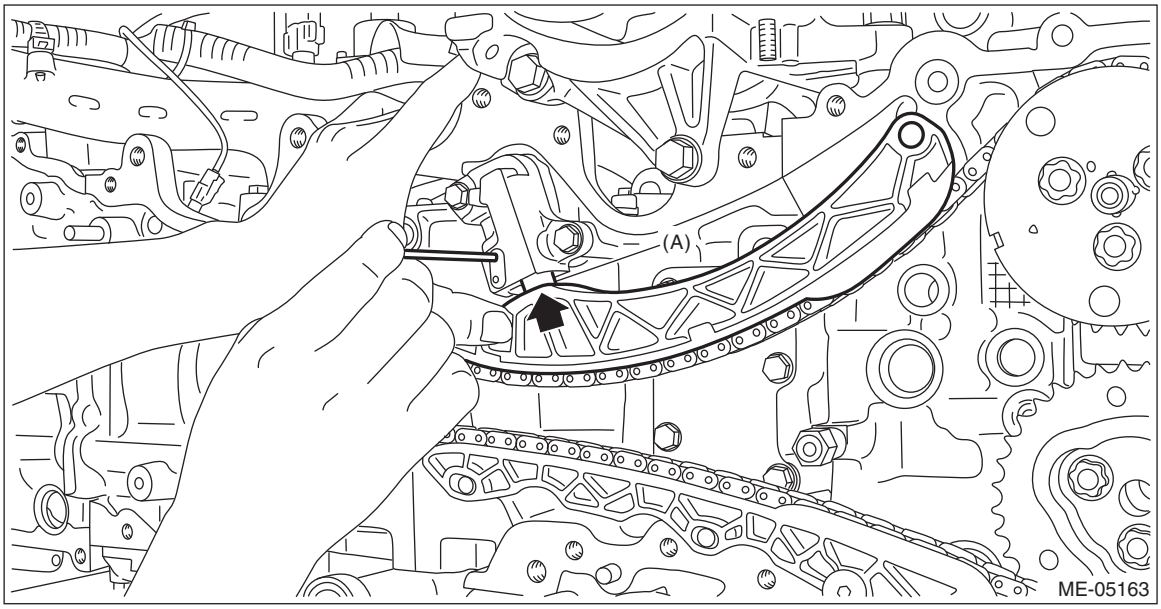


2. TIMING CHAIN LH

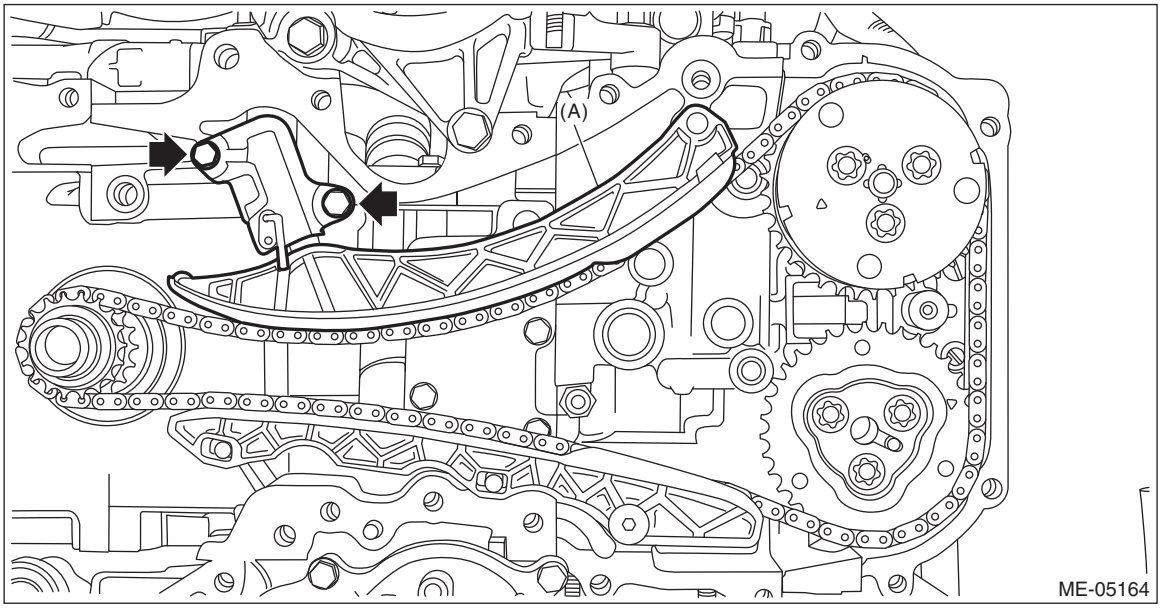
1) Remove the timing chain RH. <Ref. to ME(H4DO)-109, TIMING CHAIN RH, REMOVAL, Timing Chain Assembly.>
2) Using ST and by turning the crankshaft, align the alignment marks of crank sprocket, intake cam sprocket LH and exhaust cam sprocket LH to the positions as shown in the figure.
ST 18252AA000 CRANKSHAFT SOCKET



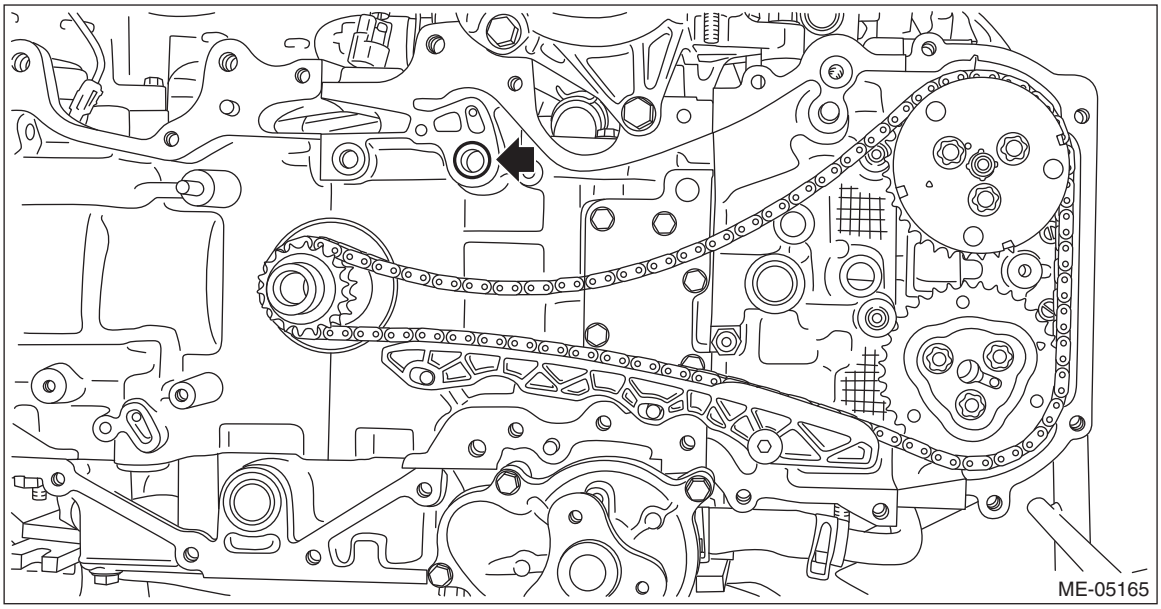
3) Push down the chain lever tensioner LH, and with a 2.5 mm (0.98 in) dia. stopper pin or a 2.5 mm (0.98 in) dia. hex wrench inserted into the stopper pin hole in the chain tensioner LH, secure the plunger (A).



4) Remove the chain tensioner LH, and remove the chain tensioner lever LH (A).



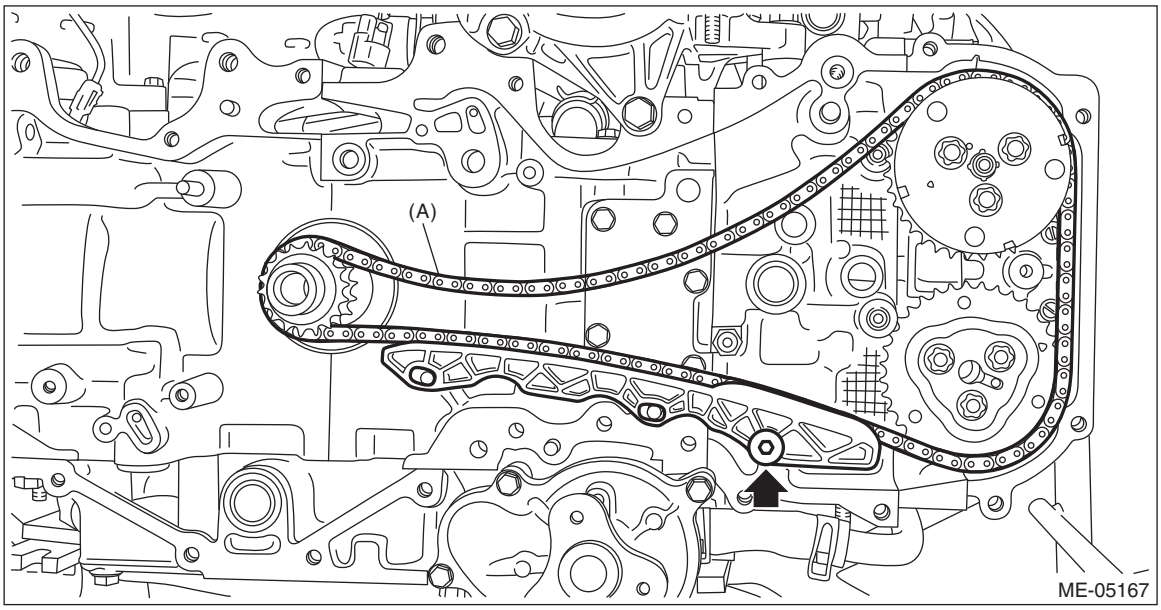
5) Remove the O-ring from the cylinder block LH.



6) Remove the chain guide LH, and remove the timing chain LH (A).

CAUTION:
• If the timing chain LH is not installed, the exhaust camshaft LH is kept at zero-lift position. All cams on the exhaust camshaft LH are not pressing down the roller rocker arm (exhaust valve). (Under this condition, exhaust valves remain unlifted.)
• Intake camshaft LH is kept at lift position. All cams on the intake camshaft LH are pressing down the roller rocker arm (intake valve). (Under this condition, intake valves remain lifted.)
• Intake camshaft LH and exhaust camshaft RH can be independently rotated with the timing chain LH removed. When the exhaust camshaft LH is turned, the valve heads contact each other and valve stem may bend as described in above. Do not turn the exhaust camshaft LH to the outside of range of zero-lift (in range where it can be turned lightly by hand).
• #1 piston and #4 piston are located near TDC. If the intake camshaft LH is turned, the valve and the piston may contact and valve stem may bend. Do not turn the intake camshaft LH at this time.

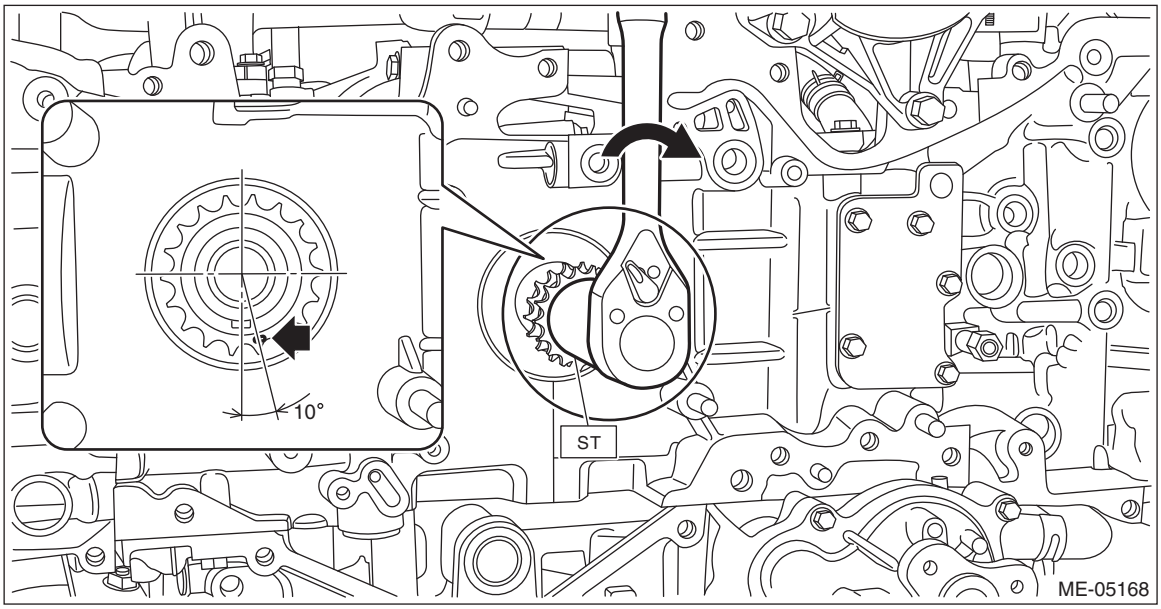
NOTE:
To avoid mixing with RH side, keep the removed part in order.



7) Using ST and by turning the crankshaft approximately 200° clockwise, align the alignment marks of crank sprocket to the positions as shown in the figure.

CAUTION:
• This procedure is required to prevent the valve and piston contacting with each other, by moving the all pistons to the middle of the cylinders.
• Never turn counterclockwise because the valve and piston may contact. Counterclockwise turn is allowed only when adjusting precisely the alignment marks, after turning the crank sprocket alignment mark clockwise near the position as shown in the figure.

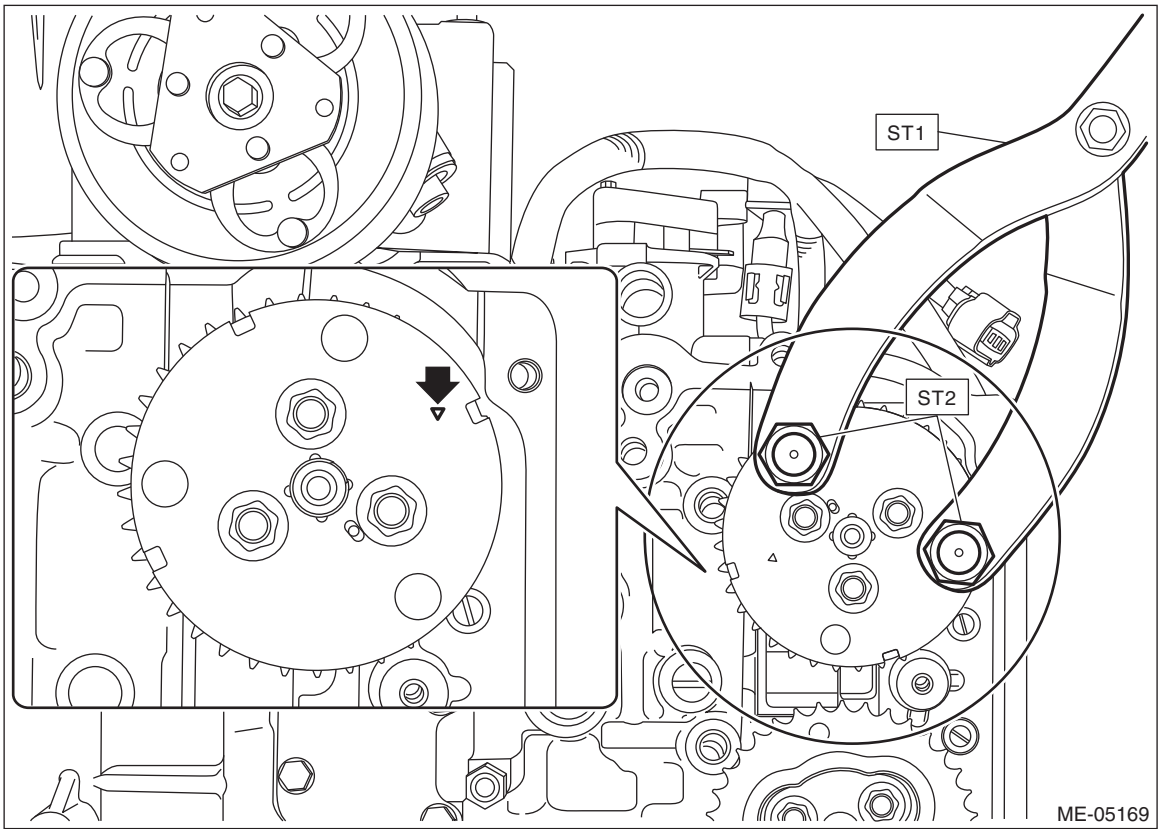
ST 18252AA000 CRANKSHAFT SOCKET



8) Using ST and by turning the intake cam sprocket LH approximately 180°, align the alignment marks of intake cam sprocket LH to the positions (zero-lift position) as shown in the figure.

CAUTION:
After this work, when the intake valve and exhaust valve lift at the same time, the valve heads contact each other and valve stem may bend. Do not turn the intake camshaft LH and exhaust camshaft LH to the outside of range of zero-lift (in range where it can be turned lightly by hand).

ST1 18355AA000 PULLEY WRENCH
ST2 18334AA030 PULLEY WRENCH PIN SET



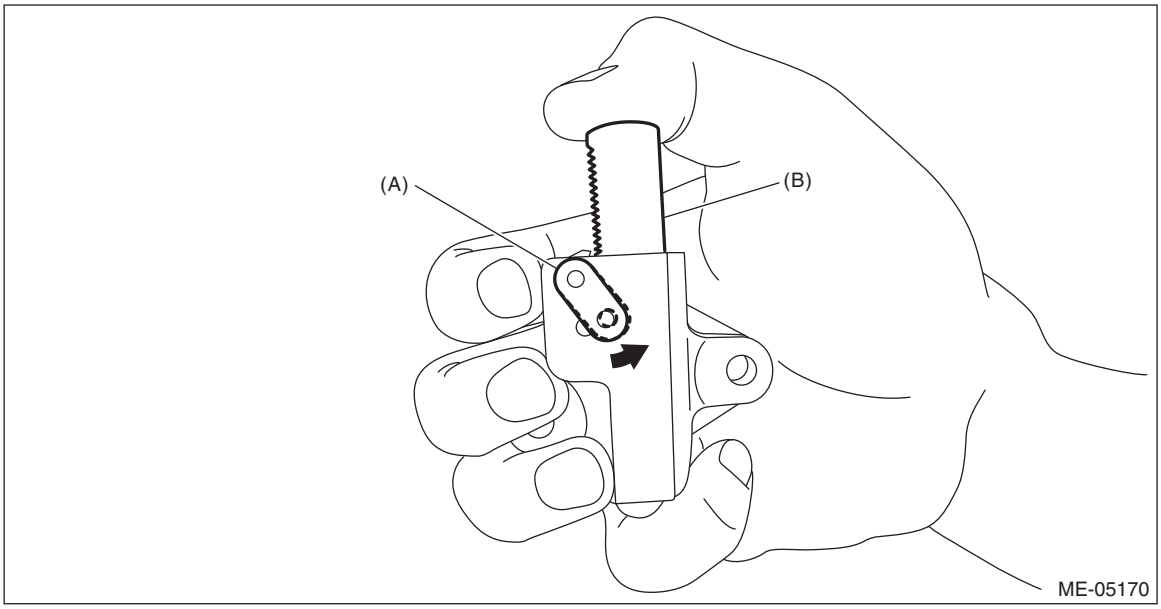
B: INSTALLATION

CAUTION:
Install the timing chain LH, before installing the timing chain RH.

1. TIMING CHAIN RH

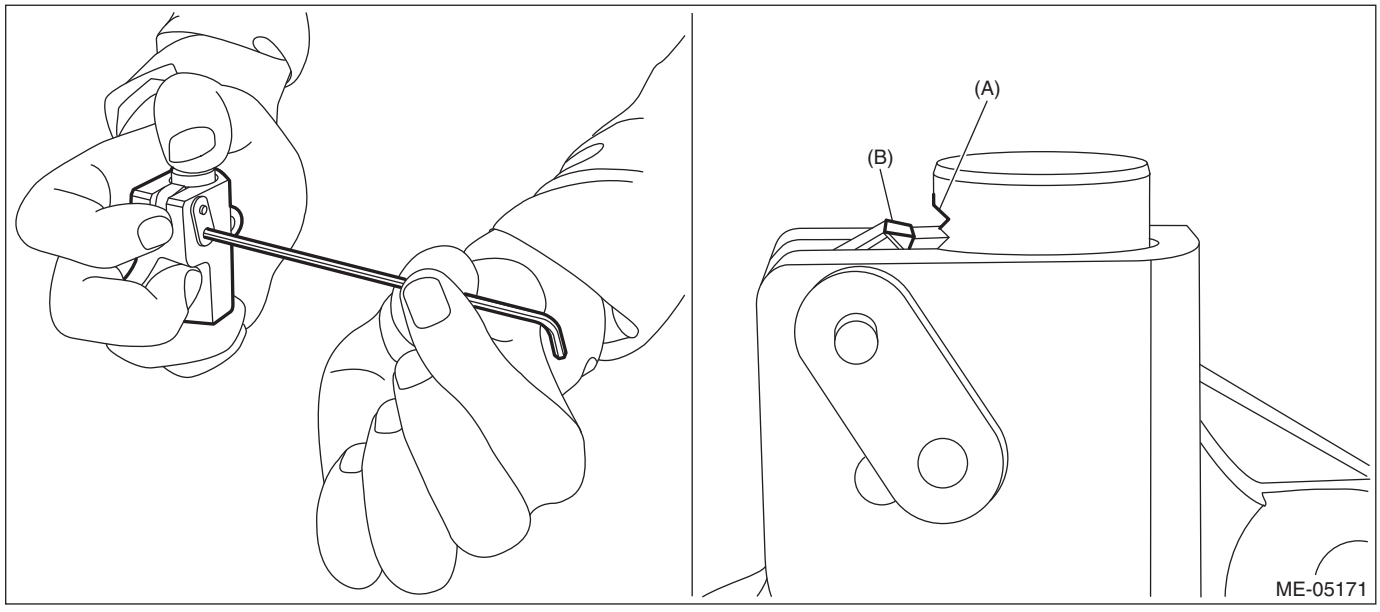
NOTE:
- Be careful that the foreign matter is not into or onto the assembled component during installation.
- Apply engine oil to all component parts of the timing chain.

1) Install timing chain LH. <Ref. to ME(H4DO)-121, TIMING CHAIN LH, INSTALLATION, Timing Chain Assembly.>
2) Prepare to attach the chain tensioner RH.
   (1) Move the link plate (A) in the direction of arrow to press in the plunger (B).



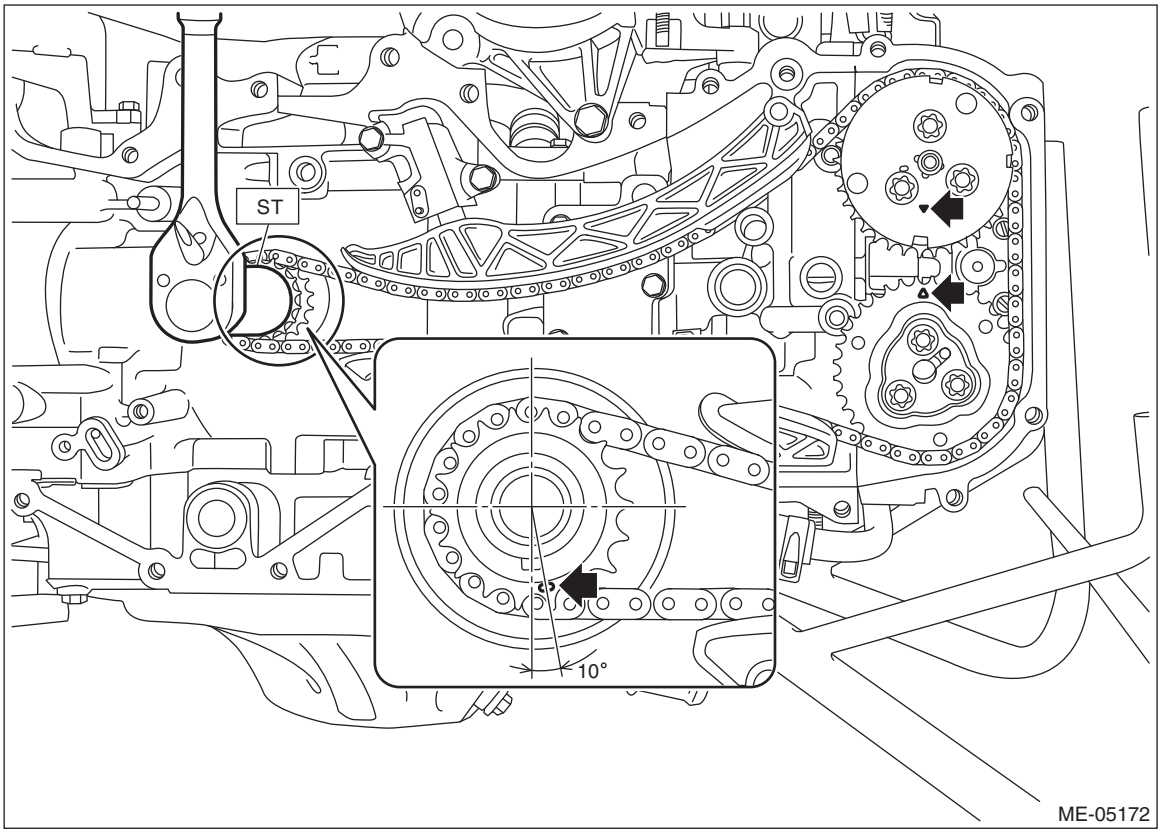
   (2) With a 2.5 mm (0.98 in) dia. stopper pin or a 2.5 mm (0.98 in) (nominal) dia. hex wrench inserted into the stopper pin hole, secure the plunger.

NOTE:
If the stopper pin hole on the link plate and the stopper pin hole on the chain tensioner are not aligned, check that the first notch of plunger rack (A) is engaged with the stopper tooth (B). If not engaged, retract the plunger a little so that the first notch of plunger rack (A) is engaged with the stopper tooth (B).



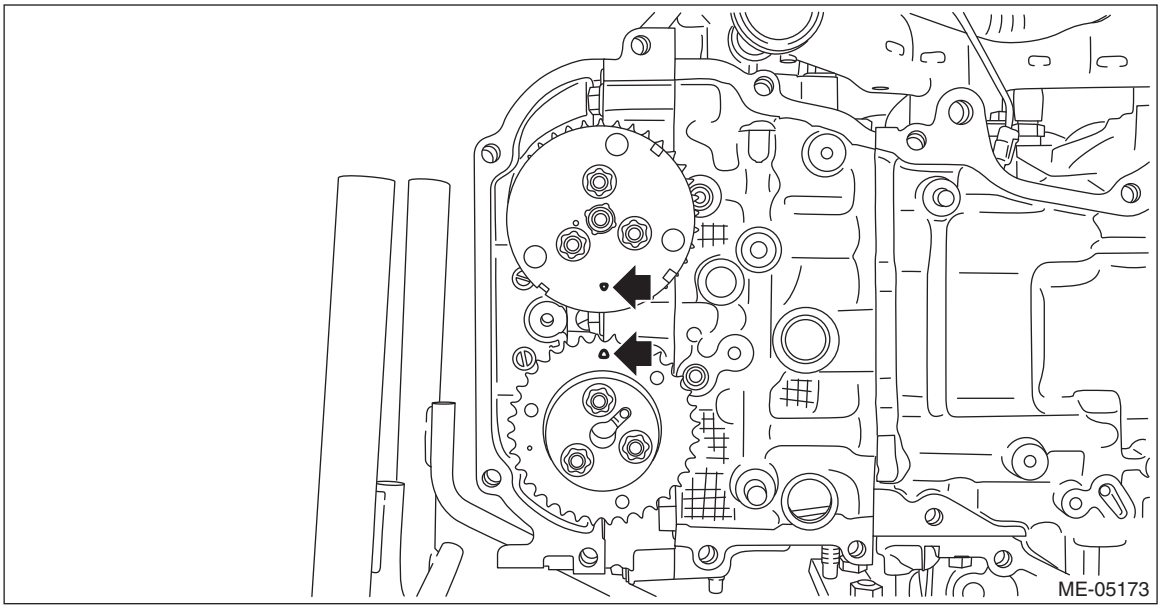
3) Using ST and by turning the crankshaft, align the alignment marks of crank sprocket, intake cam sprocket LH and exhaust cam sprocket LH to the positions as shown in the figure.

NOTE:
If the alignment marks are aligned to the positions as shown in the figure, the crankshaft key is located at six o'clock position.
ST 18252AA000 CRANKSHAFT SOCKET



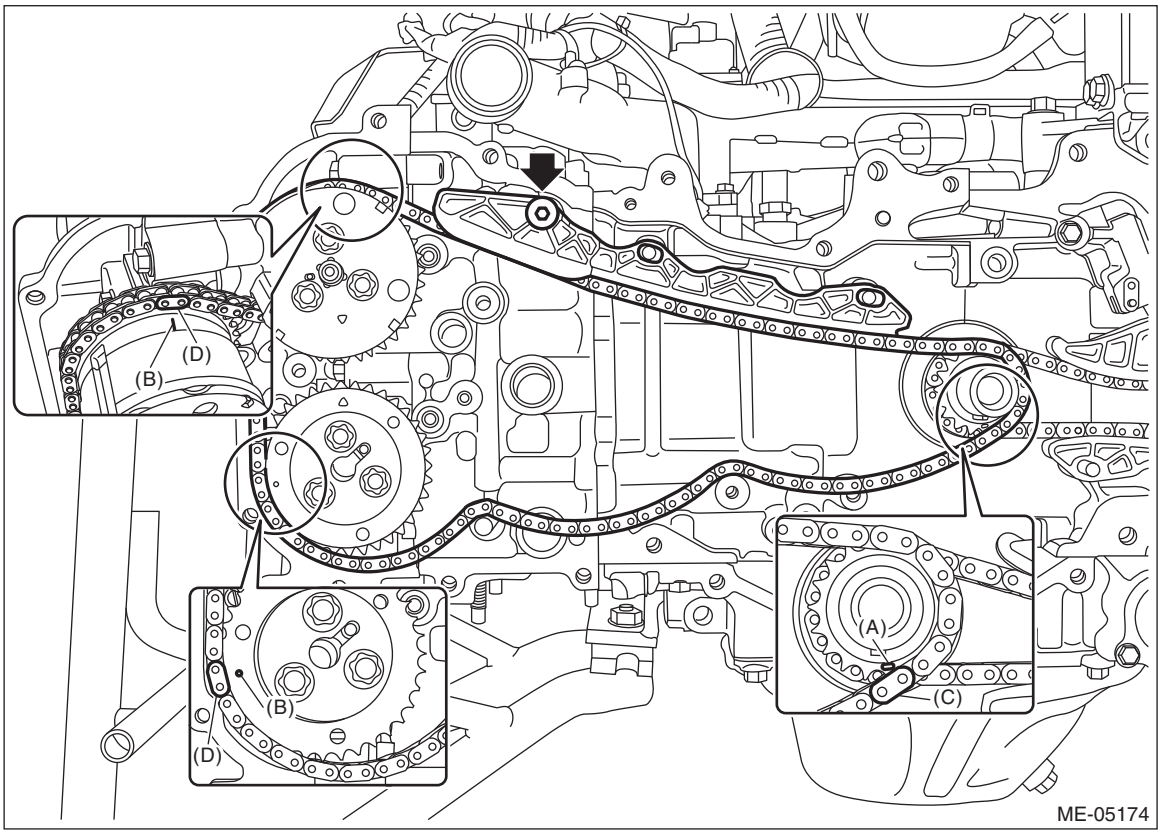
4) Align the alignment marks of intake cam sprocket RH and exhaust cam sprocket RH to the positions as shown in the figure.

CAUTION:
To prevent valve damage, turn the intake cam sprocket RH and exhaust cam sprocket RH only within the range of zero-lift (in range where it can be turned lightly by hand).



5) Install the timing chain RH and the timing chain guide RH.
   (1) Match the timing chain mark (yellow) to the alignment mark of the crank sprocket.
   (2) Match the timing chain mark (orange) to the timing mark position of the intake cam sprocket RH.
   (3) Match the timing chain mark (orange) to the timing mark position of the exhaust cam sprocket RH.
   (4) Install the timing chain guide RH.

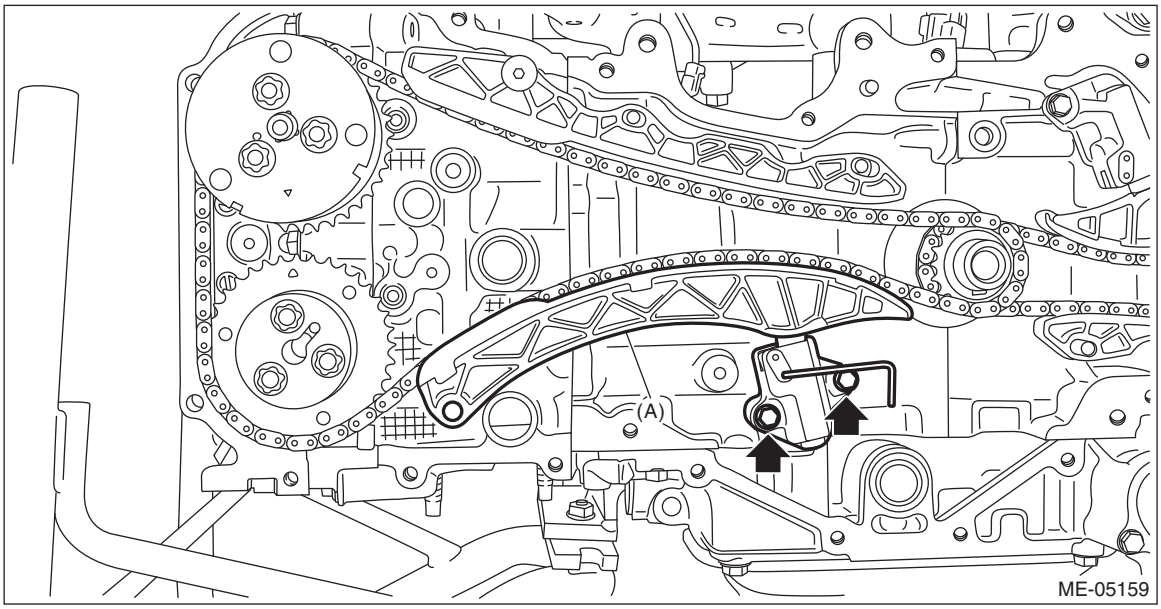
Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)



(A) Alignment mark
(B) Timing mark
(C) Yellow
(D) Orange

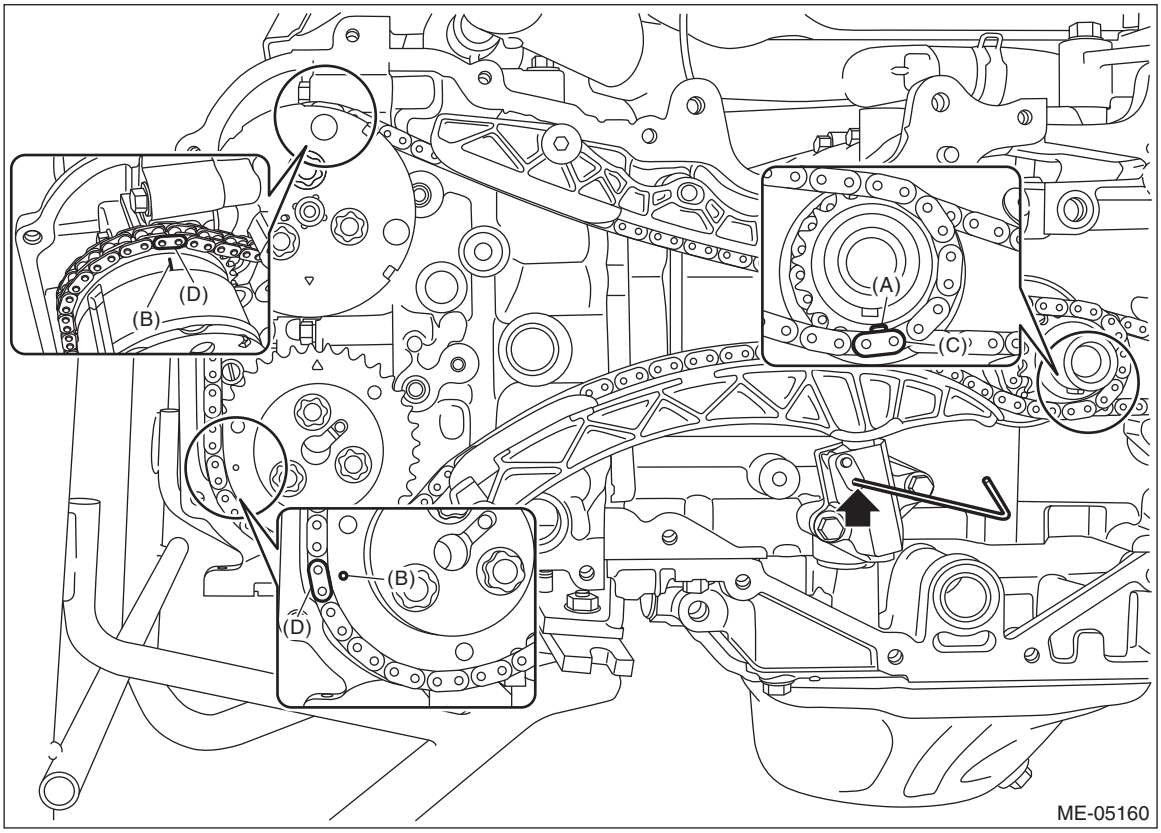
6) Install the chain tensioner lever RH (A) and chain tensioner RH.

Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)



7) Pull out the stopper pin from the chain tensioner RH.

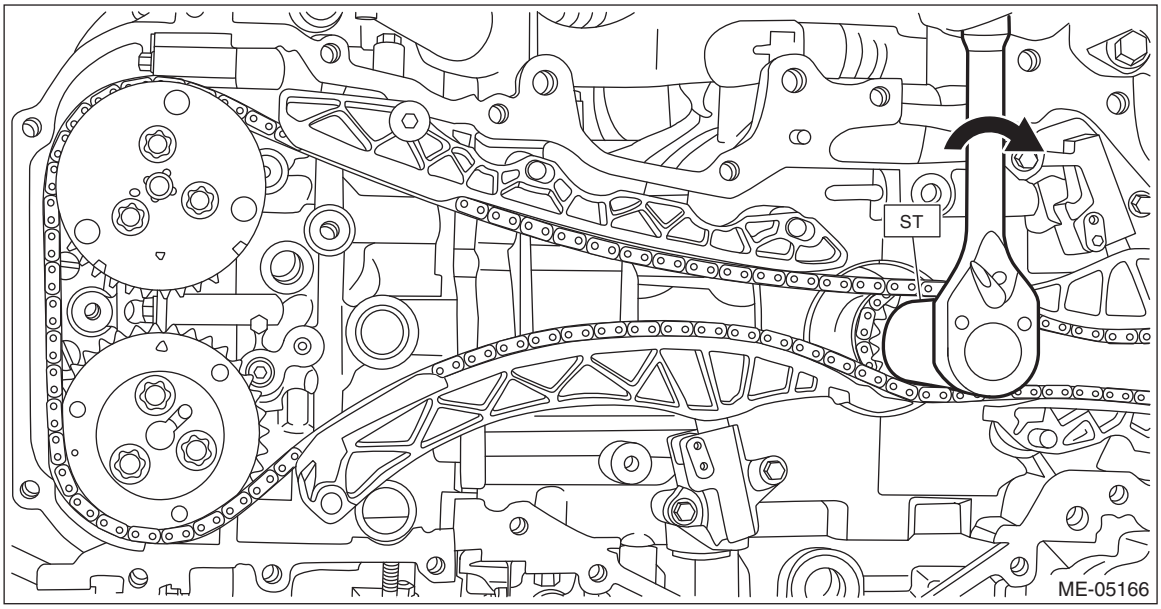
CAUTION:
Confirm the following before pulling out the stopper pin.
- **Matching of the timing chain mark (yellow) to the alignment mark of the crank sprocket.**
- **Matching of the timing chain mark (orange) to the timing mark position of the intake cam sprocket RH.**
- **Matching of the timing chain mark (orange) to the timing mark position of the exhaust cam sprocket RH.**



(A) Alignment mark
(B) Timing mark
(C) Yellow
(D) Orange

8) Using the ST, turn the crankshaft clockwise, and make sure that there are no abnormal conditions.

CAUTION:
Always make sure to perform this confirmation.
ST 18252AA000 CRANKSHAFT SOCKET

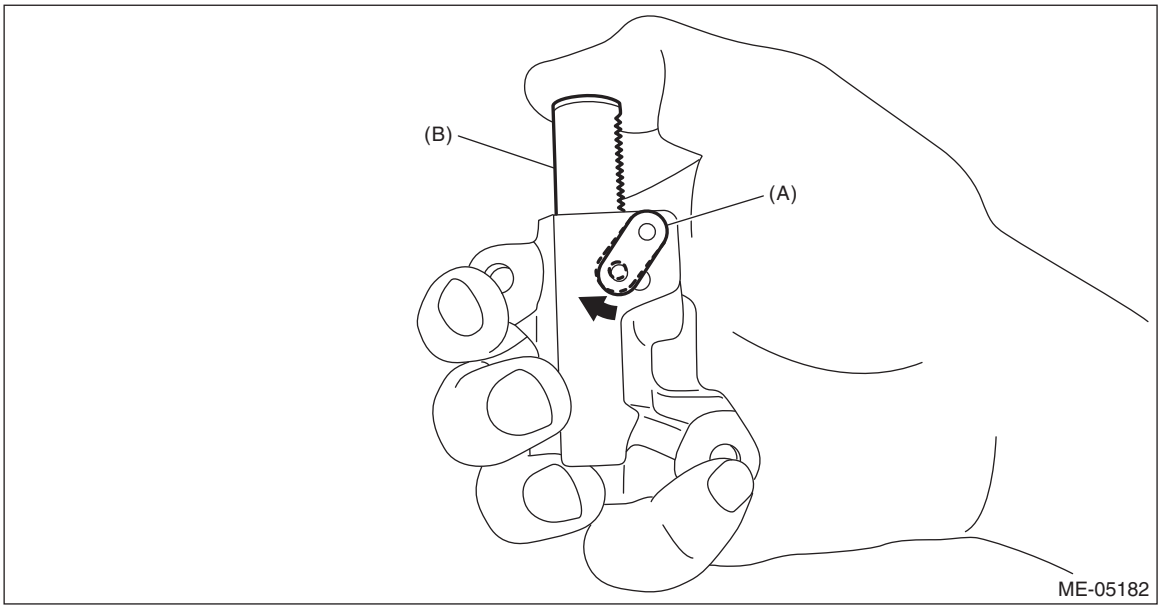


9) Install the chain cover. <Ref. to ME(H4DO)-96, INSTALLATION, Chain Cover.>

2. TIMING CHAIN LH

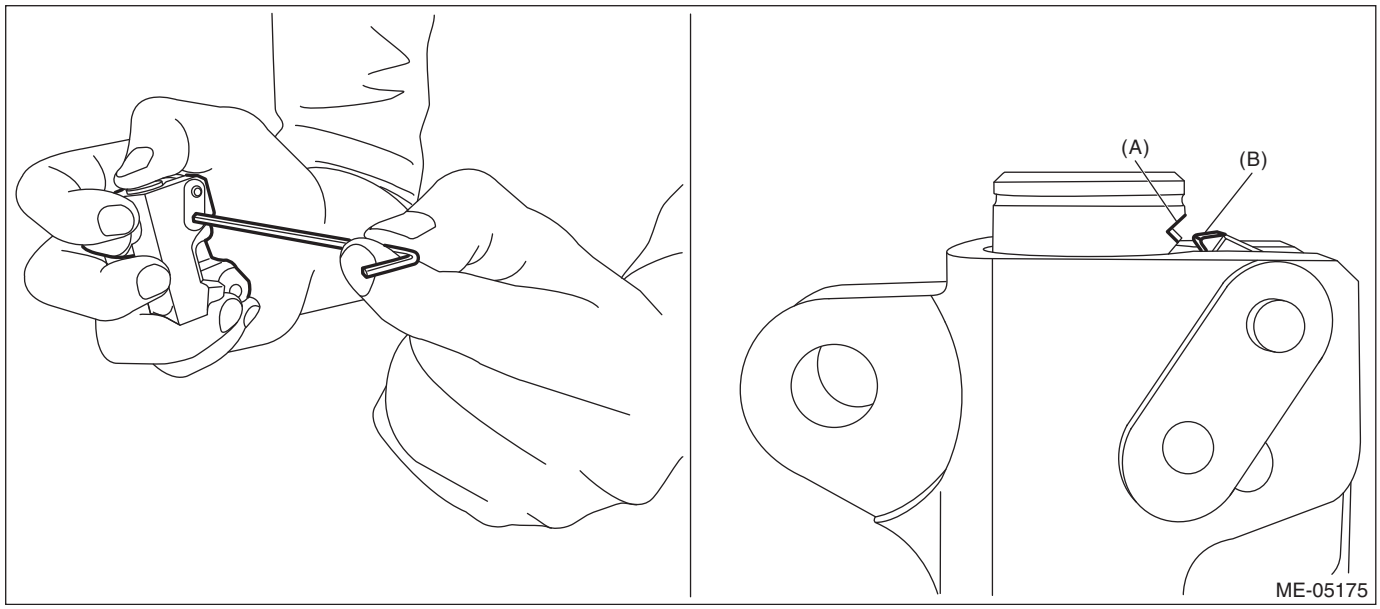
NOTE:
- Be careful that the foreign matter is not into or onto the assembled component during installation.
- Apply engine oil to all component parts of the timing chain.

1) Prepare to attach the chain tensioner LH.
   (1) Move the link plate (A) in the direction of arrow to press in the plunger (B).



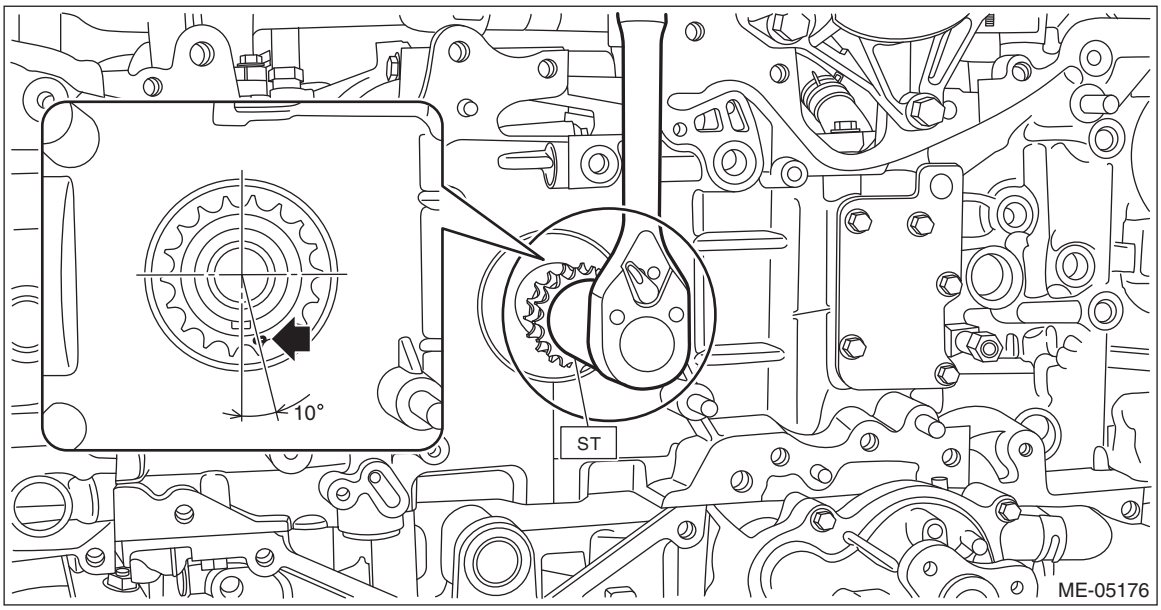
(2) With a 2.5 mm (0.98 in) dia. stopper pin or a 2.5 mm (0.98 in) (nominal) dia. hex wrench inserted into the stopper pin hole, secure the plunger.

NOTE:
If the stopper pin hole on the link plate and the stopper pin hole on the chain tensioner are not aligned, check that the first notch of plunger rack (A) is engaged with the stopper tooth (B). If not engaged, retract the plunger a little so that the first notch of plunger rack (A) is engaged with the stopper tooth (B).



2) Check that the crank sprocket is located at the position sown in the figure. If not aligned, using ST turn the crankshaft to align the crank sprocket alignment mark to the position shown in the figure.

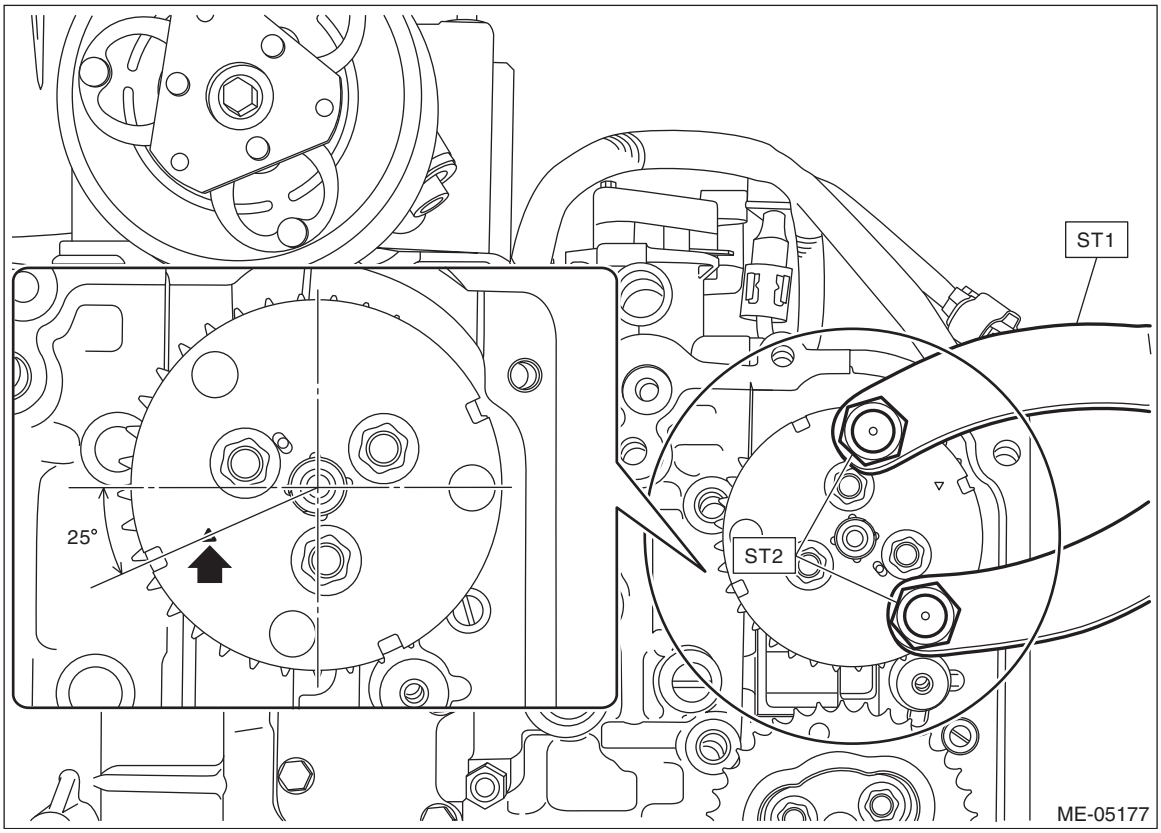
NOTE:
This procedure is required to prevent the valve and piston contacting with each other in the next step.
ST 18252AA000 CRANKSHAFT SOCKET



3) Using ST and by turning the intake cam sprocket LH, align the alignment marks to the positions as shown in the figure.

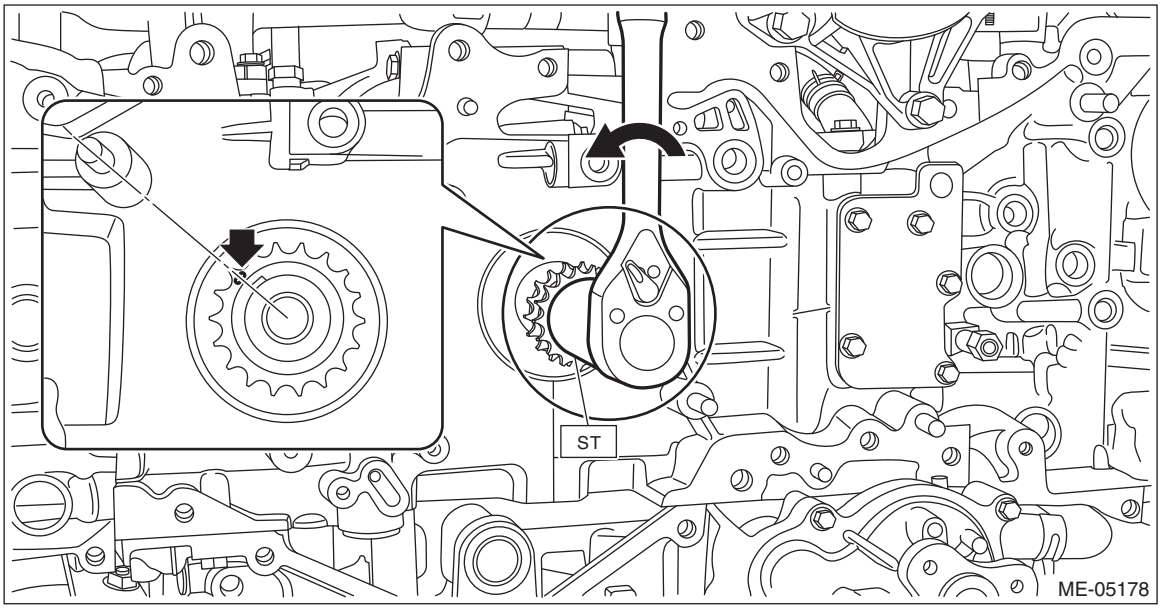
CAUTION:
When the intake valve and exhaust valve lift at the same time, the valve heads contact each other and valve stem may bend. Do not turn the exhaust camshaft LH.

ST1 18355AA000 PULLEY WRENCH
ST2 18334AA030 PULLEY WRENCH PIN SET



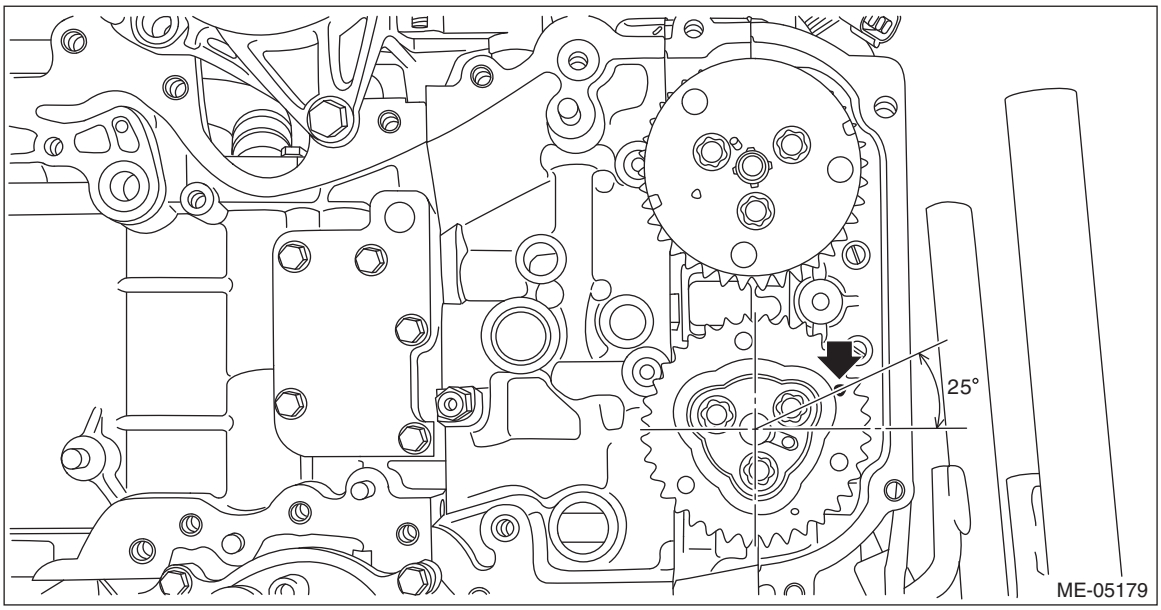
4) Using ST and by turning the crankshaft approximately 200° counterclockwise, align the alignment marks of crank sprocket to the positions as shown in the figure.

CAUTION:
Never turn clockwise because the valve and piston may contact. Clockwise turn is allowed only when adjusting precisely the alignment marks, after turning the crank sprocket alignment mark counterclockwise near the position as shown in the figure.
ST 18252AA000 CRANKSHAFT SOCKET



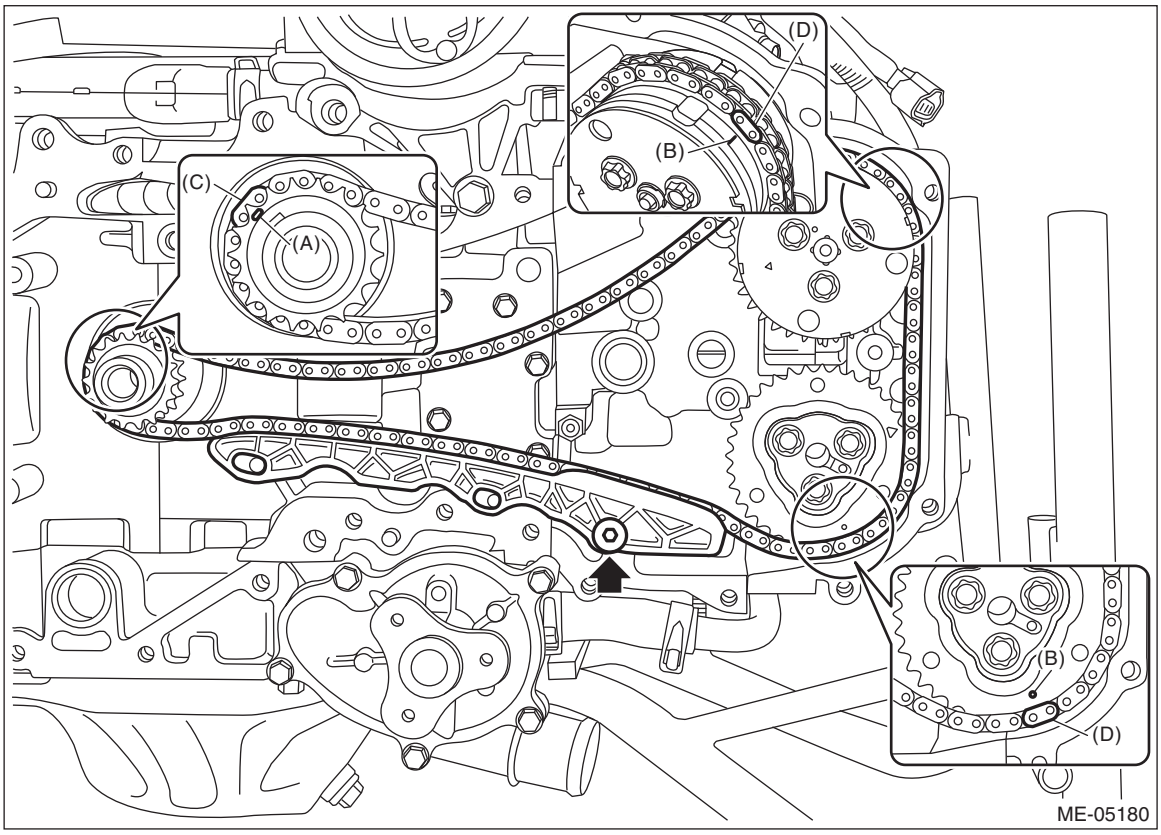
5) Align the alignment mark of exhaust cam sprocket LH to the position shown in the figure.

CAUTION:
To prevent valve damage, turn the exhaust cam sprocket LH only within the range of zero-lift (in range where it can be turned lightly by hand).



6) Install the timing chain LH and the timing chain guide LH.
   (1) Match the timing chain mark (yellow) to the alignment mark of the crank sprocket.
   (2) Match the timing chain mark (orange) to the timing mark position of the intake cam sprocket LH.
   (3) Match the timing chain mark (orange) to the timing mark position of the exhaust cam sprocket LH.
   (4) Install timing chain guide LH.

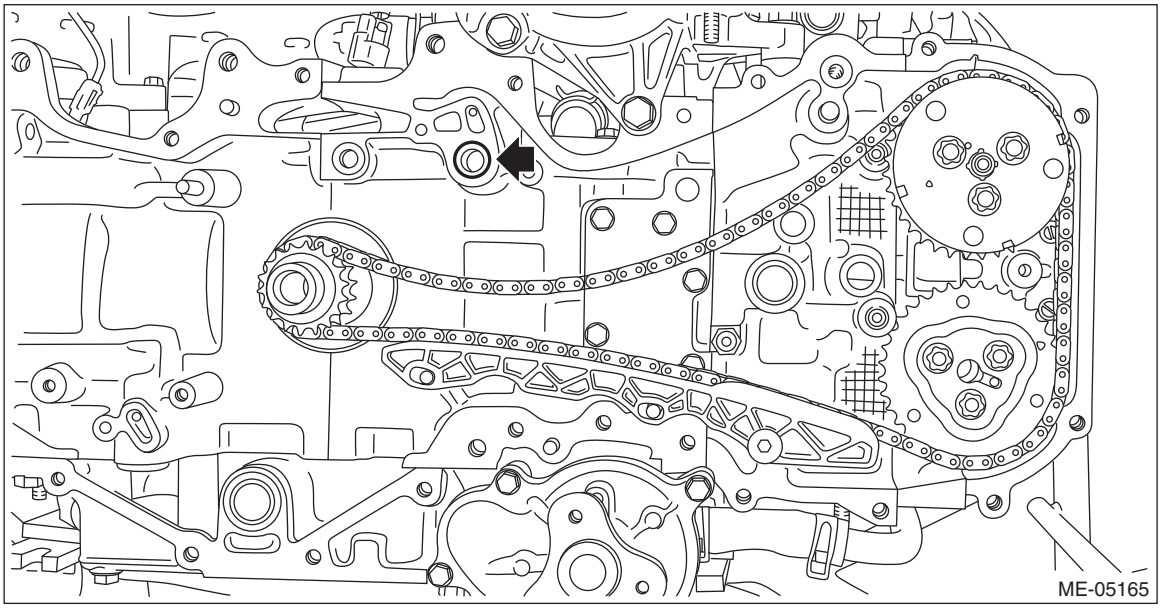
Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)



(A) Alignment mark
(B) Timing mark
(C) Yellow
(D) Orange

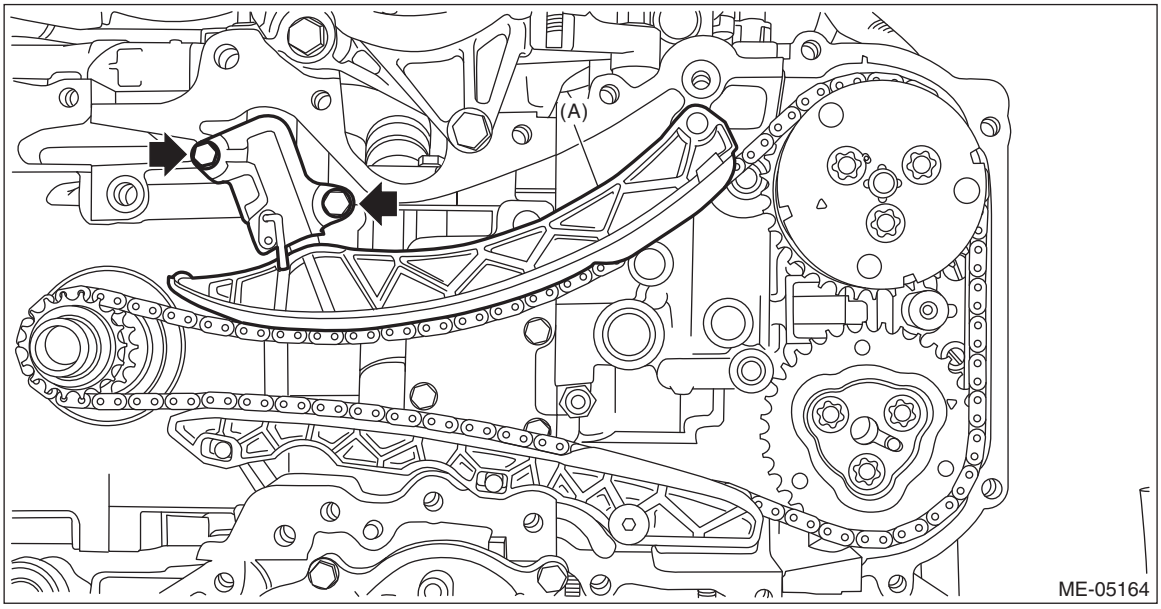
7) Install O-rings to the cylinder block LH.

NOTE:
Use new O-rings.



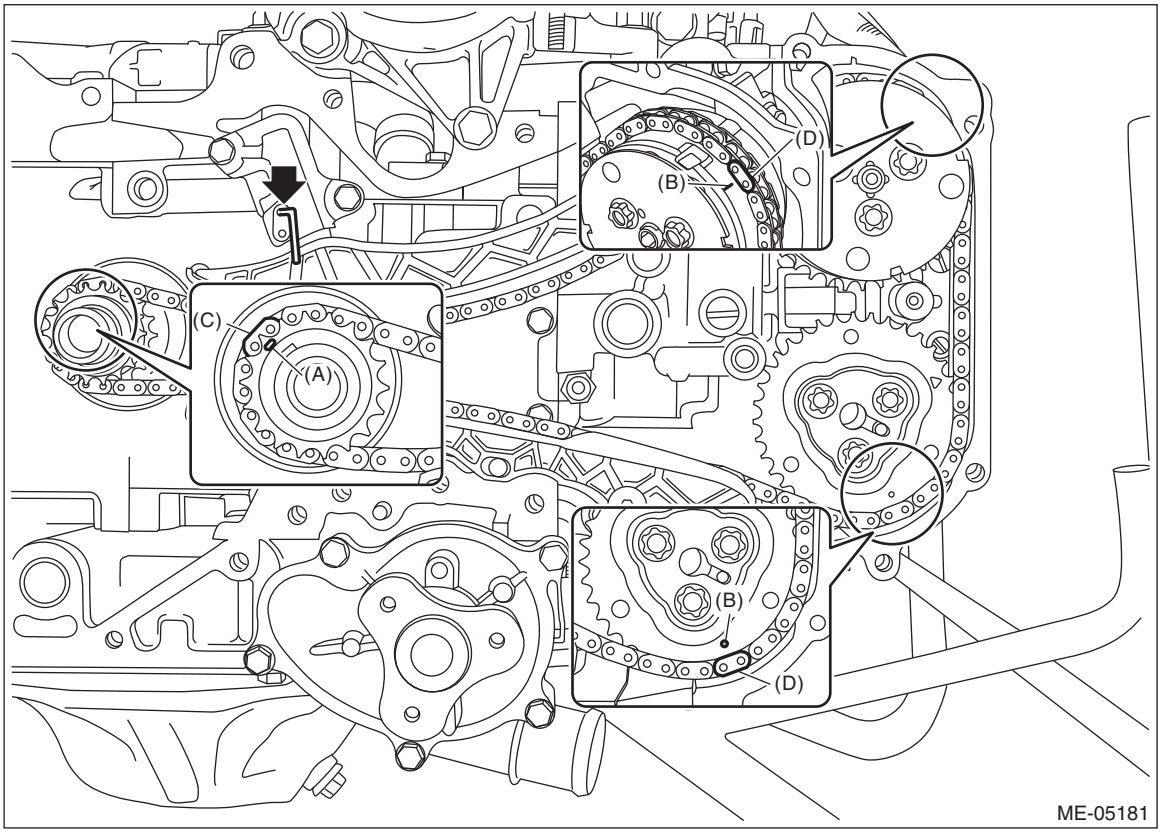
8) Install the chain tensioner lever LH (A) and chain tensioner LH.

Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)



9) Pull out the stopper pin from the chain tensioner LH.

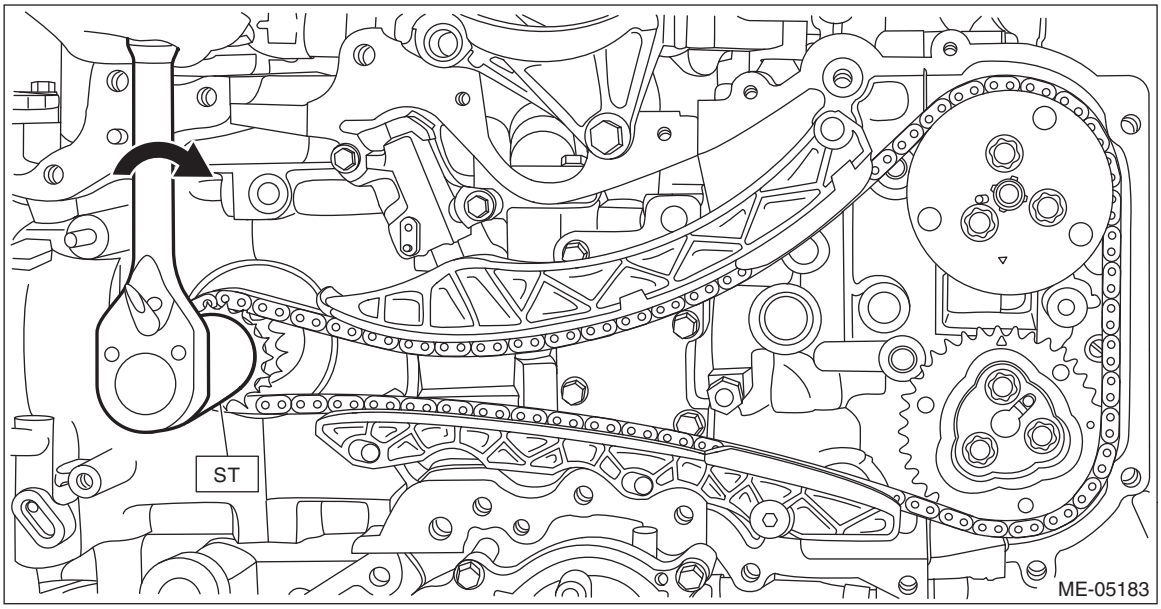
CAUTION:
Confirm the following before pulling out the stopper pin.
- **Matching of the timing chain mark (yellow) to the alignment mark of the crank sprocket.**
- **Matching of the timing chain mark (orange) to the timing mark position of the intake cam sprocket LH.**
- **Matching of the timing chain mark (orange) to the timing mark position of the exhaust cam sprocket RH.**



(A) Alignment mark
(B) Timing mark
(C) Yellow
(D) Orange

10) Using the ST, turn the crankshaft clockwise, and make sure that there are no abnormal conditions.

CAUTION:
Always make sure to perform this confirmation.
ST 18252AA000 CRANKSHAFT SOCKET



11) Install the timing chain RH. <Ref. to ME(H4DO)-116, TIMING CHAIN RH, INSTALLATION, Timing Chain Assembly.>

C: INSPECTION

1) Check the timing chain, chain guide, chain tensioner lever and chain tensioner for deformation, cracks or other damages.
2) Check the chain guide and chain tensioner lever for abnormal wear.

16.Cam Sprocket

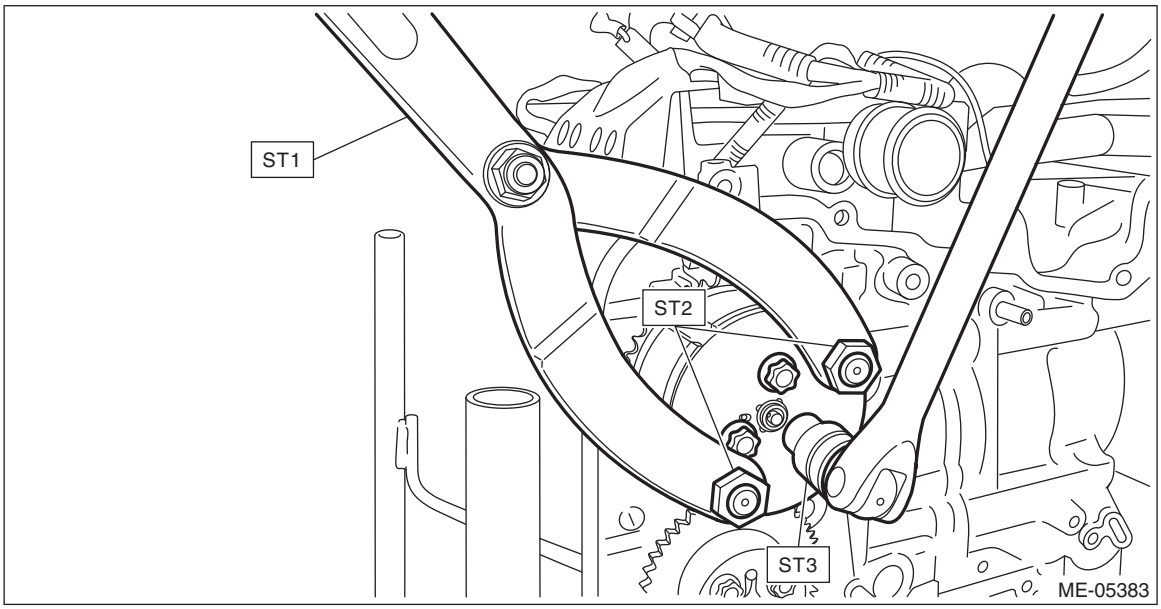
A: REMOVAL

1. CAM SPROCKET RH

NOTE:
When replacing a single part, perform the work with the engine installed to body.

- **Intake cam sprocket RH**

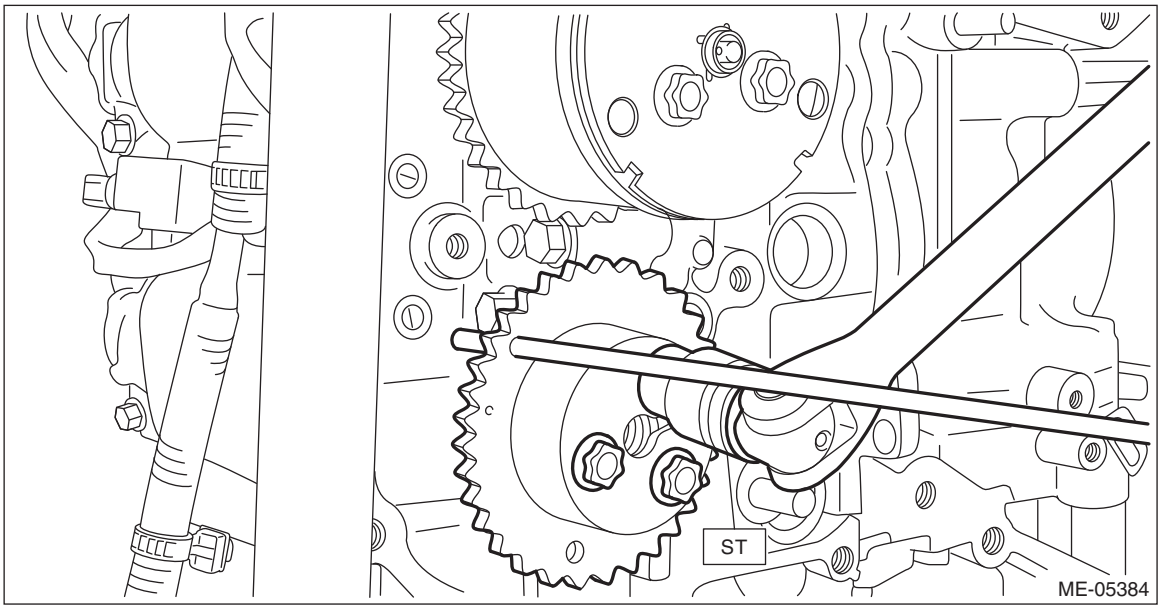
1) Remove the chain cover. <Ref. to ME(H4DO)-91, REMOVAL, Chain Cover.>
2) Remove the timing chain RH. <Ref. to ME(H4DO)-116, TIMING CHAIN RH, INSTALLATION, Timing Chain Assembly.>
3) Hold the intake cam sprocket RH using the ST1 and ST2, and remove the bolts using the ST3.
ST1 18355AA000 PULLEY WRENCH
ST2 18334AA030 PULLEY WRENCH PIN SET
ST3 18270KA010 SOCKET



4) Remove the intake cam sprocket RH.

- **Exhaust cam sprocket RH**

1) Remove the chain cover. <Ref. to ME(H4DO)-91, REMOVAL, Chain Cover.>
2) Remove the timing chain RH. <Ref. to ME(H4DO)-109, TIMING CHAIN RH, REMOVAL, Timing Chain Assembly.>
3) Hold the exhaust cam sprocket RH by inserting the 6 mm (0.236 in) dia. steel rod into the exhaust cam sprocket RH hole as shown in the figure, and remove the bolts using the ST.
ST 18270KA010 SOCKET



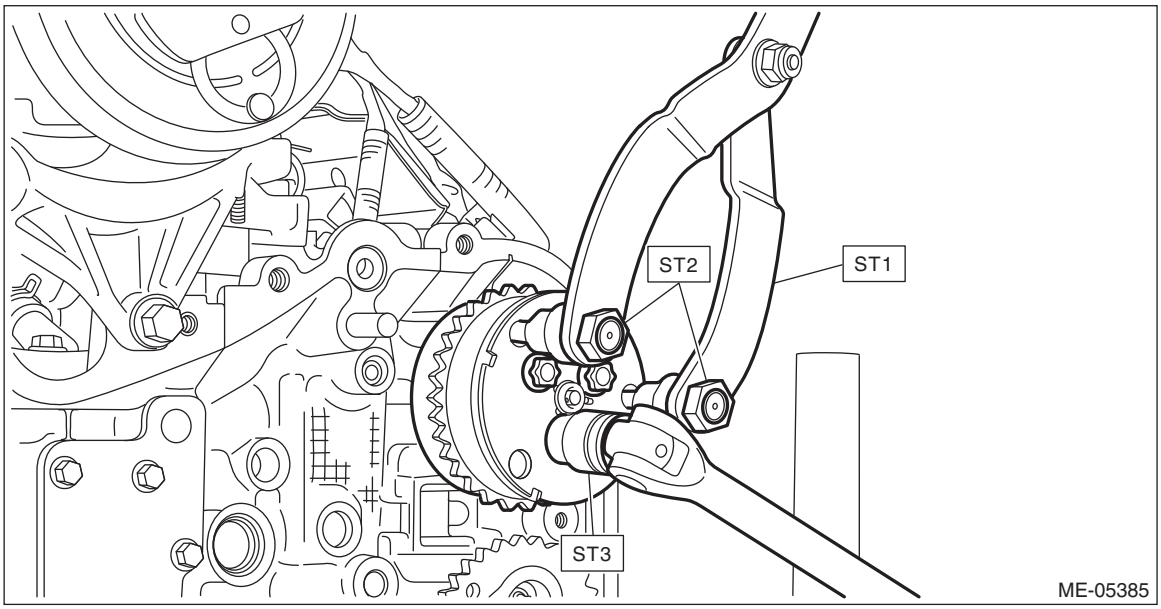
4) Remove the exhaust cam sprocket RH.

2. CAM SPROCKET LH

NOTE:
When replacing a single part, perform the work with the engine installed to body.

- **Intake cam sprocket LH**

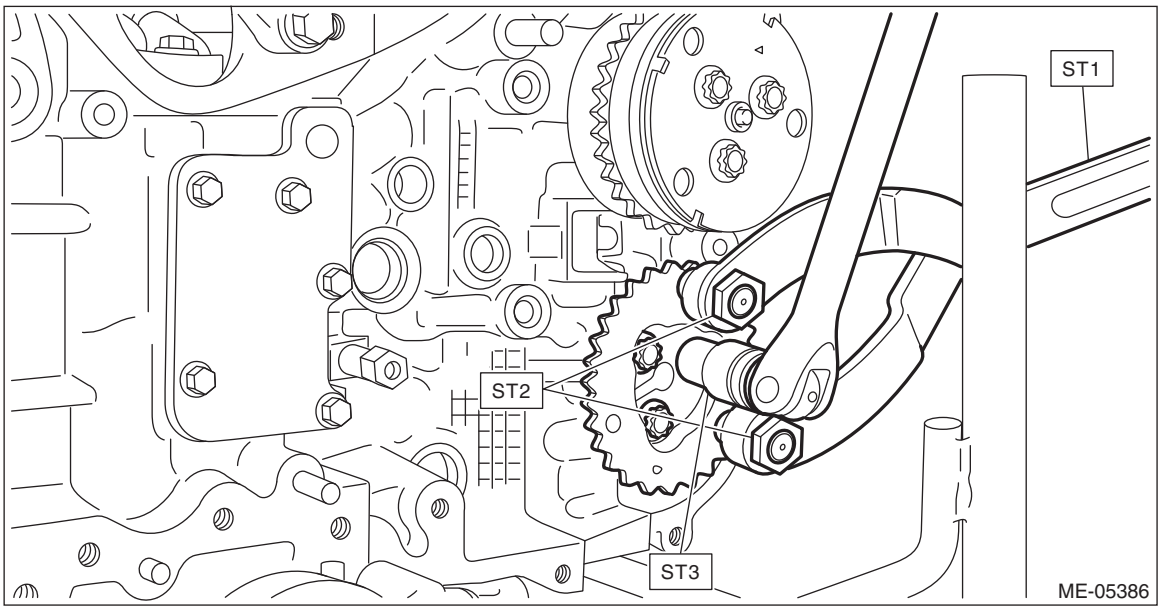
1) Remove the chain cover. <Ref. to ME(H4DO)-91, REMOVAL, Chain Cover.>
2) Remove the timing chain LH. <Ref. to ME(H4DO)-111, TIMING CHAIN LH, REMOVAL, Timing Chain Assembly.>
3) Hold the intake cam sprocket LH using the ST1 and ST2, and remove the bolts using the ST3.
ST1 18355AA000 PULLEY WRENCH
ST2 18334AA030 PULLEY WRENCH PIN SET
ST3 18270KA010 SOCKET



4) Remove the intake cam sprocket LH.

• **Exhaust cam sprocket LH**

1) Remove the chain cover. <Ref. to ME(H4DO)-91, REMOVAL, Chain Cover.>
2) Remove the timing chain LH. <Ref. to ME(H4DO)-111, TIMING CHAIN LH, REMOVAL, Timing Chain Assembly.>
3) Hold the exhaust cam sprocket LH using the ST1 and ST2, and remove the bolts using the ST3.
ST1 18355AA000 PULLEY WRENCH
ST2 18334AA020 PULLEY WRENCH PIN SET
ST3 18270KA010 SOCKET



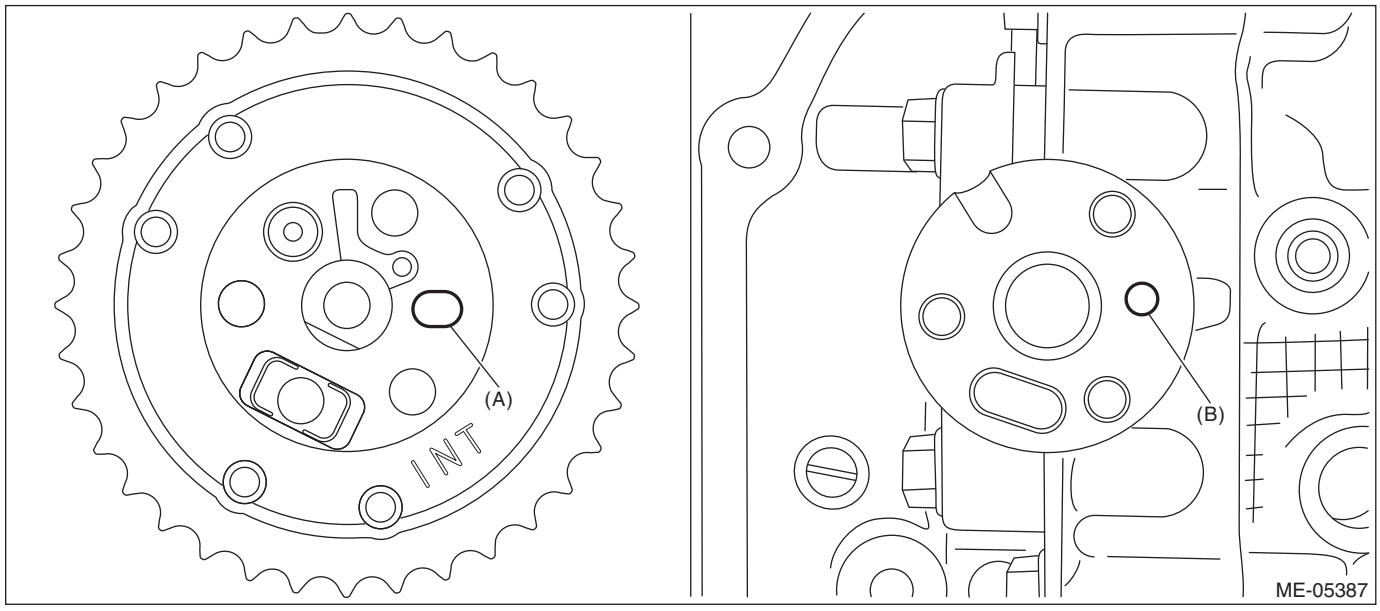
4) Remove the exhaust cam sprocket LH.

B: INSTALLATION

1. CAM SPROCKET RH

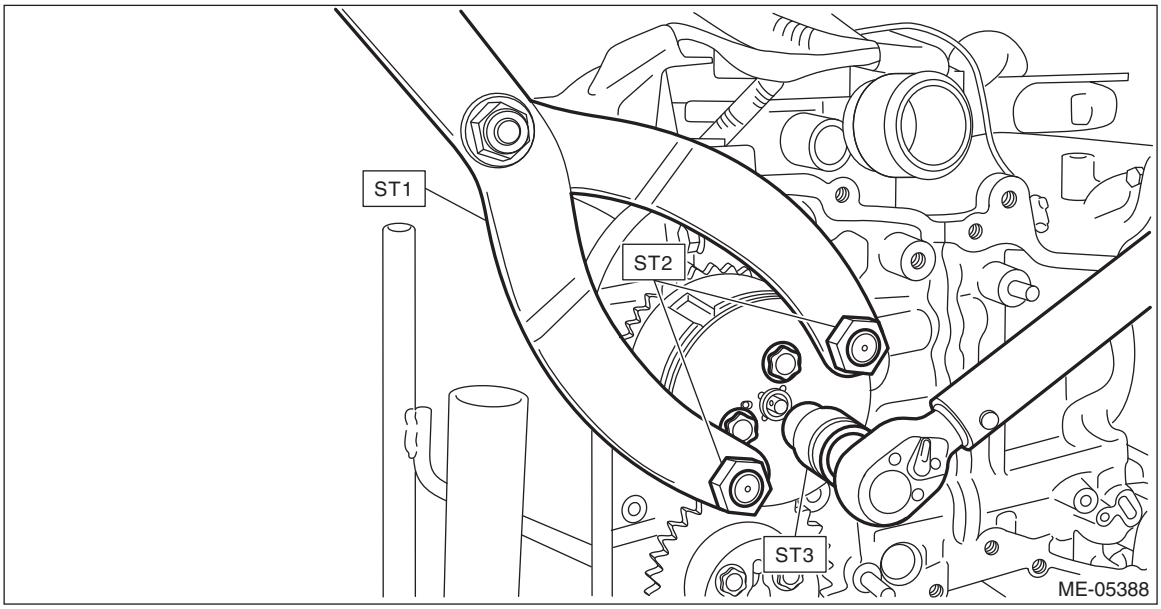
• **Intake cam sprocket RH**

1) Install the intake cam sprocket RH by aligning the knock hole (A) of intake cam sprocket RH and the knock pin (B) of intake camshaft RH.



2) Hold the intake cam sprocket RH using the ST1 and ST2, and install the bolts using the ST3.
ST1 18355AA000 PULLEY WRENCH
ST2 18334AA030 PULLEY WRENCH PIN SET
ST3 18270KA010 SOCKET

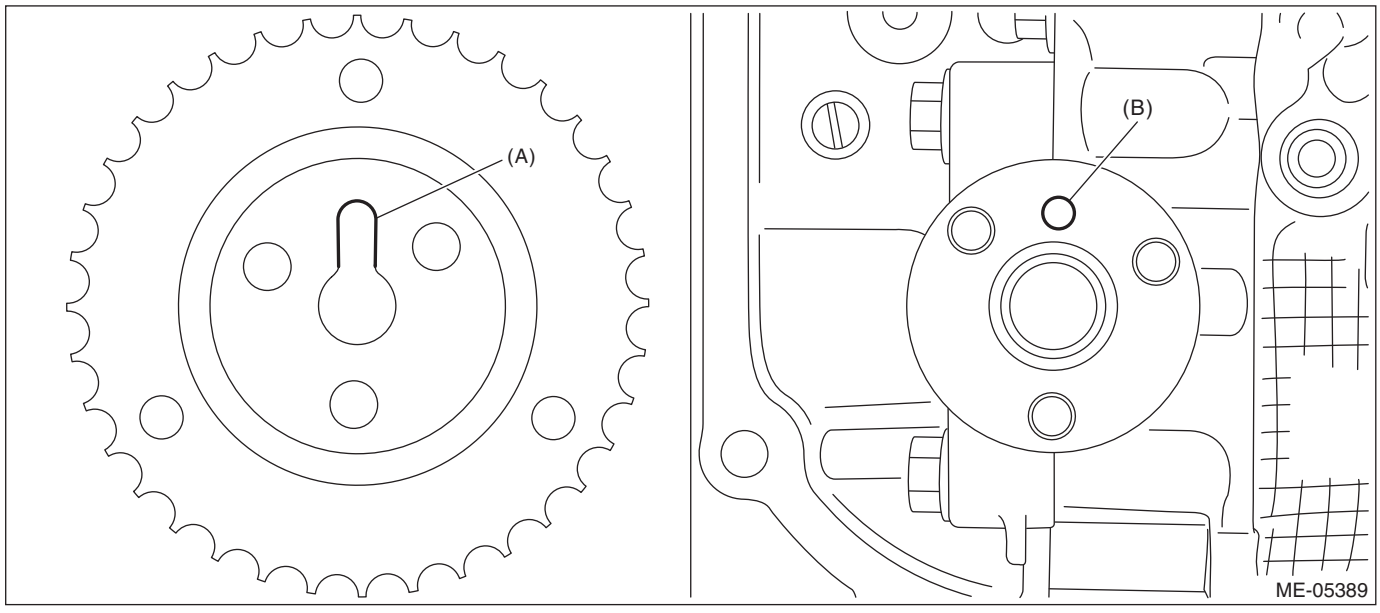
Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)



3) Install the timing chain RH. <Ref. to ME(H4DO)-116, TIMING CHAIN RH, INSTALLATION, Timing Chain Assembly.>
4) Install the chain cover. <Ref. to ME(H4DO)-96, INSTALLATION, Chain Cover.>

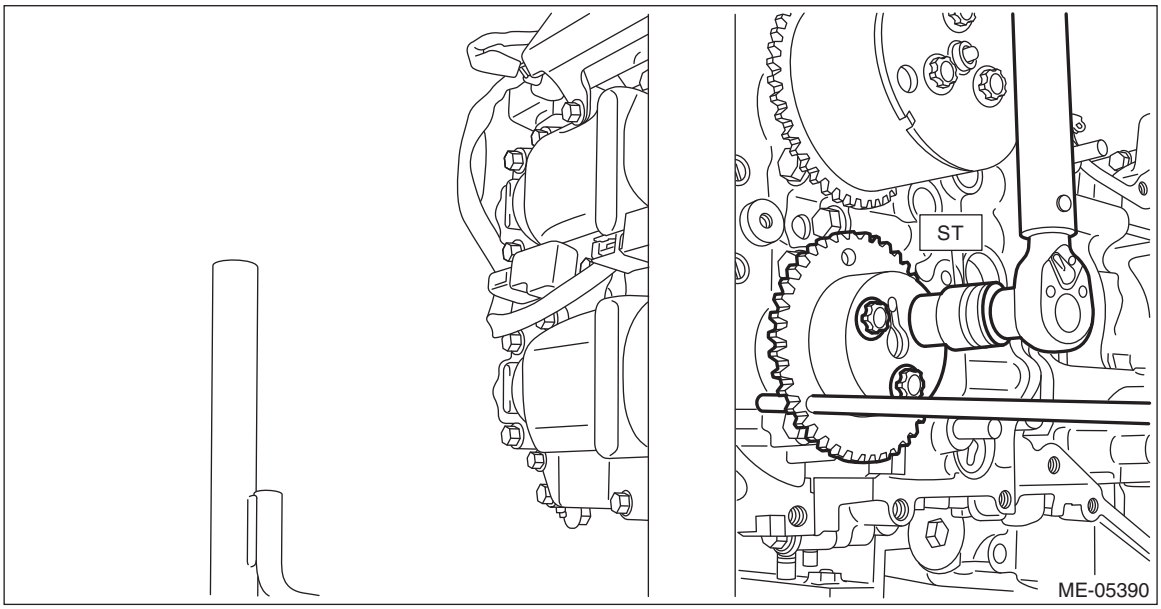
- **Exhaust cam sprocket RH**

1) Install the exhaust cam sprocket RH by aligning the knock hole (A) of exhaust cam sprocket RH and the knock pin (B) of exhaust camshaft RH.



2) Hold the exhaust cam sprocket RH by inserting the 6 mm (0.236 in) dia. steel rod into the exhaust cam sprocket RH hole as shown in the figure, and install the bolts using the ST.
ST 18270KA010 SOCKET

Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)

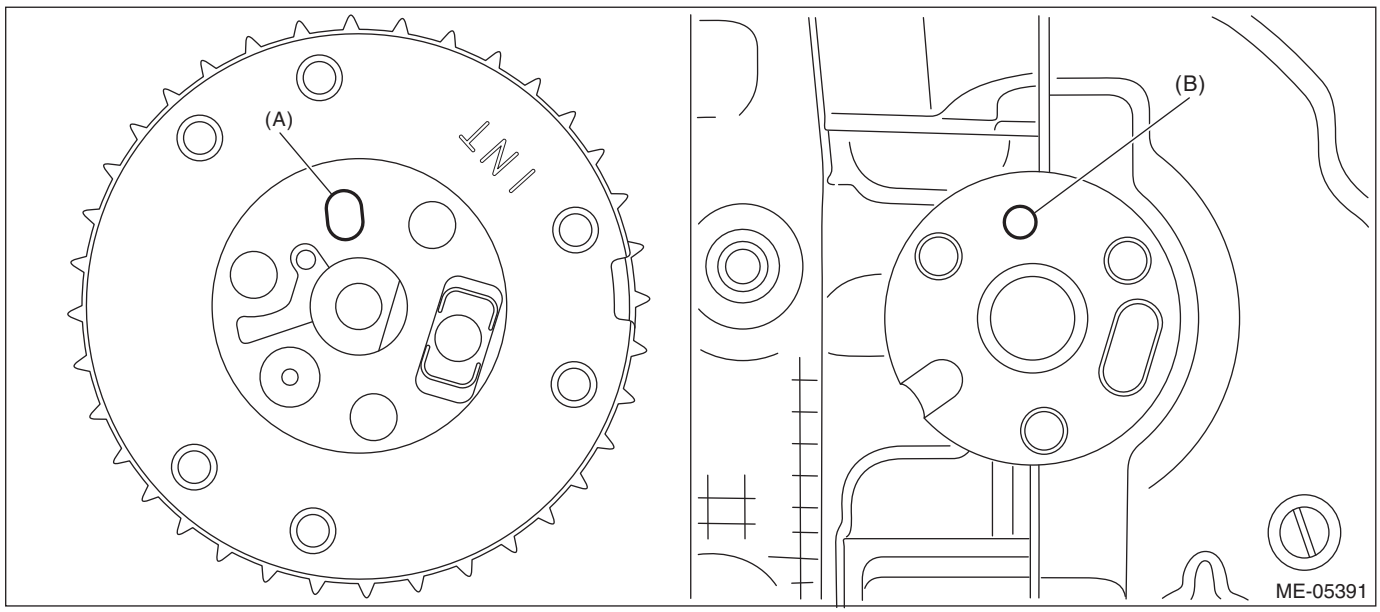


3) Install the timing chain RH. <Ref. to ME(H4DO)-116, TIMING CHAIN RH, INSTALLATION, Timing Chain Assembly.>
4) Install the chain cover. <Ref. to ME(H4DO)-96, INSTALLATION, Chain Cover.>

2. CAM SPROCKET LH

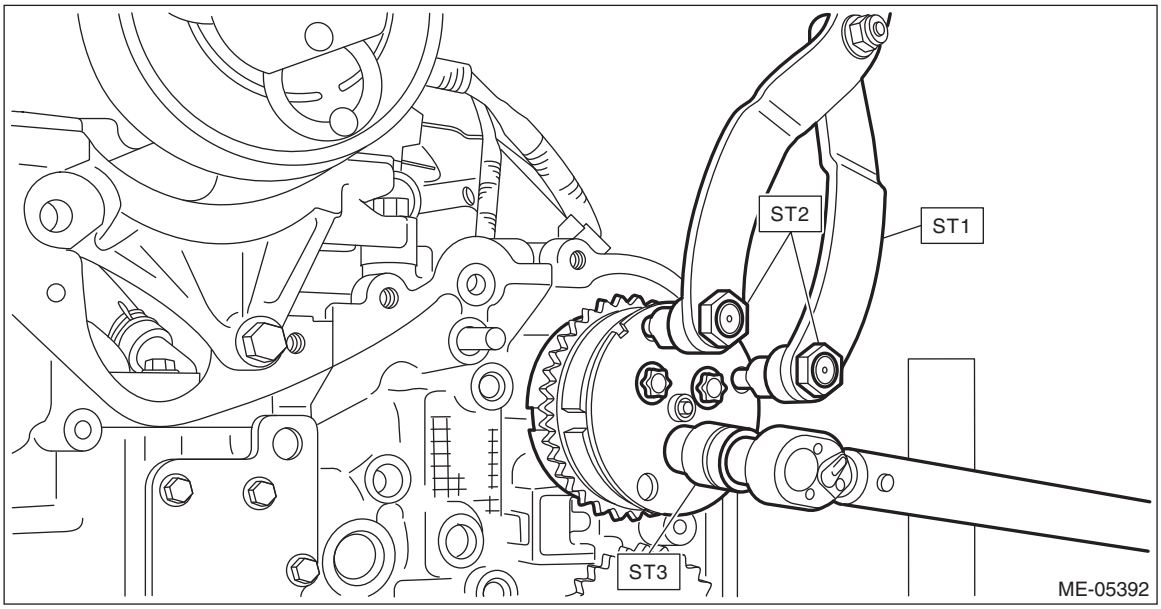
• Intake cam sprocket LH

1) Install the intake cam sprocket LH by aligning the knock hole (A) of intake cam sprocket LH and the knock pin (B) of intake camshaft LH.



2) Hold the intake cam sprocket LH using the ST1 and ST2, and install the bolts using the ST3.
ST1 18355AA000 PULLEY WRENCH
ST2 18334AA030 PULLEY WRENCH PIN SET
ST3 18270KA010 SOCKET

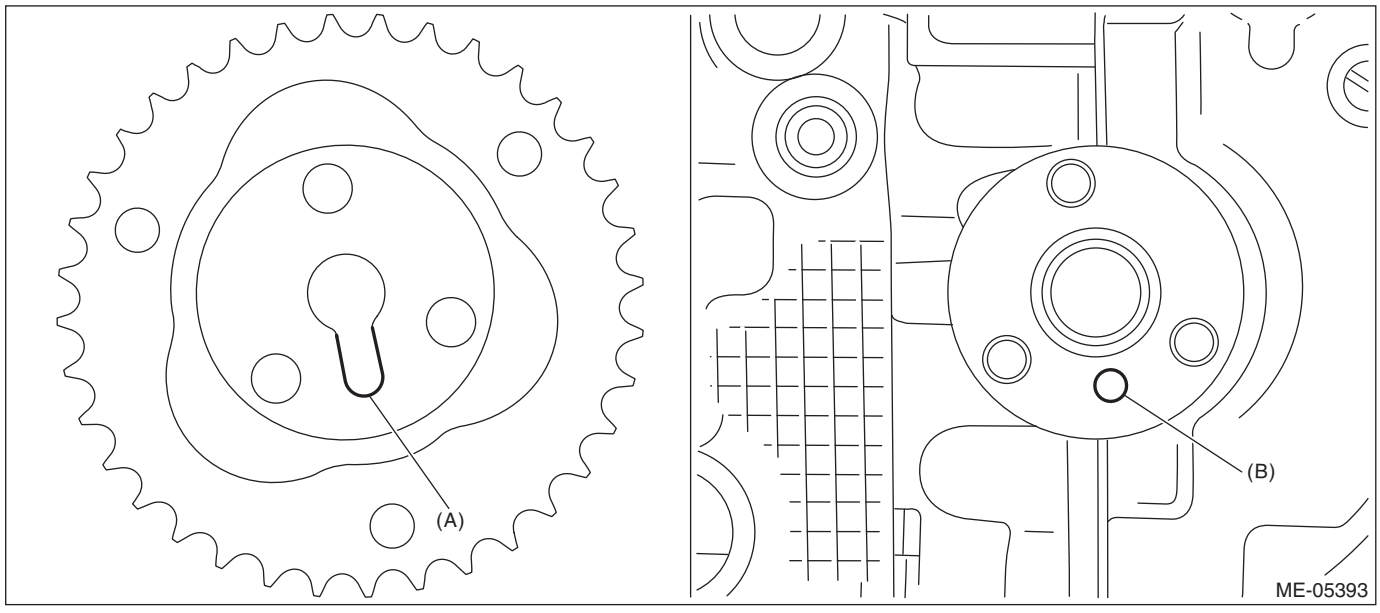
Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)



3) Install timing chain LH. <Ref. to ME(H4DO)-121, TIMING CHAIN LH, INSTALLATION, Timing Chain Assembly.>
4) Install the chain cover. <Ref. to ME(H4DO)-96, INSTALLATION, Chain Cover.>

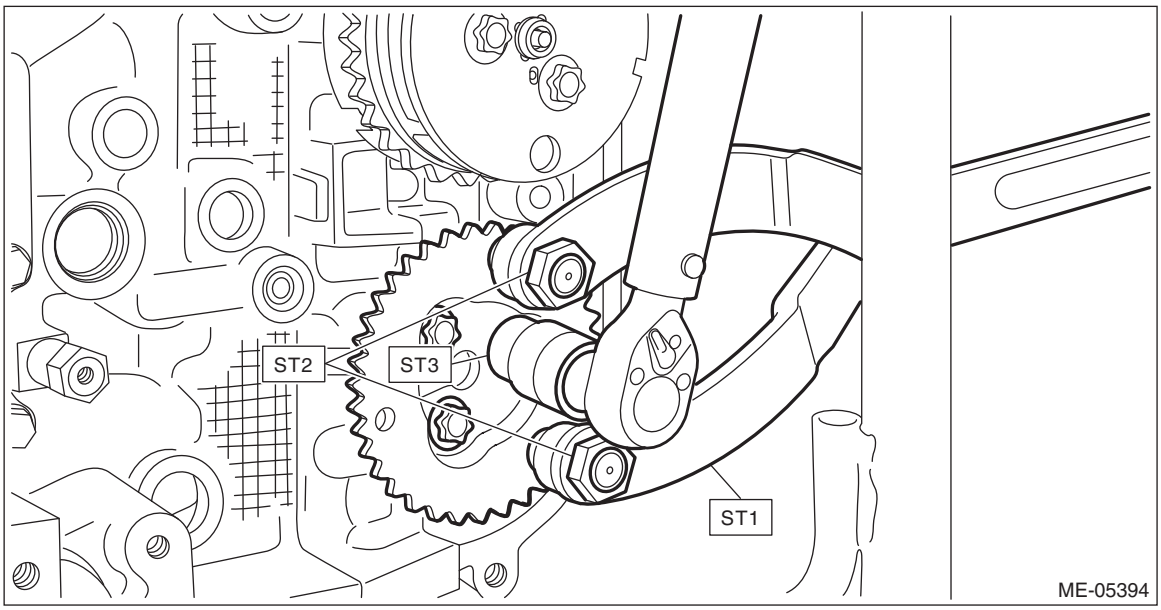
- **Exhaust cam sprocket LH**

1) Install the exhaust cam sprocket LH by aligning the knock hole (A) of exhaust cam sprocket LH and the knock pin (B) of exhaust camshaft LH.



2) Hold the exhaust cam sprocket LH using the ST1 and ST2, and install the bolts using the ST3.
ST1 18355AA000 PULLEY WRENCH
ST2 18334AA020 PULLEY WRENCH PIN SET
ST3 18270KA010 SOCKET

Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)



3) Install timing chain LH. <Ref. to ME(H4DO)-121, TIMING CHAIN LH, INSTALLATION, Timing Chain Assembly.>
4) Install the chain cover. <Ref. to ME(H4DO)-96, INSTALLATION, Chain Cover.>

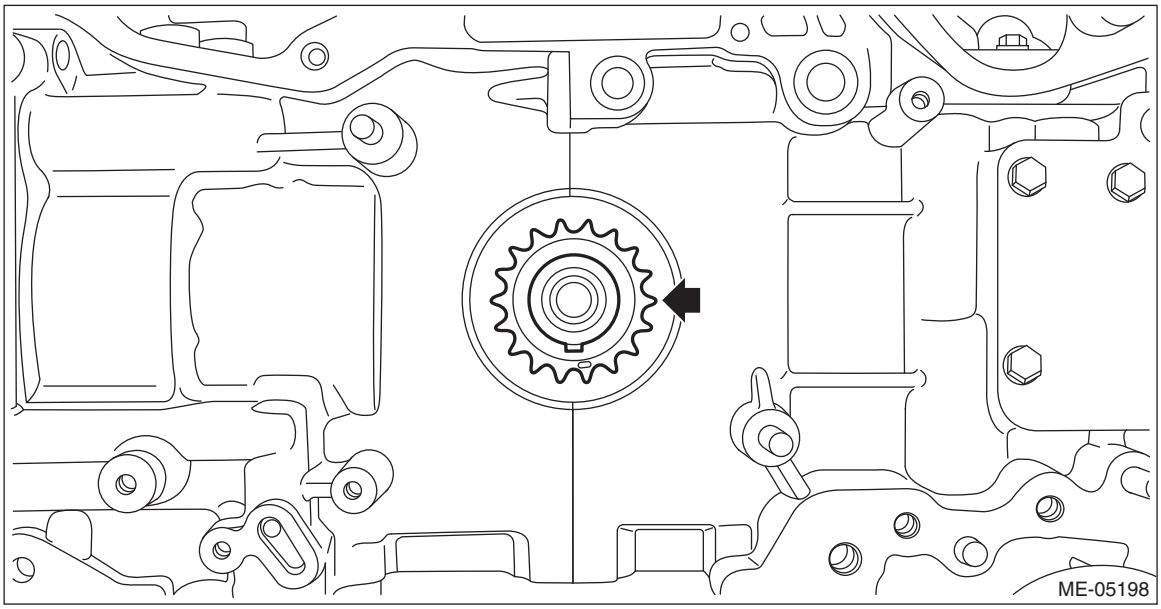
C: INSPECTION

Check the cam sprocket teeth for abnormal wear and scratches.

17.Crank Sprocket

A: REMOVAL

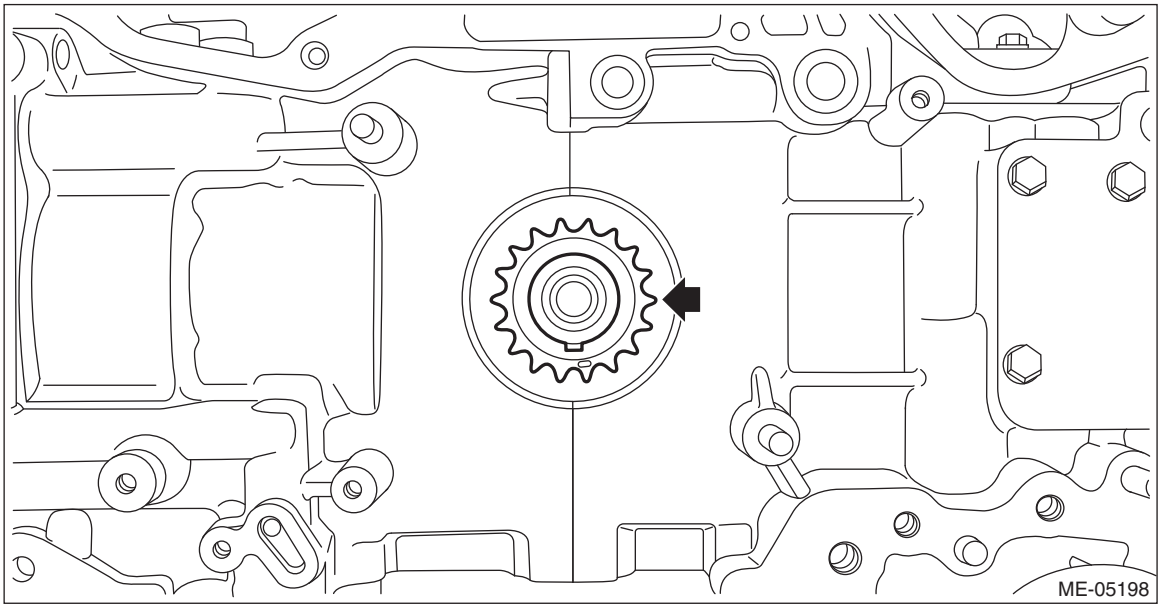
NOTE:
When replacing a single part, perform the work with the engine installed to body.
1) Remove the chain cover. <Ref. to ME(H4DO)-91, REMOVAL, Chain Cover.>
2) Remove the timing chain. <Ref. to ME(H4DO)-109, REMOVAL, Timing Chain Assembly.>
3) Remove the crank sprocket.



B: INSTALLATION

1) Install the crank sprocket.

NOTE:
The direction of installation is not specified for the crank sprocket.



2) Install the timing chain. <Ref. to ME(H4DO)-116, INSTALLATION, Timing Chain Assembly.>
3) Install the chain cover. <Ref. to ME(H4DO)-96, INSTALLATION, Chain Cover.>

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.

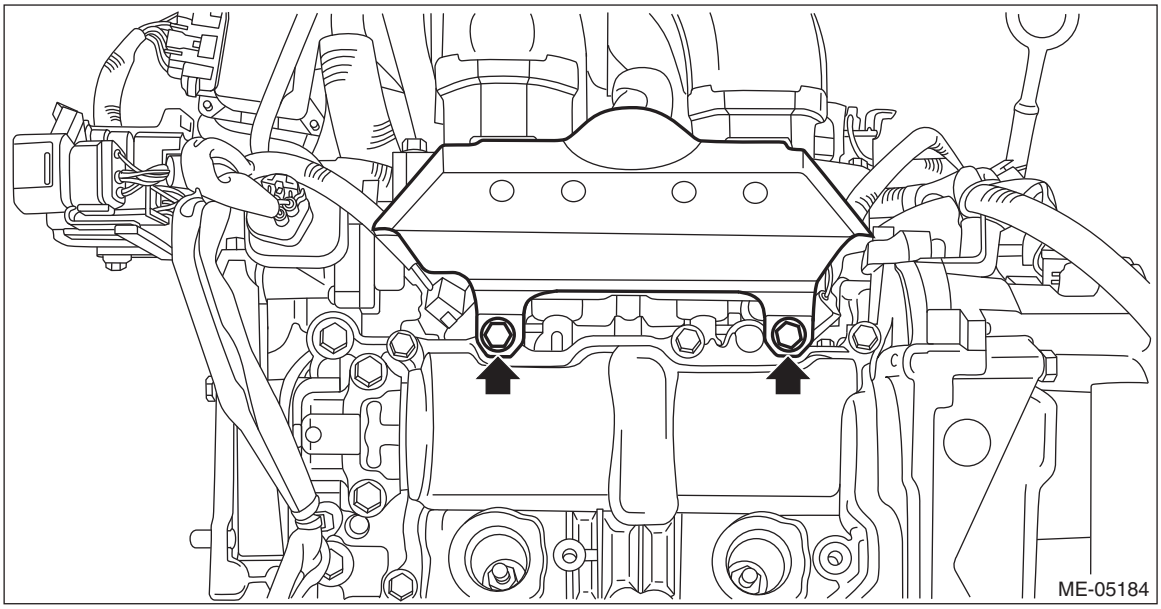
18.Rocker Cover

A: REMOVAL

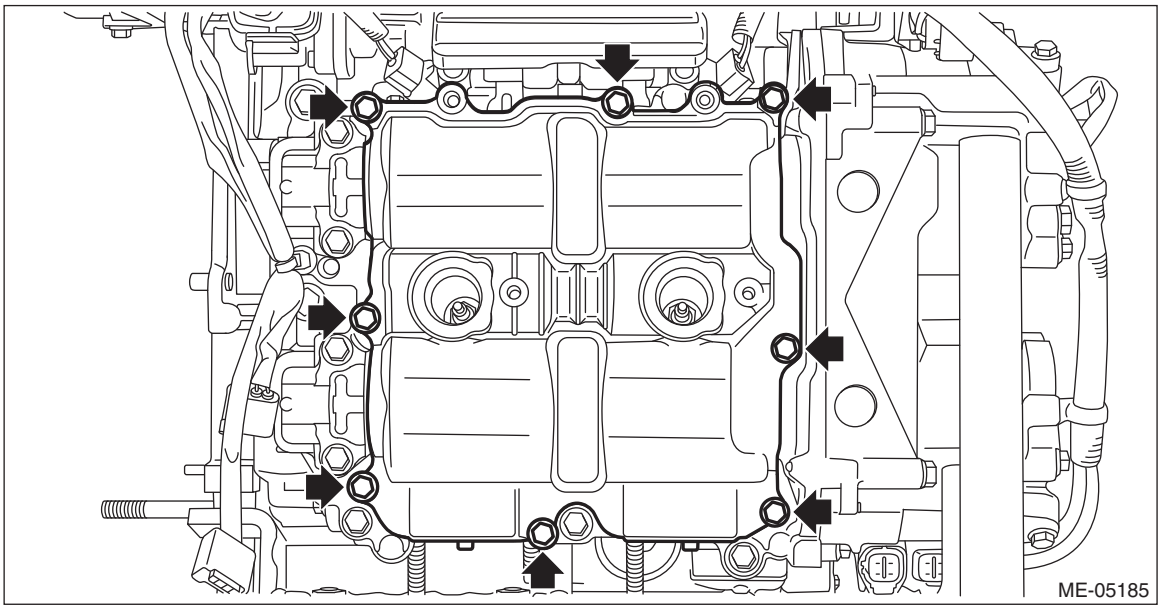
1. ROCKER COVER RH

NOTE:
When replacing a single part, perform the work with the engine installed to body.
1) When working on the vehicle

NOTE:
When working on the vehicle, perform the following steps also.
(1) Remove the air cleaner case. <Ref. to IN(H4DO)-7, REMOVAL, Air Cleaner Case.>
(2) Remove the air intake boot. <Ref. to IN(H4DO)-13, REMOVAL, Air Intake Boot.>
(3) Remove the front exhaust pipe. <Ref. to EX(H4DO)-5, REMOVAL, Front Exhaust Pipe.>
2) Remove the #1 ignition coil and the #3 ignition coil. <Ref. to IG(H4DO)-9, REMOVAL, Ignition Coil.>
3) Remove the intake manifold protector RH.

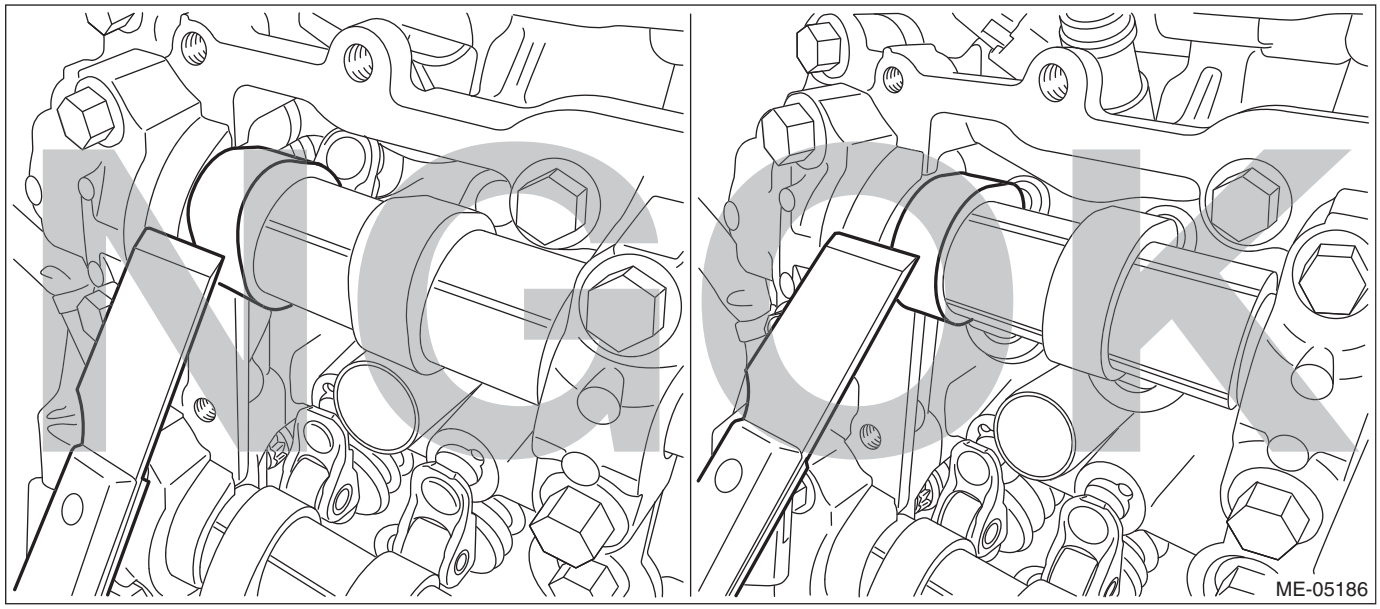


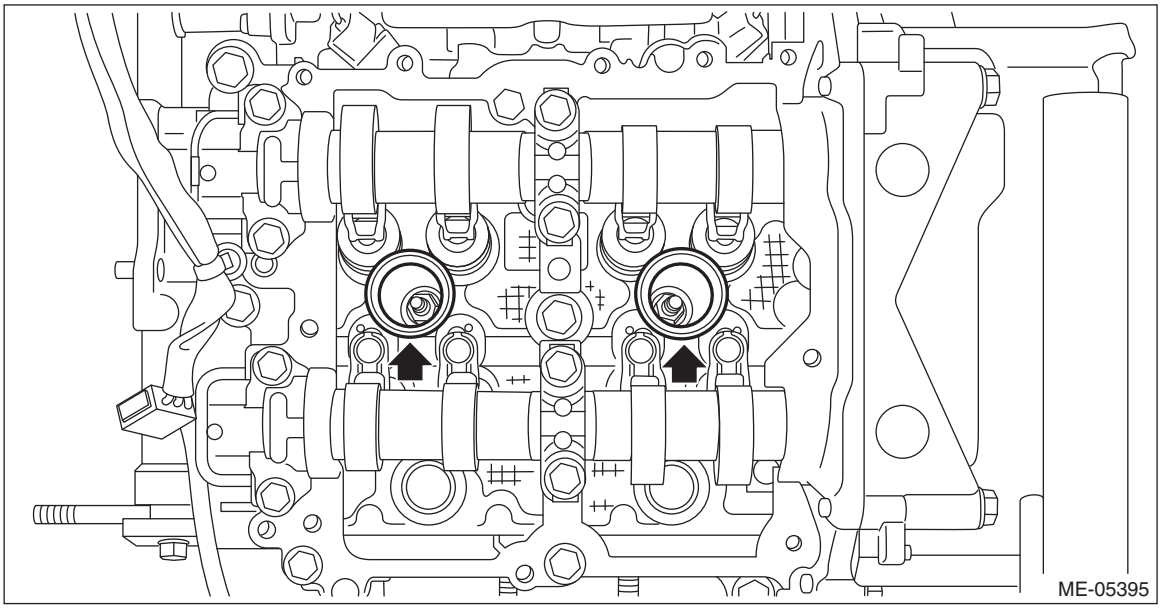
4) Remove the rocker cover RH.



5) Remove the rocker cover gasket RH, #1 spark plug pipe gasket and #3 spark plug pipe gasket, and remove the liquid gasket.

CAUTION:
• When removing the liquid gasket from engine unit using scraper, use special care not to damage the cam lobe of camshaft RH.
• If the cam lobe of camshaft RH interferes, turn the crankshaft to the position where the scraper does not touch.

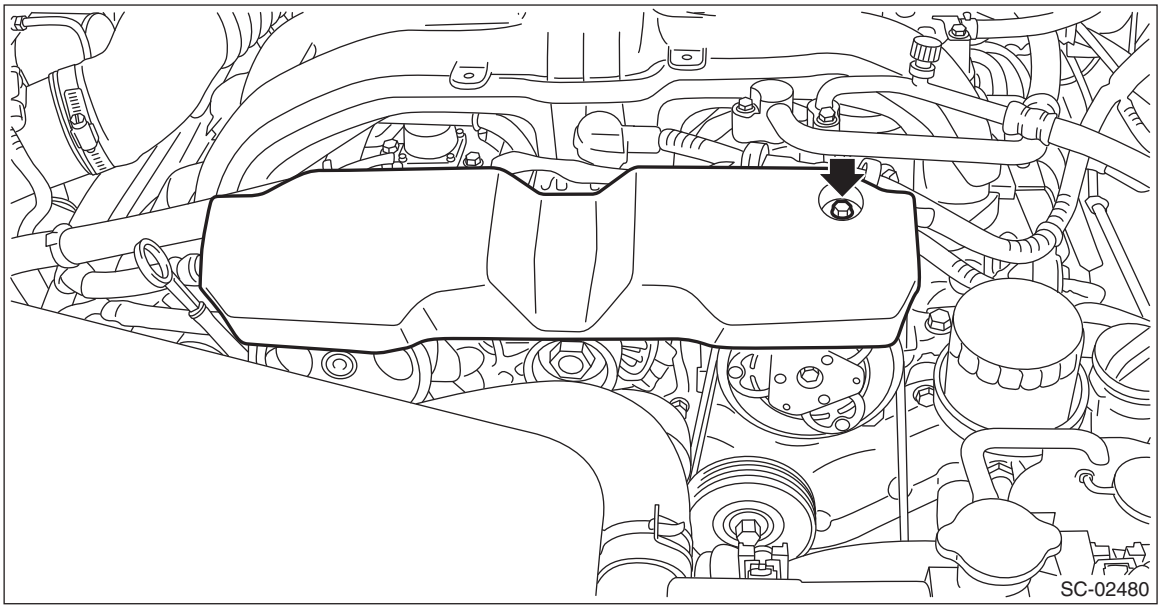




2. ROCKER COVER LH

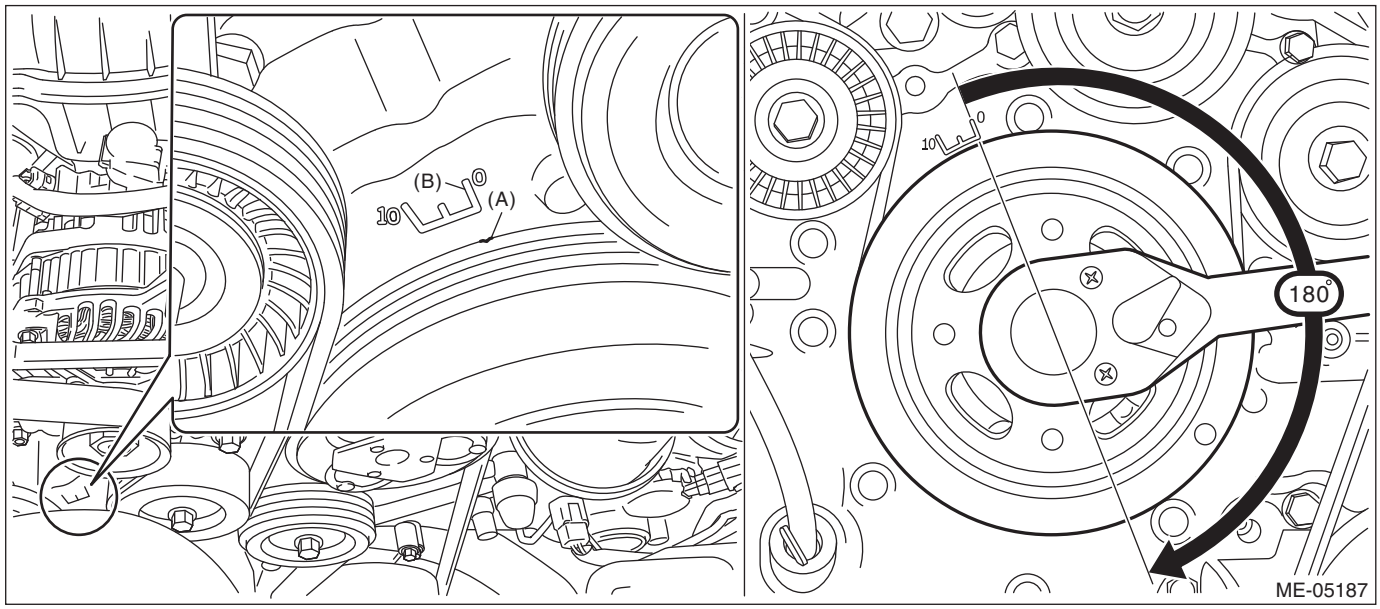
NOTE:
When replacing a single part, perform the work with the engine installed to body.
1) When working on the vehicle

NOTE:
When working on the vehicle, perform the following steps also.
(1) Remove the battery. <Ref. to SC(H4DO)-59, REMOVAL, Battery.>
(2) Remove the V-belt covers.



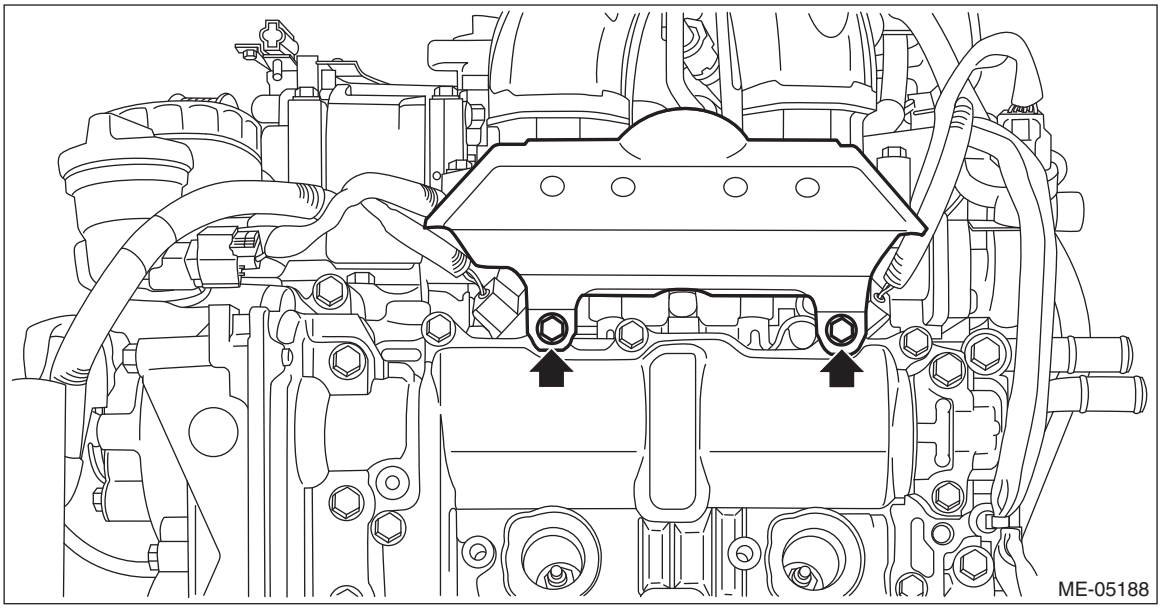
(3) Remove the air intake duct. <Ref. to IN(H4DO)-14, REMOVAL, Air Intake Duct.>
(4) Align the timing mark (A) of crank pulley to the timing gauge (B) 0° of chain cover as shown in the figure, and turn the crankshaft by 180° clockwise from that position.

NOTE:
This procedure is required to prevent the rocker cover LH and the cam lobe of camshaft LH contacting with each other when removing the rocker cover LH.

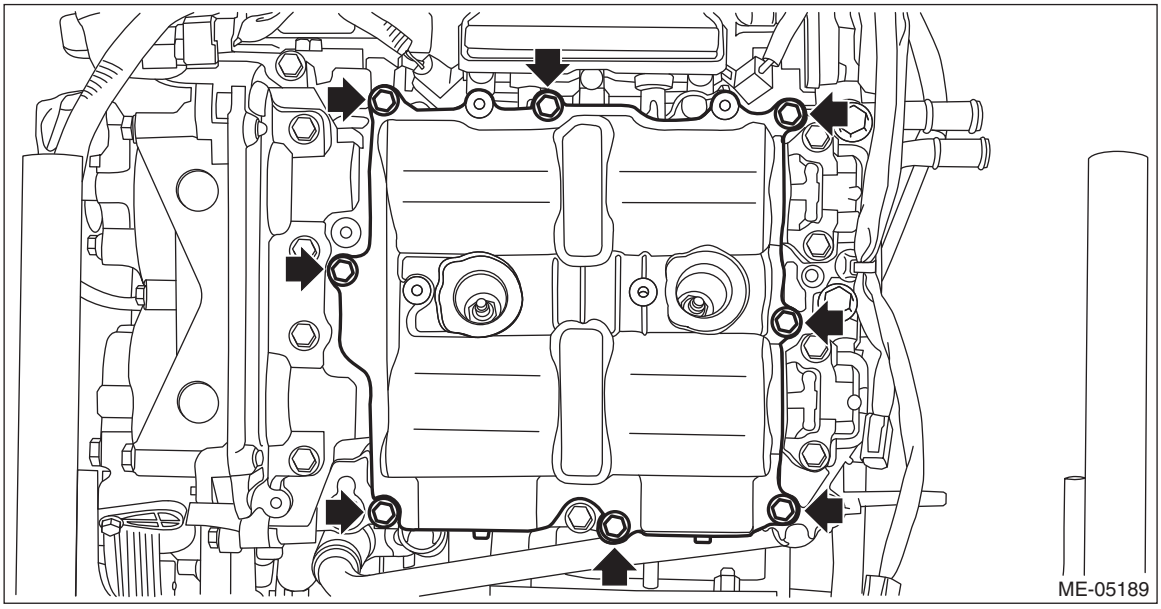


2) Remove the #2 ignition coil and the #4 ignition coil. <Ref. to IG(H4DO)-9, REMOVAL, Ignition Coil.>

3) Remove the intake manifold protector LH.

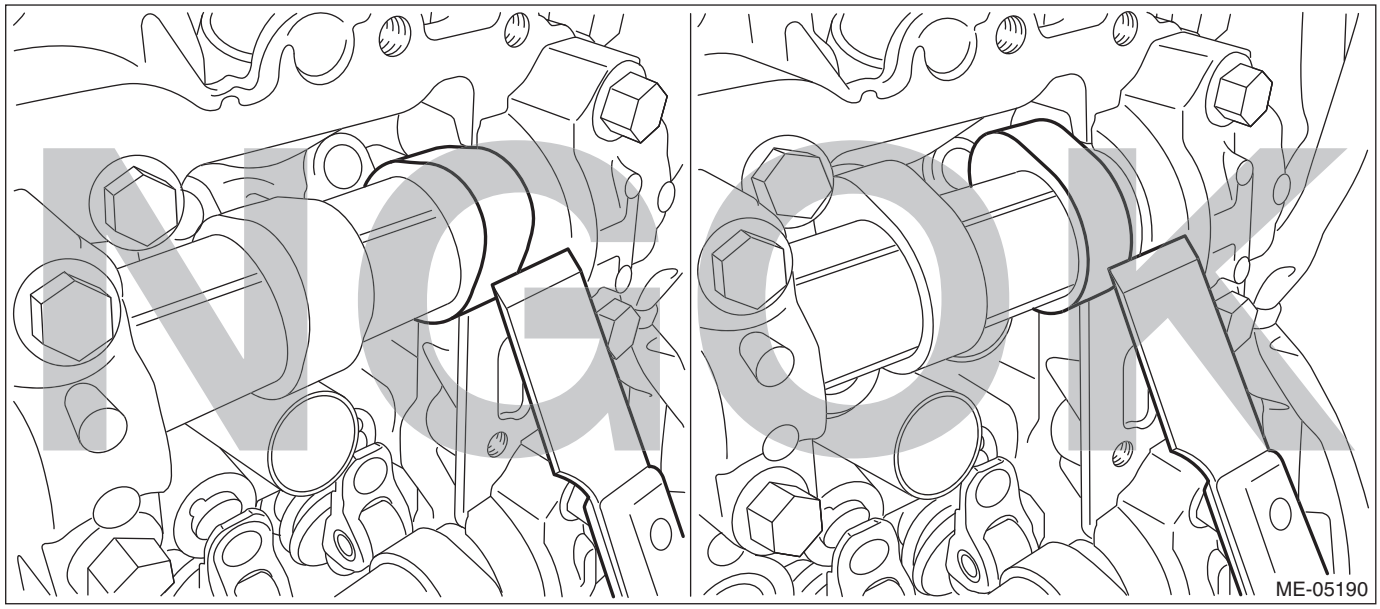


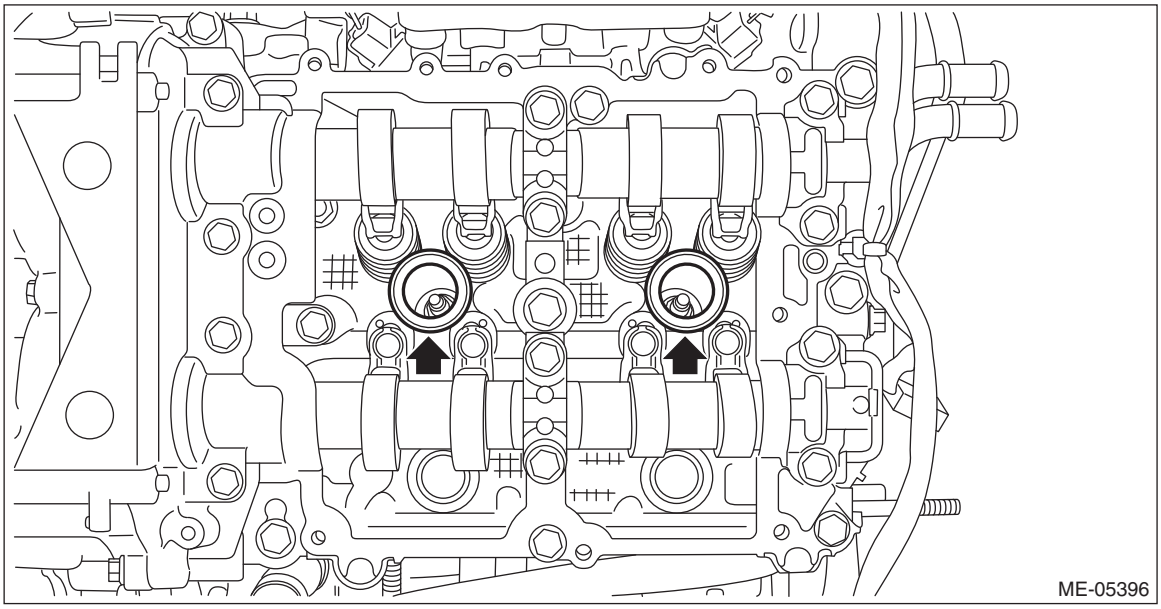
4) Remove the rocker cover LH.



5) Remove the rocker cover gasket LH, #2 spark plug pipe gasket and #4 spark plug pipe gasket, and remove the liquid gasket.

CAUTION:
• When removing the liquid gasket from engine unit using scraper, use special care not to damage the cam lobe of camshaft LH.
• If the cam lobe of camshaft LH interferes, turn the crankshaft to the position where the scraper does not touch.



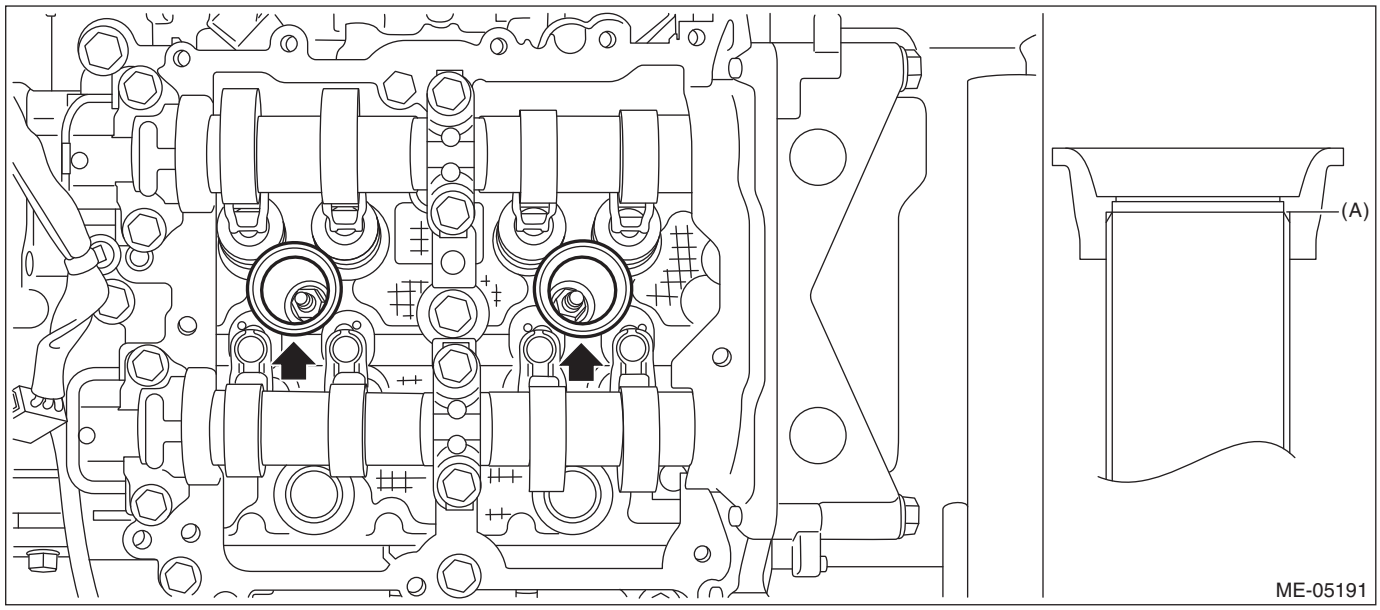


B: INSTALLATION

1. ROCKER COVER RH

1) Install the #1 spark plug pipe gasket and #3 spark plug pipe gasket to the #1 spark plug pipe and #3 spark plug pipe.

NOTE:
- Use a new #1 spark plug pipe gasket and #3 spark plug pipe gasket.
- Apply a light coat of engine oil to the #1 spark plug pipe gasket and #3 spark plug pipe gasket, and insert them onto the spark plug pipe edge (A).



2) Install the rocker cover gasket RH to the rocker cover RH.

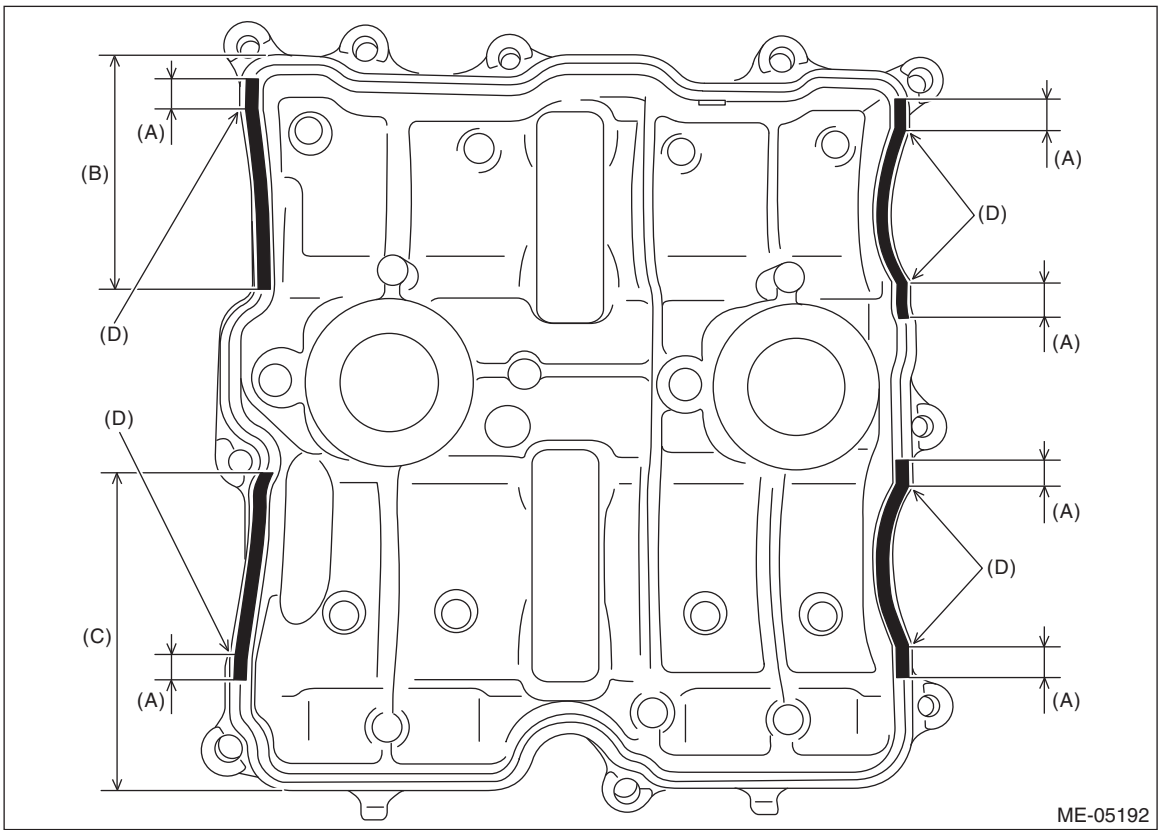
NOTE:
Use a new rocker cover gasket RH.

3) Apply liquid gasket to the mating surface of rocker cover RH as shown in the figure.

NOTE:
- Before applying liquid gasket, remove oil from liquid gasket seal surface of the engine.
- Be careful not to allow liquid gasket to be squeezed out from rocker cover RH.
- Install within 5 min. after applying liquid gasket.

Liquid gasket:
THREE BOND 1217G (Part No. K0877Y0100) or equivalent

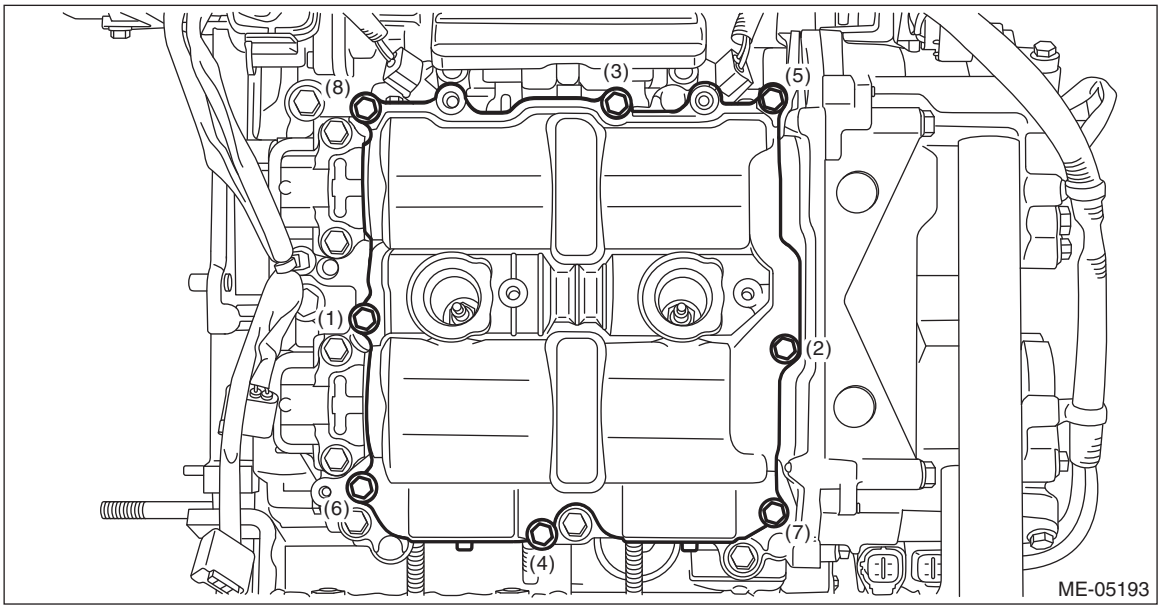
Liquid gasket applying diameter:
3.5±0.5 mm (0.1378±0.0197 in)



(A) 10 mm (0.394 in) or more
(B) 68 mm (2.677 in) or more
(C) 89 mm (3.504 in) or more
(D) Arch starting point

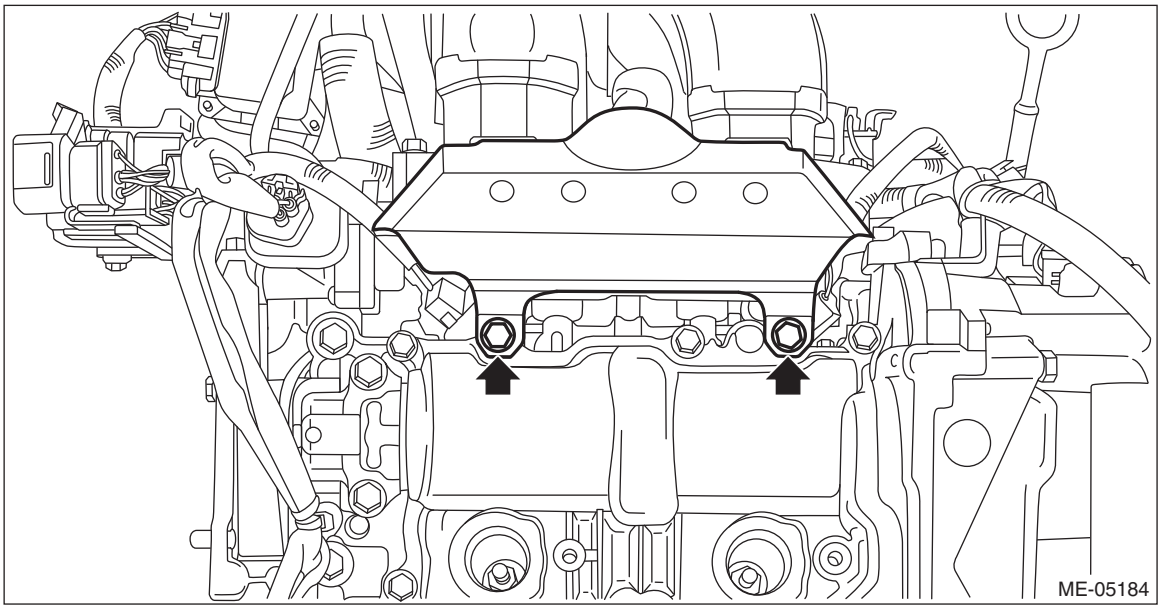
4) Set the rocker cover RH, and tighten the bolts in numerical order as shown in the figure.

Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)



5) Install the intake manifold protector RH.

Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)

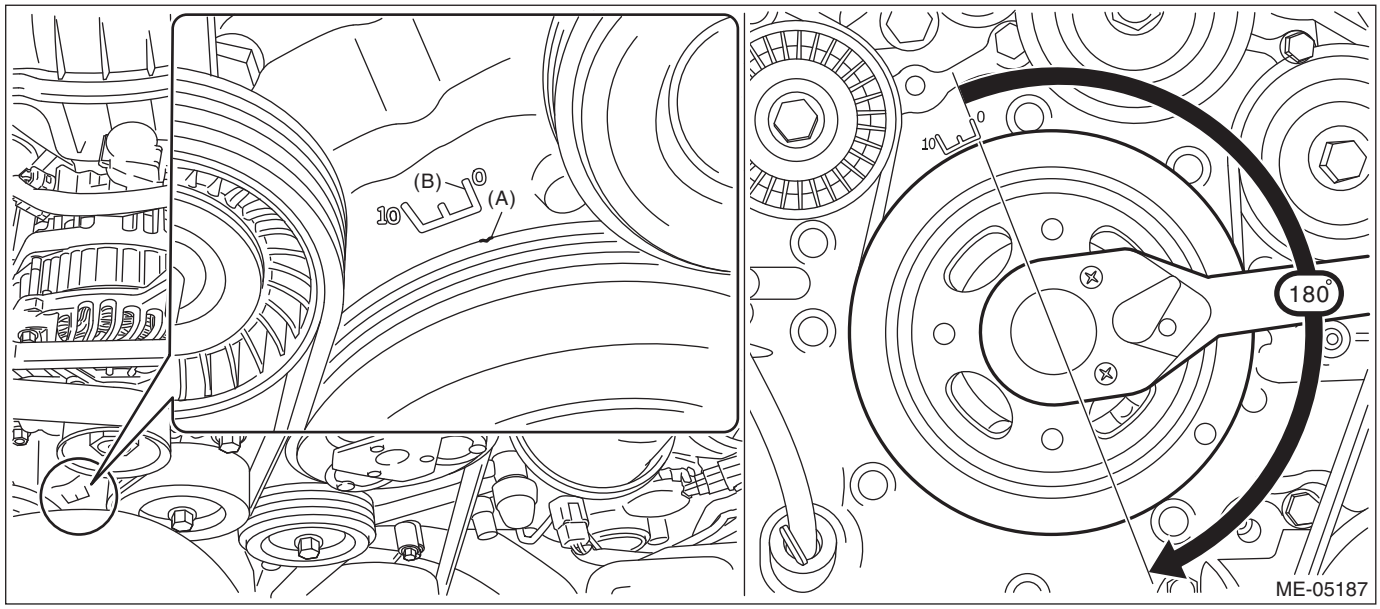


6) Install the #1 ignition coil and the #3 ignition coil. <Ref. to IG(H4DO)-9, INSTALLATION, Ignition Coil.>
7) When working on the vehicle
(1) Install the front exhaust pipe. <Ref. to EX(H4DO)-8, INSTALLATION, Front Exhaust Pipe.>
(2) Install the air intake boot. <Ref. to IN(H4DO)-13, INSTALLATION, Air Intake Boot.>
(3) Install the air cleaner case. <Ref. to IN(H4DO)-10, INSTALLATION, Air Cleaner Case.>

2. ROCKER COVER LH

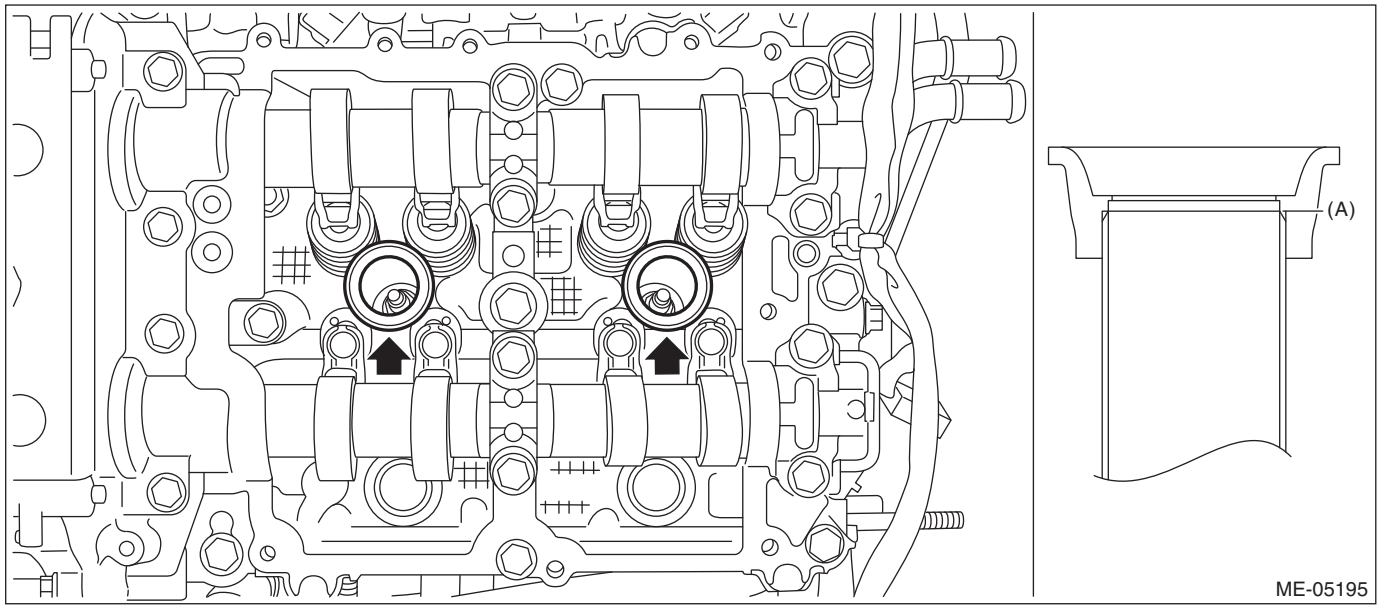
1) Align the timing mark (A) of crank pulley to the timing gauge (B) of chain cover as shown in the figure, and turn the crankshaft by 180° clockwise from that position.

NOTE:
- This procedure is required only when working on the vehicle.
- This procedure is required to prevent the rocker cover LH and the cam lobe of camshaft LH contacting with each other when installing the rocker cover LH.



2) Install the #2 spark plug pipe gasket and #4 spark plug pipe gasket to the #2 spark plug pipe and #4 spark plug pipe.

NOTE:
- Use a new #2 spark plug pipe gasket and #4 spark plug pipe gasket.
- Apply a light coat of engine oil to the #2 spark plug pipe gasket and #4 spark plug pipe gasket, and insert them onto the spark plug pipe edge (A).



3) Install the rocker cover gasket LH to the rocker cover LH.

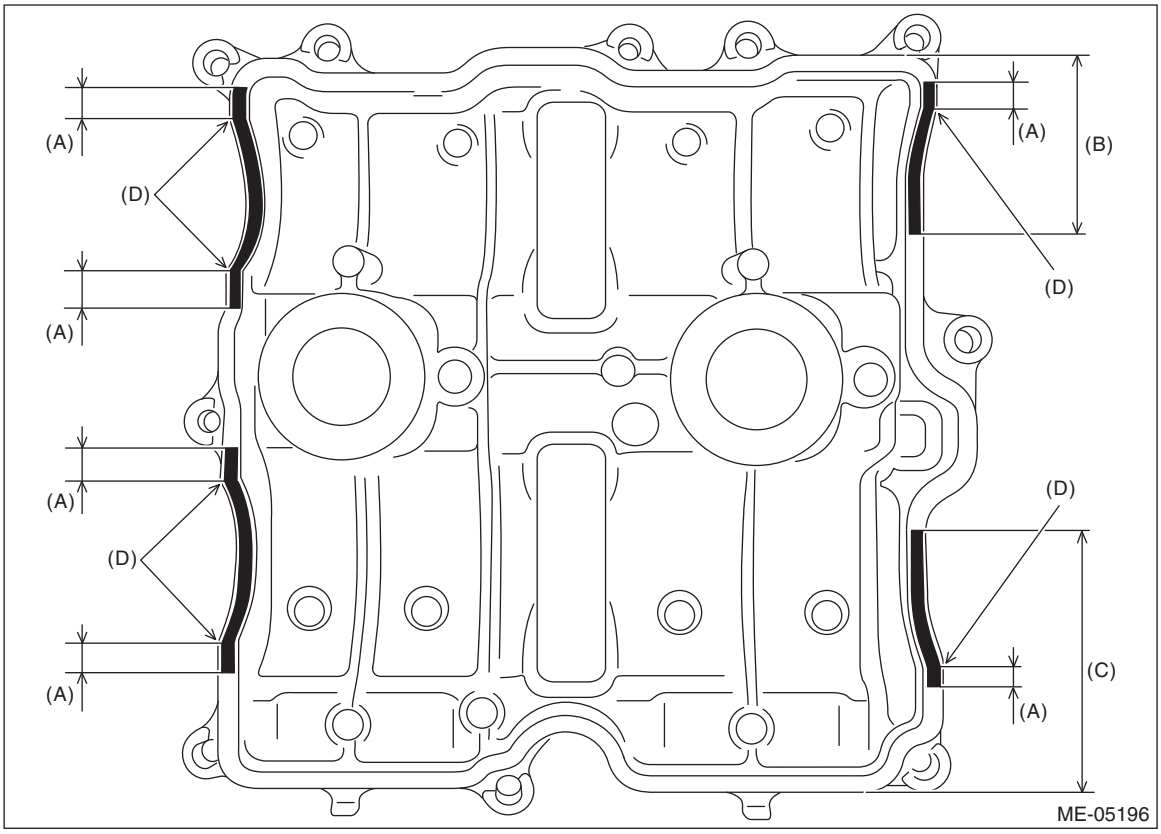
NOTE:
Use a new rocker cover gasket LH.

4) Apply liquid gasket to the mating surface of rocker cover LH as shown in the figure.

NOTE:
- Before applying liquid gasket, remove oil from liquid gasket seal surface of the engine.
- Be careful not to allow liquid gasket to be squeezed out from rocker cover LH.
- Install within 5 min. after applying liquid gasket.

Liquid gasket:
THREE BOND 1217G (Part No. K0877Y0100) or equivalent

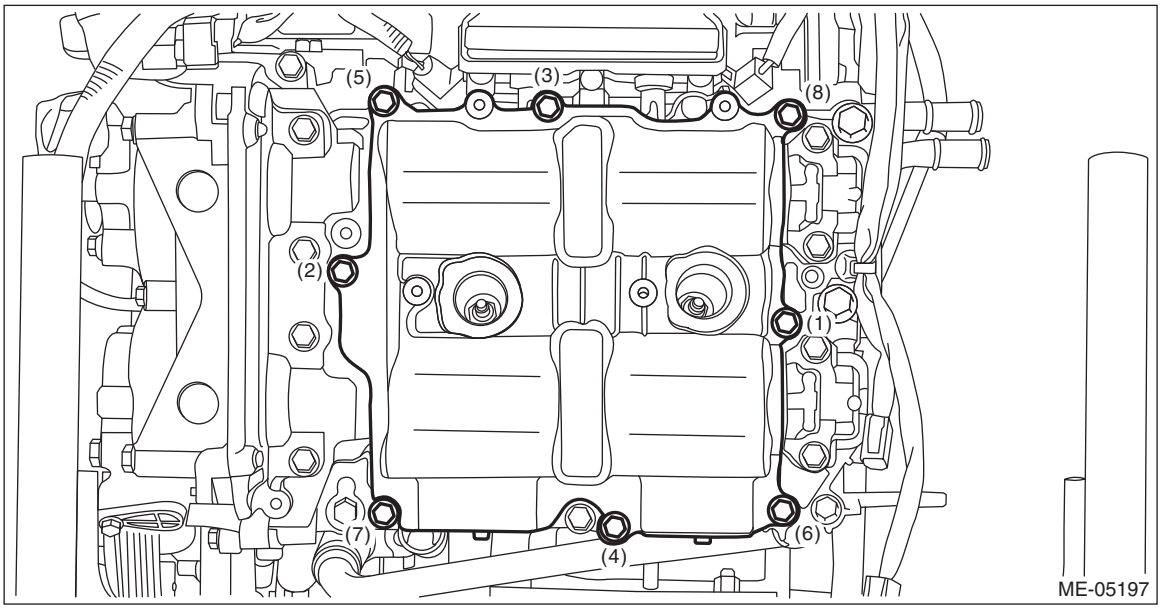
Liquid gasket applying diameter:
3.5±0.5 mm (0.1378±0.0197 in)



(A) 10 mm (0.394 in) or more
(B) 51 mm (2.008 in) or more
(C) 73 mm (2.874 in) or more
(D) Arch starting point

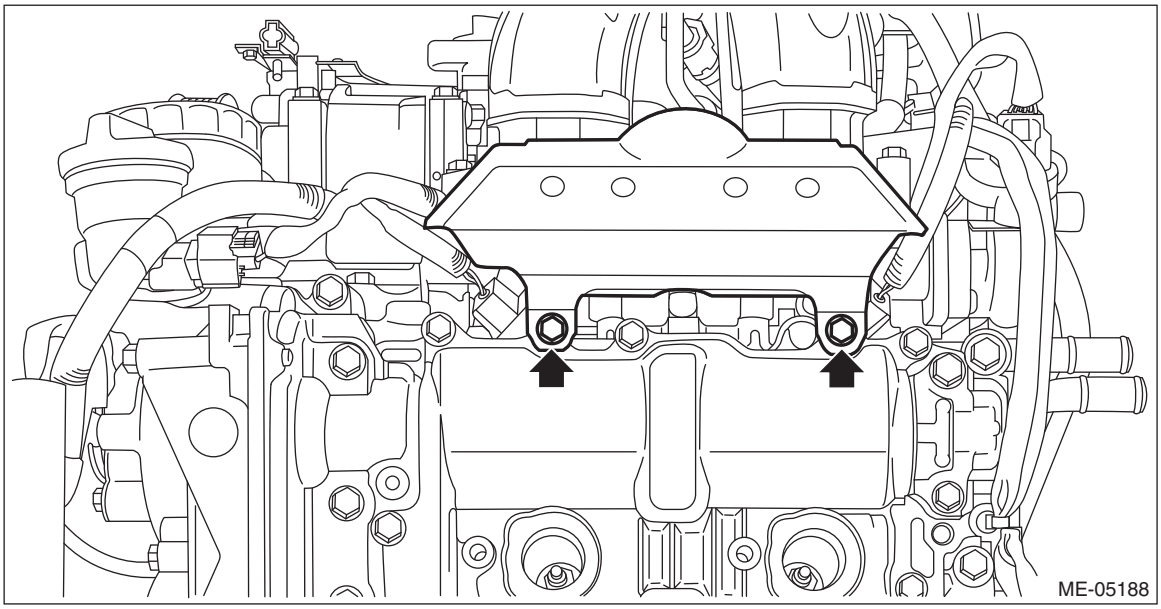
5) Set the rocker cover LH, and tighten the bolts in numerical order as shown in the figure.

Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)



6) Install the intake manifold protector LH.

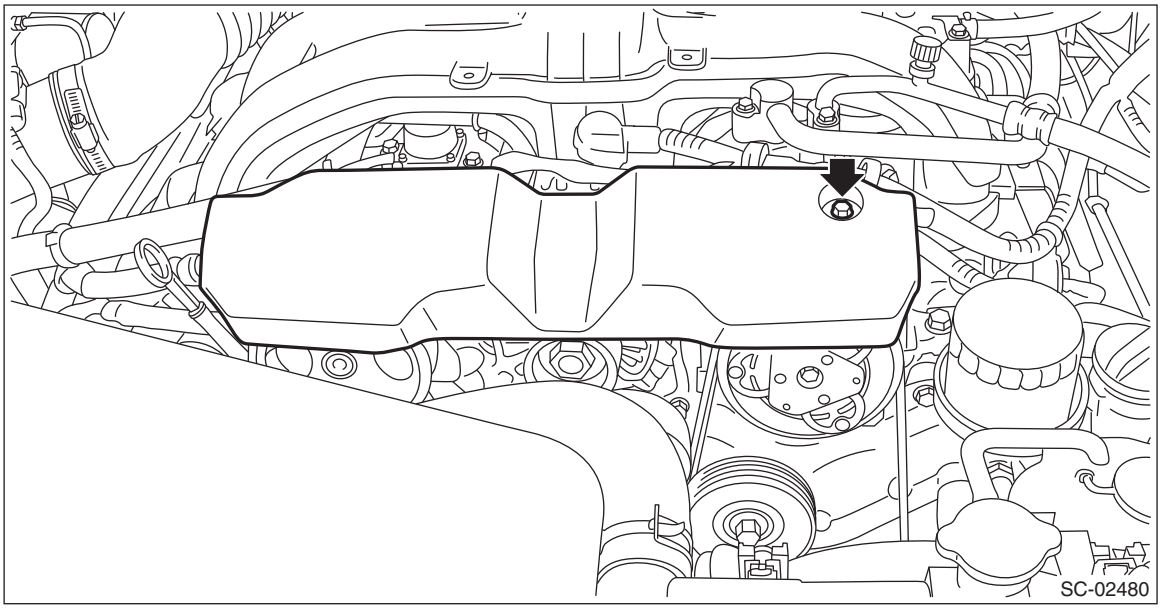
Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)



7) Install the #2 ignition coil and the #4 ignition coil. <Ref. to IG(H4DO)-9, INSTALLATION, Ignition Coil.>

8) When working on the vehicle
(1) Install the air intake duct. <Ref. to IN(H4DO)-14, INSTALLATION, Air Intake Duct.>
(2) Install the V-belt cover.

Tightening torque:
13 N·m (1.3 kgf-m, 9.6 ft-lb)



(3) Install the battery. <Ref. to SC(H4DO)-59, INSTALLATION, Battery.>

C: INSPECTION

Check that the rocker cover does not have deformation, cracks and any other damage.

19.Camshaft

A: REMOVAL

1. CAMSHAFT RH

The camshaft RH and cam carrier are designed as removing as a unit. Refer to “Cam Carrier” for removal procedures of camshaft RH. <Ref. to ME(H4DO)-152, CAM CARRIER RH, REMOVAL, Cam Carrier.> <Ref. to ME(H4DO)-183, CAM CARRIER RH, DISASSEMBLY, Cam Carrier.>

2. CAMSHAFT LH

The camshaft LH and cam carrier are designed as removing as a unit. Refer to “Cam Carrier” for removal procedures of camshaft LH. <Ref. to ME(H4DO)-156, CAM CARRIER LH, REMOVAL, Cam Carrier.> <Ref. to ME(H4DO)-184, CAM CARRIER LH, DISASSEMBLY, Cam Carrier.>

B: INSTALLATION

1. CAMSHAFT RH

The camshaft RH and cam carrier are designed as installing as a unit. Refer to “Cam Carrier” for installation procedures of camshaft RH. <Ref. to ME(H4DO)-186, CAM CARRIER RH, ASSEMBLY, Cam Carrier.> <Ref. to ME(H4DO)-162, CAM CARRIER RH, INSTALLATION, Cam Carrier.>

2. CAMSHAFT LH

The camshaft LH and cam carrier are designed as installing as a unit. Refer to “Cam Carrier” for installation procedures of camshaft LH. <Ref. to ME(H4DO)-189, CAM CARRIER LH, ASSEMBLY, Cam Carrier.> <Ref. to ME(H4DO)-172, CAM CARRIER LH, INSTALLATION, Cam Carrier.>

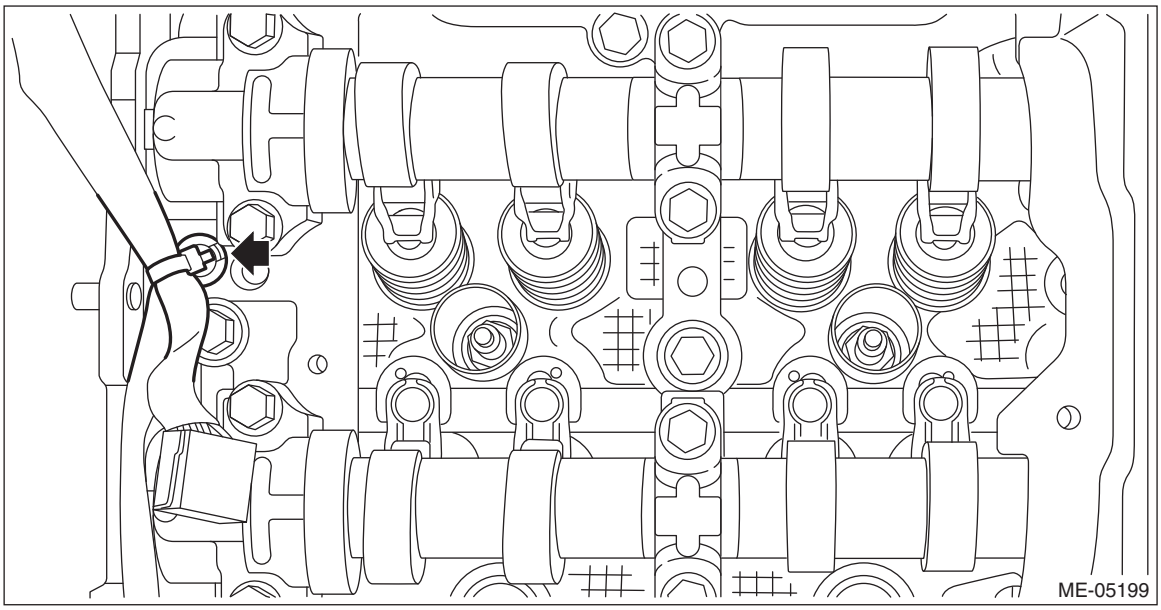
20.Cam Carrier

A: REMOVAL

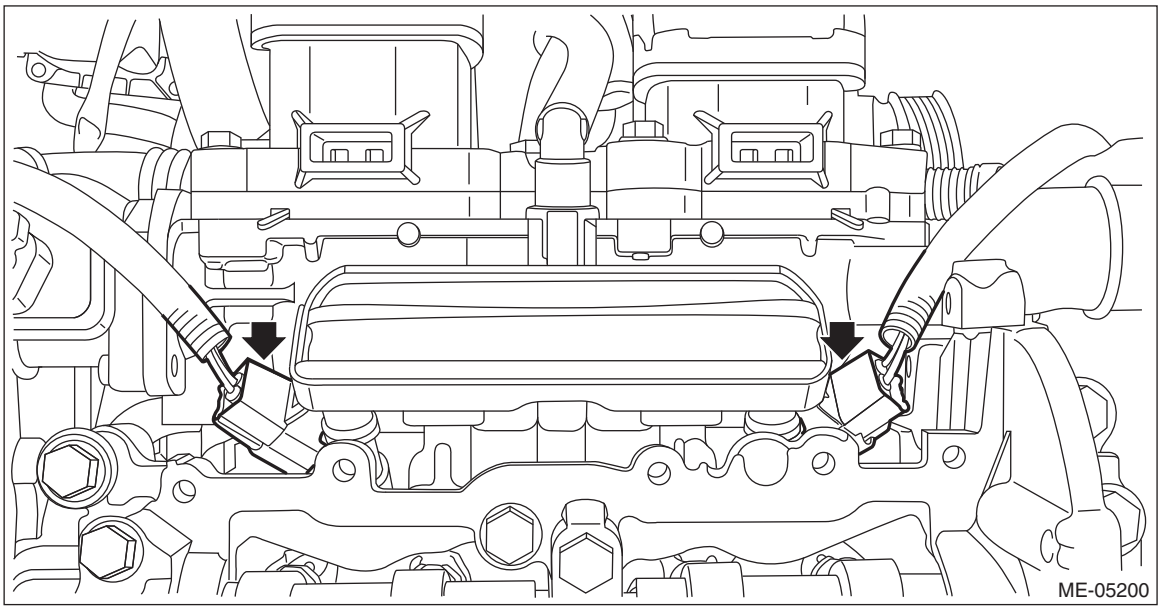
1. CAM CARRIER RH

1) Remove the engine from the vehicle. <Ref. to ME(H4DO)-44, REMOVAL, Engine Assembly.>
2) Remove the chain cover. <Ref. to ME(H4DO)-91, REMOVAL, Chain Cover.>
3) Remove the timing chain RH. <Ref. to ME(H4DO)-109, TIMING CHAIN RH, REMOVAL, Timing Chain Assembly.>
4) Remove the cam sprocket RH. <Ref. to ME(H4DO)-129, CAM SPROCKET RH, REMOVAL, Cam Sprocket.>

NOTE:
This procedure is required only when disassembling the cam carrier RH.
5) Remove the rocker cover RH. <Ref. to ME(H4DO)-139, ROCKER COVER RH, REMOVAL, Rocker Cover.>
6) Remove the clip holding the engine harness from cam carrier RH.

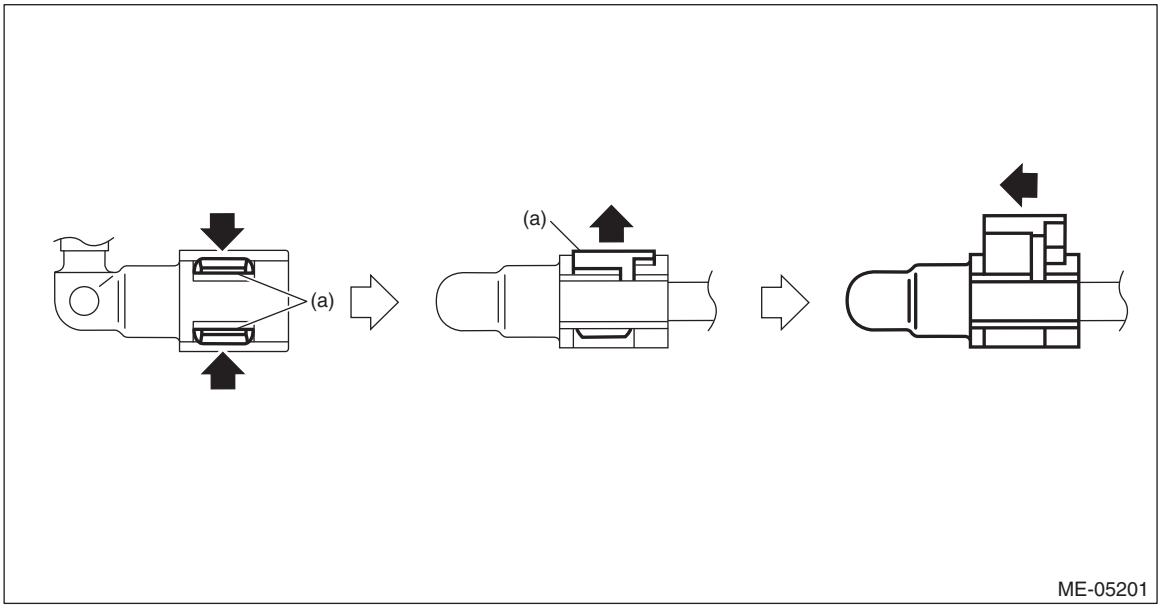


7) Remove the fuel pipe RH and the fuel injector RH.
(1) Disconnect the connector from fuel injector RH.

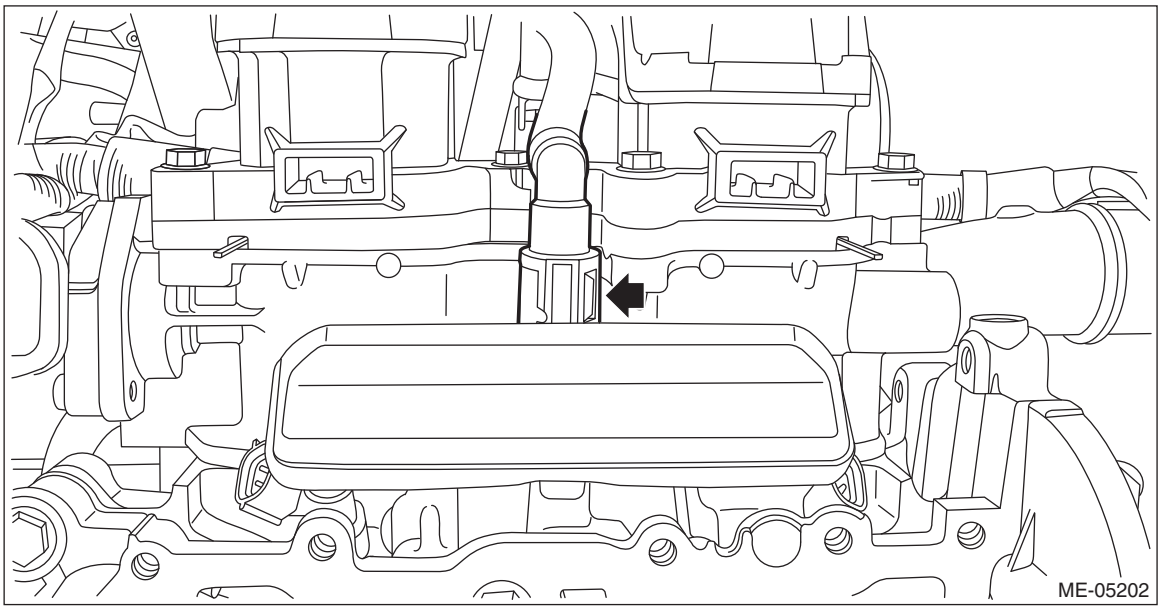


(2) Disconnect the quick connector from fuel pipe RH.

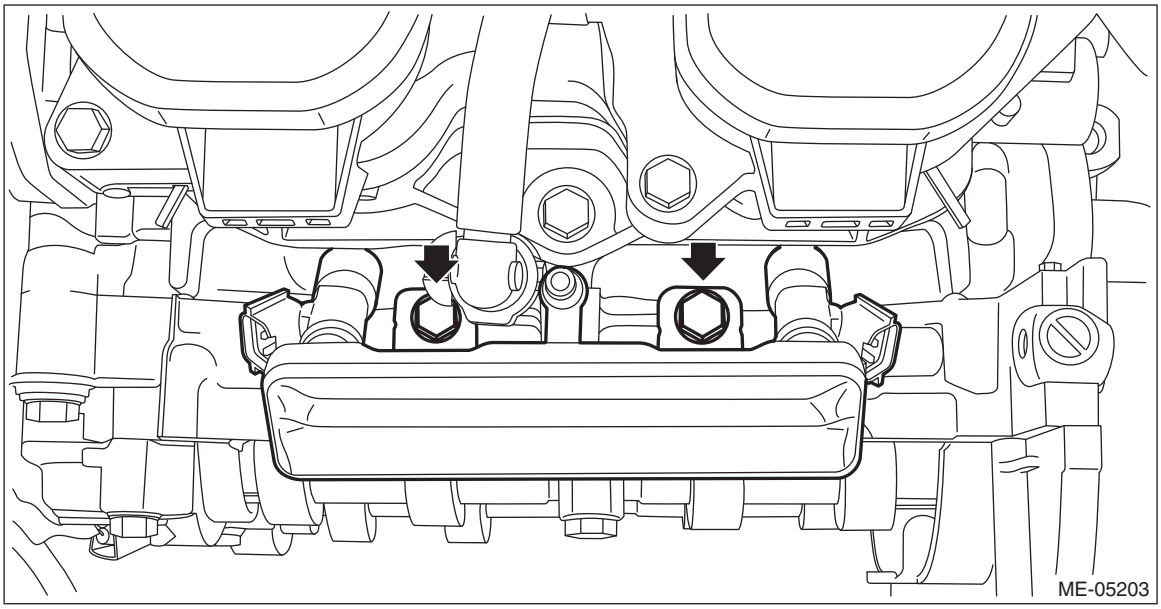
NOTE:
Disconnect the quick connector as shown in the figure.



(a) Slider



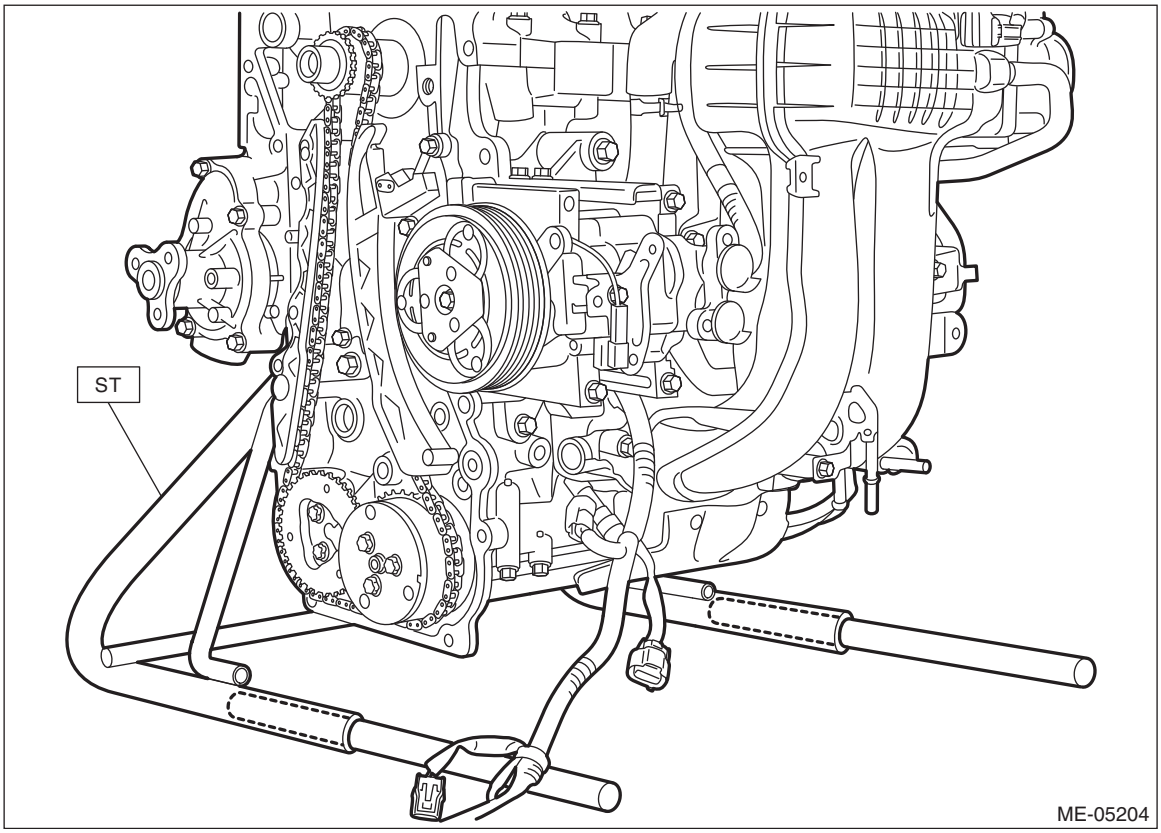
(3) Remove the bolts securing the fuel pipe RH, and remove the fuel pipe RH and the fuel injector RH.



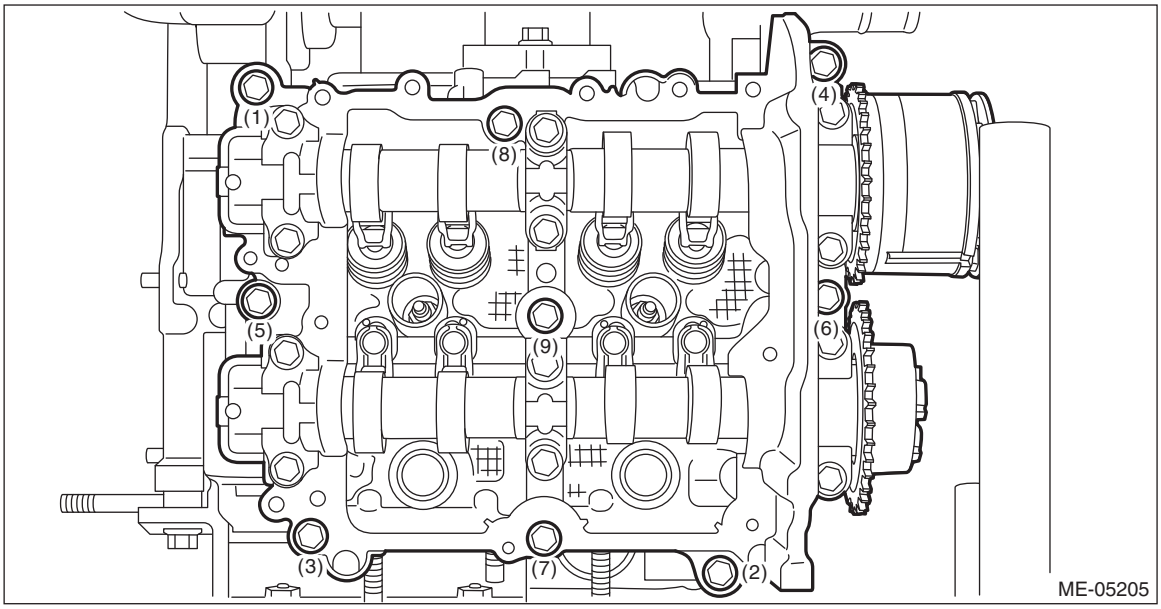
8) Insert the steel rods into ST, and set the engine so that the camshaft RH is facing up.

CAUTION:
• If the engine is standing on one side without inserting the steel rod into ST, engine may lose balance and fall down. Be sure to insert the steel rod into ST to extend the length.
• Use the steel rod with enough strength.
• Be careful not to pinch the engine harness with ST.

ST 499817100 ENGINE STAND

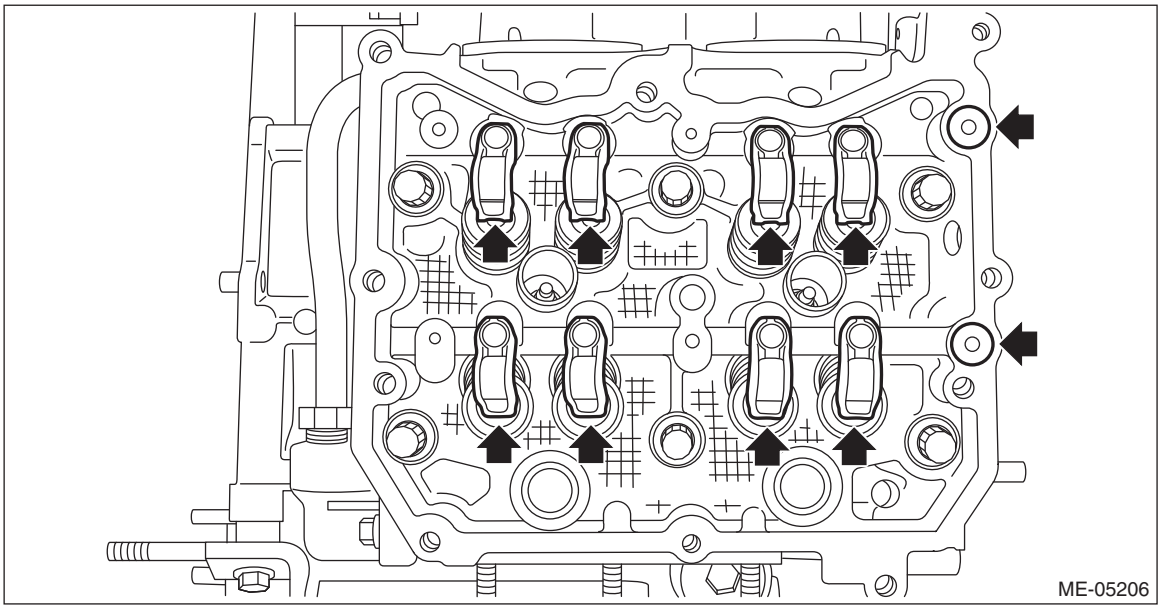


9) Loosen the bolts holding the cam carrier RH equally, a little at a time in numerical sequence and remove the cam carrier RH.



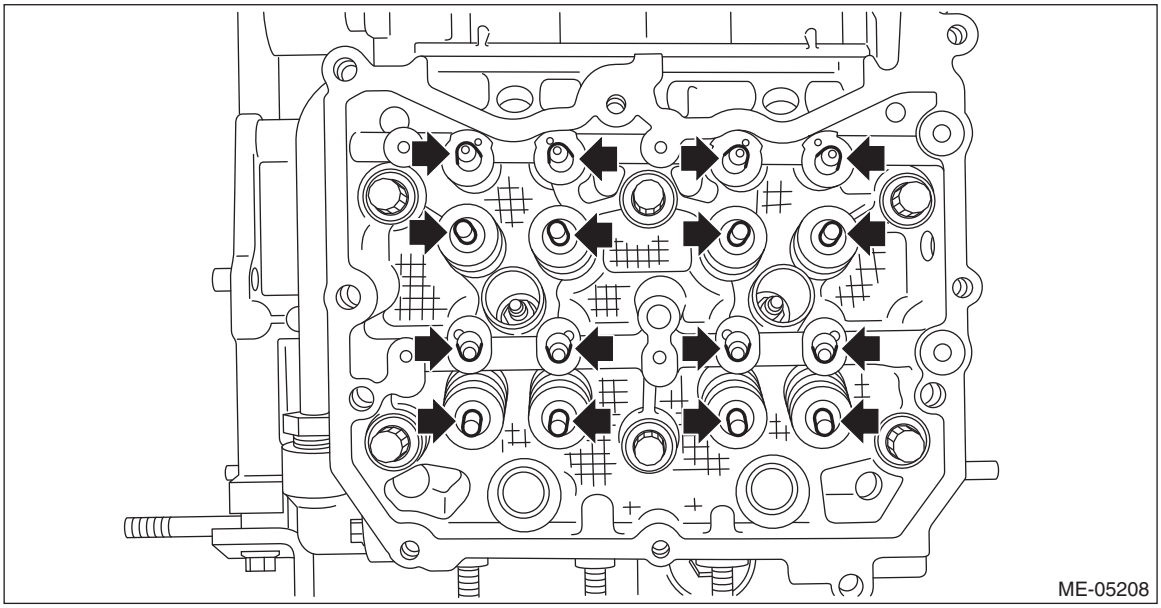
10) Remove the O-ring and the roller rocker arm from cylinder head RH.

NOTE:
Be careful not to confuse the roller rocker arms.



11) Remove the valve shim and the roller rocker arm pivot from cylinder head RH.

NOTE:
Be careful not to confuse the valve shim and the roller rocker arm pivot.

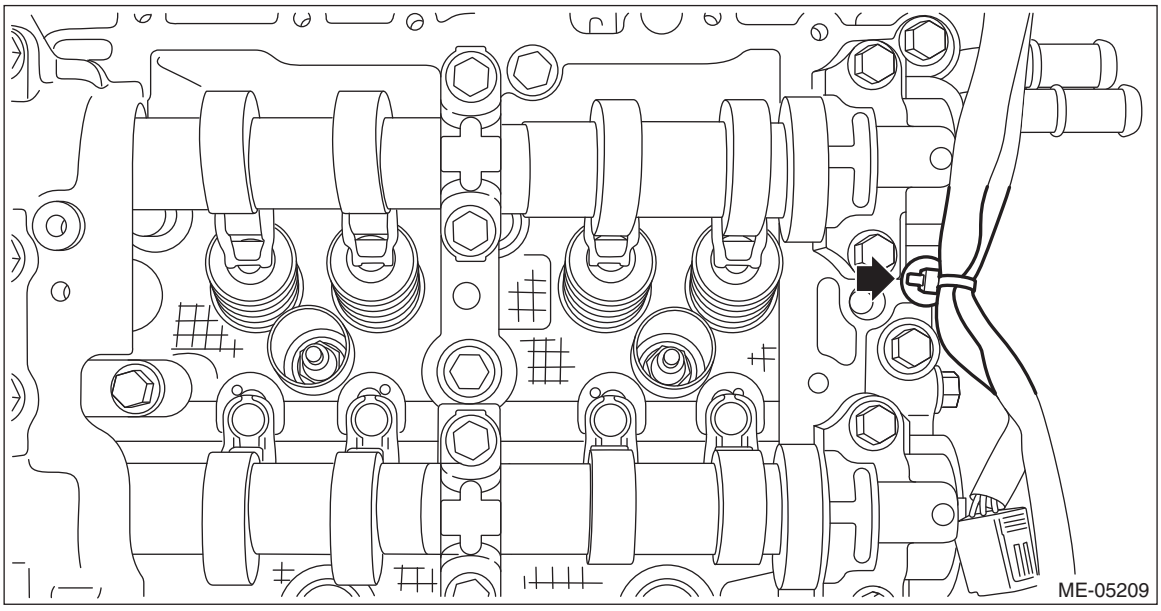


12) Remove the liquid gasket from cam carrier RH and cylinder head RH.

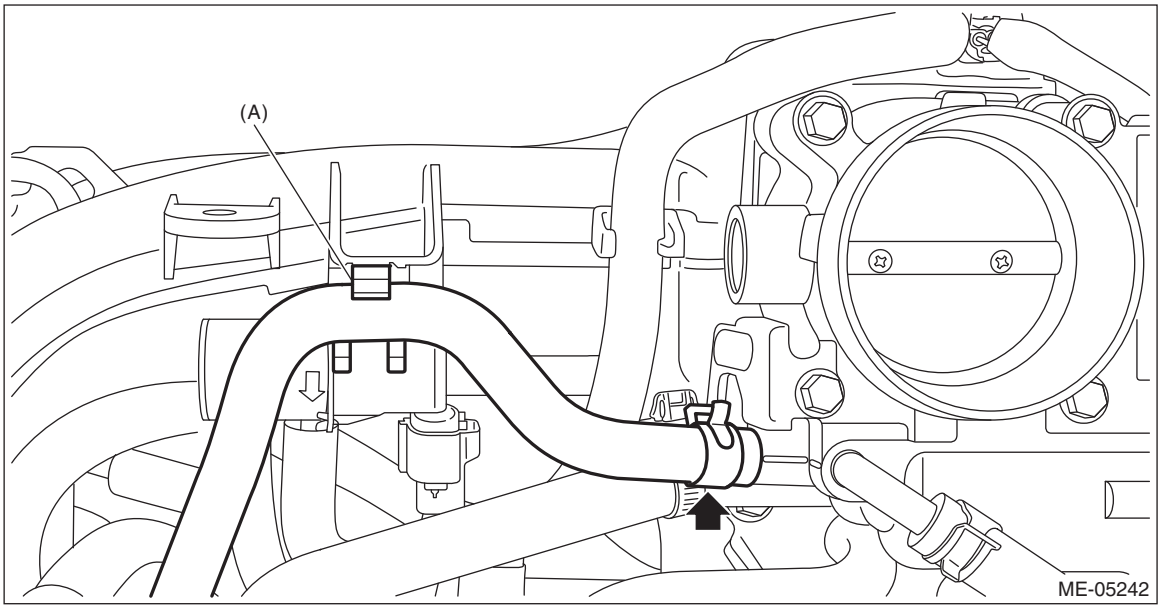
2. CAM CARRIER LH

1) Remove the engine from the vehicle. <Ref. to ME(H4DO)-44, REMOVAL, Engine Assembly.>
2) Remove the chain cover. <Ref. to ME(H4DO)-91, REMOVAL, Chain Cover.>
3) Remove the timing chain LH. <Ref. to ME(H4DO)-111, TIMING CHAIN LH, REMOVAL, Timing Chain Assembly.>
4) Remove the cam sprocket LH. <Ref. to ME(H4DO)-131, CAM SPROCKET LH, REMOVAL, Cam Sprocket.>

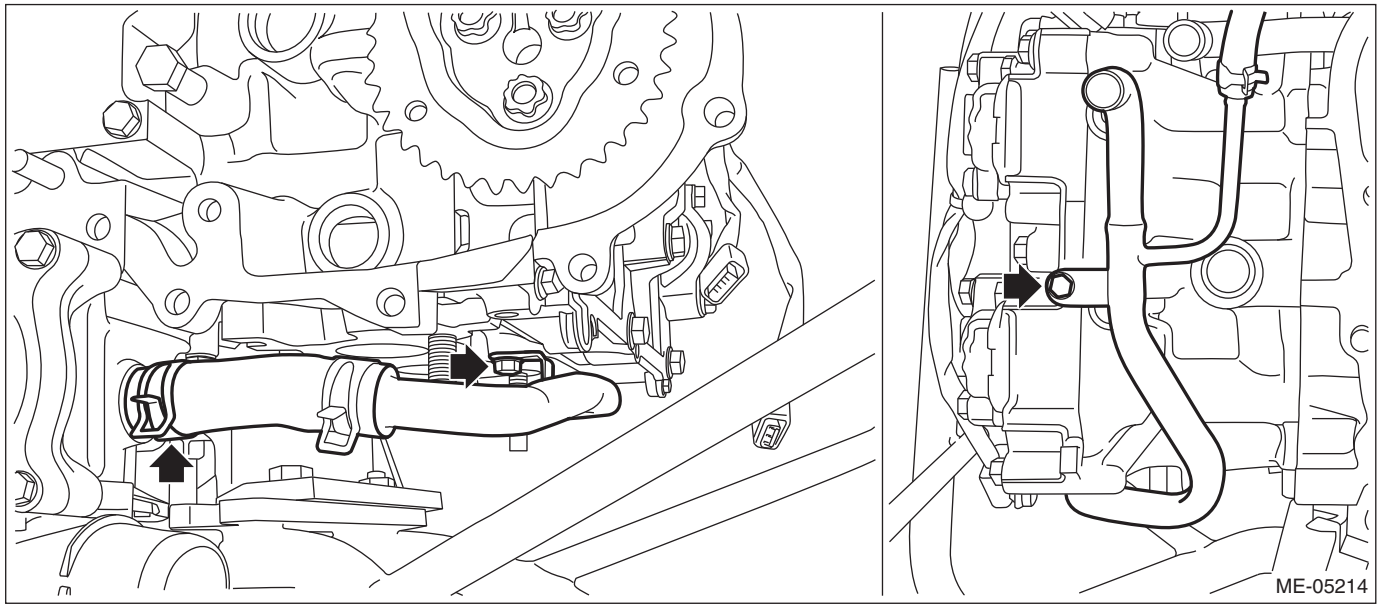
NOTE:
This procedure is required only when disassembling the cam carrier LH.
5) Remove the rocker cover LH. <Ref. to ME(H4DO)-141, ROCKER COVER LH, REMOVAL, Rocker Cover.>
6) Remove the clip holding the engine harness from cam carrier LH.



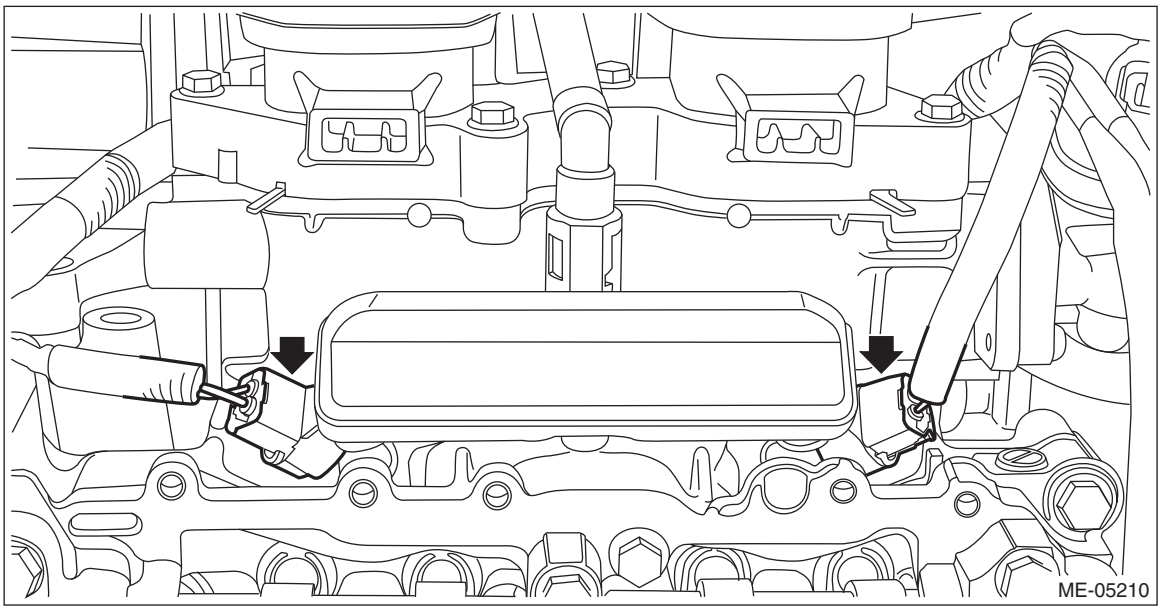
7) Remove the preheater hose from intake manifold clip (A), and disconnect the preheater hose from throttle body.



8) Disconnect the water pipe hose from oil pan upper, and remove the water pipe assembly.

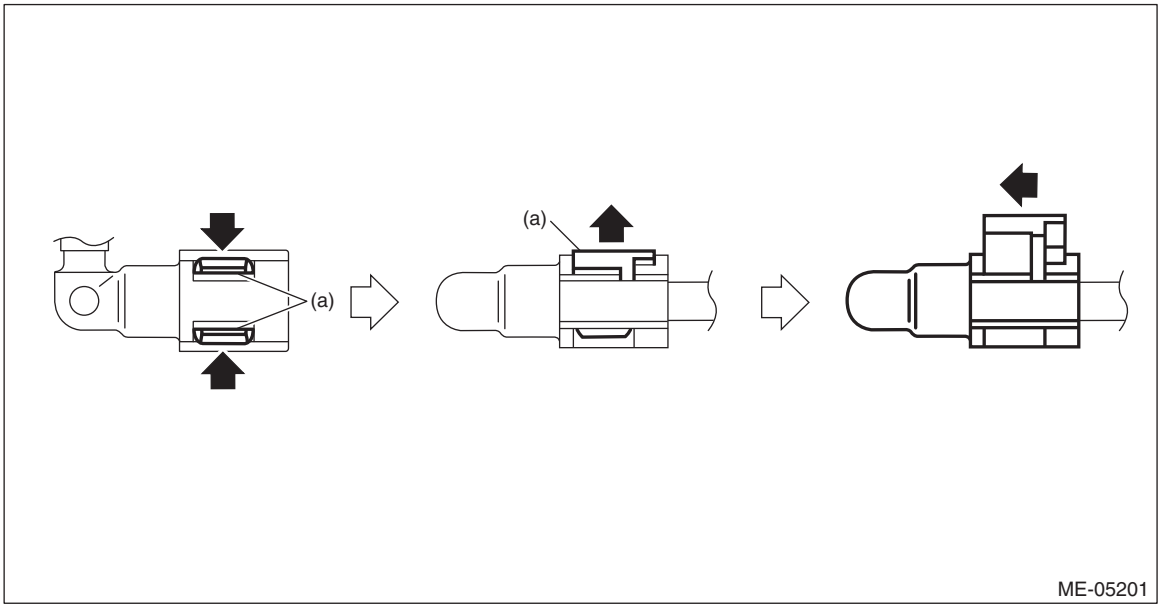


9) Remove the fuel pipe LH and the fuel injector LH.
(1) Disconnect the connector from fuel injector LH.

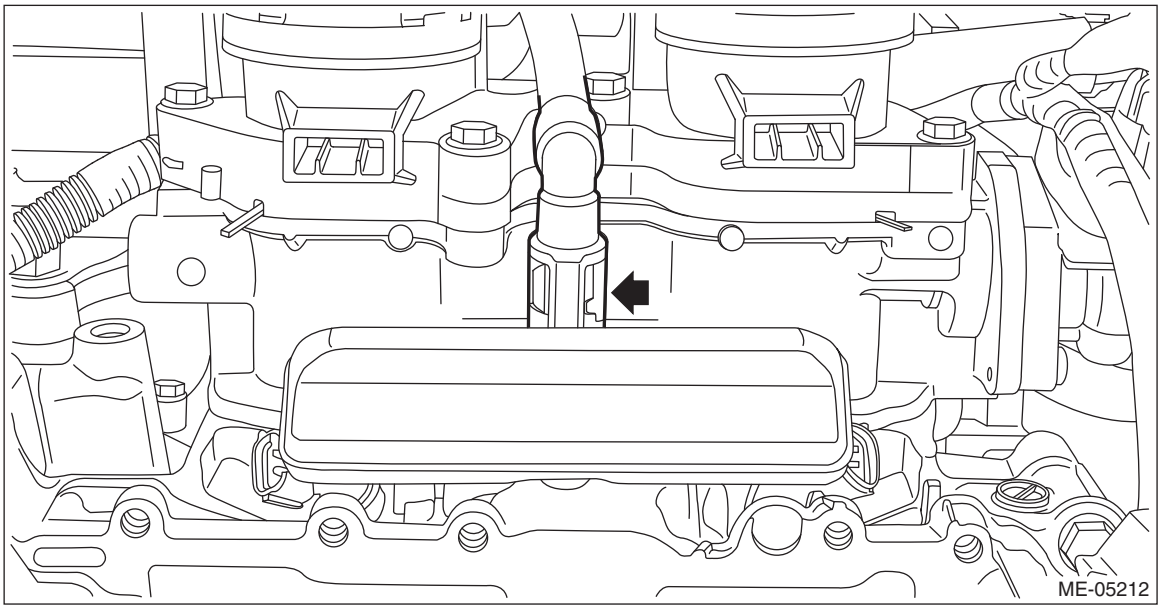


(2) Disconnect the quick connector from fuel pipe LH.

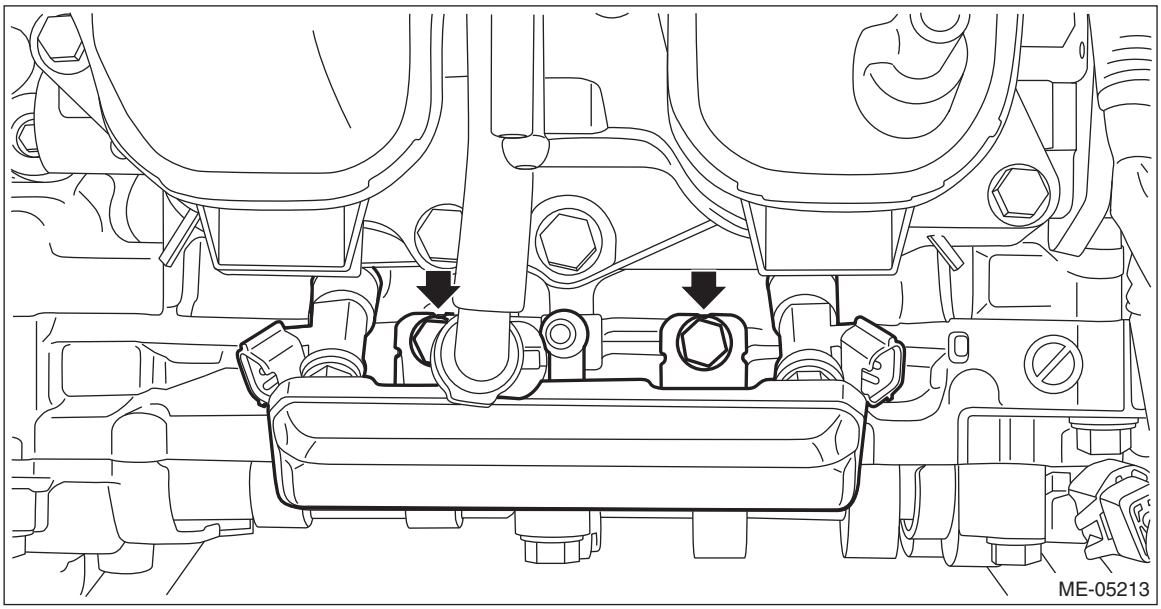
NOTE:
Disconnect the quick connector as shown in the figure.



(a) Slider



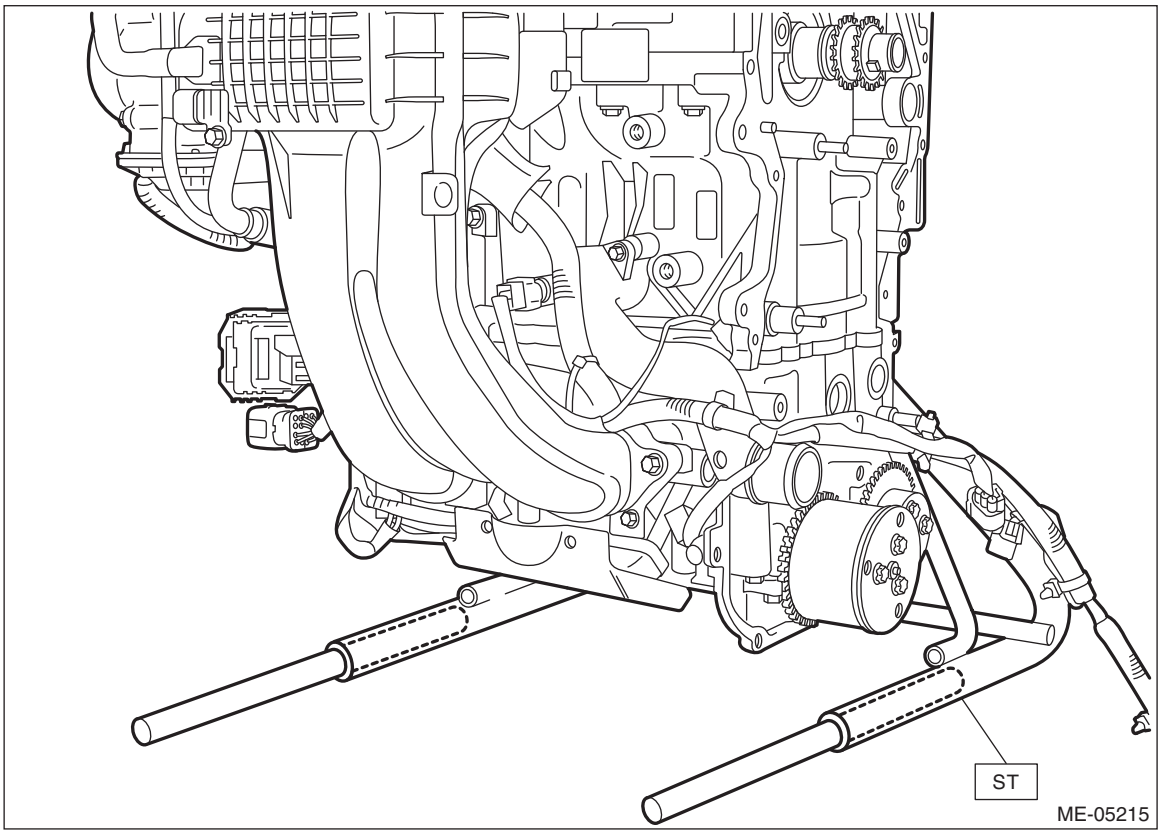
(3) Remove the bolts securing the fuel pipe LH, and remove the fuel pipe LH and the fuel injector LH.



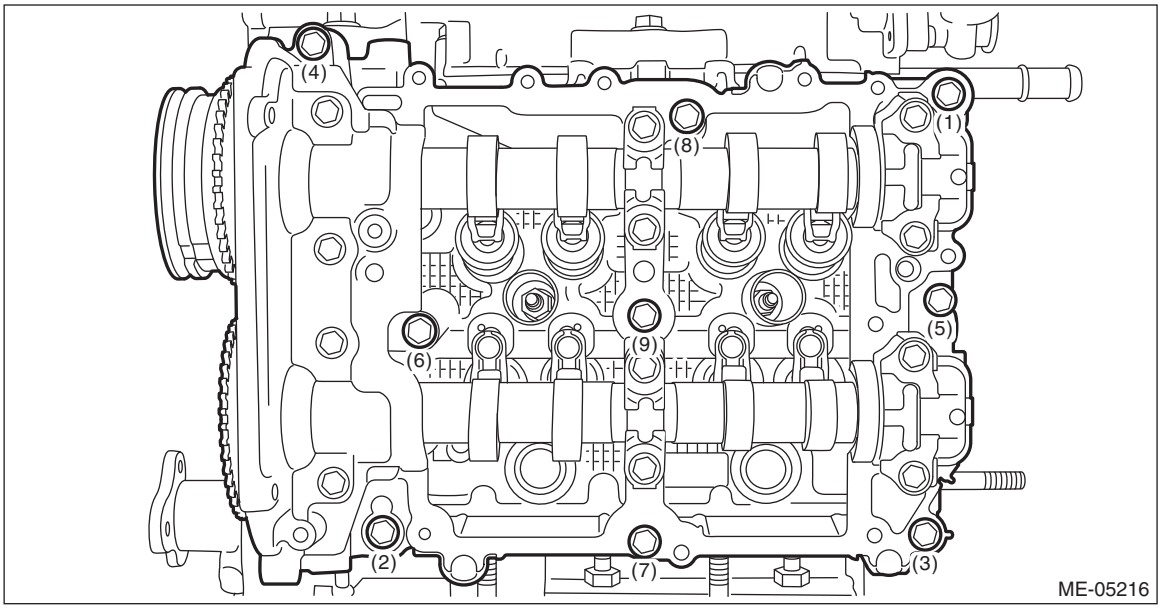
10) Insert the steel rods into ST, and set the engine so that the camshaft LH is facing up.

CAUTION:
• If the engine is standing on one side without inserting the steel rod into ST, engine may lose balance and fall down. Be sure to insert the steel rod into ST to extend the length.
• Use the steel rod with enough strength.
• Be careful not to pinch the engine harness with ST.

ST 499817100 ENGINE STAND

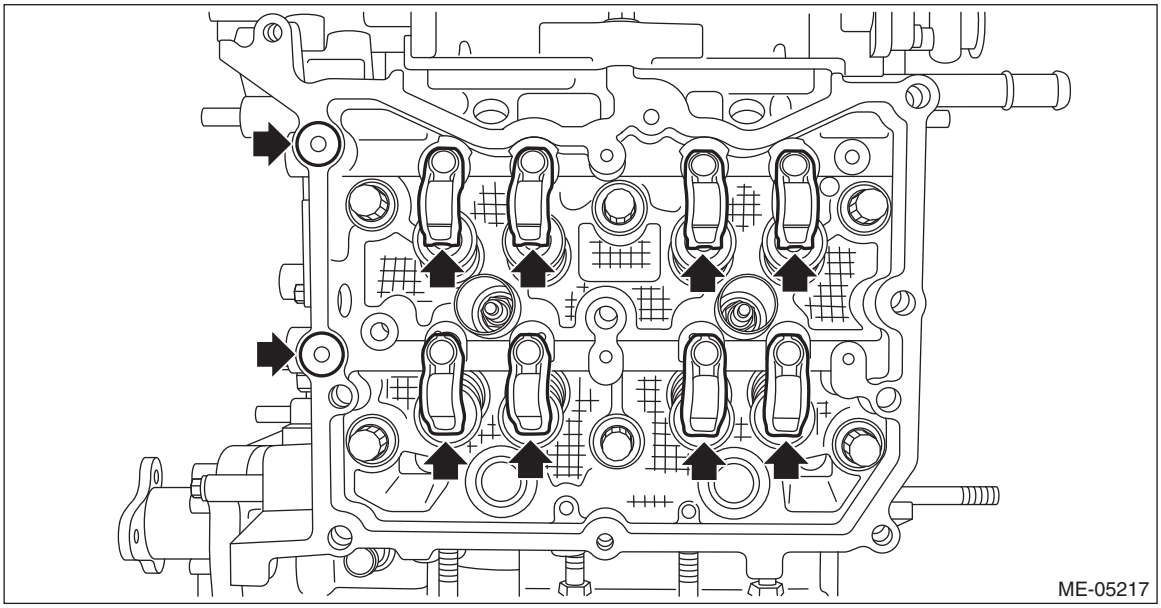


11) Loosen the bolts holding the cam carrier LH equally, a little at a time in numerical sequence and remove the cam carrier LH.



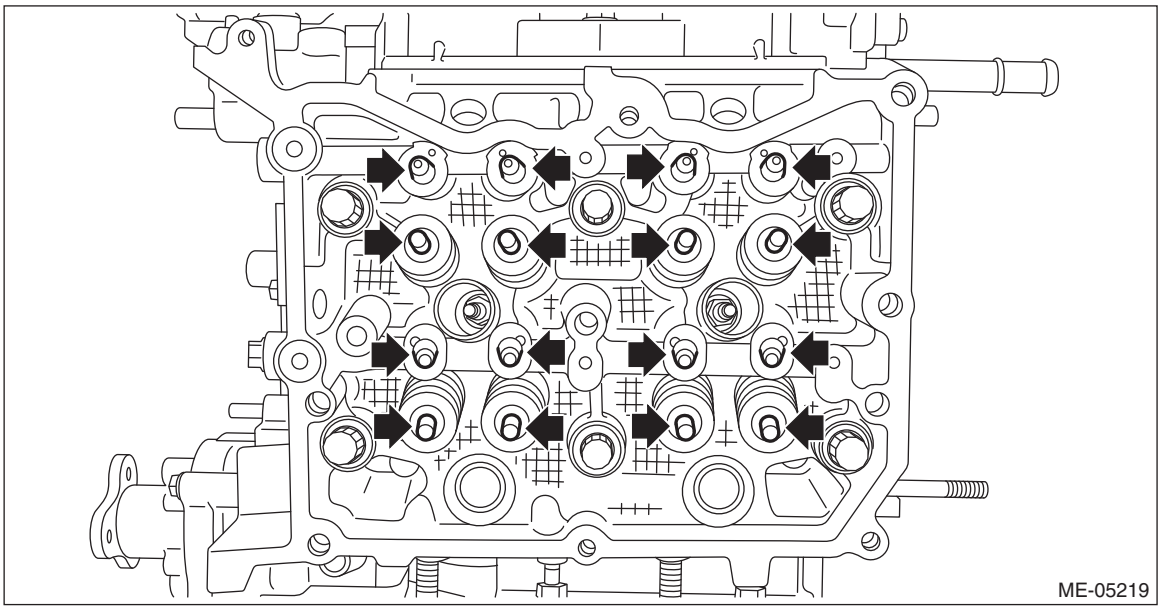
12) Remove the O-ring and the roller rocker arm from cylinder head LH.

NOTE:
Be careful not to confuse the roller rocker arms.



13) Remove the valve shim and the roller rocker arm pivot from cylinder head LH.

NOTE:
Be careful not to confuse the valve shim and the roller rocker arm pivot.



14) Remove the liquid gasket from cam carrier LH and cylinder head LH.

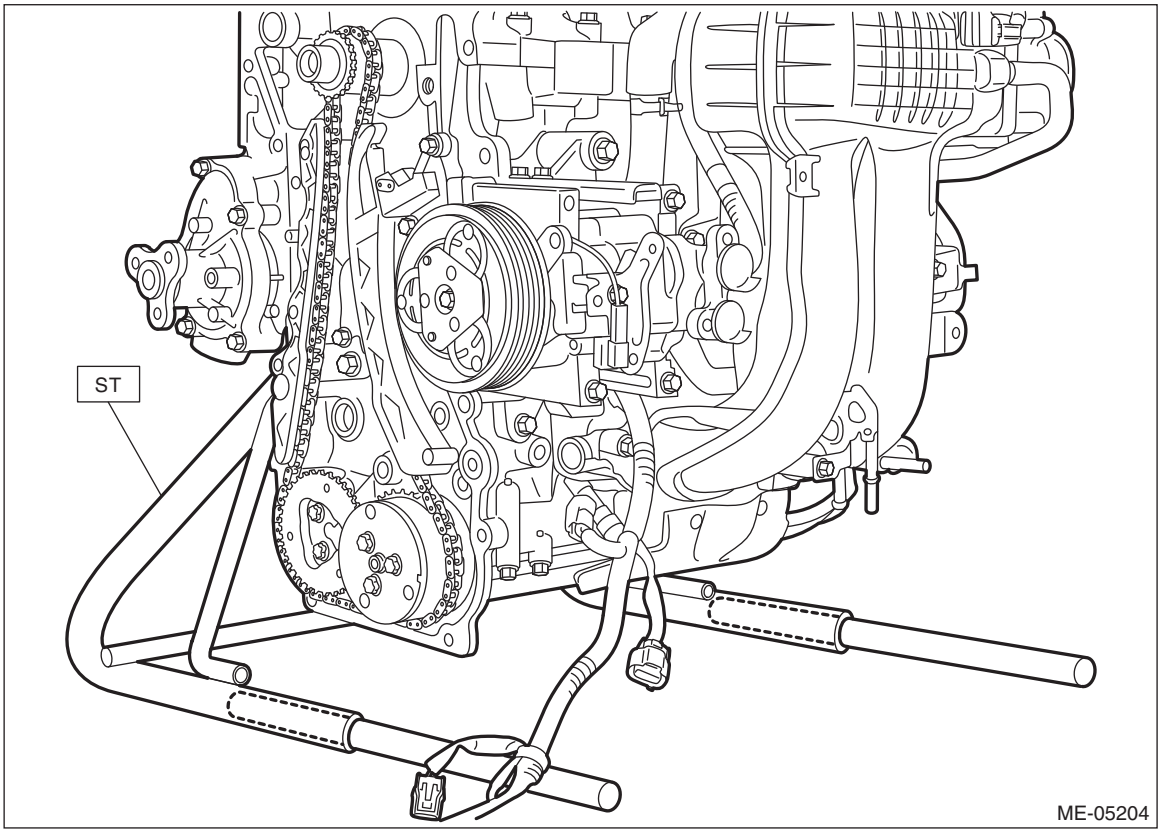
B: INSTALLATION

1. CAM CARRIER RH

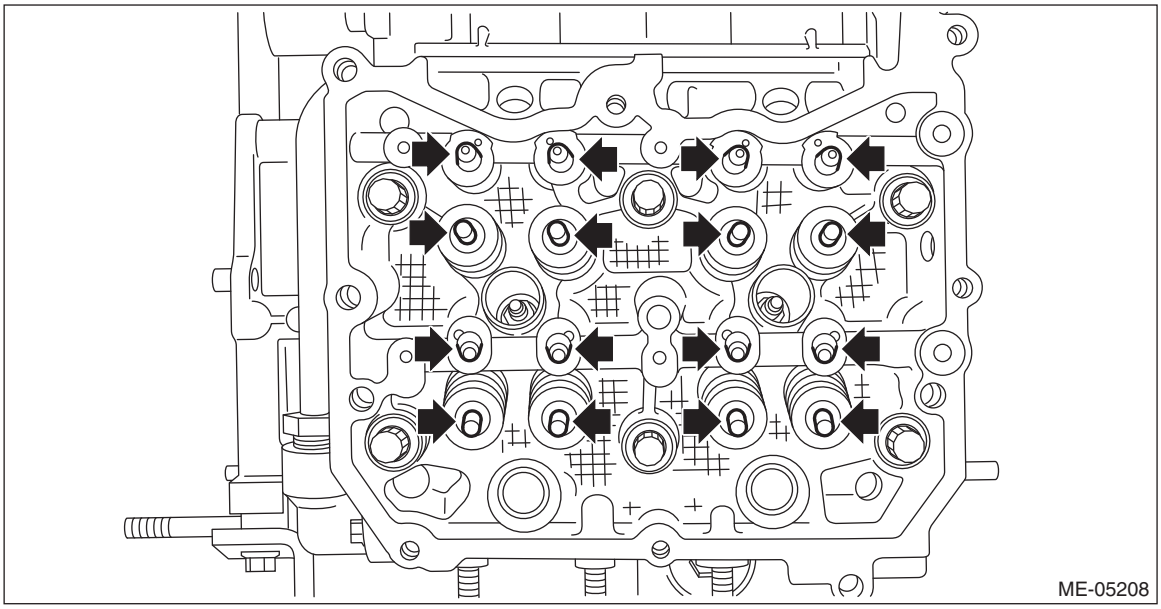
1) Insert the steel rods into ST, and set the engine so that the camshaft RH is facing up.

CAUTION:
• If the engine is standing on one side without inserting the steel rod into ST, engine may lose balance and fall down. Be sure to insert the steel rod into ST to extend the length.
• Use the steel rod with enough strength.
• Be careful not to pinch the engine harness with ST.

ST 499817100 ENGINE STAND

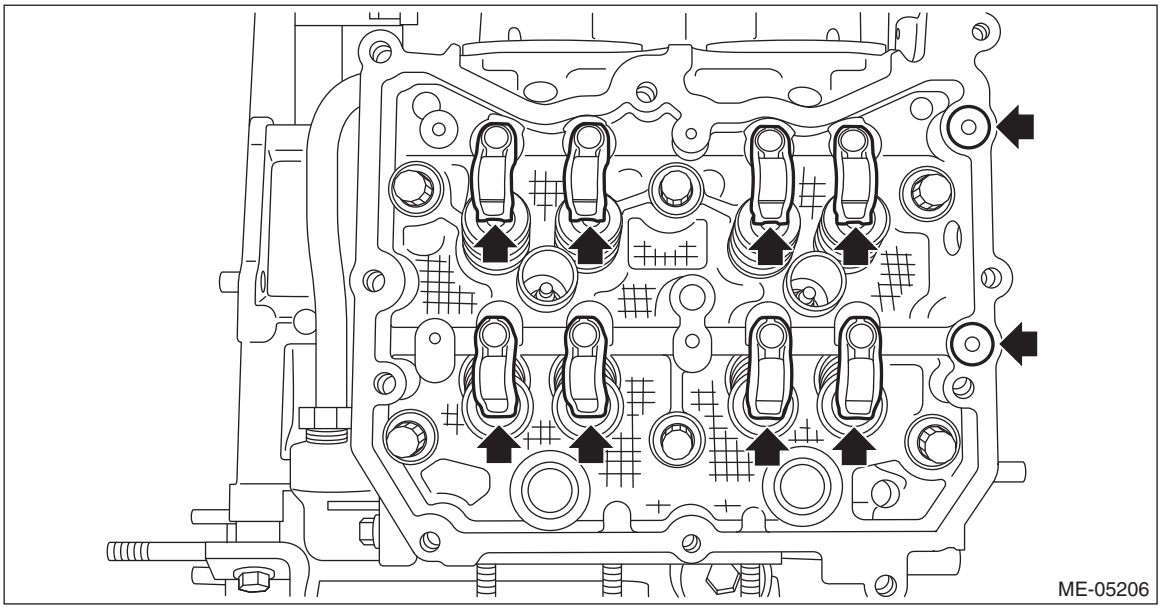


2) Apply engine oil to the valve shim and the roller rocker arm pivot, and install the valve shim and the roller rocker arm pivot to the cylinder head RH.



3) Apply engine oil to the O-ring and the roller rocker arm, and install the O-ring and the roller rocker arm to the cylinder head RH.

NOTE:
Use new O-rings.

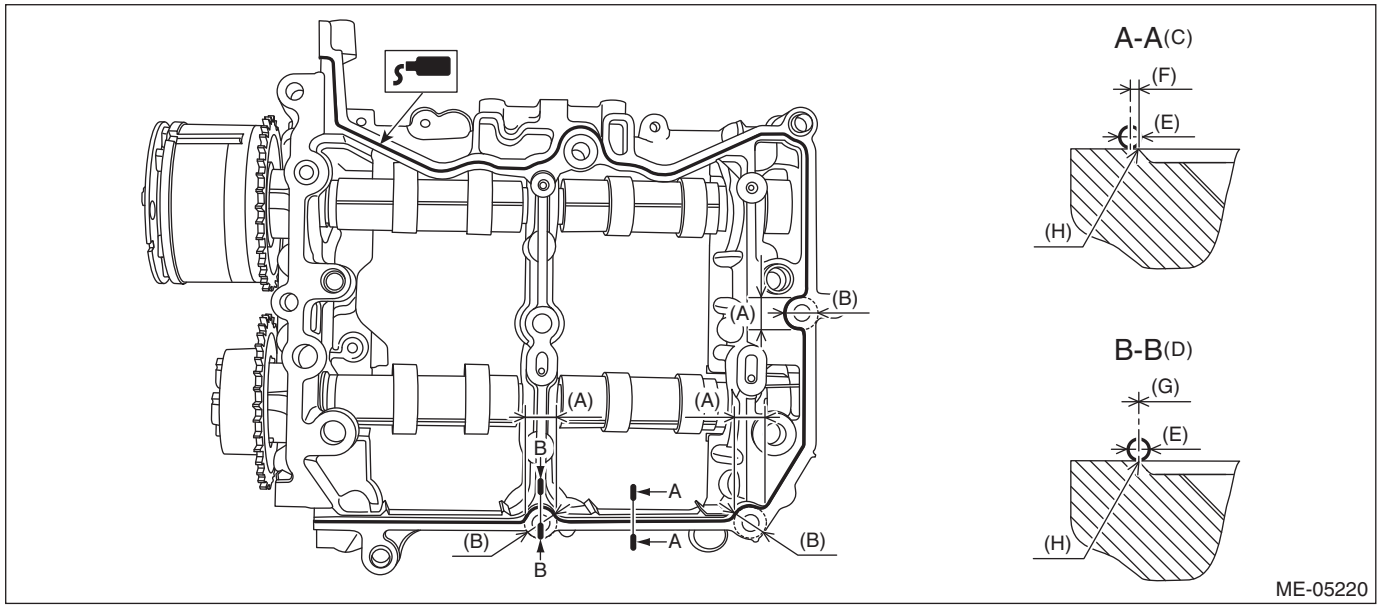


4) Apply liquid gasket to the mating surface of cam carrier RH as shown in the figure.

NOTE:
- Before applying liquid gasket, remove oil from liquid gasket seal surface of the cylinder head RH and the cam carrier RH.
- Install within 5 min. after applying liquid gasket.

Liquid gasket:
THREE BOND 1217G (Part No. 0877Y0100) or equivalent

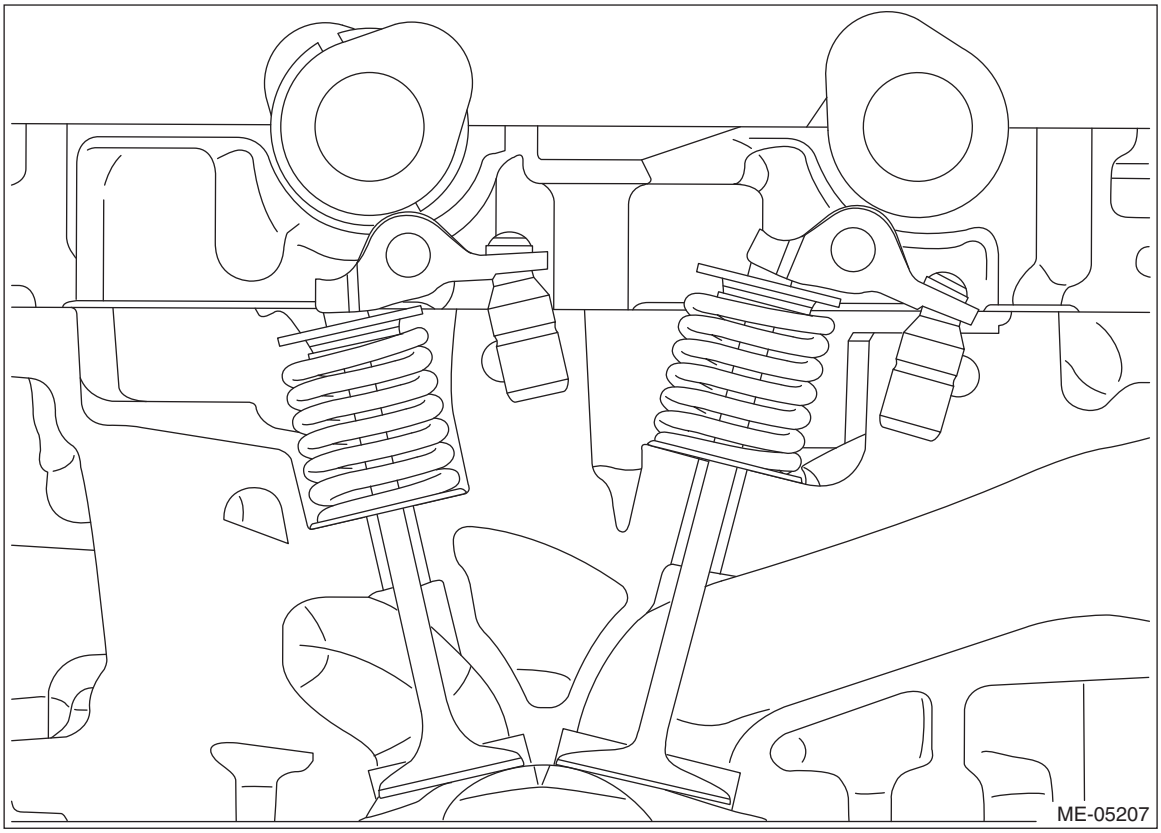
Liquid gasket applying diameter:
2.5±0.5 mm (0.0984±0.0197 in)

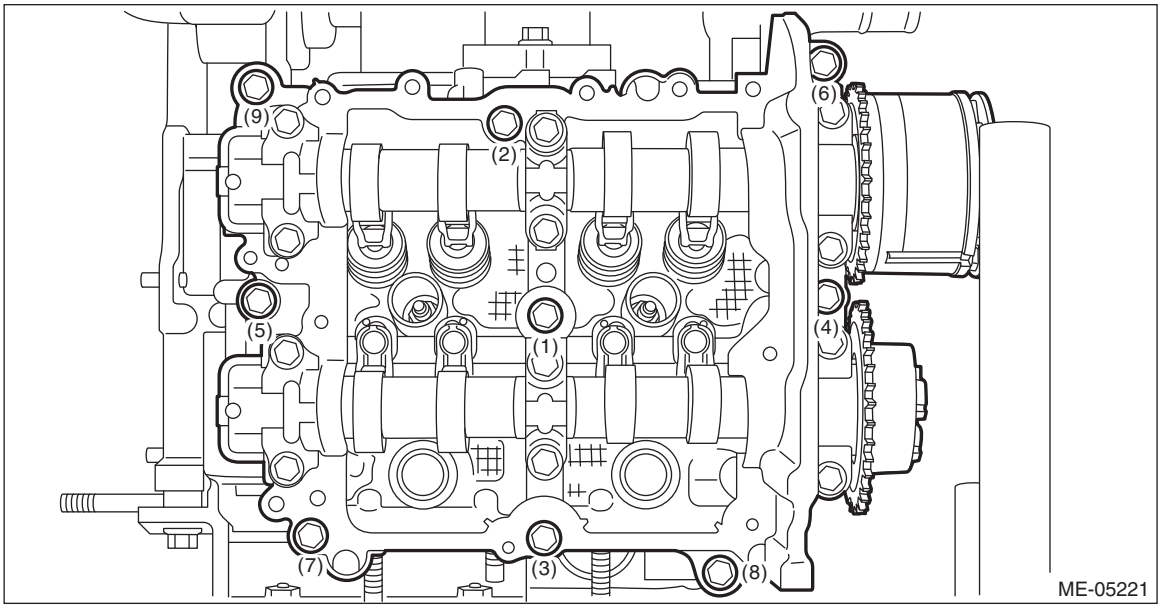


(A)	Range A	(D)	Liquid gasket applying position of mating surfaces other than range A	(G)	0±0.5 mm (0±0.0197 in)
(B)	ϕ18 mm (0.7087 in)	(E)	ϕ2.5±0.5 mm (0.0984±0.0197 in)	(H)	Chamfer edge
(C)	Liquid gasket applying position of mating surfaces of range A	(F)	1 mm (0.0394 in) or less		

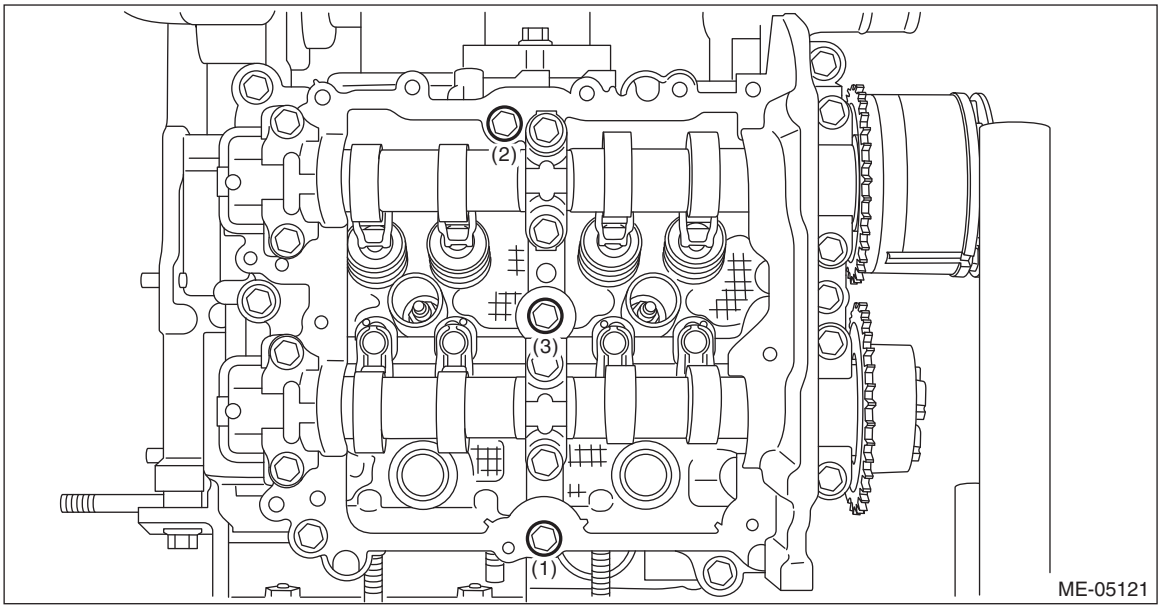
5) Install the cam carrier RH to the cylinder head RH.
   (1) Mount the cam carrier RH, then tighten all bolts with a torque of 18 N·m (1.8 kgf-m, 13.3 ft-lb) in numerical order as shown in the figure.

NOTE:
Set the intake camshaft RH and the exhaust camshaft RH to the zero-lift position.

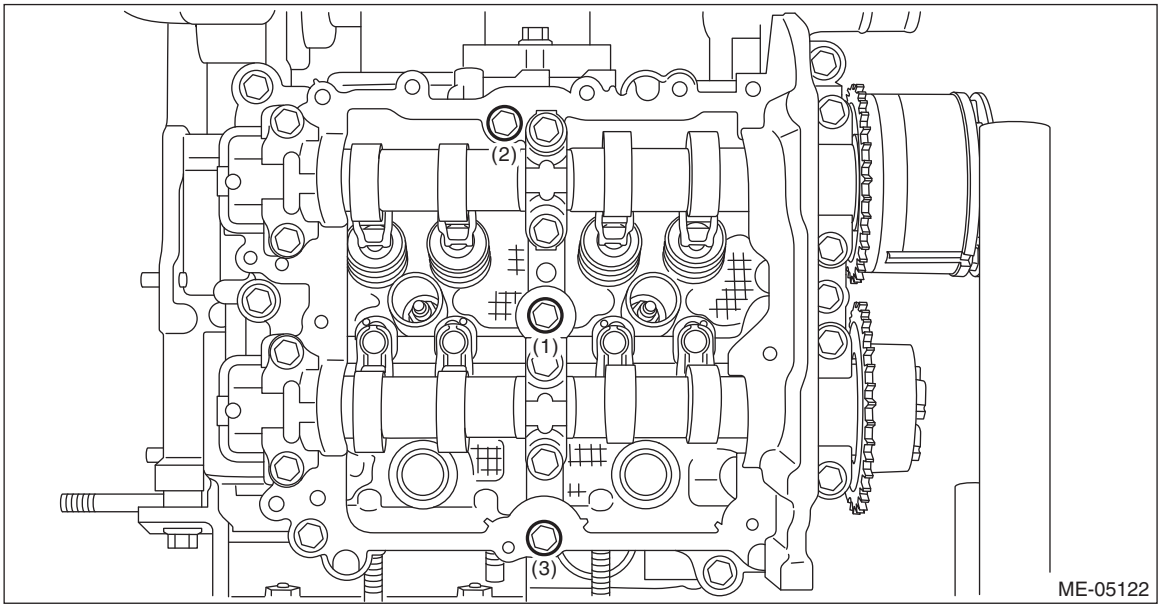




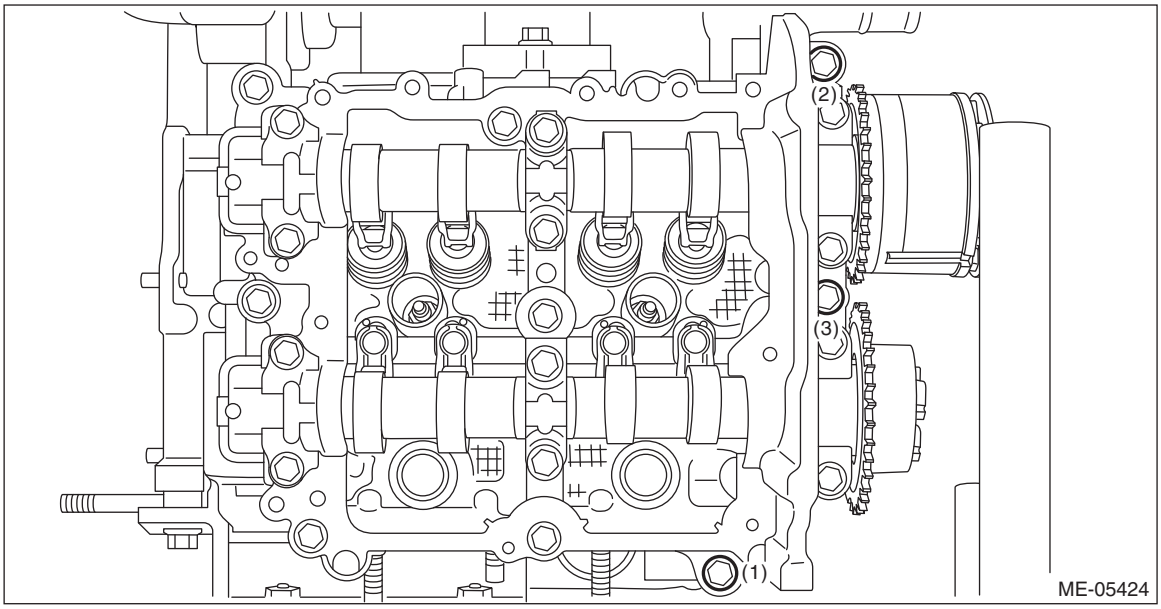
(2) Loosen the bolts (3 places) by 180° in numerical order as shown in the figure.



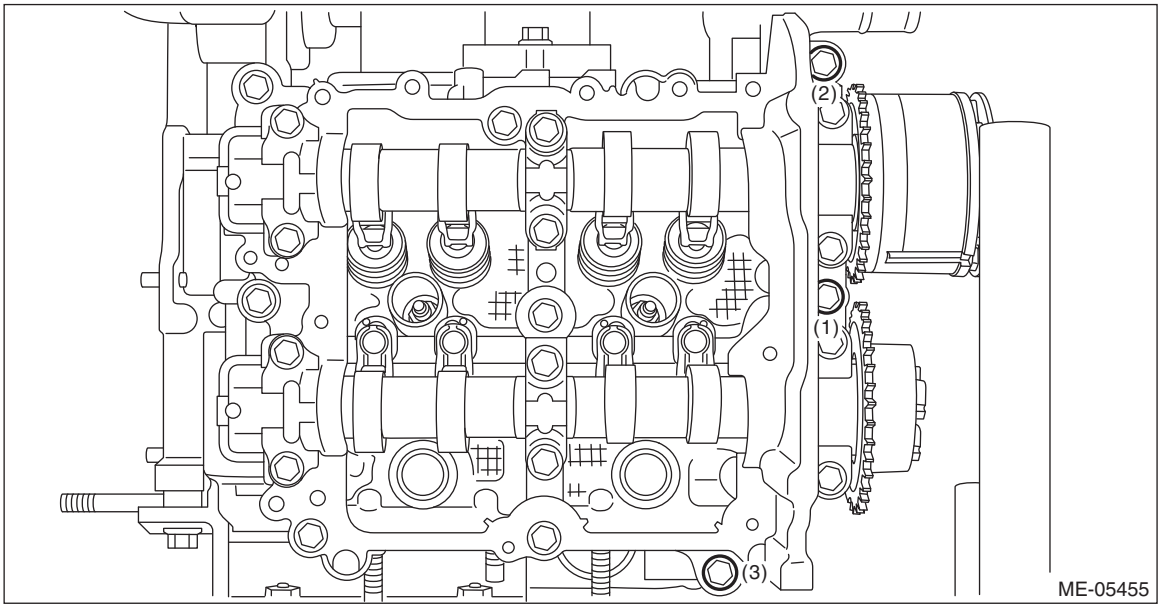
(3) Tighten the bolts (3 places) with a torque of 18 N·m (1.8 kgf-m, 13.3 ft-lb) in numerical order as shown in the figure.



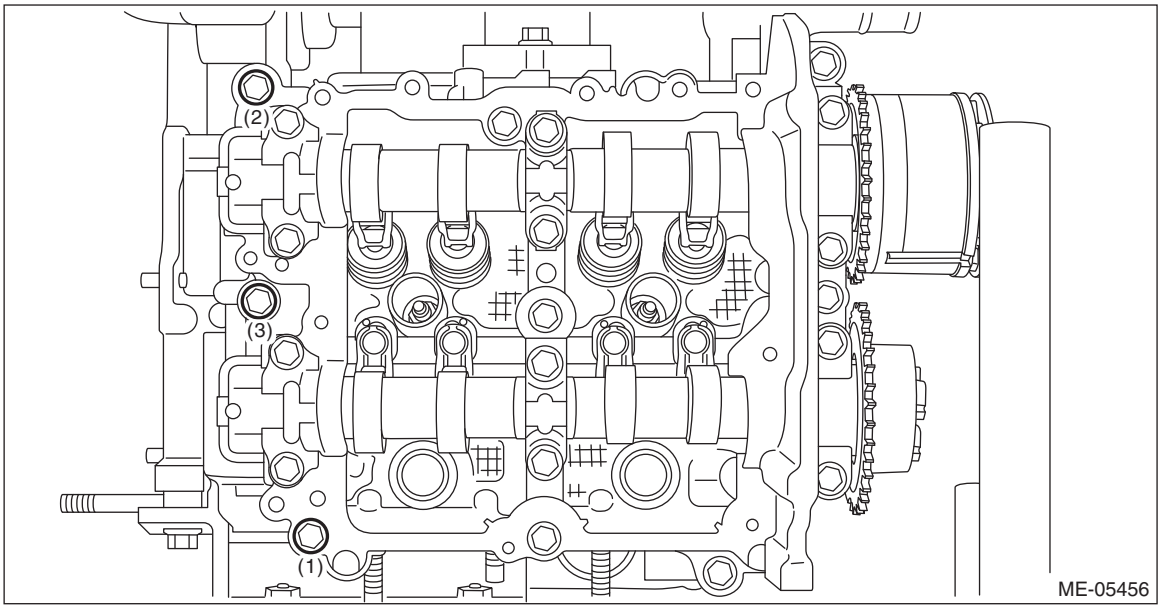
(4) Loosen the bolts (3 places) by 180° in numerical order as shown in the figure.



(5) Tighten the bolts (3 places) with a torque of 18 N·m (1.8 kgf-m, 13.3 ft-lb) in numerical order as shown in the figure.

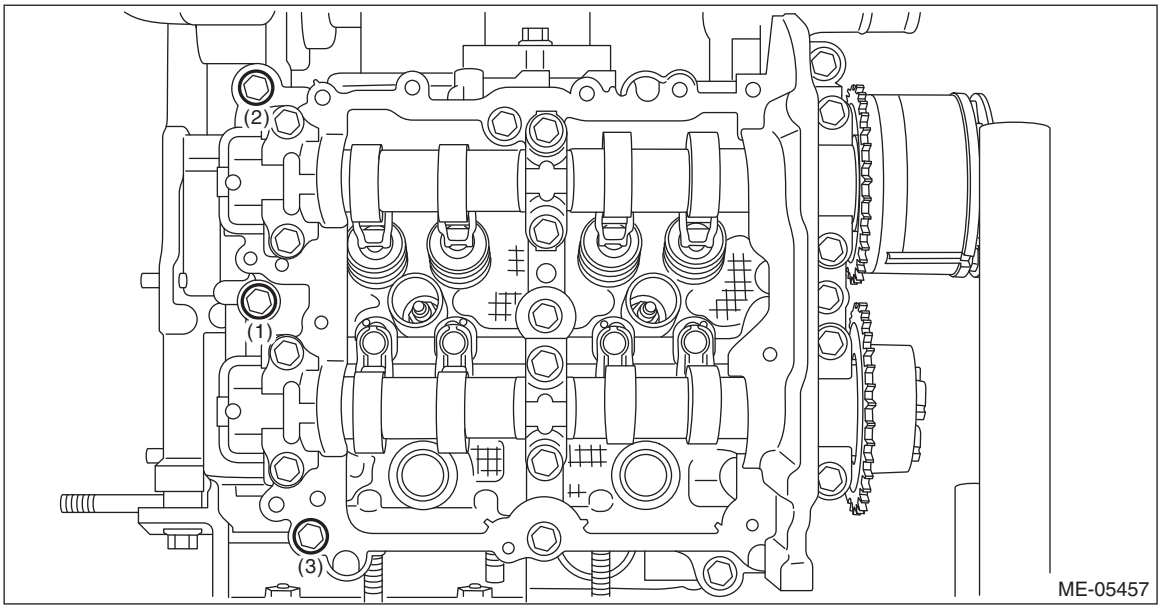


(6) Loosen the bolts (3 places) by 180° in numerical order as shown in the figure.



(7) Tighten the bolts (3 places) with a torque of 18 N·m (1.8 kgf-m, 13.3 ft-lb) in numerical order as shown in the figure.

NOTE:
After tightening, if the liquid gasket is squeezed out onto the seal surface of the chain cover, completely remove any squeezed-out liquid gasket.



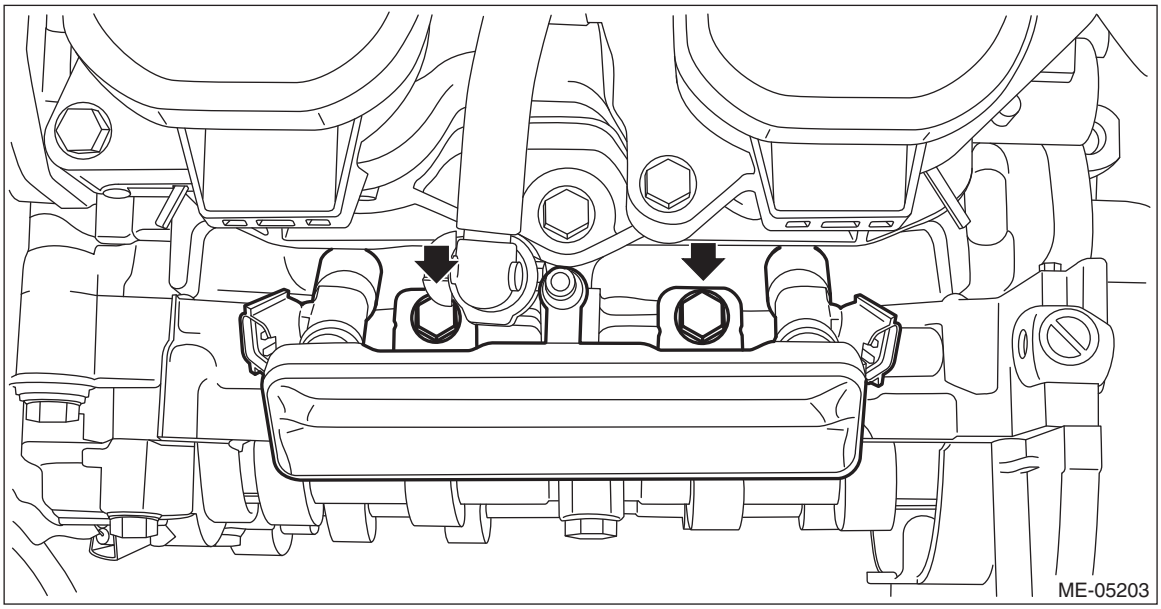
6) Set the part so that the intake manifold is on the upper side.
7) Install the cam sprocket RH. <Ref. to ME(H4DO)-132, CAM SPROCKET RH, INSTALLATION, Cam Sprocket.>

NOTE:
This procedure is required only when the cam carrier RH is removed for disassembly.
8) Check the cam clearance. <Ref. to ME(H4DO)-39, WHEN TIMING CHAIN ASSEMBLY IS REMOVED, INSPECTION, Cam Clearance.>
9) Install the timing chain RH. <Ref. to ME(H4DO)-116, TIMING CHAIN RH, INSTALLATION, Timing Chain Assembly.>

10) Install the fuel pipe RH and the fuel injector RH.
(1) Install the fuel pipe RH and the fuel injector RH, and install the bolts which secure the fuel pipe RH.

NOTE:
Use new O-rings, rubbers and seal rings.

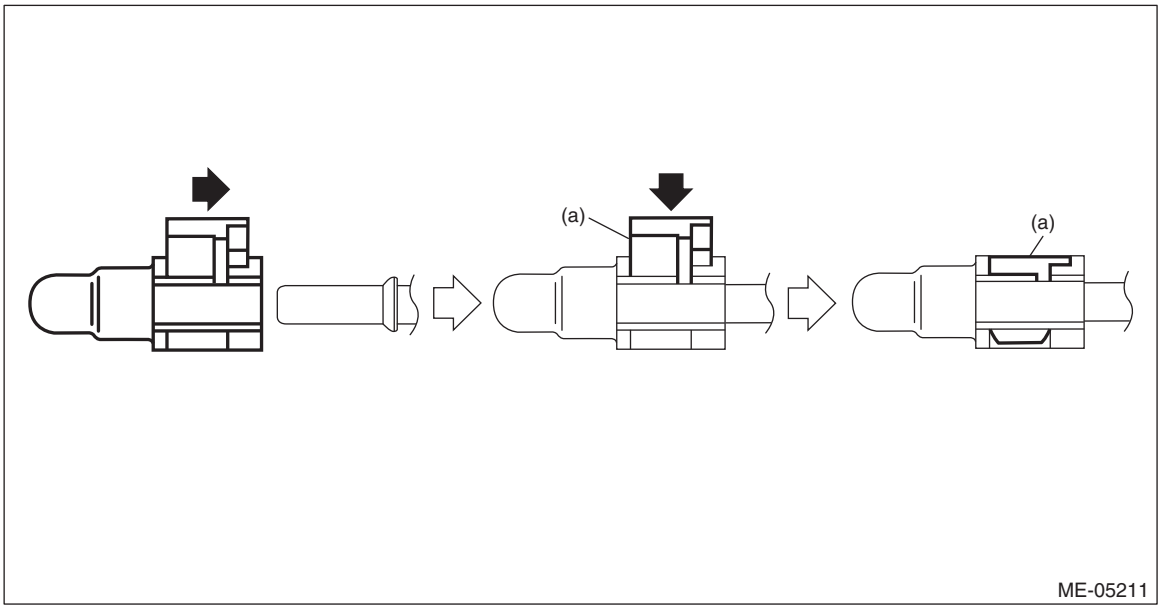
Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)



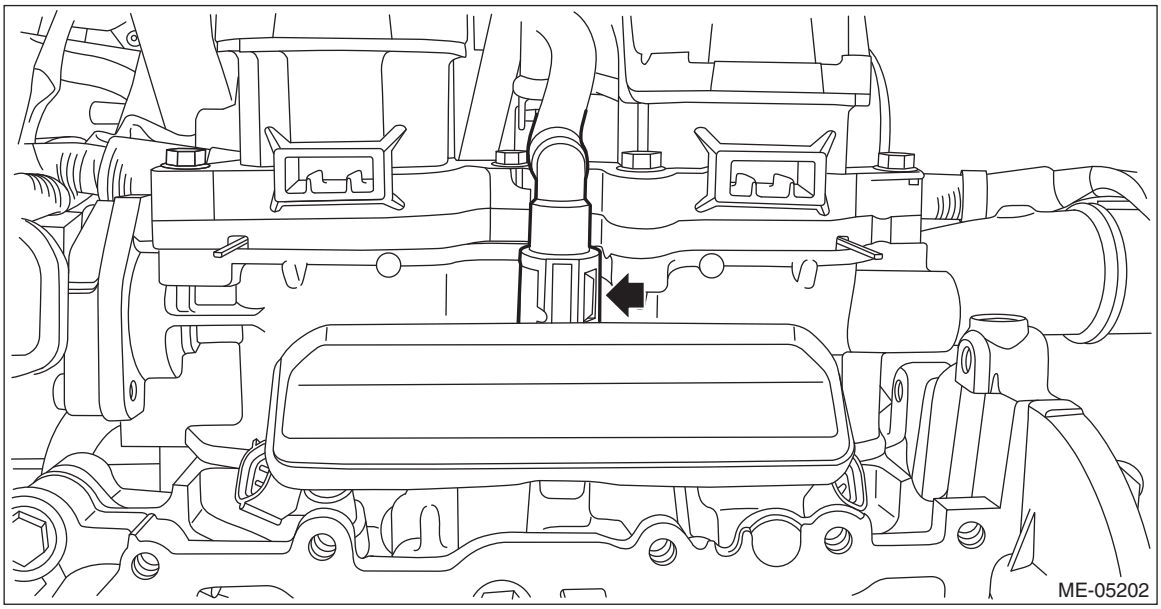
(2) Connect the quick connector to the fuel pipe RH.

CAUTION:
• Check that there is no damage or dust on the quick connector. If necessary, clean the seal surface of the pipe.
• When connecting the quick connector, make sure to insert the pipe all the way in before locking the slider.
• If it is not possible to perform the push lock operation of the slider, recheck whether the pipe is securely inserted.
• Make sure that the quick connector is securely connected.

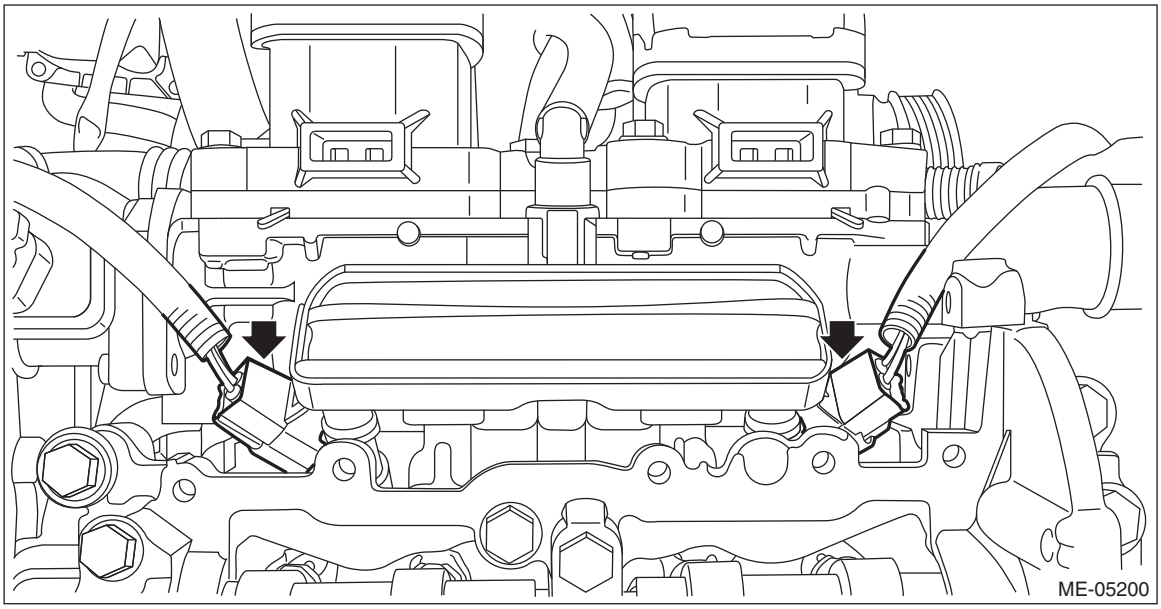
NOTE:
Connect the quick connector as shown in the figure.



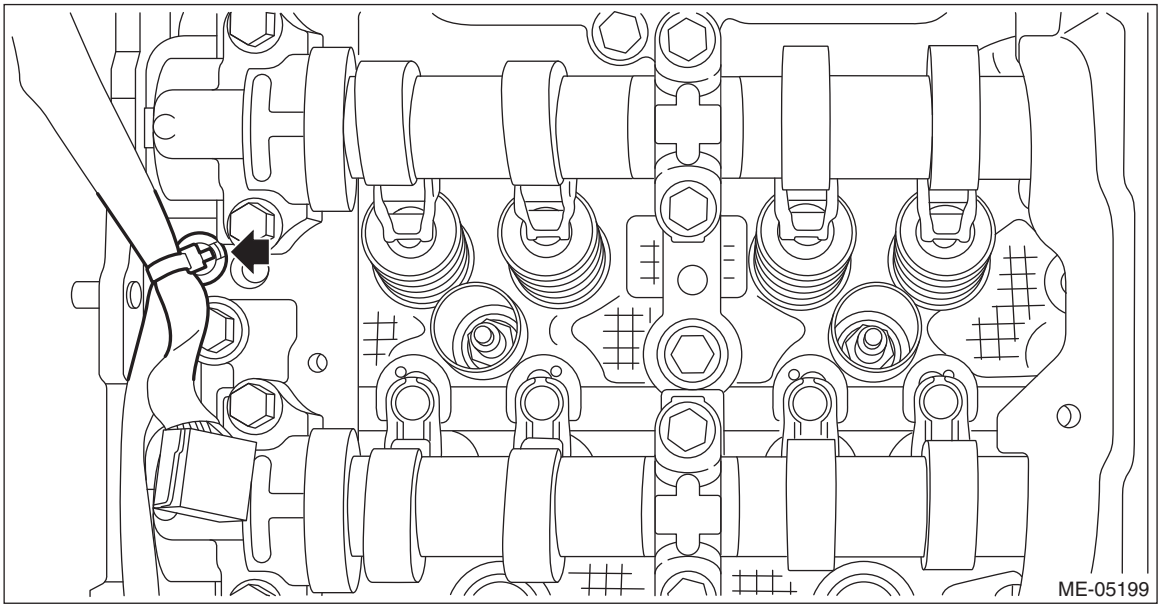
(a) Slider



(3) Connect the connectors to the fuel injector RH.



11) Secure the engine harness to the cam carrier RH with a clip.



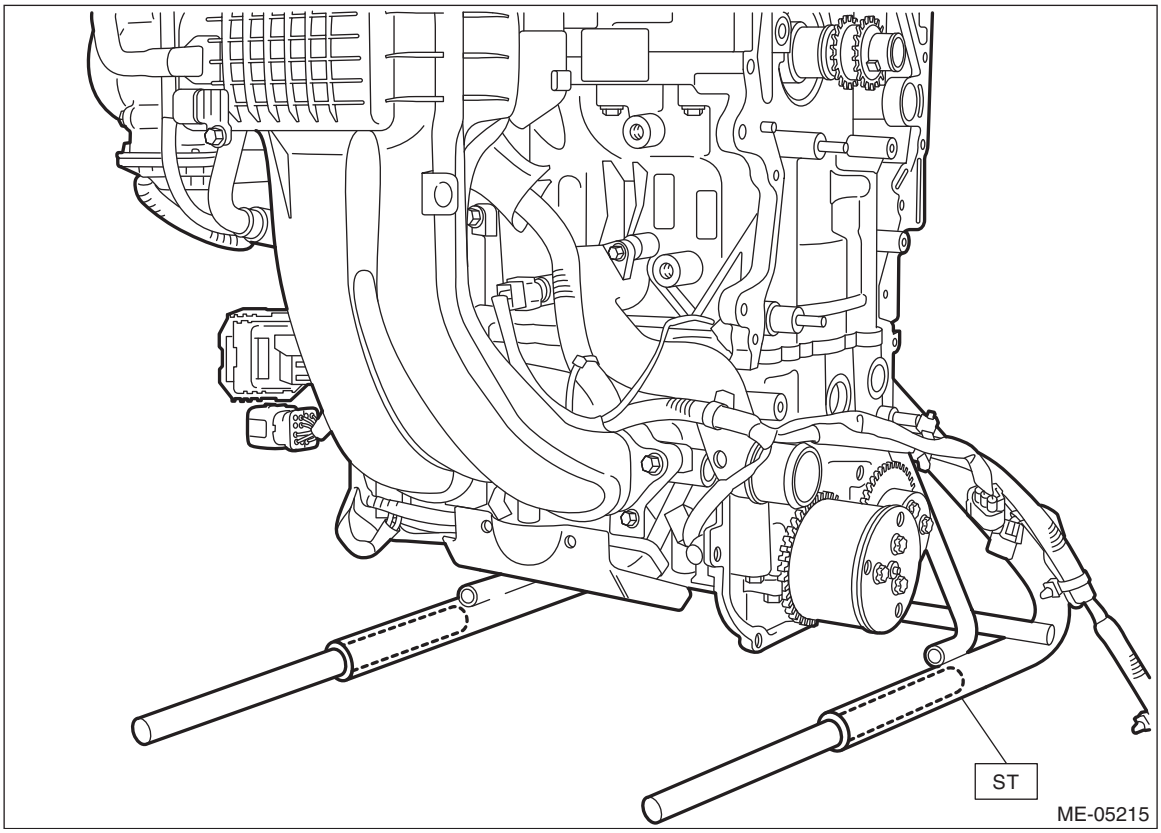
12) Install the rocker cover RH. <Ref. to ME(H4DO)-144, ROCKER COVER RH, INSTALLATION, Rocker Cover.>
13) Install the chain cover. <Ref. to ME(H4DO)-96, INSTALLATION, Chain Cover.>
14) Install the engine to the vehicle. <Ref. to ME(H4DO)-56, INSTALLATION, Engine Assembly.>

2. CAM CARRIER LH

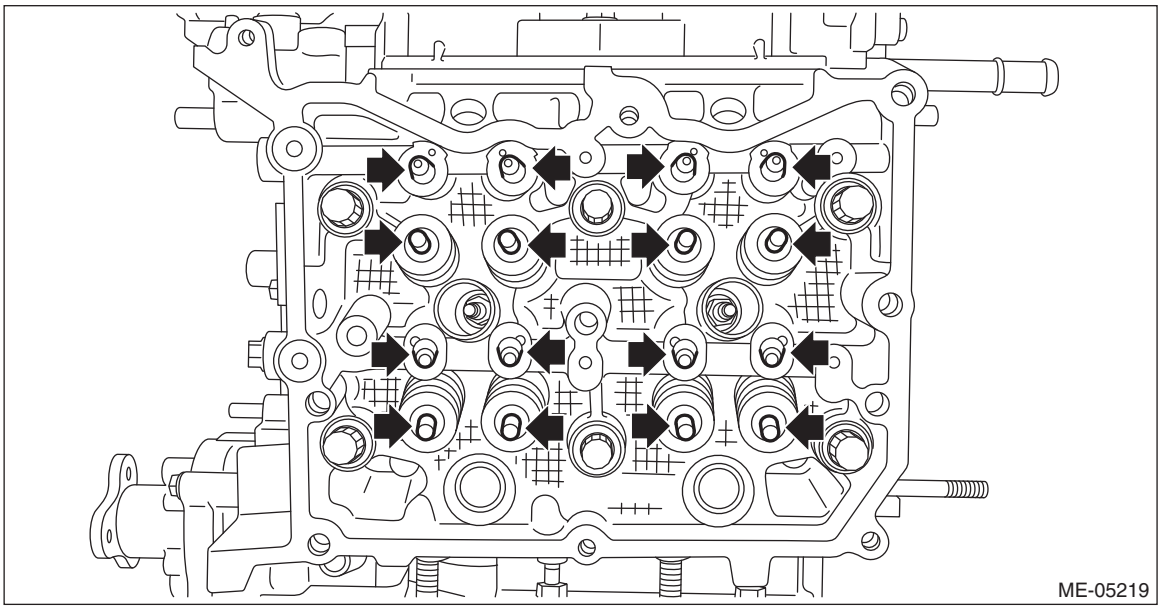
1) Insert the steel rods into ST, and set the engine so that the camshaft LH is facing up.

CAUTION:
• If the engine is standing on one side without inserting the steel rod into ST, engine may lose balance and fall down. Be sure to insert the steel rod into ST to extend the length.
• Use the steel rod with enough strength.
• Be careful not to pinch the engine harness with ST.

ST 499817100 ENGINE STAND

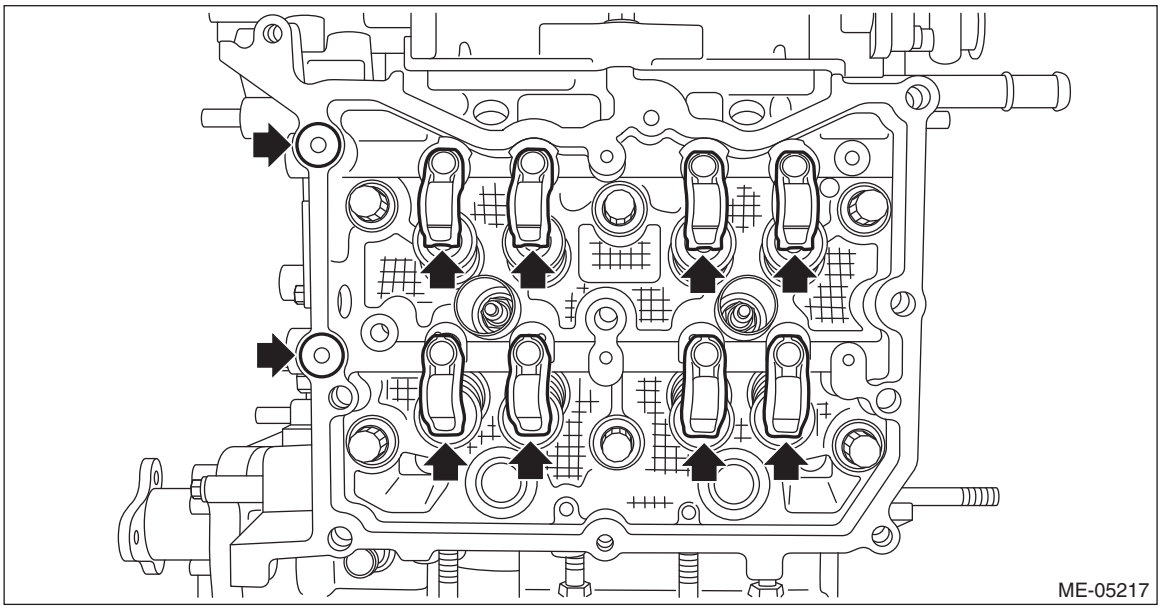


2) Apply engine oil to the valve shim and the roller rocker arm pivot, and install the valve shim and the roller rocker arm pivot to the cylinder head LH.



3) Apply engine oil to the O-ring and the roller rocker arm, and install the O-ring and the roller rocker arm to the cylinder head LH.

NOTE:
Use new O-rings.

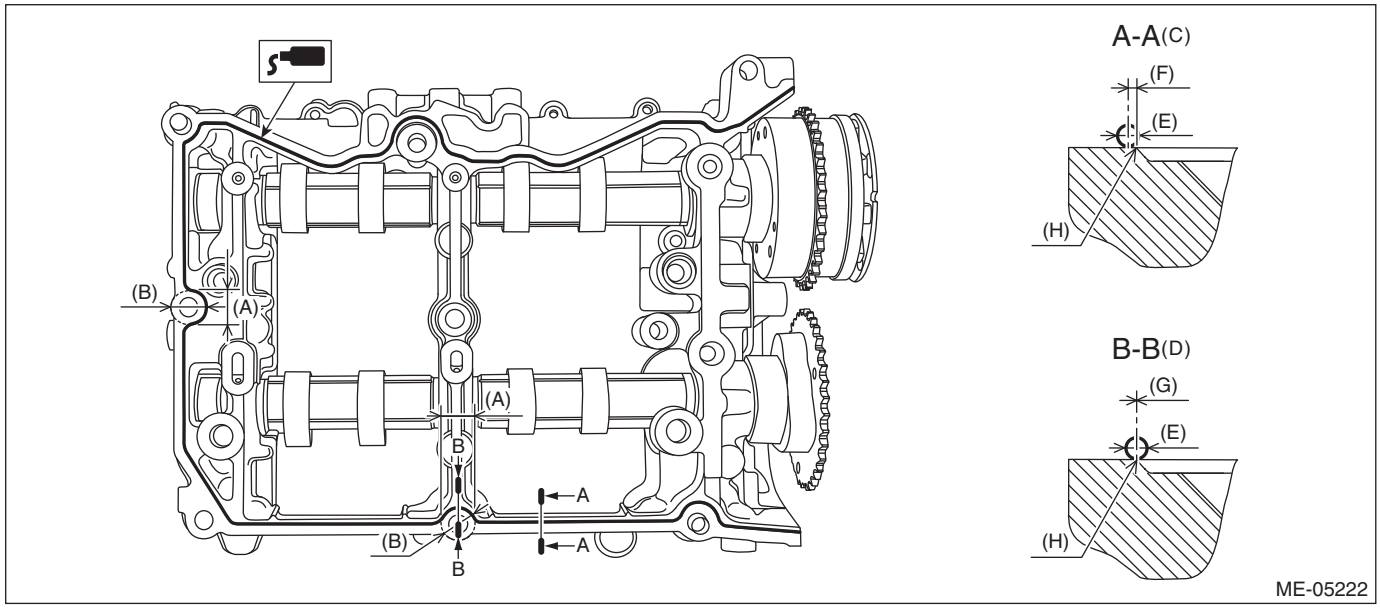


4) Apply liquid gasket to the mating surface of cam carrier LH as shown in the figure.

NOTE:
- Before applying liquid gasket, remove oil from liquid gasket seal surface of the cylinder head LH and the cam carrier LH.
- Install within 5 min. after applying liquid gasket.

Liquid gasket:
THREE BOND 1217G (Part No. 0877Y0100) or equivalent

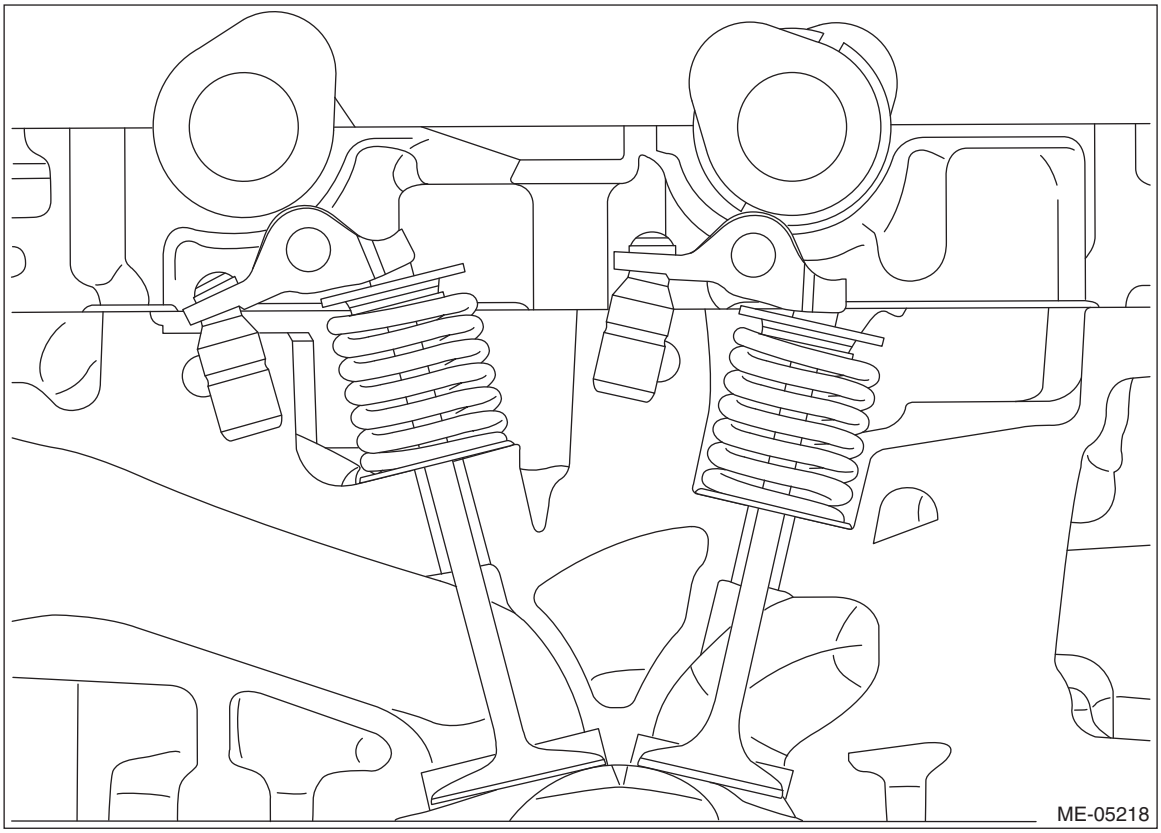
Liquid gasket applying diameter:
2.5±0.5 mm (0.0984±0.0197 in)

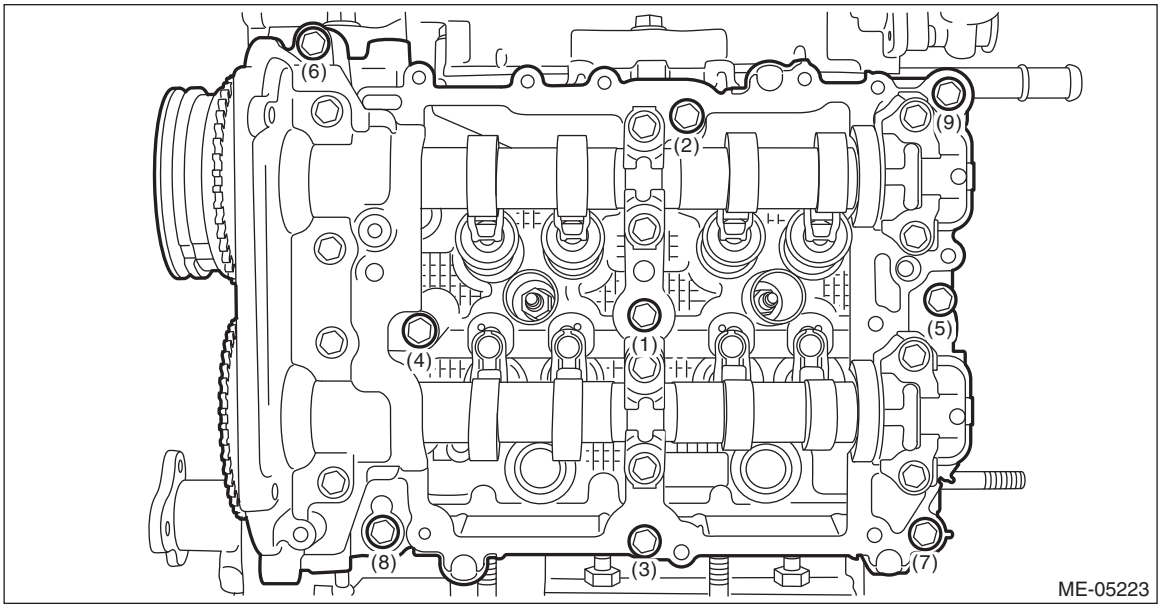


(A)	Range A	(D)	Liquid gasket applying position of mating surfaces other than range A	(G)	0±0.5 mm (0±0.0197 in)
(B)	ϕ18 mm (0.7087 in)	(E)	ϕ2.5±0.5 mm (0.0984±0.0197 in)	(H)	Chamfer edge
(C)	Liquid gasket applying position of mating surfaces of range A	(F)	1 mm (0.0394 in) or less		

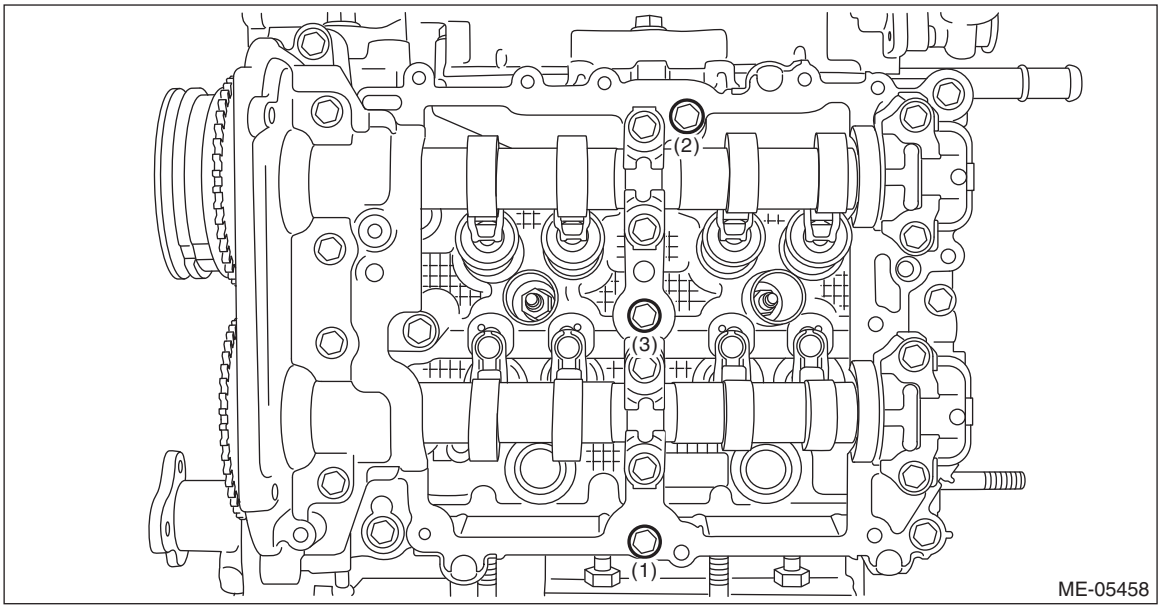
5) Install the cam carrier LH to the cylinder head LH.
   (1) Mount the cam carrier LH, then tighten all bolts with a torque of 18 N·m (1.8 kgf-m, 13.3 ft-lb) in numerical order as shown in the figure.

NOTE:
Set the intake camshaft LH and the exhaust camshaft LH to the zero-lift position.

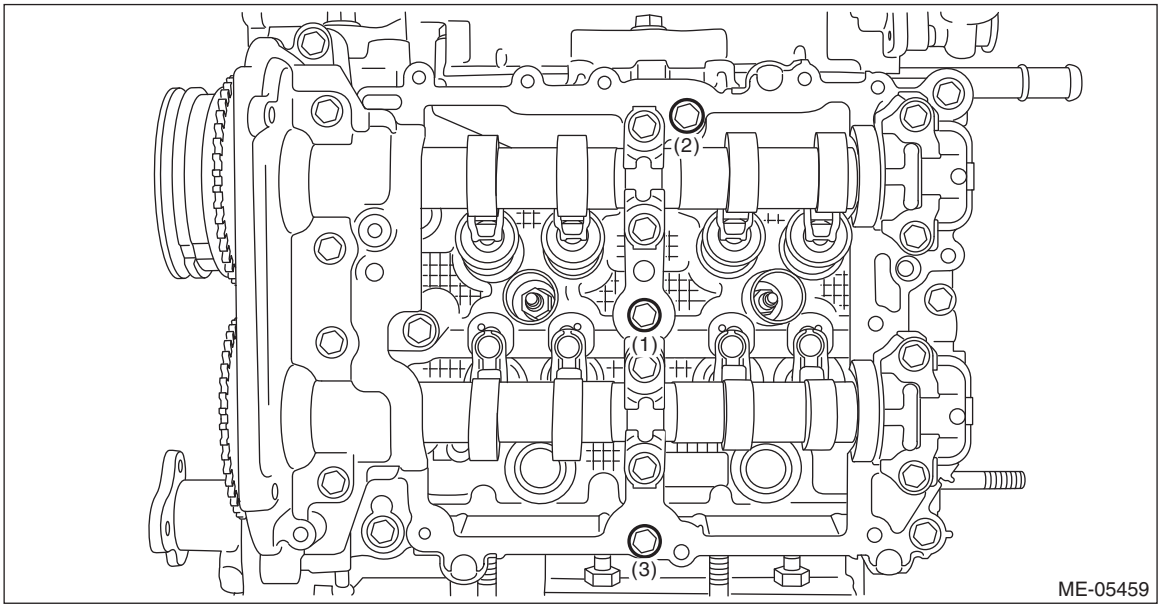




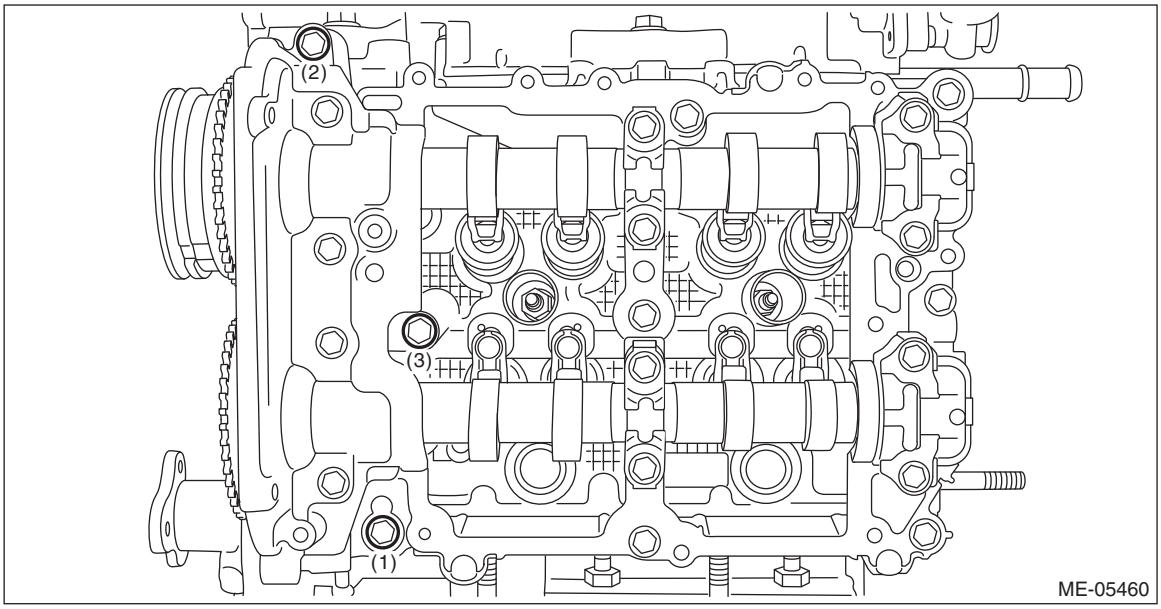
(2) Loosen the bolts (3 places) by 180° in numerical order as shown in the figure.



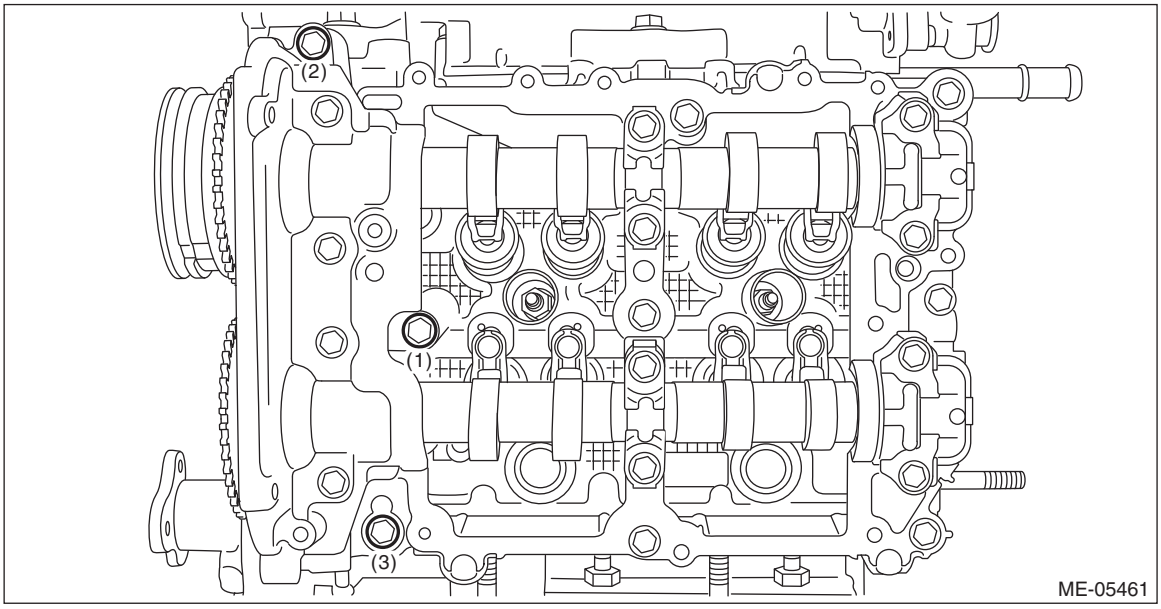
(3) Tighten the bolts (3 places) with a torque of 18 N·m (1.8 kgf-m, 13.3 ft-lb) in numerical order as shown in the figure.



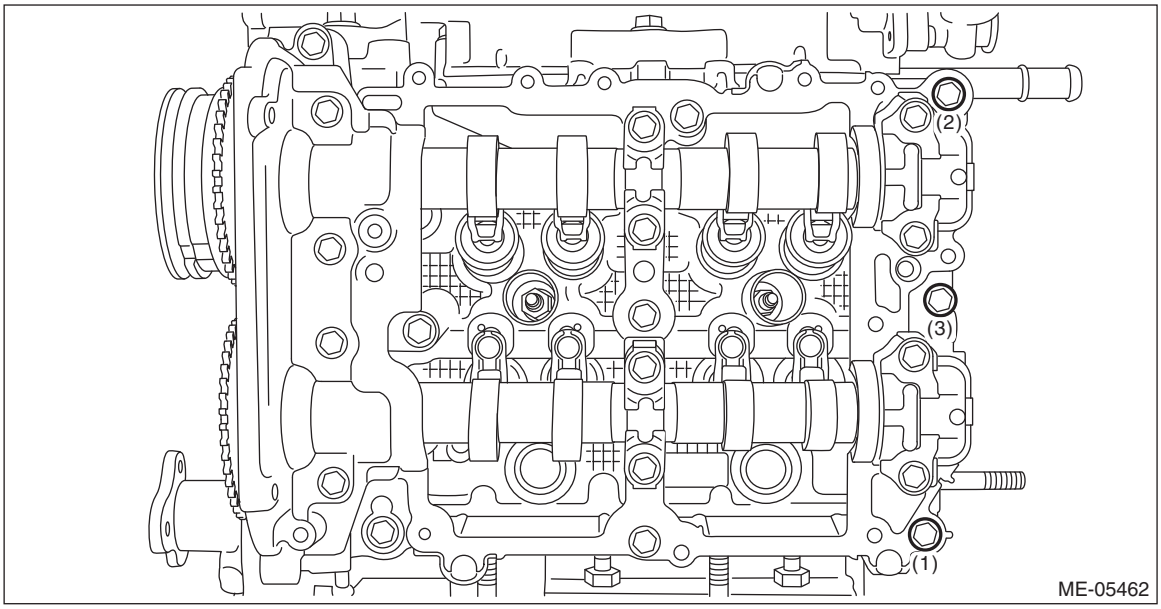
(4) Loosen the bolts (3 places) by 180° in numerical order as shown in the figure.



(5) Tighten the bolts (3 places) with a torque of 18 N·m (1.8 kgf-m, 13.3 ft-lb) in numerical order as shown in the figure.

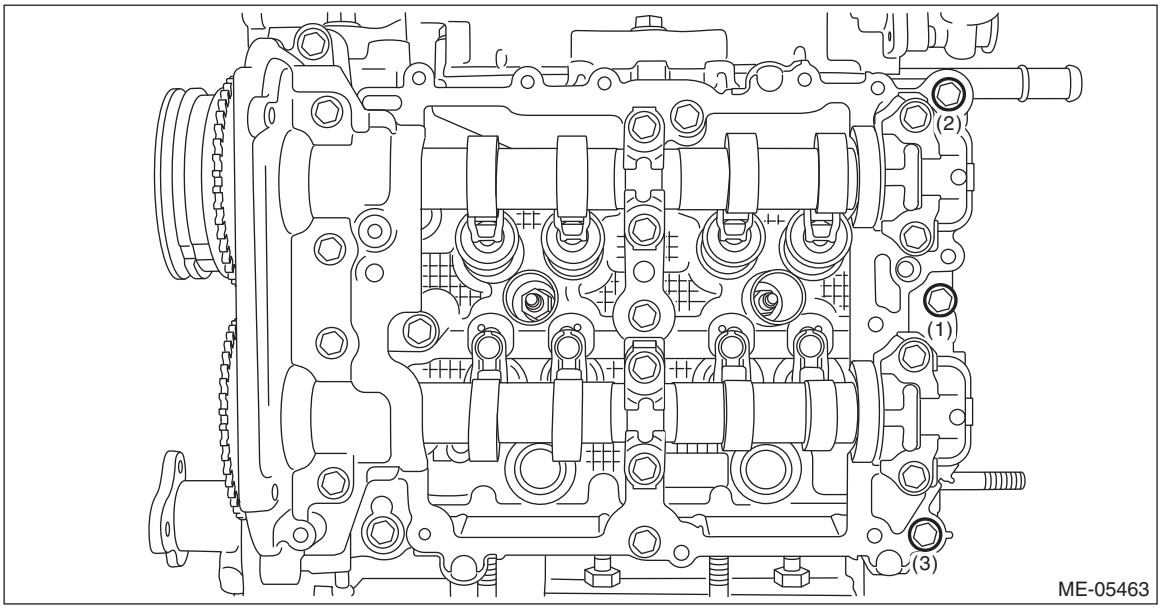


(6) Loosen the bolts (3 places) by 180° in numerical order as shown in the figure.



(7) Tighten the bolts (3 places) with a torque of 18 N·m (1.8 kgf-m, 13.3 ft-lb) in numerical order as shown in the figure.

NOTE:
After tightening, if the liquid gasket is squeezed out onto the seal surface of the chain cover, completely remove any squeezed-out liquid gasket.



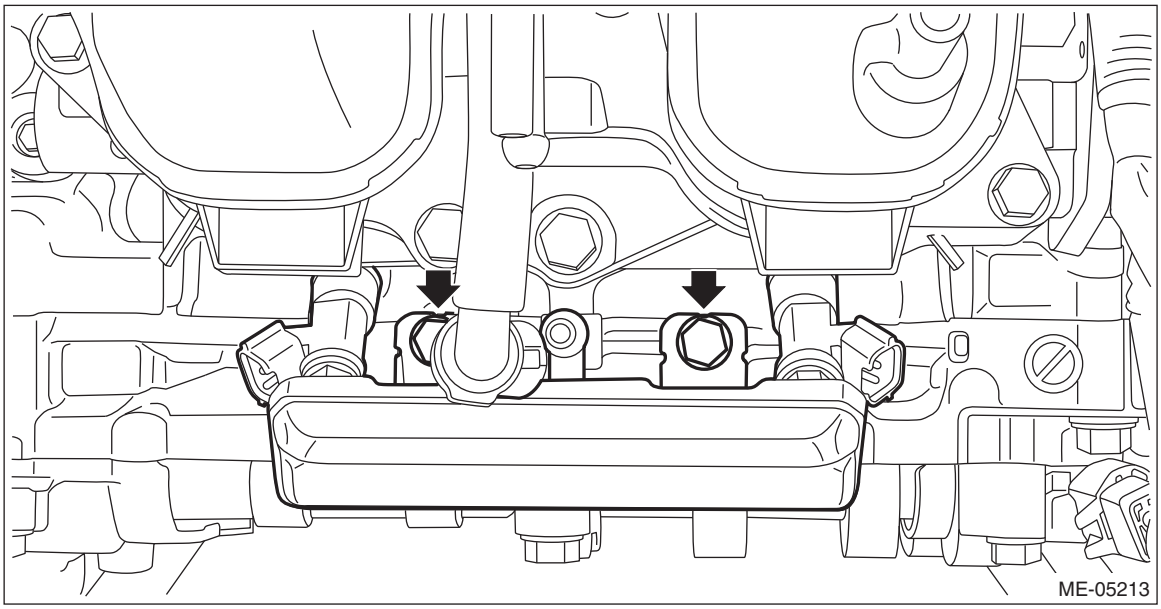
6) Set the part so that the intake manifold is on the upper side.
7) Install the cam sprocket LH. <Ref. to ME(H4DO)-134, CAM SPROCKET LH, INSTALLATION, Cam Sprocket.>

NOTE:
This procedure is required only when the cam carrier LH is removed for disassembly.
8) Check the cam clearance. <Ref. to ME(H4DO)-39, WHEN TIMING CHAIN ASSEMBLY IS REMOVED, INSPECTION, Cam Clearance.>
9) Install timing chain LH. <Ref. to ME(H4DO)-121, TIMING CHAIN LH, INSTALLATION, Timing Chain Assembly.>

10) Install the fuel pipe LH and the fuel injector LH.
(1) Install the fuel pipe LH and the fuel injector LH, and install the bolts which secure the fuel pipe LH.

NOTE:
Use new O-rings, rubbers and seal rings.

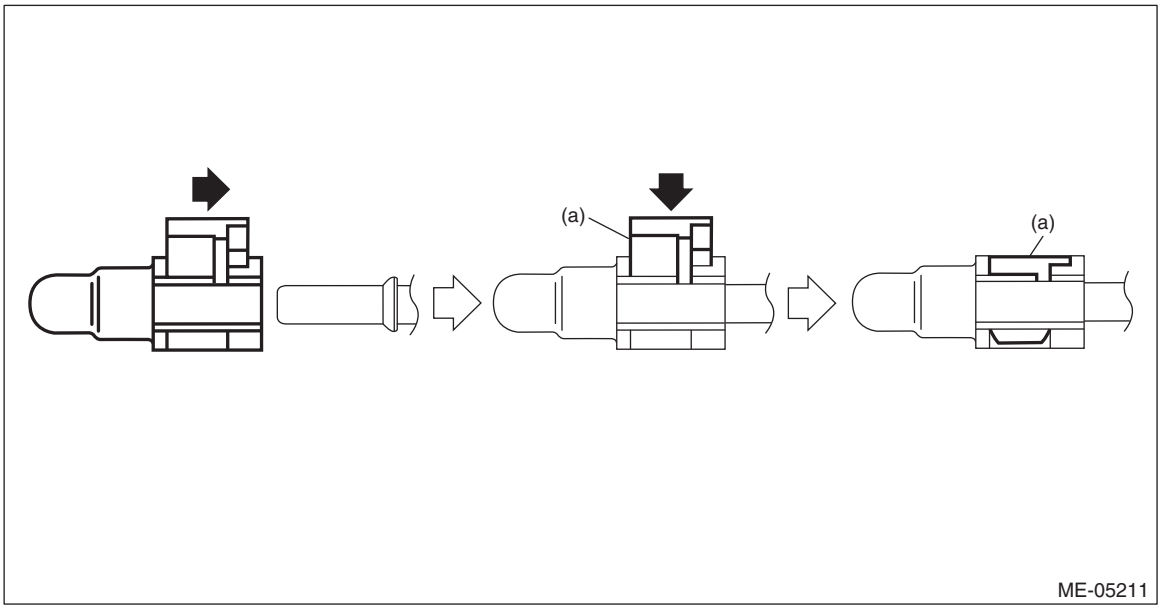
Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)



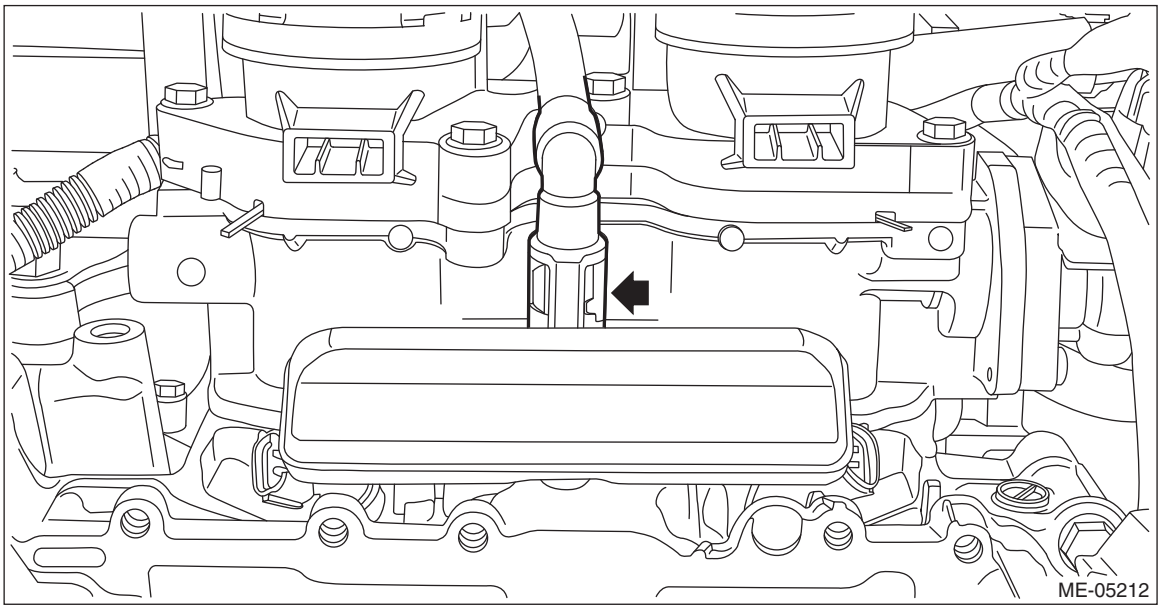
(2) Connect the quick connector to the fuel pipe LH.

CAUTION:
• Check that there is no damage or dust on the quick connector. If necessary, clean the seal surface of the pipe.
• When connecting the quick connector, make sure to insert the pipe all the way in before locking the slider.
• If it is not possible to perform the push lock operation of the slider, recheck whether the pipe is securely inserted.
• Make sure that the quick connector is securely connected.

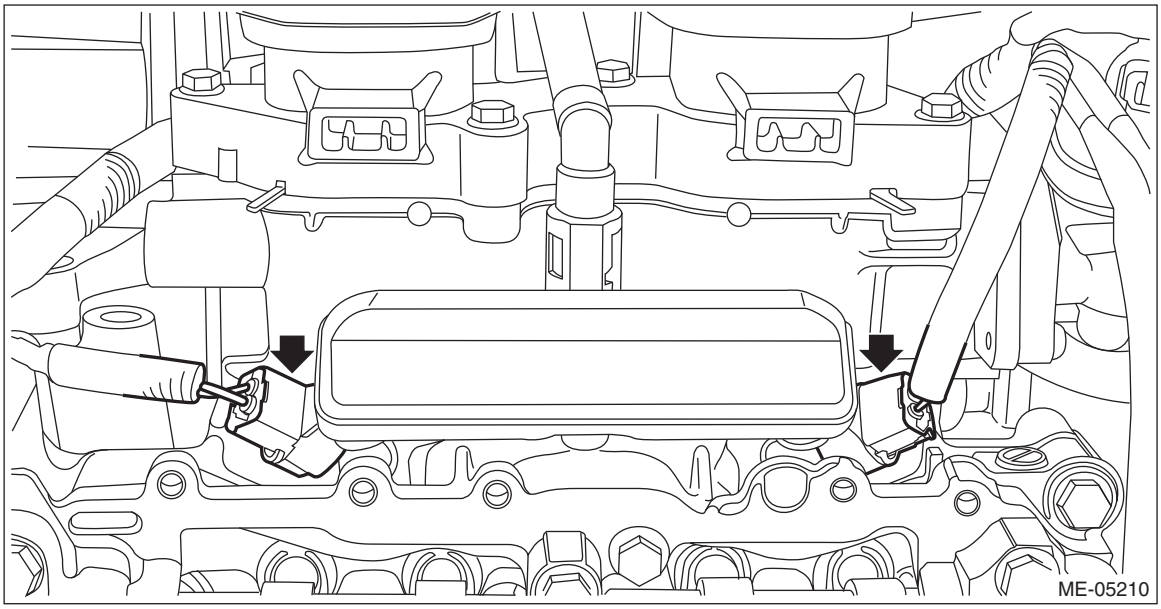
NOTE:
Connect the quick connector as shown in the figure.



(a) Slider

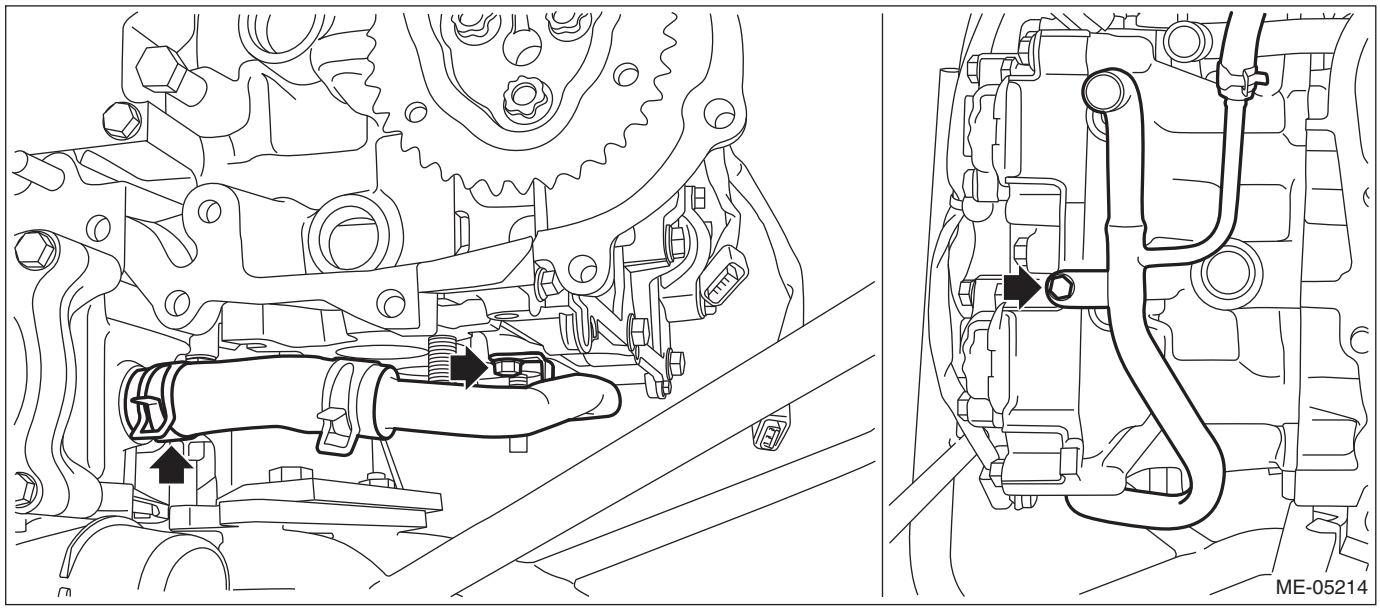


(3) Connect the connectors to the fuel injector LH.

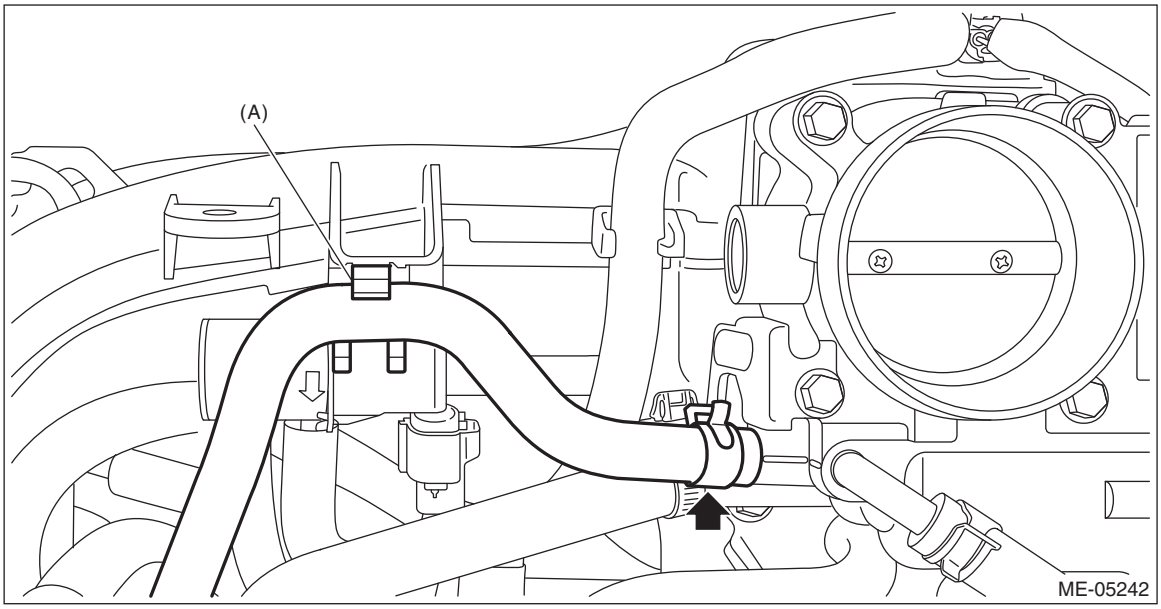


11) Connect the water pipe hose to oil pan upper, and install the water pipe assembly.

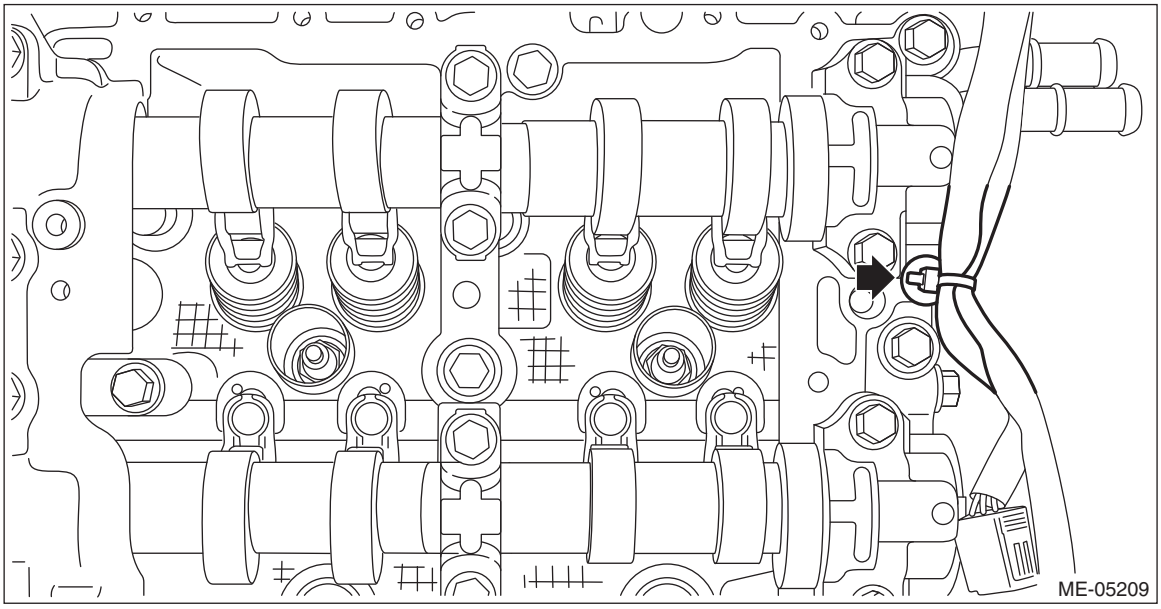
Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)



12) Connect the preheater hose to throttle body and install the preheater hose to intake manifold clip (A).



13) Secure the engine harness to the cam carrier LH with a clip.



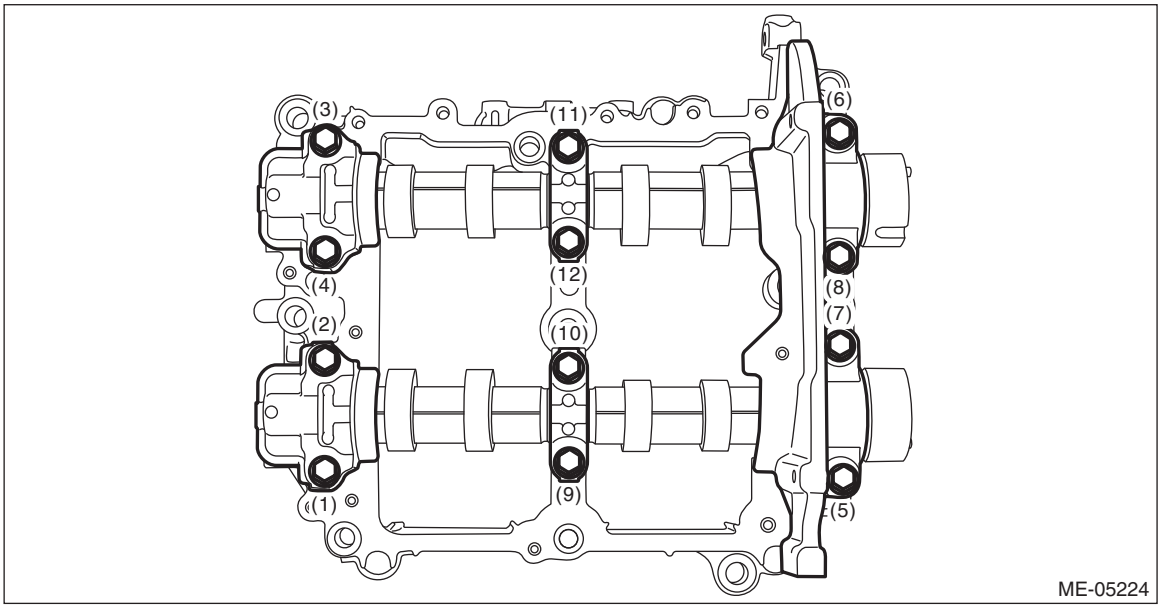
14) Install the rocker cover LH. <Ref. to ME(H4DO)-146, ROCKER COVER LH, INSTALLATION, Rocker Cover.>
15) Install the chain cover. <Ref. to ME(H4DO)-96, INSTALLATION, Chain Cover.>
16) Install the engine to the vehicle. <Ref. to ME(H4DO)-56, INSTALLATION, Engine Assembly.>

C: DISASSEMBLY

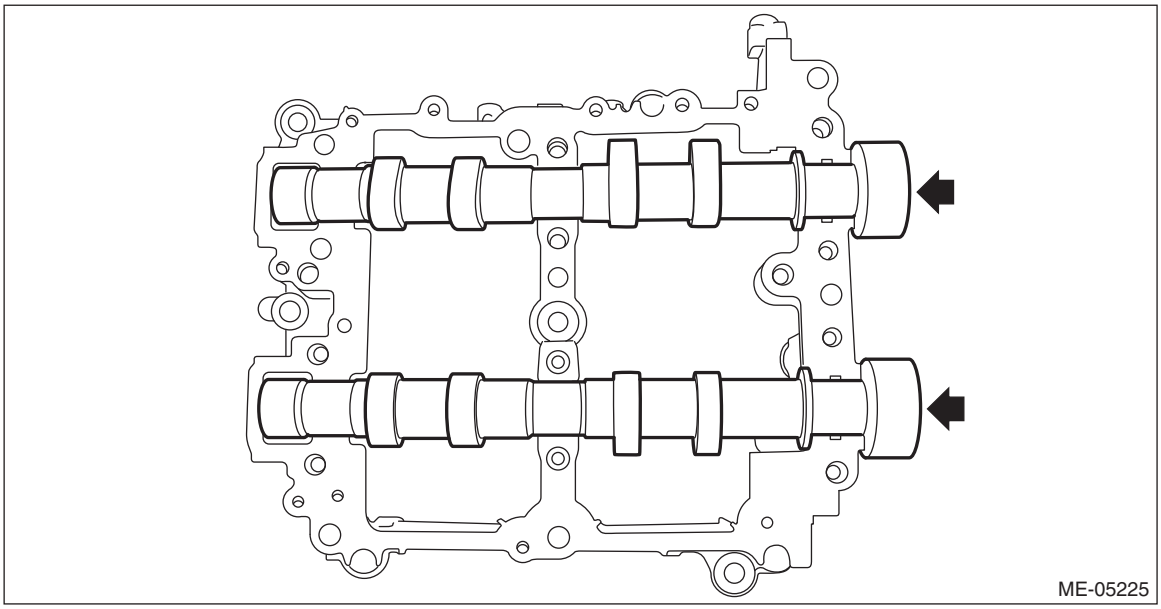
1. CAM CARRIER RH

1) Loosen the bolts (front camshaft cap RH, intake center camshaft cap RH, intake rear camshaft cap RH, exhaust center camshaft cap RH and exhaust rear camshaft cap RH) equally, a little at a time in numerical sequence as shown in the figure, and remove the camshaft cap.

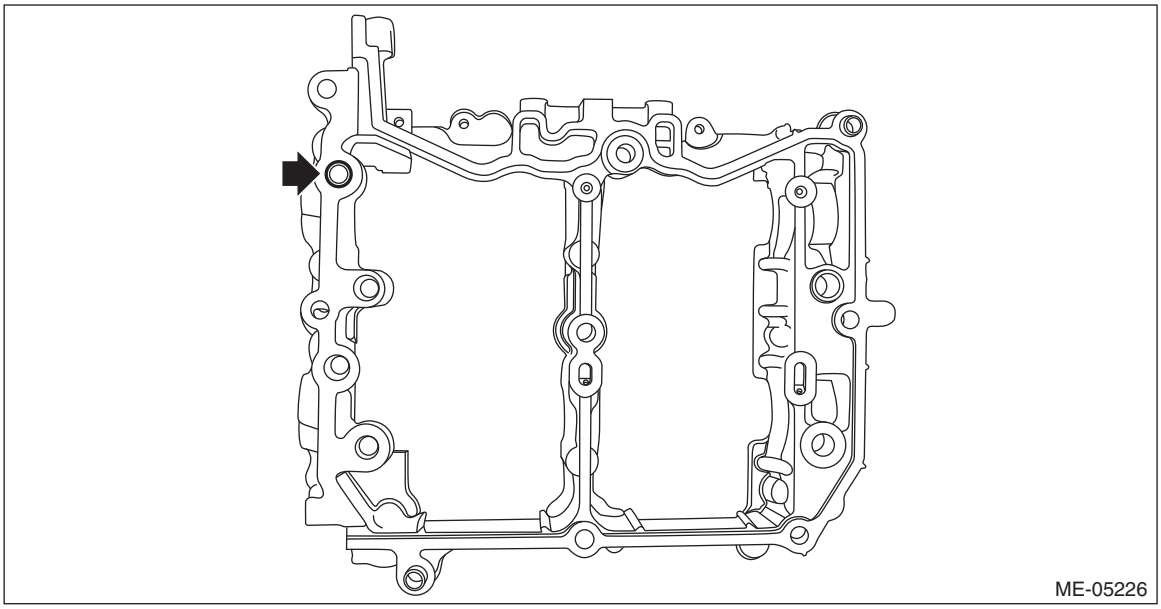
NOTE:
Arrange camshaft caps in order so that they can be installed in their original positions.



2) Remove the intake camshaft RH and the exhaust camshaft RH from cam carrier RH.



3) Remove the filter from cam carrier RH.

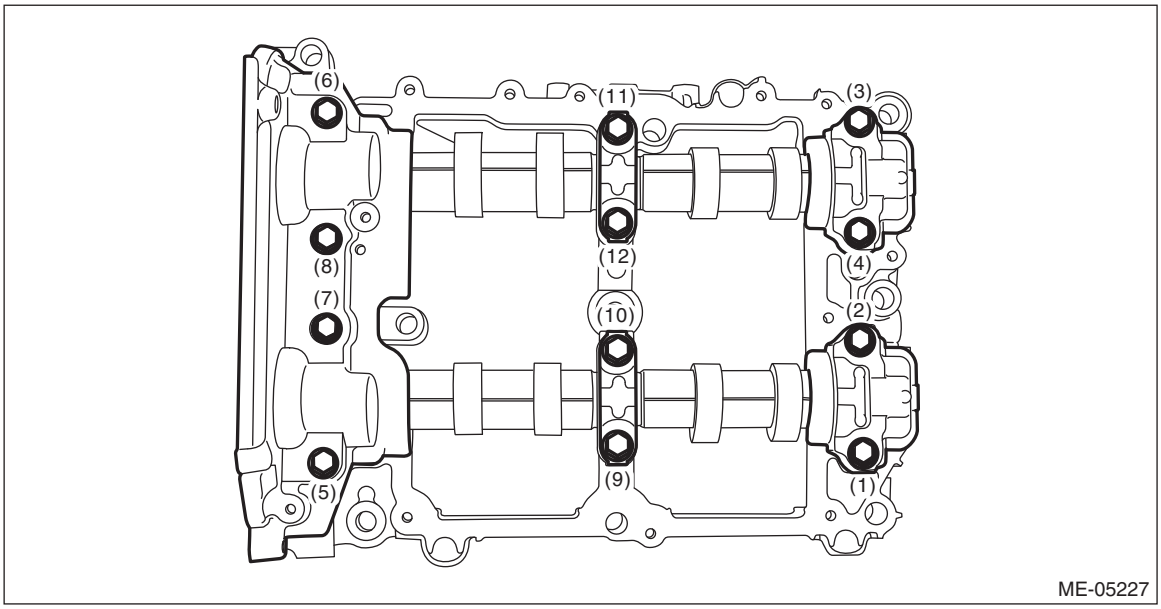


4) Remove the liquid gasket from cam carrier RH and front camshaft cap RH, intake rear camshaft cap RH and exhaust rear camshaft cap RH.

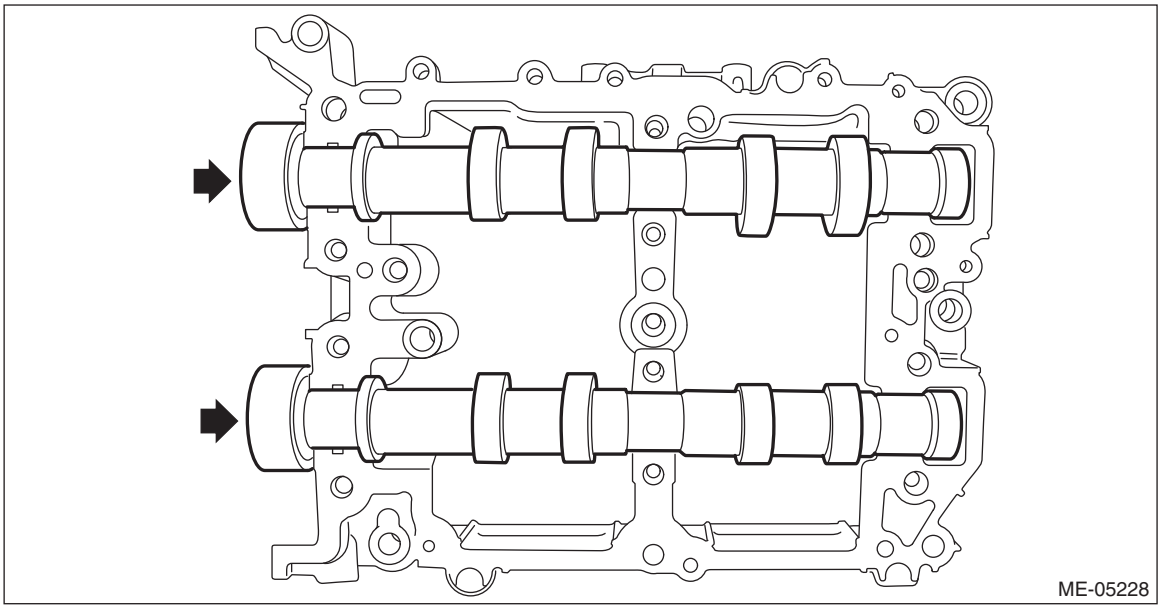
2. CAM CARRIER LH

1) Loosen the bolts (front camshaft cap LH, intake center camshaft cap LH, intake rear camshaft cap LH, exhaust center camshaft cap LH and exhaust rear camshaft cap LH) equally, a little at a time in numerical sequence as shown in the figure, and remove the camshaft cap.

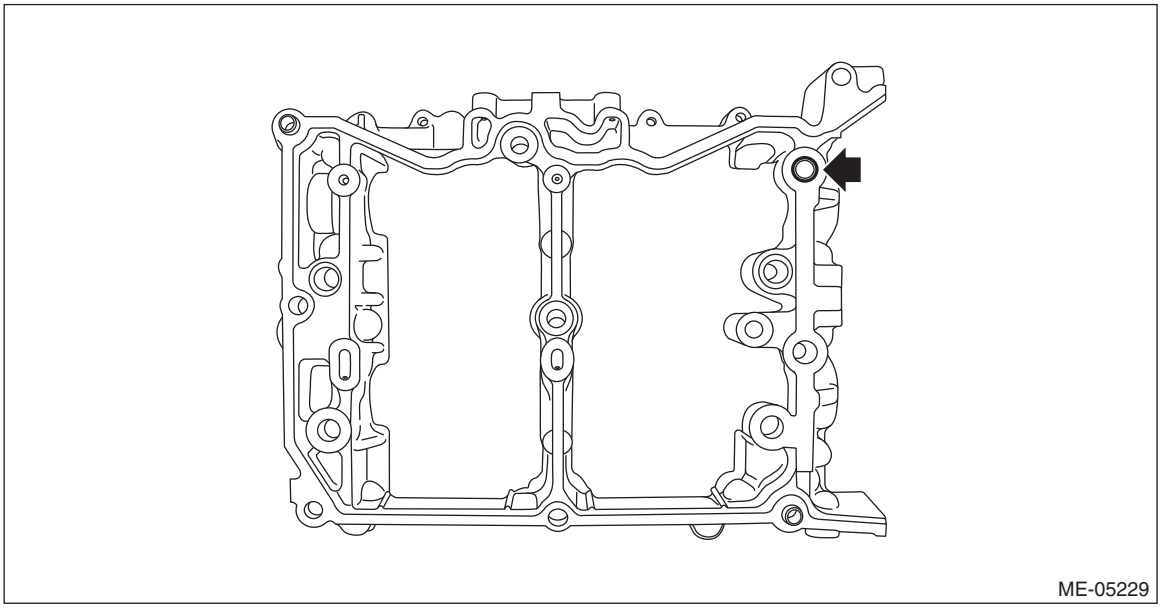
NOTE:
Arrange camshaft caps in order so that they can be installed in their original positions.



2) Remove the intake camshaft LH and the exhaust camshaft LH from cam carrier LH.



3) Remove the filter from cam carrier LH.



4) Remove the liquid gasket from cam carrier LH and front camshaft cap LH, intake rear camshaft cap LH and exhaust rear camshaft cap LH.

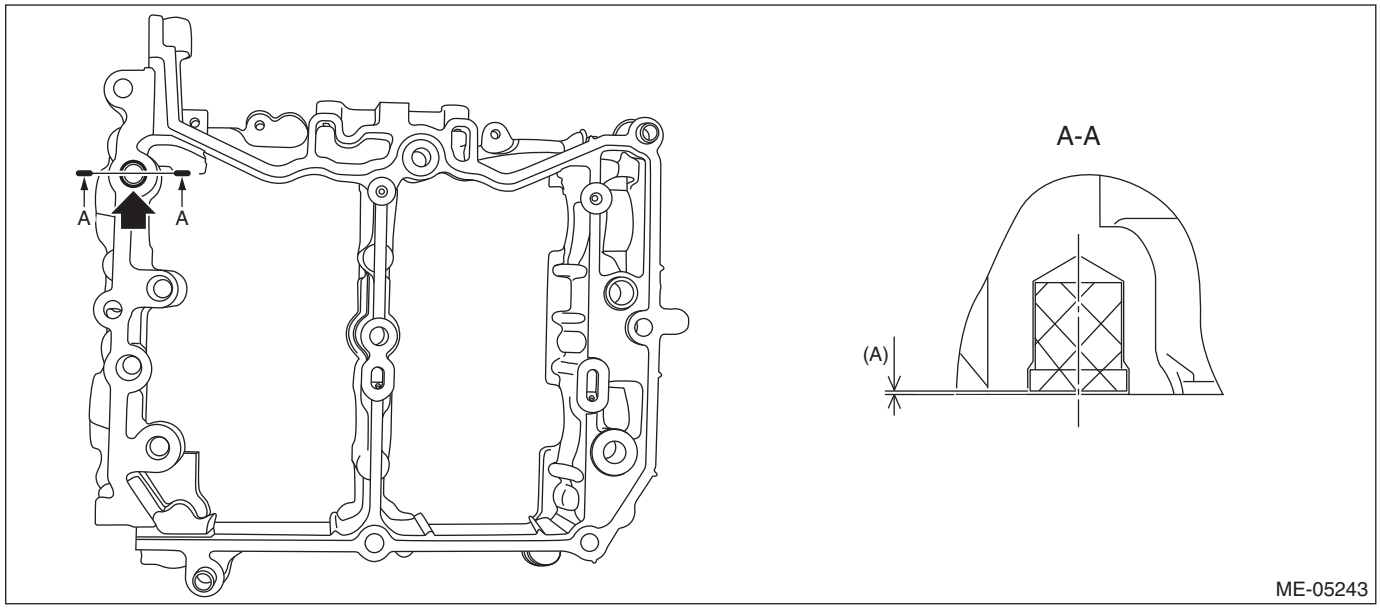
D: ASSEMBLY

1. CAM CARRIER RH

1) Install the filter to the cam carrier RH.

NOTE:
Use a new filter.

Filter insert position:
Cam carrier RH end face $0^{+0}_{-0.5}$ mm ($^{+0}_{-0.0197}$ in) position



(A) 0 — 0.5 mm (0 — 0.0197 in)

2) Set the intake camshaft RH and the exhaust camshaft RH to the cam carrier RH.

NOTE:
Apply engine oil to the journals of cam carrier RH before setting the intake camshaft RH and exhaust camshaft RH.

3) Install the front camshaft cap RH, intake center camshaft cap RH, intake rear camshaft cap RH, exhaust center camshaft cap RH and exhaust rear camshaft cap RH.

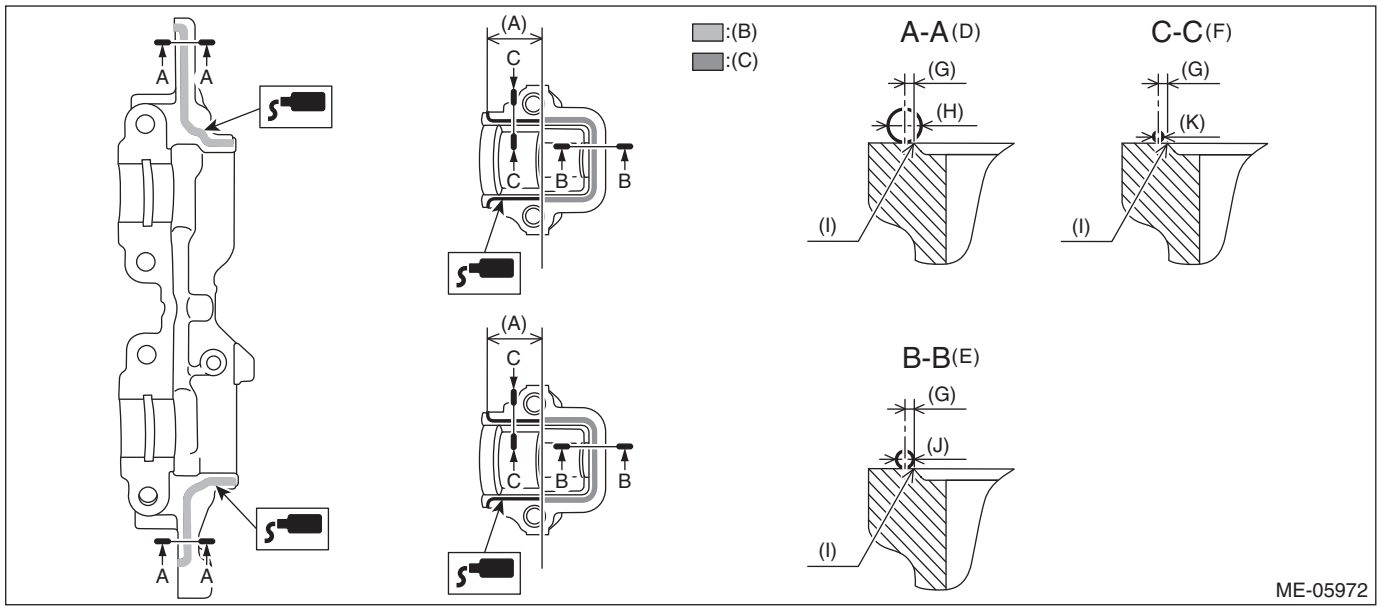
(1) Apply liquid gasket to the mating surface of front camshaft cap RH, intake rear camshaft cap RH and exhaust rear camshaft cap RH as shown in the figure.

CAUTION:
• Do not apply liquid gasket excessively. Applying excessively may cause excess gasket to flow toward cam journal, resulting in engine seizure.
• Do not apply liquid gasket excessively to the intake center camshaft cap RH and exhaust center camshaft cap RH.

NOTE:
• Before applying liquid gasket, remove oil from liquid gasket seal surface of the front camshaft cap RH, intake rear camshaft cap RH, exhaust rear camshaft cap RH and cam carrier RH.
• Install within 5 min. after applying liquid gasket.

Liquid gasket:
THREE BOND 1217G (Part No. 0877Y0100) or equivalent

Liquid gasket applying diameter:
Mating surfaces other than ranges A and B
1±0.5 mm (0.0394±0.0197 in)
Mating surfaces of range A
3.5±0.5 mm (0.1378±0.0197 in)
Mating surfaces of range B
2±0.5 mm (0.0787±0.0197 in)

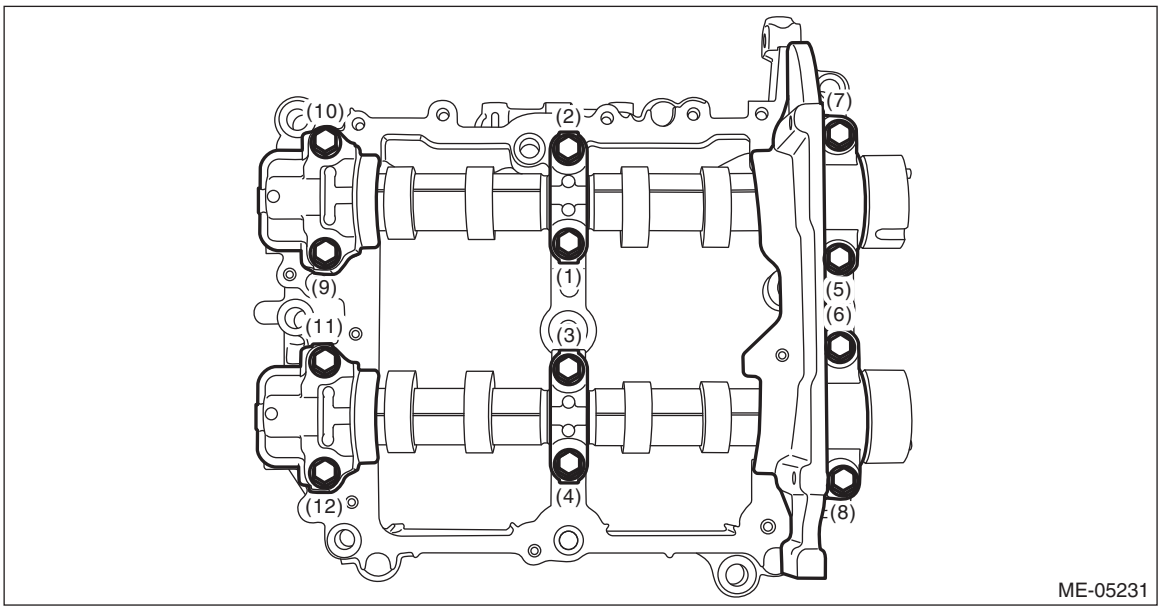


(A)	28.5 mm (1.122 in)	(E)	Liquid gasket applying position of mating surfaces of range B	(I)	Chamfer edge
(B)	Range A	(F)	Liquid gasket applying position of mating surfaces other than range A and range B	(J)	ϕ2±0.5 mm (0.0787±0.0197 in)
(C)	Range B	(G)	1 mm (0.0394 in) or less	(K)	ϕ1±0.5 mm (0.0394±0.0197 in)
(D)	Liquid gasket applying position of mating surfaces of range A	(H)	ϕ3.5±0.5 mm (0.1378±0.0197 in)		

(2) Apply engine oil to the journals of each camshaft cap before setting the camshaft cap.

(3) Tighten the bolts which secure front camshaft cap RH, intake center camshaft cap RH, intake rear camshaft cap RH, exhaust center camshaft cap RH and exhaust rear camshaft cap RH in numerical order as shown in the figure.

Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)

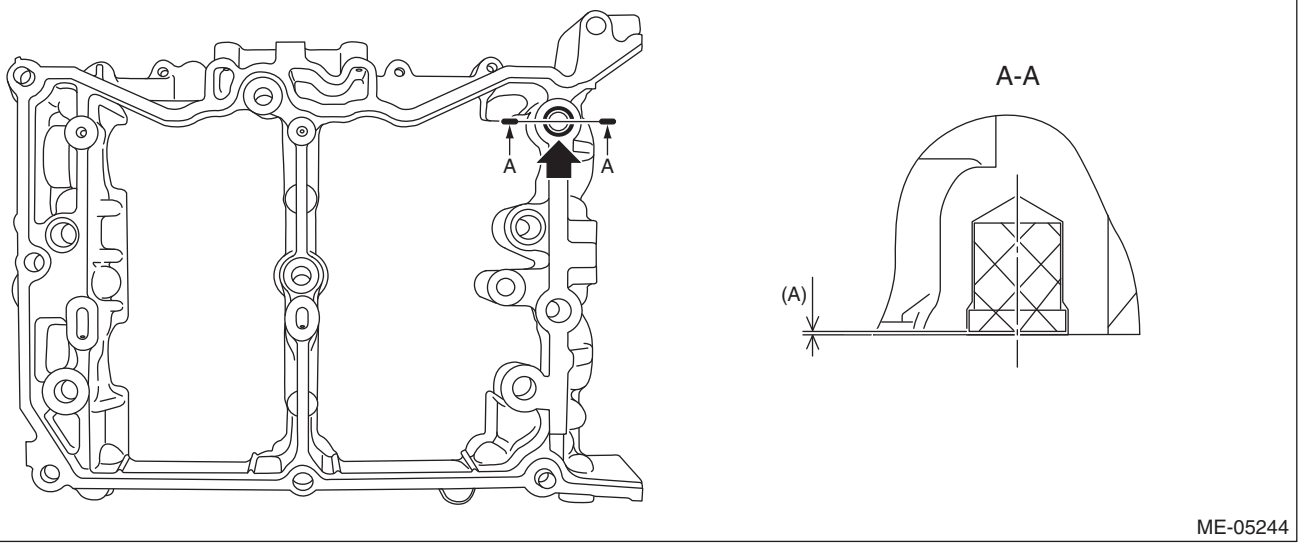


2. CAM CARRIER LH

1) Install the filter to the cam carrier LH.

NOTE:
Use a new filter.

Filter insert position:
Cam carrier LH end face $0^{+0}_{-0.5}$ mm ($^{+0}_{-0.0197}$ in) position



(A) 0 — 0.5 mm (0 — 0.0197 in)

2) Set the intake camshaft LH and the exhaust camshaft LH to the cam carrier LH.

NOTE:
Apply engine oil to the journals of cam carrier LH before setting the intake camshaft LH and exhaust camshaft LH.

3) Install the front camshaft cap LH, intake center camshaft cap LH, intake rear camshaft cap LH, exhaust center camshaft cap LH and exhaust rear camshaft cap LH.

(1) Apply liquid gasket to the mating surface of front camshaft cap LH, intake rear camshaft cap LH and exhaust rear camshaft cap LH as shown in the figure.

CAUTION:
• Do not apply liquid gasket excessively. Applying excessively may cause excess gasket to flow toward cam journal, resulting in engine seizure.
• Do not apply liquid gasket excessively to the intake center camshaft cap LH and exhaust center camshaft cap LH.

NOTE:
• Before applying liquid gasket, remove oil from liquid gasket seal surface of the front camshaft cap LH, intake rear camshaft cap LH, exhaust rear camshaft cap LH and cam carrier LH.
• Install within 5 min. after applying liquid gasket.

Liquid gasket:
THREE BOND 1217G (Part No. 0877Y0100) or equivalent

Liquid gasket applying diameter:

Mating surfaces other than ranges A, B and C

1±0.5 mm (0.0394±0.0197 in)

Mating surfaces of range A

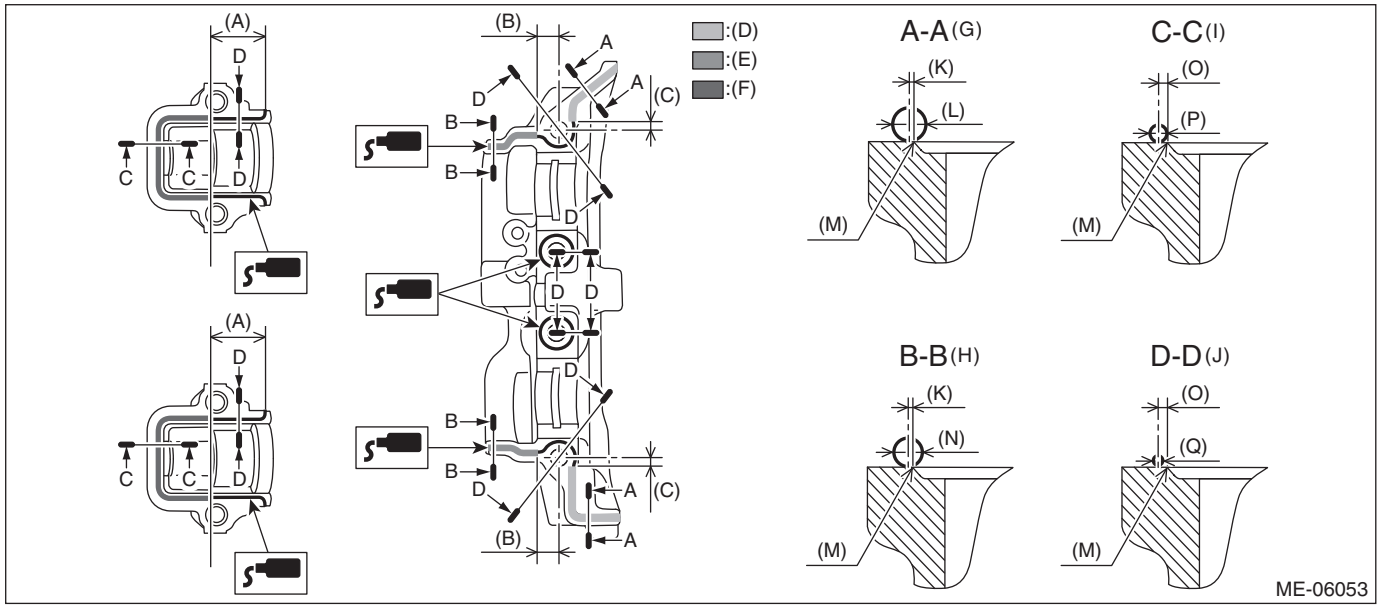
3.5±0.5 mm (0.1378±0.0197 in)

Mating surfaces of range B

3±0.5 mm (0.1181±0.0197 in)

Mating surfaces of range C

2±0.5 mm (0.0787±0.0197 in)

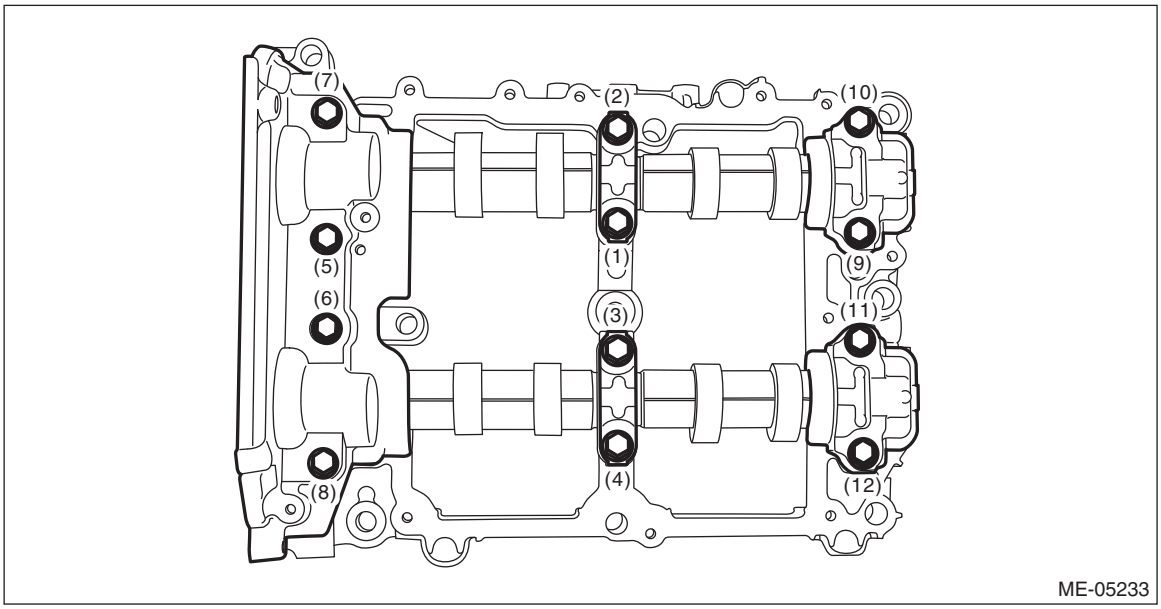


(A)	28.5 mm (1.122 in)	(G)	Liquid gasket applying position of mating surfaces of range A	(M)	Chamfer edge
(B)	11.6 mm (0.4567 in)	(H)	Liquid gasket applying position of mating surfaces of range B	(N)	ϕ3±0.5 mm (0.1181±0.0197 in)
(C)	5.1 mm (0.2008 in)	(I)	Liquid gasket applying position of mating surfaces of range C	(O)	1 mm (0.0394 in) or less
(D)	Range A	(J)	Liquid gasket applying position of mating surfaces other than range A, range B and range C	(P)	ϕ2±0.5 mm (0.0787±0.0197 in)
(E)	Range B	(K)	0.5 mm (0.0197 in)	(Q)	ϕ1±0.5 mm (0.0394±0.0197 in)
(F)	Range C	(L)	ϕ3.5±0.5 mm (0.1378±0.0197 in)		

(2) Apply engine oil to the journals of each camshaft cap before setting the camshaft cap.

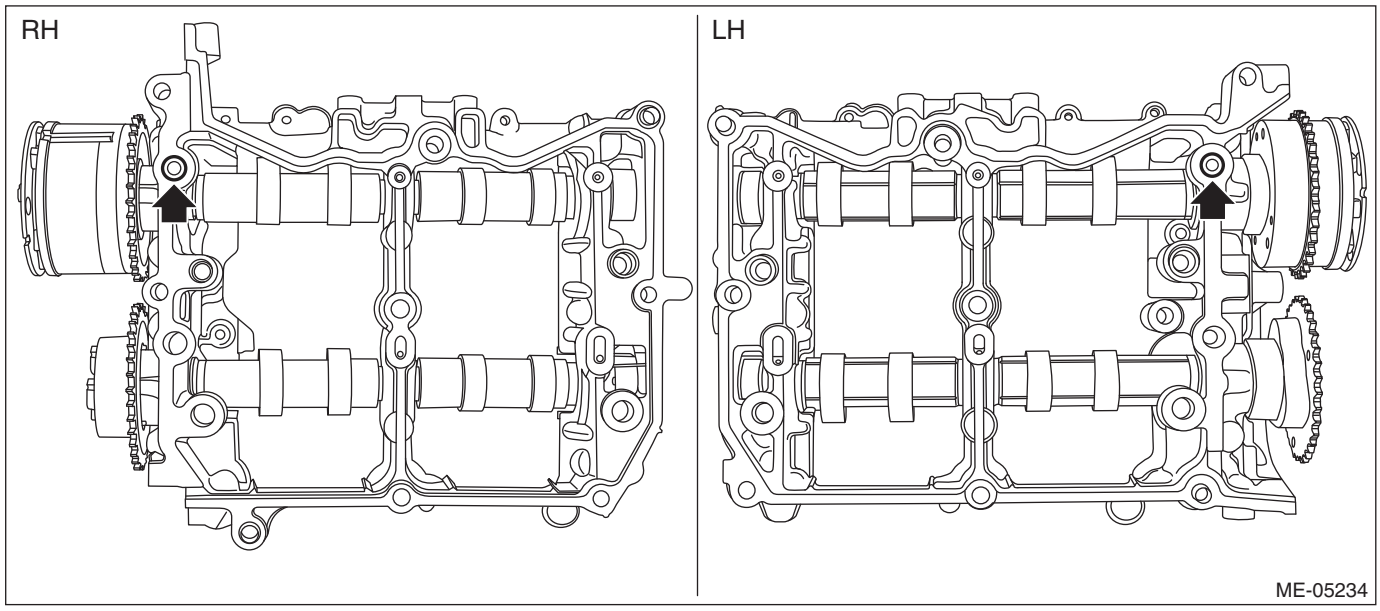
(3) Tighten the bolts which secure front camshaft cap LH, intake center camshaft cap LH, intake rear camshaft cap LH, exhaust center camshaft cap LH and exhaust rear camshaft cap LH in numerical order as shown in the figure.

Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)



E: INSPECTION

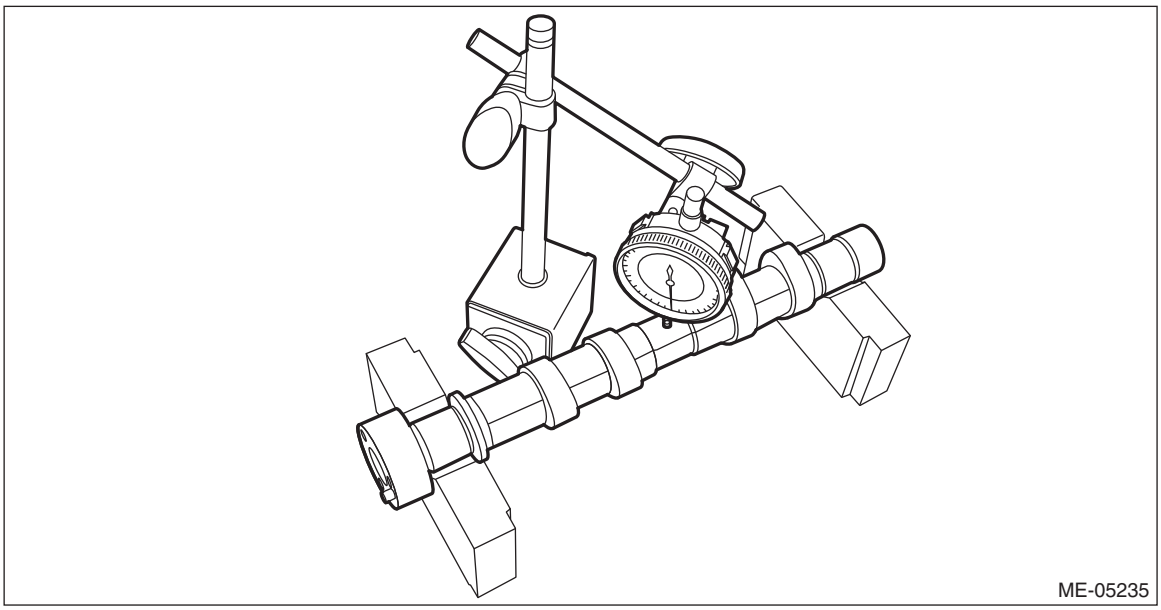
1) Visually check the cam carrier filter, and if clogging is found, replace with a new part.



2) Check the camshaft journals for damage and wear. Replace the camshaft if faulty.
3) Check the cam face condition of camshaft, and remove the minor faults by grinding with oil stone. Replace the camshaft if uneven wear is found.
4) Using a dial gauge, check the camshaft bend. If it exceeds the limit, replace the camshaft.

NOTE:
Measurement should be performed at a temperature of 20°C (68°F).

Camshaft bend limit:
0.020 mm (0.00079 in)



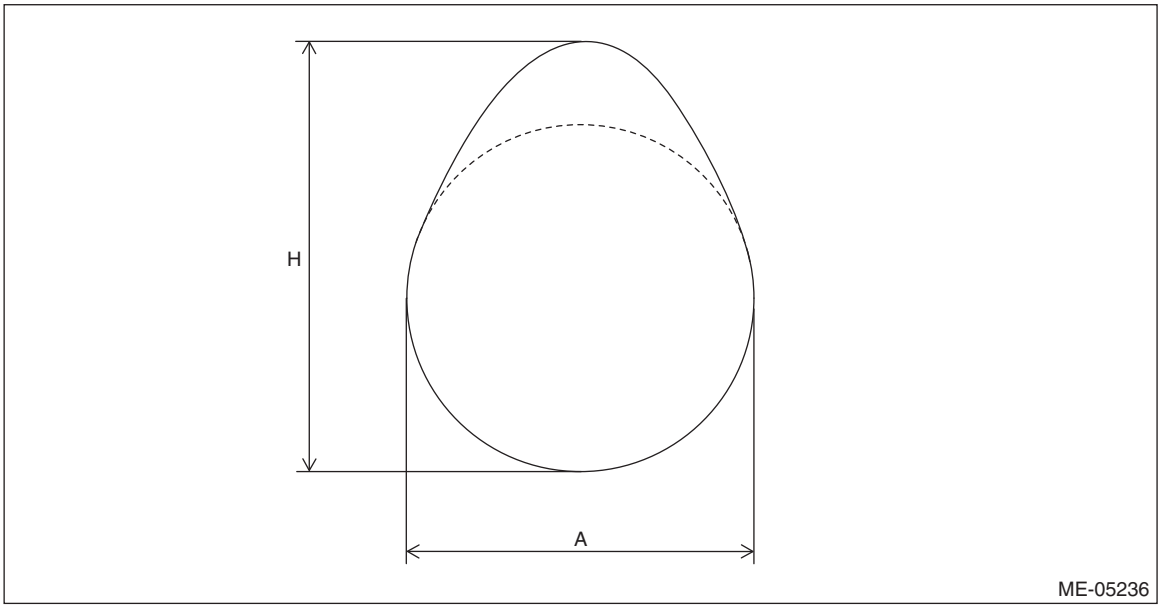
5) Check the cam lobe height “H” and cam base circle diameter “A” of camshaft using micrometer. If it is not within the standard, replace the camshaft.

NOTE:
Measurement should be performed at a temperature of 20°C (68°F).

Cam lobe height H:

Standard
Intake
40.89 — 40.99 mm (1.610 — 1.614 in)
Exhaust
40.15 — 40.25 mm (1.581 — 1.585 in)

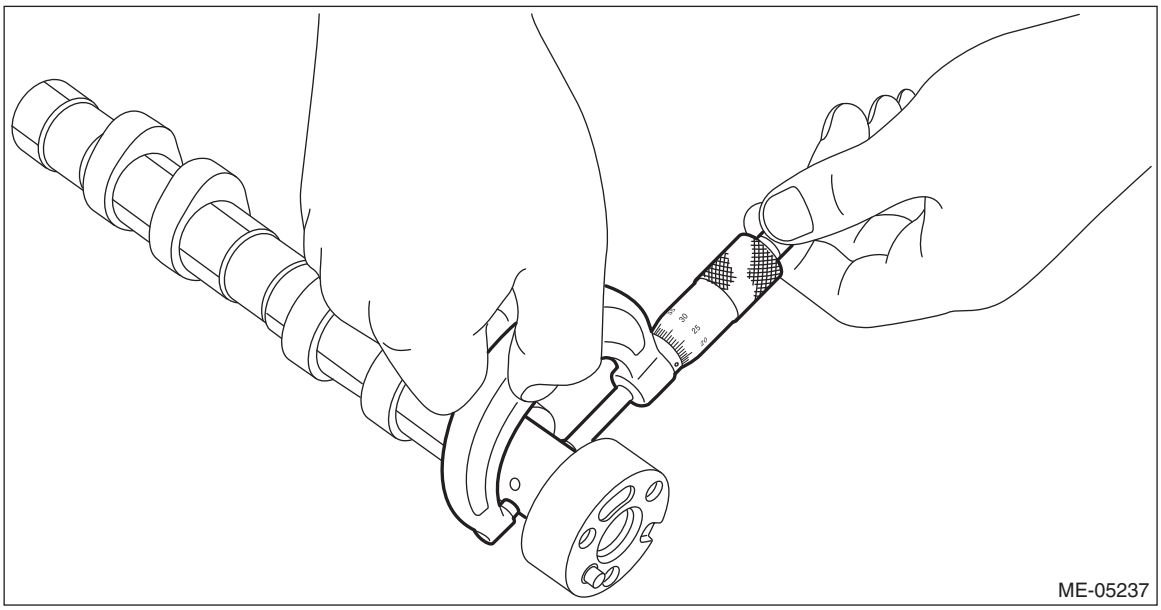
Cam base circle diameter A:
Standard
34.0 mm (1.339 in)



6) Check the camshaft journal outer diameter using micrometer. If it is not within the standard, check the oil clearance. Refer to step 7) for inspection procedure of oil clearance.

NOTE:
Measurement should be performed at a temperature of 20°C (68°F).

Camshaft journal O.D.:
Standard
25.946 — 25.963 mm (1.0215 — 1.0222 in)

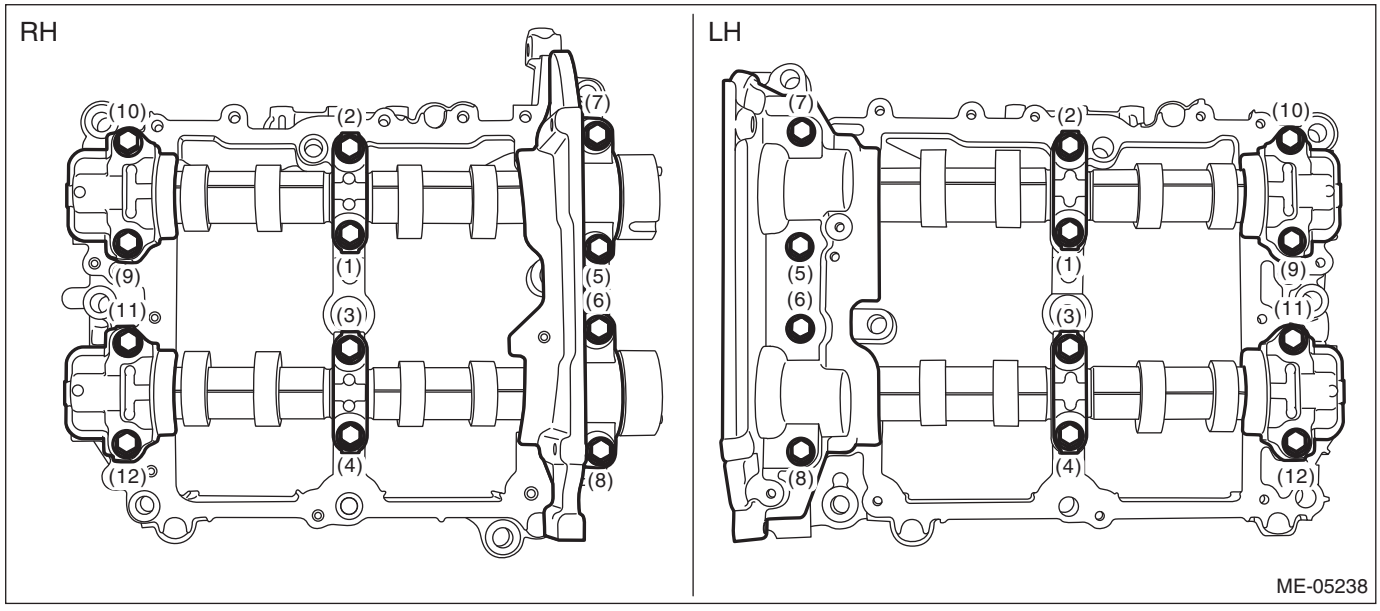


7) Check the oil clearance of camshaft journals using plastigauge.

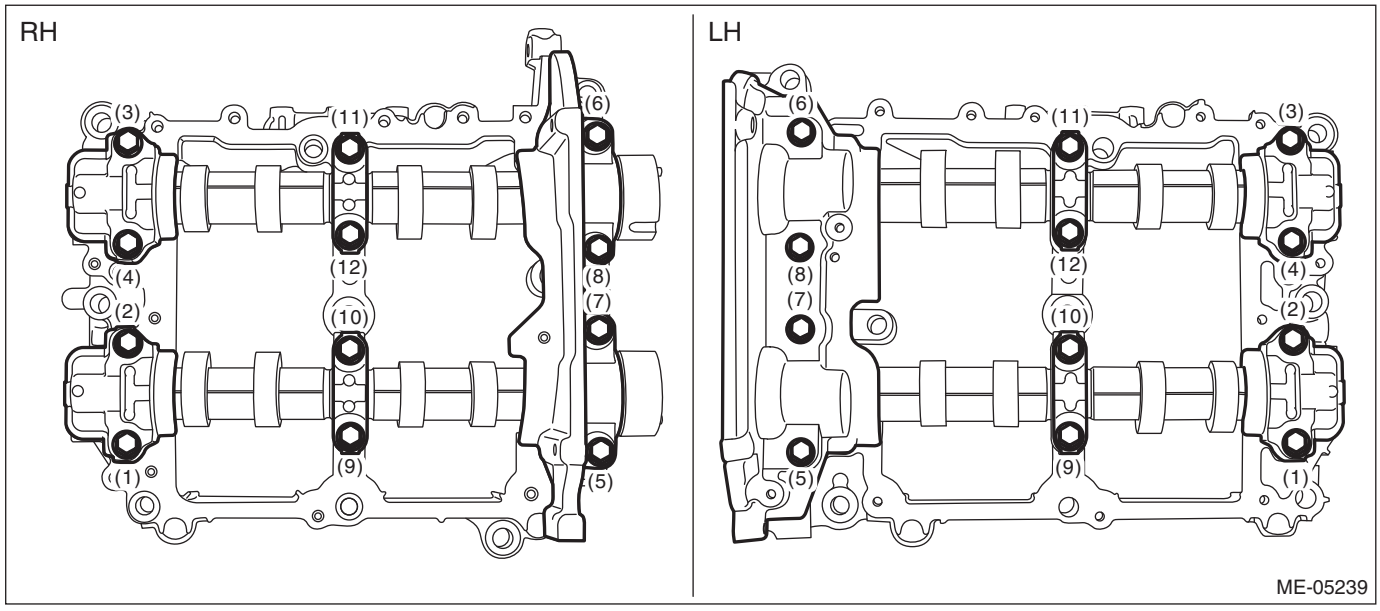
NOTE:
Measurement should be performed at a temperature of 20°C (68°F).

(1) Remove the liquid gasket from cam carrier and front camshaft cap, intake rear camshaft cap and exhaust rear camshaft cap.
(2) Clean each camshaft cap and cam carrier journals.
(3) Set the camshaft to the cam carrier.
(4) Place a plastigauge across the camshaft journals of each camshaft and set the camshaft caps.
(5) Tighten the bolts which secure front camshaft cap, intake center camshaft cap, intake rear camshaft cap, exhaust center camshaft cap and exhaust rear camshaft cap in numerical order as shown in the figure.

Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)



(6) Loosen the bolts (front camshaft cap, intake center camshaft cap, intake rear camshaft cap, exhaust center camshaft cap and exhaust rear camshaft cap) equally, a little at a time in numerical sequence as shown in the figure, and remove the camshaft cap.

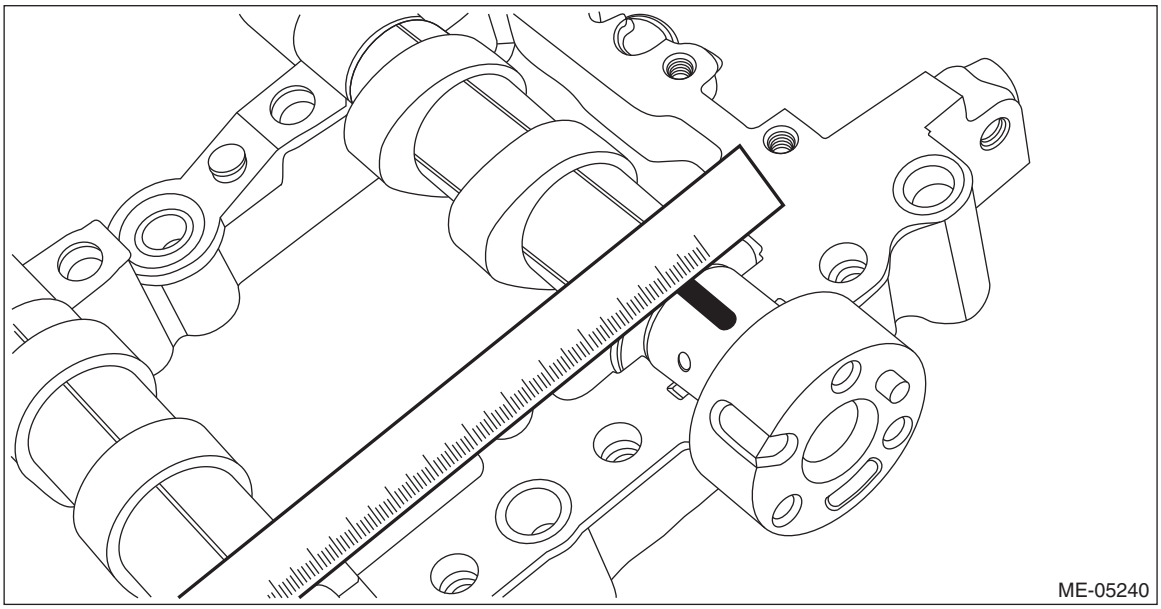


(7) Measure the widest point of the plastigauge on each journal. If it is not within the standard, replace the camshaft. If necessary, replace each camshaft cap and cam carrier as a set.

Oil clearance of camshaft journals:

Standard

0.037 — 0.072 mm (0.0015 — 0.0028 in)



(8) Completely remove the plastigauge.

8) Using a dial gauge, check the thrust clearance. If it is not within the standard or if uneven wear is found, replace each camshaft cap and cam carrier as a set. If necessary replace the camshaft.

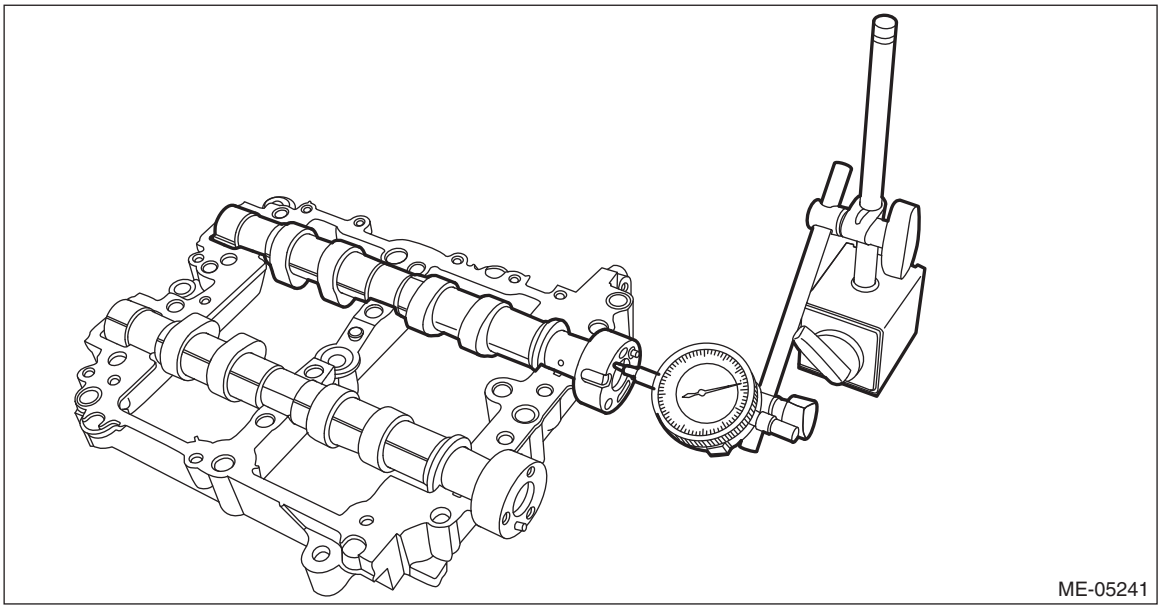
NOTE:

- Measurement should be performed at a temperature of 20°C (68°F).
- Set the dial gauge at end surface of camshaft.

Camshaft thrust clearance:

Standard

0.068 — 0.116 mm (0.0027 — 0.0047 in)

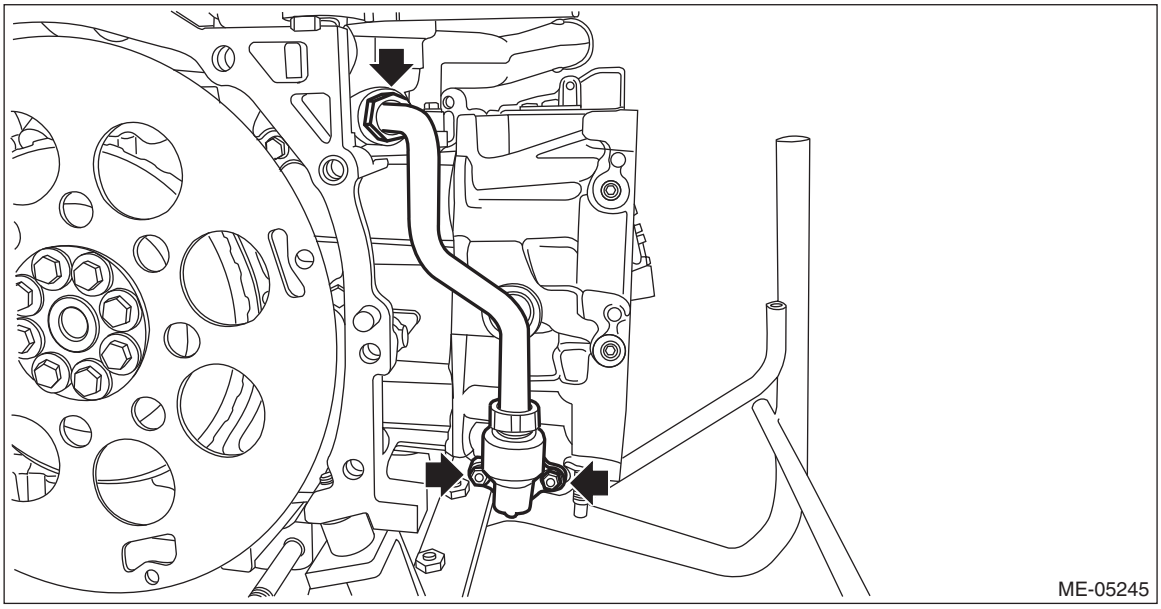


21.Cylinder Head

A: REMOVAL

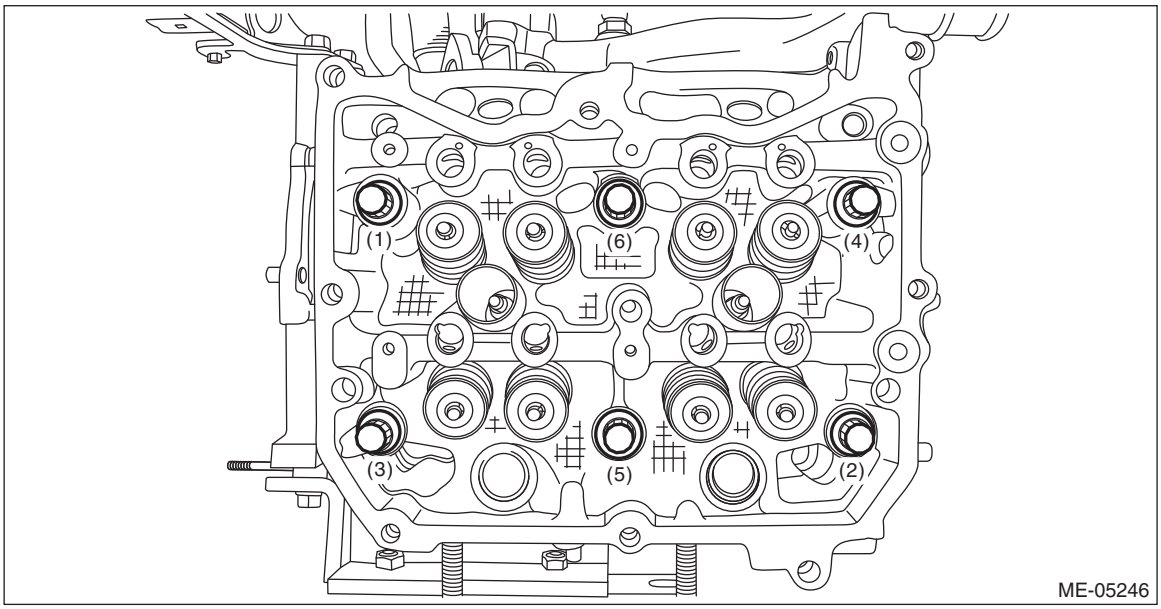
1. CYLINDER HEAD RH

1) Remove the engine from the vehicle. <Ref. to ME(H4DO)-44, REMOVAL, Engine Assembly.>
2) Remove the intake manifold. <Ref. to FU(H4DO)-21, REMOVAL, Intake Manifold.>
3) Remove the tumble generator valve assembly RH. <Ref. to FU(H4DO)-84, REMOVAL, Tumble Generator Valve Assembly.>
4) Remove the chain cover. <Ref. to ME(H4DO)-91, REMOVAL, Chain Cover.>
5) Remove the rocker cover RH. <Ref. to ME(H4DO)-139, ROCKER COVER RH, REMOVAL, Rocker Cover.>
6) Remove the cam carrier RH. <Ref. to ME(H4DO)-152, CAM CARRIER RH, REMOVAL, Cam Carrier.>
7) Remove the EGR pipe assembly from the water pipe assembly and the cylinder block RH.



8) Loosen the bolts holding the cylinder head RH equally, a little at a time in numerical sequence and while leaving the cylinder head bolts (1) and (4) engaged by three or four threads, remove the other cylinder head bolts.

NOTE:
Leave the cylinder head bolts (1) and (4) engaged by three or four threads to prevent the cylinder head RH from falling.



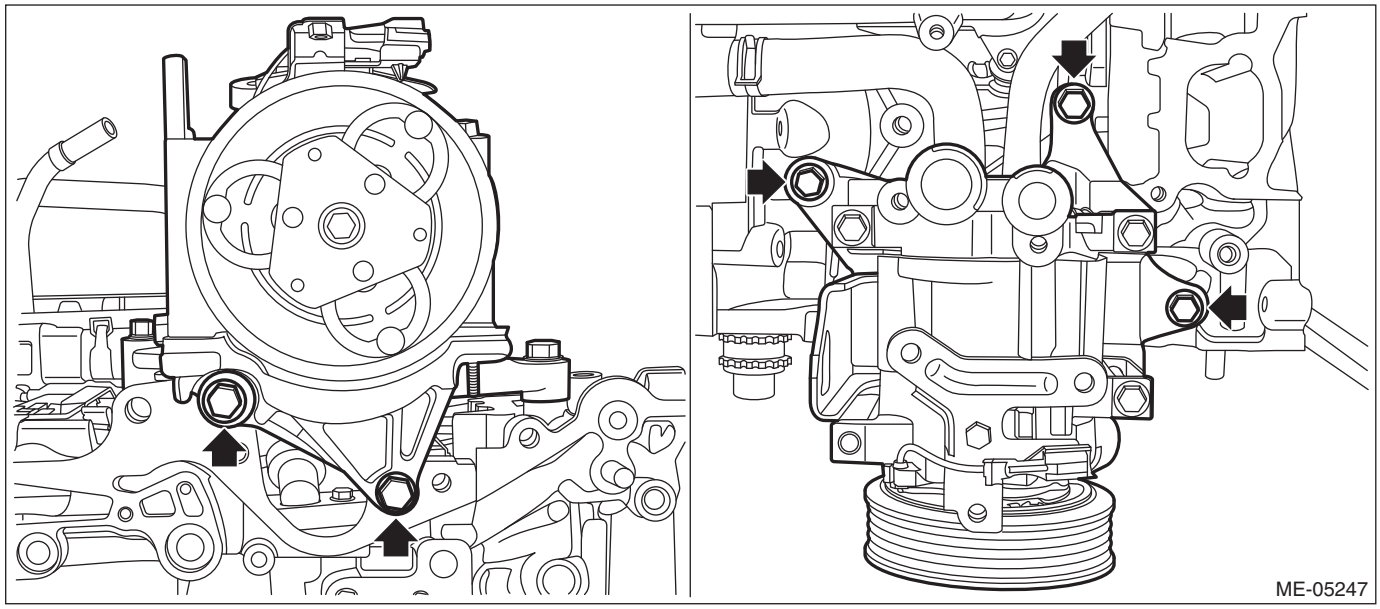
9) While tapping the cylinder head RH with a plastic hammer, separate it from cylinder block RH.
10) Remove the bolts (1) and (4) to remove cylinder head RH.
11) Remove the cylinder head gasket RH.

CAUTION:
Be careful not to scratch the mating surface of cylinder head and cylinder block.
12) Remove the liquid gasket from cylinder head RH and cam carrier RH.

2. CYLINDER HEAD LH

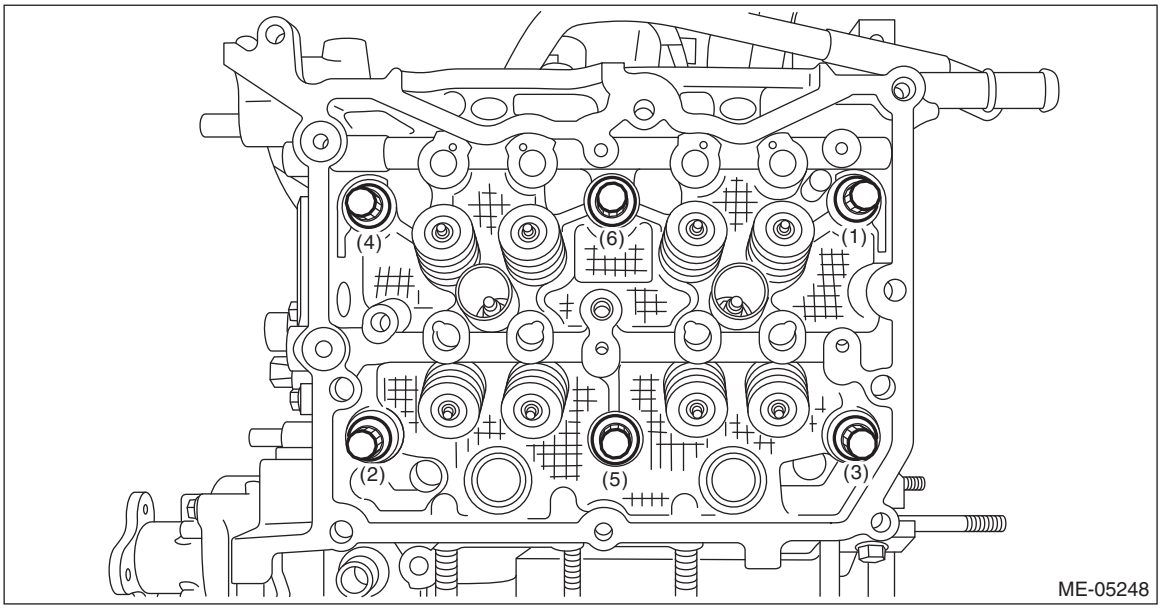
1) Remove the engine from the vehicle. <Ref. to ME(H4DO)-44, REMOVAL, Engine Assembly.>
2) Remove the intake manifold. <Ref. to FU(H4DO)-21, REMOVAL, Intake Manifold.>
3) Remove the tumble generator valve assembly LH. <Ref. to FU(H4DO)-84, REMOVAL, Tumble Generator Valve Assembly.>
4) Remove the chain cover. <Ref. to ME(H4DO)-91, REMOVAL, Chain Cover.>
5) Remove the rocker cover LH. <Ref. to ME(H4DO)-141, ROCKER COVER LH, REMOVAL, Rocker Cover.>
6) Remove the cam carrier LH. <Ref. to ME(H4DO)-156, CAM CARRIER LH, REMOVAL, Cam Carrier.>

7) Remove the bolt securing the A/C compressor bracket to the cylinder head LH, and remove the A/C compressor bracket.



8) Loosen the bolts holding the cylinder head LH equally, a little at a time in numerical sequence and while leaving the cylinder head bolts (1) and (4) engaged by three or four threads, remove the other cylinder head bolts.

NOTE:
Leave the cylinder head bolts (1) and (4) engaged by three or four threads to prevent the cylinder head LH from falling.



9) While tapping the cylinder head LH with a plastic hammer, separate it from cylinder block LH.
10) Remove the cylinder head bolts (1) and (4) to remove cylinder head LH.
11) Remove the cylinder head gasket LH.

CAUTION:
Be careful not to scratch the mating surface of cylinder head and cylinder block.
12) Remove the liquid gasket from cylinder head LH and cam carrier LH.

B: INSTALLATION

1. CYLINDER HEAD RH

1) Clean the bolt holes in the cylinder block RH.

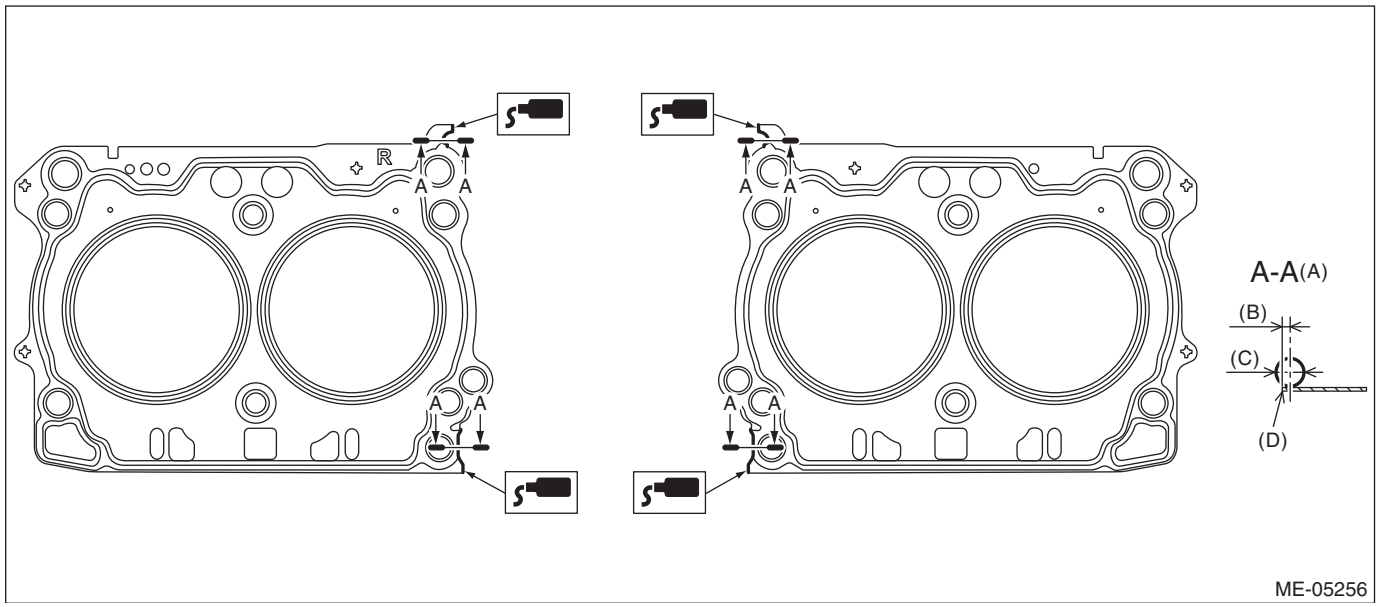
CAUTION:
To avoid erroneous tightening of the bolts, clean out the bolt holes sufficiently by blowing with compressed air to eliminate engine coolant etc.

2) Apply liquid gasket to both sides of the cylinder head gasket RH as shown in the figure.

NOTE:
- Use a new cylinder head gasket RH.
- Before applying liquid gasket, remove oil from the mating surface of the cylinder block RH and the cylinder head RH.
- Install within 5 min. after applying liquid gasket.

Liquid gasket:
THREE BOND 1217G (Part No. 0877Y0100) or equivalent

Liquid gasket applying diameter:
3±1 mm (0.1181±0.0394 in)



(A) Liquid gasket applying position
(B) 1 mm (0.0394 in) or less
(C) ϕ3±1 mm (0.1181±0.0394 in)
(D) Cylinder head gasket edge

3) Attach the cylinder head gasket RH.

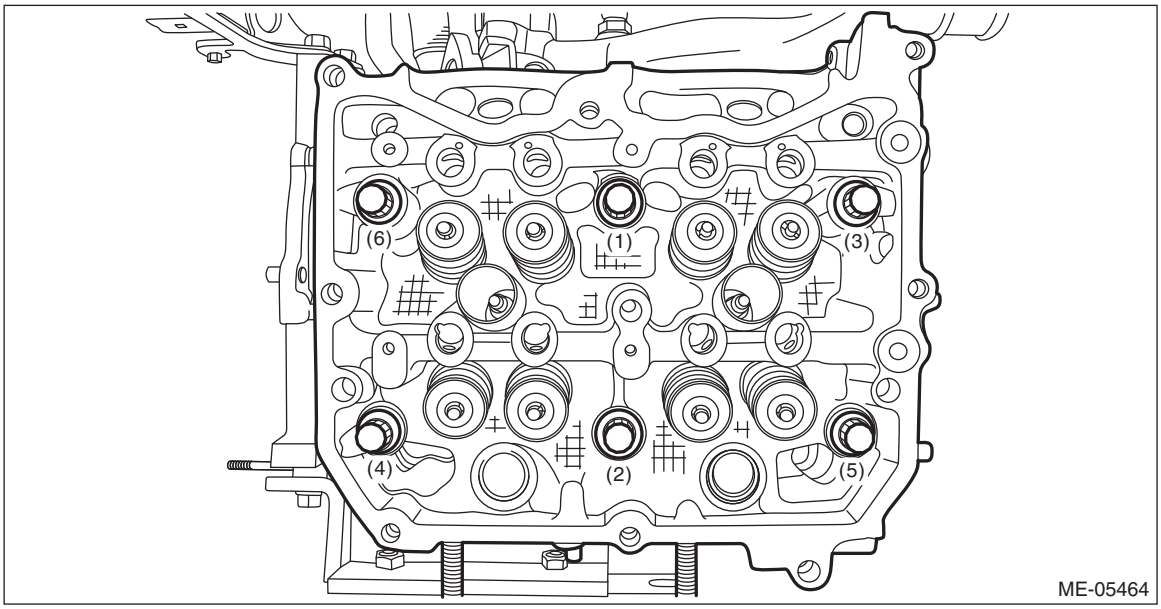
NOTE:
Check that liquid gasket RH is squeezed out from the cylinder head gasket.

4) Install the cylinder head RH to the cylinder block RH.

CAUTION:
Be careful not to scratch the mating surface of cylinder head RH and cylinder block RH.

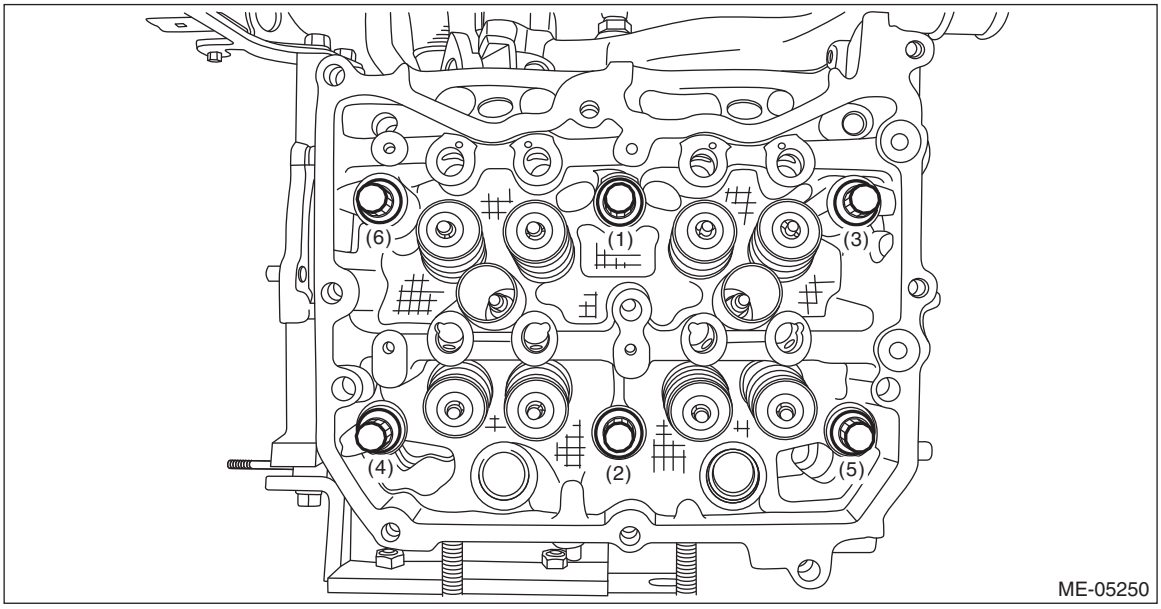
(1) Clean the cylinder head bolt threads and apply sufficient engine oil to the washer and cylinder head bolts threads.

(2) Mount the cylinder head RH onto the cylinder block RH, then tighten all bolts with a torque of 29 N·m (3.0 kgf-m, 21.4 ft-lb) in numerical order as shown in the figure.

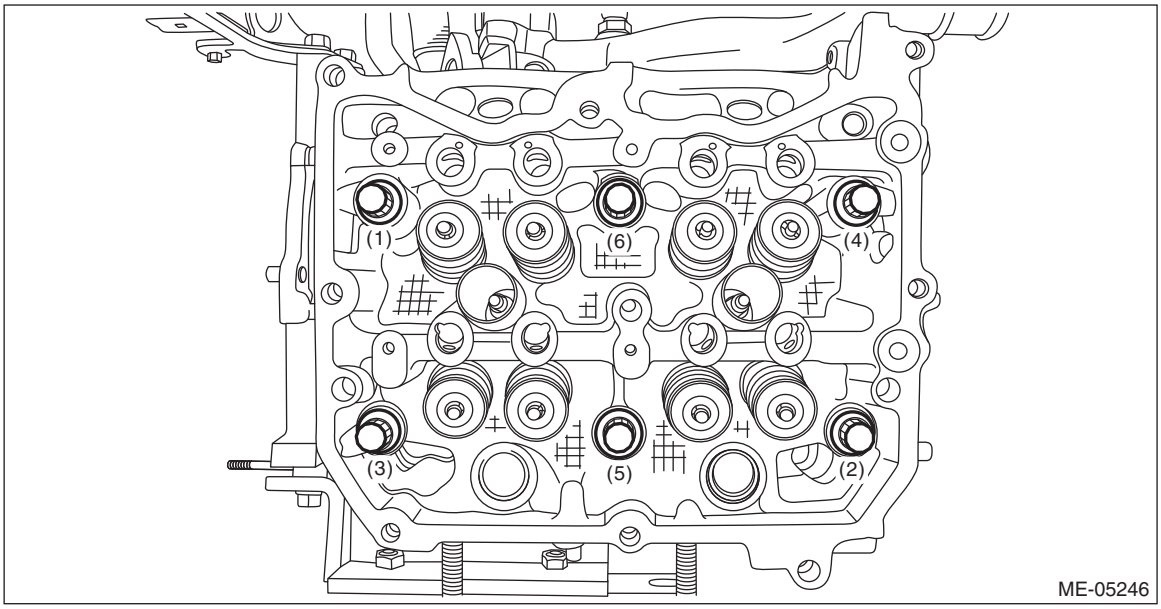


(3) Tighten all cylinder head bolts further with a torque of 100 N·m (10.2 kgf-m, 73.8 ft-lb) in numerical order as shown in the figure.

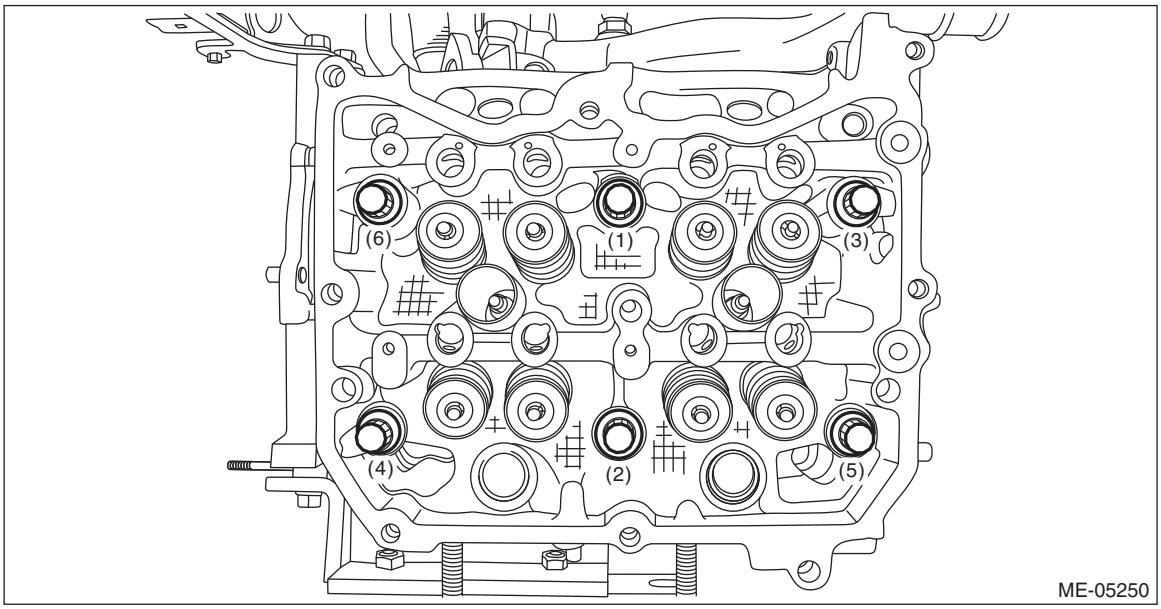
CAUTION:
If the bolt makes stick-slip sound during tightening, repeat the procedure from step 1). In that case, the cylinder head gasket RH can be reused. But it is necessary to remove liquid gasket completely from cylinder block RH, cylinder head RH and cylinder head gasket RH and re-apply to them.



(4) Loosen all cylinder head bolts 180° in numerical order as shown in the figure, and then loosen all cylinder head bolts 180° further in numerical order as shown in the figure.



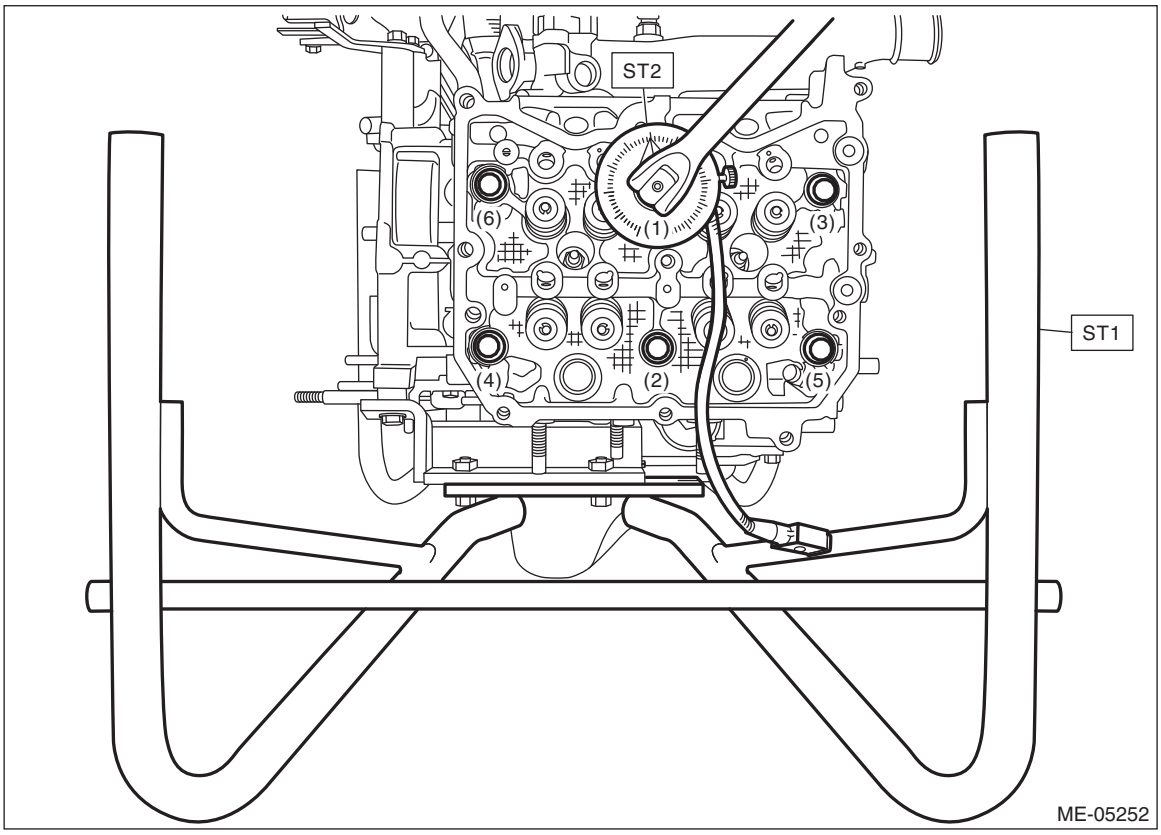
(5) Tighten all cylinder head bolts with a torque of 42 N·m (4.3 kgf-m, 31.0 ft-lb) in numerical order as shown in the figure.



(6) Tighten all cylinder head bolts with specified angle in numerical order as shown in the figure using ST2.

NOTE:
Attach the magnet used for securing the ST2 (ANGLE GAUGE) to ST1.
ST1 499817100 ENGINE STAND
ST2 18854AA000 ANGLE GAUGE

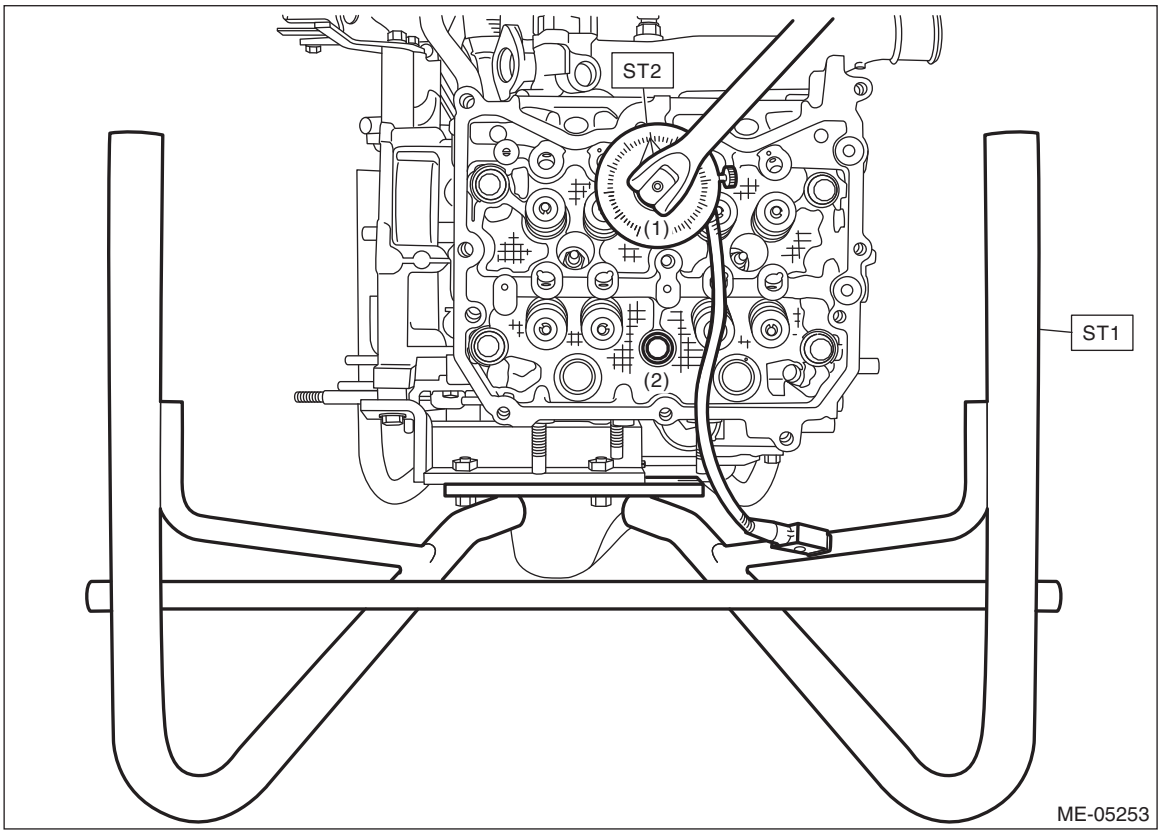
Tightening angle:
80°±2°



(7) Tighten the cylinder head bolts (2 places) with specified angle in numerical order as shown in the figure using ST2.

NOTE:
Attach the magnet used for securing the ST2 (ANGLE GAUGE) to ST1.
ST1 499817100 ENGINE STAND
ST2 18854AA000 ANGLE GAUGE

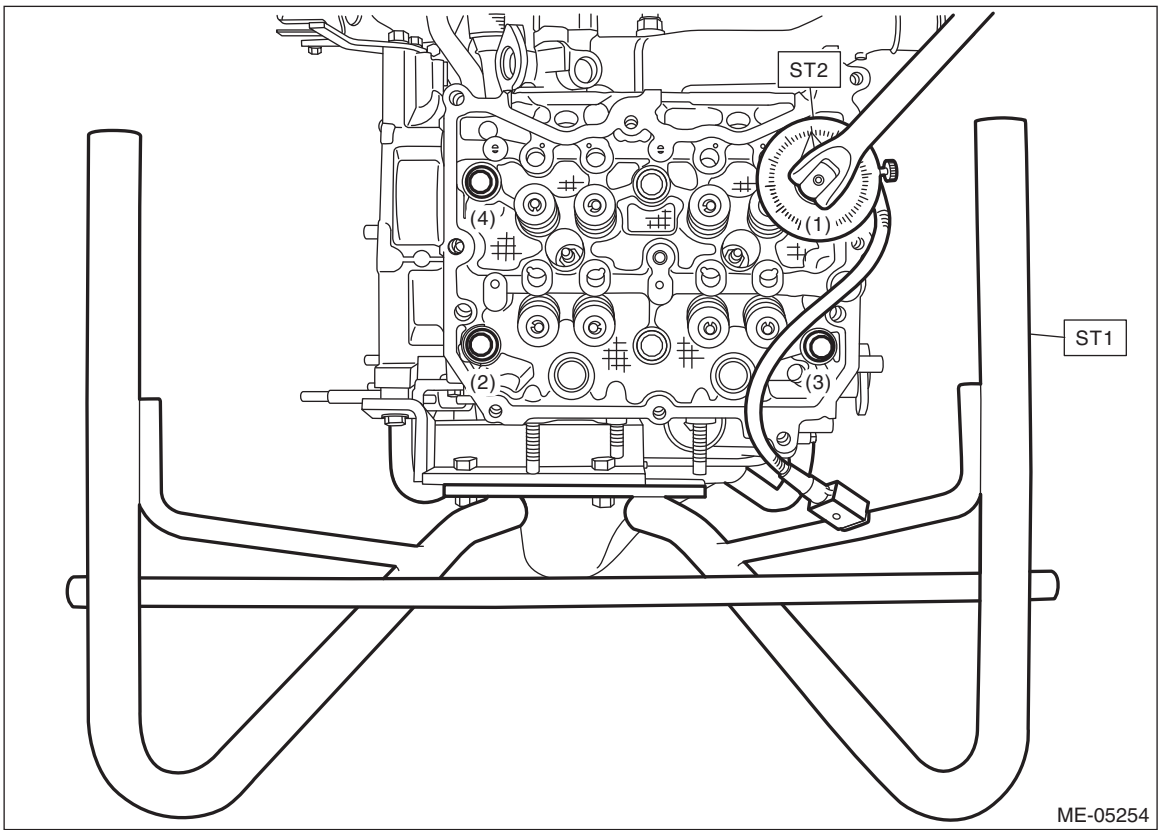
Tightening angle:
75°±2°



(8) Tighten the cylinder head bolts (4 places) with specified angle in numerical order as shown in the figure using ST2.

NOTE:
• After tightening, if the liquid gasket is squeezed out onto the seal surface of the chain cover, completely remove any squeezed-out liquid gasket.
• Attach the magnet used for securing the ST2 (ANGLE GAUGE) to ST1.
ST1 499817100 ENGINE STAND
ST2 18854AA000 ANGLE GAUGE

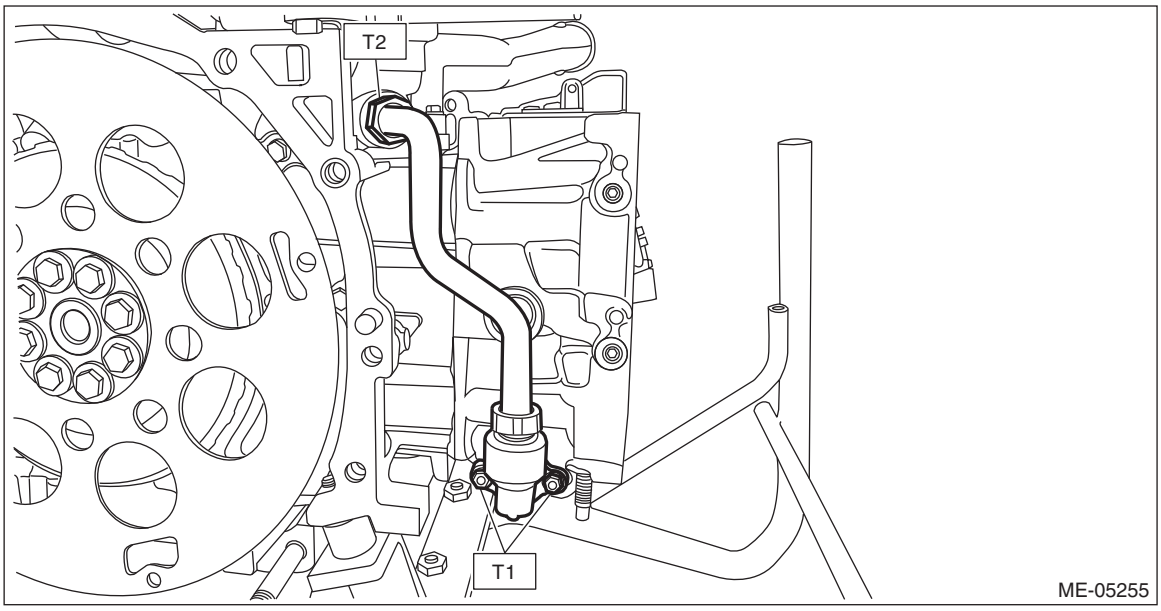
Tightening angle:
30°±2°



5) Install the EGR pipe assembly to the water pipe assembly and the cylinder block RH.

NOTE:
Use a new gasket.

Tightening torque:
T1: 6.4 N·m (0.7 kgf-m, 4.7 ft-lb)
T2: 51 N·m (5.2 kgf-m, 37.6 ft-lb)



6) Install the cam carrier RH. <Ref. to ME(H4DO)-162, CAM CARRIER RH, INSTALLATION, Cam Carrier.>

7) Install the rocker cover RH. <Ref. to ME(H4DO)-144, ROCKER COVER RH, INSTALLATION, Rocker Cover.>
8) Install the chain cover. <Ref. to ME(H4DO)-96, INSTALLATION, Chain Cover.>
9) Install the tumble generator valve assembly RH. <Ref. to FU(H4DO)-86, INSTALLATION, Tumble Generator Valve Assembly.>
10) Install the intake manifold. <Ref. to FU(H4DO)-29, INSTALLATION, Intake Manifold.>
11) Install the engine to the vehicle. <Ref. to ME(H4DO)-56, INSTALLATION, Engine Assembly.>

2. CYLINDER HEAD LH

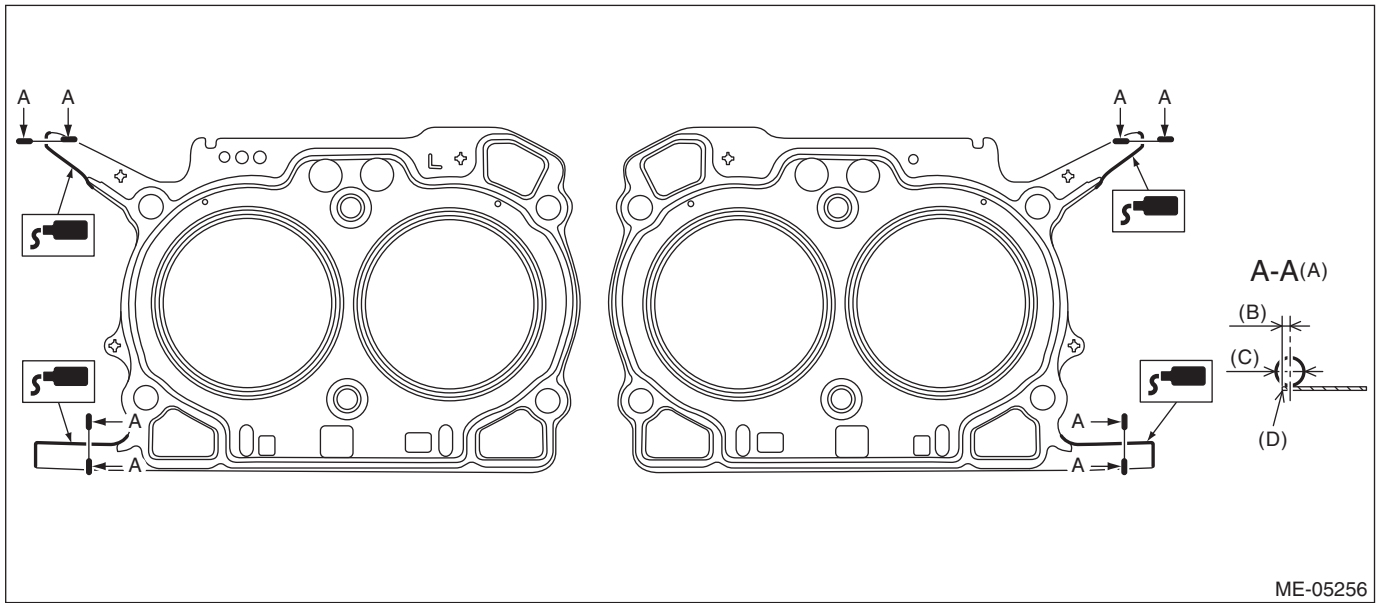
1) Clean the bolt holes in the cylinder block LH.

CAUTION:
To avoid erroneous tightening of the bolts, clean out the bolt holes sufficiently by blowing with compressed air to eliminate engine coolant etc.
2) Apply liquid gasket to both sides of the cylinder head gasket LH as shown in the figure.

NOTE:
- Use a new cylinder head gasket LH.
- Before applying liquid gasket, remove oil from the mating surface of the cylinder block LH and the cylinder head LH.
- Install within 5 min. after applying liquid gasket.

Liquid gasket:
THREE BOND 1217G (Part No. 0877Y0100) or equivalent

Liquid gasket applying diameter:
3±1 mm (0.1181±0.0394 in)



(A) Liquid gasket applying position
(B) 1 mm (0.0394 in) or less
(C) ϕ3±1 mm (0.1181±0.0394 in)
(D) Cylinder head gasket edge

3) Attach the cylinder head gasket LH.

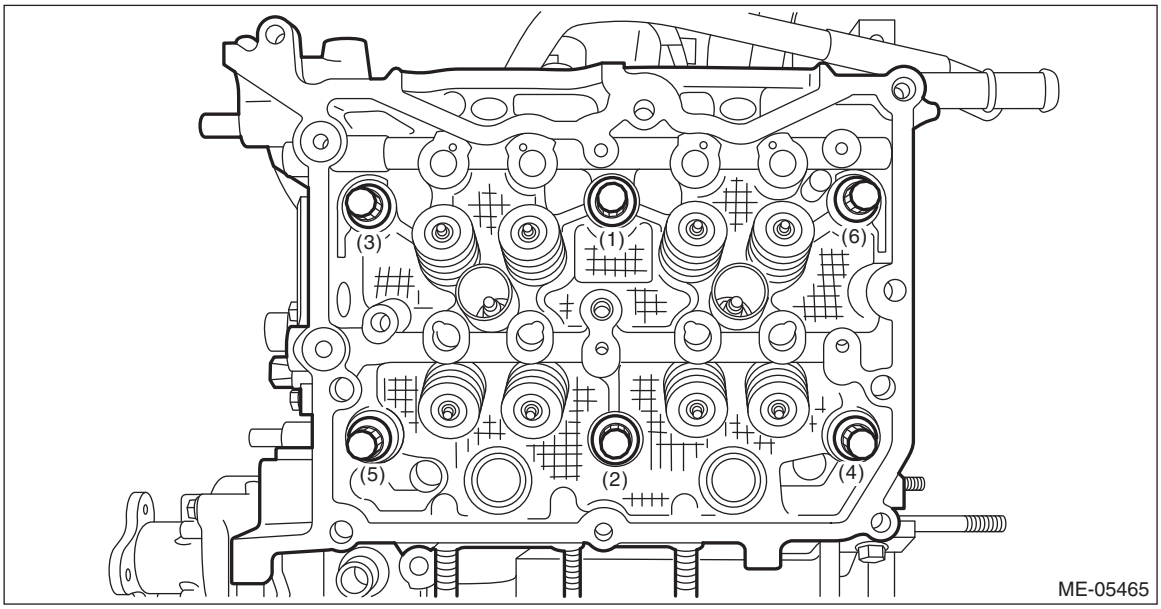
NOTE:
Check that liquid gasket is squeezed out from the cylinder head gasket LH.

4) Install the cylinder head LH to the cylinder block LH.

CAUTION:
Be careful not to scratch the mating surface of cylinder head LH and cylinder block LH.

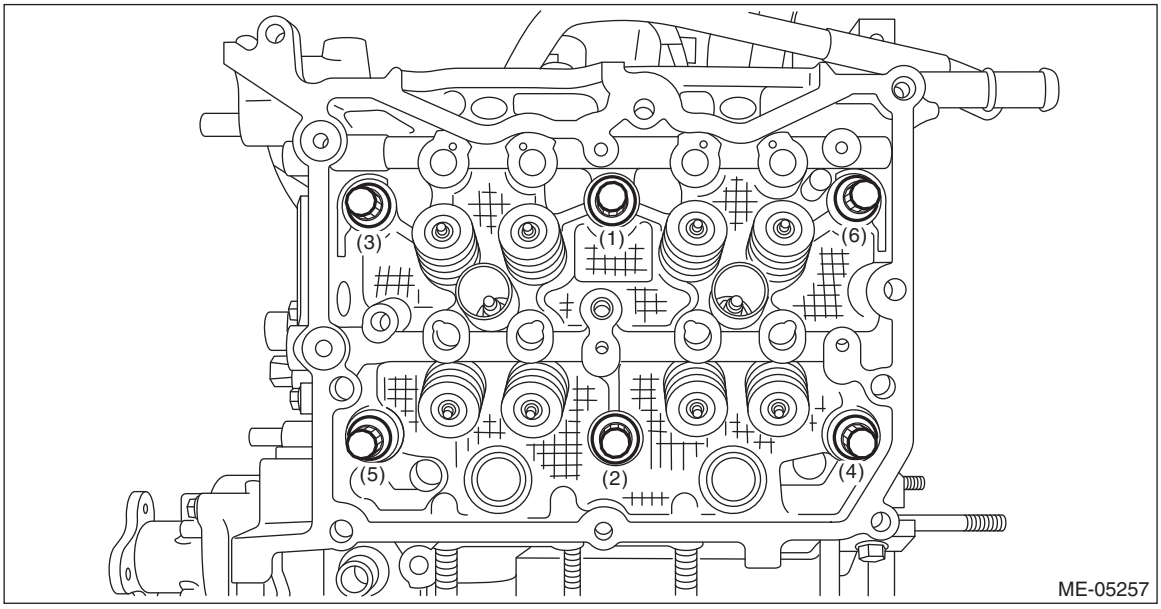
(1) Clean the cylinder head bolt threads and apply sufficient engine oil to the washer and cylinder head bolts threads.

(2) Mount the cylinder head LH onto the cylinder block LH, then tighten all bolts with a torque of 29 N·m (3.0 kgf-m, 21.4 ft-lb) in numerical order as shown in the figure.

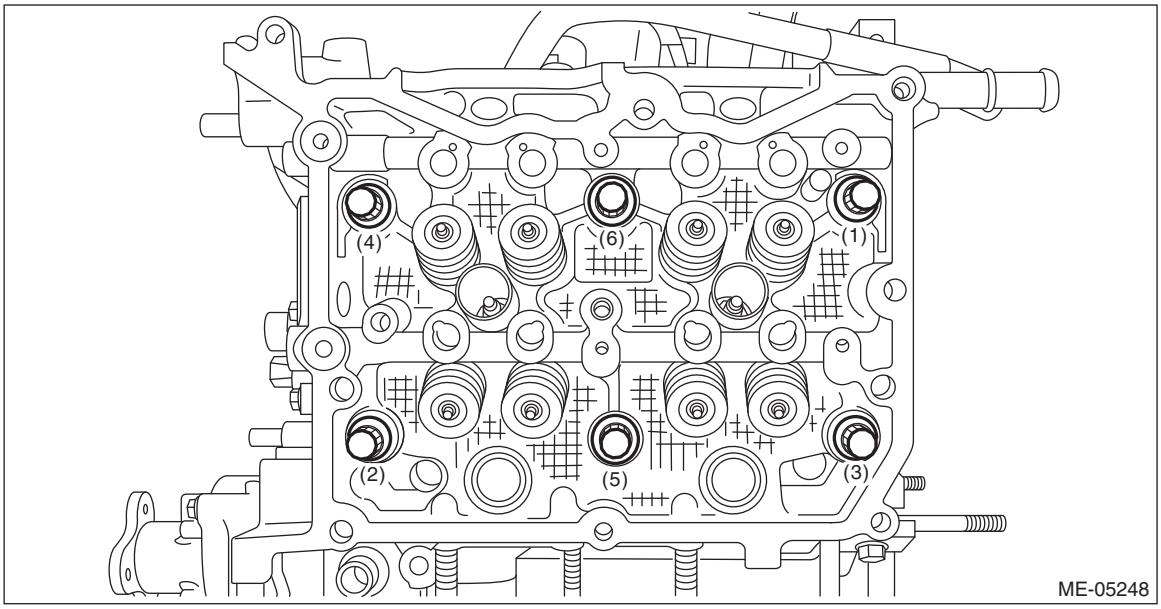


(3) Tighten all cylinder head bolts further with a torque of 100 N·m (10.2 kgf-m, 73.8 ft-lb) in numerical order as shown in the figure.

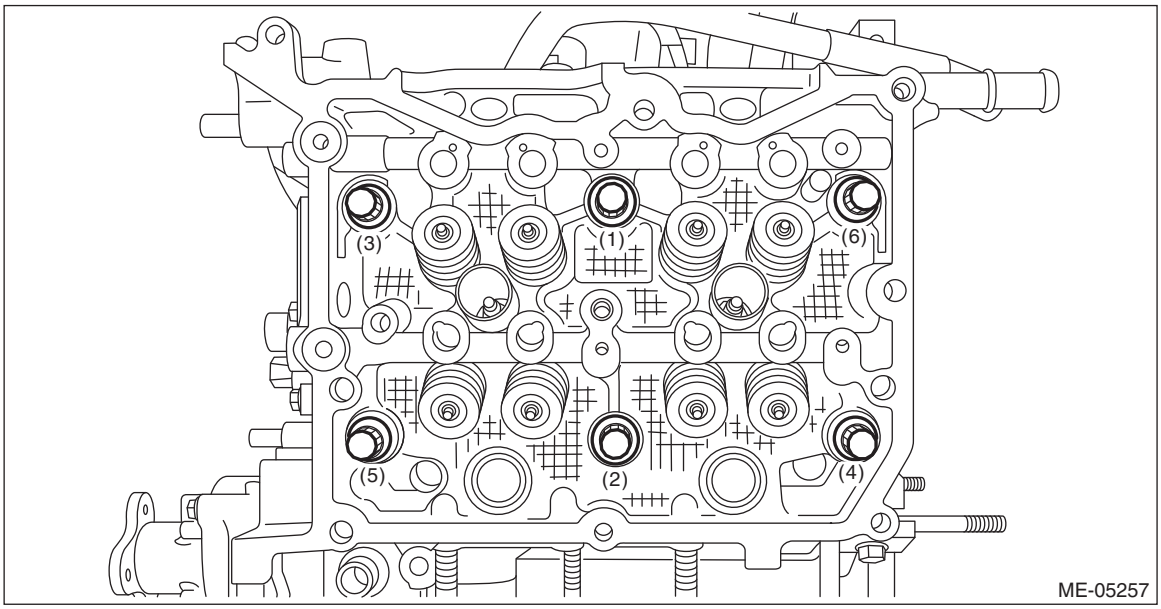
CAUTION:
If the bolt makes stick-slip sound during tightening, repeat the procedure from step 1). In that case, the cylinder head gasket LH can be reused. But it is necessary to remove liquid gasket completely from cylinder block LH, cylinder head LH and cylinder head gasket LH and re-apply to them.



(4) Loosen all cylinder head bolts 180° in numerical order as shown in the figure, and then loosen all cylinder head bolts 180° further in numerical order as shown in the figure.



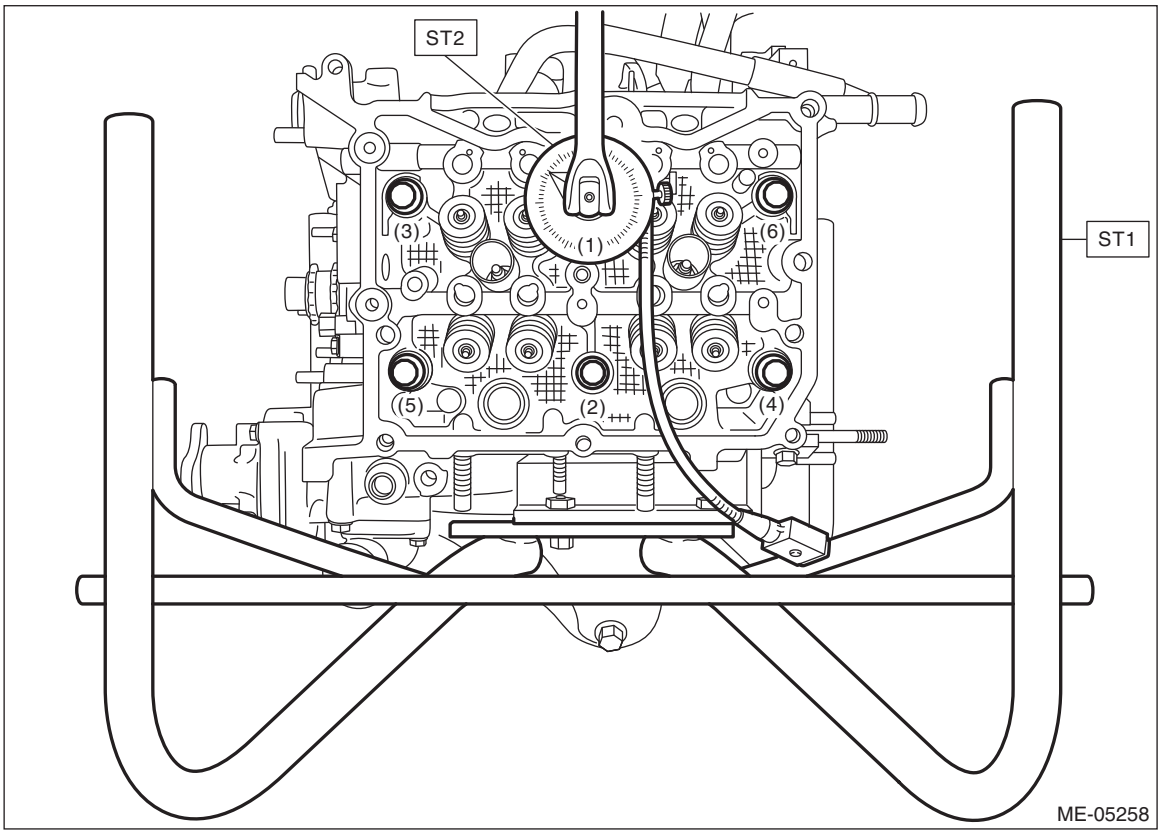
(5) Tighten all cylinder head bolts with a torque of 42 N·m (4.3 kgf-m, 31.0 ft-lb) in numerical order as shown in the figure.



(6) Tighten all cylinder head bolts with specified angle in numerical order as shown in the figure using ST2.

NOTE:
Attach the magnet used for securing the ST2 (ANGLE GAUGE) to ST1.
ST1 499817100 ENGINE STAND
ST2 18854AA000 ANGLE GAUGE

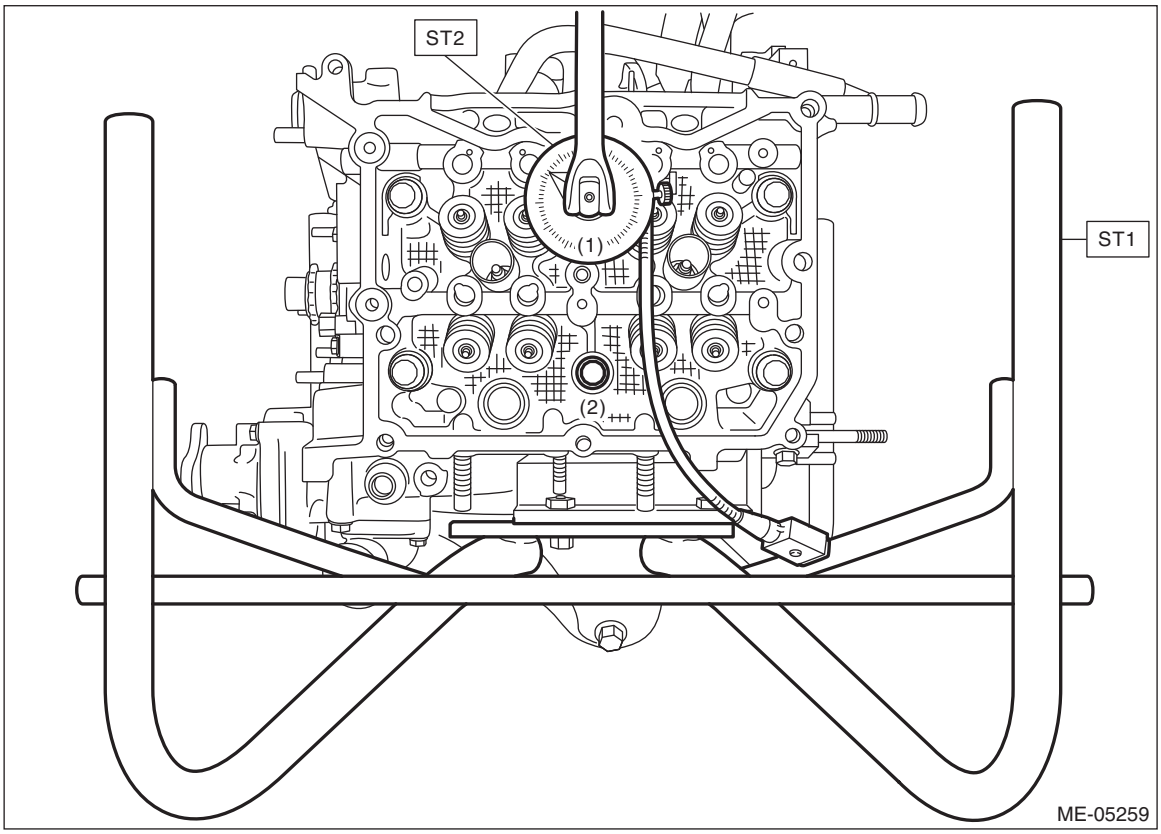
Tightening angle:
80°±2°



(7) Tighten the cylinder head bolts (2 places) with specified angle in numerical order as shown in the figure using ST2.

NOTE:
Attach the magnet used for securing the ST2 (ANGLE GAUGE) to ST1.
ST1 499817100 ENGINE STAND
ST2 18854AA000 ANGLE GAUGE

Tightening angle:
75°±2°

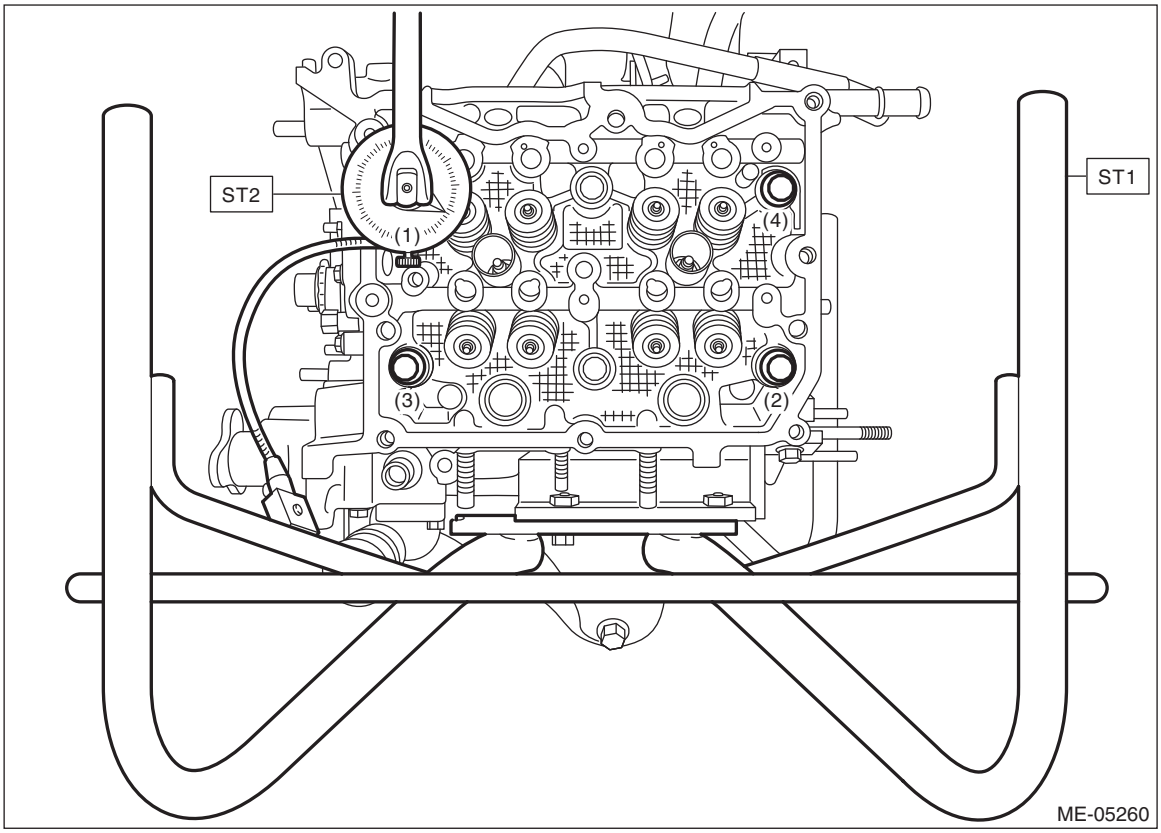


(8) Tighten the cylinder head bolts (4 places) with specified angle in numerical order as shown in the figure using ST2.

NOTE:
• After tightening, if the liquid gasket is squeezed out onto the seal surface of the chain cover, completely remove any squeezed-out liquid gasket.
• Attach the magnet used for securing the ST2 (ANGLE GAUGE) to ST1.

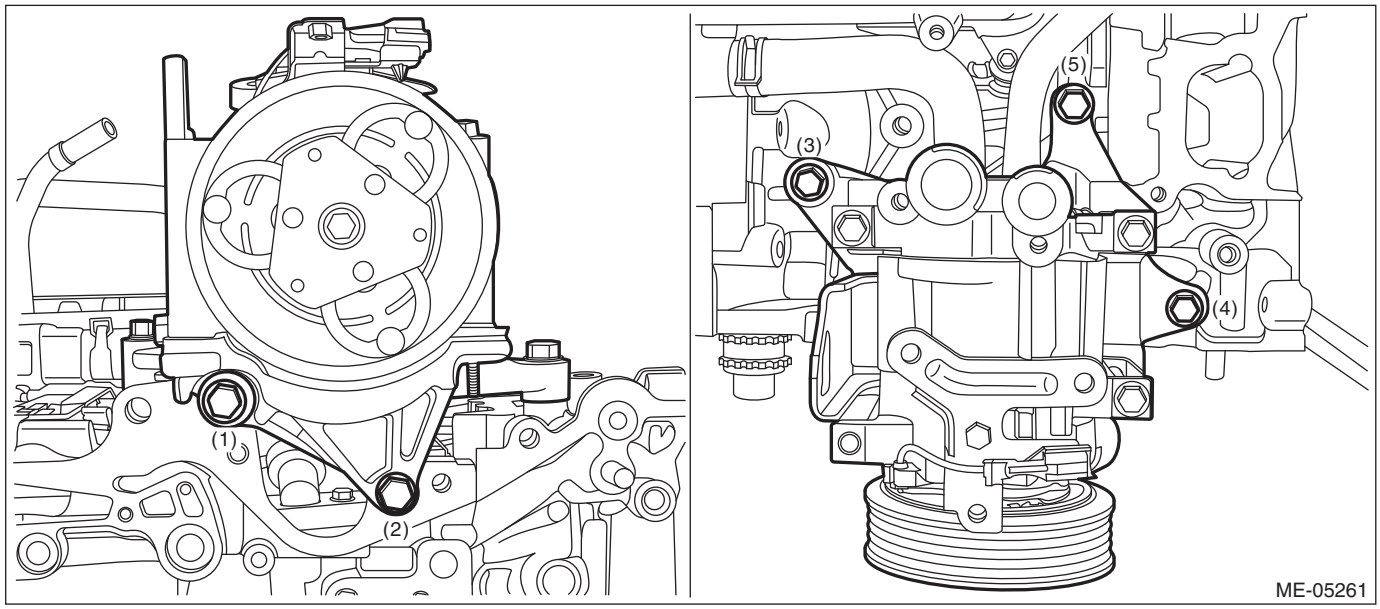
ST1 499817100 ENGINE STAND
ST2 18854AA000 ANGLE GAUGE

Tightening angle:
30°±2°



5) Set the A/C compressor bracket to the cylinder head LH, and tighten the bolts in numerical order as shown in the figure.

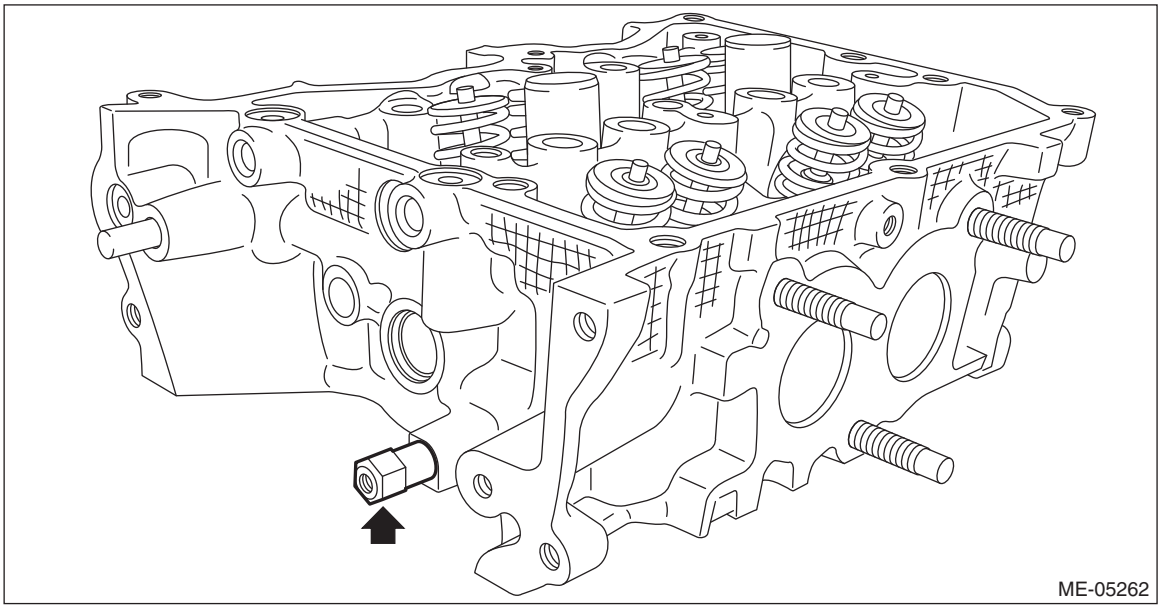
Tightening torque:
36 N·m (3.7 kgf-m, 26.6 ft-lb)



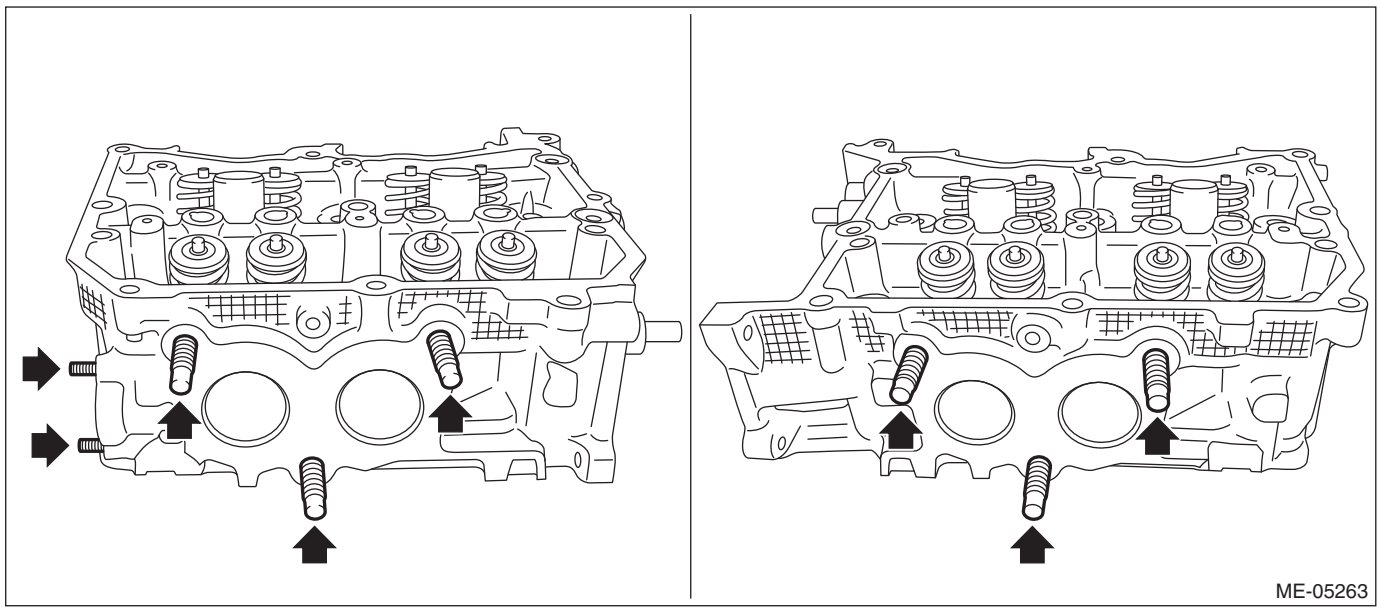
6) Install the cam carrier LH. <Ref. to ME(H4DO)-172, CAM CARRIER LH, INSTALLATION, Cam Carrier.>
7) Install the rocker cover LH. <Ref. to ME(H4DO)-146, ROCKER COVER LH, INSTALLATION, Rocker Cover.>
8) Install the chain cover. <Ref. to ME(H4DO)-96, INSTALLATION, Chain Cover.>
9) Install the tumble generator valve assembly LH. <Ref. to FU(H4DO)-86, INSTALLATION, Tumble Generator Valve Assembly.>
10) Install the intake manifold. <Ref. to FU(H4DO)-29, INSTALLATION, Intake Manifold.>
11) Install the engine to the vehicle. <Ref. to ME(H4DO)-56, INSTALLATION, Engine Assembly.>

C: DISASSEMBLY

1) Remove the chain cover securing bolt from the cylinder head LH.



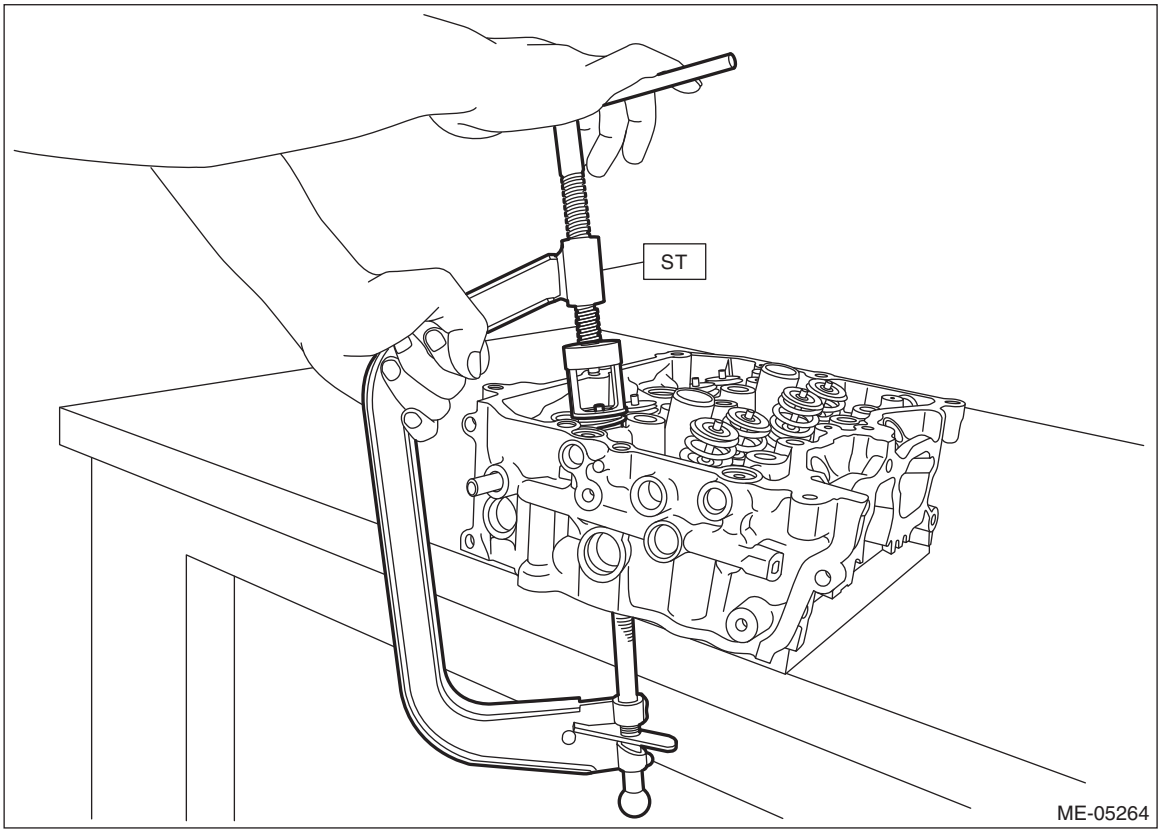
2) Remove the stud bolts from the cylinder head.



3) Compress the valve spring using ST, and remove the valve collet, valve, valve spring retainer, valve spring and valve seat.

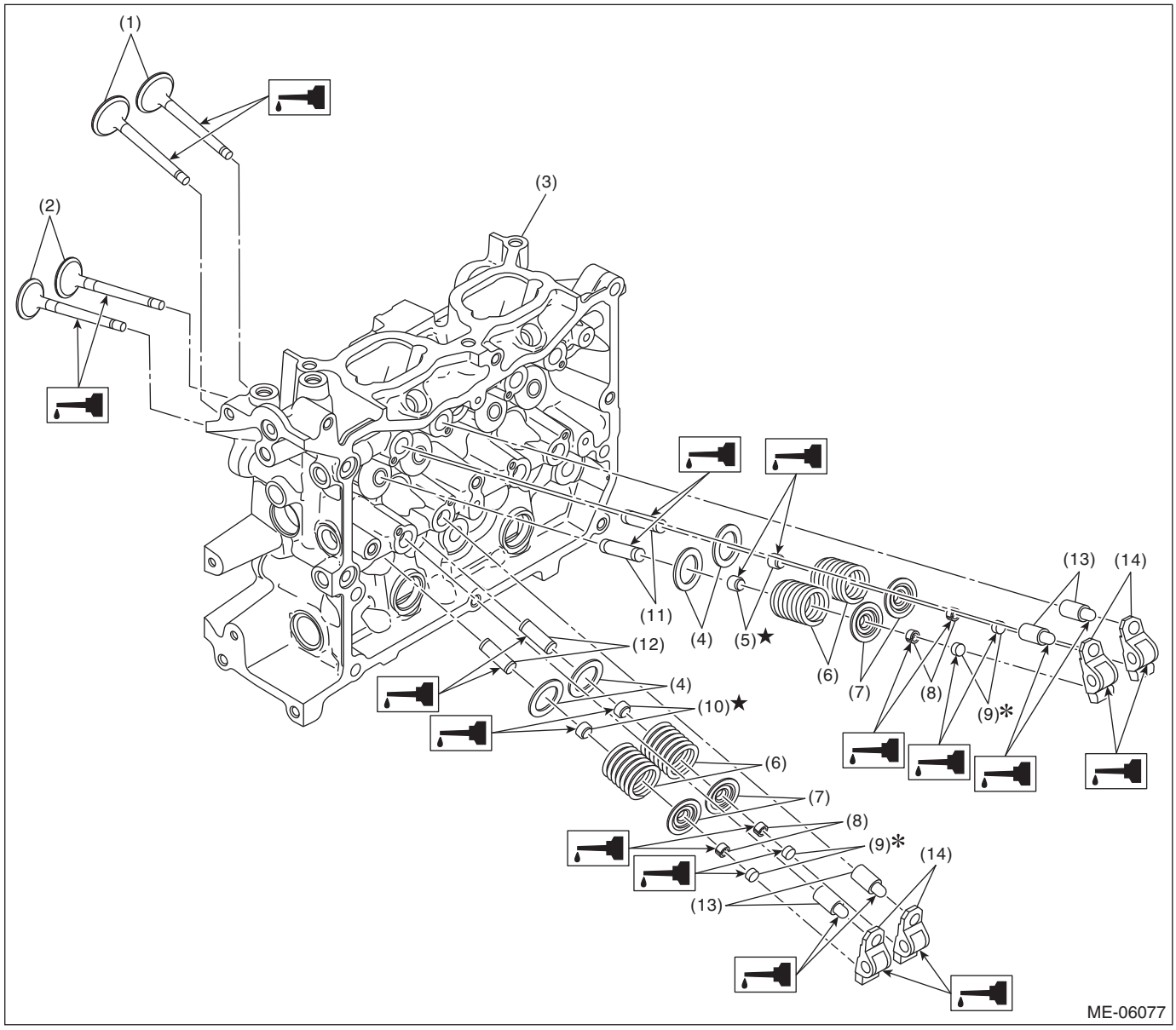
CAUTION:
During work, place a waste cloth, etc. to avoid scratching the mating surface of the cylinder head.
ST 0920287002000 REMOVER AND REPLACER

NOTE:
- Mark each part to prevent confusion.
- Pay careful attention not to damage the lips of intake valve oil seals and exhaust valve oil seals.
- Keep all the disassembled parts in order for re-installing in their original positions.
- For removal and installation procedures of the valve guide, intake valve oil seal and exhaust valve oil seal, refer to “INSPECTION”. <Ref. to ME(H4DO)-220, VALVE GUIDE, INSPECTION, Cylinder Head.> <Ref. to ME(H4DO)-229, INTAKE VALVE OIL SEAL AND EXHAUST VALVE OIL SEAL, INSPECTION, Cylinder Head.>



4) Remove all valves, valve collets, valve spring retainers, valve springs and valve seats in the same manner.

D: ASSEMBLY



(1)	Exhaust valve	(6)	Valve spring	(11)	Intake valve guide
(2)	Intake valve	(7)	Valve spring retainer	(12)	Exhaust valve guide
(3)	Cylinder head	(8)	Valve collet	(13)	Roller rocker arm pivot
(4)	Valve spring seat	(9)	Valve shim	(14)	Roller rocker arm
(5)	Intake valve oil seal	(10)	Exhaust valve oil seal		

1) Install the valves, valve collets, valve spring retainers, valve spring and valve seat.

CAUTION:
During work, place a waste cloth, etc. to avoid scratching the mating surface of the cylinder head.

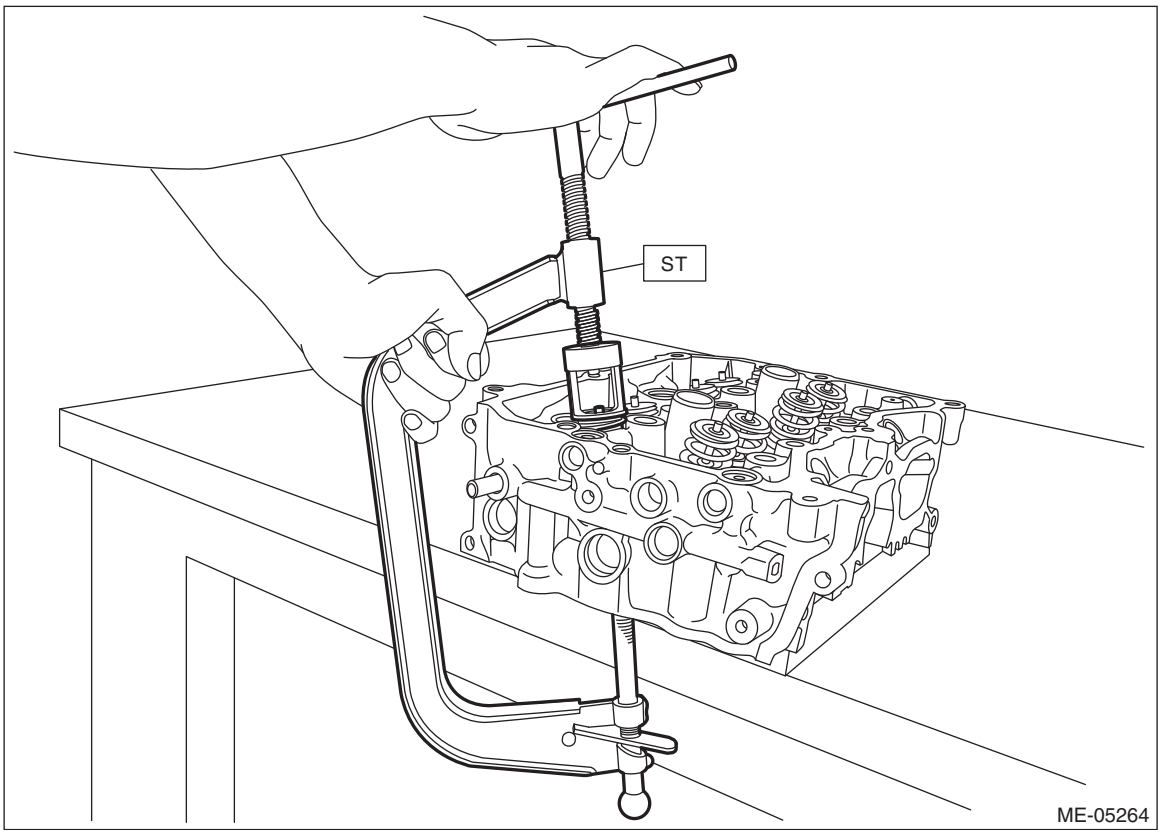
(1) Set the valve seat, valve spring and retainer onto the cylinder head.

NOTE:
When the two-stage unequal pitch type valve spring is used, be sure to install with its close-coiled end facing the cylinder head.

(2) Coat the valve stem of each valve with engine oil and insert the valve into valve guide.

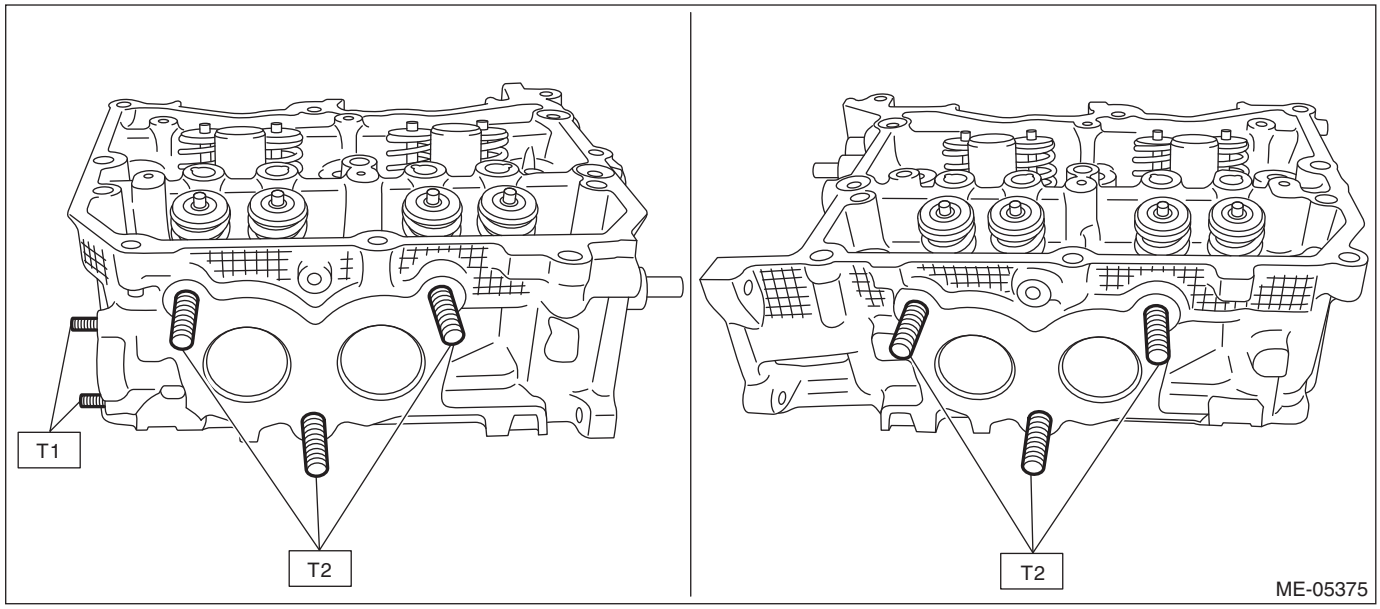
NOTE:
When inserting the valve into valve guide, use special care not to damage the oil seal lip.

(3) Compress the valve spring and install the valve collet using ST.
ST 0920287002000 REMOVER AND REPLACER



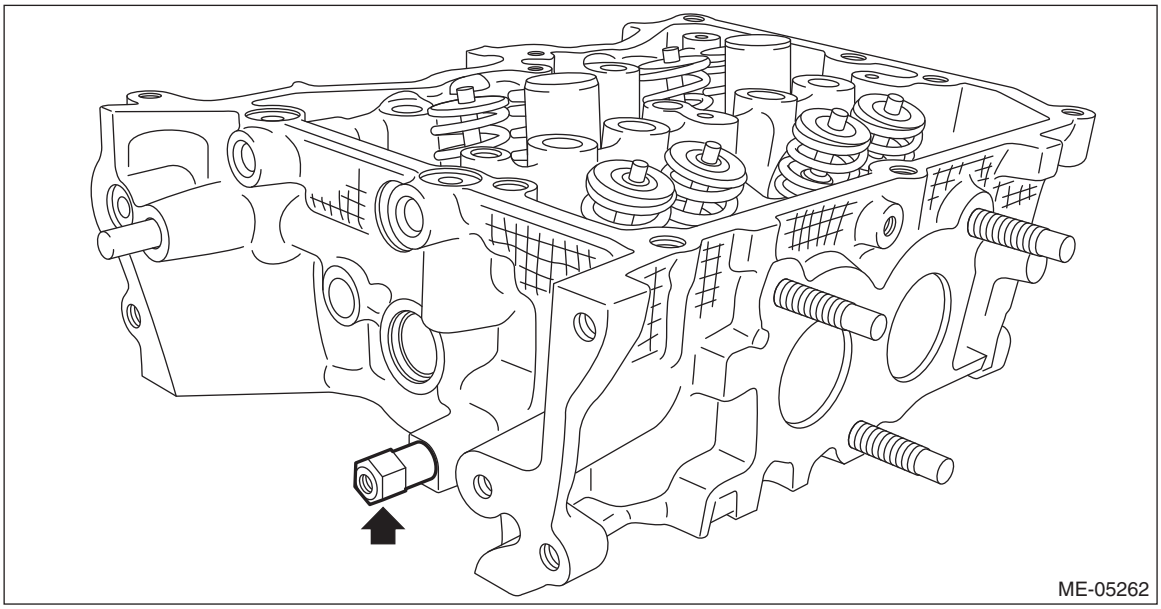
2) Install all valves, valve collets, valve spring retainers, valve spring and valve seat in the same manner.
3) Lightly tap the valve spring retainer with a plastic hammer, and make sure that the valve collet is securely attached.
4) Install the stud bolts onto cylinder heads.

Tightening torque:
T1: 6.4 N·m (0.7 kgf-m, 4.7 ft-lb)
T2: 18 N·m (1.8 kgf-m, 13.3 ft-lb)



5) Install the chain cover securing bolt to the cylinder head LH.

Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)



E: INSPECTION

1. CYLINDER HEAD

1) Visually inspect to make sure that there are no cracks, scratches or other damage.
2) Use liquid penetrant tester on the important sections to check for fissures.
3) Check that there are no marks of gas leaking or water leaking on gasket attachment surface.
4) Check the warping of the cylinder head mating surface that mates with cylinder block using a straight edge (A) and thickness gauge (B) at the locations shown in the figure. If it exceeds the limit, correct the surface by grinding it with a surface grinder or replace the cylinder head.

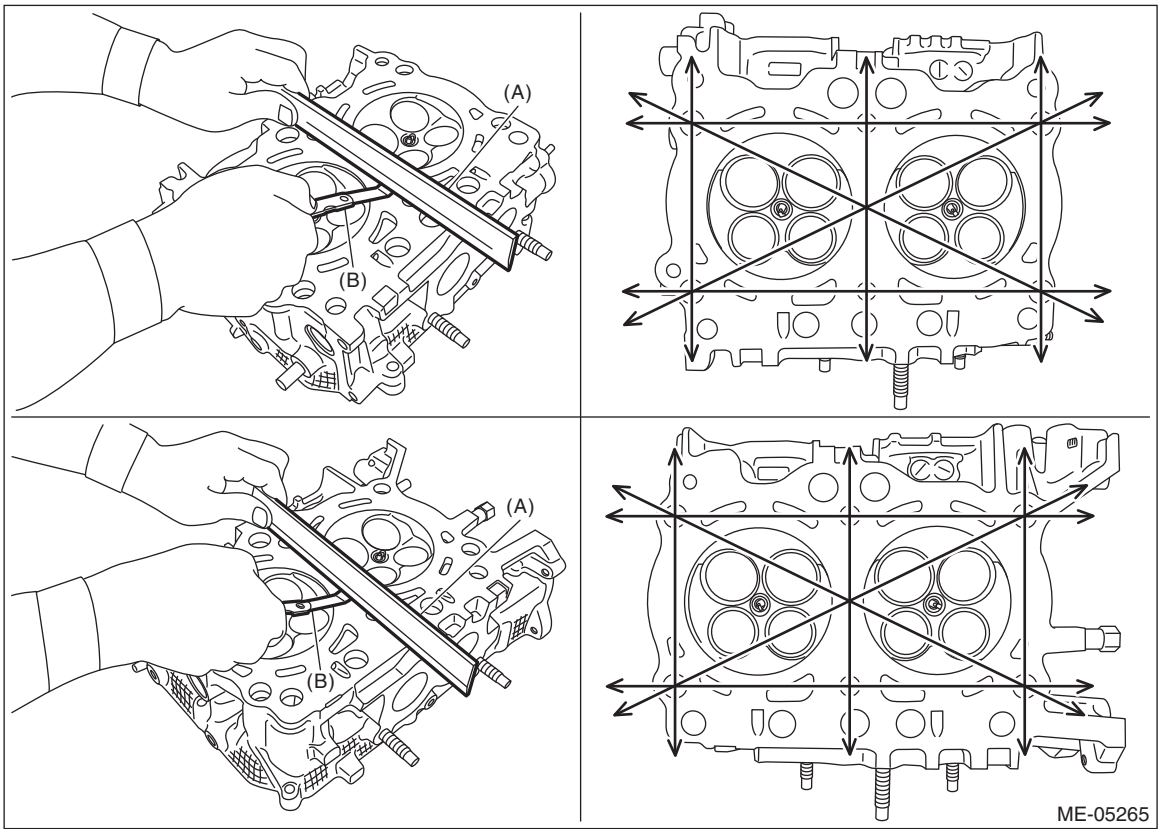
NOTE:
Measurement should be performed at a temperature of 20°C (68°F).

Warping limit:
0.020 mm (0.0008 in)

Grinding limit:
0.1 mm (0.004 in)

Standard height of cylinder head:
98.5 mm (3.878 in)

NOTE:
If the cylinder head bolt tightening torques and angle tightening is uneven, warpage of the cylinder head may occur. During installation work, make sure that tightening torque and angle tightening work is performed precisely so that it is tightened evenly.

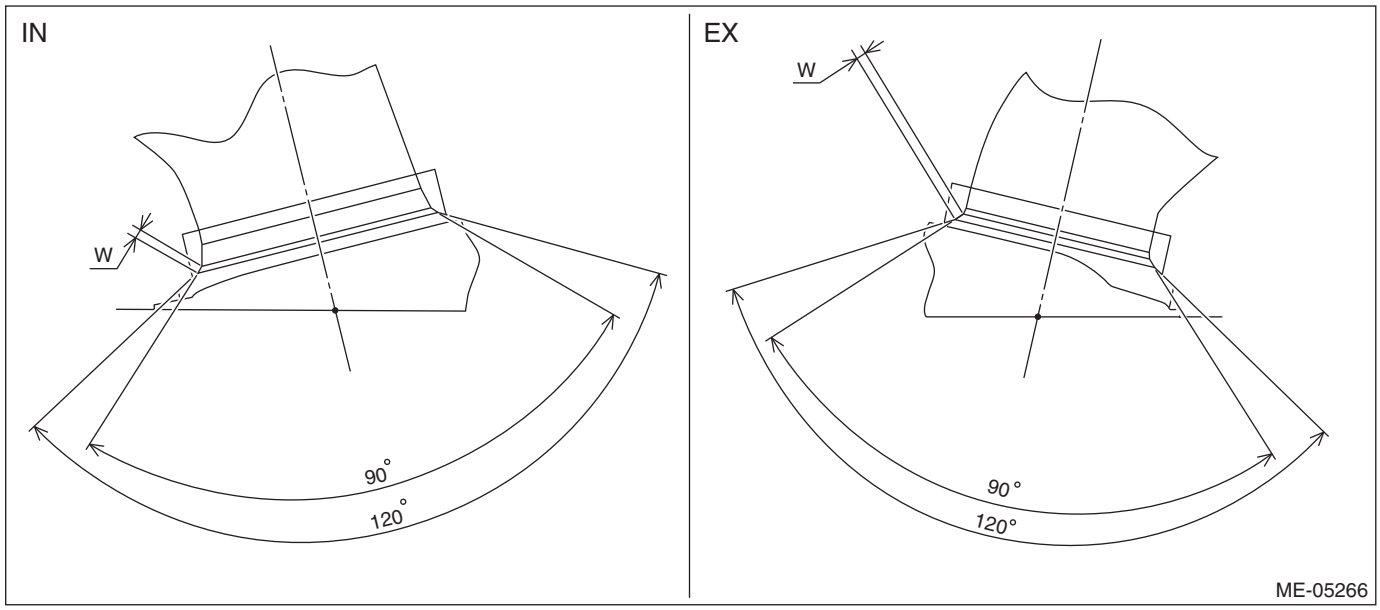


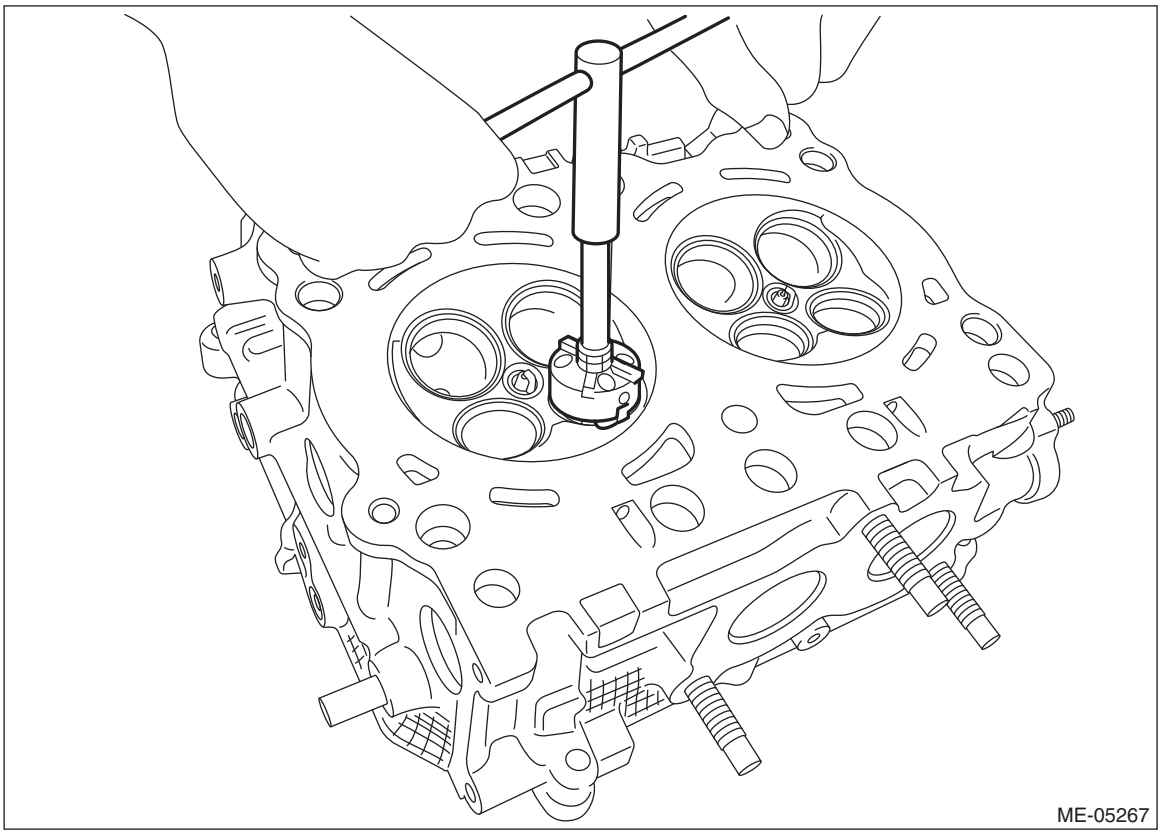
2. VALVE SEAT

Inspect the intake and exhaust valve seats of cylinder head, and correct the contact surfaces with a valve seat cutter if they are defective or when valve guides are replaced.

Contacting width W between valve and valve seat:

Standard
Intake
0.8 — 1.6 mm (0.031 — 0.063 in)
Exhaust
1.1 — 1.7 mm (0.043 — 0.067 in)





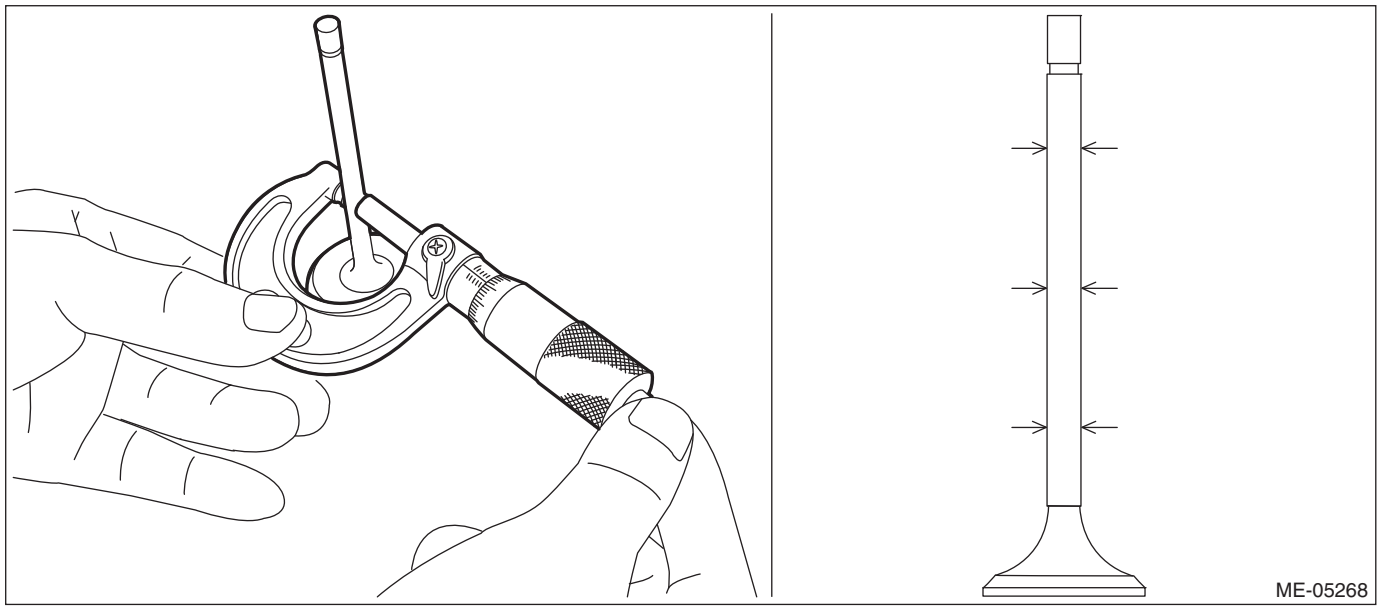
3. VALVE GUIDE

1) Check the clearance between valve guide and valve stem. Check the clearance between valve guide and valve stem by measuring respectively the outer diameter of valve stem and the inner diameter of valve guide.
   (1) Measure the outer diameter of valve stem with a micrometer. If it is not within the standard, replace the valve.

NOTE:
- Measurement should be performed at a temperature of 20°C (68°F).
- Measure the outer diameter of the valve stem at the three places as shown in the figure, and take the value of most worn location.
- If the valve is replaced, put a small amount of grinding compound on the valve seat surface of cylinder head, and lap the valve and valve seat surfaces. Replace with a new valve oil seal after lapping. For replacement of valve oil seal, refer to the “INTAKE VALVE OIL SEAL AND EXHAUST VALVE OIL SEAL”. <Ref. to ME(H4DO)-229, INTAKE VALVE OIL SEAL AND EXHAUST VALVE OIL SEAL, INSPECTION, Cylinder Head.>

Valve stem outer diameters:

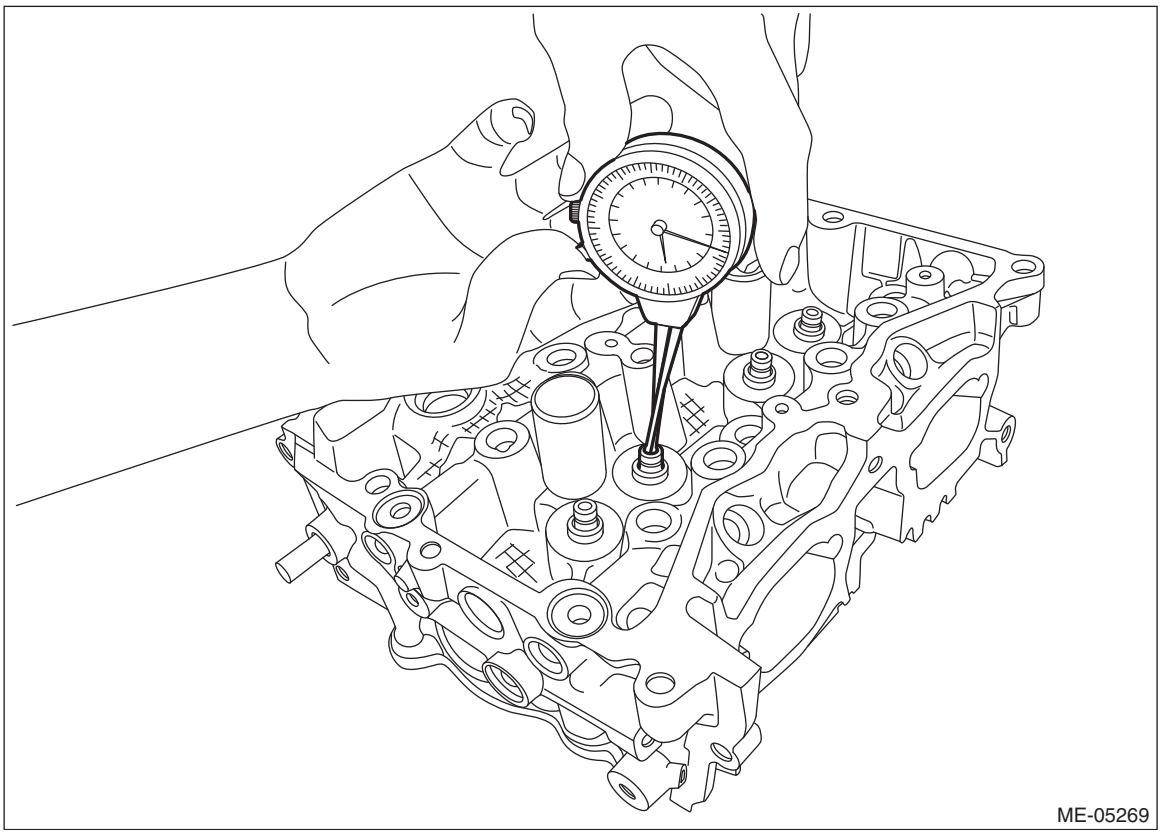
Standard
Intake
5.455 — 5.470 mm (0.2148 — 0.2154 in)
Exhaust
5.445 — 5.460 mm (0.2144 — 0.2150 in)



(2) Using a caliper gauge, measure the inner diameter of valve guide. If it is not within the standard, replace the valve guide. For replacement procedure, refer to step 2).

NOTE:
Measurement should be performed at a temperature of 20°C (68°F).

Valve guide inner diameter:
Standard
5.500 — 5.512 mm (0.2165 — 0.2170 in)



(3) Calculate the clearance between valve guide and valve stem.

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)

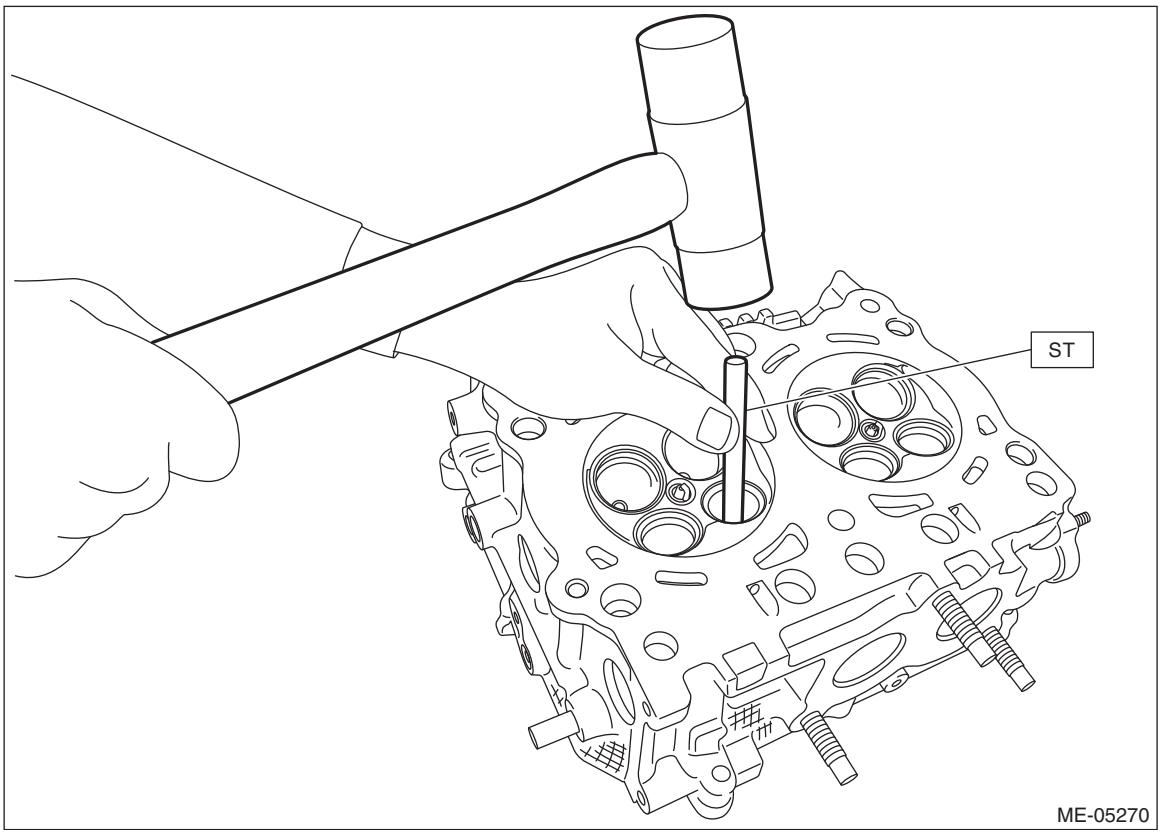
2) If the clearance between valve guide and valve stem exceeds the standard, replace the valve guide or valve, whichever shows the greater amount of wear or damage. For replacement procedure of valve guide, refer to the following.

NOTE:
If the valve is replaced, put a small amount of grinding compound on the valve seat surface of cylinder head, and lap the valve and valve seat surfaces. Replace with a new valve oil seal after lapping. For replacement of valve oil seal, refer to the “INTAKE VALVE OIL SEAL AND EXHAUST VALVE OIL SEAL”. <Ref. to ME(H4DO)-229, INTAKE VALVE OIL SEAL AND EXHAUST VALVE OIL SEAL, INSPECTION, Cylinder Head.>

(1) Insert ST into the valve guide with the combustion chamber upward and remove the valve guide using plastic hammer.

CAUTION:
- **Place a wood board wrapped with a waste cloth to stabilize the cylinder head before work.**
- **Use special care not to damage the cylinder head during work.**

ST 499765700 VALVE GUIDE REMOVER AND INSTALLER

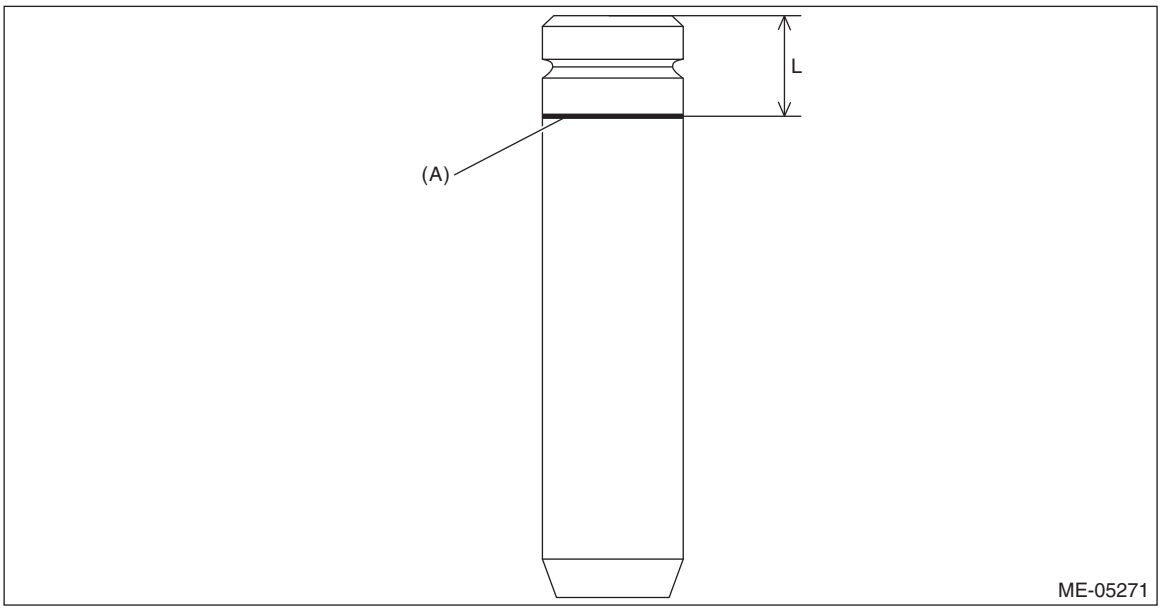


(2) Before installing the valve guide, make sure that neither scratches nor damages exist on the inner surface of valve guide holes in cylinder head.

(3) Draw a reference line (A) for insert on the valve guide using a marker as shown in the figure.

NOTE:
- Use a new valve guide.
- A reference line for insert is used as a guide when tapping-in the valve guide.

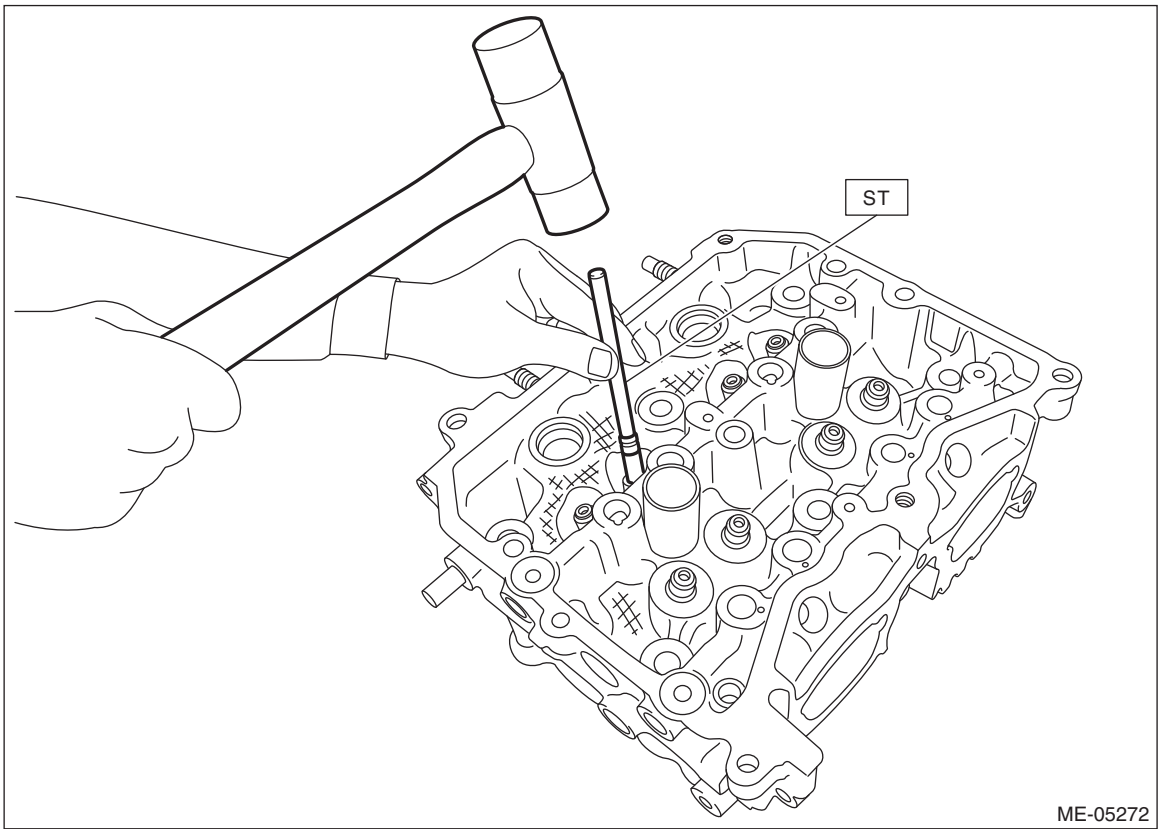
Valve guide inserting reference line position L:
15 mm (0.5906 in)



(4) Apply a enough coat of engine oil to the valve guide, and set the valve guide on the cylinder head with the combustion chamber downward.
(5) Insert the ST into the valve guide, and tap-in the valve guide to the reference line (A) for insert using plastic hammer.

CAUTION:
- **During work, place a waste cloth, etc. to avoid scratching the mating surface of the cylinder head.**
- **Use special care not to damage the cylinder head during work.**

ST 499765700 VALVE GUIDE REMOVER AND INSTALLER

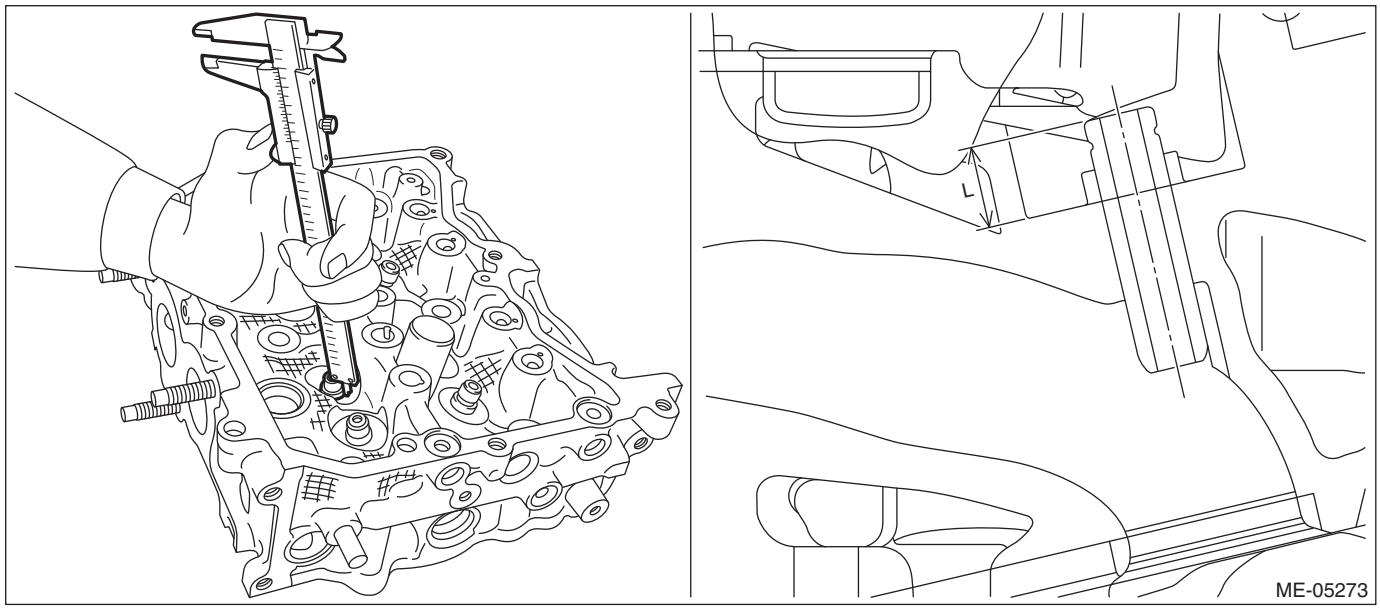


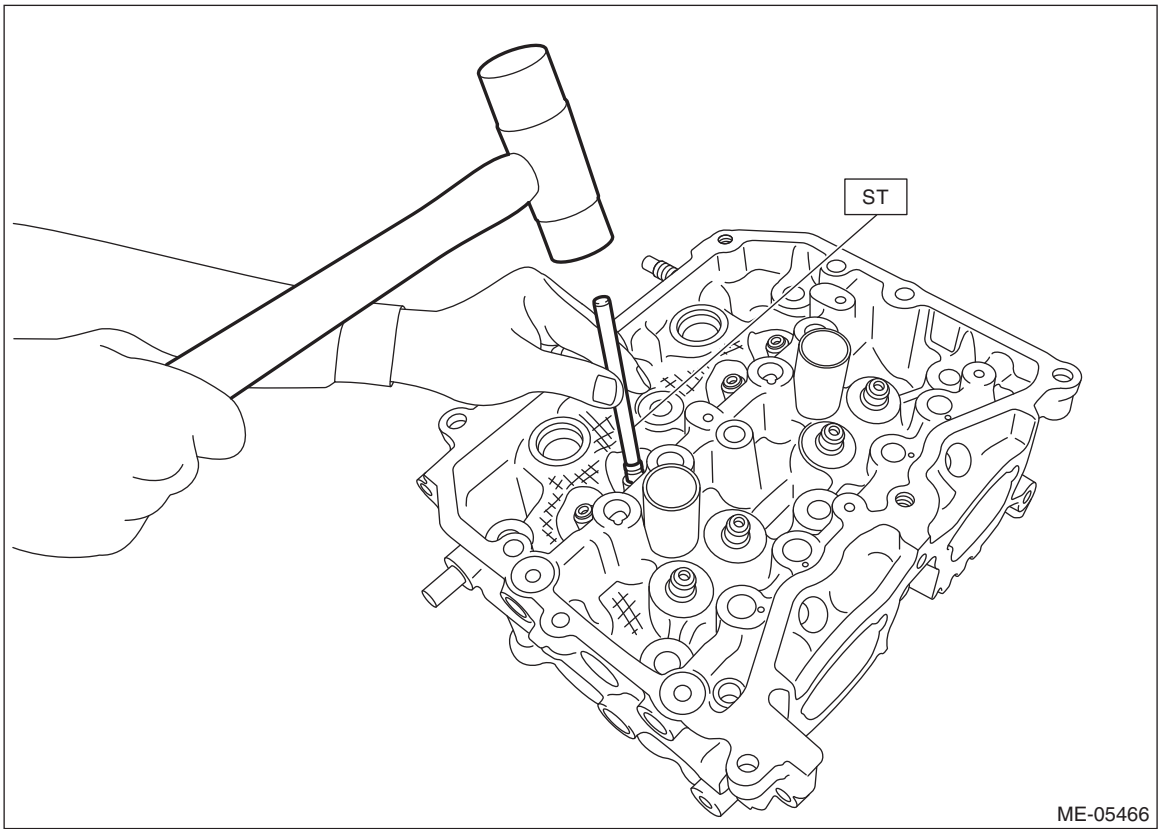
(6) Measure the valve guide protrusion amount “L” as shown in the figure using a caliper gauge. Insert the ST into the valve guide again, and tap-in the valve guide so that it is positioned within standard by referring to the measured value using plastic hammer.

CAUTION:
- **During work, place a waste cloth, etc. to avoid scratching the mating surface of the cylinder head.**
- **Use special care not to damage the cylinder head during work.**

NOTE:
Be careful not to tap-in excessively by repeating the steps of Tapping-in → Measurement → Tapping-in → Measurement … when installing the valve guide.
ST 499765700 VALVE GUIDE REMOVER AND INSTALLER

Valve guide protrusion amount L:
Standard
11.4 — 11.8 mm (0.449 — 0.465 in)



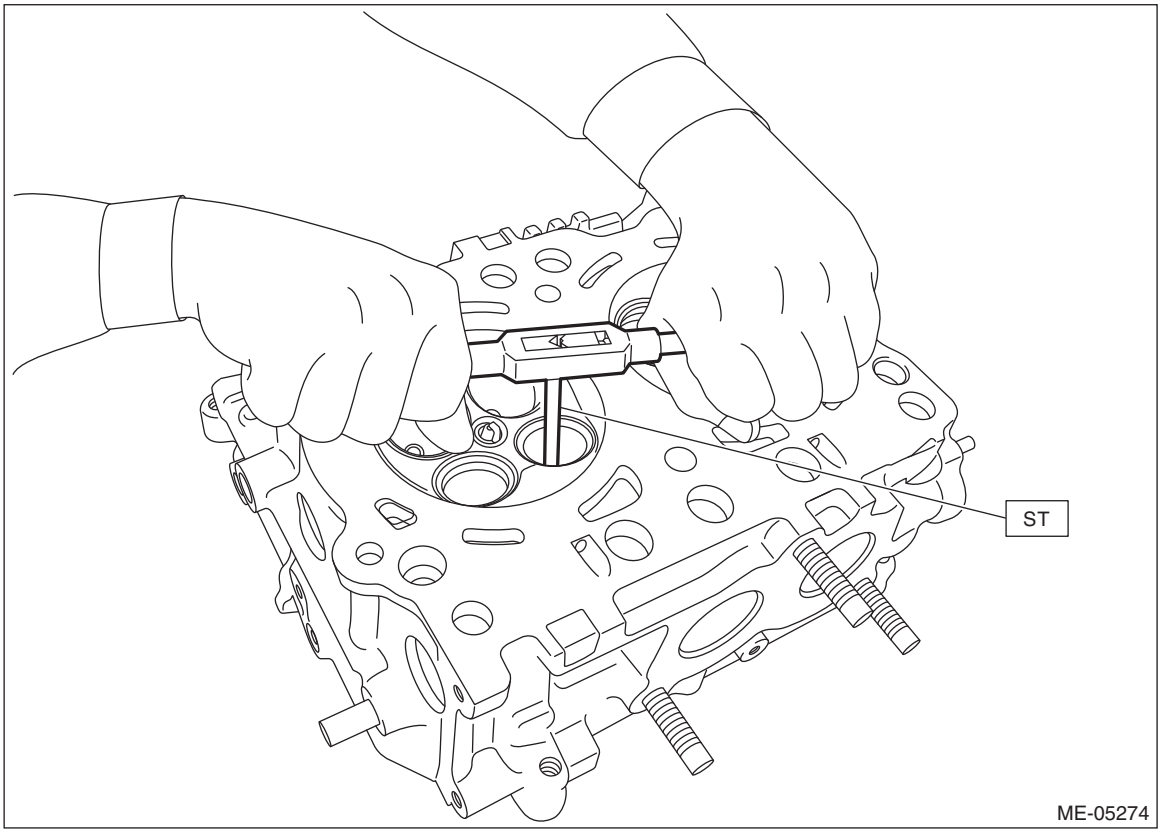

ST
ME-05466

(7) Ream the inside of valve guide with the combustion chamber upward using ST. Put the ST in valve guide, and rotate the ST slowly clockwise while pushing it lightly. Bring the ST back while rotating it clockwise.

CAUTION:
- **Place a wood board wrapped with a waste cloth to stabilize the cylinder head before work.**
- **Use special care not to damage the cylinder head during work.**

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.

ST 499765900 VALVE GUIDE REAMER



(8) After reaming, clean the valve guide to remove chips.
(9) Recheck the contact condition between valve and valve seat after replacing the valve guide.

4. INTAKE VALVE AND EXHAUST VALVE

1) Check the valve flange and valve stem for damage, wear or deformation.
2) Check the height “H” in the figure using a caliper gauge. If it is not within the standard, replace the valve.

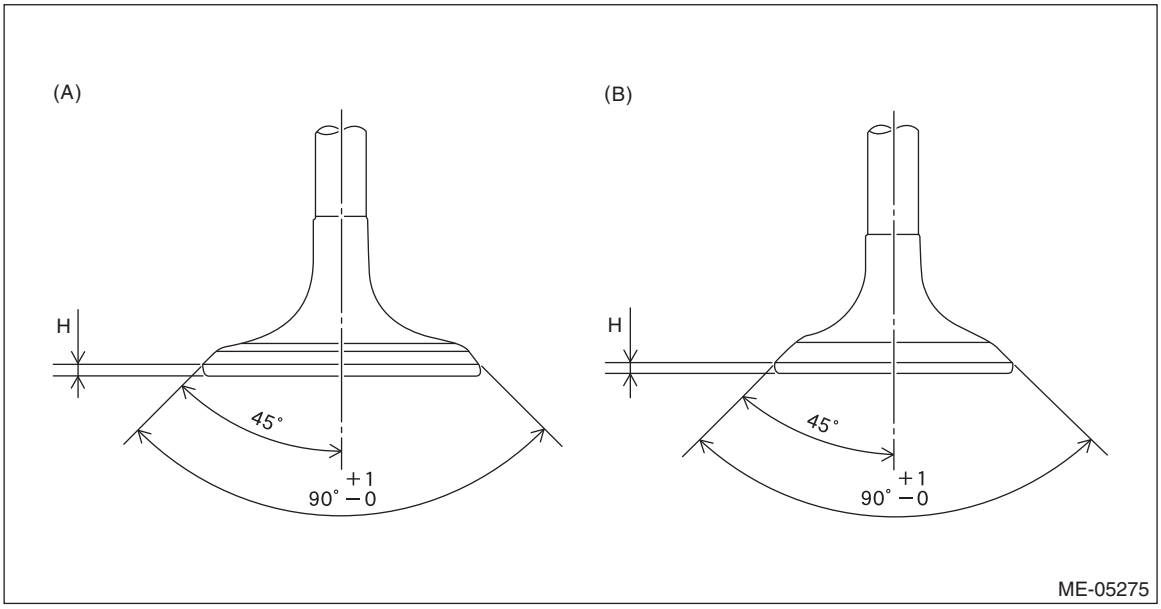
NOTE:
• It is possible to differentiate between the intake valve and the exhaust valve by their overall length.

Valve overall length:
Intake
103.8 mm (4.087 in)
Exhaust
94.1 mm (3.705 in)

• If the valve is replaced, put a small amount of grinding compound on the valve seat surface of cylinder head, and lap the valve and valve seat surfaces. Replace with a new valve oil seal after lapping. For replacement of valve oil seal, refer to the “INTAKE VALVE OIL SEAL AND EXHAUST VALVE OIL SEAL”. <Ref. to ME(H4DO)-229, INTAKE VALVE OIL SEAL AND EXHAUST VALVE OIL SEAL, INSPECTION, Cylinder Head.>

Head edge thickness H:

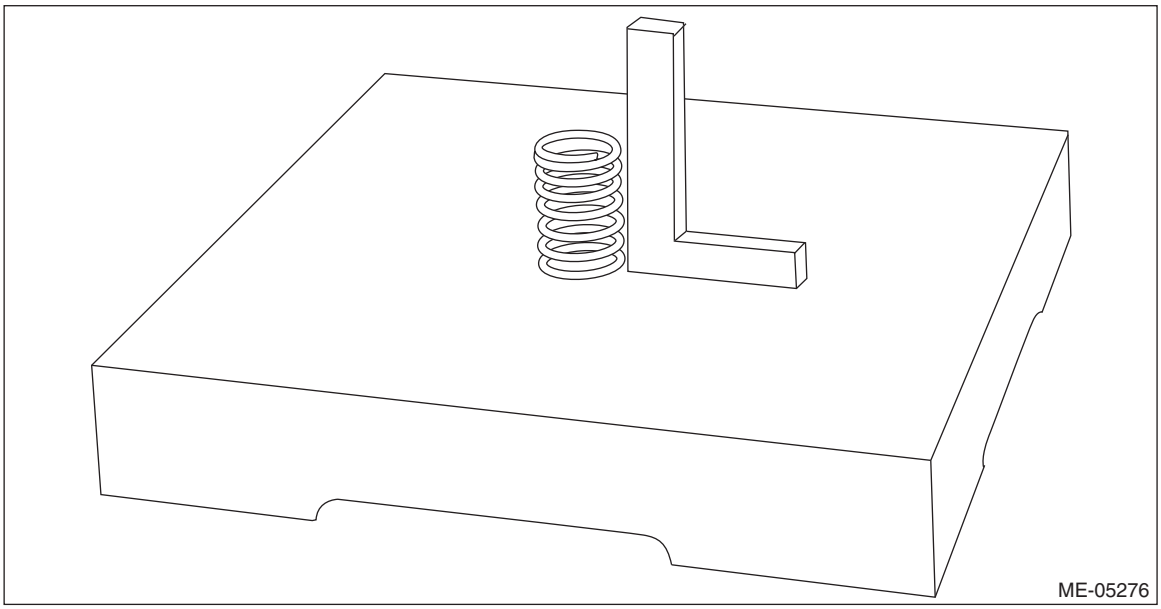
Standard
Intake (A)
0.8 — 1.2 mm (0.031 — 0.047 in)
Exhaust (B)
1.0 — 1.4 mm (0.039 — 0.055 in)



5. VALVE SPRING

1) Check the valve spring for damage and deformation.
2) Check the valve spring free length, tension and squareness. If it is not within the standard, replace the valve spring.

NOTE:
To check the squareness of the valve spring, stand the valve spring on a surface plate and check its deflection at the top of the valve spring using a try square.



Free length:

Standard
Two-stage unequal pitch type
41.06 mm (1.617 in)
Equal pitch type
38.60 mm (1.520 in)

Tension/spring height:

Standard
Set
182 — 210 N (18.56 — 21.41 kgf, 40.92 — 47.22 lbf)/33.0 mm (1.299 in)
Lift
552 — 610 N (56.29 — 62.20 kgf, 124.11 — 137.15 lbf)/22.0 mm (0.866 in)

Squareness:

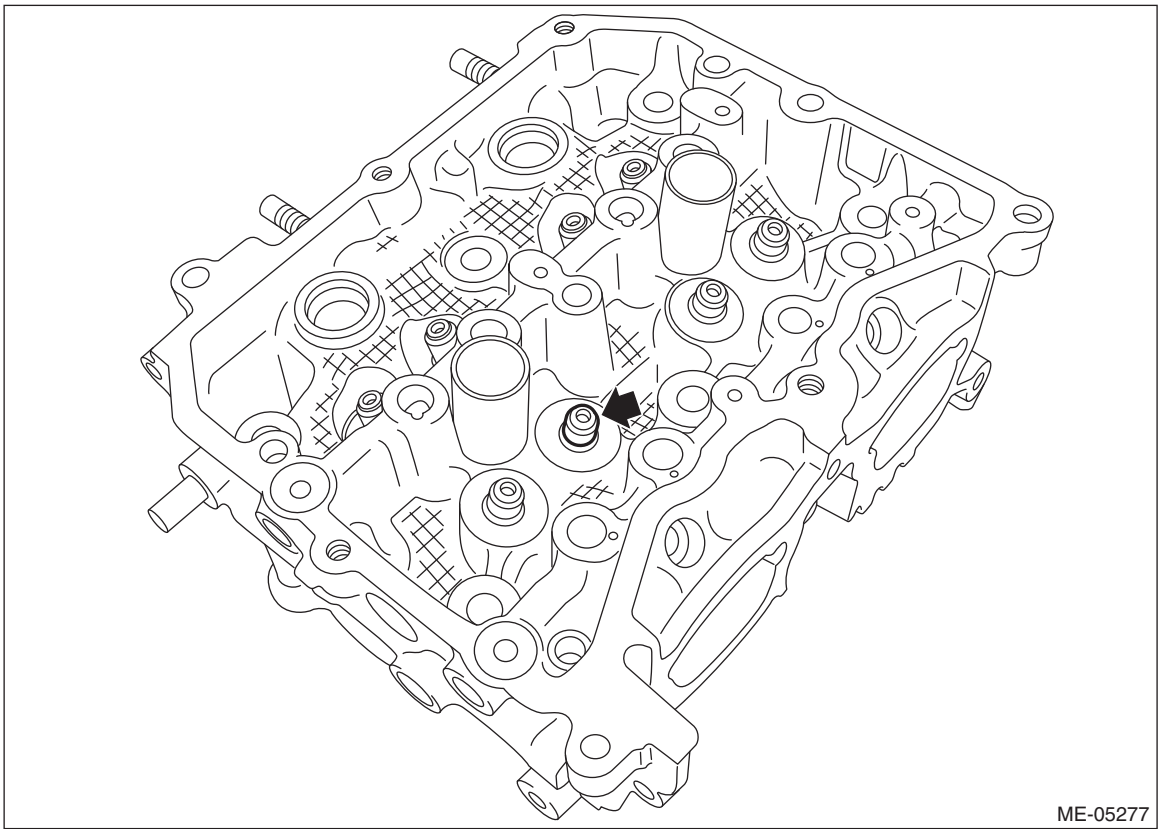
Standard
Two-stage unequal pitch type
2.5°, 1.8 mm (0.071 in) or less
Equal pitch type
2.5°, 1.7 mm (0.067 in) or less

6. INTAKE VALVE OIL SEAL AND EXHAUST VALVE OIL SEAL

1) For the following, replace the oil seal with a new part. For replacement procedure, refer to the following.
- When the lip is damaged.
- When the spring is out of the specified position.
- When readjusting the surfaces of valve and valve seat.
- When replacing the valve guide.

2) Remove the valve oil seal from the valve guide.

CAUTION:
- **During work, place a waste cloth, etc. to avoid scratching the mating surface of the cylinder head.**
- **Use special care not to damage the cylinder head and guide during work.**



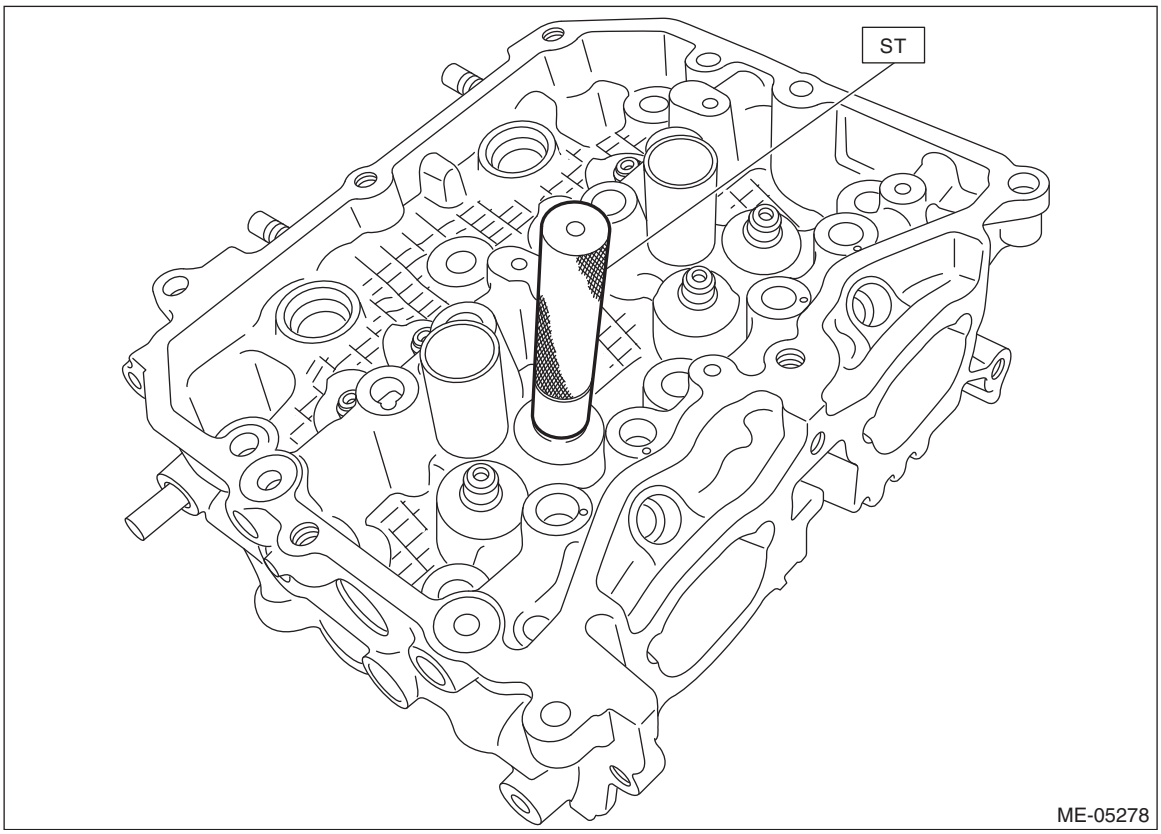
3) Using the ST, insert the valve oil seal.

CAUTION:
- **During work, place a waste cloth, etc. to avoid scratching the mating surface of the cylinder head.**
- **Use special care not to damage the cylinder head and guide during work.**

NOTE:
- Apply engine oil to valve oil seal before inserting.
- The valve oil seal can be inserted by pressing ST with hand. Do not use a plastic hammer to strike in.
- The intake valve oil seals and exhaust valve oil seals are distinguished by their colors.

Color of rubber part:
Intake [Gray]
Exhaust [Green]

ST 18261AA010 VALVE OIL SEAL GUIDE

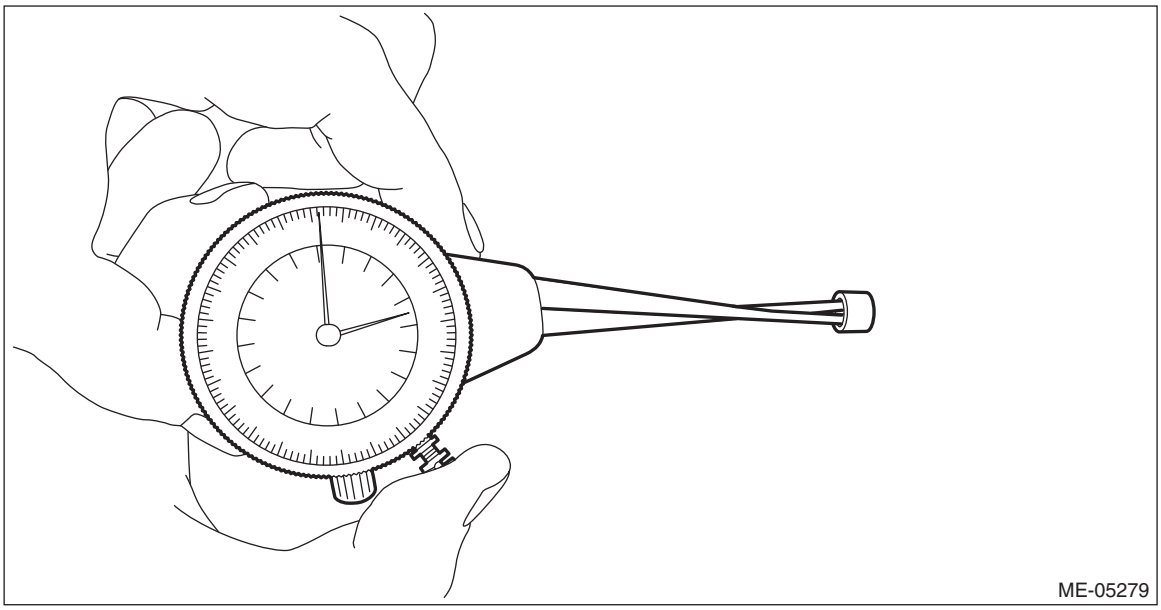


7. VALVE SHIM

1) Visually check the valve shim for damage.
2) Check the clearance between valve shim and valve stem end. Check the clearance between valve shim and valve stem end by measuring respectively the inner diameter of valve shim and the outer diameter of valve stem end.
   (1) Using a caliper gauge, measure the inner diameter of valve shim. If it is not within the standard, replace the valve shim.

NOTE:
- Measurement should be performed at a temperature of 20°C (68°F).
- If the valve shim has to be replaced, check the cam clearance and replace with the suitable valve shim. <Ref. to ME(H4DO)-39, WHEN TIMING CHAIN ASSEMBLY IS REMOVED, INSPECTION, Cam Clearance.>

Valve shim inner diameter:
Standard
5.500 — 5.560 mm (0.2165 — 0.2189 in)

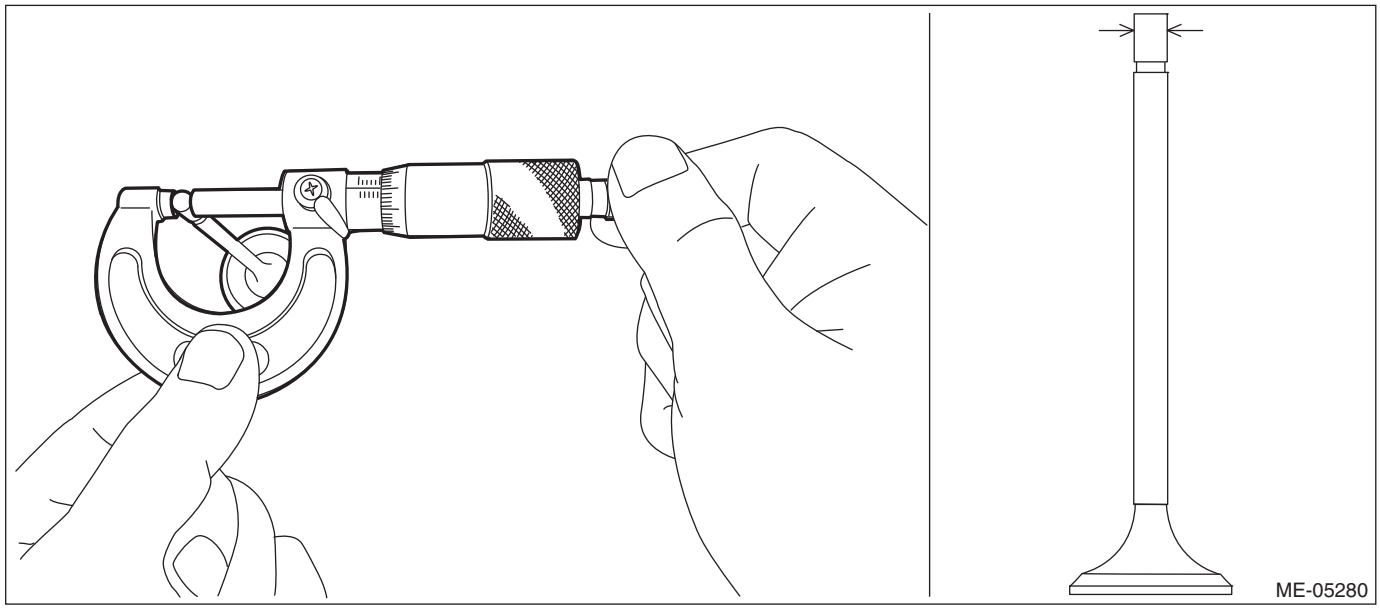


(2) Measure the outer diameter of valve stem end with a micrometer. If it is not within the standard, replace the valve.

NOTE:
• Measurement should be performed at a temperature of 20°C (68°F).
• If the valve is replaced, put a small amount of grinding compound on the valve seat surface of cylinder head, and lap the valve and valve seat surfaces. Replace with a new valve oil seal after lapping. For replacement of valve oil seal, refer to the “INTAKE VALVE OIL SEAL AND EXHAUST VALVE OIL SEAL”. <Ref. to ME(H4DO)-229, INTAKE VALVE OIL SEAL AND EXHAUST VALVE OIL SEAL, INSPECTION, Cylinder Head.>

Valve stem end outer diameter:

Standard
Intake
5.455 — 5.470 mm (0.2148 — 0.2154 in)
Exhaust
5.445 — 5.460 mm (0.2144 — 0.2150 in)



(3) Calculate the clearance between valve shim and valve stem end. If the clearance exceeds the standard, replace the valve shim or valve, whichever shows the greater amount of wear or damage.

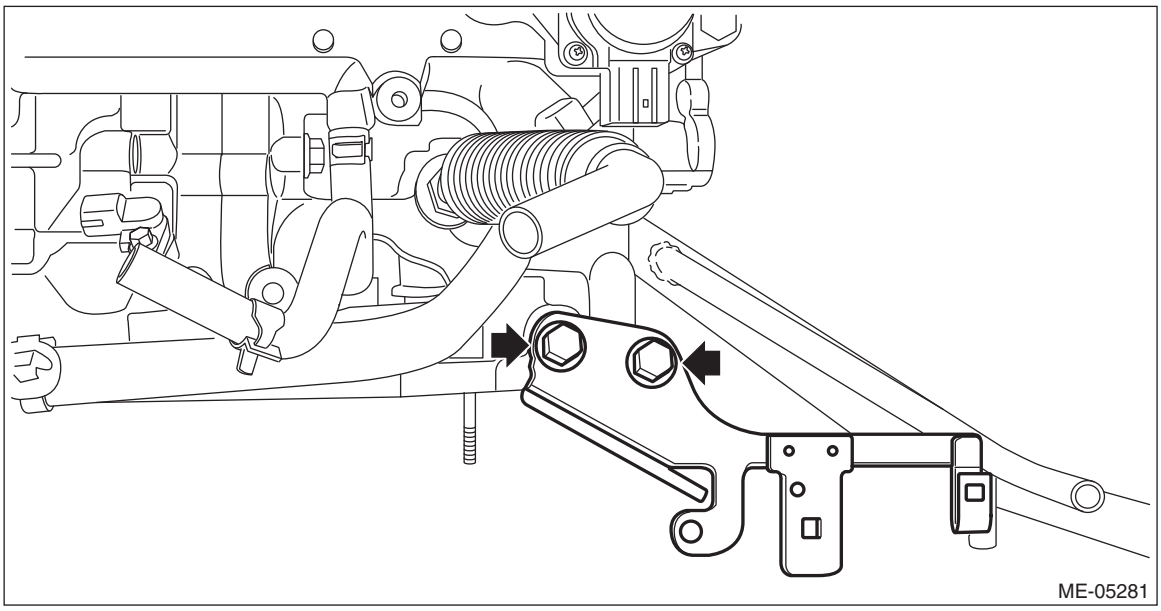
NOTE:
• If the valve is replaced, put a small amount of grinding compound on the valve seat surface of cylinder head, and lap the valve and valve seat surfaces. Replace with a new valve oil seal after lapping. For replacement of valve oil seal, refer to the “INTAKE VALVE OIL SEAL AND EXHAUST VALVE OIL SEAL”. <Ref. to ME(H4DO)-229, INTAKE VALVE OIL SEAL AND EXHAUST VALVE OIL SEAL, INSPECTION, Cylinder Head.>
• If the valve shim has to be replaced, check the cam clearance and replace with the suitable valve shim. <Ref. to ME(H4DO)-39, WHEN TIMING CHAIN ASSEMBLY IS REMOVED, INSPECTION, Cam Clearance.>

Clearance between the valve shim and valve stem end:
Standard
0.030 — 0.105 mm (0.0012 — 0.0041 in)

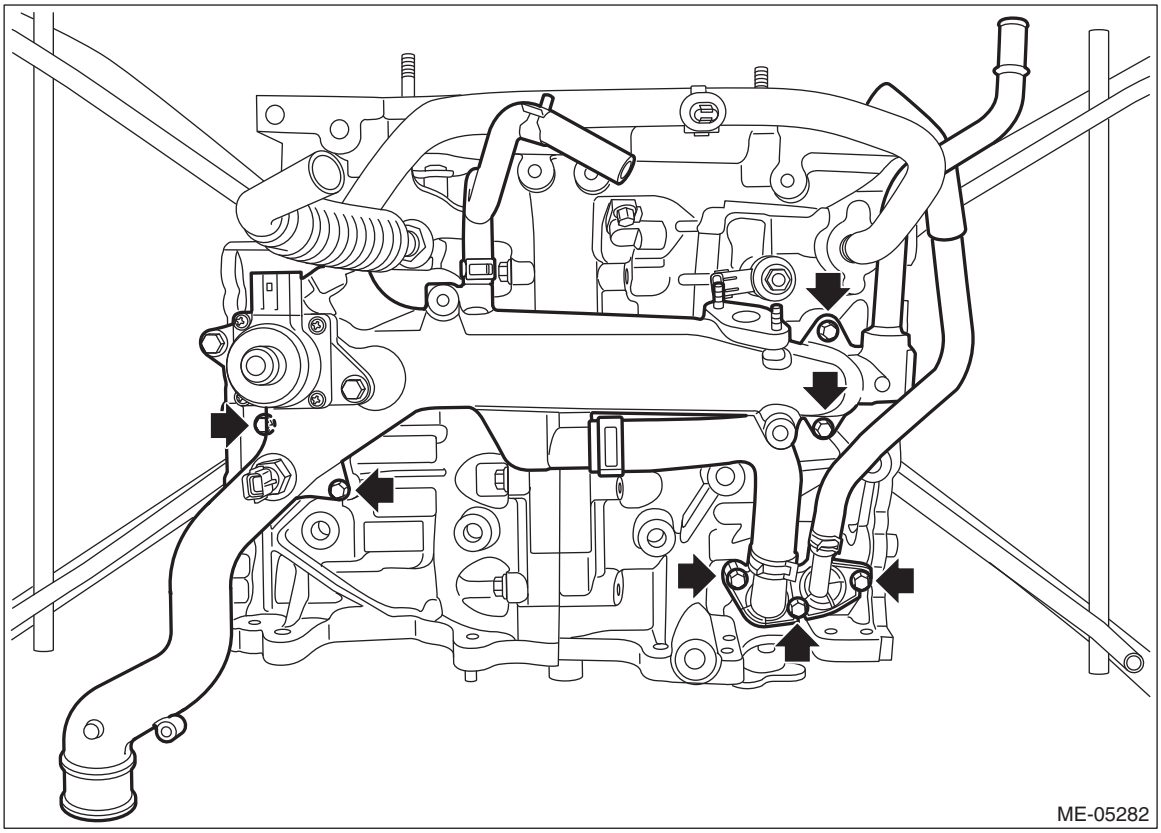
22.Cylinder Block

A: REMOVAL

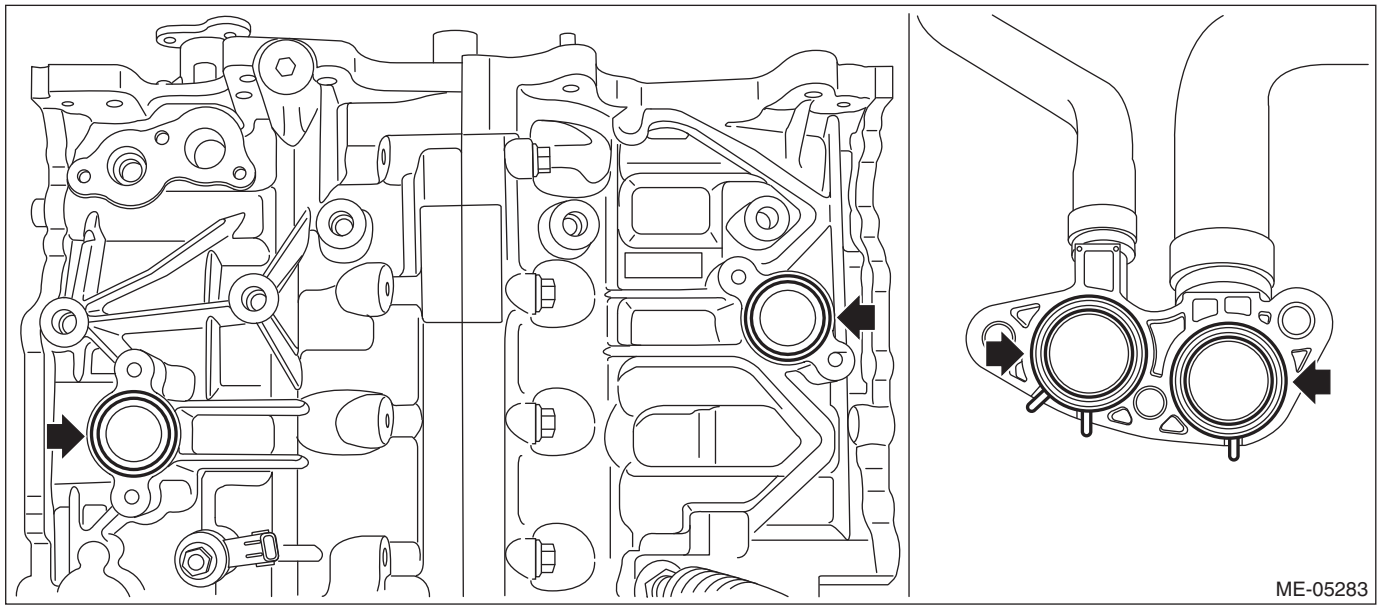
1) Remove the engine from the vehicle. <Ref. to ME(H4DO)-44, REMOVAL, Engine Assembly.>
2) Remove the intake manifold. <Ref. to FU(H4DO)-21, REMOVAL, Intake Manifold.>
3) Remove the tumble generator valve assembly. <Ref. to FU(H4DO)-84, REMOVAL, Tumble Generator Valve Assembly.>
4) Remove the chain cover. <Ref. to ME(H4DO)-91, REMOVAL, Chain Cover.>
5) Remove the rocker cover. <Ref. to ME(H4DO)-139, REMOVAL, Rocker Cover.>
6) Remove the cam carrier. <Ref. to ME(H4DO)-152, REMOVAL, Cam Carrier.>
7) Remove the cylinder head. <Ref. to ME(H4DO)-197, REMOVAL, Cylinder Head.>
8) Remove the crank sprocket. <Ref. to ME(H4DO)-137, REMOVAL, Crank Sprocket.>
9) Remove the engine hanger from cylinder block RH.



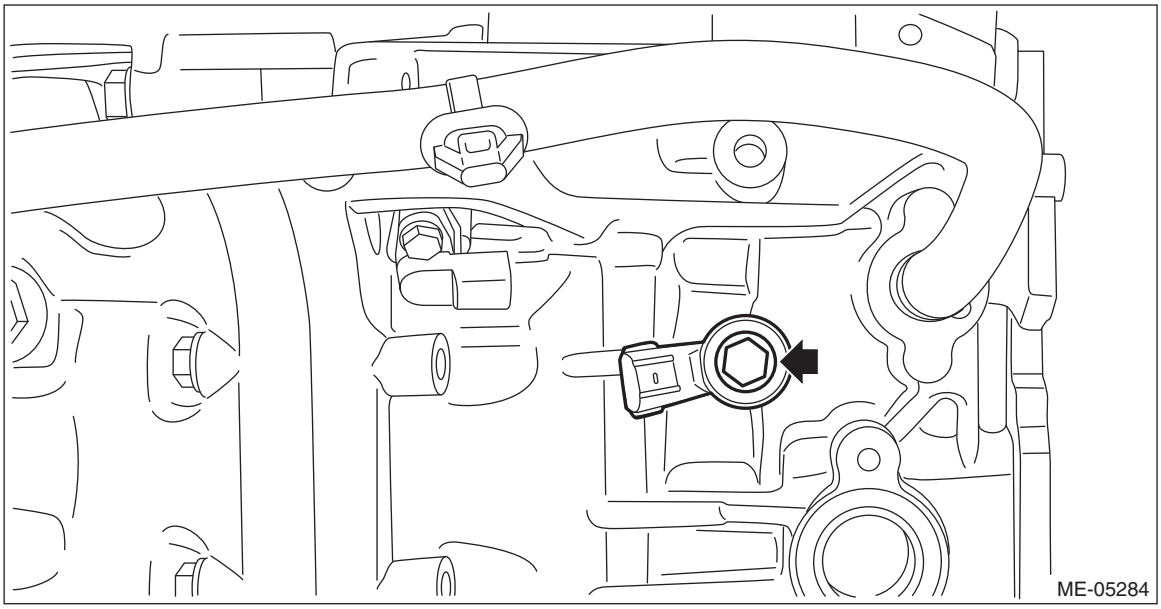
10) Remove the bolts securing the water pipe assembly and PCV connector to the cylinder block, and remove the water pipe assembly and PCV connector as a set from cylinder block.



11) Remove the O-ring from the cylinder block and PCV connector.

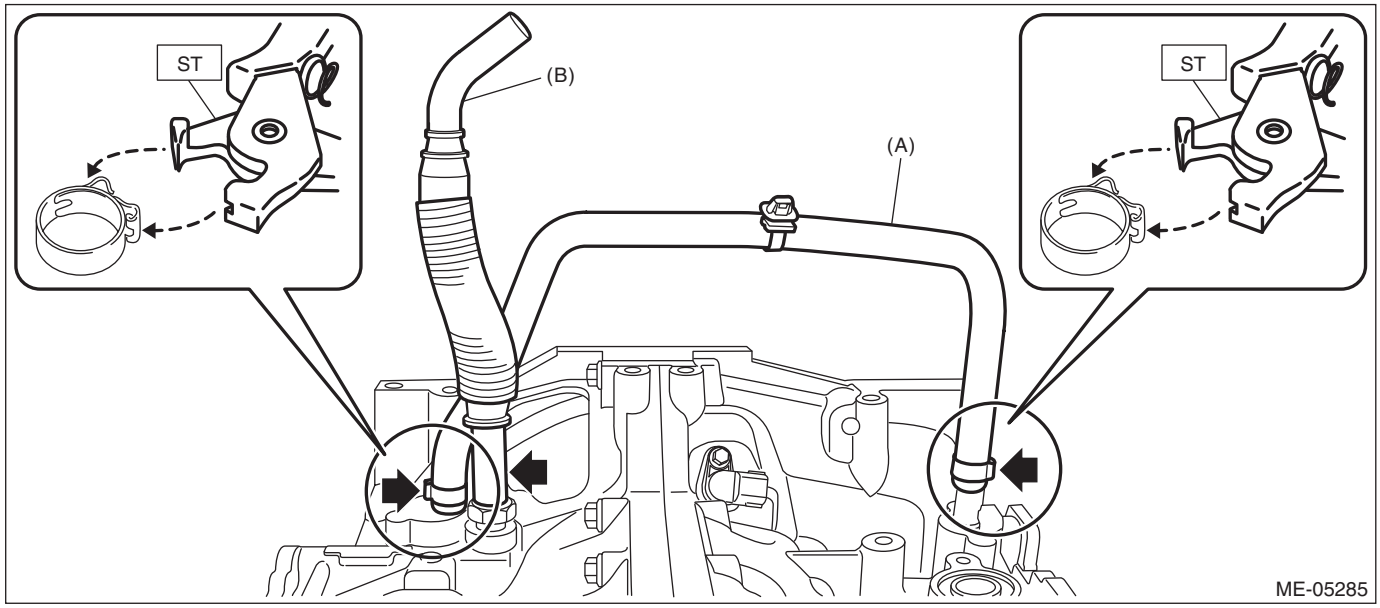


12) Remove the knock sensor from cylinder block LH.

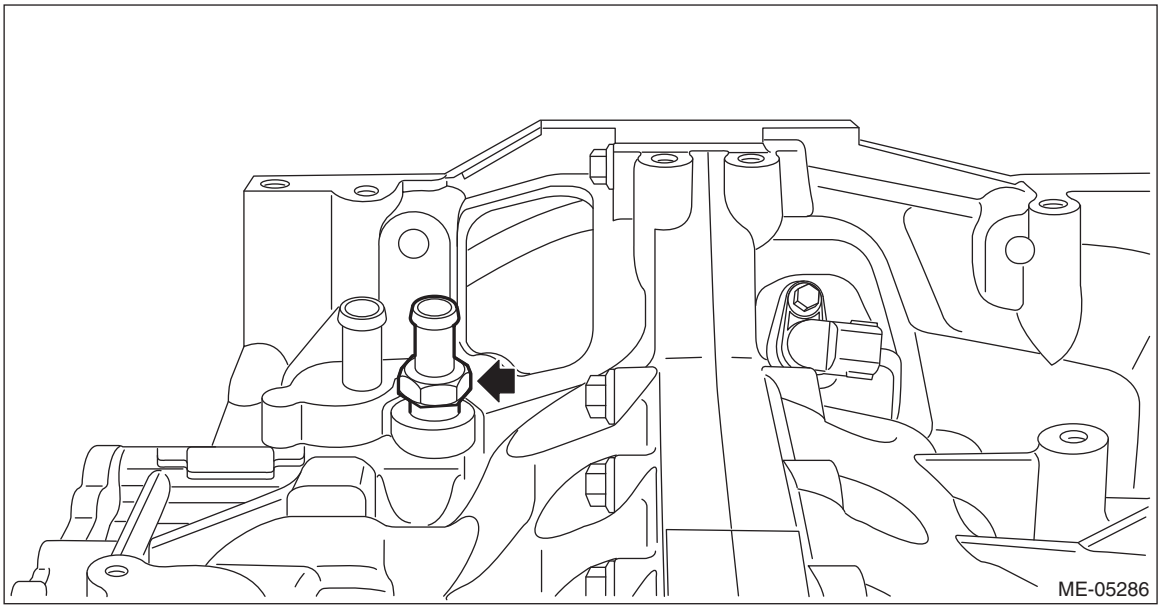


13) Remove the PCV hose assembly (A) and the vacuum hose (B) from cylinder block and PCV valve.

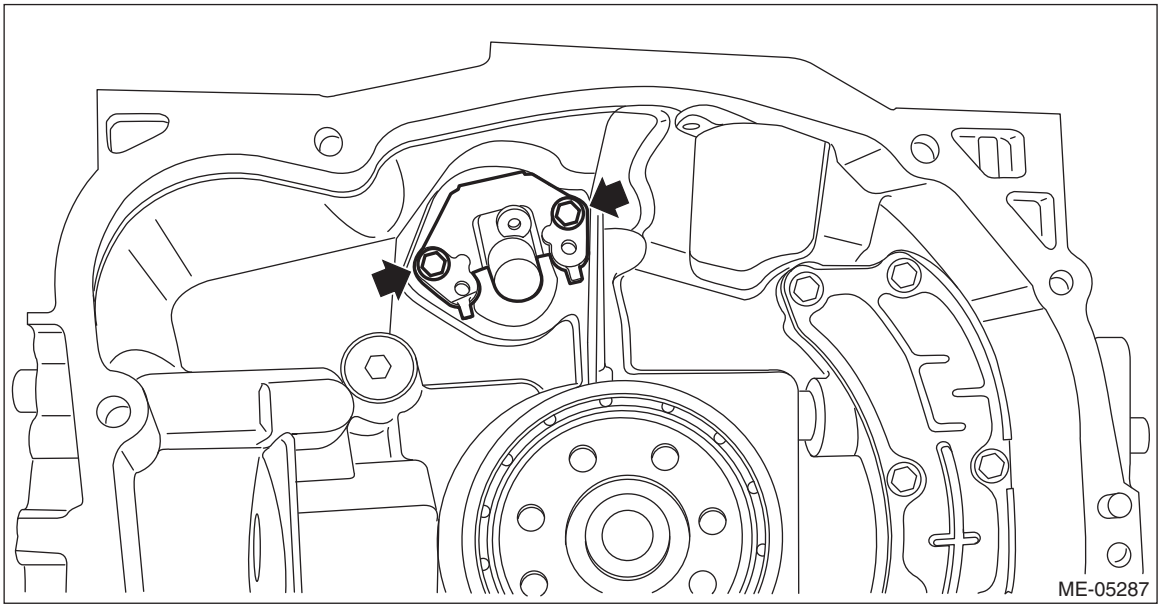
NOTE:
Pinch the clamp of the PCV hose assembly (A) by fitting the cut out in the ST with the protrusion on the clamp as shown in the figure, and unlock the clamp.
ST 18353AA000 CLAMP PLIERS



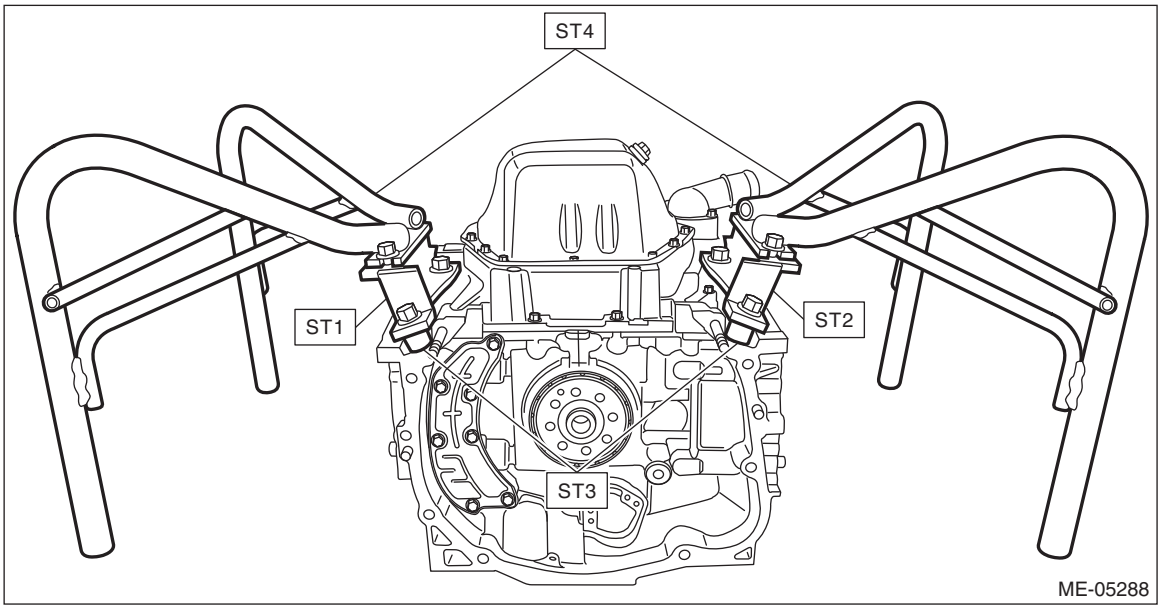
14) Remove the PCV valve from the cylinder block RH.



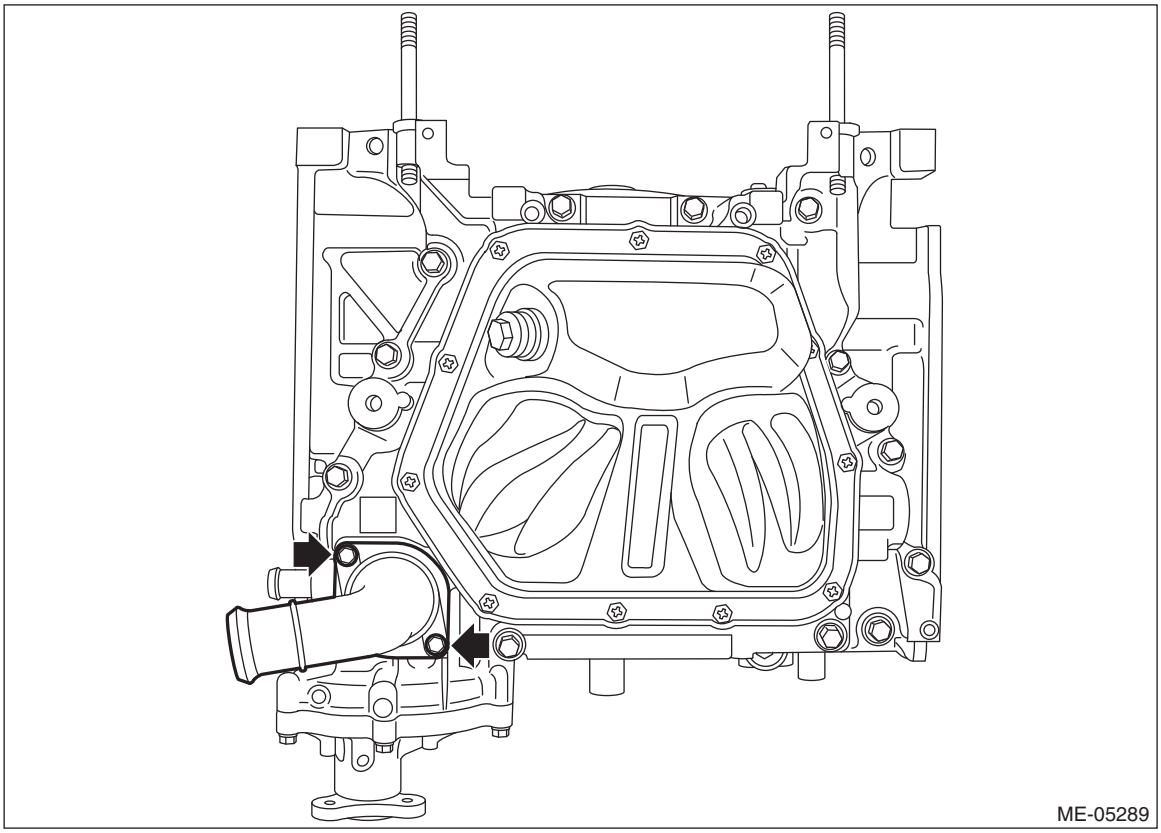
15) Remove the crankshaft position sensor plate with drive plate. (AT model) <Ref. to 4AT-73, REMOVAL, Drive Plate.>
16) Remove the clutch disc and cover. (MT model) <Ref. to CL-10, REMOVAL, Clutch Disc and Cover.>
17) Remove the crankshaft position sensor plate with flywheel. (MT model) <Ref. to CL-12, REMOVAL, Flywheel.>
18) Remove the bolts securing the crankshaft position sensor holder from the cylinder block LH, and remove the crankshaft position sensor with crankshaft position sensor holder.



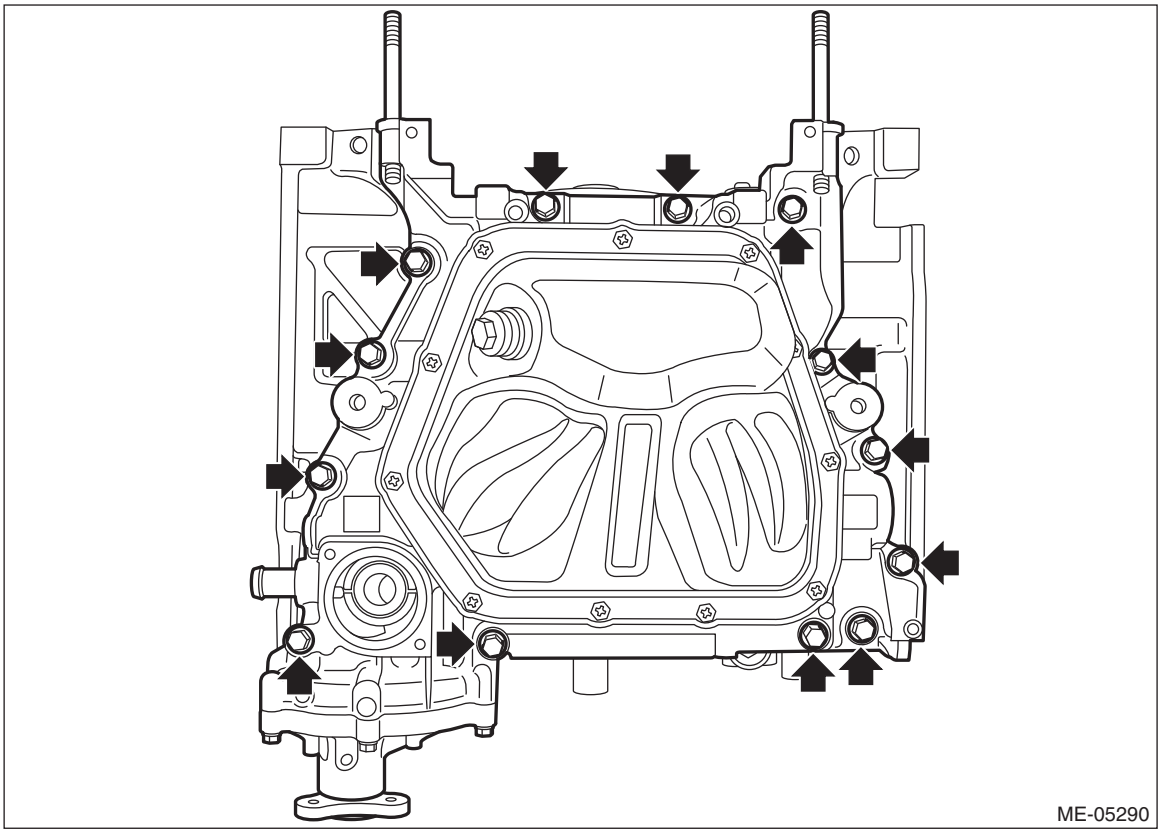
19) Set the cylinder block so that the oil pan is on the upper side, remove the ST1, ST2, ST3 and ST4 from cylinder block and oil pan upper.
ST1 498457000 ENGINE STAND ADAPTER RH
ST2 498457100 ENGINE STAND ADAPTER LH
ST3 18362AA020 ADAPTER
ST4 499817100 ENGINE STAND



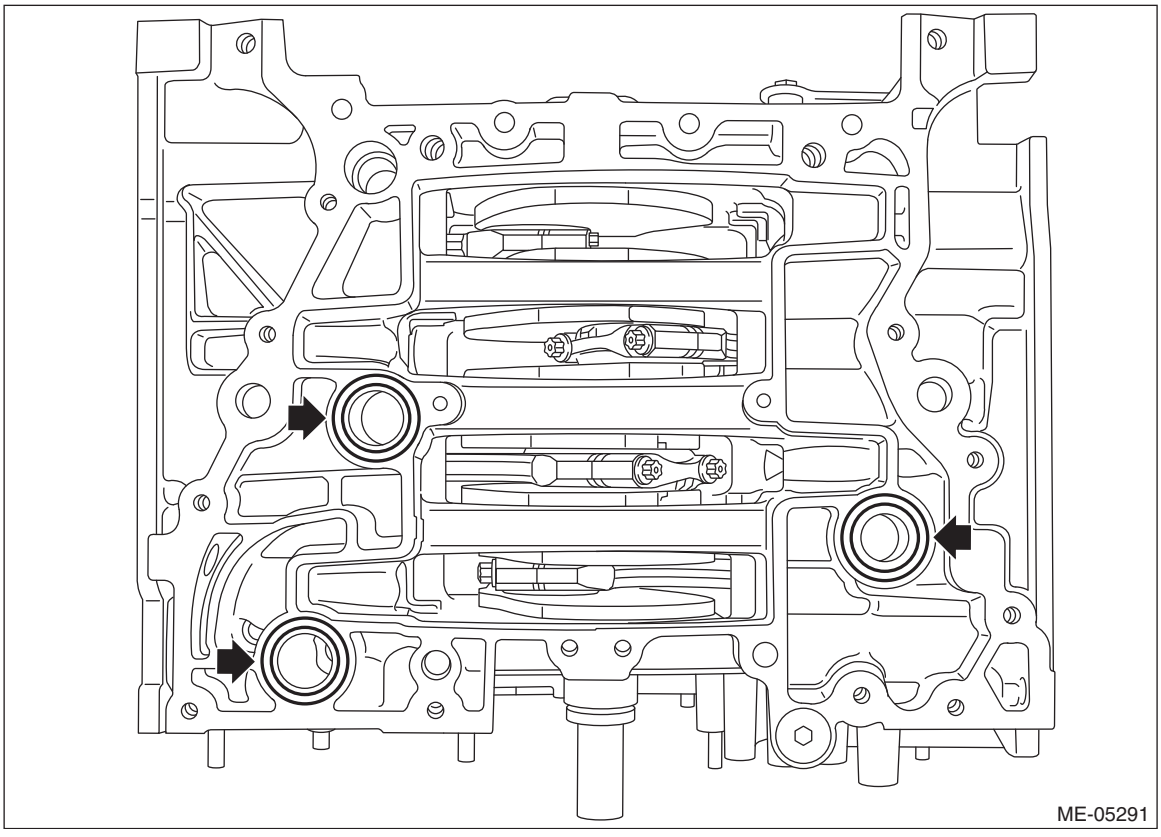
20) Remove the thermostat cover from oil pan upper, and then remove the thermostat.



21) Remove the oil pan upper with oil pan from cylinder block.

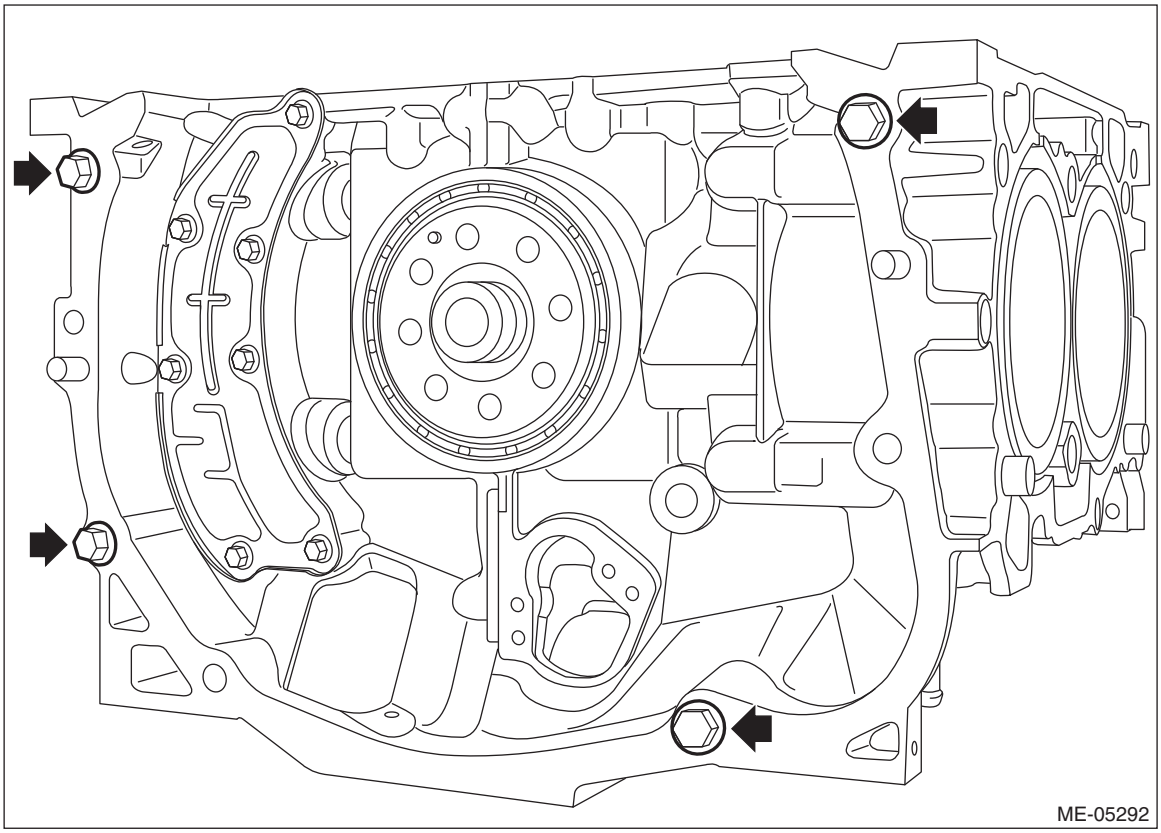


22) Remove the O-ring from the cylinder block.



23) Install the A/C compressor bracket bolts and the power steering pump bracket bolts at the locations shown in the figure.

NOTE:
• This procedure is required to prevent the knock pin damage when the cylinder block is raised in the next step.
• Use the same length bolt for the four bolts.



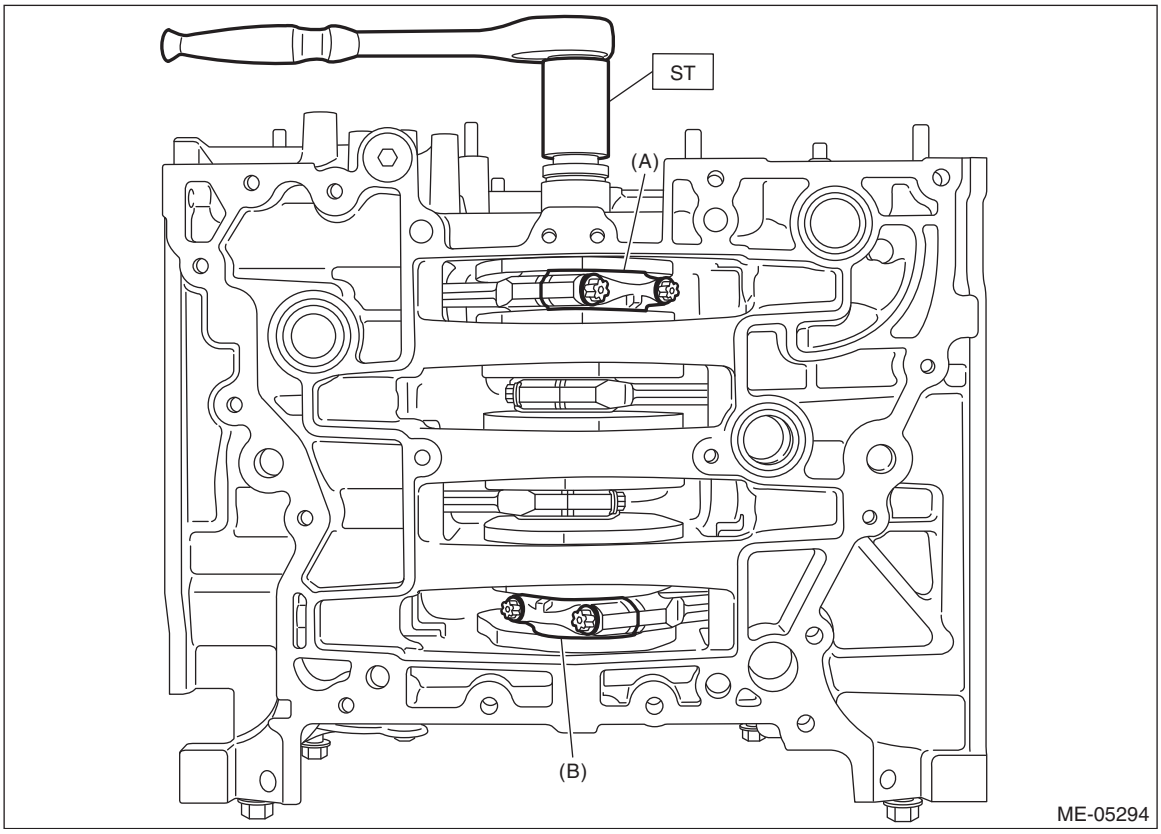
24) Raise the cylinder block so that the rear oil seal is on the lower side.

25) Remove the #1 and #4 connecting rod caps and pistons from the cylinder block.

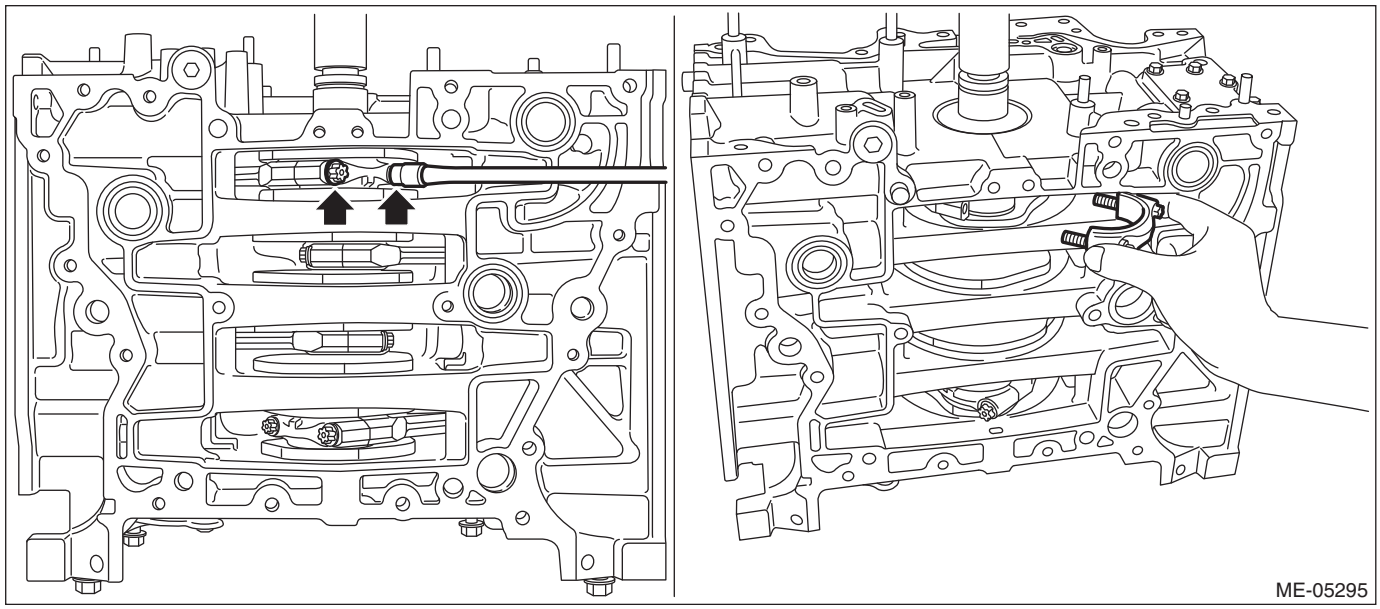
NOTE:
Mark each connecting rod cap and piston with a cylinder number.

(1) Turn the crankshaft so that the #1 connecting rod cap (A) and #4 connecting rod cap (B) is located at the position shown in the figure using ST.

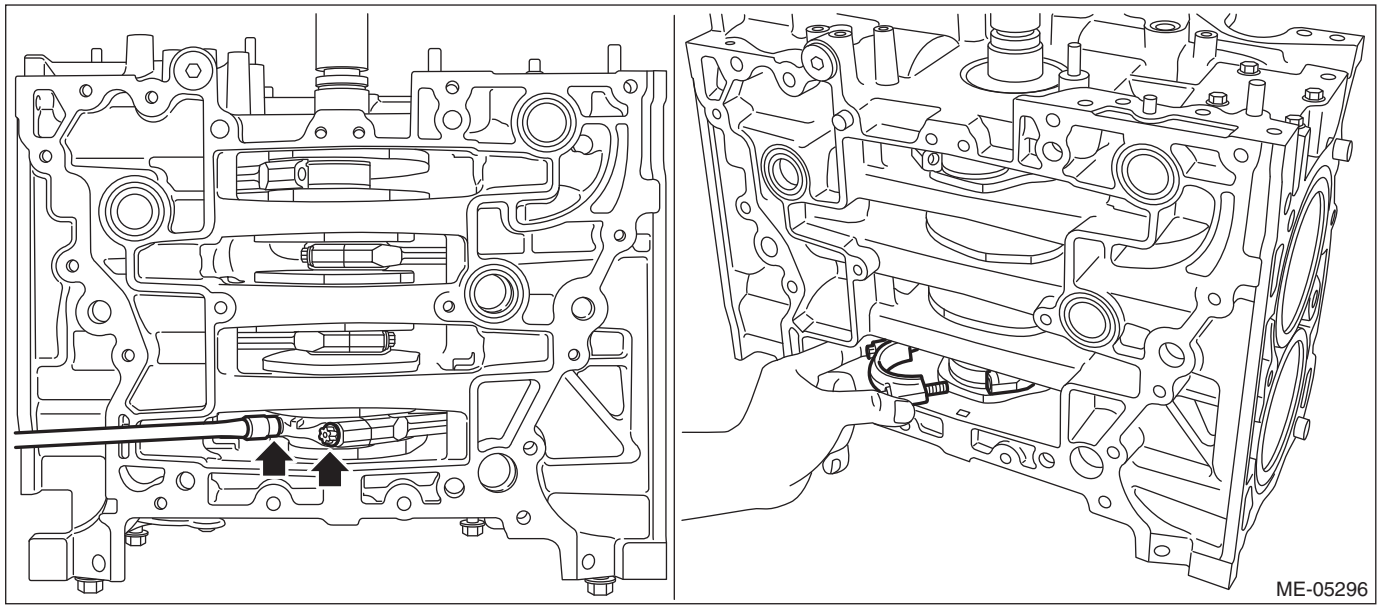
ST 18252AA000 CRANKSHAFT SOCKET



(2) Using TORX® socket E12, loosen the #1 connecting rod cap bolt, and remove the #1 connecting rod cap bolt and #1 connecting rod cap.

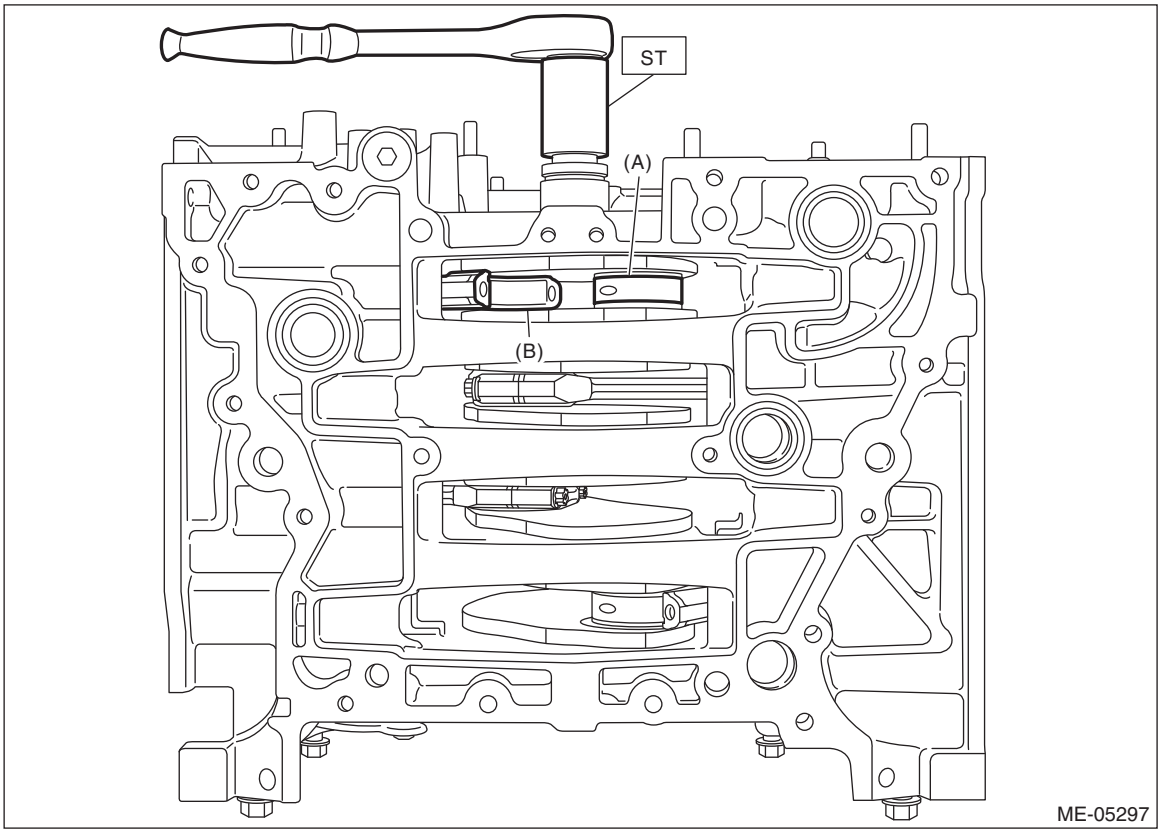


(3) Using TORX® socket E12, loosen the #4 connecting rod cap bolt, and remove the #4 connecting rod cap bolt and #4 connecting rod cap.

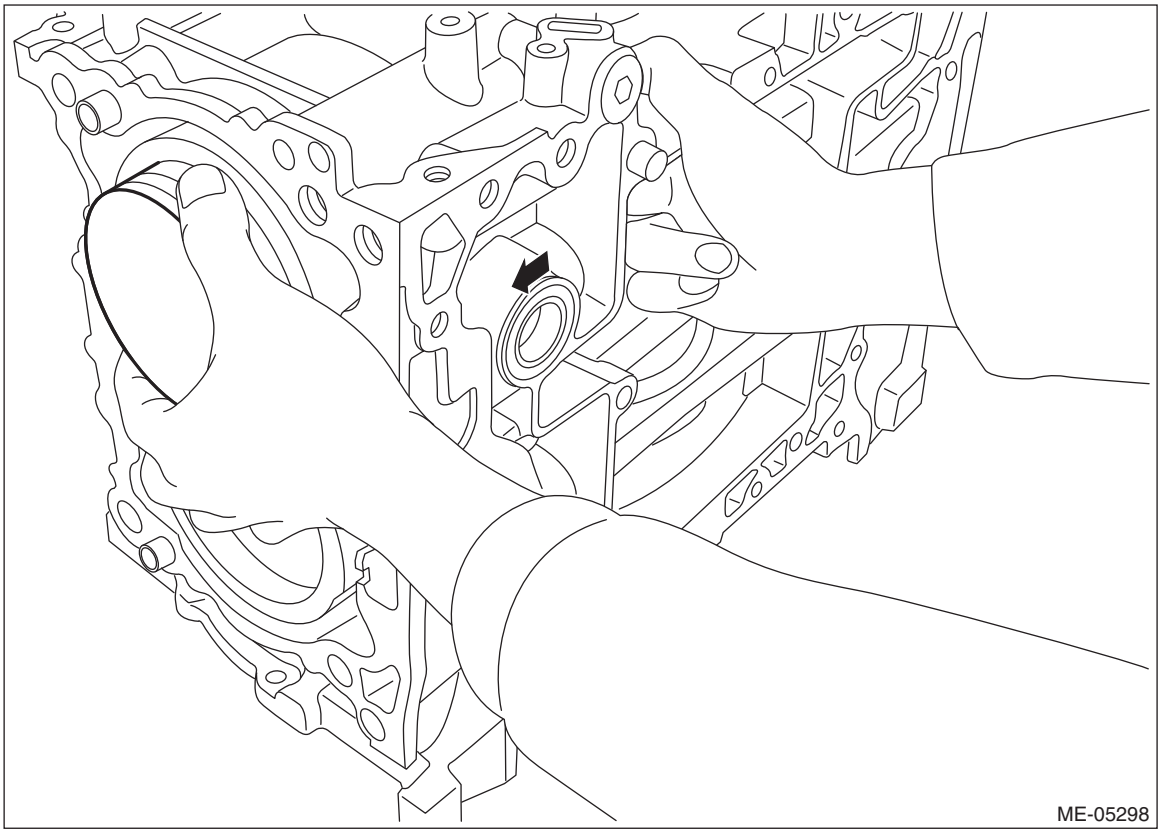


(4) Using the ST, turn the crankshaft clockwise and separate the positions of the #1 crank pin (A) and the large end of the #1 connecting rod (B).

ST 18252AA000 CRANKSHAFT SOCKET

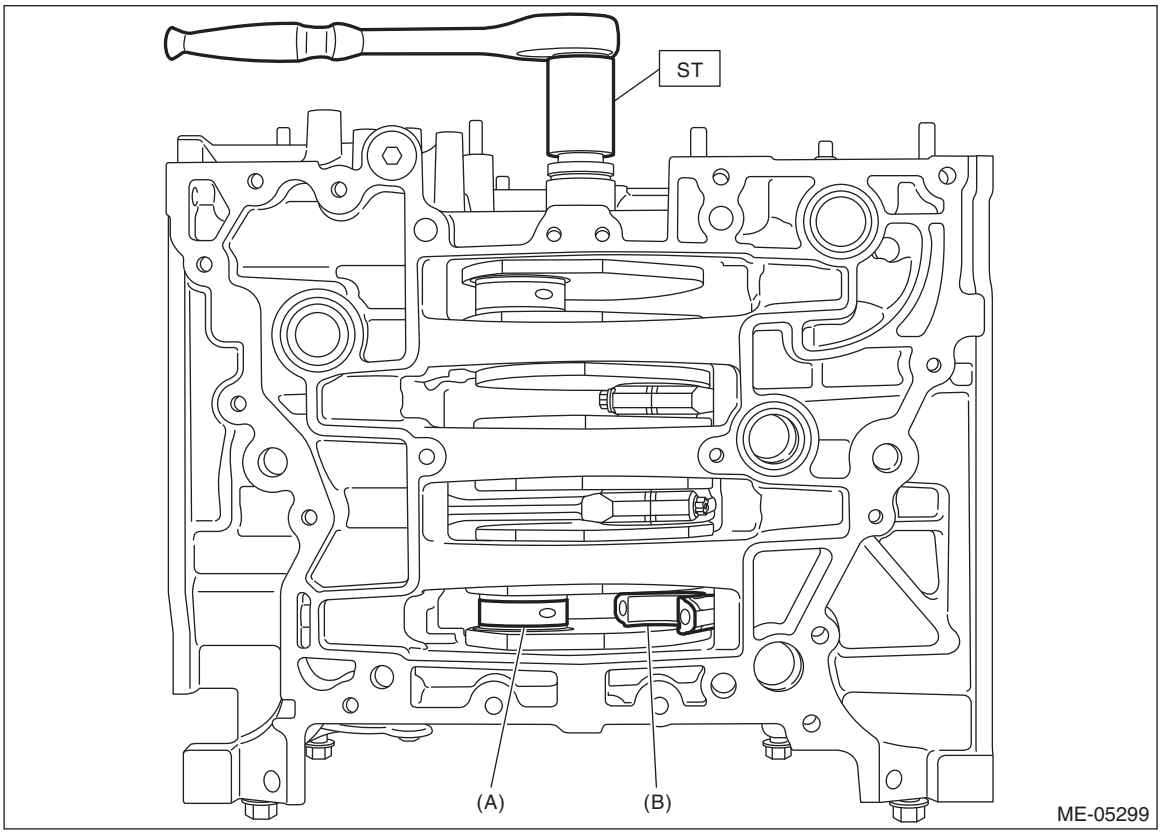


(5) Push the #1 connecting rod in the direction of the arrow, and remove the #1 piston with #1 connecting rod from the cylinder block.

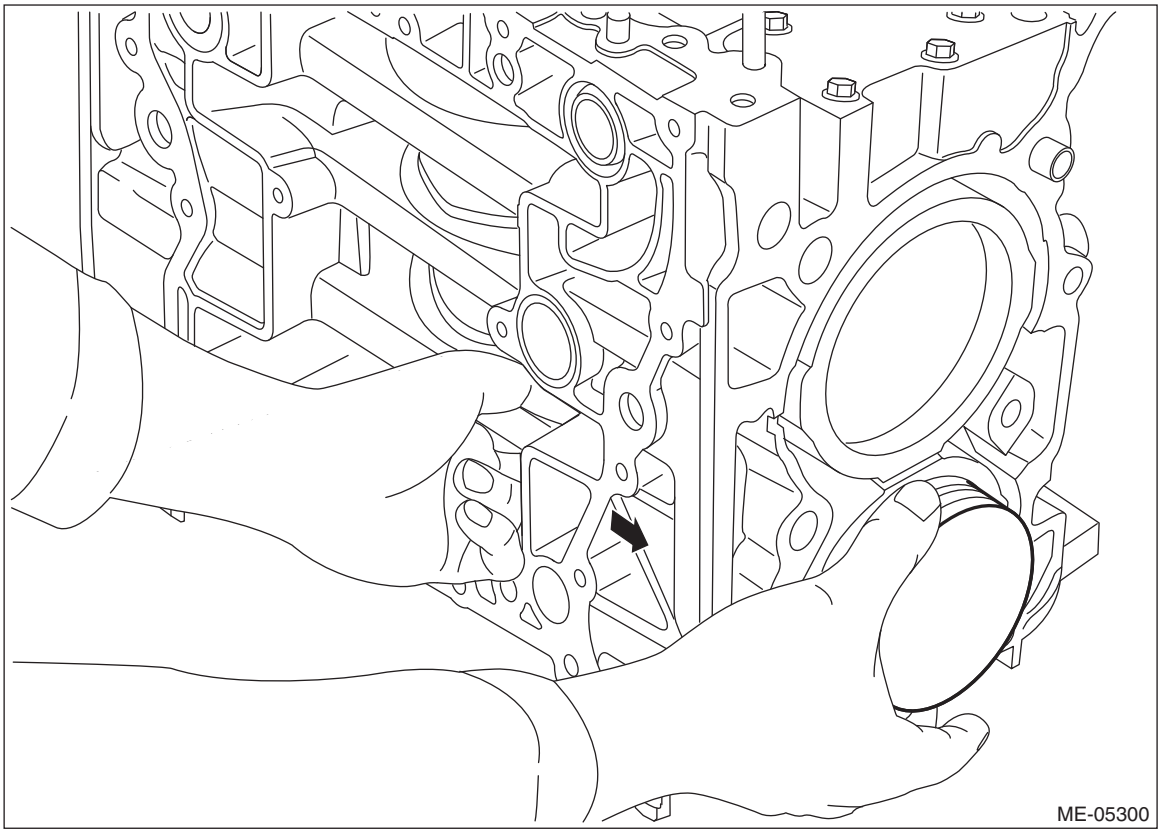


(6) Using the ST, turn the crankshaft counterclockwise and separate the positions of the #4 crank pin (A) and the large end of the #4 connecting rod (B).

ST 18252AA000 CRANKSHAFT SOCKET



(7) Push the #4 connecting rod in the direction of the arrow, and remove the #4 piston with #4 connecting rod from the cylinder block.

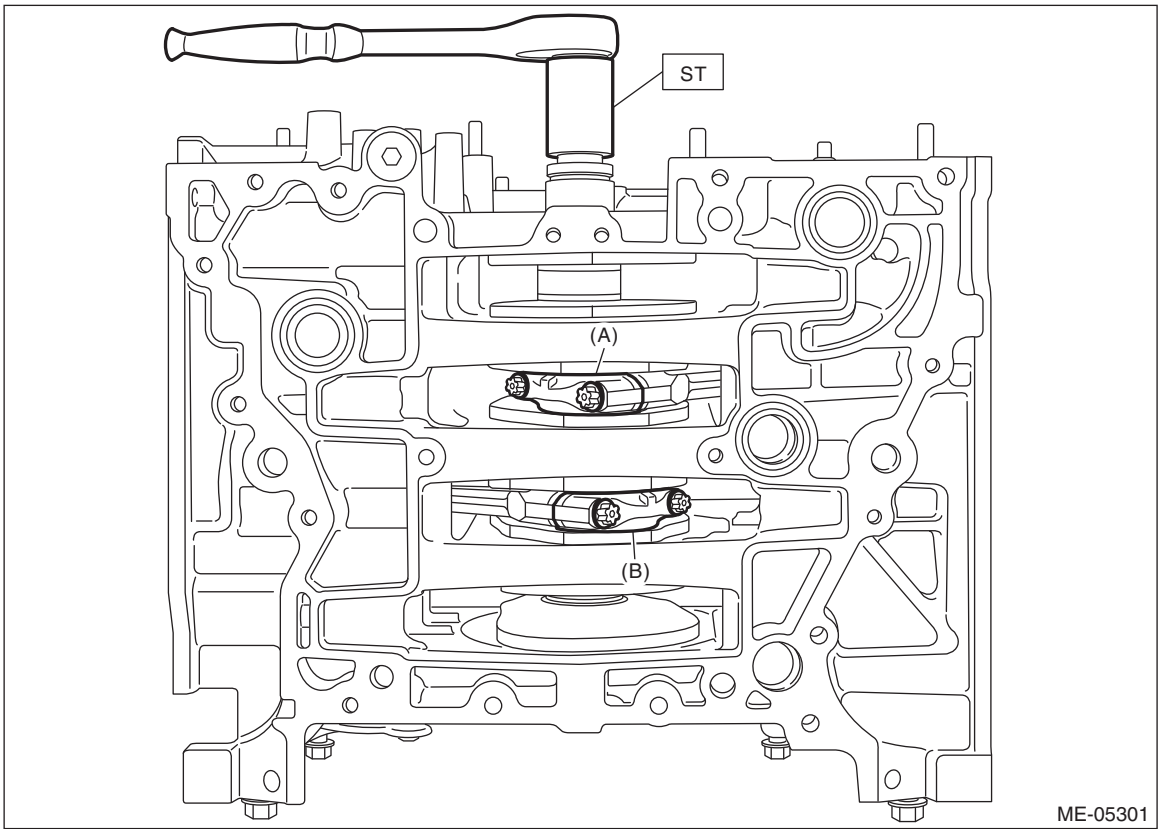


26) Remove the #2 and #3 connecting rod caps and pistons from the cylinder block.

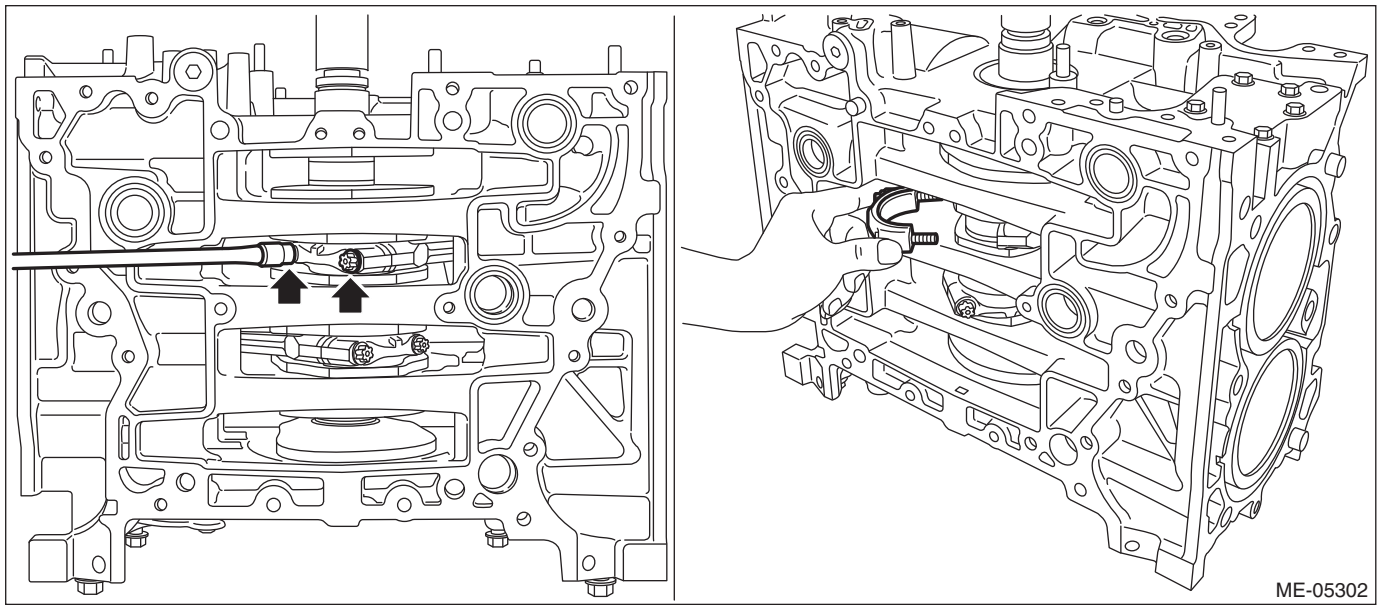
NOTE:
Mark each connecting rod cap and piston with a cylinder number.

(1) Turn the crankshaft so that the #2 connecting rod cap (A) and #3 connecting rod cap (B) is located at the position shown in the figure using ST.

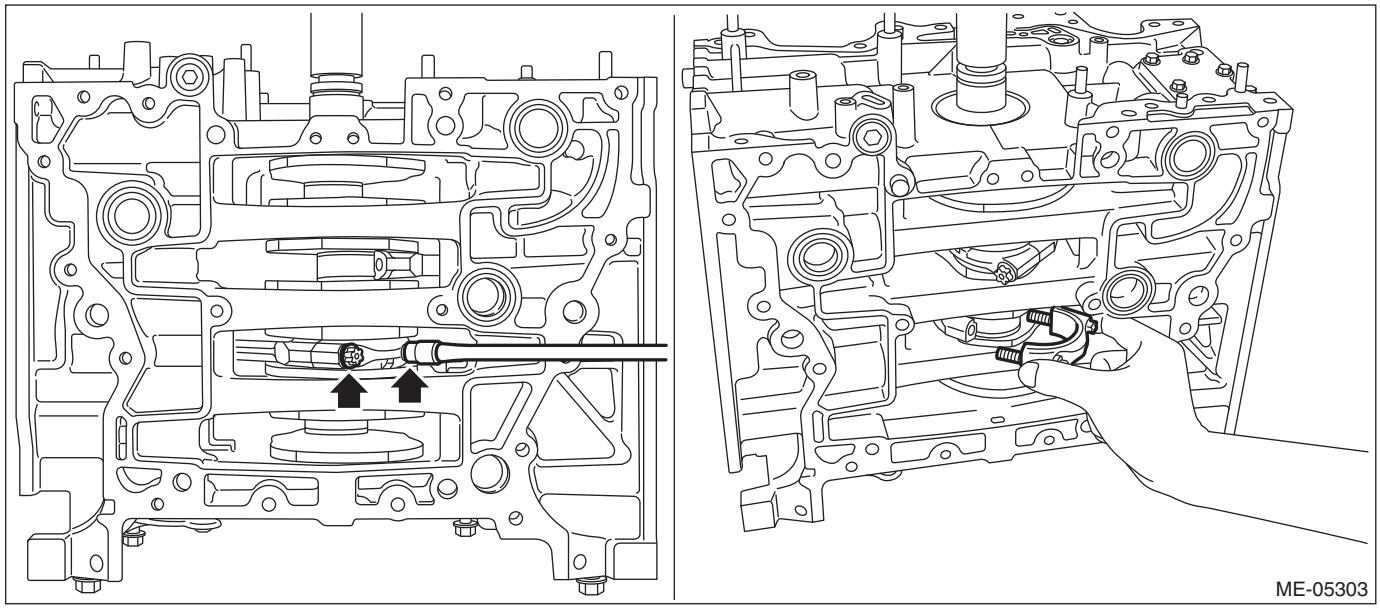
ST 18252AA000 CRANKSHAFT SOCKET



(2) Using TORX® socket E12, loosen the #2 connecting rod cap bolt, and remove the #2 connecting rod cap bolt and #2 connecting rod cap.

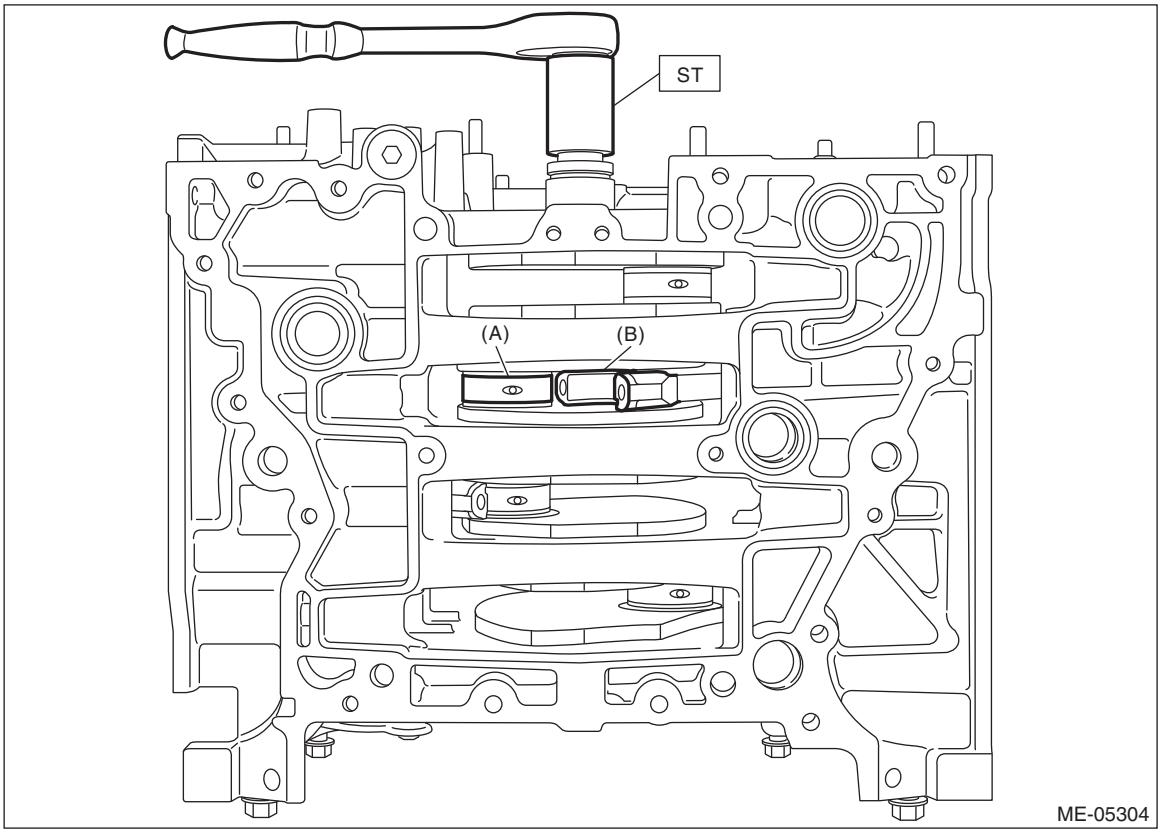


(3) Using TORX® socket E12, loosen the #3 connecting rod cap bolt, and remove the #3 connecting rod cap bolt and #3 connecting rod cap.

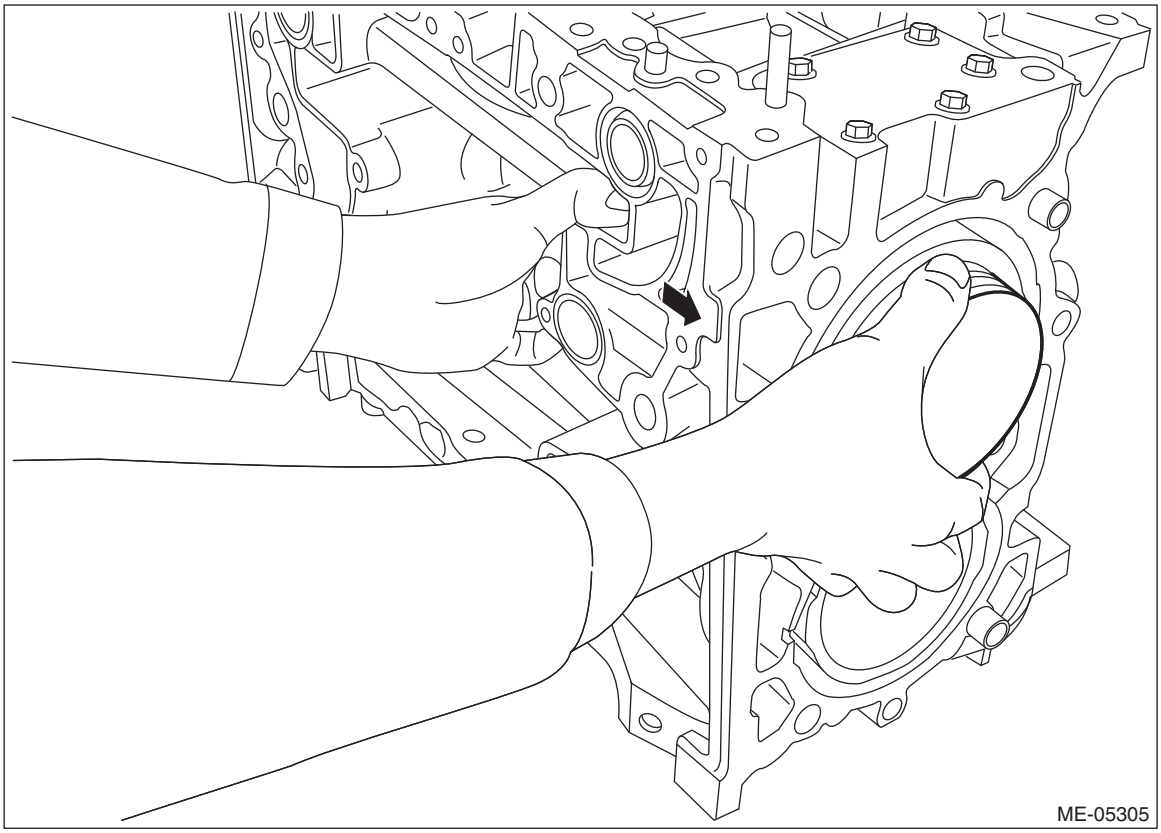


(4) Using the ST, turn the crankshaft counterclockwise and separate the positions of the #2 crank pin (A) and the large end of the #2 connecting rod (B).

ST 18252AA000 CRANKSHAFT SOCKET

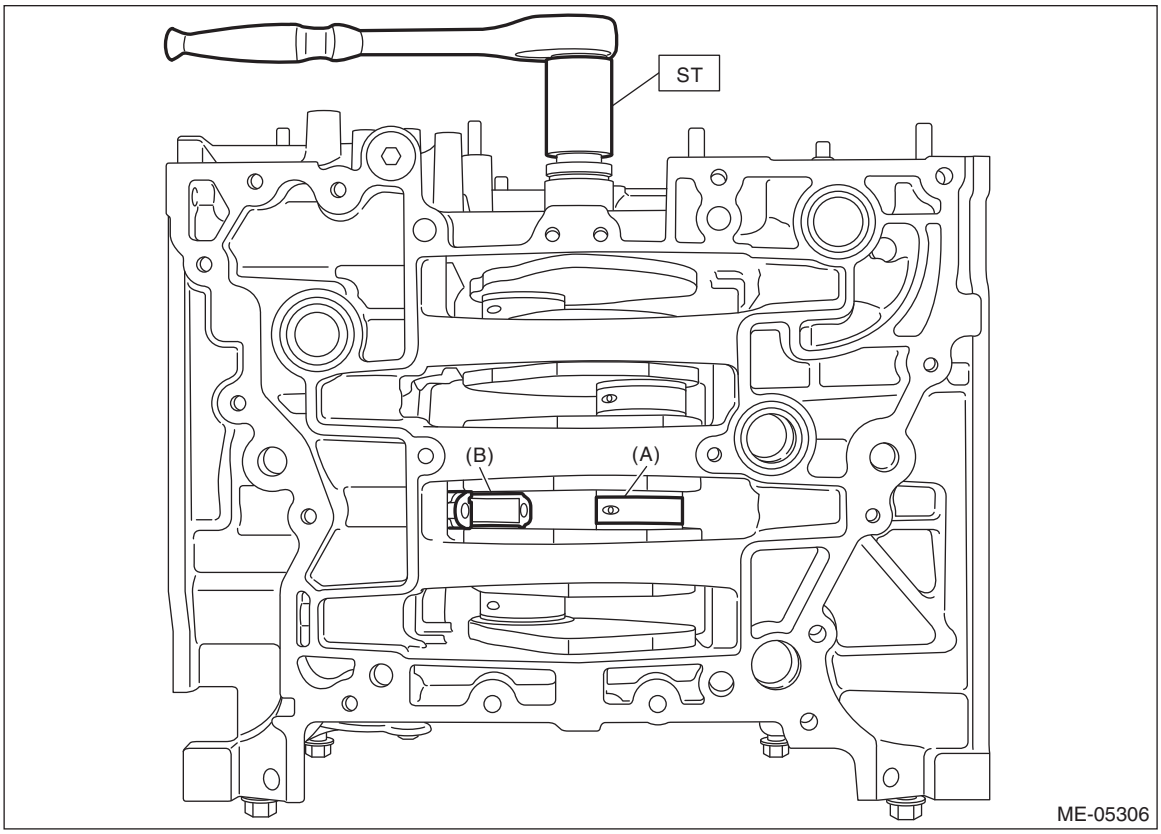


(5) Push the #2 connecting rod in the direction of the arrow, and remove the #2 piston with #2 connecting rod from the cylinder block.

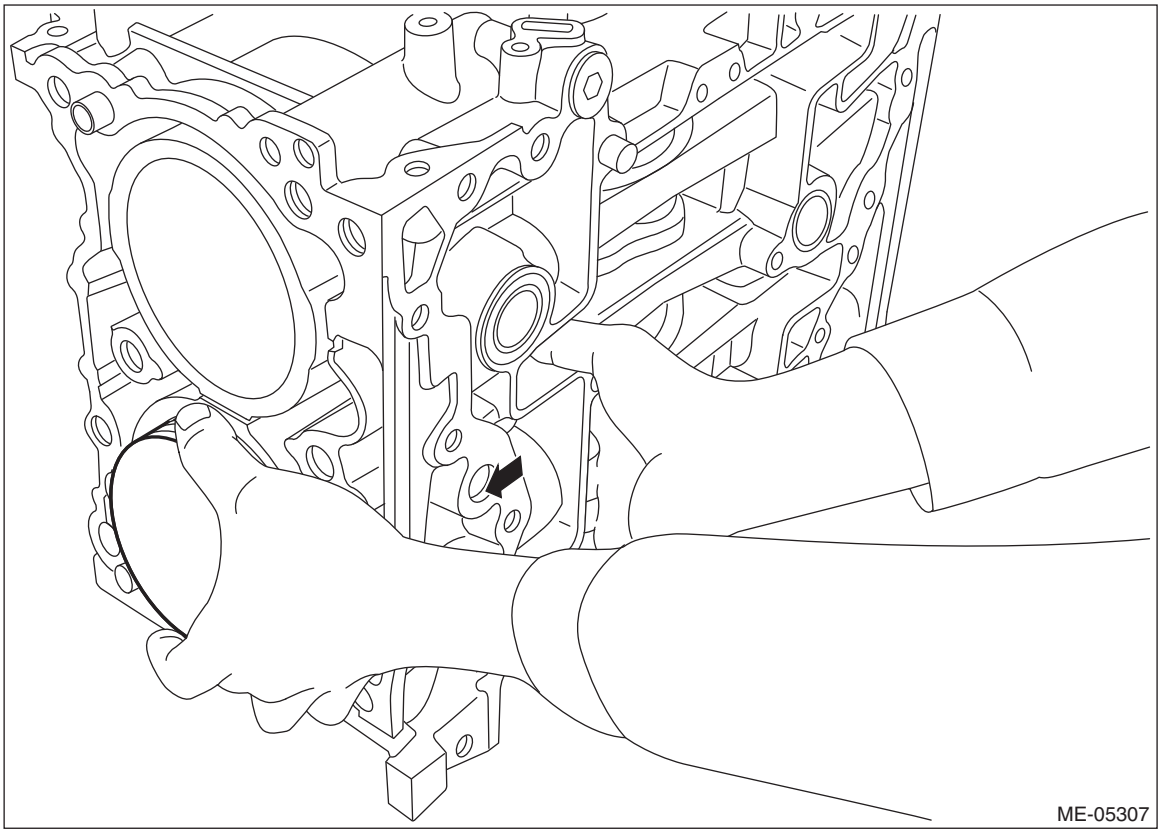


(6) Using the ST, turn the crankshaft clockwise and separate the positions of the #3 crank pin (A) and the large end of the #3 connecting rod (B).

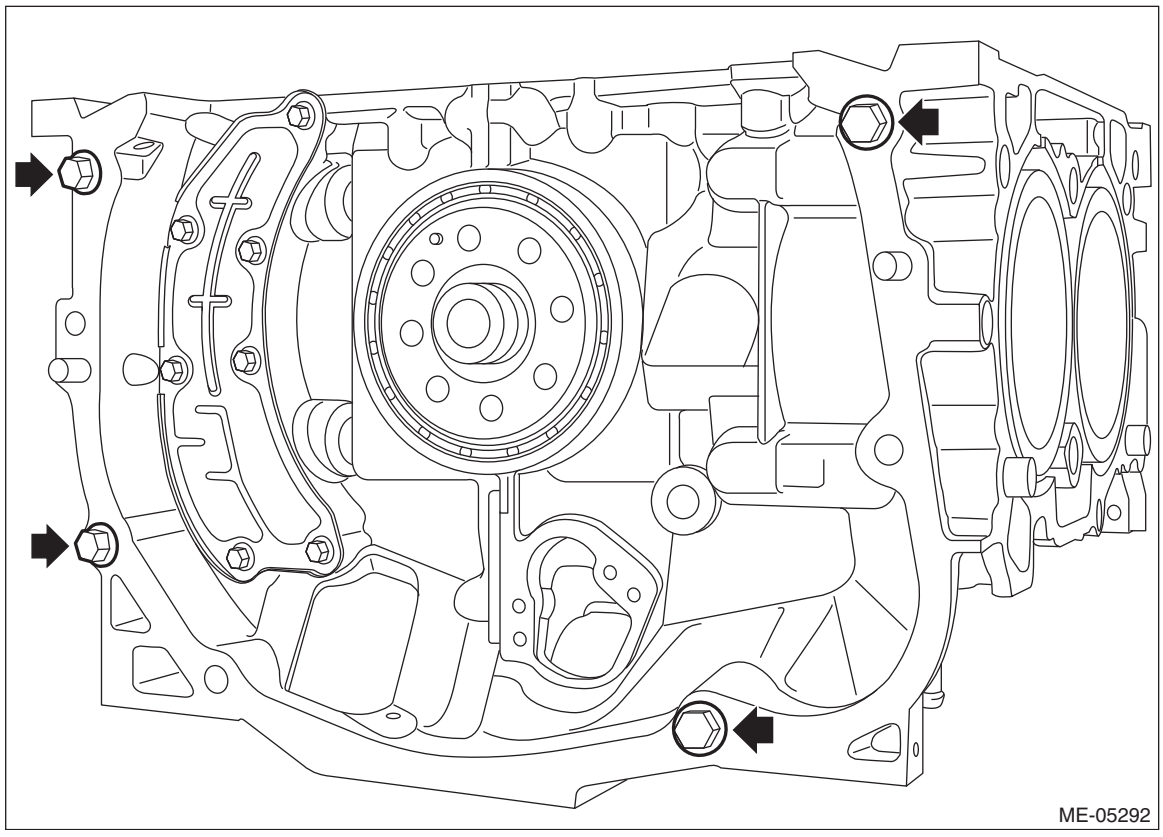
ST 18252AA000 CRANKSHAFT SOCKET



(7) Push the #3 connecting rod in the direction of the arrow, and remove the #3 piston with #3 connecting rod from the cylinder block.



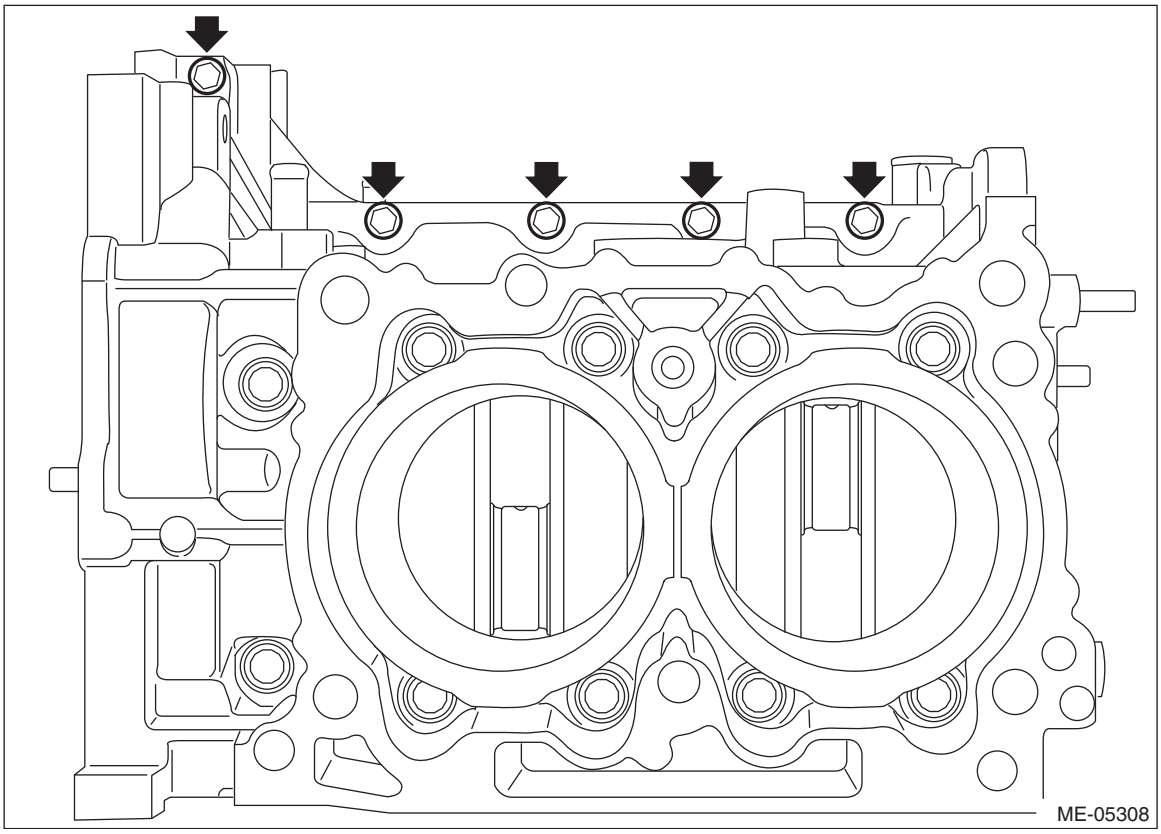
27) Set the cylinder block so that the oil pan side is on the upper side, and remove the A/C compressor bracket bolts and the power steering pump bracket bolts attached at the locations shown in the figure.



28) Set the part so that the cylinder block RH is on the upper side, and separate the cylinder block.

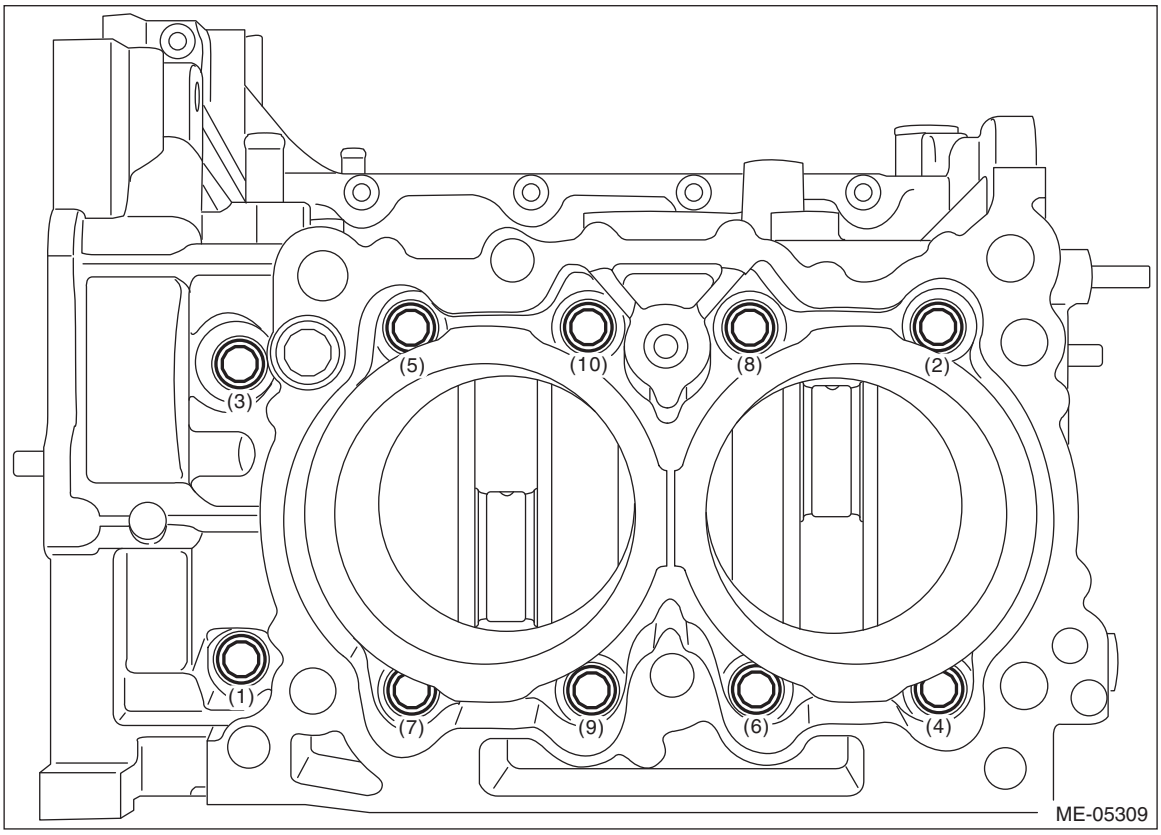
CAUTION:
- **Place a wood board wrapped with a waste cloth to prevent the knock pin damage and to stabilize the cylinder block before work.**
- **Be careful not to scratch the mating surface of cylinder block during work.**

(1) Remove the bolt shown in the figure.



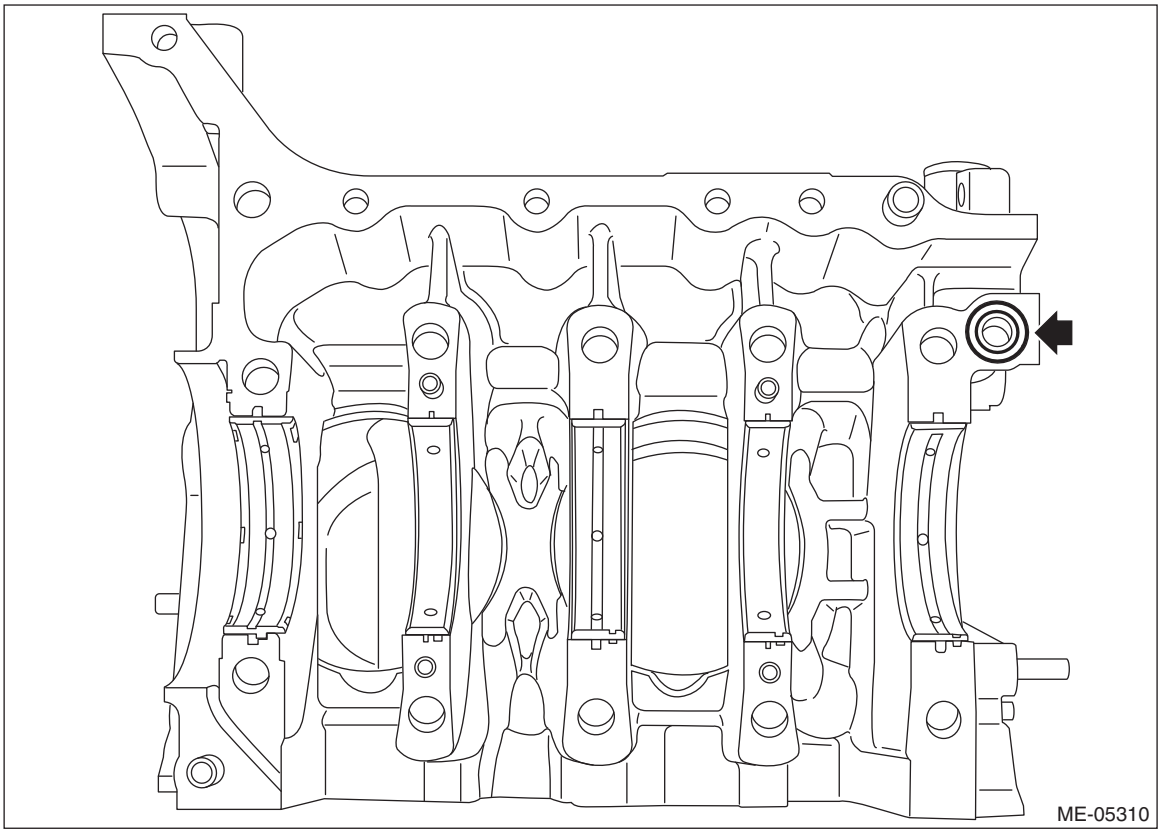
(2) Loosen the cylinder block mounting bolts in numerical order as shown in the figure, and separate the cylinder block RH and LH.

NOTE:
Lift the cylinder block RH slightly, and confirm that the crankshaft is remaining in the cylinder block LH. If the cylinder block RH is lifted carelessly when separating, the crankshaft may stick to cylinder block RH, then fall off.



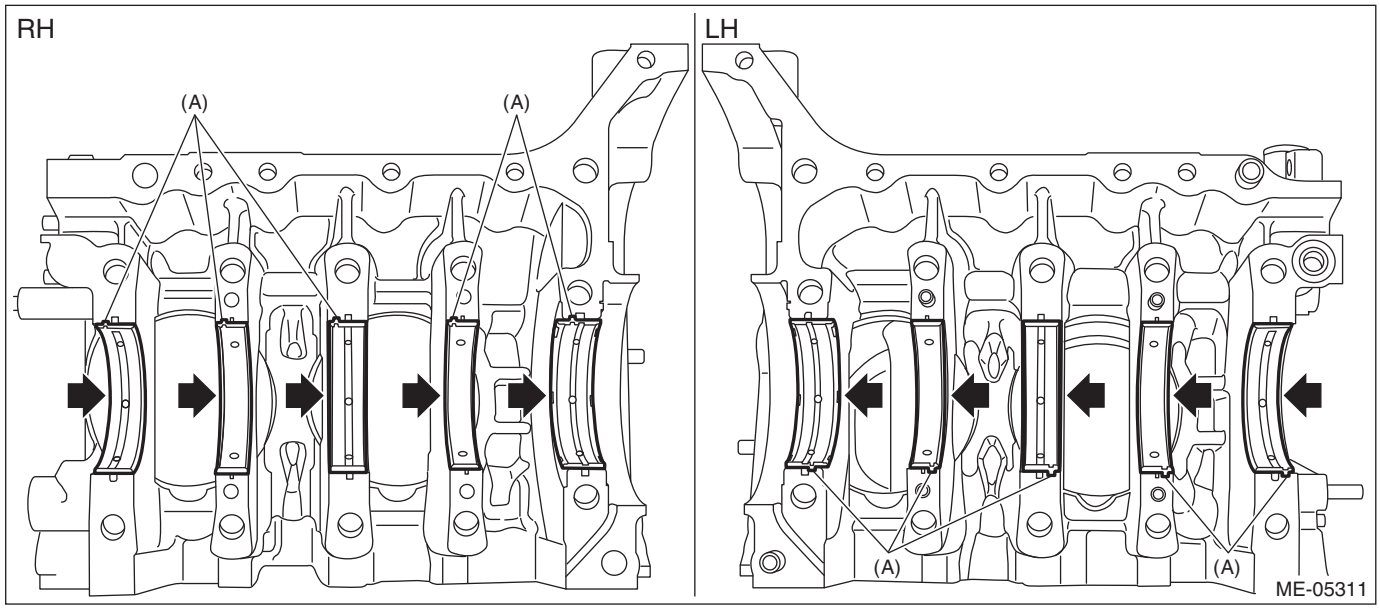
29) Remove the crankshaft from cylinder block LH, and remove the rear oil seal.

30) Remove the O-ring from the cylinder block LH.



31) Remove the crankshaft bearings from the cylinder block.

NOTE:
- Be careful not to confuse the crankshaft bearing combination.
- Press the bearing at the end opposite to locking lip (A).

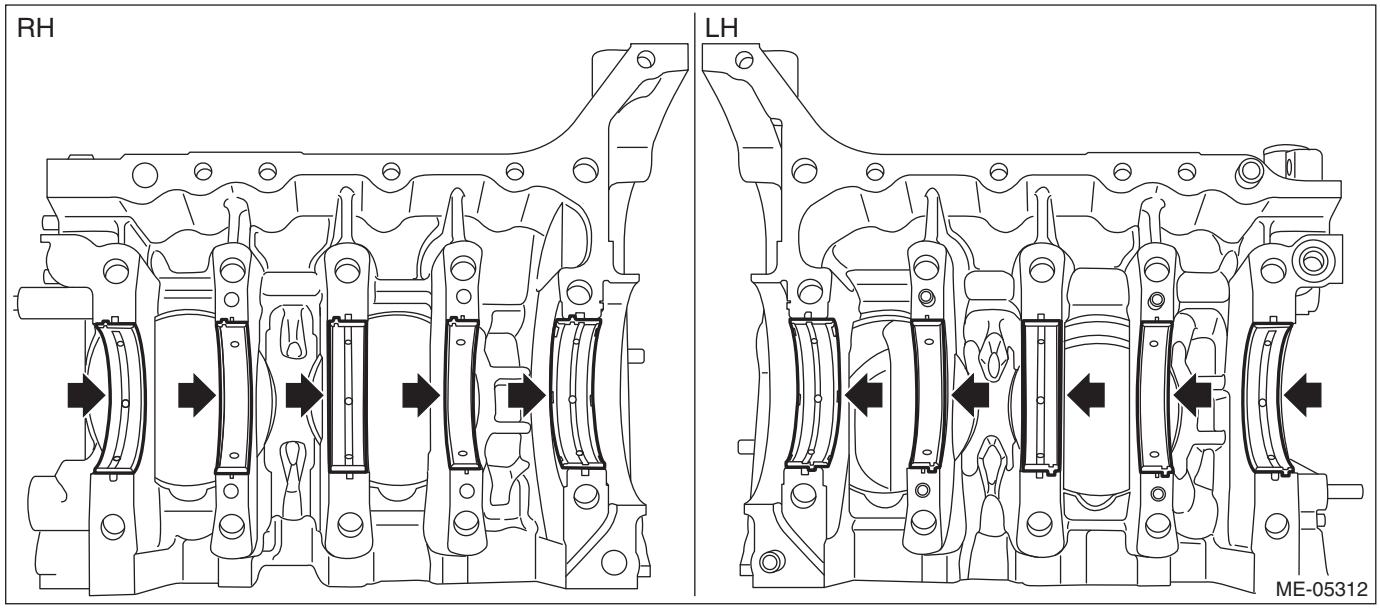


32) Remove the liquid gasket from cylinder block.

B: INSTALLATION

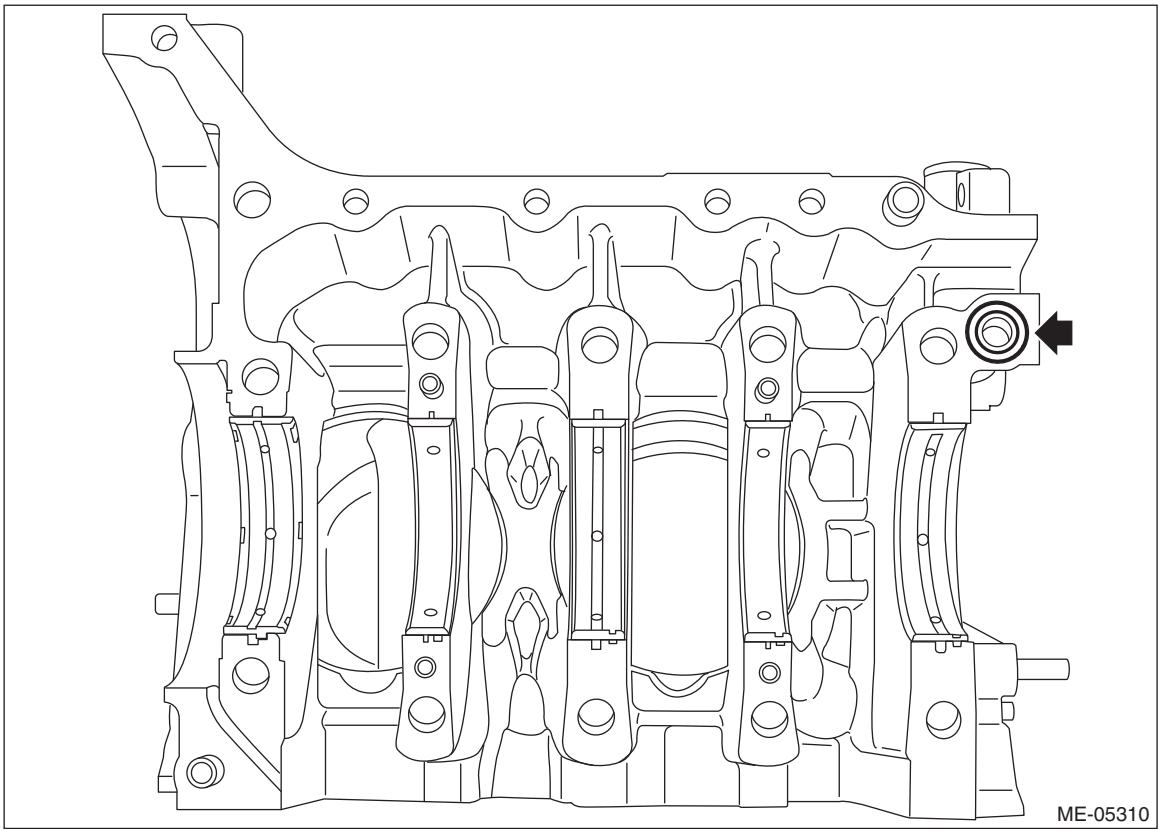
1) Apply engine oil to the crankshaft bearing, and install the crankshaft bearing to the cylinder block.

CAUTION:
• Place a wood board wrapped with a waste cloth to prevent the knock pin damage and to stabilize the cylinder block before work.
• Be careful not to scratch the mating surface of cylinder block during work.

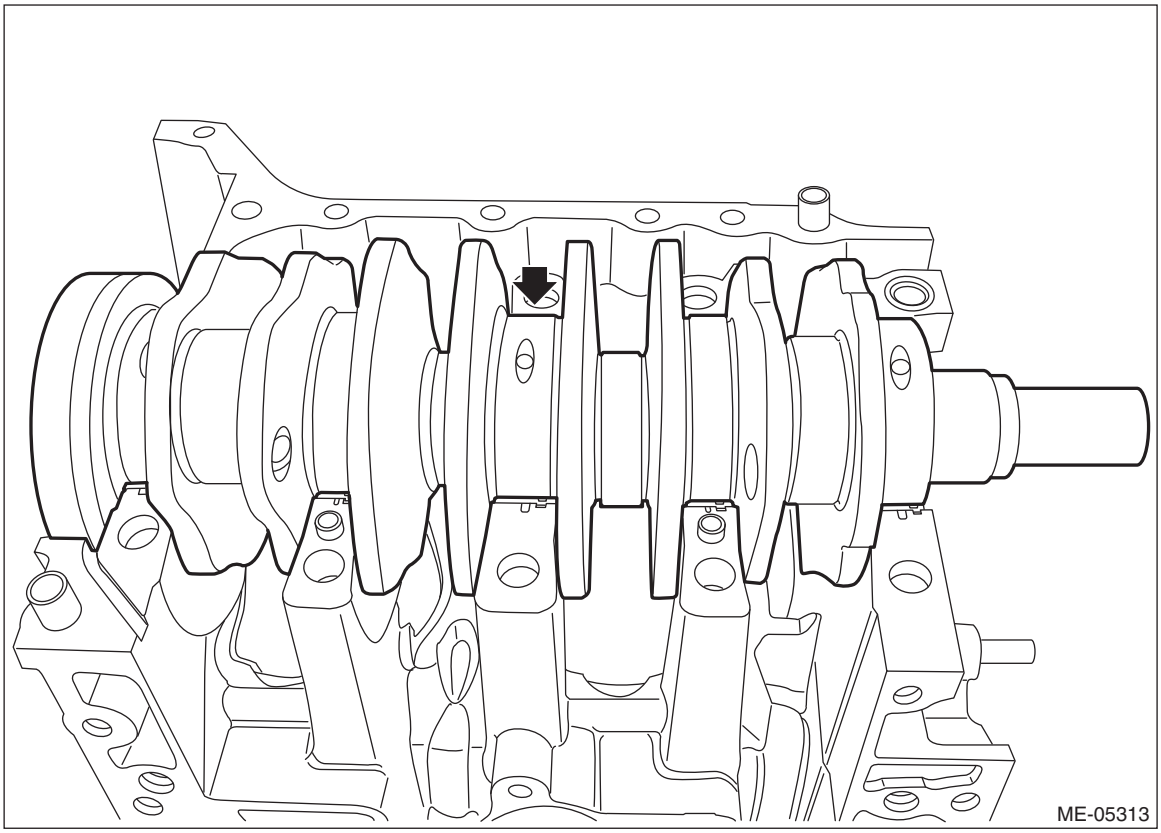


2) Install O-rings to the cylinder block LH.

NOTE:
Use new O-rings.



3) Apply engine oil to the crankshaft journal, and set the crankshaft to the cylinder block LH.



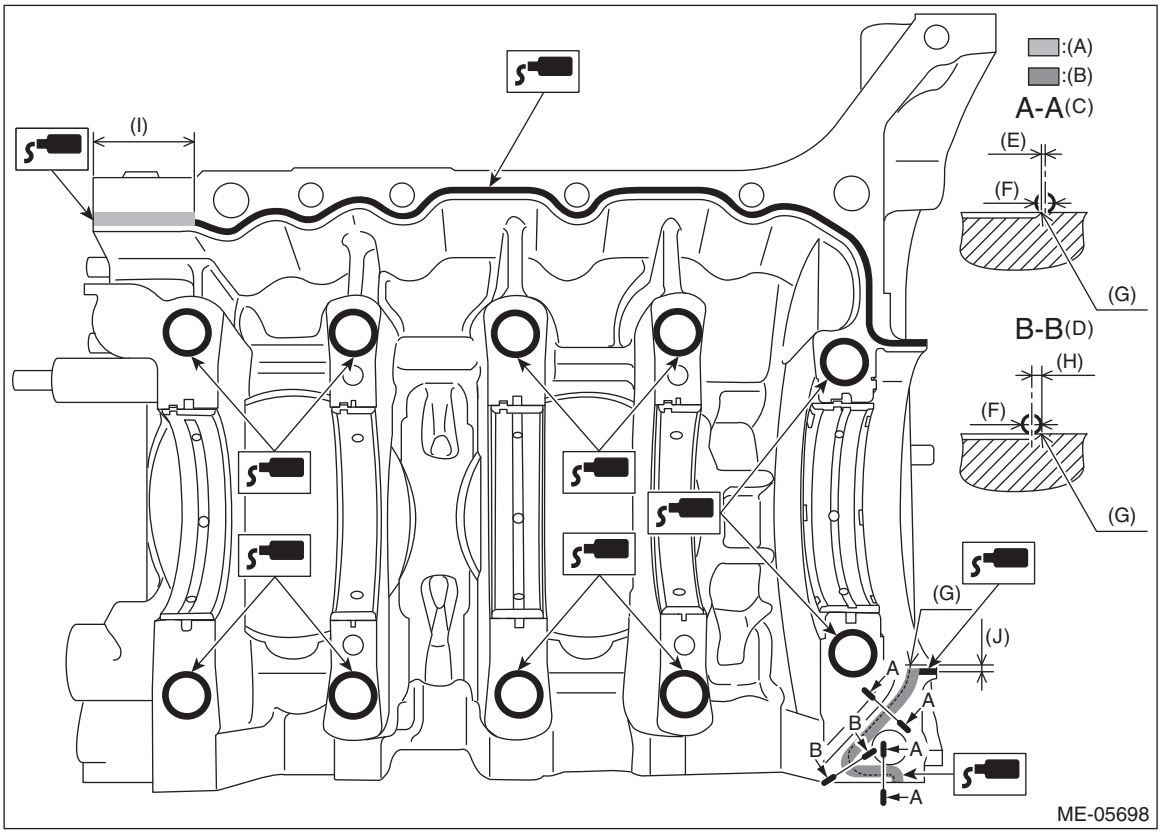
4) Apply liquid gasket to the mating surface of cylinder block RH as shown in the figure.

CAUTION:
Do not let the liquid gasket overflow to the oil passage, journal groove, because the engine seizure may result.

NOTE:
• Before applying liquid gasket, remove oil from liquid gasket seal surface of the cylinder block RH and the cylinder block LH.
• Install within 5 min. after applying liquid gasket.

Liquid gasket:
THREE BOND 1217G (Part No. K0877Y0100) or equivalent

Liquid gasket applying diameter:
Mating surfaces other than ranges A and B
1±0.5 mm (0.0394±0.0197 in)
Mating surfaces of ranges A and B
4±0.5 mm (0.1575±0.0197 in)



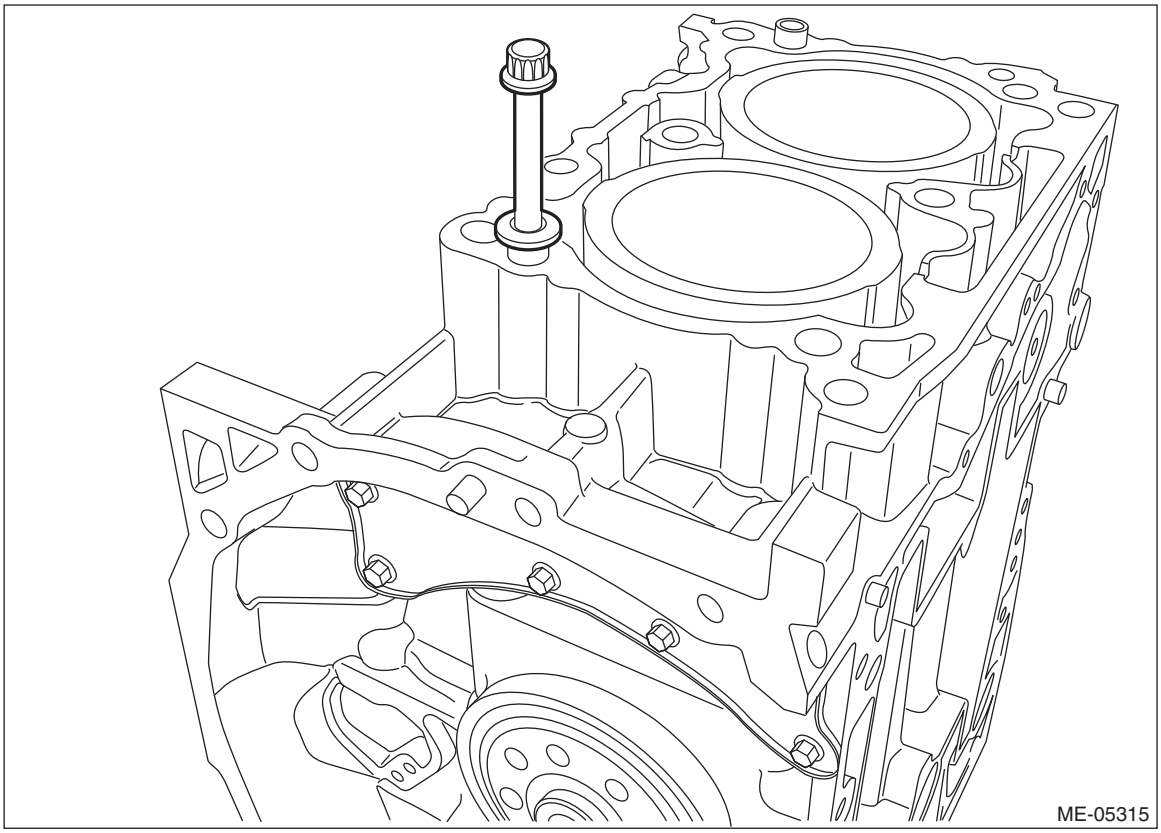
(A)	Range A	(E)	1 mm (0.0394 in) or less	(I)	36 mm (1.4173 in)
(B)	Range B	(F)	ϕ4±0.5 mm (0.1575±0.0197 in)	(J)	2.5 mm (0.0984 in)
(C)	Liquid gasket applying position of mating surfaces (other than the edge) of range B	(G)	Chamfer edge		
(D)	Liquid gasket applying position of mating surfaces (the edge) of range B	(H)	2 mm (0.0787 in)		

5) Install the cylinder block RH to the cylinder block LH.

6) Join the cylinder blocks.
(1) Apply a coat of engine oil to the washers and cylinder block mounting bolt threads.

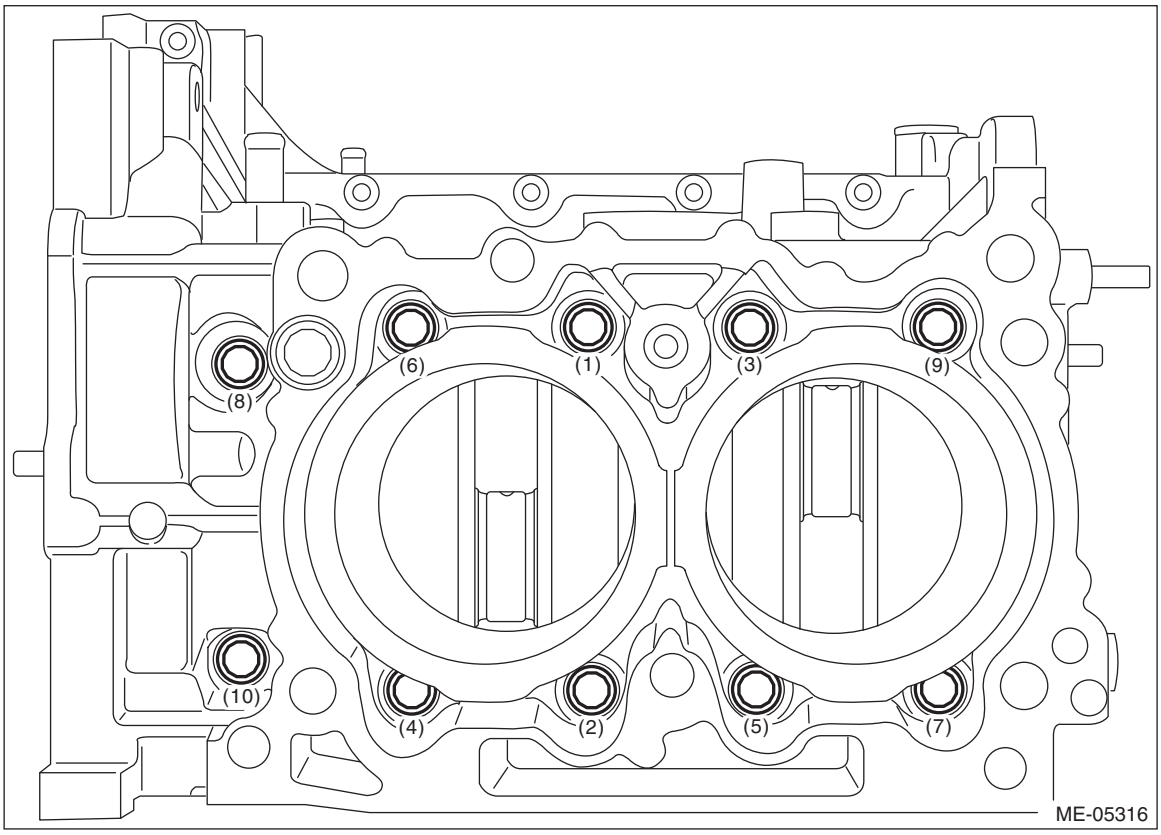
NOTE:
To prevent mixture of engine oil into the water jacket, do not apply a large amount.
(2) Install the cylinder head bolt at the locations shown in the figure.

NOTE:
This procedure is required to tighten the cylinder block mounting bolts with specified angle using ST.



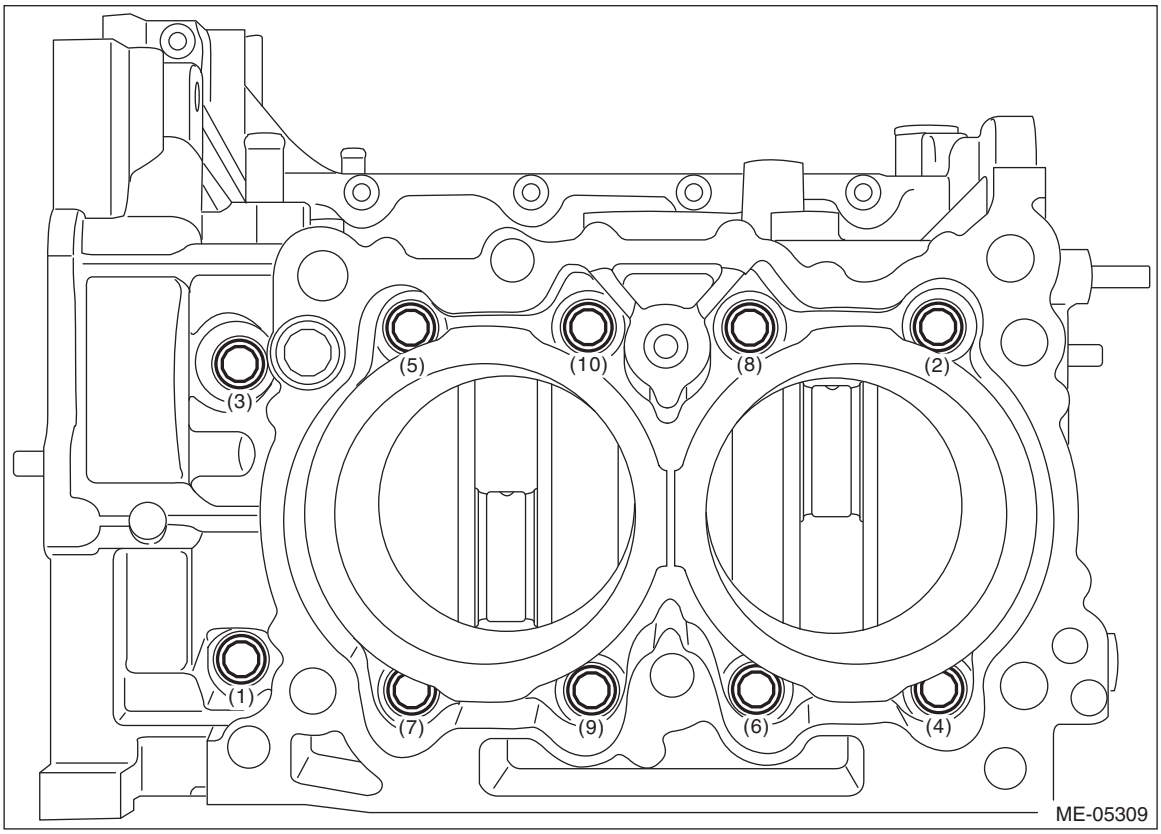
(3) Tighten all mounting bolts with a torque of 35 N·m (3.6 kgf-m, 25.8 ft-lb) in numerical order as shown in the figure.

CAUTION:
When tightening the mounting bolts with specified torque, hold the cylinder block LH while not holding the cylinder block RH to ensure the joint accuracy of the cylinder block.



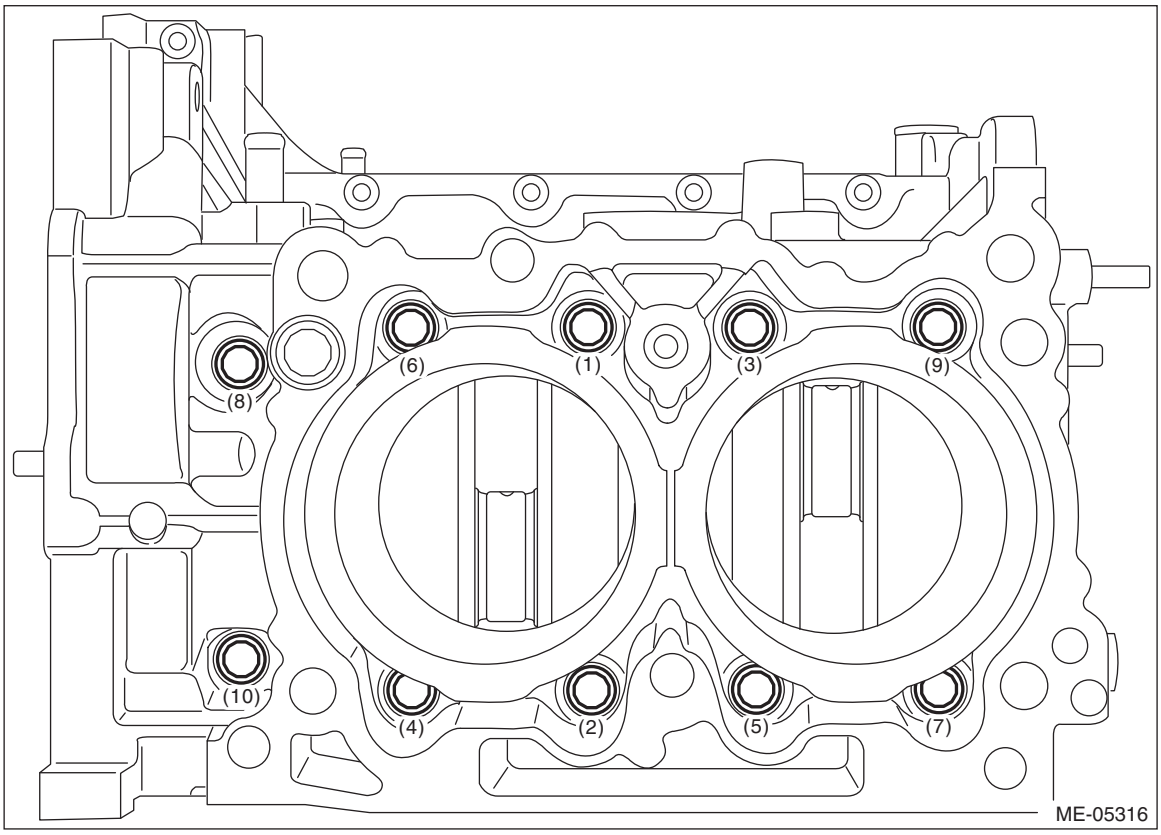
(4) Loosen all mounting bolts by 180° in numerical order as shown in the figure.

CAUTION:
When loosening the mounting bolts, hold the cylinder block LH while not holding the cylinder block RH to ensure the joint accuracy of the cylinder block.



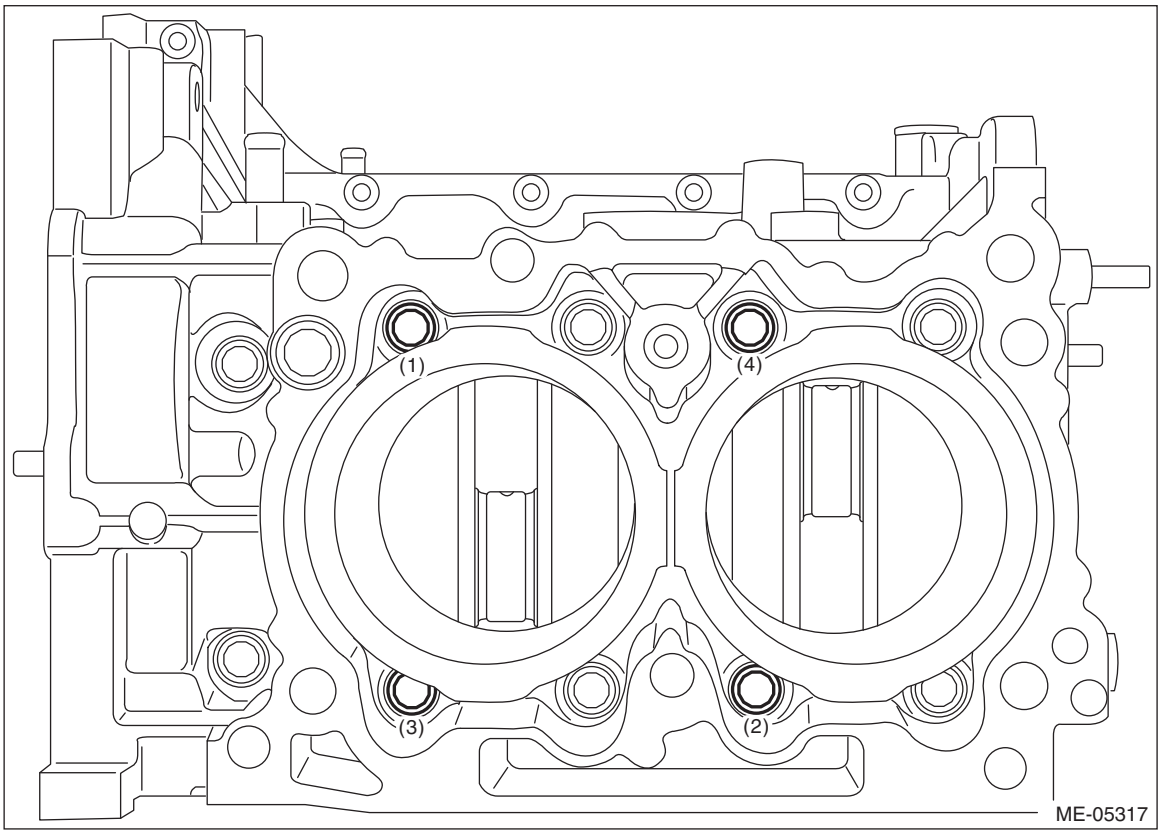
(5) Tighten all mounting bolts with a torque of 35 N·m (3.6 kgf-m, 25.8 ft-lb) in numerical order as shown in the figure.

CAUTION:
When tightening the mounting bolts with specified torque, hold the cylinder block LH while not holding the cylinder block RH to ensure the joint accuracy of the cylinder block.



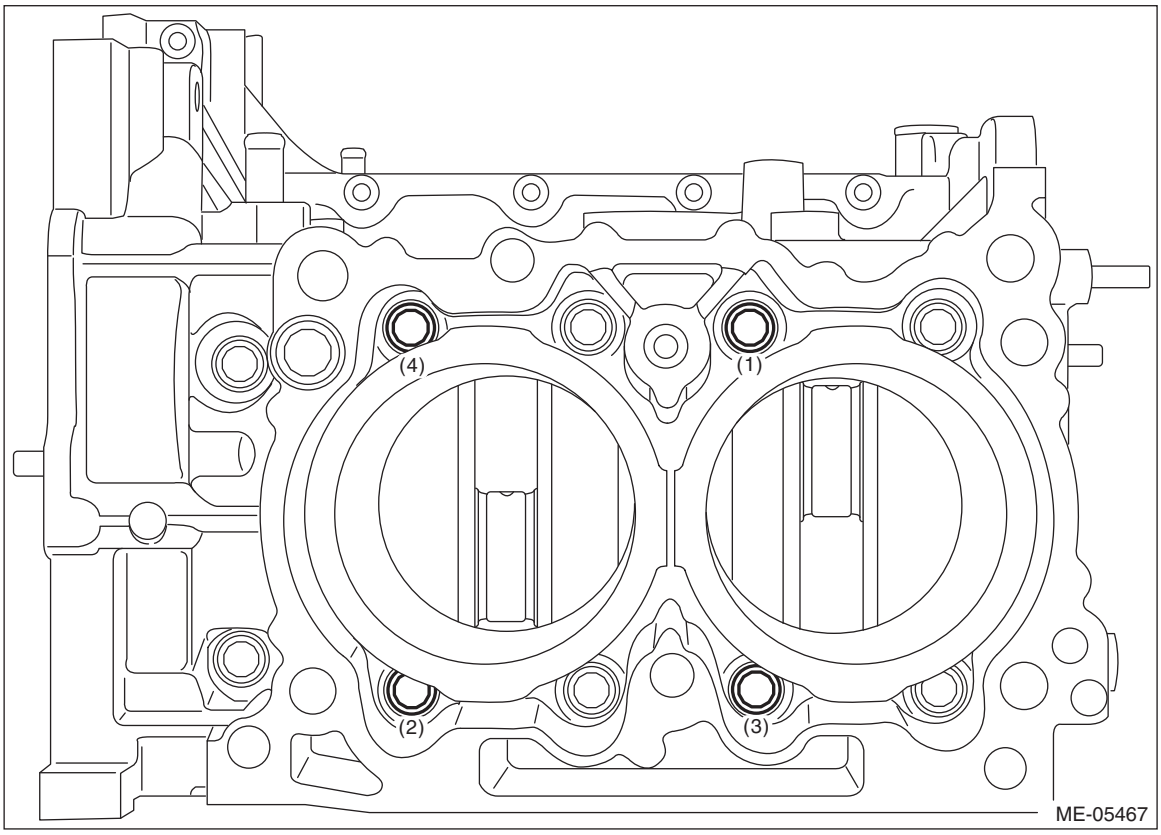
(6) Loosen the mounting bolts (4 places) by 180° in numerical order as shown in the figure.

CAUTION:
When loosening the mounting bolts, hold the cylinder block LH while not holding the cylinder block RH to ensure the joint accuracy of the cylinder block.



(7) Tighten the mounting bolts (4 places) with a torque of 17 N·m (1.7 kgf-m, 12.5 ft-lb) in numerical order as shown in the figure.

CAUTION:
When tightening the mounting bolts with specified torque, hold the cylinder block LH while not holding the cylinder block RH to ensure the joint accuracy of the cylinder block.

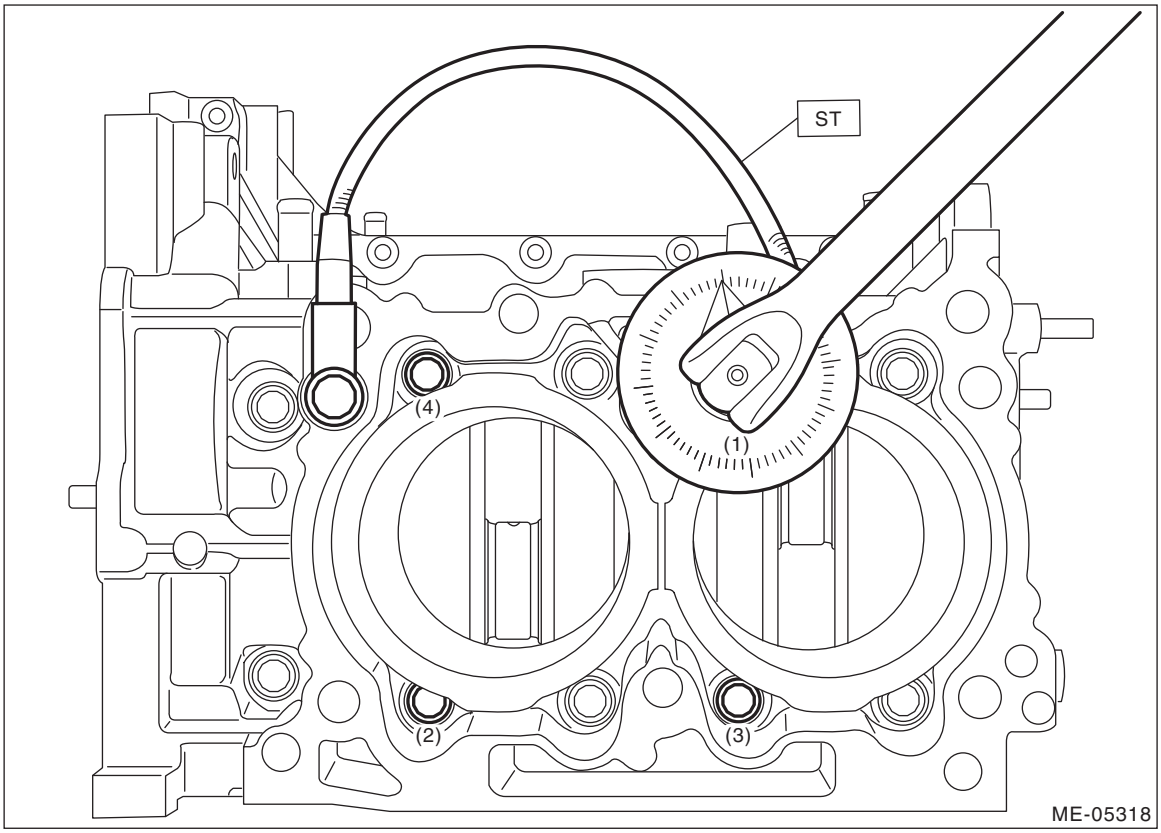


(8) Tighten the mounting bolts (4 places) with specified angle in numerical order as shown in the figure using ST.

CAUTION:
When tightening the mounting bolts with specified angle, hold the cylinder block LH while not holding the cylinder block RH to ensure the joint accuracy of the cylinder block.

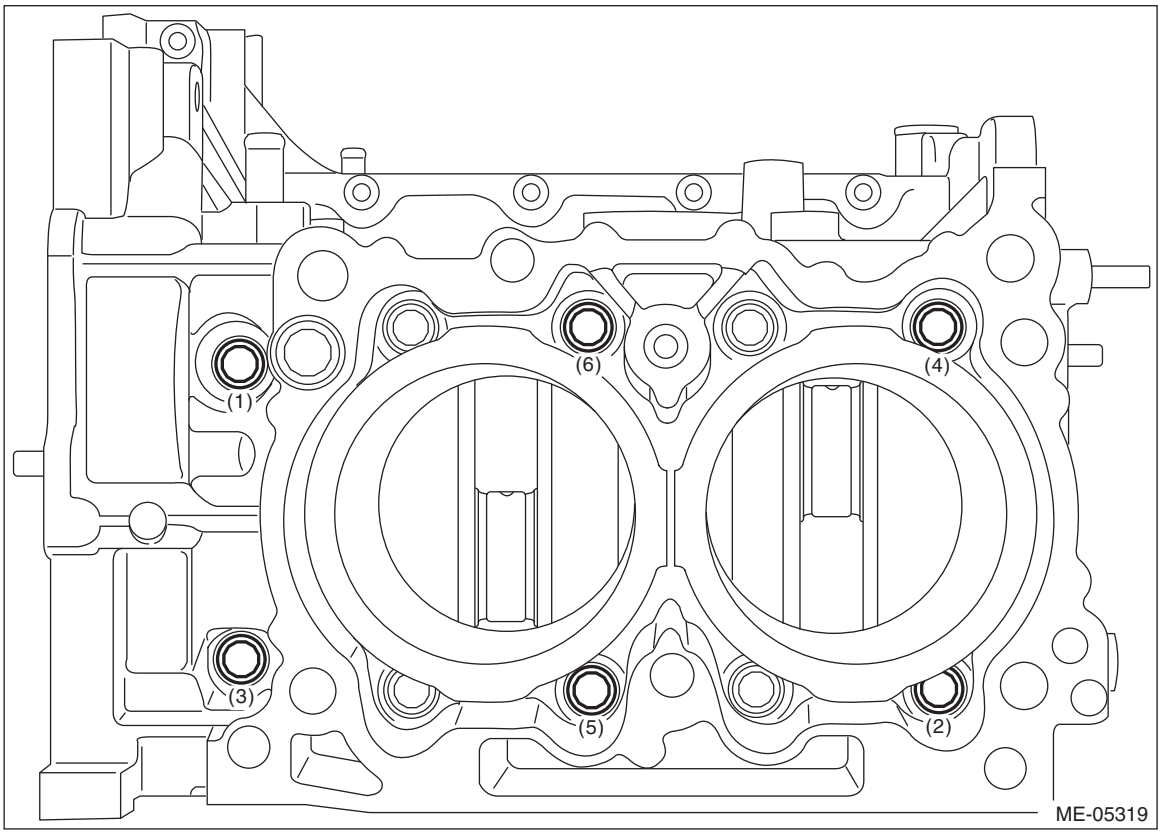
NOTE:
Attach the magnet used for securing the ST (ANGLE GAUGE) to the cylinder head bolt attached in step (2).
ST 18854AA000 ANGLE GAUGE

Tightening angle:
60°±2°



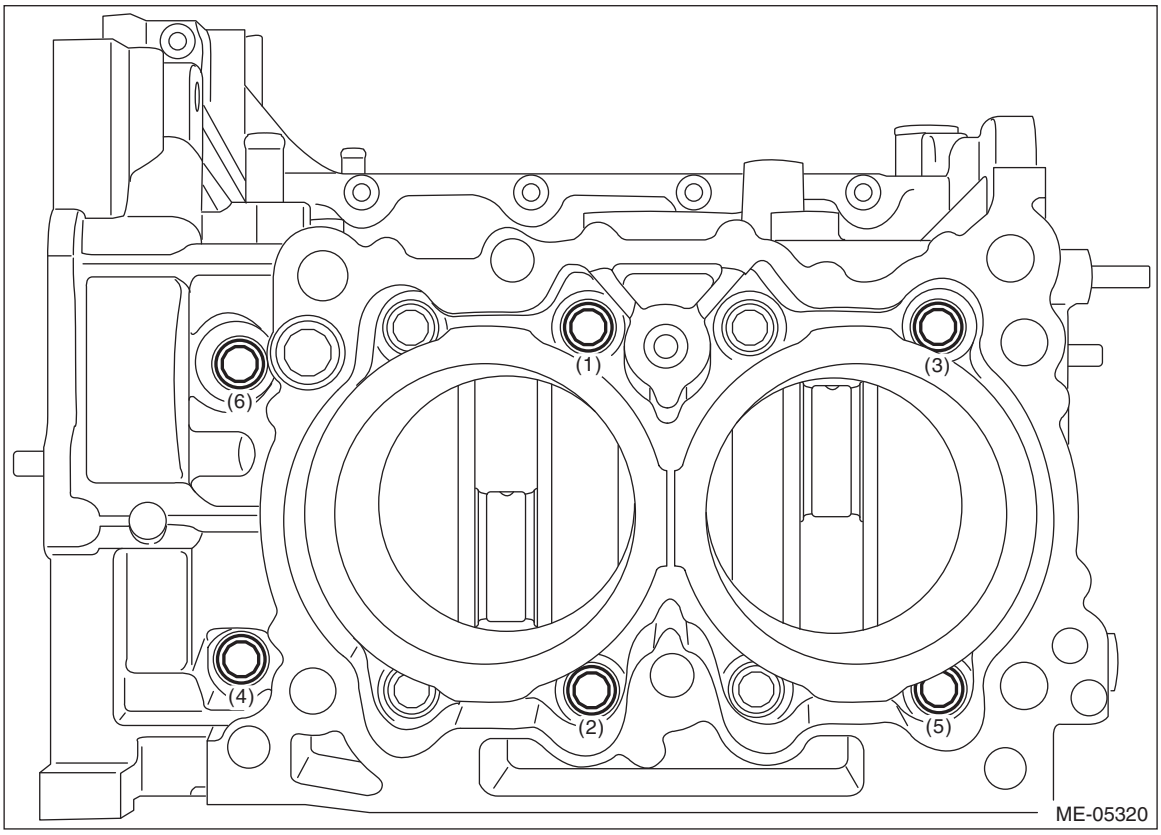
(9) Loosen the mounting bolts (6 places) by 180° in numerical order as shown in the figure.

CAUTION:
When loosening the mounting bolts, hold the cylinder block LH while not holding the cylinder block RH to ensure the joint accuracy of the cylinder block.



(10) Tighten the mounting bolts (6 places) with a torque of 17 N·m (1.7 kgf-m, 12.5 ft-lb) in numerical order as shown in the figure.

CAUTION:
When tightening the mounting bolts with specified torque, hold the cylinder block LH while not holding the cylinder block RH to ensure the joint accuracy of the cylinder block.



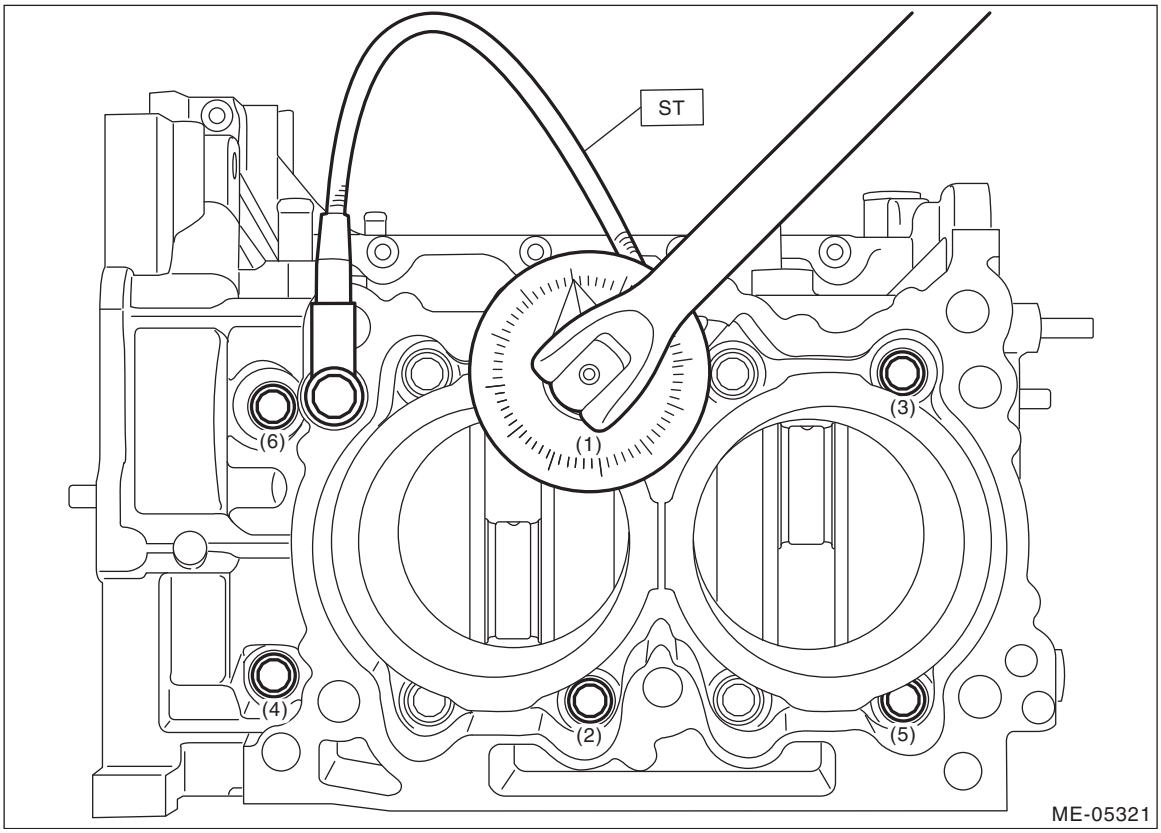
(11) Tighten the mounting bolts (6 places) with specified angle in numerical order as shown in the figure using ST.

CAUTION:
When tightening the mounting bolts with specified angle, hold the cylinder block LH while not holding the cylinder block RH to ensure the joint accuracy of the cylinder block.

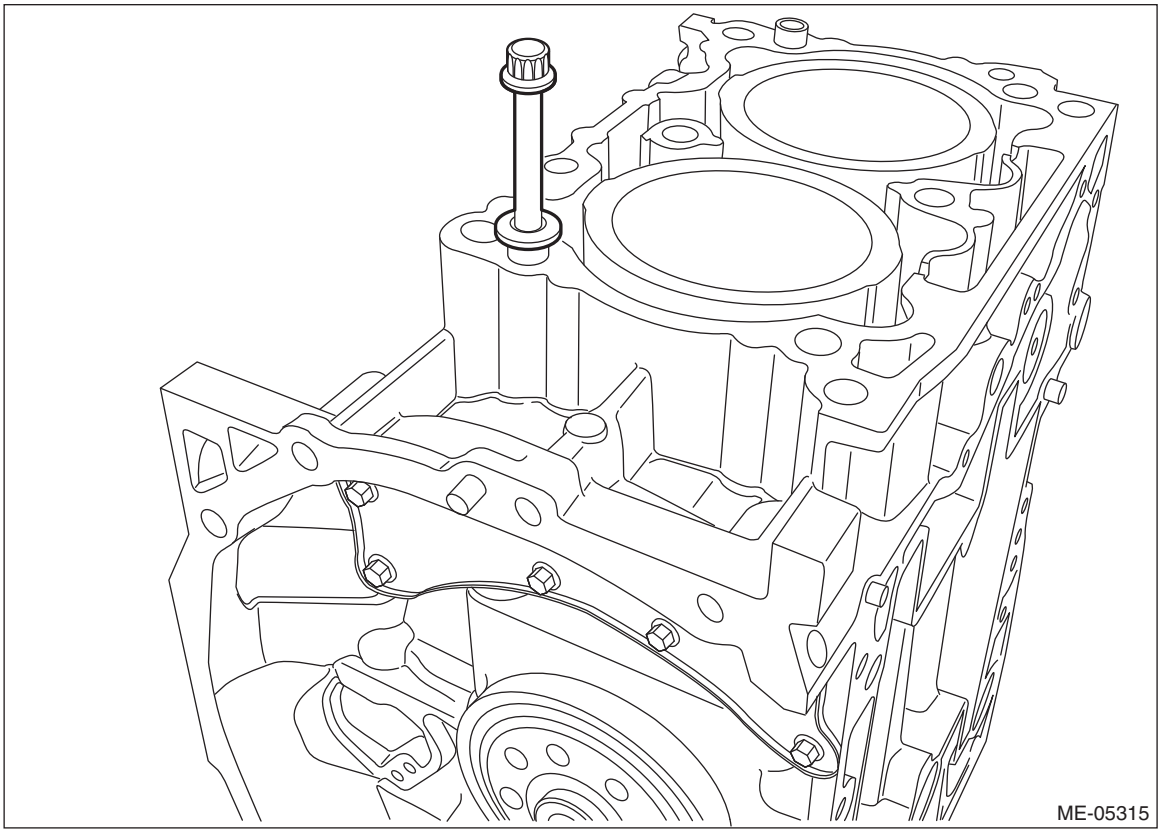
NOTE:
Attach the magnet used for securing the ST (ANGLE GAUGE) to the cylinder head bolt attached in step (2).

ST 18854AA000 ANGLE GAUGE

Tightening angle:
60°±2°



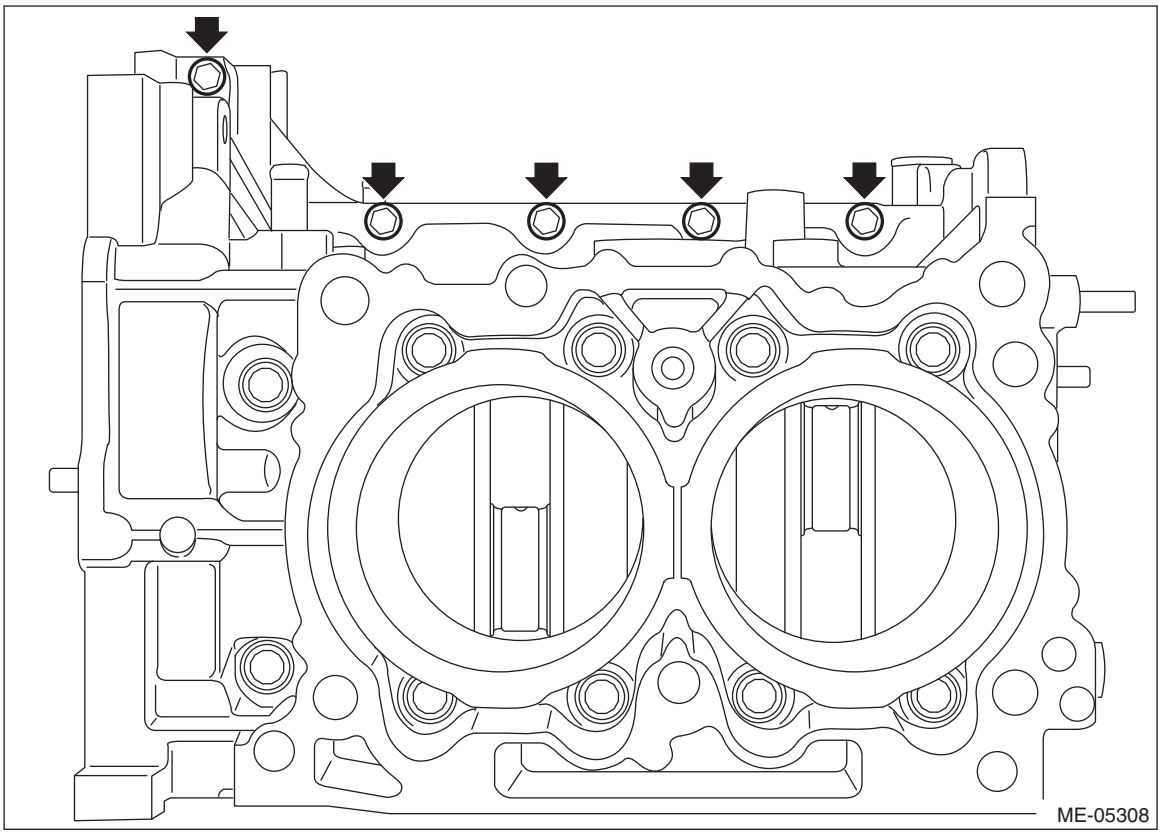
(12) Remove the cylinder head bolt attached at the locations shown in the figure.



(13) Install the bolt shown in the figure.

NOTE:
After tightening, if the liquid gasket is squeezed out in the seal surface area of the chain cover and oil pan upper, completely remove any liquid gasket that is squeezed out.

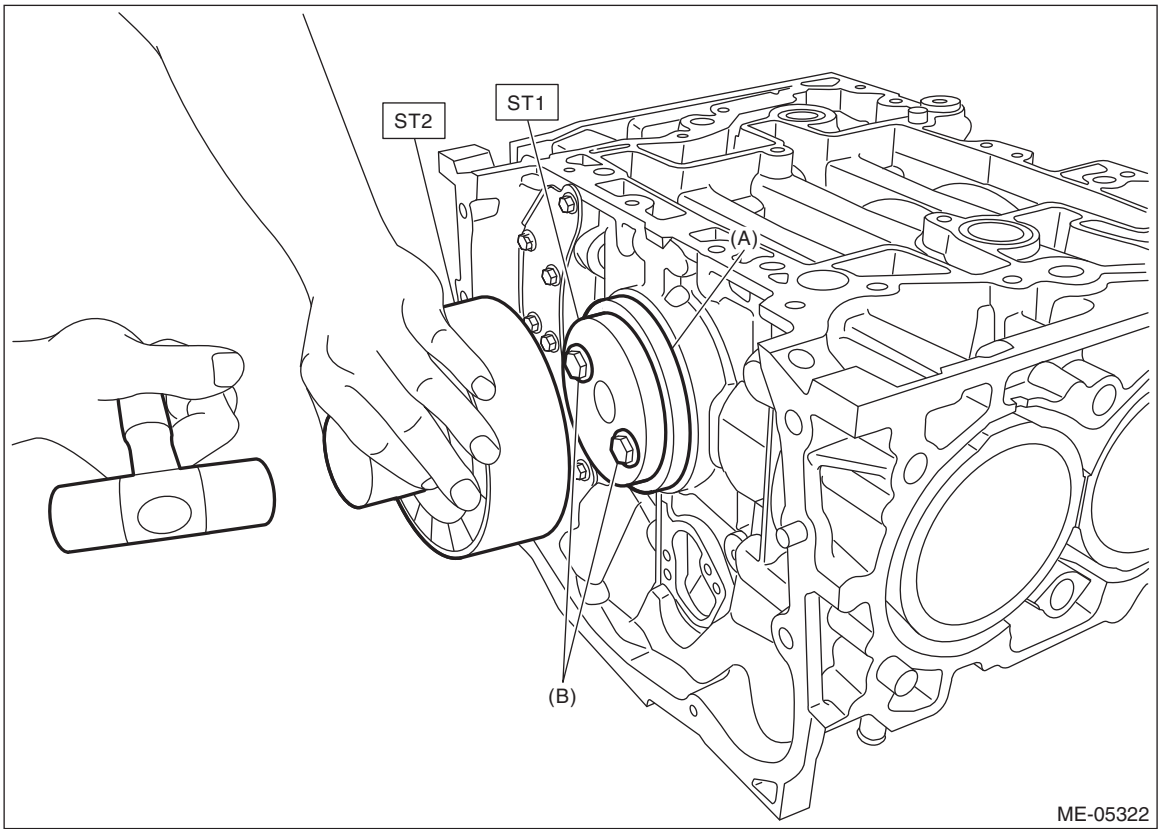
Tightening torque:
25 N·m (2.5 kgf-m, 18.4 ft-lb)



7) Set the part so that the oil pan side of cylinder block is on the upper side.

8) Apply a coat of engine oil to the oil seal inner periphery and outer periphery, and install the rear oil seal using ST1 and ST2.

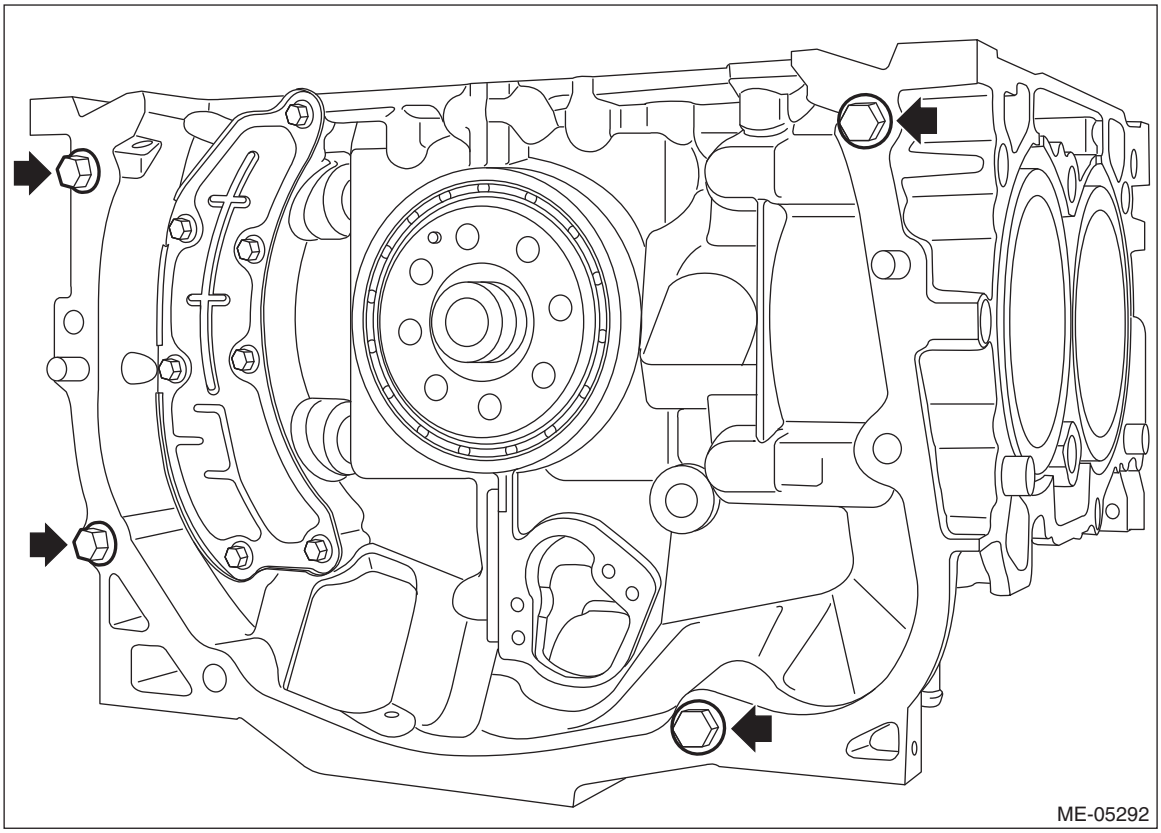
NOTE:
Use a new rear oil seal.
ST1 18671AA020 OIL SEAL GUIDE
ST2 18657AA030 OIL SEAL INSTALLER



(A) Rear oil seal
(B) Drive plate or flywheel mounting bolt

9) Install the A/C compressor bracket bolts and the power steering pump bracket bolts at the locations shown in the figure.

NOTE:
• This procedure is required to prevent the knock pin damage when the cylinder block is raised in the next step.
• Use the same length bolt for the four bolts.

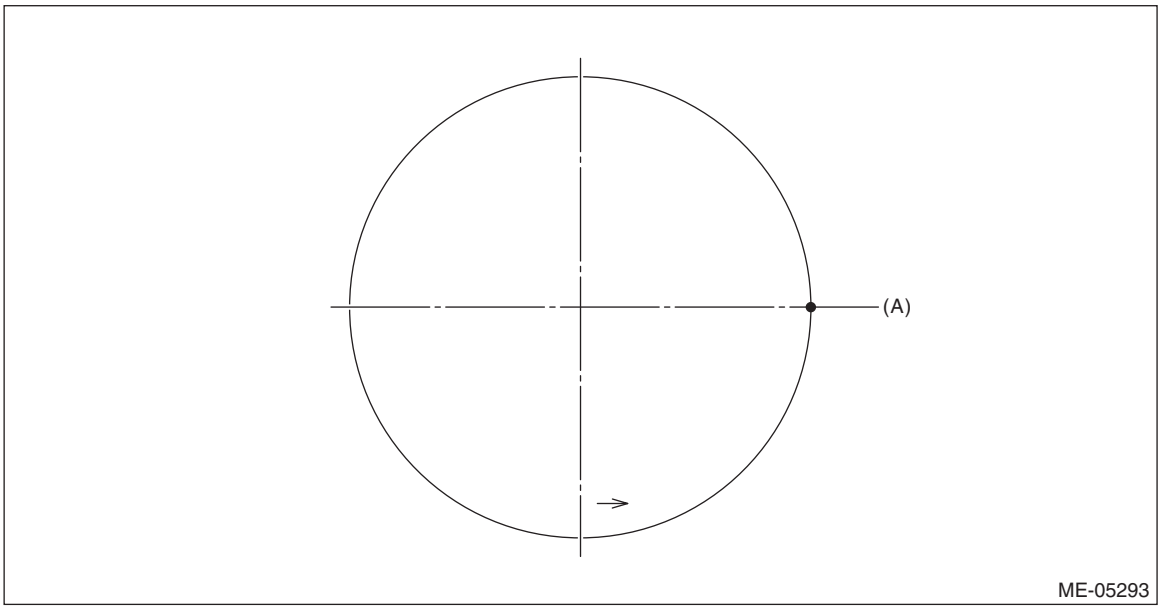


10) Raise the cylinder block so that the rear oil seal is on the lower side.

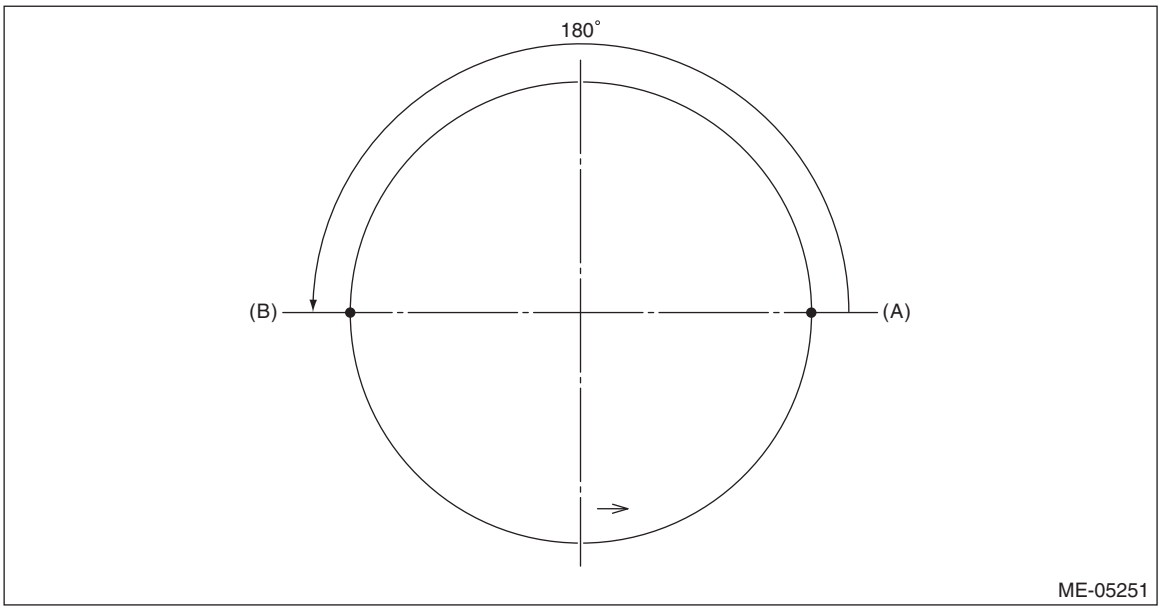
11) Align the ring closed gaps of piston ring and oil ring for each piston.

NOTE:
- Make sure ring gaps do not face the same direction.
- Check that the piston ring mark of top ring and second ring faces the top side of the piston.
- Check that the ring gaps is not positioned within the range of piston skirt extended line.

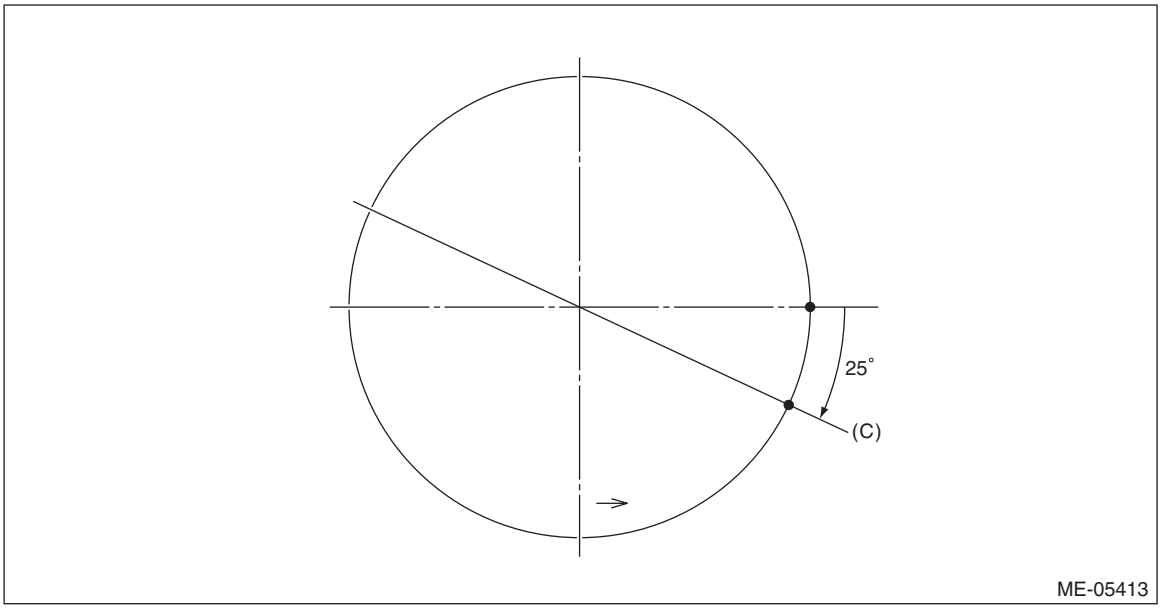
(1) Set the ring gap of the top ring to the position (A) in the figure.



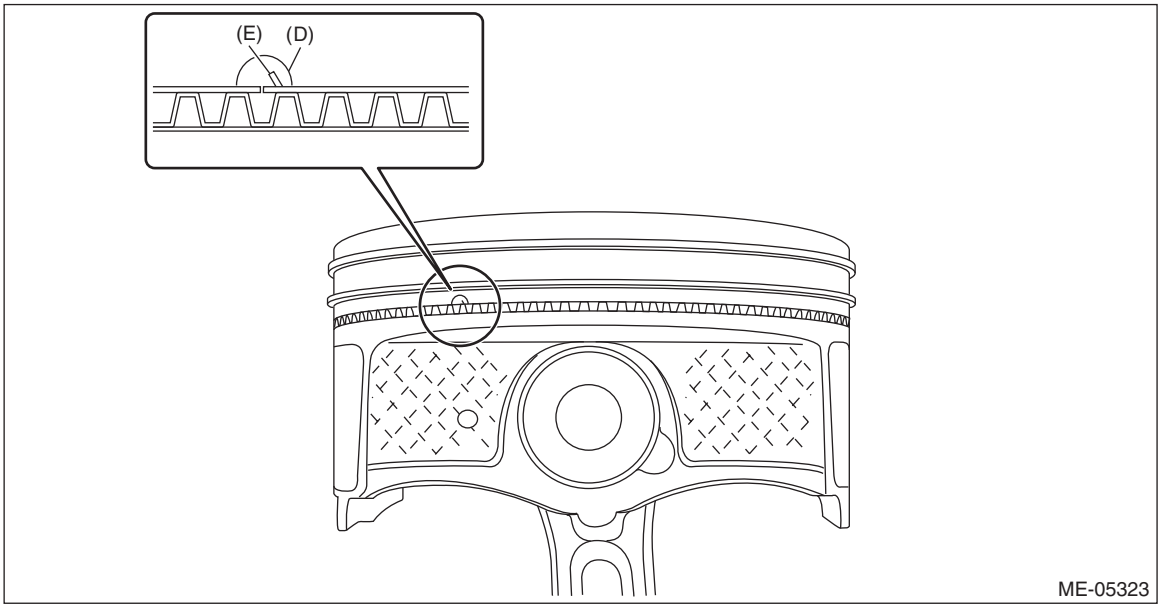
(2) Position the ring gap of second ring at (B) in the figure on the 180° opposite direction of (A).



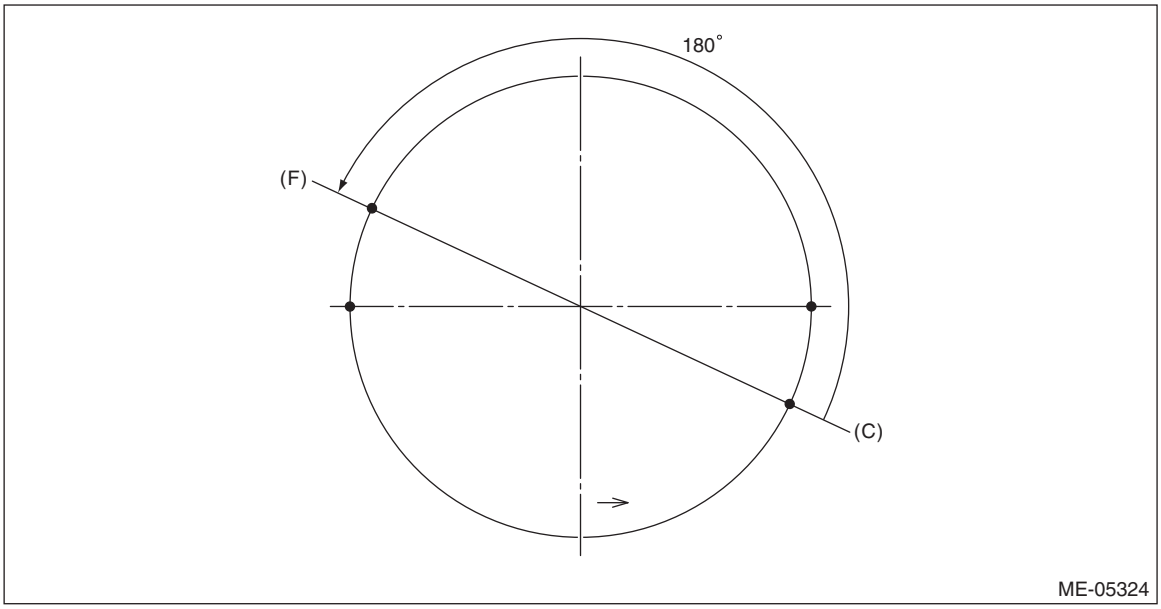
(3) Set the ring gap of the upper rail to the position (C) in the figure.



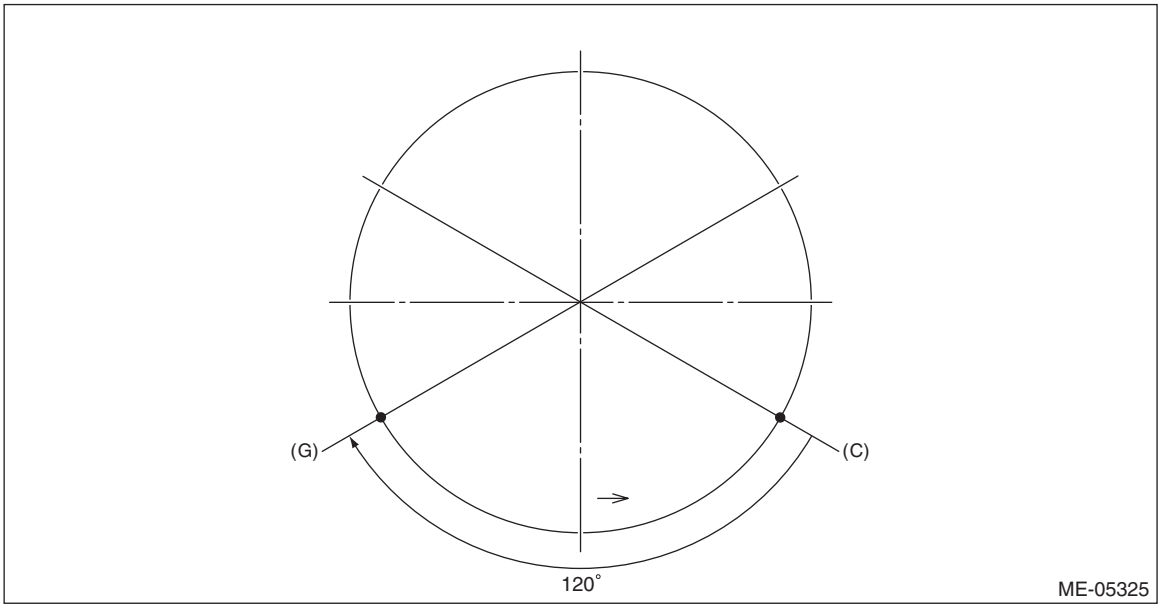
(4) Align the upper rail spin stopper (E) to the side hole (D) on the piston.



(5) Position the ring gap of expander at (F) in the figure on the 180° opposite direction of (C).

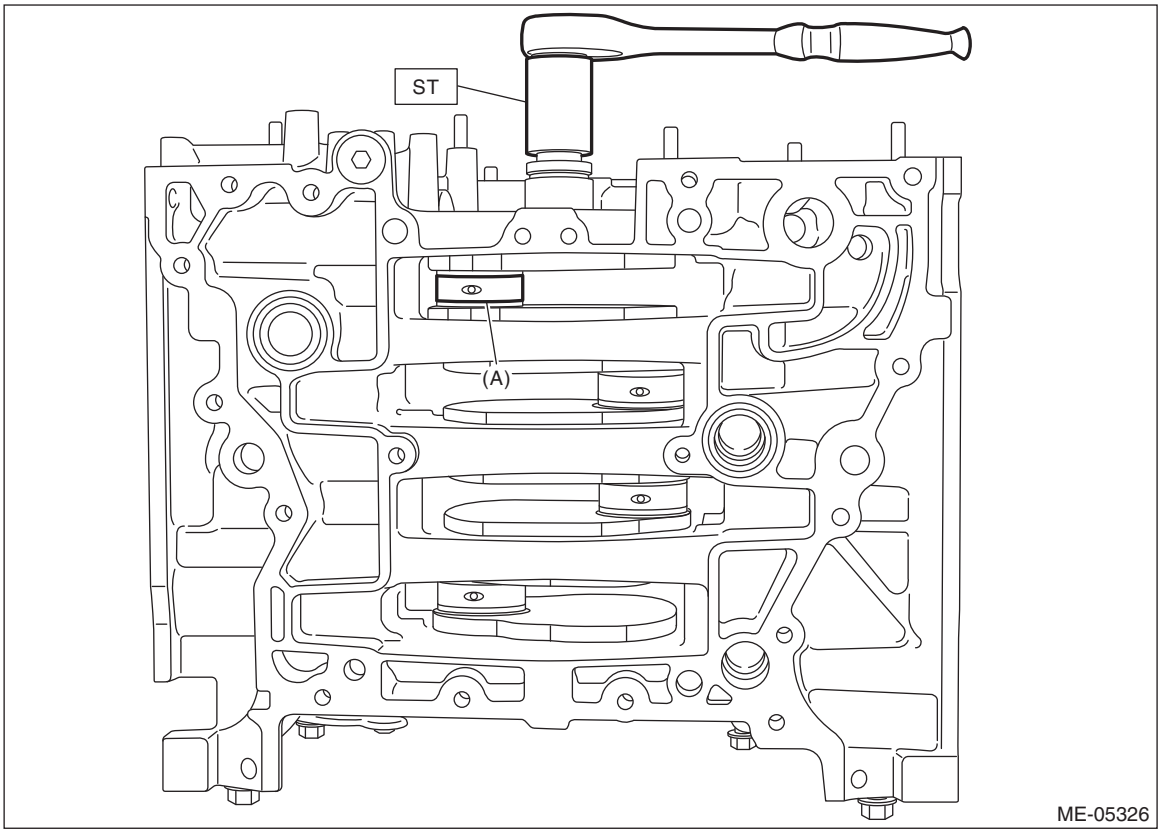


(6) Set the ring gap of lower rail at position (G), located 120° clockwise from (C) in the figure.



12) Install the piston and connecting rod to the cylinder block.
(1) Apply engine oil to the outer circumference of each piston, crank pin, and in the cylinder block.
(2) Turn the crankshaft so that the #1 crank pin (A) is positioned at TDC using ST.

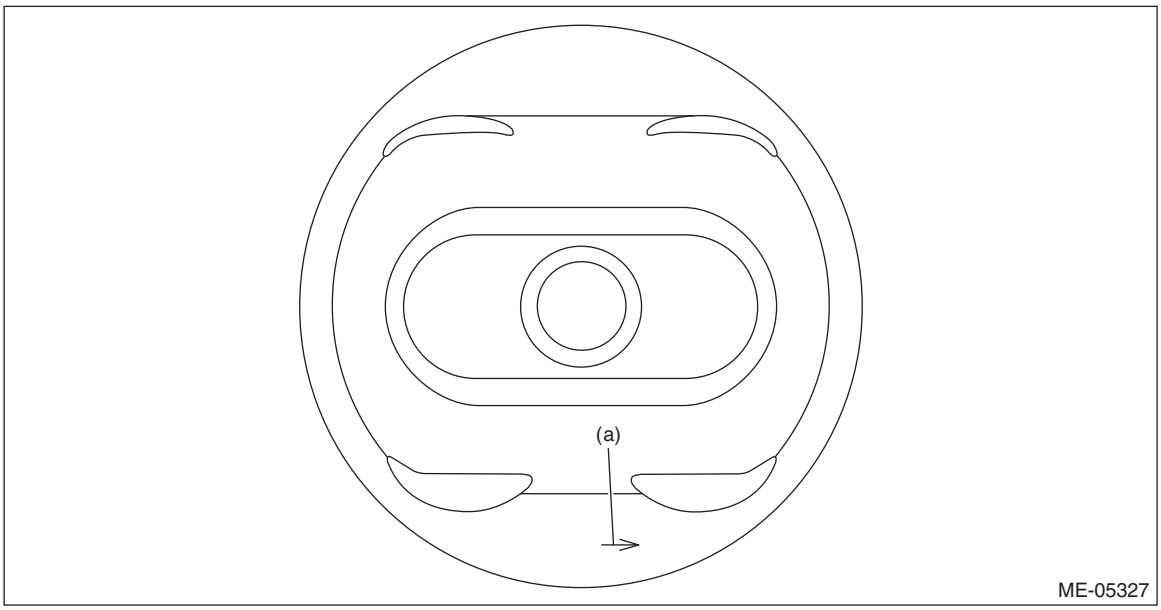
ST 18252AA000 CRANKSHAFT SOCKET



(3) Compress the piston ring using piston ring compressor, and insert the #1 connecting rod with #1 piston into cylinder block.

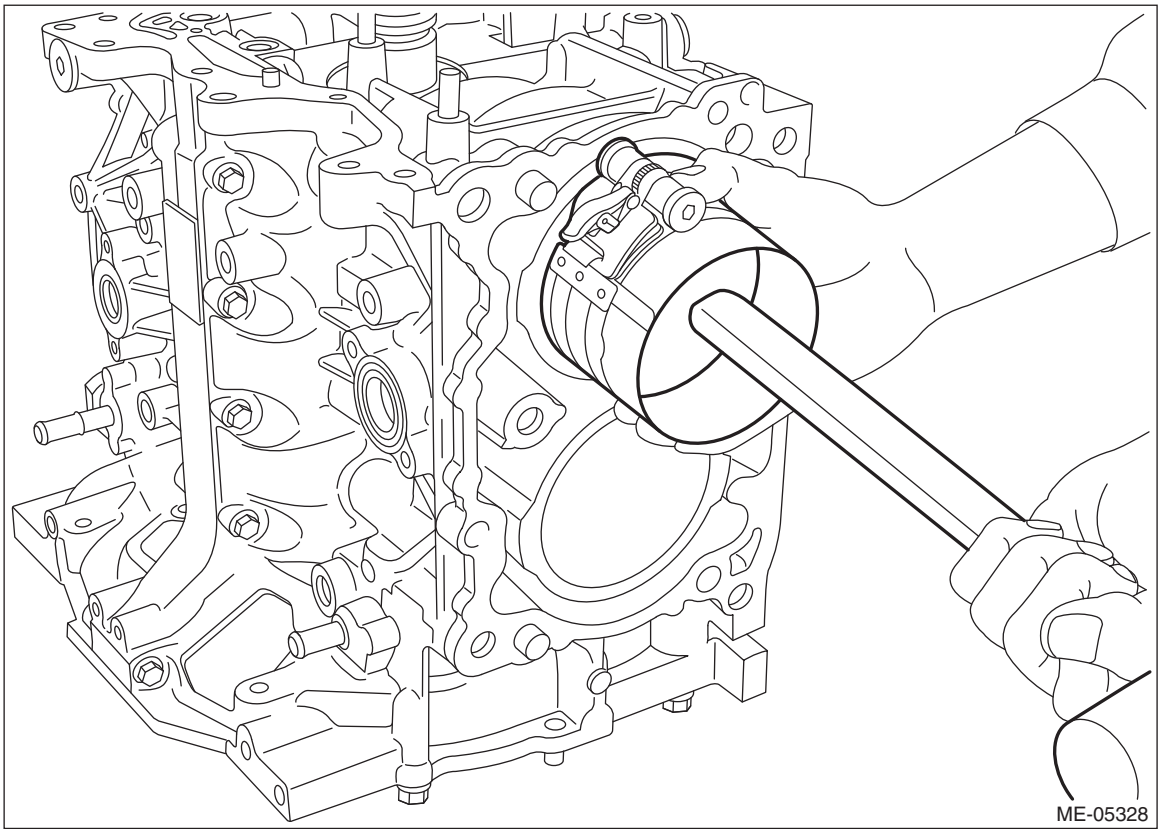
CAUTION:
- **Be careful not to damage the cylinder liner and #1 crank pin by the #1 connecting rod large end.**
- **Be careful not to apply strong impact when inserting to prevent connecting rod bearing from falling off.**

NOTE:
- Face the piston front mark (arrow) towards the front of the engine.



(a) Front mark

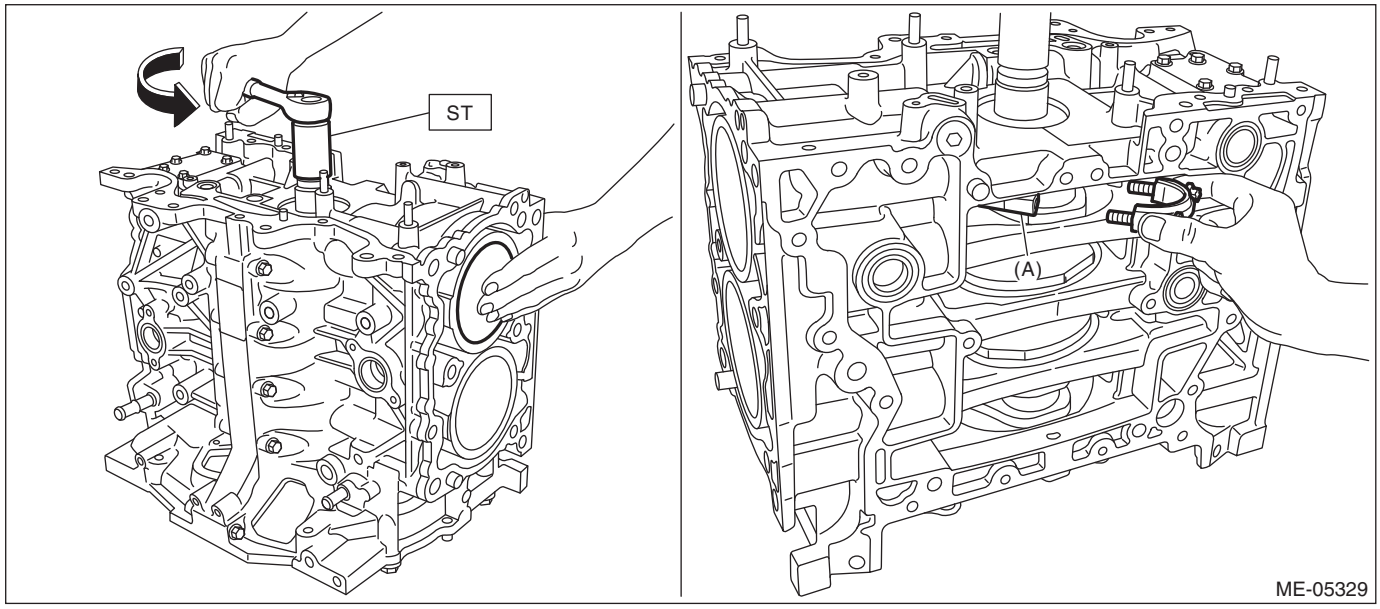
- Insert while lightly tapping the crown of the piston with the handle of a plastic hammer.



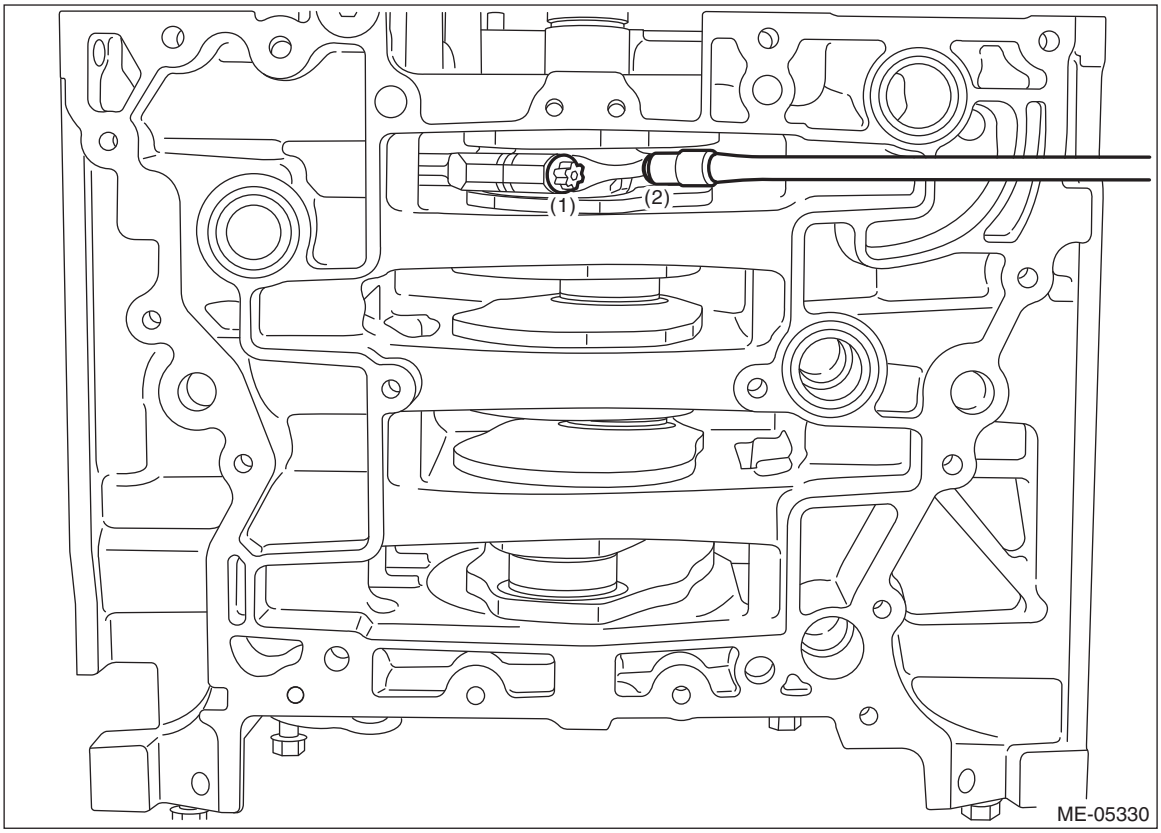
(4) Turn the crankshaft counterclockwise so that the #1 crank pin and the large end of #1 connecting rod (A) are positioned as shown in the figure using ST, while pressing the #1 piston crown, and then set the #1 connecting rod cap and #1 connecting rod cap bolt.

NOTE:
• Each connecting rod has its own mating cap. Make sure that they are assembled correctly by checking their matching symbol.
• Use a new connecting rod cap bolt.
• Apply a coat of engine oil to the #1 connecting rod cap seat and the connecting rod cap bolt threads.

ST 18252AA000 CRANKSHAFT SOCKET

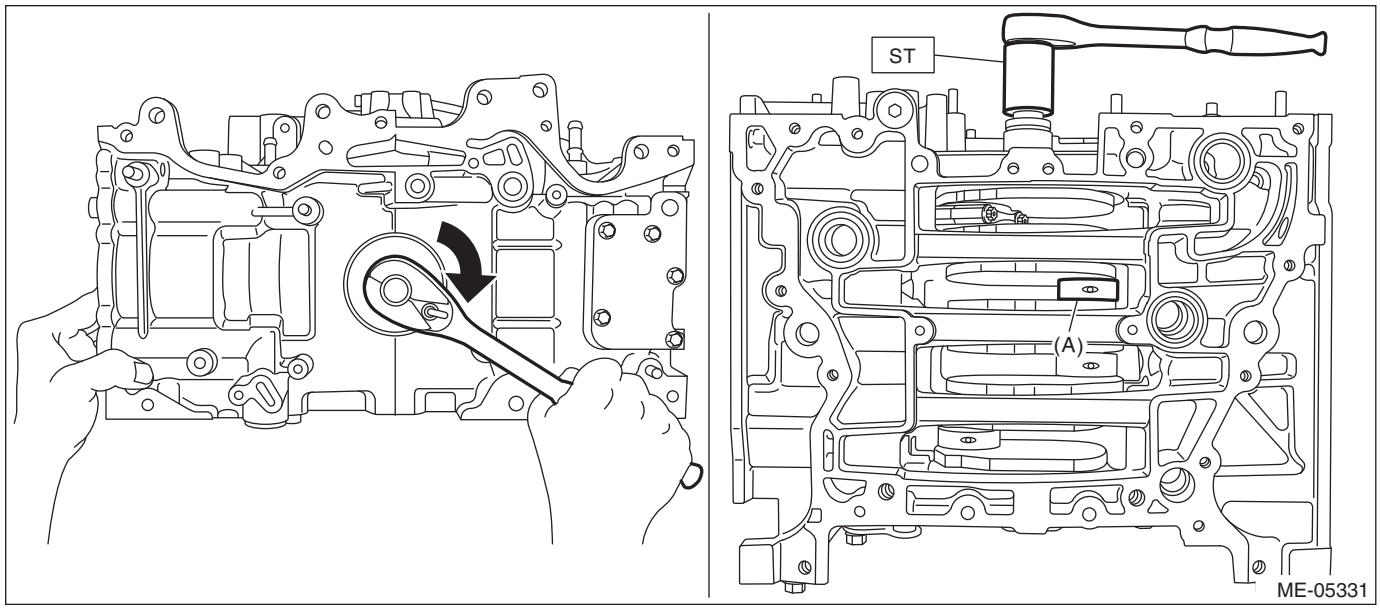


(5) Using TORX® socket E12, tighten the #1 connecting rod cap bolts to 10 N·m (1.0 kgf-m, 7.4 ft-lb) in numerical order as shown in the figure, then retighten the bolts to 22 N·m (2.2 kgf-m, 16.2 ft-lb) in numerical order as shown in the figure.



(6) Turn the crankshaft clockwise so that the #2 crank pin (A) is positioned at TDC using ST.

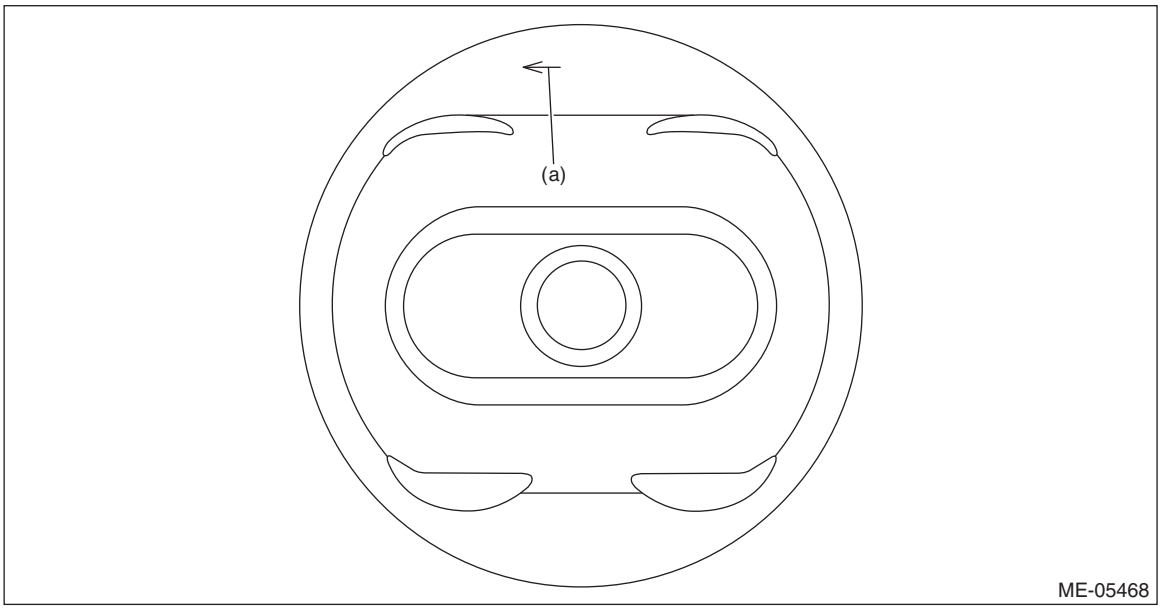
ST 18252AA000 CRANKSHAFT SOCKET



(7) Compress the piston ring using piston ring compressor, and insert the #2 connecting rod with #2 piston into cylinder block.

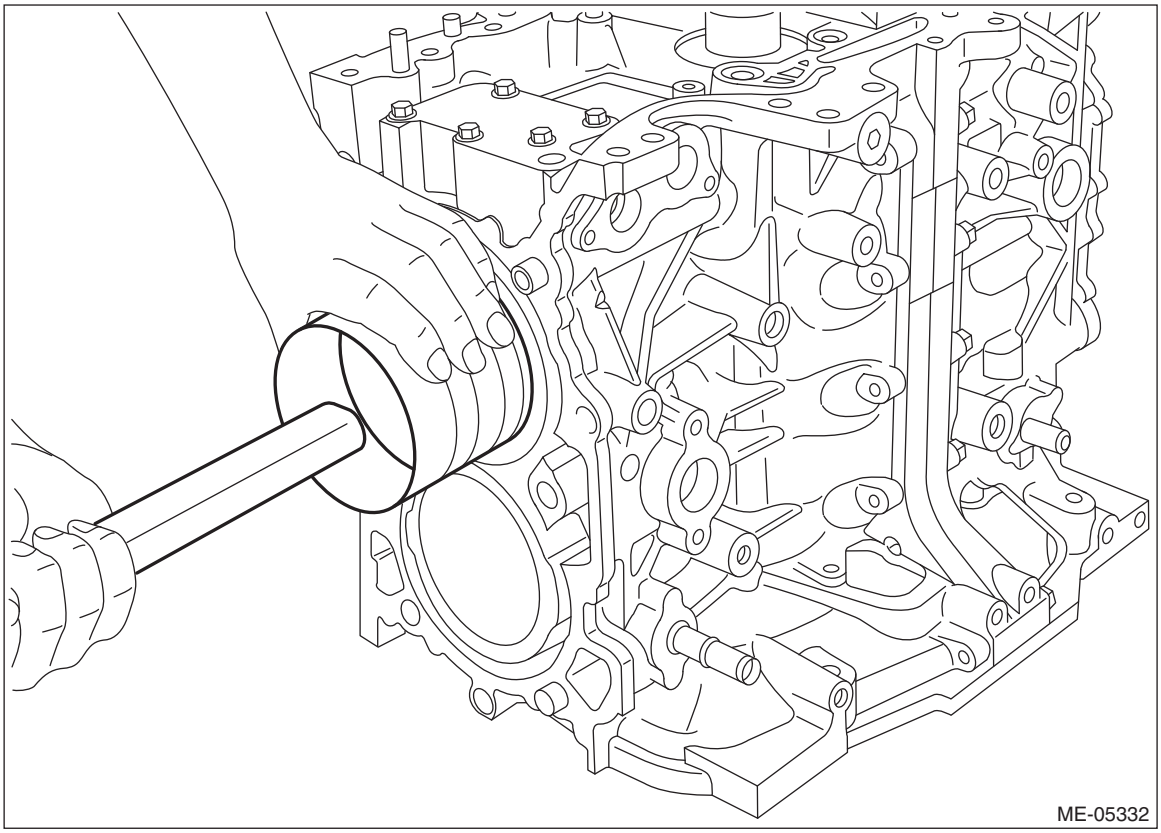
CAUTION:
- **Be careful not to damage the cylinder liner and #2 crank pin by the #2 connecting rod large end.**
- **Be careful not to apply strong impact when inserting to prevent connecting rod bearing from falling off.**

NOTE:
- Face the piston front mark (arrow) towards the front of the engine.



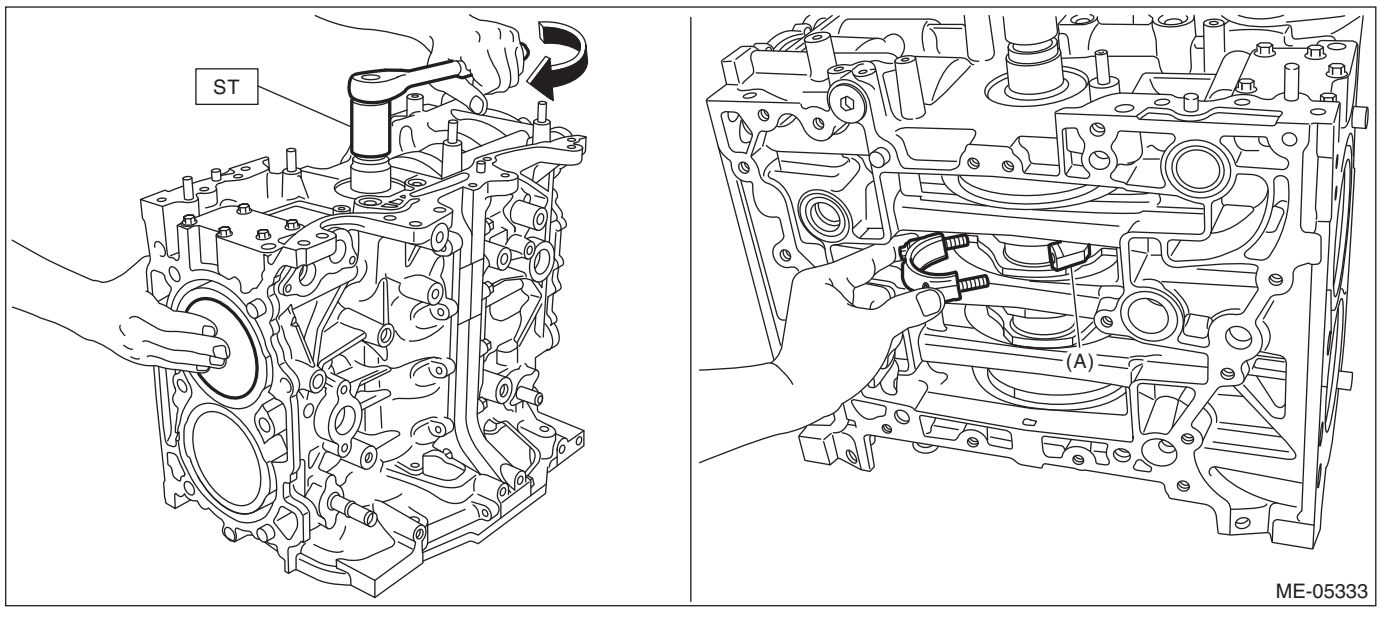
(a) Front mark

• Insert while lightly tapping the crown of the piston with the handle of a plastic hammer.

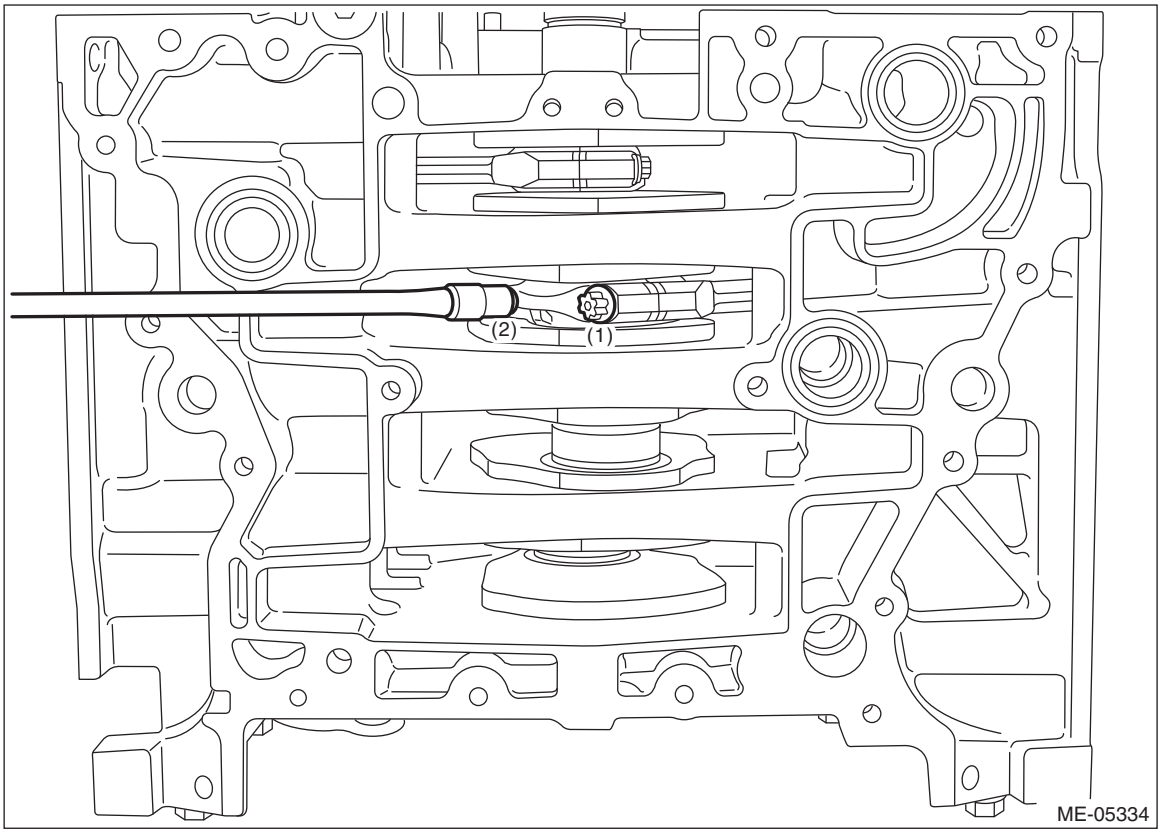


(8) Turn the crankshaft clockwise so that the #2 crank pin and the large end of #2 connecting rod (A) are positioned as shown in the figure using ST, while pressing the #2 piston crown, and then set the #2 connecting rod cap and #2 connecting rod cap bolt.

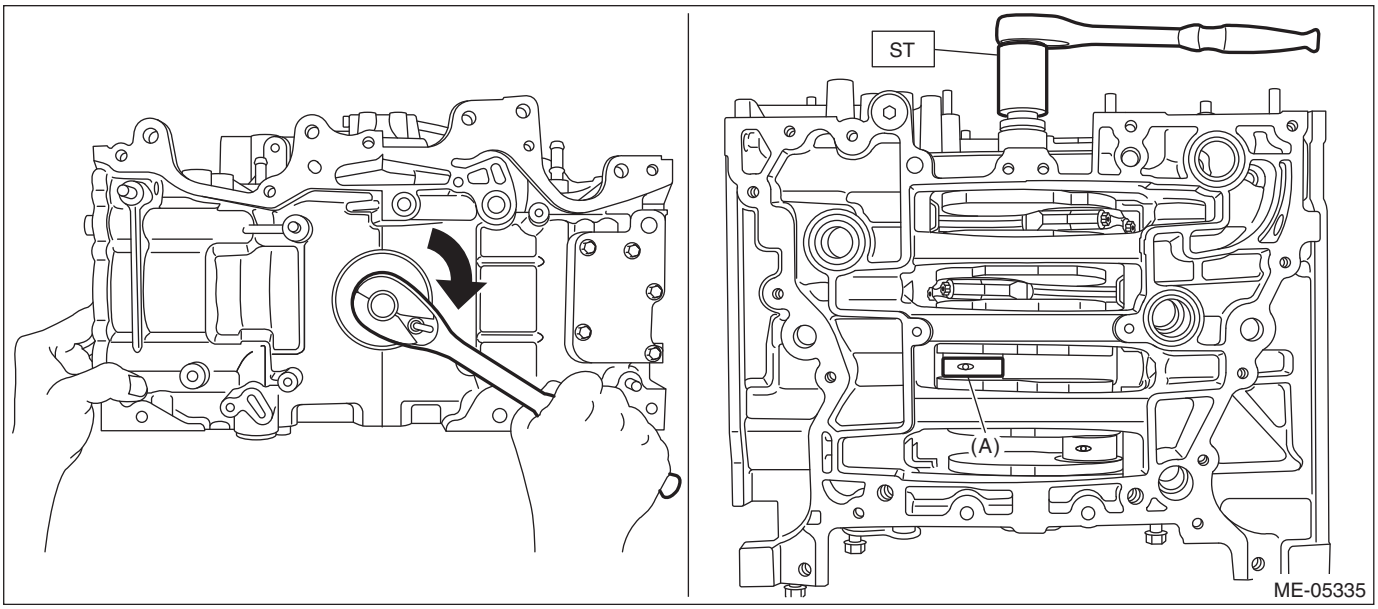
NOTE:
• Each connecting rod has its own mating cap. Make sure that they are assembled correctly by checking their matching symbol.
• Use a new connecting rod cap bolt.
• Apply a coat of engine oil to the #2 connecting rod cap seat and the connecting rod cap bolt threads.
ST 18252AA000 CRANKSHAFT SOCKET



(9) Using TORX® socket E12, tighten the #2 connecting rod cap bolts to 10 N·m (1.0 kgf-m, 7.4 ft-lb) in numerical order as shown in the figure, then retighten the bolts to 22 N·m (2.2 kgf-m, 16.2 ft-lb) in numerical order as shown in the figure.



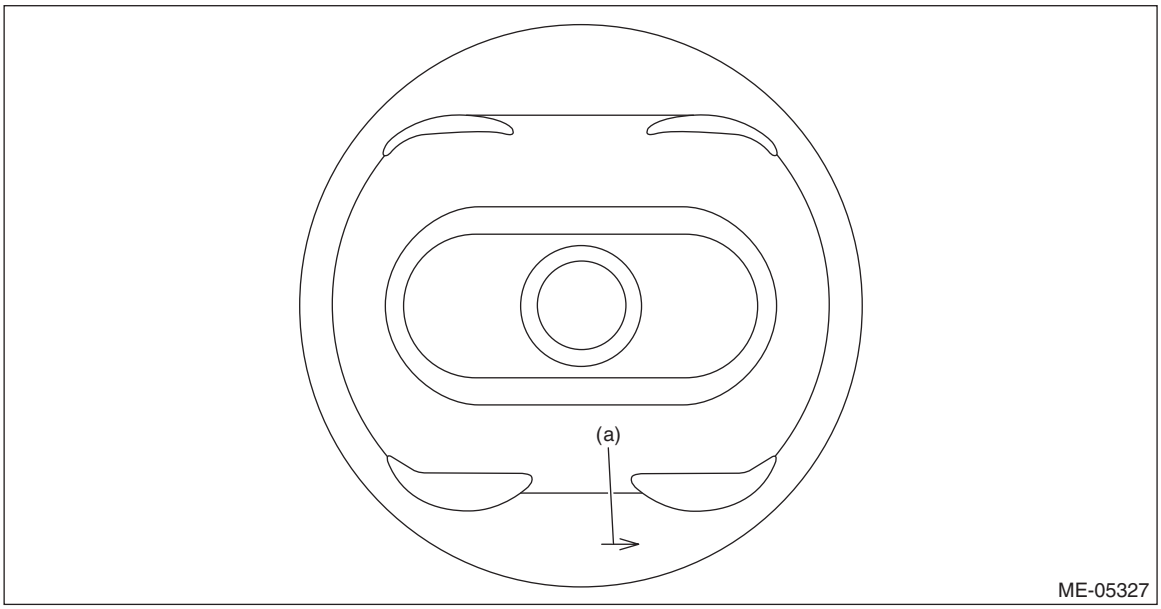
(10) Turn the crankshaft clockwise so that the #3 crank pin (A) is positioned at TDC using ST.
ST 18252AA000 CRANKSHAFT SOCKET



(11) Compress the piston ring using piston ring compressor, and insert the #3 connecting rod with #3 piston into cylinder block.

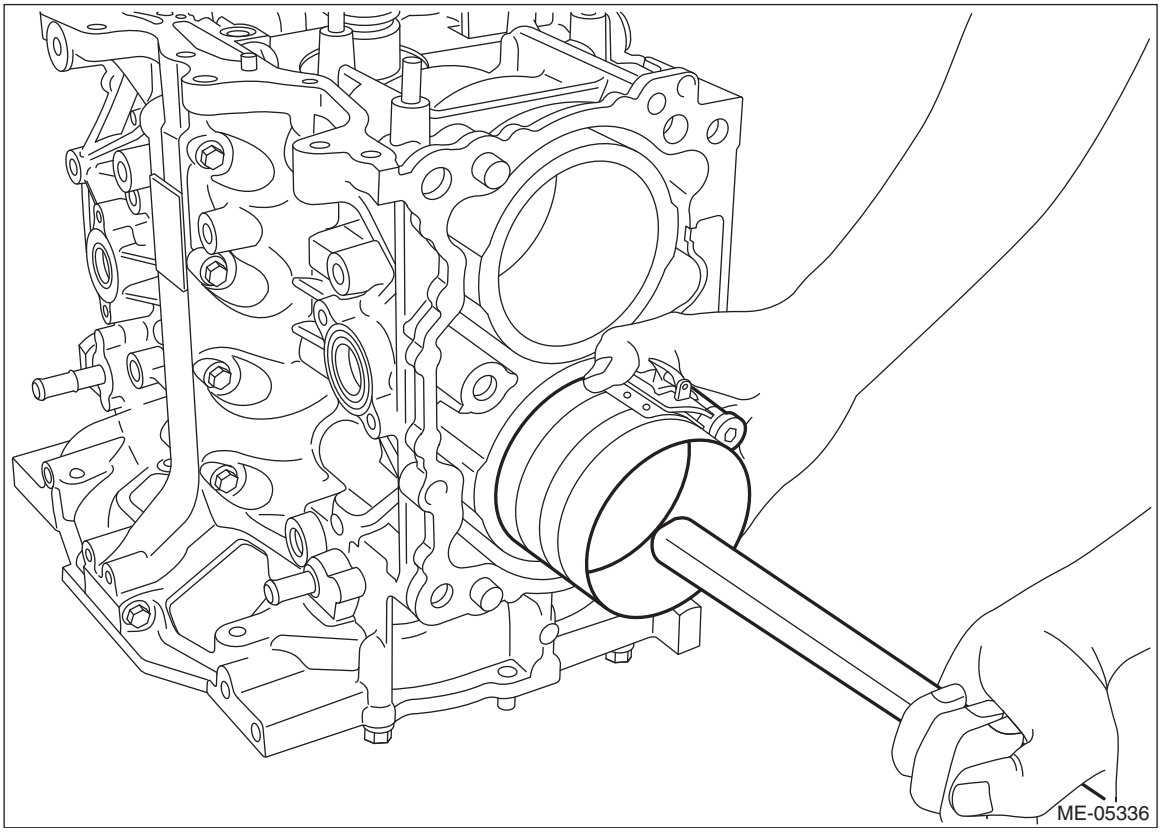
CAUTION:
- **Be careful not to damage the cylinder liner and #3 crank pin by the #3 connecting rod large end.**
- **Be careful not to apply strong impact when inserting to prevent connecting rod bearing from falling off.**

NOTE:
- Face the piston front mark (arrow) towards the front of the engine.



(a) Front mark

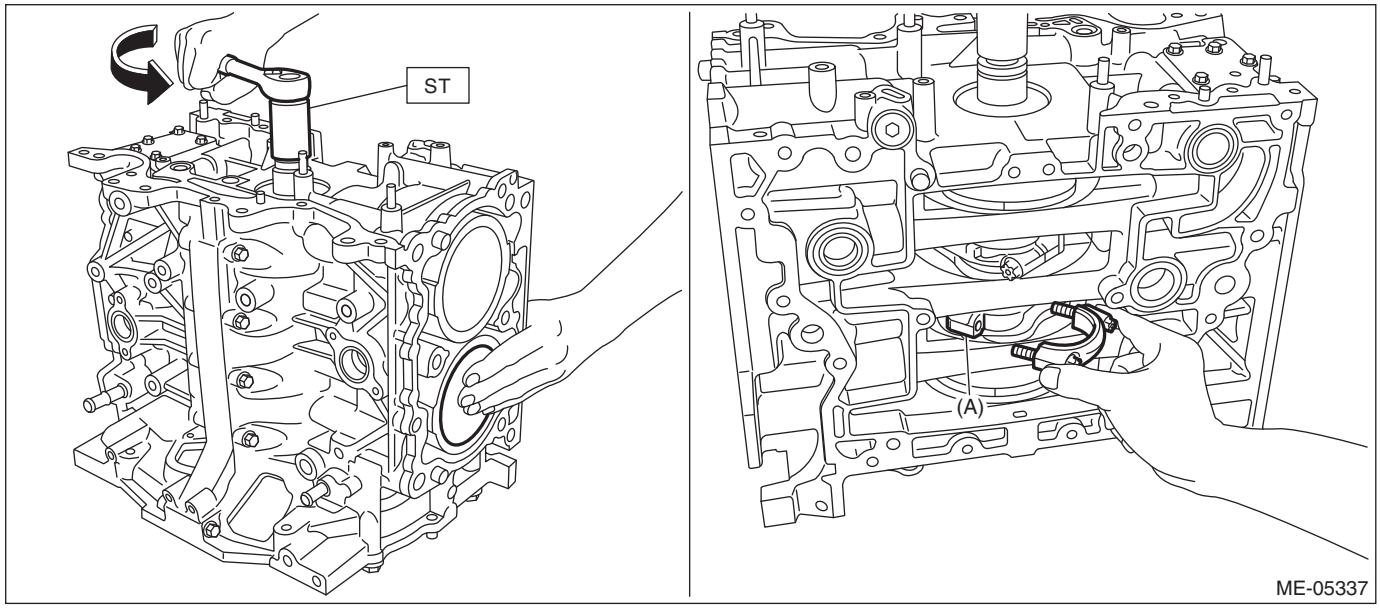
- Insert while lightly tapping the crown of the piston with the handle of a plastic hammer.



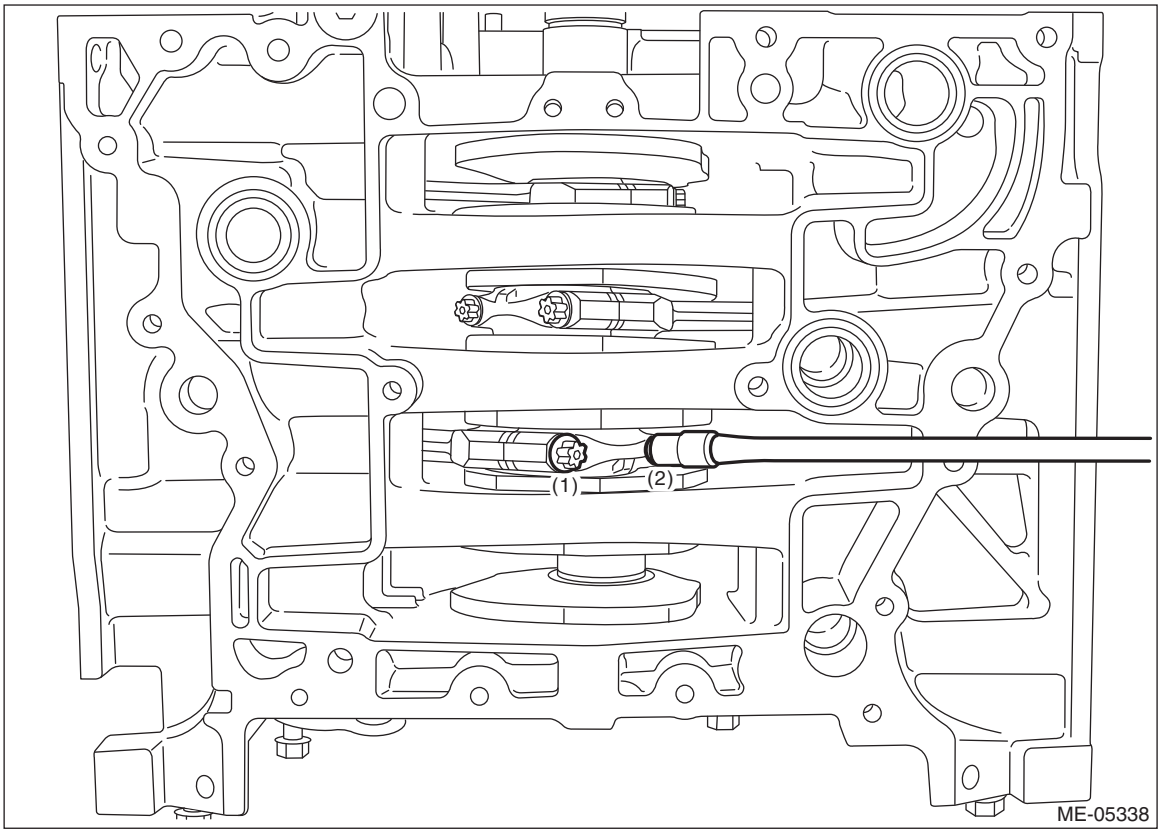
(12) Turn the crankshaft counterclockwise so that the #3 crank pin and the large end of #3 connecting rod are positioned as shown in the figure using ST, while pressing the #3 piston crown, and then set the #3 connecting rod cap and #3 connecting rod cap bolt.

NOTE:
• Each connecting rod has its own mating cap. Make sure that they are assembled correctly by checking their matching symbol.
• Use a new connecting rod cap bolt.
• Apply a coat of engine oil to the #3 connecting rod cap seat and the connecting rod cap bolt threads.

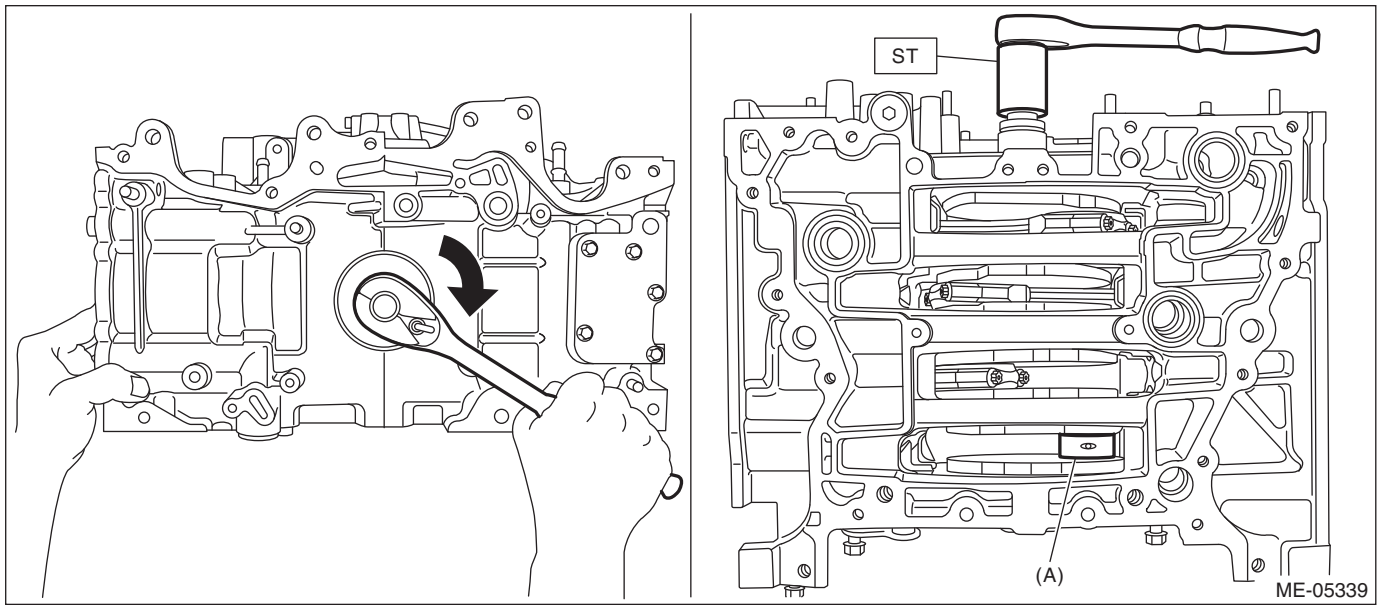
ST 18252AA000 CRANKSHAFT SOCKET



(13) Using TORX® socket E12, tighten the #3 connecting rod cap bolts to 10 N·m (1.0 kgf-m, 7.4 ft-lb) in numerical order as shown in the figure, then retighten the bolts to 22 N·m (2.2 kgf-m, 16.2 ft-lb) in numerical order as shown in the figure.



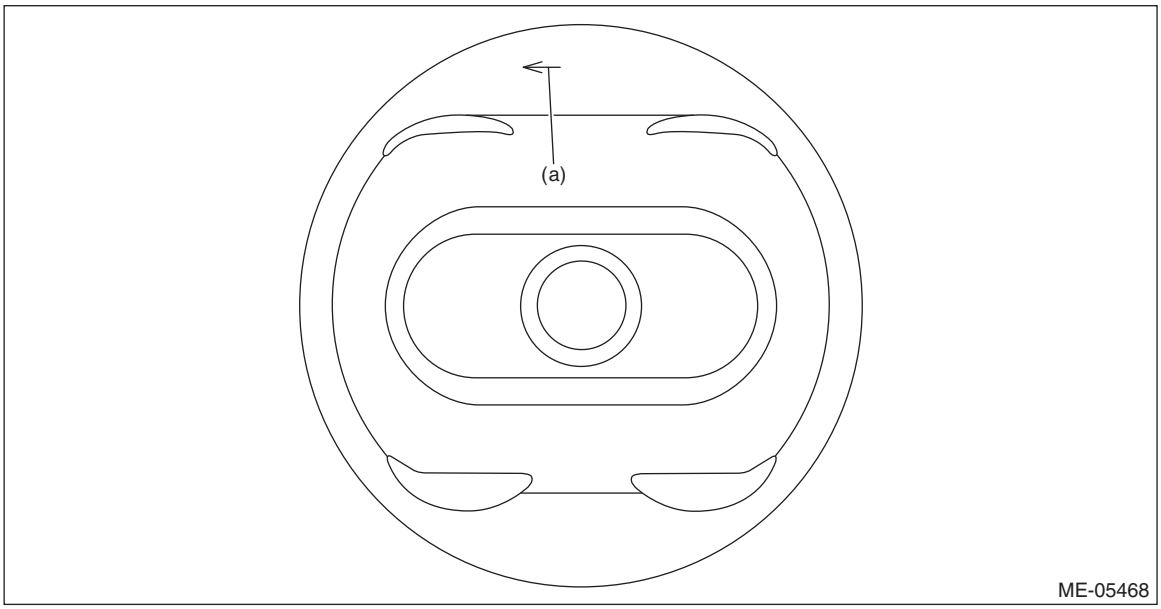
(14) Turn the crankshaft clockwise so that the #4 crank pin (A) is positioned at TDC using ST.
ST 18252AA000 CRANKSHAFT SOCKET



(15) Compress the piston ring using piston ring compressor, and insert the #4 connecting rod with #4 piston into cylinder block.

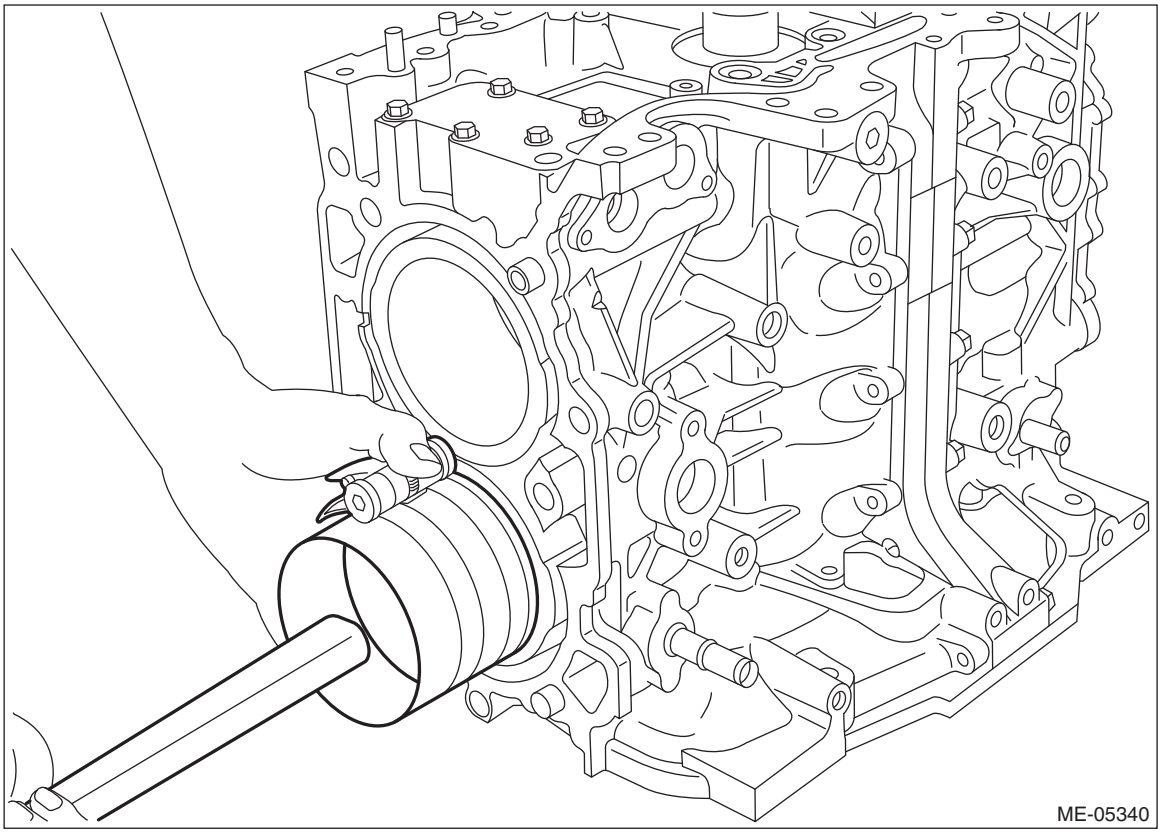
CAUTION:
- **Be careful not to damage the cylinder liner and #4 crank pin by the #4 connecting rod large end.**
- **Be careful not to apply strong impact when inserting to prevent connecting rod bearing from falling off.**

NOTE:
- Face the piston front mark (arrow) towards the front of the engine.



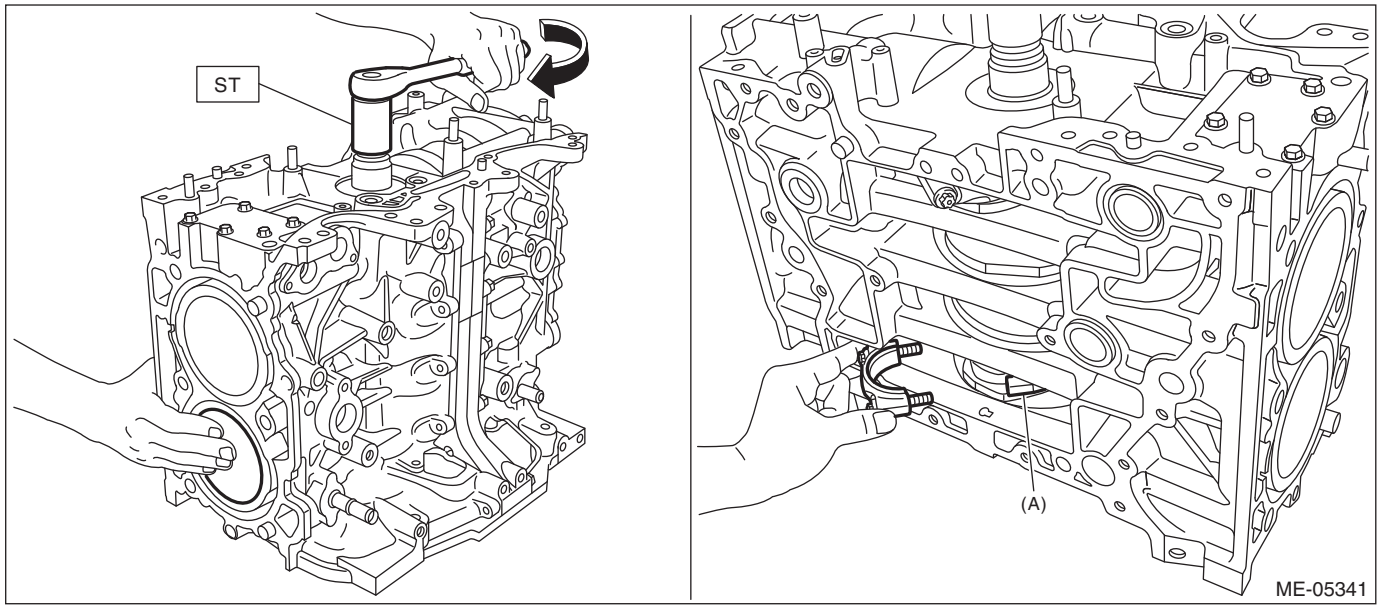
(a) Front mark

• Insert while lightly tapping the crown of the piston with the handle of a plastic hammer.

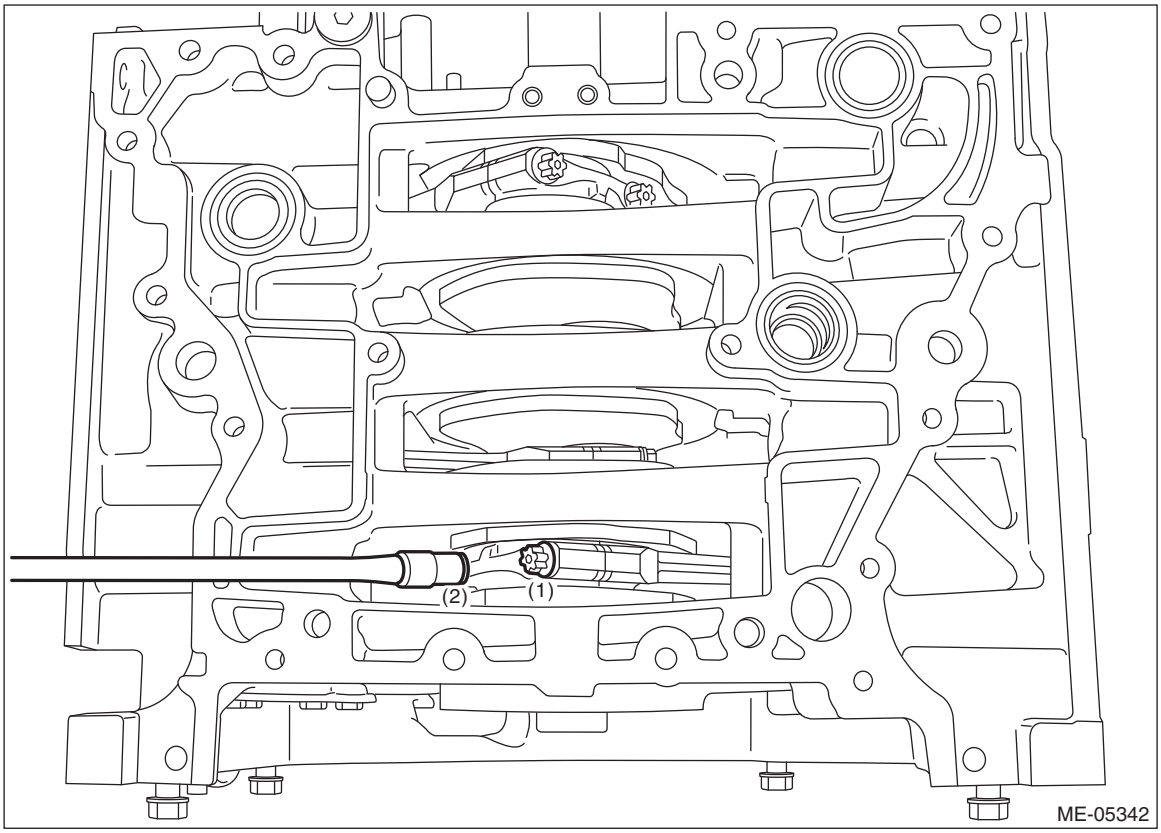


(16) Turn the crankshaft clockwise so that the #4 crank pin and the large end of #4 connecting rod (A) are positioned as shown in the figure using ST, while pressing the #4 piston crown, and then set the #4 connecting rod cap and #4 connecting rod cap bolt.

NOTE:
• Each connecting rod has its own mating cap. Make sure that they are assembled correctly by checking their matching symbol.
• Use a new connecting rod cap bolt.
• Apply a coat of engine oil to the #4 connecting rod cap seat and the connecting rod cap bolt threads.
ST 18252AA000 CRANKSHAFT SOCKET

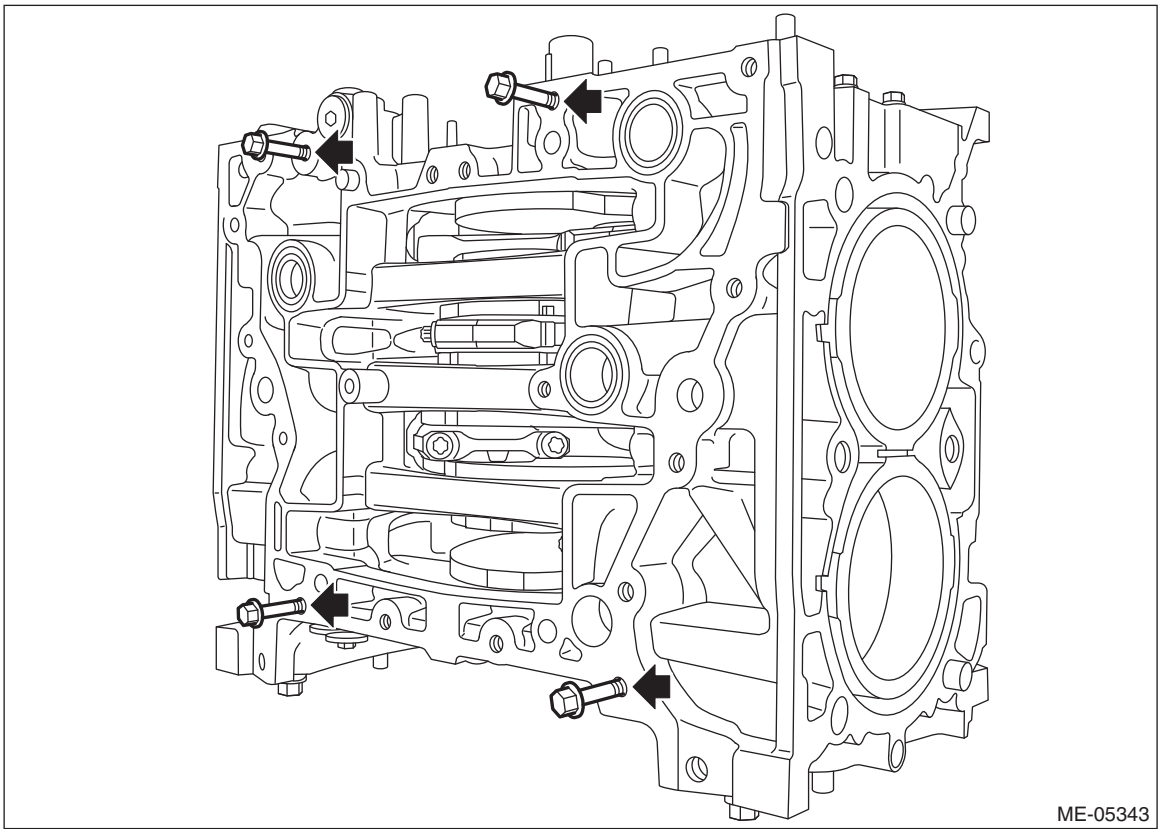


(17) Using TORX® socket E12, tighten the #4 connecting rod cap bolts to 10 N·m (1.0 kgf-m, 7.4 ft-lb) in numerical order as shown in the figure, then retighten the bolts to 22 N·m (2.2 kgf-m, 16.2 ft-lb) in numerical order as shown in the figure.



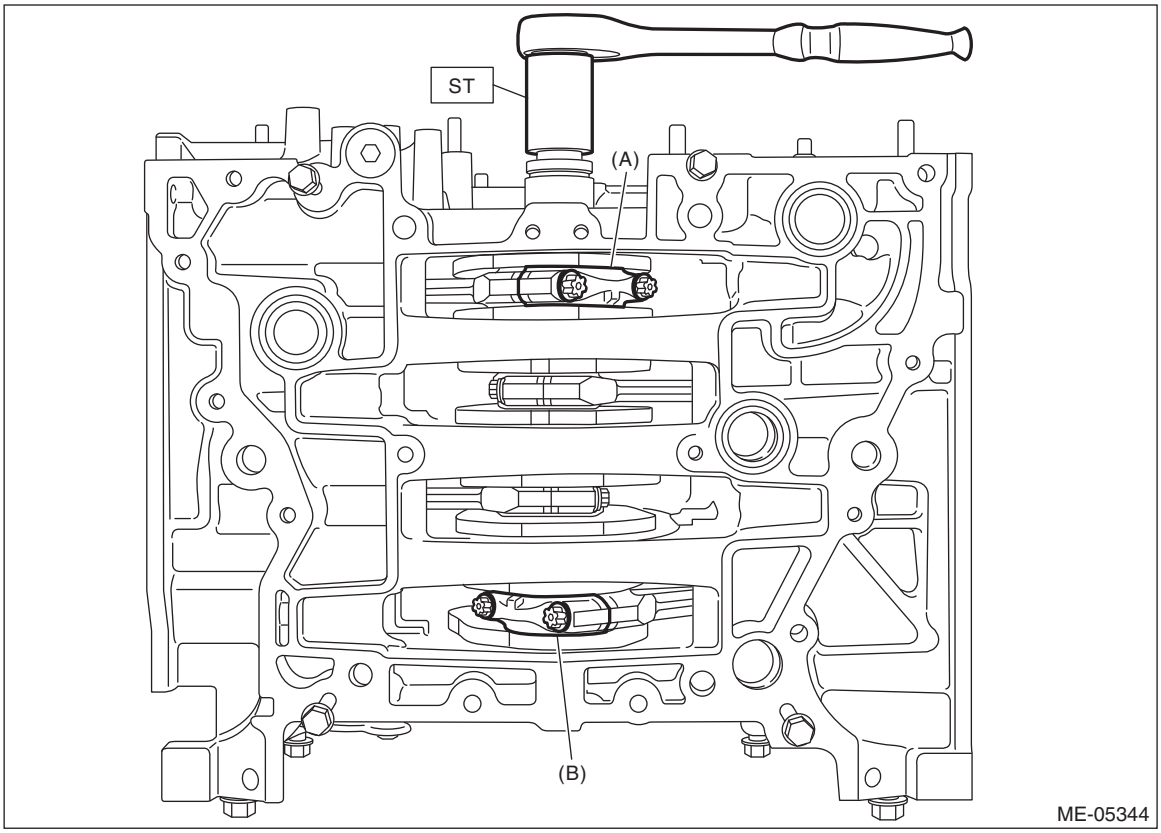
(18) Install the cam carrier mounting bolts at the locations shown in the figure.

NOTE:
This procedure is required to tighten the connecting rod cap bolts with specified angle using ST.



(19) Turn the crankshaft so that the #1 connecting rod cap (A) and #4 connecting rod cap (B) is located at the position shown in the figure using ST.

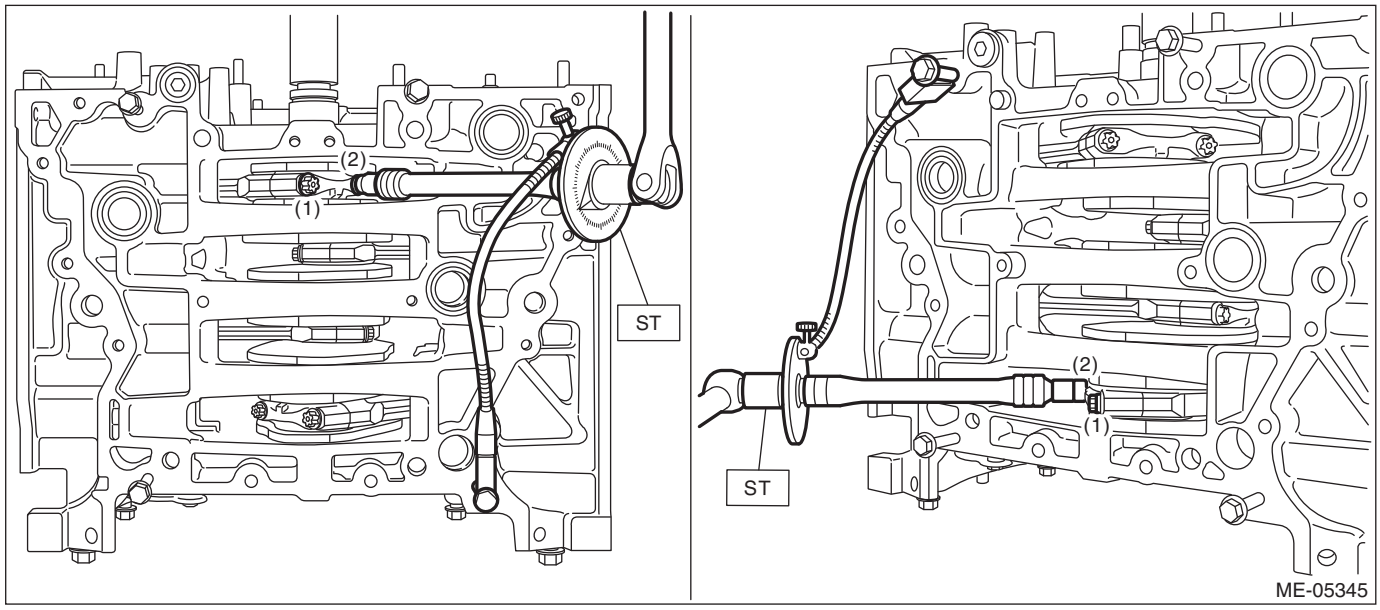
ST 18252AA000 CRANKSHAFT SOCKET



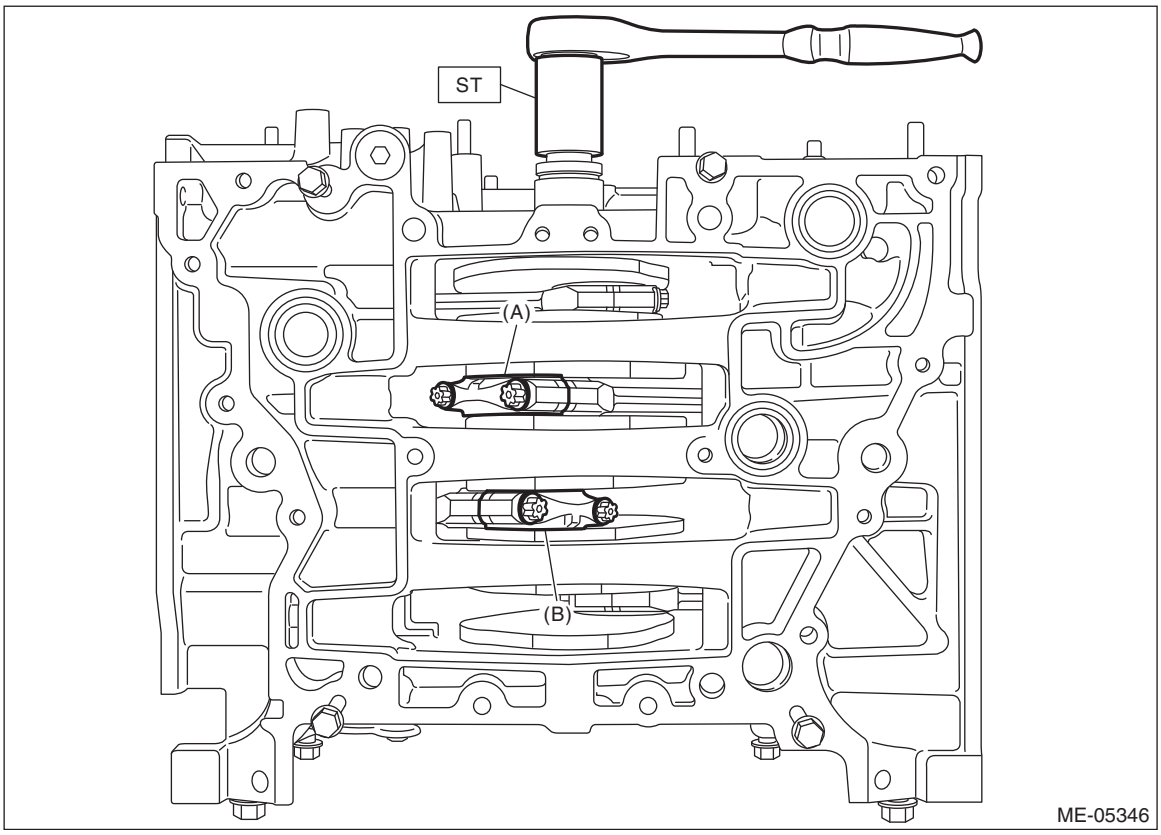
(20) Using ST and TORX® socket E12, tighten the #1 connecting rod cap bolts and #4 connecting rod cap bolts with specified angle in numerical order as shown in the figure.

NOTE:
Attach the magnet used for securing the ST (ANGLE GAUGE) to the cam carrier mounting bolt attached in step (18).
ST 18854AA000 ANGLE GAUGE

Tightening angle:
137°±2°



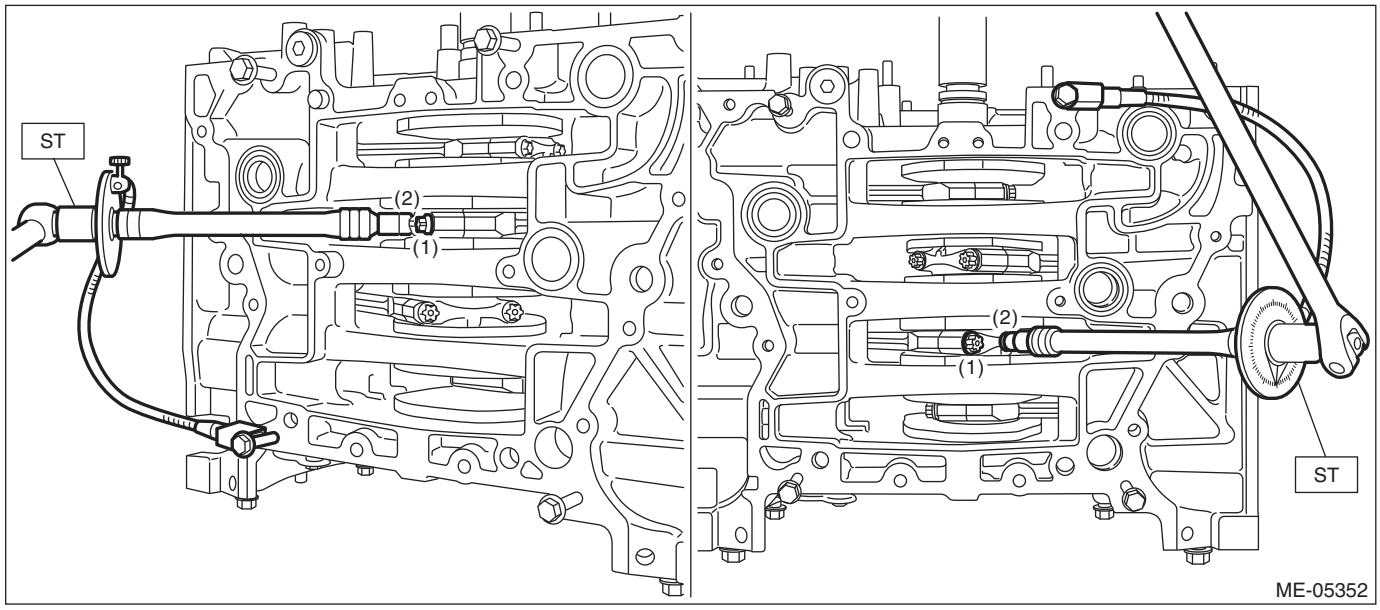
(21) Turn the crankshaft so that the #2 connecting rod cap (A) and #3 connecting rod cap (B) is located at the position shown in the figure using ST.
ST 18252AA000 CRANKSHAFT SOCKET



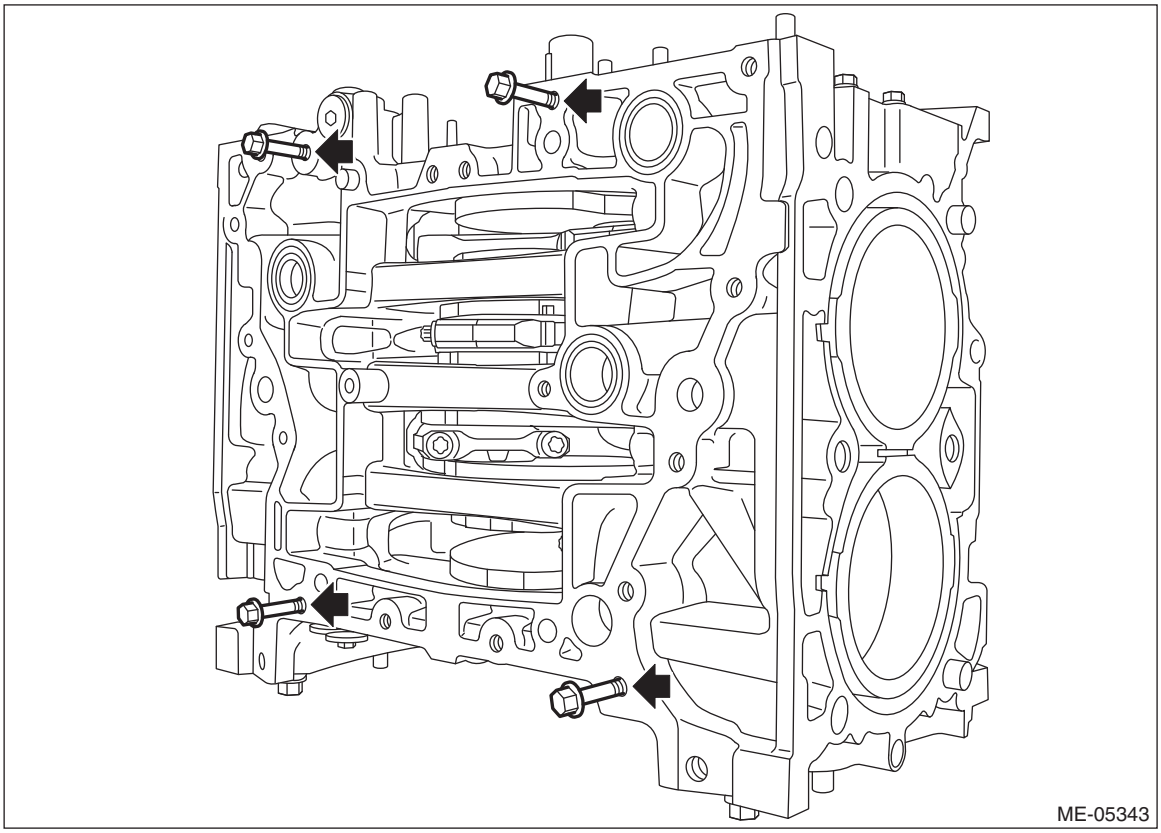
(22) Using ST and TORX® socket E12, tighten the #2 connecting rod cap bolts and #3 connecting rod cap bolts with specified angle in numerical order as shown in the figure.

NOTE:
Attach the magnet used for securing the ST (ANGLE GAUGE) to the cam carrier mounting bolt attached in step (18).
ST 18854AA000 ANGLE GAUGE

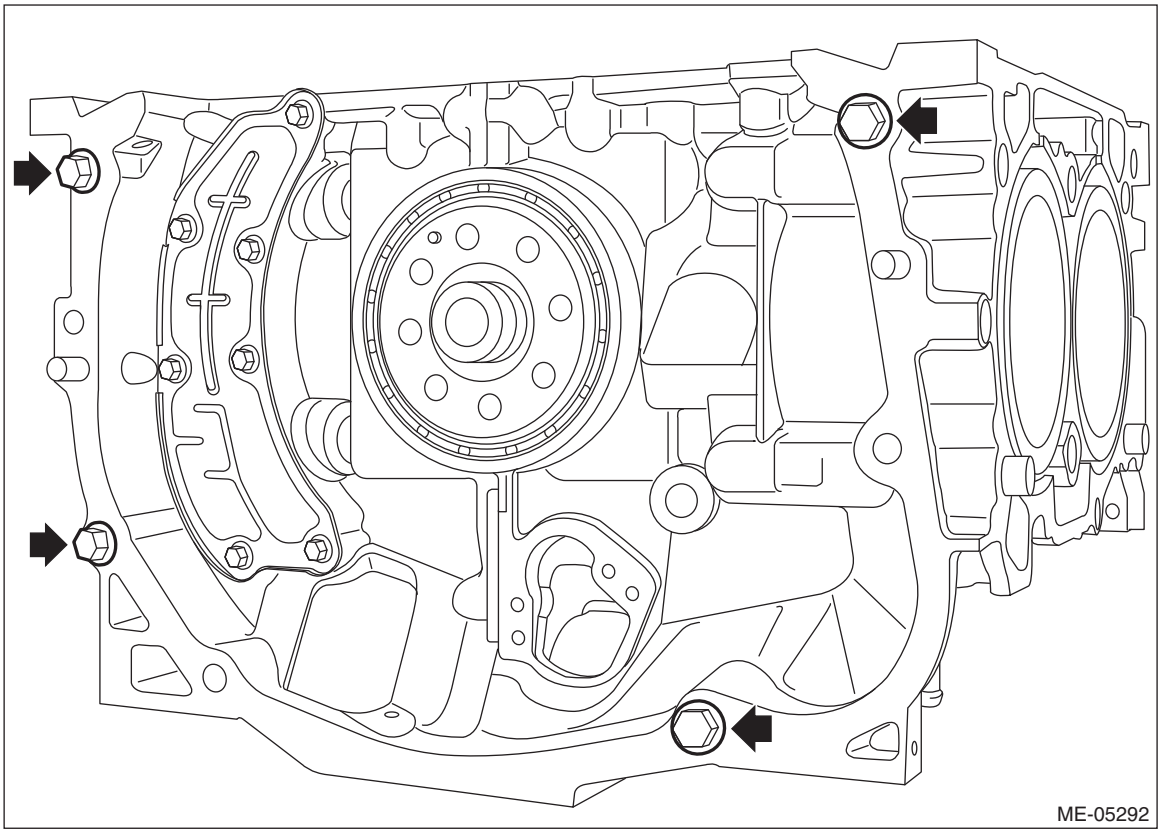
Tightening angle:
137°±2°



(23) Remove the cam carrier mounting bolts attached at the locations shown in the figure.



13) Set the cylinder block so that the oil pan side is on the upper side, and remove the A/C compressor bracket bolts and the power steering pump bracket bolts attached at the locations shown in the figure.

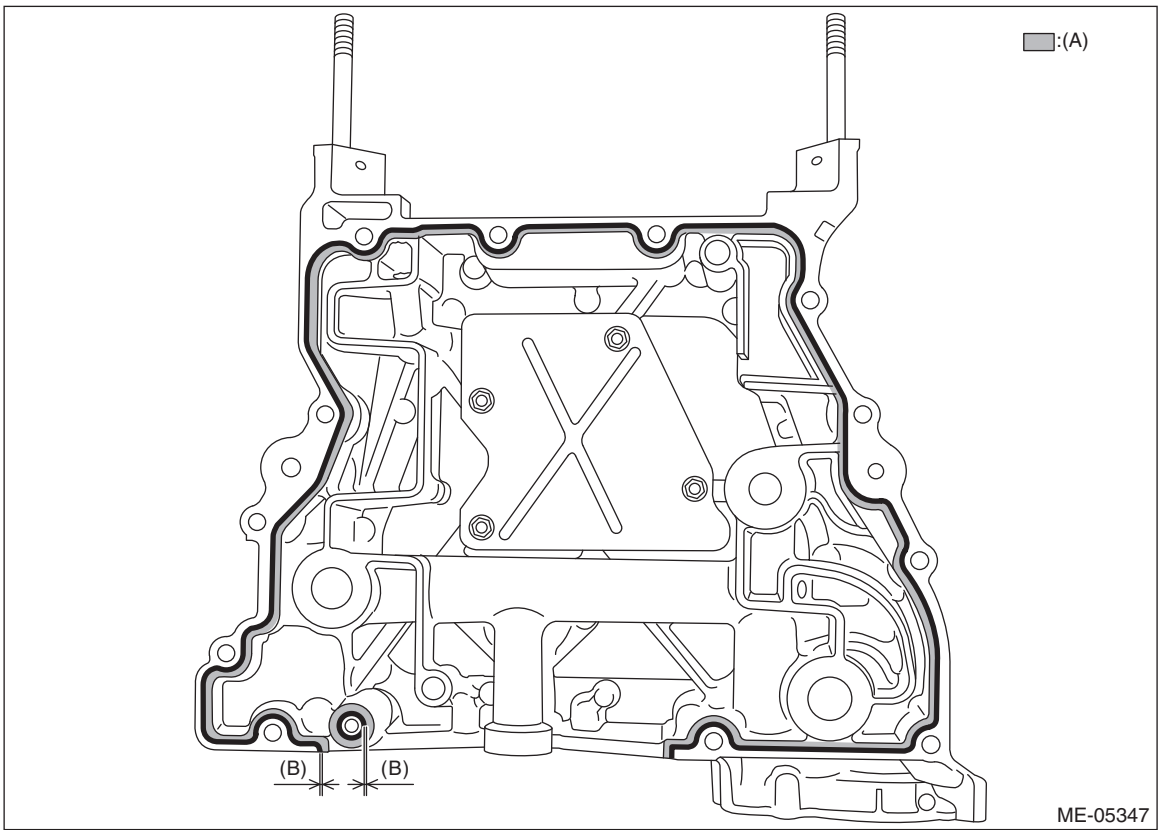


14) Install the oil pan upper with oil pan to the cylinder block.
(1) Apply liquid gasket to the mating surface of oil pan upper as shown in the figure.

NOTE:
• Before applying liquid gasket, remove oil from liquid gasket seal surface of the cylinder block and the oil pan upper.
• Install within 5 min. after applying liquid gasket.
• Apply liquid gasket 1.5 mm (0.0591 in) outside from the chamfer surface. However, application of liquid gasket on the chamfer surface around the bolt hole is allowed.

Liquid gasket:
THREE BOND 1217G (Part No. 0877Y0100) or equivalent

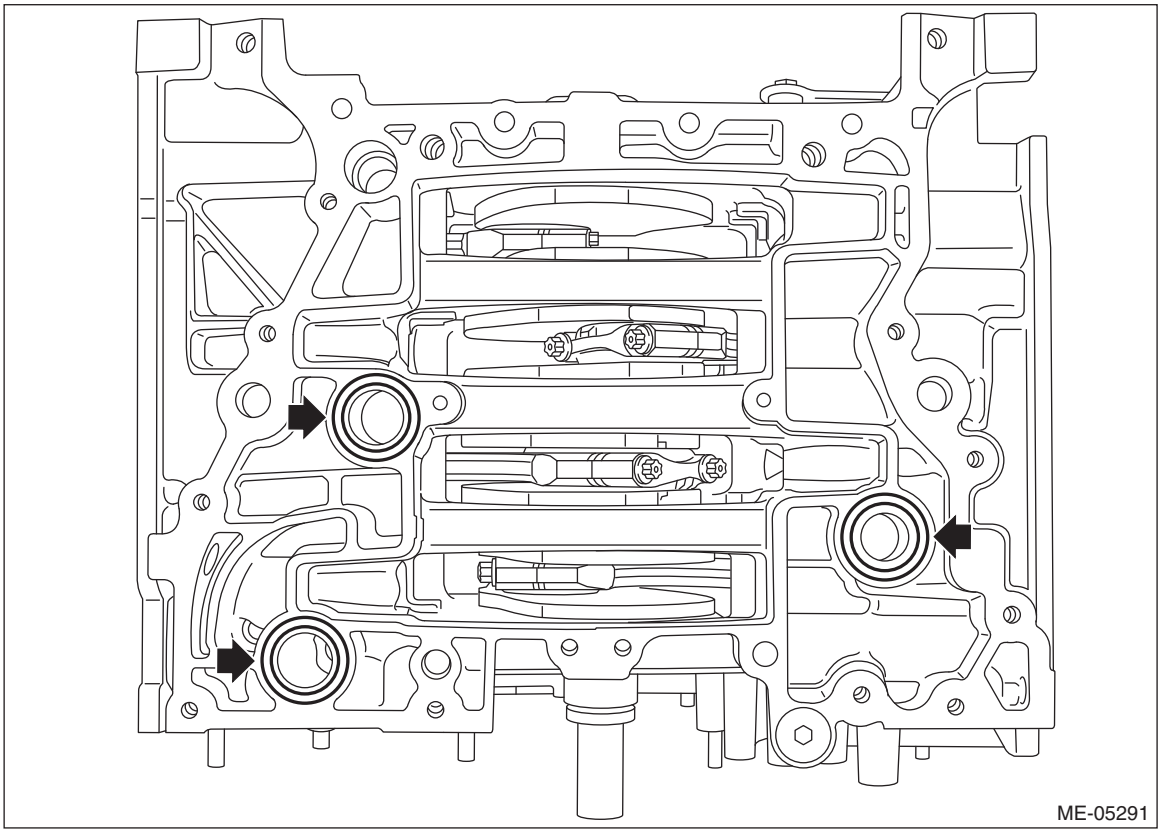
Liquid gasket applying diameter:
5±1 mm (0.1969±0.0394 in)



(A) Chamfer surface (B) 1.5 mm (0.0591 in)

(2) Install the O-ring to the cylinder block.

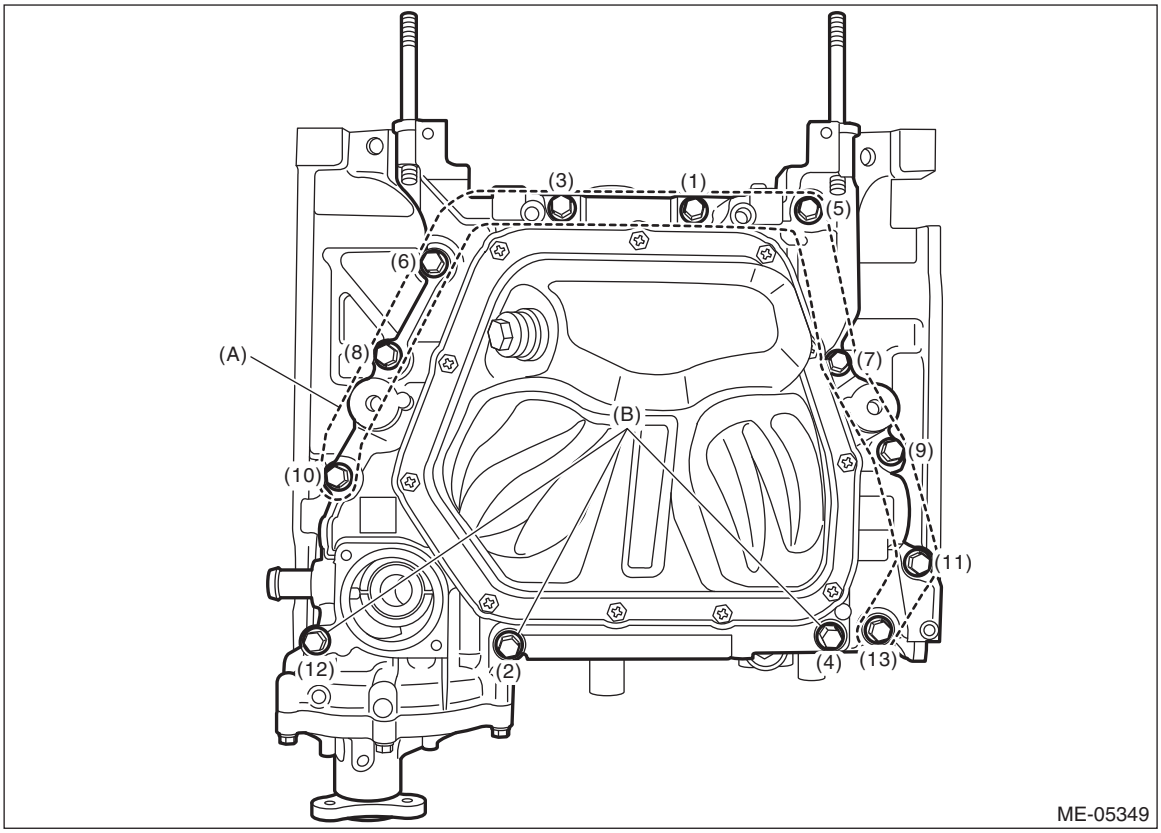
NOTE:
Use new O-rings.



(3) Set the oil pan with oil pan upper to the cylinder block, and tighten the bolts in numerical order as shown in the figure.

NOTE:
After tightening, if the liquid gasket is squeezed out onto the seal surface of the chain cover, completely remove any squeezed-out liquid gasket.

Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)

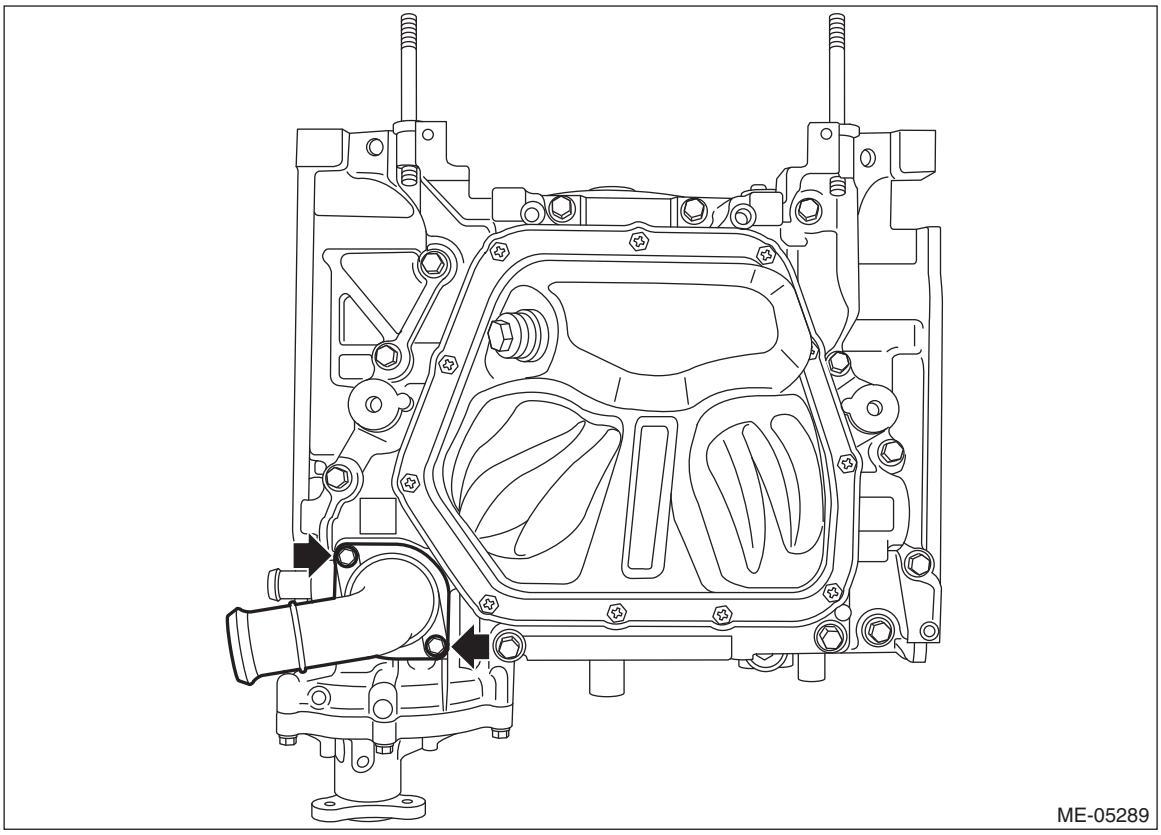


(A) M8 × 25 (B) M8 × 75

15) Set the thermostat to the oil pan upper, and install the thermostat cover.

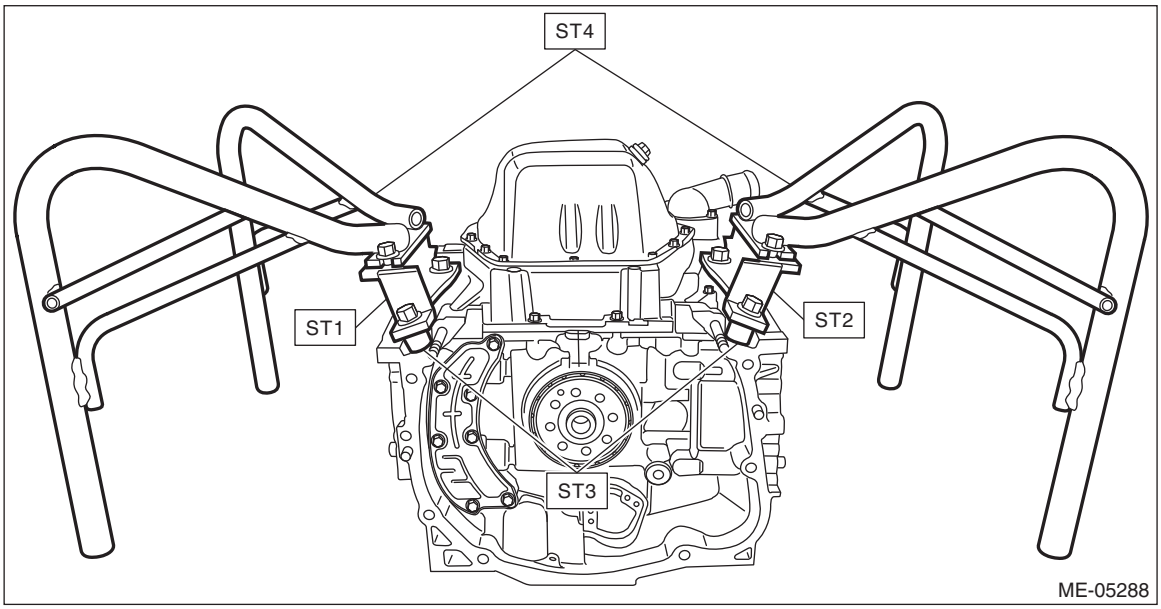
NOTE:
Use a new gasket.

Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)



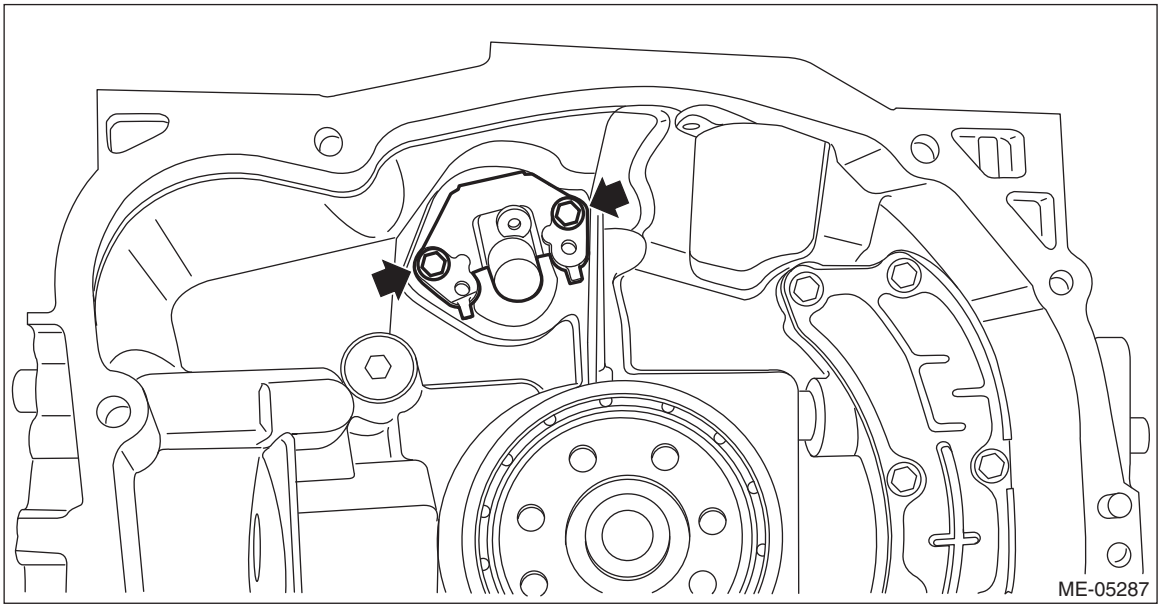
16) Install the ST1, ST2, ST3 and ST4 to the cylinder block and oil pan upper.
ST1 498457000 ENGINE STAND ADAPTER RH
ST2 498457100 ENGINE STAND ADAPTER LH
ST3 18362AA020 ADAPTER
ST4 499817100 ENGINE STAND

Tightening torque:
35 N·m (3.6 kgf-m, 25.8 ft-lb)



17) Install the crankshaft position sensor with crankshaft position sensor holder to the cylinder block LH.

Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)



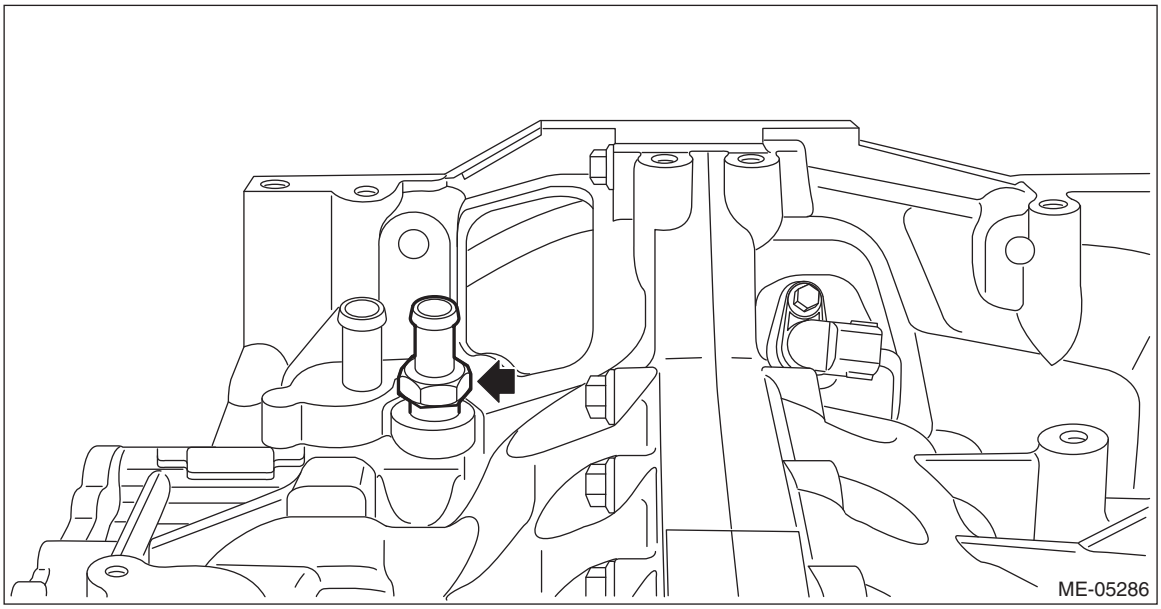
18) Install the crankshaft position sensor plate with drive plate. (AT model) <Ref. to 4AT-73, INSTALLATION, Drive Plate.>
19) Install the crankshaft position sensor plate with flywheel. (MT model) <Ref. to CL-12, INSTALLATION, Flywheel.>
20) Install the clutch disc and cover. (MT model) <Ref. to CL-10, INSTALLATION, Clutch Disc and Cover.>

21) Install the PCV valve onto the cylinder block RH.

NOTE:
Apply liquid gasket to the bolt threads of PCV valve.

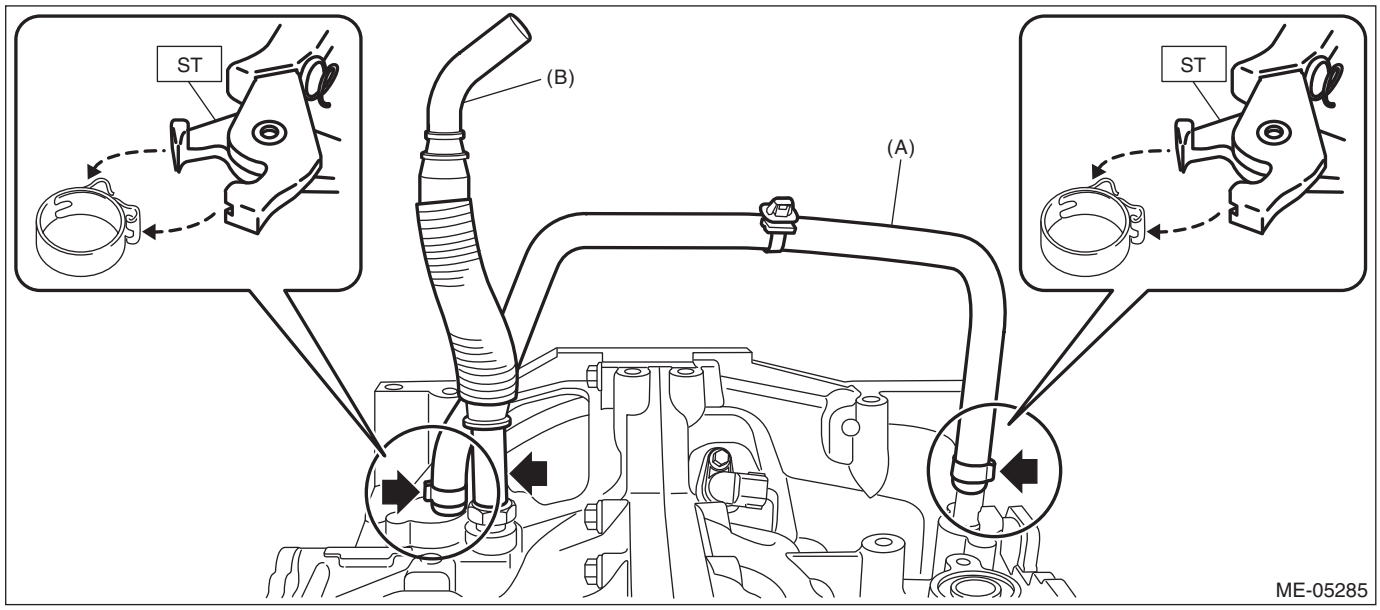
Liquid gasket:
THREE BOND 1141G or equivalent

Tightening torque:
23 N·m (2.3 kgf-m, 17.0 ft-lb)



22) Install the PCV hose assembly (A) and the vacuum hose (B) to cylinder block and PCV valve.

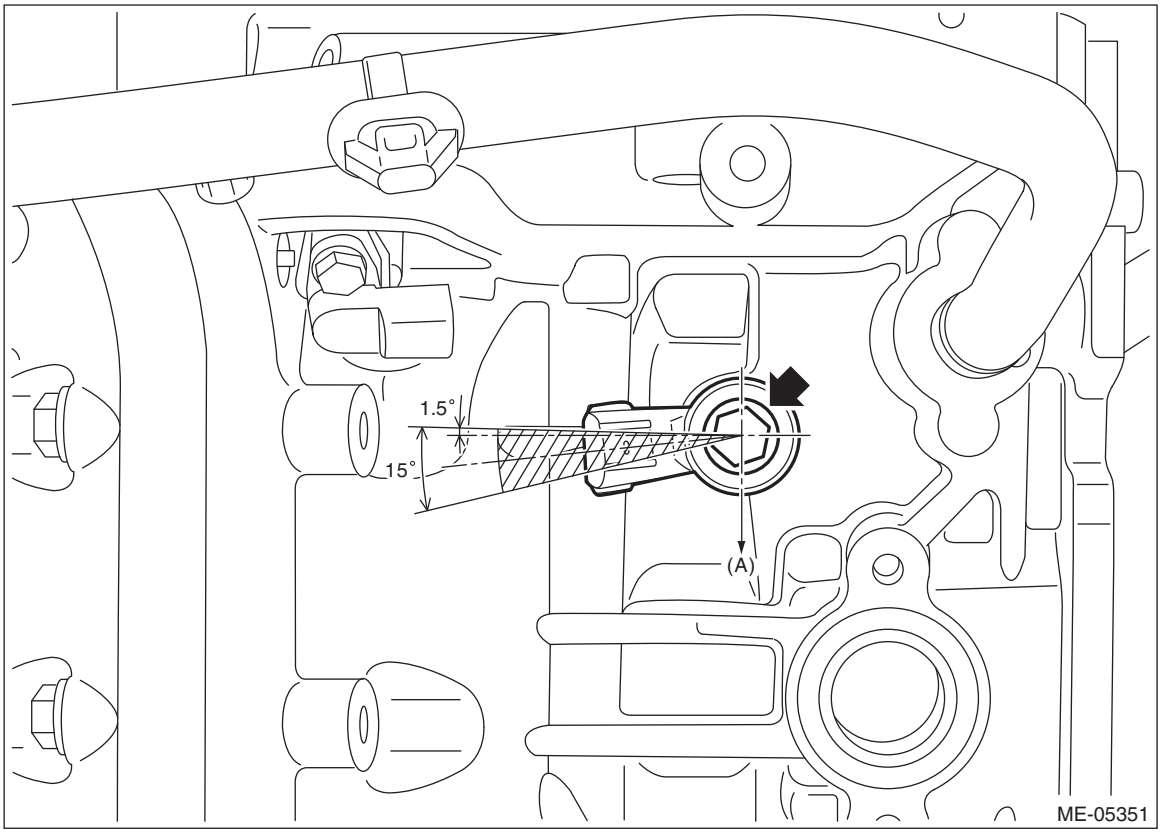
NOTE:
Use a new clamp for the PCV hose assembly, fit the cut out in the ST with the protrusion on the clamp as shown in the figure, and lock the clamp.
ST 18353AA000 CLAMP PLIERS



23) Install the knock sensor to the cylinder block LH.

NOTE:
Knock sensor must be positioned toward engine front so that the connector center position is within the range of 76.5 — 91.5° (shaded area).

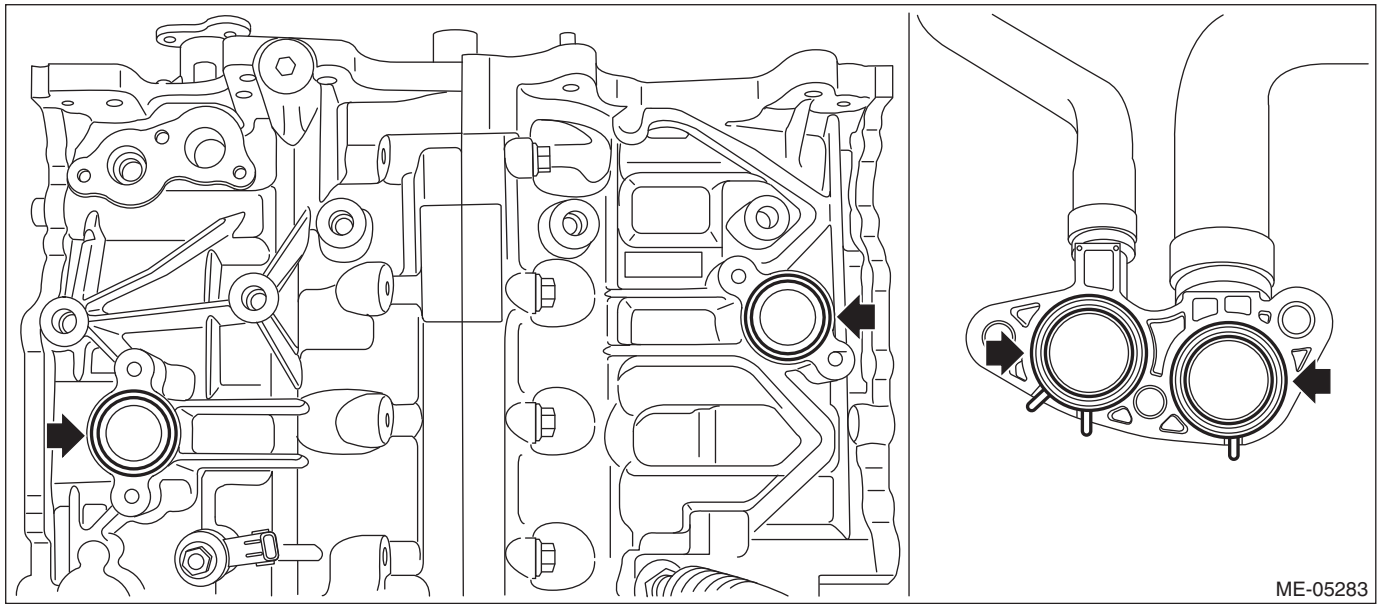
Tightening torque:
24 N·m (2.4 kgf-m, 17.7 ft-lb)



(A) Front of engine

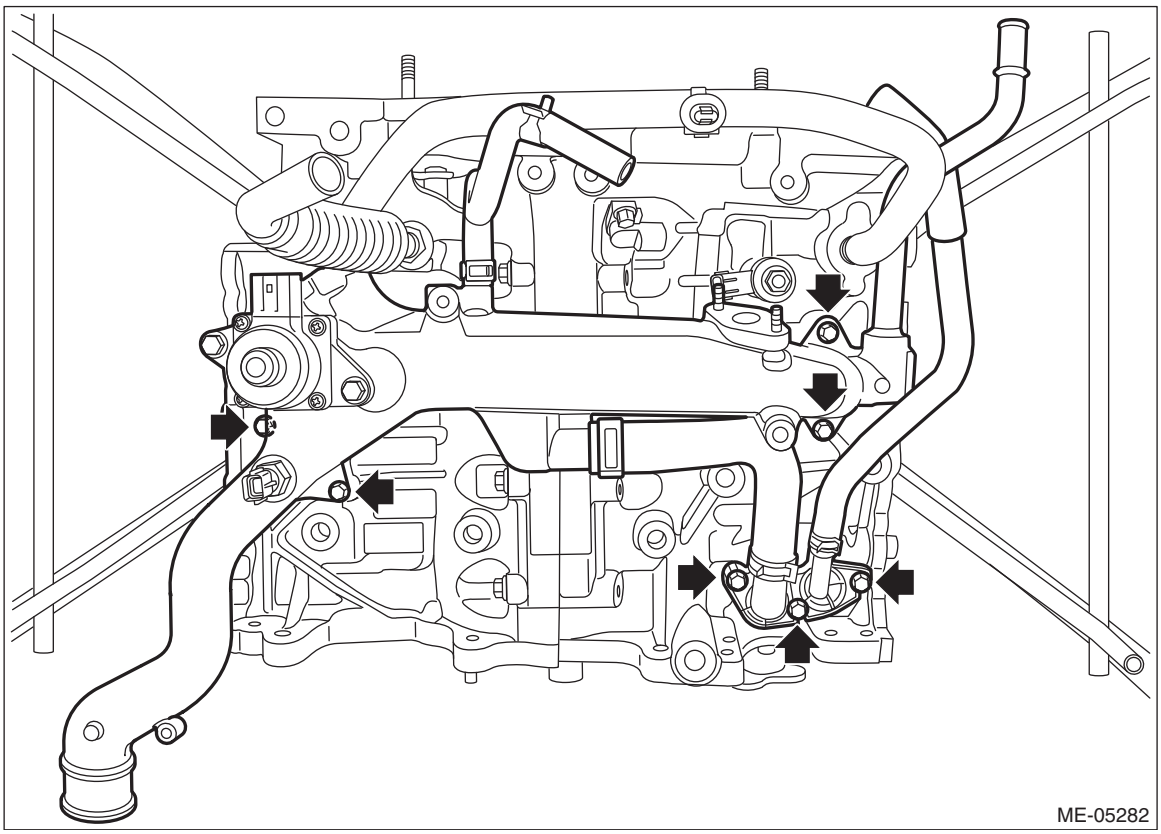
24) Install the O-ring to the cylinder block and PCV connector.

NOTE:
Use new O-rings.



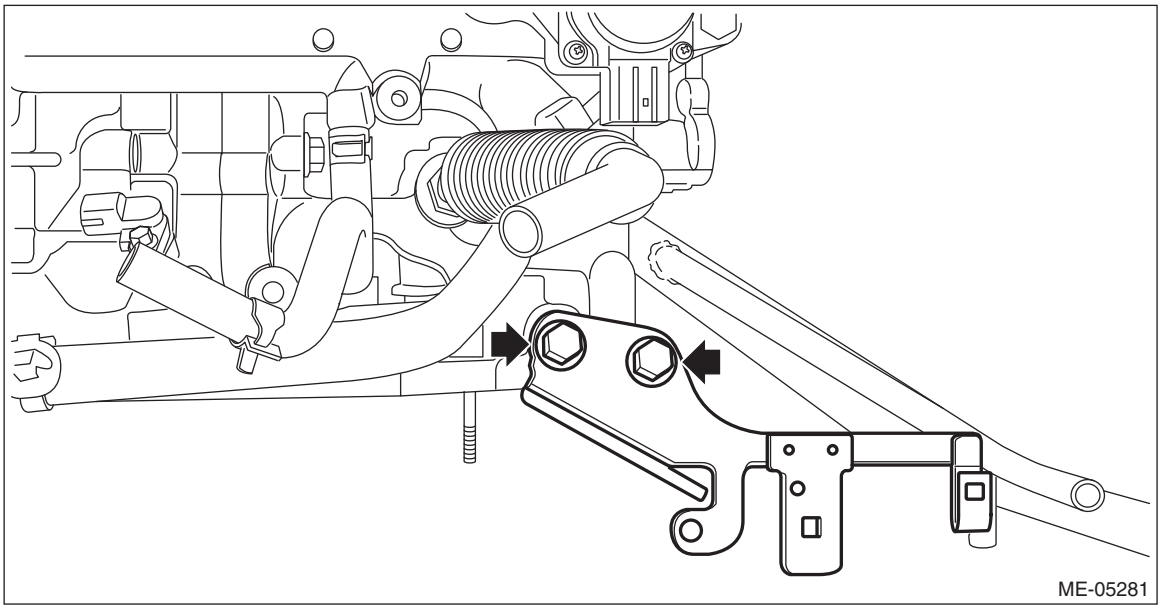
25) Install the water pipe assembly and PCV connector to the cylinder block.

Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)



26) Install the engine hanger to the cylinder block RH.

Tightening torque:
21 N·m (2.1 kgf-m, 15.5 ft-lb)

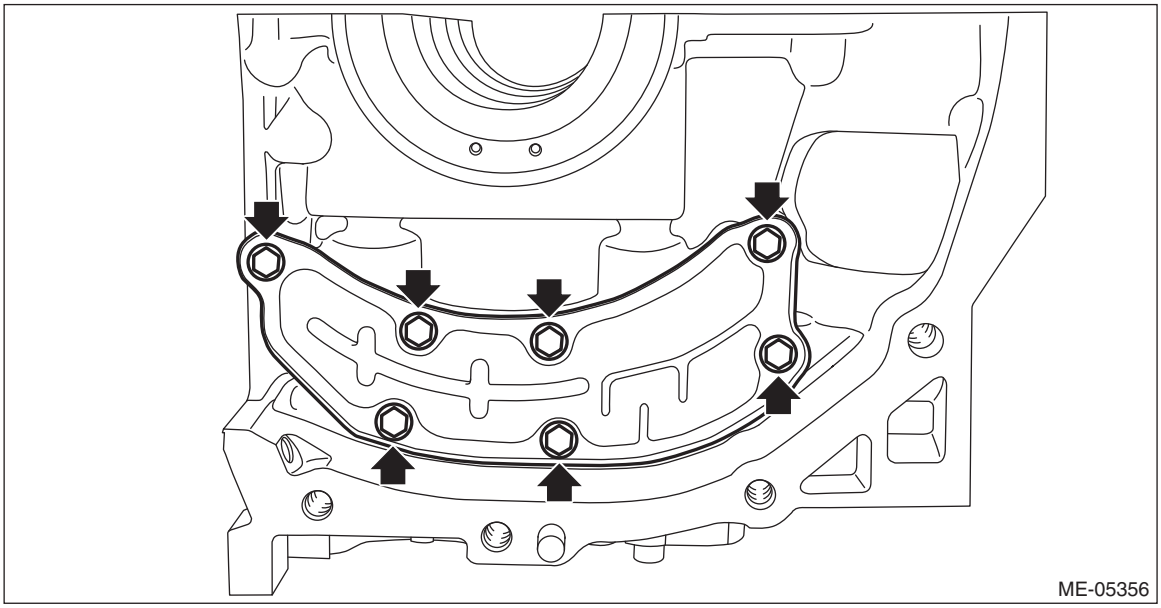


27) Install the crank sprocket. <Ref. to ME(H4DO)-137, INSTALLATION, Crank Sprocket.>
28) Install the cylinder head. <Ref. to ME(H4DO)-200, INSTALLATION, Cylinder Head.>
29) Install the cam carrier. <Ref. to ME(H4DO)-162, INSTALLATION, Cam Carrier.>
30) Install the rocker cover. <Ref. to ME(H4DO)-144, INSTALLATION, Rocker Cover.>
31) Install the chain cover. <Ref. to ME(H4DO)-96, INSTALLATION, Chain Cover.>
32) Install the tumble generator valve assembly. <Ref. to FU(H4DO)-86, INSTALLATION, Tumble Generator Valve Assembly.>
33) Install the intake manifold. <Ref. to FU(H4DO)-29, INSTALLATION, Intake Manifold.>
34) Install the engine to the vehicle. <Ref. to ME(H4DO)-56, INSTALLATION, Engine Assembly.>

C: DISASSEMBLY

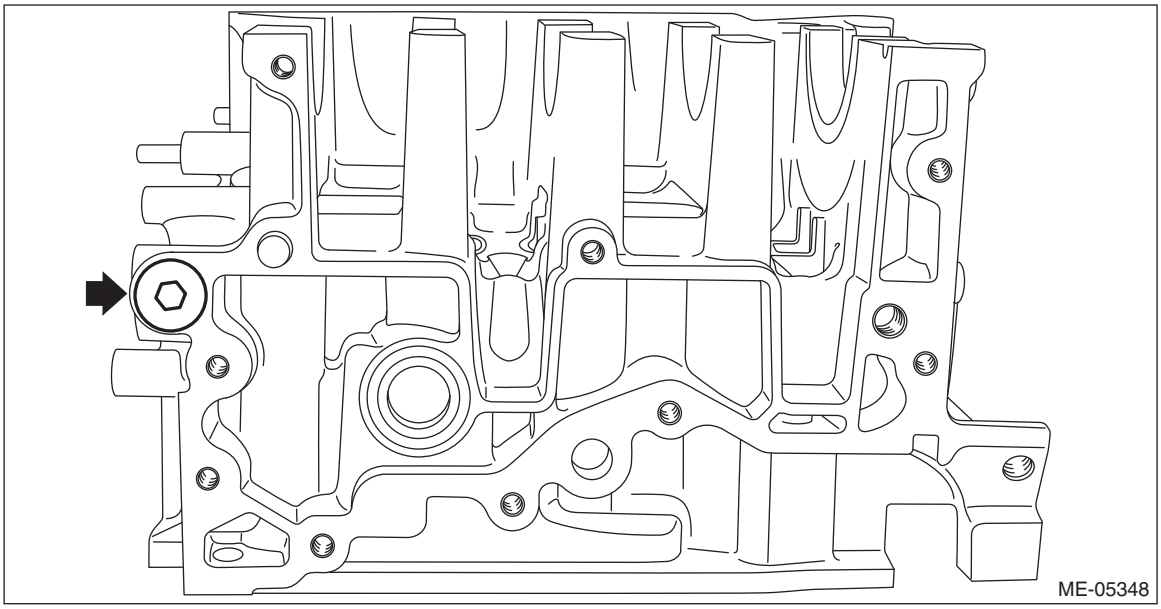
1. CYLINDER BLOCK

1) Remove the oil separator cover from cylinder block RH.

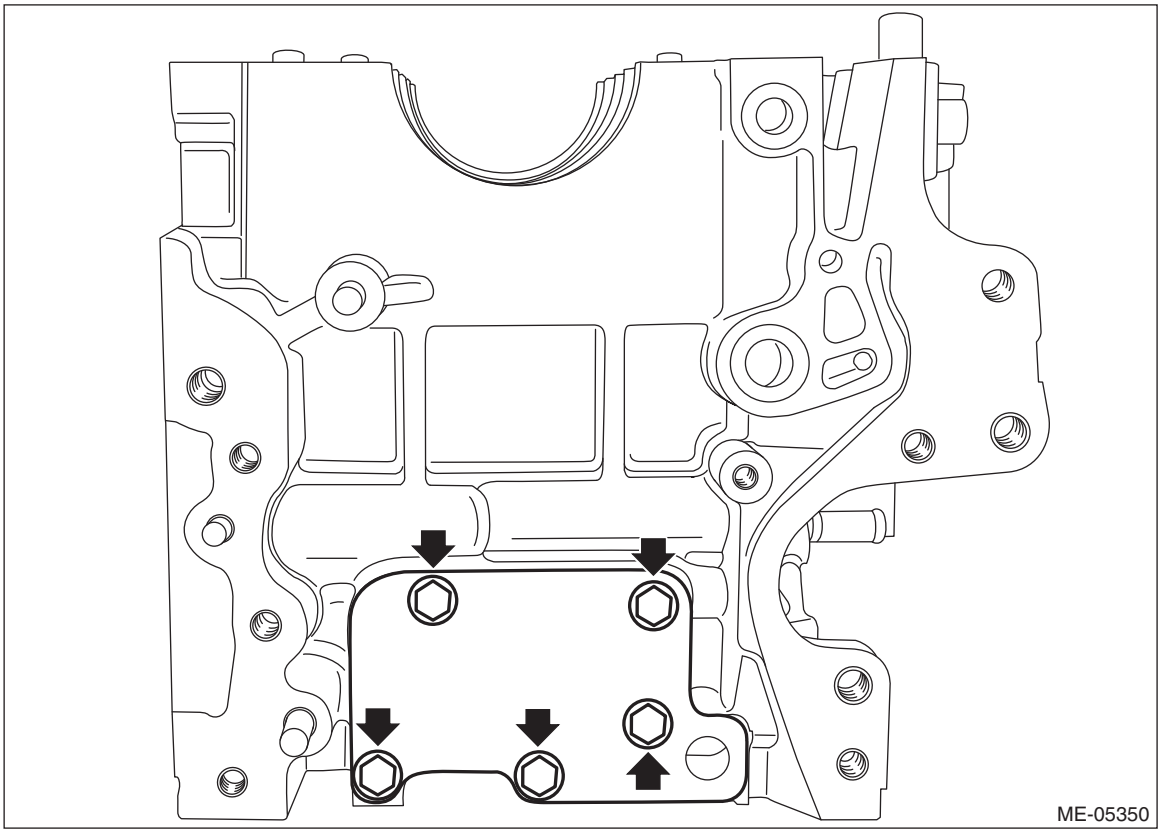


2) Remove the liquid gasket from cylinder block RH.

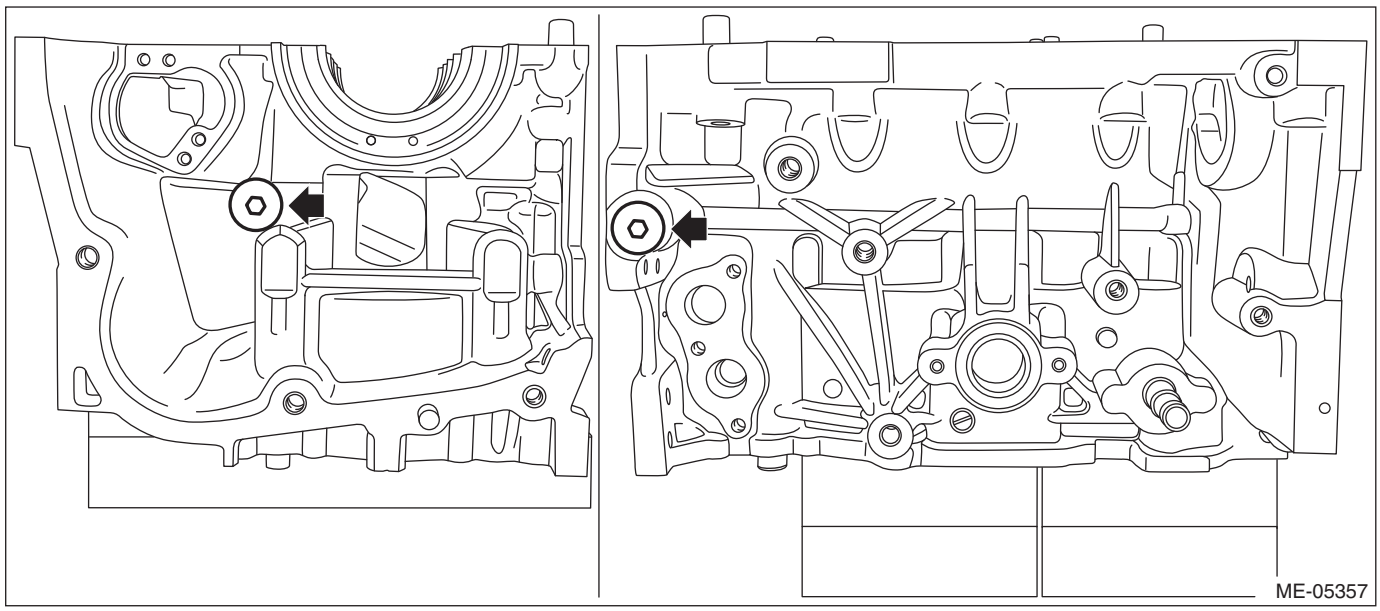
3) Remove the main gallery plug from cylinder block RH.



4) Remove the liquid gasket from the bolt holes in the cylinder block RH and the threaded portion of the main gallery plug.
5) Remove the cylinder block plate from cylinder block LH.

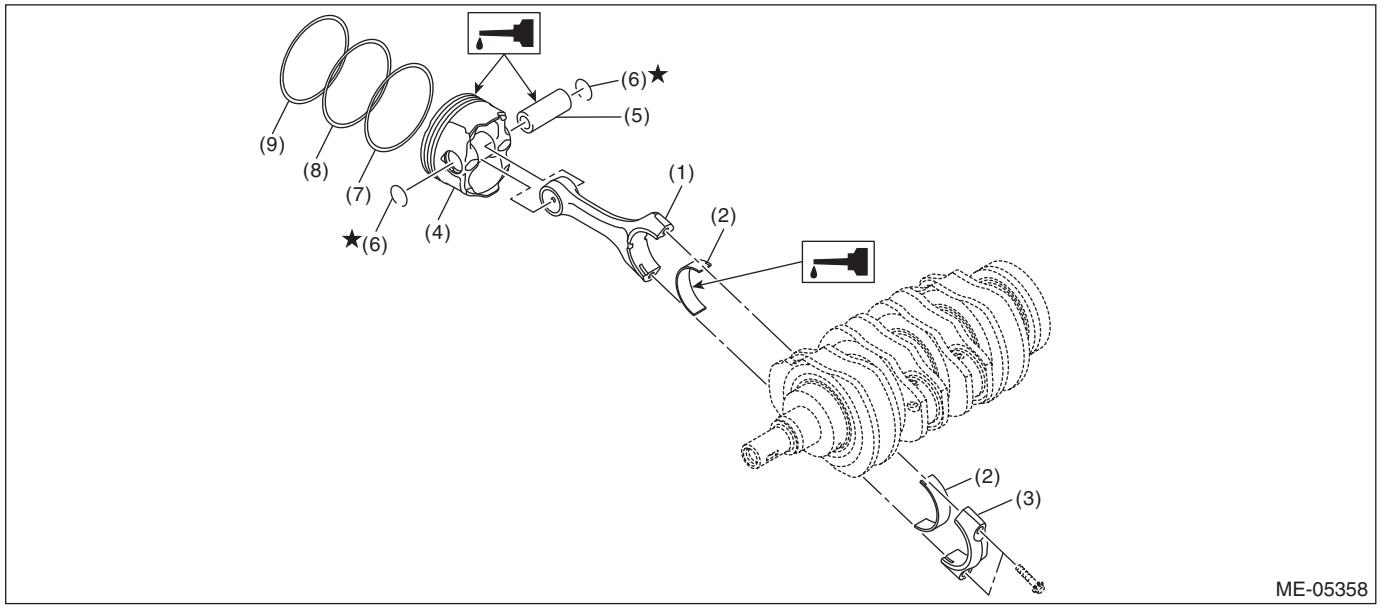


6) Remove the main gallery plug from cylinder block LH.



7) Remove the liquid gasket from the bolt holes in the cylinder block LH and the threaded portion of the main gallery plug.

2. PISTON AND CONNECTING ROD



(1)	Connecting rod	(4)	Piston	(7)	Oil ring
(2)	Connecting rod bearing	(5)	Piston pin	(8)	Second ring
(3)	Connecting rod cap	(6)	Circlip	(9)	Top ring

NOTE:
To prevent confusion of various parts, mark each part.
1) Remove the connecting rod bearing from connecting rod and connecting rod cap.
2) Remove the piston rings using piston ring expander, and remove the oil ring by hand.

NOTE:
- Arrange the piston rings and oil rings in order so that they can be installed in their original positions.
- Be careful not to confuse the piston rings and oil rings.

3) Remove the circlip on one end from the piston using a flat tip screwdriver.

NOTE:
Be careful not damage the piston and piston pin, by wrapping the tip of flat tip screwdriver with tape.
4) Remove the piston pin from piston, and remove the connecting rod from piston.
5) Remove the circlip on other end from the piston using a flat tip screwdriver.

NOTE:
Be careful not damage the piston and piston pin, by wrapping the tip of flat tip screwdriver with tape.

D: ASSEMBLY

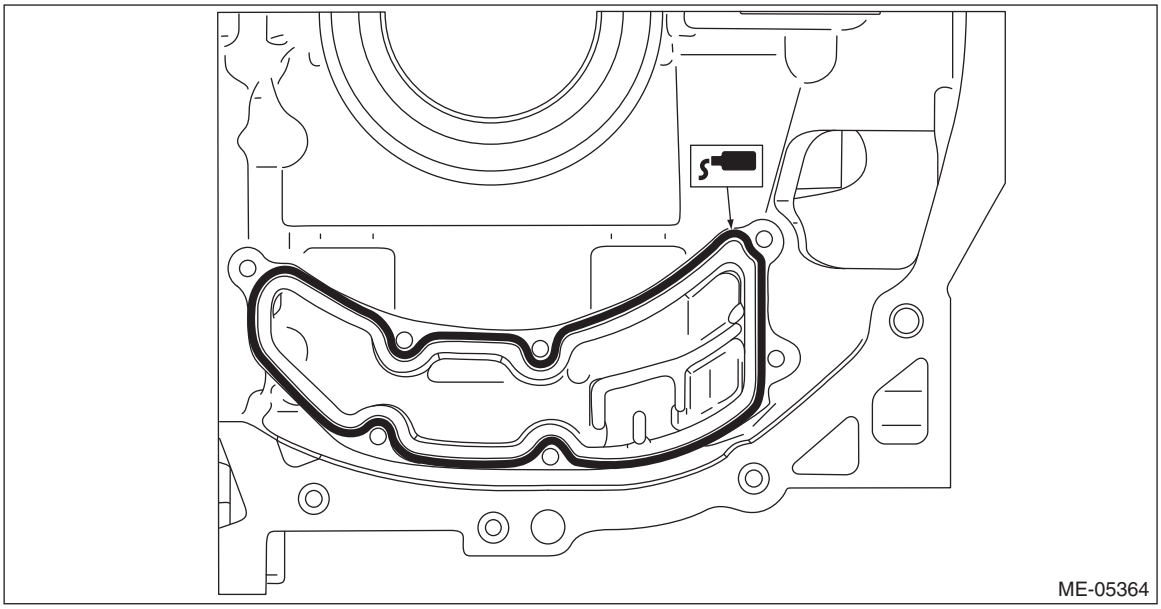
1. CYLINDER BLOCK

1) Install the oil separator cover to the cylinder block RH.
   (1) Apply liquid gasket to the mating surfaces of oil separator cover.

NOTE:
- Use new oil separator cover.
- Before applying liquid gasket, remove oil from liquid gasket seal surface of the cylinder block RH.
- Install within 5 min. after applying liquid gasket.

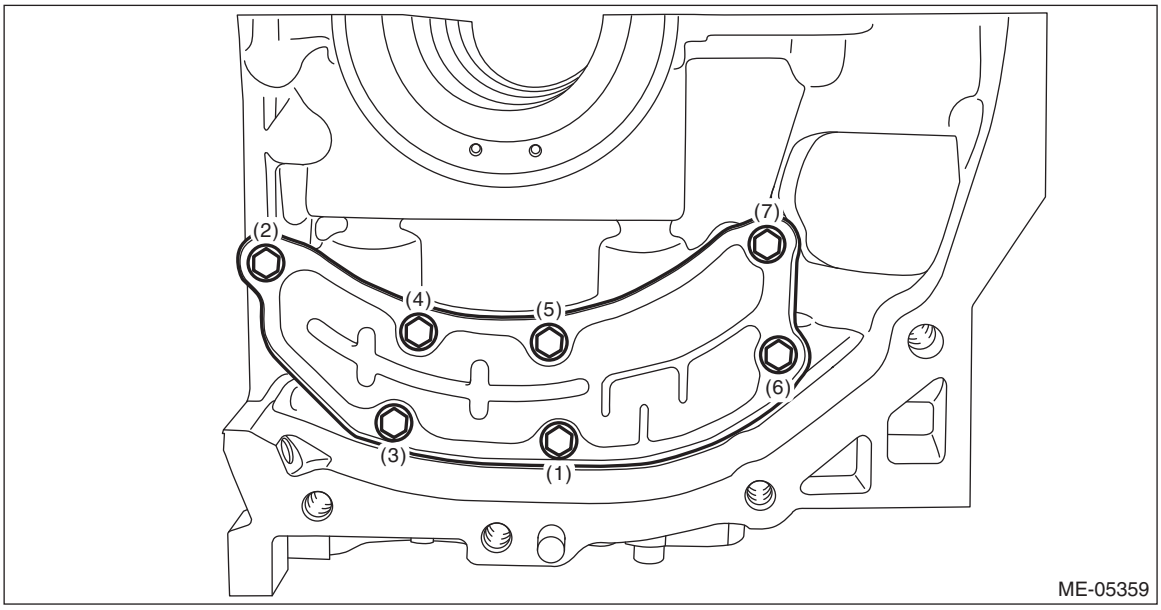
Liquid gasket:
Mating surface
THREE BOND 1217G (Part No. K0877Y0100) or equivalent

Liquid gasket applying diameter:
4 ±1 mm (0.1772±0.0197 in)



(2) Install the oil separator cover to the cylinder block RH, and tighten the oil separator cover bolts in numerical order as shown in the figure.

Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)

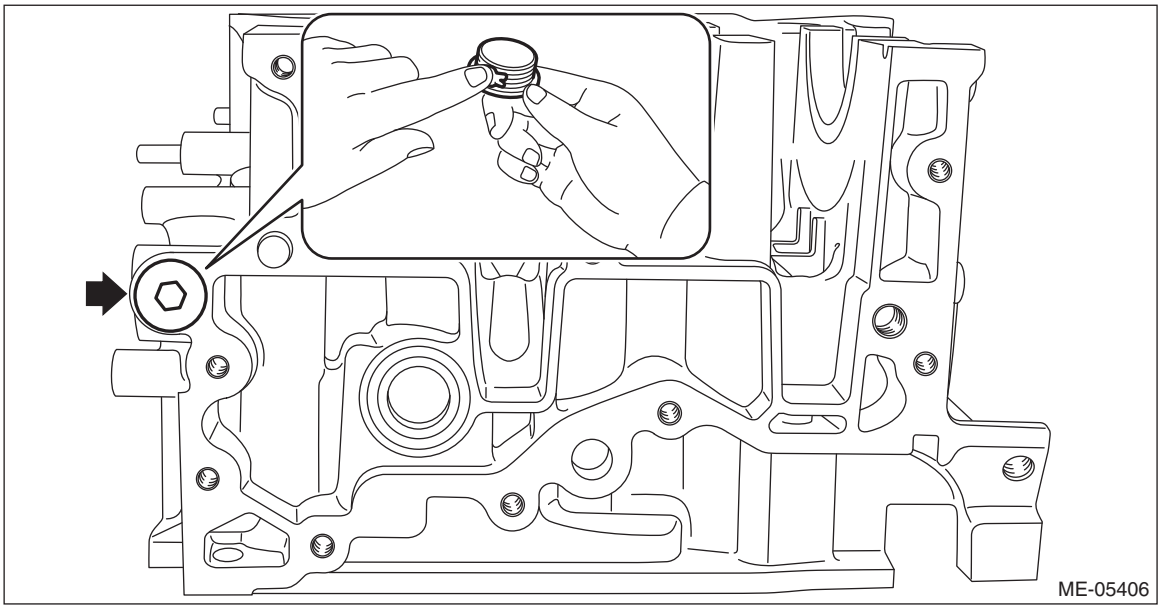


2) Apply liquid gasket to the threaded portion of the main gallery plug, and install the main gallery plug to the cylinder block RH.

NOTE:
Before applying liquid gasket, remove oil from the bolt holes in the cylinder block RH and the threaded portion of the main gallery plug.

Liquid gasket:
THREE BOND 1105 (Part No. 004403010) or equivalent

Tightening torque:
37 N·m (3.8 kgf-m, 27.3 ft-lb)

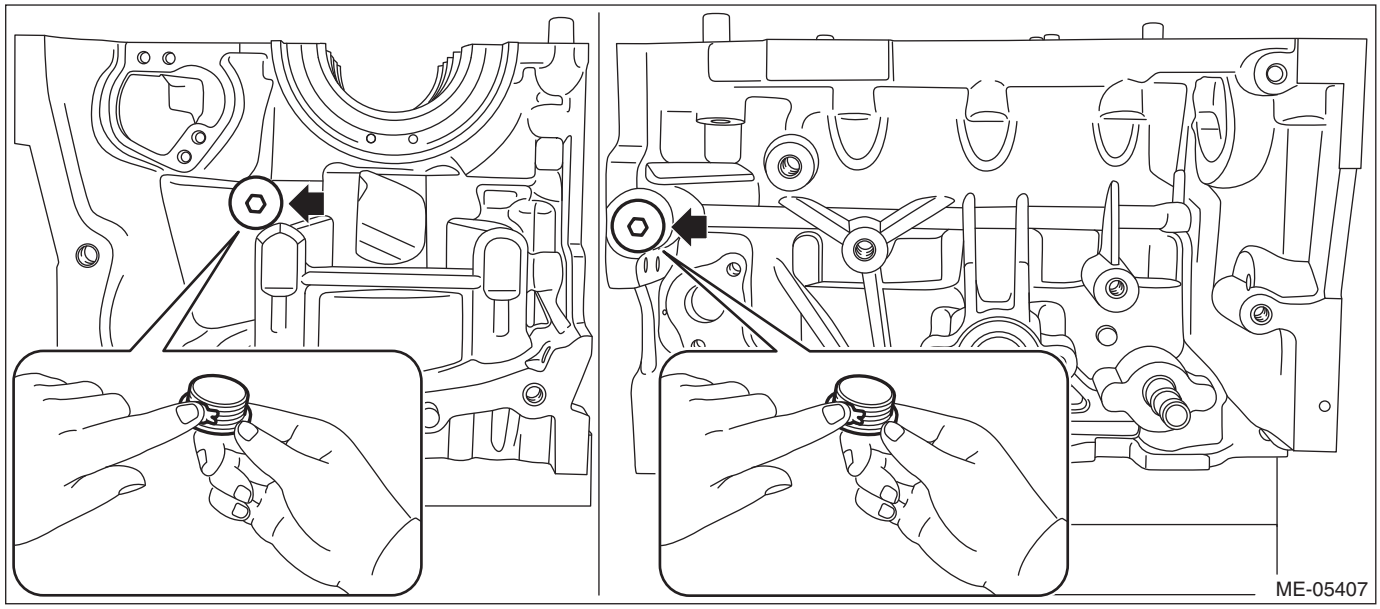


3) Apply liquid gasket to the threaded portion of the main gallery plug, and install the main gallery plug to the cylinder block LH.

NOTE:
Before applying liquid gasket, remove oil from the bolt holes in the cylinder block LH and the threaded portion of the main gallery plug.

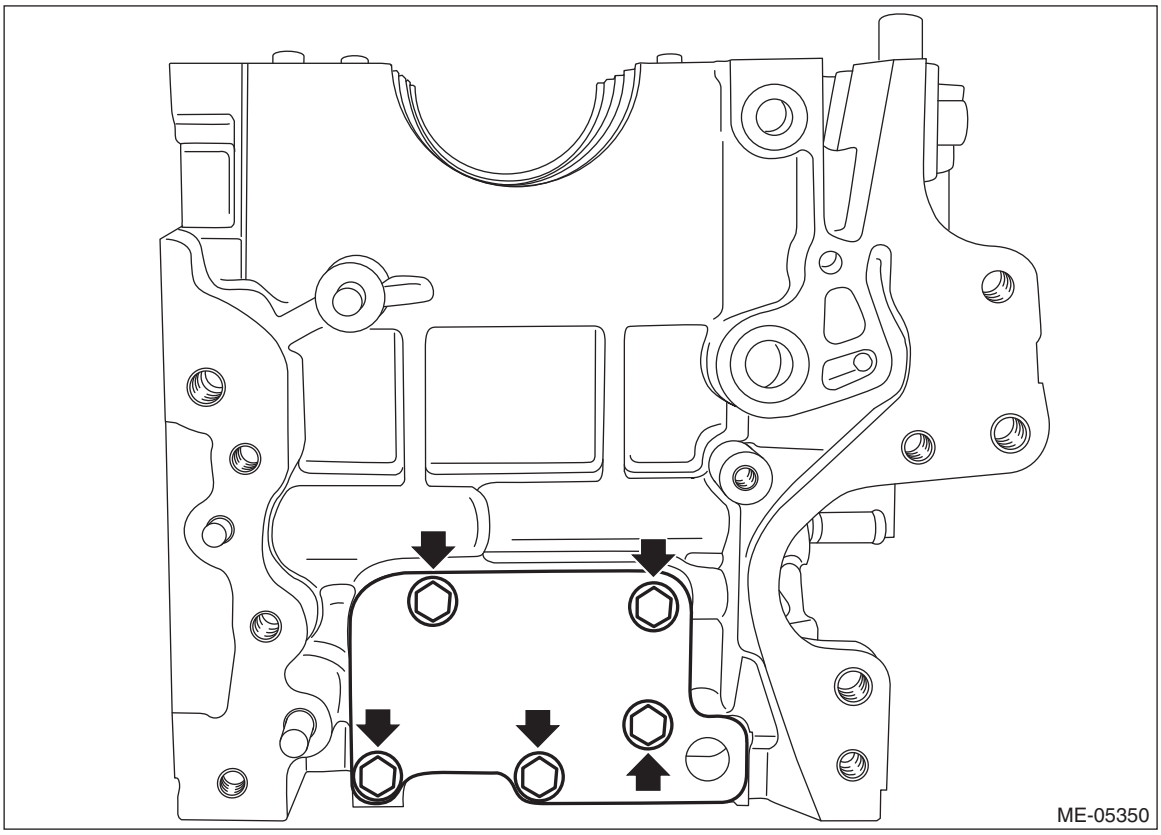
Liquid gasket:
THREE BOND 1105 (Part No. 004403010) or equivalent

Tightening torque:
37 N·m (3.8 kgf-m, 27.3 ft-lb)

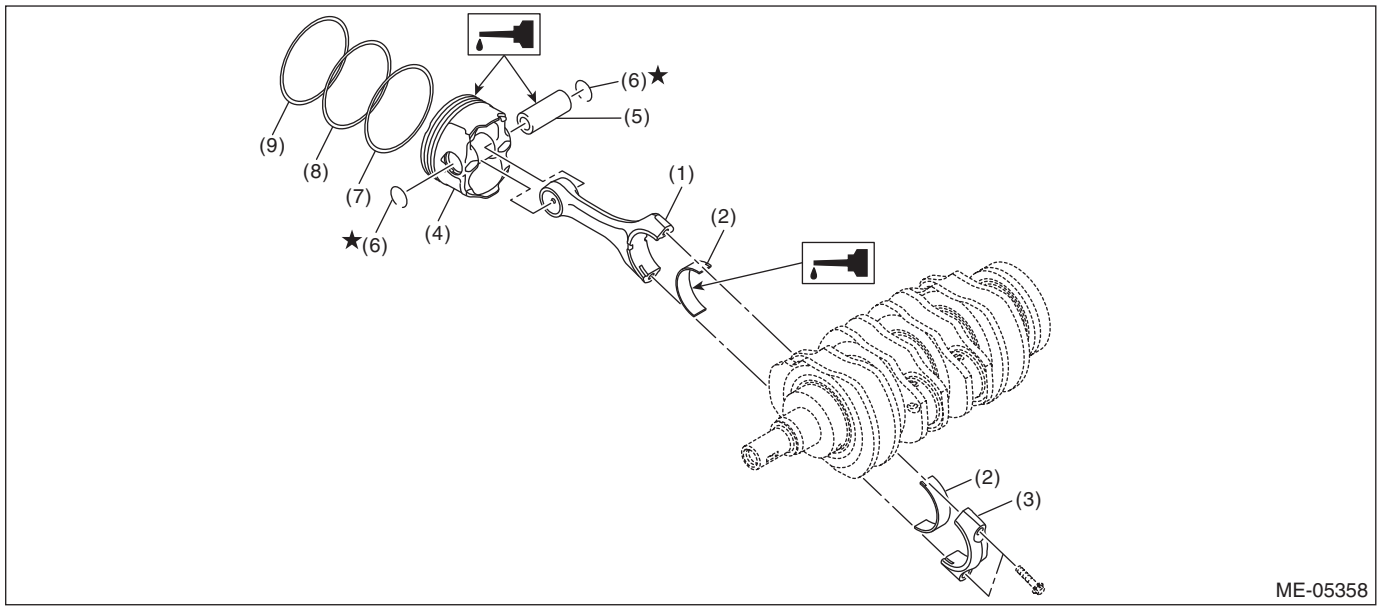


4) Install the cylinder block plate onto cylinder block LH.

Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)



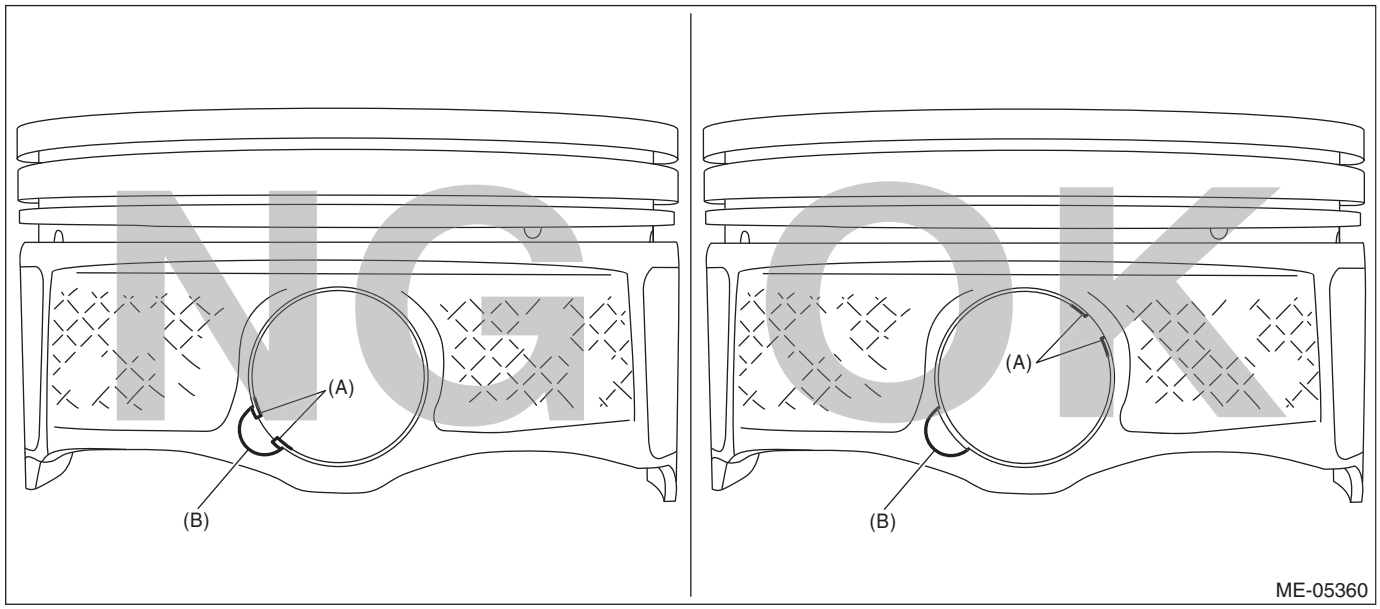
2. PISTON AND CONNECTING ROD



(1)	Connecting rod	(4)	Piston	(7)	Oil ring
(2)	Connecting rod bearing	(5)	Piston pin	(8)	Second ring
(3)	Connecting rod cap	(6)	Circlip	(9)	Top ring

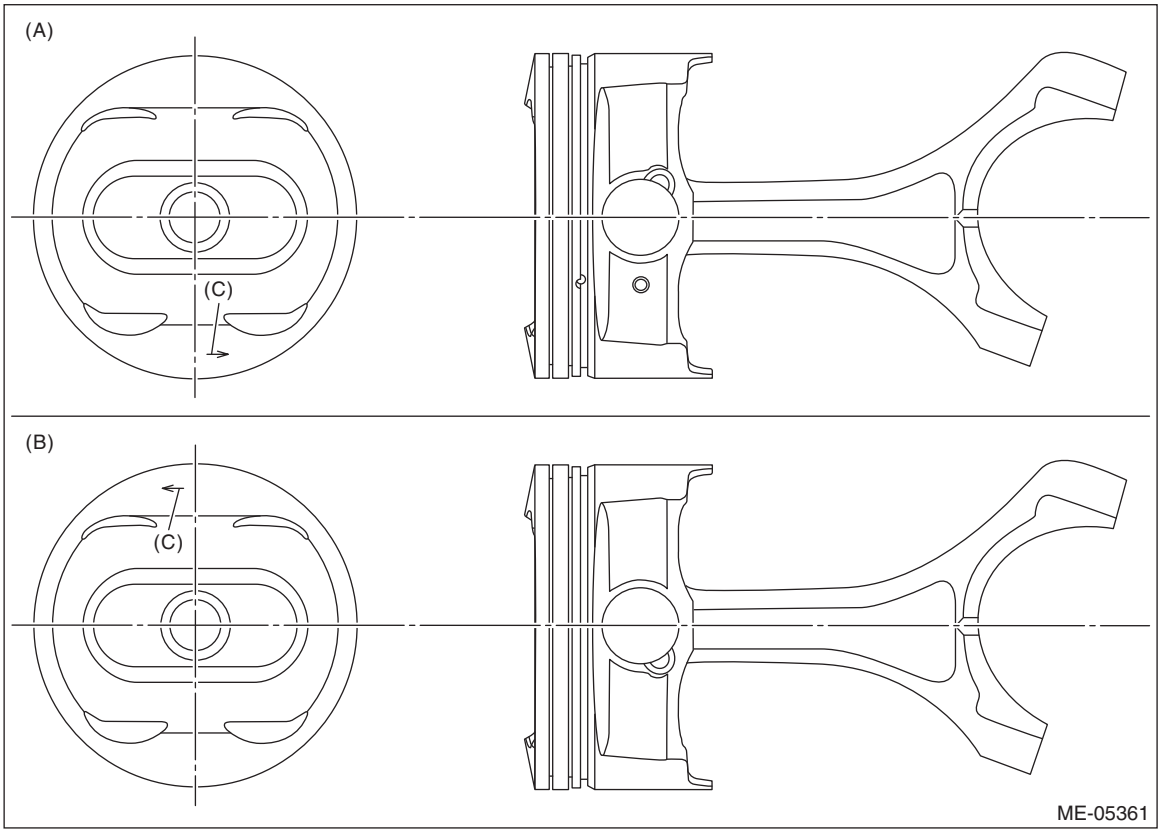
1) Install the connecting rod bearing to the connecting rod and connecting rod cap.
2) Install the circlip on one end of the piston using a flat tip screwdriver.

NOTE:
- Be careful not damage the piston, by wrapping the tip of flat tip screwdriver with tape.
- Make sure the circlip is firmly inserted into the circlip groove.
- After circlip installation, turn the circlip so that the ends of circlip (A) and the cutout portion of circlip (B) do not match.



3) Set the piston to the connecting rod.

NOTE:
Align the front mark of piston and the connecting rod direction correctly as shown in the figure.

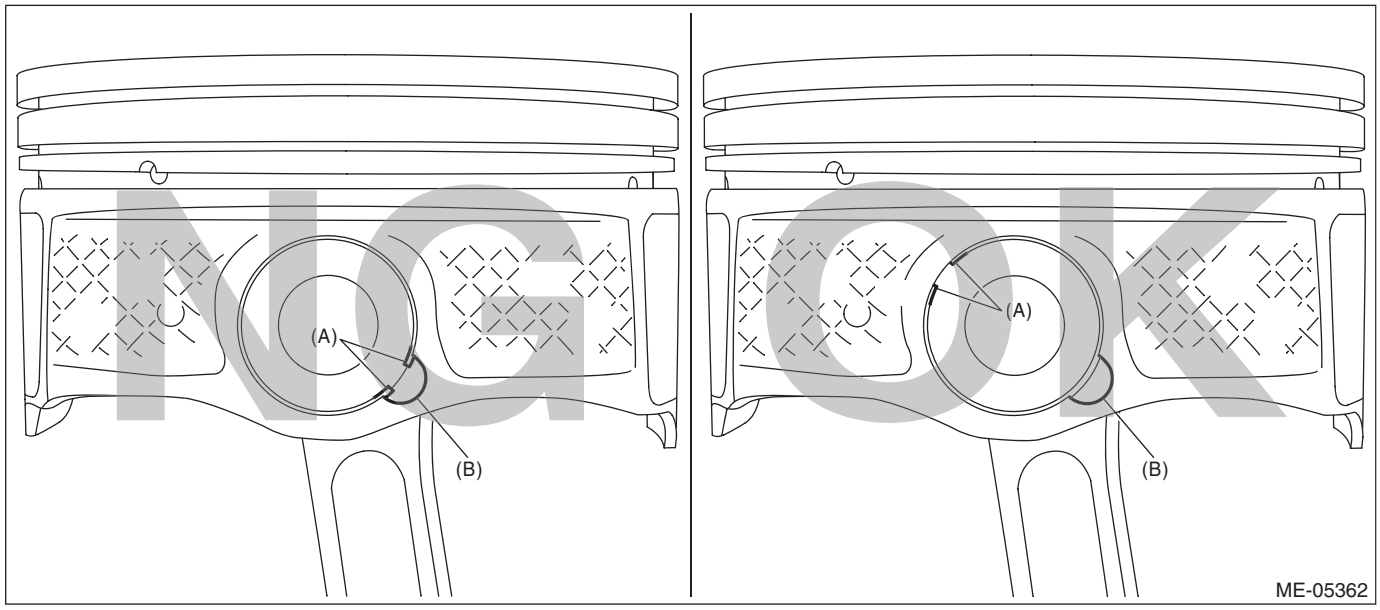


(A) RH side (#1 and #3) (B) LH side (#2 and #4) (C) Front mark

4) Apply engine oil to the piston pin, and attach the piston pin.

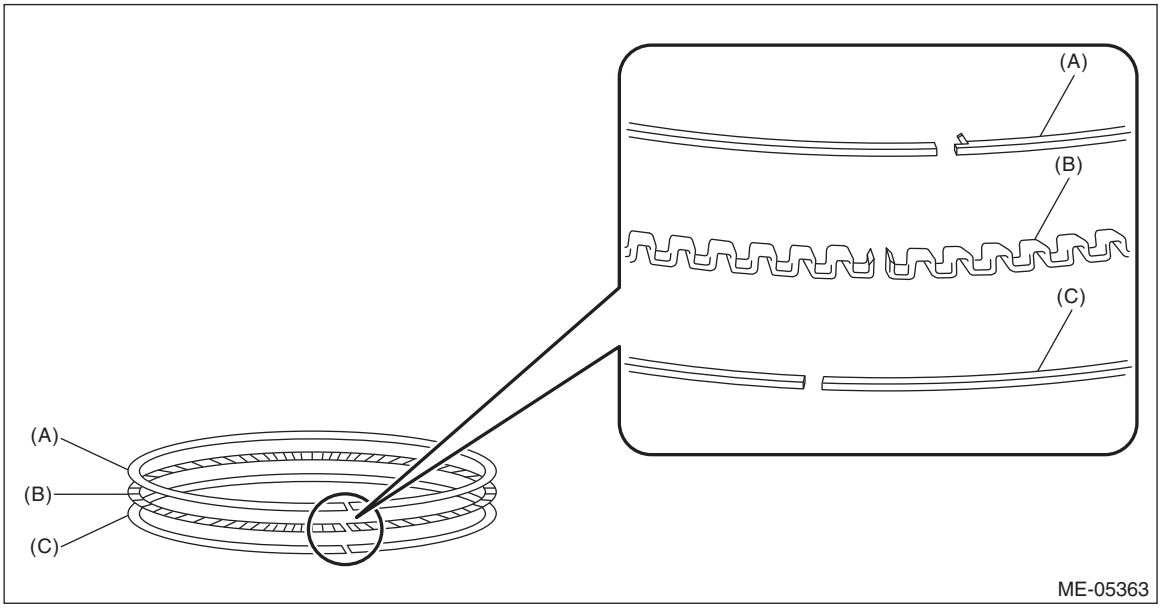
5) Install the circlip on the piston using a flat tip screwdriver.

NOTE:
- Be careful not damage the piston and piston pin, by wrapping the tip of flat tip screwdriver with tape.
- Make sure the circlip is firmly inserted into the circlip groove.
- After circlip installation, turn the circlip so that the ends of circlip (A) and the cutout portion of circlip (B) do not match.



6) Install the oil ring upper rail, expander and lower rail by hand.

NOTE:
Oil ring consists of the upper rail, expander and lower rail.



(A) Upper rail (B) Expander (C) Lower rail

7) Install the second ring and top ring using piston ring expander.

NOTE:
Install so that the piston ring mark faces the top side of the piston.

E: INSPECTION

1. CYLINDER BLOCK & PISTON

1) Visually inspect to make sure that there are no cracks, scratches or other damage.
2) Use liquid penetrant tester on the important sections to check for fissures.
3) Check that there are no traces of gas leaking or water leaking on the gasket attachment surface.
4) Check the oil passages for clogging.
5) Check for warpage of mating surfaces of the cylinder block that contacts cylinder head using a straight edge and thickness gauge. If it exceeds the limit, correct the surface by grinding it with a surface grinder or replace the cylinder block.

NOTE:
Measurement should be performed at a temperature of 20°C (68°F).

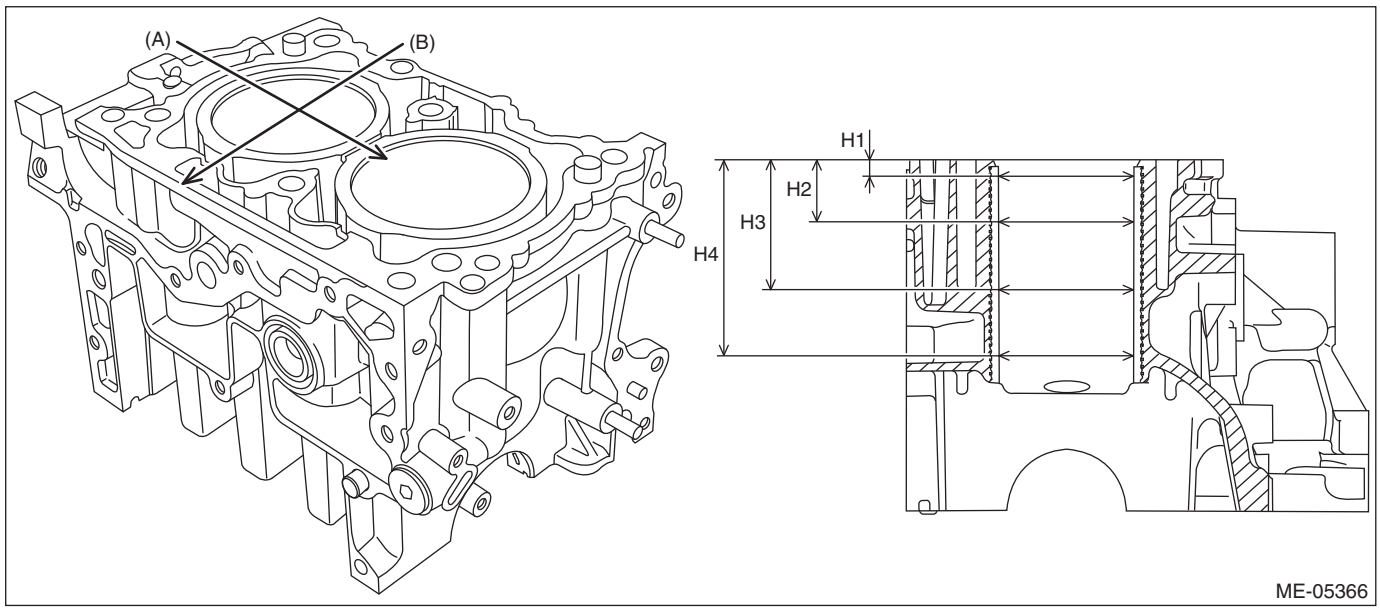
Cylinder block warpage:
Limit
0.025 mm (0.00098 in)

Grinding limit of cylinder block :
To 204.9 mm (8.067 in)

Height of cylinder block:
Standard
205.0 mm (8.071 in)

6) Using a cylinder bore gauge, check the cylindricality and out-of-roundness of cylinder liner. If it is not within the standard, perform reboring (including honing), or replace the cylinder block and piston as a set. For reboring and honing procedure, refer to step 8).

NOTE:
- Measure the cylinder liner with cylinder blocks separated (into cylinder block RH and cylinder block LH).
- Measurement should be performed at a temperature of 20°C (68°F).
- Write down all measurement values as the values are used in the next procedure.
- Measure the inner diameter of each cylinder liner in both the thrust and piston pin directions at the heights as shown in the figure.



(A) Piston pin direction
(B) Thrust direction
H1: 10 mm (0.3937 in)
H2: 45 mm (1.7717 in)
H3: 80 mm (3.1496 in)
H4: 105 mm (4.1339 in)

- Calculate the cylindricality of cylinder liner by using the following formula.

Calculation formula
C = The larger value between the calculation values C' and C'' C' = (D (a)–D (b))/2 C'' = (D (c)–D (d))/2
C: Cylindricality of cylinder liner D (a): The largest value of all the values obtained by measuring the cylinder liner inner diameter in the direction of the piston pin D (b): The smallest value of all the values obtained by measuring the cylinder liner inner diameter in the direction of the piston pin D (c): The largest value of all the values obtained by measuring the cylinder liner inner diameter in the thrust direction D (d): The smallest value of all the values obtained by measuring the cylinder liner inner diameter in the thrust direction

- Calculate the out-of-roundness of cylinder liner at each measurement height by using the following formula.

Calculation formula
R = (D(e)–D(f))/2
R: Out-of-roundness of cylinder liner D(e): The larger value between the measurement values in the piston pin direction and in the thrust direction of cylinder liner inner diameter D(f): The smaller value between the measurement values in the piston pin direction and in the thrust direction of cylinder liner inner diameter

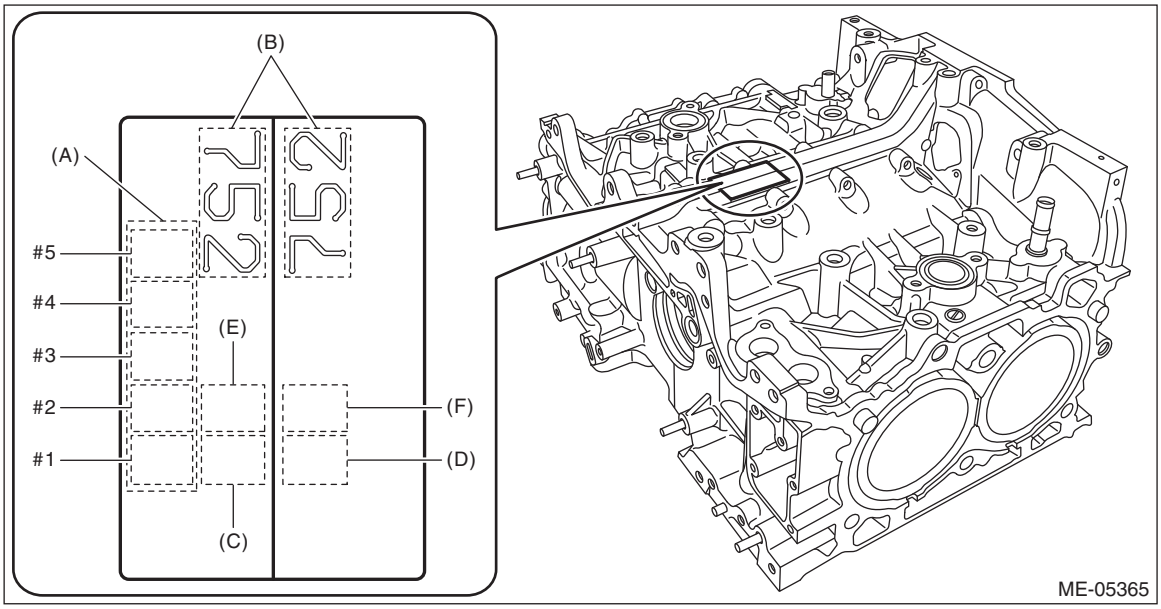
Cylindricality of cylinder liner:
Limit
0.030 mm (0.0012 in)

Out-of-roundness of cylinder liner:
Limit
0.030 mm (0.0012 in)

7) Check the clearance between cylinder liner and piston. Check the clearance between cylinder liner and piston by measuring the inner diameter of cylinder liner and the outer diameter of piston respectively.

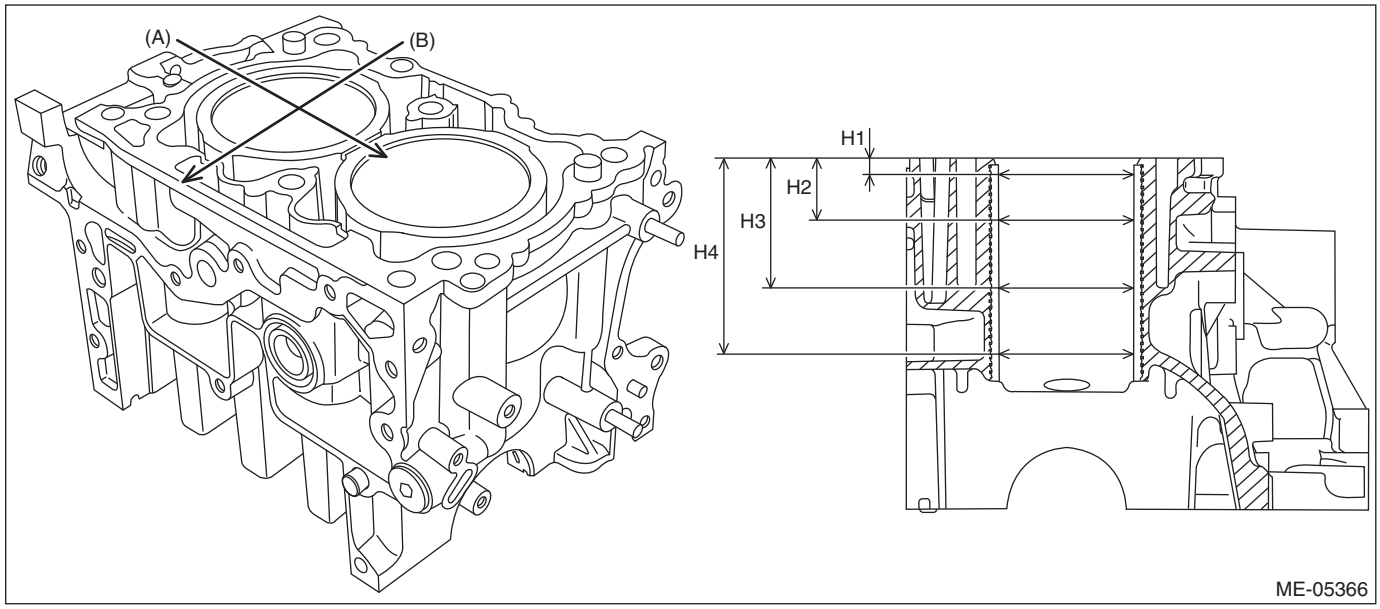
(1) Measure the inner diameter of cylinder liner. If it is not within the standard, perform reboring (including honing), or replace the cylinder block and piston as a set. For reboring and honing procedure, refer to step 8).

NOTE:
- Measure the cylinder liner with cylinder blocks separated (into cylinder block RH and cylinder block LH).
- Measurement should be performed at a temperature of 20°C (68°F).
- The cylinder bore size mark is stamped on the upper face of the cylinder block.



(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

• Measure the inner diameter of each cylinder liner in both the thrust and piston pin directions at the heights as shown in the figure and read the value of the most worn location.



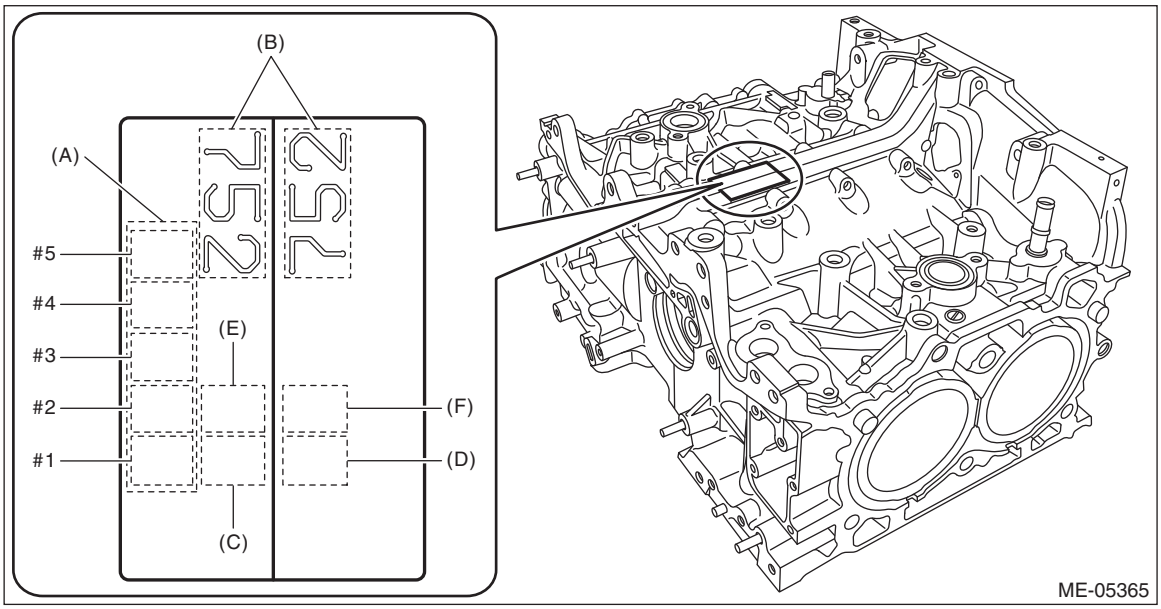
(A) Piston pin direction (B) Thrust direction

H1: 10 mm (0.3937 in) H2: 45 mm (1.7717 in) H3: 80 mm (3.1496 in)
H4: 105 mm (4.1339 in)

Inner diameter of cylinder liner:
Cylinder bore size mark A
Standard
94.005 — 94.015 mm (3.7010 — 3.7014 in)
Cylinder bore size mark B
Standard
93.995 — 94.005 mm (3.7006 — 3.7010 in)

(2) Check the outer diameter of piston with a micrometer. If it is not within the standard, replace the piston.

NOTE:
- Measurement should be performed at a temperature of 20°C (68°F).
- Measure the outer diameter of each piston in thrust direction at the height as shown in the figure.
- Standard sized pistons are classified into two grades, “A” and “B”. These grades should be used as guide lines in selecting a standard piston.
- The grade can be judged by the stamp of cylinder bore size mark on the upper face of the cylinder block.

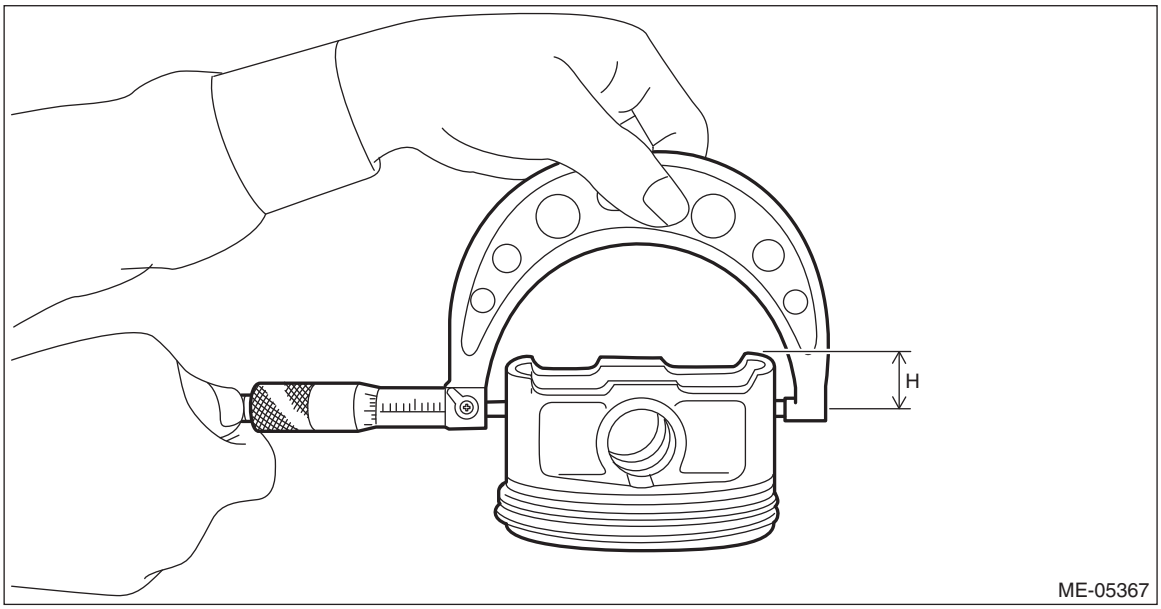


(A) Main journal size mark
(B) Cylinder block (RH) – (LH) combination mark
(C) #1 cylinder bore size mark
(D) #2 cylinder bore size mark
(E) #3 cylinder bore size mark
(F) #4 cylinder bore size mark

• If the piston is replaced, check the clearance between cylinder liner and piston in the step (3), and select a suitable sized piston.

Piston grade point H:
13.3 mm (0.52 in)

Piston outer diameter:
Standard size (grade A = cylinder bore size mark A)
Standard
93.980 — 93.990 mm (3.7000 — 3.7004 in)
Standard size (grade B = cylinder bore size mark B)
Standard
93.970 — 93.980 mm (3.6996 — 3.7000 in)



(3) Calculate the clearance between cylinder liner and piston. If it is not within the standard, perform reboring (including honing), or replace the cylinder block and piston as a set. For reboring and honing procedure, refer to step 8).

NOTE:
The clearance between cylinder liner and piston is decided by matching the cylinder block bore size mark and the grade of piston outer diameter (grade A or B).

Clearance between cylinder liner and piston:
Standard
0.015 — 0.035 mm (0.00059 — 0.00138 in)

8) Reboring and honing
(1) If any of the cylindricality, out-of-roundness, inner diameter or clearance between cylinder liner and piston is out of standard or if there is any damage on the cylinder liner, perform reboring (including honing).

CAUTION:
When any of the cylinder liner needs reboring, all other cylinder liners must be rebored at the same time, and replaced with proper size pistons.

Oversize piston outer diameter:
0.25 mm (0.0098 in) oversize
Standard
94.220 — 94.240 mm (3.7094 — 3.7102 in)
0.50 mm (0.0197 in) oversize
Standard
94.470 — 94.490 mm (3.7193 — 3.7201 in)
(2) If the inner diameter of cylinder liner exceeds the limit after reboring (including honing), replace the cylinder block and piston as a set.

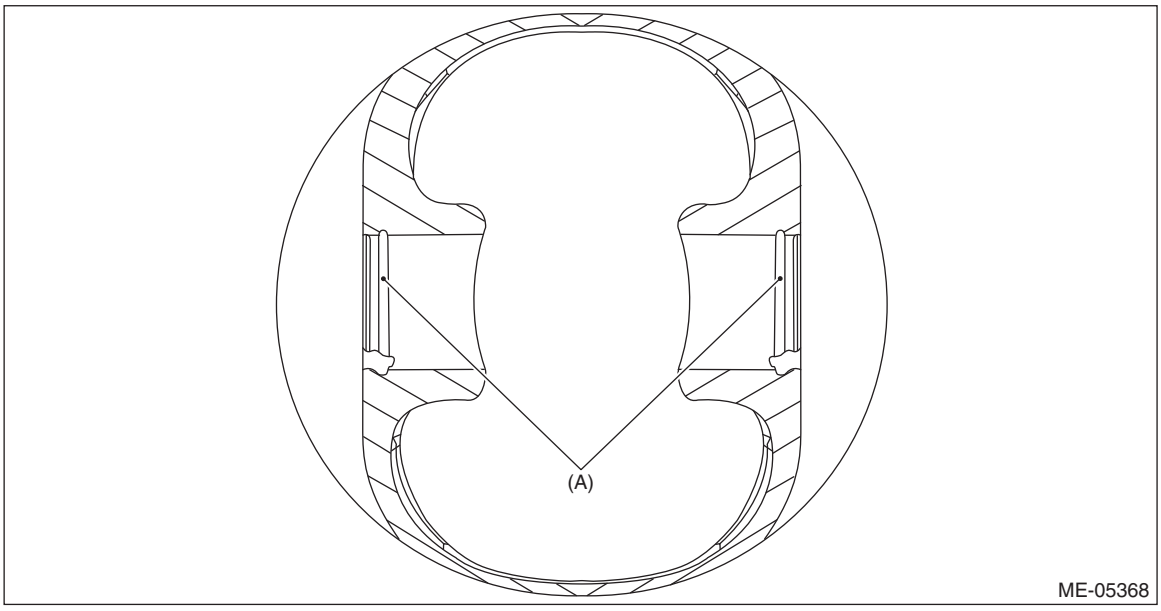
NOTE:
• Immediately after reboring (including honing), the inner diameter of cylinder liner may differ from its real diameter due to temperature rise. Thus, when measuring the inner diameter of cylinder liner, wait until the temperature has cooled to 20°C (68°F).
• For the measurement of the inner diameter of cylinder liner, refer to step 7).

Inner diameter of cylinder liner boring limit (diameter):
To 94.505 mm (3.7207 in)

2. PISTON AND PISTON PIN

1) Check the piston and piston pin for wear or crack.
2) Check the snap ring for distortion or wear.
3) Check the piston ring groove for damage.
4) Check the circlip groove (A) for burr.

NOTE:
If the burr is found, remove the burr from groove.

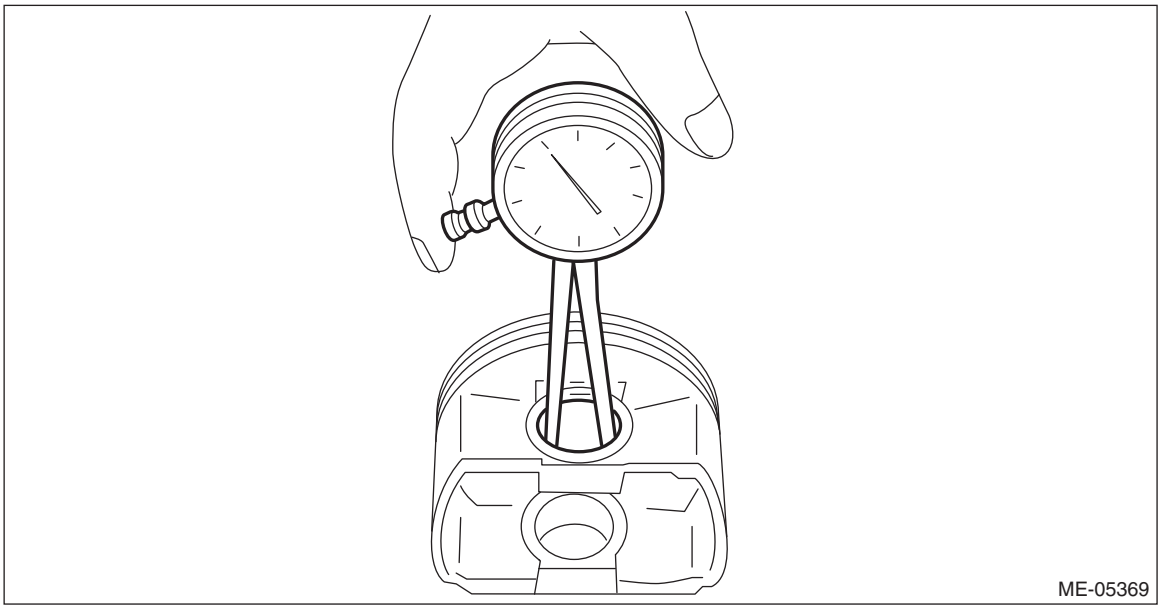


5) Check that the piston pin can be inserted into the piston pin hole with a thumb at 20°C (68°F).

6) Check the clearance between piston pin hole and piston pin. Check the clearance between piston pin hole and piston pin by measuring respectively the inner diameter of piston pin hole and the outer diameter of piston pin.

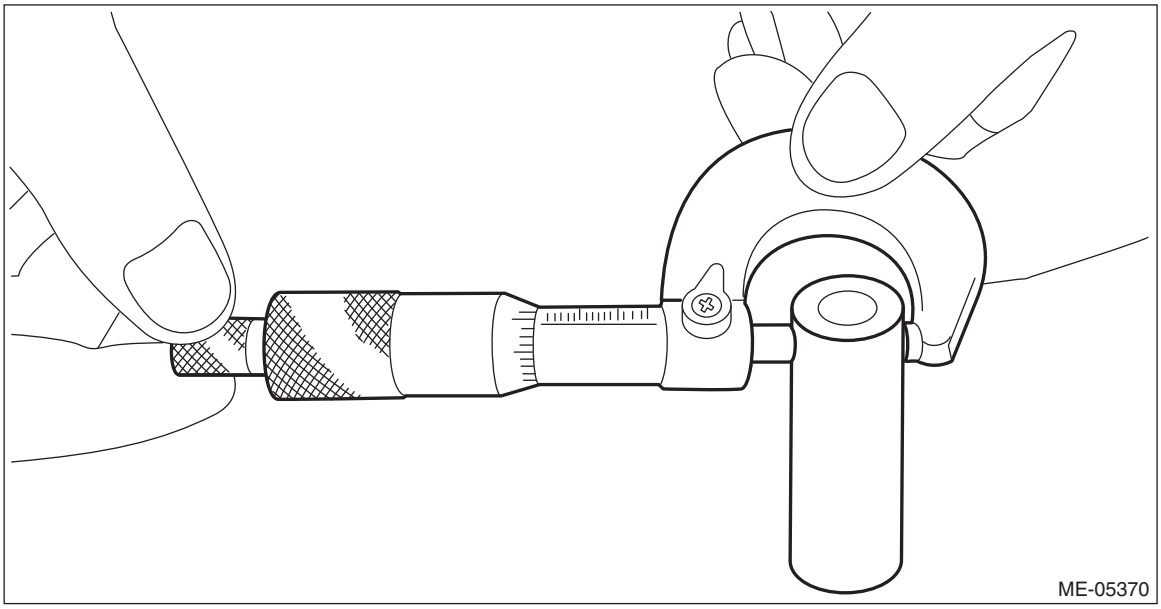
(1) Using a caliper gauge, measure the inner diameter of piston pin hole.

NOTE:
- Measurement should be performed at a temperature of 20°C (68°F).
- Record the measured value.



(2) Measure the outer diameter of piston pin with a micrometer.

NOTE:
- Measurement should be performed at a temperature of 20°C (68°F).
- Record the measured value.



(3) Calculate the clearance between piston pin hole and piston pin. If it is not within the standard, replace the piston and piston pin as a set.

Clearance between piston pin hole and piston pin:
Standard
0.004 — 0.008 mm (0.0002 — 0.0003 in)

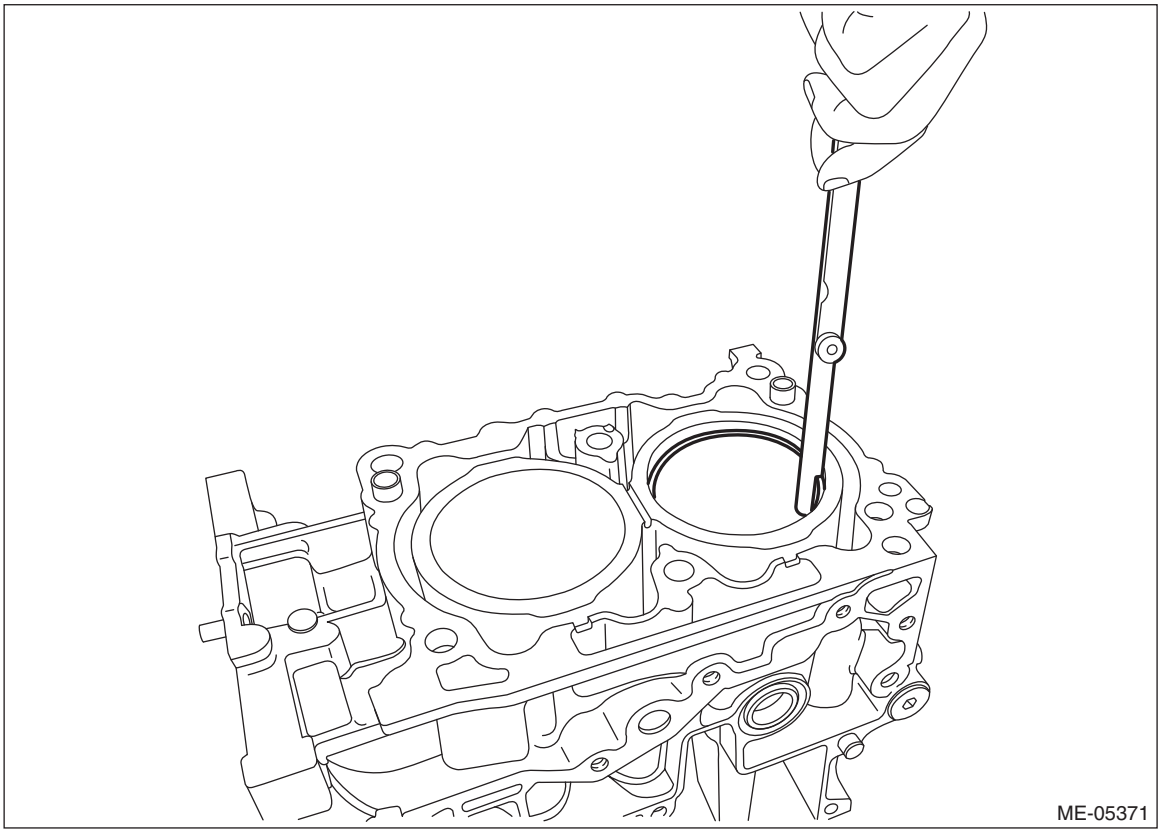
3. PISTON RING

1) Make sure the piston ring is not broken or damaged.
2) Using a cylindrical guide, insert the piston ring and oil ring into the cylinder liner so that they are perpendicular to the cylinder wall, and check the piston ring gap using a thickness gauge. If it is not within the standard, replace the piston ring or oil ring.

NOTE:
Use piston ring with same size as piston when replacing piston ring.

Piston ring gap:

Standard
Top ring
0.20 — 0.30 mm (0.0079 — 0.0118 in)
Second ring
0.30 — 0.45 mm (0.0118 — 0.0177 in)
Oil ring rail
0.20 — 0.50 mm (0.0079 — 0.0197 in)

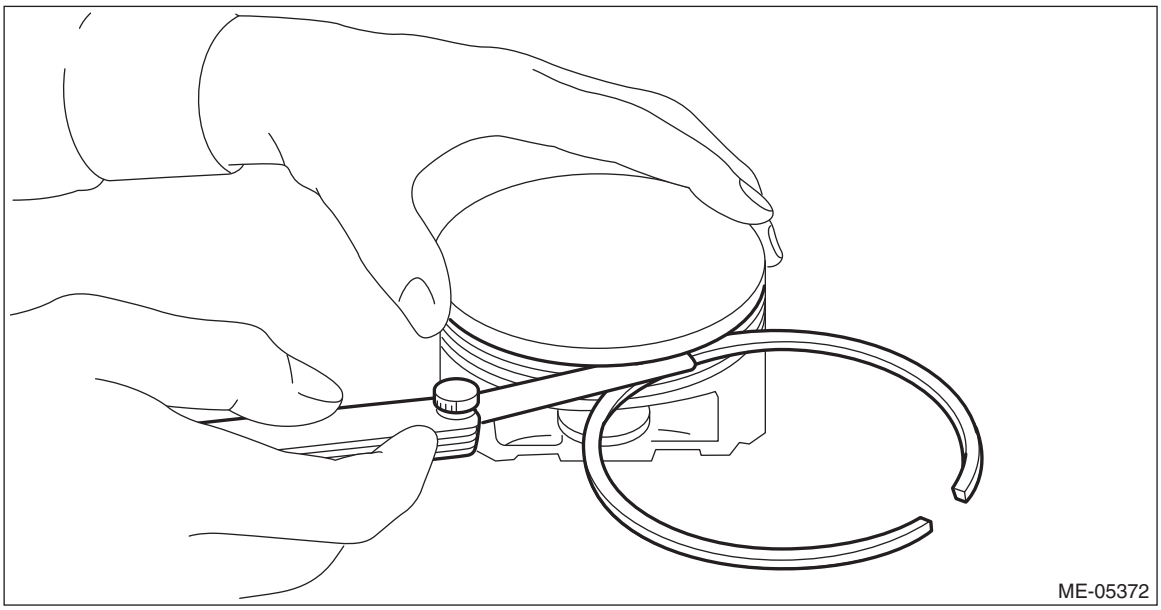


3) Fit the piston ring straight into the piston ring groove, then check the clearance between piston ring and piston ring groove with a thickness gauge. If it is not within the standard, replace the piston ring or oil ring.

NOTE:
- Before measuring the clearance, clean the piston ring groove and piston ring.
- Use piston ring with same size as piston when replacing piston ring.

Clearance between piston ring and piston ring groove:

Standard
Top ring
0.040 — 0.080 mm (0.0016 — 0.0031 in)
Second ring
0.030 — 0.070 mm (0.0012 — 0.0028 in)

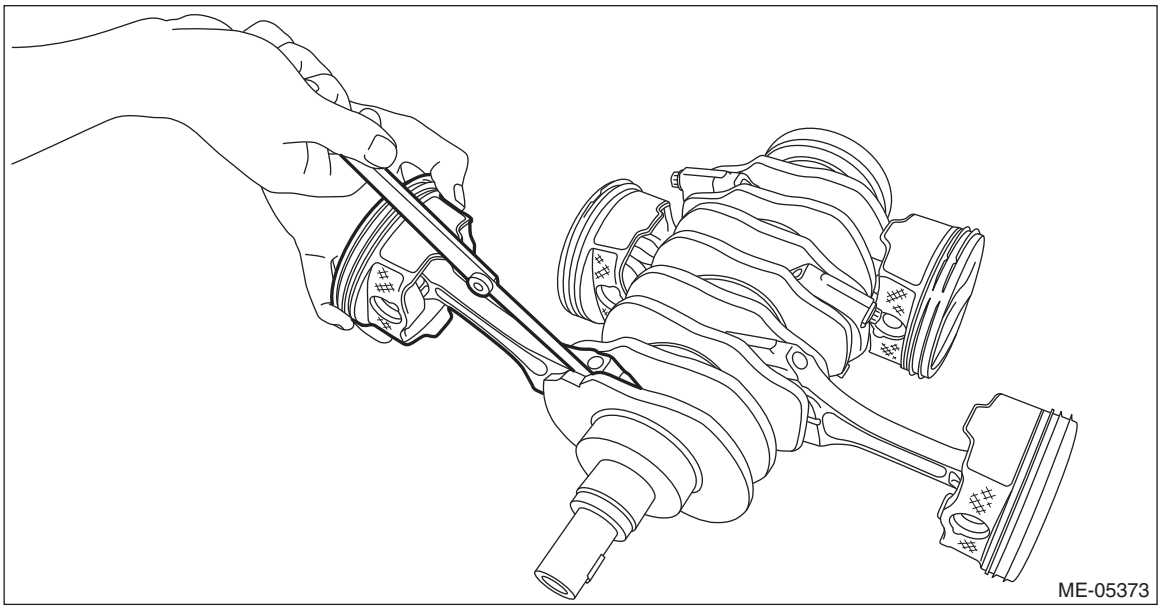


4. CONNECTING ROD

1) Check that the large or small end thrust surface is not damaged.
2) Install the connecting rod to the crankshaft, and check the thrust clearance using a thickness gauge. If it is not within the standard, replace the connecting rod.

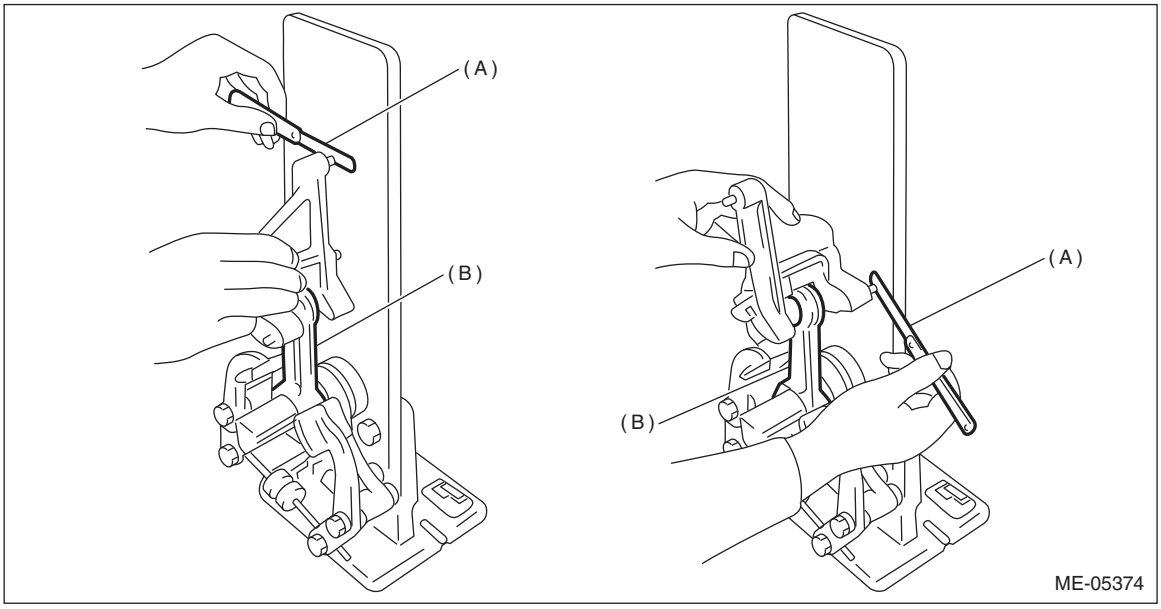
NOTE:
- Do not forget to install the connecting rod bearing and the connecting rod cap bearing, when installing the connecting rod to the crankshaft.
- Measurement should be performed at a temperature of 20°C (68°F).
- Measure the thrust clearance of each connecting rod at several points, and replace the connecting rod if there is uneven wear.

Connecting rod thrust clearance:
Standard
0.070 — 0.330 mm (0.0028 — 0.0130 in)



3) Check for bend or twist using a connecting rod aligner. If it exceeds the limit, replace the connecting rod.

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

4) Inspect the connecting rod bearing for scar, peeling, seizure, melting or wear, etc.

5) Check the oil clearance on each connecting rod bearing using plastigauge. If it is not within the standard, replace the connecting rod bearing.

NOTE:
- Measurement should be performed at a temperature of 20°C (68°F).
- Measure the outer diameter of crank pin using micrometer, and select the suitable size connecting rod bearing when replacing the connecting rod bearing.

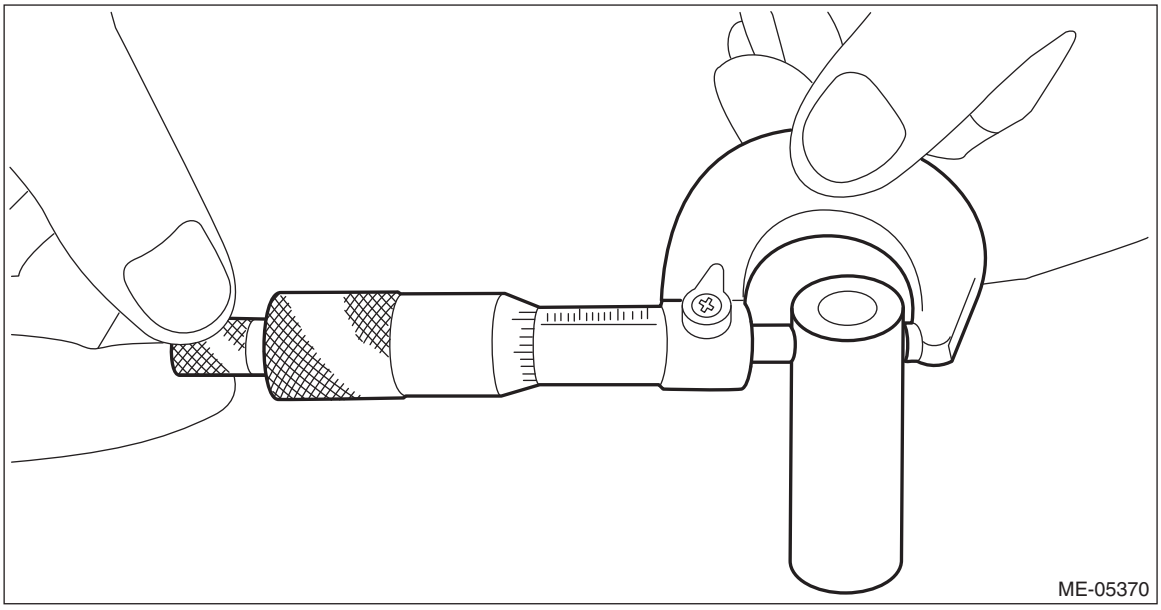
Unit: mm (in)

Bearing	Bearing size (Thickness at center)	Outer diameter of crank pin
Standard	1.492 — 1.508 (0.0587 — 0.0594)	47.976 — 48.000 (1.8888 — 1.8898)
0.03 (0.0012) Undersize	1.511 — 1.515 (0.0595 — 0.0596)	47.946 — 47.970 (1.8876 — 1.8886)
0.05 (0.0020) Undersize	1.521 — 1.525 (0.0599 — 0.0600)	47.926 — 47.950 (1.8868 — 1.8878)
0.25 (0.0098) Undersize	1.621 — 1.625 (0.0638 — 0.0640)	47.726 — 47.750 (1.8790 — 1.8799)

Connecting rod oil clearance:
Standard
0.017 — 0.047 mm (0.0007 — 0.0019 in)

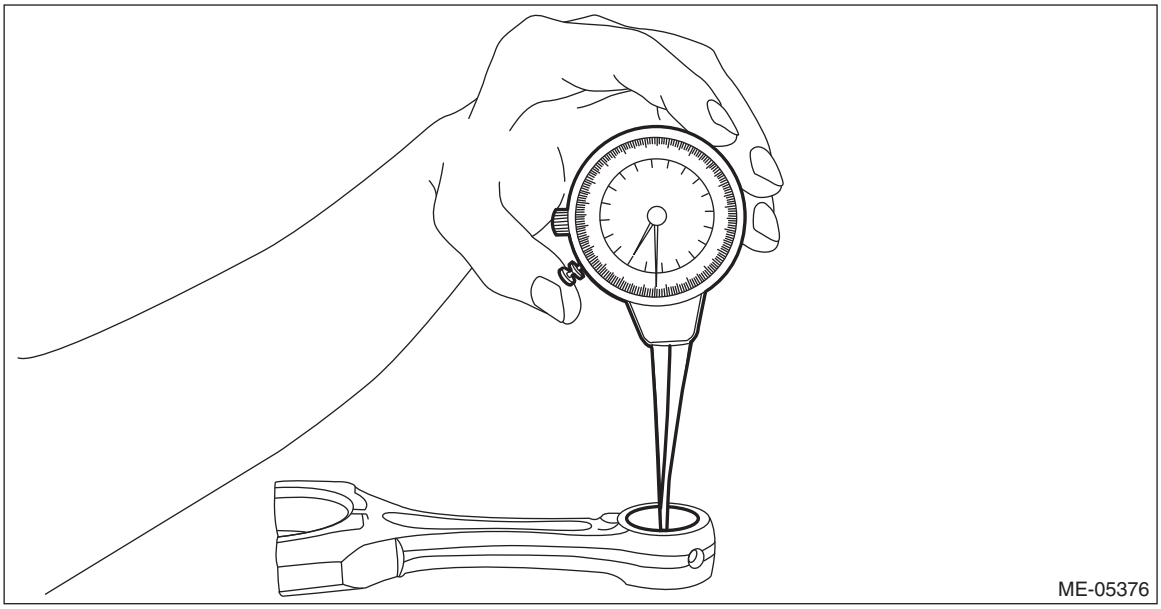
6) Check the bushing at connecting rod small end for damage.
7) Check the clearance between piston pin and bushing at connecting rod small end. Check the clearance between the piston pin and bushing at connecting rod small end by measuring respectively the outer diameter of piston pin and the inner diameter of bushing at connecting rod small end.
(1) Measure the outer diameter of piston pin with a micrometer.

NOTE:
- Measurement should be performed at a temperature of 20°C (68°F).
- Record the measured value.



(2) Using a caliper gauge, measure the inner diameter of bushing at connecting rod small end.

NOTE:
- Measurement should be performed at a temperature of 20°C (68°F).
- Record the measured value.



(3) Calculate the clearance between piston pin and bushing at connecting rod small end.

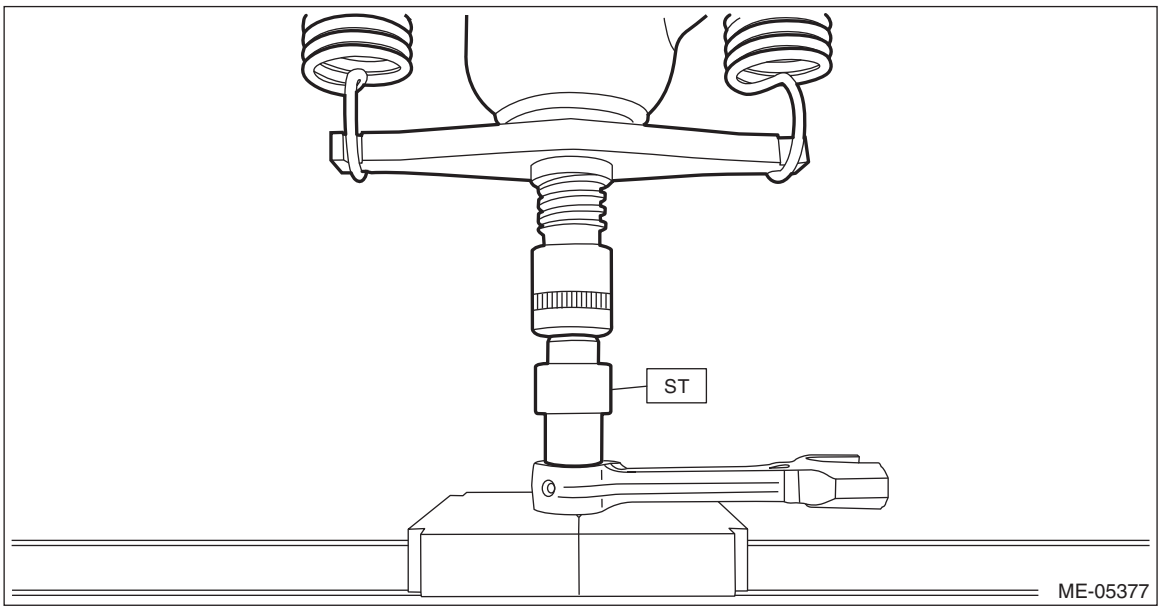
Clearance between piston pin and bushing at connecting rod small end:
Standard
0.004 — 0.026 mm (0.0002 — 0.0010 in)

8) If the clearance between piston pin and bushing at connecting rod small end exceeds the standard, replace the piston pin and bushing at connecting rod small end as a set. For replacement procedure of bushing at connecting rod small end, refer to the following.

(1) Remove the bushing from connecting rod with ST and press.

(2) Press the bushing with ST and the press, after applying engine oil on the periphery of bushing.

ST 18350AA000 CONNECTING ROD BUSHING REMOVER AND INSTALLER



(3) Make two 3 mm (0.12 in) holes in the pressed bushing to match the pre-manufactured holes on the connecting rod, then ream the inside of the bushing.

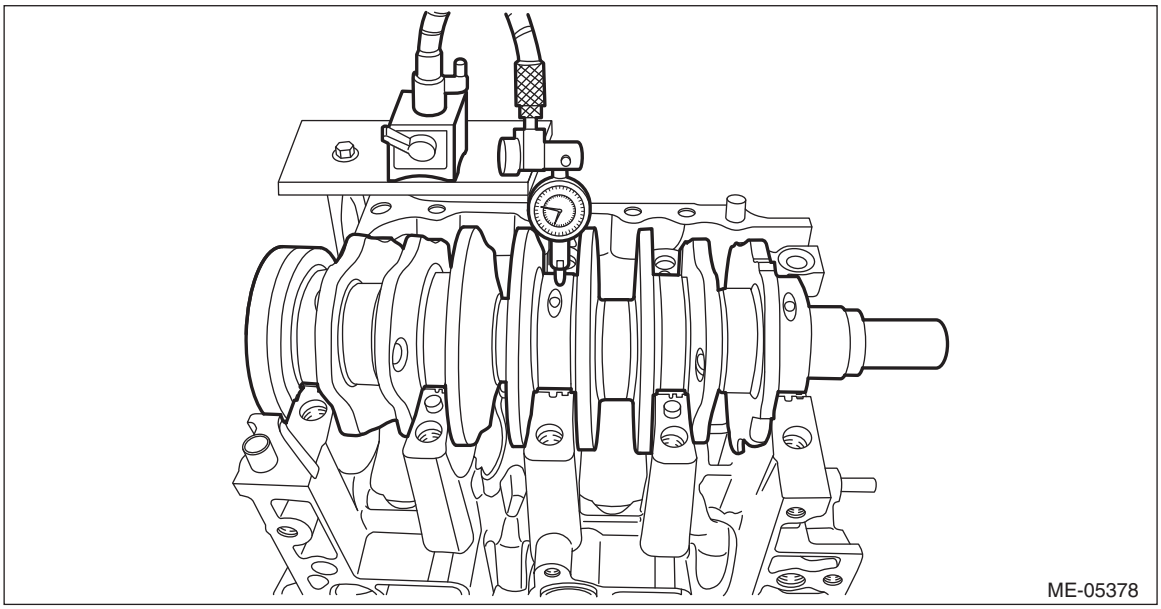
(4) After completion of reaming, clean the bushing to remove chips.

5. CRANKSHAFT AND CRANKSHAFT BEARING

1) Clean the crankshaft completely, and check it for cracks using liquid penetrant tester.
2) Using a dial gauge, check the crankshaft bend. If it exceeds the limit, grind to correct or replace the crankshaft.

NOTE:
• If a suitable V-block is not available, using just the #1 and #5 crankshaft bearings on cylinder block, position the crankshaft on cylinder block. Then, measure the crankshaft bend using a dial gauge.
• Measurement should be performed at a temperature of 20°C (68°F).
• When grinding to correct the crankshaft, refer to step 3).

Crankshaft bend limit:
0.035 mm (0.0014 in)



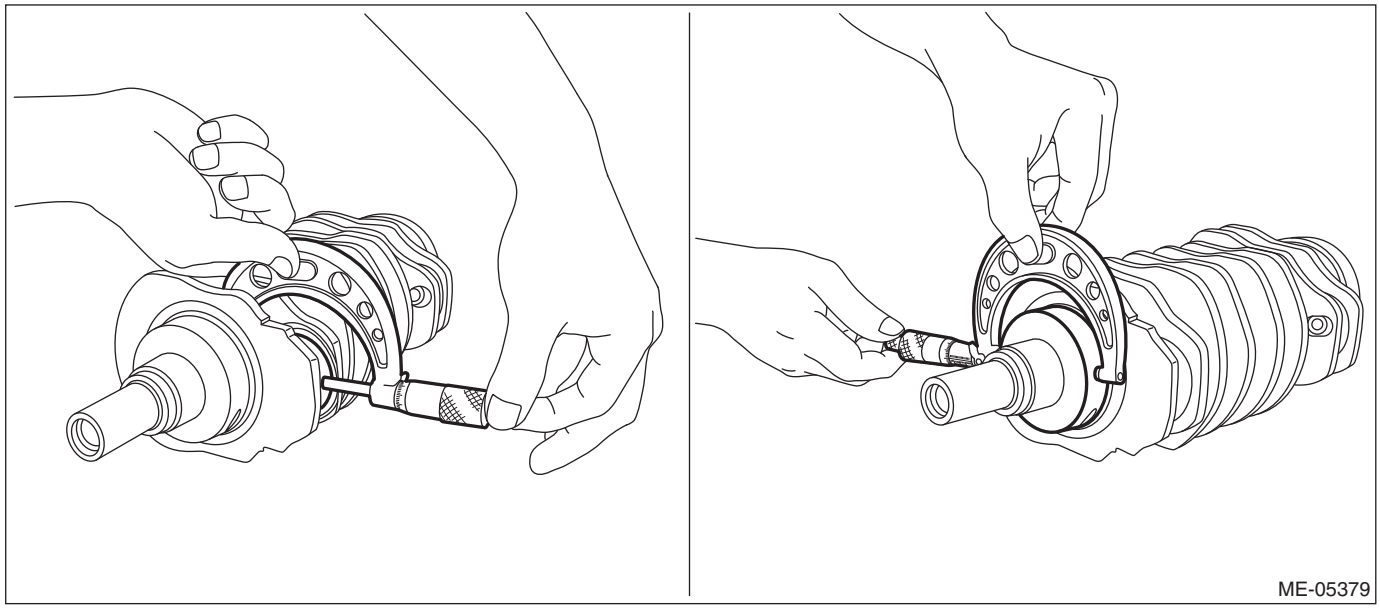
3) Using micrometer, check the outer diameter of crank journal and crank pin, cylindricality, out-of-roundness. If it is not within the standard, replace the connecting rod bearing or crankshaft bearing, and grind to correct or replace the crankshaft as required.

- Measurement should be performed at a temperature of 20°C (68°F).
- Select the suitable size connecting rod bearing or crankshaft bearing when replacing the connecting rod bearing or crankshaft bearing.
- When grinding to correct the crank journal or crank pin, finish them to the suitable dimensions as shown in the table below according to the undersize bearing to be used.

Unit: mm (in)

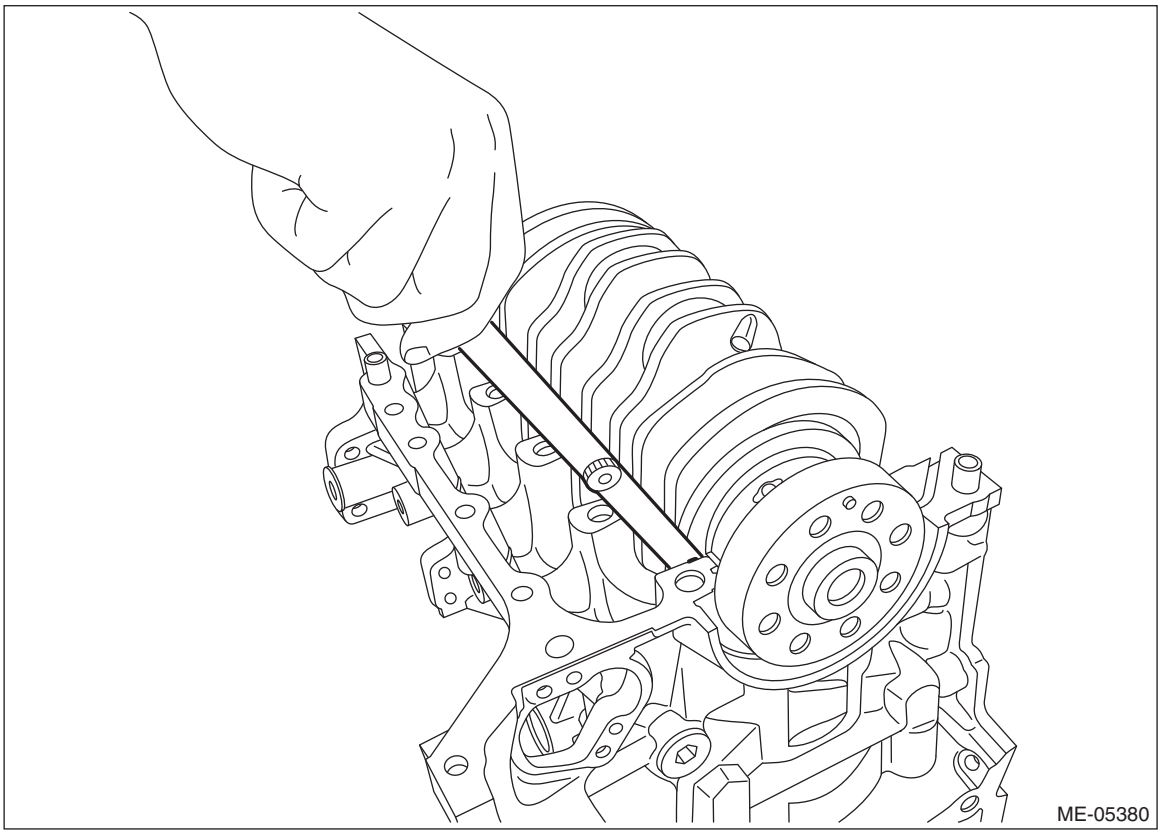
		Crank journal diameter		Crank pin outer diameter
		#1, #2, #3, #4	#5	
Standard	Journal O.D.	67.985 — 68.009 (2.6766 — 2.6775)	67.985 — 68.009 (2.6766 — 2.6775)	47.976 — 48.000 (1.8888 — 1.8898)
	Bearing size (Thickness at center)	2.495 — 2.513 (0.0982 — 0.0989)	2.493 — 2.511 (0.0981 — 0.0989)	1.492 — 1.508 (0.0587 — 0.0594)
0.03 (0.0012) Undersize	Journal O.D.	67.955 — 67.979 (2.6754 — 2.6763)	67.955 — 67.979 (2.6754 — 2.6763)	47.946 — 47.970 (1.8876 — 1.8886)
	Bearing size (Thickness at center)	2.519 — 2.522 (0.0992 — 0.0993)	2.517 — 2.520 (0.0991 — 0.0992)	1.511 — 1.515 (0.0595 — 0.0596)
0.05 (0.0020) Undersize	Journal O.D.	67.935 — 67.959 (2.6746 — 2.6755)	67.935 — 67.959 (2.6746 — 2.6755)	47.926 — 47.950 (1.8868 — 1.8878)
	Bearing size (Thickness at center)	2.529 — 2.532 (0.0996 — 0.0997)	2.527 — 2.530 (0.0995 — 0.0996)	1.521 — 1.525 (0.0599 — 0.0600)
0.25 (0.0098) Undersize	Journal O.D.	67.735 — 67.759 (2.6667 — 2.6677)	67.735 — 67.759 (2.6667 — 2.6677)	47.726 — 47.750 (1.8790 — 1.8799)
	Bearing size (Thickness at center)	2.629 — 2.632 (0.1035 — 0.1036)	2.627 — 2.630 (0.1034 — 0.1035)	1.621 — 1.625 (0.0638 — 0.0640)

Crank pin and crank journal:
Out-of-roundness
Standard
0.005 mm (0.0002 in)
Cylindricality
Standard
0.006 mm (0.0002 in)
Grinding limit (dia.)
Crank pin: To 47.726 mm (1.8790 in)
Crank journal: To 67.735 mm (2.6667 in)



4) Inspect the crankshaft bearing for scar, peeling, seizure, melting or wear, etc.
5) Use a thickness gauge to check the thrust clearance of crankshaft at #5 crankshaft bearing. If it is not within the standard, replace the #5 crankshaft bearing.
- Measurement should be performed at a temperature of 20°C (68°F).
- Select the suitable size by referring to step 3) when replacing #5 crankshaft bearing.

Crankshaft thrust clearance:
Standard
0.130 — 0.308 mm (0.00512 — 0.01213 in)



6) Check the oil clearance on each crankshaft bearing using plastigauge. If it is not within the standard, replace the crankshaft bearing, and grind to correct or replace the crankshaft as required.
- Measurement should be performed at a temperature of 20°C (68°F).
- Select the suitable size by referring to step 3) when replacing crankshaft bearing.
- When grinding to correct the crank journal, finish it to the suitable dimensions by referring to step 3) according to the undersize bearing to be used.

Crankshaft oil clearance:
Standard
0.013 — 0.031 mm (0.00051 — 0.00122 in)

23.Intake and Exhaust Valve

A: SPECIFICATION

Refer to “Cylinder Head” for removal and installation procedures of the intake and exhaust valves. <Ref. to ME(H4DO)-197, REMOVAL, Cylinder Head.> <Ref. to ME(H4DO)-200, INSTALLATION, Cylinder Head.>

24.Piston

A: SPECIFICATION

Refer to “Cylinder Block” for removal and installation procedures of pistons. <Ref. to ME(H4DO)-233, REMOVAL, Cylinder Block.> <Ref. to ME(H4DO)-251, INSTALLATION, Cylinder Block.>

25.Connecting Rod

A: SPECIFICATION

Refer to “Cylinder Block” for removal and installation procedures of connecting rod.
<Ref. to ME(H4DO)-233, REMOVAL, Cylinder Block.> <Ref. to ME(H4DO)-251, INSTALLATION, Cylinder Block.>

26.Crankshaft

A: SPECIFICATION

Refer to “Cylinder Block” for removal and installation procedures of the crankshaft. <Ref. to ME(H4DO)-233, REMOVAL, Cylinder Block.> <Ref. to ME(H4DO)-251, INSTALLATION, Cylinder Block.>

27.Engine Trouble in General

A: INSPECTION

NOTE:
The “RANK” shown in the chart shows the possibilities of the cause of trouble in order from “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
	Immobilizer system <Ref. to IM(diag)-2, Basic Diagnostic Procedure.>		A
2) Initial combustion does not occur.	Starter	Defective starter	C
	Engine control system <Ref. to EN(H4DO)(diag)-2, Basic Diagnostic Procedure.>		A
	Fuel line	Defective fuel pump and relay	A
		Clogged fuel line	C
		Lack of fuel or insufficient fuel	B
	Timing chain	Trouble	B
		Defective timing	B
	Compression	Incorrect cam clearance	C
		Loosened spark plug or defective gasket	C
		Loosened cylinder head bolt or defective cylinder head gasket	C
		Improper valve sealing	C
		Defective valve stem	C
		Worn or broken valve spring	B
		Worn or stuck piston rings, cylinder liner and piston	C
		Incorrect valve timing	B
		Improper engine oil (low viscosity)	B

Symptoms	Problem parts etc.	Possible cause	RANK
3) Initial combustion occurs.	Engine control system <Ref. to EN(H4DO)(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 fuel or insufficient fuel	B
	Timing chain	Trouble	B
		Defective timing	B
	Compression	Incorrect cam clearance	C
		Loosened spark plug or defective gasket	C
		Loosened cylinder head bolt or defective cylinder head gasket	C
		Improper valve sealing	C
		Defective valve stem	C
		Worn or broken valve spring	B
		Worn or stuck piston rings, cylinder liner 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(H4DO)(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 fuel or insufficient fuel	B
	Timing chain	Trouble	B
		Defective timing	B
	Compression	Incorrect cam clearance	C
		Loosened spark plug or defective gasket	C
		Loosened cylinder head bolt or defective cylinder 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

Symptoms	Problem parts etc.	Possible cause	RANK
2. Rough idle and engine stall	Engine control system <Ref. to EN(H4DO)(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 fuel or insufficient fuel	B
	Timing chain	Defective timing	C
	Compression	Incorrect cam clearance	B
		Loosened spark plug or defective gasket	B
		Loosened cylinder head bolt or defective cylinder 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
		Improper engine oil (low viscosity)	B
	Lubrication system	Incorrect oil pressure	B
		Defective rocker cover gasket	C
	Cooling system	Over-heating	C
	Others	Evaporative emission control system malfunction	A
		Stuck or damaged throttle valve	B

Symptoms	Problem parts etc.	Possible cause	RANK
3. Low output, hesitation and poor acceleration	Engine control system <Ref. to EN(H4DO)(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 fuel or insufficient fuel	C
	Timing chain	Defective timing	B
	Compression	Incorrect cam clearance	B
		Loosened spark plug or defective gasket	B
		Loosened cylinder head bolt or defective cylinder 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	Over-heating	C
		Over-cooling	C
	Others	Evaporative emission control system malfunction	A

Symptoms	Problem parts etc.	Possible cause	RANK
4. Surging	Engine control system <Ref. to EN(H4DO)(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 fuel or insufficient fuel	C
	Timing chain	Defective timing	B
	Compression	Incorrect cam clearance	B
		Loosened spark plug or defective gasket	C
		Loosened cylinder head bolt or defective cylinder 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	Over-heating	B
	Others	Evaporative emission control system malfunction	C
5. Engine does not return to idle.	Engine control system <Ref. to EN(H4DO)(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(H4DO)(diag)-2, Basic Diagnostic Procedure.>		A
	Cooling system	Over-heating	B
	Others	Evaporative emission control system malfunction	B
7. After burning in exhaust system	Engine control system <Ref. to EN(H4DO)(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 chain	Defective timing	B
	Compression	Incorrect cam clearance	B
		Loosened spark plug or defective gasket	C
		Loosened cylinder head bolt or defective cylinder 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

Symptoms	Problem parts etc.	Possible cause	RANK
8. Knocking	Engine control system <Ref. to EN(H4DO)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened oil filler cap	B
	Timing chain	Defective timing	B
	Compression	Incorrect cam clearance	C
		Incorrect valve timing	B
	Cooling system	Over-heating	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 gasket	B
		Defective crankshaft oil seal	B
		Defective rocker cover gasket	B
		Loosened oil drain plug or defective gasket	B
		Loosened oil pan mounting bolt or defective oil pan	B
10. Excessive fuel consumption	Engine control system <Ref. to EN(H4DO)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Dirty air cleaner element	A
	Timing chain	Defective timing	B
	Compression	Incorrect cam clearance	B
		Loosened spark plug or defective gasket	C
		Loosened cylinder head bolt or defective cylinder 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.	• Valve mechanism is defective. • Incorrect cam clearance • Worn camshaft • Broken valve spring • Defective valve shim
Heavy and dull clank	Oil pressure is low.	• Worn crankshaft bearing • Worn connecting rod bearing and connecting rod cap bearing at connecting rod large end
	Oil pressure is normal.	• Loosened flywheel mounting bolt • Damaged engine mounting
High-pitched clank	Sound is noticeable when accelerating with an overload condition.	• Ignition timing advanced • Accumulation of carbon inside combustion chamber • Wrong heat range of spark plug • Improper octane value gasoline
Clank when engine speed is between 1,000 and 2,000 rpms.	Sound is reduced when the fuel injector connector of the noisy cylinder is disconnected.*	• Worn crankshaft bearing • Worn connecting rod bearing and connecting rod cap bearing at connecting rod large end
Knocking sound when engine is operating under idling speed and engine is warm	Sound is reduced when the fuel injector connector of the noisy cylinder is disconnected.*	• Worn cylinder liner and piston ring • Broken or stuck piston ring • Worn piston pin and piton pin hole of piston
	Sound is not reduced if each fuel injector connector is disconnected in turn.*	• Unusually worn valve rocker • Unusually worn valve shim • Worn cam sprocket • Worn camshaft journal of cam carrier and camshaft cap
Squeaky sound	—	• Insufficient generator lubrication
Rubbing sound	—	• Poor contact of generator brush and rotor
Gear scream when starting engine	—	• Defective ignition starter switch • Worn gear and starter pinion
Sound like polishing glass with a dry cloth	—	• Defective automatic belt tensioner adjuster assembly (Loose V-belt) • Defective water pump shaft
Hissing sound	—	• Insufficient compression • Air leakage in air intake system, hose, connection or manifold
Timing chain noise	—	• Loose timing chain • Timing chain contacting with adjacent part
Valve noise	—	• Incorrect cam clearance

* 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(H4DO)(diag)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.> after connecting the fuel injector connector.

EXHAUST

EX(H4DO)

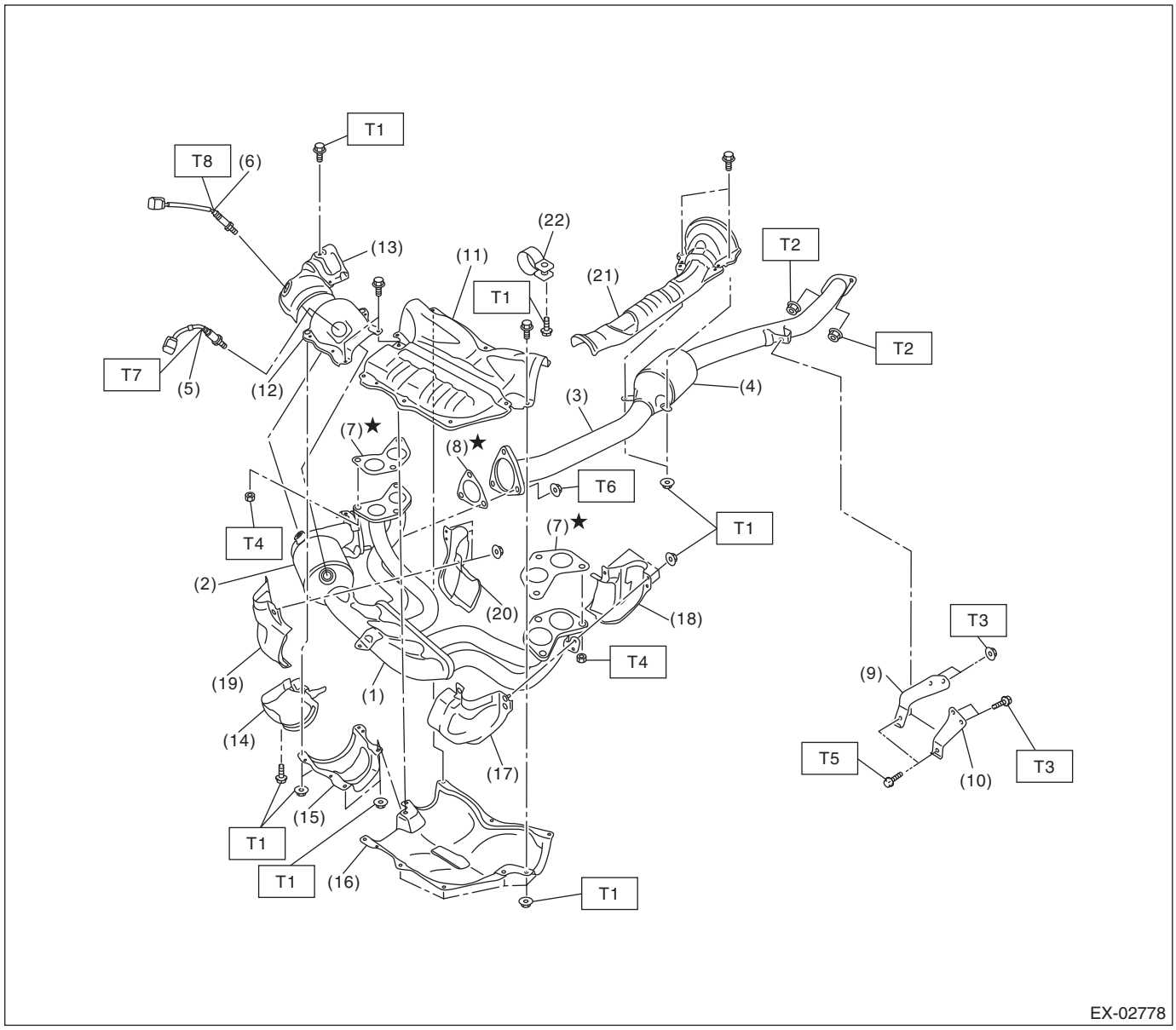
Page

1. General Description 2
2. Front Exhaust Pipe 5
3. Center Exhaust Pipe 12
4. Rear Exhaust Pipe 13
5. Muffler 16

1. General Description

A: COMPONENT

1. FRONT EXHAUST PIPE AND CENTER EXHAUST PIPE



(1)	Front exhaust pipe	(12)	Front catalytic converter upper cover LH	
(2)	Front catalytic converter	(13)	Front catalytic converter upper cover RH	
(3)	Center exhaust pipe	(14)	Front catalytic converter lower cover RH	
(4)	Rear catalytic converter	(15)	Front catalytic converter lower cover LH	
(5)	Front oxygen (A/F) sensor	(16)	Front exhaust pipe lower cover	
(6)	Rear oxygen sensor	(17)	Front exhaust pipe side cover LH (front)	
(7)	Gasket	(18)	Front exhaust pipe side cover LH (rear)	
(8)	Gasket	(19)	Front exhaust pipe side cover RH (front)	
(9)	Hanger bracket (MT model)	(20)	Front exhaust pipe side cover RH (rear)	
(10)	Hanger bracket (AT model)	(21)	Center exhaust pipe upper cover	
(11)	Front exhaust pipe upper cover	(22)	Band	

Tightening torque:N·m (kgf-m, ft-lb)

T1: 7.5 (0.8, 5.5)

T2: 18 (1.8, 13.3)

T3: 23 (2.3, 17.0)

T4: 30 (3.1, 22.1)

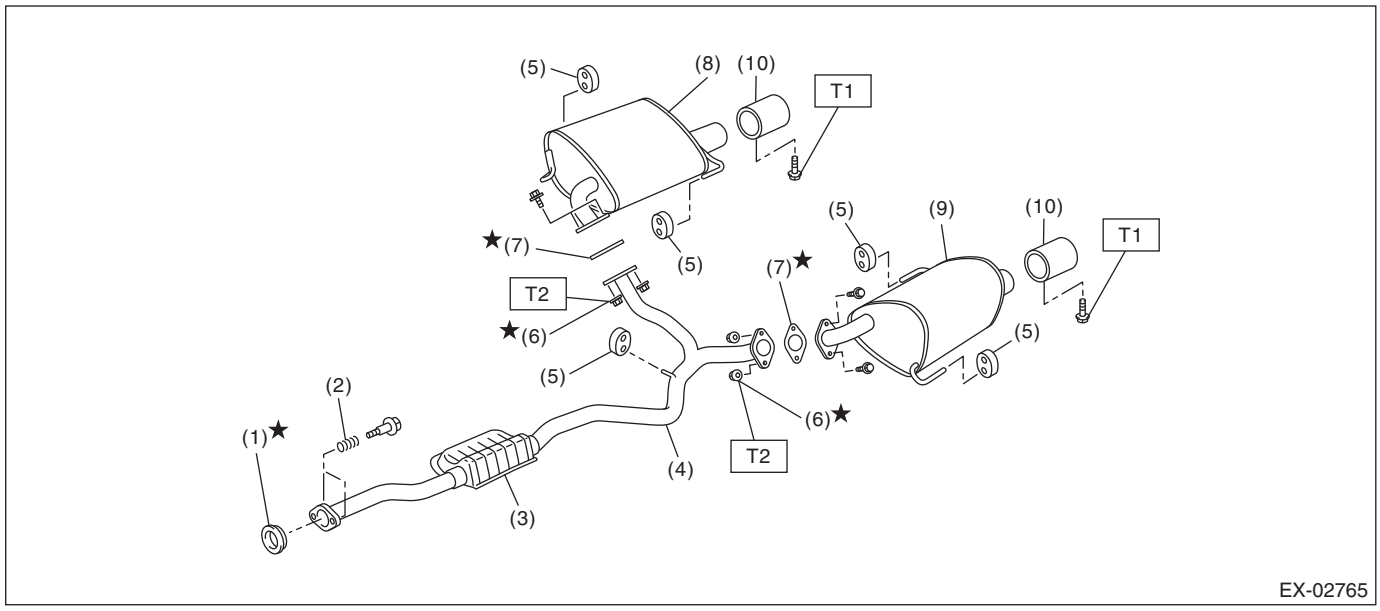
T5: 35 (3.6, 25.8)

T6: 40 (4.1, 29.5)

T7: <Ref. to FU(H4DO)-94, INSTALLATION, Front Oxygen (A/F) Sensor.>

T8: <Ref. to FU(H4DO)-98, INSTALLATION, Rear Oxygen Sensor.>

2. REAR EXHAUST PIPE AND MUFFLER



(1)	Gasket	(6)	Self-locking nut	
(2)	Spring	(7)	Gasket	
(3)	Chamber	(8)	Muffler RH	
(4)	Rear exhaust pipe	(9)	Muffler LH	
(5)	Cushion rubber	(10)	Muffler cutter (Models with muffler cutter)	

Tightening torque:N·m (kgf-m, ft-lb)
T1: 7.5 (0.8, 5.5)
T2: 48 (4.9, 35.4)

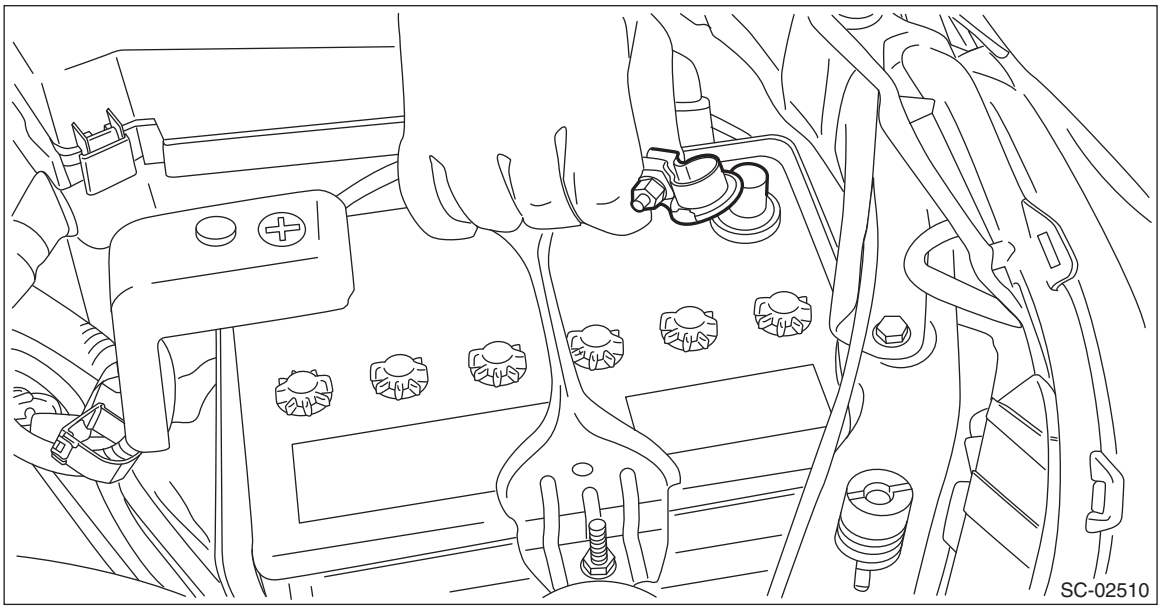
B: CAUTION

- 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 battery.
- If any fat adheres to the exhaust pipe, wipe it off. Otherwise a fire may happen.

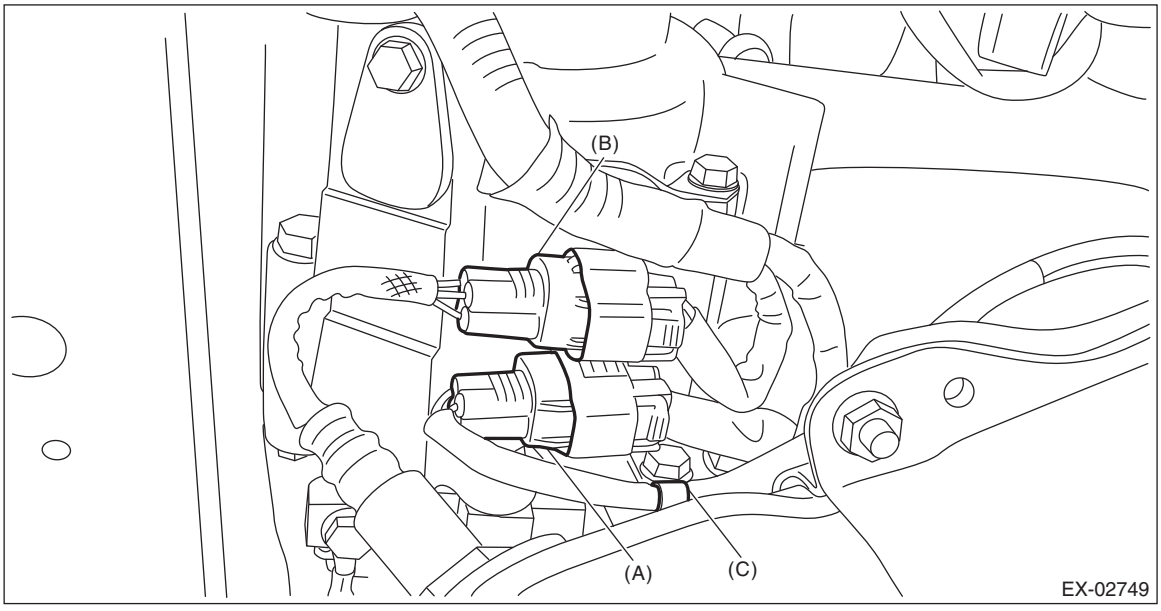
2. Front Exhaust Pipe

A: REMOVAL

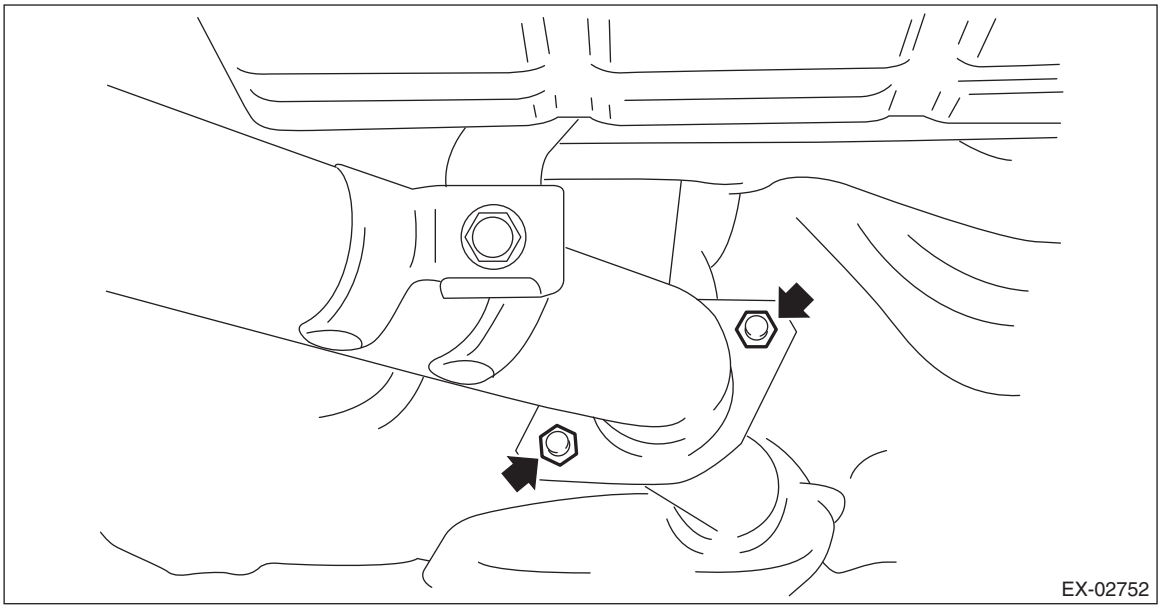
CAUTION:
Vehicle components are extremely hot after driving. Be wary of receiving burns from heated parts.
1) Disconnect the ground cable from battery.



2) Lift up the vehicle.
3) Remove the under cover RH. <Ref. to EI-26, REMOVAL, Front Under Cover.>
4) Disconnect the front oxygen (A/F) sensor connector (A) and rear oxygen sensor connector (B) and remove the clip (C) fastening the harness.

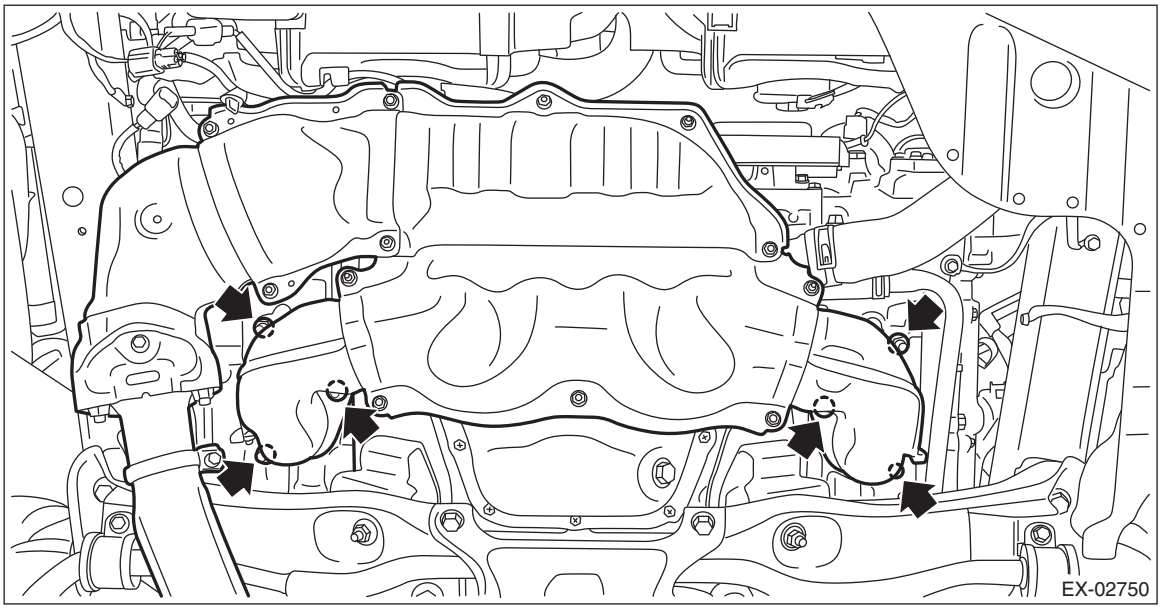


5) Remove the rear exhaust pipe from center exhaust pipe.

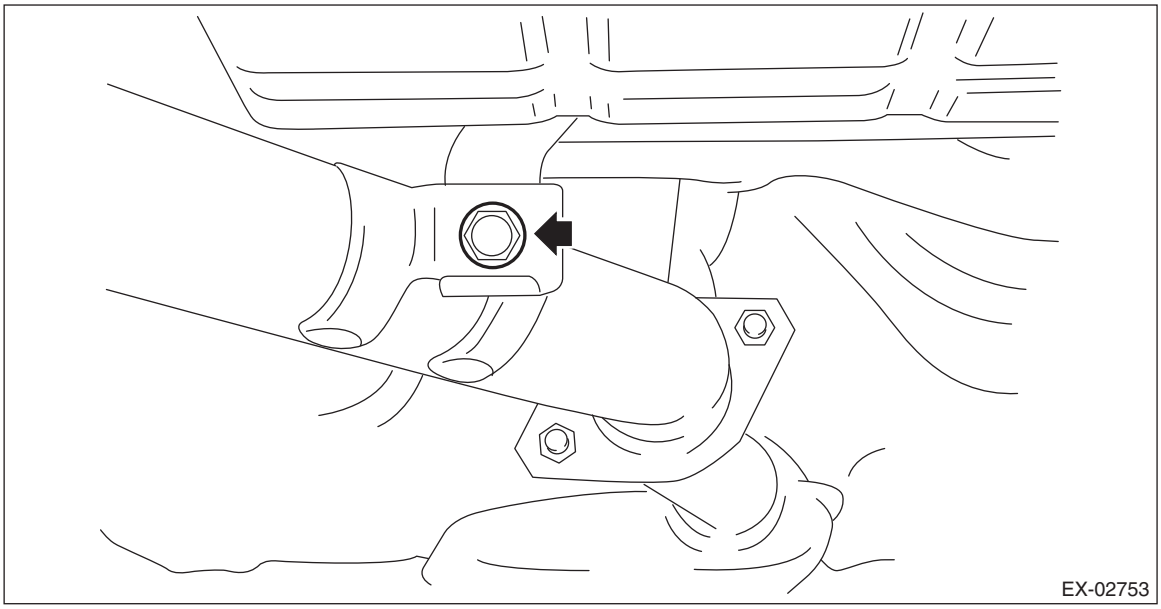


6) Remove the nuts which hold front exhaust pipe onto cylinder heads.

CAUTION:
Be careful not to drop the front exhaust pipe and center exhaust pipe assembly.



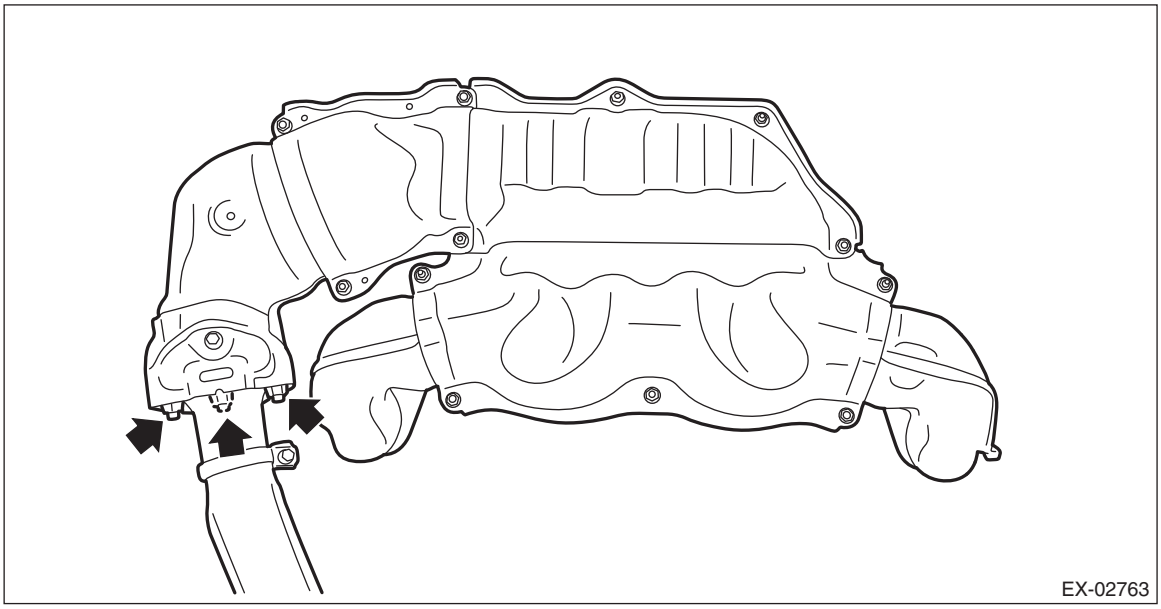
7) Remove the bolt which holds center exhaust pipe to hanger bracket.



8) Remove the front exhaust pipe and center exhaust pipe from vehicle as a unit.

CAUTION:
• The front exhaust pipe and center exhaust pipe assembly are very heavy. Be careful not to drop the exhaust pipes when removing.
• After removing the front exhaust pipe and center exhaust pipe assembly, do not pull the rear exhaust pipe with excessive force.

9) Remove the center exhaust pipe from the front exhaust pipe.



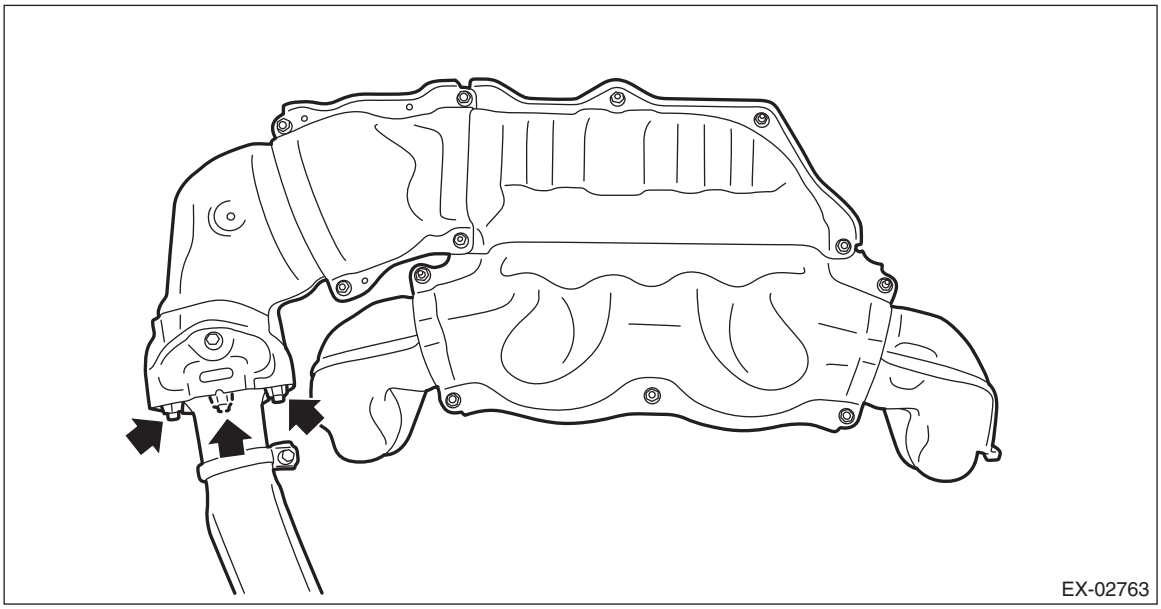
10) Remove the front oxygen (A/F) sensor and rear oxygen sensor from front exhaust pipe. <Ref. to FU(H4DO)-93, REMOVAL, Front Oxygen (A/F) Sensor.> <Ref. to FU(H4DO)-97, REMOVAL, Rear Oxygen Sensor.>

B: INSTALLATION

1) Install the front oxygen (A/F) sensor and rear oxygen sensor to the front exhaust pipe. <Ref. to FU(H4DO)-94, INSTALLATION, Front Oxygen (A/F) Sensor.> <Ref. to FU(H4DO)-98, INSTALLATION, Rear Oxygen Sensor.>
2) Install the center exhaust pipe to front exhaust pipe.

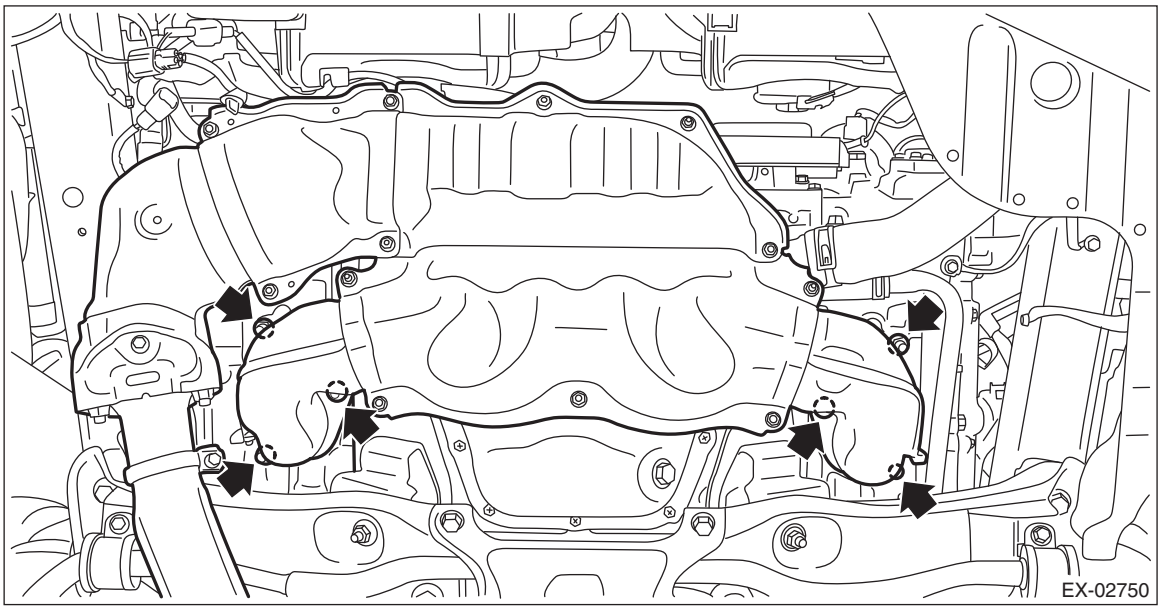
NOTE:
Use a new gasket.

Tightening torque:
40 N·m (4.1 kgf-m, 29.5 ft-lb)



3) Install the front exhaust pipe and center exhaust pipe as a unit to the vehicle.

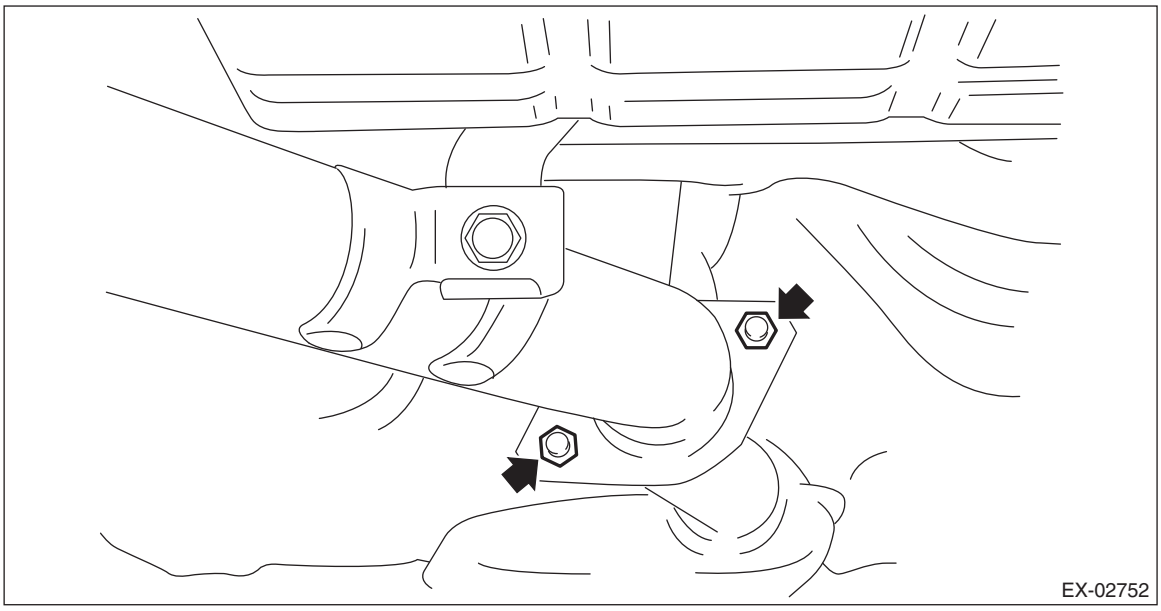
NOTE:
Use a new gasket.
4) Temporarily tighten the nuts which hold front exhaust pipe to cylinder heads.



5) Install the rear exhaust pipe to center exhaust pipe.

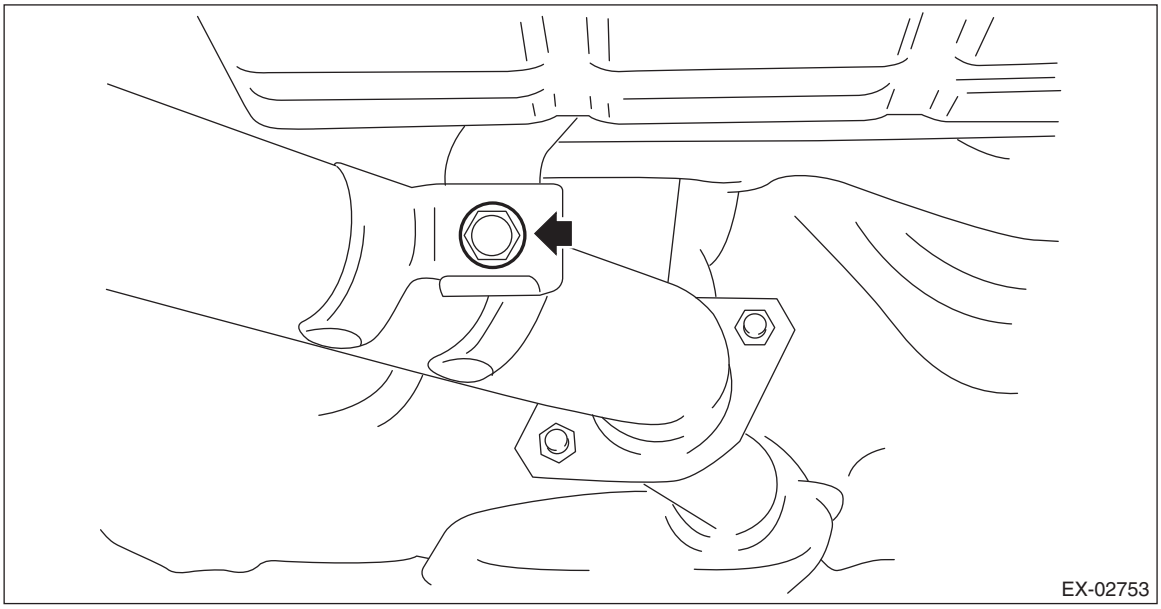
NOTE:
Use a new gasket.

Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)



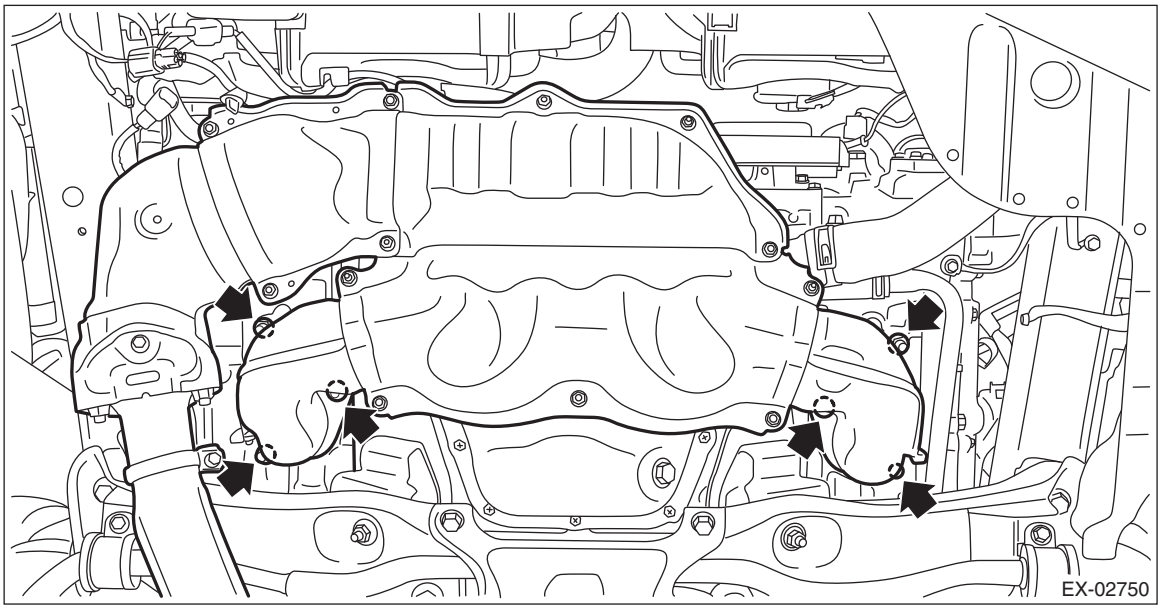
6) Tighten the bolts which secure the center exhaust pipe to the hanger bracket.

Tightening torque:
35 N·m (3.6 kgf-m, 25.8 ft-lb)

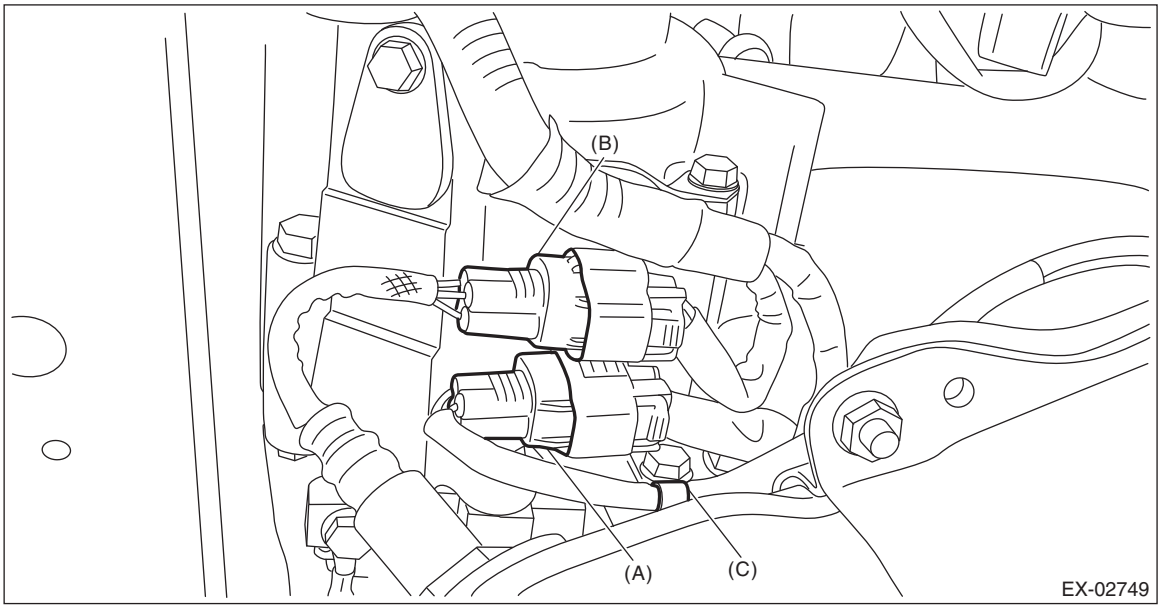


7) Tighten the nuts which hold front exhaust pipe to cylinder heads.

Tightening torque:
30 N·m (3.1 kgf-m, 22.1 ft-lb)

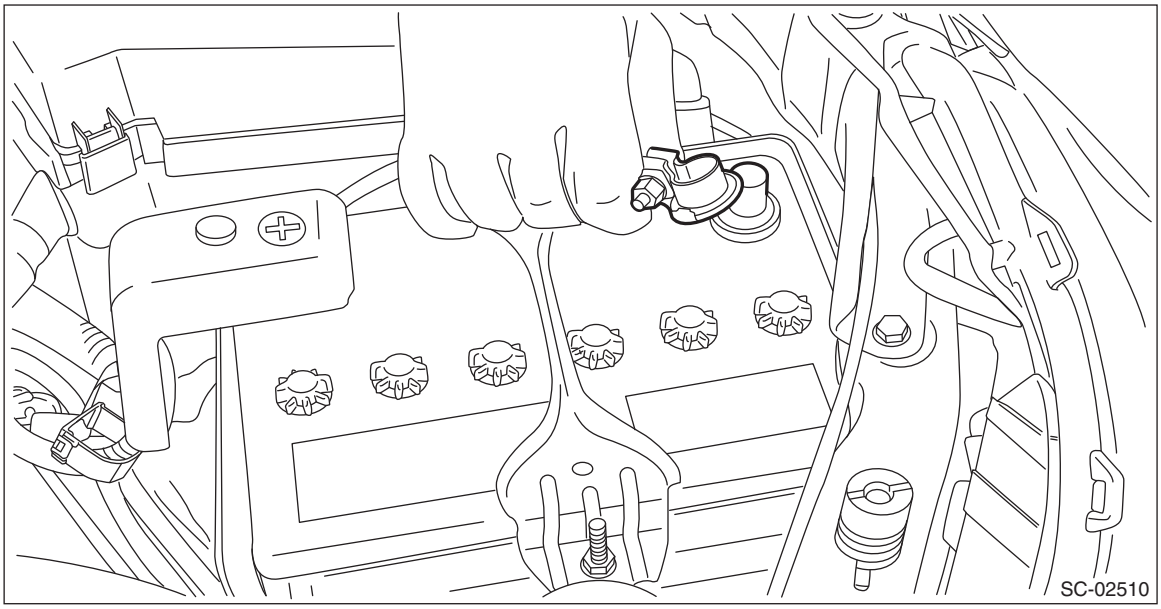


8) Connect the front oxygen (A/F) sensor connector (A) and rear oxygen sensor connector (B), and fasten the harness with the clip (C).



9) Install the under cover RH. <Ref. to EI-26, INSTALLATION, Front Under Cover.>
10) Lower the vehicle.

11) Connect the battery ground terminal.



C: INSPECTION

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

3. Center Exhaust Pipe

A: REMOVAL

After removing the center exhaust pipe and front exhaust pipe as a unit, separate them. Refer to “Front Exhaust Pipe” for the removal procedure. <Ref. to EX(H4DO)-5, REMOVAL, Front Exhaust Pipe.>

B: INSTALLATION

Install the center exhaust pipe and front exhaust pipe as one unit. Refer to “Front Exhaust Pipe” for the installation procedure. <Ref. to EX(H4DO)-8, INSTALLATION, Front Exhaust Pipe.>

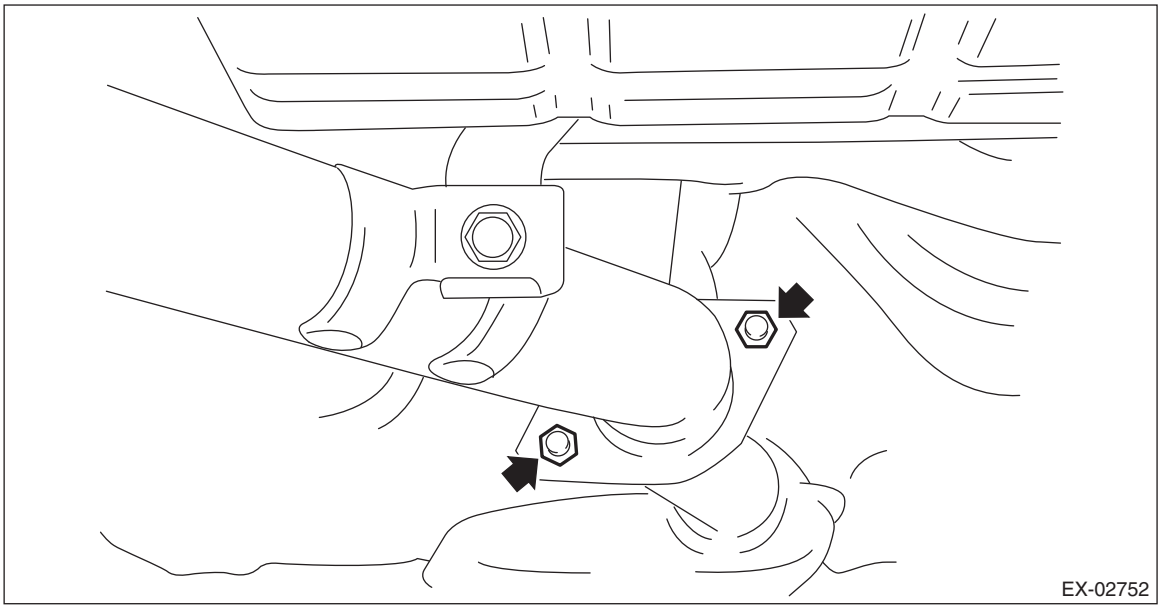
C: INSPECTION

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

4. Rear Exhaust Pipe

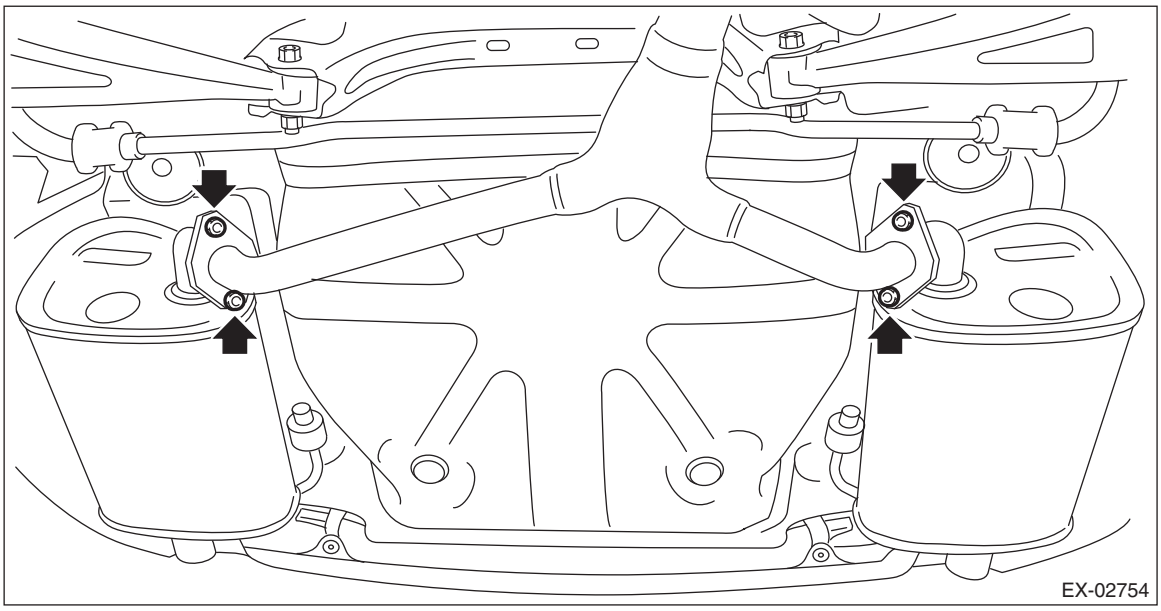
A: REMOVAL

CAUTION:
Vehicle components are extremely hot after driving. Be wary of receiving burns from heated parts.
1) Lift up the vehicle.
2) Remove the center exhaust pipe from rear exhaust pipe.



3) Remove the muffler from rear exhaust pipe.

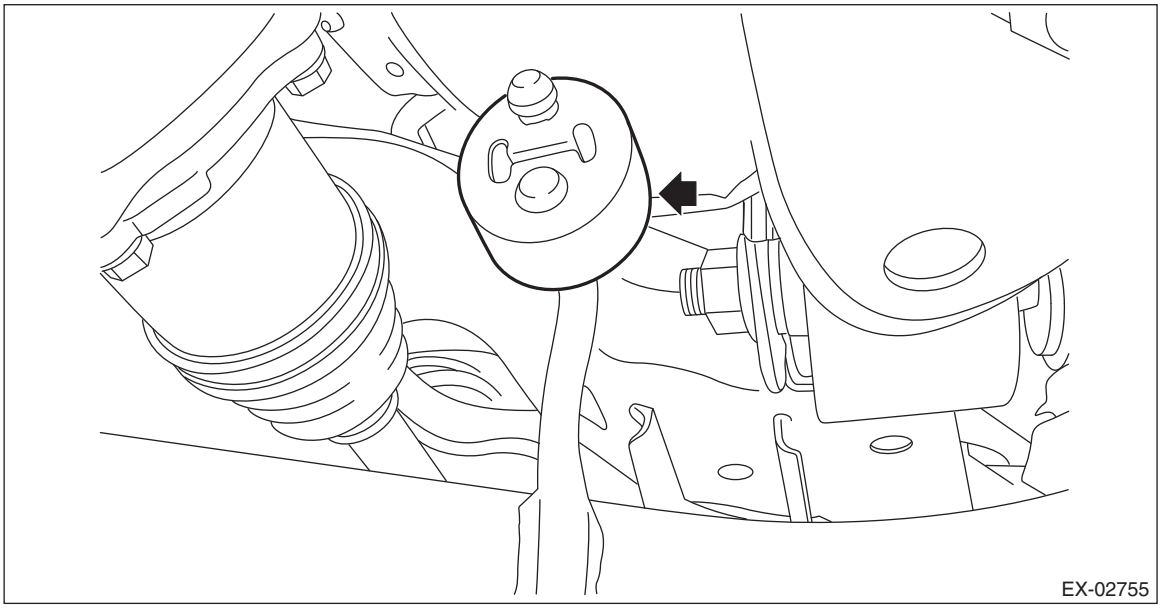
CAUTION:
Be careful not to drop the rear exhaust pipe.



4) Apply a coat of spray type lubricant to the mating area of cushion rubber.

5) Remove the rear exhaust pipe from the cushion rubber.

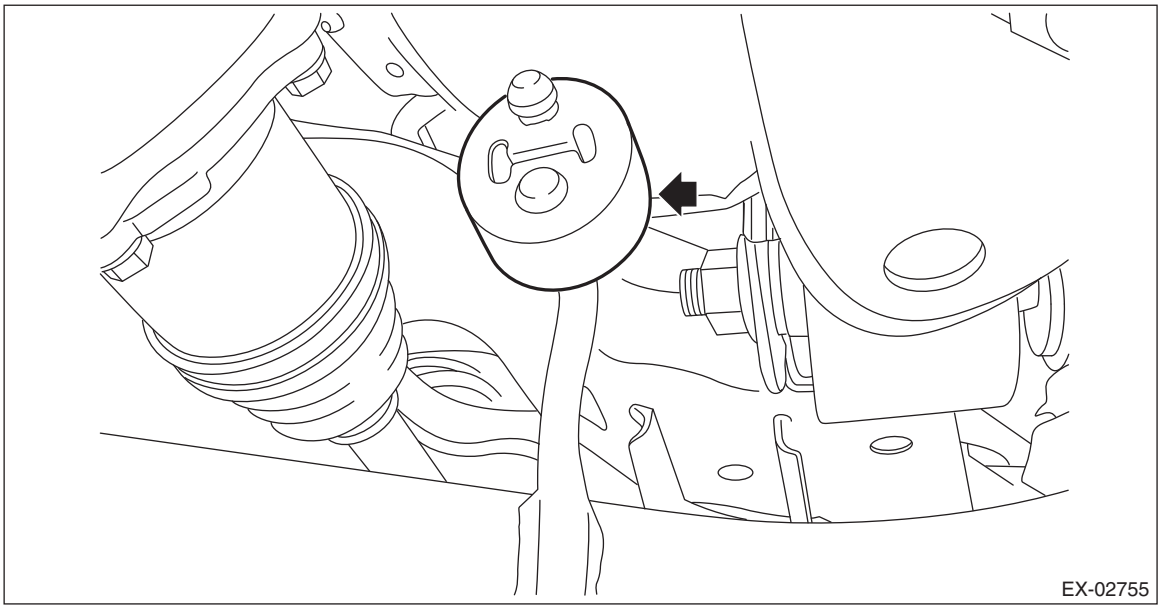
CAUTION:
Be careful not to let the muffler contact the rear bumper.



B: INSTALLATION

1) Apply a coat of spray type lubricant to the mating area of cushion rubber.
2) Install the rear exhaust pipe to cushion rubber.

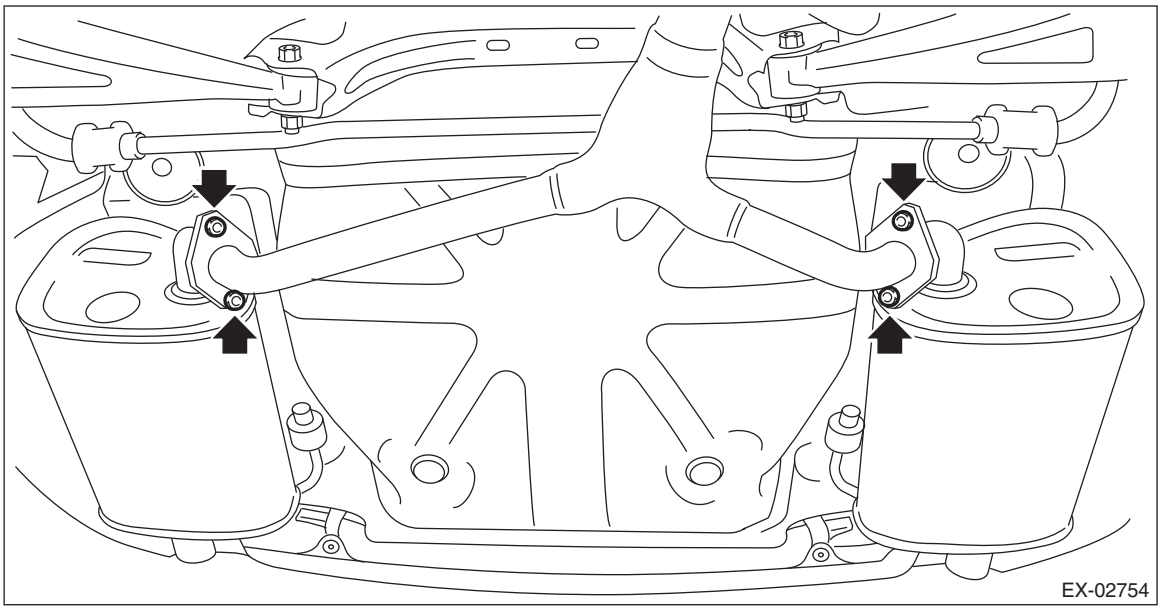
NOTE:
After assembling, degrease the lubricant which was applied to the cushion rubber while removing/installing.



3) Install the rear exhaust pipe to the muffler.

NOTE:
Use a new gasket and self-locking nut.

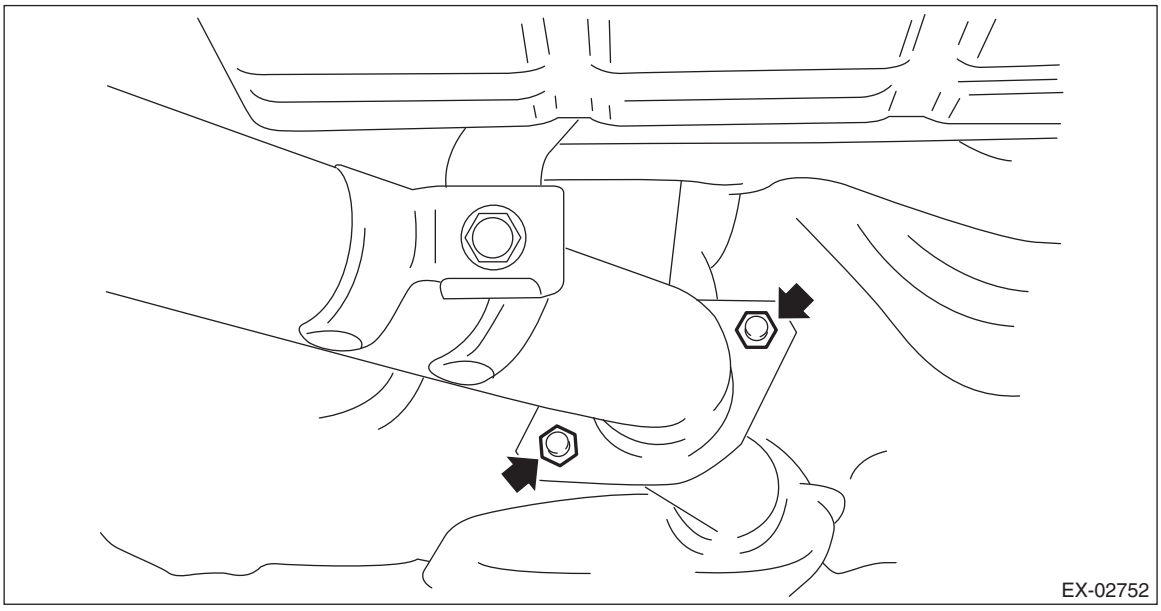
Tightening torque:
48 N·m (4.9 kgf-m, 35.4 ft-lb)



4) Install the center exhaust pipe to rear exhaust pipe.

NOTE:
Use a new gasket.

Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)



5) Lower the vehicle.

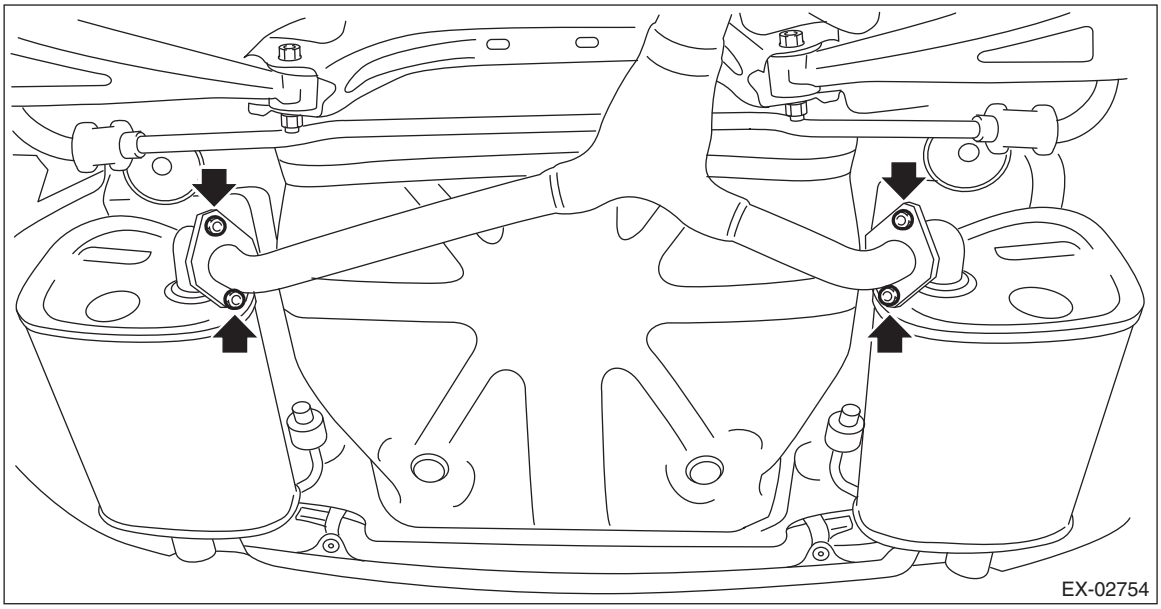
C: INSPECTION

1) Check the connections and welded parts for exhaust leaks.
2) Make sure there are no holes or rusting.
3) Check the cushion rubber for wear or crack.

5. Muffler

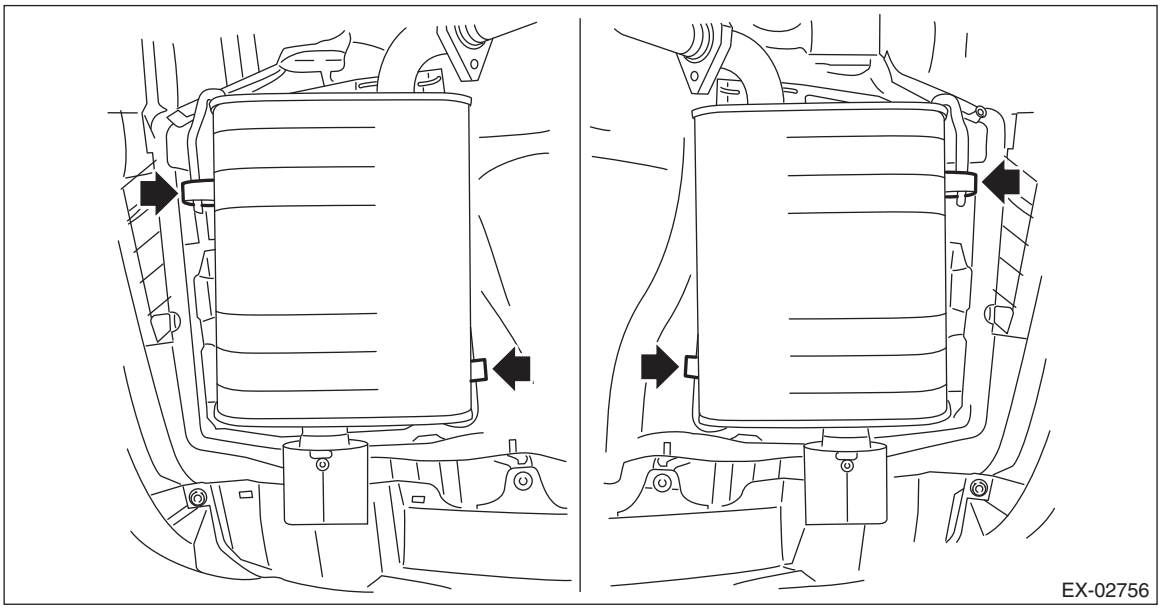
A: REMOVAL

CAUTION:
Vehicle components are extremely hot after driving. Be wary of receiving burns from heated parts.
1) Lift up the vehicle.
2) Remove the rear exhaust pipe from the muffler.



3) Apply a coat of spray type lubricant to the mating area of cushion rubber.
4) Remove the muffler from the cushion rubber.

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.
- After assembling, degrease the lubricant which was applied to the cushion rubber while removing/installing.

Tightening torque:
48 N·m (4.9 kgf-m, 35.4 ft-lb)

C: INSPECTION

1) Check the connections and welded parts for exhaust leaks.
2) Make sure there are no holes or rusting.
3) Check the cushion rubber for wear or crack.

COOLING

CO(H4DO)

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1. General Description

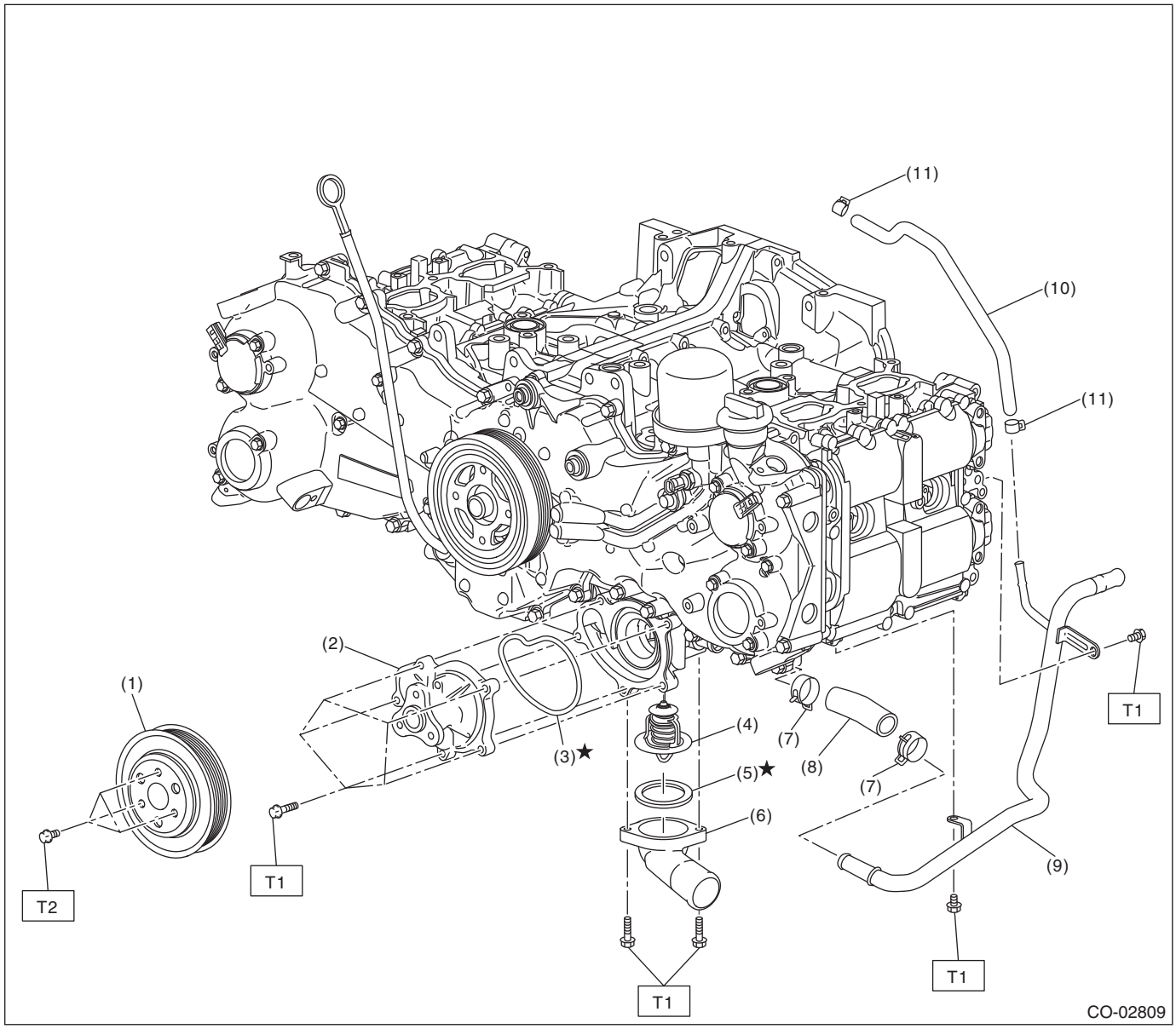
A: SPECIFICATION

Cooling system					Electric fan + Forced engine coolant circulation system
Total engine coolant capacity	ℓ (US qt, Imp qt)				AT model: Approx. 7.0 (7.4, 6.2)
					MT model: Approx. 7.1 (7.5, 6.2)
Water pump	Type				Centrifugal impeller type
	Discharge performance	Discharge rate ℓ (US gal, Imp gal) /min.			230 (60.8, 50.6)
		Pump speed — Discharge pressure			6,600 rpm — 211.0 kPa (22 mAq)
		Engine coolant temperature			80°C (176°F)
	Impeller diameter mm (in)				60 (2.36)
	Number of impeller vanes				7
	Pump pulley diameter mm (in)				130 (5.12)
Thermostat	Type				Wax pellet type
	Starting temperature to open				86 — 90°C (187 — 194°F)
	Fully opens				95°C (203°F)
	Valve lift mm (in)				8.0 (0.315) or more
	Valve bore mm (in)				32 (1.26)
Radiator fan	Motor input	Main fan W			90
		Sub fan W			90
	Fan diameter / Blade	Main fan			300 mm (11.81 in)/4
		Sub fan			300 mm (11.81 in)/5
Radiator	Type				Down flow, pressure type
	Core dimensions	Width × Height × Thickness mm (in)			687.4 × 340 × 16 (27.06 × 13.39 × 0.63)
	Pressure range in which cap valve is open kPa (kg/cm^2, psi)		Positive pressure side	Standard	93 — 123 (0.95 — 1.25, 14 — 18)
				Limit	83 (0.85, 12)
			Negative pressure side	Standard	–1.0 to –4.9 or less (–0.01 — –0.05, –0.1 — –0.7)
	Fins				Corrugated fin type
Reservoir tank	Capacity ℓ (US qt, Imp qt)				0.45 (0.48, 0.40)

	Recommended materials	Item number	Alternative
Coolant	SUBARU SUPER COOLANT (Concentrated type)	—	—
	SUBARU SUPER COOLANT (Diluted type)	K0670Y0001	
Water for dilution	Distilled water	—	Soft water or tap water
Cooling system protective agent	Cooling system conditioner	SOA345001	—

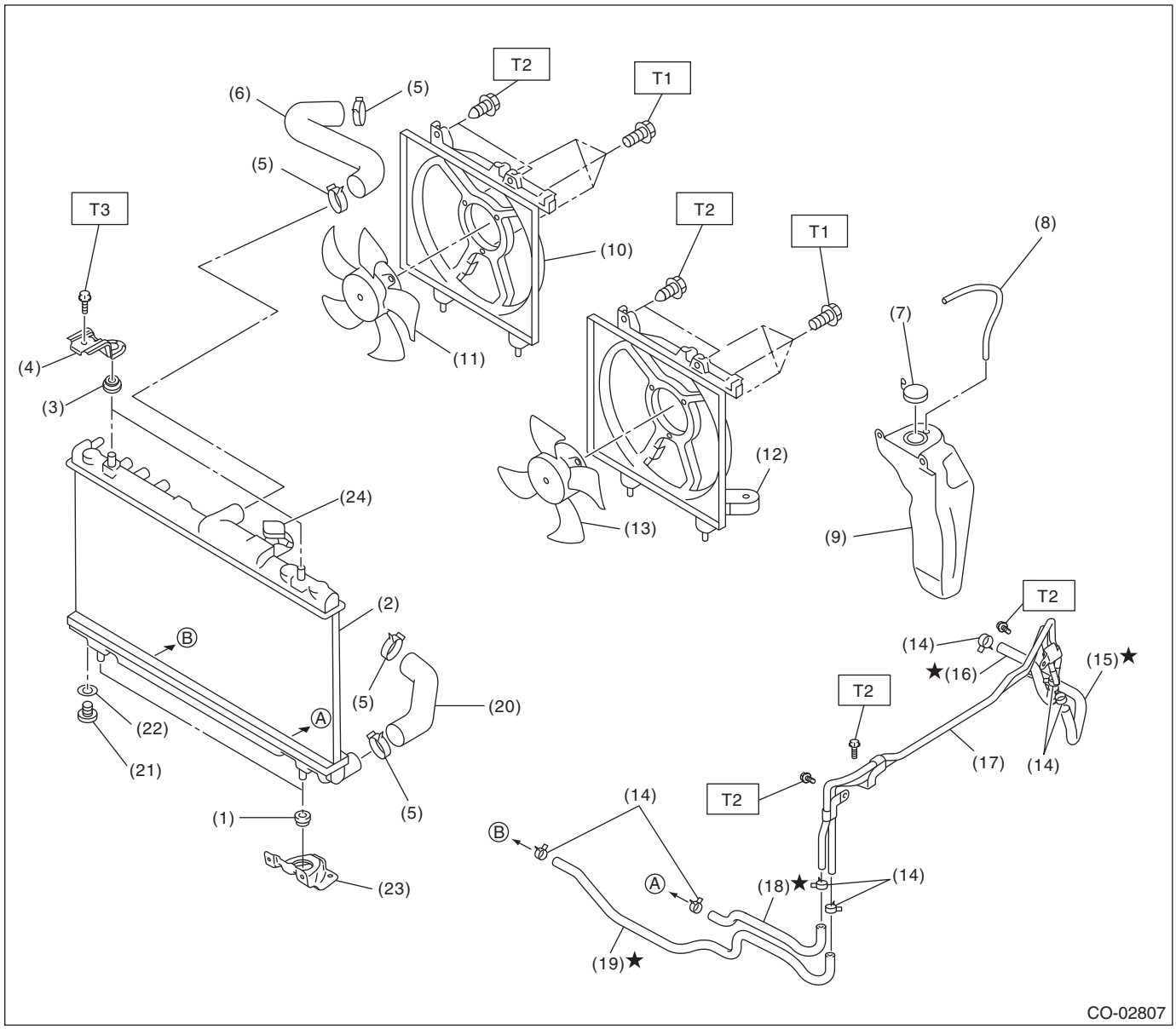
B: COMPONENT

1. WATER PUMP



(1)	Water pump pulley	(6)	Thermostat cover	(11)	Clip
(2)	Water pump ASSY	(7)	Clip		
(3)	Gasket	(8)	Water pipe hose	***Tightening torque:N·m (kgf-m, ft-lb)***	
(4)	Thermostat	(9)	Water pipe ASSY	***T1: 6.4 (0.7, 4.7)***	
(5)	Gasket	(10)	Preheater hose	***T2: 14 (1.4, 10.3)***	

2. RADIATOR & RADIATOR FAN



(1)	Radiator lower cushion	(11)	Radiator sub fan, radiator sub fan motor ASSY	(21)	Radiator drain plug
(2)	Radiator	(12)	Radiator main fan shroud	(22)	O-ring
(3)	Radiator upper cushion	(13)	Radiator main fan, radiator main fan motor ASSY	(23)	Radiator lower bracket
(4)	Radiator upper bracket	(14)	ATF hose clip (AT model)	(24)	Radiator cap
(5)	Clip	(15)	ATF hose A (AT model)		
(6)	Radiator inlet hose	(16)	ATF hose B (AT model)		
(7)	Engine coolant reservoir tank cap	(17)	ATF pipe (AT model)		
(8)	Over flow hose	(18)	ATF hose C (AT model)		
(9)	Engine coolant reservoir tank	(19)	ATF hose D (AT model)		
(10)	Radiator sub fan shroud	(20)	Radiator outlet hose		

Tightening torque:N·m (kgf-m, ft-lb)

T1: 5 (0.5, 3.7)

T2: 7.5 (0.8, 5.5)

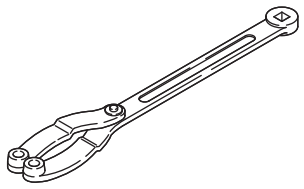
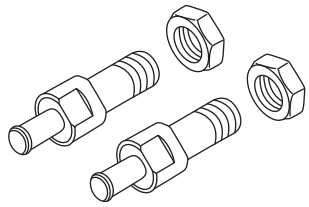
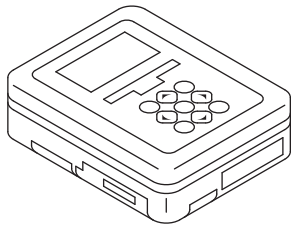
T3: 12 (1.2, 8.9)

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 battery.
- Prepare a container and cloth to prevent scattering of engine coolant when performing work where engine coolant can be spilled. If the 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 engine coolant.

D: PREPARATION TOOL

1. SPECIAL TOOL

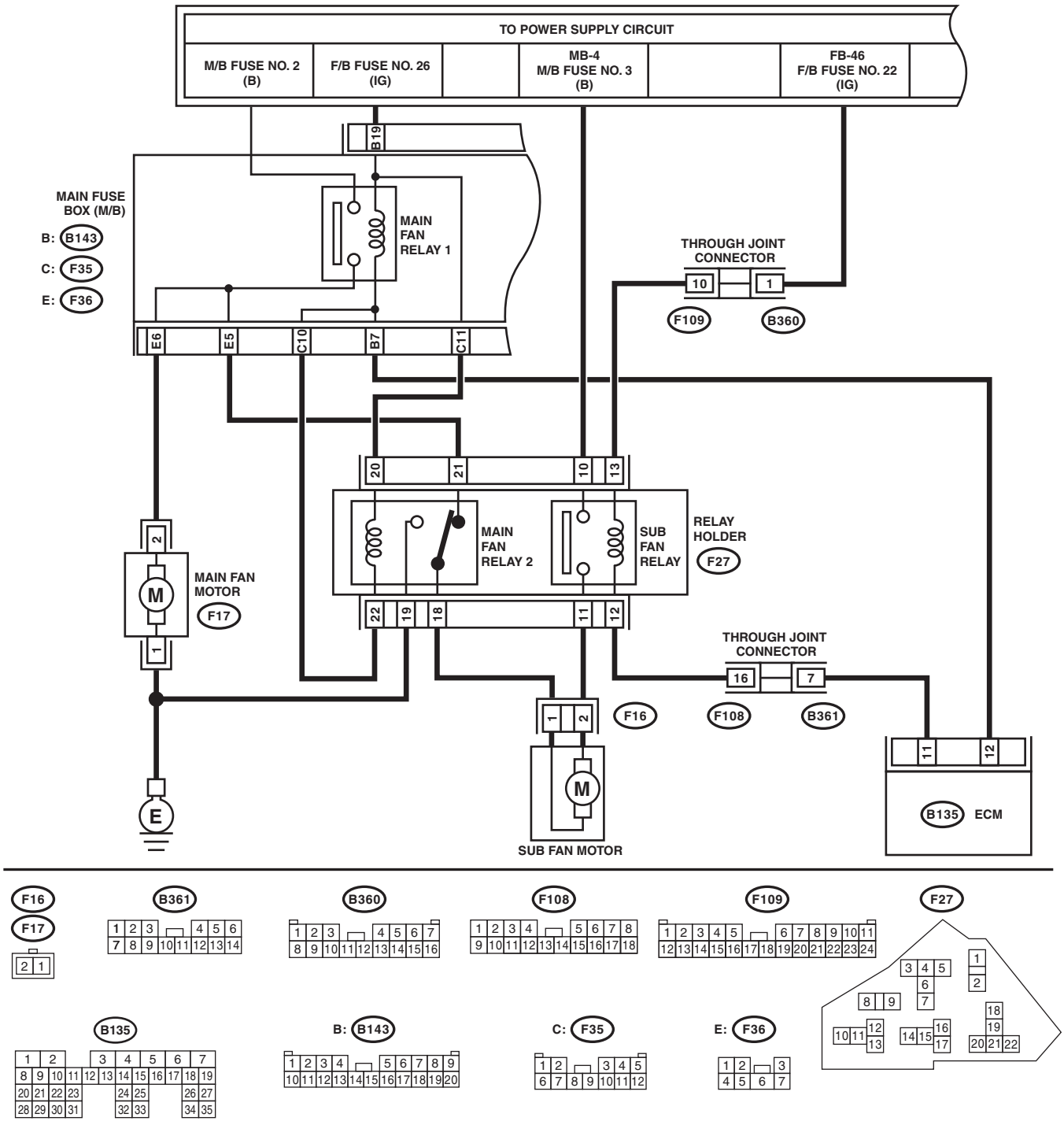
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18355AA000	18355AA000	PULLEY WRENCH	Used for removing and installing water pump pulley.
 ST18334AA030	18334AA030	PULLEY WRENCH PIN SET	Used for removing and installing water pump pulley.
 ST1B022XU0	1B022XU0	SUBARU SELECT MONITOR III KIT	Used for troubleshooting the electrical system.

2. GENERAL TOOL

TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance and voltage.
Radiator cap tester	Used for checking radiator and radiator cap.

2. Radiator Fan System

A: WIRING DIAGRAM



CO-02804

B: INSPECTION

Operating condition:

Vehicle speed	A/C compressor load	Engine coolant temperature		
		Increase: 94°C (201°F) or less Decrease: 92°C (198°F) or less	Increase: 95 — 99°C (203 — 210°F) Decrease: 93 — 94°C (199 — 201°F)	Increase: 100°C (212°F) or more Decrease: 95°C (203°F) or more
		Radiator fan operation	Radiator fan operation	Radiator fan operation
During acceleration: 19 km/h (12 MPH) or less During deceleration: 10 km/h (6 MPH) or less	OFF	OFF	Low-Speed	High-Speed
	Low	Low-Speed	Low-Speed	High-Speed
	High	High-Speed	High-Speed	High-Speed
During acceleration: 20 — 69 km/h (12 — 43 MPH) During deceleration: 11 — 64 km/h (7 — 40 MPH)	OFF	OFF	Low-Speed	High-Speed
	Low	High-Speed	High-Speed	High-Speed
	High	High-Speed	High-Speed	High-Speed
During acceleration: 70 — 134 km/h (43 — 83 MPH) During deceleration: 65 — 129 km/h (40 — 80 MPH)	OFF	OFF	Low-Speed	High-Speed
	Low	OFF	Low-Speed	High-Speed
	High	Low-Speed	High-Speed	High-Speed
During acceleration: 135 km/h (84 MPH) or more During deceleration: 130 km/h (81 MPH) or more	OFF	OFF	OFF	High-Speed
	Low	OFF	Low-Speed	High-Speed
	High	OFF	Low-Speed	High-Speed

DIAGNOSIS:
Radiator main fan and radiator sub fans do not rotate under the above operating conditions.

	Step	Check	Yes	No
1	**CHECK OPERATION OF RADIATOR FAN.** 1) Connect the delivery (test) mode connector. 2) Turn the ignition switch to ON. 3) Using the Subaru Select Monitor, check the forced operation of the radiator fan relay. NOTE: • When performing a forced operation radiator fan relay check using the Subaru Select Monitor, the radiator main fan and radiator sub fan will repeat low speed revolution → high speed revolution → OFF in this order. • Subaru Select Monitor Refer to "Compulsory Valve Operation Check Mode" for detailed procedures. <Ref. to EN(H4DO)(diag)-57, Compulsory Valve Operation Check Mode.>	Do the radiator main fans and radiator sub fans rotate at low speed?	Go to step **2**.	Go to step **3**.
2	**CHECK OPERATION OF RADIATOR FAN.** 1) Connect the delivery (test) mode connector. 2) Turn the ignition switch to ON. 3) Using the Subaru Select Monitor, check the forced operation of the radiator fan relay. NOTE: • When performing a forced operation radiator fan relay check using the Subaru Select Monitor, the radiator main fan and radiator sub fan will repeat low speed revolution → high speed revolution → OFF in this order. • Subaru Select Monitor Refer to "Compulsory Valve Operation Check Mode" for detailed procedures. <Ref. to EN(H4DO)(diag)-57, Compulsory Valve Operation Check Mode.>	Do the radiator main fans and radiator sub fans rotate at high speed?	Radiator main fan system is normal.	Go to step **27**.
3	**CHECK POWER SUPPLY TO SUB FAN RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the sub fan relay from the relay holder. 3) Measure the voltage between the sub fan relay terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 10 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **4**.	Go to step **5**.
4	**CHECK POWER SUPPLY TO SUB FAN RELAY.** 1) Turn the ignition switch to ON. 2) Measure the voltage between the sub fan relay terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 13 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **7**.	Go to step **6**.
5	**CHECK FUSE.** 1) Turn the ignition switch to OFF. 2) Remove the fuse No. 3. 3) Check the condition of fuse.	Is the fuse blown out?	Replace the fuse.	Repair the power supply line.
6	**CHECK FUSE.** 1) Turn the ignition switch to OFF. 2) Remove the fuse No. 22. 3) Check the condition of fuse.	Is the fuse blown out?	Replace the fuse.	Repair the power supply line.

Step		Check	Yes	No
7	**CHECK SUB FAN RELAY.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between sub fan relay terminals. ***Terminals*** ***No. 10 — No. 11:***	Is the resistance 1 MΩ or more?	Go to step **8**.	Replace the sub fan relay. <Ref. to AC-43, Relay and Fuse.>
8	**CHECK SUB FAN RELAY.** 1) Connect the battery to terminals No. 13 and No. 12 of the sub fan relay. 2) Measure the resistance between sub fan relay terminals. ***Terminals*** ***No. 10 — No. 11:***	Is the resistance less than 1 Ω?	Go to step **9**.	Replace the sub fan relay. <Ref. to AC-43, Relay and Fuse.>
9	**CHECK HARNESS BETWEEN SUB FAN RELAY TERMINAL AND SUB FAN MOTOR CONNECTOR.** 1) Disconnect the connector from the sub fan motor. 2) Measure the resistance of harness between the sub fan relay terminal and sub fan motor connector. ***Connector & terminal*** ***(F16) No. 2 — (F27) No. 11:***	Is the resistance less than 1 Ω?	Go to step **10**.	Repair the open circuit of harness between sub fan relay terminal and sub fan motor connector.
10	**CHECK HARNESS BETWEEN SUB FAN MOTOR CONNECTOR AND MAIN FAN RELAY 2 CONNECTOR.** 1) Remove main fan relay 2 from the relay holder. 2) Measure the resistance of harness between sub fan motor connector and main fan relay 2 connector. ***Connector & terminal*** ***(F16) No. 1 — (F27) No. 18:***	Is the resistance less than 1 Ω?	Go to step **11**.	Repair the open circuit of the harness between sub fan motor connector and main fan relay 2 connector.
11	**CHECK FOR POOR CONTACT.** Check poor contact of sub fan motor connector.	Is there poor contact of the sub fan motor connector?	Repair the poor contact of sub fan motor connector.	Go to step **12**.
12	**CHECK SUB FAN MOTOR.** Connect the battery positive (+) terminal to terminal No. 2 of the sub fan motor, and the ground (–) terminal to terminal No. 1.	Does the radiator sub fan rotate?	Go to step **13**.	Replace the sub fan motor. <Ref. to CO(H4DO)-37, Radiator Sub Fan and Fan Motor.>
13	**CHECK MAIN FAN RELAY 2.** Measure the resistance of main fan relay 2. ***Terminals*** ***No. 21 — No. 18:***	Is the resistance less than 1 Ω?	Go to step **14**.	Replace the main fan relay 2. <Ref. to AC-43, Relay and Fuse.>
14	**CHECK HARNESS BETWEEN MAIN FAN RELAY 2 AND MAIN FAN MOTOR CONNECTOR.** 1) Disconnect the connector from the main fan motor. 2) Measure the resistance of the harness between main fan relay 2 terminal and main fan motor connector. ***Connector & terminal*** ***(F17) No. 2 — (F27) No. 21:***	Is the resistance less than 1 Ω?	Go to step **15**.	Repair the open circuit of the harness between main fan relay 2 terminal and main fan motor connector.

	Step	Check	Yes	No
15	**CHECK GROUND CIRCUIT OF MAIN FAN MOTOR.** Measure the resistance between main fan motor connector and chassis ground. ***Connector & terminal*** ***(F17) No. 1 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **16**.	Repair the open circuit of the harness between main fan motor connector and chassis ground.
16	**CHECK FOR POOR CONTACT.** Check poor contact of main fan motor connector.	Is there poor contact of the main fan motor connector?	Repair the poor contact of main fan motor connector.	Go to step **17**.
17	**CHECK MAIN FAN MOTOR.** Connect the battery positive (+) terminal to terminal No. 2 of the main fan motor, and the ground (–) terminal to terminal No. 1.	Does the radiator main fan rotate?	Go to step **18**.	Replace the main fan motor. <Ref. to CO(H4DO)-34, Radiator Main Fan and Fan Motor.>
18	**CHECK HARNESS BETWEEN SUB FAN RELAY AND ECM.** 1) Disconnect the connector from ECM. 2) Measure the resistance between the sub fan relay terminal and ECM connector. ***Connector & terminal*** ***(B135) No. 11 — (F27) No. 12:***	Is the resistance less than 1 Ω?	Go to step **19**.	Repair the open circuit of harness between sub fan relay terminal and ECM.
19	**CHECK FOR POOR CONTACT.** Check for poor contact of ECM connector.	Is there poor contact of ECM connector?	Repair the poor contact of ECM connector.	Check the DTC. Repair the trouble cause. <Ref. to EN(H4DO)(diag)-42, Read Diagnostic Trouble Code (DTC).>
20	**CHECK MAIN FAN RELAY 1.** 1) Turn the ignition switch to OFF. 2) Remove main fan relay 1 from the main fuse box. 3) Measure the resistance between terminals of main fan relay 1 switch.	Is the resistance 1 MΩ or more?	Go to step **21**.	Replace the main fan relay 1. <Ref. to AC-43, Relay and Fuse.>
21	**CHECK MAIN FAN RELAY 1.** 1) Connect the main fan relay 1 coil side terminal to the battery. 2) Measure the resistance between terminals of main fan relay 1 switch.	Is the resistance less than 1 Ω?	Go to step **22**.	Replace the main fan relay 1. <Ref. to AC-43, Relay and Fuse.>
22	**CHECK HARNESS BETWEEN MAIN FAN RELAY 1 AND MAIN FAN MOTOR CONNECTOR.** 1) Disconnect the connector from the main fan motor. 2) Measure the resistance of the harness between main fan relay 1 terminal and main fan motor connector. ***Connector & terminal*** ***(F17) No. 2 — (F36) No. 6:***	Is the resistance less than 1 Ω?	Go to step **23**.	Repair the open circuit of the harness between main fan relay 1 terminal and main fan motor connector.
23	**CHECK HARNESS BETWEEN MAIN FAN RELAY 1 AND ECM.** 1) Disconnect the connector from ECM. 2) Measure the resistance between main fan relay 1 terminal and ECM connector. ***Connector & terminal*** ***(B135) No. 12 — (B143) No. 7:***	Is the resistance less than 1 Ω?	Go to step **24**.	Repair the open circuit of the harness between main fan relay 1 terminal and ECM.

	Step	Check	Yes	No
24	**CHECK HARNESS BETWEEN MAIN FAN RELAY 2 AND ECM.** Measure the resistance between main fan relay 2 terminal and ECM connector. ***Connector & terminal*** ***(B135) No. 12 — (F27) No. 22:***	Is the resistance less than 1 Ω?	Go to step **25**.	Repair the open circuit of the harness between main fan relay 2 terminal and ECM.
25	**CHECK FUSE.** 1) Turn the ignition switch to OFF. 2) Remove the fuse No. 2 and No. 26. 3) Check the condition of fuse.	Is the fuse blown out?	Replace the fuse.	Go to step **26**.
26	**CHECK FOR POOR CONTACT.** Check for poor contact of ECM connector.	Is there poor contact of ECM connector?	Repair the poor contact of ECM connector.	Repair the power supply circuit to the main fuse box.
27	**CHECK OPERATION OF RADIATOR FAN.** If the both fans do not rotate at high speed in the condition of step 2, check whether the radiator sub fan is rotating.	Does the radiator sub fan rotate?	Go to step **20**.	Go to step **28**.
28	**CHECK GROUND CIRCUIT OF MAIN FAN RELAY 2.** 1) Remove the main fan relay 2 from A/C relay holder. 2) Measure the resistance between main fan relay 2 terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 19 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **29**.	Repair the open circuit of harness between main fan relay 2 and chassis ground.
29	**CHECK POWER SUPPLY TO MAIN FAN RELAY 2.** 1) Turn the ignition switch to ON. 2) Measure the voltage between main fan relay 2 terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 20 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **30**.	Repair the power supply line.
30	**CHECK MAIN FAN RELAY 2.** 1) Turn the ignition switch to OFF. 2) Remove the main fan relay 2. 3) Measure the resistance of main fan relay 2. ***Terminals*** ***(F27) No. 18 — (F27) No. 19:***	Is the resistance 1 MΩ or more?	Go to step **31**.	Replace the main fan relay 2. <Ref. to AC-43, Relay and Fuse.>
31	**CHECK MAIN FAN RELAY 2.** 1) Connect the battery to terminals No. 20 and No. 22 of the main fan relay 2. 2) Measure the resistance of main fan relay 2. ***Terminals*** ***(F27) No. 18 — (F27) No. 19:***	Is the resistance less than 1 Ω?	Go to step **23**.	Replace the main fan relay 2. <Ref. to AC-43, Relay and Fuse.>

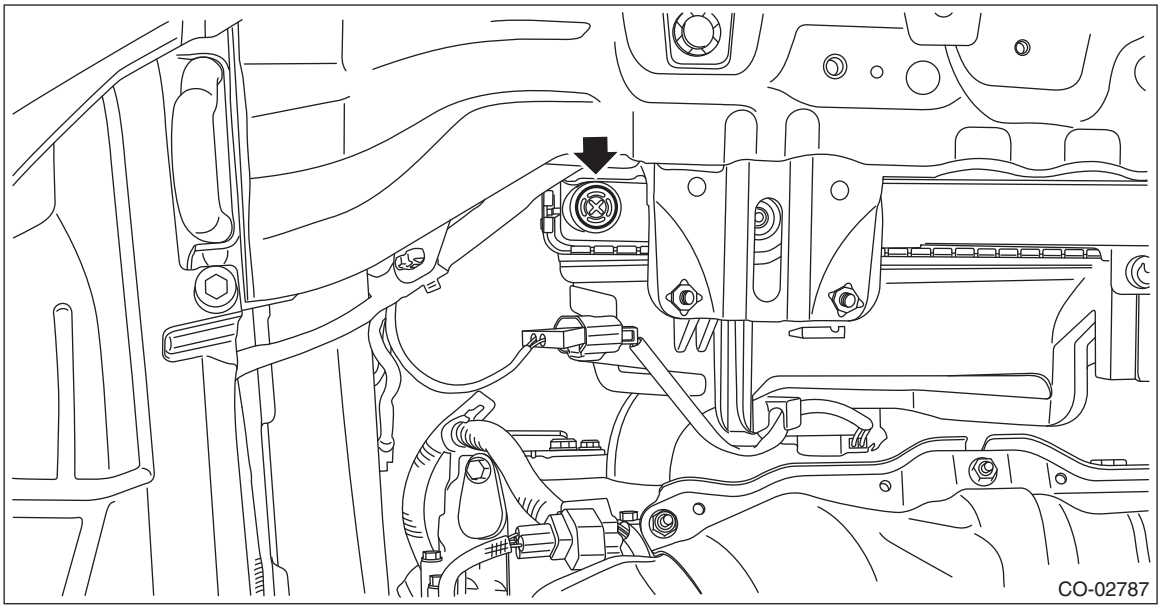
3. Engine Coolant

A: REPLACEMENT

1. DRAINING OF ENGINE COOLANT

1) Lift up the vehicle.
2) Remove the under cover RH. <Ref. to EI-26, REMOVAL, Front Under Cover.>
3) Remove the drain plug to drain engine coolant into container.

NOTE:
Remove the radiator cap so that engine coolant will drain faster.



4) Install the drain plug.
5) Install the under cover RH. <Ref. to EI-26, INSTALLATION, Front Under Cover.>

2. FILLING OF ENGINE COOLANT

1) Pour cooling system conditioner through the filler neck.

Cooling system protective agent:
Refer to "SPECIFICATION" for cooling system protective agent. <Ref. to CO(H4DO)-2, SPECIFICATION, General Description.>

2) Pour engine coolant into the radiator up to the filler neck position.

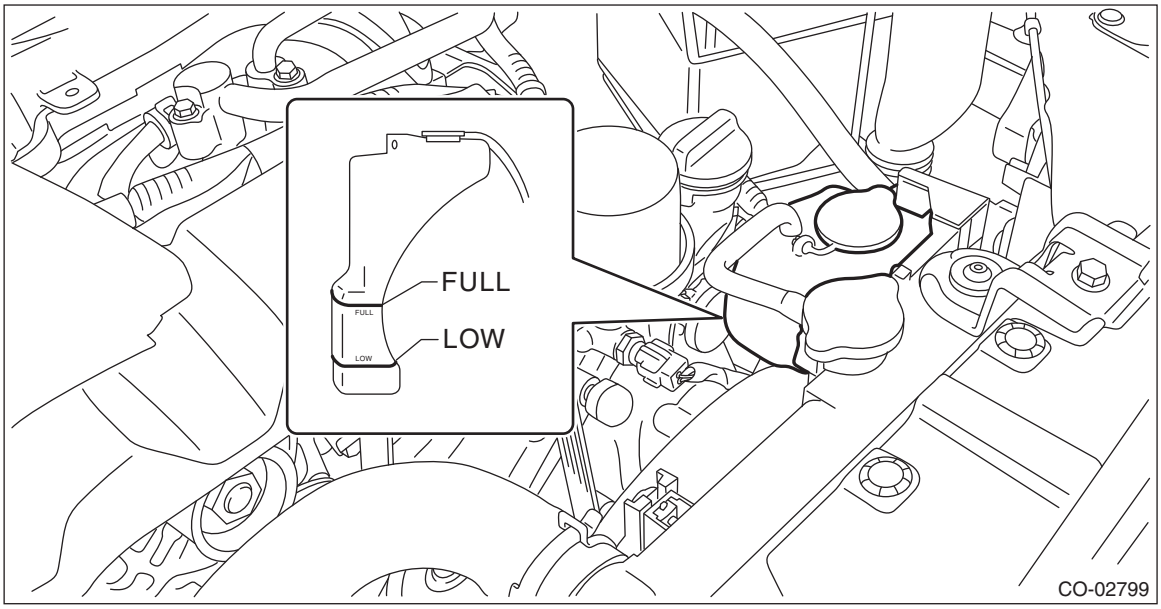
Recommended engine coolant:
Refer to "SPECIFICATION" for recommended engine coolant. <Ref. to CO(H4DO)-2, SPECIFICATION, General Description.>

Engine coolant level:
Refer to "SPECIFICATION" for engine coolant level. <Ref. to CO(H4DO)-2, SPECIFICATION, General Description.>

Engine coolant concentration:
Refer to "ADJUSTMENT" for the recommended engine coolant concentration. <Ref. to CO(H4DO)-14, ADJUSTMENT, Engine Coolant.>

NOTE:
The SUBARU Super Coolant contains anti-freeze and anti-rust agents, and is especially made for Subaru engines with an aluminum cylinder block. Be sure to use SUBARU Super Coolant, since other coolant may cause corrosion.

3) Fill engine coolant into the reservoir tank up to “FULL” level.



4) Close the radiator cap and start the engine. Race 5 to 6 times at 3,000 rpm or less, then stop the engine. (Complete this operation within 40 seconds.)
5) Wait for one minute after the engine stops, and open the radiator cap. If the engine coolant level drops, add engine coolant into radiator up to the filler neck position.
6) Perform the procedures 4) and 5) again.
7) Attach the radiator cap and reservoir tank cap properly.
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) or less.
11) Open the radiator cap. If the engine coolant level drops, add engine coolant into the radiator up to the filler neck position and the reservoir tank to “FULL” level.
12) Attach the radiator cap correctly.
13) Set the heater setting to maximum hot position and the blower speed setting to “LO” and start the engine. Perform racing at 3,000 rpm or less. If the flowing sound is heard from heater core at this time, perform the procedures from 9) again.

B: ADJUSTMENT

1. PROCEDURE TO ADJUST THE SUBARU SUPER COOLANT CONCENTRATION

CAUTION:
Use the SUBARU Super Coolant with a 50 — 60% concentration in order to obtain maximum anti-freeze and anti-rust performance.
To adjust the concentration of SUBARU Super Coolant according to temperature, find the proper SUBARU Super Coolant concentration in the table, and add dilution water to the SUBARU Super Coolant (concentrated type) until it reaches the proper dilution.

Relationship of SUBARU Super Coolant concentration and freezing temperature			
SUBARU Super Coolant concentration	50%	55%	60%
Freezing temperature	–36°C (–33°F)	–41°C (–42°F)	–50°C (–58°F)

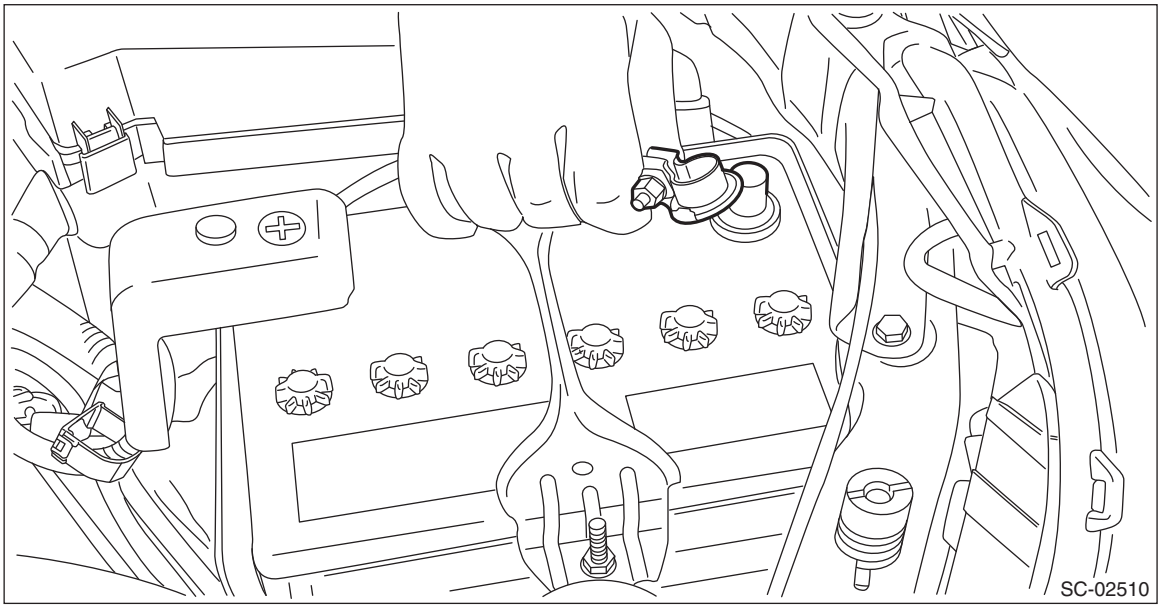
Engine coolant and diluting water:
Refer to “SPECIFICATION” for recommended engine coolant and diluting water. <Ref. to CO(H4DO)-2, SPECIFICATION, General Description.>

4. Water Pump

A: REMOVAL

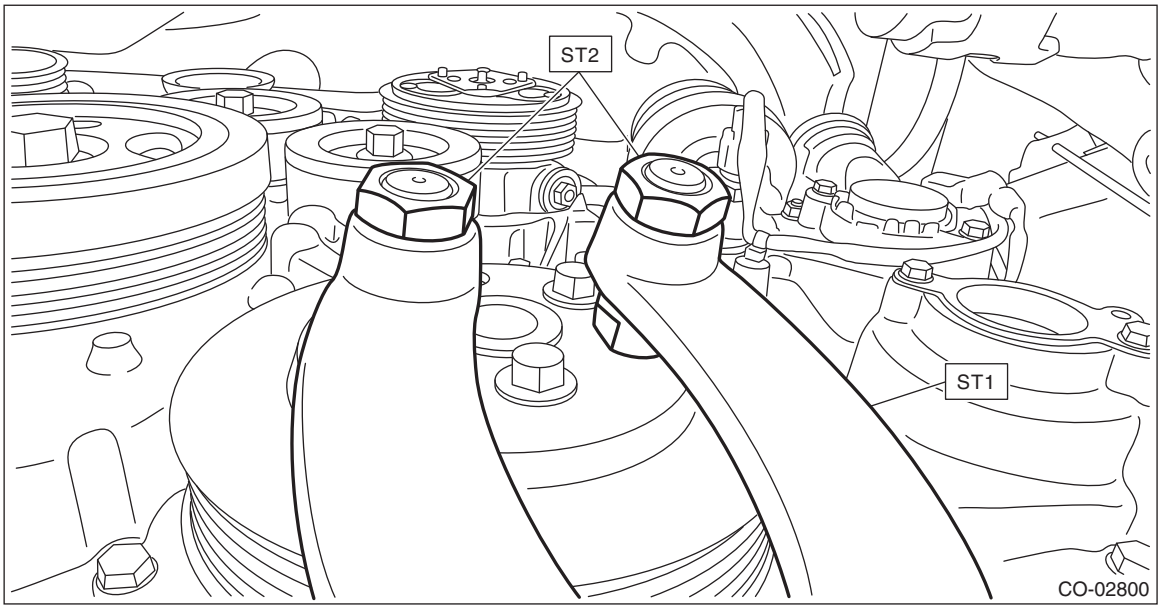
1. WATER PUMP PULLEY

1) Disconnect the ground cable from battery.



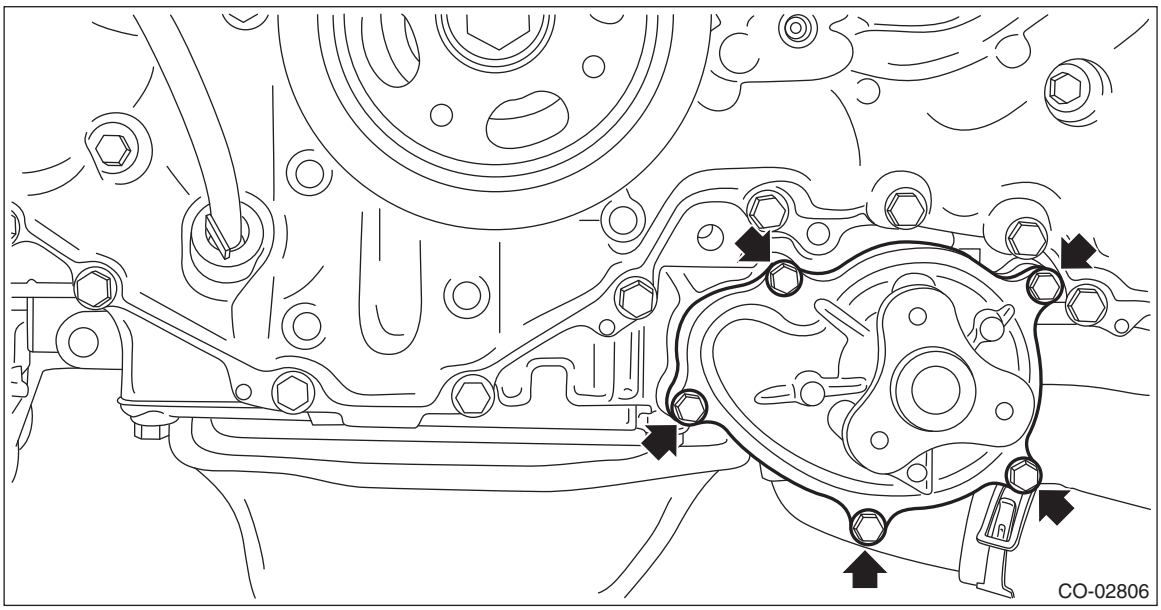
2) Remove the V-belts. <Ref. to ME(H4DO)-70, REMOVAL, V-belt.>
3) Remove the main fan motor assembly. <Ref. to CO(H4DO)-34, REMOVAL, Radiator Main Fan and Fan Motor.>
4) Lift up the vehicle.
5) Remove the under cover. <Ref. to EI-26, REMOVAL, Front Under Cover.>
6) Remove the water pump pulley using the ST.

ST1 18355AA000 PULLEY WRENCH
ST2 18334AA030 PULLEY WRENCH PIN SET



2. WATER PUMP

1) Drain engine coolant. <Ref. to CO(H4DO)-13, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
2) Remove the water pump pulley. <Ref. to CO(H4DO)-15, WATER PUMP PULLEY, REMOVAL, Water Pump.>
3) Remove the front exhaust pipe. <Ref. to EX(H4DO)-5, REMOVAL, Front Exhaust Pipe.>
4) Remove the water pump from the oil pan upper.

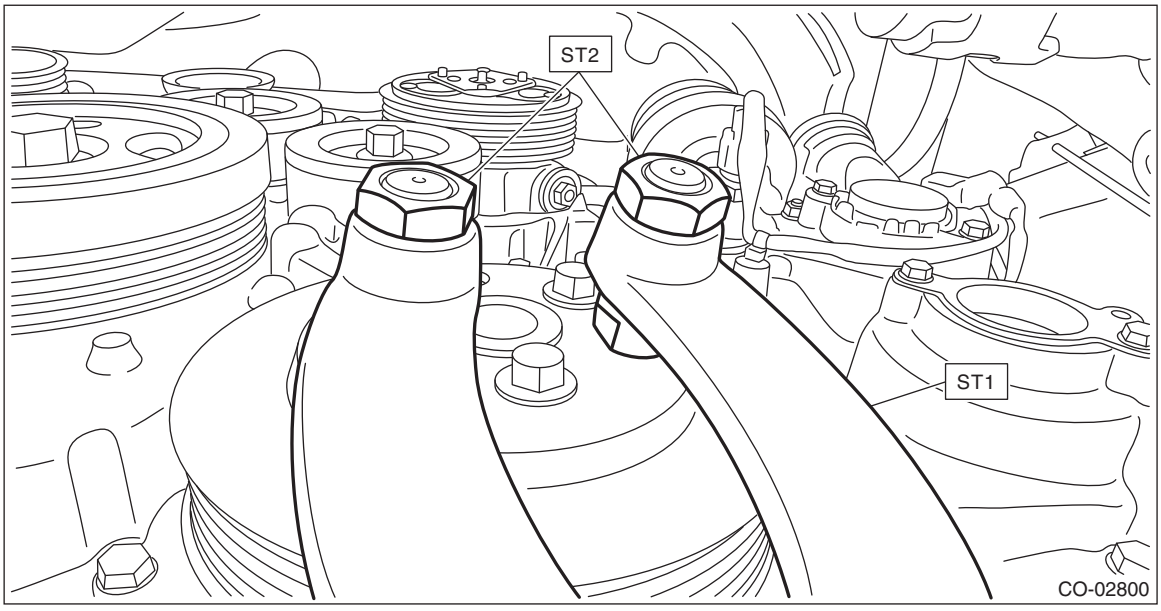


B: INSTALLATION

1. WATER PUMP PULLEY

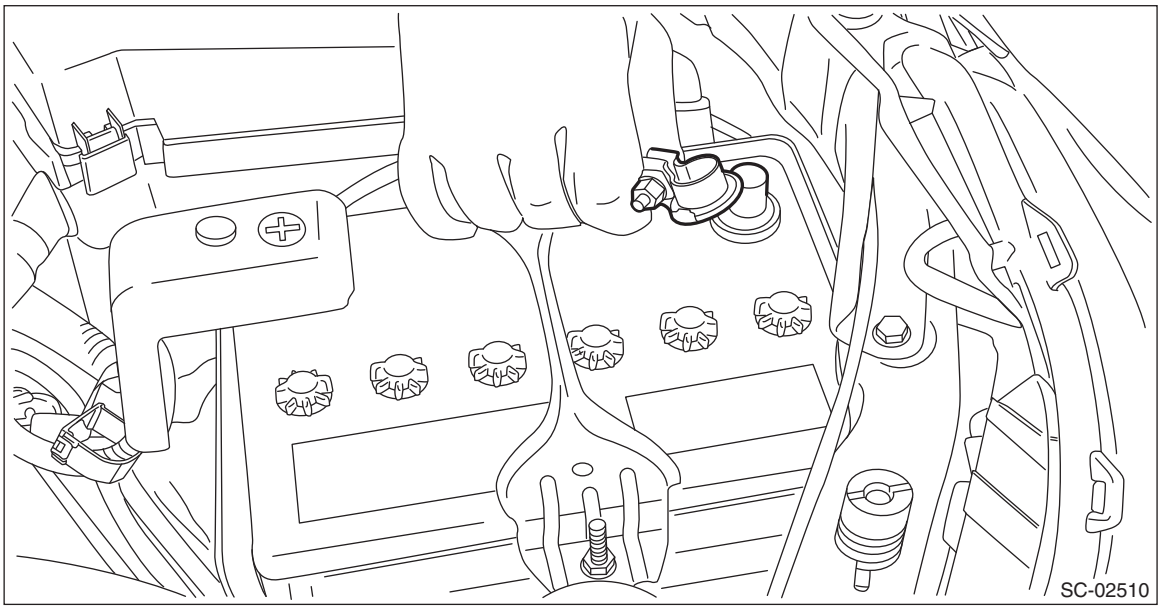
1) Using the ST, install the water pump pulley.
ST1 18355AA000 PULLEY WRENCH
ST2 18334AA030 PULLEY WRENCH PIN SET

Tightening torque:
14 N·m (1.4 kgf-m, 10.3 ft-lb)



2) Install the under cover. <Ref. to EI-26, INSTALLATION, Front Under Cover.>
3) Lower the vehicle.

4) Install the main fan motor assembly. <Ref. to CO(H4DO)-35, INSTALLATION, Radiator Main Fan and Fan Motor.>
5) Install the V-belts. <Ref. to ME(H4DO)-73, INSTALLATION, V-belt.>
6) Connect the battery ground terminal.

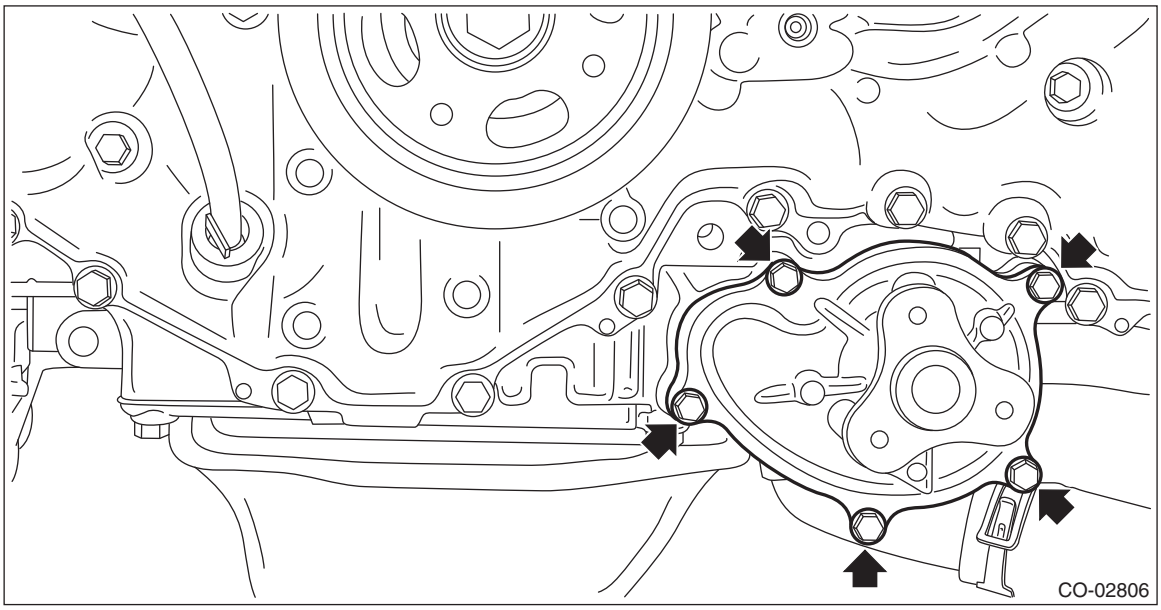


2. WATER PUMP

1) Install the water pump to oil pan upper.

NOTE:
Use a new gasket.

Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)



2) Install the front exhaust pipe. <Ref. to EX(H4DO)-8, INSTALLATION, Front Exhaust Pipe.>
3) Install the water pump pulley. <Ref. to CO(H4DO)-16, WATER PUMP PULLEY, INSTALLATION, Water Pump.>
4) Fill engine coolant. <Ref. to CO(H4DO)-13, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

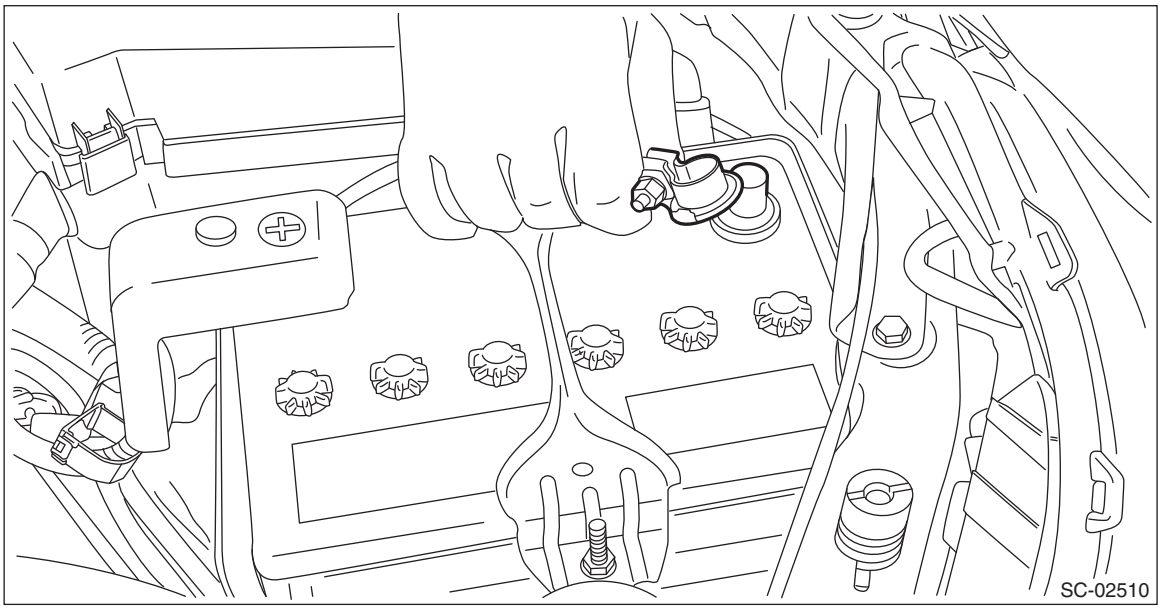
C: INSPECTION

1) Check the water pump bearing for smooth rotation.
2) Check the water pump pulley for abnormalities.
3) Make sure the impeller is not abnormally deformed or damaged.

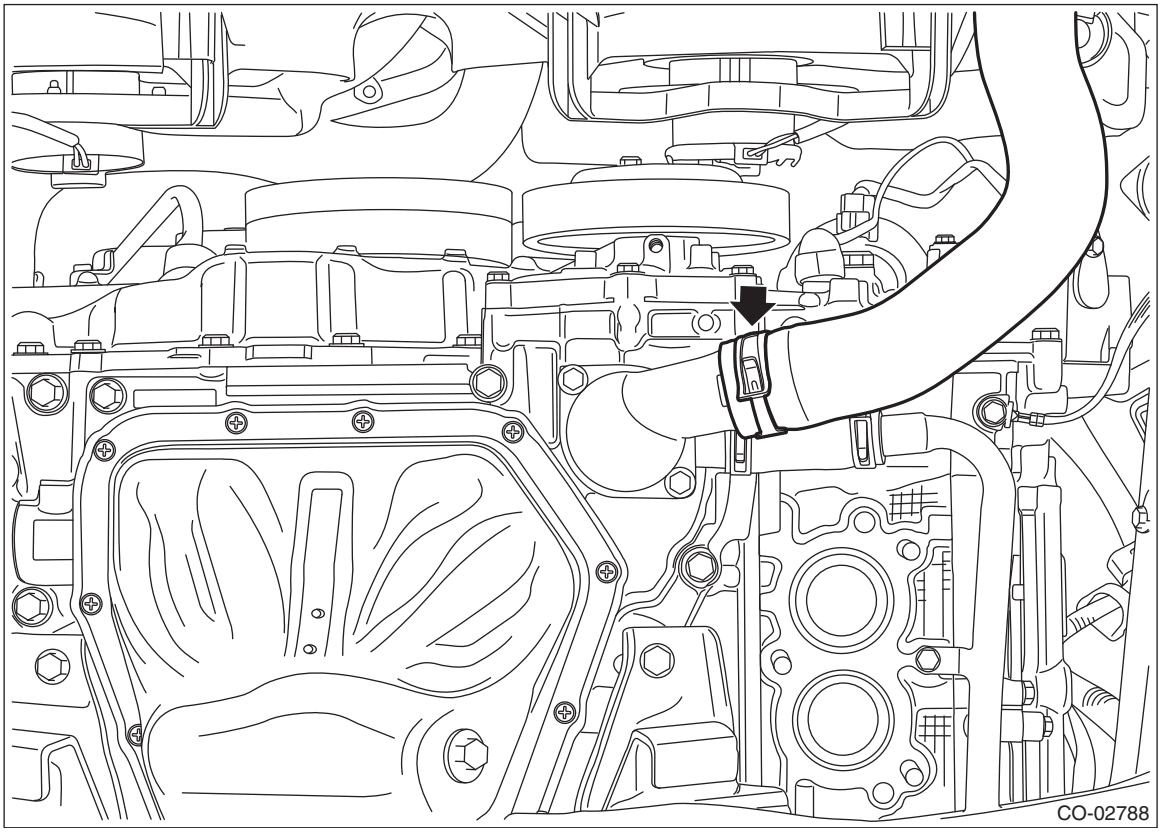
5. Thermostat

A: REMOVAL

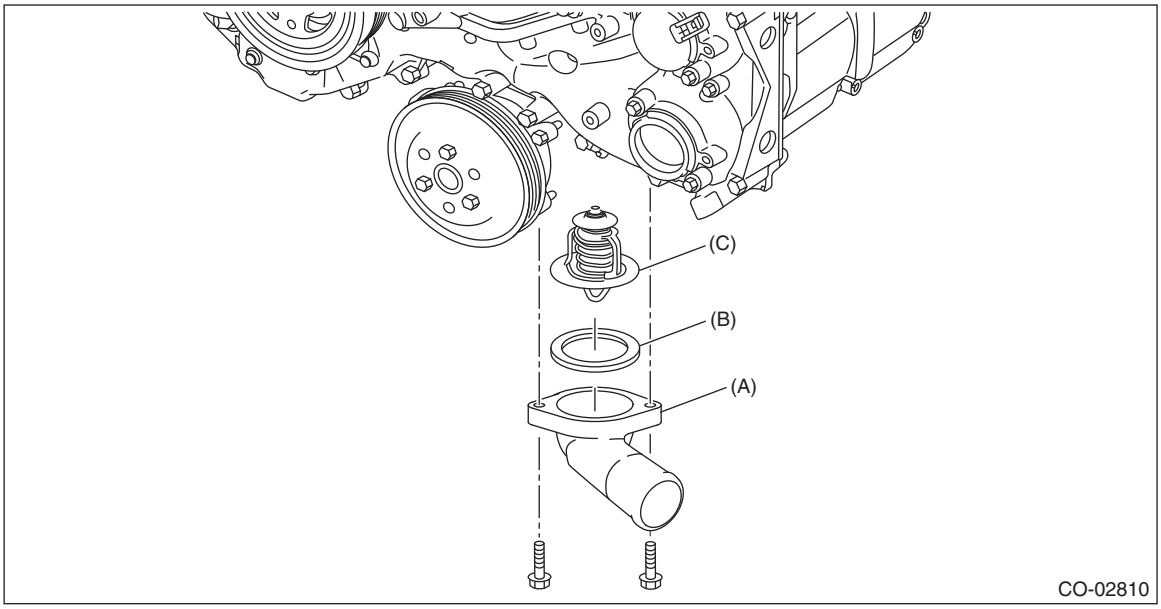
1) Disconnect the ground cable from battery.



2) Lift up the vehicle.
3) Remove the under cover. <Ref. to EI-26, REMOVAL, Front Under Cover.>
4) Drain engine coolant. <Ref. to CO(H4DO)-13, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
5) Remove the front exhaust pipe. <Ref. to EX(H4DO)-5, REMOVAL, Front Exhaust Pipe.>
6) Disconnect the radiator outlet hose from thermostat cover.



7) Remove the thermostat cover, and then remove the gasket and thermostat.



(A) Thermostat cover (B) Gasket (C) Thermostat

B: INSTALLATION

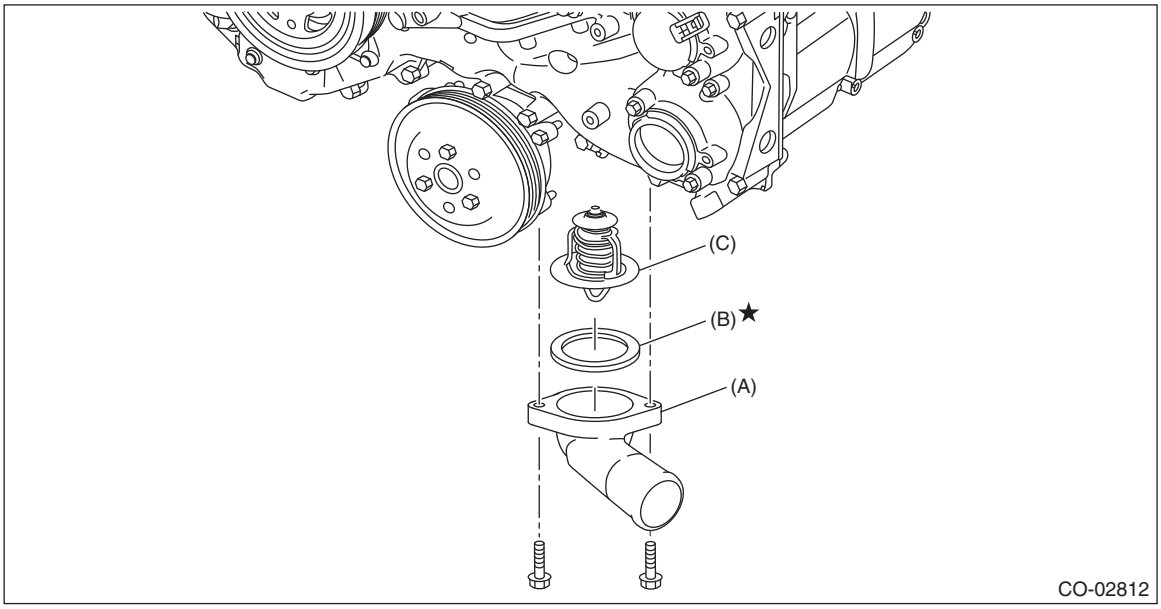
1) Install a gasket to thermostat.

NOTE:
Use a new gasket.

2) Install the thermostat and thermostat cover.

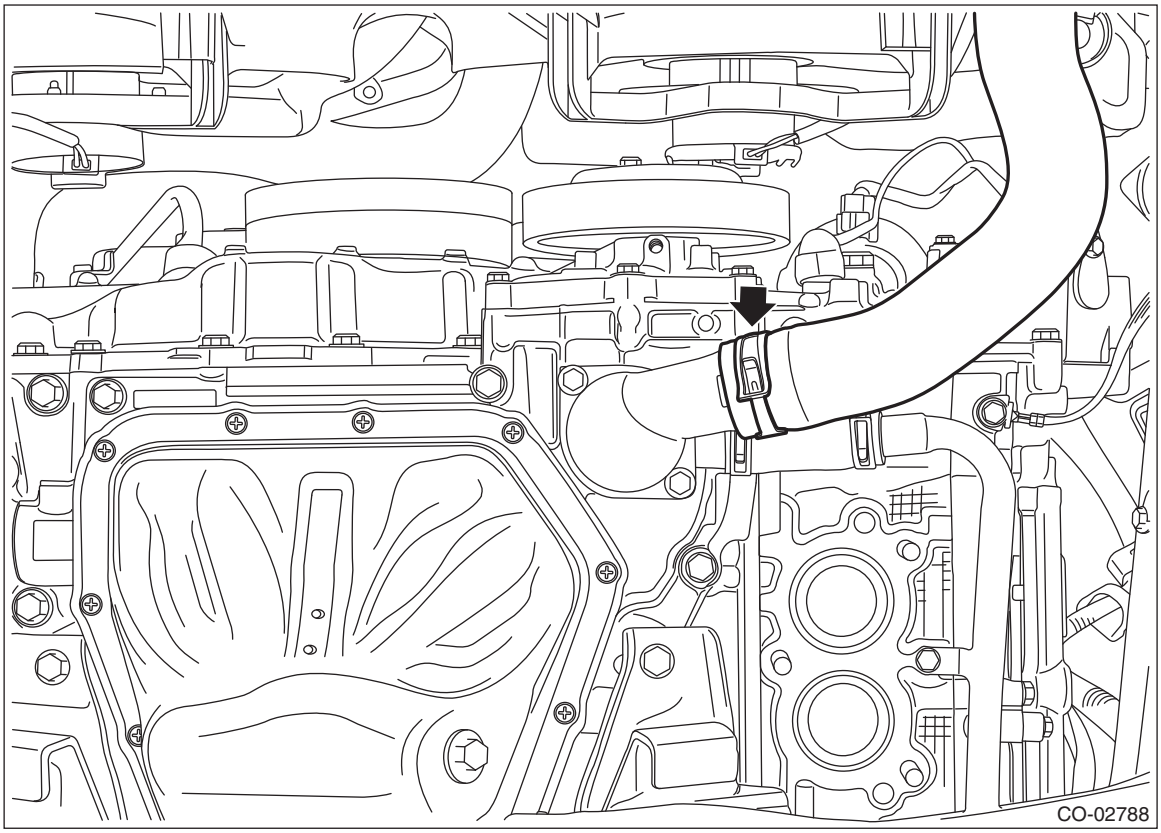
NOTE:
Use a new gasket.

Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)

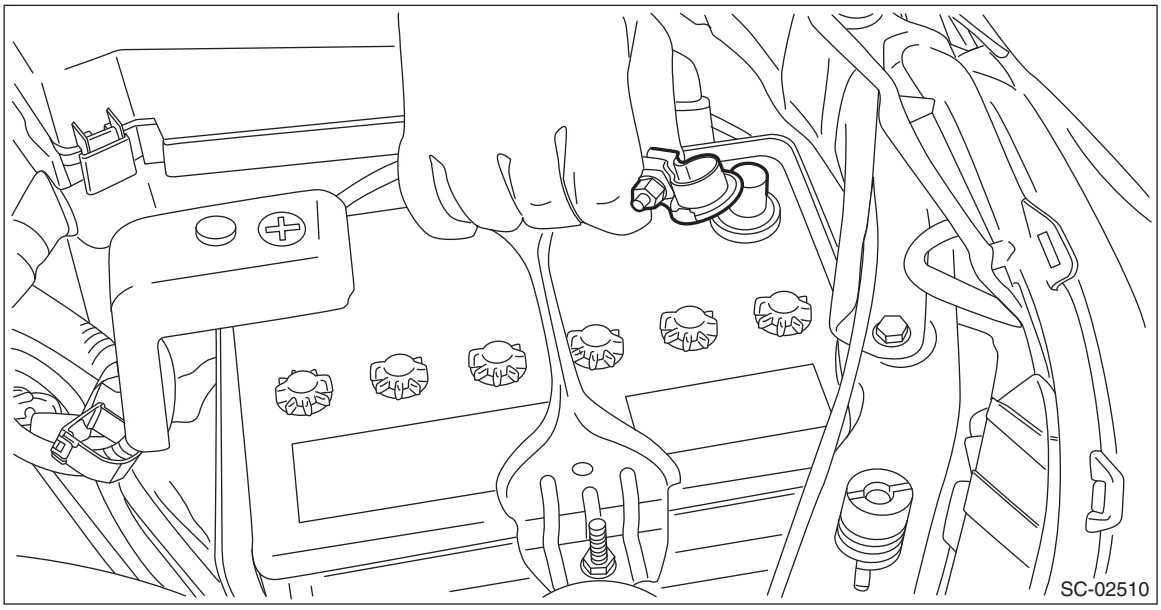


(A) Thermostat cover (B) Gasket (C) Thermostat

3) Connect the radiator outlet hose to thermostat cover.



4) Install the front exhaust pipe. <Ref. to EX(H4DO)-8, INSTALLATION, Front Exhaust Pipe.>
5) Install the under cover. <Ref. to EI-26, INSTALLATION, Front Under Cover.>
6) Lower the vehicle.
7) Connect the battery ground terminal.



8) Fill engine coolant. <Ref. to CO(H4DO)-13, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

C: INSPECTION

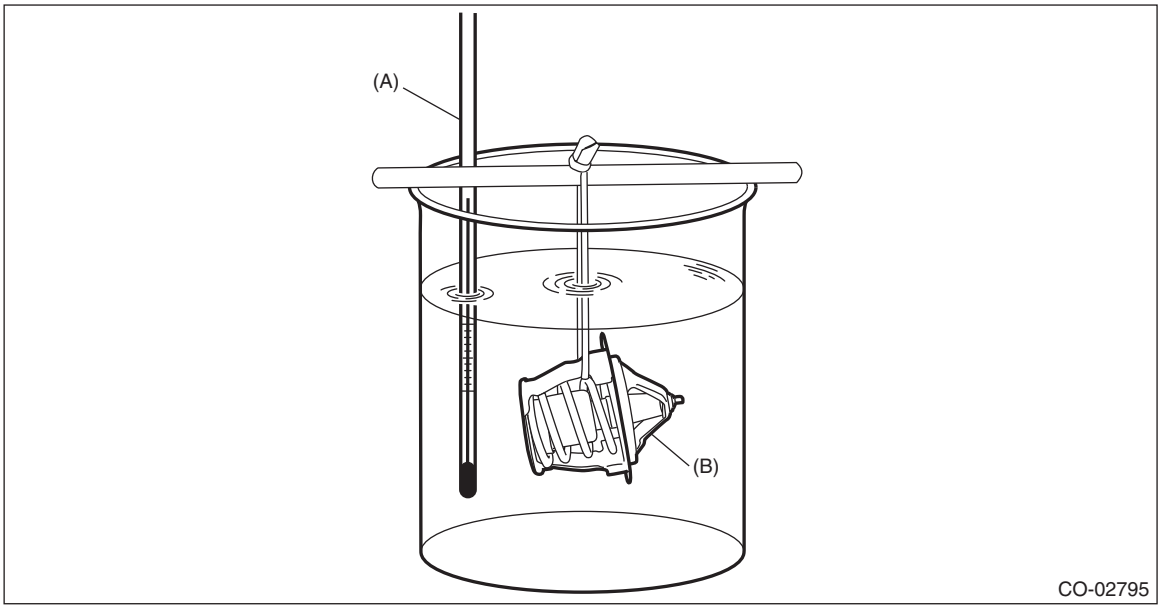
1) Check that the thermostat does not have deformation, cracks or damage.
2) Check that the thermostat valve closes completely at an ambient temperature.
3) Immerse the thermostat and a thermometer in water. Raise water temperature gradually, and check the temperature and valve lift when the valve begins to open and when the valve is fully opened. Replace the thermostat if faulty.

NOTE:
- During the test, agitate the water for even temperature distribution.
- Leave the thermostat in the boiling water for five minutes or more before measuring the valve lift.
- Hold the thermostat with a wire or the like to avoid contacting with container bottom.

Starting temperature to open:
86 — 90°C (187 — 194°F)

Full open temperature:
95°C (203°F)

Total valve lift:
8.0 mm (0.315 in) or more



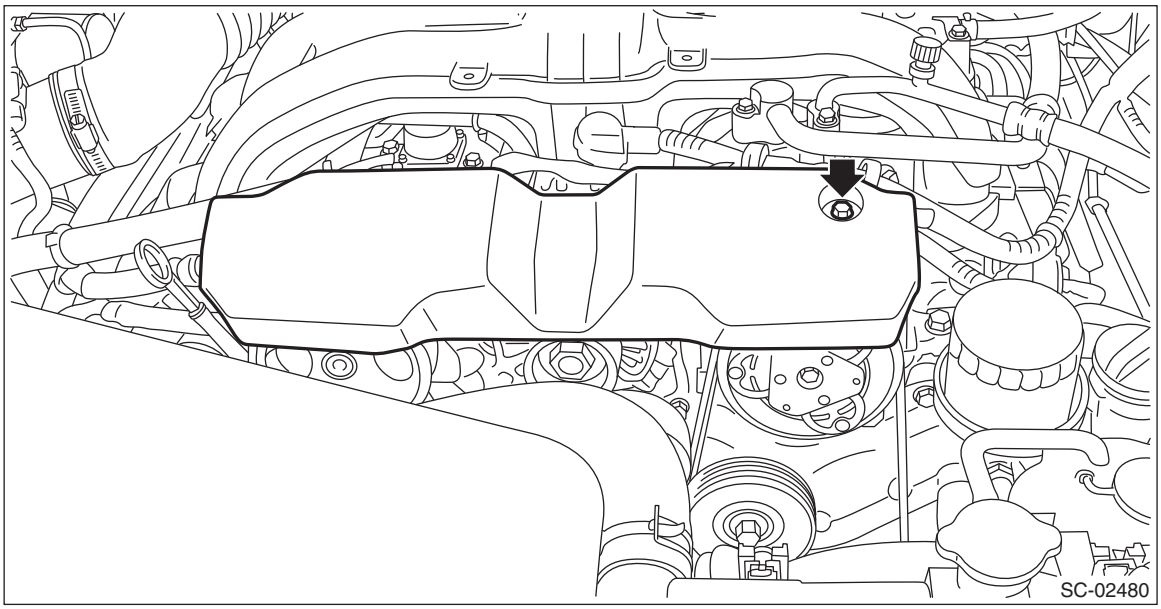
(A) Thermometer (B) Thermostat

6. Radiator

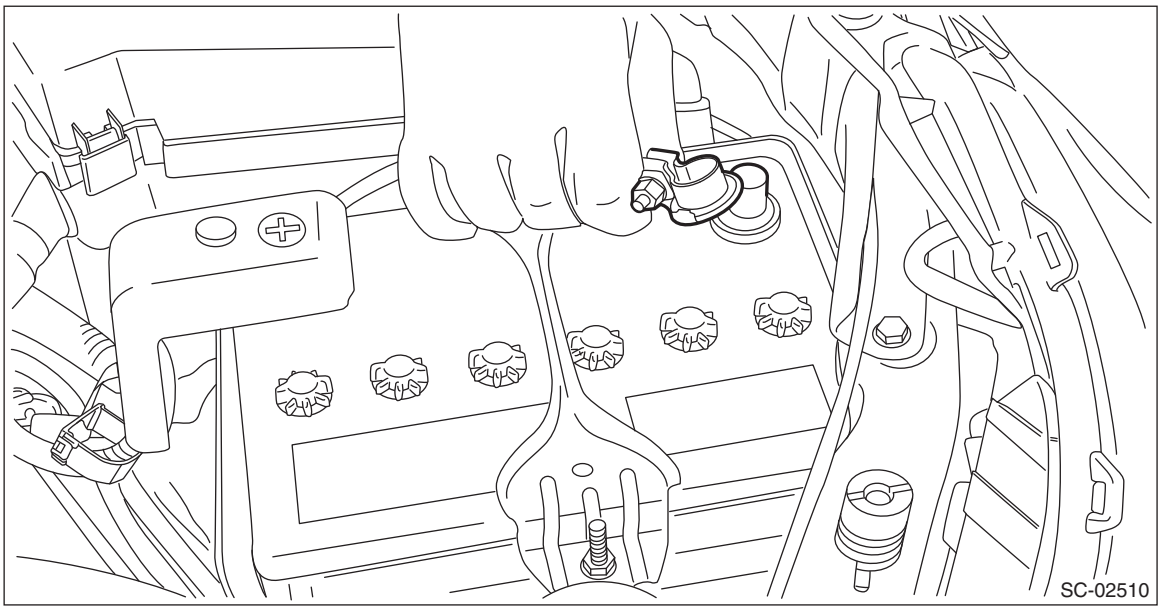
A: REMOVAL

CAUTION:
The radiator is pressurized when the engine and radiator are hot. Wait until engine and radiator cool down before working on the radiator.

1) Remove the V-belt covers.

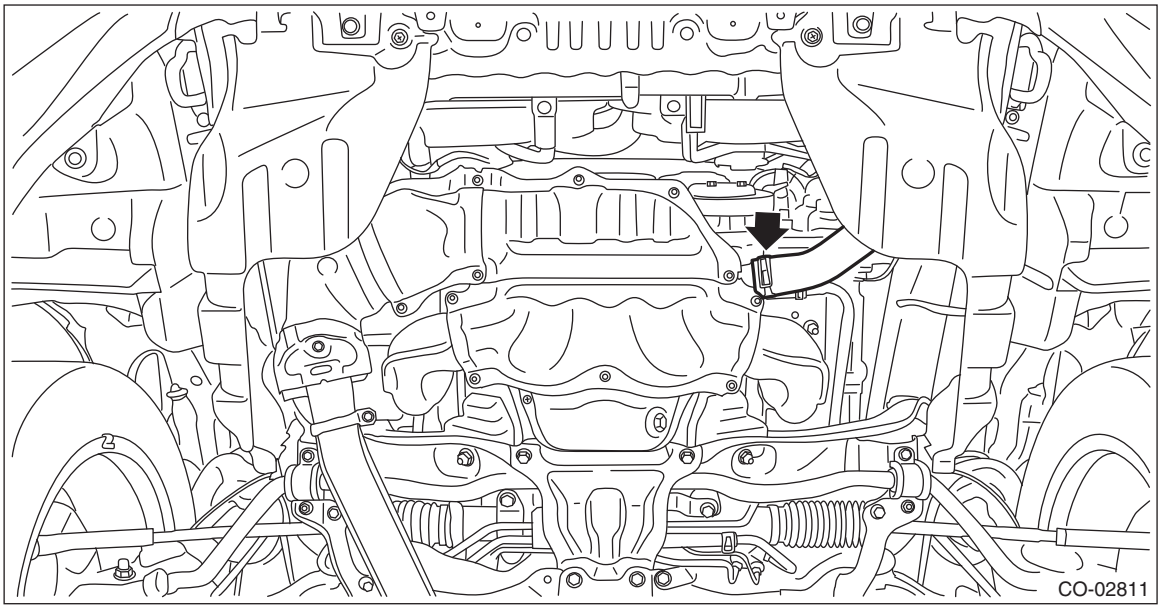


2) Disconnect the ground cable from battery.



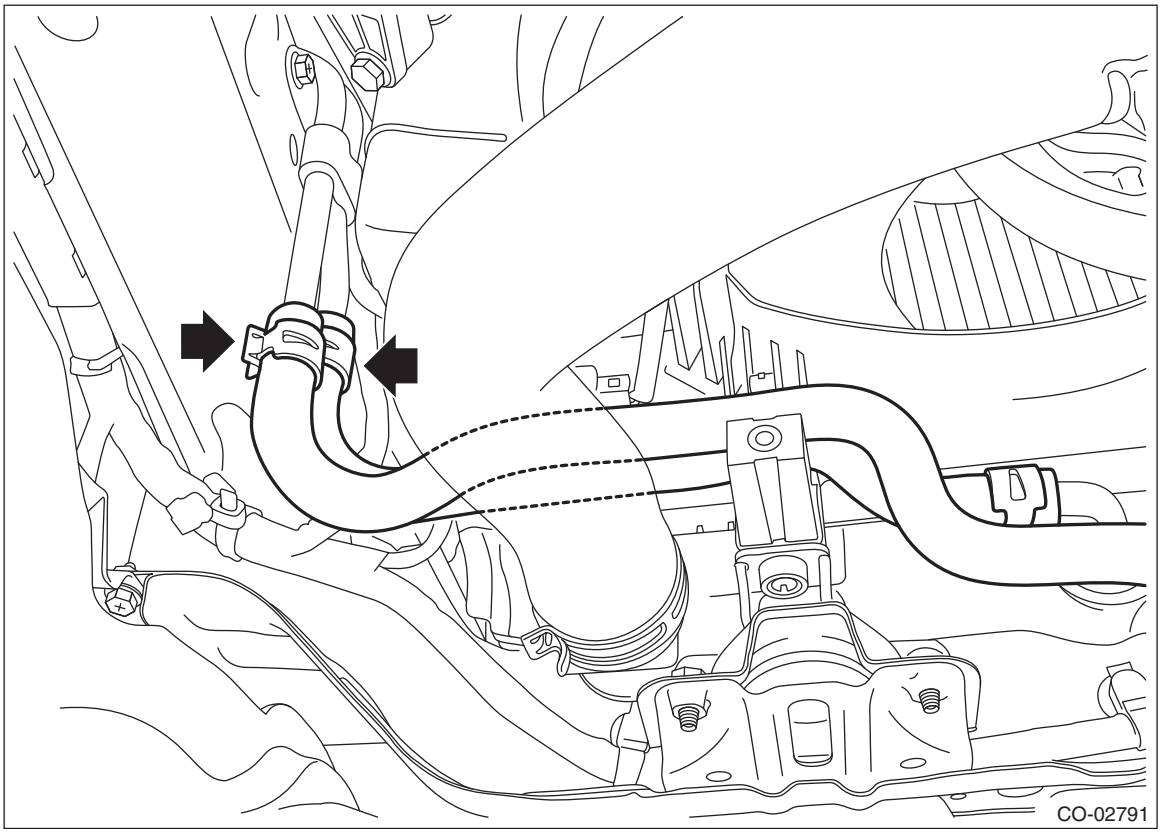
3) Lift up the vehicle.
4) Drain engine coolant. <Ref. to CO(H4DO)-13, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

5) Disconnect the radiator outlet hose from thermostat cover.



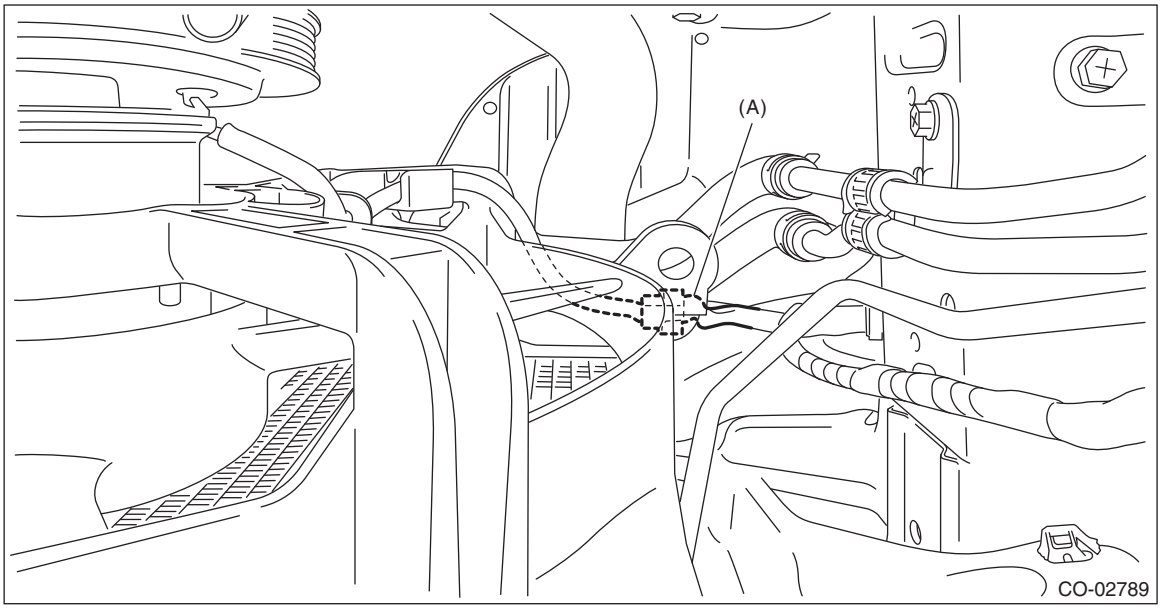
6) Disconnect the ATF cooler hoses from ATF pipes. (AT model)

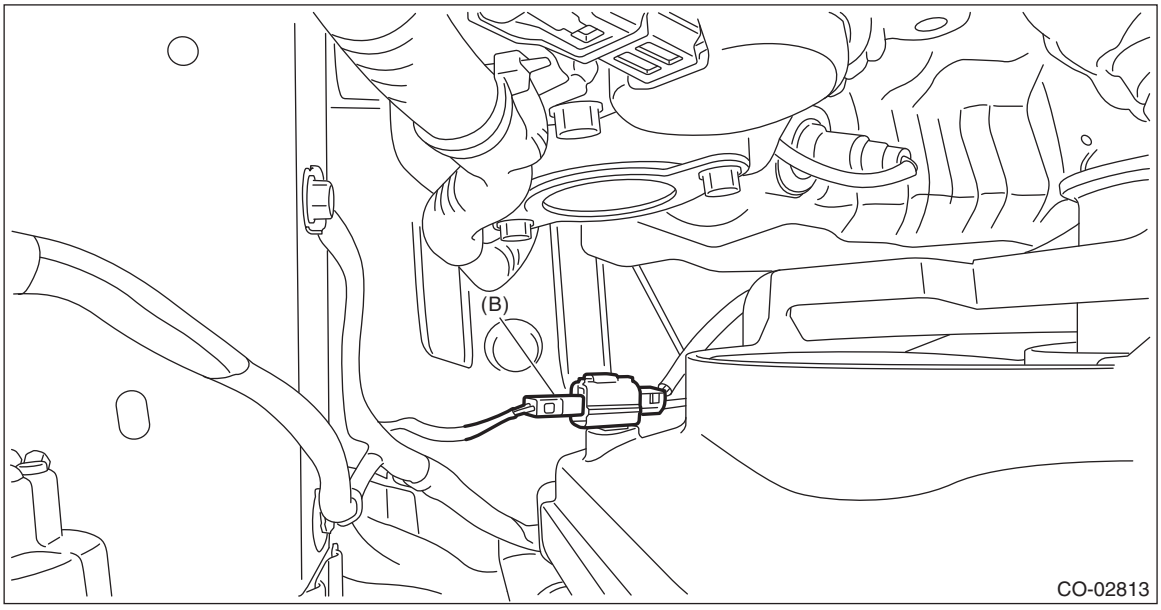
NOTE:
Plug the ATF pipe to prevent ATF from leaking.



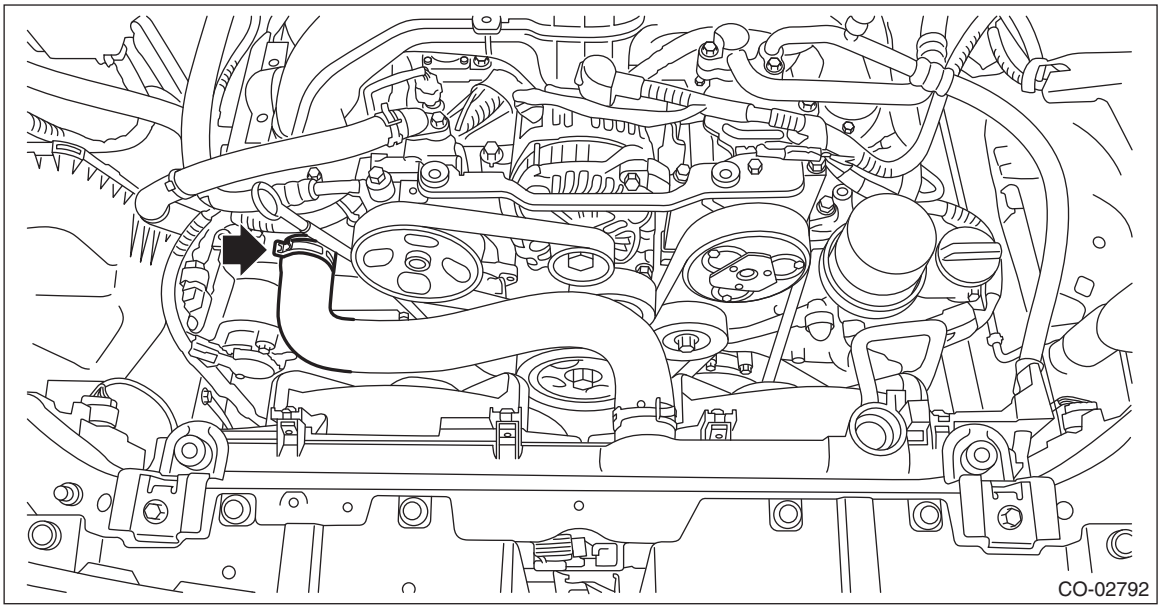
7) Lower the vehicle.
8) Remove the air intake duct (Rear). <Ref. to IN(H4DO)-14, REMOVAL, Air Intake Duct.>
9) Remove the reservoir tank. <Ref. to CO(H4DO)-40, REMOVAL, Reservoir Tank.>

10) Disconnect the connector (A) from the main fan motor assembly and the connector (B) from the sub fan motor assembly.

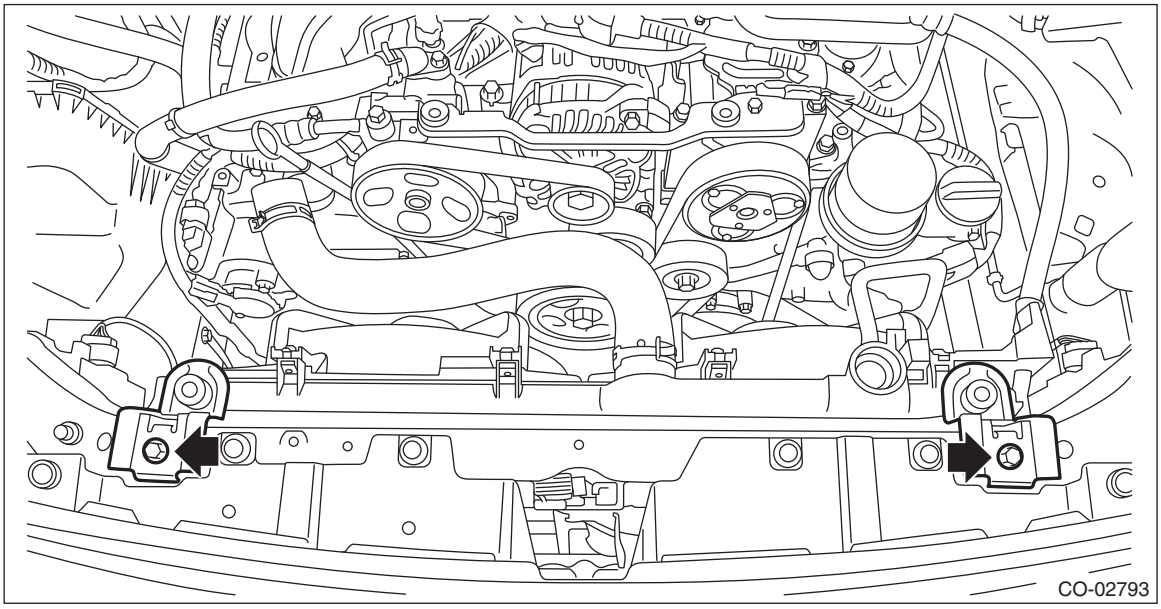




11) Disconnect the radiator inlet hose from the water pipe assembly.



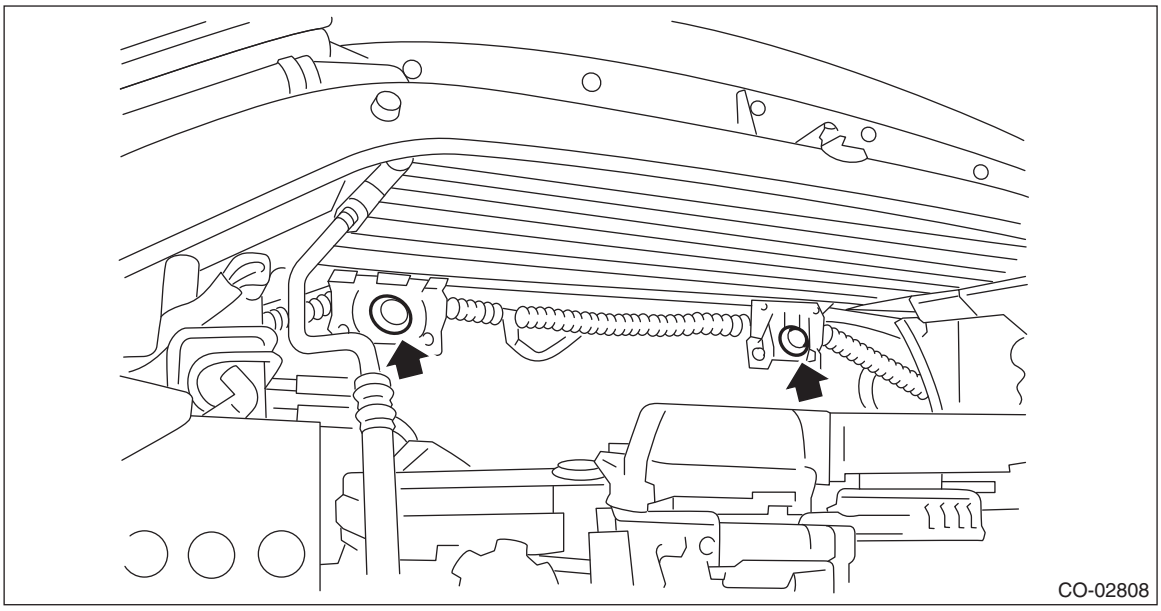
12) Remove the radiator upper brackets.



13) Lift the radiator up and away from vehicle.

B: INSTALLATION

1) Attach the radiator lower cushion to the radiator lower bracket.

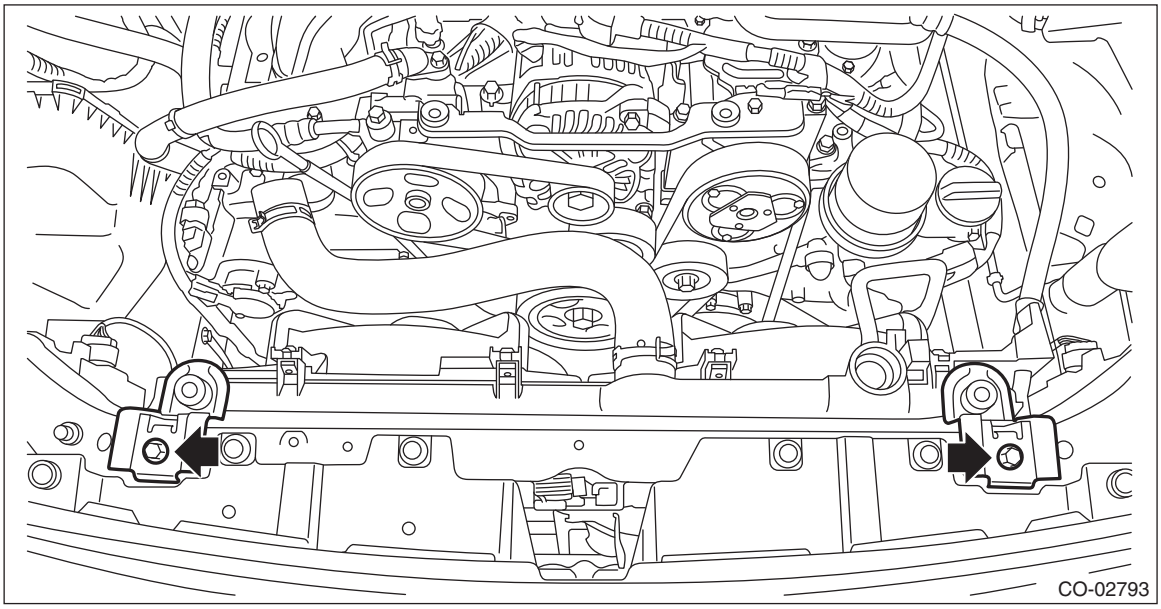


2) Install the radiator to vehicle.

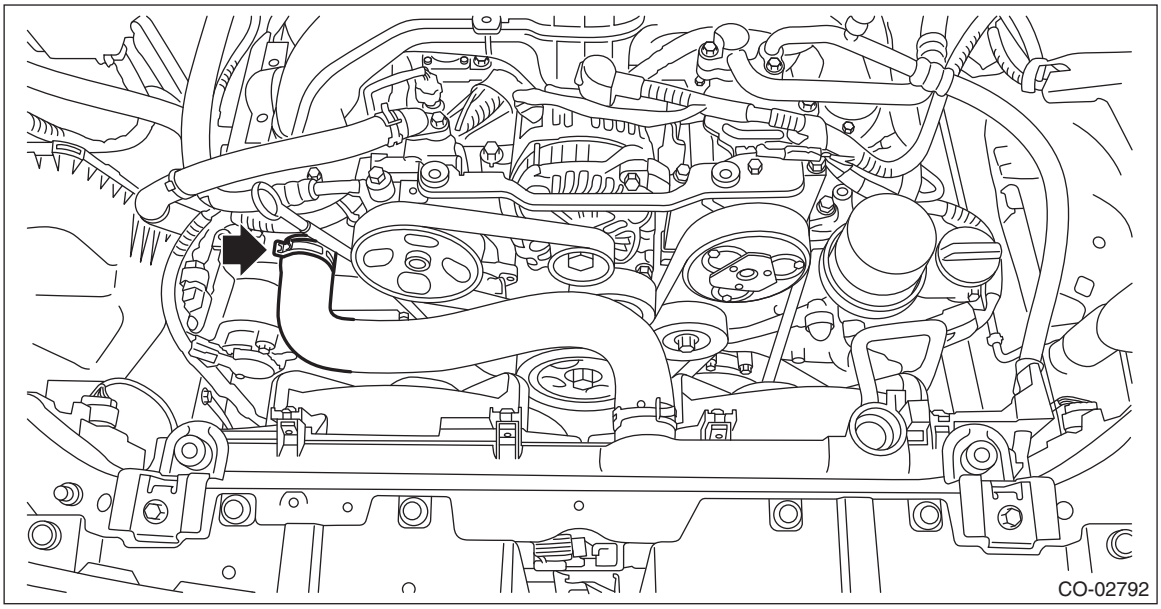
NOTE:
Make pins on the lower side of radiator be fitted into the radiator lower cushions.

3) Install the radiator upper brackets.

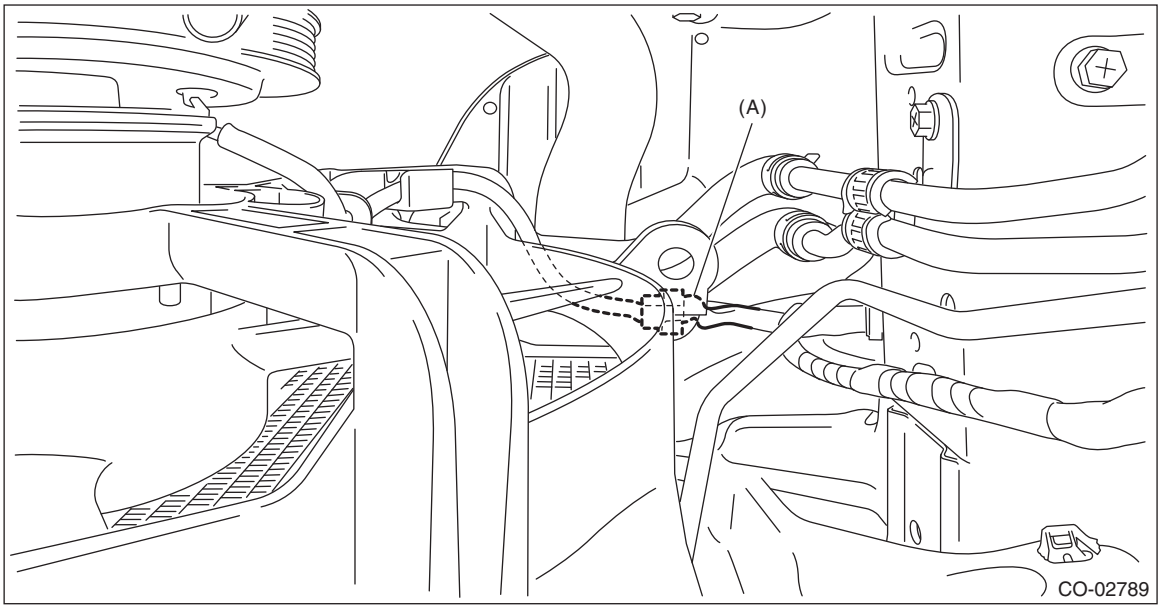
Tightening torque:
12 N·m (1.2 kgf-m, 8.9 ft-lb)

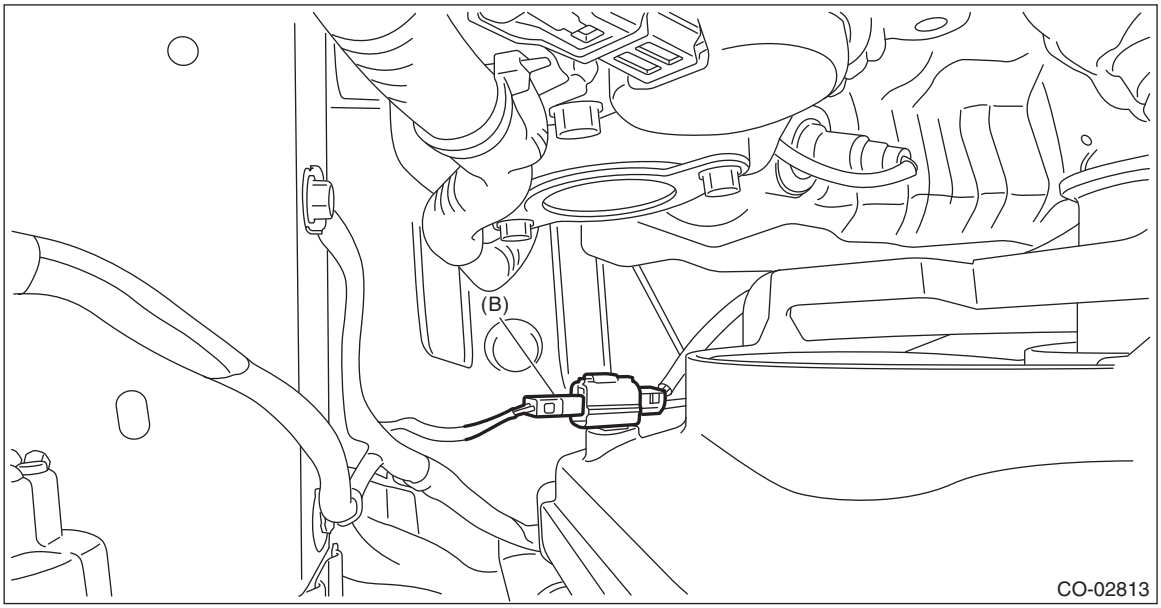


4) Connect the radiator inlet hose to the water pipe assembly.



5) Connect the connector (A) to the main fan motor assembly and the connector (B) to the sub fan motor assembly.

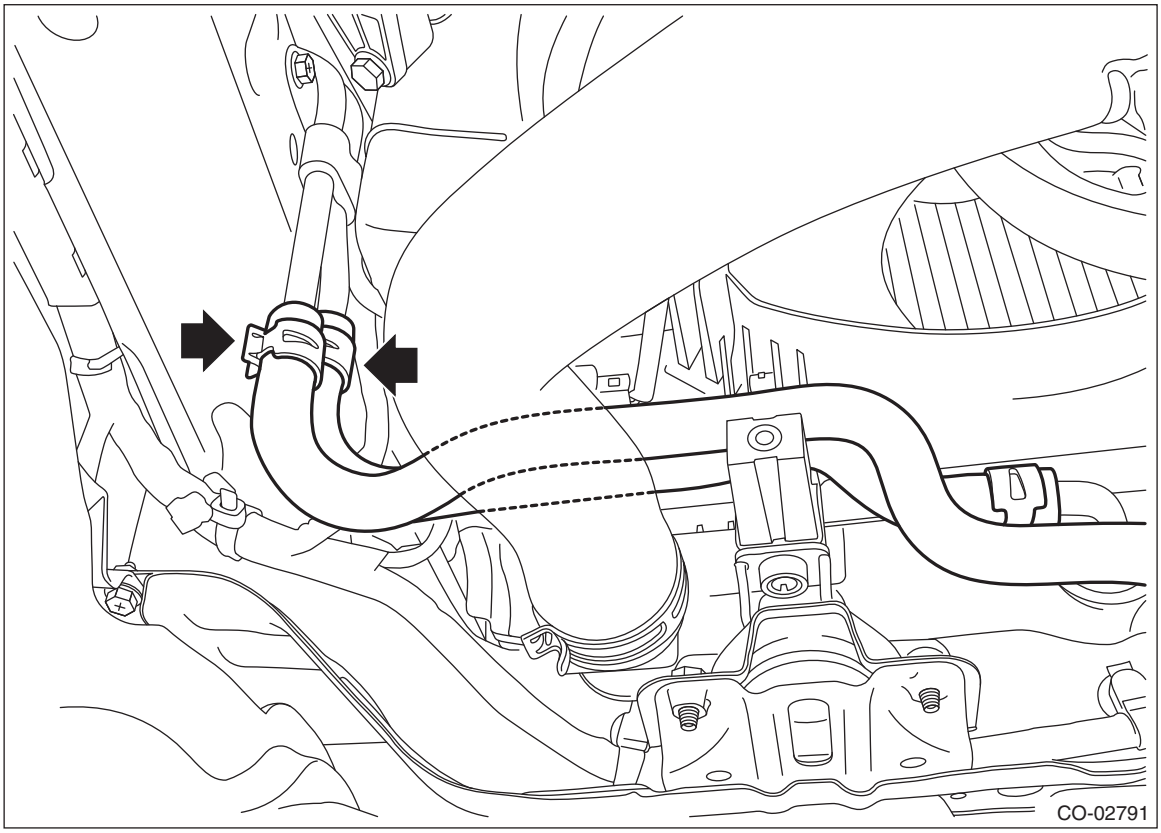




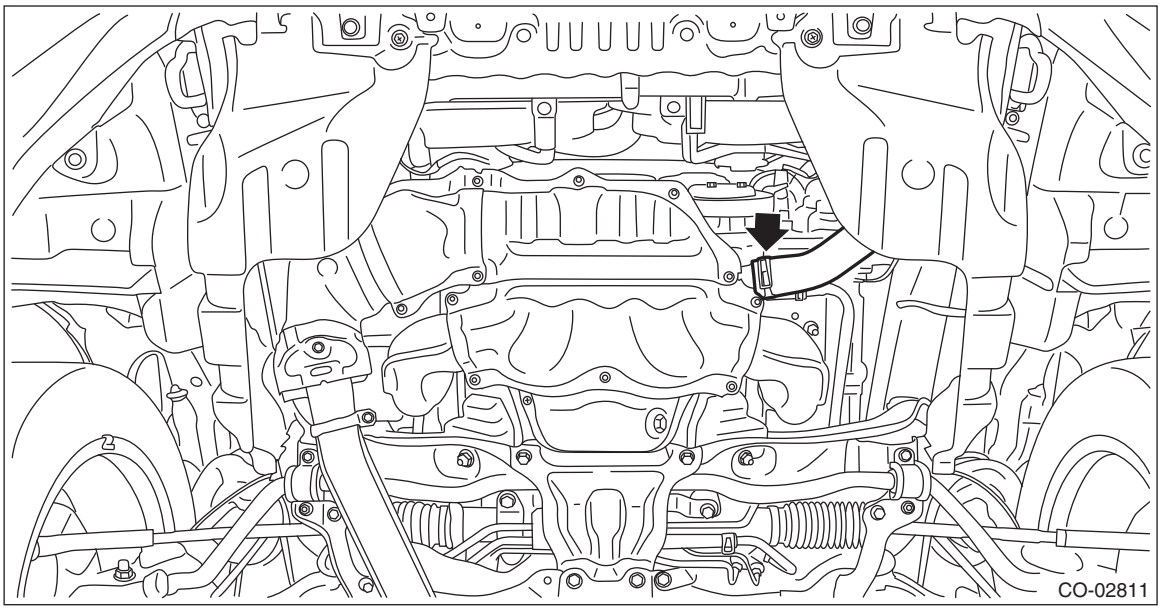
6) Install the reservoir tank. <Ref. to CO(H4DO)-40, INSTALLATION, Reservoir Tank.>
7) Install the air intake duct (rear). <Ref. to IN(H4DO)-14, INSTALLATION, Air Intake Duct.>
8) Lift up the vehicle.

9) Connect the ATF hoses to the ATF pipes. (AT model)

NOTE:
Use a new ATF hose.

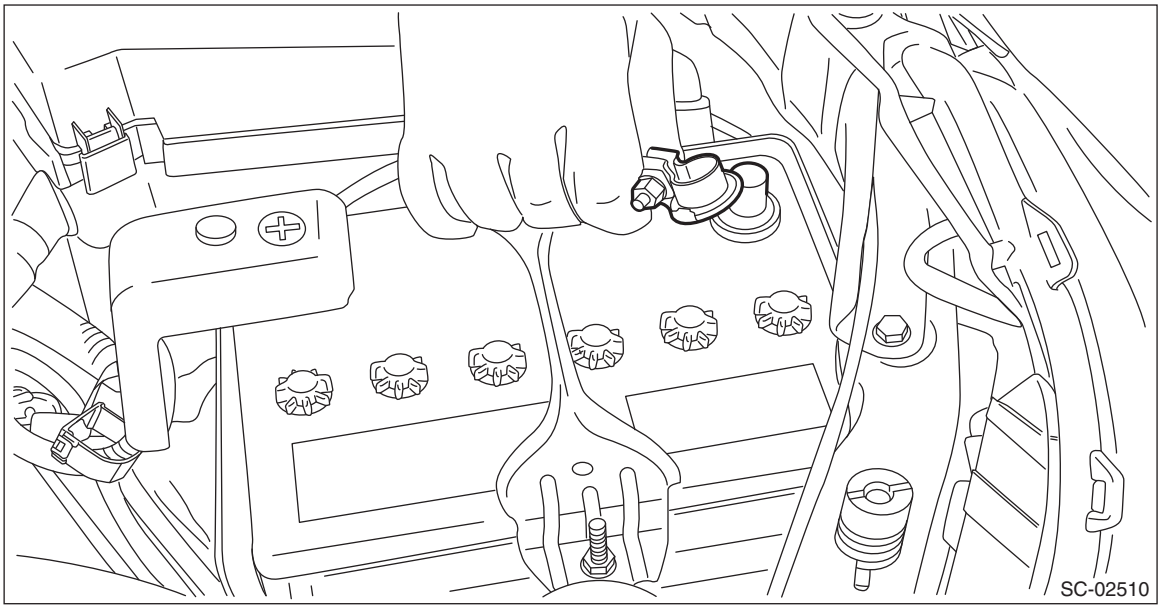


10) Connect the radiator outlet hose.



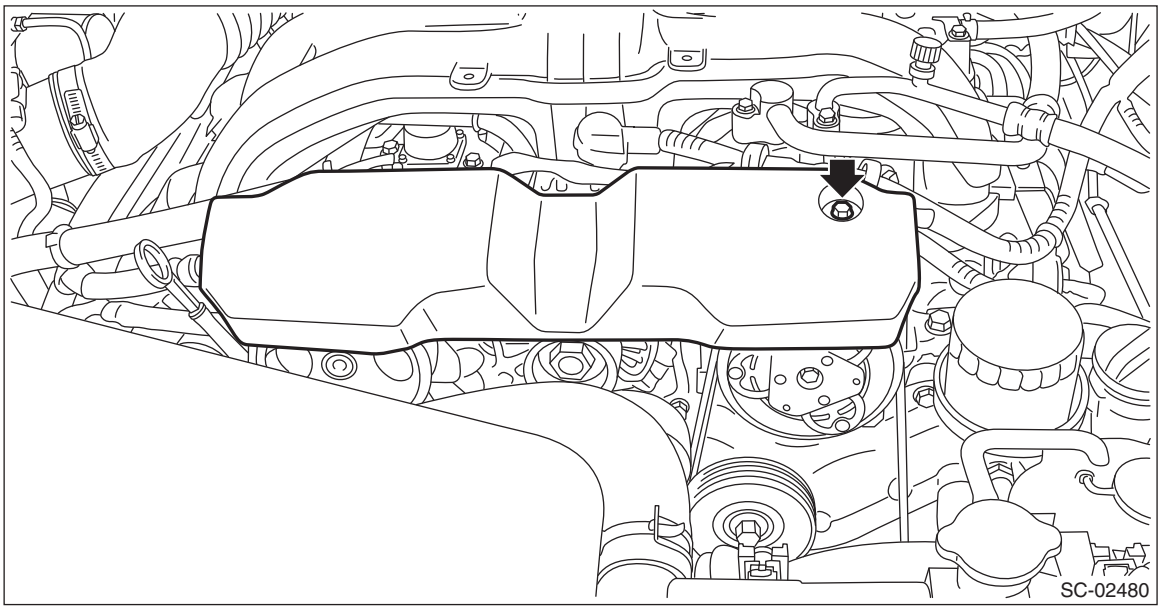
11) Lower the vehicle.

12) Connect the battery ground terminal.



13) Install the V-belt cover.

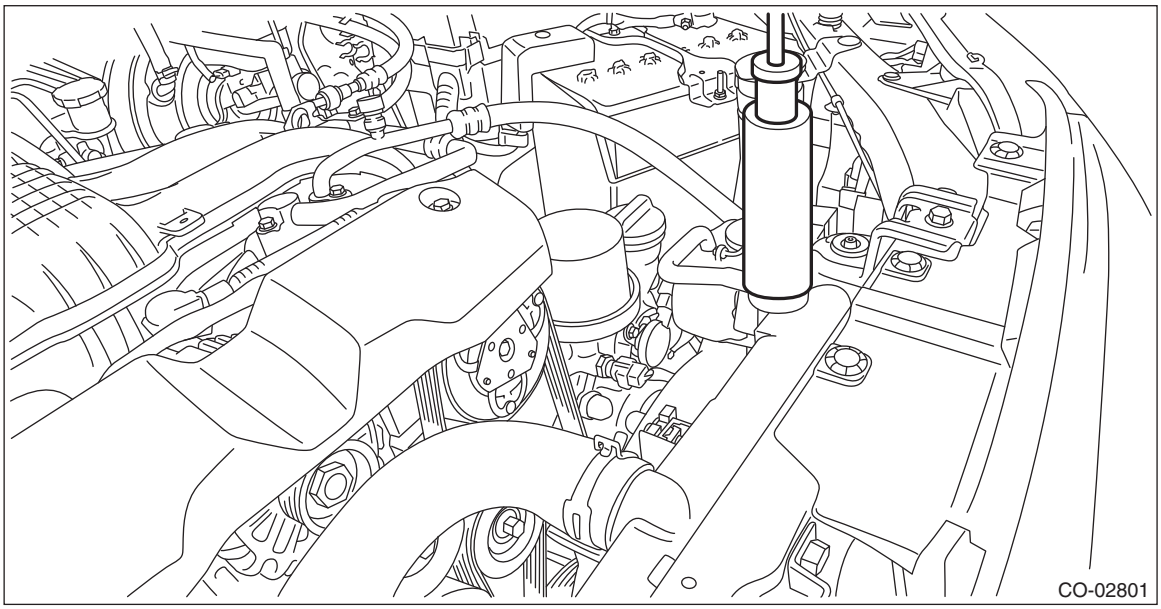
Tightening torque:
13 N·m (1.3 kgf-m, 9.6 ft-lb)



14) Fill engine coolant. <Ref. to CO(H4DO)-13, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
15) Check the ATF level. (AT model) <Ref. to 4AT-27, INSPECTION, Automatic Transmission Fluid.>

C: INSPECTION

1) Check that the radiator does not have deformation, cracks or damage.
2) Check that the hose has no cracks, damage or loose part.
3) Remove the radiator cap, fill the radiator with engine coolant, and then install the radiator cap tester to the filler neck of radiator.



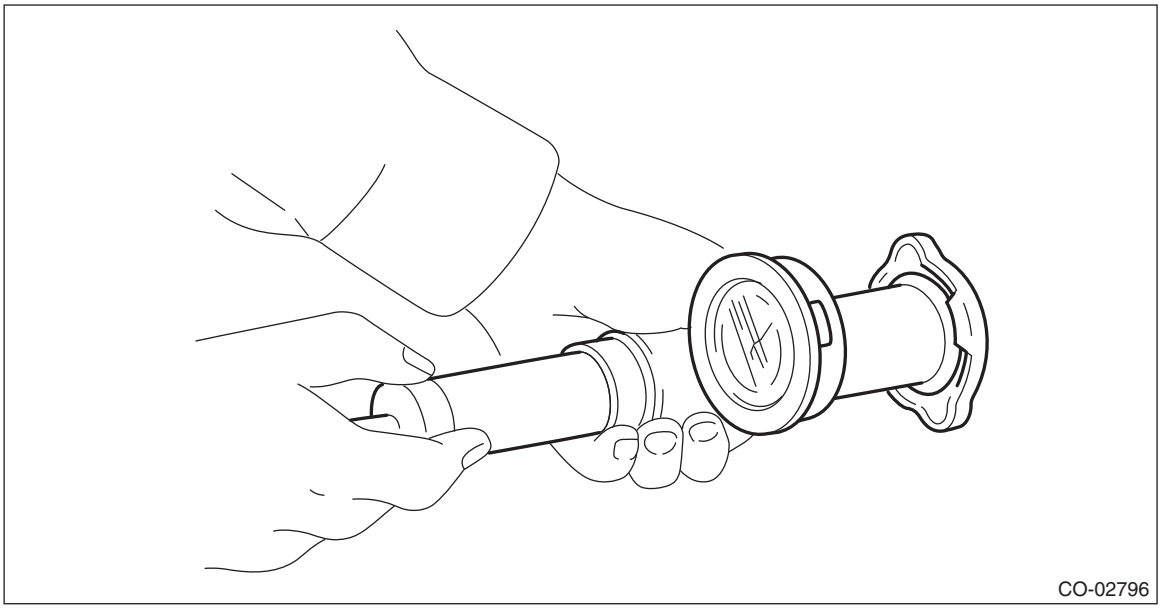
4) Apply a pressure of 157 kPa (1.6 kgf/cm^2, 23 psi) to the radiator, and check the following items.
- Leakage from the radiator or its vicinity
- Leakage from the hose or its connections

CAUTION:
- **Engine should be turned off.**
- **Wipe engine coolant from check points in advance.**
- **Be careful of engine coolant from spurting out when removing the radiator cap tester.**
- **Be careful not to deform the filler neck of radiator when installing and removing the radiator cap tester.**

7. Radiator Cap

A: INSPECTION

1) Check that the radiator cap does not have deformation, cracks or damage.
2) Attach the radiator cap tester to radiator cap.



3) Increase pressure until the radiator cap tester gauge needle stops. Radiator cap is functioning properly if it holds the service limit pressure for 5 — 6 seconds. Replace the radiator cap if its valve opens at less than the service limit.

Standard:
93 — 123 kPa (0.95 — 1.25 kgf/cm^2, 14 — 18 psi)

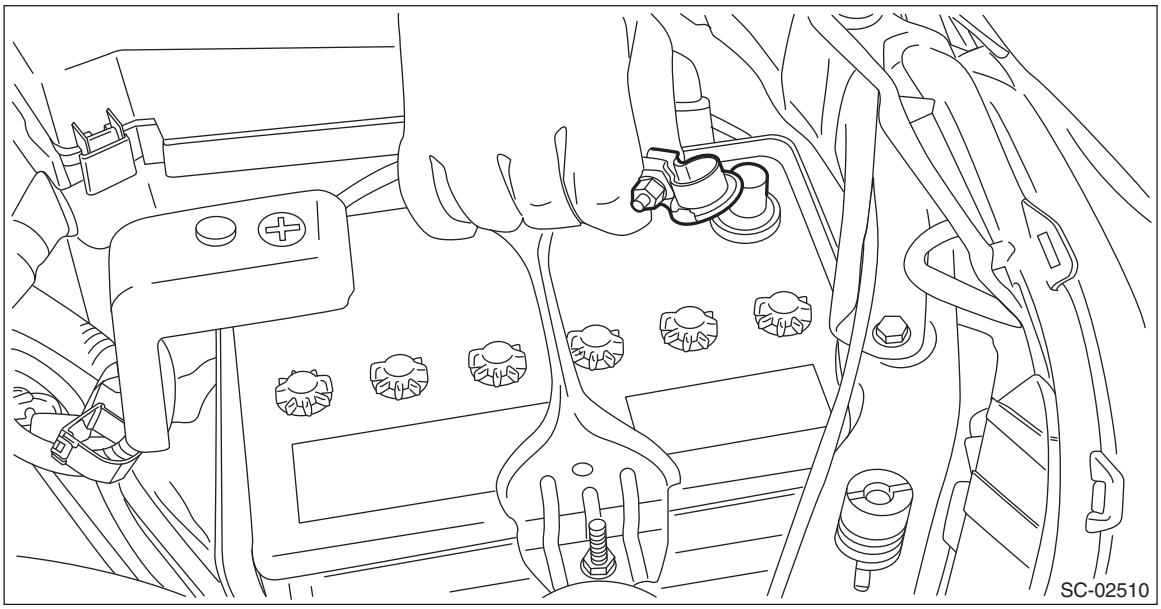
Service limit:
83 kPa (0.85 kgf/cm^2, 12 psi)

CAUTION:
Be sure to remove foreign matter and rust from the cap in advance. Otherwise, results of pressure test will be incorrect.

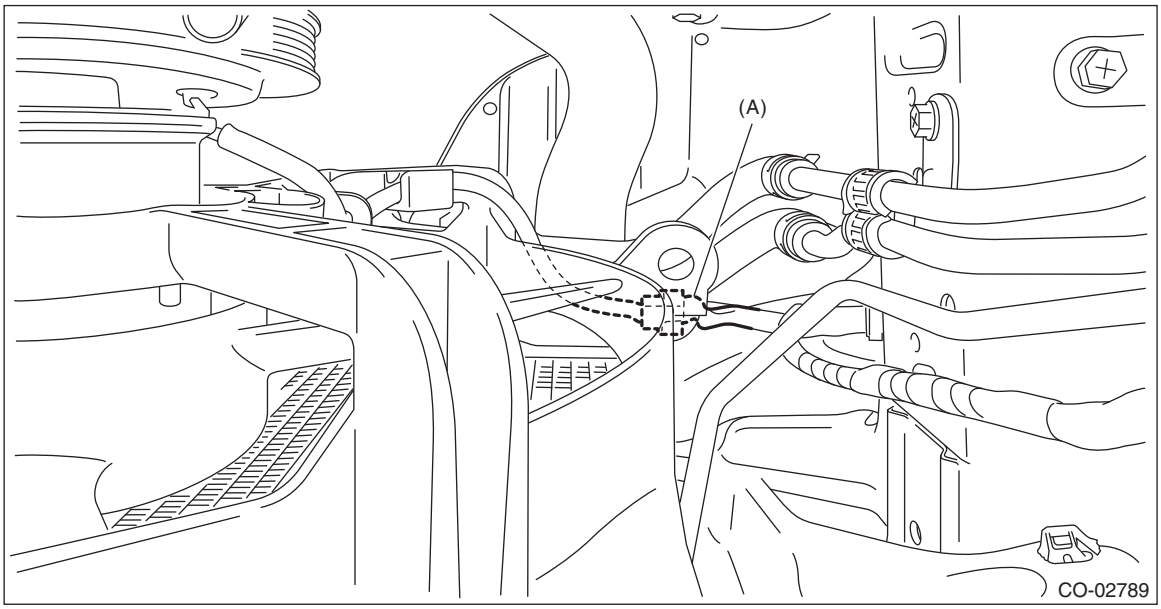
8. Radiator Main Fan and Fan Motor

A: REMOVAL

1) Disconnect the ground cable from battery.

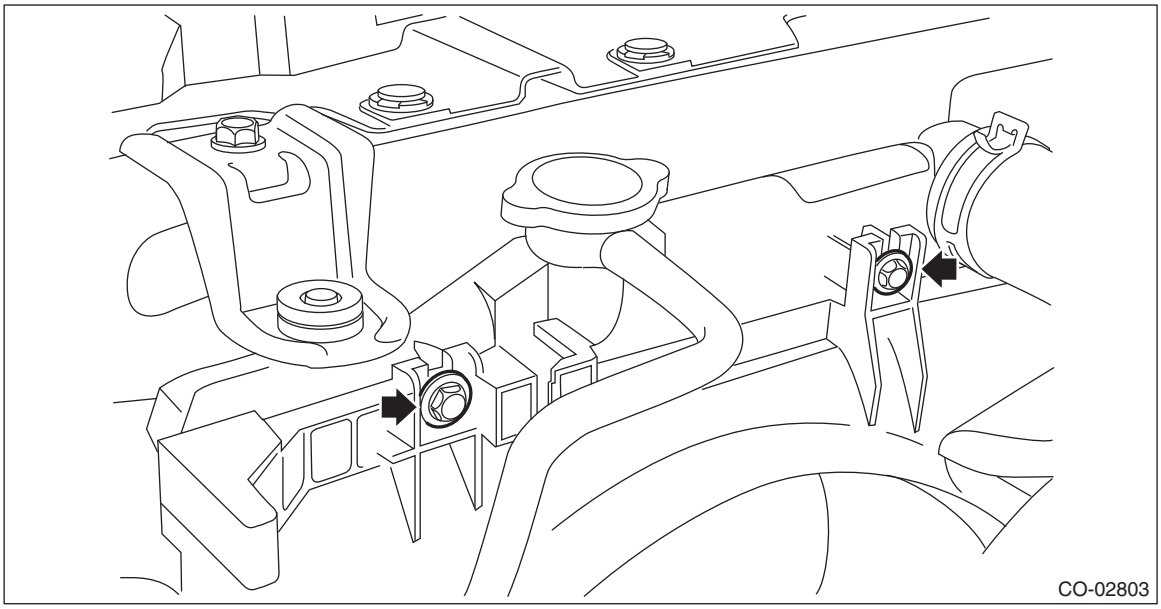


2) Remove the reservoir tank. <Ref. to CO(H4DO)-40, REMOVAL, Reservoir Tank.>
3) Disconnect the connector (A) from the main fan motor assembly.



4) Remove the ATF hose from the clip of the radiator main fan shroud. (AT model)

5) Remove the bolts which hold the radiator main fan shroud onto the radiator.



6) Remove the radiator main fan and fan motor from vehicle.

B: INSTALLATION

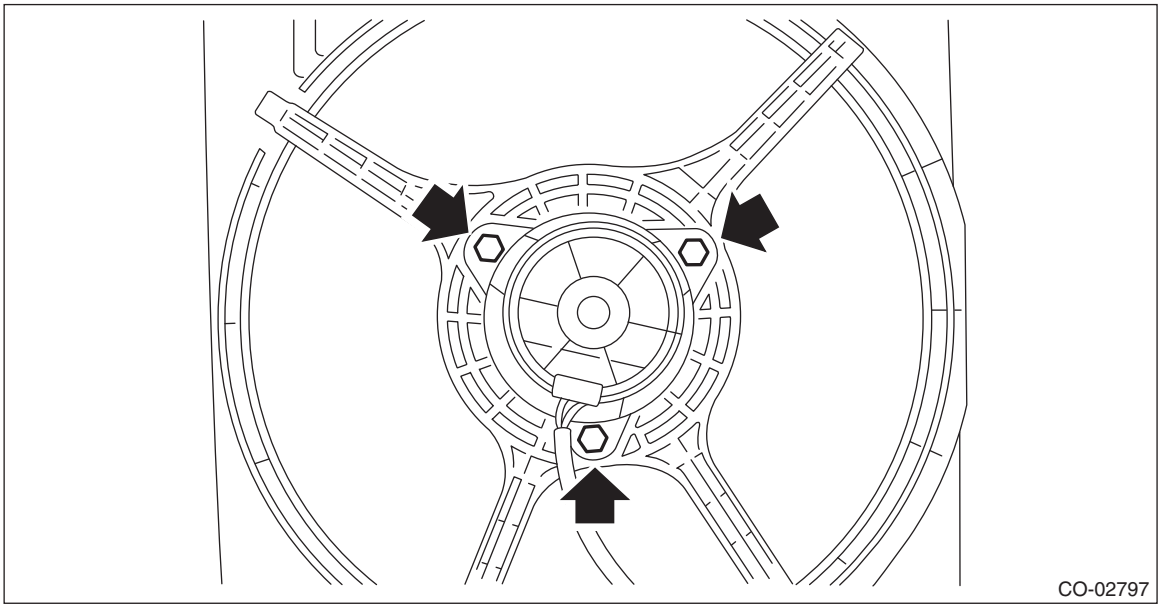
Install in the reverse order of removal.

NOTE:
If the installation of the radiator main fan and fan motor is difficult, attempt installation after loosening the bolts which hold the radiator sub fan shroud to the radiator.

Tightening torque:
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)

C: DISASSEMBLY

1) Remove the clip which holds the main fan motor assembly connector onto the radiator main fan shroud.
2) Remove the main fan motor assembly from the radiator main fan shroud.



D: ASSEMBLY

Assemble in the reverse order of disassembly.

Tightening torque:
5 N·m (0.5 kgf-m, 3.7 ft-lb)

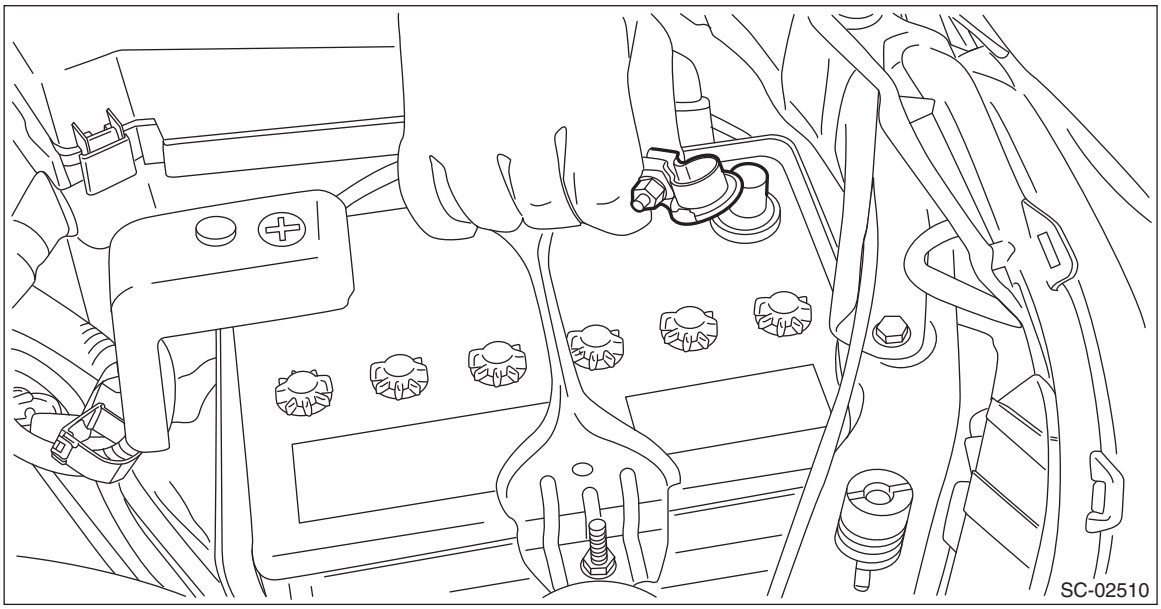
E: INSPECTION

Check that the radiator main fan, radiator main fan shroud and main fan motor assembly do not have deformation, cracks or damage.

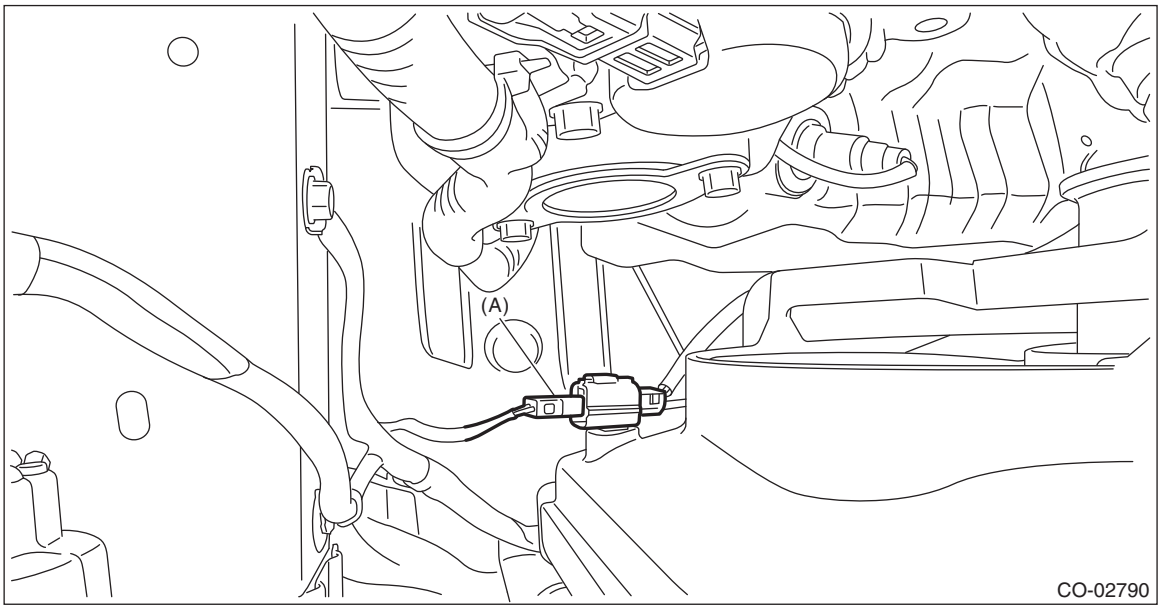
9. Radiator Sub Fan and Fan Motor

A: REMOVAL

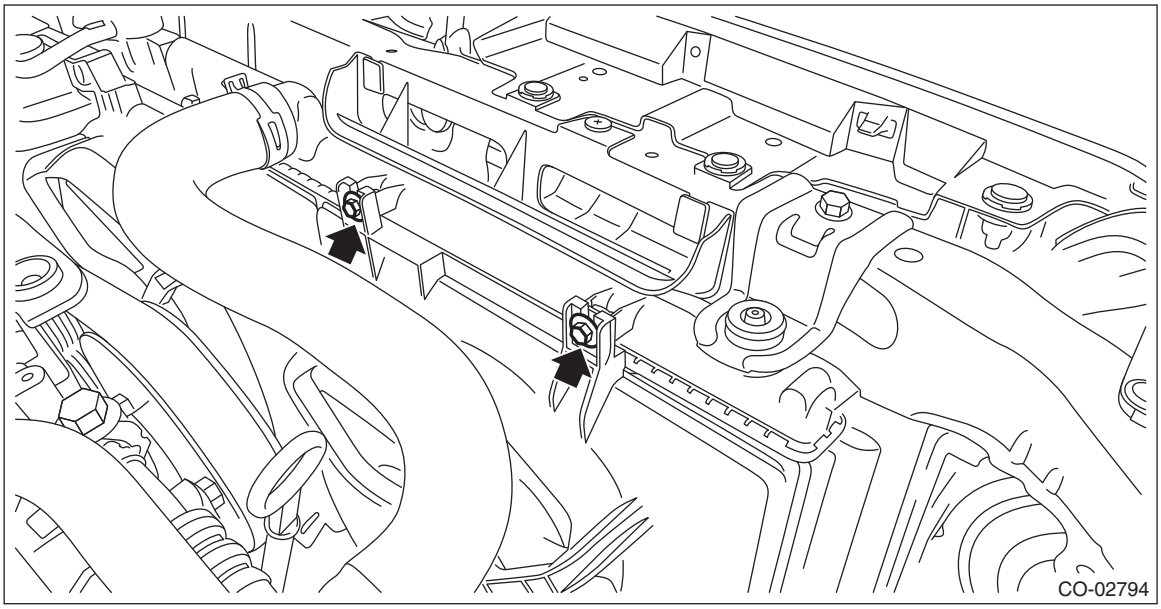
1) Disconnect the ground cable from battery.



2) Remove the air intake duct (Rear). <Ref. to IN(H4DO)-14, REMOVAL, Air Intake Duct.>
3) Disconnect the connector (A) from the sub fan motor assembly.



4) Remove the bolts which hold the radiator sub fan shroud onto the radiator.



5) Remove the radiator sub fan and fan motor from vehicle.

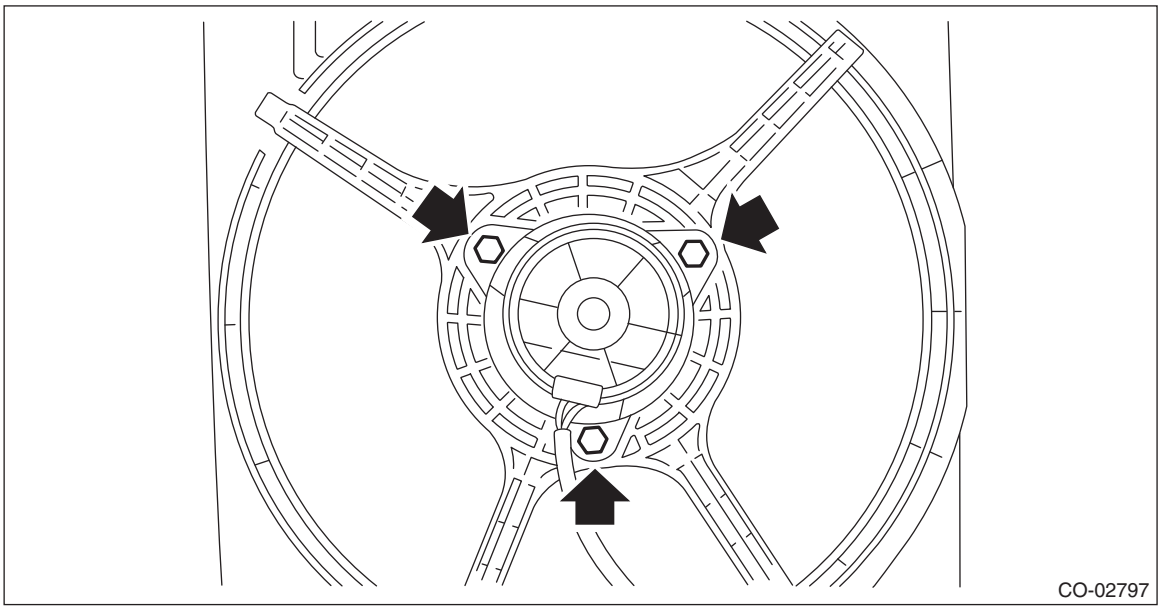
B: INSTALLATION

CAUTION:
Confirm that the radiator hose is securely connected.
Install in the reverse order of removal.

Tightening torque:
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)

C: DISASSEMBLY

1) Remove the clip which holds the sub fan motor assembly connector onto the radiator sub fan shroud.
2) Remove the sub fan motor assembly from the radiator sub fan shroud.



D: ASSEMBLY

Assemble in the reverse order of disassembly.

Tightening torque:
5 N·m (0.5 kgf-m, 3.7 ft-lb)

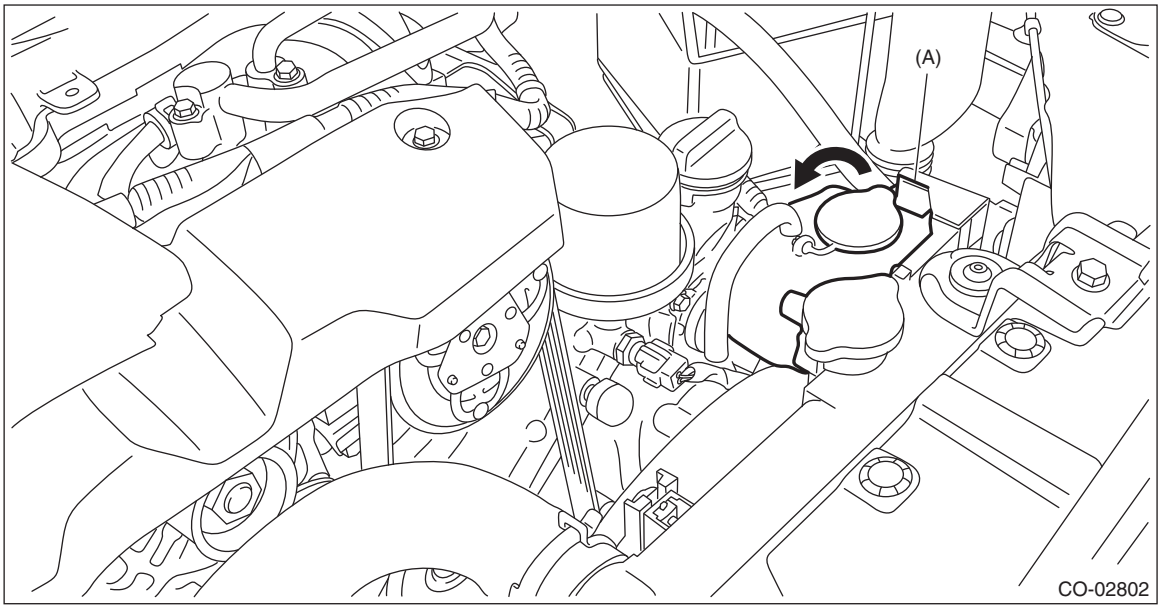
E: INSPECTION

Check that the radiator sub fan, radiator sub fan shroud and sub fan motor assembly do not have deformation, cracks or damage.

10.Reservoir Tank

A: REMOVAL

1) Disconnect the over flow hose connected to the radiator filler neck from the reservoir tank.
2) Push in the claw (A), and pull the reserve tank in the direction of the arrow to remove.



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

1) Check that the reservoir tank does not have deformation, cracks or damage.
2) Make sure the over flow hoses are not cracked, damaged or loose.
3) Make sure the engine coolant level is between “FULL” and “LOW”.

11.Engine Cooling System Trouble in General

A: INSPECTION

Trouble	Possible cause	Corrective action
Over-heating	a. Insufficient engine coolant	Replenish engine coolant, inspect for leakage, and repair it if necessary.
	b. Defective thermostat	Replace.
	c. Malfunction of water pump	Replace.
	d. Clogged engine coolant passage	Clean.
	e. Improper ignition timing	Inspect and repair ignition control system. <Ref. to EN(H4DO)(diag)-2, Basic Diagnostic Procedure.>
	f. Clogged or leaking radiator	Clean, repair or replace.
	g. Defective radiator cap	Replace.
	h. Improper engine oil in engine coolant	Replace the engine coolant. If ineffective, check, repair or replace engine components.
	i. Air/fuel mixture ratio too lean	Inspect and repair the fuel injection system. <Ref. to EN(H4DO)(diag)-2, Basic Diagnostic Procedure.>
	j. Excessive back pressure in exhaust system	Clean or replace.
	k. Insufficient clearance between piston and cylinder	Adjust or replace.
	l. Slipping clutch	Repair or replace.
	m. Dragging brake	Adjust.
	n. Malfunction of 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	Repair or replace.
	b. Leakage from water pump	Replace.
	c. Leakage from water pipe	Repair or replace.
	d. Leakage around cylinder head gasket	Retighten cylinder head bolts or replace cylinder head gasket.
	e. Damaged or cracked cylinder head and cylinder block	Repair or replace.
	f. Damaged or cracked thermostat cover	Repair or replace.
	g. Leakage from radiator	Repair or replace.
Noise	a. Defective radiator fan	Replace.
	b. Defective water pump bearing	Replace water pump.
	c. Defective water pump mechanical seal	Replace water pump.

LUBRICATION

LU(H4DO)

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7. Engine Oil Filter 28
8. Engine Lubrication System Trouble in General 30

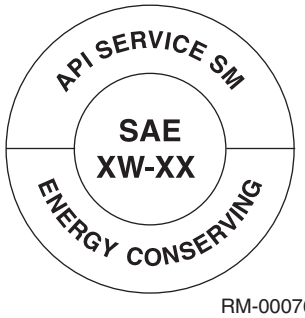
1. General Description

A: SPECIFICATION

Lubrication method					Forced lubrication
Oil pump	Pump type				Trochoid type
	Number of teeth	Inner rotor			11
		Outer rotor			12
	Outer rotor diameter × thickness			mm (in)	77 × 12 (3.03 × 0.47)
	Performance (Oil temperature 120°C (248°F))	600 rpm	Discharge pressure	kPa (kgf/cm^2, psi)	40 (0.4, 5.8)
			Discharge rate	ℓ (US qt, Imp qt)/min.	5.8 (6.1, 5.1) or more
		6,000 rpm	Discharge pressure	kPa (kgf/cm^2, psi)	323 (3.3, 46.8)
			Discharge rate	ℓ (US qt, Imp qt)/min.	55 (58.1, 48.4) or more
	Relief valve working pressure (2-step relief)	1st opening pressure		kPa (kgf/cm^2, psi)	150 (1.5, 21.7)
		Main opening pressure		kPa (kgf/cm^2, psi)	570 (5.8, 82.6)
Oil filter	Filter type				Full-flow filter type
	Filtration area cm^2 (sq in)		Filter with outer diameter of 68 mm (2.68 in)		1,100 (171)
			Filter with outer diameter of 80 mm (3.15 in)		1,300 (202)
	By-pass valve opening pressure			kPa (kgf/cm^2, psi)	160 (1.6, 23.2)
	Outer diameter × width mm (in)		Filter with outer diameter of 68 mm (2.68 in)		68 × 85 (2.68 × 3.35)
			Filter with outer diameter of 80 mm (3.15 in)		80 × 75 (3.15 × 2.95)
	Installation screw specifications				M 20 × 1.5
Oil pressure switch	Type				Immersed contact point type
	Operating voltage				12 V
	Warning light operating pressure			kPa (kgf/cm^2, psi)	14.7 (0.1, 2.1)
	Proof pressure			kPa (kgf/cm^2, psi)	981 (10, 142.2) or more
Engine oil	Total capacity (at overhaul)			ℓ (US qt, Imp qt)	6.1 (6.4, 5.4)
	When replacing engine oil and oil filter			ℓ (US qt, Imp qt)	5.2 (5.5, 4.6)
	When replacing engine oil only			ℓ (US qt, Imp qt)	5.0 (5.3, 4.4)

Required oil:

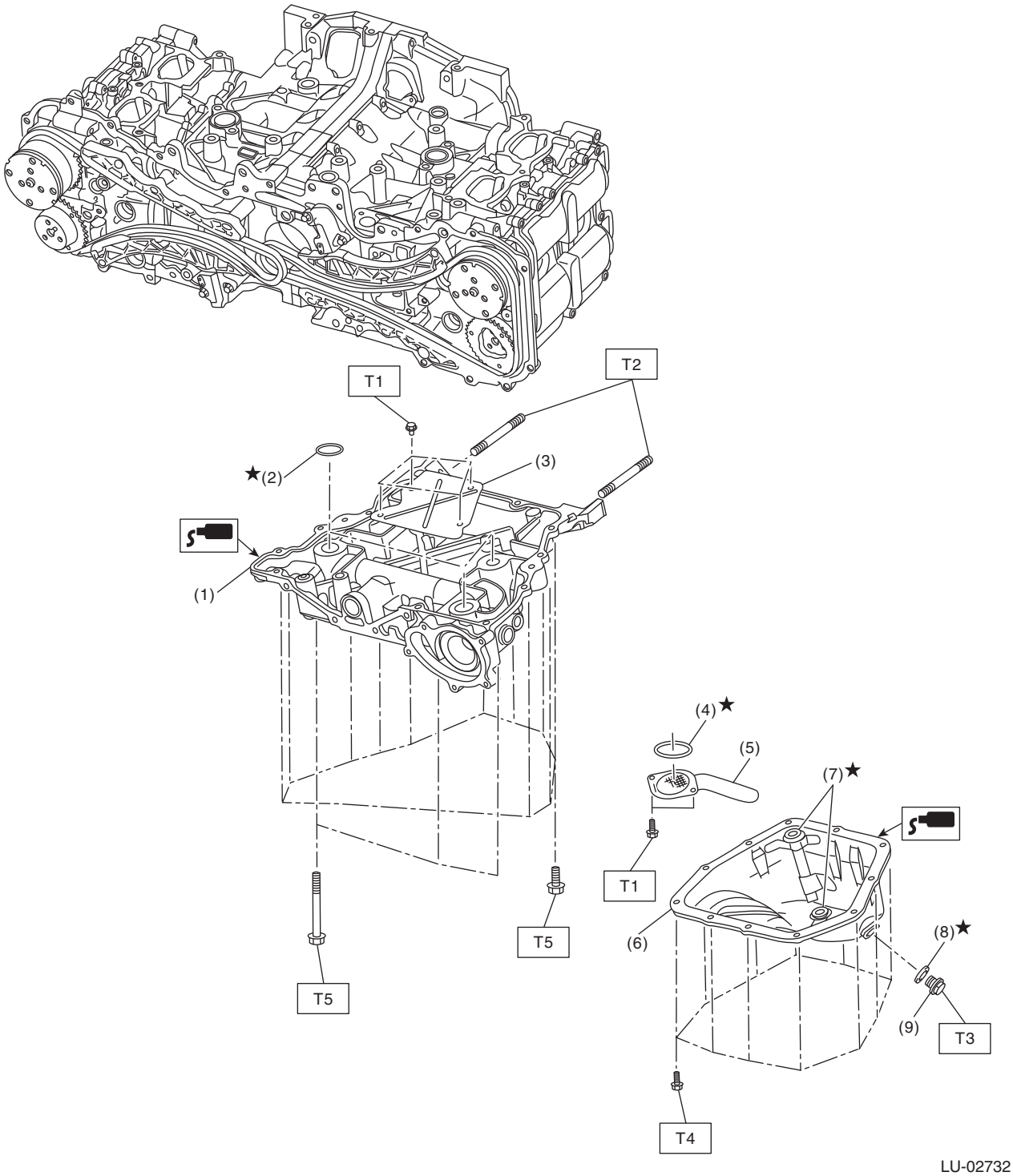
CAUTION:
- **Use 0W-20 (synthetic oil).**
- **It is acceptable to fill an engine with oil of another brand when replacing the oil, but make sure to use following oil specified by Subaru.**

Engine oil standard		SAE viscosity No.
 RM-00076 For API standard, oil with SM "Energy Conserving" or SN "Resource Conserving" logo.	or	 RM-00002 Those with the ILSAC standard GF-4 or GF-5 "starburst mark" displayed on top of the container.	0W-20 (synthetic oil)

NOTE:
The proper viscosity oil helps the engine maintain its ideal temperature, and cranking speed increased by reducing viscosity friction in hot condition.

B: COMPONENT

1. OIL PAN AND STRAINER

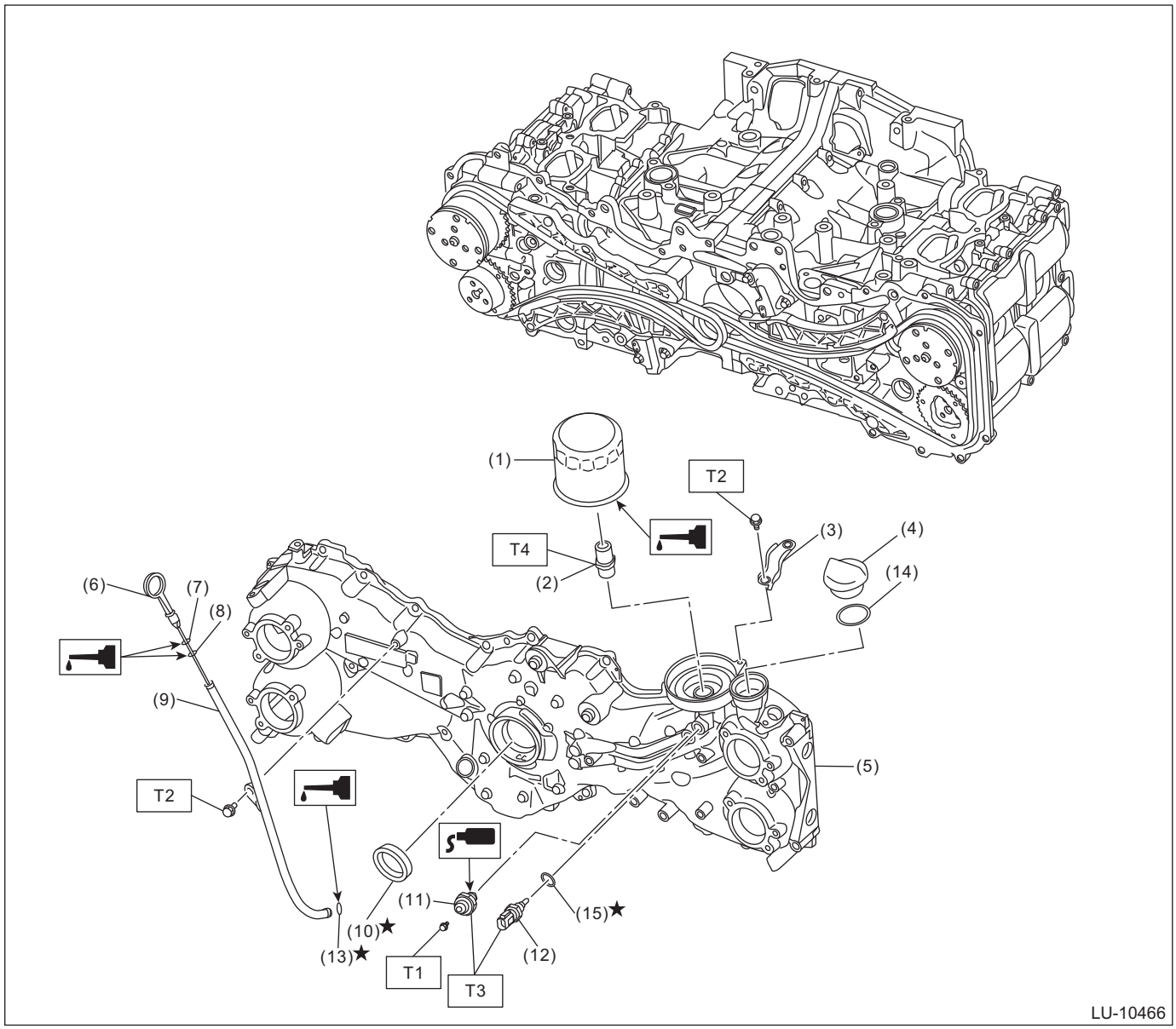


(1) Oil pan upper
(2) O-ring
(3) Baffle plate
(4) O-ring
(5) Oil strainer
(6) Oil pan
(7) Oil pan seal ring
(8) Drain plug gasket
(9) Drain plug

Tightening torque:N·m (kgf-m, ft-lb)

T1: 6.4 (0.7, 4.7)
T2: 18 (1.8, 13.3)
T3: 41.7 (4.3, 30.8)
T4: <Ref. to LU(H4DO)-18, OIL PAN, INSTALLATION, Oil Pan and Strainer.>
T5: <Ref. to LU(H4DO)-20, OIL PAN UPPER, INSTALLATION, Oil Pan and Strainer.>

2. OIL FILTER AND OIL LEVEL GAUGE



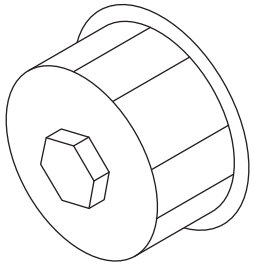
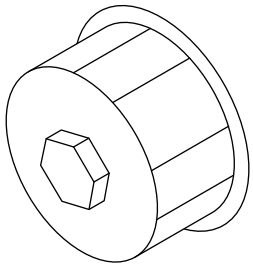
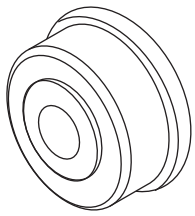
(1)	Oil filter	(8)	O-ring	(15)	Gasket
(2)	Oil pump union	(9)	Oil level gauge guide		
(3)	Generator code stay	(10)	Front oil seal	***Tightening torque:N·m (kgf-m, ft-lb)***	
(4)	Oil filler cap	(11)	Oil pressure switch	***T1:***	***1.5 (0.2, 1.1***
(5)	Chain cover	(12)	Engine oil temperature sensor	***T2:***	***6.4 (0.7, 4.7)***
(6)	Oil level gauge	(13)	O-ring	***T3:***	***18 (1.8, 13.3)***
(7)	O-ring	(14)	O-ring	***T4:***	***45 (4.6, 33.2)***

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 battery.
- If the engine oil is spilt over exhaust pipe or the under cover, wipe it off with cloth to avoid emitting smoke or causing a fire.
- 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 of oil.

D: PREPARATION TOOL

1. SPECIAL TOOL

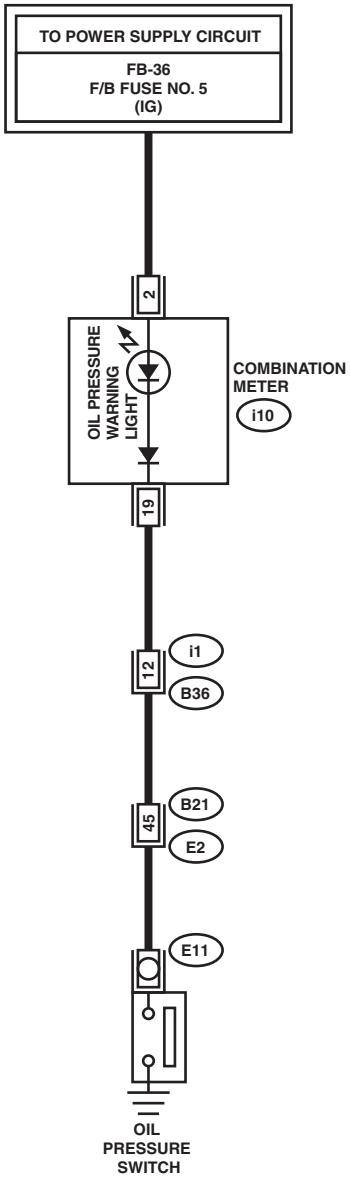
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18332AA000	18332AA000	OIL FILTER WRENCH	Used for removing and installing the oil filter with outer diameter of 68 mm (2.68 in).
 ST-498547000	498547000	OIL FILTER WRENCH	Used for removing and installing the oil filter with outer diameter of 80 mm (3.15 in).
 ST41399FG020	41399FG020	SPECIAL TOOL B	Used for installing the front oil seal.

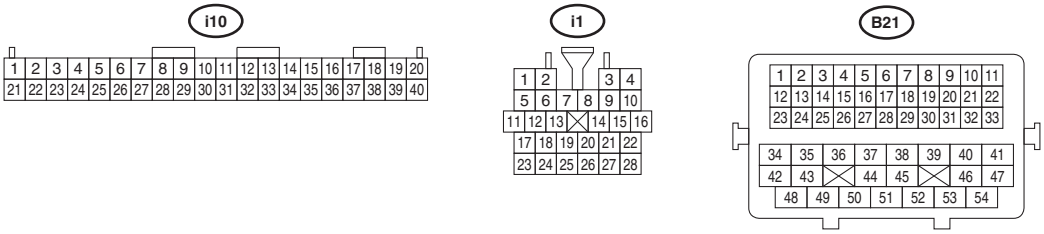
2. GENERAL TOOL

TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance and voltage.

2. Oil Pressure System

A: WIRING DIAGRAM





LU-02742

B: INSPECTION

	Step	Check	Yes	No
1	**CHECK COMBINATION METER.** 1) Turn the ignition switch to ON. (engine OFF) 2) Check the warning light in the combination meter.	Does the warning light illuminate?	Go to step **2**.	Repair or replace the combination meter. <Ref. to IDI-5, INSPECTION, Combination Meter System.>
2	**CHECK HARNESS CONNECTOR BETWEEN COMBINATION METER AND 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. <Ref. to LU(H4DO)-23, 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*** ***No. 2 — No. 19:***	Is the resistance less than 10 Ω?	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between combination meter and oil pressure switch • Poor contact of combination meter connector • Poor contact of oil pressure switch connector • Poor contact of coupling connector	Repair or replace the combination meter. <Ref. to IDI-5, INSPECTION, Combination Meter System.>

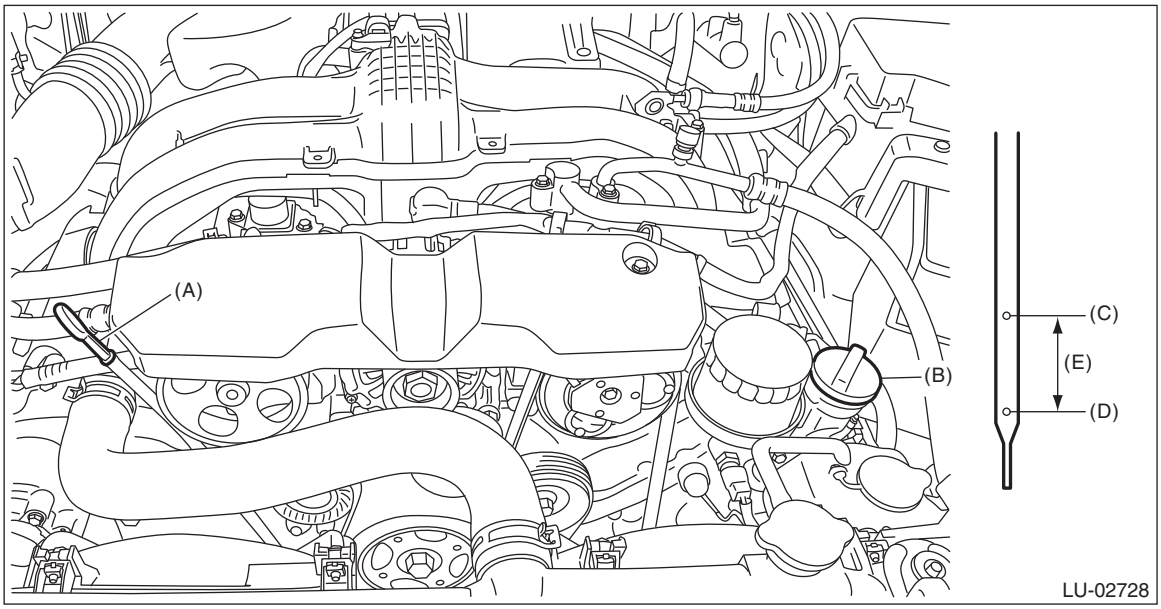
3. Engine Oil

A: INSPECTION

CAUTION:
If the engine oil is spilt over exhaust pipe or the under cover, wipe it off with cloth to avoid emitting smoke or causing a fire.

1) Park the vehicle on a level surface.
2) Remove the oil level gauge and wipe away the oil.
3) Reinsert the oil level gauge all the way. Be sure that the oil level gauge is correctly inserted and properly orientated.
4) Pull out the oil level gauge again, and check the oil level. If the engine oil level is below “L” line, check for oil leakage from engine and add oil to bring the level up to “F” line.
5) Start the engine to circulate the oil in engine room.
6) After turning off the engine, wait a few minutes for the oil to return to the oil pan before checking the level.

NOTE:
- To prevent overfilling of engine oil, do not add oil above “F” line when the engine is cold.
- As the oil level gauge is used for daily maintenance, “F” line and “L” line is set assuming that the engine is cold.



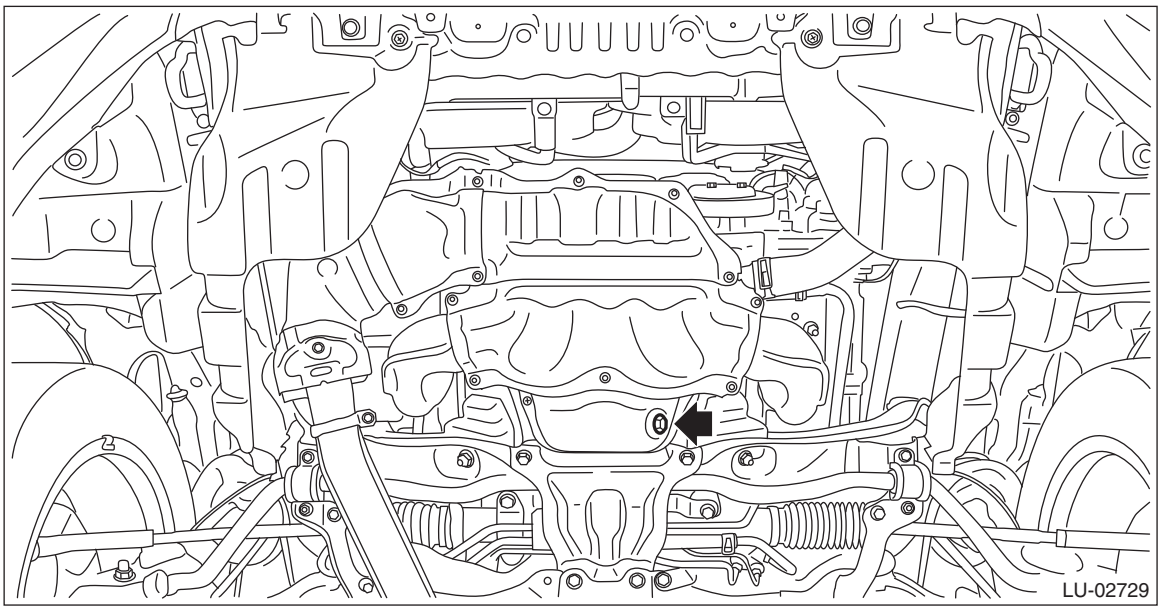
(A) Oil level gauge
(B) Oil filler cap
(C) “F” line
(D) “L” line
(E) Approx. 1.0 ℓ (1.1 US qt, 0.9 Imp qt)

B: REPLACEMENT

CAUTION:
If the engine oil is spilt over exhaust pipe or the under cover, wipe it off with cloth to avoid emitting smoke or causing a fire.

1) Open the oil filler cap for quick draining of engine oil.
2) Lift up the vehicle.
3) Drain engine oil by loosening the drain plug.

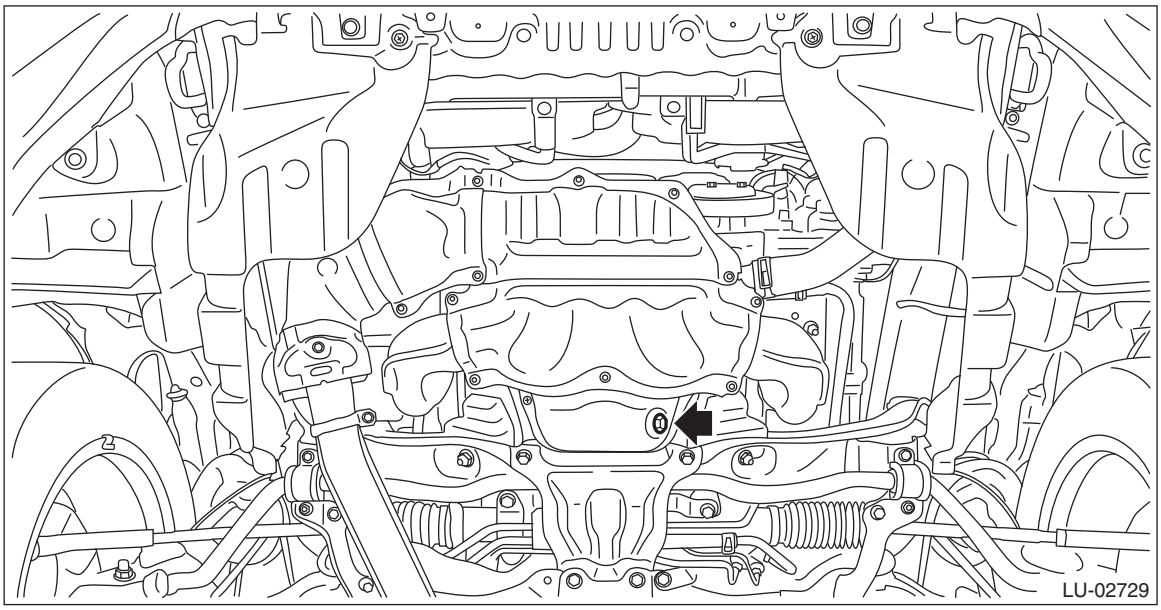
NOTE:
Prepare the container for draining of engine oil.



4) After draining the engine oil, tighten the engine oil drain plug.

NOTE:
Use a new drain plug gasket.

Tightening torque:
41.7 N·m (4.3 kgf-m, 30.8 ft-lb)



5) Lower the vehicle.

6) Select engine oil of adequate quality and viscosity and fill it through the oil filler duct to the “F” line on the oil level gauge. Make sure that the vehicle is parked on a level surface when checking oil level.

Recommended oil:

Refer to “SPECIFICATION” for recommended oil. <Ref. to LU(H4DO)-2, SPECIFICATION, General Description.>

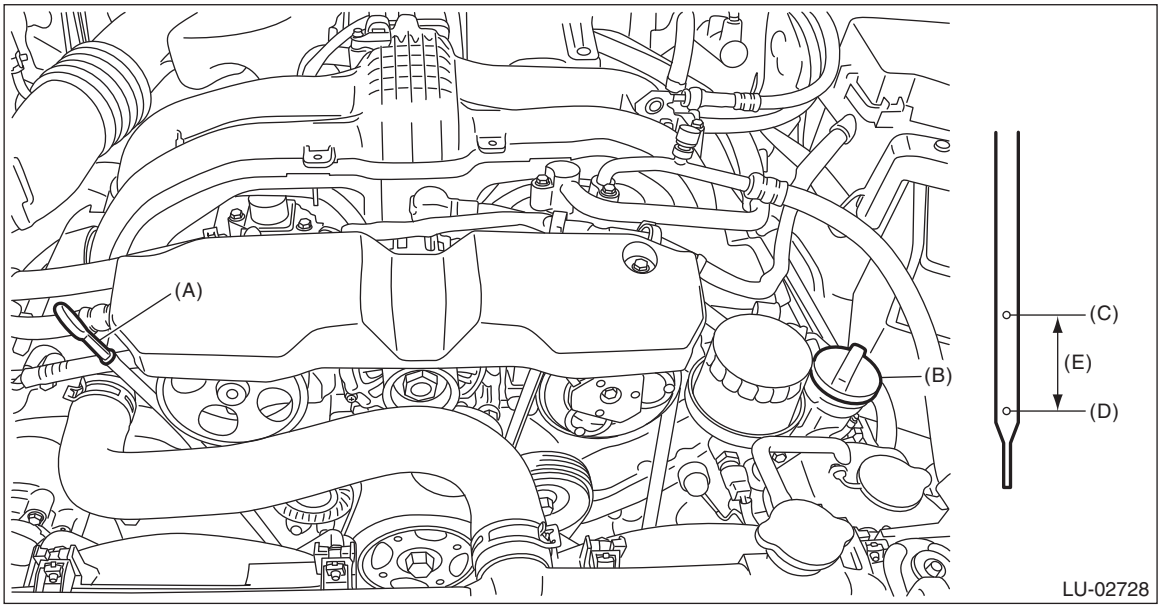
Engine oil capacity:

Refer to “SPECIFICATION” for engine oil capacity. <Ref. to LU(H4DO)-2, SPECIFICATION, General Description.>

7) Close the oil filler cap.

8) Start the engine to circulate the oil in engine room.

9) After stopping the engine, recheck the oil level. If necessary, add engine oil up to the “F” line on oil level gauge.



(A) Oil level gauge
(B) Oil filler cap
(C) “F” line
(D) “L” line
(E) Approx. 1.0 ℓ (1.1 US qt, 0.9 Imp qt)

4. Oil Pump

A: SPECIFICATION

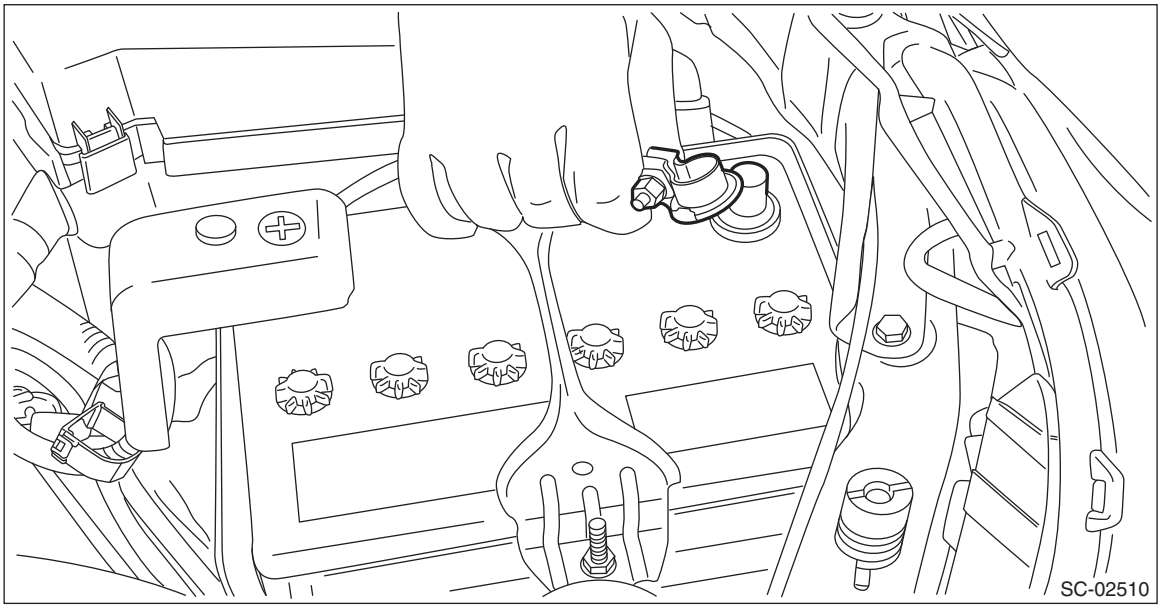
The oil pump cannot be disassembled.
Refer to “Chain Cover” for removal and installation procedure. <Ref. to ME(H4DO)-91, REMOVAL, Chain Cover.> <Ref. to ME(H4DO)-96, INSTALLATION, Chain Cover.>

5. Oil Pan and Strainer

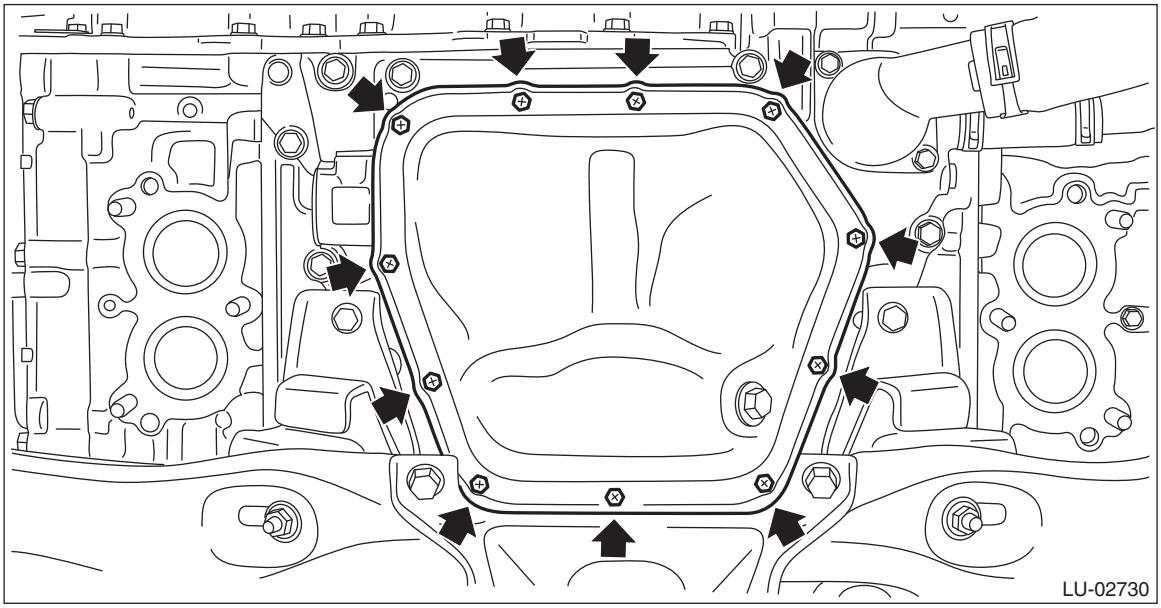
A: REMOVAL

1. OIL PAN

1) Disconnect the ground cable from battery.



2) Drain the engine oil. <Ref. to LU(H4DO)-12, REPLACEMENT, Engine Oil.>
3) Lift up the vehicle.
4) Remove the under cover. <Ref. to EI-26, REMOVAL, Front Under Cover.>
5) Remove the front exhaust pipe. <Ref. to EX(H4DO)-5, REMOVAL, Front Exhaust Pipe.>
6) Remove the bolts which secure oil pan to oil pan upper.

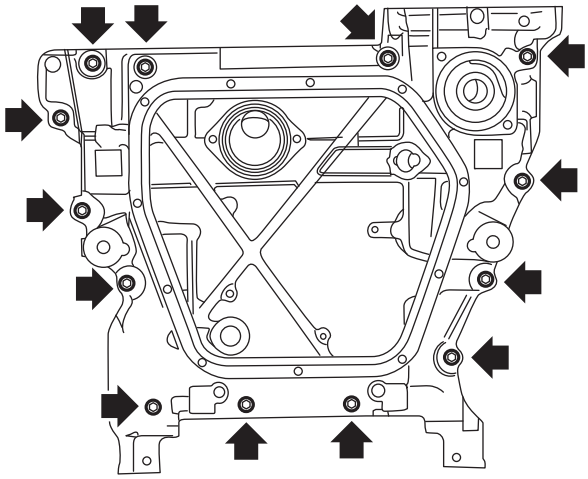


7) Insert an oil pan cutter blade into the gap between oil pan upper and oil pan, and remove the oil pan.

CAUTION:
Do not use a screwdriver or similar tool in place of oil pan cutter.

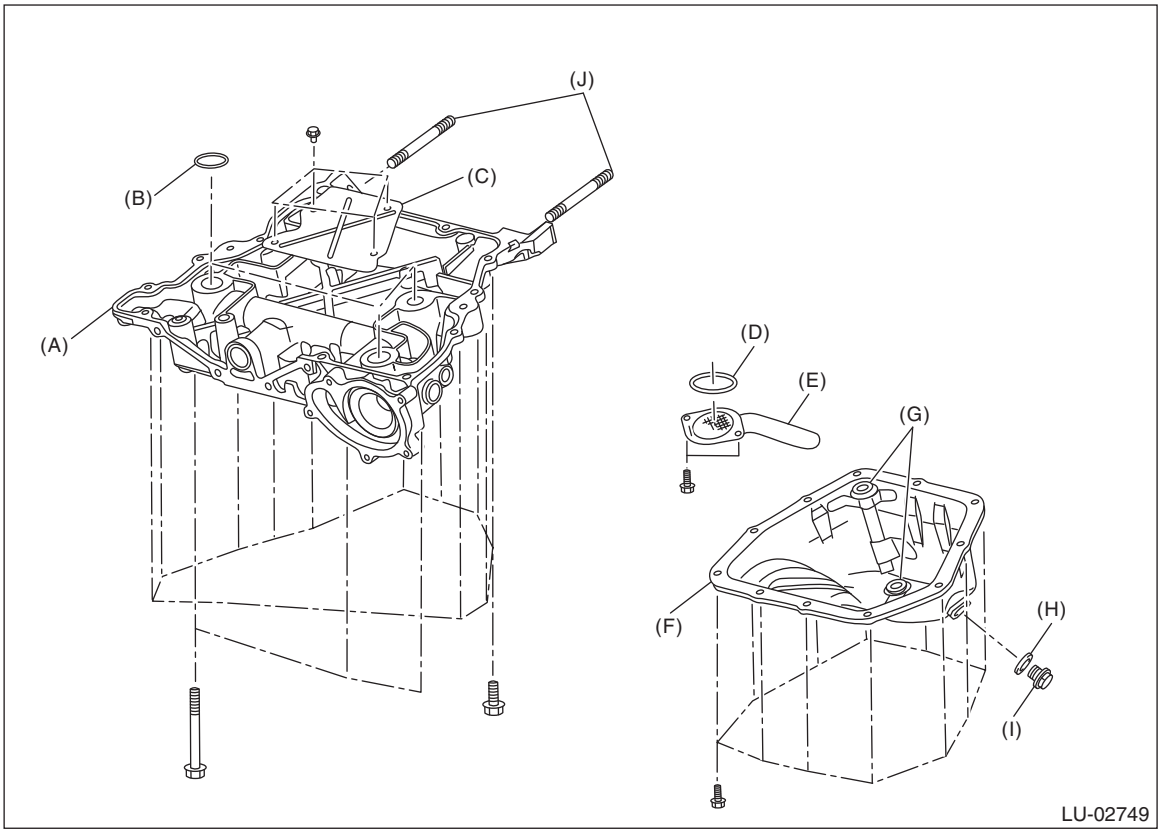
2. OIL PAN UPPER

1) Remove the engine from the vehicle. <Ref. to ME(H4DO)-44, REMOVAL, Engine Assembly.>
2) Remove the water pump. <Ref. to CO(H4DO)-15, REMOVAL, Water Pump.>
3) Remove the thermostat cover. <Ref. to CO(H4DO)-19, REMOVAL, Thermostat.>
4) Remove the water pipe assembly. <Ref. to CO(H4DO)-3, WATER PUMP, COMPONENT, General Description.>
5) Remove the oil pan. <Ref. to LU(H4DO)-15, OIL PAN, REMOVAL, Oil Pan and Strainer.>
6) Remove the bolts which secure oil pan upper to cylinder block, and remove the oil pan upper.


LU-02747

7) Remove the baffle plate from the oil pan upper.
8) Remove the oil strainer from the oil pan upper.

9) Remove stud bolts from the oil pan upper.



(A) Oil pan upper
(B) O-ring
(C) Baffle plate
(D) O-ring
(E) Oil strainer
(F) Oil pan
(G) Oil pan seal ring
(H) Drain plug gasket
(I) Drain plug
(J) Stud bolt

B: INSTALLATION

1. OIL PAN

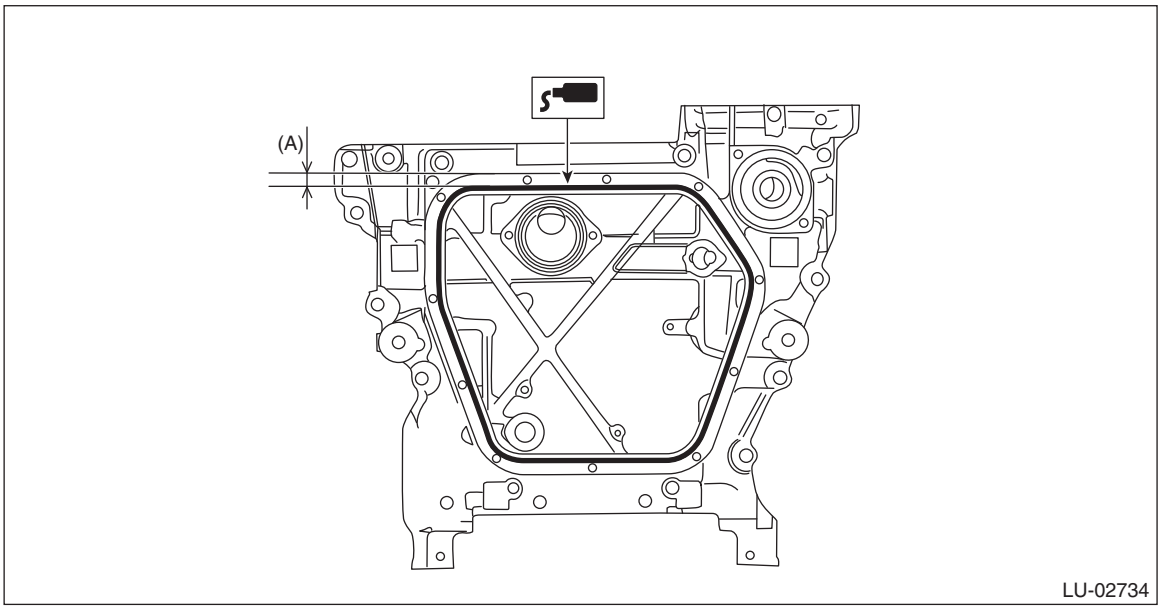
NOTE:
- Before installing the oil pan, wipe and clean the mating surface of oil pan and oil pan upper.
- Use a new oil pan seal ring.

1) Apply liquid gasket to the mating surface of the oil pan upper, and install the oil pan.

NOTE:
Install within 5 min. after applying liquid gasket.

Liquid gasket:
THREE BOND 1217G (Part No. K0877Y0100) or equivalent

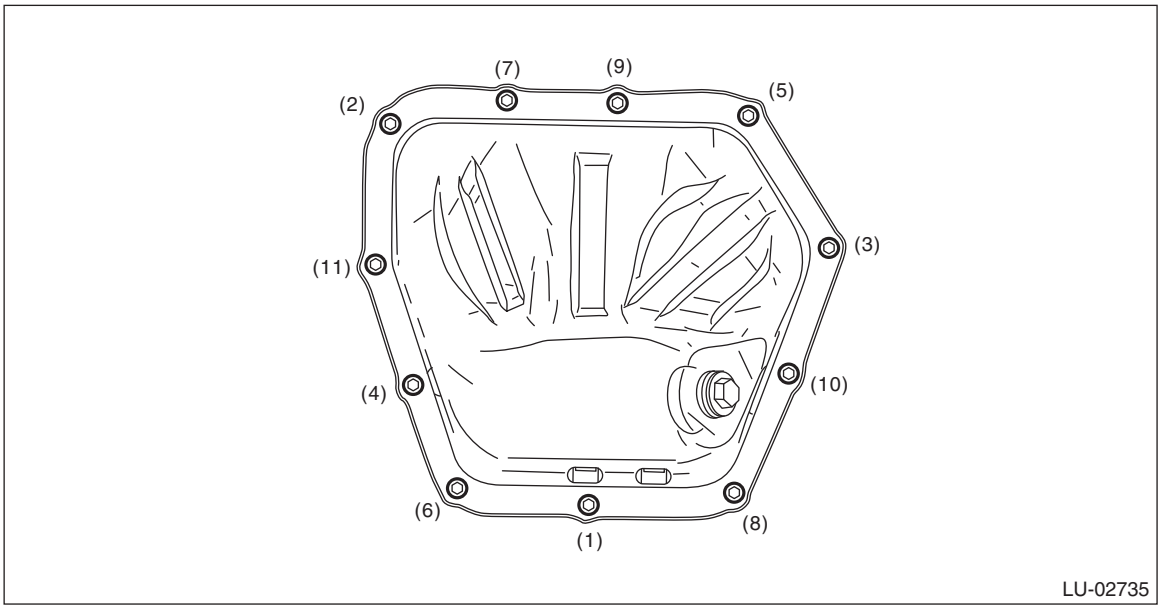
Liquid gasket applying diameter:
5±1 mm (0.1969±0.0394 in)



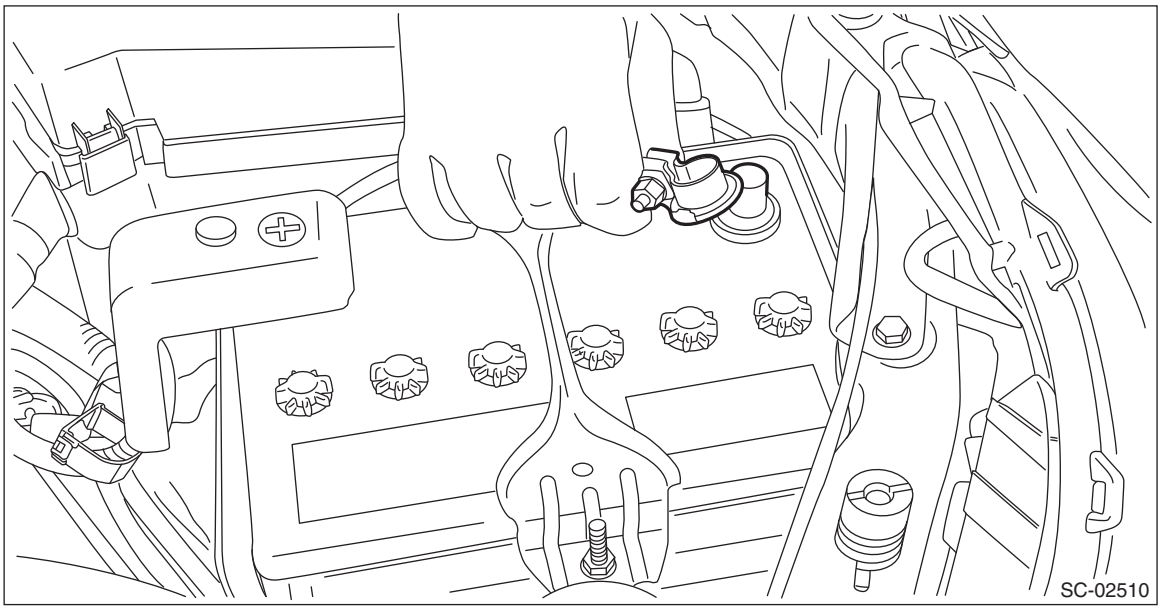
(A) 9.5 mm (0.374 in)

2) Tighten the bolts to install the oil pan to the oil pan upper in the numerical order.

Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)



3) Install the front exhaust pipe. <Ref. to EX(H4DO)-8, INSTALLATION, Front Exhaust Pipe.>
4) Install the under cover. <Ref. to EI-26, INSTALLATION, Front Under Cover.>
5) Lower the vehicle.
6) Connect the battery ground terminal.



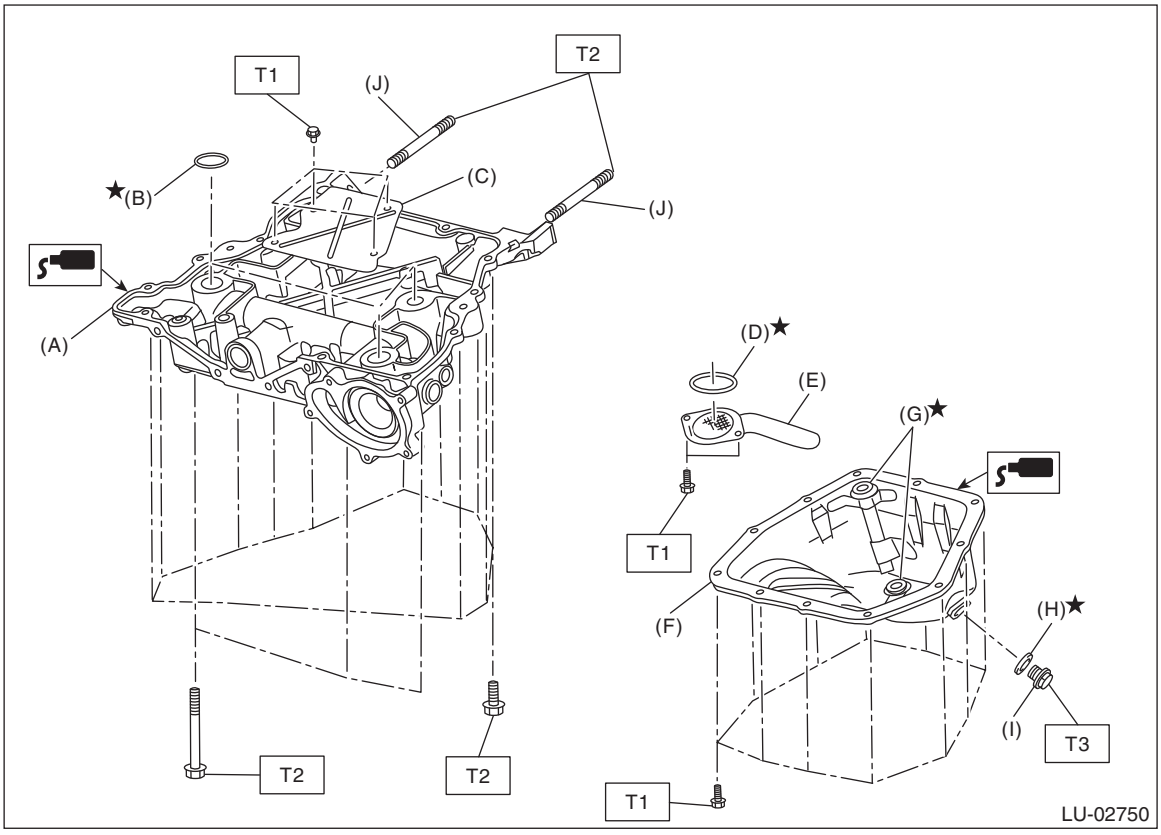
7) Refill the engine oil. <Ref. to LU(H4DO)-12, REPLACEMENT, Engine Oil.>

2. OIL PAN UPPER

NOTE:
Before installing the oil pan upper, clean the mating surface of oil pan upper and cylinder block.
1) Attach the stud bolts to the oil pan upper.
2) Attach the oil strainer to the oil pan upper.

NOTE:
Use new O-rings.
3) Attach the baffle plate to the oil pan upper.

Tightening torque:
T1: 6.4 N·m (0.7 kgf-m, 4.7 ft-lb)
T2: 18 N·m (1.8 kgf-m, 13.3 ft-lb)
T3: 41.7 N·m (4.3 kgf-m, 30.8 ft-lb)



(A)	Oil pan upper	(B)	O-ring	(C)	Baffle plate
(D)	O-ring	(E)	Oil strainer	(F)	Oil pan
(G)	Oil pan seal ring	(H)	Drain plug gasket	(I)	Drain plug
(J)	Stud bolt				

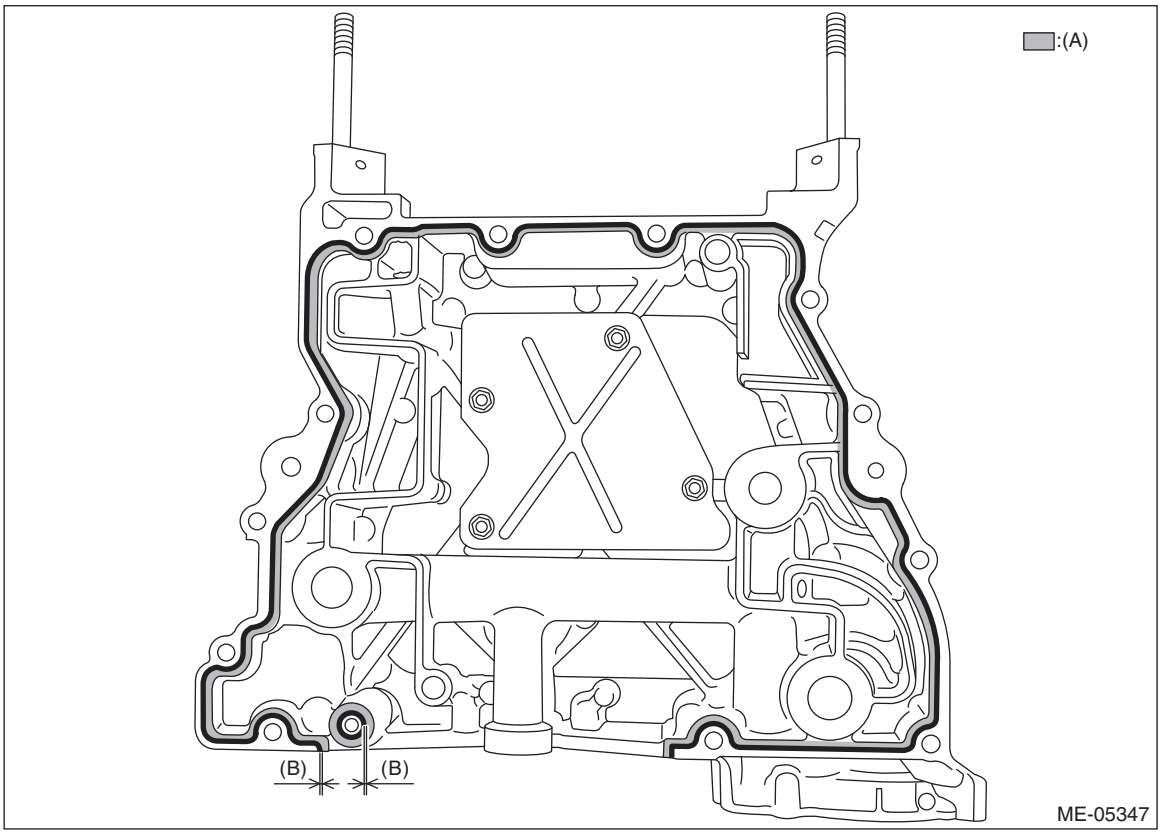
4) Apply liquid gasket to the mating surface of the oil pan upper as shown in the figure, and install the oil pan upper to the cylinder block.

CAUTION:
Be careful not to apply any liquid gasket to the O-ring.

NOTE:
- Use new O-rings.
- Install within 5 min. after applying liquid gasket.
- Apply liquid gasket 1.5 mm (0.0591 in) outside from the chamfer surface. However, application of liquid gasket on the chamfer surface around the bolt hole is allowed.

Liquid gasket:
THREE BOND 1217G (Part No. K0877Y0100) or equivalent

Liquid gasket applying diameter:
5±1 mm (0.1969±0.0394 in)

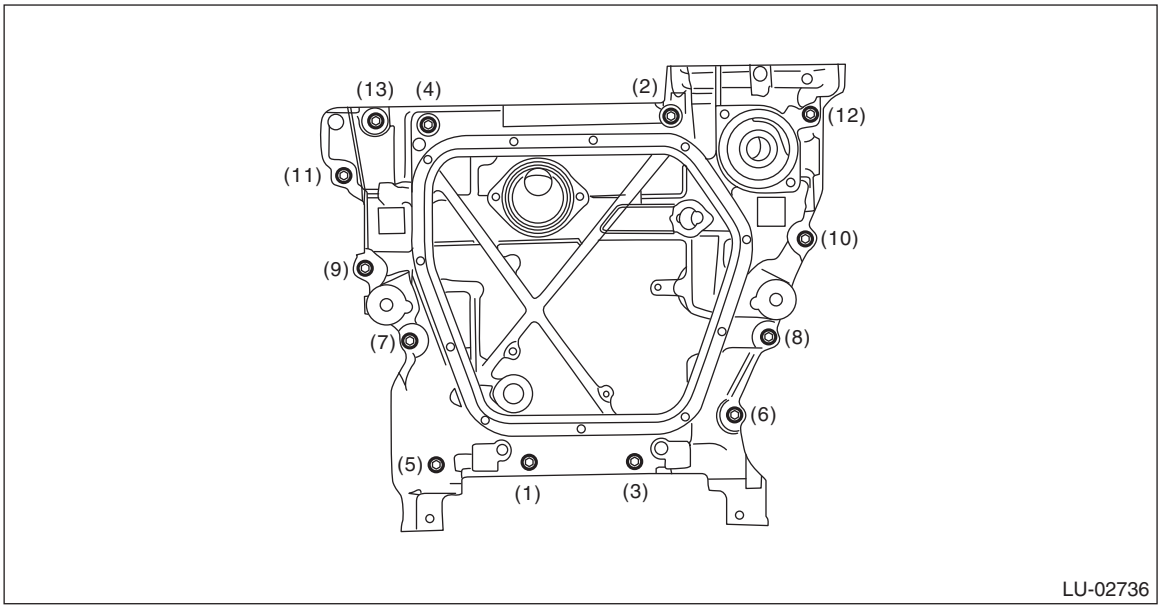


(A) Chamfer surface (B) 1.5 mm (0.0591 in)

5) Tighten the bolts to install the oil pan upper to the cylinder block in the numerical order.

NOTE:
After tightening, if the liquid gasket is squeezed out onto the seal surface of the chain cover, completely remove any squeezed-out liquid gasket.

Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)



6) Install the oil pan. <Ref. to LU(H4DO)-18, OIL PAN, INSTALLATION, Oil Pan and Strainer.>
7) Install the water pipe assembly. <Ref. to CO(H4DO)-3, WATER PUMP, COMPONENT, General Description.>
8) Install the thermostat cover. <Ref. to CO(H4DO)-20, INSTALLATION, Thermostat.>
9) Install the water pump. <Ref. to CO(H4DO)-16, INSTALLATION, Water Pump.>
10) Lower the vehicle.
11) Install the engine to the vehicle. <Ref. to ME(H4DO)-56, INSTALLATION, Engine Assembly.>
12) Refill the engine oil. <Ref. to LU(H4DO)-12, REPLACEMENT, Engine Oil.>

C: INSPECTION

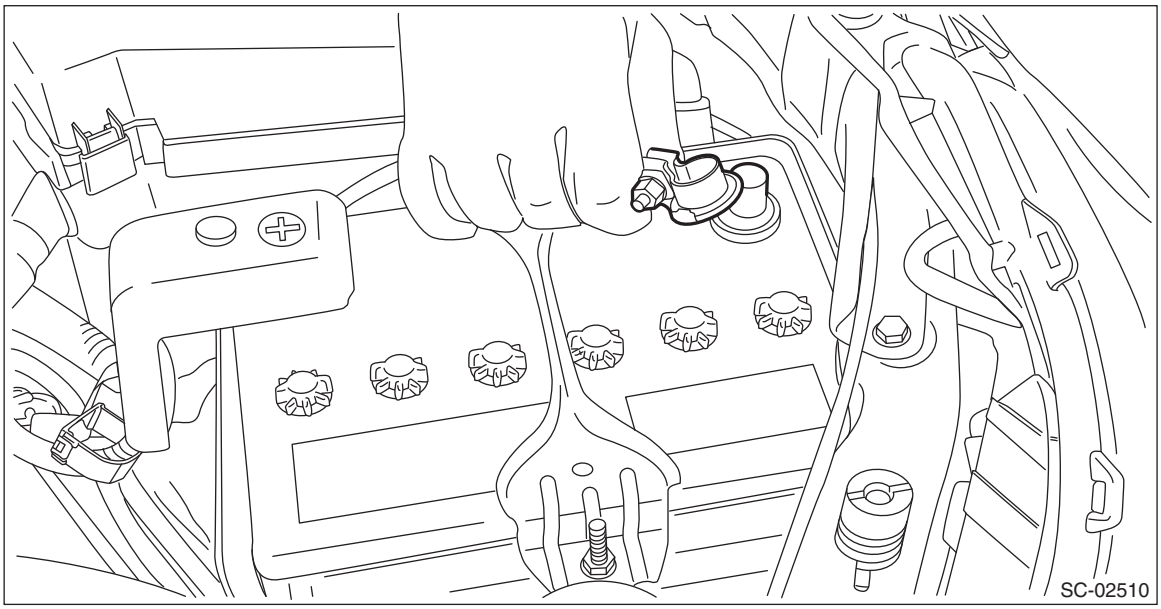
Check that the oil pan, oil pan upper, oil strainer and baffle plate do not have deformation, cracks or damage.

6. Oil Pressure Switch

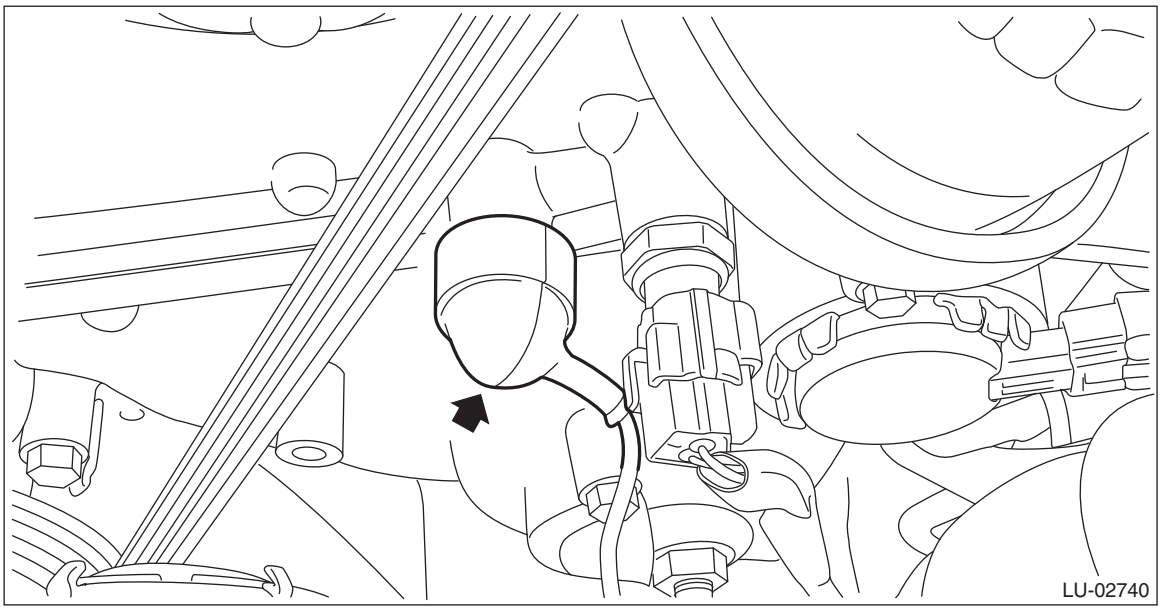
A: REMOVAL

CAUTION:
If the engine oil is spilt over exhaust pipe or the under cover, wipe it off with cloth to avoid emitting smoke or causing a fire.

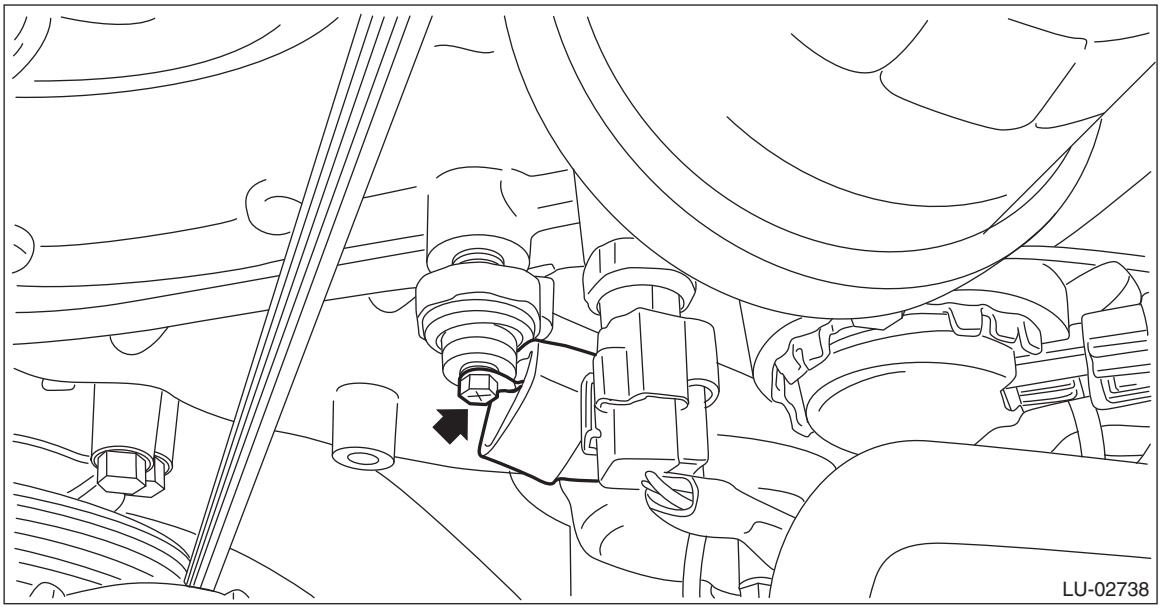
1) Disconnect the ground cable from battery.



2) Remove the rubber cap.

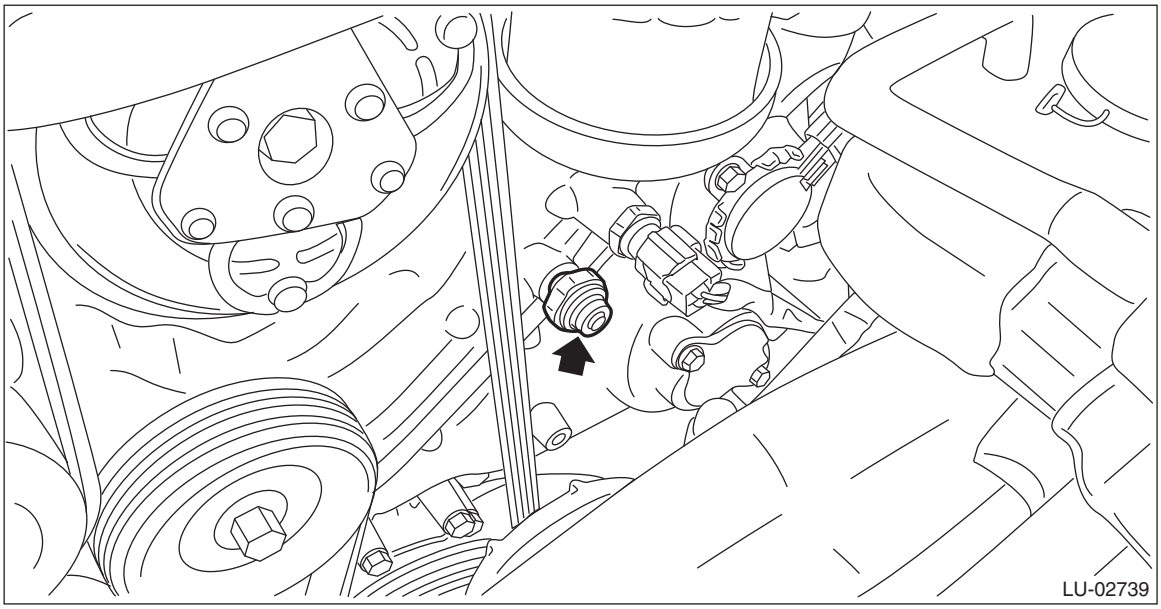


3) Disconnect the terminal from oil pressure switch.



4) Remove the oil pressure switch.

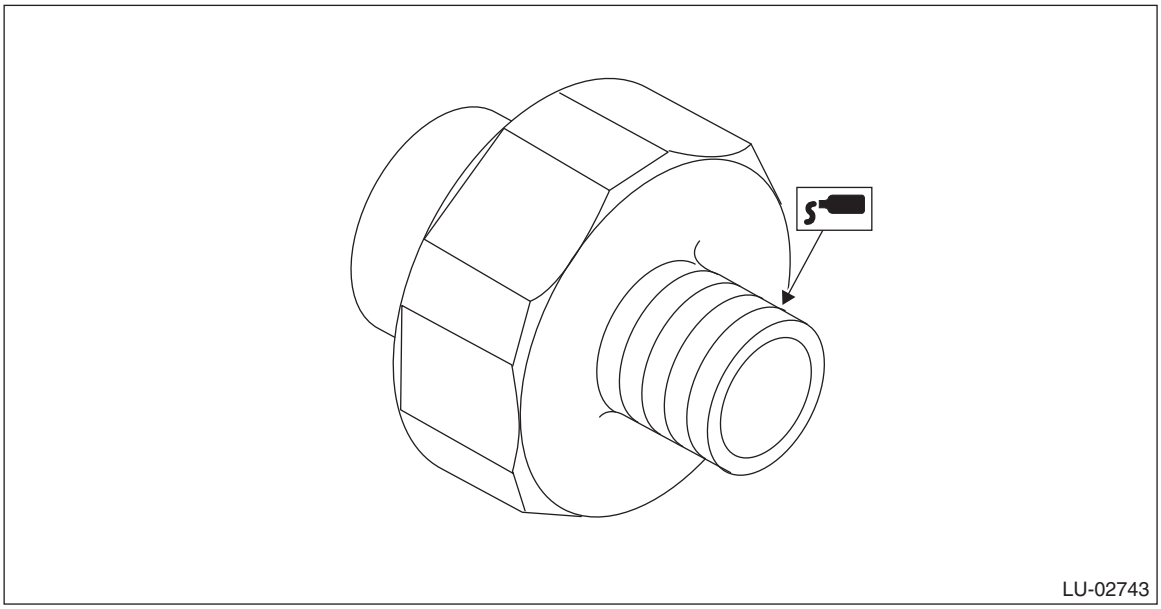
CAUTION:
Catch the engine oil using cloth to prevent it from splashing.



B: INSTALLATION

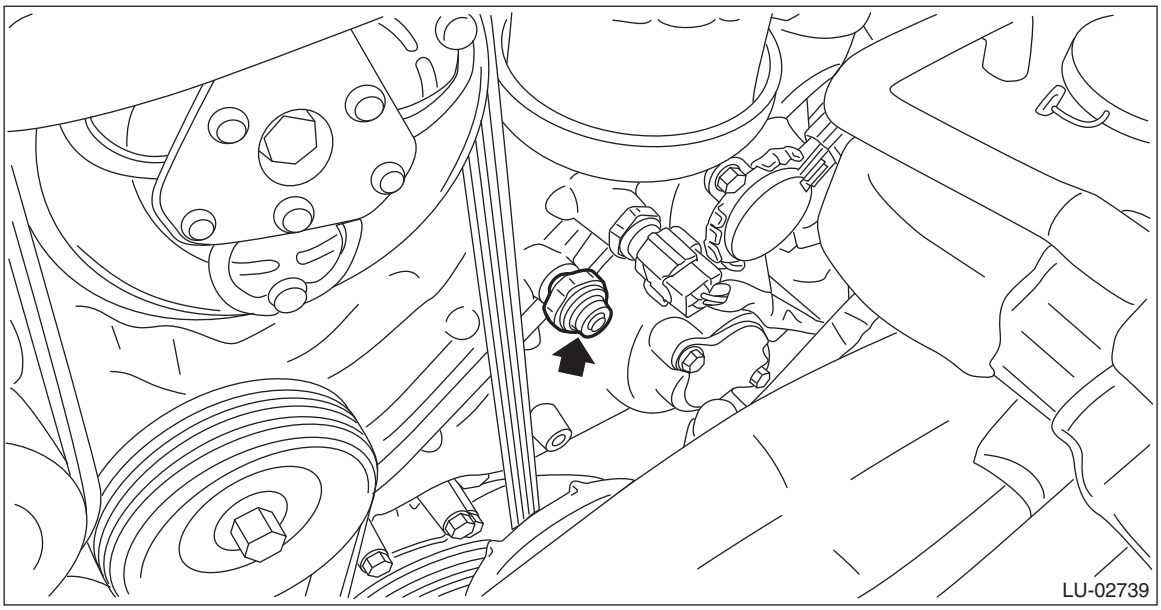
1) Apply liquid gasket to the oil pressure switch threads.

Liquid gasket:
THREE BOND 1324 (Part No. 004403042) or equivalent



2) Install the oil pressure switch to cylinder block.

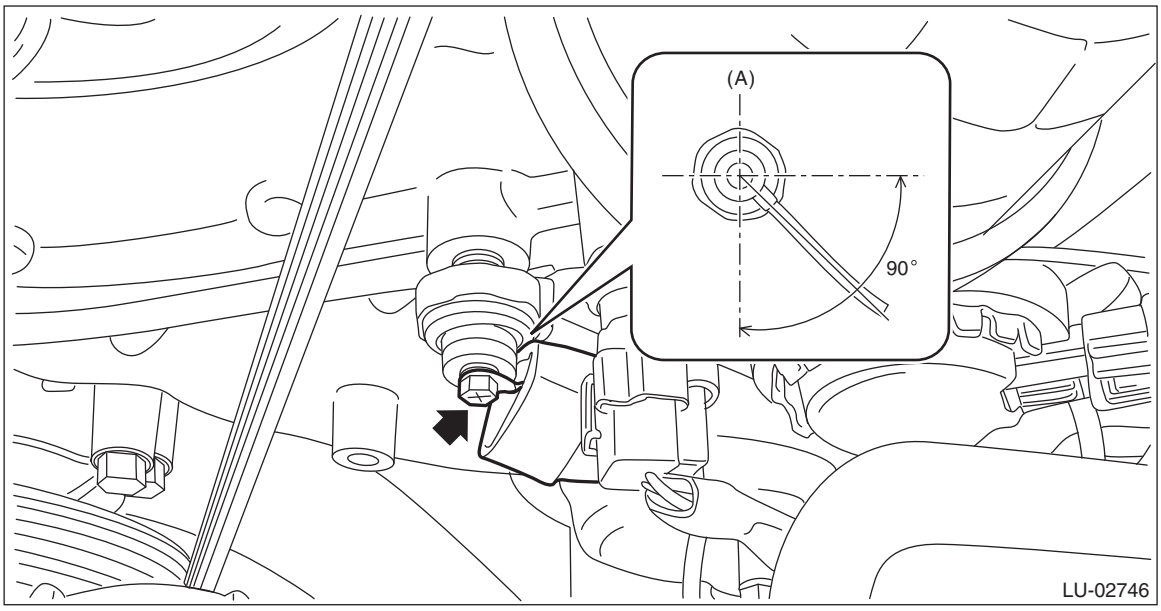
Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)



3) Connect the terminal to the oil pressure switch.

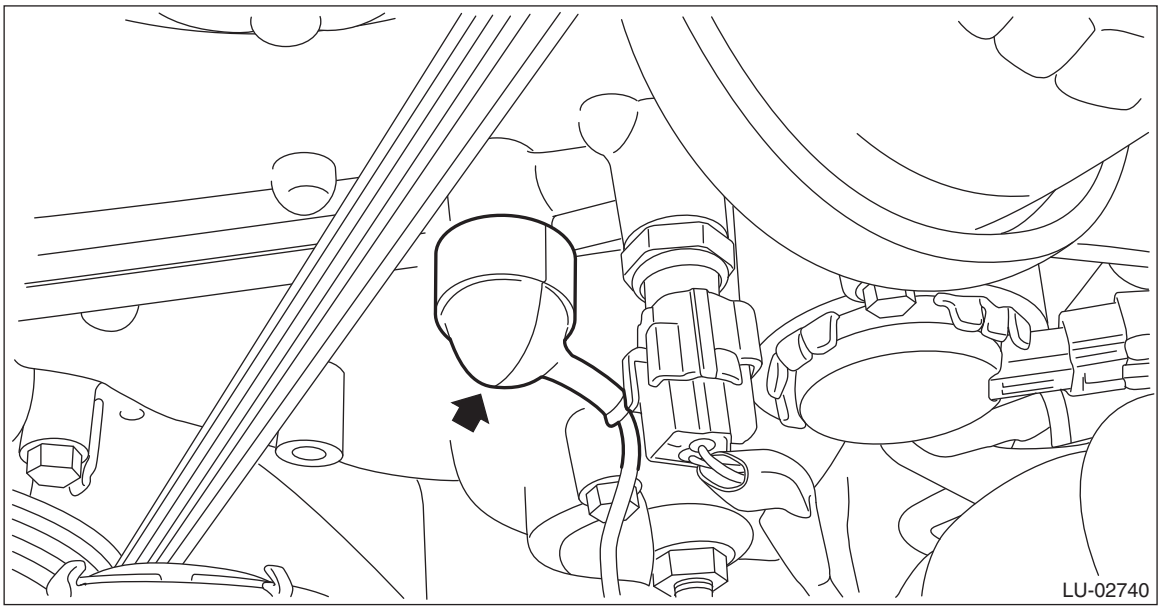
NOTE:
The oil pressure switch harness must be tightened within the range of a 90° angle as shown below.

Tightening torque:
1.5 N·m (0.2 kgf-m, 1.1 ft-lb)

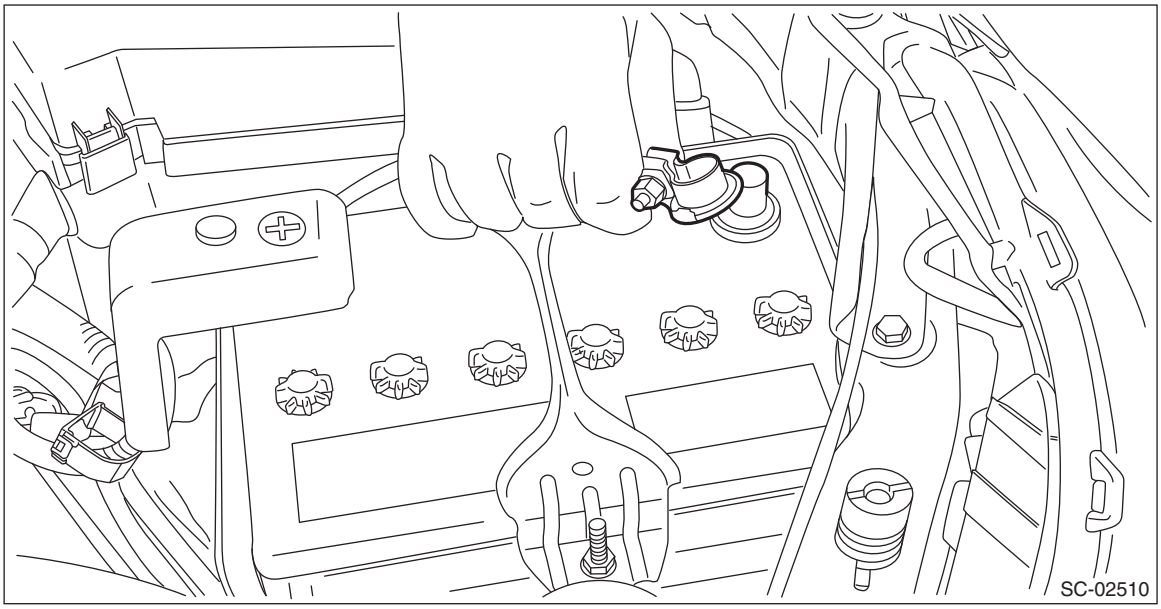


(A) Upper side of the engine

4) Attach the rubber cap.



5) Connect the battery ground terminal.



C: INSPECTION

1) Check that the oil pressure switch does not have deformation, cracks or damage.
2) Check the oil pressure switch installation portion for oil leakage and oil seepage.

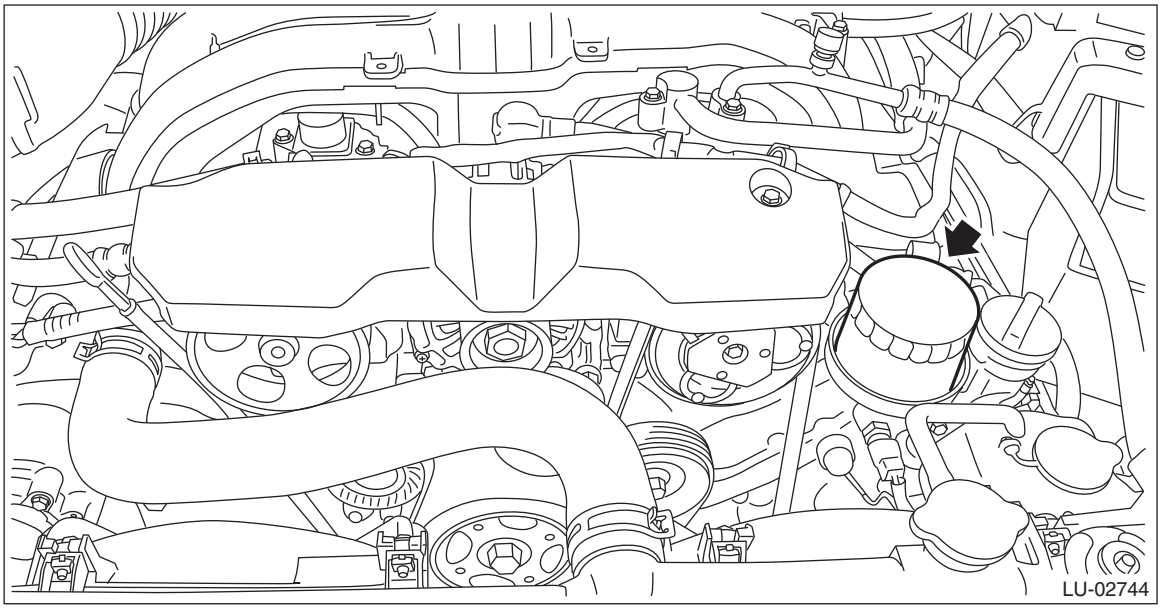
7. Engine Oil Filter

A: REMOVAL

1. OIL FILTER

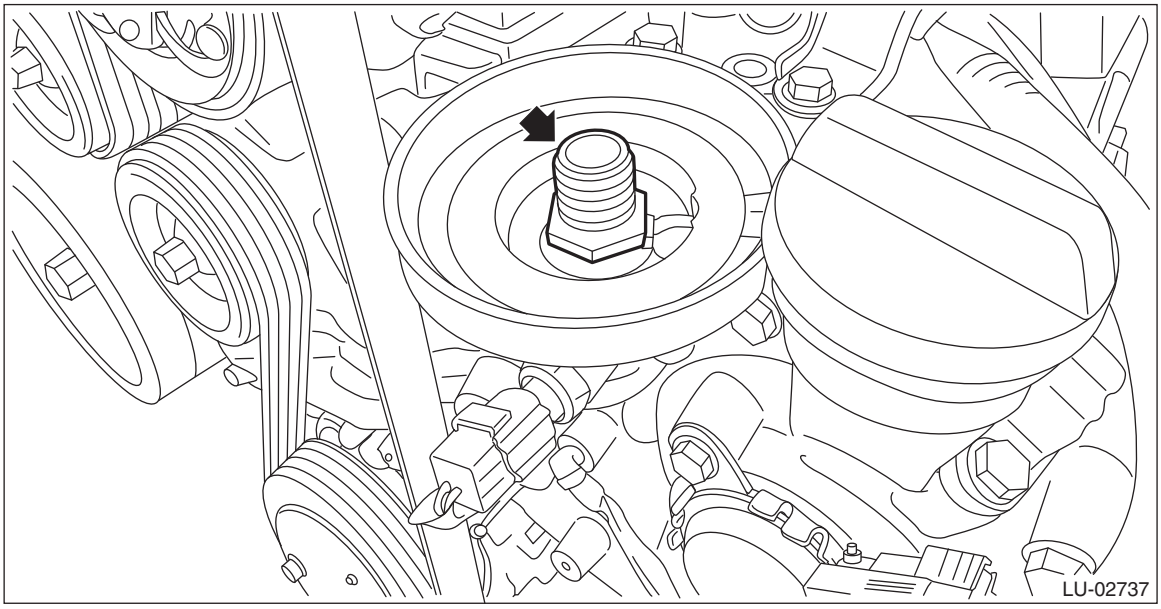
CAUTION:
If the engine oil is spilt over exhaust pipe or the under cover, wipe it off with cloth to avoid emitting smoke or causing a fire.

NOTE:
Clean off water or dust from the oil element mating surface using air.
Remove the oil filter using ST.
ST 18332AA000 OIL FILTER WRENCH (FILTER WITH OUTER DIAMETER OF 68 MM (2.68 IN))
ST 498547000 OIL FILTER WRENCH (FILTER WITH OUTER DIAMETER OF 80 MM (3.15 IN))



2. OIL PUMP UNION

1) Remove the oil filter. <Ref. to LU(H4DO)-28, OIL FILTER, REMOVAL, Engine Oil Filter.>
2) Remove the oil pump union from the chain cover.



B: INSTALLATION

1. OIL FILTER

CAUTION:
Do not tighten excessively, or oil may leak.
1) Clean the oil filter installing surface on the chain cover.
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 of the oil filter.
- Further tighten (approx. additional one rotation) the oil filter with outer diameter of 68 mm (2.68 in) after the seal rubber of the oil filter comes in contact with the chain cover. When using a torque wrench, tighten to 14 N·m (1.4 kgf-m, 10.3 ft-lb).
- Further tighten (approx. additional 3/4 rotation) the oil filter with outer diameter of 80 mm (3.15 in) after the seal rubber of the oil filter comes in contact with the chain cover. When using a torque wrench, tighten to 14 N·m (1.4 kgf-m, 10.3 ft-lb).

4) After installing, check the engine oil level and replenish it if necessary. <Ref. to LU(H4DO)-11, INSPECTION, Engine Oil.>

2. OIL PUMP UNION

Install in the reverse order of removal.

Tightening torque:
45 N·m (4.6 kgf-m, 33.2 ft-lb)

C: INSPECTION

1) After installing the oil filter, run the engine and check for oil leakage.

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(H4DO)-11, INSPECTION, Engine Oil.>

8. 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
Warning light remains ON.	a. Oil pressure switch failure	
	❍ Cracked diaphragm or oil leakage within switch	Replace.
	❍ Broken spring or seized contacts	Replace.
	b. Low oil pressure	
	❍ Clogging of oil filter	Replace.
	❍ Malfunction of oil by-pass valve in oil filter	Replace.
	❍ Clogged oil passage	Clean.
	❍ Excessive tip clearance and side clearance of oil pump rotor	Replace.
	❍ Clogged oil strainer or broken pipe	Clean or replace.
	c. No oil pressure	
	❍ Insufficient engine oil (degradation, etc.)	Replace.
	❍ Broken pipe of oil strainer	Replace.
	❍ Stuck oil pump rotor	Replace.
Warning light does not illuminate.	a. Malfunction of combination meter	Replace.
	b. Poor contact of switch contact points	Replace.
	c. Disconnection of wiring	Repair.
Warning light flickers momentarily.	a. Defective terminal contact	Repair.
	b. Defective wiring harness	Repair.
	c. Oil pressure switch failure	
	❍ Cracked diaphragm or oil leakage within switch	Replace.
	❍ Broken spring or seized contacts	Replace.
	d. Low oil pressure	
	❍ Clogging of oil filter	Replace.
	❍ Malfunction of oil by-pass valve in oil filter	Replace.
	❍ Clogged oil passage	Clean.
	❍ Excessive tip clearance and side clearance of oil pump rotor	Replace.
	❍ Clogged oil strainer or broken pipe	Clean or replace.

SPEED CONTROL SYSTEMS

SP(H4DO)

Page

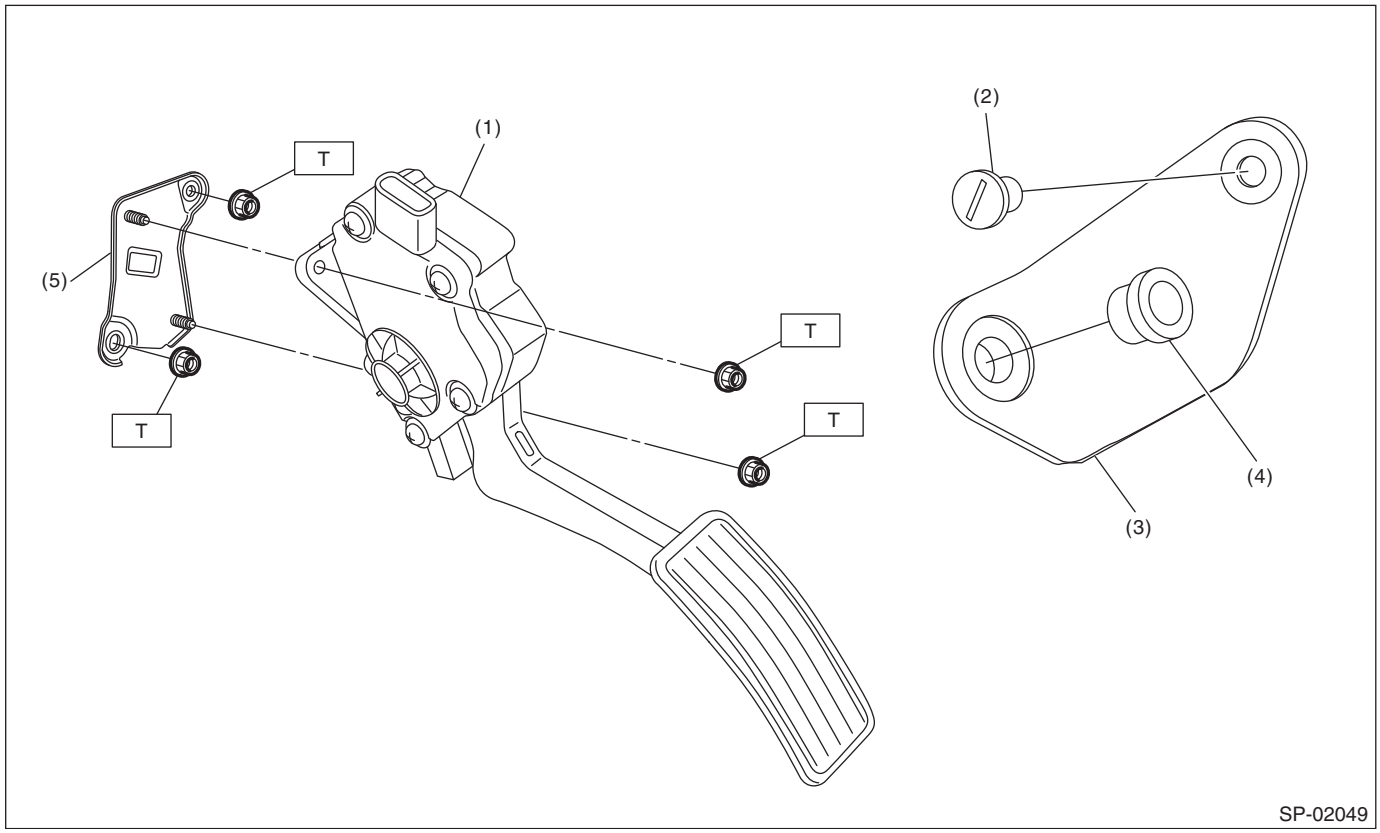
1. General Description 2
2. Accelerator Pedal 4

1. General Description

A: SPECIFICATION

Accelerator pedal	Stroke	At pedal pad	50 — 59 mm (1.97 — 2.32 in)

B: COMPONENT



(1) Accelerator pedal ASSY
(2) Clip
(3) Accelerator plate
(4) Accelerator stopper
(5) Accelerator pedal bracket

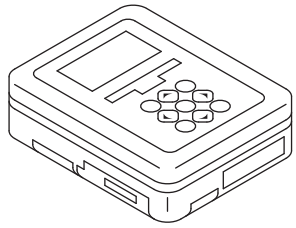
Tightening torque:N·m (kgf-m, ft-lb)
T: 18 (1.8, 13.3)

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 battery.

D: PREPARATION TOOL

1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST1B022XU0	1B022XU0	SUBARU SELECT MONITOR III KIT	Used for inspecting the accelerator pedal.

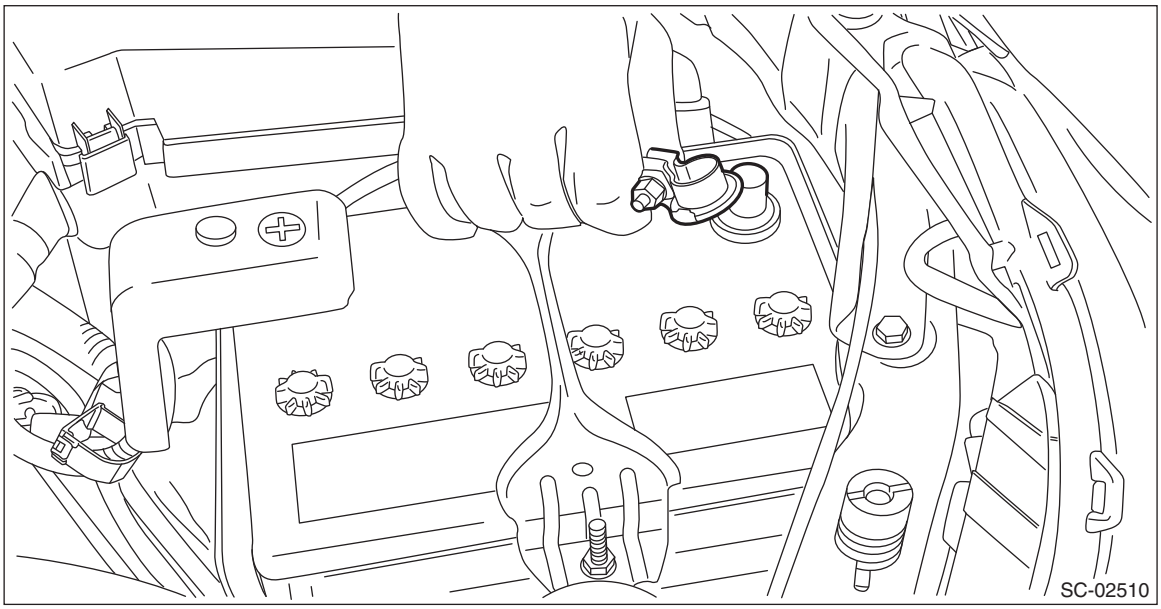
2. GENERAL TOOL

TOOL NAME	REMARKS
Circuit tester	Used for measuring voltage.

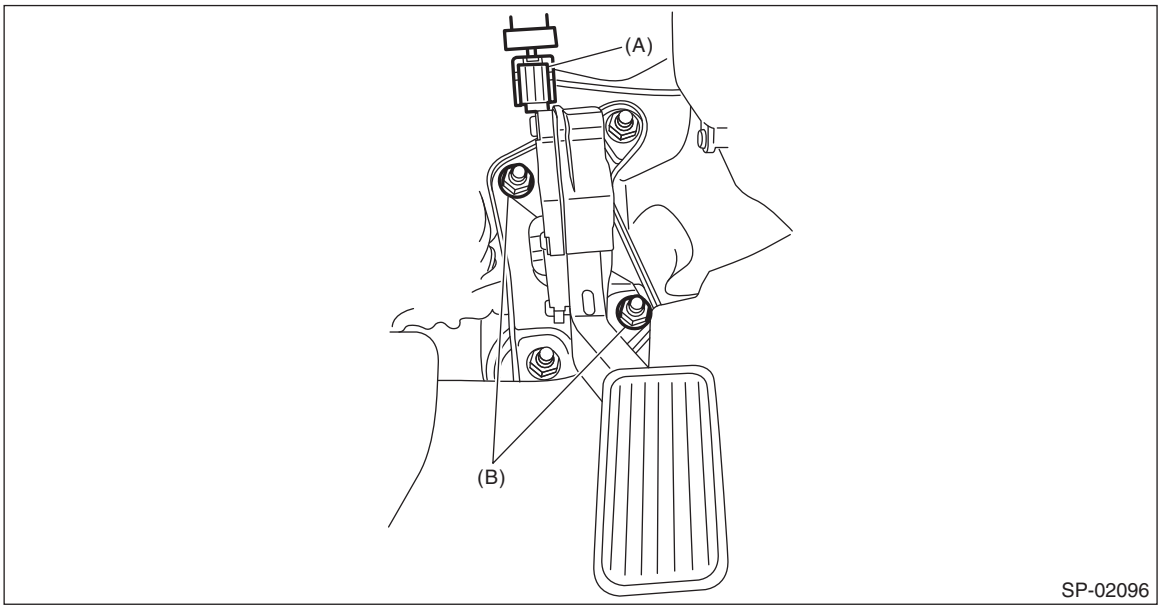
2. Accelerator Pedal

A: REMOVAL

1) Disconnect the ground cable from battery.



2) Disconnect the connector (A).
3) Remove the nut (B) securing accelerator pedal assembly, and remove the accelerator pedal assembly.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)

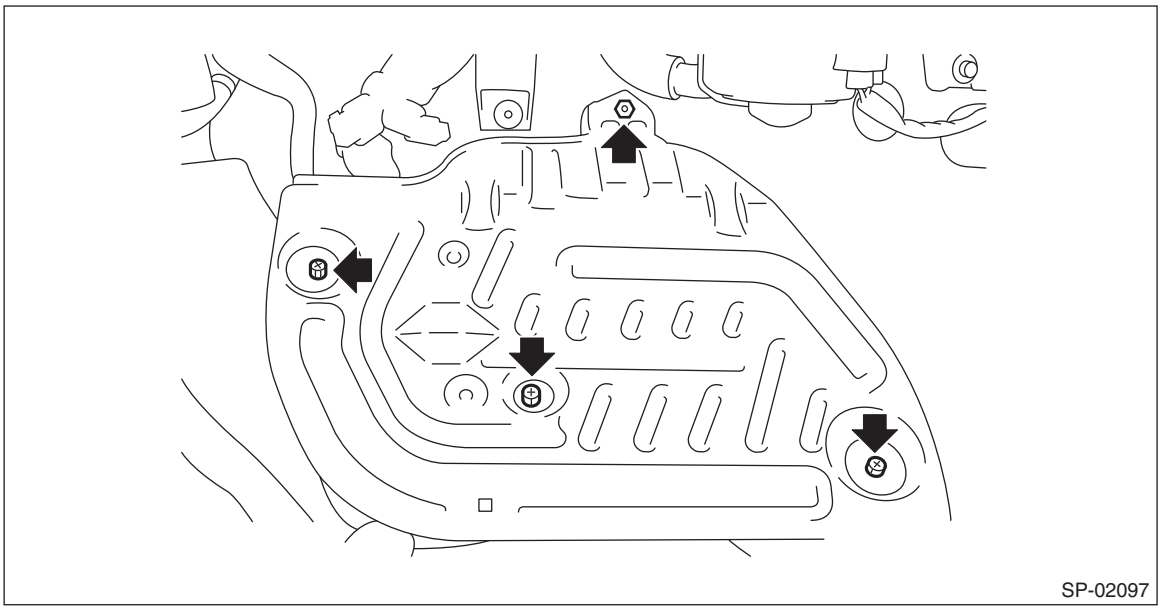
C: DISASSEMBLY

NOTE:
The accelerator pedal cannot be disassembled.

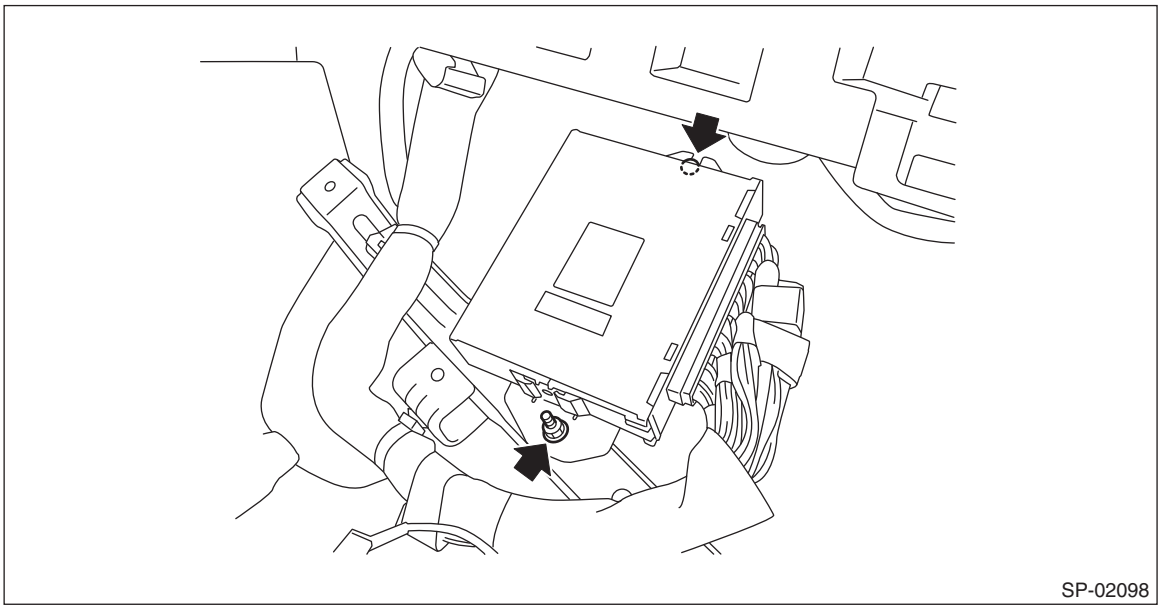
D: INSPECTION

1. CHECK ACCELERATOR PEDAL SENSOR AREA (METHOD WITH CIRCUIT TESTER)

1) Remove the glove box lower cover. <Ref. to EI-48, REMOVAL, Glove Box.>
2) Remove the lower inner trim of passenger's side. <Ref. to EI-56, REMOVAL, Lower Inner Trim.>
3) Turn over the floor mat of passenger's seat.
4) Remove the protect cover.

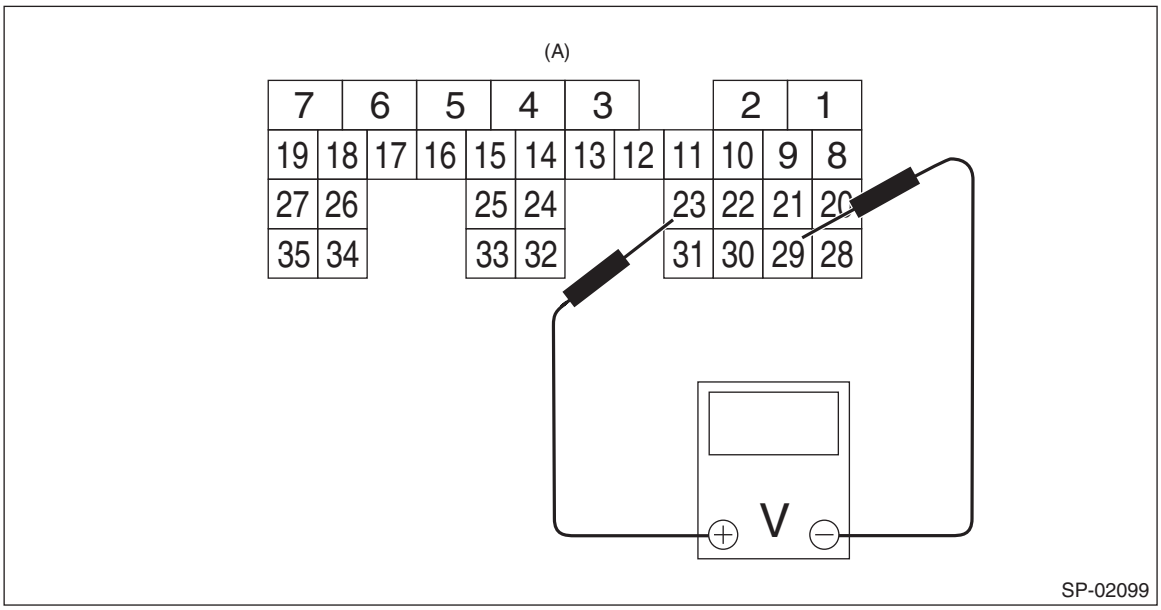

SP-02097

5) Remove the nuts and bolts which hold the ECM to the bracket.

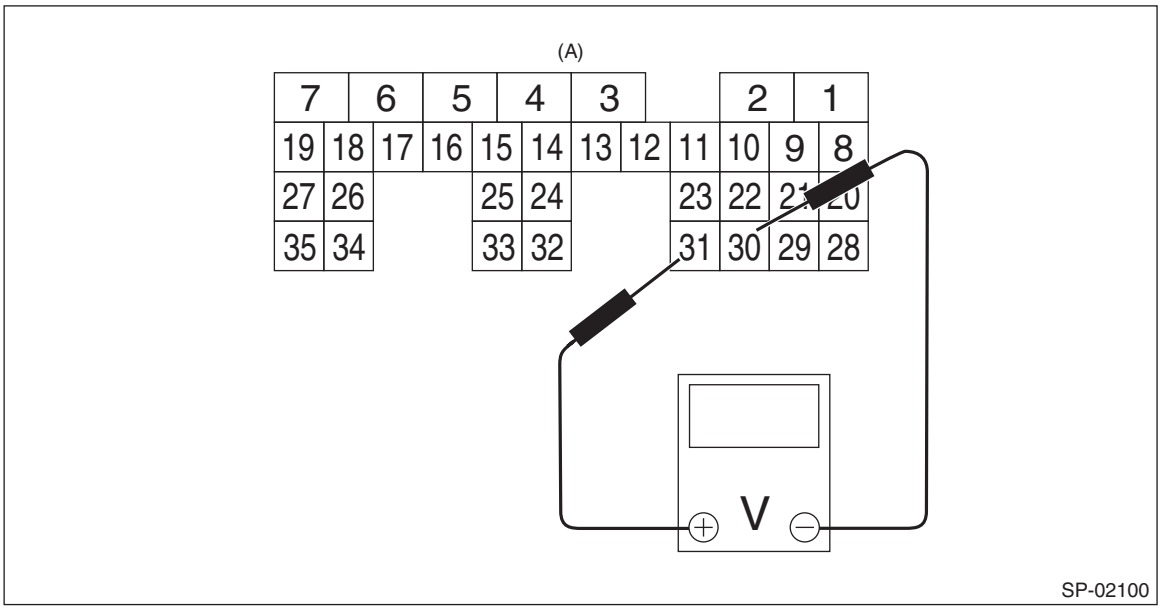

SP-02098

6) Turn the ignition switch to ON. (engine OFF)

7) Measure the voltage between ECM connector terminals.
Main sensor side



Sub sensor side



(A) To ECM connector

Accelerator pedal sensor	Accelerator pedal	Terminal No.	Standard
Main	Not depressed (Full closed)	23 (+) and 29 (–)	Approx. 1.0 V
	Depressed (Full opened)		Approx. 3.3 V
Sub	Not depressed (Full closed)	31 (+) and 30 (–)	Approx. 1.0 V
	Depressed (Full opened)		Approx. 3.3 V

8) After inspection, install the related parts in the reverse order of removal.

Tightening torque:
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)

2. CHECK ACCELERATOR PEDAL SENSOR AREA (METHOD WITH SUBARU SELECT MONITOR)

1) Turn the ignition switch to ON. (engine OFF)
2) Read the accelerator pedal opening angle signal and voltage of accelerator pedal sensor using Subaru Select Monitor. <Ref. to EN(H4DO)(diag)-36, READ CURRENT DATA FOR ENGINE (NORMAL MODE), OPERATION, Subaru Select Monitor.> <Ref. to EN(H4DOTC)(diag)-37, READ CURRENT DATA FOR ENGINE (NORMAL MODE), OPERATION, Subaru Select Monitor.>

Accelerator pedal sensor	Accelerator pedal opening angle signal	Standard
Main	0.0%	Approx. 1.0 V
	100.0%	Approx. 3.3 V
Sub	0.0%	Approx. 1.0 V
	100.0%	Approx. 3.3 V

3. OTHER INSPECTIONS

1) Check that the accelerator pedal does not have deformation, cracks or damage.
2) Check for smooth operation when the accelerator pedal is depressed.
3) Check if the accelerator pedal returns to its original position smoothly when the pedal is released.

IGNITION

IG(H4DO)

Page

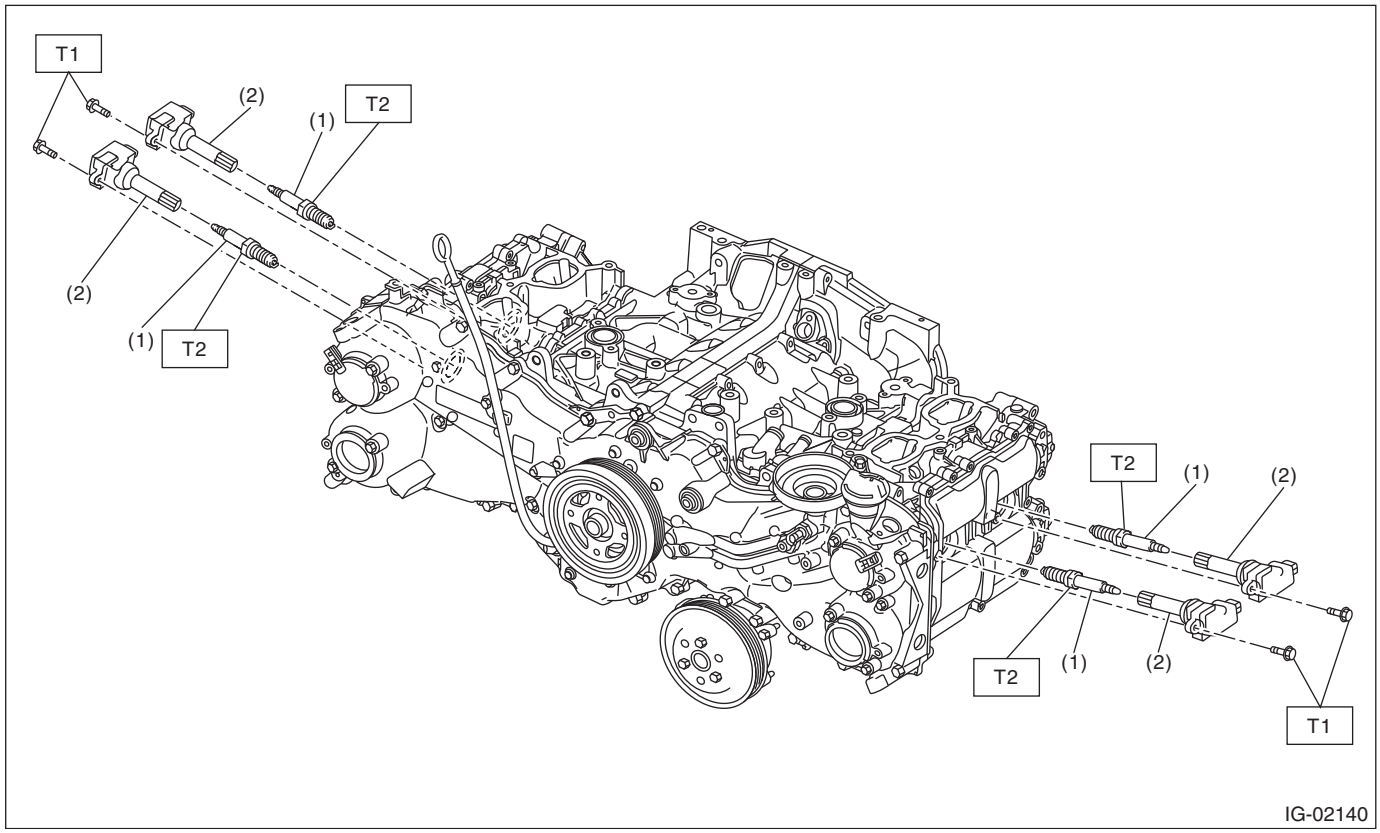
1. General Description 2
2. Spark Plug 4
3. Ignition Coil 9

1. General Description

A: SPECIFICATION

Item			Specifications
Ignition coil	Type		FK0400
	Ignition system		Independent ignition coil
	Manufacturer		Diamond Electric
Spark plug	Manufacturer and type		NGK: SILZKAR7B11
	Thread size (diameter, pitch, length) mm		12, 1.25, 26.5
	Spark plug gap mm (in)	Standard	1.0 — 1.1 (0.039 — 0.043)
	Electrode		Iridium

B: COMPONENT



(1) Spark plug
(2) Ignition coil

Tightening torque:N·m (kgf-m, ft-lb)
T1: 12 (1.2, 8.9)
T2: 17 (1.7, 12.5)

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.
- 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 battery.

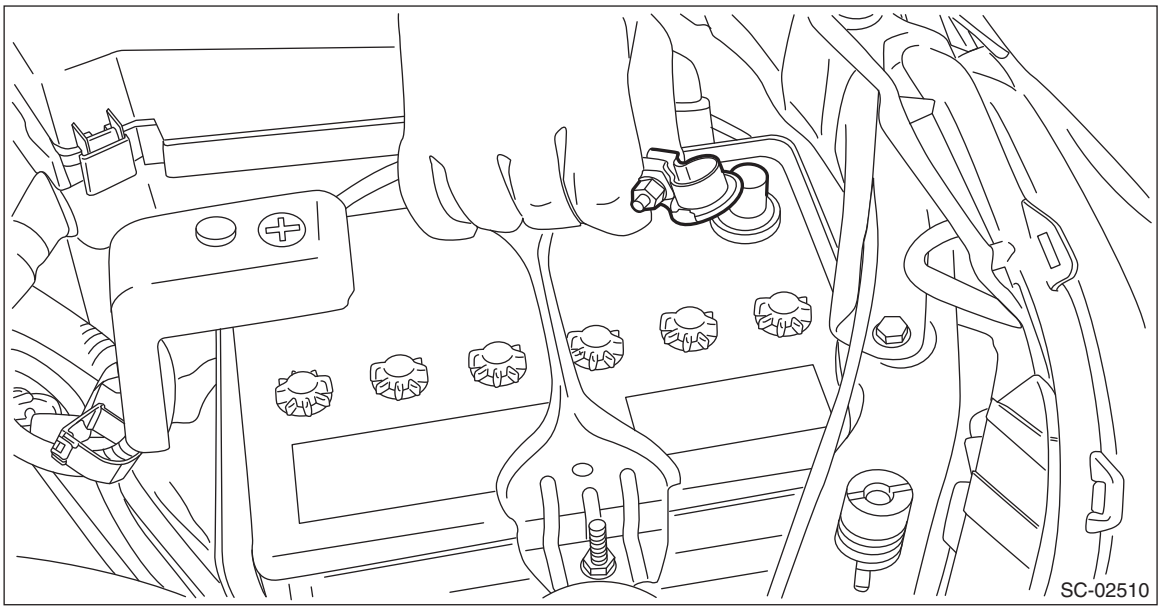
2. Spark Plug

A: REMOVAL

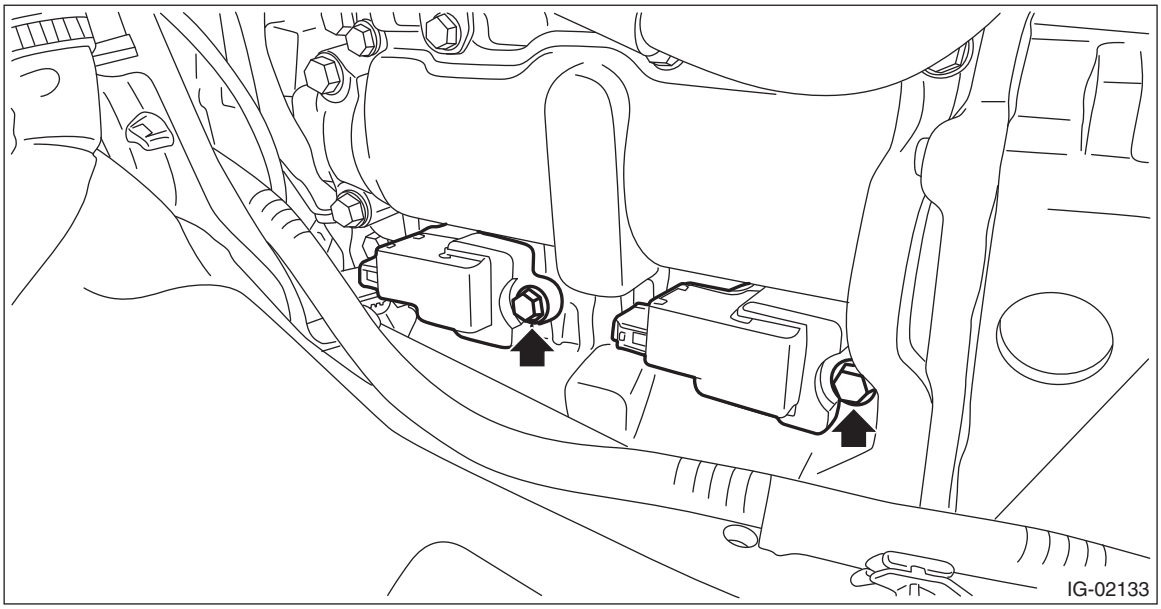
Spark plug:
Refer to "SPECIFICATION" for spark plug. <Ref. to IG(H4DO)-2, SPECIFICATION, General Description.>

1. RH SIDE

1) Disconnect the ground cable from battery.



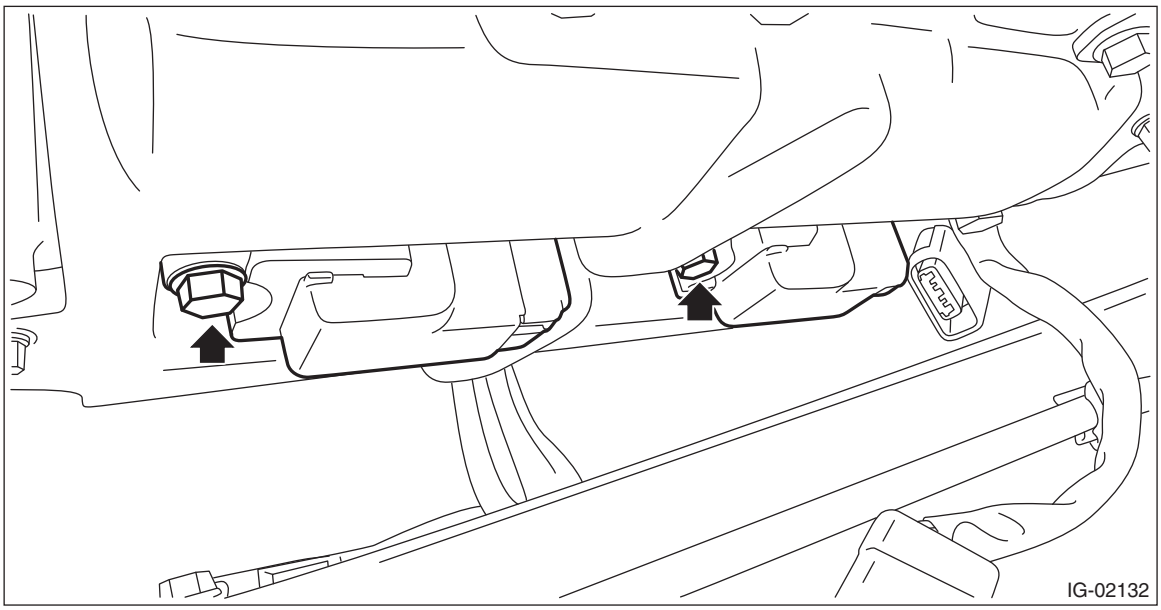
2) Remove the air cleaner case. <Ref. to IN(H4DO)-7, REMOVAL, Air Cleaner Case.>
3) Disconnect the connector from ignition coil.
4) Remove the ignition coil.



5) Remove the spark plug with a spark plug socket.

2. LH SIDE

1) Remove the battery. <Ref. to SC(H4DO)-59, REMOVAL, Battery.>
2) Disconnect the connector from ignition coil.
3) Remove the ignition coil.



4) Remove the spark plug with a spark plug socket.

B: INSTALLATION

1. RH SIDE

Install in the reverse order of removal.

CAUTION:
Degrease the ignition coil installation portion and the mounting bolts.

Tightening torque (Spark plug):
17 N·m (1.7 kgf-m, 12.5 ft-lb)

Tightening torque (Ignition coil):
12 N·m (1.2 kgf-m, 8.9 ft-lb)

2. LH SIDE

Install in the reverse order of removal.

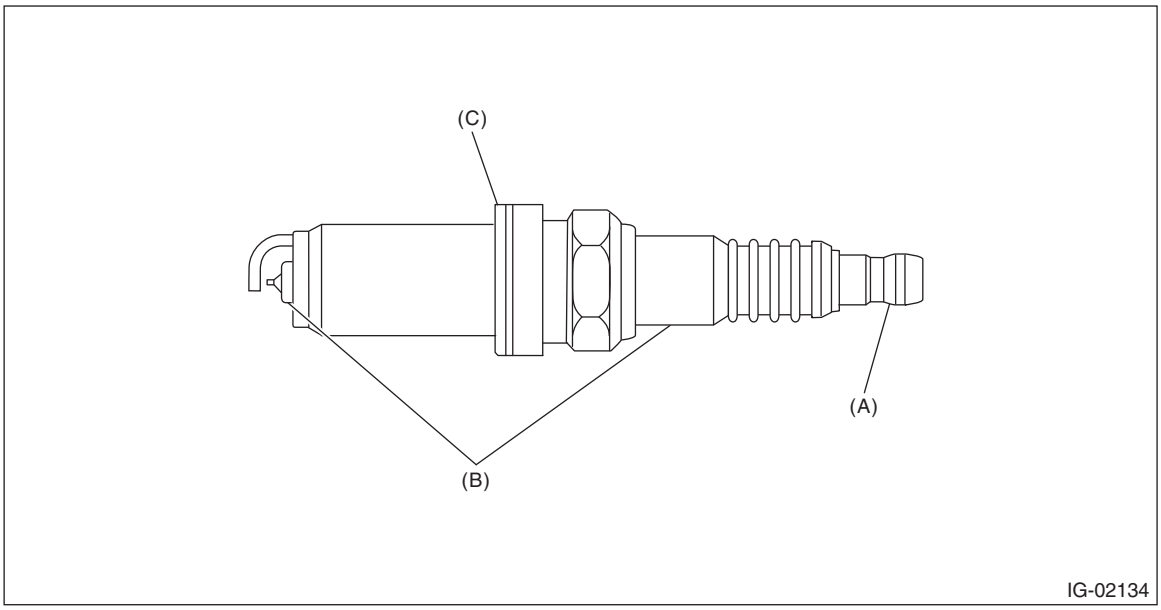
CAUTION:
Degrease the ignition coil installation portion and the mounting bolts.

Tightening torque (Spark plug):
17 N·m (1.7 kgf-m, 12.5 ft-lb)

Tightening torque (Ignition coil):
12 N·m (1.2 kgf-m, 8.9 ft-lb)

C: INSPECTION

1) Check the spark plug for abnormalities. If defective, replace the spark plug.

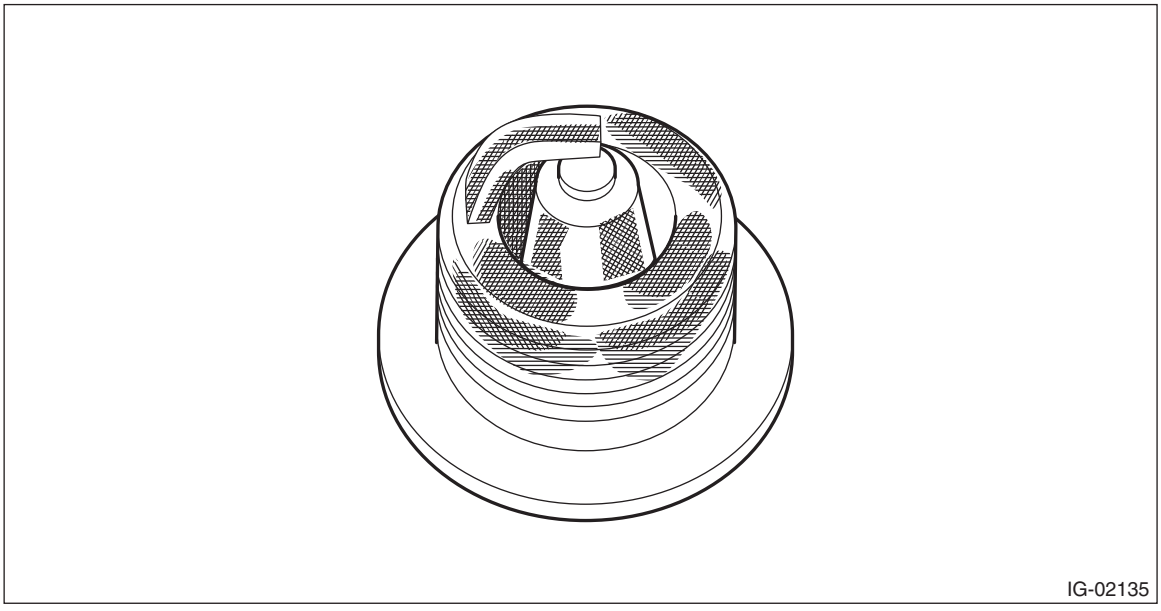


(A) Terminal damage (B) Crack or damage in insulator (C) Damaged gasket

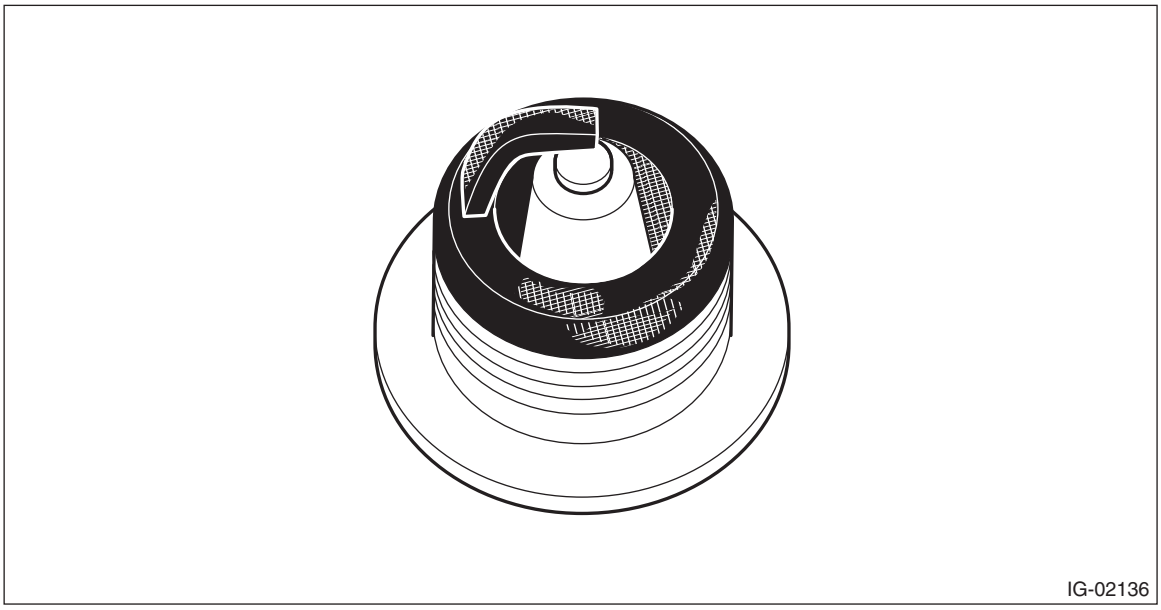
2) Check the spark plug electrode and condition of the insulator. If abnormal, check and repair the cause and replace the spark plug.

(1) Normal:

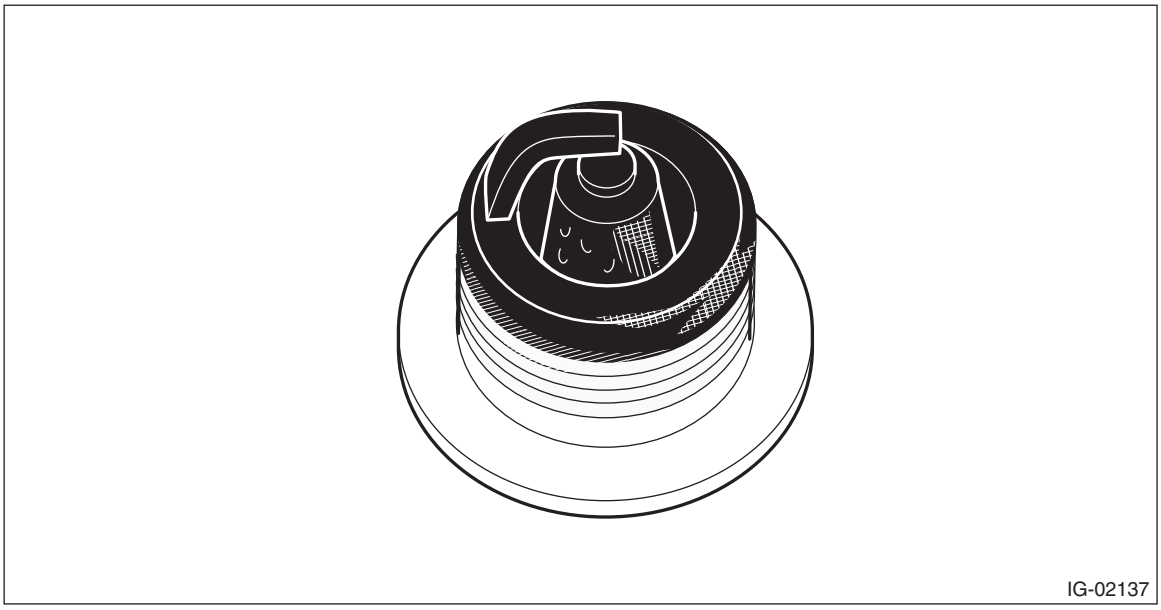
Brown to grayish-tan deposits and slight electrode wear indicate correct spark plug heat range.



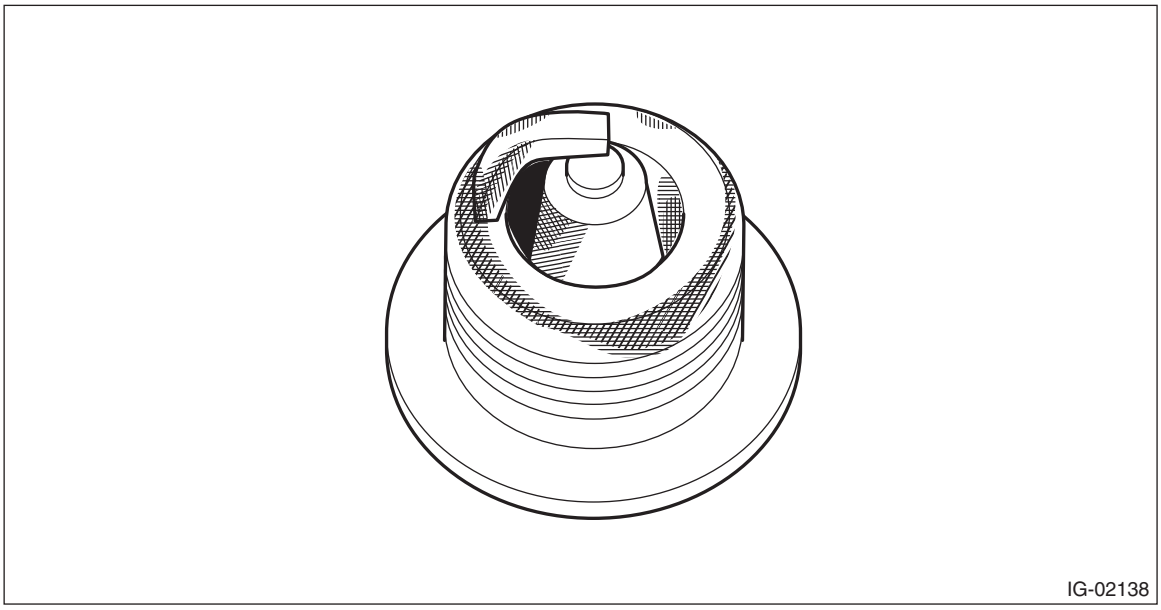
(2) Carbon fouled:
Dry fluffy carbon deposits on insulator and electrode are mostly caused by slow speed driving in the city, weak ignition, too rich fuel mixture, etc.


IG-02136

(3) Oil fouled:
Wet black deposits show oil entrance into combustion chamber through worn piston rings or increased clearance between valve guides and valve stems.


IG-02137

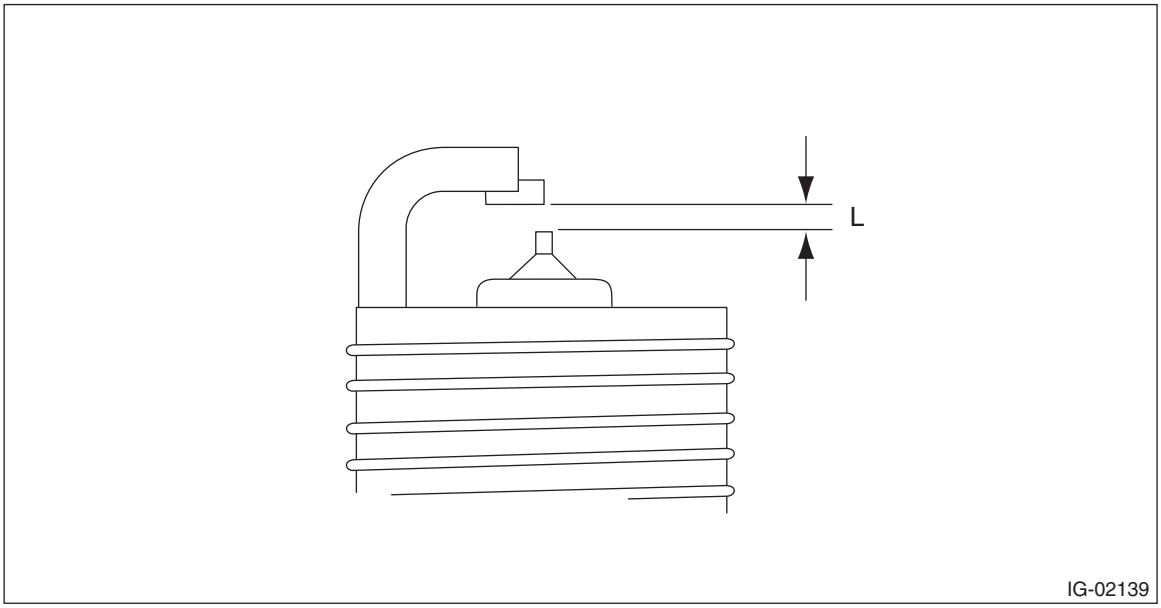
(4) Overheating:
White or light gray insulator with black or brown spots and bluish burnt electrodes indicate engine overheating, wrong selection of fuel, or loose spark plugs.


IG-02138

3) Using a nylon brush, etc., clean and remove the carbon or oxide deposits from the spark plug. If deposits are too stubborn, replace the spark plugs. After cleaning the spark plugs, check the spark plug gap “L” using a gap gauge. If it is not within the standard, replace the spark plug.

NOTE:
- Never use a plug cleaner.
- Do not use a metal brush as it may damage the electrode area.

Spark plug gap L:
Standard
1.0 — 1.1 mm (0.039 — 0.043 in)



IG-02139

3. Ignition Coil

A: REMOVAL

Direct ignition type is adopted. Refer to “Spark Plug” for removal procedure. <Ref. to IG(H4DO)-4, REMOVAL, Spark Plug.>

B: INSTALLATION

Direct ignition type is adopted. Refer to “Spark Plug” for the installation procedure. <Ref. to IG(H4DO)-5, INSTALLATION, Spark Plug.>

C: INSPECTION

For inspection procedure, refer to “Diagnostics for Engine Starting Failure”. <Ref. to EN(H4DO)(diag)-77, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>

STARTING/CHARGING SYSTEMS

SC(H4DO)

Page

1. General Description 2
2. Starter 9
3. Generator 33
4. Battery 59

1. General Description

A: SPECIFICATION

1. NON-TURBO MODEL

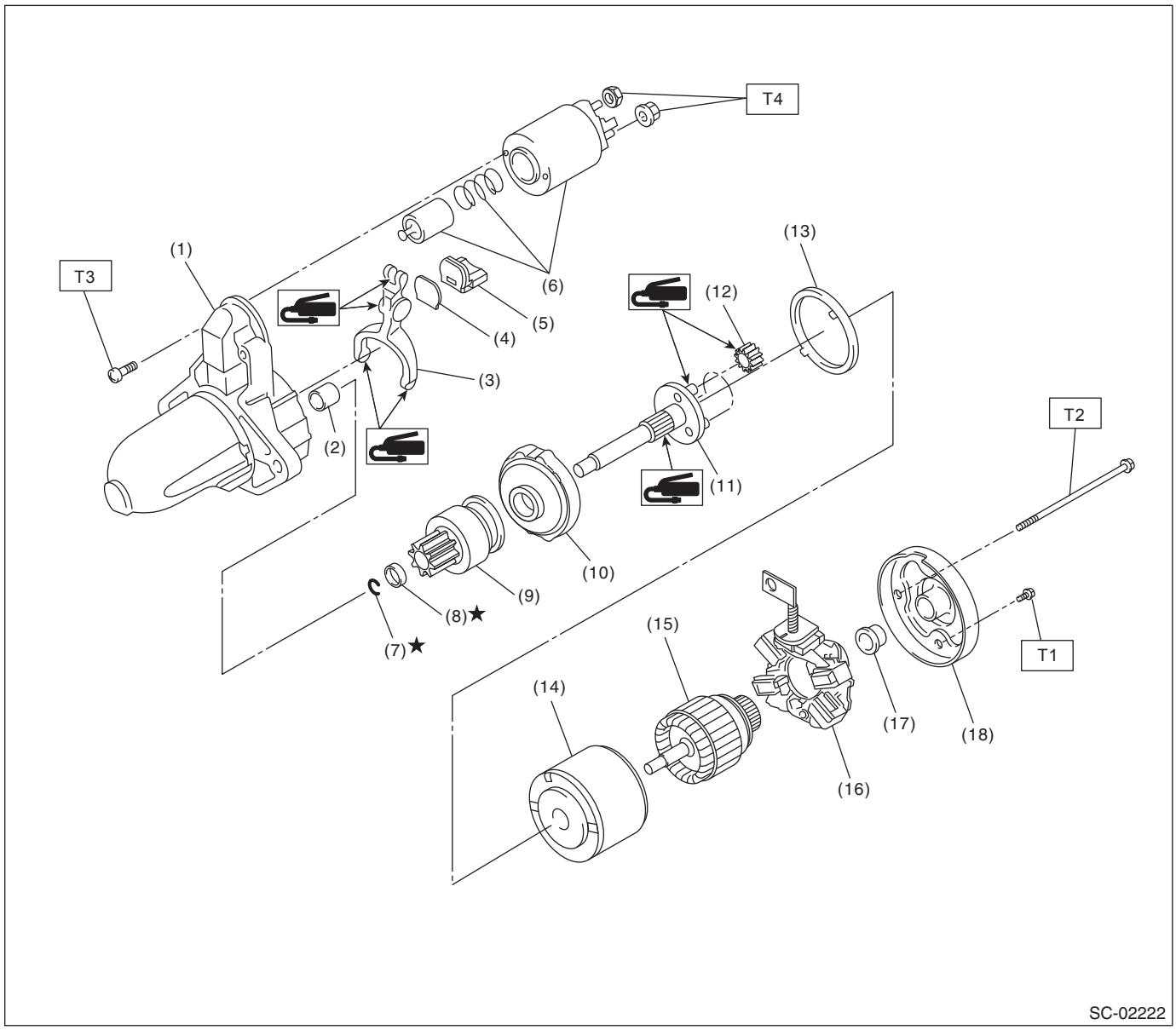
Item			Specifications	
Vehicle model			AT	MT
Starter	Type		Reduction type	
	Model		M000T20175	M000T30475
	Manufacturer		Mitsubishi Electric	
	Voltage and output		12 V — 1.4 kW	12 V — 1.0 kW
	Direction of rotation		Counterclockwise (when observed from pinion)	
	Number of pinion teeth		9	8
	Armature commutator runout	Standard	0.05 mm (0.0020 in)	
		Limit	0.10 mm (0.0039 in)	
	Armature depth of segment mold	Standard	0.5 mm (0.020 in)	
	Brush length	Standard	12.3 mm (0.484 in)	
		Limit	7.0 mm (0.276 in)	
	Brush spring force	Standard	15.9 — 19.5 N (1.62 — 1.99 kgf, 3.57 — 4.38 lbf)	
		Limit	2.5 N (0.25 kgf, 0.56 lbf)	
	No-load characteristics	Voltage	11 V	
		Current	90 A or less	95 A or less
		Rotating speed	2,000 rpm or more	2,500 rpm or more
	Load characteristics	Voltage	7.7 V	7.5 V
		Current	400 A	300 A
		Torque	16.7 N·m (1.7 kgf-m, 12.3 ft-lb) or more	8.84 N·m (0.9 kgf-m, 6.5 ft-lb) or more
		Rotating speed	710 rpm or more	870 rpm or more
	Lock characteristics	Voltage	3.5 V	4 V
		Current	960 A or less	680 A or less
		Torque	31 N·m (3.2 kgf-m, 22.9 ft-lb) or more	17 N·m (1.7 kgf-m, 12.5 ft-lb) or more
Generator	Type		Rotating-field three-phase type, voltage regulator built-in type, with load response control system	
	Model		A2TL0091	
	Manufacturer		Mitsubishi Electric	
	Voltage and output		12 V — 110 A	
	Polarity on ground side		Negative	
	Direction of rotation		Clockwise (when observed from pulley side)	
	Stator connection		3-phase Y-type	
	Output current		1,500 rpm — 46 A or more 2,500 rpm — 90 A or more 5,000 rpm — 109 A or more	
	Regulated voltage		14.1 — 14.8 V [20°C (68°F)]	
	Rotor slip ring outer diameter	Standard	22.7 mm (0.894 in)	
		Limit	22.1 mm (0.870 in)	
	Brush length	Standard	18.5 mm (0.728 in)	
		Limit	5.0 mm (0.197 in)	
Battery	Type and capacity		12 V — 52 AH (65D 23L)	12 V — 48 AH (55D 23L)

2. TURBO MODEL

Item			Specifications
Vehicle model			AT
Starter	Type		Reduction type
	Model		M000T20175
	Manufacturer		Mitsubishi Electric
	Voltage and output		12 V — 1.4 kW
	Direction of rotation		Counterclockwise (when observed from pinion)
	Number of pinion teeth		9
	Armature commutator runout	Standard	0.05 mm (0.0020 in)
		Limit	0.10 mm (0.0039 in)
	Armature depth of segment mold	Standard	0.5 mm (0.020 in)
	Brush length	Standard	12.3 mm (0.484 in)
		Limit	7.0 mm (0.276 in)
	Brush spring force	Standard	15.9 — 19.5 N (1.62 — 1.99 kgf, 3.57 — 4.38 lbf)
		Limit	2.5 N (0.25 kgf, 0.56 lbf)
	No-load characteristics	Voltage	11 V
		Current	90 A or less
		Rotating speed	2,000 rpm or more
	Load characteristics	Voltage	7.7 V
		Current	400 A
		Torque	16.7 N·m (1.7 kgf-m, 12.3 ft-lb) or more
		Rotating speed	710 rpm or more
	Lock characteristics	Voltage	3.5 V
		Current	960 A or less
		Torque	31 N·m (3.2 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		A3TG6591
	Manufacturer		Mitsubishi Electric
	Voltage and output		12 V — 110 A
	Polarity on ground side		Negative
	Direction of rotation		Clockwise (when observed from pulley side)
	Stator connection		3-phase Y-type
	Output current		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)]
	Rotor slip ring outer diameter	Standard	22.7 mm (0.894 in)
		Limit	22.1 mm (0.870 in)
	Brush length	Standard	18.5 mm (0.728 in)
		Limit	5.0 mm (0.197 in)
Battery	Type and capacity		12 V — 52 AH (65D 23L)

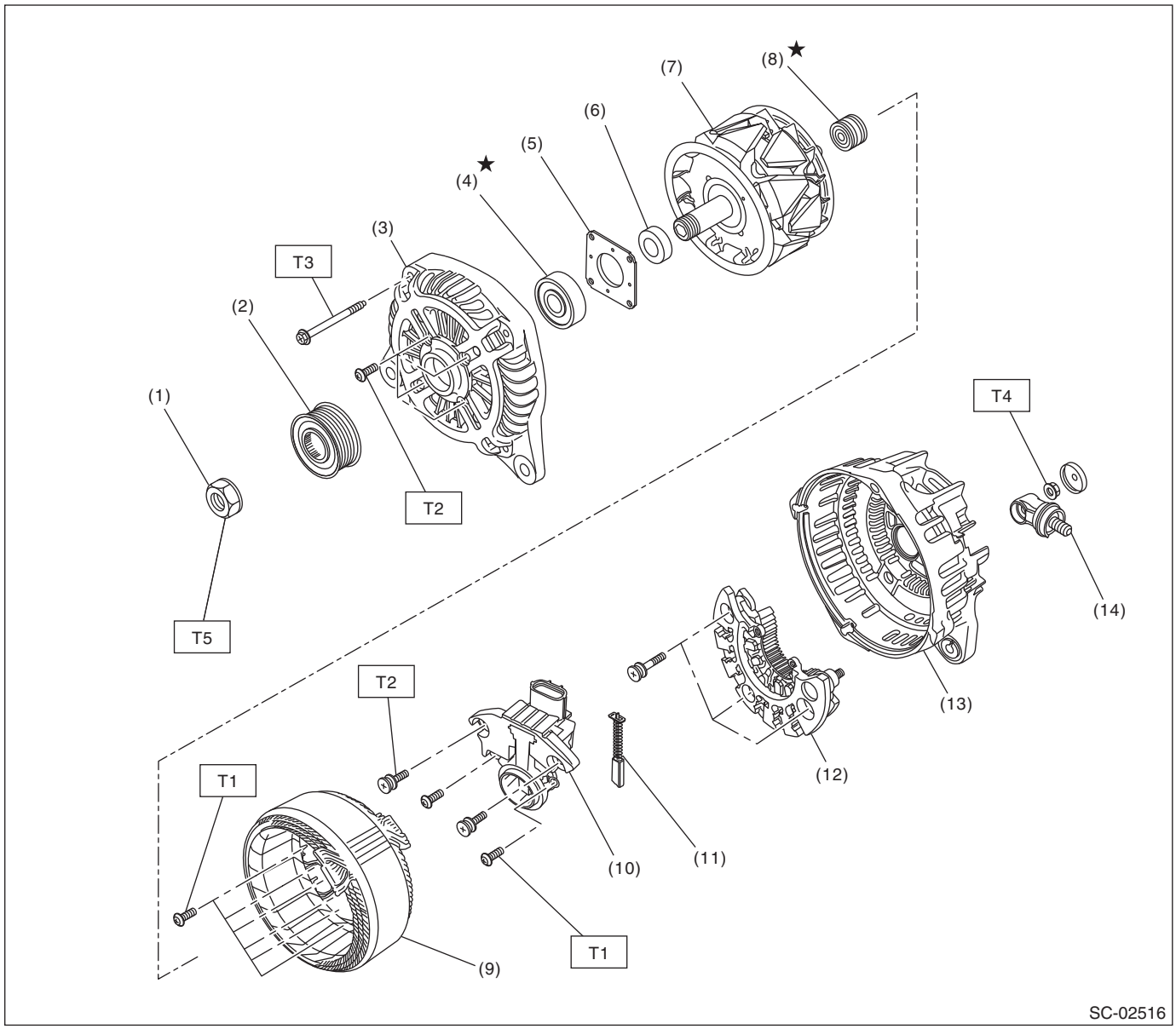
B: COMPONENT

1. STARTER



(1)	Starter housing ASSY	(9)	Overrunning clutch	(17)	Sleeve bearing
(2)	Sleeve bearing	(10)	Internal gear ASSY	(18)	Starter cover ASSY
(3)	Shift lever	(11)	Shaft		
(4)	Plate	(12)	Pinion gear	***Tightening torque:N·m (kgf-m, ft-lb)***	
(5)	Seal rubber	(13)	Seal rubber	***T1:***	***1.4 (0.1, 1.0)***
(6)	Magnet switch ASSY	(14)	Yoke ASSY	***T2:***	***6 (0.6, 4.4)***
(7)	Snap ring	(15)	Armature ASSY	***T3:***	***7.5 (0.8, 5.5)***
(8)	Stopper	(16)	Brush holder ASSY	***T4:***	***10 (1.0, 7.4)***

2. GENERATOR

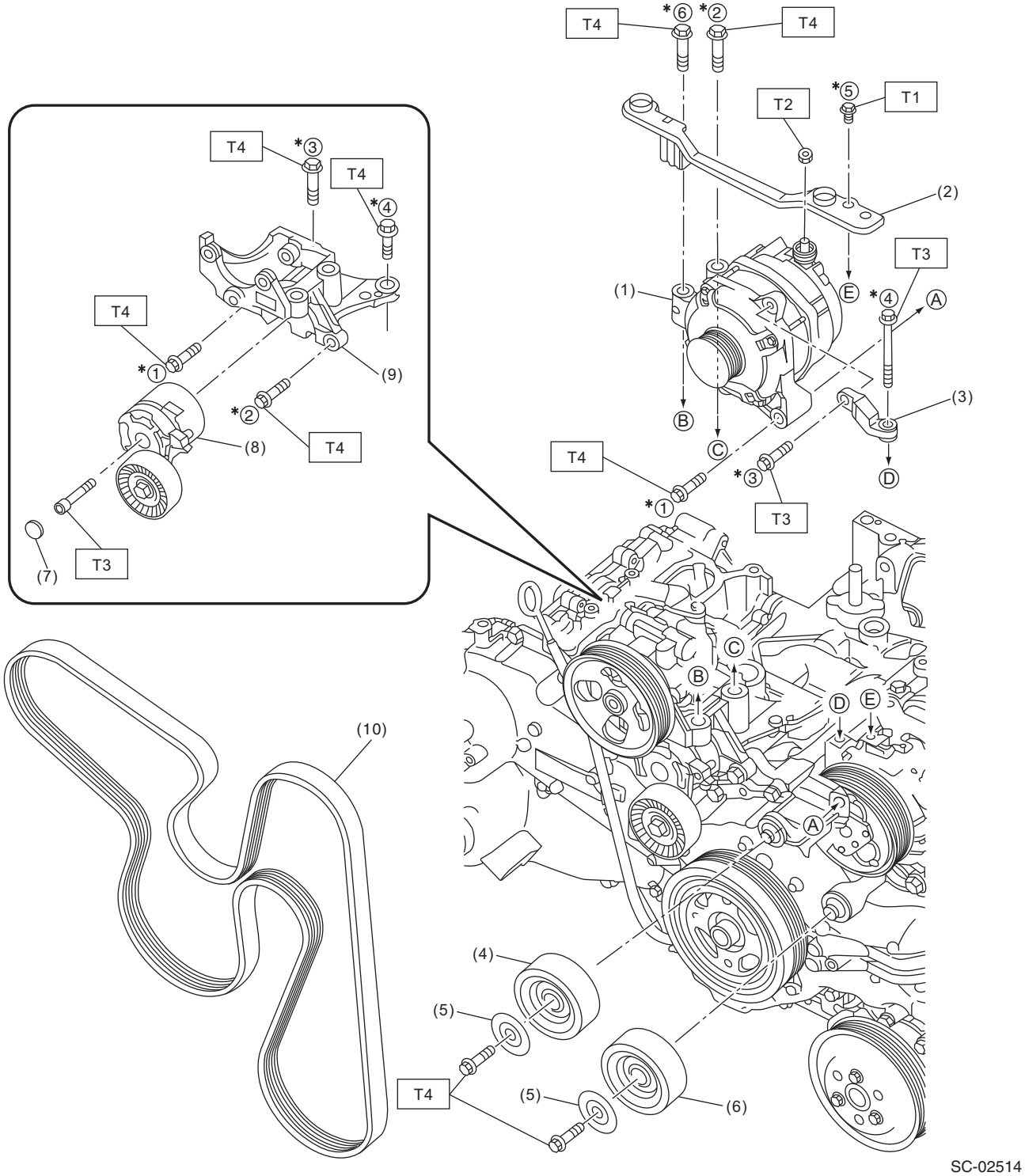


(1)	Nut	(8)	Bearing
(2)	Pulley	(9)	Stator coil
(3)	Front cover	(10)	IC regulator
(4)	Ball bearing	(11)	Brush
(5)	Bearing retainer	(12)	Rectifier
(6)	Spacer	(13)	Rear cover
(7)	Rotor	(14)	Terminal B

Tightening torque:N·m (kgf-m, ft-lb)
T1: 2 (0.2, 1.5)
T2: 3.9 (0.4, 2.9)
T3: 4.4 (0.4, 3.2)
T4: 8.9 (0.9, 6.6)
T5: 108 (11.0, 79.8)

3. GENERATOR BRACKET

- Non-turbo model



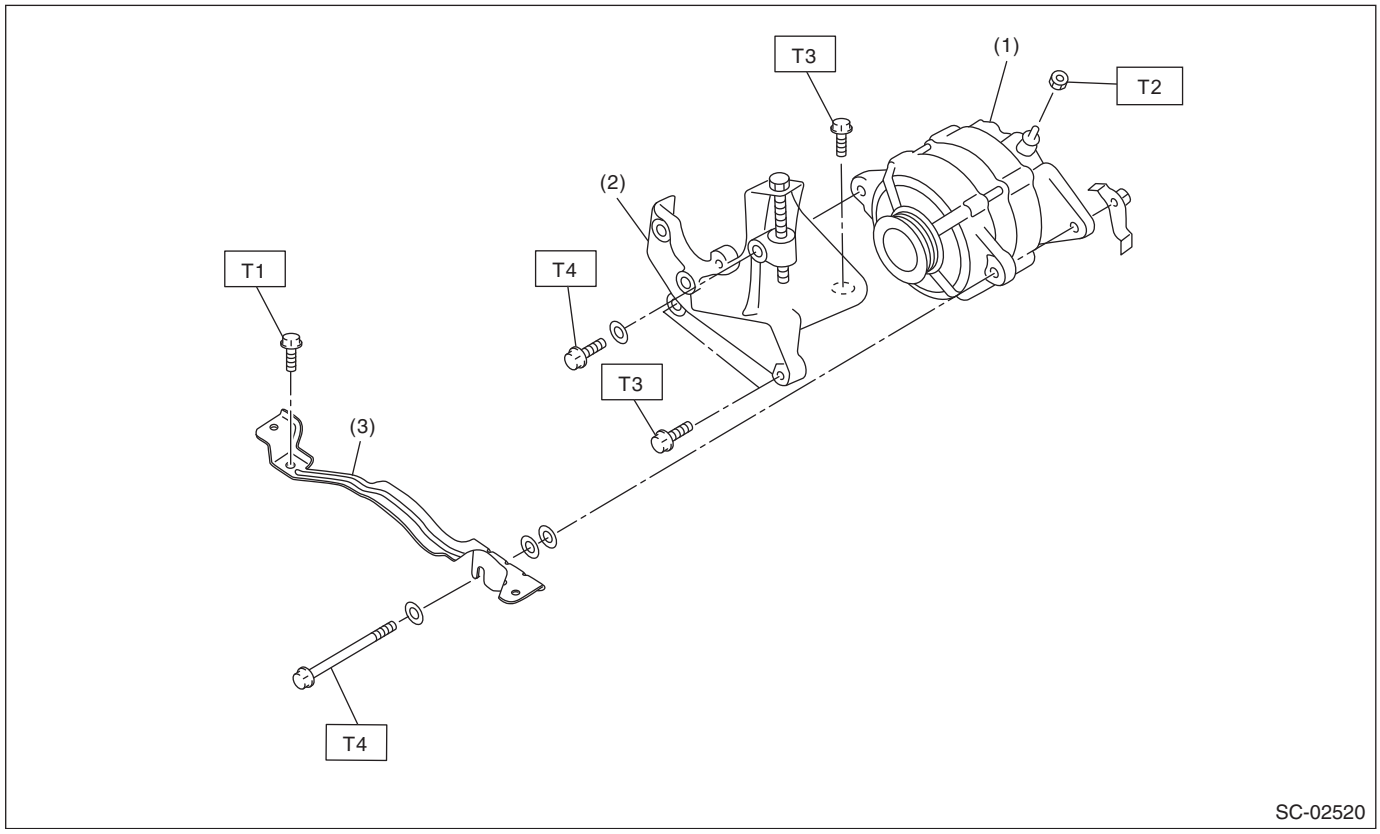
SC-02514

(1) Generator
(2) V-belt cover bracket
(3) Generator bracket
(4) Idler pulley A
(5) Idler pulley cover
(6) Idler pulley B
(7) Cap
(8) V-belt tensioner ASSY
(9) Power steering pump bracket
(10) V-belt

* Tighten the generator and V-belt cover brackets in the numerical order.
* Tighten the power steering pump bracket in the numerical order.

Tightening torque:N·m (kgf-m, ft-lb)
T1: 8.5 (0.9, 6.3)
T2: 16 (1.6, 11.8)
T3: 25 (2.5, 18.4)
T4: 36 (3.7, 26.6)

- Turbo model



(1) Generator
(2) Power steering pump bracket
(3) Collector cover bracket

Tightening torque:N·m (kgf-m, ft-lb)
T1: 8.5 (0.9, 6.3)
T2: 16 (1.6, 11.8)
T3: 22 (2.2, 16.2)
T4: 25 (2.5, 18.4)

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 battery.

D: PREPARATION TOOL

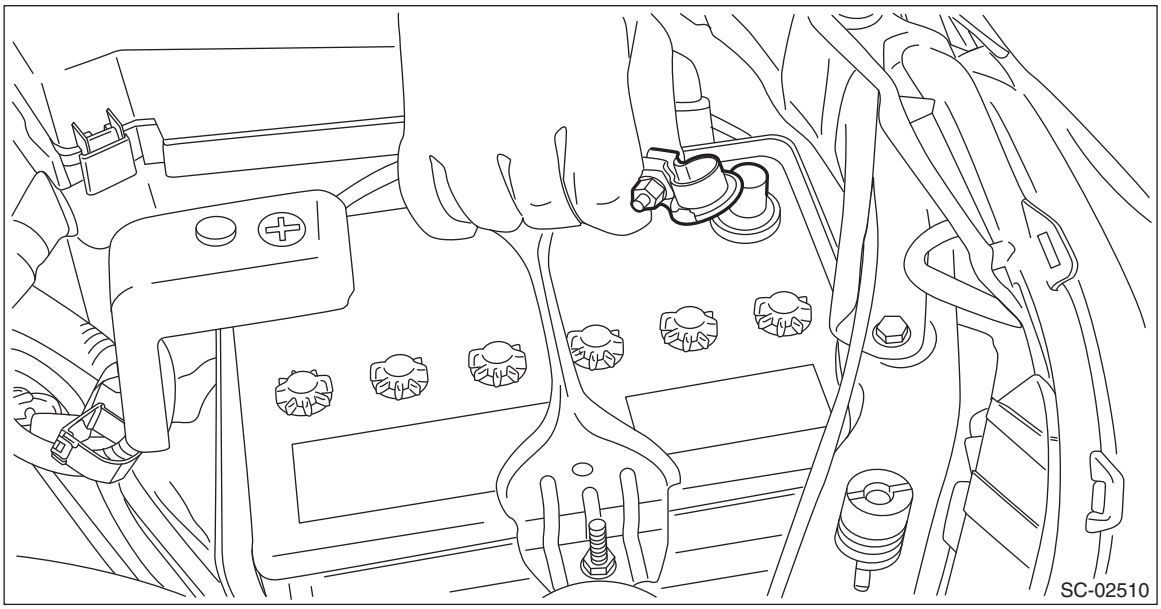
1. GENERAL TOOL

TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance, voltage and current.

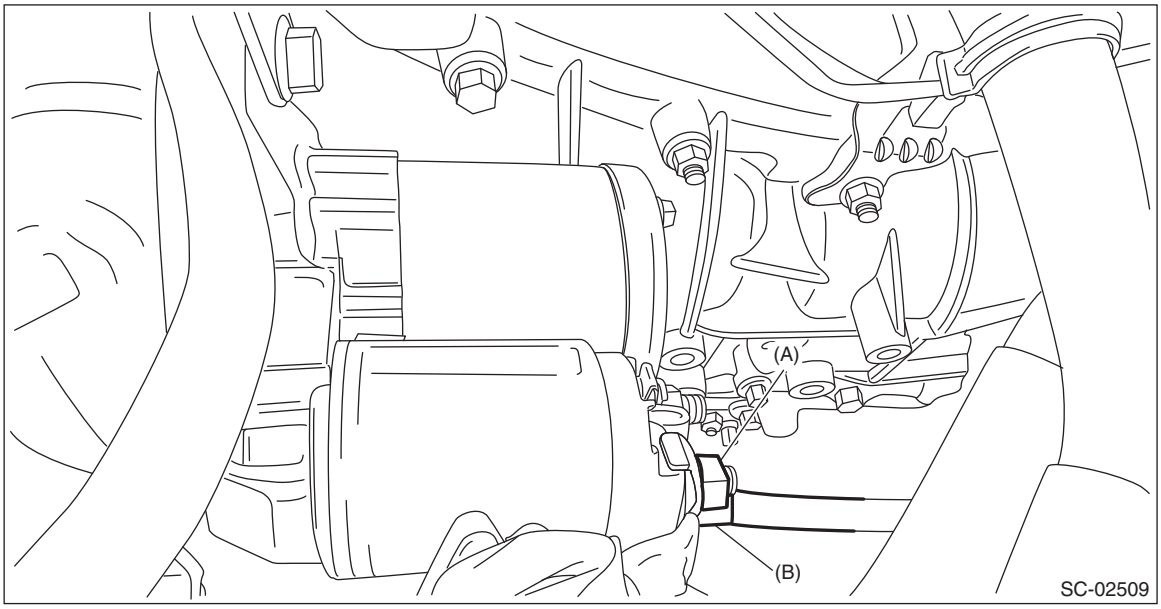
2. Starter

A: REMOVAL

1) Disconnect the ground cable from battery.

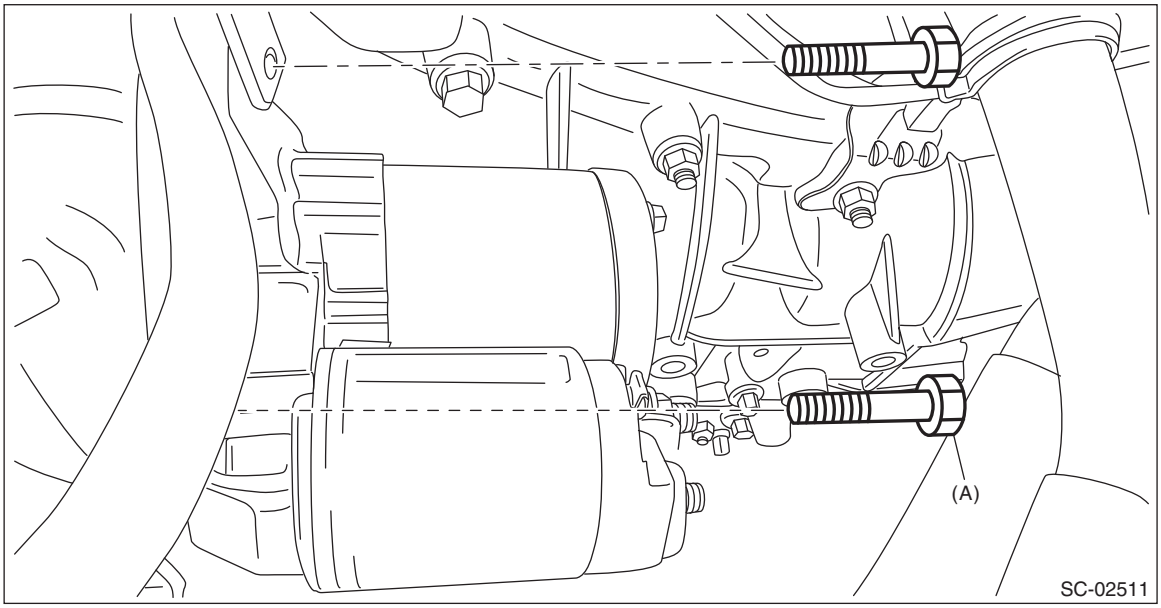


2) Remove the air intake boot. (non-turbo model) <Ref. to IN(H4DO)-13, REMOVAL, Air Intake Boot.>
3) Remove the intercooler. (turbo model) <Ref. to IN(H4DOTC)-13, REMOVAL, Intercooler.>
4) Disconnect the connector (B) and terminal (A) from starter.



5) Remove the starter from transmission.

NOTE:
For the AT model, a nut is used at (A).

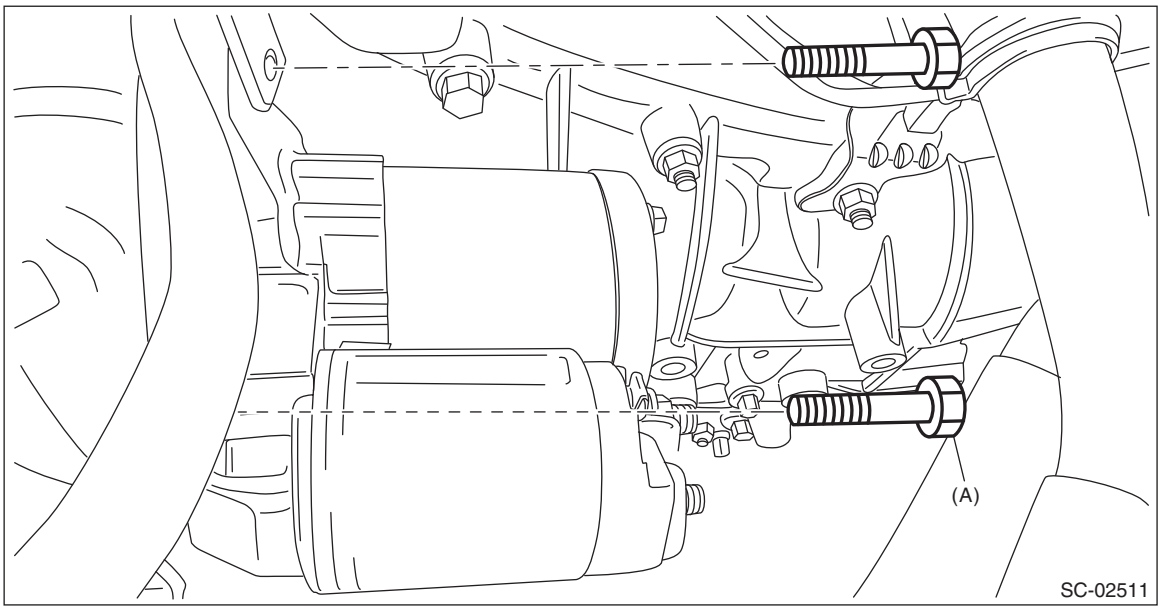


B: INSTALLATION

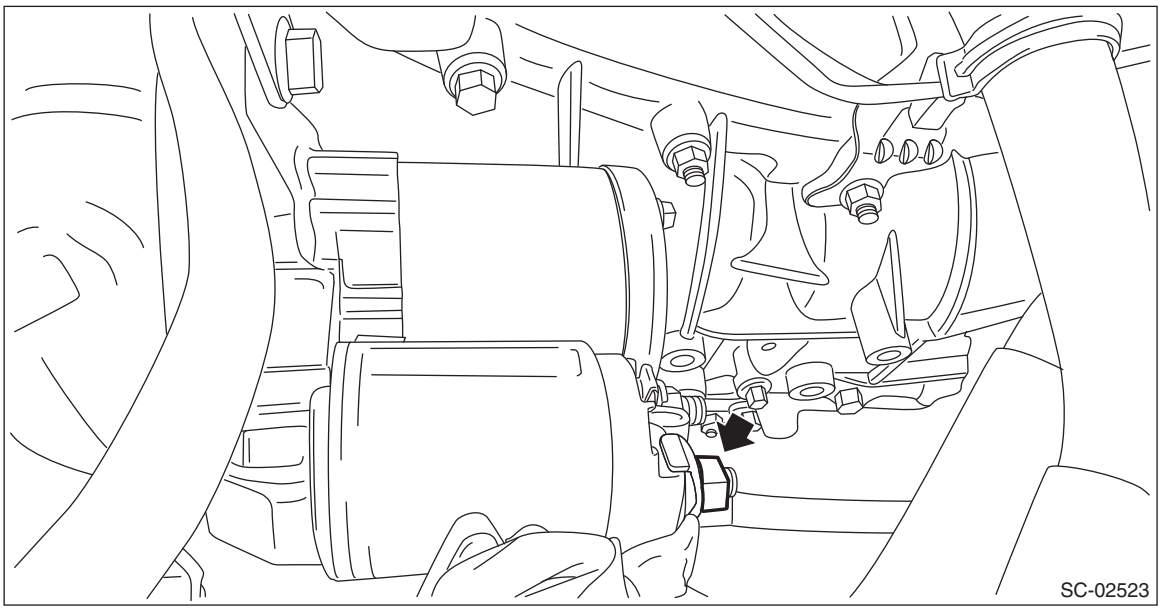
Install in the reverse order of removal.

NOTE:
For the AT model, a nut is used at (A).

Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)

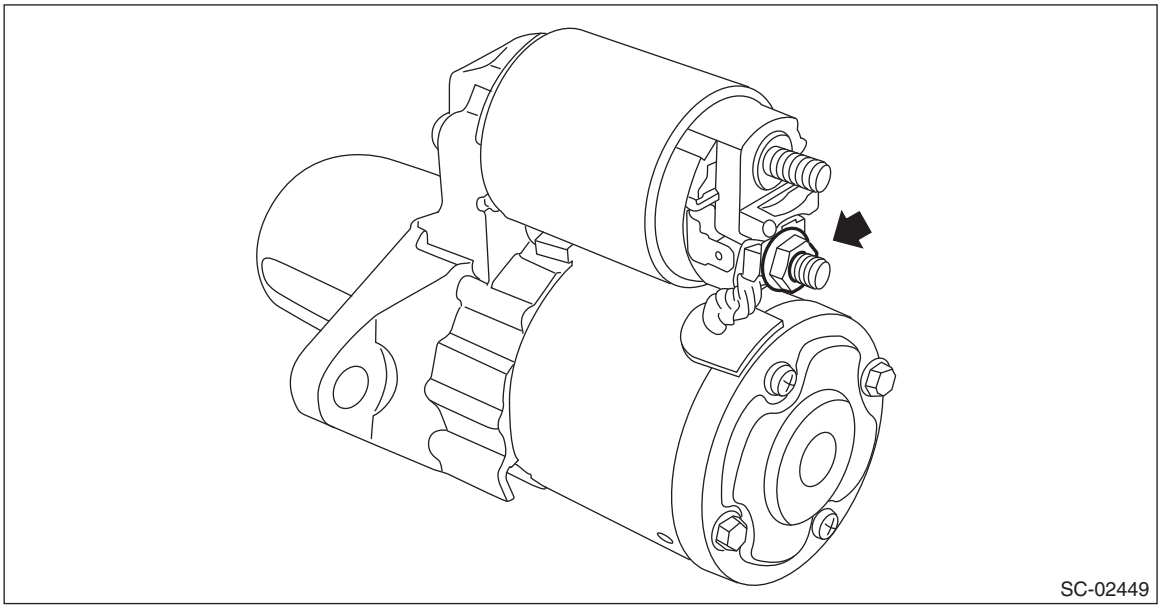


Tightening torque:
10 N·m (1.0 kgf-m, 7.4 ft-lb)

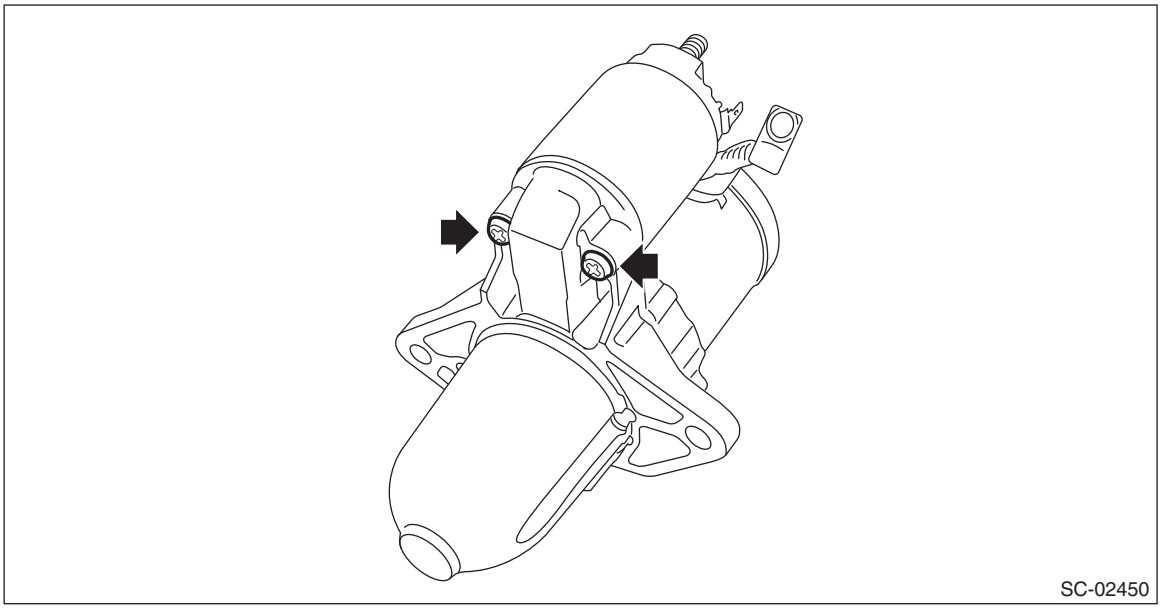


C: DISASSEMBLY

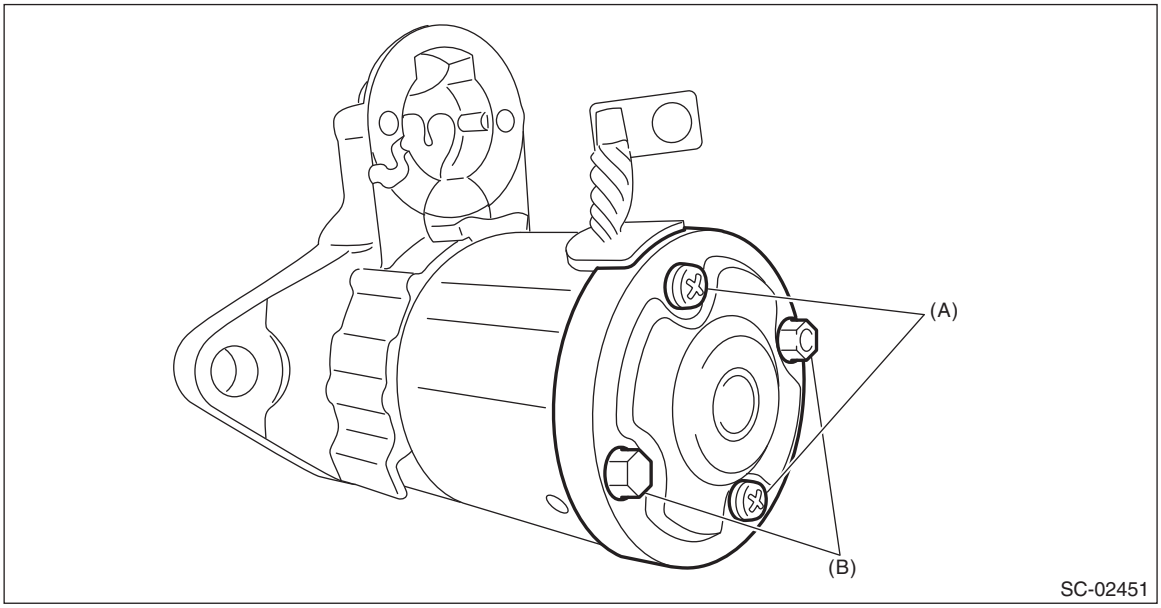
1) Disconnect the terminal M from the magnet switch assembly.



2) Remove the magnet switch assembly from the starter housing assembly.

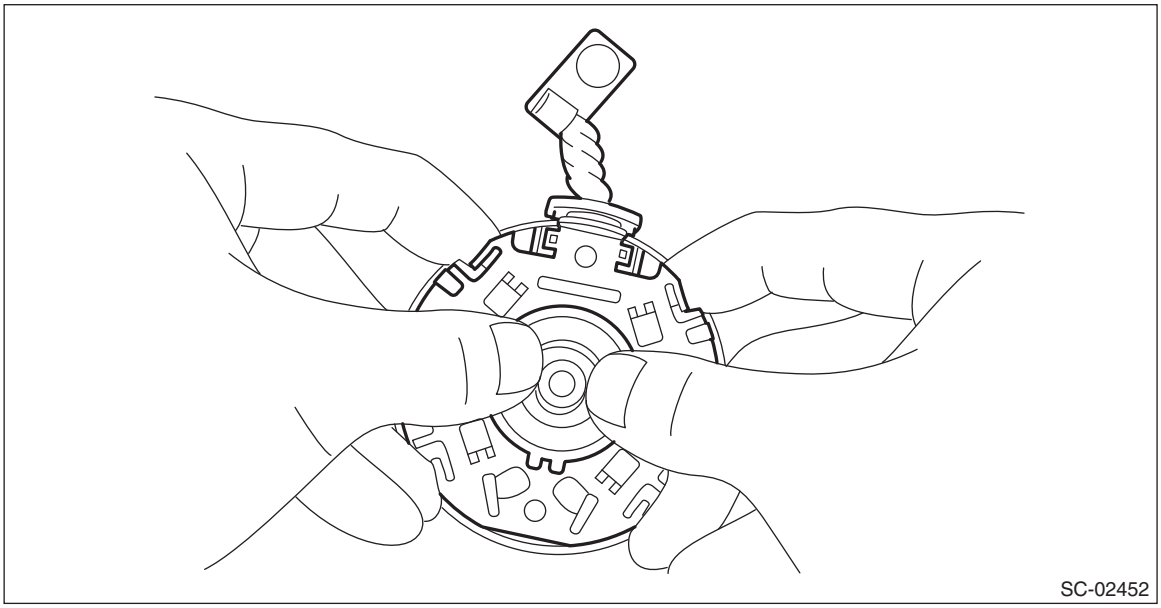


3) Remove screws (A) of the brush holder assembly, and through bolts (B) on both sides, and remove the starter cover assembly.

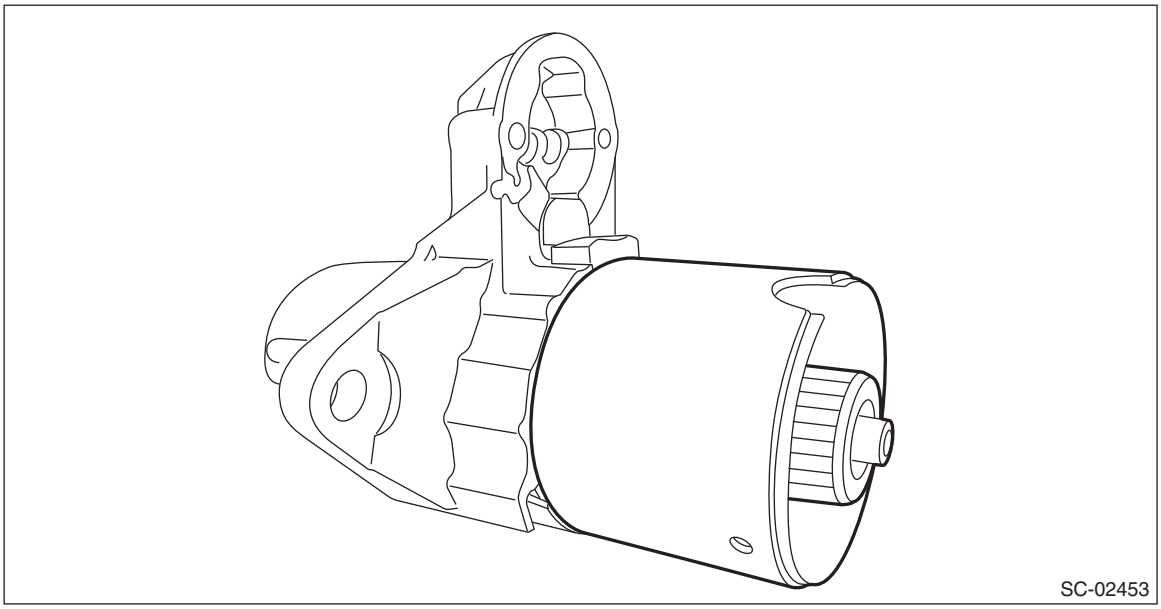


4) Remove the brush holder assembly from the armature assembly.

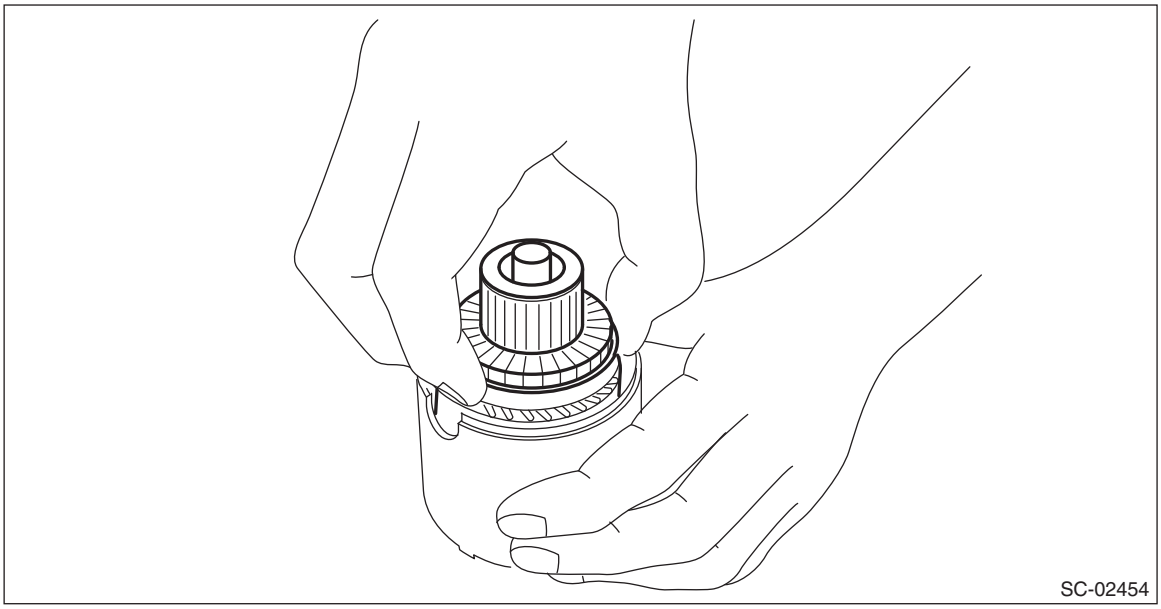
NOTE:
Hold the brush with your fingers so that the brush spring does not come flying out.


SC-02452

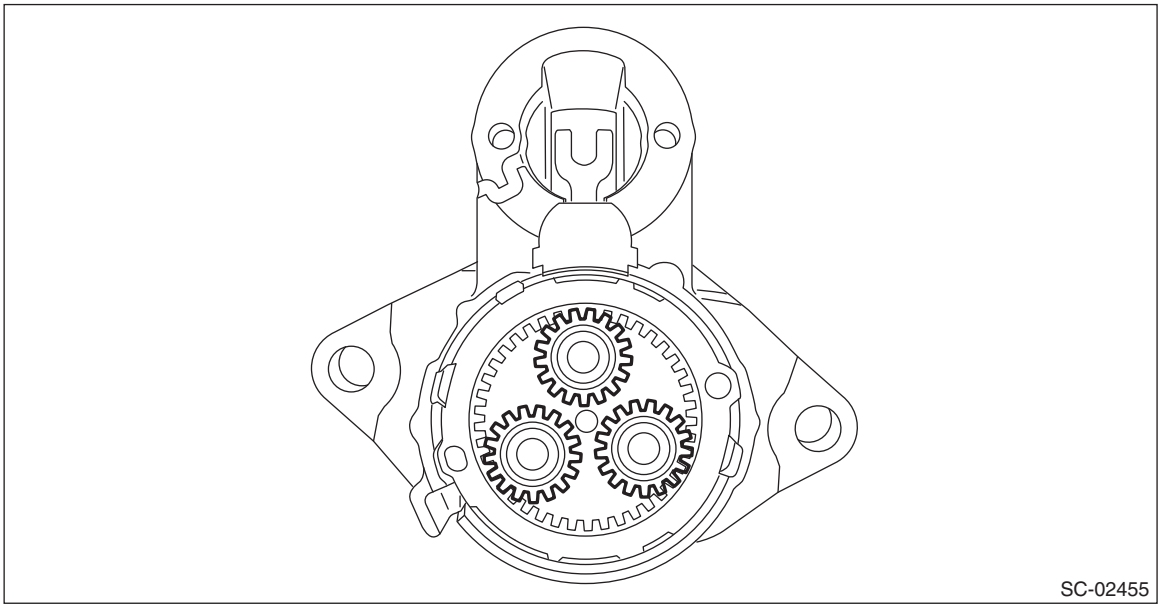
5) Remove the armature assembly and yoke assembly from the starter housing assembly together as a single unit.


SC-02453

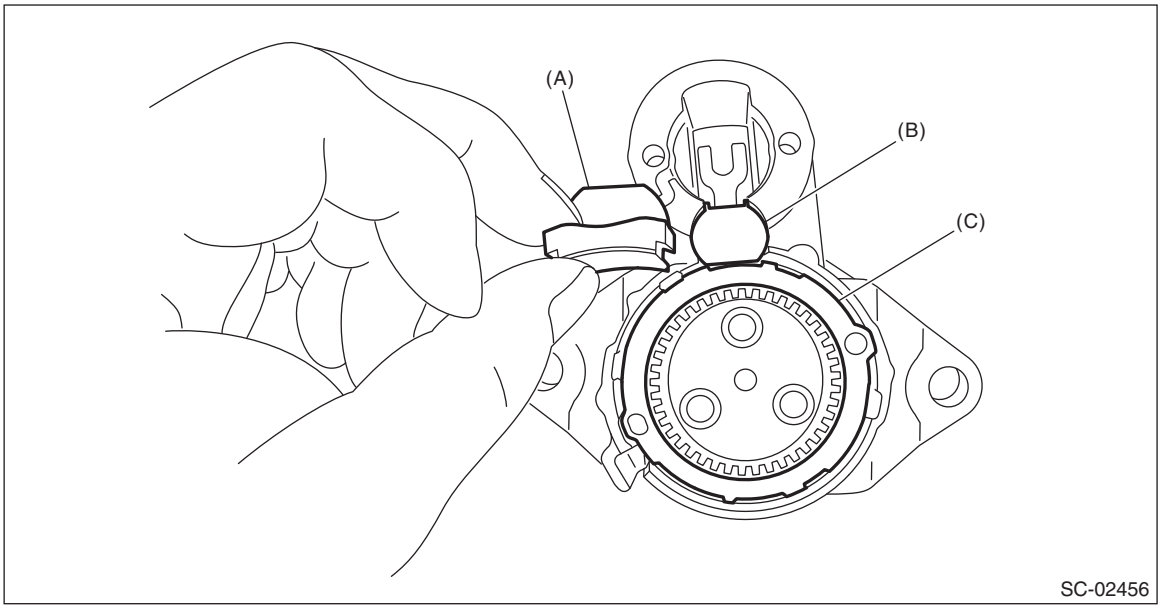
6) Separate the armature assembly and yoke assembly.


SC-02454

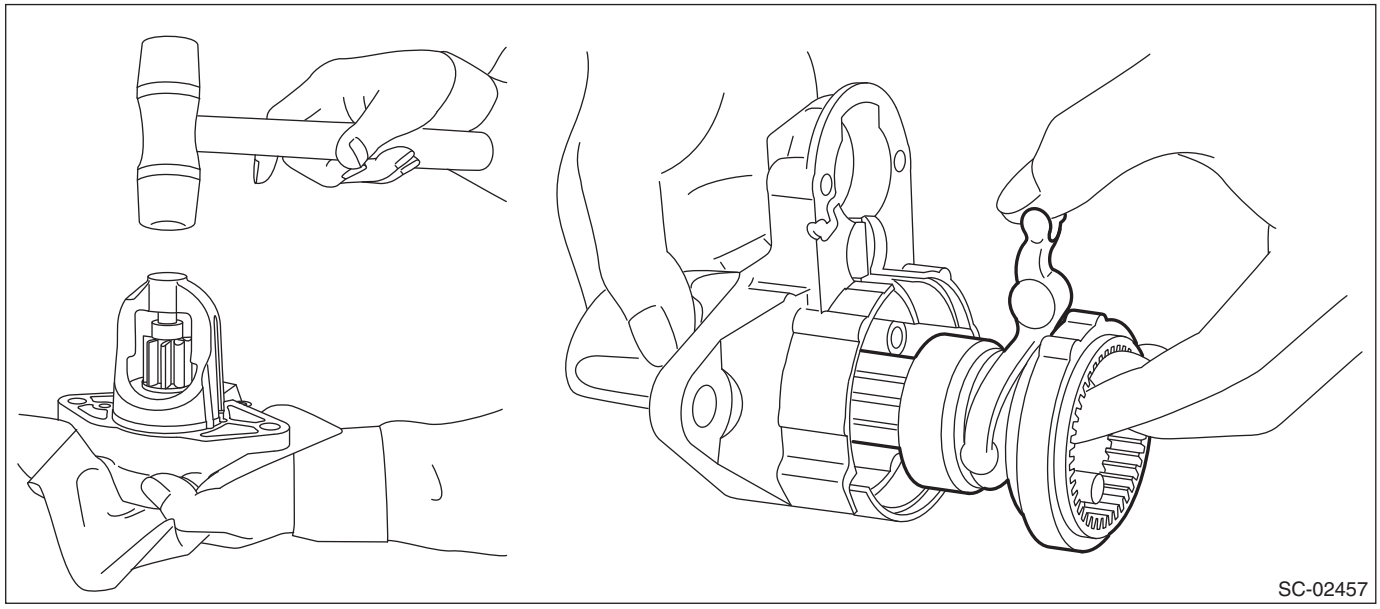
7) Remove the pinion gear from the internal gear assembly.


SC-02455

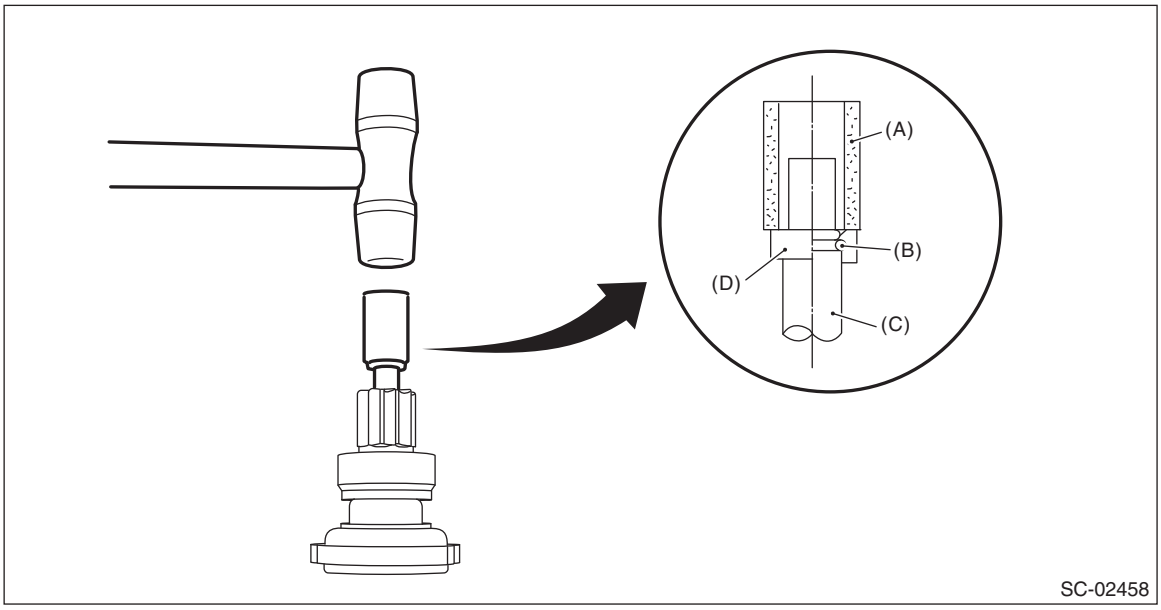
8) Remove seal rubber (A), plate (B), and seal rubber (C).



9) Lightly tap the starter housing assembly with a plastic hammer as shown in the figure, and remove the overrunning clutch, internal gear assembly, shaft and shift lever together as one unit.

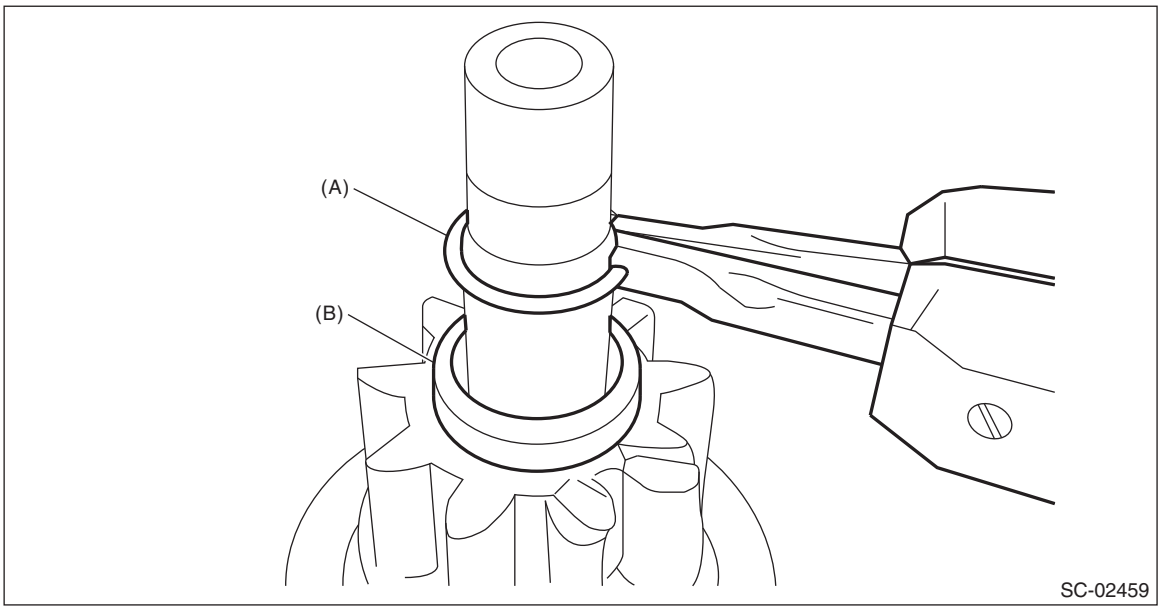


10) Use the following procedures to remove the overrunning clutch from the shaft.
(1) Use an appropriate tool (such as a fit socket wrench), and remove the stopper from snap ring by lightly tapping the stopper with a plastic hammer.

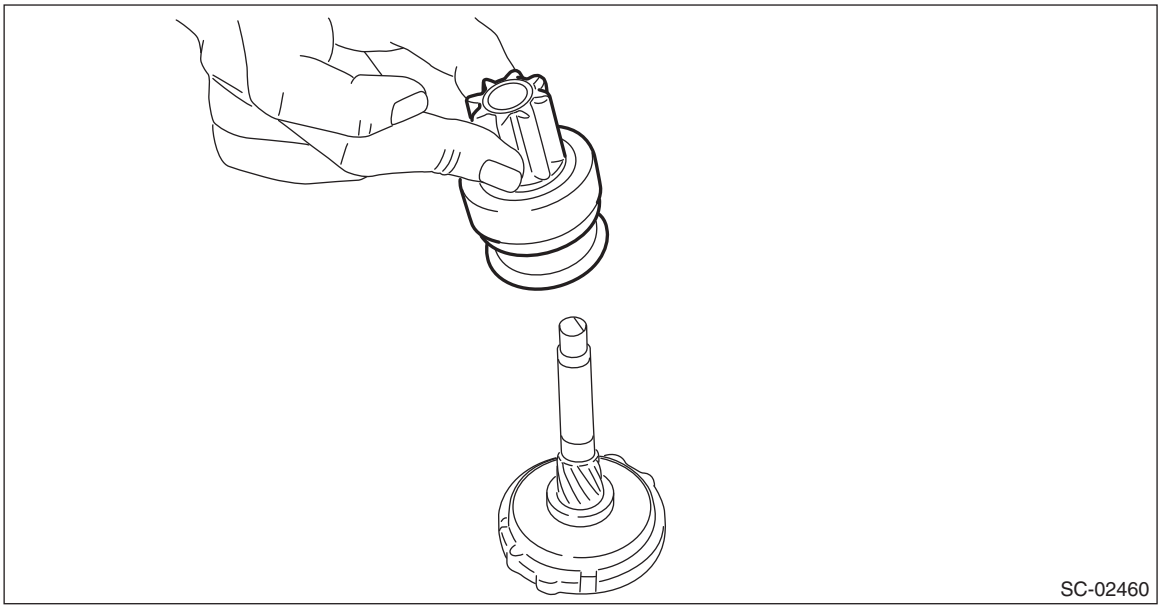


(A) Appropriate tool (B) Snap ring (C) Shaft
(D) Stopper

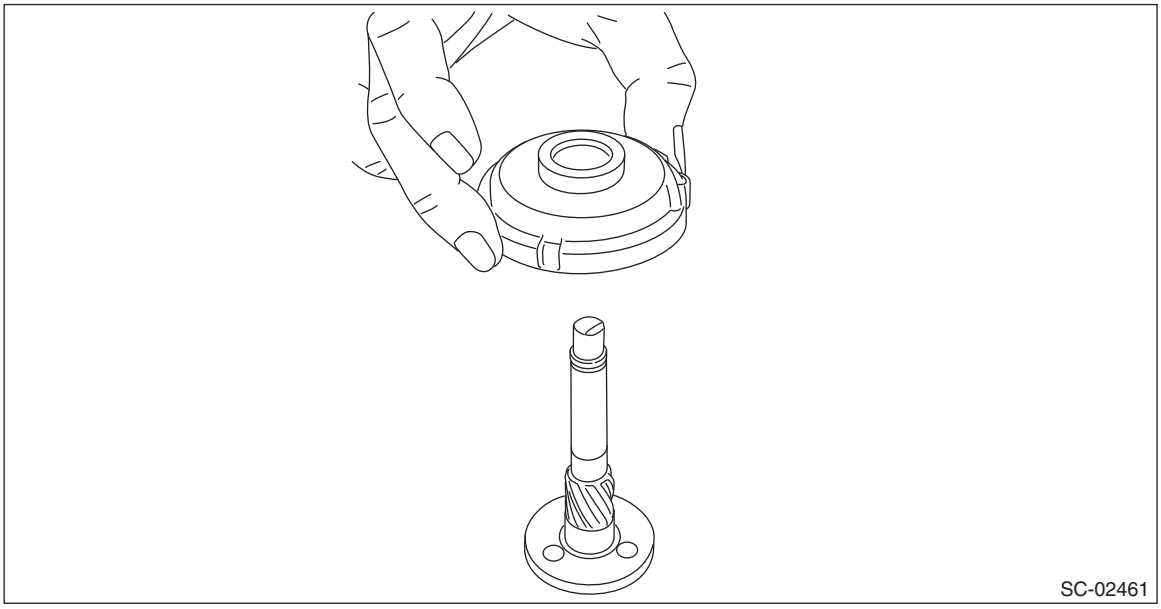
(2) Remove snap ring (A) from the shaft, and remove stopper (B).



(3) Remove the overrunning clutch from the shaft.


SC-02460

11) Separate the internal gear assembly and shaft.

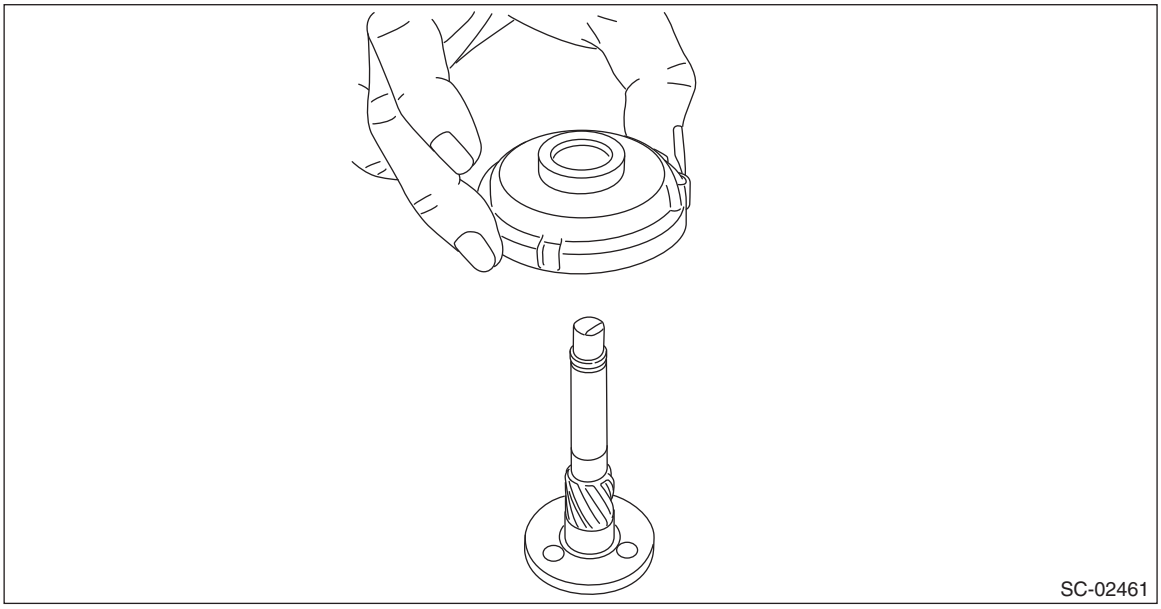

SC-02461

D: ASSEMBLY

1) Apply grease to the shaft sliding surfaces of the internal gear assembly.

Grease:
Multemp #6129 or equivalent

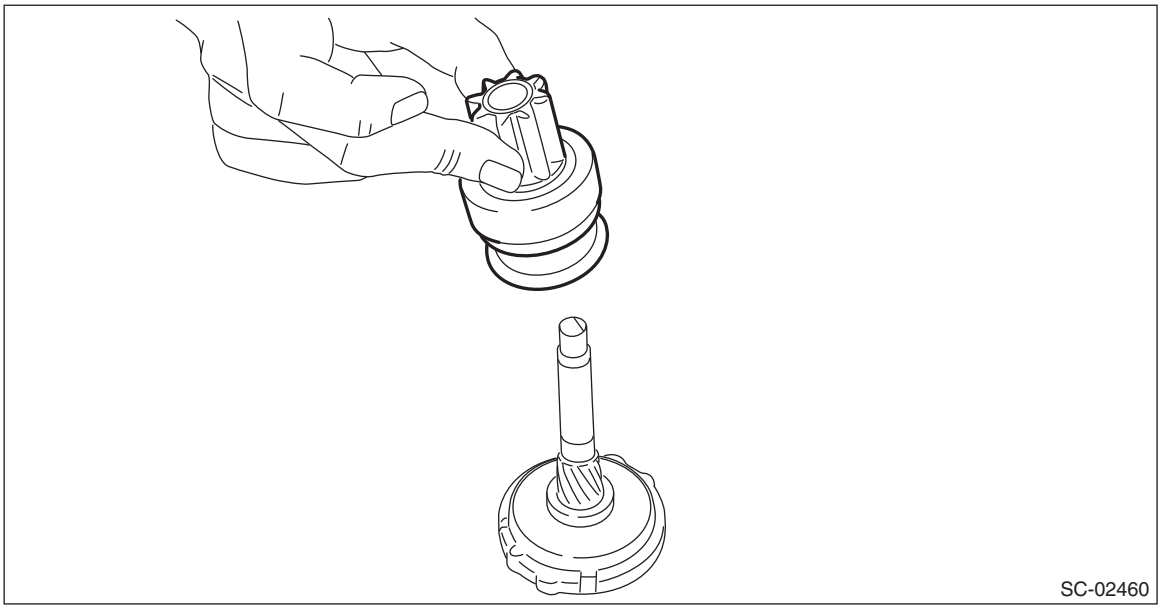
2) Assemble the shaft to the internal gear assembly.


SC-02461

3) Assemble the overrunning clutch as follows:
(1) Apply grease to the spline portion of the shaft.

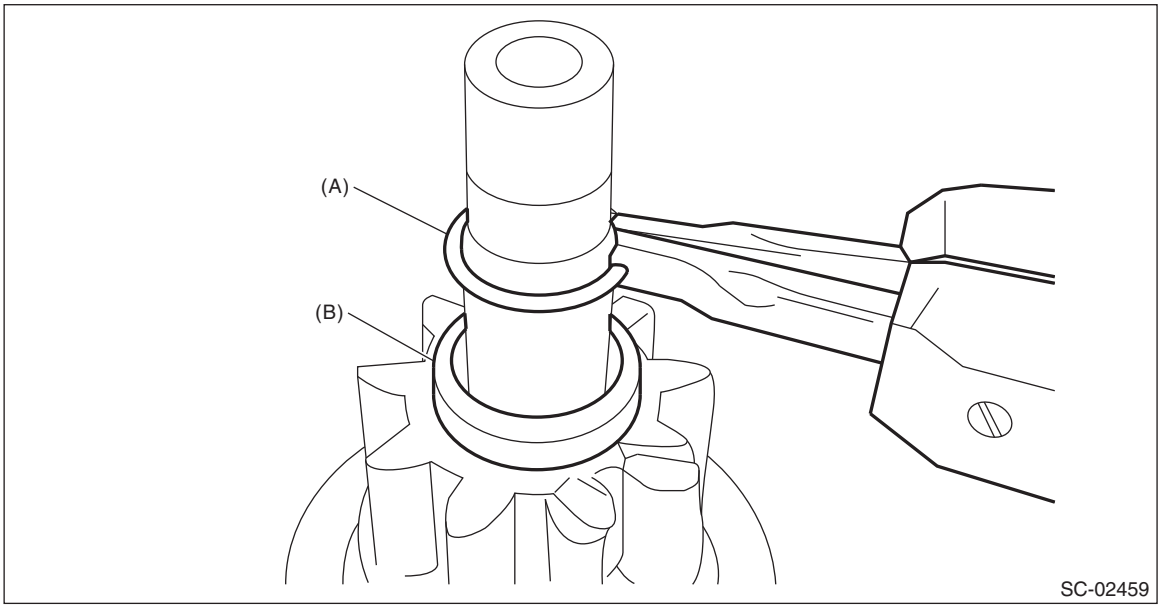
Grease:
Multemp #6129 or equivalent

(2) Install the overrunning clutch to shaft.

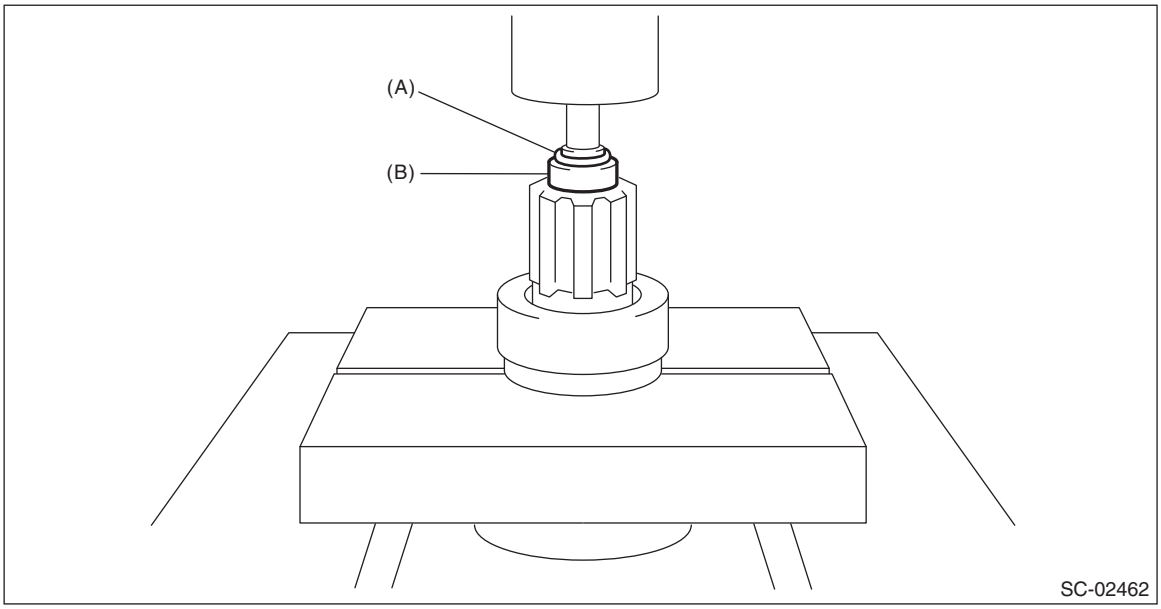

SC-02460

(3) Pass stopper (B) through the shaft assembly, and attach snap ring (A).

NOTE:
Use new stoppers and snap rings.



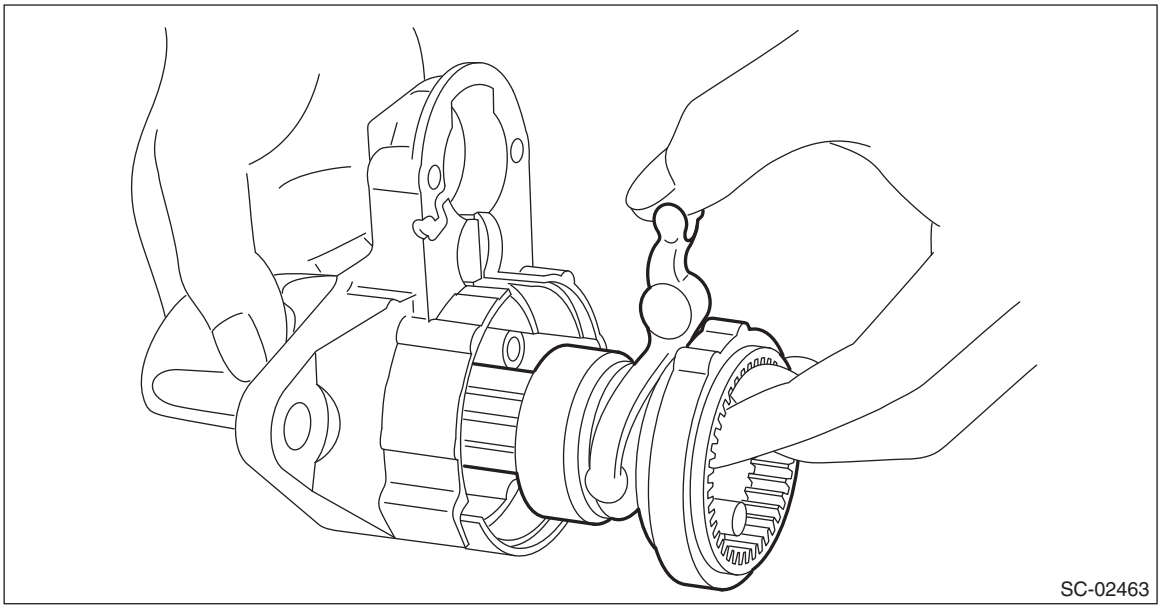
(4) Using a press, pressure fit stopper (B) into snap ring (A).



4) Assemble the overrunning clutch, internal gear assembly, shaft and shift lever as a single unit into the starter housing assembly.

NOTE:
Apply grease to the moving parts of the shift lever.

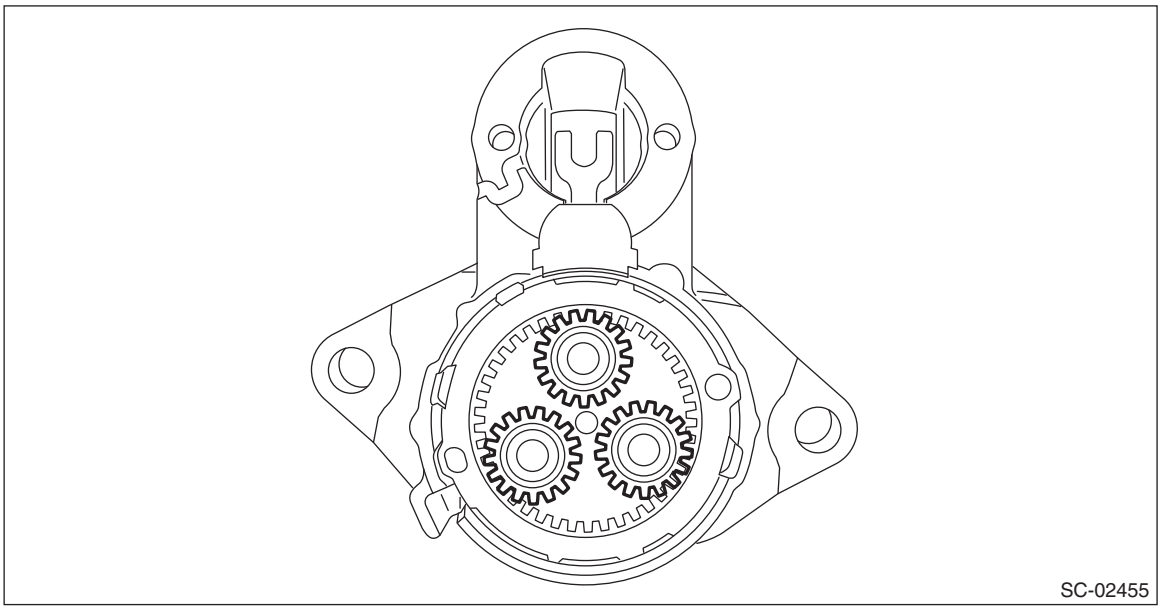
Grease:
Multemp #6129 or equivalent



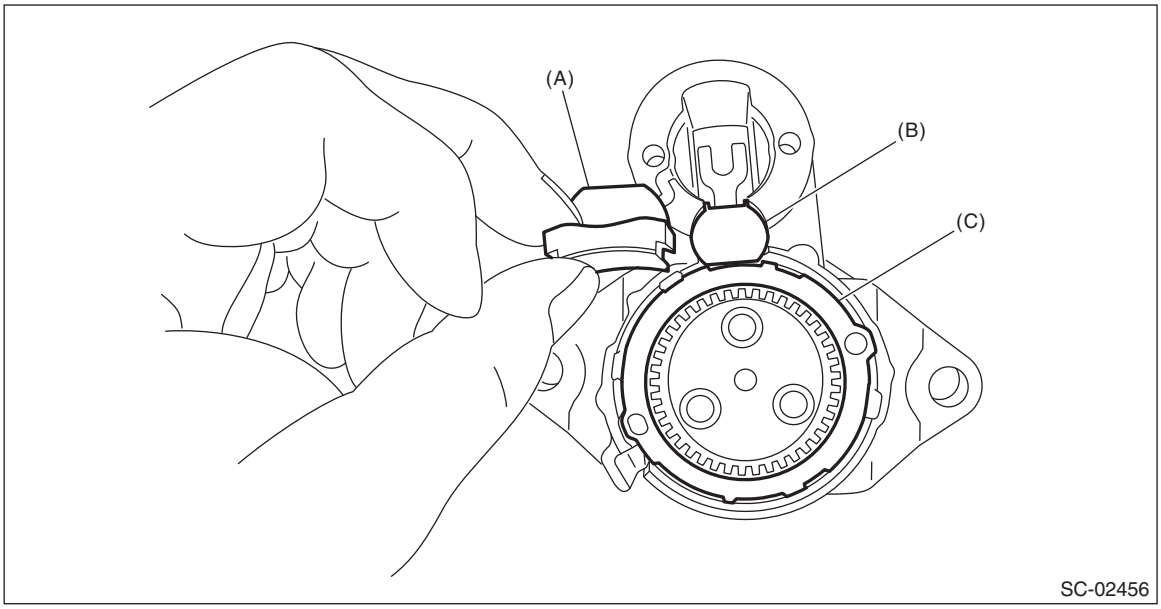
5) Apply grease to the inside of the internal gear assembly and pinion gear, and attach the pinion gear to the internal gear assembly.

NOTE:
- Apply grease evenly to the contact surfaces of each gear.
- Be careful that no debris becomes attached.

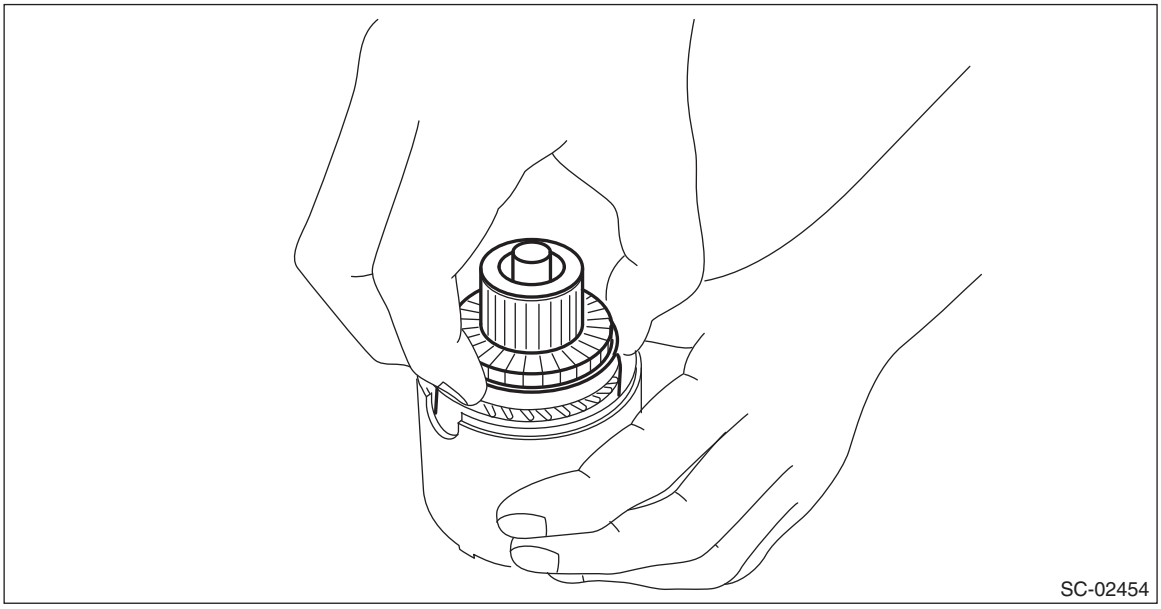
Grease:
Molykote® AG650 or equivalent



6) Install seal rubber (A), plate (B), and seal rubber (C).

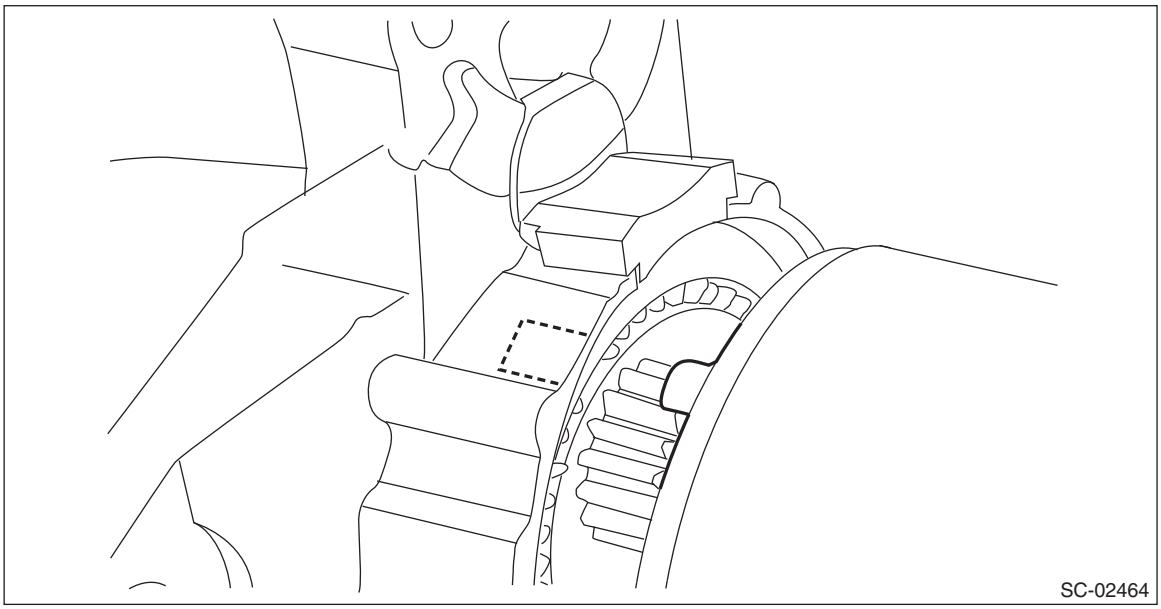


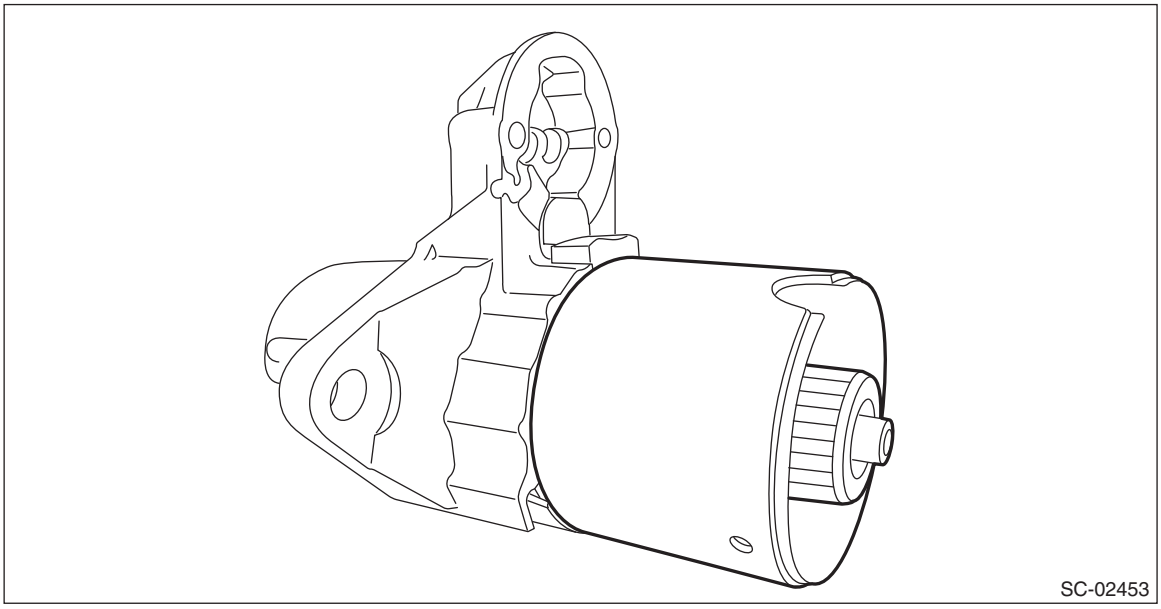
7) Assemble the armature assembly to the yoke assembly.



8) Attach the armature assembly and yoke assembly to the starter housing assembly together as a single unit.

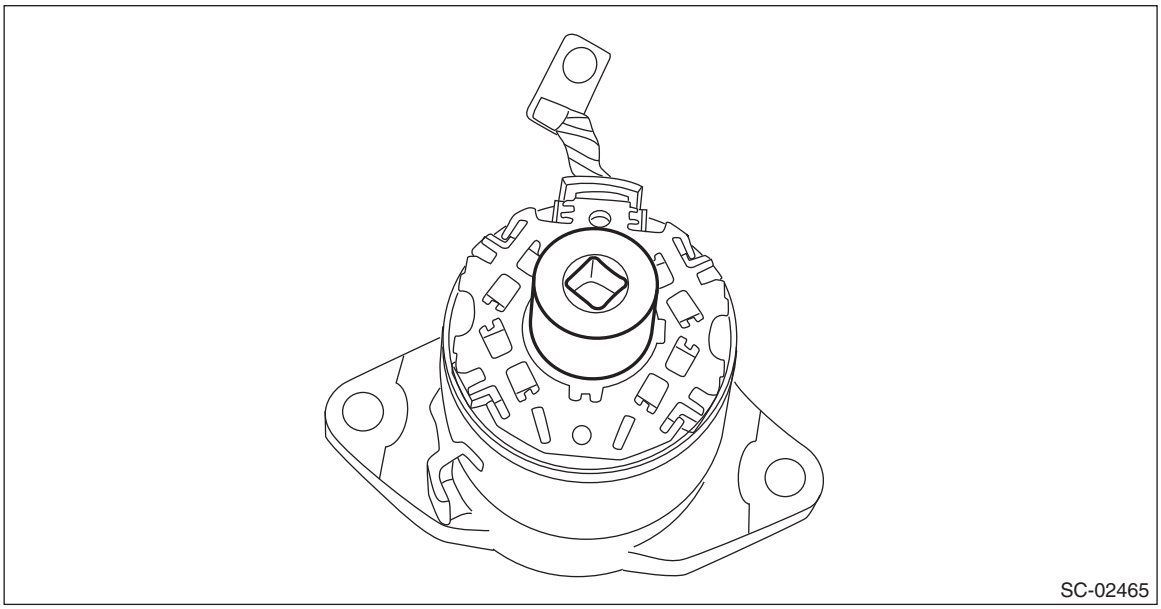
NOTE:
As shown in the figure, match the protrusion of the yoke assembly to the cut out of the starter housing assembly.


SC-02464


SC-02453

9) Use an appropriate tool (such as correctly sized socket wrenches) and attach the brush holder assembly to the armature assembly.

NOTE:
Be careful not to damage the brushes.

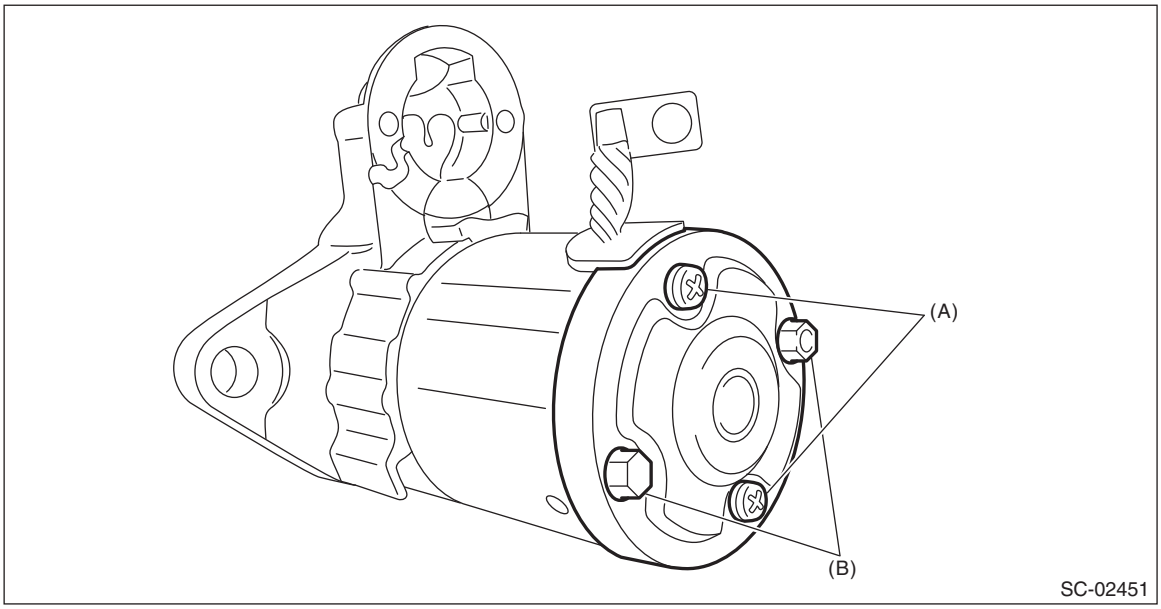

SC-02465

10) Secure starter cover assembly to the brush holder assembly with screws (A).

Tightening torque:
1.4 N·m (0.1 kgf-m, 1.0 ft-lb)

11) Tighten through bolts (B) on both sides.

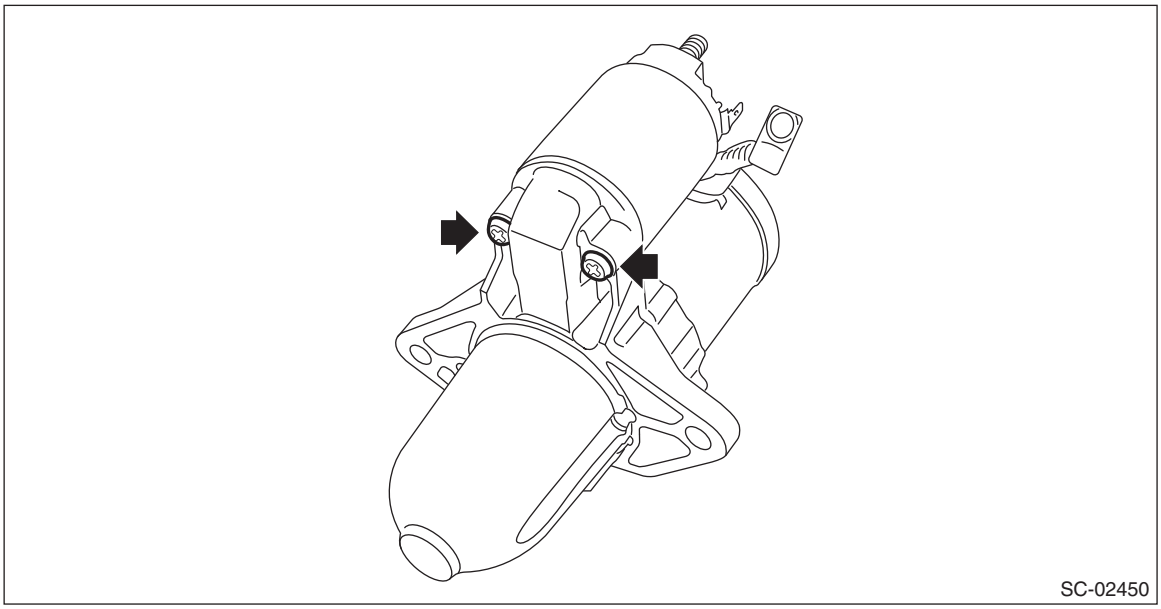
Tightening torque:
6 N·m (0.6 kgf-m, 4.4 ft-lb)



SC-02451

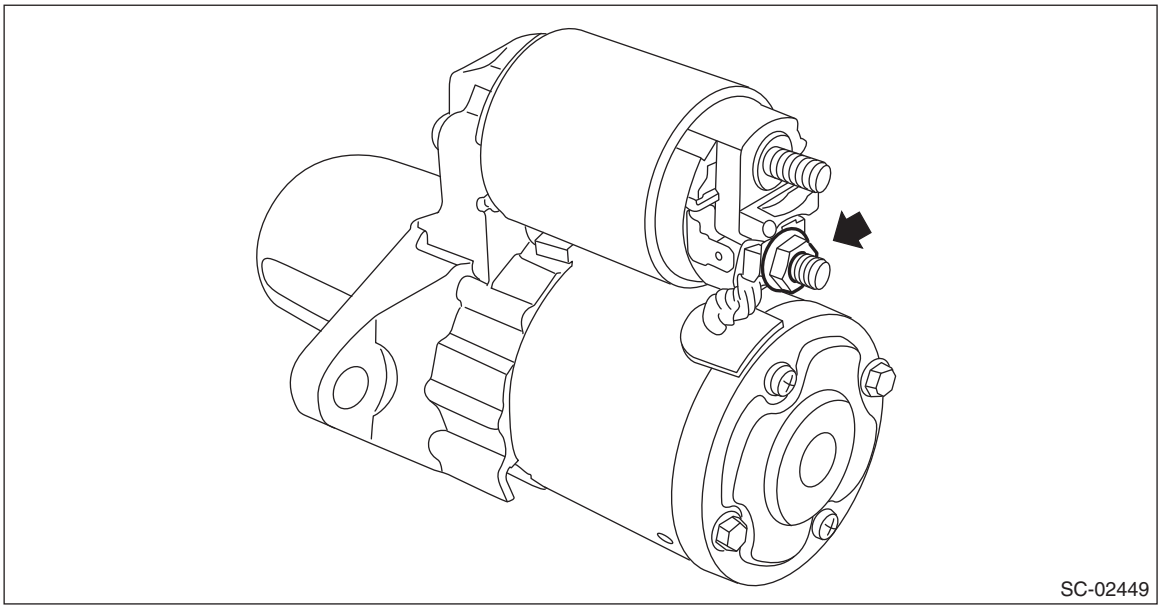
12) Attach the magnet switch assembly to the starter housing assembly.

Tightening torque:
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)


SC-02450

13) Attach the cable to the terminal M of the magnet switch assembly, and secure with nuts.

Tightening torque:
10 N·m (1.0 kgf-m, 7.4 ft-lb)

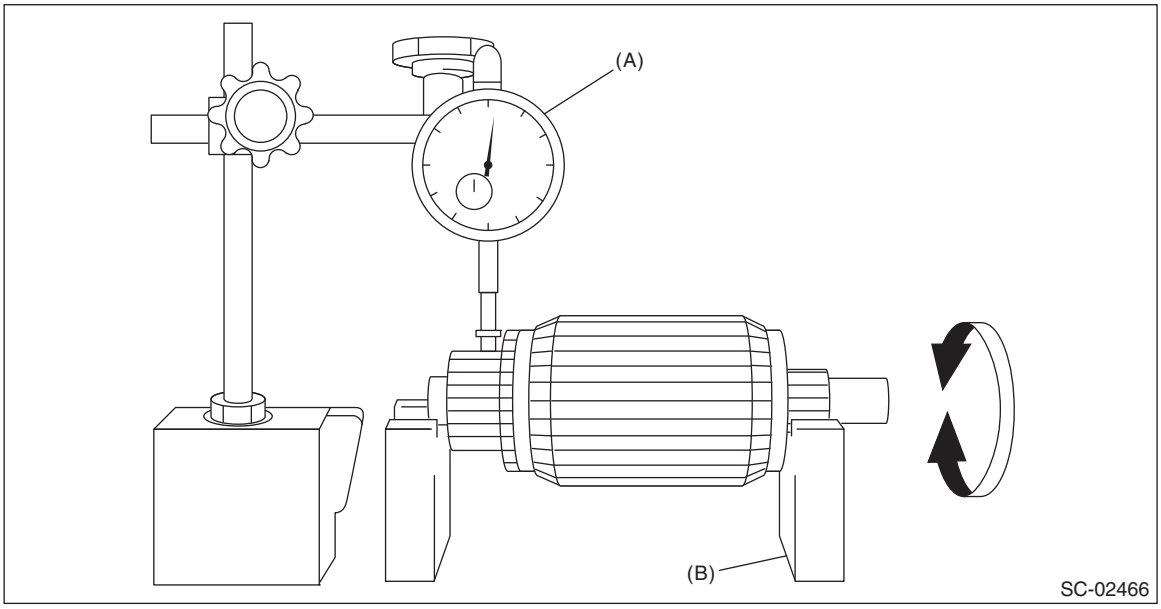

SC-02449

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) Check for runout on the commutator. If excessive, replace the armature.

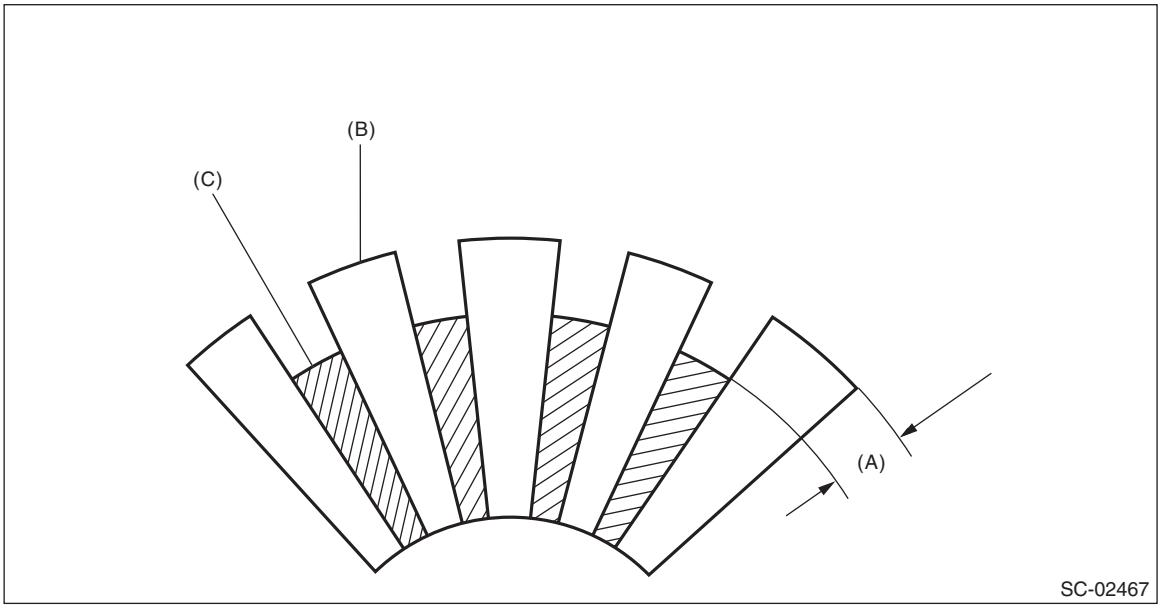
Commutator runout:
Standard
0.05 mm (0.0020 in)
Limit
0.10 mm (0.0039 in)



(A) Dial gauge
(B) V-block

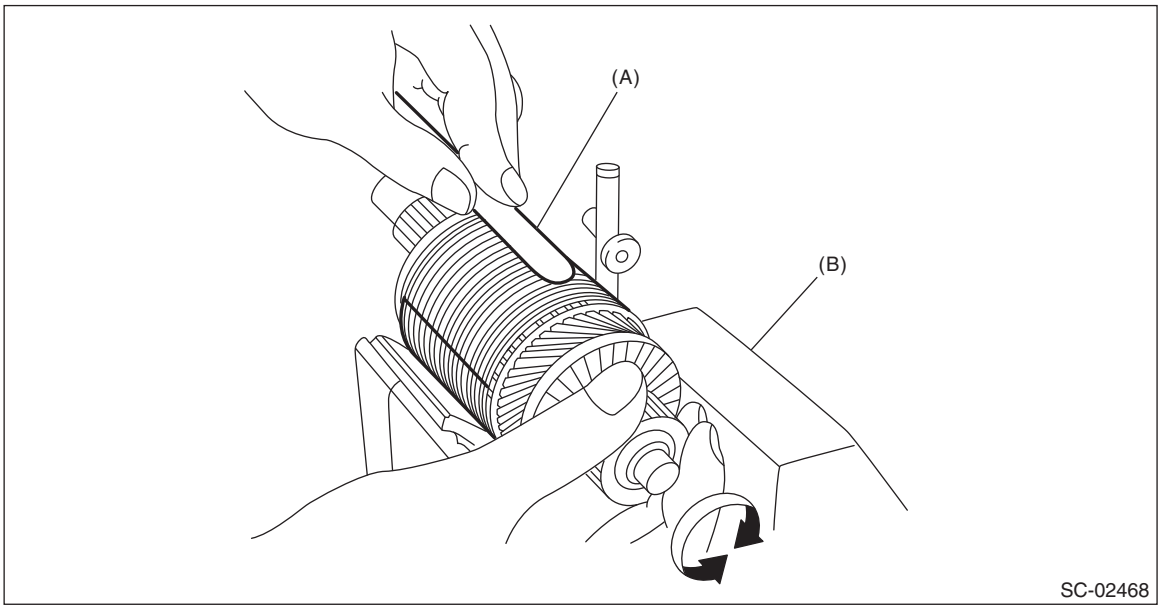
3) Check the depth of the segment mold. If it is not within the standard, replace the armature.

Depth of segment mold:
Standard
0.50 mm (0.020 in)



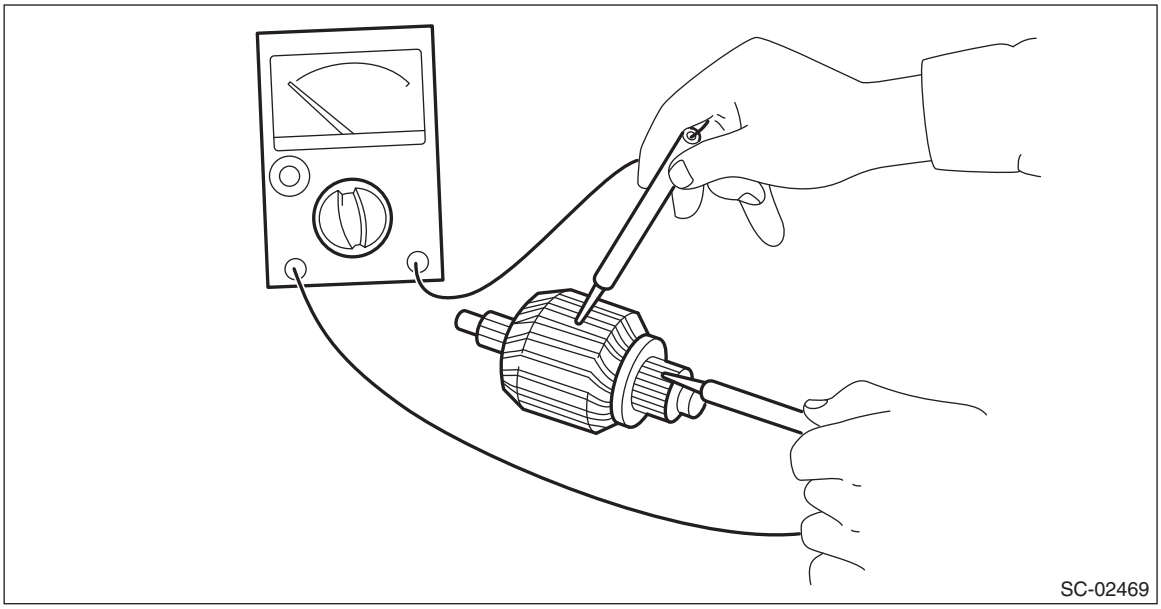
(A) Depth of mold (B) Segment (C) Mold

4) Place the armature on the growler tester to check for short circuits. While slowly turning the armature, support the steel sheet for the armature core. If the circuit of the armature is shorted, the steel sheet will vibrate, causing it to move towards the core. When the steel sheet has moved or vibrated, replace the armature.



(A) Steel sheet (B) Growler tester

5) 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 continuity, replace the armature.



2. YOKE

Make sure that the pole is set at the predetermined position.

3. OVERRUNNING CLUTCH

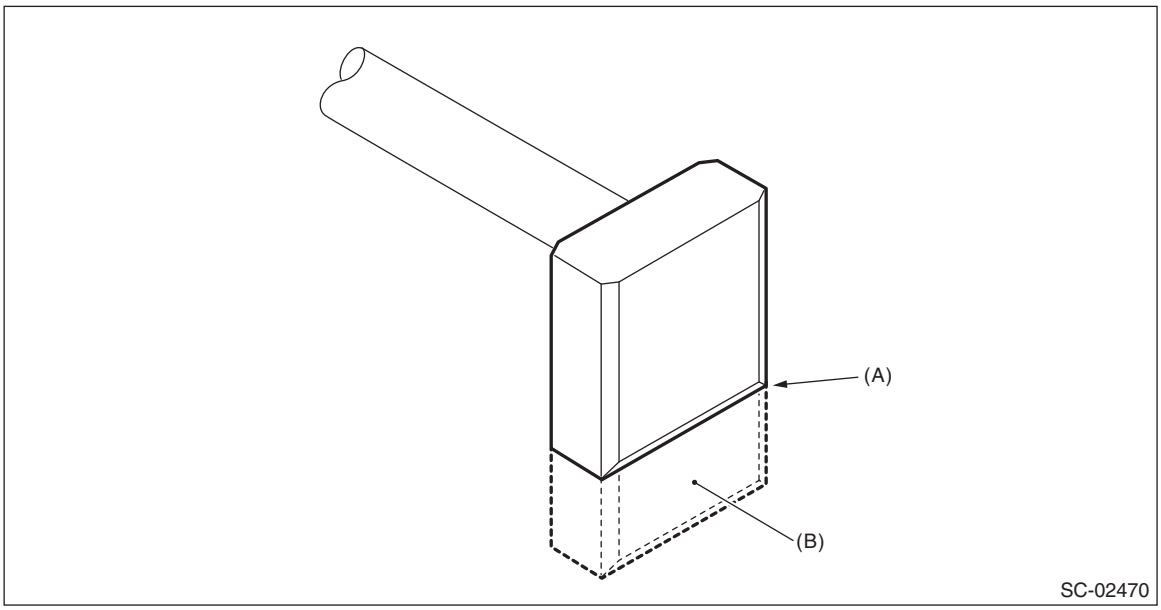
Inspect the pinion, and if there is any wear or damage, replace the overrunning clutch. Also, check that the pinion rotates counterclockwise smoothly and does not rotate clockwise. If there is any fault, replace the overrunning clutch.

CAUTION:
To prevent spilling of grease, do not clean the overrunning clutch with oil.

4. BRUSH AND BRUSH HOLDER

1) Visually check the brush. If there is any abnormal wear or cracks, replace the brush.
2) Measure the length of the brush. If it exceeds service limits, replace the brush.

Brush length:
Standard
12.3 mm (0.484 in)
Limit
7.0 mm (0.276 in)



(A) Service limit line (B) Brush

3) Check that the brush moves smoothly in the brush holder.
4) 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 lbf) (When new)

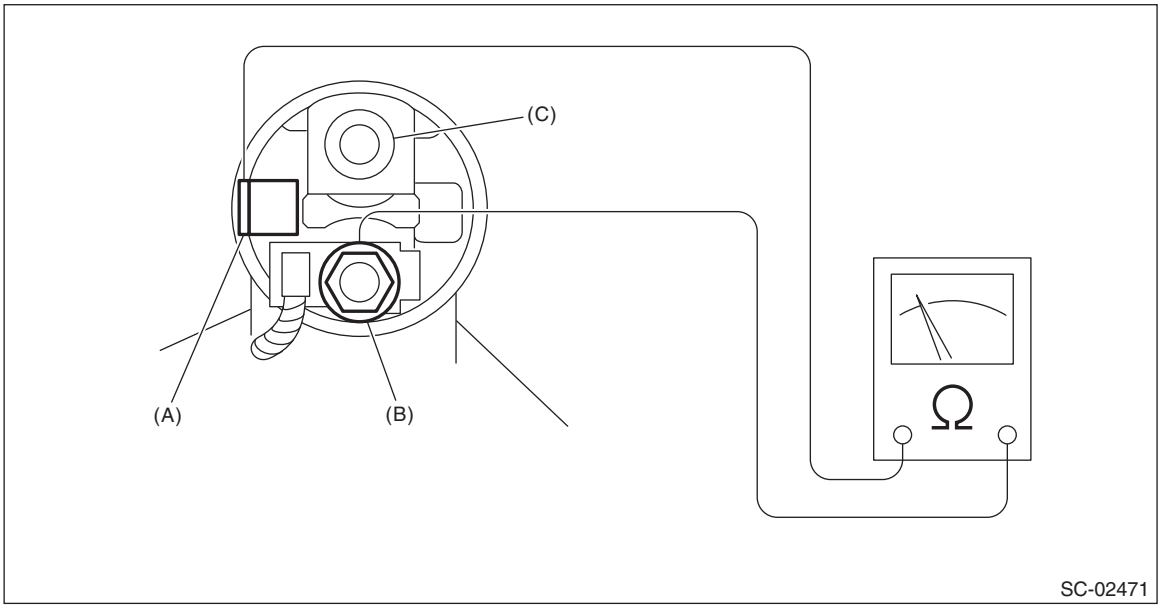
Limit
2.5 N (0.25 kgf, 0.56 lbf)

5. SWITCH ASSEMBLY

Using a circuit tester (set to “ohm”), 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.

Resistance between switch assembly terminals:

Terminals	Standard
S — M	1 Ω or less
S — Ground	1 Ω or less
M — B	1 MΩ or more



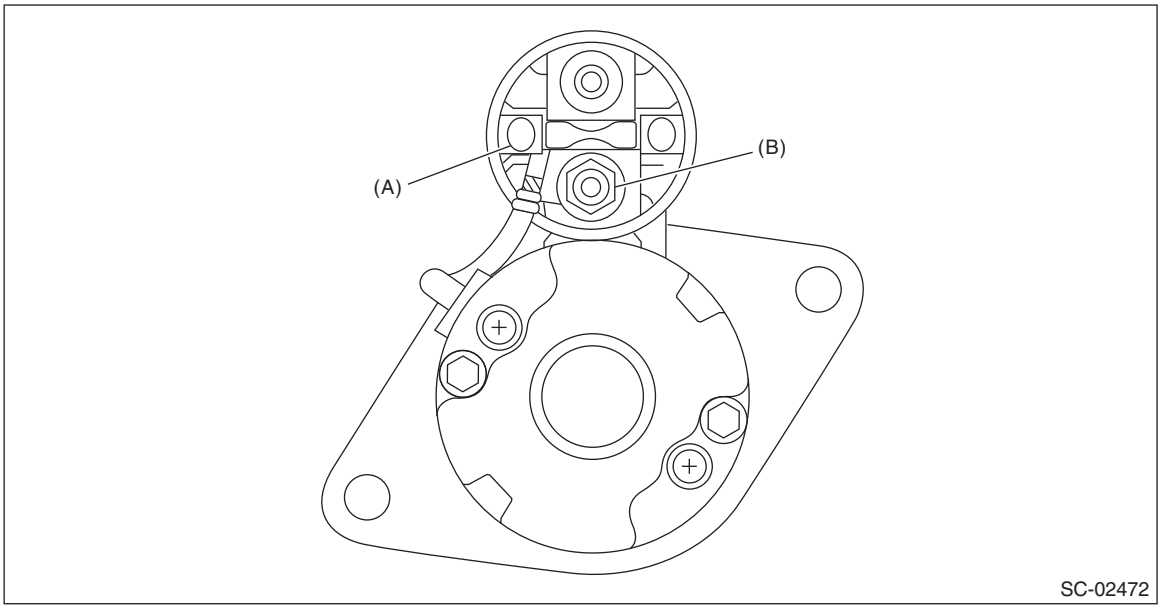
(A) Terminal S (B) Terminal M (C) Terminal B

6. SWITCH ASSEMBLY OPERATION

1) Using a lead wire, connect the switch assembly terminal S to the positive terminal of battery, and the starter body to the 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.

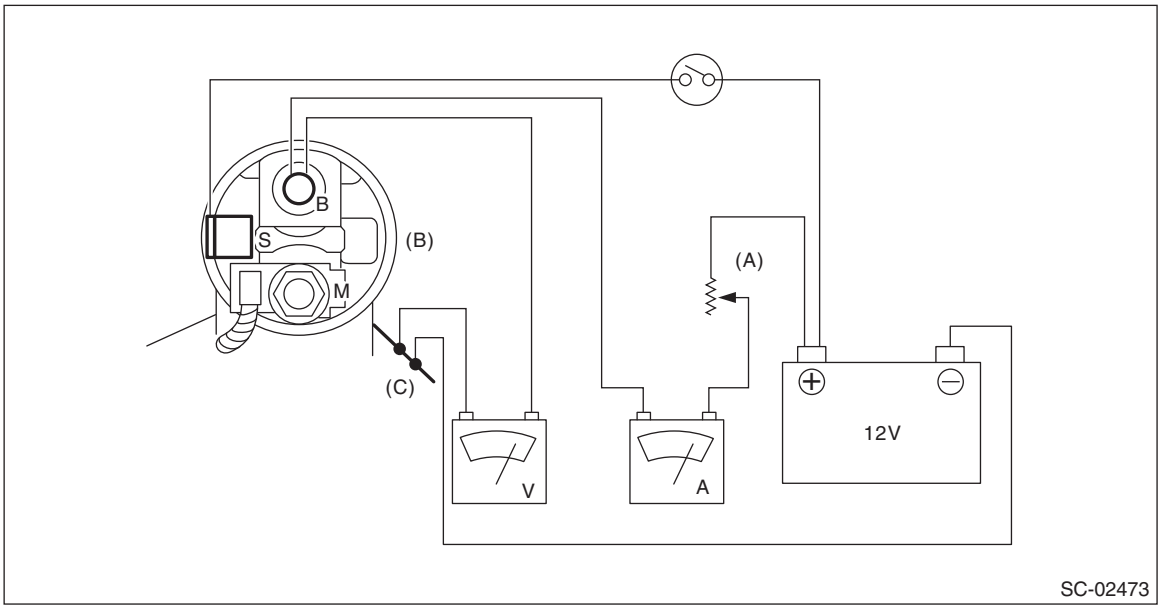
2) Disconnect the connector from terminal M. Then using a lead wire, connect the positive terminal of battery and terminal M, and ground terminal to starter body.
In this test set up, the pinion should return to its original position even when it is pulled out with a screwdriver.



(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) Magnet switch (C) Starter body

1) Adjust the variable resistance with the switch on until the voltage is 11 V, and read the value displayed by the ammeter to measure starter speed. Compare these values with the standard.

No-load test (standard):

Voltage/Current
AT model
Max. 11 V/90 A or less
MT model
Max. 11 V/95 A or less

Rotating speed
AT model
2,000 rpm or more
MT model
2,500 rpm or more

2) 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
AT model
7.7 V/16.7 N·m (1.7 kgf-m, 12.3 ft-lb)
MT model
7.5 V/8.84 N·m (0.9 kgf-m, 6.5 ft-lb)

Current/Speed
AT model
400 A/710 rpm or more
MT model
300 A/870 rpm or more
3) 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
AT model
3.5 V/960 A or less
MT model
4 V/680 A or less

Torque
AT model
31 N·m (3.2 kgf-m, 22.9 ft-lb) or more
MT model
17 N·m (1.7 kgf-m, 12.5 ft-lb) or more

8. OTHER INSPECTIONS

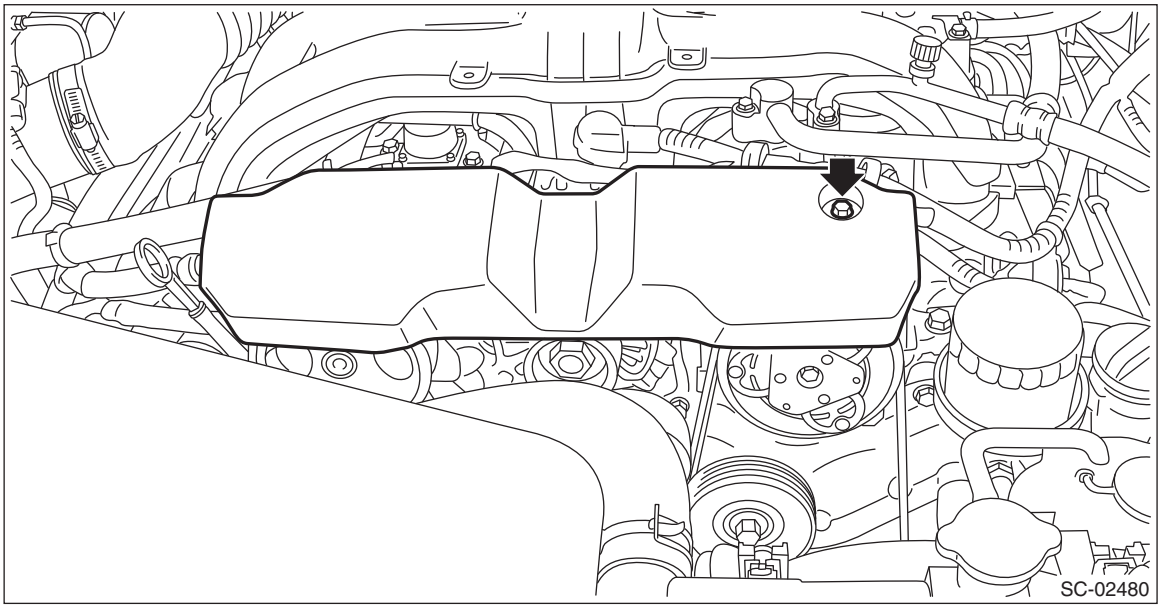
Check that the starter does not have deformation, cracks and any other damage.

3. Generator

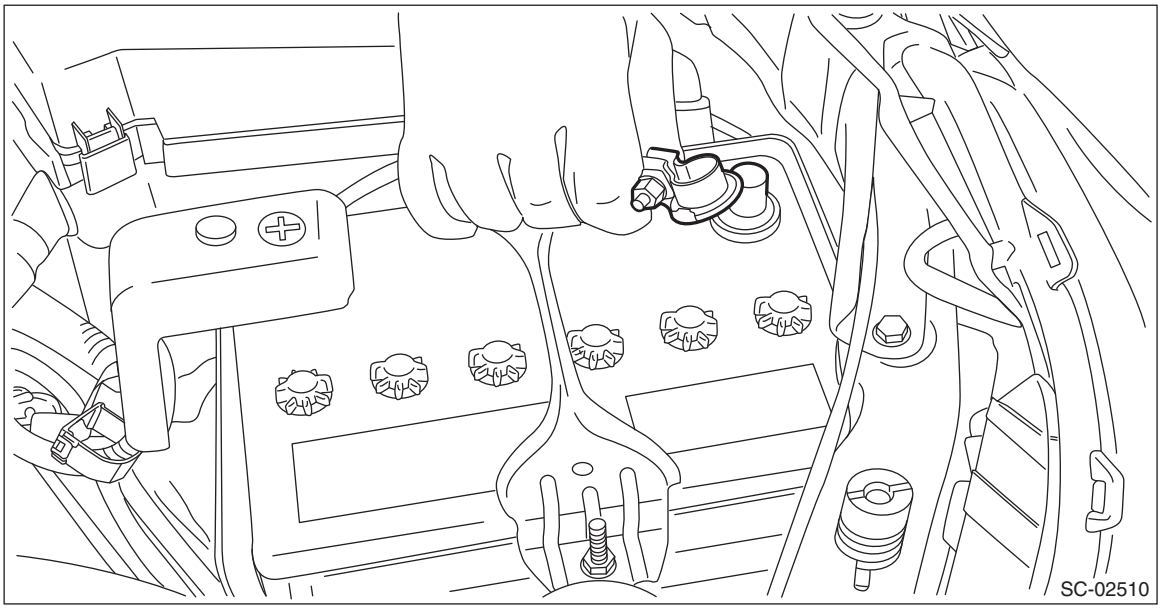
A: REMOVAL

1. NON-TURBO MODEL

1) Remove the V-belt covers.

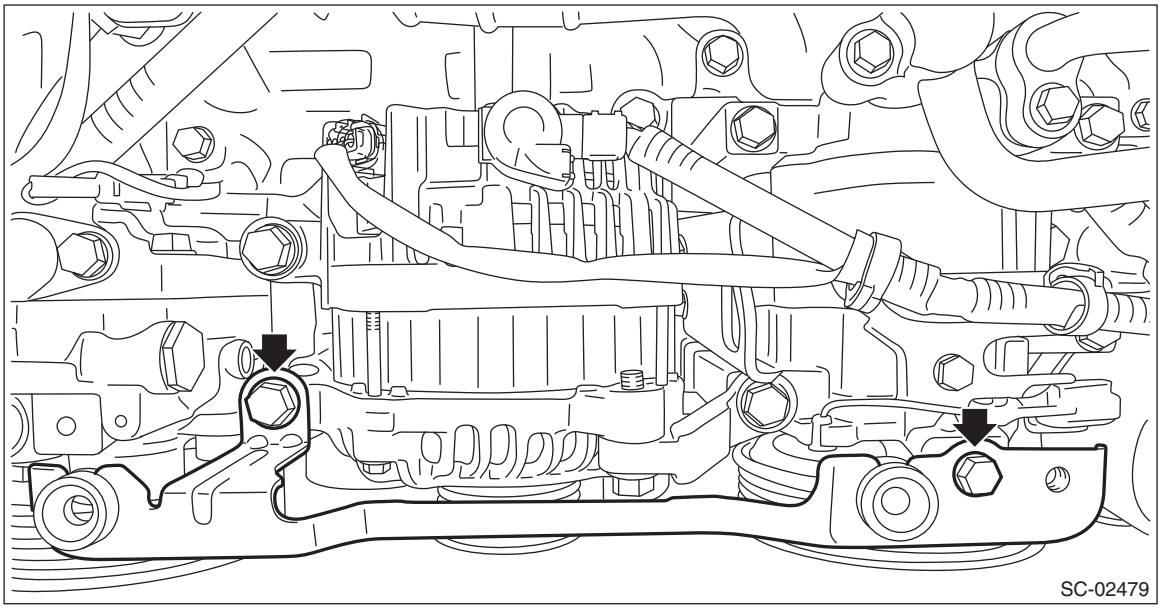


2) Disconnect the ground cable from battery.

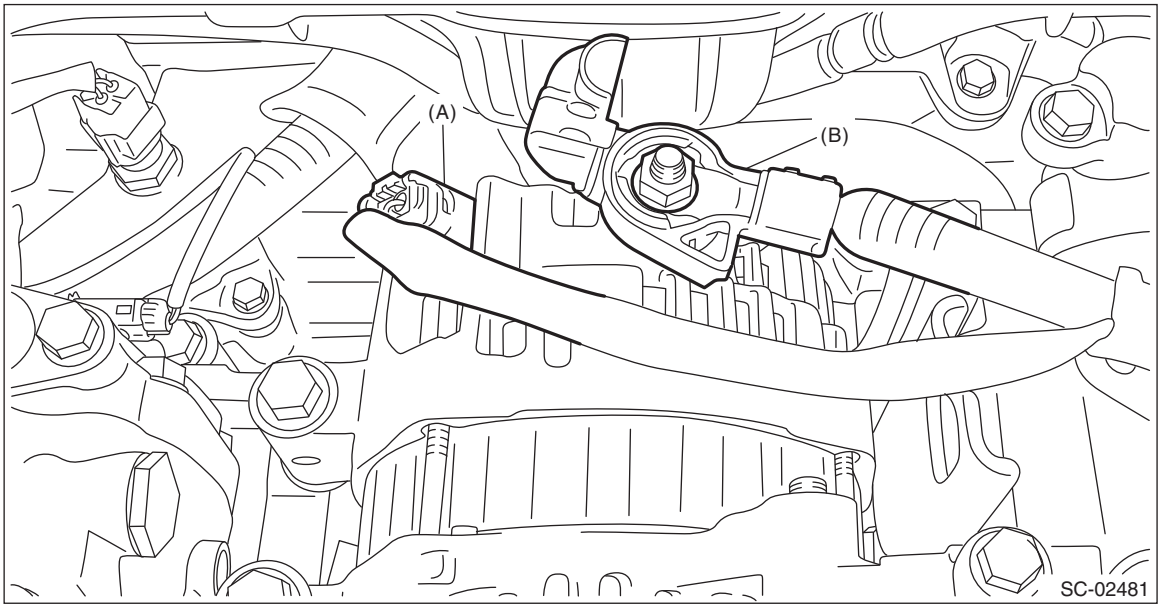


3) Remove the V-belts. <Ref. to ME(H4DO)-70, REMOVAL, V-belt.>

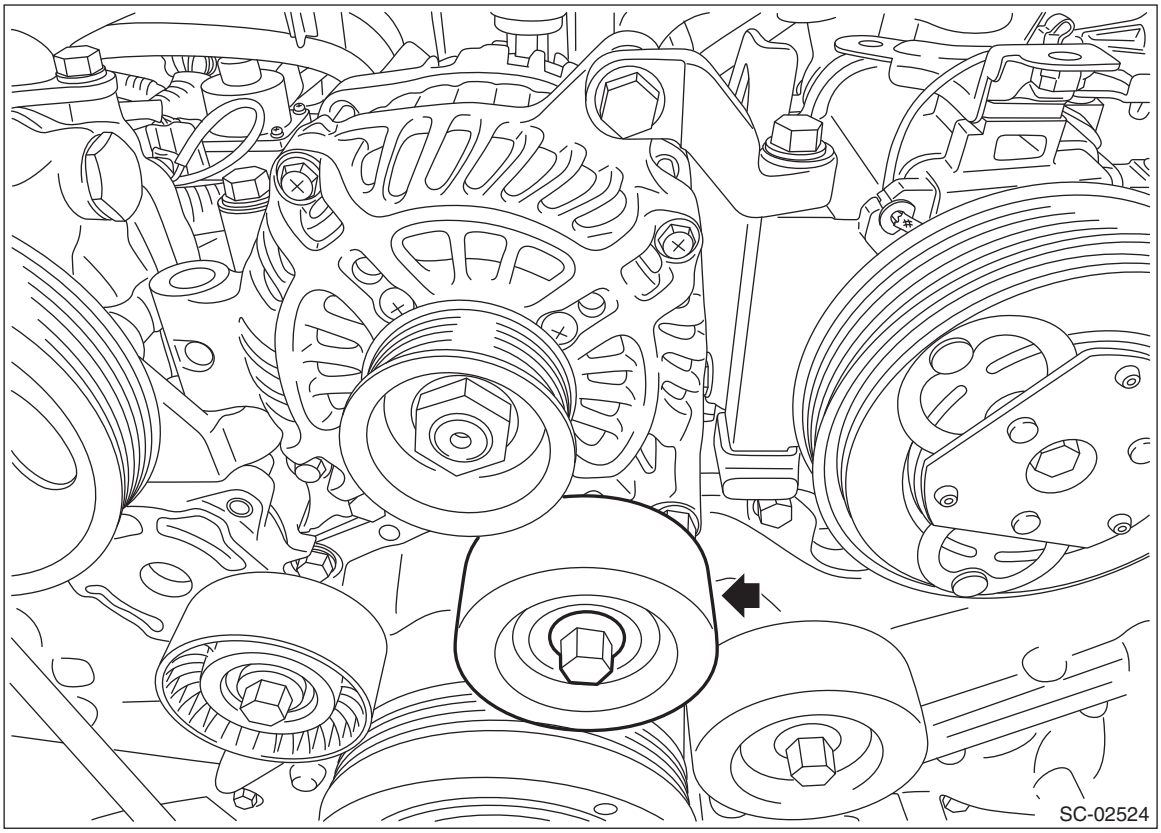
4) Remove the V-belt cover bracket.



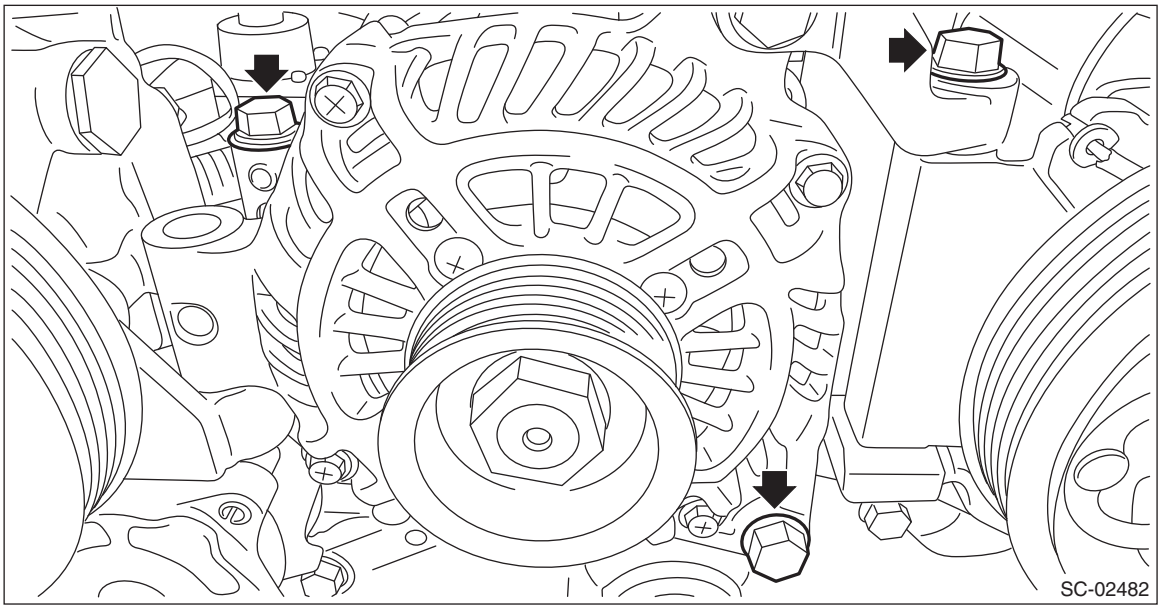
5) Disconnect the connector (A) and terminal (B) from the generator.



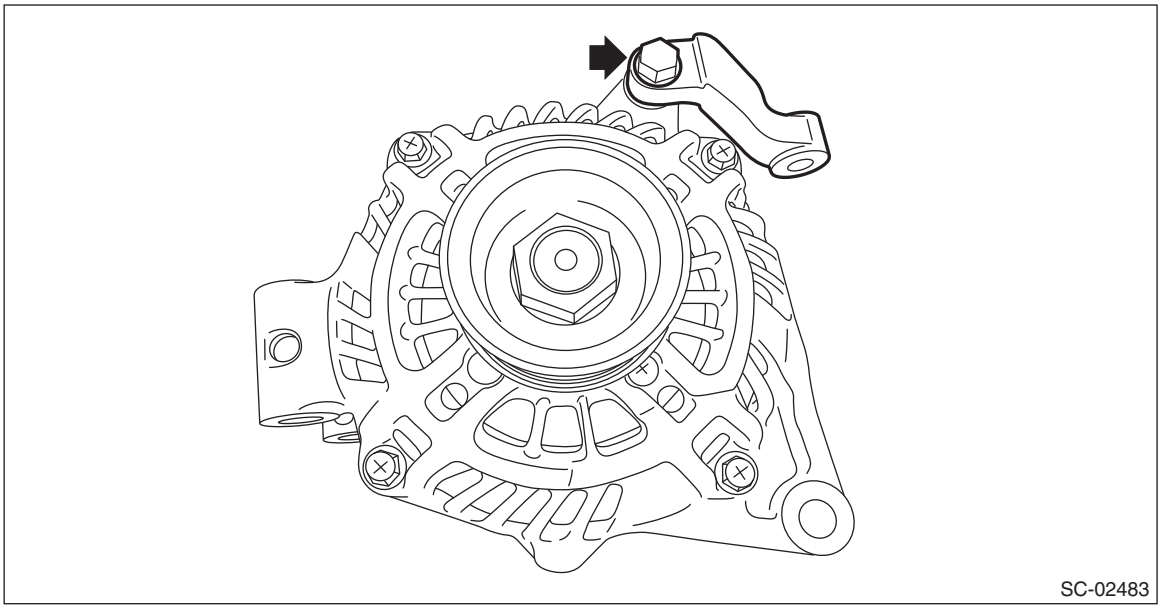
6) Remove the idler pulley from the chain cover.



7) Remove the generator from the bracket.

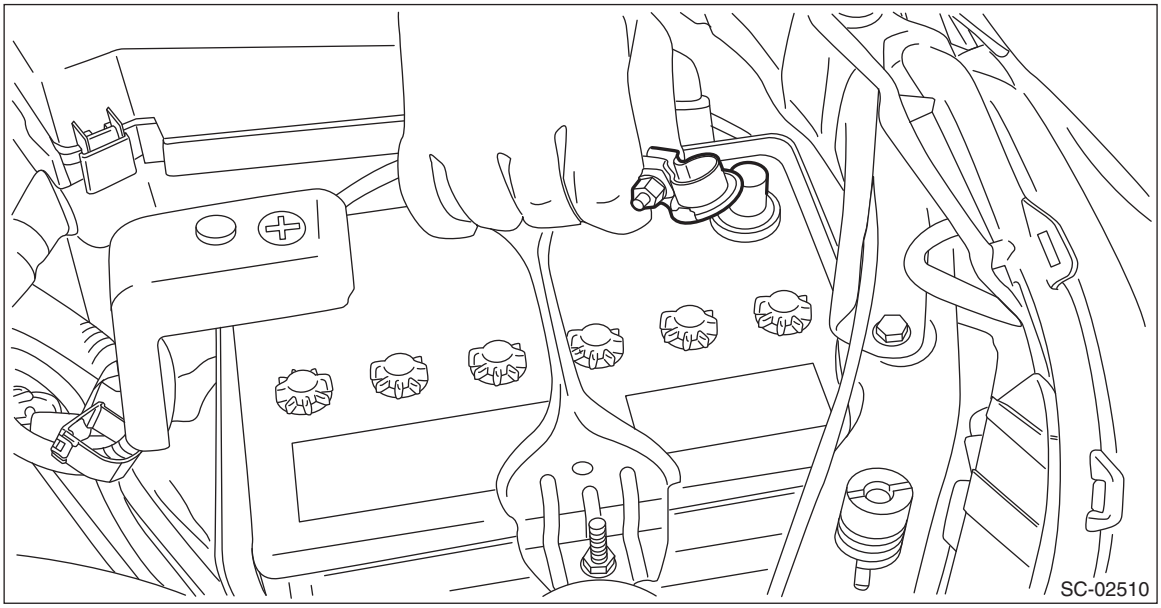


8) Remove the generator bracket from the generator.

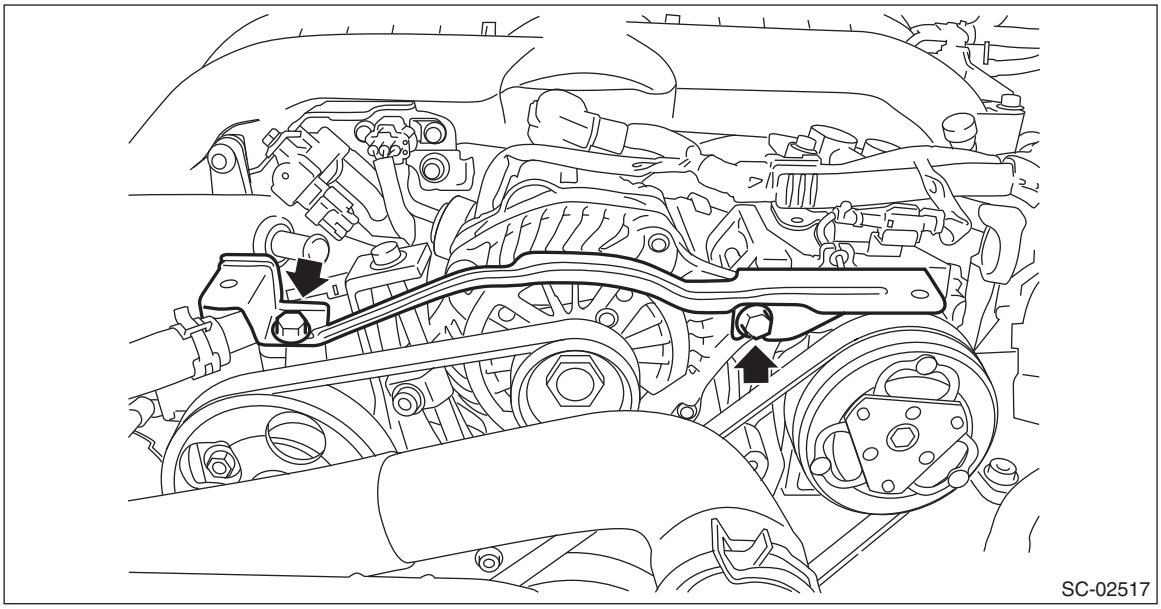


2. TURBO MODEL

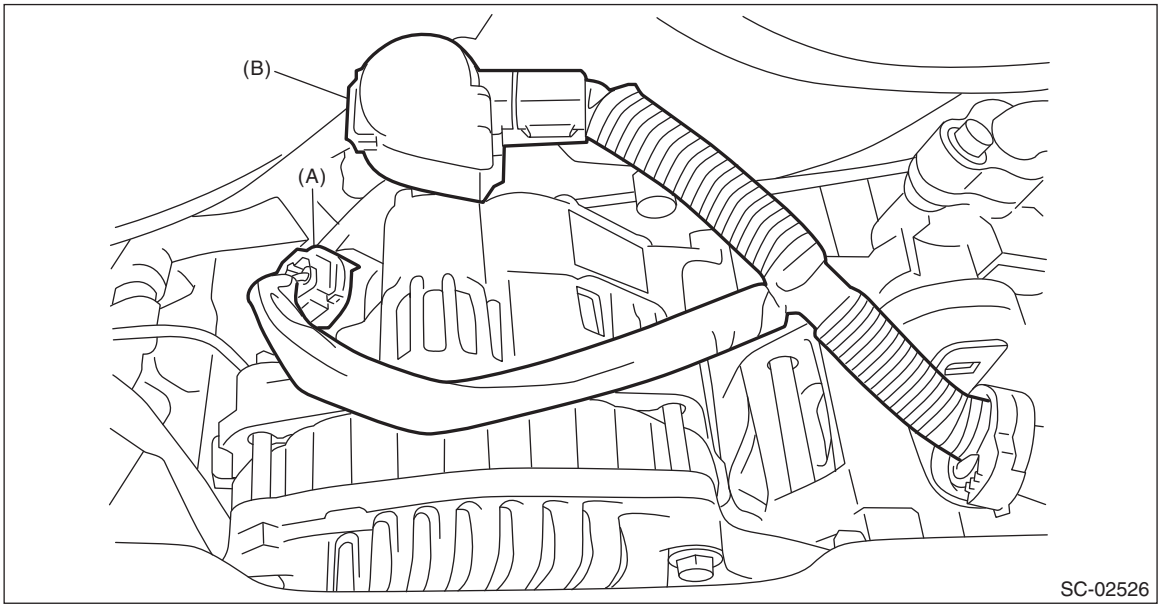
1) Remove the collector cover.
2) Disconnect the ground cable from battery.



3) Remove the collector cover bracket.

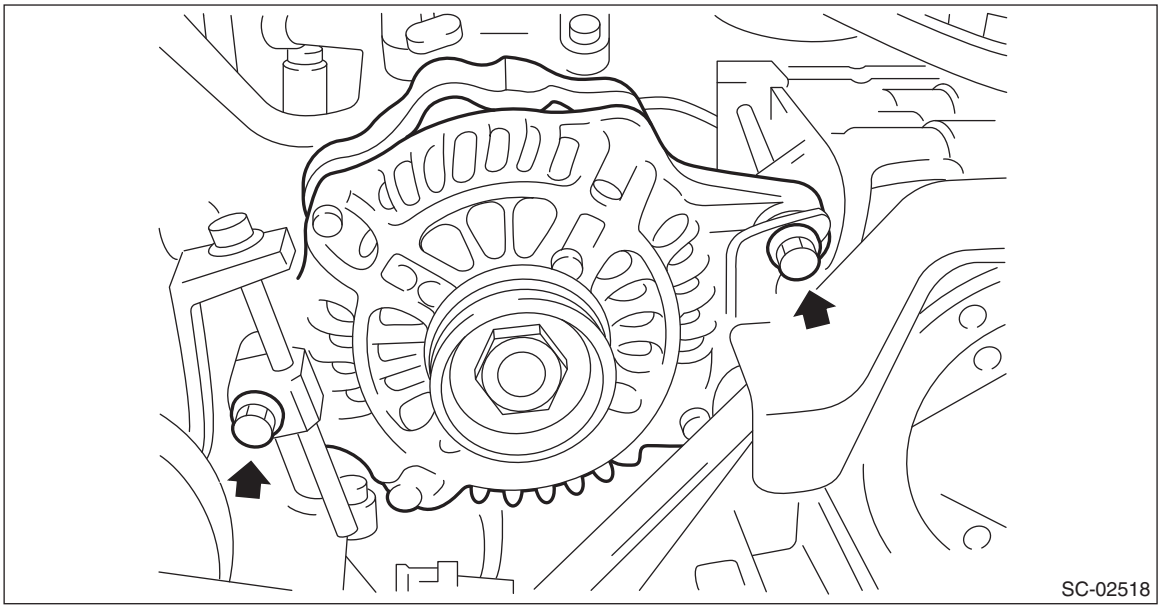


4) Disconnect connector (A) and terminal (B) from generator.



5) Remove the front side belts. <Ref. to ME(H4DOTC)-38, FRONT SIDE BELT, REMOVAL, V-belt.>

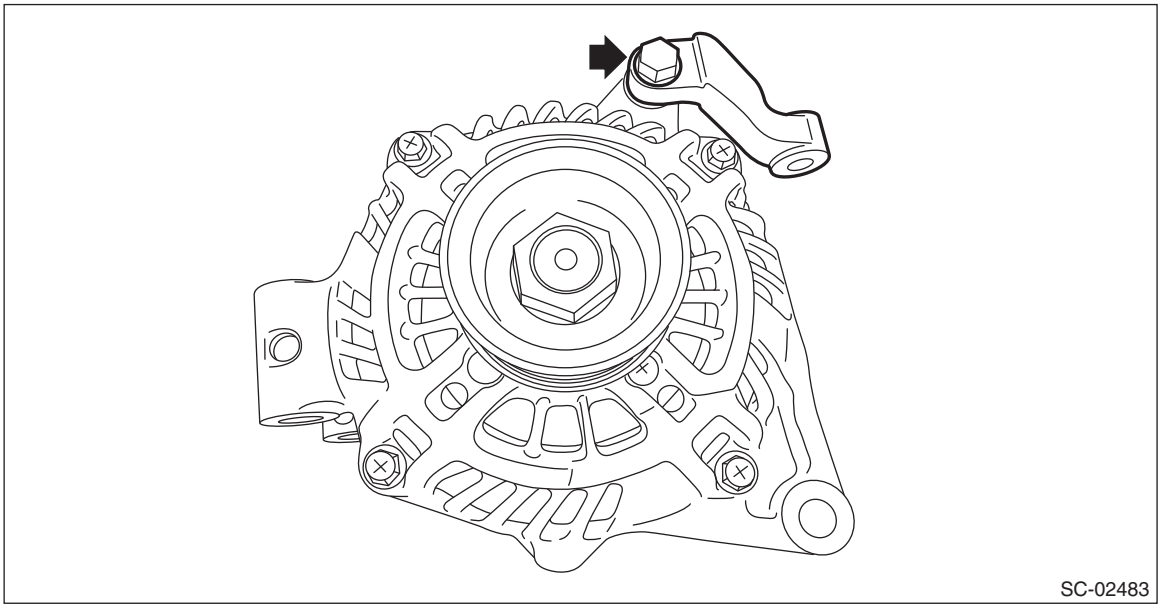
6) Remove the generator from the bracket.



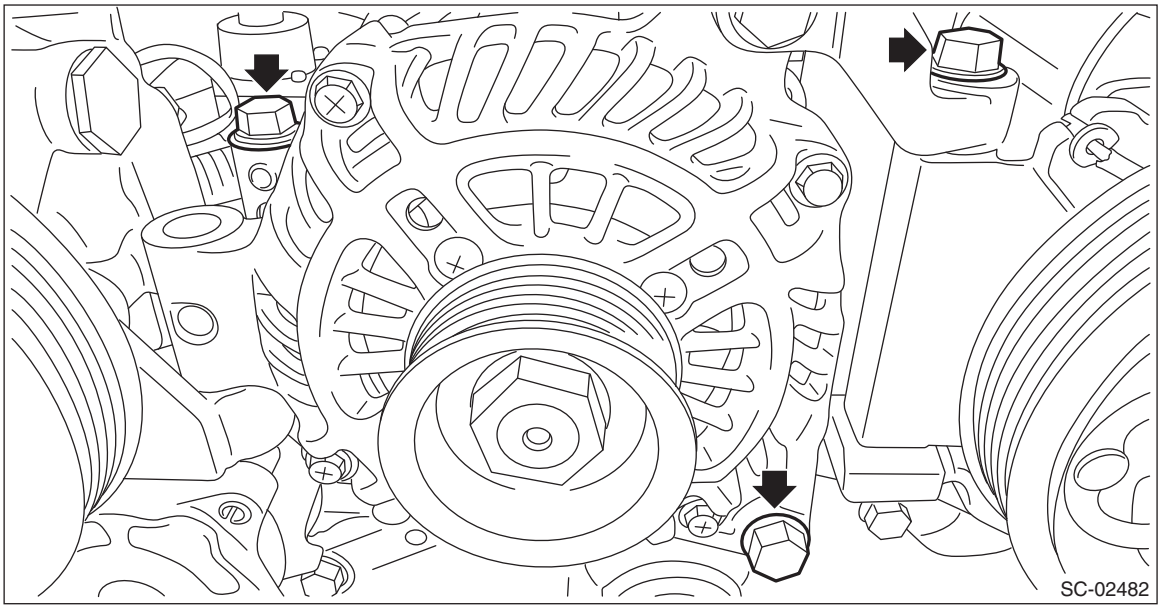
B: INSTALLATION

1. NON-TURBO MODEL

1) Temporarily install the generator bracket to the generator.

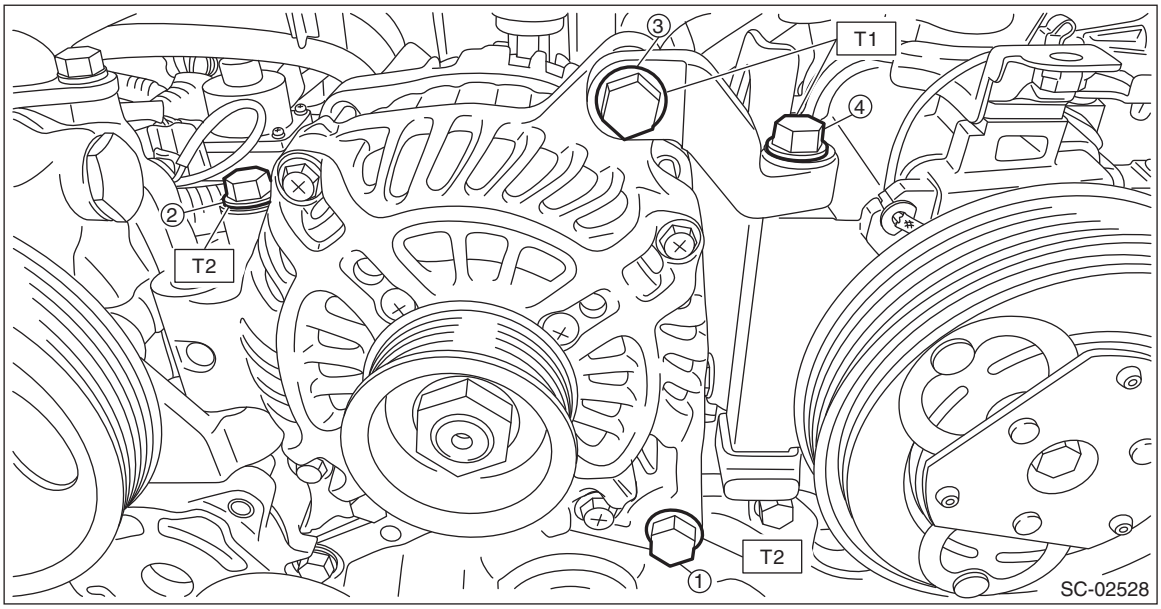


2) Temporarily install the generator to the engine.



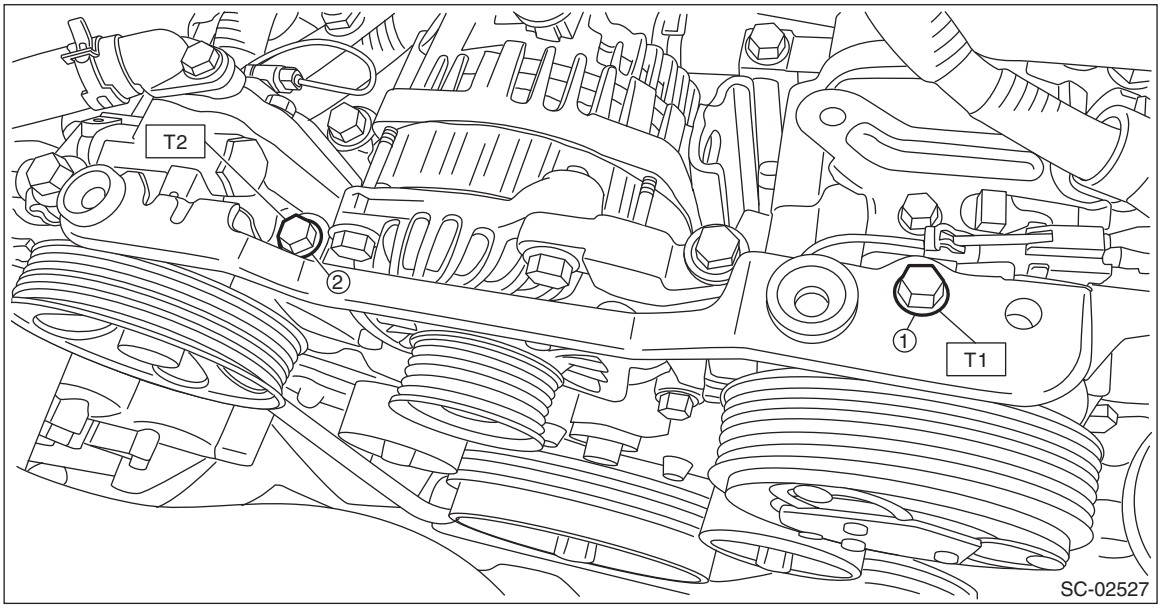
3) * Tighten the generator and generator bracket in the numerical order.

Tightening torque:
T1: 25 N·m (2.5 kgf-m, 18.4 ft-lb)
T2: 36 N·m (3.7 kgf-m, 26.6 ft-lb)



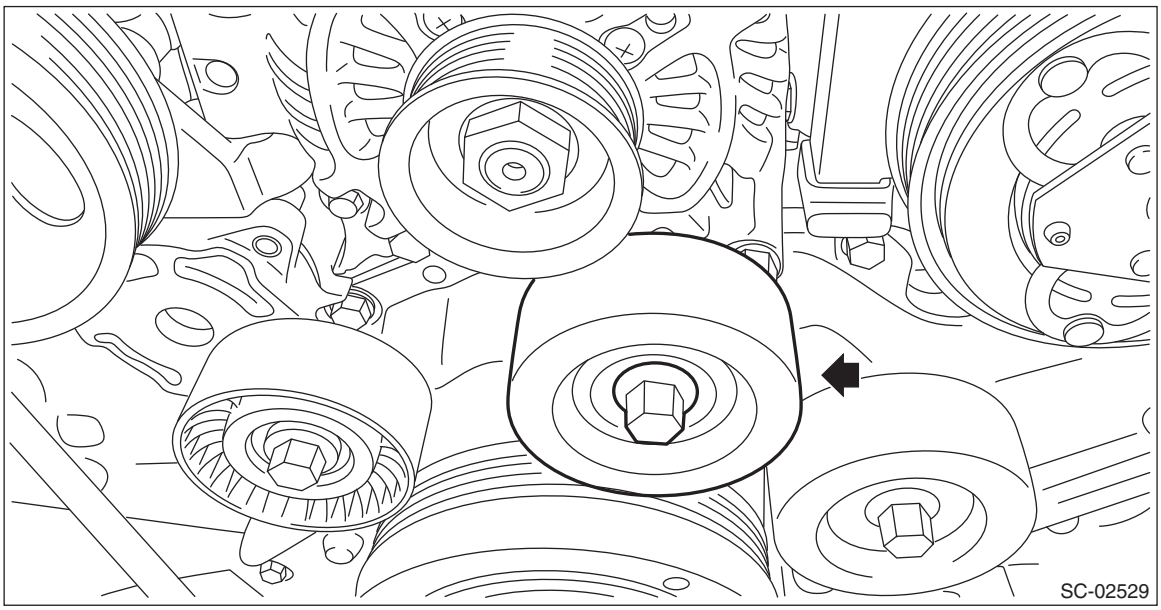
4) Install the V-belt cover bracket and tighten the bolts in the numerical order.

Tightening torque:
T1: 8.5 N·m (0.9 kgf-m, 6.3 ft-lb)
T2: 36 N·m (3.7 kgf-m, 26.6 ft-lb)



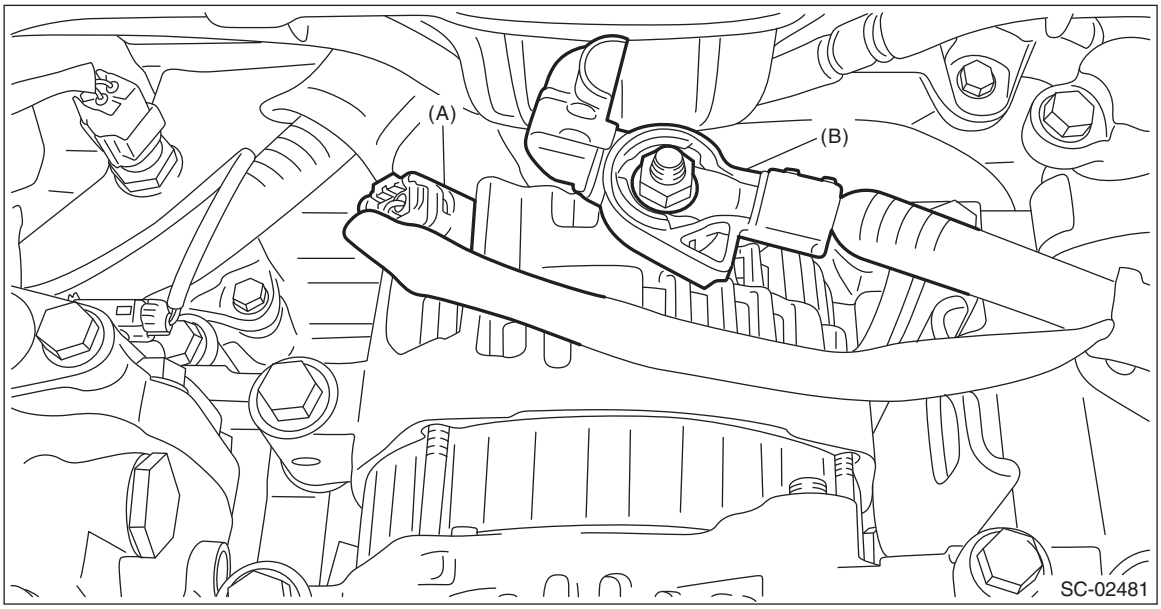
5) Install the idler pulley to the chain cover.

Tightening torque:
36 N·m (3.7 kgf-m, 26.6 ft-lb)

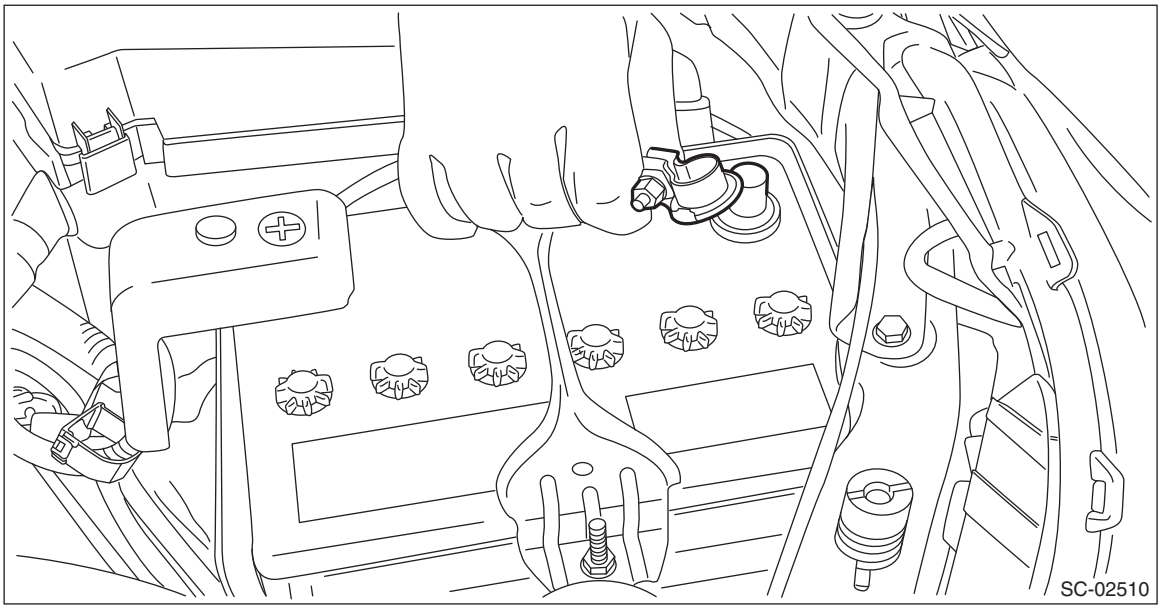


6) Connect the connector (A) and terminal (B) to the generator.

Tightening torque:
16 N·m (1.6 kgf-m, 11.8 ft-lb)

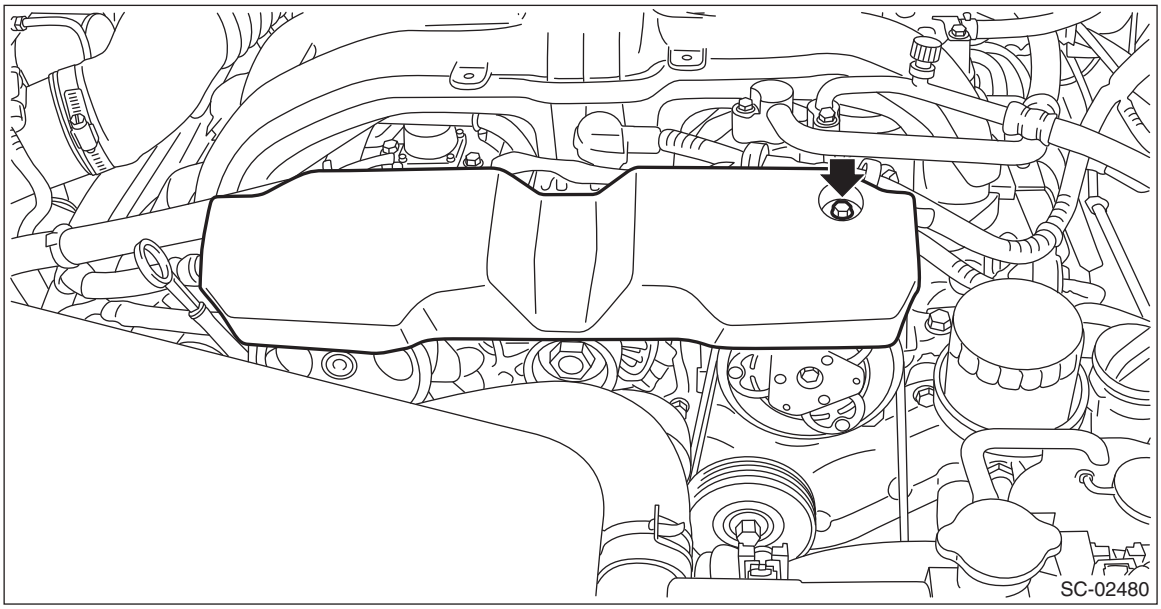


7) Install the V-belts. <Ref. to ME(H4DO)-73, INSTALLATION, V-belt.>
8) Connect the battery ground terminal.



9) Install the V-belt cover.

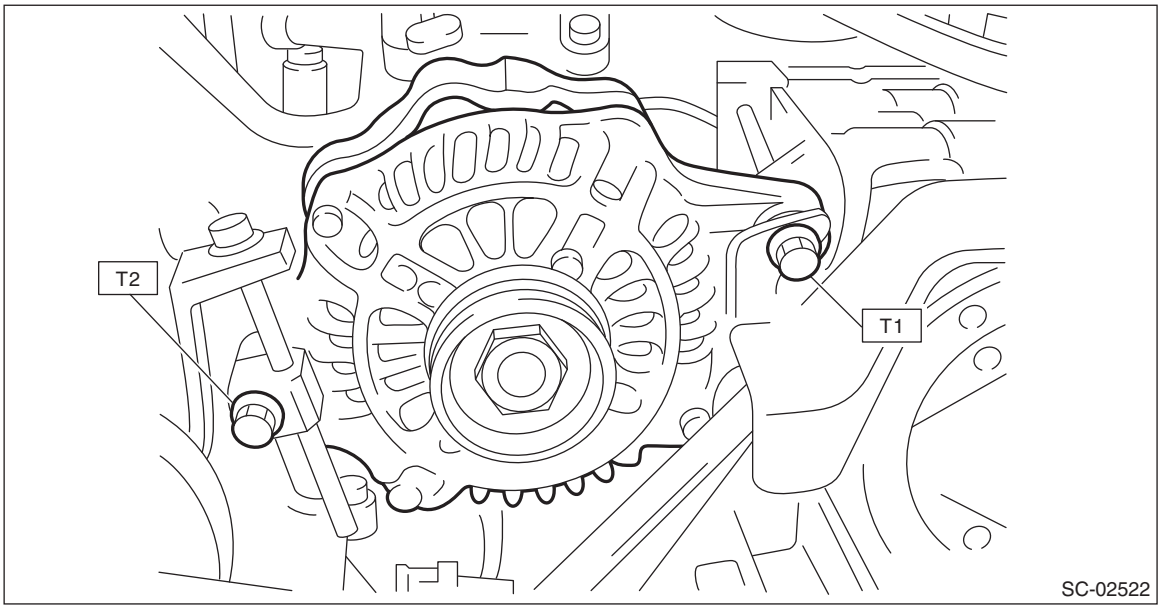
Tightening torque:
13 N·m (1.3 kgf-m, 9.6 ft-lb)



2. TURBO MODEL

CAUTION:
Check and adjust the front side belt tension. <Ref. to ME(H4DOTC)-44, FRONT SIDE BELT, INSPECTION, V-belt.>
1) Install the generator to the bracket.

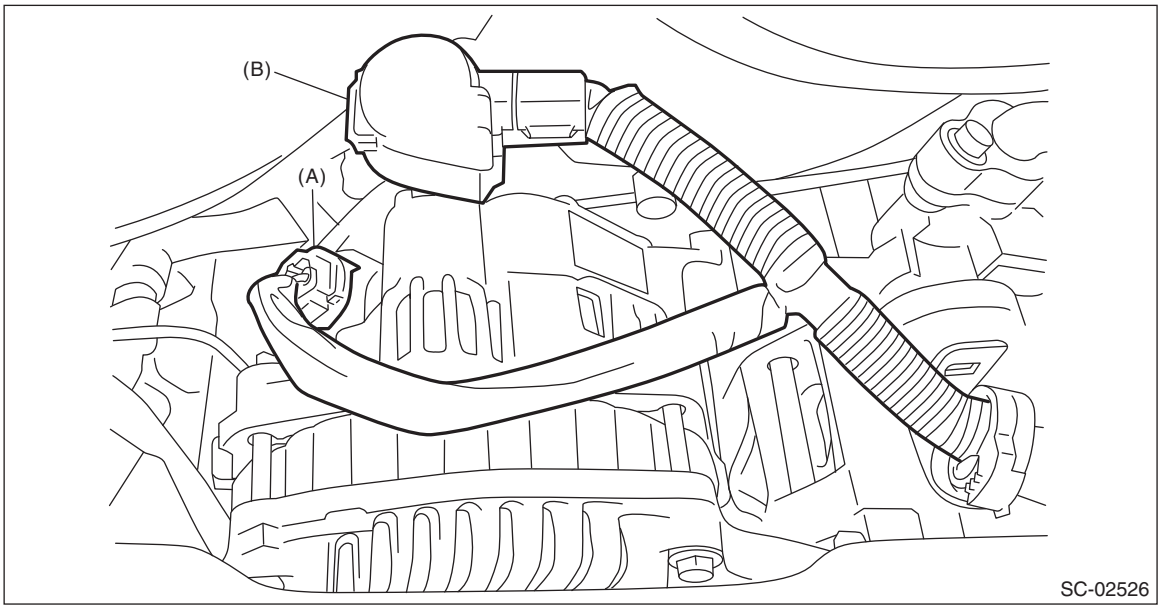
Tightening torque:
T1: 22 N·m (2.2 kgf-m, 16.2 ft-lb)
T2: 25 N·m (2.5 kgf-m, 18.4 ft-lb)



2) Install the front side belt. <Ref. to ME(H4DOTC)-38, FRONT SIDE BELT, INSTALLATION, V-belt.>

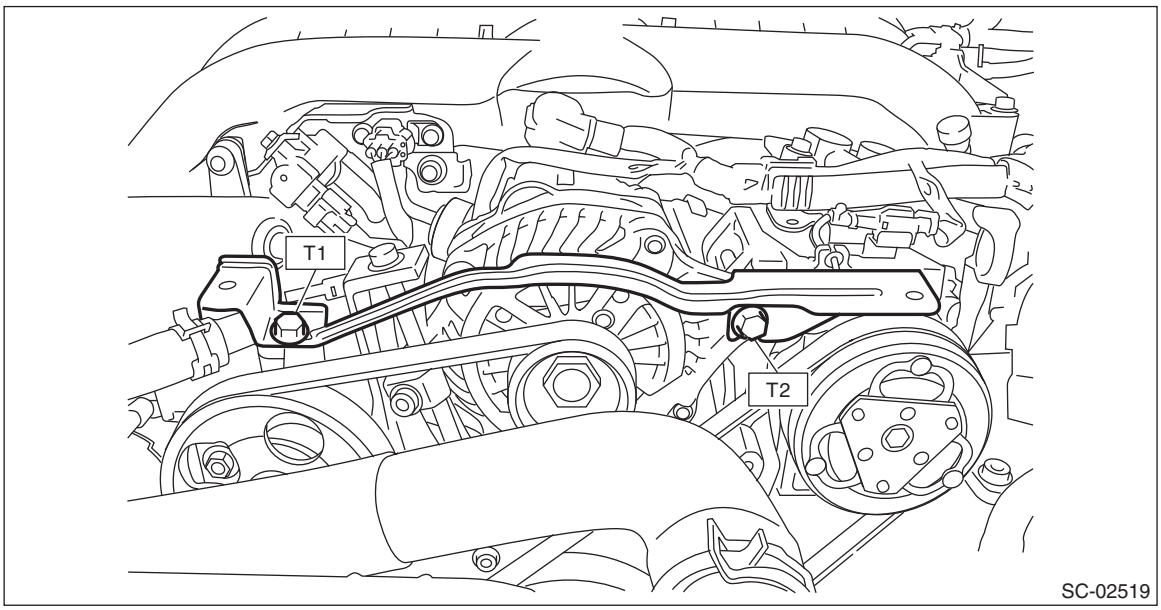
3) Connect the connector (A) and terminal (B) to the generator.

Tightening torque:
16 N·m (1.6 kgf-m, 11.8 ft-lb)

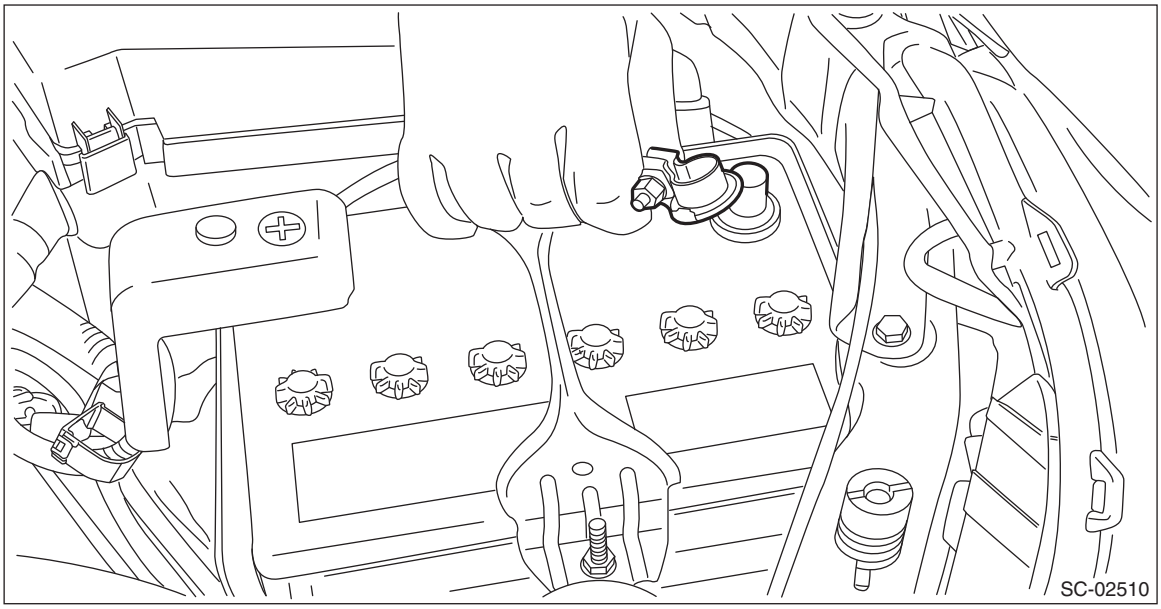


4) Install the collector cover bracket.

Tightening torque:
T1: 8.5 N·m (0.9 kgf-m, 6.3 ft-lb)
T2: 25 N·m (2.5 kgf-m, 18.4 ft-lb)



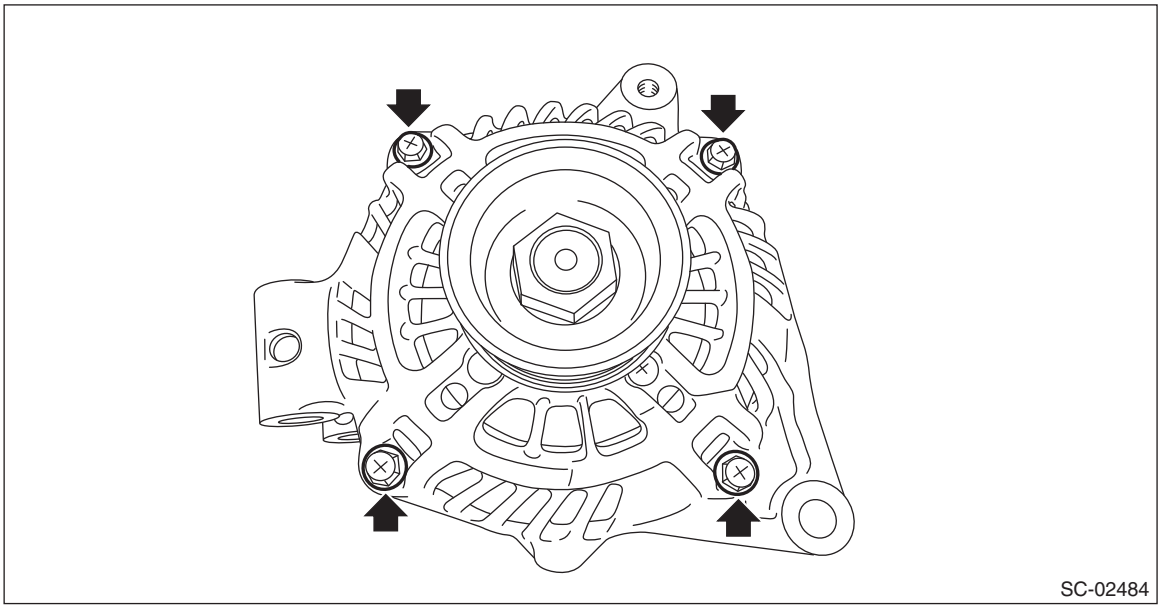
5) Connect the battery ground terminal.



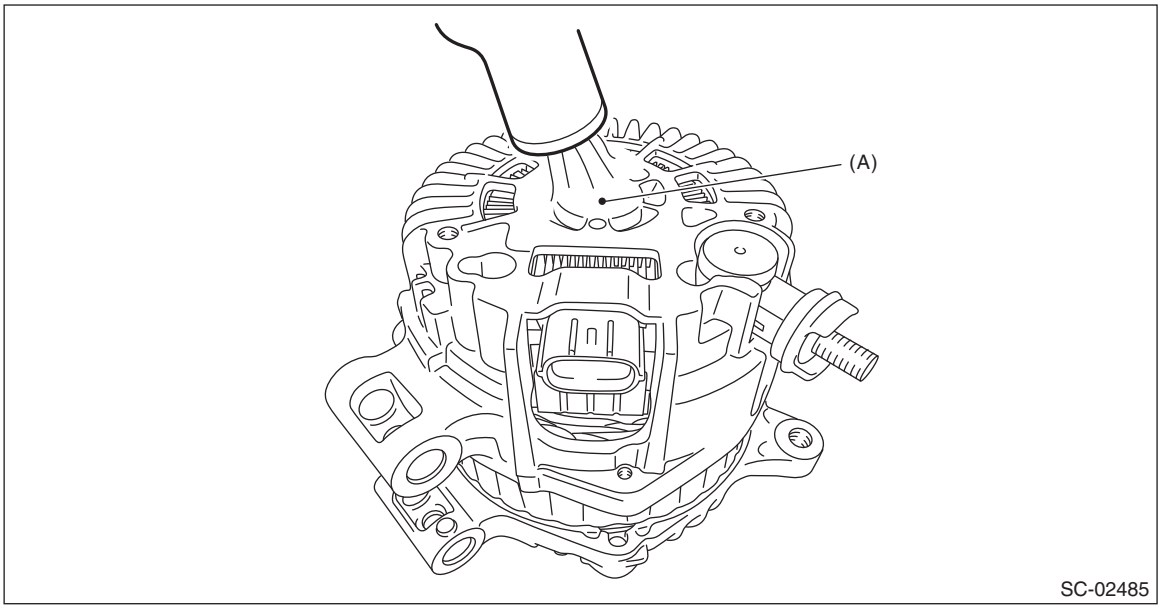
6) Install the collector cover.

C: DISASSEMBLY

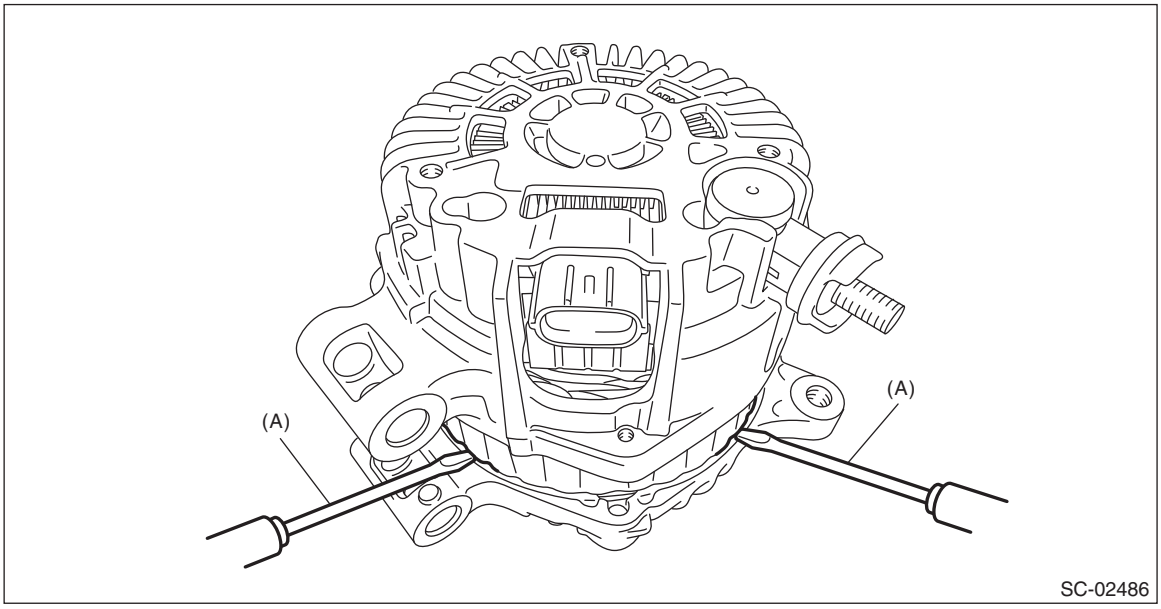
1) Remove the four through bolts.



2) Use a drier to heat the rear cover (A) portion to 50 — 60°C (122 — 140°F).



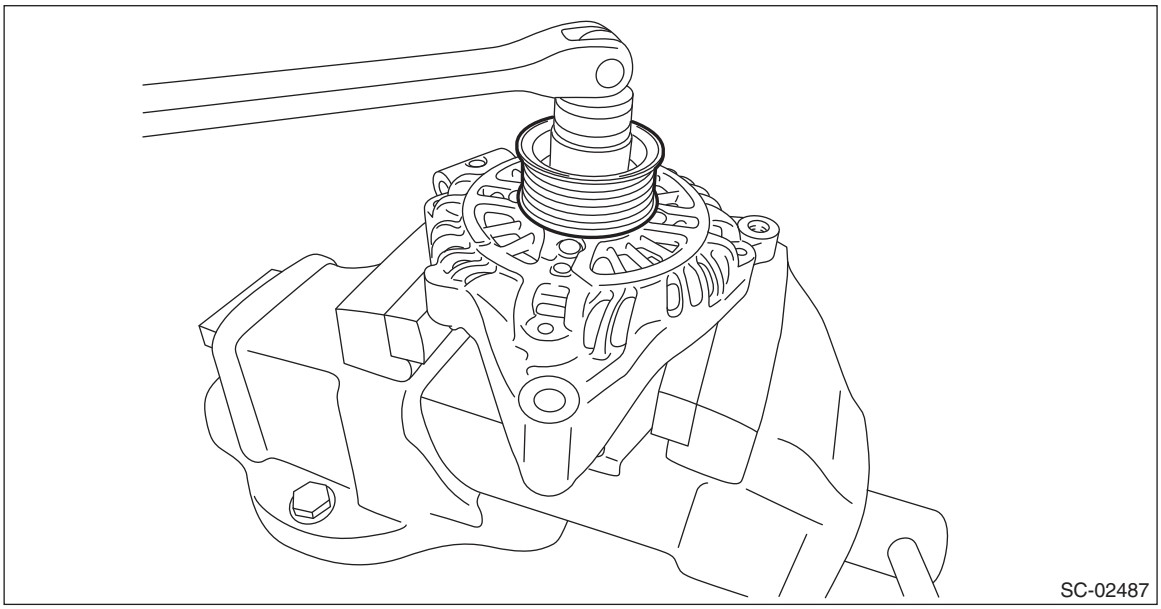
3) Insert the flat tip screwdriver into the gap between stator core and front cover to disassemble.

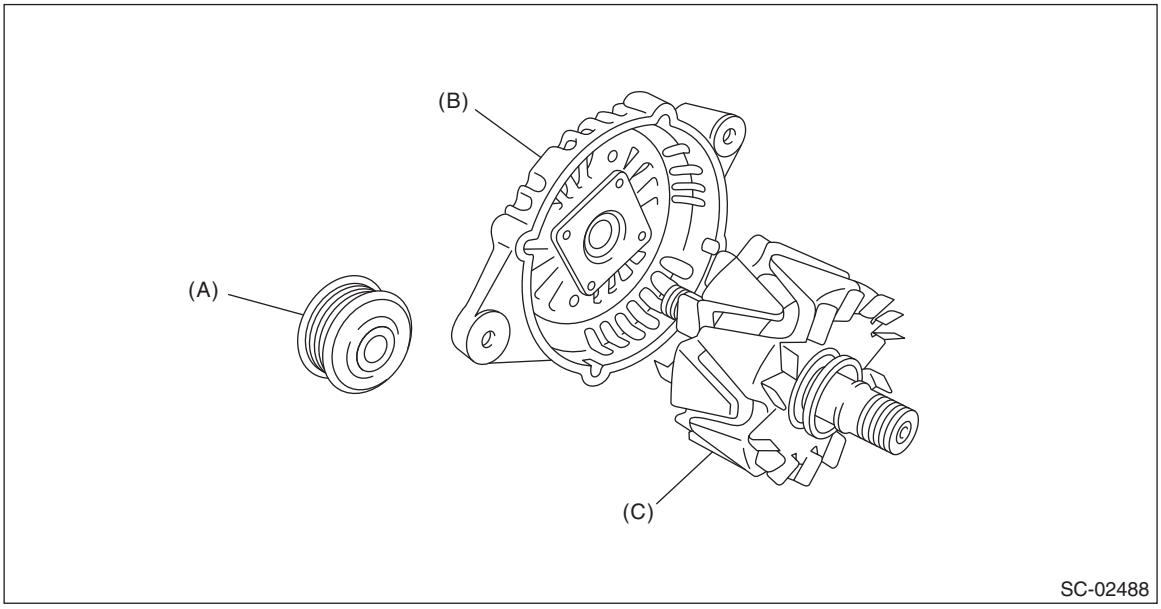


(A) Flat tip screwdriver

4) Using a vise, support the rotor and remove the pulley nut, then remove the rotor from the front cover.

CAUTION:
When holding the rotor with a vise, place aluminum plates or wooden pieces on the vise jaws to prevent rotor from damage.

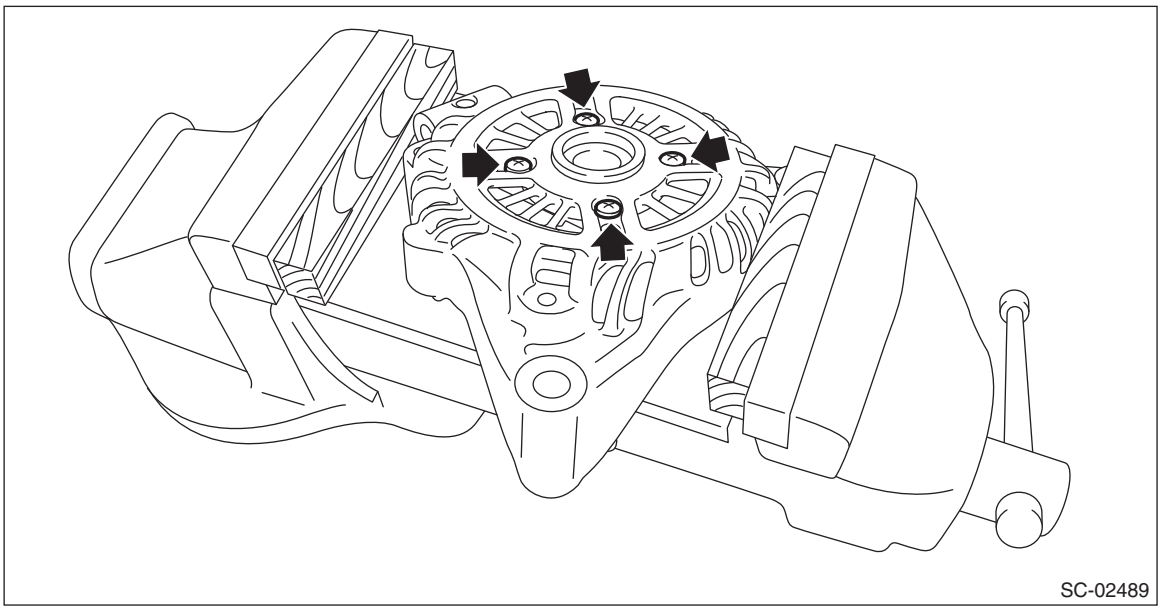

SC-02487



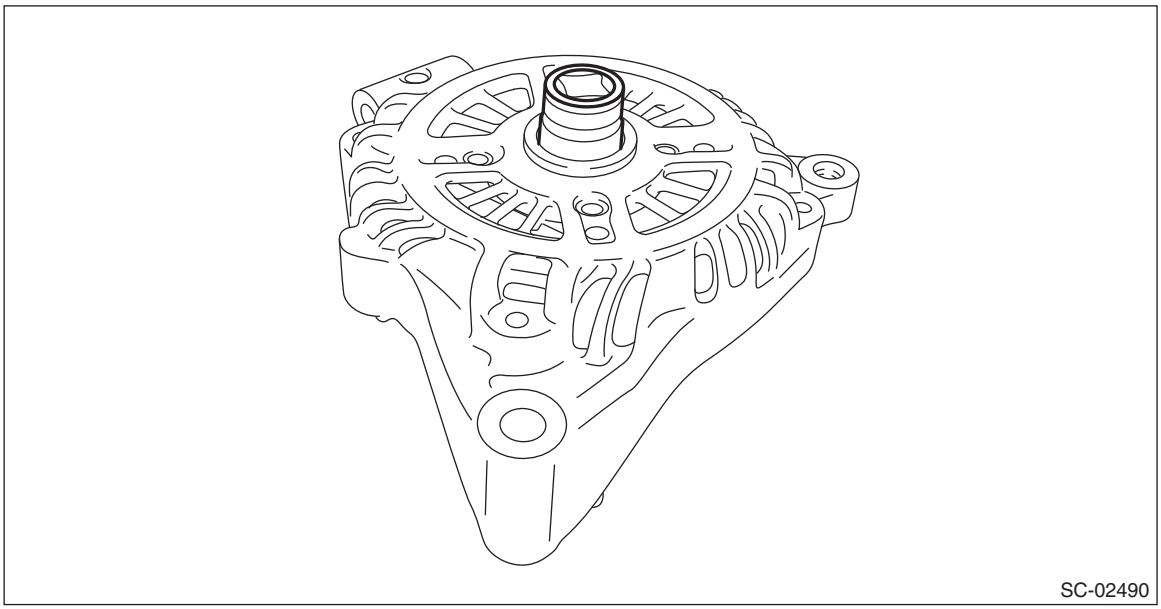
SC-02488

(A) Pulley (B) Front cover (C) Rotor

5) Use the following procedures to remove the ball bearings.
(1) Remove the bolt, and then detach the bearing retainer.

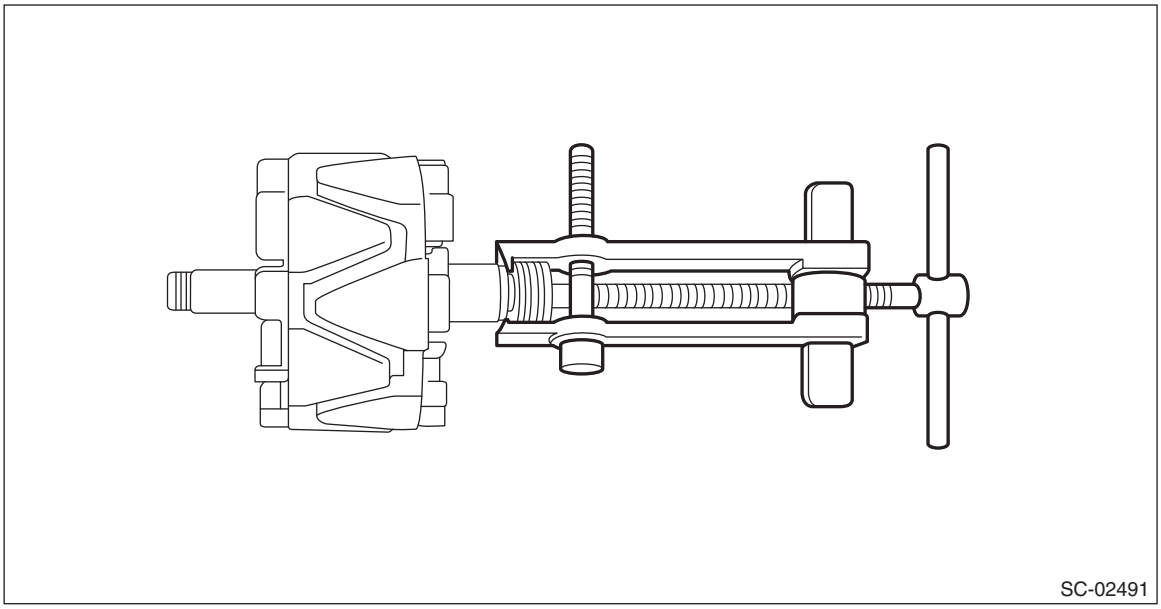

SC-02489

(2) Firmly attach an appropriate tool (such as a correct size socket wrench) to the bearing inner race.

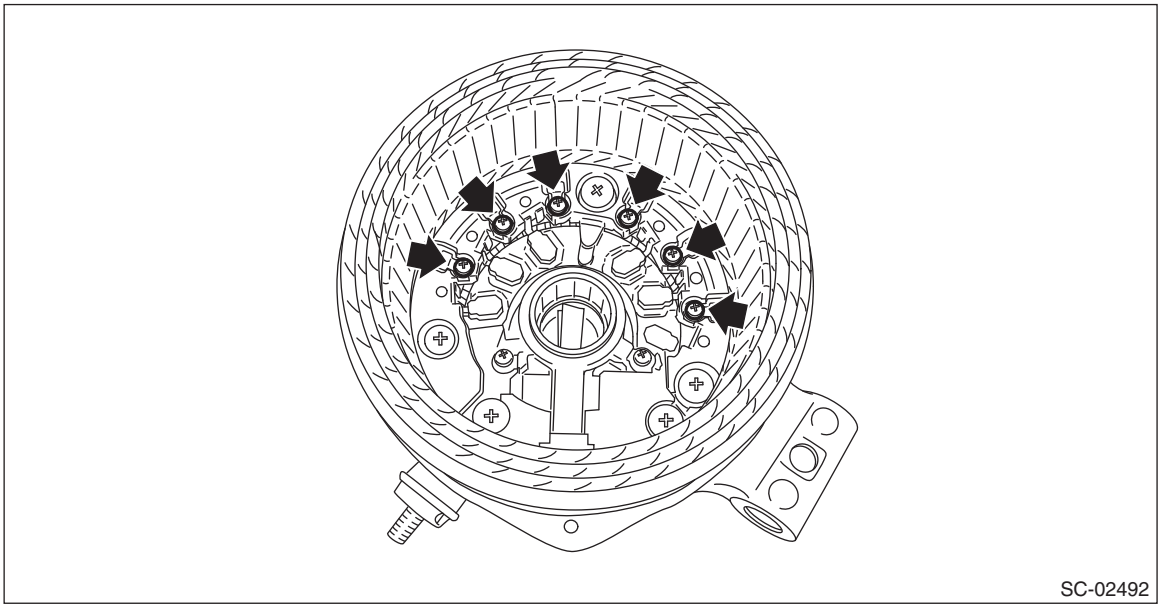

SC-02490

(3) Use the press to push the ball bearings out from the front cover.

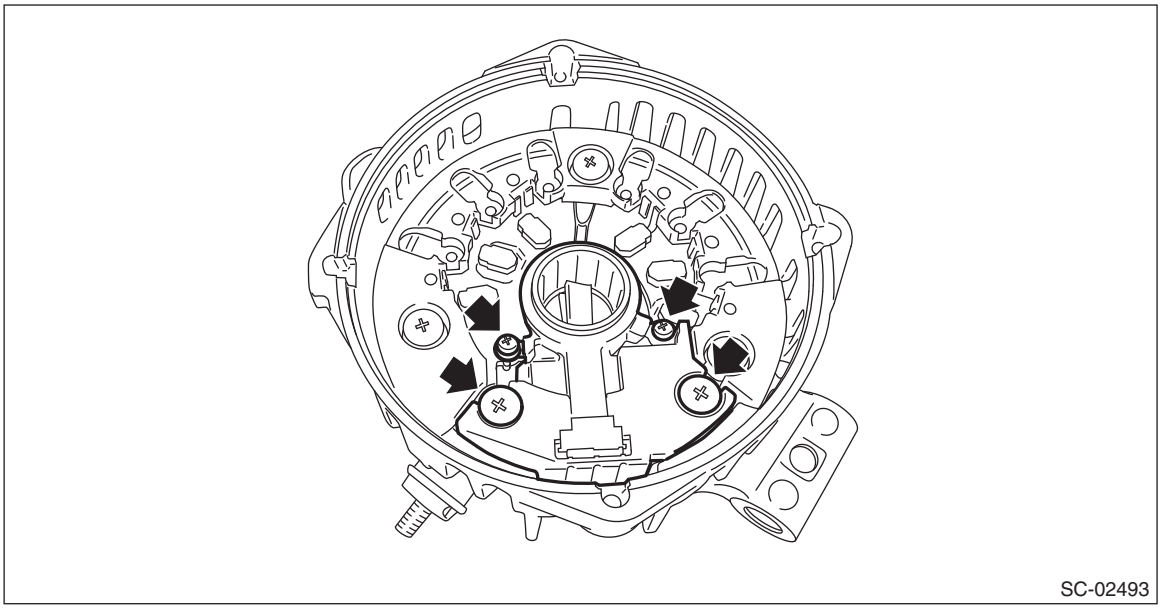
6) Using the bearing puller, remove the bearings from the rotor.


SC-02491

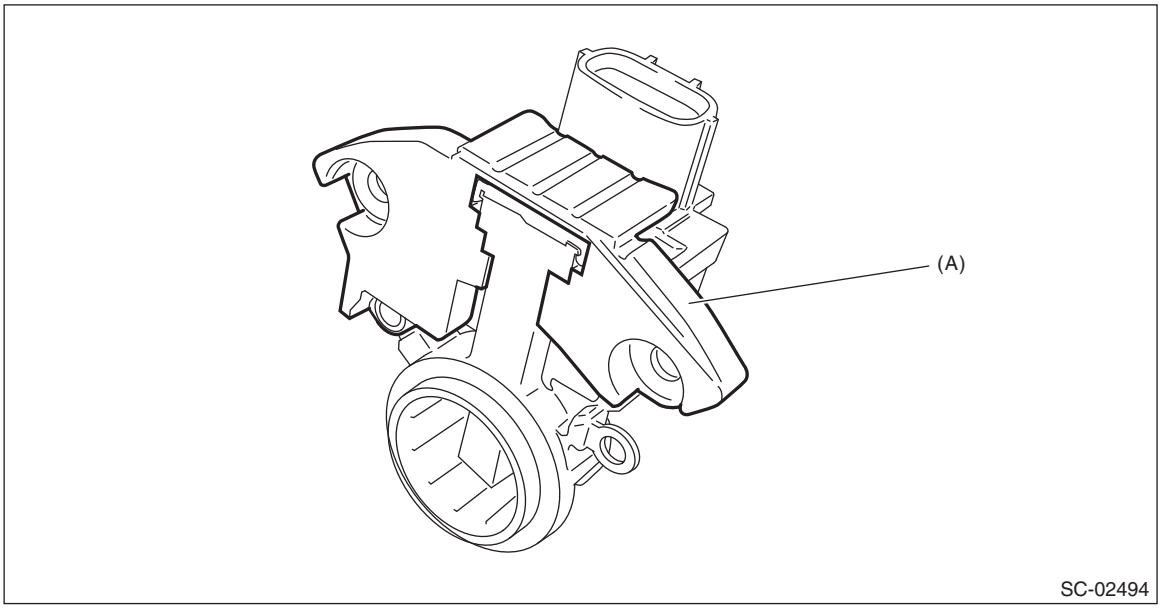
7) Remove six bolts which connect the rectifier and stator coil, then remove the stator coil.


SC-02492

8) Remove four screws which secure the IC regulator to the rear cover, then remove the IC regulator.


SC-02493

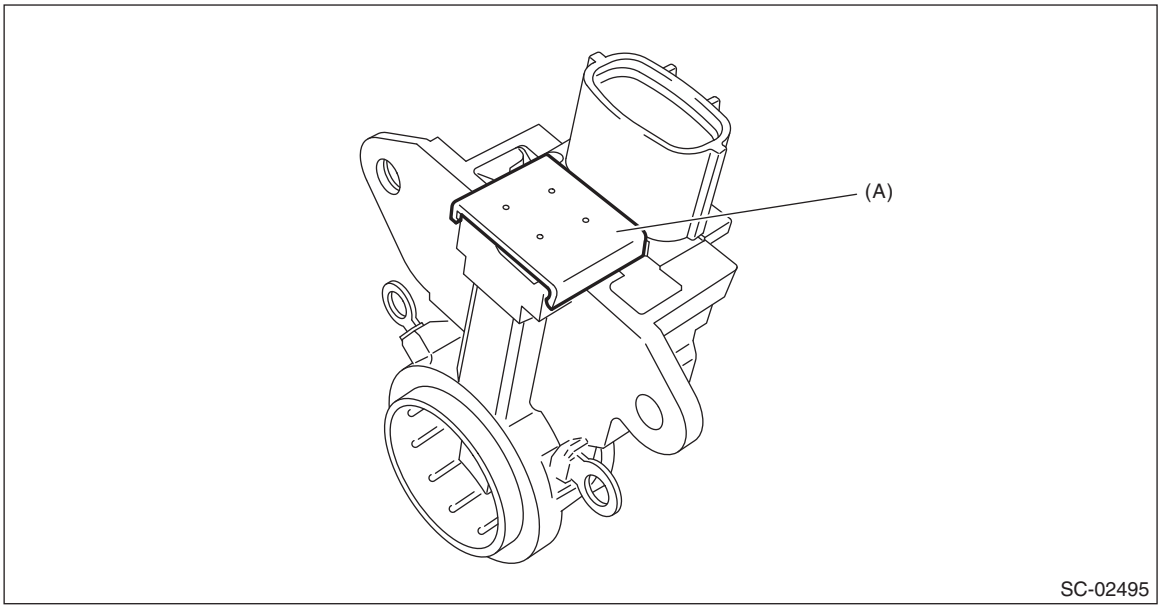
9) Use the following procedures to remove the brush.
(1) Remove the cover A.



SC-02494

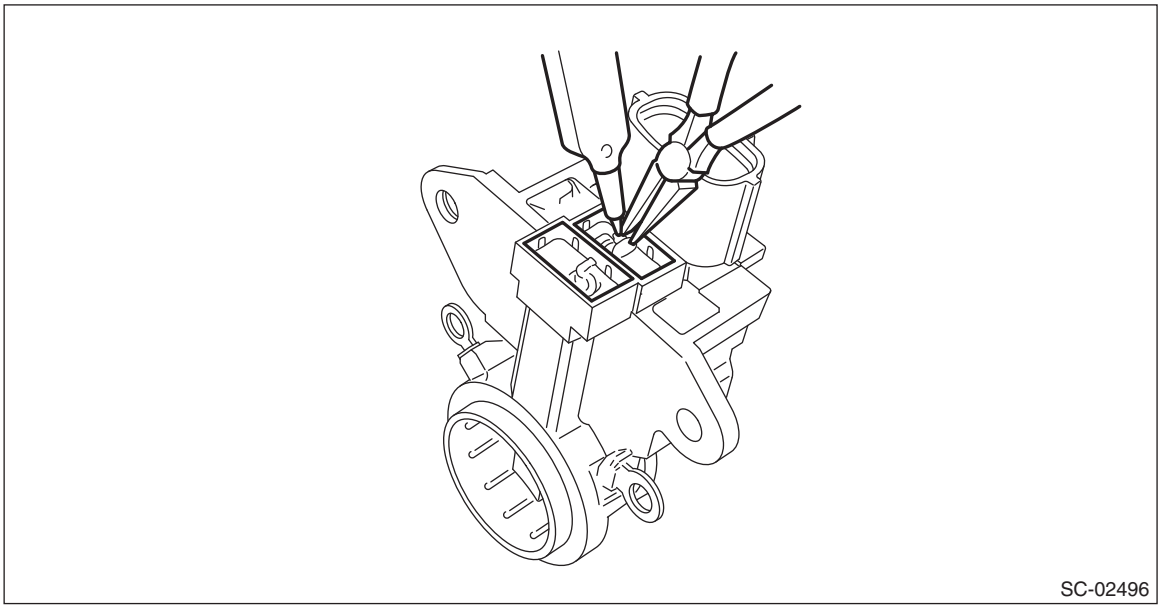
(A) Cover A

(2) Remove the cover B.

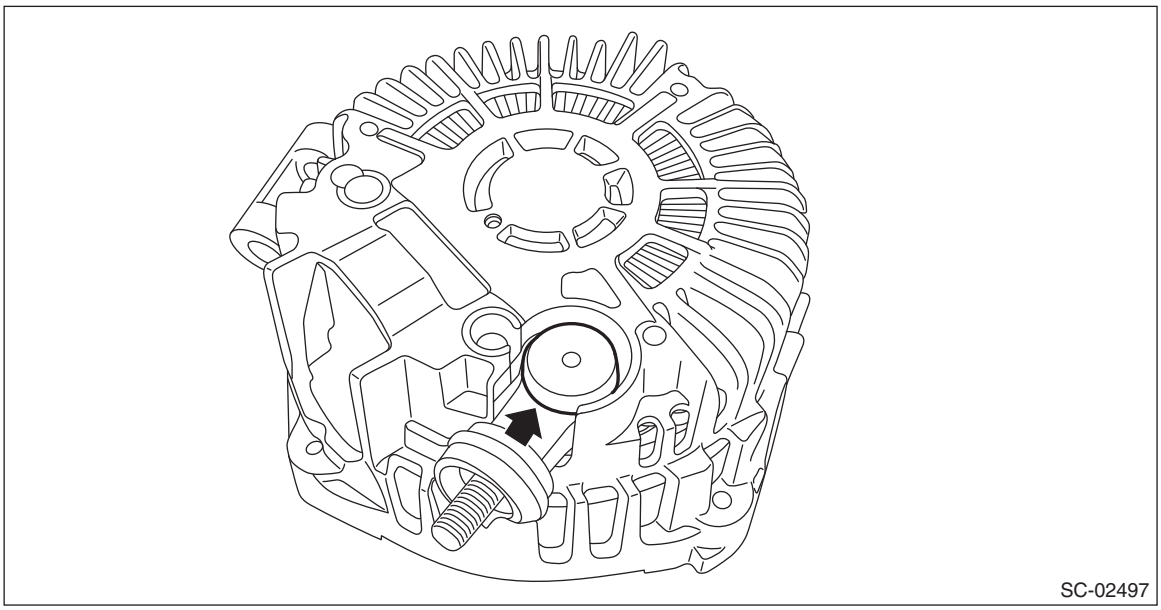


(A) Cover B

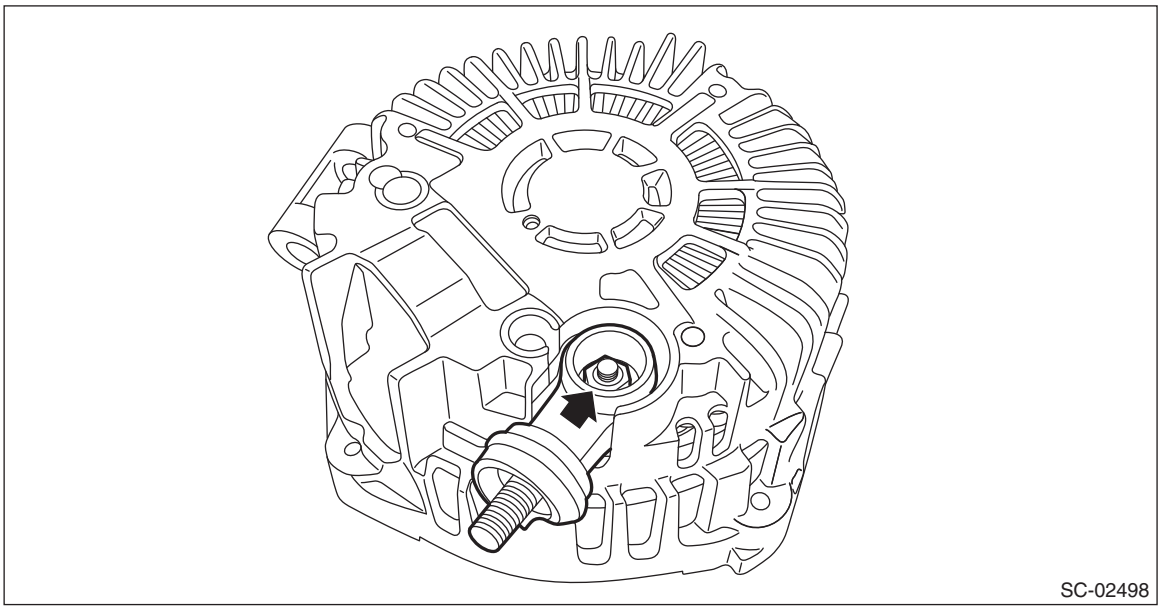
(3) Disconnect the connection and remove the brush.



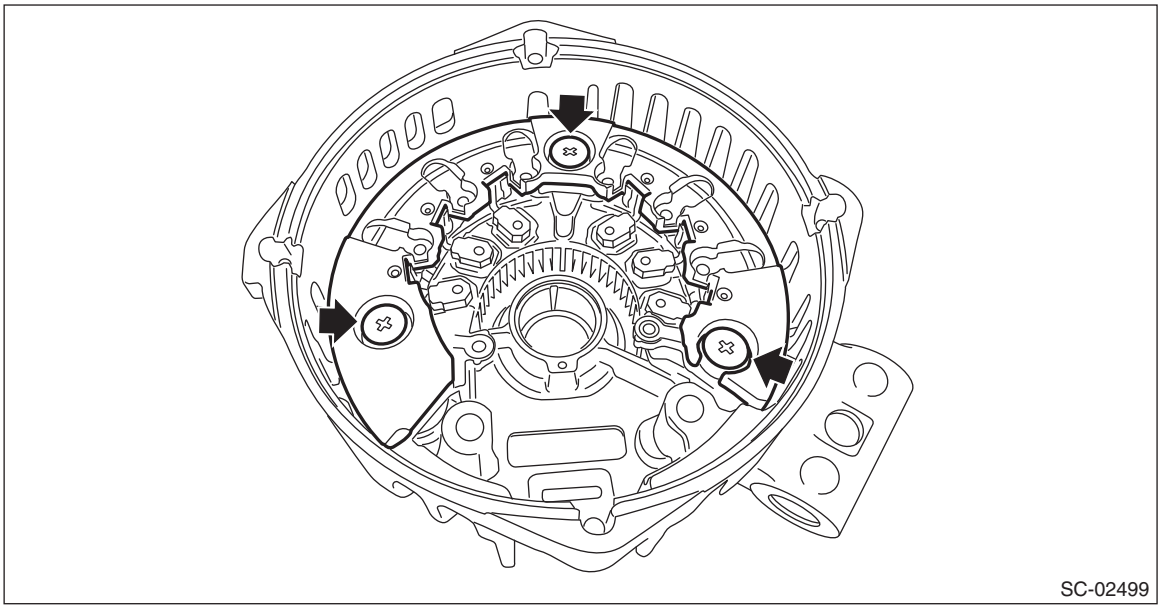
10) Remove the rectifier as follows.
(1) Remove the cover on terminal B.


SC-02497

(2) Remove the nut on terminal B.


SC-02498

(3) Remove the bolts which secure the rectifier, and remove the rectifier.



D: ASSEMBLY

Assemble in the reverse order of disassembly.

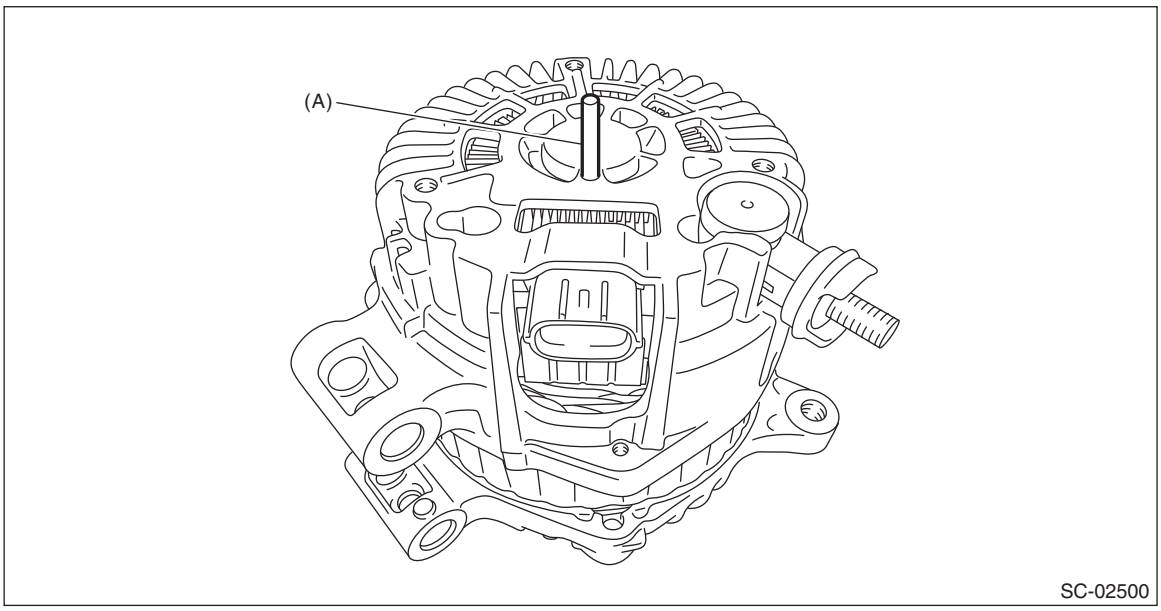
NOTE:
• Refer to component for tightening torque of each part. <Ref. to SC(H4DO)-5, GENERATOR, COMPONENT, General Description.>
• After assembling, manually turn the pulley to check that the rotor rotates smoothly.

1) Assembling the rear cover and rectifier
Remove old silicone grease on the mating surface of rear cover and rectifier and apply new silicone grease.

CAUTION:
Do not apply silicone grease to the attachment threads of rectifier.

2) Push of the brush
Before assembling the front and rear parts, press the brush down into the brush holder, then fix the brush in that position by inserting a [1 mm (0.0394 in) dia., 40 — 50 mm (1.5748 — 1.9685 in) long] wire through the hole as shown in the figure.

CAUTION:
After assembling, remove the wire.



(A) Wire

3) Install the ball bearings.
   (1) Set the ball bearings in the front cover, then securely install an appropriate tool (such as a socket wrench of proper size) to the bearing outer race.
   (2) Using a press to press the ball bearings into the specified location.
   (3) Install the bearing retainer.

4) Install the bearings.

CAUTION:
Do not apply grease to the bearings. If there is any oil on the bearing box, remove it completely.
   (1) Use a press to install the bearings to the rotor shaft.
   (2) Heat the bearing box in rear cover at 50 to 60°C (122 to 140°F), and then press the bearing into rear cover.

E: INSPECTION

1. DIODE

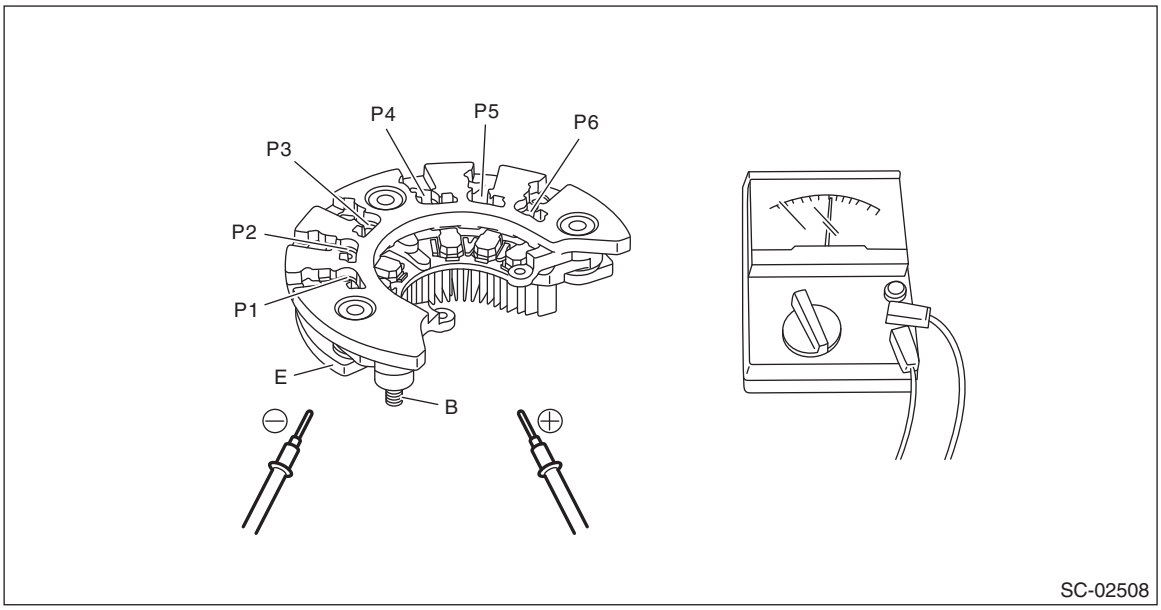
CAUTION:
There is the possibility of damaging the diodes if a mega-tester (used to measure high voltages) or a similar measuring instrument is used. Never use a mega tester or equivalent for this test.
1) Check for continuity between the diode lead and terminal E or B. If continuity is not as shown in the table, replace the rectifier.

- At analog type tester

Tester lead		Continuity
–lead	+lead	
E	P1, P2, P3, P4, P5, P6	Yes
B		No
P1, P2, P3, P4, P5, P6	E	No
	B	Yes

- At digital type tester

Tester lead		Continuity
–lead	+lead	
E	P1, P2, P3, P4, P5, P6	No
B		Yes
P1, P2, P3, P4, P5, P6	E	Yes
	B	No



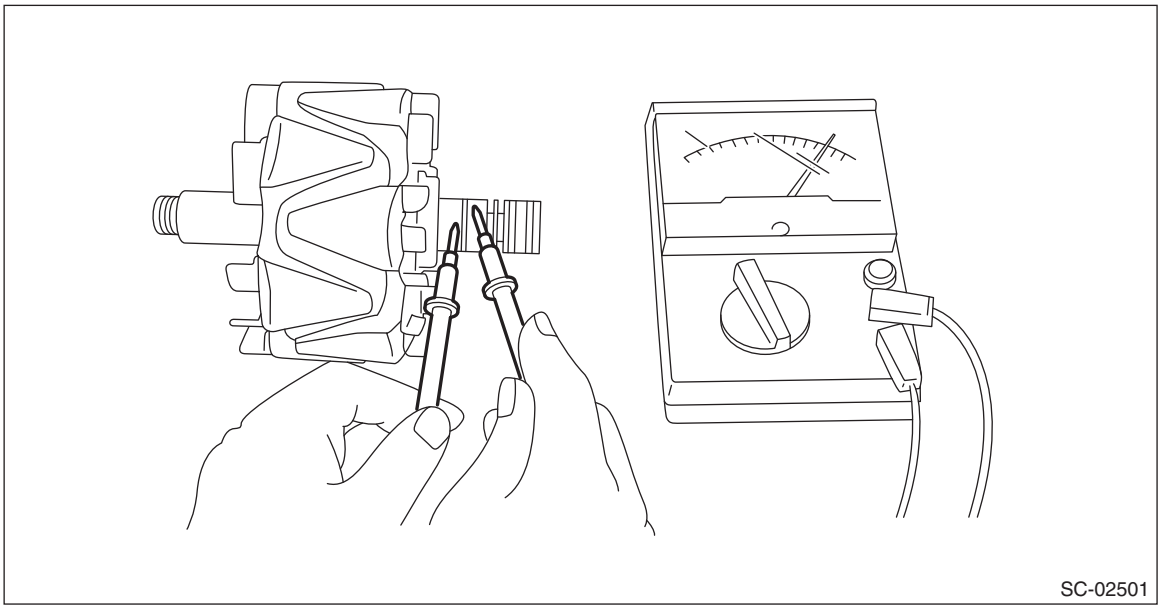
2. ROTOR

1) Slip ring surface
Inspect the slip rings for contamination or any roughness on 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 if the slip ring is worn.

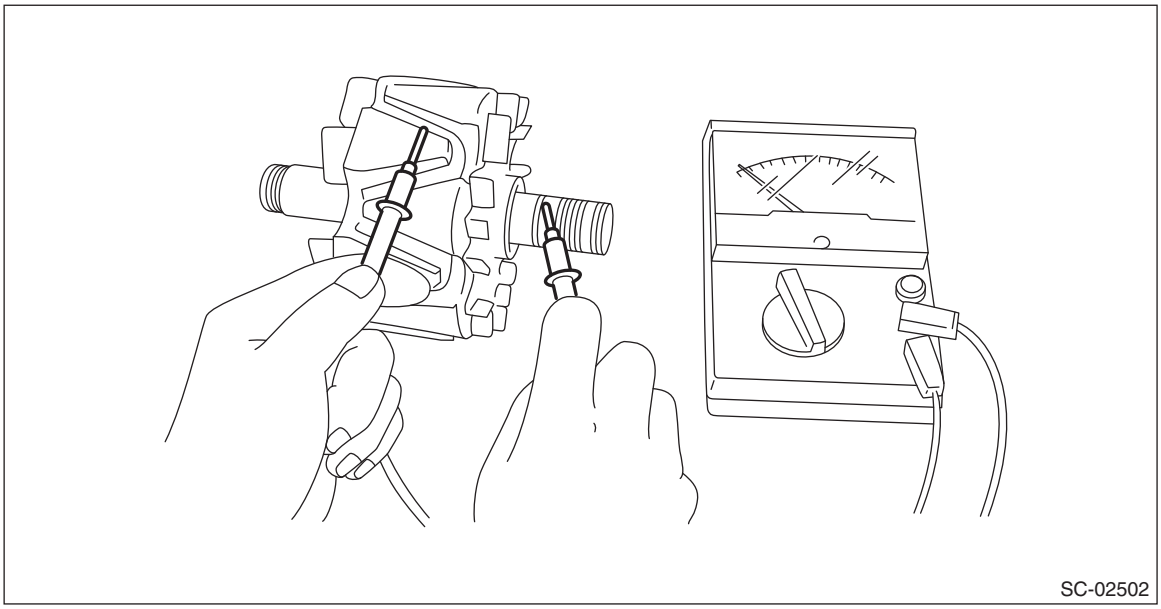
Slip ring outer diameter:
Standard
22.7 mm (0.894 in)
Limit
22.1 mm (0.870 in)

3) Continuity test
Using a circuit tester, check the resistance between slip rings. If the resistance is not within the standard, replace the rotor.

Standard:
Approx. 2.0 — 2.4 Ω


SC-02501

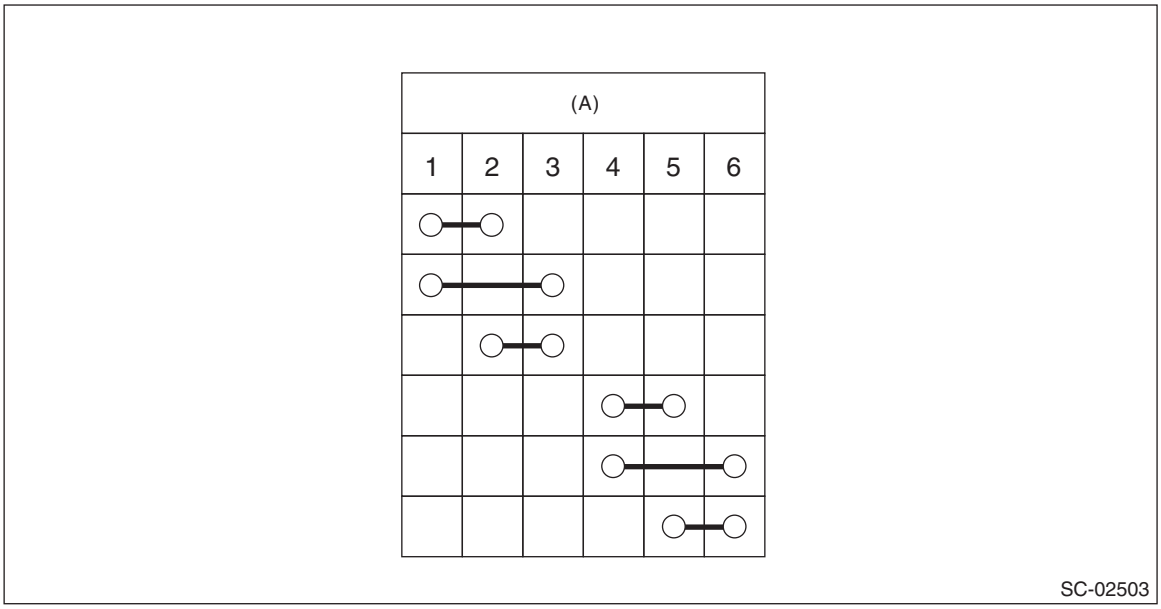
4) Insulation test
Check the continuity between slip ring and rotor core or shaft. If there is continuity, replace the rotor because the rotor coil is grounded.


SC-02502

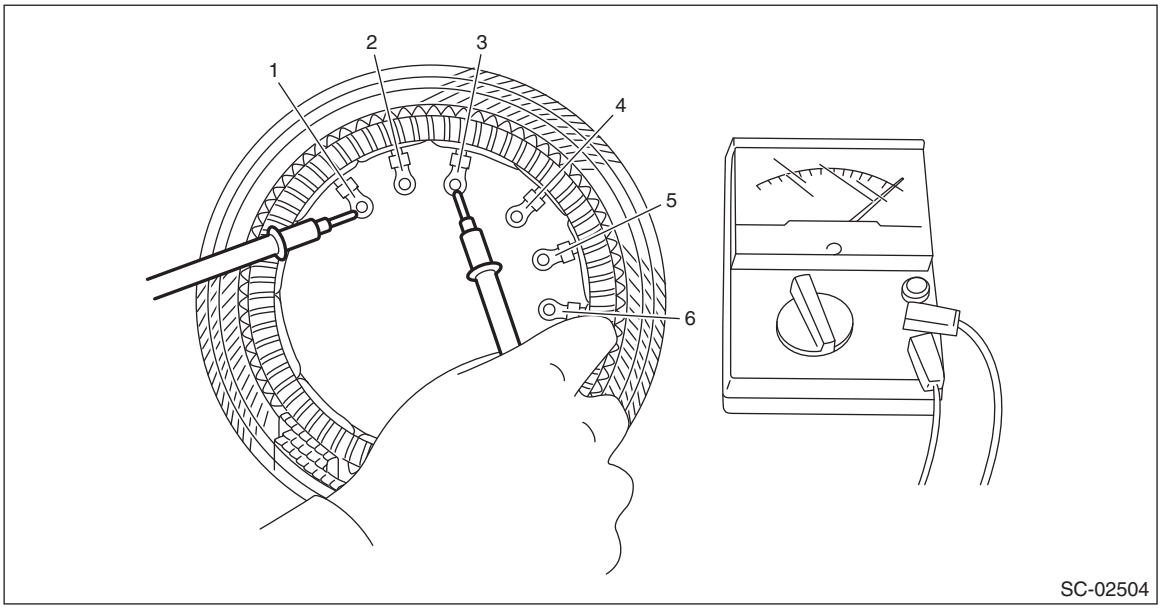
5) Bearing
Check the bearings. If there is any noise, or the rotor does not rotate smoothly, replace the bearings.

3. STATOR COIL

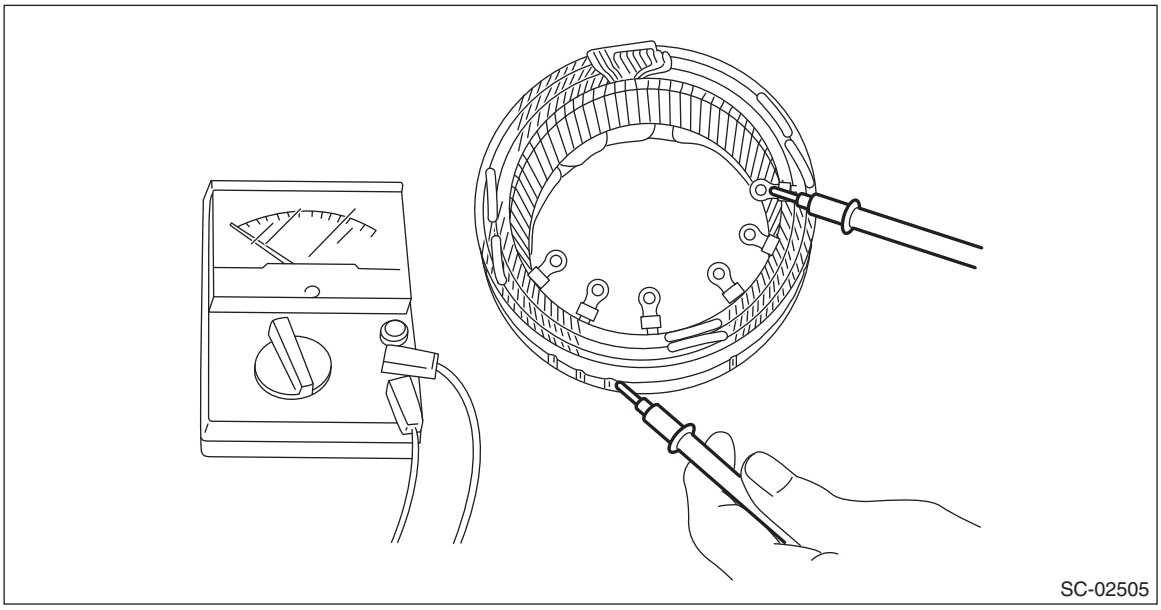
1) Continuity test
Inspect the continuity between the stator coil terminals. If continuity is not as shown in the table, replace the stator coil.



(A) Terminals



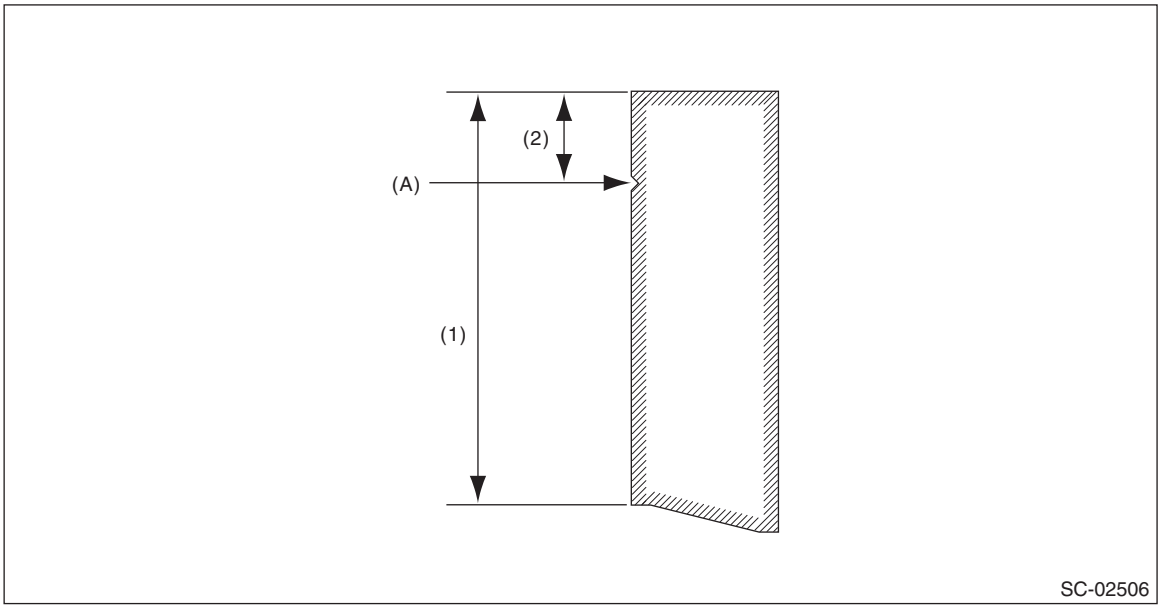
2) Insulation test
Inspect the continuity between the stator coil stator core and lead wire terminals. If there is continuity, replace the stator coil because the stator coil is grounded.


SC-02505

4. BRUSH

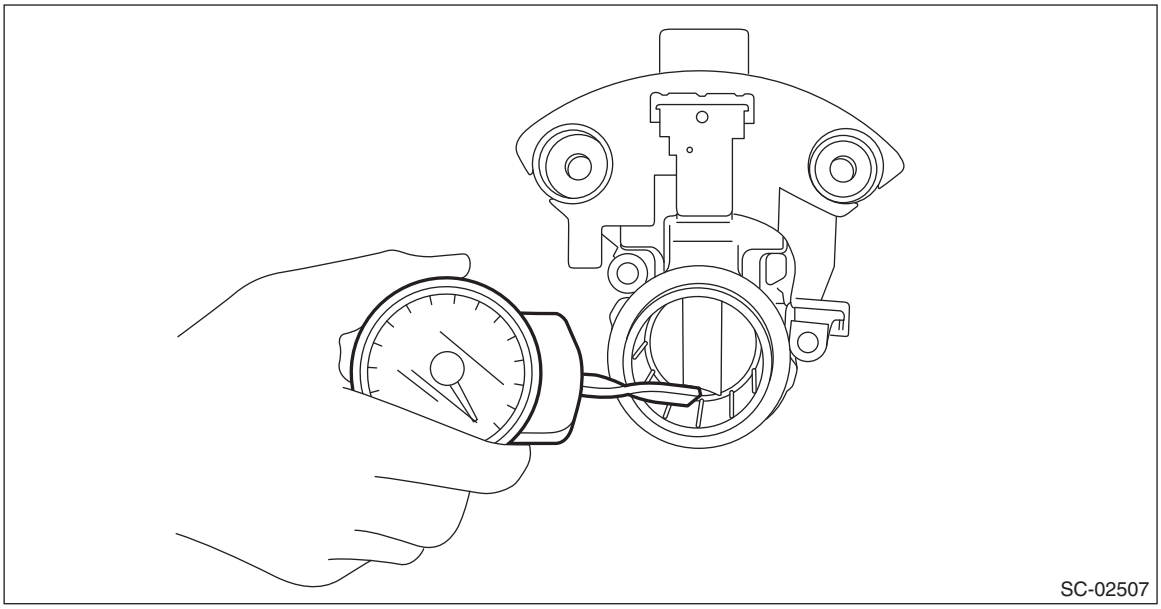
1) Measure the length of each brush. Replace the brush if wear exceeds service limits. There is a service limit mark (A) on each brush.

Brush length:
Standard (1)
18.5 mm (0.728 in)
Limit (2)
5.0 mm (0.197 in)



SC-02506

2) Check that there is appropriate pressure on the brush spring. Using a spring pressure indicator, push the brush into the brush holder until its tip protrudes 2 mm (0.0787 in). Then measure the pressure of brush spring. If the pressure is 1.7 N (173 gf, 6.11 ozf) or less, replace the brush spring. 4.1 — 5.3 N (418 — 540 gf, 14.75 — 19.06 ozf) pressure is required on the new spring.



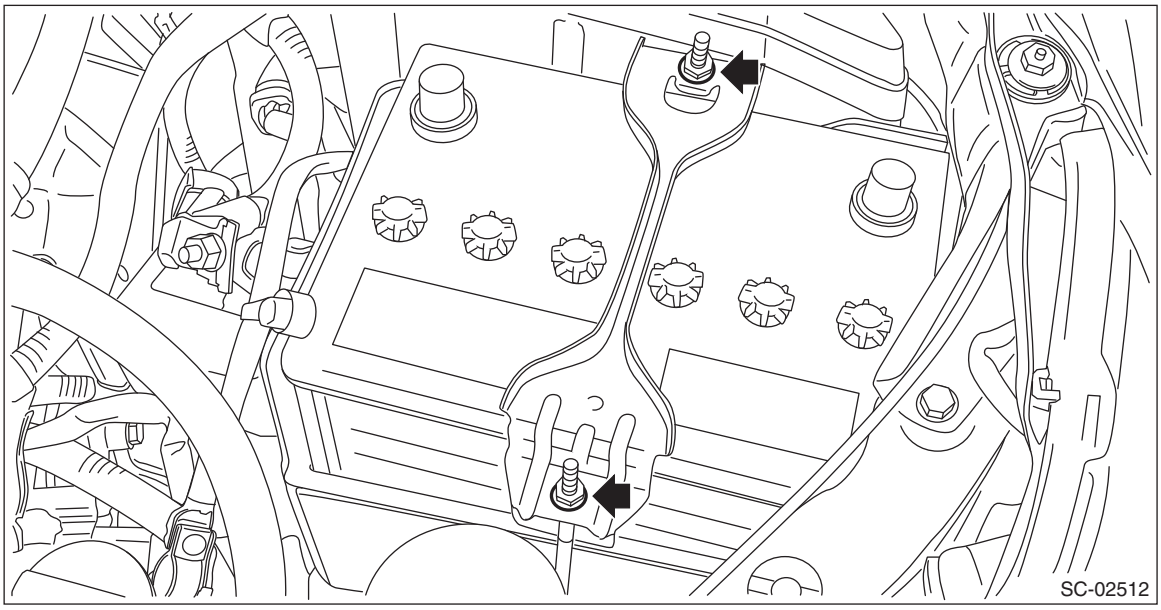
5. BALL BEARING

Check the ball bearings. Replace the ball bearings if there is resistance in the rotation, or if there is any abnormal noise.

4. Battery

A: REMOVAL

1) Disconnect the positive (+) terminal after disconnecting the negative (–) terminal of battery.
2) Remove the battery cable holder from the battery rod.
3) Remove the flange nut from battery rod and remove battery holder.



4) Remove the battery.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
3.5 N·m (0.4 kgf-m, 2.6 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 the battery.
- After the battery is installed, initial diagnosis of the electronic throttle control is performed. Wait for 10 seconds or more after turning the ignition switch to ON, and then start the engine.

C: INSPECTION

WARNING:
- **Electrolyte is corrosive acid, and has toxicity; be careful of handling the fluid.**
- **Make sure the electrode does not come into contact with skin, eyes or clothing. Especially at contact with eyes, flush with water for 15 minutes and get prompt medical attention.**
- **In addition, be careful not to let the electrode contact with the coated parts.**
- **Be careful when handling the batteries because they produce explosive gases.**
- **Be sure to keep battery away from any fire.**
- **For safety, in case an explosion does occur, wear eye protection or shield your eyes when working near any battery. In addition, never lean over the battery.**
- **Ventilate sufficiently when using or charging battery in enclosed space.**
- **Before starting work, remove rings, metal watch-bands, and other metal jewelry.**
- **Never allow metal tools to contact the positive battery terminal and anything connected to it while you are at the same time in contact with any other metallic portion of the vehicle.**

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

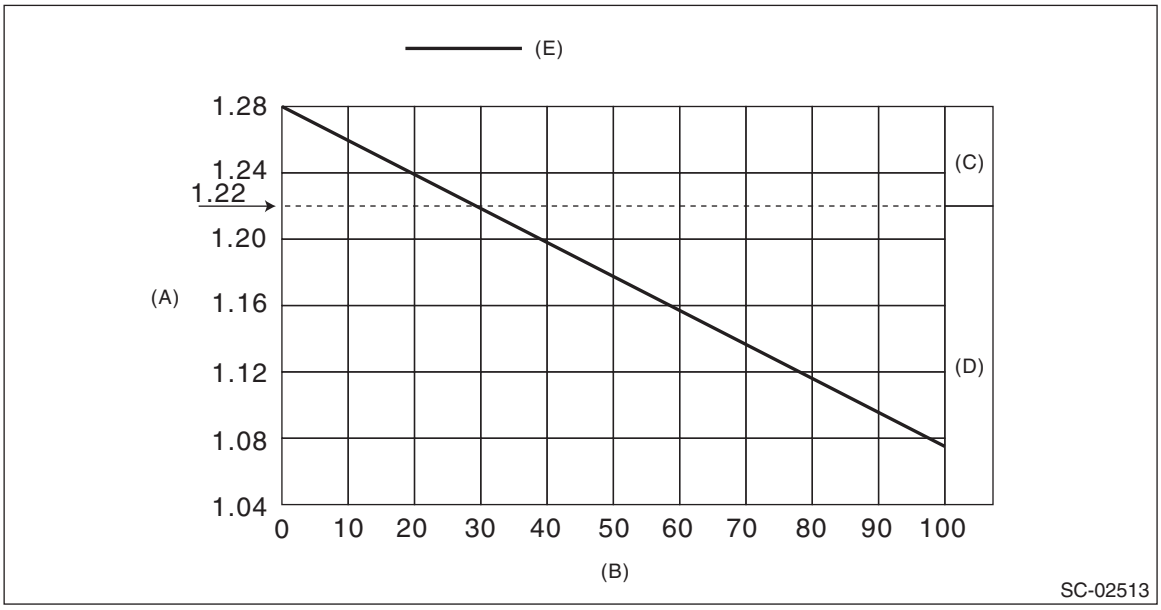
Check the electrolyte level in each cell. If the level is below MIN level, bring the level to MAX level by pouring distilled water into the battery cell. Do not fill beyond MAX level.

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 calculation:

S_{20} = St + 0.0007 × (t – 20)
S_{20}: Specific gravity corrected at electrolyte temperature of 20°C
St: Measured specific gravity
t: Measured temperature (°C)
Judge whether or not the battery requires charging according to corrected specific gravity.
Standard specific gravity: 1.220 — 1.290 [at 20°C (68°F)]

2) Measuring the specific gravity of the electrolyte 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.



(A) Specific gravity [20°C (68°F)]
(B) Amount of discharge (%)
(C) Good
(D) Need to charge
(E) Battery with standard specific gravity 1.280 [20°C (68°F)]

D: MEASUREMENT

WARNING:
Do not bring an open flame close to the battery when working.

CAUTION:
- **Prior to charging, corroded terminals should be cleaned with a brush and common caustic soda solution.**
- **Be careful since battery electrolyte 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 of 1.250 — 1.290 for one hour or more.
2) Voltage per battery cell should be held at a specific value in a range of 2.5 — 2.8 V for one hour or more.

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

CAUTION:
- **Observe the items in "3. NORMAL CHARGING".**
- **Never use 10 A or more when charging the battery because it will shorten the battery life.**

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, quick charging must be carried out within a current range that will not raise the electrolyte temperature to 40°C (104°F) or more.
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.

ENGINE (DIAGNOSTICS)

EN(H4DO)(diag)

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1. Basic Diagnostic Procedure

A: PROCEDURE

1. ENGINE

	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(H4DO)(diag)-4, 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(H4DO)(diag)-70, 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(H4DO)(diag)-326, INSPECTION, General Diagnostic Table.>
3	**CHECK COMMUNICATION STATUS.** 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor or general scan tool to the data link connector. 3) Turn the ignition switch to ON, and run the Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed procedures, refer to "Subaru Select Monitor". <Ref. to EN(H4DO)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Does Subaru Select Monitor or general scan tool communicate with vehicle normally?	Go to step **4**.	Inspection using "Diagnostics Procedure for Subaru Select Monitor Communication". <Ref. to EN(H4DO)(diag)-84, Diagnostic Procedure for Subaru Select Monitor Communication.>
4	**CHECK DTC.** Read DTC using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor Refer to "Read Diagnostic Trouble Code" for detailed operation procedure. <Ref. to EN(H4DO)(diag)-42, Read Diagnostic Trouble Code (DTC).> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is DTC displayed on Subaru Select Monitor or general scan tool?	Record the DTC. Repair the trouble cause. <Ref. to EN(H4DO)(diag)-86, List of Diagnostic Trouble Code (DTC).> Go to step **5**.	Repair the related parts. NOTE: If DTC is not shown on display although the malfunction indicator light illuminates, perform the diagnosis of malfunction indicator light circuit or combination meter. <Ref. to EN(H4DO)(diag)-61, Malfunction Indicator Light.>

	Step	Check	Yes	No
5	**CHECK FREEZE FRAME DATA.** Check the freeze frame data using the Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed procedures, refer to "Subaru Select Monitor". <Ref. to EN(H4DO)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is freeze frame data displayed on Subaru Select Monitor or general scan tool?	Record the freeze frame data. Repair the cause of fault, and go to the next step. Go to step **6**.	Go to step **6**.
6	**PERFORM DIAGNOSIS.** 1) Perform the Clear Memory Mode. <Ref. to EN(H4DO)(diag)-56, Clear Memory Mode.> 2) Perform the Inspection Mode or Drive Cycle. <Ref. to EN(H4DO)(diag)-43, Inspection Mode.> <Ref. to EN(H4DO)(diag)-48, Drive Cycle.>	Is DTC displayed on Subaru Select Monitor or general scan tool?	Inspect using "Diagnostic Procedure with Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DO)(diag)-93, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

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.

<table>
<tr><td>Customer's name</td><td></td><td>Engine No.</td><td></td></tr>
<tr><td>Date of purchase</td><td></td><td>Fuel type</td><td></td></tr>
<tr><td>Date of repair</td><td></td><td rowspan="2">Odometer reading</td><td>km</td></tr>
<tr><td>V.I.N.</td><td></td><td>miles</td></tr>
<tr><td>Weather</td><td colspan="3">❑ Fine
❑ Cloudy
❑ Rainy
❑ Snowy
❑ Various/Others:</td></tr>
<tr><td rowspan="2">Ambient air temperature</td><td>°C (°F)</td><td colspan="2"></td></tr>
<tr><td colspan="3">❑ Hot
❑ Warm
❑ Cool
❑ Cold</td></tr>
<tr><td>Place</td><td colspan="3">❑ Highway
❑ Suburbs
❑ Inner city
❑ Uphill
❑ Downhill
❑ Rough road
❑ Others:</td></tr>
<tr><td>Engine temperature</td><td colspan="3">❑ Cold
❑ Warming-up
❑ After warming-up
❑ Any temperature
❑ Others:</td></tr>
<tr><td>Engine speed</td><td>rpm</td><td colspan="2"></td></tr>
<tr><td>Vehicle speed</td><td>km/h (MPH)</td><td colspan="2"></td></tr>
<tr><td>Driving conditions</td><td colspan="3">❑ Not affected
❑ At starting
❑ While idling
❑ At racing
❑ While accelerating
❑ While cruising
❑ While decelerating
❑ While turning (RH/LH)</td></tr>
<tr><td>Headlight</td><td>❑ ON/❑ OFF</td><td>Rear defogger</td><td>❑ ON/❑ OFF</td></tr>
<tr><td>Blower</td><td>❑ ON/❑ OFF</td><td>Audio</td><td>❑ ON/❑ OFF</td></tr>
<tr><td>A/C compressor</td><td>❑ ON/❑ OFF</td><td>Rear entertainment system</td><td>❑ ON/❑ OFF</td></tr>
<tr><td>Radiator fan</td><td>❑ ON/❑ OFF</td><td>Car phone</td><td>❑ ON/❑ OFF</td></tr>
<tr><td>Front wiper</td><td>❑ ON/❑ OFF</td><td>Wireless device</td><td>❑ ON/❑ OFF</td></tr>
<tr><td>Rear wiper</td><td>❑ ON/❑ OFF</td><td colspan="2"></td></tr>
</table>

2. CHECK LIST NO. 2

Check the following item about the vehicle's state when the malfunction indicator light turns on.

NOTE:
Use copies of this page for interviewing customers.

a) Other warning lights or indicators illuminate. ❑ Yes / ❑ No
❑ Low fuel warning light ❑ Charge warning light ❑ Engine coolant temperature warning light ❑ Oil pressure warning light ❑ ATF temperature warning light or SPORT indicator light ❑ Driver's control center differential indicator light ❑ ABS warning light ❑ VDC warning light ❑ Cruise indicator light ❑ SI-CRUISE warning light ❑ Immobilizer indicator light ❑ STEERING warning light ❑ Electronic parking brake warning light ❑ Glow indicator light ❑ Sedimentor warning light ❑ Others:
b) Fuel level
• Lack of fuel: ❑ Yes / ❑ No • Indicator position of fuel gauge: • Experienced running out of fuel: ❑ Yes / ❑ No
c) Intentional connecting or disconnecting of harness connectors or spark plug cords: ❑ Yes / ❑ No
• What:
d) Intentional connecting or disconnecting of hoses: ❑ Yes / ❑ No
• What:
e) Installing of other parts except genuine parts: ❑ Yes / ❑ No
• What: • Where:
f) Occurrence of noise: ❑ Yes / ❑ No
• From where: • What kind:
g) Occurrence of smell: ❑ Yes / ❑ No
• From where: • What kind:
h) Intrusion of water into engine compartment or passenger compartment: ❑ Yes / ❑ No
i) Troubles occurred
❑ Engine does not start. ❑ Engine stalls during idling. ❑ Engine stalls while driving. ❑ Engine speed decreases. ❑ Engine speed does not decrease. ❑ Rough idling ❑ Poor acceleration ❑ Back fire ❑ After fire ❑ Does not shift. ❑ 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:
• Do not use electrical test equipment on the airbag system 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. Doing so will damage the ECM instantly, and other parts will also 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. Perform the Clear Memory Mode after connecting the connectors. <Ref. to EN(H4DO)(diag)-56, Clear Memory Mode.>

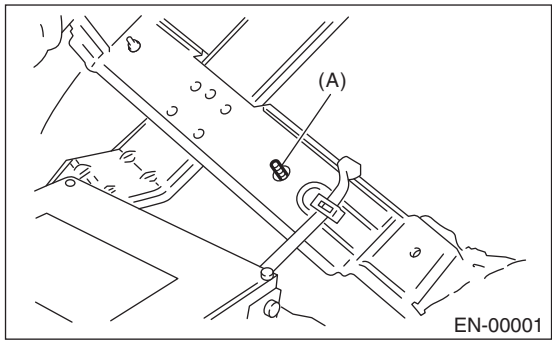
5) When measuring the voltage or resistance of individual sensor or all electrical control modules, use a tapered pin with a diameter of less than 0.6 mm (0.024 in). Do not insert the pin 4 mm (0.16 in) or more into the part.

CAUTION:
When replacing the ECM, be careful not to use the wrong spec. ECM to avoid any damage on the fuel injection system.

NOTE:
When replacing the ECM of the models with Immobilizer, immobilizer system must be registered. To do so, all ignition keys and ID cards need to be prepared. Refer to the “PC application help for Subaru Select Monitor”.

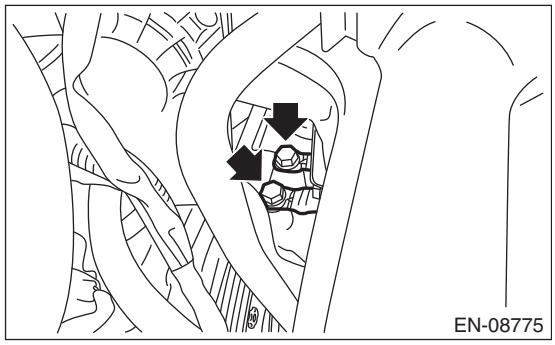
6) Take care not to allow water to get into the connectors when servicing or washing the vehicle in rainy weather. Avoid exposure to water even if the connectors are waterproof.

7) Use ECM mounting stud bolts at the body side grounding point when measuring voltage and resistance inside the passenger compartment.



(A) Stud bolt

8) Use the engine ground terminal or engine assembly for the grounding point to chassis when measuring the voltage and resistance in engine compartment.



9) Every engine control system-related part is a precision part. Do not drop them.

10) Observe the following cautions when installing a radio in vehicle.

CAUTION:
• The antenna must be kept as far apart as possible from control module. (ECM is installed under the passenger’s side floor mat.)
• The antenna feeder must be placed as far apart as possible from the ECM and engine control system 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.

11) When disconnecting the fuel hose, release the fuel pressure. <Ref. to FU(H4DO)-109, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>

12) Warning lights 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 VDC memory clear procedure of self-diagnosis function. <Ref. to VDC(diag)-25, Clear Memory Mode.>

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 the electrolyte.

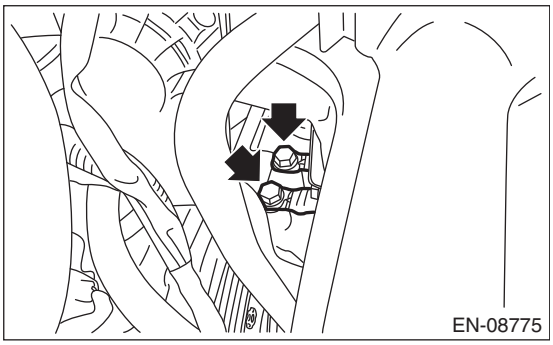
Standard voltage: 12 V

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

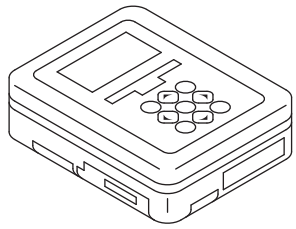
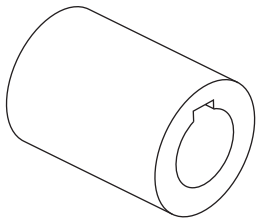
Make sure that the engine ground terminal has no contamination, corrosion or looseness and is properly connected to the engine.



C: NOTE

• The on-board diagnostic (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 of sensors as may disable the drive, the fail-safe function is provided to ensure the minimal drivability.
• 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 when it detects a malfunction.
• Freeze frame engine condition data are stored until the DTCs are cleared. However when such malfunctions as fuel trim fault and misfire are detected with the freeze frame engine condition data stored, they are rewritten into those related to the fuel trim fault and 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 performing diagnosis, connect the Subaru Select Monitor or general scan tool to the vehicle.

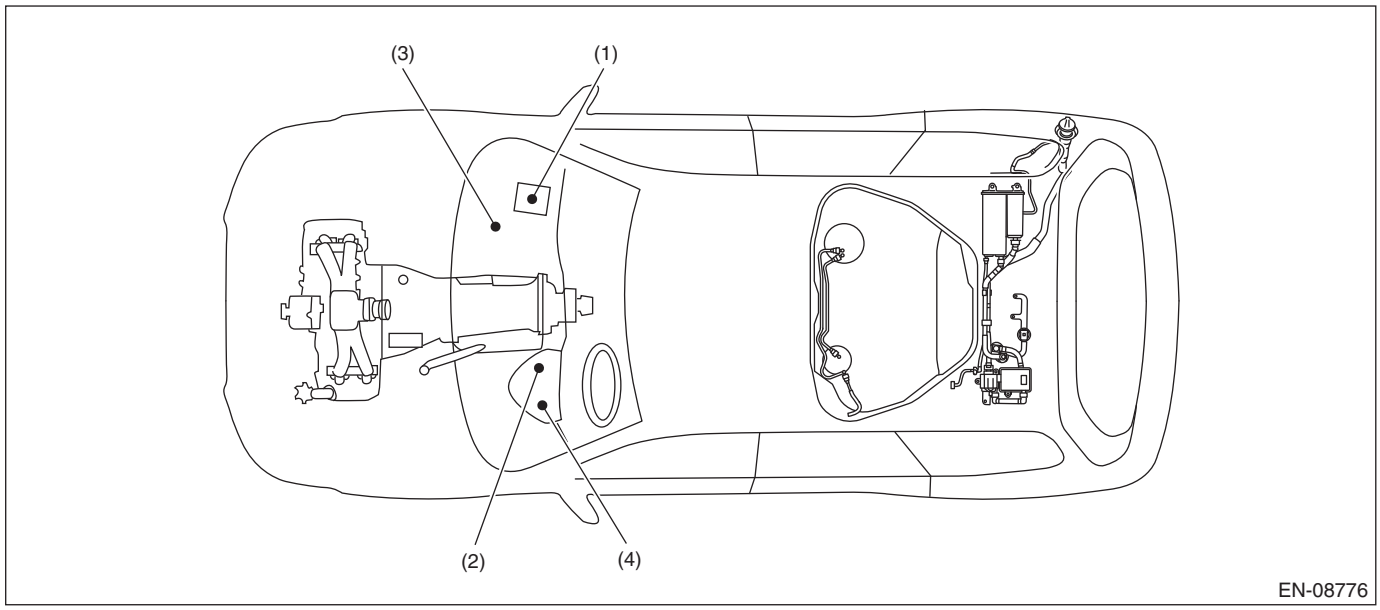
D: PREPARATION TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST1B022XU0	1B022XU0	SUBARU SELECT MONITOR III KIT	Used for troubleshooting the electrical system.
 ST18252AA000	18252AA000	CRANKSHAFT SOCKET	Used for rotating crankshaft.

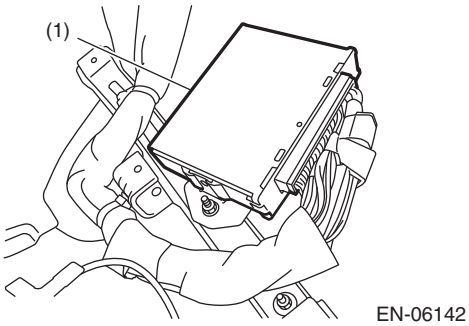
4. Electrical Component Location

A: LOCATION

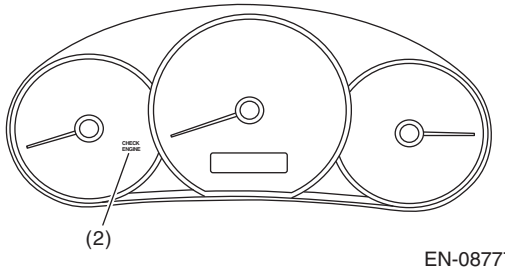
1. CONTROL MODULE



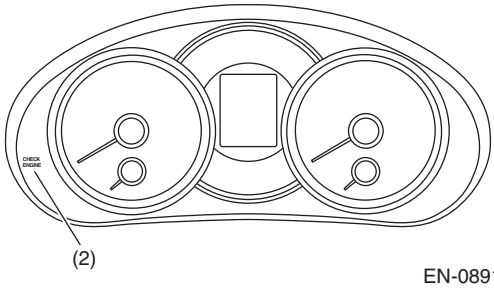
(1) Engine control module (ECM)
(2) Malfunction indicator light
(3) Delivery (test) mode connector
(4) Data link connector

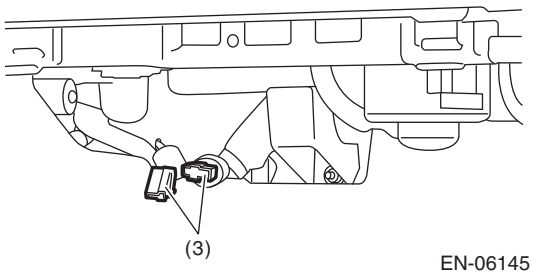


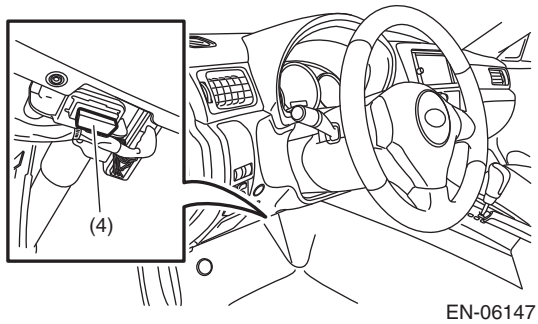
• Normal meter



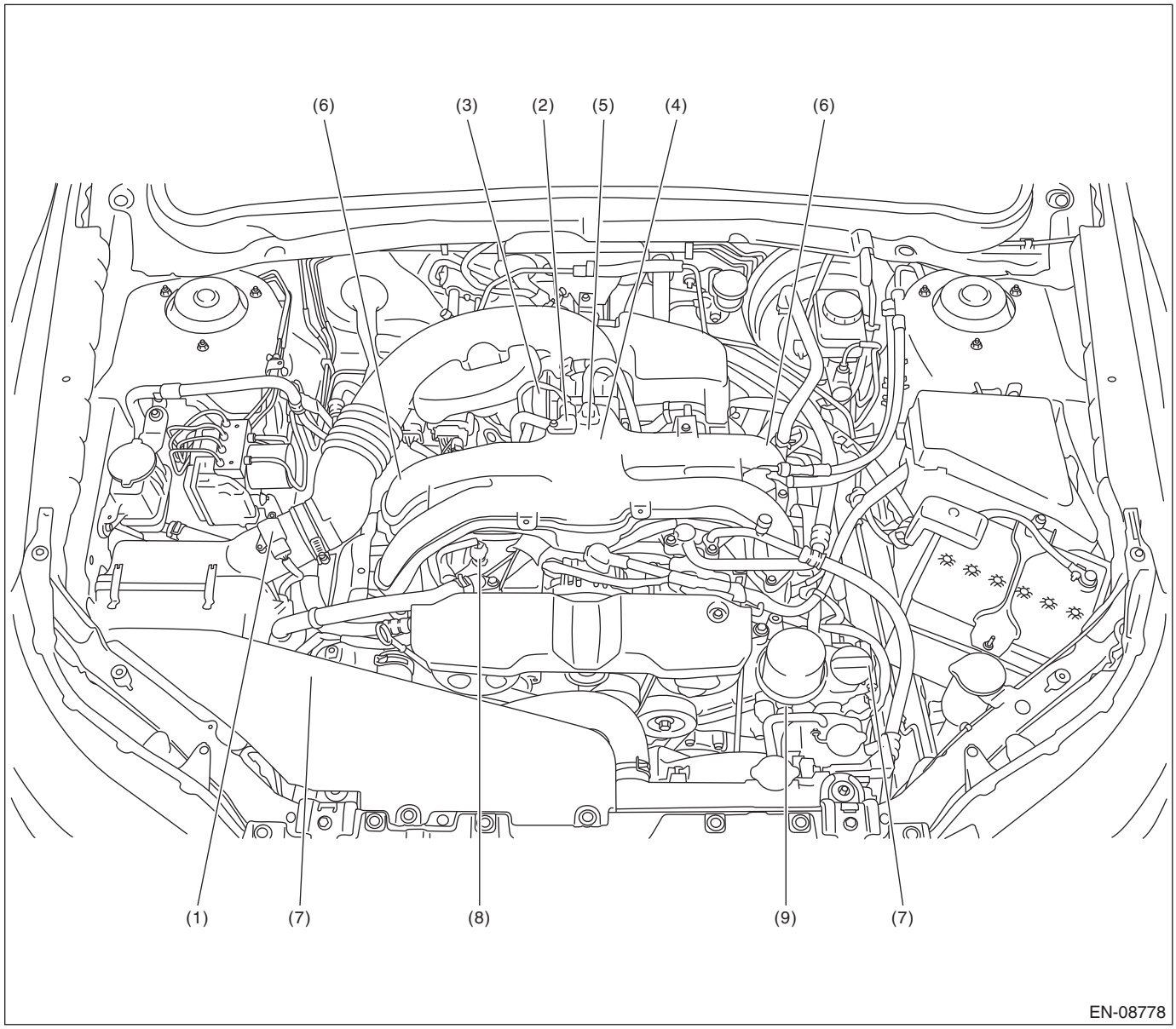
• Luminescent meter



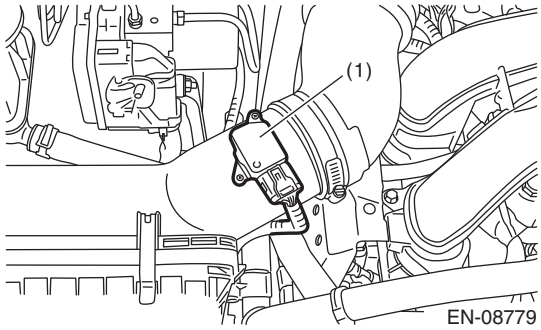




2. SENSOR



(1) Mass air flow and intake air temperature sensor
(2) Manifold absolute pressure sensor
(3) Electronic throttle control
(4) Knock sensor
(5) Crankshaft position sensor
(6) Tumble generator valve actuators (with built-in opening angle switch)
(7) Intake camshaft position sensor
(8) Engine coolant temperature sensor
(9) Engine Oil Temperature Sensor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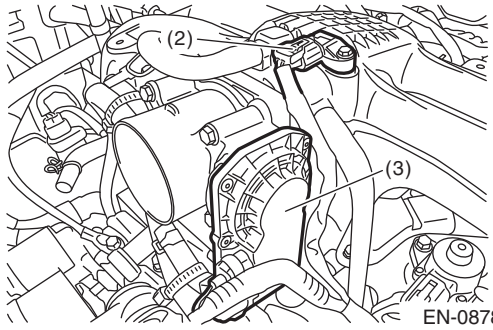
EN-08779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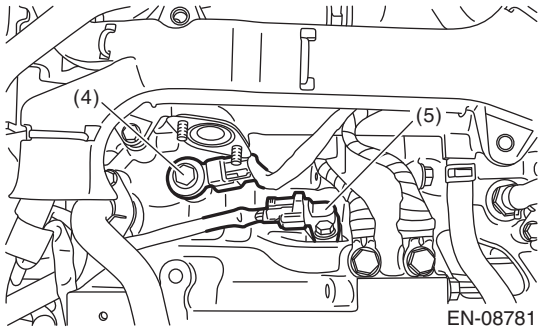
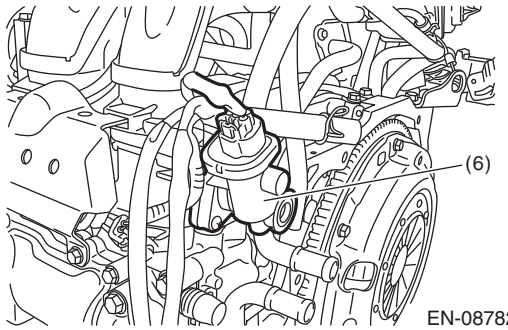
(3)
EN-08780


(4)
(5)
EN-08781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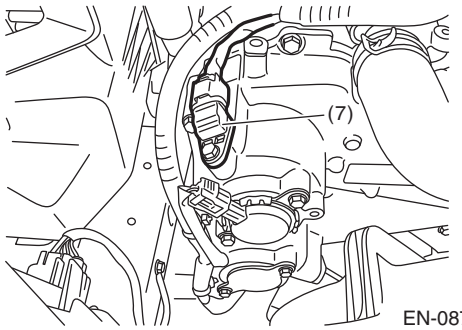
EN-08782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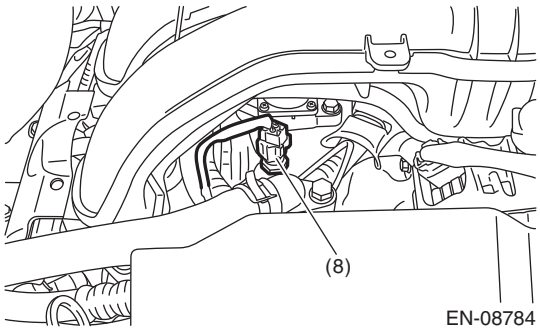
EN-08783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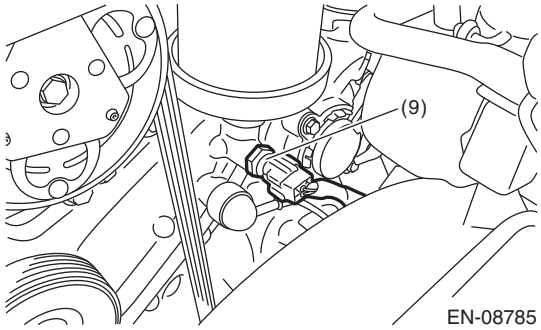
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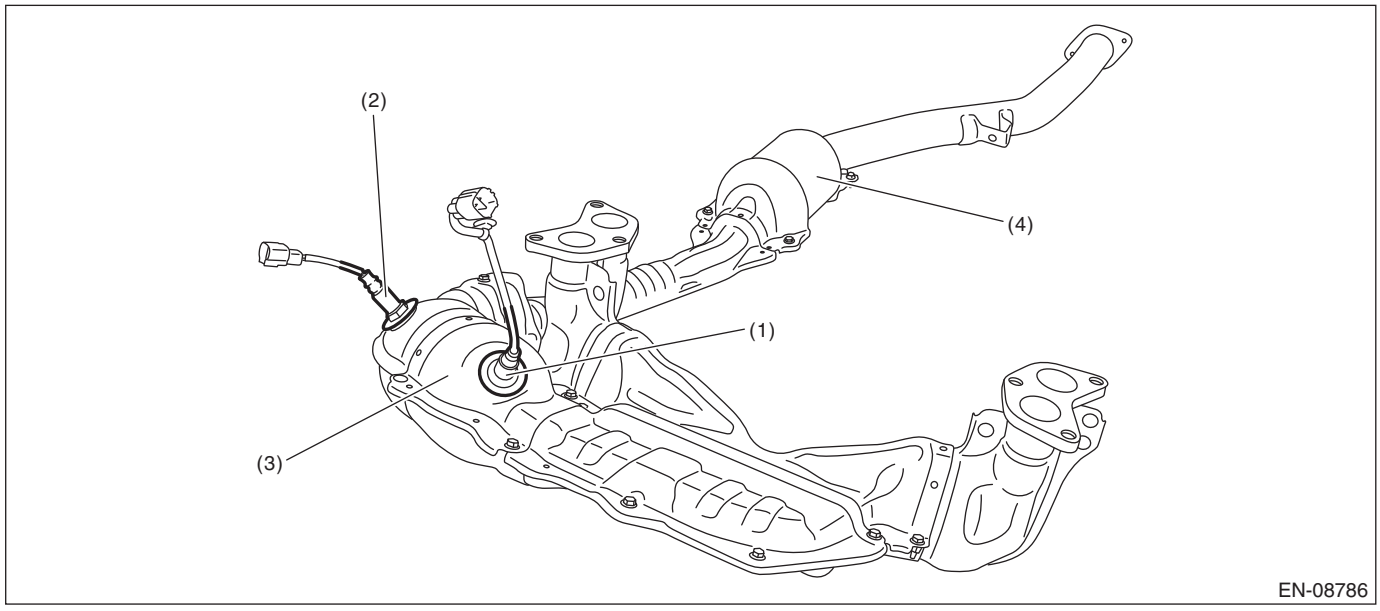
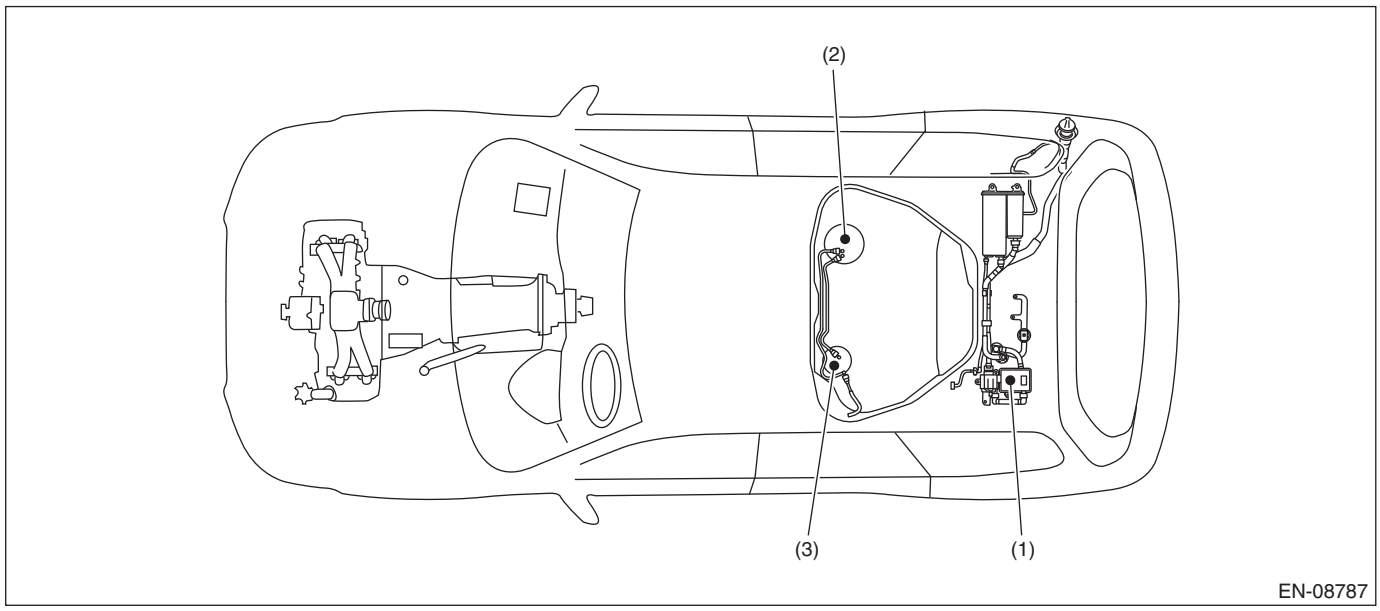
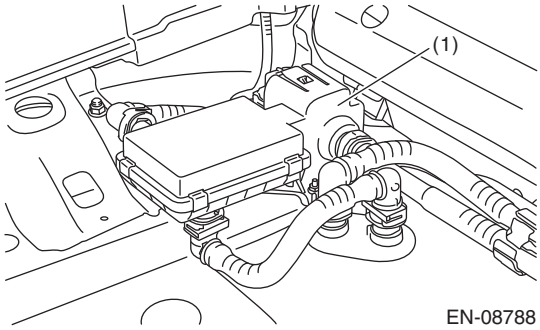


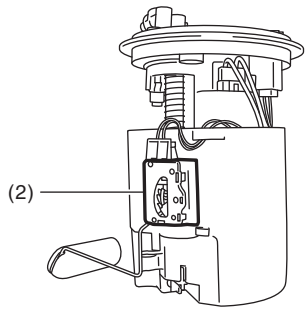
(1) Front oxygen (A/F) sensor
(2) Rear oxygen sensor
(3) Front catalytic converter
(4) Rear catalytic converter



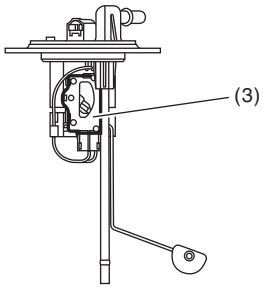
(1) Leak check valve ASSY (with built-in pressure sensor)
(2) Fuel level sensor
(3) Fuel sub level sensor



EN-08788

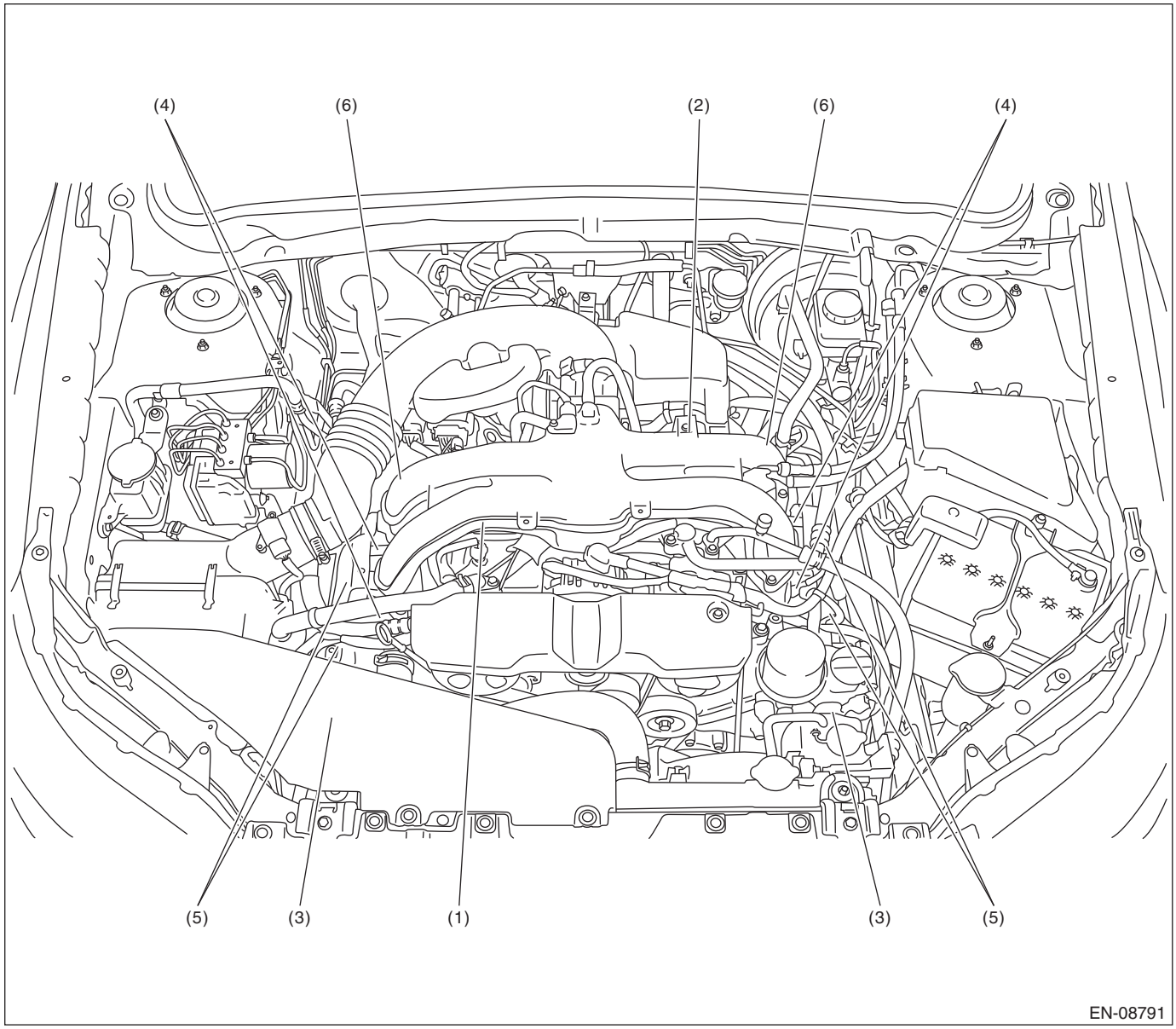


EN-08789

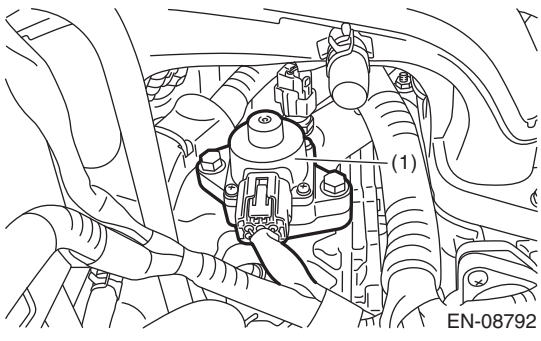


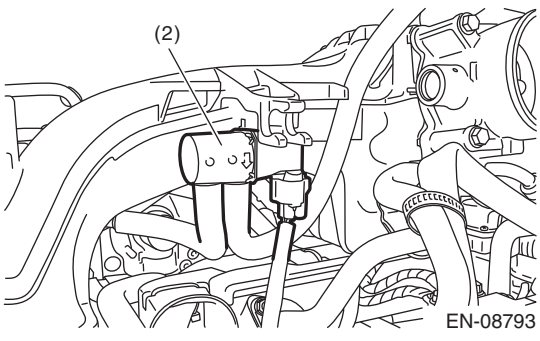
EN-08790

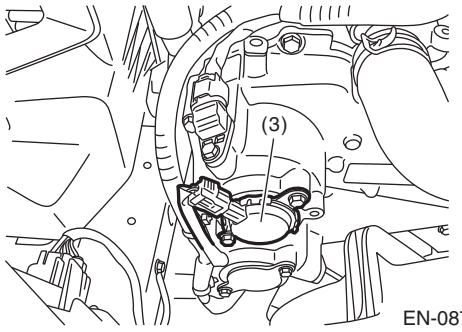
3. SOLENOID VALVE, ACTUATOR, EMISSION CONTROL SYSTEM PARTS AND IGNITION SYSTEM PARTS

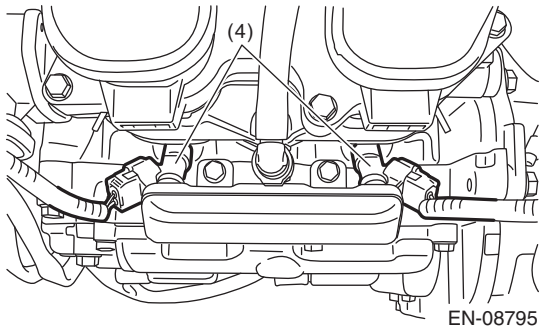


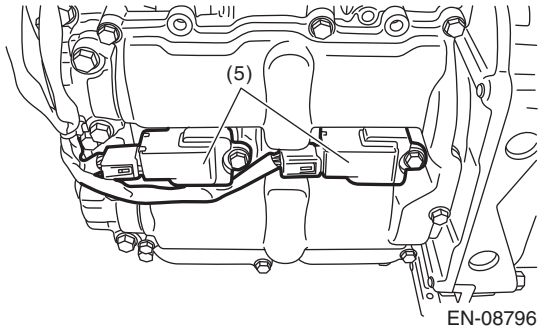
(1) EGR control valve
(2) Purge control solenoid valve
(3) Intake oil control solenoid
(4) Fuel injector
(5) Ignition coil
(6) Tumble generator valve actuator

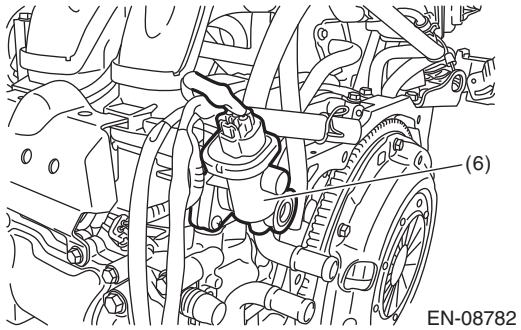


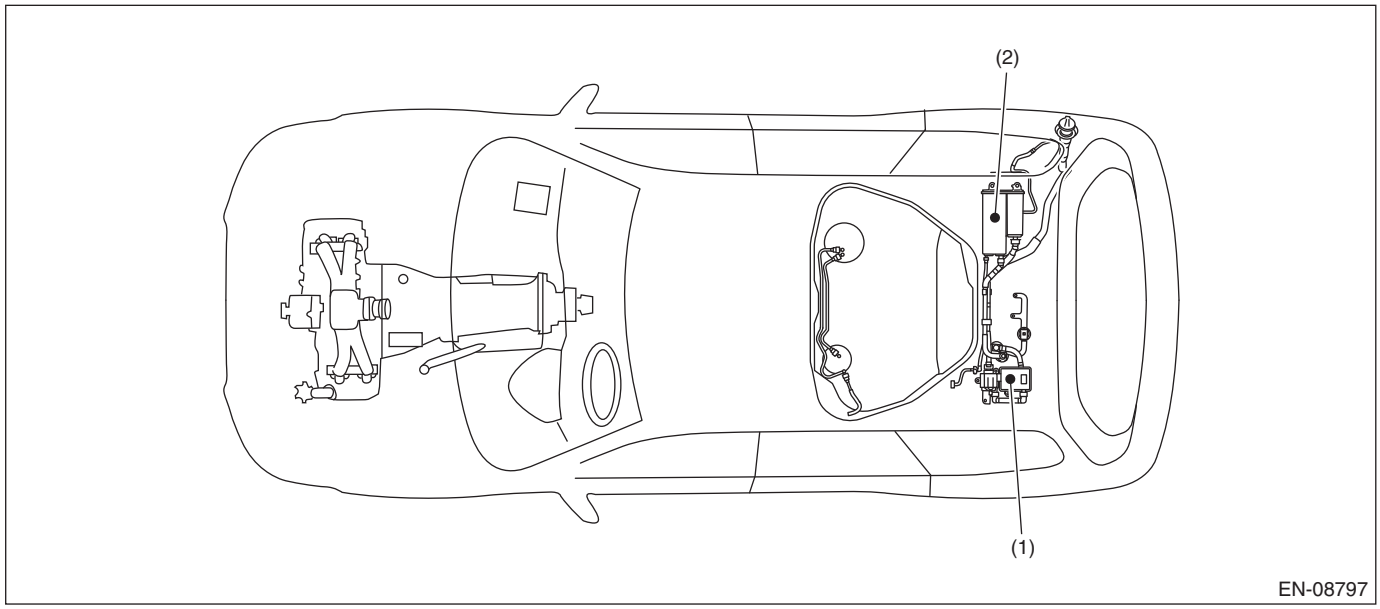




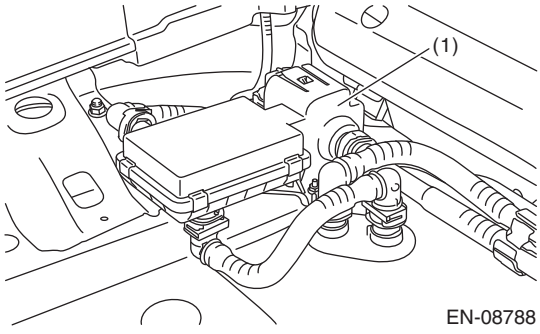


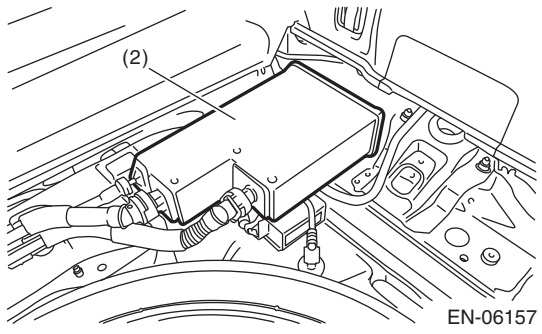




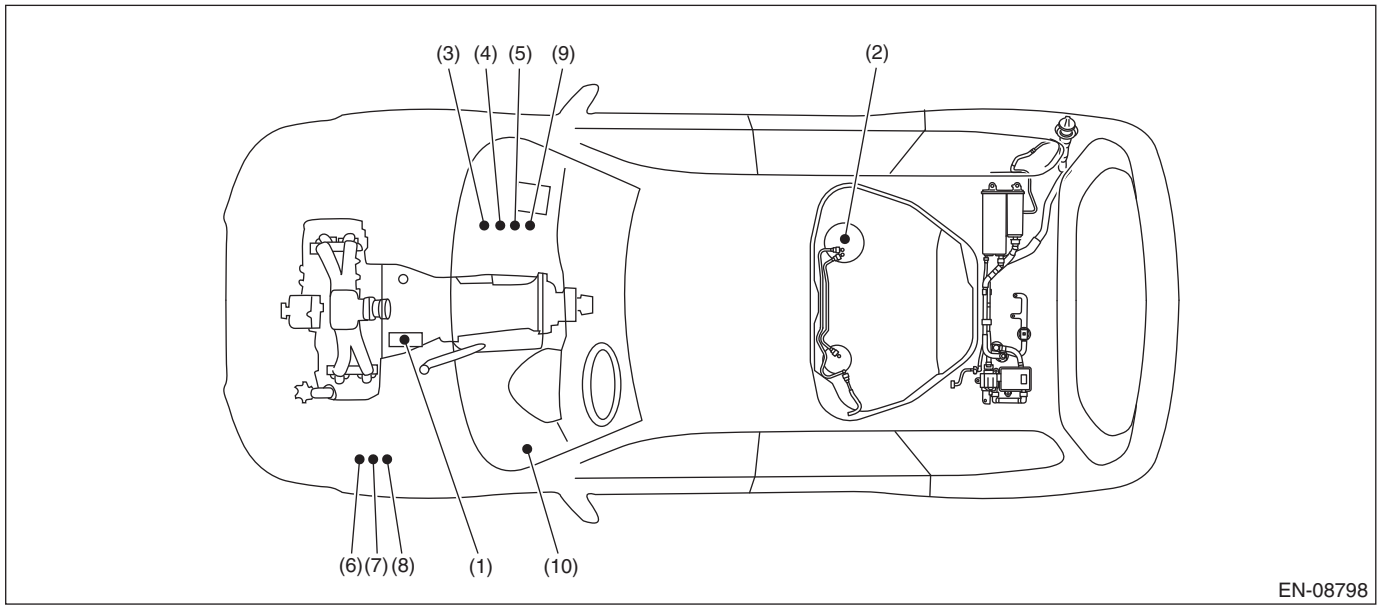


(1) Leak check valve ASSY (2) Canister

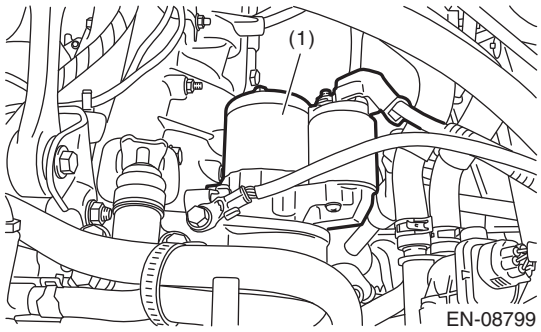


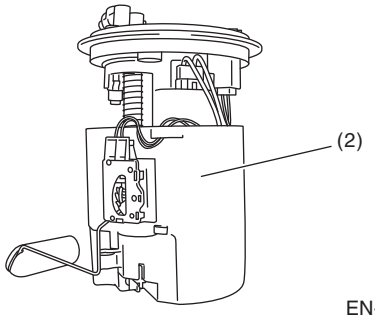


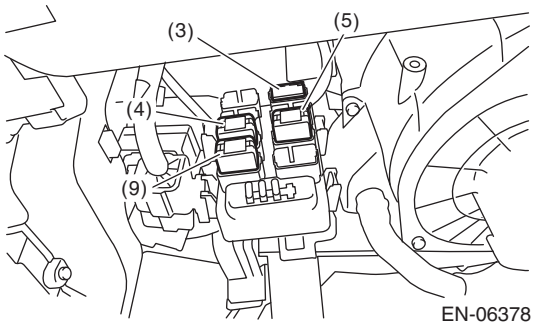
Electrical Component Location

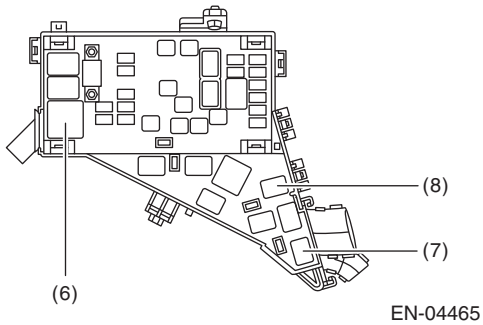


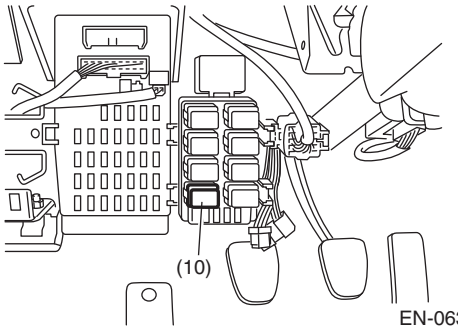
(1) Starter
(2) Fuel pump
(3) Main relay
(4) Fuel pump relay
(5) Electronic throttle control relay
(6) Radiator main fan relay 1
(7) Radiator sub fan relay
(8) Radiator main fan relay 2
(9) A/F, oxygen sensor relay
(10) Starter relay





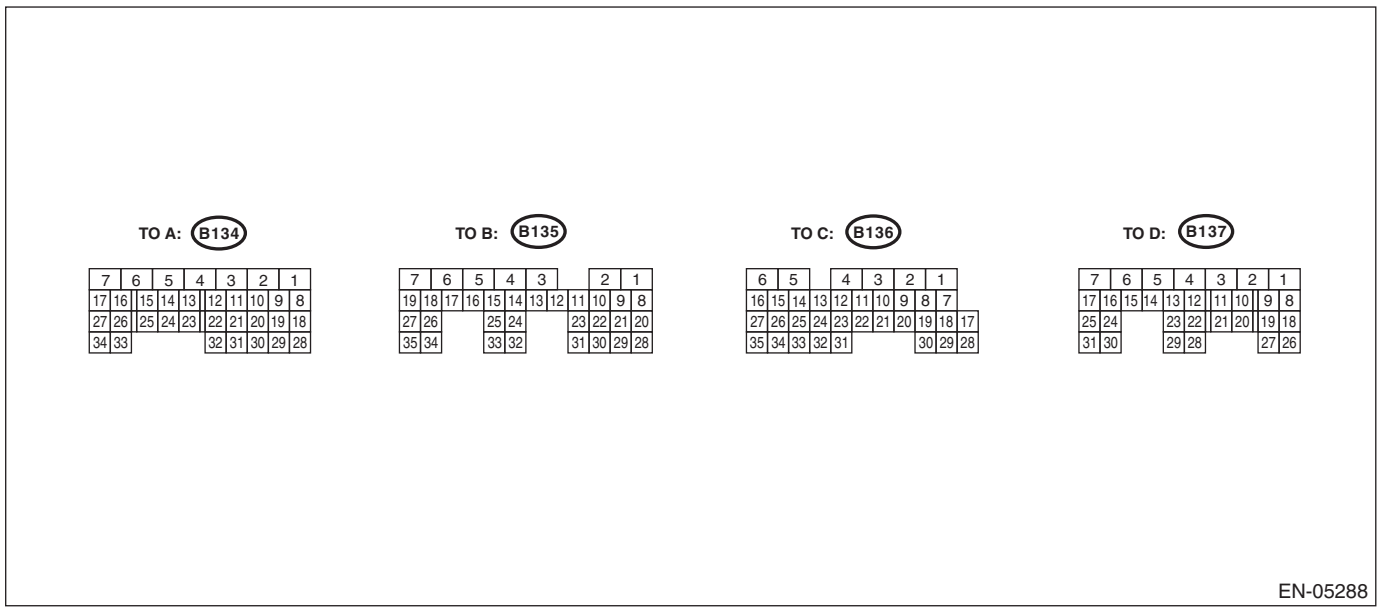





(10)
EN-06328

5. Engine Control Module (ECM) I/O Signal

A: ELECTRICAL SPECIFICATION



Description		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (engine OFF)	Engine ON (idling)	
Crankshaft position sensor	Signal (+)	B137	17	0	–7 — +7	Waveform
	Signal (–)	B137	25	0	0	—
	Shield	B137	31	0	0	—
Front oxygen (A/F) sensor	Signal (+)	B136	19	2.8 — 3.2	2.8 — 3.2	—
	Signal (–)	B136	18	2.4 — 2.7	2.4 — 2.7	—
	Shield	B136	9	0	0	—
Rear oxygen sensor	Signal	B136	20	0	0 — 0.9	—
	Shield	B136	9	0	0	—
	Ground (sensor)	B135	30	0	0	—
Front oxygen (A/F) sensor heater	Signal 1	B136	6	—	—	Waveform
	Signal 2	B136	5	—	—	Waveform
Rear oxygen sensor heater signal		B135	6	0 — 13	—	Waveform
Engine coolant temperature sensor	Signal	B137	22	1.0 — 1.4	1.0 — 1.4	After engine is warmed up.
	Ground (sensor)	B134	29	0	0	After engine is warmed up.
Air flow sensor	Signal	B136	22	—	0.3 — 4.5	—
	Shield	B136	10	0	0	—
	Ground	B136	11	0	0	—
Intake air temperature sensor signal		B136	31	0.3 — 4.6	0.3 — 4.6	—
Engine oil temperature sensor signal		B137	9	1.0 — 1.4	1.0 — 1.4	After engine is warmed up.
Starter switch		B136	16	0	0	Cranking: 8 — 14
Ignition switch		B136	30	10 — 13	12 — 14	—
Neutral position switch		B136	35	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	—

Description		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (engine OFF)	Engine ON (idling)	
Delivery (test) mode switch		B136	34	10 — 13	12 — 14	When connector connected: 0
Knock sensor	Signal	B137	2	2.8	2.8	—
	Shield	B137	8	0	0	—
Back-up power supply		B136	2	10 — 13	12 — 14	Ignition switch “OFF”: 10 — 13
Control module power supply		B137	7	10 — 13	12 — 14	—
		B136	1	10 — 13	12 — 14	—
Sensor power supply		B134	19	5	5	—
		B135	22	5	5	—
Ignition control	#1	B134	21	0	0 or 5	Waveform
	#2	B134	22	0	0 or 5	Waveform
	#3	B134	31	0	0 or 5	Waveform
	#4	B134	32	0	0 or 5	Waveform
Fuel injector	#1	B134	10	10 — 13	1 — 14	Waveform
	#2	B134	11	10 — 13	1 — 14	Waveform
	#3	B134	12	10 — 13	1 — 14	Waveform
	#4	B134	13	10 — 13	1 — 14	Waveform
Fuel pump relay control		B136	33	ON: 0.5 or less OFF: 10 — 13	ON: 0.5 or less OFF: 12 — 14	—
A/C relay control		B135	35	ON: 0.5 or less OFF: 10 — 13	ON: 0.5 or less OFF: 12 — 14	—
A/C switch		B136	29	ON: 10 — 13 OFF: 0	ON: 12 — 14 OFF: 0	—
Blower fan switch		B135	19	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	Manual A/C model
A/C middle pressure switch		B136	7	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	—
Radiator fan relay 1 control		B135	11	ON: 0.5 or less OFF: 10 — 13	ON: 0.5 or less OFF: 12 — 14	—
Radiator fan relay 2 control		B135	12	ON: 0.5 or less OFF: 10 — 13	ON: 0.5 or less OFF: 12 — 14	—
Malfunction indicator light		B135	33	—	—	Light “ON”: 1 or less Light “OFF”: 10 — 14
Engine speed output		B135	15	—	0 — 13 or more	Waveform
Purge control solenoid valve		B137	6	ON: 1 or less OFF: 10 — 13	ON: 1 or less OFF: 12 — 14	Waveform
EGR control valve	Signal 1	B134	8	0 or 10 — 13	0 or 12 — 14	Waveform
	Signal 2	B134	9	0 or 10 — 13	0 or 12 — 14	Waveform
	Signal 3	B134	20	0 or 10 — 13	0 or 12 — 14	Waveform
	Signal 4	B134	30	0 or 10 — 13	0 or 12 — 14	Waveform
Manifold absolute pressure sensor	Signal	B137	20	1.7 — 2.4	1.1 — 1.6	—
	Power supply	B134	19	5	5	
	Ground (sensor)	B134	29	0	0	
SSM communication		B135	14	1 or less ←→ 4 or more	1 or less ←→ 4 or more	—

Description		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (engine OFF)	Engine ON (idling)	
Electronic Throttle	Main	B134	18	Approx. 0.7	Approx. 0.6 — 0.7 (After engine is warmed up.)	Fully closed: Approx. 0.6 Fully open: Approx. 4.0
	Sub	B134	28	Approx. 1.6	Approx. 1.5 — 1.6 (After engine is warmed up.)	Fully closed: Approx. 1.5 Fully open: Approx. 4.2
	Power supply	B134	19	5	5	—
	Ground (sensor)	B134	29	0	0	—
Electronic throttle control motor (+)		B134	2	Duty waveform	Duty waveform	Drive frequency: 500 Hz
Electronic throttle control motor (–)		B134	1	Duty waveform	Duty waveform	Drive frequency: 500 Hz
Electronic throttle control motor power supply		B135	7	10 — 13	12 — 14	—
Electronic throttle control motor relay		B135	17	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	When ignition switch is turned to ON: ON
Intake oil control solenoid (LH)	Signal (+)	B134	17	ON: 10 — 13 OFF: 0	ON: 12 — 14 OFF: 0	—
	Signal (–)	B134	16	0	0	—
Intake oil control solenoid (RH)	Signal (+)	B134	34	ON: 10 — 13 OFF: 0	ON: 12 — 14 OFF: 0	—
	Signal (–)	B134	27	0	0	—
Intake camshaft position sensor (LH)		B137	16	0 or 5	0 or 5	Waveform
Intake camshaft position sensor (RH)		B137	24	0 or 5	0 or 5	Waveform
Camshaft position sensor ground		B137	30	0	0	—
Accelerator pedal position sensor	Main sensor signal	B135	23	Fully closed: 1 Fully opened: 3.3	Fully closed: 1 Fully opened: 3.3	—
	Shield	B136	4	0	0	—
	Main power supply	B135	21	5	5	—
	Ground (main sensor)	B135	29	0	0	—
	Sub signal sensor	B135	31	Fully closed: 1 Fully opened: 3.3	Fully closed: 1 Fully opened: 3.3	—
	Sub power supply	B135	22	5	5	—
	Ground (sub sensor)	B135	30	0	0	—
Starter relay		B135	26	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	ON: cranking
Clutch switch		B135	9	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	MT model

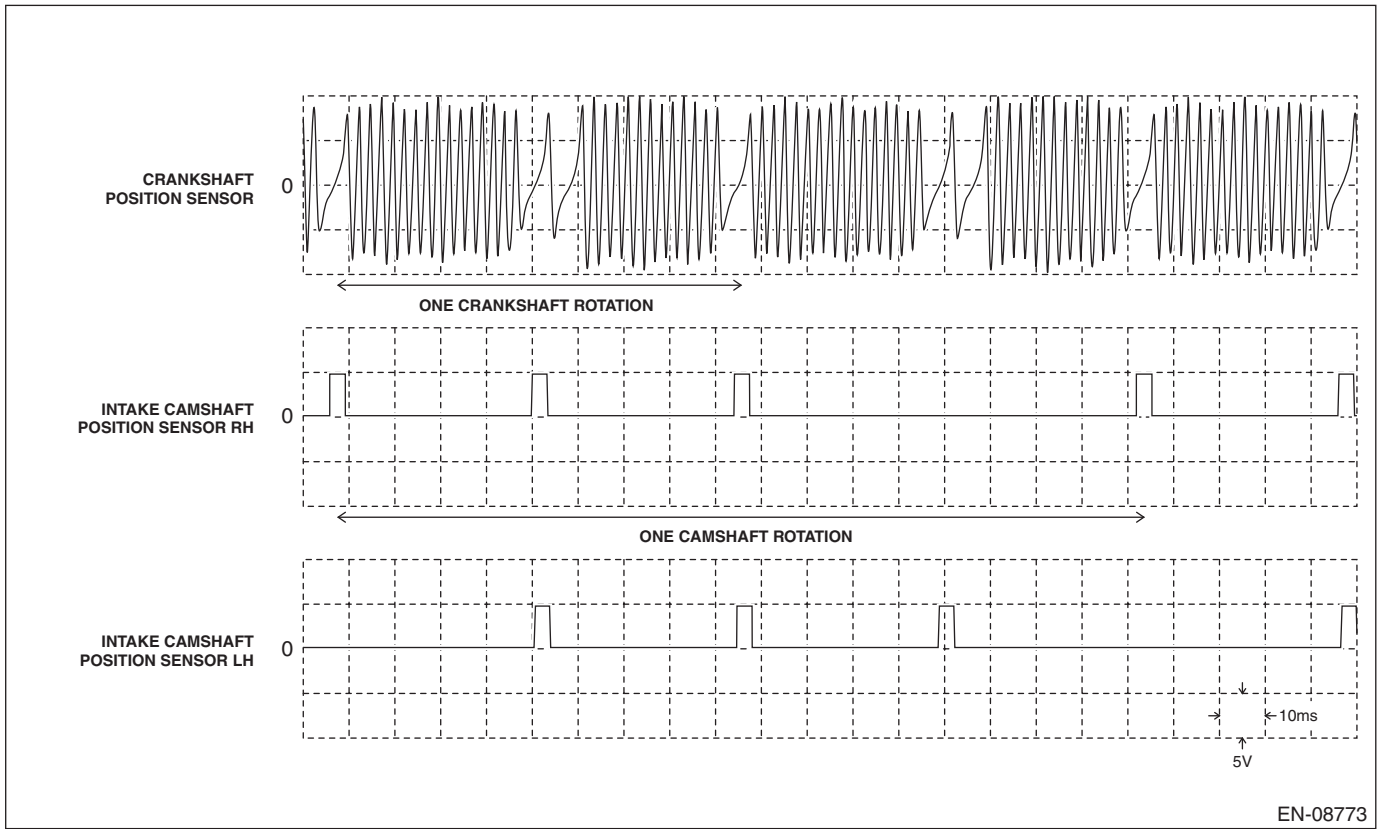
Description		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (engine OFF)	Engine ON (idling)	
Brake switch 1 (brake switch)		B136	15	When brake pedal is depressed: 0 When brake pedal is released: 10 — 13	When brake pedal is depressed: 0 When brake pedal is released: 12 — 14	—
Brake switch 2 (stop light switch)		B136	3	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 command switch		B136	12	When operating nothing: 3.5 — 4.5 When operating RES/ACC: 2.5 — 3.5 When operating vehicle distance setting: 1.5 — 2.5 When operating SET/COAST: 0.5 — 1.5 When operating CANCEL: 0 — 0.5	When operating nothing: 3.5 — 4.5 When operating RES/ACC: 2.5 — 3.5 When operating vehicle distance setting: 1.5 — 2.5 When operating SET/COAST: 0.5 — 1.5 When operating CANCEL: 0 — 0.5	—
Cruise control main switch		B136	13	ON: 0 OFF: 5	ON: 0 OFF: 5	—
CAN communication	(Hi)	B136	17	—	—	—
	(Lo)	B136	28	—	—	—
Self-shutoff control		B135	13	0	0	—
Power steering oil pressure switch		B137	28	10 — 13	ON: 0 OFF: 12 — 14	—
Tumble generator valve opening angle switch signal (LH)		B137	13	Fully closed: 0.5 or less Fully opened: 9.5 or more	Fully closed: 0.5 or less Fully opened: 9.5 or more	—
Tumble generator valve (LH open)		B134	23	0 or 10 — 13	0 or 12 — 14	—
Tumble generator valve (LH closed)		B134	24	0 or 10 — 13	0 or 12 — 14	—
Tumble generator valve opening angle switch signal (RH)		B137	14	Fully closed: 0.5 or less Fully opened: 9.5 or more	Fully closed: 0.5 or less Fully opened: 9.5 or more	—
Tumble generator valve (RH open)		B134	25	0 or 10 — 13	0 or 12 — 14	—
Tumble generator valve (RH closed)		B134	26	0 or 10 — 13	0 or 12 — 14	—
Immobilizer	Communication 1	B135	25	—	—	—
	Communication 2	B135	24	—	—	—
ELCM	Switching valve	B135	4	10 — 13	12 — 14	Operating: 0
	Pressure sensor	B136	21	1 — 4	1 — 4	When ignition switch is turned to ON: atmospheric pressure
	Vacuum pump	B137	27	10 — 13	12 — 14	Operating: 0

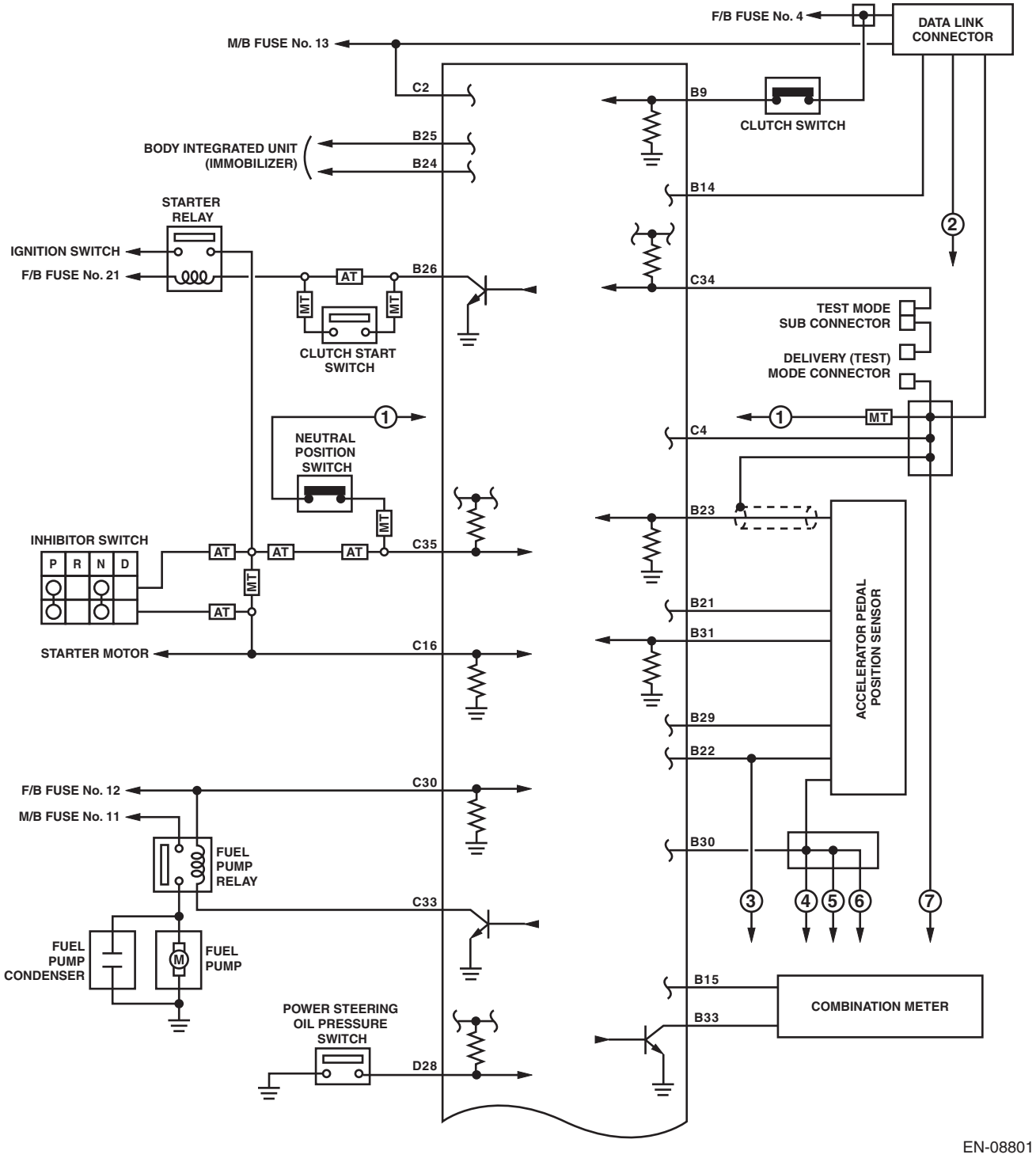
Engine Control Module (ECM) I/O Signal

Description		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (engine OFF)	Engine ON (idling)	
Ground	Sensor	B134	29	0	0	—
		B135	30	0	0	—
	Engine 1	B134	6	0	0	—
	Engine 2	B134	4	0	0	—
	Engine 3	B134	3	0	0	—
	Engine 4	B137	1	0	0	—
	Engine 5	B137	3	0	0	—
	Body	B136	4	0	0	—

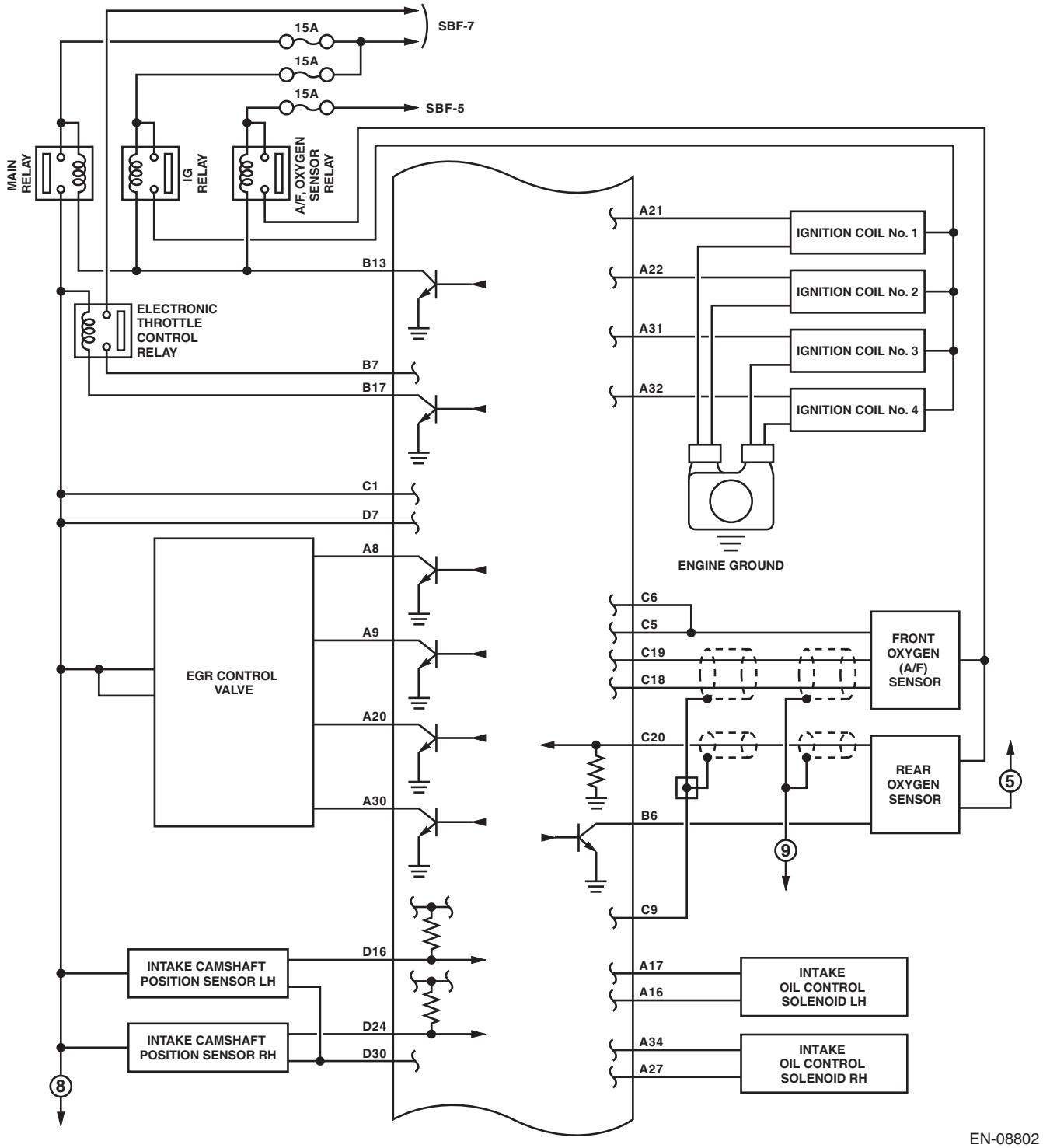
Input/output name:
- Crankshaft position sensor
- Intake camshaft position sensor RH
- Intake camshaft position sensor LH

Measuring condition:
- After warming-up
- At idling

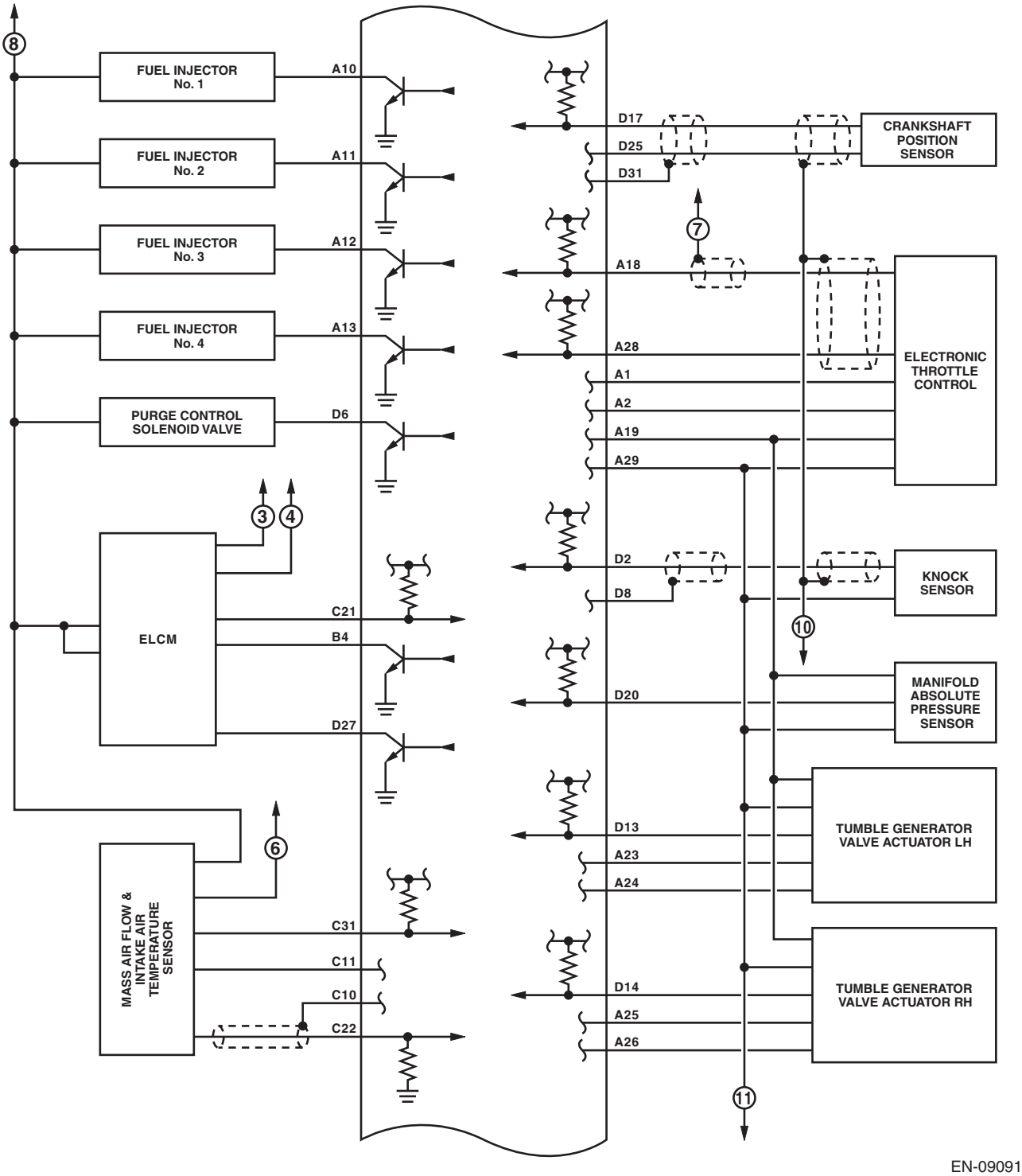



F/B FUSE No. 4
DATA LINK CONNECTOR
M/B FUSE No. 13
C2
B9
CLUTCH SWITCH
BODY INTEGRATED UNIT (IMMOBILIZER)
B25
B24
B14
STARTER RELAY
IGNITION SWITCH
F/B FUSE No. 21
AT
B26
C34
MT
CLUTCH START SWITCH
TEST MODE SUB CONNECTOR
DELIVERY (TEST) MODE CONNECTOR
NEUTRAL POSITION SWITCH
C4
B23
INHIBITOR SWITCH
P R N D
C35
B21
B31
ACCELERATOR PEDAL POSITION SENSOR
STARTER MOTOR
C16
B29
B22
F/B FUSE No. 12
M/B FUSE No. 11
C30
B30
FUEL PUMP RELAY
C33
FUEL PUMP CONDENSER
FUEL PUMP
B15
COMBINATION METER
B33
POWER STEERING OIL PRESSURE SWITCH
D28
EN-08801

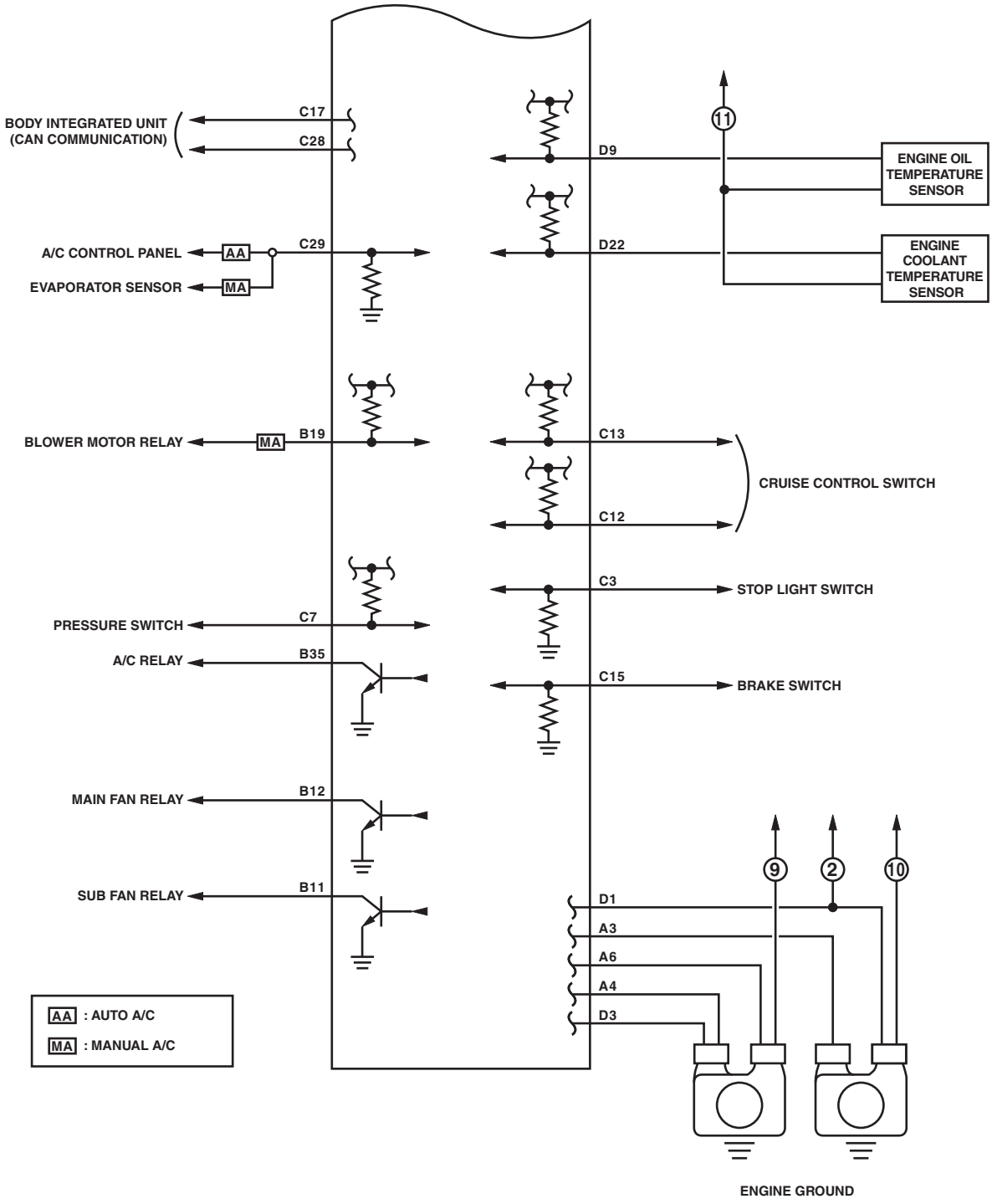
Engine Control Module (ECM) I/O Signal



EN-08802


8
FUEL INJECTOR No. 1
FUEL INJECTOR No. 2
FUEL INJECTOR No. 3
FUEL INJECTOR No. 4
PURGE CONTROL SOLENOID VALVE
A10
A11
A12
A13
D6
3
4
ELCM
C21
B4
D27
6
MASS AIR FLOW & INTAKE AIR TEMPERATURE SENSOR
C31
C11
C10
C22
D17
D25
D31
CRANKSHAFT POSITION SENSOR
7
A18
A28
A1
A2
A19
A29
ELECTRONIC THROTTLE CONTROL
D2
D8
KNOCK SENSOR
10
D20
MANIFOLD ABSOLUTE PRESSURE SENSOR
D13
A23
A24
TUMBLE GENERATOR VALVE ACTUATOR LH
D14
A25
A26
TUMBLE GENERATOR VALVE ACTUATOR RH
11

EN-09091


BODY INTEGRATED UNIT (CAN COMMUNICATION)
C17
C28
A/C CONTROL PANEL
AA
C29
EVAPORATOR SENSOR
MA
BLOWER MOTOR RELAY
MA
B19
PRESSURE SWITCH
C7
A/C RELAY
B35
MAIN FAN RELAY
B12
SUB FAN RELAY
B11
AA : AUTO A/C
MA : MANUAL A/C
11
D9
ENGINE OIL TEMPERATURE SENSOR
D22
ENGINE COOLANT TEMPERATURE SENSOR
C13
CRUISE CONTROL SWITCH
C12
C3
STOP LIGHT SWITCH
C15
BRAKE SWITCH
9
2
10
D1
A3
A6
A4
D3
ENGINE GROUND

EN-08804

6. Engine Condition Data

A: ELECTRICAL SPECIFICATION

Contents	Specifications
Engine load	13.6 — 40.5 (%): Idling
	14.7 — 29.8 (%): 2,500 rpm racing

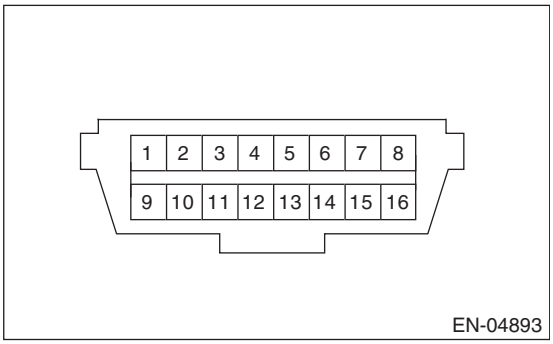
Measuring condition:
- After engine is warmed up.
- Set the select lever in “P” range or “N” range, or the shift lever in neutral.
- Turn the A/C to OFF.
- Turn all the accessory switches to OFF.

7. Data Link Connector

A: NOTE

This connector is used for Subaru Select Monitor.

CAUTION:
Do not connect any scan tools other than Subaru Select Monitor or general scan tool because the circuit for Subaru Select Monitor may be damaged.



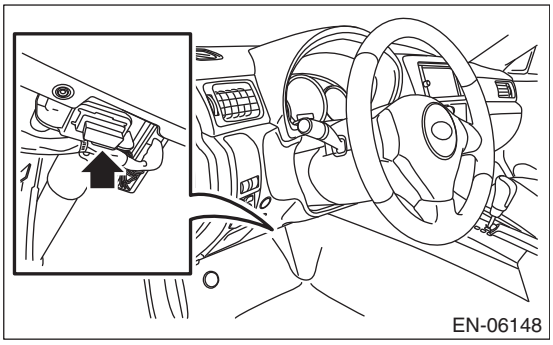
Terminal No.	Remarks	Terminal No.	Remarks
1	Empty	9	Empty
2	Empty	10	Empty
3	Empty	11	Empty
4	Ground	12	Empty
5	Ground	13	Empty
6	CAN communication (Hi)	14	CAN communication (Lo)
7	Subaru Select Monitor signal	15	Empty
8	Empty	16	Power supply

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) Connect the general scan tool to data link connector located in the lower portion of the instrument panel (on the driver's side).



3) Using the general scan tool, call up each 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 $08: Request control for on-board system, test, and component
   (8) MODE $09: Request vehicle information
4) Read out the data according to repair procedures. (For detailed operation procedure, refer to the general scan tool operation manual.)

NOTE:
For details concerning DTC, refer to "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DO)(diag)-86, List of Diagnostic Trouble Code (DTC).>

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	MPH
$0E	Ignition timing advance	°
$0F	Intake air temperature	°C
$10	Intake air amount	g/s
$11	Throttle valve opening angle	%
$13	Air fuel ratio sensor	—
$15	Oxygen sensor output voltage and short term fuel trim associated with oxygen sensor (Bank 1 Sensor 2)	V and %
$1C	Supporting OBD system	—
$1F	Elapsed time after starting the engine	sec
$21	Travel distance after the malfunction indicator light illuminates	miles
$24	A/F value and A/F sensor output voltage (Bank 1 Sensor 1)	— and V
$2C	Target EGR	%
$2D	EGR deviation	%
$2E	Evaporative purge	%
$2F	Fuel level	%
$30	Number of warm ups after DTC clear	—
$31	Travel distance after DTC clear	miles
$33	Barometric pressure	kPa
$34	A/F value and A/F sensor current (Bank 1 Sensor 1)	— and mA
$3C	Catalyst 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 while malfunction indicator lit	min
$4E	Elapsed time after DTC clear	min
$51	Fuel used	—
$5A	Relative accelerator opening angle	%
$65	Neutral status	—

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 (Bank 1 Sensor 1)	%
$07	Long term fuel trim (Bank 1 Sensor 1)	%
$0B	Intake manifold absolute pressure	kPa
$0C	Engine speed	rpm
$0D	Vehicle speed	MPH
$0E	Ignition timing advance	°
$0F	Intake air temperature	°C
$10	Intake air amount	g/s
$11	Throttle valve opening angle	%
$13	Air fuel ratio sensor	—
$15	Oxygen sensor output voltage and short term fuel trim associated with oxygen sensor (Bank 1 Sensor 2)	V and %
$1C	Supporting OBD system	—
$1F	Elapsed time after starting the engine	sec
$2C	Target EGR	%
$2D	EGR deviation	%
$2E	Evaporative purge	%
$2F	Fuel level	%
$33	Barometric pressure	kPa
$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	%
$65	Neutral status	—

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 "List of Diagnostic Trouble Code (DTC)" for information about data denoting emission-related powertrain DTC. <Ref. to EN(H4DO)(diag)-86, 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).

6. MODE $06

Refer to test value of troubleshooting and data of test limit indicated on the support data bit sequence table. A list of the support data is shown in List 1.

NOTE:
- Subaru Select Monitor

For detailed operation procedures, refer to "Application help".
- General scan tool

For detailed operation procedures, refer to the general scan tool operation manual.
- Some items are not displayed according to the specifications.
- Measurement items for each DTC of "VVT Monitor Bank 1" and "VVT Monitor Bank 2"

A list of the measurement items is shown in List 2. (Used to confirm the on-board monitor test result for DTC P0011, P0016, P0018 and P0021.)

List 1

OBDMID	TID	SID	Diagnostic item
$01	$81	$0A	A/F sensor continuity failure (Bank 1 Sensor 1)
	$82	$8D	
	$83	$14	
	$84	$1E	A/F sensor range failure (Bank 1 Sensor 1)
	$85	$1E	
	$86	$20	A/F sensor response failure (Bank 1 Sensor 1)
$02	$87	$0B	Oxygen sensor circuit failure (Bank 1 Sensor 2)
	$88	$0B	
	$07	$0B	Oxygen sensor drop failure (Bank 1 Sensor 2)
	$08	$0B	
	$A5	$0B	
	$05	$10	Oxygen sensor response failure (Bank 1 Sensor 2)
	$06	$10	
$21	$89	$20	Catalyst deterioration diagnosis (Bank 1)
$31	$8A	$FD	EGR system diagnosis
$35	$8B	$9D	VVT monitor (Bank 1)
	$8C	$9D	
	$8D	$9D	
	$8E	$9D	
$36	$8B	$9D	VVT monitor (Bank 2)
	$8C	$9D	
	$8D	$9D	
	$8E	$9D	
$3C	$96	$FE	Evaporative emission control system (0.02 inch leak)
	$97	$FE	
$3D	$98	$FE	Evaporative emission control system (Purge flow)
$41	$99	$24	A/F sensor heater failure (Bank 1 Sensor 1)
	$9A	$24	
	$9B	$14	A/F sensor heater characteristics failure (Bank 1 Sensor 1)
$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	

List 2

OBDMID	TID	SID	Diagnostic item		
$35	$8B	$9D	+	Intake air	VVT monitor bank 1 (RH)
	$8C	$9D	-		
$36	$8B	$9D	+	Intake air	VVT monitor bank 2 (LH)
	$8C	$9D	-		

7. MODE $07

Refer to the data of DTC (pending code) for troubleshooting result about emission in the first time.

8. MODE $09

Perform “Active Test” of the on-board system.

9. MODE $09

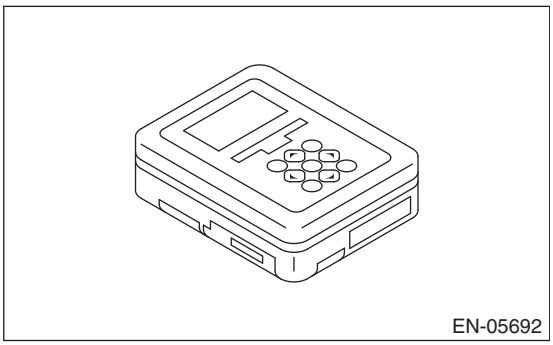
Refer to data of vehicle specification (V.I.N., calibration ID, diagnosis frequency etc.).

9. Subaru Select Monitor

A: OPERATION

1. HOW TO USE SUBARU SELECT MONITOR

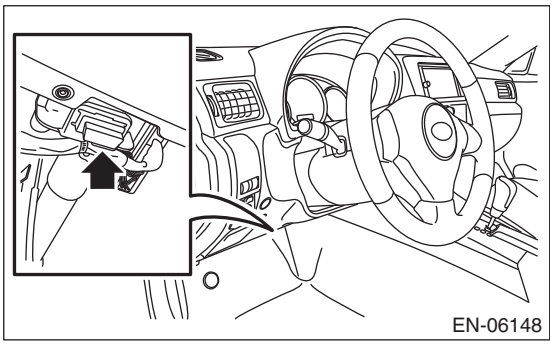
1) Prepare the Subaru Select Monitor kit. <Ref. to EN(H4DO)(diag)-8, PREPARATION TOOL, General Description.>


EN-05692

2) Prepare PC with Subaru Select Monitor installed.
3) Connect the USB cable to SDI (Subaru Diagnosis Interface) and USB port on the personal computer (dedicated port for the Subaru Select Monitor).

NOTE:
The dedicated port for the Subaru Select Monitor means the USB port which was used to install the Subaru Select Monitor.
4) Connect the diagnosis cable to SDI.
5) Connect SDI to data link connector located in the lower portion of the instrument panel (on the driver's side).

CAUTION:
Do not connect the scan tools except for Subaru Select Monitor and general scan tool.


EN-06148

6) Start the PC.
7) Turn the ignition switch to ON (engine OFF) and run the "PC application for Subaru Select Monitor".
8) Call up DTC and data, then record them.

NOTE:
For detailed operation procedures, refer to "PC application help for Subaru Select Monitor".

2. READ CURRENT DATA FOR ENGINE (NORMAL MODE)

1) On «Main Menu» display, select {Each System Check}.
2) On «System Selection Menu» display, select {Engine Control System}.
3) Click the [OK] button after the information of engine type has been displayed.
4) On «Engine Diagnosis» display, select {Current Data Display & Save}.
5) On «Current Data Display & Save» display, select {Normal sampling}.
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	%	13.6 — 40.5%
Engine coolant temperature signal	Coolant Temp.	°C or °F	85°C or 185°F or more (after warm-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	700 rpm (Agree with the tachometer indication)
Meter vehicle speed signal	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	2.5 g/s or 0.33 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
Atmospheric pressure signal	Atmosphere Pressure	mmHg, kPa, inHg or psig	(Atmospheric pressure)
Intake manifold relative pressure	Mani. Relative Pressure	mmHg, kPa, inHg or psig	(Air intake absolute pressure – Atmospheric pressure)
Learned ignition timing	Learned Ignition Timing	deg	0 deg
Acceleration opening angle signal	Accel. Opening Angle	%	0.0%
Purge control solenoid duty ratio	CPC Valve Duty Ratio	%	0 — 3%
Number of EGR steps	No. of EGR steps	STEP	0 STEP
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 control solenoid duty ratio RH	OCV Duty R	%	40 — 60%
Oil control solenoid duty ratio LH	OCV Duty L	%	40 — 60%
Oil control solenoid current RH	OCV Current R	mA	550 — 850 mA
Oil control solenoid current LH	OCV Current L	mA	550 — 850 mA
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 #1	—	1.0
A/F correction #3	A/F Correction #3	%	0.3%
A/F learning #3	A/F Learning #3	%	0.00%
Throttle motor duty	Throttle Motor Duty	%	–15%
Throttle motor voltage	Throttle Motor Voltage	V	(Battery voltage)

Contents	Display	Unit of measure	Note (at idling)
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 acceleration 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
Fuel level sensor signal	Fuel level resistance	Ω	2 — 96 Ω
Engine oil temperature signal	Oil Temperature	°C	≥ 85°C (after warm-up)
#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	Knocking Correction	deg	0.0 deg
AT vehicle ID signal	AT Vehicle ID Signal	—	ON/OFF
D-check require Flag	D-check Require Flag	—	OFF
Delivery (test) mode terminal	Delivery Mode Connector (Test Mode Connector)	—	OFF
Neutral position switch signal	Neutral Position Switch	—	ON
Soft idle switch signal	Idle Switch Signal	—	ON
Ignition switch signal	Ignition Switch	—	ON
Power steering switch signal	P/S Switch	—	OFF (when OFF)
Air conditioning switch signal	A/C Switch	—	OFF (when OFF)
Starter switch signal	Starter Switch	—	OFF
Rear oxygen monitor	Rear O2 Rich Signal	—	Rich/Lean
Knocking signal	Knocking Signal	—	OFF
Crankshaft position sensor signal	Crankshaft Position Sig.	—	ON
Camshaft position sensor signal	Camshaft Position Sig.	—	ON
Rear defogger switch signal	Rear Defogger SW	—	OFF (when OFF)
Blower fan switch signal	Blower Fan SW	—	OFF (when OFF)
Light switch signal	Light Switch	—	OFF (when OFF)
A/C middle pressure switch signal	A/C Mid Pressure Switch	—	OFF (when OFF)
Air conditioner compressor relay output signal	A/C Compressor Signal	—	OFF (when OFF)
Radiator fan relay 1 signal	Radiator Fan Relay #1	—	OFF (when OFF)
Radiator fan relay 2 signal	Radiator Fan Relay #2	—	OFF (when OFF)
Fuel pump relay signal	Fuel Pump Relay	—	ON output
Tumble generator valve output signal	TGV Output	—	OFF
Tumble generator valve driving signal	TGV Drive	—	Closing direction
AT coordinate retard angle demand signal	Retard Signal from AT	—	OFF
AT coordinate fuel cut demand signal	Fuel Cut signal from AT	—	OFF
Vehicle dynamics control (VDC) torque down prohibition output	Ban of Torque Down	—	ON
Vehicle dynamics control (VDC) torque down demand	Request Torque Down VDC	—	OFF
AT coordinate permission signal	Torque permission signal	—	ON (OFF on MT vehicles)
Electronic throttle control motor relay signal	ETC Motor Relay	—	ON
Clutch switch signal	Clutch Switch	—	OFF (when OFF)
Stop light switch signal	Stop Light Switch	—	OFF (when OFF)
SET/COAST switch signal	SET/COAST Switch	—	OFF (when OFF)
RES/ACC switch signal	RESUME/ACCEL Switch	—	OFF (when OFF)

Contents	Display	Unit of measure	Note (at idling)
Brake switch signal*	Brake Switch	—	OFF (when OFF)
Main switch signal	Main Switch	—	OFF (when OFF)
Cruise control cancel switch signal	CC Cancel SW	—	OFF (when OFF)
Malfunction indicator light signal	MIL On Flag	—	OFF (when unlit)
Tumble generator valve RH opening switch signal	TGV Position SW1	—	Close
Tumble generator valve LH opening switch signal	TGV Position SW2	—	Close
ELCM switching valve drive signal	ELCM switching valve	—	Open
ELCM vacuum pump drive signal	ELCM pump	—	OFF

NOTE:
- For detailed operation procedures, refer to “PC application help for Subaru Select Monitor”.
- *: For models without cruise control, the brake switch signal does not change.

3. READ CURRENT DATA FOR ENGINE (OBD MODE)

1) On «Main Menu» display, select {Each System Check}.
2) On «System Selection Menu» display, select {Engine Control System}.
3) Click the [OK] button after the information of engine type has been displayed.
4) On «Engine Diagnosis» display, select {OBD System}.
5) On «OBD Menu» display, select {Current Data Display & Save}.
6) On «Current Data Display & Save» display, select {All 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	Note (at idling)	Unit of measure
Number of diagnosis code	Number of Diag. Code:	0	—
Condition of malfunction indicator light	MI(MIL)	OFF	—
Monitoring test of misfire	Misfire monitoring (Supp)	YES	—
Monitoring test of misfire	Misfire monitoring (Rdy)	YES	—
Monitoring test of fuel system	Fuel system monitoring (Supp)	YES	—
Monitoring test of fuel system	Fuel system monitoring (Rdy)	YES	—
Monitoring test of comprehensive component	Component monitoring (Supp)	YES	—
Monitoring test of comprehensive component	Component monitoring (Rdy)	YES	—
Test of catalyst	Catalyst Diagnosis (Supp)	YES	—
Test of catalyst	Catalyst Diagnosis (Rdy)	NO	—
Test of heating-type catalyst	Heated catalyst (Supp)	NO	—
Test of heating-type catalyst	Heated catalyst (Rdy)	N/A	—
Test of evaporative emission purge control system	Evaporative purge system (Supp)	YES	—
Test of evaporative emission purge control system	Evaporative purge system (Rdy)	NO	—
Secondary air system test	Secondary air system (Supp)	NO	—
Secondary air system test	Secondary air system (Rdy)	N/A	—
Test of air conditioning system refrigerant	A/C system refrigerant (Supp)	NO	—
Test of air conditioning system refrigerant	A/C system refrigerant (Rdy)	N/A	—

Contents	Display	Note (at idling)	Unit of measure
Test of oxygen sensor	Oxygen sensor (Supp)	YES	—
Test of oxygen sensor	Oxygen sensor (Rdy)	NO	—
Test of oxygen sensor heater	O2 Heater Diagnosis (Supp)	YES	—
Test of oxygen sensor heater	O2 Heater Diagnosis (Rdy)	NO	—
Test of EGR system	EGR system (Supp)	YES	—
Test of EGR system	EGR system (Rdy)	NO	—
Air fuel ratio control system for bank 1	Fuel system for Bank 1	Cl_normal	—
Engine load data	Calculated load value	23.0	%
Engine coolant temperature signal	Coolant Temp.	92	°C
Short term fuel trim by front oxygen (A/F) sensor (Bank 1)	Short term fuel trim B1	–0.8	%
Long term fuel trim by front oxygen (A/F) sensor (Bank 1)	Long term fuel trim B1	0.0	%
Intake manifold absolute pressure signal	Mani. Absolute Pressure	211	mmHg
Engine speed signal	Engine Speed	700	rpm
Vehicle speed signal	Vehicle Speed	0	km/h
#1 Cylinder ignition timing	Ignition timing adv. #1	16.0	°
Intake air temperature signal	Intake Air Temp.	36	°C
Intake air amount	Mass Air Flow	2.7	g/s
Throttle position signal	Throttle Opening Angle	13	%
Oxygen sensor (Bank 1 Sensor 2)	Oxygen sensor #12	0.7	V
A/F correction (Bank 1 Sensor 2)	Short term fuel trim #12	0.0	%
On-board diagnostic system	OBD System	OBD/OBD2	—
Front oxygen (A/F) sensor (Bank 1 Sensor 1)	Oxygen sensor #11	Supported	—
Oxygen sensor (Bank 1 Sensor 2)	Oxygen sensor #12	Supported	—
Elapsed time after engine start	Time Since Engine Start	—	sec
Travel distance after the malfunction indicator light illuminates	Lighted MI lamp history	—	km
A/F lambda signal (Bank 1 Sensor 1)	A/F Sensor #11	1.001	—
A/F sensor output signal (Bank 1 Sensor 1)	A/F Sensor #11	2.79	V
Target EGR	Commanded EGR	—	%
EGR error	EGR Error	—	%
Evaporative purge	Commanded Evap Purge	0	%
Fuel level signal	Fuel Level	—	%
Number of warm ups after DTC clear	Number of warm-ups	—	—
Travel distance after DTC clear	Meter since DTC cleared	—	km
Atmospheric pressure signal	Atmosphere Pressure	Atmospheric pressure	mmHg
A/F lambda signal (Bank 1 Sensor 1)	A/F Sensor #11	1.001	—
A/F sensor current (Bank 1 Sensor 1)	A/F Sensor #11	0.00	mA
Catalyst temperature #1	Catalyst Temperature #11	—	°C
Monitoring test of misfire	Misfire monitoring (Enable)	YES	—
Monitoring test of misfire	Misfire monitoring (Comp)	NO	—
Monitoring test of fuel system	Fuel system monitoring (Enable)	YES	—
Monitoring test of fuel system	Fuel system monitoring (Comp)	NO	—
Monitoring test of comprehensive component	Component monitoring (Enable)	YES	—

Contents	Display	Note (at idling)	Unit of measure
Monitoring test of comprehensive component	Component monitoring (Comp)	NO	—
Test of catalyst	Catalyst Diagnosis (Enable)	YES	—
Test of catalyst	Catalyst Diagnosis (Comp)	NO	—
Test of heating-type catalyst	Heated catalyst (Enable)	N/A	—
Test of heating-type catalyst	Heated catalyst (Comp)	N/A	—
Test of evaporative emission purge control system	Evaporative purge system (Enable)	YES	—
Test of evaporative emission purge control system	Evaporative purge system (Comp)	NO	—
Secondary air system test	Secondary air system (Enable)	N/A	—
Secondary air system test	Secondary air system (Comp)	N/A	—
Test of air conditioning system refrigerant	A/C system refrigerant (Enable)	N/A	—
Test of air conditioning system refrigerant	A/C system refrigerant (Comp)	N/A	—
Test of oxygen sensor	Oxygen sensor (Enable)	YES	—
Test of oxygen sensor	Oxygen sensor (Comp)	NO	—
Test of oxygen sensor heater	O2 Heater Diagnosis (Enable)	YES	—
Test of oxygen sensor heater	O2 Heater Diagnosis (Comp)	NO	—
Test of EGR system	EGR system (Enable)	YES	—
Test of EGR system	EGR system (Comp)	NO	—
ECM power supply voltage	Control module voltage	13.789	V
Absolute load	Absolute Load Value	22	%
A/F target lambda	Target Equivalence Ratio	0.976	—
Relative throttle opening angle	Relative Throttle Pos.	2	%
Ambient temperature	Ambient Temperature	Ambient air temperature	°C
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 while malfunction indicator light lit	Time while MIL lighted	—	min
Elapsed time after DTC clear	Time since DTC cleared	—	min
Type of fuel	Type of fuel	GAS	—
Relative acceleration opening angle	Relative Accelera. Pos.	0	%
Neutral condition	AT drive status/MT gear status	NEUT	—

NOTE:
For detailed operation procedures, refer to “PC application help for Subaru Select Monitor”.

4. READ FREEZE FRAME DATA FOR ENGINE (OBD MODE)

1) On «Main Menu» display, select {Each System Check}.
2) On «System Selection Menu» display, select {Engine Control System}.
3) Click the [OK] button after the information of engine type has been displayed.
4) On «Engine Diagnosis» display, select {OBD System}.
5) On «OBD Menu» display, select {Freeze Frame Data Display}.

- A list of the support data is shown in the following table.

Contents	Display	Unit of measure
DTCs of freeze frame data	Freeze frame data	—
Air fuel ratio control system for bank 1	Fuel system for Bank 1	—
Engine load data	Calculated load value	%
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 psig
Engine speed signal	Engine Speed	rpm
Vehicle speed signal	Vehicle Speed	km/h or MPH
Ignition timing advance for #1 cylinder	Ignition timing adv. #1	°
Intake air temperature signal	Intake Air Temp.	°C or °F
Intake air amount	Mass Air Flow	g/s or lb/m
Throttle position signal	Throttle Opening Angle	%
Oxygen sensor (Bank 1 Sensor 2)	Oxygen sensor #12	V
A/F correction (Bank 1 Sensor 2)	Short term fuel trim #12	%
On-board diagnostic system	OBD System	—
Front oxygen (A/F) sensor (Bank 1 Sensor 1)	Oxygen sensor #11	—
Oxygen sensor (Bank 1 Sensor 2)	Oxygen sensor #12	—
Elapsed time after engine start	Time Since Engine Start	sec
Target EGR	Commanded EGR	%
EGR deviation	EGR Error	%
Evaporative purge	Commanded Evap Purge	%
Fuel level signal	Fuel Level	%
Atmospheric pressure	Atmosphere Pressure	mmHg, kPa, inHg or psig
ECM power supply voltage	Control module voltage	V
Absolute load	Absolute Load Value	%
A/F target lambda	Target Equivalence Ratio	—
Relative throttle opening angle	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.	%
Neutral condition	AT drive status/MT gear status	—

NOTE:
For detailed operation procedures, refer to “PC application help for Subaru Select Monitor”.

5. V.I.N REGISTRATION

1) On «Main Menu» display, select {Each System Check}.
2) On «System Selection Menu» display, select {Engine Control System}.
3) Click the [OK] button after the information of engine type has been displayed.
4) On the «Engine Diagnosis» display, select {Entry VIN}.
5) Perform the procedures shown on the display screen.

10.Read Diagnostic Trouble Code (DTC)

A: OPERATION

1. SUBARU SELECT MONITOR (NORMAL MODE)

1) On «Main Menu» display, select {Each System Check}.
2) On «System Selection Menu» display, select {Engine Control System}.
3) Click the [OK] button after the information of engine type has been displayed.
4) On «Engine Diagnosis» display, select {Diagnostic Code(s) Display}.
5) On «Diagnostic Code(s) Display» display, select {Temporary Diagnostic Code(s)} or {Memorized Diagnostic Code(s)}.

NOTE:
• For detailed operation procedures, refer to “PC application help for Subaru Select Monitor”.
• For details concerning DTC, refer to “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4DO)(diag)-86, List of Diagnostic Trouble Code (DTC).>

2. SUBARU SELECT MONITOR (OBD MODE)

1) On «Main Menu» display, select {Each System Check}.
2) On «System Selection Menu» display, select {Engine Control System}.
3) Click the [OK] button after the information of engine type has been displayed.
4) On «Engine Diagnosis» display, select {OBD System}.
5) On «OBD Menu» display, select {Diagnostic Code(s) Display}.
6) Make sure DTC is shown on the screen.

NOTE:
• For detailed operation procedures, refer to “PC application help for Subaru Select Monitor”.
• For details concerning DTC, refer to “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4DO)(diag)-86, 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(H4DO)(diag)-86, 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

Perform the diagnosis shown in the following DTC table.
When performing the diagnosis not listed in “List of Diagnostic Trouble Code (DTC)”, refer to the item on the drive cycle. <Ref. to EN(H4DO)(diag)-48, Drive Cycle.>

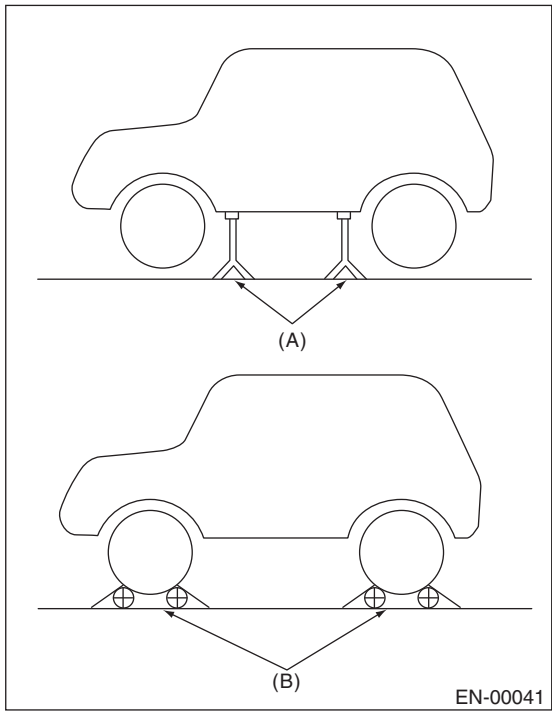
DTC	Item	Condition
P0011	Intake Camshaft Position - Timing Over-Advanced or System Performance (Bank 1)	—
P0016	Crankshaft Position - Camshaft Position Correlation (Bank1)	—
P0018	Crankshaft Position - Camshaft Position Correlation (Bank2)	—
P0021	Intake Camshaft Position - Timing Over-Advanced or System 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	—
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 (Bank1 Sensor2)	—
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)	—
P0345	Camshaft Position Sensor “A” Circuit (Bank 2)	—
P0451	Evaporative Emission System Pressure Sensor/Switch Range/Performance	—
P0452	Evaporative Emission System Pressure Sensor/Switch Low	—
P0453	Evaporative Emission System Pressure Sensor/Switch High	—
P0458	Evaporative Emission System Purge Control Valve Circuit Low	—
P0462	Fuel Level Sensor “A” Circuit Low	—
P0463	Fuel Level Sensor “A” Circuit High	—
P0500	Vehicle Speed Sensor “A”	—
P0512	Starter Request Circuit	—

DTC	Item	Condition
P0513	Incorrect Immobilizer Key	—
P0604	Internal Control Module Random Access Memory (RAM) Error	—
P0605	Internal Control Module Read Only Memory (ROM) Error	—
P0607	Throttle Control System Circuit Range/Performance	—
P0638	Throttle Actuator Control Range/Performance (Bank 1)	—
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) (Bank1 Sensor1)	—
P1153	O2 Sensor Circuit Range/Performance (High) (Bank1 Sensor1)	—
P1160	Return Spring Failure	—
P1518	Starter Switch Circuit Low Input	—
P1560	Back-Up Voltage Circuit Malfunction	—
P1570	Antenna	—
P1571	Reference Code Incompatibility	—
P1572	IMM Circuit Failure (Except Antenna Circuit)	—
P1574	Key Communication Failure	—
P1576	EGI Control Module EEPROM	—
P1577	IMM Control Module EEPROM	—
P1578	Meter Failure	—
P2006	Intake Manifold Runner Control Stuck Closed (Bank 1)	—
P2007	Intake Manifold Runner Control Stuck Closed (Bank 2)	—
P2009	Intake Manifold Runner Control Circuit Low (Bank 1)	—
P2012	Intake Manifold Runner Control Circuit Low (Bank 2)	—
P2088	Intake Camshaft Position Actuator Control Circuit Low (Bank 1)	—
P2089	Intake Camshaft Position Actuator Control Circuit High (Bank 1)	—
P2092	Intake Camshaft Position Actuator Control Circuit Low (Bank 2)	—
P2093	Intake Camshaft Position Actuator Control Circuit High (Bank 2)	—
P2101	Throttle Actuator Control Motor Circuit Range/Performance	—
P2102	Throttle Actuator Control Motor Circuit Low	—
P2103	Throttle Actuator Control Motor Circuit High	—
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	—
P2401	Evaporative Emission System Leak Detection Pump Control Circuit Low	—
P2419	Evaporative Emission System Switching Valve Control Circuit Low	—
U0073	CAN Failure, Bus ‘OFF’ Detection	—
U0101	CAN (TCU) Data not Loaded	—
U0122	CAN (VDC) Data not Loaded	—
U0140	CAN (BCU) Data not Loaded	—
U0402	CAN (TCU) Data Abnormal	—
U0416	CAN (VDC) Data Abnormal	—
U0422	CAN (BCU) Data Abnormal	—

1. PREPARATION FOR THE INSPECTION MODE

1) Check that the battery voltage is 12 V or more and fuel remains approx. 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.

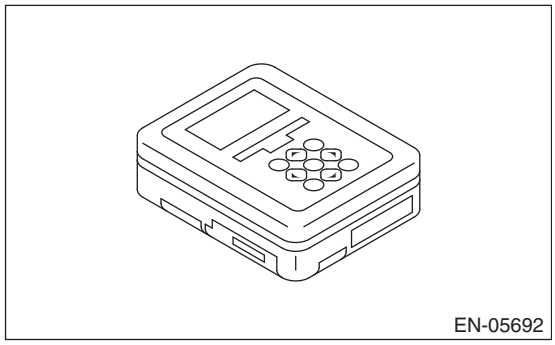
WARNING:
• Before lifting up the vehicle, ensure parking brake is applied.
• Do not use a pantograph jack in place of a rigid rack.
• Secure a rope or wire to the front or rear towing hooks to prevent the lateral runout of front wheels.
• Before rotating the wheels, make sure that there is no one in front of the vehicle. Besides while the wheels are rotating, make sure that no one approaches the vehicle front side.
• Make sure that there is nothing around the wheels. For AWD model, pay attention to all four wheels.
• While servicing, do not depress or release the clutch pedal or accelerator pedal quickly regardless of the engine speed. Quick operation may cause the vehicle to drop off the free roller.
• To prevent the vehicle from slipping due to vibration, do not place anything between rigid rack and the vehicle.



(A) Rigid rack
(B) Free roller

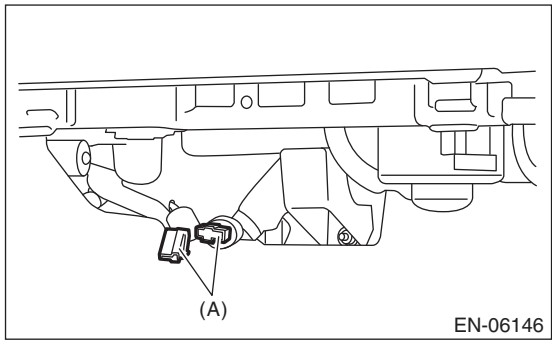
2. SUBARU SELECT MONITOR

1) Check that no DTC remains after clearing memory. <Ref. to EN(H4DO)(diag)-56, Clear Memory Mode.>
2) Warm up the engine.
3) Prepare the Subaru Select Monitor kit. <Ref. to EN(H4DO)(diag)-8, PREPARATION TOOL, General Description.>



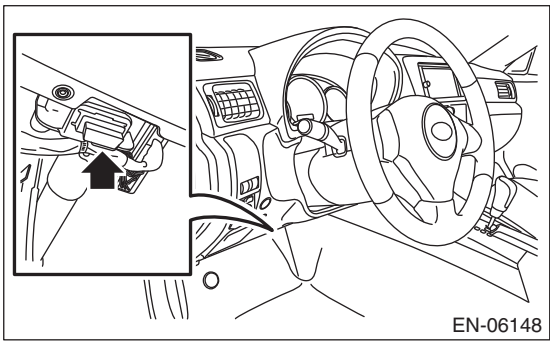
4) Prepare PC with Subaru Select Monitor installed.
5) Connect the USB cable to SDI (Subaru Diagnosis Interface) and USB port on the personal computer (dedicated port for the Subaru Select Monitor).

NOTE:
The dedicated port for the Subaru Select Monitor means the USB port which was used to install the Subaru Select Monitor.
6) Connect the diagnosis cable to SDI.
7) Connect the delivery (test) mode connector (A) located under the glove box.



8) Connect SDI to data link connector located in the lower portion of the instrument panel (on the driver's side).

CAUTION:
Do not connect the scan tools except for Subaru Select Monitor and general scan tool.



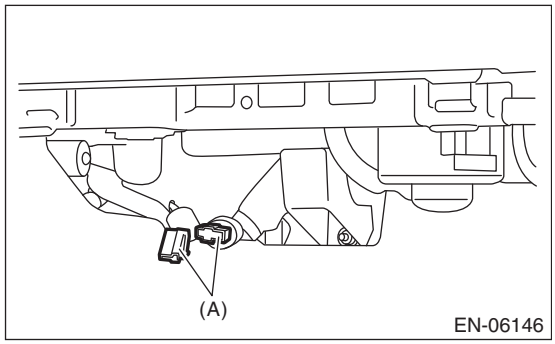
9) Start the PC.
10) Turn the ignition switch to ON (engine OFF) and run the "PC application for Subaru Select Monitor".
11) On «Main Menu» display, select {Each System Check}.
12) On «System Selection Menu» display, select {Engine Control System}.
13) Click the [OK] button after the information of engine type has been displayed.
14) On «Engine Diagnosis» display, select {Dealer Check Mode Procedure}.
15) When the «Perform Inspection (Dealer Check) Mode ?» is shown on the screen, click the [Next] button.
16) 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 procedures, refer to "PC application help for Subaru Select Monitor".
• For details concerning DTC, refer to "List of Diagnostic Trouble Code (DTC)".
<Ref. to EN(H4DO)(diag)-86, 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 system diagnosis is finished, perform the VDC memory clearance procedure of self-diagnosis function. <Ref. to VDC(diag)-25, Clear Memory Mode.>

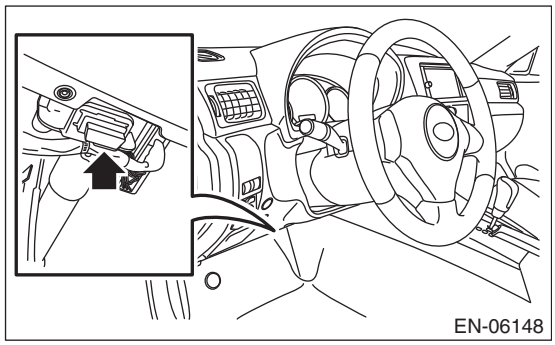
3. GENERAL SCAN TOOL

1) Check that no DTC remains after clearing memory. <Ref. to EN(H4DO)(diag)-56, Clear Memory Mode.>
2) Warm up the engine.
3) Connect the delivery (test) mode connector (A) located under the glove box.



4) 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 the scan tools except for Subaru Select Monitor and general scan tool.



5) Start the engine.

NOTE:
• Ensure the selector lever is placed in the "P" range before starting. (AT model)
• Depress the clutch pedal when starting engine. (MT model)

6) Turn the neutral position switch to ON using select lever or shift lever.
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 select lever or shift lever in D position (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 system diagnosis is finished, perform the VDC memory clearance procedure of self-diagnosis function. <Ref. to VDC(diag)-25, Clear Memory Mode.>

10) Using the general scan tool, check for DTC and record the result(s).

NOTE:
• For detailed operation procedures, refer to the general scan tool operation manual.
• For details concerning DTC, refer to “List of Diagnostic Trouble Code (DTC)”.
<Ref. to EN(H4DO)(diag)-86, List of Diagnostic Trouble Code (DTC).>

12.Drive Cycle

A: PROCEDURE

It is necessary to perform the drive cycle listed below if DTC is not found in the Inspection Mode. It is possible to complete diagnosis of the DTC by performing the indicated drive cycle. After the repair for the DTC, perform a necessary drive cycle and make sure the function recovers and the DTC is recorded.

1. PREPARATION FOR DRIVE CYCLE

1) Check that the battery voltage is 12 V or more and fuel remains approx. half [20 — 40 ℓ (5.3 — 10.6 US gal, 4.4 — 8.8 Imp gal)].
2) After performing the diagnostics and Clear Memory Mode, check that no DTC remains. <Ref. to EN(H4DO)(diag)-56, Clear Memory Mode.>
3) Check the delivery (test) mode connector is disconnected.

NOTE:
• Perform the drive cycle after warming up the engine except when the engine coolant temperature at engine start is specified.
• Perform the drive cycle twice if the DTC in the list is marked with *. After completing the first drive cycle, stop the engine and perform second diagnosis in same condition.

2. DRIVE CYCLE A

DTC	Item	Condition
*P0125	Insufficient Coolant Temperature for Closed Loop Fuel Control	Engine coolant temperature at engine start is less than 20°C (68°F).
*P0126	Insufficient Engine Coolant Temperature for Stable Operation	—
*P0128	Coolant Thermostat (Engine Coolant Temperature Below Thermostat Regulating Temperature)	—
*P0133	O2 Sensor Circuit Slow Response (Bank 1 Sensor 1)	—
*P0141	O2 Sensor Heater Circuit (Bank1 Sensor2)	—
*P0171	System Too Lean (Bank 1)	Complete diagnosis with drive cycle B or C as well.
*P0172	System Too Rich (Bank 1)	Complete diagnosis with drive cycle B or C as well.
*P0196	Engine Oil Temperature Sensor Circuit Range/Performance	—
*P0301	Cylinder 1 Misfire Detected	Complete diagnosis with drive cycle B or C as well.
*P0302	Cylinder 2 Misfire Detected	Complete diagnosis with drive cycle B or C as well.
*P0303	Cylinder 3 Misfire Detected	Complete diagnosis with drive cycle B or C as well.
*P0304	Cylinder 4 Misfire Detected	Complete diagnosis with drive cycle B or C as well.
*P0420	Catalyst System Efficiency Below Threshold (Bank 1)	—
*P0459	Evaporative Emission System Purge Control Valve Circuit High	—
*P2096	Post Catalyst Fuel Trim System Too Lean (Bank 1)	Complete diagnosis with drive cycle B or C as well.
*P2097	Post Catalyst Fuel Trim System Too Rich (Bank 1)	Complete diagnosis with drive cycle B or C as well.

Diagnostic procedure:
1) Drive for 20 minutes or more at a constant speed of 80 km/h (50 MPH) or more.
2) Stop the vehicle and idle for one minute.

3. DRIVE CYCLE B

DTC	Item	Condition
*P0171	System Too Lean (Bank 1)	Complete diagnosis with drive cycle A or C as well.
*P0172	System Too Rich (Bank 1)	Complete diagnosis with drive cycle A or C as well.
*P0301	Cylinder 1 Misfire Detected	Complete diagnosis with drive cycle A or C as well.
*P0302	Cylinder 2 Misfire Detected	Complete diagnosis with drive cycle A or C as well.
*P0303	Cylinder 3 Misfire Detected	Complete diagnosis with drive cycle A or C as well.
*P0304	Cylinder 4 Misfire Detected	Complete diagnosis with drive cycle A or C as well.
*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)	Complete diagnosis with drive cycle A or C as well.
*P2097	Post Catalyst Fuel Trim System Too Rich (Bank 1)	Complete diagnosis with drive cycle A or C as well.

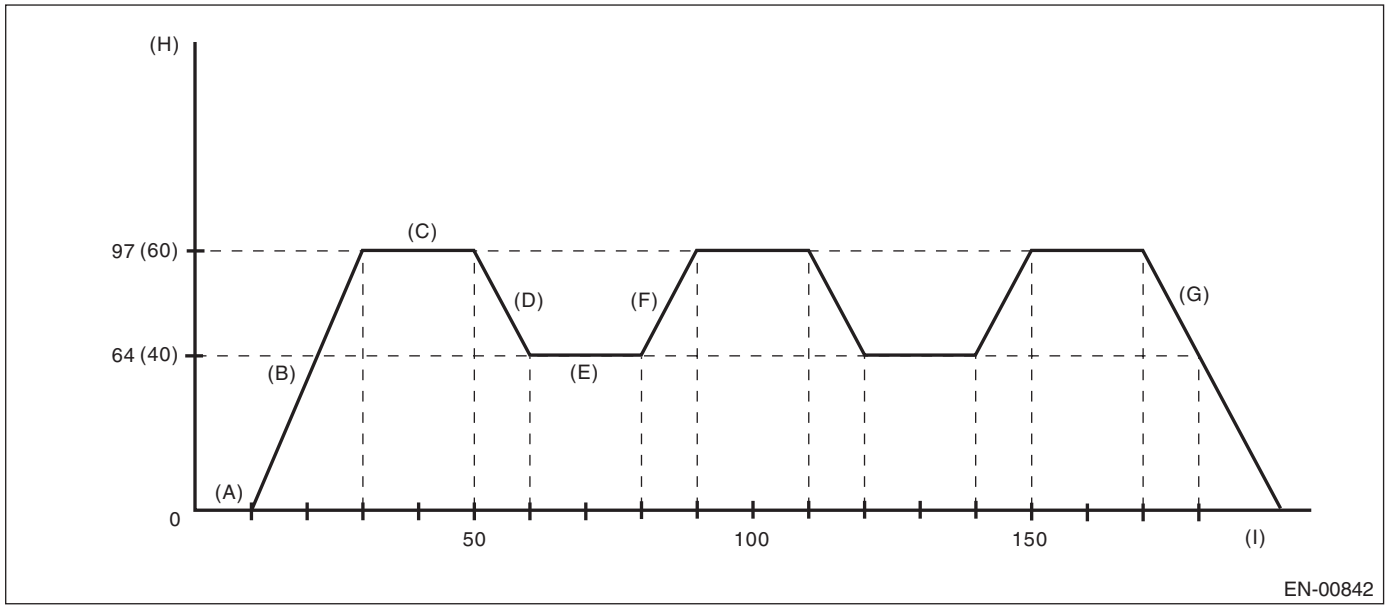
Diagnostic procedure:
1) Drive at 10 km/h (6 MPH) or more.
2) Stop the vehicle and idle for ten minutes.

4. DRIVE CYCLE C

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)	Complete diagnosis with drive cycle A or B as well.
*P0172	System Too Rich (Bank 1)	Complete diagnosis with drive cycle A or B as well.
*P0301	Cylinder 1 Misfire Detected	Complete diagnosis with drive cycle A or B as well.
*P0302	Cylinder 2 Misfire Detected	Complete diagnosis with drive cycle A or B as well.
*P0303	Cylinder 3 Misfire Detected	Complete diagnosis with drive cycle A or B as well.
*P0304	Cylinder 4 Misfire Detected	Complete diagnosis with drive cycle A or B as well.
*P0400	Exhaust Gas Recirculation Flow	—
*P0441	Evaporative Emission Cont. Sys. Incorrect Purge Flow	—
*P1449	Evaporative Emission Cont. Sys. Air Filter Clog	—
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)	—

DTC	Item	Condition
P1499	EGR Solenoid Valve Signal #4 Circuit Malfunction (High Input)	—
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)	Complete diagnosis with drive cycle A or B as well.
*P2097	Post Catalyst Fuel Trim System Too Rich (Bank 1)	Complete diagnosis with drive cycle A or B as well.

Diagnostic procedure:
Drive according to the drive pattern described below.



(A) Idle the engine for 10 seconds or more.
(B) Accelerate to 97 km/h (60 MPH) or more within 20 seconds.
(C) Drive for 20 seconds or more at 97 km/h (60 MPH) or more.
(D) Decelerate with fully closed throttle to 64 km/h (40 MPH) or less.
(E) Drive for 20 seconds or more at 64 km/h (40 MPH) or less.
(F) Accelerate to 97 km/h (60 MPH) or more within 10 seconds.
(G) Stop vehicle with the throttle fully closed.
(H) Vehicle speed km/h (MPH)
(I) Sec.

5. DRIVE CYCLE E

DTC	Item	Condition
*P0461	Fuel Level Sensor “A” Circuit Range/Performance	—

Diagnostic procedure:
1) Make sure that the battery voltage is 10.9 V or more.
2) Perform the Clear Memory Mode. <Ref. to EN(H4DO)(diag)-56, Clear Memory Mode.>
3) Drive for approximately 30 ℓ (7.9 US gal, 6.6 Imp gal) of fuel.

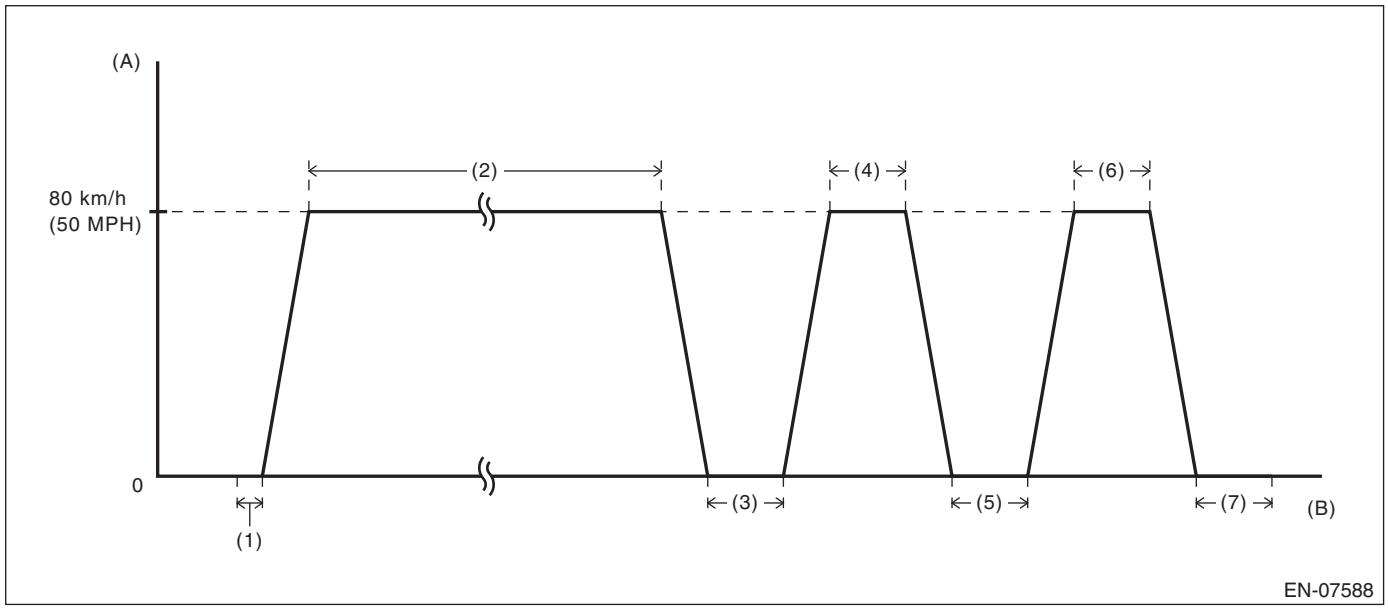
NOTE:
- It is acceptable to drive the vehicle intermittently.
- Do not disconnect the battery terminals while diagnosing. (Data will be cleared by disconnecting the battery terminals.)

6. DRIVE CYCLE F

DTC	Item	Condition
*P0111	Intake Air Temperature Sensor 1 Circuit Range/Performance	—

Diagnostic procedure:

1) Make sure that the engine coolant temperature is less than 30°C (86°F).
2) Drive according to the drive pattern described below.



(A) Vehicle speed

(B) Elapsed time

(1) Idle the engine for 10 seconds or more after engine start.

(2) Drive for 8 minutes or more at a constant speed of 80 km/h (50 MPH) or more.

(3) Stop the vehicle and idle for 30 seconds or more.

(4) Drive for 30 seconds or more at a constant speed of 80 km/h (50 MPH) or more.

(5) Stop the vehicle and idle for 30 seconds or more.

(6) Drive for 30 seconds or more at a constant speed of 80 km/h (50 MPH) or more.

(7) Stop the vehicle and idle for 30 seconds.

NOTE:

- There is no given transition time between idling and cruising.
- Driving at constant speed only on a downhill causes smaller engine load and may result in failure to obtain a right diagnostic result.
- When the engine stops while performing drive cycle F, perform it again from the state of procedure 1).

7. DRIVE CYCLE H

DTC	Item	Condition
*P050A	Cold Start Idle Air Control System Performance	—
*P050B	Cold Start Ignition Timing Performance	—

1) Perform the Clear Memory Mode. <Ref. to EN(H4DO)(diag)-56, Clear Memory Mode.>
2) With the ignition switch ON, read the engine coolant temperature, intake air temperature and fuel temperature. <Ref. to EN(H4DO)(diag)-36, READ CURRENT DATA FOR ENGINE (NORMAL MODE), OPERATION, Subaru Select Monitor.>
3) If the values from step 2) satisfy the following two conditions, idle the engine for one minute.

Condition:
|Engine coolant temperature — Intake air temperature| ≤ 5°C (9°F)
|Engine coolant temperature — Fuel temperature| ≤ 2°C (3.6°F)

NOTE:
- If the conditions are not satisfied, turn the ignition switch to OFF and wait until the parameters are satisfied.
- For AT models, hold the select lever to “P” range or “N” range at idling, and for MT models, the shift lever in the neutral position at idling.

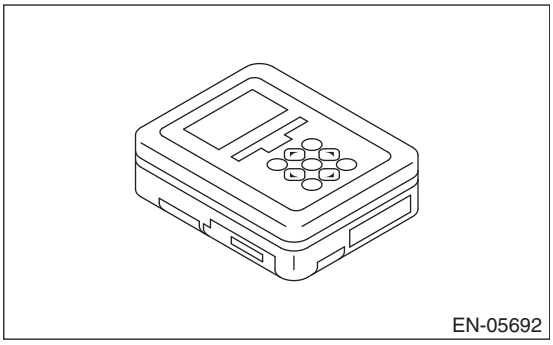
8. DRIVE CYCLE I

DTC	Item	Condition
*P0455	Evaporative Emission System Leak Detected (Large Leak)	Engine coolant temperature: 5 — 45°C (41 — 113°F) Intake air temperature: 5 — 50°C (41 — 122°F)
*P0456	Evaporative Emission Control System Leak Detected (Very Small Leak)	
*P1451	Evaporative Emission Cont. Sys.	
*P2402	Evaporative Emission System Leak Detection Pump Control Circuit High	
*P2404	Evaporative Emission System Leak Detection Pump Sense Circuit Range/Performance	
*P2420	Evaporative Emission System Switching Valve Control Circuit High	

CAUTION:
Be careful of the state of the battery when performing the DRIVE CYCLE I consecutively. Performing the DRIVE CYCLE I consecutively without the engine running may cause a low battery voltage and battery discharge.

NOTE:
- If it is necessary to perform DRIVE CYCLE I consecutively, drive the vehicle under the following conditions to release accumulated evaporating gas. Performing the DRIVE CYCLE I consecutively without starting the engine causes a large amount of evaporating gas to accumulate in the canister, which hinders an accurate diagnosis.
  - After engine is warmed up
  - Drive for 10 minutes or more at a speed of 48 km/h (30 MPH) or more (duration of drive can be an accumulation)
- To obtain an accurate diagnostic result, perform the procedures according to the following points.
  - Do not refuel gas immediately before performing DRIVE CYCLE I. There will be a large amount of evaporating gas immediately after refuel, which may cause a less accurate diagnostic performance.
  - Do not shake the vehicle while performing DRIVE CYCLE I. Shaking the vehicle causes evaporating gas to increase inside the fuel tank, which may cause a less accurate diagnostic performance.
  - Do not perform any service operation including installation or removal of parts or connectors while performing DRIVE CYCLE I. Performing service operation could affect on the functions of related parts, which may cause a less accurate diagnostic performance.

1) Prepare the Subaru Select Monitor kit. <Ref. to EN(H4DO)(diag)-8, PREPARATION TOOL, General Description.>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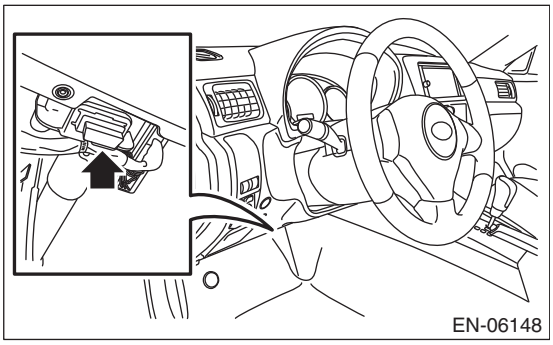
2) Prepare PC with Subaru Select Monitor installed.
3) Connect the USB cable to SDI (Subaru Diagnosis Interface) and USB port on the personal computer (dedicated port for the Subaru Select Monitor).

NOTE:
The dedicated port for the Subaru Select Monitor means the USB port which was used to install the Subaru Select Monitor.
4) Connect the diagnosis cable to SDI.
5) Connect SDI to data link connector located in the lower portion of the instrument panel (on the driver's side).

CAUTION:
Do not connect the scan tools except for Subaru Select Monitor and general scan tool.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6) Start the PC.
7) Turn the ignition switch to ON (engine OFF) and run the "PC application for Subaru Select Monitor".
8) On «Main Menu» display, select {Each System Check}.
9) On «System Selection Menu» display, select {Engine Control System}.
10) Click the [OK] button after the information of engine type has been displayed.
11) On «Engine Diagnosis» display, select {OBD System}.
12) On «OBD Menu» display, select {Evaporative System Leak Test}.
13) On «Evaporative System Leak Test» display, select {Evaporative System Leak Test}.
14) On «Evaporative System Leak Test is running. Press Cancel to exit this function.» display, click the [OK] button to perform evaporative system leak test.

15) When «Conditions have been enabled to control this function. Turn the ignition switch off to terminate the test.» display appears, wait for 30 minutes without clicking the [OK] button.

CAUTION:
Do not leave the vehicle for an extended period of time after the test is complete. This may cause early deterioration of the battery or discharged battery.

NOTE:
• Clicking the [OK] button bring the «Evaporative System Leak Test» display back, although the test is continuing.
• The Subaru Select Monitor screen does not change after the evaporative system leak test is complete or when the test is aborted by turning off the ignition switch.
• If «Test conditions are not correct» display appears, check that the engine coolant temperature and intake air temperature are within the specified range using Subaru Select Monitor. If the conditions are satisfied, make the necessary preparation for the drive cycle again. <Ref. to EN(H4DO)(diag)-48, PREPARATION FOR DRIVE CYCLE, PROCEDURE, Drive Cycle.>
16) After 30 minutes passed from the start of step 14), click the [OK] button to return to the «Evaporative System Leak Test» display.
17) Click buttons until the «OBD Menu» display appears, then select {Result of on-board monitor test}.
18) In the {Result of on-board monitor test}, check TID $C1 — $CA of MID $3C.

Result of on-board monitor test

Display	Details	Remarks
$0000 is stored in all Val.	During the evaporative system leak test, the test conditions were not met and the test was cancelled.	Once the test conditions are met, perform the test again.
All Val. are stored with values and OK is set to all the results.	Evaporative system leak test is completed correctly.	While the ignition switch is ON, read temporary codes using the Subaru Select Monitor.
Some results were no good.	The evaporative system leak test completed successfully but the results were faulty.	While the ignition switch is ON, read temporary codes using the Subaru Select Monitor.

19) When the evaporative system leak test is completed correctly, read the temporary codes with the ignition switch turned to ON position. If the DTC is recorded, check the appropriate DTC. <Ref. to EN(H4DO)(diag)-42, OPERATION, Read Diagnostic Trouble Code (DTC).>

NOTE:
The temporary code will be cleared by turning ignition switch to OFF.

9. DRIVE CYCLE J

DTC	Item	Condition
P2610	ECM/PCM Internal Engine Off Timer Performance	—

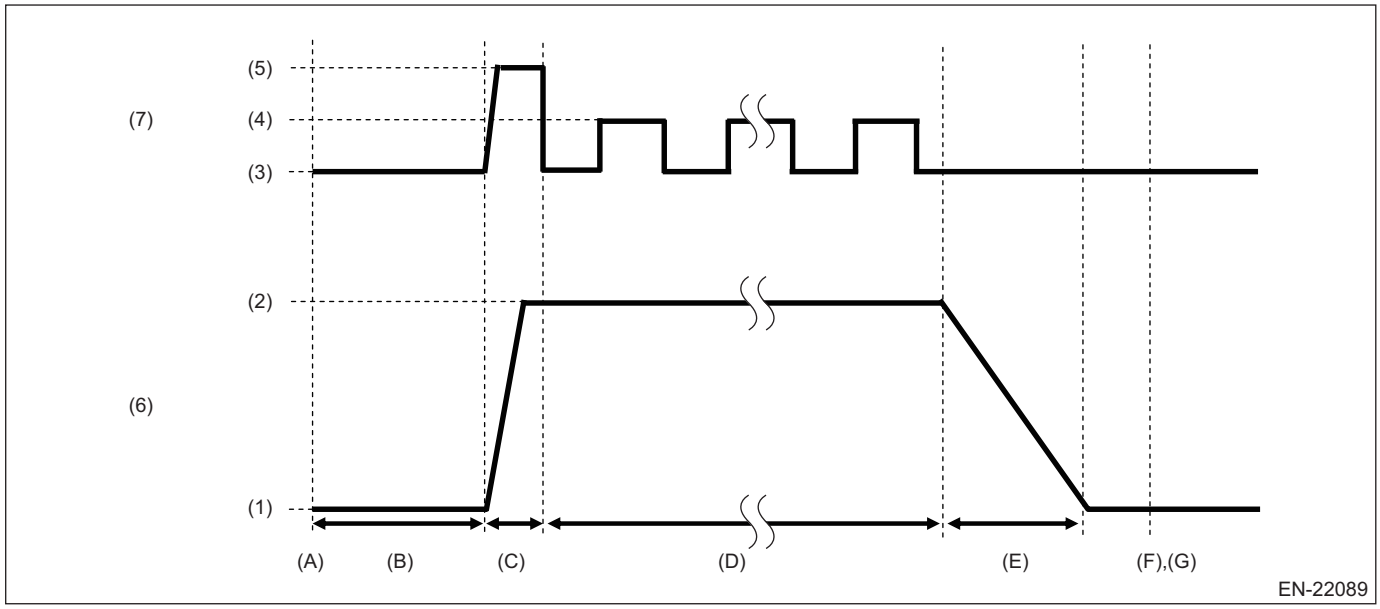
1) Idle the engine for 15 minutes or more.
2) Turn the ignition switch to OFF.
3) After 6 hours passed from the start of step 2), read the temporary code using the Subaru Select Monitor. <Ref. to EN(H4DO)(diag)-42, OPERATION, Read Diagnostic Trouble Code (DTC).>

10.DRIVE CYCLE T

Diagnostic procedure:

WARNING:
When performing the drive cycle T on the public road, be very careful of the traffic condition and the safe driving must be the high priority.

1) Using the Subaru Select Monitor, perform the clear memory for «Engine». <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>
2) Drive according to the drive pattern described below.



(1) 0 km/h (0 MPH)
(2) 60 km/h (37.3 MPH)
(3) 0%
(4) 20%
(5) 30 — 60%
(6) Vehicle speed
(7) Accelerator pedal opening angle

(A) Start the engine after warming up the engine (coolant temperature at 70°C (158°F)).
(B) Idle the engine at least three minutes.
(C) Accelerate the vehicle to 60 km/h (37.3 MPH).
(D) With the vehicle speed of 60 km/h (37.3 MPH) maintained, repeat accelerator pedal opening angle 0% (five seconds) ←→ 20% (five seconds) for 20 minutes or more.
(E) Decelerate with the accelerator pedal fully closed for at least five seconds.
(F) Park the vehicle. (Driving method while vehicle is driven to a stop at safe place is not restricted.)
(G) Stop the engine.

3) Read the temporary code using the Subaru Select Monitor or general scan tool. <Ref. to EN(H4DO)(diag)-42, OPERATION, Read Diagnostic Trouble Code (DTC).>

13.Clear Memory Mode

A: OPERATION

1. SUBARU SELECT MONITOR (NORMAL MODE)

1) On «Main Menu» display, select {Each System Check}.
2) On «System Selection Menu» display, select {Engine Control System}.
3) Click the [OK] button after the information of engine type has been displayed.
4) On «Engine Diagnosis» display, select {Clear Memory}.
5) When the “Clear Memory?” is shown on the screen, click the [YES] button.
6) When “Done” and “Turn off the ignition switch.” are shown on the display screen, turn the ignition switch to OFF.

NOTE:
• Initial diagnosis of electronic throttle control is performed after memory clearance. Wait for 10 seconds or more after turning the ignition switch to ON, and then start the engine.
• For detailed operation procedures, refer to “PC application help for Subaru Select Monitor”.

2. SUBARU SELECT MONITOR (OBD MODE)

1) On «Main Menu» display, select {Each System Check}.
2) On «System Selection Menu» display, select {Engine Control System}.
3) Click the [OK] button after the information of engine type has been displayed.
4) On «Engine Diagnosis» display, select {OBD System}.
5) On «OBD Menu» display, select {Clear Diagnostic Code(s)}.
6) When the “Clear Diagnostic Code?” is shown on the screen, click the [Yes] button.
7) When “Done” and “Turn off the ignition switch.” are shown on the display screen, turn the ignition switch to OFF.

NOTE:
• Initial diagnosis of electronic throttle control is performed after memory clearance. Wait for 10 seconds or more after turning the ignition switch to ON, and then start the engine.
• For detailed operation procedures, refer to “PC application help for Subaru Select Monitor”.

3. GENERAL SCAN TOOL

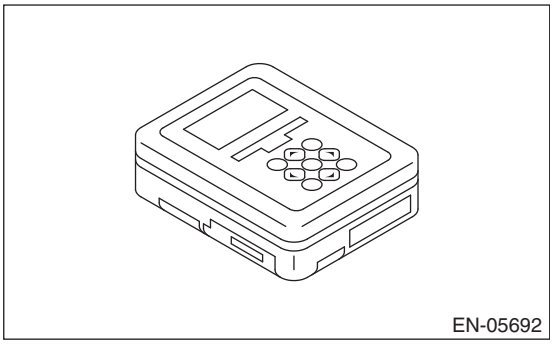
For clear memory procedures using the general scan tool, refer to “General Scan Tool Instruction Manual”.

NOTE:
Initial diagnosis of electronic throttle control is performed after memory clearance. Wait for 10 seconds or more after turning the ignition switch to ON, and then start the engine.

14.Compulsory Valve Operation Check Mode

A: OPERATION

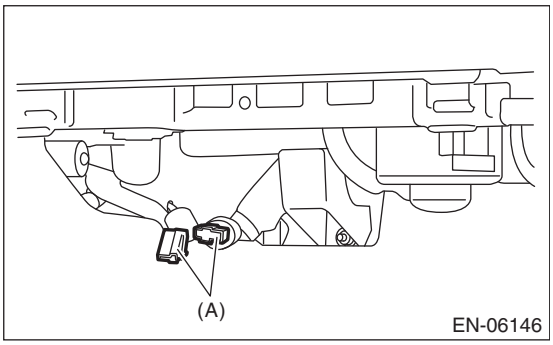
1) Prepare the Subaru Select Monitor kit. <Ref. to EN(H4DO)(diag)-8, PREPARATION TOOL, General Description.>


EN-05692

2) Prepare PC with Subaru Select Monitor installed.
3) Connect the USB cable to SDI (Subaru Diagnosis Interface) and USB port on the personal computer (dedicated port for the Subaru Select Monitor).

NOTE:
The dedicated port for the Subaru Select Monitor means the USB port which was used to install the Subaru Select Monitor.

4) Connect the diagnosis cable to SDI.
5) Connect the delivery (test) mode connector (A) located under the glove box.



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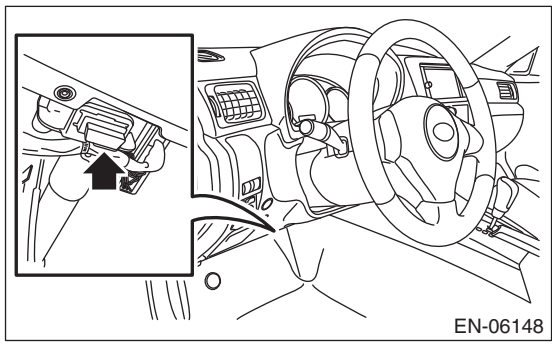
6) Connect SDI to data link connector located in the lower portion of the instrument panel (on the driver's side).

CAUTION:
Do not connect the scan tools except for Subaru Select Monitor and general scan tool.


EN-06148

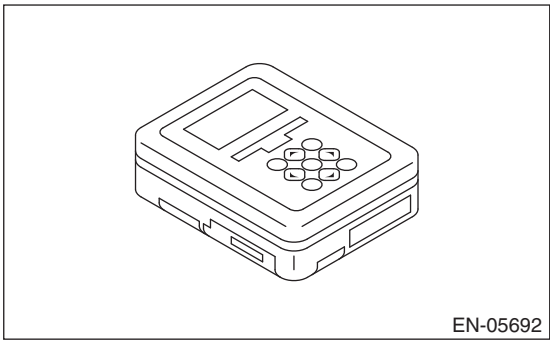
7) Start the PC.
8) Turn the ignition switch to ON (engine OFF) and run the "PC application for Subaru Select Monitor".
9) On «Main Menu» display, select {Each System Check}.
10) On «System Selection Menu» display, select {Engine Control System}.
11) Click the [OK] button after the information of engine type has been displayed.
12) On «Engine Diagnosis» display, select {System Operation Check Mode}.
13) On «System Operation Check Mode» display, select {Actuator ON/OFF Operation}.
14) Select the actuator to be forcibly driven on the «Actuator ON/OFF Operation» display and click the [Next] button.
15) Clicking the [Finished] button completes the compulsory drive mode of actuator. The display will then return to the «Actuator ON/OFF Operation» screen.

NOTE:
For detailed operation procedures, refer to "PC application help for Subaru Select Monitor".

15. System Operation Check Mode

A: OPERATION

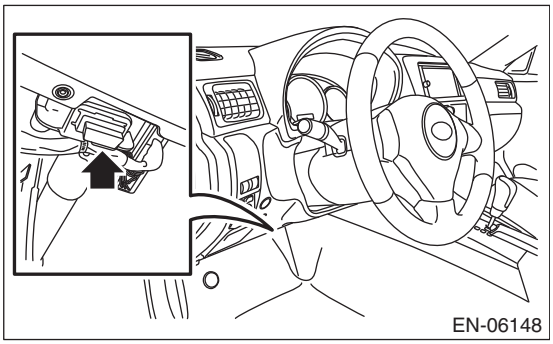
1) Prepare the Subaru Select Monitor kit. <Ref. to EN(H4DO)(diag)-8, PREPARATION TOOL, General Description.>


EN-05692

2) Prepare PC with Subaru Select Monitor installed.
3) Connect the USB cable to SDI (Subaru Diagnosis Interface) and USB port on the personal computer (dedicated port for the Subaru Select Monitor).

NOTE:
The dedicated port for the Subaru Select Monitor means the USB port which was used to install the Subaru Select Monitor.
4) Connect the diagnosis cable to SDI.
5) Connect SDI to data link connector located in the lower portion of the instrument panel (on the driver's side).

CAUTION:
Do not connect the scan tools except for Subaru Select Monitor and general scan tool.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6) Start the PC.
7) Turn the ignition switch to ON (engine OFF) and run the "PC application for Subaru Select Monitor".
8) On «Main Menu» display, select {Each System Check}.
9) On «System Selection Menu» display, select {Engine Control System}.
10) Click the [OK] button after the information of engine type has been displayed.
11) On «Engine Diagnosis» display, select {System Operation Check Mode}.
12) The following items are displayed on the monitor.

Display
Actuator ON/OFF Operation
Immobilizer System
Fuel Pump Control
Fixed Idle Ignition Timing
Idle Speed Control
Injector Control
EGR Valve Control

1. FUEL PUMP CONTROL (OFF DRIVE)

CAUTION:
After executing the system operation check mode, execute the Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>.
1) On «System Operation Check Mode» display, select {Fuel Pump Control}.
2) On «Fuel Pump Control» display, select {OFF Drive}.
3) On «Start the Engine» display, start the engine and click the [OK] button.
4) On «OFF Drive» display, click the [Execution] button and execute the OFF drive.
5) Click the [Cancel] button to stop the OFF drive.
6) Click the [F12 Exit] button to end the OFF drive. The screen will return to the «Fuel Pump Control» screen.

NOTE:
For detailed operation procedures, refer to "PC application help for Subaru Select Monitor".

2. FUEL PUMP CONTROL (ON/OFF DRIVE)

CAUTION:
After executing the system operation check mode, execute the Clear Memory Mode. <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>
1) On «System Operation Check Mode» display, select {Fuel Pump Control}.
2) On «Fuel Pump Control» display, select {ON/OFF Dr.}.
3) On «Turn Ignition Switch ON with Engine OFF» display, turn the ignition switch to ON and click the [OK] button.
4) On «ON/OFF Dr.» display, click the [Execution] button and execute the ON/OFF drive.
5) Click the [Cancel] button to stop the ON/OFF drive.

6) Click the [F12 Exit] button to end the ON/OFF drive. The screen will return to the «Fuel Pump Control» screen.

NOTE:
For detailed operation procedures, refer to “PC application help for Subaru Select Monitor”.

3. IDLING IGNITION TIMING FIXED

CAUTION:
After executing the system operation check mode, execute the Clear Memory Mode. <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>
1) On «System Operation Check Mode» display, select {Fixed Idle Ignition Timing}.
2) On «Start the Engine» display, start the engine and click the [OK] button.
3) On «Fixed Idle Ignition Timing» display, click the [Execution] button and execute the idling ignition timing fixed.
4) Click the [Cancel] button to stop the idling ignition timing fixed.
5) Click the [F12 Exit] button to end the idle ignition timing fixed. The screen will return to the «System Operation Check Mode» screen.

NOTE:
For detailed operation procedures, refer to “PC application help for Subaru Select Monitor”.

4. IDLE SPEED CONTROL

CAUTION:
After executing the system operation check mode, execute the Clear Memory Mode. <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>
1) On «System Operation Check Mode» display, select {Idle Speed Control}.
2) On «Start the Engine» display, start the engine and click the [OK] button.
3) In the «Idle Speed Control» display, click the [△] button or the [▽] button to change the setting values, then click the [OK] button.
Setting is possible in a range between 500 rpm — 2,000 rpm, in increments of 50 rpm. However, the engine speed that can actually be controlled will vary depending on the vehicle.
4) Click the [Cancel] button to stop the idle speed control.
5) Click the [F12 Exit] button to end the idle speed control. The screen will return to the «System Operation Check Mode» screen.

NOTE:
For detailed operation procedures, refer to “PC application help for Subaru Select Monitor”.

5. INJECTOR CONTROL (INJECTION STOP MODE)

CAUTION:
After executing the system operation check mode, execute the Clear Memory Mode. <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>
1) On «System Operation Check Mode» display, select {Injector Control}.
2) On «Injector Control» display, select {Injection Stop Mode}.
3) On «Injection Stop Mode» display, select the fuel injector to be stopped.
4) On «Start the Engine» display, start the engine and click the [OK] button.
5) On «Fuel Injector #» display, click the [Execution] button and execute the injection stop mode.
6) Click the [Cancel] button to stop the injection stop mode.
7) Click the [F12 Exit] button to return the «Injection Stop Mode» display screen.
8) On the «Injection Stop Mode» display, click the [Return] button to end the «Injection Stop Mode». The screen will return to the «Injector Control» screen.

NOTE:
For detailed operation procedures, refer to “PC application help for Subaru Select Monitor”.

6. INJECTOR CONTROL (INJECTION QUANTITY CONTROL)

CAUTION:
After executing the system operation check mode, execute the Clear Memory Mode. <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>
1) On «System Operation Check Mode» display, select {Injector Control}.
2) On «Injector Control» display, select {Injection Quantity Control}.
3) On «Start the Engine» display, start the engine and click the [OK] button.
4) In the «Injection Quantity Control» display, click the [△] button or the [▽] button to change the setting values, then click the [OK] button.
Setting is possible in a range between 0 — 20%, in increments of 1%.
5) Click the [Cancel] button to stop the injection quantity control.
6) Click the [F12 Exit] button to end the injection quantity control. The screen will return to the «Injector Control» screen.

NOTE:
For detailed operation procedures, refer to “PC application help for Subaru Select Monitor”.

7. EGR VALVE CONTROL

CAUTION:
After executing the system operation check mode, execute the Clear Memory Mode. <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>

1) On «System Operation Check Mode» display, select {EGR Valve Control}.
2) On «Start the Engine» display, start the engine and click the [OK] button.
3) In the «EGR Valve Control» display, click the [△] button or the [▽] button to change the setting values, then click the [OK] button.
Setting is possible in increments of 1 STEP. However, the STEP number that can actually be controlled will vary depending on the vehicle.
4) Click the [Cancel] button to stop the EGR valve control.
5) Click the [F12 Exit] button to end the EGR valve control. The screen will return to the «System Operation Check Mode» screen.

NOTE:
For detailed operation procedures, refer to “PC application help for Subaru Select Monitor”.

16.Malfunction Indicator Light

A: PROCEDURE

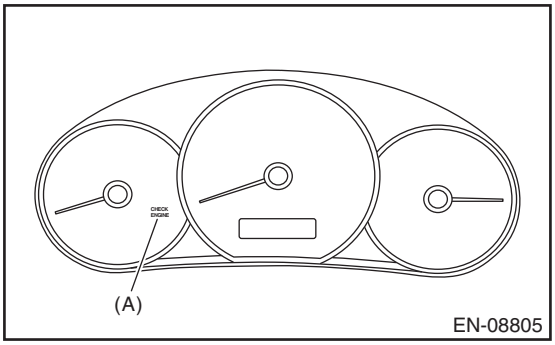
1. Activation of malfunction indicator light <Ref. to EN(H4DO)(diag)-61, ACTIVATION OF MALFUNCTION INDICATOR LIGHT, Malfunction Indicator Light.>
↓
2. Malfunction indicator light does not come on <Ref. to EN(H4DO)(diag)-63, MALFUNCTION INDICATOR LIGHT DOES NOT COME ON, Malfunction Indicator Light.>
↓
3. Malfunction indicator light does not go off <Ref. to EN(H4DO)(diag)-65, MALFUNCTION INDICATOR LIGHT DOES NOT GO OFF, Malfunction Indicator Light.>
↓
4. Malfunction indicator light does not blink <Ref. to EN(H4DO)(diag)-66, MALFUNCTION INDICATOR LIGHT DOES NOT BLINK, Malfunction Indicator Light.>
↓
5. Malfunction indicator light remains blinking <Ref. to EN(H4DO)(diag)-68, MALFUNCTION INDICATOR LIGHT REMAINS BLINKING, Malfunction Indicator Light.>

B: ACTIVATION OF MALFUNCTION INDICATOR LIGHT

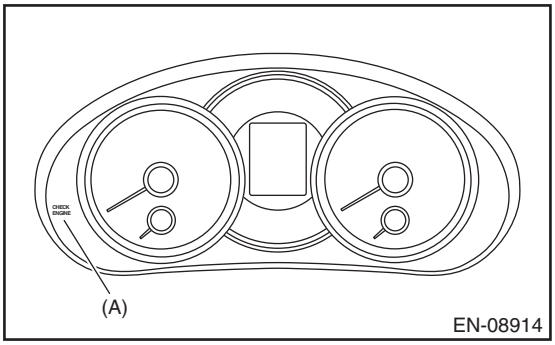
1) When the ignition switch is turned to ON (engine OFF), the malfunction indicator light (A) in the combination meter illuminates.

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(H4DO)(diag)-63, MALFUNCTION INDICATOR LIGHT DOES NOT COME ON, Malfunction Indicator Light.>

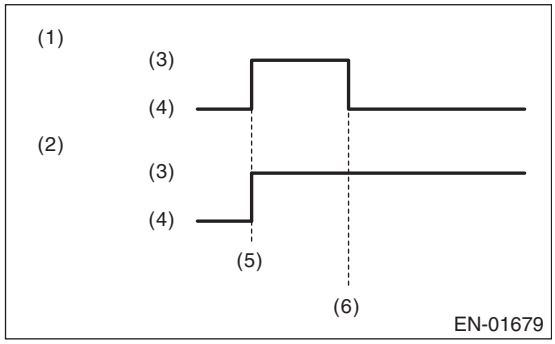
- Normal meter



- Luminescent meter

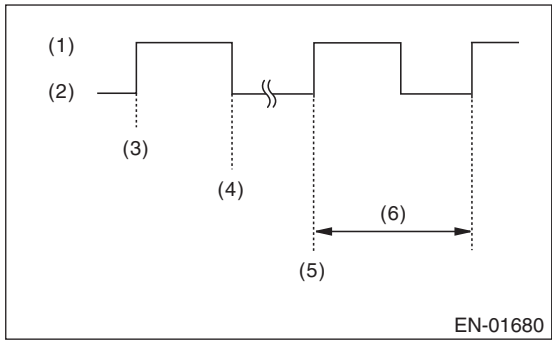


2) After starting the engine, the malfunction indicator light goes out. If it does not go off, any of the engine and emission control system has malfunction.



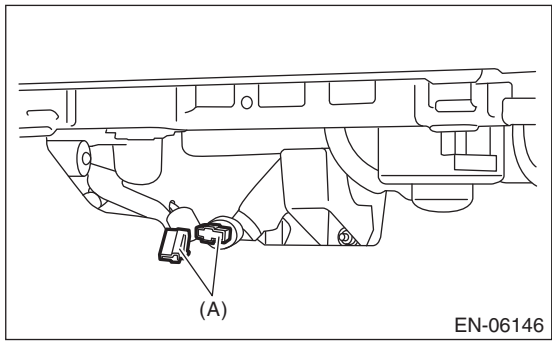
(1) No faulty
(2) Trouble occurs
(3) ON
(4) OFF
(5) Ignition switch ON
(6) Engine start

3) If the diagnostic system detects a misfire which could damage the catalyst, the malfunction indicator light will blink at a cycle of 1 Hz.



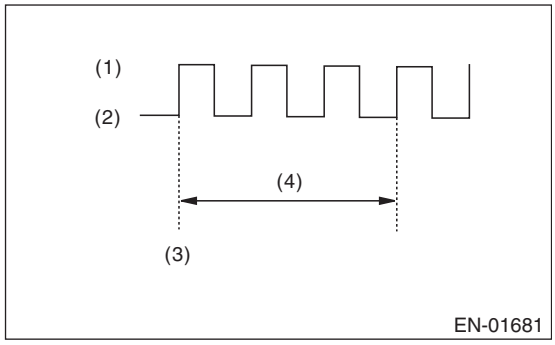
(1) ON
(2) OFF
(3) Ignition switch ON
(4) Engine start
(5) Misfire start
(6) 1 second

4) Turn the ignition switch to OFF and connect the delivery (test) mode connector (A) located under the glove box.



(1) When the ignition switch is turned to ON (engine OFF), the malfunction indicator light illuminates.
(2) After the engine starts, malfunction indicator light blinks in a cycle of 0.5 Hz. (During diagnosis)

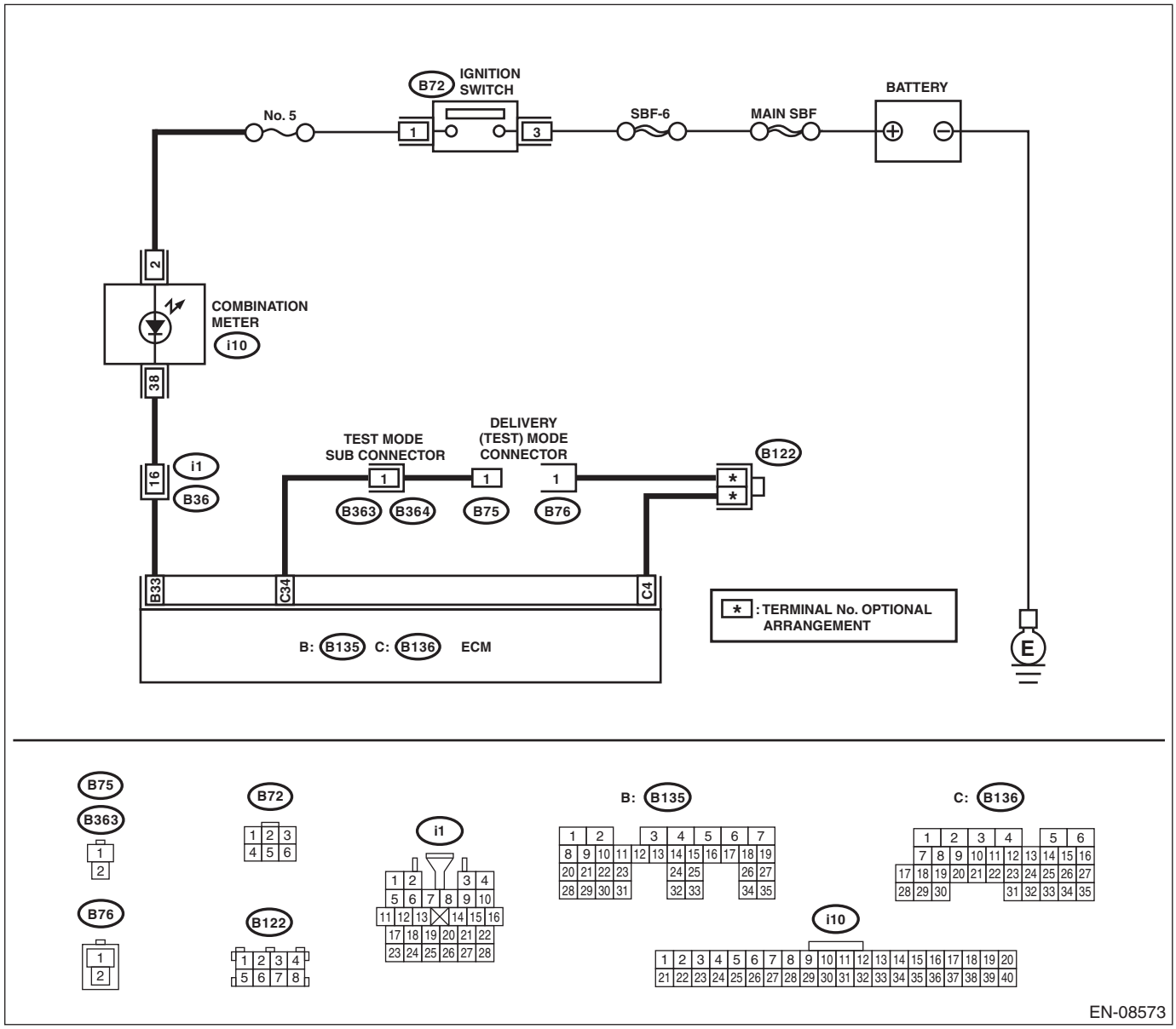
(3) Malfunction indicator light blinks at a cycle of 3 Hz after diagnosis if there is no trouble. Malfunction indicator light illuminates if faulty.



(1) ON
(2) OFF
(3) Ignition switch ON
(4) 1 second

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 illuminate.
WIRING DIAGRAM:



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*** ***(B135) No. 33 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **5**.	Go to step **2**.

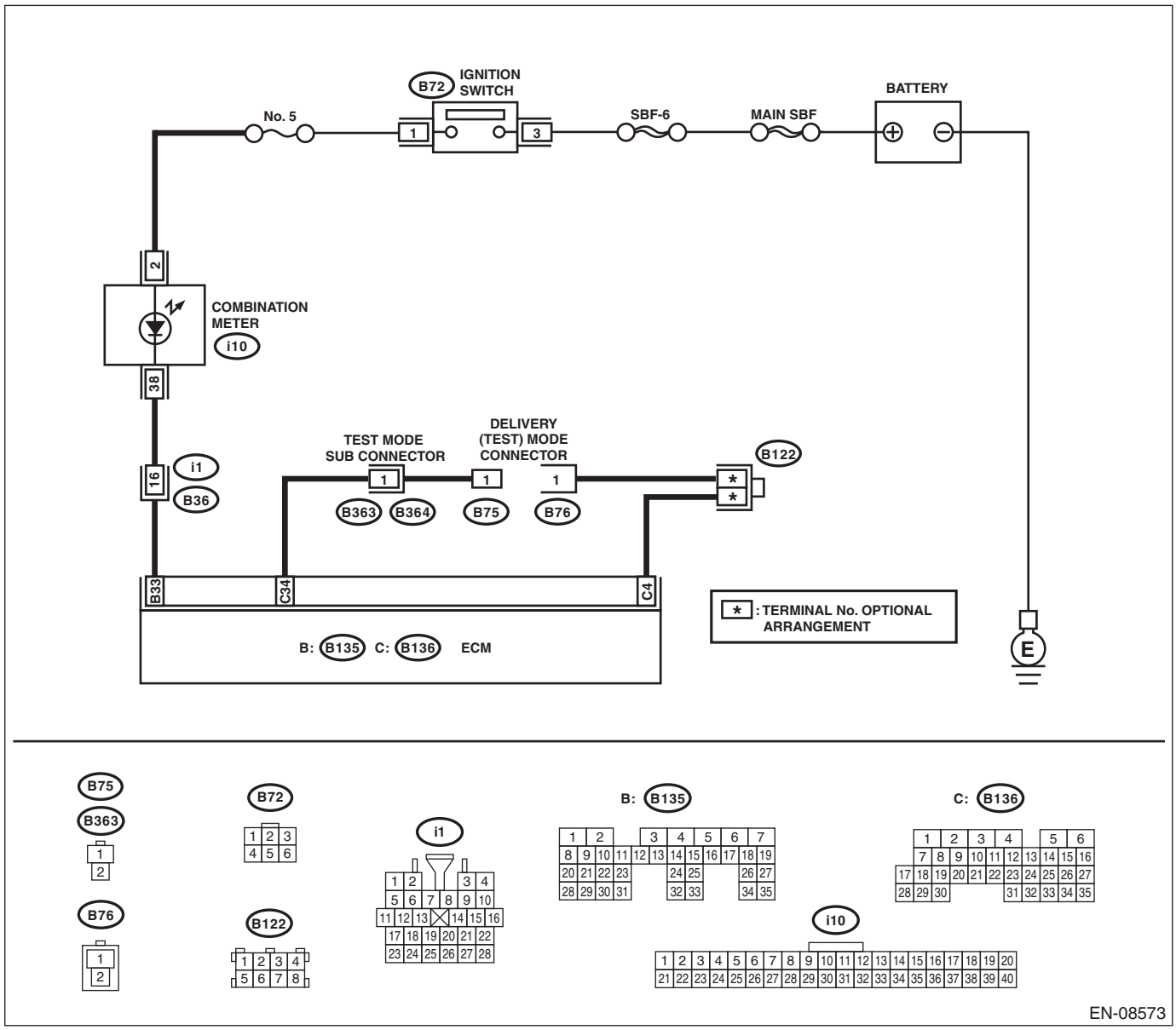
	Step	Check	Yes	No
2	**CHECK HARNESS BETWEEN ECM AND COMBINATION METER CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Remove the combination meter. <Ref. to IDI-20, Combination Meter.> 3) Disconnect the connector from ECM and combination meter. 4) Measure the resistance of harness between ECM and combination meter connector. ***Connector & terminal*** ***(B135) No. 33 — (i10) No. 38:***	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 combination meter connector • Poor contact of coupling connector
3	**CHECK FOR POOR CONTACT.** Check for poor contact of combination meter connector.	Is there poor contact of combination meter connector?	Repair the poor contact of combination meter connector.	Go to step **4**.
4	**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. ***Connector & terminal*** ***(i10) No. 2 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Replace the meter case assembly of combination meter. <Ref. to IDI-20, Combination Meter.>	Check the following item and repair if necessary. NOTE: • Blown out of fuse (No. 5) • Open circuit or short circuit to ground in harness of power supply circuit
5	**CHECK FOR POOR CONTACT.** Check for poor connection by shaking or pulling ECM connector and harness.	Does the malfunction indicator light illuminate?	Repair the poor contact of ECM connector.	Go to step **6**.
6	**CHECK ECM CONNECTOR.** Check the connection of ECM connector.	Is the ECM connector correctly connected?	Replace the ECM. <Ref. to FU(H4DO)-101, Engine Control Module (ECM).>	Repair the connection of ECM 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 display.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND COMBINATION METER CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Turn the ignition switch to ON.	Does the malfunction indicator light illuminate?	Repair the short circuit of harness between ECM and combination meter connector.	Replace the ECM. <Ref. to FU(H4DO)-101, Engine Control Module (ECM).>

E: MALFUNCTION INDICATOR LIGHT DOES NOT BLINK

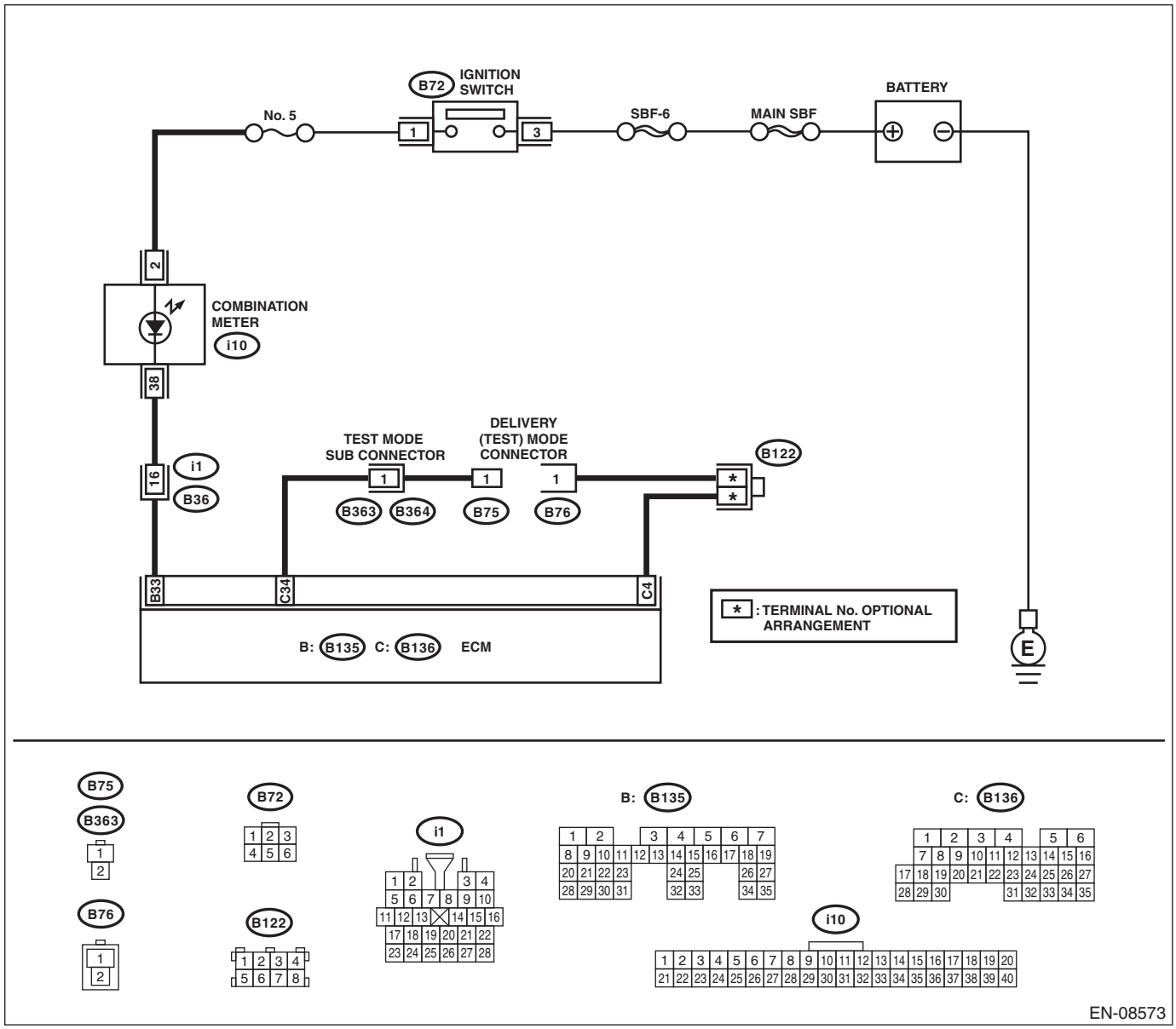
DIAGNOSIS:

- The malfunction indicator light circuit is open or shorted.
- The delivery (test) mode connector circuit is open.

TROUBLE SYMPTOM:

Malfunction indicator light does not blink during Inspection Mode.

WIRING DIAGRAM:



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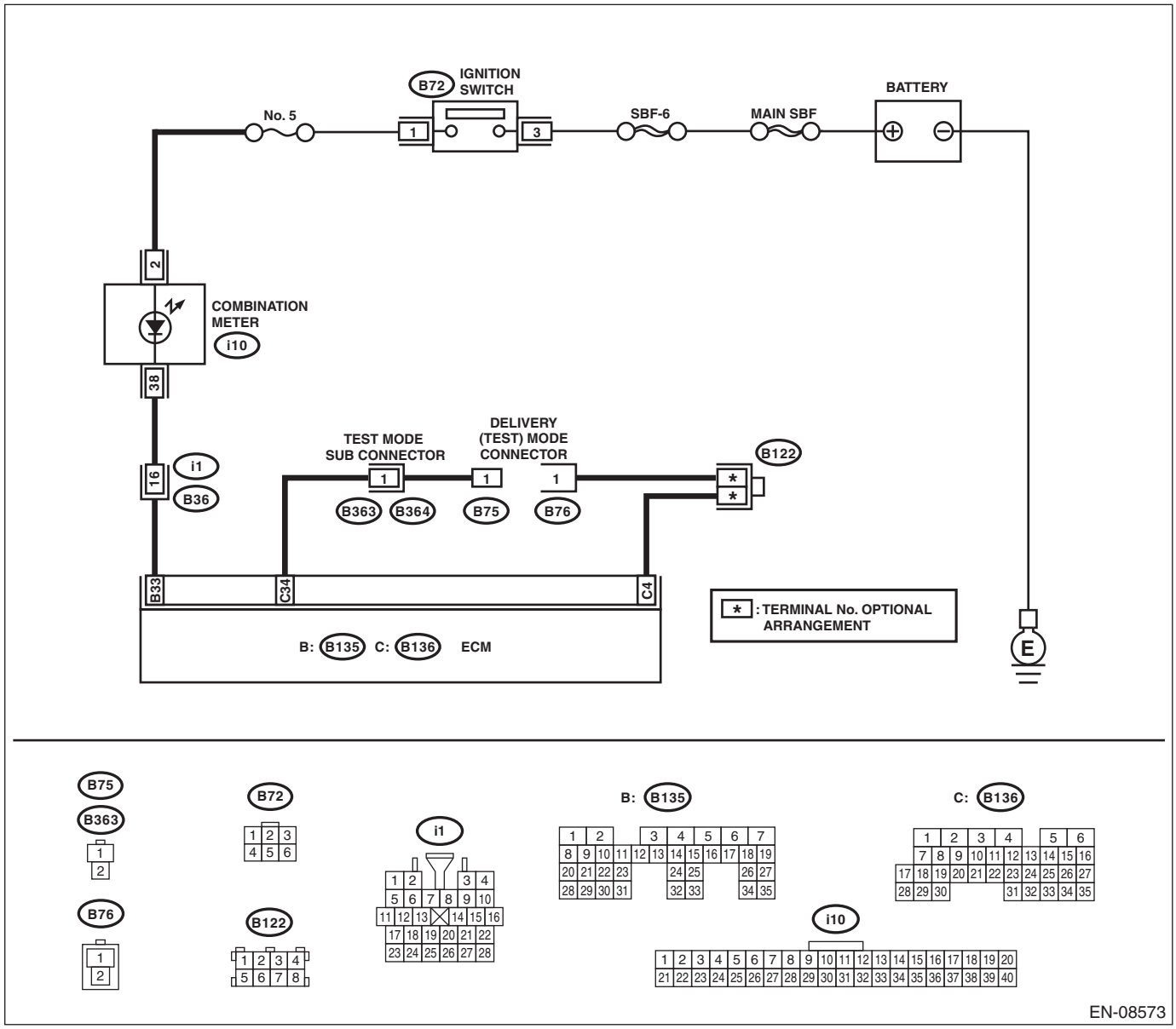
	Step	Check	Yes	No
1	**CHECK STATUS OF MALFUNCTION INDICATOR LIGHT.** 1) Turn the ignition switch to OFF. 2) Check the delivery (test) mode connector is disconnected. 3) Turn the ignition switch to ON. (engine OFF)	Does the malfunction indicator light illuminate?	Go to step **2**.	Repair the malfunction indicator light circuit. <Ref. to EN(H4DO)(diag)-63, MALFUNCTION INDICATOR LIGHT DOES NOT COME ON, Malfunction Indicator Light.>
2	**CHECK HARNESS BETWEEN ECM AND COMBINATION METER CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Turn the ignition switch to ON.	Does the malfunction indicator light illuminate?	Repair the ground short circuit of harness between ECM and combination meter connector.	Go to step **3**.
3	**CHECK HARNESS BETWEEN ECM AND DELIVERY (TEST) MODE CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Connect the delivery (test) mode connector. 3) Measure the resistance of harness between ECM connectors. ***Connector & terminal*** ***(B136) No. 34 — (B136) 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: • Open circuit in harness between ECM connector • Poor contact of each connector between ECM connector.
4	**CHECK FOR POOR CONTACT.** Check for poor contact of ECM connector.	Is there poor contact of ECM connector?	Repair the poor contact of ECM connector.	Replace the ECM. <Ref. to FU(H4DO)-101, Engine Control Module (ECM).>

F: MALFUNCTION INDICATOR LIGHT REMAINS BLINKING

DIAGNOSIS:
The delivery (test) mode connector circuit is shorted.
TROUBLE SYMPTOM:
Malfunction indicator light blinks when delivery (test) mode connector is not connected.
WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK DELIVERY (TEST) MODE CONNECTOR.** 1) Check the delivery (test) mode connector is disconnected. 2) Turn the ignition switch to ON.	Does the malfunction indicator light blink?	Go to step **2**.	System is normal. NOTE: Malfunction indicator light blinks when delivery (test) mode connector is connected.

	Step	Check	Yes	No
2	**CHECK HARNESS BETWEEN ECM AND DELIVERY (TEST) MODE CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 34 — Chassis ground:***	Is the resistance less than 5 Ω?	Repair the short circuit to ground in harness between ECM and delivery (test) mode connector.	Replace the ECM. <Ref. to FU(H4DO)-101, Engine Control Module (ECM).>

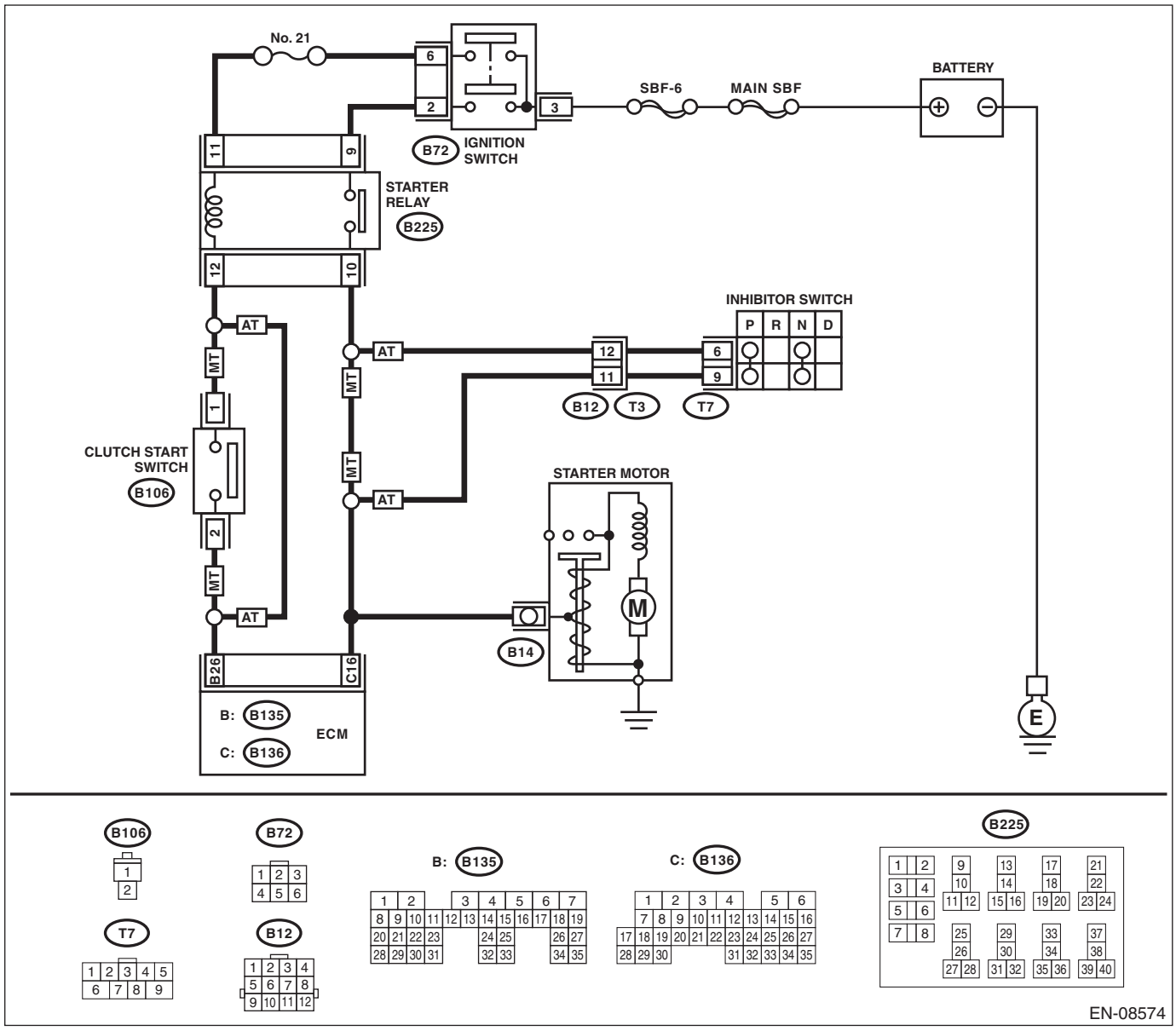
17.Diagnostics for Engine Starting Failure

A: PROCEDURE

1. Check of the fuel amount
↓
2. Inspection of starter motor circuit <Ref. to EN(H4DO)(diag)-71, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
3. Inspection of ECM power supply and ground line <Ref. to EN(H4DO)(diag)-75, 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(H4DO)(diag)-77, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>
↓
5. Inspection of fuel pump circuit <Ref. to EN(H4DO)(diag)-79, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
6. Inspection of fuel injector circuit <Ref. to EN(H4DO)(diag)-82, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

B: STARTER MOTOR CIRCUIT

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, Inspection Mode.>.
WIRING DIAGRAM:



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**.

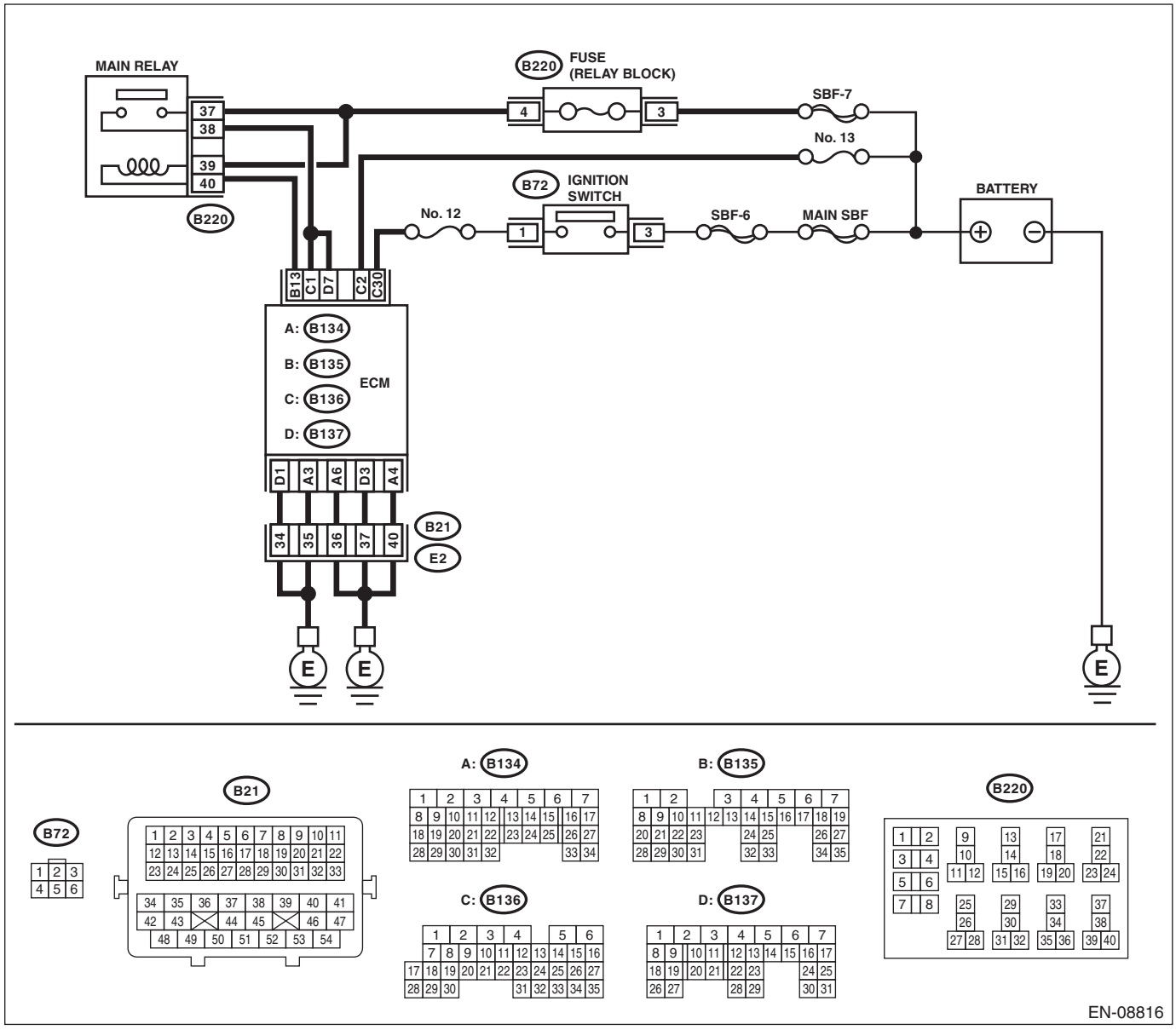
Step		Check	Yes	No
3	**CHECK DTC.**	Is DTC displayed? <Ref. to EN(H4DO)(diag)-42, OPERATION, Read Diagnostic Trouble Code (DTC).>	Check the appropriate DTC using the "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DO)(diag)-86, List of Diagnostic Trouble Code (DTC).>	The circuit has returned to a normal condition at this time. Reproduce the failure, and then perform the diagnosis again. NOTE: In this case, temporary poor contact of connector, temporary open or short circuit of harness may be the cause.
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 START. 4) Measure the voltage between the starter motor connector and the engine ground. ***Connector & terminal*** ***(B14) No. 1 (+) — Engine ground (–):*** NOTE: • For AT model, place the select lever in "P" range or "N" range. • For MT model, depress the clutch pedal.	Is the voltage 10 V or more?	Check the starter motor. <Ref. to SC(H4DO)-10, Starter.>	Go to step **5**.
5	**CHECK HARNESS BETWEEN BATTERY AND IGNITION SWITCH CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ignition switch. 3) Measure the power supply voltage between ignition switch connector and chassis ground. ***Connector & terminal*** ***(B72) No. 3 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **6**.	Repair the power supply circuit.
6	**CHECK IGNITION SWITCH.** Measure the resistance between ignition switch terminals after turning the ignition switch to START position. ***Terminals*** ***No. 3 — No. 2:*** ***No. 3 — No. 6:***	Is the resistance less than 1 Ω?	Go to step **7**.	Replace the ignition switch. <Ref. to SL-38, REPLACEMENT, Ignition Key Lock.>
7	**CHECK INPUT VOLTAGE OF STARTER RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the starter relay. 3) Connect the connector to ignition switch. 4) Measure the voltage between starter relay connector and chassis ground after turning the ignition switch to START position. ***Connector & terminal*** ***(B225) No. 9 (+) — Chassis ground (–):*** ***(B225) No. 11 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **8**.	Check the following item and repair if necessary. • Blown out of fuse • Open or short circuit to ground in harness between starter relay and ignition switch connector

	Step	Check	Yes	No
8	**CHECK STARTER RELAY.** 1) Connect the battery to starter relay terminals No. 11 and No. 12. 2) Measure the resistance between starter relay terminals. ***Terminals*** ***No. 9 — No. 10:***	Is the resistance less than 1 Ω?	Go to step **9**.	Replace the starter relay. <Ref. to EN(H4DO)(diag)-9, Electrical Component Location.>
9	**CHECK TRANSMISSION TYPE.**	Is the transmission type AT?	Go to step **10**.	Go to step **14**.
10	**CHECK HARNESS BETWEEN ECM AND STARTER RELAY CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM and starter relay connector. ***Connector & terminal*** ***(B135) No. 26 — (B225) No. 12:***	Is the resistance less than 1 Ω?	Go to step **11**.	Repair the open circuit of harness between ECM and starter relay connector.
11	**CHECK HARNESS BETWEEN STARTER RELAY AND INHIBITOR SWITCH CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from inhibitor switch. 3) Measure the resistance of harness between starter relay connector and inhibitor relay connector. ***Connector & terminal*** ***(B225) No. 10 — (T7) No. 6:***	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 starter relay connector and inhibitor switch connector • Poor contact of coupling connector
12	**CHECK HARNESS BETWEEN INHIBITOR SWITCH AND STARTER MOTOR.** Measure the resistance of harness between the inhibitor switch connector and starter motor. ***Connector & terminal*** ***(T7) No. 9 — (B14) No. 1:***	Is the resistance less than 1 Ω?	Go to step **13**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between inhibitor switch connector and starter motor • Poor contact of coupling connector
13	**CHECK INHIBITOR SWITCH.** 1) Place the select lever in “P” range and “N” range. 2) Measure the resistance between inhibitor switch terminals. ***Terminals*** ***No. 6 — No. 9:***	Is the resistance less than 1 Ω?	Check the engine control module (ECM) power supply and ground line. <Ref. to EN(H4DO)(diag)-75, CHECK POWER SUPPLY AND GROUND LINE OF ENGINE CONTROL MODULE (ECM), Diagnostics for Engine Starting Failure.>	Replace the inhibitor switch. <Ref. to 4AT-52, Inhibitor Switch.>

	Step	Check	Yes	No
14	**CHECK HARNESS BETWEEN STARTER RELAY AND CLUTCH START SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from clutch start switch. 3) Install the starter relay. 4) Turn the ignition switch to START. 5) Measure the voltage between the clutch start switch connector and chassis ground. ***Connector & terminal*** ***(B106) No. 1 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **15**.	Repair the open circuit in harness between starter relay connector and clutch start switch connector.
15	**CHECK CLUTCH START SWITCH.** Measure the resistance between clutch start switch terminals while depressing the clutch pedal. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 1 Ω?	Go to step **16**.	Replace the clutch start switch. <Ref. to CL-25, Clutch Switch.>
16	**CHECK HARNESS BETWEEN ECM AND CLUTCH START SWITCH.** Measure the resistance of harness between ECM and clutch start switch connector. ***Connector & terminal*** ***(B135) No. 26 — (B106) No. 2:***	Is the resistance less than 1 Ω?	Go to step **17**.	Repair the open circuit of harness between ECM and clutch start switch connector.
17	**CHECK HARNESS BETWEEN STARTER RELAY AND STARTER MOTOR.** Measure the resistance of harness between starter relay connector and starter motor. ***Connector & terminal*** ***(B225) No. 10 — (B14) No. 1:***	Is the resistance less than 1 Ω?	Check the engine control module (ECM) power supply and ground line. <Ref. to EN(H4DO)(diag)-75, CHECK POWER SUPPLY AND GROUND LINE OF ENGINE CONTROL MODULE (ECM), Diagnostics for Engine Starting Failure.>	Repair the open circuit of the harness between starter relay connector and starter motor.

C: CHECK POWER SUPPLY AND GROUND LINE OF ENGINE CONTROL MODULE (ECM)

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.
WIRING DIAGRAM:

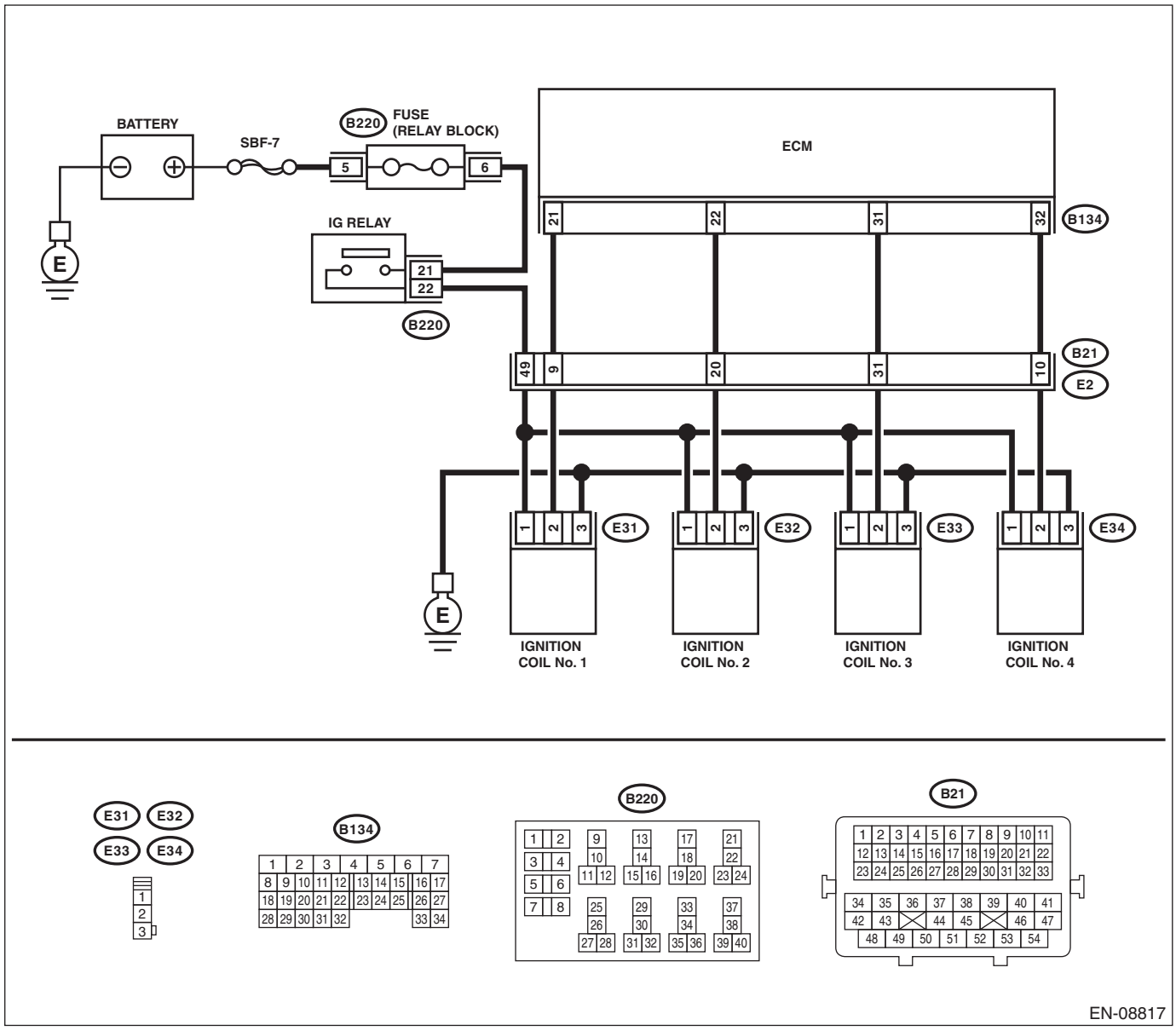


Step		Check	Yes	No
1	**CHECK MAIN RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the main relay. 3) Connect the battery to main relay terminals No. 39 and No. 40. 4) Measure the resistance between main relay terminals. ***Terminals*** ***No. 37 — No. 38:***	Is the resistance less than 1 Ω?	Go to step **2**.	Replace the main relay. <Ref. to FU(H4DO)-103, Main Relay.>

	Step	Check	Yes	No
2	**CHECK GROUND CIRCUIT FOR ECM.** 1) Disconnect the connector from ECM. 2) Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 3 — Chassis ground:*** ***(B134) No. 4 — Chassis ground:*** ***(B134) No. 6 — Chassis ground:*** ***(B137) No. 1 — Chassis ground:*** ***(B137) No. 3 — Chassis ground:***	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 of harness between ECM connector and engine ground terminal. • Poor contact of coupling connector
3	**CHECK INPUT VOLTAGE OF ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 2 (+) — Chassis ground (–):*** ***(B136) No. 30 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **4**.	Repair the open or ground short circuit of harness of power supply circuit.
4	**CHECK INPUT VOLTAGE OF MAIN RELAY.** Measure the voltage between main relay connector and chassis ground. ***Connector & terminal*** ***(B220) No. 37 (+) — Chassis ground (–):*** ***(B220) No. 39 (+) — 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) Turn the ignition switch to OFF. 2) Install the main relay. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 13 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **6**.	Repair the open circuit in harness between ECM and main relay connector.
6	**CHECK INPUT VOLTAGE OF ECM.** 1) Turn the ignition switch to OFF. 2) Connect the connector to ECM. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 1 (+) — Chassis ground (–):*** ***(B137) No. 7 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Check ignition control system. <Ref. to EN(H4DO)(diag)-77, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and main relay connector • Poor contact of main relay connector • Poor contact of ECM connector

D: IGNITION CONTROL SYSTEM

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, Inspection Mode.>.
WIRING DIAGRAM:

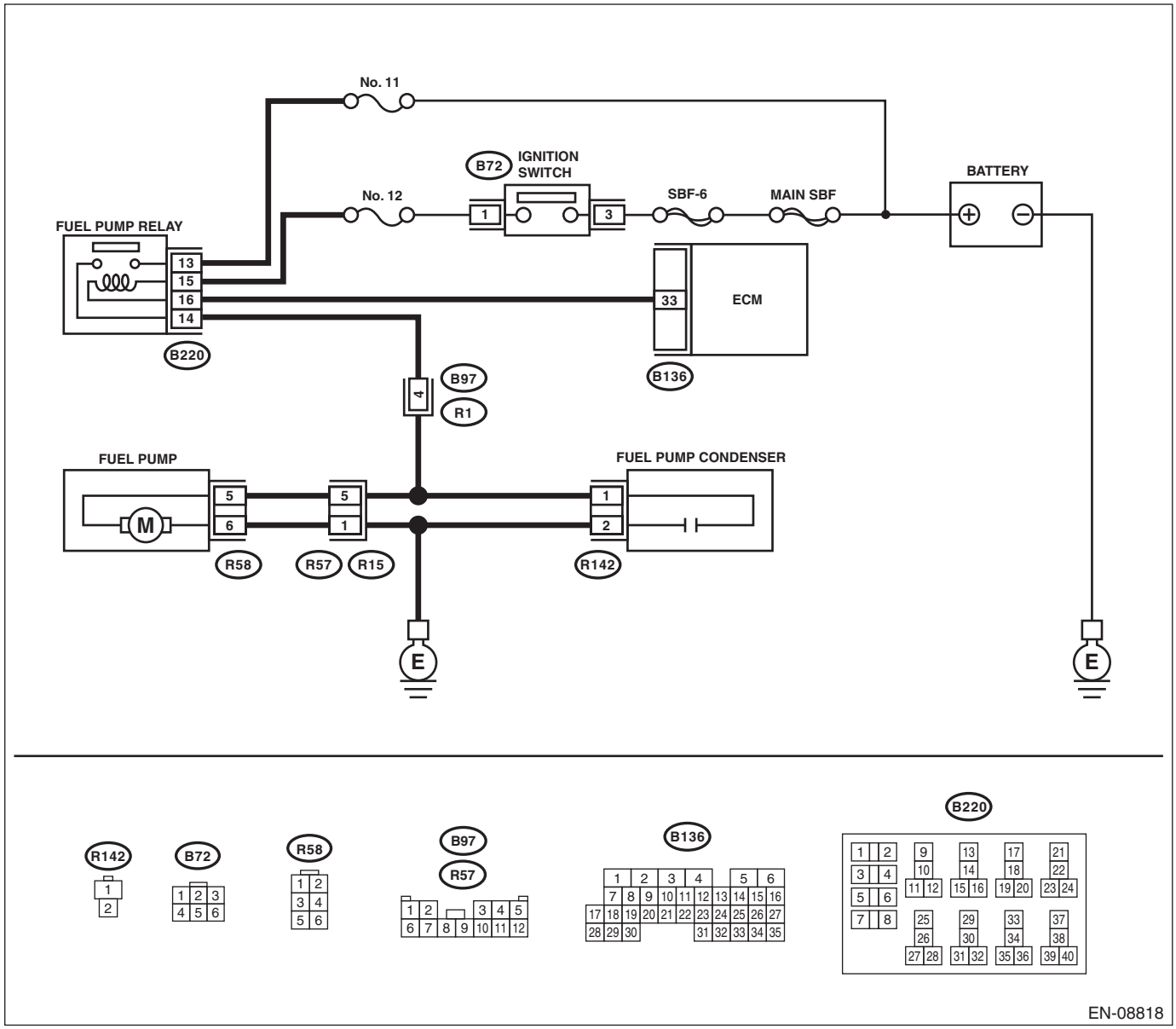


Step		Check	Yes	No
1	**CHECK SPARK PLUG CONDITION.** 1) Remove the spark plug. <Ref. to IG(H4DO)-4, REMOVAL, Spark Plug.> 2) Check the spark plug condition. <Ref. to IG(H4DO)-6, INSPECTION, Spark Plug.>	Is the spark plug condition normal?	Go to step **2**.	Replace the spark plug. <Ref. to IG(H4DO)-4, Spark Plug.>

	Step	Check	Yes	No
2	**CHECK IGNITION SYSTEM FOR SPARKS.** 1) Connect the spark plug to ignition coil. 2) Release the fuel pressure. <Ref. to FU(H4DO)-109, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.> 3) Contact the spark plug thread portion to 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(H4DO)(diag)-79, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>	Go to step **3**.
3	**CHECK IGNITION COIL POWER SUPPLY CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ignition coil. 3) Turn the ignition switch to ON. 4) Measure the voltage between ignition coil connector and engine ground. ***Connector & terminal*** ***(E31) No. 1 (+) — Engine ground (–):*** ***(E32) No. 1 (+) — Engine ground (–):*** ***(E33) No. 1 (+) — Engine ground (–):*** ***(E34) No. 1 (+) — 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 or short circuit to ground in harness of power supply circuit • Poor contact of coupling connector • Blown out of fuse
4	**CHECK HARNESS OF IGNITION COIL GROUND CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between ignition coil connector and engine ground. ***Connector & terminal*** ***(E31) No. 3 — Engine ground:*** ***(E32) No. 3 — Engine ground:*** ***(E33) No. 3 — Engine ground:*** ***(E34) No. 3 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **5**.	Repair the open circuit in harness between ignition coil connector and engine grounding terminal.
5	**CHECK HARNESS BETWEEN ECM AND IGNITION COIL CONNECTOR.** 1) Disconnect the connector from ECM. 2) Measure the resistance of harness between ECM and ignition coil connector. ***Connector & terminal*** ***(B134) No. 21 — (E31) No. 2:*** ***(B134) No. 22 — (E32) No. 2:*** ***(B134) No. 31 — (E33) No. 2:*** ***(B134) No. 32 — (E34) No. 2:***	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 of harness between ECM and ignition coil connector • Poor contact of coupling connector
6	**CHECK HARNESS BETWEEN ECM AND IGNITION COIL CONNECTOR.** Measure the resistance of harness between ECM and engine ground. ***Connector & terminal:*** ***(B134) No. 21 — Engine ground:*** ***(B134) No. 22 — Engine ground:*** ***(B134) No. 31 — Engine ground:*** ***(B134) No. 32 — Engine ground:***	Is the resistance 1 MΩ or more?	Go to step **7**.	Repair the ground short circuit of harness between ECM and ignition coil connector.
7	**CHECK FOR POOR CONTACT.** Check for poor contact of ECM connector.	Is there poor contact of ECM connector?	Repair the poor contact of ECM connector.	Replace the ignition coil. <Ref. to IG(H4DO)-9, Ignition Coil.>

E: FUEL PUMP CIRCUIT

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.
WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK OPERATING SOUND OF FUEL PUMP.** Check if the fuel pump operates for two seconds when turning the ignition switch to ON. NOTE: Fuel pump operation can be executed using the Subaru Select Monitor. For the procedures, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DO)(diag)-57, Compulsory Valve Operation Check Mode.>	Does the fuel pump emit operating sound?	Check the fuel injector circuit. <Ref. to EN(H4DO)(diag)-82, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>	Go to step **2**.

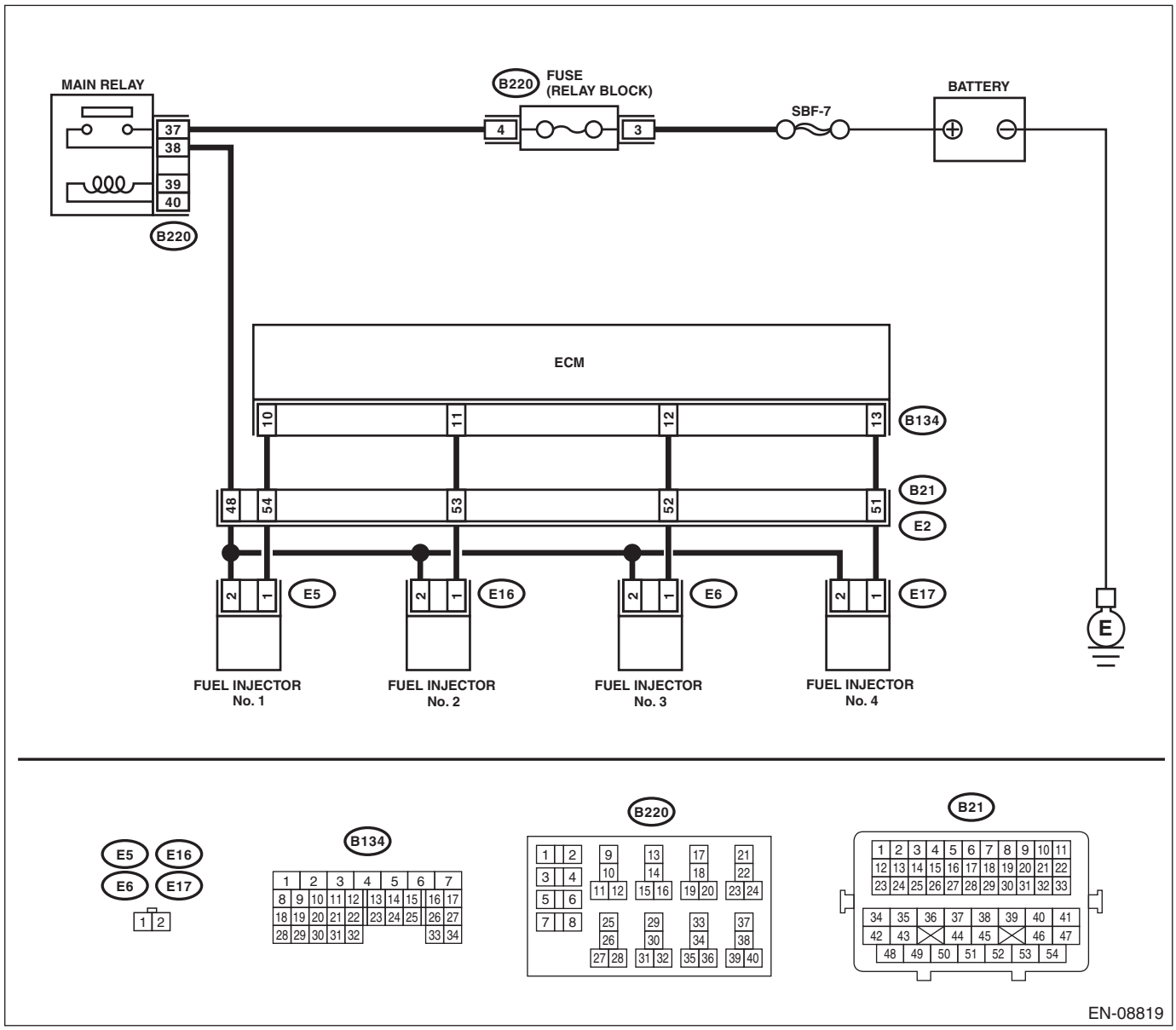
	Step	Check	Yes	No
2	**CHECK GROUND CIRCUIT OF FUEL PUMP.** 1) Turn the ignition switch to OFF. 2) Remove the fuel pump access hole lid. 3) Disconnect the connector from fuel pump. 4) Measure the resistance of harness between fuel pump and chassis ground. ***Connector & terminal*** ***(R58) No. 6 — Chassis ground:***	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 of coupling connector
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. 5 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Replace the fuel pump. <Ref. to FU(H4DO)-138, Fuel Pump.>	Go to step **4**.
4	**CHECK HARNESS BETWEEN FUEL PUMP AND FUEL PUMP RELAY CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between fuel pump connector and fuel pump relay connector. ***Connector & terminal*** ***(R58) No. 5 — (B220) No. 14:***	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 fuel pump relay connector • Poor contact of coupling connector
5	**CHECK HARNESS BETWEEN FUEL PUMP AND FUEL PUMP RELAY CONNECTOR.** Measure the resistance of harness between fuel pump connector and fuel pump relay connector. ***Connector & terminal*** ***(R58) No. 5 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **6**.	Repair the short circuit to ground in harness between fuel pump connector and fuel pump relay connector.
6	**CHECK FUEL PUMP RELAY.** 1) Remove the fuel pump relay. 2) Connect the battery to fuel pump relay terminals No. 15 and No. 16. 3) Measure the resistance between fuel pump relay terminals. ***Terminals*** ***No. 13 — No. 14:***	Is the resistance less than 1 Ω?	Go to step **7**.	Replace the fuel pump relay. <Ref. to FU(H4DO)-105, Fuel Pump Relay.>
7	**CHECK HARNESS BETWEEN ECM AND FUEL PUMP RELAY CONNECTOR.** 1) Disconnect the connector from ECM. 2) Measure the resistance of harness between ECM and fuel pump relay connector. ***Connector & terminal*** ***(B136) No. 33 — (B220) No. 16:***	Is the resistance less than 1 Ω?	Go to step **8**.	Repair the open circuit of harness between ECM and fuel pump relay connector.

	Step	Check	Yes	No
8	**CHECK POWER SUPPLY OF FUEL PUMP RELAY.** 1) Turn the ignition switch to ON. 2) Measure the voltage between fuel pump relay connector and chassis ground. ***Connector & terminal*** ***(B220) No. 13 (+) — Chassis ground (–):*** ***(B220) No. 15 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the poor contact of ECM connector.	Repair the open or ground short circuit of harness of power supply circuit.

F: FUEL INJECTOR CIRCUIT

CAUTION:
- **Check or repair only faulty parts.**
- **After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.**

WIRING DIAGRAM:



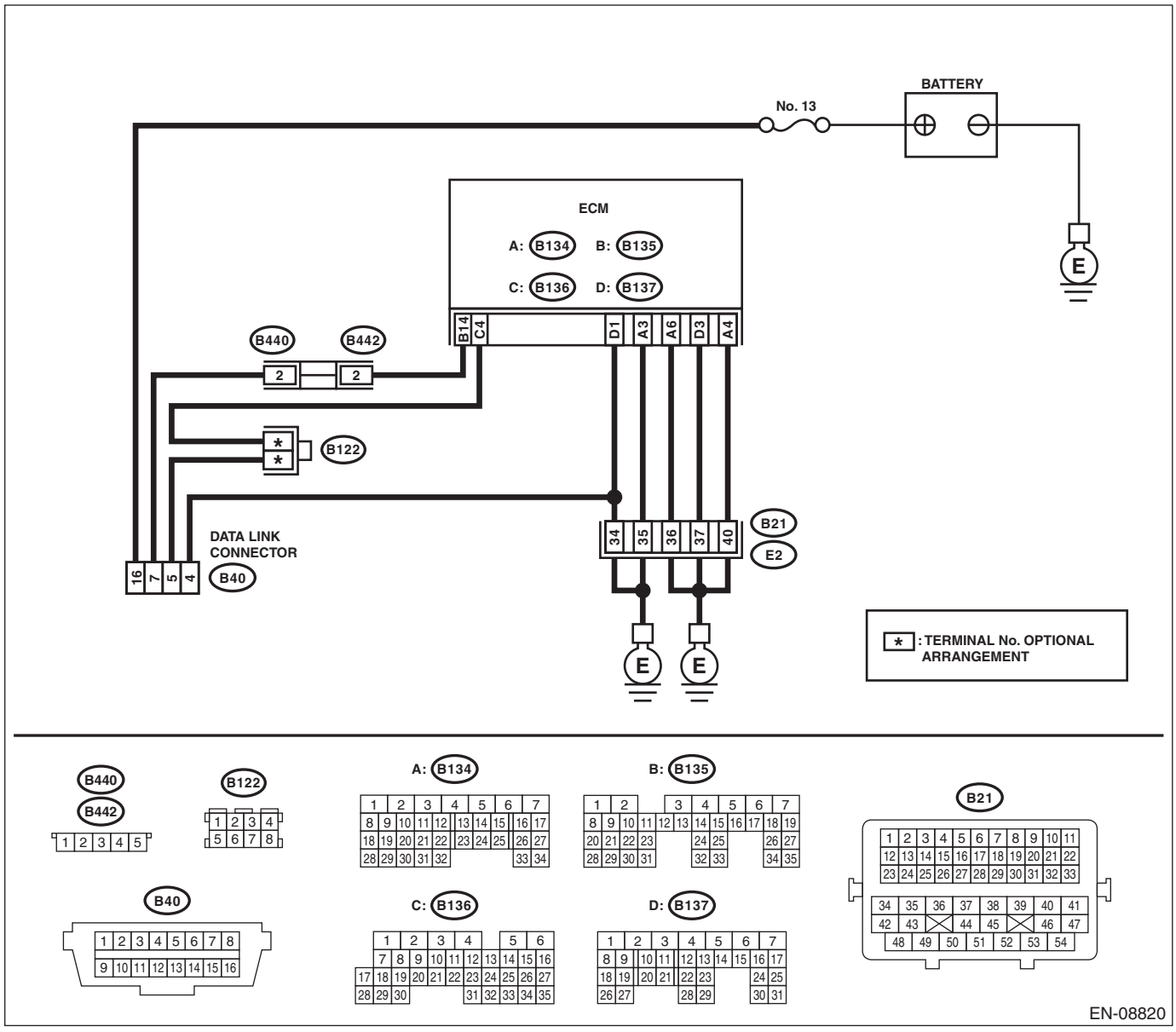
Step		Check	Yes	No
1	**CHECK OPERATION OF EACH FUEL INJECTOR.** While cranking the engine, check each fuel injector emits operating sound. Use a sound scope or attach a screwdriver to the injector to listen to sounds for this check.	Does the fuel pump emit operating sound?	Check the fuel pressure. <Ref. to ME(H4DO)-30, INSPECTION, Fuel Pressure.>	Go to step **2**.

	Step	Check	Yes	No
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 connector and fuel injector connector • Poor contact of main relay connector • Poor contact of coupling connector
3	**CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM and fuel injector connector. ***Connector & terminal*** ***#1 (B134) No. 10 — (E5) No. 1:*** ***#2 (B134) No. 11 — (E16) No. 1:*** ***#3 (B134) No. 12 — (E6) No. 1:*** ***#4 (B134) No. 13 — (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 of coupling connector
4	**CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***#1 (B134) No. 10 — Chassis ground:*** ***#2 (B134) No. 11 — Chassis ground:*** ***#3 (B134) No. 12 — Chassis ground:*** ***#4 (B134) No. 13 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **5**.	Repair the short circuit to ground in harness between ECM and fuel injector connector.
5	**CHECK EACH FUEL INJECTOR.** Measure the resistance between each fuel injector terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 5 — 20 Ω?	Go to step **6**.	Replace the faulty fuel injector. <Ref. to FU(H4DO)-78, Fuel Injector.>
6	**CHECK FOR POOR CONTACT.** Check for poor contact of ECM connector.	Is there poor contact of ECM connector?	Repair the poor contact of ECM connector.	Inspection using “General Diagnostic Table”. <Ref. to EN(H4DO)(diag)-326, INSPECTION, General Diagnostic Table.>

18.Diagnostic Procedure for Subaru Select Monitor Communication

A: COMMUNICATION FOR INITIALIZING IMPOSSIBLE

DIAGNOSIS:
Open or short circuit in data link connector
TROUBLE SYMPTOM:
Subaru Select Monitor communication failure
WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK POWER SUPPLY CIRCUIT.** Connect the SDI (Subaru Diagnosis Interface) or general scan tool to data link connector.	Does SDI or general scan tool turn ON?	Go to step **4**.	Go to step **2**.

	Step	Check	Yes	No
2	**CHECK 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 the power supply circuit. NOTE: In this case, repair the following item: • Open or ground short circuit of harness between battery and data link connector • Blown out of fuse (M/B No. 13)
3	**CHECK HARNESS BETWEEN DATA LINK CONNECTOR AND CHASSIS GROUND.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between data link connector and chassis ground. ***Connector & terminal*** ***(B40) No. 4 — Chassis ground:*** ***(B40) No. 5 — Chassis ground:***	Is the resistance less than 5 Ω?	Repair the poor contact of data link connector.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and data link connector • Open circuit of harness between ECM and engine ground • Poor contact of ECM connector • Poor contact of joint connector
4	**CHECK HARNESS BETWEEN ECM AND DATA LINK CONNECTOR.** 1) Disconnect the connector from ECM, TCM, VDC CM, airbag CM and body integrated unit. **CAUTION:** **When disconnecting the connector from airbag CM, always follow the precautions on AB section. <Ref. to AB-4, CAUTION, General Description.>** 2) Measure the resistance of harness between ECM and data link connector. ***Connector & terminal*** ***(B135) No. 14 — (B40) No. 7:***	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 of harness between ECM and data link connector • Poor contact of joint connector
5	**CHECK HARNESS BETWEEN ECM AND DATA LINK CONNECTOR.** Measure the resistance between data link connector and chassis ground. ***Connector & terminal*** ***(B40) No. 7 — Chassis ground:***	Is the resistance 1 MΩ or more?	Repair the poor contact of the ECM or data link connector.	Repair the ground short circuit of harness between ECM and data link connector.

19.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(H4DO)(diag)-93, 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 (Bank1)	<Ref. to EN(H4DO)(diag)-101, DTC P0016 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0018	Crankshaft Position - Camshaft Position Correlation (Bank2)	<Ref. to EN(H4DO)(diag)-109, DTC P0018 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0021	Intake Camshaft Position - Timing Over-Advanced or System Performance (Bank 2)	<Ref. to EN(H4DO)(diag)-117, 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(H4DO)(diag)-125, 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(H4DO)(diag)-127, 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(H4DO)(diag)-129, 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(H4DO)(diag)-131, 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(H4DO)(diag)-133, 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(H4DO)(diag)-135, 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(H4DO)(diag)-136, 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(H4DO)(diag)-137, 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(H4DO)(diag)-139, 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(H4DO)(diag)-141, 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(H4DO)(diag)-143, 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(H4DO)(diag)-145, 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(H4DO)(diag)-146, DTC P0112 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Note
P0113	Intake Air Temperature Sensor 1 Circuit High	<Ref. to EN(H4DO)(diag)-148, 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(H4DO)(diag)-150, DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0118	Engine Coolant Temperature Circuit High	<Ref. to EN(H4DO)(diag)-152, 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(H4DO)(diag)-154, 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(H4DO)(diag)-156, 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(H4DO)(diag)-158, 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(H4DO)(diag)-159, 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(H4DO)(diag)-160, 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(H4DO)(diag)-161, 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(H4DO)(diag)-163, 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(H4DO)(diag)-165, 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(H4DO)(diag)-166, 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(H4DO)(diag)-168, 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(H4DO)(diag)-170, 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(H4DO)(diag)-172, 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 (Bank1 Sensor2)	<Ref. to EN(H4DO)(diag)-174, DTC P0140 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK1 SENSOR2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0141	O2 Sensor Heater Circuit (Bank1 Sensor2)	<Ref. to EN(H4DO)(diag)-176, DTC P0141 O2 SENSOR HEATER CIRCUIT (BANK1 SENSOR2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0171	System Too Lean (Bank 1)	<Ref. to EN(H4DO)(diag)-176, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0172	System Too Rich (Bank 1)	<Ref. to EN(H4DO)(diag)-177, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Note
P0196	Engine Oil Temperature Sensor Circuit Range/Performance	<Ref. to EN(H4DO)(diag)-179, 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(H4DO)(diag)-180, DTC P0197 ENGINE OIL TEMPERATURE SENSOR LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0198	Engine Oil Temperature Sensor High	<Ref. to EN(H4DO)(diag)-182, 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(H4DO)(diag)-184, 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(H4DO)(diag)-186, 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(H4DO)(diag)-188, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0302	Cylinder 2 Misfire Detected	<Ref. to EN(H4DO)(diag)-188, DTC P0302 CYLINDER 2 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0303	Cylinder 3 Misfire Detected	<Ref. to EN(H4DO)(diag)-188, DTC P0303 CYLINDER 3 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0304	Cylinder 4 Misfire Detected	<Ref. to EN(H4DO)(diag)-189, 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(H4DO)(diag)-194, 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(H4DO)(diag)-196, 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(H4DO)(diag)-198, 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(H4DO)(diag)-200, 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(H4DO)(diag)-201, 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(H4DO)(diag)-203, DTC P0345 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0400	Exhaust Gas Recirculation Flow	<Ref. to EN(H4DO)(diag)-205, DTC P0400 EXHAUST GAS RECIRCULATION FLOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0420	Catalyst System Efficiency Below Threshold (Bank 1)	<Ref. to EN(H4DO)(diag)-206, DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0441	Evaporative Emission Cont. Sys. Incorrect Purge Flow	<Ref. to EN(H4DO)(diag)-210, DTC P0441 EVAPORATIVE EMISSION CONT. SYS. INCORRECT PURGE FLOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0451	Evaporative Emission System Pressure Sensor/Switch Range/Performance	<Ref. to EN(H4DO)(diag)-211, DTC P0451 EVAPORATIVE EMISSION SYSTEM PRESSURE SENSOR/SWITCH RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0452	Evaporative Emission System Pressure Sensor/Switch Low	<Ref. to EN(H4DO)(diag)-212, DTC P0452 EVAPORATIVE EMISSION SYSTEM PRESSURE SENSOR/SWITCH LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0453	Evaporative Emission System Pressure Sensor/Switch High	<Ref. to EN(H4DO)(diag)-214, DTC P0453 EVAPORATIVE EMISSION SYSTEM PRESSURE SENSOR/SWITCH HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Note
P0455	Evaporative Emission System Leak Detected (Large Leak)	<Ref. to EN(H4DO)(diag)-216, DTC P0455 EVAPORATIVE EMISSION SYSTEM LEAK DETECTED (LARGE LEAK), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0456	Evaporative Emission Control System Leak Detected (Very Small Leak)	<Ref. to EN(H4DO)(diag)-217, DTC P0456 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0458	Evaporative Emission System Purge Control Valve Circuit Low	<Ref. to EN(H4DO)(diag)-218, 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(H4DO)(diag)-220, 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(H4DO)(diag)-222, 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(H4DO)(diag)-222, 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(H4DO)(diag)-223, DTC P0463 FUEL LEVEL SENSOR “A” CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0500	Vehicle Speed Sensor “A”	<Ref. to EN(H4DO)(diag)-224, DTC P0500 VEHICLE SPEED SENSOR “A”, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0506	Idle Air Control System RPM Lower Than Expected	<Ref. to EN(H4DO)(diag)-225, 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(H4DO)(diag)-226, DTC P0507 IDLE AIR CONTROL SYSTEM RPM HIGHER THAN EXPECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P050A	Cold Start Idle Air Control System Performance	<Ref. to EN(H4DO)(diag)-227, DTC P050A COLD START IDLE AIR CONTROL SYSTEM PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P050B	Cold Start Ignition Timing Performance	<Ref. to EN(H4DO)(diag)-235, DTC P050B COLD START IGNITION TIMING PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0512	Starter Request Circuit	<Ref. to EN(H4DO)(diag)-236, DTC P0512 STARTER REQUEST CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0513	Incorrect Immobilizer Key	<Ref. to IM(diag)-15, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0604	Internal Control Module Random Access Memory (RAM) Error	<Ref. to EN(H4DO)(diag)-238, 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(H4DO)(diag)-238, DTC P0605 INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0607	Throttle Control System Circuit Range/Performance	<Ref. to EN(H4DO)(diag)-239, DTC P0607 THROTTLE CONTROL SYSTEM CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0638	Throttle Actuator Control Range/Performance (Bank 1)	<Ref. to EN(H4DO)(diag)-240, DTC P0638 THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0700	Transmission Control System (MIL Request)	<Ref. to EN(H4DO)(diag)-240, 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(H4DO)(diag)-241, DTC P0851 PARK/NEUTRAL SWITCH INPUT CIRCUIT LOW (AT MODEL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

List of Diagnostic Trouble Code (DTC)

DTC	Item	Note
P0851	Neutral Switch Input Circuit Low (MT Model)	<Ref. to EN(H4DO)(diag)-243, 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(H4DO)(diag)-245, DTC P0852 PARK/NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT MODEL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0852	Neutral Switch Input Circuit High (MT Model)	<Ref. to EN(H4DO)(diag)-247, DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT MODEL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1152	O2 Sensor Circuit Range/Performance (Low) (Bank1 Sensor1)	<Ref. to EN(H4DO)(diag)-249, DTC P1152 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK1 SENSOR1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1153	O2 Sensor Circuit Range/Performance (High) (Bank1 Sensor1)	<Ref. to EN(H4DO)(diag)-251, DTC P1153 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1160	Return Spring Failure	<Ref. to EN(H4DO)(diag)-252, DTC P1160 RETURN SPRING FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1449	Evaporative Emission Cont. Sys. Air Filter Clog	<Ref. to EN(H4DO)(diag)-253, DTC P1449 EVAPORATIVE EMISSION CONT. SYS. AIR FILTER CLOG, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1451	Evaporative Emission Cont. Sys.	<Ref. to EN(H4DO)(diag)-254, DTC P1451 EVAPORATIVE EMISSION CONT. SYS., Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1492	EGR Solenoid Valve Signal #1 Circuit Malfunction (Low Input)	<Ref. to EN(H4DO)(diag)-255, DTC P1492 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1493	EGR Solenoid Valve Signal #1 Circuit Malfunction (High Input)	<Ref. to EN(H4DO)(diag)-255, 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(H4DO)(diag)-255, 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(H4DO)(diag)-255, 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(H4DO)(diag)-255, 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(H4DO)(diag)-255, 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(H4DO)(diag)-256, 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(H4DO)(diag)-259, 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(H4DO)(diag)-262, DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1560	Back-Up Voltage Circuit Malfunction	<Ref. to EN(H4DO)(diag)-264, DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1570	Antenna	<Ref. to IM(diag)-16, DTC P1570 ANTENNA, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1571	Reference Code Incompatibility	<Ref. to IM(diag)-18, DTC P1571 REFERENCE CODE INCOMPATIBILITY, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Note
P1572	IMM Circuit Failure (Except Antenna Circuit)	<Ref. to IM(diag)-19, DTC P1572 IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1574	Key Communication Failure	<Ref. to IM(diag)-22, DTC P1574 KEY COMMUNICATION FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1576	EGI Control Module EEPROM	<Ref. to IM(diag)-23, DTC P1576 EGI CONTROL MODULE EEPROM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1577	IMM Control Module EEPROM	<Ref. to IM(diag)-24, DTC P1577 IMM CONTROL MODULE EEPROM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1578	Meter Failure	<Ref. to IM(diag)-25, DTC P1578 METER FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2004	Intake Manifold Runner Control Stuck Open (Bank 1)	<Ref. to EN(H4DO)(diag)-266, DTC P2004 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2005	Intake Manifold Runner Control Stuck Open (Bank 2)	<Ref. to EN(H4DO)(diag)-266, 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(H4DO)(diag)-267, 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(H4DO)(diag)-267, DTC P2007 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2009	Intake Manifold Runner Control Circuit Low (Bank 1)	<Ref. to EN(H4DO)(diag)-268, DTC P2009 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2012	Intake Manifold Runner Control Circuit Low (Bank 2)	<Ref. to EN(H4DO)(diag)-270, DTC P2012 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2088	Intake Camshaft Position Actuator Control Circuit Low (Bank 1)	<Ref. to EN(H4DO)(diag)-272, DTC P2088 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2089	Intake Camshaft Position Actuator Control Circuit High (Bank 1)	<Ref. to EN(H4DO)(diag)-274, DTC P2089 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2092	Intake Camshaft Position Actuator Control Circuit Low (Bank 2)	<Ref. to EN(H4DO)(diag)-276, DTC P2092 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2093	Intake Camshaft Position Actuator Control Circuit High (Bank 2)	<Ref. to EN(H4DO)(diag)-278, 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(H4DO)(diag)-280, 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(H4DO)(diag)-286, 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(H4DO)(diag)-292, 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(H4DO)(diag)-297, 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(H4DO)(diag)-299, DTC P2103 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Note
P2109	Throttle/Pedal Position Sensor “A” Minimum Stop Performance	<Ref. to EN(H4DO)(diag)-300, 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(H4DO)(diag)-301, 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(H4DO)(diag)-303, 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(H4DO)(diag)-305, 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(H4DO)(diag)-307, 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(H4DO)(diag)-309, 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(H4DO)(diag)-312, DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D”/“E” VOLTAGE CORRELATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2401	Evaporative Emission System Leak Detection Pump Control Circuit Low	<Ref. to EN(H4DO)(diag)-314, DTC P2401 EVAPORATIVE EMISSION SYSTEM LEAK DETECTION PUMP CONTROL CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2402	Evaporative Emission System Leak Detection Pump Control Circuit High	<Ref. to EN(H4DO)(diag)-316, DTC P2402 EVAPORATIVE EMISSION SYSTEM LEAK DETECTION PUMP CONTROL CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2404	Evaporative Emission System Leak Detection Pump Sense Circuit Range/Performance	<Ref. to EN(H4DO)(diag)-318, DTC P2404 EVAPORATIVE EMISSION SYSTEM LEAK DETECTION PUMP SENSE CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2419	Evaporative Emission System Switching Valve Control Circuit Low	<Ref. to EN(H4DO)(diag)-321, 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(H4DO)(diag)-323, DTC P2420 EVAPORATIVE EMISSION SYSTEM SWITCHING VALVE CONTROL CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2610	ECM/PCM Internal Engine Off Timer Performance	<Ref. to EN(H4DO)(diag)-325, DTC P2610 ECM/PCM INTERNAL ENGINE OFF TIMER PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
U0073	CAN Failure, Bus ‘OFF’ Detection	<Ref. to EN(H4DO)(diag)-325, DTC U0073 CAN FAILURE, BUS ‘OFF’ DETECTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
U0101	CAN (TCU) Data not Loaded	<Ref. to EN(H4DO)(diag)-325, DTC U0101 CAN (TCU) DATA NOT LOADED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
U0122	CAN (VDC) Data not Loaded	<Ref. to EN(H4DO)(diag)-325, DTC U0122 CAN (VDC) DATA NOT LOADED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
U0140	CAN (BCU) Data not Loaded	<Ref. to EN(H4DO)(diag)-325, DTC U0140 CAN (BCU) DATA NOT LOADED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
U0402	CAN (TCU) Data Abnormal	<Ref. to EN(H4DO)(diag)-325, DTC U0402 CAN (TCU) DATA ABNORMAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
U0416	CAN (VDC) Data Abnormal	<Ref. to EN(H4DO)(diag)-325, DTC U0416 CAN (VDC) DATA ABNORMAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
U0422	CAN (BCU) Data Abnormal	<Ref. to EN(H4DO)(diag)-325, DTC U0422 CAN (BCU) DATA ABNORMAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

20.Diagnostic Procedure with Diagnostic Trouble Code (DTC)

A: DTC P0011 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1)

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-9, DTC P0011 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

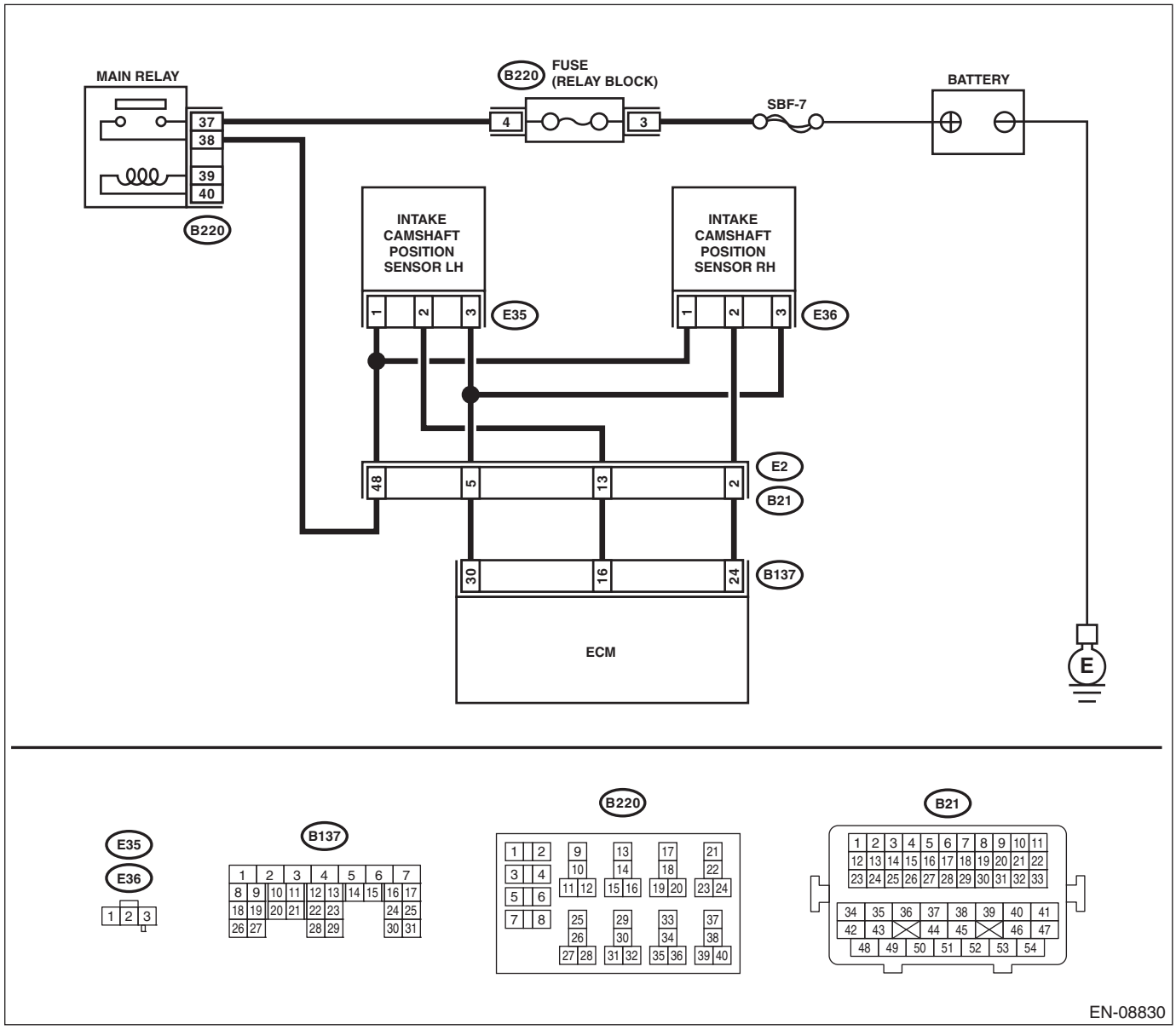
TROUBLE SYMPTOM:

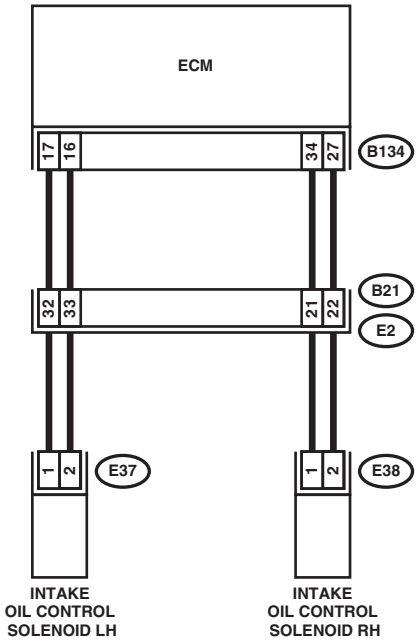
- Engine stalls.
- Improper idling

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

Wiring diagram:

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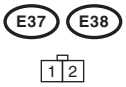
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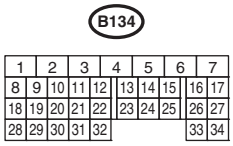
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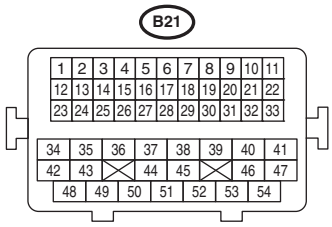
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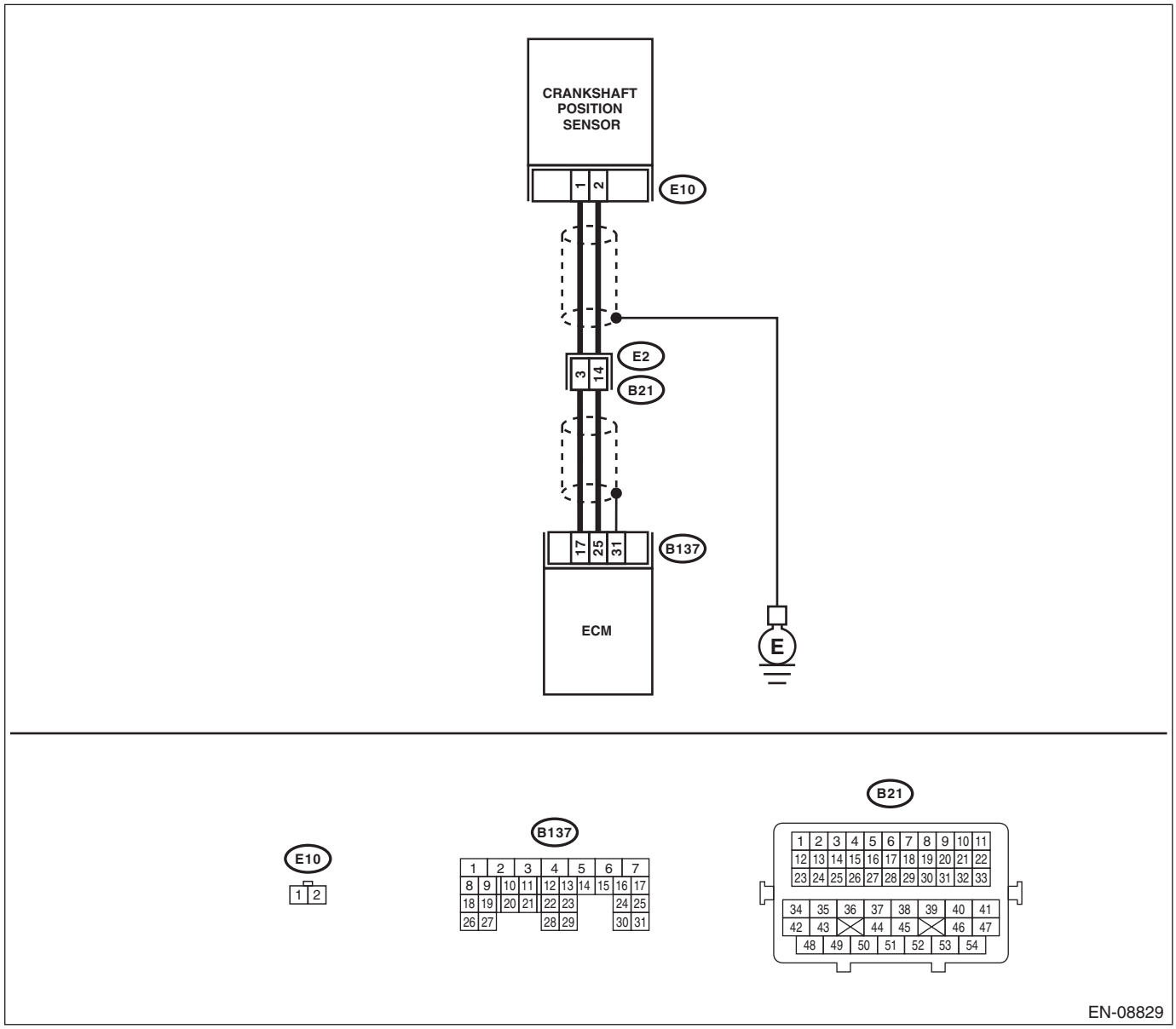
EN-08836



Step		Check	Yes	No
1	**CHECK DTC.** Read the engine DTC using the Subaru Select Monitor or general scan tool. <Ref. to EN(H4DO)(diag)-42, Read Diagnostic Trouble Code (DTC).>	Is DTC other than P0011 displayed? (Current malfunction)	Check the appropriate DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DO)(diag)-86, List of Diagnostic Trouble Code (DTC).>	Save the freeze frame data. <Ref. to EN(H4DO)(diag)-41, READ FREEZE FRAME DATA FOR ENGINE (OBD MODE), OPERATION, Subaru Select Monitor.> Go to step **2**.

	Step	Check	Yes	No
2	**CHECK ENGINE OIL CONDITION.** Check the engine oil condition. NOTE: Check the following items. • Oil amount is within the specified range • Occurrence of abnormal dirt • Coagulation due to additives • Use of oil with specified viscosity	Is the check result OK?	Go to step **3**.	Adjust oil amount or replace the engine oil and oil filter. <Ref. to LU(H4DO)-11, Engine Oil.> <Ref. to LU(H4DO)-28, Engine Oil Filter.> Go to step **3**.
3	**CHECK ON-BOARD MONITOR TEST RESULTS.** 1) Replace the intake oil control solenoid RH. <Ref. to FU(H4DO)-65, Oil Control Valve.> 2) Perform the Clear Memory Mode for the engine using the Subaru Select Monitor or a general scan tool. <Ref. to EN(H4DO)(diag)-56, Clear Memory Mode.> 3) Perform drive cycle T. <Ref. to EN(H4DO)(diag)-48, Drive Cycle.> 4) Read values of «VVT Monitor Bank 1» and «VVT Monitor Bank 2» according to MODE$06 reading procedures using the Subaru Select Monitor or general scan tool. <Ref. to EN(H4DO)(diag)-32, MODE $06, OPERATION, General Scan Tool.> **CAUTION:** **• When performing driving cycle, there should be 2 persons (driver and checker) and the checker should perform the data check.** **• When performing the drive cycle on the public road, be very careful of the traffic condition and the safe driving must be the high priority.** NOTE: • When the diagnostic value is 0, the diagnosis is incomplete. Therefore, do not stop the engine and perform the drive cycle again. • Diagnostic values are updated repeatedly, and therefore, always check the data while diagnostic values are being read. 5) Record the read values in «VVT Monitor Bank 1» and «VVT Monitor Bank 2».	Is the value in «VVT Monitor Bank 1» of the replaced oil control solenoid 1000 or more?	Go to step **5**.	Go to step **4**.
4	**CHECK ON-BOARD MONITOR TEST RESULTS.** Compare the values in «VVT Monitor Bank 1» and «VVT Monitor Bank 2» recorded in step 3.	Is the value in «VVT Monitor Bank 1» 1000 or less, and also larger than the value (value in «VVT Monitor Bank 2» ×1.5+100) compared to the value in «VVT Monitor Bank 2»?	Go to step **5**.	Idle the engine for five minutes, and then replace (flush) the oil filter and engine oil. <Ref. to LU(H4DO)-11, Engine Oil.> <Ref. to LU(H4DO)-28, Engine Oil Filter.> Go to step **14**.

	Step	Check	Yes	No
5	**CHECK HARNESS AND CONNECTOR.** Check the harness and connector for bending, damage and poor contact. NOTE: Check the following items. • ECM <Ref. to FU(H4DO)-101, Engine Control Module (ECM).> • Oil control solenoid <Ref. to FU(H4DO)-65, Oil Control Valve.> • Camshaft position sensor <Ref. to FU(H4DO)-51, Camshaft Position Sensor.> • Crankshaft position sensor <Ref. to FU(H4DO)-46, Crankshaft Position Sensor.>	Is the check result OK?	Go to step **6**.	Repair or replace faulty parts. <Ref. to FU(H4DO)-101, Engine Control Module (ECM).> <Ref. to FU(H4DO)-65, Oil Control Valve.> <Ref. to FU(H4DO)-51, Camshaft Position Sensor.> <Ref. to FU(H4DO)-46, Crankshaft Position Sensor.> Go to step **6**.
6	**CHECK HARNESS AND CONNECTOR (OPEN CIRCUIT).** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from the intake oil control solenoid RH. 4) Measure the resistance of harness between ECM connector and intake oil control solenoid RH connector. ***Connector & terminal*** ***(B134) No. 27 — (E38) No. 2:***	Is the resistance 1 Ω or less?	Go to step **7**.	Repair or replace faulty parts. Go to step **14**.
7	**CHECK HARNESS AND CONNECTOR (OPEN CIRCUIT).** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from the intake camshaft position sensor RH. 4) Measure the resistance between intake camshaft position sensor RH connector and ECM connector. ***Connector & terminal*** ***(B137) No. 24 — (E36) No. 2:***	Is the resistance 1 Ω or less?	Go to step **8**.	Repair or replace faulty parts. Go to step **14**.
8	**CHECK HARNESS AND CONNECTOR (OPEN CIRCUIT).** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from the crankshaft position sensor. 4) Measure the resistance between crankshaft position sensor connector and ECM connector. ***Connector & terminal*** ***(B137) No. 17 — (E10) No. 1:***	Is the resistance 1 Ω or less?	Go to step **9**.	Repair or replace faulty parts. Go to step **14**.
9	**CHECK ENGINE OIL PRESSURE.** Check the engine oil pressure. <Ref. to ME(H4DO)-28, Engine Oil Pressure.>	Is the engine oil pressure normal?	Go to step **11**.	Go to step **10**.

	Step	Check	Yes	No
10	**CHECK OIL STRAINER.** Check the oil strainer. <Ref. to LU(H4DO)-15, Oil Pan and Strainer.>	Are there any foreign matter mixed in oil strainer in the oil pan?	Check and clean inside the oil strainer. <Ref. to LU(H4DO)-15, Oil Pan and Strainer.> Go to step **11**.	Replace the chain cover. <Ref. to ME(H4DO)-91, Chain Cover.> **CAUTION:** **Excessive application of liquid gasket during assembly of the chain cover may cause malfunction. Use the type specified in the service manual and apply appropriate amount (wire diameter). <Ref. to ME(H4DO)-96, INSTALLATION, Chain Cover.>** Go to step **12**.
11	**CHECK OIL PASSAGES OF CHAIN COVER.** 1) Remove the engine from the vehicle. <Ref. to ME(H4DO)-44, Engine Assembly.> 2) Check oil passages of chain cover. <Ref. to ME(H4DO)-91, Chain Cover.> NOTE: Check that the following oil passages have O-rings and that there is no foreign matter. • Inlet port of oil pump • Discharge port of oil pump • Each O ring at passages to left and right cylinder heads • Oil control solenoid • Entry of foreign matter	Is the check result OK?	Go to step **12**.	Replace the defective parts. Replace the chain cover in the case of foreign matter entry. <Ref. to ME(H4DO)-91, Chain Cover.> Go to step **12**.
12	**CHECK THE CONDITION OF CAMSHAFT.** 1) Remove the timing chain. <Ref. to ME(H4DO)-109, REMOVAL, Timing Chain Assembly.> 2) Rotate the camshaft by hand to compare the rotation resistances of the four shafts. NOTE: Compare rotational resistance with the camshaft in bank 2 and check the following items to see if there is any obvious fault such as unsmoothness of the camshaft in bank 1 and rotational resistance. • Foreign matter adhered to the camshaft • Damage to camshaft (scratch, scuffed, wear, etc.) • Check of influence of cam journal bearing not rotating properly	Is the check result OK?	Go to step **13**.	Replace the cam carrier and the camshaft. <Ref. to ME(H4DO)-152, Cam Carrier.> <Ref. to ME(H4DO)-151, Camshaft.> Go to step **13**.

	Step	Check	Yes	No
13	**CHECK OIL PASSAGES BETWEEN OIL PUMP AND OIL CONTROL SOLENOID.** Visually check the following portions of oil passages connecting oil pump to oil control solenoid to see if there is any obvious fault such as adherence of foreign matter and clogging. • Oil passage of the cam carrier • Oil passage of the cylinder head side • Oil passage from cam sprocket to camshaft connecting section • Oil passage of the sprocket back side with the sprocket removed, and the camshaft end NOTE: Refer to the removal procedure of cam carrier in the service manual. <Ref. to ME(H4DO)-152, REMOVAL, Cam Carrier.>	Is the check result OK?	Replace the sprocket. <Ref. to ME(H4DO)-129, REMOVAL, Cam Sprocket.> **CAUTION:** **• Excessive application of liquid gasket during assembly of the chain cover may cause malfunction. Use the type specified in the service manual and apply appropriate amount (wire diameter). <Ref. to ME(H4DO)-96, INSTALLATION, Chain Cover.>** **• Push the oil filter until it becomes flush with the cam carrier surface. (Do not push excessively.) <Ref. to ME(H4DO)-186, ASSEMBLY, Cam Carrier.>** Go to step **14**.	Remove the foreign matter. Replace the cam carrier oil filter. <Ref. to ME(H4DO)-152, Cam Carrier.> **CAUTION:** **• Excessive application of liquid gasket during assembly of the chain cover may cause malfunction. Use the type specified in the service manual and apply appropriate amount (wire diameter). <Ref. to ME(H4DO)-96, INSTALLATION, Chain Cover.>** **• Push the oil filter until it becomes flush with the cam carrier surface. (Do not push excessively.) <Ref. to ME(H4DO)-186, ASSEMBLY, Cam Carrier.>** NOTE: After the procedure is finished, idle the engine for five minutes, and then replace (flush) the oil filter and engine oil. <Ref. to LU(H4DO)-11, Engine Oil.> <Ref. to LU(H4DO)-28, Engine Oil Filter.> Go to step **14**.

	Step	Check	Yes	No
14	**CHECK ON-BOARD MONITOR TEST RESULTS.** 1) Perform the Clear Memory Mode for the engine using the Subaru Select Monitor or a general scan tool. <Ref. to EN(H4DO)(diag)-56, Clear Memory Mode.> 2) Perform drive cycle T. <Ref. to EN(H4DO)(diag)-48, Drive Cycle.> 3) Read values of «VVT Monitor Bank 1» and «VVT Monitor Bank 2» according to MODE$06 reading procedures using the Subaru Select Monitor or general scan tool. <Ref. to EN(H4DO)(diag)-32, MODE $06, OPERATION, General Scan Tool.> **CAUTION:** **• When performing driving cycle, there should be 2 persons (driver and checker) and the checker should perform the data check.** **• When performing the drive cycle on the public road, be very careful of the traffic condition and the safe driving must be the high priority.** NOTE: • When the diagnostic value is 0, the diagnosis is incomplete. Therefore, do not stop the engine and perform the drive cycle again. • Diagnostic values are updated repeatedly, and therefore, always check the data while diagnostic values are being read. 4) Record the read values in «VVT Monitor Bank 1» and «VVT Monitor Bank 2».	Is the value in «VVT Monitor Bank 1» 1000 or more?	Replace the ECM. <Ref. to FU(H4DO)-101, Engine Control Module (ECM).>	Go to step **15**.
15	**CHECK CURRENT DATA.** Compare the values in «VVT Monitor Bank 1» and «VVT Monitor Bank 2» recorded in step 14.	Is the value in «VVT Monitor Bank 1» 1000 or less, and also larger than the value (value in «VVT Monitor Bank 2» ×1.5+100) compared to the value in «VVT Monitor Bank 2»?	Replace the ECM. <Ref. to FU(H4DO)-101, Engine Control Module (ECM).>	End.

B: DTC P0016 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK1)

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-11, DTC P0016 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

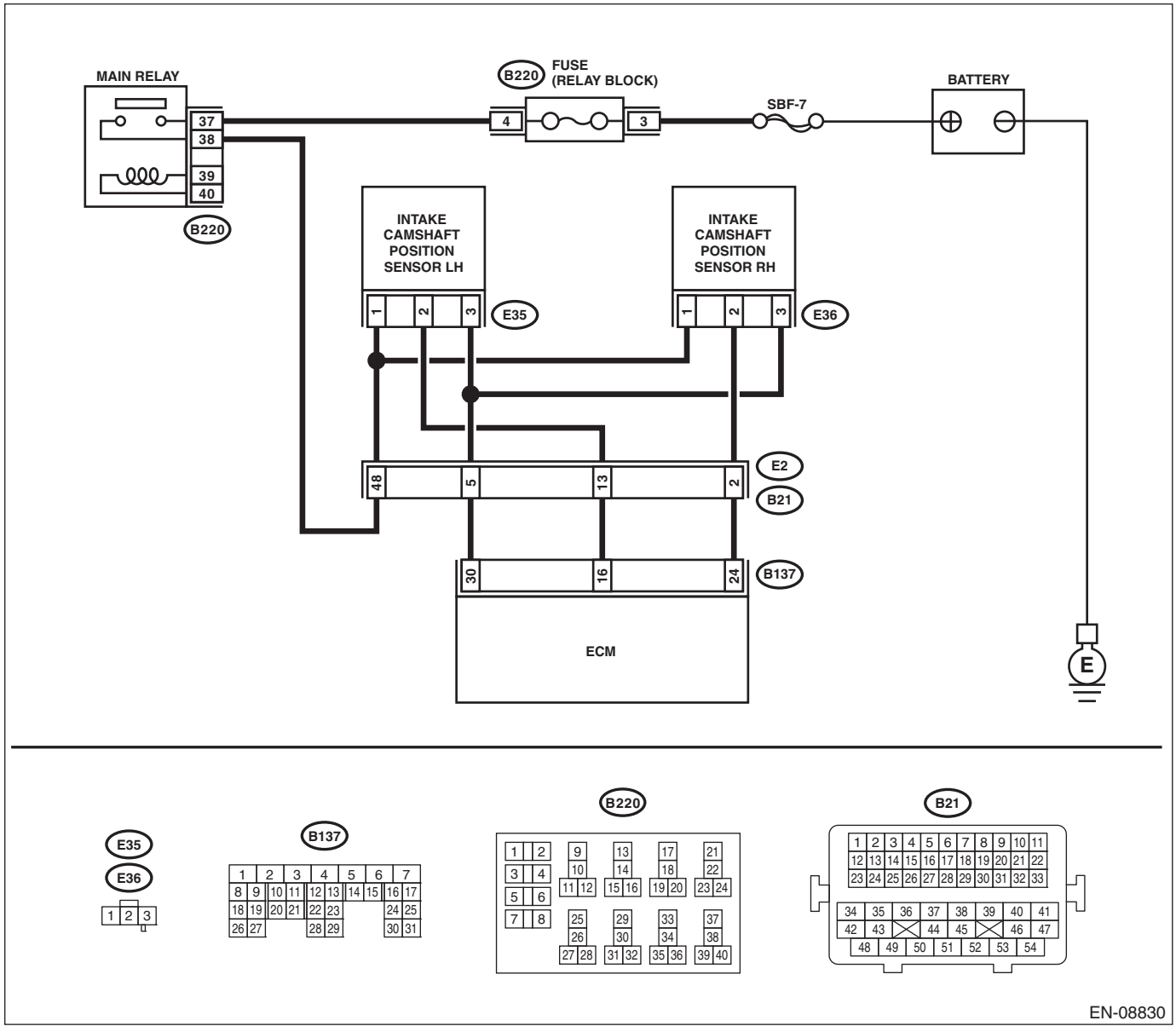
TROUBLE SYMPTOM:

- Engine stalls.
- Improper idling

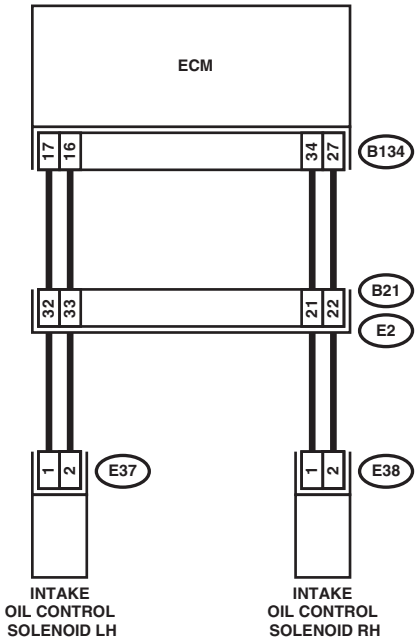
CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

Wiring diagram:



EN-08830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B21
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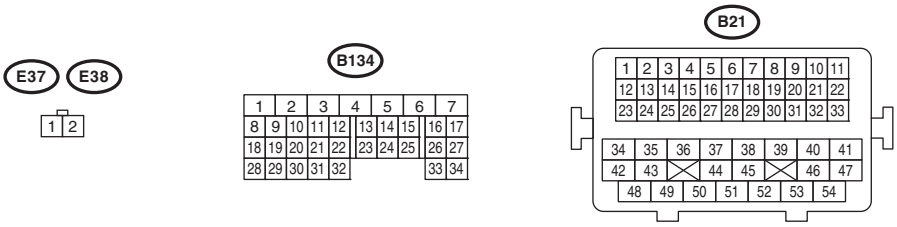
OIL CONTROL
SOLENOID LH
INTAKE
OIL CONTROL
SOLENOID RH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E38
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B21
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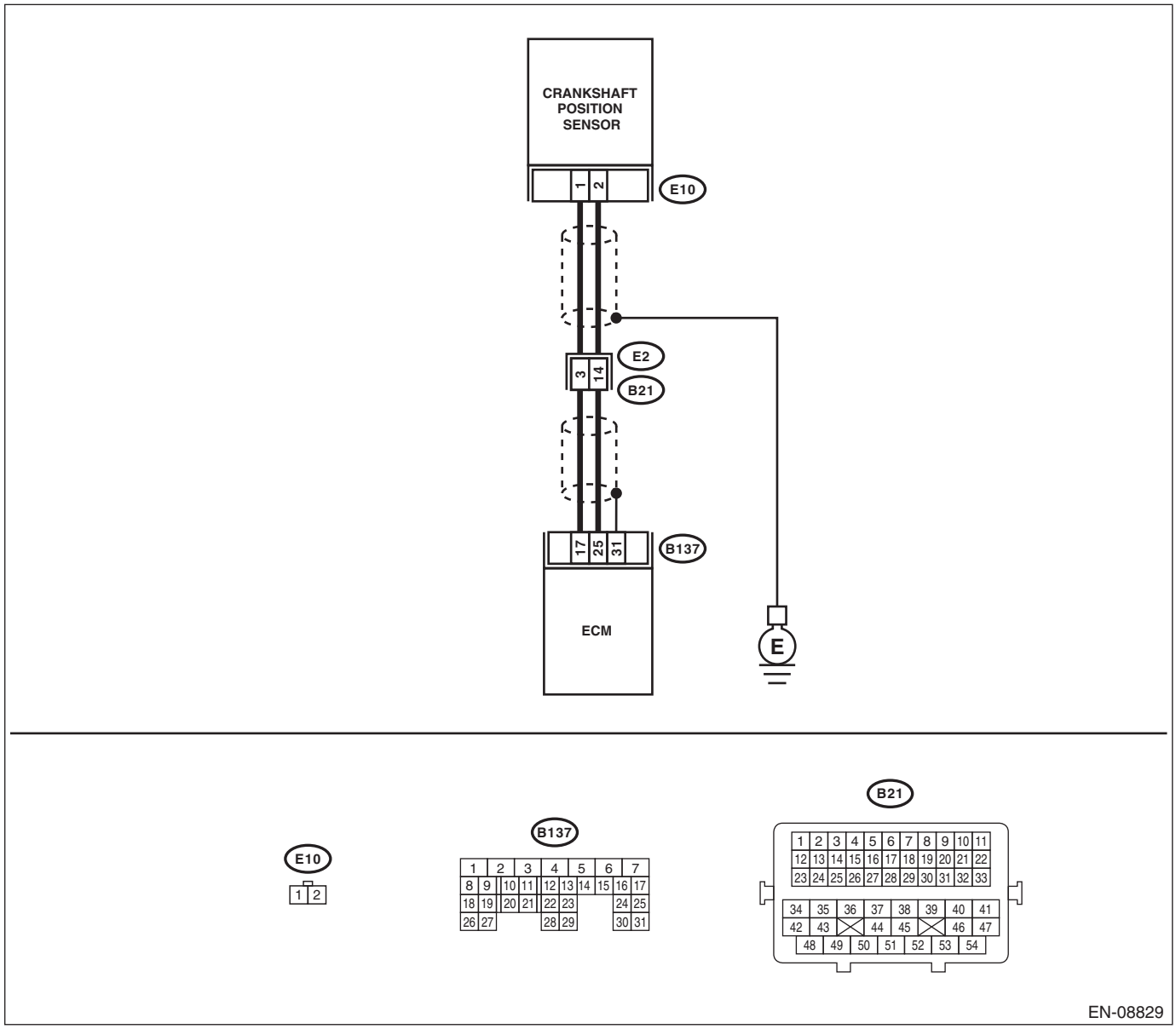
EN-08836



	Step	Check	Yes	No
1	**CHECK DTC.** Read the engine DTC using the Subaru Select Monitor or general scan tool. <Ref. to EN(H4DO)(diag)-42, Read Diagnostic Trouble Code (DTC).>	Is other than DTC P0016 displayed? (Current malfunction)	Check the appropriate DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DO)(diag)-86, List of Diagnostic Trouble Code (DTC).>	Save the freeze frame data. <Ref. to EN(H4DO)(diag)-41, READ FREEZE FRAME DATA FOR ENGINE (OBD MODE), OPERATION, Subaru Select Monitor.> Go to step **2**.

	Step	Check	Yes	No
2	**CHECK ENGINE OIL CONDITION.** Check the engine oil condition. NOTE: Check the following items. • Oil amount is within the specified range • Occurrence of abnormal dirt • Coagulation due to additives • Use of oil with specified viscosity	Is the check result OK?	Go to step **3**.	Adjust oil amount or replace the engine oil and oil filter. <Ref. to LU(H4DO)-11, Engine Oil.> <Ref. to LU(H4DO)-28, Engine Oil Filter.> Go to step **3**.
3	**CHECK THE CHAIN TIMING.** 1) Perform the Clear Memory Mode for the engine using the Subaru Select Monitor or a general scan tool. <Ref. to EN(H4DO)(diag)-56, Clear Memory Mode.> 2) Turn the ignition switch to OFF. 3) Disconnect the connector of the intake oil control solenoid RH. (DTC is included, but it does not affect the inspection.) 4) Turn the ignition switch to ON. 5) Start monitoring «VVT Adv. Ang. Amount R» of the current data display. <Ref. to EN(H4DO)(diag)-36, READ CURRENT DATA FOR ENGINE (NORMAL MODE), OPERATION, Subaru Select Monitor.> 6) Start the engine. 7) Read «VVT Adv. Ang. Amount R» within 10 seconds after starting the engine. NOTE: If 10 seconds or more elapses after the engine is started, the position after the elapse is judged as the reference and [0] will be displayed. 8) Record the read value in «VVT Adv. Ang. Amount R». 9) Stop the engine.	Is «VVT Adv. Ang. Amount R» within 10 seconds after starting the engine ±10 deg. or more apart from the reference value (0 deg)?	Repair the chain timing. <Ref. to ME(H4DO)-109, Timing Chain Assembly.> Go to step **15**.	Go to step **4**.

	Step	Check	Yes	No
4	**CHECK ON-BOARD MONITOR TEST RESULTS.** 1) Replace the intake oil control solenoid RH. <Ref. to FU(H4DO)-65, Oil Control Valve.> 2) Perform the Clear Memory Mode for the engine using the Subaru Select Monitor or a general scan tool. <Ref. to EN(H4DO)(diag)-56, Clear Memory Mode.> 3) Perform drive cycle T. <Ref. to EN(H4DO)(diag)-48, Drive Cycle.> 4) Read values of «VVT Monitor Bank 1» and «VVT Monitor Bank 2» according to MODE$06 reading procedures using the Subaru Select Monitor or general scan tool. <Ref. to EN(H4DO)(diag)-32, MODE $06, OPERATION, General Scan Tool.> **CAUTION:** **• When performing driving cycle, there should be 2 persons (driver and checker) and the checker should perform the data check.** **• When performing the drive cycle on the public road, be very careful of the traffic condition and the safe driving must be the high priority.** NOTE: • When the diagnostic value is 0, the diagnosis is incomplete. Therefore, do not stop the engine and perform the drive cycle again. • Diagnostic values are updated repeatedly, and therefore, always check the data while diagnostic values are being read. 5) Record the read values in «VVT Monitor Bank 1» and «VVT Monitor Bank 2».	Is the value in «VVT Monitor Bank 1» of the replaced oil control solenoid 1000 or more?	Go to step **6**.	Go to step **5**.
5	**CHECK ON-BOARD MONITOR TEST RESULTS.** Compare the values in «VVT Monitor Bank 1» and «VVT Monitor Bank 2» recorded in step 4.	Is the value in «VVT Monitor Bank 1» 1000 or less, and also larger than the value (value in «VVT Monitor Bank 2» ×1.5+100) compared to the value in «VVT Monitor Bank 2»?	Go to step **6**.	Idle the engine for five minutes, and then replace (flush) the oil filter and engine oil. <Ref. to LU(H4DO)-11, Engine Oil.> <Ref. to LU(H4DO)-28, Engine Oil Filter.> Go to step **15**.

	Step	Check	Yes	No
6	**CHECK HARNESS AND CONNECTOR.** Check the harness and connector for bending, damage and poor contact. NOTE: Check the following items. • ECM <Ref. to FU(H4DO)-101, Engine Control Module (ECM).> • Oil control solenoid <Ref. to FU(H4DO)-65, Oil Control Valve.> • Camshaft position sensor <Ref. to FU(H4DO)-51, Camshaft Position Sensor.> • Crankshaft position sensor <Ref. to FU(H4DO)-46, Crankshaft Position Sensor.>	Is the check result OK?	Go to step **7**.	Repair or replace faulty parts. <Ref. to FU(H4DO)-101, Engine Control Module (ECM).> <Ref. to FU(H4DO)-65, Oil Control Valve.> <Ref. to FU(H4DO)-51, Camshaft Position Sensor.> <Ref. to FU(H4DO)-46, Crankshaft Position Sensor.> Go to step **7**.
7	**CHECK HARNESS AND CONNECTOR (OPEN CIRCUIT).** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from the intake oil control solenoid RH. 4) Measure the resistance of harness between ECM connector and intake oil control solenoid RH connector. ***Connector & terminal*** ***(B134) No. 27 — (E38) No. 2:***	Is the resistance 1 Ω or less?	Go to step **8**.	Repair or replace faulty parts. Go to step **15**.
8	**CHECK HARNESS AND CONNECTOR (OPEN CIRCUIT).** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from the intake camshaft position sensor RH. 4) Measure the resistance between intake camshaft position sensor RH connector and ECM connector. ***Connector & terminal*** ***(B137) No. 24 — (E36) No. 2:***	Is the resistance 1 Ω or less?	Go to step **9**.	Repair or replace faulty parts. Go to step **15**.
9	**CHECK HARNESS AND CONNECTOR (OPEN CIRCUIT).** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from the crankshaft position sensor. 4) Measure the resistance between crankshaft position sensor connector and ECM connector. ***Connector & terminal*** ***(B137) No. 17 — (E10) No. 1:***	Is the resistance 1 Ω or less?	Go to step **10**.	Repair or replace faulty parts. Go to step **15**.
10	**CHECK ENGINE OIL PRESSURE.** Check the engine oil pressure. <Ref. to ME(H4DO)-28, Engine Oil Pressure.>	Is the engine oil pressure normal?	Go to step **12**.	Go to step **11**.

	Step	Check	Yes	No
11	**CHECK OIL STRAINER.** Check the oil strainer. <Ref. to LU(H4DO)-15, Oil Pan and Strainer.>	Are there any foreign matter mixed in oil strainer in the oil pan?	Check and clean inside the oil strainer. <Ref. to LU(H4DO)-15, Oil Pan and Strainer.> Go to step **12**.	Replace the chain cover. <Ref. to ME(H4DO)-91, Chain Cover.> **CAUTION:** **Excessive application of liquid gasket during assembly of the chain cover may cause malfunction. Use the type specified in the service manual and apply appropriate amount (wire diameter). <Ref. to ME(H4DO)-96, INSTALLATION, Chain Cover.>** Go to step **13**.
12	**CHECK OIL PASSAGES OF CHAIN COVER.** 1) Remove the engine from the vehicle. <Ref. to ME(H4DO)-44, Engine Assembly.> 2) Check oil passages of chain cover. <Ref. to ME(H4DO)-91, Chain Cover.> NOTE: Check that the following oil passages have O-rings and that there is no foreign matter. • Inlet port of oil pump • Discharge port of oil pump • Each O ring at passages to left and right cylinder heads • Oil control solenoid • Entry of foreign matter	Is the check result OK?	Go to step **13**.	Replace the defective parts. Replace the chain cover in the case of foreign matter entry. <Ref. to ME(H4DO)-91, Chain Cover.> Go to step **13**.
13	**CHECK THE CONDITION OF CAMSHAFT.** 1) Remove the timing chain. <Ref. to ME(H4DO)-109, REMOVAL, Timing Chain Assembly.> 2) Rotate the camshaft by hand to compare the rotation resistances of the four shafts. NOTE: Compare rotational resistance with the camshaft in bank 2 and check the following items to see if there is any obvious fault such as unsmoothness of the camshaft in bank 1 and rotational resistance. • Foreign matter adhered to the camshaft • Damage to camshaft (scratch, scuffed, wear, etc.) • Check of influence of cam journal bearing not rotating properly	Is the check result OK?	Go to step **14**.	Replace the cam carrier and the camshaft. <Ref. to ME(H4DO)-152, Cam Carrier.> <Ref. to ME(H4DO)-151, Camshaft.> Go to step **14**.

	Step	Check	Yes	No
14	**CHECK OIL PASSAGES BETWEEN OIL PUMP AND OIL CONTROL SOLENOID.** Visually check the following portions of oil passages connecting oil pump to oil control solenoid to see if there is any obvious fault such as adherence of foreign matter and clogging. • Oil passage of the cam carrier • Oil passage of the cylinder head side • Oil passage from cam sprocket to camshaft connecting section • Oil passage of the sprocket back side with the sprocket removed, and the camshaft end NOTE: Refer to the removal procedure of cam carrier in the service manual. <Ref. to ME(H4DO)-152, REMOVAL, Cam Carrier.>	Is the check result OK?	Replace the sprocket. <Ref. to ME(H4DO)-129, REMOVAL, Cam Sprocket.> **CAUTION:** **• Excessive application of liquid gasket during assembly of the chain cover may cause malfunction. Use the type specified in the service manual and apply appropriate amount (wire diameter). <Ref. to ME(H4DO)-96, INSTALLATION, Chain Cover.>** **• Push the oil filter until it becomes flush with the cam carrier surface. (Do not push excessively.) <Ref. to ME(H4DO)-186, ASSEMBLY, Cam Carrier.>** Go to step **15**.	Remove the foreign matter. Replace the cam carrier oil filter. (Do not reuse it.) <Ref. to ME(H4DO)-152, Cam Carrier.> **CAUTION:** **• Excessive application of liquid gasket during assembly of the chain cover may cause malfunction. Use the type specified in the service manual and apply appropriate amount (wire diameter). <Ref. to ME(H4DO)-96, INSTALLATION, Chain Cover.>** **• Push the oil filter until it becomes flush with the cam carrier surface. (Do not push excessively.) <Ref. to ME(H4DO)-186, ASSEMBLY, Cam Carrier.>** NOTE: After the procedure is finished, idle the engine for five minutes, and then replace (flush) the oil filter and engine oil. <Ref. to LU(H4DO)-11, Engine Oil.> <Ref. to LU(H4DO)-28, Engine Oil Filter.> Go to step **15**.
15	**CHECK DTC.** 1) Using the Subaru Select Monitor or a general scan tool, perform the clear memory of engine. <Ref. to EN(H4DO)(diag)-56, Clear Memory Mode.> 2) Perform drive cycle T. <Ref. to EN(H4DO)(diag)-48, Drive Cycle.> 3) Read the engine DTC using the Subaru Select Monitor or general scan tool. <Ref. to EN(H4DO)(diag)-42, Read Diagnostic Trouble Code (DTC).>	Is DTC P0016 displayed? (Current malfunction)	Replace the ECM and perform drive cycle T. When DTC is not displayed, end the diagnosis. <Ref. to FU(H4DO)-101, Engine Control Module (ECM).>	ECM is good; finish the diagnosis.

C: DTC P0018 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK2)

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-12, DTC P0018 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

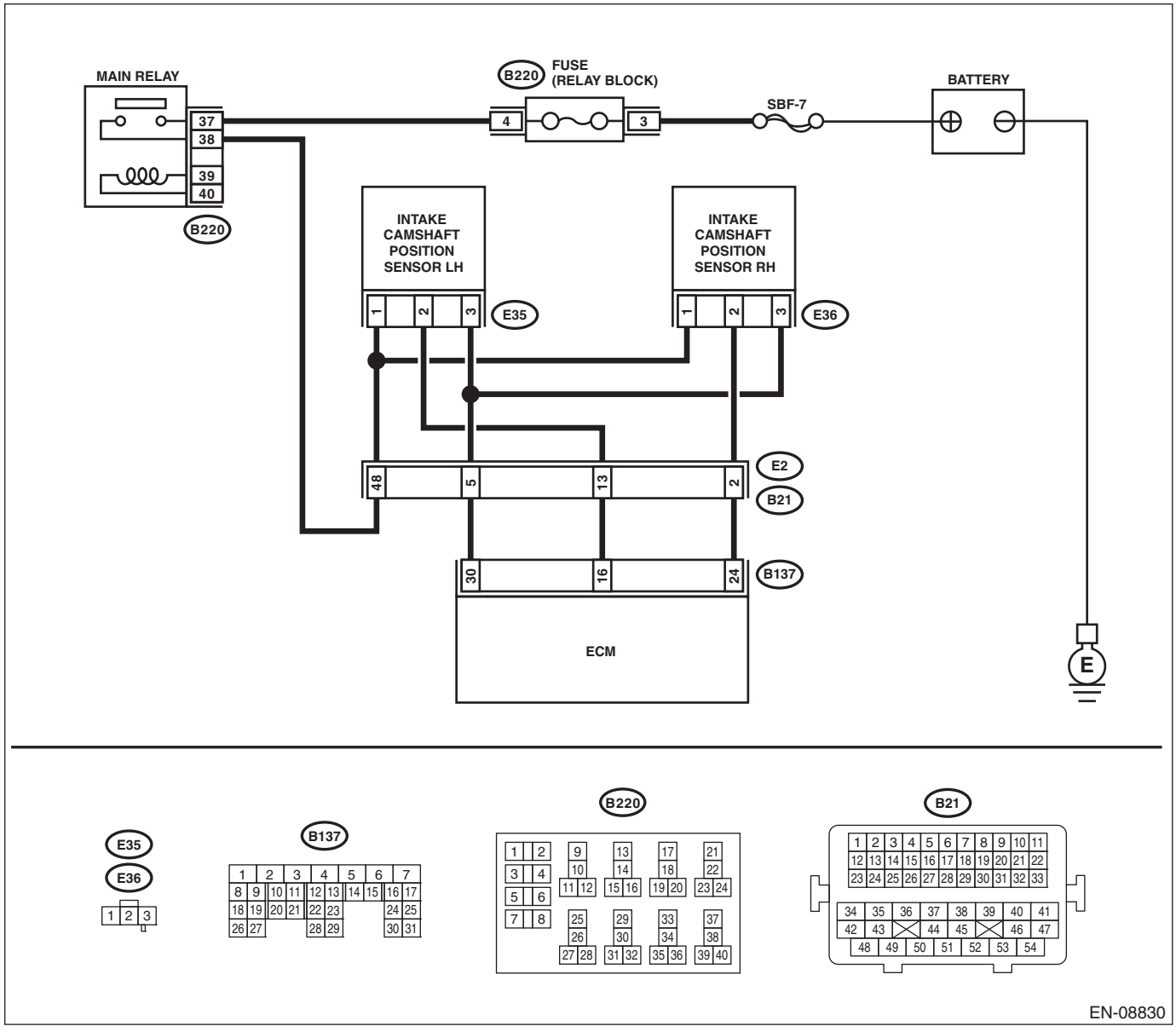
TROUBLE SYMPTOM:

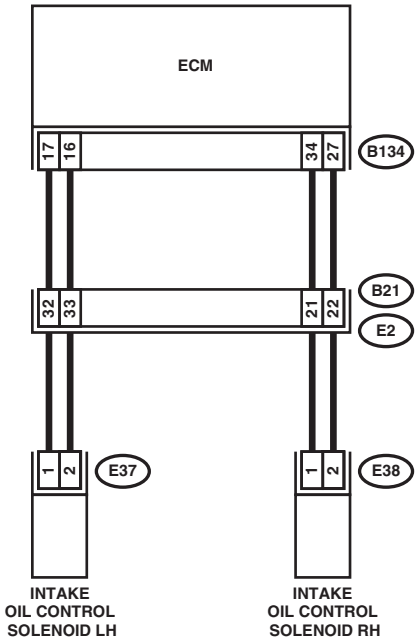
- Engine stalls.
- Improper idling

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

Wiring diagram:

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E38
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INTAKE
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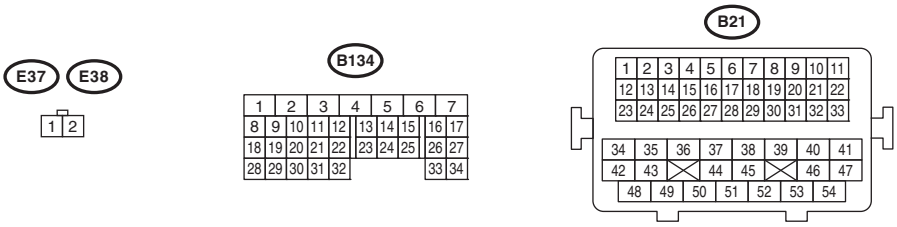
SOLENOID RH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E38
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B21
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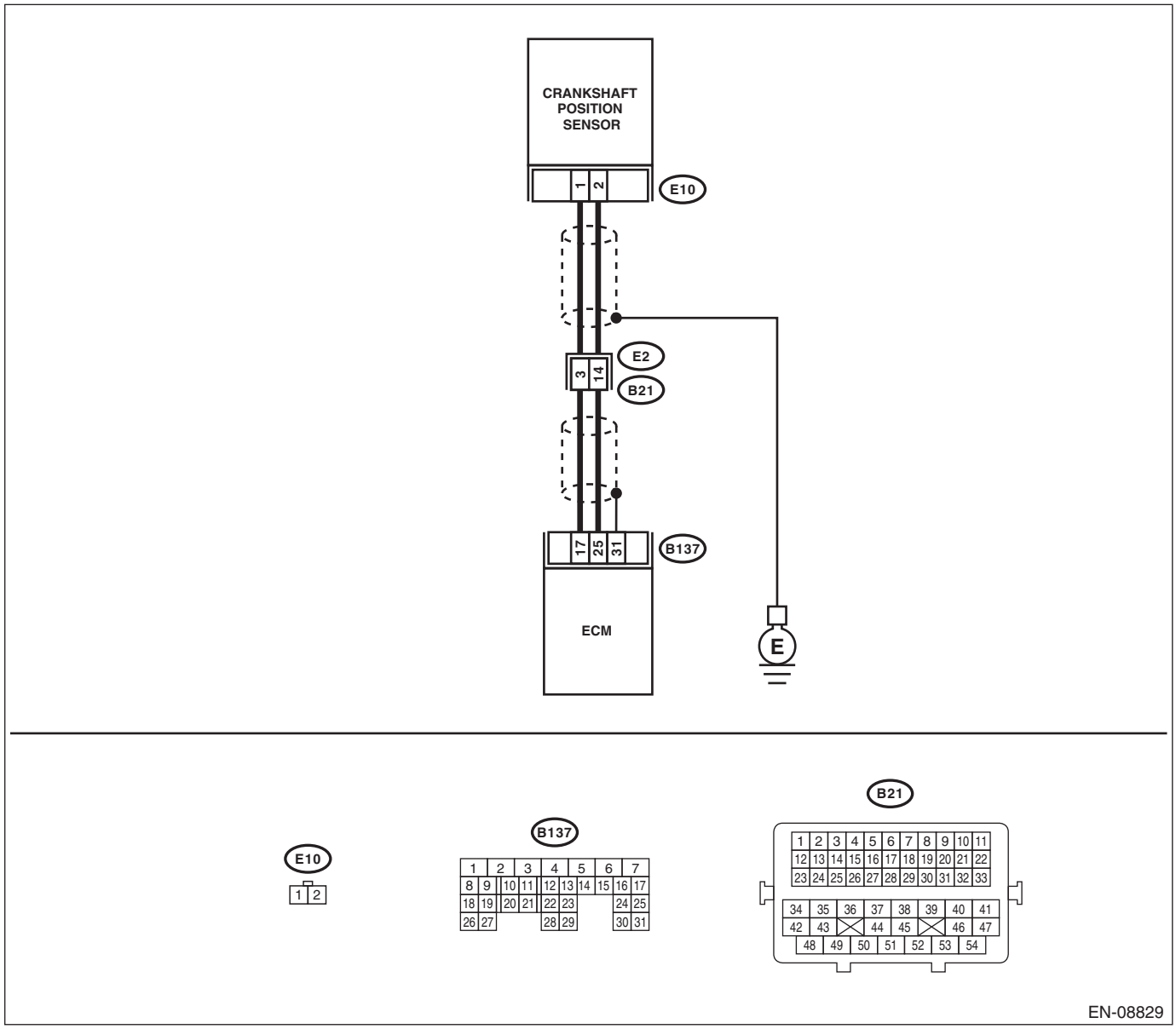
EN-08836



Step		Check	Yes	No
1	**CHECK DTC.** Read the engine DTC using the Subaru Select Monitor or general scan tool. <Ref. to EN(H4DO)(diag)-42, Read Diagnostic Trouble Code (DTC).>	Is other than DTC P0018 displayed? (Current malfunction)	Check the appropriate DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DO)(diag)-86, List of Diagnostic Trouble Code (DTC).>	Save the freeze frame data. <Ref. to EN(H4DO)(diag)-41, READ FREEZE FRAME DATA FOR ENGINE (OBD MODE), OPERATION, Subaru Select Monitor.> Go to step **2**.

	Step	Check	Yes	No
2	**CHECK ENGINE OIL CONDITION.** Check the engine oil condition. NOTE: Check the following items. • Oil amount is within the specified range • Occurrence of abnormal dirt • Coagulation due to additives • Use of oil with specified viscosity	Is the check result OK?	Go to step **3**.	Adjust oil amount or replace the engine oil and oil filter. <Ref. to LU(H4DO)-11, Engine Oil.> <Ref. to LU(H4DO)-28, Engine Oil Filter.> Go to step **3**.
3	**CHECK THE CHAIN TIMING.** 1) Perform the Clear Memory Mode for the engine using the Subaru Select Monitor or a general scan tool. <Ref. to EN(H4DO)(diag)-56, Clear Memory Mode.> 2) Turn the ignition switch to OFF. 3) Disconnect the connector of the intake oil control solenoid LH. (DTC is included, but it does not affect the inspection.) 4) Turn the ignition switch to ON. 5) Start monitoring «VVT Adv. Ang. Amount L» of the current data display. <Ref. to EN(H4DO)(diag)-36, READ CURRENT DATA FOR ENGINE (NORMAL MODE), OPERATION, Subaru Select Monitor.> 6) Start the engine. 7) Read «VVT Adv. Ang. Amount L» within 10 seconds after starting the engine. NOTE: If 10 seconds or more elapses after the engine is started, the position after the elapse is judged as the reference and [0] will be displayed. 8) Record the read value in «VVT Adv. Ang. Amount L». 9) Stop the engine.	Is «VVT Adv. Ang. Amount L» within 10 seconds after starting the engine ±10 deg. or more apart from the reference value (0 deg)?	Repair the chain timing. <Ref. to ME(H4DO)-109, Timing Chain Assembly.> Go to step **15**.	Go to step **4**.

	Step	Check	Yes	No
4	**CHECK ON-BOARD MONITOR TEST RESULTS.** 1) Replace the intake oil control solenoid LH. <Ref. to FU(H4DO)-65, Oil Control Valve.> 2) Perform the Clear Memory Mode for the engine using the Subaru Select Monitor or a general scan tool. <Ref. to EN(H4DO)(diag)-56, Clear Memory Mode.> 3) Perform drive cycle T. <Ref. to EN(H4DO)(diag)-48, Drive Cycle.> 4) Read values of «VVT Monitor Bank 1» and «VVT Monitor Bank 2» according to MODE$06 reading procedures using the Subaru Select Monitor or general scan tool. <Ref. to EN(H4DO)(diag)-32, MODE $06, OPERATION, General Scan Tool.> **CAUTION:** **• When performing driving cycle, there should be 2 persons (driver and checker) and the checker should perform the data check.** **• When performing the drive cycle on the public road, be very careful of the traffic condition and the safe driving must be the high priority.** NOTE: • When the diagnostic value is 0, the diagnosis is incomplete. Therefore, do not stop the engine and perform the drive cycle again. • Diagnostic values are updated repeatedly, and therefore, always check the data while diagnostic values are being read. 5) Record the read values in «VVT Monitor Bank 1» and «VVT Monitor Bank 2».	Is the value in «VVT Monitor Bank 2» of the replaced oil control solenoid 1000 or more?	Go to step **6**.	Go to step **5**.
5	**CHECK ON-BOARD MONITOR TEST RESULTS.** Compare the values in «VVT Monitor Bank 1» and «VVT Monitor Bank 2» recorded in step 4.	Is the value in «VVT Monitor Bank 2» 1000 or less, and also larger than the value (value in «VVT Monitor Bank 1» ×1.5+100) compared to the value in «VVT Monitor Bank 1»?	Go to step **6**.	Idle the engine for five minutes, and then replace (flush) the oil filter and engine oil. <Ref. to LU(H4DO)-11, Engine Oil.> <Ref. to LU(H4DO)-28, Engine Oil Filter.> Go to step **15**.

	Step	Check	Yes	No
6	**CHECK HARNESS AND CONNECTOR.** Check the harness and connector for bending, damage and poor contact. NOTE: Check the following items. • ECM <Ref. to FU(H4DO)-101, Engine Control Module (ECM).> • Oil control solenoid <Ref. to FU(H4DO)-65, Oil Control Valve.> • Camshaft position sensor <Ref. to FU(H4DO)-51, Camshaft Position Sensor.> • Crankshaft position sensor <Ref. to FU(H4DO)-46, Crankshaft Position Sensor.>	Is the check result OK?	Go to step **7**.	Repair or replace faulty parts. <Ref. to FU(H4DO)-101, Engine Control Module (ECM).> <Ref. to FU(H4DO)-65, Oil Control Valve.> <Ref. to FU(H4DO)-51, Camshaft Position Sensor.> <Ref. to FU(H4DO)-46, Crankshaft Position Sensor.> Go to step **7**.
7	**CHECK HARNESS AND CONNECTOR (OPEN CIRCUIT).** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from the intake oil control solenoid LH. 4) Measure the resistance of harness between ECM connector and intake oil control solenoid LH connector. ***Connector & terminal*** ***(B134) No. 16 — (E37) No. 2:***	Is the resistance 1 Ω or less?	Go to step **8**.	Repair or replace faulty parts. Go to step **15**.
8	**CHECK HARNESS AND CONNECTOR (OPEN CIRCUIT).** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from intake camshaft position sensor LH. 4) Measure the resistance between intake camshaft position sensor LH connector and ECM connector. ***Connector & terminal*** ***(B137) No. 16 — (E35) No. 2:***	Is the resistance 1 Ω or less?	Go to step **9**.	Repair or replace faulty parts. Go to step **15**.
9	**CHECK HARNESS AND CONNECTOR (OPEN CIRCUIT).** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from the crankshaft position sensor. 4) Measure the resistance between crankshaft position sensor connector and ECM connector. ***Connector & terminal*** ***(B137) No. 17 — (E10) No. 1:***	Is the resistance 1 Ω or less?	Go to step **10**.	Repair or replace faulty parts. Go to step **15**.
10	**CHECK ENGINE OIL PRESSURE.** Check the engine oil pressure. <Ref. to ME(H4DO)-28, Engine Oil Pressure.>	Is the engine oil pressure normal?	Go to step **12**.	Go to step **11**.

	Step	Check	Yes	No
11	**CHECK OIL STRAINER.** Check the oil strainer. <Ref. to LU(H4DO)-15, Oil Pan and Strainer.>	Are there any foreign matter mixed in oil strainer in the oil pan?	Check and clean inside the oil strainer. <Ref. to LU(H4DO)-15, Oil Pan and Strainer.> Go to step **12**.	Replace the chain cover. <Ref. to ME(H4DO)-91, Chain Cover.> **CAUTION:** **Excessive application of liquid gasket during assembly of the chain cover may cause malfunction. Use the type specified in the service manual and apply appropriate amount (wire diameter). <Ref. to ME(H4DO)-96, INSTALLATION, Chain Cover.>** Go to step **13**.
12	**CHECK OIL PASSAGES OF CHAIN COVER.** 1) Remove the engine from the vehicle. <Ref. to ME(H4DO)-44, Engine Assembly.> 2) Check oil passages of chain cover. <Ref. to ME(H4DO)-91, Chain Cover.> NOTE: Check that the following oil passages have O-rings and that there is no foreign matter. • Inlet port of oil pump • Discharge port of oil pump • Each O ring at passages to left and right cylinder heads • Oil control solenoid LH • Entry of foreign matter	Is the check result OK?	Go to step **13**.	Replace the defective parts. Replace the chain cover in the case of foreign matter entry. <Ref. to ME(H4DO)-91, Chain Cover.> Go to step **13**.
13	**CHECK THE CONDITION OF CAMSHAFT.** 1) Remove the timing chain. <Ref. to ME(H4DO)-109, REMOVAL, Timing Chain Assembly.> 2) Rotate the camshaft by hand to compare the rotation resistances of the four shafts. NOTE: Compare rotational resistance with the camshaft in bank 1 and check the following items to see if there is any obvious fault such as unsmoothness of the camshaft in bank 2 and rotational resistance. • Foreign matter adhered to the camshaft • Damage to camshaft (scratch, scuffed, wear, etc.) • Check of influence of cam journal bearing not rotating properly	Is the check result OK?	Go to step **14**.	Replace the cam carrier and the camshaft. <Ref. to ME(H4DO)-152, Cam Carrier.> <Ref. to ME(H4DO)-151, Camshaft.> Go to step **14**.

	Step	Check	Yes	No
14	**CHECK OIL PASSAGES BETWEEN OIL PUMP AND OIL CONTROL SOLENOID.** Visually check the following portions of oil passages connecting oil pump to oil control solenoid to see if there is any obvious fault such as adherence of foreign matter and clogging. • Oil passage of the cam carrier • Oil passage of the cylinder head side • Oil passage from cam sprocket to camshaft connecting section • Oil passage of the sprocket back side with the sprocket removed, and the camshaft end NOTE: Refer to the removal procedure of cam carrier in the service manual. <Ref. to ME(H4DO)-152, REMOVAL, Cam Carrier.>	Is the check result OK?	Replace the sprocket. <Ref. to ME(H4DO)-129, REMOVAL, Cam Sprocket.> **CAUTION:** **• Excessive application of liquid gasket during assembly of the chain cover may cause malfunction. Use the type specified in the service manual and apply appropriate amount (wire diameter). <Ref. to ME(H4DO)-96, INSTALLATION, Chain Cover.>** **• Push the oil filter until it becomes flush with the cam carrier surface. (Do not push excessively.) <Ref. to ME(H4DO)-186, ASSEMBLY, Cam Carrier.>** Go to step **15**.	Remove the foreign matter. Replace the cam carrier oil filter. (Do not reuse it.) <Ref. to ME(H4DO)-152, Cam Carrier.> **CAUTION:** **• Excessive application of liquid gasket during assembly of the chain cover may cause malfunction. Use the type specified in the service manual and apply appropriate amount (wire diameter). <Ref. to ME(H4DO)-96, INSTALLATION, Chain Cover.>** **• Push the oil filter until it becomes flush with the cam carrier surface. (Do not push excessively.) <Ref. to ME(H4DO)-186, ASSEMBLY, Cam Carrier.>** NOTE: After the procedure is finished, idle the engine for five minutes, and then replace (flush) the oil filter and engine oil. <Ref. to LU(H4DO)-11, Engine Oil.> <Ref. to LU(H4DO)-28, Engine Oil Filter.> Go to step **15**.
15	**CHECK DTC.** 1) Using the Subaru Select Monitor or a general scan tool, perform the clear memory of engine. <Ref. to EN(H4DO)(diag)-56, Clear Memory Mode.> 2) Perform drive cycle T. <Ref. to EN(H4DO)(diag)-48, Drive Cycle.> 3) Read the engine DTC using the Subaru Select Monitor or general scan tool. <Ref. to EN(H4DO)(diag)-42, Read Diagnostic Trouble Code (DTC).>	Is DTC P0018 displayed? (Current malfunction)	Replace the ECM and perform drive cycle T. When DTC is not displayed, end the diagnosis. <Ref. to FU(H4DO)-101, Engine Control Module (ECM).>	ECM is good; finish the diagnosis.

D: DTC P0021 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 2)

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-12, DTC P0021 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

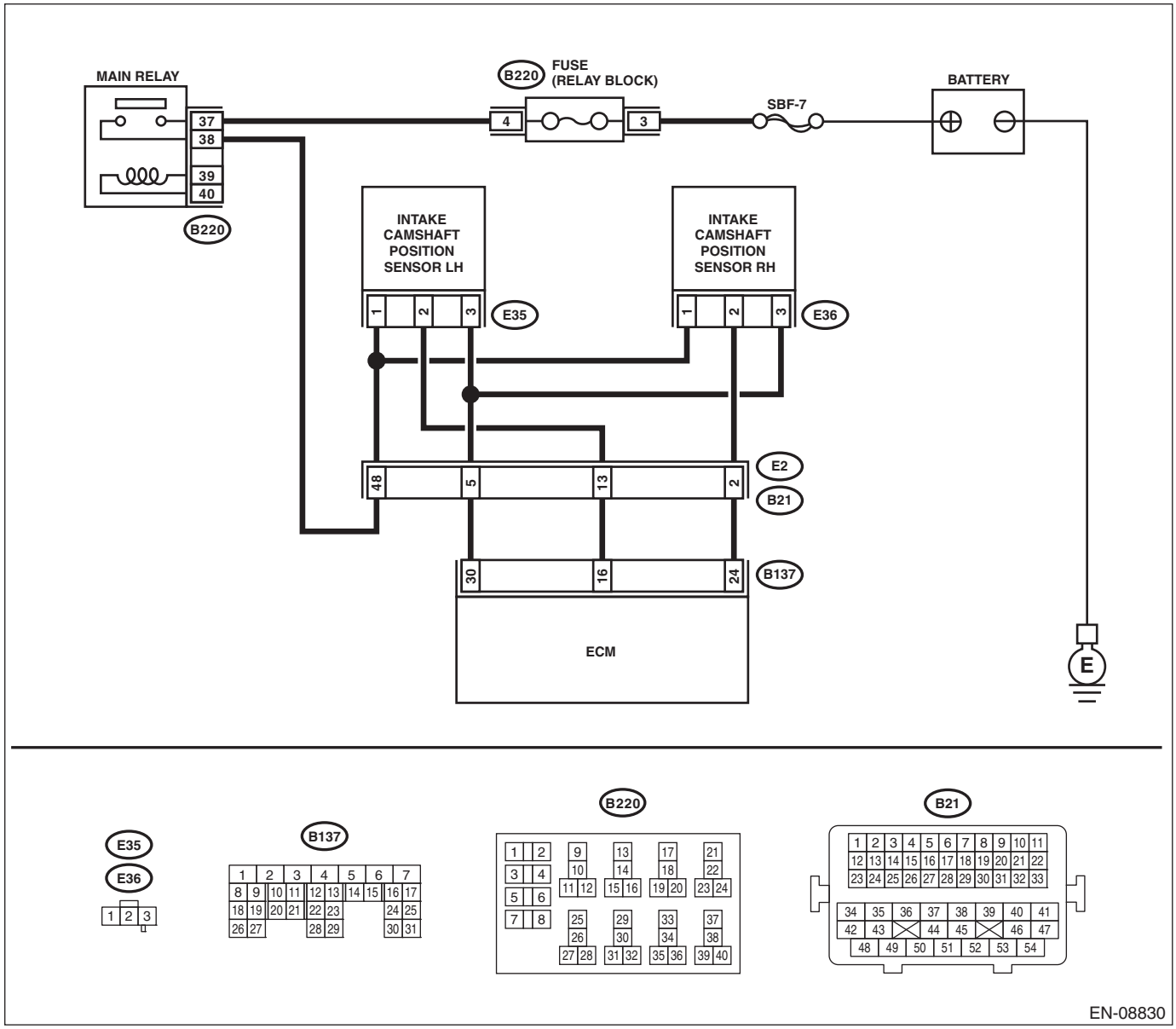
TROUBLE SYMPTOM:

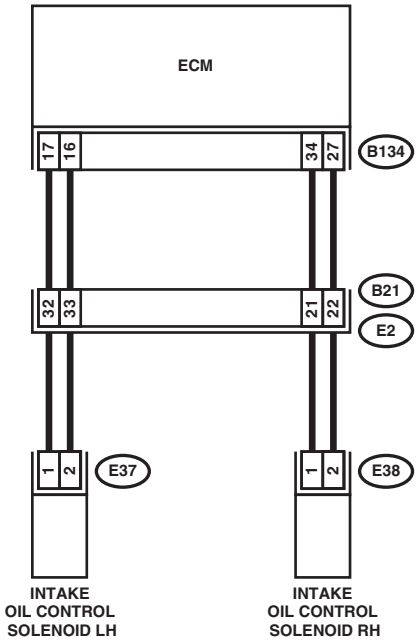
- Engine stalls.
- Improper idling

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

Wiring diagram:

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OIL CONTROL
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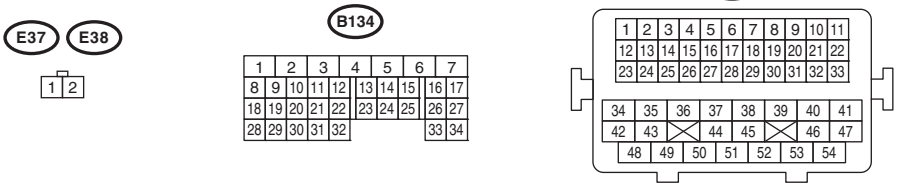
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E38
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B134
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B21
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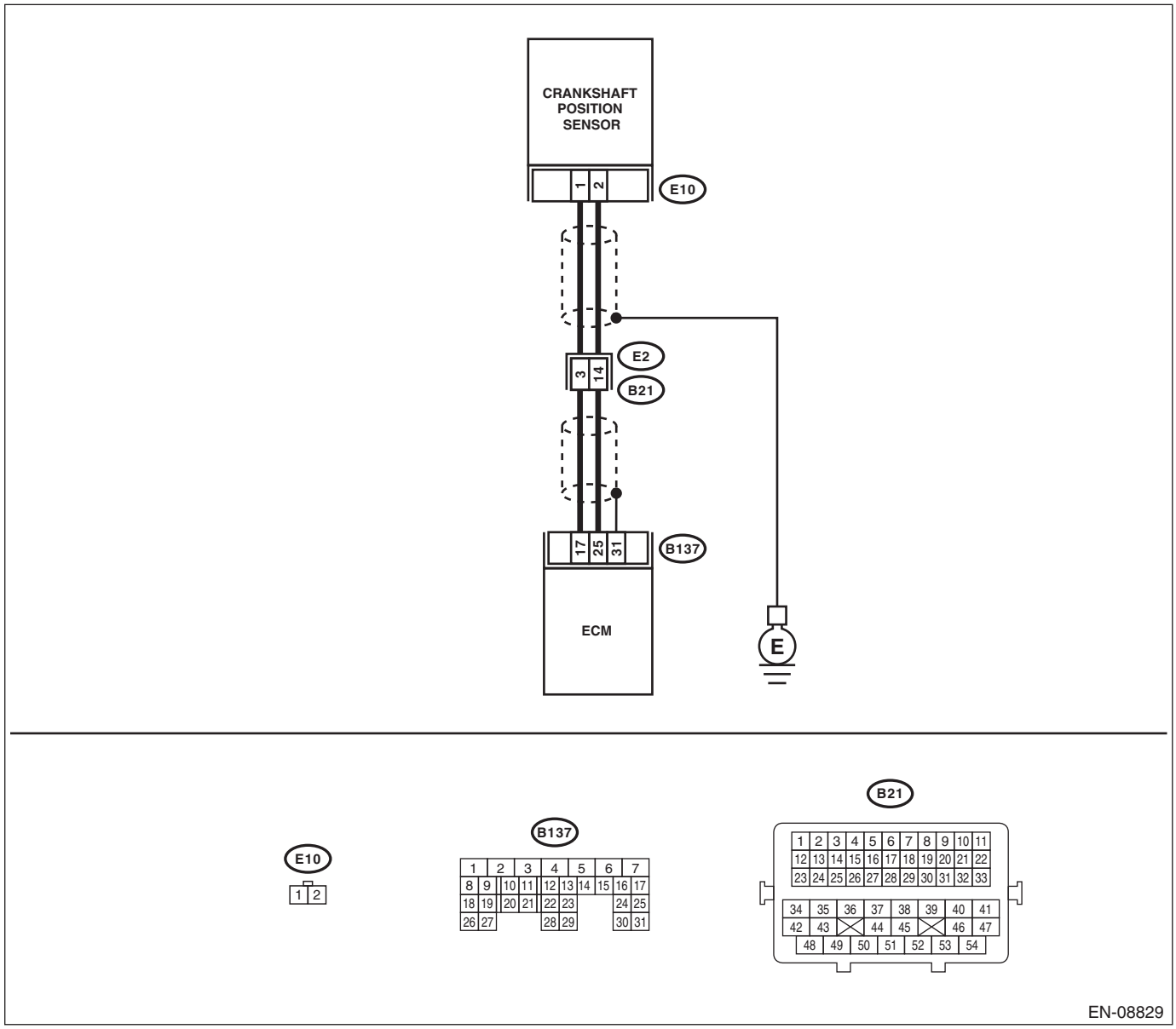
EN-08836



	Step	Check	Yes	No
1	**CHECK DTC.** Read the engine DTC using the Subaru Select Monitor or general scan tool. <Ref. to EN(H4DO)(diag)-42, Read Diagnostic Trouble Code (DTC).>	Is DTC other than P0021 displayed? (Current malfunction)	Check the appropriate DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DO)(diag)-86, List of Diagnostic Trouble Code (DTC).>	Save the freeze frame data. <Ref. to EN(H4DO)(diag)-41, READ FREEZE FRAME DATA FOR ENGINE (OBD MODE), OPERATION, Subaru Select Monitor.> Go to step **2**.

	Step	Check	Yes	No
2	**CHECK ENGINE OIL CONDITION.** Check the engine oil condition. NOTE: Check the following items. • Oil amount is within the specified range • Occurrence of abnormal dirt • Coagulation due to additives • Use of oil with specified viscosity	Is the check result OK?	Go to step **3**.	Adjust oil amount or replace the engine oil and oil filter. <Ref. to LU(H4DO)-11, Engine Oil.> <Ref. to LU(H4DO)-28, Engine Oil Filter.> Go to step **3**.
3	**CHECK ON-BOARD MONITOR TEST RESULTS.** 1) Replace the intake oil control solenoid LH. <Ref. to FU(H4DO)-65, Oil Control Valve.> 2) Perform the Clear Memory Mode for the engine using the Subaru Select Monitor or a general scan tool. <Ref. to EN(H4DO)(diag)-56, Clear Memory Mode.> 3) Perform drive cycle T. <Ref. to EN(H4DO)(diag)-48, Drive Cycle.> 4) Read values of «VVT Monitor Bank 1» and «VVT Monitor Bank 2» according to MODE$06 reading procedures using the Subaru Select Monitor or general scan tool. <Ref. to EN(H4DO)(diag)-32, MODE $06, OPERATION, General Scan Tool.> **CAUTION:** **• When performing driving cycle, there should be 2 persons (driver and checker) and the checker should perform the data check.** **• When performing the drive cycle on the public road, be very careful of the traffic condition and the safe driving must be the high priority.** NOTE: • When the diagnostic value is 0, the diagnosis is incomplete. Therefore, do not stop the engine and perform the drive cycle again. • Diagnostic values are updated repeatedly, and therefore, always check the data while diagnostic values are being read. 5) Record the read values in «VVT Monitor Bank 1» and «VVT Monitor Bank 2».	Is the value in «VVT Monitor Bank 2» of the replaced oil control solenoid 1000 or more?	Go to step **5**.	Go to step **4**.
4	**CHECK ON-BOARD MONITOR TEST RESULTS.** Compare the values in «VVT Monitor Bank 1» and «VVT Monitor Bank 2» recorded in step 3.	Is the value in «VVT Monitor Bank 2» 1000 or less, and also larger than the value (value in «VVT Monitor Bank 1» ×1.5+100) compared to the value in «VVT Monitor Bank 1»?	Go to step **5**.	Idle the engine for five minutes, and then replace (flush) the oil filter and engine oil. <Ref. to LU(H4DO)-11, Engine Oil.> <Ref. to LU(H4DO)-28, Engine Oil Filter.> Go to step **14**.

	Step	Check	Yes	No
5	**CHECK HARNESS AND CONNECTOR.** Check the harness and connector for bending, damage and poor contact. NOTE: Check the following items. • ECM <Ref. to FU(H4DO)-101, Engine Control Module (ECM).> • Oil control solenoid <Ref. to FU(H4DO)-65, Oil Control Valve.> • Camshaft position sensor <Ref. to FU(H4DO)-51, Camshaft Position Sensor.> • Crankshaft position sensor <Ref. to FU(H4DO)-46, Crankshaft Position Sensor.>	Is the check result OK?	Go to step **6**.	Repair or replace faulty parts. <Ref. to FU(H4DO)-101, Engine Control Module (ECM).> <Ref. to FU(H4DO)-65, Oil Control Valve.> <Ref. to FU(H4DO)-51, Camshaft Position Sensor.> <Ref. to FU(H4DO)-46, Crankshaft Position Sensor.> Go to step **6**.
6	**CHECK HARNESS AND CONNECTOR (OPEN CIRCUIT).** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from the intake oil control solenoid LH. 4) Measure the resistance of harness between ECM connector and intake oil control solenoid LH connector. ***Connector & terminal*** ***(B134) No. 16 — (E37) No. 2:***	Is the resistance 1 Ω or less?	Go to step **7**.	Repair or replace faulty parts. Go to step **14**.
7	**CHECK HARNESS AND CONNECTOR (OPEN CIRCUIT).** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from intake camshaft position sensor LH. 4) Measure the resistance between intake camshaft position sensor LH connector and ECM connector. ***Connector & terminal*** ***(B137) No. 16 — (E35) No. 2:***	Is the resistance 1 Ω or less?	Go to step **8**.	Repair or replace faulty parts. Go to step **14**.
8	**CHECK HARNESS AND CONNECTOR (OPEN CIRCUIT).** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from the crankshaft position sensor. 4) Measure the resistance between crankshaft position sensor connector and ECM connector. ***Connector & terminal*** ***(B137) No. 17 — (E10) No. 1:***	Is the resistance 1 Ω or less?	Go to step **9**.	Repair or replace faulty parts. Go to step **14**.
9	**CHECK ENGINE OIL PRESSURE.** Check the engine oil pressure. <Ref. to ME(H4DO)-28, Engine Oil Pressure.>	Is the engine oil pressure normal?	Go to step **11**.	Go to step **10**.

	Step	Check	Yes	No
10	**CHECK OIL STRAINER.** Check the oil strainer. <Ref. to LU(H4DO)-15, Oil Pan and Strainer.>	Are there any foreign matter mixed in oil strainer in the oil pan?	Check and clean inside the oil strainer. <Ref. to LU(H4DO)-15, Oil Pan and Strainer.> Go to step **11**.	Replace the chain cover. <Ref. to ME(H4DO)-91, Chain Cover.> **CAUTION:** **Excessive application of liquid gasket during assembly of the chain cover may cause malfunction. Use the type specified in the service manual and apply appropriate amount (wire diameter). <Ref. to ME(H4DO)-96, INSTALLATION, Chain Cover.>** Go to step **12**.
11	**CHECK OIL PASSAGES OF CHAIN COVER.** 1) Remove the engine from the vehicle. <Ref. to ME(H4DO)-44, Engine Assembly.> 2) Check oil passages of chain cover. <Ref. to ME(H4DO)-91, Chain Cover.> NOTE: Check that the following oil passages have O-rings and that there is no foreign matter. • Inlet port of oil pump • Discharge port of oil pump • Each O ring at passages to left and right cylinder heads • Oil control solenoid • Entry of foreign matter	Is the check result OK?	Go to step **12**.	Replace the defective parts. Replace the chain cover in the case of foreign matter entry. <Ref. to ME(H4DO)-91, Chain Cover.> Go to step **12**.
12	**CHECK THE CONDITION OF CAMSHAFT.** 1) Remove the timing chain. <Ref. to ME(H4DO)-109, REMOVAL, Timing Chain Assembly.> 2) Rotate the camshaft by hand to compare the rotation resistances of the four shafts. NOTE: Compare rotational resistance with the camshaft in bank 1 and check the following items to see if there is any obvious fault such as unsmoothness of the camshaft in bank 2 and rotational resistance. • Foreign matter adhered to the camshaft • Damage to camshaft (scratch, scuffed, wear, etc.) • Check of influence of cam journal bearing not rotating properly	Is the check result OK?	Go to step **13**.	Replace the cam carrier and the camshaft. <Ref. to ME(H4DO)-152, Cam Carrier.> <Ref. to ME(H4DO)-151, Camshaft.> Go to step **13**.

Step		Check	Yes	No
13	**CHECK OIL PASSAGES BETWEEN OIL PUMP AND OIL CONTROL SOLENOID.** Visually check the following portions of oil passages connecting oil pump to intake oil control solenoid to see if there is any obvious fault such as adherence of foreign matter and clogging. • Oil passage of the cam carrier • Oil passage of the cylinder head side • Oil passage from cam sprocket to camshaft connecting section • Oil passage of the sprocket back side with the sprocket removed, and the camshaft end NOTE: Refer to the removal procedure of cam carrier in the service manual. <Ref. to ME(H4DO)-152, REMOVAL, Cam Carrier.>	Is the check result OK?	Replace the sprocket. <Ref. to ME(H4DO)-129, REMOVAL, Cam Sprocket.> **CAUTION:** **• Excessive application of liquid gasket during assembly of the chain cover may cause malfunction. Use the type specified in the service manual and apply appropriate amount (wire diameter). <Ref. to ME(H4DO)-96, INSTALLATION, Chain Cover.>** **• Push the oil filter until it becomes flush with the cam carrier surface. (Do not push excessively.) <Ref. to ME(H4DO)-186, ASSEMBLY, Cam Carrier.>** Go to step **14**.	Remove the foreign matter. Replace the cam carrier oil filter. (Do not reuse it.) <Ref. to ME(H4DO)-152, Cam Carrier.> **CAUTION:** **• Excessive application of liquid gasket during assembly of the chain cover may cause malfunction. Use the type specified in the service manual and apply appropriate amount (wire diameter). <Ref. to ME(H4DO)-96, INSTALLATION, Chain Cover.>** **• Push the oil filter until it becomes flush with the cam carrier surface. (Do not push excessively.) <Ref. to ME(H4DO)-186, ASSEMBLY, Cam Carrier.>** NOTE: After the procedure is finished, idle the engine for five minutes, and then replace (flush) the oil filter and engine oil. <Ref. to LU(H4DO)-11, Engine Oil.> <Ref. to LU(H4DO)-28, Engine Oil Filter.> Go to step **14**.

	Step	Check	Yes	No
14	**CHECK ON-BOARD MONITOR TEST RESULTS.** 1) Perform the Clear Memory Mode for the engine using the Subaru Select Monitor or a general scan tool. <Ref. to EN(H4DO)(diag)-56, Clear Memory Mode.> 2) Perform drive cycle T. <Ref. to EN(H4DO)(diag)-48, Drive Cycle.> 3) Read values of «VVT Monitor Bank 1» and «VVT Monitor Bank 2» according to MODE$06 reading procedures using the Subaru Select Monitor or general scan tool. <Ref. to EN(H4DO)(diag)-32, MODE $06, OPERATION, General Scan Tool.> **CAUTION:** **• When performing driving cycle, there should be 2 persons (driver and checker) and the checker should perform the data check.** **• When performing the drive cycle on the public road, be very careful of the traffic condition and the safe driving must be the high priority.** NOTE: • When the diagnostic value is 0, the diagnosis is incomplete. Therefore, do not stop the engine and perform the drive cycle again. • Diagnostic values are updated repeatedly, and therefore, always check the data while diagnostic values are being read. 4) Record the read values in «VVT Monitor Bank 1» and «VVT Monitor Bank 2».	Is the value in «VVT Monitor Bank 2» 1000 or more?	Replace the ECM. <Ref. to FU(H4DO)-101, Engine Control Module (ECM).>	Go to step **15**.
15	**CHECK CURRENT DATA.** Compare the values in «VVT Monitor Bank 1» and «VVT Monitor Bank 2» recorded in step 14.	Is the value in «VVT Monitor Bank 2» 1000 or less, and also larger than the value (value in «VVT Monitor Bank 1» ×1.5+100) compared to the value in «VVT Monitor Bank 1»?	Replace the ECM. <Ref. to FU(H4DO)-101, Engine Control Module (ECM).>	End.

E: DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1)

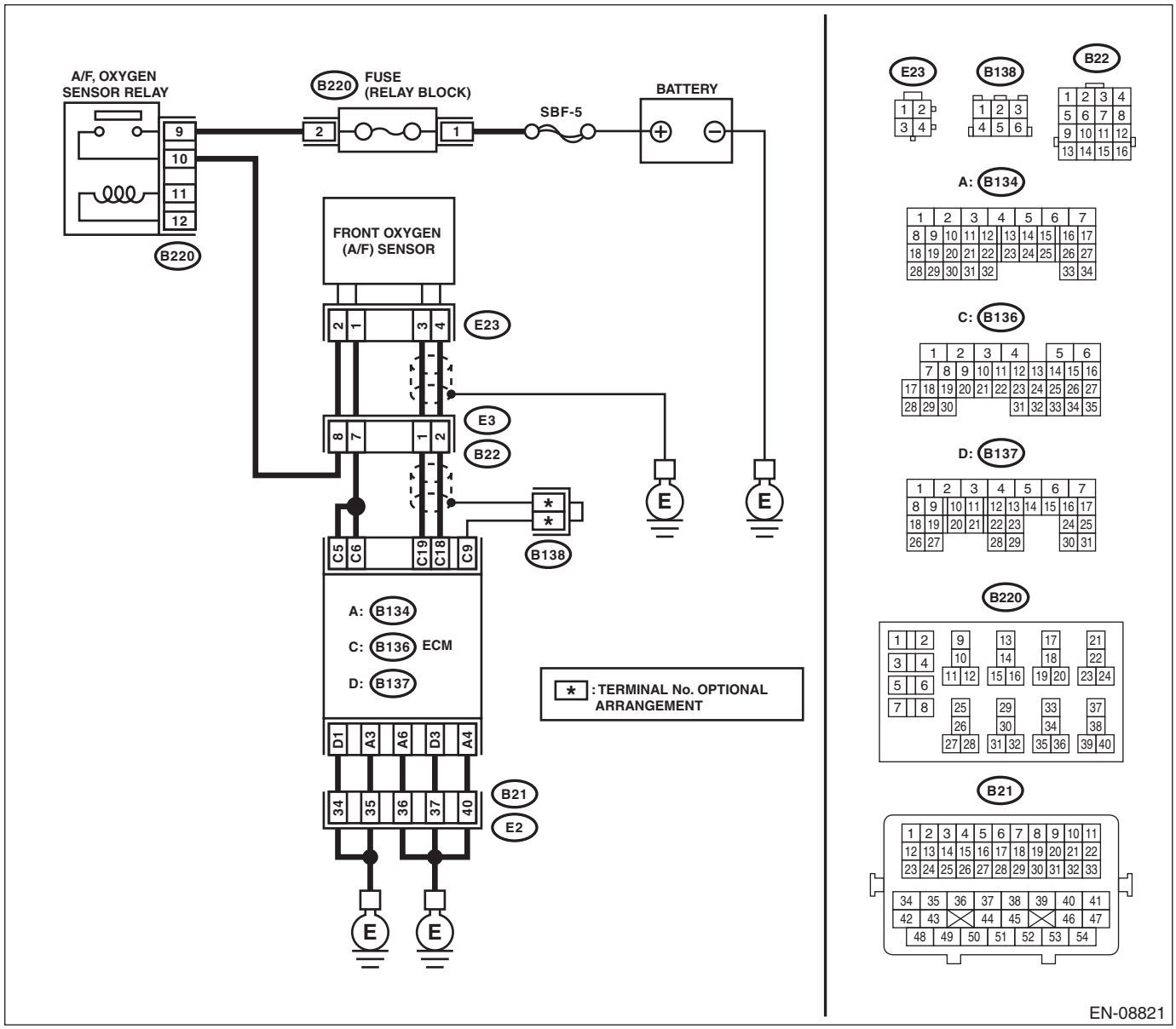
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-13, DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	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. ***Connector & terminal*** ***(B136) No. 5 — (E23) No. 1:*** ***(B136) No. 6 — (E23) No. 1:*** ***(B136) No. 19 — (E23) No. 3:*** ***(B136) No. 18 — (E23) No. 4:***	Is the resistance less than 1 Ω?	Go to step **2**.	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 of coupling connector
2	**CHECK FRONT OXYGEN (A/F) SENSOR.** Measure the resistance between front oxygen (A/F) sensor terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 2 — 3 Ω?	Go to step **3**.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DO)-93, Front Oxygen (A/F) Sensor.>
3	**CHECK FOR POOR CONTACT.** Check for poor contact of ECM and front oxygen (A/F) sensor connector.	Is there poor contact of ECM or front oxygen (A/F) sensor connector?	Repair the poor contact of ECM or front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DO)-93, Front Oxygen (A/F) Sensor.>

F: DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1)

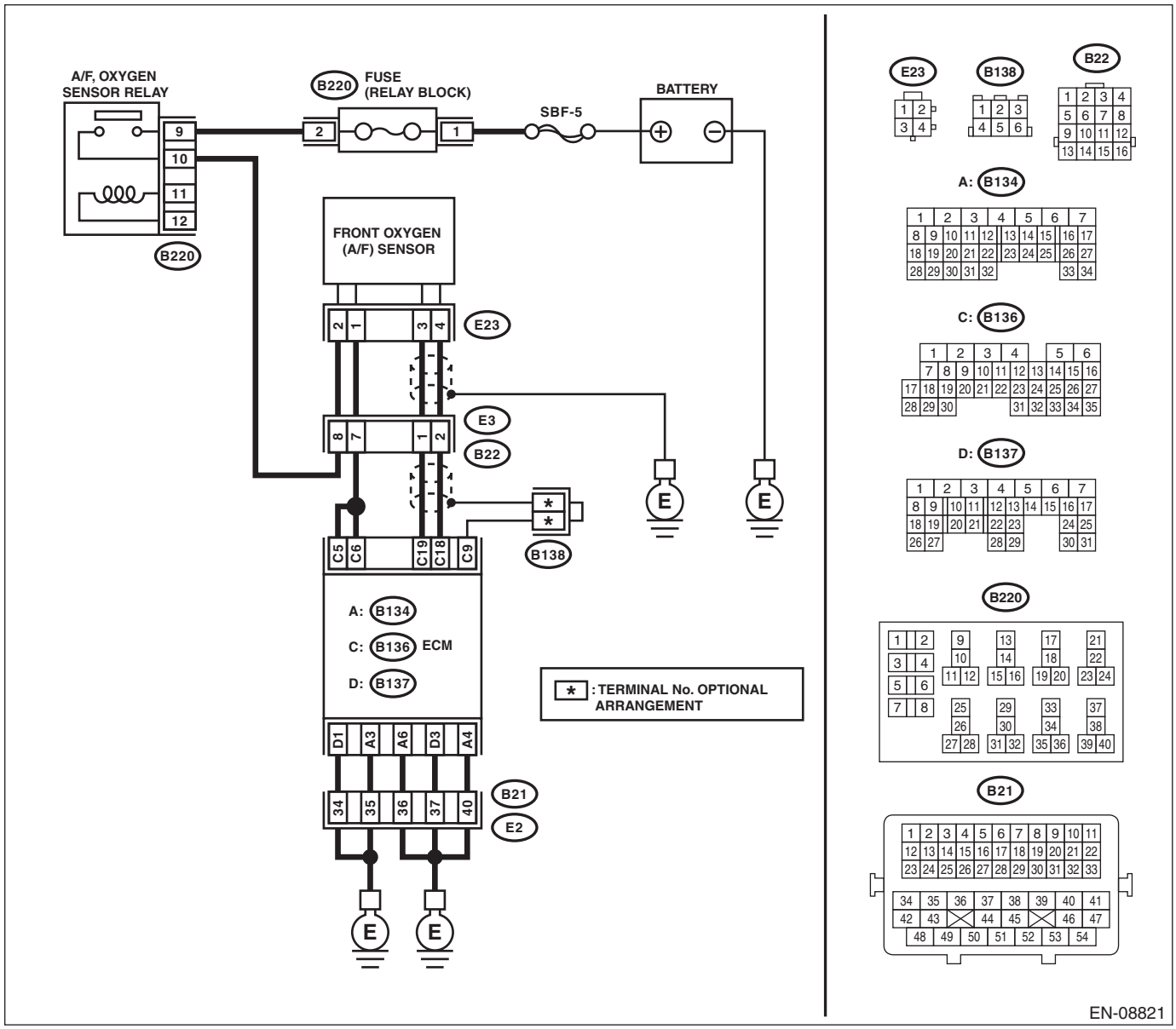
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-15, DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK POWER SUPPLY TO FRONT OXYGEN (A/F) SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors 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. 2 (+) — Engine ground (–):***	Is the voltage 10 V or more?	Go to step **2**.	Repair the power supply line. NOTE: In this case, repair the following item: • Open circuit in harness between A/F, oxygen sensor relay connector and front oxygen (A/F) sensor connector • Poor contact of A/F, oxygen sensor relay connector • Poor contact of coupling connector • Malfunction of A/F, oxygen sensor relay
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. 3) Measure the resistance between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B136) No. 5 — (E23) No. 1:*** ***(B136) No. 6 — (E23) No. 1:***	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 of coupling connector
3	**CHECK GROUND CIRCUIT FOR ECM.** Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 3 — Chassis ground:*** ***(B134) No. 4 — Chassis ground:*** ***(B134) No. 6 — Chassis ground:*** ***(B137) No. 1 — Chassis ground:*** ***(B137) No. 3 — 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 of harness between ECM and engine ground • Poor contact of coupling connector
4	**CHECK FRONT OXYGEN (A/F) SENSOR.** Measure the resistance between front oxygen (A/F) sensor terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 2 — 3 Ω?	Repair the poor contact of ECM connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DO)-93, Front Oxygen (A/F) Sensor.>

G: DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1)

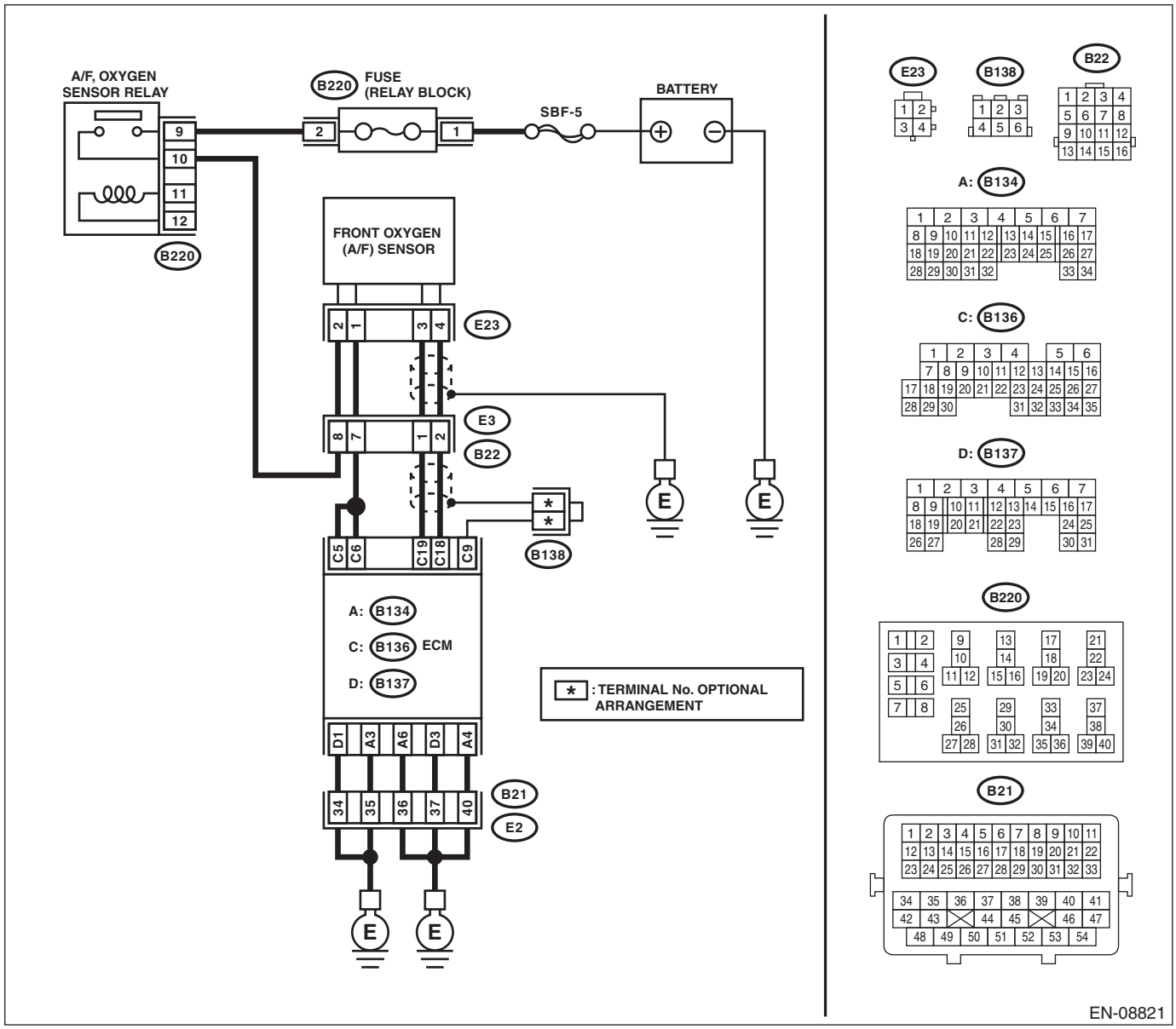
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-17, DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 5 (+) — Chassis ground (–):*** ***(B136) No. 6 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the short circuit to power in the harness between ECM and front oxygen (A/F) sensor connector.	Go to step **2**.
2	**CHECK GROUND CIRCUIT FOR ECM.** 1) Disconnect the connector from ECM. 2) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 3 — Chassis ground:*** ***(B134) No. 4 — Chassis ground:*** ***(B134) No. 6 — Chassis ground:*** ***(B137) No. 1 — Chassis ground:*** ***(B137) No. 3 — Chassis ground:***	Is the resistance less than 5 Ω?	Repair the poor contact of ECM connector.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and engine ground • Poor contact of coupling connector

H: DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2)

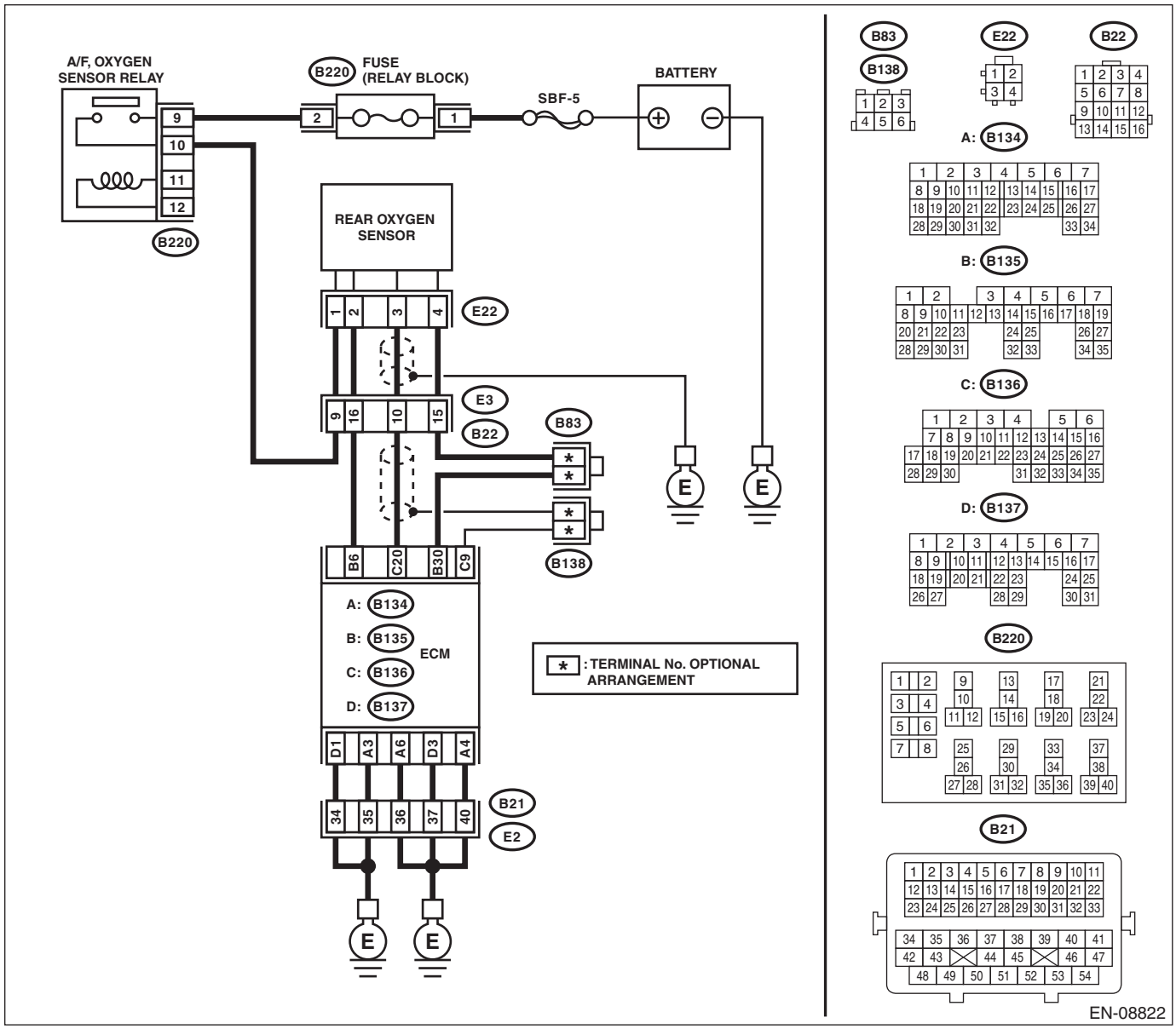
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-19, DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK POWER SUPPLY TO REAR OXYGEN SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from rear oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between rear oxygen sensor connector and engine ground. ***Connector & terminal*** ***(E22) No. 1 (+) — Engine ground (–):***	Is the voltage 10 V or more?	Go to step **2**.	Repair the power supply line. Or replace the main relay. NOTE: In this case, repair the following item: • Open circuit in harness between A/F, oxygen sensor relay connector and rear oxygen sensor connector • Poor contact of A/F, oxygen sensor relay connector • Poor contact of coupling connector • Malfunction of A/F, oxygen sensor relay
2	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between ECM and oxygen sensor connector. ***Connector & terminal*** ***(B135) No. 6 — (E22) No. 2:***	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 rear oxygen sensor connector • Poor contact of coupling connector
3	**CHECK GROUND CIRCUIT FOR ECM.** Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 3 — Chassis ground:*** ***(B134) No. 4 — Chassis ground:*** ***(B134) No. 6 — Chassis ground:*** ***(B137) No. 1 — Chassis ground:*** ***(B137) No. 3 — 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 of harness between ECM and engine ground • Poor contact of coupling connector
4	**CHECK REAR OXYGEN SENSOR.** Measure the resistance between rear oxygen sensor terminals. ***Terminals*** ***No. 2 — No. 1:***	Is the resistance 5 — 7 Ω?	Repair the poor contact of ECM connector.	Replace the rear oxygen sensor. <Ref. to FU(H4DO)-97, Rear Oxygen Sensor.>

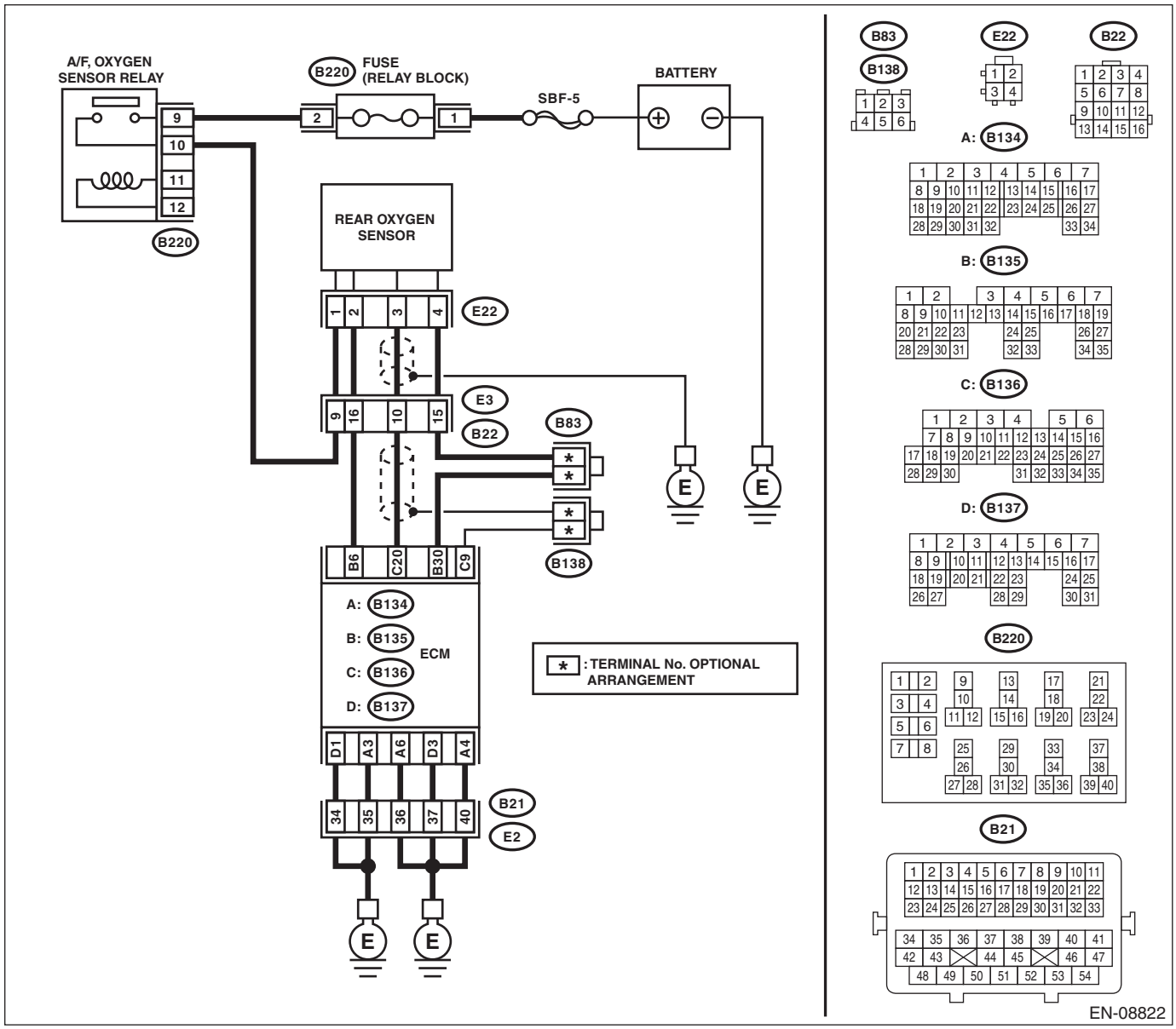
I: DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2)

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-21, DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 6 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the short circuit to power in the harness between ECM and rear oxygen sensor connector.	Go to step **2**.

Step		Check	Yes	No
2	**CHECK GROUND CIRCUIT FOR ECM.** 1) Disconnect the connector from ECM. 2) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 3 — Chassis ground:*** ***(B134) No. 4 — Chassis ground:*** ***(B134) No. 6 — Chassis ground:*** ***(B137) No. 1 — Chassis ground:*** ***(B137) No. 3 — Chassis ground:***	Is the resistance less than 5 Ω?	Repair the poor contact of ECM connector.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and engine ground • Poor contact of coupling connector

J: DTC P0068 MAP/MAF - THROTTLE POSITION CORRELATION

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-23, DTC P0068 MAP/MAF - THROTTLE POSITION CORRELATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**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 **2**.
2	**CHECK MANIFOLD ABSOLUTE PRESSURE SENSOR.** 1) Start the engine and warm up engine until coolant temperature is higher than 75°C (167°F). 2) For AT models, set the select lever to "P" range or "N" range, and for MT models, place the shift lever in the neutral position. 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 procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DO)(diag)-35, 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 **3**.	Replace the manifold absolute pressure sensor. <Ref. to FU(H4DO)-74, Manifold Absolute Pressure Sensor.>
3	**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 procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DO)(diag)-35, 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 **4**.	Replace the electronic throttle control. <Ref. to FU(H4DO)-17, Throttle Body.>
4	**CHECK THROTTLE OPENING ANGLE.**	Is the measured value 85% or more when throttle is fully open?	Replace the manifold absolute pressure sensor. <Ref. to FU(H4DO)-74, Manifold Absolute Pressure Sensor.>	Replace the electronic throttle control. <Ref. to FU(H4DO)-17, Throttle Body.>

K: DTC P0101 MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-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 servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK FOR 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(H4DO)(diag)-86, List of Diagnostic Trouble Code (DTC).>	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DO)-71, Mass Air Flow and Intake Air Temperature Sensor.>

L: DTC P0102 MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

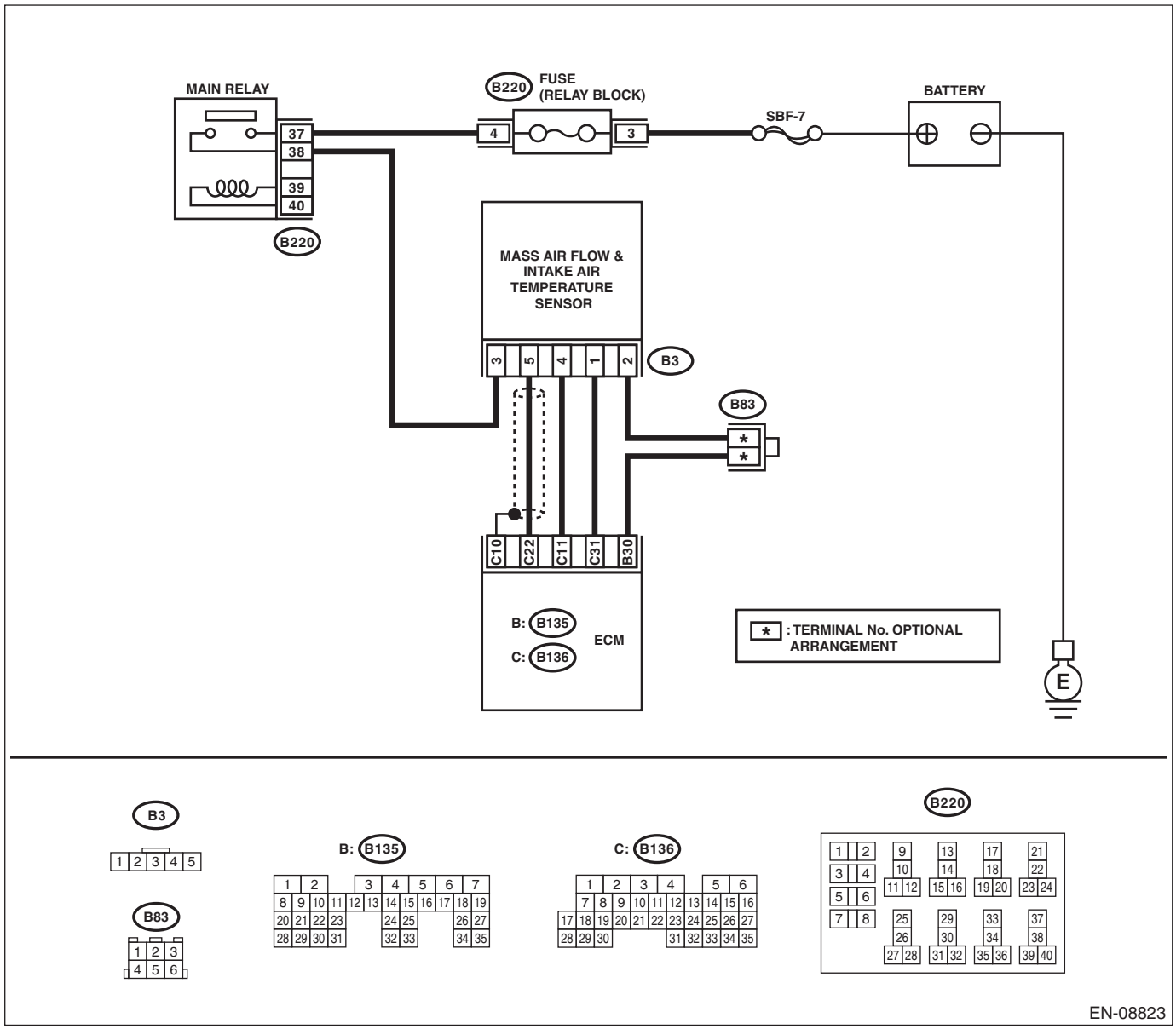
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-27, DTC P0102 MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Improper idling
- Engine stalls.
- Poor driving performance

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of air flow 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(H4DO)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the voltage less than 0.2 V?	Go to step **2**.	Even if DTC is detected, 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, temporary open or short circuit of harness may be the cause.
2	**CHECK POWER SUPPLY OF MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the mass air flow and intake air temperature sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between mass air flow and intake air temperature sensor connector and engine ground. ***Connector & terminal*** ***(B3) No. 3 (+) — 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 mass air flow and intake air temperature sensor connector • Poor contact of main relay connector
3	**CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM and the mass air flow and intake air temperature sensor connector. ***Connector & terminal*** ***(B136) No. 22 — (B3) No. 5:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the open circuit in harness between ECM and the mass air flow and intake air temperature sensor connector.
4	**CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR CONNECTOR.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 22 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **5**.	Repair the short circuit to ground in harness between ECM and mass air flow and intake air temperature sensor connector.
5	**CHECK FOR POOR CONTACT.** Check for poor contact of ECM and mass air flow and intake air temperature sensor connector.	Is there poor contact of ECM or mass air flow and intake air temperature sensor connector?	Repair the poor contact of ECM or mass air flow and intake air temperature sensor connector.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DO)-71, Mass Air Flow and Intake Air Temperature Sensor.>

M: DTC P0103 MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:

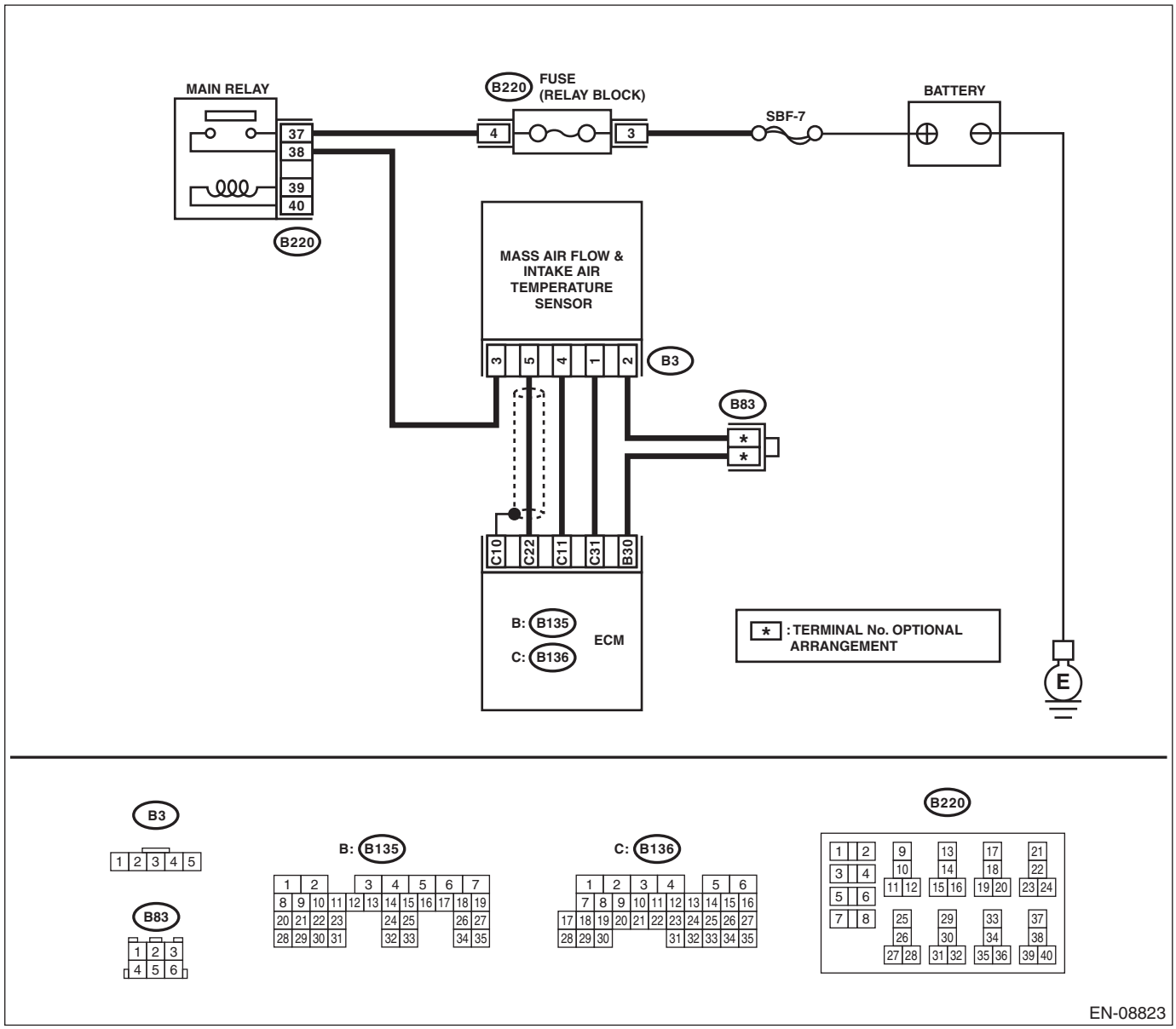
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-29, DTC P0103 MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Improper idling
- Engine stalls.
- Poor driving performance

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of air flow 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(H4DO)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the voltage 5 V or more?	Go to step **2**.	Even if DTC is detected, 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, temporary open or short circuit of harness may be the cause.
2	**CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the mass air flow and intake air temperature sensor. 3) Start the engine. 4) Read the data of air flow 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(H4DO)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the voltage 5 V or more?	Repair the short circuit of harness to power supply between ECM and mass air flow and intake air temperature sensor connector.	Go to step **3**.
3	**CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between mass air flow and intake air temperature sensor connector and engine ground. ***Connector & terminal*** ***(B3) No. 4 — Engine 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 mass air flow and intake air temperature sensor connector • Poor contact of ECM connector
4	**CHECK FOR POOR CONTACT.** Check for poor contact of mass air flow and intake air temperature sensor connector.	Is there poor contact of mass air flow and intake air temperature sensor connector?	Repair the poor contact of mass air flow and intake air temperature sensor connector.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DO)-71, Mass Air Flow and Intake Air Temperature Sensor.>

N: DTC P0107 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT

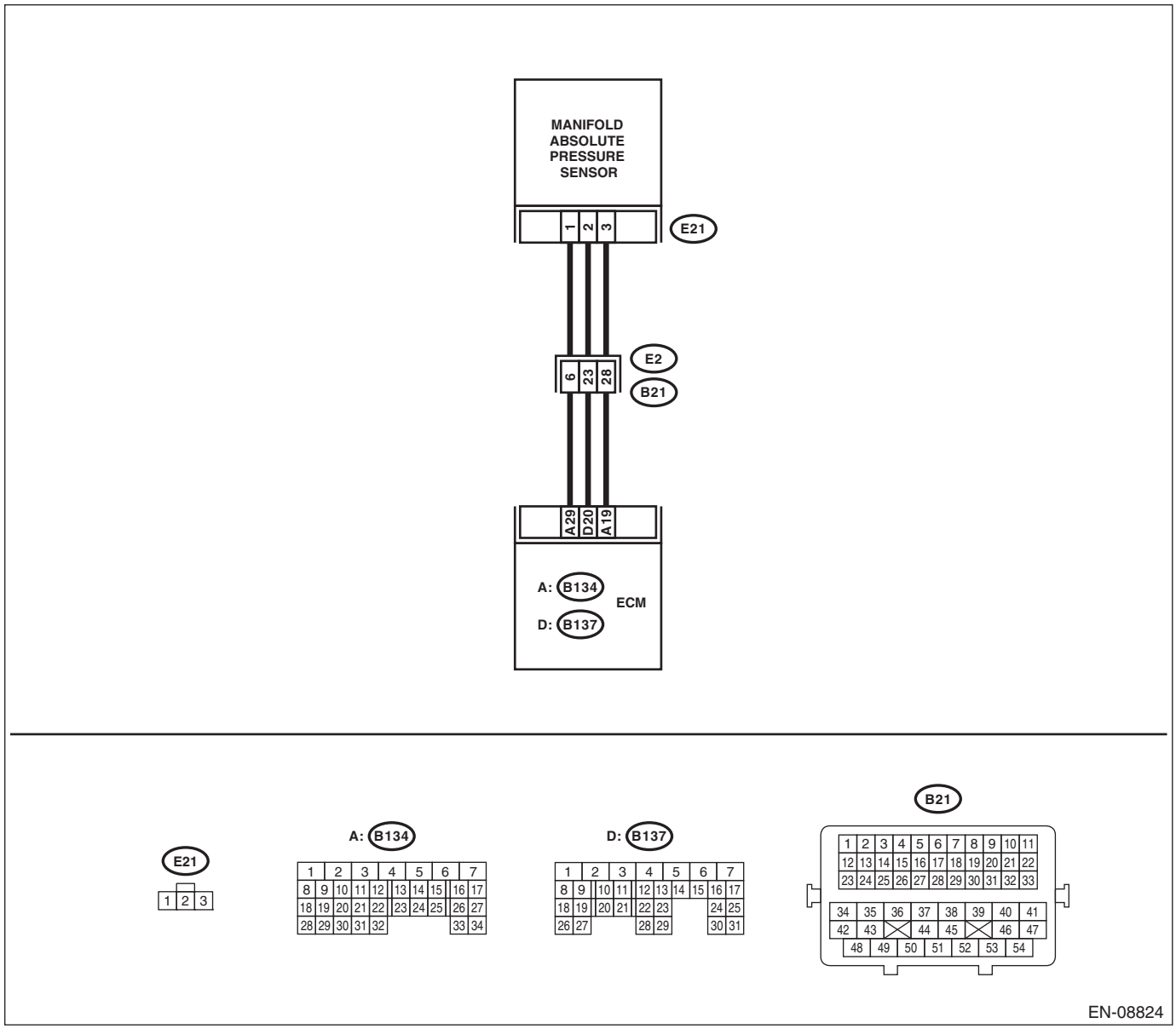
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-31, DTC P0107 MANIFOLD ABSOLUTE PRESSURE/ BAROMETRIC PRESSURE CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	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 procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DO)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the measured value less than 13.3 kPa (100 mmHg, 3.94 inHg)?	Go to step **2**.	Even if DTC is detected, 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, temporary open or short circuit of harness may be the cause.
2	**CHECK POWER SUPPLY OF MANIFOLD ABSOLUTE PRESSURE SENSOR.** 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. ***Connector & terminal*** ***(E21) No. 3 (+) — Engine ground (–):***	Is the voltage 4.5 V or more?	Go to step **3**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and manifold absolute pressure sensor connector. • Poor contact of ECM connector • Poor contact of coupling connector
3	**CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM and manifold absolute pressure sensor connector. ***Connector & terminal*** ***(B137) No. 20 — (E21) 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: • Open circuit of harness between ECM and manifold absolute pressure sensor connector. • Poor contact of coupling connector
4	**CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 20 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **5**.	Repair ground short circuit of harness between ECM and manifold absolute pressure sensor connector.
5	**CHECK FOR POOR CONTACT.** Check for poor contact of ECM and manifold absolute pressure sensor connector.	Is there poor contact of ECM or manifold absolute pressure sensor connector?	Repair the poor contact of ECM or manifold absolute pressure sensor connector.	Replace the manifold absolute pressure sensor. <Ref. to FU(H4DO)-74, Manifold Absolute Pressure Sensor.>

O: DTC P0108 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT

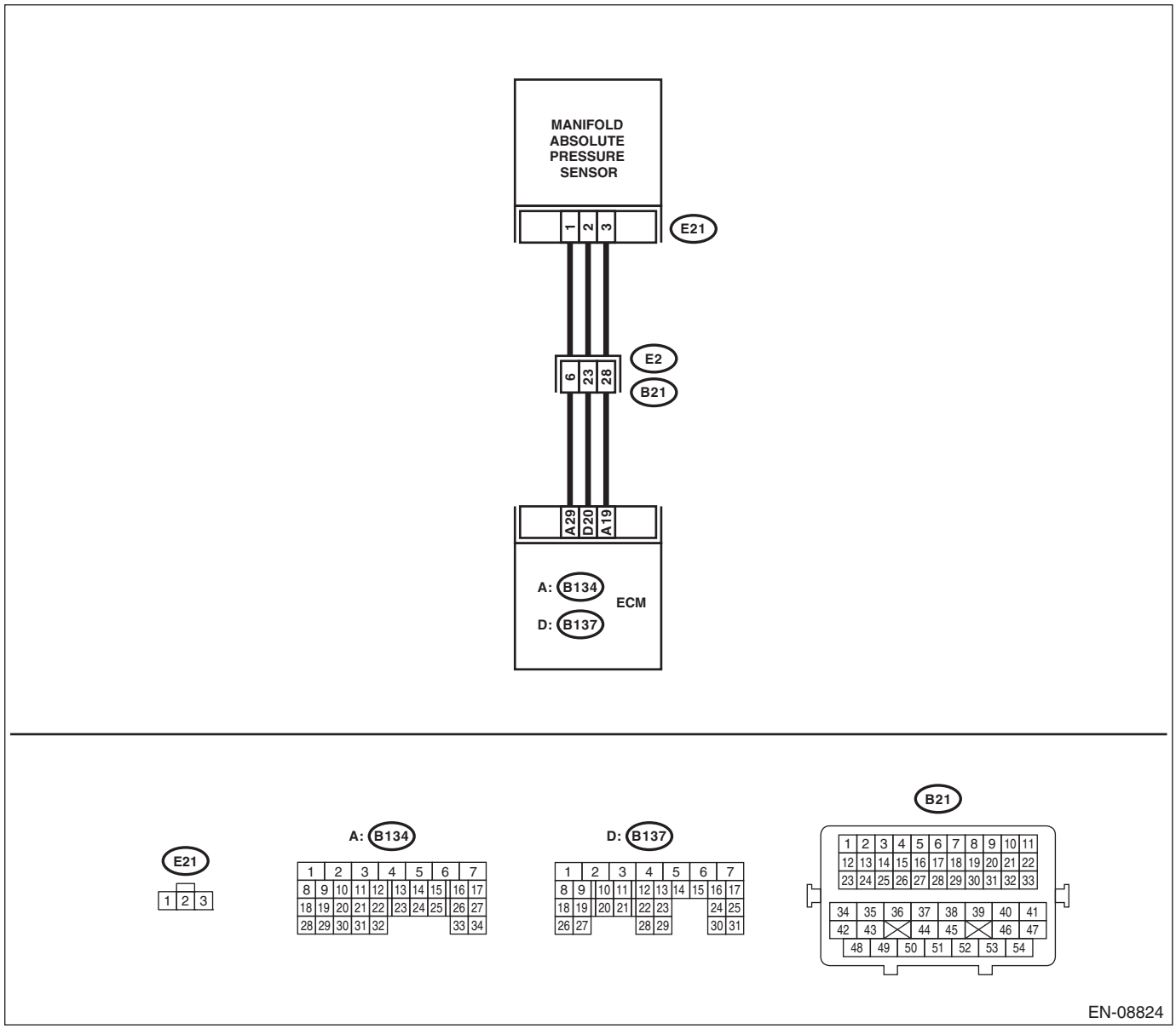
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-33, DTC P0108 MANIFOLD ABSOLUTE PRESSURE/ BAROMETRIC PRESSURE CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	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 procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DO)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the measured value 119.5 kPa (896.5 mmHg, 35.29 inHg) or more?	Go to step **2**.	Even if DTC is detected, 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, temporary open or short circuit of harness may be the cause.
2	**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) Start the engine. 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 procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DO)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the measured value 119.5 kPa (896.5 mmHg, 35.29 inHg) or more?	Repair the short circuit to power in harness between ECM and manifold absolute pressure sensor connector.	Go to step **3**.
3	**CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between manifold absolute pressure sensor connector and engine ground. ***Connector & terminal*** ***(E21) No. 2 — Engine 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 of harness between ECM and manifold absolute pressure sensor connector. • Poor contact of ECM connector • Poor contact of coupling connector
4	**CHECK FOR POOR CONTACT.** Check for poor contact of manifold absolute pressure sensor connector.	Is there 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(H4DO)-74, Manifold Absolute Pressure Sensor.>

P: DTC P0111 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT RANGE/PERFORMANCE

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-35, 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 servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**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(H4DO)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the engine coolant temperature 75°C (167°F) or higher?	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DO)-71, Mass Air Flow and Intake Air Temperature Sensor.>	Check for DTC P0125. <Ref. to EN(H4DO)(diag)-158, DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Q: DTC P0112 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT LOW

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-37, DTC P0112 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

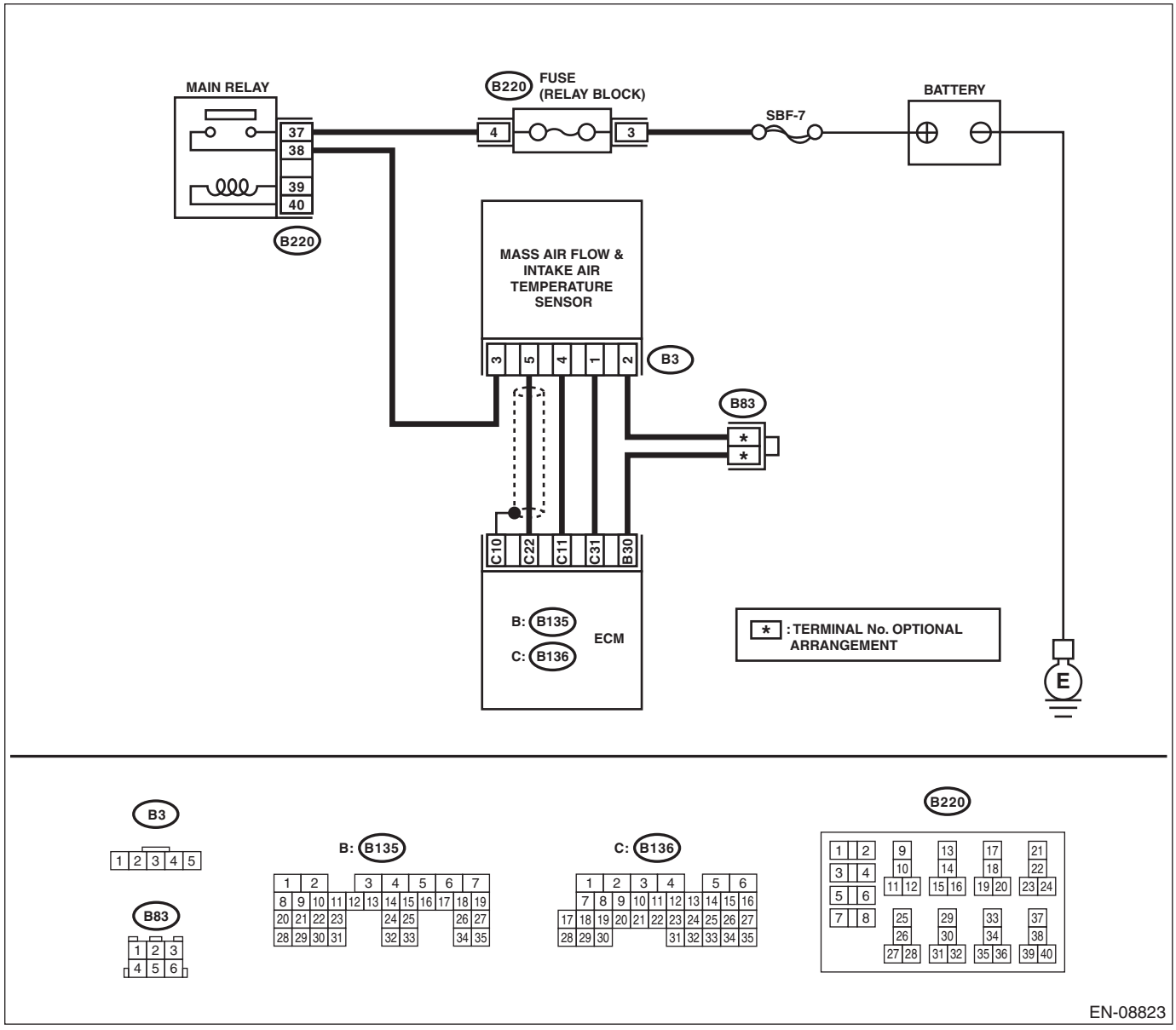
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of 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(H4DO)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the intake air temperature 120°C (248°F) or more?	Go to step **2**.	Even if DTC is detected, 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, temporary open or short circuit of harness may be the cause.
2	**CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and the mass air flow and intake air temperature sensor. 3) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 31 — Chassis ground:***	Is the resistance 1 MΩ or more?	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DO)-71, Mass Air Flow and Intake Air Temperature Sensor.>	Repair the short circuit to ground in harness between ECM and mass air flow and intake air temperature sensor connector.

R: DTC P0113 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT HIGH

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-39, DTC P0113 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

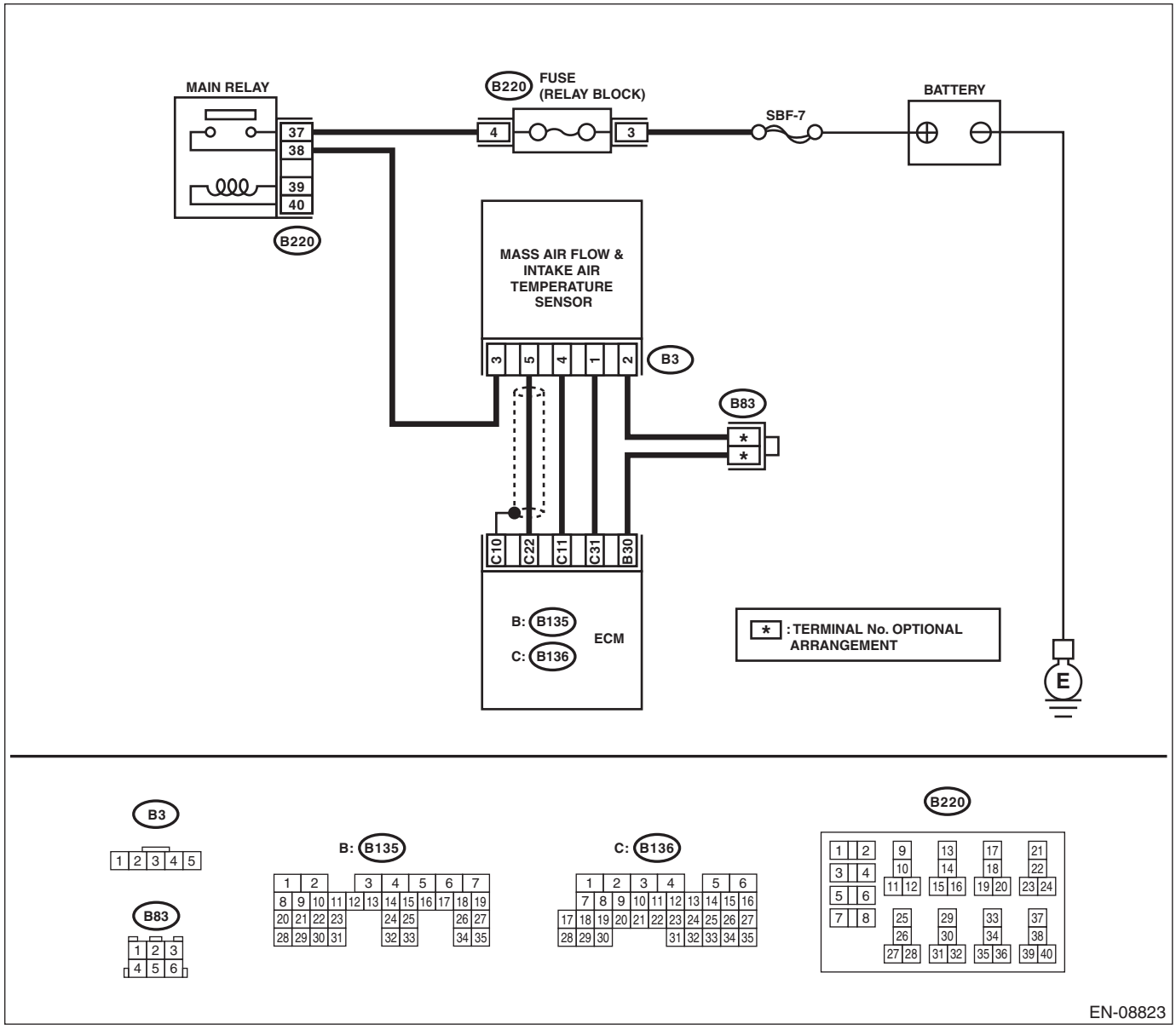
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of 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(H4DO)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the intake air temperature –40°C (–40°F)?	Go to step **2**.	Even if DTC is detected, 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, temporary open or short circuit of harness may be the cause.
2	**CHECK FOR POOR CONTACT.** Check for poor contact of ECM and mass air flow and intake air temperature sensor connector.	Is there poor contact of ECM or mass air flow and intake air temperature sensor connector?	Repair the poor contact of ECM or mass air flow and intake air temperature sensor connector.	Go to step **3**.
3	**CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and the mass air flow and intake air temperature sensor. 3) Measure the resistance of harness between ECM and the mass air flow and intake air temperature sensor connector. ***Connector & terminal*** ***(B136) No. 31 — (B3) No. 1:*** ***(B135) No. 30 — (B3) 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: • Open circuit in harness between ECM and mass air flow and intake air temperature sensor connector • Poor contact of joint connector
4	**CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR CONNECTOR.** 1) Connect all connectors. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 31 (+) — Chassis ground (–):***	Is the voltage 5 V or more?	Repair the short circuit of harness to power supply between ECM and mass air flow and intake air temperature sensor connector.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DO)-71, Mass Air Flow and Intake Air Temperature Sensor.>

S: DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW

DTC DETECTING CONDITION:

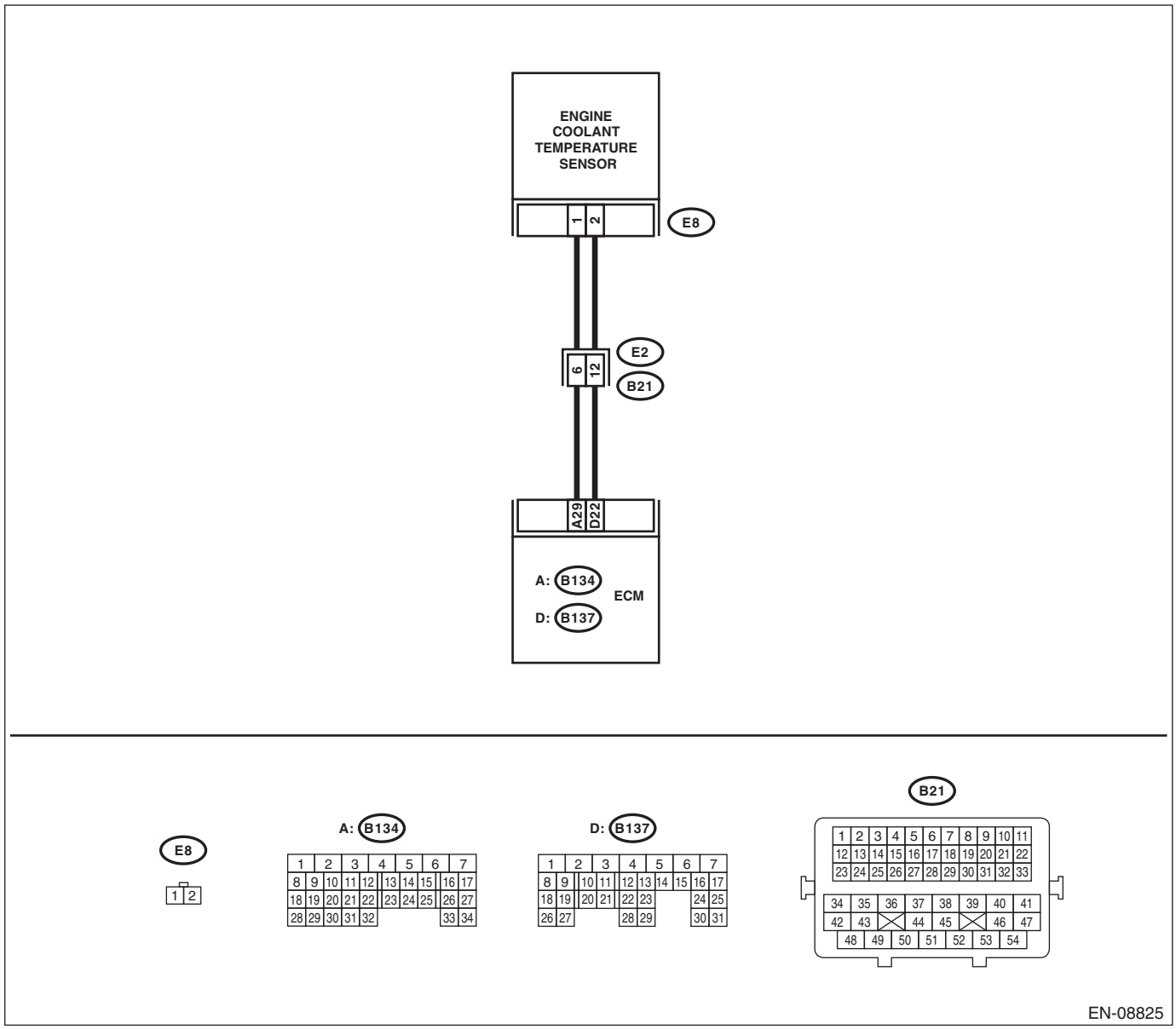
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-41, DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Hard to start
- Improper idling
- Poor driving performance

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 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(H4DO)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the engine coolant temperature 120°C (248°F) or higher?	Go to step **2**.	Even if DTC is detected, 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, temporary open or short circuit of harness may be the cause.
2	**CHECK HARNESS BETWEEN ECM AND ENGINE COOLANT TEMPERATURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and engine coolant temperature sensor. 3) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 22 — Chassis ground:***	Is the resistance 1 MΩ or more?	Replace the engine coolant temperature sensor. <Ref. to FU(H4DO)-42, Engine Coolant Temperature Sensor.>	Repair short circuit in harness to ground between ECM and engine coolant temperature sensor connector.

T: DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH

DTC DETECTING CONDITION:

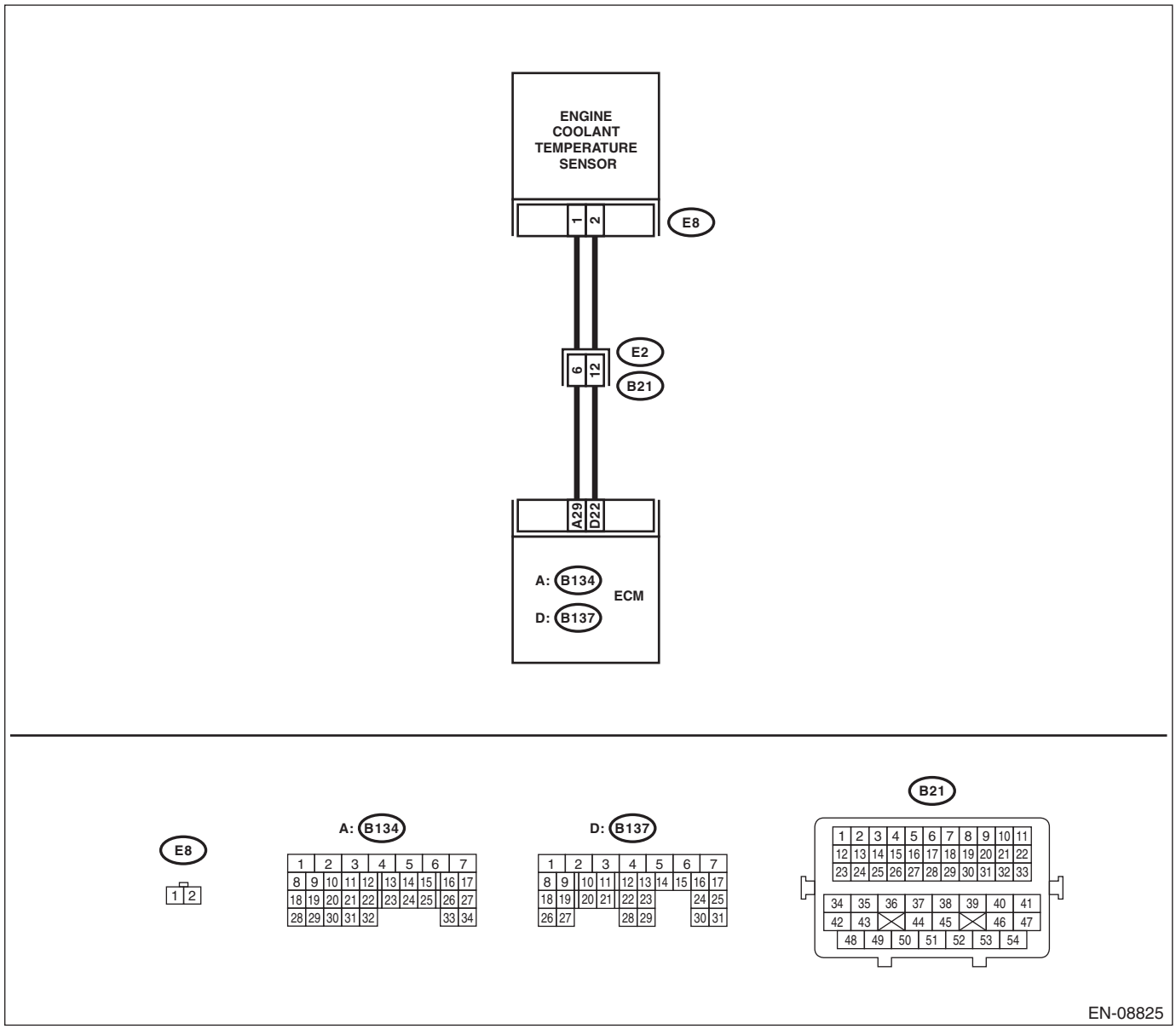
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-43, DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Hard to start
- Improper idling
- Poor driving performance

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 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(H4DO)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the engine coolant temperature –40°C (–40°F)?	Go to step **2**.	Even if DTC is detected, 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, temporary open or short circuit of harness may be the cause.
2	**CHECK FOR POOR CONTACT.** Check for poor contact of ECM and engine coolant temperature sensor connector.	Is there poor contact of ECM or engine coolant temperature sensor connector?	Repair the poor contact of ECM or engine coolant temperature sensor connector.	Go to step **3**.
3	**CHECK HARNESS BETWEEN ECM AND ENGINE COOLANT TEMPERATURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and engine coolant temperature sensor. 3) Measure the resistance of harness between ECM and engine coolant temperature sensor connector. ***Connector & terminal*** ***(B137) No. 22 — (E8) No. 2:*** ***(B134) No. 29 — (E8) 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 engine coolant temperature sensor connector • Poor contact of coupling connector
4	**CHECK HARNESS BETWEEN ECM AND ENGINE COOLANT TEMPERATURE SENSOR CONNECTOR.** 1) Connect all connectors. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 22 (+) — Chassis ground (–):***	Is the voltage 5 V or more?	Repair the short circuit to power in harness between ECM and engine coolant temperature sensor connector.	Replace the engine coolant temperature sensor. <Ref. to FU(H4DO)-42, Engine Coolant Temperature Sensor.>

U: DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT LOW

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-45, DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

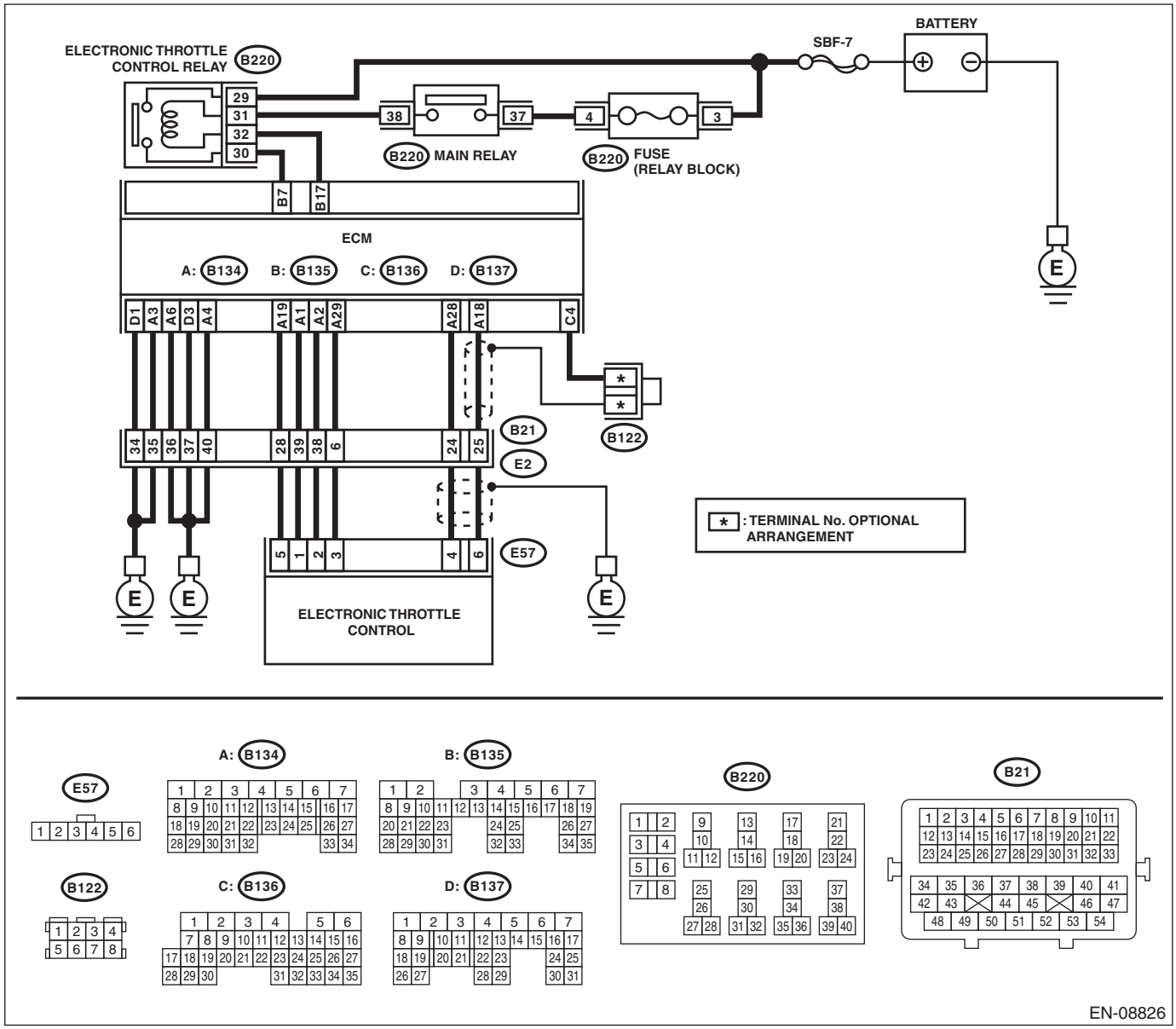
TROUBLE SYMPTOM:

- Improper idling
- Engine stalls.
- Poor driving performance

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and electronic throttle control. 3) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 19 — Chassis ground:*** ***(B134) No. 18 — Chassis ground:*** ***(B134) No. 18 — (B136) No. 4:***	Is the resistance 1 MΩ or more?	Go to step **2**.	Repair the short circuit to ground in harness between ECM and electronic throttle control connector.
2	**CHECK SHORT CIRCUIT INSIDE THE ECM.** 1) Connect the connector to ECM. 2) Measure the resistance between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 6 — Engine ground:***	Is the resistance 1 MΩ or more?	Replace the electronic throttle control. <Ref. to FU(H4DO)-17, Throttle Body.>	Repair the short circuit to ground in harness between ECM and electronic throttle control connector. Replace the ECM if defective. <Ref. to FU(H4DO)-101, Engine Control Module (ECM).>

V: DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT HIGH

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-47, DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

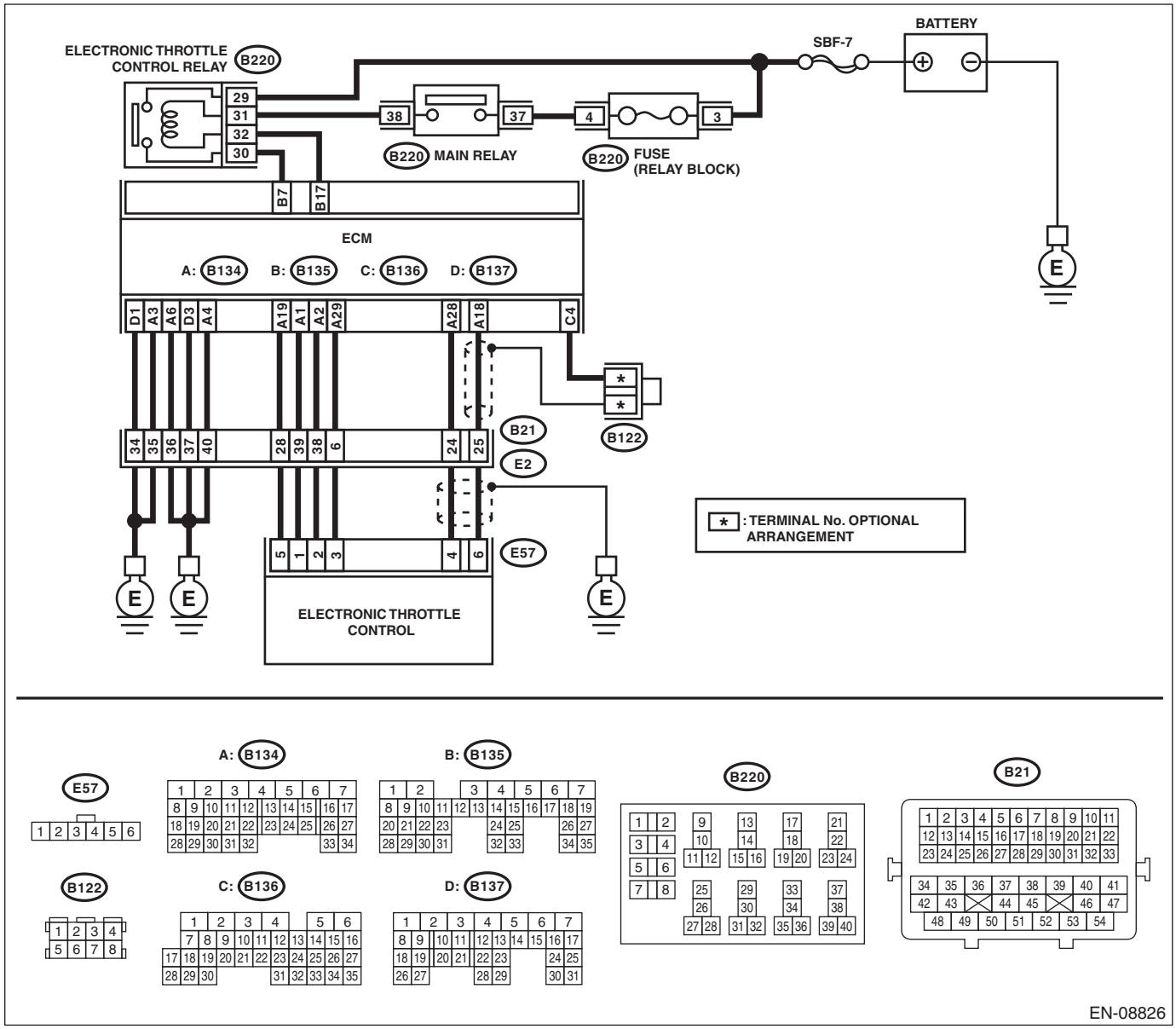
TROUBLE SYMPTOM:

- Improper idling
- Engine stalls.
- Poor driving performance

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and electronic throttle control. 3) Measure the resistance of harness between ECM 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 **2**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and electronic throttle control connector • Poor contact of coupling connector
2	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL CONNECTOR.** 1) Connect the connector to ECM. 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 **3**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and engine ground • Poor contact of ECM connector • Poor contact of coupling connector
3	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 6 (+) — Engine ground (–):***	Is the voltage 5 V or more?	Repair the short circuit to power in harness between ECM and electronic throttle control connector.	Go to step **4**.
4	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between ECM connectors. ***Connector & terminal*** ***(B134) No. 19 — (B134) No. 18:***	Is the resistance 1 MΩ or more?	Repair the poor contact of electronic throttle control connector. Replace the electronic throttle control if defective. <Ref. to FU(H4DO)-17, Throttle Body.>	Repair the short circuit to power in harness between ECM and electronic throttle control connector.

W: DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-49, 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 servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK TIRE SIZE.**	Is the tire size as specified and the same size as three other wheels?	Go to step **2**.	Replace the tire.
2	**CHECK ENGINE COOLANT.** Check the following items: • Amount of engine coolant • Engine coolant freeze • Contamination of engine coolant	Is the engine coolant normal?	Go to step **3**.	Fill or replace the engine coolant. <Ref. to CO(H4DO)-13, REPLACEMENT, Engine Coolant.>
3	**CHECK THERMOSTAT.**	Does the thermostat remain opened?	Replace the thermostat. <Ref. to CO(H4DO)-19, Thermostat.>	Replace the engine coolant temperature sensor. <Ref. to FU(H4DO)-42, Engine Coolant Temperature Sensor.>

X: DTC P0126 INSUFFICIENT ENGINE COOLANT TEMPERATURE FOR STABLE OPERATION

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION<Ref. to GD(H4DO)-51, DTC P0126 INSUFFICIENT ENGINE COOLANT TEMPERATURE FOR STABLE OPERATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Hard to start
- Improper idling
- Poor driving performance

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode<Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode<Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK FOR 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(H4DO)(diag)-86, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK ENGINE COOLANT TEMPERATURE SENSOR.** 1) Disconnect the connectors from the engine coolant temperature sensor. 2) Measure the resistance between engine coolant temperature sensor terminals when the engine coolant is cold and after warmed up. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance of engine coolant temperature sensor different between when engine coolant is cold and after warmed up?	Repair the poor contact of ECM connector.	Replace the engine coolant temperature sensor. <Ref. to FU(H4DO)-42, Engine Coolant Temperature Sensor.>

Y: DTC P0128 COOLANT THERMOSTAT (ENGINE COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE)

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION<Ref. to GD(H4DO)-53, DTC P0128 COOLANT THERMOSTAT (ENGINE COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

Thermostat remains open.

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode<Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode<Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK FOR 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(H4DO)(diag)-86, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK ENGINE COOLANT.**	Is the engine coolant amount normal?	Go to step **3**.	Refill the engine coolant. <Ref. to CO(H4DO)-13, Engine Coolant.>
3	**CHECK RADIATOR FAN.** 1) Start the engine. 2) Check the radiator fan operation.	Does the radiator fan continuously rotate for 3 minutes or more during idling?	Repair radiator fan circuit. <Ref. to CO(H4DO)-34, Radiator Main Fan and Fan Motor.>and<Ref. to CO(H4DO)-37, Radiator Sub Fan and Fan Motor.>	Replace the thermostat. <Ref. to CO(H4DO)-19, Thermostat.>

Z: DTC P0131 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1)

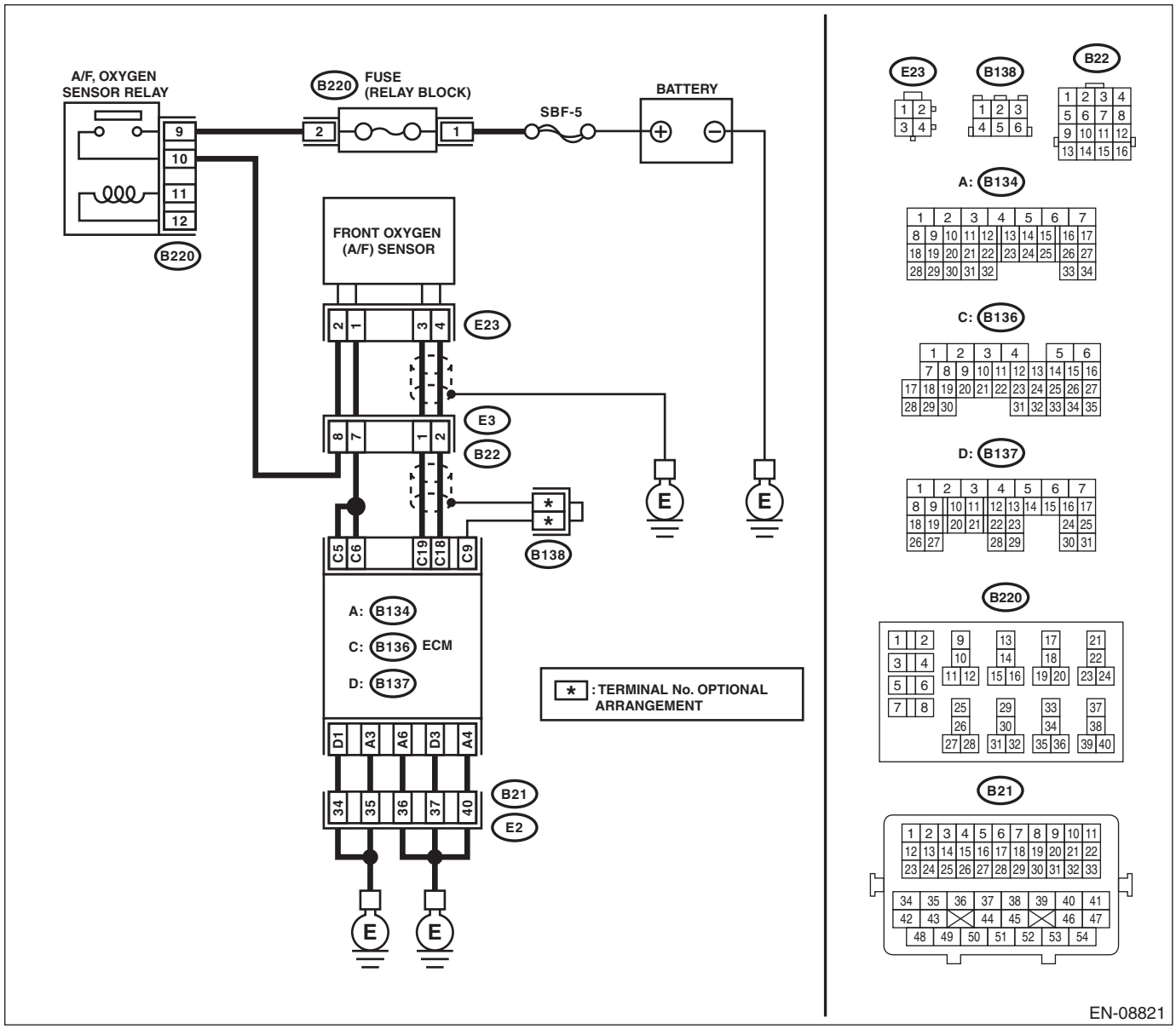
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-56, DTC P0131 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Has water entered the connector?	Completely remove any water inside.	Go to step **2**.

	Step	Check	Yes	No
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 and front oxygen (A/F) sensor connector. 3) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 18 — Chassis ground:*** ***(B136) No. 19 — 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 FOR POOR CONTACT.** Check for poor contact of the front oxygen (A/F) sensor connector.	Is there poor contact of front oxygen (A/F) sensor connector?	Repair the poor contact of front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DO)-93, Front Oxygen (A/F) Sensor.>

AA:DTC P0132 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1)

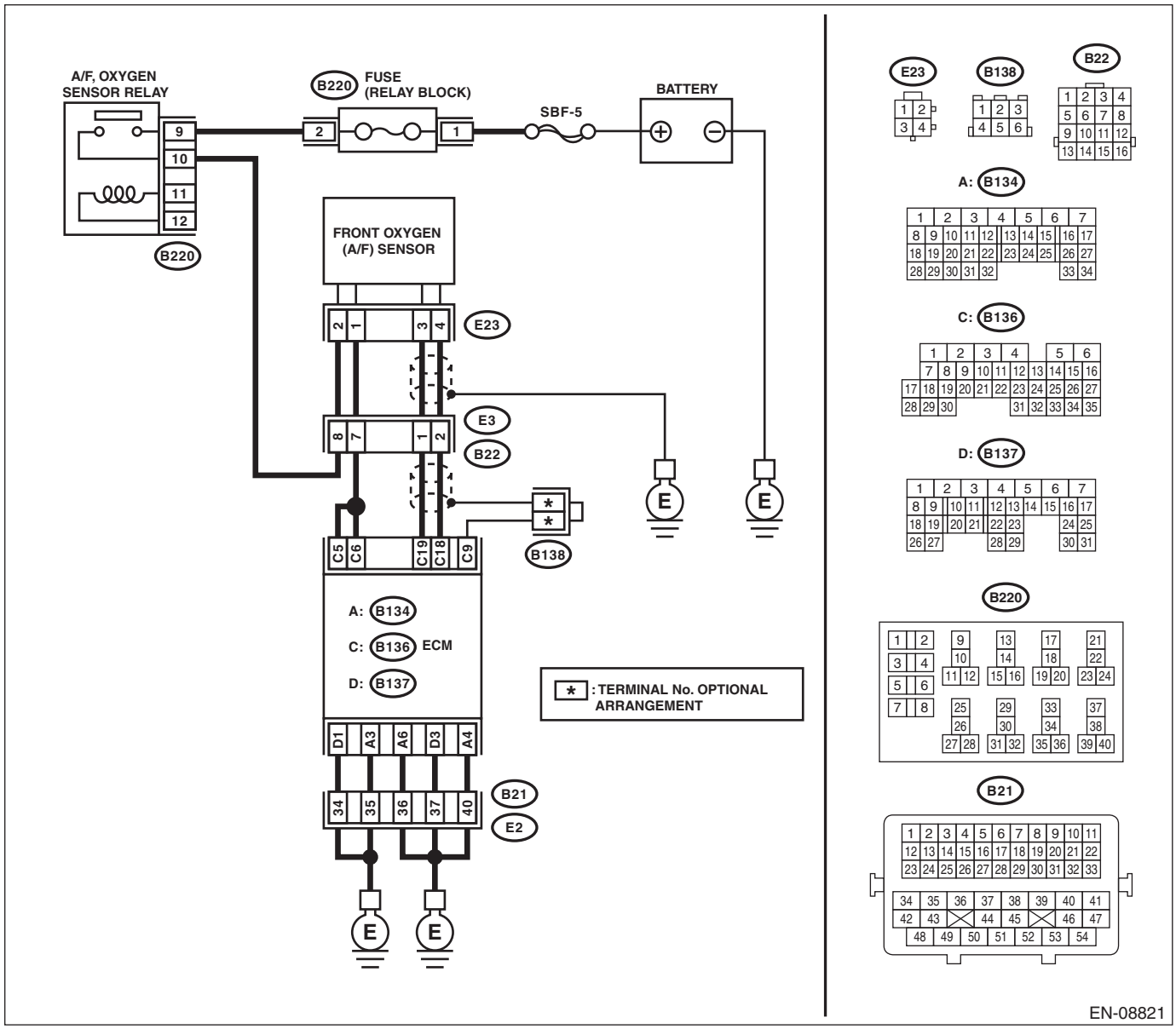
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-58, DTC P0132 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Has water entered the connector?	Completely remove any water inside.	Go to step **2**.

	Step	Check	Yes	No
2	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from front oxygen (A/F) sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 18 (+) — Chassis ground (–):*** ***(B136) No. 19 (+) — Chassis ground (–):***	Is the voltage 8 V or more?	Repair the short circuit to power in the harness between ECM and front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DO)-93, Front Oxygen (A/F) Sensor.>

AB:DTC P0133 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1)

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-60, DTC P0133 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK EXHAUST SYSTEM.** NOTE: Check the following items. • 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(H4DO)-93, Front Oxygen (A/F) Sensor.>

AC:DTC P0134 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1)

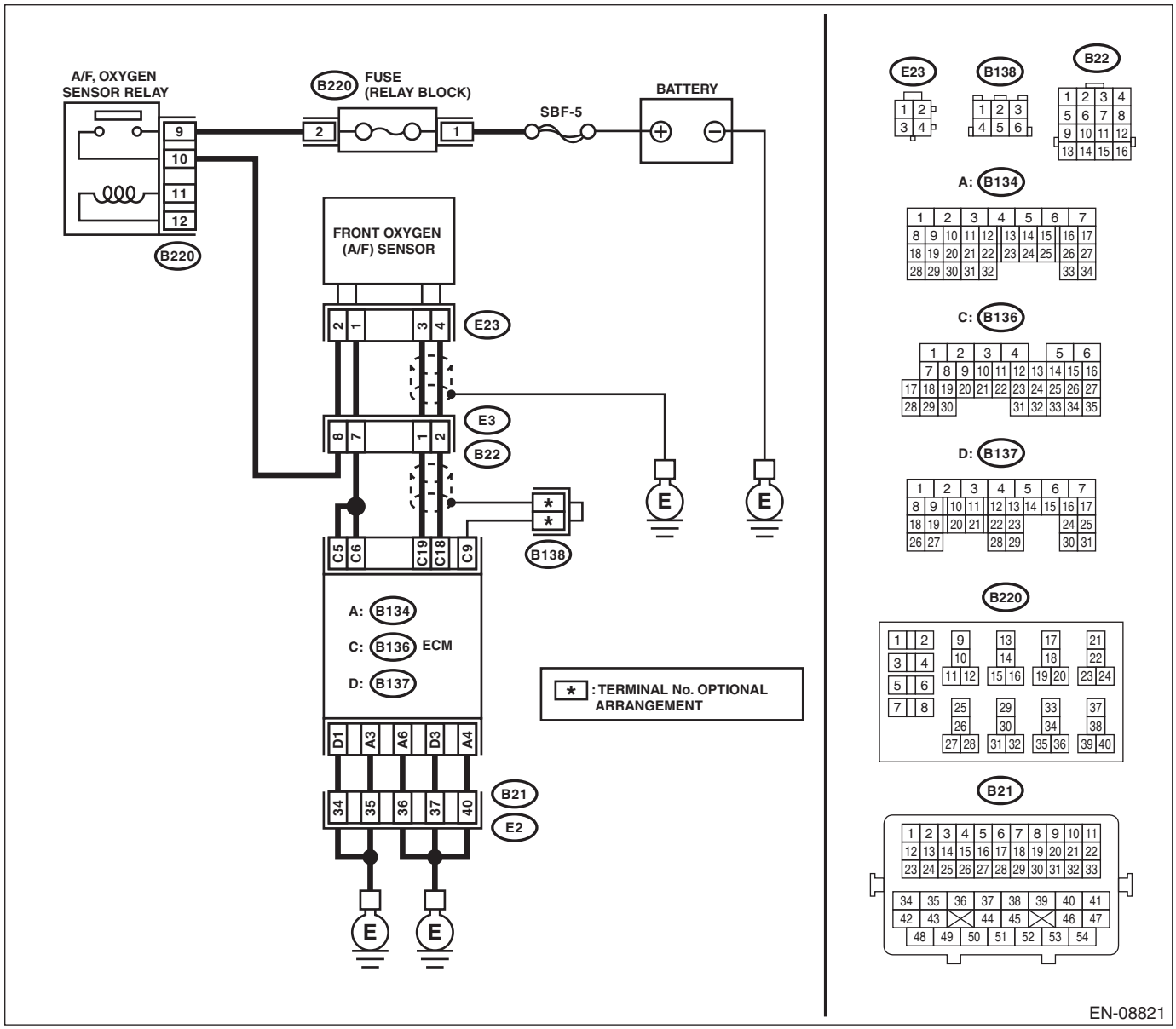
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-63, DTC P0134 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors 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*** ***(B136) No. 19 — (E23) No. 3:*** ***(B136) No. 18 — (E23) No. 4:***	Is the resistance less than 1 Ω?	Go to step **2**.	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 of coupling connector
2	**CHECK FOR POOR CONTACT.** Check for poor contact of ECM and front oxygen (A/F) sensor connector.	Is there poor contact of ECM or front oxygen (A/F) sensor connector?	Repair the poor contact of ECM or front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DO)-93, Front Oxygen (A/F) Sensor.>

AD:DTC P0137 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2)

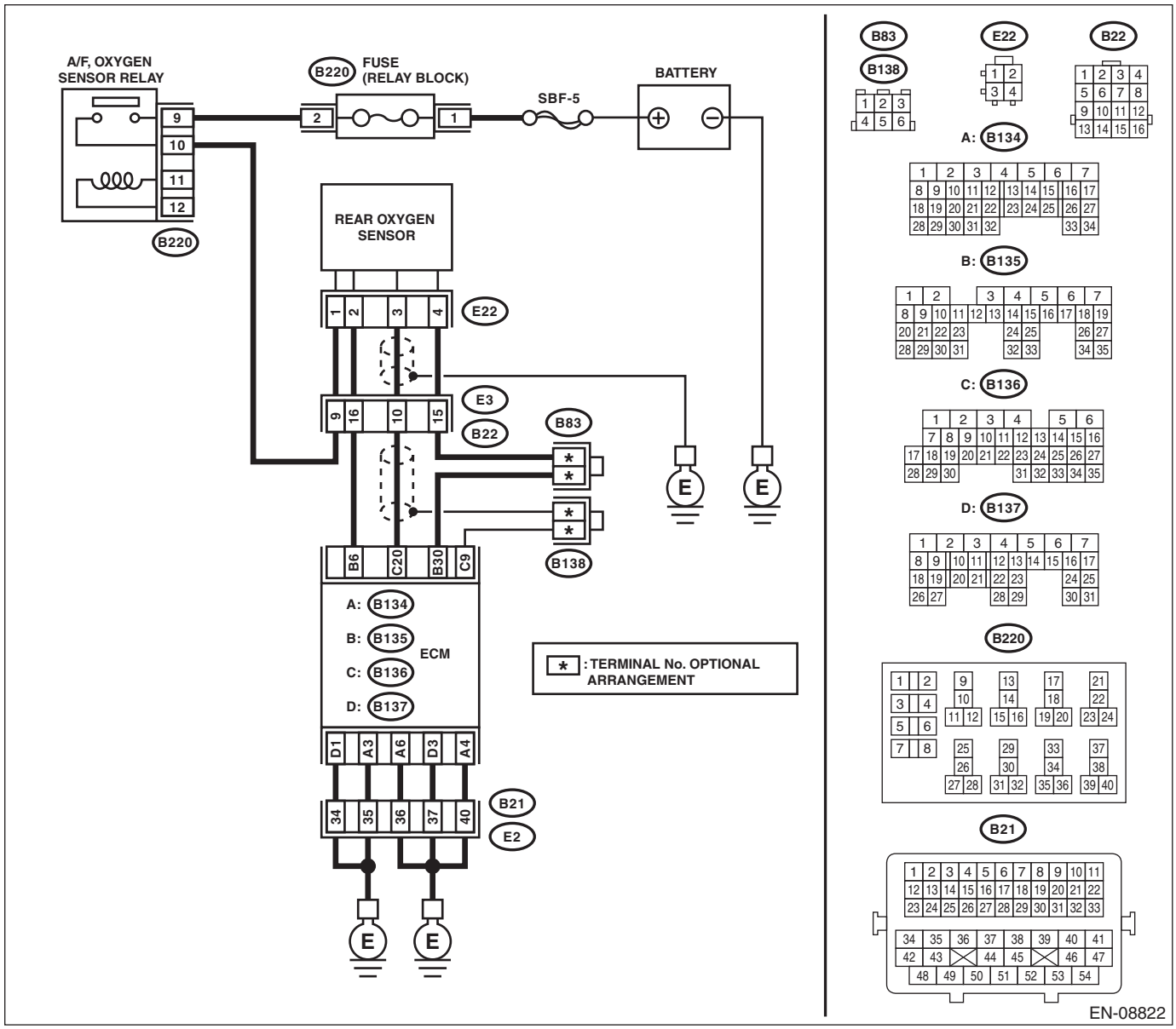
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-65, DTC P0137 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm up the engine until engine coolant temperature is higher than 75°C (167°F), and keep the engine speed at 3,000 rpm. (2 minutes maximum) 2) Read the data of rear oxygen 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(H4DO)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the voltage 490 mV or more?	Go to step **5**.	Go to step **2**.
2	**CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Has water entered the connector?	Completely remove any water inside.	Go to step **3**.
3	**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*** ***(B136) No. 20 — (E22) No. 3:*** ***(B135) No. 30 — (E22) 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: • Open circuit in harness between ECM and rear oxygen sensor connector • Poor contact of coupling connector
4	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between rear oxygen sensor connector and chassis ground. ***Connector & terminal*** ***(E22) No. 3 (+) — Chassis ground (–):***	Is the voltage 0.2 — 0.5 V?	Replace the rear oxygen sensor. <Ref. to FU(H4DO)-97, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and rear oxygen sensor connector • Poor contact of coupling connector • Poor contact of ECM connector
5	**CHECK EXHAUST SYSTEM.** Check exhaust system parts. NOTE: Check the following items. • Looseness and improper fitting of exhaust system parts • Damage (crack, hole etc.) of parts • Loose part and improper installation 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(H4DO)-97, Rear Oxygen Sensor.>

AE:DTC P0138 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2)

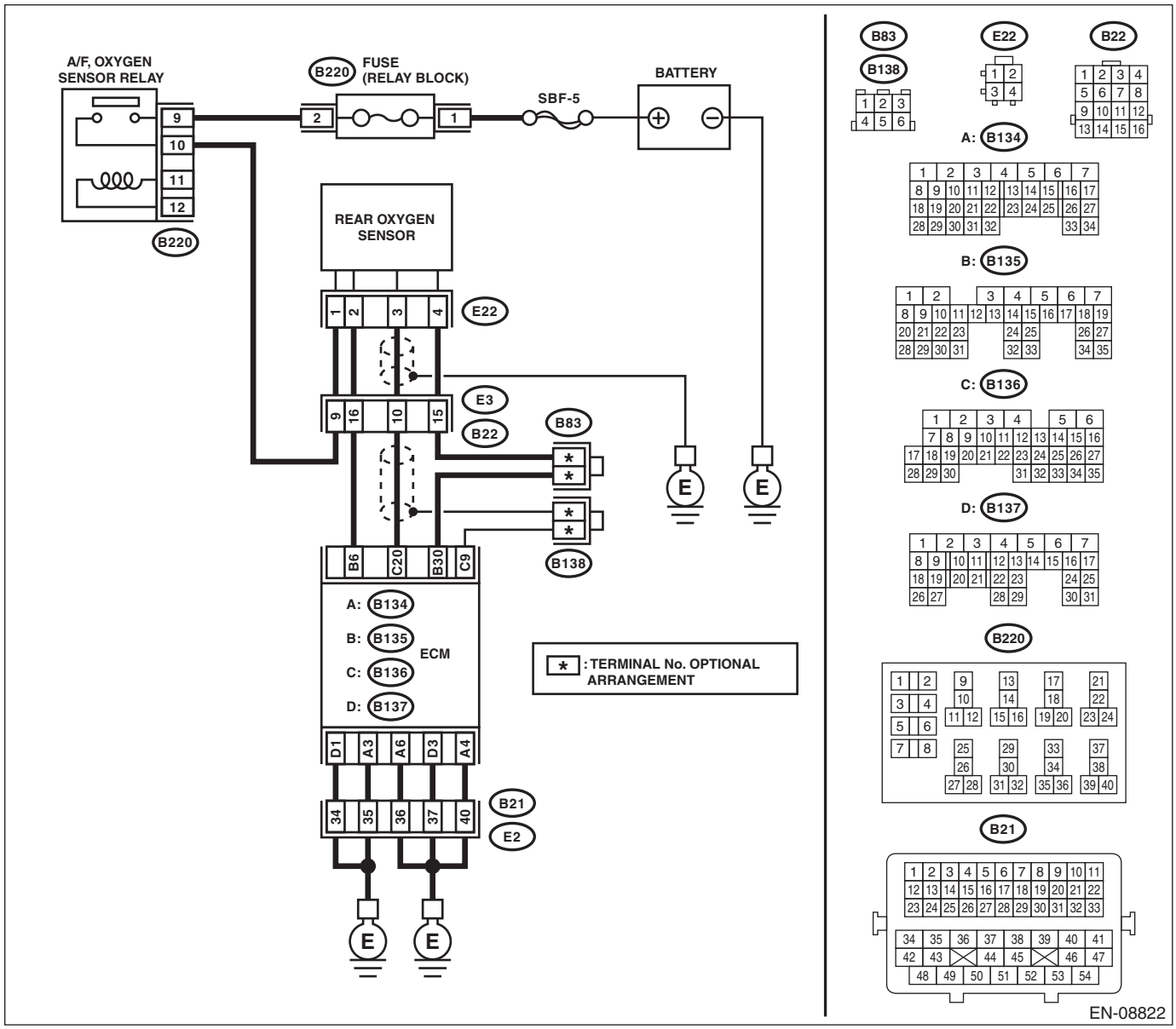
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-68, DTC P0138 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm up the engine until engine coolant temperature is higher than 75°C (167°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: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DO)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the voltage 250 mV or less?	Go to step **5**.	Go to step **2**.
2	**CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Has water entered the connector?	Completely remove any water inside.	Go to step **3**.
3	**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*** ***(B136) No. 20 — (E22) No. 3:*** ***(B135) No. 30 — (E22) 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: • Open circuit in harness between ECM and rear oxygen sensor connector • Poor contact of coupling connector
4	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between rear oxygen sensor connector and chassis ground. ***Connector & terminal*** ***(E22) No. 3 (+) — Chassis ground (–):***	Is the voltage 0.2 — 0.5 V?	Replace the rear oxygen sensor. <Ref. to FU(H4DO)-97, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and rear oxygen sensor connector • Poor contact of coupling connector • Poor contact of ECM connector
5	**CHECK EXHAUST SYSTEM.** Check exhaust system parts. NOTE: Check the following items. • Looseness and improper fitting of exhaust system parts • Damage (crack, hole etc.) of parts • Loose part and improper installation 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(H4DO)-97, Rear Oxygen Sensor.>

AF:DTC P0139 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2)

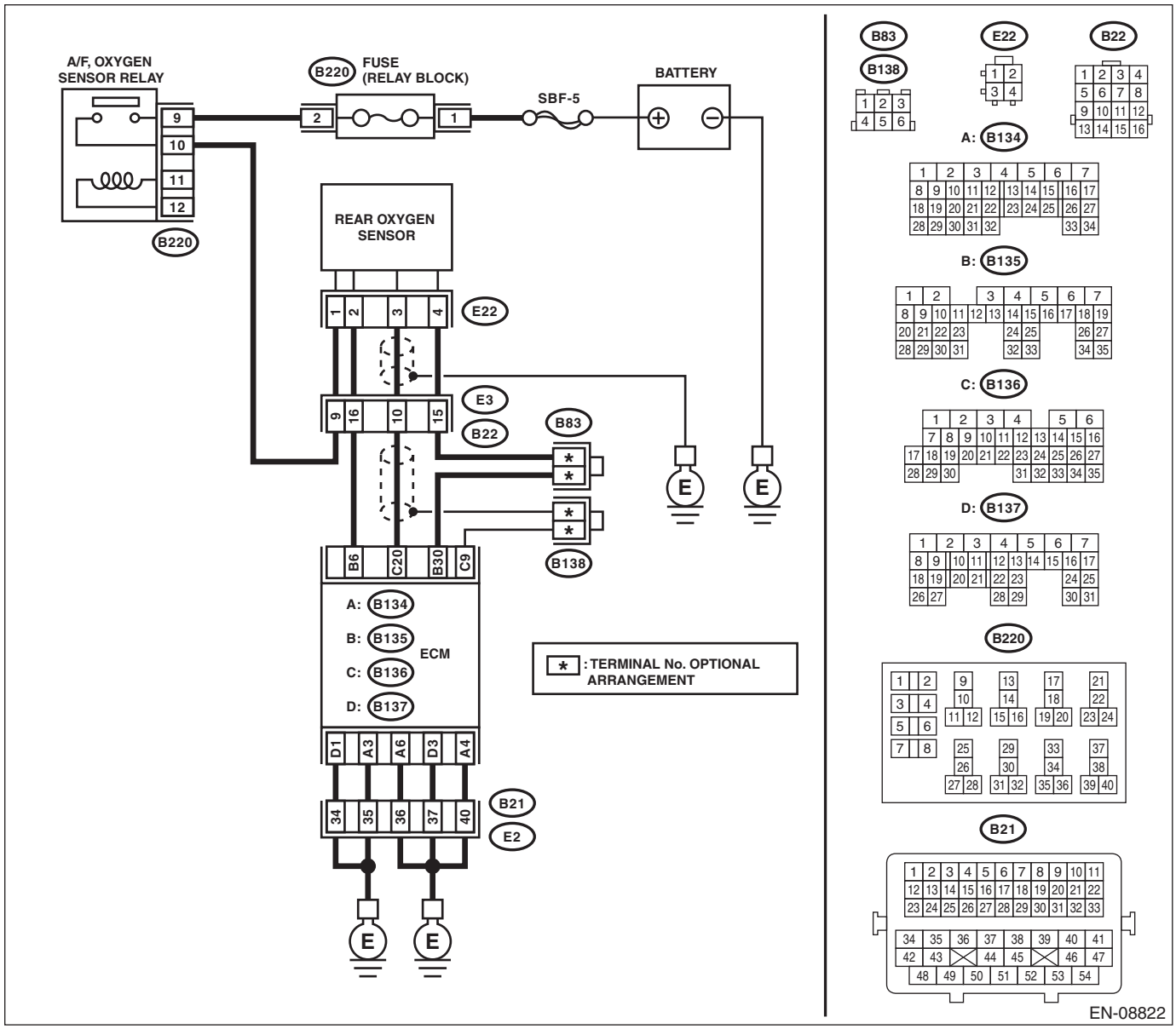
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-69, DTC P0139 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**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*** ***(B136) No. 20 — (E22) No. 3:***	Is the resistance less than 1 Ω?	Go to step **2**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and rear oxygen sensor connector • Poor contact of coupling connector
2	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** Measure the resistance between rear oxygen sensor connector and chassis ground. ***Connector & terminal*** ***(E22) No. 3 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **3**.	Repair the ground short circuit of harness between ECM and rear oxygen sensor connector.
3	**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(H4DO)-97, Rear Oxygen Sensor.>	Even if DTC is detected, 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, temporary open or short circuit of harness may be the cause.

AG:DTC P0140 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK1 SENSOR2)

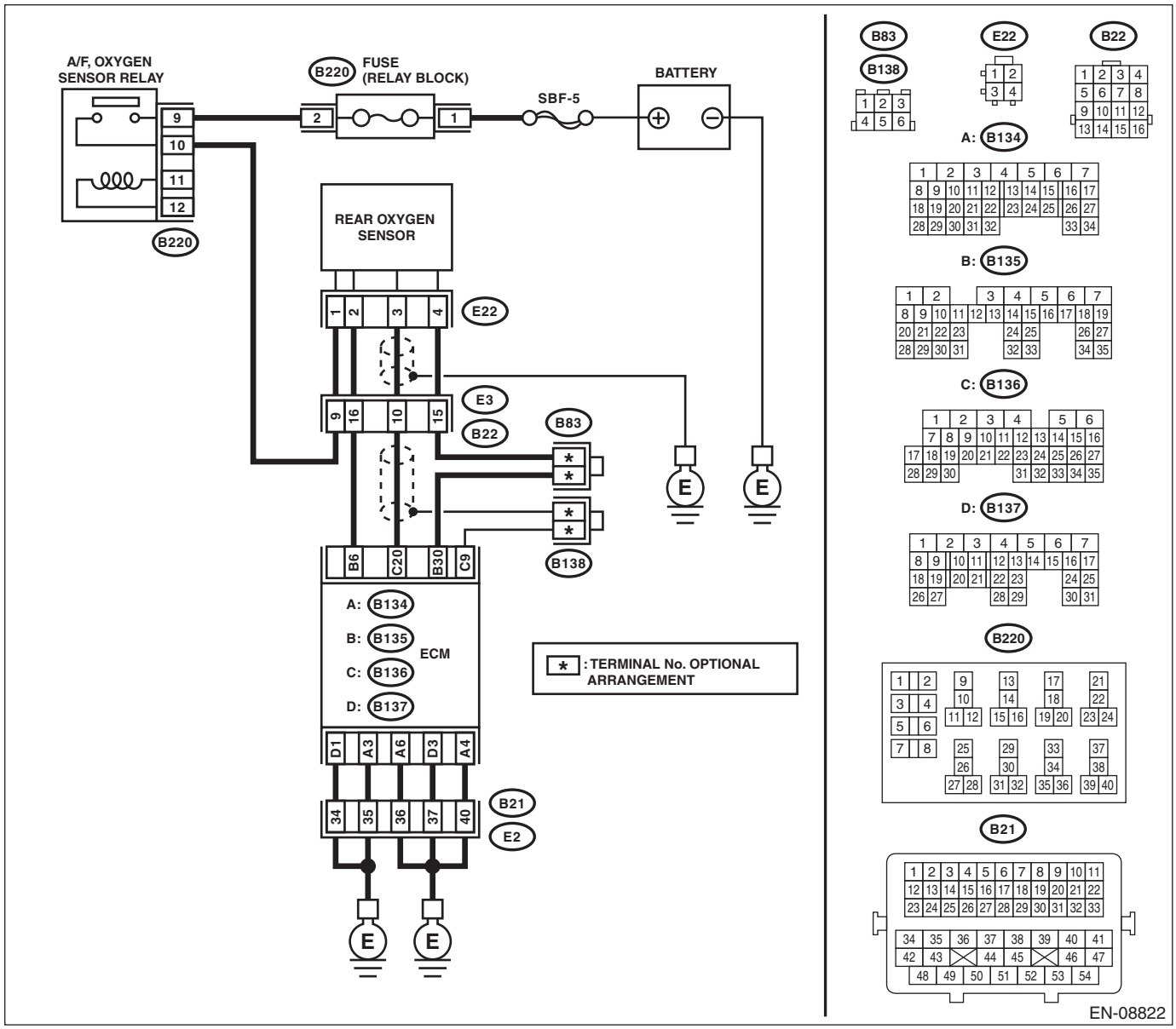
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-77, DTC P0140 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK1 SENSOR2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm up the engine until engine coolant temperature is higher than 75°C (167°F), and keep the engine speed at 3,000 rpm. (2 minutes maximum) 2) Read the data of rear oxygen 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(H4DO)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the voltage 490 mV or more?	Go to step **6**.	Go to step **2**.
2	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm up the engine until engine coolant temperature is higher than 75°C (167°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: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DO)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation 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.**	Has water entered the connector?	Completely remove any water inside.	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*** ***(B136) No. 20 — (E22) No. 3:*** ***(B135) No. 30 — (E22) No. 4:***	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 rear oxygen sensor connector • Poor contact of coupling connector

	Step	Check	Yes	No
5	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between rear oxygen sensor connector and chassis ground. ***Connector & terminal*** ***(E22) No. 3 (+) — Chassis ground (–):***	Is the voltage 0.2 — 0.5 V?	Replace the rear oxygen sensor. <Ref. to FU(H4DO)-97, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and rear oxygen sensor connector • Poor contact of coupling connector • Poor contact of ECM connector
6	**CHECK EXHAUST SYSTEM.** Check exhaust system parts. NOTE: Check the following items. • Looseness and improper fitting of exhaust system parts • Damage (crack, hole etc.) of parts • Loose part and improper installation 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(H4DO)-97, Rear Oxygen Sensor.>

AH:DTC P0141 O2 SENSOR HEATER CIRCUIT (BANK1 SENSOR2)

Refer to DTC P0037 for diagnostic procedure. <Ref. to EN(H4DO)(diag)-131, DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AI: DTC P0171 SYSTEM TOO LEAN (BANK 1)

Refer to DTC P0172 for diagnostic procedure. <Ref. to EN(H4DO)(diag)-177, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AJ:DTC P0172 SYSTEM TOO RICH (BANK 1)

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-82, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Improper idling
- Engine stalls.
- Poor driving performance

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, 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 OPEN FLAMES" signs near the working area.** **CAUTION:** **Be careful not to spill fuel.** Measure the fuel pressure. <Ref. to ME(H4DO)-30, INSPECTION, Fuel Pressure.> **CAUTION:** **Release fuel pressure before removing the fuel pressure gauge.**	Is the measured value 340 — 400 kPa (3.5 — 4.1 kg/cm^2, 49 — 58 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 procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DO)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the engine coolant temperature 75°C (167°F) or higher?	Go to step **5**.	Replace the engine coolant temperature sensor. <Ref. to FU(H4DO)-42, Engine Coolant Temperature Sensor.>

	Step	Check	Yes	No
5	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.** 1) Start the engine and warm up engine until coolant temperature is higher than 75°C (167°F). 2) For AT models, set the select lever to "P" range or "N" range, and for MT models, place the shift lever in the neutral position. 3) Turn the A/C switch to OFF. 4) Turn all the accessory switches to OFF. 5) Read the data of the 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(H4DO)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the measured value 2.0 — 5.0 g/s (0.26 — 0.66 lb/m)?	Go to step **6**.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DO)-71, Mass Air Flow and Intake Air Temperature Sensor.>
6	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.** 1) Start the engine and warm up engine until coolant temperature is higher than 75°C (167°F). 2) For AT models, set the select lever to "P" range or "N" range, and for MT models, place the shift lever in the 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 the 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(H4DO)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Subtract ambient temperature from intake air temperature. Is the obtained value –10 — 50°C (–18 — 90°F)?	Repair the poor contact of ECM connector.	Check the mass air flow and intake air temperature sensor. <Ref. to FU(H4DO)-71, Mass Air Flow and Intake Air Temperature Sensor.>

AK:DTC P0196 ENGINE OIL TEMPERATURE SENSOR CIRCUIT RANGE/PERFORMANCE

DTC DETECTING CONDITION:
- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-83, DTC P0196 ENGINE OIL TEMPERATURE SENSOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:
- Hard to start
- Improper idling
- Poor driving performance

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

Step		Check	Yes	No
1	**CHECK FOR 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(H4DO)(diag)-86, List of Diagnostic Trouble Code (DTC).>	Replace the engine oil temperature sensor. <Ref. to FU(H4DO)-44, Engine Oil Temperature Sensor.>

AL:DTC P0197 ENGINE OIL TEMPERATURE SENSOR LOW

DTC DETECTING CONDITION:

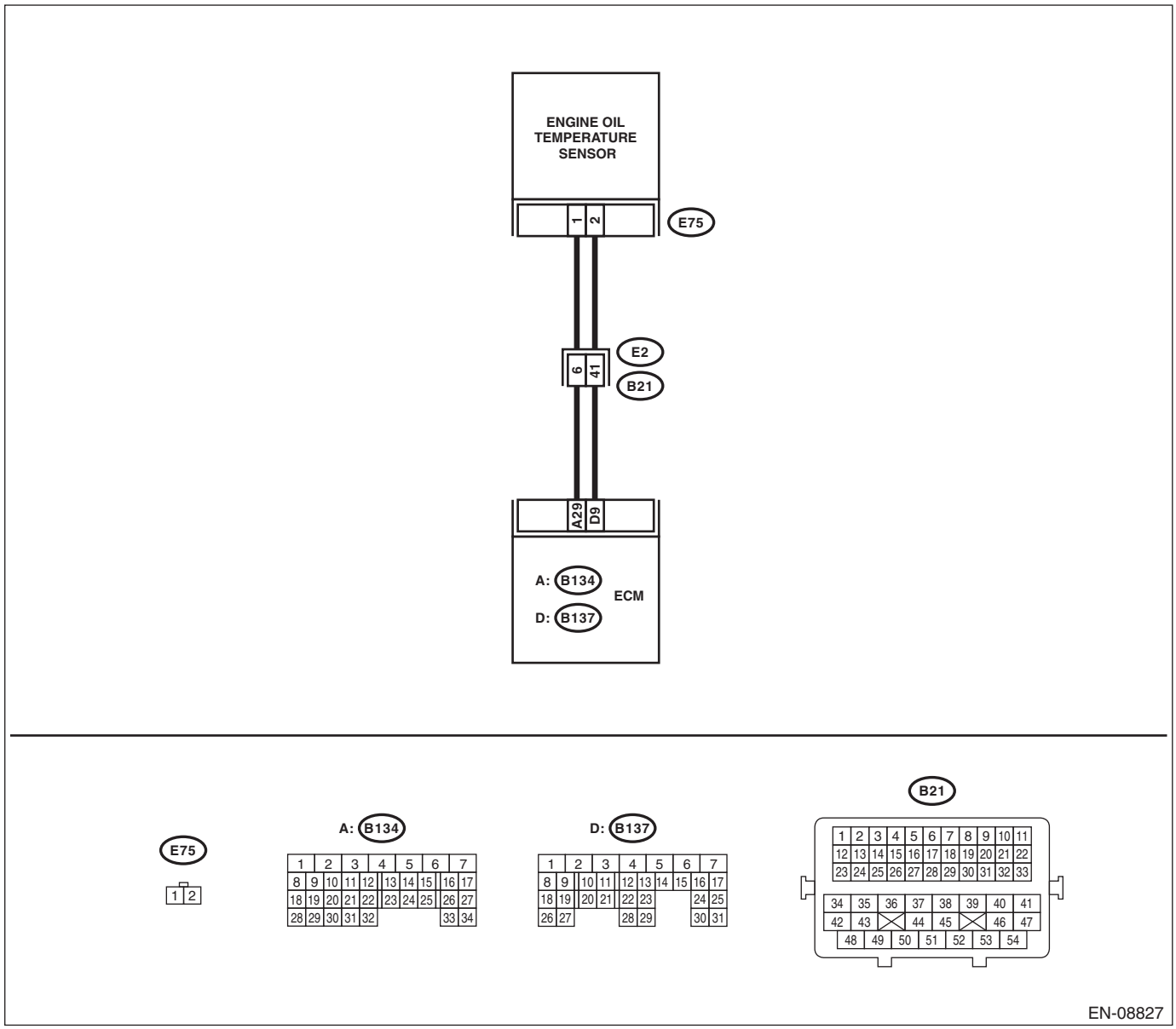
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-85, DTC P0197 ENGINE OIL TEMPERATURE SENSOR LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Hard to start
- Improper idling
- Poor driving performance

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of engine oil 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(H4DO)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the engine oil temperature 150°C (302°F) or higher?	Go to step **2**.	Even if DTC is detected, 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, temporary open or short circuit of harness may be the cause.
2	**CHECK HARNESS BETWEEN ECM AND ENGINE OIL TEMPERATURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM and engine oil temperature sensor. 3) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 9 — Chassis ground:***	Is the resistance 1 MΩ or more?	Replace the engine oil temperature sensor. <Ref. to FU(H4DO)-44, Engine Oil Temperature Sensor.>	Repair the short circuit to ground in the harness between the ECM and engine oil temperature sensor connector.

AM:DTC P0198 ENGINE OIL TEMPERATURE SENSOR HIGH

DTC DETECTING CONDITION:

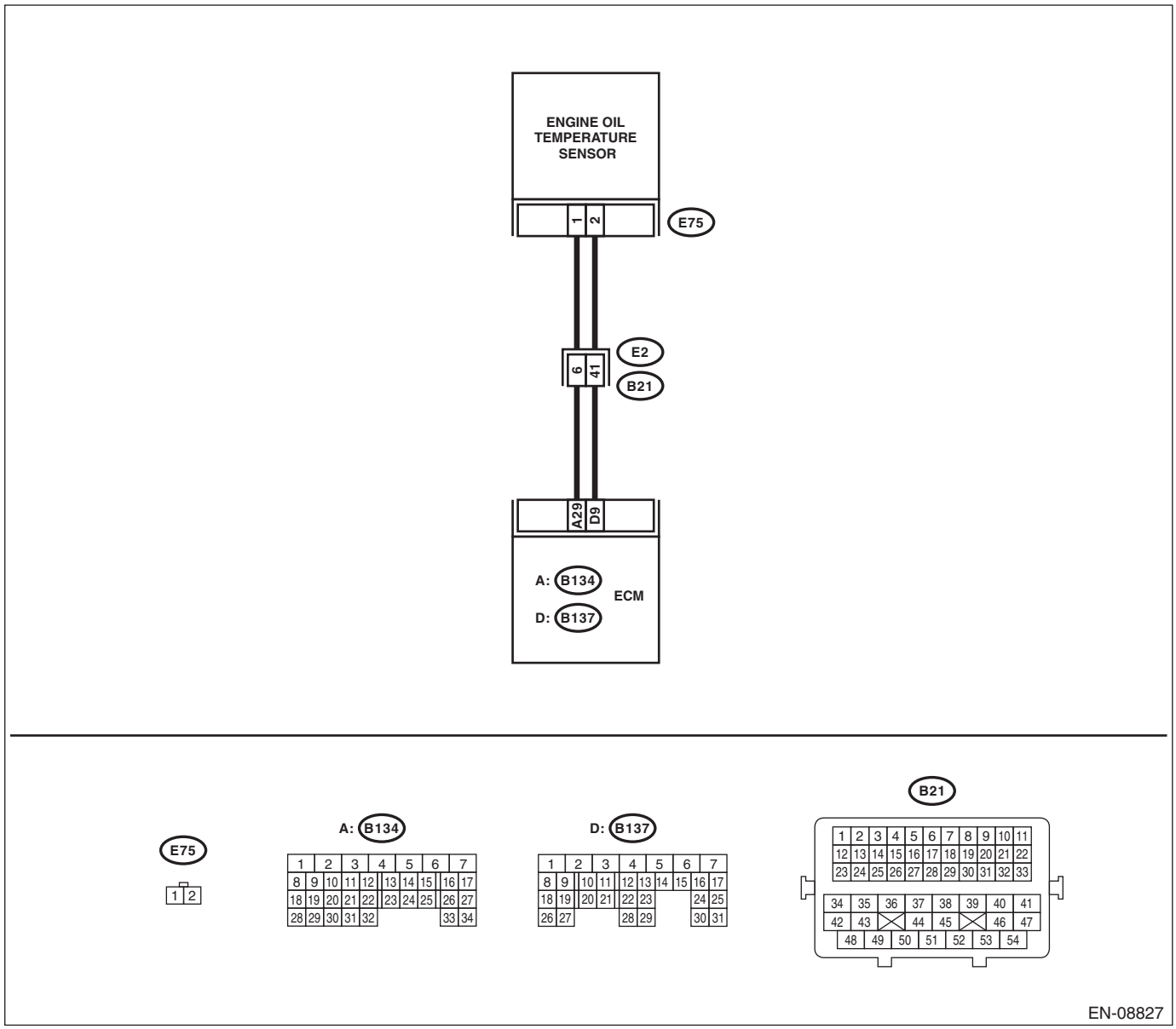
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-87, DTC P0198 ENGINE OIL TEMPERATURE SENSOR HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Hard to start
- Improper idling
- Poor driving performance

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of engine oil 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(H4DO)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the engine oil temperature –40°C (–40°F)?	Go to step **2**.	Even if DTC is detected, 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, temporary open or short circuit of harness may be the cause.
2	**CHECK FOR POOR CONTACT.** Check for poor contact between the ECM and engine oil temperature sensor connectors.	Is there poor contact of the ECM or engine oil temperature sensor connectors?	Repair the poor contact of ECM or engine oil temperature sensor connector.	Go to step **3**.
3	**CHECK HARNESS BETWEEN ECM AND ENGINE OIL TEMPERATURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM and engine oil temperature sensor. 3) Measure the resistance of the harness between the ECM and engine oil temperature sensor connector. ***Connector & terminal*** ***(B137) No. 9 — (E75) No. 2:*** ***(B134) No. 29 — (E75) 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 engine oil temperature sensor connector • Poor contact of coupling connector
4	**CHECK HARNESS BETWEEN ECM AND ENGINE OIL TEMPERATURE SENSOR CONNECTOR.** 1) Connect all connectors. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 9 (+) — Chassis ground (–):***	Is the voltage 5 V or more?	Repair the short circuit to power in harness between ECM and engine oil temperature sensor connector.	Replace the engine oil temperature sensor. <Ref. to FU(H4DO)-44, Engine Oil Temperature Sensor.>

AN:DTC P0222 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT LOW

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-89, DTC P0222 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

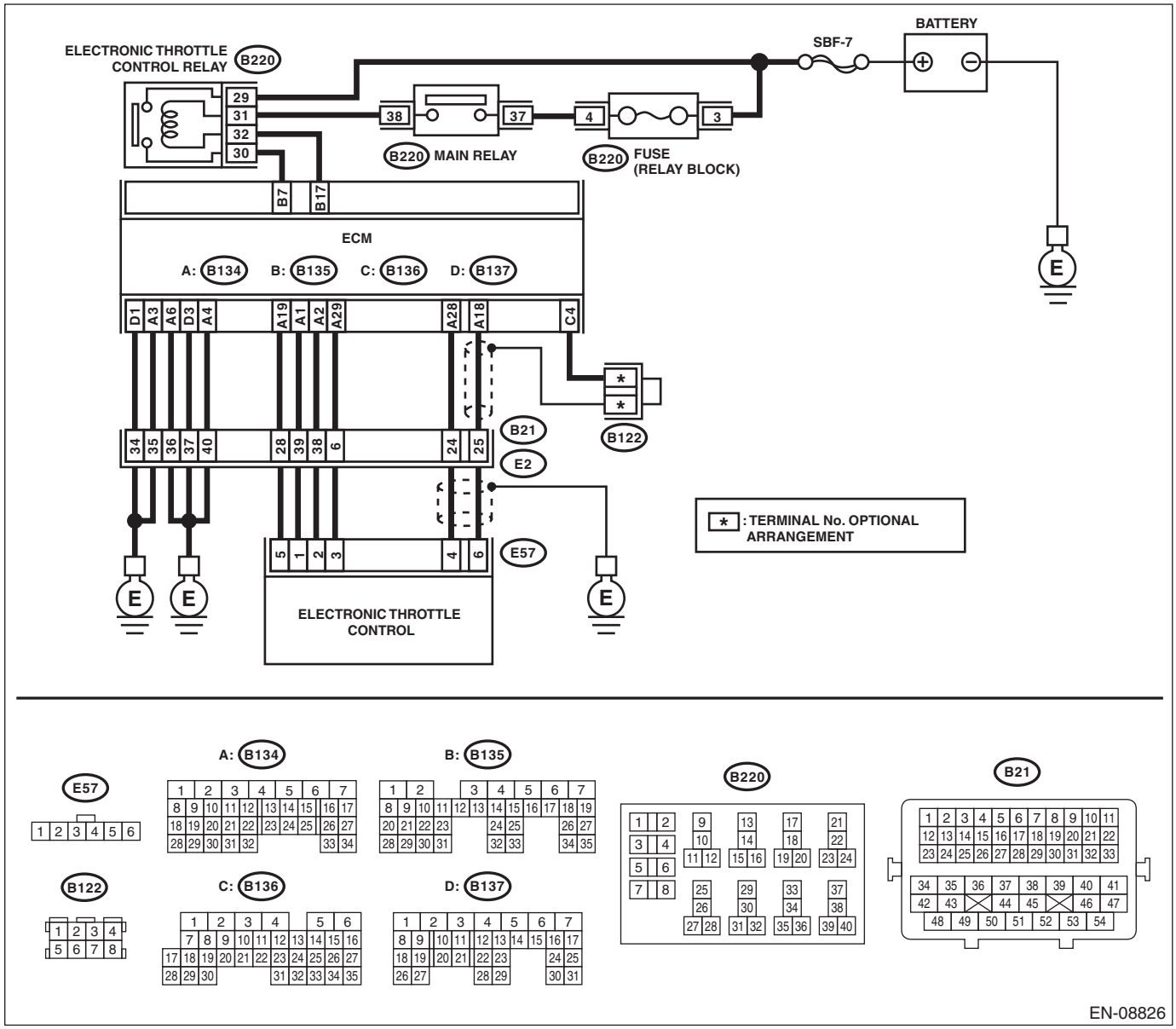
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance
- Engine stalls.

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and electronic throttle control. 3) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 19 — Chassis ground:*** ***(B134) No. 28 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **2**.	Repair the short circuit to ground in harness between ECM and electronic throttle control connector.
2	**CHECK SHORT CIRCUIT INSIDE THE ECM.** 1) Connect the connector to ECM. 2) Measure the resistance between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 4 — Engine ground:***	Is the resistance 1 MΩ or more?	Replace the electronic throttle control. <Ref. to FU(H4DO)-17, Throttle Body.>	Repair the short circuit to ground in harness between ECM and electronic throttle control connector. Replace the ECM if defective. <Ref. to FU(H4DO)-101, Engine Control Module (ECM).>

AO:DTC P0223 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT HIGH

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-91, DTC P0223 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

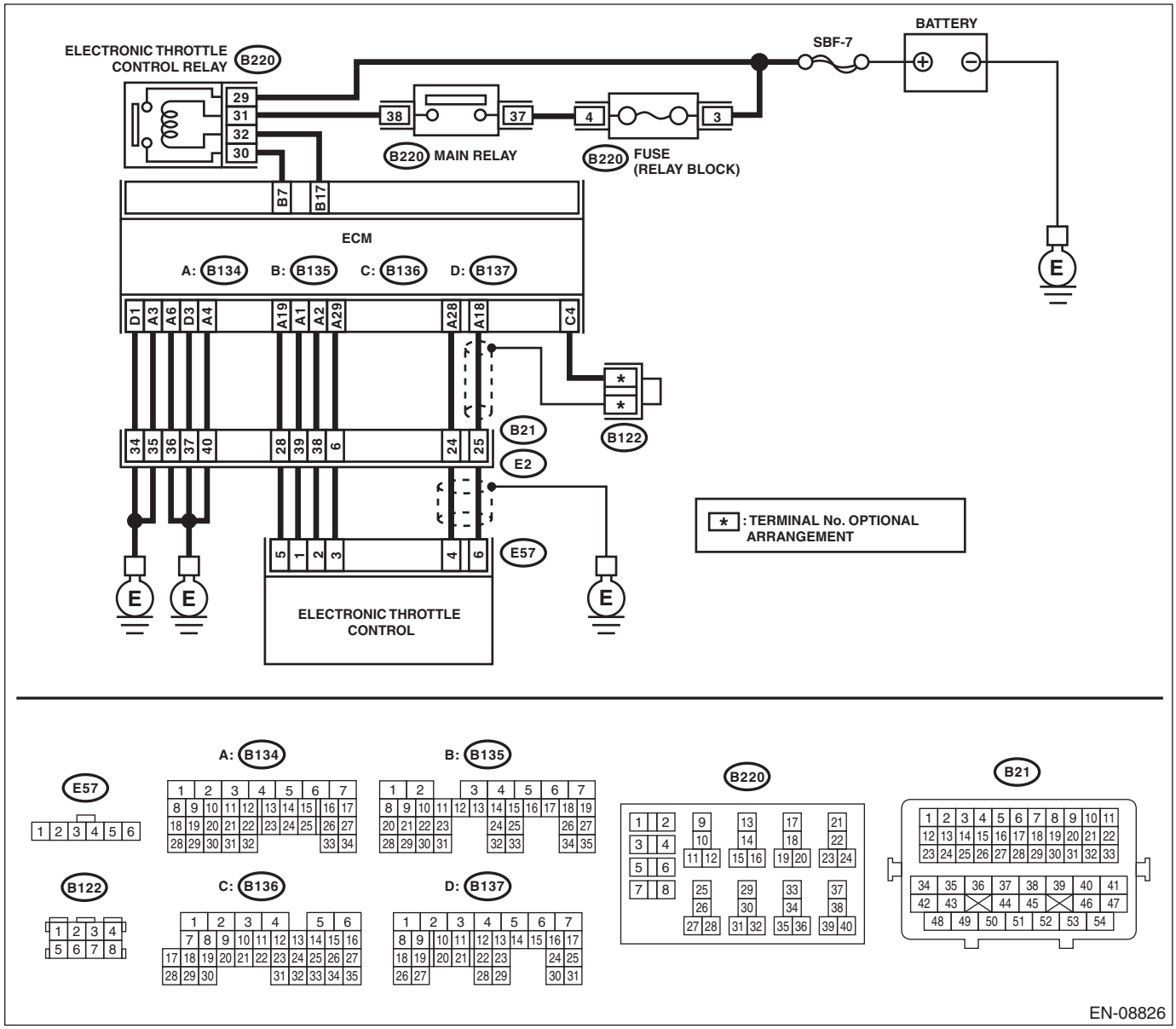
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance
- Engine stalls.

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and electronic throttle control. 3) Measure the resistance of harness between ECM 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 **2**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and electronic throttle control connector • Poor contact of coupling connector
2	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL CONNECTOR.** 1) Connect the connector to ECM. 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 **3**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and engine ground • Poor contact of ECM connector • Poor contact of coupling connector
3	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 4 (+) — Engine ground (–):***	Is the voltage 5 V or more?	Repair the short circuit to power in harness between ECM and electronic throttle control connector.	Go to step **4**.
4	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between ECM connectors. ***Connector & terminal*** ***(B134) No. 19 — (B134) No. 28:***	Is the resistance 1 MΩ or more?	Repair the poor contact of electronic throttle control connector. Replace the electronic throttle control if defective. <Ref. to FU(H4DO)-17, Throttle Body.>	Repair the short circuit to power in harness between ECM and electronic throttle control connector.

AP:DTC P0301 CYLINDER 1 MISFIRE DETECTED

NOTE:
For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(H4DO)(diag)-189, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AQ:DTC P0302 CYLINDER 2 MISFIRE DETECTED

NOTE:
For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(H4DO)(diag)-189, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AR:DTC P0303 CYLINDER 3 MISFIRE DETECTED

NOTE:
For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(H4DO)(diag)-189, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AS:DTC P0304 CYLINDER 4 MISFIRE DETECTED

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- Immediately at fault recognition (A misfire which could damage catalyst occurs.)
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-99, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

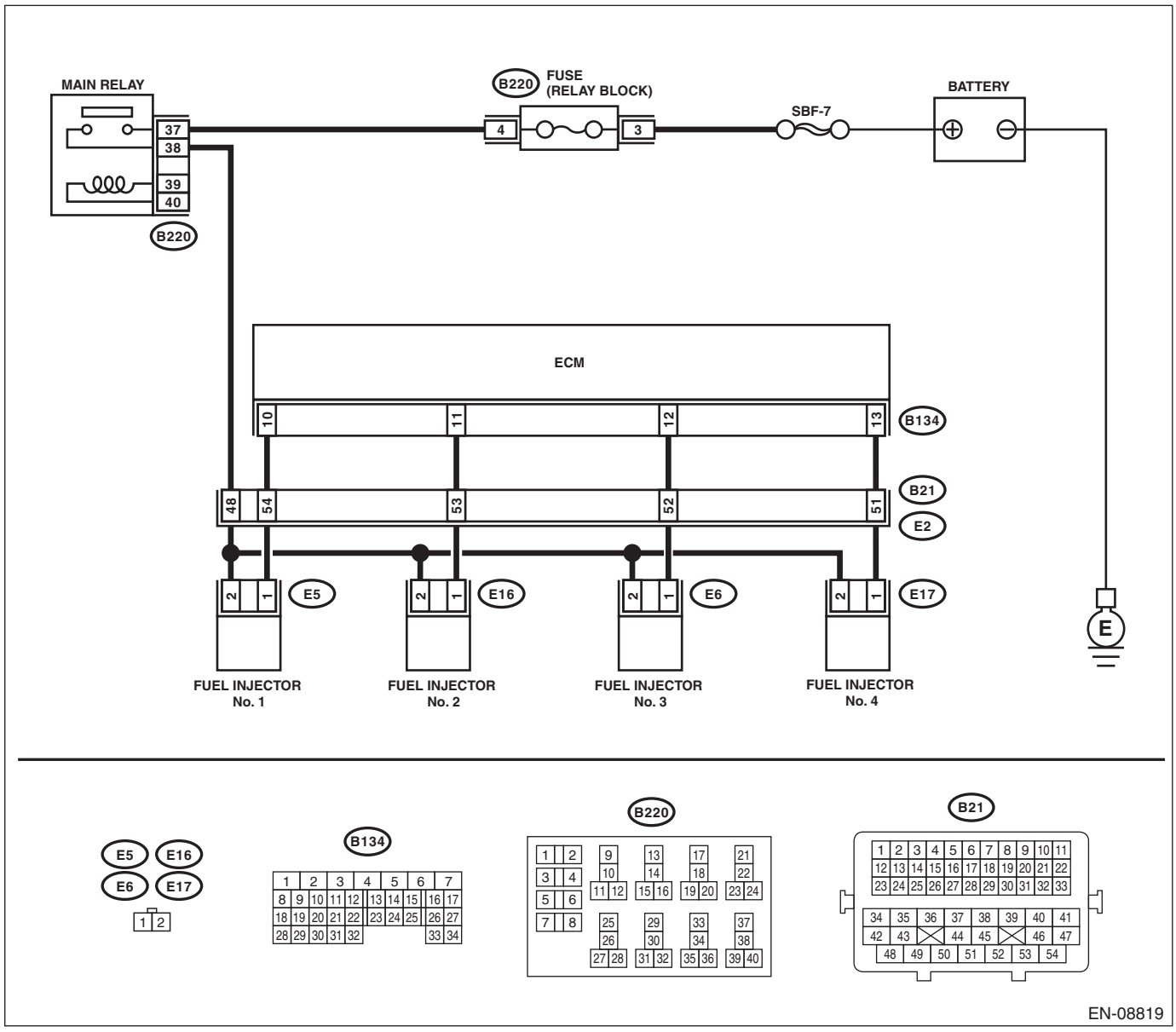
TROUBLE SYMPTOM:

- Engine stalls.
- Improper idling
- Rough driving

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



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	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 on faulty cylinders. ***Connector & terminal*** ***#1 (B134) No. 10 (+) — Chassis ground (–):*** ***#2 (B134) No. 11 (+) — Chassis ground (–):*** ***#3 (B134) No. 12 (+) — Chassis ground (–):*** ***#4 (B134) No. 13 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **6**.	Go to step **2**.
2	**CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel injector on faulty cylinders. 3) Measure the resistance between fuel injector 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 **3**.	Repair the short circuit to ground in harness between ECM and fuel injector connector.
3	**CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR.** Measure the resistance of harness between ECM and fuel injector on faulty cylinders. ***Connector & terminal*** ***#1 (B134) No. 10 — (E5) No. 1:*** ***#2 (B134) No. 11 — (E16) No. 1:*** ***#3 (B134) No. 12 — (E6) No. 1:*** ***#4 (B134) No. 13 — (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 of coupling connector
4	**CHECK FUEL INJECTOR.** Measure the resistance between fuel injector terminals on faulty cylinder. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 5 — 20 Ω?	Go to step **5**.	Replace the faulty fuel injector. <Ref. to FU(H4DO)-78, Fuel Injector.>
5	**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 the main relay connector and fuel injector connector on faulty cylinders • Poor contact of coupling connector • Poor contact of main relay connector

	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR 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 and chassis ground on faulty cylinders. ***Connector & terminal*** ***#1 (B134) No. 10 (+) — Chassis ground (–):*** ***#2 (B134) No. 11 (+) — Chassis ground (–):*** ***#3 (B134) No. 12 (+) — Chassis ground (–):*** ***#4 (B134) No. 13 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the short circuit to power in harness between ECM and fuel injector connector.	Go to step **7**.
7	**CHECK FUEL INJECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between fuel injector terminals on faulty cylinder. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 5 — 20 Ω?	Go to step **8**.	Replace the faulty fuel injector. <Ref. to FU(H4DO)-78, Fuel Injector.>
8	**CHECK INSTALLATION CONDITION 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. <Ref. to FU(H4DO)-52, INSTALLATION, Camshaft Position Sensor.> <Ref. to FU(H4DO)-46, INSTALLATION, Crankshaft Position Sensor.>	Go to step **9**.
9	**CHECK CRANKSHAFT POSITION SENSOR PLATE.**	Is the crankshaft position sensor plate rusted or does it have broken teeth?	Replace the crankshaft position sensor plate. <Ref. to ME(H4DO)-233, Cylinder Block.>	Go to step **10**.
10	**CHECK INSTALLATION CONDITION OF TIMING CHAIN.** Turn the crankshaft using ST, and align the alignment mark on crank sprocket with alignment mark on cylinder block. ST 18252AA000 CRANKSHAFT SOCKET	Is the timing chain dislocated from its proper position?	Correct the installation condition of timing chain. <Ref. to ME(H4DO)-109, Timing Chain Assembly.>	Go to step **11**.
11	**CHECK FUEL LEVEL.**	Is the fuel meter indication higher than the “Lower” level?	Go to step **12**.	Refill the fuel so that the fuel meter indication is higher than the “Lower” level, and proceed to the next step. Go to step **12**.
12	**CHECK STATUS OF MALFUNCTION INDICATOR LIGHT.** 1) Clear the memory using the Subaru Select Monitor or general scan tool. <Ref. to EN(H4DO)(diag)-56, Clear Memory Mode.> 2) Start the engine, and drive the vehicle 10 minutes or more.	Does the malfunction indicator light illuminate or blink?	Go to step **14**.	Go to step **13**.

Step		Check	Yes	No
13	**CHECK CAUSE OF MISFIRE.**	Was the cause of misfire identified when the engine is running?	Finish diagnostics operation, if the engine has no abnormality.	Repair the poor contact of connector. NOTE: In this case, repair the following item: • Poor contact of ignition coil connector • Poor contact of fuel injector connector on faulty cylinders • Poor contact of ECM connector • Poor contact of coupling connector
14	**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 **15**.
15	**CHECK MISFIRE SYMPTOM.** 1) Turn the ignition switch to ON. 2) Check for DTC. <Ref. to EN(H4DO)(diag)-42, Read Diagnostic Trouble Code (DTC).>	Does the Subaru Select Monitor or general scan tool indicate only one DTC?	Go to step **18**.	Go to step **16**.
16	**CHECK DTC.**	Is DTC P0301 and P0303 displayed on the Subaru Select Monitor or general scan tool?	Go to step **19**.	Go to step **17**.
17	**CHECK DTC.**	Is DTC P0302 and P0304 displayed on the Subaru Select Monitor or general scan tool?	Go to step **20**.	Go to step **21**.
18	**ONLY ONE CYLINDER.**	Is there any fault in the cylinder?	Repair or replace faulty parts. NOTE: Check the following items. • Spark plug • Ignition coil • Fuel injector • Compression ratio	Go to DTC P0171. <Ref. to EN(H4DO)(diag)-176, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Step		Check	Yes	No
19	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. • Spark plug • Ignition coil • Fuel injector • Compression ratio • Skipping timing chain teeth	Go to DTC P0171. <Ref. to EN(H4DO)(diag)-176, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
20	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. • Spark plug • Ignition coil • Fuel injector • Compression ratio • Skipping timing chain teeth	Go to DTC P0171. <Ref. to EN(H4DO)(diag)-176, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
21	CYLINDER AT RANDOM.	Is the engine idle rough?	Go to DTC P0171. <Ref. to EN(H4DO)(diag)-176, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Repair or replace faulty parts. NOTE: Check the following items. • Spark plug • Ignition coil • Fuel injector • Compression ratio

AT:DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW (BANK 1 OR SINGLE SENSOR)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-100, DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

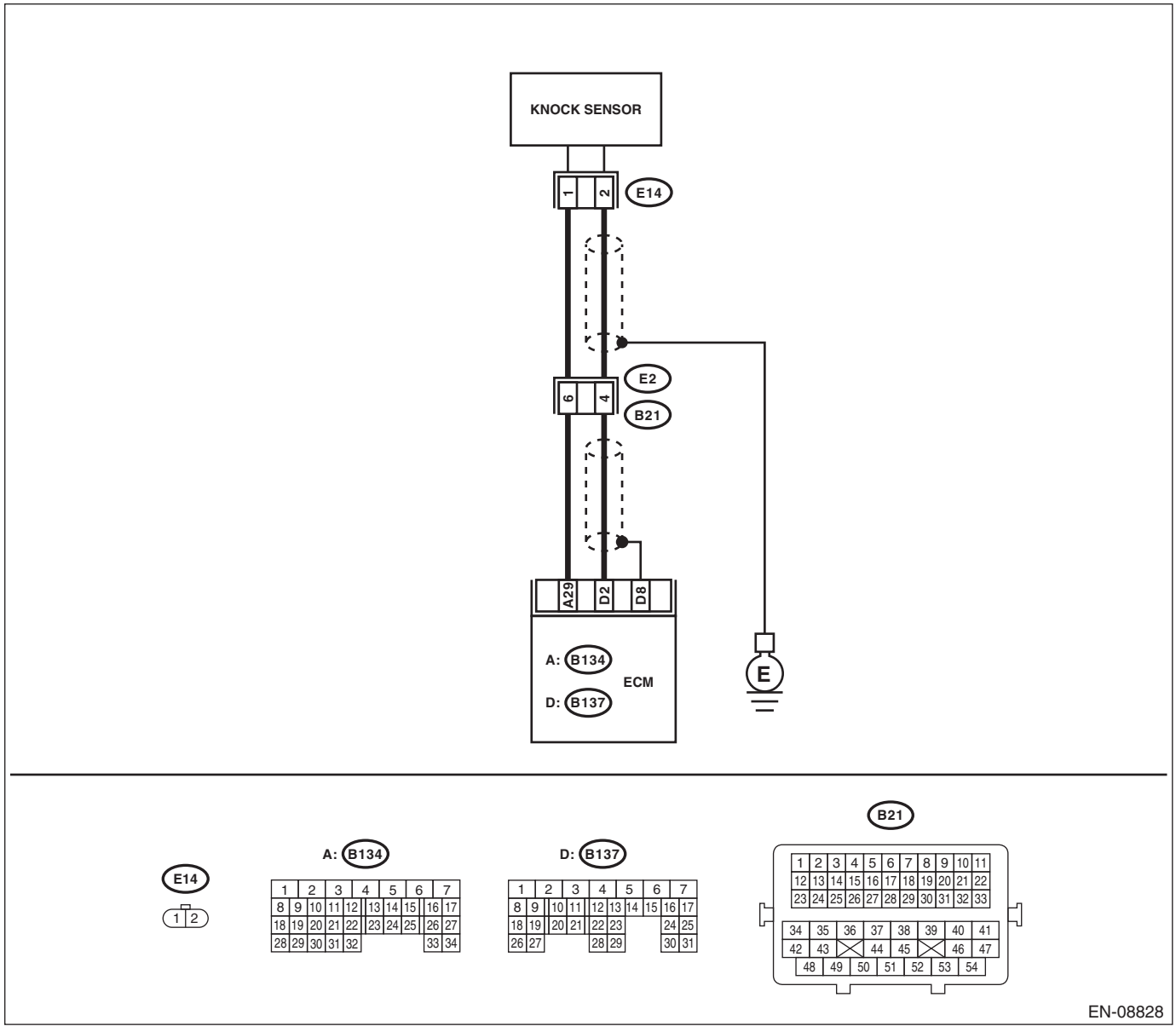
TROUBLE SYMPTOM:

- Poor driving performance
- Knocking occurs.

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND KNOCK SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between ECM connectors. ***Connector & terminal*** ***(B137) No. 2 — (B134) No. 29:***	Is the resistance 600 kΩ or more?	Go to step **2**.	Repair the poor contact of ECM connector.
2	**CHECK KNOCK SENSOR.** 1) Disconnect the connector from the knock sensor. 2) Measure the resistance between knock sensor terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 600 kΩ or more?	Replace the knock sensor. <Ref. to FU(H4DO)-67, Knock Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and knock sensor connector • Poor contact of knock sensor connector • Poor contact of coupling connector

AU:DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH (BANK 1 OR SINGLE SENSOR)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-102, DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

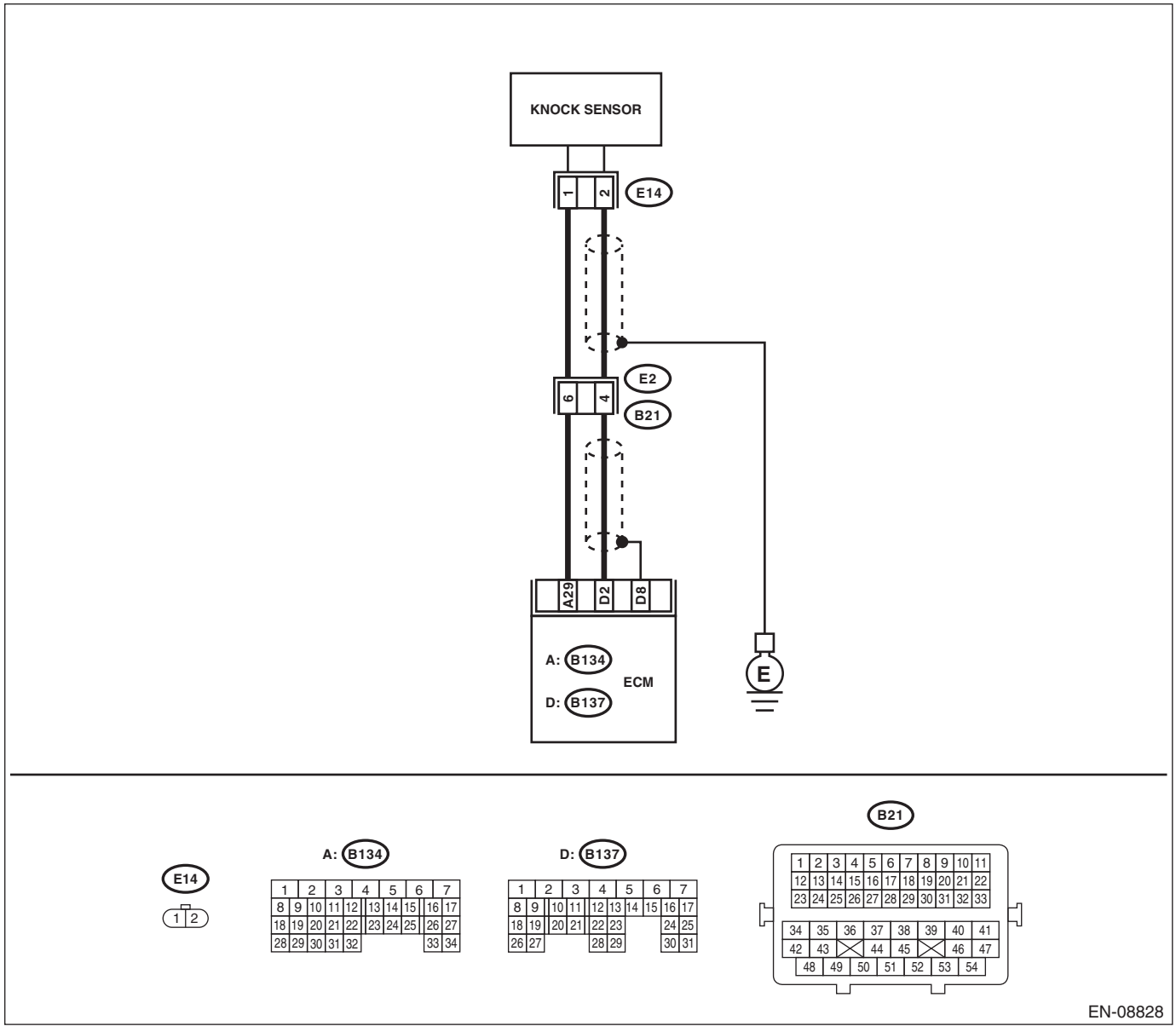
TROUBLE SYMPTOM:

- Poor driving performance
- Knocking occurs.

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND KNOCK SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between ECM connectors. ***Connector & terminal*** ***(B137) No. 2 — (B134) No. 29:***	Is the resistance less than 500 kΩ?	Go to step **2**.	Go to step **3**.
2	**CHECK KNOCK SENSOR.** 1) Disconnect the connector from the knock sensor. 2) Measure the resistance between knock sensor terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 500 kΩ?	Replace the knock sensor. <Ref. to FU(H4DO)-67, Knock Sensor.>	Repair the short circuit to ground in harness between ECM and knock sensor 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 connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 2 (+) — Chassis ground (–):***	Is the voltage 2 V or more?	Even if DTC is detected, 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, temporary open or short circuit of harness may be the cause.	Repair the poor contact of ECM connector.

AV:DTC P0335 CRANKSHAFT POSITION SENSOR “A” CIRCUIT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-104, DTC P0335 CRANKSHAFT POSITION SENSOR “A” CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

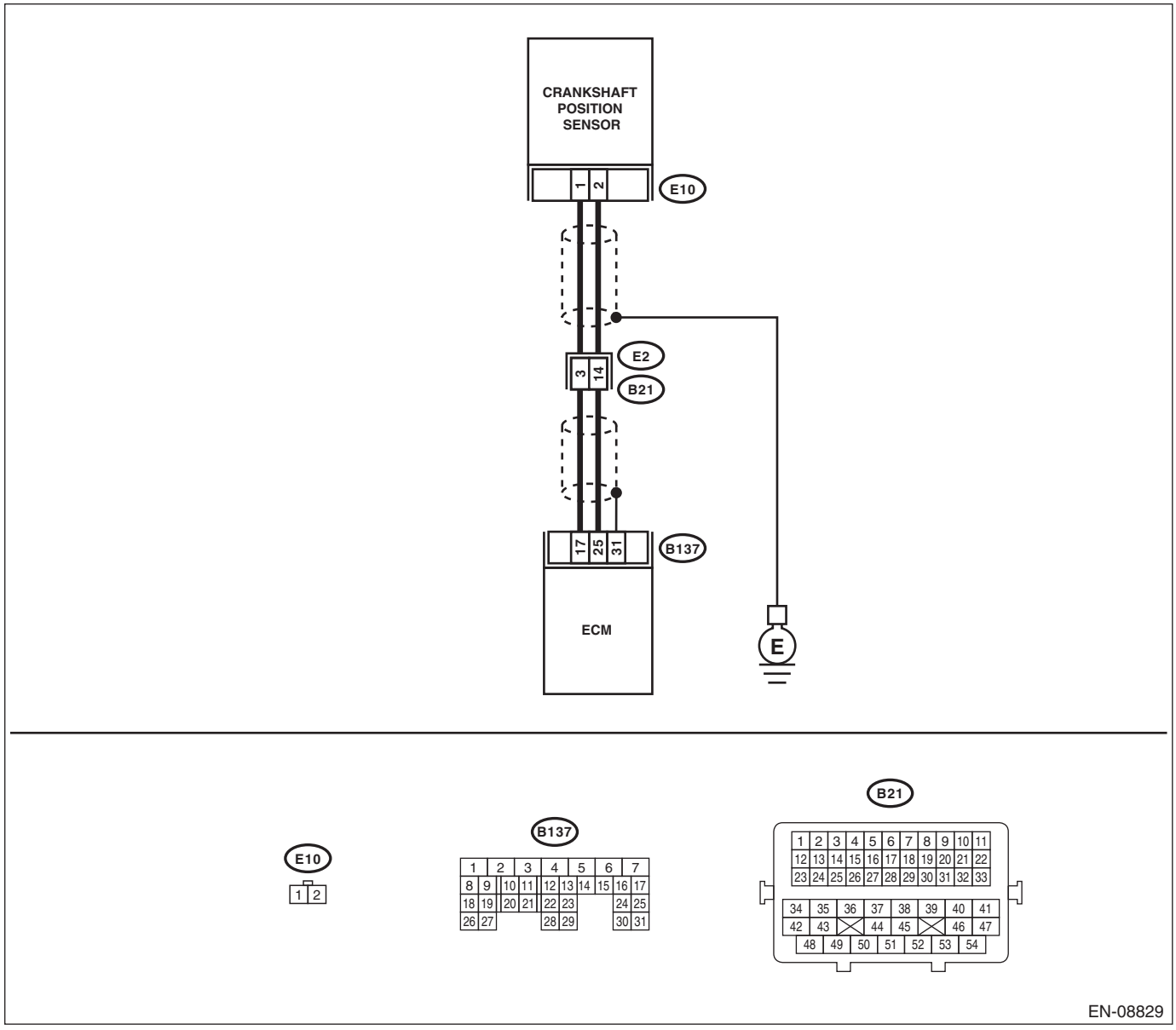
TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK INSTALLATION CONDITION OF CRANKSHAFT POSITION SENSOR.**	Is the crankshaft position sensor installation bolt tightened securely?	Go to step **2**.	Tighten the crankshaft position sensor installation bolt securely. <Ref. to FU(H4DO)-46, INSTALLATION, Crankshaft Position Sensor.>
2	**CHECK CRANKSHAFT POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Remove the crankshaft position sensor. 3) Measure the resistance between terminals of crankshaft position sensor. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance between 1 and 4 kΩ?	Go to step **3**.	Replace the crankshaft position sensor. <Ref. to FU(H4DO)-46, Crankshaft Position Sensor.>
3	**CHECK HARNESS BETWEEN ECM AND CRANKSHAFT POSITION SENSOR CONNECTOR.** 1) Disconnect the connector from ECM. 2) Measure the resistance of harness between ECM and crankshaft position sensor connector. ***Connector & terminal*** ***(B137) No. 17 — (E10) No. 1:*** ***(B137) No. 25 — (E10) No. 2:***	Is the resistance less than 1 Ω?	Repair the poor contact of ECM and crankshaft position sensor connector.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and crankshaft position sensor connector • Poor contact of coupling connector

AW:DTC P0336 CRANKSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-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 servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK CONDITION OF CRANKSHAFT POSITION SENSOR.** Turn the ignition switch to OFF.	Is the crankshaft position sensor installation bolt tightened securely?	Go to step **2**.	Tighten the crankshaft position sensor installation bolt securely. <Ref. to FU(H4DO)-46, INSTALLATION, Crankshaft Position Sensor.>
2	**CHECK CRANKSHAFT POSITION SENSOR PLATE.**	Is there crack or damage in the crankshaft position sensor plate teeth?	Replace the crankshaft position sensor plate. <Ref. to ME(H4DO)-233, Cylinder Block.>	Go to step **3**.
3	**CHECK INSTALLATION CONDITION OF TIMING CHAIN.** Turn the crankshaft, and align alignment mark on crank sprocket with alignment mark on cylinder block. ST 18252AA000 CRANKSHAFT SOCKET	Is the timing chain dislocated from its proper position?	Correct the installation condition of timing chain. <Ref. to ME(H4DO)-109, Timing Chain Assembly.>	Replace the crankshaft position sensor. <Ref. to FU(H4DO)-46, Crankshaft Position Sensor.>

AX:DTC P0340 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-108, DTC P0340 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

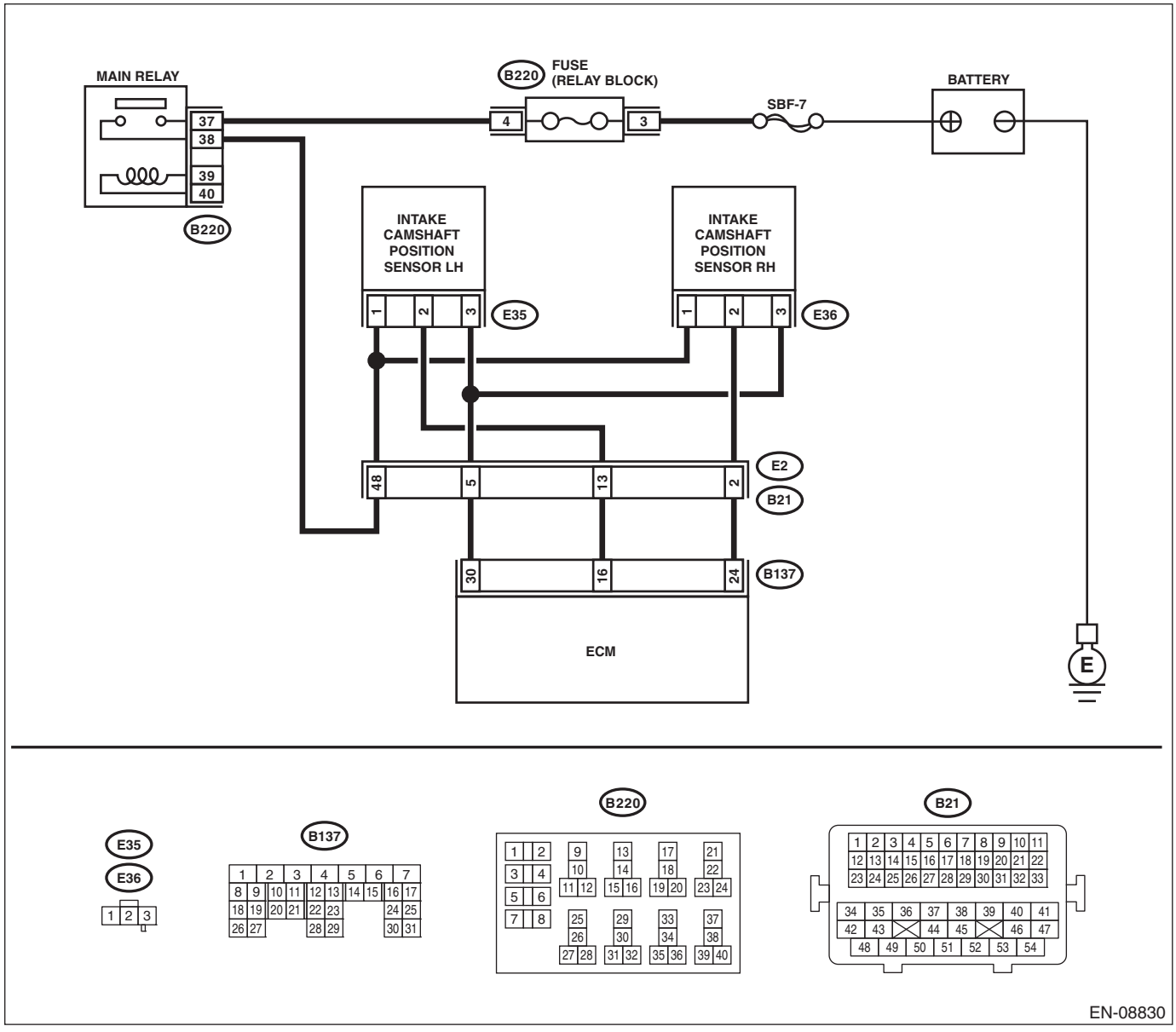
TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	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) Turn the ignition switch to ON. 4) Measure the voltage between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E36) No. 1 (+) — 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: • Open circuit or short circuit to ground in harness between main relay connector and camshaft position sensor connector • Poor contact of coupling connector
2	**CHECK HARNESS BETWEEN ECM AND CAMSHAFT POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between ECM and camshaft position sensor connector. ***Connector & terminal*** ***(B137) No. 24 — (E36) No. 2:*** ***(B137) No. 30 — (E36) 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 ECM and camshaft position sensor connector • Poor contact of coupling connector
3	**CHECK HARNESS BETWEEN ECM AND CAMSHAFT POSITION SENSOR CONNECTOR.** Measure the resistance between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E36) No. 2 — Engine ground:***	Is the resistance 1 MΩ or more?	Go to step **4**.	Repair short circuit to ground in harness between ECM and camshaft position sensor connector.
4	**CHECK HARNESS BETWEEN ECM AND CAMSHAFT POSITION SENSOR CONNECTOR.** Measure the voltage between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E36) No. 2 (+) — Engine ground (–):***	Is the voltage 5 V or more?	Repair the short circuit to power in the harness between ECM and camshaft position sensor connector.	Go to step **5**.
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(H4DO)(diag)-18, Engine Control Module (ECM) I/O Signal.>	Is there any abnormality in waveform?	Replace the camshaft position sensor. <Ref. to FU(H4DO)-51, Camshaft Position Sensor.>	Repair the following item. • Poor contact of ECM connector • Poor contact of camshaft position sensor connector • Poor contact of coupling connector

AY:DTC P0345 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 2)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-110, DTC P0345 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

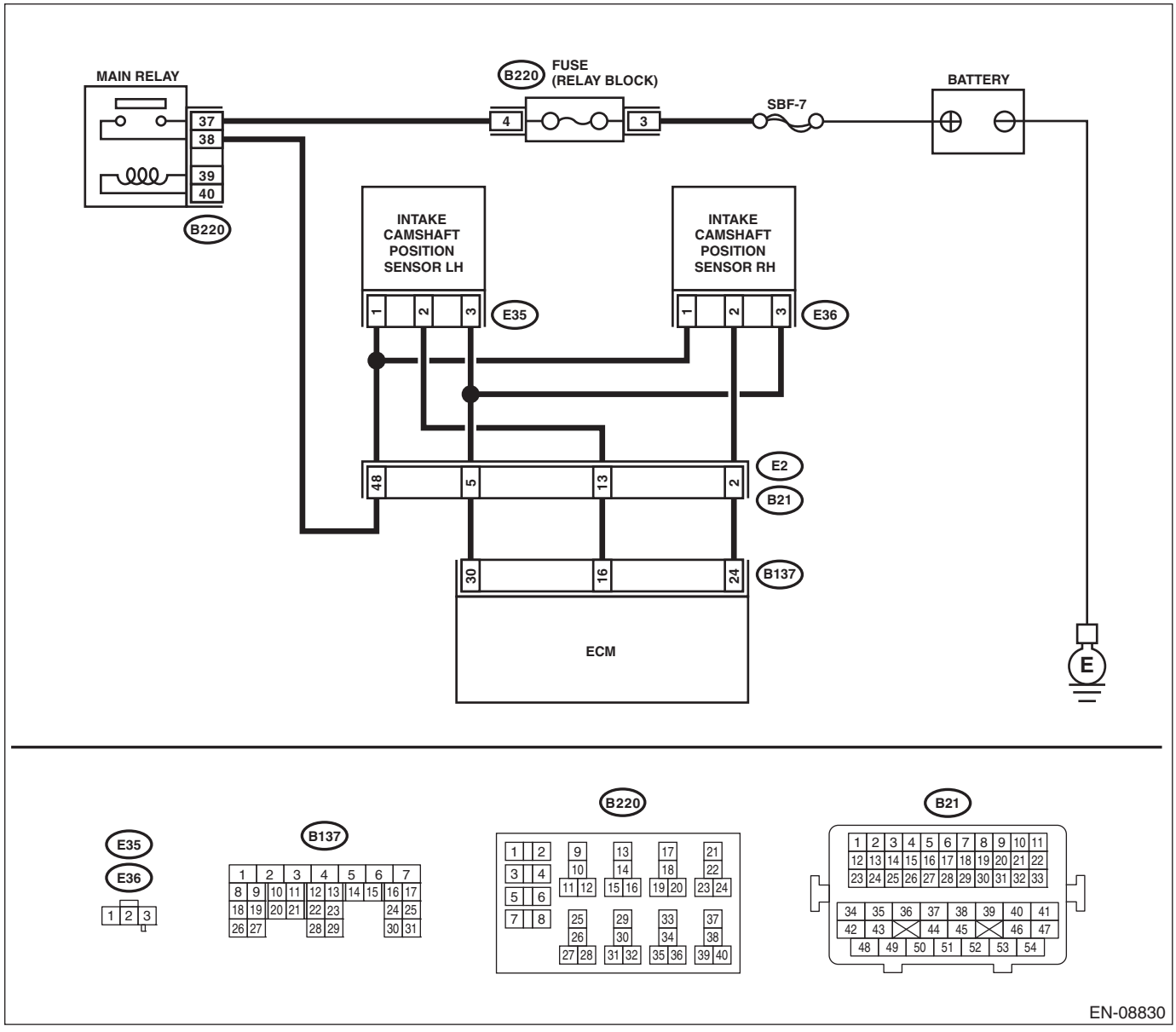
TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



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	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) Turn the ignition switch to ON. 4) Measure the voltage between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E35) No. 1 (+) — 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: • Open circuit or short circuit to ground in harness between main relay connector and camshaft position sensor connector • Poor contact of coupling connector
2	**CHECK HARNESS BETWEEN ECM AND CAMSHAFT POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between ECM and camshaft position sensor connector. ***Connector & terminal*** ***(B137) No. 16 — (E35) No. 2:*** ***(B137) No. 30 — (E35) 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 ECM and camshaft position sensor connector • Poor contact of coupling connector
3	**CHECK HARNESS BETWEEN ECM AND CAMSHAFT POSITION SENSOR CONNECTOR.** Measure the resistance between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E35) No. 2 — Engine ground:***	Is the resistance 1 MΩ or more?	Go to step **4**.	Repair short circuit to ground in harness between ECM and camshaft position sensor connector.
4	**CHECK HARNESS BETWEEN ECM AND CAMSHAFT POSITION SENSOR CONNECTOR.** Measure the voltage between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E35) No. 2 (+) — Engine ground (–):***	Is the voltage 5 V or more?	Repair the short circuit to power in the harness between ECM and camshaft position sensor connector.	Go to step **5**.
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(H4DO)(diag)-18, Engine Control Module (ECM) I/O Signal.>	Is there any abnormality in waveform?	Replace the camshaft position sensor. <Ref. to FU(H4DO)-51, Camshaft Position Sensor.>	Repair the following item. • Poor contact of ECM connector • Poor contact of camshaft position sensor connector • Poor contact of coupling connector

AZ:DTC P0400 EXHAUST GAS RECIRCULATION FLOW

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-111, DTC P0400 EXHAUST GAS RECIRCULATION FLOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Movement performance problem when engine is low speed.
- Improper idling
- Movement performance problem

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**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 procedures, refer to “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H4DO)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the measured value 53.3 kPa (400 mmHg, 15.75 inHg) or more?	Make sure that the EGR control valve, manifold absolute pressure sensor and throttle body are installed securely.	Go to step **2**.
2	**CHECK EGR CONTROL VALVE.** Remove the EGR control valve.	Are there any holes, clogged lines or foreign matters in the EGR system?	Repair the EGR system.	Replace EGR control valve. <Ref. to EC(H4DO)-26, EGR Control Valve.>

BA:DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1)

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-114, DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

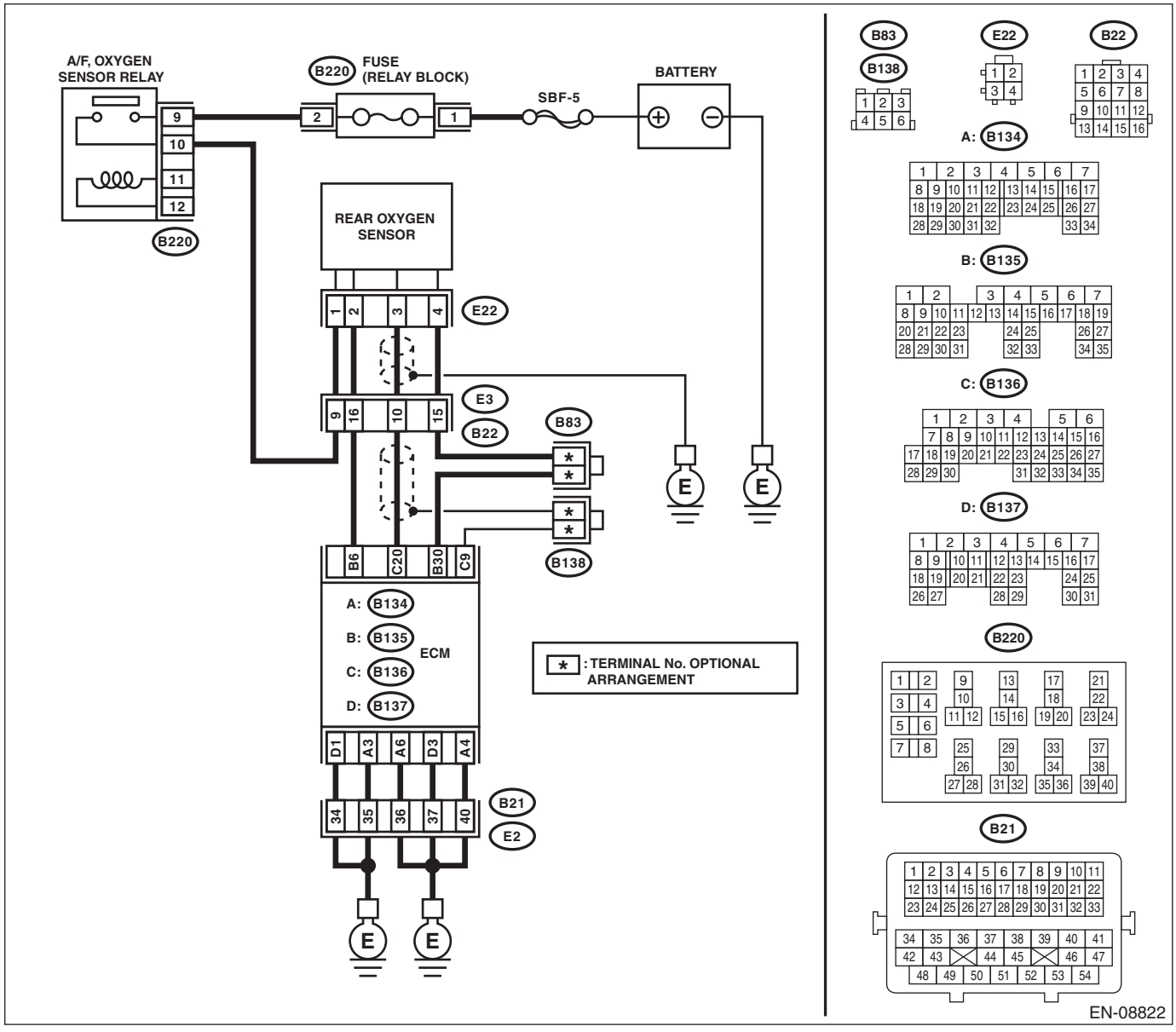
TROUBLE SYMPTOM:

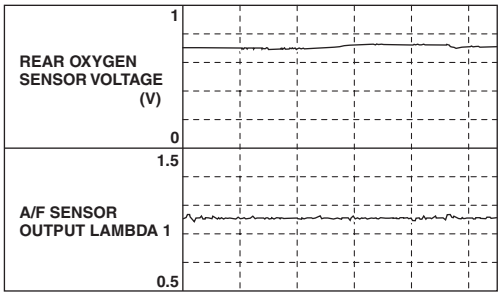
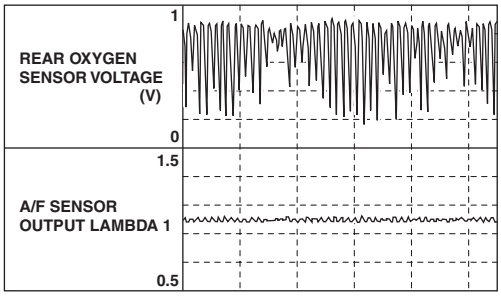
- Engine stalls.
- Idle mixture is out of specifications.

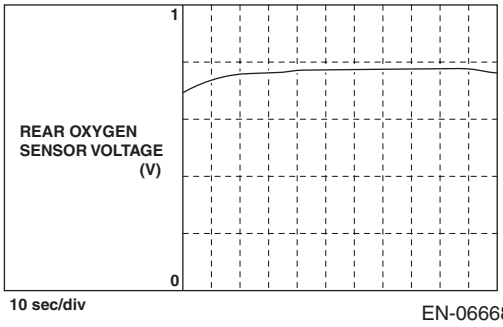
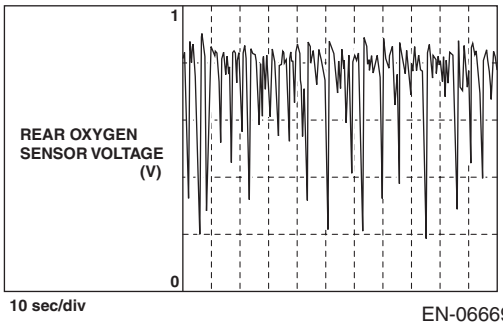
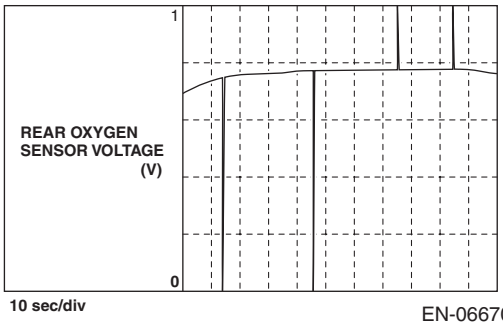
CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK EXHAUST SYSTEM.** Check for gas leaks or air suction caused by loose or dislocated nuts and bolts, and open hole at exhaust pipes. NOTE: Check the following positions. • Between cylinder head and front exhaust pipe • Between front exhaust pipe and front catalytic converter • Between front catalytic converter and rear catalytic converter • Loose or improperly attached 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(H4DO)-2, General Description.>	Go to step **2**.
2	**CHECK WAVEFORM DATA ON THE SUBARU SELECT MONITOR (WHILE DRIVING).** 1) Drive at a constant speed between 80 — 112 km/h (50 — 70 MPH). 2) After 5 minutes have elapsed in the condition of step 1), use the Subaru Select Monitor while still driving to read the waveform data. • At normal condition  EN-06666 • At abnormal condition (numerous inversion)  EN-06667	Is a normal waveform displayed?	Even if DTC is detected, 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, temporary open or short circuit of harness may be the cause.	Go to step **3**.

	Step	Check	Yes	No
3	**CHECK WAVEFORM DATA ON THE SUBARU SELECT MONITOR (WHILE IDLING).** 1) Run the engine at idle. 2) In the condition of step 1), use the Subaru Select Monitor to read the waveform data. • At normal condition  EN-06668 • At abnormal condition 1 (numerous inversion)  EN-06669 • At abnormal condition 2 (noise input)  EN-06670	Is a normal waveform displayed?	Go to step **4**.	• The waveform is displayed at abnormal condition 1: Go to step **4**. • The waveform is displayed at abnormal condition 2: Go to step **5**.
4	**CHECK CATALYTIC CONVERTER.**	Is the catalytic converter damaged?	Replace the catalytic converter. <Ref. to EC(H4DO)-7, Front Catalytic Converter.>	Go to step **5**.
5	**CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Has water entered the connector?	Completely remove any water inside.	Go to step **6**.

	Step	Check	Yes	No
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*** ***(B136) No. 20 — (E22) No. 3:*** ***(B135) No. 30 — (E22) No. 4:***	Is the resistance less than 1 Ω?	Go to step **7**.	Repair the harness and connector. NOTE: Repair the following locations. • Open circuit in harness between ECM and rear oxygen sensor connector • Poor contact of coupling connector
7	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between rear oxygen sensor connector and chassis ground. ***Connector & terminal*** ***(E22) No. 3 (+) — Chassis ground (–):***	Is the voltage 0.2 — 0.5 V?	Go to step **8**.	Repair the harness and connector. NOTE: Repair the following locations. • Open circuit in harness between ECM and rear oxygen sensor connector • Poor contact of ECM connector • Poor contact of coupling connector
8	**CHECK REAR OXYGEN SENSOR SHIELD.** 1) Turn the ignition switch to OFF. 2) Expose the rear oxygen sensor connector body side harness sensor shield. 3) Measure the resistance between sensor shield and chassis ground.	Is the resistance less than 1 Ω?	Replace the rear oxygen sensor. <Ref. to FU(H4DO)-97, Rear Oxygen Sensor.>	Repair the open circuit of rear oxygen sensor harness.

BB:DTC P0441 EVAPORATIVE EMISSION CONT. SYS. INCORRECT PURGE FLOW

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-116, DTC P0441 EVAPORATIVE EMISSION CONT. SYS. INCORRECT PURGE FLOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

Improper idling

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK FOR 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(H4DO)(diag)-86, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK PURGE CONTROL SOLENOID VALVE.** Operate the purge control solenoid valve using the Subaru Select Monitor. NOTE: Refer to "Compulsory Valve Operation Check Mode" for more operation procedures. <Ref. to EN(H4DO)(diag)-57, Compulsory Valve Operation Check Mode.>	Does the purge control solenoid valve operate?	Go to step **3**.	Replace the purge control solenoid valve. <Ref. to EC(H4DO)-21, Purge Control Solenoid Valve.>
3	**CHECK EVAPORATIVE EMISSION CONTROL SYSTEM LINE.** 1) Turn the ignition switch to OFF. 2) Check the delivery (test) mode connector is disconnected.	Are there holes, cracks, clogging, or disconnection, misconnection of hoses or pipes in evaporative emission control system?	Repair or replace the hoses or pipes.	Repair the poor contact of ECM connector.

BC:DTC P0451 EVAPORATIVE EMISSION SYSTEM PRESSURE SENSOR/ SWITCH RANGE/PERFORMANCE

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION<Ref. to GD(H4DO)-119, DTC P0451 EVAPORATIVE EMISSION SYSTEM PRESSURE SENSOR/SWITCH RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode<Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode<Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK FOR 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(H4DO)(diag)-86, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK CURRENT DATA.** 1) Turn the ignition switch to ON (engine OFF). 2) Using the Subaru Select Monitor or general scan tool, read atmospheric pressure signal and intake manifold absolute pressure signal data, and compare them with the actual atmospheric pressure. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H4DO)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual. • To read the actual atmospheric pressure, connect the Subaru Select Monitor or general scan tool to the other known good vehicle.	Is the difference with the actual atmospheric pressure 27 kPa (200 mmHg, 7.9 inHg) or more?	Replace the parts that showed deviations from the actual atmospheric pressure. • If deviations are found in atmospheric pressure signal data: Replace the leak check valve assembly. <Ref. to EC(H4DO)-37, Leak Check Valve Assembly.> • If deviations are found in intake manifold absolute pressure signal data: Replace the manifold pressure sensor. <Ref. to FU(H4DO)-74, Manifold Absolute Pressure Sensor.>	Even if DTC is detected, 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, temporary open or short circuit of harness may be the cause.

BD:DTC P0452 EVAPORATIVE EMISSION SYSTEM PRESSURE SENSOR/ SWITCH LOW

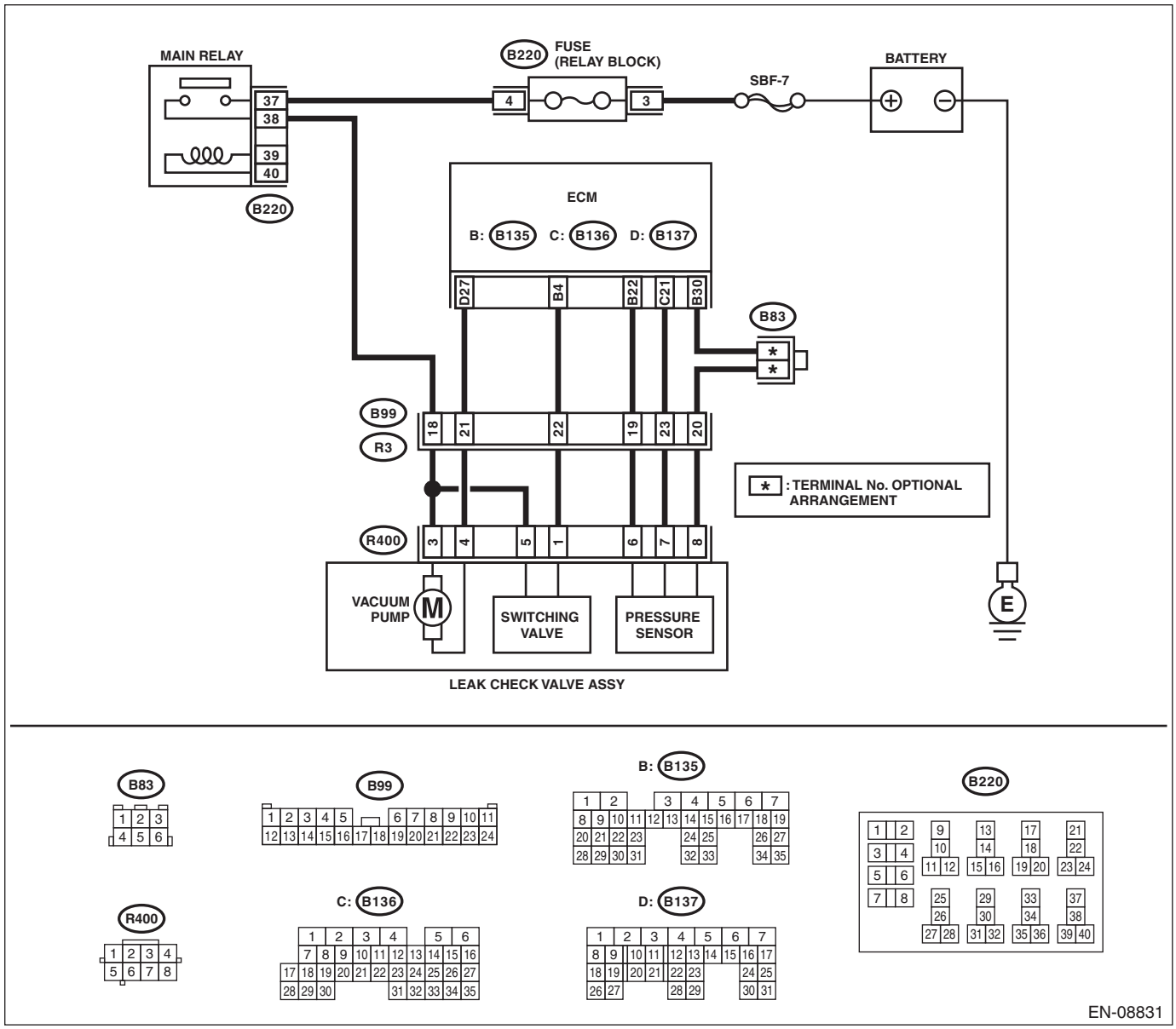
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-121, DTC P0452 EVAPORATIVE EMISSION SYSTEM PRESSURE SENSOR/SWITCH LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Turn the ignition switch to ON. 2) Read the data of atmospheric pressure signal using the Subaru Select Monitor or a general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DO)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the measured value 34 kPa (255 mmHg, 10 inHg) or more?	Go to step **2**.	Even if DTC is detected, 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, temporary open or short circuit of harness may be the cause.
2	**CHECK POWER SUPPLY OF LEAK CHECK VALVE ASSEMBLY.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the leak check valve assembly. 3) Turn the ignition switch to ON. 4) Measure the voltage between the leak check valve assembly connector and chassis ground. ***Connector & terminal*** ***(R400) No. 6 (+) — Chassis ground (–):***	Is the voltage 4.5 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 ECM and the leak check valve assembly connector • Poor contact of ECM connector • Poor contact of coupling connector
3	**CHECK HARNESS BETWEEN ECM AND LEAK CHECK VALVE ASSEMBLY CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 21 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **4**.	Repair the short circuit to ground in harness between ECM and leak check valve assembly connector.
4	**CHECK FOR POOR CONTACT.** Check for poor contact of leak check valve assembly connector.	Is there poor contact in the leak check valve assembly connector?	Repair the poor contact in the leak check valve assembly connector.	Replace the leak check valve assembly. <Ref. to EC(H4DO)-37, Leak Check Valve Assembly.>

BE:DTC P0453 EVAPORATIVE EMISSION SYSTEM PRESSURE SENSOR/ SWITCH HIGH

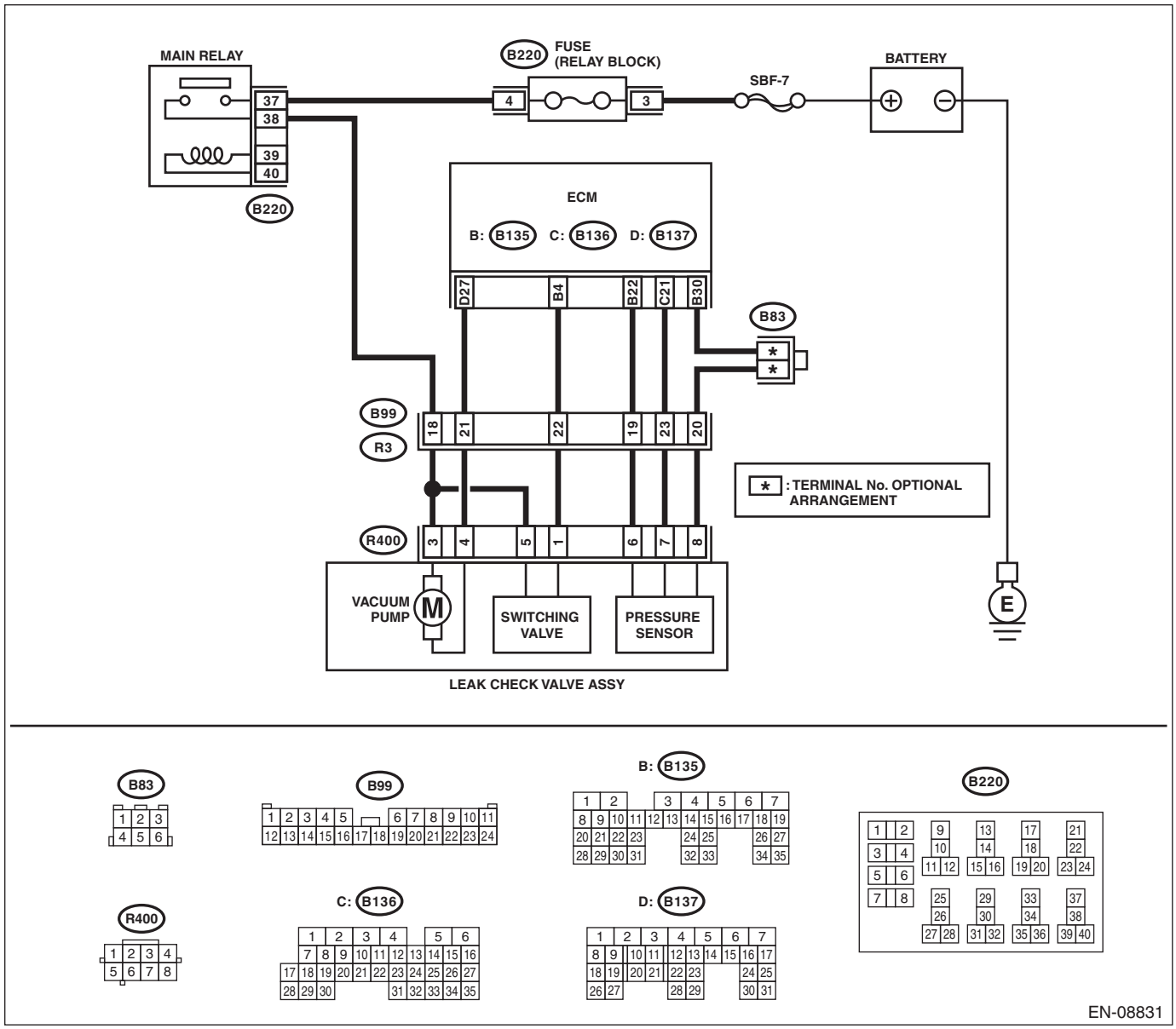
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-123, DTC P0453 EVAPORATIVE EMISSION SYSTEM PRESSURE SENSOR/SWITCH HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Turn the ignition switch to ON. 2) Read the data of atmospheric pressure signal using the Subaru Select Monitor or a general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DO)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the measured value 125 kPa (938 mmHg, 36.9 inHg) or more?	Go to step **2**.	Even if DTC is detected, 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, temporary open or short circuit of harness may be the cause.
2	**CHECK HARNESS BETWEEN ECM AND LEAK CHECK VALVE ASSEMBLY CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and the leak check valve assembly. 3) Measure the resistance of harness between ECM and the leak check valve assembly connector. ***Connector & terminal*** ***(B136) No. 21 — (R400) No. 7:*** ***(B135) No. 30 — (R400) No. 8:***	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 the leak check valve assembly connector • Poor contact of coupling connector • Poor contact of joint connector
3	**CHECK FOR POOR CONTACT.** Check for poor contact of ECM and the leak check valve assembly connector.	Is there poor contact in ECM and the leak check valve assembly connector?	Repair the poor contact of ECM and the leak check valve assembly connector.	Go to step **4**.
4	**CHECK LEAK CHECK VALVE ASSEMBLY.** Check the pressure sensor of the leak check valve assembly. <Ref. to EC(H4DO)-41, CHECK PRESSURE SENSOR, INSPECTION, Leak Check Valve Assembly.>	Is the pressure sensor of the leak check valve assembly OK?	Repair the short circuit to power in harness between ECM and leak check valve assembly connector.	Replace the leak check valve assembly. <Ref. to EC(H4DO)-37, Leak Check Valve Assembly.>

BF:DTC P0455 EVAPORATIVE EMISSION SYSTEM LEAK DETECTED (LARGE LEAK)

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-125, DTC P0455 EVAPORATIVE EMISSION SYSTEM LEAK DETECTED (LARGE 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.
- Fuel filler cap loose or lost

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**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 has caught while tightening.	Is the fuel filler cap tightened securely?	Go to step **2**.	Tighten fuel filler cap securely.
2	**CHECK FUEL FILLER CAP.**	Is the fuel filler cap genuine?	Go to step **3**.	Replace with a genuine fuel filler cap.
3	**CHECK FUEL FILLER PIPE GASKET.**	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(H4DO)-133, Fuel Filler Pipe.>	Go to step **4**.
4	**CHECK PURGE CONTROL SOLENOID VALVE.** Check air-tightness of the purge control solenoid valve. <Ref. to EC(H4DO)-24, INSPECTION, Purge Control Solenoid Valve.>	Is the purge control solenoid valve OK?	Go to step **5**.	Replace the purge control solenoid valve. <Ref. to EC(H4DO)-21, Purge Control Solenoid Valve.>
5	**CHECK EVAPORATIVE EMISSION CONTROL SYSTEM LINE.**	Are there holes on the evaporation line?	Repair or replace the evaporation line. <Ref. to FU(H4DO)-158, Fuel Delivery and Evaporation Lines.>	Go to step **6**.
6	**CHECK CANISTER.**	Are there holes on the canister?	Replace the canister. <Ref. to EC(H4DO)-9, Canister.>	Go to step **7**.
7	**CHECK LEAK CHECK VALVE ASSEMBLY.**	Are there damage or holes on the leak check valve assembly?	Replace the leak check valve assembly. <Ref. to EC(H4DO)-37, Leak Check Valve Assembly.>	Go to step **8**.

Step		Check	Yes	No
8	**CHECK FUEL TANK.** Remove the fuel tank. <Ref. to FU(H4DO)-112, Fuel Tank.>	Are there damage or holes on the fuel tank?	Repair or replace the fuel tank. <Ref. to FU(H4DO)-112, Fuel Tank.>	Go to step **9**.
9	**CHECK ANY OTHER MECHANICAL TROUBLE IN EVAPORATIVE EMISSION CONTROL SYSTEM.**	Are there holes, cracks, clogging, or disconnection, misconnection of hoses or pipes in evaporative emission control system?	Repair or replace the hoses or pipes.	Repair the poor contact of ECM connector.

BG:DTC P0456 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK)

NOTE:
For the diagnostic procedure, refer to DTC P0455. <Ref. to EN(H4DO)(diag)-216, DTC P0455 EVAPORATIVE EMISSION SYSTEM LEAK DETECTED (LARGE LEAK), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BH:DTC P0458 EVAPORATIVE EMISSION SYSTEM PURGE CONTROL VALVE CIRCUIT LOW

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-134, DTC P0458 EVAPORATIVE EMISSION SYSTEM PURGE CONTROL VALVE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

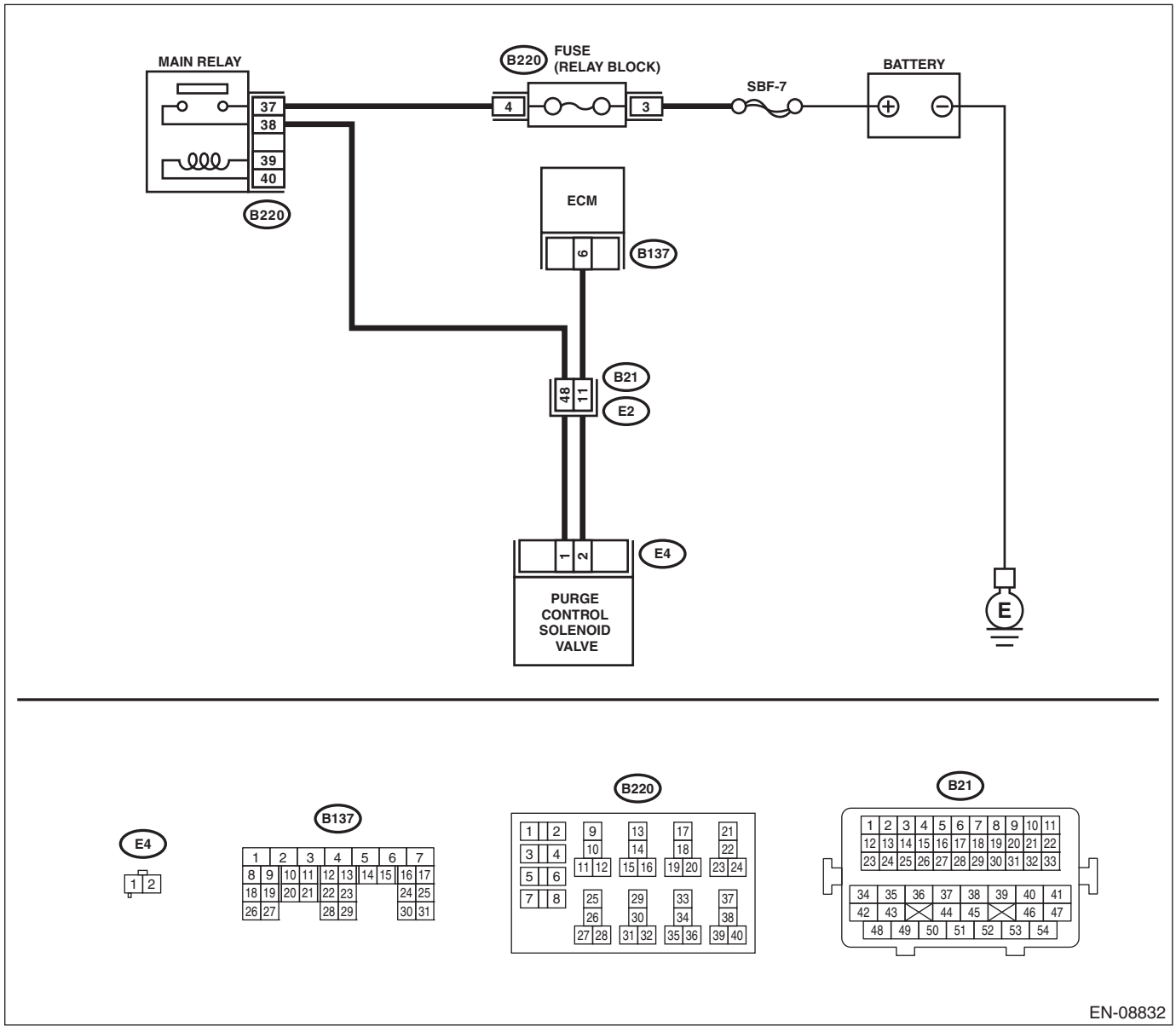
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	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. 6 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **2**.	Go to step **3**.
2	**CHECK FOR POOR CONTACT.** Check for poor contact of ECM connector.	Is there poor contact of ECM connector?	Repair the poor contact of ECM connector.	Even if DTC is detected, 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 open or short circuit of harness or temporary poor contact of connector may be the cause.
3	**CHECK POWER SUPPLY TO PURGE CONTROL SOLENOID VALVE.** Measure the voltage between purge control solenoid valve connector and engine ground. ***Connector & terminal*** ***(E4) No. 1 (+) — Engine ground (–):***	Is the voltage 10 V or more?	Go to step **4**.	Repair the power supply circuit.
4	**CHECK HARNESS BETWEEN ECM AND PURGE CONTROL SOLENOID VALVE CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and purge control solenoid valve. 3) Measure the resistance between the purge control solenoid valve connector and engine ground. ***Connector & terminal*** ***(E4) No. 2 — Engine ground:***	Is the resistance 1 MΩ or more?	Go to step **5**.	Repair the ground short circuit of harness between ECM and purge control solenoid valve connector.
5	**CHECK HARNESS BETWEEN ECM AND PURGE CONTROL SOLENOID VALVE CONNECTOR.** Measure the resistance of harness between ECM and purge control solenoid valve. ***Connector & terminal*** ***(B137) No. 6 — (E4) No. 2:***	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 purge control solenoid valve connector • Poor contact of coupling connector
6	**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 10 — 100 Ω?	Repair the poor contact of purge control solenoid valve connector.	Replace the purge control solenoid valve. <Ref. to EC(H4DO)-21, Purge Control Solenoid Valve.>

BI: DTC P0459 EVAPORATIVE EMISSION SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-136, DTC P0459 EVAPORATIVE EMISSION SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

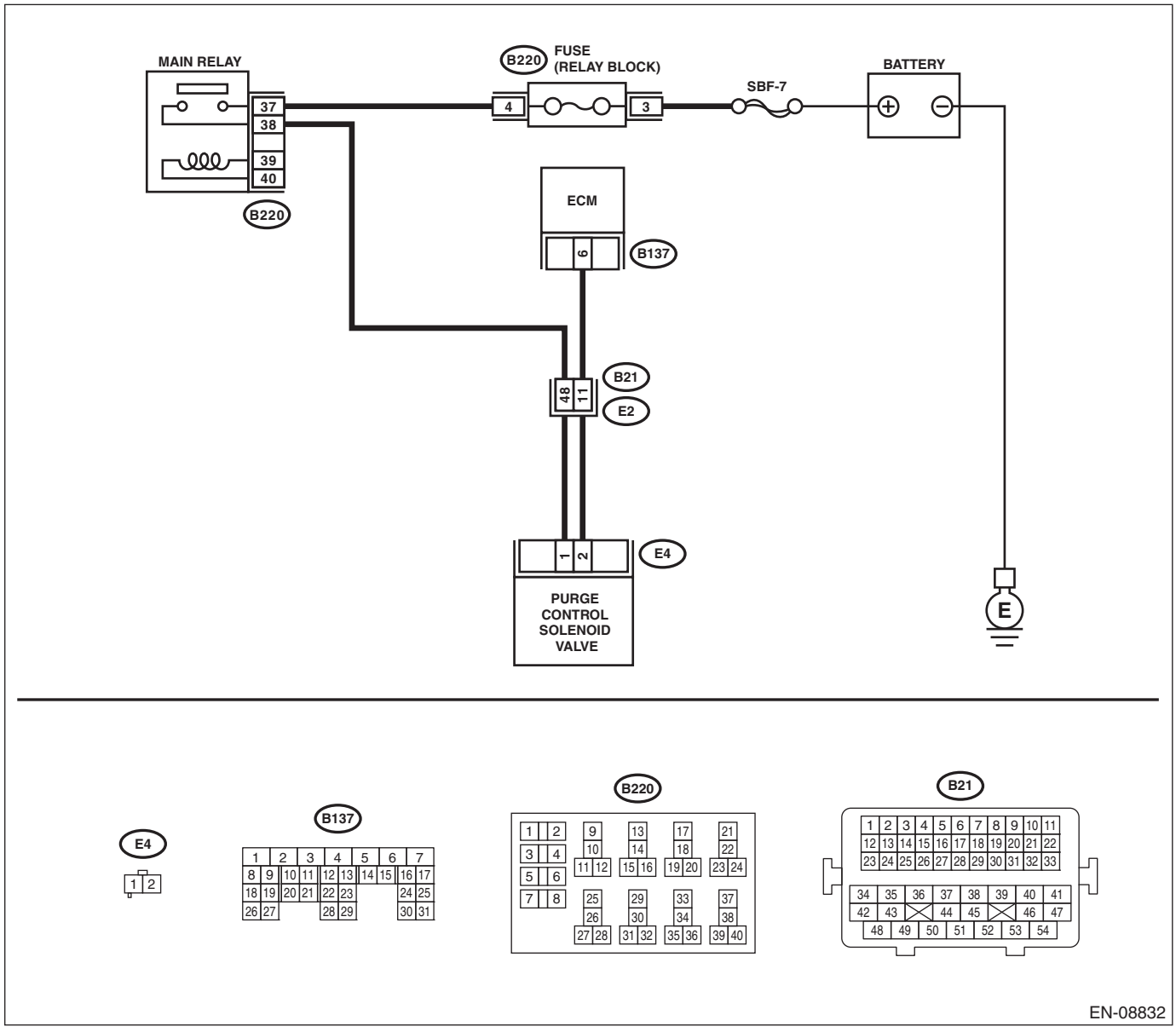
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND PURGE CONTROL SOLENOID VALVE CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and purge control solenoid valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 6 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the short circuit to power in the harness between ECM and purge control solenoid valve connector.	Go to step **2**.
2	**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(H4DO)-21, Purge Control Solenoid Valve.>	Repair the poor contact of ECM connector.

BJ:DTC P0461 FUEL LEVEL SENSOR “A” CIRCUIT RANGE/PERFORMANCE

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-138, DTC P0461 FUEL LEVEL SENSOR “A” CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

Step		Check	Yes	No
1	**CHECK FOR 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(H4DO)(diag)-86, List of Diagnostic Trouble Code (DTC).>	Replace the fuel level sensor and fuel sub level sensor. <Ref. to FU(H4DO)-143, Fuel Level Sensor.> <Ref. to FU(H4DO)-147, Fuel Sub Level Sensor.>

BK:DTC P0462 FUEL LEVEL SENSOR “A” CIRCUIT LOW

NOTE:
For the diagnostic procedure, refer to DTC P0463. <Ref. to EN(H4DO)(diag)-223, DTC P0463 FUEL LEVEL SENSOR “A” CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BL:DTC P0463 FUEL LEVEL SENSOR “A” CIRCUIT HIGH

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-142, DTC P0463 FUEL LEVEL SENSOR “A” CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

Step		Check	Yes	No
1	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is DTC P0462 or P0463 displayed on the Subaru Select Monitor?	Check the combination meter. <Ref. to IDI-11, CHECK FUEL LEVEL SENSOR, INSPECTION, Combination Meter System.>	Even if DTC is detected, 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, temporary open or short circuit of harness may be the cause.

BM:DTC P0500 VEHICLE SPEED SENSOR “A”

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-144, DTC P0500 VEHICLE SPEED SENSOR “A”, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

Step		Check	Yes	No
1	**CHECK DTC OF VDC.** Check DTC of VDC.	Is DTC of VDC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Repair the poor contact of ECM connector.

BN:DTC P0506 IDLE AIR CONTROL SYSTEM RPM LOWER THAN EXPECTED

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-145, 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 servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK FOR 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(H4DO)(diag)-86, List of Diagnostic Trouble Code (DTC).>	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(H4DO)-4, Air Cleaner Element.>	Go to step **3**.
3	**CHECK ELECTRONIC THROTTLE CONTROL.** 1) Remove the electronic throttle control. <Ref. to FU(H4DO)-17, REMOVAL, Throttle Body.> 2) 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. <Ref. to EN(H4DO)(diag)-292, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BO:DTC P0507 IDLE AIR CONTROL SYSTEM RPM HIGHER THAN EXPECTED

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-146, 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 servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK FOR 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(H4DO)(diag)-86, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK AIR INTAKE SYSTEM.** 1) Start and idle the engine. 2) Check the following items. • 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. <Ref. to FU(H4DO)-17, REMOVAL, Throttle Body.> 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. <Ref. to EN(H4DO)(diag)-292, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BP:DTC P050A COLD START IDLE AIR CONTROL SYSTEM PERFORMANCE

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION<Ref. to GD(H4DO)-147, DTC P050A COLD START IDLE AIR CONTROL SYSTEM PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

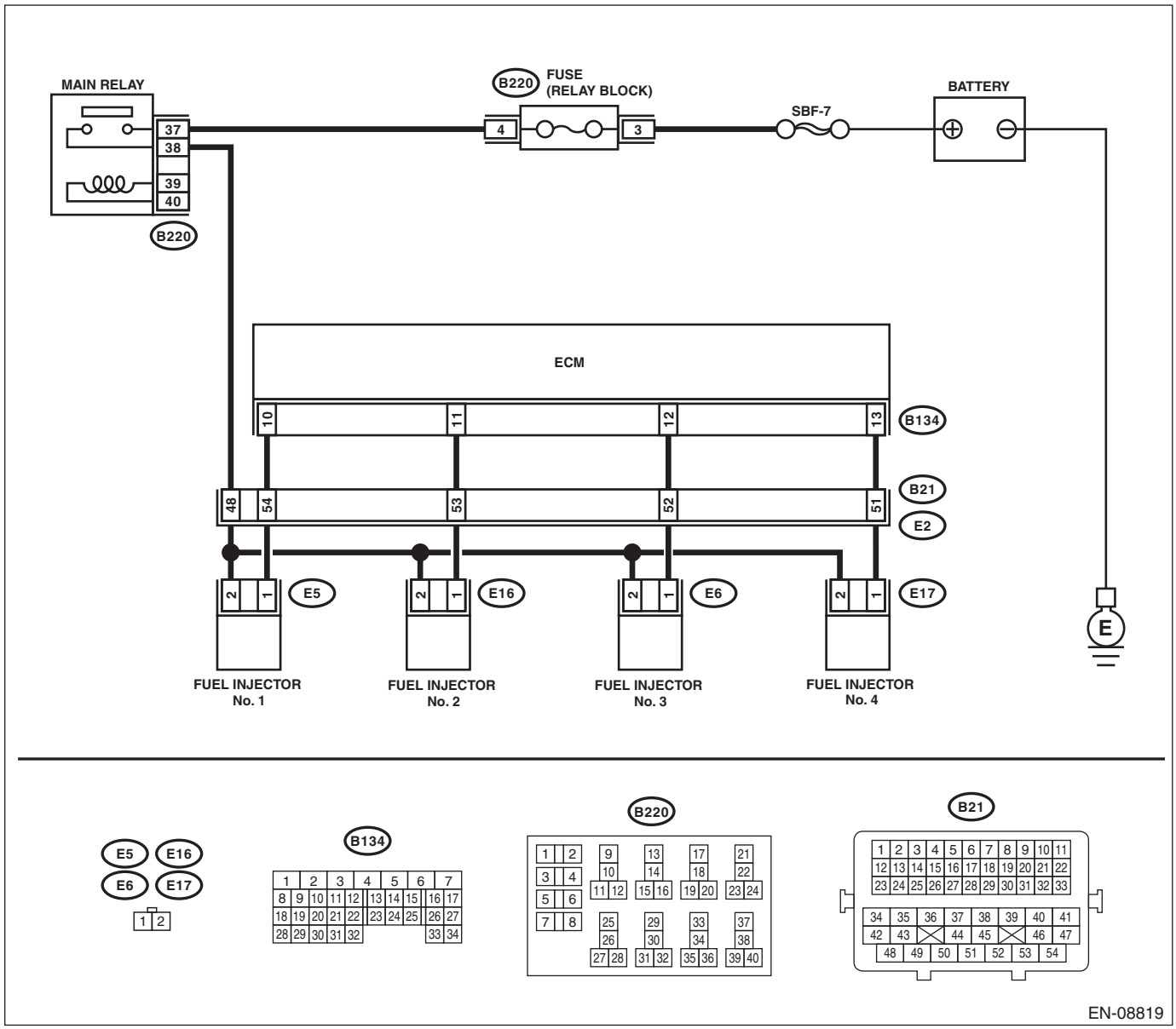
TROUBLE SYMPTOM:

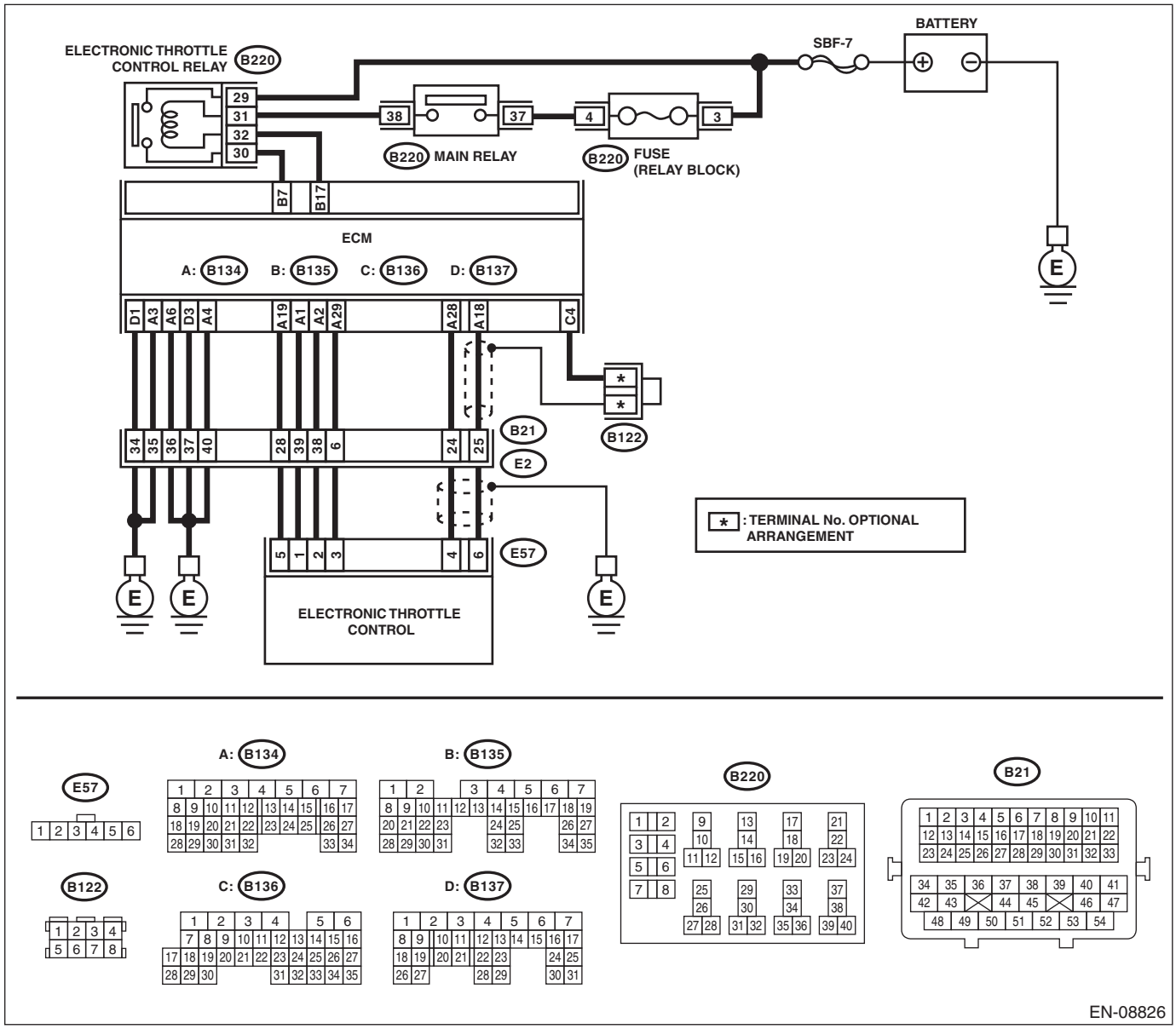
- Engine keeps running at higher speed than specified idle speed.
- Engine keeps running at a lower speed than the specified idle speed.
- Engine stalls.

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode<Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode<Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





Step		Check	Yes	No
1	**CHECK FOR 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(H4DO)(diag)-86, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK ENGINE OIL.**	Is there a proper amount of engine oil?	Go to step **3**.	Replace engine oil. <Ref. to LU(H4DO)-12, REPLACEMENT, Engine Oil.>
3	**CHECK EXHAUST SYSTEM.**	Are there holes or loose bolts on exhaust system?	Repair the exhaust system.	Go to step **4**.

	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 OPEN FLAMES" signs near the working area.** **CAUTION:** **Be careful not to spill fuel.** Measure the fuel pressure. <Ref. to ME(H4DO)-30, INSPECTION, Fuel Pressure.> **CAUTION:** **Release fuel pressure before removing the fuel pressure gauge.**	Is the measured value 340 — 400 kPa (3.5 — 4.1 kg/cm^2, 49 — 58 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(H4DO)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the engine coolant temperature 75°C (167°F) or higher?	Go to step **7**.	Replace the engine coolant temperature sensor. <Ref. to FU(H4DO)-42, 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 higher than 75°C (167°F). 2) For AT models, set the select lever to "P" range or "N" range, and for MT models, place the shift lever in the neutral position. 3) Turn the A/C switch to OFF. 4) Turn all the accessory switches to OFF. 5) Read the data of the 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(H4DO)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the measured value 2.0 — 5.0 g/s (0.26 — 0.66 lb/m)?	Go to step **8**.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DO)-71, Mass Air Flow and Intake Air Temperature Sensor.>

	Step	Check	Yes	No
8	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.** 1) Start the engine and warm up engine until coolant temperature is higher than 75°C (167°F). 2) For AT models, set the select lever to "P" range or "N" range, and for MT models, place the shift lever in the 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 the 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(H4DO)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Subtract ambient temperature from intake air temperature. Is the obtained value –10 — 50°C (–18 — 90°F)?	Go to step **9**.	Check the mass air flow and intake air temperature sensor. <Ref. to FU(H4DO)-71, Mass Air Flow and Intake Air Temperature Sensor.>
9	**CHECK OUTPUT SIGNAL OF ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground on faulty cylinders. ***Connector & terminal*** ***#1 (B134) No. 10 (+) — Chassis ground (–):*** ***#2 (B134) No. 11 (+) — Chassis ground (–):*** ***#3 (B134) No. 12 (+) — Chassis ground (–):*** ***#4 (B134) No. 13 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **14**.	Go to step **10**.
10	**CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel injector on faulty cylinders. 3) Measure the resistance between fuel injector 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 short circuit to ground in harness between ECM and fuel injector connector.
11	**CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR.** Measure the resistance of harness between ECM and fuel injector connector on faulty cylinders. ***Connector & terminal*** ***#1 (B134) No. 10 — (E5) No. 1:*** ***#2 (B134) No. 11 — (E16) No. 1:*** ***#3 (B134) No. 12 — (E6) No. 1:*** ***#4 (B134) No. 13 — (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 of coupling connector

	Step	Check	Yes	No
12	**CHECK FUEL INJECTOR.** Measure the resistance between fuel injector terminals on faulty cylinder. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 5 — 20 Ω?	Go to step **13**.	Replace the faulty fuel injector. <Ref. to FU(H4DO)-78, 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 the main relay connector and fuel injector connector on faulty cylinders • Poor contact of coupling connector • Poor contact of main relay connector
14	**CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR 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 and chassis ground on faulty cylinders. ***Connector & terminal*** ***#1 (B134) No. 10 (+) — Chassis ground (–):*** ***#2 (B134) No. 11 (+) — Chassis ground (–):*** ***#3 (B134) No. 12 (+) — Chassis ground (–):*** ***#4 (B134) No. 13 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the short circuit to power in the harness between the ECM and fuel injector.	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*** ***No. 1 — No. 2:***	Is the resistance 5 — 20 Ω?	Go to step **16**.	Replace the faulty fuel injector. <Ref. to FU(H4DO)-78, Fuel Injector.>
16	**CHECK INSTALLATION CONDITION 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. <Ref. to FU(H4DO)-52, INSTALLATION, Camshaft Position Sensor.> <Ref. to FU(H4DO)-46, INSTALLATION, Crankshaft Position Sensor.>	Go to step **17**.
17	**CHECK CRANKSHAFT POSITION SENSOR PLATE.**	Is the crankshaft position sensor plate rusted or does it have broken teeth?	Replace the crankshaft position sensor plate. <Ref. to ME(H4DO)-233, Cylinder Block.>	Go to step **18**.

	Step	Check	Yes	No
18	**CHECK INSTALLATION CONDITION OF TIMING CHAIN.** Turn the crankshaft using ST, and align the alignment mark on crank sprocket with alignment mark on cylinder block. ST 18252AA000 CRANKSHAFT SOCKET	Is the timing chain dislocated from its proper position?	Correct the installation condition of timing chain. <Ref. to ME(H4DO)-109, Timing Chain Assembly.>	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. 31 and No. 32 of electronic throttle control relay. 4) Measure the resistance between electronic throttle control relay terminals. ***Terminals*** ***No. 29 — No. 30:***	Is the resistance less than 1 Ω?	Go to step **20**.	Replace the electronic throttle control relay. <Ref. to FU(H4DO)-107, 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. ***Connector & terminal*** ***(B220) No. 29 (+) — Chassis ground (–):***	Is the voltage 10 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 CONNECTOR.** 1) Disconnect the connector from ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control relay connector and chassis ground. ***Connector & terminal*** ***(B220) No. 32 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the short circuit to power in the harness between ECM and electronic throttle control relay connector.	Go to step **22**.
22	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between electronic throttle control relay connector and chassis ground. ***Connector & terminal*** ***(B220) No. 32 — Chassis ground:*** ***(B220) No. 30 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **23**.	Repair the short circuit in harness to ground between ECM and electronic throttle control relay connector.
23	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY CONNECTOR.** Measure the resistance of harness between ECM and electronic throttle control relay connector. ***Connector & terminal*** ***(B135) No. 17 — (B220) No. 32:*** ***(B135) No. 7 — (B220) No. 30:***	Is the resistance less than 1 Ω?	Go to step **24**.	Repair the open circuit in harness between ECM and electronic throttle control relay connector.

	Step	Check	Yes	No
24	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and electronic throttle control. 3) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 19 — Chassis ground:*** ***(B134) No. 18 — Chassis ground:*** ***(B134) No. 18 — (B136) No. 4:*** ***(B134) No. 28 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **25**.	Repair the short circuit to ground in harness between ECM and electronic throttle control connector.
25	**CHECK SHORT CIRCUIT INSIDE THE ECM.** 1) Connect the connector to ECM. 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 1 MΩ or more?	Go to step **26**.	Repair the short circuit to ground in harness between ECM and electronic throttle control connector. Replace the ECM if defective. <Ref. to FU(H4DO)-101, Engine Control Module (ECM).>
26	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL CONNECTOR.** 1) Disconnect the connector from ECM. 2) Measure the resistance of harness between ECM and electronic throttle control connector. ***Connector & terminal*** ***(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 **27**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and electronic throttle control connector • Poor contact of coupling connector
27	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL CONNECTOR.** 1) Connect the connector to ECM. 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 **28**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and engine ground • Poor contact of ECM connector • Poor contact of coupling connector
28	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 6 (+) — Engine ground (–):*** ***(E57) No. 4 (+) — Engine ground (–):***	Is the voltage 5 V or more?	Repair the short circuit to power in harness between ECM and electronic throttle control connector.	Go to step **29**.

	Step	Check	Yes	No
29	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between ECM connectors. ***Connector & terminal*** ***(B134) No. 19 — (B134) No. 18:*** ***(B134) No. 19 — (B134) No. 28:***	Is the resistance 1 MΩ or more?	Go to step **30**.	Repair the short circuit to power in harness between ECM and electronic throttle control connector.
30	**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(H4DO)(diag)-35, Subaru Select Monitor.>	Is the voltage 0.81 — 0.87 V?	Go to step **31**.	Repair the poor contact of electronic throttle control connector. Replace the electronic throttle control if defective. <Ref. to FU(H4DO)-17, Throttle Body.>
31	**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(H4DO)(diag)-35, Subaru Select Monitor.>	Is the voltage 1.64 — 1.70 V?	Go to step **32**.	Repair the poor contact of electronic throttle control connector. Replace the electronic throttle control if defective. <Ref. to FU(H4DO)-17, Throttle Body.>
32	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and electronic throttle control. 3) Measure the resistance between ECM and electronic throttle control connector. ***Connector & terminal*** ***(B134) No. 2 — (E57) No. 2:*** ***(B134) No. 1 — (E57) No. 1:***	Is the resistance less than 1 Ω?	Go to step **33**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and electronic throttle control connector • Poor contact of coupling connector
33	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL CONNECTOR.** 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 5 V or more?	Repair the short circuit to power in harness between ECM and electronic throttle control connector.	Go to step **34**.

	Step	Check	Yes	No
34	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector 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 **35**.	Repair the short circuit to ground in harness between ECM and electronic throttle control connector.
35	**CHECK HARNESS BETWEEN ELECTRONIC THROTTLE CONTROL CONNECTOR.** Measure the resistance between electronic throttle control connectors. ***Connector & terminal*** ***(E57) No. 2 — (E57) No. 1:***	Is the resistance 1 MΩ or more?	Go to step **36**.	Repair the short circuit of harness between ECM and electronic throttle control connector.
36	**CHECK ELECTRONIC THROTTLE CONTROL GROUND CIRCUIT.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 3 — Chassis ground:*** ***(B134) No. 4 — Chassis ground:*** ***(B134) No. 6 — Chassis ground:*** ***(B137) No. 1 — Chassis ground:*** ***(B137) No. 3 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **37**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and engine ground • Poor contact of coupling connector
37	**CHECK ELECTRONIC THROTTLE CONTROL.** Measure the resistance between electronic throttle control terminals. ***Terminals*** ***No. 2 — No. 1:***	Is the resistance 50 Ω or less?	Go to step **38**.	Replace the electronic throttle control. <Ref. to FU(H4DO)-17, Throttle Body.>
38	**CHECK ELECTRONIC THROTTLE CONTROL.** Move the throttle valve to the fully open 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 the poor contact of ECM connector.	Replace the electronic throttle control. <Ref. to FU(H4DO)-17, Throttle Body.>

BQ:DTC P050B COLD START IGNITION TIMING PERFORMANCE

NOTE:
For the diagnostic procedure, refer to DTC P050A. <Ref. to EN(H4DO)(diag)-227, DTC P050A COLD START IDLE AIR CONTROL SYSTEM PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BR:DTC P0512 STARTER REQUEST CIRCUIT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-153, DTC P0512 STARTER REQUEST CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

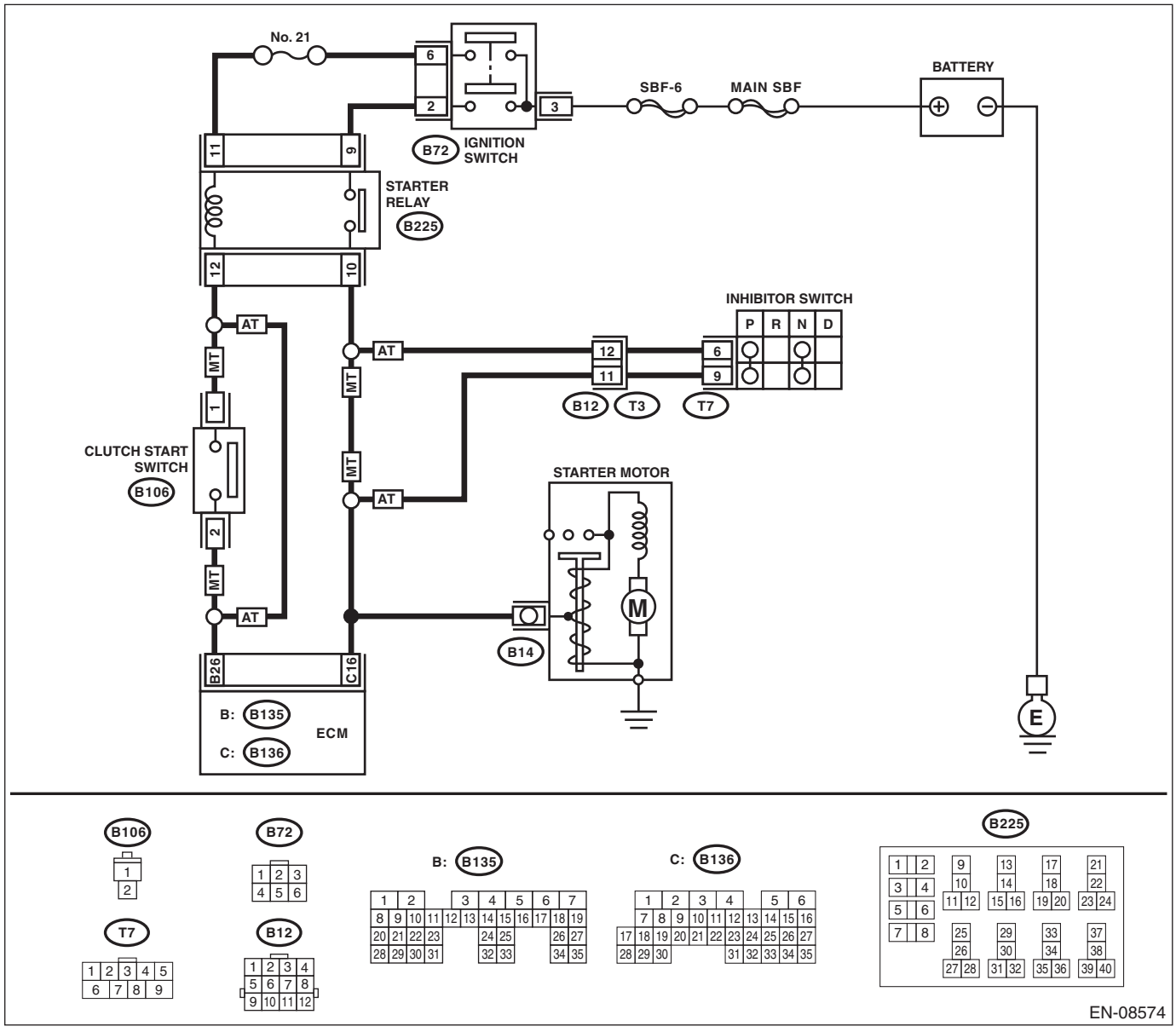
TROUBLE SYMPTOM:

Failure of engine to start

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK FOR 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(H4DO)(diag)-86, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK HARNESS BETWEEN ECM AND STARTER RELAY CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 16 (+) — Chassis ground (–):*** NOTE: For AT model, place the select lever in “P” range or “N” range.	Is the voltage 10 V or more?	Repair the short circuit to power supply in harness between ECM and starter relay connector.	Repair the poor contact of ECM connector.

BS:DTC P0604 INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-155, 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 servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

Step	Check	Yes	No
1 **CHECK FOR 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(H4DO)(diag)-86, List of Diagnostic Trouble Code (DTC).>	Even if DTC is detected, 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, temporary open or short circuit of harness may be the cause.

BT:DTC P0605 INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR

NOTE:
For the diagnostic procedure, refer to DTC P0607. <Ref. to EN(H4DO)(diag)-239, DTC P0607 THROTTLE CONTROL SYSTEM CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BU:DTC P0607 THROTTLE CONTROL SYSTEM CIRCUIT RANGE/PERFORMANCE

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-157, DTC P0607 THROTTLE CONTROL SYSTEM CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

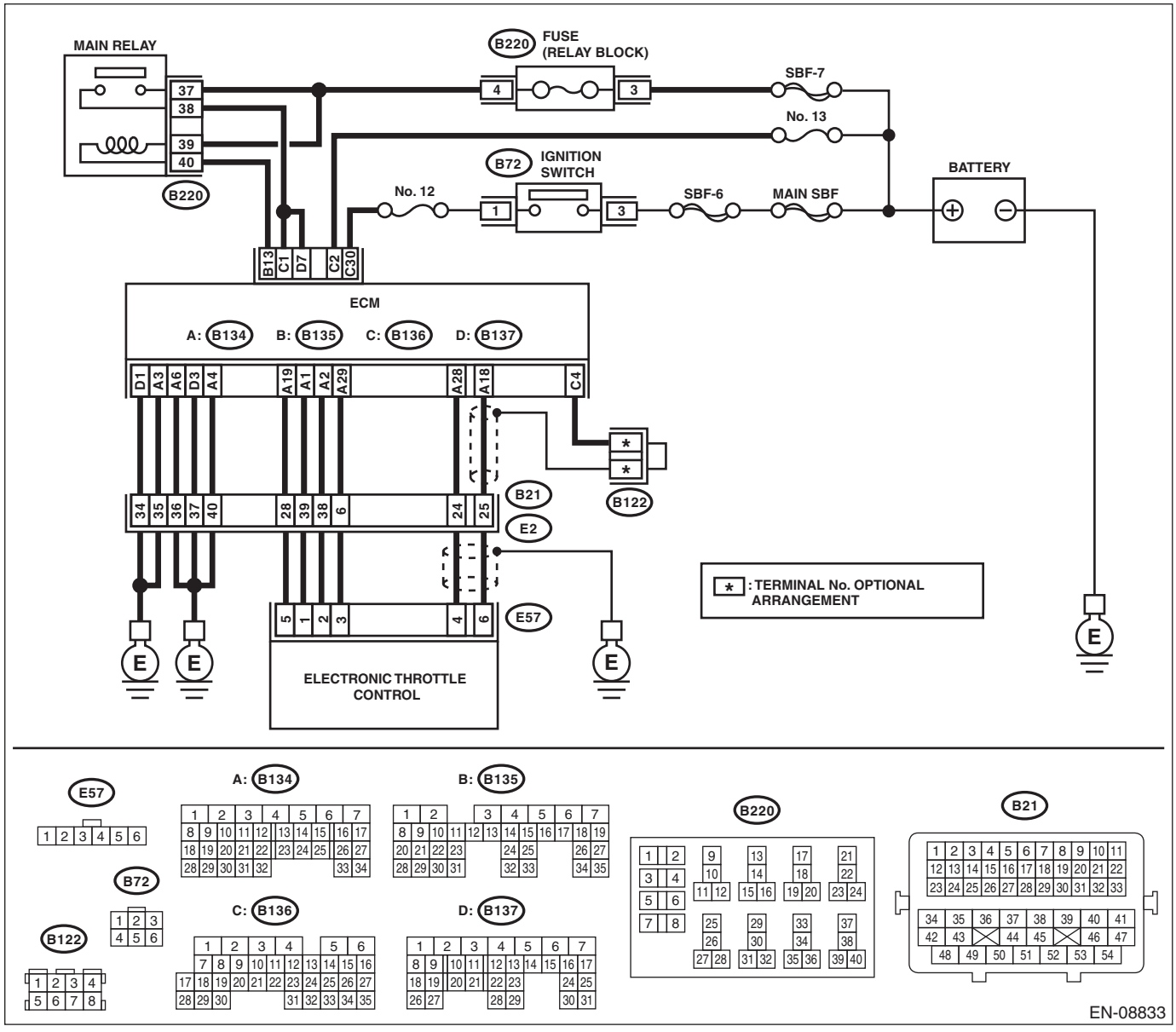
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK INPUT VOLTAGE OF ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 1 (+) — Chassis ground (–):*** ***(B137) No. 7 (+) — 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 and chassis ground. ***Connector & terminal*** ***(B136) No. 1 (+) — Chassis ground (–):*** ***(B137) No. 7 (+) — 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 CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and electronic throttle control. 3) Measure the resistance of harness between ECM and electronic throttle control connector. ***Connector & terminal*** ***(B134) No. 19 — (E57) No. 5:*** ***(B134) No. 29 — (E57) 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: • Open circuit in harness between ECM and electronic throttle control connector • Poor contact of coupling connector
4	**CHECK ECM GROUND HARNESS.** 1) Connect all connectors. 2) Turn the ignition to ON. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 3 (+) — Chassis ground (–):*** ***(B134) No. 4 (+) — Chassis ground (–):*** ***(B134) No. 6 (+) — Chassis ground (–):*** ***(B137) No. 1 (+) — Chassis ground (–):*** ***(B137) No. 3 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Repair the poor contact of ECM connector.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in ground circuit • Further tightening of the engine ground terminal • Poor contact of coupling connector

BV:DTC P0638 THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1)

NOTE:
For the diagnostic procedure, refer to DTC P2101. <Ref. to EN(H4DO)(diag)-292, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BW:DTC P0700 TRANSMISSION CONTROL SYSTEM (MIL REQUEST)

NOTE:
For the diagnostic procedure, refer to AT section. <Ref. to 4AT(diag)-2, Basic Diagnostic Procedure.>

BX:DTC P0851 PARK/NEUTRAL SWITCH INPUT CIRCUIT LOW (AT MODEL)

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-162, DTC P0851 PARK/NEUTRAL SWITCH INPUT CIRCUIT LOW (AT MODEL), Diagnostic Trouble Code (DTC) Detecting Criteria.>

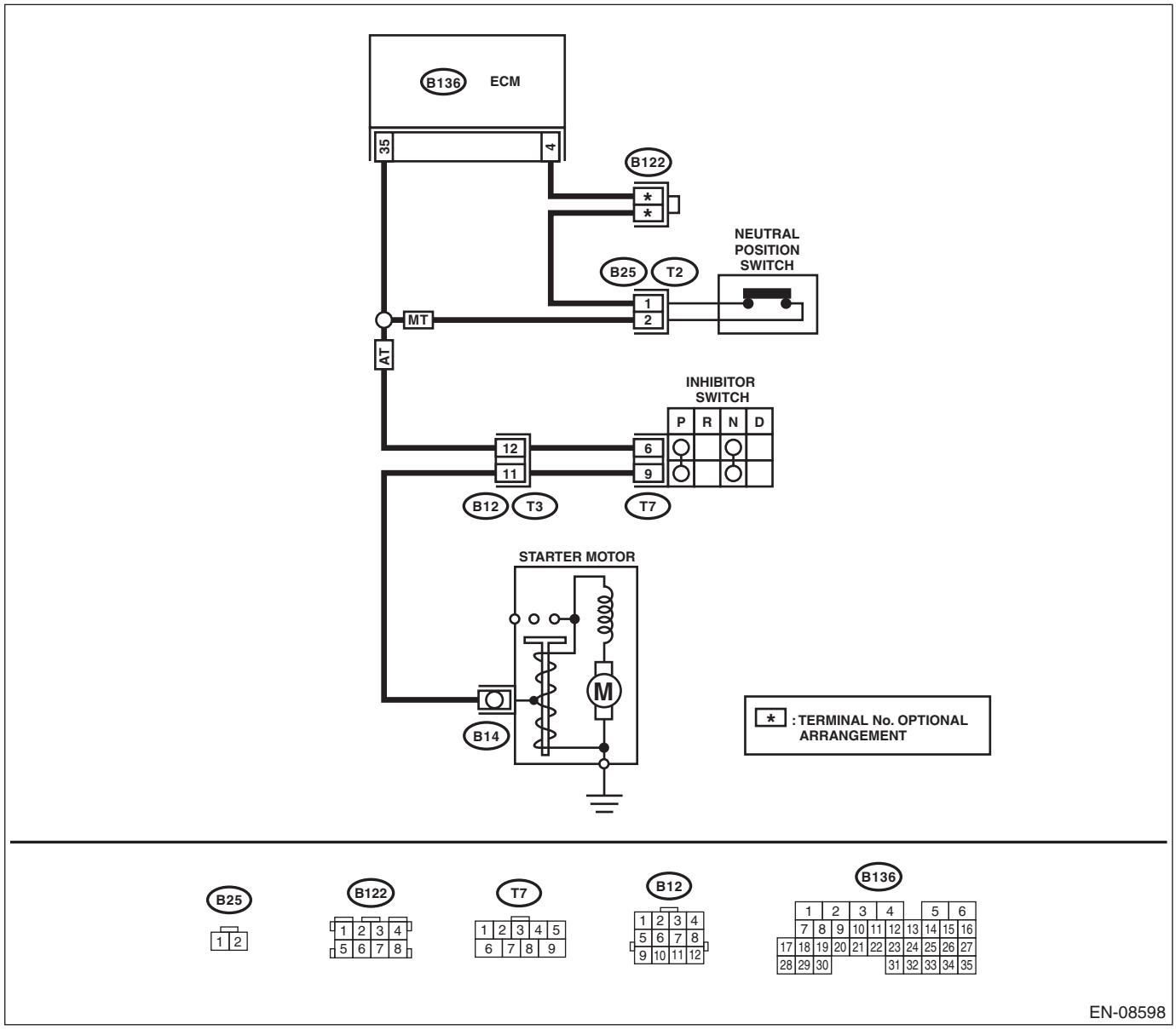
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK SELECT CABLE.**	Is there any fault in select cable?	Repair or adjust the select cable. <Ref. to CS-25, Select Cable.>	Go to step **2**.

	Step	Check	Yes	No
2	**CHECK INPUT SIGNAL OF ECM.** 1) Turn the ignition switch to ON. 2) Place the select lever in other than "P" range and "N" range. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 35 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the poor contact of 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 between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 35 — 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 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-52, Inhibitor Switch.>	Repair short circuit to ground in harness between transmission harness connector and inhibitor switch connector.

BY:DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW (MT MODEL)

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-163, DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW (MT MODEL), Diagnostic Trouble Code (DTC) Detecting Criteria.>

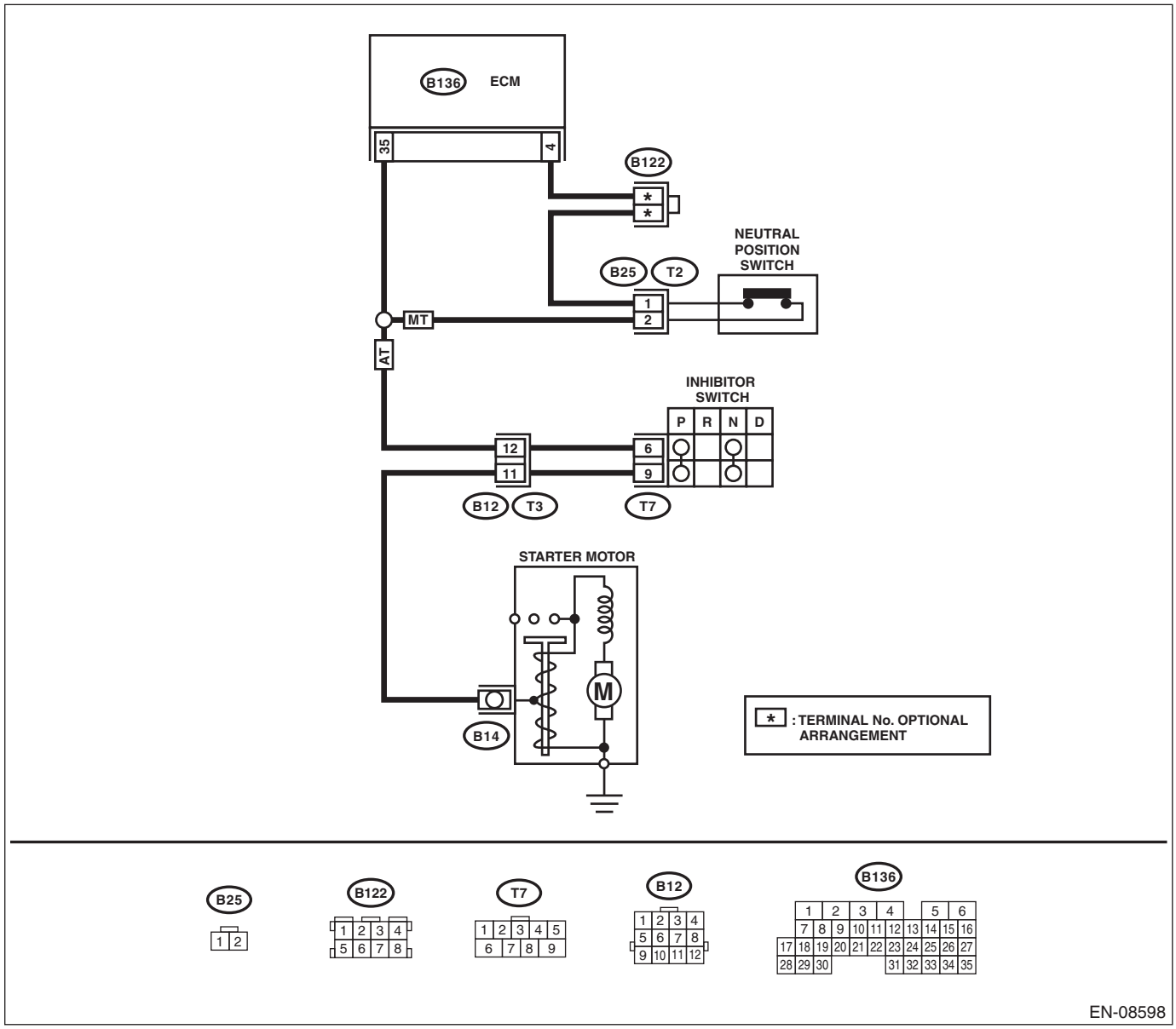
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	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 other than neutral. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 35 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the poor contact of ECM connector.	Go to step **2**.
2	**CHECK HARNESS BETWEEN ECM AND NEUTRAL POSITION SWITCH CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and neutral position switch. 3) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 35 — Chassis ground:***	Is the resistance 1 MΩ or more?	Replace the neutral position switch. <Ref. to 5MT-34, Switches and Harness.>	Repair the short circuit to ground harness between ECM and neutral position switch connector.

BZ:DTC P0852 PARK/NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT MODEL)

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-164, DTC P0852 PARK/NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT MODEL), Diagnostic Trouble Code (DTC) Detecting Criteria.>

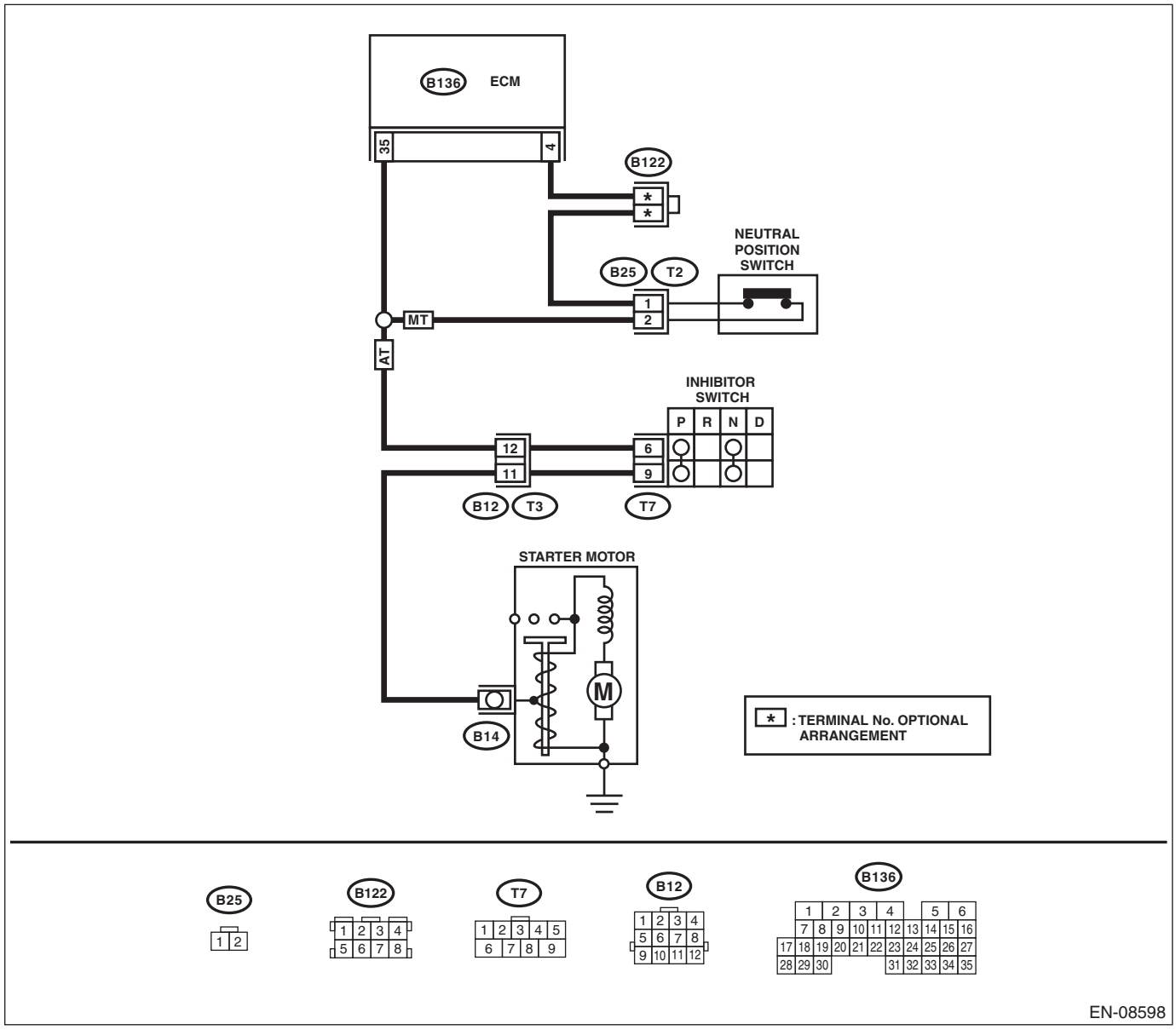
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK SELECT CABLE.**	Is there any fault in select cable?	Repair or adjust the select cable. <Ref. to CS-25, Select Cable.>	Go to step **2**.

Step		Check	Yes	No
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 "P" range and "N" range. ***Connector & terminal*** ***(B136) No. 35 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Repair the poor contact of ECM connector.	Go to step **3**.
3	**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. 35 — (T7) No. 6:***	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 inhibitor switch connector • Poor contact of coupling connector
4	**CHECK INHIBITOR SWITCH GROUND LINE.** Measure the resistance of harness between inhibitor switch connector and engine ground. ***Connector & terminal*** ***(T7) No. 9 — Engine ground:***	Is the resistance less than 5 Ω?	Replace the inhibitor switch. <Ref. to 4AT-52, Inhibitor Switch.>	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between inhibitor switch connector and starter motor ground line • Poor contact of coupling connector • Poor contact of starter motor connector • Poor contact of starter motor ground • Starter motor

CA:DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT MODEL)

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-165, DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT MODEL), Diagnostic Trouble Code (DTC) Detecting Criteria.>

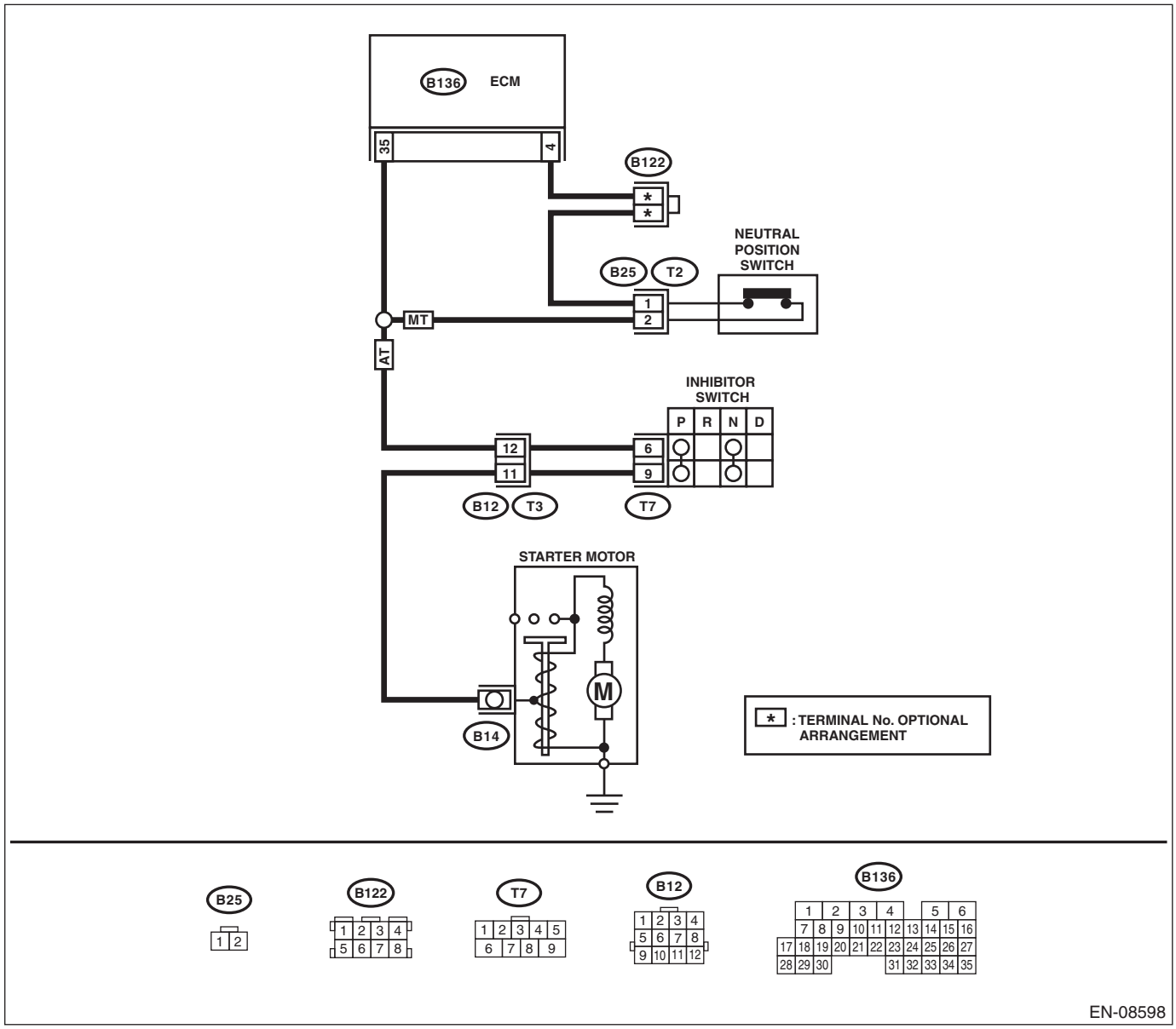
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	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. 35 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Repair the poor contact of ECM connector.	Go to step **2**.
2	**CHECK HARNESS BETWEEN ECM AND NEUTRAL POSITION SWITCH CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and neutral position switch. 3) Measure the resistance of harness between ECM and neutral position switch connector. ***Connector & terminal*** ***(B136) No. 35 — (B25) No. 2:*** ***(B136) No. 4 — (B25) No. 1:***	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 neutral position switch connector • Poor contact of coupling connector
3	**CHECK NEUTRAL POSITION SWITCH.** 1) Place the shift lever in neutral. 2) Measure the resistance between neutral position switch terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 1 Ω?	Repair the poor contact of neutral position switch connector.	Replace the neutral position switch. <Ref. to 5MT-34, Switches and Harness.>

CB:DTC P1152 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK1 SENSOR1)

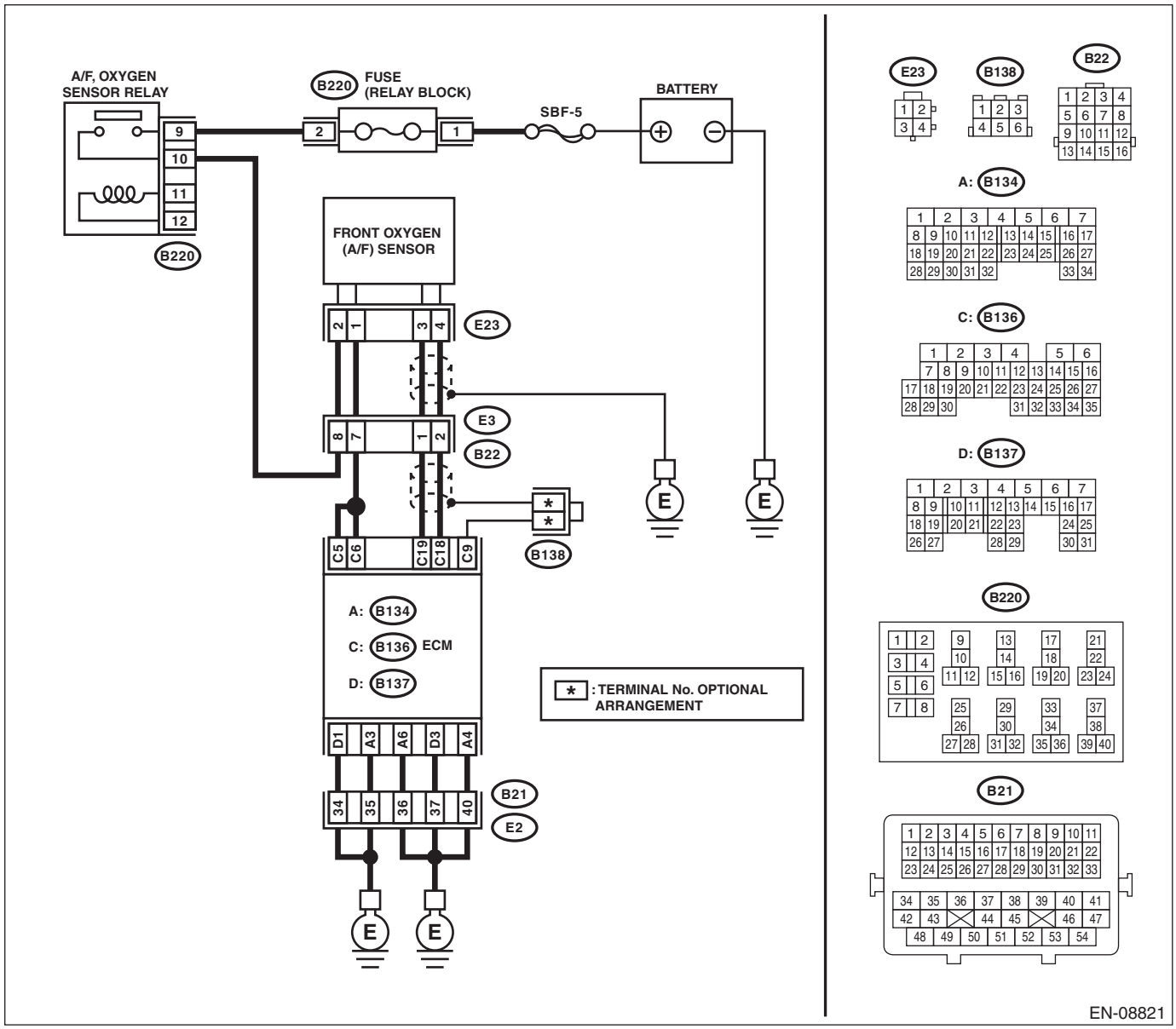
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-166, DTC P1152 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK1 SENSOR1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Has water entered the connector?	Completely remove any water inside.	Go to step **2**.

	Step	Check	Yes	No
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 and front oxygen (A/F) sensor. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B136) No. 19 — (E23) No. 3:*** ***(B136) No. 18 — (E23) No. 4:***	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 of coupling connector
3	**CHECK FOR POOR CONTACT.** Check for poor contact of the front oxygen (A/F) sensor connector.	Is there poor contact of front oxygen (A/F) sensor connector?	Repair the poor contact of front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DO)-93, Front Oxygen (A/F) Sensor.>

CC:DTC P1153 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1)

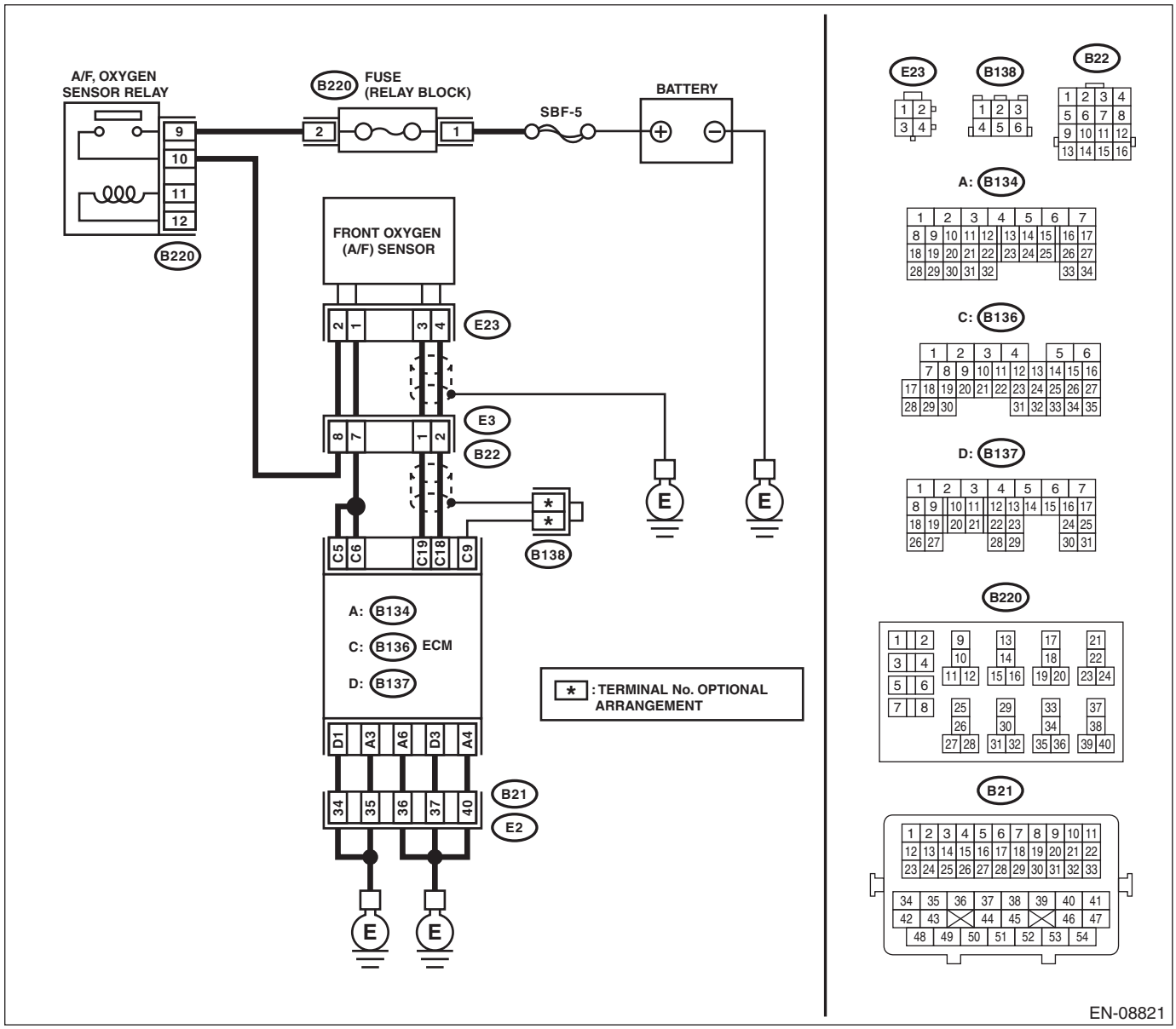
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-168, DTC P1153 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Has water entered the connector?	Completely remove any water inside.	Go to step **2**.

	Step	Check	Yes	No
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. 3) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 19 — Chassis ground:*** ***(B136) No. 18 — 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 OUTPUT SIGNAL FOR ECM.** 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 19 (+) — Chassis ground (–):***	Is the voltage 4.5 V or more?	Go to step **5**.	Go to step **4**.
4	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 18 (+) — Chassis ground (–):***	Is the voltage 4.95 V or more?	Go to step **5**.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DO)-93, Front Oxygen (A/F) Sensor.>
5	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 19 (+) — Chassis ground (–):*** ***(B136) No. 18 (+) — Chassis ground (–):***	Is the voltage 8 V or more?	Repair the short circuit to power in the harness between ECM and front oxygen (A/F) sensor connector. After repair, replace the ECM. <Ref. to FU(H4DO)-101, Engine Control Module (ECM).>	Repair the poor contact of ECM connector.

CD:DTC P1160 RETURN SPRING FAILURE

NOTE:
For the diagnostic procedure, refer to DTC P2101. <Ref. to EN(H4DO)(diag)-292, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CE:DTC P1449 EVAPORATIVE EMISSION CONT. SYS. AIR FILTER CLOG

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-172, DTC P1449 EVAPORATIVE EMISSION CONT. SYS. AIR FILTER CLOG, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK FOR 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(H4DO)(diag)-86, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK DRAIN TUBE OF LEAK CHECK VALVE ASSEMBLY.**	Is the drain tube of leak check valve assembly clogged?	Replace the drain tube of leak check valve assembly. <Ref. to EC(H4DO)-37, Leak Check Valve Assembly.>	Go to step **3**.
3	**CHECK HOSES BETWEEN LEAK CHECK VALVE ASSY AND DRAIN SEPARATOR.**	Are the hoses between the leak check valve assembly and drain separator clogged?	Replace the hose between leak check valve assembly and drain separator. <Ref. to EC(H4DO)-9, Canister.> <Ref. to EC(H4DO)-43, Drain Separator.>	Go to step **4**.
4	**CHECK DRAIN SEPARATOR.**	Is the drain separator clogged?	Replace the drain separator. <Ref. to EC(H4DO)-43, Drain Separator.>	Replace the leak check valve assembly. <Ref. to EC(H4DO)-37, Leak Check Valve Assembly.>

CF:DTC P1451 EVAPORATIVE EMISSION CONT. SYS.

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-174, DTC P1451 EVAPORATIVE EMISSION CONT. SYS., Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK DRAIN TUBE BETWEEN CANISTER AND LEAK CHECK VALVE ASSEMBLY.**	Is the drain tube between canister and leak check valve assembly clogged?	Replace the drain tube between the canister and leak check valve assembly. <Ref. to EC(H4DO)-9, Canister.>	Go to step **2**.
2	**CHECK HOSES BETWEEN CANISTER AND FUEL TANK.**	Are the hoses between the canister and fuel tank clogged?	Replace the hoses between the canister and fuel tank. <Ref. to EC(H4DO)-9, Canister.> <Ref. to FU(H4DO)-112, Fuel Tank.>	Replace the canister. <Ref. to EC(H4DO)-9, Canister.> After the operation is complete, go to the next step. Go to step **3**.
3	**CHECK EVAPORATIVE EMISSION CONTROL SYSTEM.** Perform drive cycle I. <Ref. to EN(H4DO)(diag)-52, DRIVE CYCLE I, PROCEDURE, Drive Cycle.>	Is DTC P1451 displayed on the display?	Replace the leak check valve assembly. <Ref. to EC(H4DO)-37, Leak Check Valve Assembly.>	End.

CG:DTC P1492 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (LOW INPUT)

NOTE:
For the diagnostic procedure, refer to DTC P1498. <Ref. to EN(H4DO)(diag)-256, DTC P1498 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CH:DTC P1493 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (HIGH INPUT)

NOTE:
For the diagnostic procedure, refer to DTC P1499. <Ref. to EN(H4DO)(diag)-259, DTC P1499 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CI: DTC P1494 EGR SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (LOW INPUT)

NOTE:
For the diagnostic procedure, refer to DTC P1498. <Ref. to EN(H4DO)(diag)-256, DTC P1498 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CJ:DTC P1495 EGR SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (HIGH INPUT)

NOTE:
For the diagnostic procedure, refer to DTC P1499. <Ref. to EN(H4DO)(diag)-259, DTC P1499 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CK:DTC P1496 EGR SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (LOW INPUT)

NOTE:
For the diagnostic procedure, refer to DTC P1498. <Ref. to EN(H4DO)(diag)-256, DTC P1498 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CL:DTC P1497 EGR SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (HIGH INPUT)

NOTE:
For the diagnostic procedure, refer to DTC P1499. <Ref. to EN(H4DO)(diag)-259, DTC P1499 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CM:DTC P1498 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-175, DTC P1492 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.> <Ref. to GD(H4DO)-179, DTC P1494 EGR SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.> <Ref. to GD(H4DO)-179, DTC P1496 EGR SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.> <Ref. to GD(H4DO)-179, DTC P1498 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

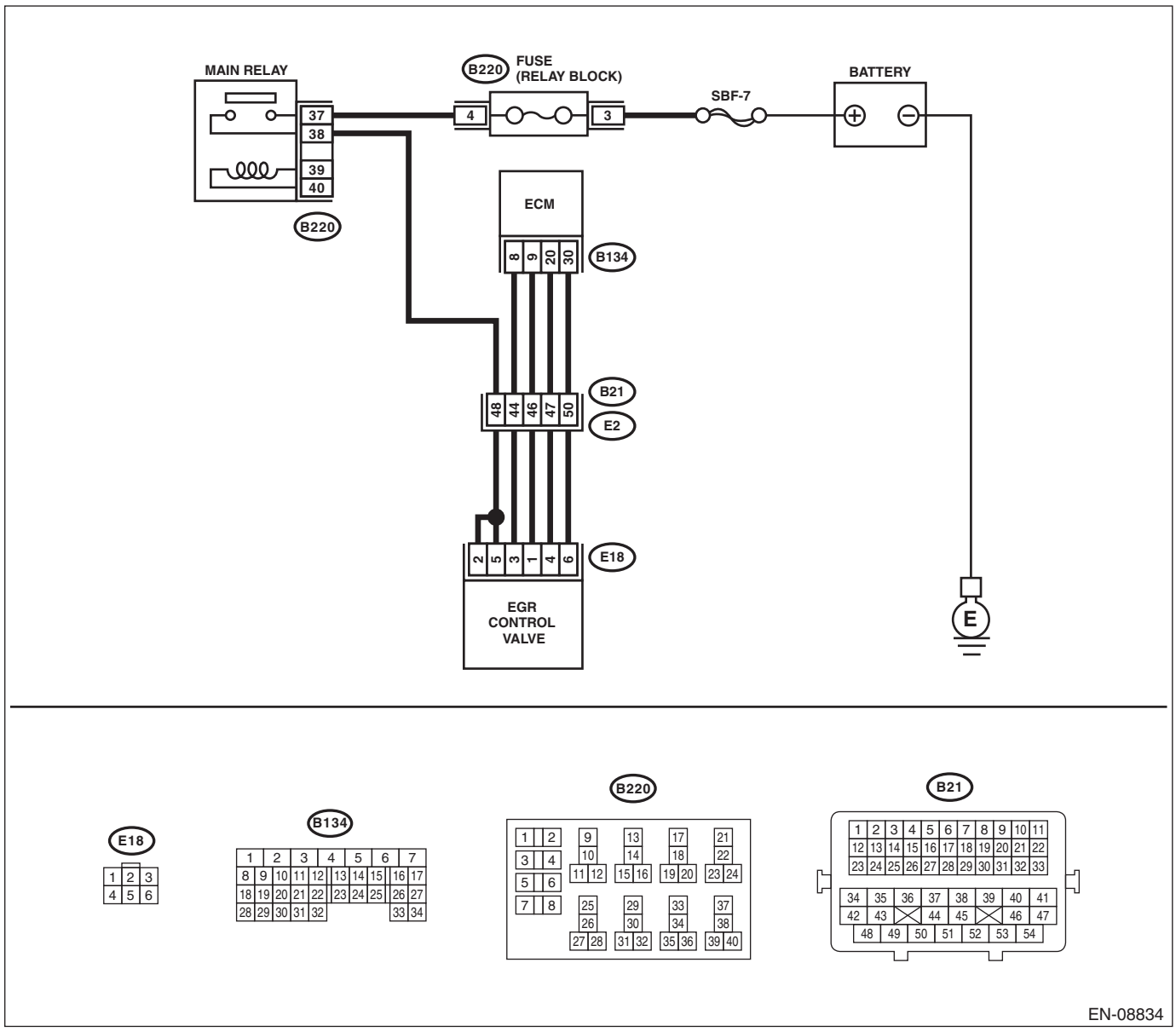
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance
- Engine breathing

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-08834

Step		Check	Yes	No
1	**CHECK POWER SUPPLY TO EGR CONTROL VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the EGR control valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between EGR control 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: • Open circuit in harness between EGR control valve and main relay connector • Poor contact of coupling connector

	Step	Check	Yes	No
2	**CHECK HARNESS BETWEEN ECM AND EGR CONTROL VALVE CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between ECM and EGR control valve connector. ***Connector & terminal*** ***DTC P1492; (B134) No. 8 — (E18) No. 3:*** ***DTC P1494; (B134) No. 9 — (E18) No. 1:*** ***DTC P1496; (B134) No. 20 — (E18) No. 4:*** ***DTC P1498; (B134) No. 30 — (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: • Open circuit of harness between ECM and EGR control valve connector • Poor contact of coupling connector
3	**CHECK HARNESS BETWEEN ECM AND EGR CONTROL VALVE CONNECTOR.** 1) Disconnect the connector from ECM. 2) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***DTC P1492; (B134) No. 8 — Chassis ground:*** ***DTC P1494; (B134) No. 9 — Chassis ground:*** ***DTC P1496; (B134) No. 20 — Chassis ground:*** ***DTC P1498; (B134) No. 30 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **4**.	Repair the ground short in harness between ECM and EGR control valve connector.
4	**CHECK FOR POOR CONTACT.** Check poor contact between ECM and EGR control valve connector.	Is there poor contact in ECM or EGR control valve connector?	Repair the poor contact of ECM or EGR control valve connector.	Replace EGR control valve. <Ref. to EC(H4DO)-26, EGR Control Valve.>

CN:DTC P1499 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-177, DTC P1493 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.> <Ref. to GD(H4DO)-179, DTC P1495 EGR SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.> <Ref. to GD(H4DO)-179, DTC P1497 EGR SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.> <Ref. to GD(H4DO)-179, DTC P1499 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

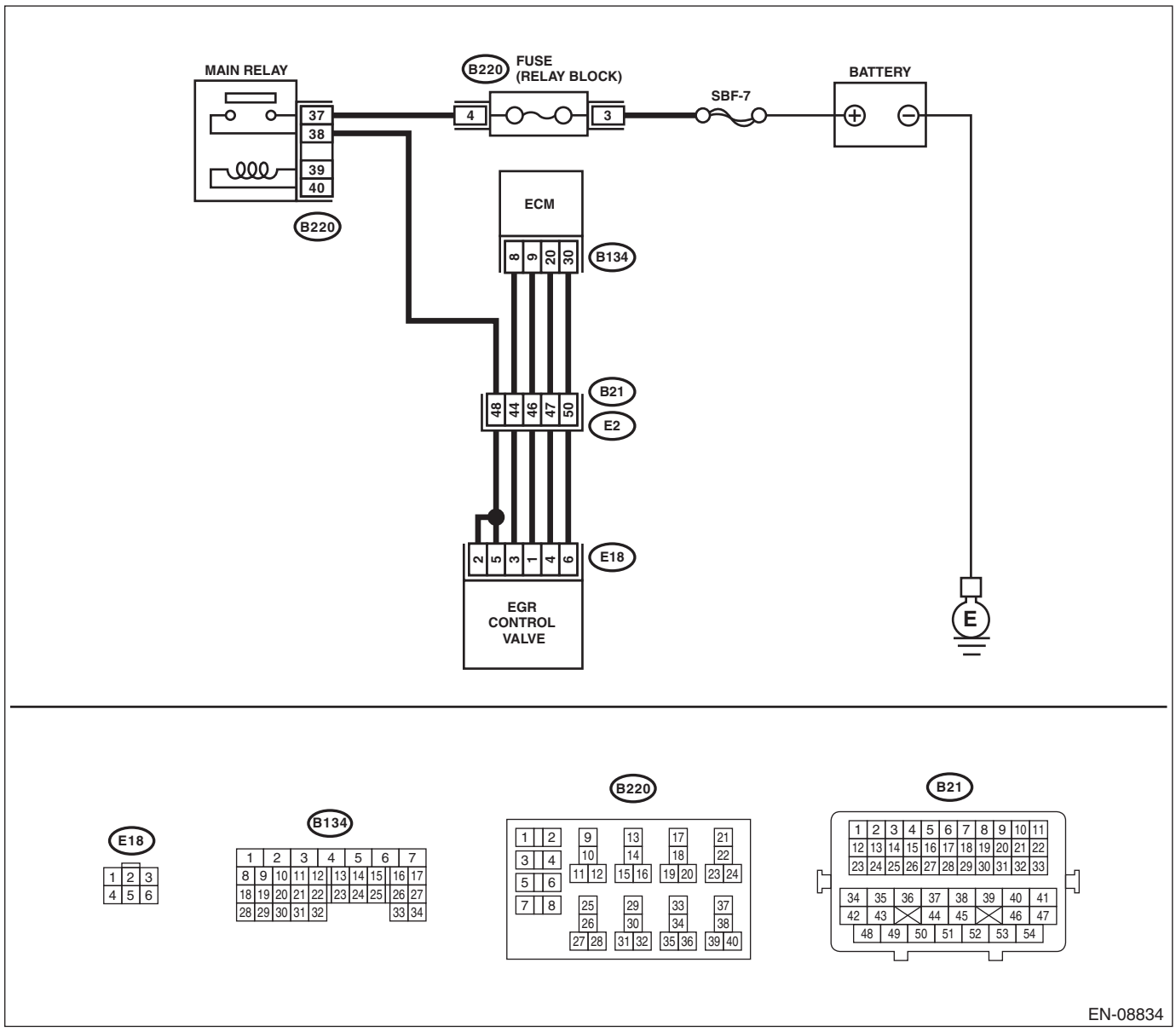
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance
- Engine breathing

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND EGR CONTROL VALVE CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and EGR control valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***DTC P1493; (B134) No. 8 (+) — Chassis ground (–):*** ***DTC P1495; (B134) No. 9 (+) — Chassis ground (–):*** ***DTC P1497; (B134) No. 20 (+) — Chassis ground (–):*** ***DTC P1499; (B134) No. 30 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the short circuit to power in the harness between the ECM and EGR control valve connector.	Go to step **2**.

	Step	Check	Yes	No
2	**CHECK EGR CONTROL VALVE.** Measure the resistance between EGR control valve terminals. ***Terminals*** ***DTC P1493; No. 2 — No. 3:*** ***DTC P1493; No. 5 — No. 3:*** ***DTC P1495; No. 2 — No. 1:*** ***DTC P1495; No. 5 — No. 1:*** ***DTC P1497; No. 2 — No. 4:*** ***DTC P1497; No. 5 — No. 4:*** ***DTC P1499; No. 2 — No. 6:*** ***DTC P1499; No. 5 — No. 6:***	Is the resistance 20 Ω or more?	Repair the poor contact of ECM connector.	Replace EGR control valve. <Ref. to EC(H4DO)-26, EGR Control Valve.>

CO:DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT

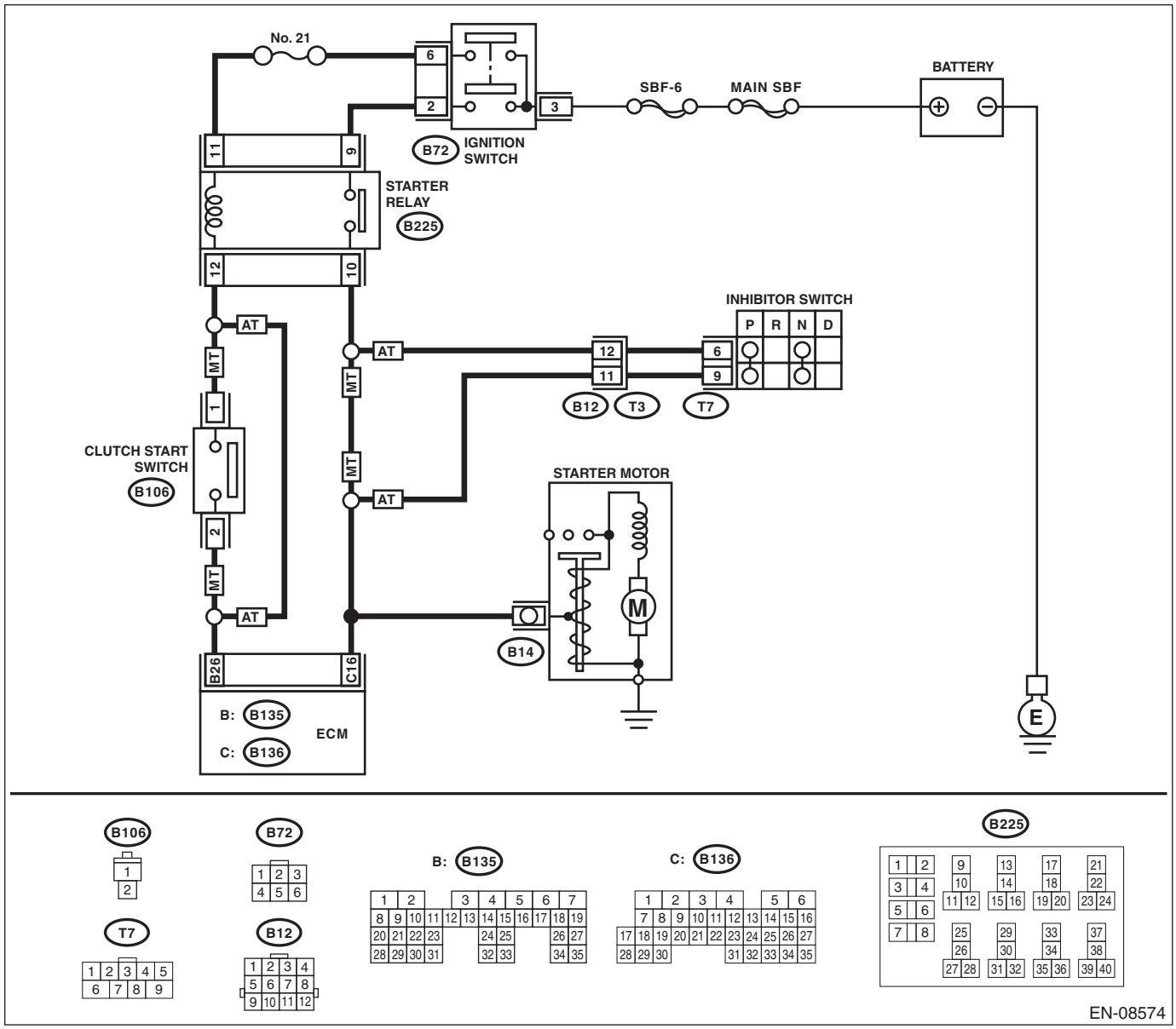
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-180, DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-08574

	Step	Check	Yes	No
1	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DO)(diag)-86, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK HARNESS BETWEEN ECM AND STARTER RELAY CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Remove the starter relay. 3) Disconnect the connectors from ECM and starter motor. 4) Measure the resistance of harness between ECM and starter relay connector. ***Connector & terminal*** ***(B136) No. 16 — (B225) No. 10:*** NOTE: For AT model, place the select lever in "P" range or "N" range.	Is the resistance less than 1 Ω?	Go to step **3**.	NOTE: Check the following item and repair or replace if necessary. • Open circuit of harness between ECM and starter relay connector • Poor contact of coupling connector
3	**CHECK HARNESS BETWEEN ECM AND STARTER RELAY CONNECTOR.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 16 — Chassis ground:***	Is the resistance 1 MΩ or more?	Repair the poor contact of ECM connector.	Repair the short circuit to ground in harness between ECM and starter relay connector.

CP:DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION

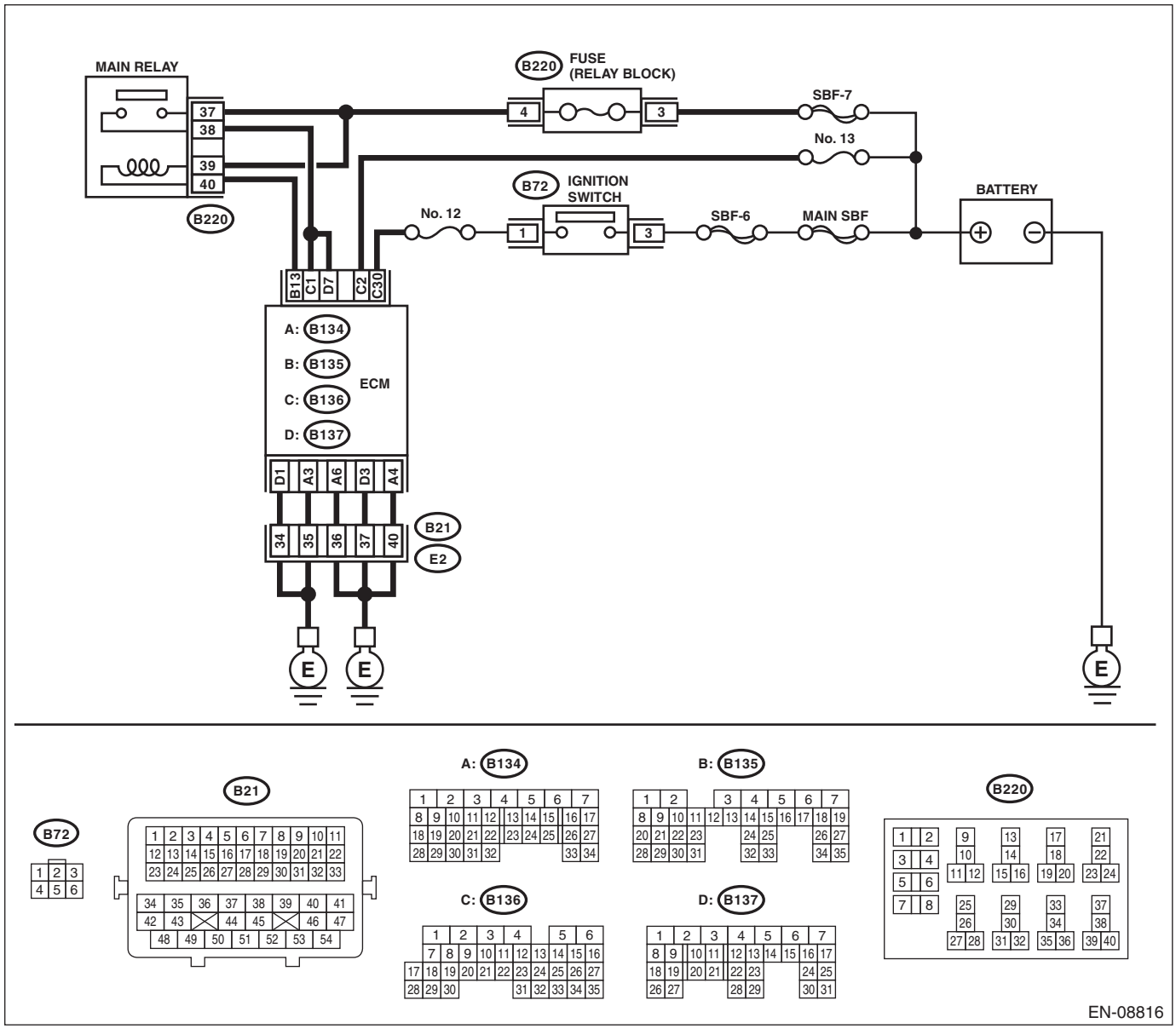
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-181, DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



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. ***Connector & terminal*** ***(B136) No. 2 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the poor contact of ECM connector.	Go to step **2**.

	Step	Check	Yes	No
2	**CHECK HARNESS BETWEEN ECM AND MAIN FUSE BOX CONNECTOR.** 1) Disconnect the connector from ECM. 2) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 2 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **3**.	Repair the ground short circuit of harness between ECM and battery terminal.
3	**CHECK FUSE NO. 13 (MAIN FUSE BOX).**	Is the fuse blown out?	Replace the fuse.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and battery • Poor contact of ECM connector • Poor contact of battery terminal

CQ:DTC P2004 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-183, DTC P2004 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK FOR 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(H4DO)(diag)-86, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK TUMBLE GENERATOR VALVE RH.** 1) Remove the tumble generator valve assembly RH. 2) Check the tumble generator valve.	Is there any dirt or clogging with foreign objects in the tumble generator valve?	Clean the tumble generator valve.	Replace the tumble generator valve RH. <Ref. to FU(H4DO)-84, Tumble Generator Valve Assembly.>

CR:DTC P2005 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 2)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-184, DTC P2005 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK FOR 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(H4DO)(diag)-86, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK TUMBLE GENERATOR VALVE LH.** 1) Remove the tumble generator valve assembly LH. 2) Check the tumble generator valve.	Is there any dirt or clogging with foreign objects in the tumble generator valve?	Clean the tumble generator valve.	Replace the tumble generator valve LH. <Ref. to FU(H4DO)-84, Tumble Generator Valve Assembly.>

CS:DTC P2006 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-185, DTC P2006 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK FOR 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(H4DO)(diag)-86, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK TUMBLE GENERATOR VALVE RH.** 1) Remove the tumble generator valve assembly RH. 2) Check the tumble generator valve.	Is there any dirt or clogging with foreign objects in the tumble generator valve?	Clean the tumble generator valve.	Replace the tumble generator valve RH. <Ref. to FU(H4DO)-84, Tumble Generator Valve Assembly.>

CT:DTC P2007 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 2)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-186, DTC P2007 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK FOR 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(H4DO)(diag)-86, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK TUMBLE GENERATOR VALVE LH.** 1) Remove the tumble generator valve assembly LH. 2) Check the tumble generator valve.	Is there any dirt or clogging with foreign objects in the tumble generator valve?	Clean the tumble generator valve.	Replace the tumble generator valve LH. <Ref. to FU(H4DO)-84, Tumble Generator Valve Assembly.>

CU:DTC P2009 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 1)

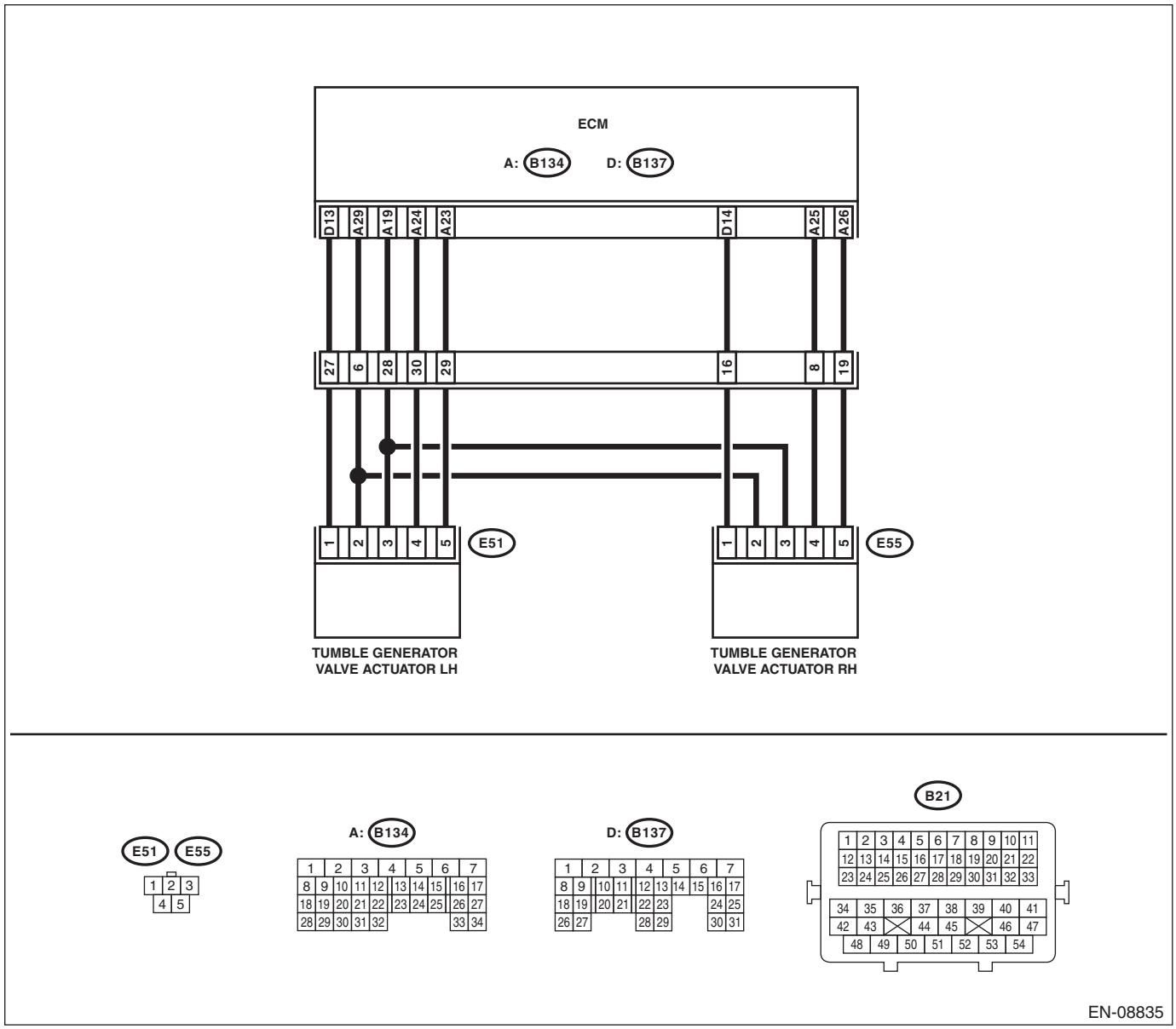
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-187, DTC P2009 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ACTUATOR RH CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 25 (+) — Chassis ground (–):*** ***(B134) No. 26 (+) — Chassis ground (–):***	Is the voltage 5 V or more?	Repair the short circuit to power in harness between ECM and tumble generator valve actuator RH connector.	Replace the tumble generator valve actuator RH. <Ref. to FU(H4DO)-91, Tumble Generator Valve Actuator.>

CV:DTC P2012 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 2)

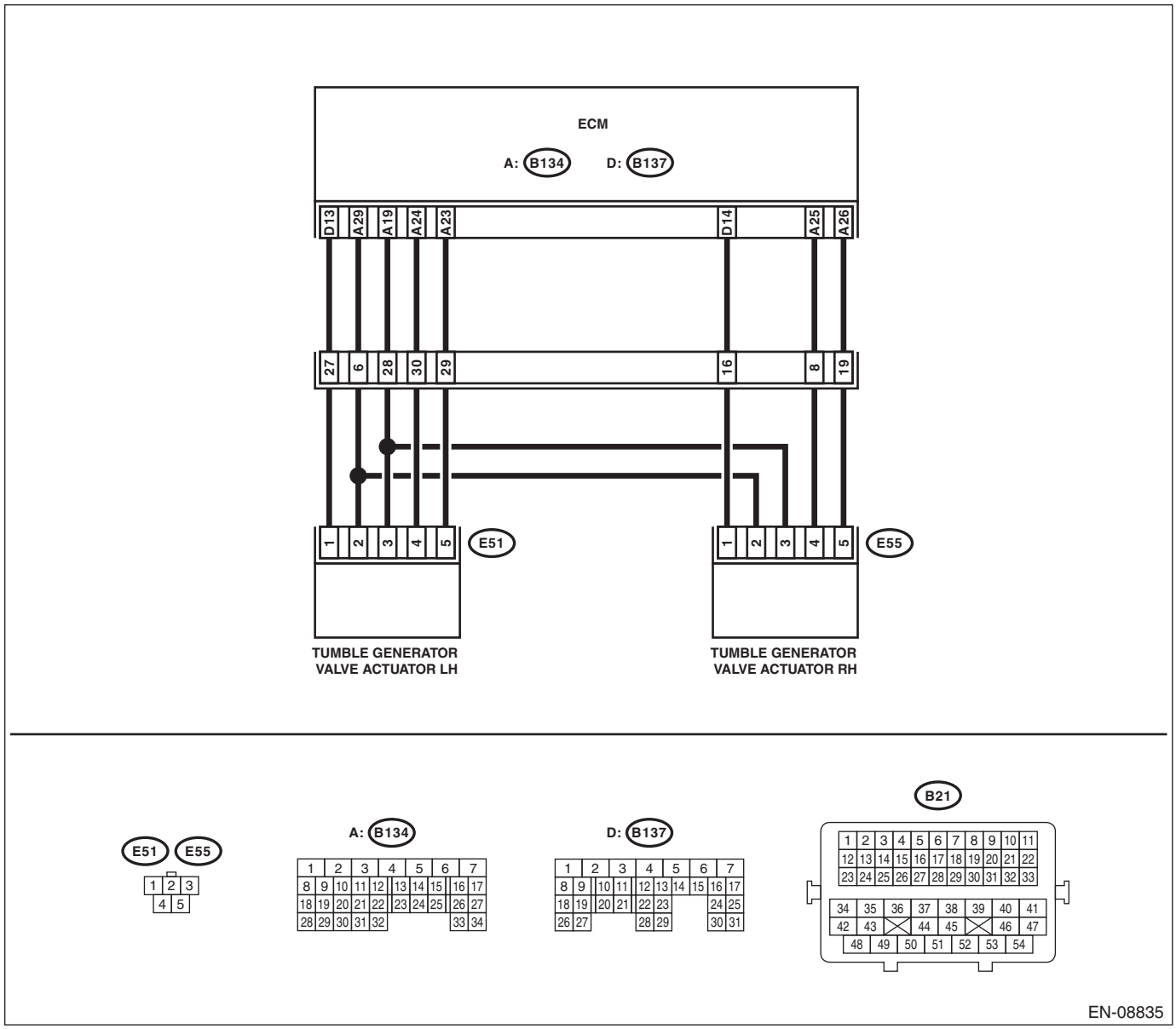
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-188, DTC P2012 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ACTUATOR LH CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 23 (+) — Chassis ground (–):*** ***(B134) No. 24 (+) — Chassis ground (–):***	Is the voltage 5 V or more?	Repair the short circuit to power in harness between ECM and tumble generator valve actuator LH connector.	Replace the tumble generator valve actuator LH. <Ref. to FU(H4DO)-91, Tumble Generator Valve Actuator.>

CW:DTC P2088 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-189, DTC P2088 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

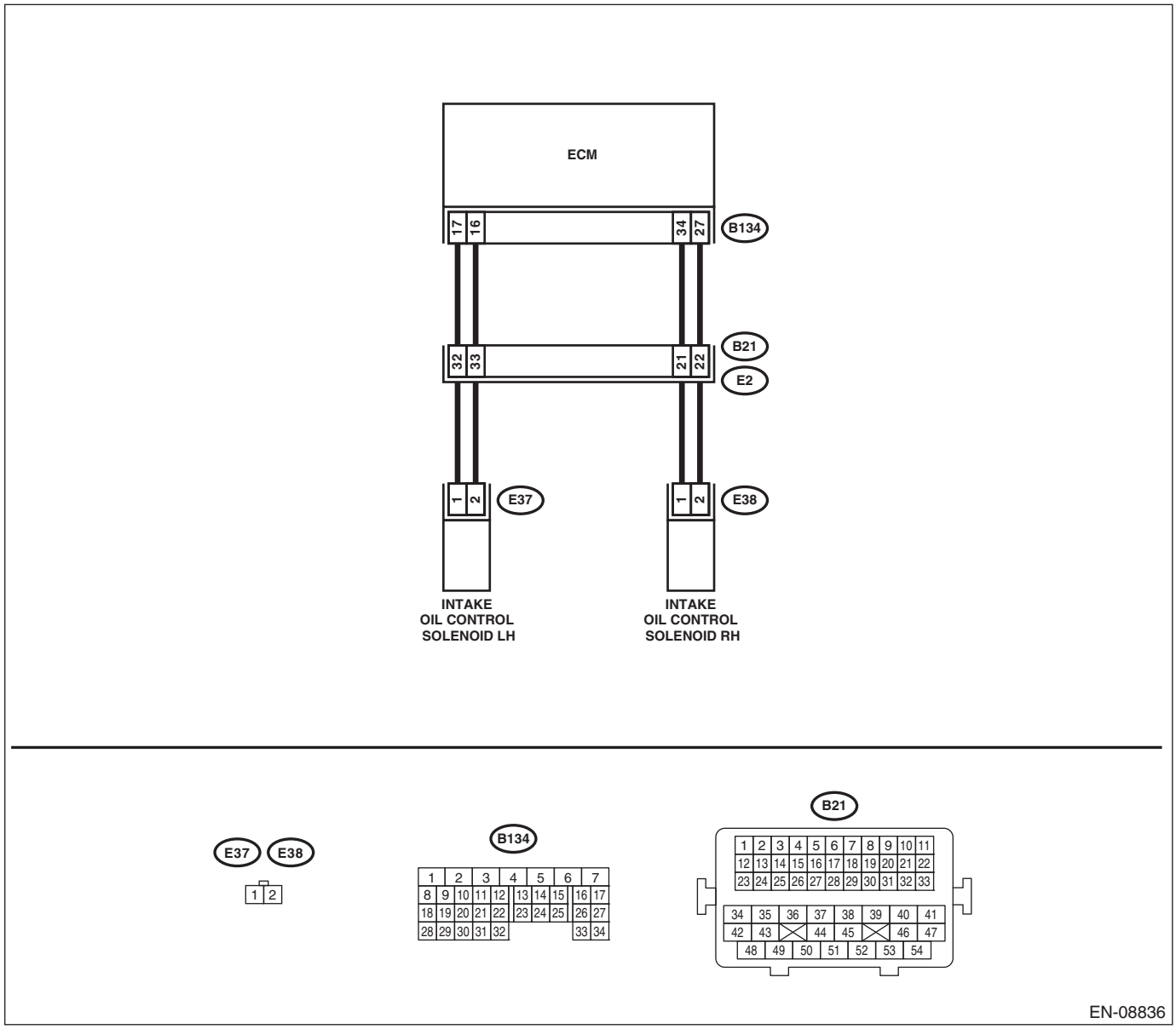
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND OIL CONTROL SOLENOID RH CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and oil control solenoid RH. 3) Measure the resistance of harness between ECM and oil control solenoid RH connector. ***Connector & terminal*** ***(B134) No. 34 — (E38) No. 1:*** ***(B134) No. 27 — (E38) No. 2:***	Is the resistance less than 1 Ω?	Go to step **2**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and oil control solenoid RH connector • Poor contact of coupling connector
2	**CHECK HARNESS BETWEEN ECM AND OIL CONTROL SOLENOID RH CONNECTOR.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 34 — Chassis ground:*** ***(B134) No. 27 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **3**.	Repair the short circuit to ground in harness between ECM and oil control solenoid RH connector.
3	**CHECK OIL CONTROL SOLENOID.** Measure the resistance between oil control solenoid terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 6 — 12 Ω?	Repair the poor contact of ECM and oil control solenoid RH connector.	Replace the oil control solenoid RH. <Ref. to FU(H4DO)-65, Oil Control Valve.>

CX:DTC P2089 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-190, DTC P2089 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

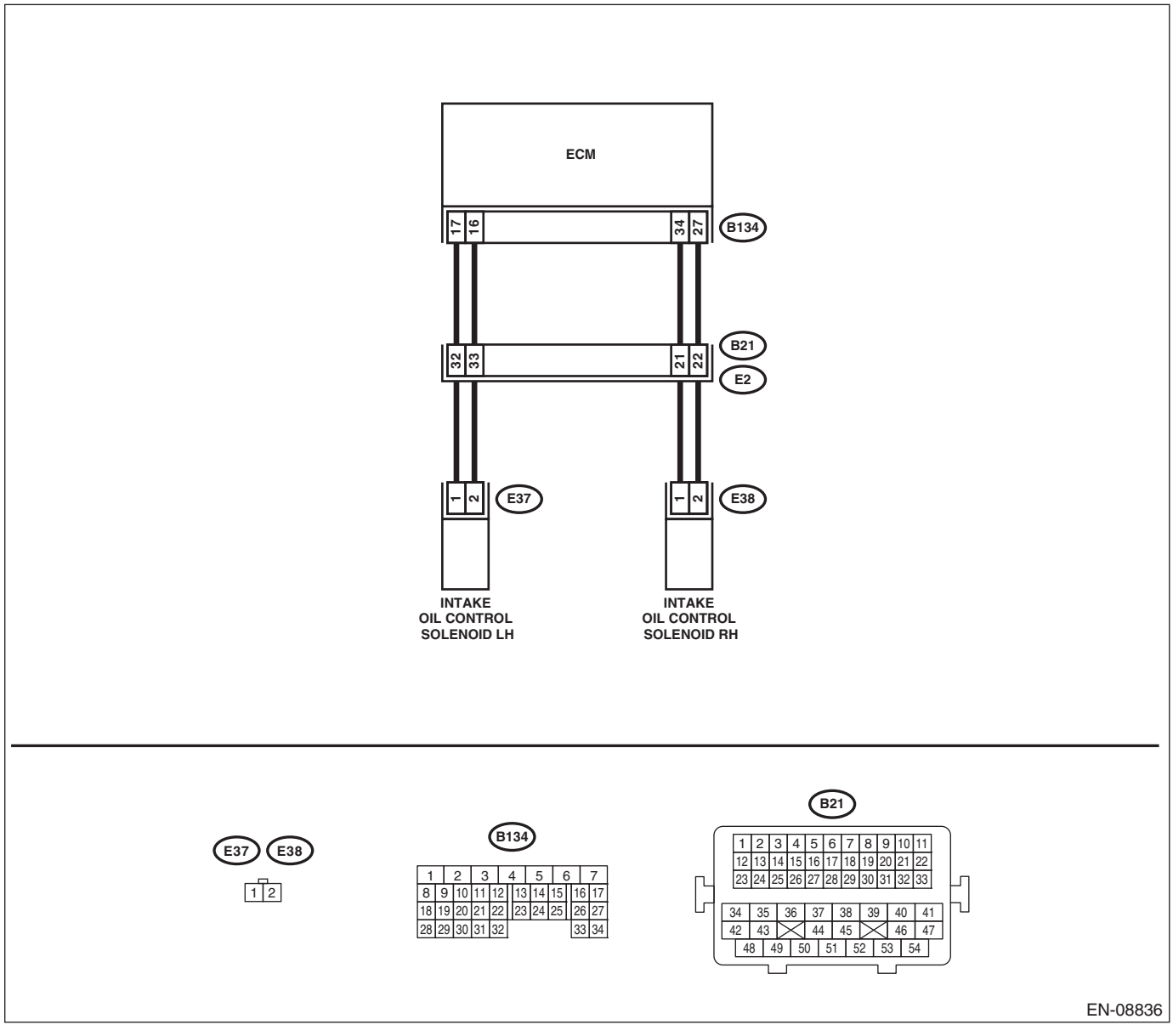
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND OIL CONTROL SOLENOID RH CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and oil control solenoid RH. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 34 (+) — Chassis ground (–):*** ***(B134) No. 27 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **2**.	Repair the short circuit to power supply in harness between ECM and oil control solenoid RH connector.
2	**CHECK HARNESS BETWEEN ECM AND OIL CONTROL SOLENOID RH CONNECTOR.** Measure the resistance of harness between ECM and oil control solenoid RH connector. ***Connector & terminal*** ***(B134) No. 34 — (E38) No. 1:*** ***(B134) No. 27 — (E38) No. 2:***	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 oil control solenoid RH connector • Poor contact of coupling connector
3	**CHECK OIL CONTROL SOLENOID.** Measure the resistance between oil control solenoid terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 6 — 12 Ω?	Repair the poor contact of ECM and oil control solenoid RH connector.	Replace the oil control solenoid RH. <Ref. to FU(H4DO)-65, Oil Control Valve.>

CY:DTC P2092 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 2)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-191, DTC P2092 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

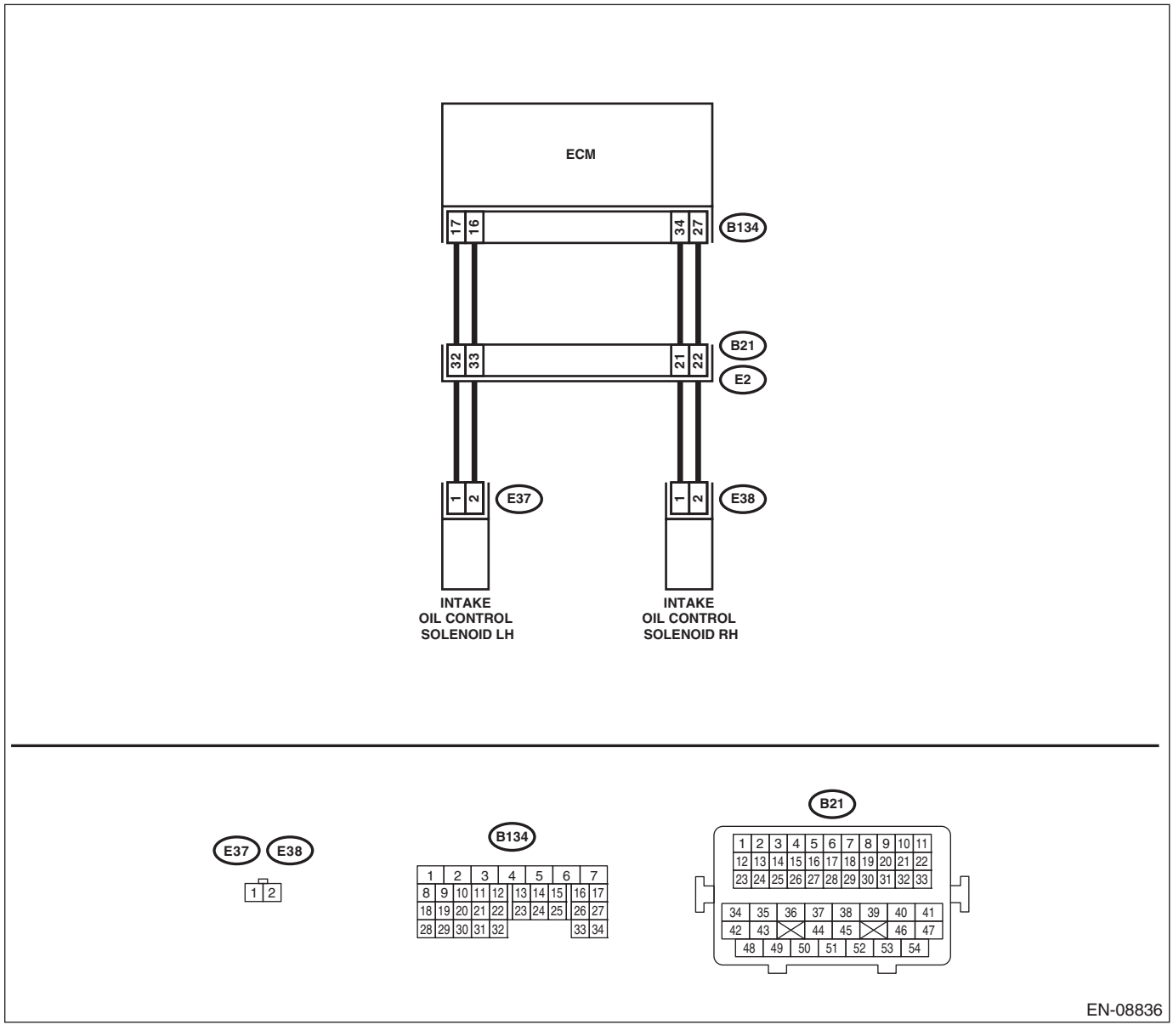
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND OIL CONTROL SOLENOID LH CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and oil control solenoid LH. 3) Measure the resistance of harness between ECM and oil control solenoid LH connector. ***Connector & terminal*** ***(B134) No. 17 — (E37) No. 1:*** ***(B134) No. 16 — (E37) No. 2:***	Is the resistance less than 1 Ω?	Go to step **2**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and oil control solenoid LH connector • Poor contact of coupling connector
2	**CHECK HARNESS BETWEEN ECM AND OIL CONTROL SOLENOID LH CONNECTOR.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 17 — Chassis ground:*** ***(B134) No. 16 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **3**.	Repair the short circuit to ground in harness between ECM and oil control solenoid LH connector.
3	**CHECK OIL CONTROL SOLENOID.** Measure the resistance between oil control solenoid terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 6 — 12 Ω?	Repair the poor contact of ECM and oil control solenoid LH connector.	Replace the oil control solenoid LH. <Ref. to FU(H4DO)-65, Oil Control Valve.>

CZ:DTC P2093 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 2)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-191, DTC P2093 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

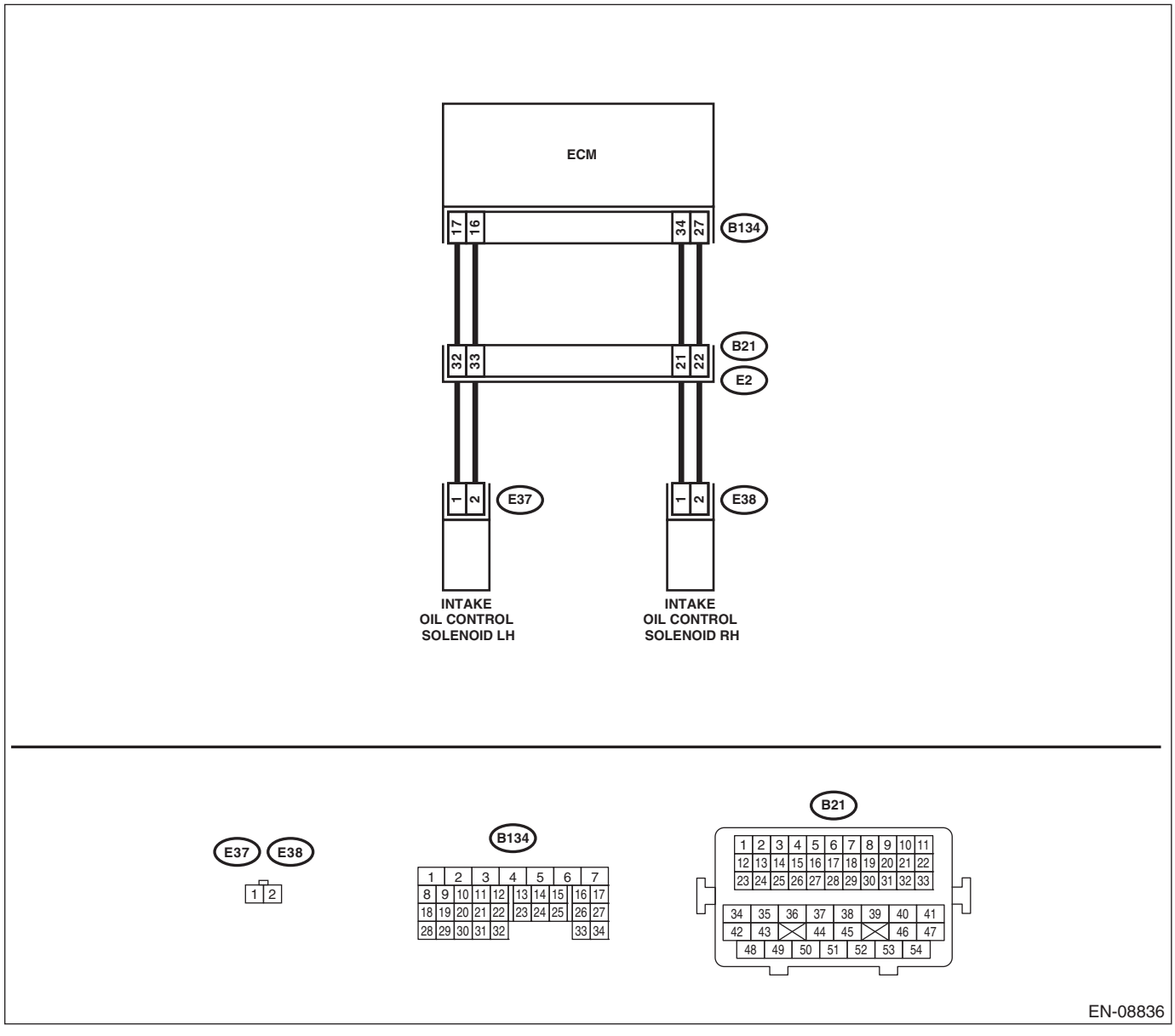
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND OIL CONTROL SOLENOID LH CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and oil control solenoid LH. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 17 (+) — Chassis ground (–):*** ***(B134) No. 16 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **2**.	Repair the short circuit to power supply in harness between ECM and oil control solenoid LH connector.
2	**CHECK HARNESS BETWEEN ECM AND OIL CONTROL SOLENOID LH CONNECTOR.** Measure the resistance of harness between ECM and oil control solenoid LH connector. ***Connector & terminal*** ***(B134) No. 17 — (E37) No. 1:*** ***(B134) No. 16 — (E37) No. 2:***	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 oil control solenoid LH connector • Poor contact of coupling connector
3	**CHECK OIL CONTROL SOLENOID.** Measure the resistance between oil control solenoid terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 6 — 12 Ω?	Repair the poor contact of ECM and oil control solenoid LH connector.	Replace the oil control solenoid LH. <Ref. to FU(H4DO)-65, Oil Control Valve.>

DA:DTC P2096 POST CATALYST FUEL TRIM SYSTEM TOO LEAN (BANK 1)

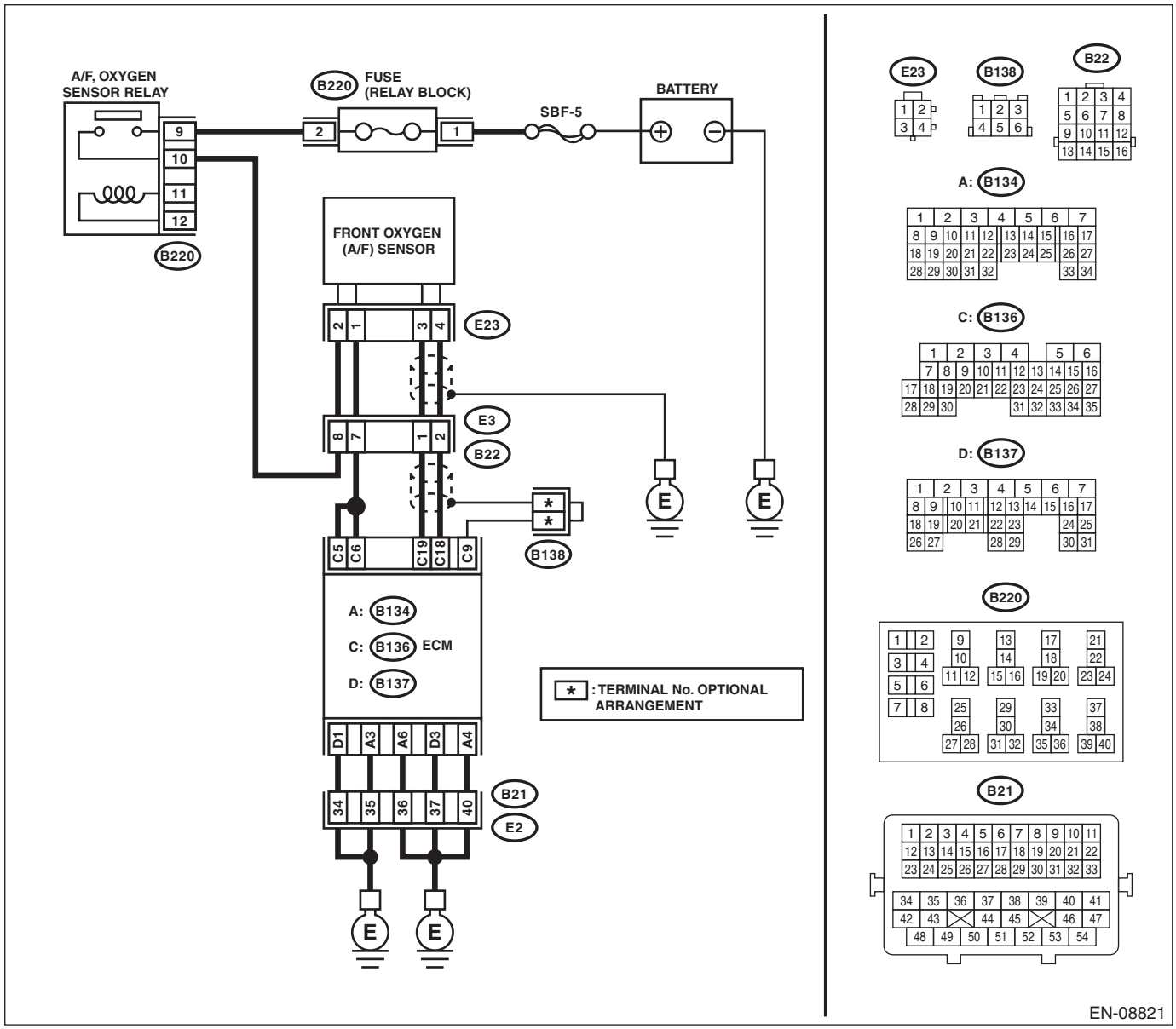
DTC DETECTING CONDITION:

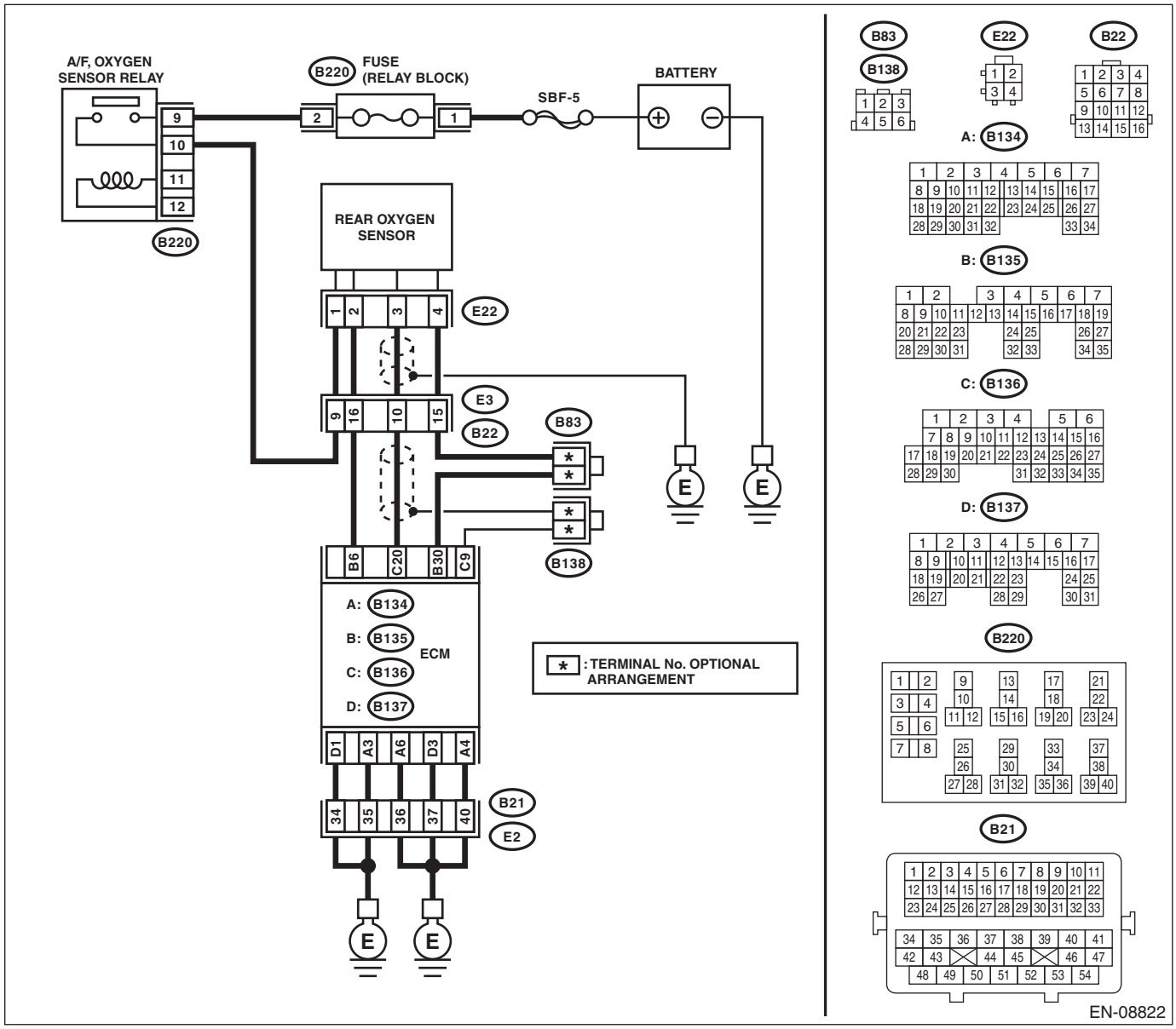
- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-192, DTC P2096 POST CATALYST FUEL TRIM SYSTEM TOO LEAN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





Step		Check	Yes	No
1	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DO)(diag)-86, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Has water entered the connector?	Completely remove any water inside.	Go to step **3**.

	Step	Check	Yes	No
3	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and front oxygen (A/F) sensor. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B136) No. 19 — (E23) No. 3:*** ***(B136) No. 18 — (E23) 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: • Open circuit in harness between ECM and front oxygen (A/F) sensor connector • Poor contact of coupling connector
4	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 19 — Chassis ground:*** ***(B136) No. 18 — 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 front oxygen (A/F) sensor connector and chassis ground. ***Connector & terminal*** ***(E23) No. 3 (+) — Chassis ground (–):***	Is the voltage 4.5 V or more?	Go to step **7**.	Go to step **6**.
6	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between front oxygen (A/F) sensor connector and chassis ground. ***Connector & terminal*** ***(E23) No. 4 (+) — Chassis ground (–):***	Is the voltage 4.95 V or more?	Go to step **7**.	Go to step **8**.
7	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between front oxygen (A/F) sensor connector and chassis ground. ***Connector & terminal*** ***(E23) No. 3 (+) — Chassis ground (–):*** ***(E23) No. 4 (+) — Chassis ground (–):***	Is the voltage 8 V or more?	Repair the short circuit to power in the harness between ECM and front oxygen (A/F) sensor connector. After repair, replace the ECM. <Ref. to FU(H4DO)-101, Engine Control Module (ECM).>	Repair the poor contact of ECM connector.
8	**CHECK EXHAUST SYSTEM.**	Are there holes or loose bolts on exhaust system?	Repair the exhaust system.	Go to step **9**.
9	**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 **10**.

	Step	Check	Yes	No
10	**CHECK FUEL PRESSURE.** **WARNING:** **Place "NO OPEN FLAMES" signs near the working area.** **CAUTION:** **Be careful not to spill fuel.** 1) Connect the front oxygen (A/F) sensor connector. 2) Measure the fuel pressure. <Ref. to ME(H4DO)-30, INSPECTION, Fuel Pressure.> **CAUTION:** **Release fuel pressure before removing the fuel pressure gauge.**	Is the measured value 340 — 400 kPa (3.5 — 4.1 kg/cm^2, 49 — 58 psi)?	Go to step **11**.	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
11	**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(H4DO)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the engine coolant temperature 75°C (167°F) or higher?	Go to step **12**.	Replace the engine coolant temperature sensor. <Ref. to FU(H4DO)-42, Engine Coolant Temperature Sensor.>
12	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.** 1) Start the engine and warm up engine until coolant temperature is higher than 75°C (167°F). 2) For AT models, set the select lever to "P" range or "N" range, and for MT models, place the shift lever in the neutral position. 3) Turn the A/C switch to OFF. 4) Turn all the accessory switches to OFF. 5) Read the data of the 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(H4DO)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the measured value 2.0 — 5.0 g/s (0.26 — 0.66 lb/m)?	Go to step **13**.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DO)-71, Mass Air Flow and Intake Air Temperature Sensor.>

	Step	Check	Yes	No
13	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.** 1) Start the engine and warm up engine until coolant temperature is higher than 75°C (167°F). 2) For AT models, set the select lever to "P" range or "N" range, and for MT models, place the shift lever in the 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 the 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(H4DO)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Subtract ambient temperature from intake air temperature. Is the obtained value –10 — 50°C (–18 — 90°F)?	Go to step **14**.	Check the mass air flow and intake air temperature sensor. <Ref. to FU(H4DO)-71, Mass Air Flow and Intake Air Temperature Sensor.>
14	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm up the engine until engine coolant temperature is higher than 75°C (167°F), and keep the engine speed at 3,000 rpm. (2 minutes maximum) 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Depress the clutch pedal. (MT model) • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DO)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the voltage 490 mV or more?	Go to step **15**.	Go to step **16**.
15	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm up the engine until engine coolant temperature is higher than 75°C (167°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: • Depress the clutch pedal. (MT model) • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DO)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the voltage 250 mV or less?	Go to step **17**.	Go to step **16**.

	Step	Check	Yes	No
16	**CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Has water entered the connector?	Completely remove any water inside.	Go to step **18**.
17	**CHECK FRONT OXYGEN (A/F) SENSOR USING REAR OXYGEN SENSOR SIGNAL.** 1) Warm up the engine until engine coolant temperature is higher than 75°C (167°F), then keep the engine idling for 5 minutes or more. 2) Read the data of rear oxygen 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(H4DO)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is a voltage of 250 mV or less maintained for 5 minutes or more?	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DO)-93, Front Oxygen (A/F) Sensor.>	Go to step **18**.
18	**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*** ***(B136) No. 20 — (E22) No. 3:*** ***(B135) No. 30 — (E22) No. 4:***	Is the resistance less than 1 Ω?	Go to step **19**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and rear oxygen sensor connector • Poor contact of coupling connector
19	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between rear oxygen sensor connector and chassis ground. ***Connector & terminal*** ***(E22) No. 3 (+) — Chassis ground (–):***	Is the voltage 0.2 — 0.5 V?	Replace the rear oxygen sensor. <Ref. to FU(H4DO)-97, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and rear oxygen sensor connector • Poor contact of ECM connector • Poor contact of coupling connector

DB:DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH (BANK 1)

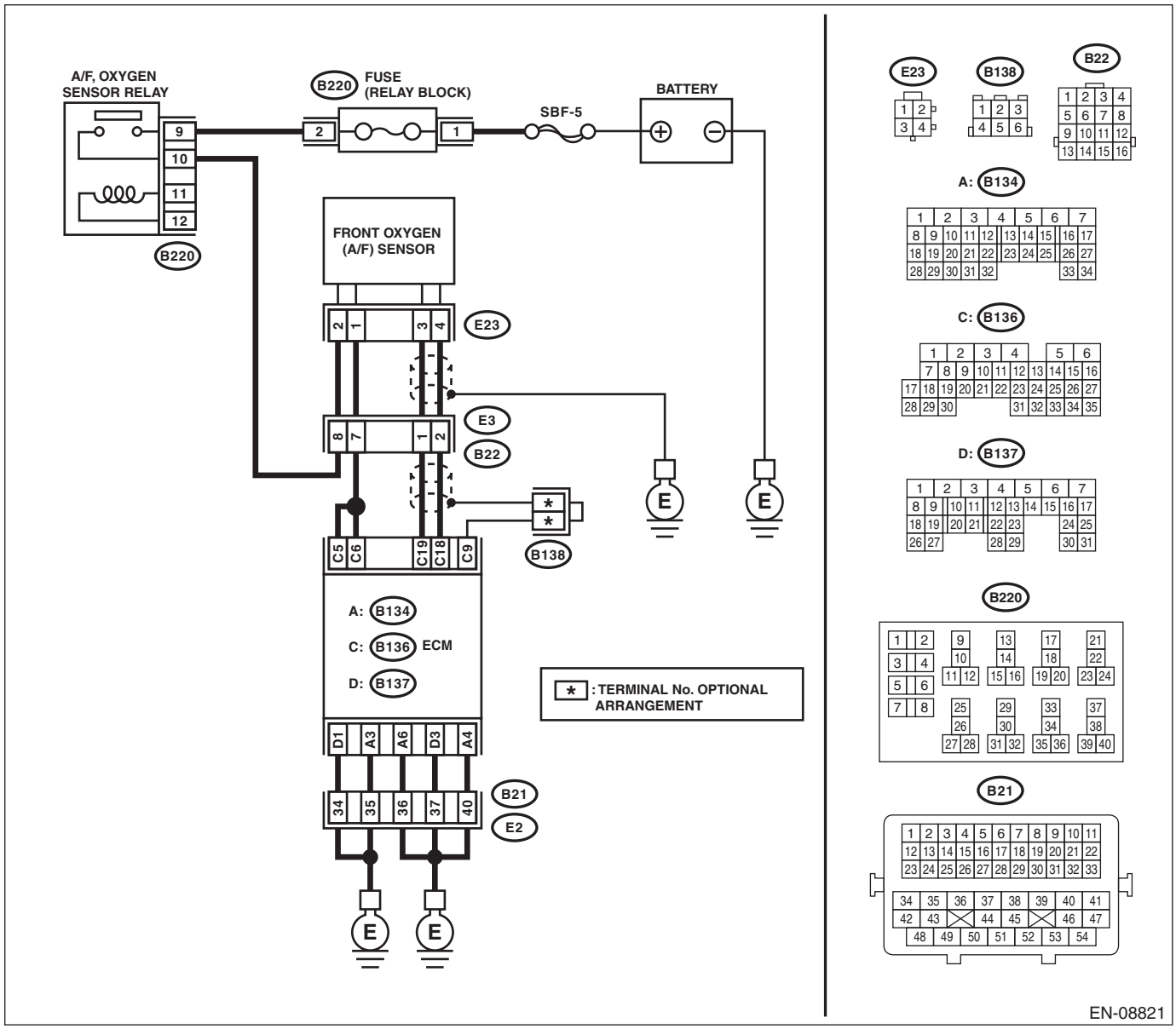
DTC DETECTING CONDITION:

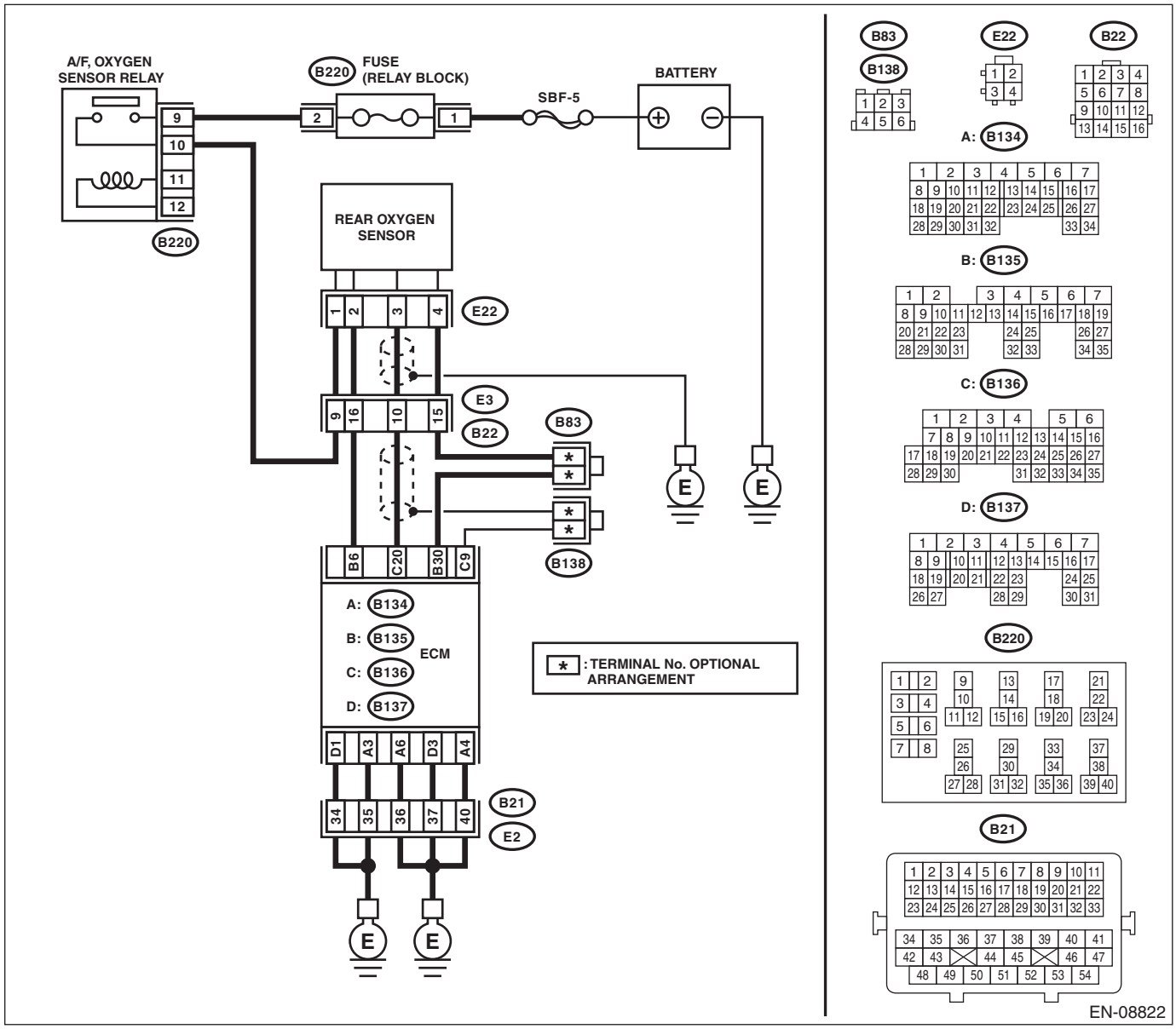
- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-194, DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





Step		Check	Yes	No
1	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DO)(diag)-86, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Has water entered the connector?	Completely remove any water inside.	Go to step **3**.

	Step	Check	Yes	No
3	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and front oxygen (A/F) sensor. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B136) No. 19 — (E23) No. 3:*** ***(B136) No. 18 — (E23) 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: • Open circuit in harness between ECM and front oxygen (A/F) sensor connector • Poor contact of coupling connector
4	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 19 — Chassis ground:*** ***(B136) No. 18 — 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 front oxygen (A/F) sensor connector and chassis ground. ***Connector & terminal*** ***(E23) No. 3 (+) — Chassis ground (–):***	Is the voltage 4.5 V or more?	Go to step **7**.	Go to step **6**.
6	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between front oxygen (A/F) sensor connector and chassis ground. ***Connector & terminal*** ***(E23) No. 4 (+) — Chassis ground (–):***	Is the voltage 4.95 V or more?	Go to step **7**.	Go to step **8**.
7	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between front oxygen (A/F) sensor connector and chassis ground. ***Connector & terminal*** ***(E23) No. 3 (+) — Chassis ground (–):*** ***(E23) No. 4 (+) — Chassis ground (–):***	Is the voltage 8 V or more?	Repair the short circuit to power in the harness between ECM and front oxygen (A/F) sensor connector. After repair, replace the ECM. <Ref. to FU(H4DO)-101, Engine Control Module (ECM).>	Repair the poor contact of ECM connector.
8	**CHECK EXHAUST SYSTEM.**	Are there holes or loose bolts on exhaust system?	Repair the exhaust system.	Go to step **9**.
9	**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 **10**.

	Step	Check	Yes	No
10	**CHECK FUEL PRESSURE.** **WARNING:** **Place "NO OPEN FLAMES" signs near the working area.** **CAUTION:** **Be careful not to spill fuel.** 1) Connect the front oxygen (A/F) sensor connector. 2) Measure the fuel pressure. <Ref. to ME(H4DO)-30, INSPECTION, Fuel Pressure.> **CAUTION:** **Release fuel pressure before removing the fuel pressure gauge.**	Is the measured value 340 — 400 kPa (3.5 — 4.1 kg/cm^2, 49 — 58 psi)?	Go to step **11**.	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
11	**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(H4DO)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the engine coolant temperature 75°C (167°F) or higher?	Go to step **12**.	Replace the engine coolant temperature sensor. <Ref. to FU(H4DO)-42, Engine Coolant Temperature Sensor.>
12	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.** 1) Start the engine and warm up engine until coolant temperature is higher than 75°C (167°F). 2) For AT models, set the select lever to "P" range or "N" range, and for MT models, place the shift lever in the neutral position. 3) Turn the A/C switch to OFF. 4) Turn all the accessory switches to OFF. 5) Read the data of the 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(H4DO)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the measured value 2.0 — 5.0 g/s (0.26 — 0.66 lb/m)?	Go to step **13**.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DO)-71, Mass Air Flow and Intake Air Temperature Sensor.>

	Step	Check	Yes	No
13	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.** 1) Start the engine and warm up engine until coolant temperature is higher than 75°C (167°F). 2) For AT models, set the select lever to "P" range or "N" range, and for MT models, place the shift lever in the 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 the 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(H4DO)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Subtract ambient temperature from intake air temperature. Is the obtained value –10 — 50°C (–18 — 90°F)?	Go to step **14**.	Check the mass air flow and intake air temperature sensor. <Ref. to FU(H4DO)-71, Mass Air Flow and Intake Air Temperature Sensor.>
14	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm up the engine until engine coolant temperature is higher than 75°C (167°F), and keep the engine speed at 3,000 rpm. (2 minutes maximum) 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Depress the clutch pedal. (MT model) • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DO)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the voltage 490 mV or more?	Go to step **15**.	Go to step **16**.
15	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm up the engine until engine coolant temperature is higher than 75°C (167°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: • Depress the clutch pedal. (MT model) • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DO)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the voltage 250 mV or less?	Go to step **17**.	Go to step **16**.

	Step	Check	Yes	No
16	**CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Has water entered the connector?	Completely remove any water inside.	Go to step **18**.
17	**CHECK FRONT OXYGEN (A/F) SENSOR USING REAR OXYGEN SENSOR SIGNAL.** 1) Warm up the engine until engine coolant temperature is higher than 75°C (167°F), then keep the engine idling for 5 minutes or more. 2) Read the data of rear oxygen 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(H4DO)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is a voltage of 0.8 V or more maintained for 5 minutes or more?	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DO)-93, Front Oxygen (A/F) Sensor.>	Go to step **18**.
18	**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*** ***(B136) No. 20 — (E22) No. 3:*** ***(B135) No. 30 — (E22) No. 4:***	Is the resistance less than 1 Ω?	Go to step **19**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and rear oxygen sensor connector • Poor contact of coupling connector
19	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between rear oxygen sensor connector and chassis ground. ***Connector & terminal*** ***(E22) No. 3 (+) — Chassis ground (–):***	Is the voltage 0.2 — 0.5 V?	Replace the rear oxygen sensor. <Ref. to FU(H4DO)-97, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and rear oxygen sensor connector • Poor contact of ECM connector • Poor contact of coupling connector

DC:DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/ PERFORMANCE

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-196, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

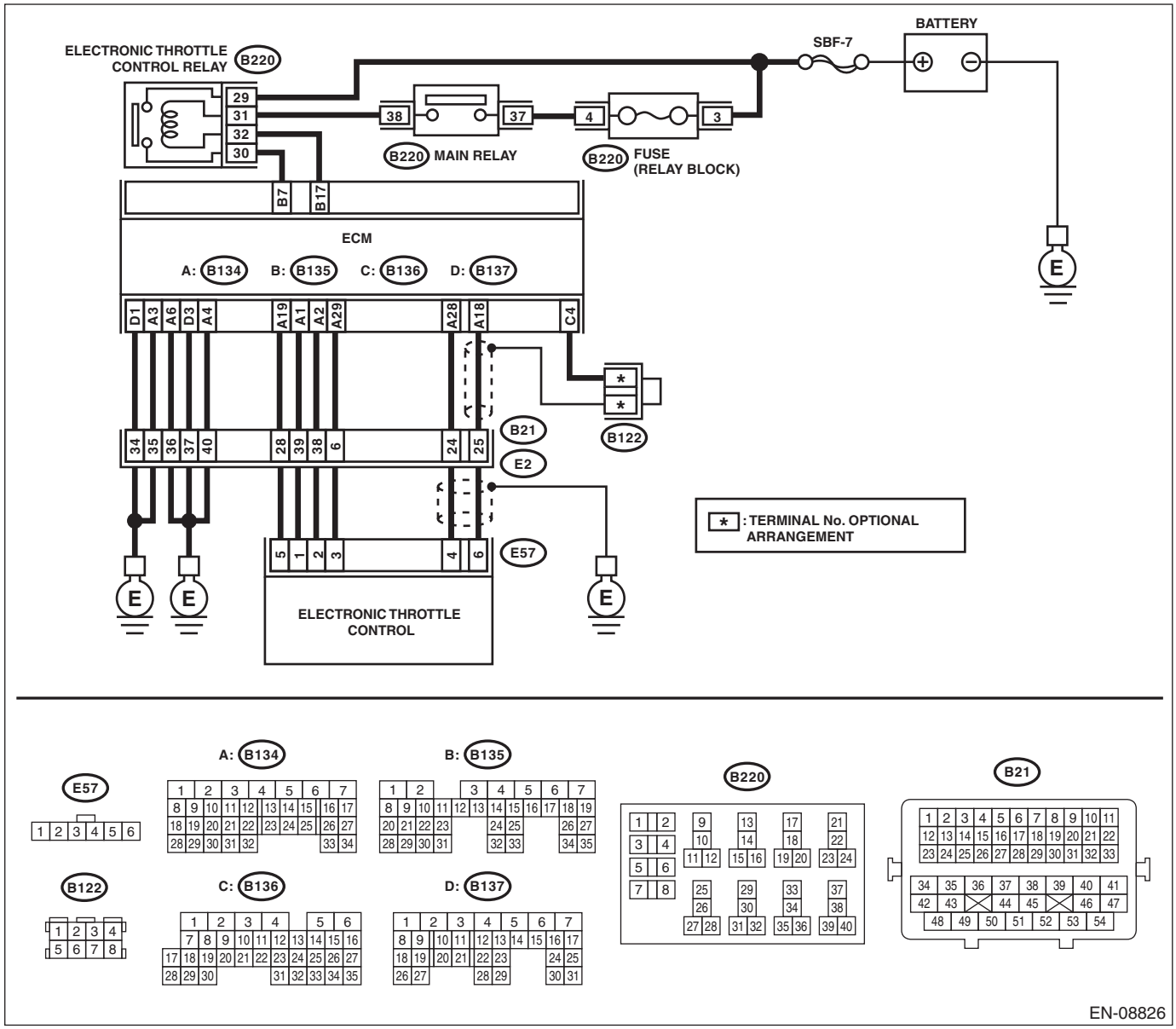
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance
- Engine stalls.

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	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. 31 and No. 32 of electronic throttle control relay. 4) Measure the resistance between electronic throttle control relay terminals. ***Terminals*** ***No. 29 — No. 30:***	Is the resistance less than 1 Ω?	Go to step **2**.	Replace the electronic throttle control relay. <Ref. to FU(H4DO)-107, Electronic Throttle Control Relay.>
2	**CHECK POWER SUPPLY OF ELECTRONIC THROTTLE CONTROL RELAY.** Measure the voltage between electronic throttle control relay connector and chassis ground. ***Connector & terminal*** ***(B220) No. 29 (+) — Chassis ground (–):***	Is the voltage 10 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 CONNECTOR.** 1) Disconnect the connector from ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control relay connector and chassis ground. ***Connector & terminal*** ***(B220) No. 32 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the short circuit to power in the harness between ECM and electronic throttle control relay connector.	Go to step **4**.
4	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between electronic throttle control relay connector and chassis ground. ***Connector & terminal*** ***(B220) No. 32 — Chassis ground:*** ***(B220) No. 30 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **5**.	Repair the short circuit in harness to ground between ECM and electronic throttle control relay connector.
5	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY CONNECTOR.** Measure the resistance between ECM and electronic throttle control relay connector. ***Connector & terminal*** ***(B135) No. 17 — (B220) No. 32:*** ***(B135) No. 7 — (B220) No. 30:***	Is the resistance less than 1 Ω?	Go to step **6**.	Repair the open circuit in harness between ECM and electronic throttle control relay connector.
6	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from electronic throttle control. 3) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 19 — Chassis ground:*** ***(B134) No. 18 — Chassis ground:*** ***(B134) No. 18 — (B136) No. 4:*** ***(B134) No. 28 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **7**.	Repair the short circuit to ground in harness between ECM and electronic throttle control connector.

	Step	Check	Yes	No
7	**CHECK SHORT CIRCUIT INSIDE THE ECM.** 1) Connect the connector to ECM. 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 1 MΩ or more?	Go to step **8**.	Repair the short circuit to ground in harness between ECM and electronic throttle control connector. Replace the ECM if defective. <Ref. to FU(H4DO)-101, Engine Control Module (ECM).>
8	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL CONNECTOR.** 1) Disconnect the connector from ECM. 2) Measure the resistance of harness between ECM and electronic throttle control connector. ***Connector & terminal*** ***(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 **9**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and electronic throttle control connector • Poor contact of coupling connector
9	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL CONNECTOR.** 1) Connect the connector to ECM. 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 **10**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and engine ground • Poor contact of ECM connector • Poor contact of coupling connector
10	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 6 (+) — Engine ground (–):*** ***(E57) No. 4 (+) — Engine ground (–):***	Is the voltage 5 V or more?	Repair the short circuit to power in harness between ECM and electronic throttle control connector.	Go to step **11**.
11	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between ECM connectors. ***Connector & terminal*** ***(B134) No. 19 — (B134) No. 18:*** ***(B134) No. 19 — (B134) No. 28:***	Is the resistance 1 MΩ or more?	Go to step **12**.	Repair the short circuit to power in harness between ECM and electronic throttle control connector.

	Step	Check	Yes	No
12	**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(H4DO)(diag)-35, Subaru Select Monitor.>	Is the voltage 0.81 — 0.87 V?	Go to step **13**.	Repair the poor contact of electronic throttle control connector. Replace the electronic throttle control if defective. <Ref. to FU(H4DO)-17, Throttle Body.>
13	**CHECK SENSOR OUTPUT.** Read the data of sub throttle sensor signal using Subaru Select Monitor. NOTE: Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DO)(diag)-35, Subaru Select Monitor.>	Is the voltage 1.64 — 1.70 V?	Go to step **14**.	Repair the poor contact of electronic throttle control connector. Replace the electronic throttle control if defective. <Ref. to FU(H4DO)-17, Throttle Body.>
14	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and electronic throttle control. 3) Measure the resistance between ECM and electronic throttle control connector. ***Connector & terminal*** ***(B134) No. 2 — (E57) No. 2:*** ***(B134) No. 1 — (E57) No. 1:***	Is the resistance less than 1 Ω?	Go to step **15**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and electronic throttle control connector • Poor contact of coupling connector
15	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL CONNECTOR.** 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 5 V or more?	Repair the short circuit to power in harness between ECM and electronic throttle control connector.	Go to step **16**.
16	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector 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 **17**.	Repair the short circuit to ground in harness between ECM and electronic throttle control connector.
17	**CHECK ELECTRONIC THROTTLE CONTROL CONNECTOR HARNESS.** Measure the resistance between electronic throttle control connectors. ***Connector & terminal*** ***(E57) No. 2 — (E57) No. 1:***	Is the resistance 1 MΩ or more?	Go to step **18**.	Repair the short circuit of harness between ECM and electronic throttle control connector.

	Step	Check	Yes	No
18	**CHECK ELECTRONIC THROTTLE CONTROL GROUND CIRCUIT.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 3 — Chassis ground:*** ***(B134) No. 4 — Chassis ground:*** ***(B134) No. 6 — Chassis ground:*** ***(B137) No. 1 — Chassis ground:*** ***(B137) No. 3 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **19**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and engine ground • Poor contact of coupling connector
19	**CHECK ELECTRONIC THROTTLE CONTROL.** Measure the resistance between electronic throttle control terminals. ***Terminals*** ***No. 2 — No. 1:***	Is the resistance 50 Ω or less?	Go to step **20**.	Replace the electronic throttle control. <Ref. to FU(H4DO)-17, Throttle Body.>
20	**CHECK ELECTRONIC THROTTLE CONTROL.** Move the throttle valve to the fully open 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 the poor contact of ECM connector.	Replace the electronic throttle control. <Ref. to FU(H4DO)-17, Throttle Body.>

DD:DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-198, DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

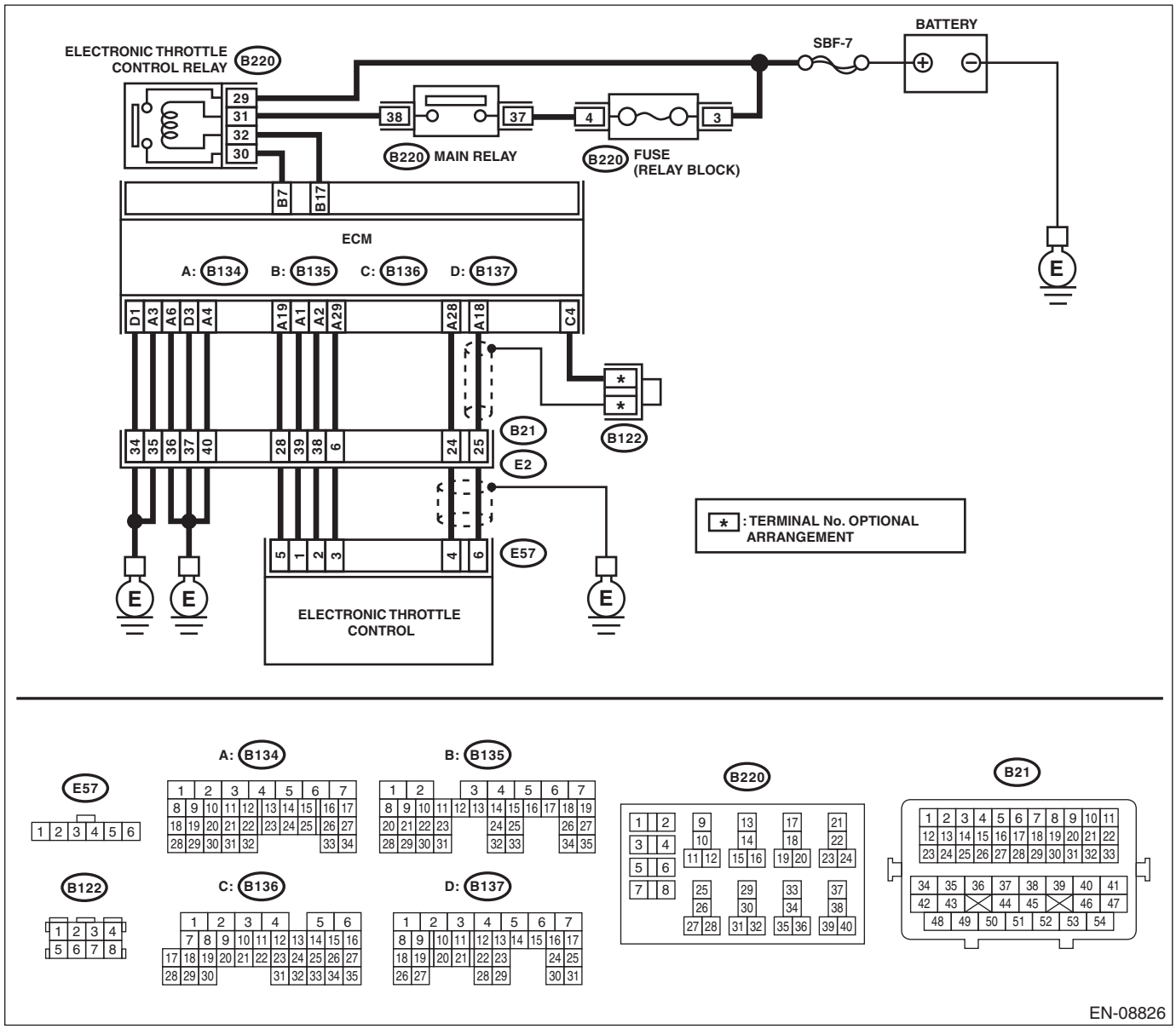
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance
- Engine stalls.

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	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. 31 and No. 32 of electronic throttle control relay. 4) Measure the resistance between electronic throttle control relay terminals. ***Terminals*** ***No. 29 — No. 30:***	Is the resistance less than 1 Ω?	Go to step **2**.	Replace the electronic throttle control relay. <Ref. to FU(H4DO)-107, Electronic Throttle Control Relay.>
2	**CHECK POWER SUPPLY OF ELECTRONIC THROTTLE CONTROL RELAY.** Measure the voltage between electronic throttle control relay connector and chassis ground. ***Connector & terminal*** ***(B220) No. 29 (+) — Chassis ground (–):***	Is the voltage 10 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 CONNECTOR.** 1) Disconnect the connector from ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control relay connector and chassis ground. ***Connector & terminal*** ***(B220) No. 32 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the short circuit to power in the harness between ECM and electronic throttle control relay connector.	Go to step **4**.
4	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between electronic throttle control relay connector and chassis ground. ***Connector & terminal*** ***(B220) No. 32 — Chassis ground:*** ***(B220) No. 30 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **5**.	Repair the short circuit in harness to ground between ECM and electronic throttle control relay connector.
5	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY CONNECTOR.** Measure the resistance between ECM and electronic throttle control relay connector. ***Connector & terminal*** ***(B135) No. 17 — (B220) No. 32:*** ***(B135) No. 7 — (B220) No. 30:***	Is the resistance less than 1 Ω?	Repair the poor contact of ECM connector.	Repair the open circuit in harness between ECM and electronic throttle control relay connector.

DE:DTC P2103 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH

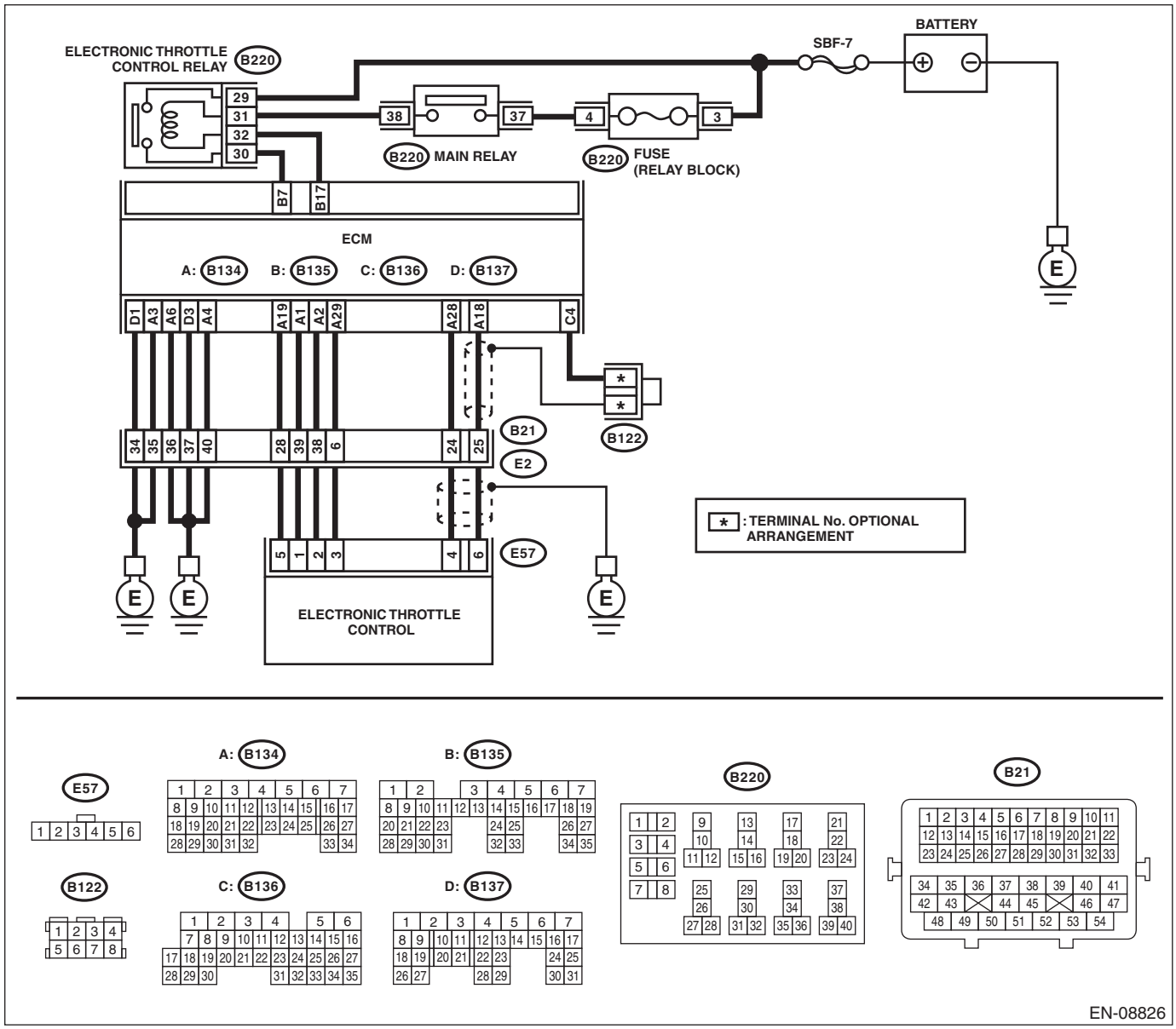
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-200, DTC P2103 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	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. ***Terminals*** ***No. 29 — No. 30:***	Is the resistance 1 MΩ or more?	Go to step **2**.	Replace the electronic throttle control relay. <Ref. to FU(H4DO)-107, 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. ***Connector & terminal*** ***(B220) No. 30 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the short circuit to power in the harness between ECM and electronic throttle control relay connector.	Go to step **3**.
3	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 17 — Chassis ground:***	Is the resistance 1 MΩ or more?	Repair the poor contact of ECM connector.	Repair the short circuit in harness to ground between ECM and electronic throttle control relay connector.

DF:DTC P2109 THROTTLE/PEDAL POSITION SENSOR “A” MINIMUM STOP PERFORMANCE

NOTE:
For the diagnostic procedure, refer to DTC P2101. <Ref. to EN(H4DO)(diag)-292, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DG:DTC P2122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-204, DTC P2122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

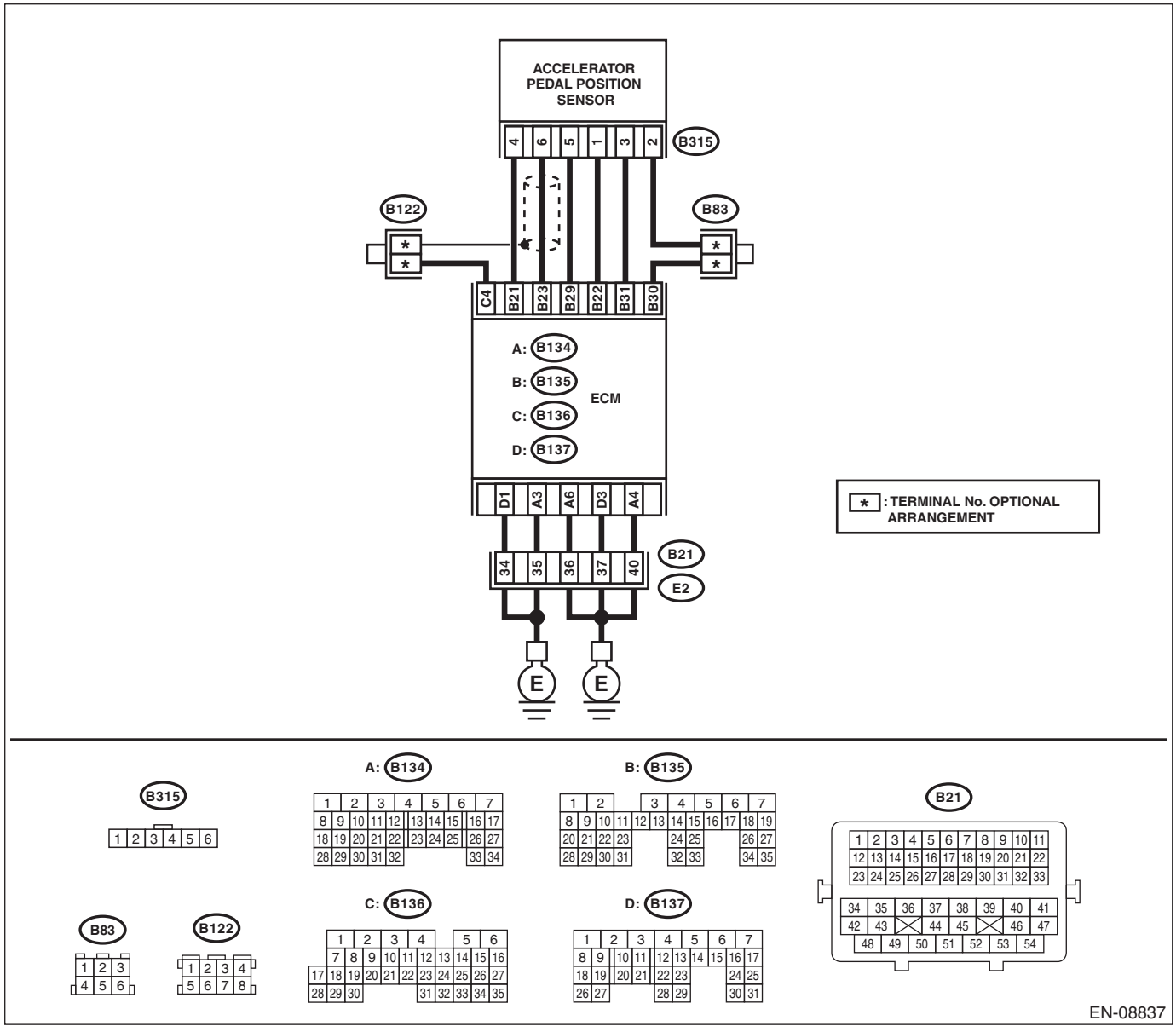
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and accelerator pedal position sensor. 3) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 21 — Chassis ground:*** ***(B135) No. 23 — Chassis ground:*** ***(B135) No. 23 — (B136) No. 4:***	Is the resistance 1 MΩ or more?	Go to step **2**.	Repair the short circuit to ground in harness between ECM and accelerator pedal position sensor connector.
2	**CHECK SHORT CIRCUIT INSIDE THE ECM.** 1) Connect the connector to ECM. 2) Measure the resistance between accelerator pedal position sensor connector and chassis ground. ***Connector & terminal*** ***(B315) No. 6 — Chassis ground:***	Is the resistance 1 MΩ or more?	Replace the accelerator pedal. <Ref. to SP(H4DO)-4, Accelerator Pedal.>	Repair the short circuit to ground in harness between ECM and accelerator pedal position sensor connector. Replace the ECM if defective. <Ref. to FU(H4DO)-101, Engine Control Module (ECM).>

DH:DTC P2123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-206, DTC P2123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

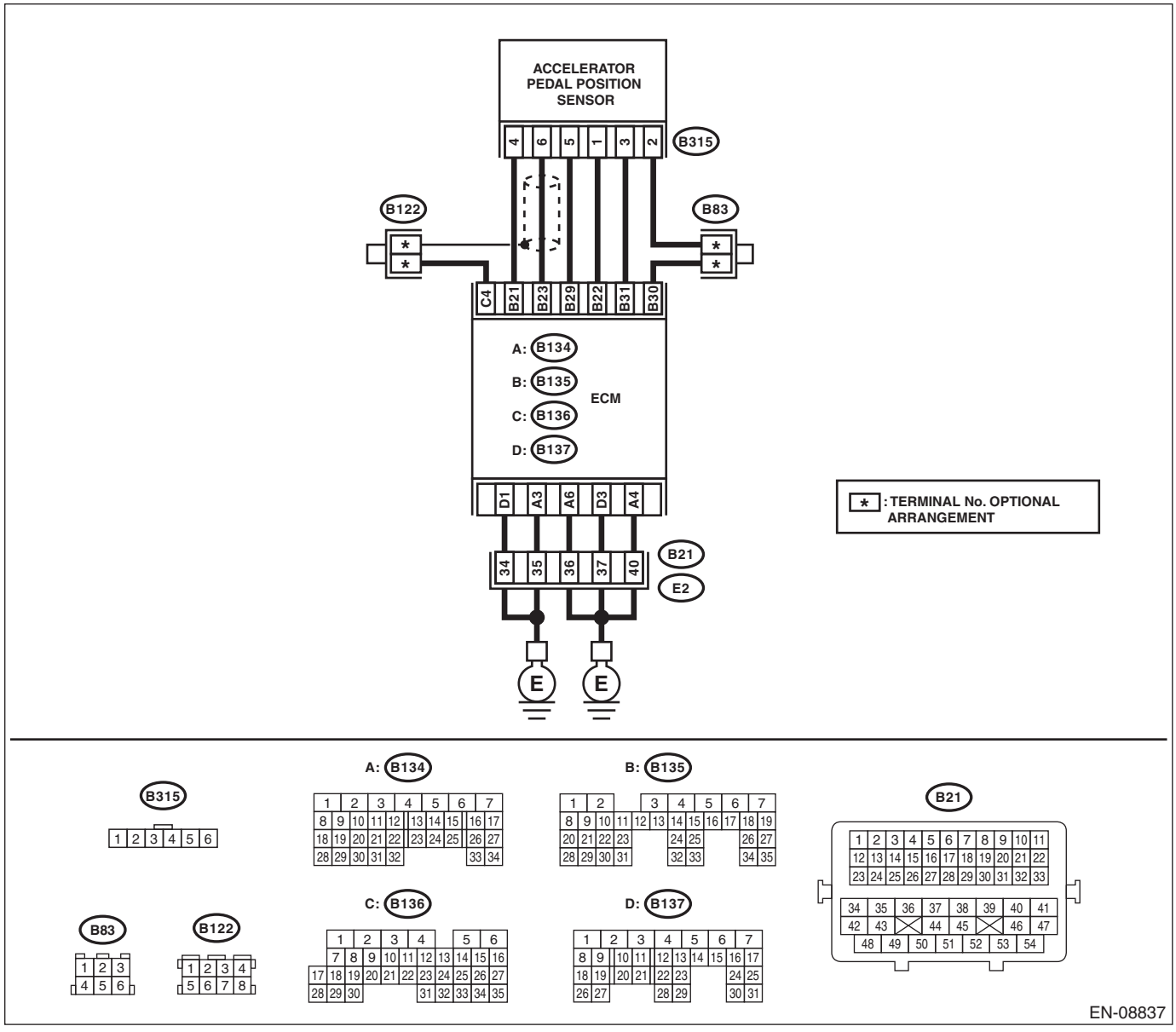
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and accelerator pedal position sensor. 3) Measure the resistance of harness between ECM and accelerator pedal position sensor connector. ***Connector & terminal*** ***(B135) No. 23 — (B315) No. 6:*** ***(B135) No. 29 — (B315) No. 5:***	Is the resistance less than 1 Ω?	Go to step **2**.	Repair the open circuit in harness between ECM and accelerator pedal position sensor connector.
2	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR CONNECTOR.** 1) Connect the connector to ECM. 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 **3**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and engine ground • Poor contact of ECM connector • Poor contact of coupling connector
3	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between accelerator pedal position sensor connector and chassis ground. ***Connector & terminal*** ***(B315) No. 6 (+) — Chassis ground (–):***	Is the voltage 5 V or more?	Repair the short circuit to power supply in the harness between the ECM and accelerator pedal position sensor connector.	Go to step **4**.
4	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between ECM connectors. ***Connector & terminal*** ***(B135) No. 21 — (B135) No. 23:***	Is the resistance 1 MΩ or more?	Repair the poor contact of accelerator pedal position sensor connector. Replace the accelerator pedal if defective. <Ref. to SP(H4DO)-4, Accelerator Pedal.>	Repair the short circuit to power supply in the harness between the ECM and accelerator pedal position sensor connector.

DI: DTC P2127 THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-208, DTC P2127 THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

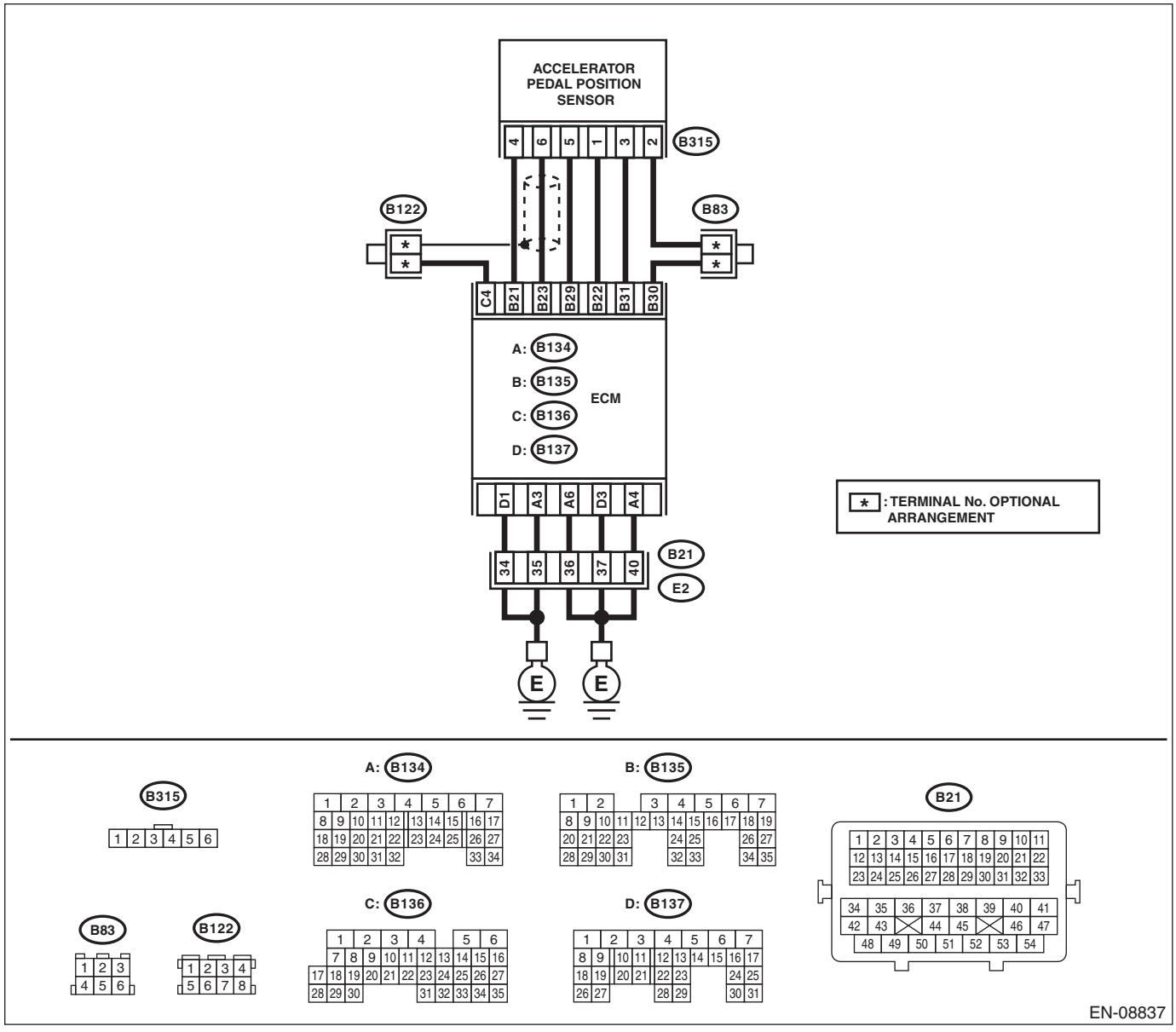
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and accelerator pedal position sensor. 3) Measure the resistance between ECM 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 **2**.	Repair the short circuit to ground in harness between ECM and accelerator pedal position sensor connector.
2	**CHECK SHORT CIRCUIT INSIDE THE ECM.** 1) Connect the connector to ECM. 2) Measure the resistance between accelerator pedal position sensor connector and chassis ground. ***Connector & terminal*** ***(B315) No. 3 — Chassis ground:***	Is the resistance 1 MΩ or more?	Replace the accelerator pedal. <Ref. to SP(H4DO)-4, Accelerator Pedal.>	Repair the short circuit to ground in harness between ECM and accelerator pedal position sensor connector. Replace the ECM if defective. <Ref. to FU(H4DO)-101, Engine Control Module (ECM).>

DJ:DTC P2128 THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-210, DTC P2128 THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

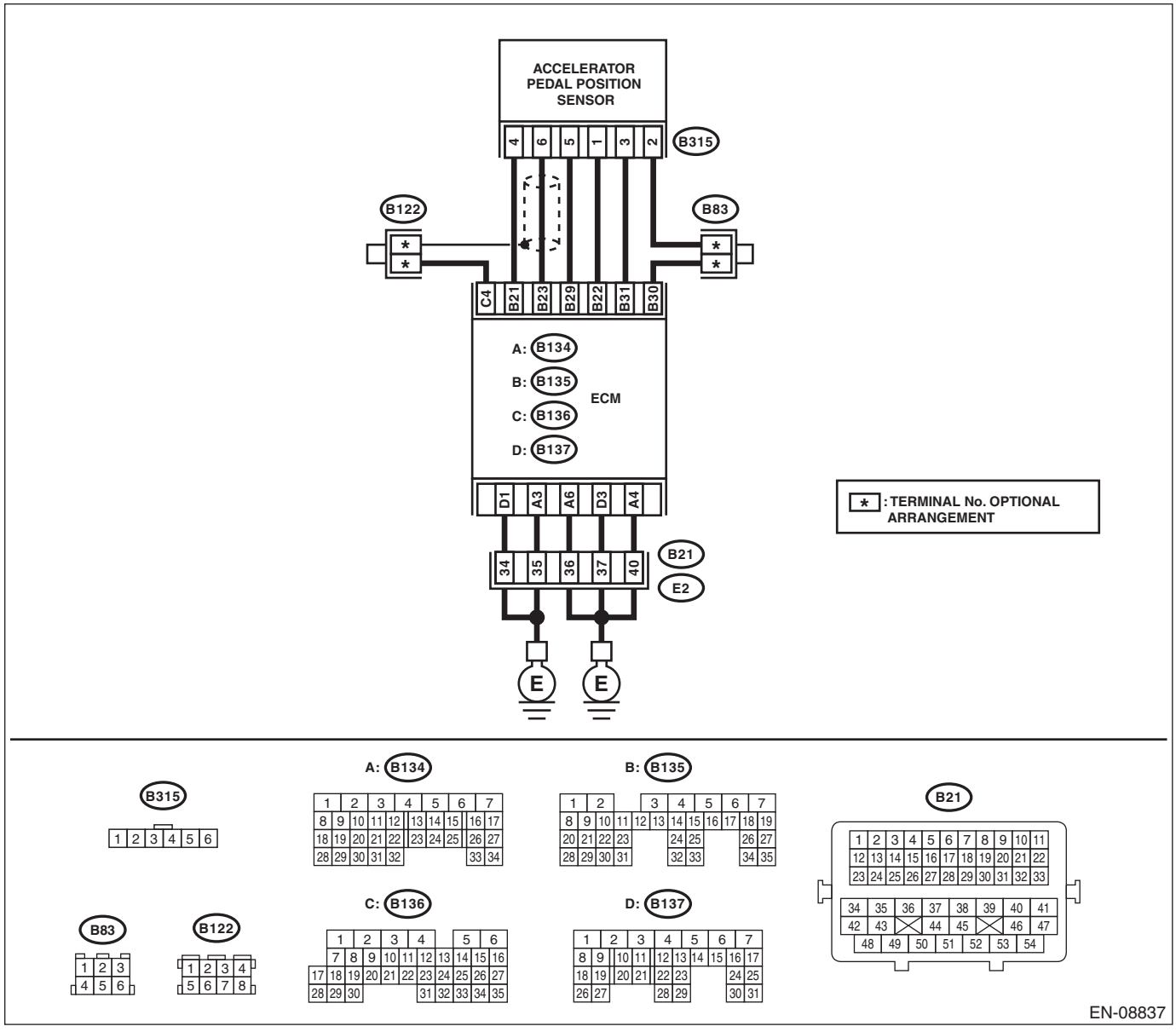
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and accelerator pedal position sensor. 3) Measure the resistance of harness between ECM and accelerator pedal position sensor connector. ***Connector & terminal*** ***(B135) No. 31 — (B315) No. 3:*** ***(B135) No. 30 — (B315) No. 2:***	Is the resistance less than 1 Ω?	Go to step **2**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and accelerator pedal position sensor connector • Poor contact of joint connector
2	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR CONNECTOR.** 1) Connect the connector to ECM. 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 1 Ω?	Go to step **3**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and engine ground • Poor contact of ECM connector • Poor contact of coupling connector
3	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between accelerator pedal position sensor connector and chassis ground. ***Connector & terminal*** ***(B315) No. 3 (+) — Chassis ground (–):***	Is the voltage 5 V or more?	Repair the short circuit to power supply in the harness between the ECM and accelerator pedal position sensor connector.	Go to step **4**.
4	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between ECM connectors. ***Connector & terminal*** ***(B135) No. 22 — (B135) No. 31:***	Is the resistance 1 MΩ or more?	Repair the poor contact of accelerator pedal position sensor connector. Replace the accelerator pedal if defective. <Ref. to SP(H4DO)-4, Accelerator Pedal.>	Repair the short circuit to power supply in the harness between the ECM and accelerator pedal position sensor connector.

DK:DTC P2135 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A”/“B” VOLTAGE CORRELATION

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-212, DTC P2135 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A”/“B” VOLTAGE CORRELATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

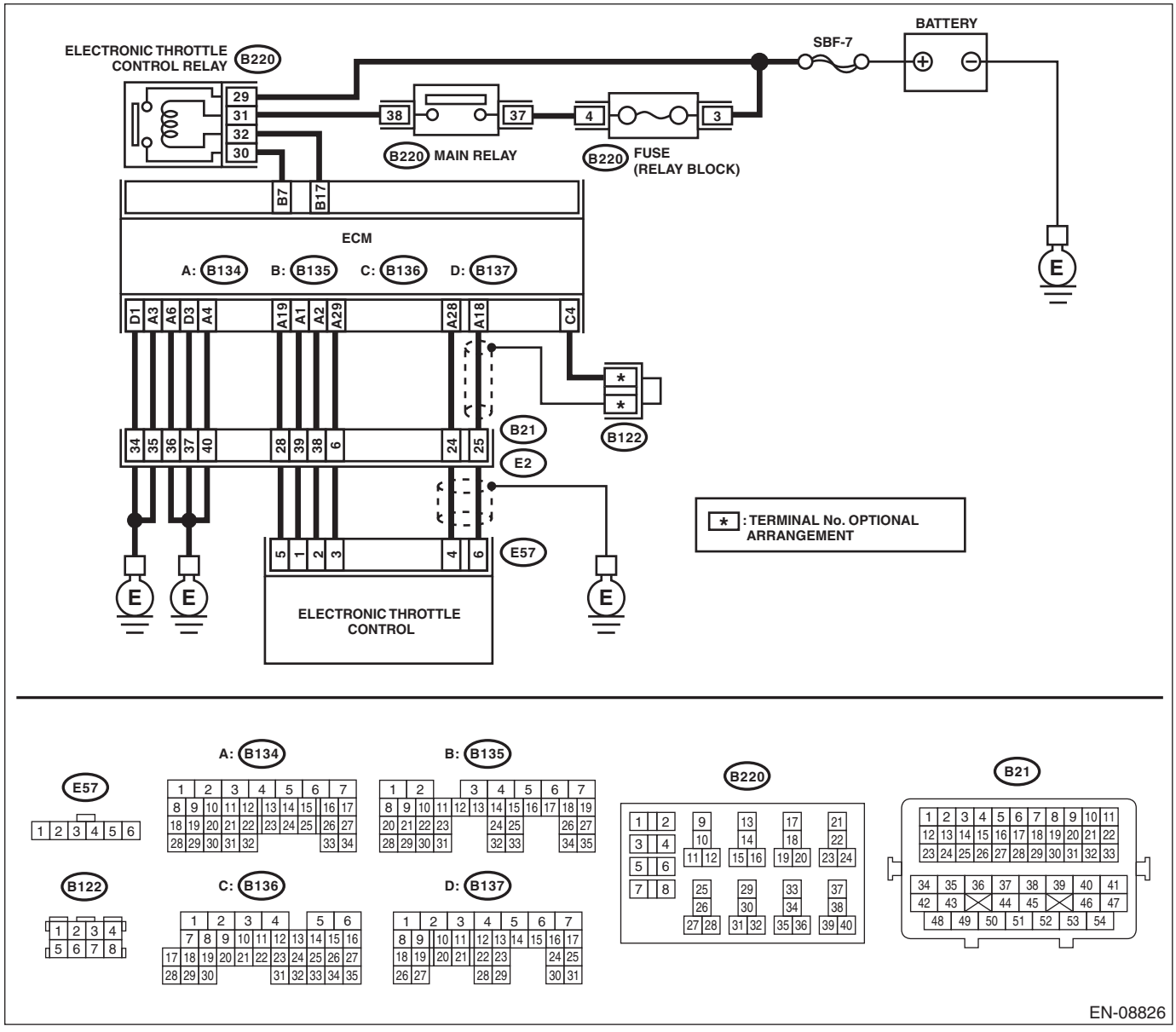
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and electronic throttle control. 3) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 19 — Chassis ground:*** ***(B134) No. 18 — Chassis ground:*** ***(B134) No. 18 — (B136) No. 4:*** ***(B134) No. 28 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **2**.	Repair the short circuit to ground in harness between ECM and electronic throttle control connector.
2	**CHECK SHORT CIRCUIT INSIDE THE ECM.** 1) Connect the connector to ECM. 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 1 MΩ or more?	Go to step **3**.	Repair the short circuit to ground in harness between ECM and electronic throttle control connector. Replace the ECM if defective. <Ref. to FU(H4DO)-101, Engine Control Module (ECM).>
3	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL CONNECTOR.** 1) Disconnect the connector from ECM. 2) Measure the resistance of harness between ECM and electronic throttle control connector. ***Connector & terminal*** ***(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 **4**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and electronic throttle control connector • Poor contact of coupling connector
4	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL CONNECTOR.** 1) Connect the connector to ECM. 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 the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and engine ground • Poor contact of ECM connector • Poor contact of coupling connector
5	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 6 (+) — Engine ground (–):*** ***(E57) No. 4 (+) — Engine ground (–):***	Is the voltage 5 V or more?	Repair the short circuit to power in harness between ECM and electronic throttle control connector.	Go to step **6**.

	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between ECM connectors. ***Connector & terminal*** ***(B134) No. 19 — (B134) No. 18:*** ***(B134) No. 19 — (B134) No. 28:***	Is the resistance 1 MΩ or more?	Repair the poor contact of electronic throttle control connector. Replace the electronic throttle control if defective. <Ref. to FU(H4DO)-17, Throttle Body.>	Repair the short circuit to power in harness between ECM and electronic throttle control connector.

DL:DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D”/“E” VOLTAGE CORRELATION

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-214, DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D”/“E” VOLTAGE CORRELATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

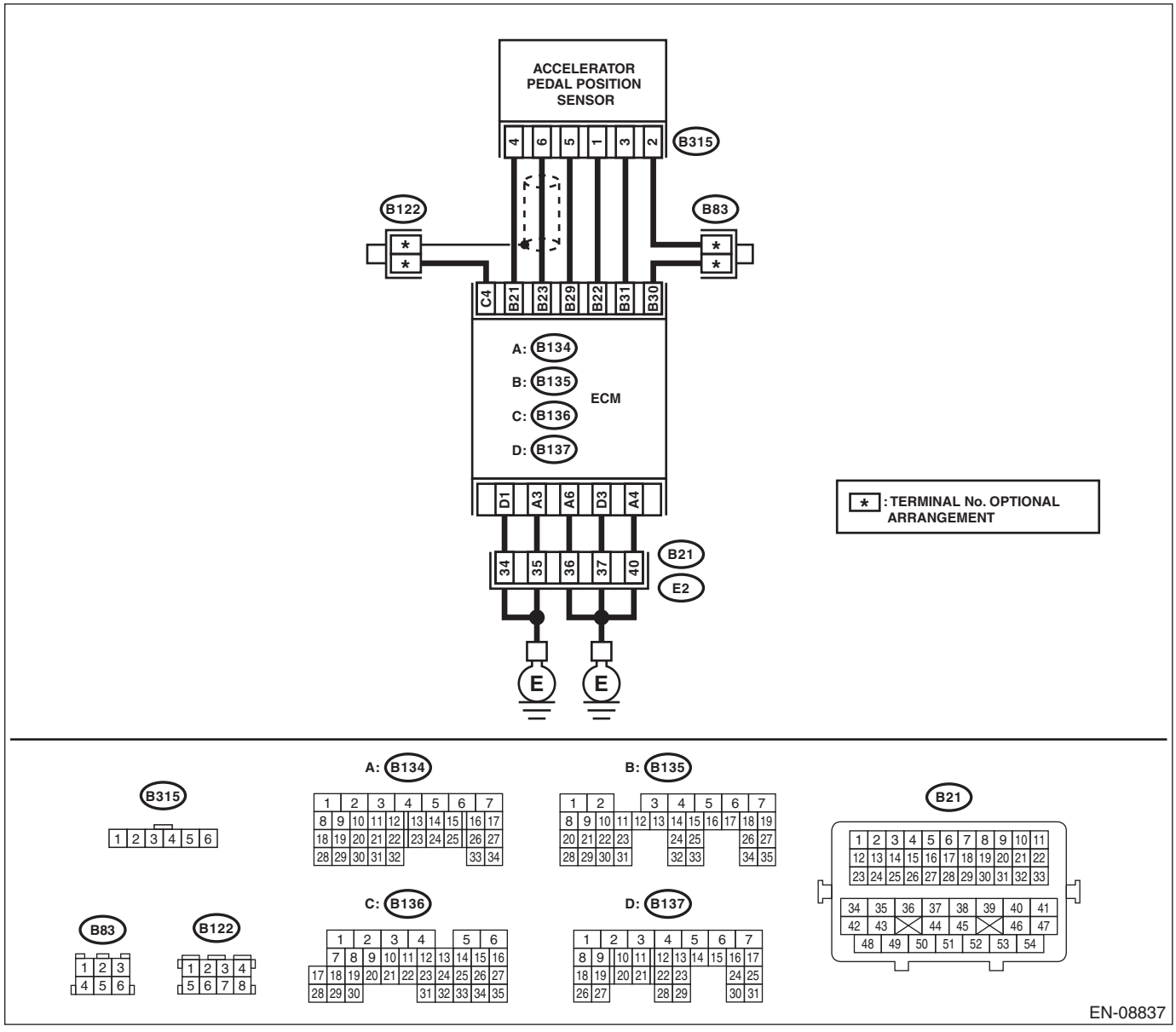
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ACCELERATOR PEDAL POSITION SENSOR OUTPUT.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***Main accelerator pedal position sensor signal*** ***(B135) No. 23 (+) — Chassis ground (–):*** ***Sub accelerator pedal position sensor signal*** ***(B135) No. 31 (+) — Chassis ground (–):***	Is the difference in measured values for the main accelerator pedal position sensor signal and the sub accelerator pedal position sensor signal 0 V?	Go to step **3**.	Go to step **2**.
2	**CHECK ACCELERATOR PEDAL POSITION SENSOR OUTPUT.** 1) Measure the voltage between accelerator pedal position sensor connector and chassis ground. ***Connector & terminal*** ***(B315) No. 6 (+) — Chassis ground (–):*** ***(B315) No. 3 (+) — Chassis ground (–):***	Is the difference in measured values for the main accelerator pedal position sensor signal and the sub accelerator pedal position sensor signal 0 V?	Replace the accelerator pedal. <Ref. to SP(H4DO)-4, Accelerator Pedal.>	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and accelerator pedal position sensor connector • Short circuit to ground in harness between ECM and accelerator pedal position sensor connector
3	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR CONNECTOR.** Measure the resistance of harness between accelerator pedal position sensor connector and chassis ground. ***Connector & terminal*** ***(B315) No. 5 — Chassis ground:*** ***(B315) No. 2 — Chassis ground:***	Is the resistance less than 5 Ω?	Repair the poor contact of ECM connector.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and accelerator pedal position sensor connector • Open circuit of harness between ECM and engine ground • Poor contact of ECM connector • Poor contact of joint connector

DM:DTC P2401 EVAPORATIVE EMISSION SYSTEM LEAK DETECTION PUMP CONTROL CIRCUIT LOW

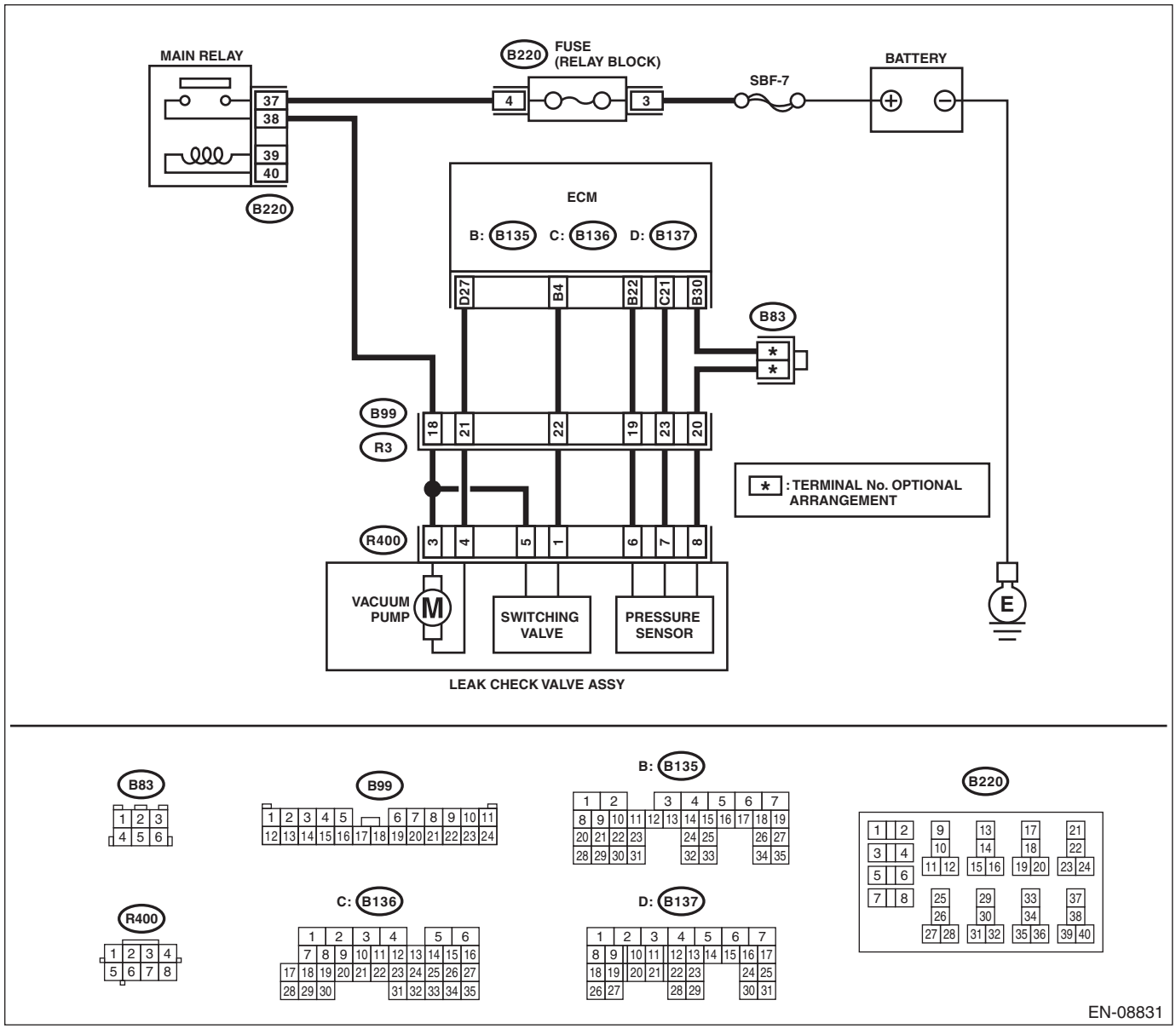
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-216, DTC P2401 EVAPORATIVE EMISSION SYSTEM LEAK DETECTION PUMP CONTROL CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND LEAK CHECK VALVE ASSEMBLY CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 27 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **2**.	Go to step **3**.
2	**CHECK FOR POOR CONTACT.** Check for poor contact of ECM connector.	Is there poor contact of ECM connector?	Repair the poor contact of ECM connector.	Even if DTC is detected, 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 open or short circuit of harness or temporary poor contact of connector may be the cause.
3	**CHECK POWER SUPPLY TO LEAK CHECK VALVE ASSEMBLY.** Measure the voltage between the leak check valve assembly connector and engine ground. ***Connector & terminal*** ***(R400) No. 3 (+) — Engine ground (–):***	Is the voltage 10 V or more?	Go to step **4**.	Repair the power supply circuit.
4	**CHECK HARNESS BETWEEN ECM AND LEAK CHECK VALVE ASSEMBLY CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and the leak check valve assembly. 3) Measure the resistance between leak check valve assembly and chassis ground. ***Connector & terminal*** ***(R400) No. 4 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **5**.	Repair the short circuit to ground in harness between ECM and leak check valve assembly connector.
5	**CHECK HARNESS BETWEEN ECM AND LEAK CHECK VALVE ASSEMBLY CONNECTOR.** Measure the resistance of harness between ECM and the leak check valve assembly connector. ***Connector & terminal*** ***(B137) No. 27 — (R400) No. 4:***	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 the leak check valve assembly connector • Poor contact of coupling connector
6	**CHECK LEAK CHECK VALVE ASSEMBLY.** Check the vacuum pump of the leak check valve assembly. <Ref. to EC(H4DO)-41, CHECK VACUUM PUMP, INSPECTION, Leak Check Valve Assembly.>	Is the vacuum pump of the leak check valve assembly OK?	Repair the poor contact in the leak check valve assembly connector.	Replace the leak check valve assembly. <Ref. to EC(H4DO)-37, Leak Check Valve Assembly.>

DN:DTC P2402 EVAPORATIVE EMISSION SYSTEM LEAK DETECTION PUMP CONTROL CIRCUIT HIGH

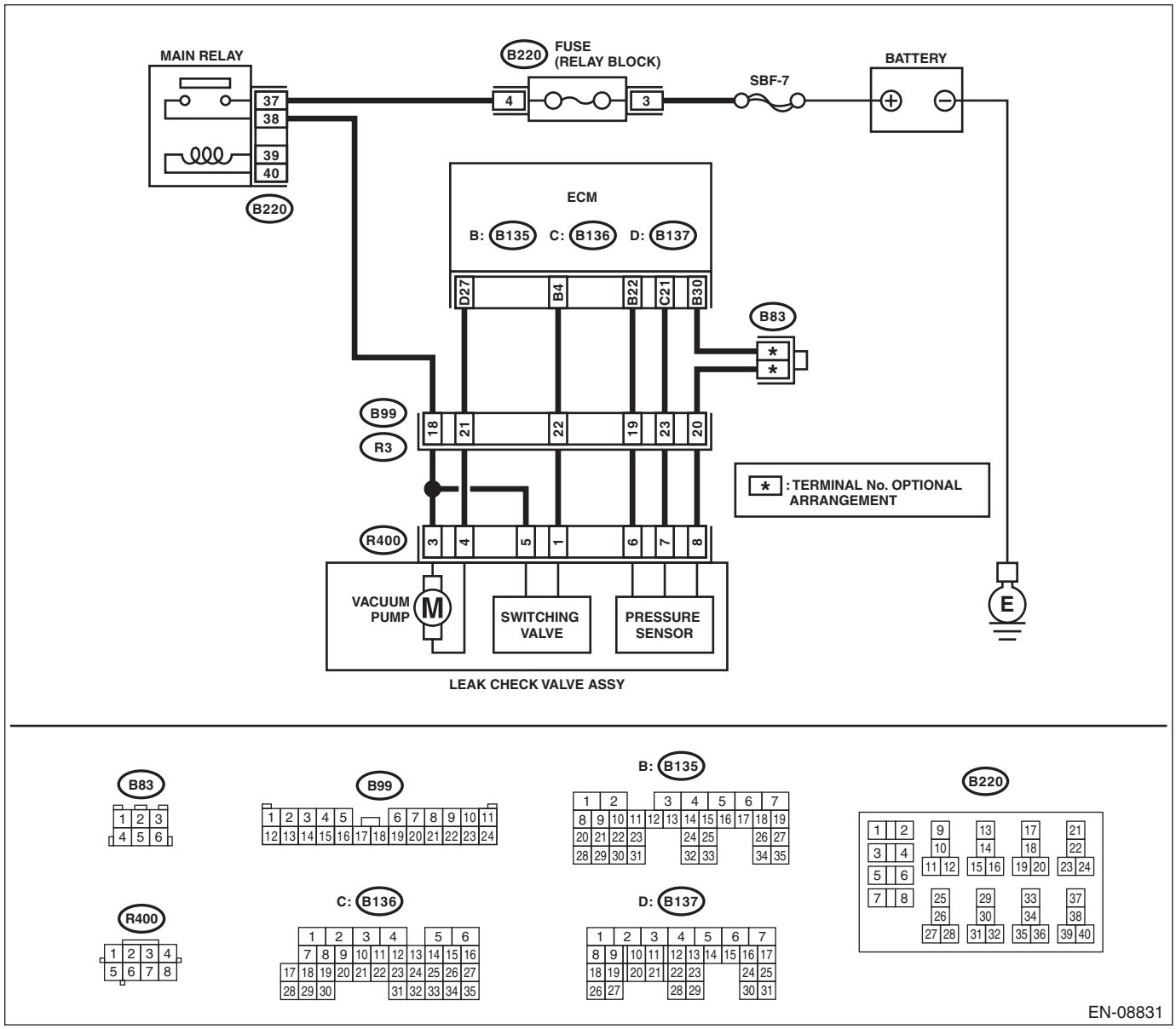
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-218, DTC P2402 EVAPORATIVE EMISSION SYSTEM LEAK DETECTION PUMP CONTROL CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND LEAK CHECK VALVE ASSEMBLY CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the leak check valve assembly. 3) Turn the ignition switch to ON. 4) Measure the voltage between leak check valve assembly and chassis ground. ***Connector & terminal*** ***(R400) No. 4 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the short circuit to power in harness between ECM and leak check valve assembly connector.	Go to step **2**.
2	**CHECK LEAK CHECK VALVE ASSEMBLY.** 1) Turn the ignition switch to OFF. 2) Check the vacuum pump of the leak check valve assembly. <Ref. to EC(H4DO)-41, CHECK VACUUM PUMP, INSPECTION, Leak Check Valve Assembly.>	Is the vacuum pump of the leak check valve assembly OK?	Repair the poor contact in the leak check valve assembly connector.	Replace the leak check valve assembly. <Ref. to EC(H4DO)-37, Leak Check Valve Assembly.>

DO:DTC P2404 EVAPORATIVE EMISSION SYSTEM LEAK DETECTION PUMP SENSE CIRCUIT RANGE/PERFORMANCE

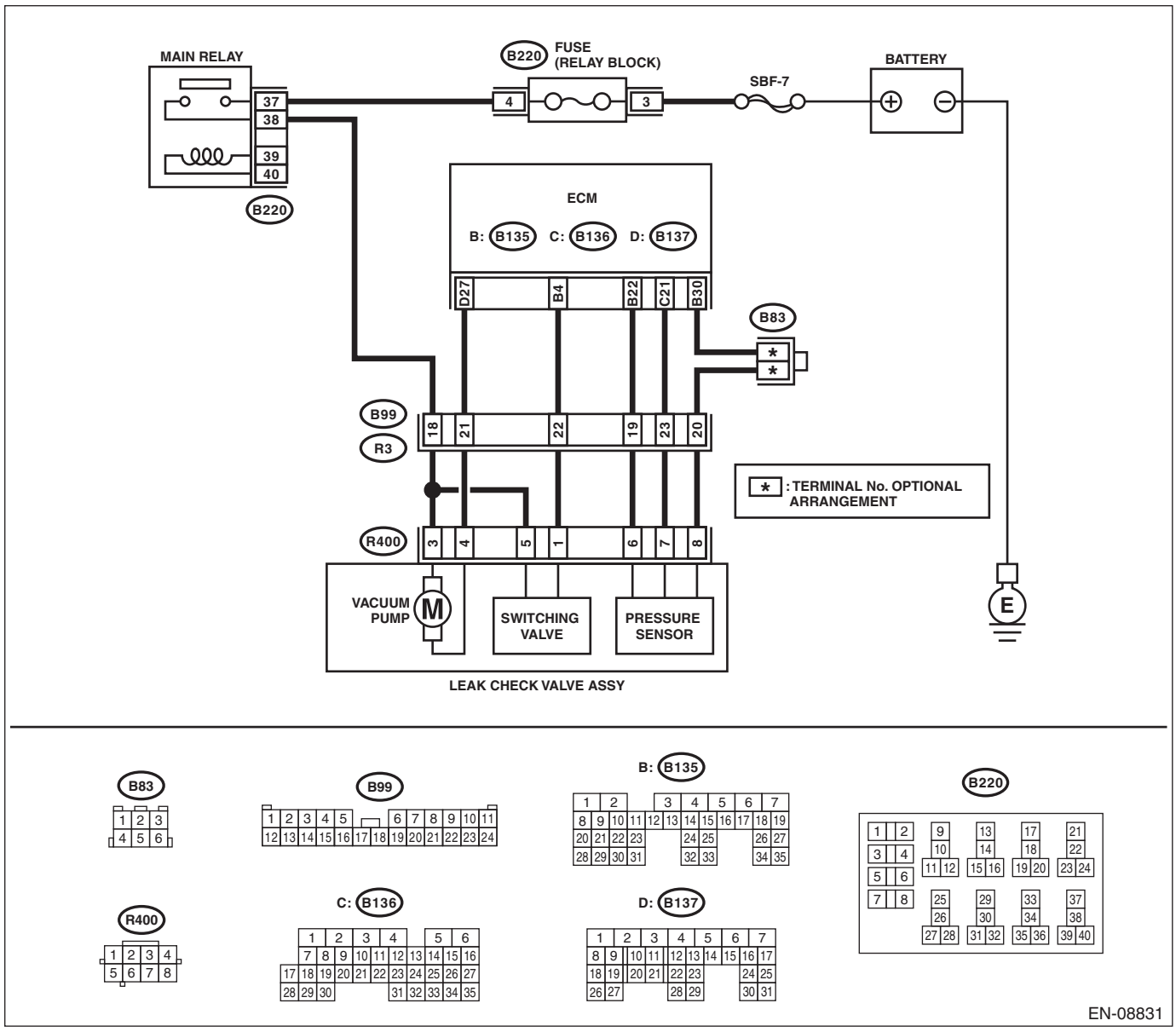
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-220, DTC P2404 EVAPORATIVE EMISSION SYSTEM LEAK DETECTION PUMP SENSE CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK FOR 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(H4DO)(diag)-86, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK ELCM PUMP.** Operate the ELCM pump using the Subaru Select Monitor. NOTE: Refer to "Compulsory Valve Operation Check Mode" for more operation procedures. <Ref. to EN(H4DO)(diag)-57, Compulsory Valve Operation Check Mode.>	Does the ELCM pump operate?	Go to step **6**.	Go to step **3**.
3	**CHECK POWER SUPPLY OF LEAK CHECK VALVE ASSEMBLY.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the leak check valve assembly. 3) Turn the ignition switch to ON. 4) Measure the voltage between the leak check valve assembly connector and chassis ground. ***Connector & terminal*** ***(R400) No. 3 (+) — Chassis 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 main relay and the leak check valve assembly connector • Poor contact of main relay connector • Poor contact of coupling connector
4	**CHECK HARNESS BETWEEN ECM AND LEAK CHECK VALVE ASSEMBLY CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM and the leak check valve assembly connector. ***Connector & terminal*** ***(B137) No. 27 — (R400) No. 4:***	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 the leak check valve assembly connector • Poor contact of coupling connector
5	**CHECK HARNESS BETWEEN ECM AND LEAK CHECK VALVE ASSEMBLY CONNECTOR.** 1) Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 27 — Chassis ground:***	Is the resistance 1 MΩ or more?	Replace the leak check valve assembly. <Ref. to EC(H4DO)-37, Leak Check Valve Assembly.>	Repair the short circuit to ground in harness between ECM and leak check valve assembly connector.

	Step	Check	Yes	No
6	**CHECK ELCM SWITCHING VALVE.** Operate the ELCM switching valve using the Subaru Select Monitor. NOTE: Refer to "Compulsory Valve Operation Check Mode" for more operation procedures. <Ref. to EN(H4DO)(diag)-57, Compulsory Valve Operation Check Mode.>	Does the ELCM switching valve operate?	Go to step **10**.	Go to step **7**.
7	**CHECK POWER SUPPLY OF LEAK CHECK VALVE ASSEMBLY.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the leak check valve assembly. 3) Turn the ignition switch to ON. 4) Measure the voltage between the leak check valve assembly connector and chassis ground. ***Connector & terminal*** ***(R400) No. 5 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **8**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between the main relay and the leak check valve assembly connector • Poor contact of main relay connector • Poor contact of coupling connector
8	**CHECK HARNESS BETWEEN ECM AND LEAK CHECK VALVE ASSEMBLY CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM and the leak check valve assembly connector. ***Connector & terminal*** ***(B135) No. 4 — (R400) No. 1:***	Is the resistance less than 1 Ω?	Go to step **9**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and the leak check valve assembly connector • Poor contact of coupling connector
9	**CHECK HARNESS BETWEEN ECM AND LEAK CHECK VALVE ASSEMBLY CONNECTOR.** 1) Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 4 — Chassis ground:***	Is the resistance 1 MΩ or more?	Replace the leak check valve assembly. <Ref. to EC(H4DO)-37, Leak Check Valve Assembly.>	Repair the short circuit to ground in harness between ECM and leak check valve assembly connector.
10	**CHECK EVAPORATIVE EMISSION CONTROL SYSTEM.** Perform drive cycle I. <Ref. to EN(H4DO)(diag)-52, DRIVE CYCLE I, PROCEDURE, Drive Cycle.>	Is DTC P2404 displayed on the display?	Replace the leak check valve assembly. <Ref. to EC(H4DO)-37, Leak Check Valve Assembly.>	Even if DTC is detected, 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, temporary open or short circuit of harness may be the cause.

DP:DTC P2419 EVAPORATIVE EMISSION SYSTEM SWITCHING VALVE CONTROL CIRCUIT LOW

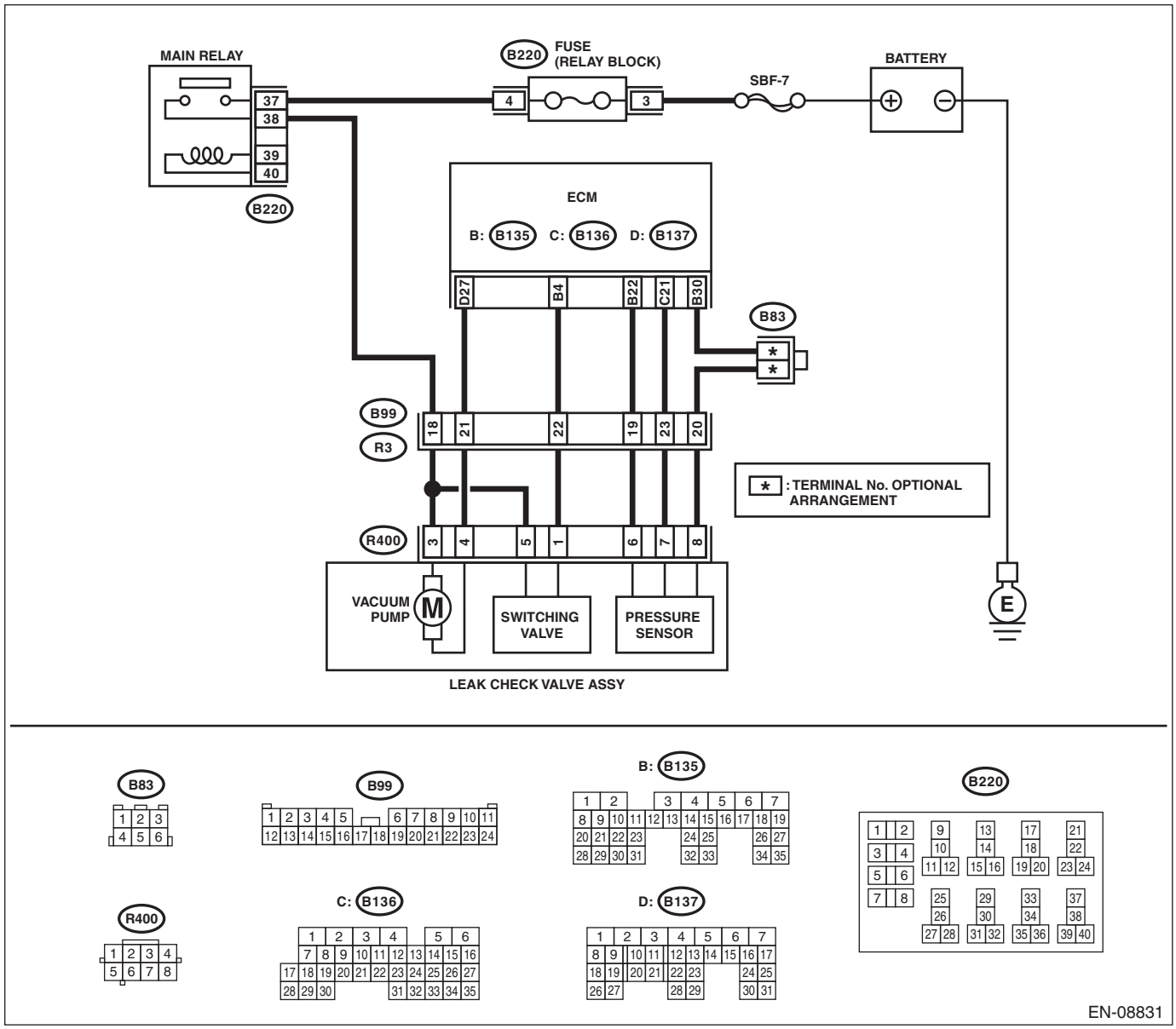
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-221, DTC P2419 EVAPORATIVE EMISSION SYSTEM SWITCHING VALVE CONTROL CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND LEAK CHECK VALVE ASSEMBLY CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 4 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **2**.	Go to step **3**.
2	**CHECK FOR POOR CONTACT.** Check for poor contact of ECM connector.	Is there poor contact of ECM connector?	Repair the poor contact of ECM connector.	Even if DTC is detected, 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 open or short circuit of harness or temporary poor contact of connector may be the cause.
3	**CHECK POWER SUPPLY TO LEAK CHECK VALVE ASSEMBLY.** Measure the voltage between the leak check valve assembly connector and engine ground. ***Connector & terminal*** ***(R400) No. 5 (+) — Engine ground (–):***	Is the voltage 10 V or more?	Go to step **4**.	Repair the power supply circuit.
4	**CHECK HARNESS BETWEEN ECM AND LEAK CHECK VALVE ASSEMBLY CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and the leak check valve assembly. 3) Measure the resistance between leak check valve assembly and chassis ground. ***Connector & terminal*** ***(R400) No. 1 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **5**.	Repair the short circuit to ground in harness between ECM and leak check valve assembly connector.
5	**CHECK HARNESS BETWEEN ECM AND LEAK CHECK VALVE ASSEMBLY CONNECTOR.** Measure the resistance of harness between ECM and the leak check valve assembly connector. ***Connector & terminal*** ***(B135) No. 4 — (R400) 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 the leak check valve assembly connector • Poor contact of coupling connector
6	**CHECK LEAK CHECK VALVE ASSEMBLY.** Check the switching valve of the leak check valve assembly. <Ref. to EC(H4DO)-39, CHECK SWITCHING VALVE, INSPECTION, Leak Check Valve Assembly.>	Is the switching valve of the leak check valve assembly OK?	Repair the poor contact in the leak check valve assembly connector.	Replace the leak check valve assembly. <Ref. to EC(H4DO)-37, Leak Check Valve Assembly.>

DQ:DTC P2420 EVAPORATIVE EMISSION SYSTEM SWITCHING VALVE CONTROL CIRCUIT HIGH

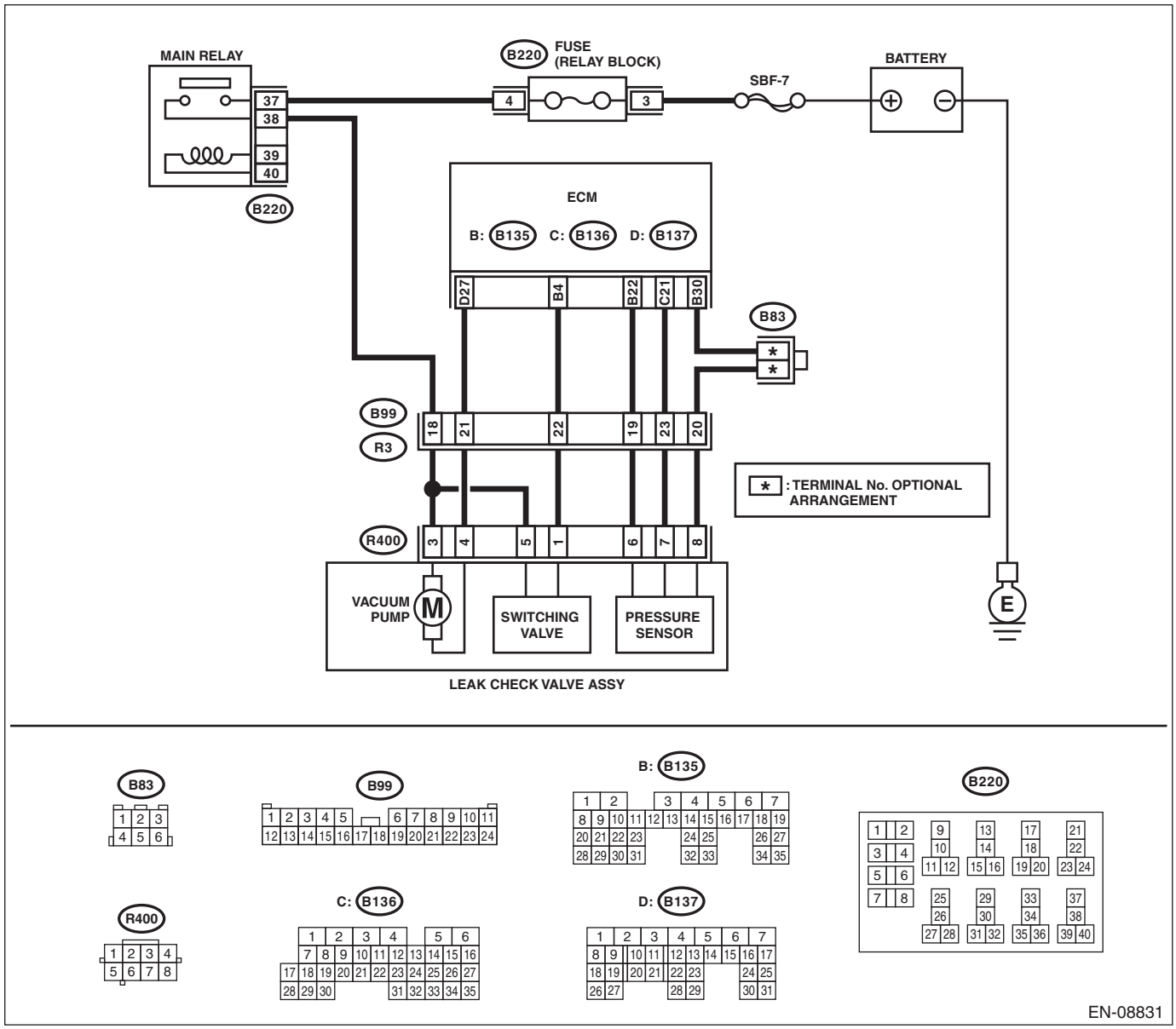
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DO)-223, DTC P2420 EVAPORATIVE EMISSION SYSTEM SWITCHING VALVE CONTROL CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND LEAK CHECK VALVE ASSEMBLY CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the leak check valve assembly. 3) Turn the ignition switch to ON. 4) Measure the voltage between leak check valve assembly and chassis ground. ***Connector & terminal*** ***(R400) No. 1 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the short circuit to power in harness between ECM and leak check valve assembly connector.	Go to step **2**.
2	**CHECK LEAK CHECK VALVE ASSEMBLY.** 1) Turn the ignition switch to OFF. 2) Check the switching valve of the leak check valve assembly. <Ref. to EC(H4DO)-39, CHECK SWITCHING VALVE, INSPECTION, Leak Check Valve Assembly.>	Is the switching valve of the leak check valve assembly OK?	Repair the poor contact in the leak check valve assembly connector.	Replace the leak check valve assembly. <Ref. to EC(H4DO)-37, Leak Check Valve Assembly.>

DR:DTC P2610 ECM/PCM INTERNAL ENGINE OFF TIMER PERFORMANCE

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION<Ref. to GD(H4DO)-225, DTC P2610 ECM/PCM INTERNAL ENGINE OFF TIMER PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode<Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode<Ref. to EN(H4DO)(diag)-43, PROCEDURE, Inspection Mode.>.

Step	Check	Yes	No
1 **CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4DO)(diag)-86, List of Diagnostic Trouble Code (DTC).>	Replace the ECM. <Ref. to FU(H4DO)-101, Engine Control Module (ECM).> NOTE: The soak timer IC is built into the ECM.

DS:DTC U0073 CAN FAILURE, BUS ‘OFF’ DETECTION

NOTE:
For the diagnostic procedure, refer to LAN section. <Ref. to LAN(diag)-2, Basic Diagnostic Procedure.>

DT:DTC U0101 CAN (TCU) DATA NOT LOADED

NOTE:
For the diagnostic procedure, refer to LAN section. <Ref. to LAN(diag)-2, Basic Diagnostic Procedure.>

DU:DTC U0122 CAN (VDC) DATA NOT LOADED

NOTE:
For the diagnostic procedure, refer to LAN section. <Ref. to LAN(diag)-2, Basic Diagnostic Procedure.>

DV:DTC U0140 CAN (BCU) DATA NOT LOADED

NOTE:
For the diagnostic procedure, refer to LAN section. <Ref. to LAN(diag)-2, Basic Diagnostic Procedure.>

DW:DTC U0402 CAN (TCU) DATA ABNORMAL

NOTE:
For the diagnostic procedure, refer to LAN section. <Ref. to LAN(diag)-2, Basic Diagnostic Procedure.>

DX:DTC U0416 CAN (VDC) DATA ABNORMAL

NOTE:
For the diagnostic procedure, refer to LAN section. <Ref. to LAN(diag)-2, Basic Diagnostic Procedure.>

DY:DTC U0422 CAN (BCU) DATA ABNORMAL

NOTE:
For the diagnostic procedure, refer to LAN section. <Ref. to LAN(diag)-2, Basic Diagnostic Procedure.>

21.General Diagnostic Table

A: INSPECTION

1. ENGINE

NOTE:
Malfunction of parts other than those listed is also possible. <Ref. to ME(H4DO)-323, Engine Trouble in General.>

Symptoms	Faulty 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) 8) Electronic throttle control
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 control valve
3. Engine does not return to idle.	1) Engine coolant temperature sensor 2) Electronic throttle control 3) Manifold absolute pressure sensor 4) Mass air flow and intake air temperature sensor 5) EGR control valve 6) Accelerator pedal position sensor 7) Engine oil temperature 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) Engine torque control signal circuit 10) Ignition parts (*1) 11) EGR control valve 12) Accelerator pedal position sensor 13) Engine oil temperature sensor
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) Electronic throttle control 9) Fuel pump and fuel pump relay 10) EGR control valve

Symptoms	Faulty 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 control 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 control 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 spark plug.
*2: Indicate the symptom occurring only in cold temperatures.
*3: Ensure the secure installation.
*4: Check fuel injector and fuel filter.
*5: Inspect air leak in air intake system.

GENERAL DESCRIPTION

GD(H4DO)

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2. Diagnostic Trouble Code (DTC) Detecting Criteria 9

1. List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Item	Index
P0011	Intake Camshaft Position - Timing Over-Advanced or System Performance (Bank 1)	<Ref. to GD(H4DO)-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 (Bank1)	<Ref. to GD(H4DO)-11, DTC P0016 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0018	Crankshaft Position - Camshaft Position Correlation (Bank2)	<Ref. to GD(H4DO)-12, DTC P0018 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0021	Intake Camshaft Position - Timing Over-Advanced or System Performance (Bank 2)	<Ref. to GD(H4DO)-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(H4DO)-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(H4DO)-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(H4DO)-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(H4DO)-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(H4DO)-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(H4DO)-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(H4DO)-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(H4DO)-27, 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(H4DO)-29, 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(H4DO)-31, 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(H4DO)-33, 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(H4DO)-35, 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(H4DO)-37, 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(H4DO)-39, DTC P0113 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0117	Engine Coolant Temperature Circuit Low	<Ref. to GD(H4DO)-41, DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0118	Engine Coolant Temperature Circuit High	<Ref. to GD(H4DO)-43, DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DTC	Item	Index
P0122	Throttle/Pedal Position Sensor/Switch “A” Circuit Low	<Ref. to GD(H4DO)-45, 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(H4DO)-47, 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(H4DO)-49, 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(H4DO)-51, 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(H4DO)-53, 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(H4DO)-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(H4DO)-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(H4DO)-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(H4DO)-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(H4DO)-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(H4DO)-68, 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(H4DO)-69, DTC P0139 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0140	O2 Sensor Circuit No Activity Detected (Bank1 Sensor2)	<Ref. to GD(H4DO)-77, DTC P0140 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK1 SENSOR2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0141	O2 Sensor Heater Circuit (Bank1 Sensor2)	<Ref. to GD(H4DO)-79, DTC P0141 O2 SENSOR HEATER CIRCUIT (BANK1 SENSOR2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0171	System Too Lean (Bank 1)	<Ref. to GD(H4DO)-81, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0172	System Too Rich (Bank 1)	<Ref. to GD(H4DO)-82, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0196	Engine Oil Temperature Sensor Circuit Range/Performance	<Ref. to GD(H4DO)-83, DTC P0196 ENGINE OIL TEMPERATURE SENSOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0197	Engine Oil Temperature Sensor Low	<Ref. to GD(H4DO)-85, DTC P0197 ENGINE OIL TEMPERATURE SENSOR LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0198	Engine Oil Temperature Sensor High	<Ref. to GD(H4DO)-87, 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(H4DO)-89, 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(H4DO)-91, DTC P0223 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0301	Cylinder 1 Misfire Detected	<Ref. to GD(H4DO)-93, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DTC	Item	Index
P0302	Cylinder 2 Misfire Detected	<Ref. to GD(H4DO)-99, DTC P0302 CYLINDER 2 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0303	Cylinder 3 Misfire Detected	<Ref. to GD(H4DO)-99, DTC P0303 CYLINDER 3 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0304	Cylinder 4 Misfire Detected	<Ref. to GD(H4DO)-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(H4DO)-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(H4DO)-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(H4DO)-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(H4DO)-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(H4DO)-108, 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(H4DO)-110, DTC P0345 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0400	Exhaust Gas Recirculation Flow	<Ref. to GD(H4DO)-111, DTC P0400 EXHAUST GAS RECIRCULATION FLOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0420	Catalyst System Efficiency Below Threshold (Bank 1)	<Ref. to GD(H4DO)-114, DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0441	Evaporative Emission Cont. Sys. Incorrect Purge Flow	<Ref. to GD(H4DO)-116, DTC P0441 EVAPORATIVE EMISSION CONT. SYS. INCORRECT PURGE FLOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0451	Evaporative Emission System Pressure Sensor/Switch Range/Performance	<Ref. to GD(H4DO)-119, DTC P0451 EVAPORATIVE EMISSION SYSTEM PRESSURE SENSOR/SWITCH RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0452	Evaporative Emission System Pressure Sensor/Switch Low	<Ref. to GD(H4DO)-121, DTC P0452 EVAPORATIVE EMISSION SYSTEM PRESSURE SENSOR/SWITCH LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0453	Evaporative Emission System Pressure Sensor/Switch High	<Ref. to GD(H4DO)-123, DTC P0453 EVAPORATIVE EMISSION SYSTEM PRESSURE SENSOR/SWITCH HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0455	Evaporative Emission System Leak Detected (Large Leak)	<Ref. to GD(H4DO)-125, DTC P0455 EVAPORATIVE EMISSION SYSTEM LEAK DETECTED (LARGE LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0456	Evaporative Emission Control System Leak Detected (Very Small Leak)	<Ref. to GD(H4DO)-133, DTC P0456 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0458	Evaporative Emission System Purge Control Valve Circuit Low	<Ref. to GD(H4DO)-134, 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(H4DO)-136, 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(H4DO)-138, 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(H4DO)-140, DTC P0462 FUEL LEVEL SENSOR “A” CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

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P0463	Fuel Level Sensor “A” Circuit High	<Ref. to GD(H4DO)-142, DTC P0463 FUEL LEVEL SENSOR “A” CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0500	Vehicle Speed Sensor “A”	<Ref. to GD(H4DO)-144, DTC P0500 VEHICLE SPEED SENSOR “A”, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0506	Idle Air Control System RPM Lower Than Expected	<Ref. to GD(H4DO)-145, 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(H4DO)-146, DTC P0507 IDLE AIR CONTROL SYSTEM RPM HIGHER THAN EXPECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P050A	Cold Start Idle Air Control System Performance	<Ref. to GD(H4DO)-147, DTC P050A COLD START IDLE AIR CONTROL SYSTEM PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P050B	Cold Start Ignition Timing Performance	<Ref. to GD(H4DO)-152, DTC P050B COLD START IGNITION TIMING PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0512	Starter Request Circuit	<Ref. to GD(H4DO)-153, DTC P0512 STARTER REQUEST CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0513	Incorrect Immobilizer Key	<Ref. to GD(H4DO)-154, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0604	Internal Control Module Random Access Memory (RAM) Error	<Ref. to GD(H4DO)-155, 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(H4DO)-156, DTC P0605 INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0607	Throttle Control System Circuit Range/Performance	<Ref. to GD(H4DO)-157, DTC P0607 THROTTLE CONTROL SYSTEM CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0638	Throttle Actuator Control Range/Performance (Bank 1)	<Ref. to GD(H4DO)-159, DTC P0638 THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0700	Transmission Control System (MIL Request)	<Ref. to GD(H4DO)-161, 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(H4DO)-162, 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(H4DO)-163, 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(H4DO)-164, 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(H4DO)-165, DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT MODEL), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1152	O2 Sensor Circuit Range/Performance (Low) (Bank1 Sensor1)	<Ref. to GD(H4DO)-166, DTC P1152 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK1 SENSOR1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1153	O2 Sensor Circuit Range/Performance (High) (Bank1 Sensor1)	<Ref. to GD(H4DO)-168, DTC P1153 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1160	Return Spring Failure	<Ref. to GD(H4DO)-170, DTC P1160 RETURN SPRING FAILURE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1449	Evaporative Emission Cont. Sys. Air Filter Clog	<Ref. to GD(H4DO)-172, DTC P1449 EVAPORATIVE EMISSION CONT. SYS. AIR FILTER CLOG, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1451	Evaporative Emission Cont. Sys.	<Ref. to GD(H4DO)-174, DTC P1451 EVAPORATIVE EMISSION CONT. SYS., Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1492	EGR Solenoid Valve Signal #1 Circuit Malfunction (Low Input)	<Ref. to GD(H4DO)-175, DTC P1492 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

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P1493	EGR Solenoid Valve Signal #1 Circuit Malfunction (High Input)	<Ref. to GD(H4DO)-177, 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(H4DO)-179, 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(H4DO)-179, 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(H4DO)-179, 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(H4DO)-179, 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(H4DO)-179, DTC P1498 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1499	EGR Solenoid Valve Signal #4 Circuit Malfunction (High Input)	<Ref. to GD(H4DO)-179, 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(H4DO)-180, DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1560	Back-Up Voltage Circuit Malfunction	<Ref. to GD(H4DO)-181, DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1570	Antenna	<Ref. to GD(H4DO)-182, DTC P1570 ANTENNA, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1571	Reference Code Incompatibility	<Ref. to GD(H4DO)-182, DTC P1571 REFERENCE CODE INCOMPATIBILITY, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1572	IMM Circuit Failure (Except Antenna Circuit)	<Ref. to GD(H4DO)-182, DTC P1572 IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1574	Key Communication Failure	<Ref. to GD(H4DO)-182, DTC P1574 KEY COMMUNICATION FAILURE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1576	EGI Control Module EEPROM	<Ref. to GD(H4DO)-182, DTC P1576 EGI CONTROL MODULE EEPROM, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1577	IMM Control Module EEPROM	<Ref. to GD(H4DO)-182, DTC P1577 IMM CONTROL MODULE EEPROM, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1578	Meter Failure	<Ref. to GD(H4DO)-182, DTC P1578 METER FAILURE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2004	Intake Manifold Runner Control Stuck Open (Bank 1)	<Ref. to GD(H4DO)-183, 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(H4DO)-184, 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(H4DO)-185, 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(H4DO)-186, DTC P2007 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2009	Intake Manifold Runner Control Circuit Low (Bank 1)	<Ref. to GD(H4DO)-187, DTC P2009 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

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P2012	Intake Manifold Runner Control Circuit Low (Bank 2)	<Ref. to GD(H4DO)-188, DTC P2012 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2088	Intake Camshaft Position Actuator Control Circuit Low (Bank 1)	<Ref. to GD(H4DO)-189, DTC P2088 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2089	Intake Camshaft Position Actuator Control Circuit High (Bank 1)	<Ref. to GD(H4DO)-190, DTC P2089 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2092	Intake Camshaft Position Actuator Control Circuit Low (Bank 2)	<Ref. to GD(H4DO)-191, DTC P2092 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2093	Intake Camshaft Position Actuator Control Circuit High (Bank 2)	<Ref. to GD(H4DO)-191, 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(H4DO)-192, 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(H4DO)-194, 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(H4DO)-196, 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(H4DO)-198, DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2103	Throttle Actuator Control Motor Circuit High	<Ref. to GD(H4DO)-200, 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(H4DO)-202, 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(H4DO)-204, 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(H4DO)-206, 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(H4DO)-208, 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(H4DO)-210, 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(H4DO)-212, 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(H4DO)-214, DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D”/“E” VOLTAGE CORRELATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2401	Evaporative Emission System Leak Detection Pump Control Circuit Low	<Ref. to GD(H4DO)-216, DTC P2401 EVAPORATIVE EMISSION SYSTEM LEAK DETECTION PUMP CONTROL CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2402	Evaporative Emission System Leak Detection Pump Control Circuit High	<Ref. to GD(H4DO)-218, DTC P2402 EVAPORATIVE EMISSION SYSTEM LEAK DETECTION PUMP CONTROL CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2404	Evaporative Emission System Leak Detection Pump Sense Circuit Range/Performance	<Ref. to GD(H4DO)-220, DTC P2404 EVAPORATIVE EMISSION SYSTEM LEAK DETECTION PUMP SENSE CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

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P2419	Evaporative Emission System Switching Valve Control Circuit Low	<Ref. to GD(H4DO)-221, 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(H4DO)-223, DTC P2420 EVAPORATIVE EMISSION SYSTEM SWITCHING VALVE CONTROL CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2610	ECM/PCM Internal Engine Off Timer Performance	<Ref. to GD(H4DO)-225, DTC P2610 ECM/PCM INTERNAL ENGINE OFF TIMER PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
U0073	CAN Failure, Bus 'OFF' Detection	<Ref. to GD(H4DO)-232, DTC U0073 CAN FAILURE, BUS 'OFF' DETECTION, Diagnostic Trouble Code (DTC) Detecting Criteria.>
U0101	CAN (TCU) Data not Loaded	<Ref. to GD(H4DO)-234, DTC U0101 CAN (TCU) DATA NOT LOADED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
U0122	CAN (VDC) Data not Loaded	<Ref. to GD(H4DO)-234, DTC U0122 CAN (VDC) DATA NOT LOADED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
U0140	CAN (BCU) Data not Loaded	<Ref. to GD(H4DO)-234, DTC U0140 CAN (BCU) DATA NOT LOADED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
U0402	CAN (TCU) Data Abnormal	<Ref. to GD(H4DO)-234, DTC U0402 CAN (TCU) DATA ABNORMAL, Diagnostic Trouble Code (DTC) Detecting Criteria.>
U0416	CAN (VDC) Data Abnormal	<Ref. to GD(H4DO)-234, DTC U0416 CAN (VDC) DATA ABNORMAL, Diagnostic Trouble Code (DTC) Detecting Criteria.>
U0422	CAN (BCU) Data Abnormal	<Ref. to GD(H4DO)-234, DTC U0422 CAN (BCU) DATA ABNORMAL, 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 AVCS system malfunction.
Judge NG when the amount of AVCS actual timing advance does not approach to the amount of AVCS target timing advance.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Time of establishing all secondary parameter conditions	≥ 1000 ms (AT model) ≥ 500 ms (MT model)
Battery voltage	≥ 10.9 V
Engine speed	≥ 1500 rpm
Engine coolant temperature	≥ 40 °C (104 °F)
AVCS control	Operation
Target timing advance change amount (per 64 ms)	< 3.84 °CA

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after warming up when the engine speed increases and AVCS operates.

4. DIAGNOSTIC METHOD

1) When the conditions during which the differences of AVCS target timing advance amount and AVCS actual timing advance amount is large continues for certain amount of time.
2) When the differences of target timing advance amount and actual timing advance amount is calculated during AVCS control, and the difference per predetermined time is the specified value or larger.

• Abnormality Judgment

Judge as NG when the following conditions are established within the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Σ(Target position – Actual position)	> 6000 °CA (AT model) (Bank 1) > 6000 °CA (AT model) (Bank 2) > 3500 °CA (MT model) (Bank 1) > 3500 °CA (MT model) (Bank 2)
or	
Σ(Target position – Actual position)	< –6000 °CA (AT model) (Bank 1) < –6000 °CA (AT model) (Bank 2) < –3500 °CA (MT model) (Bank 1) < –3500 °CA (MT model) (Bank 2)

Time Needed for Diagnosis:
- AT model: 40000 ms
- MT model: 35000 ms

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

- **Normality Judgment**

Judge as OK and clear the NG if the following conditions are established within the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Σ(Target position – Actual position)	≤ 6000 °CA (AT model) (Bank 1) ≤ 6000 °CA (AT model) (Bank 2) ≤ 3500 °CA (MT model) (Bank 1) ≤ 3500 °CA (MT model) (Bank 2) and ≥ –6000 °CA (AT model) (Bank 1) ≥ –6000 °CA (AT model) (Bank 2) ≥ –3500 °CA (MT model) (Bank 1) ≥ –3500 °CA (MT model) (Bank 2)

Time Needed for Diagnosis:

- AT model: 40000 ms
- MT model: 35000 ms

B: DTC P0016 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK1)

1. OUTLINE OF DIAGNOSIS

Detect the AVCS system malfunction.
Judge as NG when standard timing advance amount is far from learning angle.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Engine speed	≥ 550 rpm and < 900 rpm
Engine coolant temperature	≥ 70 °C (158 °F)
AVCS control	Not in operation
Target timing advance	0°CA

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting engine and while AVCS is not operating.

4. DIAGNOSTIC METHOD

Judge as NG when the absolute value of the difference between cam signal input position and learning value is out of specification.

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
|Crankshaft position when camshaft position sensor signal is input – Learning value|	> 10 °CA

Time Needed for Diagnosis: 5000 ms
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

NOTE:
Initial standard learning value is the value of crank angle initially input at the production plant. And then it will be updated every time normal judgment has been completed. Learning value will not be updated if NG judgment occurs because timing belt or chain derails suddenly in process or because wrong assembly occurs during servicing.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
|Crankshaft position when camshaft position sensor signal is input – Learning value|	≤ 10 °CA

Time Needed for Diagnosis: Less than 1 second

C: DTC P0018 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK2)

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0016. <Ref. to GD(H4DO)-11, DTC P0016 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

D: DTC P0021 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 2)

1. OUTLINE OF DIAGNOSIS

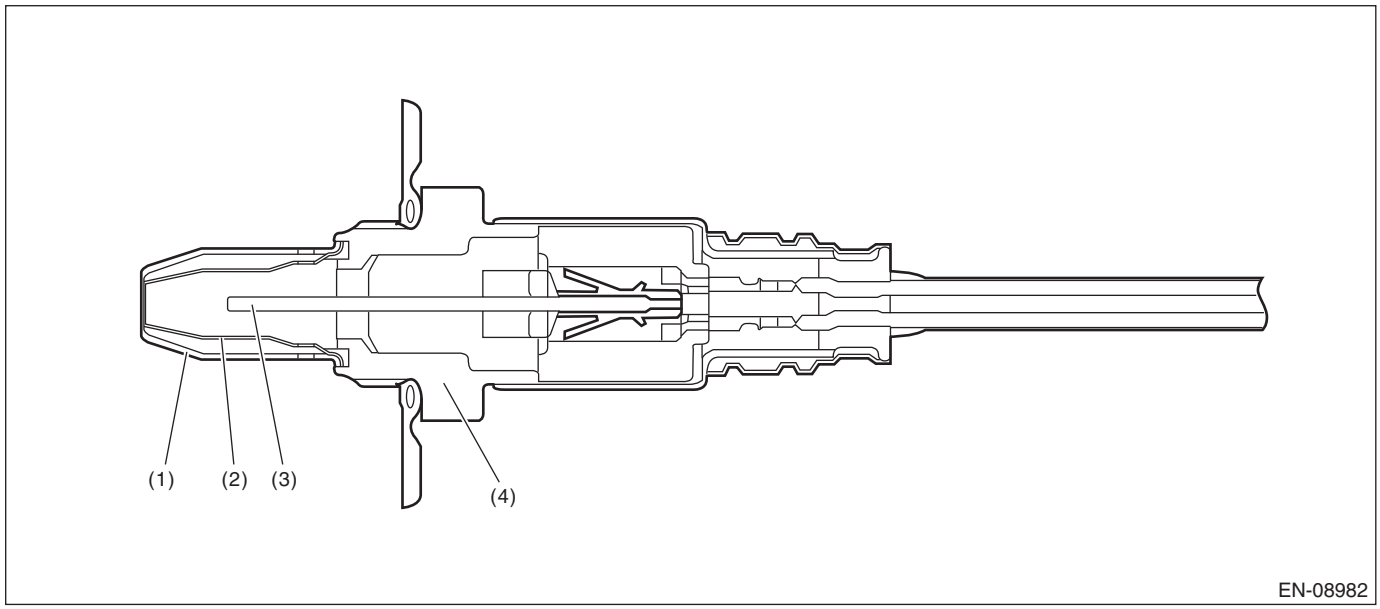
NOTE:
For the detection standard, refer to DTC P0011. <Ref. to GD(H4DO)-9, DTC P0011 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

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 when looking at engine status such as deceleration fuel cut.

2. COMPONENT DESCRIPTION



(1) Element cover (outer)
(2) Element cover (inner)
(3) Sensor element
(4) Sensor housing

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Condition established time	≥ 42000 ms
Battery voltage	≥ 10.9 V
Heater current	Permitted
Control duty ≥ 35 %	Experienced
After fuel cut	≥ 20000 ms

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after 42000 ms seconds or more have passed since the engine started.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Front oxygen (A/F) sensor impedance	> 50 Ω

Time Needed for Diagnosis: 10000 ms
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Front oxygen (A/F) sensor impedance	≤ 50 Ω

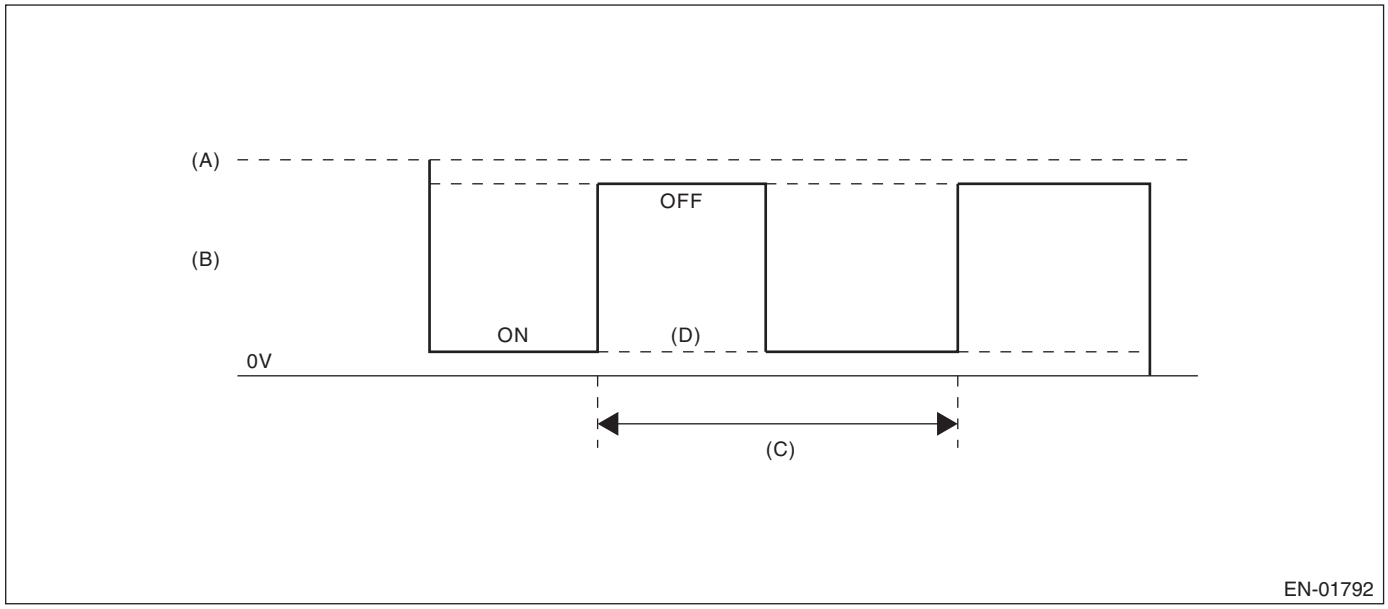
Time Needed for Diagnosis: 10000 ms

F: DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

Detect front oxygen (A/F) sensor heater open or short circuit.
The front oxygen (A/F) 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 as NG when the terminal voltage remains Low.

2. COMPONENT DESCRIPTION



(A) Battery voltage
(B) Front oxygen (A/F) sensor heater output voltage
(C) 128 ms
(D) Low error

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	Low
Front oxygen (A/F) sensor heater control duty	< 87.5 %

Time Needed for Diagnosis: 4 ms × 250 time(s)
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	High

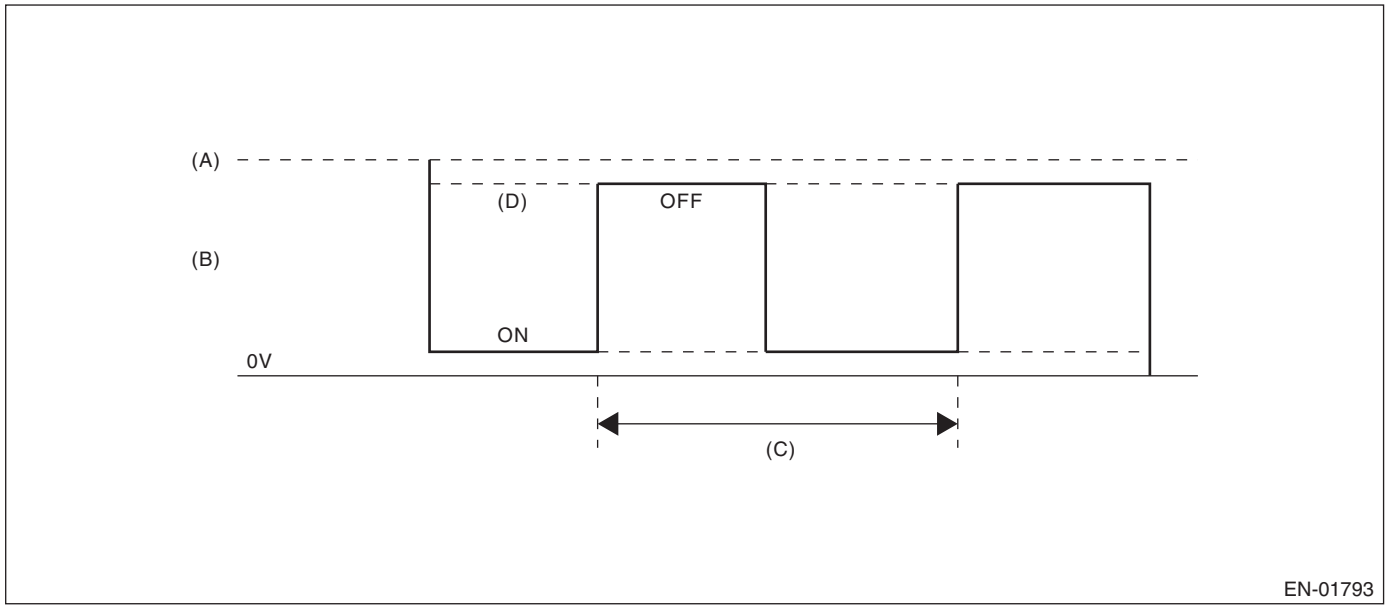
Time Needed for Diagnosis: Less than 1 second

G: DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

Detect front oxygen (A/F) sensor heater open or short circuit.
The front oxygen (A/F) 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 as NG when the terminal voltage remains High.

2. COMPONENT DESCRIPTION



(A) Battery voltage
(B) Front oxygen (A/F) sensor heater output voltage
(C) 128 ms
(D) High error

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	High
Front oxygen (A/F) sensor heater control duty	≥ 12.5 %

Time Needed for Diagnosis: 4 ms × 500 time(s)
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	Low

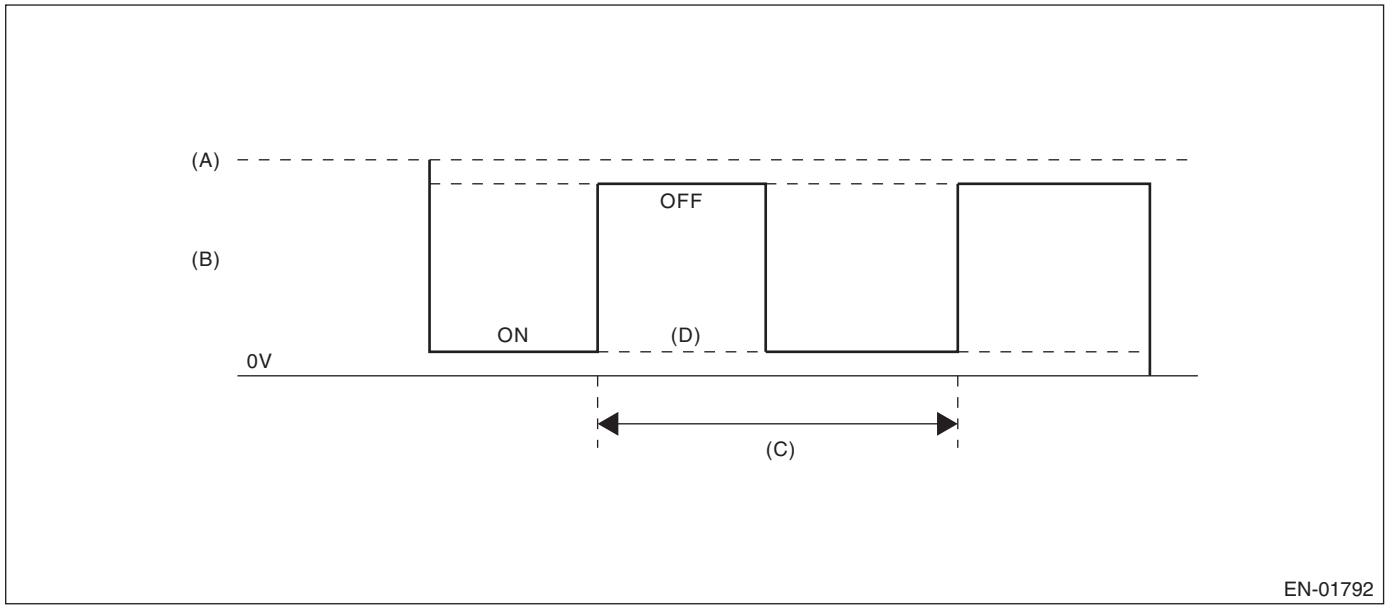
Time Needed for Diagnosis: Less than 1 second

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 as NG when the terminal voltage remains Low.

2. COMPONENT DESCRIPTION



(A) Battery voltage
(B) Output voltage of the rear oxygen sensor heater
(C) 256 ms (cycle)
(D) Low error

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Elapsed time after starting the engine	≥ 1 second
Engine speed	< 8000 rpm

4. GENERAL DRIVING CYCLE

After starting the engine, perform the diagnosis continuously when engine is low speed.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	Low
Rear oxygen sensor heater control duty	< 75 %

Time Needed for Diagnosis: 8 ms × 1250 time(s)
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	High

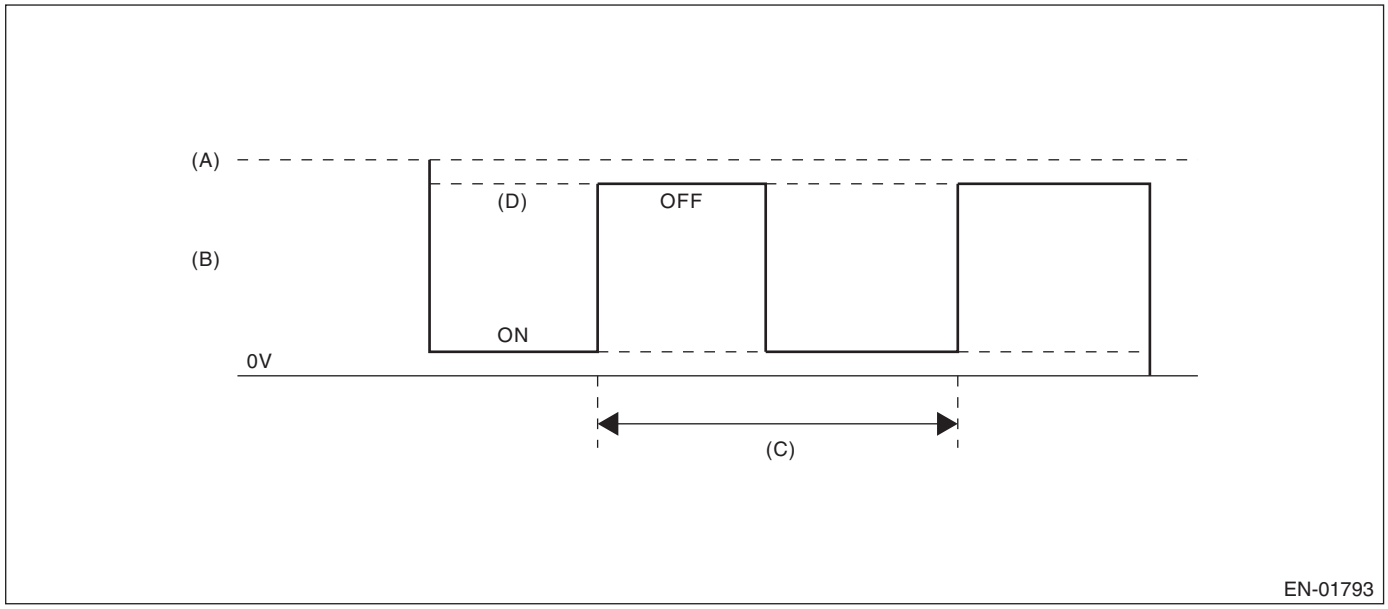
Time Needed for Diagnosis: Less than 1 second

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 as NG when the terminal voltage remains High.

2. COMPONENT DESCRIPTION



(A) Battery voltage
(B) Output voltage of the rear oxygen sensor heater
(C) 256 ms (cycle)
(D) High error

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Elapsed time after starting the engine	≥ 1 second
Engine speed	< 8000 rpm

4. GENERAL DRIVING CYCLE

After starting the engine, perform the diagnosis continuously when engine is low speed.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	High
Rear oxygen sensor heater control duty	≥ 20 %

Time Needed for Diagnosis: 8 ms × 1250 time(s)
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	Low

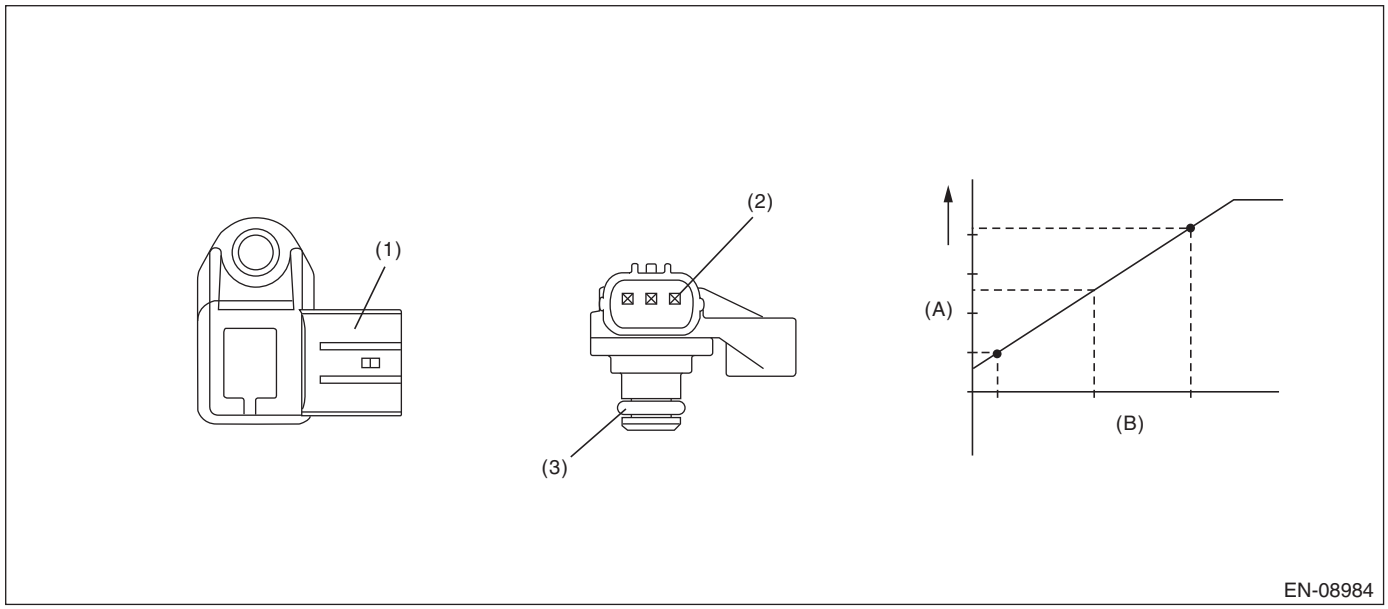
Time Needed for Diagnosis: Less than 1 second

J: DTC P0068 MAP/MAF - THROTTLE POSITION CORRELATION

1. OUTLINE OF DIAGNOSIS

Detect problems in the intake manifold pressure sensor output properties.
Judge as 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



(A) Output voltage
(B) Absolute pressure
(1) Connector
(2) Terminals
(3) O-ring

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	≥ 60 °C (140 °F)

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after idling.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when Low side or High side becomes NG.
If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Low	
Engine speed	< 2800 rpm
Throttle position	≥ 12 °
Output voltage	< 1.44 V
Engine load	> 0.39 g/rev (0.01 oz/rev)
High	
Engine speed	550 rpm — 900 rpm
Throttle position	< 3.51 °
Output voltage	≥ 2.4 V
Engine load	< 0.32 g/rev (0.01 oz/rev)

Time Needed for Diagnosis:
Low side: 5000 ms
High side: 10000 ms
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.
If the duration of time while the following conditions are met is longer than the time indicated, judge as OK.

Judgment Value

Malfunction Criteria	Threshold Value
Low	
Engine speed	< 2800 rpm
Throttle position	≥ 12 °
Output voltage	≥ 1.44 V
Engine load	> 0.39 g/rev (0.01 oz/rev)
High	
Engine speed	550 rpm — 900 rpm
Throttle position	< 3.51 °
Output voltage	< 2.4 V
Engine load	< 0.32 g/rev (0.01 oz/rev)

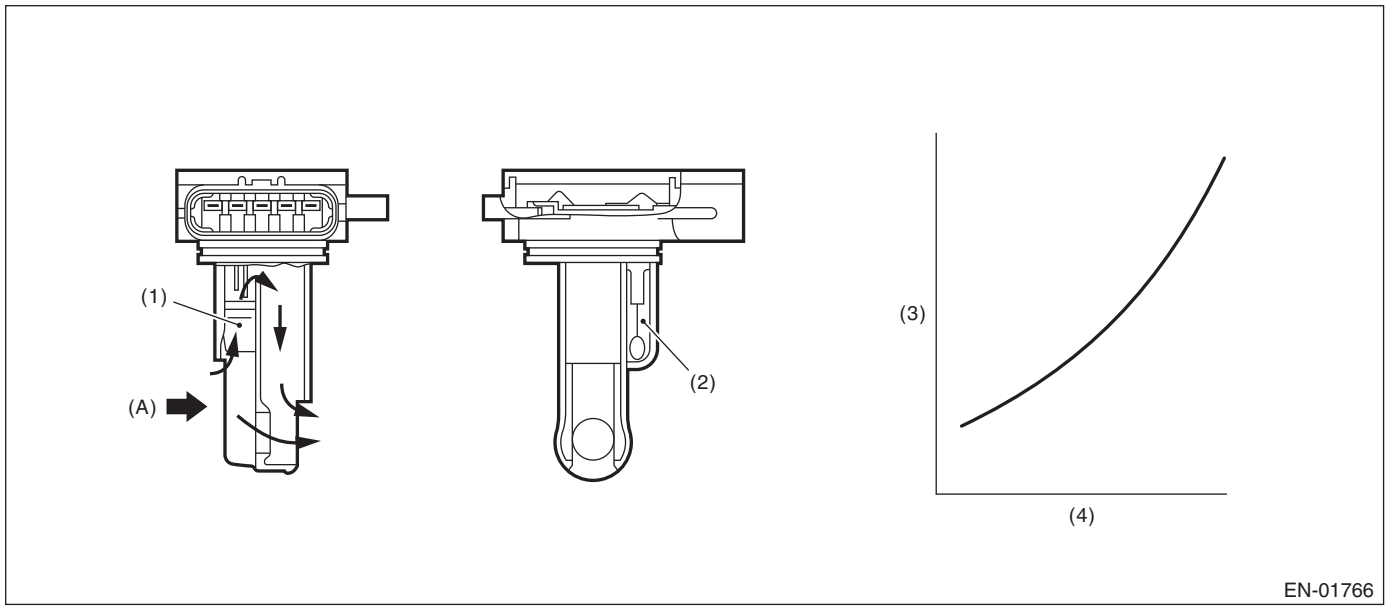
Time Needed for Diagnosis:
Low side: Less than 1 s
High side: Less than 1 s

K: DTC P0101 MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of air flow sensor output properties.
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



(A) Air

(1) Air flow sensor
(2) Intake air temperature sensor
(3) Voltage (V)
(4) Amount of intake air (kg (lb)/s)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	≥ 60 °C (140 °F)

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after idling.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when Low side or High side becomes NG.
If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Low	
Output voltage	< 1.47 V
Engine speed	≥ 2000 rpm
Throttle opening angle	≥ 12 °
Intake manifold pressure	≥ 66.7 kPa (500 mmHg, 19.7 inHg)
High (1)	
Output voltage	≥ 2.66 V
Engine speed	550 rpm — 900 rpm
Throttle opening angle	< 3.51 °
Intake manifold pressure	≥ 40 kPa (300 mmHg, 11.8 inHg)
High (2)	
Output voltage	≥ 1.37 V
Engine speed	550 rpm — 900 rpm
Throttle opening angle	< 3.51 °
Intake manifold pressure	≥ 40 kPa (300 mmHg, 11.8 inHg)
Fuel system diagnosis	Rich side malfunction

Time Needed for Diagnosis:
Low: 5000 ms
High: 10000 ms
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 and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Low	
Output voltage	≥ 1.47 V
Engine speed	≥ 2000 rpm
Throttle opening angle	≥ 12 °
Intake manifold pressure	≥ 66.7 kPa (500 mmHg, 19.7 inHg)
High	
Output voltage	< 2.66 V
Engine speed	550 rpm — 900 rpm
Throttle opening angle	< 3.51 °
Intake manifold pressure	< 40 kPa (300 mmHg, 11.8 inHg)
Fuel system diagnosis	Rich side normal

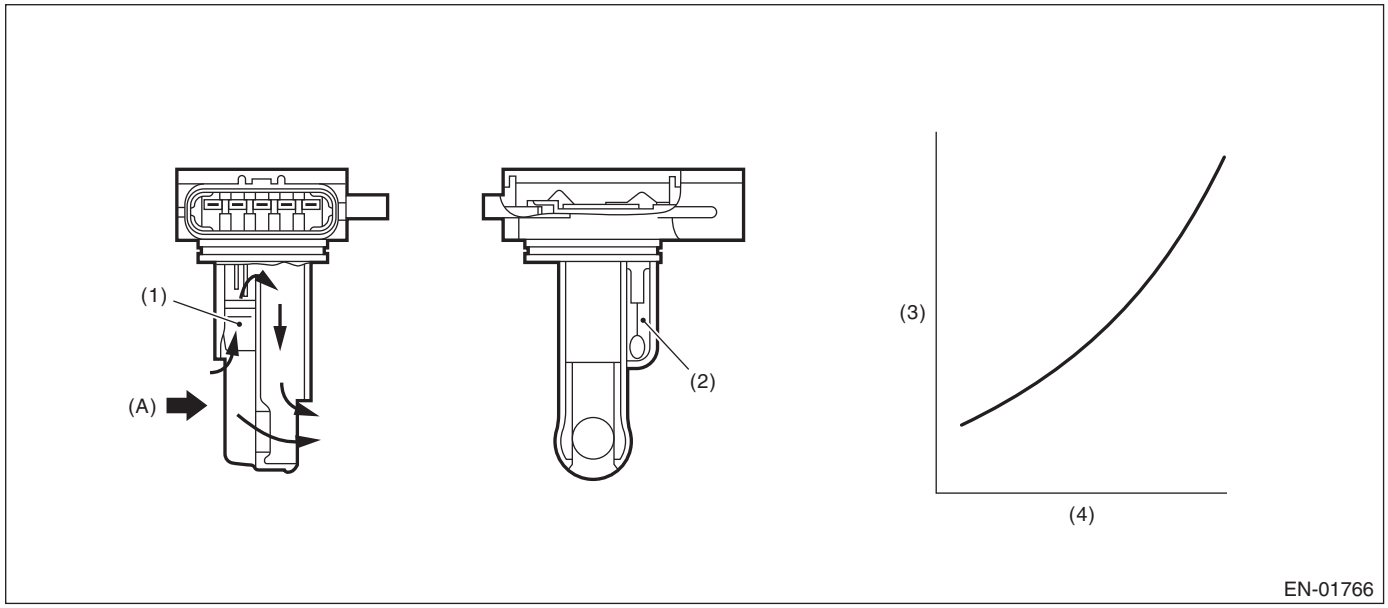
Time Needed for Diagnosis:
Low: Less than 1 s
High: Less than 1 s

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 out of specification.

2. COMPONENT DESCRIPTION



(A) Air

(1) Air flow sensor
(2) Intake air temperature sensor
(3) Voltage (V)
(4) Amount of intake air (kg (lb)/s)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≤ 0.22 V

Time Needed for Diagnosis: 500 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	> 0.22 V

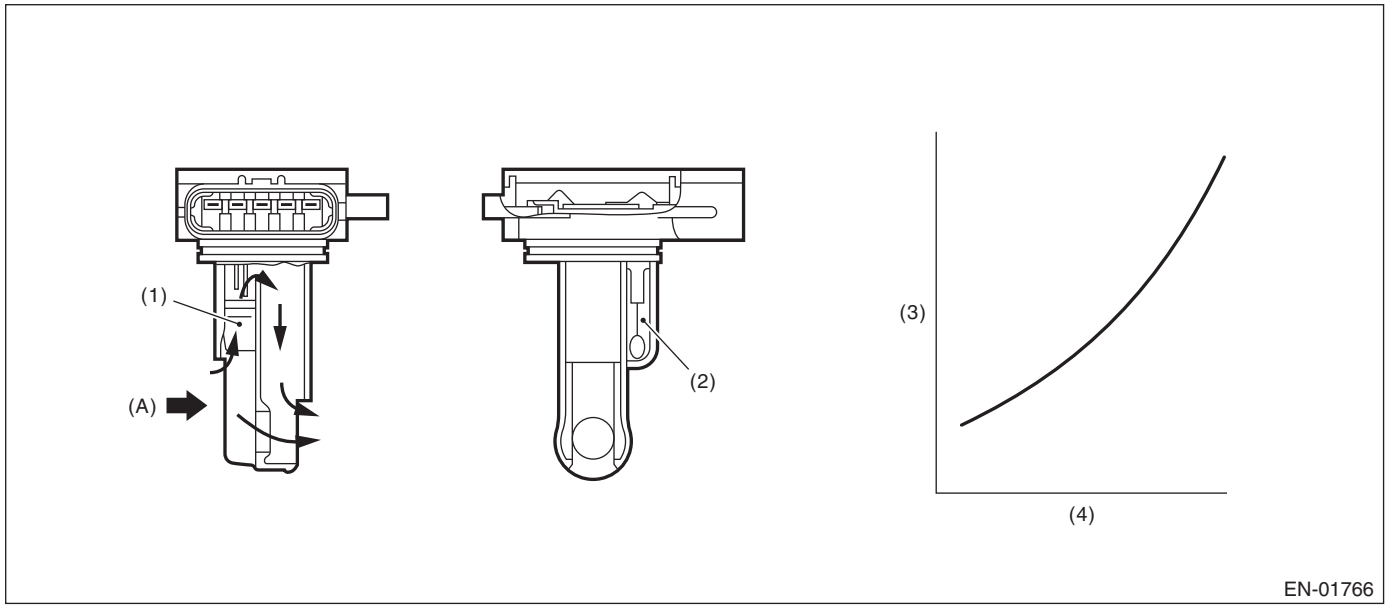
Time Needed for Diagnosis: Less than 1 second

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 out of specification.

2. COMPONENT DESCRIPTION



(A) Air

(1) Air flow sensor
(2) Intake air temperature sensor
(3) Voltage (V)
(4) Amount of intake air (kg (lb)/s)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.071 V

Time Needed for Diagnosis: 500 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 4.071 V

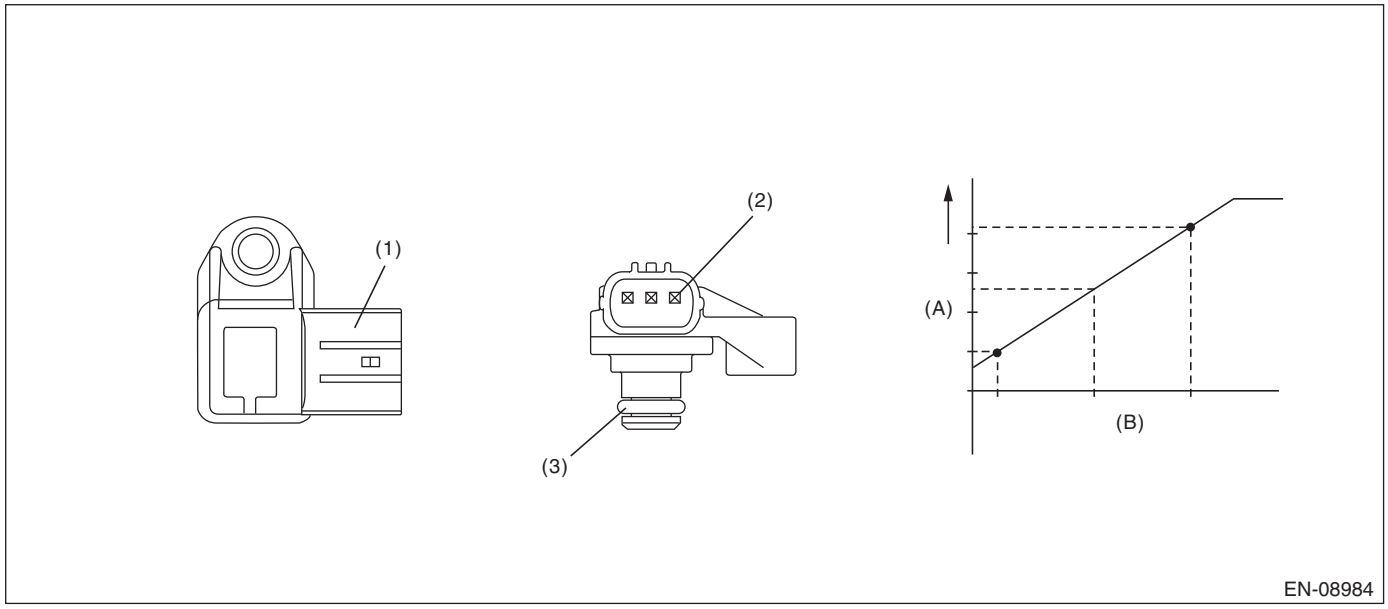
Time Needed for Diagnosis: Less than 1 second

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 out of specification.

2. COMPONENT DESCRIPTION



(A) Output voltage
(B) Absolute pressure
(1) Connector
(2) Terminals
(3) O-ring

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≤ 0.573 V

Time Needed for Diagnosis: 500 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	> 0.573 V

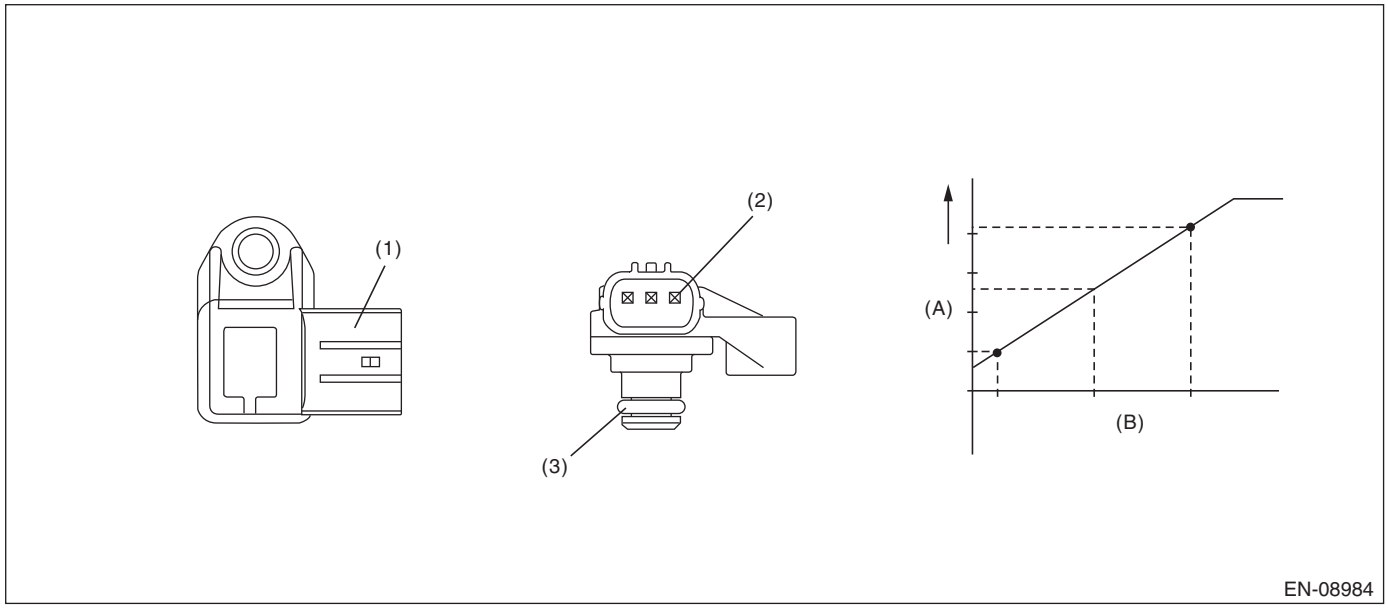
Time Needed for Diagnosis: Less than 1 second

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 out of specification.

2. COMPONENT DESCRIPTION



(A) Output voltage
(B) Absolute pressure
(1) Connector
(2) Terminals
(3) O-ring

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 3.906 V

Time Needed for Diagnosis: 500 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 3.906 V

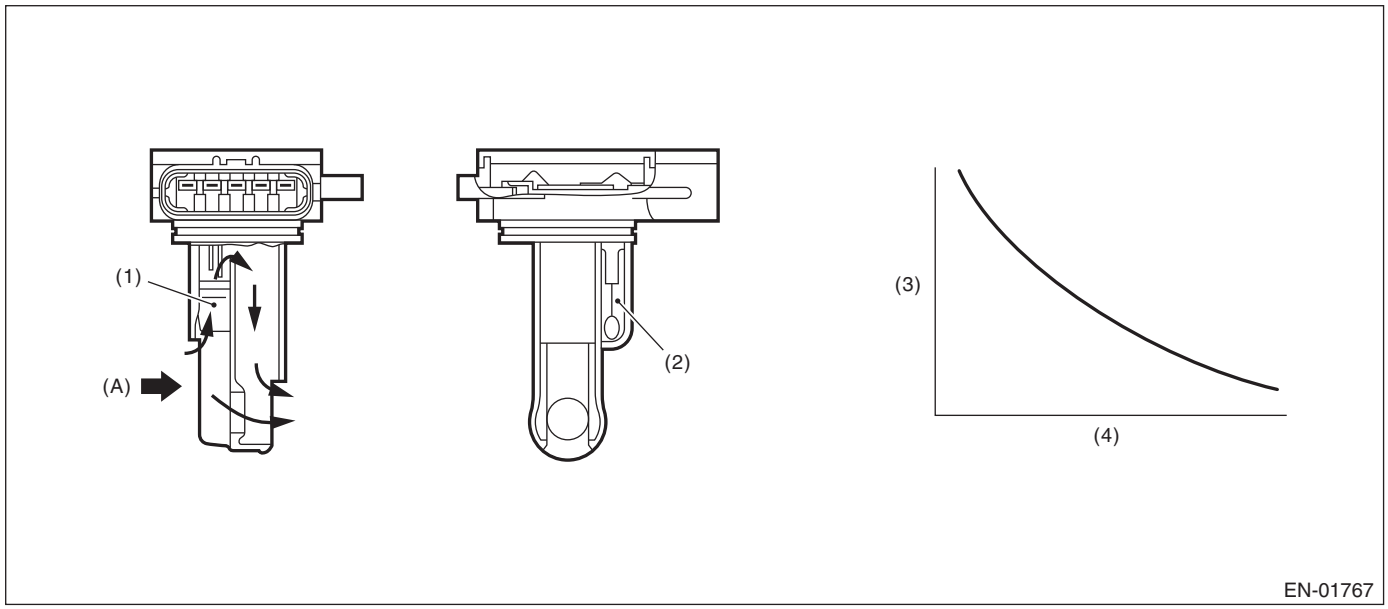
Time Needed for Diagnosis: Less than 1 second

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



(A) Air

(1) Air flow sensor
(2) Intake air temperature sensor
(3) Resistance value (Ω)
(4) Intake air temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature at engine starting	< 35 °C (95 °F)
Battery voltage	≥ 10.9 V
Continuous time when the vehicle speed is less than 140 km/h (87 MPH)	≥ 600 s
Engine coolant temperature	≥ 70 °C (158 °F)
Intake air amount sum value	≥ Value of Map 1
Number of experiences under conditions below	≥ 3 time(s)
• Continuous time when vehicle speed is less than 4 km/h (2.5 MPH)	≥ Value from Map 2
• Continuous time when vehicle speed is 40 km/h (24.9 MPH) or more	≥ 15 s
and	
Establishing time of 1, 2	≥ 15 s
1. Intake air amount	≥ 10 g/s (0.35 oz/s)
2. Vehicle speed	≥ 4 km/h (2.5 MPH)

Map 1

Engine coolant temperature °C (°F)	–20 (–4)	–10 (14)	0 (32)	10 (50)	20 (68)
Intake air amount sum value (g (oz))	50000 (1763.5)	9239 (325.86)	8176 (288.37)	6973 (245.94)	5856 (206.54)

Map 2

Engine coolant temperature °C (°F)	–30 (–22)	0 (32)	10 (50)	20 (68)
Continuous time (s) when vehicle speed is less than 4 km/h (2.5 MPH)	250	40	32	24

4. GENERAL DRIVING CYCLE

Perform the diagnosis when the vehicle speed condition is met after warming up from a cold condition.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage difference between Max. and Min.	< 0.02 V(Equivalent to approximately 0.5°C (0.9°F) near 25°C)

Time Needed for Diagnosis: Less than 1 second
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage difference between Max. and Min.	≥ 0.02 V

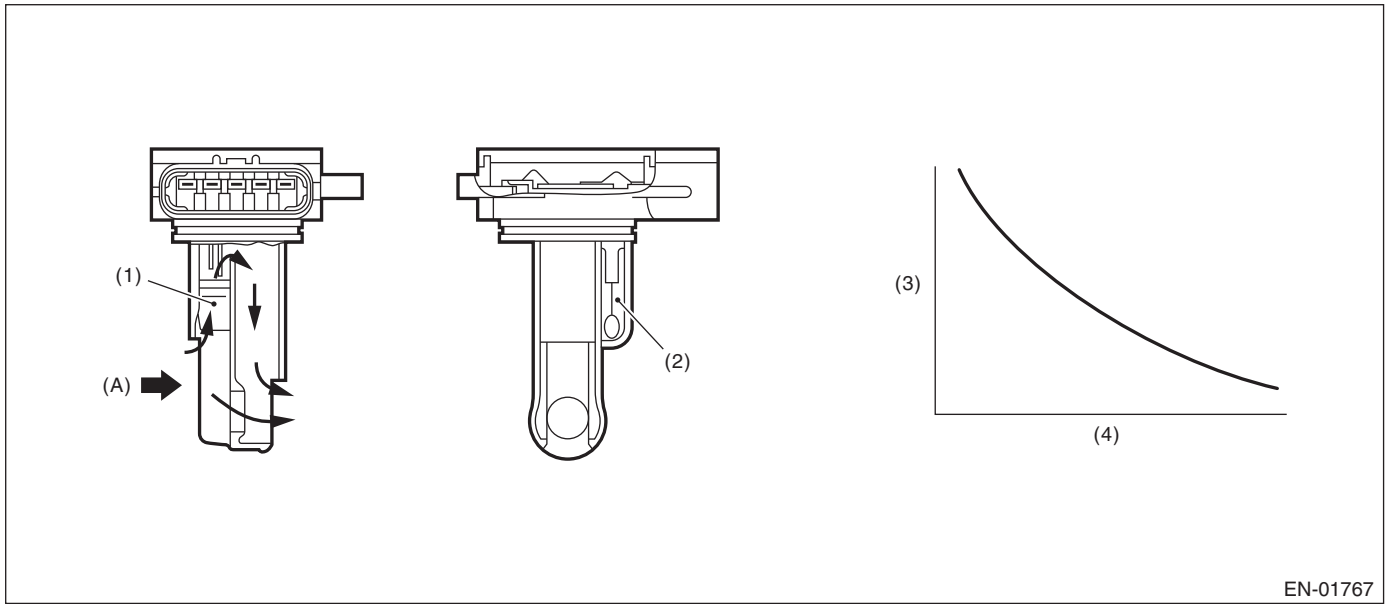
Time Needed for Diagnosis: Less than 1 second

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 out of specification.

2. COMPONENT DESCRIPTION



(A) Air

(1) Air flow sensor
(2) Intake air temperature sensor
(3) Resistance value (Ω)
(4) Intake air 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**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.395 V

Time Needed for Diagnosis: 500 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 0.395 V

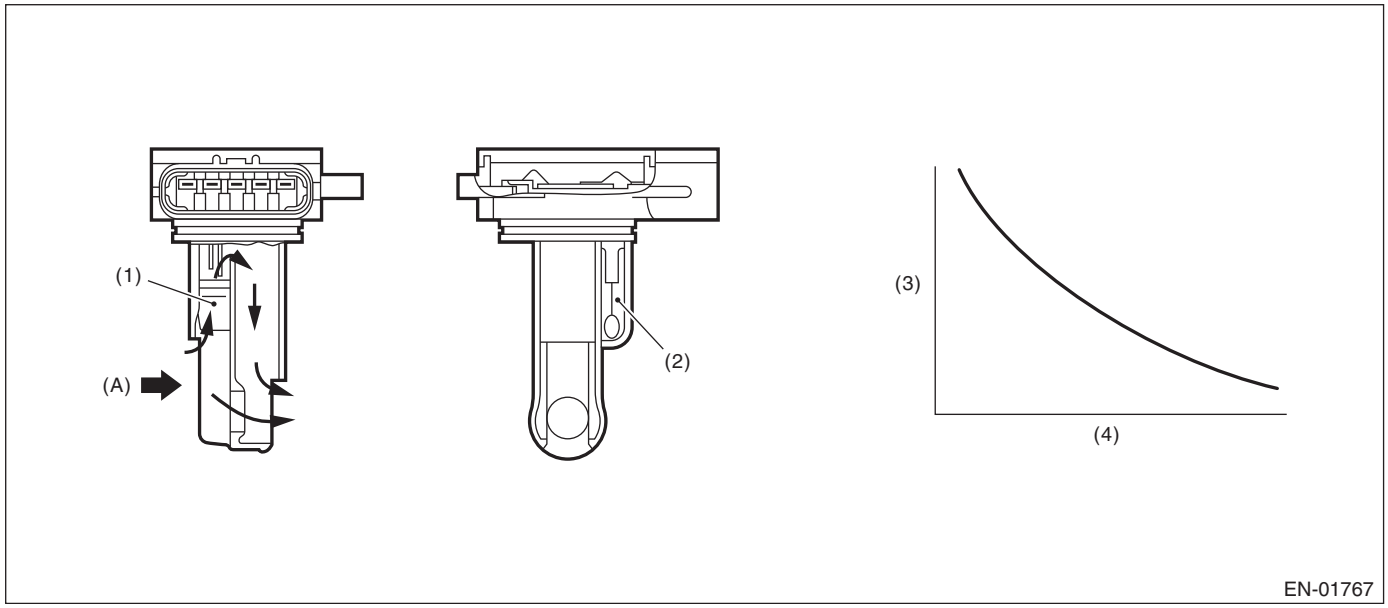
Time Needed for Diagnosis: Less than 1 second

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 out of specification.

2. COMPONENT DESCRIPTION



(A) Air

(1) Air flow sensor
(2) Intake air temperature sensor
(3) Resistance value (Ω)
(4) Intake air 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**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.712 V

Time Needed for Diagnosis: 500 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 4.712 V

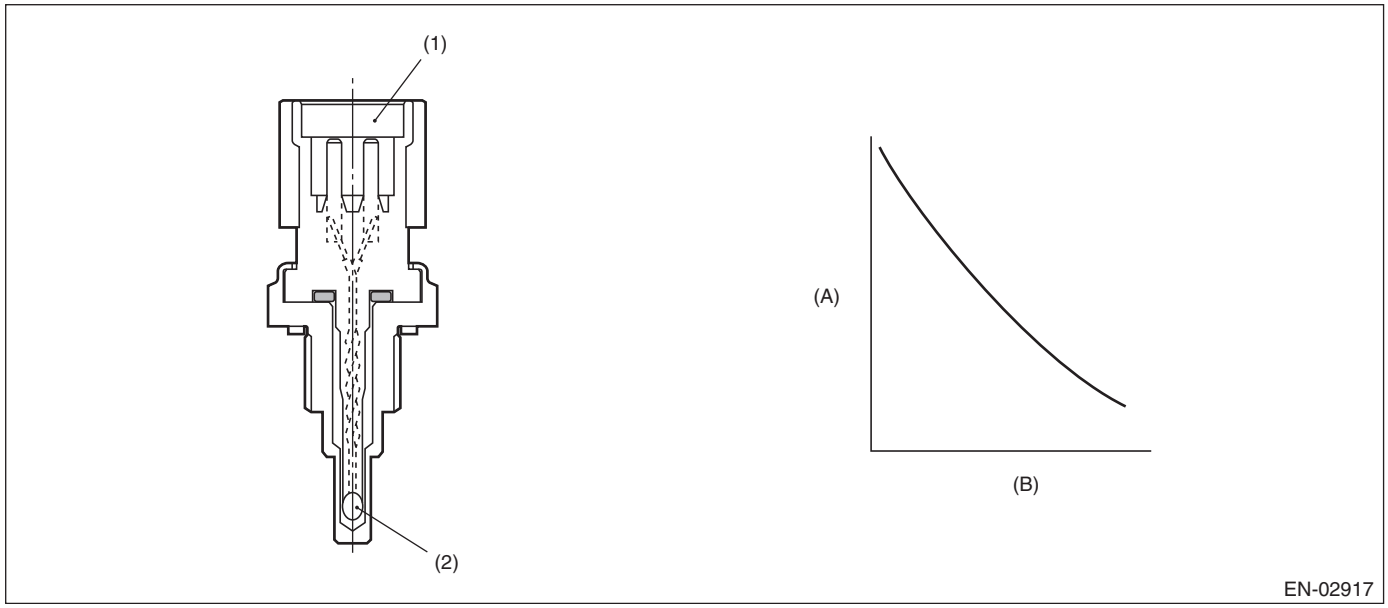
Time Needed for Diagnosis: Less than 1 second

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 out of specification.

2. COMPONENT DESCRIPTION



(A) Resistance value (kΩ)
(B) Temperature °C (°F)
(1) Connector
(2) Thermistor element

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.464 V

Time Needed for Diagnosis: 500 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 0.464 V

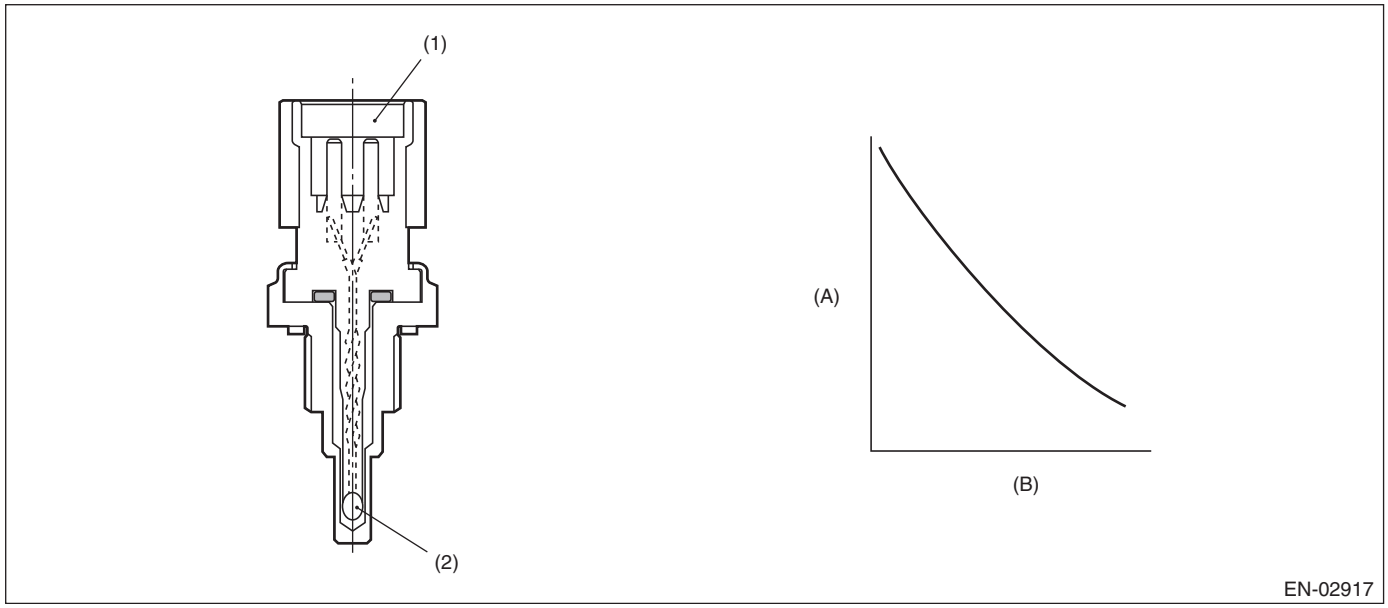
Time Needed for Diagnosis: Less than 1 second

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 out of specification.

2. COMPONENT DESCRIPTION



(A) Resistance value (kΩ)
(B) Temperature °C (°F)
(1) Connector
(2) Thermistor element

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.702 V

Time Needed for Diagnosis: 500 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 4.702 V

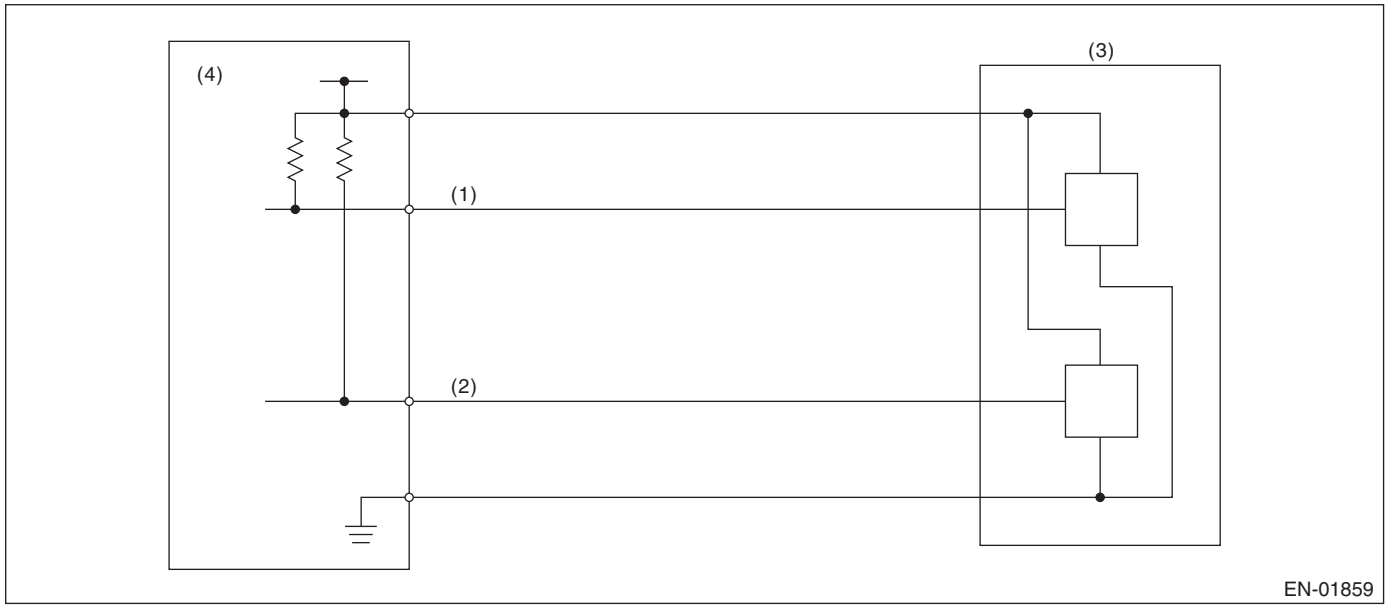
Time Needed for Diagnosis: Less than 1 second

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 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
Battery voltage	≥ 6 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	≤ 0.23 V

Time Needed for Diagnosis: 24 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	> 0.23 V

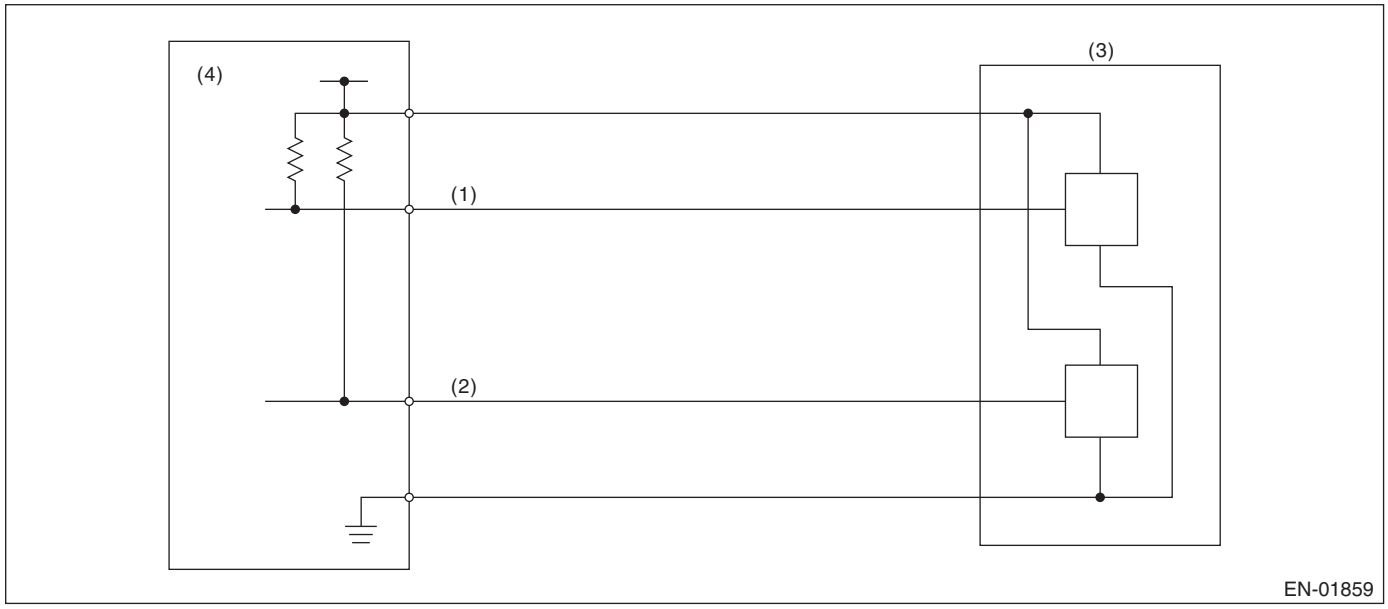
Time Needed for Diagnosis: 24 ms

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 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
Battery voltage	≥ 6 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	≥ 4.858 V

Time Needed for Diagnosis: 24 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	< 4.858 V

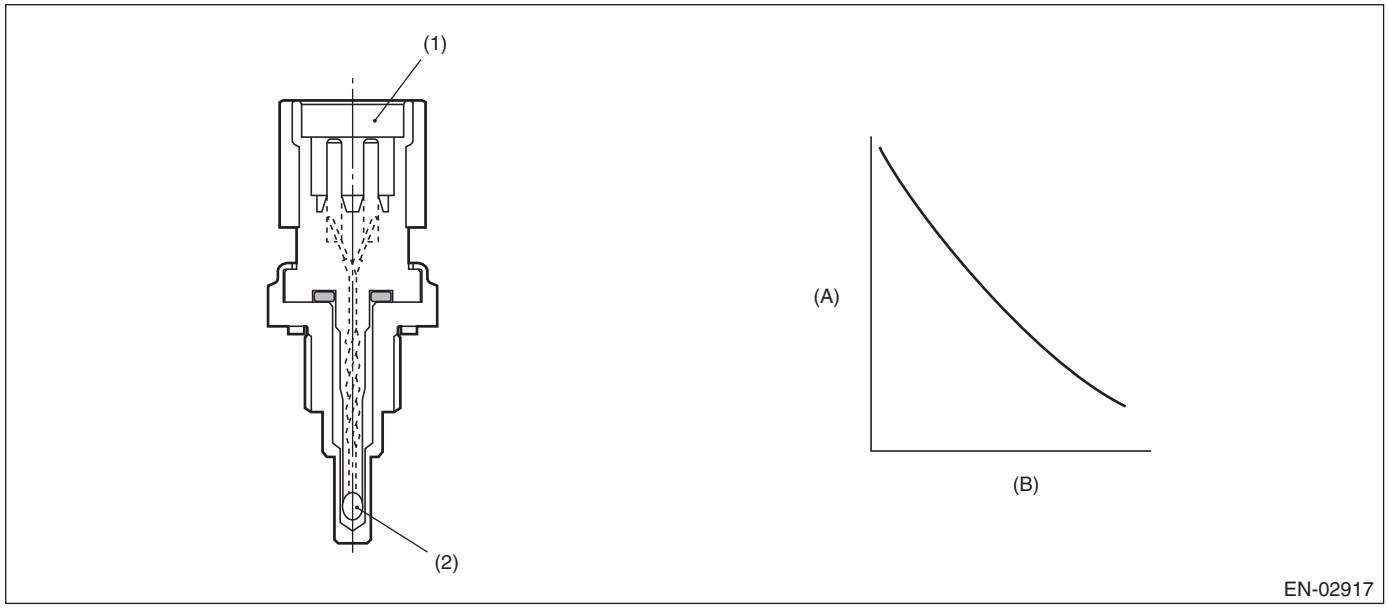
Time Needed for Diagnosis: 24 ms

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



(A) Resistance value (kΩ)
(B) Temperature °C (°F)
(1) Connector
(2) Thermistor element

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	≥ Value from Map
Battery voltage	≥ 10.9 V

Map

Engine coolant temperature °C (°F)	–40 (–40)	–30 (–22)	–20 (–4)	–10 (14)	0 (32)	10 (50)	20 (68)	30 (86)
Engine speed rpm	500	500	500	500	500	500	500	500

Engine coolant temperature °C (°F)	40 (104)	50 (122)	60 (140)	70 (158)	80 (176)	90 (194)	100 (212)	110 (230)
Engine speed rpm	500	500	500	500	500	500	500	500

4. GENERAL DRIVING CYCLE

Perform the diagnosis only once after engine start.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG if the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature	< 20 °C (68 °F)
Timer for diagnosis after engine start	≥ Judgment value of timer after engine start

Timer for diagnosis after engine start
a. Timer stop at fuel cut
b. During the driving conditions except a) above, timer counts up as follows.
64 ms + TWCNT ms (when at 64 ms)
TWCNT is defined as follows,
TWCNT = 0 at idle switch ON
TWCNT show on the following table at idle switch OFF.

		Vehicle speed km/h (MPH)							
		0 (0)	8 (5)	16 (9.9)	24 (14.9)	32 (19.9)	40 (24.9)	48 (29.8)	56 (34.8)
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	185.26 ms
	–10 (14)	0 ms	25.704 ms	33.606 ms	41.508 ms	68.52 ms	95.532 ms	125.667 ms	155.802 ms
	0 (32)	0 ms	17.646 ms	25.548 ms	33.45 ms	53.652 ms	73.855 ms	97.12 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
	20 (68)	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 = 424954 ms – 26406 ms × Ti
Ti : The lowest coolant temperature after engine start
Time Needed for Diagnosis: Less than 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
Engine coolant temperature	≥ 20 °C (68 °F)

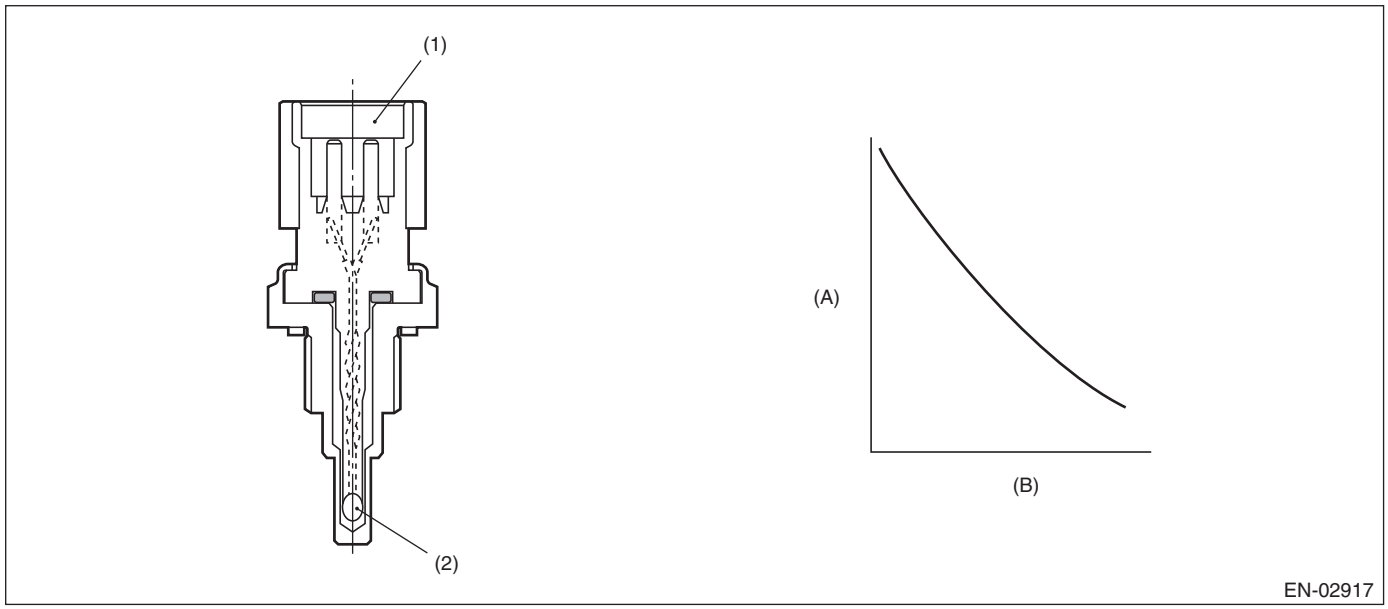
Time Needed for Diagnosis: Less than 1 second

X: DTC P0126 INSUFFICIENT ENGINE COOLANT TEMPERATURE FOR STABLE OPERATION

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of the engine coolant temperature sensor characteristics.
When the ignition is ON after the specified period of soaking time has elapsed, compare the engine coolant temperature with intake air temperature. Judge as NG if the difference between two temperatures is larger than the predetermined value.

2. COMPONENT DESCRIPTION



(A) Resistance value (kΩ)
(B) Temperature °C (°F)
(1) Connector
(2) Thermistor element

3. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Engine speed	< 300 rpm
Soaking time	≥ 21600 s
Engine coolant temperature at the last engine stop	≥ 58.5°C (137.3°F)

4. GENERAL DRIVING CYCLE

Perform the diagnosis only once after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature – intake air temperature	> 15°C (27°F)

Time Needed for Diagnosis: 320 ms
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature – intake air temperature	≤ 15°C (27°F)

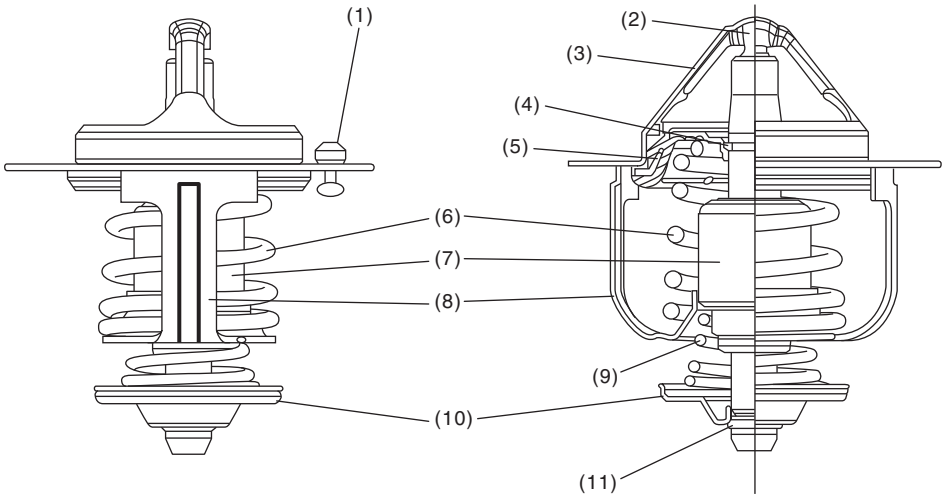
Time Needed for Diagnosis: Less than 1 second

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 any one of the following conditions is established.
• When the actual engine coolant temperature does not reach to the maximum temperature necessary to perform other OBDII diagnosis (Judgment 1)
• When the actual engine coolant temperature does not reach to the range within –11°C (–19.8°F) from the regulated temperature (Judgment 2)
• When the difference between the estimated coolant temperature and the actual engine coolant temperature exceeds the predetermined value (Judgment 3)

2. COMPONENT DESCRIPTION



(1) Jiggle valve
(2) Piston
(3) Flange
(4) Stop ring
(5) Dust seal
(6) Main spring
(7) Wax element
(8) Frame
(9) Bypass spring
(10) Bypass valve
(11) Stop ring

3. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
<judgement 1 and judgement 2>	
Battery voltage	≥ 10.9 V
Estimate ambient temperature	≥ –7 °C (19.4 °F)
Vehicle speed	≥ 30 km/h (18.6 MPH)
After experiencing the estimated engine coolant temperature > regulated coolant temperature – 7 °C (12.6°F), the estimated engine coolant temperature > regulated coolant temperature – 7 °C (12.6°F) + 4 °C (7.2°F)	Completed
Intake air amount sum value	≥ Value of Map 1
<judgement 3>	
Battery voltage	≥ 10.9 V
Estimate ambient temperature	≥ –7 °C (19.4 °F)
Vehicle speed	≥ 30 km/h (18.6 MPH)
Estimated coolant temperature	≥ Value from Map 2

Map 1

Engine coolant temperature at engine starting °C (°F)	–7 (19.4)	0 (32)	8 (46.4)	25 (77)
Intake air amount sum value g (oz)	7500 (264.53)	7000 (246.89)	6650 (234.55)	6240 (220.08)

Map 2

Estimate ambient temperature °C (°F)	–7 (19.4)	0 (32)	8 (46.4)	25 (77)
Estimated coolant temperature °C (°F)	53 (127.4)	56 (132.8)	65 (149)	75 (167)

4. GENERAL DRIVING CYCLE

Perform the diagnosis only once after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
When any one of the followings is established.	
• Actual engine coolant temperature (Judgement 1)	< Value of Map 3
• Actual engine coolant temperature (Judgement 2)	< (regulated temperature or alternative threshold value) – 11.1°C (20°F)
• Estimated engine coolant temperature – actual engine coolant temperature (Judgement 3)	> Value of Map 4

Map 3

Estimate ambient temperature °C (°F)	–7 (19.4)	0 (32)	8 (46.4)	25 (77)
Actual engine coolant temperature °C (°F)	60.9 (141.6)	60.9 (141.6)	75 (167)	75 (167)

Map 4

Estimate ambient temperature °C (°F)	–7 (19.4)	0 (32)	8 (46.4)	25 (77)
Estimated engine coolant temperature – actual engine coolant temperature °C (°F)	19 (34.2)	19 (34.2)	19 (34.2)	19 (34.2)

Time Needed for Diagnosis: 16 — 30 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
All of the following conditions are established.	
• Engine coolant temperature at engine starting	< 58.5 °C (137.3 °F)
• Actual engine coolant temperature	> Value of Map 3
• Actual engine coolant temperature	> (regulated temperature or alternative threshold value) – 11.1°C (20°F)
• Estimated engine coolant temperature – actual engine coolant temperature	< Value of Map 4

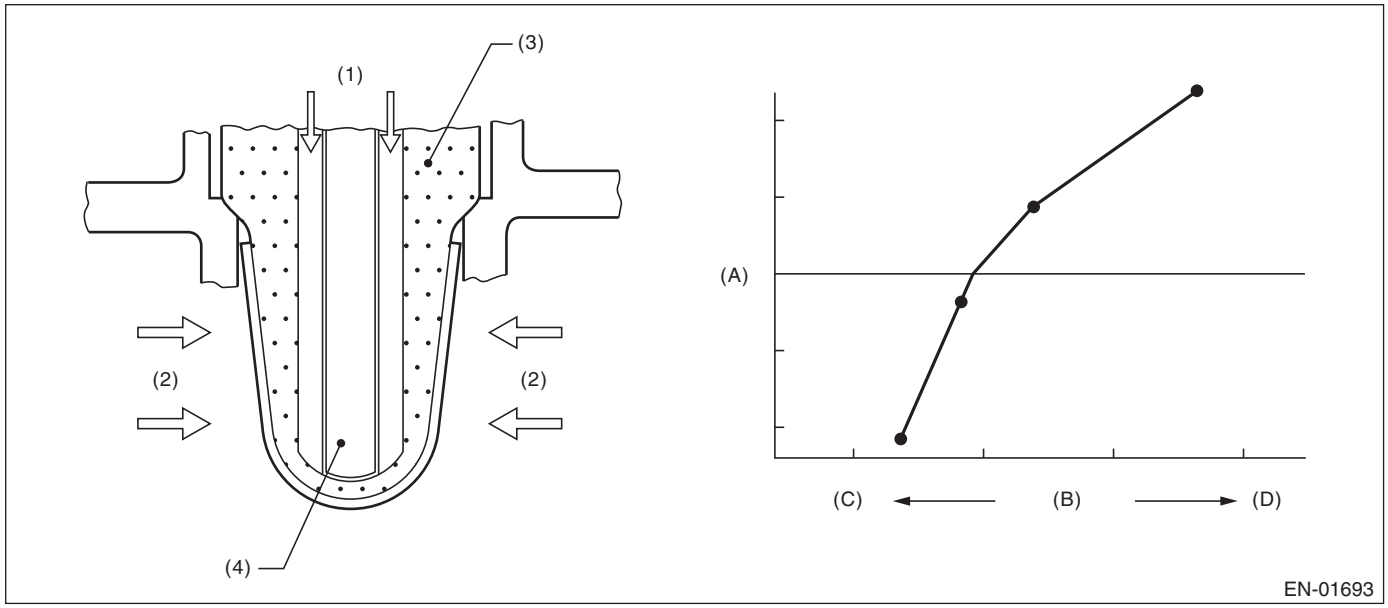
Time Needed for Diagnosis: Less than 1 second

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 voltage is out of the specified range.

2. COMPONENT DESCRIPTION



(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich

(1) Atmosphere
(2) Exhaust gas
(3) ZrO_2
(4) Ceramic heater

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Input voltage (+)	< 1.128 V
or	
Input voltage (–)	< 0.23 V
or	
|Input voltage (+) – Input voltage (–)|	< 0.573 V

Time Needed for Diagnosis:
Input voltage (+): 1000 ms
Input voltage (–): 1000 ms
|Input voltage (+) – Input voltage (–)|: 1000 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Input voltage (+)	≥ 1.128 V
Input voltage (–)	≥ 0.23 V
|Input voltage (+) – Input voltage (–)|	≥ 0.573 V

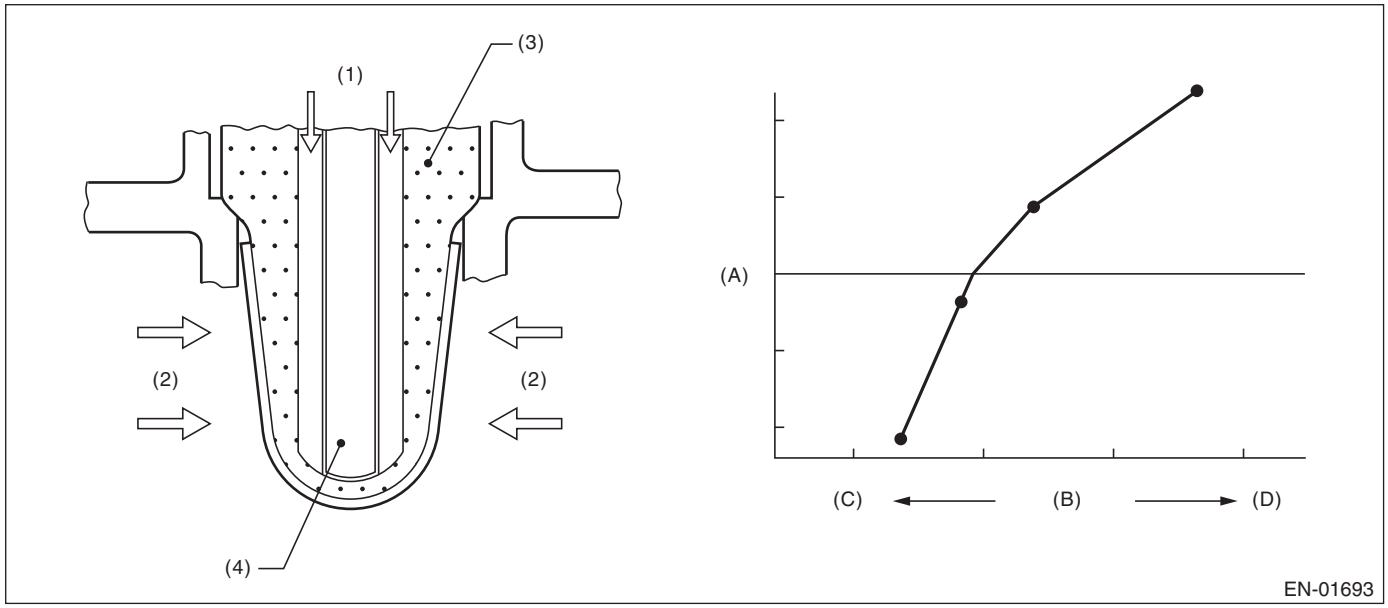
Time Needed for Diagnosis: Less than 1 second

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 voltage is out of the specified range.

2. COMPONENT DESCRIPTION



(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich

(1) Atmosphere
(2) Exhaust gas
(3) ZrO_2
(4) Ceramic heater

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Input voltage (+)	> 3.589 V
or	
Input voltage (–)	> 3.599 V

Time Needed for Diagnosis:
Input voltage (+): 1000 ms
Input voltage (–): 1000 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

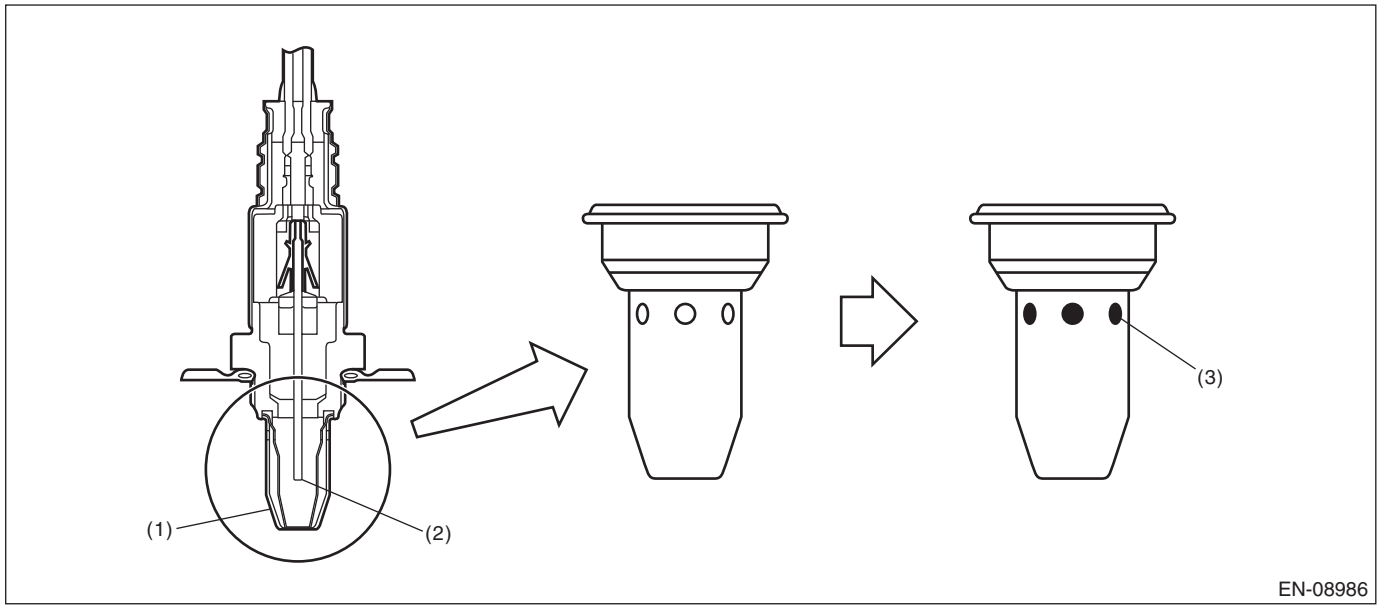
Malfunction Criteria	Threshold Value
Input voltage (+)	≤ 3.589 V
Input voltage (–)	≤ 3.599 V

Time Needed for Diagnosis: Less than 1 second

AB:DTC P0133 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1)

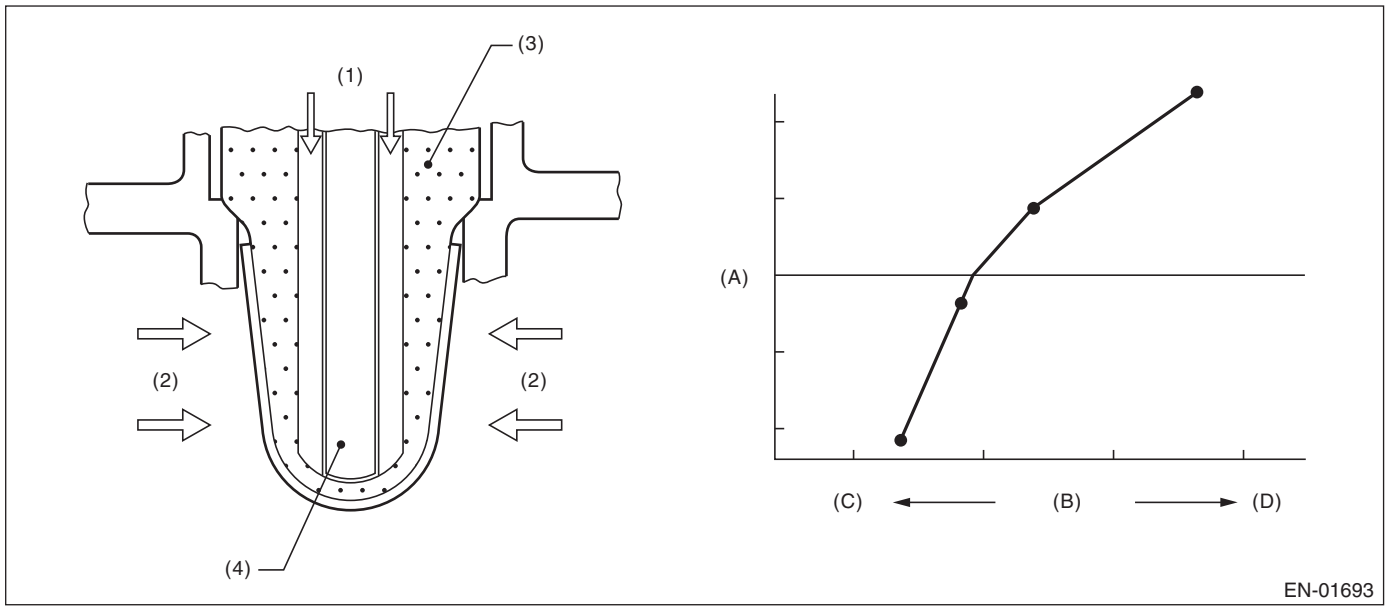
1. OUTLINE OF DIAGNOSIS

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 actual change from rich to lean occurs.
Judge as NG when the actual movement in comparison to the ECM control amount is slow.



(1) Cover (2) Zirconia (3) Clogging

2. COMPONENT DESCRIPTION



(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich

(1) Atmosphere
(3) ZrO_2
(4) Ceramic heater
(2) Exhaust gas

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Time needed for all secondary parameters to be in enable conditions	≥ 1024 ms
Battery voltage	≥ 10.9 V
Atmospheric pressure	> 75 kPa (563 mmHg, 22.2 inHg)
Closed loop control with main feedback	Operation
Front oxygen (A/F) sensor impedance	0 Ω — 50 Ω
Elapsed time after starting the engine	≥ 120000 ms
Engine coolant temperature	≥ 70 °C (158 °F)
Engine speed	1000 rpm — 3200 rpm
Vehicle speed	10 km/h — 120 km/h (6.2 MPH — 74.6 MPH)
Amount of intake air	10 g/s — 40 g/s (0.35 oz/s — 1.41 oz/s)
Engine load	< 0.02 g/rev (0 oz/rev)
Learning value of EVAP conc. during purge	< 0.2
Total time of operating canister purge	≥ 19.9 s

4. GENERAL DRIVING CYCLE

Perform diagnosis only once at a constant speed of 10 km/h — 120 km/h (6.2 MPH — 74.6 MPH) 120000 ms or more after starting the engine.

5. DIAGNOSTIC METHOD

Calculate faf difference every 32 ms × 4 , and the λ value difference. Calculate the diagnosis value after calculating 820 time(s).

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
parafca = td2faf/td2lmd where, td2faf (N) = td2faf (n–1) + |d2faf (n)| td2lmd (N) = td2lmd (n–1) + |d2lmd (n)| add up to 32 ms × 4 × 820 time(s). d2faf (n) = (faf (n) – faf (n–1)) – (faf (n–1) – faf (n–2)) d2lmd (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	> 0.4

Time Needed for Diagnosis: 32 ms × 4 × 820 time(s)
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
parafca = td2faf/td2lmd where, td2faf (N) = td2faf (n–1) + |d2faf (n)| td2lmd (N) = td2lmd (n–1) + |d2lmd (n)| add up to 32 ms × 4 × 820 time(s). d2faf (n) = (faf (n) – faf (n–1)) – (faf (n–1) – faf (n–2)) d2lmd (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	≤ 0.4

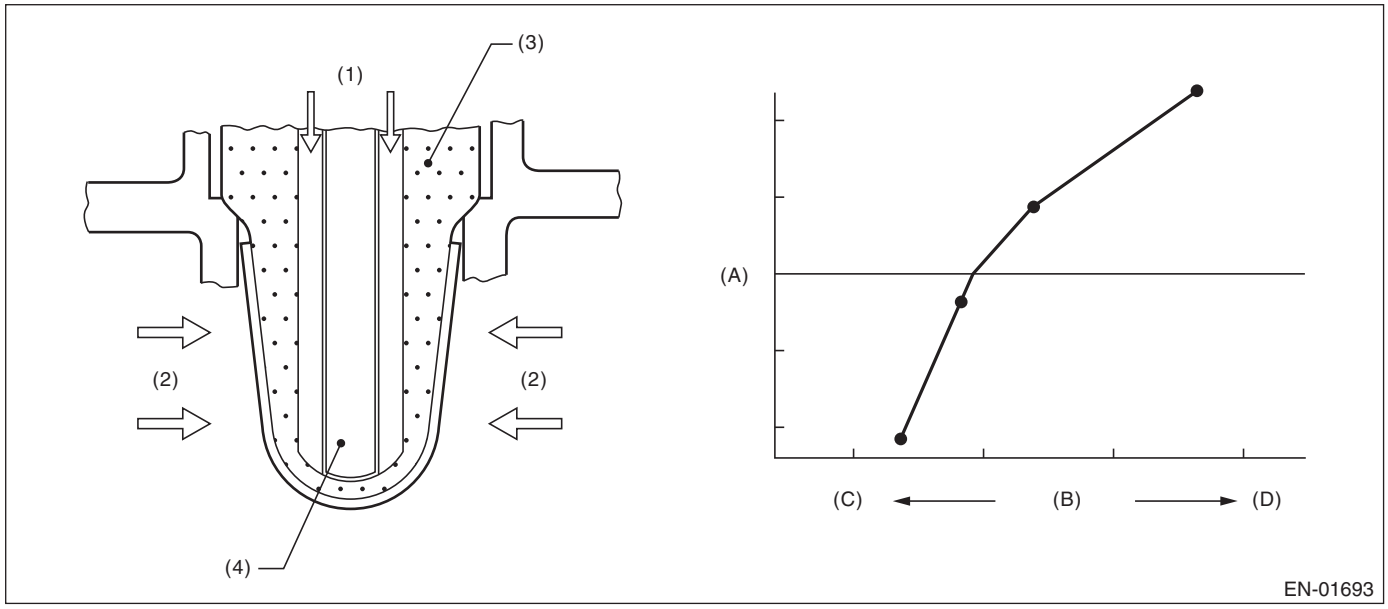
Time Needed for Diagnosis: 32 ms × 4 × 820 time(s)

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



(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich

(1) Atmosphere
(3) ZrO_2
(4) Ceramic heater
(2) Exhaust gas

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Time of heater control duty at 70 % or more	≥ 36000 ms
Front oxygen (A/F) sensor impedance.	> 500 Ω

Time Needed for Diagnosis: 5000 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Front oxygen (A/F) sensor impedance.	≤ 500 Ω

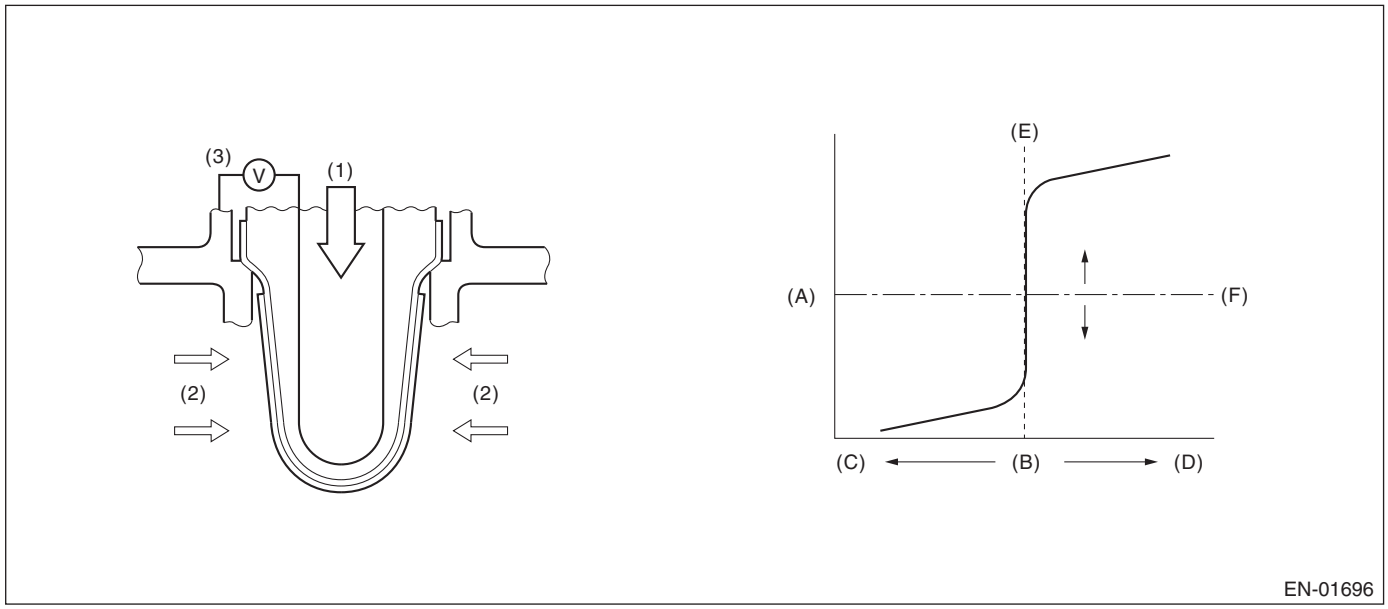
Time Needed for Diagnosis: Less than 1 second

AD:DTC P0137 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2)

1. OUTLINE OF DIAGNOSIS

Detect continuity NG of the oxygen sensor. If the oxygen sensor voltage reading is not within the probable range considering the operating conditions, judge as NG.

2. COMPONENT DESCRIPTION



(A)	Electromotive force	(B)	Air fuel ratio	(C)	Rich
(D)	Lean	(E)	Theoretical air fuel ratio	(F)	Comparative voltage
(1)	Atmosphere	(2)	Exhaust gas	(3)	Electromotive force

3. ENABLE CONDITION

Used for abnormality judgment

Secondary Parameters	Enable Conditions
High	
Secondary air system	Not in operation
Closed loop control at the oxygen sensor	In operation
Misfire detection every 200 rotations	< 5 time(s)
Front oxygen (A/F) sensor compensation coefficient	Not in limit value
Battery voltage	≥ 10.9 V
Engine coolant temperature	≥ 70 °C (158 °F)
Low (1)	
Secondary air system	Not in operation
Closed loop control at the oxygen sensor	In operation
Misfire detection every 200 rotations	< 5 time(s)
Front oxygen (A/F) sensor compensation coefficient	Not in limit value
Battery voltage	≥ 10.9 V
Engine coolant temperature	≥ 70 °C (158 °F)
Amount of intake air	≥ 10 g/s (0.35 oz/s)
Low (2)	
Secondary air system	Not in operation
Closed loop control at the oxygen sensor	In operation
Misfire detection every 200 rotations	< 5 time(s)
Front oxygen (A/F) sensor compensation coefficient	Not in limit value
Battery voltage	≥ 10.9 V
Engine coolant temperature	≥ 70 °C (158 °F)
Amount of intake air	< 10 g/s (0.35 oz/s)
Current continuation time of the rear oxygen sensor heater	≥ 30000 ms
Low (3)	
Secondary air system	Not in operation
Closed loop control at the oxygen sensor	In operation
Misfire detection every 200 rotations	< 5 time(s)
Front oxygen (A/F) sensor compensation coefficient	Not in limit value
Battery voltage	≥ 10.9 V
Engine coolant temperature	≥ 70 °C (158 °F)
Amount of intake air	< 10 g/s (0.35 oz/s)
Current continuation time of the rear oxygen sensor heater	≥ 30000 ms
Fuel cut	Experienced

Used for normality judgment

Secondary Parameters	Enable Conditions
Secondary air system	Not in operation
Closed loop control at the oxygen sensor	In operation
Misfire detection every 200 rotations	< 5 time(s)
Front oxygen (A/F) sensor compensation coefficient	Not in limit value
Battery voltage	≥ 10.9 V
Engine coolant temperature	≥ 70 °C (158 °F)

4. GENERAL DRIVING CYCLE

After starting the engine, continuously perform the diagnosis with the same engine condition.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
High Sensor output voltage	> 1.2 V	P0138
Low Sensor output voltage	< 0.03 V	P0137

Time Needed for Diagnosis:

High: 2500 ms
Low (1): 20000 ms
Low (2): 40000 ms
Low (3): Value from Map

Map

Fuel cut time (ms)	0	2000	10000
Time Needed for Diagnosis (ms)	40000	40000	60000

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
High Sensor output voltage	≤ 1.2 V	P0138
Low Sensor output voltage	≥ 0.03 V	P0137

Time Needed for Diagnosis:

High: Less than 1 s
Low (1): Less than 1 s
Low (2): Less than 1 s
Low (3): Less than 1 s

AE:DTC P0138 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2)

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0137. <Ref. to GD(H4DO)-65, DTC P0137 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

AF:DTC P0139 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2)

1. OUTLINE OF DIAGNOSIS

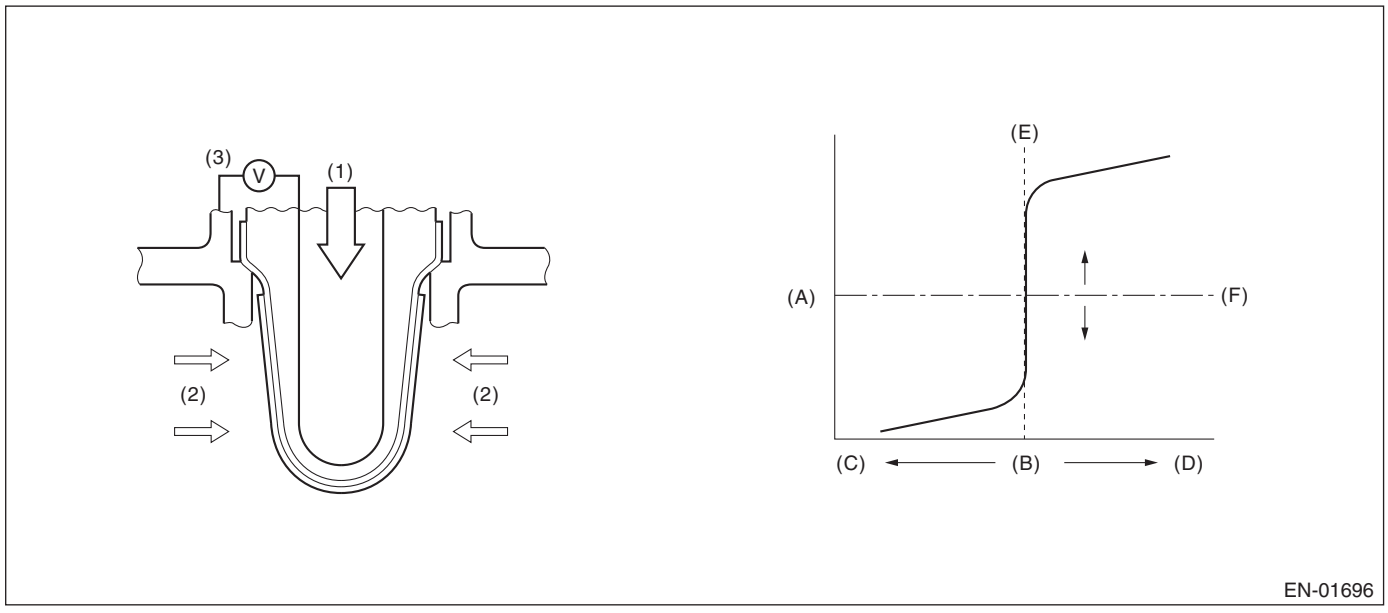
Detect the slow response of the oxygen sensor.
Judge as NG if either the rich to lean response diagnosis or lean to rich response diagnosis is NG, and judge as OK if both are OK.
[Rich → lean diagnosis response]
1. Measure the response time for oxygen sensor output changes when the A/F ratio changes 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. Response time calculation is categorized in two by voltage difference.
   - Response time in small voltage difference: Intermediate
   - Response time in large voltage difference: Wide
2. Judge as NG when the oxygen sensor voltage is large (rich) even after deceleration fuel cut has occurred.

[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



(A)	Electromotive force	(B)	Air fuel ratio	(C)	Rich
(D)	Lean	(E)	Theoretical air fuel ratio	(F)	Comparative voltage
(1)	Atmosphere	(2)	Exhaust gas	(3)	Electromotive force

3. ENABLE CONDITION

Rich → lean diagnosis response

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
A/F main feedback control condition	Complete
Deceleration fuel cut time of 5000 ms or more (intermediate) Deceleration fuel cut time of 5000 ms or more (wide)	Experienced
After fuel cut	≥ 2000 ms (Intermediate) ≥ 2000 ms (Wide)
Estimated temperature of the rear oxygen sensor element	≥ 500 °C (932 °F) (Intermediate) ≥ 500 °C (932 °F) (Wide)
Number of deceleration fuel cut	≥ 1 time(s)

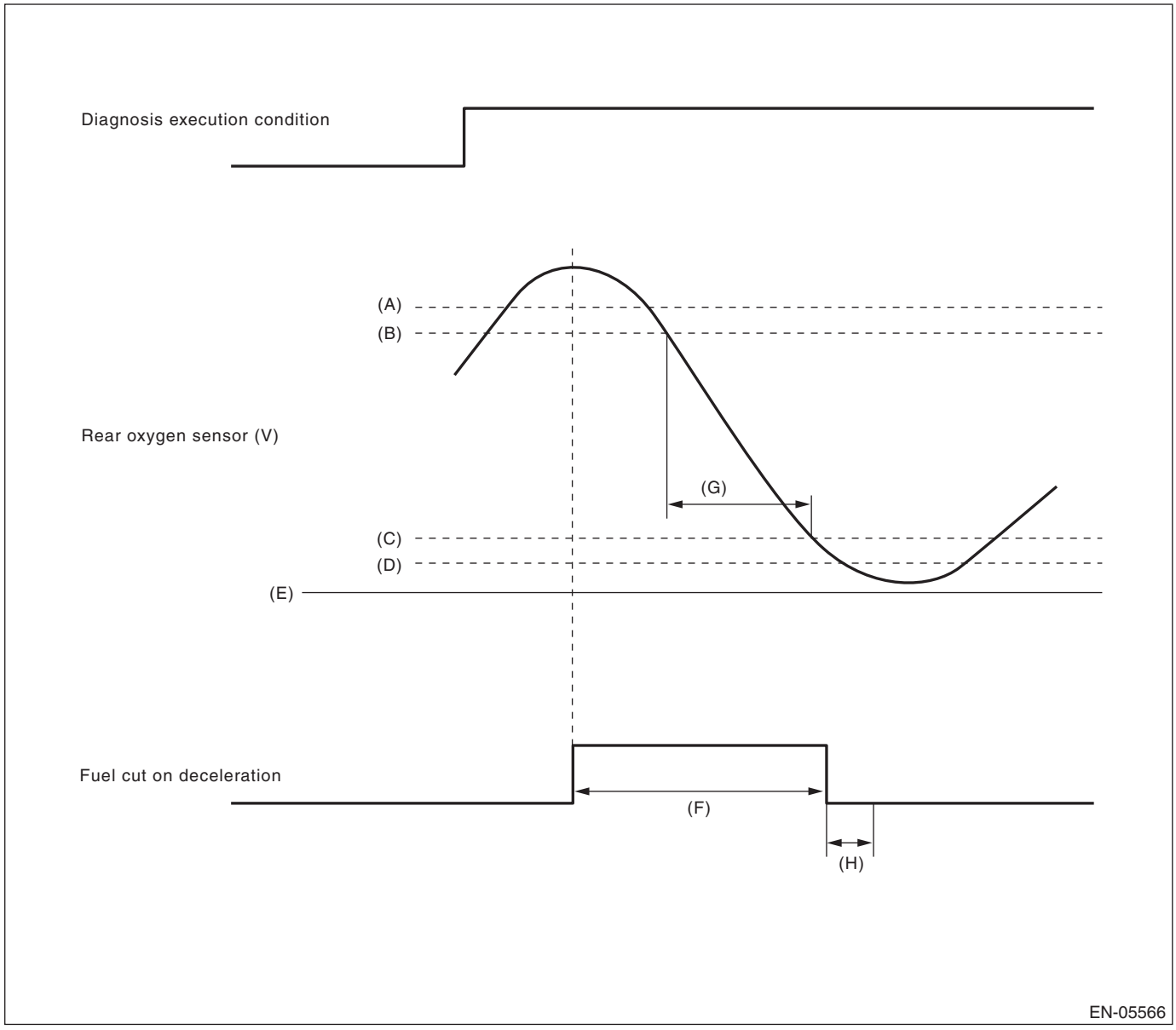
4. GENERAL DRIVING CYCLE

Perform diagnosis once during deceleration fuel cut from a constant and high speed driving, when rear oxygen sensor is warmed up sufficiently. (Pay attention to the oxygen sensor voltage for the timing of the deceleration.)

5. DIAGNOSTIC METHOD

- Intermediate

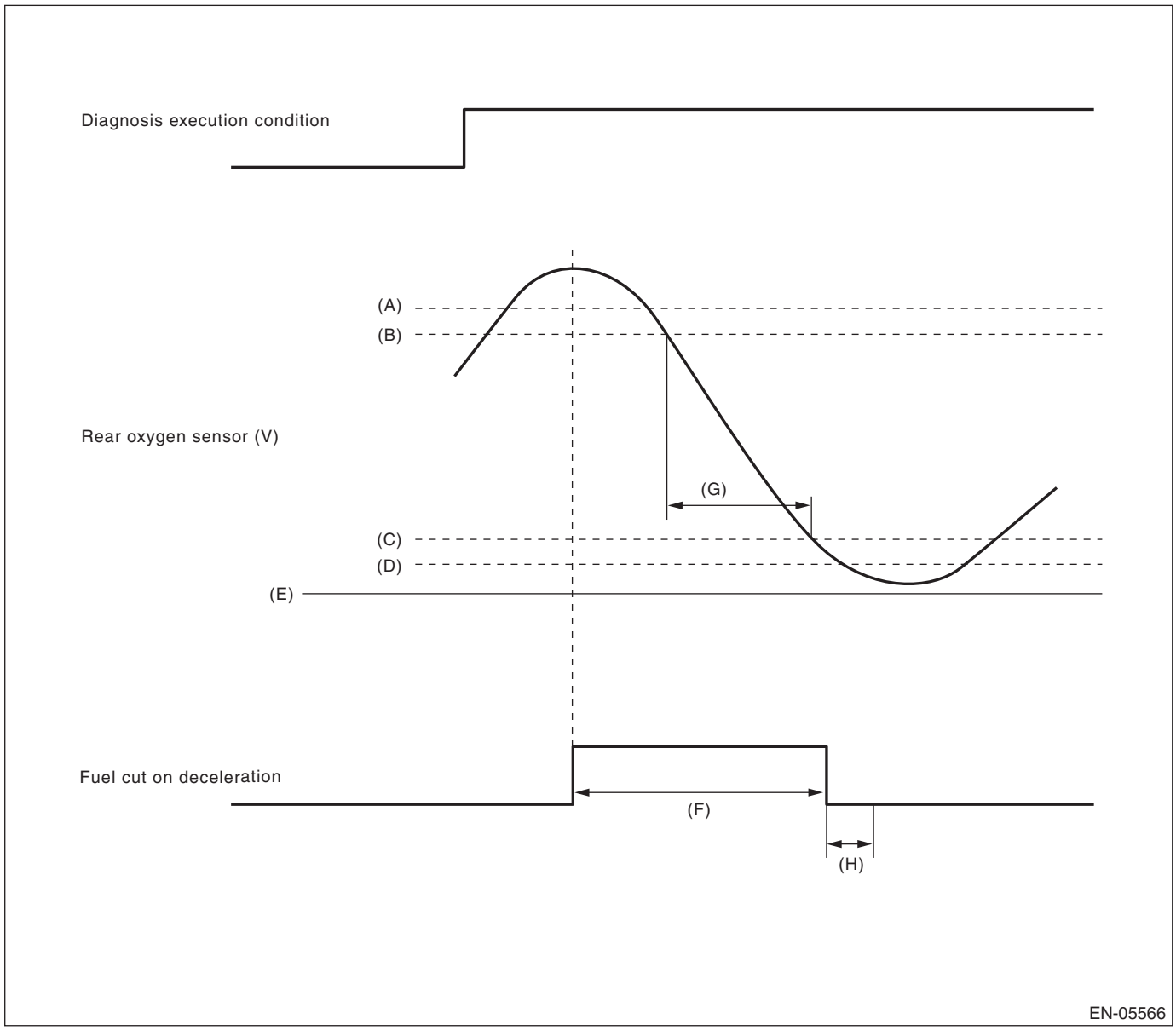
When the oxygen sensor output voltage changes from 0.55 V (rich) to 0.15 V (lean), calculate the minimum response time for output change between 0.5 V and 0.2 V for the judgment criteria.



(A) 0.55 V
(B) 0.5 V
(C) 0.2 V
(D) 0.15 V
(E) 0 V
(F) More than 5000 ms
(G) Measure the response time.
(H) Execute the malfunction judgment in 2000 ms from the recovery of fuel cut on deceleration.

- Wide

When the oxygen sensor output voltage changes from 0.65 V (rich) to 0.05 V (lean), calculate the minimum response time for output change between 0.6 V and 0.1 V for the judgment criteria.



(A) 0.65 V
(B) 0.6 V
(C) 0.1 V
(D) 0.05 V
(E) 0 V
(F) More than 5000 ms
(G) Measure the response time.
(H) Execute the malfunction judgment in 2000 ms from the recovery of fuel cut on deceleration.

• 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:
Perform NG judgment only during fuel cut, when exhaust gas apparently changes from rich → lean. Even without deceleration fuel cut, judge as OK if the value is below the threshold.
2) Judge as NG when the oxygen sensor voltage at a deceleration fuel cut is large.
Judge as NG when oxygen sensor voltage is large even after a long period of deceleration fuel cut has completed.

Judgment value (Intermediate)

Malfunction Criteria	Threshold Value
Shortest time change from rich (0.5 V O_2 output) to lean (0.2 V) when voltage reduces from 0.55 V to 0.15 V	> 491 ms
or	
Longest time over 0.55 V	≥ 2000 ms

Judgment value (Wide)

Malfunction Criteria	Threshold Value
Shortest time change from rich (0.6 V O_2 output) to lean (0.1 V) when voltage reduces from 0.65 V to 0.05 V	> Value from Map
or	
Longest time over 0.65 V	≥ 2000 ms

Map

Estimated temperature of rear oxygen sensor element when fuel cut starts °C (°F)	0 (32)	450 (842)	480 (896)	500 (932)	1000 (1832)
Longest time in rich status after fuel cut (ms)	2000	2000	2000	2000	2000

Time Needed for Diagnosis: 1 time(s)
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 and clear the NG if the following conditions are established.

Judgment value (Intermediate)

Malfunction Criteria	Threshold Value
Shortest time change from rich (0.5 V O_2 output) to lean (0.2 V) when voltage reduces from 0.55 V to 0.15 V	≤ 491 ms

Judgment value (Wide)

Malfunction Criteria	Threshold Value
Shortest time change from rich (0.6 V O_2 output) to lean (0.1 V) when voltage reduces from 0.65 V to 0.05 V	≤ 2000 ms

Time Needed for Diagnosis: 1 time(s)

6. ENABLE CONDITION

Lean → rich response diagnosis

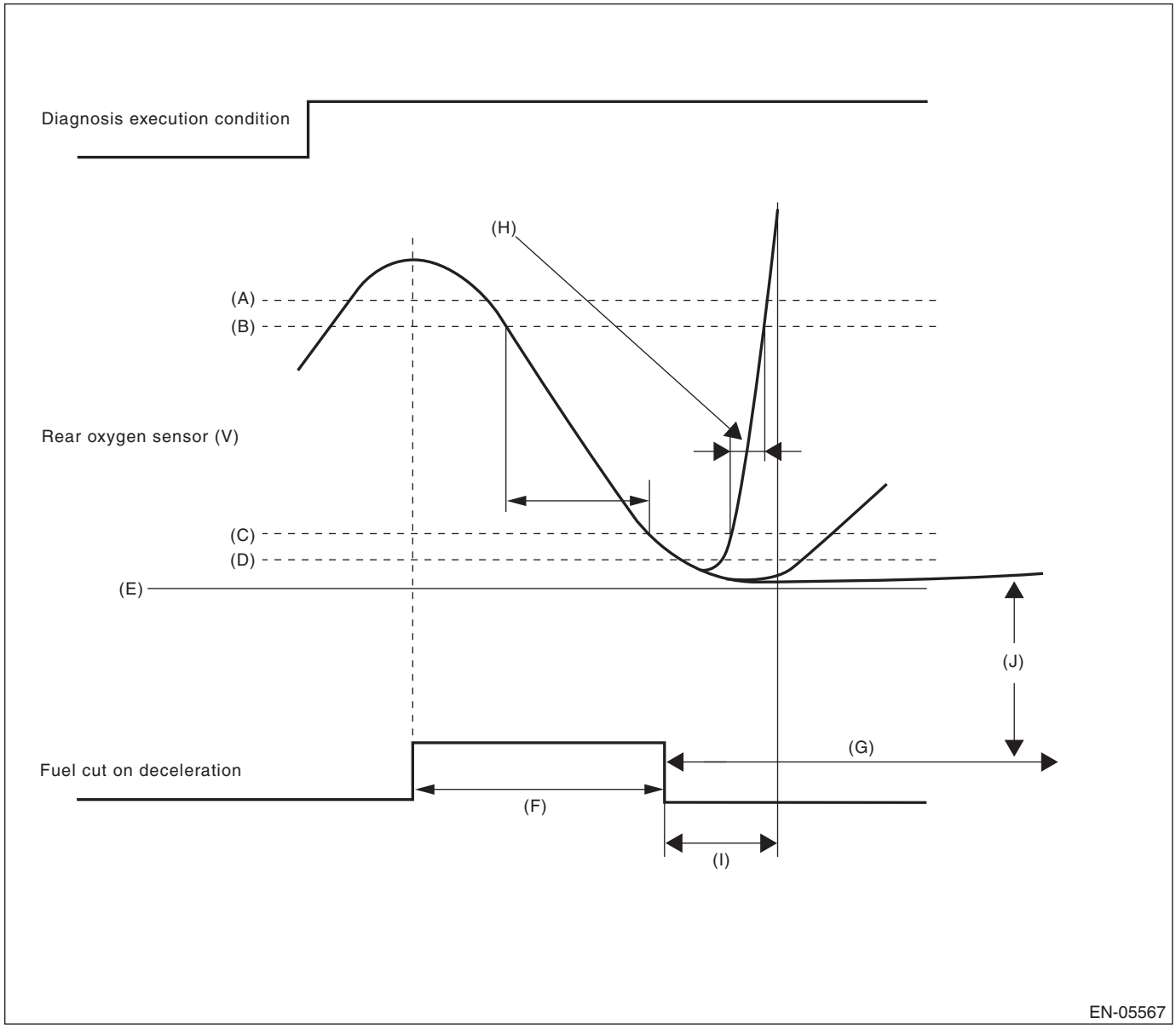
Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
A/F main feedback control condition	Complete
Deceleration fuel cut time is 6000 ms or more	Experienced
After fuel cut	≥ 2000 ms
Number of deceleration fuel cut	≥ 1 time(s)

7. GENERAL DRIVING CYCLE

Perform diagnosis once during deceleration fuel cut from a constant and high speed driving, when rear oxygen sensor is warmed up sufficiently. (Pay attention to the oxygen sensor voltage for the timing of the deceleration.)

8. DIAGNOSTIC METHOD

When the oxygen sensor output voltage changes from 0.25 V (lean) to 0.55 V (rich), calculate the minimum response time for output change between 0.3 V and 0.5 V for the judgment criteria.



(A) 0.55 V
(B) 0.5 V
(C) 0.3 V
(D) 0.25 V
(E) 0 V
(F) More than 5 seconds
(G) More than 120000 ms
(H) Measure the response time (diagnostic value).
(I) Execute the malfunction judgment in 4000 ms from the recovery of fuel cut on deceleration.
(J) Judge NG when the voltage of rear oxygen sensor is 0.25 V or less for 120000 ms or more after recovery of fuel cut on deceleration.

• 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
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 changes from 0.25 V to 0.55 V or Longest time under 0.25 V	> 4000 ms ≥ 120000 ms

Time Needed for Diagnosis: 1 time(s)
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 and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Shortest time change from lean (0.3 V O_2 output) to rich (0.5 V) when voltage changes from 0.25 V to 0.55 V	≤ 4000 ms

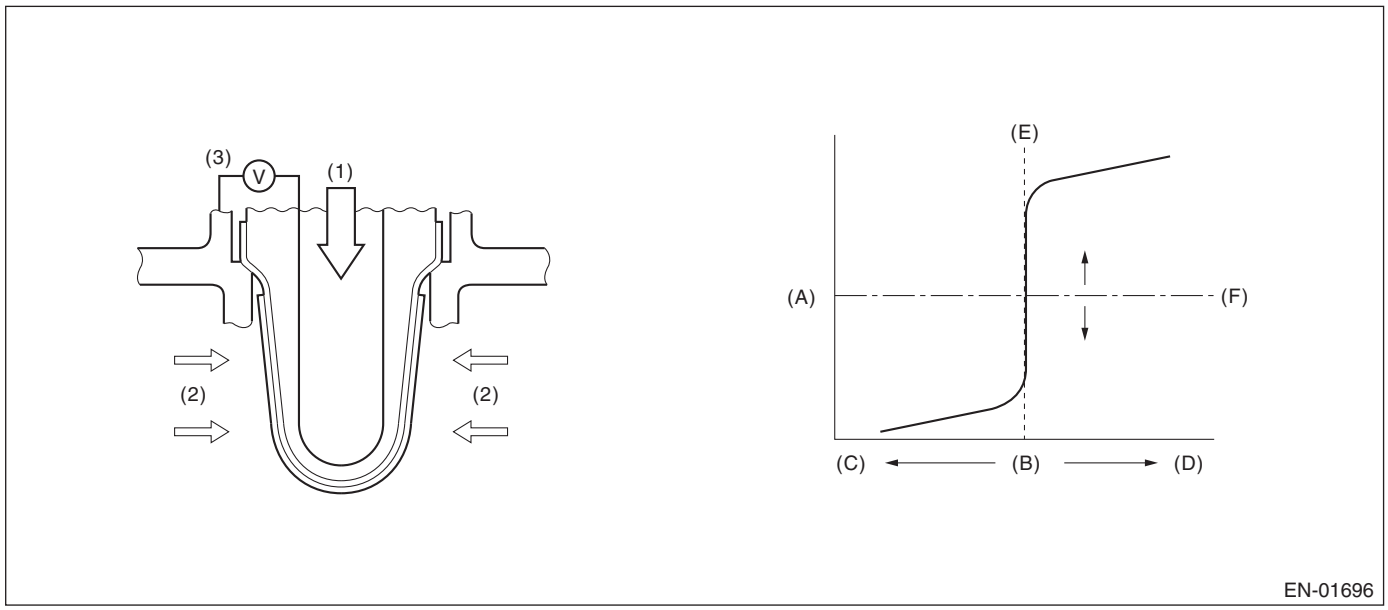
Time Needed for Diagnosis: 1 time(s)

AG:DTC P0140 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK1 SENSOR2)

1. OUTLINE OF DIAGNOSIS

Detect the rear oxygen sensor open or short circuit. Judge as NG when the rear oxygen sensor voltage can be determined to be abnormal considering conditions such as intake air amount, engine coolant temperature, main feedback control and deceleration fuel cut.

2. COMPONENT DESCRIPTION



(A)	Electromotive force	(B)	Air fuel ratio	(C)	Rich
(D)	Lean	(E)	Theoretical air fuel ratio	(F)	Comparative voltage
(1)	Atmosphere	(2)	Exhaust gas	(3)	Electromotive force

3. ENABLE CONDITION (USED ONLY FOR MALFUNCTION JUDGMENT)

Secondary Parameters	Enable Conditions
Closed loop control at the rear oxygen sensor	In operation
Target output voltage of rear oxygen sensor	≥ 0.55 V + 0.05 V
Amount of intake air	≥ 10 g/s (0.35 oz/s)
Engine coolant temperature	≥ 75 °C (167 °F)
Misfire detection every 200 rotations	< 5 time(s)
Front oxygen (A/F) sensor compensation coefficient	Not in limit value
Battery voltage	≥ 10.9 V
Deceleration fuel cut of 5000 ms or more.	Experienced

4. GENERAL DRIVING CYCLE

Perform the diagnosis once after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Minimum output voltage	> 0.15 V
or	
Maximum output voltage	< 0.55 V

Time Needed for Diagnosis: 200000 ms
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG if the following conditions are established.

Judgment Value

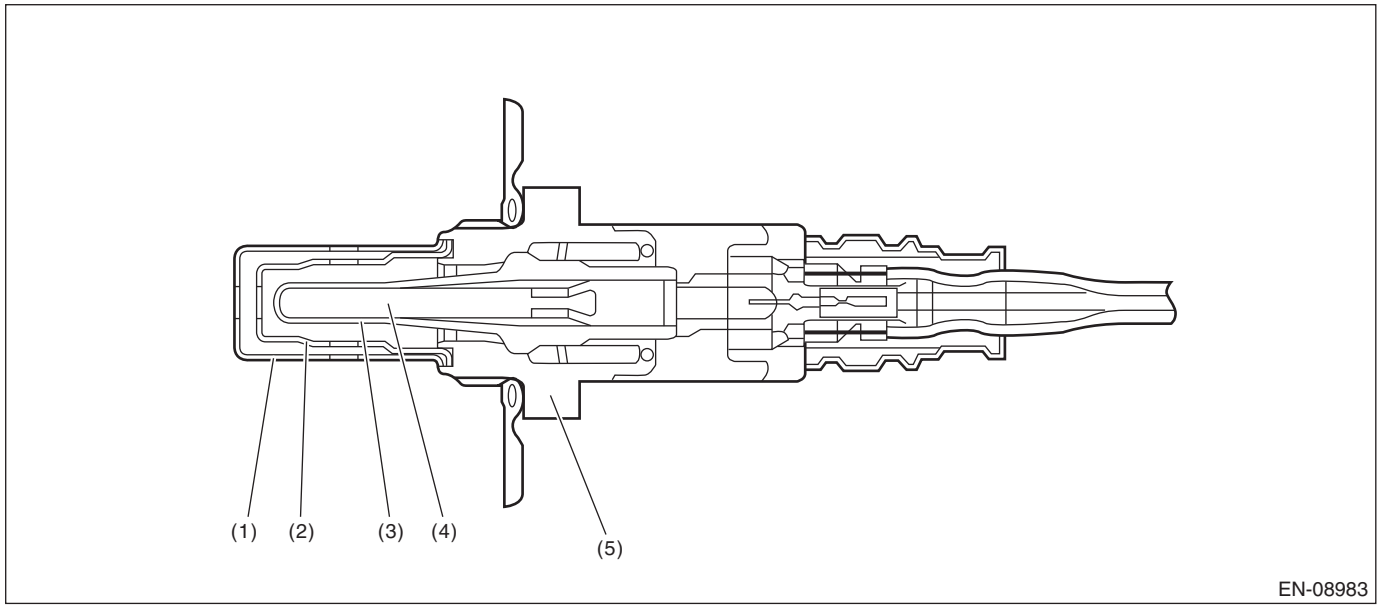
Malfunction Criteria	Threshold Value
Diagnosis of the rear oxygen sensor voltage low side	Incomplete
Minimum output voltage	≤ 0.15 V
Maximum output voltage	≥ 0.55 V

AH:DTC P0141 O2 SENSOR HEATER CIRCUIT (BANK1 SENSOR2)

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of rear oxygen sensor heater.
While observing the engine condition, judge as NG if the rear oxygen sensor impedance is great.

2. COMPONENT DESCRIPTION



(1) Element cover (outer)
(2) Element cover (inner)
(3) Sensor element
(4) Ceramic heater
(5) Sensor housing

3. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Elapsed time after starting the engine	≥ 1000 ms
Engine coolant temperature	≥ 75 °C (167 °F)
A/F sensor element impedance	≤ 50 Ω
A/F sensor heater control duty	≤ 75 %
Rear oxygen sensor heater control duty	< 70 %

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after 1000 ms seconds or more have passed since the engine started.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Output terminal for heater characteristics failure detection	Low

Time Needed for Diagnosis: 4 ms × 2500 time(s)
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output terminal for heater characteristics failure detection	High

Time Needed for Diagnosis: 4 ms × 2500 time(s)

AI: 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

Secondary Parameters	Enable Conditions
A/F main learning system	In operation
Engine coolant temperature	≥ 70 °C (158 °F)
Engine load change	< 0.02 g/rev (0 oz/rev)
Engine load	≥ Value of Map 1

Map 1

Engine speed (rpm)	Idling	700	1000	1500	2000	2500	3000	3500	4000	4500
Measured value (g (oz)/rev)	na	0.23 (0.01)	0.19 (0.01)	0.1825 (0.01)	0.2 (0.01)	0.2225 (0.01)	0.23 (0.01)	0.23 (0.01)	0.26 (0.01)	0.2625 (0.01)

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 meeting the malfunction criteria below continues for 10 s × 5 time(s) or more, judge that there is a fault in the fuel system.

Judgment Value

Malfunction Criteria	Threshold Value
fsobd = (sglmd – tglmda) + faf + flaf In this case: sglmd = measured lambda tglmda = target lambda faf = Main feedback compensation coefficient (every 64 ms) flaf = main feedback learning compensation coefficient	≥ Value from Map 2

Map 2

Amount of air (g (oz)/s)	0 (0)	3.2 (0.11)	6.4 (0.23)	9.6 (0.34)	12.8 (0.45)	16 (0.56)	19.2 (0.68)
fsobdL1 (%)	1.4	1.4	1.332	1.25	1.25	1.25	1.25

Time Needed for Diagnosis: 10 s × 5 time(s)
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
fsobd = (sglmd – tglmda) + faf + flaf	< 1.2

Time Needed for Diagnosis: 10 s

AJ: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	≥ 70 °C (158 °F)
Engine load change	≤ 0.02 g/rev (0 oz/rev)
Learning value of EVAP conc.	< 0.15
Cumulative time of canister purge after engine start	≥ 20 s
Continuous period after canister purge starting	≥ 29884 ms
Engine load	≥ Value of Map 1

Map 1

Engine speed (rpm)	Idling	700	1000	1500	2000	2500	3000	3500	4000	4500
Measured value (g (oz)/rev)	na	0.23 (0.01)	0.19 (0.01)	0.1825 (0.01)	0.2 (0.01)	0.2225 (0.01)	0.23 (0.01)	0.23 (0.01)	0.26 (0.01)	0.2625 (0.01)

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 meeting the malfunction criteria below continues for 10 s × 5 time(s) or more, judge that there is a fault in the fuel system.

Judgment Value

Malfunction Criteria	Threshold Value
fsobd = (sglmd – tglmda) + faf + flaf In this case: sglmd = measured lambda tglmda = target lambda faf = main feedback compensation coefficient (every 64 milliseconds) flaf = main feedback learning compensation coefficient	< Value of Map 2

Map 2

Amount of air (g (oz)/s)	0 (0)	3.2 (0.11)	6.4 (0.23)	9.6 (0.34)	12.8 (0.45)	16 (0.56)	19.2 (0.68)
fsobdL1 (%)	0.6	0.6	0.668	0.735	0.735	0.735	0.735

Time Needed for Diagnosis: 10 s × 5 time(s)
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK if the status that the criteria below are met continues for 10 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
fsobd = (sglmd – tglmda) + faf + flaf	≥ 0.8

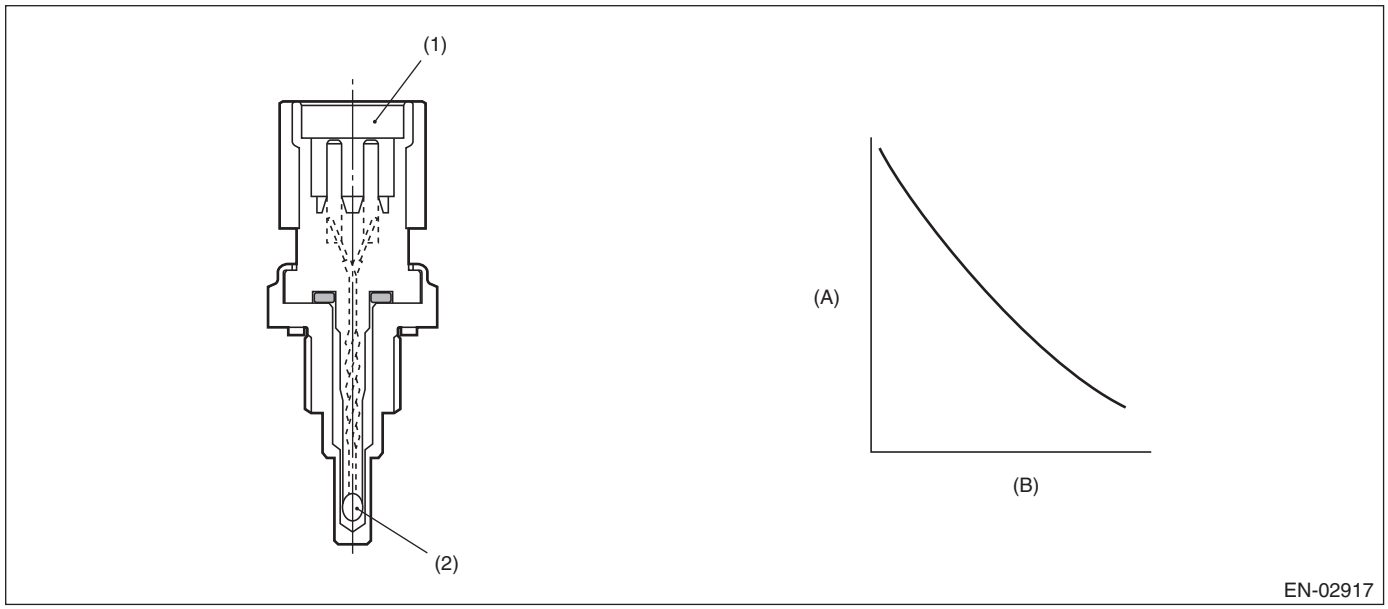
Time Needed for Diagnosis: 10 s

AK: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. COMPONENT DESCRIPTION



(A) Resistance value (kΩ)
(B) Temperature °C (°F)
(1) Connector
(2) Thermistor element

3. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Engine speed	≥ Value from Map

Map

Engine coolant temperature °C (°F)	–40 (–40)	–30 (–22)	–20 (–4)	–10 (14)	0 (32)	10 (50)	20 (68)	30 (86)
Engine speed rpm	500	500	500	500	500	500	500	500

Engine coolant temperature °C (°F)	40 (104)	50 (122)	60 (140)	70 (158)	80 (176)	90 (194)	100 (212)	110 (230)
Engine speed rpm	500	500	500	500	500	500	500	500

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Engine oil temperature	< 40 °C (104 °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
b. During the driving conditions except a) above, timer counts up as follows.
64 ms + TOILCNT ms (when at 64 ms)
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 (9.9)	24 (14.9)	32 (19.9)	40 (24.9)	48 (29.8)	56 (34.8)
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 judgement value (t).
t = 1882940 ms – 43302 ms × Ti (t ≥ 2400000)
Ti = The lowest coolant temperature after starting the engine.
Time Needed for Diagnosis: Less than 1 second
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Engine oil temperature	≥ 40 °C (104 °F)

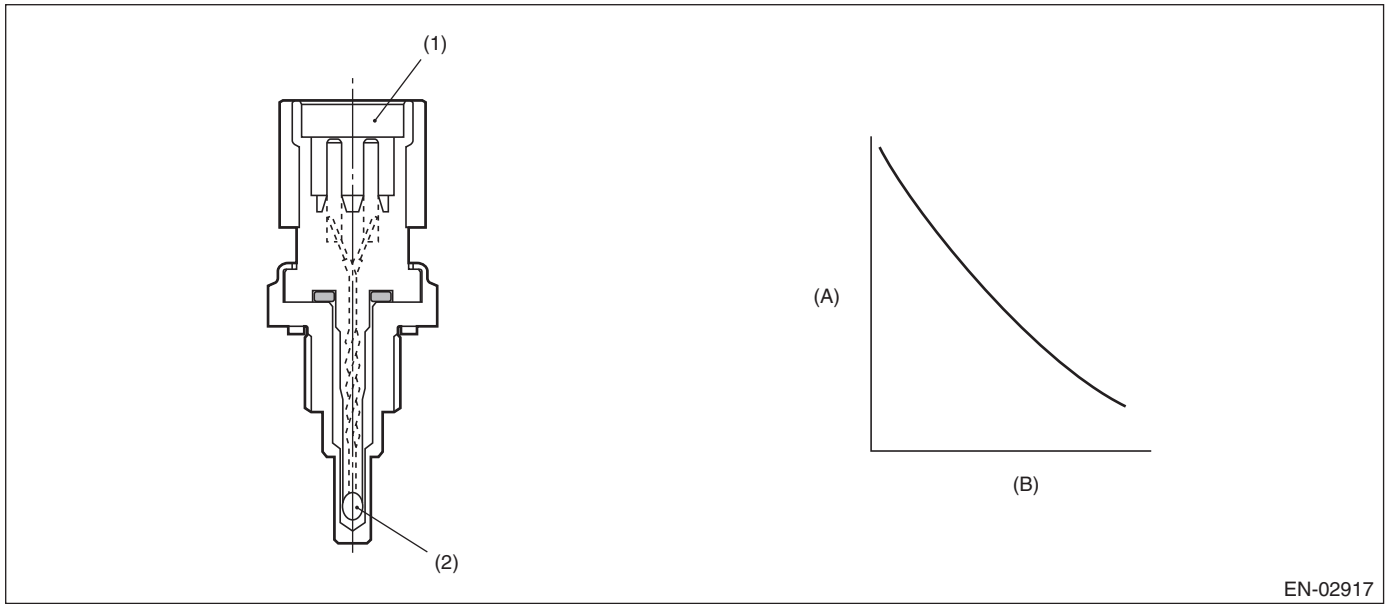
Time Needed for Diagnosis: Less than 1 second

AL: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 judgment value.

2. COMPONENT DESCRIPTION



(A) Resistance value (kΩ)
(B) Temperature °C (°F)
(1) Connector
(2) Thermistor element

3. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.135 V

Time Needed for Diagnosis: 500 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 0.135 V

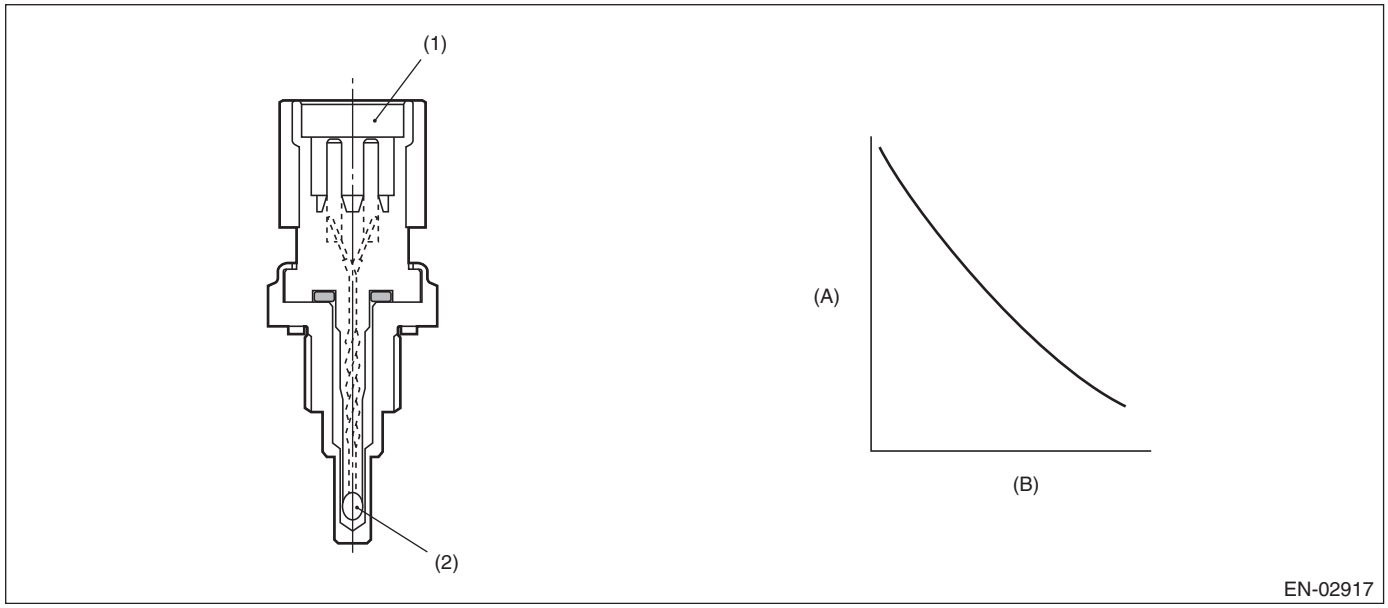
Time Needed for Diagnosis: Less than 1 second

AM: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. COMPONENT DESCRIPTION



(A) Resistance value (kΩ)
(B) Temperature °C (°F)
(1) Connector
(2) Thermistor element

3. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.876 V

Time Needed for Diagnosis: 500 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 4.876 V

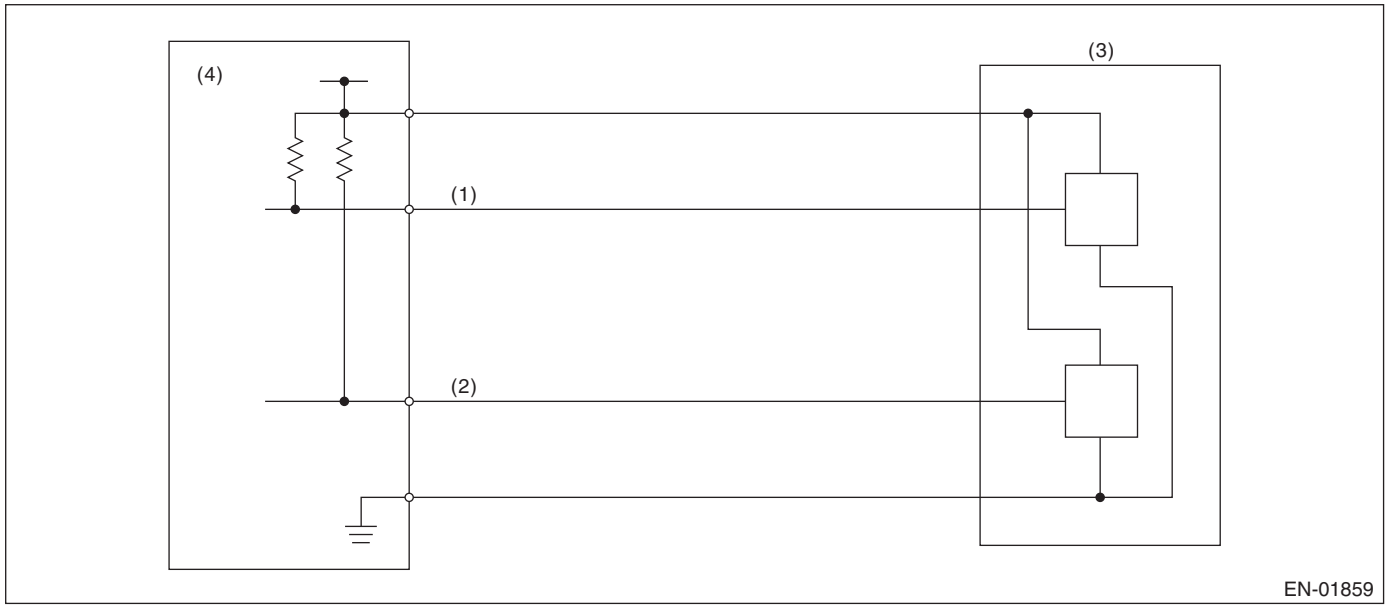
Time Needed for Diagnosis: Less than 1 second

AN: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 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
Battery voltage	≥ 6 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 2 input voltage	≤ 1.11 V

Time Needed for Diagnosis: 24 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 2 input voltage	> 1.11 V

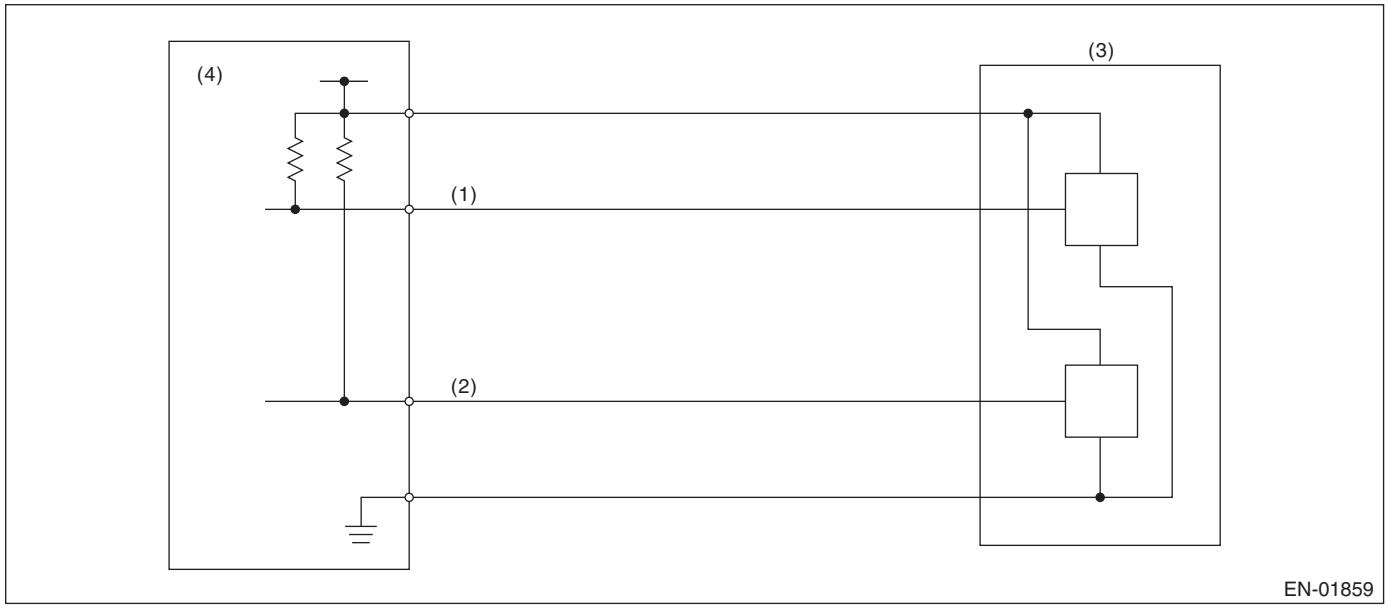
Time Needed for Diagnosis: 24 ms

AO: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 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
Battery voltage	≥ 6 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 2 input voltage	≥ 4.858 V

Time Needed for Diagnosis: 24 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 2 input voltage	< 4.858 V

Time Needed for Diagnosis: 24 ms

AP: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
All secondary parameters enable conditions	≥ 1024 ms
Intake manifold pressure change at 180°CA	< Value of Map 1
Throttle position change during 16 milliseconds	< 21 °
Fuel shut-off function	Not in operation
Fuel level	≥ 9.6 ℓ (2.54 US gal, 2.11 Imp gal)
Vehicle dynamic control or AT torque control	Not in operation
Evaporative system leak check	Not in operation
Engine speed	450 rpm — 6400 rpm
Intake manifold pressure	≥ Value from Map 2
Battery voltage	≥ 8 V
Fuel parameter determination	Not extremely low volatility
Elapsed time after starting the engine	≥ 0 ms
Engine speed change during 32 milliseconds	< 1000 rpm

Map 1

- AT model

rpm	700	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6300
kPa (mmHg, inHg)	13.3 (100, 3.9)	13.3 (100, 3.9)	13.3 (100, 3.9)	13.3 (100, 3.9)	13.3 (100, 3.9)	13.3 (100, 3.9)	13.3 (100, 3.9)	13.3 (100, 3.9)	13.3 (100, 3.9)	13.3 (100, 3.9)	13.3 (100, 3.9)	13.3 (100, 3.9)	13.3 (100, 3.9)

- MT model

rpm	650	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6300
kPa (mmHg, inHg)	13.3 (100, 3.9)	13.3 (100, 3.9)	13.3 (100, 3.9)	13.3 (100, 3.9)	13.3 (100, 3.9)	13.3 (100, 3.9)	13.3 (100, 3.9)	13.3 (100, 3.9)	13.3 (100, 3.9)	13.3 (100, 3.9)	13.3 (100, 3.9)	13.3 (100, 3.9)	13.3 (100, 3.9)

Map 2

- AT model (Tumble generator valve open)

rpm	700	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6300
kPa (mmHg, inHg)	28 (210.0, 8.3)	24.4 (183.0, 7.2)	23.2 (174.0, 6.9)	23.5 (176.0, 6.9)	22.9 (172.0, 6.8)	25.1 (188.0, 7.4)	30 (225.0, 8.9)	27.9 (209.0, 8.2)	30.1 (226.0, 8.9)	32.7 (245.0, 9.6)	35.2 (264.0, 10.4)	38.8 (291.0, 11.5)	43.1 (323.0, 12.7)

- AT model (Tumble generator valve closed)

rpm	700	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6300
kPa (mmHg, inHg)	28 (210.0, 8.3)	24.4 (183.0, 7.2)	23.2 (174.0, 6.9)	23.5 (176.0, 6.9)	22.9 (172.0, 6.8)	25.1 (188.0, 7.4)	30 (225.0, 8.9)	27.9 (209.0, 8.2)	30.1 (226.0, 8.9)	32.7 (245.0, 9.6)	35.2 (264.0, 10.4)	38.8 (291.0, 11.5)	43.1 (323.0, 12.7)

- MT model (Tumble generator valve open)

Vehicle speed < 64 km/h (39.8 MPH)

rpm	650	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6300
kPa (mmHg, inHg)	26.5 (199, 7.8)	22.1 (166, 6.5)	21.5 (161, 6.3)	21.6 (162, 6.4)	21.3 (160, 6.3)	22 (165, 6.5)	27.1 (203, 8)	25.6 (192, 7.6)	27.5 (206, 8.1)	30.3 (227, 8.9)	33.6 (252, 9.9)	36.7 (275, 10.8)	41.3 (310, 12.2)

Vehicle speed ≥ 68 km/h (42.3 MPH)

rpm	650	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6300
kPa (mmHg, inHg)	26.5 (199, 7.8)	22.1 (166, 6.5)	34.7 (260, 10.2)	34.7 (260, 10.2)	39.6 (297, 11.7)	41.3 (310, 12.2)	44 (330, 13)	44 (330, 13)	44 (330, 13)	46.7 (350, 13.8)	49.3 (370, 14.6)	52 (390, 15.4)	53.3 (400, 15.7)

- MT model (Tumble generator valve closed)

Vehicle speed < 64 km/h (39.8 MPH)

rpm	650	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6300
kPa (mmHg, inHg)	26.5 (199, 7.8)	22.1 (166, 6.5)	21.5 (161, 6.3)	21.6 (162, 6.4)	21.3 (160, 6.3)	22 (165, 6.5)	27.1 (203, 8)	25.6 (192, 7.6)	27.5 (206, 8.1)	30.3 (227, 8.9)	33.6 (252, 9.9)	36.7 (275, 10.8)	41.3 (310, 12.2)

Vehicle speed ≥ 68 km/h (42.3 MPH)

rpm	650	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6300
kPa (mmHg, inHg)	26.5 (199, 7.8)	22.1 (166, 6.5)	34.7 (260, 10.2)	34.7 (260, 10.2)	39.6 (297, 11.7)	41.3 (310, 12.2)	44 (330, 13)	44 (330, 13)	44 (330, 13)	46.7 (350, 13.8)	49.3 (370, 14.6)	52 (390, 15.4)	53.3 (400, 15.7)

3. GENERAL DRIVING CYCLE

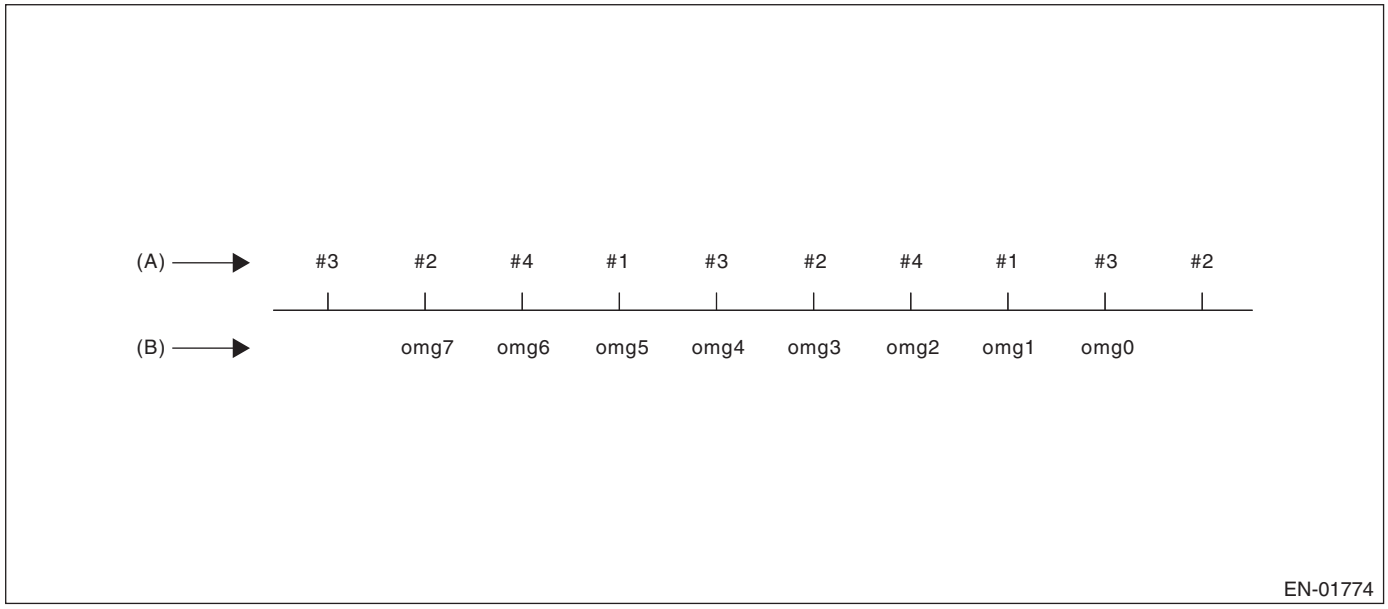
- If conditions are met, it is possible to detect the misfires from idling to high engine speed. However, to avoid excessive load or harm to the engine, perform diagnosis at idle.
- Perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

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. Count the number of misfires, if the misfire ratio is higher during 1000 revs. or 200 revs., 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)
	• 180° Interval Difference Method • 360° Interval Difference Method • 720° Interval Difference Method	• FTP 1.5 times misfire NG judgment • Catalyst damage misfire NG judgment

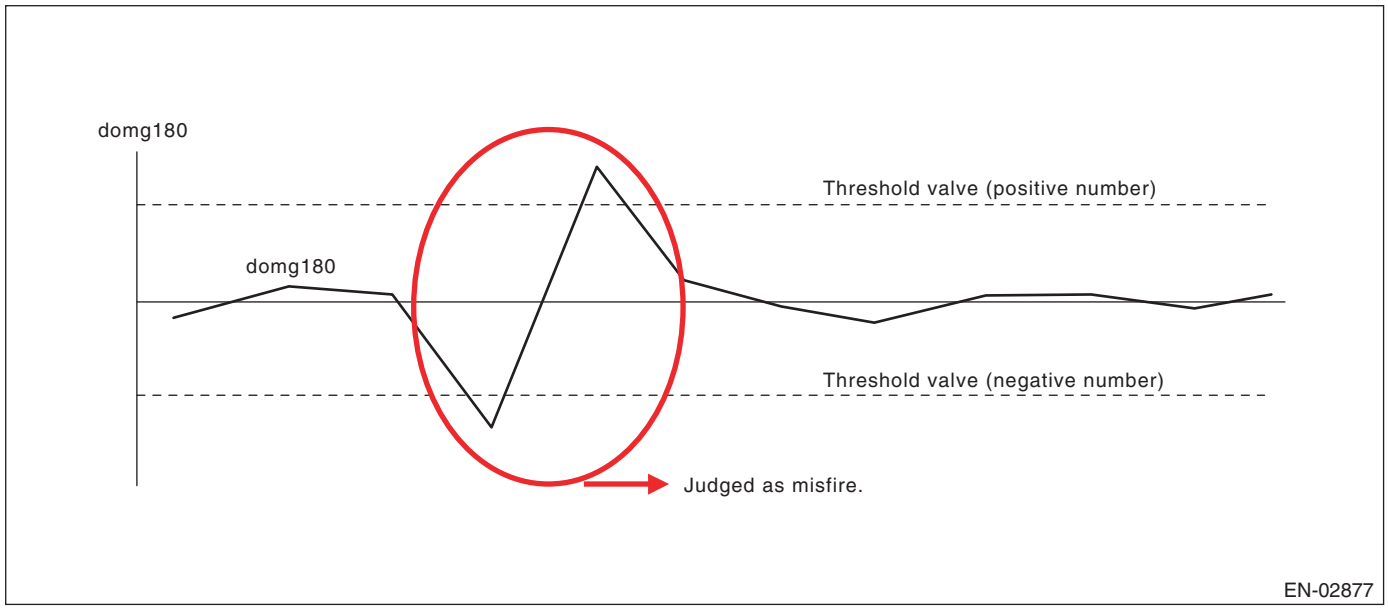
As shown in the following figure, pick a cylinder as the standard and name it omg 0. And the former crankshaft position speed is named omg 1, the second former crankshaft position speed is named omg 2, the third is named omg 3, etc.



(A) Ignition order (B) Crankshaft position speed

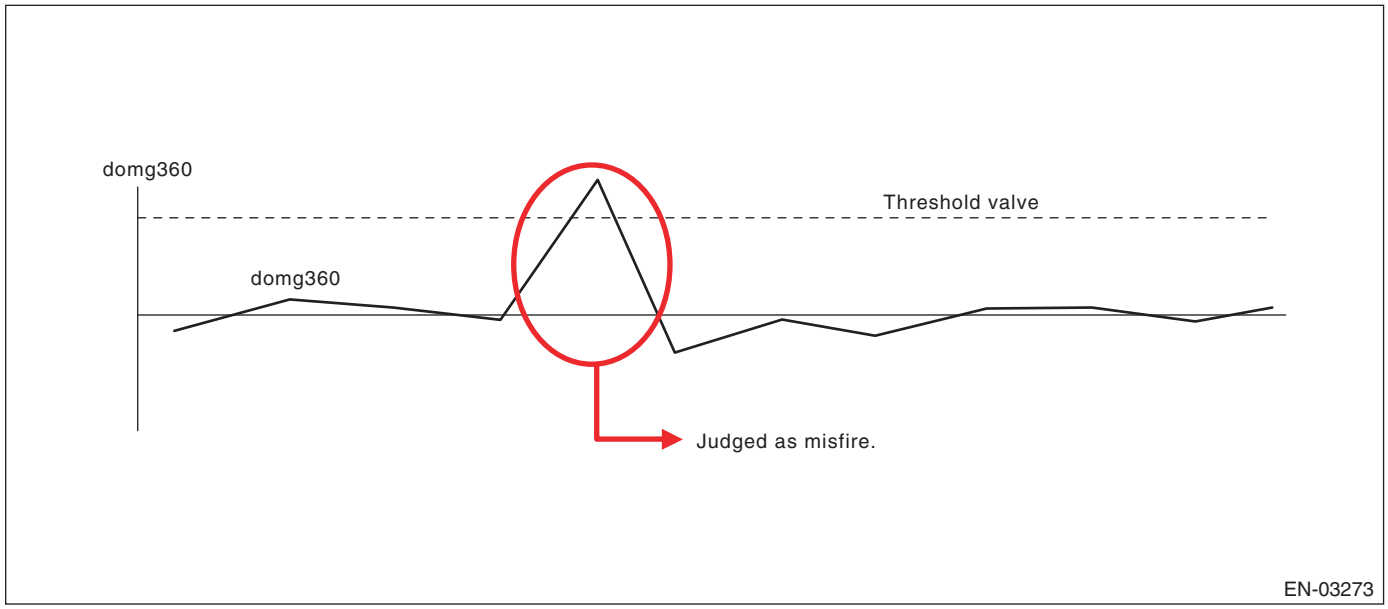
180° Interval Difference Method

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 ≤ judgment value of negative side (Judgment value before 180° CA)	



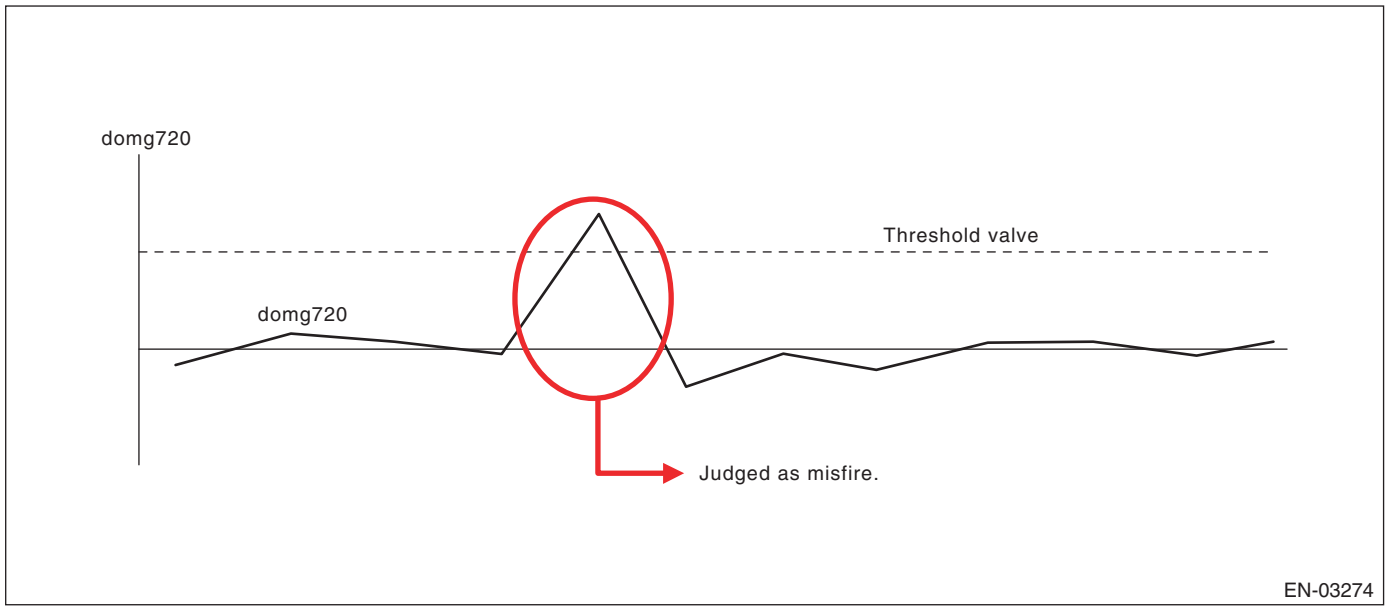
360° Interval Difference Method

Diagnostic value	domg 360 = (omg 1 – omg 0) – (omg 3 – omg 2)
Misfire judgment	domg 360 > Judgment value → Judge as misfire



720° Interval Difference Method

Diagnostic value	domg 720 = (omg 1 – omg 0) – (omg 5 – omg 4)
Misfire judgment	domg 720 > Judgment value → Judge as misfire



- **FTP 1.5 times misfire (Misfire occurrence level which influences exhaust gas)**
- **Abnormality Judgment**

Judgment Value (Judge that malfunction occurs when the misfire ratio is high in 1000 engine revs.)

Malfunction Criteria	Threshold Value
FTP emission judgment value	≥ 18 × 100/2000% in 1000 revs.

Time Needed for Diagnosis: 1000 engine revs.
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

- **Normality Judgment**

Judgment Value

Malfunction Criteria	Threshold Value
FTP emission judgment value	< 18 × 100/2000% in 1000 revs.

Time Needed for Diagnosis: 1000 engine revs.

- **Catalyst damage misfire (Misfire occurrence level damaging catalyst)**
- **Abnormality Judgment**

Judgment Value

Malfunction Criteria	Threshold Value
Catalyst damage misfire judgment value	≥ Value from Map 3

Map 3

		Intake air (g(oz)/rev)							
		0.16 (0.01)	0.28 (0.01)	0.4 (0.01)	0.52 (0.02)	0.64 (0.02)	0.76 (0.03)	0.92 (0.03)	1.1 (0.04)
Engine speed (rpm)	700	100	100	100	100	90	80	64	48
	1000	100	100	100	100	90	80	63	44
	1500	100	100	90	80	73	67	54	40
	2000	80	80	80	80	68	57	51	44
	2500	80	80	73	67	62	57	51	44
	3000	67	67	62	57	51	44	44	44
	3500	67	67	56	44	40	36	34	31
	4000	57	57	44	31	24	20	20	20
	4500	44	44	33	31	20	20	20	20
	5000	44	44	38	31	20	20	20	20
	5500	36	36	31	27	20	20	20	20
	6000	20	20	20	20	20	20	20	20
	6300	20	20	20	20	20	20	20	20

Time Needed for Diagnosis: 200 engine revs.
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judgment Value

Malfunction Criteria	Threshold Value
Catalyst damage misfire judgment value	< Value of Map 3

Time Needed for Diagnosis: 200 engine revs.

AQ:DTC P0302 CYLINDER 2 MISFIRE DETECTED

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0301. <Ref. to GD(H4DO)-93, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

AR:DTC P0303 CYLINDER 3 MISFIRE DETECTED

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0301. <Ref. to GD(H4DO)-93, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

AS:DTC P0304 CYLINDER 4 MISFIRE DETECTED

1. OUTLINE OF DIAGNOSIS

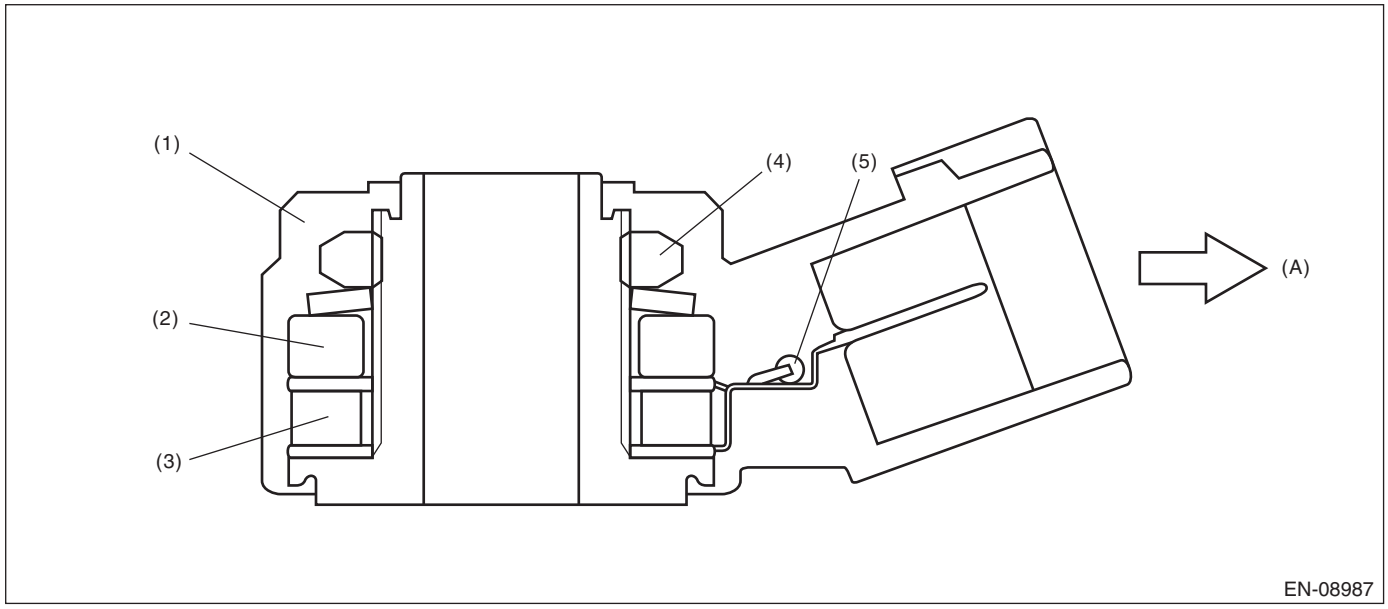
NOTE:
For the detection standard, refer to DTC P0301. <Ref. to GD(H4DO)-93, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

AT: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 out of specification.

2. COMPONENT DESCRIPTION



(A) To knock sensor harness

(1) Case
(2) Weight
(3) Piezoelectric element
(4) Nut
(5) Resistance

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.243 V

Time Needed for Diagnosis: 1000 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 0.243 V

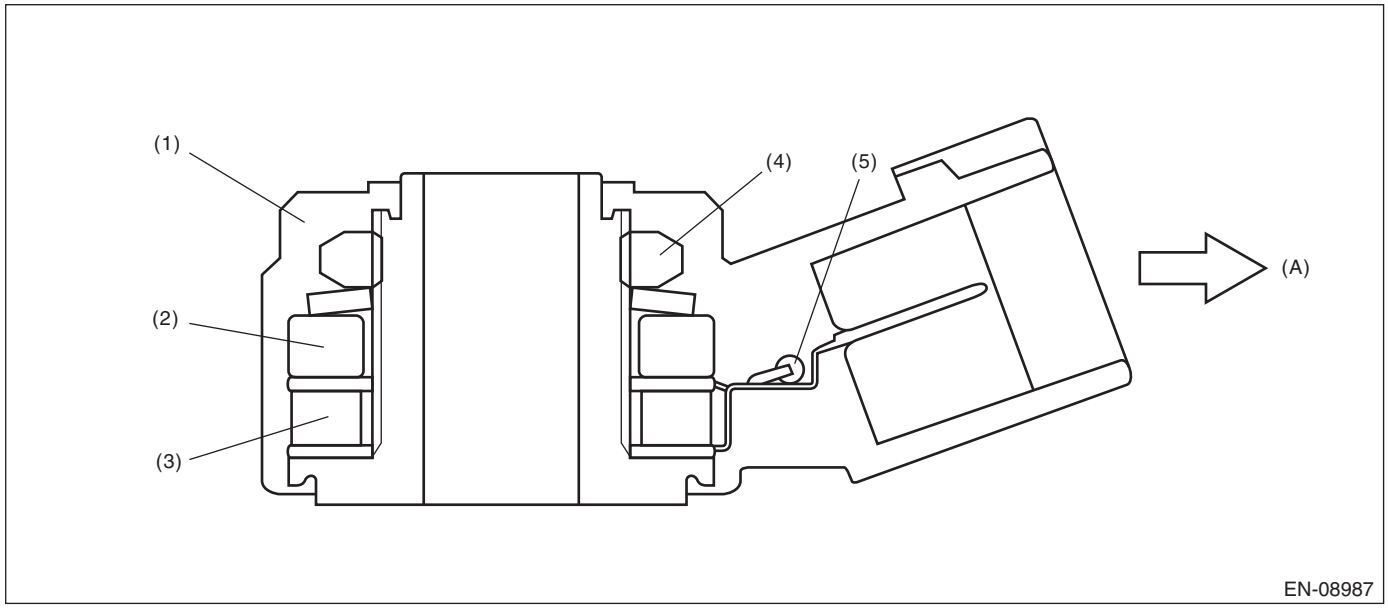
Time Needed for Diagnosis: Less than 1 second

AU: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 out of specification.

2. COMPONENT DESCRIPTION



(A) To knock sensor harness

(1) Case
(2) Weight
(3) Piezoelectric element
(4) Nut
(5) Resistance

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.709 V

Time Needed for Diagnosis: 1000 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 4.709 V

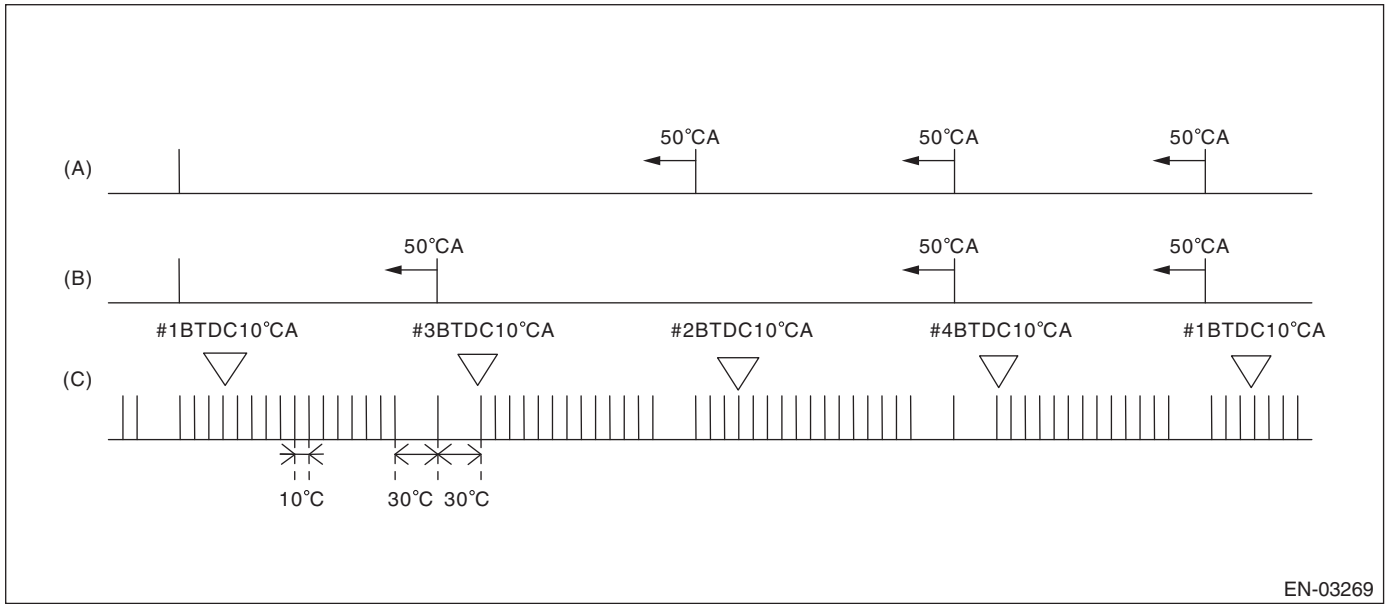
Time Needed for Diagnosis: Less than 1 second

AV:DTC P0335 CRANKSHAFT POSITION SENSOR “A” CIRCUIT

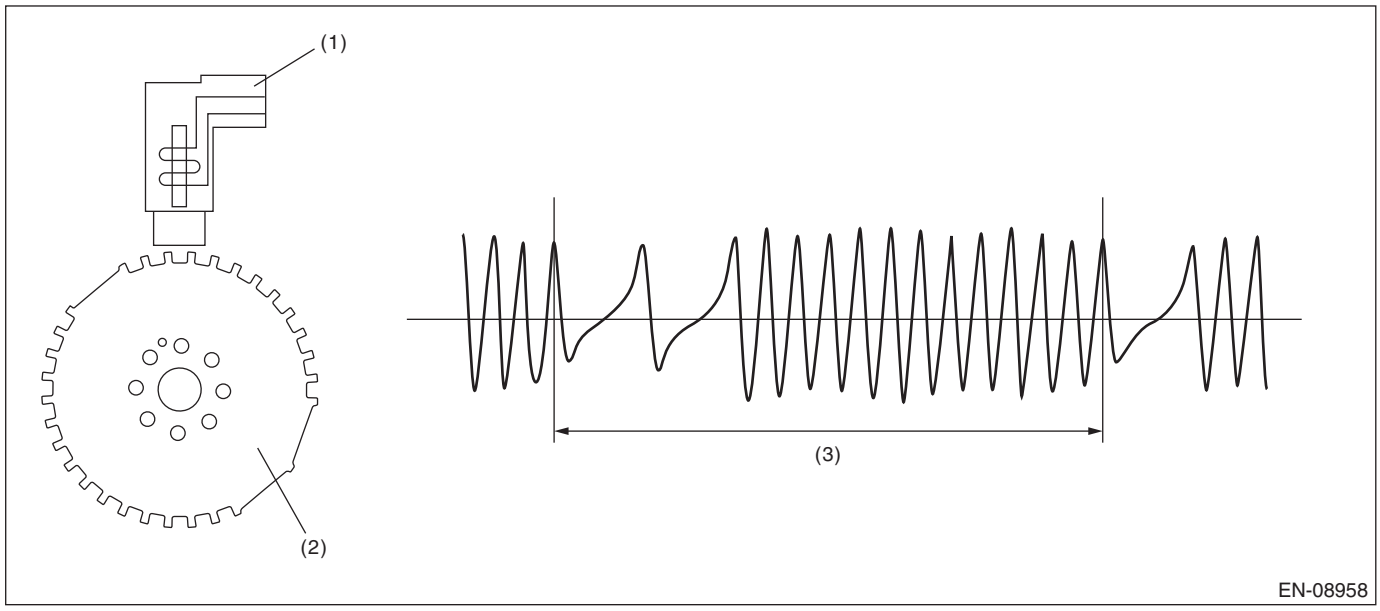
1. OUTLINE OF DIAGNOSIS

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 rotated.

2. COMPONENT DESCRIPTION



(A) Camshaft signal (RH) (B) Camshaft signal (LH) (C) Crankshaft signal



(1) Crankshaft position sensor (2) Crankshaft position sensor plate (3) Crankshaft half-turn

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Starter switch	ON
Crankshaft position sensor signal	Not detected
Battery voltage	≥ 8 V

Time Needed for Diagnosis: 3000 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Crankshaft position sensor signal	Input exists
Battery voltage	≥ 8 V

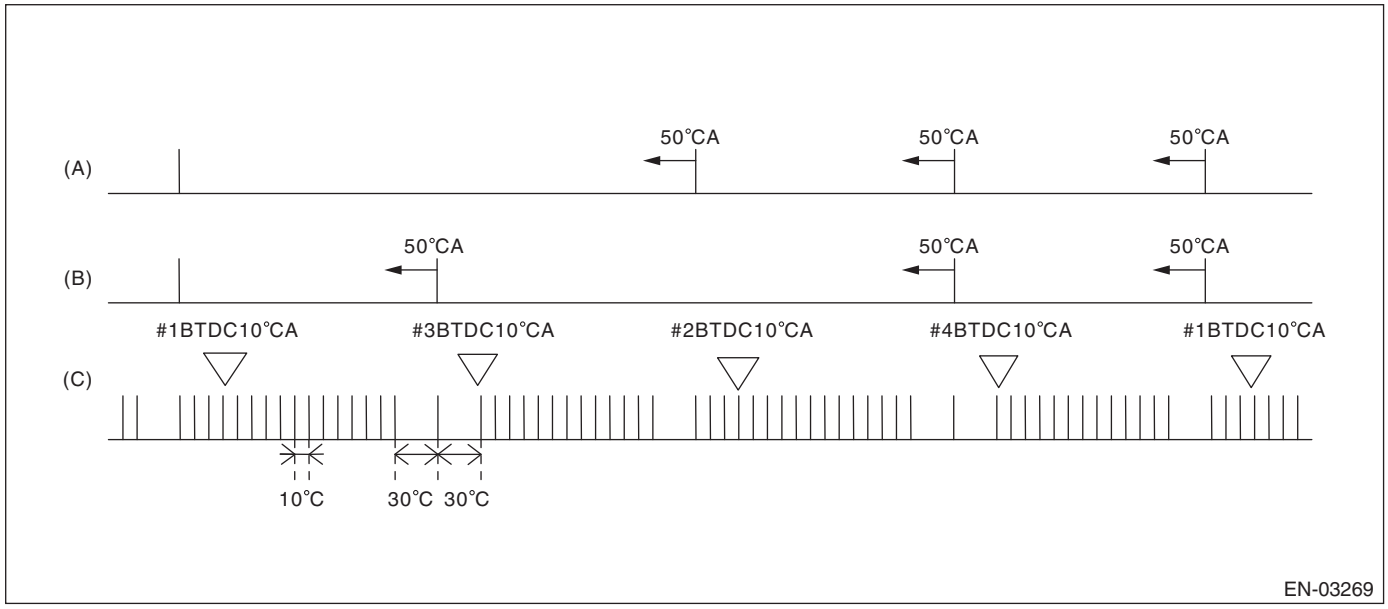
Time Needed for Diagnosis: Less than 1 second

AW:DTC P0336 CRANKSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE

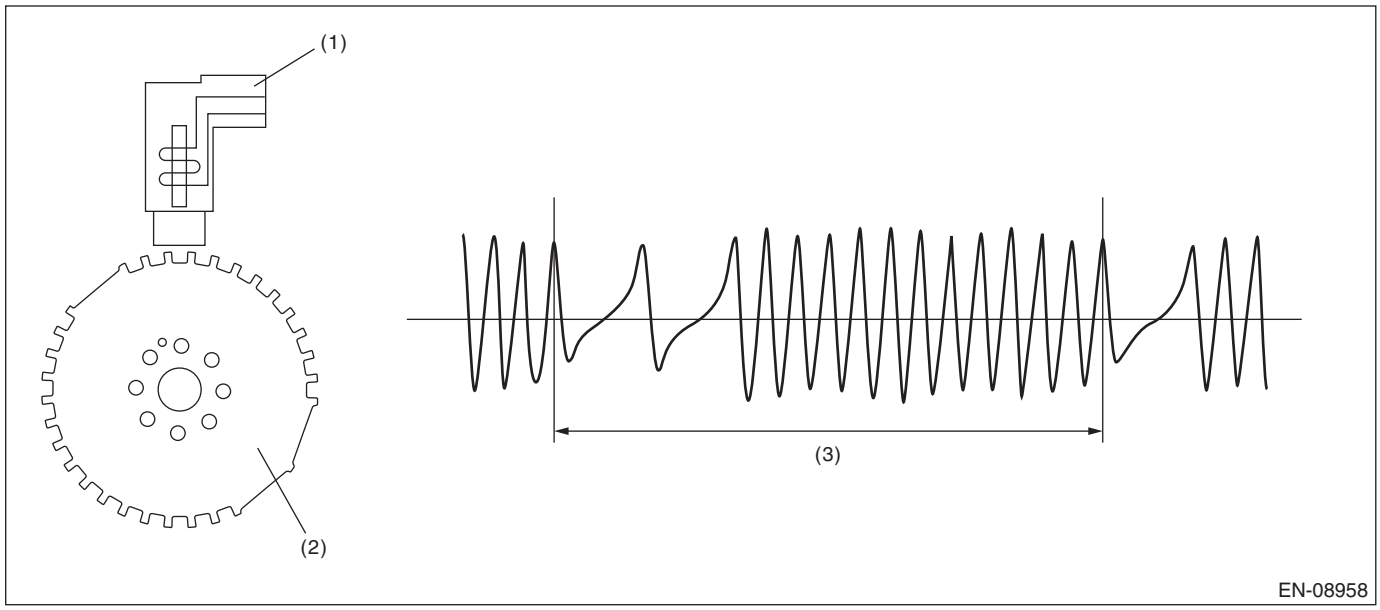
1. OUTLINE OF DIAGNOSIS

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 of crankshaft.

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
Battery voltage	≥ 8 V
Engine speed	< 4000 rpm

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously under 3000 rpm engine speed.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Cylinder number identification	Completed
Amount of crank sensor signal during 1 rev of crankshaft.	Not = 30

Time Needed for Diagnosis: 10 engine revs. engine revs.
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Cylinder number identification	Completed
Amount of crank sensor signal during 1 rev of crankshaft.	= 30

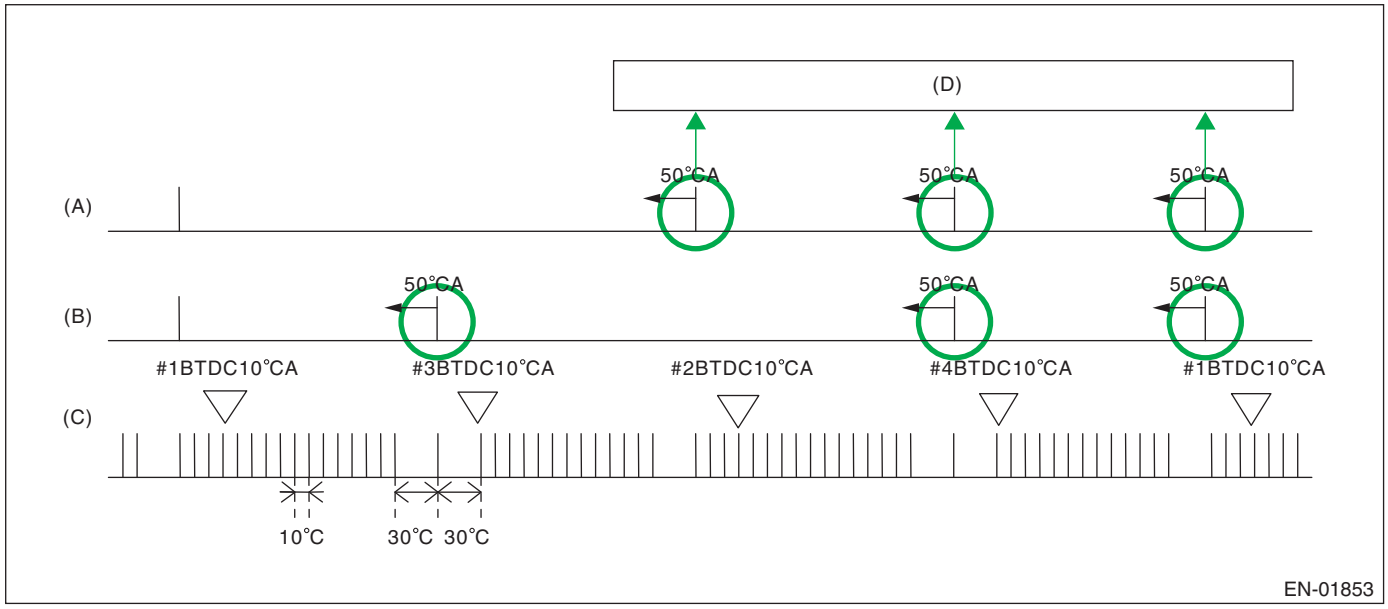
Time Needed for Diagnosis: Less than 1 second

AX: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 (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 crankshaft revolutions.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 8 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment 1

Judge as NG when the status where the number of camshaft position sensor signal in two crankshaft revolutions is less than 3 time(s).

Judgment Value

Malfunction Criteria	Threshold Value
Amount of camshaft sensor signal during 2 revs of crankshaft.	< 3 time(s)

Time Needed for Diagnosis: Engine two revolutions × 4 time(s)
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment 1

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Camshaft position sensor signal	≥ 3 time(s)

Time Needed for Diagnosis: 2 engine revs.

• Abnormality Judgment 2

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Starter	ON
Camshaft position sensor signal	No input

Time Needed for Diagnosis: 3000 ms

• Normality Judgment 2

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Camshaft position sensor signal	Input exists

Time Needed for Diagnosis: Less than 1 second

AY:DTC P0345 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 2)

1. OUTLINE OF DIAGNOSIS

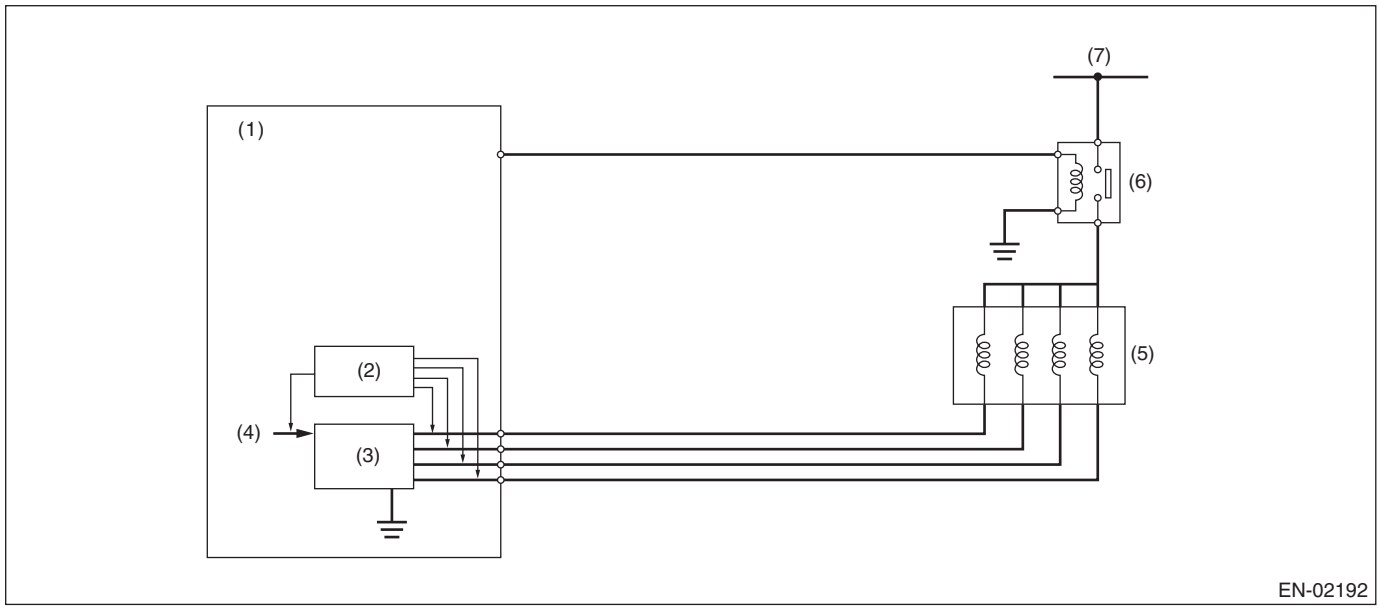
NOTE:
For the detection standard, refer to DTC P0340. <Ref. to GD(H4DO)-108, DTC P0340 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

AZ: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



(1) ECM
(2) Detecting circuit
(3) Switching circuit
(4) CPU
(5) EGR valve
(6) Main relay
(7) Battery power supply

3. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
Elapsed time after starting the engine	≥ 40 s
Engine coolant temperature	≥ 70 °C(158 °F)
Engine speed	1200 rpm — 2950 rpm
Intake manifold pressure (absolute pressure)	< 44 kPa (330 mmHg, 13 inHg)
Ambient air temperature	≥ 5 °C(41 °F)
Throttle position	< 0.25 °
Battery voltage	≥ 10.9 V
Atmospheric pressure	≥ 75 kPa (563 mmHg, 22.2 inHg)
Vehicle speed	≥58 km/h (36 MPH)
Fuel shut-off function	In operation
Neutral switch	OFF
Elapsed time after neutral switch ON/OFF change	≥ Value from Map
No load change (A/C, power steering, lighting, rear defogger, heater fan and radiator fan)	≥ 5000 ms

Map

Engine coolant temperature °C (°F)	–40 (–40)	–30 (–22)	–20 (–4)	–10 (14)	0 (32)	10 (50)	20 (68)	30 (86)
Elapsed time after neutral switch change msec	580	530	480	440	400	360	330	310

Engine coolant temperature °C (°F)	40 (104)	50 (122)	60 (140)	70 (158)	80 (176)	90 (194)	100 (212)	110 (230)
Elapsed time after neutral switch change msec	300	290	280	280	280	280	280	280

4. GENERAL DRIVING CYCLE

During deceleration fuel cut from 53 km/h (approx. 33 MPH) or more, 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.)

5. DIAGNOSTIC METHOD

Measure the pressure values 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 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**

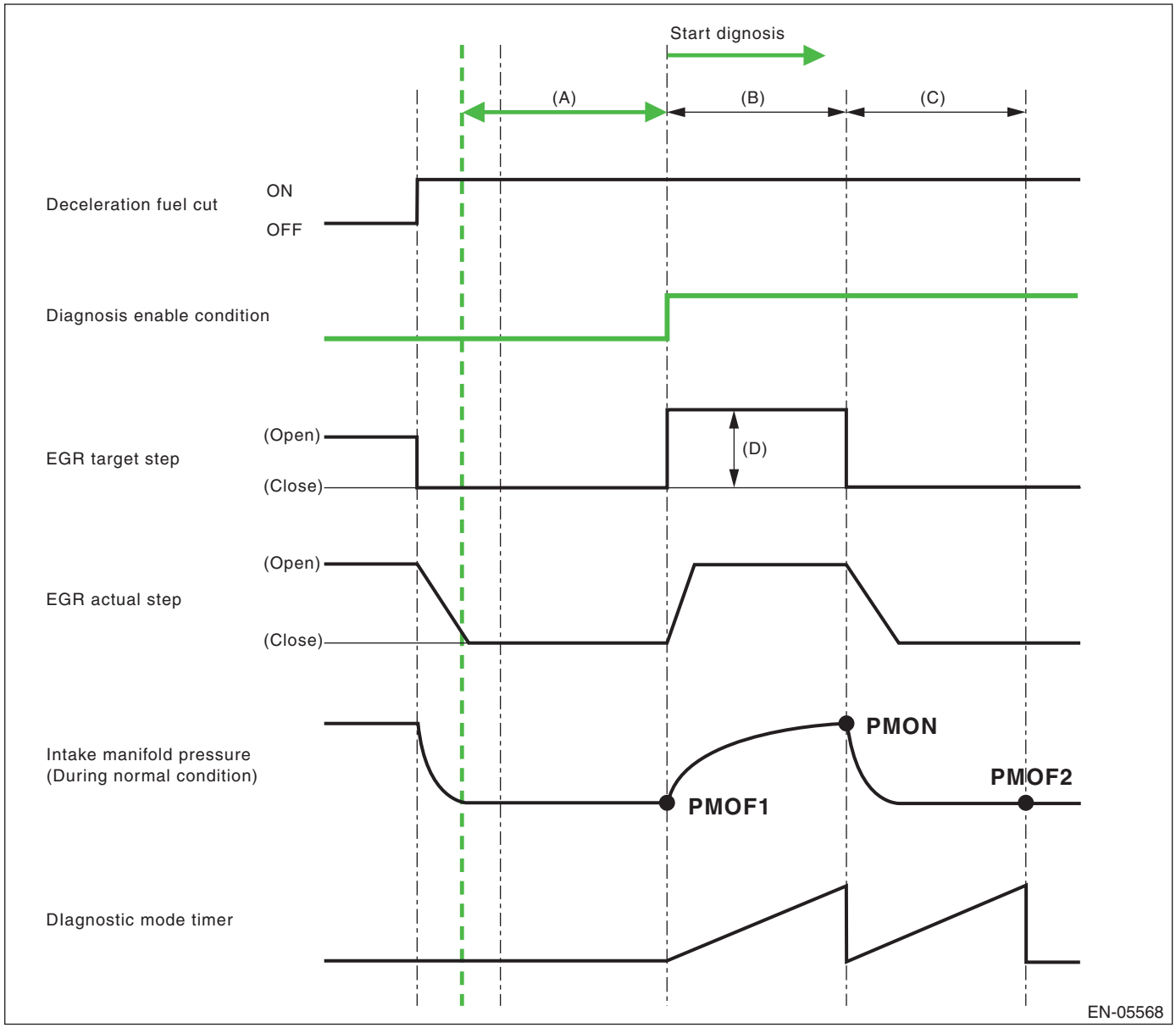
Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
PMON – (PMOF1 + PMOF2)/2	< 2.5 kPa (18.63 mmHg, 0.7 inHg)

Time Needed for Diagnosis: 1 time

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.



(A) 3000 ms (B) 1000 ms (C) 1000 ms
(D) 45 step(s)

- **Normality Judgment**

Judge as OK and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
PMON – (PMOF1 + PMOF2)/2	≥ 2.5 kPa (18.63 mmHg, 0.7 inHg)

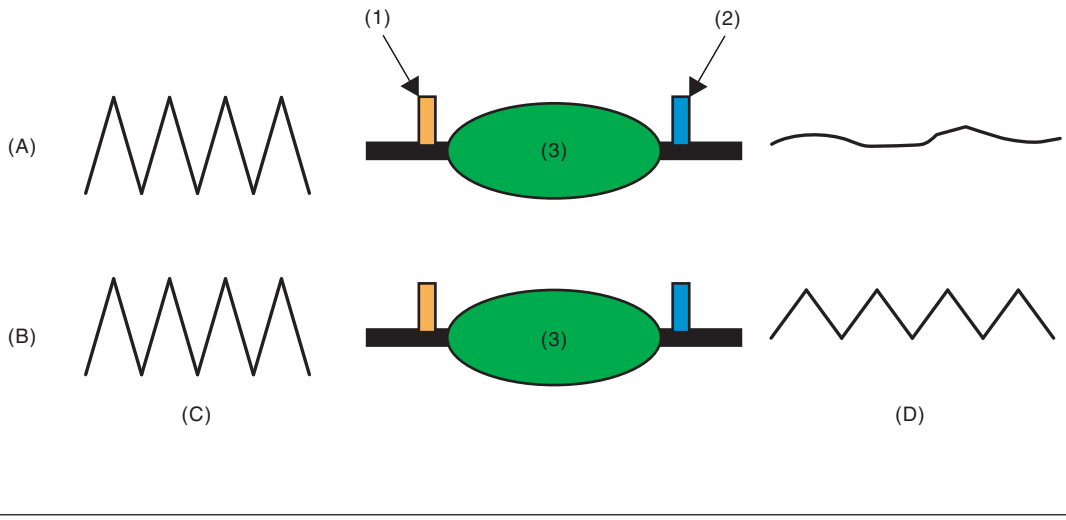
Time Needed for Diagnosis: 1 time

BA:DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect the deterioration of the catalyst 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



(A) Normal
(B) Deterioration
(C) Output waveform from the front oxygen (A/F) sensor
(D) Output waveform from the front oxygen sensor
(1) Front oxygen (A/F) sensor
(2) Front oxygen sensor
(3) Catalytic converter

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Atmospheric pressure	≥ 75 kPa (563 mmHg, 22.2 inHg)
Engine coolant temperature	≥ 70 °C (158 °F)
Estimated catalyst temperature	≥ 580 °C (1076 °F) (AT model) ≥ 580 °C (1076 °F) (MT model)
Misfire detection every 200 rotations	< 5 time(s)
Learning value of evaporation gas density	< 0.2
Sub feedback	In operation
Evaporative system diagnosis	Not in operation
Time of difference (< 0.10) between actual lambda and target lambda	≥ 1000 ms
Vehicle speed	> 60 km/h (37.3 MPH)
Amount of intake air	≥ 10 g/s (0.35 oz/s) and < 35 g/s (1.23 oz/s)
Engine load change every 0.5 engine revs.	< 0.02 g/rev (0 oz/rev)
Rear oxygen output change from 660 mV or less to 660 mV or more	Experienced after fuel cut
Elapsed time after starting the engine	≥ 230 second
Purge execution calculated time	≥ 0 s

4. GENERAL DRIVING CYCLE

Perform the diagnosis only once at a constant speed of 60 km/h (37.3 MPH) or higher.

5. DIAGNOSTIC METHOD

After the enable conditions have been established, calculate the front oxygen (A/F) sensor lambda value deviation sum value (Σ |(sglmd$_n$ – sglmd$_{n-1}$)|), and rear oxygen sensor output voltage deviation sum value (Σ |(ro2sad$_n$ – ro2sad$_{n-1}$)|) in every 32 ms × 4 times. If the front oxygen (A/F) sensor lambda value deviation sum value (Σ |(sglmd$_n$ – sglmd$_{n-1}$)|) is the predetermined value or more, calculate the judgment value.

• Abnormality Judgment

If the duration of time while the following conditions are met is within the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Σ |(ro2sad$_n$ – ro2sad$_{n-1}$)| / Σ |(sglmd$_n$ – sglmd$_{n-1}$)|	> 8.02

Time Needed for Diagnosis: 30 — 55 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is within the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Σ |(ro2sad$_n$ – ro2sad$_{n-1}$)| / Σ |(sglmd$_n$ – sglmd$_{n-1}$)|	≤ 8.02

Time Needed for Diagnosis: 30 — 55 seconds

BB:DTC P0441 EVAPORATIVE EMISSION CONT. SYS. INCORRECT PURGE FLOW

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of purge flow by the change of ELCM pressure sensor output value before/after purge introduction.

2. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
<Common conditions>	
Battery voltage	≥ 10.9 V
Atmospheric pressure	> 75 kPa (563 mmHg, 22.2 inHg)
<First diagnosis>	
Learning value of EVAP conc. during purge	< 0.2
Total time of canister purge operation	≥ 120 s
<Second diagnosis>	
Time after cancel of second diagnosis	≥ 60000 ms
Total time of canister purge operation	≥ 120 s
Intake manifold pressure (absolute pressure)	> 13.3 kPa (100 mmHg, 3.9 inHg)
Engine speed	≥ 1050 rpm
Intake manifold pressure (relative pressure)	< 13.3 kPa (100 mmHg, 3.9 inHg)
Vehicle speed	≥ 30 km/h (18.6 MPH)
Closed air/fuel ratio control	In operation
Air fuel ratio	> 0.76 and < 1.25
Main feedback compensation coefficient	> 0.9
Learning value of EVAP conc. during purge	< 0.2

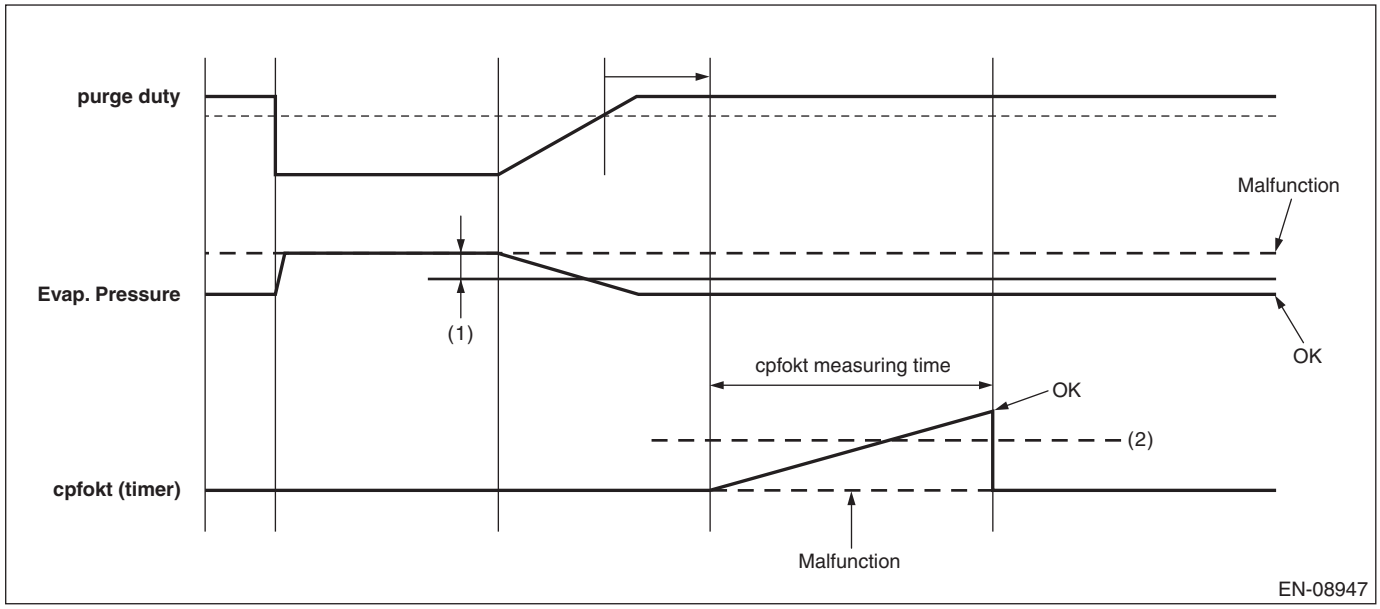
3. GENERAL DRIVING CYCLE

Perform the diagnosis only once after engine start.

4. DIAGNOSTIC METHOD

First diagnosis

Pressure decreases when the purge is introduced compared with when the purge is not performed. By using this, judge if the purge is correctly performed. If there is no pressure decrease, go to the second diagnosis.



(1) 0.0045 V (2) 2000 ms

- **Abnormality Judgment**

Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
ELCM pressure sensor output voltage when purge is not performed – ELCM pressure sensor output voltage when purge is performed	> 0.0045 V
The accumulated time while the above conditions are met: cpfokt	< 2000 ms

Time Needed for Diagnosis: 26 seconds

- **Normality Judgment**

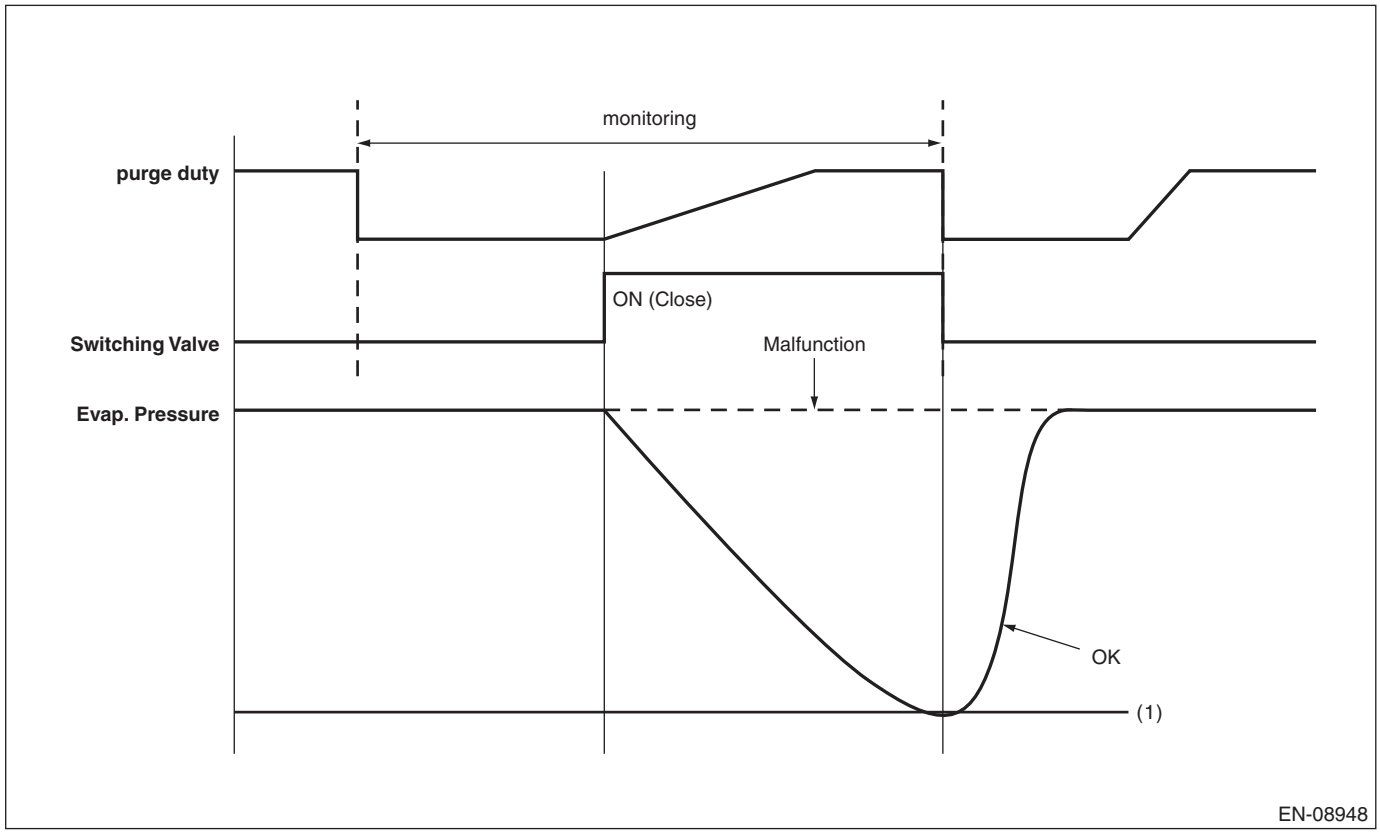
Judge as OK and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
ELCM pressure sensor output voltage when purge is not performed – ELCM pressure sensor output voltage when purge is performed	> 0.0045 V
The accumulated time while the above conditions are met: cpfokt	≥ 2000 ms

Time Needed for Diagnosis: 26 seconds

Second diagnosis
Close the ELCM switching valve, and close the fuel tank completely, and perform the forced purging. If pressure change amount is 0.7 kPa (5 mmHg, 0.2 inHg) or less, judge as malfunction of purge flow.



(1) 0.7 kPa (5 mmHg, 0.2 inHg)

- **Abnormality Judgment**

Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
ELCM pressure sensor output voltage when purge is not performed – ELCM pressure sensor output voltage when purge is performed	< 0.7 kPa (5 mmHg, 0.2 inHg)
Time of negative pressure introduction	≥ 30000 ms

Time Needed for Diagnosis: 21 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

- **Normality Judgment**

Judge as OK and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
ELCM pressure sensor output voltage when purge is not performed – ELCM pressure sensor output voltage when purge is performed	≥ 0.7 kPa (5 mmHg, 0.2 inHg)

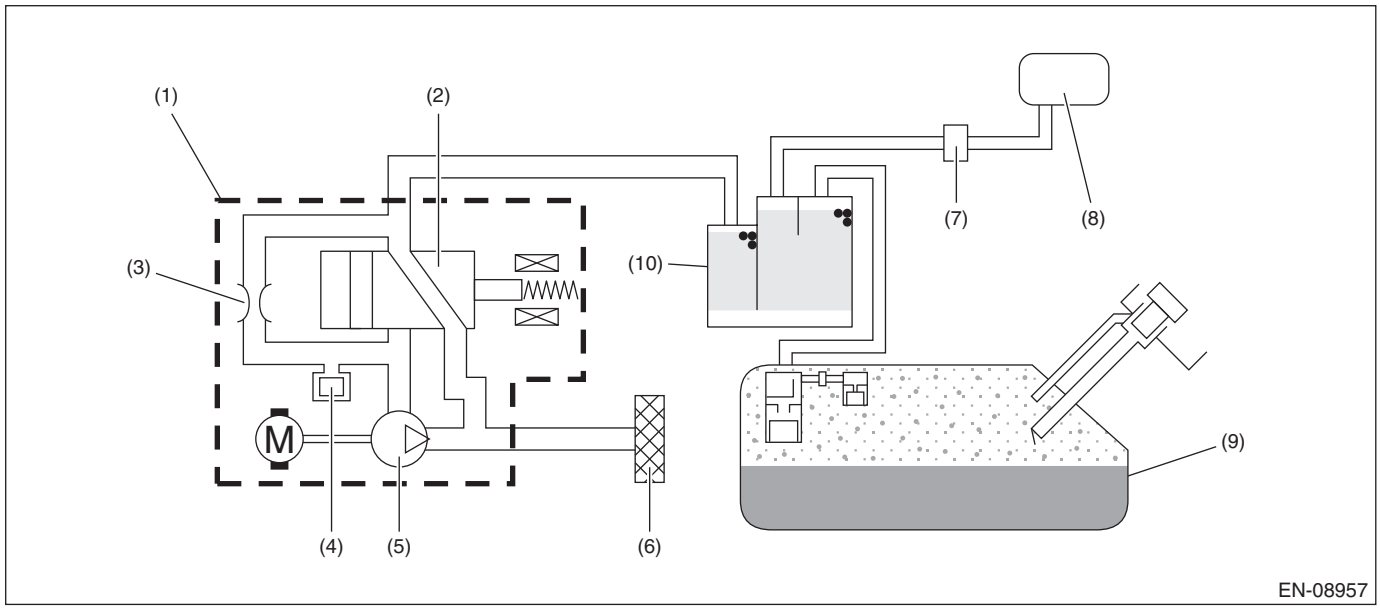
Time Needed for Diagnosis: Less than 21 seconds

BC:DTC P0451 EVAPORATIVE EMISSION SYSTEM PRESSURE SENSOR/ SWITCH RANGE/PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of ELCM pressure sensor output properties.
Judge as NG when the ELCM pressure sensor output value is largely different from the intake manifold pressure when the ignition switch is ON.

2. COMPONENT DESCRIPTION



(1) ELCM
(2) Switching valve
(3) Reference orifice (0.02 inch orifice)
(4) Pressure sensor
(5) Vacuum pump
(6) Drain filter
(7) Purge control solenoid valve
(8) Intake manifold
(9) Fuel tank
(10) Canister

3. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
Ignition switch	ON
Engine speed	< 300 rpm
Vehicle speed	< 1 km/h (0.621 MPH)
Soaking time	≥ 60 s
Variation value of intake manifold pressure (absolute pressure) since ignition switch is turned to ON	< 1.332 kPa (9.99 mmHg, 0.39 inHg)
ELCM vacuum pump	Not in operation
ELCM switching valve	Open
Purge control	Not in operation

4. GENERAL DRIVING CYCLE

Perform the diagnosis once at ignition ON.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
| ELCM pressure sensor output value – intake manifold pressure (absolute pressure) when ignition switch is ON |	> 4.226 kPa (31.7 mmHg, 1.25 inHg)

Time Needed for Diagnosis: 328 ms
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
| ELCM pressure sensor output value – intake manifold pressure (absolute pressure) when ignition switch is ON |	≤ 4.226 kPa (31.7 mmHg, 1.25 inHg)

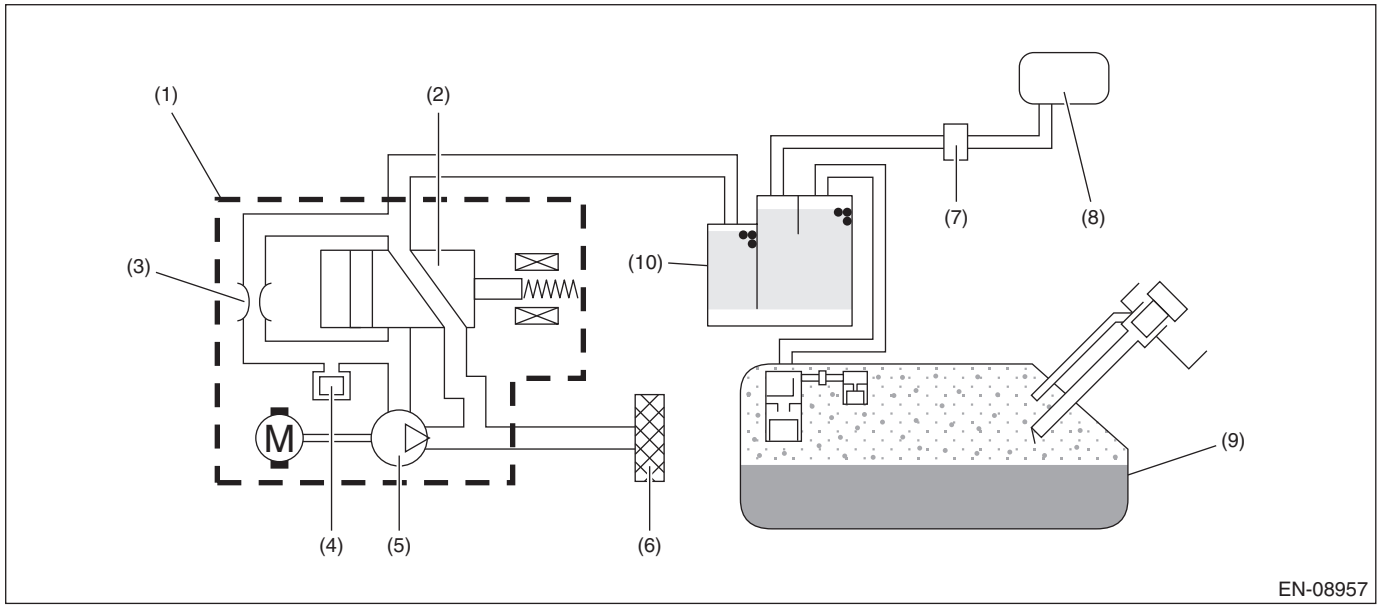
Time Needed for Diagnosis: 262 ms

BD:DTC P0452 EVAPORATIVE EMISSION SYSTEM PRESSURE SENSOR/ SWITCH LOW

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the ELCM pressure sensor.
Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(1) ELCM
(2) Switching valve
(3) Reference orifice (0.02 inch orifice)
(4) Pressure sensor
(5) Vacuum pump
(6) Drain filter
(7) Purge control solenoid valve
(8) Intake manifold
(9) Fuel tank
(10) Canister

3. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.973 V

Time Needed for Diagnosis: 1000 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 0.973 V

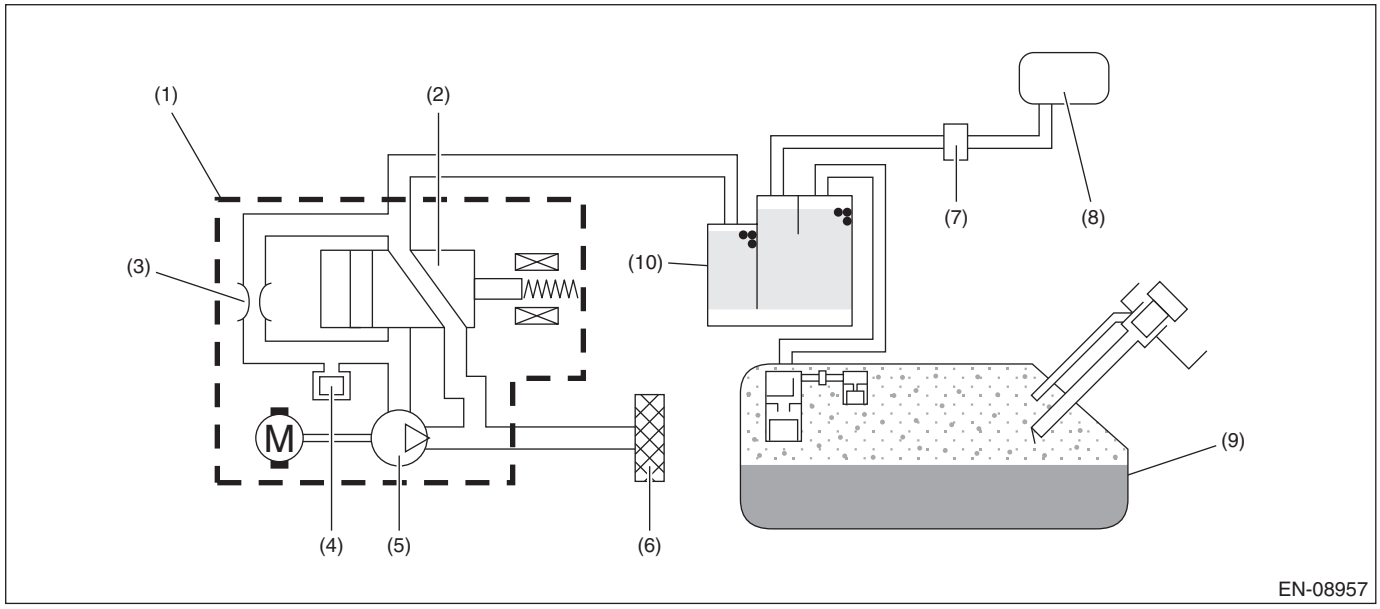
Time Needed for Diagnosis: Less than 1 second

BE:DTC P0453 EVAPORATIVE EMISSION SYSTEM PRESSURE SENSOR/ SWITCH HIGH

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the ELCM pressure sensor.
Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(1) ELCM
(2) Switching valve
(3) Reference orifice (0.02 inch orifice)
(4) Pressure sensor
(5) Vacuum pump
(6) Drain filter
(7) Purge control solenoid valve
(8) Intake manifold
(9) Fuel tank
(10) Canister

3. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.095 V

Time Needed for Diagnosis: 1000 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 4.095 V

Time Needed for Diagnosis: Less than 1 second

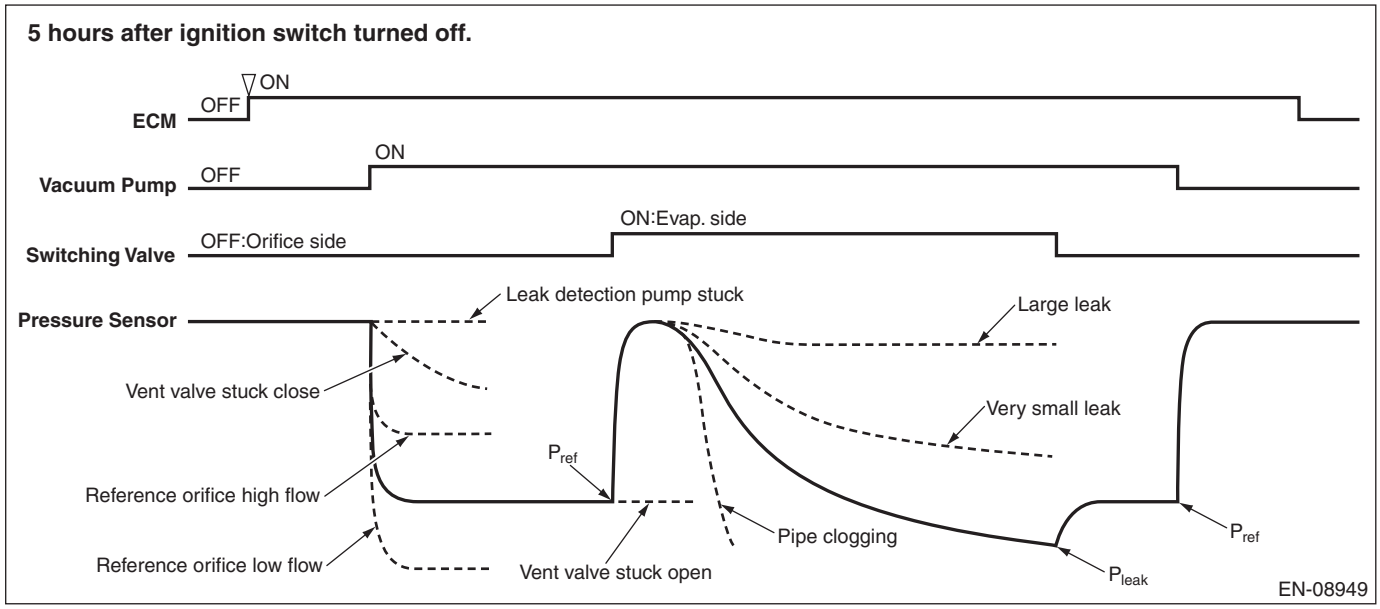
BF:DTC P0455 EVAPORATIVE EMISSION SYSTEM LEAK DETECTED (LARGE LEAK)

1. OUTLINE OF DIAGNOSIS

This diagnosis judges whether the ELCM operation is normal or not, and whether the evaporative emission system has leak and clogging or not.
To purge the canister, after driving of 10 minutes or more, perform the five hours soaking after ignition switch OFF in order to stabilize the evaporative gas status. After five hours passed, ECM is activated by soaking timer, and the leak check is started.
Judges whether the ELCM operation is normal or not, by measuring the reference pressure status via reference orifice (0.02 inch orifice). Judge as malfunction if the reference pressure is out of specified range. Then, judge whether there is a leak or not, by comparing the pressure (leak pressure) when the reference pressure and the evaporative emission system are in negative pressure condition. Judge as system leak in the evaporative emission system if the leak pressure is higher than reference pressure. Judge as clogging of pipe if the leak pressure becomes lower than the reference pressure within the specified amount of time.
0.02 inch leak and 0.04 inch leak can be distinguished by measuring the leak pressure.
The diagnosis results are stored inside ECM until the engine is started again.

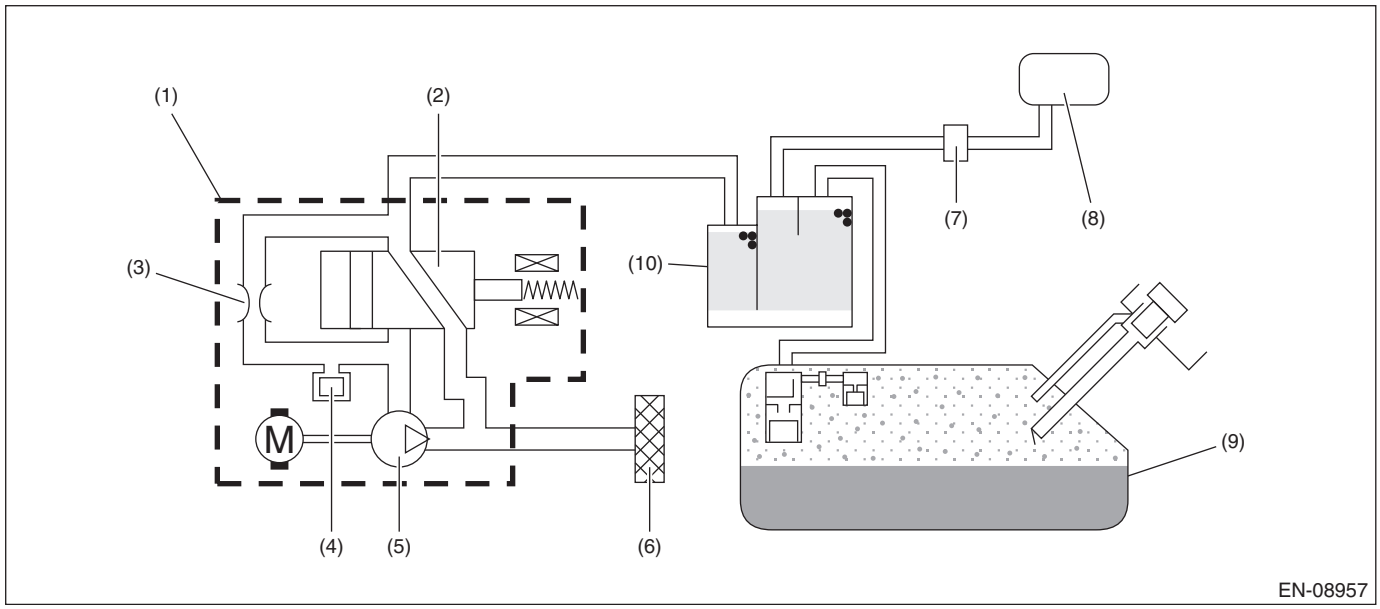
Diagnostic item	
ELCM system (ELCM body)	Vacuum pump stuck Switching valve stuck to open Switching valve stuck to close Reference orifice flow large Reference orifice flow small
Leak check	Large leak • 0.04 inch leak • Fuel cap loose • Fuel cap off • System malfunction
	Very small leak • 0.02 inch leak
Clogging of pipe	—

OUTLINE OF DIAGNOSIS



2. COMPONENT DESCRIPTION

ELCM consists of the pressure sensor, the reference orifice (diameter of 0.02 inch), the vacuum pump which introduces the negative pressure into evaporative emission system, and the switching valve which switches the passage to introduce the negative pressure.



(1) ELCM
(2) Switching valve
(3) Reference orifice (0.02 inch orifice)
(4) Pressure sensor
(5) Vacuum pump
(6) Drain filter
(7) Purge control solenoid valve
(8) Intake manifold
(9) Fuel tank
(10) Canister

3. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
Activation of soaking timer	Completed
Battery voltage	≥ 10.9 V
Ignition switch	OFF
Engine coolant temperature	≥ 4.4 °C (39.9 °F) and < 45 °C (113 °F)
Intake air temperature	≥ 4.4 °C (39.9 °F) and < 50 °C (122 °F)
Atmospheric pressure	≥ 75 kPa (563 mmHg, 22.2 inHg) and < 110 kPa (825 mmHg, 32.5 inHg)
Fuel level	< 60 ℓ (15.85 US gal, 13.2 Imp gal)
EVAP conc. learning during previous driving cycle	Done
Learning value of EVAP conc. during previous driving cycle	≤ 0.2
Accumulated purge amount during previous driving cycle	≥ Value of Map 1
Soaking timer IC diagnosis	Completed*

*: Engine running time of 600 s or more is required during previous driving cycle

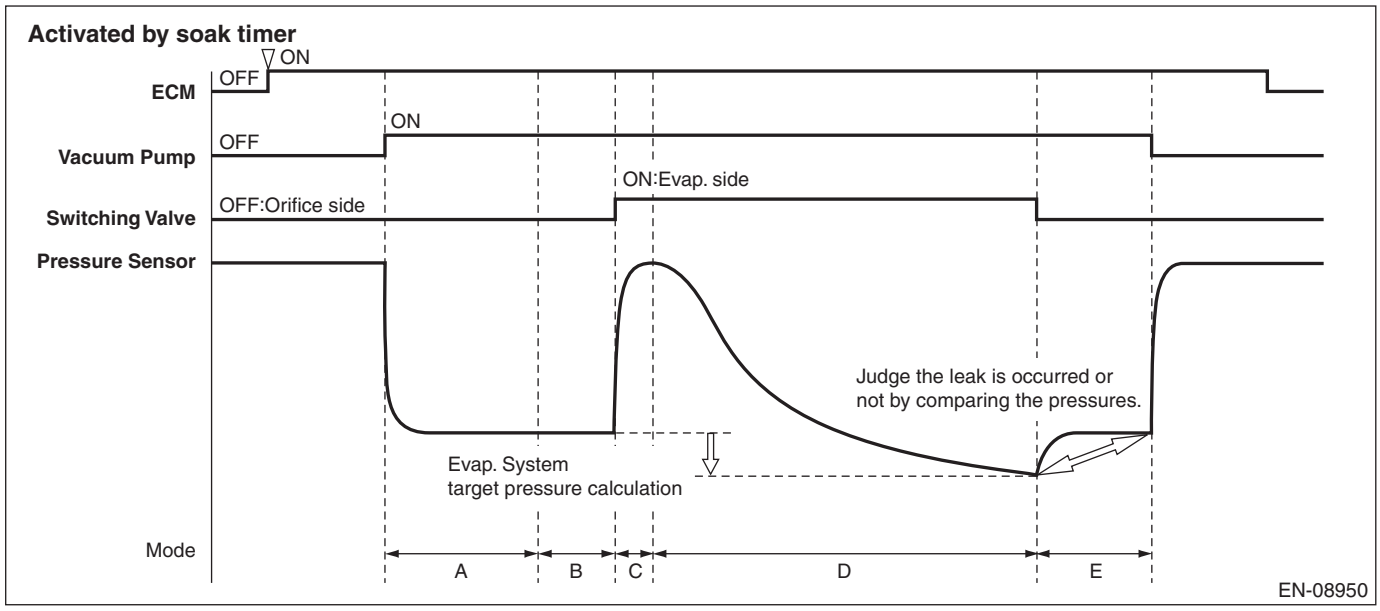
Map 1

Engine coolant temperature °C (°F)	0 (32)	25 (77)	50 (122)
Accumulated purge amount during previous driving cycle g (oz)	2700 (95.23)	2700 (95.23)	4450 (156.95)

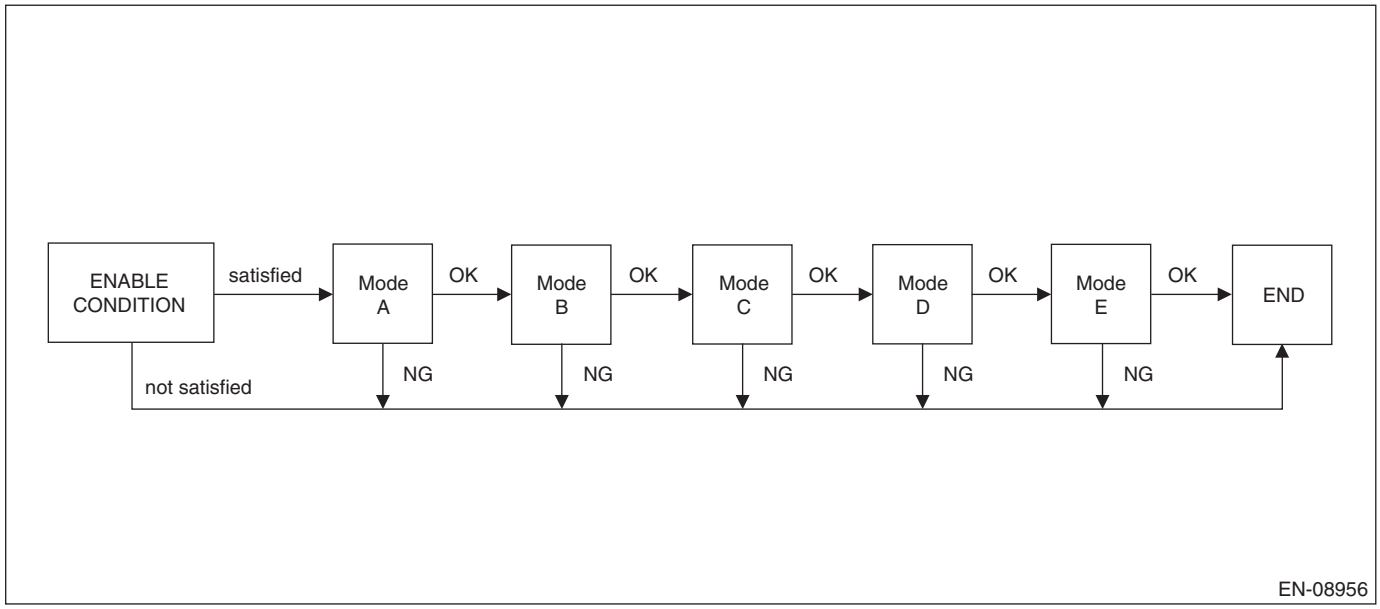
4. GENERAL DRIVING CYCLE

Perform the diagnosis only once when five hours has passed after ignition switch is OFF.

5. DIAGNOSTIC METHOD



Mode	Explanation of Mode	Diagnosis Period
A	Vacuum pump operation confirmation and characteristics stability	7 s or less & 300 s
B	Measurement of reference pressure for setting the target negative pressure	40 s or less
C	Switching valve operation confirmation	12 s or less
D	Clogging of pipe diagnosis and leak pressure measurement	900 s or less
E	Reference pressure measurement for judgement	40 s or less



Mode A (Vacuum pump operation confirmation and characteristics stability)

Purpose: Detect the vacuum pump operation trouble.
Judge as NG when the following conditions are established.
Judge as OK if the following conditions are not established, and warm up for five minutes to stabilize the vacuum pump characteristics.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
Elapsed time after mode change	≥ 6976 ms	P2404
Pressure sensor output value	> –0.2 kPa (–1.68 mmHg, –0.1 inHg)	

Mode B (Measurement of reference pressure for setting the target negative pressure)

1. Purpose: Judge the reference pressure stability.
Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
Elapsed time after mode change	≥ 40 s	P2404
|Pressure sensor maximum output value – Pressure sensor minimum output value|	> 0.3 kPa (2.355 mmHg, 0.1 inHg)	

2. Purpose: Judge whether the reference pressure is within the normal range, and detect the vacuum pump and orifice malfunctions.
Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
Reference pressure for setting the target negative pressure	< Value of Map 2 or > Value of Map 3	P2404

Map 2

Atmospheric pressure kPa (mmHg, inHg)	70 (525, 20.7)	80 (600, 23.6)	90 (675, 26.6)	100 (750, 29.5)
Reference pressure for setting the target negative pressure kPa (mmHg, inHg)	–4 (–29.79, –1.2)	–4.1 (–30.593, –1.2)	–4.2 (–31.395, –1.2)	–4.3 (–32.19, –1.3)

Map 3

Atmospheric pressure kPa (mmHg, inHg)	70 (525, 20.7)	80 (600, 23.6)	90 (675, 26.6)	100 (750, 29.5)
Reference pressure for setting the target negative pressure kPa (mmHg, inHg)	–0.9 (–7.065, –0.3)	–1 (–7.86, –0.3)	–1.2 (–8.663, –0.3)	–1.3 (–9.465, –0.4)

Mode C (Switching valve operation confirmation)

Purpose: Measure the pressure increase when switching valve is changed from open to close, and detect the stuck to open/close malfunctions of the switching valve.
Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
Elapsed time after mode change	≥ 12000 ms	P2404
Pressure sensor output value – Reference pressure for setting the target negative pressure	< 0.2 kPa (1.68 mmHg, 0.1 inHg)	

Mode D (Clogging of pipe diagnosis and leak pressure measurement)

1. **Clogging of pipe**
   Purpose: Measure the time required for the evaporative emission system to reach the target negative pressure by the vacuum pump, and detect the clogging of pipe trouble.
   Judge as clogging of pipe malfunction if the evaporative emission system reaches to the target negative pressure within the specified time.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
Time required to reach to the target negative pressure	< 30000 ms	P1451
When any one of the followings is established.		
•Reference pressure for setting the target negative pressure – Pressure sensor output value	≥ Value of Map 4	
•Pressure sensor output value	< –5 kPa (–37.298 mmHg, –1.5 inHg)	

Map 4

Time of negative pressure introduction ms	0	100000	200000	300000	400000	500000	600000	700000	800000	900000	1000000	1100000	1200000
Reference pressure for setting the target negative pressure – Pressure sensor output value kPa (mmHg, inHg)	0.9 (7.058, 0.3)	0.9 (7.058, 0.3)	0.9 (7.058, 0.3)	0.9 (7.058, 0.3)	0.9 (7.058, 0.3)	0.9 (7.058, 0.3)	0.9 (7.058, 0.3)	0.9 (7.058, 0.3)	0.9 (7.058, 0.3)	0.9 (7.058, 0.3)	0.9 (7.058, 0.3)	0.9 (7.058, 0.3)	0.9 (7.058, 0.3)

2. **Leak pressure measurement**
   Purpose: Measure the pressure (leak pressure) when the evaporative emission system becomes the negative pressure by the vacuum pump.
   Store the pressure as a leak pressure while the following conditions are met.

Judgment Value

Conditions for storing the leak pressure	Threshold Value
When any one of the followings is established.	
•Reference pressure for setting the target negative pressure – Pressure sensor output value	≥ Value of Map 4
•Pressure sensor output value	< –5 kPa (–37.298 mmHg, –1.5 inHg)
•Time of negative pressure introduction	≥ 900000 ms

Mode E (Measurement of reference pressure for judgement)

1. Purpose: Judge the reference pressure stability.
Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
Elapsed time after mode change	≥ 40 s	P2404
|Pressure sensor maximum output value – Pressure sensor minimum output value|	> 0.3 kPa (2.355 mmHg, 0.1 inHg)	

2. Purpose: Judge whether the reference pressure is within the normal range, and detect the vacuum pump and orifice malfunctions. Judge the vacuum pump performance stability.
Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
When any one of the followings is established.		P2404
•Reference pressure for judgement	< Value of Map 5 or > Value of Map 6	
•|Reference pressure for setting the target negative pressure – Reference pressure for judgement|	> 0.9 kPa (7.058 mmHg, 0.3 inHg)	

Map 5

Atmospheric pressure kPa (mmHg, inHg)	70 (525, 20.7)	80 (600, 23.6)	90 (675, 26.6)	100 (750, 29.5)
Reference pressure for judgement kPa (mmHg, inHg)	–4.5 (–34.02, –1.3)	–4.6 (–34.815, –1.4)	–4.7 (–35.618, –1.4)	–4.9 (–36.42, –1.4)

Map 6

Atmospheric pressure kPa (mmHg, inHg)	70 (525, 20.7)	80 (600, 23.6)	90 (675, 26.6)	100 (750, 29.5)
Reference pressure for judgement kPa (mmHg, inHg)	–0.8 (–6.18, –0.2)	–0.9 (–6.983, –0.3)	–1 (–7.785, –0.3)	–1.1 (–8.58, –0.3)

3. Purpose: Judge the presence of evaporative emission system leak.
Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
<Large leak (0.04 inch)> Leak pressure lleakjdg = (Reference pressure for judgement) × 0.377 – (–0.341)	 > Reference pressure for judgement and ≥ lleakjdg	P0455
<Very small leak (0.02 inch)> Leak pressure	 > Reference pressure for judgement and < lleakjdg	P0456

Time Needed for Diagnosis: Approx. 23 min

- **Abnormality Judgment**

At next engine start, confirm whether the enable conditions are satisfied even though refueling has been done during soaking, and determine the malfunction.
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

- **Normality Judgment**

At next engine start, confirm whether the enable conditions are satisfied even though refueling has been done during soaking, then, if the following conditions are established, judge as OK and clear the NG.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
NG flag	Not set	P0455 P0456 P1451 P2404

BG:DTC P0456 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK)

1. OUTLINE OF DIAGNOSIS

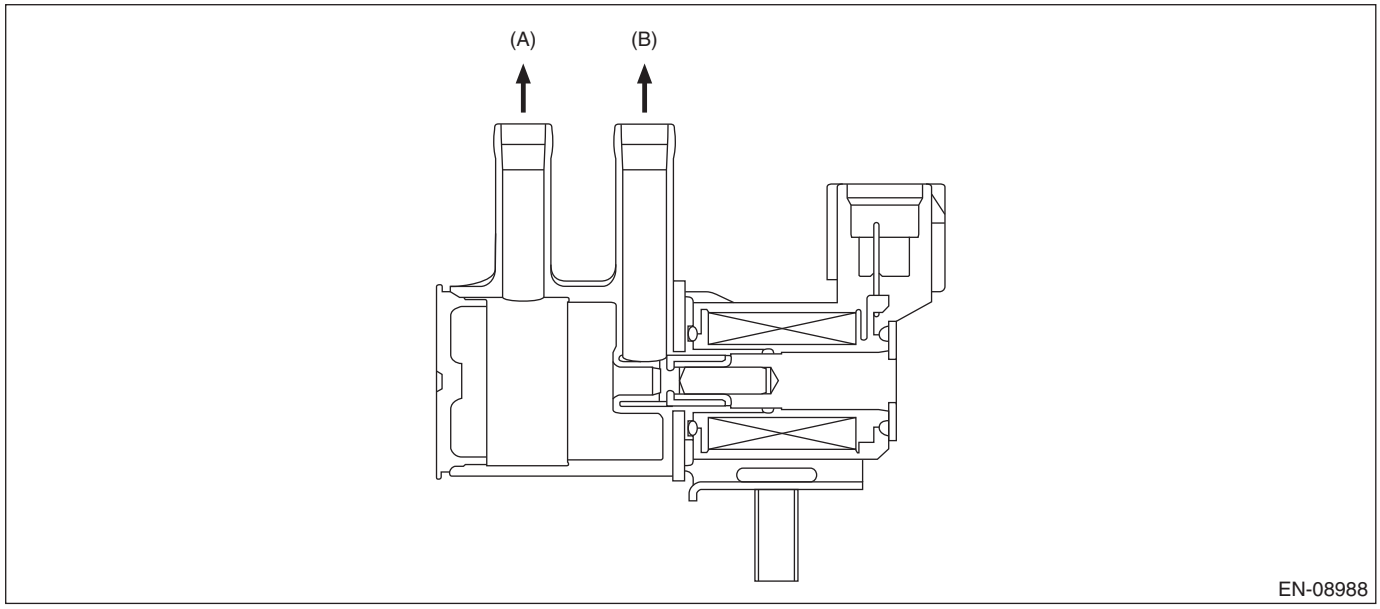
NOTE:
For the detection standard, refer to DTC P0455. <Ref. to GD(H4DO)-125, DTC P0455 EVAPORATIVE EMISSION SYSTEM LEAK DETECTED (LARGE LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

BH: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
Battery voltage	≥ 10.9 V
Elapsed time after starting the engine	≥ 1 second

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Duty ratio of “ON”	< 0.75
Terminal output voltage	Low

Time Needed for Diagnosis: 2500 ms
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage	High

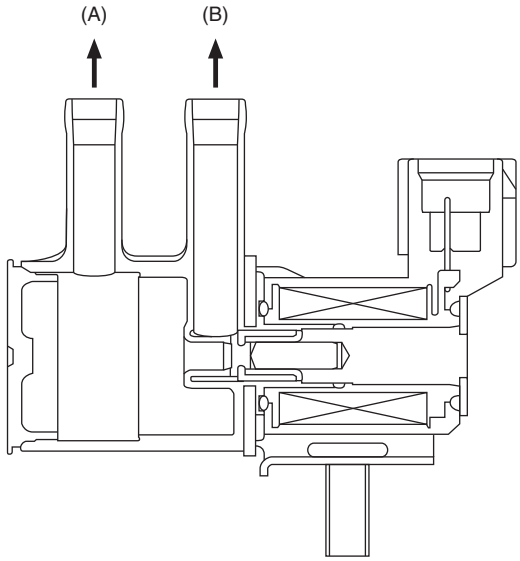
Time Needed for Diagnosis: Less than 1 second

BI: 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-08988

(A) To canister (B) To intake manifold

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Elapsed time after starting the engine	≥ 1 second

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Duty ratio of "ON"	≥ 0.25
Terminal output voltage	High

Time Needed for Diagnosis: 2500 ms
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage	Low

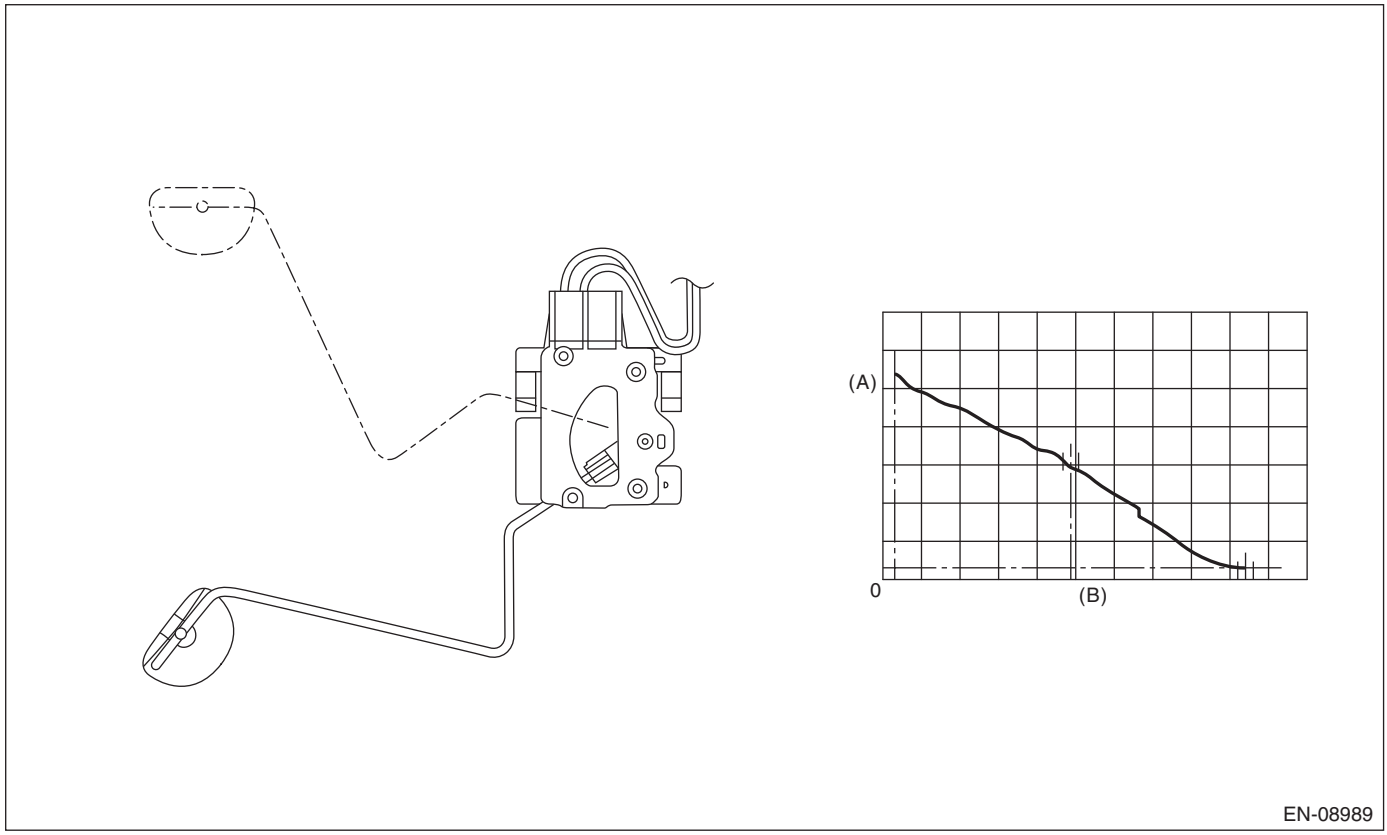
Time Needed for Diagnosis: Less than 1 second

BJ: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 (B) Resistance

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 following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Accumulated amount of intake air	≥ 330957 g (11672.85 oz)
Max. – min. values of fuel level output	< 2.6 ℓ (0.69 US gal, 0.57 Imp gal)
Battery voltage	≥ 10.9 V
Engine speed	< 7000 rpm
Elapsed time after starting the engine	≥ 5000 ms

Time Needed for Diagnosis: Less than 1 second
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Accumulated amount of intake air	≥ 330957 g (11672.85 oz)
Max. – min. values of fuel level output	≥ 2.6 ℓ (0.69 US gal, 0.57 Imp gal)
Battery voltage	≥ 10.9 V
Engine speed	< 7000 rpm
Elapsed time after starting the engine	≥ 5000 ms

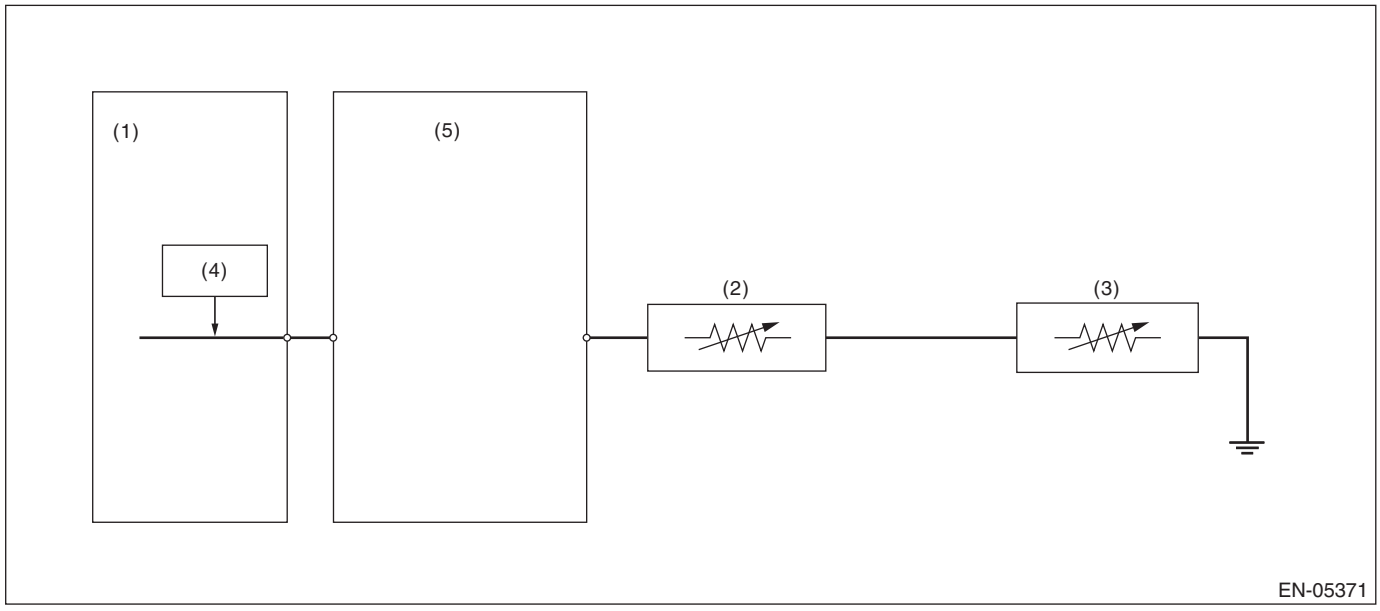
Time Needed for Diagnosis: Less than 1 second

BK: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 out of specification.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Fuel level sensor
(3) Fuel sub level sensor
(4) Detecting circuit
(5) Body integrated unit

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Elapsed time after starting the engine	≥ 3000 ms
Output voltage	< 0.173 V

Time Needed for Diagnosis: 2500 ms
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Elapsed time after starting the engine	≥ 3000 ms
Output voltage	≥ 0.173 V

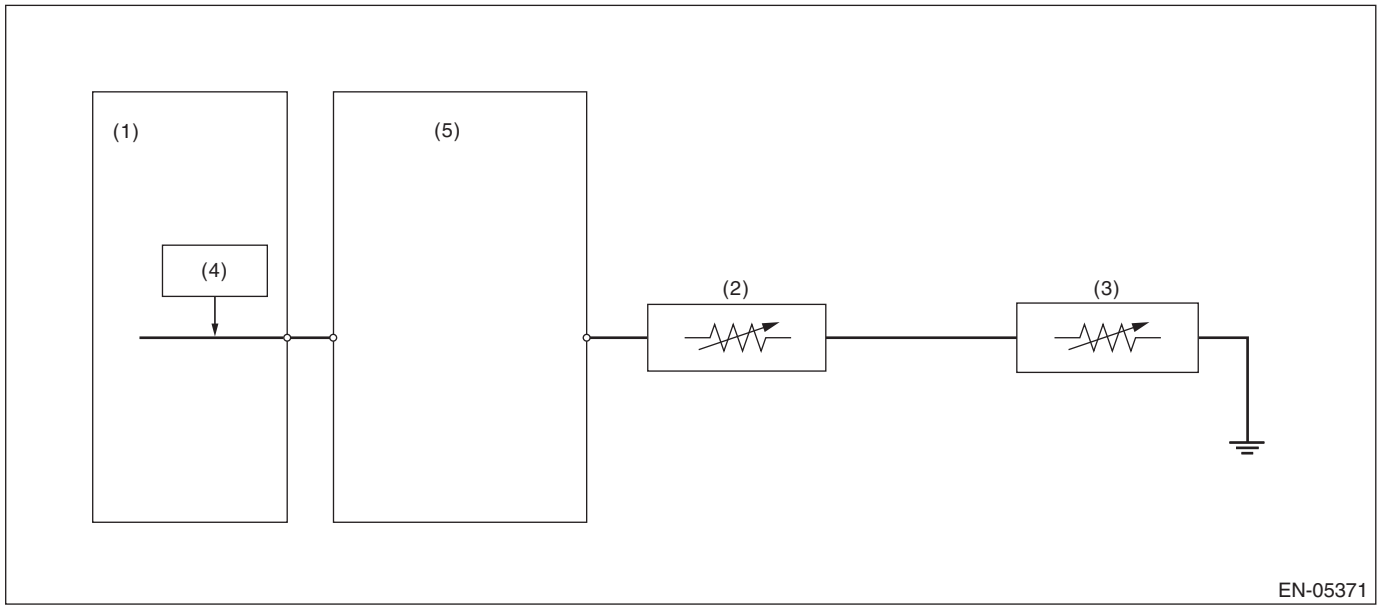
Time Needed for Diagnosis: Less than 1 second

BL: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 out of specification.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Fuel level sensor
(3) Fuel sub level sensor
(4) Detecting circuit
(5) Body integrated unit

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Elapsed time after starting the engine	≥ 3000 ms
Output voltage	≥ 7.212 V

Time Needed for Diagnosis: 1000 ms
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Elapsed time after starting the engine	≥ 3000 ms
Output voltage	< 7.212 V

Time Needed for Diagnosis: Less than 1 second

BM:DTC P0500 VEHICLE SPEED SENSOR “A”

1. OUTLINE OF DIAGNOSIS

Judge as NG when outside of the judgment value.
Judge NG when the received data from VDCCM&H/U is abnormal vehicle speed, and the vehicle speed data is impossible.

2. COMPONENT DESCRIPTION

Vehicle speed signals are taken in to the VDC control module and hydraulic control unit, and normal/erroneous data of the ABS wheel speed sensor is received by CAN communication from the VDC control module and hydraulic control unit.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Elapsed time after starting the engine	≥ 2000 ms

4. GENERAL DRIVING CYCLE

Always perform diagnosis more than 2000 ms after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Front ABS wheel speed sensor status	Malfunction
Either of the following is established	
Front left wheel speed	≥ 300 km/h (186.4 MPH)
Front right wheel speed	≥ 300 km/h (186.4 MPH)

Time Needed for Diagnosis: 2500 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Front left wheel speed	> 0 km/h (0 MPH) and < 300 km/h (186.4 MPH)
Front right wheel speed	> 0 km/h (0 MPH) and < 300 km/h (186.4 MPH)

Time Needed for Diagnosis: 2500 ms

BN: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 kPa (563 mmHg, 22.2 inHg)
Fuel level	≥ 9.6 ℓ (2.54 US gal, 2.11 Imp gal)
Elapsed time after starting the engine	≥ 10.49 s
Feedback of ISC	In operation
Lambda value (left and right)	≥ 0.81 and < 1.1
After switching air conditioner to ON/OFF	≥ 5.1 s
After intake manifold pressure changes by 4 kPa (30 mmHg, 1.2 inHg) or more.	> 5.1 s
Elapsed time after switching neutral position switch to ON/OFF	> 5.1 s
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

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Actual engine speed – Targeted engine speed	< –100 rpm
Feedback compensation for ISC	Max.

Time Needed for Diagnosis: 10 s × 3 time(s)
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Actual engine speed – Targeted engine speed	≥ –100 rpm

Time Needed for Diagnosis: 10 s

BO: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 kPa (563 mmHg, 22.2 inHg)
Fuel level	≥ 9.6 ℓ (2.54 US gal, 2.11 Imp gal)
Elapsed time after starting the engine	≥ 10.49 s
Feedback of ISC	In operation
Lambda value (left and right)	≥ 0.81 and < 1.1
After switching air conditioner to ON/OFF	≥ 5.1 s
After intake manifold pressure changes by 4 kPa (30 mmHg, 1.2 inHg) or more.	> 5.1 s
Elapsed time after switching neutral position switch to ON/OFF	> 5.1 s
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**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Actual – Target engine speed	≥ 200 rpm
Feedback compensation for ISC	Min.

Time Needed for Diagnosis: 10 s × 3 time(s)
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Actual – Target engine speed	< 200 rpm

Time Needed for Diagnosis: 10 s

BP:DTC P050A COLD START IDLE AIR CONTROL SYSTEM PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect malfunctions of the catalyst advanced idling retard angle control.
Judge as NG when ECM is not controlling the angle properly during catalyst advanced idling retard angle control.
Judge as NG if there is exhaust gas temperature diagnosis, idle speed diagnosis and final ignition timing diagnosis, and if any one of them is judged as NG.

- Exhaust gas temperature diagnosis (P050A)

Judge as NG when the estimated exhausted gas temperature in 14 seconds after the cold start is below the specified value.

- Idle speed diagnosis (P050A)

Judge as NG when actual engine speed is not close to target engine speed at cold start.

- Final ignition timing diagnosis (P050B)

Judge as NG when actual retard amount is under the specified value at cold start.

2. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
<Exhaust gas temperature diagnosis>	
Atmospheric pressure	≥ 75 kPa (563 mmHg, 22.2 inHg)
Battery voltage	> 10.9 V
Engine condition	In operation
Vehicle speed	≤ 2 km/h (1.2 MPH)
Misfire in 200 engine revs.	< 5
Elapsed time after gear position change (P ←→ D or N ←→ D)	≥ 3000 ms
ISC feedback	In operation
Throttle opening angle	< 0.37 °
Fuel property	Not extremely low volatility
Target retard amount	≥ 8 °CA (AT model) ≥ 8 °CA (MT model)
<Idle speed diagnosis>	
Atmospheric pressure	≥ 75 kPa (563 mmHg, 22.2 inHg)
Battery voltage	> 10.9 V
Engine condition	In operation
Vehicle speed	≤ 2 km/h (1.2 MPH)
Misfire in 200 engine revs.	< 5
Engine coolant temperature	≤ 50°C (122°F)
Intake air amount sum value	≤ Value of Map 1
Elapsed time after gear position change (P ←→ D or N ←→ D)	≥ 3000 ms
Throttle opening angle	< 0.37 °
Fuel property	Not extremely low volatility
Elapsed time after starting the engine	≥ 2000 ms
<Final ignition timing diagnosis>	
Atmospheric pressure	≥ 75 kPa (563 mmHg, 22.2 inHg)
Battery voltage	> 10.9 V
Engine condition	In operation
Vehicle speed	≤ 2 km/h (1.2 MPH)
Misfire in 200 engine revs.	< 5
Engine coolant temperature	≤ 50°C (122°F)
Intake air amount sum value	≤ Value of Map 2
Elapsed time after gear position change (P ←→ D or N ←→ D)	≥ 3000 ms
Throttle opening angle	< 0.37 °
Fuel property	Not extremely low volatility
Target retard amount	≥ Value from Map 3

Map 1

Coolant temperature after starting the engine °C (°F)	–40 (–40)	–30 (–22)	–20 (–4)	–10 (14)	0 (32)	10 (50)	20 (68)	30 (86)
Threshold Value g (oz)	965.6 (34.06)	869.1 (30.65)	772.5 (27.25)	659.8 (23.27)	547.2 (19.3)	466.7 (16.46)	395.9 (13.96)	354.1 (12.49)

Coolant temperature after starting the engine °C (°F)	40 (104)	50 (122)	60 (140)	70 (158)	80 (176)	90 (194)	100 (212)	110 (230)
Threshold Value g (oz)	321.9 (11.35)	289.7 (10.22)	273.6 (9.65)	273.6 (9.65)	273.6 (9.65)	273.6 (9.65)	273.6 (9.65)	273.6 (9.65)

Map 2

Coolant temperature after starting the engine °C (°F)	–40 (–40)	–30 (–22)	–20 (–4)	–10 (14)	0 (32)	10 (50)	20 (68)	30 (86)
Threshold Value g (oz)	965.6 (34.06)	869.1 (30.65)	772.5 (27.25)	659.8 (23.27)	547.2 (19.3)	466.7 (16.46)	395.9 (13.96)	354.1 (12.49)

Coolant temperature after starting the engine °C (°F)	40 (104)	50 (122)	60 (140)	70 (158)	80 (176)	90 (194)	100 (212)	110 (230)
Threshold Value g (oz)	321.9 (11.35)	289.7 (10.22)	273.6 (9.65)	273.6 (9.65)	273.6 (9.65)	273.6 (9.65)	273.6 (9.65)	273.6 (9.65)

Map 3

Engine coolant temperature	–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 (AT model)	6.4 °CA	6.4 °CA	6.4 °CA	6.4 °CA	6.4 °CA	6.4 °CA	6.4 °CA	6.4 °CA	6.4 °CA	3.5 °CA
Threshold value (MT model)	6.4 °CA	6.4 °CA	6.4 °CA	6.4 °CA	6.4 °CA	6.4 °CA	6.4 °CA	6.4 °CA	6.4 °CA	3.5 °CA

3. GENERAL DRIVING CYCLE

Perform the diagnosis at cold start.

4. DIAGNOSTIC METHOD

• Exhaust gas temperature diagnosis

Abnormality Judgment
Calculate the estimated exhaust gas temperature when the diagnostic enable condition is established. Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Estimated exhaust gas temperature	< Value of Map 4

Map 4

Coolant temperature after starting the engine	–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 (AT model)	220 °C (428 °F)	220 °C (428 °F)	220 °C (428 °F)	220 °C (428 °F)	220 °C (428 °F)	214 °C (417.2 °F)	206 °C (402.8 °F)	206 °C (402.8 °F)	184 °C (363.2 °F)	178 °C (352.4 °F)
Threshold value (MT model)	214 °C (417.2 °F)	214 °C (417.2 °F)	214 °C (417.2 °F)	214 °C (417.2 °F)	214 °C (417.2 °F)	214 °C (417.2 °F)	214 °C (417.2 °F)	198 °C (388.4 °F)	194 °C (381.2 °F)	190 °C (374 °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 and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Estimated exhaust gas temperature	≥ Value of Map 4

Time Needed for Diagnosis: Less than 1 second

• Idle speed diagnosis

Abnormality Judgment
Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Actual engine speed – Target engine speed	< –50 — –100 rpm (AT model) < – 100 rpm (MT model)

Time Needed for Diagnosis: 5000 ms
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.
Normality Judgment
Judge as OK and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Actual engine speed – Target engine speed	≥ –50 — –100 rpm (AT model) ≥ – 100 rpm (MT model)

Time Needed for Diagnosis: 5000 ms

- **Final ignition timing diagnosis**

Abnormality Judgment
Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Final ignition timing – ignition timing during CSERS* *: Ignition timing during CSERS (Cold Start Emission Reduction Strategy) = Base ignition timing – retard amount	≥ Value of Map 5

Map 5

Engine coolant temperature	–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 (AT model)	3.5 °CA	3.5 °CA	3.5 °CA	3.5 °CA	3.5 °CA	3.5 °CA	3.5 °CA	3.5 °CA	3.5 °CA	3.5 °CA
Threshold value (MT model)	3.5 °CA	3.5 °CA	3.5 °CA	3.5 °CA	3.5 °CA	3.5 °CA	3.5 °CA	3.5 °CA	3.5 °CA	3.5 °CA

Time Needed for Diagnosis: 5000 ms
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment
Judge as OK and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Final ignition timing – ignition timing during CSERS* *: Ignition timing during CSERS (Cold Start Emission Reduction Strategy) = Base ignition timing – retard amount	< Value of Map 5

Time Needed for Diagnosis: 5000 ms

BQ:DTC P050B COLD START IGNITION TIMING PERFORMANCE

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P050A. <Ref. to GD(H4DO)-147, DTC P050A COLD START IDLE AIR CONTROL SYSTEM PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

BR:DTC P0512 STARTER REQUEST CIRCUIT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of starter SW.
Judge as 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**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Engine condition	After engine starting
Starter OFF signal	Not detected
Battery voltage	≥ 8 V

Time Needed for Diagnosis: 60000 ms
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Starter OFF signal	Detected
Battery voltage	≥ 8 V

Time Needed for Diagnosis: Less than 1 second

BS: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 body integrated unit)
P1570	Antenna	Faulty antenna
P1571	Reference Code Incompatibility	Reference code incompatibility between body integrated unit and ECM
P1572	IMM Circuit Failure (Except Antenna Circuit)	Communication failure between body integrated unit and ECM
P1574	Key Communication Failure	Failure of body integrated unit to verify key (transponder) ID code or transponder failure
P1576	EGI Control Module EEPROM	ECM malfunctioning
P1577	IMM Control Module EEPROM	Body integrated unit malfunctioning
P1578	Meter Failure	Reference code incompatibility between body integrated unit and combination meter

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 for the outline of the diagnosis of the top are established.

BT: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 CPU normal RAM, judge as NG.
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 following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Write the specified value to RAM and then read.	The written value cannot be read.

Time Needed for Diagnosis: Less than 1 second
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Write the specified value to RAM and then read.	The written value can be read.

Time Needed for Diagnosis: Less than 1 second

BU: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 if the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
SUM value of ROM	Standard

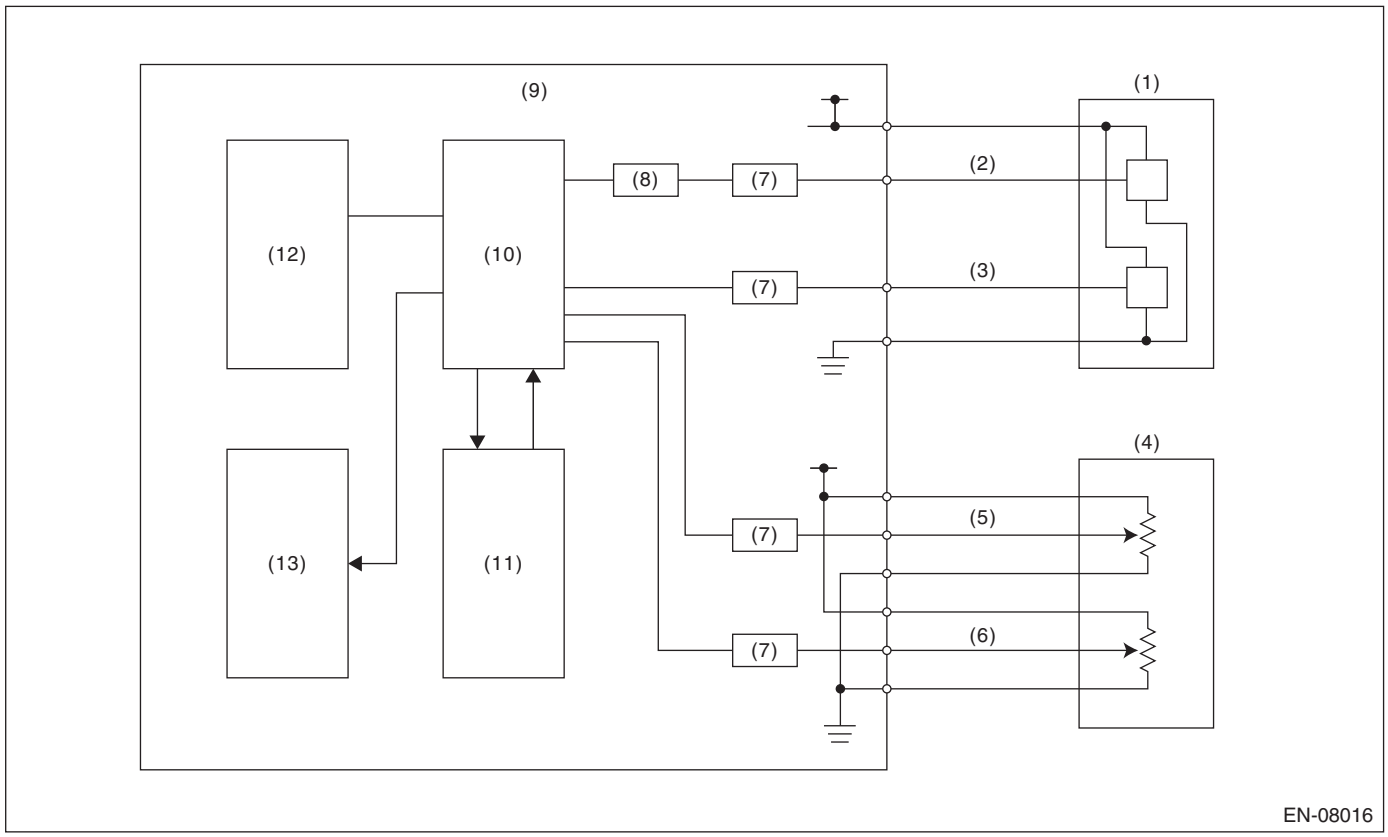
Time Needed for Diagnosis: Undetermined
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

BV:DTC P0607 THROTTLE CONTROL SYSTEM CIRCUIT RANGE/PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Judge as NG when any one of the followings is established.
(1) Monitoring IC operates abnormally. (Monitoring IC malfunction)
(2) Input amplifier circuit of throttle position sensor 1 operates abnormally. (fourfold amplifier malfunction)
(3) CPU operates abnormally. (Instruction/flow check)
(4) A/D converter operates abnormally. (ADC malfunction)
(5) EEPROM operates abnormally. (EEPROM malfunction)
(6) Output IC operates abnormally. (Output driver malfunction)

2. COMPONENT DESCRIPTION



(1)	Throttle position sensor	(6)	Accelerator pedal position sensor 2	(10)	CPU
(2)	Throttle position sensor 1	(7)	I/F circuit	(11)	Monitoring IC
(3)	Throttle position sensor 2	(8)	Amplifier circuit	(12)	EEPROM
(4)	Accelerator pedal position sensor	(9)	Engine control module (ECM)	(13)	Output IC
(5)	Accelerator pedal position sensor 1				

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
(1) Battery voltage	≥ 6 V
(2) Ignition switch	ON
(2) Battery voltage	≥ 6 V
(3) Ignition switch	ON
(3) ETC control	Permitted
(4) Ignition switch	ON
(4) Battery voltage	≥ 6 V
(5) Starter switch	OFF
(5) Battery voltage	> 6 V
(6) Ignition switch	ON
(6) Battery voltage	≥ 10.9 V

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
(1) Monitoring IC operation	The result and estimated value match.
(2) | Throttle position sensor 1 opening angle – (Throttle position sensor 1 opening angle after passing amplifier)/4 |	< 3 °
(3) Main CPU calculation result	The result and estimated value match.
(4) | Standard voltage – Voltage reading |	< 0.078125 V
(5) EEPROM writing	Writing completed
(6) Communication with output IC	Possible to communicate

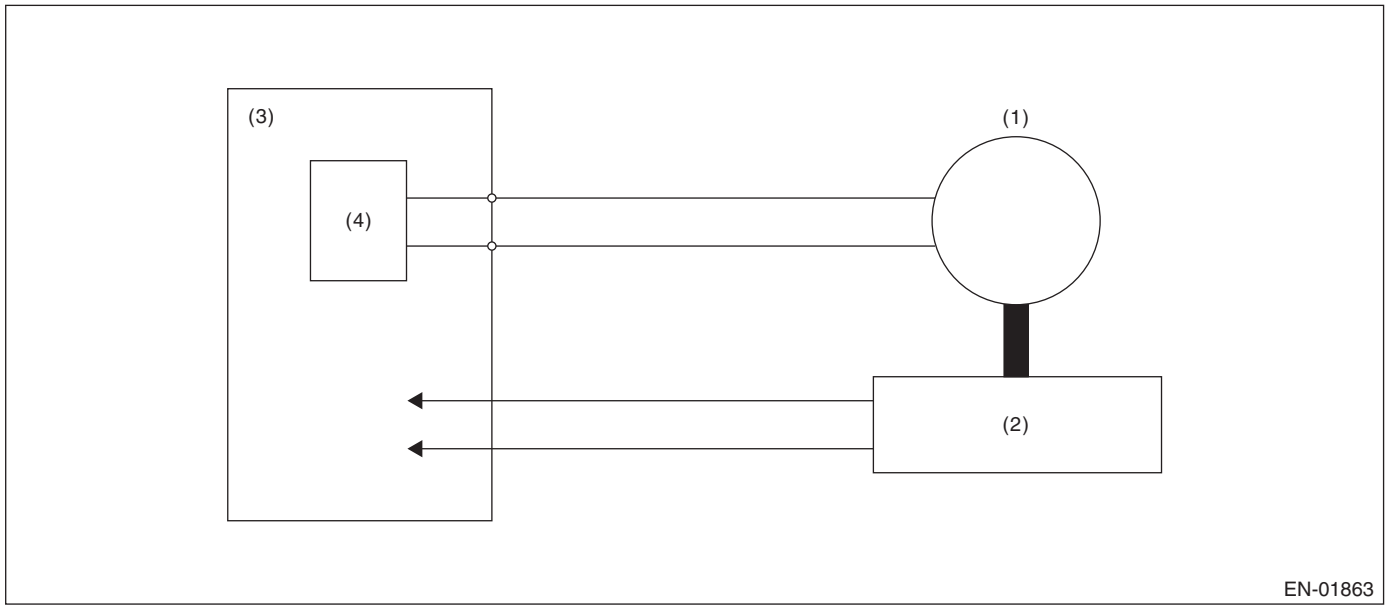
Time Needed for Diagnosis:
(1): 200 ms
(2): 24 ms
(3): 192 ms
(4): 200 ms
(5): 48 ms
(6): 2500 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

BW: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 the specified duty or more 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 electronic throttle control	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously when the electronic throttle control is operating.

5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

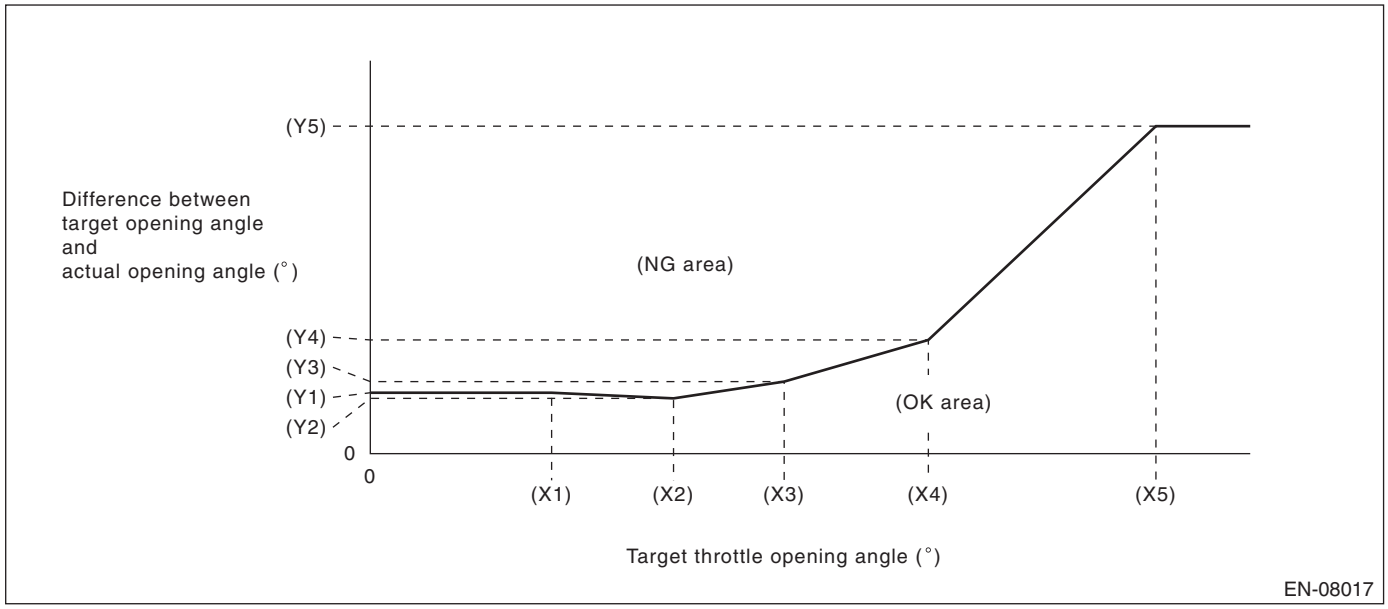
Judgment Value

Malfunction Criteria	Threshold Value
Difference between target opening angle and actual opening angle	Within the OK range of **judgment value detail**
Output duty to drive circuit	< 95 %

Time Needed for Diagnosis:

- Difference between target opening angle and actual opening angle:
  - NG judgment: Refer to the **judgment time detail**.
  - OK judgment: 2000 ms
- Output duty to drive circuit: 2000 ms

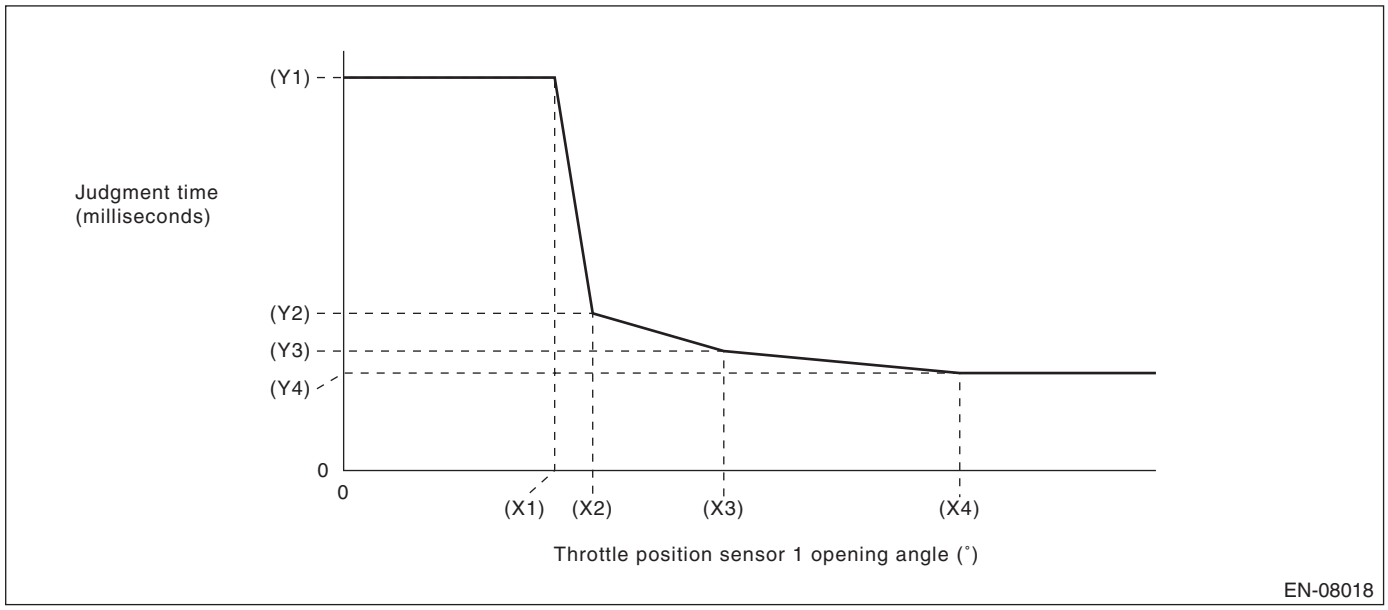
Details of Judgment Value



(X1) 6.915 °
(X2) 11.565 °
(X3) 15.785 °
(X4) 21.285 °
(X5) 29.965 °

(Y1) 4.65 °
(Y2) 4.22 °
(Y3) 5.5 °
(Y4) 8.68 °
(Y5) 25 °

Judgment time detail



(X1) 8.049999237 °
(X2) 9.5 °
(X3) 14.5 °
(X4) 23.5 °

(Y1) 1000 ms
(Y2) 400 ms
(Y3) 304 ms
(Y4) 248 ms

NOTE:
Judgment time is constantly 1000 ms with Actual opening angle ≤ Target opening angle.
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

BX:DTC P0700 TRANSMISSION CONTROL SYSTEM (MIL REQUEST)

1. OUTLINE OF DIAGNOSIS

Judge as NG when there is CAN communication with the TCM and there is a MIL lighting request.

2. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
MIL lighting request from TCM	Yes

Time Needed for Diagnosis: 2500 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
MIL lighting request from TCM	None

Time Needed for Diagnosis: Less than 1 second

BY:DTC P0851 PARK/NEUTRAL SWITCH INPUT CIRCUIT LOW (AT MODEL)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of neutral SW.
Judge as NG when the ECM neutral terminal input differs from the reception data from TCM.

2. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Starter relay	OFF

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds after starting the engine.

4. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Neutral switch signal in ECM when “P”/“N” range in TCM are “OFF” and when the other switches are “ON”	LOW (ON)

Time Needed for Diagnosis: 100 time(s)
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Neutral switch signal in ECM when “P”/“N” range in TCM are “OFF” and when the other switches are “ON”	HIGH (OFF)

Time Needed for Diagnosis: Less than 1 second

BZ:DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW (MT MODEL)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of neutral SW.
Judge as 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
Battery voltage	≥ 10.9 V
Starter relay	OFF

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds after starting the engine.

4. DIAGNOSTIC METHOD

- **Abnormality Judgment**

Judge NG when the malfunction criteria below are completed determined times or more after the neutral SW change.

Judgment Value

Malfunction Criteria	Threshold Value
Neutral switch signal (while changing from a to b below)	LOW (ON) continues.
Driving condition change	From a) to b)
a) Engine speed 600 rpm — 900 rpm & Vehicle speed = 0 km/h (0 MPH)	
b) Engine speed 1600 rpm — 2550 rpm & Vehicle speed ≥ 64 km/h (39.8 MPH)	

Time Needed for Diagnosis: 3 time(s)
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

- **Normality Judgment**

Judge as OK and clear NG when there is change in the neutral SW.

Judgment Value

Malfunction Criteria	Threshold Value
Neutral switch signal (while changing from a to b below)	Changes to HIGH (OFF).
Driving condition change	From a) to b)
a) Engine speed 600 rpm — 900 rpm & Vehicle speed = 0 km/h (0 MPH)	
b) Engine speed 1600 rpm — 2550 rpm & Vehicle speed ≥ 64 km/h (39.8 MPH)	

Time Needed for Diagnosis: Less than 1 second

CA:DTC P0852 PARK/NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT MODEL)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of neutral SW.
Judge as NG when the ECM neutral terminal input differs from the reception data from TCM.

2. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Starter relay	OFF

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds after starting the engine.

4. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Neutral switch signal in ECM when “P”/“N” range in TCM are “ON” and when the other switches are “OFF”	HIGH (OFF)

Time Needed for Diagnosis: 100 time(s)
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Neutral switch signal in ECM when “P”/“N” range in TCM are “ON” and when the other switches are “OFF”	LOW (ON)

Time Needed for Diagnosis: Less than 1 second

CB:DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT MODEL)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of neutral SW.
Judge as 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
Battery voltage	≥ 10.9 V
Starter relay	OFF

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds after starting the engine.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below are completed determined times or more after the neutral SW change.

Judgment Value

Malfunction Criteria	Threshold Value
Neutral switch signal (while changing from a to b below)	HIGH (OFF) continues.
Driving condition change	From a) to b)
a) Engine speed 600 rpm — 900 rpm & Vehicle speed = 0 km/h (0 MPH)	
b) Engine speed 1600 rpm — 2550 rpm & Vehicle speed ≥ 64 km/h (39.8 MPH)	

Time Needed for Diagnosis: 3 time(s)
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear NG when there is change in the neutral SW.

Judgment Value

Malfunction Criteria	Threshold Value
Neutral switch signal (while changing from a to b below)	Changes to LOW (ON).
Driving condition change	From a) to b)
a) Engine speed 600 rpm — 900 rpm & Vehicle speed = 0 km/h (0 MPH)	
b) Engine speed 1600 rpm — 2550 rpm & Vehicle speed ≥ 64 km/h (39.8 MPH)	

Time Needed for Diagnosis: Less than 1 second

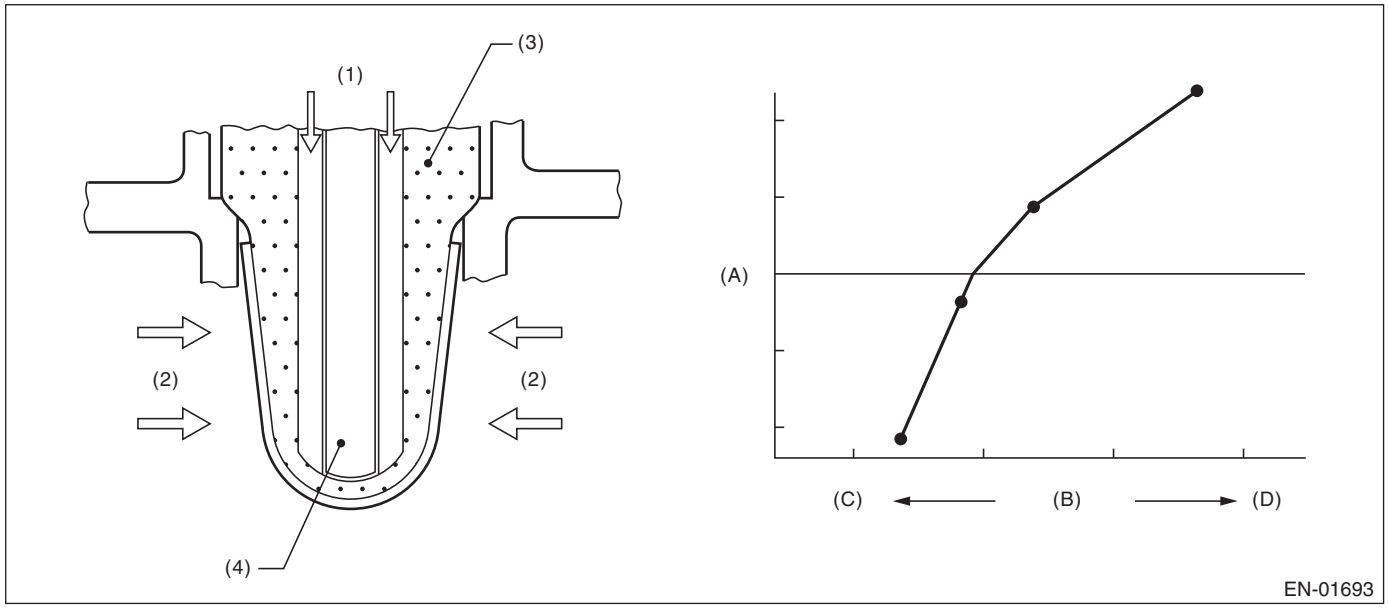
CC:DTC P1152 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK1 SENSOR1)

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
λ > 1: Lean
λ < 1: Rich

2. COMPONENT DESCRIPTION



(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich

(1) Atmosphere
(2) Exhaust gas
(3) ZrO_2
(4) Ceramic heater

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Time needed for all secondary parameters to be in enable conditions	≥ 4096 ms
Battery voltage	≥ 10.9 V
Atmospheric pressure	≥ 75 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.
Elapsed time after starting the engine	≥ 60000 ms
Engine coolant temperature	≥ 70 °C (158 °F)
Vehicle speed	≥ 20 km/h (12.4 MPH)
Amount of intake air	≥ 6 g/s (0.21 oz/s)
Load change at 180°CA	< 0.02 g/rev (0 oz/rev)
Front oxygen (A/F) sensor impedance	0 Ω — 50 Ω
Learning value of evaporation gas density	< 0.2
Total time of operating canister purge	≥ 19.9 s
Targeted lambda value load compensation coefficient	–0.03 — 0.000

4. GENERAL DRIVING CYCLE

Perform diagnosis continuously at a constant speed of 20 km/h (12.4 MPH) or more after 60000 ms have passed since the engine started.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
λ value	< 0.85

Time Needed for Diagnosis: 10000 ms
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
λ value	≥ 0.85

Time Needed for Diagnosis: Less than 1 second

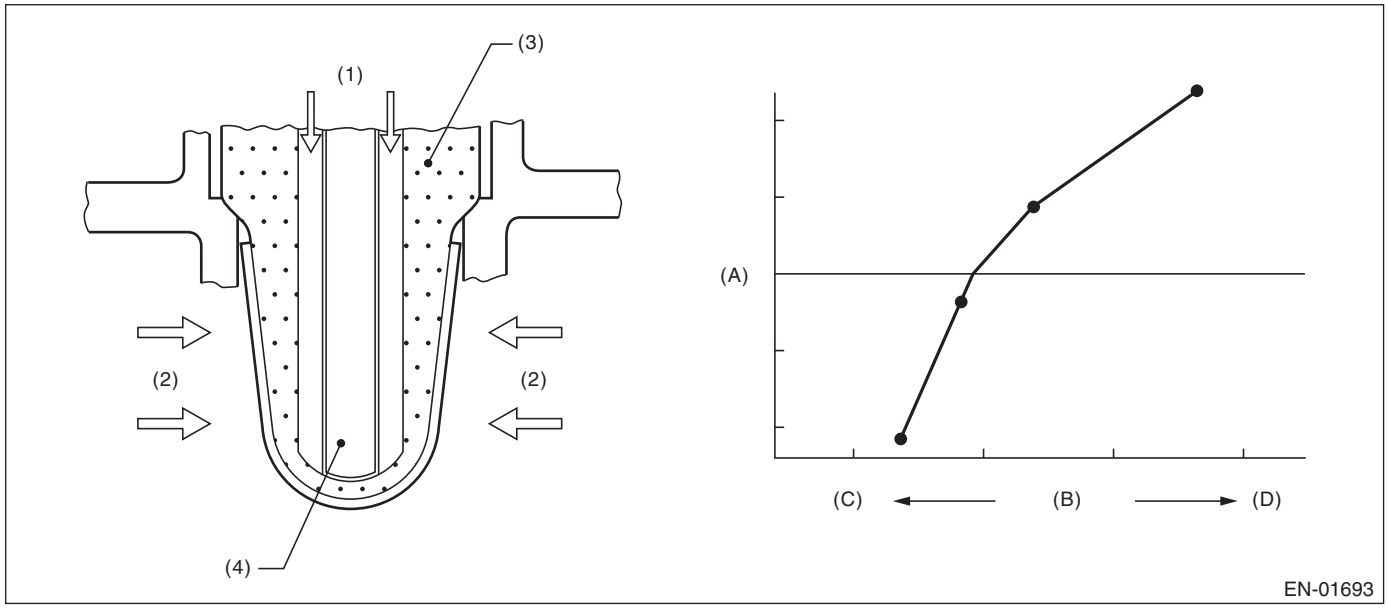
CD:DTC P1153 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1)

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
λ > 1: Lean
λ < 1: Rich

2. COMPONENT DESCRIPTION



(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich

(1) Atmosphere
(2) Exhaust gas
(3) ZrO_2
(4) Ceramic heater

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Time needed for all secondary parameters to be in enable conditions	≥ 4096 ms
Battery voltage	≥ 10.9 V
Atmospheric pressure	≥ 75 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.
Elapsed time after starting the engine	≥ 60000 ms
Engine coolant temperature	≥ 70 °C (158 °F)
Vehicle speed	≥ 20 km/h (12.4 MPH)
Amount of intake air	≥ 6 g/s (0.21 oz/s)
Load change at 180°CA	< 0.02 g/rev (0 oz/rev)
Front oxygen (A/F) sensor impedance	0 Ω — 50 Ω
Learning value of evaporation gas density	< 0.2
Total time of operating canister purge	≥ 19.9 s
Targeted lambda value load compensation coefficient	–0.03 — 0.000

4. GENERAL DRIVING CYCLE

Perform diagnosis continuously at a constant speed of 20 km/h (12.4 MPH) or more after 60000 ms have passed since the engine started.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
λ value	> 1.15

Time Needed for Diagnosis: 10000 ms
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
λ value	≤ 1.15

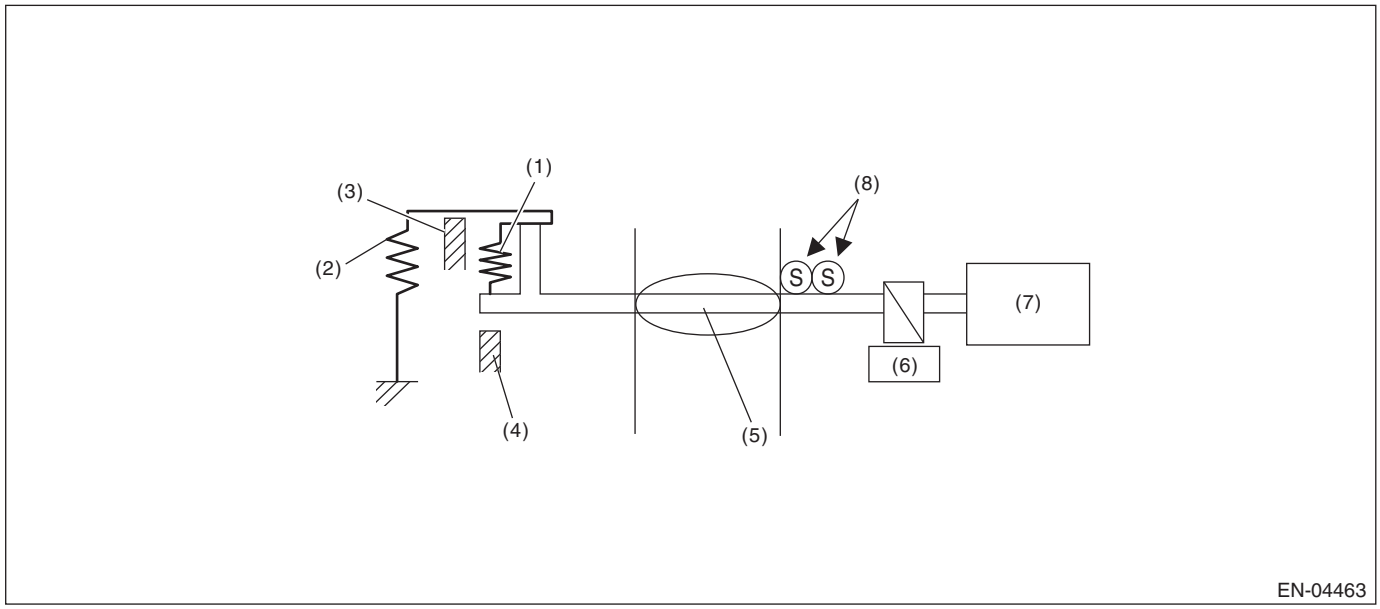
Time Needed for Diagnosis: Less than 1 second

CE:DTC P1160 RETURN SPRING FAILURE

1. OUTLINE OF DIAGNOSIS

Judge as NG when the valve is opened more than the default opening angle, but does not move to the close direction with the motor power stopped.

2. COMPONENT DESCRIPTION



(1) Opener spring
(2) Return spring
(3) Intermediate stopper
(4) Full closed stopper
(5) Throttle valve
(6) Gear
(7) DC motor
(8) Main and sub throttle position sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 6 V
Throttle position sensor	Normal

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 following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Opening variation after continuity is set to OFF	< 2 °

Time Needed for Diagnosis: 24 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Opening variation after continuity is set to OFF	≥ 2 °

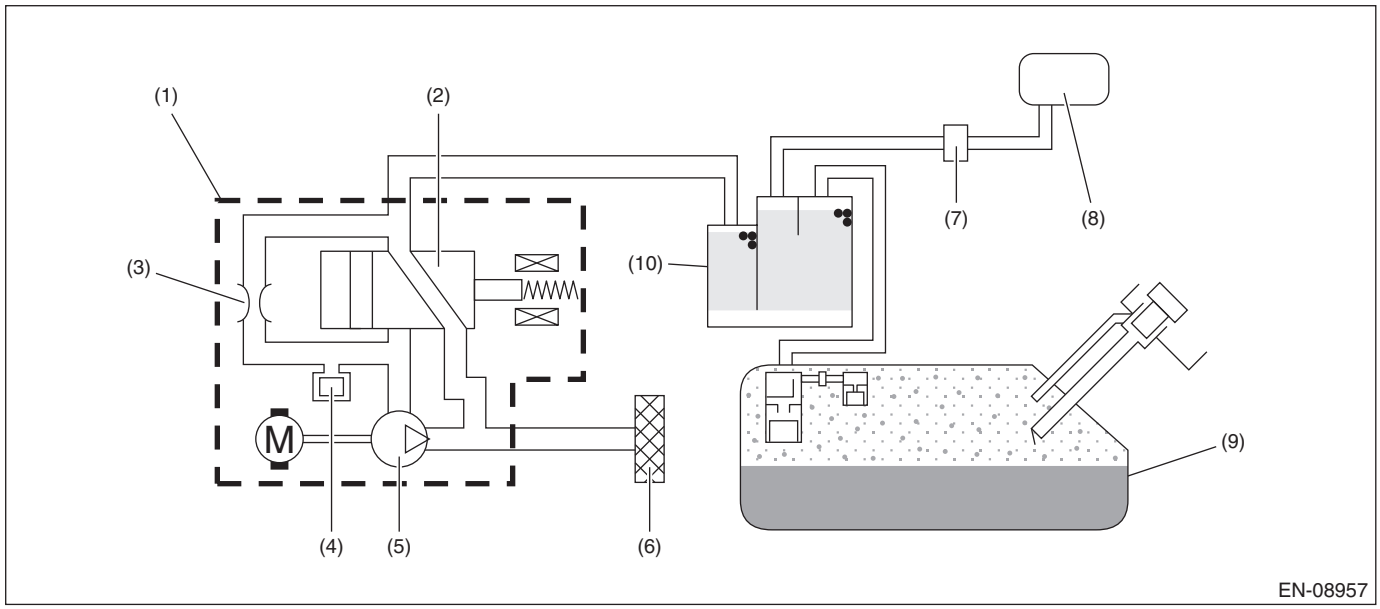
Time Needed for Diagnosis: 3400 ms

CF:DTC P1449 EVAPORATIVE EMISSION CONT. SYS. AIR FILTER CLOG

1. OUTLINE OF DIAGNOSIS

Detect the drain filter clogging by the pressure change during purge introduction.
Judge as drain filter clogging malfunction if the pressure in the evaporative emission system piping suddenly decreases by the purging.

2. COMPONENT DESCRIPTION



(1) ELCM
(2) Switching valve
(3) Reference orifice (0.02 inch orifice)
(4) Pressure sensor
(5) Vacuum pump
(6) Drain filter
(7) Purge control solenoid valve
(8) Intake manifold
(9) Fuel tank
(10) Canister

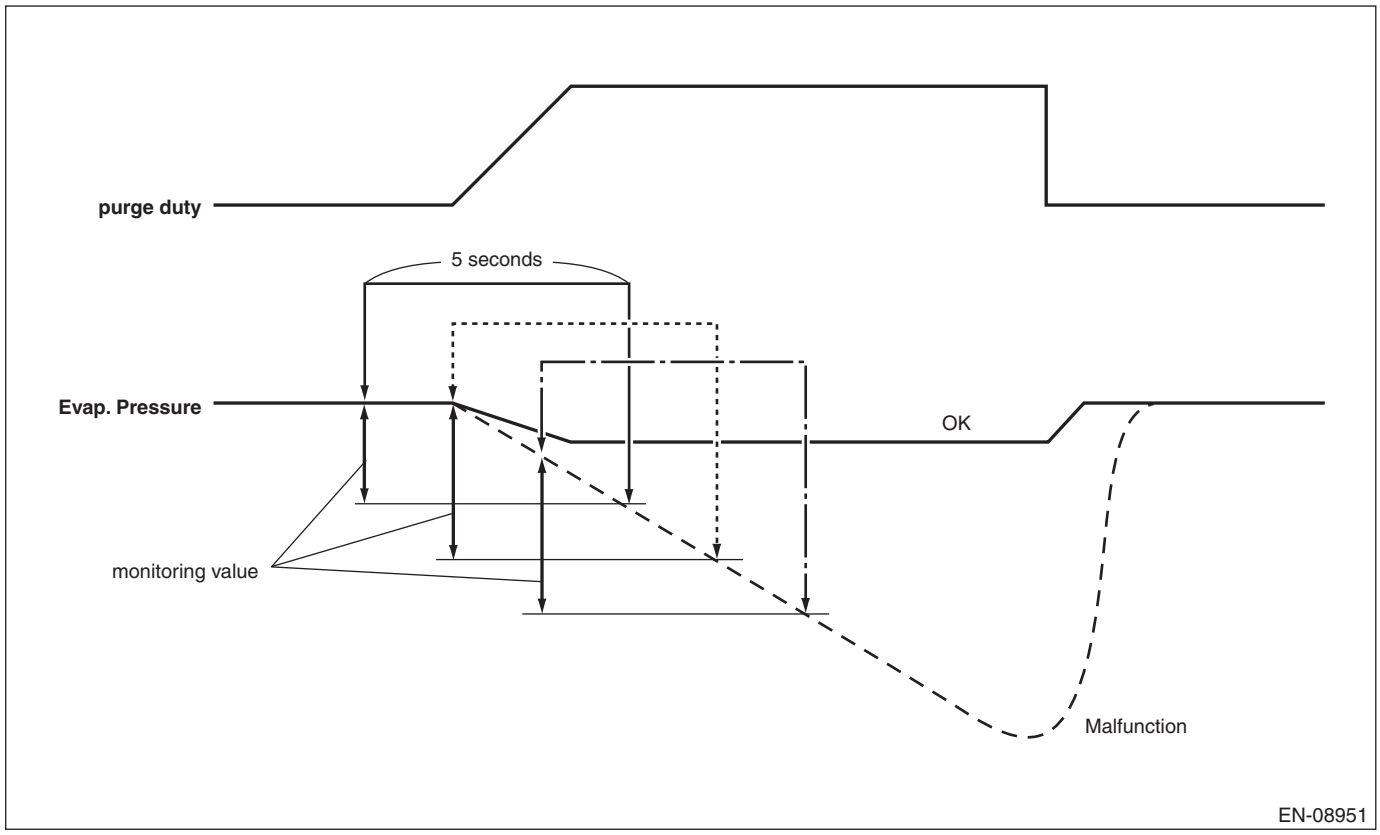
3. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Elapsed time after starting the engine	≥ 20000 ms
Continuous time of |Pressure sensor output value – Pressure sensor output value 64 ms ago | ≤ 0.7 kPa (5 mmHg, 0.2 inHg)	≥ 5120 ms + 13000 ms
Establishing time for following conditions	≥ 10000 ms
•ELCM vacuum pump	Not in operation
•ELCM switching valve	Open

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when purging is performed after 20000 ms have passed since the engine started.

5. DIAGNOSTIC METHOD



Calculate the difference between the ELCM pressure sensor output value as of 5 seconds ago and the current one, and if the value is greater than judgment value, detect and judge as filter clogging trouble.

- **Abnormality Judgment**

Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
|Pressure sensor output value as of 5 seconds ago – Current pressure sensor output value|	> Value from Map
Number of above conditions established	> 2 time(s)

Map

Vehicle speed km/h (MPH)	0 (0)	20 (12.4)	40 (24.9)	60 (37.3)	80 (49.7)	100 (62.1)	120 (74.6)	300 (186.4)
|Pressure sensor output value as of 5 seconds ago – Current pressure sensor output value| kPa (mmHg, inHg)	0.8 (5.864 , 0.2)	0.8 (5.864 , 0.2)	0.9 (6.757 , 0.3)	1 (7.649 , 0.3)	1 (7.649 , 0.3)	1 (7.649 , 0.3)	1 (7.649 , 0.3)	1.6 (11.647 , 0.5)

Time Needed for Diagnosis: Approx. 5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

- **Normality Judgment**

Judge as OK and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
|Pressure sensor output value as of 5 seconds ago – Current pressure sensor output value|	≤ Value from Map

CG:DTC P1451 EVAPORATIVE EMISSION CONT. SYS.

1. OUTLINE OF DIAGNOSIS

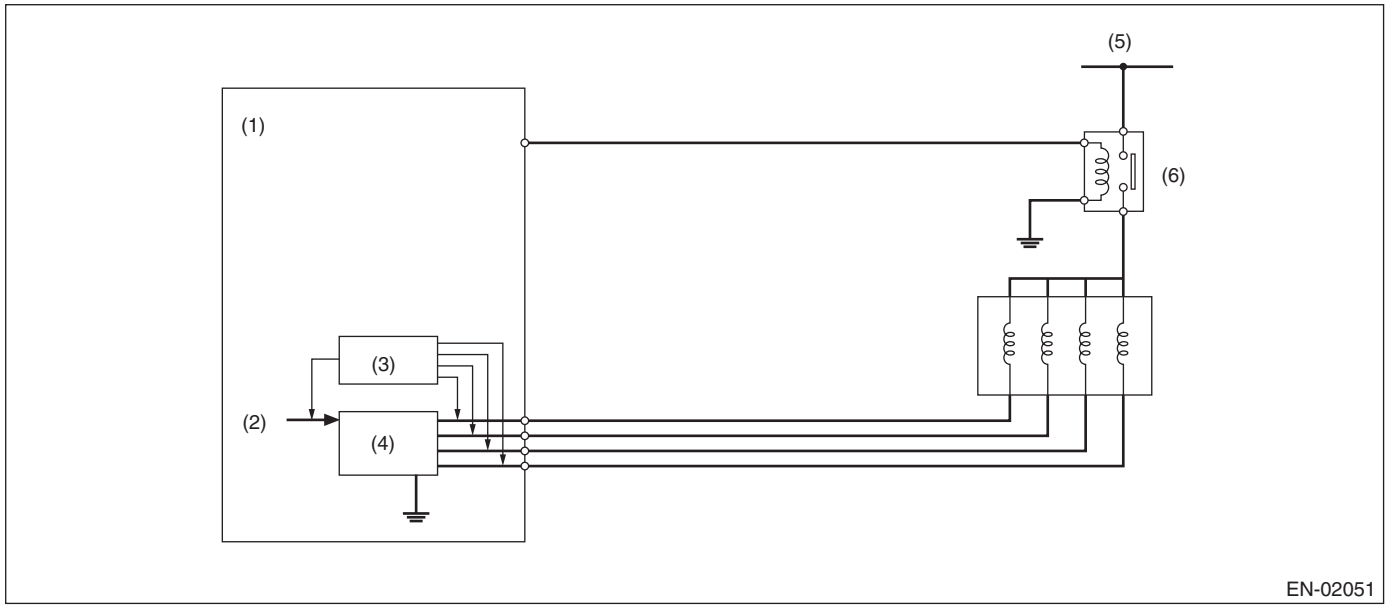
NOTE:
For the detection standard, refer to DTC P0455. <Ref. to GD(H4DO)-125, DTC P0455 EVAPORATIVE EMISSION SYSTEM LEAK DETECTED (LARGE LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CH: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



(1) Engine control module (ECM)
(2) Computer unit (CPU)
(3) Detecting circuit
(4) Switch circuit
(5) Battery voltage
(6) Main relay

3. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
Elapsed time after starting the engine	≥ 1 second
EGR valve target position	> 0 step
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Perform diagnosis continuously during EGR operation.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs OFF signal	Low level
or	
Terminal voltage level when EGR operates	Low level

Time Needed for Diagnosis: 2500 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs OFF signal	High level
Terminal voltage level when EGR operates	High level

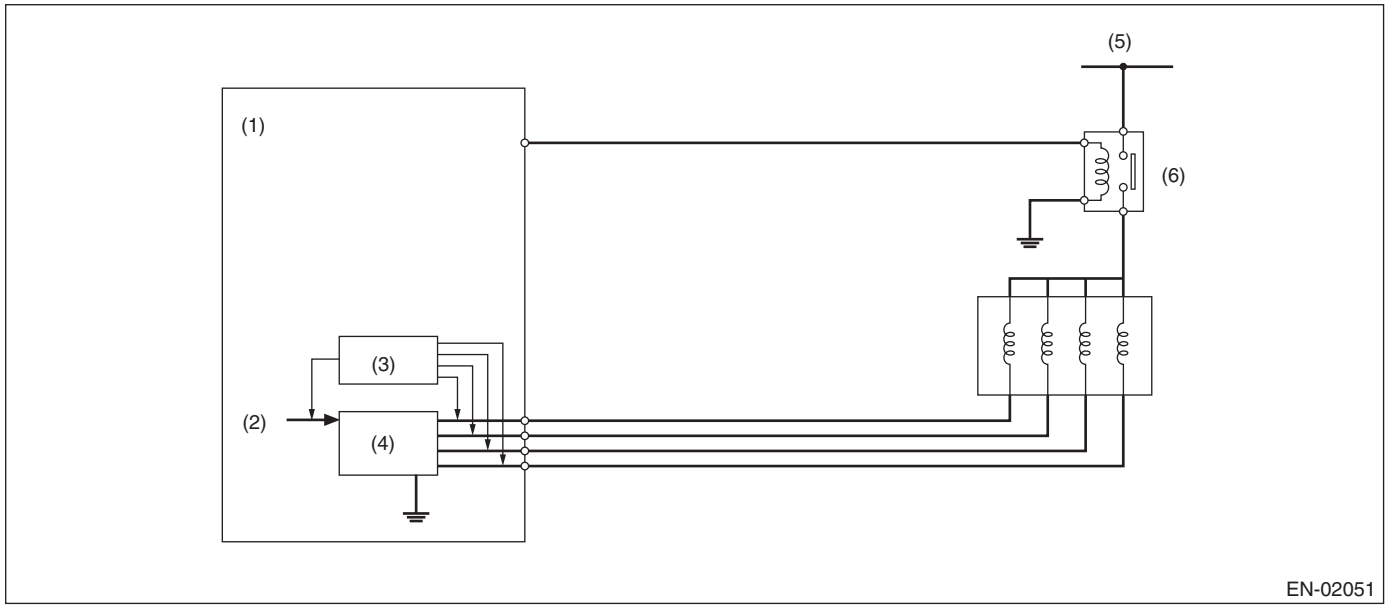
Time Needed for Diagnosis: 256 ms

CI: 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)
(2) Computer unit (CPU)
(3) Detecting circuit
(4) Switch circuit
(5) Battery voltage
(6) Main relay

3. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
Elapsed time after starting the engine	≥ 1 second
EGR valve target position	> 0 step
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs ON signal	High level
or	
Terminal voltage level when EGR operates	High level

Time Needed for Diagnosis: 2500 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs ON signal	Low level
Terminal voltage level when EGR operates	Low level

Time Needed for Diagnosis: 256 ms

CJ:DTC P1494 EGR SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (LOW INPUT)

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P1492. <Ref. to GD(H4DO)-175, DTC P1492 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CK:DTC P1495 EGR SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (HIGH INPUT)

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P1493. <Ref. to GD(H4DO)-177, DTC P1493 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CL:DTC P1496 EGR SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (LOW INPUT)

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P1492. <Ref. to GD(H4DO)-175, DTC P1492 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CM:DTC P1497 EGR SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (HIGH INPUT)

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P1493. <Ref. to GD(H4DO)-177, DTC P1493 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CN:DTC P1498 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT)

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P1492. <Ref. to GD(H4DO)-175, DTC P1492 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CO:DTC P1499 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT)

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P1493. <Ref. to GD(H4DO)-177, DTC P1493 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CP: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 it becomes after engine start despite no starter ON experience.

2. ENABLE CONDITIONS

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 (0.6 MPH)
Starter ON signal	Not detected
Engine condition	Changed from before start to after start
Battery voltage	≥ 8 V

Time Needed for Diagnosis: Less than 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 if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Starter ON	Experienced
Starter ON diagnosis	No diagnosis experience
Battery voltage	≥ 8 V

Time Needed for Diagnosis: Less than 1 second

CQ: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 power voltage is low.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Voltage of back-up power supply	Low
Battery voltage	≥ 10.9 V
Engine condition	After engine starting

Time Needed for Diagnosis: 2500 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Voltage of back-up power supply	High
Battery voltage	≥ 10.9 V
Engine condition	After engine starting

Time Needed for Diagnosis: Less than 1 second

CR:DTC P1570 ANTENNA

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0513. <Ref. to GD(H4DO)-154, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CS:DTC P1571 REFERENCE CODE INCOMPATIBILITY

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0513. <Ref. to GD(H4DO)-154, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CT:DTC P1572 IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT)

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0513. <Ref. to GD(H4DO)-154, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CU:DTC P1574 KEY COMMUNICATION FAILURE

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0513. <Ref. to GD(H4DO)-154, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CV:DTC P1576 EGI CONTROL MODULE EEPROM

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0513. <Ref. to GD(H4DO)-154, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CW:DTC P1577 IMM CONTROL MODULE EEPROM

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0513. <Ref. to GD(H4DO)-154, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CX:DTC P1578 METER FAILURE

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0513. <Ref. to GD(H4DO)-154, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CY: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	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generator valve opening switch	= High
Tumble generator valve “close” signal output time	≥ 1600 ms

Time Needed for Diagnosis: 4600 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generator valve opening switch	= Low
Tumble generator valve “close” signal output time	≥ 1600 ms

Time Needed for Diagnosis: 1600 ms

CZ: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	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generator valve opening switch	= High
Tumble generator valve “close” signal output time	≥ 1600 ms

Time Needed for Diagnosis: 4600 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generator valve opening switch	= Low
Tumble generator valve “close” signal output time	≥ 1600 ms

Time Needed for Diagnosis: 1600 ms

DA: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

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generator valve opening switch	= Low
Tumble generator valve “open” signal output time	≥ 1600 ms

Time Needed for Diagnosis: 4600 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generator valve opening switch	= High
Tumble generator valve “open” signal output time	≥ 1600 ms

Time Needed for Diagnosis: 1600 ms

DB: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

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generator valve opening switch	= Low
Tumble generator valve “open” signal output time	≥ 1600 ms

Time Needed for Diagnosis: 4600 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generator valve opening switch	= High
Tumble generator valve “open” signal output time	≥ 1600 ms

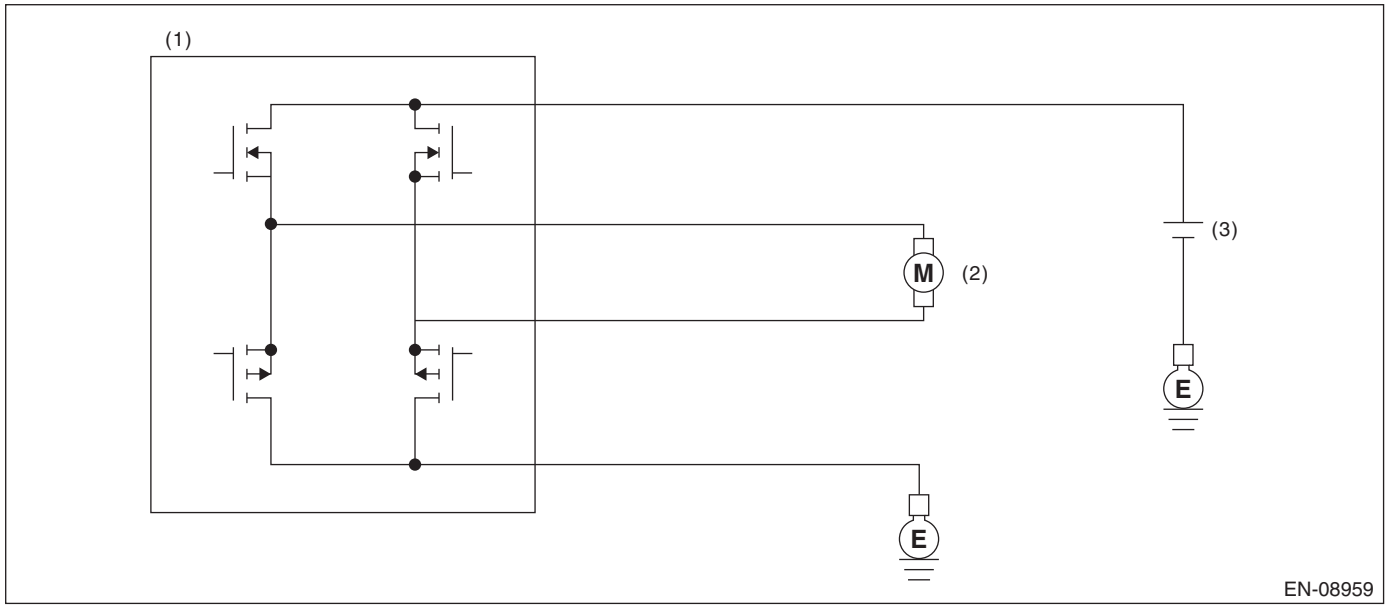
Time Needed for Diagnosis: 1600 ms

DC: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 as 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

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

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 open NG when the open NG signal is sent 96 ms × 10 time(s) in a row.

Judgment Value

Malfunction Criteria	Threshold Value
Overcurrent NG signal input	Low

Time Needed for Diagnosis: 96 ms × 10 time(s)
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG when the OK signal is sent.

Judgment Value

Malfunction Criteria	Threshold Value
Overcurrent NG signal input	High

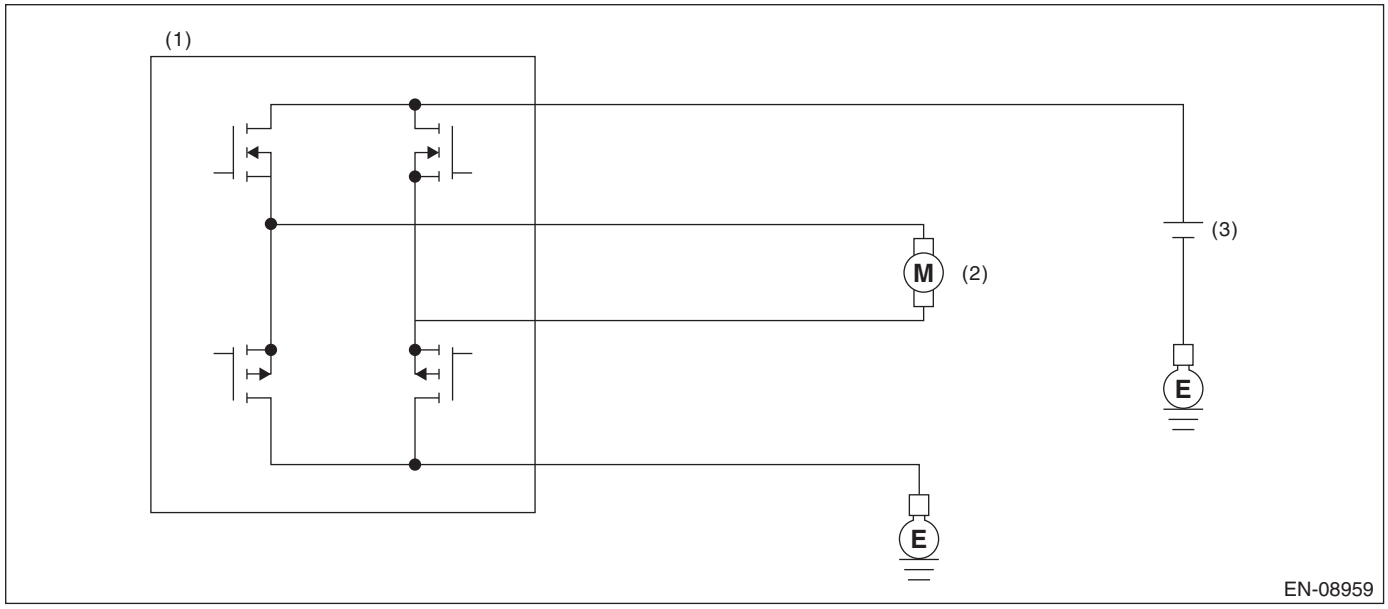
Time Needed for Diagnosis: Less than 1 second

DD: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 as 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

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

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 open NG when the open NG signal is sent 96 ms × 10 time(s) in a row.

Judgment Value

Malfunction Criteria	Threshold Value
Overcurrent NG signal input	Low

Time Needed for Diagnosis: 96 ms × 10 time(s)
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG when the OK signal is sent.

Judgment Value

Malfunction Criteria	Threshold Value
Overcurrent NG signal input	High

Time Needed for Diagnosis: Less than 1 second

DE:DTC P2088 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the oil control solenoid.
Judge as NG when the current is small even though the duty signal is large.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Oil control solenoid control duty	≥ 99.61 %
Oil control solenoid control present current	< 0.306 A

Time Needed for Diagnosis: 2000 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Target current value of the oil control solenoid	≥ 0.14 A
|Target current value of the oil control solenoid – oil control solenoid control current value|	< 0.08 A

Time Needed for Diagnosis: 2000 ms

DF:DTC P2089 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of oil control solenoid.
Judge as NG when the current is large even though the duty signal is small.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Oil control solenoid control duty	< 0.39 %
Oil control solenoid control present current	≥ 0.306 A

Time Needed for Diagnosis: 2000 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
|Target current value of the oil control solenoid – oil control solenoid control current value|	< 0.08 A

Time Needed for Diagnosis: 2000 ms

DG:DTC P2092 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 2)

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P2088. <Ref. to GD(H4DO)-189, DTC P2088 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

DH:DTC P2093 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 2)

1. OUTLINE OF DIAGNOSIS

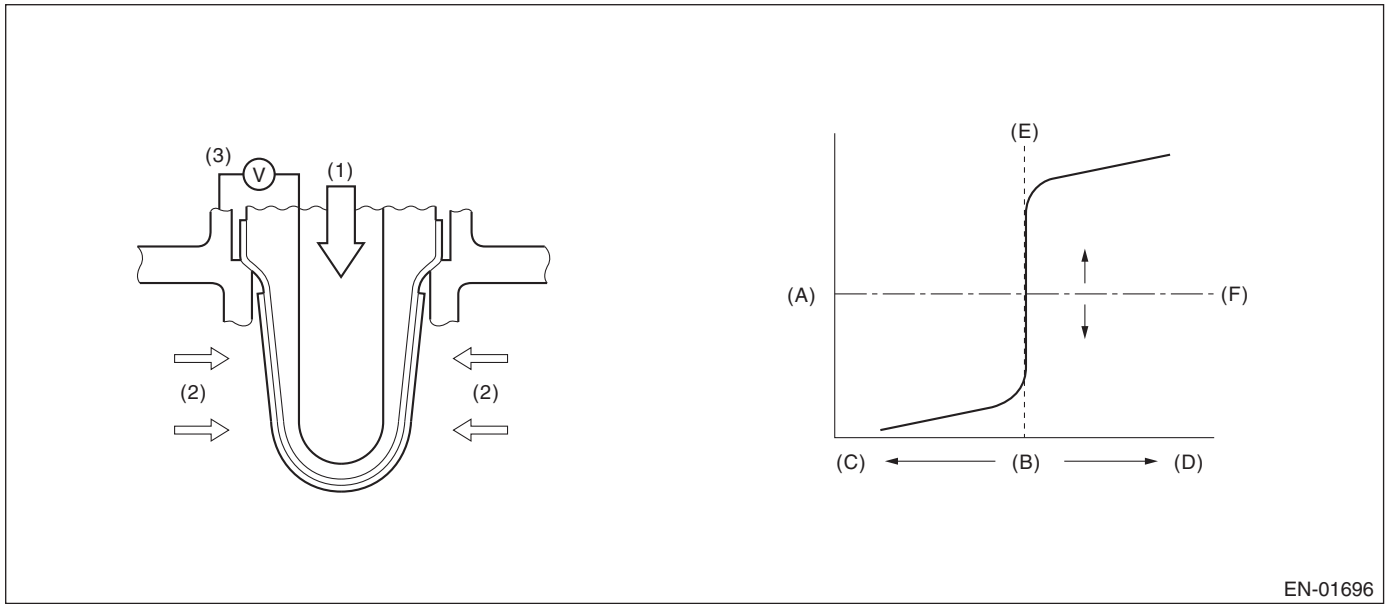
NOTE:
For the detection standard, refer to DTC P2089. <Ref. to GD(H4DO)-190, DTC P2089 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

DI: DTC P2096 POST CATALYST FUEL TRIM SYSTEM TOO LEAN (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel system from the size of the sub feedback learning value.
Control the sub feedback learning and judge as NG when the learning value is in the lean zone.

2. COMPONENT DESCRIPTION



(A)	Electromotive force	(B)	Air fuel ratio	(C)	Rich
(D)	Lean	(E)	Theoretical air fuel ratio	(F)	Comparative voltage
(1)	Atmosphere	(2)	Exhaust gas	(3)	Electromotive force

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Conditions for carrying out the sub feedback learning	Complete
Continuous time when all conditions are established.	≥ 1 s

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when the vehicle is idling or running at a constant speed of 80 km/h (50 MPH) or more.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Sub feedback learning value	< –0.04

Time Needed for Diagnosis: 5 s × 1 time(s)
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Sub feedback learning value	≥ –0.04 + 0

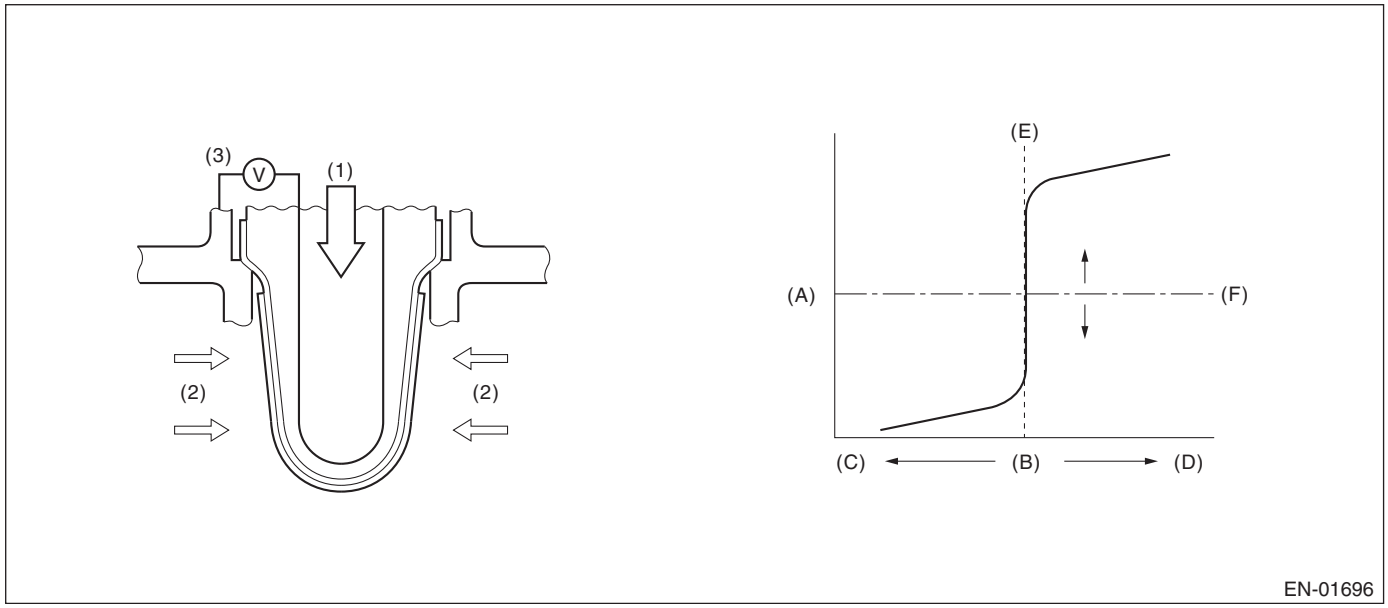
Time Needed for Diagnosis: 5 s

DJ:DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel system from the size of the sub feedback learning value.
Sub feedback learning is being performed. When the learning value goes to the rich side, judge as NG.

2. COMPONENT DESCRIPTION



(A)	Electromotive force	(B)	Air fuel ratio	(C)	Rich
(D)	Lean	(E)	Theoretical air fuel ratio	(F)	Comparative voltage
(1)	Atmosphere	(2)	Exhaust gas	(3)	Electromotive force

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Conditions for carrying out the sub feedback learning	Complete
Continuous time when all conditions are established.	≥ 1 s

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when the vehicle is idling or running at a constant speed of 80 km/h (50 MPH) or more.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Sub feedback learning value	≥ 0.025

Time Needed for Diagnosis: 5 s × 1 time(s)
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Sub feedback learning value	< 0.025 + 0

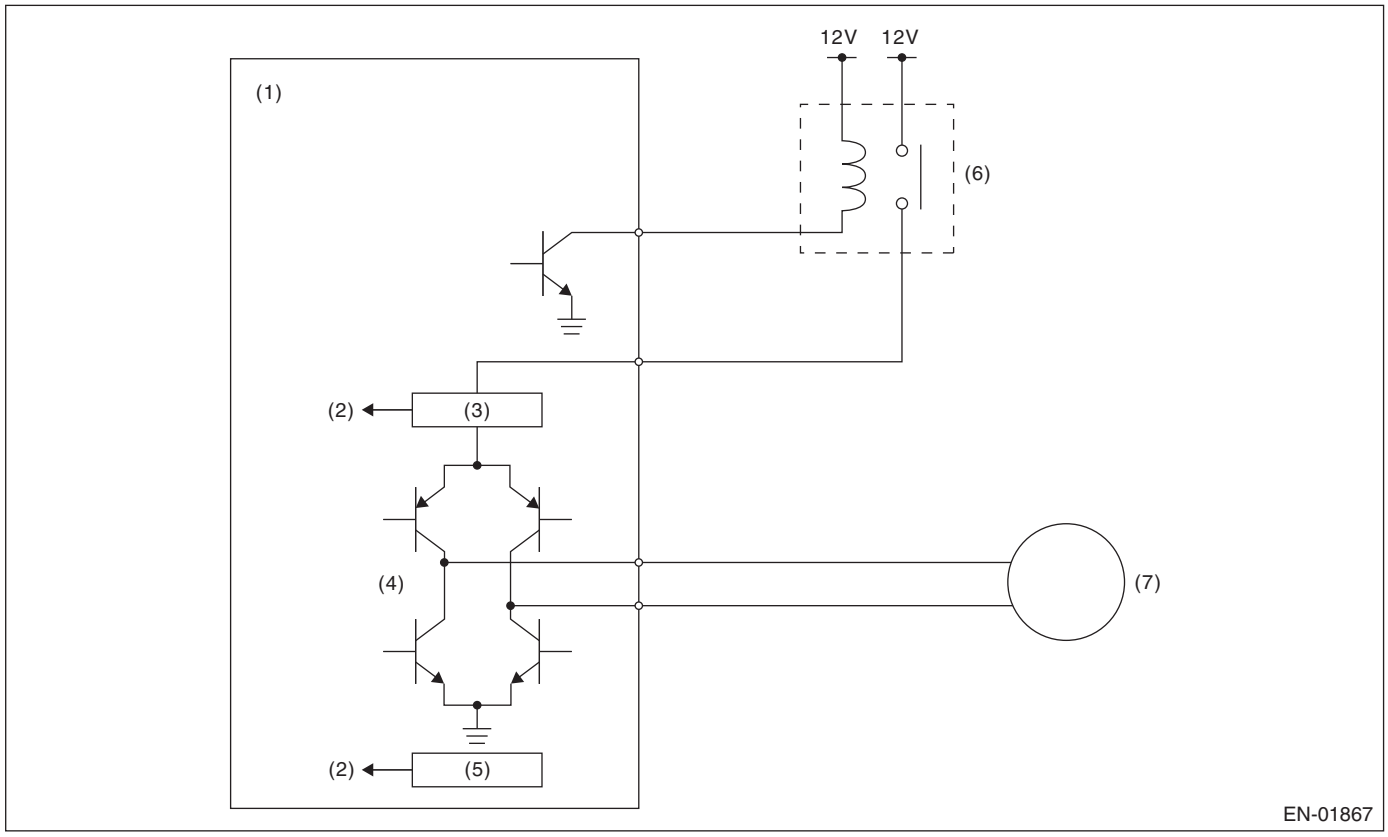
Time Needed for Diagnosis: 5 s

DK:DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/ PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Judge as NG when the motor current becomes 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
CPU communication line sub → main normal judgment	Normal

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Motor current	> 8 A
or	
Drive circuit inner temperature	> 175°C (347°F)

Time Needed for Diagnosis: 512 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Motor current	≤ 8 A
Drive circuit inner temperature	≤ 175°C (347°F)

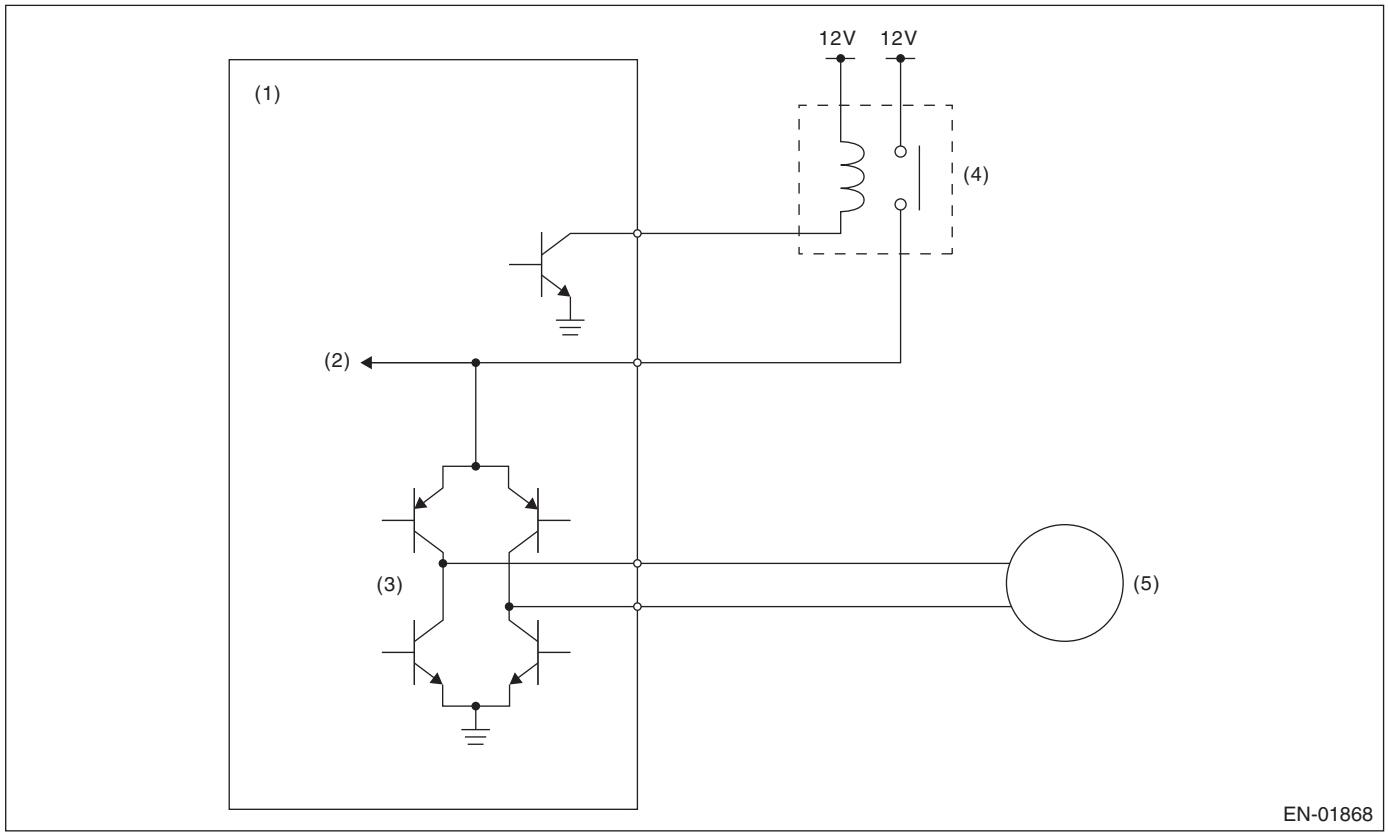
Time Needed for Diagnosis: 2000 ms

DL: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



(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
Battery voltage	≥ 11 V
Electronic throttle control relay output	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Motor power voltage	≤ 5 V

Time Needed for Diagnosis: 352 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Motor power voltage	> 5 V

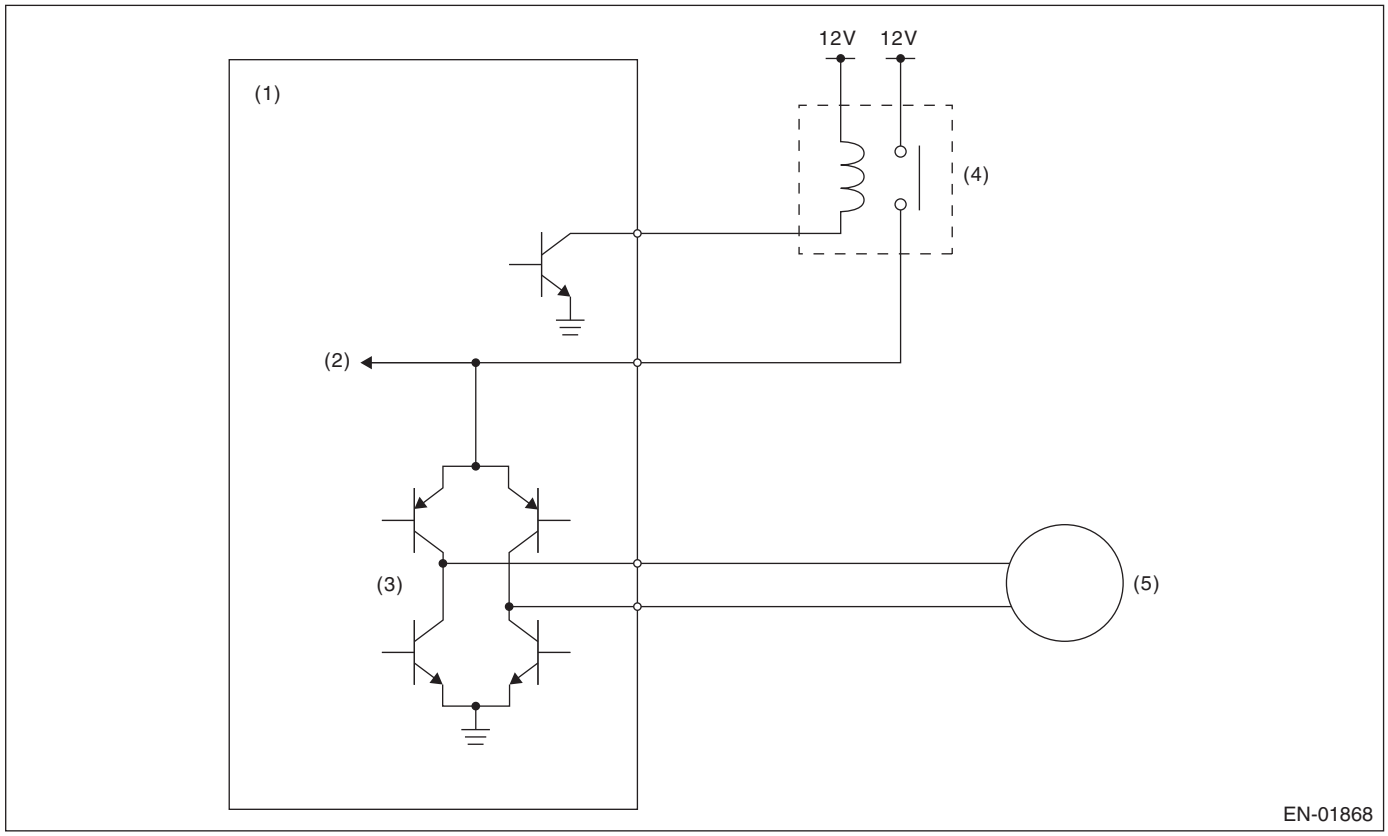
Time Needed for Diagnosis: 2000 ms

DM: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 control relay to OFF.

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
Battery voltage	≥ 6 V
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

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Motor power voltage	≥ 5 V

Time Needed for Diagnosis: 600 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Motor power voltage	< 5 V

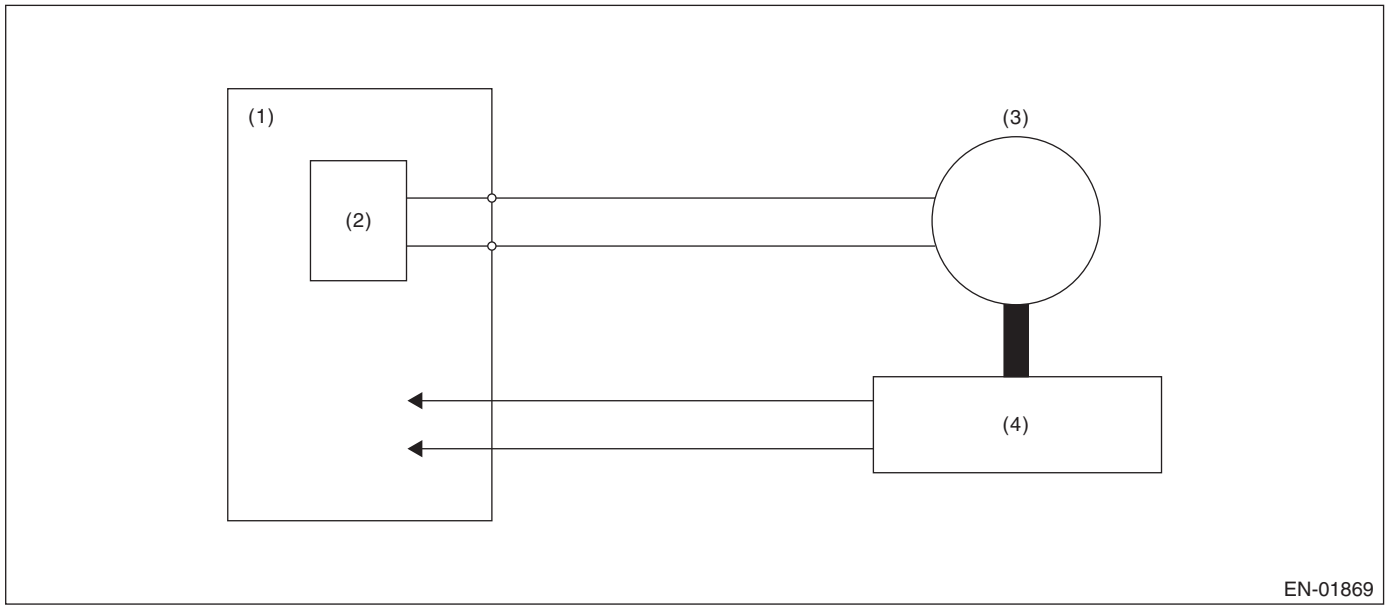
Time Needed for Diagnosis: 400 ms

DN:DTC P2109 THROTTLE/PEDAL POSITION SENSOR “A” MINIMUM STOP PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Judge as NG when full close point learning cannot conducted or abnormal value is detected.

2. COMPONENT DESCRIPTION



(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 clear memory)	OFF → ON

4. GENERAL DRIVING CYCLE

Perform the diagnosis at full closed point learning.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Throttle sensor opening angle at full close point learning	< 9.884 ° or > 20.116 °
or	
Throttle opening angle when the ignition switch is ON – Throttle minimum stop position	< 0.887 °

Time Needed for Diagnosis: 8 ms — 80 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Throttle sensor opening angle at full close point learning	≥ 9.884 ° and ≤ 20.116 °
Throttle opening angle when the ignition switch is ON – Throttle minimum stop position	≥ 0.887 °

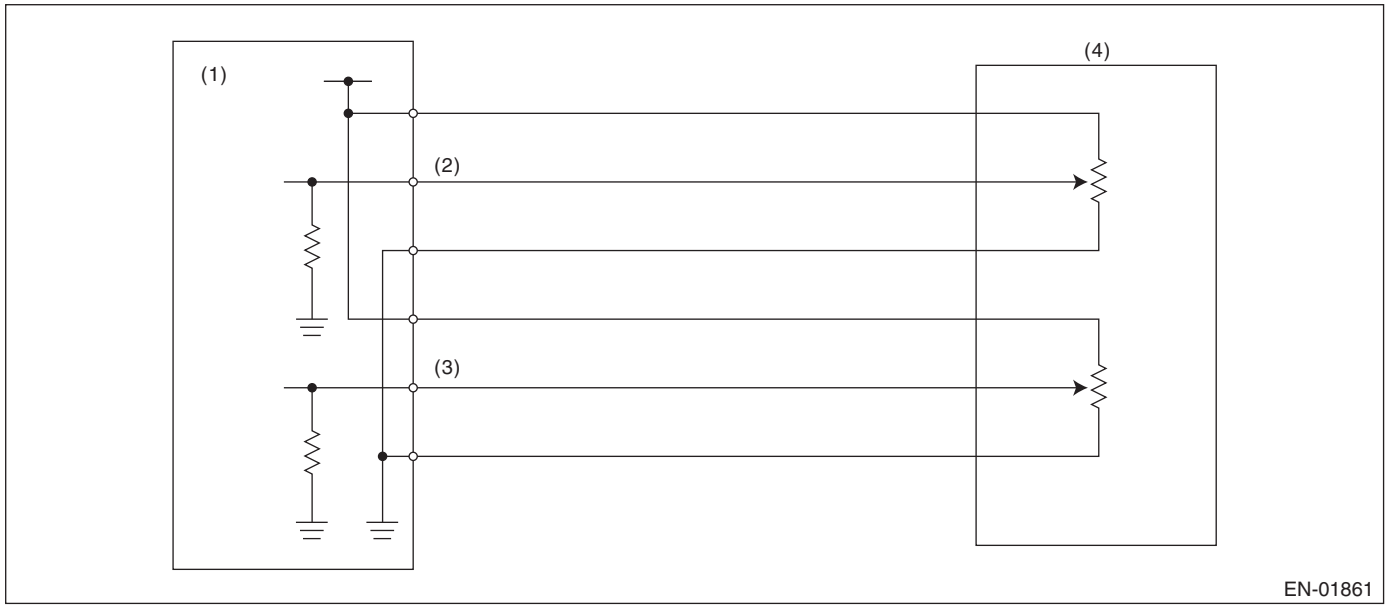
Time Needed for Diagnosis: 8 ms

DO: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 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
Battery voltage	≥ 6 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	< 0.295 V

Time Needed for Diagnosis: 100 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	≥ 0.295 V

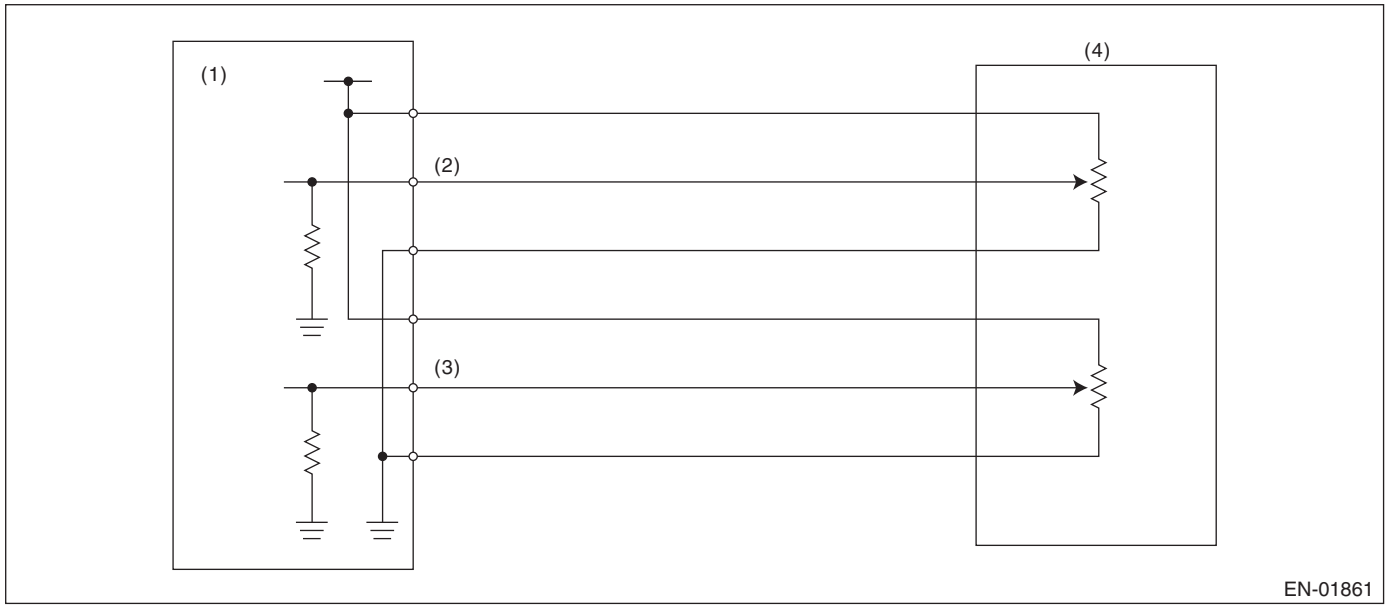
Time Needed for Diagnosis: 100 ms

DP: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 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
Battery voltage	≥ 6 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	≥ 4.783 V

Time Needed for Diagnosis: 32 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	< 4.783 V

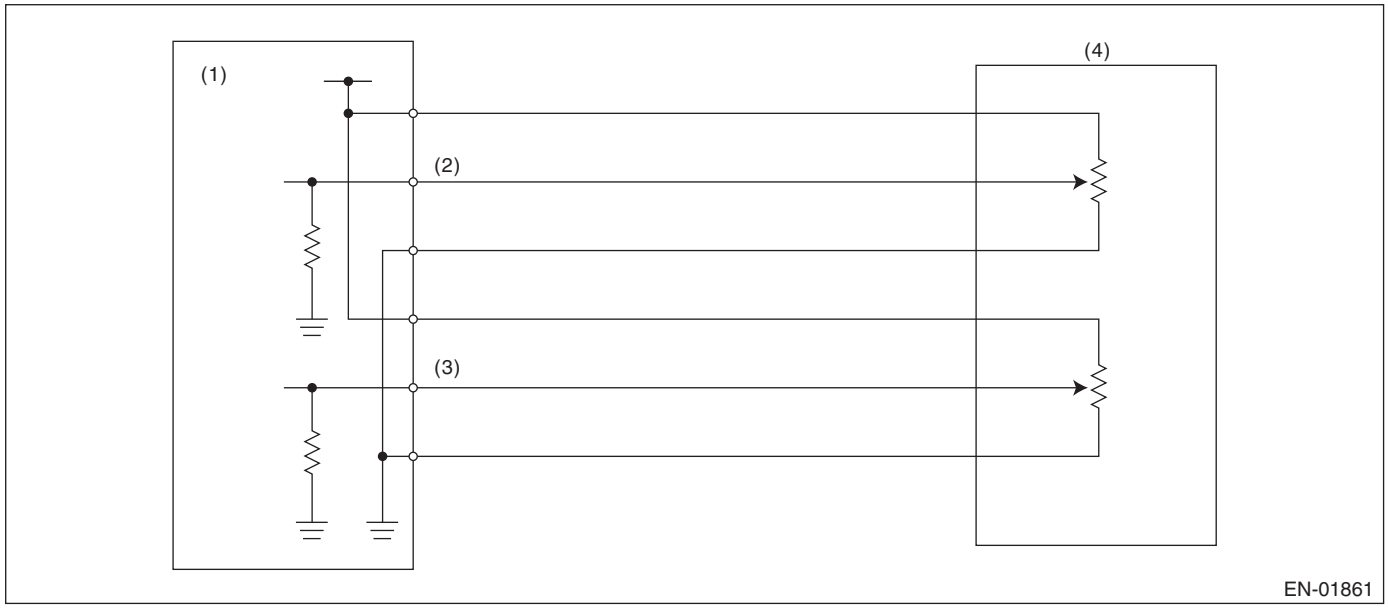
Time Needed for Diagnosis: 32 ms

DQ: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 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
Battery voltage	≥ 6 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 2 input voltage	< 0.295 V

Time Needed for Diagnosis: 100 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 2 input voltage	≥ 0.295 V

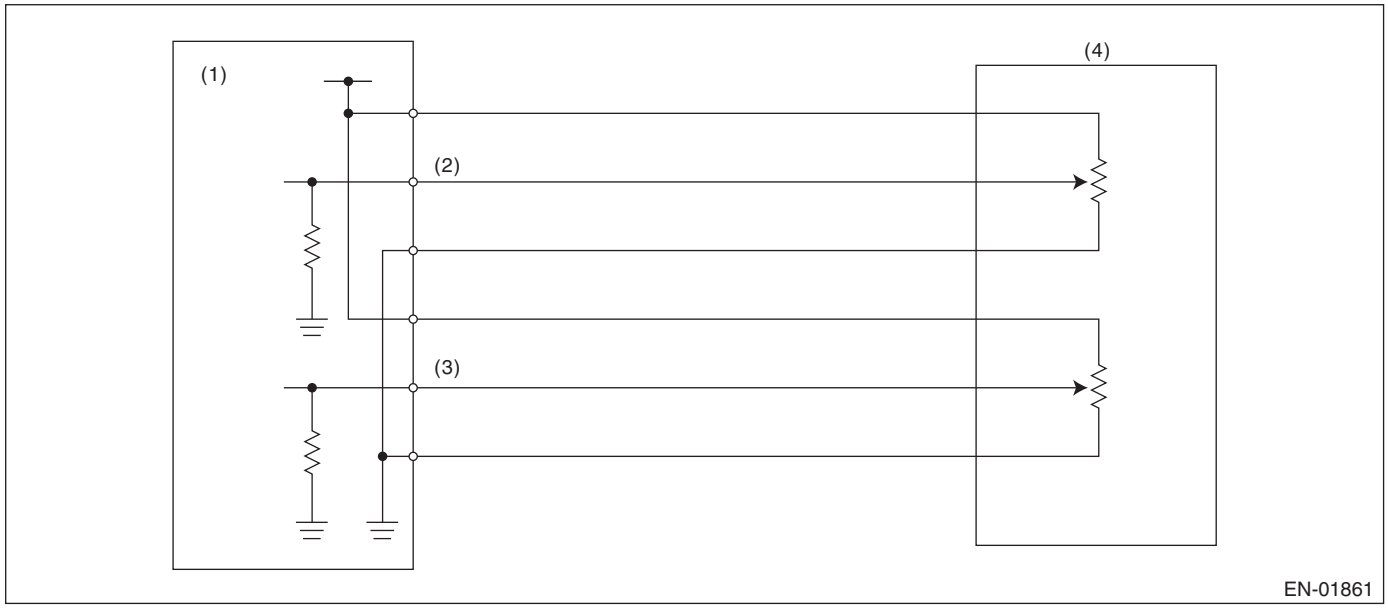
Time Needed for Diagnosis: 100 ms

DR: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 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
Battery voltage	≥ 6 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 2 input voltage	≥ 4.783 V

Time Needed for Diagnosis: 100 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 2 input voltage	< 4.783 V

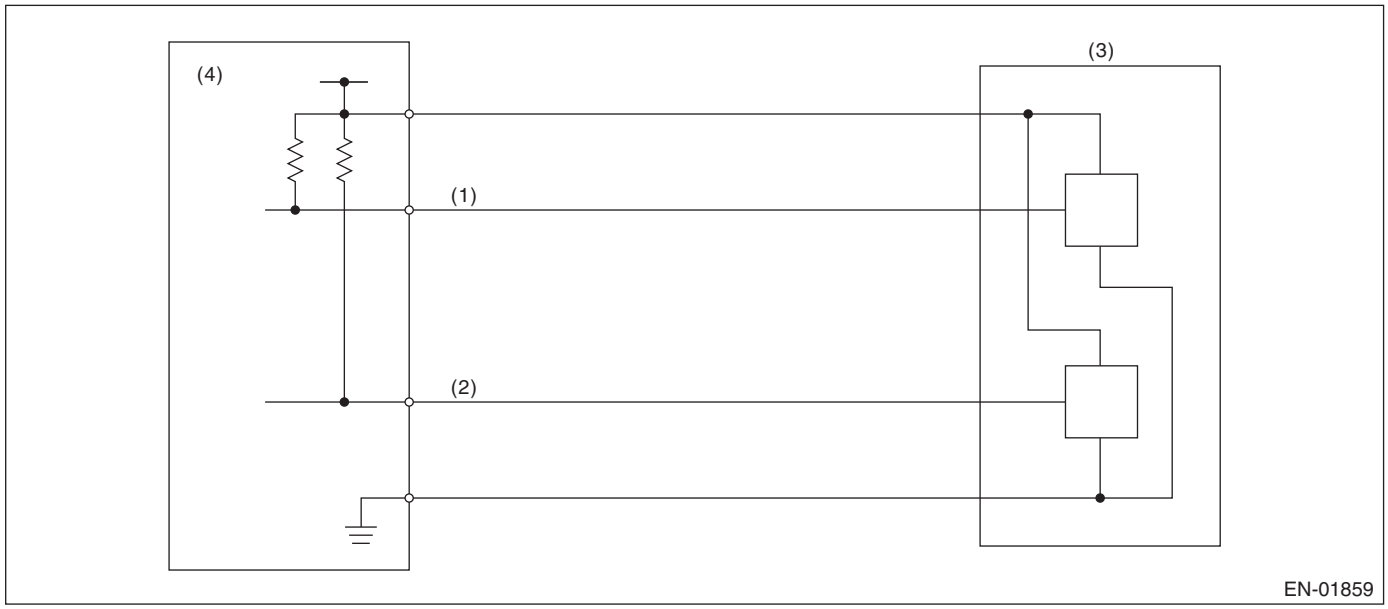
Time Needed for Diagnosis: 100 ms

DS: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
(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
Battery voltage	≥ 6 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

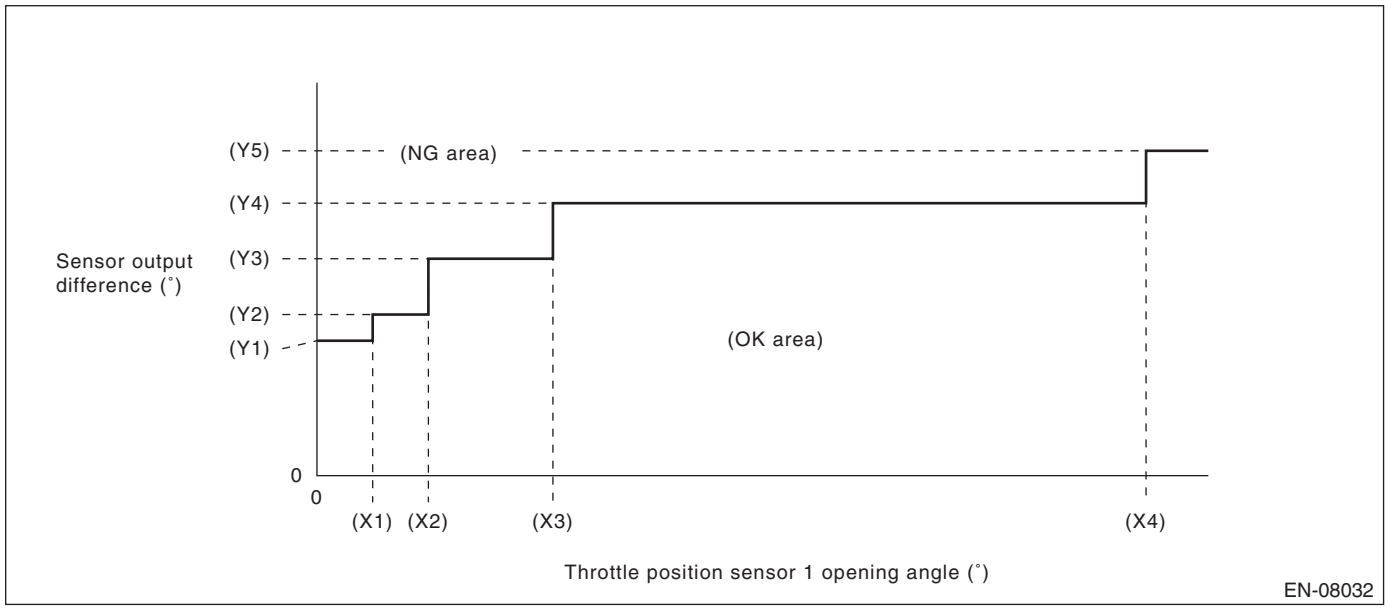
• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Signal difference between two sensors	Within the NG range of **judgment value detail**

Details of Judgment Value



(X1) 2.125 °
(X2) 4.25 °
(X3) 9 °
(X4) 31.625 °

(Y1) 5.15 °
(Y2) 6.15 °
(Y3) 8.28 °
(Y4) 10.4 °
(Y5) 12.4 °

Time Needed for Diagnosis: 212 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Signal difference between two sensors	Within the OK range of **judgment value detail**

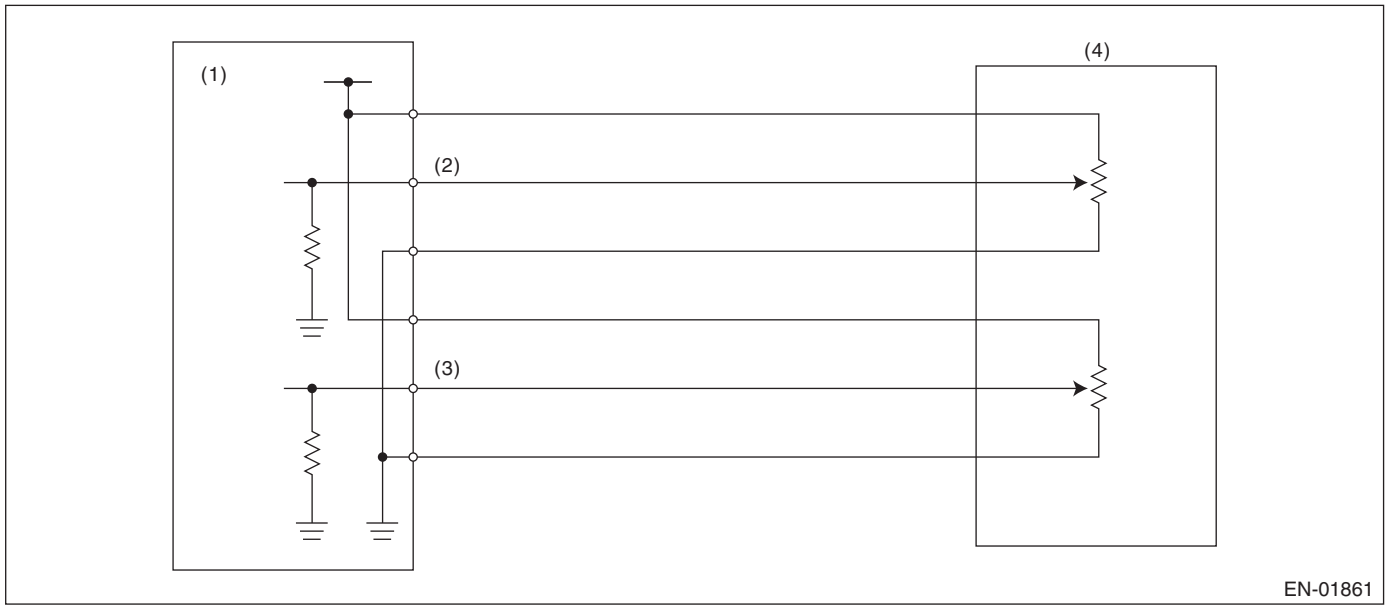
Time Needed for Diagnosis: 24 ms

DT: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
Battery voltage	≥ 6 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

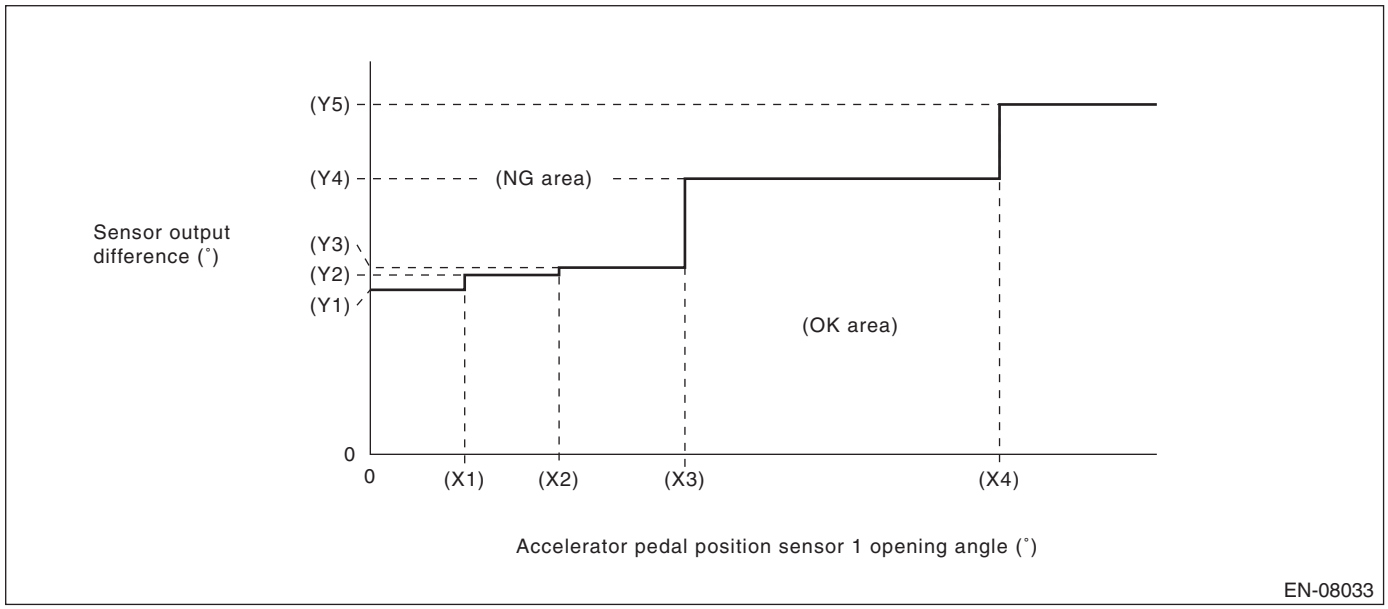
• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Signal difference between two sensors	Within the NG range of **judgment value detail**

Details of Judgment Value



(X1) 0.6 °
(X2) 1.2 °
(X3) 2 °
(X4) 4 °

(Y1) 1.465 °
(Y2) 1.597 °
(Y3) 1.663 °
(Y4) 2.455 °
(Y5) 3.116 °

Time Needed for Diagnosis: 116 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Signal difference between two sensors	Within the OK range of **judgment value detail**

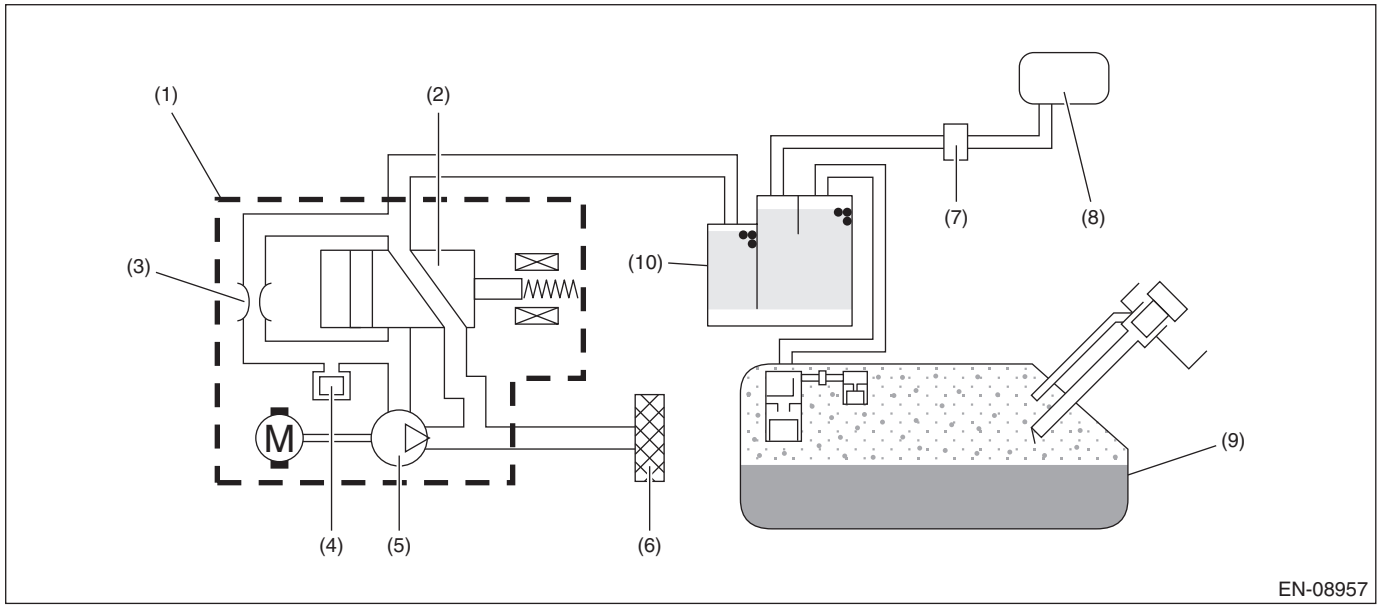
Time Needed for Diagnosis: 116 ms

DU:DTC P2401 EVAPORATIVE EMISSION SYSTEM LEAK DETECTION PUMP CONTROL CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the ELCM vacuum pump.
Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(1) ELCM
(2) Switching valve
(3) Reference orifice (0.02 inch orifice)
(4) Pressure sensor
(5) Vacuum pump
(6) Drain filter
(7) Purge control solenoid valve
(8) Intake manifold
(9) Fuel tank
(10) Canister

3. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9
Terminal output voltage when ECM outputs OFF signal	Low

Time Needed for Diagnosis: 2500 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9
Terminal output voltage when ECM outputs OFF signal	High

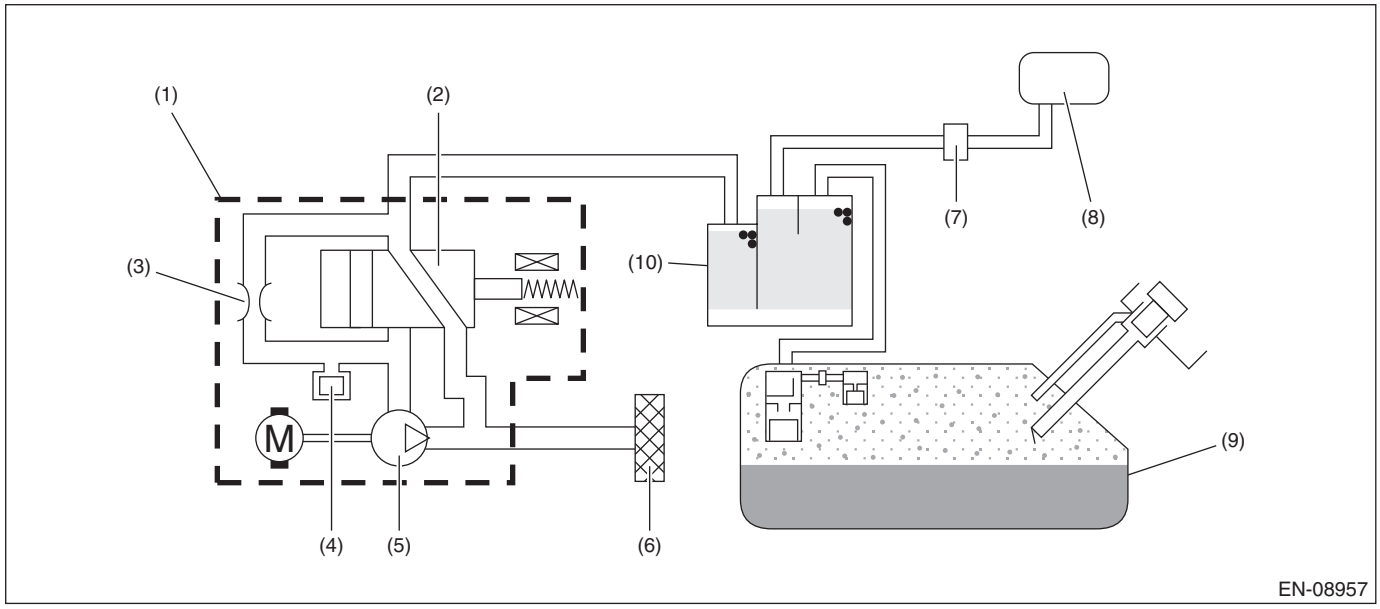
Time Needed for Diagnosis: Less than 1 second

DV:DTC P2402 EVAPORATIVE EMISSION SYSTEM LEAK DETECTION PUMP CONTROL CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the ELCM vacuum pump.
Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(1) ELCM
(2) Switching valve
(3) Reference orifice (0.02 inch orifice)
(4) Pressure sensor
(5) Vacuum pump
(6) Drain filter
(7) Purge control solenoid valve
(8) Intake manifold
(9) Fuel tank
(10) Canister

3. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9
Terminal output voltage when ECM outputs ON signal	High

Time Needed for Diagnosis: 2500 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9
Terminal output voltage when ECM outputs ON signal	Low

Time Needed for Diagnosis: Less than 1 second

DW:DTC P2404 EVAPORATIVE EMISSION SYSTEM LEAK DETECTION PUMP SENSE CIRCUIT RANGE/PERFORMANCE

1. OUTLINE OF DIAGNOSIS

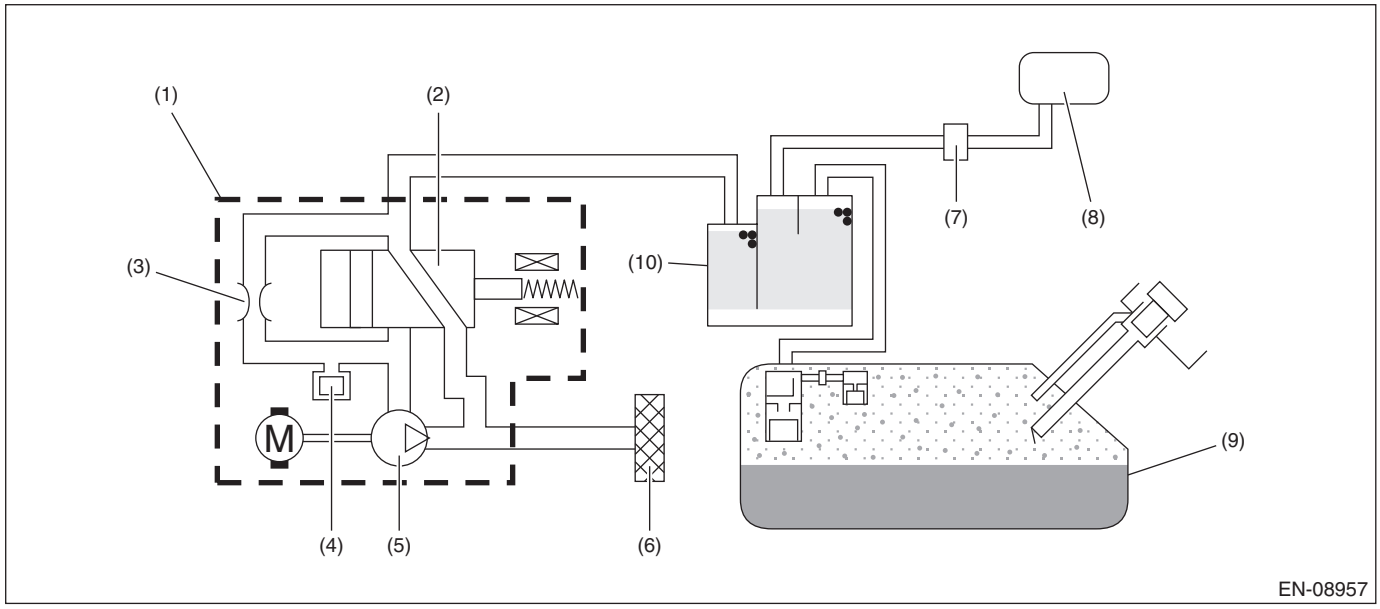
NOTE:
For the detection standard, refer to DTC P0455. <Ref. to GD(H4DO)-125, DTC P0455 EVAPORATIVE EMISSION SYSTEM LEAK DETECTED (LARGE LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

DX:DTC P2419 EVAPORATIVE EMISSION SYSTEM SWITCHING VALVE CONTROL CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the ELCM switching valve.
Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(1) ELCM
(2) Switching valve
(3) Reference orifice (0.02 inch orifice)
(4) Pressure sensor
(5) Vacuum pump
(6) Drain filter
(7) Purge control solenoid valve
(8) Intake manifold
(9) Fuel tank
(10) Canister

3. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9
Terminal output voltage when ECM outputs OFF signal	Low

Time Needed for Diagnosis: 2500 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9
Terminal output voltage when ECM outputs OFF signal	High

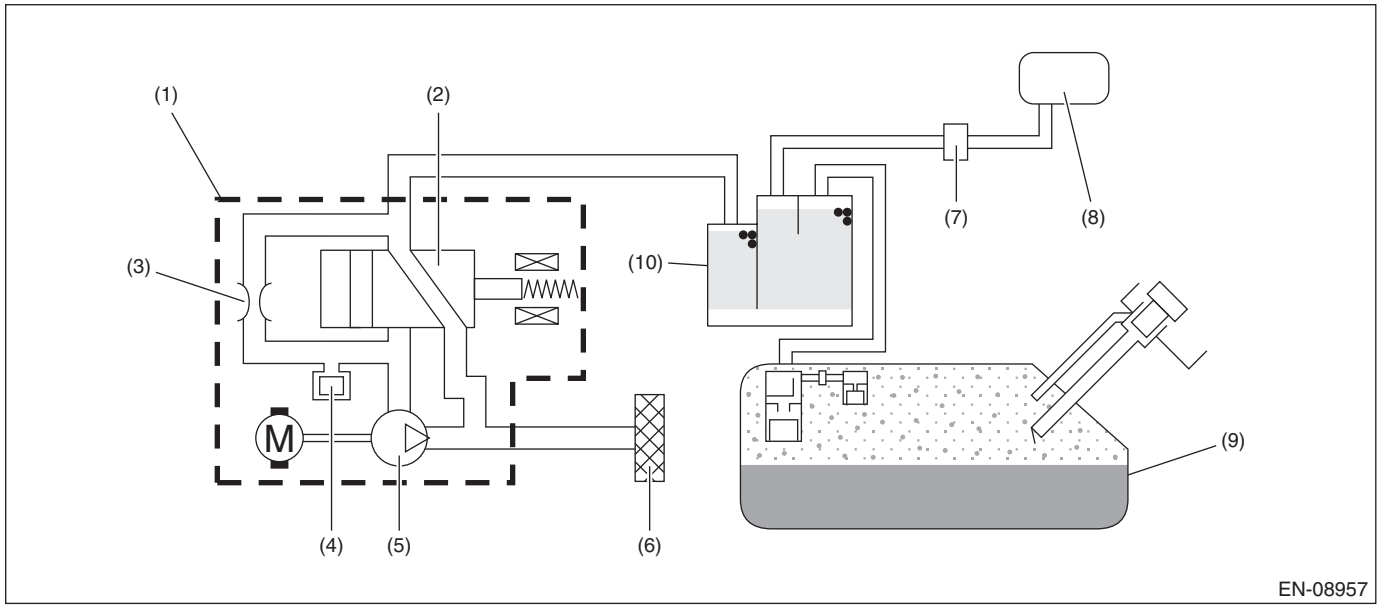
Time Needed for Diagnosis: Less than 1 second

DY:DTC P2420 EVAPORATIVE EMISSION SYSTEM SWITCHING VALVE CONTROL CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the ELCM switching valve.
Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(1) ELCM
(2) Switching valve
(3) Reference orifice (0.02 inch orifice)
(4) Pressure sensor
(5) Vacuum pump
(6) Drain filter
(7) Purge control solenoid valve
(8) Intake manifold
(9) Fuel tank
(10) Canister

3. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9
Terminal output voltage when ECM outputs ON signal	High

Time Needed for Diagnosis: 2500 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9
Terminal output voltage when ECM outputs ON signal	Low

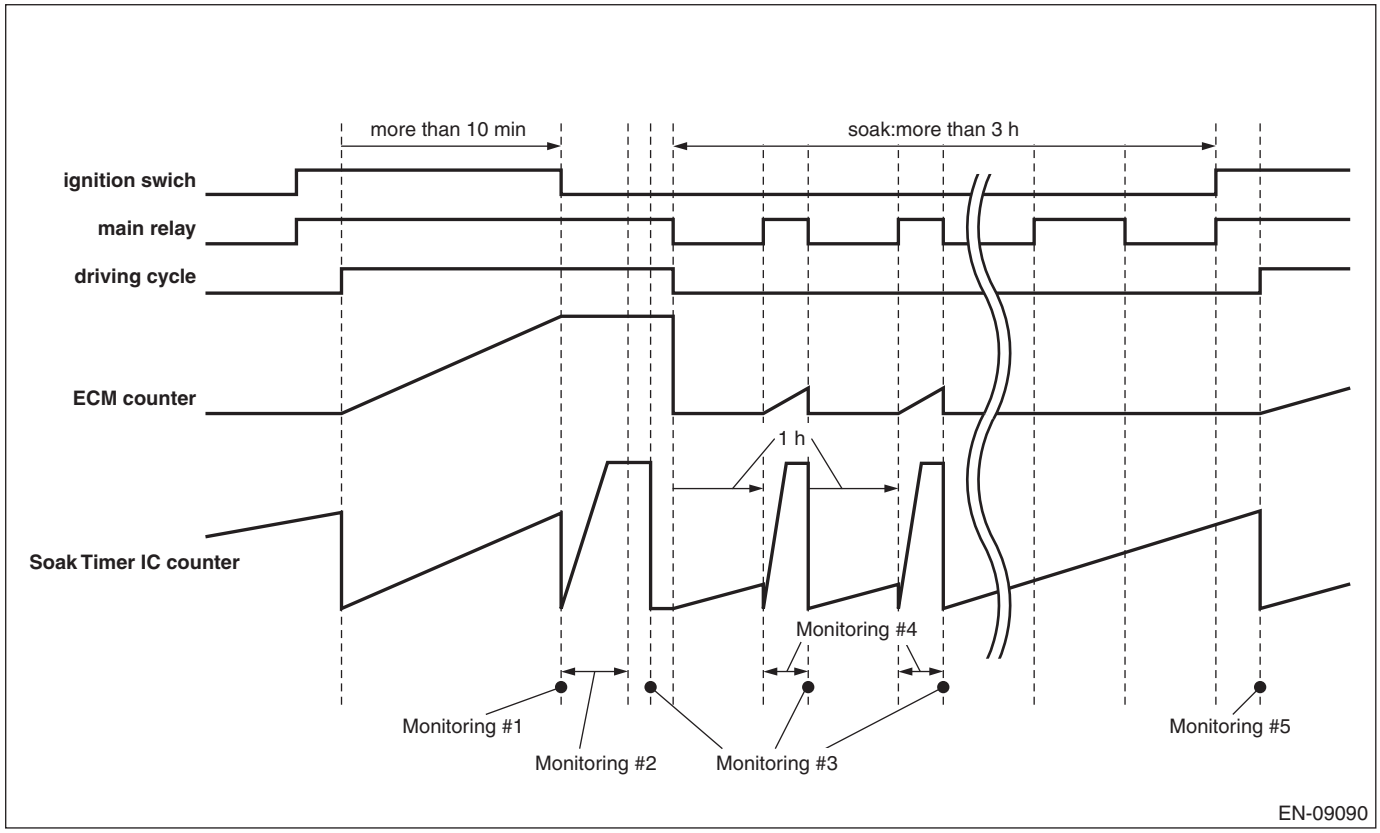
Time Needed for Diagnosis: Less than 1 second

DZ:DTC P2610 ECM/PCM INTERNAL ENGINE OFF TIMER PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect malfunction of soaking timer IC by the five diagnoses below.

Monitor Number	Explanation	Time required for diagnosis
Monitor #1 <Timer diagnosis>	Perform diagnosis of the soaking timer IC accuracy	196 ms
Monitor #2 <Full count diagnosis>	Perform diagnosis of the soaking timer IC counter function	4000 ms
Monitor #3 <Soaking timer IC setting diagnosis>	Perform diagnosis of communication between ECM and soaking timer IC	196 ms
Monitor #4 <Timer diagnosis (during soaking)>	Perform diagnosis of the soaking timer IC accuracy during soaking	3000 ms
Monitor #5 <Wake-up diagnosis>	Perform diagnosis of wake-up function	64 ms



2. COMPONENT DESCRIPTION

The soaking timer IC is built into the ECM.

3. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
<Timer diagnosis & full count diagnosis & soaking timer IC setting diagnosis>	
Battery voltage	≥ 10.9 V
Ignition switch	OFF
Elapsed time after starting the engine	> 600 s
<Timer diagnosis (during soaking)>	
Battery voltage	≥ 10.9 V
Ignition switch	OFF
<Wake-up diagnosis>	
Ignition switch	ON
Wake-up activation time setting	Completed
Time in the soaking timer IC	> 18000 s

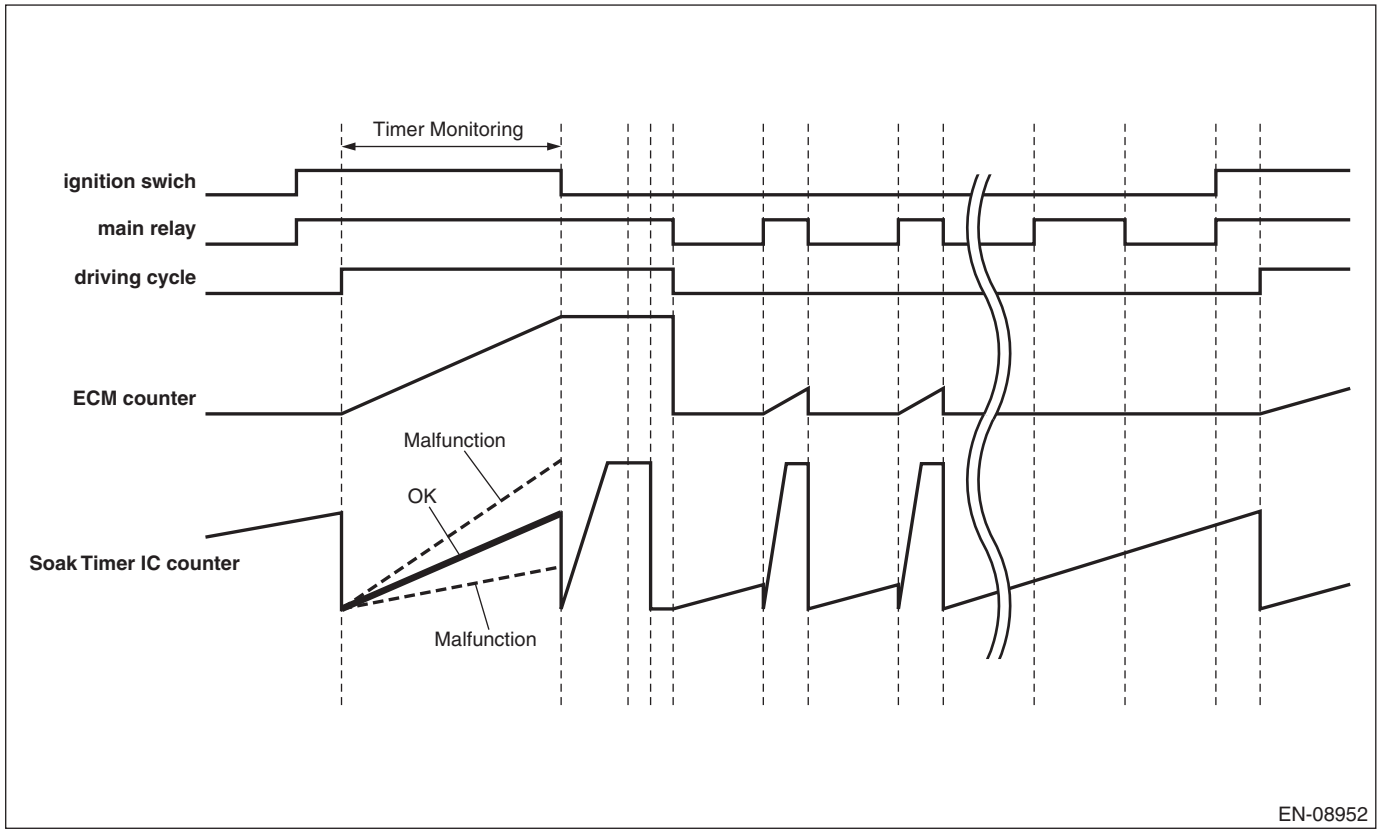
4. GENERAL DRIVING CYCLE

Perform the diagnosis only once when 10 minutes have passed after the engine start and the ignition switch is OFF, and also when the ignition switch is ON after the soaking of five hours or more.

5. DIAGNOSTIC METHOD

<Timer diagnosis>

Start the count up operation of counters in ECM and in soaking timer IC when the engine is started.
Judge as timer malfunction if the difference between the counter in ECM and counter in soaking timer IC exceeds the allowable limit when the ignition switch is OFF.



- **Abnormality Judgment**

Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
|osoaktimcpu – osoaktimic| / osoaktimcpu osoaktimcpu = Counter in ECM osoaktimic = Counter in soaking timer IC	> 0.4

- **Normality Judgment**

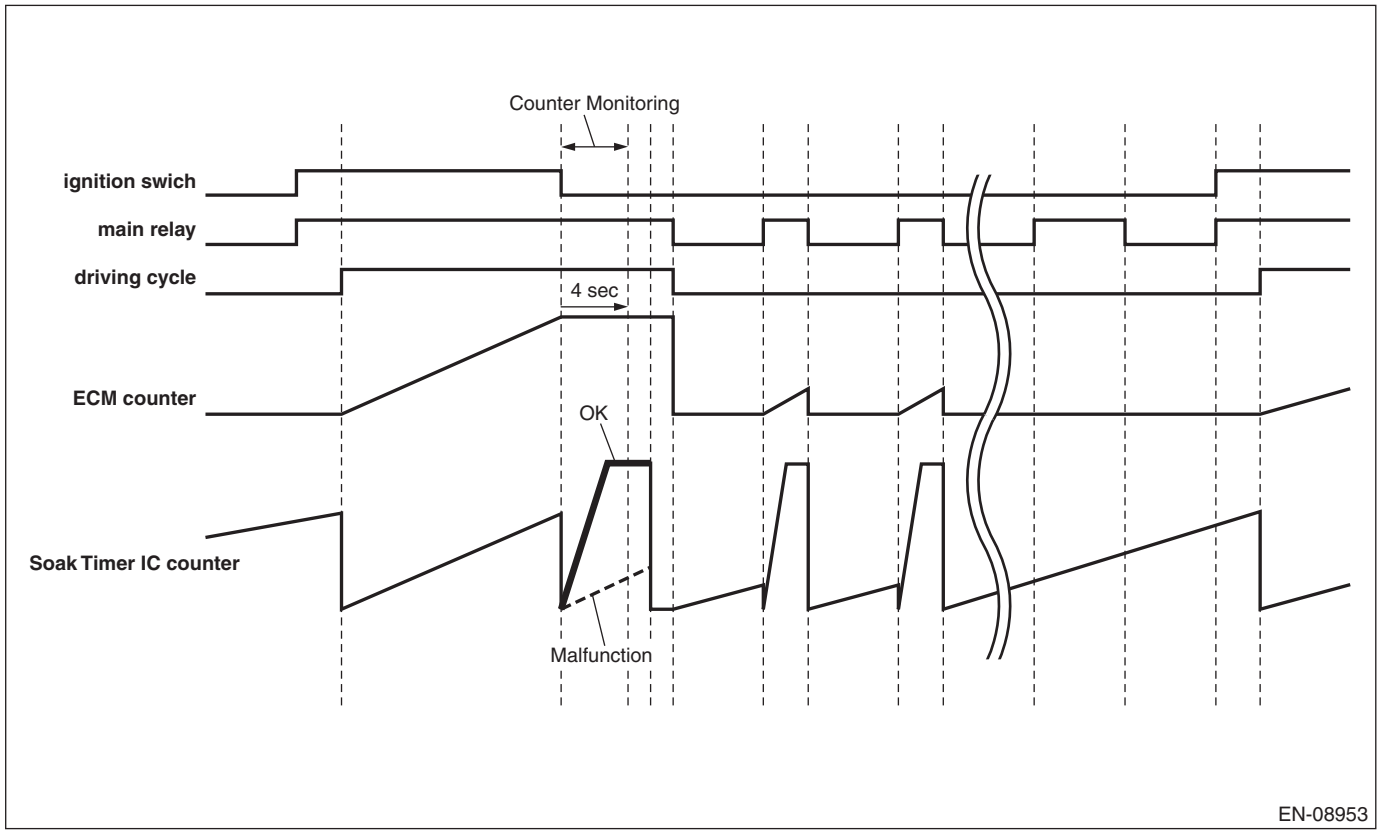
Judge as OK when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
|osoaktimcpu – osoaktimic| / osoaktimcpu	≤ 0.4

<Full count diagnosis>

After the timer diagnosis is completed, reset the counter in soaking timer IC and start the count up operation. Judge as full count diagnosis malfunction if counter in soaking timer IC is not $3FF (1023 count) after 4 seconds.



- **Abnormality Judgment**

Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
osoakfcntic osoakfcntic = Counter in soaking timer IC	≠ $3FF (1023 count)

- **Normality Judgment**

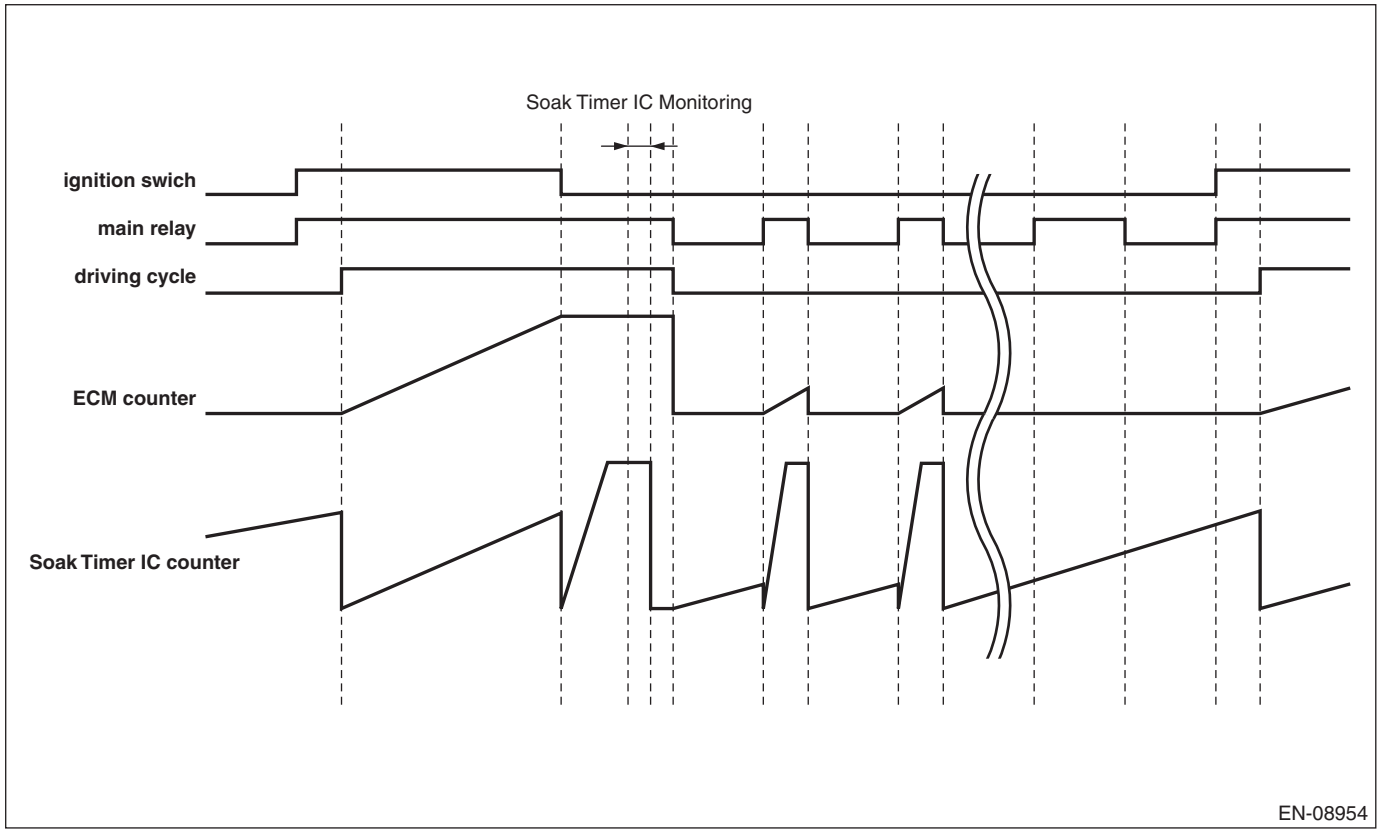
Judge as OK when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
osoakfcntic	= $3FF (1023 count)

<Soaking timer IC setting diagnosis>

When setting the activation setting time to soaking timer IC, compare the writing value to soaking timer IC with read out value. Judge as malfunction if the values do not match 3 times in a row.



- **Abnormality Judgment**

Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Writing value and read out value when setting the soaking timer	Unmatch
Number of retrying the soaking timer setting	≥ 3 times

- **Normality Judgment**

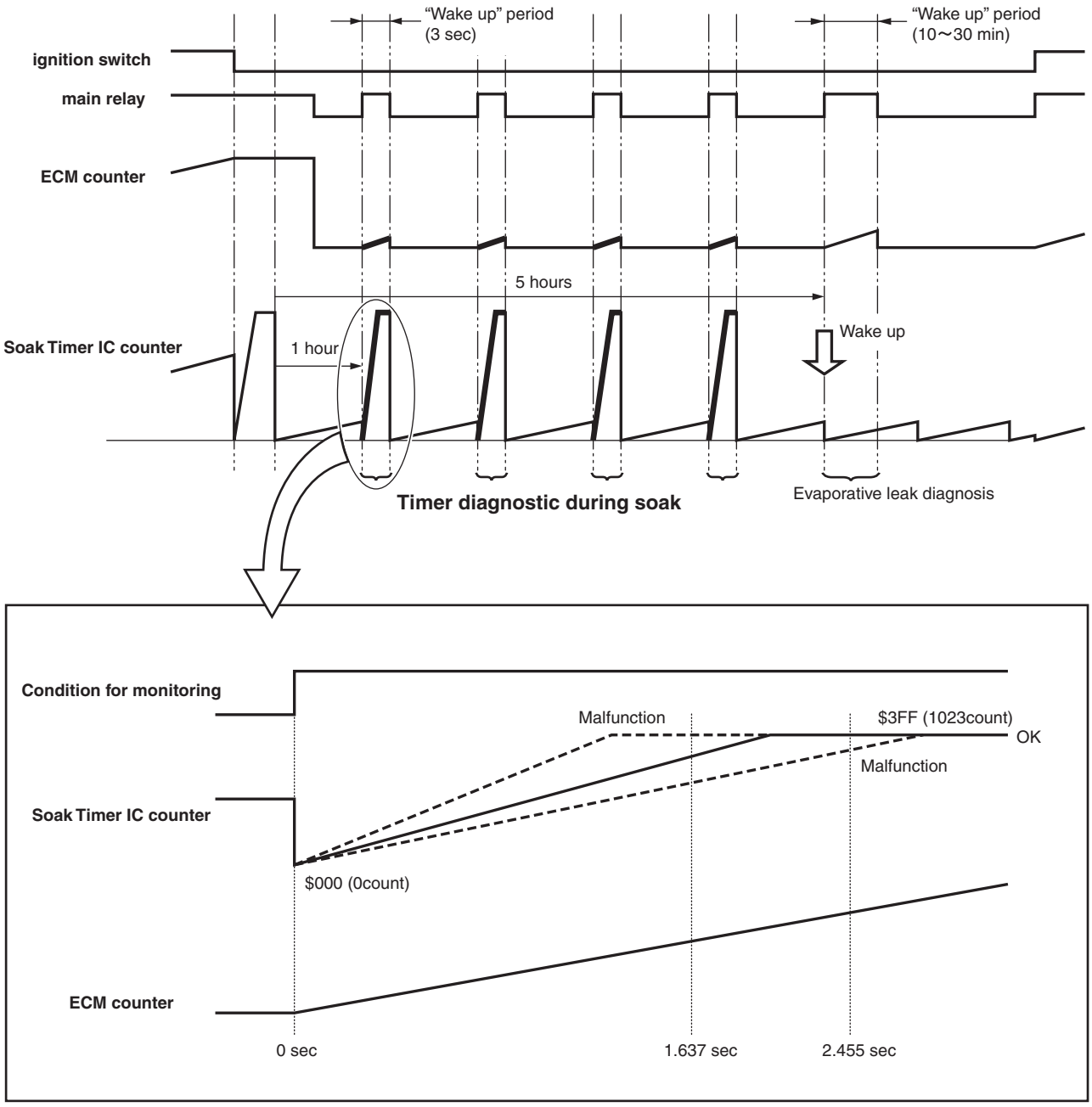
Judge as OK when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Writing value and read out value when setting the soaking timer	Match

<Timer diagnosis (during soaking)>

Wake-up at the predetermined interval until five hours have passed after the ignition switch is OFF, and compare the counter in soaking timer IC with the counter in ECM.
Judge as malfunction if the counter in soaking timer IC is counted up to maximum value (1023 count) when the counter in ECM is 1637 ms, or if the counter in soaking timer IC is not counted up to maximum value (1023 count) when the counter in ECM is 2455 ms.



EN-08981

- **Abnormality Judgment**

Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
When any one of the followings is established.	
• All of the following conditions are established.	
Counter in ECM	≤ 1637 ms
Counter in soaking timer IC	= $3FF (1023 count)
• All of the following conditions are established.	
Counter in ECM	≥ 2455 ms
Counter in soaking timer IC	≠ $3FF (1023 count)

- **Normality Judgment**

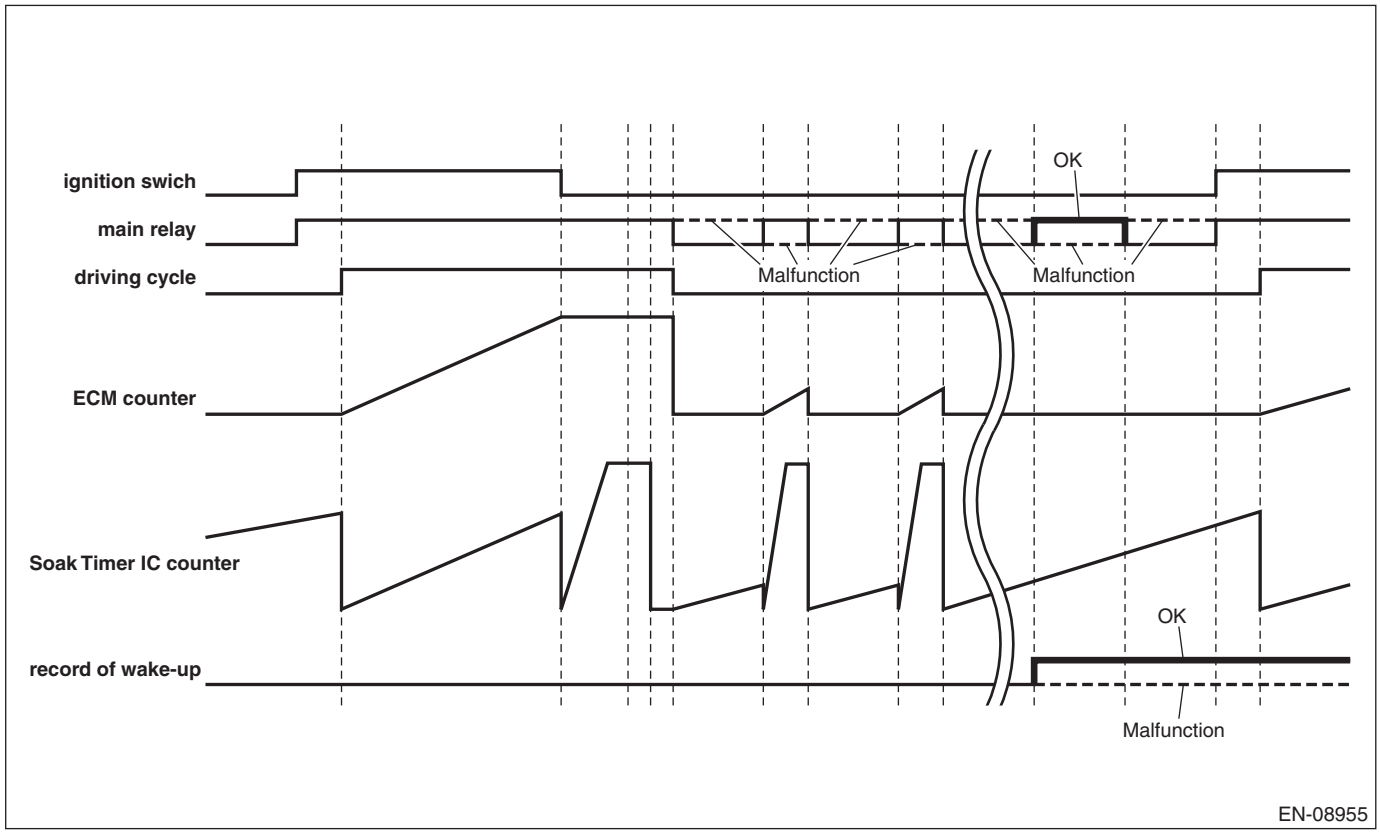
Judge as OK when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Following conditions are established.	
• All of the following conditions are established.	
Counter in ECM	≤ 1637 ms
Counter in soaking timer IC	≠ $3FF (1023 count)
• All of the following conditions are established.	
Counter in ECM	≥ 2455 ms
Counter in soaking timer IC	= $3FF (1023 count)

<Wake-up diagnosis>

Store the wake-up activation history when the ECM wakes up by the soaking timer IC.
Next time when the ignition switch is ON, if there is no wake-up activation history even though the counter in soaking timer IC exceeds the activation setting time, judge as wake-up malfunction.



- **Abnormality Judgment**

Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Wake-up activation history	None

- **Normality Judgment**

Judge as OK when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Wake-up activation history	Exist

- **Abnormality Judgment**

Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Driving cycle	Completed
When any one of the followings is established.	
• Timer diagnosis	NG
• Full count diagnosis	NG
• Soaking timer IC setting diagnosis	NG
• Timer diagnosis (during soaking)	NG
• Wake-up diagnosis	NG

Time Needed for Diagnosis: 18620 s (Approx. 5 hours)
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

- **Normality Judgment**

Judge as OK and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Driving cycle	Completed
All of the following conditions are established.	
• Timer diagnosis	OK
• Full count diagnosis	OK
• Soaking timer IC setting diagnosis	OK
• Timer diagnosis (during soaking)	OK
• Wake-up diagnosis	OK

Time Needed for Diagnosis: 18620 s (Approx. 5 hours)

EA:DTC U0073 CAN FAILURE, BUS 'OFF' DETECTION

1. OUTLINE OF DIAGNOSIS

Detect malfunction of CAN communication.
When CAN communications is not possible, and CAN communications with TCM, VDC CM and body integrated unit is not possible, judge as NG if data from the TCM, VDC CM and body integrated unit are not normal.

2. COMPONENT DESCRIPTION

ECM, TCM, VDC CM and body integrated unit 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 CONDITIONS

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	> 10.9 V
Starter switch	OFF
Engine	run
bus off flag or error warning flag	set (error)
or	
ID received from control module connected to driving system CAN	None during 500 milliseconds
or	
Data updated from control module connected to driving system CAN	None during 2000 milliseconds

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 if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	> 10.9 V
Starter switch	OFF
Engine	run
bus off flag or error warning flag	clear (No error)
ID received from control module connected to driving system CAN	Yes
Data updated from control module connected to driving system CAN	Yes

Time Needed for Diagnosis: 1000 ms

EB:DTC U0101 CAN (TCU) DATA NOT LOADED

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC U0073. <Ref. to GD(H4DO)-232, DTC U0073 CAN FAILURE, BUS 'OFF' DETECTION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

EC:DTC U0122 CAN (VDC) DATA NOT LOADED

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC U0073. <Ref. to GD(H4DO)-232, DTC U0073 CAN FAILURE, BUS 'OFF' DETECTION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

ED:DTC U0140 CAN (BCU) DATA NOT LOADED

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC U0073. <Ref. to GD(H4DO)-232, DTC U0073 CAN FAILURE, BUS 'OFF' DETECTION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

EE:DTC U0402 CAN (TCU) DATA ABNORMAL

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC U0073. <Ref. to GD(H4DO)-232, DTC U0073 CAN FAILURE, BUS 'OFF' DETECTION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

EF:DTC U0416 CAN (VDC) DATA ABNORMAL

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC U0073. <Ref. to GD(H4DO)-232, DTC U0073 CAN FAILURE, BUS 'OFF' DETECTION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

EG:DTC U0422 CAN (BCU) DATA ABNORMAL

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC U0073. <Ref. to GD(H4DO)-232, DTC U0073 CAN FAILURE, BUS 'OFF' DETECTION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

ENGINE 2 SECTION

This service manual has been prepared to provide SUBARU service personnel with the necessary information and data for the correct maintenance and repair of SUBARU vehicles.
This manual includes the procedures for maintenance, disassembling, reassembling, inspection and adjustment of components and diagnostics for guidance of experienced mechanics.
Please peruse and utilize this manual fully to ensure complete repair work for satisfying our customers by keeping their vehicle in optimum condition. When replacement of parts during repair work is needed, be sure to use SUBARU genuine parts.

All information, illustration and specifications contained in this manual are based on the latest product information available at the time of publication approval.

FUEL INJECTION (FUEL SYSTEMS)	FU(H4DOTC)
EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)	EC(H4DOTC)
INTAKE (INDUCTION)	IN(H4DOTC)
MECHANICAL	ME(H4DOTC)
EXHAUST	EX(H4DOTC)
COOLING	CO(H4DOTC)
LUBRICATION	LU(H4DOTC)
SPEED CONTROL SYSTEMS	SP(H4DOTC)
IGNITION	IG(H4DOTC)
STARTING/CHARGING SYSTEMS	SC(H4DOTC)
ENGINE (DIAGNOSTICS)	EN(H4DOTC) (diag)
GENERAL DESCRIPTION	GD(H4DOTC)

FUEL INJECTION (FUEL SYSTEMS)

FU(H4DOTC)

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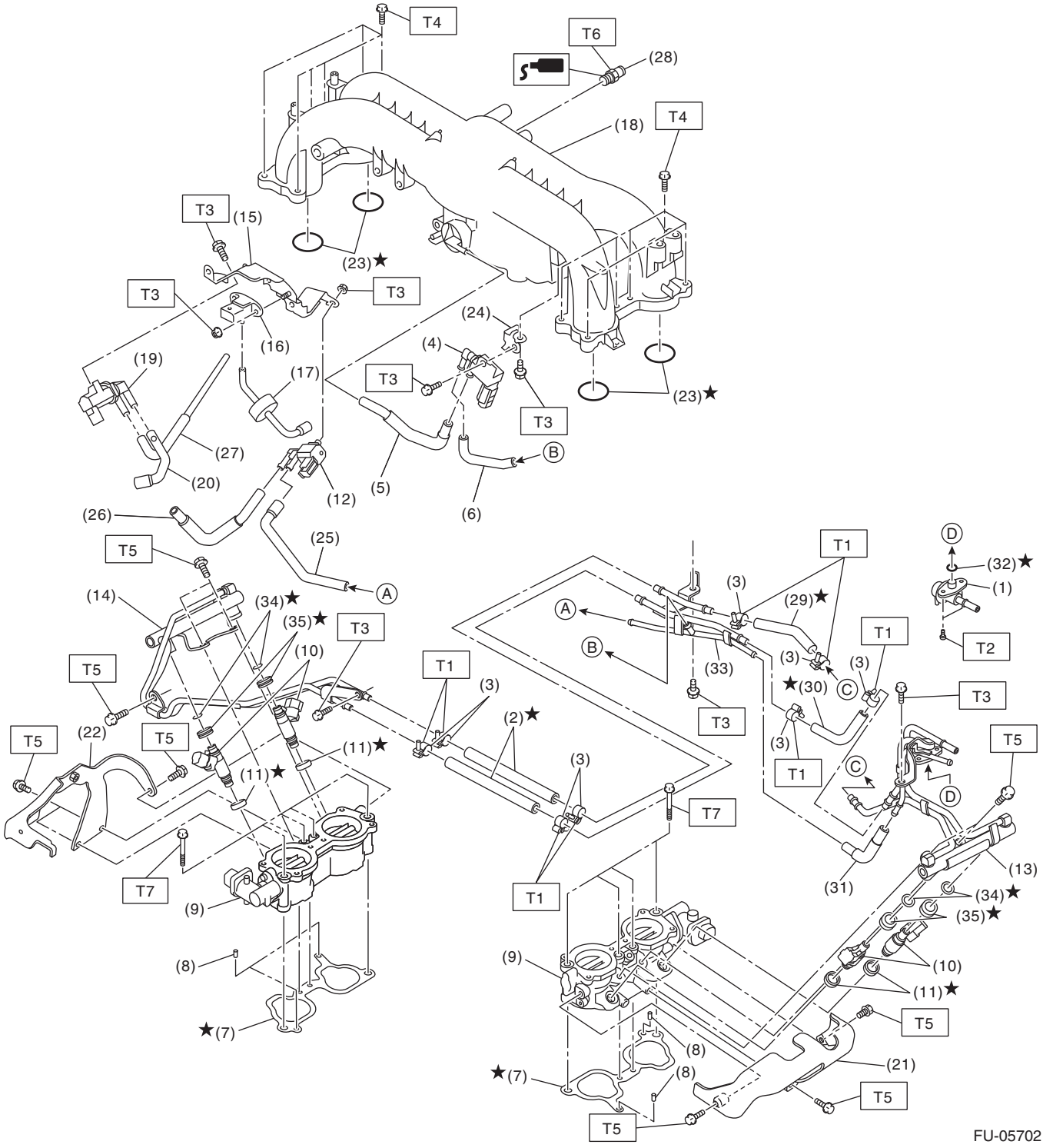
1. General Description

A: SPECIFICATION

Fuel tank	Capacity	64 ℓ (16.9 US gal, 14.1 Imp gal)
	Install locations	Under rear seat
Fuel pump	Type	Impeller
	Shutoff discharge pressure	550 — 850 kPa (5.61 — 8.67 kgf/cm^2, 79.8 — 123.3 psi)
	Discharge rate	155 ℓ (40.9 US gal, 34.1 Imp gal)/h or more. [12 V at 300 kPa (3.06 kgf/cm^2, 43.5 psi)]
Fuel filter		In-tank type

B: COMPONENT

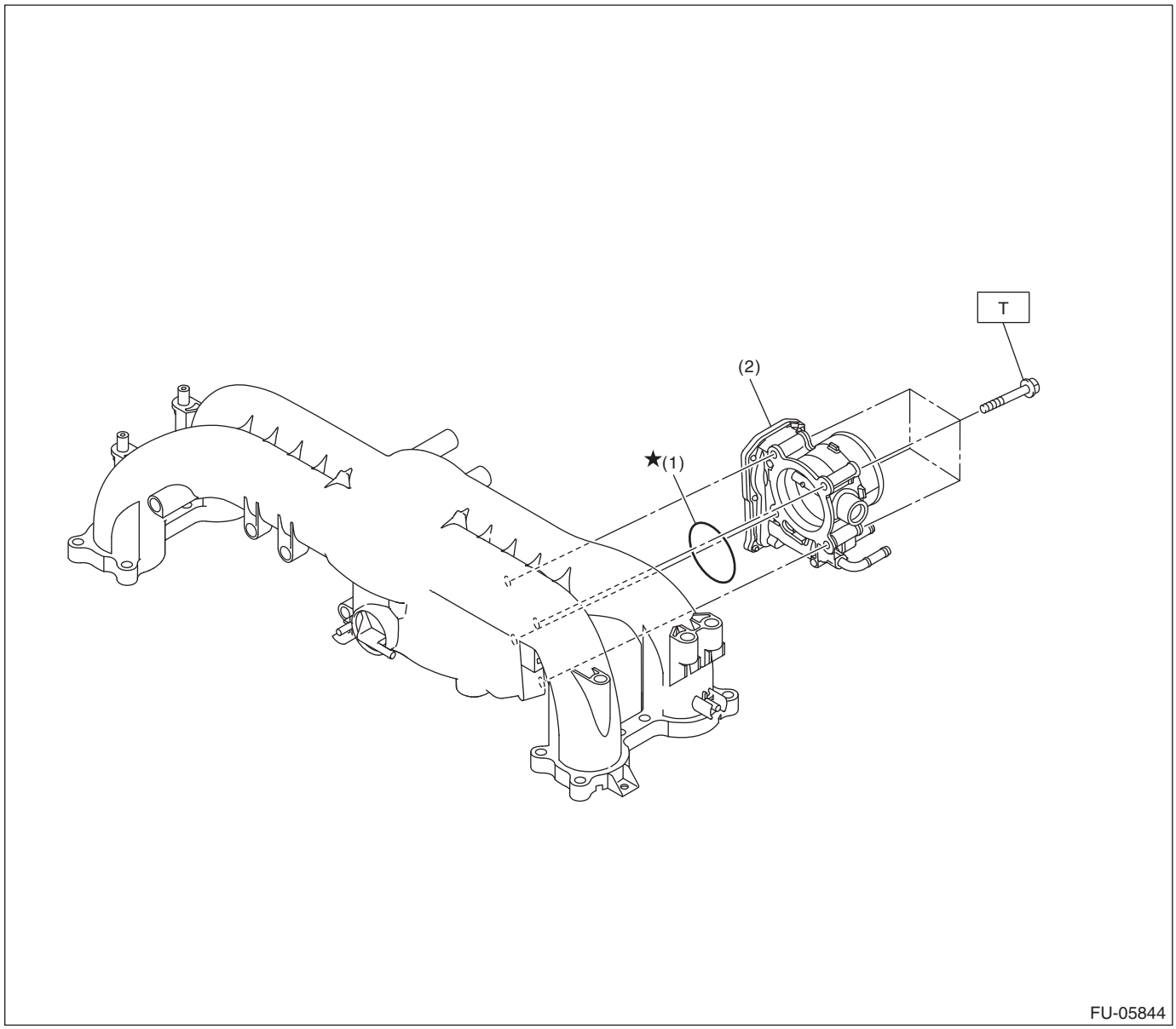
1. INTAKE MANIFOLD



(1) Pressure regulator
(2) Fuel hose A
(3) Clamp
(4) Purge control solenoid valve 1
(5) Vacuum hose D
(6) Vacuum hose C
(7) Intake manifold gasket
(8) Guide pin
(9) Tumble generator valve ASSY
(10) Fuel injector
(11) Seal ring
(12) Purge control solenoid valve 2
(13) Fuel injector pipe LH
(14) Fuel injector pipe RH
(15) Solenoid valve bracket
(16) Manifold absolute pressure sensor
(17) Filter
(18) Intake manifold
(19) Wastegate control solenoid valve ASSY
(20) Vacuum hose
(21) Fuel pipe protector LH
(22) Fuel pipe protector RH
(23) O-ring
(24) Solenoid valve bracket
(25) Vacuum hose B
(26) Vacuum hose A
(27) Air control hose
(28) Nipple
(29) Fuel hose B
(30) Fuel hose C
(31) Vacuum hose
(32) O-ring
(33) Fuel pipe
(34) O-ring
(35) Rubber

Tightening torque:N·m (kgf-m, ft-lb)
T1: 1.25 (0.1, 0.9)
T2: 3.5 (0.4, 2.6)
T3: 6.4 (0.7, 4.7)
T4: 8.3 (0.8, 6.1)
T5: 19 (1.9, 14.0)
T6: 23 (2.3, 17.0)
T7: 25 (2.5, 18.4)

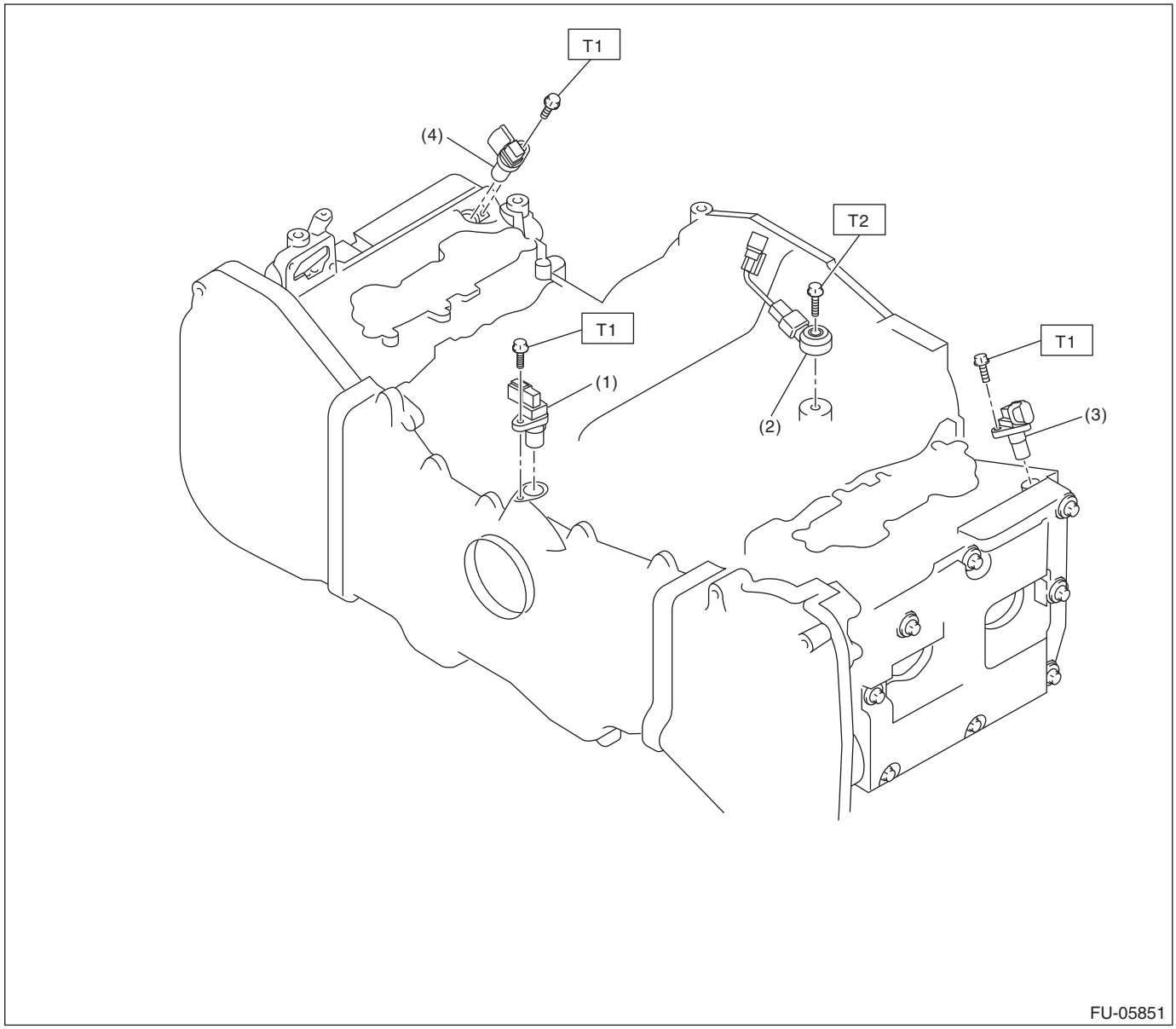
2. AIR INTAKE SYSTEM



(1) O-ring
(2) Throttle body

Tightening torque:N·m (kgf-m, ft-lb)
T: 8 (0.8, 5.9)

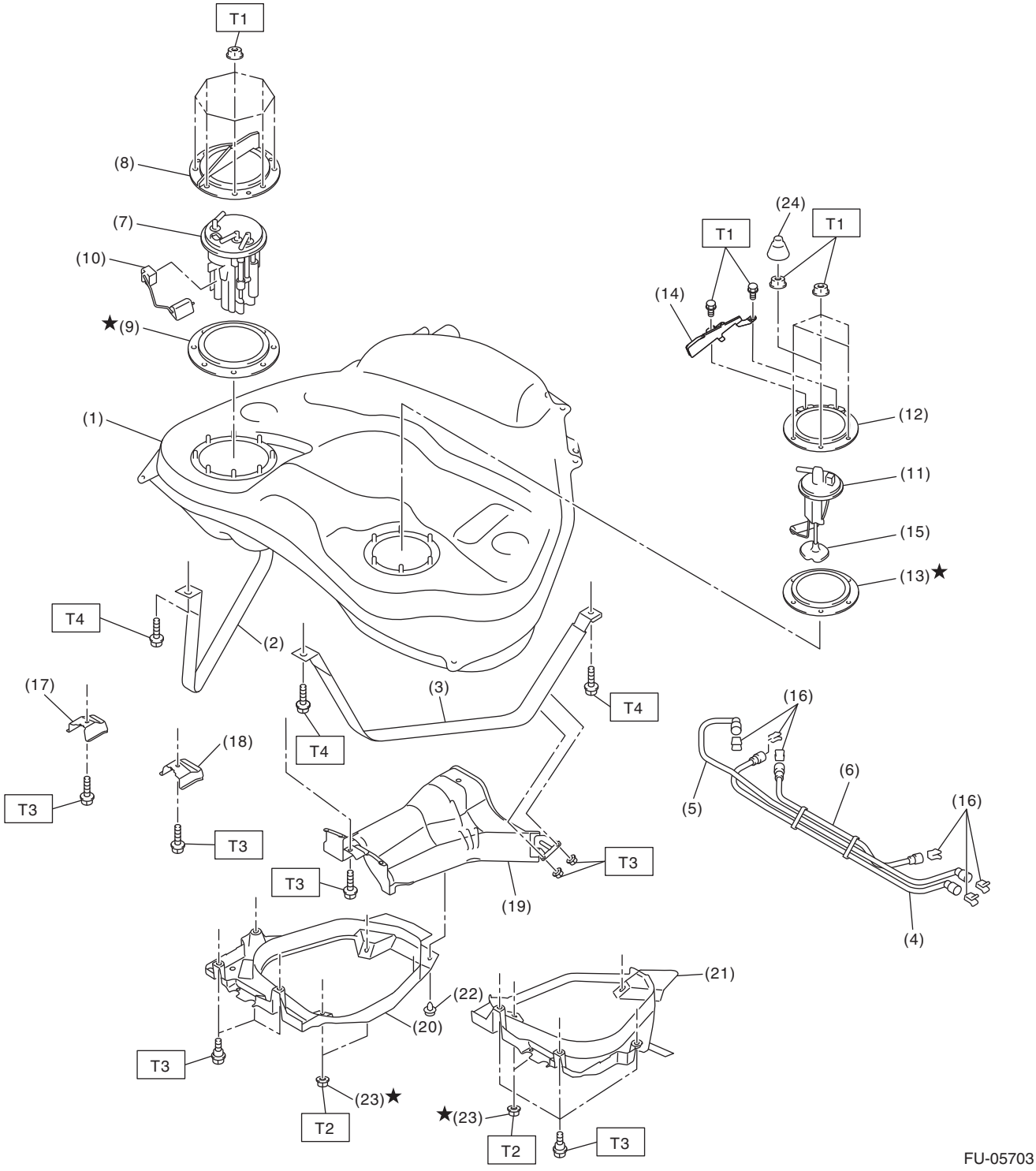
3. CRANKSHAFT POSITION, CAMSHAFT POSITION AND KNOCK SENSORS



(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 (0.7, 4.7)
T2: 24 (2.4, 17.7)

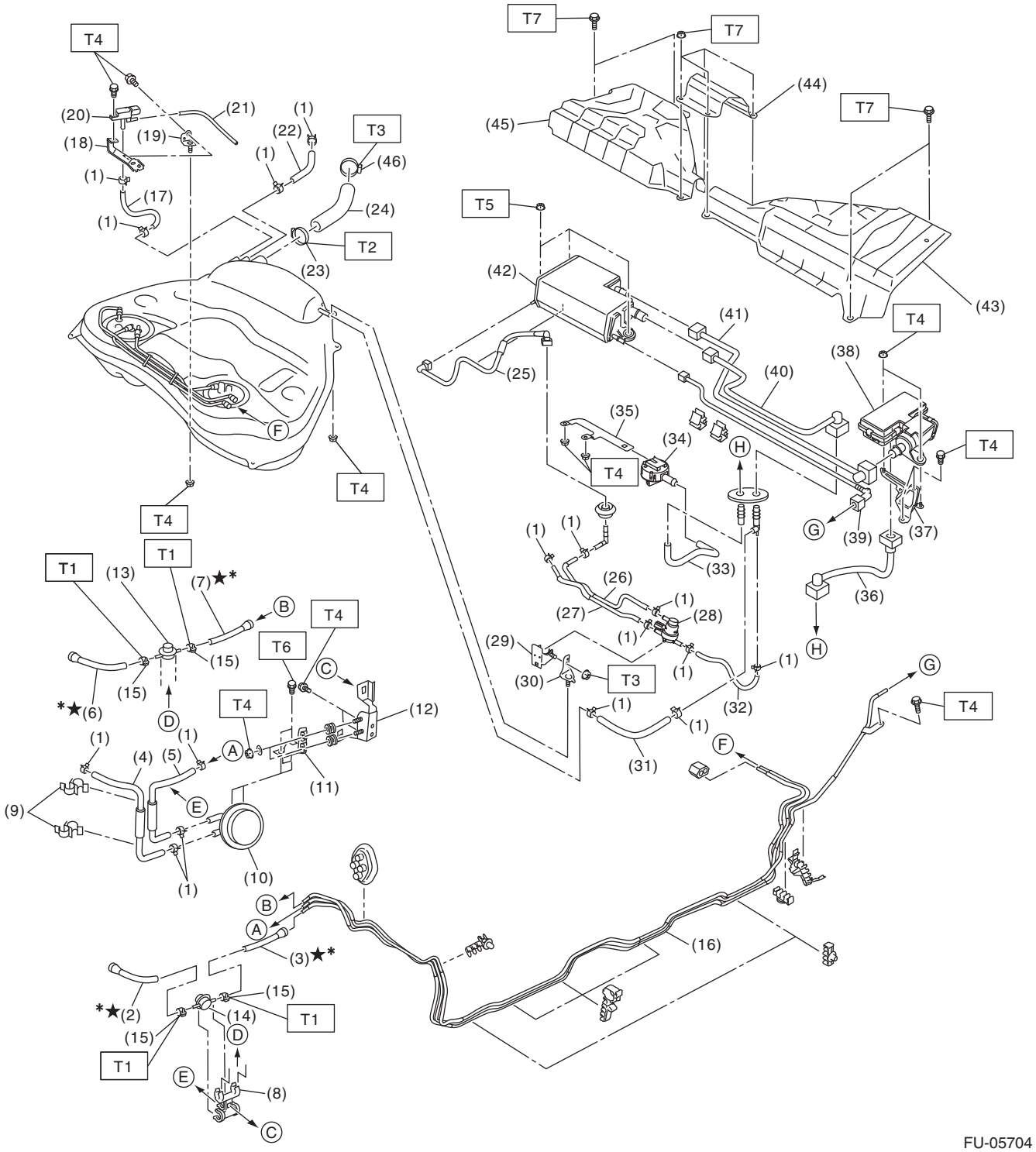
4. FUEL TANK


T1
(8)
(7)
(10)
★(9)
(1)
(24)
T1
T1
(14)
(12)
(11)
(15)
(13)★
T4
(2)
(17)
(3)
T4
T4
(16)
(18)
(6)
(5)
(16)
T3
T3
T3
T3
(19)
(4)
(21)
(22)
(20)
T3
(23)★
T2
★(23)
T2
T3
FU-05703

(1) Fuel tank
(2) Fuel tank band RH
(3) Fuel tank band LH
(4) Fuel delivery tube
(5) Fuel return tube
(6) Jet pump tube
(7) Fuel pump ASSY
(8) Fuel pump upper plate
(9) Fuel pump gasket
(10) Fuel level sensor
(11) Fuel sub level sensor
(12) Fuel sub level sensor upper plate
(13) Fuel sub level sensor gasket
(14) Fuel sub level sensor protector
(15) Fuel sub level sensor filter
(16) Retainer
(17) Stopper RH
(18) Stopper LH
(19) Heat shield cover
(20) Fuel tank protector RH
(21) Fuel tank protector LH
(22) Clip
(23) Self-locking nut
(24) Rubber cap

Tightening torque:N·m (kgf-m, ft-lb)
T1: 4.4 (0.4, 3.2)
T2: 9 (0.9, 6.6)
T3: 18 (1.8, 13.3)
T4: 33 (3.4, 24.3)

5. FUEL LINE



FU-05704

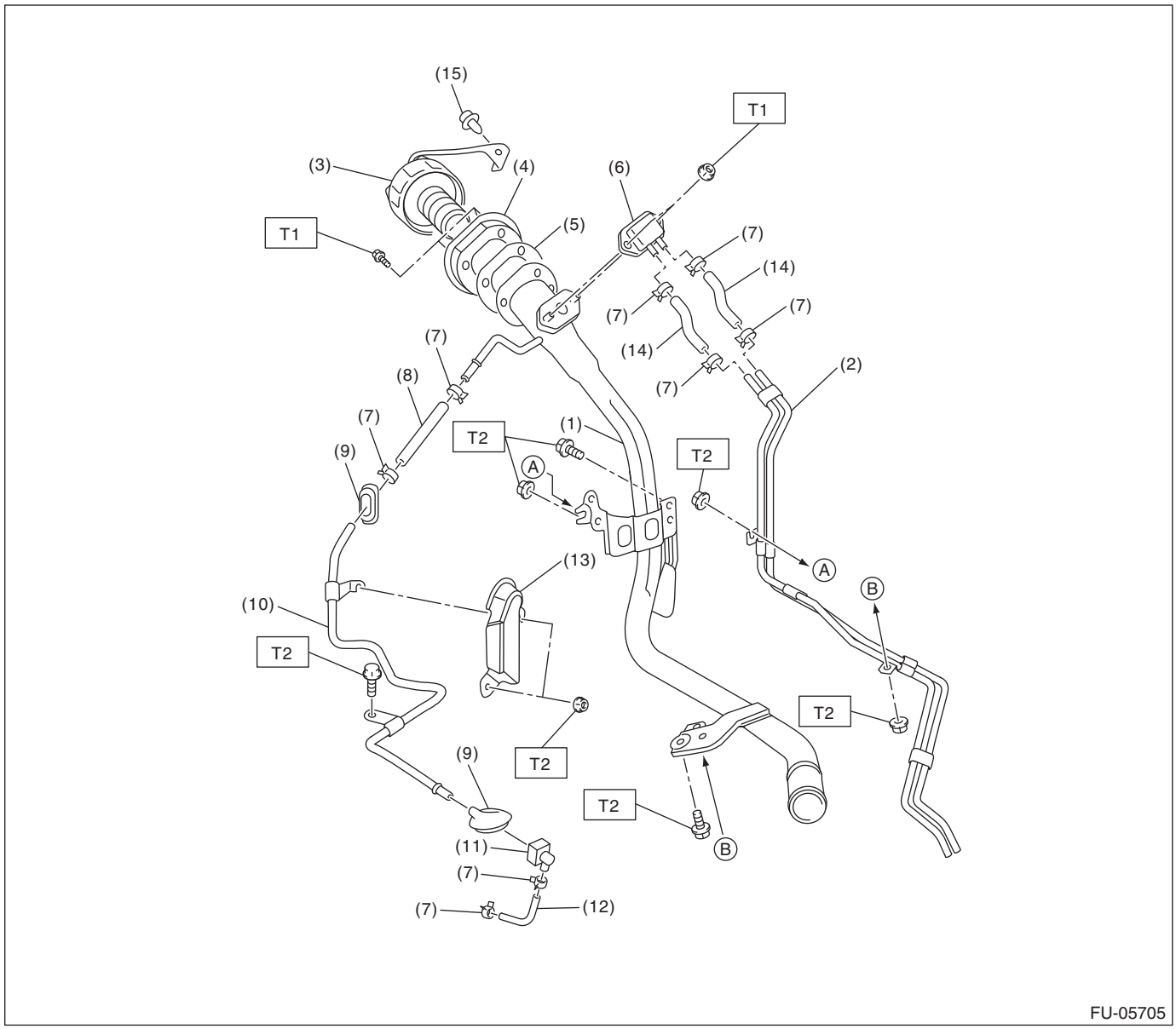
(1) Clip
(2) Fuel return hose A
(3) Fuel return hose B
(4) Evaporation hose A
(5) Evaporation hose B
(6) Fuel delivery hose A
(7) Fuel delivery hose B
(8) Fuel damper holder
(9) Clamp
(10) Purge damper
(11) Purge damper bracket
(12) Damper bracket
(13) Fuel damper A
(14) Fuel damper B
(15) Clamp
(16) Fuel pipe ASSY
(17) Pressure hose
(18) Fuel tank pressure sensor bracket A
(19) Fuel tank pressure sensor bracket B
(20) Fuel tank pressure sensor
(21) Vacuum hose
(22) Evaporation hose C
(23) Clamp
(24) Fuel filler hose
(25) PCV drain tube
(26) Evaporation hose D
(27) Evaporation hose E
(28) Pressure control solenoid valve
(29) Pressure control solenoid valve bracket A
(30) Pressure control solenoid valve bracket B
(31) Evaporation hose F
(32) Evaporation hose G
(33) Drain hose
(34) Drain separator
(35) Drain separator bracket
(36) Drain tube A
(37) Drain valve bracket
(38) Drain valve
(39) Purge tube
(40) Vent tube
(41) Drain tube B
(42) Canister
(43) Canister cover LH
(44) Center canister cover
(45) Canister cover RH
(46) Clamp

Tightening torque:N·m (kgf-m, ft-lb)

T1: 1.25 (0.1, 0.9)
T2: 2 (0.2, 1.5)
T3: 2.5 (0.3, 1.8)
T4: 7.5 (0.8, 5.5)
T5: 8 (0.8, 5.9)
T6: 13 (1.3, 9.6)
T7: 18 (1.8, 13.3)

* It can be reused if the quick connector side is disconnected.

6. FUEL FILLER PIPE

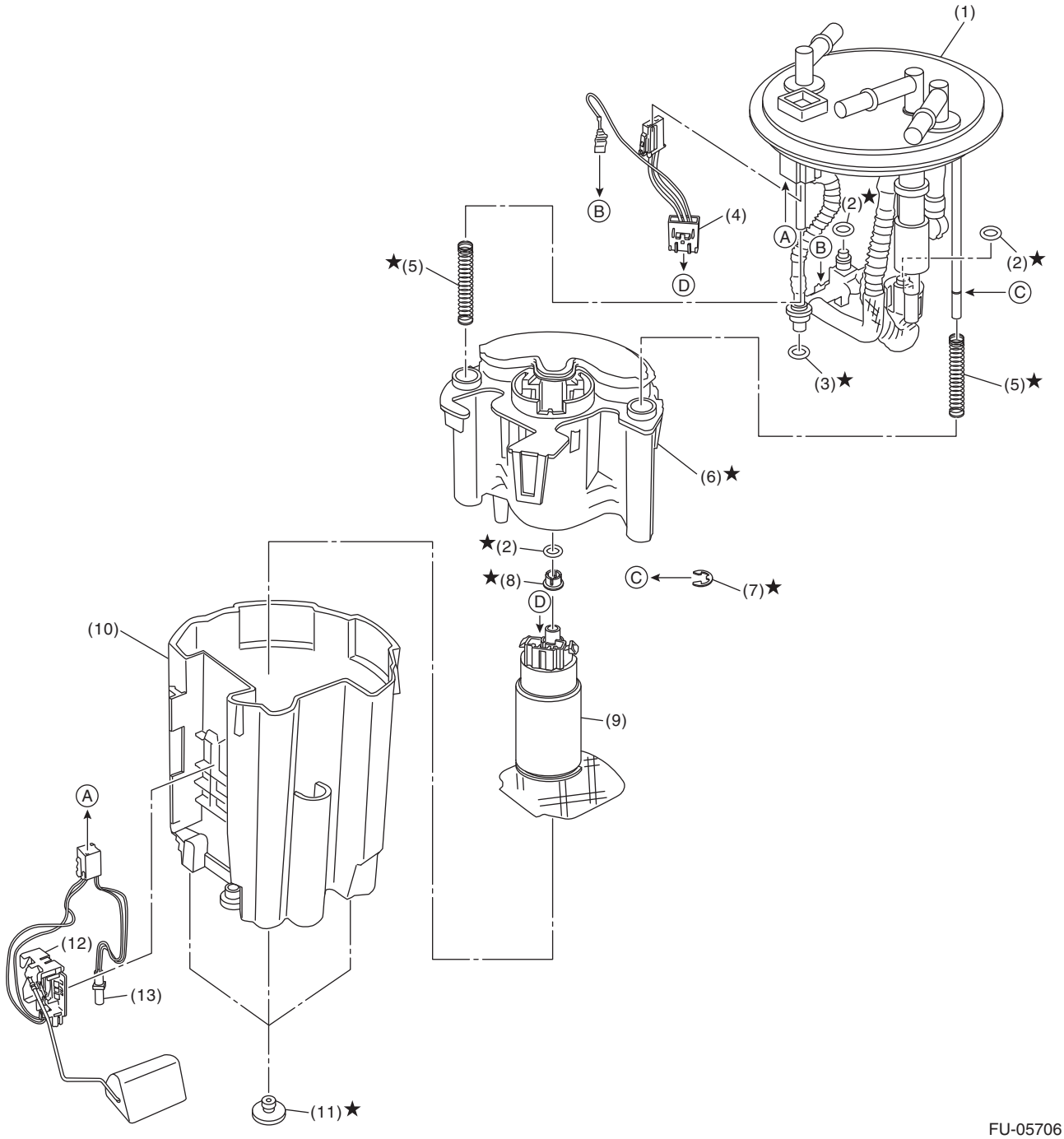


FU-05705

(1) Fuel filler pipe
(2) Evaporation pipe A
(3) Fuel filler cap
(4) Filler ring
(5) Filler pipe gasket
(6) Shut valve
(7) Clip
(8) Evaporation hose A
(9) Grommet
(10) Evaporation pipe B
(11) Quick connector
(12) Evaporation hose B
(13) Evaporation pipe protector
(14) Evaporation hose C
(15) Clip

Tightening torque:N·m (kgf-m, ft-lb)
T1: 4.4 (0.4, 3.2)
T2: 7.5 (0.8, 5.5)

7. FUEL PUMP



FU-05706

(1) Sub tank bracket ASSY
(2) O-ring
(3) O-ring
(4) Fuel pump harness
(5) Spring
(6) Fuel filter
(7) Clip
(8) Spacer
(9) Pump ASSY
(10) Sub tank
(11) Cushion
(12) Fuel level sensor
(13) Fuel temperature sensor

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 OPEN FLAMES” 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

1. SPECIAL TOOL

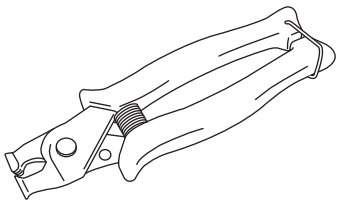
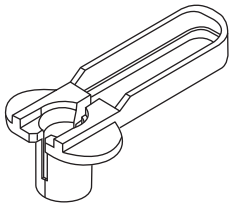
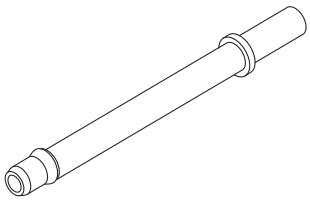
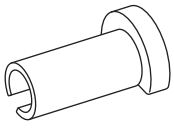
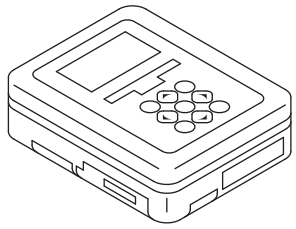
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18353AA000	18353AA000	CLAMP PLIERS	• Used for removing and installing the PCV hose. • This tool is made by the French company CAILLAU. (code) 54.0.000.205 To make it easier to obtain, it has been provided with a tool number.
 ST18371AA000	18371AA000	CONNECTOR REMOVER	Used for disconnecting the quick connector on the fuel return hose side of the engine compartment (intake manifold).
 ST18471AA000	18471AA000	FUEL PIPE ADAPTER	Used for draining fuel.
 ST42099AE000	42099AE000	QUICK CONNECTOR RELEASE	Used for removing the quick connector.

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST1B022XU0	1B022XU0	SUBARU SELECT MONITOR III KIT	Used for draining fuel and each inspection.

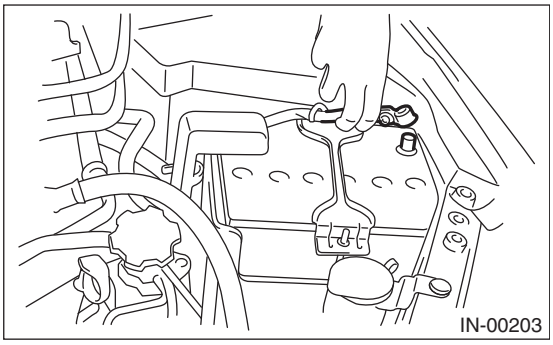
2. GENERAL TOOL

TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance and voltage.
Oscilloscope	Used for inspecting the waveform of each sensor.

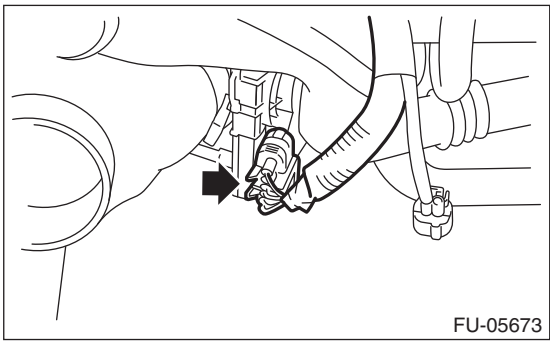
2. Throttle Body

A: REMOVAL

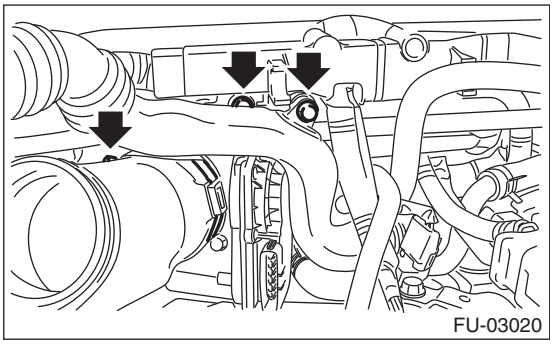
1) Remove the collector cover.
2) Disconnect the ground cable from battery.



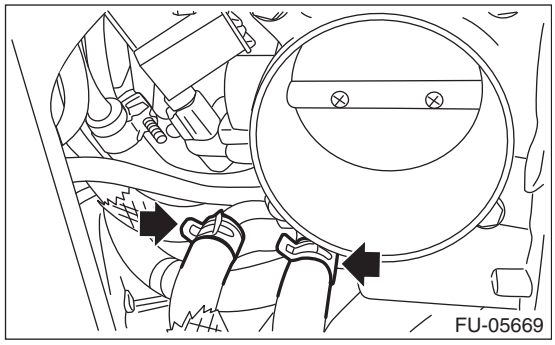
3) Lift up the vehicle.
4) Remove the under cover. <Ref. to EI-26, REMOVAL, Front Under Cover.>
5) Drain approximately 3.0 ℓ (3.2 US qt, 2.6 Imp qt) of coolant. <Ref. to CO(H4DOTC)-13, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
6) Remove the intercooler. <Ref. to IN(H4DOTC)-13, REMOVAL, Intercooler.>
7) Disconnect the connectors from the throttle position sensor.



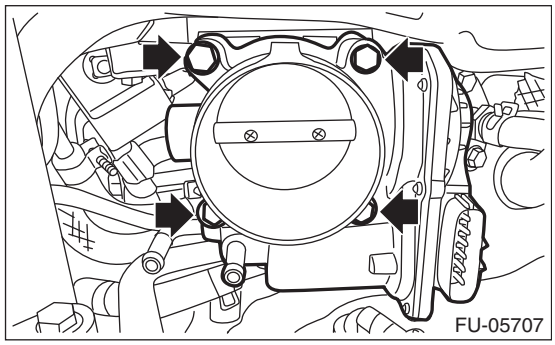
8) Remove the bolts which secure the air by-pass pipe and PCV pipe to the intake manifold, and loosen the clamp which connects the throttle body and intake duct.



9) Remove the intake duct from the throttle body.
10) Disconnect the engine coolant hose from throttle body.



11) Remove the throttle body from the intake manifold.

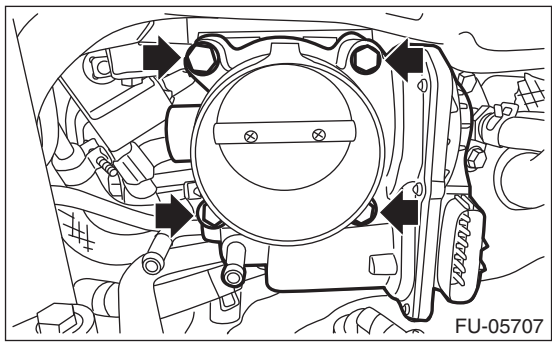


B: INSTALLATION

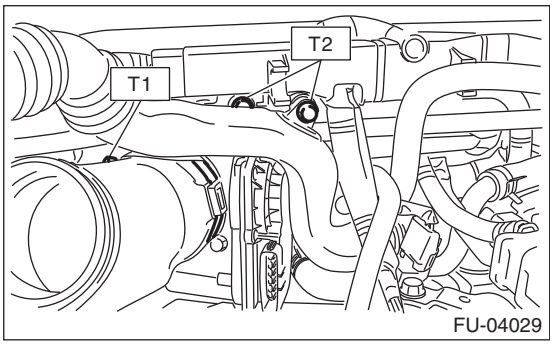
Install in the reverse order of removal.

NOTE:
Use new O-rings.

Tightening torque:
8 N·m (0.8 kgf-m, 5.9 ft-lb)



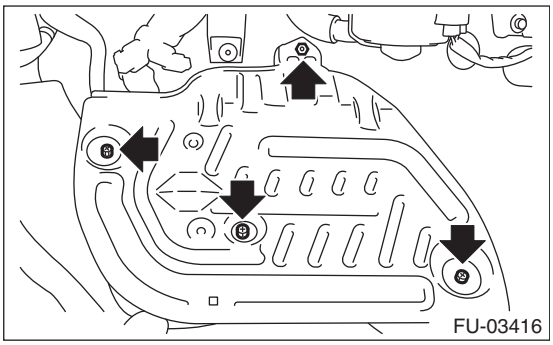
Tightening torque:
T1: 3 N·m (0.3 kgf-m, 2.2 ft-lb)
T2: 6.4 N·m (0.7 kgf-m, 2.2 ft-lb)



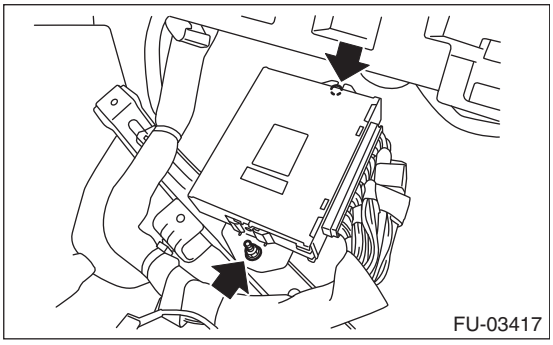
C: INSPECTION

1. THROTTLE SENSOR INSPECTION (METHOD WITH CIRCUIT TESTER)

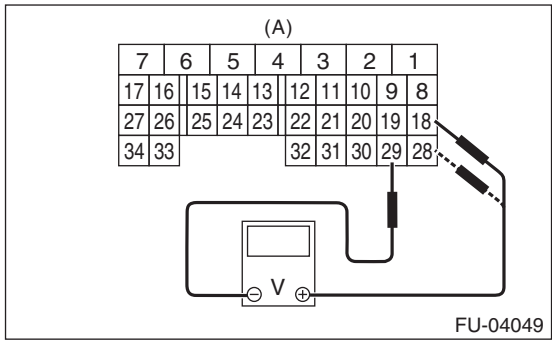
1) Remove the glove box lower cover. <Ref. to EI-48, REMOVAL, Glove Box.>
2) Remove the lower inner trim of passenger's side. <Ref. to EI-56, REMOVAL, Lower Inner Trim.>
3) Turn over the floor mat of passenger's seat.
4) Remove the protect cover.



5) Remove the nuts and bolts which hold the ECM to the bracket.



6) Turn the ignition switch to ON. (engine OFF)
7) Measure the voltage between ECM connector terminals.



(A) To ECM connector

Throttle sensor	Accelerator pedal	Terminal No.	Standard
Main	Not depressed (Full closed)	18 (+) and 29 (–)	Approx. 0.6 V
	Depressed (Full opened)		Approx. 3.96 V
Sub	Not depressed (Full closed)	28 (+) and 29 (–)	Approx. 1.48 V
	Depressed (Full opened)		Approx. 4.17 V

8) After inspection, install the related parts in the reverse order of removal.

Tightening torque:
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)

2. THROTTLE SENSOR INSPECTION (METHOD WITH SUBARU SELECT MONITOR)

1) Turn the ignition switch to ON. (engine OFF)
2) Read the throttle opening angle signal and voltage of throttle sensor using Subaru Select Monitor. <Ref. to EN(H4DOTC)(diag)-37, READ CURRENT DATA FOR ENGINE (NORMAL MODE), OPERATION, Subaru Select Monitor.>

Throttle sensor	Throttle opening angle signal	Standard
Main	0.0%	Approx. 0.6 V
	100.0%	Approx. 3.96 V
Sub	0.0%	Approx. 1.48 V
	100.0%	Approx. 4.17 V

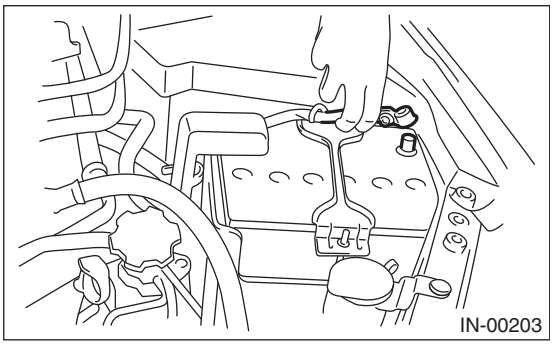
3. OTHER INSPECTIONS

1) Check that the throttle body has no deformation, cracks or other damages.
2) Check that the engine coolant hose has no cracks, damage or loose part.

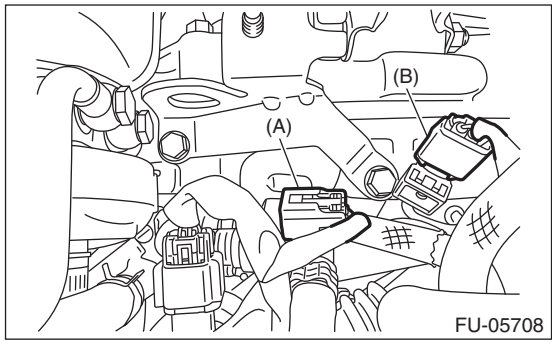
3. Intake Manifold

A: REMOVAL

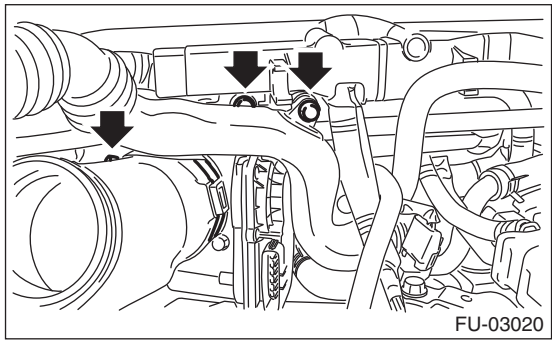
1) Remove the collector cover.
2) Collect the refrigerant from A/C system. <Ref. to AC-23, PROCEDURE, Refrigerant Recovery Procedure.>
3) Release the fuel pressure. <Ref. to FU(H4DOTC)-65, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
4) Disconnect the ground cable from battery.



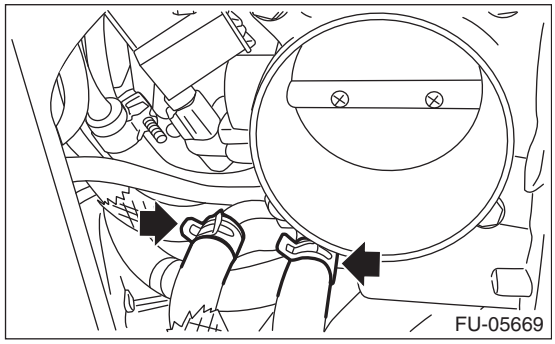
5) Open the fuel filler lid and remove the fuel filler cap.
6) Lift up the vehicle.
7) Remove the under cover. <Ref. to EI-26, REMOVAL, Front Under Cover.>
8) Drain approximately 3.0 ℓ (3.2 US qt, 2.6 Imp qt) of coolant. <Ref. to CO(H4DOTC)-13, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
9) Remove the air intake duct (rear) and air cleaner case. <Ref. to IN(H4DOTC)-10, REMOVAL, Air Intake Duct.> <Ref. to IN(H4DOTC)-8, REMOVAL, Air Cleaner Case.>
10) Remove the intercooler. <Ref. to IN(H4DOTC)-13, REMOVAL, Intercooler.>
11) Remove the generator. <Ref. to SC(H4DO)-33, REMOVAL, Generator.>
12) Remove the coolant filler tank. <Ref. to CO(H4DOTC)-29, REMOVAL, Coolant Filler Tank.>
13) Disconnect the A/C pressure hoses from A/C compressor. <Ref. to AC-42, REMOVAL, Hose and Pipe.>
14) Disconnect the connector (A) from the PCV hose assembly and the connector (B) from the knock sensor.



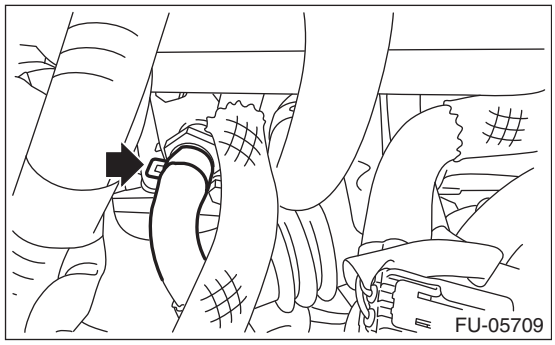
15) Remove the bolts which secure the air by-pass pipe and PCV pipe to the intake manifold, and loosen the clamp which connects the throttle body and intake duct.



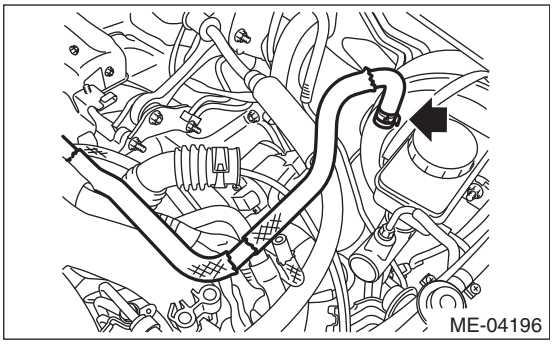
16) Remove the intake duct from the throttle body.
17) Disconnect the engine coolant hose from throttle body.



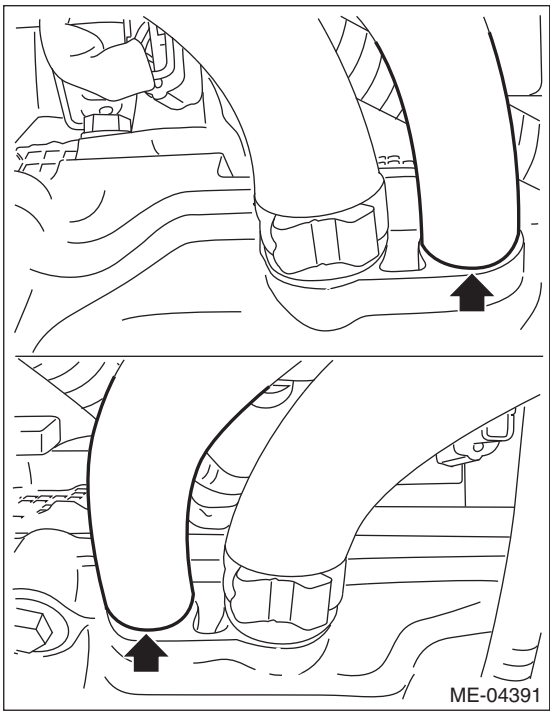
18) Disconnect the vacuum hose from nipple.



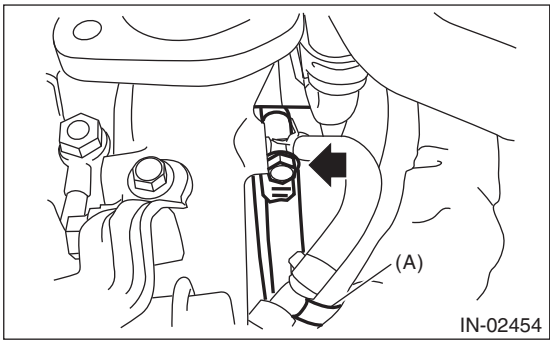
19) Disconnect the brake booster vacuum hose.



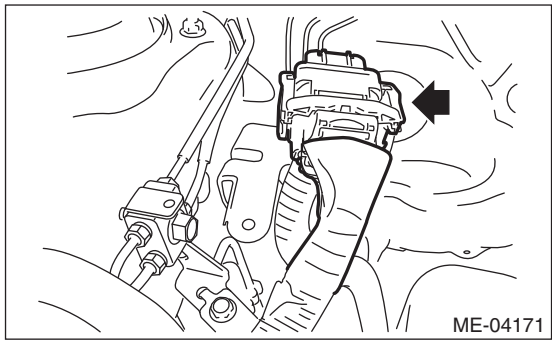
20) Disconnect the vacuum hose from rocker cover.



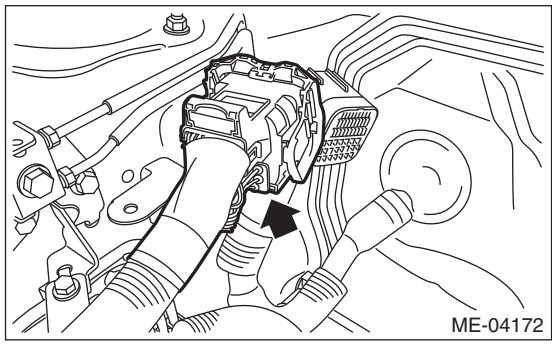
21) Disconnect the air control hose (A) from the waste gate actuator, and loosen the clamp which holds the intake duct to the turbocharger.



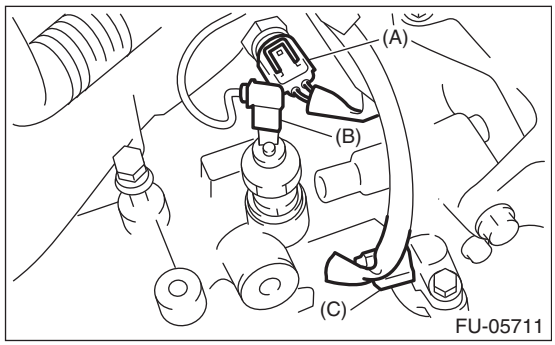
22) Disconnect the bulkhead harness connectors from the engine harness connectors.



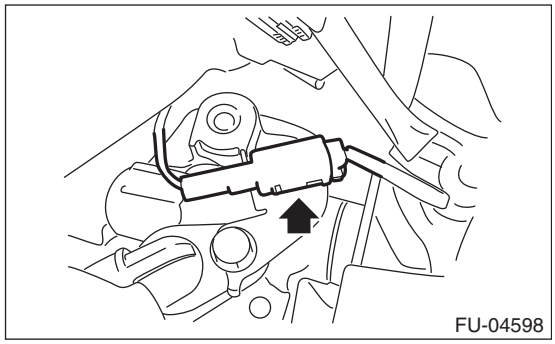
23) Remove the engine harness connector from the engine harness bracket.



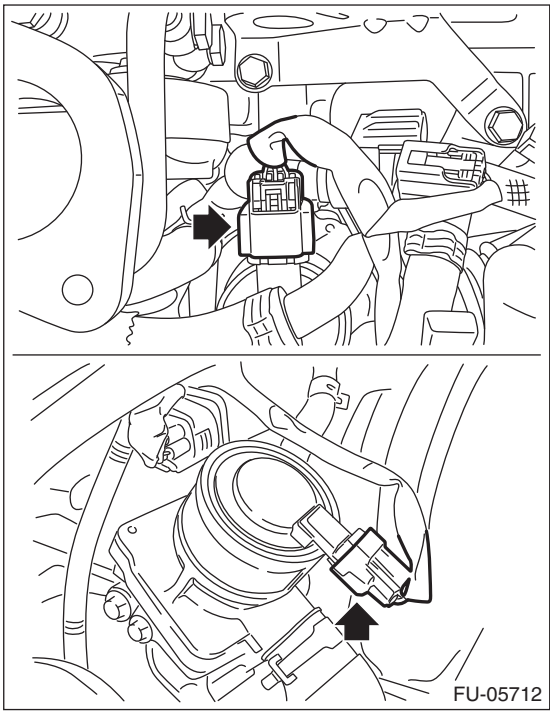
24) Disconnect the connector (A) from the engine coolant temperature sensor, connector (B) from the oil pressure switch, and connector (C) from the crankshaft position sensor.



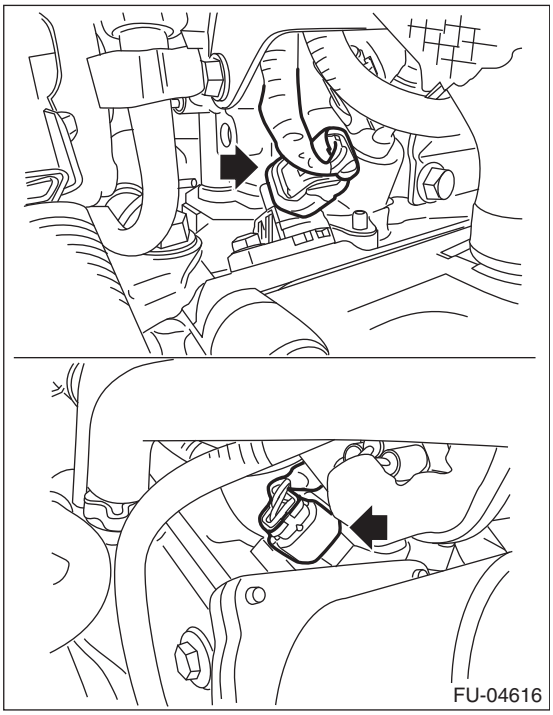
25) Disconnect the connector from power steering pump switch.



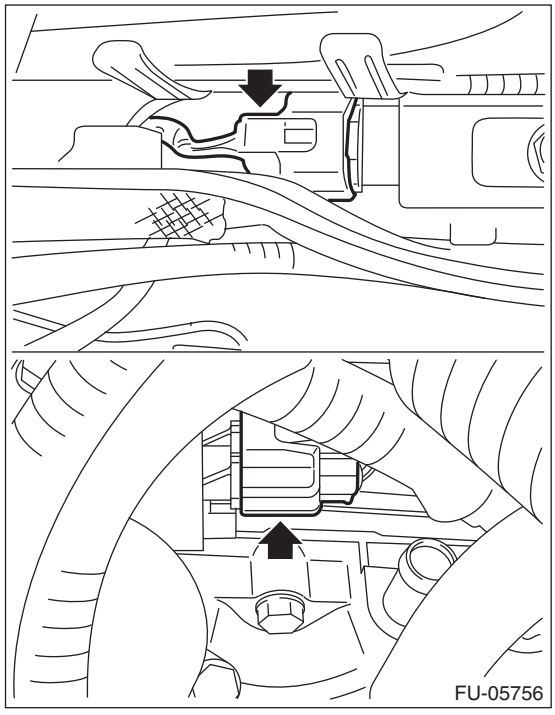
26) Disconnect the connector from the secondary air combination valve.



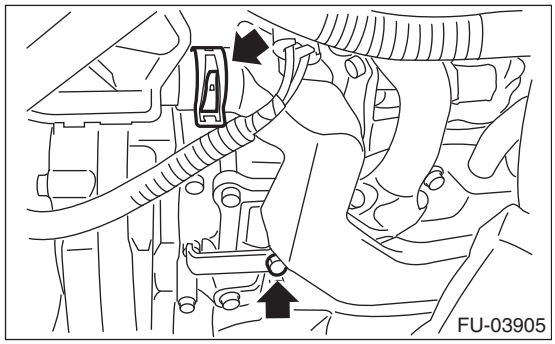
27) Disconnect the connector from camshaft position sensor.



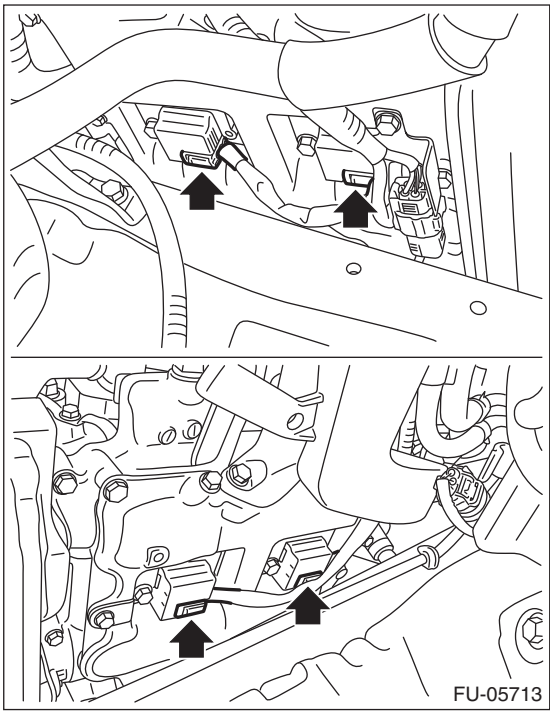
28) Disconnect the connector from the oil flow control solenoid valve.



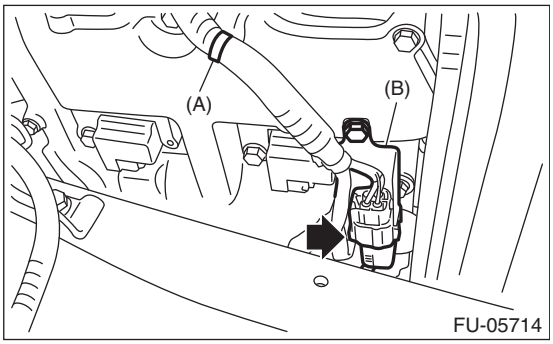
29) Disconnect the air duct from the secondary air pump, and remove the bolts securing the air duct on the rocker cover LH.



30) Disconnect the connector from ignition coil.

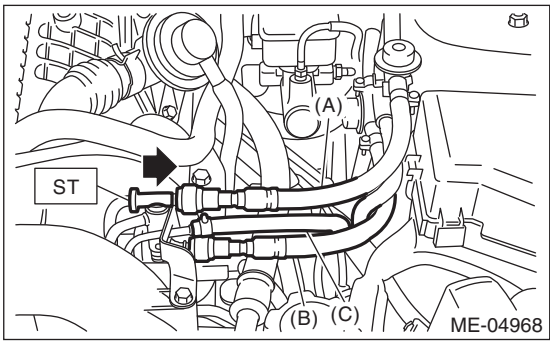


31) Disconnect the connector from the front oxygen (A/F) sensor, and remove the clip (A) and stay (B) which hold the engine harness to the rocker cover RH.



32) Attach ST to the fuel delivery pipe and push ST in the direction of arrow mark to disconnect the fuel delivery hose.
ST 42099AE000 QUICK CONNECTOR RELEASE

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

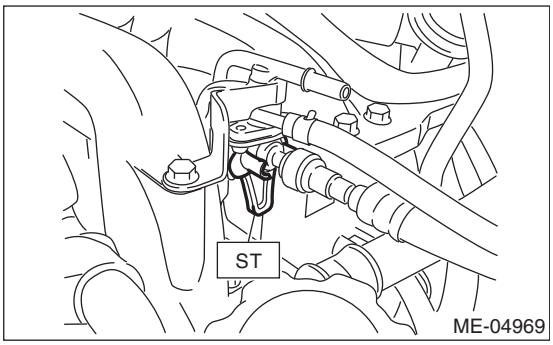


(A) Fuel delivery hose
(B) Fuel return hose
(C) Evaporation hose

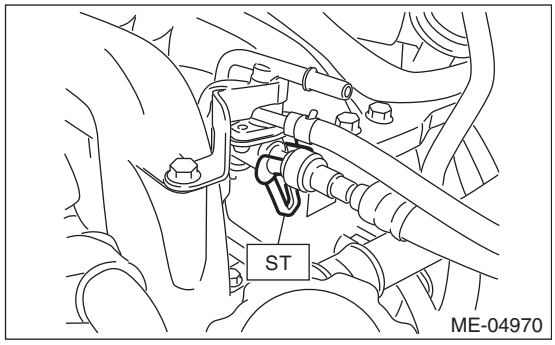
33) Disconnect the fuel return hose using the ST.
ST 18371AA000 CONNECTOR REMOVER

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

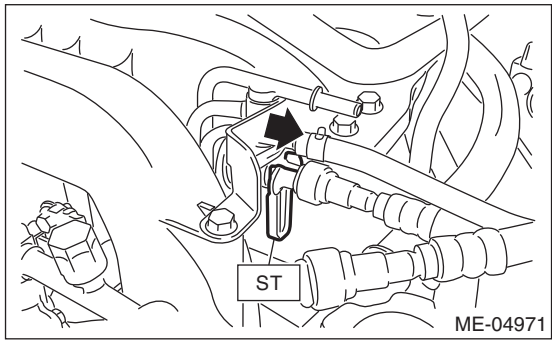
(1) Attach ST to the fuel return pipe as shown in the figure.



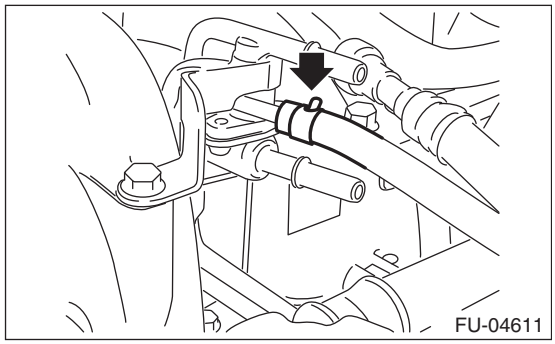
(2) Insert the front side of ST into the quick connector.



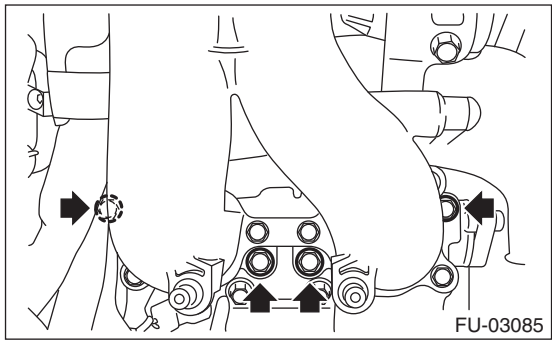
(3) Insert the back side of ST into the quick connector and push ST in the direction of arrow mark to disconnect the fuel return hose.



34) Remove the clip and disconnect the evaporation hose from the fuel pipe.



35) Remove the intake manifold from cylinder head.

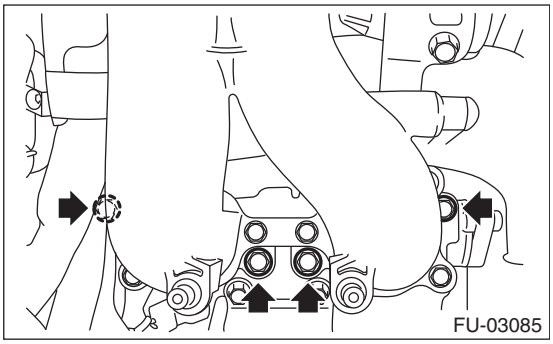


B: INSTALLATION

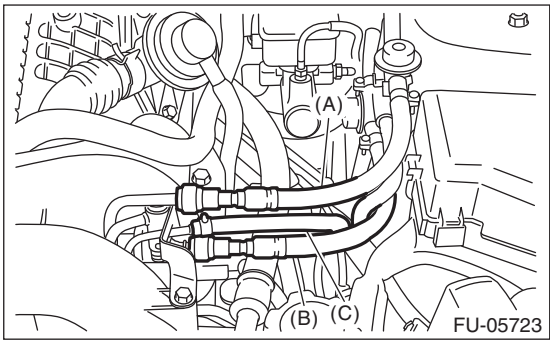
1) Install the intake manifold onto cylinder heads.

NOTE:
Use a new gasket.

Tightening torque:
25 N·m (2.5 kgf-m, 18.4 ft-lb)



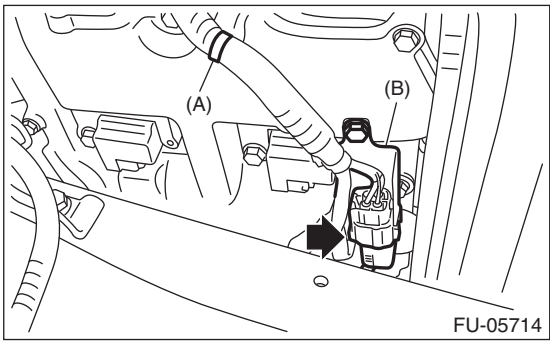
2) Connect the fuel delivery hose, fuel return hose, and evaporation hose.



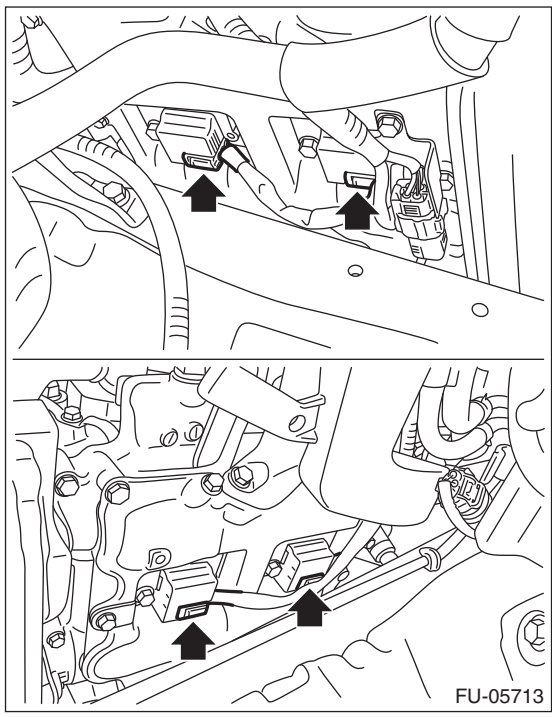
(A) Fuel delivery hose
(B) Fuel return hose
(C) Evaporation hose

3) Connect the front oxygen (A/F) sensor connector, and secure the engine harness to the rocker cover RH with clip (A) and stay (B).

Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)

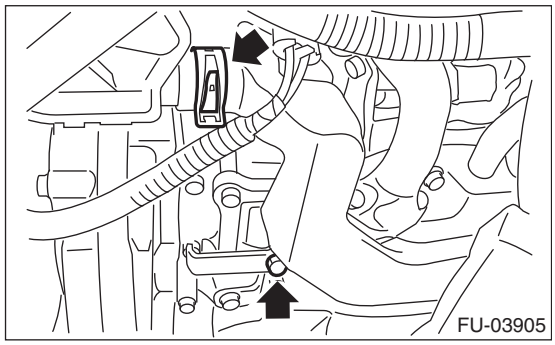


4) Connect the connector to the ignition coil.

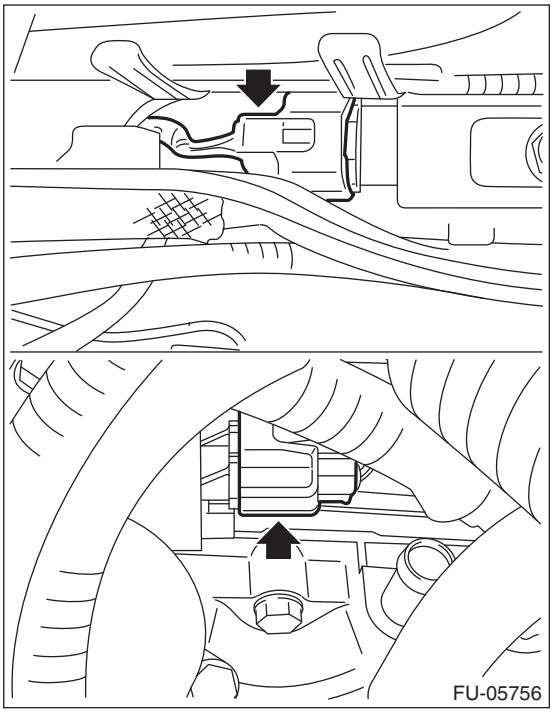


5) Connect the air duct to the secondary air pump, and install the air duct on the rocker cover LH.

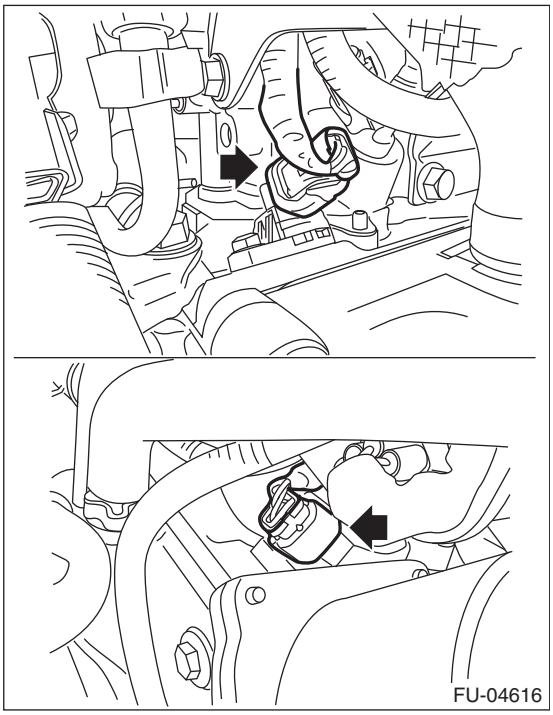
Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)



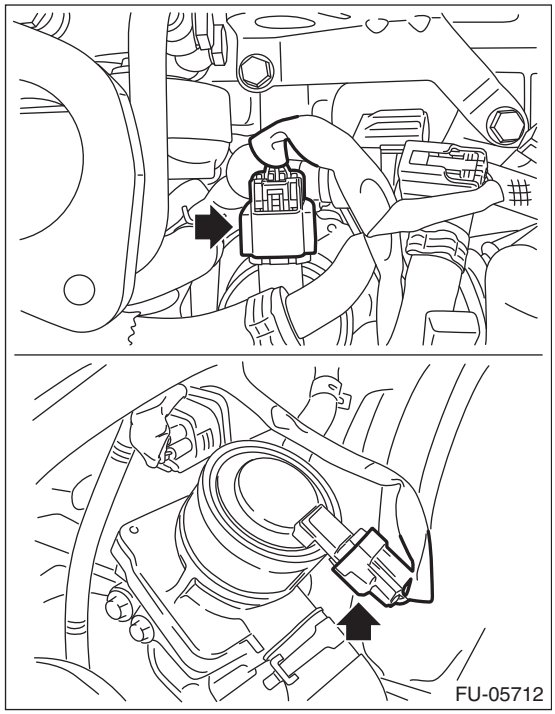
6) Connect the connector to oil flow control solenoid valve.



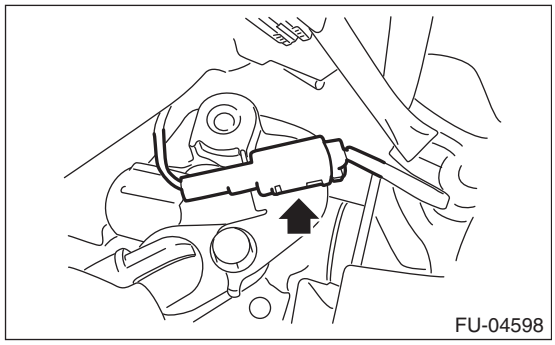
7) Connect the connectors to camshaft position sensor.



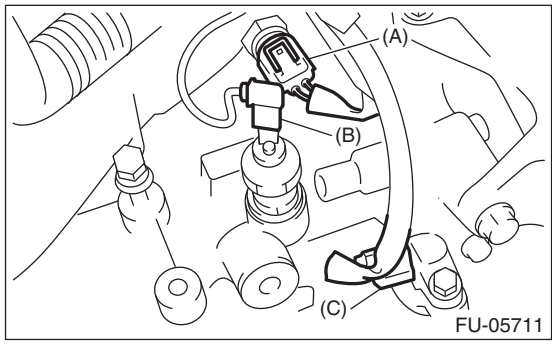
8) Connect the connector to the secondary air combination valve.



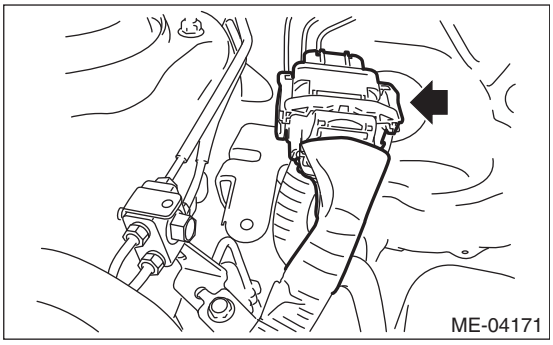
9) Connect the connector to the power steering pump switch.



10) Connect the connector (A) to the engine coolant temperature sensor, connector (B) to the oil pressure switch, and the connector (C) to the crankshaft position sensor.

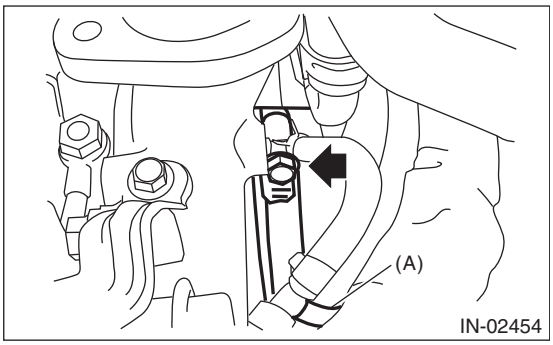


11) Install the engine harness connector to engine harness bracket, then connect the bulkhead harness connector to the engine harness connector.

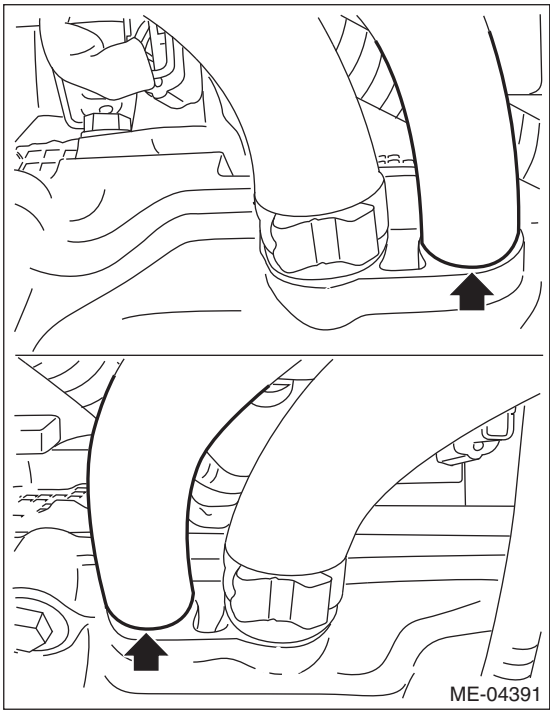


12) Connect the air control hose (A) to the wastegate actuator, and install the turbocharger to the intake duct.

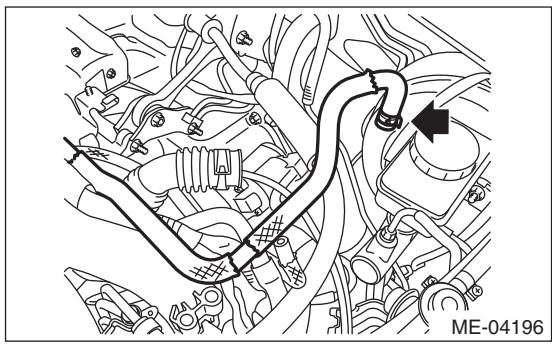
Tightening torque:
3 N·m (0.3 kgf-m, 2.2 ft-lb)



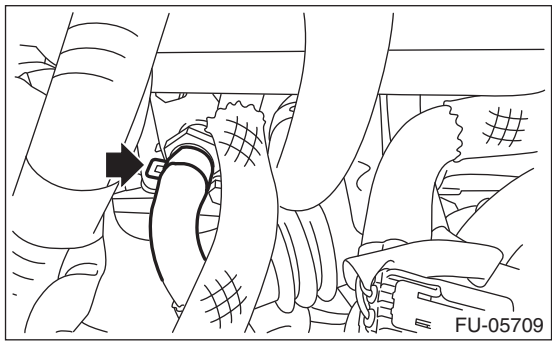
13) Connect the vacuum hose to the rocker cover.



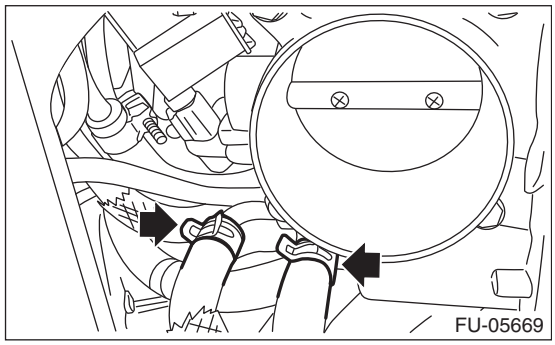
14) Connect the brake booster vacuum hose.



15) Connect the vacuum hose to the nipple.



16) Connect the engine coolant hoses to throttle body.

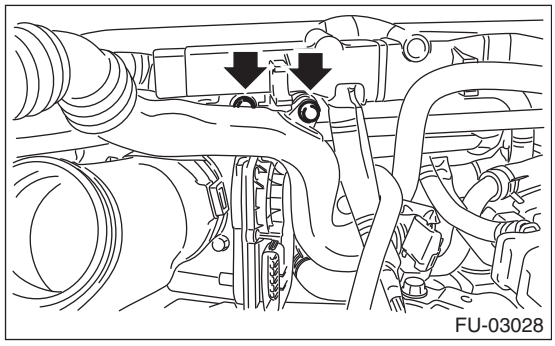


17) Install the intake duct to the throttle body.

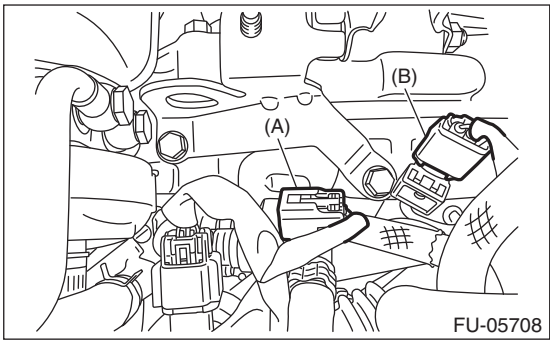
Tightening torque:
3 N·m (0.3 kgf-m, 2.2 ft-lb)

18) Attach the bolts which secure the air by-pass pipe and PCV pipe to the intake manifold.

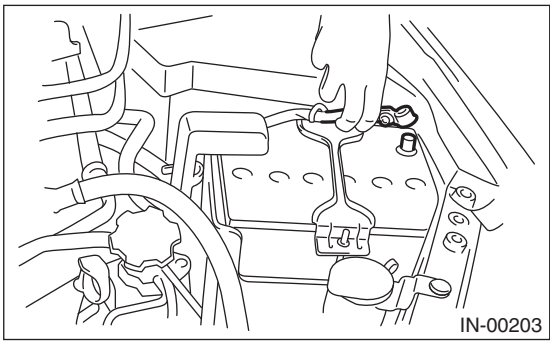
Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)



19) Connect the connector (A) to the PCV hose assembly and the connector (B) to the knock sensor.



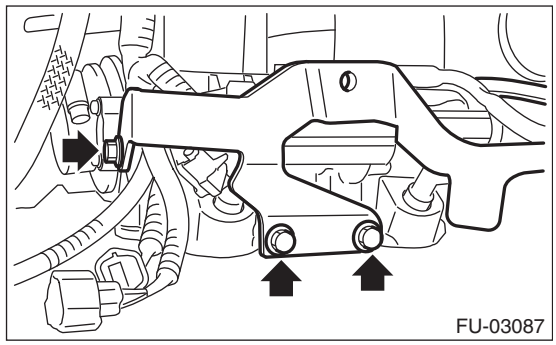
20) Install the A/C pressure hoses to A/C compressor. <Ref. to AC-42, INSTALLATION, Hose and Pipe.>
21) Install the coolant filler tank. <Ref. to CO(H4DOTC)-29, INSTALLATION, Coolant Filler Tank.>
22) Install the generator. <Ref. to SC(H4DO)-38, INSTALLATION, Generator.>
23) Install the intercooler. <Ref. to IN(H4DOTC)-13, INSTALLATION, Intercooler.>
24) Install the air intake duct (rear) and air cleaner case. <Ref. to IN(H4DOTC)-8, INSTALLATION, Air Cleaner Case.> <Ref. to IN(H4DOTC)-10, INSTALLATION, Air Intake Duct.>
25) Connect the battery ground terminal.



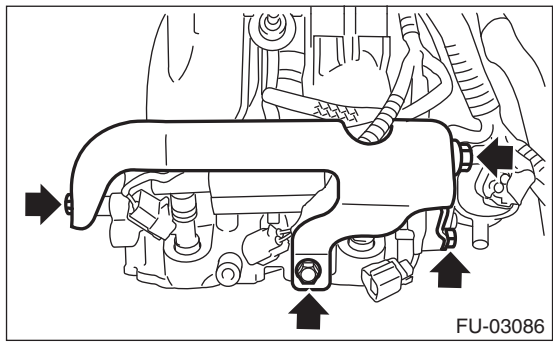
26) Lift up the vehicle.
27) Install the under cover. <Ref. to EI-26, INSTALLATION, Front Under Cover.>
28) Lower the vehicle.
29) Fill engine coolant. <Ref. to CO(H4DOTC)-13, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
30) Charge the A/C system with refrigerant. <Ref. to AC-24, PROCEDURE, Refrigerant Charging Procedure.>
31) Install the collector cover.

C: DISASSEMBLY

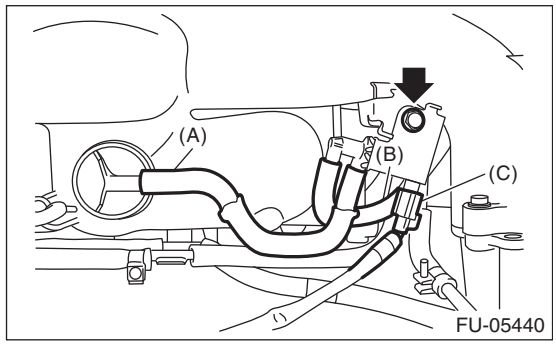
1) Remove the fuel pipe protector RH from the intake manifold.



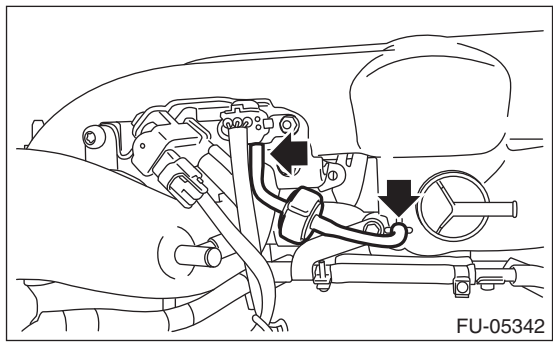
2) Remove the engine ground terminal from the fuel pipe protector LH and remove the fuel pipe protector LH from the intake manifold.



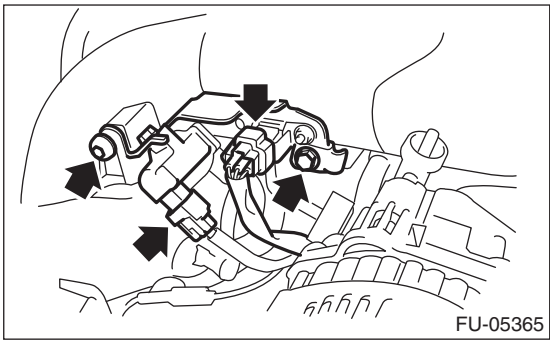
3) Disconnect the vacuum hose (A) from intake manifold.
4) Disconnect the vacuum hose (B) and the connector (C) from the fuel pipe, and remove the purge control solenoid valve 1 from the intake manifold.



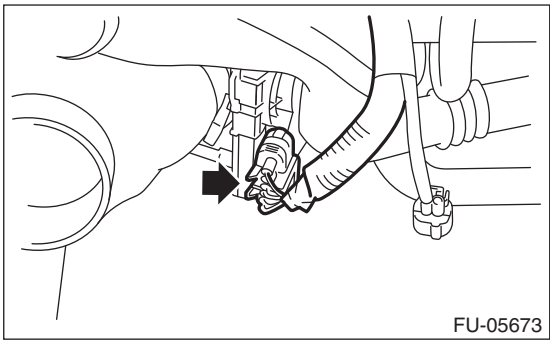
5) Disconnect the filter assembly.



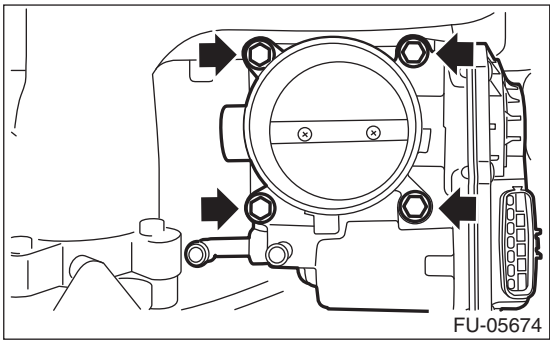
6) Disconnect the connector from the wastegate control solenoid valve and the manifold absolute pressure sensor, and remove the solenoid valve bracket assembly from the intake manifold.



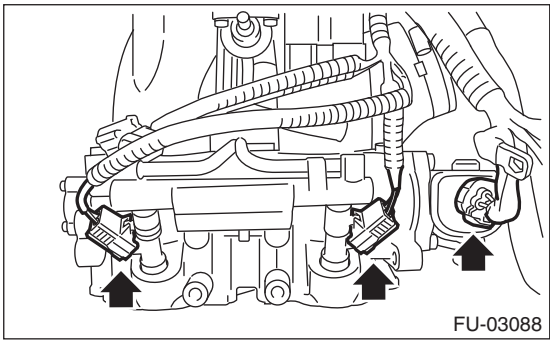
7) Disconnect the connector from the purge control solenoid valve 2, and disconnect the vacuum hose from the intake duct and the fuel pipe.
8) Disconnect the connectors from the throttle position sensor.



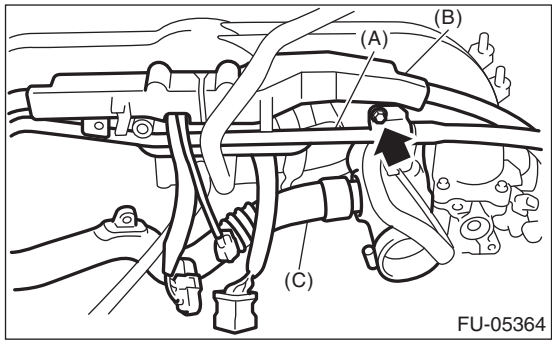
9) Remove the throttle body from the intake manifold.



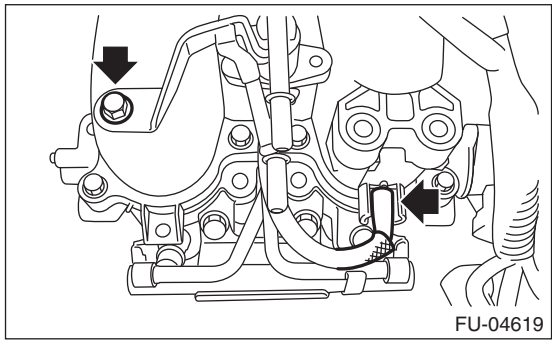
10) Disconnect the connector from the fuel injector and tumble generator valve assembly.



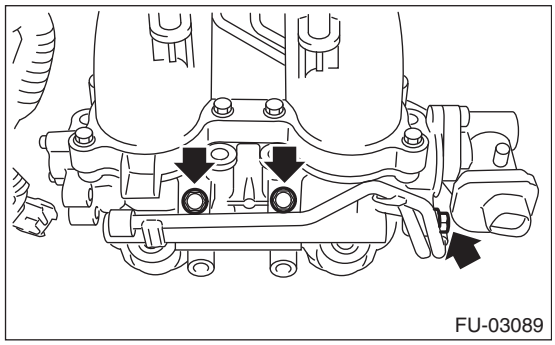
11) Remove the PCV pipe (A), harness assembly (B) and intake duct (C) from the intake manifold.



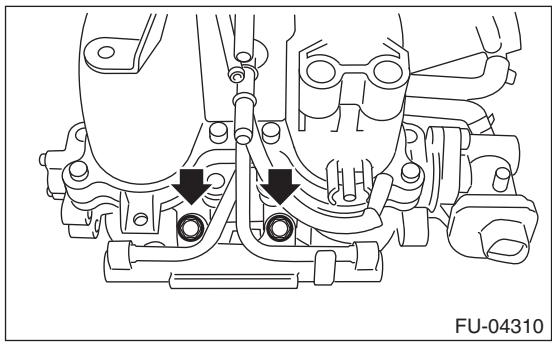
12) Remove the bolt which secures the fuel injector pipe LH onto the intake manifold, and disconnect the pressure regulator vacuum hose from the intake manifold.



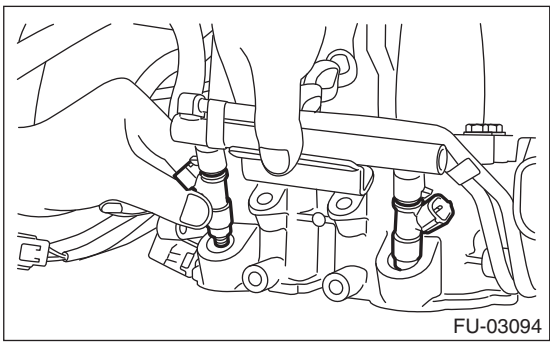
13) Remove the bolts which hold fuel injector pipe onto intake manifold.
- RH side



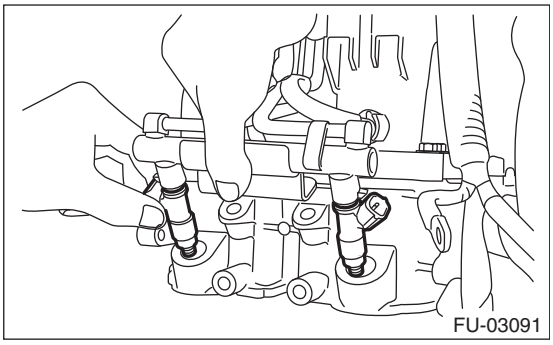
- LH side



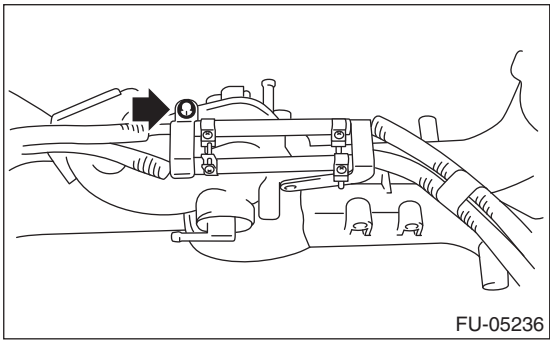
14) Remove the fuel injector.
- RH side



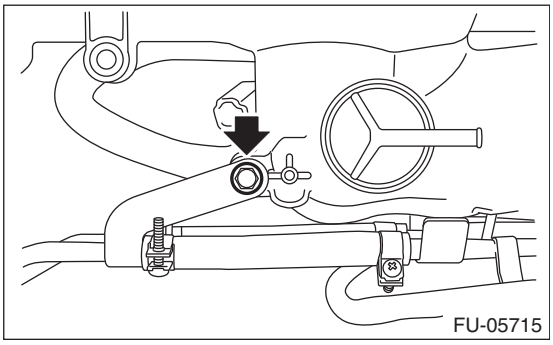
- LH side



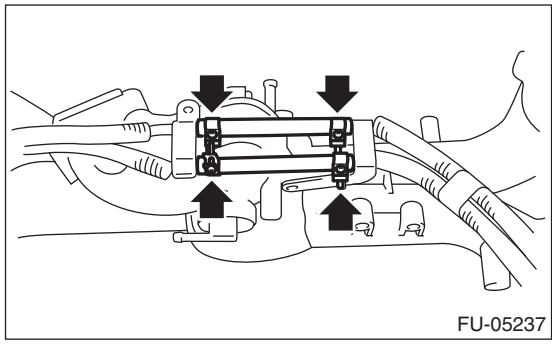
15) Remove the bolts which hold fuel pipe onto intake manifold.



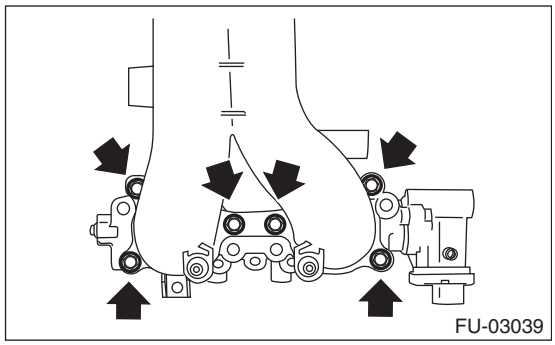
16) Remove the bolt which holds fuel injector pipe RH onto intake manifold.



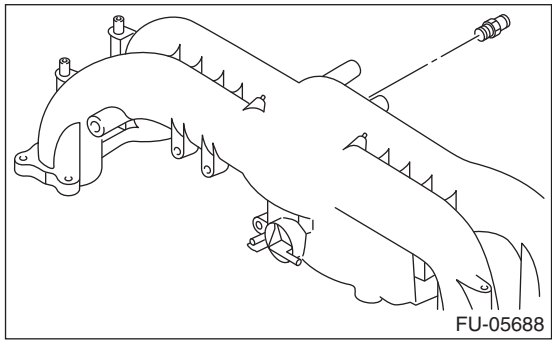
17) Loosen the clamp which holds the fuel hose to the fuel injector pipe RH and the fuel pipe, and then disconnect the pipe from the fuel hose.



18) Remove the fuel injector pipe and the fuel pipe.
19) Remove the tumble generator valve assembly from the intake manifold.



20) Remove the nipple from the intake manifold.

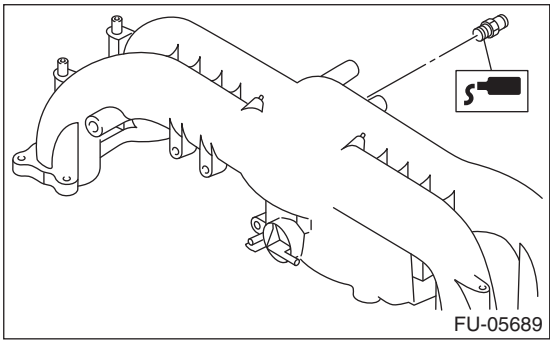


D: ASSEMBLY

1) Apply liquid gasket to the nipple threads, and install the nipple to the intake manifold.

Liquid gasket:
THREE BOND 1105 (Part No. 004403010) or equivalent

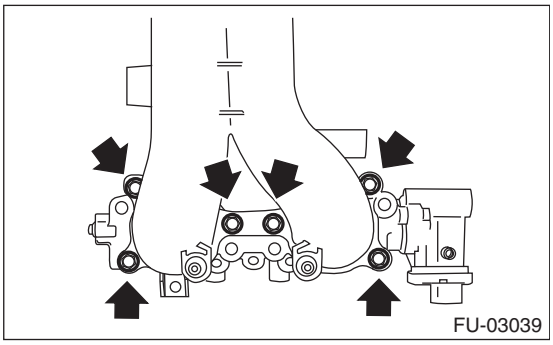
Tightening torque:
23 N·m (2.3 kgf-m, 17.0 ft-lb)



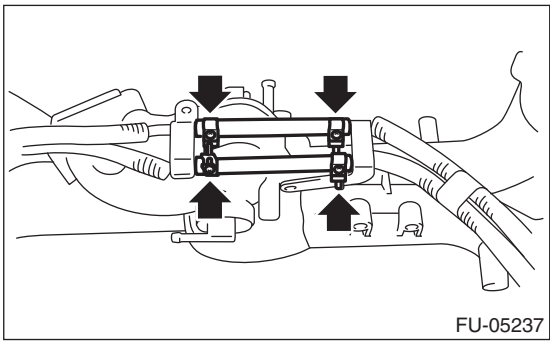
2) Install the tumble generator valve assembly onto intake manifold.

NOTE:
Use new O-rings.

Tightening torque:
8.3 N·m (0.8 kgf-m, 6.1 ft-lb)

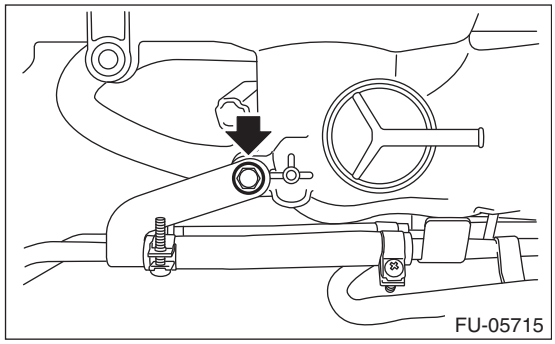


3) Install the fuel injector pipe.
4) Connect fuel hoses to the fuel injector pipe and the fuel pipe. <Ref. to FU(H4DOTC)-92, CONNECTING THE FUEL DELIVERY HOSE, FUEL RETURN HOSE AND FUEL HOSE, INSTALLATION, Fuel Delivery, Return and Evaporation Lines.>



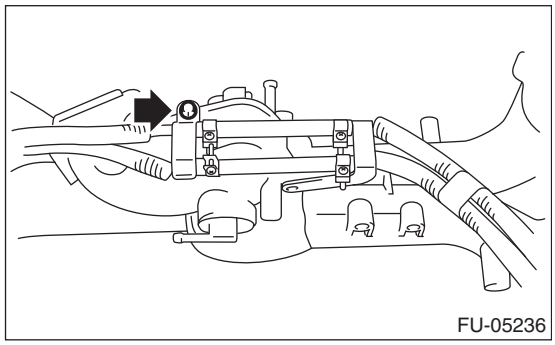
5) Secure the fuel injector pipe RH to intake manifold with bolt.

Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)



6) Secure the fuel pipe to intake manifold with bolts.

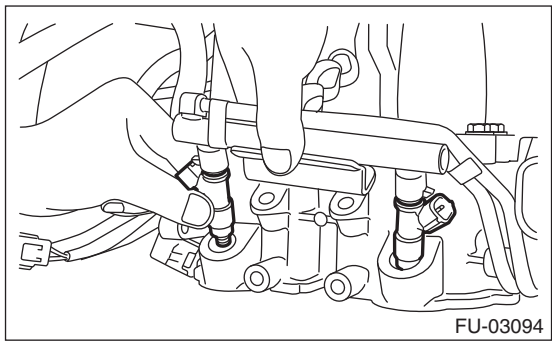
Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)



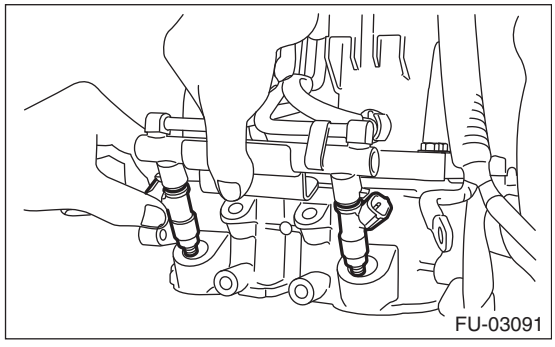
7) Install the fuel injector.

NOTE:
Use new O-rings, rubbers and seal rings.

- RH side



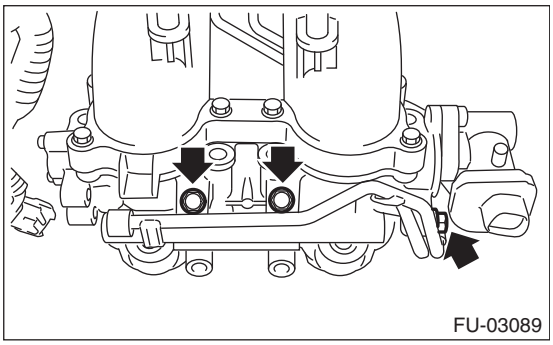
- LH side



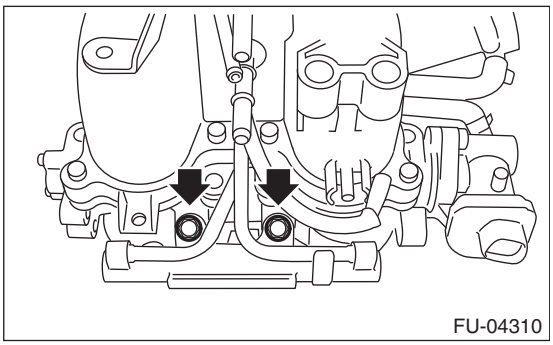
8) Secure the fuel injector pipe to intake manifold with bolts.

Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)

- RH side

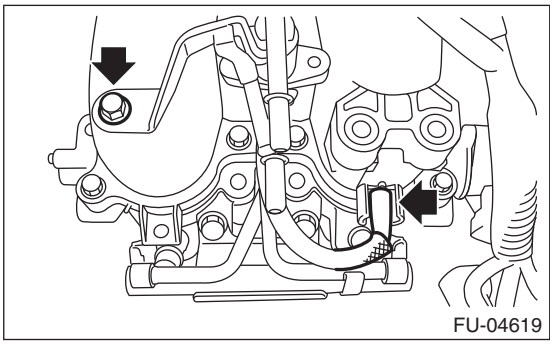


- LH side



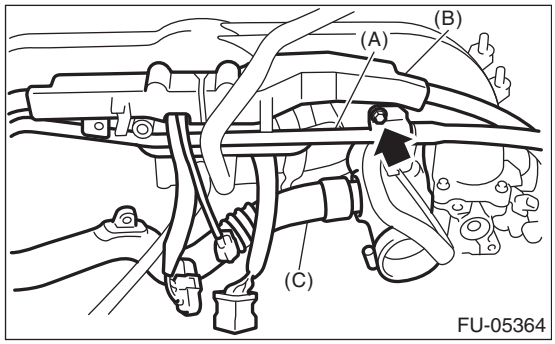
9) Secure the fuel injector pipe LH to intake manifold with bolt, and connect the pressure regulator vacuum hose to the intake manifold.

Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)

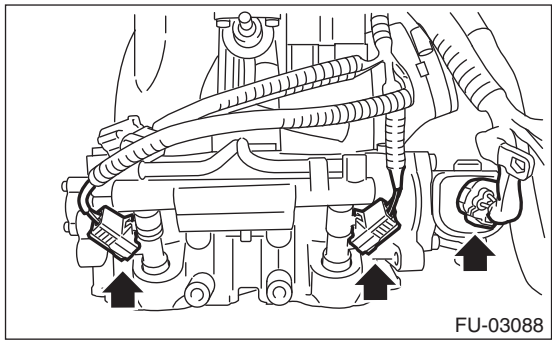


10) Install PCV pipe (A), harness assembly (B) and intake duct (C) to the intake manifold.

Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)



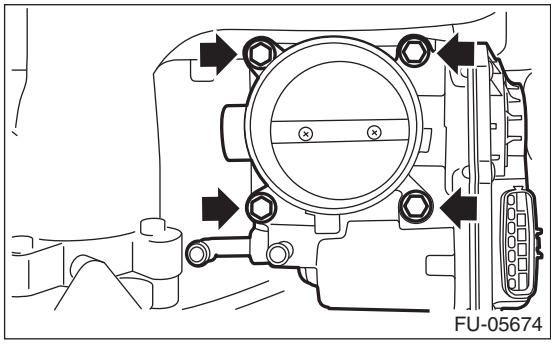
11) Connect the connector to the fuel injector and the tumble generator valve assembly.



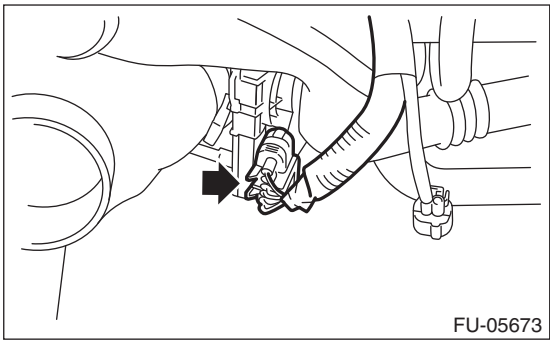
12) Install the throttle body to the intake manifold.

NOTE:
Use new O-rings.

Tightening torque:
8 N·m (0.8 kgf-m, 5.9 ft-lb)

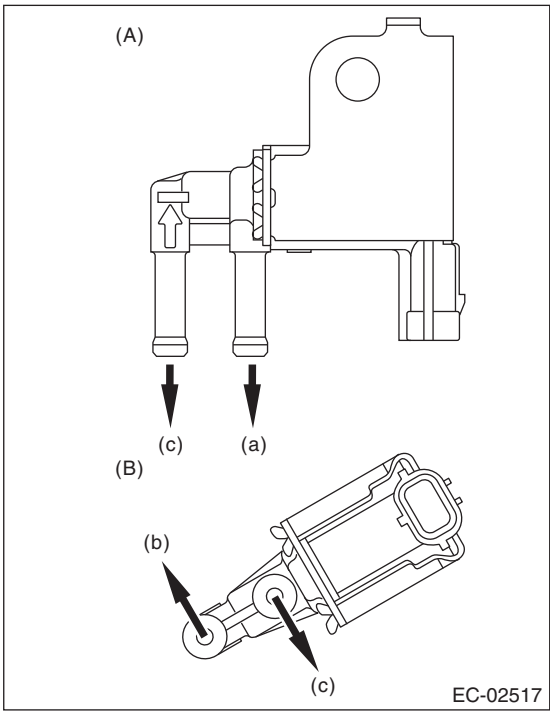


13) Connect the connector to the throttle position sensor.



14) Connect the vacuum hose to the intake duct and the fuel pipe, then connect the connector to the purge control solenoid valve 2.

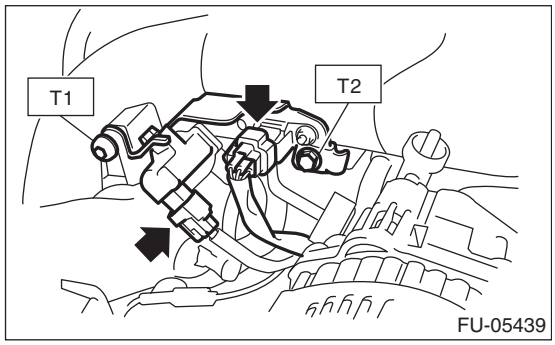
NOTE:
Connect the vacuum hose as shown in the figure.



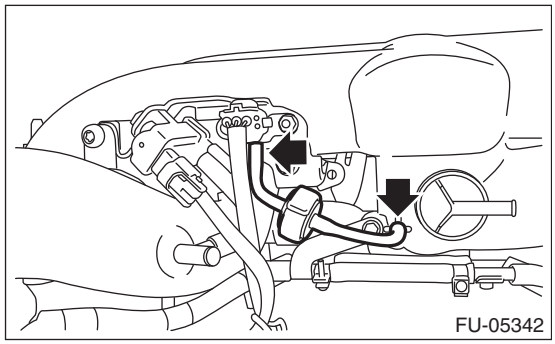
(A) Purge control solenoid valve 1
(B) Purge control solenoid valve 2
(a) To intake manifold
(b) To intake duct
(c) To fuel pipe

15) Install the solenoid valve bracket assembly to the intake manifold, and connect the connector to the wastegate control solenoid valve and the manifold absolute pressure sensor.

Tightening torque:
T1: 17 N·m (1.7 kgf-m, 12.5 ft-lb)
T2: 19 N·m (1.9 kgf-m, 14.0 ft-lb)

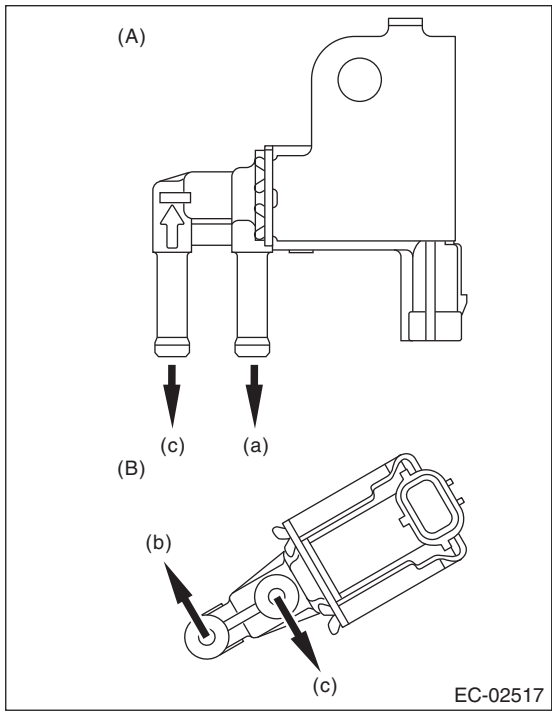


16) Connect the filter assembly.



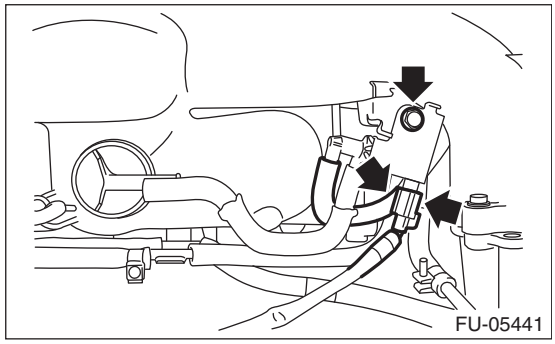
17) Connect the vacuum hose and the connector the fuel pipe, and install the purge control solenoid valve 1 to the intake manifold.

NOTE:
Connect the vacuum hose as shown in the figure.



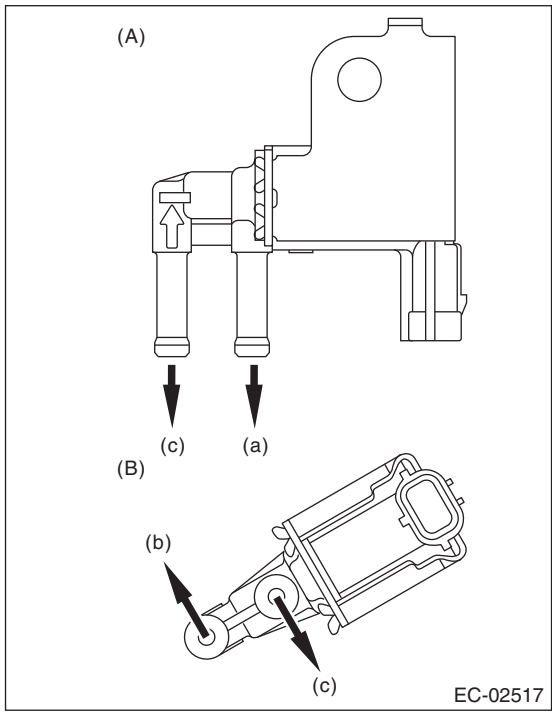
(A) Purge control solenoid valve 1
(B) Purge control solenoid valve 2
(a) To intake manifold
(b) To intake duct
(c) To fuel pipe

Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)

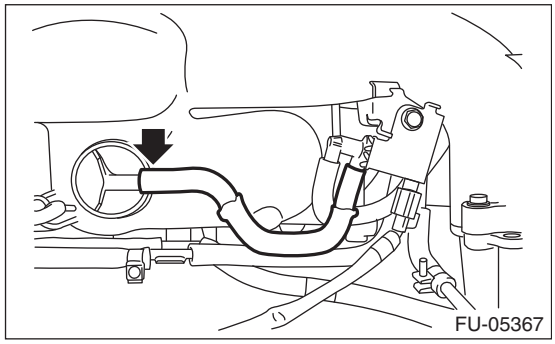


18) Connect the vacuum hose to the intake manifold.

NOTE:
Connect the vacuum hose as shown in the figure.

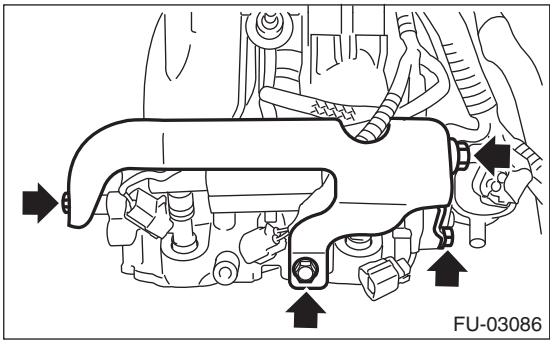


(A) Purge control solenoid valve 1
(B) Purge control solenoid valve 2
(a) To intake manifold
(b) To intake duct
(c) To fuel pipe



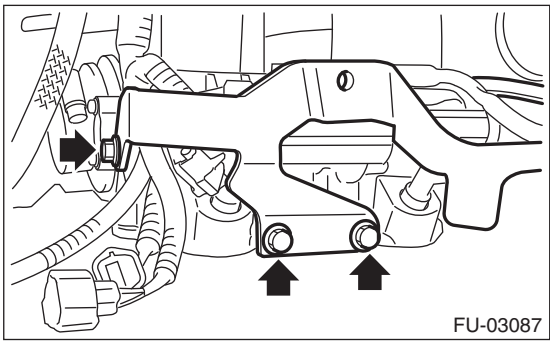
19) Install the fuel pipe protector LH to the intake manifold, and install the engine ground terminal to the fuel pipe protector LH.

Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)



20) Install the fuel pipe protector RH to the intake manifold.

Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)



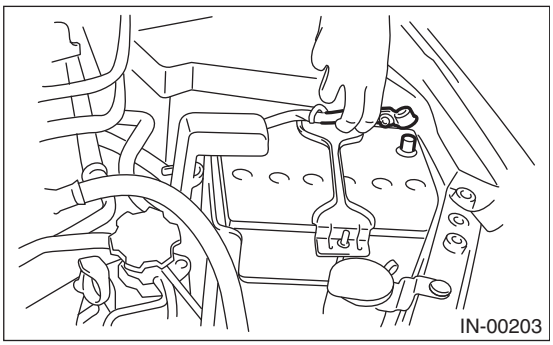
E: INSPECTION

1) Check that the intake manifold and fuel pipe have no deformation, cracks and other damages.
2) Check that the hose has no cracks, damage or loose part.

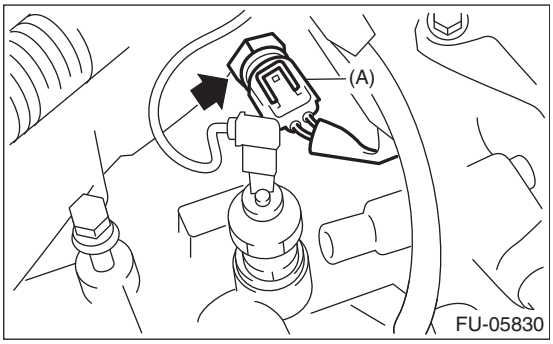
4. Engine Coolant Temperature Sensor

A: REMOVAL

1) Remove the collector cover.
2) Disconnect the ground cable from battery.



3) Remove the generator. <Ref. to SC(H4DO)-33, REMOVAL, Generator.>
4) Drain engine coolant. <Ref. to CO(H4DOTC)-13, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
5) Disconnect the connector (A) from the engine coolant temperature sensor, and remove the engine coolant temperature sensor.



B: INSTALLATION

Install in the reverse order of removal.

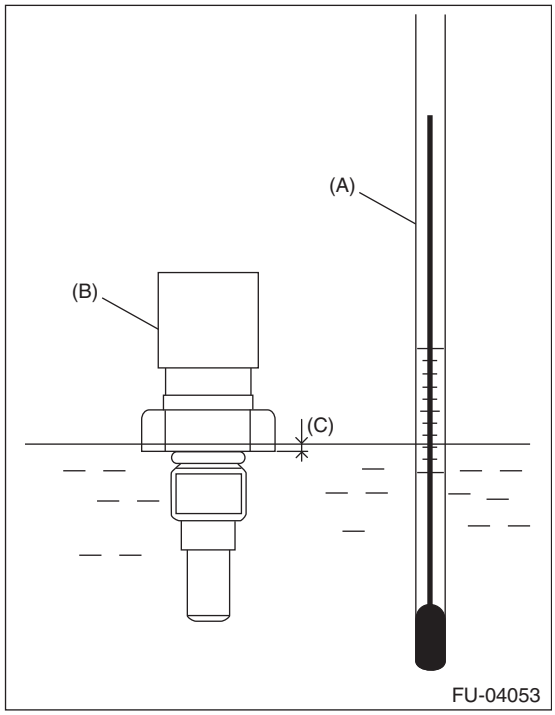
NOTE:
Use a new gasket.

Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)

C: INSPECTION

1) Check that the engine coolant temperature sensor has no deformation, cracks or other damages.
2) Immerse the engine coolant temperature sensor and a thermometer in water.

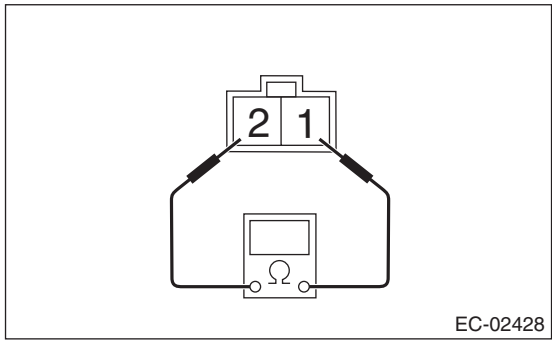
CAUTION:
Take care not to allow water to get into the engine coolant temperature sensor connector. Completely remove any water inside.



(A) Thermometer
(B) Engine coolant temperature sensor
(C) Hexagonal part height: To approx. $^1/_3$

3) Raise water temperature gradually, measure the resistance between the engine coolant temperature sensor terminals when the temperature is 20°C (68°F) and 80°C (176°F).

NOTE:
Agitate the water for even temperature distribution.

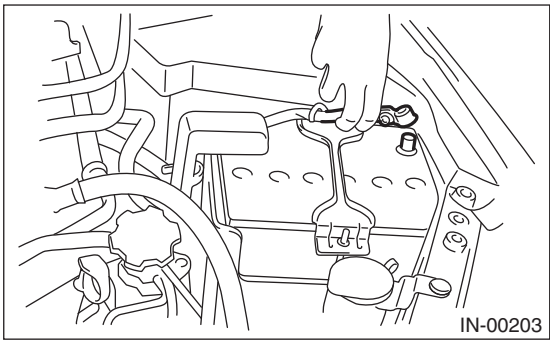


Water temperature	Terminal No.	Standard
20°C (68°F)	1 and 2	2.45±0.2 kΩ
80°C (176°F)		0.318±0.013 kΩ

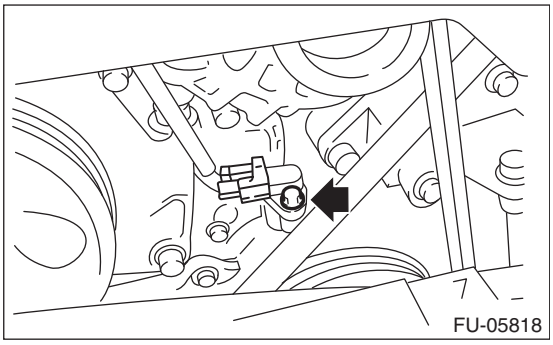
5. Crankshaft Position Sensor

A: REMOVAL

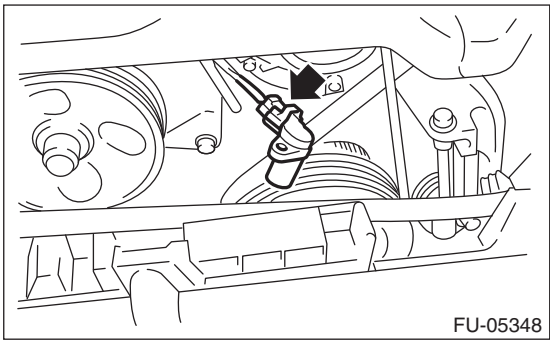
1) Remove the collector cover.
2) Disconnect the ground cable from battery.



3) Remove the bolt which secures crankshaft position sensor to oil pump.



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



B: INSTALLATION

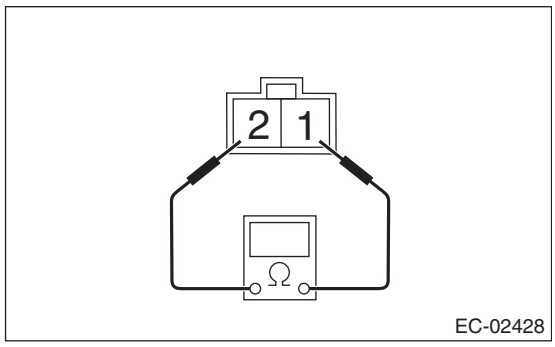
Install in the reverse order of removal.

Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)

C: INSPECTION

1. CRANKSHAFT POSITION SENSOR (METHOD WITH CIRCUIT TESTER)

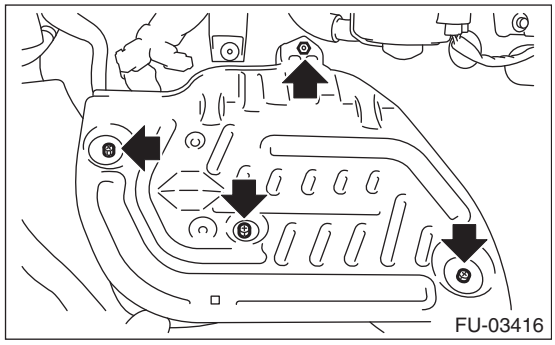
Measure the resistance between crankshaft position sensor terminals.



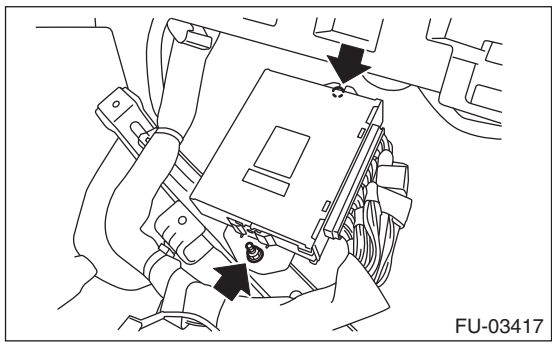
Terminal No.	Standard
1 and 2	2.04±0.204 kΩ

2. CRANKSHAFT POSITION SENSOR (METHOD WITH OSCILLOSCOPE)

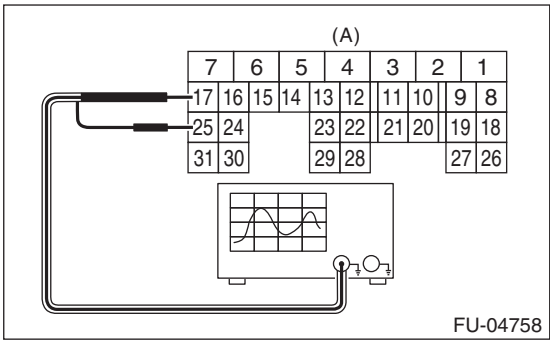
1) Prepare an oscilloscope.
2) Remove the glove box lower cover. <Ref. to EI-48, REMOVAL, Glove Box.>
3) Remove the lower inner trim of passenger's side. <Ref. to EI-56, REMOVAL, Lower Inner Trim.>
4) Turn over the floor mat of passenger's seat.
5) Remove the protect cover.



6) Remove the nuts and bolts which hold the ECM to the bracket.



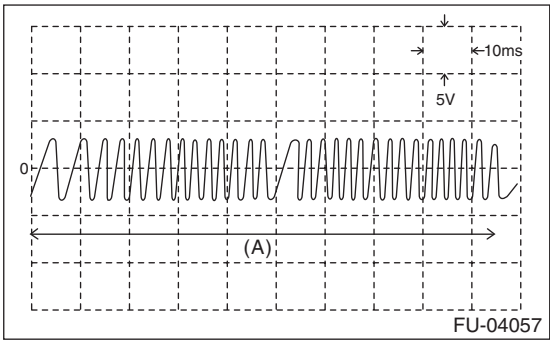
7) Connect the probe to ECM connector.



(A) To ECM connector

Terminal No.	Probe
17	+
25	–

8) Start the engine and let it idle.
9) Check the pattern is the same as the waveform and voltage shown below.



(A) One crankshaft rotation

10) After inspection, install the related parts in the reverse order of removal.

Tightening torque:
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)

3. OTHER INSPECTIONS

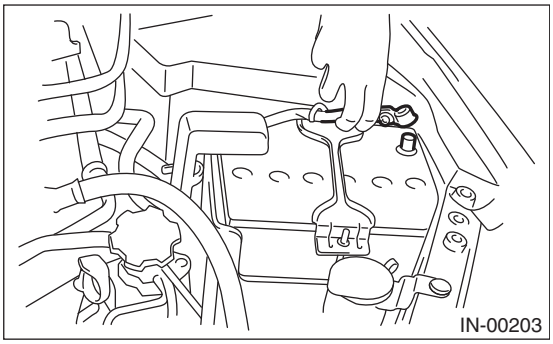
Check that the crankshaft position sensor has no deformation, cracks or other damages.

6. Camshaft Position Sensor

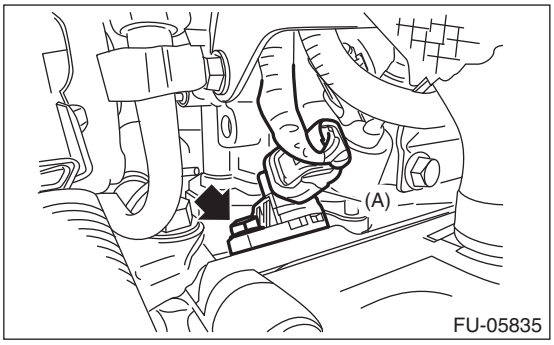
A: REMOVAL

1. CAMSHAFT POSITION SENSOR RH

1) Remove the collector cover.
2) Disconnect the ground cable from battery.

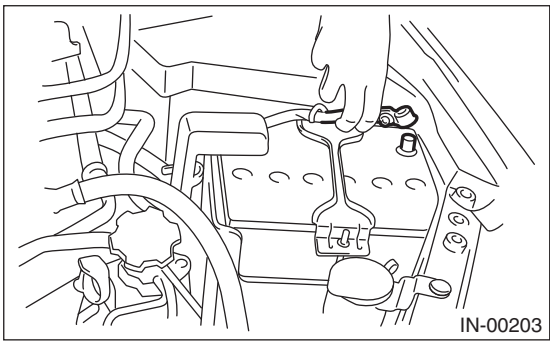


3) Disconnect the connector (A) from the camshaft position sensor RH, and remove the camshaft position sensor RH from the rear side of the cylinder head.

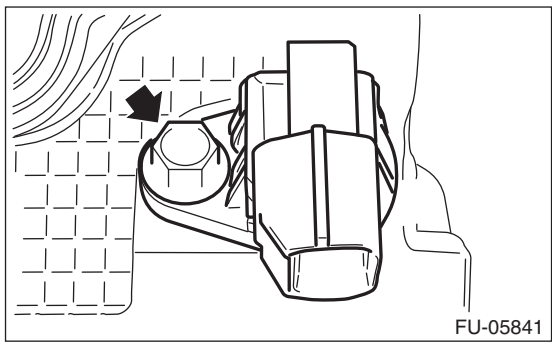


2. CAMSHAFT POSITION SENSOR LH

1) Remove the collector cover.
2) Disconnect the ground cable from battery.



3) Remove the intake manifold. <Ref. to FU(H4DOTC)-18, REMOVAL, Intake Manifold.>
4) Remove the camshaft position sensor LH.



B: INSTALLATION

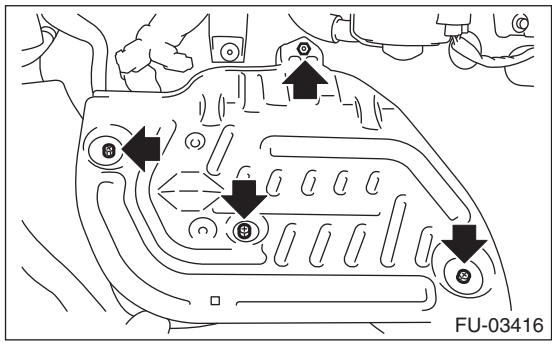
Install in the reverse order of removal.

Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)

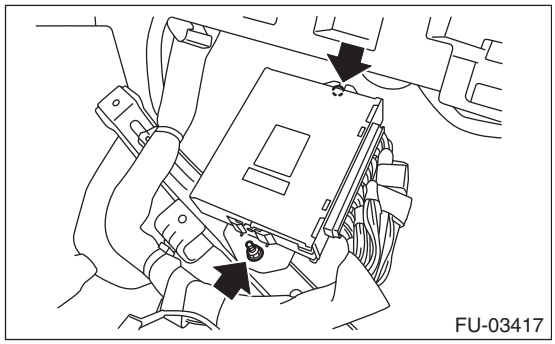
C: INSPECTION

1. CAMSHAFT POSITION SENSOR (METHOD WITH OSCILLOSCOPE)

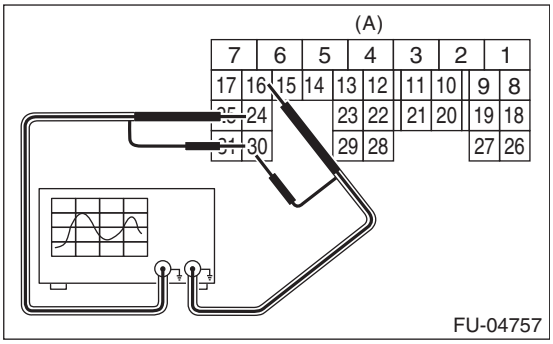
1) Prepare an oscilloscope.
2) Remove the glove box lower cover. <Ref. to EI-48, REMOVAL, Glove Box.>
3) Remove the lower inner trim of passenger's side. <Ref. to EI-56, REMOVAL, Lower Inner Trim.>
4) Turn over the floor mat of passenger's seat.
5) Remove the protect cover.



6) Remove the nuts and bolts which hold the ECM to the bracket.



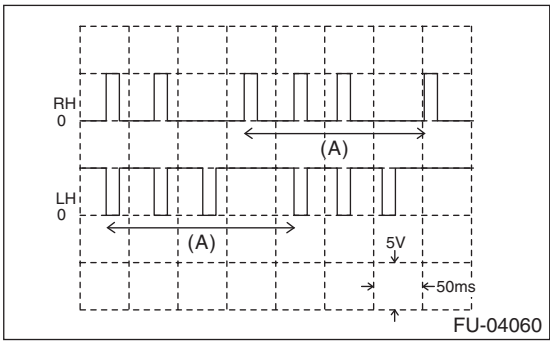
7) Connect the probe to ECM connector.



(A) To ECM connector

Camshaft position sensor	Terminal No.	Probe
RH	24	+
LH	16	+
RH and LH	30	–

8) Start the engine and let it idle.
9) Check the pattern is the same as the waveform and voltage shown below.



(A) One camshaft rotation

10) After inspection, install the related parts in the reverse order of removal.

Tightening torque:
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)

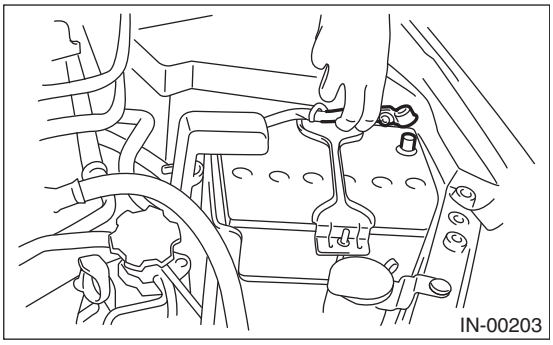
2. OTHER INSPECTIONS

Check that the camshaft position sensor has no deformation, cracks or other damages.

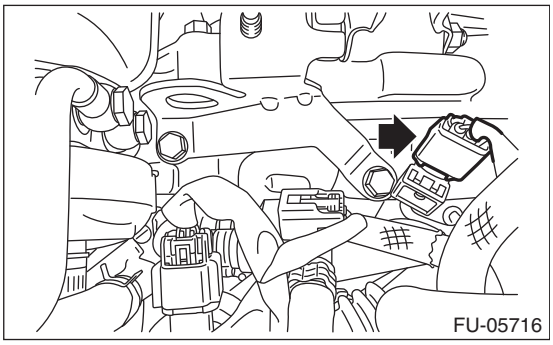
7. Knock Sensor

A: REMOVAL

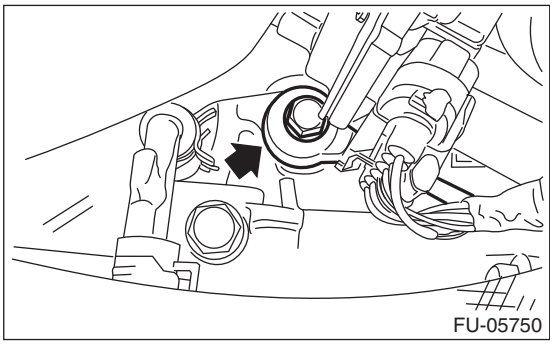
1) Remove the collector cover.
2) Disconnect the ground cable from battery.



3) Remove the intercooler. <Ref. to IN(H4DOTC)-13, REMOVAL, Intercooler.>
4) Disconnect the connector from the knock sensor.



5) Remove the knock sensor from cylinder block.

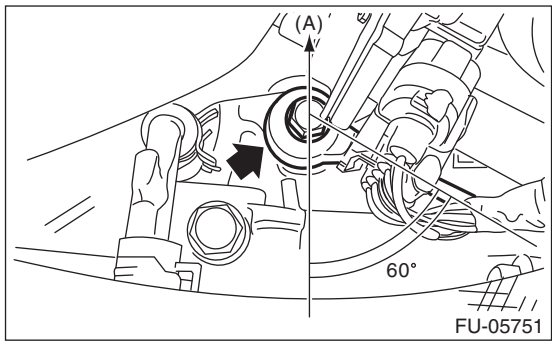


B: INSTALLATION

1) Install the knock sensor to the cylinder block.

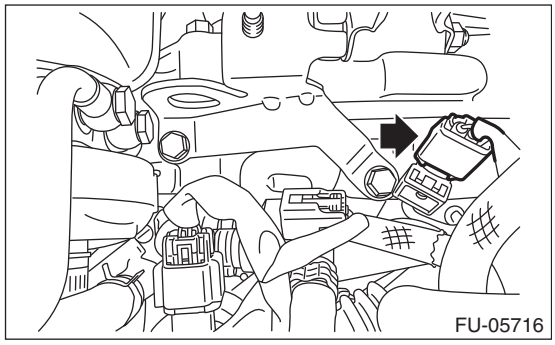
NOTE:
The portion of the knock sensor cord that is pulled out must be positioned at a 60° angle relative to the engine rear.

Tightening torque:
24 N·m (2.4 kgf-m, 17.7 ft-lb)

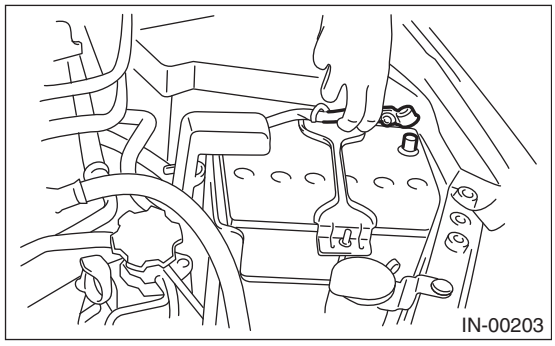


(A) Front side of vehicle

2) Connect the knock sensor connector.

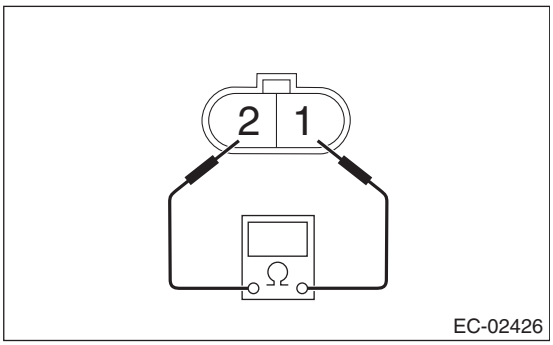


3) Install the intercooler. <Ref. to IN(H4DOTC)-13, INSTALLATION, Intercooler.>
4) Connect the battery ground terminal.



C: INSPECTION

1) Check that the knock sensor has no deformation, cracks or other damages.
2) Measure the resistance between knock sensor terminals.



Terminal No.	Standard
1 and 2	560±28 kΩ

8. Throttle Position Sensor

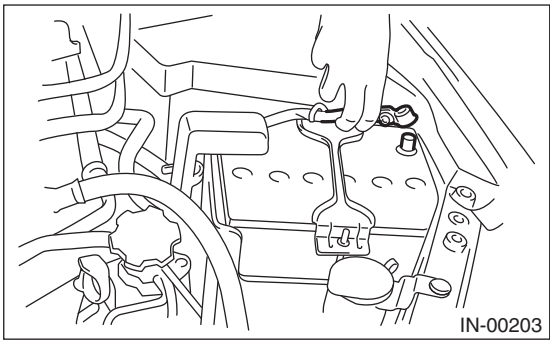
A: SPECIFICATION

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 procedure. <Ref. to FU(H4DOTC)-16, REMOVAL, Throttle Body.> <Ref. to FU(H4DOTC)-16, INSTALLATION, Throttle Body.>

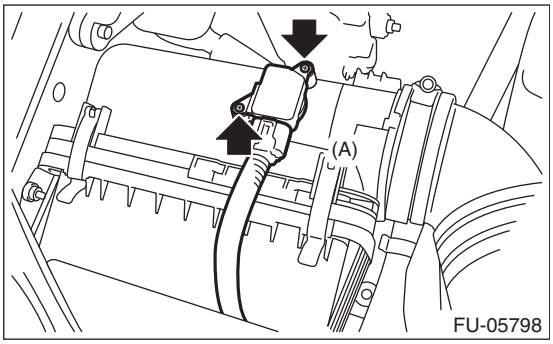
9. Mass Air Flow and Intake Air Temperature Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.



2) Disconnect the connector (A) from the mass air flow and intake air temperature sensor, and remove the mass air flow and intake air temperature sensor.



B: INSTALLATION

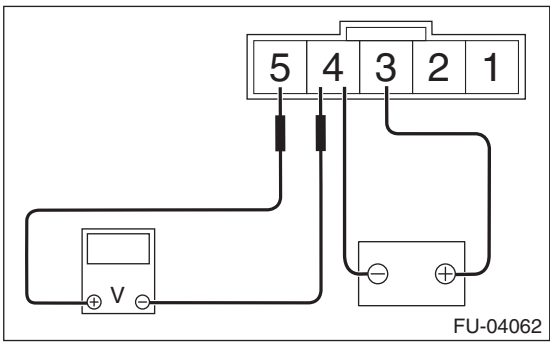
Install in the reverse order of removal.

Tightening torque:
1 N·m (0.1 kgf-m, 0.7 ft-lb)

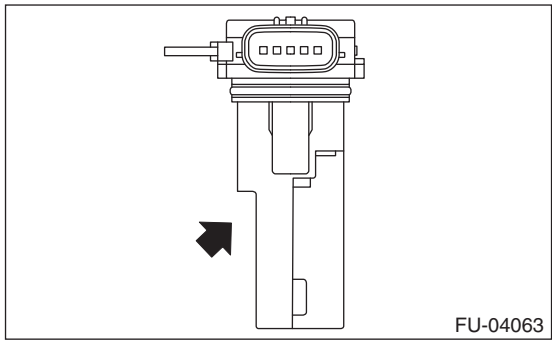
C: INSPECTION

1. CHECK MASS AIR FLOW SENSOR UNIT

1) Connect battery positive terminal to terminal No. 3 and battery ground terminal to terminal No. 4, and circuit tester positive terminal to terminal No. 5 and circuit tester negative terminal to terminal No. 4.

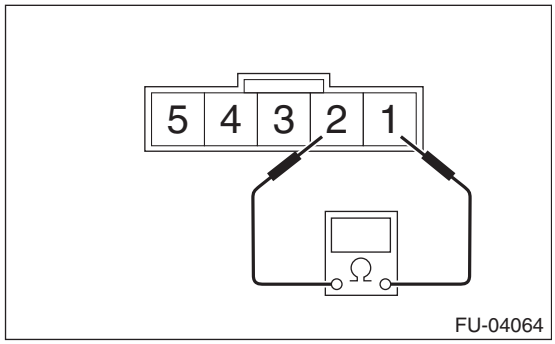


2) Check that the voltage changes when air is blown to the mass air flow sensor unit from arrow direction.



2. CHECK INTAKE AIR TEMPERATURE SENSOR UNIT

Measure the resistance between intake air temperature sensor terminals.



Temperature	Terminal No.	Standard
–20°C (–4°F)	1 and 2	16.0±2.4 kΩ
20°C (68°F)		2.45±0.24 kΩ
60°C (140°F)		0.580±0.087 kΩ

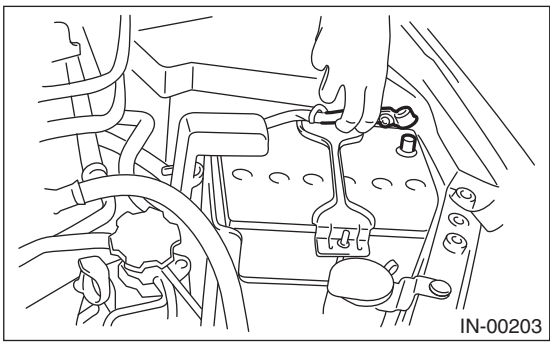
3. OTHER INSPECTIONS

1) Check that the mass air flow and intake air temperature sensor has no deformation, cracks or other damages.
2) Check that the mass air flow and intake air temperature sensor has no dirt.

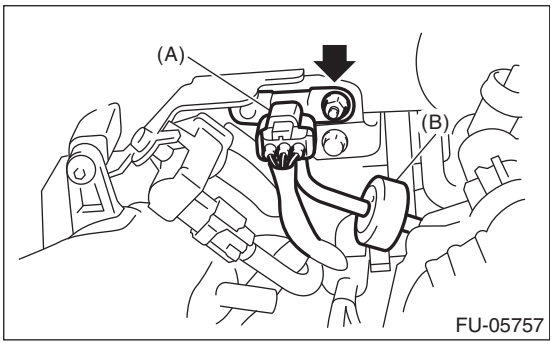
10.Manifold Absolute Pressure Sensor

A: REMOVAL

1) Remove the collector cover.
2) Disconnect the ground cable from battery.



3) Disconnect the connector (A) from manifold absolute pressure sensor, and remove the filter assembly (B) from intake manifold.
4) Remove the manifold absolute pressure sensor from the solenoid valve bracket.



B: INSTALLATION

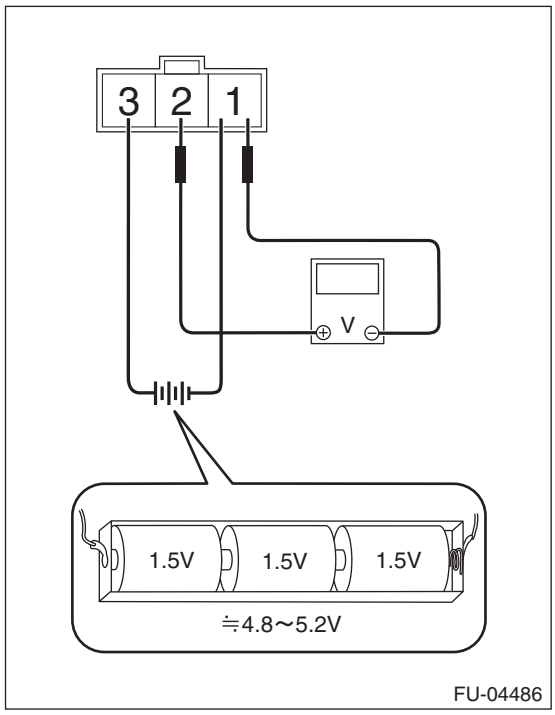
Install in the reverse order of removal.

Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)

C: INSPECTION

1) Check that the manifold absolute pressure sensor has no deformation, cracks or other damages.
2) Connect dry-cell battery positive terminal to terminal No. 3 and dry-cell battery ground terminal to terminal No. 1, circuit tester positive terminal to terminal No. 2 and the circuit tester negative terminal to terminal No. 1.

NOTE:
- Use new dry-cell batteries.
- Using circuit tester, check the voltage of a single dry-cell battery is 1.6 V or more. And also check the voltage of three batteries in series is between 4.8 V and 5.2 V.

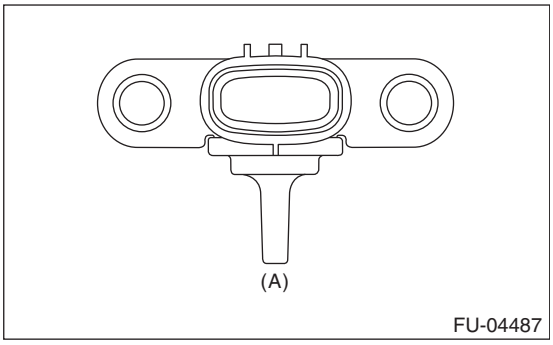


3) Check the voltage at a normal atmospheric pressure.

NOTE:
The atmospheric pressure at higher altitude is lower than normal. Therefore, the voltage is lower than the standard value.

Terminal No.	Standard
2 (+) and 1 (–)	Approx. 2.2 V (when 25°C (77°F))

4) Connect the Mighty Vac to the pressure port (A) of manifold absolute pressure sensor.



5) Check the voltage when generating vacuum and positive pressure using Mighty Vac.

CAUTION:
Do not apply vacuum of less than –88 — 200 kPa (–0.9 — 2.04 kgf/cm^2, –12.8 — 29.0 psi). Doing so may damage the manifold absolute pressure sensor.

NOTE:
When vacuum occurs at the pressure port of manifold absolute pressure sensor, the voltage will drop from the value as in step 3). When positive pressure occurs, on the other hand, the voltage will rise.

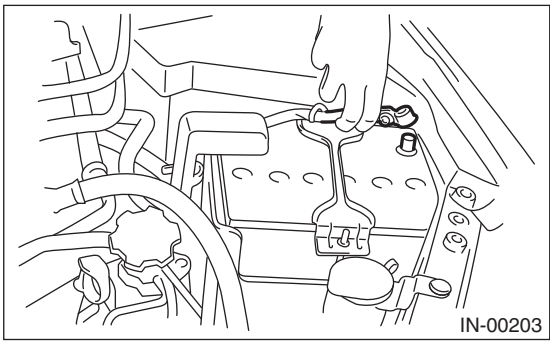
Pressure	Terminal No.	Standard
–88 kPa (–0.9 kgf/cm^2, –12.8 psi)	2 (+) and 1 (–)	Approx. 1.0 V (when 25°C (77°F))
152 kPa (1.55 kgf/cm^2, 22.0 psi)		Approx. 4.5 V (when 25°C (77°F))

11.Fuel Injector

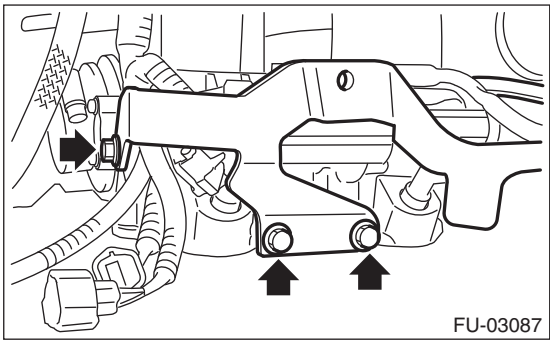
A: REMOVAL

1. RH SIDE

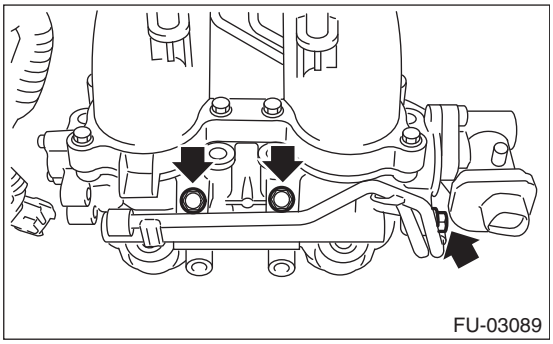
1) Release the fuel pressure. <Ref. to FU(H4DOTC)-65, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Remove the collector cover.
3) Disconnect the ground cable from battery.



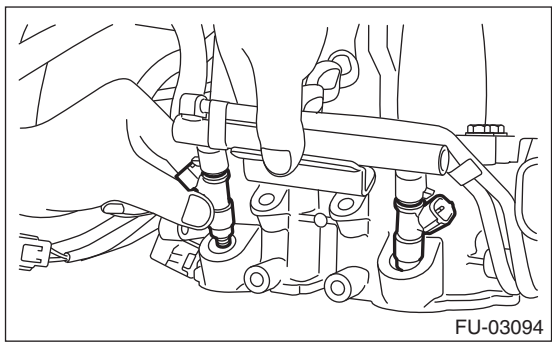
4) Open the fuel filler lid and remove the fuel filler cap.
5) Remove the intake manifold. <Ref. to FU(H4DOTC)-18, REMOVAL, Intake Manifold.>
6) Remove the fuel pipe protector RH from the intake manifold.



7) Disconnect the connector from fuel injector.
8) Remove the bolts which secure the fuel injector pipe RH to the intake manifold.

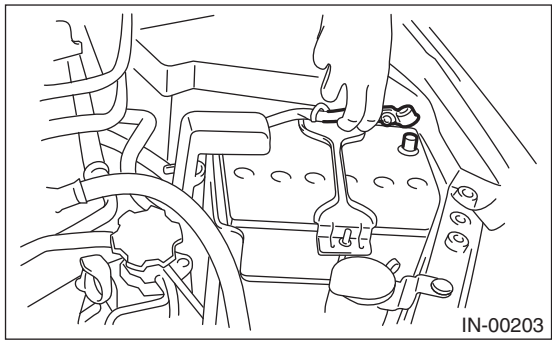


9) Remove the fuel injector.

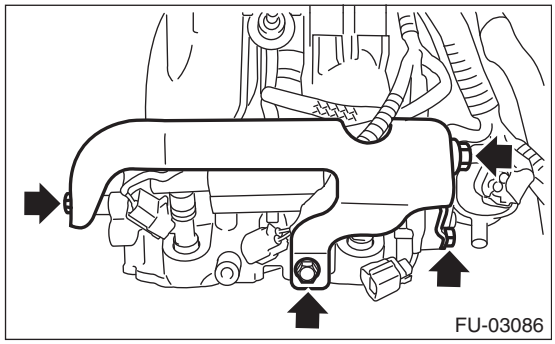


2. LH SIDE

1) Release the fuel pressure. <Ref. to FU(H4DOTC)-65, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Remove the collector cover.
3) Disconnect the ground cable from battery.

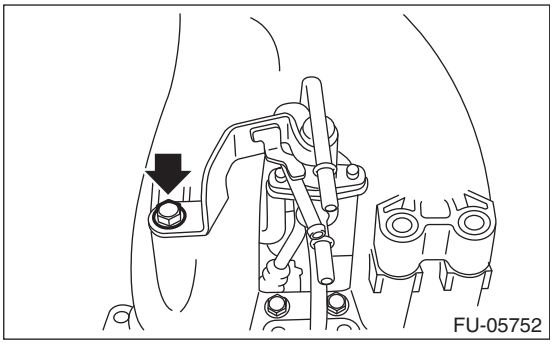


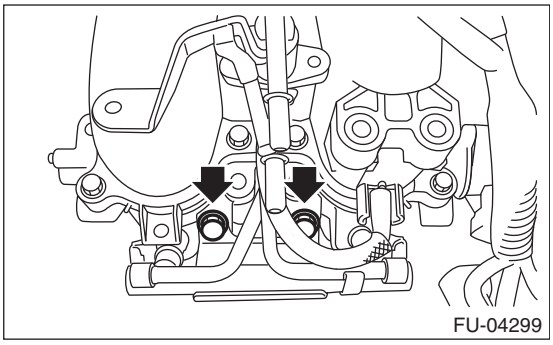
4) Open the fuel filler lid and remove the fuel filler cap.
5) Remove the intake manifold. <Ref. to FU(H4DOTC)-18, REMOVAL, Intake Manifold.>
6) Remove the engine ground terminal from the fuel pipe protector LH and remove the fuel pipe protector LH from the intake manifold.



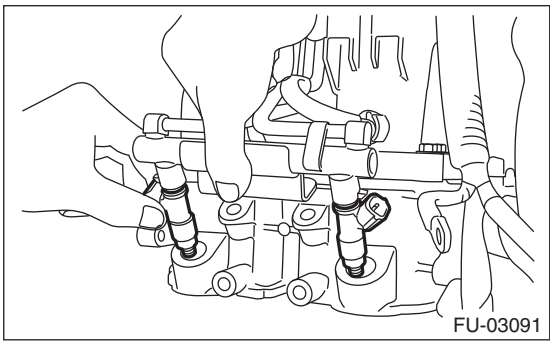
7) Disconnect the connector from fuel injector.

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





9) Remove the fuel injector.



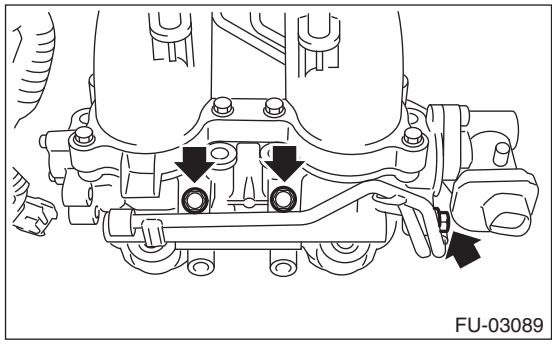
B: INSTALLATION

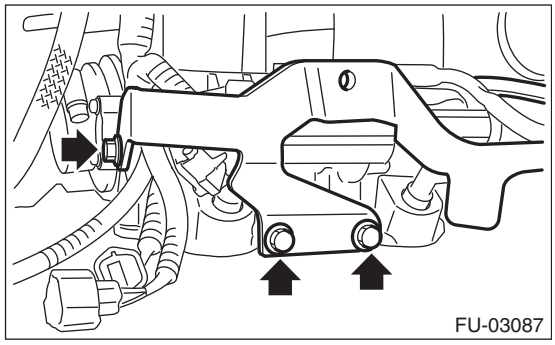
1. RH SIDE

Install in the reverse order of removal.

NOTE:
Use new O-rings, rubbers and seal rings.

Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)



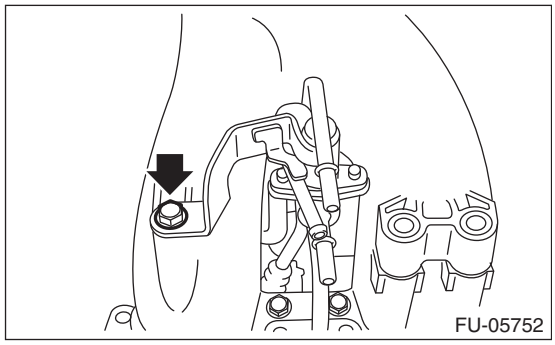


2. LH SIDE

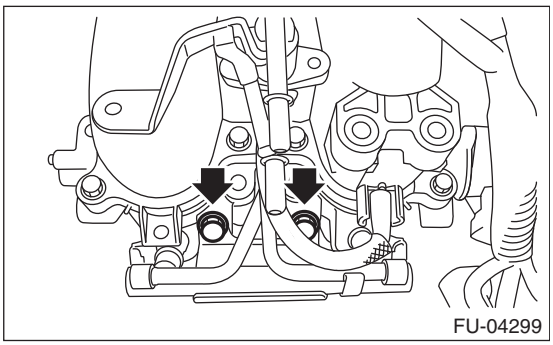
Install in the reverse order of removal.

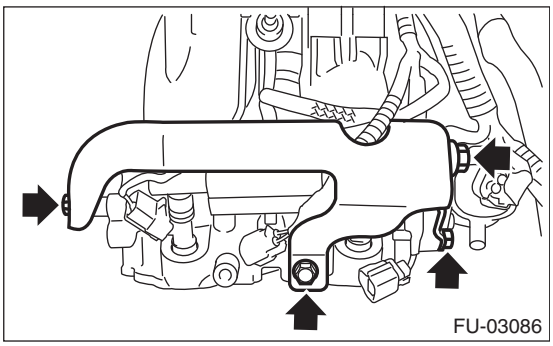
NOTE:
Use new O-rings, rubbers and seal rings.

Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)



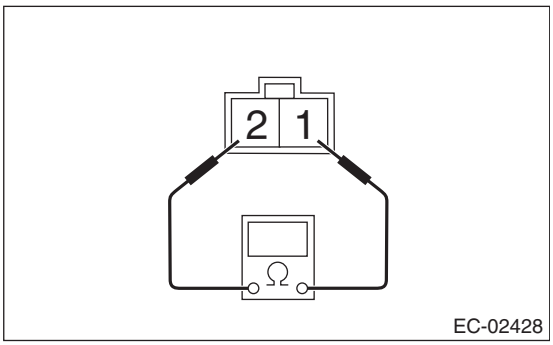
Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)


FU-04299


FU-03086

C: INSPECTION

1) Check that the fuel injector has no deformation, cracks or other damages.
2) Measure the resistance between fuel injector terminals.



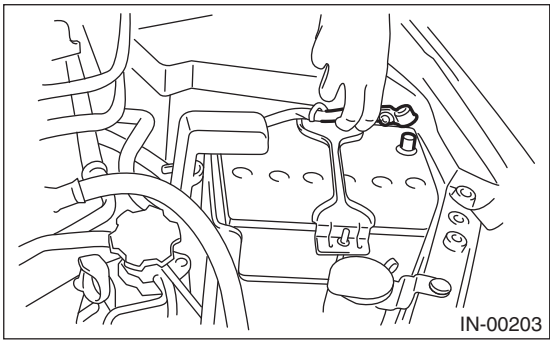
EC-02428

Terminal No.	Standard
1 and 2	Approx. 12.0 Ω (when 20°C (68°F))

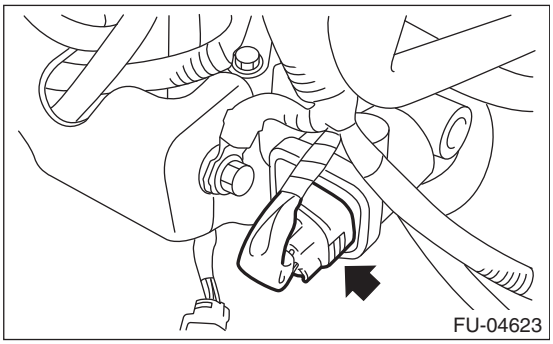
12.Tumble Generator Valve Assembly

A: REMOVAL

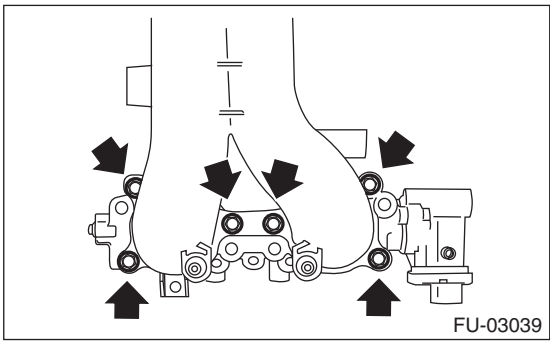
1) Release the fuel pressure. <Ref. to FU(H4DOTC)-65, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Remove the collector cover.
3) Disconnect the ground cable from battery.



4) Open the fuel filler lid and remove the fuel filler cap.
5) Remove the intake manifold. <Ref. to FU(H4DOTC)-18, REMOVAL, Intake Manifold.>
6) Disconnect the connector from the tumble generator valve assembly.



7) Remove the fuel injector. <Ref. to FU(H4DOTC)-45, REMOVAL, Fuel Injector.>
8) Remove the tumble generator valve assembly from the intake manifold.



B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Use a new gasket.

Tightening torque:
8.3 N·m (0.8 kgf-m, 6.1 ft-lb)

C: INSPECTION

1) Check that the tumble generator valve assembly has no deformation, cracks or other damages.
2) Check tumble generator valve for contamination or clogging.

13. Tumble Generator Valve Actuator

A: SPECIFICATION

The tumble generator valve assembly cannot be disassembled.
Refer to “Tumble Generator Valve Assembly” for removal and installation procedures. <Ref. to FU(H4DOTC)-48, REMOVAL, Tumble Generator Valve Assembly.> <Ref. to FU(H4DOTC)-48, INSTALLATION, Tumble Generator Valve Assembly.>

14.Oil Flow Control Solenoid Valve

A: REMOVAL

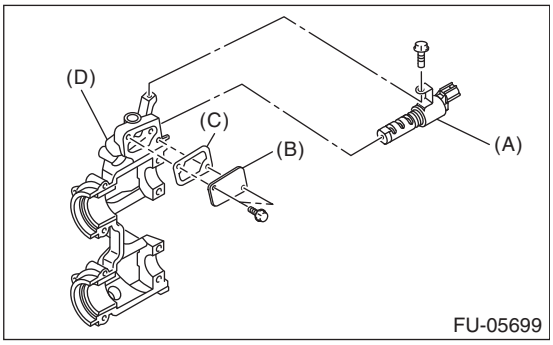
Oil flow control solenoid valve is a unit with front camshaft cap.
Refer to “Camshaft” for removal procedures. <Ref. to ME(H4DOTC)-58, REMOVAL, Camshaft.>

B: INSTALLATION

Refer to “Camshaft” for installation procedure. <Ref. to ME(H4DOTC)-60, INSTALLATION, Camshaft.>

C: DISASSEMBLY

1) Remove the two mounting bolts securing oil return cover, and remove the oil return cover and gasket.
2) Remove the bolt securing oil flow control solenoid valve, and remove the oil flow control solenoid valve.



(A) Oil flow control solenoid valve
(B) Oil return cover
(C) Gasket
(D) Front camshaft cap

D: ASSEMBLY

1) Install the oil flow control solenoid valve.

Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)

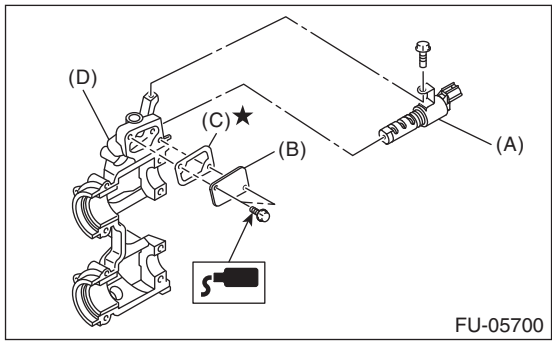
2) Apply liquid gasket to the two bolts securing oil return cover.

Liquid gasket:
THREE BOND 1324 (Part No. 004403042) or equivalent

3) Attach the oil return cover and gasket.

NOTE:
Use a new gasket.

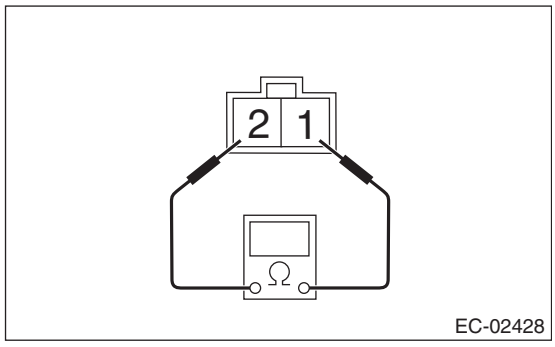
Tightening torque:
9 N·m (0.9 kgf-m, 6.6 ft-lb)



(A) Oil flow control solenoid valve
(B) Oil return cover
(C) Gasket
(D) Front camshaft cap

E: INSPECTION

1) Check that the oil flow control solenoid valve has no deformation, cracks or other damages.
2) Measure the resistance between the oil flow control solenoid valve terminals.

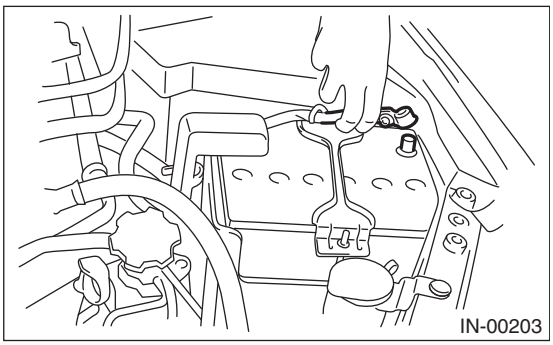


Terminal No.	Standard
1 and 2	7.4±0.5 Ω (when 20°C (68°F))

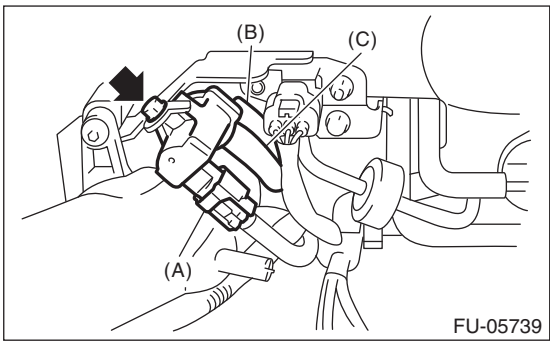
15. Wastegate Control Solenoid Valve

A: REMOVAL

1) Remove the collector cover.
2) Disconnect the ground cable from battery.



3) Disconnect the connector (A) from the wastegate control solenoid valve.
4) Disconnect the vacuum hose (B) and air control hose (C) from the wastegate control solenoid valve.
5) Remove the wastegate control solenoid valve from the bracket.



B: INSTALLATION

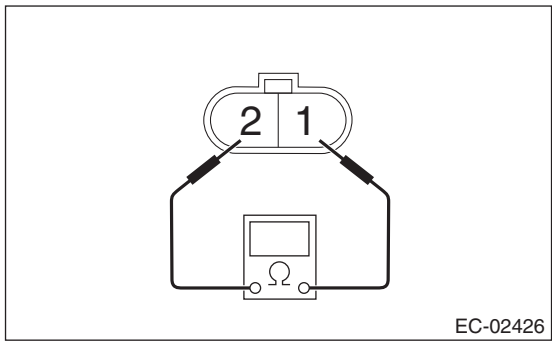
Install in the reverse order of removal.

Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)

C: INSPECTION

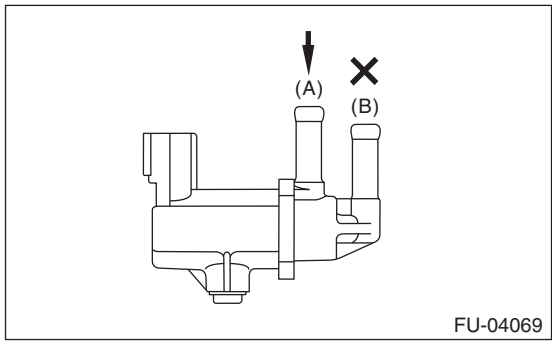
1. WASTEGATE CONTROL SOLENOID VALVE

1) Check that the wastegate control solenoid valve has no deformation, cracks or other damages.
2) Check the resistance between the wastegate control solenoid valve terminals.

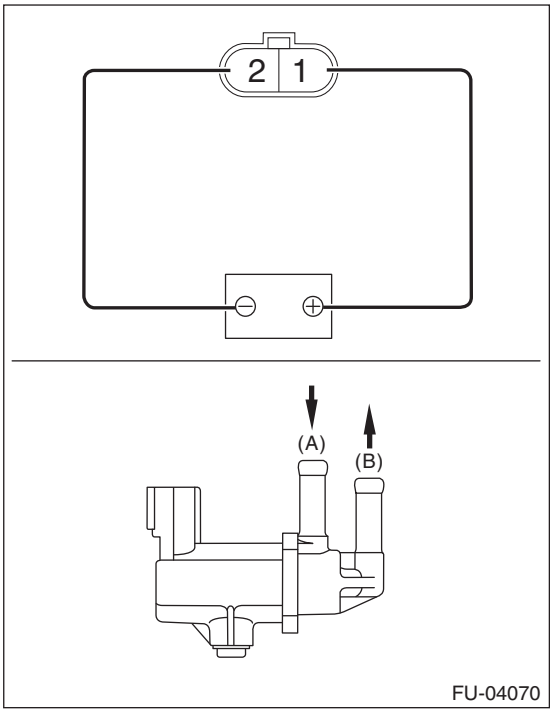


Terminal No.	Standard
1 and 2	28±2 Ω (when 20°C (68°F))

3) Check that air does not come out from (B) when air is blown into (A).



4) Connect the battery positive terminal to the terminal No. 1 and the battery negative terminal to the terminal No. 2. Check that air is discharged from (B), when supplying air to (A).



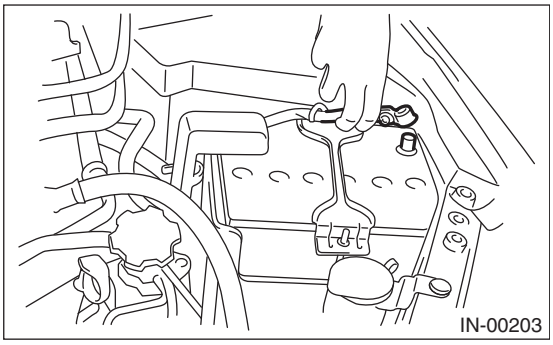
2. OTHER INSPECTIONS

Check that the vacuum hose and air control hose have no cracks, damage or loose part.

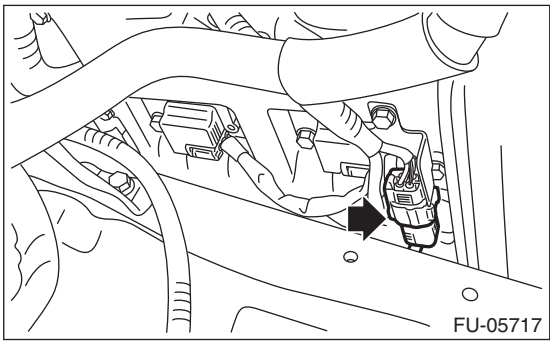
16.Front Oxygen (A/F) Sensor

A: REMOVAL

1) Remove the collector cover.
2) Disconnect the ground cable from battery.

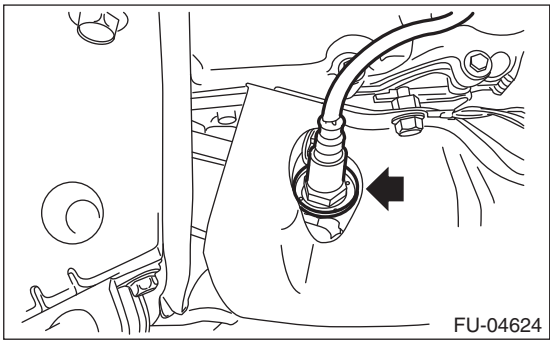


3) Remove the air intake duct (rear) and air cleaner case. <Ref. to IN(H4DOTC)-10, REMOVAL, Air Intake Duct.> <Ref. to IN(H4DOTC)-8, REMOVAL, Air Cleaner Case.>
4) Disconnect the connectors from front oxygen (A/F) sensor.



5) Lift up the vehicle.
6) Remove the under cover. <Ref. to EI-26, REMOVAL, Front Under Cover.>
7) Apply spray-type lubricant to the threaded portion of front oxygen (A/F) sensor, and leave it for one minute or more.
8) Remove the front oxygen (A/F) sensor.

CAUTION:
When removing the front oxygen (A/F) sensor, wait until exhaust pipe cools, otherwise it will damage the exhaust pipe.



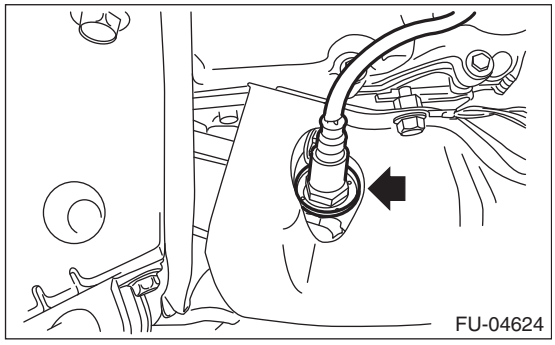
B: INSTALLATION

CAUTION:
If lubricant is spilt onto the exhaust pipe, wipe it off completely with cloth to avoid emission of smoke or causing a fire.
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.

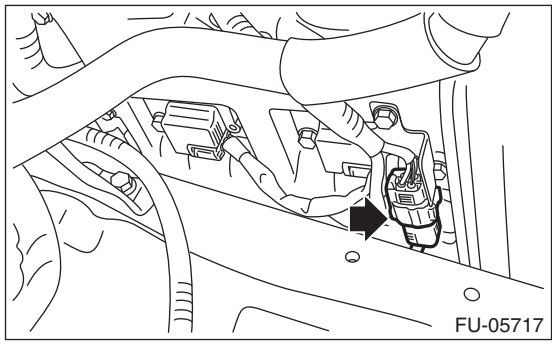
CAUTION:
Never apply anti-seize compound to the protector of front oxygen (A/F) sensor.

Anti-seize compound:
NEVER-SEEZ NSN, JET LUBE SS-30 or equivalent
2) Install the front oxygen (A/F) sensor.

Tightening torque:
30 N·m (3.1 kgf-m, 22.1 ft-lb)

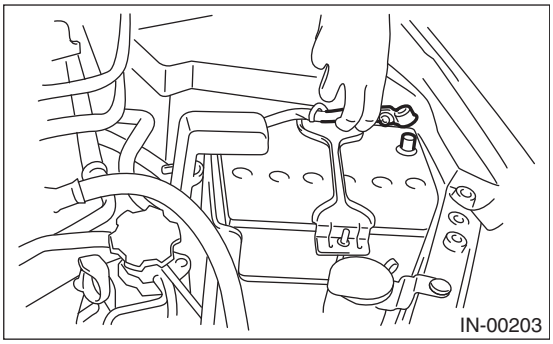


3) Install the under cover. <Ref. to EI-26, INSTALLATION, Front Under Cover.>
4) Lower the vehicle.
5) Connect the connector of front oxygen (A/F) sensor.



6) Install the air intake duct (rear) and air cleaner case. <Ref. to IN(H4DOTC)-8, INSTALLATION, Air Cleaner Case.> <Ref. to IN(H4DOTC)-10, INSTALLATION, Air Intake Duct.>

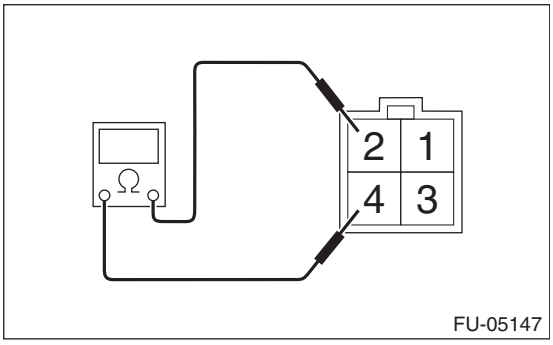
7) Connect the battery ground terminal.



8) Install the collector cover.

C: INSPECTION

1) Check that the front oxygen (A/F) sensor has no deformation, cracks or other damages.
2) Measure the resistance between front oxygen (A/F) sensor terminals.

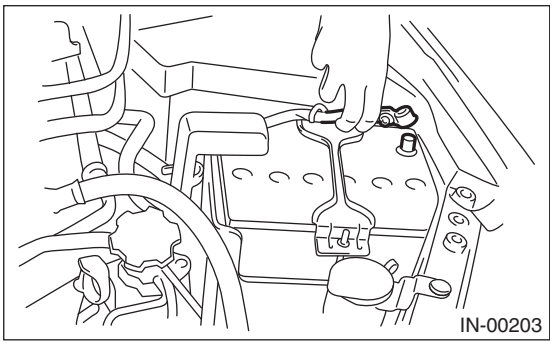


Terminal No.	Standard
2 and 4	2.4±0.24 Ω (when 20°C (68°F))

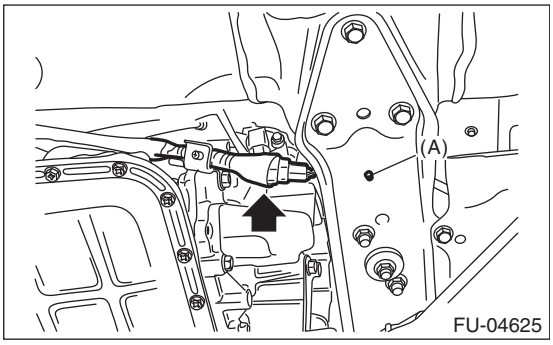
17.Rear Oxygen Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.

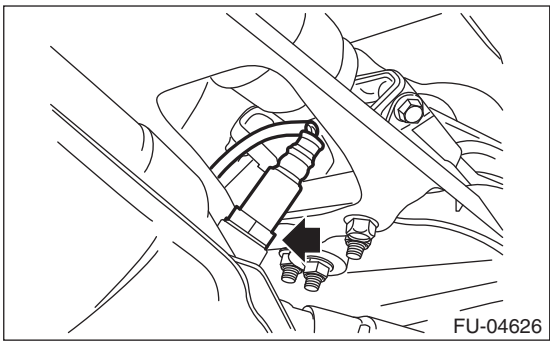


2) Lift up the vehicle.
3) Disconnect the connector from the rear oxygen sensor, and remove the clip (A) holding the rear oxygen sensor harness.



4) Apply spray-type lubricant to the threaded portion of rear oxygen sensor, and leave it for one minute or more.
5) Remove the rear oxygen sensor.

CAUTION:
When removing the rear oxygen sensor, wait until exhaust pipe cools, otherwise it will damage the exhaust pipe.



B: INSTALLATION

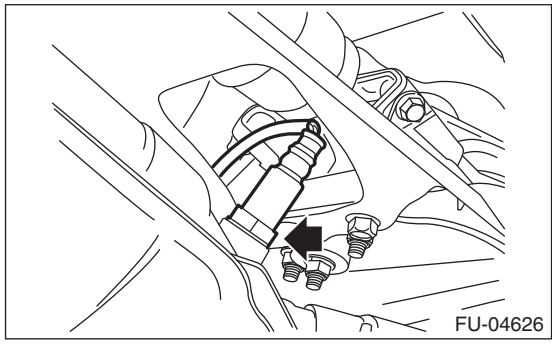
CAUTION:
If lubricant is spilt over the exhaust pipe, wipe it off with cloth to avoid emission of smoke or causing a fire.
1) Before installing rear oxygen sensor, apply the anti-seize compound only to the threaded portion of rear oxygen sensor to make the next removal easier.

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

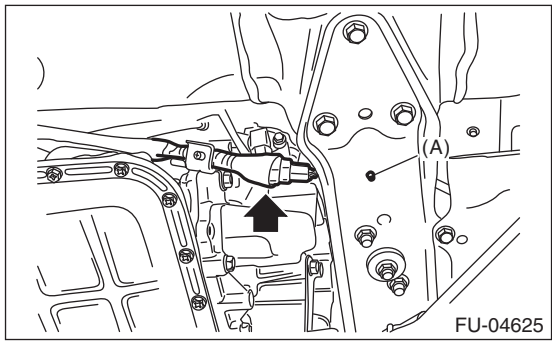
Anti-seize compound:
NEVER-SEEZ NSN, JET LUBE SS-30 or equivalent

2) Install the rear oxygen sensor.

Tightening torque:
21 N·m (2.1 kgf-m, 15.5 ft-lb)

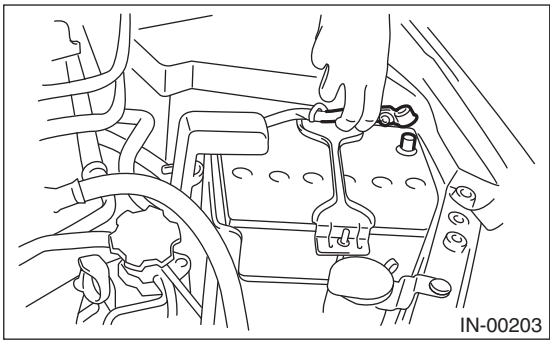


3) Connect the connector to the rear oxygen sensor, and hold the rear oxygen sensor harness with clip (A).



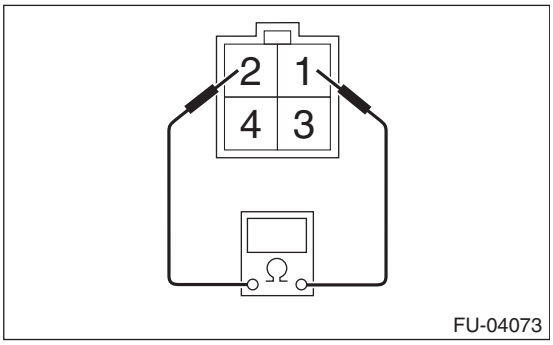
4) Lower the vehicle.

5) Connect the ground cable to battery.



C: INSPECTION

1) Check that the rear oxygen sensor has no deformation, cracks or other damages.
2) Measure the resistance between rear oxygen sensor terminals.

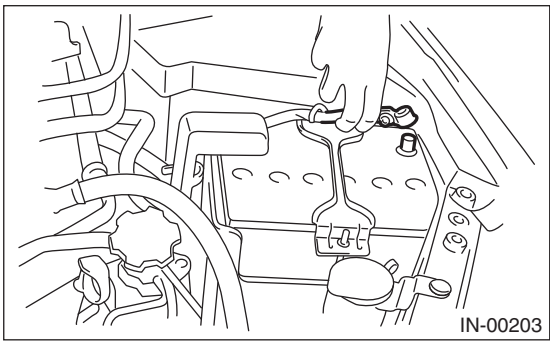


Terminal No.	Standard
1 and 2	$5.6^{+0.8}_{-0.6}$ Ω (when 20°C (68°F))

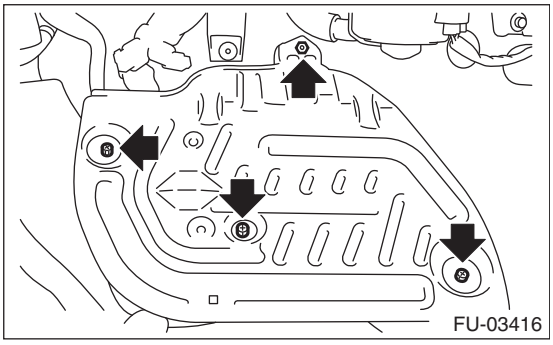
18.Engine Control Module (ECM)

A: REMOVAL

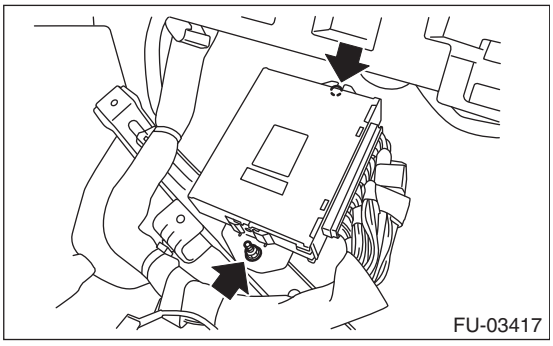
1) Disconnect the ground cable from battery.



2) Remove the glove box lower cover. <Ref. to EI-48, REMOVAL, Glove Box.>
3) Remove the lower inner trim of passenger's side. <Ref. to EI-56, REMOVAL, Lower Inner Trim.>
4) Turn over the floor mat of passenger's seat.
5) Remove the protect cover.



6) Remove the nuts and bolts which hold the ECM to the bracket.



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

B: INSTALLATION

Install in the reverse order of removal.

CAUTION:
• When the ECM of model with immobilizer has been replaced, be sure to perform the registration of immobilizer system. (Refer to "PC application help for Subaru Select Monitor".)
• If replacing ECM or the bracket, replace both parts with new parts at a time.
• After installing the bracket to ECM, do not separate the bracket.
• If the bracket has been installed to ECM in the wrong direction, replace both parts to new parts.

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 (0.8 kgf-m, 5.5 ft-lb)

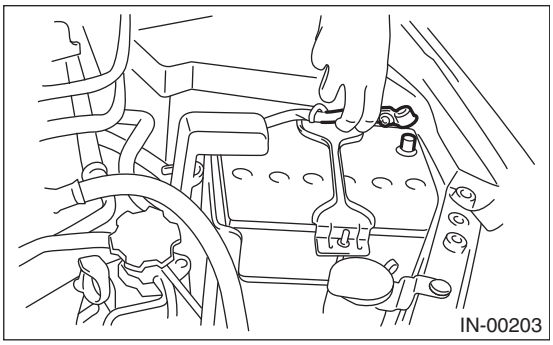
C: INSPECTION

Check that the ECM has no deformation, cracks or other damages.

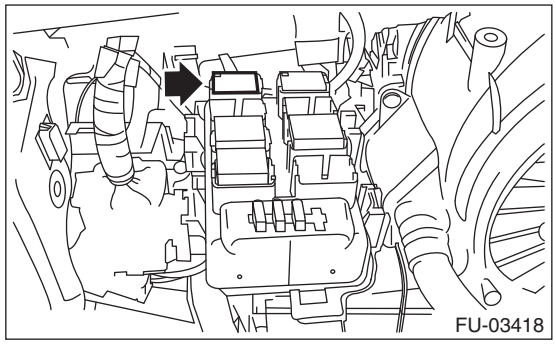
19.Main Relay

A: REMOVAL

1) Disconnect the ground cable from battery.



2) Remove the glove box lower cover. <Ref. to EI-48, REMOVAL, Glove Box.>
3) Remove the main relay from the relay block on the back side of the glove box.

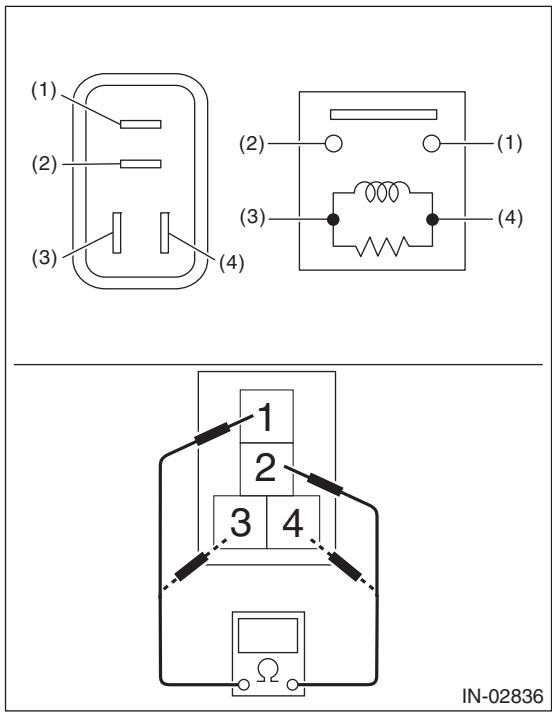


B: INSTALLATION

Install in the reverse order of removal.

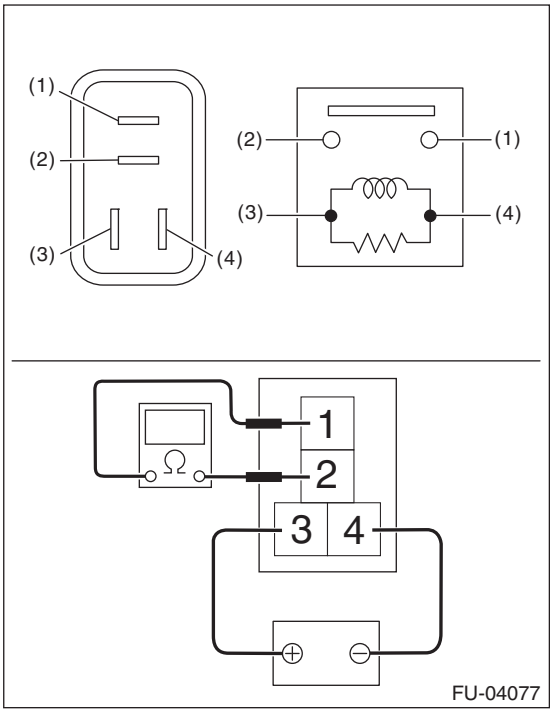
C: INSPECTION

1) Check that the main relay has no deformation, cracks or other damages.
2) Measure the resistance between main relay terminals.



Terminal No.	Standard
1 and 2	1 MΩ or more
3 and 4	130.4 — 230.8 Ω (when 20°C (68°F))

3) Connect battery positive terminal to terminal No. 3 and battery ground terminal to terminal No. 4, and measure the resistance between the main relay terminals.

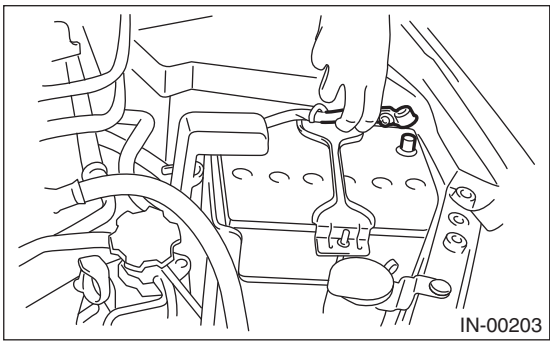


Terminal No.	Standard
1 and 2	Less than 1 Ω

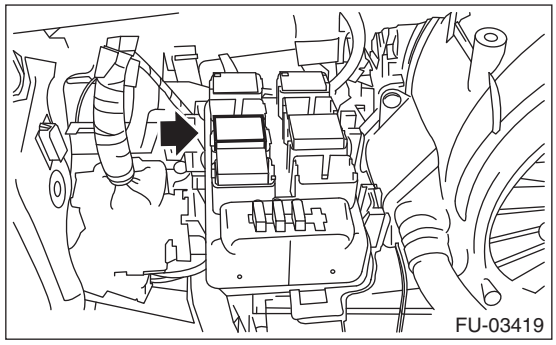
20.Fuel Pump Relay

A: REMOVAL

1) Disconnect the ground cable from battery.



2) Remove the glove box lower cover. <Ref. to EI-48, REMOVAL, Glove Box.>
3) Remove the fuel pump relay from the relay block on the back side of the glove box.

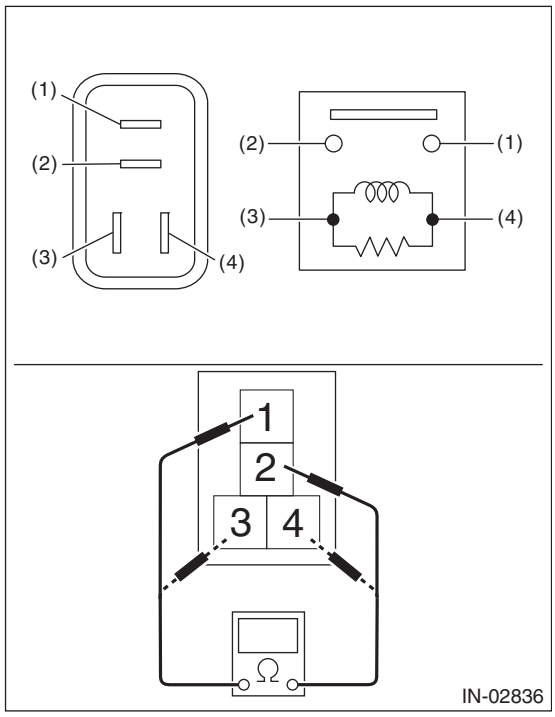


B: INSTALLATION

Install in the reverse order of removal.

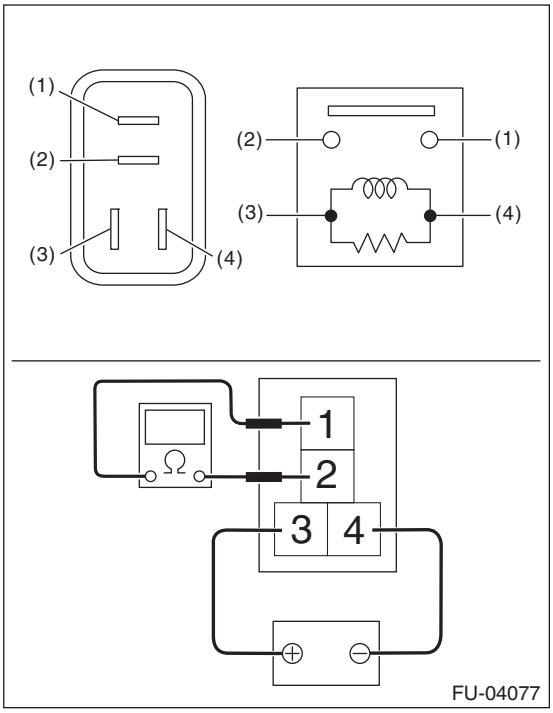
C: INSPECTION

1) Check that the fuel pump relay has no deformation, cracks or other damages.
2) Measure the resistance between fuel pump relay terminals.



Terminal No.	Standard
1 and 2	1 MΩ or more
3 and 4	93.8 — 136.4 Ω (when 20°C (68°F))

3) Connect battery positive terminal to terminal No. 3 and battery ground terminal to terminal No. 4, and measure the resistance between the fuel pump relay terminals.

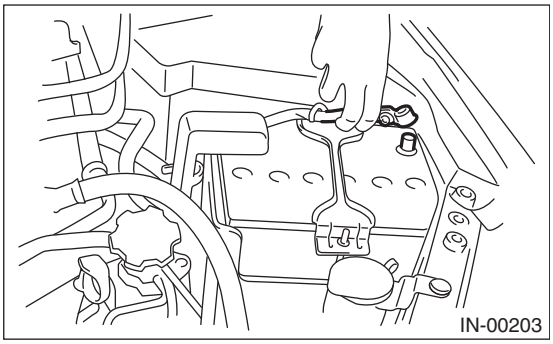


Terminal No.	Standard
1 and 2	Less than 1 Ω

21.Electronic Throttle Control Relay

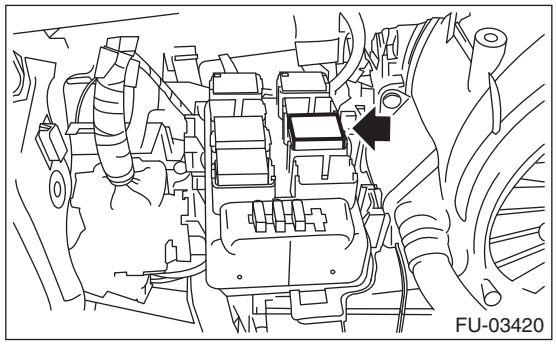
A: REMOVAL

1) Disconnect the ground cable from battery.



2) Remove the glove box lower cover. <Ref. to EI-48, REMOVAL, Glove Box.>

3) Remove the electronic throttle control relay from the relay block on the back side of the glove box.



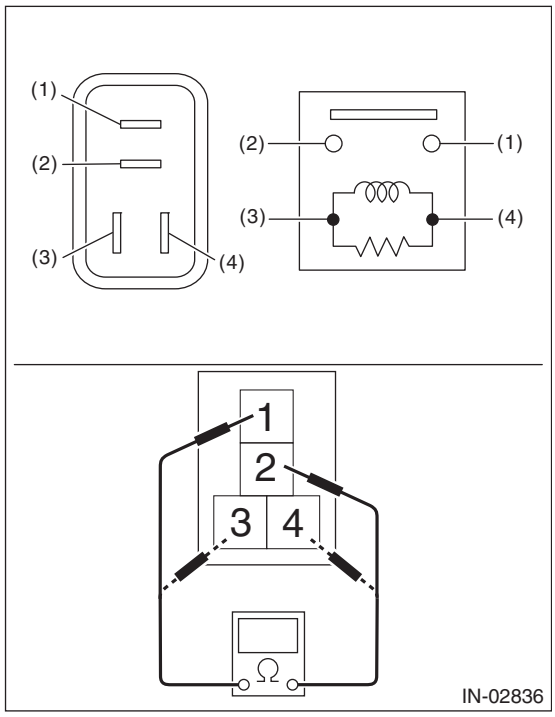
B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

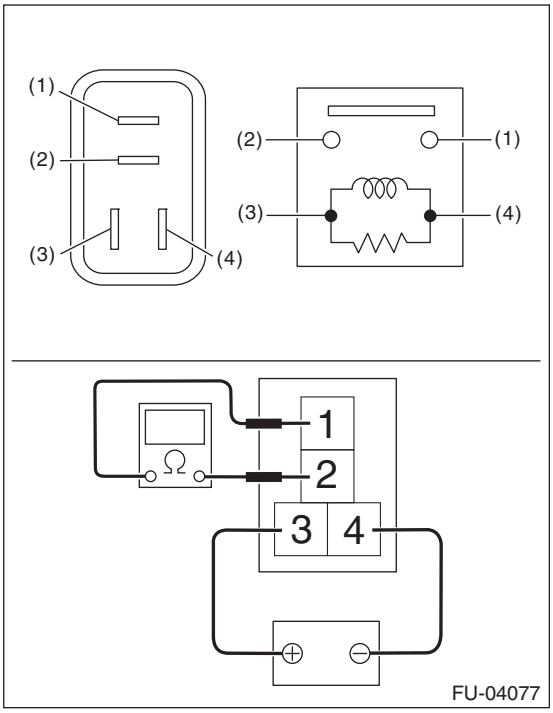
1) Check that the electronic throttle control relay has no deformation, cracks or other damages.

2) Measure the resistance between electronic throttle control relay terminals.



Terminal No.	Standard
1 and 2	1 MΩ or more
3 and 4	93.8 — 136.4 Ω (when 20°C (68°F))

3) Connect battery positive terminal to terminal No. 3 and battery ground terminal to terminal No. 4, and measure the resistance between the electronic throttle control relay terminals.

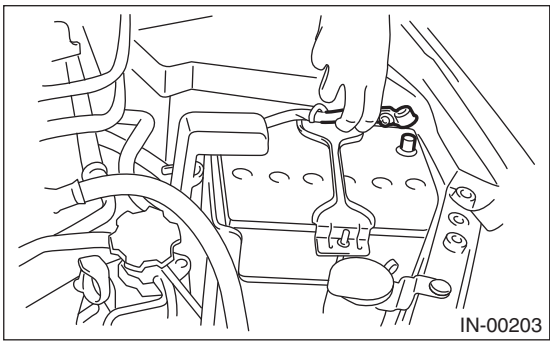


Terminal No.	Standard
1 and 2	Less than 1 Ω

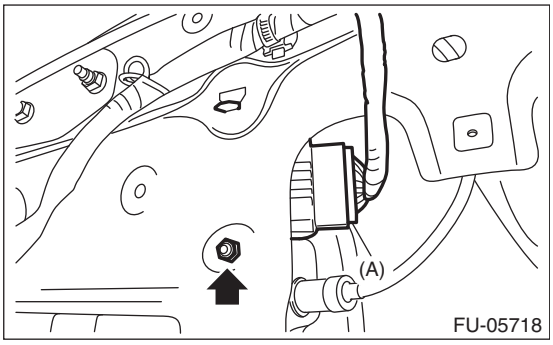
22.Fuel Pump Control Unit

A: REMOVAL

1) Disconnect the ground cable from battery.



2) Remove the right side rear quarter trim. <Ref. to EI-60, REMOVAL, Rear Quarter Trim.>
3) Disconnect the connector (A) from the fuel pump control unit, and remove the fuel pump control unit.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
5 N·m (0.5 kgf-m, 3.7 ft-lb)

C: INSPECTION

Check that the fuel pump control unit has no deformation, cracks or other damages.

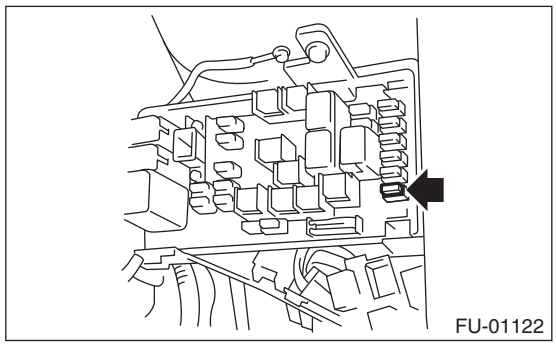
23.Fuel

A: PROCEDURE

1. RELEASING OF FUEL PRESSURE

WARNING:
Place "NO OPEN FLAMES" signs near the working area.

CAUTION:
Be careful not to spill fuel.
1) Remove the fuse of fuel pump from main fuse box.



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.
5) Install the fuse of fuel pump to the main fuse box.

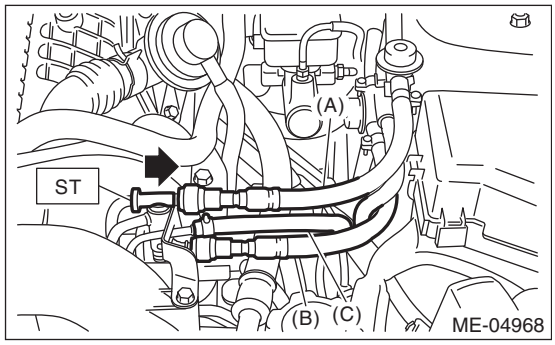
2. DRAINING FUEL (WITH SUBARU SELECT MONITOR)

WARNING:
Place "NO OPEN FLAMES" signs near the working area.

CAUTION:
Be careful not to spill fuel.

NOTE:
• If the fuel pump cannot be driven, refer to the procedures for draining from the fuel filler hose. <Ref. to FU(H4DOTC)-65, DRAINING FUEL (THROUGH THE FUEL FILLER HOSE), PROCEDURE, Fuel.>
• Be careful not to let the battery run-out.
1) Release the fuel pressure. <Ref. to FU(H4DOTC)-65, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Attach ST to the fuel delivery pipe and push ST in the direction of arrow mark to disconnect the fuel delivery hose.
ST 42099AE000 QUICK CONNECTOR RELEASE

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



(A) Fuel delivery hose
(B) Fuel return hose
(C) Evaporation hose

3) Connect ST to the fuel delivery hose.
ST 18471AA000 FUEL PIPE ADAPTER
4) Connect the gasoline proof hose to ST and put the end of the hose in the container.
5) Drive the fuel pump and drain the fuel using Subaru Select Monitor. <Ref. to EN(H4DOTC)(diag)-58, FUEL PUMP CONTROL (ON/OFF DRIVE), OPERATION, System Operation Check Mode.>

CAUTION:
Be careful not to spill fuel.
6) Install the related parts in the reverse order after draining the fuel.

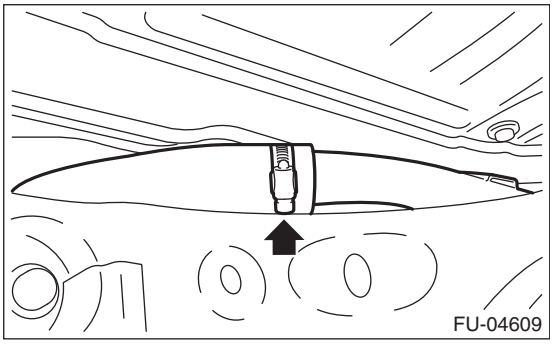
3. DRAINING FUEL (THROUGH THE FUEL FILLER HOSE)

WARNING:
Place "NO OPEN FLAMES" signs near the working area.

CAUTION:
• Be careful not to spill fuel.
• Fuel may remain in the fuel filler pipe. Draining the fuel from the fuel filler pipe through the fill opening using the gasoline proof pump and the gasoline proof hose (ø10 or less) before the operation.
1) Lift up the vehicle.
2) Remove the rear exhaust pipe and muffler. <Ref. to EX(H4DOTC)-12, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-14, REMOVAL, Muffler.>

3) Open the fuel filler lid and remove the fuel filler cap.
4) Drain the fuel from the fuel filler pipe through the filler opening using the gasoline proof pump and the gasoline proof hose (ø10 or less).
5) Disconnect the fuel filler hose from the fuel filler pipe assembly.

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

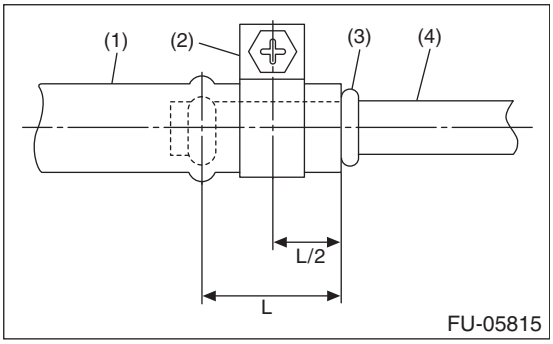


6) Set the container under the vehicle and insert the gasoline proof hose (ø10 or less) into the fuel filler hose to drain the fuel.

CAUTION:
Be careful not to spill fuel.
7) Install the related parts in the reverse order after draining the fuel.

NOTE:
Correctly insert the fuel filler hose to the spool, and then install the clamp as shown.

Tightening torque:
2.5 N·m (0.3 kgf-m, 1.8 ft-lb)



(1) Fuel filler hose
(2) Clamp
(3) Spool
(4) Fuel filler pipe

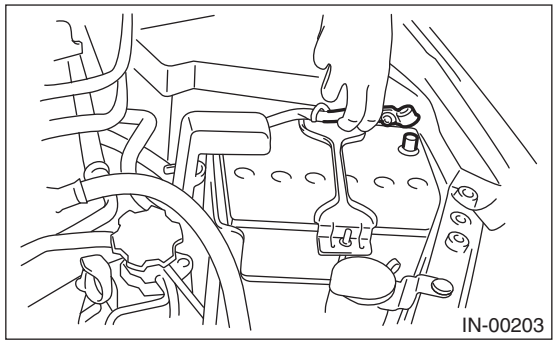
24.Fuel Tank

A: REMOVAL

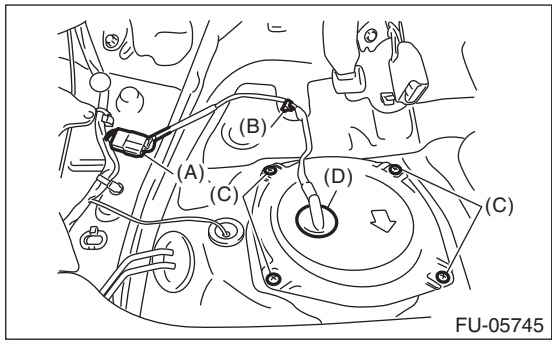
WARNING:
Place "NO OPEN FLAMES" signs near the working area.

CAUTION:
Be careful not to spill fuel.

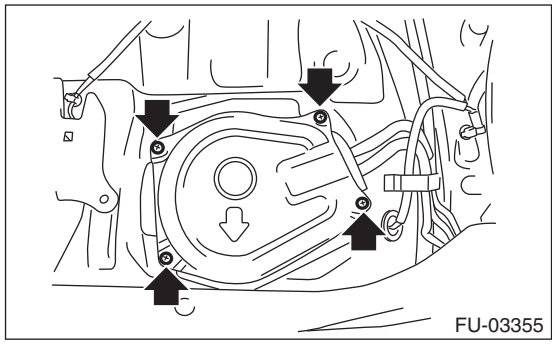
1) Release the fuel pressure. <Ref. to FU(H4DOTC)-65, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Drain fuel. <Ref. to FU(H4DOTC)-65, DRAINING FUEL (WITH SUBARU SELECT MONITOR), PROCEDURE, Fuel.>
3) Disconnect the ground cable from battery.



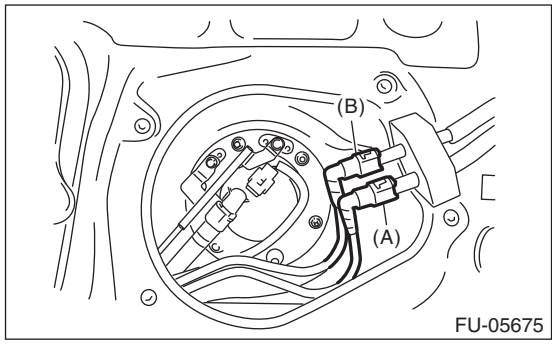
4) Remove the rear seat cushion. <Ref. to SE-16, REMOVAL, Rear Seat.>
5) Remove the service hole cover of fuel pump.
   (1) Disconnect fuel pump connector (A), and remove clip (B).
   (2) Remove the screw (C).
   (3) Push the grommet (D) down and remove the service hole cover.



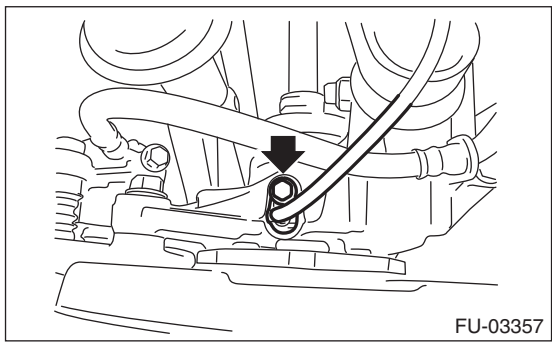
6) Remove the service hole cover of fuel sub level sensor.



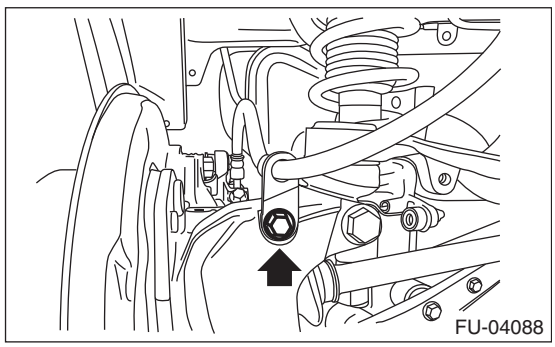
7) Disconnect the quick connector of fuel delivery tube (A) and fuel return tube (B). <Ref. to FU(H4DOTC)-88, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>



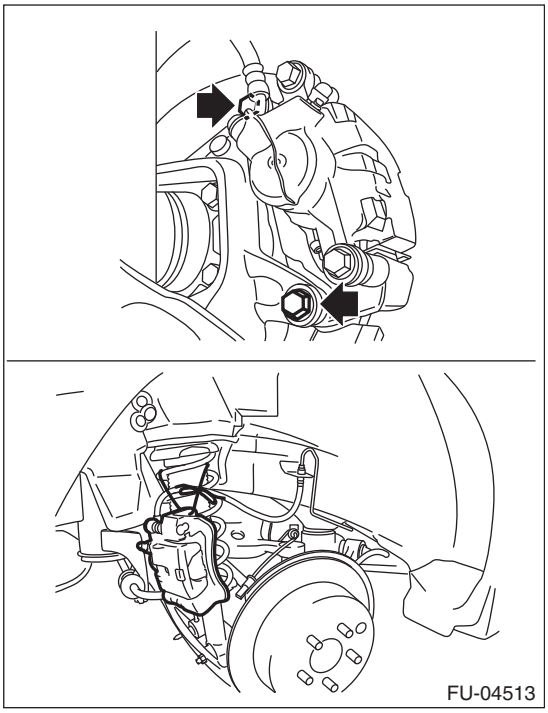
8) Remove the rear wheels.
9) Lift up the vehicle.
10) Remove the rear ABS wheel speed sensor from the rear housing.



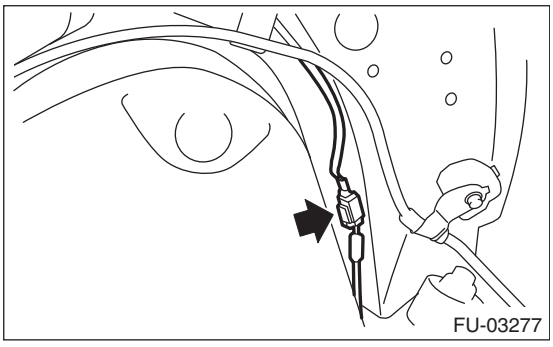
11) Remove the rear brake hose bracket from rear housing.



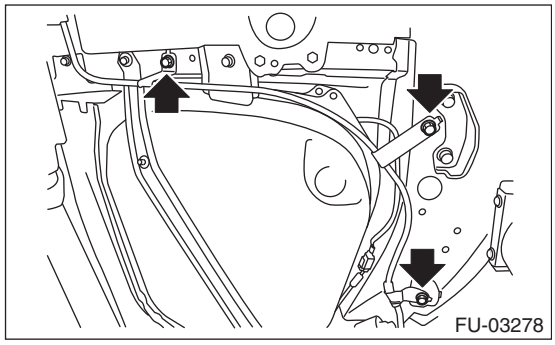
12) Remove the rear disc brake assembly and tie it to the body side of the vehicle.



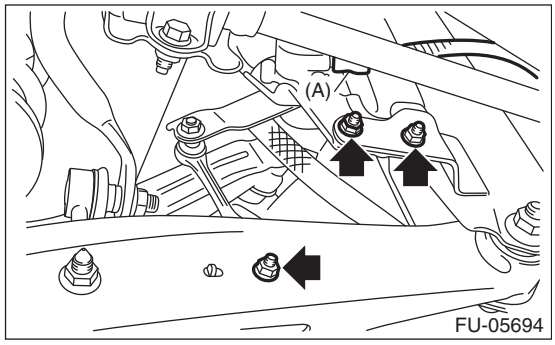
13) Remove the parking brake cable from parking brake assembly. <Ref. to PB-6, REMOVAL, Parking Brake Assembly (Rear Disc Brake).>
14) Remove the rear exhaust pipe and muffler. <Ref. to EX(H4DOTC)-12, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-14, REMOVAL, Muffler.>
15) Remove the propeller shaft. <Ref. to DS-10, REMOVAL, Propeller Shaft.>
16) Remove the heat shield cover and fuel tank protector.
17) Disconnect the connector from the rear ABS wheel speed sensor.



18) Remove the parking brake cable clamp from the body.



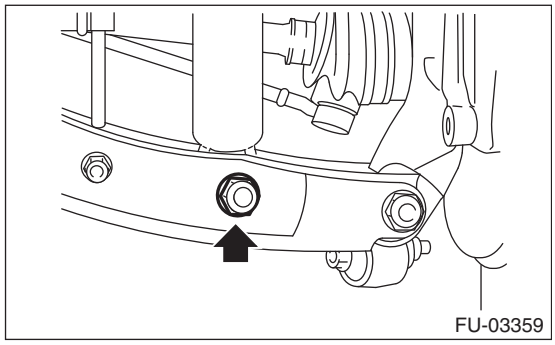
19) Disconnect the connector (A) from the rear vehicle height sensor, and remove the rear vehicle height sensor. (model with auto headlight beam leveler, left side only)



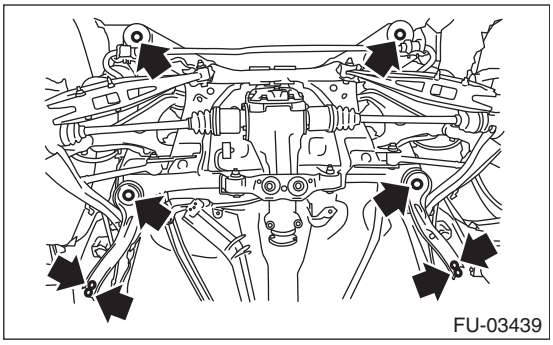
20) Remove the rear suspension assembly.

WARNING:
A helper is required to perform this work.

(1) Support the rear differential with the transmission jack.
(2) Remove the bolt and nut which secures rear shock absorber to rear suspension arm.

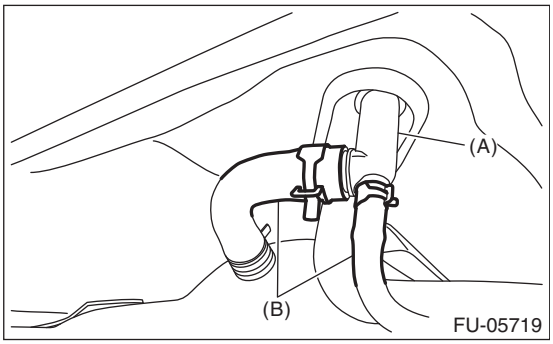


(3) Remove the bolts which secure the rear suspension assembly to the body.



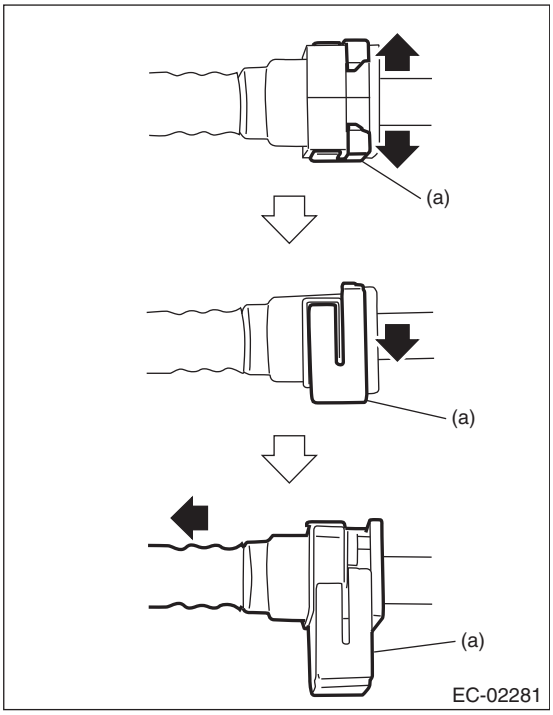
(4) Remove the rear suspension assembly.

21) Disconnect the evaporation hose (B) from connector (A).

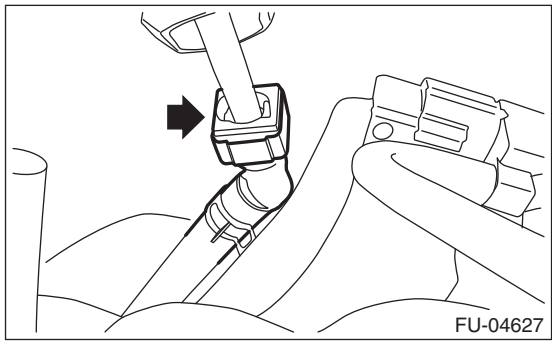


22) Disconnect the quick connector of the evaporation hose from the evaporation pipe.

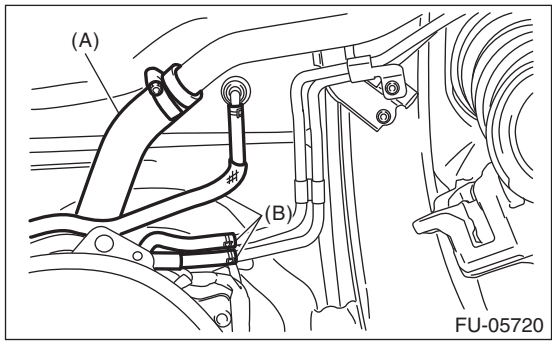
NOTE:
Disconnect the quick connector as shown in the figure.



(a) Retainer

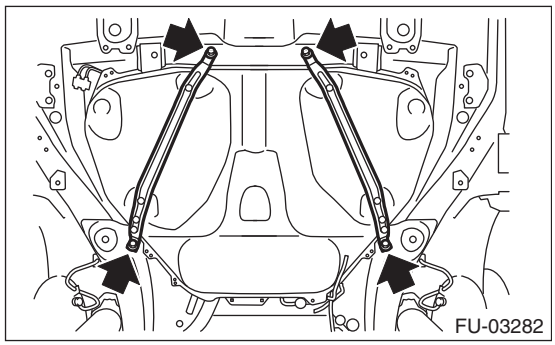


23) Disconnect the fuel filler hose (A) and evaporation hose (B).



24) Support the fuel tank with a transmission jack, remove the bolts from the fuel tank band, and remove the fuel tank from the vehicle.

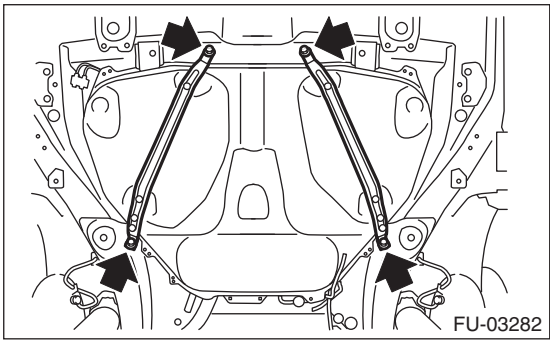
WARNING:
- **A helper is required to perform this work.**
- **Fuel may remain in the fuel tank. This will cause the left and right sides to be unbalanced. Be careful not to drop the fuel tank.**



B: INSTALLATION

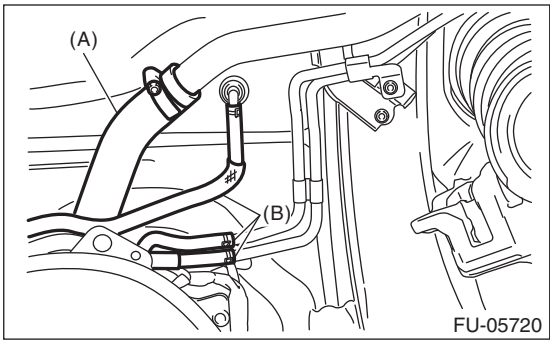
1) Support the fuel tank with a transmission jack, set the fuel tank in place, and temporarily tighten the bolts of the fuel tank band.

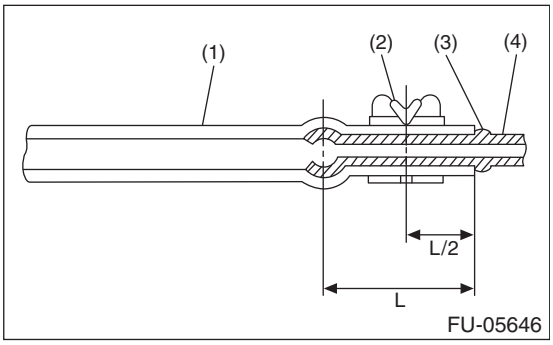
WARNING:
A helper is required to perform this work.



2) Securely insert the fuel filler hose (A) and evaporation hose (B) until the hose end contacts the spool, then attach the clamp or clip as shown in the figure.

Tightening torque:
2.5 N·m (0.3 kgf-m, 1.8 ft-lb)

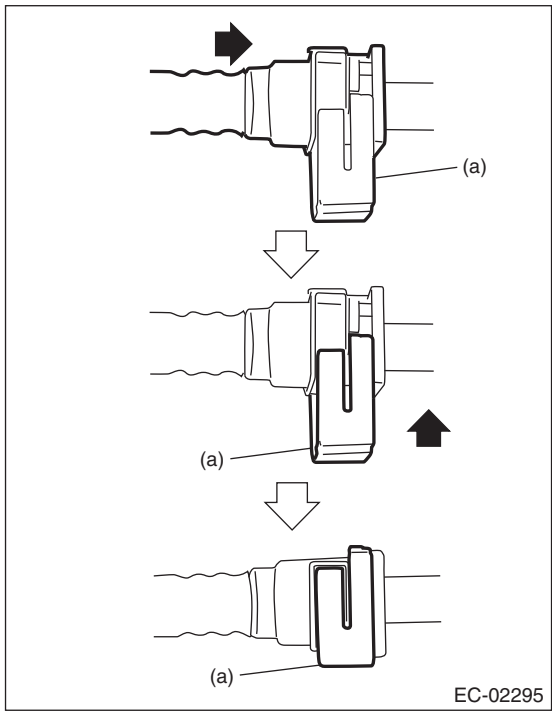




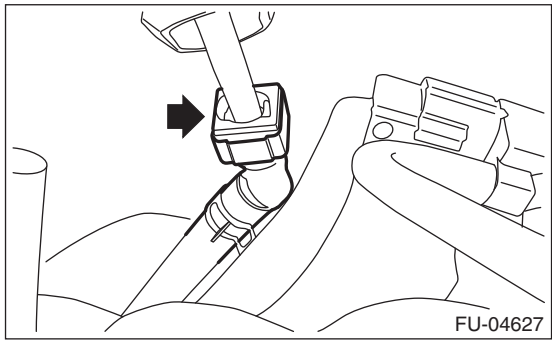
(1) Hose
(2) Clamp or clip
(3) Spool
(4) Pipe

3) Connect the quick connector of the evaporation hose to the evaporation pipe.

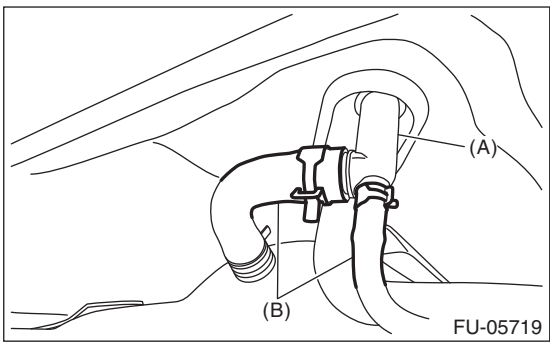
CAUTION:
• Check that there is no damage or dust on the quick connector. If necessary, clean the seal surface of the pipe.
• When connecting the quick connector, securely insert the pipe all the way before locking the retainer.
• When it is difficult to lock the retainer, make sure that the pipe is securely inserted.
• Make sure that the quick connector is securely connected.



(a) Retainer

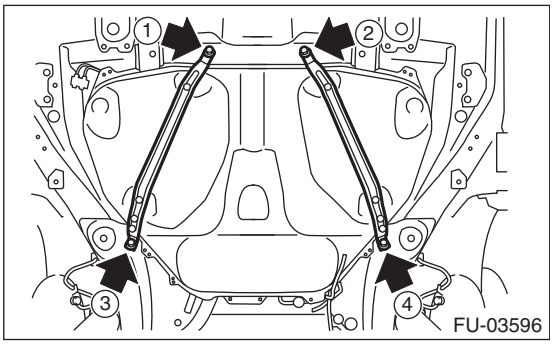


4) Connect evaporation hose (B) to connector (A).



5) Tighten the bolts of the fuel tank band in the order shown in the figure.

Tightening torque:
33 N·m (3.4 kgf-m, 24.3 ft-lb)

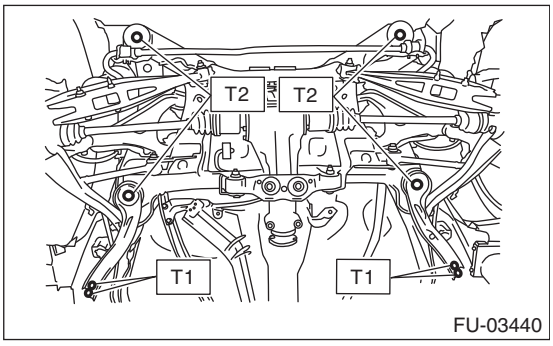


6) Install the rear suspension assembly.

WARNING:
A helper is required to perform this work.

(1) Support the rear differential with the transmission jack.
(2) Support the rear suspension assembly and install the rear suspension assembly to the body.

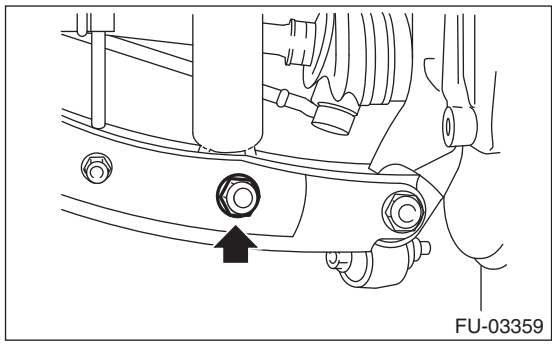
Tightening torque:
T1: 70 N·m (7.1 kgf-m, 51.6 ft-lb)
T2: 145 N·m (14.8 kgf-m, 106.9 ft-lb)



(3) Install the rear shock absorber to the rear suspension arm.

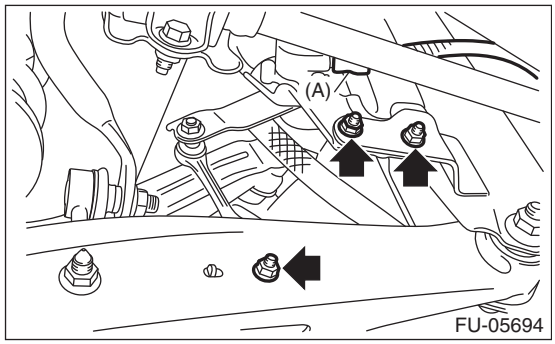
NOTE:
Use a new self-locking nut.

Tightening torque:
120 N·m (12.2 kgf-m, 88.5 ft-lb)



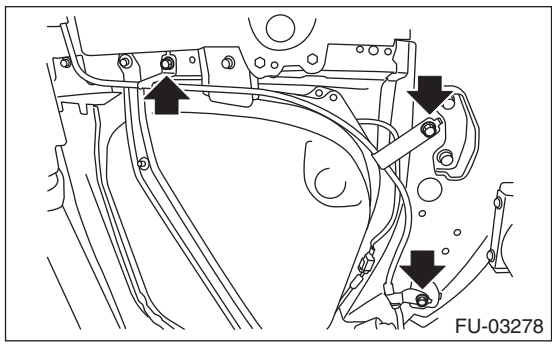
7) Install the rear vehicle height sensor and connect the connector (A) to the rear vehicle height sensor. (model with auto headlight beam leveler, left side only)

Tightening torque:
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)

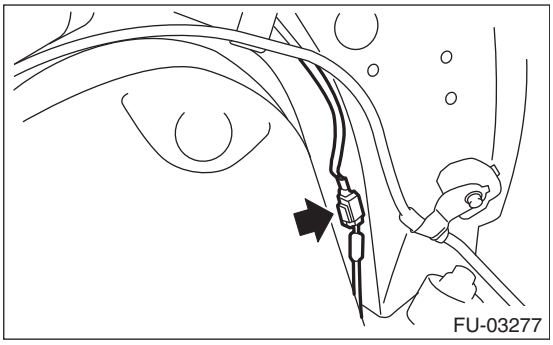


8) Install the parking brake cable clamp to the body.

Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)



9) Connect the connector to the rear ABS wheel speed sensor.



10) Install the heat shield cover.

Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)

11) Install the fuel tank protector.

Tightening torque:
Nut: 9 N·m (0.9 kgf-m, 6.6 ft-lb)
Bolt: 18 N·m (1.8 kgf-m, 13.3 ft-lb)

12) Install the propeller shaft. <Ref. to DS-11, INSTALLATION, Propeller Shaft.>

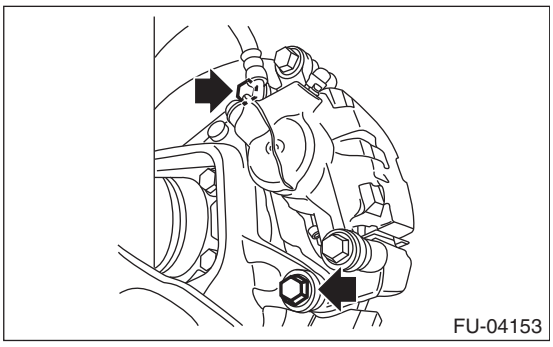
13) Install the rear exhaust pipe and muffler. <Ref. to EX(H4DOTC)-12, INSTALLATION, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-14, INSTALLATION, Muffler.>

14) Lower the vehicle.

15) Connect the parking brake cable to the parking brake assembly. <Ref. to PB-7, INSTALLATION, Parking Brake Assembly (Rear Disc Brake).>

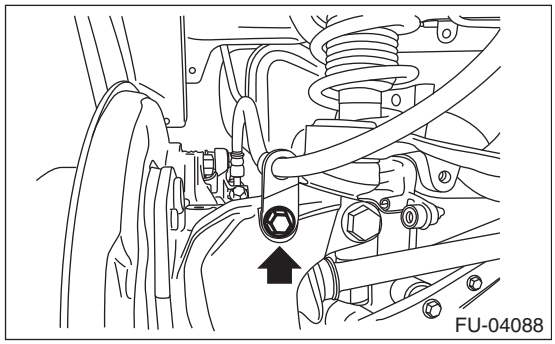
16) Install the rear disc brake assembly.

Tightening torque:
66 N·m (6.7 kgf-m, 48.7 ft-lb)



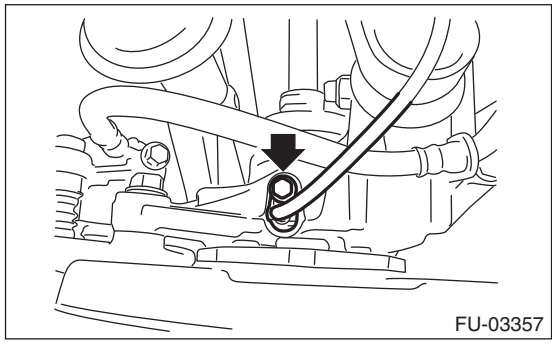
17) Install the rear brake hose bracket to the rear housing.

Tightening torque:
33 N·m (3.4 kgf-m, 24.3 ft-lb)



18) Attach the rear ABS wheel speed sensor to the rear housing.

Tightening torque:
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)

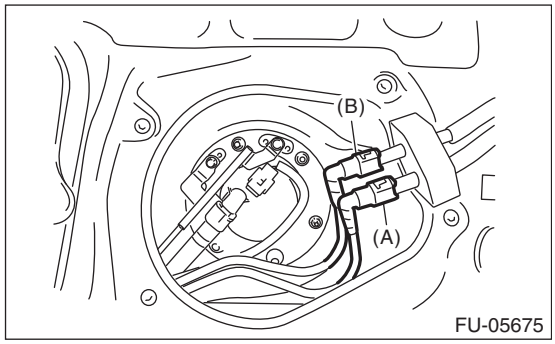


19) Install the rear wheels.

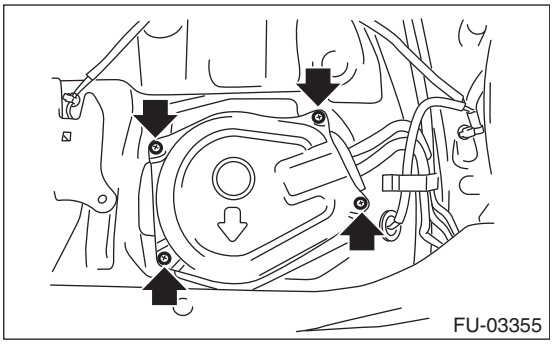
Tightening torque:
100 N·m (10.2 kgf-m, 73.8 ft-lb)

20) Connect the quick connector of fuel delivery tube (A) and fuel return tube (B). <Ref. to FU(H4DOTC)-91, INSTALLATION, Fuel Delivery, Return and Evaporation Lines.>

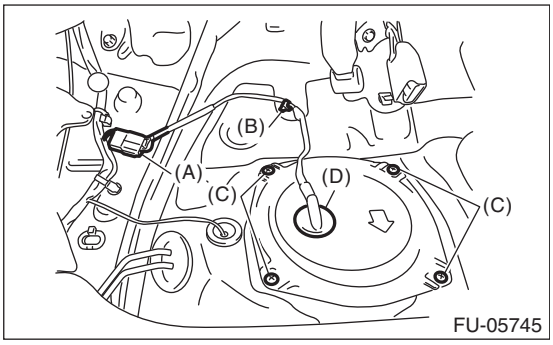
NOTE:
When connecting, be careful not to reverse the delivery side and return side.



21) Install the service hole cover of fuel sub level sensor.

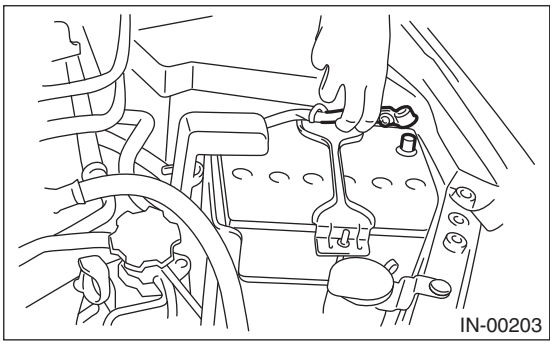


22) Attach the service hole cover of the fuel pump, and attach the connector and clip.



(A) Connector
(B) Clip
(C) Screw
(D) Grommet

23) Install the rear seat cushion. <Ref. to SE-18, INSTALLATION, Rear Seat.>
24) Connect the battery ground terminal.



25) Inspect the wheel alignment and adjust if necessary.
26) Perform reinitialization of the auto headlight beam leveler system. (model with auto headlight beam leveler) <Ref. to LI-16, PROCEDURE, Auto Headlight Beam Leveler System.>

C: INSPECTION

1) Check that the fuel tank and fuel pipe have no deformation, cracks and other damages.
2) Check that the fuel hose has no cracks, damage or loose part.

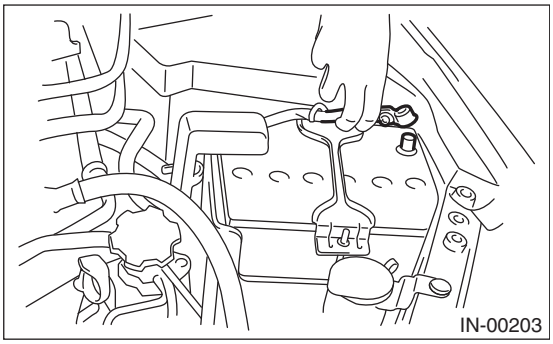
25.Fuel Filler Pipe

A: REMOVAL

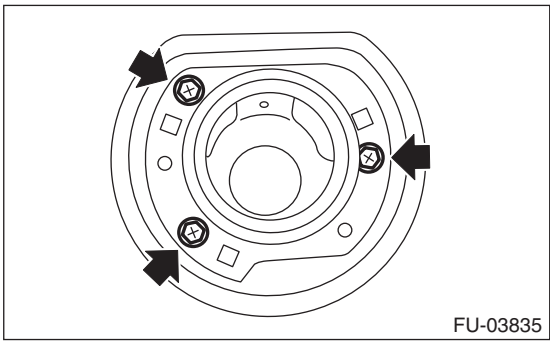
WARNING:
Place "NO OPEN FLAMES" signs near the working area.

CAUTION:
Be careful not to spill fuel.

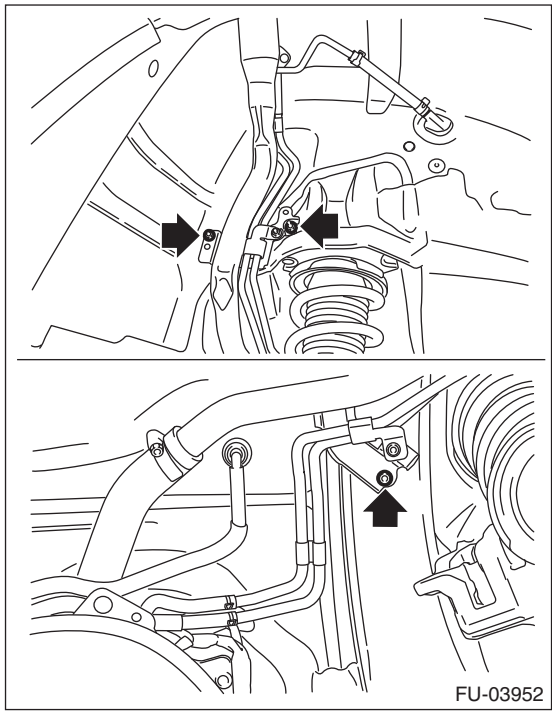
1) Release the fuel pressure. <Ref. to FU(H4DOTC)-65, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Drain fuel. <Ref. to FU(H4DOTC)-65, DRAINING FUEL (WITH SUBARU SELECT MONITOR), PROCEDURE, Fuel.>
3) Disconnect the ground cable from battery.



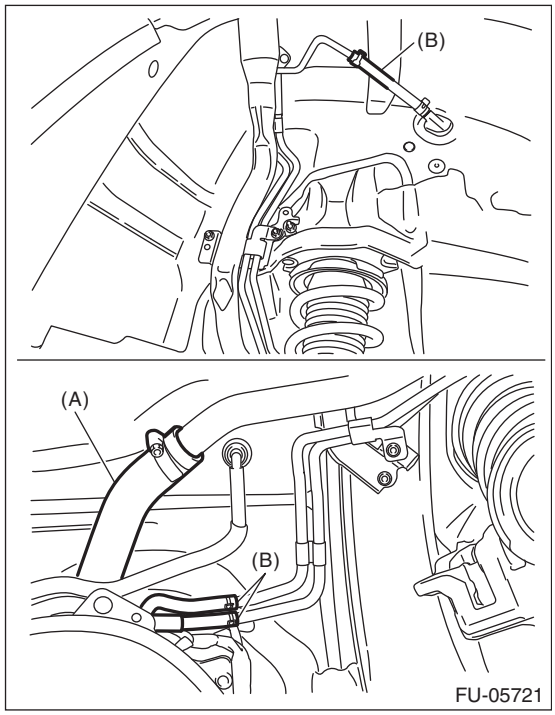
4) Open the fuel filler lid, and remove the filler cap.
5) Remove the screws which secure the fuel filler ring, and then remove the fuel filler ring.



6) Remove the rear wheel RH.
7) Lift up the vehicle.
8) Remove the rear mud guard RH. <Ref. to EI-28, REAR MUD GUARD, REMOVAL, Mud Guard.>
9) Remove the rear sub frame. <Ref. to RS-18, REMOVAL, Rear Sub Frame.>
10) Remove the bolts and nuts which secure fuel filler pipe assembly onto the vehicle body.



11) Disconnect the evaporation hose (A) and the fuel filler hose (B) from the fuel filler pipe assembly.

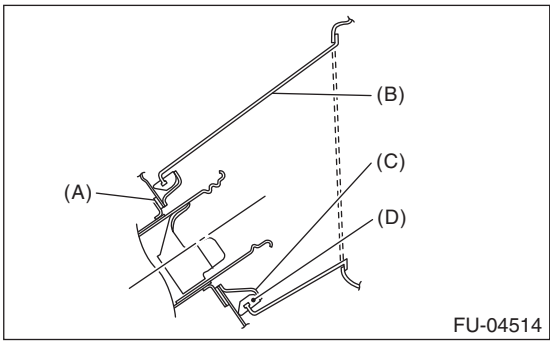


12) Remove the fuel filler pipe assembly from the underside of the vehicle.

B: INSTALLATION

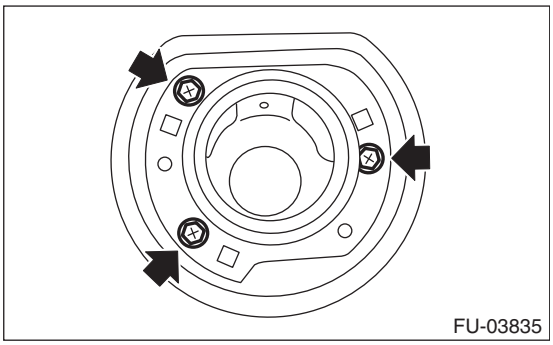
1) Open the fuel filler lid.
2) Attach the fuel filler pipe gasket to the fuel filler pipe assembly, and insert the fuel filler pipe assembly from inside of the rear fender.
3) Install the fuel filler ring to the fuel filler pipe assembly.

NOTE:
If the edges of rubber gasket are folded toward inside, straighten it with a flat tip screwdriver.



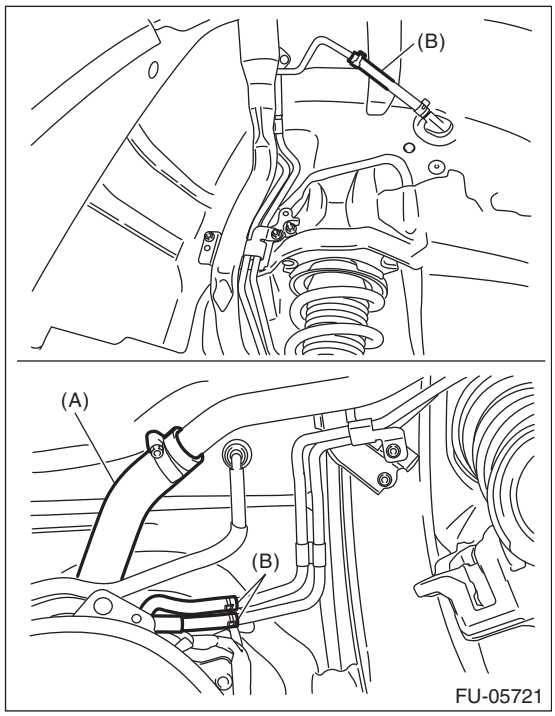
(A) Fuel filler pipe gasket
(B) Fuel saucer
(C) Fuel filler ring
(D) Rubber gasket

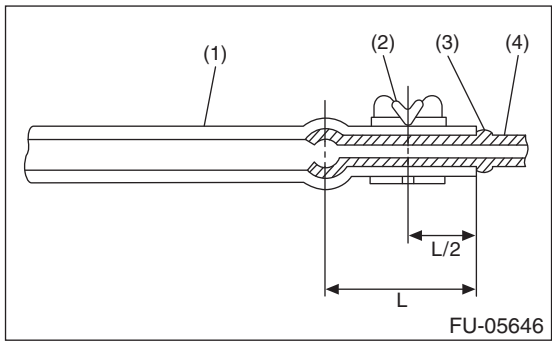
Tightening torque:
4.4 N·m (0.4 kgf-m, 3.2 ft-lb)



4) Securely insert the evaporation hose (A) and the fuel filler hose (B) until the hose ends contact the spool, then attach the clamp or clip as shown in the figure.

Tightening torque:
2.5 N·m (0.3 kgf-m, 1.8 ft-lb)

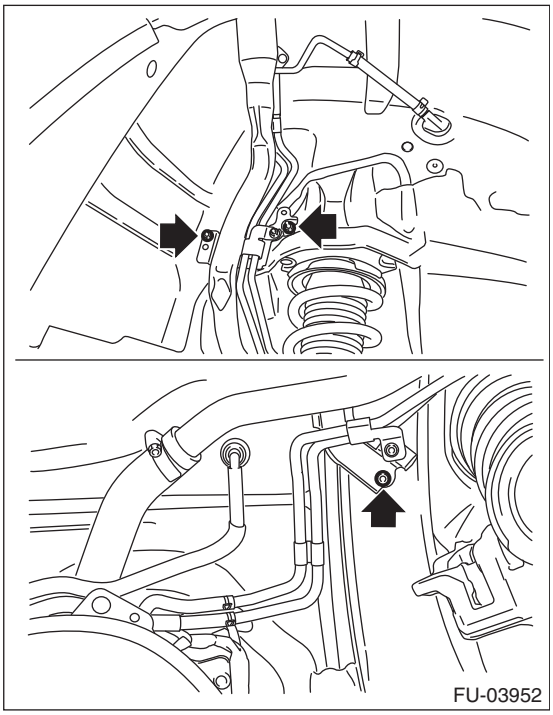




(1) Hose
(2) Clamp or clip
(3) Spool
(4) Pipe

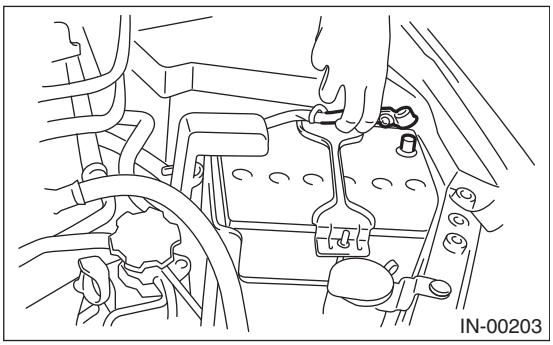
5) Install the fuel filler pipe assembly to vehicle body.

Tightening torque:
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)



6) Install the rear sub frame. <Ref. to RS-19, INSTALLATION, Rear Sub Frame.>
7) Install the rear mud guard RH. <Ref. to EI-28, INSTALLATION, Mud Guard.>
8) Lower the vehicle.
9) Install the rear wheel RH.

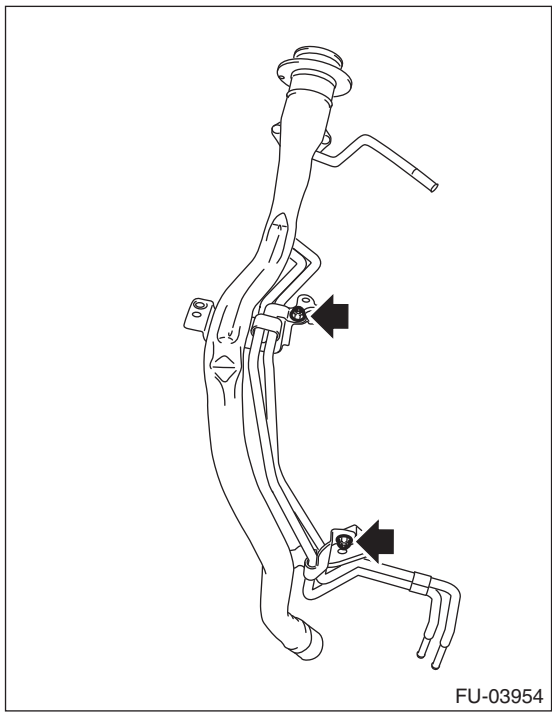
Tightening torque:
100 N·m (10.2 kgf-m, 73.8 ft-lb)
10) Connect the battery ground terminal.



11) Inspect the wheel alignment and adjust if necessary.
12) Perform reinitialization of the auto headlight beam leveler system. (model with auto headlight beam leveler) <Ref. to LI-16, PROCEDURE, Auto Headlight Beam Leveler System.>

C: DISASSEMBLY

1) Remove the shut valve from the fuel filler pipe. <Ref. to EC(H4DOTC)-22, REMOVAL, Shut Valve.>
2) Remove the evaporation pipe from the fuel filler pipe.



D: ASSEMBLY

Assemble in the reverse order of disassembly.

Tightening torque:
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)

E: INSPECTION

1) Check that the fuel filler pipe and evaporation pipe have no deformation, cracks or other damages.
2) Check that the hose has no cracks, damage or loose part.

26.Fuel Pump

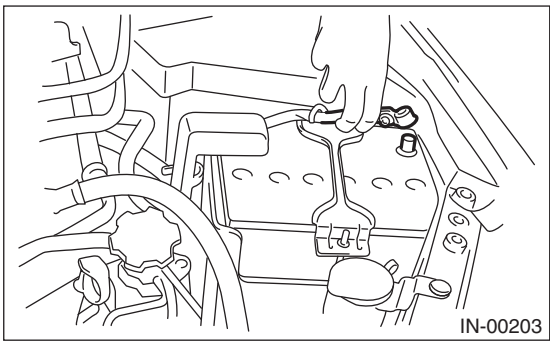
A: REMOVAL

WARNING:
Place "NO OPEN FLAMES" signs near the working area.

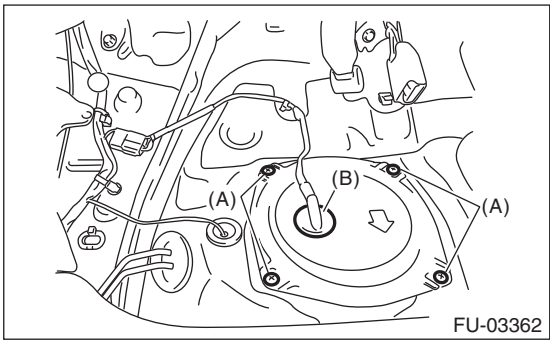
CAUTION:
- **Be careful not to spill fuel.**
- **If the fuel gauge indicates that two thirds or more of the fuel is remaining, be sure to drain fuel before starting work to avoid the fuel to spill.**

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

1) Release the fuel pressure. <Ref. to FU(H4DOTC)-65, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Drain fuel. <Ref. to FU(H4DOTC)-65, DRAINING FUEL (WITH SUBARU SELECT MONITOR), PROCEDURE, Fuel.>
3) Disconnect the ground cable from battery.

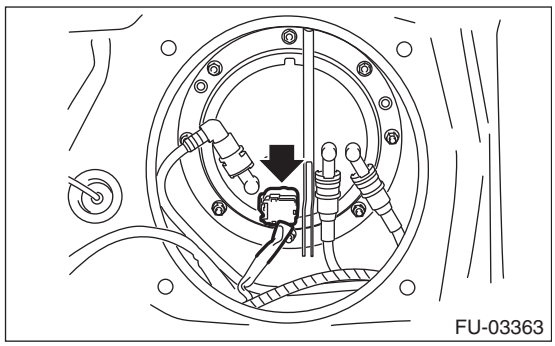

IN-00203

4) Remove the rear seat cushion. <Ref. to SE-16, REMOVAL, Rear Seat.>
5) Remove the service hole cover.
   (1) Remove the screws (A).
   (2) Push the grommet (B) down and remove service hole cover.

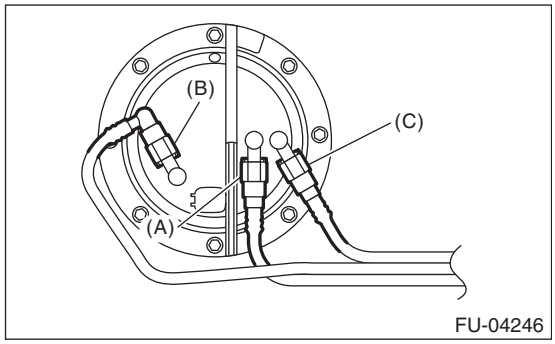


FU-03362

6) Disconnect the connector from fuel pump.

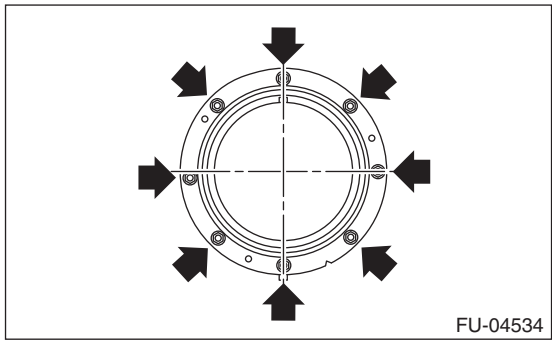

FU-03363

7) Disconnect the quick connectors of fuel delivery tube (A), fuel return tube (B), and jet pump tube (C). <Ref. to FU(H4DOTC)-88, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>



FU-04246

8) Remove the nuts which hold the fuel pump upper plate to the fuel tank.


FU-04534

9) Remove the fuel pump assembly from the fuel tank.

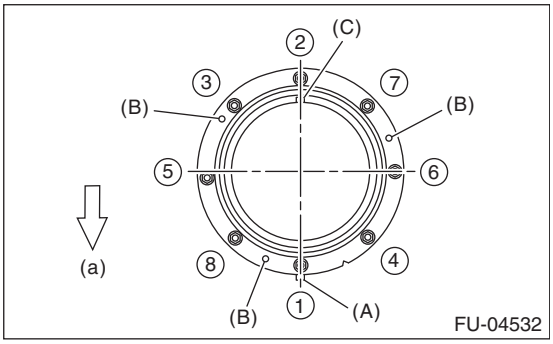
B: INSTALLATION

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.
- Align protrusion (A) of the gasket to the position shown in the figure.
- Insert the protrusion (B) of gasket to the fuel pump upper plate. (3 places)
- Align the protrusion (C) of fuel pump assembly with the cutout on the fuel pump upper plate.
- 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 (0.4 kgf-m, 3.2 ft-lb)

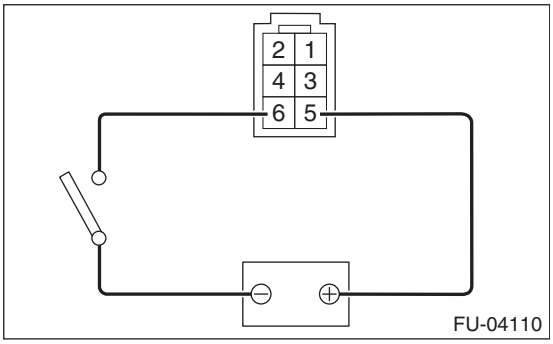


(a) Front side of vehicle

C: INSPECTION

1) Check that the fuel pump has no deformation, cracks or other damages.
2) Connect battery positive terminal to terminal No. 5 and battery ground terminal to terminal No. 6, and inspect the fuel pump operation.

WARNING:
- **Wipe off fuel completely.**
- **Keep the battery as far apart from fuel pump as possible.**
- **Do not run the fuel pump for a long time under non-load condition.**



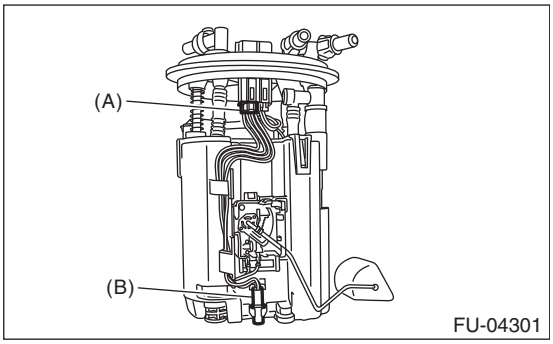
27.Fuel Level Sensor

A: REMOVAL

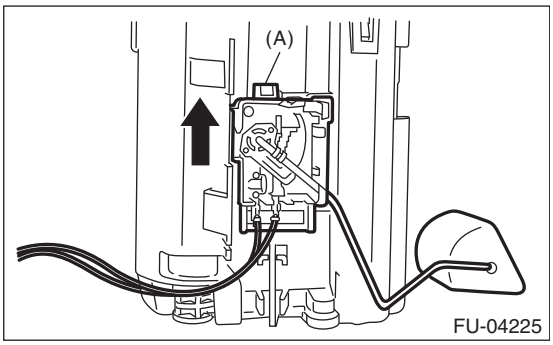
WARNING:
Place "NO OPEN FLAMES" signs near the working area.

CAUTION:
- **Be careful not to spill fuel.**
- **If the fuel gauge indicates that two thirds or more of the fuel is remaining, be sure to drain fuel before starting work to avoid the fuel to spill.**

NOTE:
The fuel level sensor is built in fuel pump assembly.
1) Remove the fuel pump assembly. <Ref. to FU(H4DOTC)-77, REMOVAL, Fuel Pump.>
2) Disconnect the connector (A) from the sub tank bracket assembly.
3) Remove the fuel temperature sensor (B) from sub tank.



4) Slide the fuel level sensor in the direction of the arrow and remove the fuel level sensor by pressing the claw (A) of the fuel level sensor.



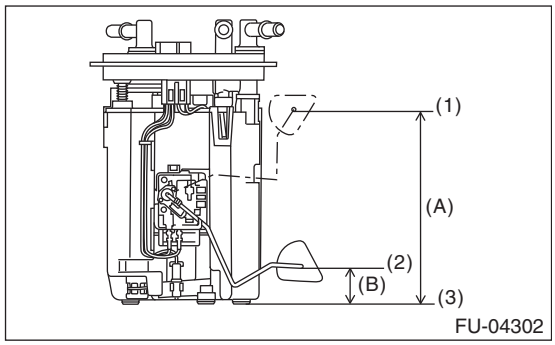
B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

1) Check that the fuel level sensor has no damage.
2) Measure the fuel level sensor float position.

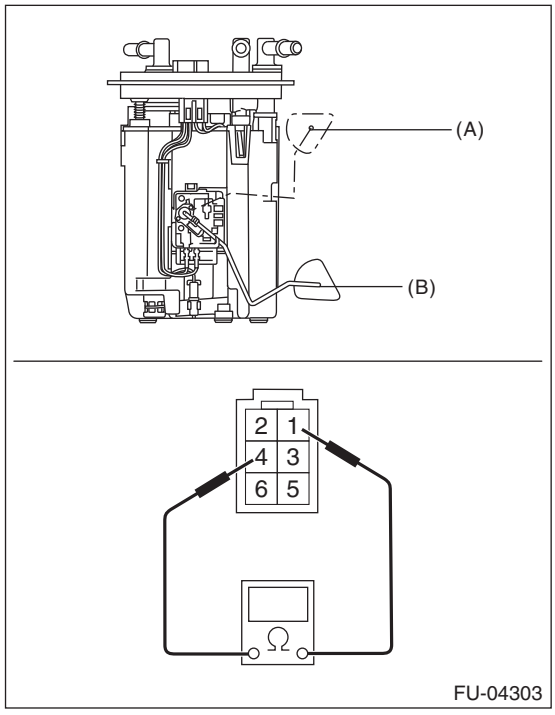
NOTE:
When inspecting the fuel level sensor, perform the work with it installed to the fuel pump.



(1) FULL
(2) EMPTY
(3) Fuel tank seating surface

Float position	Standard
FULL to Fuel tank seating surface (A)	135±4 mm (5.315±0.157 in)
EMPTY to Fuel tank seating surface (B)	23.7±4 mm (0.933±0.157 in)

3) Measure the resistance between fuel level sensor terminals.



Float position	Terminal No.	Standard
FULL (A)	1 and 4	2.0±1.0 Ω
EMPTY (B)		31.9±1.0 Ω

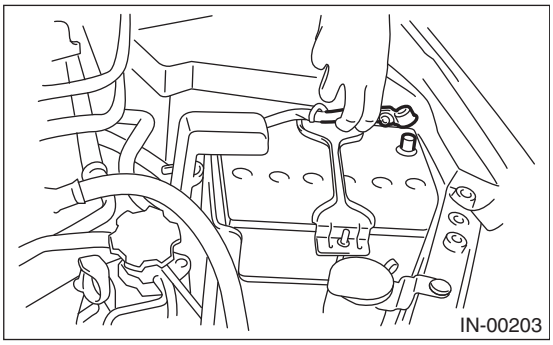
28.Fuel Sub Level Sensor

A: REMOVAL

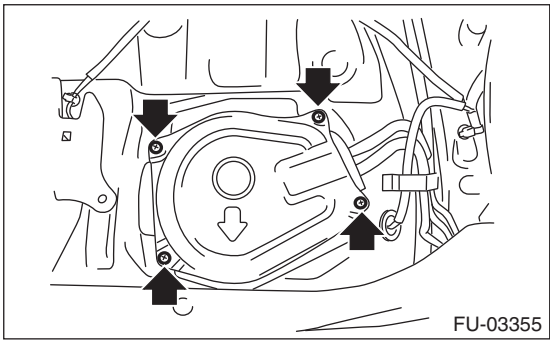
WARNING:
Place "NO OPEN FLAMES" signs near the working area.

CAUTION:
- **Be careful not to spill fuel.**
- **If the fuel gauge indicates that two thirds or more of the fuel is remaining, be sure to drain fuel before starting work to avoid the fuel to spill.**

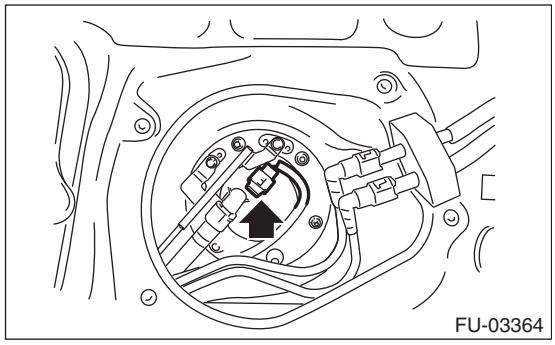
1) Release the fuel pressure. <Ref. to FU(H4DOTC)-65, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Drain fuel. <Ref. to FU(H4DOTC)-65, DRAINING FUEL (WITH SUBARU SELECT MONITOR), PROCEDURE, Fuel.>
3) Disconnect the ground cable from battery.


IN-00203

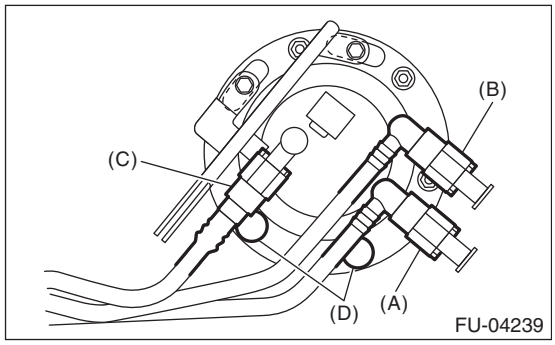
4) Remove the rear seat cushion. <Ref. to SE-16, REMOVAL, Rear Seat.>
5) Remove the service hole cover.


FU-03355

6) Disconnect the connector from the fuel sub level sensor.

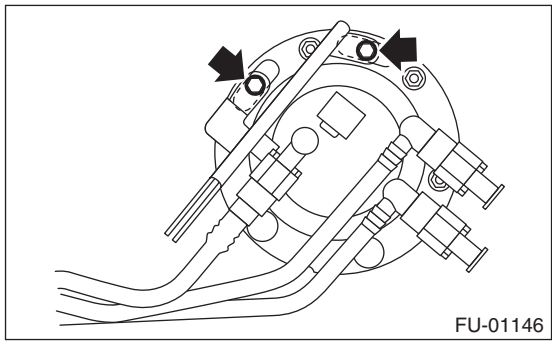

FU-03364

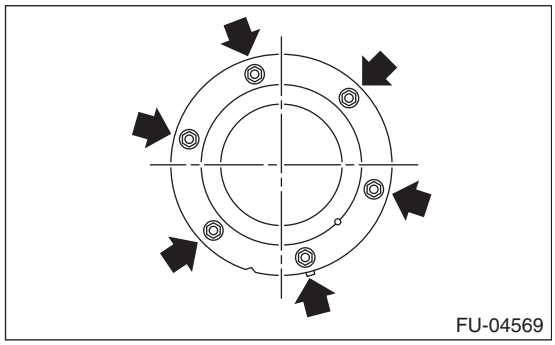
7) Disconnect the quick connectors of fuel delivery tube (A), fuel return tube (B), and jet pump tube (C). <Ref. to FU(H4DOTC)-88, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>
8) Remove the rubber cap (D) from the nut.



FU-04239

9) Remove the bolts and nuts which hold fuel sub level sensor protector and fuel sub level sensor upper plate to the fuel tank.


FU-01146


FU-04569

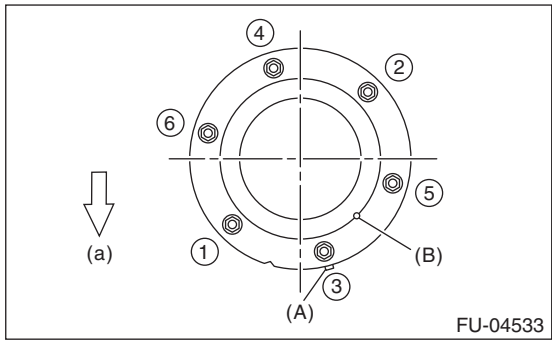
10) Remove the fuel sub level sensor from the fuel tank.

B: INSTALLATION

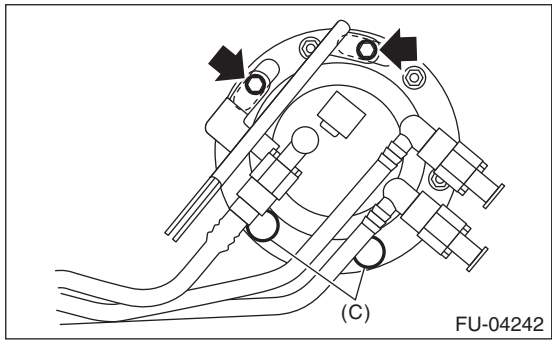
Install in the reverse order of removal while being careful of the following.
- Make sure the sealing portion is free from fuel or foreign matter before installation.
- Align protrusion (A) of the gasket to the position shown in the figure.
- Align protrusion (B) of the fuel sub level sensor to the cutout in the fuel sub level sensor upper plate.
- Tighten the nuts and bolts to the specified torque in the order as shown in the figure.
- After tightening, install the rubber cap (C) at the position shown in the figure.

NOTE:
- Use a new gasket.
- Do not forget to install rubber cap (C).

Tightening torque:
4.4 N·m (0.4 kgf-m, 3.2 ft-lb)

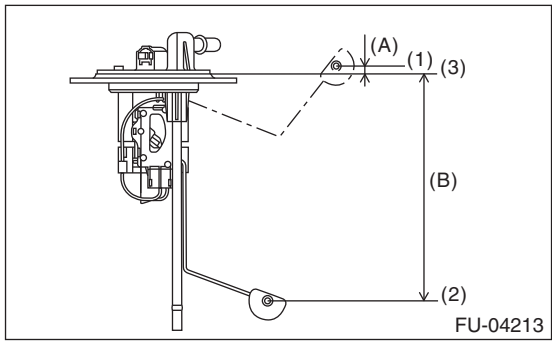


(a) Front side of vehicle



C: INSPECTION

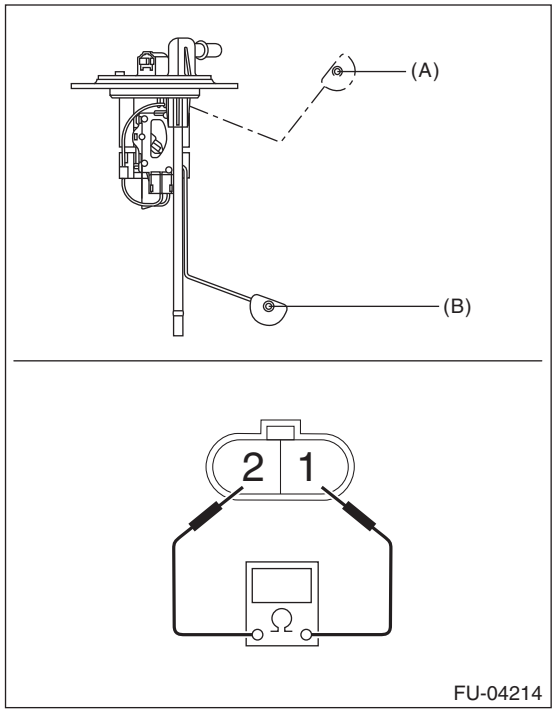
1) Check that the fuel sub level sensor has no damage.
2) Measure the fuel sub level sensor float position.



(1) FULL
(2) EMPTY
(3) Datum points

Float position	Standard
FULL to Datum point (A)	5.31±3.5 mm (0.209±0.138 in)
EMPTY to Datum point (B)	160.6±3.5 mm (6.323±0.138 in)

3) Measure the resistance between fuel sub level sensor terminals.



Float position	Terminal No.	Standard
FULL (A)	1 and 2	$2.0^{+0.5}_{-1.0}$ Ω
EMPTY (B)		62.1±1.0 Ω

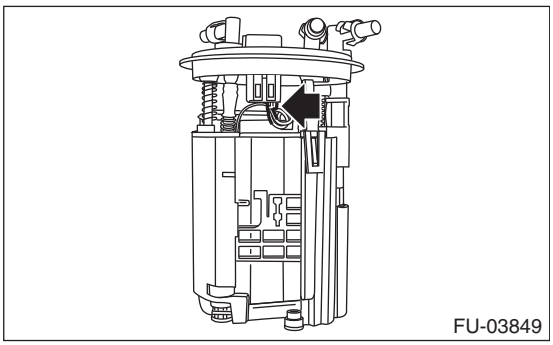
29.Fuel Filter

A: REMOVAL

WARNING:
Place "NO OPEN FLAMES" signs near the working area.

CAUTION:
- **Be careful not to spill fuel.**
- **If the fuel gauge indicates that two thirds or more of the fuel is remaining, be sure to drain fuel before starting work to avoid the fuel to spill.**
- **Be careful not to drop or apply any impact to the fuel pump during work. This may deteriorate its performance.**

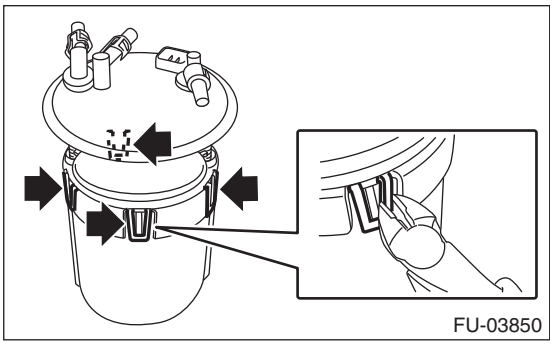
NOTE:
The fuel filter is built in fuel pump assembly.
1) Remove the fuel pump assembly. <Ref. to FU(H4DOTC)-77, REMOVAL, Fuel Pump.>
2) Remove the fuel level sensor and fuel temperature sensor. <Ref. to FU(H4DOTC)-79, REMOVAL, Fuel Level Sensor.>
3) Disconnect the pump assembly connector from sub tank bracket assembly.


FU-03849

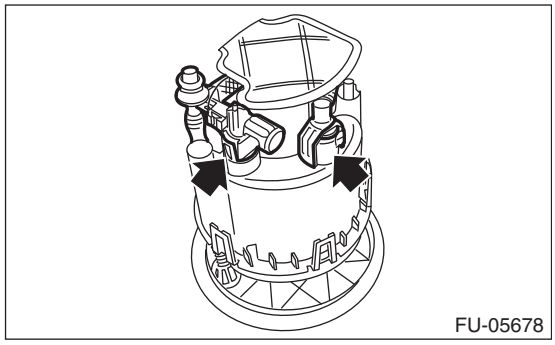
4) Cut off the tab holders connecting the sub tank bracket assembly and the sub tank in four locations, and separate the sub tank bracket assembly and the sub tank.

CAUTION:
Be careful not to damage the sub tank.

NOTE:
If the O-ring is remaining on the sub tank, remove.

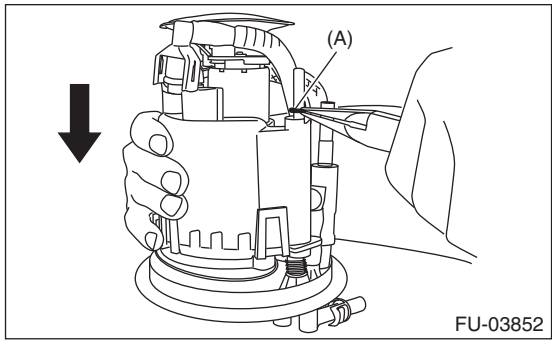

FU-03850

5) Disconnect two connectors of fuel delivery pipe from fuel filter assembly.


FU-05678

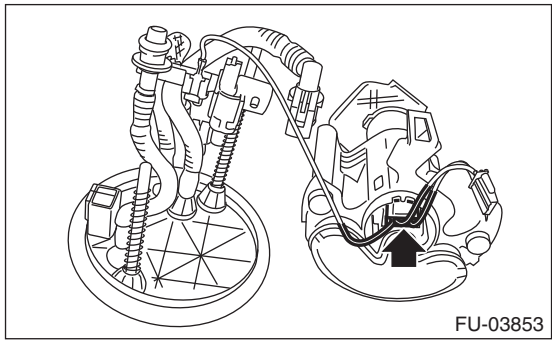
6) Push to compress the fuel filter assembly in the direction of the arrow, remove clip (A), and separate the sub tank bracket assembly and the fuel filter assembly.

CAUTION:
When separating the sub tank bracket assembly and the fuel filter assembly, be careful not to damage the ground wire.



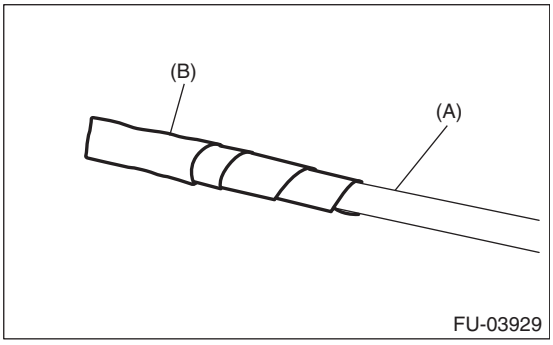
FU-03852

7) Disconnect the connector from the pump assembly.


FU-03853

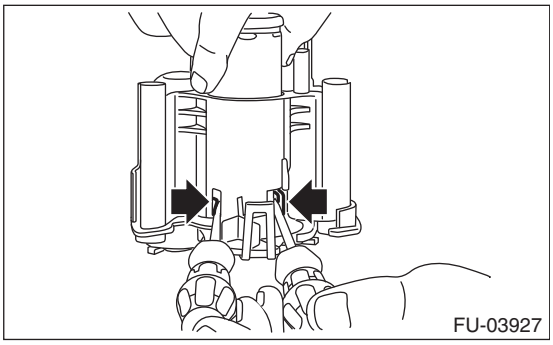
8) Lift the two tab holders connecting the pump assembly to the fuel filter using a flat tip screwdriver (with a shaft diameter of approx. 3 mm (0.12 in)), etc., and separate the fuel filter and pump assembly.

CAUTION:
• To prevent damaging the tabs of the pump assembly, wrap the tip of flat tip screwdriver (A), etc. with tape (B).



• Be careful not to drop or apply any impact to the pump assembly.

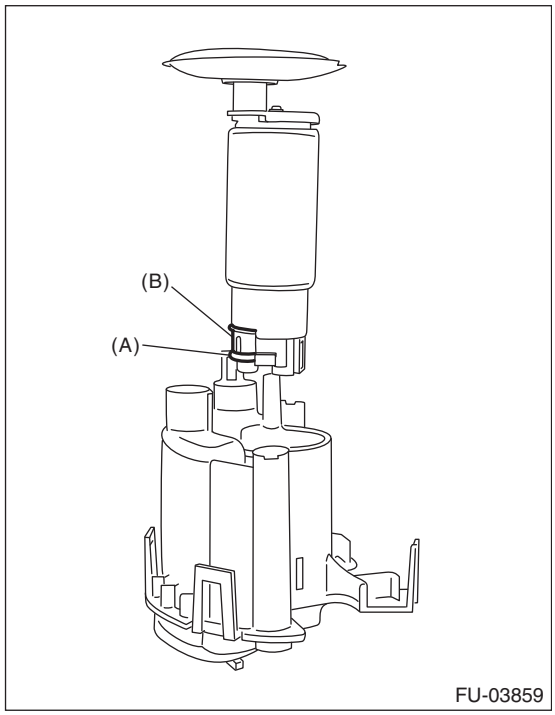
NOTE:
If the spacer and O-ring is remaining on the pump assembly, remove these.



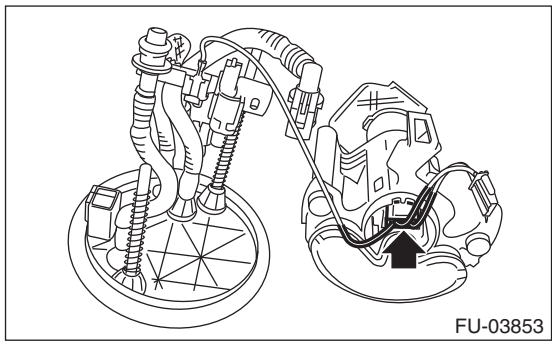
B: INSTALLATION

1) Assemble O-ring (A) and spacer (B) to the pump assembly and attach the pump assembly to the fuel filter.

NOTE:
- Use new O-rings (8 mm (0.31 in) inner diameter).
- Use a new spacer.
- Apply gasoline to the O-ring.
- Insert the pump assembly until a click is heard.

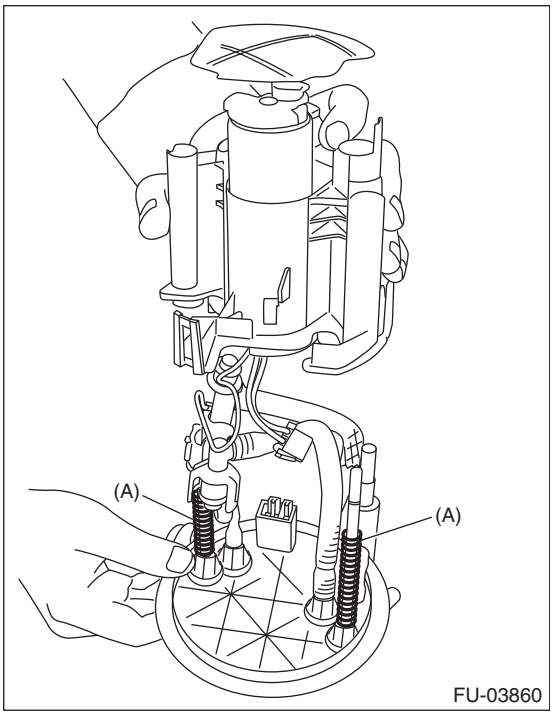


2) Connect the connector to the pump assembly.



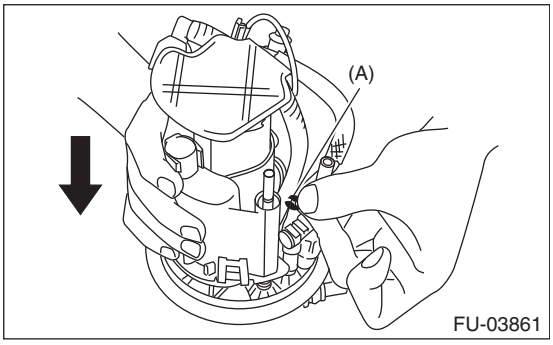
3) Attach spring (A) to the metal rod of the sub tank bracket assembly, and assemble the fuel filter assembly.

NOTE:
Use a new spring.



4) Push the fuel filter assembly in the direction of the arrow to compress, and attach clip (A).

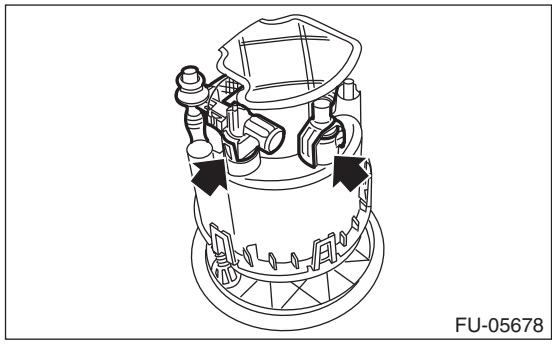
NOTE:
Use a new clip.



5) Connect the fuel piping connector to the fuel filter assembly.

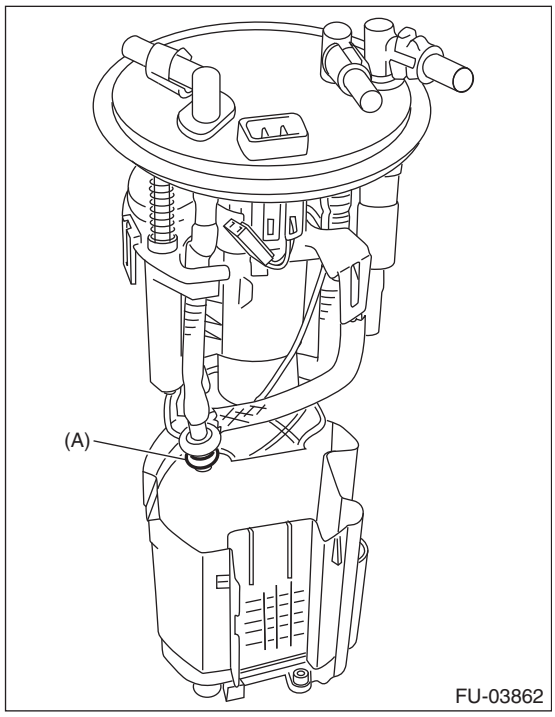
NOTE:
- Use new O-rings.
- Apply gasoline to the O-ring.
- The O-rings of the black and white connectors are identified by a difference in diameter. Be careful not to confuse the two during assembly.

O-ring inner diameter:
Black connector O-ring [Approx. 7 mm (0.28 in)]
White connector O-ring [Approx. 8 mm (0.31 in)]

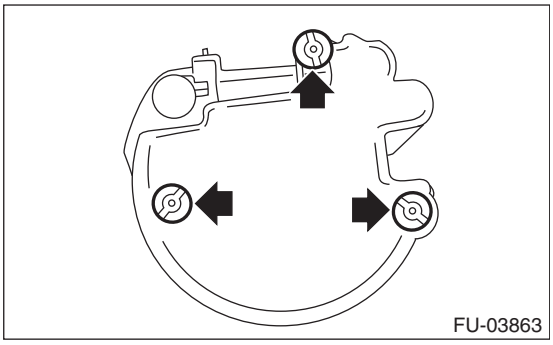


6) Attach the O-ring (A) to the fuel filter assembly, and attach the sub tank to the sub tank bracket assembly.

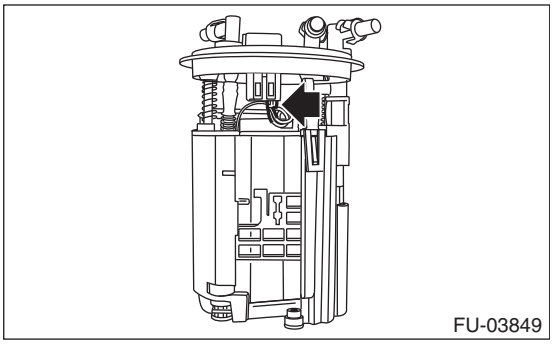
NOTE:
- Use new O-rings (8 mm (0.31 in) inner diameter).
- Apply gasoline to the O-ring.
- Insert the pump assembly until a “pop” is heard.



7) Replace the cushion on the rear face of the sub tank with a new cushion.



8) Connect the pump assembly connector to the sub tank bracket assembly.



9) Install the fuel level sensor and fuel temperature sensor. <Ref. to FU(H4DOTC)-79, INSTALLATION, Fuel Level Sensor.>

10) Inspect the fuel level sensor. <Ref. to FU(H4DOTC)-79, INSPECTION, Fuel Level Sensor.>

11) Install the fuel pump assembly. <Ref. to FU(H4DOTC)-78, INSTALLATION, Fuel Pump.>

30.Fuel Damper

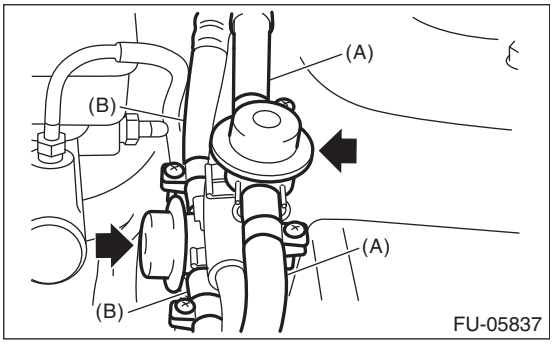
A: REMOVAL

WARNING:
Place "NO OPEN FLAMES" signs near the working area.

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)-65, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Disconnect the fuel delivery hose (A) and fuel return hose (B) from the fuel damper, and remove the fuel damper.

NOTE:
Be careful not to confuse the delivery side with the return side of the fuel damper.



B: INSTALLATION

Install in the reverse order of removal.

NOTE:
- Be careful not to confuse the delivery side with the return side of the fuel damper.
- For information about connecting fuel delivery hose and fuel return hose, refer to "Fuel Delivery, Return & Evaporation Lines". <Ref. to FU(H4DOTC)-92, CONNECTING THE FUEL DELIVERY HOSE, FUEL RETURN HOSE AND FUEL HOSE, INSTALLATION, Fuel Delivery, Return and Evaporation Lines.>

C: INSPECTION

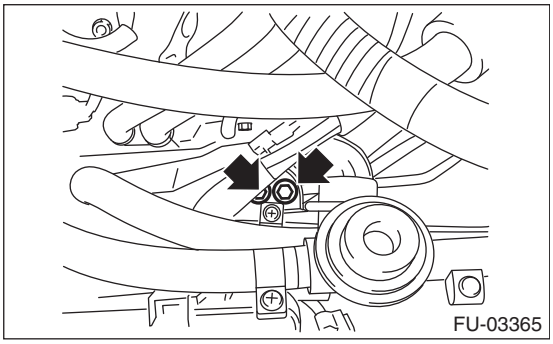
1) Check that the fuel damper has no deformation, cracks or other damages.
2) Check that the fuel hose has no cracks, damage or loose part.

31.Purge Damper

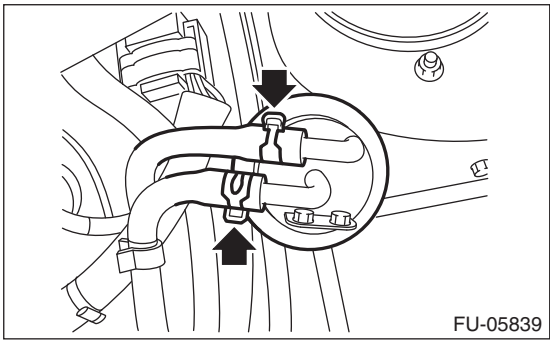
A: REMOVAL

WARNING:
Place "NO OPEN FLAMES" signs near the working area.

1) Remove the bolts which secure the purge damper to the purge damper bracket.



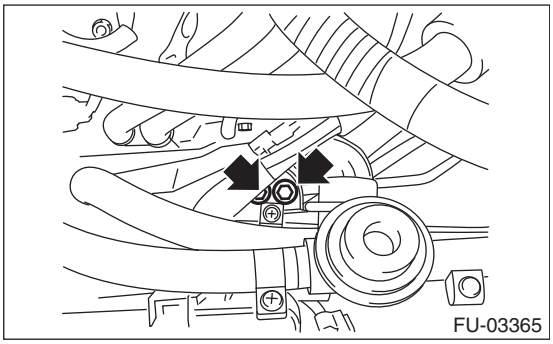
2) Disconnect the evaporation hose from the purge damper and remove the purge damper.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
13 N·m (1.3 kgf-m, 9.6 ft-lb)

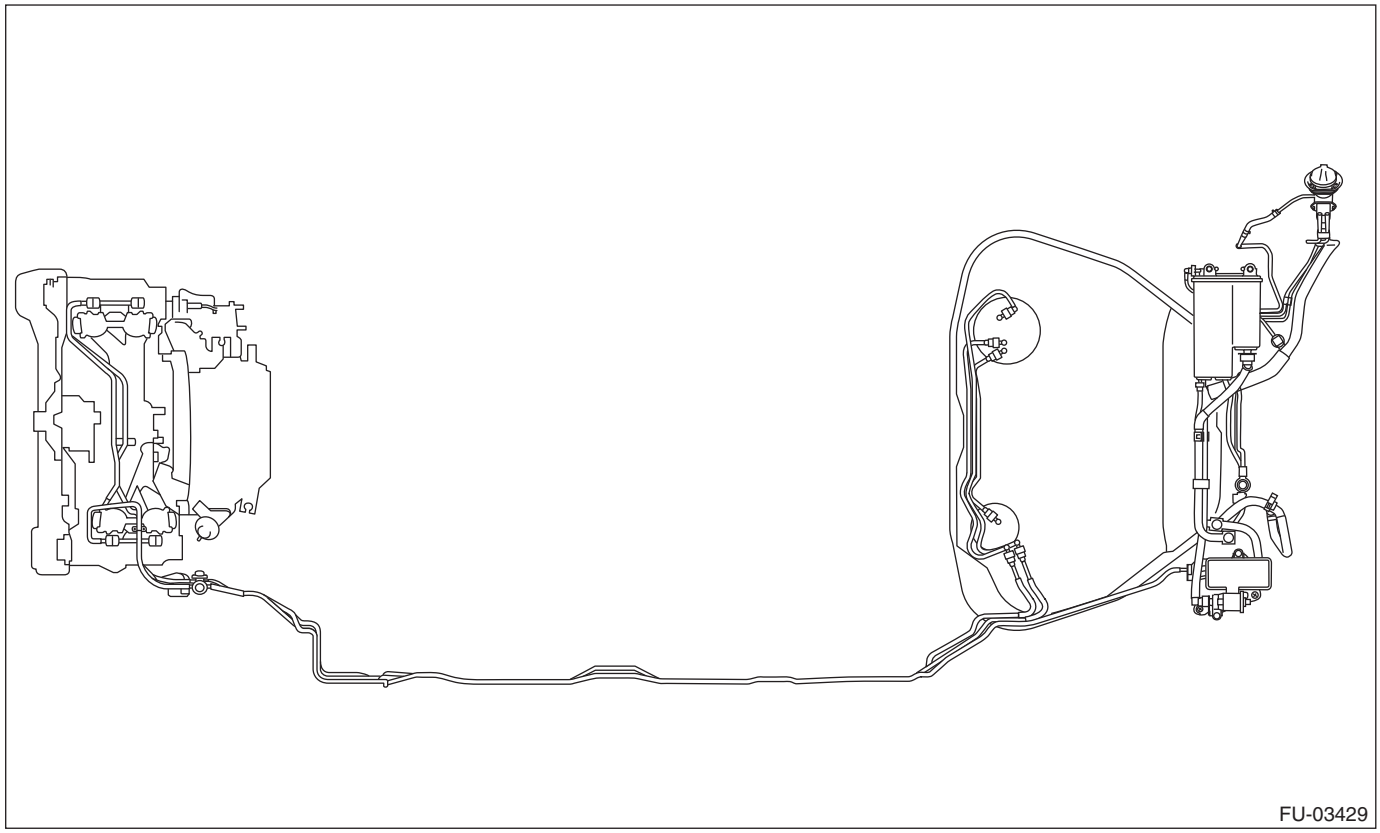


C: INSPECTION

1) Check that the purge damper has no deformation, cracks or other damages.
2) Check that the evaporation hose has no cracks, damage or loose part.

32.Fuel Delivery, Return and Evaporation Lines

A: REMOVAL



WARNING:
Place “NO OPEN FLAMES” signs near the working area.

CAUTION:
Be careful not to spill fuel.

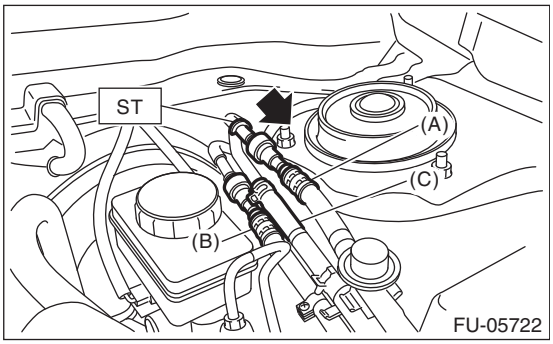
1) Release the fuel pressure. <Ref. to FU(H4DOTC)-65, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Open the fuel filler lid and remove the fuel filler cap.
3) Remove the floor mat. <Ref. to EI-68, REMOVAL, Floor Mat.>
4) In the engine compartment, disconnect the fuel delivery hoses, fuel return hoses and evaporation hoses.

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

(1) Set the ST to the fuel pipe.

ST 42099AE000 QUICK CONNECTOR RELEASE

(2) Disconnect the quick connector of the fuel delivery hose and fuel return hose by pushing the ST in the direction of the arrow.
(3) Remove the clip and disconnect the evaporation hose from the fuel pipe.



(A) Fuel delivery hose
(B) Fuel return hose
(C) Evaporation hose

5) Remove the canister. <Ref. to EC(H4DOTC)-7, REMOVAL, Canister.>
6) Remove the fuel tank. <Ref. to FU(H4DOTC)-67, REMOVAL, Fuel Tank.>
7) Remove the fuel pipe assembly from vehicle.
8) Disconnect the quick connector, then disconnect the fuel delivery tube, fuel return tube and jet pump tube from the fuel tank.

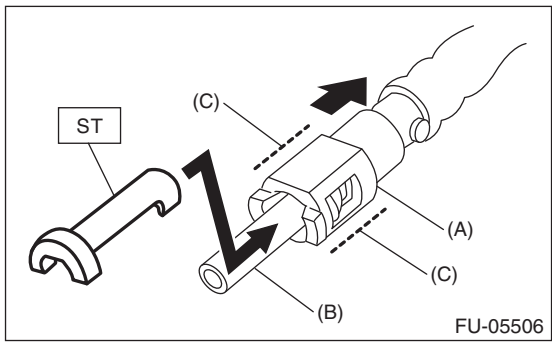
• When using ST

1. Attach ST to the pipe and push ST in the direction of arrow mark to disconnect the quick connector.

ST 42099AE000 QUICK CONNECTOR RELEASE

CAUTION:
• Be careful not to spill fuel.
• Catch the fuel from hoses using a container or cloth.
• To disconnect the connector, hold (C) shown in the figure and pull in axial direction.
• If the connector and pipe are sticking to each other, push and pull the connector with ST pushed, and then pull the connector after it starts moving freely.
• When disconnecting the connector, do not bend or twist the tube forcibly. If the tube is bent, replace with a new part.

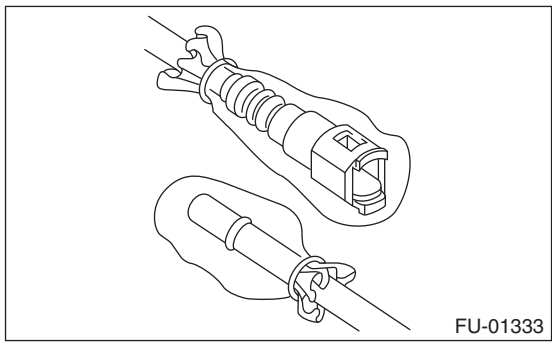
NOTE:
Clean the pipe and quick connector, if they are covered with dust.



(A) Quick connector
(B) Pipe
(C) Connector holding position

2. To prevent from damaging or entering foreign matter, wrap the pipes and quick connectors with plastic bag etc.

CAUTION:
When reusing the retainer, do not disconnect the retainer from the connector.

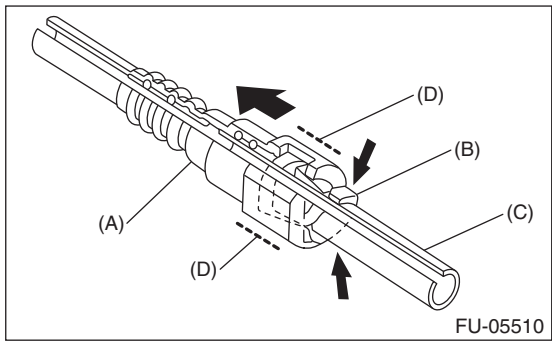


• When not using ST

1. Push the retainer in the direction of the arrow, disconnect the quick connector from pipe.

CAUTION:
- **Be careful not to spill fuel.**
- **Catch the fuel from hoses using a container or cloth.**
- **To disconnect the connector, hold (D) shown in the figure and pull in axial direction.**
- **If the connector and pipe are sticking to each other, push and pull the connector with the retainer pushed in the direction of the arrow, and then pull the connector after it starts moving freely.**
- **When disconnecting the connector, do not bend or twist the tube forcibly. If the tube is bent, replace with a new part.**

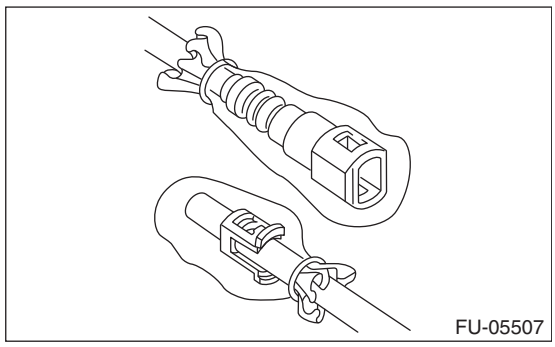
NOTE:
Clean the pipe and quick connector, if they are covered with dust.



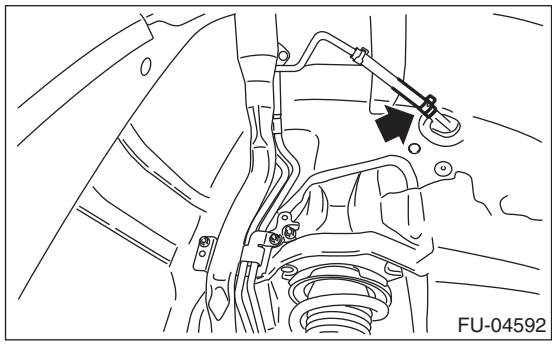
(A) Quick connector
(B) Retainer
(C) Pipe
(D) Connector holding position

2. To prevent from damaging or entering foreign matter, wrap the pipes and quick connectors with plastic bag etc.

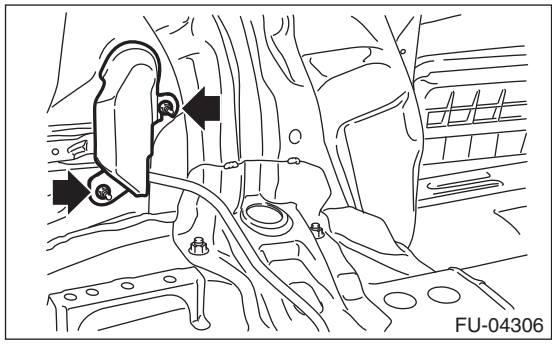
CAUTION:
When reusing the retainer, do not disconnect the retainer from the pipe.



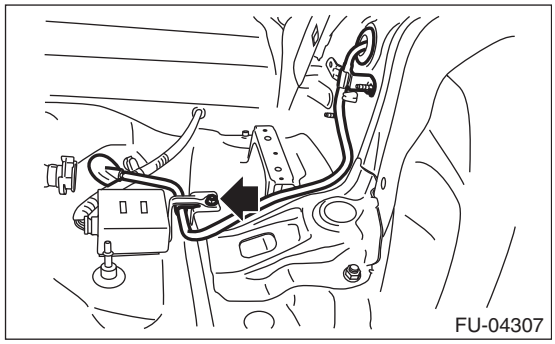
9) Remove the evaporation pipe.
(1) Remove the rear mud guard RH. <Ref. to EI-28, REMOVAL, Mud Guard.>
(2) Disconnect the evaporation hose.



(3) Remove the right side rear quarter trim. <Ref. to EI-60, REMOVAL, Rear Quarter Trim.>
(4) Remove the evaporation pipe protector.



(5) Remove the evaporation pipe from vehicle.



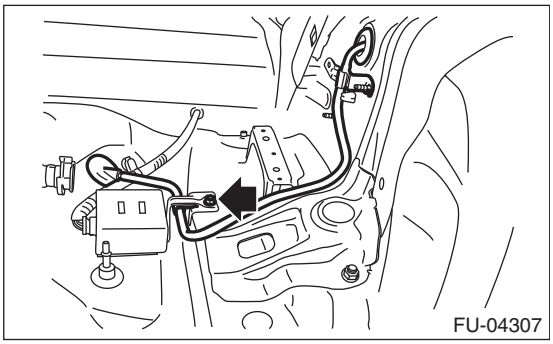
B: INSTALLATION

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

1. EVAPORATION PIPE INSTALLATION

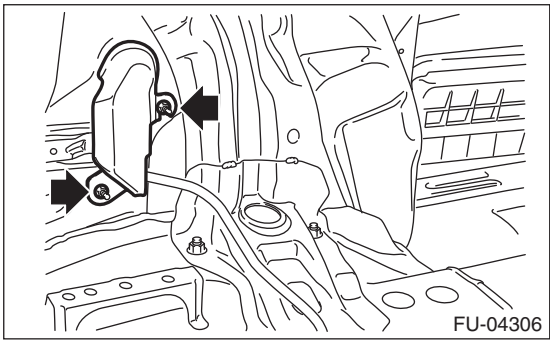
1) Install the evaporation pipe to the vehicle.

Tightening torque:
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)

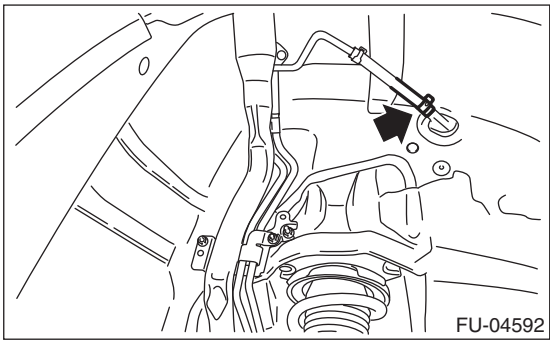


2) Install the evaporation pipe protector.

Tightening torque:
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)



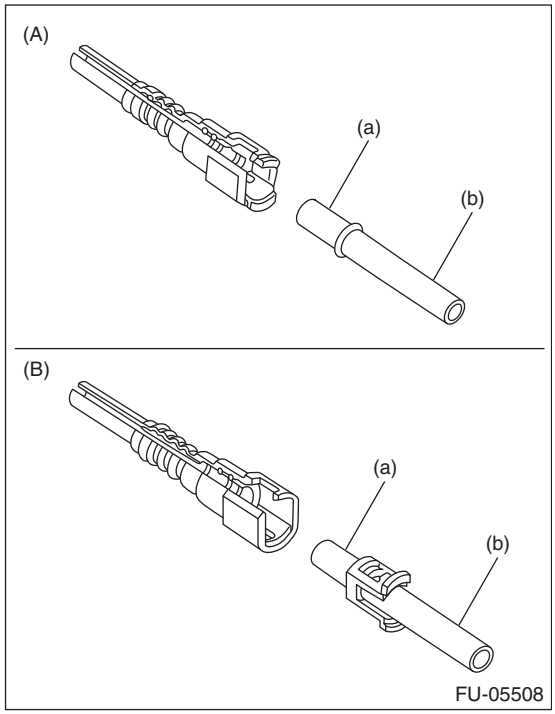
3) Install the right side rear quarter trim. <Ref. to EI-61, INSTALLATION, Rear Quarter Trim.>
4) Connect the evaporation hose.



5) Install the rear mud guard RH. <Ref. to EI-28, INSTALLATION, Mud Guard.>

2. CONNECTING THE FUEL LINE QUICK CONNECTOR

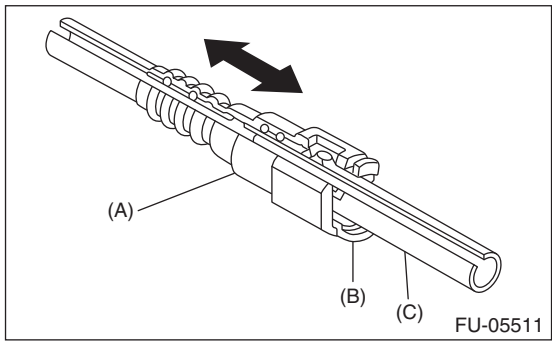
CAUTION:
• Make sure there are no damage or dust on connections. If necessary, clean seal surface of pipe.



(A) When removed using the ST
(B) When removed without using the ST
(a) Seal surface
(b) Pipe

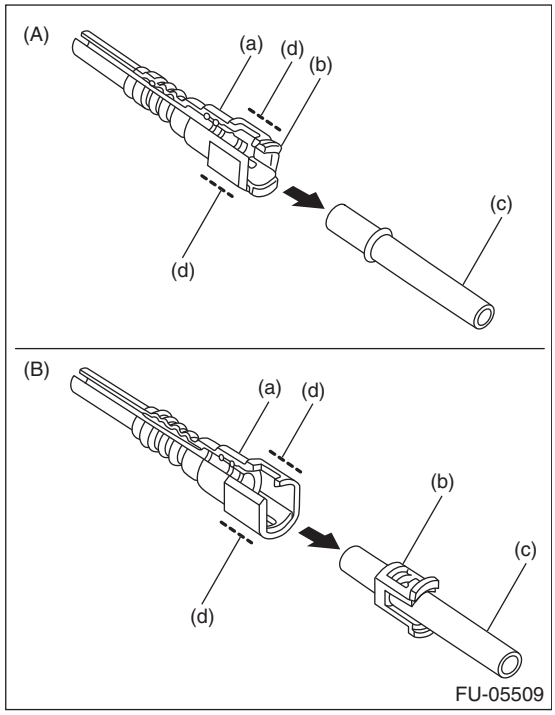
• When reusing the retainer, make sure that neither scratches nor deformation exist on the retainer. If it is faulty, use a new part.
1) Connect the quick connector to pipe.

CAUTION:
• Make sure that the quick connector is securely connected.



(A) Quick connector
(B) Retainer
(C) Pipe

• Make sure the two retainer pawls are engaged in their mating positions in the quick connector.
• Be sure to inspect tubes and their connections for any leakage of fuel.
• To connect the connector, hold (d) shown in the figure and push in axial direction.
• When connecting the connector, do not bend or twist the tube forcibly. If the tube is bent, replace with a new part.



(A) When removed using the ST
(B) When removed without using the ST
(a) Quick connector
(b) Retainer
(c) Pipe
(d) Connector holding position

3. CONNECTING THE FUEL DELIVERY HOSE, FUEL RETURN HOSE AND FUEL HOSE

Connect the fuel delivery hose, fuel return hose, and fuel hose as shown in the figure.

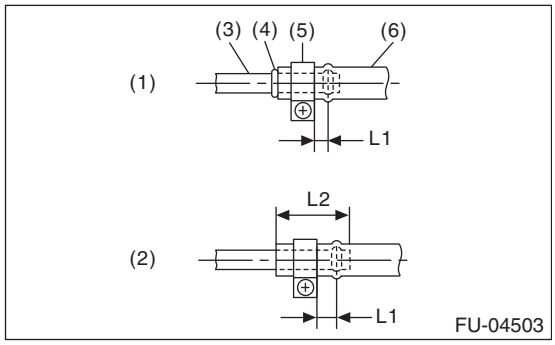
CAUTION:
• If the connection portion has a spool or stopper, do not allow the end of the hose to bend or ride over by inserting the hose too deep.
• Be sure to inspect hoses and their connections for any leakage of fuel.

NOTE:
Use new fuel delivery hose, fuel return hose, and fuel hose.

Tightening torque:
1.25 N·m (0.1 kgf-m, 0.9 ft-lb)

L1: 2.5±1.5 mm (0.098±0.059 in)

L2: 22.5±2.5 mm (0.886±0.098 in)

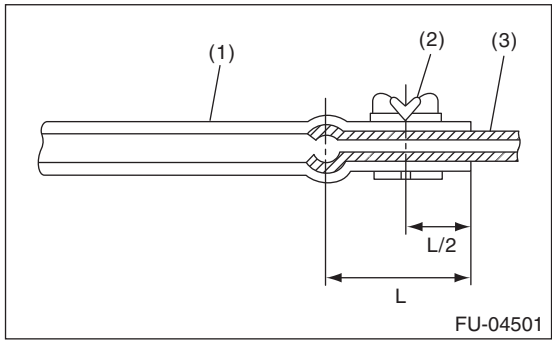


(1) When there is a spool or bump
(2) When there is no spool or bump
(3) Pipe
(4) Spool or bump
(5) Clamp
(6) Hose

4. EVAPORATION HOSE CONNECTION

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

L = 17.5±2.5 mm (0.689±0.098 in)



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

C: INSPECTION

1) Check that the fuel pipe has no deformation, cracks or other damages.
2) Check that the hose and tube have no cracks, damage or loose part.

33.Fuel System Trouble in General

A: INSPECTION

Trouble	Possible cause	Corrective action
Insufficient fuel supply to injector	a. 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 parts.
	b. Decline of fuel pump function	Replace the fuel pump.
	c. Clogged fuel filter	Replace the fuel filter. Clean or replace the fuel tank if necessary.
	d. Clogged or bent pipe, hose or tube of fuel line	Clean, correct or replace the pipe, hose or tube of the fuel line.
	e. Air is mixed in fuel system.	Check the fuel line connections, and repair or replace the defective part.
	f. Damaged diaphragm of pressure regulator	Replace the pressure regulator.
Leakage or run-out of fuel	a. Loose connection in pipe, hose or tube of fuel line	Check the fuel line connections, and repair or replace the defective part.
	b. Cracks in pipe, hose or tube of fuel line	Replace the pipe, hose or tube of the fuel line.
	c. Cracks or defective welded part of fuel tank	Replace the fuel tank.
	d. Clogged or bent pipe, hose or tube of fuel line	Clean, correct or replace the pipe, hose or tube of the fuel line.
Gasoline smell inside of compartment	a. Loose connection in pipe, hose or tube of fuel line	Check the fuel line connections, and repair or replace the defective part.
	b. Defective gasket of fuel saucer or fuel filler pipe assembly	Correct or replace the gasket.
	c. Defective canister	Replace the canister.
Defective fuel gauge	a. Defective operation of fuel level sensor	Replace the fuel level sensor.
	b. Defective operation of combination meter	Replace the combination meter.
Noise	a. Big operation noise or vibration from fuel pump	Replace the fuel pump.

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 to 0°C (32°F) or less 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.

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

EC(H4DOTC)

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8.	Fuel Sub Level Sensor	17
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16.	PCV Valve	27
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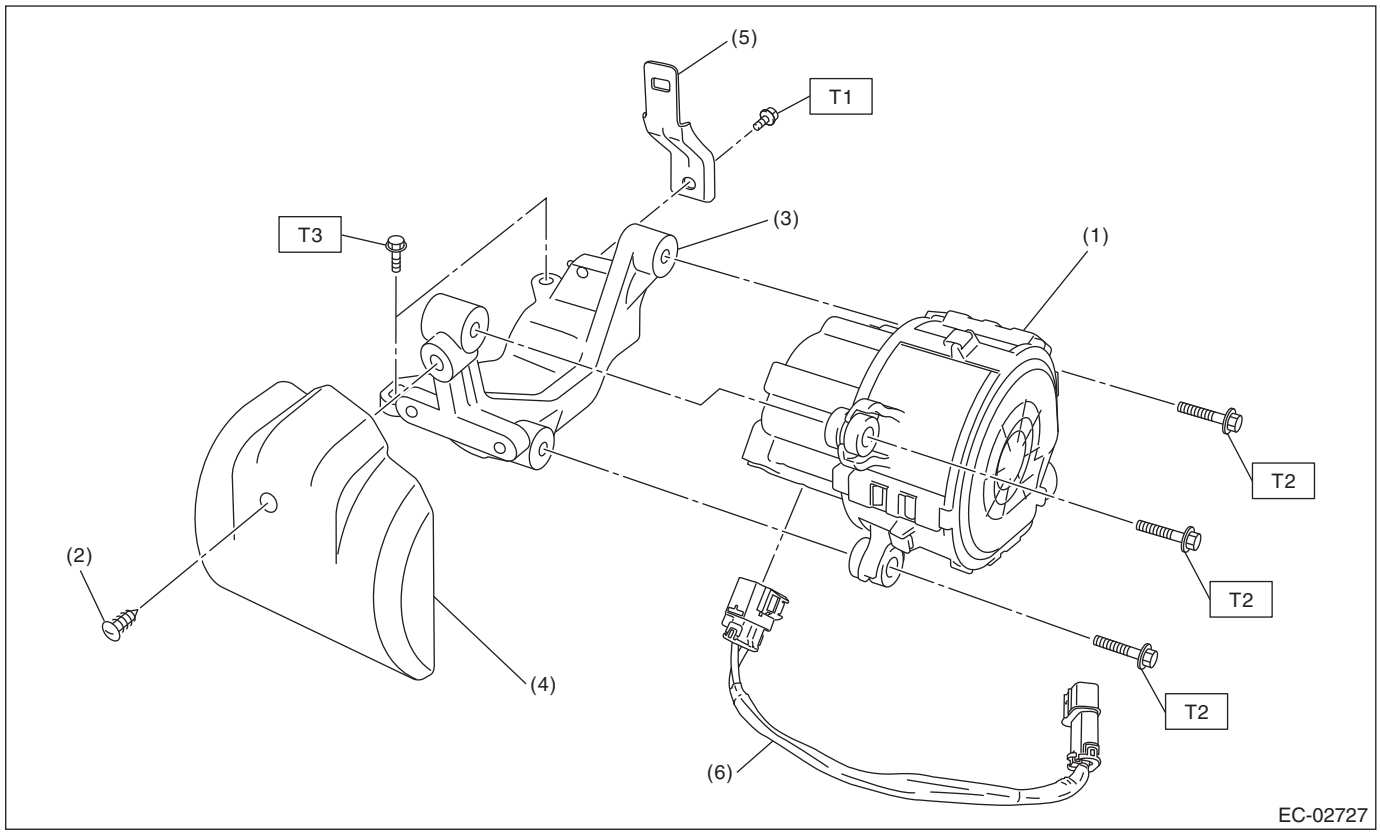
18.	Secondary Air Combination Valve	30

1. General Description

A: COMPONENT

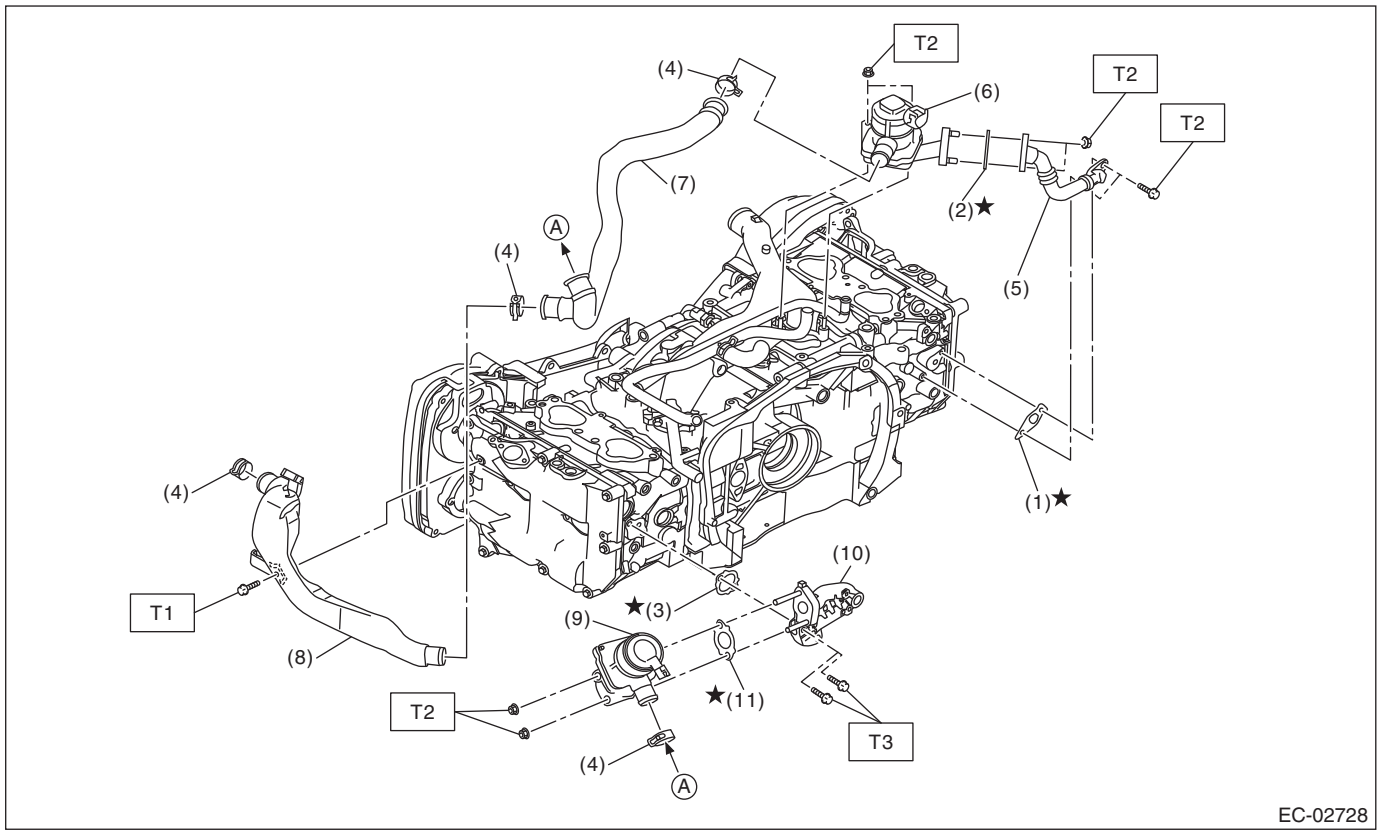
1. SECONDARY AIR PUMP



(1)	Secondary air pump	(4)	Secondary air pump cover
(2)	Clip	(5)	Harness stay
(3)	Secondary air pump bracket	(6)	Secondary air pump harness

Tightening torque:N·m (kgf-m, ft-lb)
T1: 6.4 (0.7, 4.7)
T2: 9 (0.9, 6.6)
T3: 19 (1.9, 14.0)

2. SECONDARY AIR COMBINATION VALVE



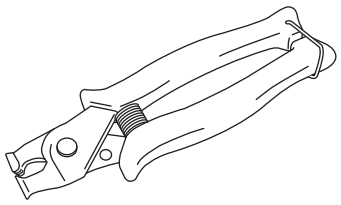
(1)	Gasket	(7)	Air duct A	***Tightening torque:N·m (kgf-m, ft-lb)***
(2)	Gasket	(8)	Air duct B	***T1: 6.4 (0.7, 4.7)***
(3)	Gasket	(9)	Secondary air combination valve LH	***T2: 9 (0.9, 6.6)***
(4)	Clip	(10)	Secondary air pipe LH	***T3: 19 (1.9, 14.0)***
(5)	Secondary air pipe RH	(11)	Gasket	
(6)	Secondary air combination valve RH			

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	• Used for removing and installing the PCV hose. • This tool is made by the French company CAILLAU. (code) 54.0.000.205 To make this easier to obtain, it has been provided with a tool number.

2. GENERAL TOOL

TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance and voltage.
Mighty Vac	Used for inspecting the fuel tank pressure sensor.

2. Front Catalytic Converter

A: REMOVAL

The front catalytic converter is integrated into the center exhaust pipe (front). Refer to “Center Exhaust Pipe” for removal procedures. <Ref. to EX(H4DOTC)-7, REMOVAL, Center Exhaust Pipe.>

B: INSTALLATION

The front catalytic converter is integrated into the center exhaust pipe (front). Refer to “Center Exhaust Pipe” for installation procedures. <Ref. to EX(H4DOTC)-8, INSTALLATION, Center Exhaust Pipe.>

C: INSPECTION

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

3. Rear Catalytic Converter

A: REMOVAL

The rear catalytic converter is integrated into the center exhaust pipe (rear). Refer to “Center Exhaust Pipe” for removal procedures. <Ref. to EX(H4DOTC)-7, REMOVAL, Center Exhaust Pipe.>

B: INSTALLATION

The rear catalytic converter is integrated into the center exhaust pipe (rear). Refer to “Center Exhaust Pipe” for installation procedures. <Ref. to EX(H4DOTC)-8, INSTALLATION, Center Exhaust Pipe.>

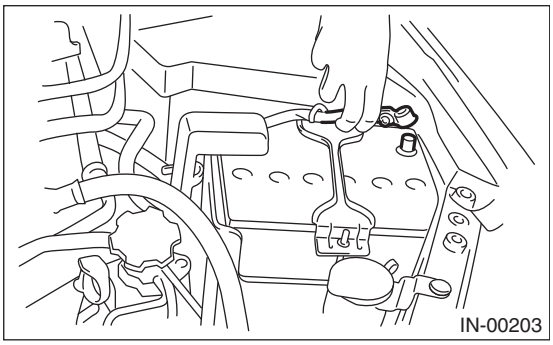
C: INSPECTION

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

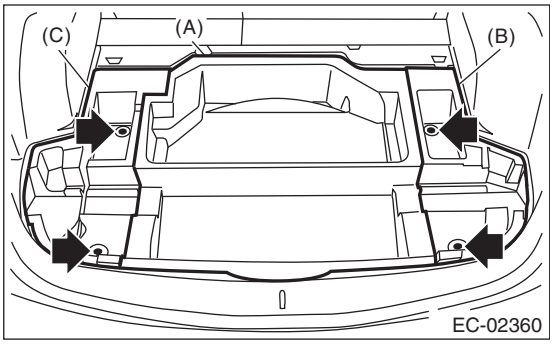
4. Canister

A: REMOVAL

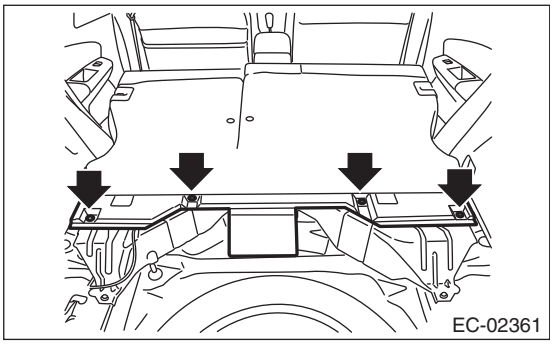
1) Disconnect the ground cable from battery.



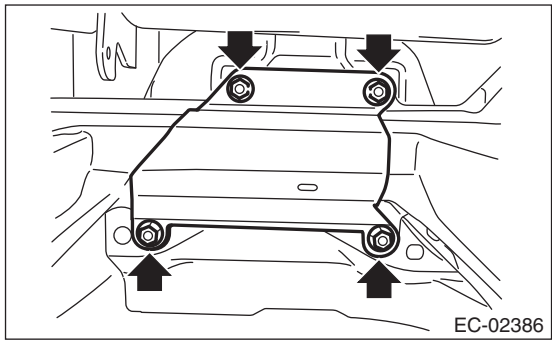
2) Open the rear gate, and remove the luggage floor mat.
3) Remove the center sub trunk (A) (model with center sub trunk), and remove the sub trunk RH (B) and sub trunk LH (C) fixed by clips.



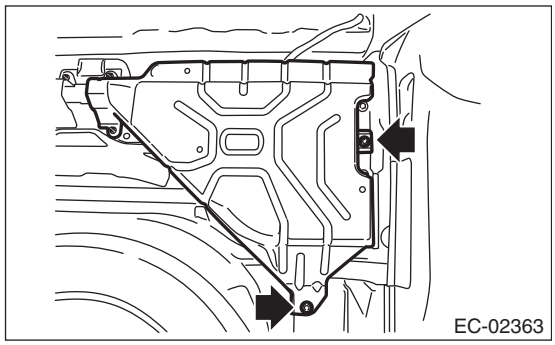
4) Tilt the rear seat backrest forward.
5) Remove the clips that is holding the rear seat backrest cover on the canister cover, and turn over the rear seat backrest cover toward the front side of the vehicle.



6) Remove the center canister cover.

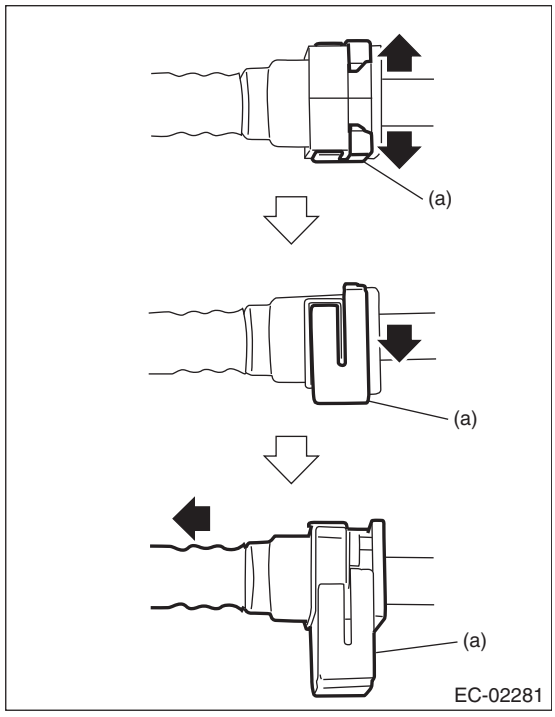


7) Remove the canister cover RH.

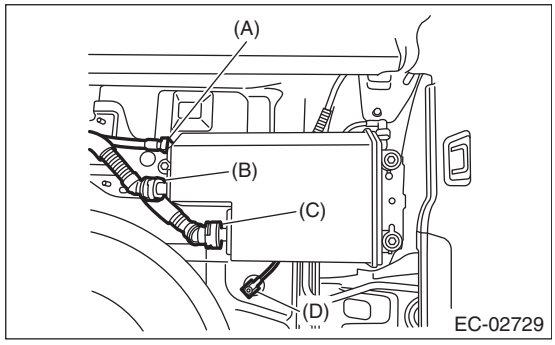


8) Disconnect the purge tube (A), vent tube (B), drain tube A (C) and PCV drain tube (D).

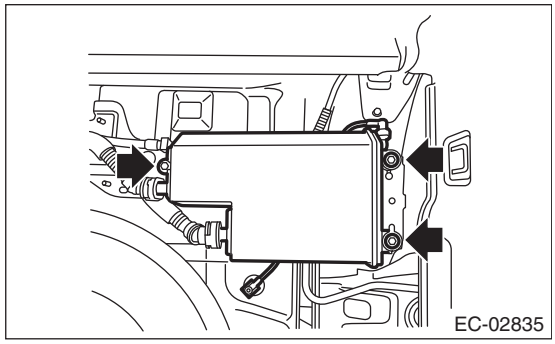
NOTE:
Disconnect the quick connector as shown in the figure.



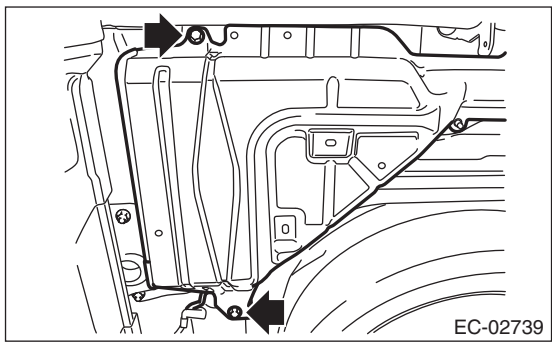
(a) Retainer



9) Remove the canister.

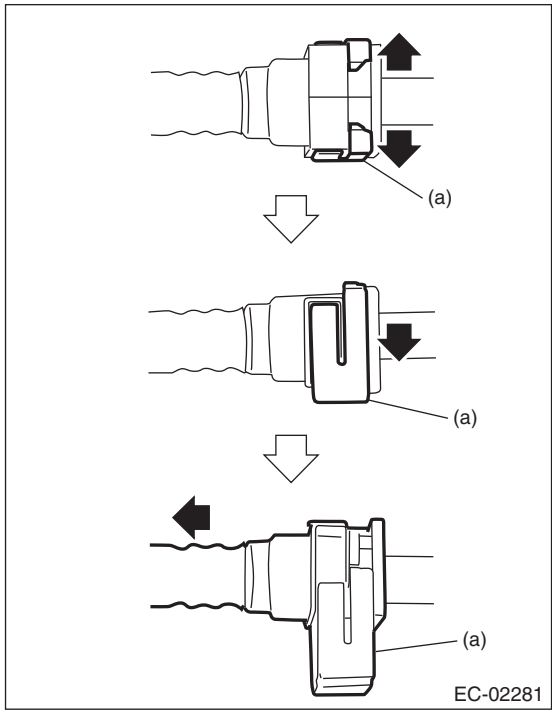


10) Remove the canister cover LH.

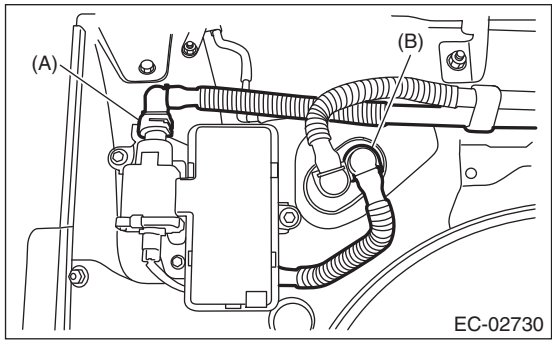


11) Disconnect drain tube A (A) and drain tube B (B).

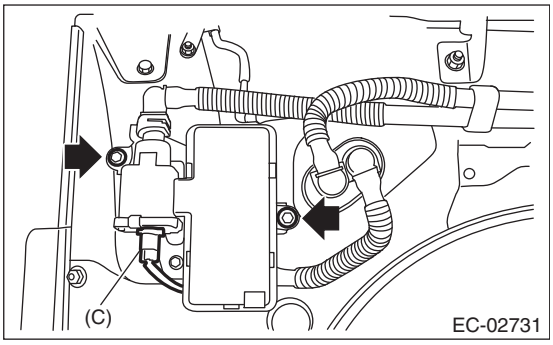
NOTE:
Disconnect the quick connector as shown in the figure.



(a) Retainer

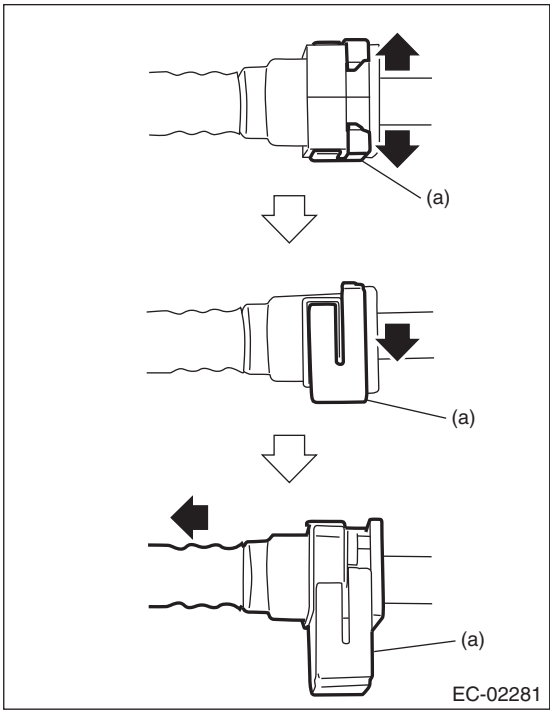


12) Disconnect connector (C) from the drain valve, and remove the drain valve.

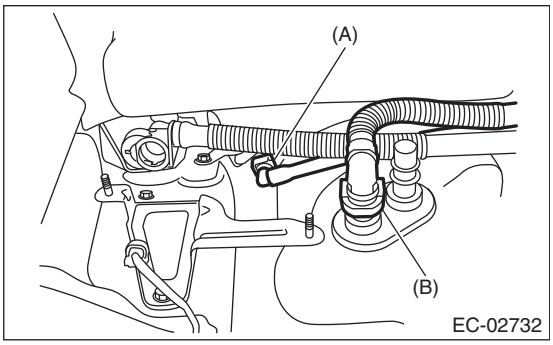


13) Disconnect purge tube (A) and vent tube (B).

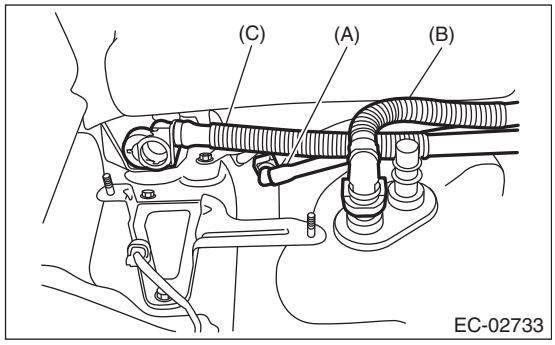
NOTE:
Disconnect the quick connector as shown in the figure.



(a) Retainer



14) Remove purge tube (A), vent tube (B), and drain tube A (C).



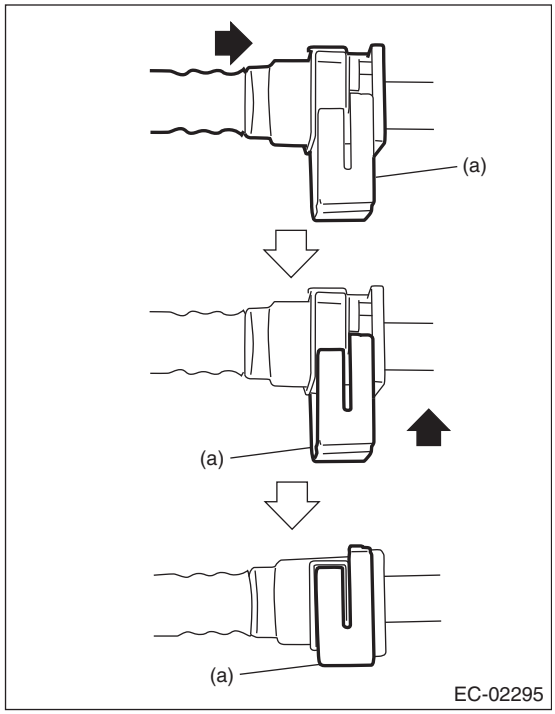
B: INSTALLATION

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

- Connect the quick connector as shown in the figure.

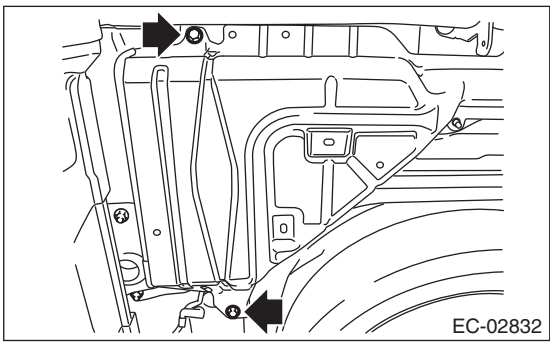
CAUTION:

- **Check that there is no damage or dust on the quick connector. If necessary, clean the seal surface of the pipe.**
- **When connecting the quick connector, securely insert the pipe all the way before locking the retainer.**
- **If it is not possible to perform the push lock operation of the retainer, recheck whether the pipe is securely inserted.**
- **Make sure that the quick connector is securely connected.**

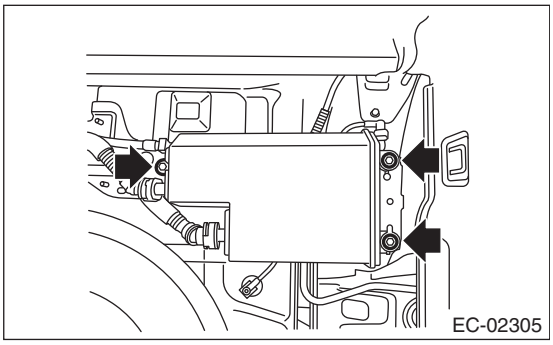


(a) Retainer

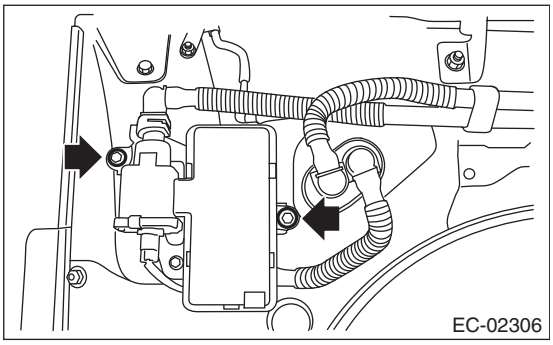
Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)



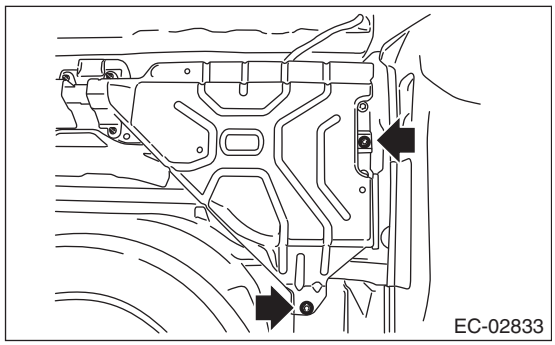
Tightening torque:
8 N·m (0.8 kgf-m, 5.9 ft-lb)

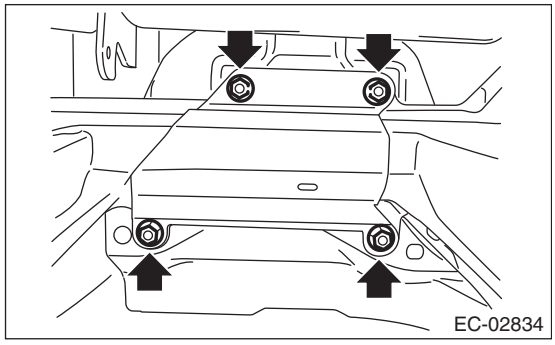


Tightening torque:
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)



Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)





C: INSPECTION

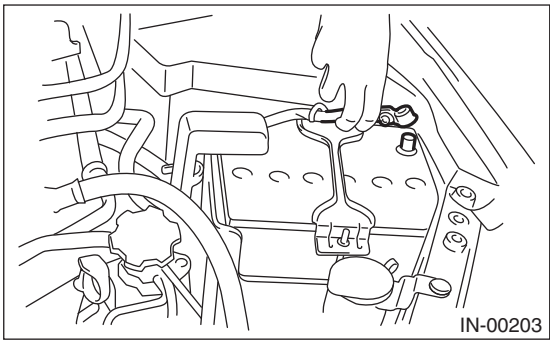
1) Check that the canister and drain valve have no deformation, cracks or other damages.
2) Check that the tube has no cracks, damage or loose part.

5. Purge Control Solenoid Valve

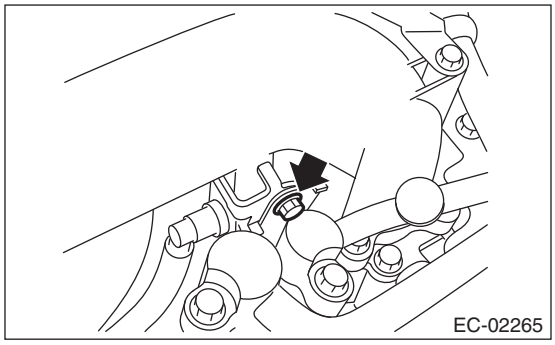
A: REMOVAL

1. PURGE CONTROL SOLENOID VALVE 1

1) Remove the collector cover.
2) Disconnect the ground cable from battery.



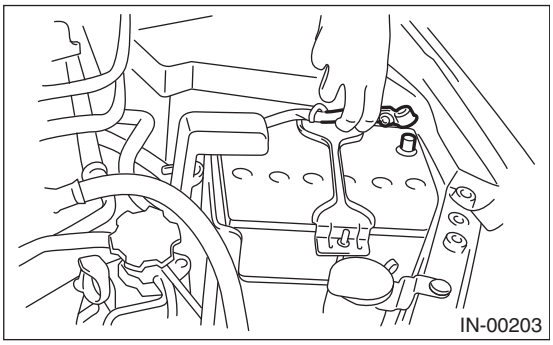
3) Remove the bolts which secure purge control solenoid valve 1 to the intake manifold, and disconnect the connector from the purge control solenoid valve 1.



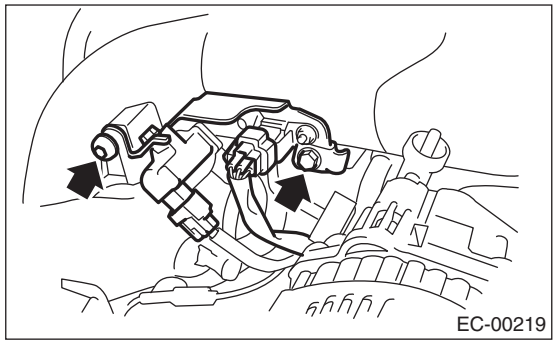
4) Disconnect the vacuum hose from purge control solenoid valve 1.

2. PURGE CONTROL SOLENOID VALVE 2

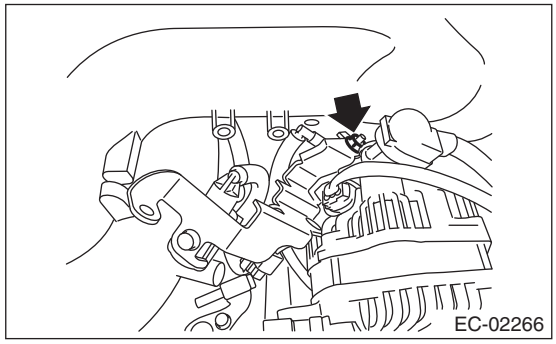
1) Remove the collector cover.
2) Disconnect the ground cable from battery.



3) Remove the solenoid valve bracket assembly from the intake manifold.



4) Disconnect the connector and the vacuum hose from purge control solenoid valve 2.
5) Remove the purge control solenoid valve 2 from the solenoid valve bracket assembly.

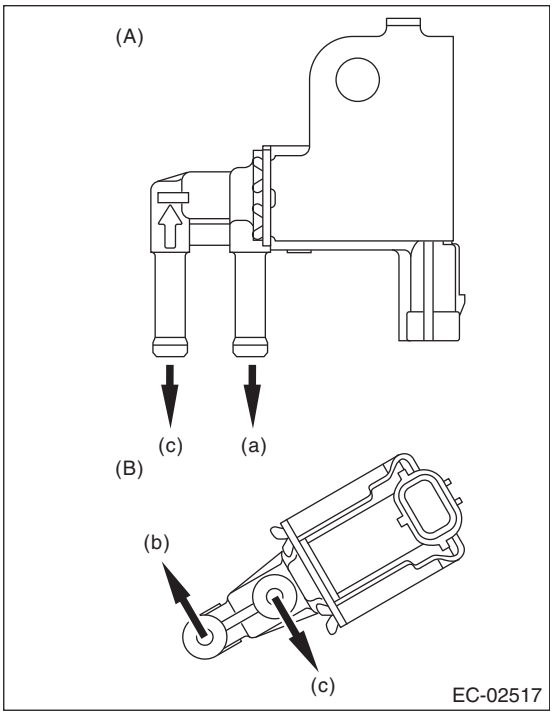


B: INSTALLATION

1. PURGE CONTROL SOLENOID VALVE 1

Install in the reverse order of removal.

NOTE:
Connect the vacuum hose as shown in the figure.



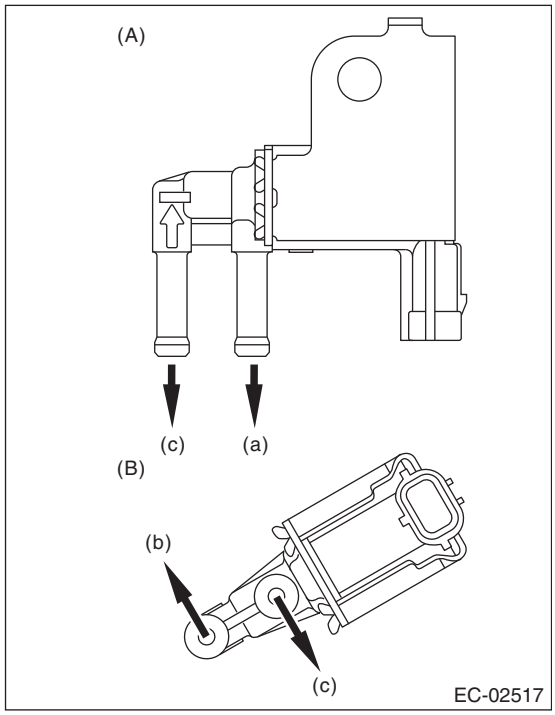
(A) Purge control solenoid valve 1
(B) Purge control solenoid valve 2
(a) To intake manifold
(b) To intake duct
(c) To fuel pipe

Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)

2. PURGE CONTROL SOLENOID VALVE 2

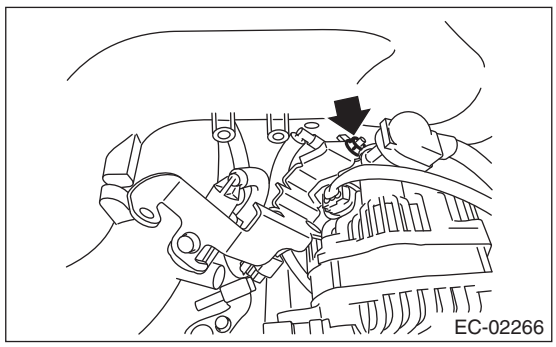
Install in the reverse order of removal.

NOTE:
Connect the vacuum hose as shown in the figure.

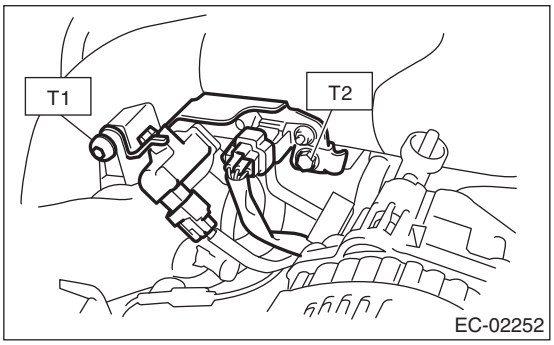


(A) Purge control solenoid valve 1
(B) Purge control solenoid valve 2
(a) To intake manifold
(b) To intake duct
(c) To fuel pipe

Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)



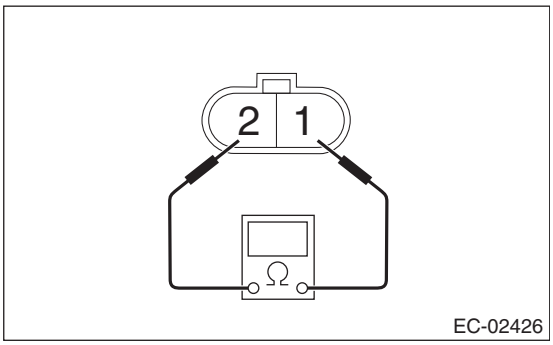
Tightening torque:
T1: 17 N·m (1.7 kgf-m, 12.5 ft-lb)
T2: 19 N·m (1.9 kgf-m, 14.0 ft-lb)



C: INSPECTION

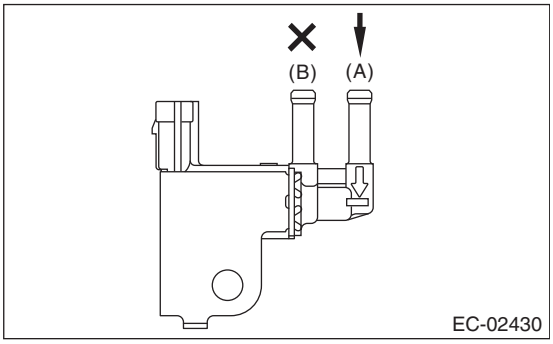
1. PURGE CONTROL SOLENOID VALVE

1) Check that the purge control solenoid valve has no deformation, cracks or other damages.
2) Measure the resistance between the purge control solenoid valve terminals.

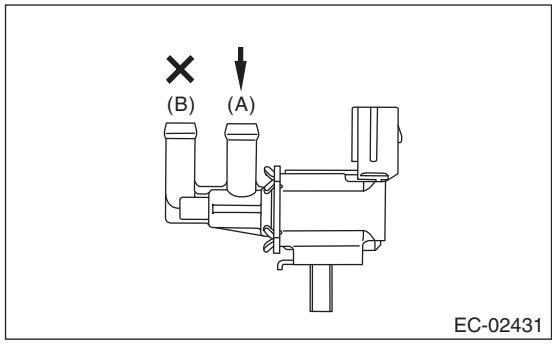


	Terminal No.	Standard
Purge control solenoid valve 1	1 and 2	32±2 Ω (when 20°C (68°F))
Purge control solenoid valve 2		24±3 Ω (when 20°C (68°F))

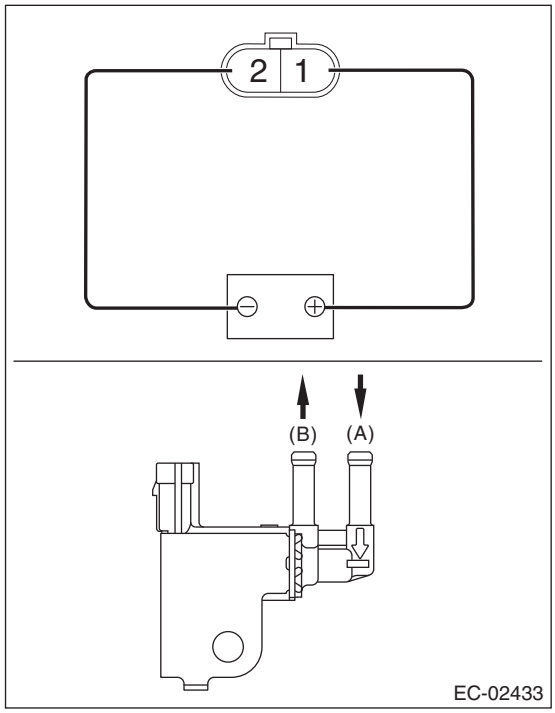
3) Check that air does not come out from (B) when air is blown into (A).
- Purge control solenoid valve 1



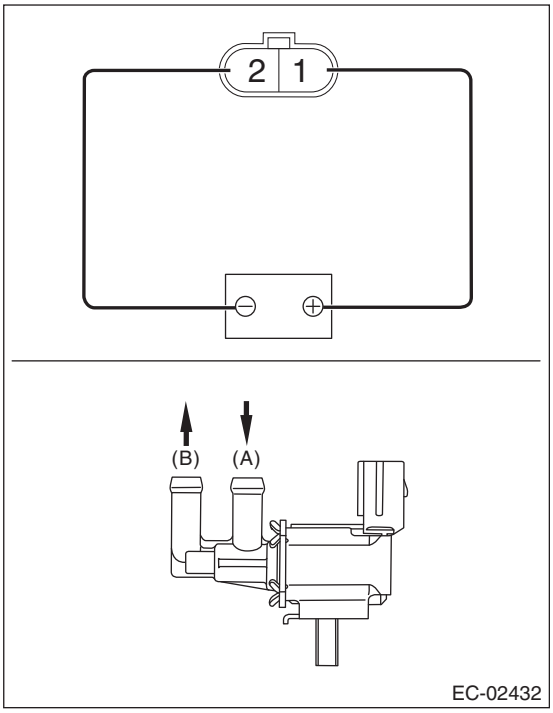
- Purge control solenoid valve 2



4) With terminal No. 1 connected to the battery positive terminal and terminal No. 2 to the battery ground terminal, check that air comes out from (B) when air is blown into (A).
- Purge control solenoid valve 1



- Purge control solenoid valve 2



2. OTHER INSPECTIONS

Check the vacuum hose for cracks, damage or looseness.

6. Fuel Level Sensor

A: REMOVAL

For removal procedures, refer to the “FU(H4DOTC)” section. <Ref. to FU(H4DOTC)-79, REMOVAL, Fuel Level Sensor.>

B: INSTALLATION

For installation procedures, refer to the “FU(H4DOTC)” section. <Ref. to FU(H4DOTC)-79, INSTALLATION, Fuel Level Sensor.>

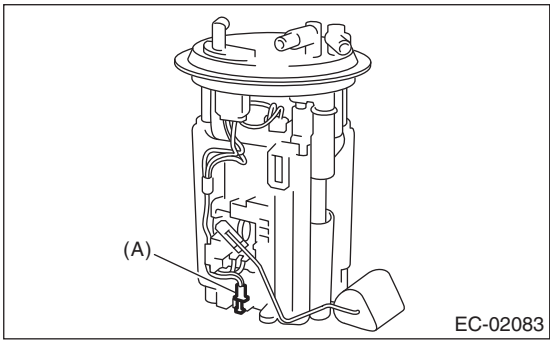
C: INSPECTION

For inspection procedures, refer to the “FU(H4DOTC)” section. <Ref. to FU(H4DOTC)-79, INSPECTION, Fuel Level Sensor.>

7. Fuel Temperature Sensor

A: REMOVAL

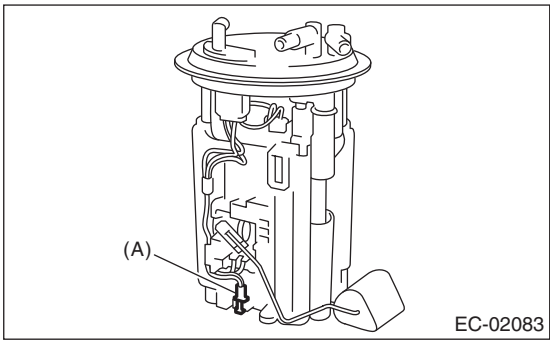
The fuel temperature sensor and fuel level sensor are integrated into one unit; therefore, refer to “Fuel Level Sensor” for removal procedure. <Ref. to FU(H4DOTC)-79, REMOVAL, Fuel Level Sensor.>



(A) Fuel temperature 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)-79, INSTALLATION, Fuel Level Sensor.>

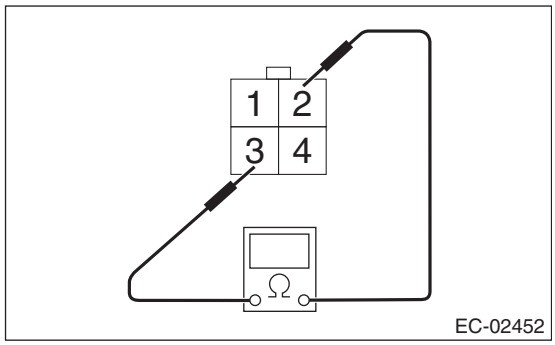


(A) Fuel temperature sensor

C: INSPECTION

1) Check that the fuel temperature sensor has no deformation, cracks or other damages.
2) Check the resistance between the fuel temperature sensor terminals.

CAUTION:
When measuring the resistance, check the circuit tester specification and be careful not to turn on electricity 3 V or more to prevent damaging the fuel temperature sensor.



Temperature	Terminal No.	Standard
–10°C (14°F)	2 and 3	11.21±0.69 kΩ (measured current 0.10 mA)
20°C (68°F)		2.502±0.08 kΩ (measured current 0.10 mA)
50°C (122°F)		0.7176±0.034 kΩ (measured current 0.10 mA)

8. Fuel Sub Level Sensor

A: REMOVAL

For removal procedures, refer to the “FU(H4DOTC)” section. <Ref. to FU(H4DOTC)-80, REMOVAL, Fuel Sub Level Sensor.>

B: INSTALLATION

For installation procedures, refer to the “FU(H4DOTC)” section. <Ref. to FU(H4DOTC)-81, INSTALLATION, Fuel Sub Level Sensor.>

C: INSPECTION

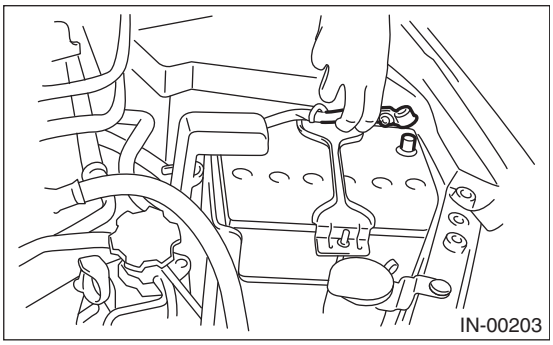
For inspection procedures, refer to the “FU(H4DOTC)” section. <Ref. to FU(H4DOTC)-81, INSPECTION, Fuel Sub Level Sensor.>

9. Fuel Tank Pressure Sensor

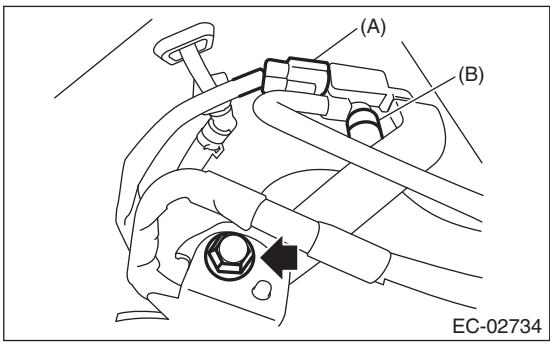
A: REMOVAL

WARNING:
Place "NO OPEN FLAMES" signs near the working area.

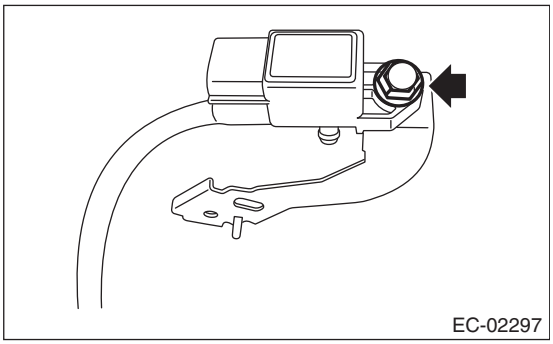
1) Disconnect the ground cable from battery.



2) Open the fuel filler lid and remove the fuel filler cap.
3) Lift up the vehicle.
4) Disconnect the connecter (A) and the pressure hose (B) from the fuel tank pressure sensor and remove the fuel tank pressure sensor together with the bracket.



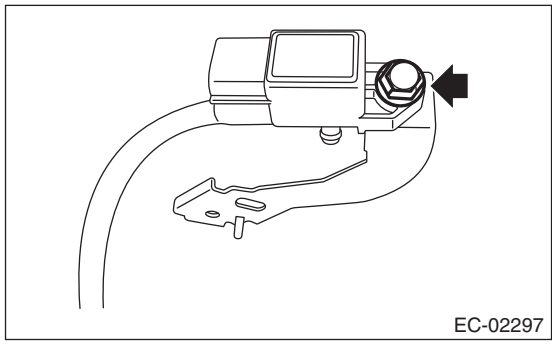
5) Remove the fuel tank pressure sensor from the bracket.

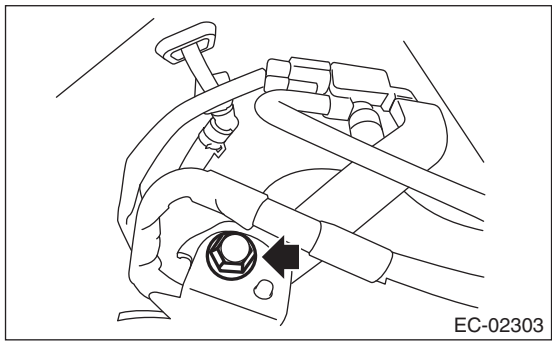


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
7.35 N·m (0.7 kgf-m, 5.4 ft-lb)



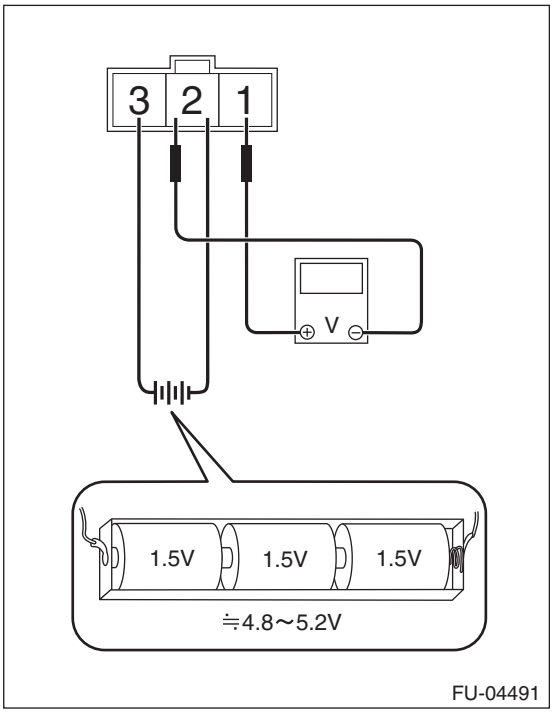


C: INSPECTION

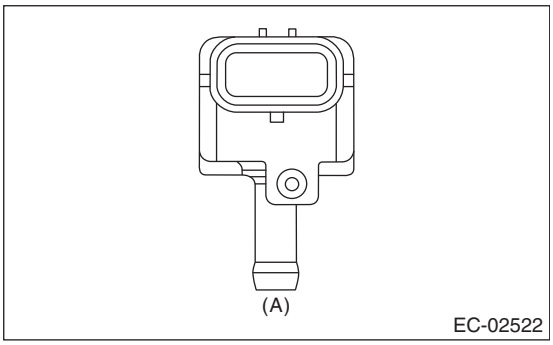
1. FUEL TANK PRESSURE SENSOR

1) Check that the fuel tank pressure sensor has no deformation, cracks or other damages.
2) Connect dry-cell battery positive terminal to terminal No. 3 and dry-cell battery ground terminal to terminal No. 2, and circuit tester positive terminal to terminal No. 1 and circuit tester negative terminal to terminal No. 2.

NOTE:
- Use new dry-cell batteries.
- Using circuit tester, check the voltage of a single dry-cell battery is 1.6 V or more. And also check the voltage of three batteries in series is between 4.8 V and 5.2 V.



3) Connect the Mighty Vac to the pressure port (A) of fuel tank pressure sensor.



4) Check the voltage when generating vacuum and positive pressure using Mighty Vac.

CAUTION:
Do not apply pressure out of the range of –10 — 20 kPa (–0.1 — 0.2 kgf/cm^2, –1.45 — 2.90 psi). Doing so may damage the fuel tank pressure sensor.

Pressure	Terminal No.	Standard
–6.666 kPa (–0.07 kgf/cm^2, –0.97 psi)	1 (+) and 2 (–)	Approx. 0.5 V (when 25°C (77°F))
–2.000 kPa (–0.02 kgf/cm^2, –0.29 psi)		Approx. 1.9 V (when 25°C (77°F))
2.000 kPa (0.02 kgf/cm^2, 0.29 psi)		Approx. 3.1 V (when 25°C (77°F))
6.666 kPa (0.07 kgf/cm^2, 0.97 psi)		Approx. 4.5 V (when 25°C (77°F))

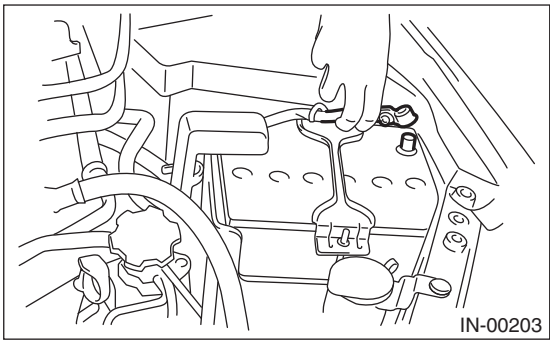
2. OTHER INSPECTIONS

Check that the hose has no cracks, damage or loose part.

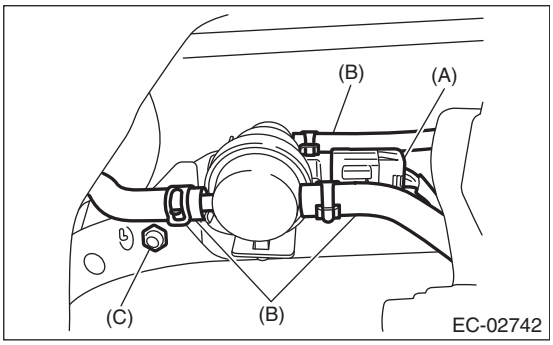
10.Pressure Control Solenoid Valve

A: REMOVAL

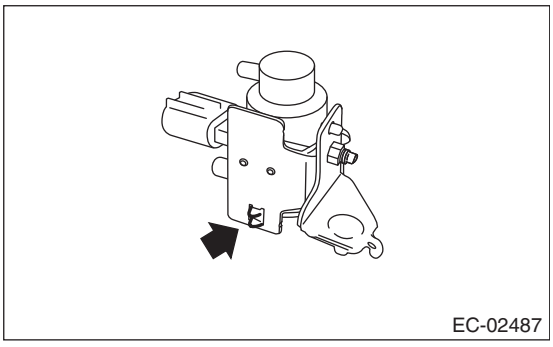
1) Disconnect the ground cable from battery.



2) Lift up the vehicle.
3) Disconnect connector (A) and evaporation hose (B) from the pressure control solenoid valve.
4) Remove the nut (C) securing the bracket to the fuel tank and remove the pressure control solenoid valve together with the bracket.



5) Remove the pressure control solenoid valve from the bracket.



B: INSTALLATION

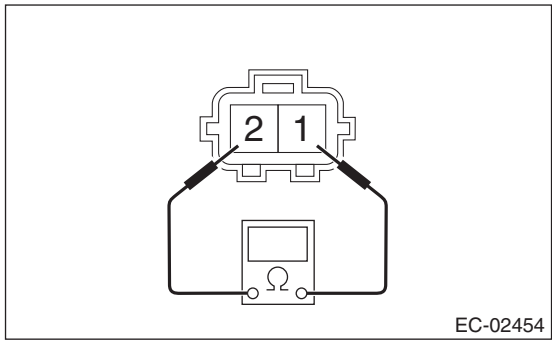
Install in the reverse order of removal.

Tightening torque:
7.35 N·m (0.7 kgf-m, 5.4 ft-lb)

C: INSPECTION

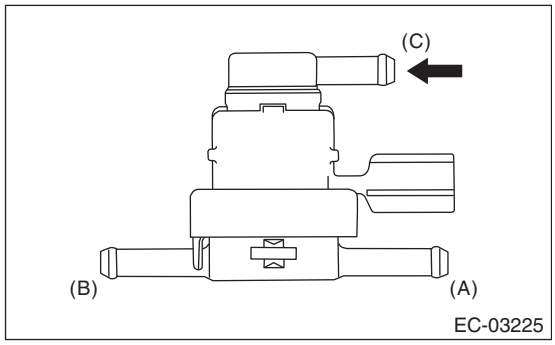
1. PRESSURE CONTROL SOLENOID VALVE

1) Check that the pressure control solenoid valve has no deformation, cracks or other damages.
2) Check the resistance between the pressure control solenoid valve terminals.



Terminal No.	Standard
1 and 2	20 — 30 Ω

3) Connect the Mighty Vac to fuel tank side of the pressure control solenoid valve.



(A) Fuel tank side
(B) Canister side
(C) Barometric pressure

4) Using the Mighty Vac, generate the positive pressure. Check that the Mighty Vac gauge needle rises at the pressure (0.55 — 1.55 kPa (0.006 — 0.016 kgf/cm^2, 0.08 — 0.23 psi)) then lowers.
5) Using the Mighty Vac, generate the negative pressure. Check that the Mighty Vac gauge needle does not rise.

2. OTHER INSPECTIONS

Check that the evaporation hose has no cracks, damage or loose part.

11.Drain Filter

A: SPECIFICATION

The drain valve is a non-disassembled part, so do not remove the drain filter from drain valve. Refer to “Canister” for removal and installation procedures. <Ref. to EC(H4DOTC)-7, REMOVAL, Canister.> <Ref. to EC(H4DOTC)-9, INSTALLATION, Canister.>

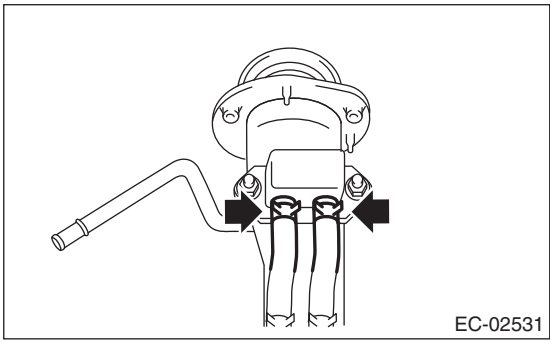
12.Shut Valve

A: REMOVAL

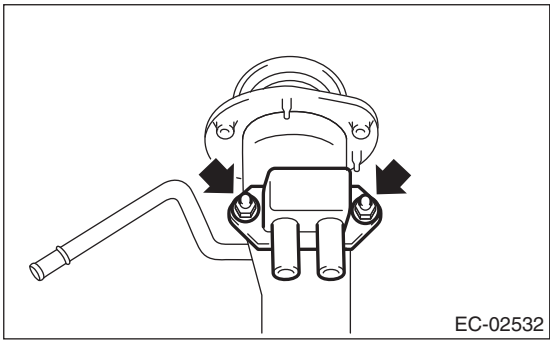
WARNING:
Place “NO OPEN FLAMES” signs near the working area.

CAUTION:
Be careful not to spill fuel.

1) Remove the fuel filler pipe. <Ref. to FU(H4DOTC)-74, 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 (0.5 kgf-m, 3.3 ft-lb)

C: INSPECTION

1) Check that the shut valve has no deformation, cracks or other damages.
2) Check that the evaporation hose has no cracks, damage or loose part.

13.Drain Valve

A: REMOVAL

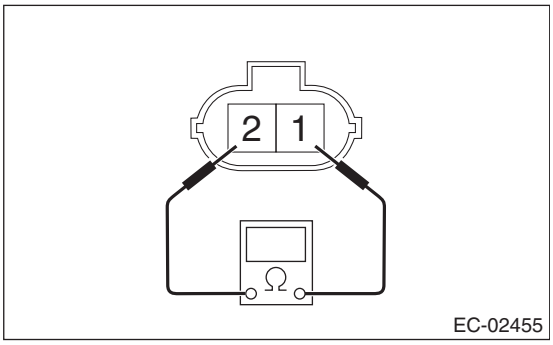
Refer to “Canister” for removal procedures. <Ref. to EC(H4DOTC)-7, REMOVAL, Canister.>

B: INSTALLATION

Refer to “Canister” for installation procedures. <Ref. to EC(H4DOTC)-9, INSTALLATION, Canister.>

C: INSPECTION

Check the resistance between drain valve terminals.

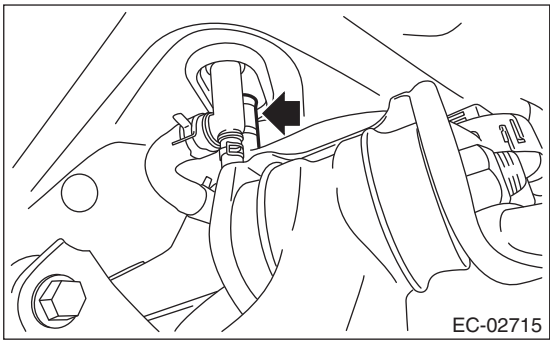


Terminal No.	Standard
1 and 2	20 — 30 Ω

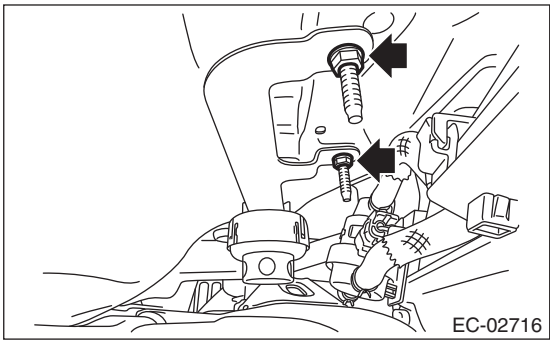
14.Drain Separator

A: REMOVAL

1) Lift up the vehicle.
2) Disconnect the drain hose from the connector.



3) Remove the drain separator from the vehicle.



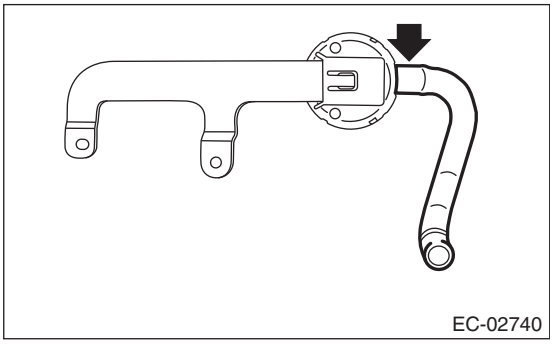
B: INSTALLATION

Install in the reverse order of removal.

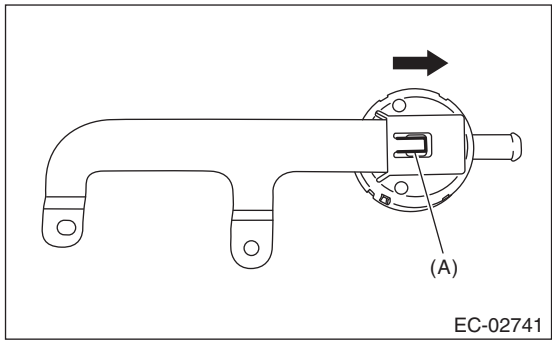
Tightening torque:
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)

C: DISASSEMBLY

1) Disconnect the drain hose from the drain separator.



2) Lift up the claw (A) of the drain separator and slide the drain separator in the direction of the arrow to remove the drain separator.



D: ASSEMBLY

Assemble in the reverse order of disassembly.

E: INSPECTION

1) Check that the drain separator and drain separator bracket have no deformation, crack, or other damage.
2) Check that the drain hose has no crack, damage, or looseness.
3) Check that no foreign substances are clogged in the drain separator.

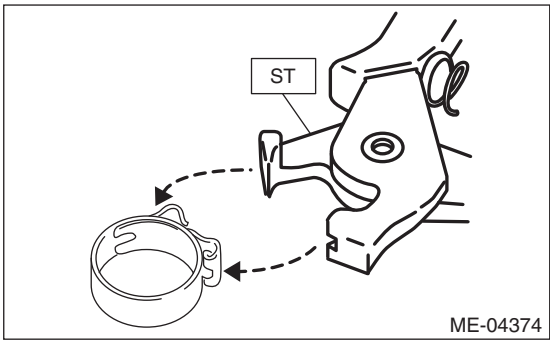
15.PCV Hose Assembly

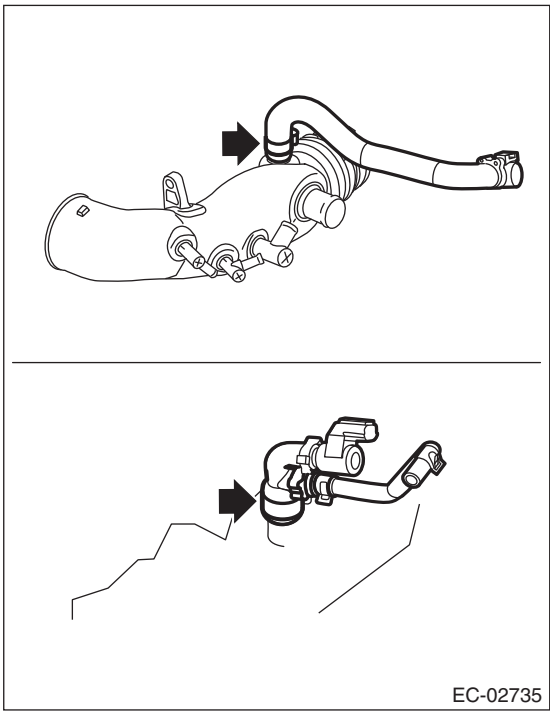
A: REMOVAL

CAUTION:
Do not remove unless the hose and the diagnostics connector are broken.

1) Remove the collector cover.
2) Remove the intake manifold. <Ref. to FU(H4DOTC)-18, REMOVAL, Intake Manifold.>
3) Remove the turbocharger. <Ref. to IN(H4DOTC)-15, REMOVAL, Turbocharger.>
4) Remove the intake duct. <Ref. to IN(H4DOTC)-11, REMOVAL, Intake Duct.>
5) Remove the PCV hose assembly from the intake duct and the cylinder block RH.

NOTE:
Pinch the clamp of the PCV hose assembly by fitting the cut out in the ST with the protrusion on the clamp as shown in the figure, and unlock the clamp.
ST 18353AA000 CLAMP PLIERS

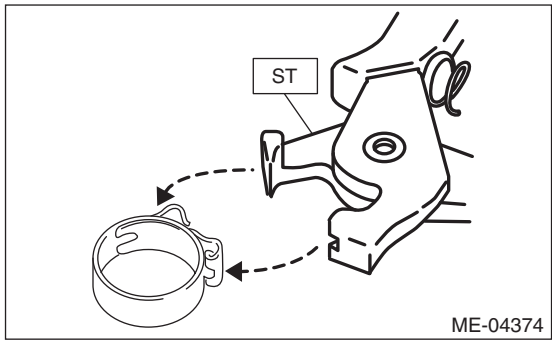


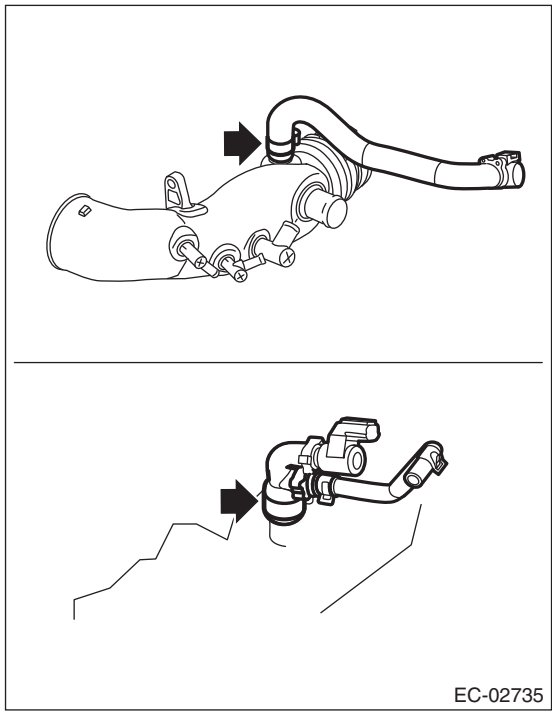


B: INSTALLATION

1) Install the PCV hose assembly to the intake duct and the cylinder block RH.

NOTE:
Use a new clamp for the PCV hose assembly, fit the cut out in the ST with the protrusion on the clamp as shown in the figure, and lock the clamp.
ST 18353AA000 CLAMP PLIERS



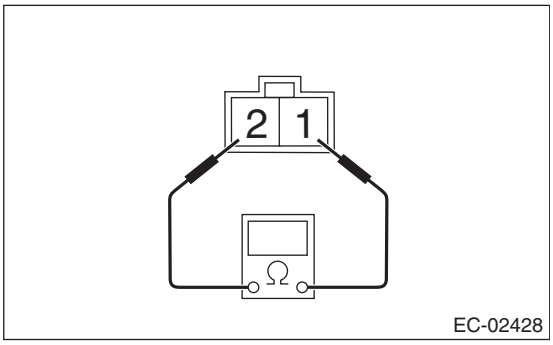


2) Install the intake duct. <Ref. to IN(H4DOTC)-12, INSTALLATION, Intake Duct.>
3) Install the turbocharger. <Ref. to IN(H4DOTC)-16, INSTALLATION, Turbocharger.>
4) Install the intake manifold. <Ref. to FU(H4DOTC)-23, INSTALLATION, Intake Manifold.>
5) Install the collector cover.

C: INSPECTION

1. DIAGNOSIS CONNECTOR

1) Check that the diagnosis connector has no deformation, cracks and any other damage.
2) Check the resistance between the diagnosis connector terminals.



Terminal No.	Standard
1 and 2	Less than 1 Ω

2. OTHER INSPECTIONS

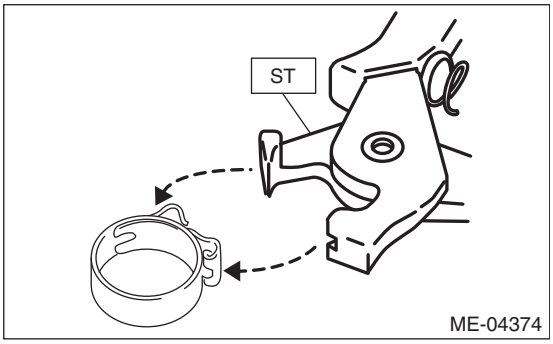
1) Check that the PCV connector has no deformation, cracks or other damages.
2) Check that the hose has no cracks, damage or loose part.

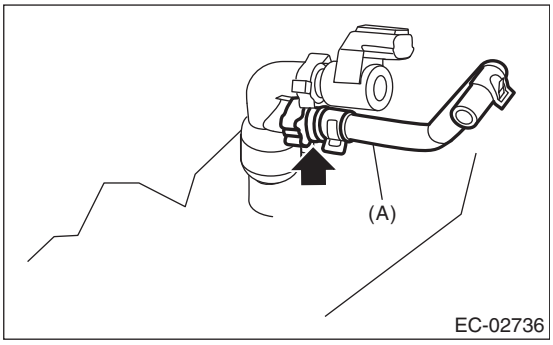
16.PCV Valve

A: REMOVAL

CAUTION:
Do not remove unless the PCV valve is broken.
1) Remove the collector cover.
2) Remove the intake manifold. <Ref. to FU(H4DOTC)-18, REMOVAL, Intake Manifold.>
3) Remove the secondary air combination valve RH. <Ref. to EC(H4DOTC)-30, REMOVAL, Secondary Air Combination Valve.>
4) Disconnect the vacuum hose (A) from the PCV valve and remove the PCV valve from the PCV connector.

NOTE:
Pinch the clamp of the PCV connector by fitting the cut out in the ST with the protrusion on the clamp as shown in the figure, and unlock the clamp.
ST 18353AA000 CLAMP PLIERS

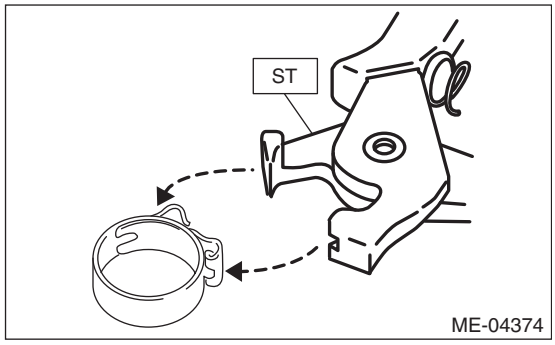


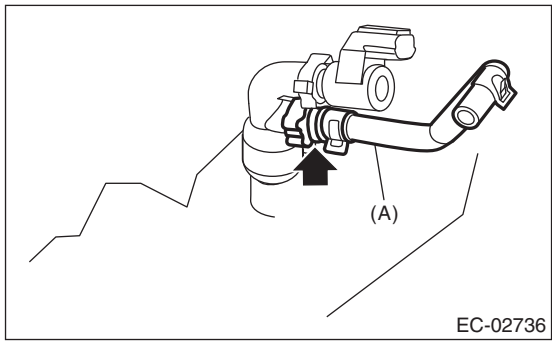


B: INSTALLATION

1) Install the PCV valve to the PCV connector and connect the vacuum hose (A) to the PCV valve.

NOTE:
Use a new clamp for the PCV connector clamp, fit the cut out in the ST with the protrusion on the clamp as shown in the figure, and lock the clamp.
ST 18353AA000 CLAMP PLIERS



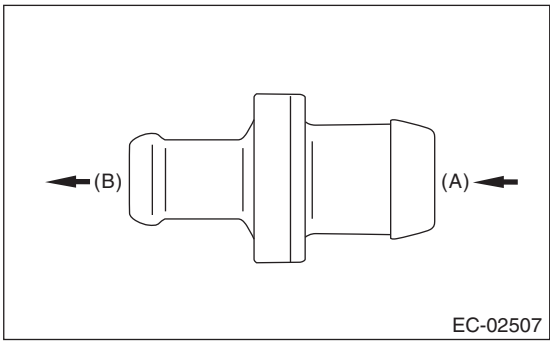


2) Install the secondary air combination valve RH. <Ref. to EC(H4DOTC)-31, INSTALLATION, Secondary Air Combination Valve.>
3) Install the intake manifold. <Ref. to FU(H4DOTC)-23, INSTALLATION, Intake Manifold.>
4) Install the collector cover.

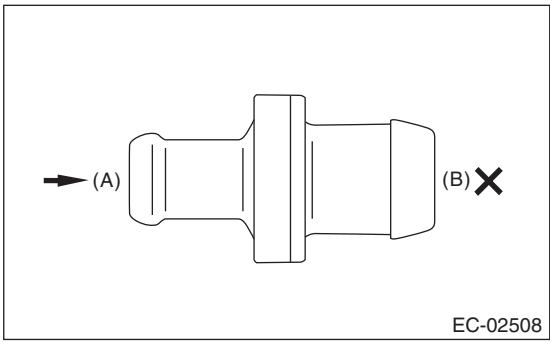
C: INSPECTION

1. PCV VALVE

1) Check that the PCV valve has no deformation, cracks or other damages.
2) Check that air is discharged from (B) when air is blown into (A).



3) Check that air does not come out from (B) when air is blown into (A).



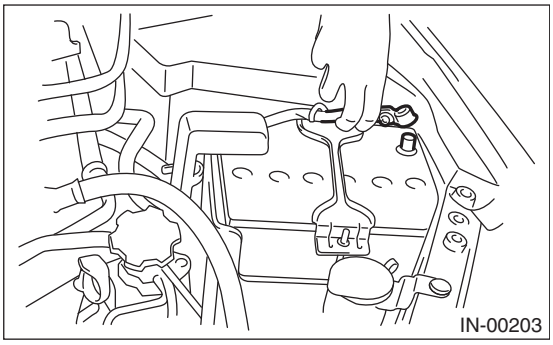
2. OTHER INSPECTIONS

Check the vacuum hose for cracks, damage or looseness.

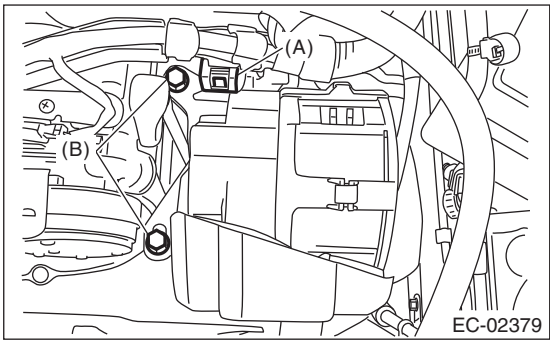
17.Secondary Air Pump

A: REMOVAL

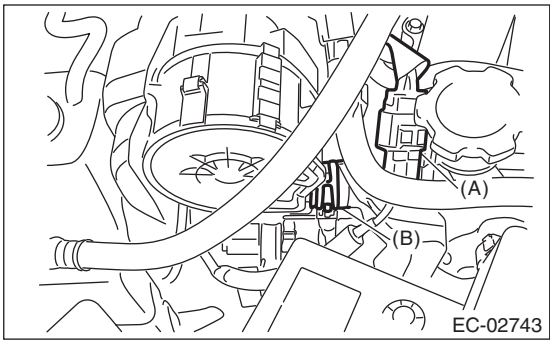
1) Remove the collector cover.
2) Disconnect the ground cable from battery.



3) Remove the clip (A) which holds the harness on the harness stay and remove the bolt (B) which holds the secondary air pump on the vehicle.



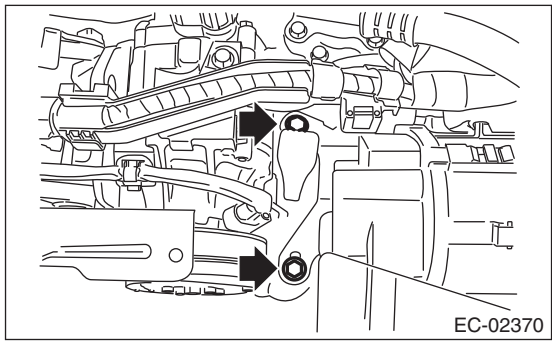
4) Disconnect the connector (A) and air duct (B) from secondary air pump and remove the secondary air pump.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)

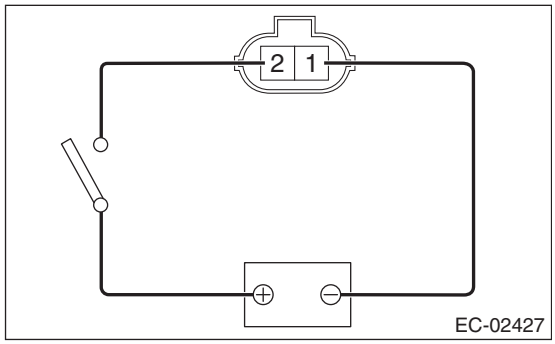


C: INSPECTION

1. SECONDARY AIR PUMP

1) Check that the secondary air pump has no deformation, cracks or other damages.
2) Connect battery positive terminal to terminal No. 2 and battery ground terminal to terminal No. 1, and inspect the secondary air pump operation.

CAUTION:
Do not operate the secondary air pump continuously for 80 seconds or more.



2. OTHER INSPECTIONS

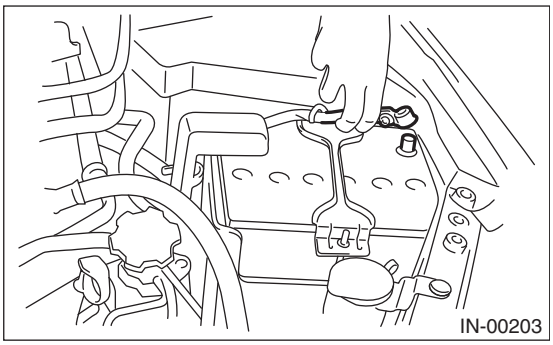
Check that the air duct or resonator has no cracks, damage or loose part.

18.Secondary Air Combination Valve

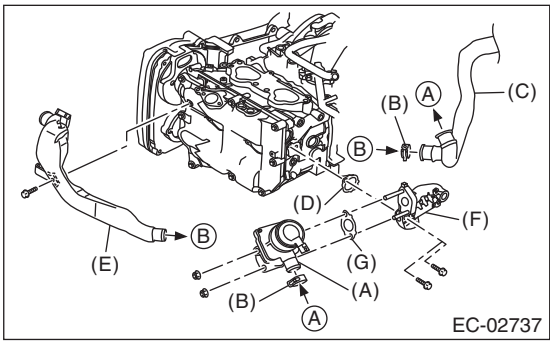
A: REMOVAL

1. SECONDARY AIR COMBINATION VALVE LH

1) Remove the collector cover.
2) Disconnect the ground cable from battery.



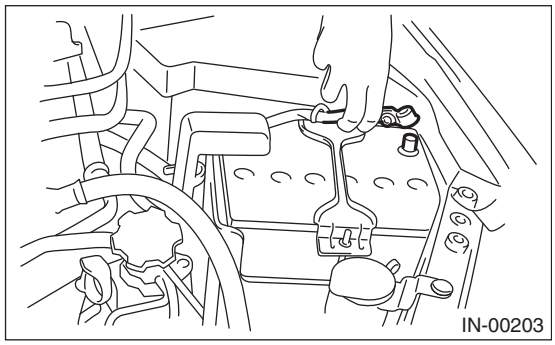
3) Remove the intercooler. <Ref. to IN(H4DOTC)-13, REMOVAL, Intercooler.>
4) Disconnect the connector from the secondary air combination valve LH.
5) Disconnect the air duct A.
6) Remove the secondary air pipe LH.
7) Remove the secondary air combination valve LH.



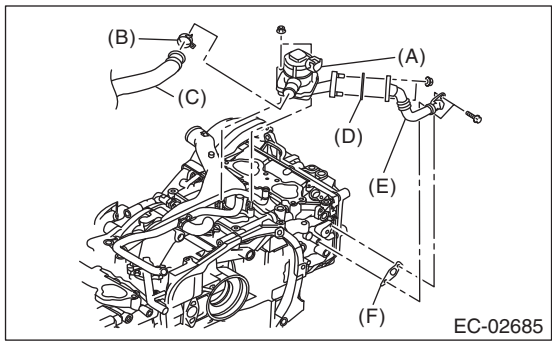
(A) Secondary air combination valve LH
(B) Clip
(C) Air duct A
(D) Gasket
(E) Air duct B
(F) Secondary air pipe LH
(G) Gasket

2. SECONDARY AIR COMBINATION VALVE RH

1) Remove the collector cover.
2) Disconnect the ground cable from battery.



3) Remove the intercooler. <Ref. to IN(H4DOTC)-13, REMOVAL, Intercooler.>
4) Remove the intake manifold. <Ref. to FU(H4DOTC)-18, REMOVAL, Intake Manifold.>
5) Disconnect the air duct A.
6) Disconnect the secondary air pipe RH.
7) Remove the secondary air combination valve RH.



(A) Secondary air combination valve RH
(B) Clip
(C) Air duct A
(D) Gasket
(E) Secondary air pipe RH
(F) Gasket

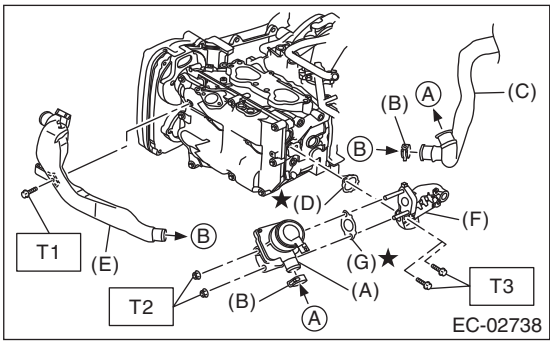
B: INSTALLATION

1. SECONDARY AIR COMBINATION VALVE LH

Install in the reverse order of removal.

NOTE:
Use a new gasket.

Tightening torque:
T1: 6.4 N·m (0.7 kgf-m, 4.7 ft-lb)
T2: 9 N·m (0.9 kgf-m, 6.6 ft-lb)
T3: 19 N·m (1.9 kgf-m, 14.0 ft-lb)



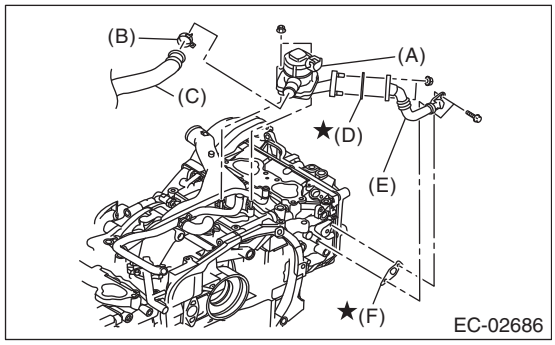
(A) Secondary air combination valve LH
(B) Clip
(C) Air duct A
(D) Gasket
(E) Air duct B
(F) Secondary air pipe LH
(G) Gasket

2. SECONDARY AIR COMBINATION VALVE RH

Install in the reverse order of removal.

NOTE:
Use a new gasket.

Tightening torque:
9 N·m (0.9 kgf-m, 6.6 ft-lb)

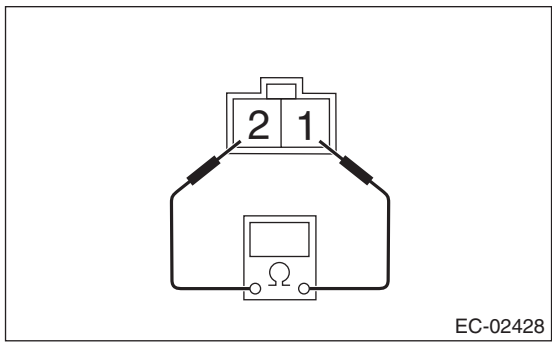


(A) Secondary air combination valve RH
(B) Clip
(C) Air duct A
(D) Gasket
(E) Secondary air pipe RH
(F) Gasket

C: INSPECTION

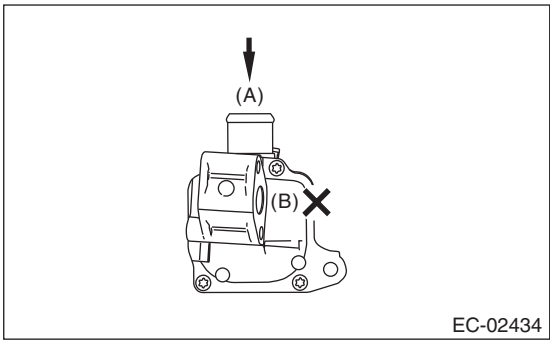
1. SECONDARY AIR COMBINATION VALVE LH

1) Check that the secondary air combination valve LH has no deformation, cracks or other damages.
2) Check the resistance between the terminals of secondary air combination valve LH.

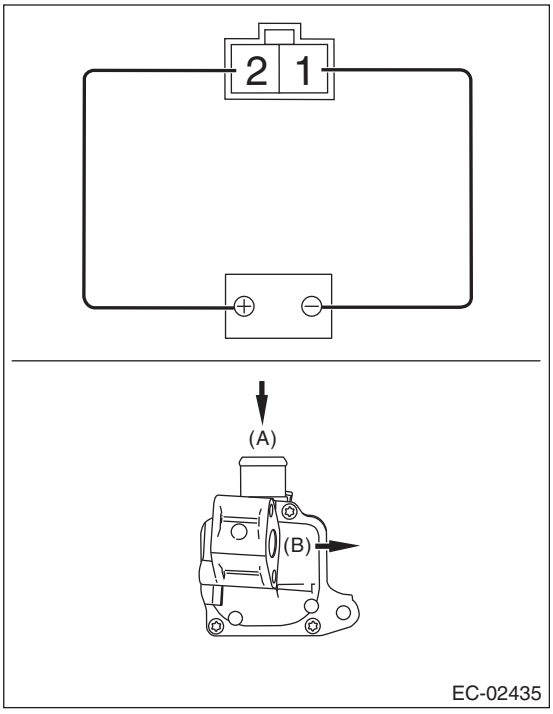


Terminal No.	Standard
1 and 2	5.0±0.5 Ω (when 20°C (68°F))

3) Check that air does not come out from (B) when air is blown into (A).

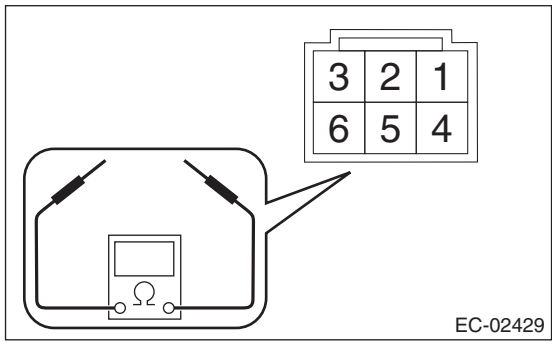


4) With terminal No. 2 connected to the battery positive terminal and terminal No. 1 to the battery ground terminal, check that air comes out from (B) when air is blown into (A).



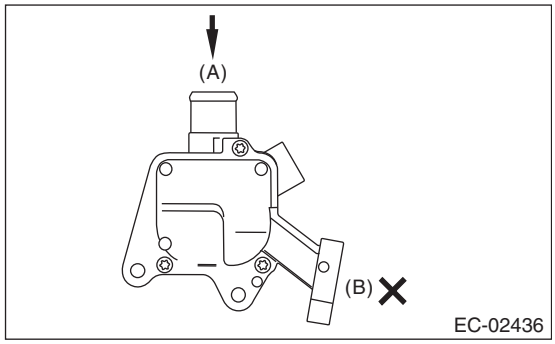
2. SECONDARY AIR COMBINATION VALVE RH

1) Check that the secondary air combination valve RH has no deformation, cracks or other damages.
2) Check the resistance between the terminals of secondary air combination valve RH.

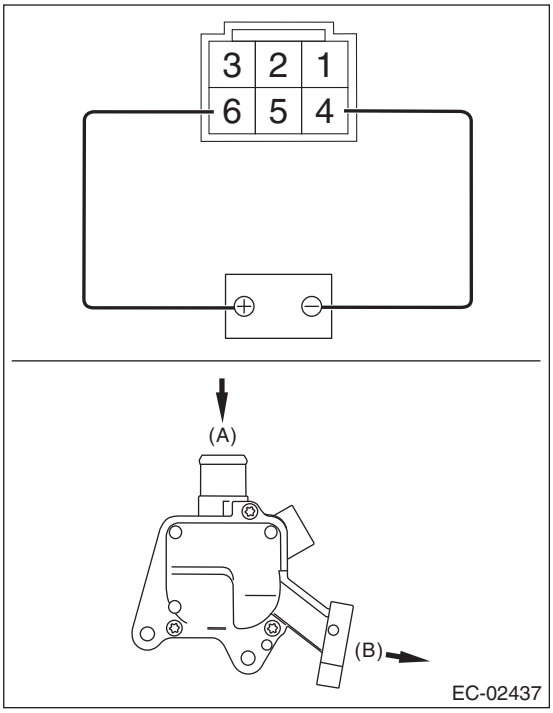


Terminal No.	Standard
4 and 6	5.0±0.5 Ω (when 20°C (68°F))
2 and 3	15 kΩ or less
1 and 2	4.5 kΩ or less

3) Check that air does not come out from (B) when air is blown into (A).



4) With terminal No. 6 connected to the battery positive terminal and terminal No. 4 to the battery ground terminal, check that air comes out from (B) when air is blown into (A).



3. OTHER INSPECTIONS

1) Check that the secondary air pipe has no deformation, cracks or other damages.
2) Check that the air duct has no cracks, damage or loose part.

INTAKE (INDUCTION)

IN(H4DOTC)

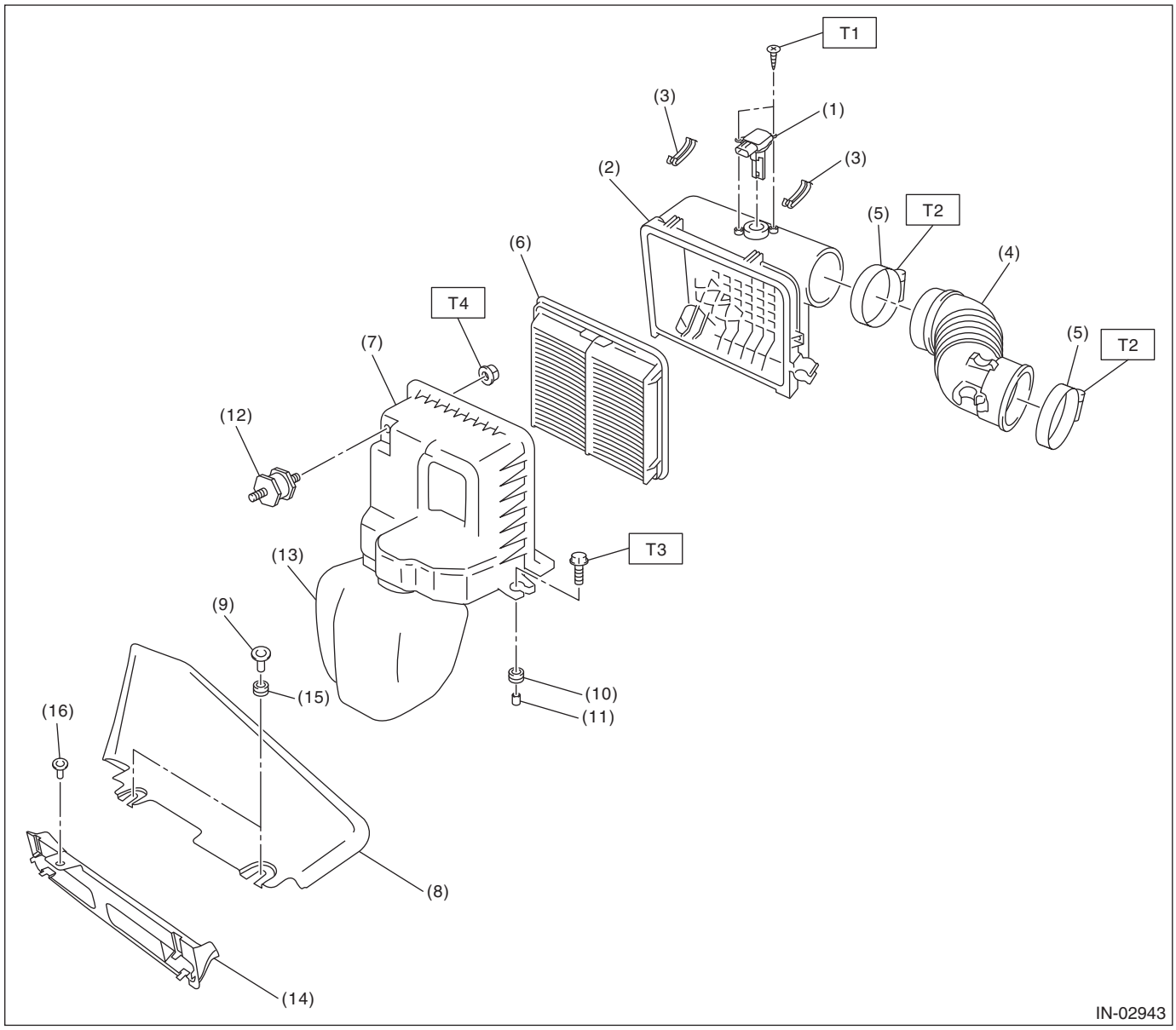
Page

1. General Description 2
2. Air Cleaner Element 7
3. Air Cleaner Case 8
4. Air Intake Duct 10
5. Intake Duct 11
6. Intercooler 13
7. Turbocharger 15
8. Air By-pass Valve 19
9. Resonator Chamber 20

1. General Description

A: COMPONENT

1. AIR CLEANER

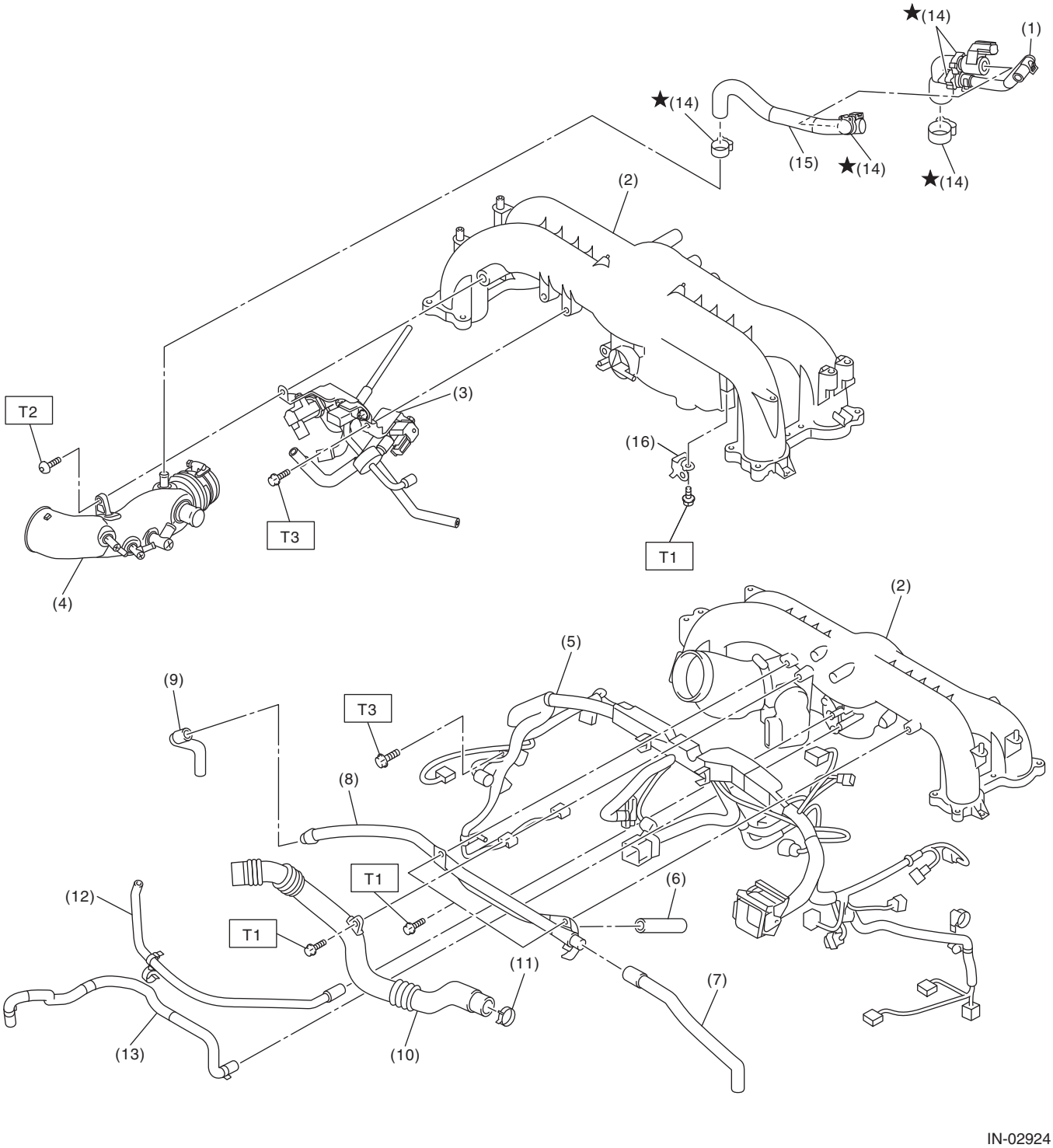


(1)	Mass air flow and intake air temperature sensor	(9)	Clip
(2)	Air cleaner case (rear)	(10)	Cushion
(3)	Clip	(11)	Spacer
(4)	Air intake boot	(12)	Cushion
(5)	Clamp	(13)	Resonator chamber
(6)	Air cleaner element	(14)	Air intake duct (front)
(7)	Air cleaner case (front)	(15)	Cushion
(8)	Air intake duct (rear)	(16)	Clip

Tightening torque:N·m (kgf-m, ft-lb)

T1: 1 (0.1, 0.7)
T2: 2.5 (0.3, 1.8)
T3: 6 (0.6, 4.4)
T4: 7.5 (0.8, 5.5)

2. INTAKE DUCT



IN-02924

(1)	PCV hose ASSY A	(8)	PCV pipe	(15)	PCV hose ASSY B
(2)	Intake manifold	(9)	Vacuum hose	(16)	Solenoid valve bracket
(3)	Solenoid valve bracket ASSY	(10)	Air by-pass pipe		
(4)	Intake duct	(11)	Clamp		
(5)	Engine harness ASSY	(12)	Vacuum hose		
(6)	Vacuum hose	(13)	Brake booster vacuum hose		
(7)	Vacuum hose	(14)	Clamp		

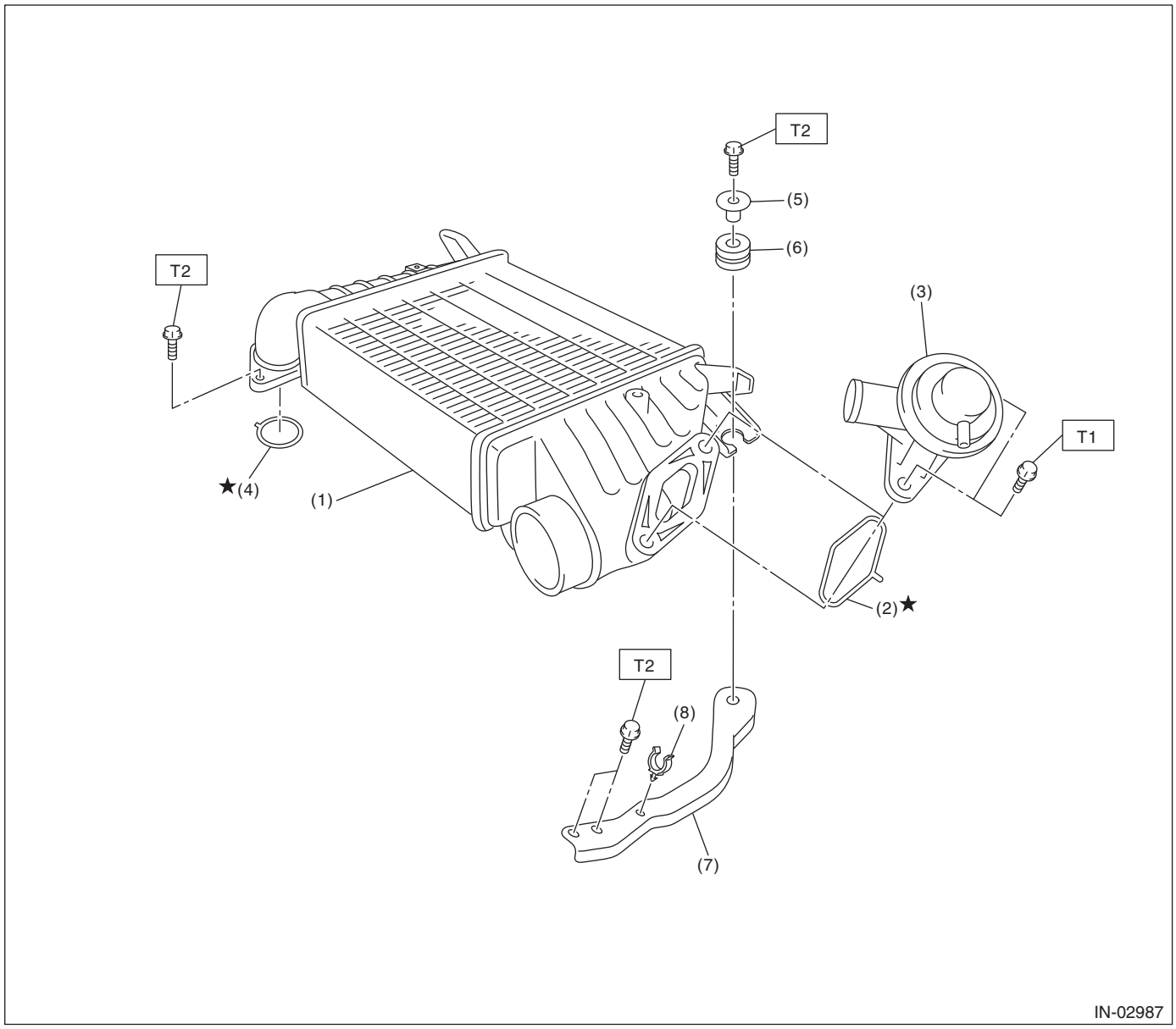
Tightening torque:N·m (kgf-m, ft-lb)

T1: 6.4 (0.7, 4.7)

T2: 17 (1.7, 12.5)

T3: 19 (1.9, 14.0)

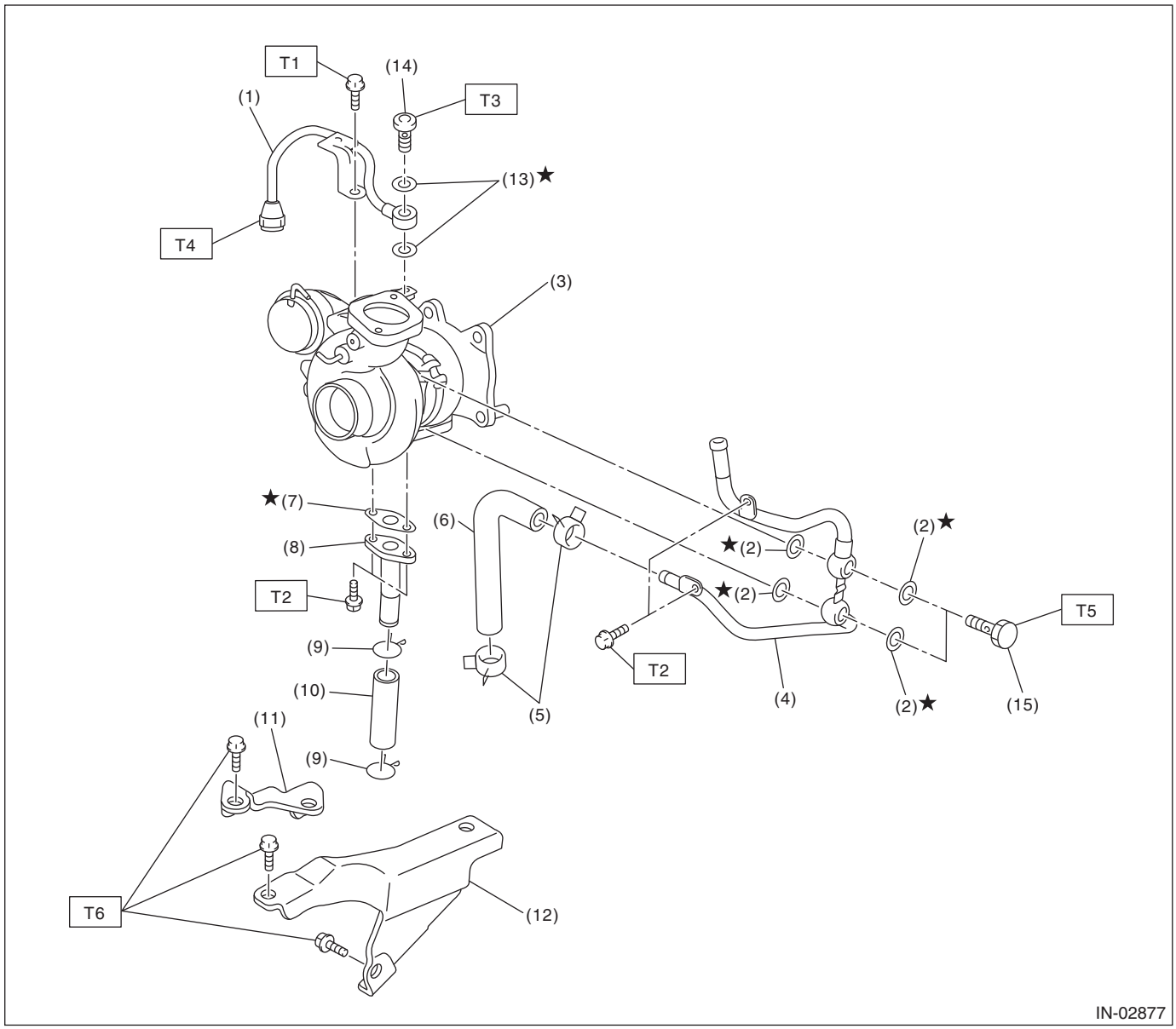
3. INTERCOOLER



(1)	Intercooler	(5)	Spacer
(2)	O-ring	(6)	Cushion
(3)	Air by-pass valve	(7)	Intercooler stay
(4)	O-ring	(8)	Clip

Tightening torque:N·m (kgf-m, ft-lb)
T1: 6.5 (0.7, 4.8)
T2: 16 (1.6, 11.8)

4. TURBOCHARGER



(1)	Oil inlet pipe	(9)	Clip	
(2)	Gasket	(10)	Oil outlet hose	
(3)	Turbocharger	(11)	Turbocharger stay RH	
(4)	Water pipe	(12)	Turbocharger stay LH	
(5)	Clip	(13)	Gasket	
(6)	Engine coolant hose	(14)	Union bolt A	
(7)	Gasket	(15)	Union bolt B	
(8)	Oil outlet pipe			

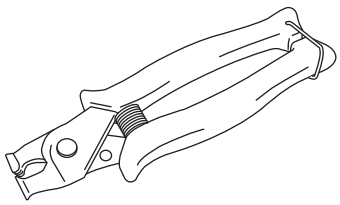
Tightening torque:N·m (kgf-m, ft-lb)
T1: 5 (0.5, 3.7)
T2: 6.5 (0.7, 4.8)
T3: 16 (1.6, 11.8)
T4: 20 (2.0, 14.8)
T5: 23 (2.3, 17.0)
T6: 33 (3.4, 24.3)

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	• Used for removing and installing the PCV hose. • This tool is made by the French company CAILLAU. (code) 54.0.000.205 To make it easier to obtain, it has been provided with a tool number.

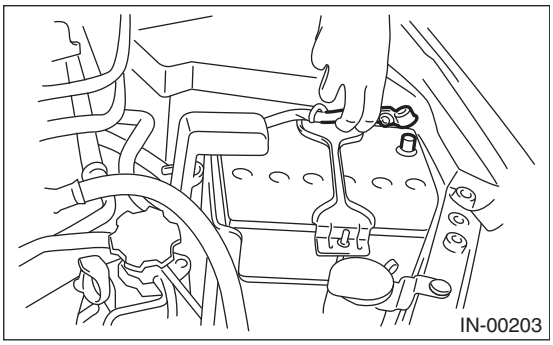
2. GENERAL TOOL

TOOL NAME	REMARKS
Mighty Vac	Used for checking waste gate actuator and air by-pass valve.

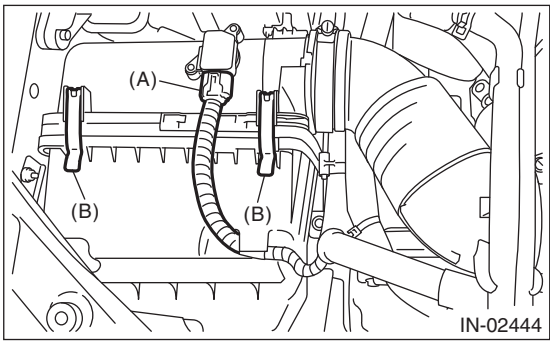
2. Air Cleaner Element

A: REMOVAL

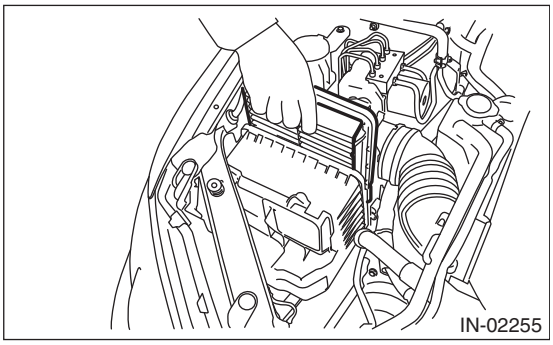
1) Disconnect the ground cable from battery.



2) Remove the air intake duct (rear). <Ref. to IN(H4DOTC)-10, REMOVAL, Air Intake Duct.>
3) Disconnect the connector (A) from air flow and intake air temperature sensor.
4) Remove the clip (B) from the air cleaner case (front).



5) Open the air cleaner case, and remove the air cleaner element.

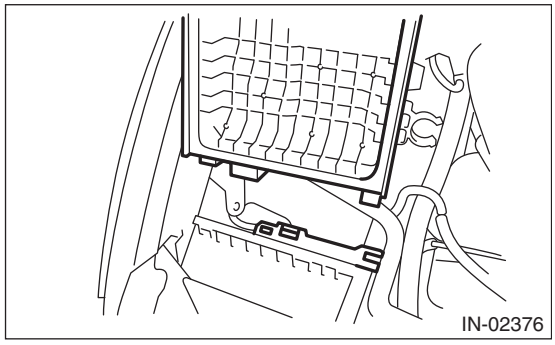


B: INSTALLATION

Install in the reverse order of removal.

CAUTION:
Be sure to use SUBARU genuine air cleaner element depending on the engine type when replacing the air cleaner elements. Using other air cleaner element may affect the engine performance.

NOTE:
• Check that there are no foreign objects in the air cleaner case.
• If the protrusion of the air cleaner case (rear) is removed when removing the air cleaner element, align the protrusion of the air cleaner case (rear) to the hole on the air cleaner case (front) to install.



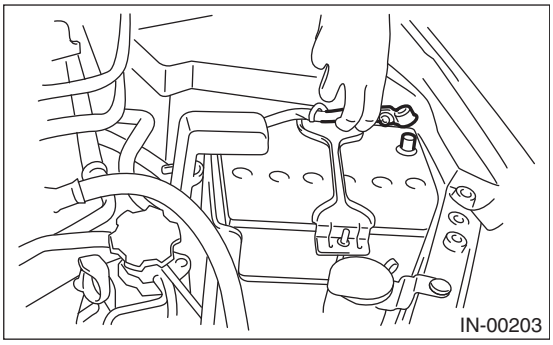
C: INSPECTION

1) Check that the air cleaner element has no deformation, cracks or other damages.
2) Check the air cleaner element for excessive dirt.

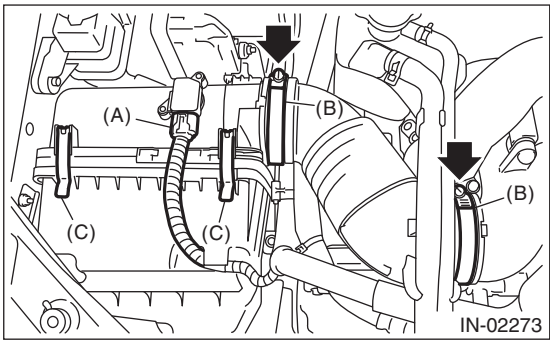
3. Air Cleaner Case

A: REMOVAL

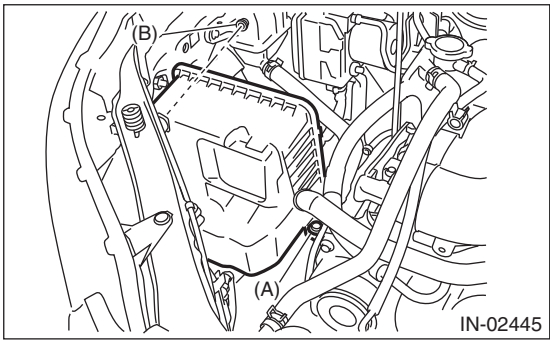
1) Remove the collector cover.
2) Disconnect the ground cable from battery.



3) Remove the air intake duct (rear). <Ref. to IN(H4DOTC)-10, REMOVAL, Air Intake Duct.>
4) Disconnect the connector (A) from air flow and intake air temperature sensor.
5) Loosen the clamp (B) which holds the air intake boot.
6) Remove the clip (C) from the air cleaner case (front).



7) Remove the air cleaner case (rear) and air intake boot.
8) Remove the air cleaner element.
9) Remove the bolts (A) and nuts (B) which secure the air cleaner case (front) to the body.

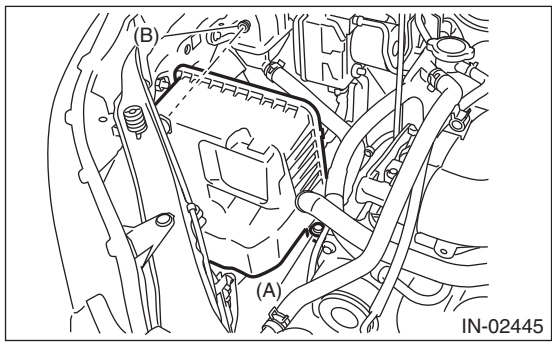


10) Remove the air cleaner case (front).

B: INSTALLATION

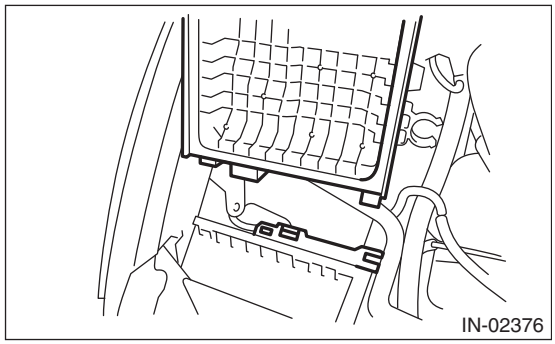
1) Install the bolt (A) and nut (B) which secure the air cleaner case (front) to the body.

Tightening torque:
Bolt (A)
6 N·m (0.6 kgf-m, 4.4 ft-lb)
Nut (B)
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)

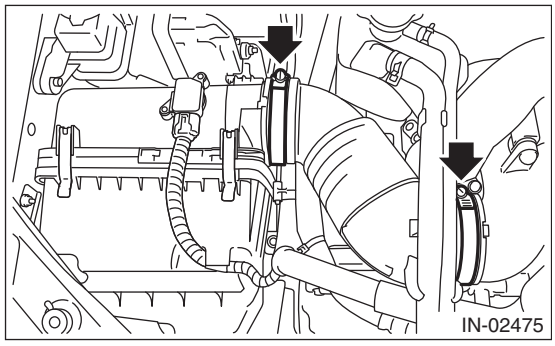


2) Install the air cleaner element.
3) Install the air cleaner case (rear) and air intake boot.

NOTE:
When installing the air cleaner case (rear), align the protrusion of the air cleaner case (rear) to the hole on the air cleaner case (front) to install.

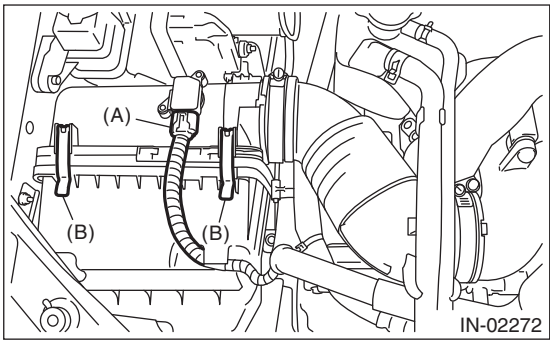


Tightening torque:
2.5 N·m (0.3 kgf-m, 1.8 ft-lb)



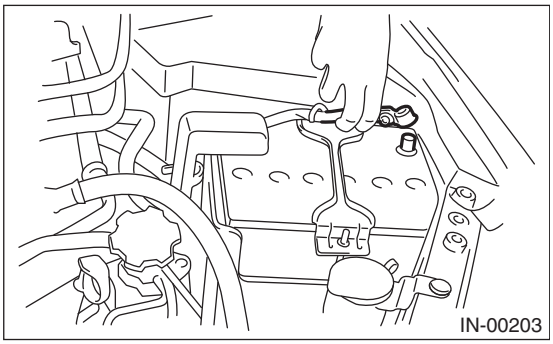
4) Install the clip (B) to the air cleaner case (front).

5) Connect the connector (A) to the mass air flow and intake air temperature sensor.



6) Install the air intake duct (rear). <Ref. to IN(H4DOTC)-10, INSTALLATION, Air Intake Duct.>

7) Connect the ground cable to battery.



8) Install the collector cover.

C: INSPECTION

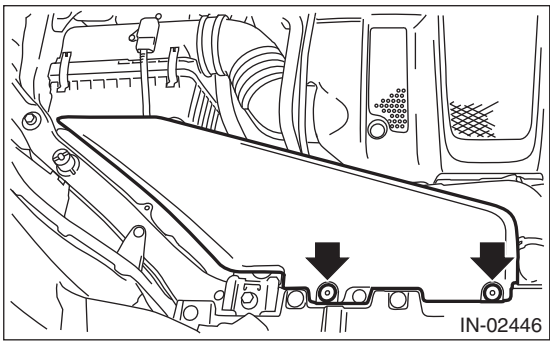
1) Check that the air cleaner case has no deformation, cracks or other damages.

2) Check that the air intake boot has no cracks, damage or loose part.

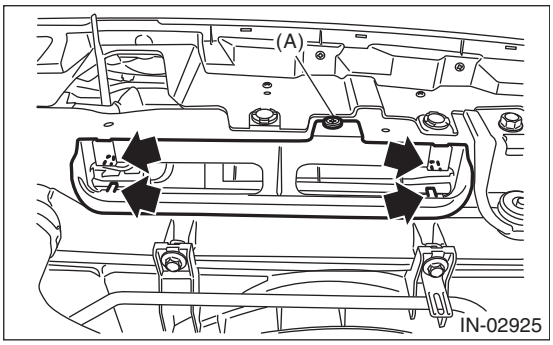
4. Air Intake Duct

A: REMOVAL

1) Remove the clip which secures air intake duct (rear), and remove the air intake duct (rear).



2) Remove the clip (A) and four claws, and remove the air intake duct (front).



B: INSTALLATION

Install in the reverse order of removal.

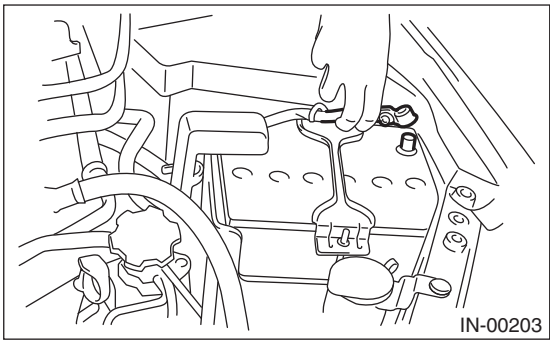
C: INSPECTION

1) Check that the air intake duct has no deformation, cracks or other damages.
2) Inspect that no foreign objects are mixed in the air intake duct.

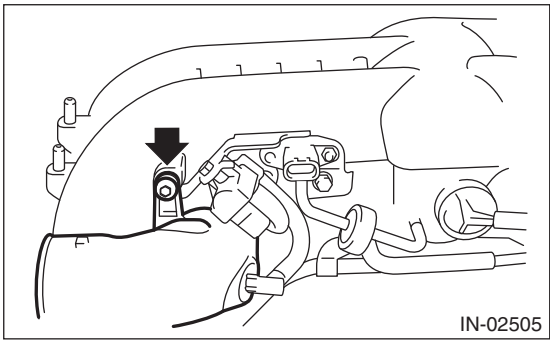
5. Intake Duct

A: REMOVAL

1) Remove the collector cover.
2) Disconnect the ground cable from battery.

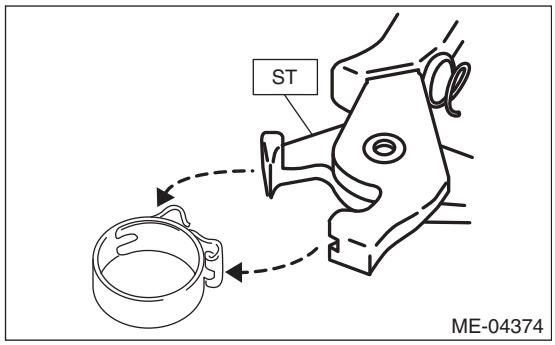


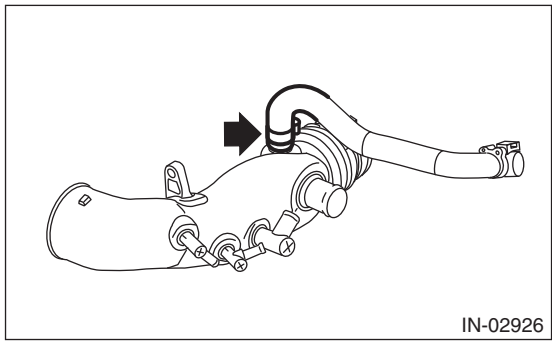
3) Remove the intake manifold. <Ref. to FU(H4DOTC)-18, REMOVAL, Intake Manifold.>
4) Remove the sensor, engine harness and fuel pipe from the intake manifold. <Ref. to FU(H4DOTC)-26, DISASSEMBLY, Intake Manifold.>
5) Remove the intake duct from intake manifold.



6) Remove the PCV hose assembly from the intake duct.

NOTE:
Pinch the clamp of the PCV hose assembly by fitting the cut out in the ST with the protrusion on the clamp as shown in the figure, and unlock the clamp.
ST 18353AA000 CLAMP PLIERS

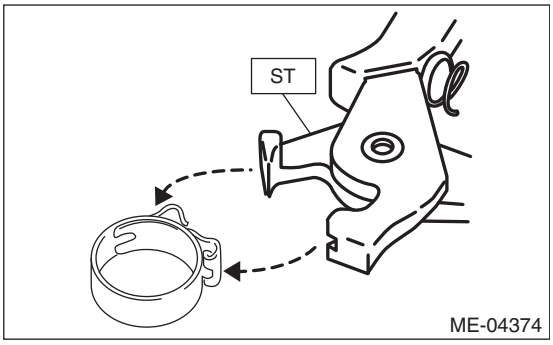


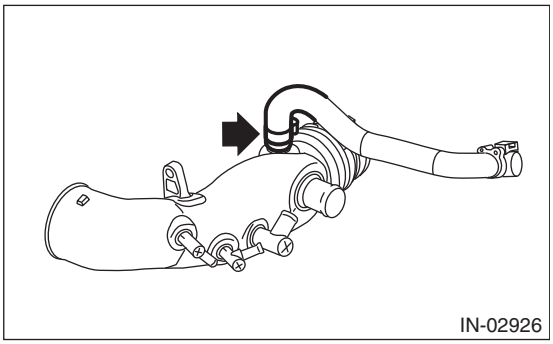


B: INSTALLATION

1) Install the PCV hose assembly onto the intake duct.

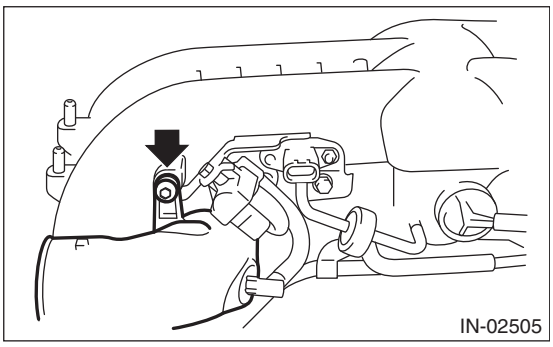
NOTE:
Use a new clamp for the PCV hose assembly, fit the cut out in the ST with the protrusion on the clamp as shown in the figure, and lock the clamp.
ST 18353AA000 CLAMP PLIERS



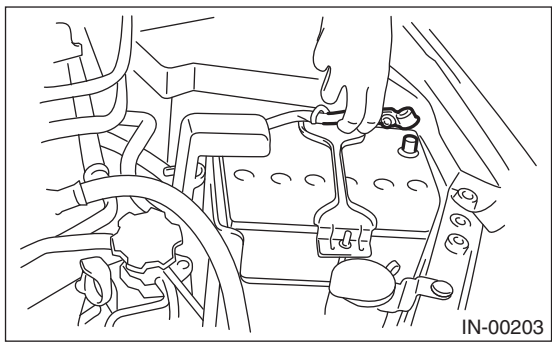


2) Install the intake duct to the intake manifold.

Tightening torque:
17 N·m (1.7 kgf-m, 12.5 ft-lb)



3) Install the sensor, engine harness and fuel pipe to the intake manifold. <Ref. to FU(H4DOTC)-29, ASSEMBLY, Intake Manifold.>
4) Install the intake manifold. <Ref. to FU(H4DOTC)-23, INSTALLATION, Intake Manifold.>
5) Connect the battery ground terminal.



6) Install the collector cover.

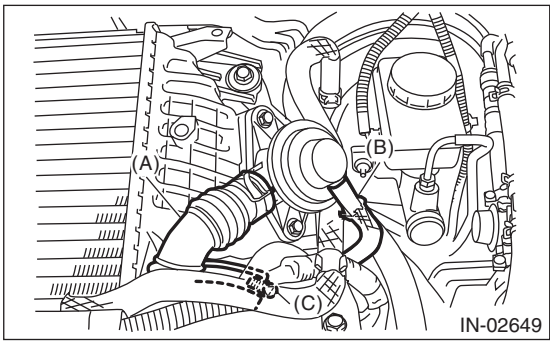
C: INSPECTION

Check that the intake duct has no deformation, cracks or other damages.

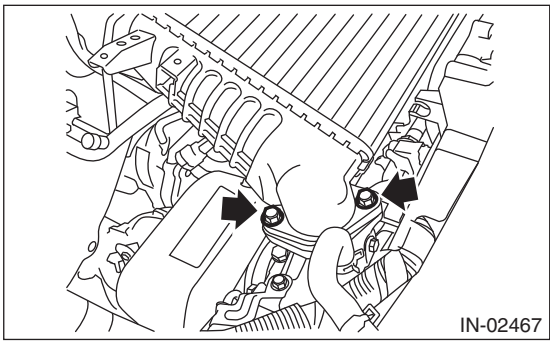
6. Intercooler

A: REMOVAL

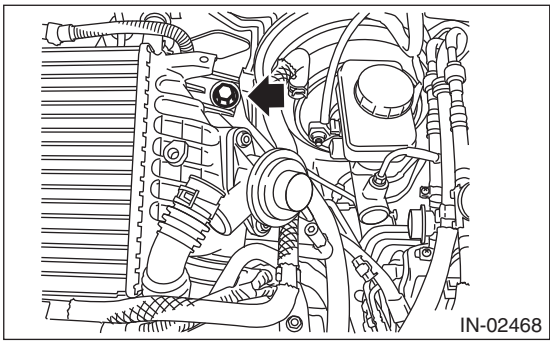
1) Remove the collector cover.
2) Disconnect the air by-pass pipe (A) and vacuum hose (B) from the air by-pass valve.
3) Loosen the clamp (C) which holds the intake duct to intercooler.



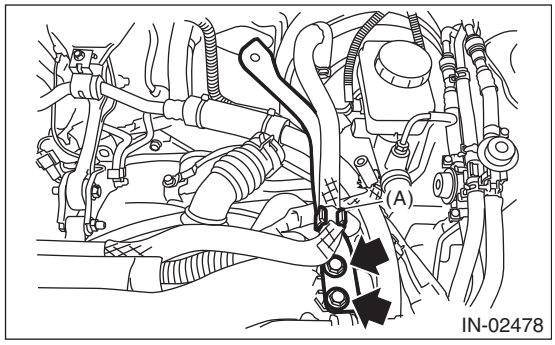
4) Remove the bolts which hold intercooler to turbocharger.



5) Remove the bolts which secure the intercooler to the intercooler stay, and remove the intercooler.



6) Remove the brake booster vacuum hose from the clip (A), and remove the intercooler stay.

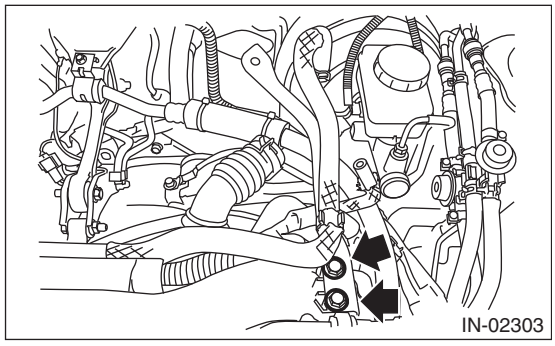


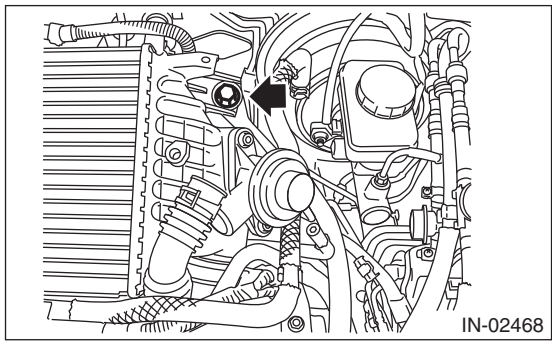
B: INSTALLATION

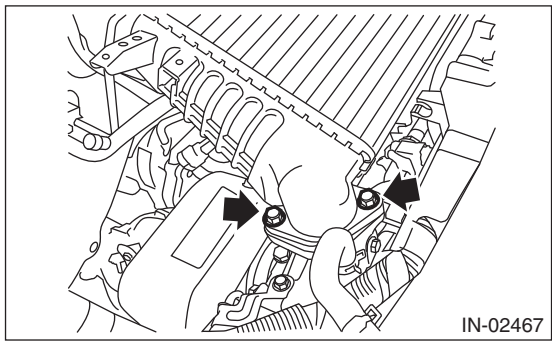
Install in the reverse order of removal.

NOTE:
- Use new O-rings.
- Be careful not to pinch the O-ring.

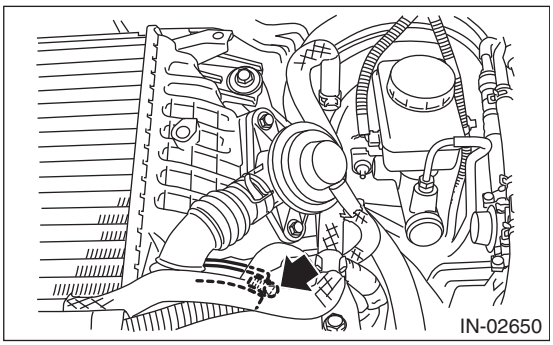
Tightening torque:
16 N·m (1.6 kgf-m, 11.8 ft-lb)





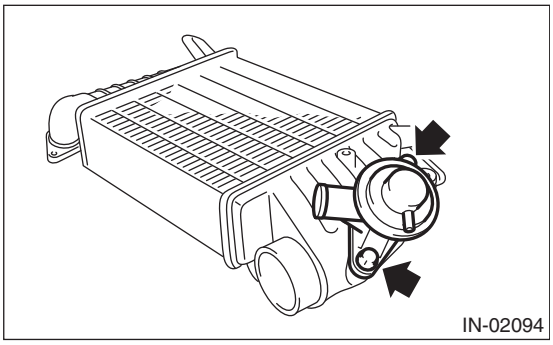


Tightening torque:
3 N·m (0.3 kgf-m, 2.2 ft-lb)



C: DISASSEMBLY

1) Remove the air by-pass valve from intercooler.



D: ASSEMBLY

Assemble in the reverse order of disassembly.

NOTE:
- Use new O-rings.
- Be careful not to pinch the O-ring.

Tightening torque:
6.5 N·m (0.7 kgf-m, 4.8 ft-lb)

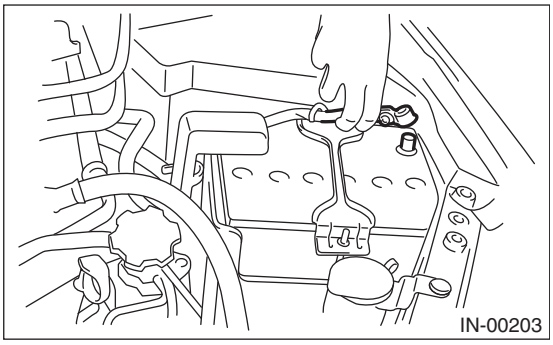
E: INSPECTION

1) Check that the intercooler has no deformation, cracks or other damages.
2) Check that the vacuum hose, air by-pass pipe and intake duct have no cracks, damage or loose part.

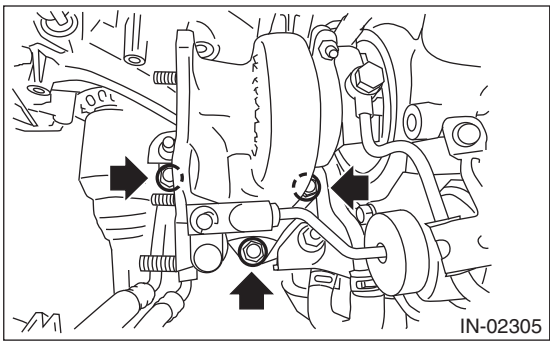
7. Turbocharger

A: REMOVAL

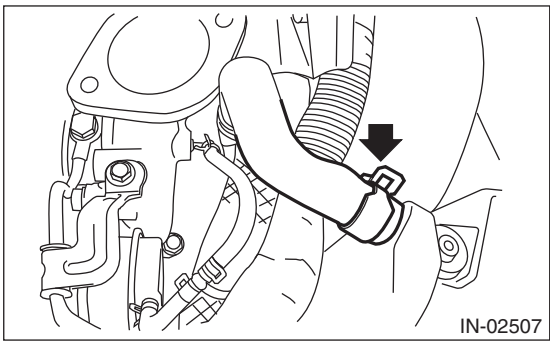
1) Remove the collector cover.
2) Disconnect the ground cable from battery.


IN-00203

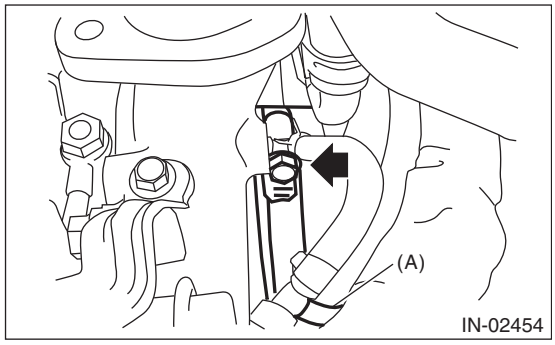
3) Lift up the vehicle.
4) Drain approximately 3.0 ℓ (3.2 US qt, 2.6 Imp qt) of coolant. <Ref. to CO(H4DOTC)-13, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
5) Lower the vehicle.
6) Remove the intercooler. <Ref. to IN(H4DOTC)-13, REMOVAL, Intercooler.>
7) Remove the center exhaust pipe. <Ref. to EX(H4DOTC)-7, REMOVAL, Center Exhaust Pipe.>
8) Lower the vehicle.
9) Separate the joint pipe from turbocharger.


IN-02305

10) Disconnect the engine coolant hoses from coolant filler tank.


IN-02507

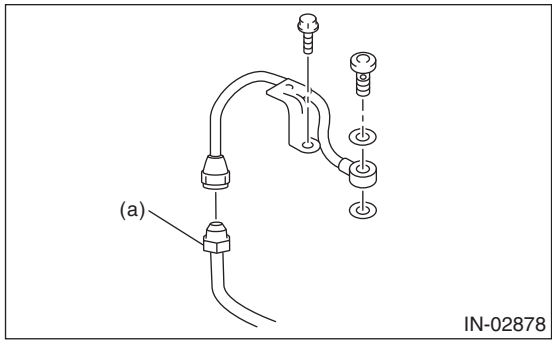
11) Disconnect the air control hose (A), and loosen the clamp holding the intake duct to the turbocharger.



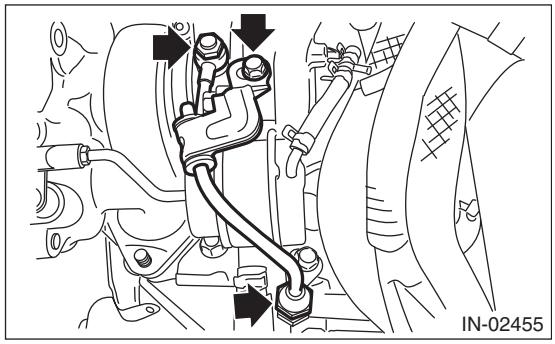
IN-02454

12) Remove the oil inlet pipe from the turbocharger.

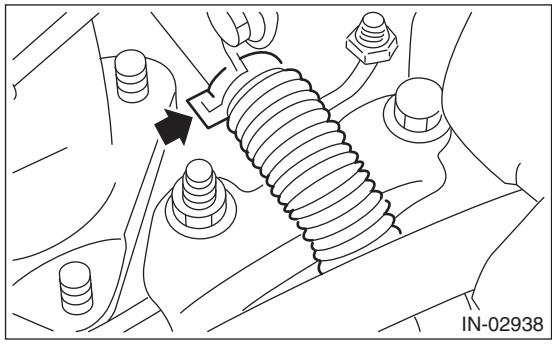
CAUTION:
In order to prevent damaging the oil pipe on the cylinder head side, fix the section (a) shown in the figure when loosing the oil inlet pipe flare nut, and avoid the part from rotating together while loosening the nut.



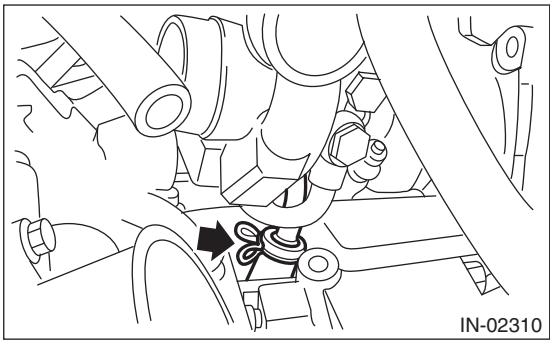
IN-02878


IN-02455

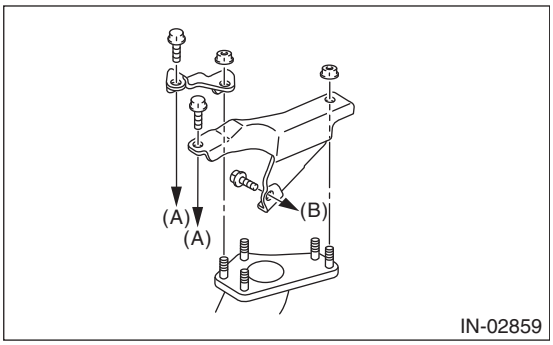
13) Disconnect the engine coolant hose from the water pipe.


IN-02938

14) Disconnect the oil outlet hose from the oil outlet pipe, and remove the turbocharger.



15) Remove the turbocharger stay.

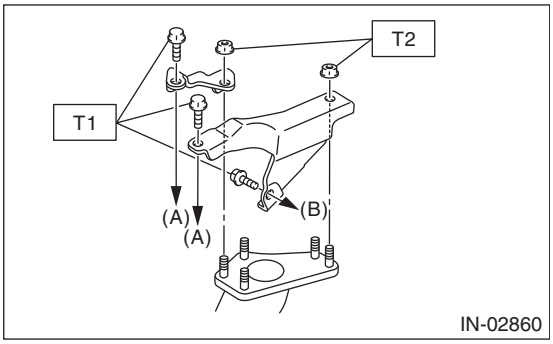


(A) To cylinder head RH
(B) To cylinder block RH

B: INSTALLATION

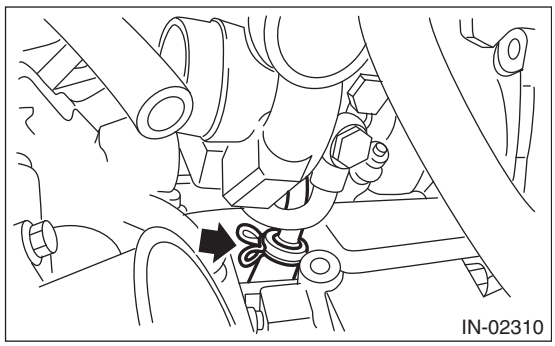
1) Install the turbocharger stay.

Tightening torque:
T1: 33 N·m (3.4 kgf-m, 24.3 ft-lb)
T2: 42.5 N·m (4.3 kgf-m, 31.3 ft-lb)

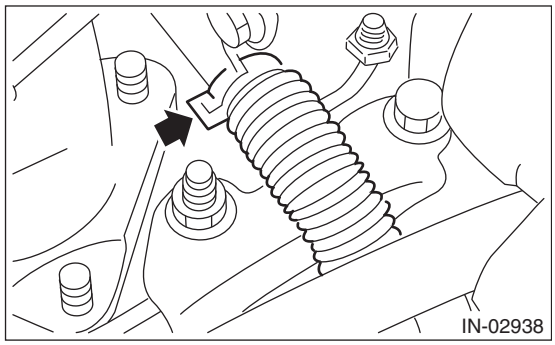


(A) To cylinder head RH
(B) To cylinder block RH

2) Connect the oil outlet hose to the oil outlet pipe.

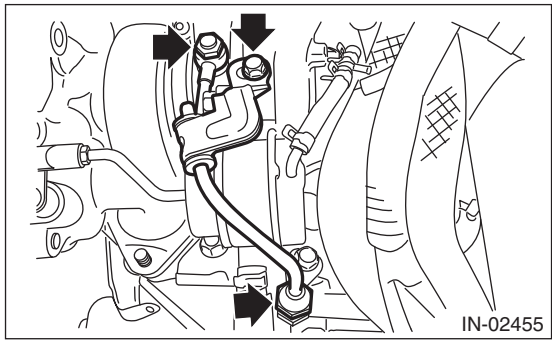


3) Connect the engine coolant hoses to the water pipe.



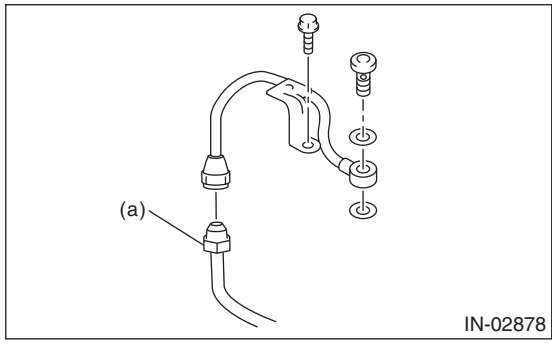
4) Temporarily tighten the bolts and flare nuts which secure the oil inlet pipe to the turbocharger.

NOTE:
Use a new gasket.

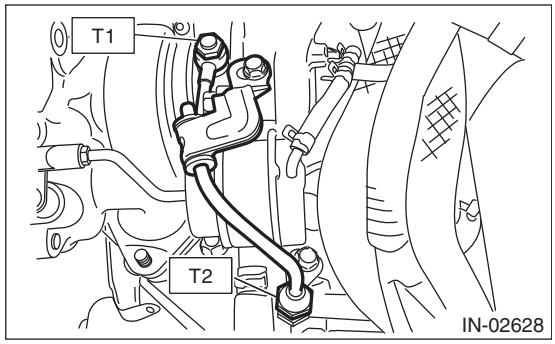


5) Tighten the union bolts and flare nuts which secure the oil inlet pipe to the turbocharger.

CAUTION:
In order to prevent damaging the oil pipe on the cylinder head side, fix the section (a) shown in the figure when tightening the oil inlet pipe flare nut, and avoid the part from rotating together while tightening the nut.

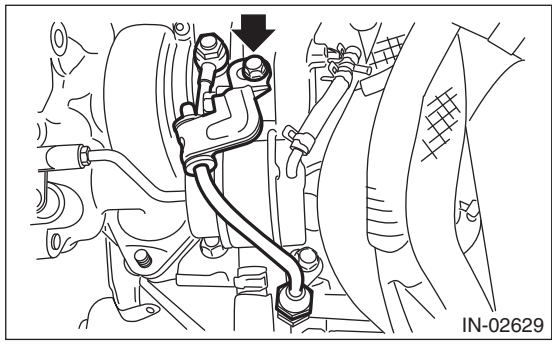


Tightening torque:
T1: 16 N·m (1.6 kgf-m, 11.8 ft-lb)
T2: 20 N·m (2.0 kgf-m, 14.8 ft-lb)



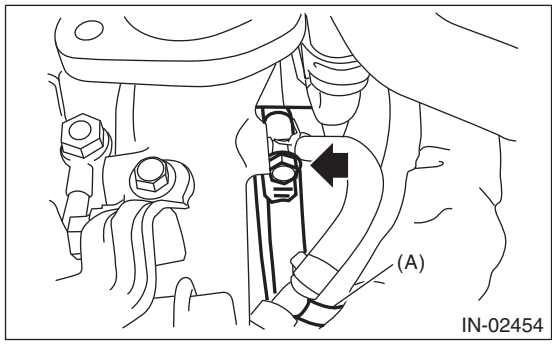
6) Tighten the bolts which hold the oil inlet pipe stay to the turbocharger.

Tightening torque:
5 N·m (0.5 kgf-m, 3.7 ft-lb)

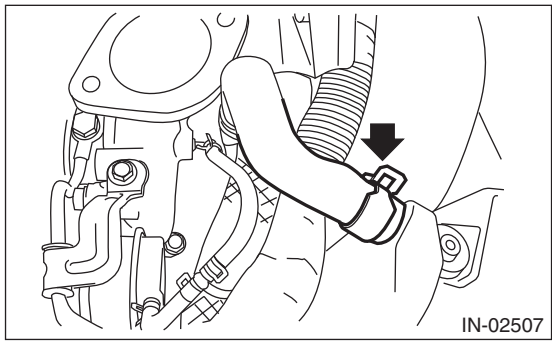


7) Connect the air control hose (A), and install the intake duct to the turbocharger.

Tightening torque:
3 N·m (0.3 kgf-m, 2.2 ft-lb)



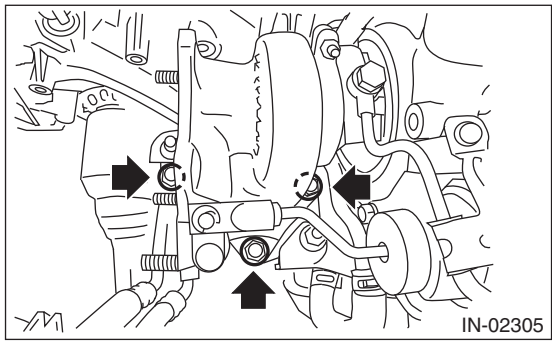
8) Connect the engine coolant hoses to the coolant filler tank.



9) Install the joint pipe to turbocharger.

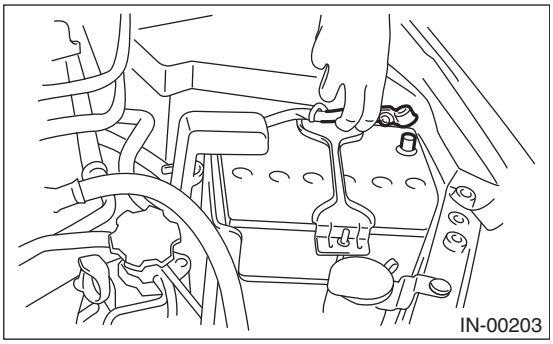
NOTE:
Replace the gasket with a new part.

Tightening torque:
42.5 N·m (4.3 kgf-m, 31.3 ft-lb)



10) Lift up the vehicle.
11) Install the center exhaust pipe. <Ref. to EX(H4DOTC)-8, INSTALLATION, Center Exhaust Pipe.>
12) Lower the vehicle.
13) Install the intercooler. <Ref. to IN(H4DOTC)-13, INSTALLATION, Intercooler.>

14) Connect the battery ground terminal.

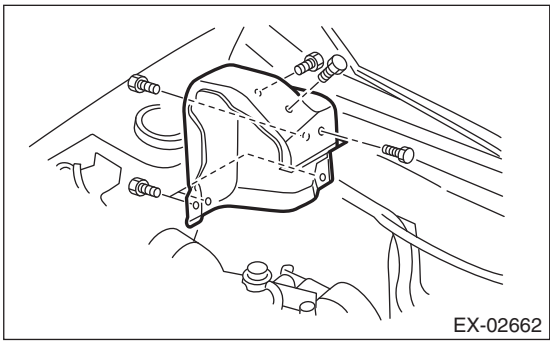


15) Fill engine coolant. <Ref. to CO(H4DOTC)-13, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
16) Install the collector cover.

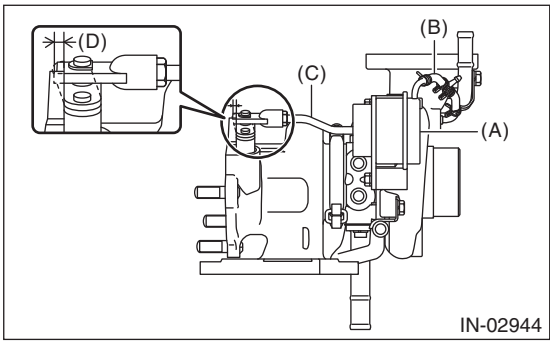
C: INSPECTION

1. WASTE GATE ACTUATOR

1) Remove the collector cover.
2) Remove the intercooler. <Ref. to IN(H4DOTC)-13, REMOVAL, Intercooler.>
3) Remove the turbocharger upper cover.



4) Remove the boost hose (B) from the waste gate actuator (A) of the turbocharger, and connect the Mighty Vac to the waste gate actuator (A).



(A) Waste gate actuator
(B) Boost hose
(C) Control rod
(D) Control rod stroke

5) Pressurize slowly with the Mighty Vac, and check the pressure when the control rod stroke (D) becomes 1 mm (0.04 in). If it is not within the standard, replace the turbocharger assembly.

CAUTION:
Do not pressurize over 56.0 kPa (0.57 kgf/cm^2, 8.12 psi) to prevent damaging the waste gate actuator.

Operating pressure (control rod stroke 1 mm (0.04 in)):
Standard
44.0 — 46.6 kPa (0.45 — 0.48 kgf/cm^2, 6.38 — 6.76 psi)

6) After inspection, install the related parts in the reverse order of removal.

Tightening torque:
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)

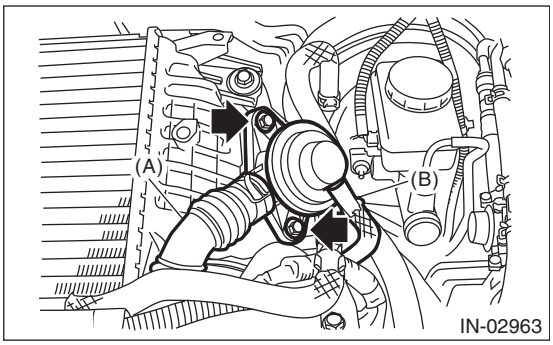
2. OTHER INSPECTIONS

1) Check that the turbocharger and pipe have no deformation, cracks or other damages.
2) Check that the hose and intake duct have no cracks, damage or loose part.
3) Check that there are no oil leaks or water leaks from the pipe attachment section.

8. Air By-pass Valve

A: REMOVAL

1) Remove the collector cover.
2) Disconnect the air by-pass pipe (A) and vacuum hose (B) from the air by-pass valve, and remove the air by-pass valve from the intercooler.



B: INSTALLATION

Install in the reverse order of removal.

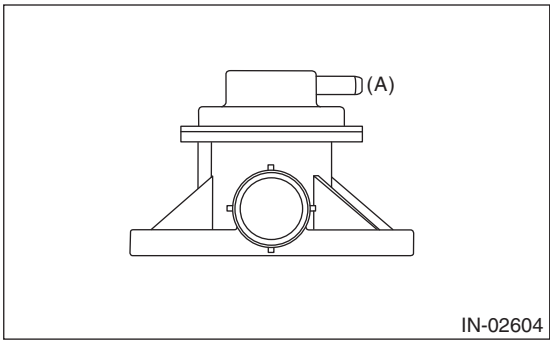
NOTE:
- Use new O-rings.
- Be careful not to pinch the O-ring.

Tightening torque:
6.5 N·m (0.7 kgf-m, 4.8 ft-lb)

C: INSPECTION

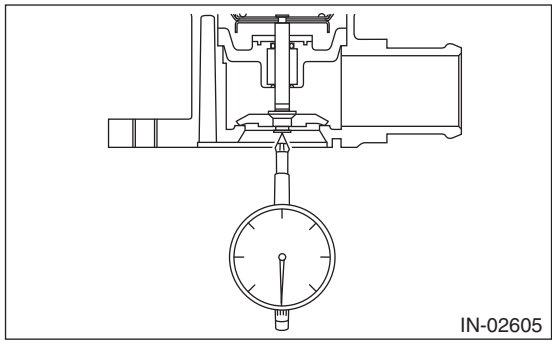
1. AIR BY-PASS VALVE

1) Check that the air by-pass valve has no deformation, cracks or other damages.
2) Connect the Mighty Vac to the nipple (A) of the air by-pass valve.



3) Using the Mighty Vac, generate the negative pressure to –93.3 kPa (–0.95 kgf/cm^2, –13.5 psi). Check that the Mighty Vac gauge needle holds 10 seconds without falling by –92.6 kPa (–0.94 kgf/cm^2, –13.4 psi).

4) Set a dial gauge to the end of valve rod of the air by-pass valve.



5) Using the Mighty Vac, generate the negative pressure, and check the pressure when dial gauge needle (valve stroke) shows 0.5 mm (0.02 in). If it is not within the standard, replace the air by-pass valve.

Opening pressure (valve stroke 0.5 mm (0.02 in)):
Standard
–53.3 — –61.3 kPa (–0.54 — –0.63 kgf/cm^2, –7.73 — –8.89 psi)

6) Generate the additional negative pressure from 5), and check the pressure when dial gauge needle (valve stroke) shows 7.5 mm (0.3 in). If it is not within the standard, replace the air by-pass valve.

Full open pressure (valve stroke 7.5 mm (0.3 in)):
Standard
–93.4 — –108 kPa (–0.95 — –1.10 kgf/cm^2, –13.5 — –15.7 psi)

2. OTHER INSPECTIONS

Check that the vacuum hose and air by-pass pipe have no cracks, damage or loose part.

9. Resonator Chamber

A: REMOVAL

The resonator chamber and air cleaner case are integrated into one unit; therefore, refer to “Air Cleaner Case” for removal procedure. <Ref. to IN(H4DOTC)-8, REMOVAL, Air Cleaner Case.>

B: INSTALLATION

The resonator chamber and air cleaner case are integrated into one unit; therefore, refer to “Air Cleaner Case” for installation procedure. <Ref. to IN(H4DOTC)-8, INSTALLATION, Air Cleaner Case.>

C: INSPECTION

Check that the resonator chamber has no deformation, cracks or other damages.

MECHANICAL

ME(H4DOTC)

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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)
	Displacement			cm^3 (cu in)	2,457 (149.94)
	Compression ratio				8.4
	Compression pressure (at 200 — 300 rpm)			kPa (kg/cm^2, psi) Standard	981 — 1,177 (10 — 12, 142 — 171)
	Number of piston rings				Pressure ring: 2, Oil ring: 1
	Intake valve timing		Open	Max. retard	ATDC 5°
				Min. advance	BTDC 35°
			Close	Max. retard	ABDC 65°
				Min. advance	ABDC 25°
	Exhaust valve timing		Open		BBDC 55°
			Close		ATDC 5°
	Valve clearance mm (in)	Inspection value	Intake		$0.20^{+0.04}_{-0.06}$ ($0.0079^{+0.0016}_{-0.0024}$)
			Exhaust		0.35±0.05 (0.0138±0.0020)
		Adjustment value	Intake		$0.20^{+0.01}_{-0.03}$ ($0.0079^{+0.0004}_{-0.0012}$)
			Exhaust		0.35±0.02 (0.0138±0.0008)
	Idle rpm (select lever in “P” or “N” range) rpm		No load	Standard	700±100
			A/C ON	Standard	825±100
	Ignition order				1 → 3 → 2 → 4
	Ignition timing			BTDC/rpm Standard	17°±10°/700

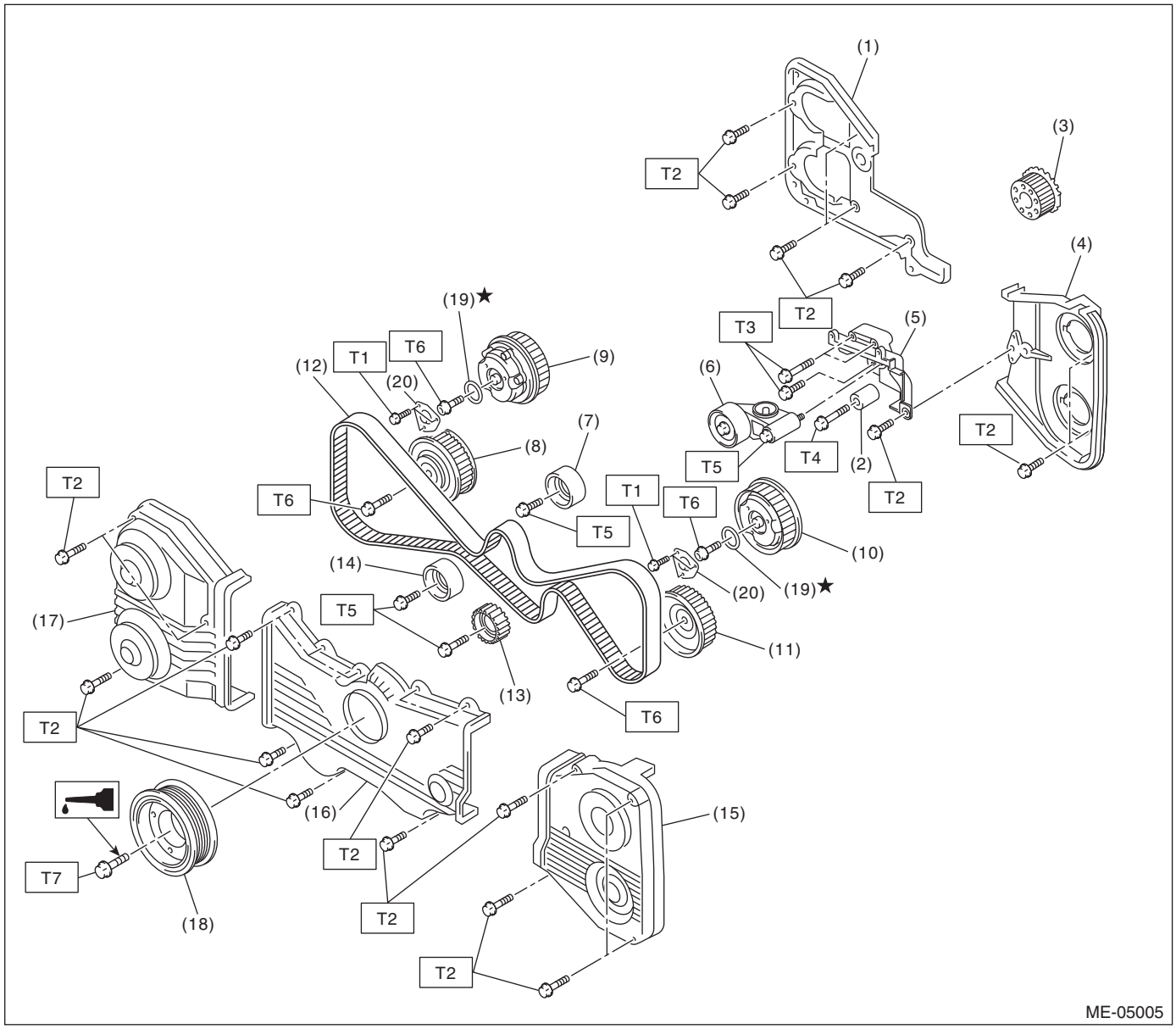
NOTE:
OS: Oversize US: Undersize

Belt tension adjuster	Adjuster rod protrusion amount		mm (in)	5.2 — 6.2 (0.205 — 0.244)
Camshaft	Bending limit		mm (in)	0.020 (0.00079)
	Cam lobe height mm (in)	Intake	Standard	46.55 — 46.65 (1.833 — 1.837)
		Exhaust	Standard	46.75 — 46.85 (1.841 — 1.844)
	Cam base circle diameter mm (in)		Standard	37.0 (1.457)
	Journal O.D. mm (in)	Front	Standard	37.946 — 37.963 (1.4939 — 1.4946)
		Center, rear	Standard	29.946 — 29.963 (1.1790 — 1.1796)
	Oil clearance mm (in)		Standard	0.037 — 0.072 (0.0015 — 0.0028)
	Thrust clearance mm (in)		Standard	0.068 — 0.116 (0.0027 — 0.0047)
Cylinder head	Warping limit (Mating surface with cylinder block)		mm (in)	0.035 (0.0014)
	Grinding limit		mm (in)	0.3 (0.012)
	Standard height		mm (in)	127.5 (5.02)
Valve seat	Seating angle between valve and valve seat			90°
	Contacting width between valve and valve seat mm (in)	Intake	Standard	0.6 — 1.4 (0.024 — 0.055)
		Exhaust	Standard	1.2 — 1.8 (0.047 — 0.071)
Valve guide	Clearance between the valve guide and valve stem mm (in)	Intake	Standard	0.030 — 0.057 (0.0012 — 0.0022)
		Exhaust	Standard	0.040 — 0.067 (0.0016 — 0.0026)
	Inside diameter		mm (in)	6.000 — 6.012 (0.2362 — 0.2367)
	Valve stem outer diameters mm (in)	Intake		5.955 — 5.970 (0.2344 — 0.2350)
		Exhaust		5.945 — 5.960 (0.2341 — 0.2346)
	Valve guide protrusion amount		mm (in)	15.8 — 16.2 (0.622 — 0.638)
Valve	Head edge thickness mm (in)	Intake	Standard	1.0 — 1.4 (0.039 — 0.055)
		Exhaust	Standard	1.3 — 1.7 (0.051 — 0.067)
	Overall length mm (in)	Intake		104.4 (4.110)
		Exhaust		104.65 (4.1201)
Valve spring	Free length		mm (in)	47.32 (1.863)
	Tension/spring height		N (kgf, lb)/mm (in)	Set: 205 — 235 (20.9 — 24.0, 46.1 — 52.8)/36.0 (1.417)
				Lift: 426 — 490 (43.4 — 50.0, 95.8 — 110)/26.50 (1.043)
	Squareness			2.5°, 2.1 mm (0.083 in) or less
Valve lifter	Outer diameter mm (in)		Standard	34.959 — 34.975 (1.3763 — 1.3770)
	Valve lifter mating surface inner diameter mm (in)		Standard	34.994 — 35.016 (1.3777 — 1.3786)
	Valve lifter and valve lifter mating surface clearance mm (in)		Standard	0.019 — 0.057 (0.0007 — 0.0022)
Cylinder block	Warping limit (Mating surface with cylinder head)		mm (in)	0.025 (0.0098)
	Grinding limit		mm (in)	0.1 (0.004)
	Standard height		mm (in)	201.0 (7.91)
	Cylindricality mm (in)		Standard	0.015 (0.0006)
	Out-of-roundness mm (in)		Standard	0.010 (0.0004)
	Clearance between cylinder and piston at 20°C (68°F) mm (in)		Standard	–0.010 — 0.010 (–0.00039 — 0.00039)
	Cylinder inner diameter boring limit (diameter)		mm (in)	To 100.005 (3.9372)

Piston	Piston grade point mm (in)			38.2 (1.50)
	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	Degree of fit			Piston pin must be fitted into position with thumb at 20°C (68°F).
	Clearance between piston pin hole and piston pin mm (in)		Standard	0.004 — 0.008 (0.0002 — 0.0003)
Piston ring	Piston ring gap mm (in)	Top ring	Standard	0.20 — 0.25 (0.0079 — 0.0098)
		Second ring	Standard	0.37 — 0.52 (0.015 — 0.0203)
		Oil ring	Standard	0.20 — 0.50 (0.0079 — 0.0197)
	Clearance between piston ring and piston ring groove mm (in)	Top ring	Standard	0.040 — 0.080 (0.0016 — 0.0031)
		Second ring	Standard	0.030 — 0.070 (0.0012 — 0.0028)
Connecting rod and connecting rod bearing	Bend or twist per 100 mm (3.94 in) in length mm (in)		Limit	0.10 (0.0039)
	Thrust clearance mm (in)		Standard	0.070 — 0.330 (0.0028 — 0.0130)
	Oil clearance mm (in)		Standard	0.017 — 0.045 (0.0007 — 0.0018)
	Bearing size (Thickness at center) mm (in)	Standard		1.490 — 1.506 (0.0587 — 0.0593)
		0.03 (0.0012) US		1.504 — 1.512 (0.0592 — 0.0595)
		0.05 (0.0020) US		1.514 — 1.522 (0.0596 — 0.0599)
		0.25 (0.0098) US		1.614 — 1.622 (0.0635 — 0.0639)
Bushing of small end	Clearance between piston pin and bushing mm (in)		Standard	0 — 0.022 (0 — 0.0009)
Crankshaft and crankshaft bearing	Bending limit mm (in)			0.035 (0.0014)
	Crank pin	Out-of-roundness mm (in)	Standard	0.003 (0.0001)
		Cylindricality mm (in)	Standard	0.004 (0.0002)
		Grinding limit (dia.) mm (in)		To 51.750 (2.0374)
	Crank journal	Out-of-roundness mm (in)	Standard	0.005 (0.0002)
		Cylindricality mm (in)	Standard	0.006 (0.0002)
		Grinding limit (dia.) mm (in)		To 59.758 (2.3527)
	Crank pin outer diameter mm (in)	Standard		51.976 — 52.000 (2.0463 — 2.0472)
		0.03 (0.0012) US		51.954 — 51.970 (2.0454 — 2.0461)
		0.05 (0.0020) US		51.934 — 51.950 (2.0447 — 2.0453)
		0.25 (0.0098) US		51.734 — 51.750 (2.0368 — 2.0374)
	Crank journal outer diameter mm (in)	Standard		59.984 — 60.008 (2.3616 — 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)
	Bearing size (Thickness at center) mm (in)	#1, #3 Standard		1.998 — 2.015 (0.0787 — 0.0793)
		#1, #3 0.03 (0.0012) US		2.017 — 2.020 (0.0794 — 0.0795)
		#1, #3 0.05 (0.0020) US		2.027 — 2.030 (0.0798 — 0.0799)
		#1, #3 0.25 (0.0098) US		2.127 — 2.130 (0.0837 — 0.0839)
		#2, #4, #5 Standard		2.000 — 2.017 (0.0787 — 0.0794)
		#2, #4, #5 0.03 (0.0012) US		2.019 — 2.022 (0.0795 — 0.0796)
		#2, #4, #5 0.05 (0.0020) US		2.029 — 2.032 (0.0799 — 0.0800)
		#2, #4, #5 0.25 (0.0098) US		2.129 — 2.132 (0.0838 — 0.0839)
	Thrust clearance mm (in)		Standard	0.030 — 0.115 (0.0012 — 0.0045)
	Oil clearance mm (in)		Standard	0.010 — 0.030 (0.0004 — 0.0012)

B: COMPONENT

1. TIMING BELT

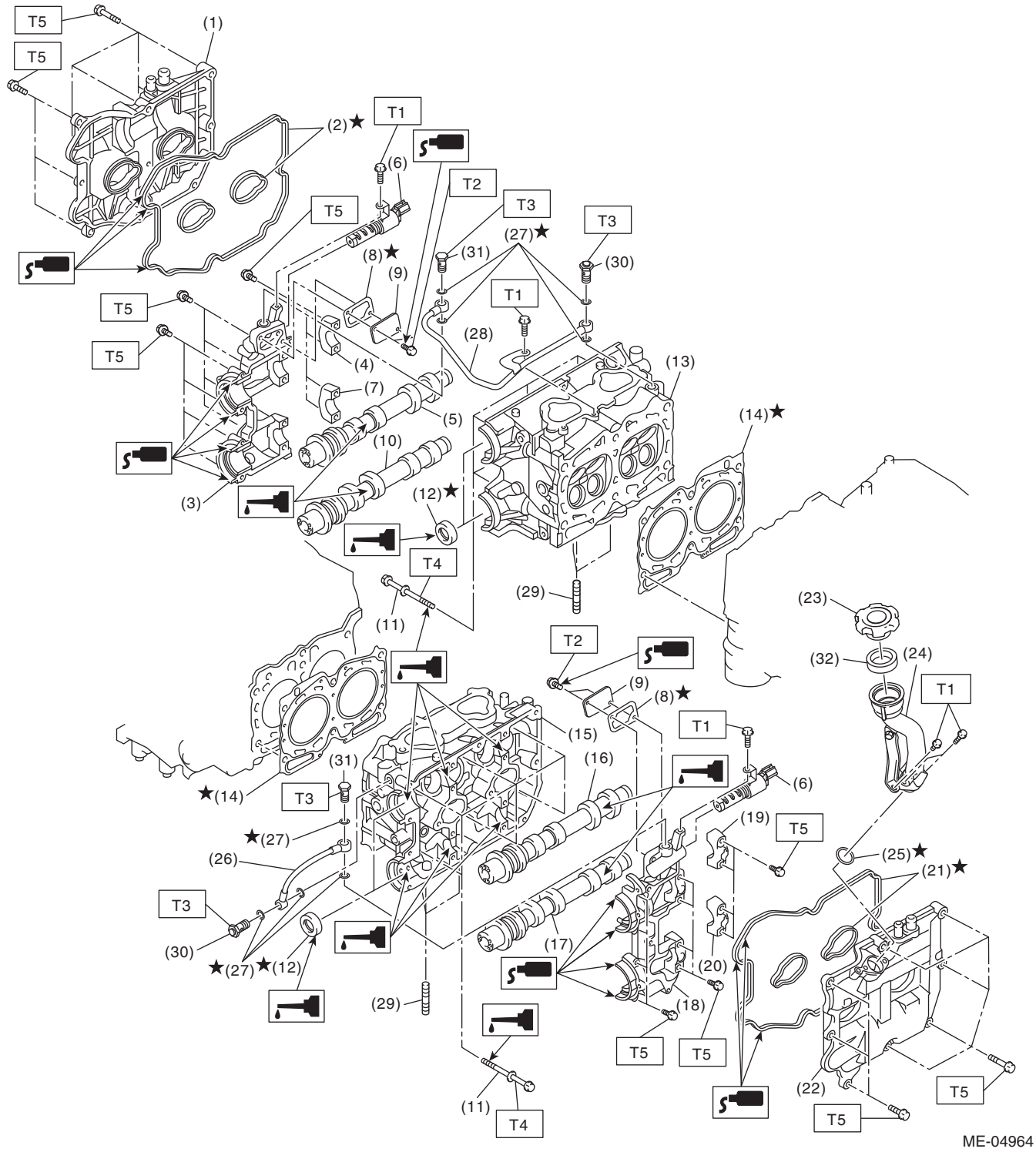


(1)	Timing belt cover No. 2 RH	(11)	Exhaust cam sprocket LH
(2)	Belt idler	(12)	Timing belt
(3)	Crank sprocket	(13)	Belt idler No. 2
(4)	Timing belt cover No. 2 LH	(14)	Belt idler
(5)	Tensioner bracket	(15)	Timing belt cover LH
(6)	Automatic belt tension adjuster ASSY	(16)	Front belt cover
(7)	Belt idler	(17)	Timing belt cover RH
(8)	Exhaust cam sprocket RH	(18)	Crank pulley
(9)	Intake cam sprocket RH	(19)	O-ring
(10)	Intake cam sprocket LH	(20)	Actuator cover

Tightening torque:N·m (kgf-m, ft-lb)

- ***T1: 3.4 (0.3, 2.5)***
- ***T2: 5 (0.5, 3.7)***
- ***T3: 24.5 (2.5, 18.1)***
- ***T4: 25 (2.5, 18.4)***
- ***T5: 39 (4.0, 28.8)***
- ***T6: <Ref. to ME(H4DOTC)-56, INSTALLATION, Cam Sprocket.>***
- ***T7: <Ref. to ME(H4DOTC)-46, INSTALLATION, Crank Pulley.>***

2. CYLINDER HEAD AND CAMSHAFT

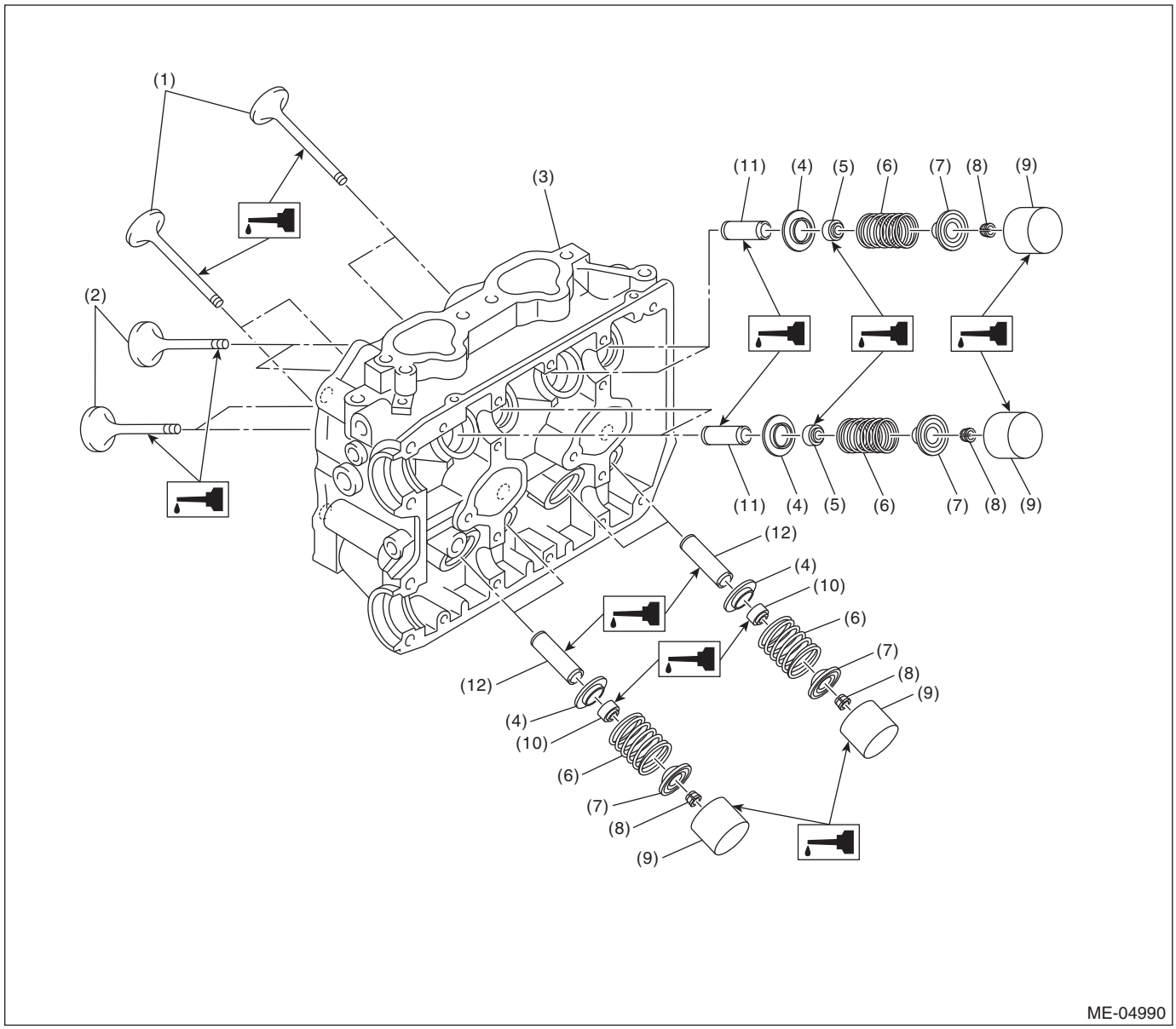


(1) Rocker cover RH
(2) Rocker cover gasket RH
(3) Front camshaft cap RH
(4) Intake camshaft cap RH
(5) Intake camshaft RH
(6) Oil flow control solenoid valve
(7) Exhaust camshaft cap RH
(8) Gasket
(9) Oil return cover
(10) Exhaust camshaft RH
(11) Cylinder head bolt
(12) Oil seal
(13) Cylinder head RH
(14) Cylinder head gasket
(15) Cylinder head LH
(16) Intake camshaft LH
(17) Exhaust camshaft LH
(18) Front camshaft cap LH
(19) Intake camshaft cap LH
(20) Exhaust camshaft cap LH
(21) Rocker cover gasket LH
(22) Rocker cover LH
(23) Oil filler cap
(24) Oil filler duct
(25) O-ring
(26) Oil pipe LH
(27) Gasket
(28) Oil pipe RH
(29) Stud bolt
(30) Union bolt with filter (with protrusion)
(31) Union bolt without filter (without protrusion)
(32) Gasket

Tightening torque:N·m (kgf-m, ft-lb)

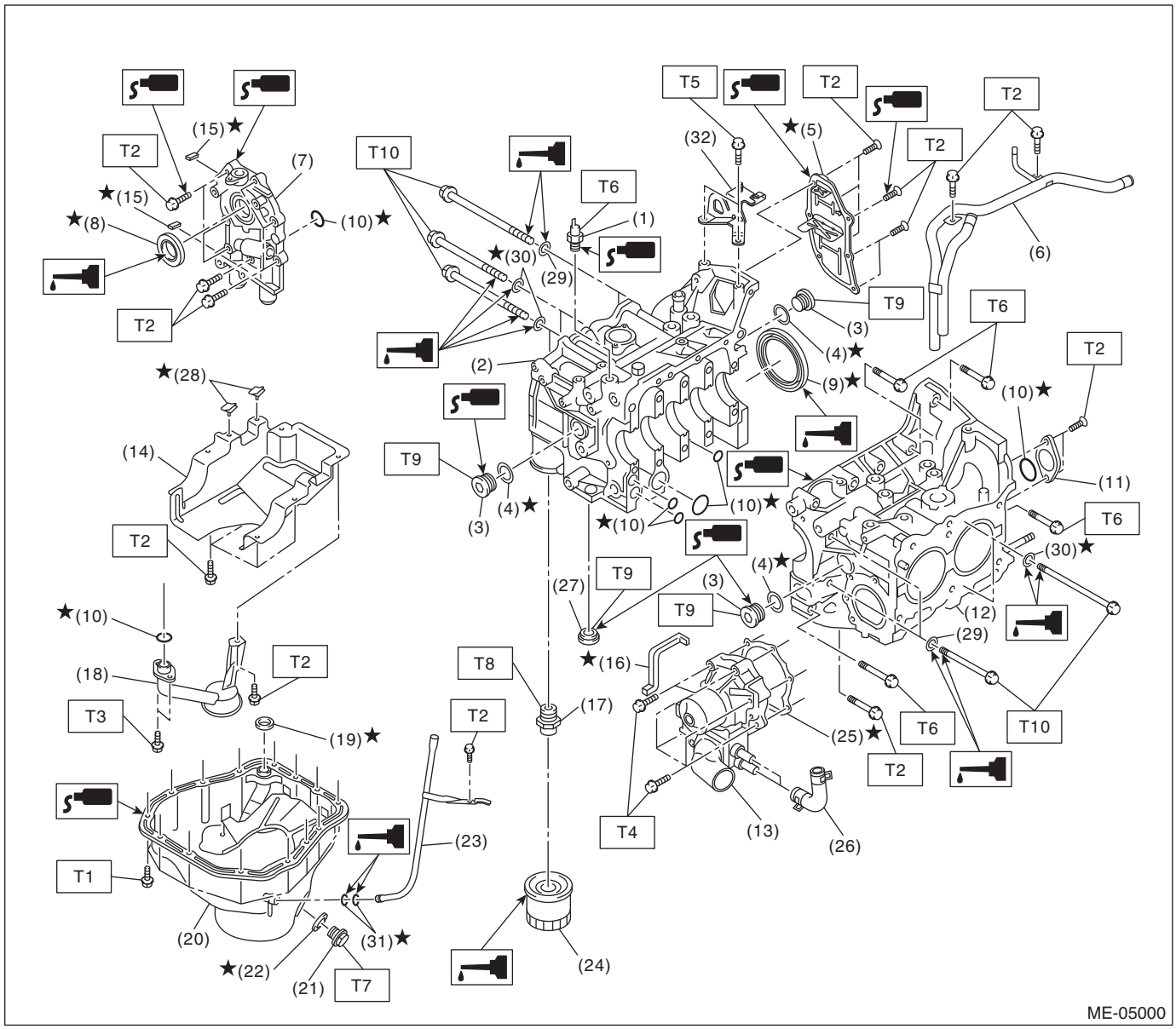
T1: 6.4 (0.7, 4.7)
T2: 9 (0.9, 6.6)
T3: 29 (3.0, 21.4)
T4: <Ref. to ME(H4DOTC)-65, INSTALLATION, Cylinder Head.>
T5: <Ref. to ME(H4DOTC)-60, INSTALLATION, Camshaft.>

3. CYLINDER HEAD AND VALVE ASSEMBLY



(1) Exhaust valve
(2) Intake valve
(3) Cylinder head
(4) Valve spring seat
(5) Intake valve oil seal
(6) Valve spring
(7) Retainer
(8) Retainer key
(9) Valve lifter
(10) Exhaust valve oil seal
(11) Intake valve guide
(12) Exhaust valve guide

4. CYLINDER BLOCK

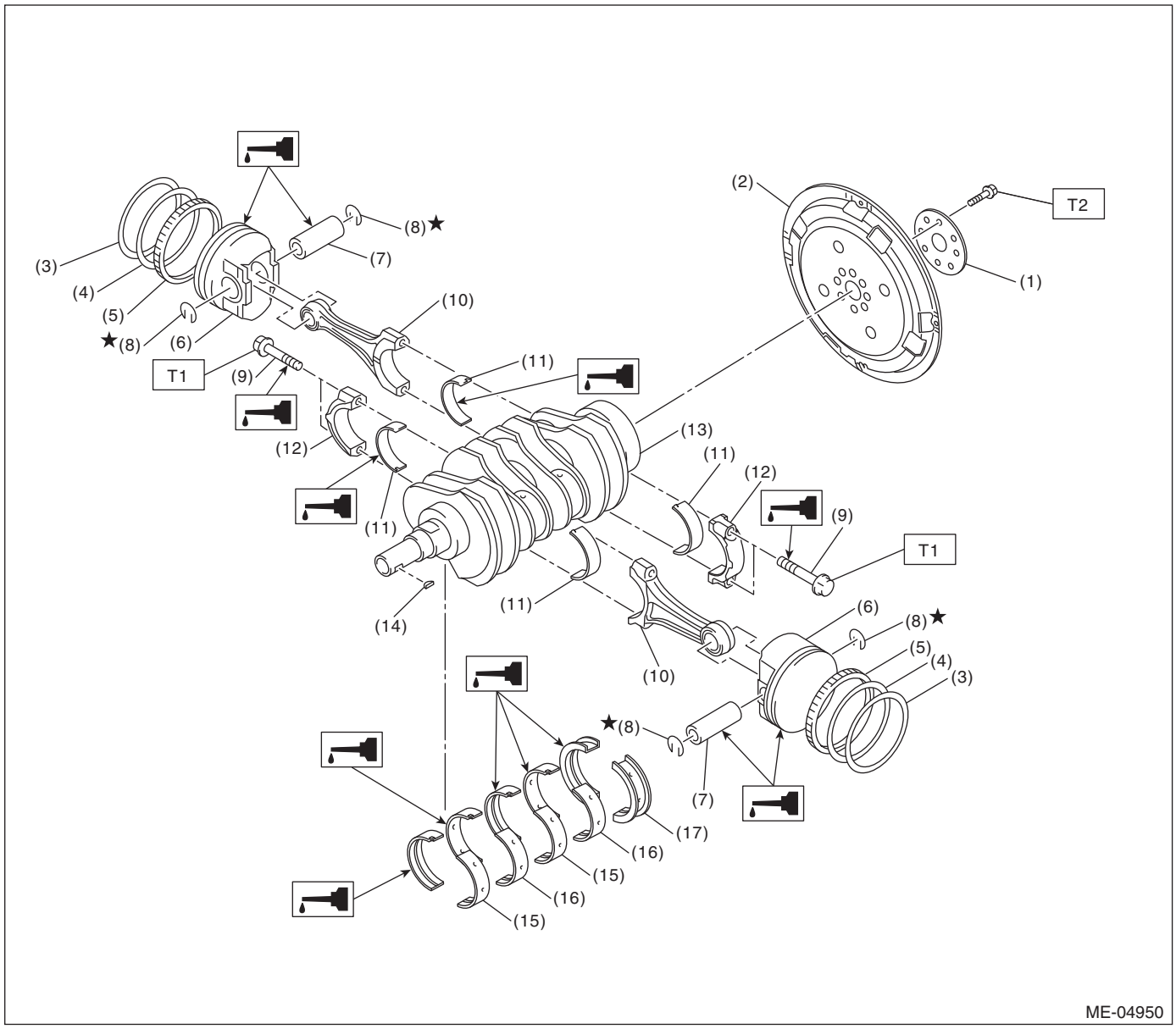


(1) Oil pressure switch
(2) Cylinder block RH
(3) Service hole plug
(4) Gasket
(5) Oil separator cover
(6) Water by-pass pipe
(7) Oil pump
(8) Front oil seal
(9) Rear oil seal
(10) O-ring
(11) Service hole cover
(12) Cylinder block LH
(13) Water pump
(14) Baffle plate
(15) Oil pump seal
(16) Water pump sealing
(17) Oil filter connector
(18) Oil strainer
(19) Gasket
(20) Oil pan
(21) Drain plug
(22) Drain plug gasket
(23) Oil level gauge guide
(24) Oil filter
(25) Gasket
(26) Water pump hose
(27) Plug
(28) Seal
(29) Washer
(30) Seal washer
(31) O-ring
(32) Engine rear hanger

Tightening torque:N·m (kgf-m, ft-lb)

T1:	***5 (0.5, 3.7)***
T2:	***6.4 (0.7, 4.7)***
T3:	***10 (1.0, 7.2)***
T4:	***First 12 (1.2, 8.9) Second 12 (1.2, 8.9)***
T5:	***16 (1.6, 11.8)***
T6:	***25 (2.5, 18.4)***
T7:	***44 (4.5, 32.5)***
T8:	***45 (4.6, 33.2)***
T9:	***70 (7.1, 51.6)***
T10:	***<Ref. to ME(H4DOTC)-77, INSTALLATION, Cylinder Block.>***

5. CRANKSHAFT AND PISTON



ME-04950

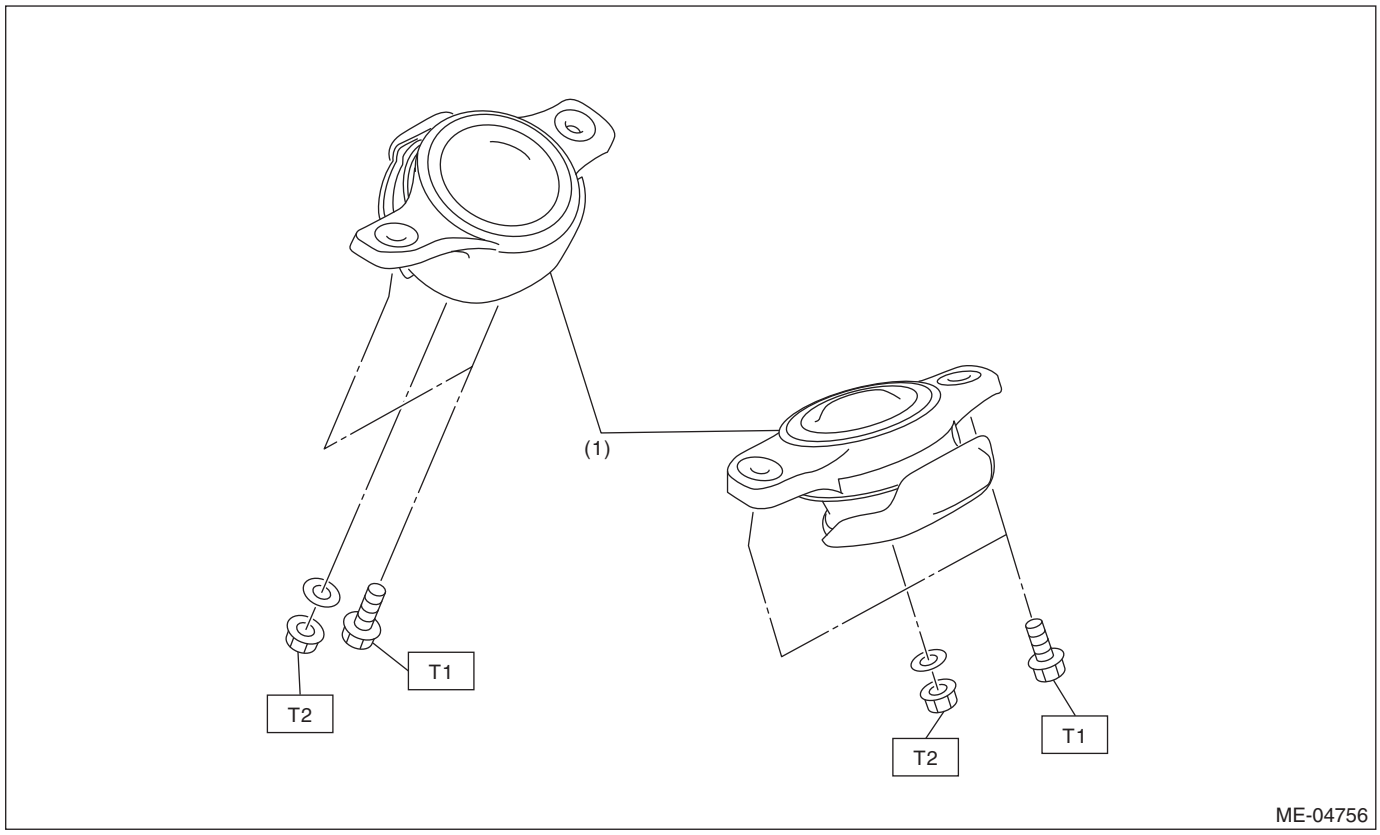
(1) Reinforcement
(2) Drive plate
(3) Top ring
(4) Second ring
(5) Oil ring
(6) Piston
(7) Piston pin
(8) Snap ring
(9) Connecting rod bolt
(10) Connecting rod
(11) Connecting rod bearing
(12) Connecting rod cap
(13) Crankshaft
(14) Woodruff key
(15) Crankshaft bearing #1, #3
(16) Crankshaft bearing #2, #4
(17) Crankshaft bearing #5

Tightening torque:N·m (kgf-m, ft-lb)

T1: 52 (5.3, 38.4)

T2: <Ref. to 4AT-73, INSTALLATION, Drive Plate.>

6. ENGINE MOUNTING



(1) Front cushion rubber

Tightening torque:N·m (kgf-m, ft-lb)
T1: 35 (3.6, 25.8)
T2: 85 (8.7, 62.7)

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 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.
• 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.

D: PREPARATION TOOL

1. SPECIAL TOOL

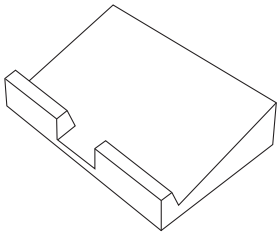
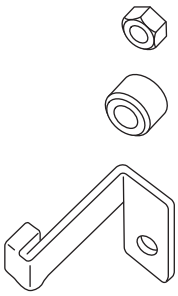
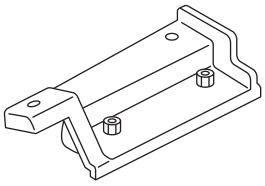
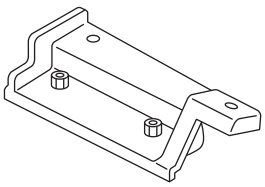
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498267600	498267600	CYLINDER HEAD TABLE	• Used for replacing valve guides. • Used for removing and installing valve spring.
 ST-498277200	498277200	STOPPER SET	Used for installing automatic transmission assembly to engine.
 ST-498457000	498457000	ENGINE STAND ADAPTER RH	Used together with ENGINE STAND (499817100).
 ST-498457100	498457100	ENGINE STAND ADAPTER LH	Used together with ENGINE STAND (499817100).

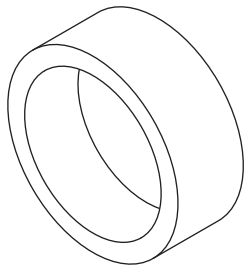
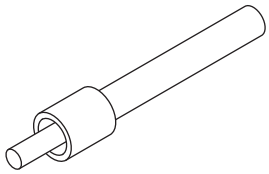
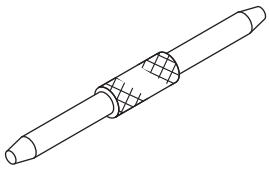
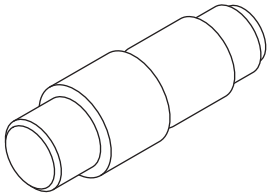
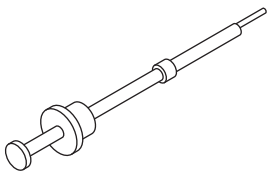
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498747300	498747300	PISTON GUIDE	Used for installing the piston into the cylinder.
 ST-498857100	498857100	VALVE OIL SEAL GUIDE	Used for press-fitting of intake valve guide oil seals and exhaust valve guide oil seals.
 ST-499017100	499017100	PISTON PIN GUIDE	Used for installing piston pin, piston and connecting rod.
 ST-499037100	499037100	CONNECTING ROD BUSHING REMOVER AND INSTALLER	Used for removing and installing connecting rod bushing.
 ST-499097700	499097700	PISTON PIN REMOVER ASSY	Used for removing piston pin.

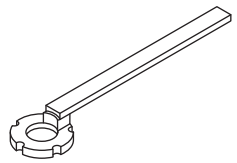
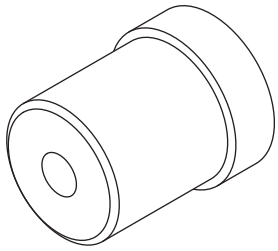
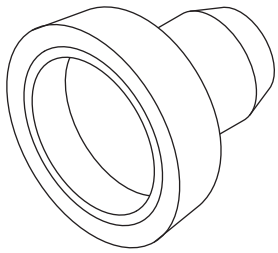
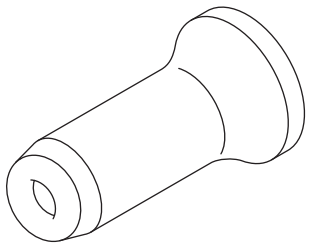
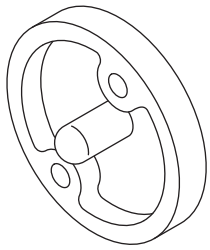
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499207400	499207400	CAM SPROCKET WRENCH	Used for removing and installing exhaust cam sprocket.
 ST-499587100	499587100	OIL SEAL INSTALLER	Used for installing oil pump oil seal.
 ST-499587200	499587200	CRANKSHAFT OIL SEAL INSTALLER	• Used for installing crankshaft oil seal. • Used together with CRANKSHAFT OIL SEAL GUIDE (499597100).
 ST-499587600	499587600	OIL SEAL INSTALLER	Used for installing the camshaft oil seal.
 ST-499597100	499597100	CRANKSHAFT OIL SEAL GUIDE	• Used for installing crankshaft oil seal. • Used together with CRANKSHAFT OIL SEAL INSTALLER (499587200).

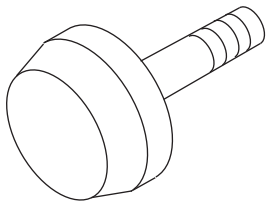
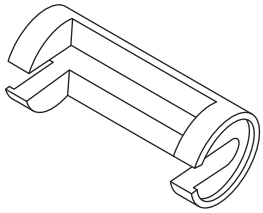
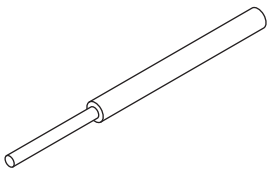
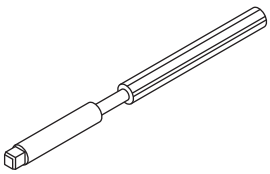
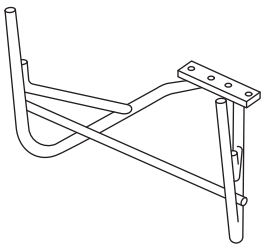
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499597200	499597200	OIL SEAL GUIDE	• Used for installing the camshaft oil seal. • Used together with OIL SEAL INSTALLER (499587600).
 ST-499718000	499718000	VALVE SPRING REMOVER	Used for removing and installing valve spring.
 ST-499767200	499767200	VALVE GUIDE REMOVER	Used for removing valve guides.
 ST-499767400	499767400	VALVE GUIDE REAMER	Used for reaming valve guides.
 ST-499817100	499817100	ENGINE STAND	• Used for disassembling and assembling engine. • Used together with ENGINE STAND ADAPTER RH (498457000) & LH (498457100).

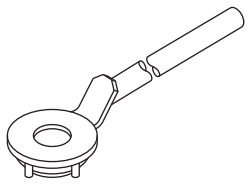
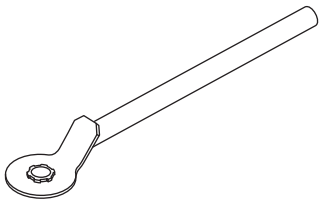
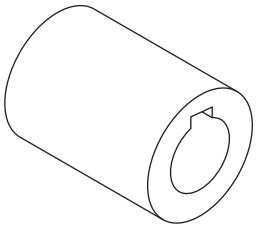
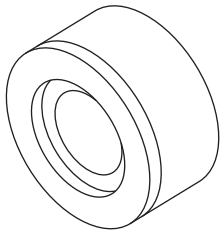
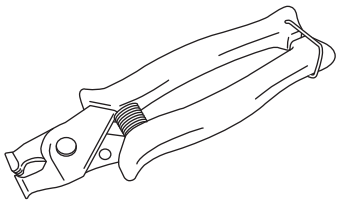
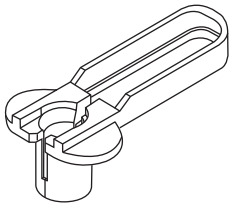
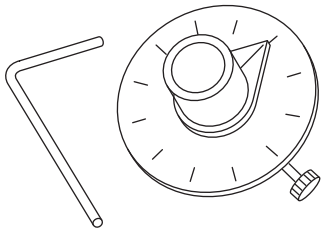
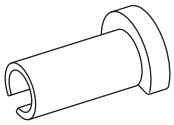
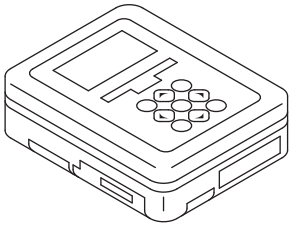
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499977400	499977400	CRANK PULLEY WRENCH	Used for removing and installing the crank pulley.
 ST-499977500	499977500	CAM SPROCKET WRENCH	Used for removing and installing intake cam sprocket.
 ST-499987500	499987500	CRANKSHAFT SOCKET	Used for rotating crankshaft.
 ST18251AA020	18251AA020	VALVE GUIDE ADJUSTER	Used for installing intake valve guides and exhaust valve guides.
 ST18353AA000	18353AA000	CLAMP PLIERS	• Used for removing and installing the PCV hose. • This tool is made by the French company CAILLAU. (code) 54.0.000.205 To make it easier to obtain, it has been provided with a tool number.

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18371AA000	18371AA000	CONNECTOR REMOVER	Used for disconnecting the quick connector on the fuel return hose side of the engine compartment (intake manifold).
 ST18854AA000	18854AA000	ANGLE GAUGE	Used for installing the crank pulley.
 ST42099AE000	42099AE000	QUICK CONNECTOR RELEASE	Used for removing the quick connector.
 ST1B022XU0	1B022XU0	SUBARU SELECT MONITOR III KIT	Used for various inspections.

2. GENERAL TOOL

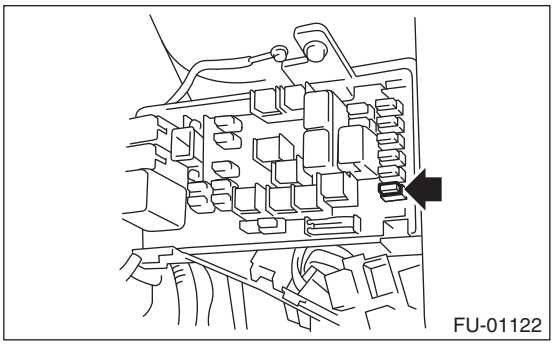
TOOL NAME	REMARKS
Compression gauge	Used for measuring compression.
Timing light	Used for measuring ignition timing.
Vacuum gauge	Used for measuring intake manifold vacuum.
Oil pressure gauge	Used for measuring engine oil pressure.
Fuel pressure gauge	Used for measuring fuel pressure.

2. Compression

A: INSPECTION

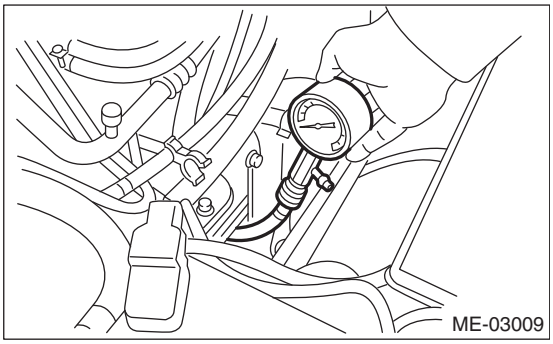
CAUTION:
After warming-up, engine becomes very hot. Be careful not to burn yourself during measurement.

1) Remove the collector cover.
2) After warming-up the engine, turn the ignition switch to OFF.
3) Make sure that the battery is fully charged.
4) Remove the fuse of fuel pump from main fuse box.



5) Start the engine and run it until it stalls.
6) After the engine stalls, crank it for five more seconds.
7) Turn the ignition switch to OFF.
8) Remove all spark plugs. <Ref. to IG(H4DOTC)-4, REMOVAL, Spark Plug.>
9) Fully open the throttle valve.
10) Check the starter motor for satisfactory performance and operation.
11) Install the compression gauge to the spark plug hole.

NOTE:
When using a screw-in type compression gauge, the screw should be less than 18 mm (0.71 in) long.



12) Crank the engine by starter motor and read the value when the needle of the compression gauge becomes stable.

NOTE:
• Perform at least two measurements per cylinder, and make sure that the values are correct.
• If the compression pressure is out of standard, check or adjust the pistons, valves and cylinders.

Compression (fully open throttle):
Standard
981 — 1,177 kPa (10 — 12 kgf/cm^2, 142 — 171 psi)
Difference between cylinders
49 kPa (0.5 kgf/cm^2, 7 psi) or less

13) After inspection, install the related parts in the reverse order of removal.

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) Read the engine idle speed using Subaru Select Monitor. <Ref. to EN(H4DOTC)(diag)-37, READ CURRENT DATA FOR ENGINE (NORMAL MODE), OPERATION, Subaru Select Monitor.>

NOTE:
• Idle speed cannot be adjusted manually, because the idle speed is automatically adjusted.
• If idle speed is out of standard, refer to the General Diagnosis Table under “Engine Control System”. <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.>

   (1) Check the idle speed when no-loaded. (Headlight, heater fan, rear defroster, radiator fan, A/C and etc. are OFF)

Idle rpm (no load and select lever in “P” or “N” range):
Standard
700±100 rpm

   (2) Check the idle speed when loaded. (Turn the A/C switch to “ON” and operate the compressor for at least one minute before measurement.)

Idle speed (A/C ON and select lever in “P” or “N” range):
Standard
825±100 rpm

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

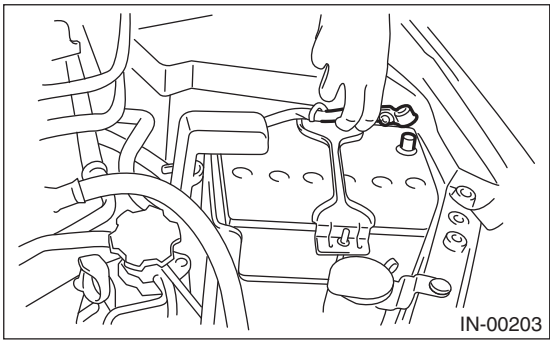
1) Before checking the ignition timing, check the following item:
   (1) Check the air cleaner element is free from clogging, spark plugs are in good condition, and hoses are connected properly.
   (2) Check the malfunction indicator light does not illuminate.
2) Warm up the engine.
3) Read the ignition timing using Subaru Select Monitor. <Ref. to EN(H4DOTC)(diag)-37, READ CURRENT DATA FOR ENGINE (NORMAL MODE), OPERATION, Subaru Select Monitor.>

NOTE:
If ignition timing is out of standard, check the ignition control system. Refer to “Engine Control System”. <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.>

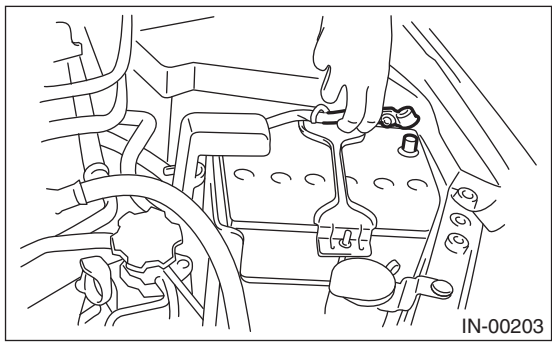
Ignition timing [BTDC/rpm]:
Standard
17°±10°/700

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) 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) Remove the collector cover.
5) Disconnect the ground cable from battery.



6) Remove the air intake duct (Rear). <Ref. to IN(H4DOTC)-10, REMOVAL, Air Intake Duct.>
7) Remove the air cleaner case. <Ref. to IN(H4DOTC)-8, REMOVAL, Air Cleaner Case.>
8) Connect the timing light to the power wire of #1 ignition coil.
9) Install the air cleaner case. <Ref. to IN(H4DOTC)-8, INSTALLATION, Air Cleaner Case.>
10) Connect the battery ground terminal.



11) Start the engine, turn the timing light to the crank pulley, and check the ignition timing through the timing belt cover gauge.

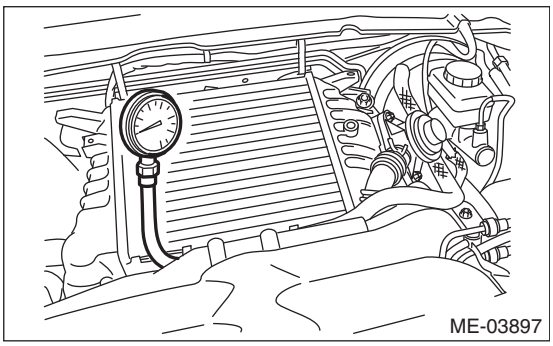
NOTE:
If ignition timing is out of standard, check the ignition control system. Refer to “Engine Control System”. <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.>

Ignition timing [BTDC/rpm]:
Standard
17°±10°/700
12) After inspection, install the related parts in the reverse order of removal.

5. Intake Manifold Vacuum

A: INSPECTION

1) Warm up the engine.
2) Remove the collector cover.
3) Remove the intercooler. <Ref. to IN(H4DOTC)-13, REMOVAL, Intercooler.>
4) Disconnect the brake booster vacuum hose from the intake manifold, and attach the vacuum gauge.



5) Install the intercooler. <Ref. to IN(H4DOTC)-13, INSTALLATION, Intercooler.>
6) Keep the engine at idle speed and read the vacuum gauge indication.

NOTE:
Condition of engine inside can be diagnosed by observing the behavior of the vacuum gauge needle as described in table below.

Intake manifold vacuum (at idling, A/C OFF):
Standard
–68.0 kPa (–510 mmHg, –20.08 inHg) or more

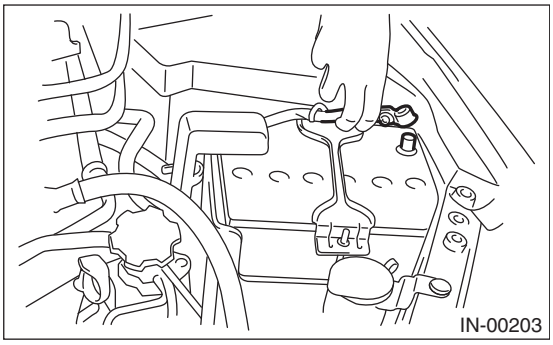
7) After inspection, install the related parts in the reverse order of removal.

Diagnosis of engine condition by inspection of intake manifold vacuum	
Vacuum gauge needle behavior	Possible engine condition
1. Needle is steady but lower than standard value. 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 standard value.	Leakage around cylinder
3. Needle drops suddenly and intermittently from standard value.	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 standard value in narrow range.	Defective ignition system

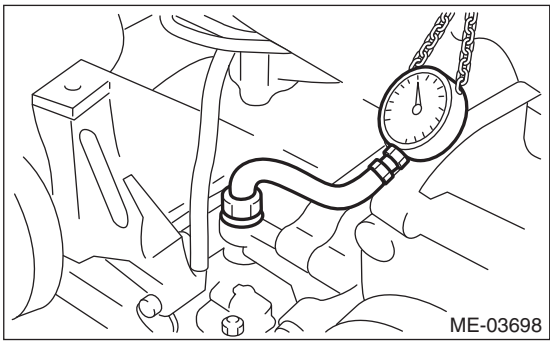
6. Engine Oil Pressure

A: INSPECTION

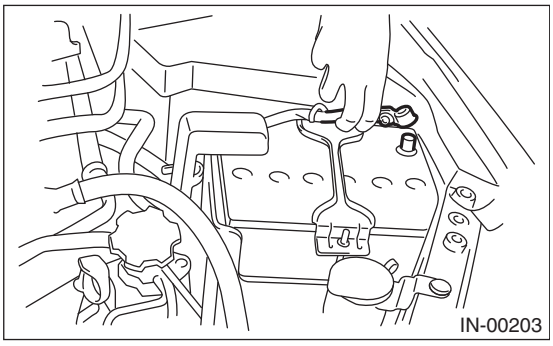
1) Remove the collector cover.
2) Disconnect the ground cable from battery.



3) Remove the oil pressure switch. <Ref. to LU(H4DOTC)-19, REMOVAL, Oil Pressure Switch.>
4) Install the oil pressure gauge to cylinder block.



5) Connect the battery ground terminal.



6) Start the engine, and check the oil pressure.

NOTE:
• Standard value is based on an engine oil temperature of 80°C (176°F).
• If the oil pressure is out of specification, check oil pump, oil filter and lubrication line. <Ref. to LU(H4DOTC)-27, INSPECTION, Engine Lubrication System Trouble in General.>
• If the oil pressure warning light is ON and oil pressure is within specification, check the oil pressure switch. <Ref. to LU(H4DOTC)-27, INSPECTION, Engine Lubrication System Trouble in General.>

Engine oil pressure:
Standard
98 kPa (1.0 kgf/cm^2, 14 psi) or more (at 600 rpm)
294 kPa (3.0 kgf/cm^2, 43 psi) or more (at 5,000 rpm)

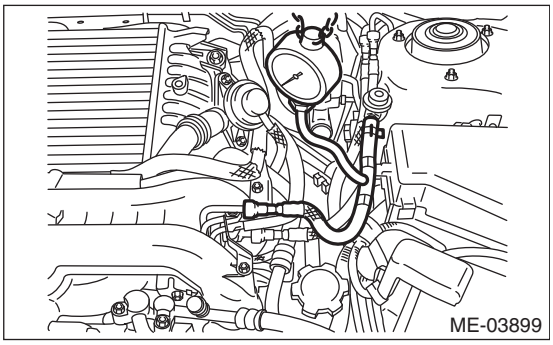
7) After inspection, install the related parts in the reverse order of removal.

7. Fuel Pressure

A: INSPECTION

CAUTION:
• Before removing the fuel pressure gauge, release the fuel pressure.
• Be careful not to spill fuel.
• Catch the fuel from hoses using a container or cloth.

1) Remove the collector cover.
2) Release the fuel pressure. <Ref. to FU(H4DOTC)-65, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
3) Open the fuel filler lid and remove the fuel filler cap.
4) Disconnect the fuel delivery hose from fuel damper, and connect fuel pressure gauge.



5) Start the engine.
6) Check the fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold.

NOTE:
• The fuel pressure gauge registers 10 to 20 kPa (0.1 to 0.2 kgf/cm^2, 1 to 3 psi) higher than standard values during high-altitude operations.
• If the fuel pressure is out of specification, check or replace the fuel pump, fuel line, pressure regulator and pressure regulator vacuum hose.

Fuel pressure:
Standard
284 — 314 kPa (2.9 — 3.2 kgf/cm^2, 41 — 46 psi)

7) After connecting the pressure regulator vacuum hose, recheck the fuel pressure.

NOTE:
• The fuel pressure gauge registers 10 to 20 kPa (0.1 to 0.2 kgf/cm^2, 1 to 3 psi) higher than standard values during high-altitude operations.
• If the fuel pressure is out of specification, check or replace the fuel pump, fuel line, pressure regulator and pressure regulator vacuum hose.

Fuel pressure:
Standard
230 — 260 kPa (2.35 — 2.65 kgf/cm^2, 33 — 38 psi)

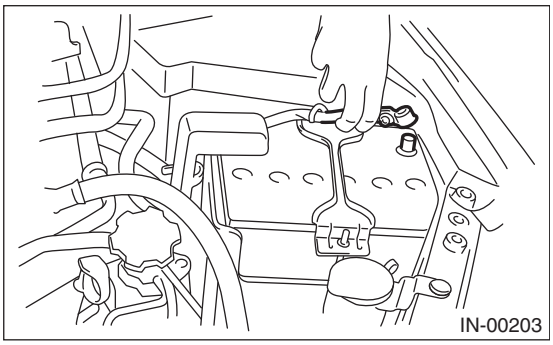
8) After inspection, install the related parts in the reverse order of removal.

NOTE:
For information about connecting fuel delivery hose, refer to “Fuel Delivery, Return & Evaporation Lines”. <Ref. to FU(H4DOTC)-92, CONNECTING THE FUEL DELIVERY HOSE, FUEL RETURN HOSE AND FUEL HOSE, INSTALLATION, Fuel Delivery, Return and Evaporation Lines.>

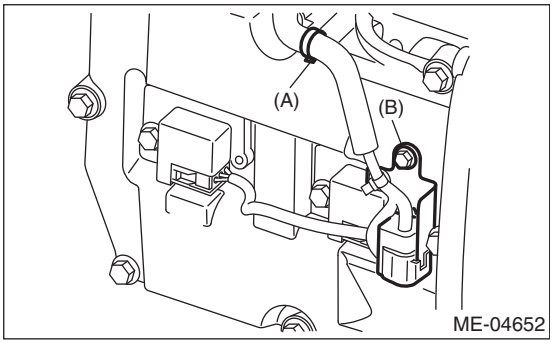
8. Valve Clearance

A: INSPECTION

1) Disconnect the ground cable from battery.

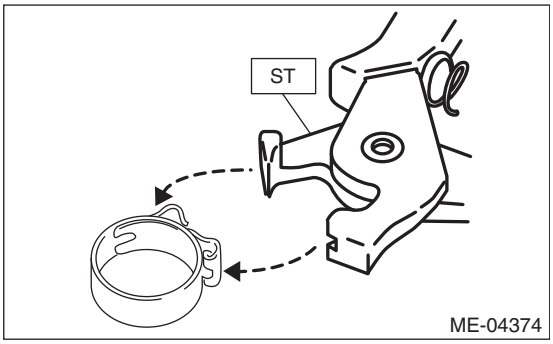


2) Remove the engine from vehicle. <Ref. to ME(H4DOTC)-29, REMOVAL, Engine Assembly.>
3) Remove the timing belt cover RH. <Ref. to ME(H4DOTC)-48, REMOVAL, Timing Belt Cover.>
4) When inspecting #1 and #3 cylinders
(1) Remove the clip (A) and the stay (B) which hold the engine harness to the rocker cover.

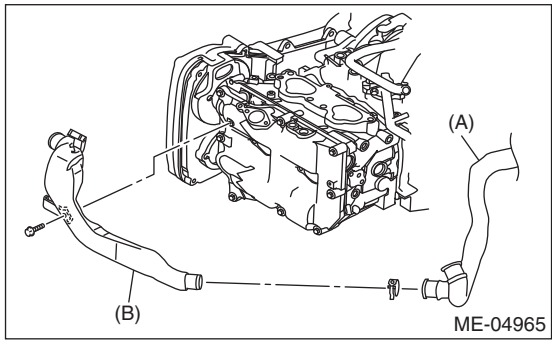


(2) Remove the ignition coil. <Ref. to IG(H4DOTC)-7, REMOVAL, Ignition Coil.>
(3) Disconnect PCV hose and vacuum hose from the rocker cover RH.

NOTE:
Pinch the clamp of the PCV hose by fitting the cut out in the ST with the protrusion on the clamp as shown in the figure, and unlock the clamp.
ST 18353AA000 CLAMP PLIERS

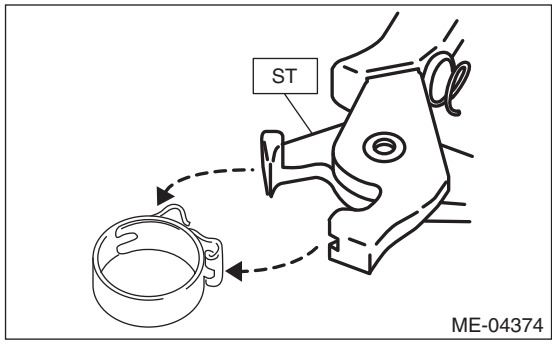


(4) Remove the rocker cover RH.
5) When inspecting #2 and #4 cylinders
(1) Remove the secondary air pump. <Ref. to EC(H4DOTC)-29, REMOVAL, Secondary Air Pump.>
(2) Remove the air duct B (B) from the rocker cover LH and the air duct A (A).



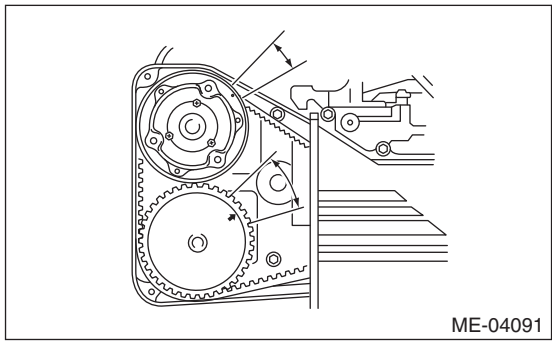
(3) Remove the ignition coil. <Ref. to IG(H4DOTC)-7, REMOVAL, Ignition Coil.>
(4) Disconnect PCV hose and vacuum hose from the rocker cover LH.

NOTE:
Pinch the clamp of the PCV hose by fitting the cut out in the ST with the protrusion on the clamp as shown in the figure, and unlock the clamp.
ST 18353AA000 CLAMP PLIERS

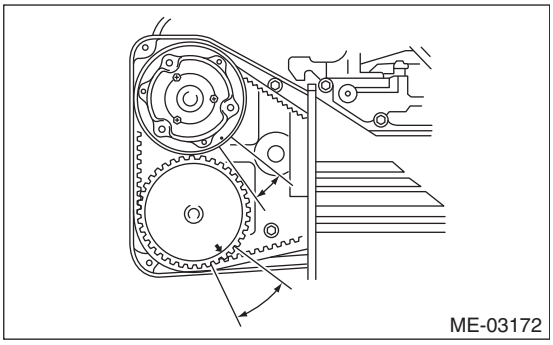


(5) Remove the rocker cover LH.
6) Turn the crank pulley clockwise until the round mark and arrow mark on the cam sprocket are set to position shown in the figure.

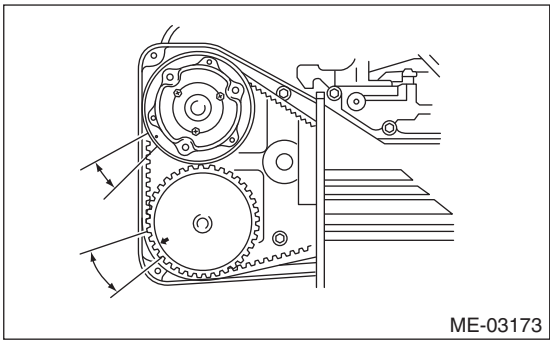
NOTE:
Turn the crank pulley using a socket wrench.
• Measurement of clearance of #1 cylinder intake valve and #3 cylinder exhaust valve



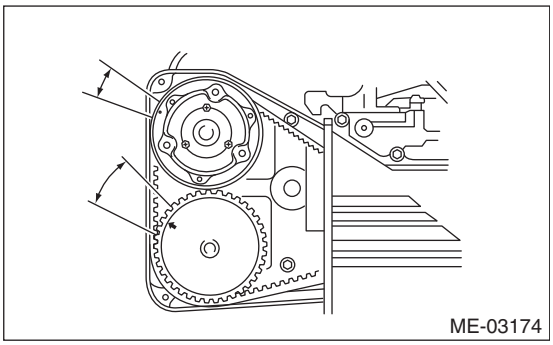
• Measurement of clearance of #2 cylinder exhaust valve and #3 cylinder intake valve



• Measurement of clearance of #2 cylinder intake valve and #4 cylinder exhaust valve



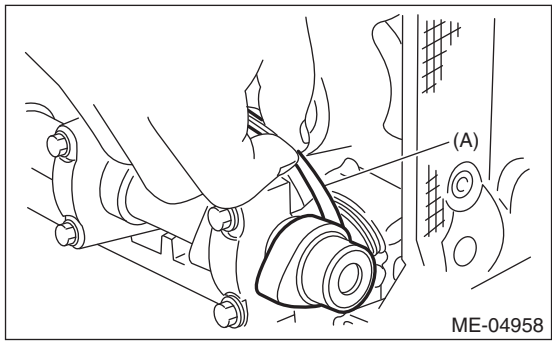
• Measurement of clearance of #1 cylinder exhaust valve and #4 cylinder intake valve



7) Measure the clearance of intake valve and exhaust valve using thickness gauge (A).

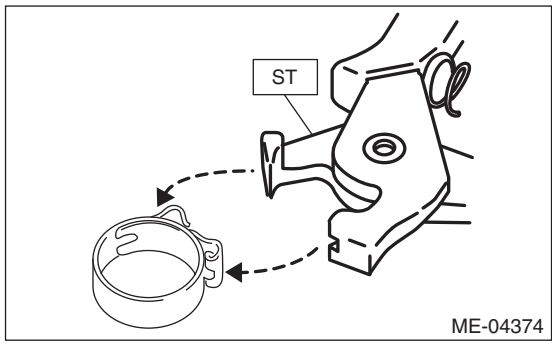
NOTE:
• Insert a thickness gauge in a direction as horizontal as possible with respect to the valve lifter.
• Lift up the vehicle, and then measure the exhaust valve clearances.
• If the measured value is not within the inspection value, take notes of the value in order to adjust the valve clearance later on.

Valve clearance (inspection value):
Intake
$0.20^{+0.04}_{-0.06}$ mm ($0.0079^{+0.0016}_{-0.0024}$ in)
Exhaust
0.35±0.05 mm (0.0138±0.0020 in)

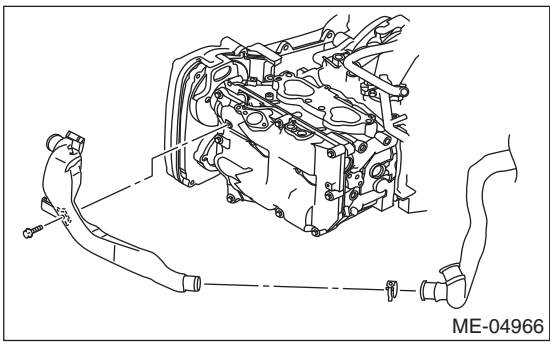


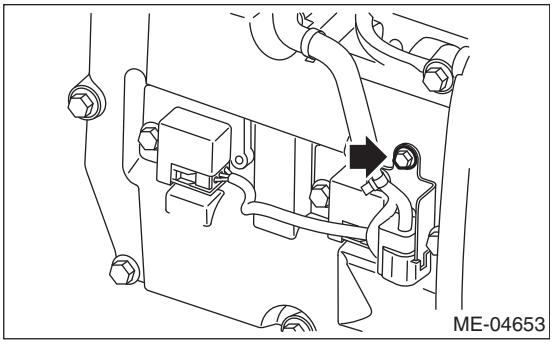
8) If necessary, adjust the valve clearance. <Ref. to ME(H4DOTC)-28, ADJUSTMENT, Valve Clearance.>
9) After inspection, install the related parts in the reverse order of removal.

NOTE:
• Refer to “Camshaft” when installing the rocker cover. <Ref. to ME(H4DOTC)-60, INSTALLATION, Camshaft.>
• Use a new clamp for the PCV hose clamp, fit the cut out in the ST with the protrusion on the clamp as shown in the figure, and lock the clamp.
ST 18353AA000 CLAMP PLIERS



Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)

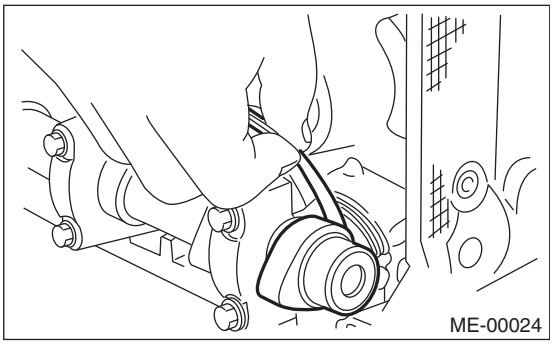

ME-04966


ME-04653

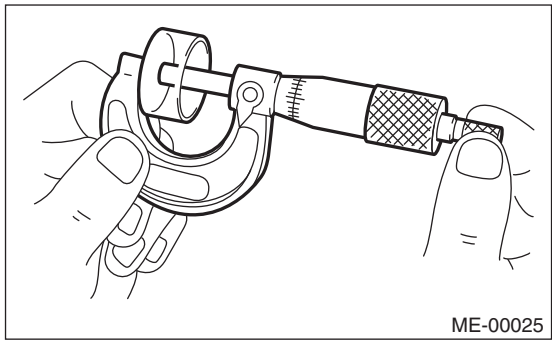
B: ADJUSTMENT

1) Measure all the valve clearances. <Ref. to ME(H4DOTC)-26, INSPECTION, Valve Clearance.>

NOTE:
Record the measured value of each valve clearance.


ME-00024

2) Remove the camshaft. <Ref. to ME(H4DOTC)-58, REMOVAL, Camshaft.>
3) Remove the valve lifter.
4) Measure the thickness of valve lifter using micrometer.


ME-00025

5) Select a valve lifter of suitable thickness using the measured valve clearance and valve lifter thickness, and install it.

NOTE:
Use a new valve lifter.

Unit: mm (in)
Intake valve: S = (V + T) – 0.19 (0.0075) Exhaust valve: S = (V + T) – 0.35 (0.0138)
S: Valve lifter thickness required V: Measured valve clearance T: Current valve lifter thickness

6) Install the camshaft. <Ref. to ME(H4DOTC)-60, INSTALLATION, Camshaft.>
7) Install the cam sprocket. <Ref. to ME(H4DOTC)-56, INSTALLATION, Cam Sprocket.>
8) Install the timing belt. <Ref. to ME(H4DOTC)-51, TIMING BELT, INSTALLATION, Timing Belt.>
9) Measure all valves for valve clearance again at this time. If the valve clearance is not within the adjustment value, repeat the procedure over again from step 2).

Valve clearance (adjustment value):
Intake
$0.20^{+0.01}_{-0.03}$ ***mm*** $(0.0079^{+0.0004}_{-0.0012}$ ***in)***
Exhaust
0.35±0.02 mm (0.0138±0.0008 in)

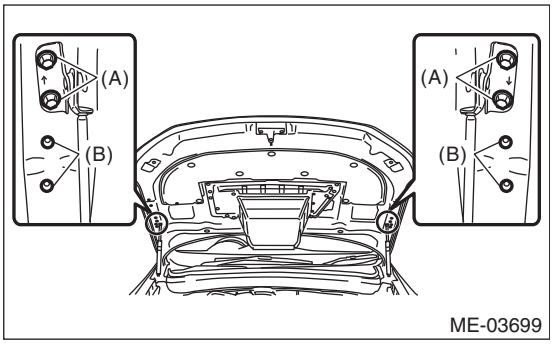
10) After adjustment, install the related parts in the reverse order of removal.

9. Engine Assembly

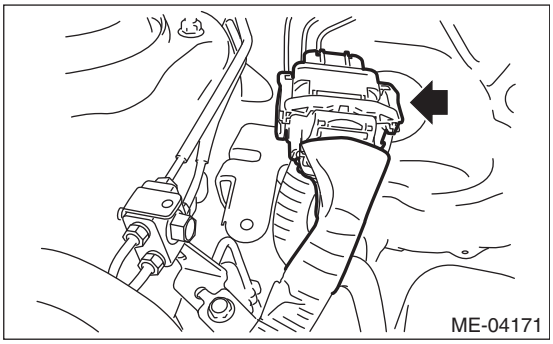
A: REMOVAL

1) Change the bolt installation position from (A) to (B), then open the front hood completely.

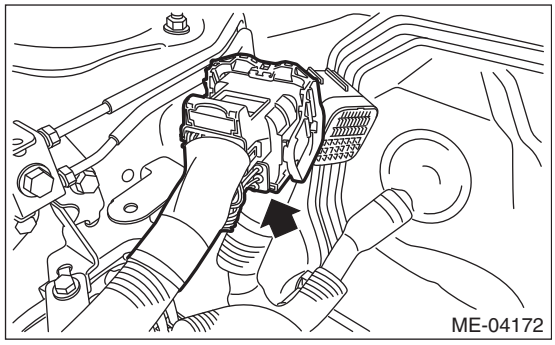
Tightening torque:
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)



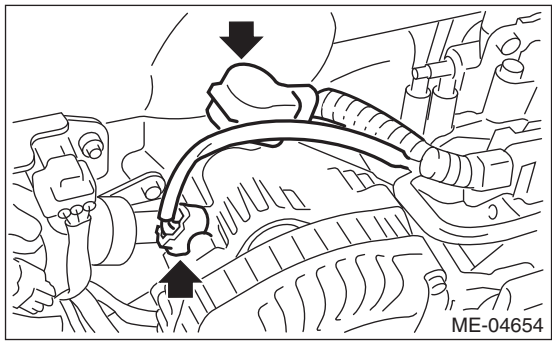
2) Remove the collector cover.
3) Collect the refrigerant from A/C system. <Ref. to AC-23, Refrigerant Recovery Procedure.>
4) Release the fuel pressure. <Ref. to FU(H4DOTC)-65, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
5) Remove the battery. <Ref. to SC(H4DO)-59, REMOVAL, Battery.>
6) Open the fuel filler lid and remove the fuel filler cap.
7) Remove the air intake duct and air cleaner case. <Ref. to IN(H4DOTC)-10, REMOVAL, Air Intake Duct.> <Ref. to IN(H4DOTC)-8, REMOVAL, Air Cleaner Case.>
8) Remove the intercooler. <Ref. to IN(H4DOTC)-13, REMOVAL, Intercooler.>
9) Remove the radiator. <Ref. to CO(H4DOTC)-19, REMOVAL, Radiator.>
10) Remove the coolant filler tank. <Ref. to CO(H4DOTC)-29, REMOVAL, Coolant Filler Tank.>
11) Disconnect the bulkhead harness connectors from the engine harness connectors.



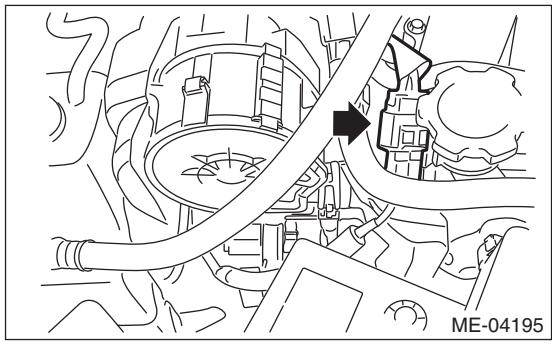
12) Remove the engine harness connector from the engine harness bracket.



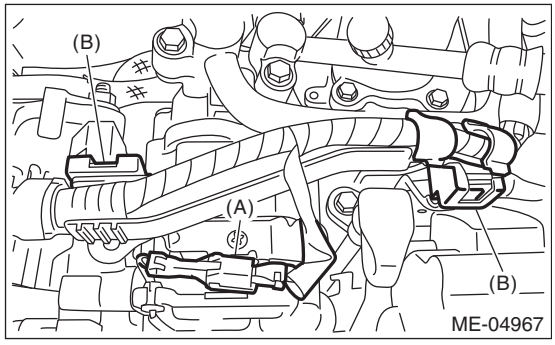
13) Disconnect the following connectors and terminals.
(1) Generator connector and terminal



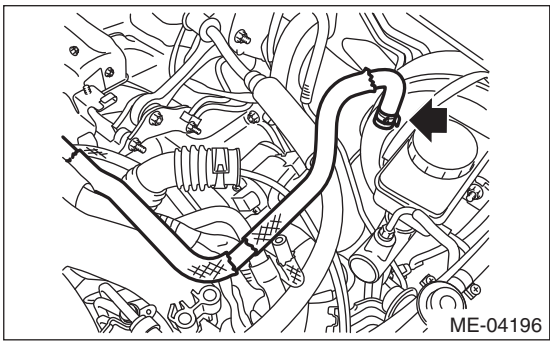
(2) Secondary air pump connector



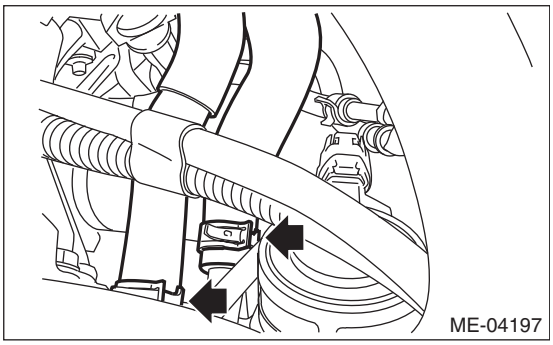
14) Disconnect the connector (A) from the A/C compressor, and remove the clip (B) securing the generator cord.



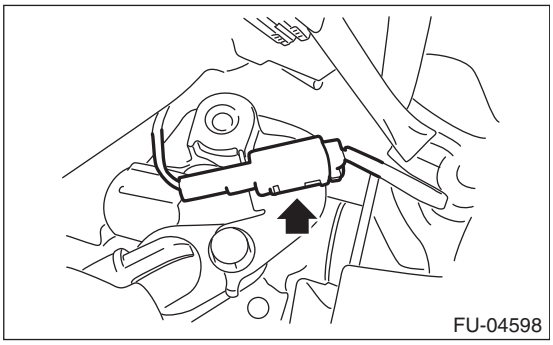
15) Disconnect the following hoses.
(1) A/C pressure hose <Ref. to AC-42, REMOVAL, Hose and Pipe.>
(2) Brake booster vacuum hose


ME-04196

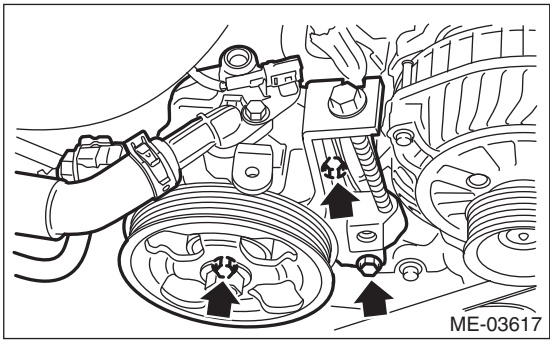
(3) Heater inlet hose and heater outlet hose


ME-04197

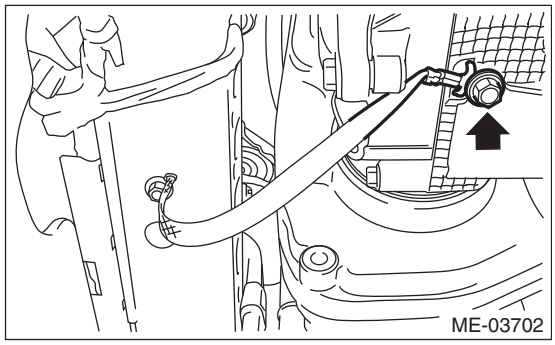
16) Remove the power steering pump.
(1) Remove the front side belts. <Ref. to ME(H4DOTC)-38, FRONT SIDE BELT, REMOVAL, V-belt.>
(2) Disconnect the connector from power steering pump switch.


FU-04598

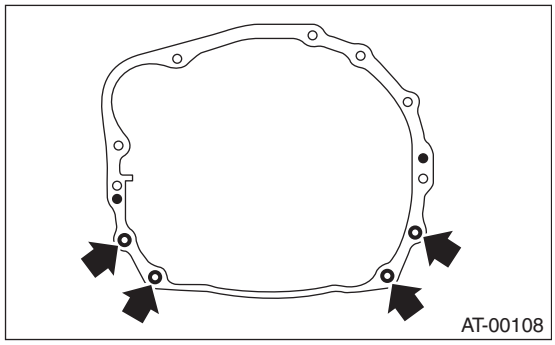
(3) Remove the power steering pump from the engine.


ME-03617

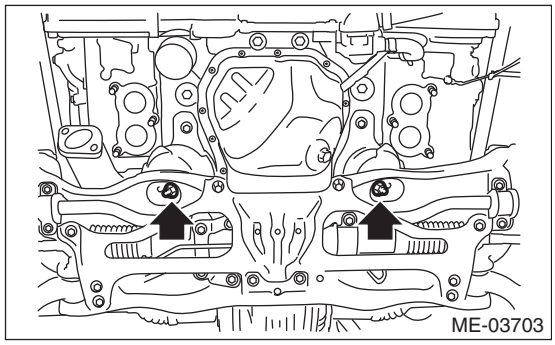
(4) Place the power steering pump on the right side wheel apron.
17) Remove the center exhaust pipe. <Ref. to EX(H4DOTC)-7, REMOVAL, Center Exhaust Pipe.>
18) Remove the turbocharger. <Ref. to IN(H4DOTC)-15, REMOVAL, Turbocharger.>
19) Remove the joint pipe and front exhaust pipe. <Ref. to EX(H4DOTC)-11, REMOVAL, Joint Pipe.> <Ref. to EX(H4DOTC)-5, REMOVAL, Front Exhaust Pipe.>
20) Disconnect the ground cable on the engine side.


ME-03702

21) Remove the bolts and nuts which hold the lower side of transmission to the engine.

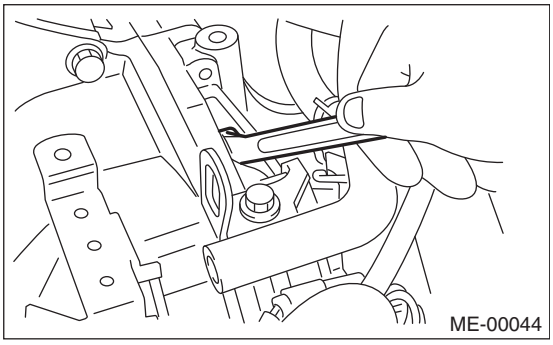

AT-00108

22) Remove the nuts which secure the engine mounting to the front crossmember.

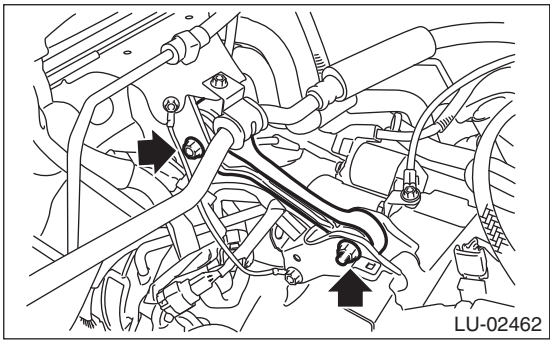

ME-03703

23) Lower the vehicle.

24) Separate the torque converter clutch from the drive plate.
(1) Remove the service hole plug.
(2) Insert the wrench into the crank pulley bolt and rotate the crank pulley to remove the bolts which hold torque converter clutch to drive plate.

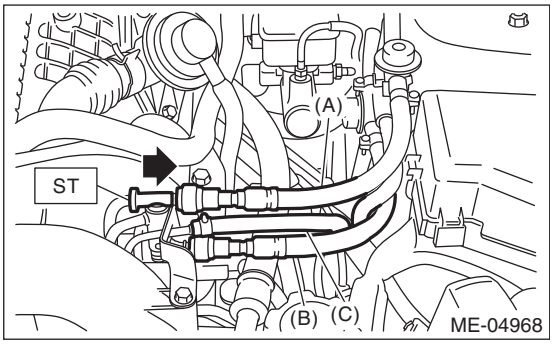


25) Remove the pitching stopper.



26) Attach ST to the fuel delivery pipe and push ST in the direction of arrow mark to disconnect the fuel delivery hose.
ST 42099AE000 QUICK CONNECTOR RELEASE

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

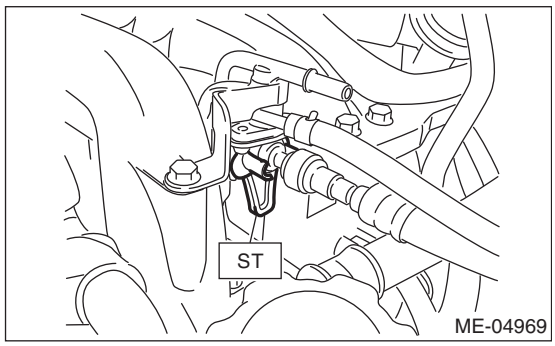


(A) Fuel delivery hose
(B) Fuel return hose
(C) Evaporation hose

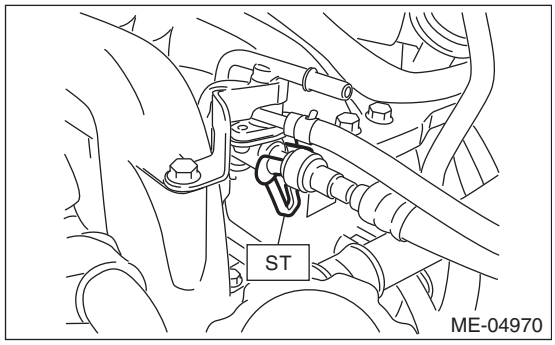
27) Disconnect the fuel return hose using the ST.
ST 18371AA000 CONNECTOR REMOVER

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

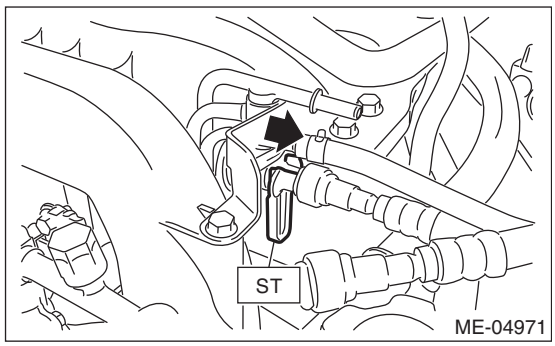
(1) Attach ST to the fuel return pipe as shown in the figure.



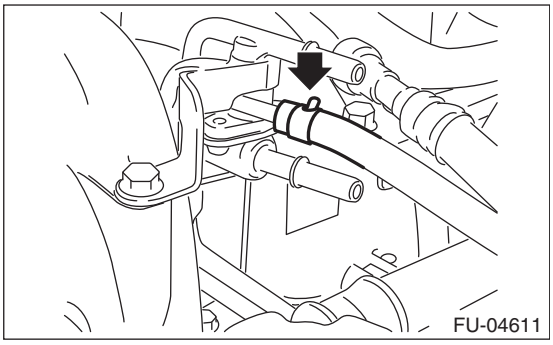
(2) Insert the front side of ST into the quick connector.



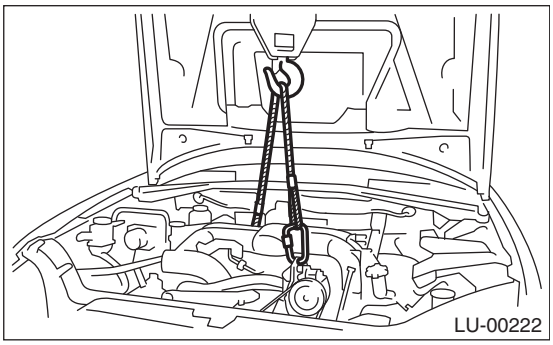
(3) Insert the back side of ST into the quick connector and push ST in the direction of arrow mark to disconnect the fuel return hose.



28) Remove the clip and disconnect the evaporation hose from the fuel pipe.

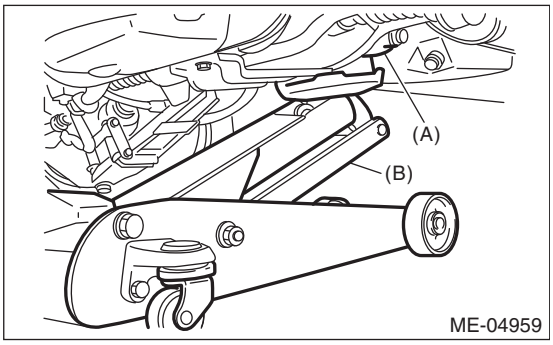


29) Support the engine with a lifting device and wire ropes.



30) Support the transmission with a garage jack.

CAUTION:
Be sure to perform this procedure to prevent the transmission from lowering by its own weight.



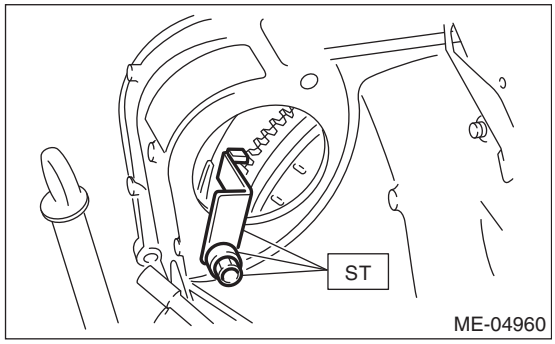
(A) Transmission
(B) Garage jack

31) Separation of engine and transmission

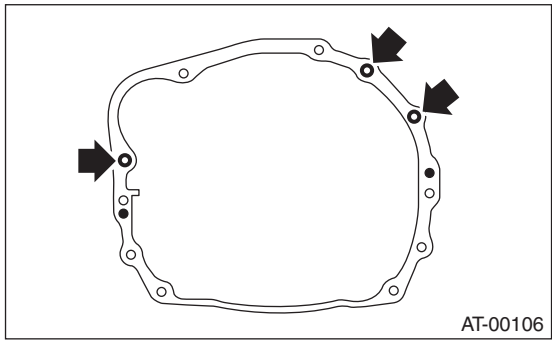
CAUTION:
Before removing the engine away from transmission, check to be sure no work has been overlooked.

(1) Remove the starter. <Ref. to SC(H4DO)-9, REMOVAL, Starter.>
(2) Attach the ST to the torque converter clutch case.

ST 498277200 STOPPER SET



(3) Remove the bolts which hold the upper side of the transmission to the engine.



32) Remove the engine from vehicle.

NOTE:
Be careful not to damage adjacent parts or body panels with crank pulley, oil level gauge, etc.

(1) Slightly raise the engine.
(2) Raise the transmission with garage jack.
(3) Slowly move the engine away from engine compartment.

33) Remove the engine mounting from the engine.

B: INSTALLATION

1) Install the engine mounting onto the engine.

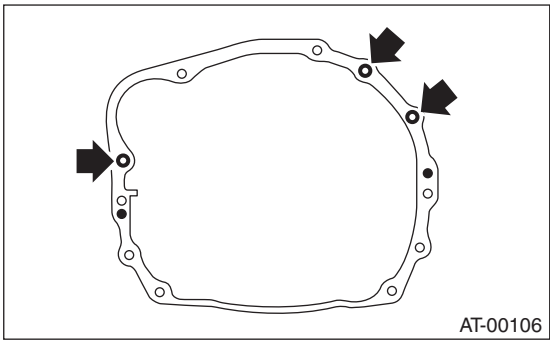
Tightening torque:
35 N·m (3.6 kgf-m, 25.8 ft-lb)

2) Position the engine in engine compartment and align it with transmission.

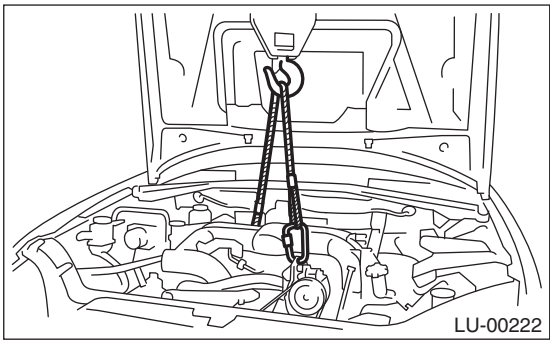
NOTE:
Be careful not to damage adjacent parts or body panels with crank pulley, oil level gauge, etc.

3) Tighten the bolts which hold upper side of transmission to engine.

Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)

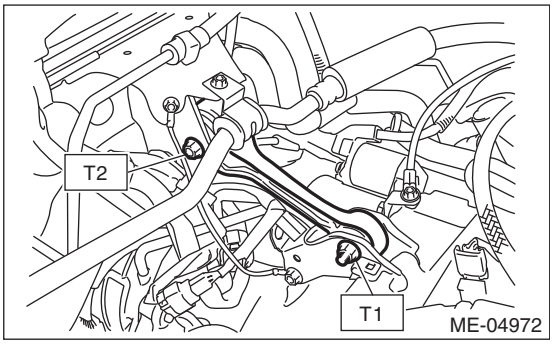


4) Remove the lifting device and wire ropes.



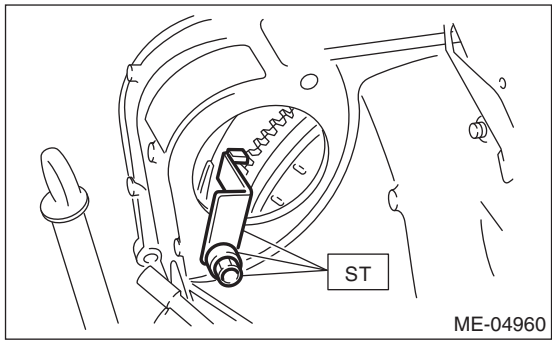
5) Remove the garage jack.
6) Install the pitching stopper.

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)



7) Remove the ST from torque converter clutch case.

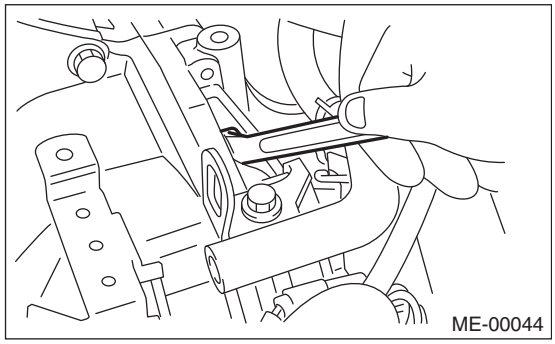
NOTE:
Be careful not to drop the ST into the torque converter clutch case when removing the ST.
ST 498277200 STOPPER SET



8) Install the starter. <Ref. to SC(H4DO)-10, INSTALLATION, Starter.>
9) Install the torque converter clutch to drive plate.
(1) Insert the wrench into the crank pulley bolt and rotate the crank pulley to install the bolts which hold torque converter clutch to drive plate.

NOTE:
Be careful not to drop bolts into the torque converter clutch case.

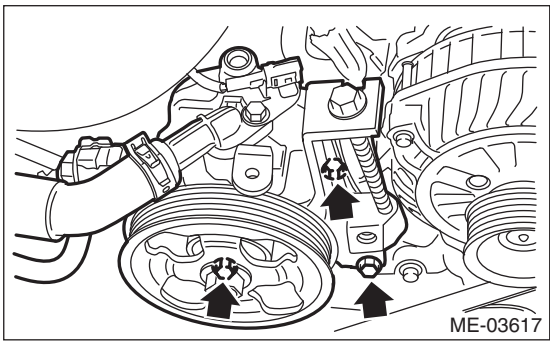
Tightening torque:
25 N·m (2.5 kgf-m, 18.4 ft-lb)



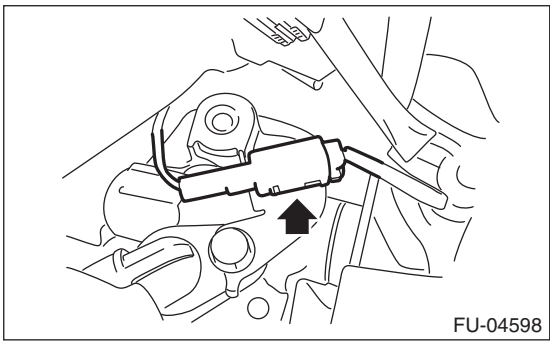
(2) Fit the plug to service hole.

10) Install the power steering pump.
(1) Install the power steering pump onto the engine.

Tightening torque:
Refer to "COMPONENT" of "Power Steering" for the tightening torque. <Ref. to PS-3, COMPONENT, General Description.>



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

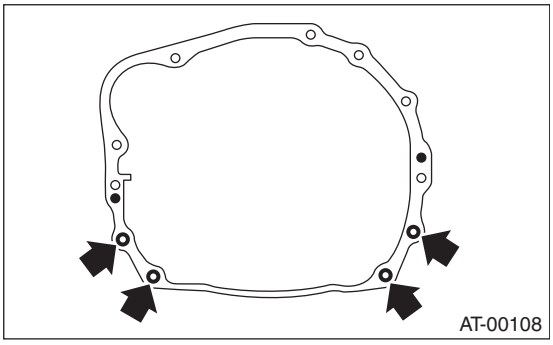


(3) Install the front side belt. <Ref. to ME(H4DOTC)-38, FRONT SIDE BELT, INSTALLATION, V-belt.>

11) Lift up the vehicle.

12) Install the bolts and nuts which hold lower side of the transmission to engine.

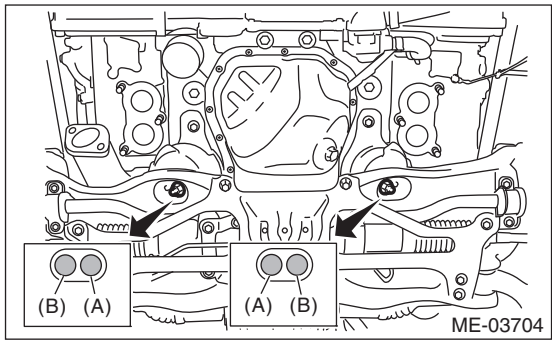
Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)



13) Install the nuts which hold the engine mounting to the crossmember.

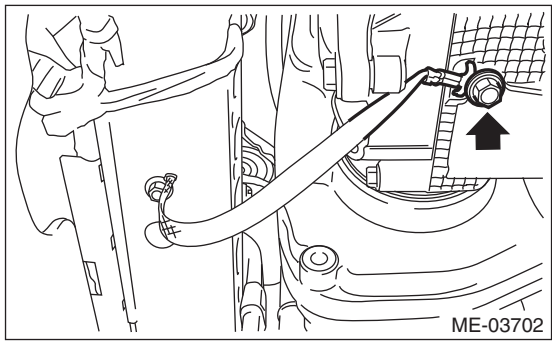
NOTE:
Make sure that the engine mounting nuts (A) and locator (B) are securely installed.

Tightening torque:
85 N·m (8.7 kgf-m, 62.7 ft-lb)



14) Connect the ground cable.

Tightening torque:
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)



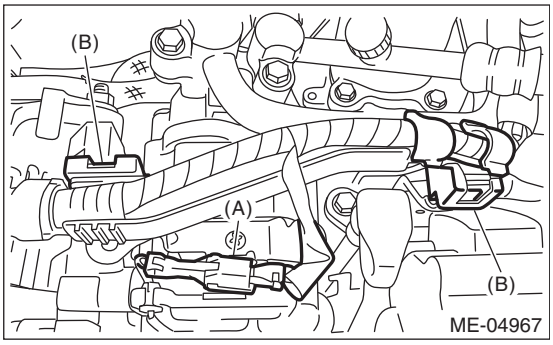
15) Install the joint pipe and front exhaust pipe. <Ref. to EX(H4DOTC)-5, INSTALLATION, Front Exhaust Pipe.> <Ref. to EX(H4DOTC)-11, INSTALLATION, Joint Pipe.>

16) Install the turbocharger. <Ref. to IN(H4DOTC)-16, INSTALLATION, Turbocharger.>

17) Install the center exhaust pipe. <Ref. to EX(H4DOTC)-8, INSTALLATION, Center Exhaust Pipe.>

18) Connect the following hoses.
(1) Fuel delivery hose, fuel return hose and evaporation hose
(2) Heater inlet hose and heater outlet hose
(3) Brake booster vacuum hose
(4) A/C pressure hose <Ref. to AC-42, INSTALLATION, Hose and Pipe.>

19) Secure the generator cord using the clip (B) and connect the connector (A) to A/C compressor.

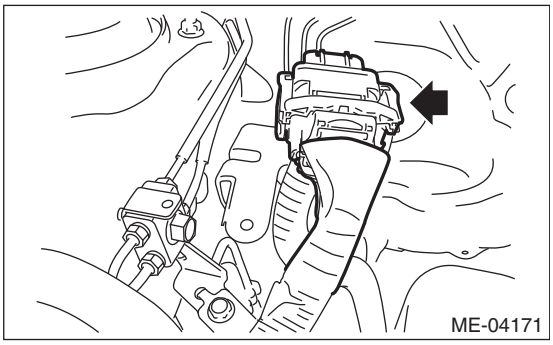


20) Connect the following connectors and terminals.
(1) Generator connector and terminal

Tightening torque:
15 N·m (1.5 kgf-m, 11.1 ft-lb)

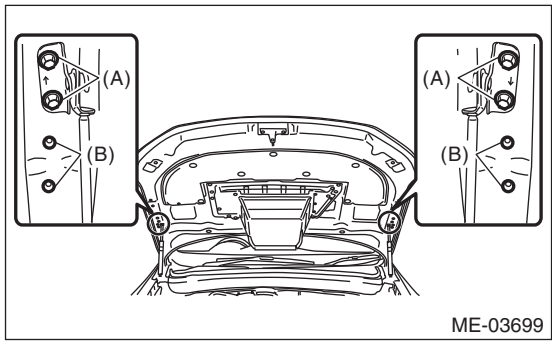
(2) Secondary air pump connector

21) Install the engine harness connector to engine harness bracket, then connect the bulkhead harness connector to the engine harness connector.



22) Install the intercooler. <Ref. to IN(H4DOTC)-13, INSTALLATION, Intercooler.>
23) Install the radiator. <Ref. to CO(H4DOTC)-20, INSTALLATION, Radiator.>
24) Install the coolant filler tank. <Ref. to CO(H4DOTC)-29, INSTALLATION, Coolant Filler Tank.>
25) Install the air cleaner case and air intake duct. <Ref. to IN(H4DOTC)-8, INSTALLATION, Air Cleaner Case.> <Ref. to IN(H4DOTC)-10, INSTALLATION, Air Intake Duct.>
26) Install the battery. <Ref. to SC(H4DO)-59, INSTALLATION, Battery.>
27) Fill engine coolant. <Ref. to CO(H4DOTC)-13, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
28) Charge the A/C system with refrigerant. <Ref. to AC-24, PROCEDURE, Refrigerant Charging Procedure.>
29) Check the ATF level and replenish it if necessary. <Ref. to 4AT-27, INSPECTION, Automatic Transmission Fluid.>
30) Install the collector cover.
31) Change the bolt installation position from (B) to (A), then close the front hood.

Tightening torque:
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)



C: INSPECTION

1) Check that pipes, hoses, connectors and clamps are installed firmly.
2) Check the engine coolant is at specified level.
3) Check that the ATF is at specified level.
4) Start the engine and check for exhaust gas leakage, engine coolant leakage, fuel leakage, noise or vibration.

10.Engine Mounting

A: REMOVAL

1) Remove the engine from the vehicle. <Ref. to ME(H4DOTC)-29, REMOVAL, Engine Assembly.>
2) Remove the engine mounting from the engine assembly.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
35 N·m (3.6 kgf-m, 25.8 ft-lb)

C: INSPECTION

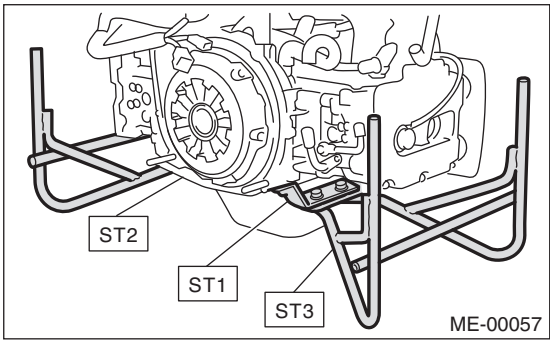
Make sure that no crack or other damages do not exist.

11.Preparation for Overhaul

A: PROCEDURE

1) After removing the engine from vehicle body, attach the ST to the engine as shown in the figure.

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.

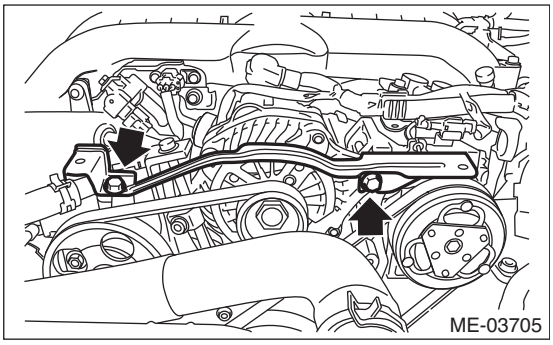
12.V-belt

A: REMOVAL

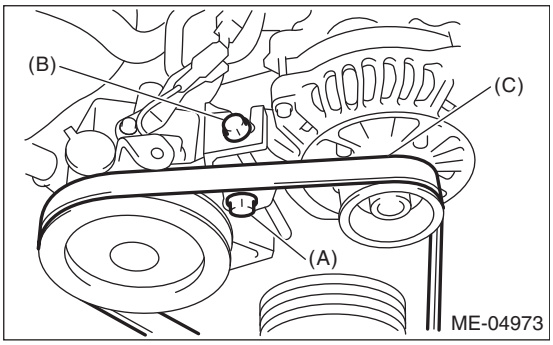
NOTE:
When replacing the single part, perform the work with the engine installed to vehicle body.

1. FRONT SIDE BELT

1) Remove the collector cover.
2) Remove the air intake duct (Rear). <Ref. to IN(H4DOTC)-10, REMOVAL, Air Intake Duct.>
3) Remove the collector cover bracket.

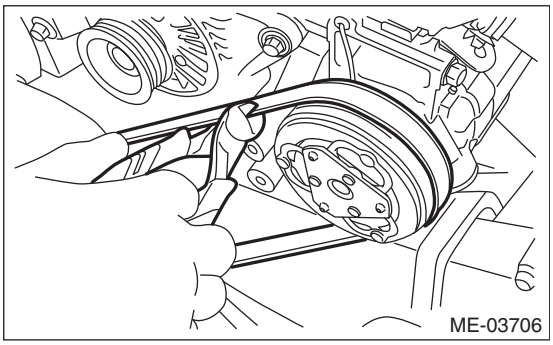


4) Loosen the bolt (A).
5) Loosen the slider bolt (B).
6) Remove the front side belt (C).



2. REAR SIDE BELT

1) Remove the front side belts. <Ref. to ME(H4DOTC)-38, FRONT SIDE BELT, REMOVAL, V-belt.>
2) Cut the rear side belt with a wire cutter, etc., and discard.

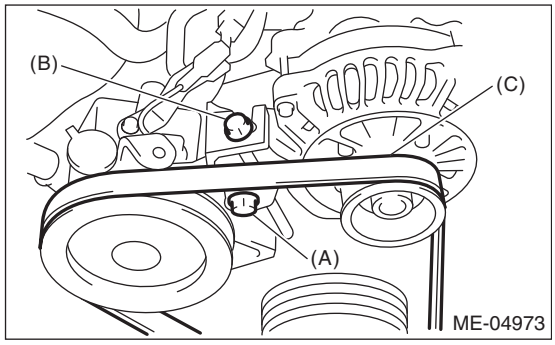


B: INSTALLATION

1. FRONT SIDE BELT

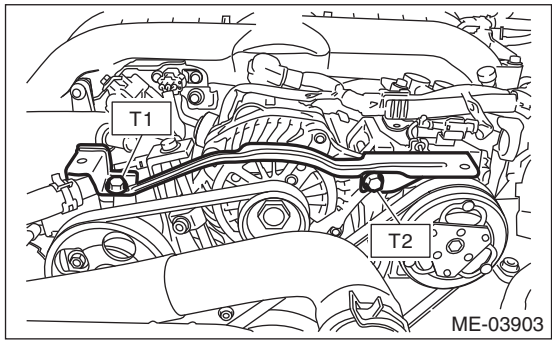
CAUTION:
• When reusing the front side belt, wipe off dust and water with cloth.
• Do not use the front side belt if there is any oil, grease or coolant on the belt.
• Be careful not to rub the belt end surface with bare hands; exposed core may cause injury.
1) Wipe off any dust, oil and water on the groove of each pulley with cloth.
2) Install the front side belt (C), and adjust the slider bolt (B) so as to obtain the specified belt tension. <Ref. to ME(H4DOTC)-44, INSPECTION, V-belt.>
3) Tighten the bolt (A).
4) Tighten the slider bolt (B).

Tightening torque:
Bolt (A)
25 N·m (2.5 kgf-m, 18.4 ft-lb)
Slider bolt (B)
8 N·m (0.8 kgf-m, 5.9 ft-lb)



5) Install the collector cover bracket.

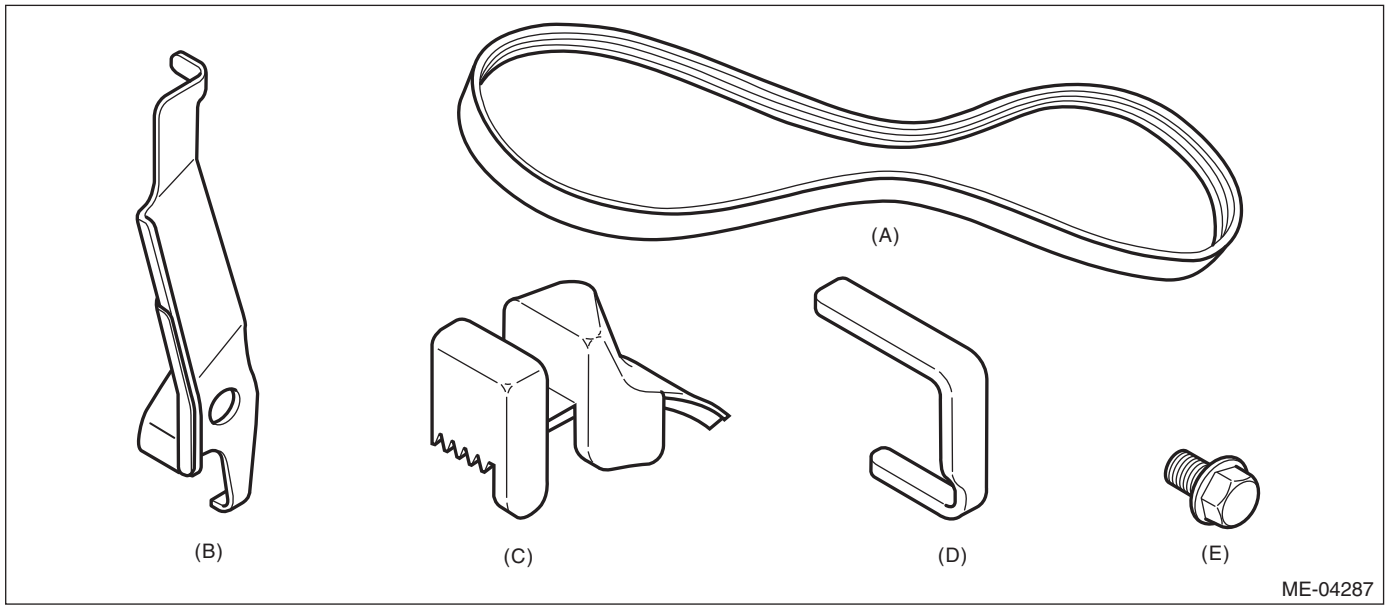
Tightening torque:
T1: 8.5 N·m (0.9 kgf-m, 6.3 ft-lb)
T2: 25 N·m (2.5 kgf-m, 18.4 ft-lb)



6) Install the air intake duct (rear). <Ref. to IN(H4DOTC)-10, INSTALLATION, Air Intake Duct.>
7) Install the collector cover.

2. REAR SIDE BELT

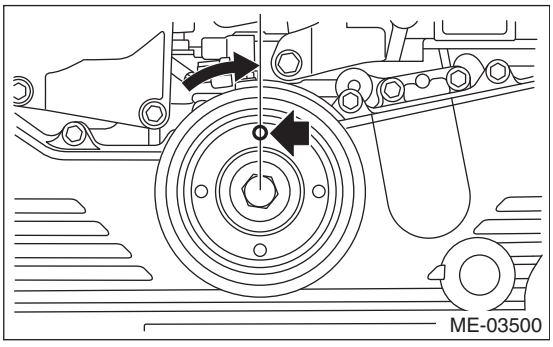
CAUTION:
- **Do not re-use the rear side belt.**
- **Be careful not to let oil, grease or coolant contact a new rear side belt.**
- **Be careful not to rub the belt end surface with bare hands; exposed core may cause injury.**
- **To install the rear side belt, always use the provided tools (belt stopper, belt guide, belt guide holder, and bolt).**



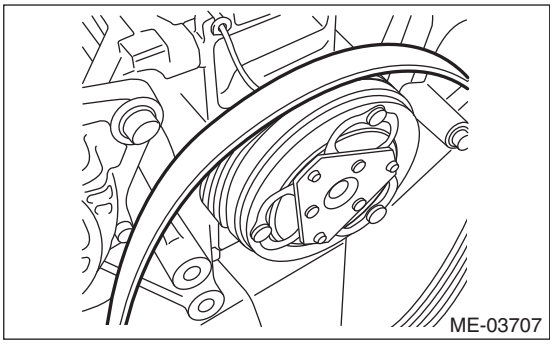
(A) Rear side belt
(B) Belt stopper
(C) Belt guide
(D) Belt guide holder
(E) Bolt

1) Wipe off any dust, oil and water on the groove of each pulley with cloth.
2) Wipe off any oil, water, dirt, and rust on the front of the crank pulley with cloth.
3) Slowly turn the crank pulley clockwise so that the service hole of the crank pulley comes around the top.

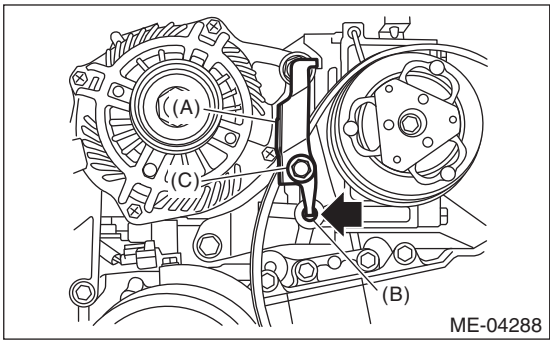
CAUTION:
Do not turn the crank pulley counterclockwise.



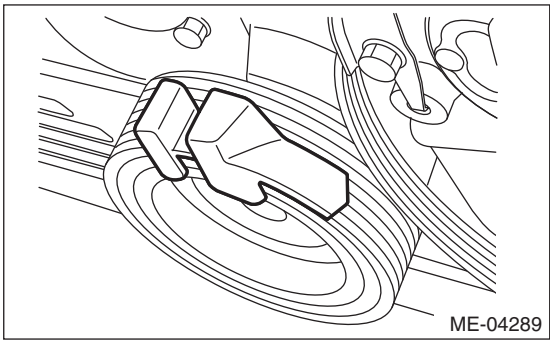
4) Hook a new rear side belt on the A/C compressor pulley.



5) As shown in the figure, insert the claw of the belt stopper (A) to the lower hole (B) of the compressor bracket, then attach with bolt (C).

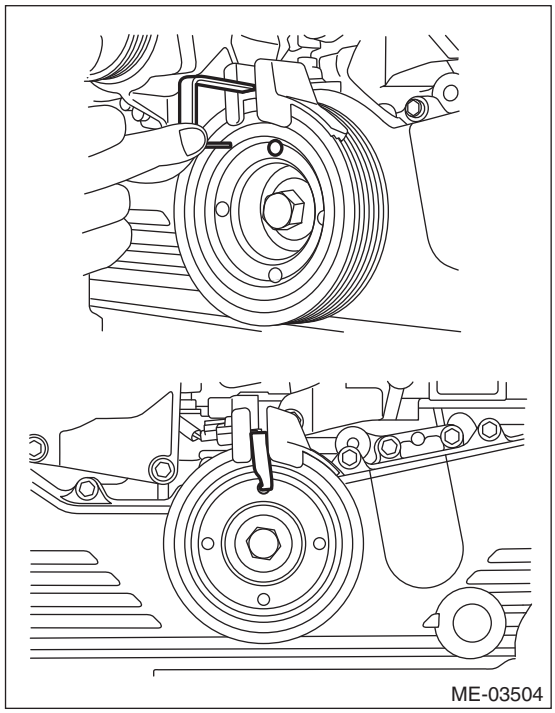


6) Place the belt guide while aligning it with the belt line of the crank pulley on the front side belt side.

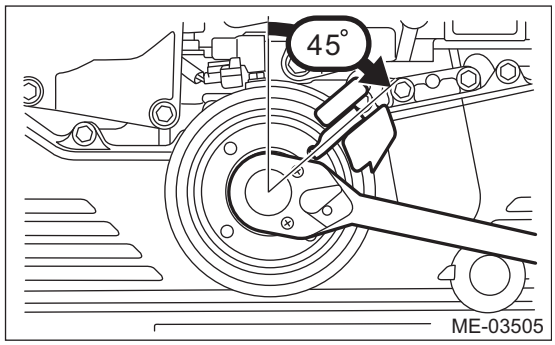


7) Insert the belt guide holder into the service hole of the crank pulley so that the belt guide comes in between.

NOTE:
Place the belt guide holder with the longer side up.

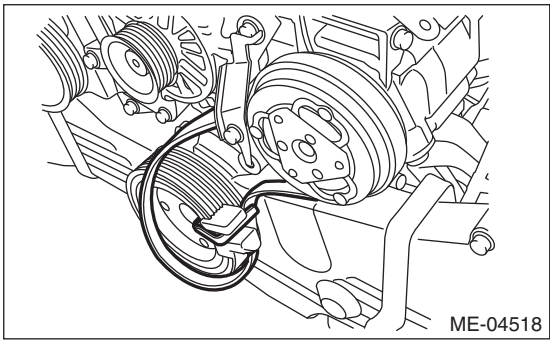


8) Slowly turn the crank pulley clockwise until the belt guide comes to approximately 45°.

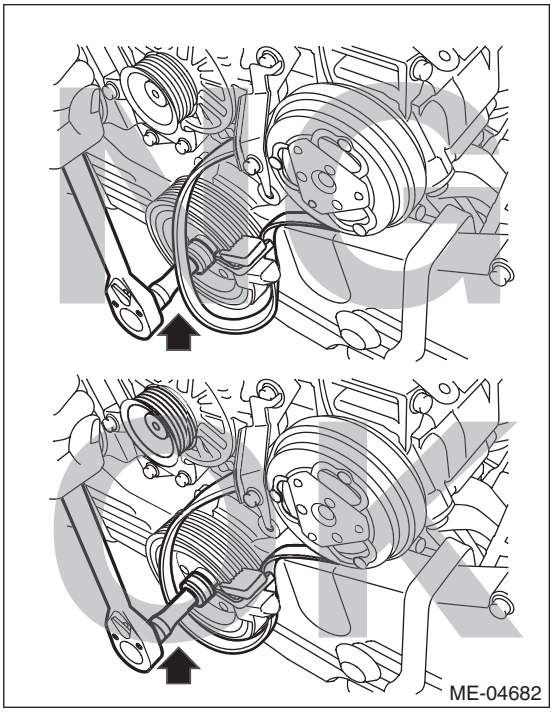


9) Place the rib surface of the rear side belt into the crank pulley groove, so that the rear side belt comes in between the belt guide holder.

CAUTION:
When it is difficult to place the rear side belt to the crank pulley groove, pull out the belt guide holder half way, then place the rear side belt into the groove so that it comes in between the belt guide holder.


ME-04518

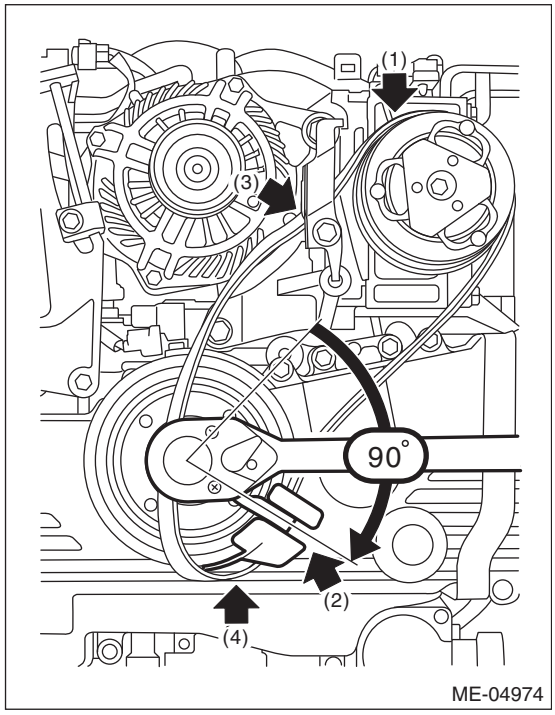
10) Place the tool through the loop of the rear side belt, and set on the crank pulley bolt.



ME-04682

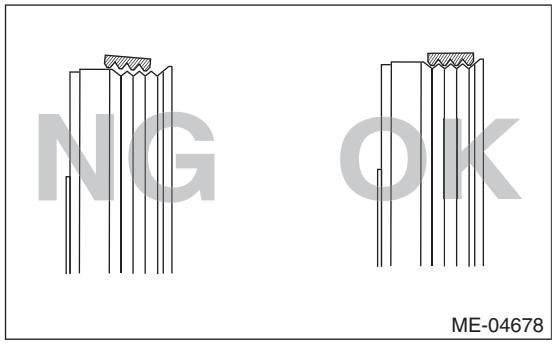
11) While checking the following, slowly turn the crank pulley approximately 90° clockwise so that the belt guide comes to the position shown in the figure.

CAUTION:
When turning the crank pulley, always make sure that the belt guide is not off from the crank pulley groove.



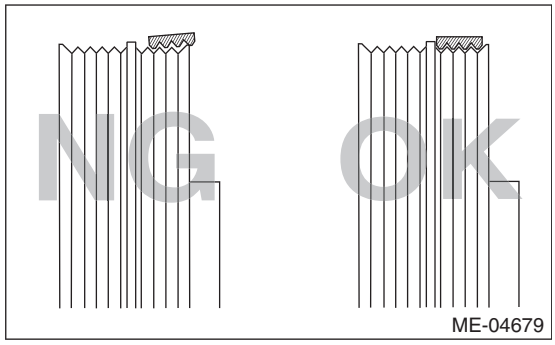
ME-04974

(1) The rib of the rear side belt is securely placed on the groove of the A/C compressor pulley.

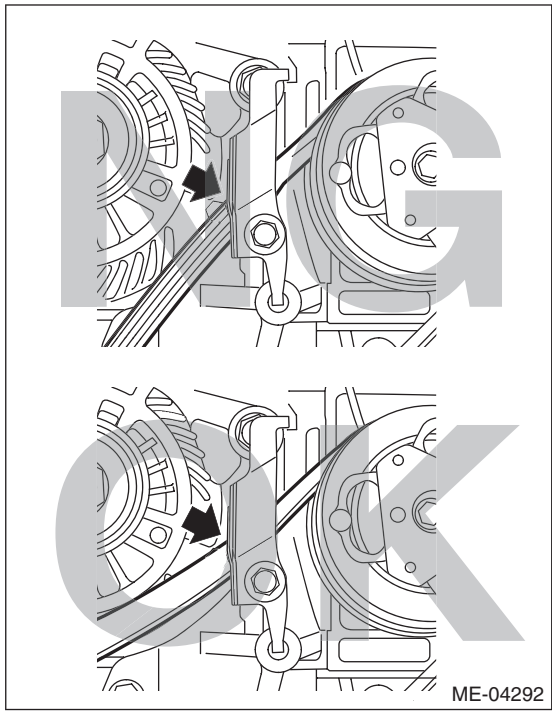


ME-04678

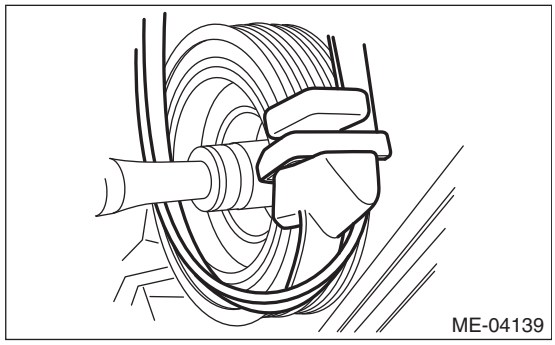
(2) The rib of the rear side belt is securely placed on the groove of the crank pulley.



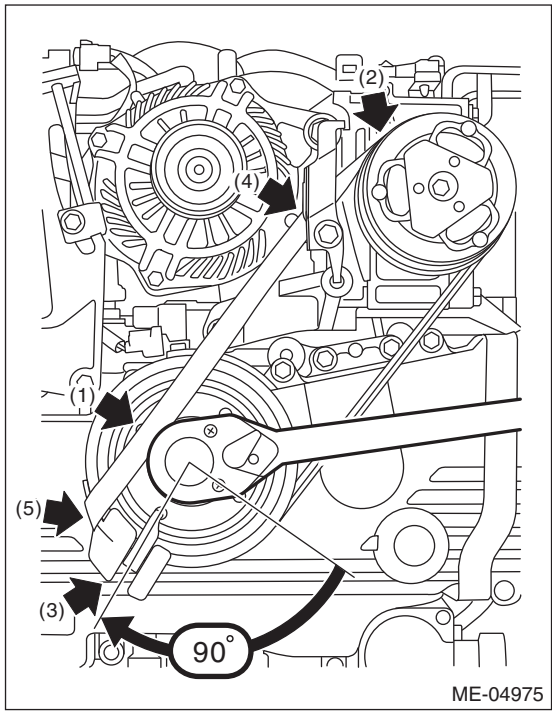
(3) The surface of the rear side belt is held by the belt stopper.



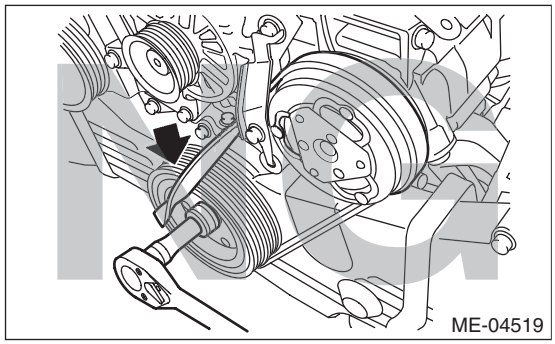
(4) The rear side belt is securely placed on the belt guide.



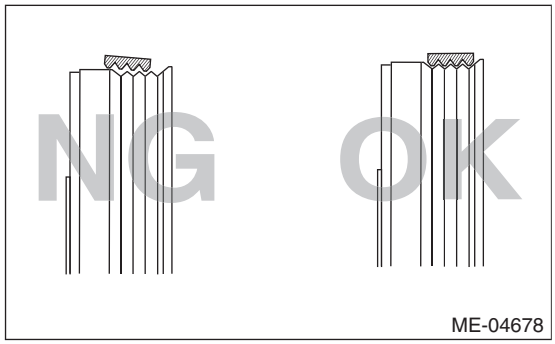
12) While checking the following, slowly turn the crank pulley approximately 90° clockwise so that the belt guide comes to the position shown in the figure.



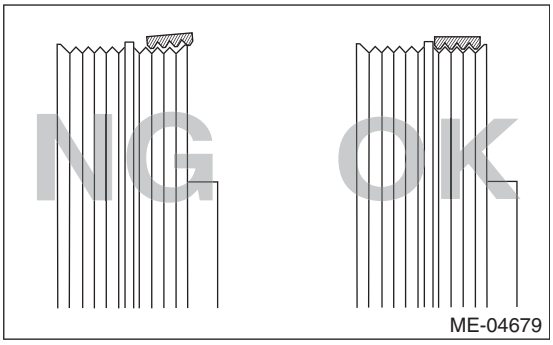
(1) The rear side belt is not twisted.



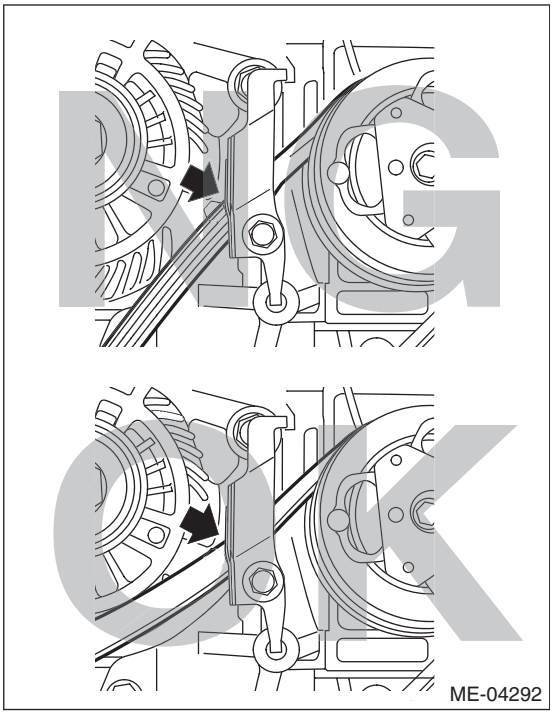
(2) The rib of the rear side belt is securely placed on the groove of the A/C compressor pulley.



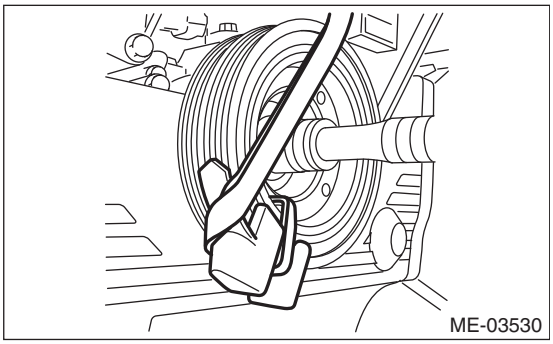
(3) The rib of the rear side belt is securely placed on the groove of the crank pulley.



(4) The surface of the rear side belt is held by the belt stopper.

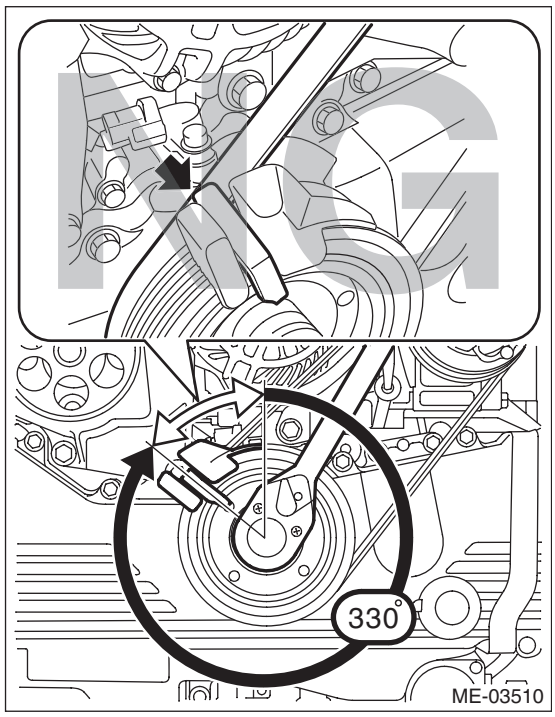


(5) The rear side belt is securely placed on the belt guide.

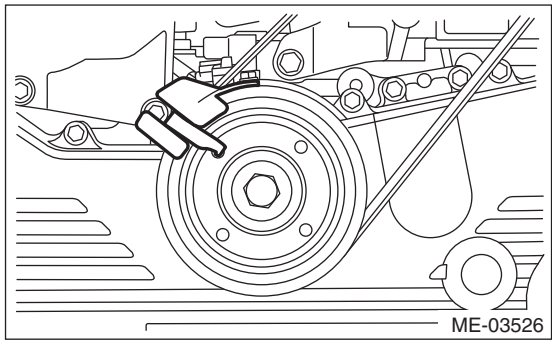


13) Slowly turn the crank pulley clockwise, and install the rear side belt.

CAUTION:
Be careful that the total of procedures 8), 11), 12) and 13) does not exceed 330°; failure to do so may cause damage to the rear side belt and fall of the belt guide holder.

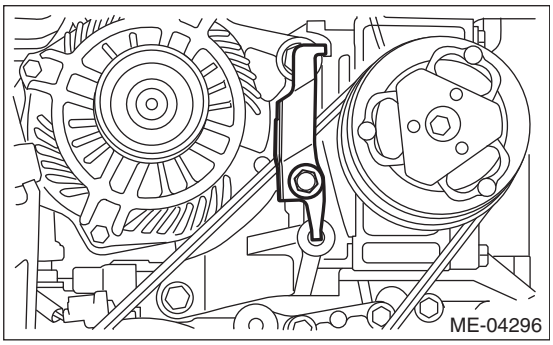


14) Remove the belt guide and belt guide holder from the crank pulley.

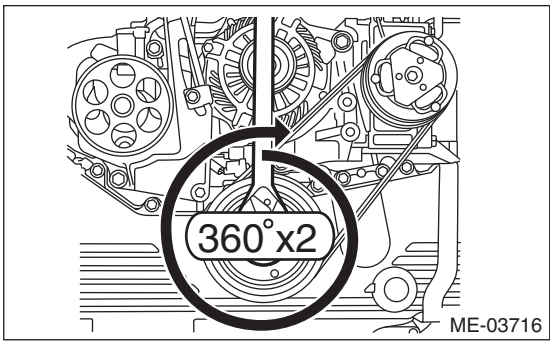


15) Remove the belt stopper from the compressor bracket.

CAUTION:
Always remove the belt stopper; failure to do so may cause smoke, fire, or belt cutting.



16) Make sure that the belt rib is securely installed on the groove of each pulley, then turn the crank pulley slowly, twice in the clockwise direction, to seat the rear side belt properly.



17) Discard the provided tools (belt stopper, belt guide, belt guide holder, and bolt) that are used.
18) Install the front side belt. <Ref. to ME(H4DOTC)-38, FRONT SIDE BELT, INSTALLATION, V-belt.>

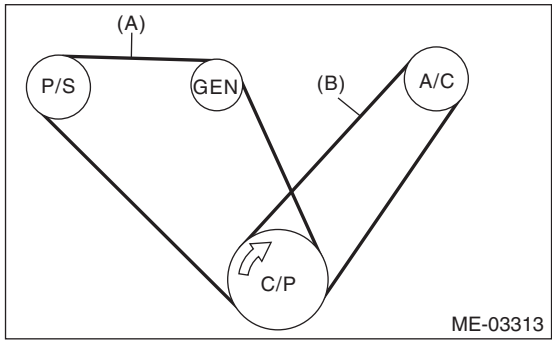
C: INSPECTION

1. FRONT SIDE BELT

CAUTION:
Check and adjust the front side belt tension so that it is within the specified range. Using the belt with a tension out of the specified range may result in a fault such as the following:
• If the front side belt tension is higher, unexpected force is generated at the power steering oil pump, generator and crankshaft bearing, causing abnormal noise due to abnormal wear of the bearing.
• If the front side belt tension is lower, the front side belt and crank pulley slip, causing abnormally high temperature on the crank pulley due to frictional heat. If this condition repeatedly occurs, the front side belt may abnormally wear, causing abnormal noise, front side belt damage or crank pulley damage.

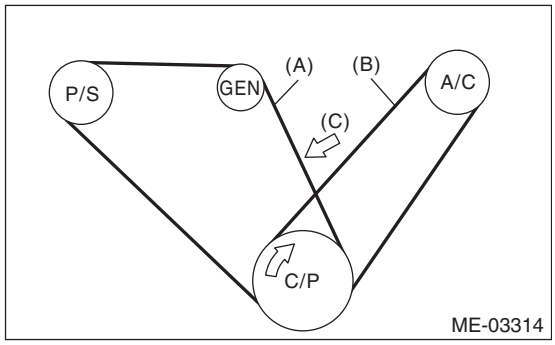
1) Replace the front side belt, if crack, fraying or wear is found.
2) Check the front side belt tension and adjust it if necessary by changing the generator installing position.

Front side belt tension (with belt tension gauge):
When installing new parts
640 — 780 N (65 — 80 kgf, 144 — 175 lbf)
At inspection
490 — 640 N (50 — 65 kgf, 110 — 144 lbf)



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

Front side belt tension (without belt tension gauge):
When installing new parts
7 — 9 mm (0.276 — 0.354 in)
At inspection
9 — 11 mm (0.354 — 0.433 in)



(A) Front side belt
(B) Rear side belt
(C) 98 N (10 kgf, 22 lbf)
C/P Crank pulley
GEN Generator pulley
P/S Power steering oil pump pulley
A/C A/C compressor pulley

2. REAR SIDE BELT

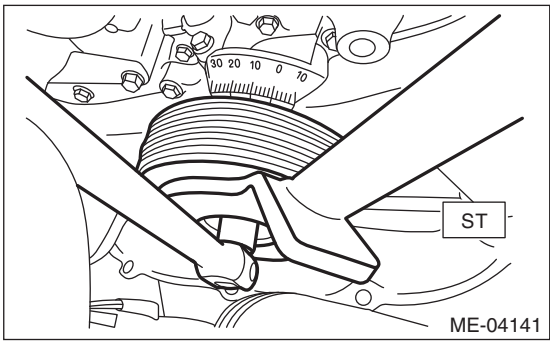
If cracks, fraying or wear is found, and when abnormal noise is produced, replace the rear side belt.

NOTE:
Because the rear side belt is a stretch type belt, it is not necessary to check deflection and tension.

13.Crank Pulley

A: REMOVAL

NOTE:
When replacing the single part, perform the work with the engine installed to vehicle body.
1) Remove the V-belts. <Ref. to ME(H4DOTC)-38, REMOVAL, V-belt.>
2) Use the ST to lock the crank pulley, and remove the crank pulley bolts.
ST 499977400 CRANK PULLEY WRENCH



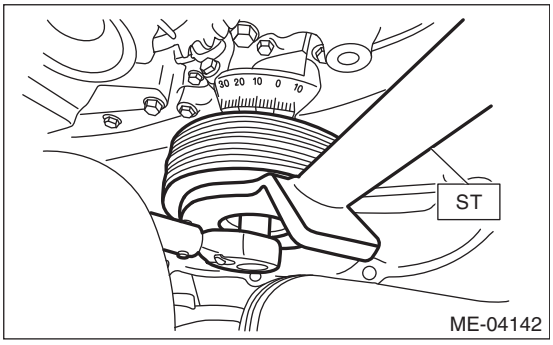
3) Remove the crank pulley.

B: INSTALLATION

1. METHOD WITHOUT ANGLE GAUGE

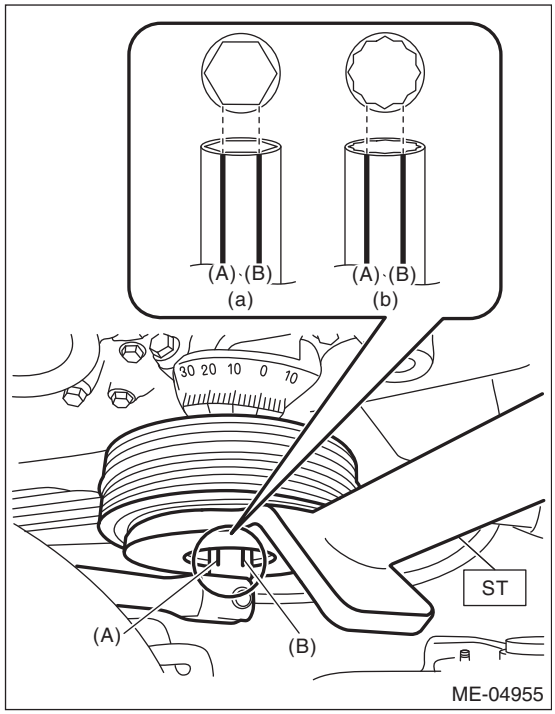
1) Clean the crankshaft thread using compressed air.
2) Install the crank pulley.
3) Apply engine oil to the crank pulley bolt seat and thread.
4) Tighten the crank pulley bolts.
(1) Use the ST to lock the crank pulley, and temporarily tighten the crank pulley bolt.
ST 499977400 CRANK PULLEY WRENCH

Tightening torque:
47 N·m (4.8 kgf-m, 34.7 ft-lb)



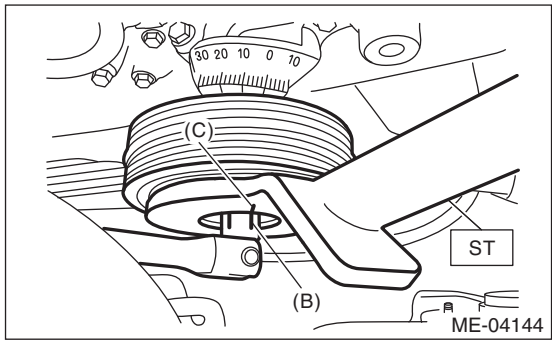
(2) Draw reference lines (A) and (B) using a marker to set the socket to the crank pulley bolt as shown in the figure.
ST 499977400 CRANK PULLEY WRENCH

NOTE:
Set the socket onto the crank pulley bolt so that reference lines (A) and (B) is visible.



(a) When using 6-point socket
(b) When using 12-point socket

(3) Draw end line (C) on ST using a marker at the same position as reference line (B) was drawn on the socket in step (2).
ST 499977400 CRANK PULLEY WRENCH

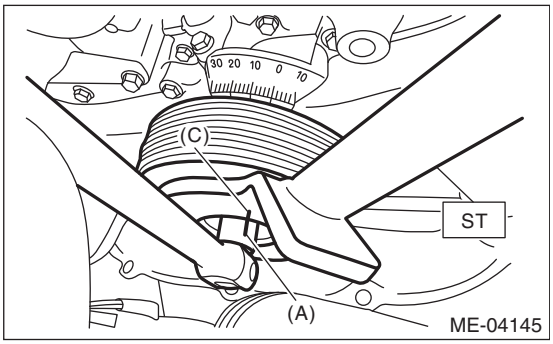


(4) Use the ST to lock the crank pulley, and tighten the crank pulley bolt to the angle where reference line (A) and end line (C) are aligned.

ST 499977400 CRANK PULLEY WRENCH

NOTE:
It should be approx. 60° when reference line (A) and end line (C) are aligned.

Tightening angle:
60°±5°



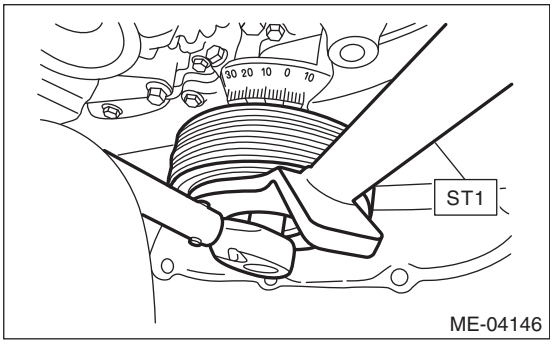
5) Install the V-belts. <Ref. to ME(H4DOTC)-38, INSTALLATION, V-belt.>

2. METHOD WITH ANGLE GAUGE

1) Clean the crankshaft thread using compressed air.
2) Install the crank pulley.
3) Apply engine oil to the crank pulley bolt seat and thread.
4) Tighten the crank pulley bolts.
(1) Remove the radiator main fan motor assembly and radiator sub motor assembly. <Ref. to CO(H4DOTC)-24, REMOVAL, Radiator Main Fan and Fan Motor.> <Ref. to CO(H4DOTC)-26, REMOVAL, Radiator Sub Fan and Fan Motor.>
(2) Use the ST1 to lock the crank pulley, and temporarily tighten the crank pulley bolt.

ST1 499977400 CRANK PULLEY WRENCH

Tightening torque:
47 N·m (4.8 kgf-m, 34.7 ft-lb)

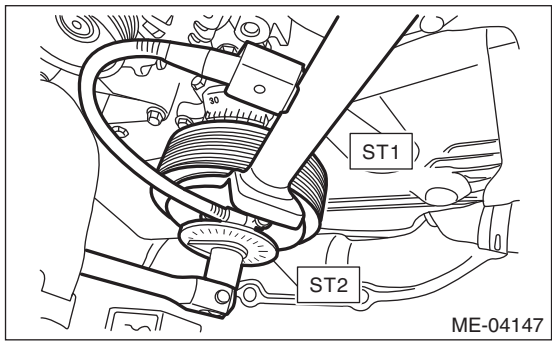


(3) Set the ST2, use the ST1 to lock the crank pulley, and tighten the crank pulley bolt to the specified angle.

ST1 499977400 CRANK PULLEY WRENCH
ST2 18854AA000 ANGLE GAUGE

NOTE:
Attach the magnet used for securing the ST2 (ANGLE GAUGE) to ST1.

Tightening angle:
60°±5°



(4) Install the radiator main fan motor assembly and radiator sub motor assembly. <Ref. to CO(H4DOTC)-24, INSTALLATION, Radiator Main Fan and Fan Motor.> <Ref. to CO(H4DOTC)-26, INSTALLATION, Radiator Sub Fan and Fan Motor.>

5) Install the V-belts. <Ref. to ME(H4DOTC)-38, INSTALLATION, V-belt.>

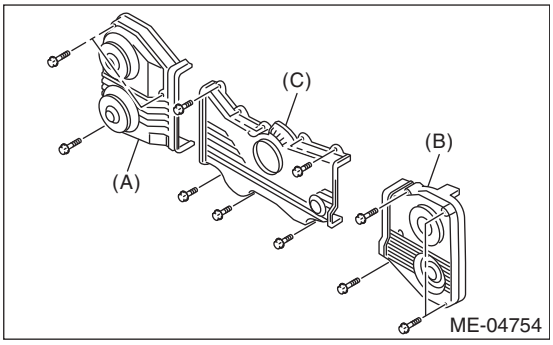
C: INSPECTION

1) Check that the crank pulley has no deformation, cracks or other damages.

14.Timing Belt Cover

A: REMOVAL

NOTE:
When replacing a single part, perform the work with the engine installed to body.
1) Remove the secondary air pump. <Ref. to EC(H4DOTC)-29, REMOVAL, Secondary Air Pump.>
2) Remove the crank pulley. <Ref. to ME(H4DOTC)-46, REMOVAL, Crank Pulley.>
3) Remove the timing belt cover RH (A).
4) Remove the timing belt cover LH (B).
5) Remove the front timing belt cover (C).



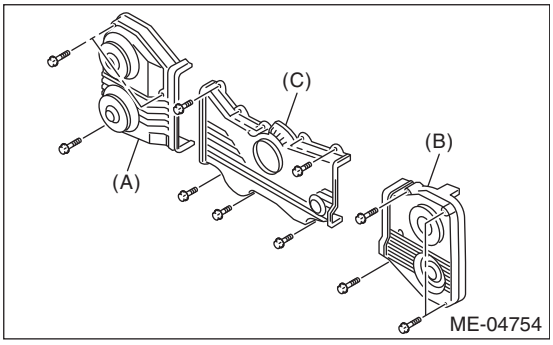
B: INSTALLATION

1) Install the front timing belt cover (C).

Tightening torque:
5 N·m (0.5 kgf-m, 3.7 ft-lb)
2) Install the timing belt cover LH (B).

Tightening torque:
5 N·m (0.5 kgf-m, 3.7 ft-lb)
3) Install the timing belt cover RH (A).

Tightening torque:
5 N·m (0.5 kgf-m, 3.7 ft-lb)



4) Install the crank pulley. <Ref. to ME(H4DOTC)-46, INSTALLATION, Crank Pulley.>
5) Install the secondary air pump. <Ref. to EC(H4DOTC)-29, INSTALLATION, Secondary Air Pump.>

C: INSPECTION

Check the timing belt cover for damage.

15.Timing Belt

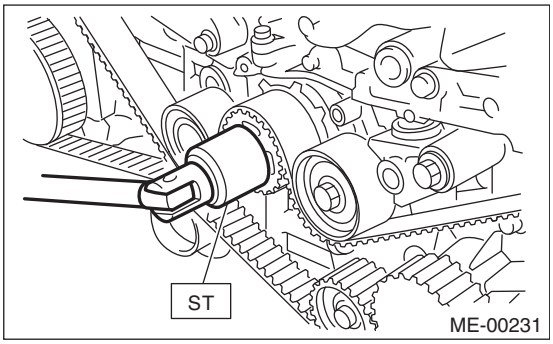
A: REMOVAL

NOTE:
• When replacing a single part, perform the work with the engine installed to body.
• When performing the work with the engine installed to body, the following parts must also be removed/installed.
  • Radiator main fan motor assembly <Ref. to CO(H4DOTC)-24, REMOVAL, Radiator Main Fan and Fan Motor.> <Ref. to CO(H4DOTC)-24, INSTALLATION, Radiator Main Fan and Fan Motor.>
  • Radiator sub fan motor assembly <Ref. to CO(H4DOTC)-26, REMOVAL, Radiator Sub Fan and Fan Motor.> <Ref. to CO(H4DOTC)-26, INSTALLATION, Radiator Sub Fan and Fan Motor.>
• When performing the work with the engine installed to body, protect the radiator with cardboards or blankets.

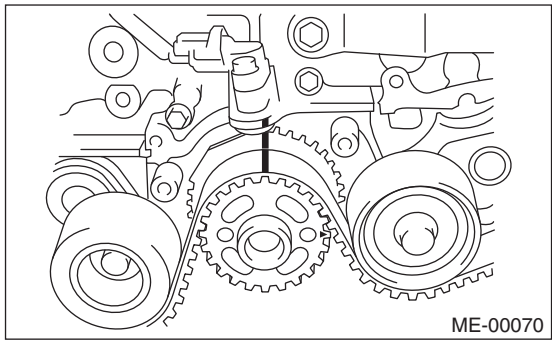
1. TIMING BELT

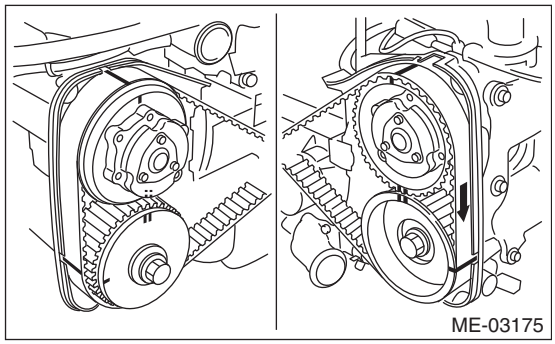
1) Remove the crank pulley. <Ref. to ME(H4DOTC)-46, REMOVAL, Crank Pulley.>
2) Remove the timing belt cover. <Ref. to ME(H4DOTC)-48, REMOVAL, Timing Belt Cover.>
3) If the alignment mark or arrow mark (which indicates the direction of rotation) on timing belt fade away, put new marks before removing 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 marks on oil pump and notches of timing belt cover.

ST 499987500 CRANKSHAFT SOCKET

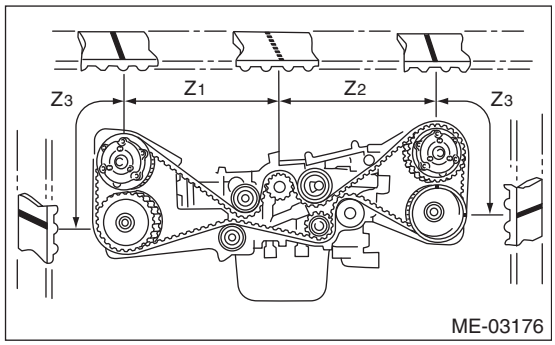


  (2) Using white paint, put an alignment mark or an arrow mark on timing belts in relation to the crank sprocket and cam sprockets.

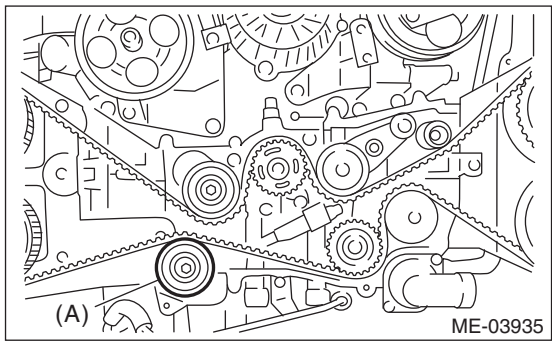




Z_1: 54.5 teeth
Z_2: 51 teeth
Z_3: 28 teeth



4) Remove the belt idler (A).

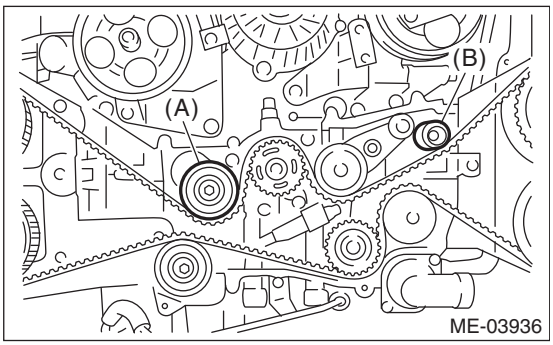


5) Remove the timing belt.

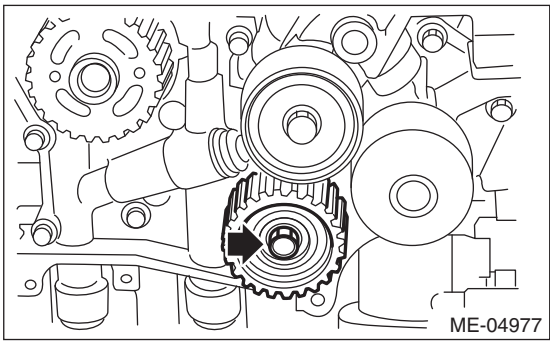
CAUTION:
After the timing belt has been removed, never rotate the intake and exhaust sprocket. If the cam sprocket is rotated, the intake and exhaust valve heads strike together and valve stems are bent.

2. AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER

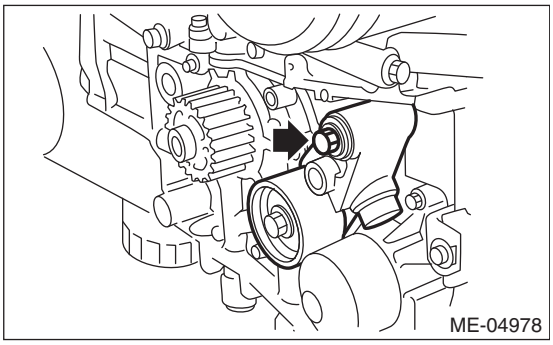
1) Remove the belt idler (A) and (B).



2) Remove the belt idler No. 2.



3) Remove the automatic belt tension adjuster assembly.



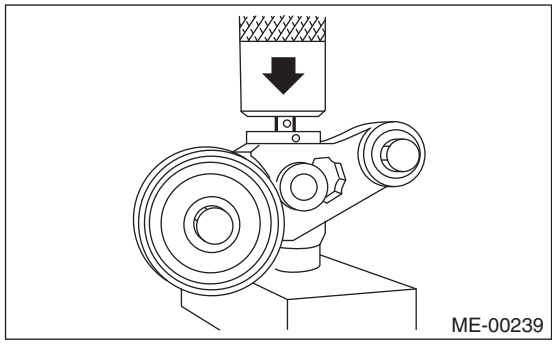
B: INSTALLATION

1. AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER

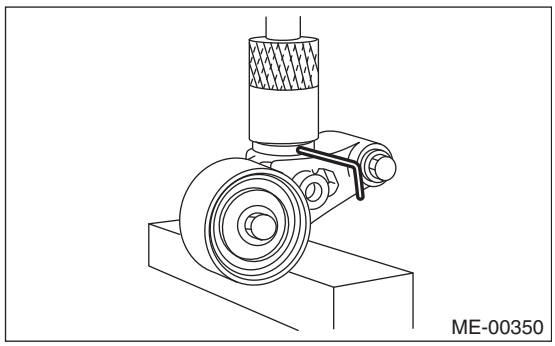
1) Prepare for installation of the automatic belt tension adjuster assembly.

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 three minutes or more.
• Do not allow press pressure to exceed 9,807 N (1,000 kgf, 2,205 lb).
• Push in the adjuster rod to the end face of the cylinder. However, do not press the adjuster rod below the end face of the 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 push in the adjuster rod with a pressure of 165 N (16.8 kgf, 37.1 lbf) or more until the adjuster rod is aligned with the stopper pin hole in the cylinder.

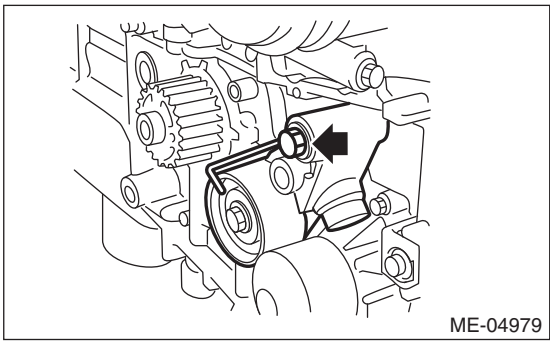


(3) With a 2 mm (0.08 in) dia. stopper pin or a 2 mm (nominal) dia. hex wrench inserted into the stopper pin hole in cylinder, secure the adjuster rod.



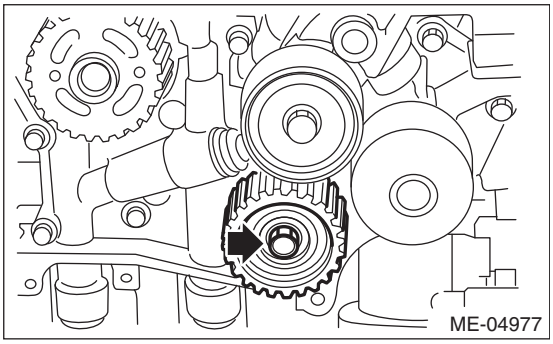
2) Install the automatic belt tension adjuster assembly.

Tightening torque:
39 N·m (4.0 kgf-m, 28.8 ft-lb)



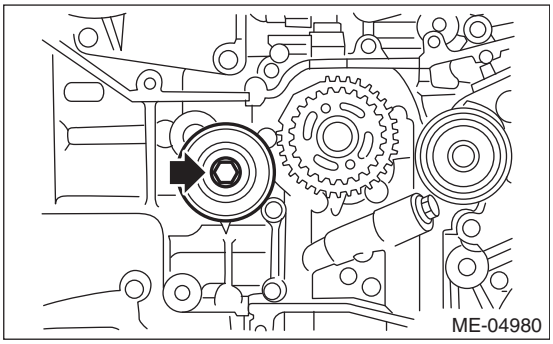
3) Install the belt idler No. 2.

Tightening torque:
39 N·m (4.0 kgf-m, 28.8 ft-lb)

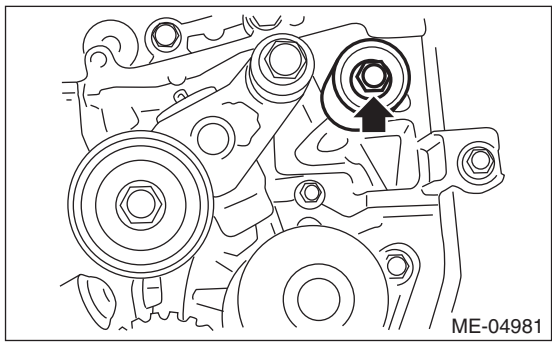


4) Install the belt idlers.

Tightening torque:
39 N·m (4.0 kgf-m, 28.8 ft-lb)



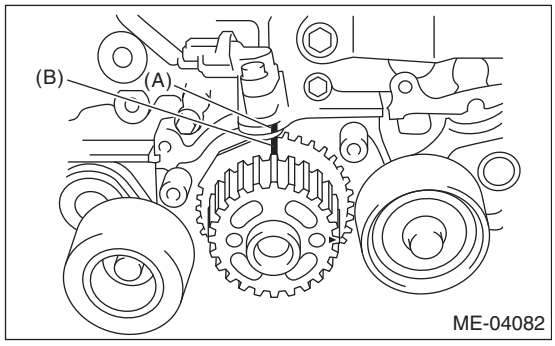
Tightening torque:
25 N·m (2.5 kgf-m, 18.4 ft-lb)



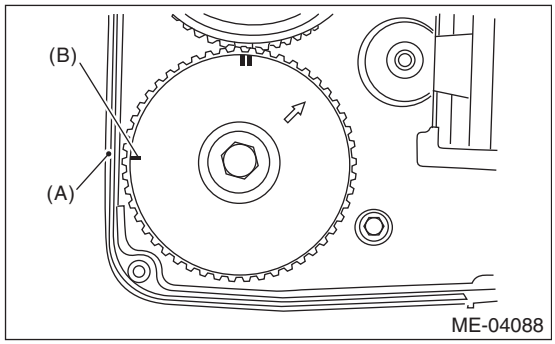
2. TIMING BELT

1) Prepare for installation of the automatic belt tension adjuster assembly. <Ref. to ME(H4DOTC)-50, AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER, INSTALLATION, Timing Belt.>

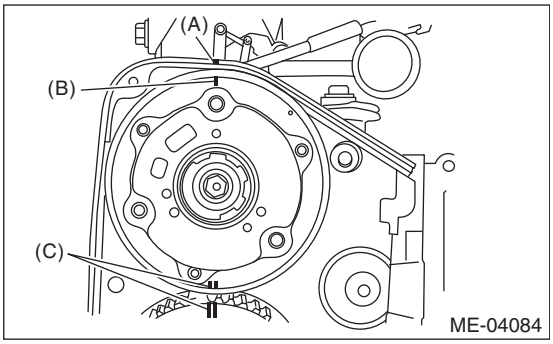
2) Align the mark (B) on crank sprocket with the mark (A) on oil pump.



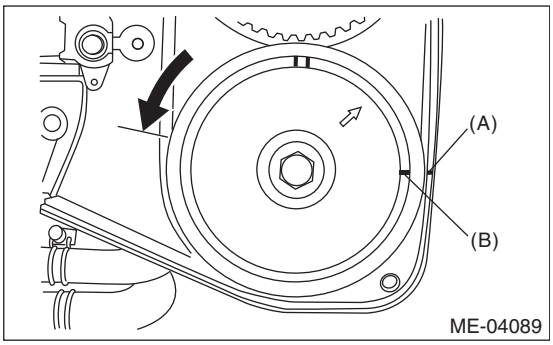
3) Align the single line mark (B) on the exhaust cam sprocket RH with notch (A) on the timing belt cover.



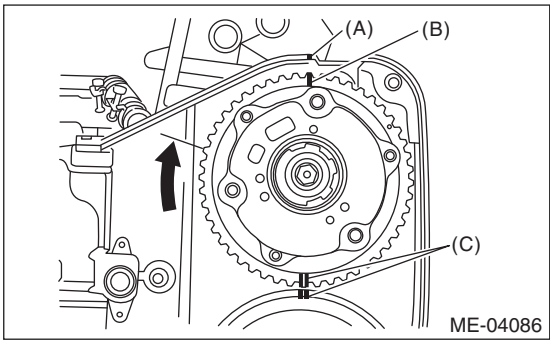
4) Align the single line mark (B) on the intake cam sprocket RH with notch (A) on the timing belt cover. Make sure that the double line marks (C) on intake and exhaust cam sprockets are aligned.



5) Align the single line mark (B) on exhaust cam sprocket LH with notch (A) on the timing belt cover by turning the sprocket counterclockwise (as viewed from front of engine).



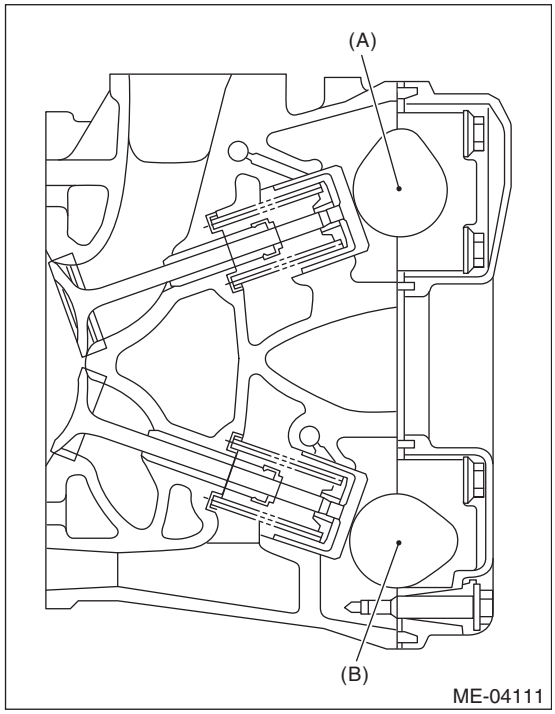
6) Align the single line mark (B) on intake cam sprocket LH with notch (A) on the timing belt cover by turning the sprocket clockwise (as viewed from front of engine). Make sure the double line marks (C) on the intake and exhaust cam sprockets are aligned.



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, heads will interfere with each other, resulting in bent valves.



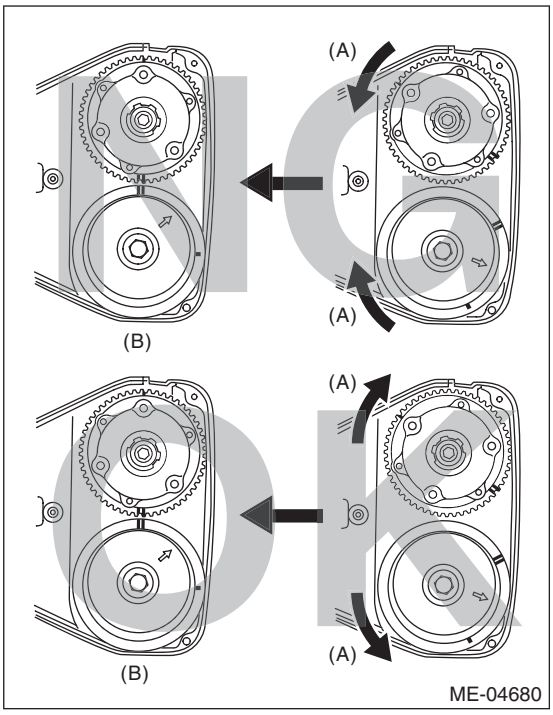
(A) Intake camshaft
(B) Exhaust camshaft

• When the timing belts are not installed, four camshafts are held at the "zero-lift" position, where all cams on camshafts are not pushing down on the intake and exhaust valves. (Under this condition, all valves remain unlifted.)

• When the camshafts are rotated to install the timing belts, #2 intake and #4 exhaust cam of camshaft LH are held, pushing their corresponding valves down. (Under this condition, these valves are held lifted.) Camshaft RH are held so that their cams do not push the 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.

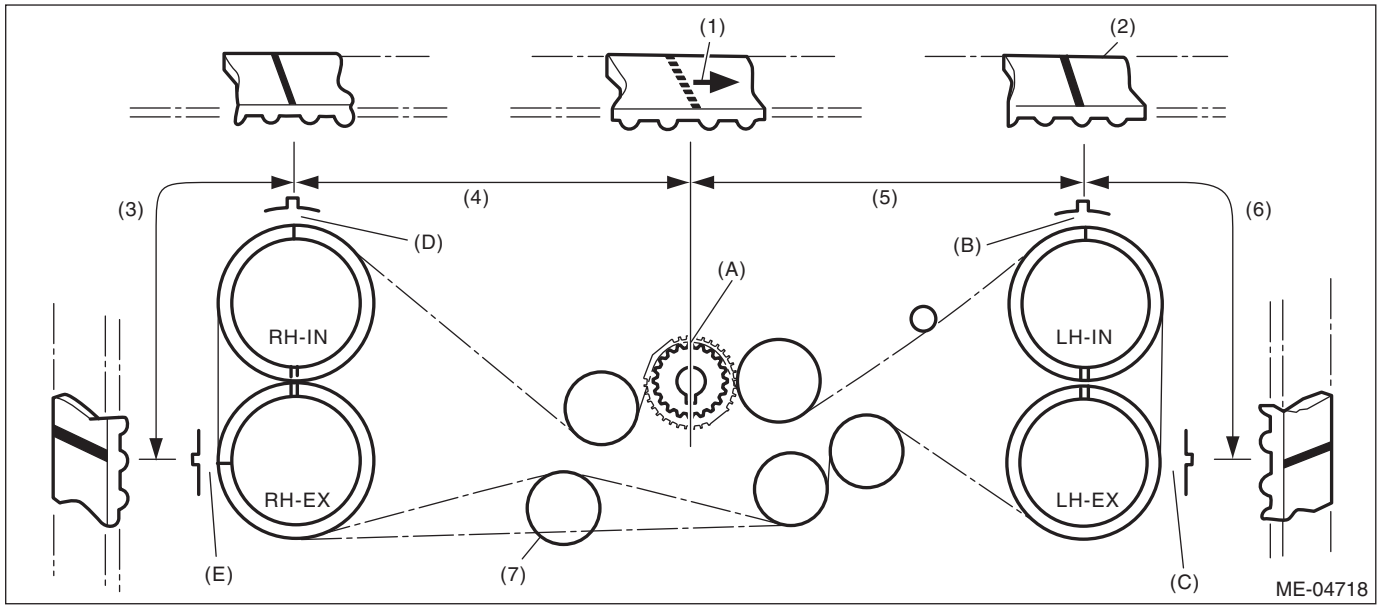
• Do not allow the camshafts to rotate in the direction shown in the upper figure. Doing this may cause both the intake and exhaust valves to lift simultaneously, resulting in mutual interference of valve heads.



(A) Direction of rotation
(B) Timing belt installation position

8) 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, and install the timing belt.

CAUTION:
- **If the timing belt slips by 1 or more teeth, the valve and piston may hit each other.**
- **Make sure that the direction of belt rotation is correct.**

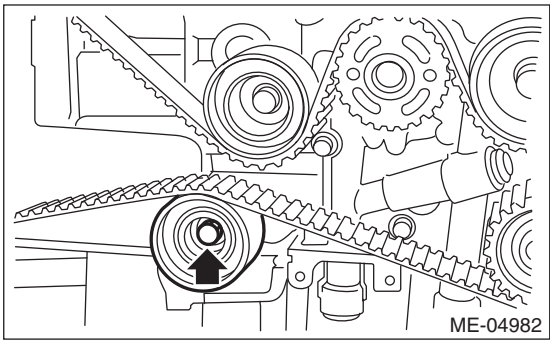


(1) Arrow mark
(2) Timing belt
(3) 28 teeth
(4) 54.5 teeth
(5) 51 teeth
(6) 28 teeth
(7) Install it in the end

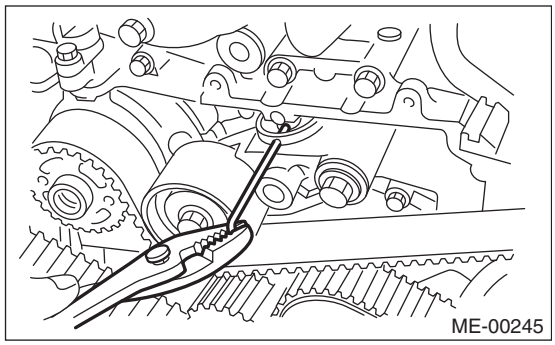
9) Install the belt idlers.

Tightening torque:
39 N·m (4.0 kgf-m, 28.8 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 cover. <Ref. to ME(H4DOTC)-48, INSTALLATION, Timing Belt Cover.>

12) Install the crank pulley. <Ref. to ME(H4DOTC)-46, INSTALLATION, Crank Pulley.>

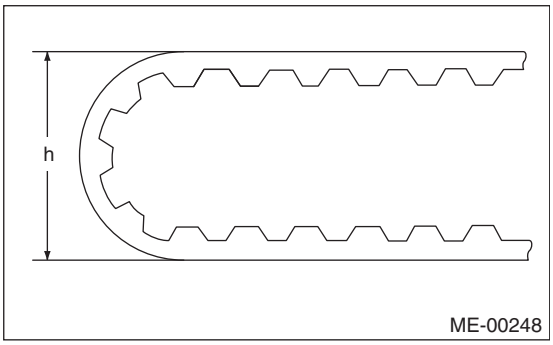
C: INSPECTION

1. TIMING BELT

1) Check the timing belt teeth for breaks, cracks or wear. If any fault is found, replace the timing belt.
2) Check the condition on the back surface of the timing belt. If cracks are found, replace the timing belt.

CAUTION:
• Be careful not to let oil, grease or coolant contact the timing 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



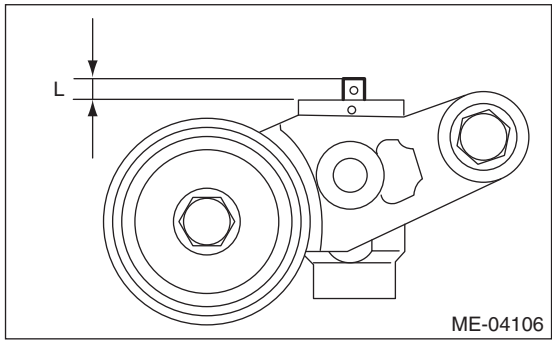
2. AUTOMATIC BELT TENSION ADJUSTER

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 on the oil seal of the rod does not indicate a problem.
2) Check that the adjuster rod does not move when a pressure of 165 N (16.8 kgf, 37.1 lb) is applied to it. This is to check adjuster rod stiffness.
3) If the adjuster rod is not stiff and moves freely when applying 165 N (16.8 kgf, 37.1 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 165 N (16.8 kgf, 37.1 lb) to it, and check the adjuster rod stiffness.
(3) If the adjuster rod is not stiff 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-in the push adjuster rod gradually taking three minutes or more.
• Do not allow press pressure to exceed 9,807 N (1,000 kgf, 2,205 lb).
• Push in the adjuster rod to the end face of the cylinder. However, do not press the adjuster rod below the end face of the cylinder. Doing so may damage the cylinder.
4) Measure the amount of adjuster rod protrusion "L" from the end surface of the cylinder. If it is not within specifications, replace the automatic belt tension adjuster assembly with a new part.

Protrusion amount of adjuster rod L:
5.2 — 6.2 mm (0.205 — 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 with a new part if faulty.
2) Check the belt tension pulley for smooth rotation. Replace the automatic belt tension adjuster assembly with a new part if abnormal noise or excessive play occurs.
3) Check the belt tension pulley for grease leakage.

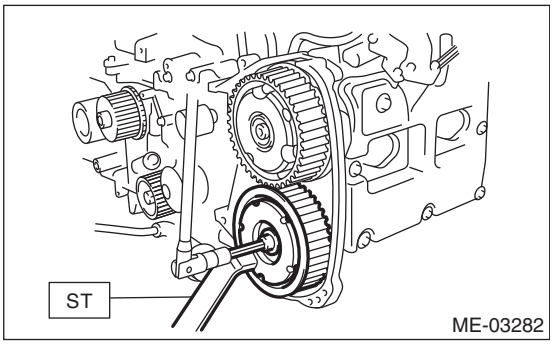
4. BELT IDLER

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.

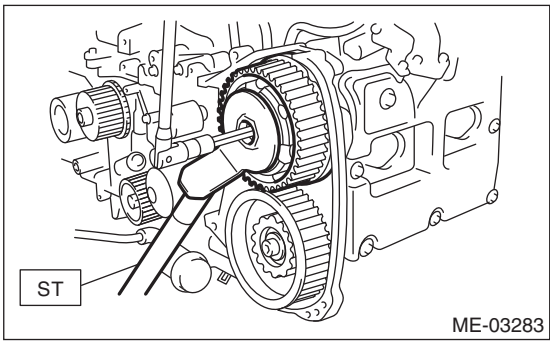
16.Cam Sprocket

A: REMOVAL

NOTE:
When replacing a single part, perform the work with the engine installed to body.
1) Remove the crank pulley. <Ref. to ME(H4DOTC)-46, REMOVAL, Crank Pulley.>
2) Remove the timing belt cover. <Ref. to ME(H4DOTC)-48, REMOVAL, Timing Belt Cover.>
3) Remove the timing belt. <Ref. to ME(H4DOTC)-49, REMOVAL, Timing Belt.>
4) Remove the actuator cover from intake cam sprocket.
5) Use the ST to lock the cam sprocket, and remove the cam sprocket bolt.
ST 499207400 CAM SPROCKET WRENCH



ST 499977500 CAM SPROCKET WRENCH



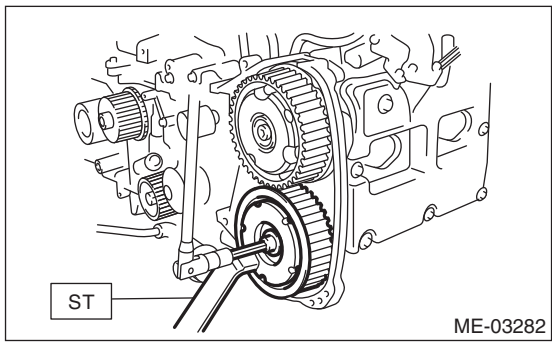
6) Remove the cam sprocket.

B: INSTALLATION

1) Install the cam sprocket.
2) Use the ST to lock the cam sprocket, and install the cam sprocket bolt.

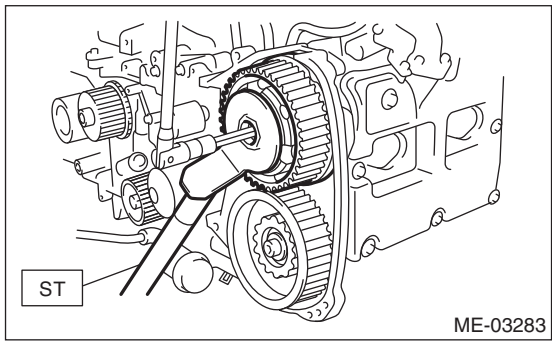
NOTE:
Do not confuse cam sprockets (LH) and (RH) during installation.
ST 499207400 CAM SPROCKET WRENCH

Tightening torque:
Tighten to 30 N·m (3.1 kgf-m, 22.1 ft-lb) of torque, and then tighten further by 45°.



ST 499977500 CAM SPROCKET WRENCH

Tightening torque:
Tighten to 30 N·m (3.1 kgf-m, 22.1 ft-lb) of torque, and then tighten further by 45°.



3) Install the actuator cover to intake cam sprocket.

NOTE:
Use new O-rings.

Tightening torque:
3.4 N·m (0.3 kgf-m, 2.5 ft-lb)
4) Install the timing belt. <Ref. to ME(H4DOTC)-50, INSTALLATION, Timing Belt.>
5) Install the timing belt cover. <Ref. to ME(H4DOTC)-48, INSTALLATION, Timing Belt Cover.>
6) Install the crank pulley. <Ref. to ME(H4DOTC)-46, INSTALLATION, Crank Pulley.>

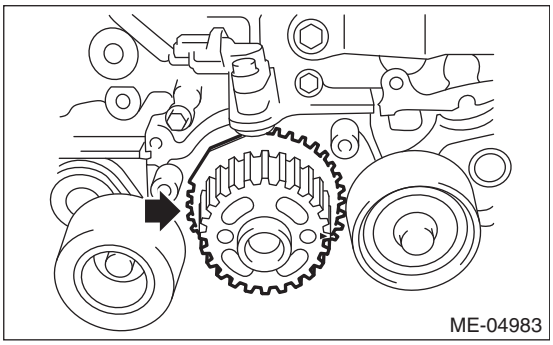
C: INSPECTION

1) Check the cam sprocket teeth for abnormal wear and scratches.
2) Make sure there is no free play between cam sprocket and key.

17.Crank Sprocket

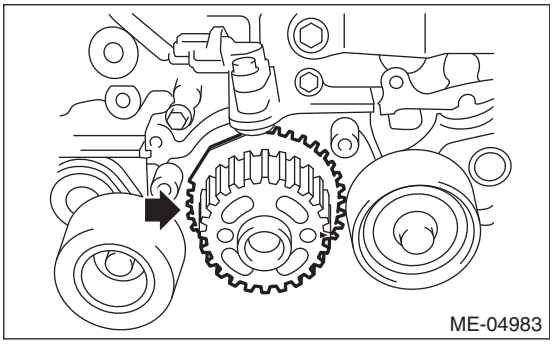
A: REMOVAL

NOTE:
When replacing a single part, perform the work with the engine installed to body.
1) Remove the crank pulley. <Ref. to ME(H4DOTC)-46, REMOVAL, Crank Pulley.>
2) Remove the timing belt cover. <Ref. to ME(H4DOTC)-48, REMOVAL, Timing Belt Cover.>
3) Remove the timing belt. <Ref. to ME(H4DOTC)-49, REMOVAL, Timing Belt.>
4) Remove the crank sprocket.



B: INSTALLATION

1) Install the crank sprocket.



2) Install the timing belt. <Ref. to ME(H4DOTC)-50, INSTALLATION, Timing Belt.>
3) Install the timing belt cover. <Ref. to ME(H4DOTC)-48, INSTALLATION, Timing Belt Cover.>
4) Install the crank pulley. <Ref. to ME(H4DOTC)-46, INSTALLATION, Crank Pulley.>

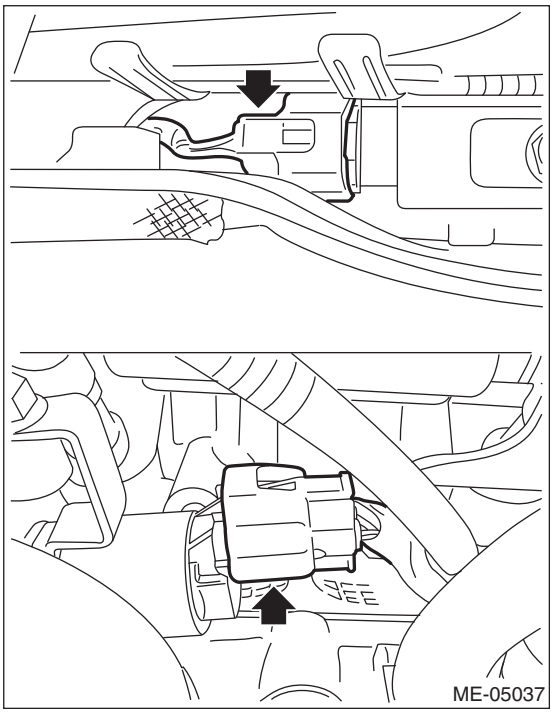
C: INSPECTION

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.Camshaft

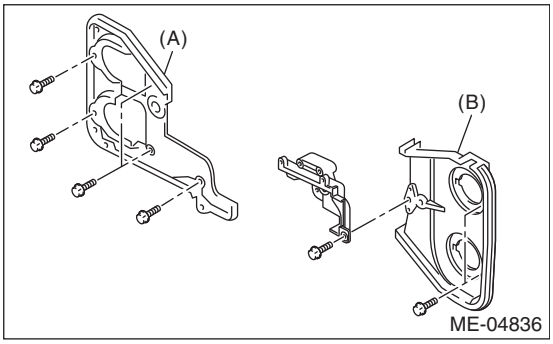
A: REMOVAL

1) Remove the engine from the vehicle. <Ref. to ME(H4DOTC)-29, REMOVAL, Engine Assembly.>
2) Remove the rear side belt. <Ref. to ME(H4DOTC)-38, REAR SIDE BELT, REMOVAL, V-belt.>
3) Remove the crank pulley. <Ref. to ME(H4DOTC)-46, REMOVAL, Crank Pulley.>
4) Remove the timing belt cover. <Ref. to ME(H4DOTC)-48, REMOVAL, Timing Belt Cover.>
5) Remove the timing belt. <Ref. to ME(H4DOTC)-49, REMOVAL, Timing Belt.>
6) Remove the cam sprocket. <Ref. to ME(H4DOTC)-56, REMOVAL, Cam Sprocket.>
7) Disconnect the connector from the oil flow control solenoid valve.

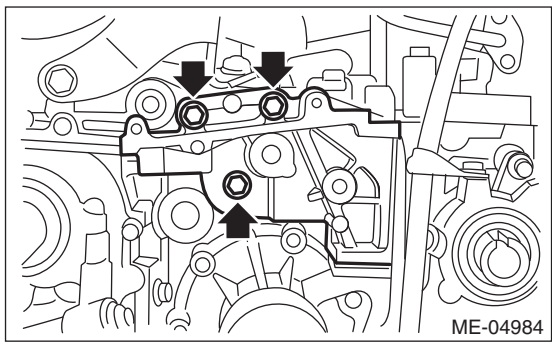


8) Remove the timing belt cover No. 2 RH (A) and timing belt cover No. 2 LH (B).

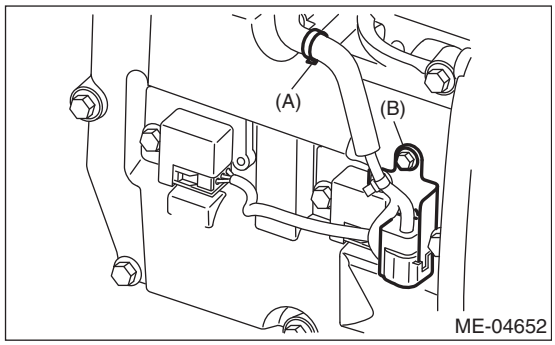
NOTE:
When removing the timing belt cover, be careful not to damage the seal rubber.



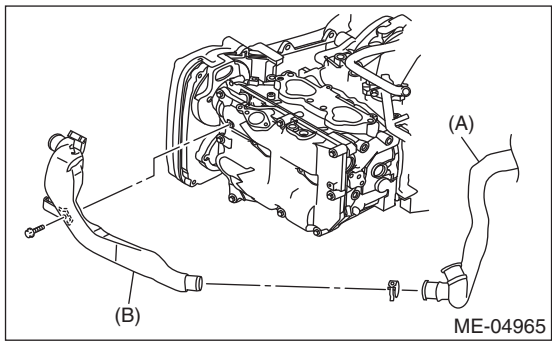
9) Remove the tensioner bracket.



10) Remove the clip (A) and the stay (B) which hold the engine harness to the rocker cover.



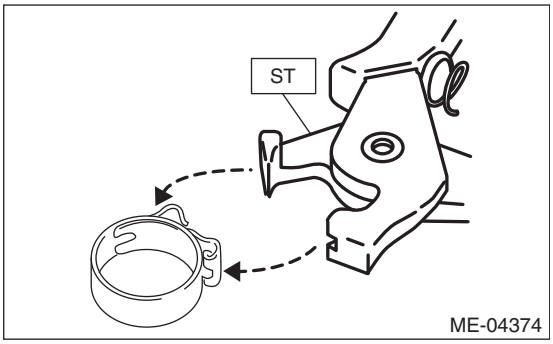
11) Remove the air duct B (B) from the rocker cover LH and the air duct A (A).



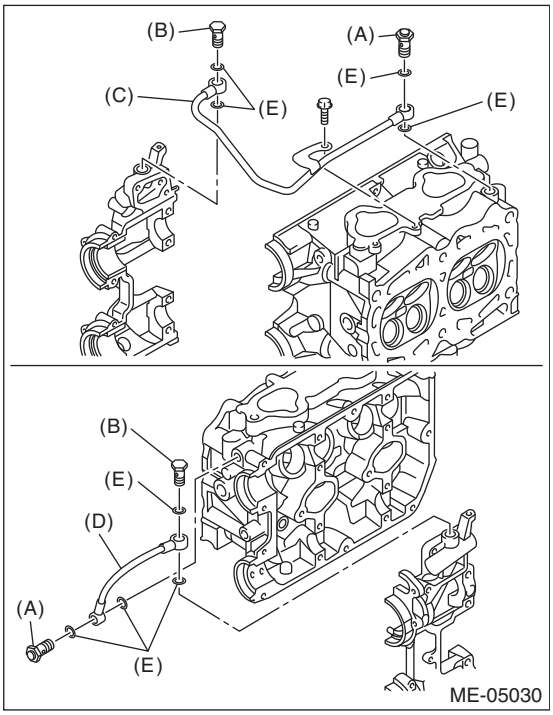
12) Remove the ignition coil. <Ref. to IG(H4DOTC)-7, REMOVAL, Ignition Coil.>

13) Disconnect PCV hose and vacuum hose from the rocker cover.

NOTE:
Pinch the clamp of the PCV hose by fitting the cut out in the ST with the protrusion on the clamp as shown in the figure, and unlock the clamp.
ST 18353AA000 CLAMP PLIERS

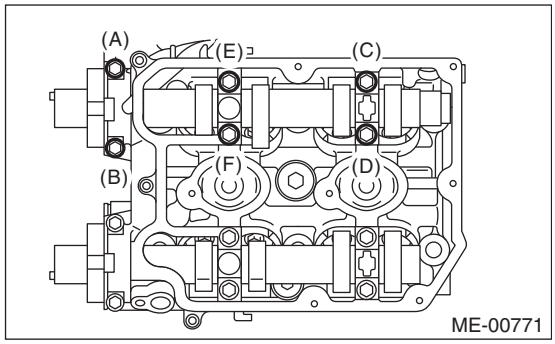


14) Remove the rocker cover.
15) Remove the union bolt without filter (without protrusion) which secures the oil pipe to the front camshaft cap.

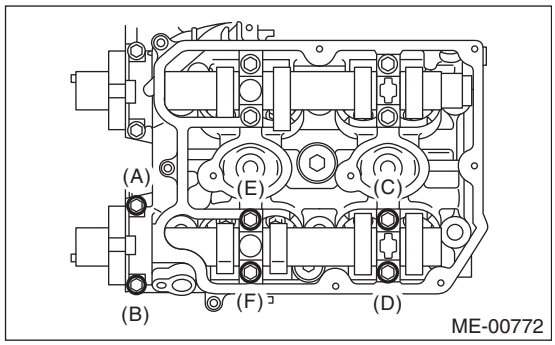


(A) Union bolt with filter (with protrusion)
(B) Union bolt without filter (without protrusion)
(C) Oil pipe RH
(D) Oil pipe LH
(E) Gasket

16) Loosen the upper side of the front camshaft cap and the intake camshaft cap bolts equally, a little at a time in alphabetical sequence shown in the figure.



17) Loosen the lower side of the front camshaft cap and the exhaust camshaft cap bolts equally, a little at a time in alphabetical sequence shown in the figure.



18) Remove the front camshaft cap.
19) Remove the intake camshaft caps and intake camshaft.
20) Remove the exhaust camshaft caps and exhaust camshaft.

NOTE:
Arrange camshaft caps in order so that they can be installed in their original positions.
21) Remove the oil seal.

CAUTION:
Do not scratch the journal surface when removing the oil seal.
22) Similarly, remove the camshaft RH.

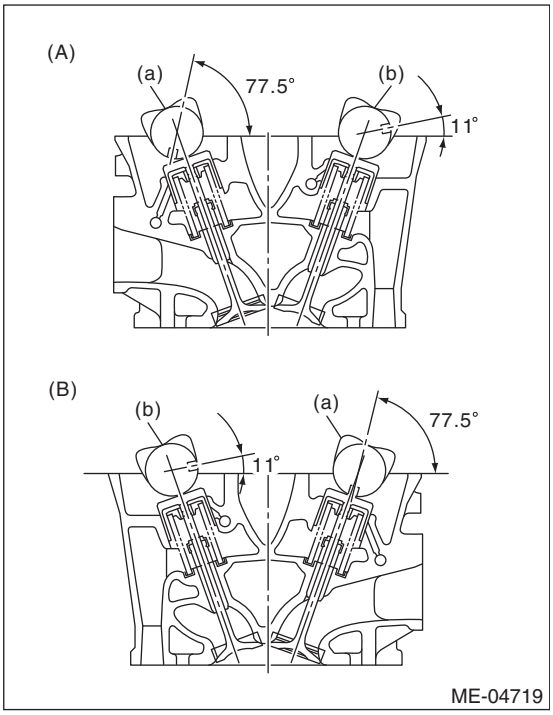
B: INSTALLATION

1) Install the camshaft.
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 lobe.

NOTE:
• Set the camshaft to the position shown in the figure.
• When set at the position shown in the figure, it is not necessary to rotate the camshaft RH when installing the timing belt, but it is necessary to rotate the camshaft LH slightly.

Intake camshaft LH:
Rotate 80° clockwise.

Exhaust camshaft LH:
Rotate 45° counterclockwise.

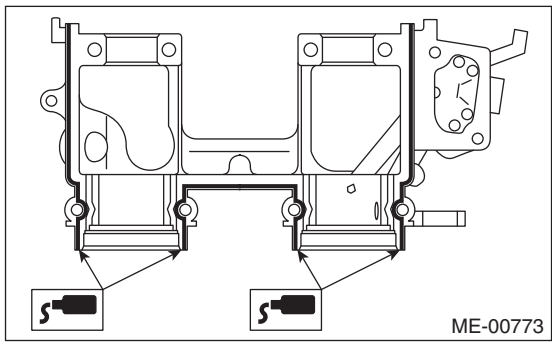


(A) Cylinder head LH
(B) Cylinder head RH
(a) Intake camshaft
(b) Exhaust camshaft

2) Install the camshaft cap.
(1) Apply small amount of liquid gasket to the mating surface of cap.

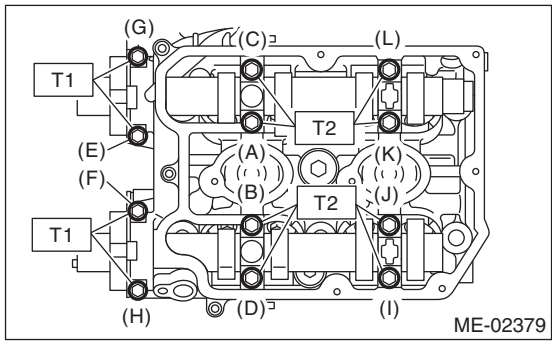
NOTE:
• Install within 5 min. after applying liquid gasket.
• Do not apply liquid gasket excessively. Applying excessively may cause excess gasket to come out and flow toward oil seal, resulting in oil leak.

Liquid gasket:
THREE BOND 1217G (Part No. K0877Y0100) or equivalent



(2) Apply a thin coat of engine oil to the cap journal surface, and install the camshaft cap to the camshaft.
(3) Gradually tighten the camshaft cap in at least two steps, in alphabetical order shown in the figure, and then tighten to the specified torque.

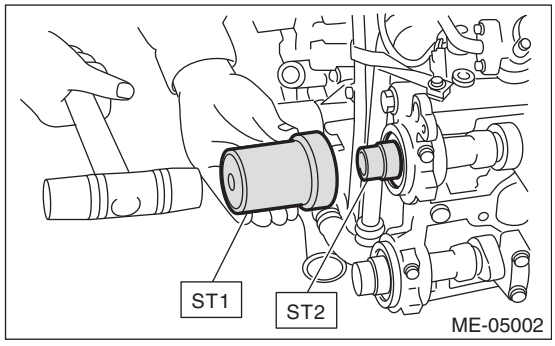
Tightening torque:
T1: 9.75 N·m (1.0 kgf-m, 7.2 ft-lb)
T2: 20 N·m (2.0 kgf-m, 14.8 ft-lb)



(4) After tightening the camshaft cap, ensure the camshaft rotates only slightly while holding it at base circle.

3) Apply a thin coat of engine oil to the periphery of the camshaft oil seal and oil seal lip, and install the oil seal on the camshaft using ST1 and ST2.

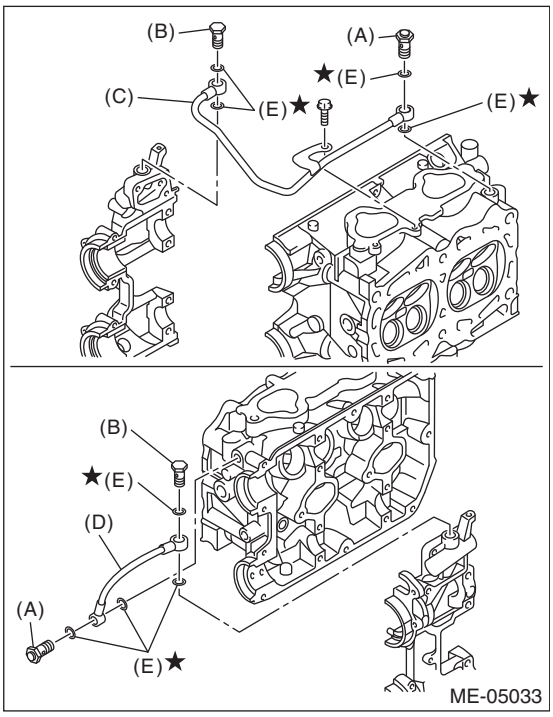
NOTE:
Use a new oil seal.
ST1 499587600 OIL SEAL INSTALLER
ST2 499597200 OIL SEAL GUIDE



4) Similarly, install the camshaft RH.
5) Install the oil pipe to the front camshaft cap using the union bolt without filter (without protrusion).

NOTE:
Use a new gasket.

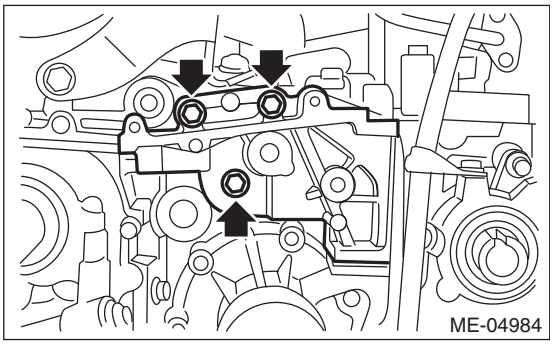
Tightening torque:
29 N·m (3.0 kgf-m, 21.4 ft-lb)



(A) Union bolt with filter (with protrusion)
(B) Union bolt without filter (without protrusion)
(C) Oil pipe RH
(D) Oil pipe LH
(E) Gasket

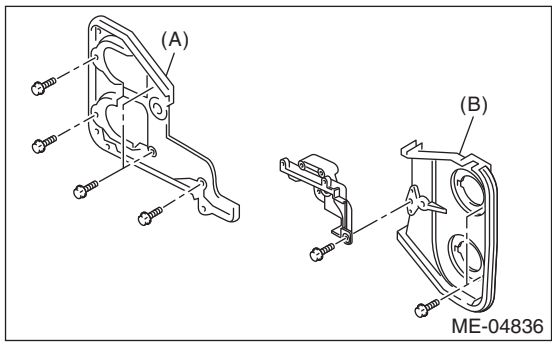
6) Install the tensioner bracket.

Tightening torque:
24.5 N·m (2.5 kgf-m, 18.1 ft-lb)



7) Install the timing belt cover No. 2 RH (A) and timing belt cover No. 2 LH (B).

Tightening torque:
5 N·m (0.5 kgf-m, 3.7 ft-lb)

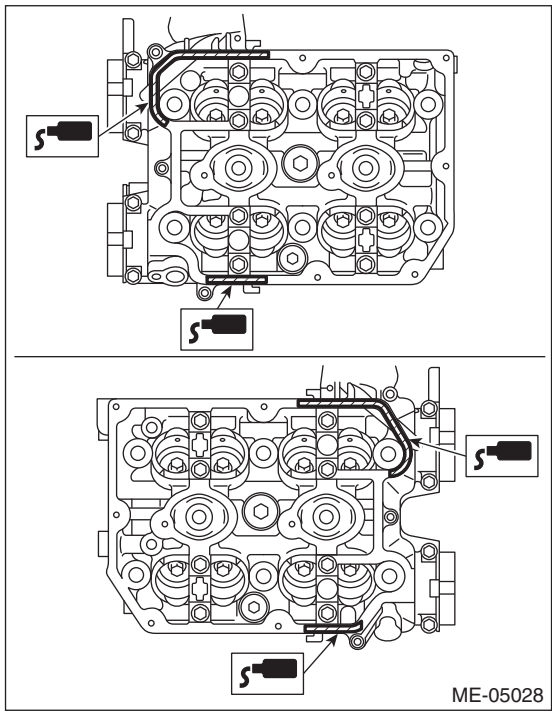


8) Install the cam sprocket. <Ref. to ME(H4DOTC)-56, INSTALLATION, Cam Sprocket.>
9) Install the timing belt. <Ref. to ME(H4DOTC)-50, INSTALLATION, Timing Belt.>
10) Adjust the valve clearance. <Ref. to ME(H4DOTC)-28, ADJUSTMENT, Valve Clearance.>
11) Install the rocker cover.
(1) Install the rocker cover gasket to the rocker cover. (outer section and ignition coil section)

NOTE:
Use a new rocker cover gasket.
(2) Apply liquid gasket to the specified point of the cylinder head.

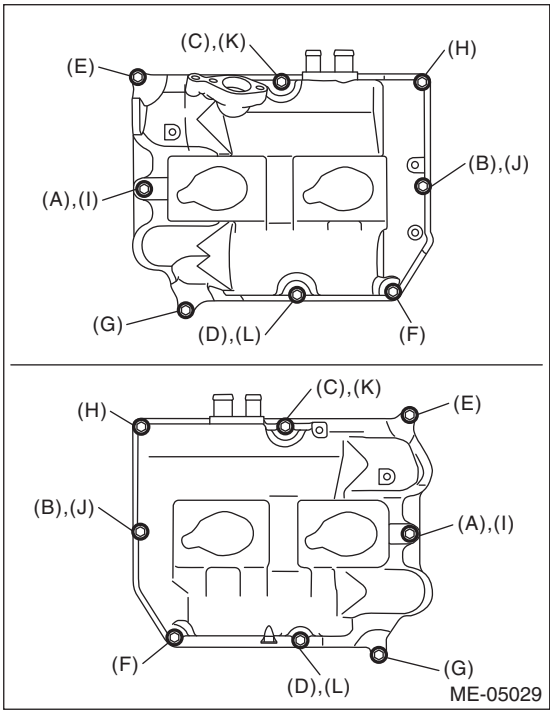
NOTE:
Install within 5 min. after applying liquid gasket.

Liquid gasket:
THREE BOND 1217G (Part No. K0877Y0100) or equivalent



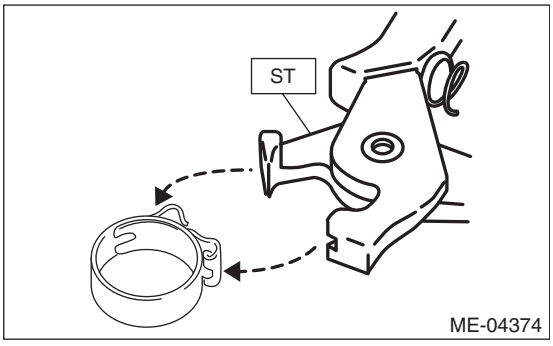
(3) Install the rocker cover onto cylinder heads. Ensure the gasket is properly positioned during installation.
(4) Temporarily tighten the rocker cover bolts in alphabetical order shown in the figure, and then tighten to specified torque in alphabetical order.

Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)

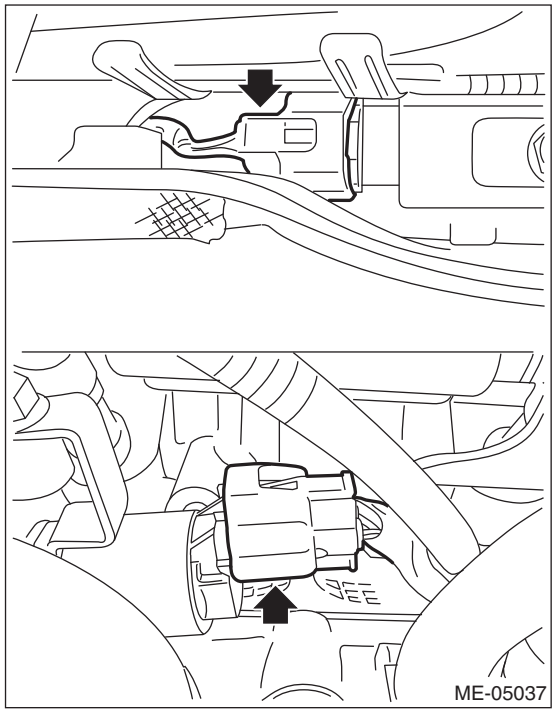


12) Connect the PCV hose and vacuum hose to the rocker cover.

NOTE:
Use a new clamp for the PCV hose clamp, fit the cut out in the ST with the protrusion on the clamp as shown in the figure, and lock the clamp.
ST 18353AA000 CLAMP PLIERS

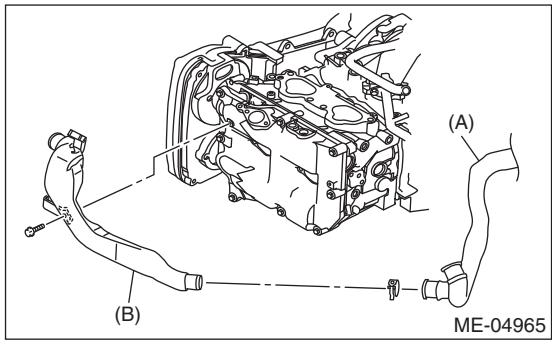


13) Connect the connector to oil flow control solenoid valve.



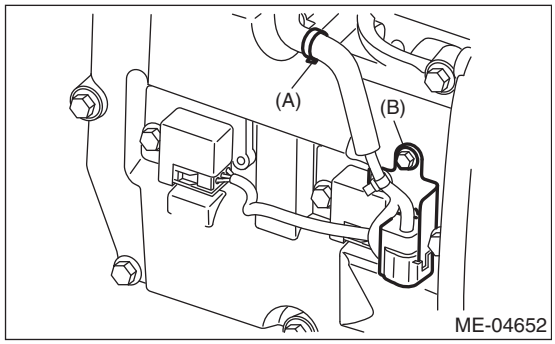
14) Install the ignition coil. <Ref. to IG(H4DOTC)-7, INSTALLATION, Ignition Coil.>
15) Install the air duct B (B) to the rocker cover LH and the air duct A (A).

Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)



16) Securely install the engine harness with clip (A) and stay (B) to the rocker cover RH.

Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)

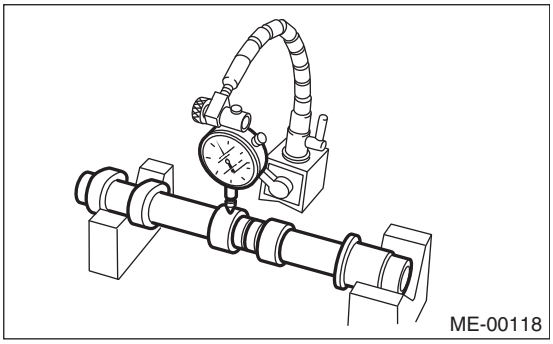


17) Install the timing belt cover. <Ref. to ME(H4DOTC)-48, INSTALLATION, Timing Belt Cover.>
18) Install the crank pulley. <Ref. to ME(H4DOTC)-46, INSTALLATION, Crank Pulley.>
19) Install the rear side belt. <Ref. to ME(H4DOTC)-39, REAR SIDE BELT, INSTALLATION, V-belt.>
20) Install the engine to the vehicle. <Ref. to ME(H4DOTC)-33, INSTALLATION, Engine Assembly.>

C: INSPECTION

1) Measure the bend, and repair or replace if necessary.

Camshaft bend limit:
0.020 mm (0.00079 in)

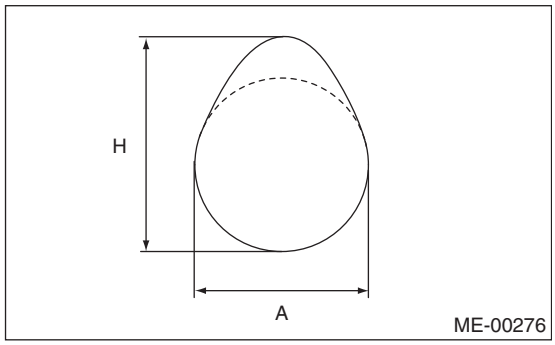


2) Check the journal for damage and wear. Replace if faulty.
3) Check the cutout portion used for camshaft sensor for damage. Replace if faulty.
4) Check the cam face condition, and remove the minor faults by grinding with oil stone. Replace if there is uneven wear or others.
5) Measure the cam lobe height “H” and cam base circle diameter “A”. If it exceeds the standard or offset wear occurs, replace it.

Cam lobe 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)

Cam base circle diameter A:
Standard
37.0 mm (1.457 in)

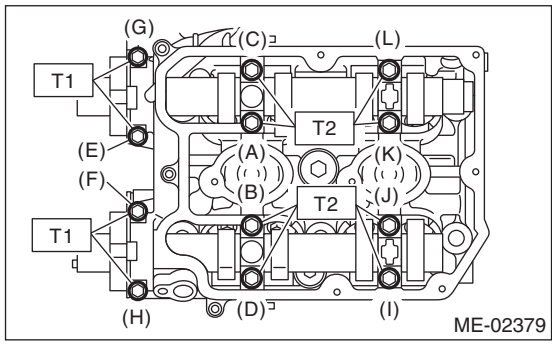


6) Measure the outside diameter of camshaft journal. If the journal diameter is not within specification, check the oil clearance.

	Camshaft journal	
	Front	Center, rear
Standard mm (in)	37.946 — 37.963 (1.4939 — 1.4946)	29.946 — 29.963 (1.1790 — 1.1796)

7) Measure the oil clearance of camshaft journal.
(1) Clean the camshaft cap and cylinder head camshaft journal.
(2) Place the camshaft on cylinder head. (Without installing the valve lifter)
(3) Place a plastigauge across each camshaft journals.
(4) Gradually tighten the camshaft cap in at least two steps, in alphabetical order shown in the figure, and then tighten to the specified torque. Do not turn the camshaft.

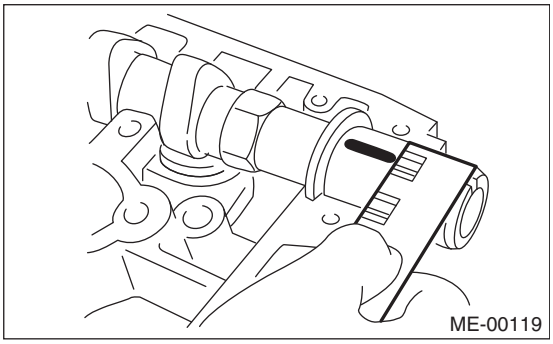
Tightening torque:
T1: 9.75 N·m (1.0 kgf-m, 7.2 ft-lb)
T2: 20 N·m (2.0 kgf-m, 14.8 ft-lb)



(5) Remove the camshaft cap.

(6) Measure the widest point of the plastigauge on each journal. If oil clearance exceeds the standard, replace the camshaft. If necessary, replace the camshaft caps and cylinder head as a set.

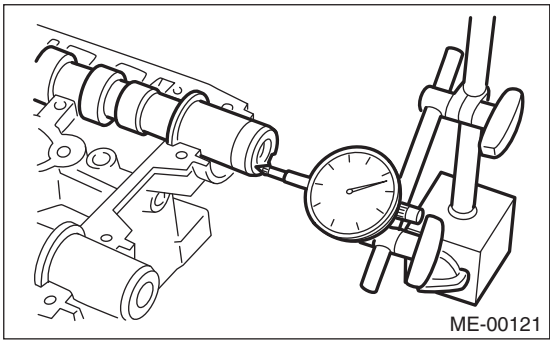
Camshaft oil clearance:
Standard
0.037 — 0.072 mm (0.0015 — 0.0028 in)



(7) Completely remove the plastigauge.

8) Measure the thrust clearance of camshaft with the dial gauge set at end of camshaft. If the thrust clearance is not within the standard or there is offset wear, replace the camshaft caps and cylinder head as a set. If necessary replace the camshaft.

Camshaft thrust clearance:
Standard
0.068 — 0.116 mm (0.0027 — 0.0047 in)

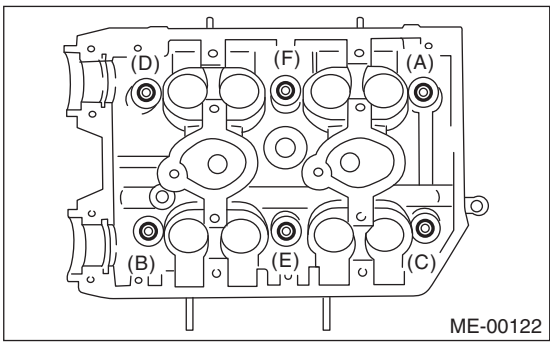


19.Cylinder Head

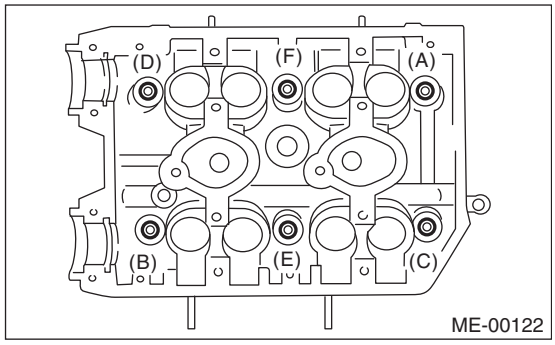
A: REMOVAL

1) Remove the engine from the vehicle. <Ref. to ME(H4DOTC)-29, REMOVAL, Engine Assembly.>
2) Remove the rear side belt. <Ref. to ME(H4DOTC)-38, REAR SIDE BELT, REMOVAL, V-belt.>
3) Remove the intake manifold. <Ref. to FU(H4DOTC)-18, REMOVAL, Intake Manifold.>
4) Remove the crank pulley. <Ref. to ME(H4DOTC)-46, REMOVAL, Crank Pulley.>
5) Remove the timing belt cover. <Ref. to ME(H4DOTC)-48, REMOVAL, Timing Belt Cover.>
6) Remove the timing belt. <Ref. to ME(H4DOTC)-49, REMOVAL, Timing Belt.>
7) Remove the cam sprocket. <Ref. to ME(H4DOTC)-56, REMOVAL, Cam Sprocket.>
8) Remove the secondary air combination valve. <Ref. to EC(H4DOTC)-30, REMOVAL, Secondary Air Combination Valve.>
9) Remove the bolts which secure A/C compressor bracket to cylinder head.
10) Remove the oil pipe. <Ref. to LU(H4DOTC)-21, REMOVAL, Oil Pipe.>
11) Remove the camshaft. <Ref. to ME(H4DOTC)-58, REMOVAL, Camshaft.>
12) Remove the oil level gauge guide. (LH side only)
13) Remove the cylinder head bolts in alphabetical order shown in the figure.

NOTE:
Leave the bolts (A) and (D) engaged by three or four threads to prevent the cylinder head from falling.



14) While tapping the cylinder head with a plastic hammer, separate it from cylinder block. Remove the bolts (A) and (D) to remove cylinder head.



15) Remove the cylinder head gasket.

CAUTION:
Be careful not to scratch the mating surface of cylinder head and cylinder block.
16) Similarly, remove the right side cylinder head.

B: INSTALLATION

1) Install the cylinder head to the cylinder block.

CAUTION:
Be careful not to scratch the mating surface of cylinder head and cylinder block.

NOTE:
Use a new cylinder head gasket.
(1) Clean the bolt threads and the bolt holes in the cylinder block

CAUTION:
To avoid erroneous tightening of the bolts, clean out the bolt holes sufficiently by blowing with compressed air to eliminate engine coolant etc.
(2) Apply a sufficient coat of engine oil to the washer and bolt thread.
(3) Tighten all bolts to 40 N·m (4.1 kgf-m, 29.5 ft-lb) in alphabetical order.
(4) Retighten all bolts to 95 N·m (9.7 kgf-m, 70.1 ft-lb) in alphabetical order.

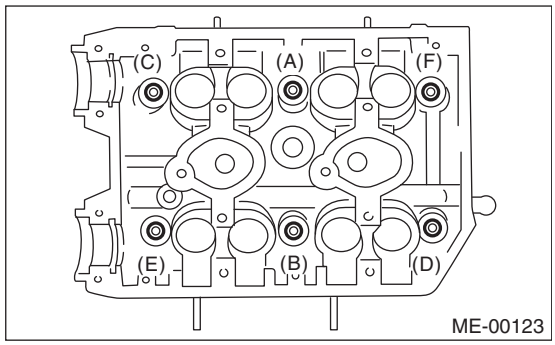
CAUTION:
If the bolt makes stick-slip sound during tightening, repeat the procedure from step (1). In this case, the cylinder head gasket can be reused.
(5) Loosen all the bolts by 180° in the reverse order of installing, and loosen them further by 180°.
(6) Tighten all bolts to 10 N·m (1.0 kgf-m, 7.4 ft-lb) in alphabetical order.
(7) Retighten all bolts to 30 N·m (3.1 kgf-m, 22.1 ft-lb) in alphabetical order.
(8) Retighten all bolts to 70 N·m (7.1 kgf-m, 51.6 ft-lb) in alphabetical order.

(9) Retighten all bolts by 80 — 90° in alphabetical order.
(10) Retighten all bolts by 40 — 45° in alphabetical order.

CAUTION:
The tightening angle of the bolt should not exceed 45°.

(11) Retighten bolts (A) and (B) by 40 — 45°.

CAUTION:
Make sure the total "tightening angle" of steps (10) and (11) does not exceed 90°.



2) Similarly, install the right side cylinder head.
3) Install the oil level gauge guide. (LH side only)

Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)

4) Install the camshaft. <Ref. to ME(H4DOTC)-60, INSTALLATION, Camshaft.>
5) Install the oil pipe. <Ref. to LU(H4DOTC)-22, INSTALLATION, Oil Pipe.>
6) Install the A/C compressor bracket on cylinder head.

Tightening torque:
36 N·m (3.7 kgf-m, 26.6 ft-lb)

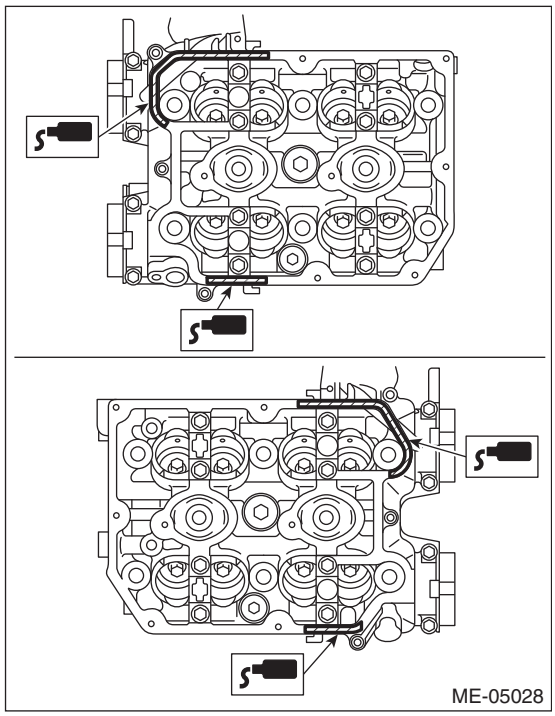
7) Install the secondary air combination valve. <Ref. to EC(H4DOTC)-31, INSTALLATION, Secondary Air Combination Valve.>
8) Install the cam sprocket. <Ref. to ME(H4DOTC)-56, INSTALLATION, Cam Sprocket.>
9) Install the timing belt. <Ref. to ME(H4DOTC)-50, INSTALLATION, Timing Belt.>
10) Adjust the valve clearance. <Ref. to ME(H4DOTC)-28, ADJUSTMENT, Valve Clearance.>
11) Install the rocker cover.
(1) Install the rocker cover gasket to the rocker cover. (outer section and ignition coil section)

NOTE:
Use a new rocker cover gasket.

(2) Apply liquid gasket to the specified point of the cylinder head.

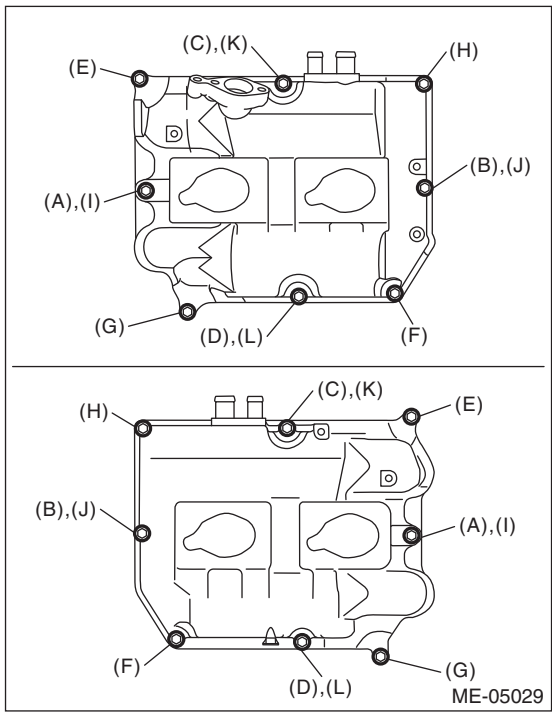
NOTE:
Install within 5 min. after applying liquid gasket.

Liquid gasket:
THREE BOND 1217G (Part No. K0877Y0100) or equivalent



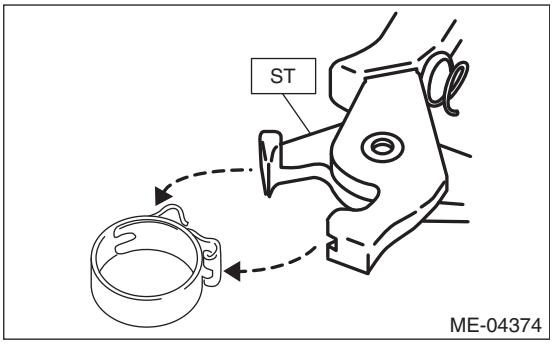
(3) Install the rocker cover onto cylinder heads. Ensure the gasket is properly positioned during installation.
(4) Temporarily tighten the rocker cover bolts in alphabetical order shown in the figure, and then tighten to specified torque in alphabetical order.

Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)



12) Connect the PCV hose to the rocker cover.

NOTE:
Use a new clamp for the PCV hose clamp, fit the cut out in the ST with the protrusion on the clamp as shown in the figure, and lock the clamp.
ST 18353AA000 CLAMP PLIERS

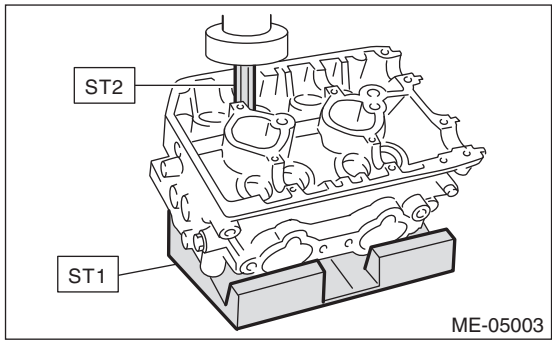


13) Install the timing belt cover. <Ref. to ME(H4DOTC)-48, INSTALLATION, Timing Belt Cover.>
14) Install the crank pulley. <Ref. to ME(H4DOTC)-46, INSTALLATION, Crank Pulley.>
15) Install the intake manifold. <Ref. to FU(H4DOTC)-23, INSTALLATION, Intake Manifold.>
16) Install the rear side belt. <Ref. to ME(H4DOTC)-39, REAR SIDE BELT, INSTALLATION, V-belt.>
17) Install the engine to the vehicle. <Ref. to ME(H4DOTC)-33, INSTALLATION, Engine Assembly.>

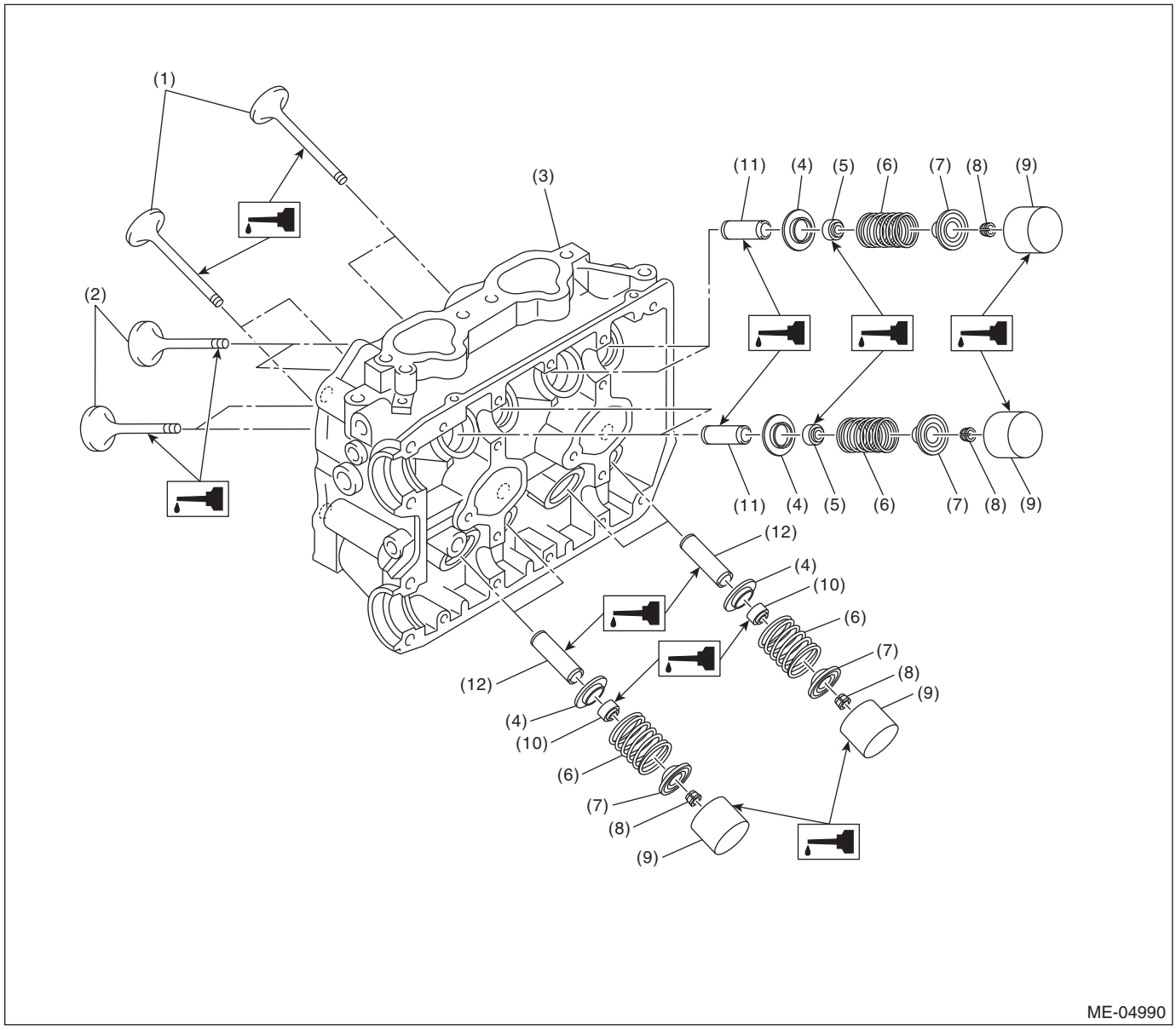
C: DISASSEMBLY

1) Remove the valve lifter.
2) Place the cylinder head on ST1.
ST1 498267600 CYLINDER HEAD TABLE
3) Using ST2, compress the valve spring and remove the valve spring retainer key. Remove each valve and valve spring.
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.
- For removal and installation procedures of the valve guide, intake valve oil seal and exhaust valve oil seal, refer to “INSPECTION”. <Ref. to ME(H4DOTC)-70, VALVE GUIDE, INSPECTION, Cylinder Head.> <Ref. to ME(H4DOTC)-72, INTAKE AND EXHAUST VALVE OIL SEAL, INSPECTION, Cylinder Head.>



D: ASSEMBLY



(1) Exhaust valve
(2) Intake valve
(3) Cylinder head
(4) Valve spring seat
(5) Intake valve oil seal
(6) Valve spring
(7) Retainer
(8) Retainer key
(9) Valve lifter
(10) Exhaust valve oil seal
(11) Intake valve guide
(12) Exhaust valve guide

1) Install the valve spring and valve.
(1) Coat the valve 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.

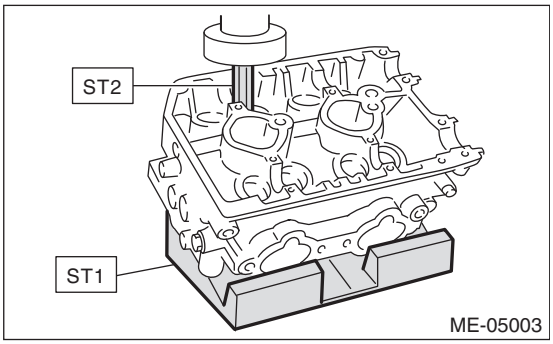
ST1 498267600 CYLINDER HEAD TABLE

(3) Install the valve spring and retainer.

NOTE:
Be sure to install the valve spring with its close-coiled end facing the cylinder head side.

(4) Set the ST2 on valve spring.

ST2 499718000 VALVE SPRING REMOVER



(5) Compress the valve spring and fit the valve spring retainer key.
(6) After installing, tap the valve spring retainers lightly with a plastic hammer for better seating.

2) Apply oil to the surface of valve lifter.
3) Install the valve lifter.

E: INSPECTION

1. CYLINDER HEAD

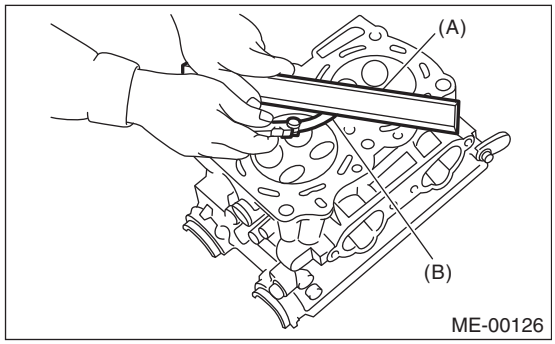
1) Check for cracks or damage. Use liquid penetrant tester on the important sections to check for fissures. Check that there are no marks of gas leaking or water leaking on gasket installing surface.
2) Measure the warping of the cylinder head surface that mates with cylinder block using a straight edge (A) and thickness gauge (B).
If the warping exceeds the limit, correct the surface by grinding it 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 warpage. When reinstalling, pay special attention to the torque so as to tighten evenly.

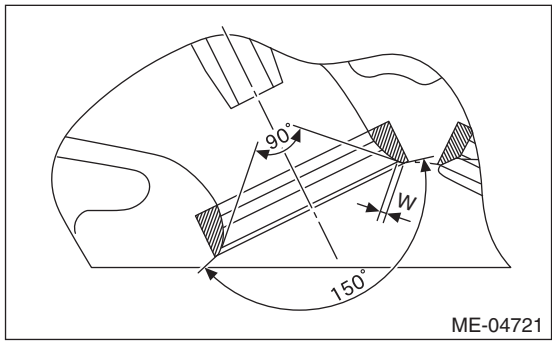


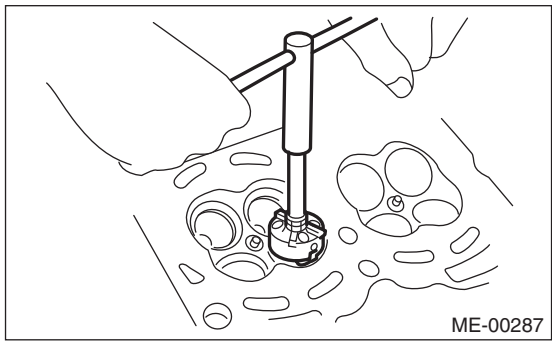
2. VALVE SEAT

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.

Contacting width W between valve and valve seat:

Standard
Intake
0.6 — 1.4 mm (0.024 — 0.055 in)
Exhaust
1.2 — 1.8 mm (0.047 — 0.071 in)





3. VALVE GUIDE

1) Check the clearance between valve guide and valve 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)

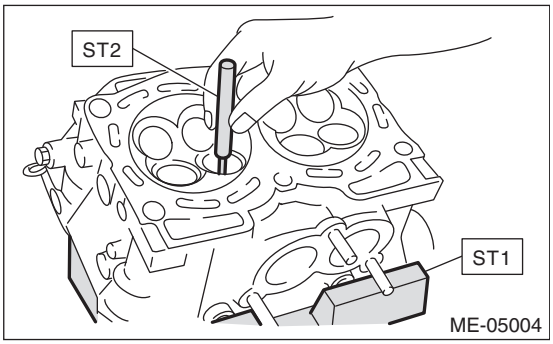
2) If the clearance between valve guide and valve stem exceeds the standard, replace the valve guide or valve itself, whichever shows the greater amount of wear or damage. See the following procedure for valve guide replacement.

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)

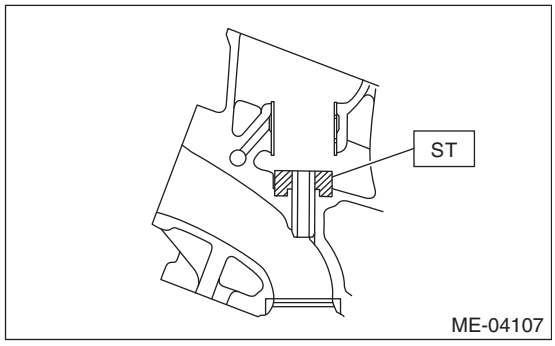
(1) Place the cylinder head on ST1 with the combustion chamber upward so that valve guides fit the holes in ST1.
(2) Insert the ST2 into valve guide and press it down to remove the valve guide.

ST1 498267600 CYLINDER HEAD TABLE
ST2 499767200 VALVE GUIDE REMOVER



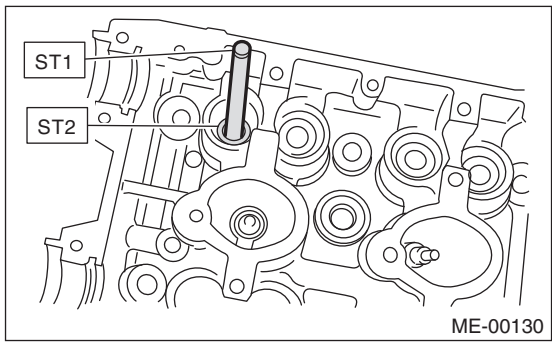
(3) Turn the cylinder head upside down and place the ST as shown in the figure.

ST 18251AA020 VALVE GUIDE ADJUSTER



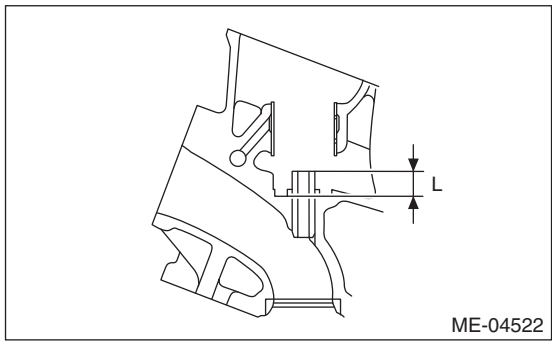
(4) Before installing a new valve guide, make sure that neither scratches nor damages exist on the inner surface of valve guide holes in cylinder head.
(5) Put a new valve guide, coated with sufficient oil, in the cylinder head, and insert the ST1 into valve guide. Press in until the valve guide upper 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 amount "L".

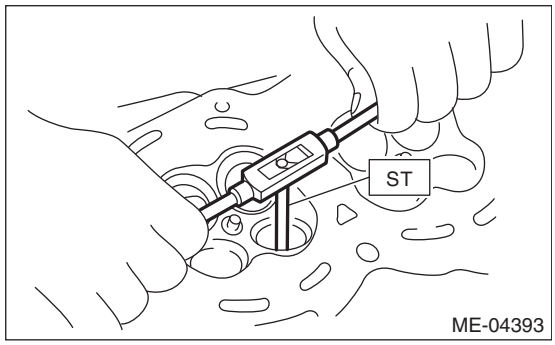
Valve guide protrusion amount L:
15.8 — 16.2 mm (0.622 — 0.638 in)



(7) Ream the inside of valve guide using ST. Put the ST in valve guide, and rotate the ST slowly clockwise while pushing it lightly. Bring the ST back while rotating it clockwise.

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.

ST 499767400 VALVE GUIDE REAMER



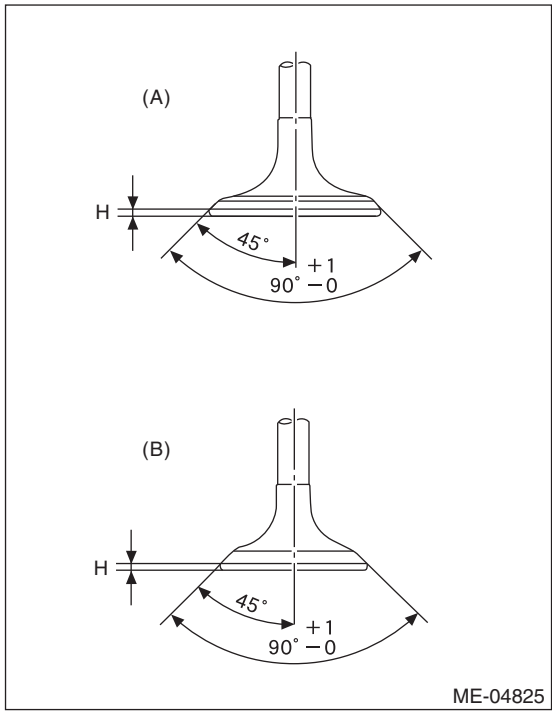
(8) After reaming, clean the valve guide to remove chips.
(9) Recheck the contact condition between valve and valve seat after replacing the valve guide.

4. INTAKE AND EXHAUST VALVE

1) Inspect the flange of valve and valve stem, and replace the valve with a new part if damaged, worn, deformed, or if dimension “H” in the figure is outside of the specified limit.

Head edge thickness H:

Standard
Intake (A)
1.0 — 1.4 mm (0.039 — 0.055 in)
Exhaust (B)
1.3 — 1.7 mm (0.051 — 0.067 in)



2) Put a small amount of grinding compound on the valve seat surface, and lap the valve and valve seat surface. Replace with a new valve oil seal after lapping.

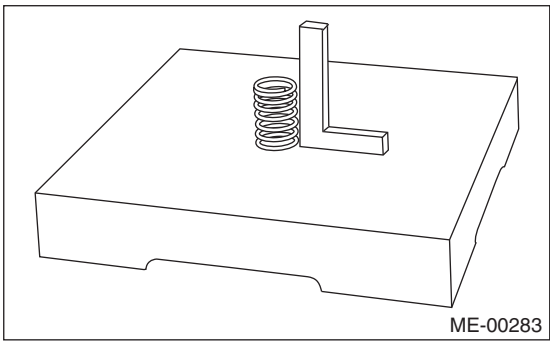
NOTE:
It is possible to differentiate between the intake valve and the exhaust valve by their overall length.

Valve overall length:
Intake
104.4 mm (4.110 in)
Exhaust
104.65 mm (4.1201 in)

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 valve spring on a surface plate and measure its deflection at the top of valve spring using a right angle gauge.

Free length mm (in)		47.32 (1.863)
Tension/spring height N (kgf, lb)/mm (in)	Set	205 — 235 (20.9 — 24.0, 46.1 — 52.8)/36.0 (1.417)
	Lift	426 — 490 (43.4 — 50.0, 95.8 — 110)/26.50 (1.041)
Squareness		2.5°, 2.1 mm (0.083 in) or less


ME-00283

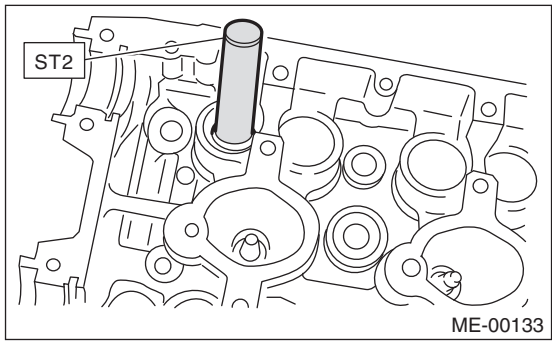
6. INTAKE AND EXHAUST VALVE OIL SEAL

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 valve and valve seat.
- When replacing the valve guide.

2) Place the cylinder head on ST1, and use ST2 to 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 to strike in.
- The intake valve oil seals and exhaust valve oil seals are distinguished by their colors.

Color of rubber part:
Intake [Gray]
Exhaust [Green]

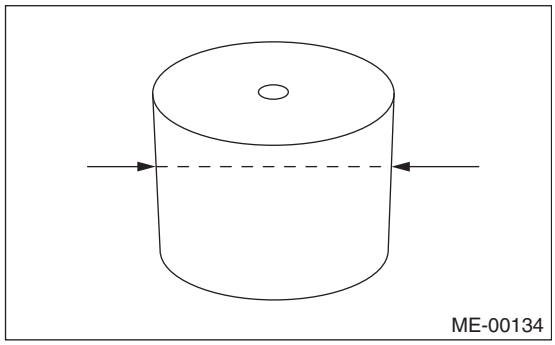


ME-00133

7. VALVE LIFTER

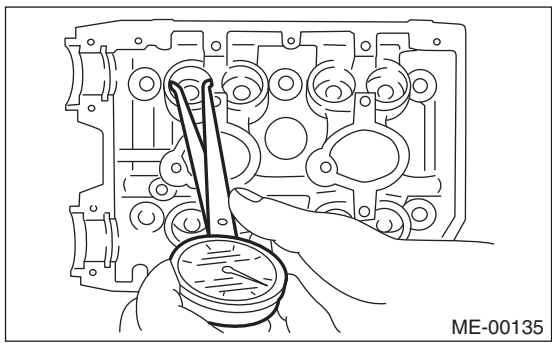
1) Check the valve lifter visually.
2) Measure the outer diameter of valve lifter.

Outer diameter of valve lifter:
34.959 — 34.975 mm (1.3763 — 1.3770 in)


ME-00134

3) Measure the inner diameter of valve lifter mating surface on cylinder head.

Inner diameter of valve lifter mating surface:
34.994 — 35.016 mm (1.3777 — 1.3786 in)


ME-00135

4) Check the clearance between valve lifter and valve lifter mating surface. The clearance can be determined from the measured value of the valve lifter outer diameter and valve lifter mating surface inner diameter. If it is not within the standard or there is uneven wear in the inner surface, replace the cylinder head.

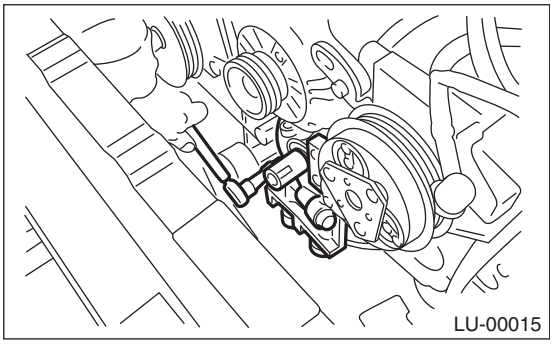
Clearance between valve lifter and valve lifter mating surface:
Standard
0.019 — 0.057 mm (0.0007 — 0.0022 in)

20.Cylinder Block

A: REMOVAL

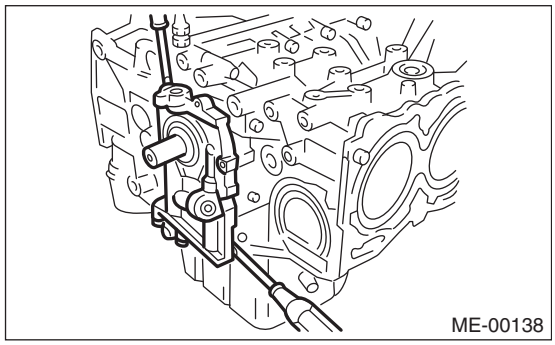
NOTE:
Before conducting this procedure, drain the engine oil completely.
1) Remove the engine from the vehicle. <Ref. to ME(H4DOTC)-29, REMOVAL, Engine Assembly.>
2) Remove the rear side belt. <Ref. to ME(H4DOTC)-38, REAR SIDE BELT, REMOVAL, V-belt.>
3) Remove the intake manifold. <Ref. to FU(H4DOTC)-18, REMOVAL, Intake Manifold.>
4) Remove the crank pulley. <Ref. to ME(H4DOTC)-46, REMOVAL, Crank Pulley.>
5) Remove the timing belt cover. <Ref. to ME(H4DOTC)-48, REMOVAL, Timing Belt Cover.>
6) Remove the timing belt. <Ref. to ME(H4DOTC)-49, REMOVAL, Timing Belt.>
7) Remove the cam sprocket. <Ref. to ME(H4DOTC)-56, REMOVAL, Cam Sprocket.>
8) Remove the crank sprocket. <Ref. to ME(H4DOTC)-57, REMOVAL, Crank Sprocket.>
9) Remove the generator and A/C compressor with their brackets.
10) Remove the camshaft. <Ref. to ME(H4DOTC)-58, REMOVAL, Camshaft.>
11) Remove the cylinder head. <Ref. to ME(H4DOTC)-65, REMOVAL, Cylinder Head.>
12) Remove the drive plate. <Ref. to 4AT-73, REMOVAL, Drive Plate.>
13) Remove the oil separator cover.
14) Remove the water by-pass pipe for heater.
15) Remove the oil filter. <Ref. to LU(H4DOTC)-26, REMOVAL, Engine Oil Filter.>
16) Remove the water pump. <Ref. to CO(H4DOTC)-15, REMOVAL, Water Pump.>
17) Remove the bolts which secure oil pump to cylinder block.

NOTE:
When disassembling and checking the oil pump, loosen the relief valve plug before removing the oil pump.


LU-00015

18) Remove the oil pump from cylinder block using a flat tip screwdriver.

CAUTION:
Be careful not to scratch the mating surface of the cylinder block and oil pump.

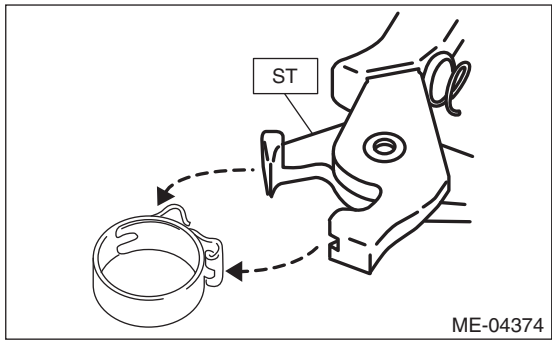

ME-00138

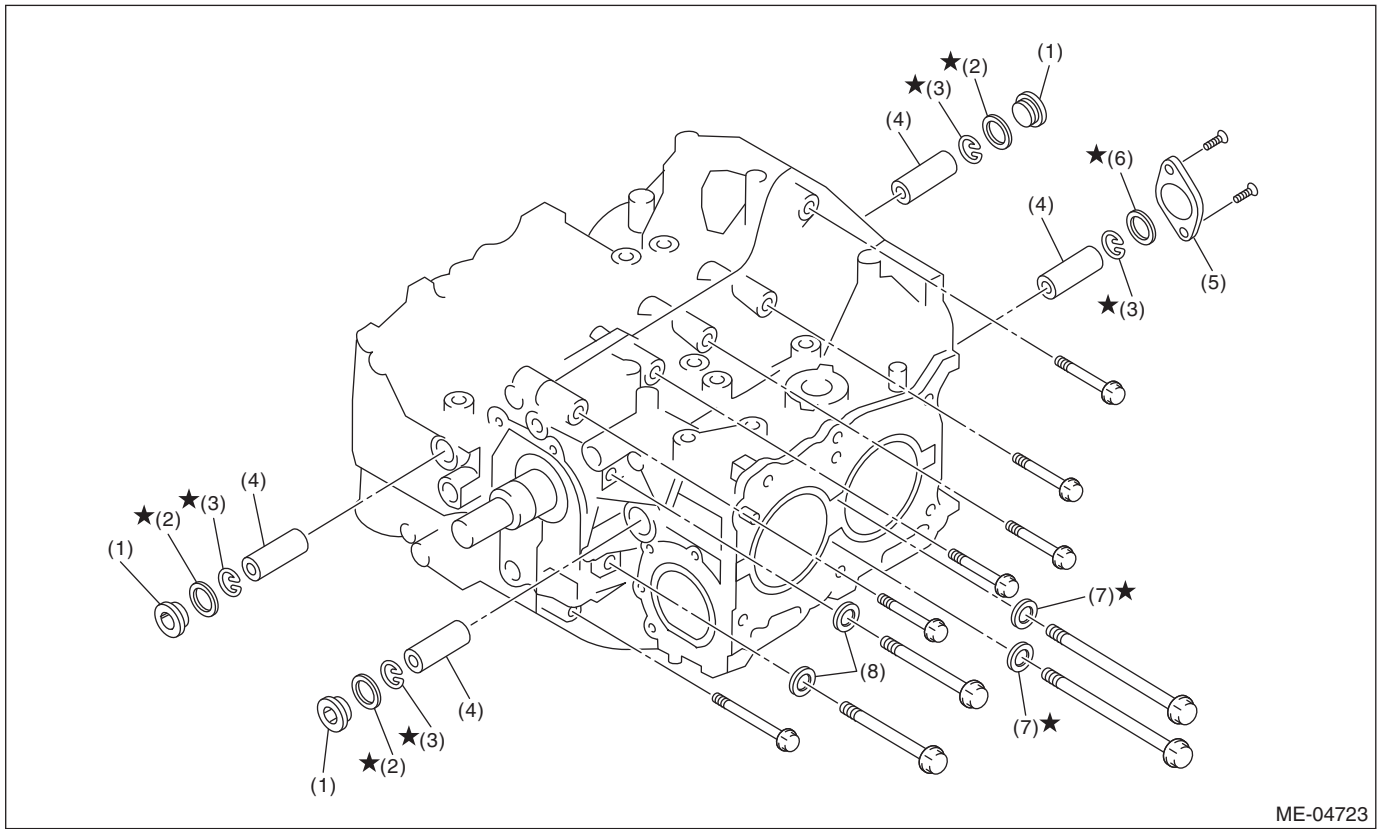
19) Remove the front oil seal from the oil pump.
20) Remove the oil pan.
(1) Set the part so that the cylinder block LH is on the upper side.
(2) Remove the bolts which secure oil pan to cylinder block.
(3) Insert an oil pan cutter blade between cylinder block-to-oil pan clearance and remove the oil pan.

CAUTION:
Do not use a screwdriver or similar tools in place of oil pan cutter.
21) Remove the oil strainer.
22) Remove the baffle plate.

23) Remove the water tank pipe assembly from the cylinder block RH.

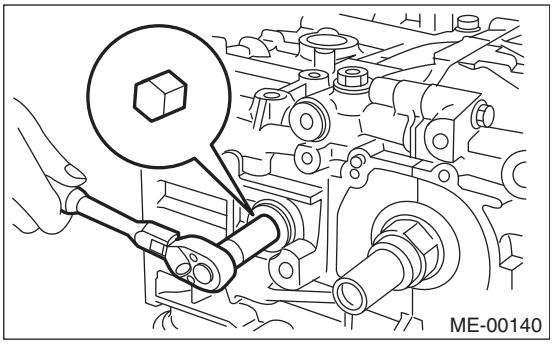
NOTE:
Pinch the clamp of the water tank pipe assembly by fitting the cut out in the ST with the protrusion on the clamp as shown in the figure, and unlock the clamp.
ST 18353AA000 CLAMP PLIERS



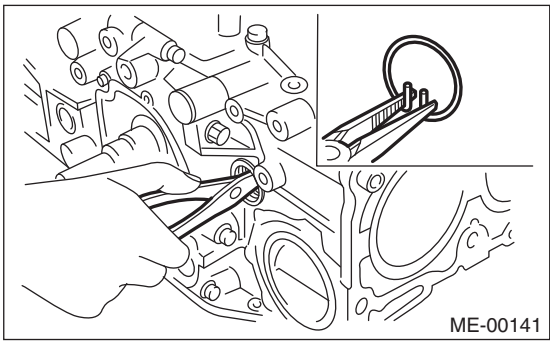


(1) Service hole plug
(2) Gasket
(3) Snap ring
(4) Piston pin
(5) Service hole cover
(6) O-ring
(7) Seal washer
(8) Washer

24) Remove the service hole plugs using a hexagon wrench [14 mm].



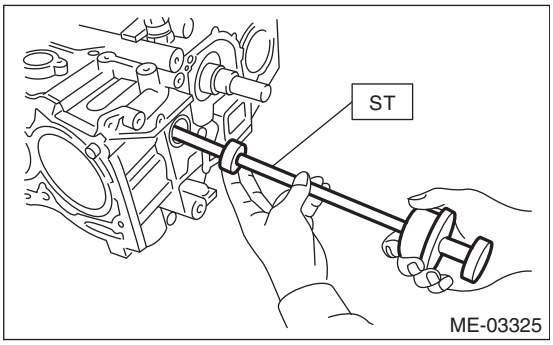
25) Remove the service hole cover.
26) Rotate the crankshaft to bring #1 and #2 pistons to bottom dead center position, then remove the piston snap ring through service hole of #1 and #2 cylinders.



27) Draw out the piston pin from #1 and #2 pistons using ST.

ST	499097700	PISTON PIN REMOVER ASSY

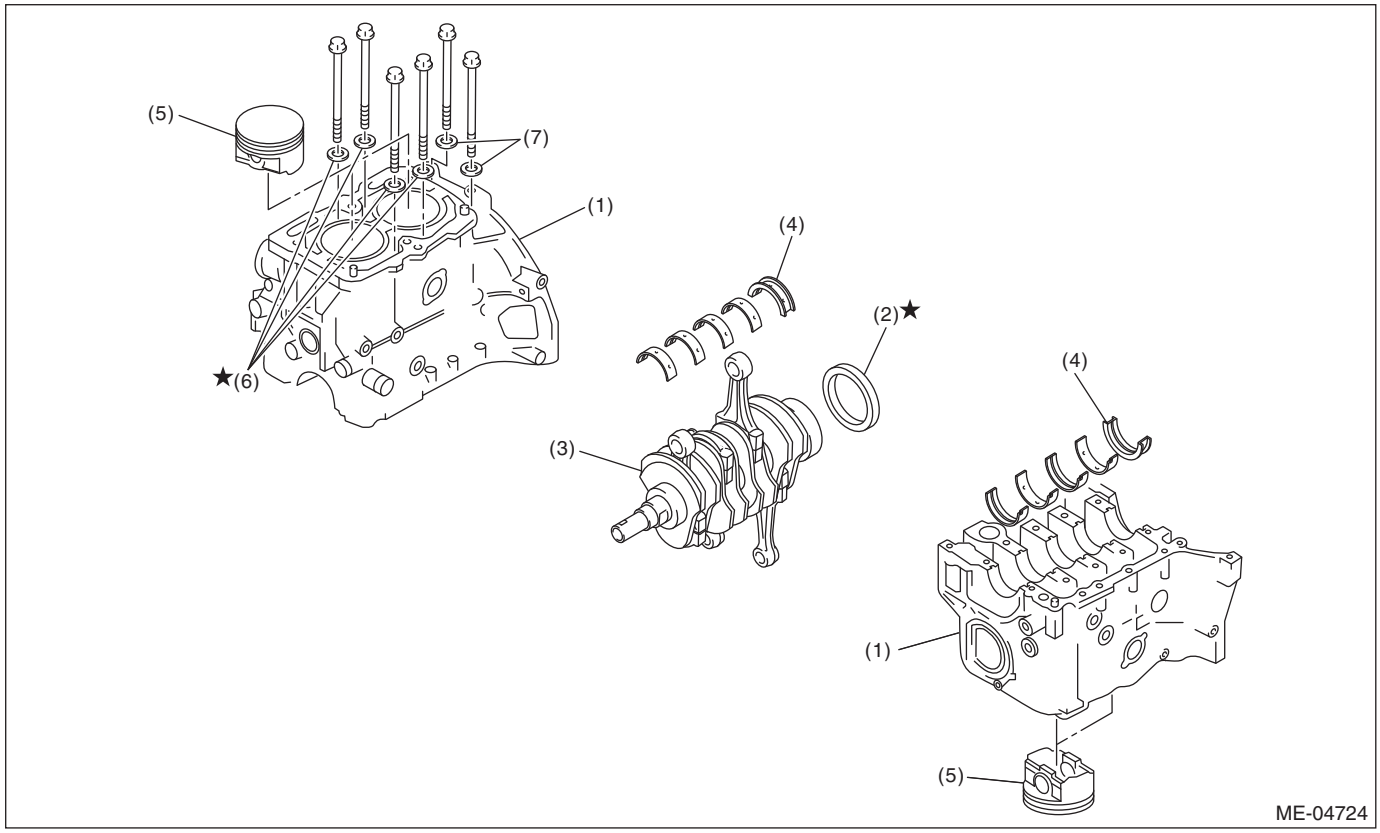
NOTE:
Be careful not to confuse the original combination of piston, piston pin and cylinder.



28) Similarly draw out the piston pins from #3 and #4 pistons.
29) Remove the cylinder block connecting bolt on the RH side.
30) Loosen the cylinder block connecting bolt on the LH side by 2 to 3 turns.
31) Set the part so that the cylinder block LH is on the upper side, and remove the cylinder block connecting bolt.

32) 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.



(1) Cylinder block
(2) Rear oil seal
(3) Crankshaft
(4) Crankshaft bearing
(5) Piston
(6) Seal washer
(7) Washer

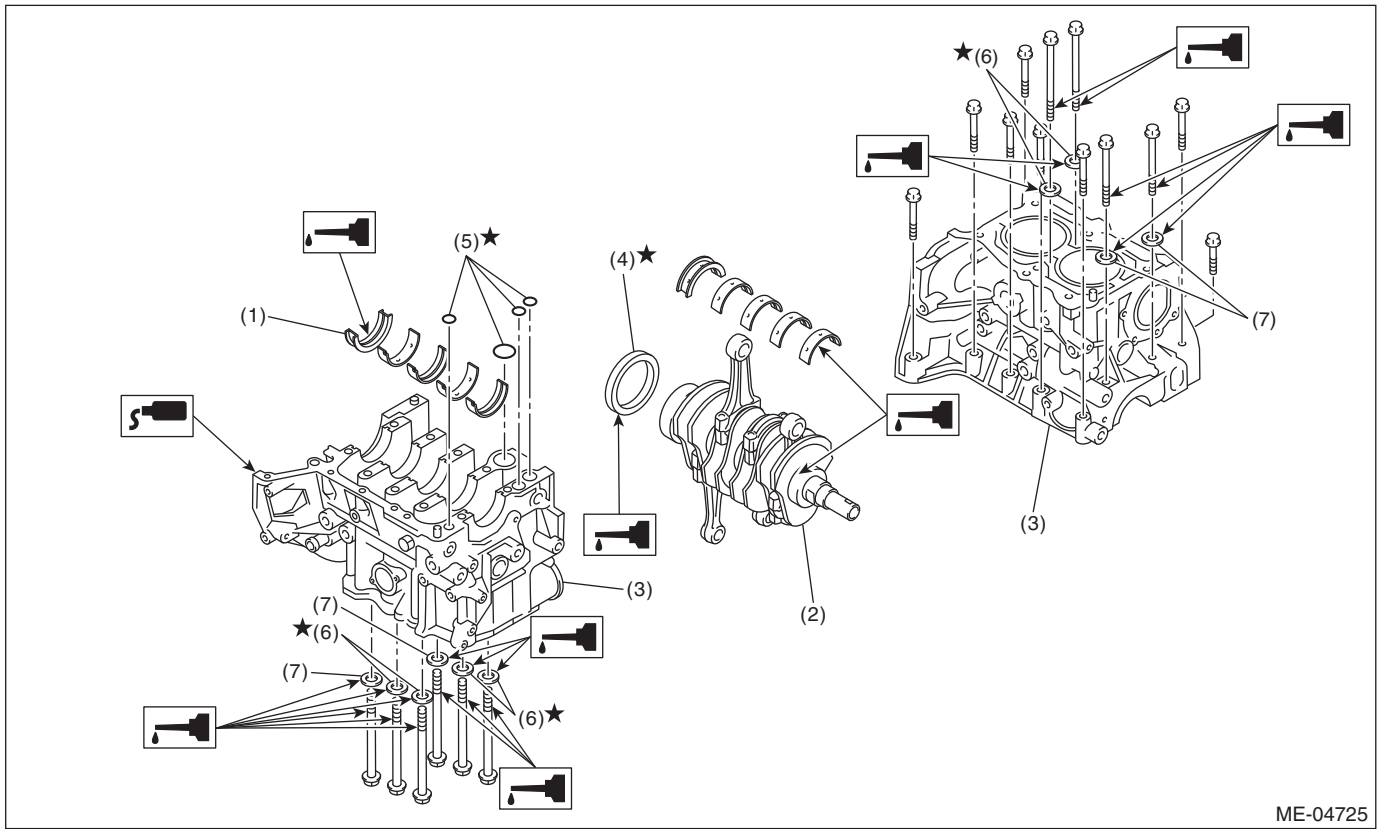
33) Remove the rear oil seal.
34) Remove the crankshaft together with connecting rod.
35) Remove the crankshaft bearings from cylinder block using a hammer handle.

NOTE:
• Press the crankshaft bearing at the end opposite to locking lip to remove.
• Be careful not to confuse the crankshaft bearing combination.

36) Remove each piston from the cylinder block using a wooden bar or hammer handle.

NOTE:
Be careful not to confuse the original combination of piston and cylinder.

B: INSTALLATION



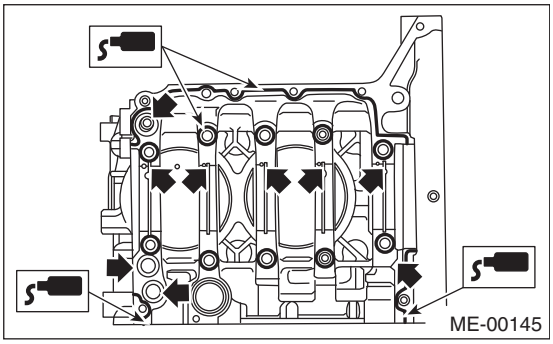
(1) Crankshaft bearing
(2) Crankshaft
(3) Cylinder block
(4) Rear oil seal
(5) O-ring
(6) Seal washer
(7) Washer

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 O-ring on cylinder block RH.

NOTE:
Use new O-rings.
3) Apply liquid gasket to the mating surfaces of cylinder block RH, and position cylinder block LH.

NOTE:
- Install within 5 min. after applying liquid gasket.
- Do not allow liquid gasket to jut into O-ring grooves, oil passages, bearing grooves, etc.

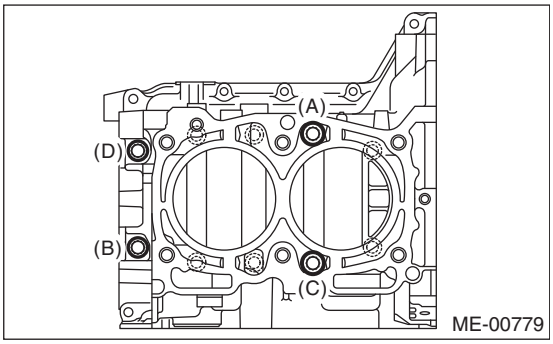
Liquid gasket:
THREE BOND 1217G (Part No. K0877Y0100) or equivalent



4) Apply a coat of engine oil to the washer and bolt thread.

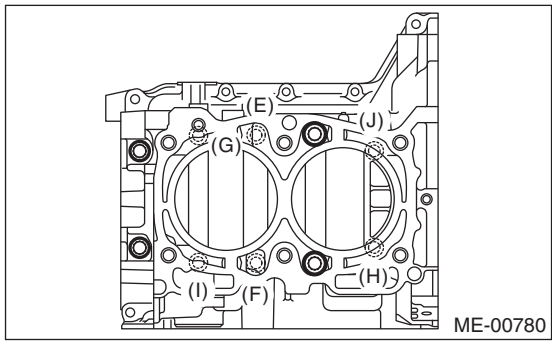
NOTE:
Use a new seal washer.
5) Tighten the 10 mm cylinder block connecting bolts on the LH side (A — D) in alphabetical order.

Tightening torque:
10 N·m (1.0 kgf-m, 7.4 ft-lb)



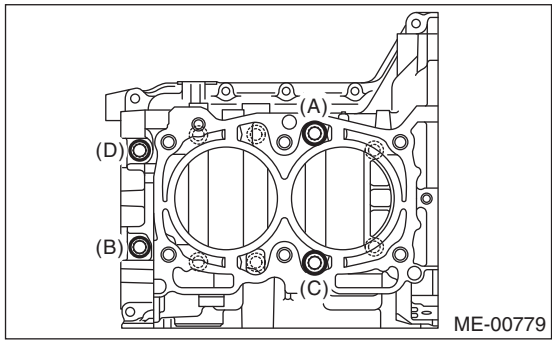
6) Tighten the 10 mm cylinder block connecting bolts on the RH side (E — J) in alphabetical order.

Tightening torque:
10 N·m (1.0 kgf-m, 7.4 ft-lb)



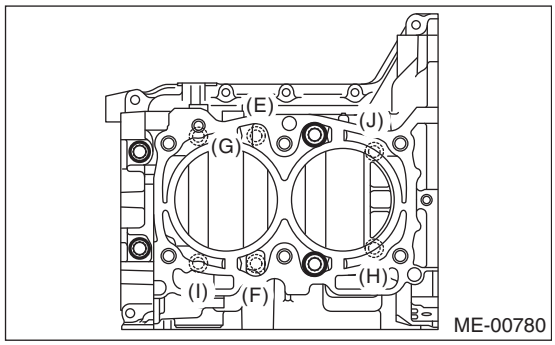
7) Tighten the LH side cylinder block connecting bolts (A — D) further in alphabetical order.

Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)



8) Tighten the RH side cylinder block connecting bolts (E — J) further in alphabetical order.

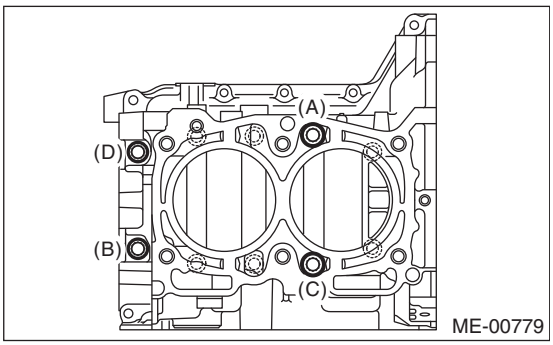
Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)



9) Tighten the LH side cylinder block connecting bolts (A — D) further in alphabetical order.
- (A), (C): Angle tightening

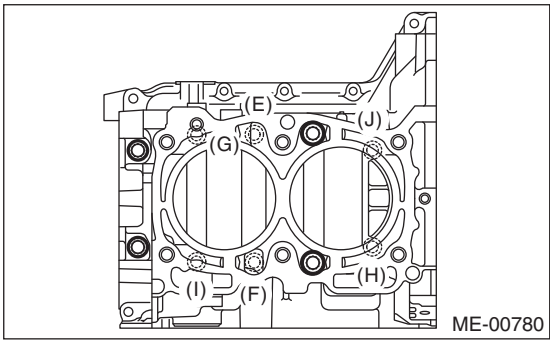
Tightening angle:
90°
- (B), (D): Torque tightening

Tightening torque:
40 N·m (4.1 kgf-m, 29.5 ft-lb)



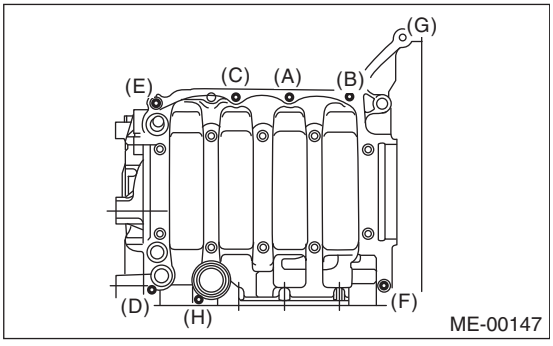
10) Tighten the RH side cylinder block connecting bolts (E — J) further in alphabetical order.

Tightening angle:
90°



11) Tighten the 8 mm and 6 mm cylinder block connecting bolts on the LH side (A — H) in alphabetical order.

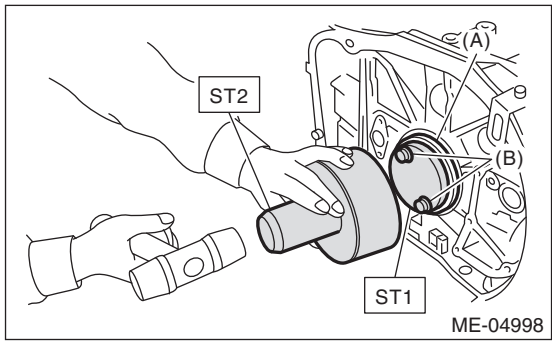
Tightening torque:
(A) — (G): 25 N·m (2.5 kgf-m, 18.4 ft-lb)
(H): 6.4 N·m (0.7 kgf-m, 4.7 ft-lb)



12) Apply a coat of engine oil to the oil seal inner periphery and outer periphery, and install the rear oil seal using ST1 and ST2.

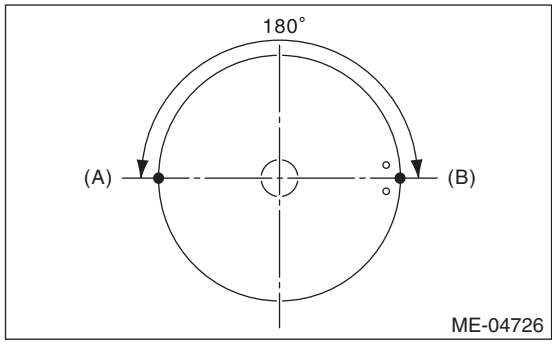
NOTE:
Use a new rear oil seal.

ST1	499597100	CRANKSHAFT OIL SEAL GUIDE
ST2	499587200	CRANKSHAFT OIL SEAL INSTALLER

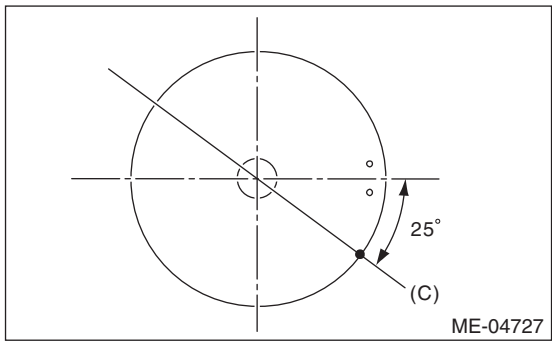


(A) Rear oil seal
(B) Flywheel attachment bolt

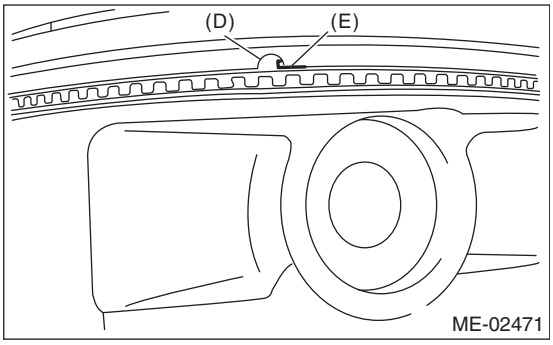
13) Position the top ring gap at (A) or (B) in the figure.
14) Position the second ring gap at 180° on the reverse side the top ring gap.



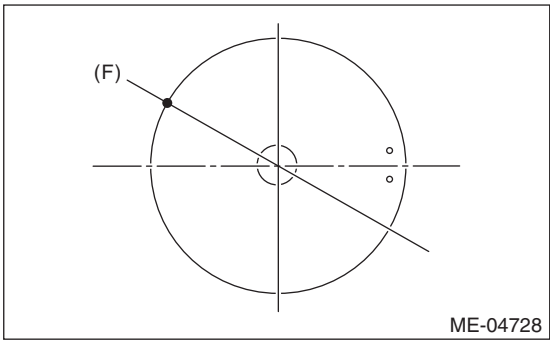
15) Position the upper rail gap at (C) in the figure.



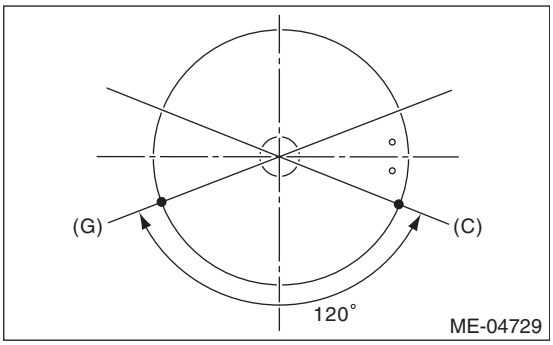
16) Align the upper rail spin stopper (E) to the side hole (D) on the piston.



17) Position the expander gap at (F) in the figure on the 180° opposite direction of (C).



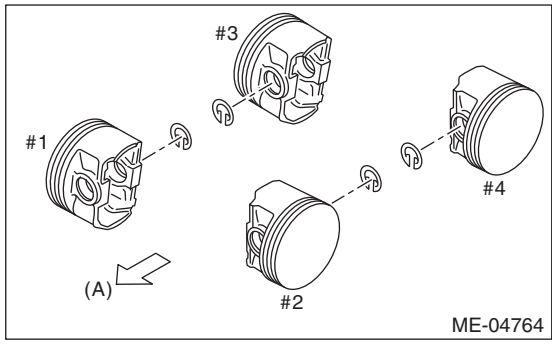
18) Set the lower rail gap at position (G), located 120° clockwise from (C) in the figure.



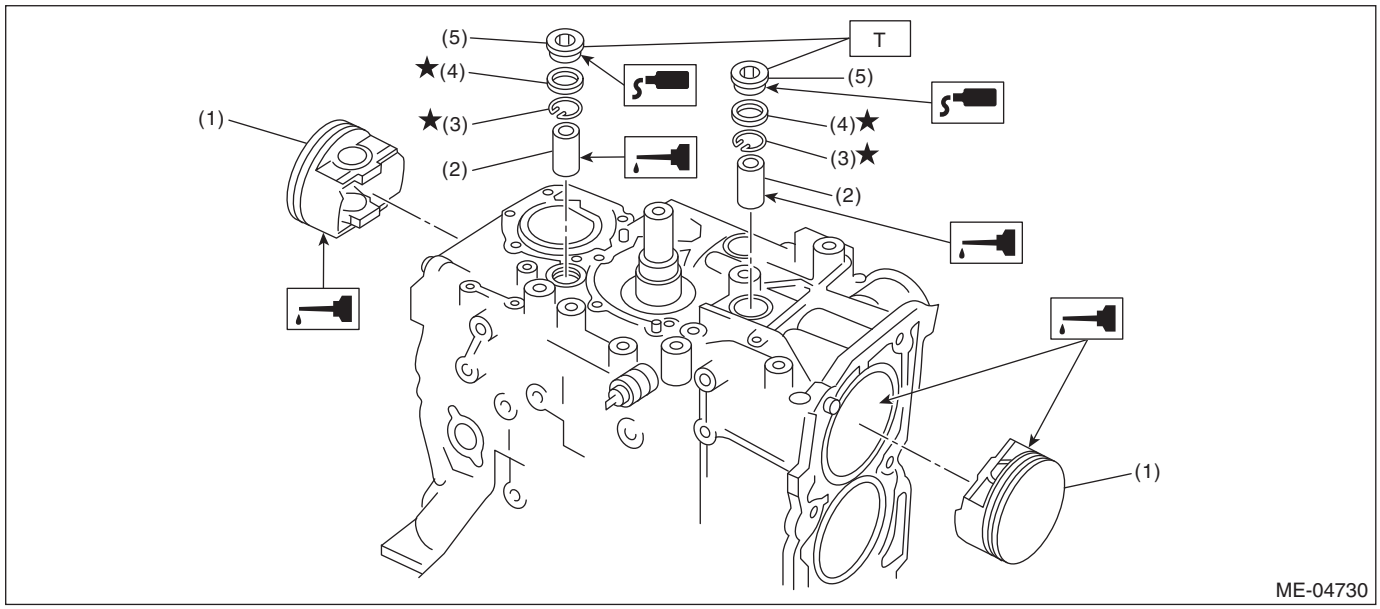
NOTE:
• Make sure ring gaps do not face the same direction.
• Make sure ring gaps are not within the piston skirt area.

19) Install the snap ring.
Before positioning the piston on the cylinder block, attach the snap ring in the service hole of the cylinder block, and the piston hole on the opposite side.

NOTE:
Use new snap rings.



(A) Front side



(1) Piston
(2) Piston pin
(3) Snap ring
(4) Gasket
(5) Service hole plug

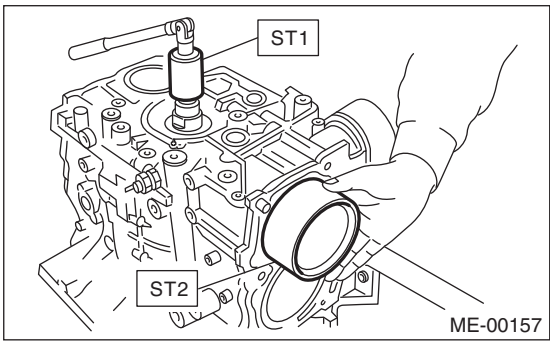
Tightening torque:N·m (kgf-m, ft-lb)
T: 70 (7.1, 51.6)

20) Install the piston.
(1) Set the parts so that the #1 and #2 cylinders are on the upper side.
(2) Using the ST1, turn the crankshaft so that #1 and #2 connecting rods are set at bottom dead center.

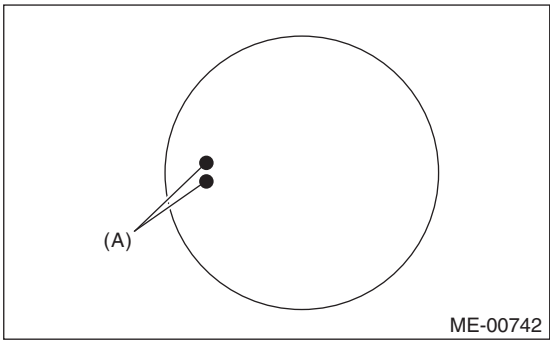
ST1 499987500 CRANKSHAFT SOCKET

(3) Apply a coat of engine oil to the pistons and cylinders and insert pistons in their cylinders using ST2.

ST2 498747300 PISTON GUIDE



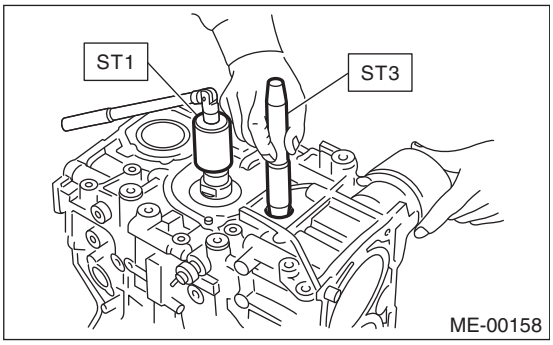
NOTE:
Face the piston front mark towards the front of the engine.



(A) Front mark

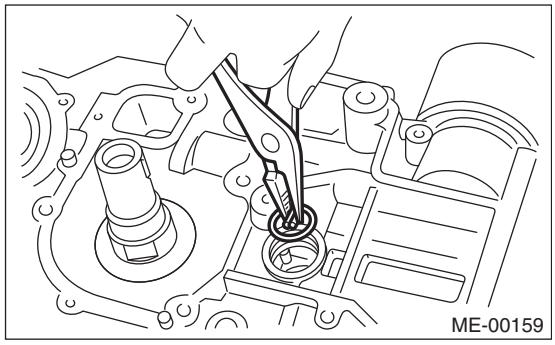
21) Install the piston pin.
(1) Apply a coat of engine oil to ST3.
(2) Insert ST3 into the service hole to align the piston pin hole and the connecting rod small end.

ST3 499017100 PISTON PIN GUIDE



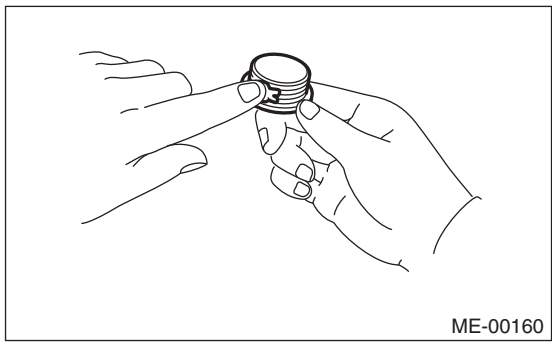
(3) Apply a thin coat of engine oil to piston pin, and insert the piston pin into piston and connecting rod through service hole.
(4) Install the snap ring.

NOTE:
Use new snap rings.



(5) Apply liquid gasket to the threaded portion of the service hole plug.

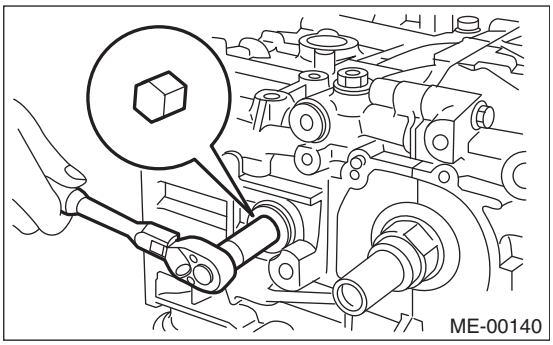
Liquid gasket:
THREE BOND 1105 (Part No. 004403010) or equivalent

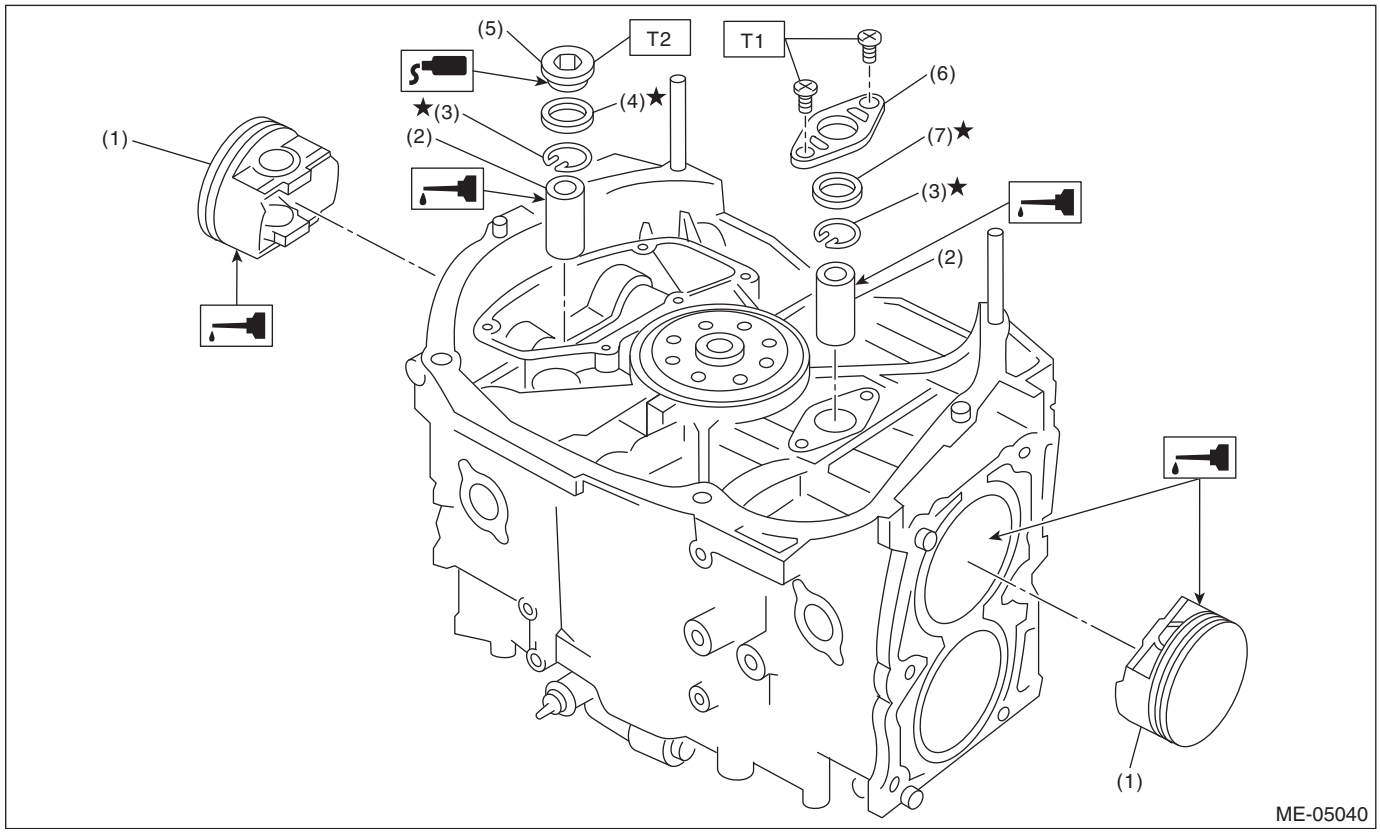


(6) Install the service hole plug and gasket.

NOTE:
Use a new gasket.

Tightening torque:
70 N·m (7.1 kgf-m, 51.6 ft-lb)





(1) Piston
(2) Piston pin
(3) Snap ring
(4) Gasket
(5) Service hole plug
(6) Service hole cover
(7) O-ring

Tightening torque:N·m (kgf-m, ft-lb)	
T1:	***6.4 (0.7, 4.7)***
T2:	***70 (7.1, 51.6)***

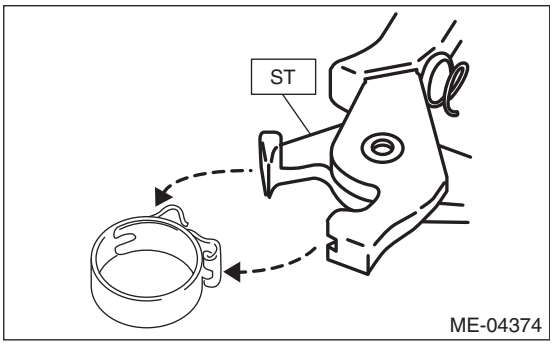
(7) Set the parts so that the #3 and #4 cylinders are on the upper side. Following the same procedures as used for #1 and #2 cylinders, install the pistons and piston pins.
(8) Install the service hole cover.

NOTE:
Use new O-rings.

Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)

22) Install the water tank pipe assembly onto the cylinder block RH.

NOTE:
Use a new clamp for the water tank pipe assembly clamp, fit the cut out in the ST with the protrusion on the clamp as shown in the figure, and lock the clamp.
ST 18353AA000 CLAMP PLIERS



23) Install the baffle plate.

Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)

24) Install the oil strainer.

NOTE:
Use new O-rings.

Tightening torque:
10 N·m (1.0 kgf-m, 7.2 ft-lb)

25) Tighten the oil strainer stay together with the baffle plate.

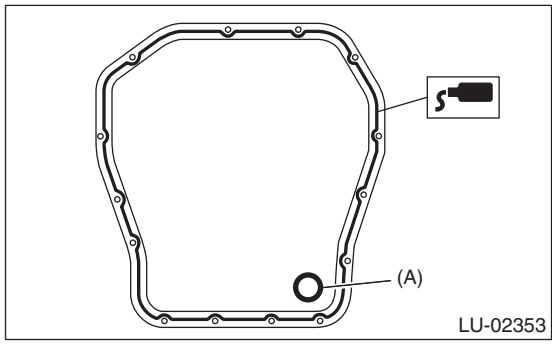
Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)

26) Apply liquid gasket to the mating surfaces of oil pan, and install the oil pan.

NOTE:
Install within 5 min. after applying liquid gasket.

Liquid gasket:
THREE BOND 1217G (Part No. K0877Y0100) or equivalent

Tightening torque:
5 N·m (0.5 kgf-m, 3.7 ft-lb)



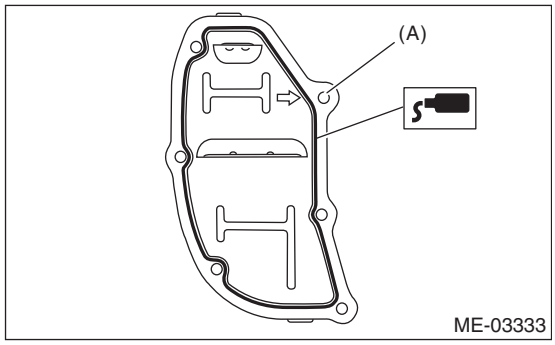
(A) Gasket

27) Apply liquid gasket to the mating surface of oil separator cover 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.
- Use new oil separator cover.

Liquid gasket:
Mating surface
THREE BOND 1217G (Part No. K0877Y0100) or equivalent
Bolt thread (A) (when reusing the bolt)
THREE BOND 1324 (Part No. 004403042) or equivalent

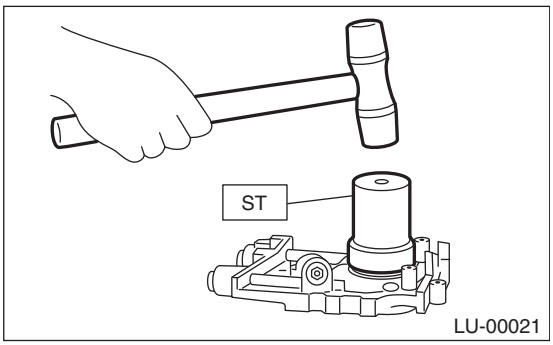
Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)



28) Install the drive plate. <Ref. to 4AT-73, INSTALLATION, Drive Plate.>

29) Install the oil pump.
(1) Using the ST, install the front oil seal.
ST 499587100 OIL SEAL INSTALLER

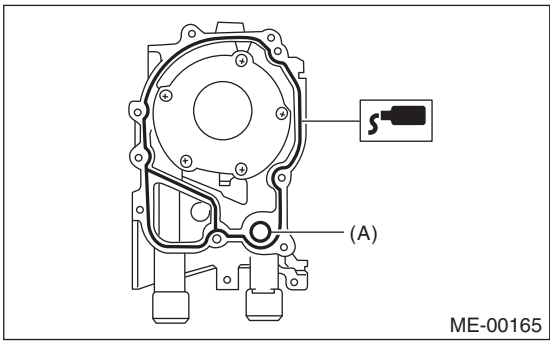
NOTE:
Use a new front oil seal.



(2) Apply liquid gasket to the mating surfaces of oil pump.

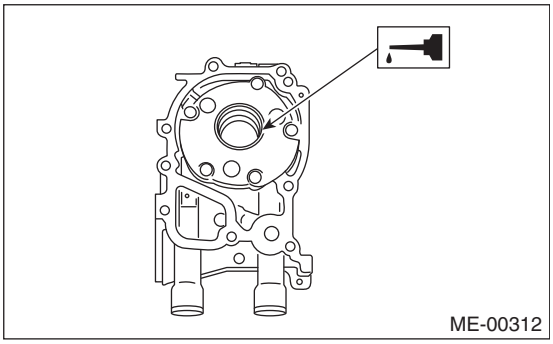
NOTE:
Install within 5 min. after applying liquid gasket.

Liquid gasket:
THREE BOND 1217G (Part No. K0877Y0100) or equivalent



(A) O-ring

(3) Apply a thin coat of engine oil to the inside of front oil seal.



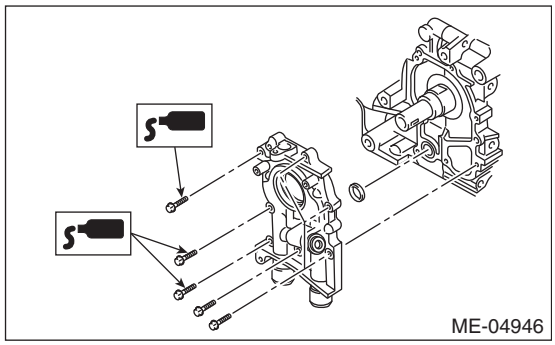
(4) Install the oil pump to cylinder block.

CAUTION:
• Be careful not to damage the front oil seal during installation.
• Make sure the front oil seal lip is not folded.

NOTE:
• Align the flat surface of oil pump's inner rotor with that of crankshaft before installation.
• Use new O-rings.
• Do not forget to assemble O-rings.
(5) Apply liquid gasket to the three bolts thread shown in figure. (when reusing bolts)

Liquid gasket:
THREE BOND 1324 (Part No. 004403042) or equivalent

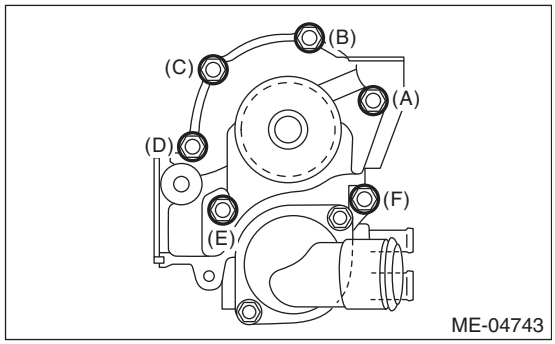
Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)



30) Install the water pump and gasket.

NOTE:
• When installing the water pump, tighten bolts in two stages in alphabetical order as shown in the figure.
• Use a new gasket.

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)



31) Install the water by-pass pipe for heater.

Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)

32) Install the oil filter. <Ref. to LU(H4DOTC)-26, INSTALLATION, Engine Oil Filter.>

33) Install the cylinder head. <Ref. to ME(H4DOTC)-65, INSTALLATION, Cylinder Head.>

34) Install the camshaft. <Ref. to ME(H4DOTC)-60, INSTALLATION, Camshaft.>
35) Install the generator and A/C compressor with their brackets.

Tightening torque:
36 N·m (3.7 kgf-m, 26.6 ft-lb)

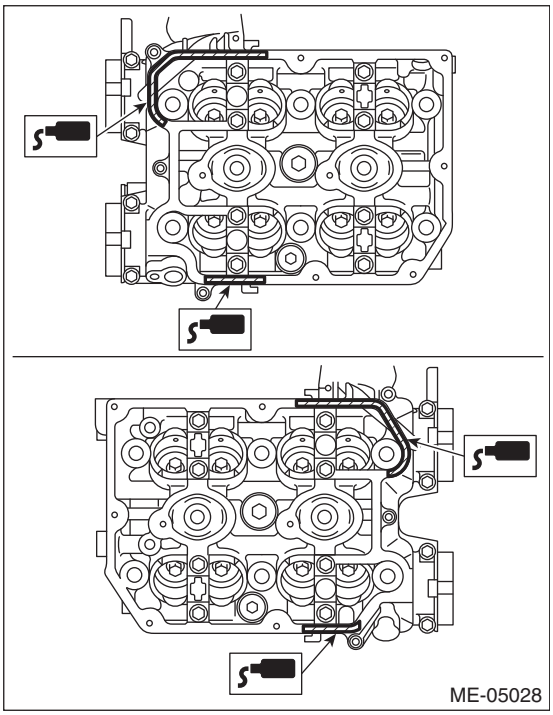
36) Install the crank sprocket. <Ref. to ME(H4DOTC)-57, INSTALLATION, Crank Sprocket.>
37) Install the cam sprocket. <Ref. to ME(H4DOTC)-56, INSTALLATION, Cam Sprocket.>
38) Install the timing belt. <Ref. to ME(H4DOTC)-50, INSTALLATION, Timing Belt.>
39) Adjust the valve clearance. <Ref. to ME(H4DOTC)-28, ADJUSTMENT, Valve Clearance.>
40) Install the rocker cover.
(1) Install the rocker cover gasket to the rocker cover. (outer section and ignition coil section)

NOTE:
Use a new rocker cover gasket.

(2) Apply liquid gasket to the specified point of the cylinder head.

NOTE:
Install within 5 min. after applying liquid gasket.

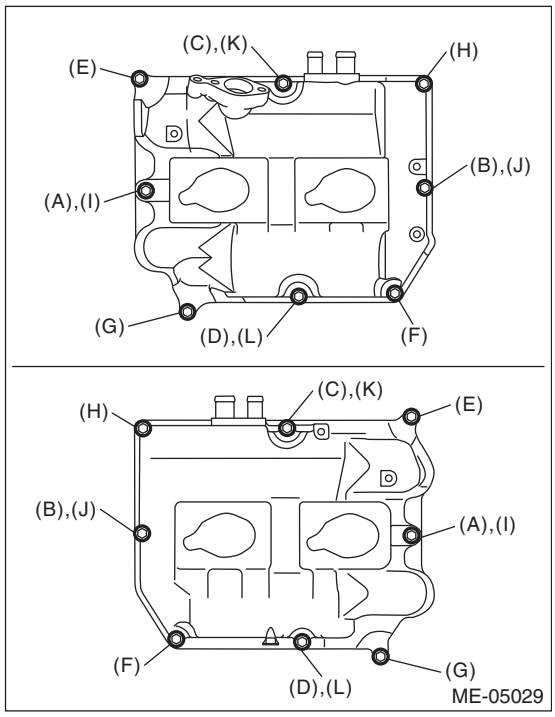
Liquid gasket:
THREE BOND 1217G (Part No. K0877Y0100) or equivalent



(3) Install the rocker cover onto cylinder heads. Ensure the gasket is properly positioned during installation.

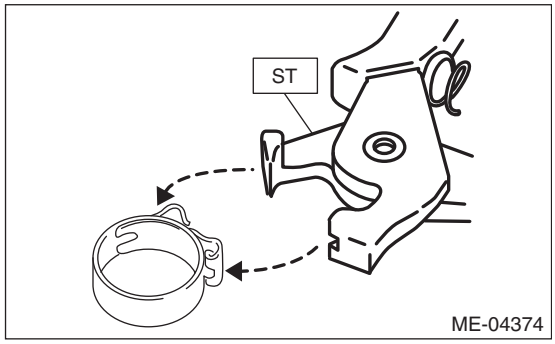
(4) Temporarily tighten the rocker cover bolts in alphabetical order shown in the figure, and then tighten to specified torque in alphabetical order.

Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)



41) Connect the PCV hose to the rocker cover.

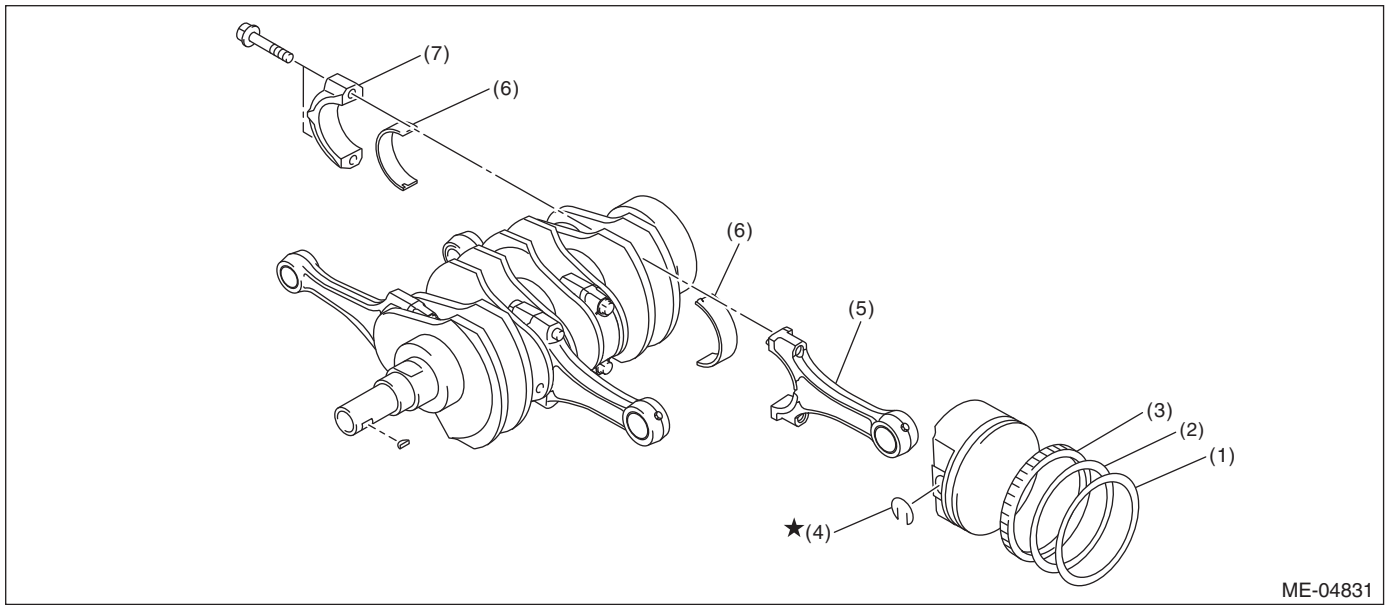
NOTE:
Use a new clamp for the PCV hose clamp, fit the cut out in the ST with the protrusion on the clamp as shown in the figure, and lock the clamp.
ST 18353AA000 CLAMP PLIERS



42) Install the timing belt cover. <Ref. to ME(H4DOTC)-48, INSTALLATION, Timing Belt Cover.>
43) Install the crank pulley. <Ref. to ME(H4DOTC)-46, INSTALLATION, Crank Pulley.>
44) Install the intake manifold. <Ref. to FU(H4DOTC)-23, INSTALLATION, Intake Manifold.>
45) Install the rear side belt. <Ref. to ME(H4DOTC)-39, REAR SIDE BELT, INSTALLATION, V-belt.>

46) Install the engine to the vehicle. <Ref. to ME(H4DOTC)-33, INSTALLATION, Engine Assembly.>

C: DISASSEMBLY



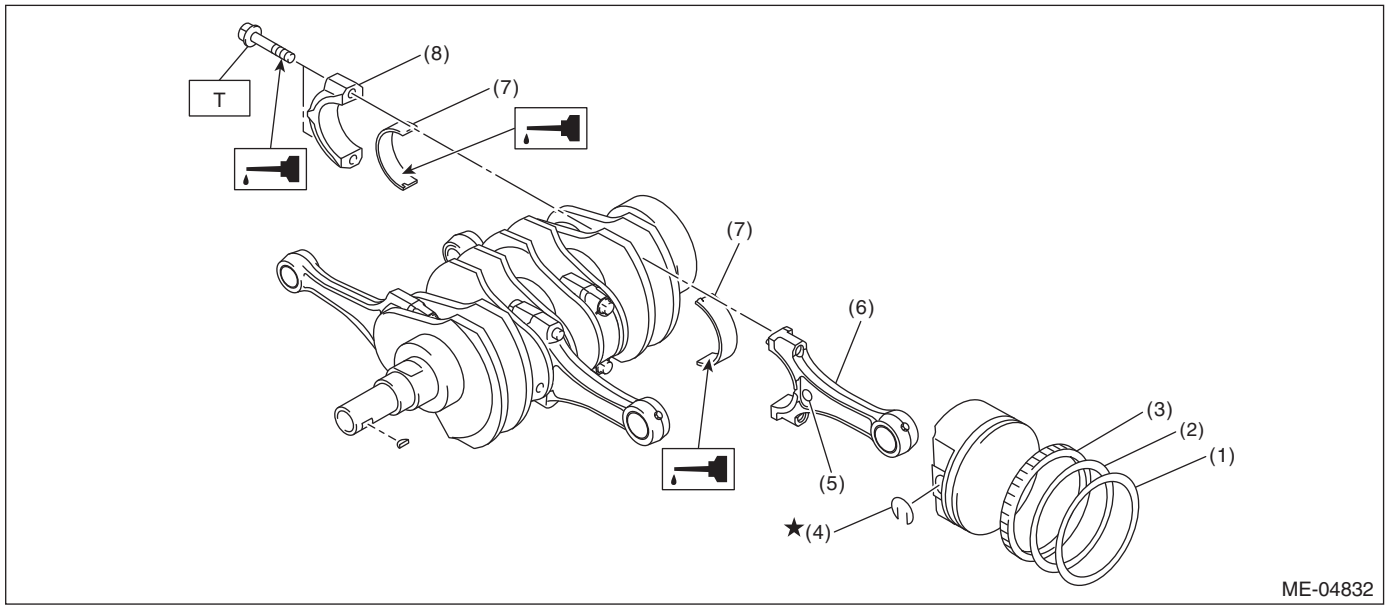
(1) Top ring
(2) Second ring
(3) Oil ring
(4) Snap ring
(5) Connecting rod
(6) Connecting rod bearing
(7) Connecting rod cap

1) Remove the connecting rod cap.
2) Remove the connecting rod bearing.

NOTE:
Keep the removed connecting rods, connecting rod caps and bearings in order so that they are kept in their original combinations/groups, and not mixed together.
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) Top ring
(2) Second ring
(3) Oil ring
(4) Snap ring
(5) Side mark
(6) Connecting rod
(7) Connecting rod bearing
(8) Connecting rod cap

Tightening torque:N·m (kgf-m, ft-lb)
T: 52 (5.3, 38.4)

1) Apply engine oil to the surface of the connecting rod bearings, and install the connecting rod bearings on connecting rods and connecting rod caps.
2) Position each connecting rod with the side with a side mark facing forward, and install it.
3) Attach the connecting rod cap and tighten it with connecting rod bolt. Make sure the arrow on connecting rod cap faces the 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 bolts, apply oil on the threads.

Tightening torque:
52 N·m (5.3 kgf-m, 38.4 ft-lb)

4) Install the oil ring upper rail, expander and lower rail by hand.
5) Install the second ring and top ring using piston ring expander.

NOTE:
Assemble so that the piston ring mark “R” faces the top side of the piston.

E: INSPECTION

1. CYLINDER BLOCK

1) Check for cracks or damage. Use liquid penetrant tester on the important sections to check for fissures. Check that there are no marks of gas leaking or water leaking on gasket installing surface.
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)

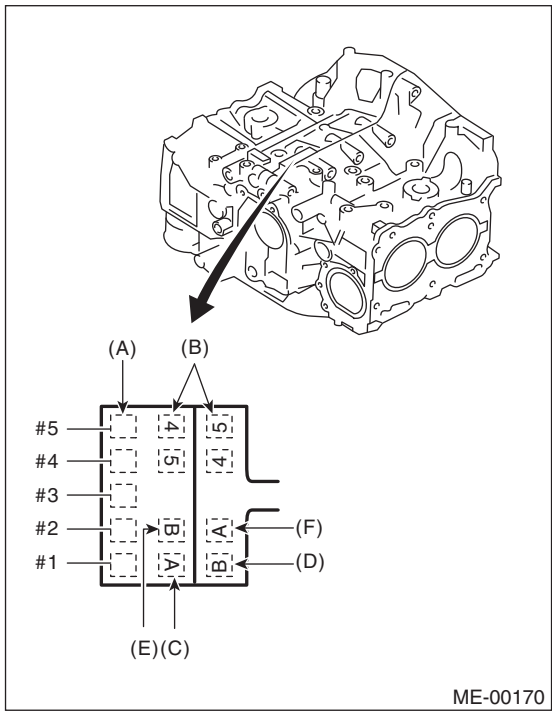
Standard height of cylinder block:
201.0 mm (7.91 in)

2. CYLINDER AND PISTON

1) The cylinder bore size is stamped on the front upper face of the cylinder block.

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)



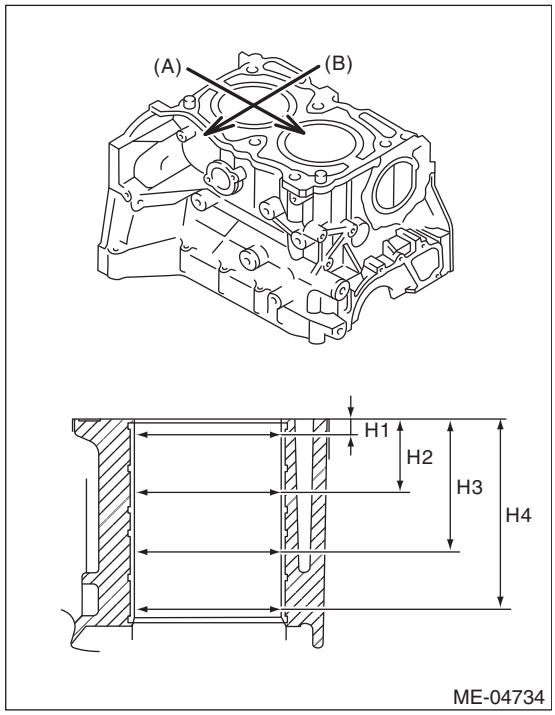
(A) Main journal size mark
(B) Cylinder block (RH) – (LH) combination mark
(C) #1 cylinder bore size mark
(D) #2 cylinder bore size mark
(E) #3 cylinder bore size mark
(F) #4 cylinder bore size mark

2) Measure 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).

Cylindricality:
Standard
0.015 mm (0.0006 in)

Out-of-roundness:
Standard
0.010 mm (0.0004 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, select a suitable sized piston by measuring the piston clearance.

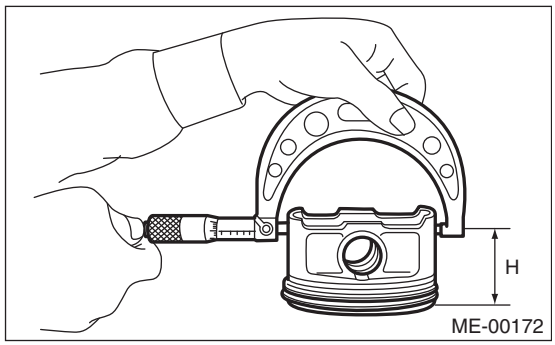
4) Measure outer diameter of each piston.
Measure the outer diameter of each piston at the height as shown in the figure. (Thrust direction)

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).

Clearance between cylinder and piston at 20°C (68°F):
Standard
–0.010 — 0.010 mm (–0.00039 — 0.00039 in)

6) Boring and honing
(1) If any of the measured value of cylindricality, out-of-roundness or cylinder-to-piston clearance is out of standard or if there is any damage on the cylinder wall, rebore it to replace with an oversize piston.

CAUTION:
When any of the cylinders needs reboring, all other cylinders must be bored at the same time, and replaced with oversize pistons.

(2) If the cylinder inner diameter exceeds the limit after boring and honing, replace the cylinder block.

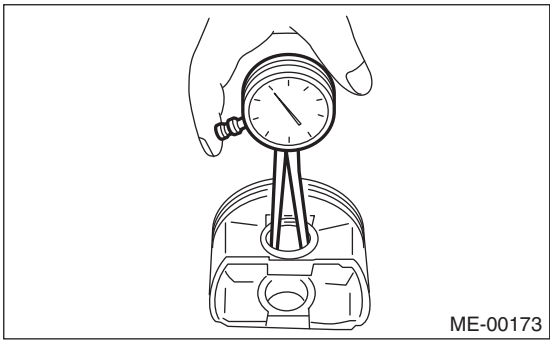
NOTE:
Immediately after reboring, the cylinder diameter may differ from its real diameter due to temperature rise. Thus, when measuring the cylinder diameter, wait until it has cooled to room temperature.

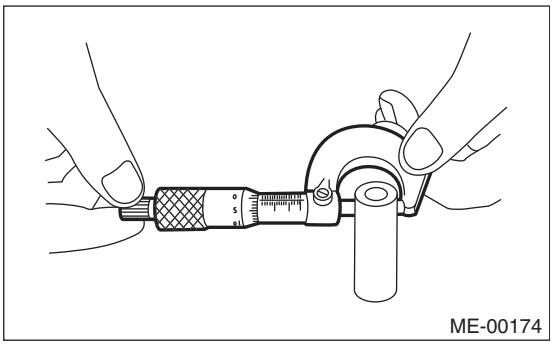
Cylinder inner diameter boring limit (diameter):
To 100.005 mm (3.9372 in)

3. PISTON AND PISTON PIN

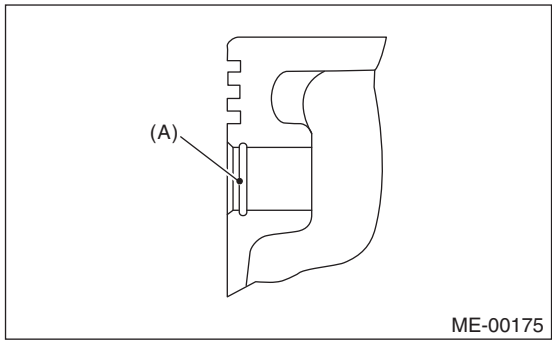
1) Check the piston and piston pin for damage, cracks or wear. Replace if faulty.
2) Check the piston ring groove for wear or damage. Replace if faulty.
3) Make sure that the piston pin can be inserted into the piston pin hole with a thumb at 20°C (68°F). Replace if faulty.

Clearance between piston pin hole and piston pin:
Standard
0.004 — 0.008 mm (0.0002 — 0.0003 in)


ME-00173


ME-00174

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.



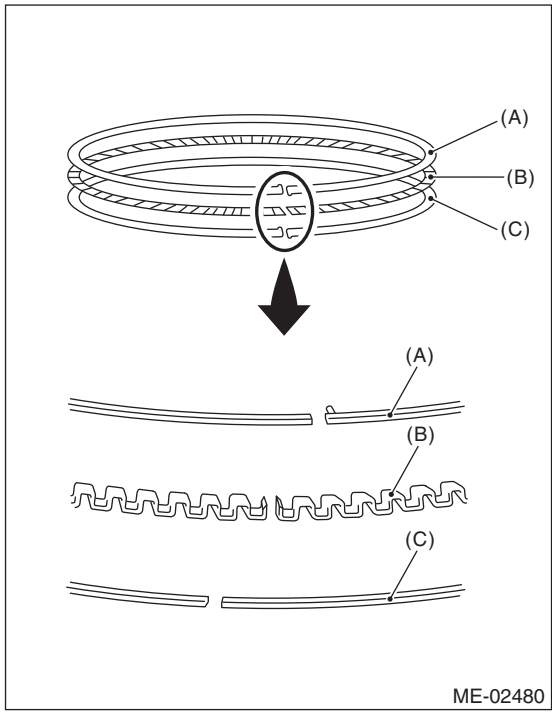
ME-00175

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:
• The top ring and second ring have the mark to determine the direction for installing. When attaching the ring to the piston, face these marks towards the top side.
• Oil ring consists of the upper rail, expander and lower rail. When attaching the oil ring to the piston, pay attention to the direction of each rail.

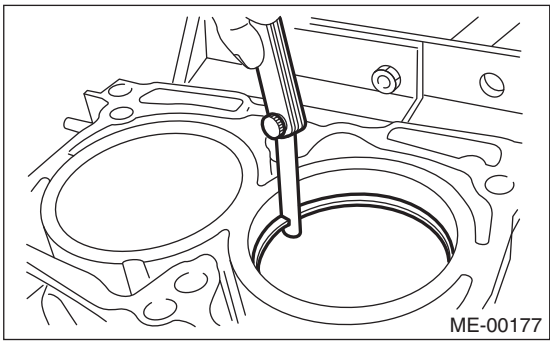


ME-02480

(A) Upper rail
(B) Expander
(C) Lower rail

2) Using the piston, insert the piston ring and oil ring into the cylinder so that they are perpendicular to the cylinder wall, and measure the piston ring gap with a thickness gauge.

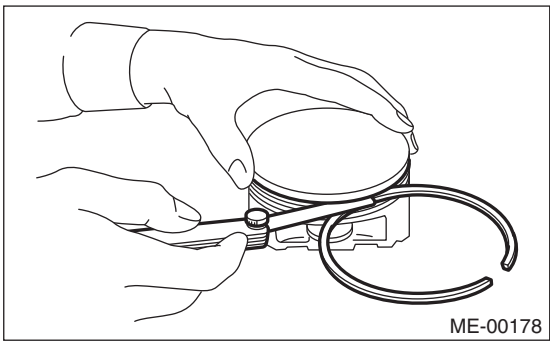
		Standard mm (in)
Piston ring gap	Top ring	0.20 — 0.25 (0.0079 — 0.0098)
	Second ring	0.37 — 0.52 (0.015 — 0.020)
	Oil ring rail	0.20 — 0.50 (0.0079 — 0.0197)


ME-00177

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.

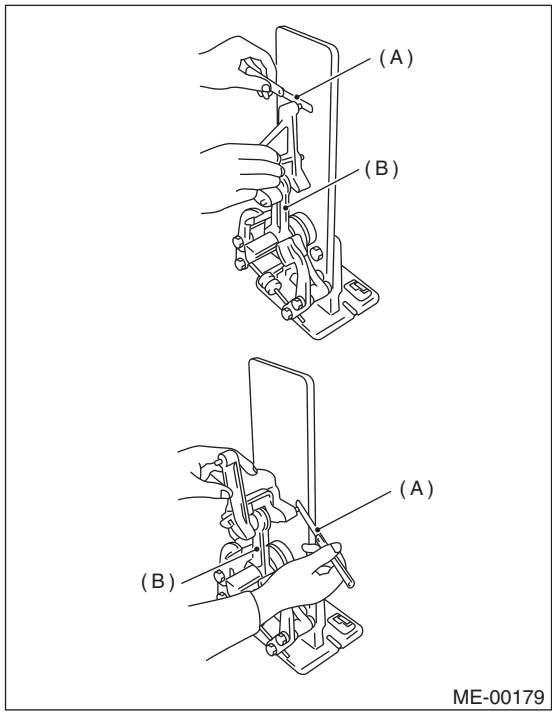
		Standard mm (in)
Clearance between piston ring and piston ring groove	Top ring	0.040 — 0.080 (0.0016 — 0.0031)
	Second ring	0.030 — 0.070 (0.0012 — 0.0028)


ME-00178

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)

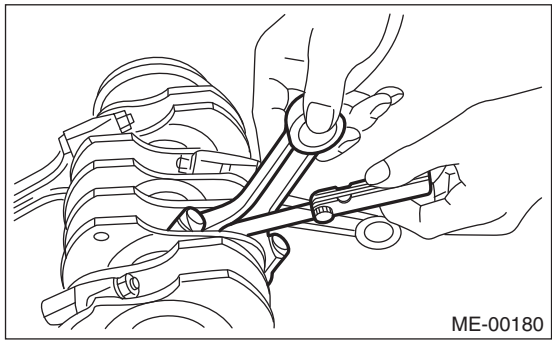


ME-00179

(A) Thickness gauge
(B) Connecting rod

3) Install the connecting rod with bearings attached to the crankshaft, and using a thickness gauge, measure the thrust clearance. If the thrust clearance exceeds the standard or uneven wear is found, replace the connecting rod.

Connecting rod thrust clearance:
Standard
0.070 — 0.330 mm (0.0028 — 0.0130 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 any oil clearance is not within the standard, replace the defective bearing with a new part of standard size or undersize as necessary.

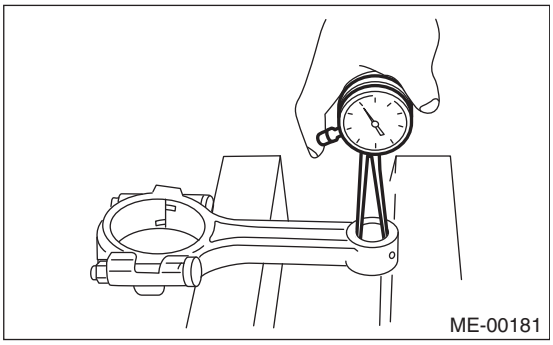
Connecting rod oil clearance:
Standard
0.017 — 0.045 mm (0.0007 — 0.0018 in)

Unit: mm (in)

Bearing	Bearing size (Thickness at center)	Outer diameter of crank pin
Standard	1.490 — 1.506 (0.0587 — 0.0593)	51.976 — 52.000 (2.0463 — 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)

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. If the measured value is not within the standard, replace it with a new part.

Clearance between piston pin and bushing:
Standard
0 — 0.022 mm (0 — 0.0009 in)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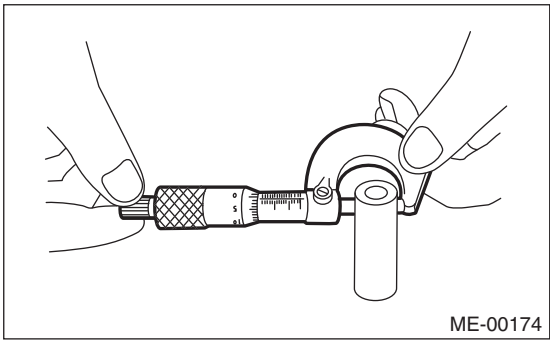
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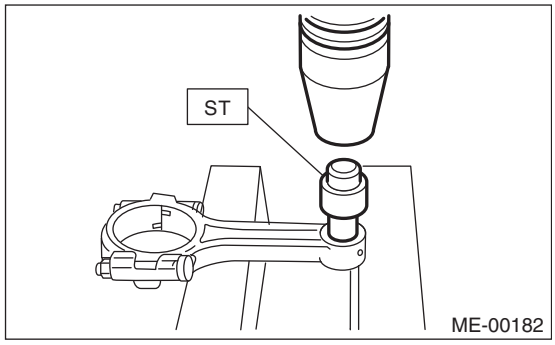
8) The replacement procedure for the connecting rod small end bushing is as follows.
(1) Remove the bushing from connecting rod with ST and press.
(2) Press the bushing with the ST after applying oil on the periphery of new bushing.

ST 499037100 CONNECTING ROD BUSHING REMOVER AND INSTALLER



ME-00182

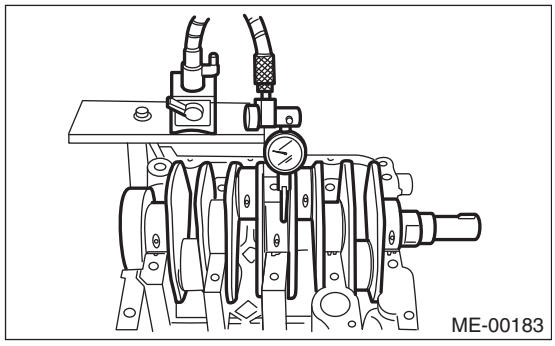
(3) Make two 3 mm (0.12 in) holes in the pressed bushing to match the pre-manufactured holes on the connecting rod, then ream the inside of the bushing.
(4) After completion of reaming, clean the bushing to remove chips.

6. CRANKSHAFT AND CRANKSHAFT BEARING

1) Clean the crankshaft completely, and check it for cracks using liquid penetrant tester. If defective, replace the crankshaft.
2) Measure warping of the crankshaft. If it exceeds the limit, correct or replace it.

NOTE:
If a suitable V-block is not available, using just the #1 and #5 crankshaft bearings on cylinder block, position the crankshaft on cylinder block. Then, measure the crankshaft bend using a dial gauge.

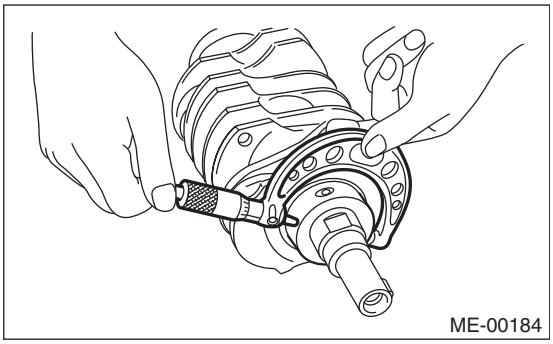
Crankshaft bend limit:
0.035 mm (0.0014 in)


ME-00183

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 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***
  - ***Standard***
  - ***0.003 mm (0.0001 in)***
- ***Cylindricality***
  - ***Standard***
  - ***0.004 mm (0.0002 in)***
- ***Grinding limit (dia.)***
  - ***To 51.750 mm (2.0374 in)***

Crank journal:
- ***Out-of-roundness***
  - ***Standard***
  - ***0.005 mm (0.0002 in)***
- ***Cylindricality***
  - ***Standard***
  - ***0.006 mm (0.0002 in)***
- ***Grinding limit (dia.)***
  - ***To 59.758 mm (2.3527 in)***

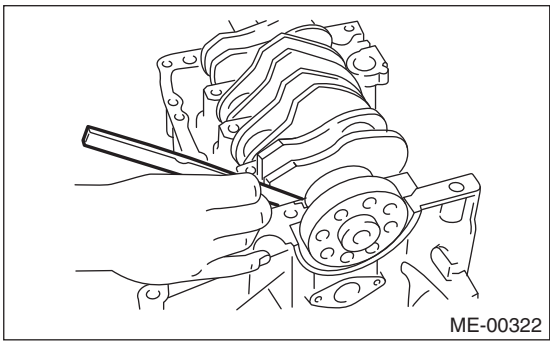


Unit: mm (in)

		Crank journal diameter		Crank pin outer diameter
		#1, #3	#2, #4, #5	
Standard	Journal O.D.	59.984 — 60.008 (2.3616 — 2.3625)	59.984 — 60.008 (2.3616 — 2.3625)	51.976 — 52.000 (2.0463 — 2.0472)
	Bearing size (Thickness at center)	1.998 — 2.015 (0.0787 — 0.0793)	2.000 — 2.017 (0.0787 — 0.0794)	1.490 — 1.506 (0.0587 — 0.0593)
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)

4) Use a thickness gauge to measure the thrust clearance of crankshaft at #5 crank journal bearing. If clearance exceeds the standard, replace the bearing.

Crankshaft thrust clearance:
Standard
0.030 — 0.115 mm (0.0012 — 0.0045 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 is out of standard, replace the defective bearing with an undersize one, and replace or grind to correct the crankshaft as necessary.

Crankshaft oil clearance:
Standard
0.010 — 0.030 mm (0.0004 — 0.0012 in)

21.Intake and Exhaust Valve

A: SPECIFICATION

Refer to “Cylinder Head” for removal and installation procedures of the intake and exhaust valves. <Ref. to ME(H4DOTC)-65, REMOVAL, Cylinder Head.> <Ref. to ME(H4DOTC)-65, INSTALLATION, Cylinder Head.>

22.Piston

A: SPECIFICATION

Refer to “Cylinder Block” for removal and installation procedures of pistons. <Ref. to ME(H4DOTC)-73, REMOVAL, Cylinder Block.> <Ref. to ME(H4DOTC)-77, INSTALLATION, Cylinder Block.>

23.Connecting Rod

A: SPECIFICATION

Refer to “Cylinder Block” for removal and installation procedures of connecting rod.
<Ref. to ME(H4DOTC)-73, REMOVAL, Cylinder Block.> <Ref. to ME(H4DOTC)-77, INSTALLATION, Cylinder Block.>

24.Crankshaft

A: SPECIFICATION

Refer to “Cylinder Block” for removal and installation procedures of the crankshaft. <Ref. to ME(H4DOTC)-73, REMOVAL, Cylinder Block.> <Ref. to ME(H4DOTC)-77, INSTALLATION, Cylinder Block.>

25.Engine Trouble in General

A: INSPECTION

NOTE:
The “RANK” shown in the chart shows the possibilities of the cause of trouble in order from “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
	Immobilizer System <Ref. to IM(diag)-2, Basic Diagnostic Procedure.>		A
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 fuel 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 cylinder 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

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 fuel 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 cylinder 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 fuel 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 cylinder 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

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 fuel 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 cylinder 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
		Improper engine oil (low viscosity)	B
	Lubrication system	Incorrect oil pressure	B
		Defective rocker cover gasket	C
	Cooling system	Over-heating	C
	Others	Evaporative emission control system malfunction	A
		Stuck or damaged throttle valve	B

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 fuel 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 cylinder 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	Over-heating	C
		Over-cooling	C
	Others	Evaporative emission control system malfunction	A

Symptoms	Problem parts etc.	Possible cause	RANK
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 fuel 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 cylinder 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	Over-heating	B
	Others	Evaporative emission control system malfunction	C
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
6. Dieseling (Run-on)	Engine control system <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.>		A
	Cooling system	Over-heating	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 cylinder 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

Symptoms	Problem parts etc.	Possible cause	RANK
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	Over-heating	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 gasket	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
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 cylinder 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.	• Valve mechanism is defective. • Incorrect valve clearance • Worn camshaft • Broken valve spring
Heavy and dull clank	Oil pressure is low.	• Worn crankshaft main bearing • Worn connecting rod bearing (large end)
	Oil pressure is normal.	• Loosened flywheel mounting bolt • Damaged engine mounting
High-pitched clank	Sound is noticeable when accelerating with an overload condition.	• Ignition timing advanced • Accumulation of carbon inside combustion chamber • Wrong heat range of spark plug • Improper octane value gasoline
Clank when engine speed is between 1,000 and 2,000 rpms.	Sound is reduced when the fuel injector connector of the noisy cylinder is disconnected.*	• Worn crankshaft 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 the fuel injector connector of the noisy cylinder is disconnected.*	• 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.*	• Unusually worn valve lifter • Worn cam sprocket • Worn camshaft journal bore in cylinder head
Squeaky sound	—	• Insufficient generator lubrication
Rubbing sound	—	• Poor contact of generator brush and rotor
Gear scream when starting engine	—	• Defective ignition starter switch • Worn gear and starter pinion
Sound like polishing glass with a dry cloth	—	• Loose V-belt • Defective water pump shaft
Hissing sound	—	• Insufficient compression • Air leakage in air intake system, hose, connection or manifold
Timing belt noise	—	• Loose timing belt • Timing belt contacting with adjacent part
Valve noise	—	• Incorrect valve clearance

* 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(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.> after connecting the fuel injector connector.

EXHAUST

EX(H4DOTC)

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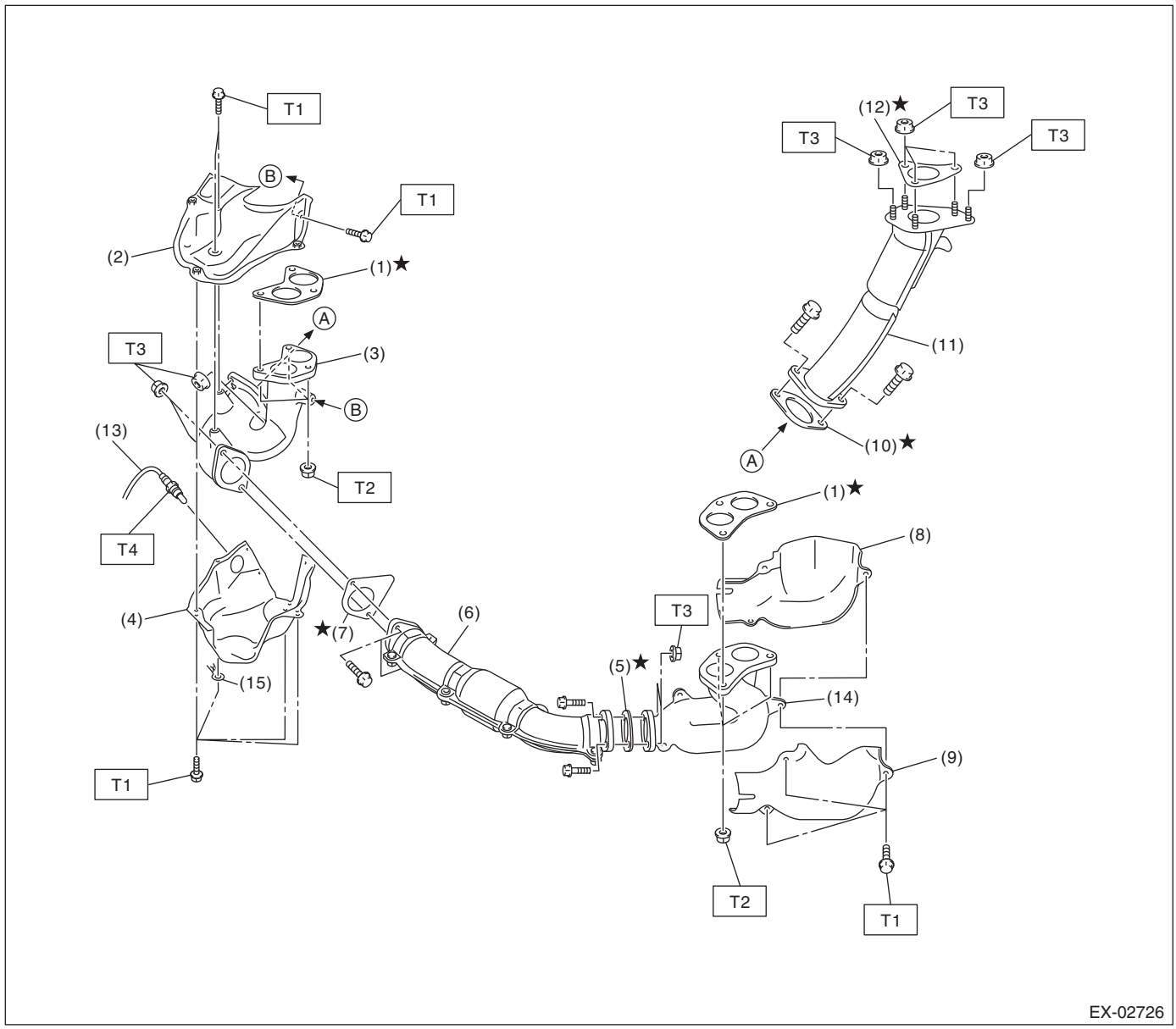
3. Center Exhaust Pipe 7
4. Joint Pipe 11
5. Rear Exhaust Pipe 12
6. Muffler 14

1. General Description

A: COMPONENT

1. FRONT EXHAUST PIPE



(1)	Gasket	(8)	Exhaust manifold LH inner cover	(15)	Ground cable
(2)	Exhaust manifold RH upper cover	(9)	Exhaust manifold LH outer cover		
(3)	Exhaust manifold RH	(10)	Gasket		
(4)	Exhaust manifold RH lower cover	(11)	Joint pipe		
(5)	Gasket	(12)	Gasket		
(6)	Front exhaust pipe	(13)	Front oxygen (A/F) sensor		
(7)	Gasket	(14)	Exhaust manifold LH		

Tightening torque:N·m (kgf-m, ft-lb)

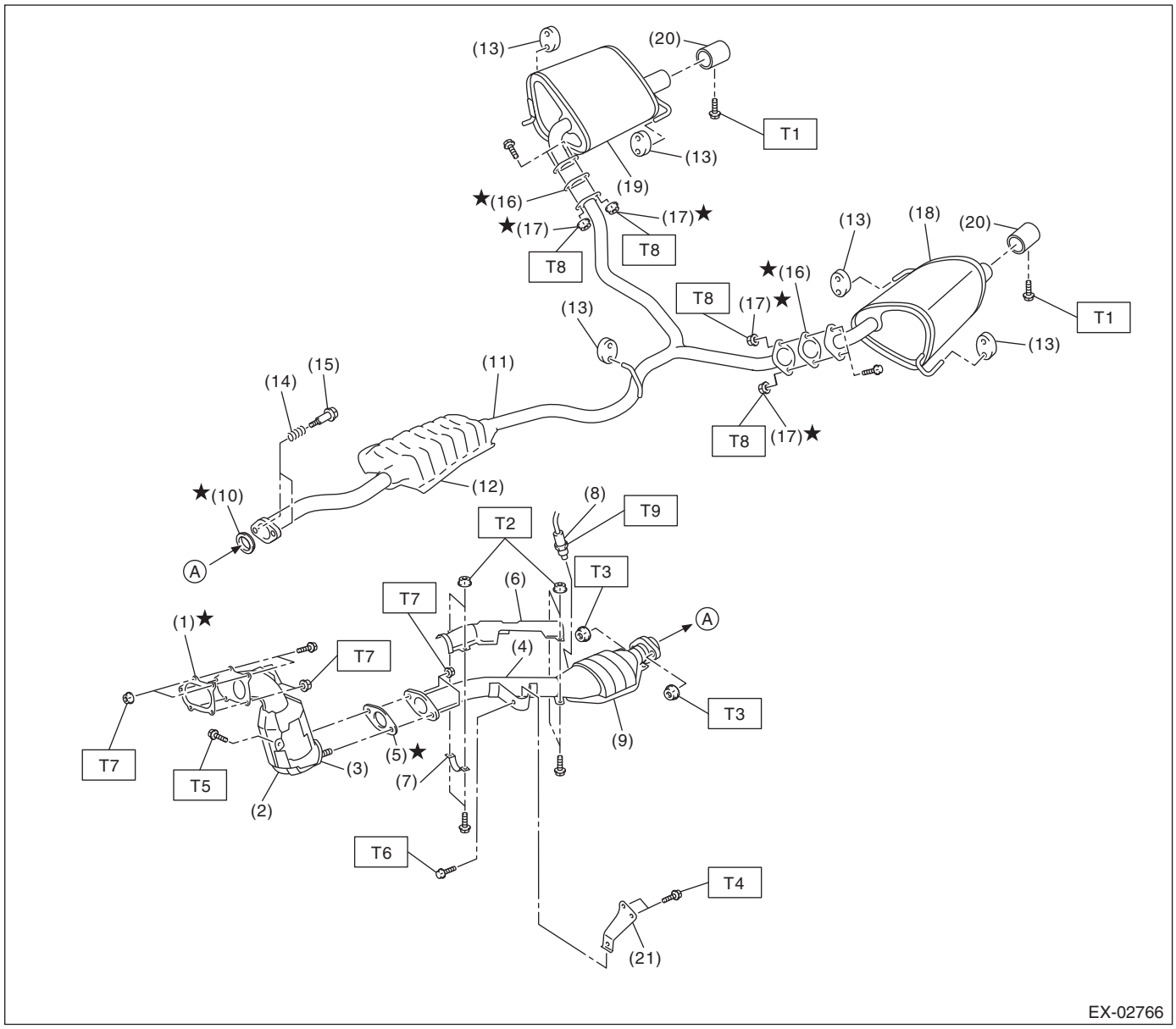
T1: 19 (1.9, 14.0)

T2: 40 (4.1, 29.5)

T3: 42.5 (4.3, 31.3)

T4: <Ref. to FU(H4DOTC)-53, INSTALLATION, Front Oxygen (A/F) Sensor.>

2. CENTER AND REAR EXHAUST PIPE, AND MUFFLER



(1) Gasket
(2) Front catalytic converter
(3) Center exhaust pipe (Front)
(4) Center exhaust pipe (Rear)
(5) Gasket
(6) Center exhaust pipe upper cover
(7) Clamp
(8) Rear oxygen sensor
(9) Rear catalytic converter
(10) Gasket
(11) Rear exhaust pipe
(12) Chamber
(13) Cushion rubber
(14) Spring
(15) Bolt
(16) Gasket
(17) Self-locking nut
(18) Muffler LH
(19) Muffler RH
(20) Muffler cutter
(21) Hanger bracket

Tightening torque:N·m (kgf-m, ft-lb)

- ***T1: 7.5 (0.8, 5.5)***
- ***T2: 13 (1.3, 9.6)***
- ***T3: 18 (1.8, 13.3)***
- ***T4: 23 (2.3, 17.0)***
- ***T5: 30 (3.1, 22.1)***
- ***T6: 35 (3.6, 25.8)***
- ***T7: 42.5 (4.3, 31.3)***
- ***T8: 48 (4.9, 35.4)***
- ***T9: <Ref. to FU(H4DOTC)-55, INSTALLATION, Rear Oxygen Sensor.>***

B: CAUTION

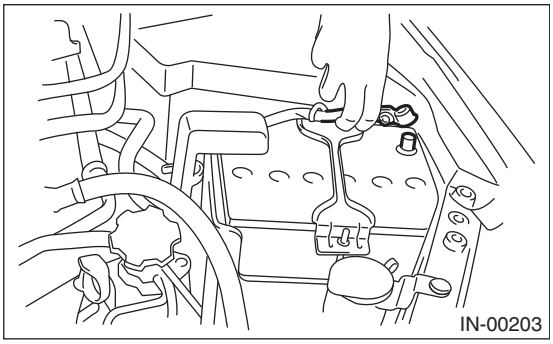
• Wear appropriate work clothing, including a cap, protective goggles and protective shoes when performing any work.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust and dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
• 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.
• If any fat adheres to the exhaust pipe, wipe it off. Otherwise a fire may happen.

2. Front Exhaust Pipe

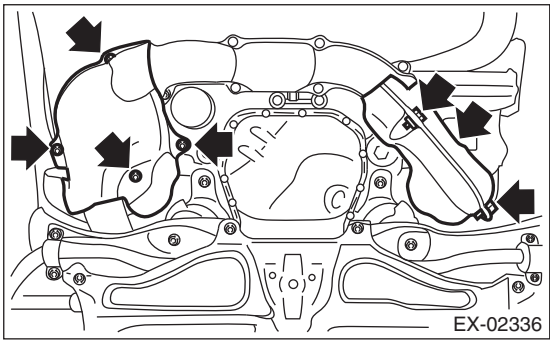
A: REMOVAL

CAUTION:
Vehicle components are extremely hot after driving. Be wary of receiving burns from heated parts.

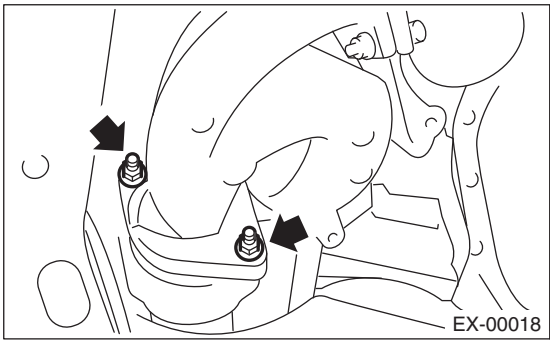
1) Disconnect the ground cable from battery.



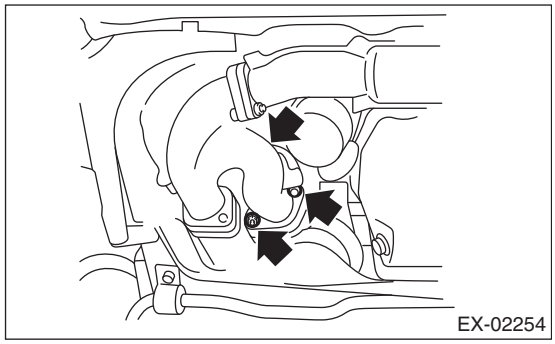
2) Lift up the vehicle.
3) Remove the under cover. <Ref. to EI-26, REMOVAL, Front Under Cover.>
4) Remove the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-53, REMOVAL, Front Oxygen (A/F) Sensor.>
5) Remove the exhaust manifold RH lower cover and exhaust manifold LH cover.

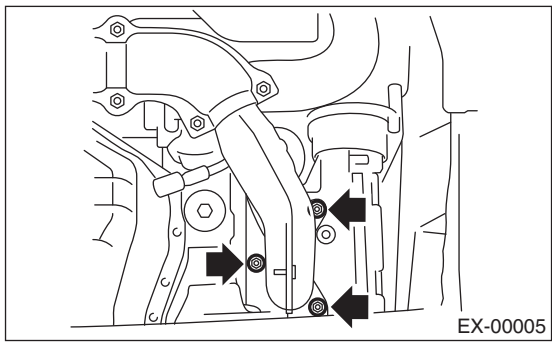


6) Remove the bolts and nuts which hold joint pipe onto exhaust manifold RH.



7) While holding the front exhaust pipe with one hand, remove the nuts which hold the exhaust manifold to the cylinder head exhaust port and remove the front exhaust pipe.



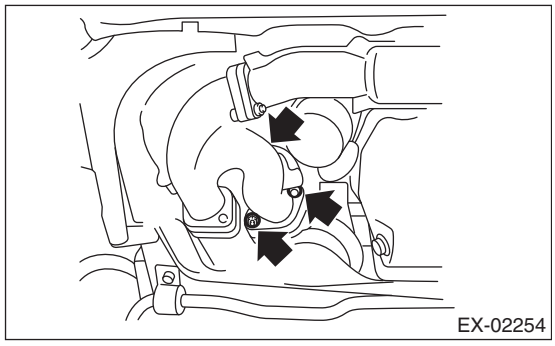


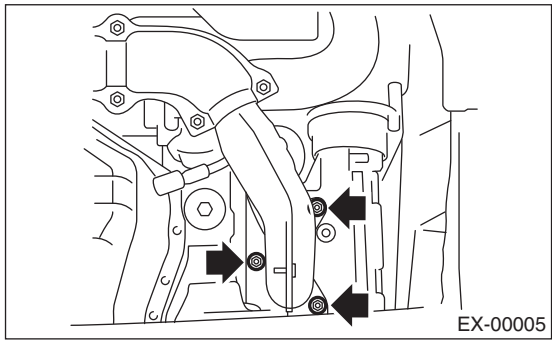
B: INSTALLATION

1) Install the front exhaust pipe.

NOTE:
Use a new gasket.

Tightening torque:
40 N·m (4.1 kgf-m, 29.5 ft-lb)

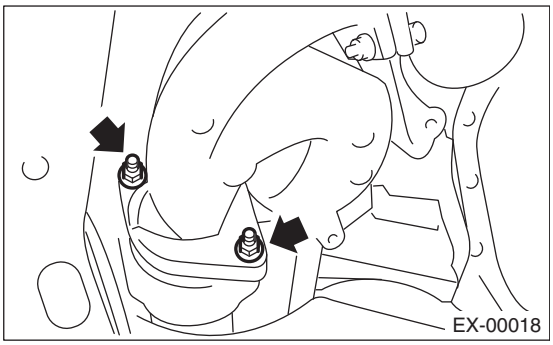




2) Install the joint pipe to the exhaust manifold RH.

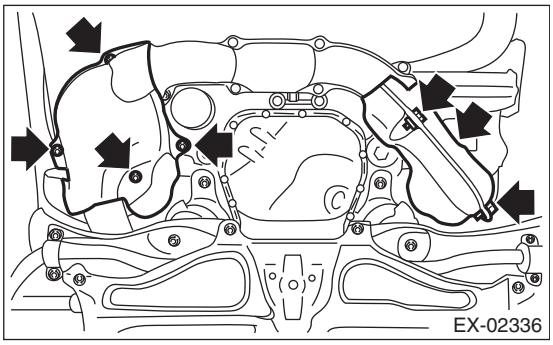
NOTE:
Use a new gasket.

Tightening torque:
42.5 N·m (4.3 kgf-m, 31.3 ft-lb)

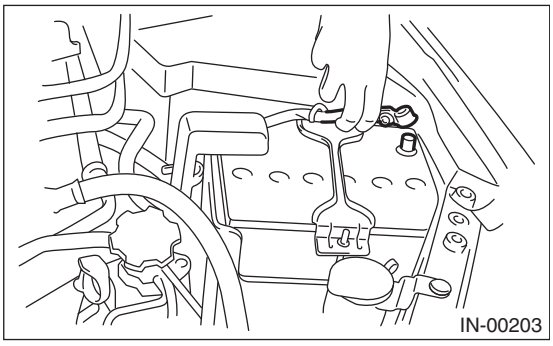


3) Install the exhaust manifold RH lower cover and exhaust manifold LH cover.

Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)

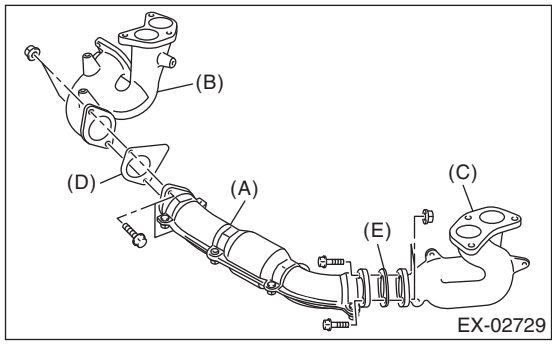


4) Install the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-53, INSTALLATION, Front Oxygen (A/F) Sensor.>
5) Install the under cover. <Ref. to EI-26, INSTALLATION, Front Under Cover.>
6) Lower the vehicle.
7) Connect the battery ground terminal.



C: DISASSEMBLY

1) Remove the exhaust manifold RH upper cover.
2) Remove the exhaust manifold RH and the exhaust manifold LH from the front exhaust pipe.



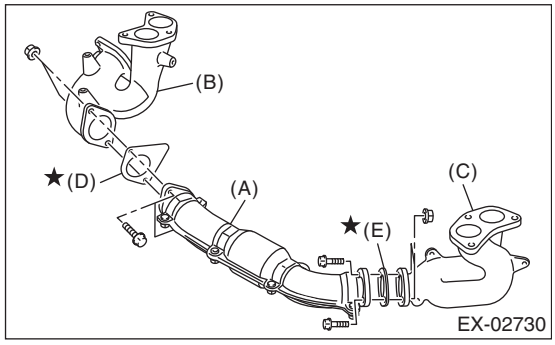
(A) Front exhaust pipe
(B) Exhaust manifold RH
(C) Exhaust manifold LH
(D) Gasket
(E) Gasket

D: ASSEMBLY

1) Install the exhaust manifold RH and the exhaust manifold LH to the front exhaust pipe.

NOTE:
Use a new gasket.

Tightening torque:
42.5 N·m (4.3 kgf-m, 31.3 ft-lb)



(A) Front exhaust pipe
(B) Exhaust manifold RH
(C) Exhaust manifold LH
(D) Gasket
(E) Gasket

2) Install the exhaust manifold RH upper cover.

Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)

E: INSPECTION

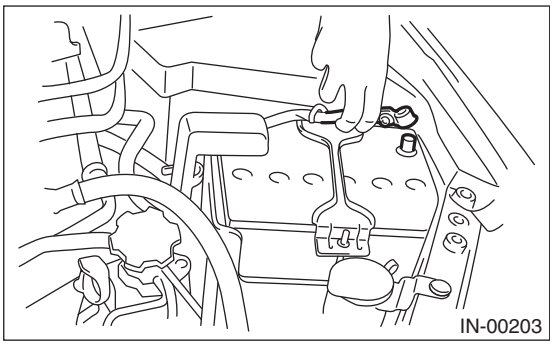
1) Check the connections and welds for exhaust leaks.
2) Make sure there are no holes or rusting.

3. Center Exhaust Pipe

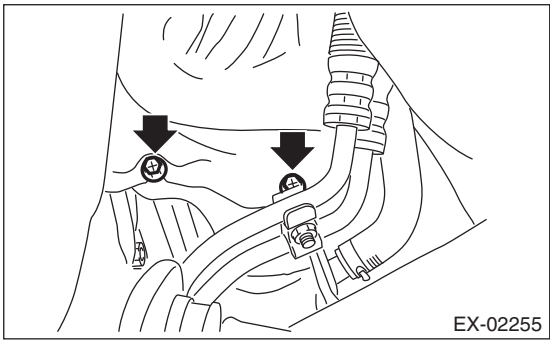
A: REMOVAL

CAUTION:
Vehicle components are extremely hot after driving. Be wary of receiving burns from heated parts.

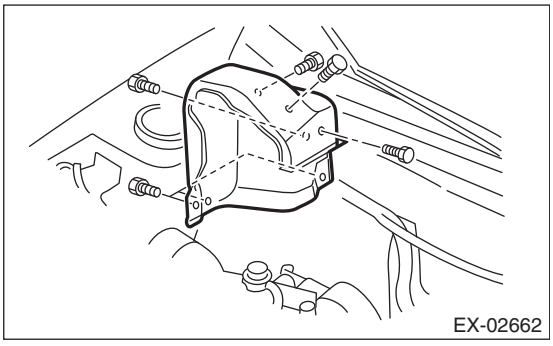
1) Remove the collector cover.
2) Disconnect the ground cable from battery.



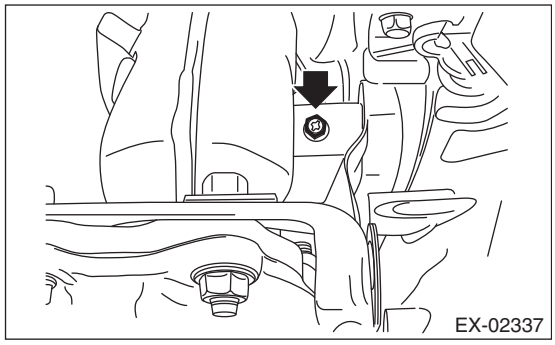
3) Remove the intercooler. <Ref. to IN(H4DOTC)-13, REMOVAL, Intercooler.>
4) Lift up the vehicle.
5) Remove the bolts which secure the lower side of the turbocharger lower cover.



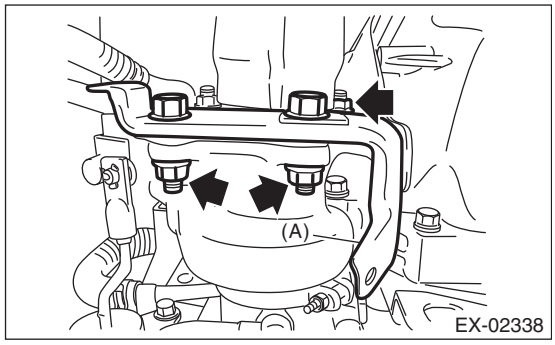
6) Lower the vehicle.
7) Remove the turbocharger upper cover.



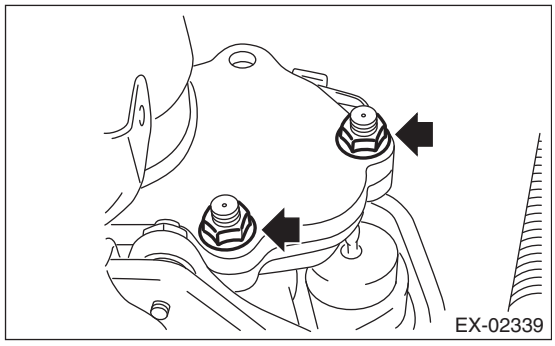
8) Remove the bolts which hold the upper side of the turbocharger lower cover.



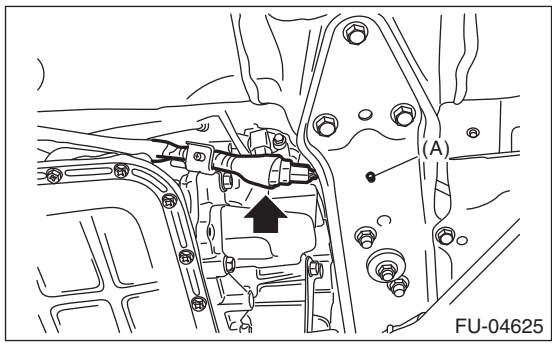
9) Remove the upper side bolts and nuts that hold the center exhaust pipe on the turbocharger, and remove the turbocharger cover stay (A).



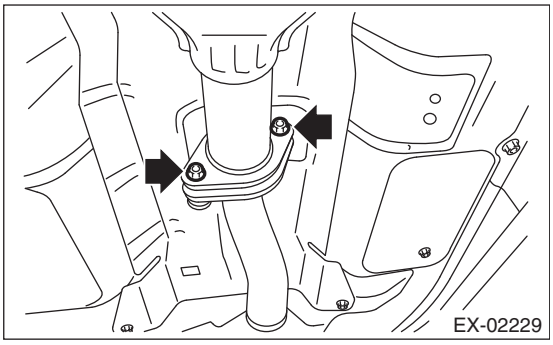
10) Lift up the vehicle.
11) Remove the lower side nuts (two places) that hold the center exhaust pipe on the turbocharger.



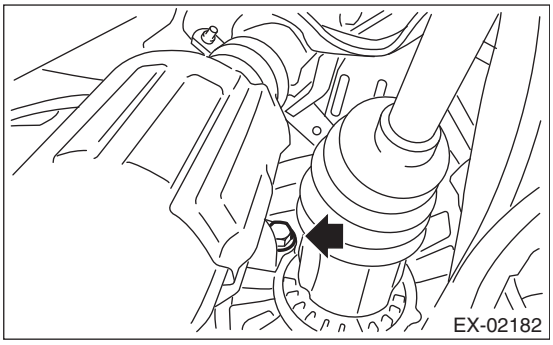
12) Disconnect the connector from the rear oxygen sensor, and remove the clip (A) holding the rear oxygen sensor harness.



13) Remove the rear exhaust pipe from center exhaust pipe.

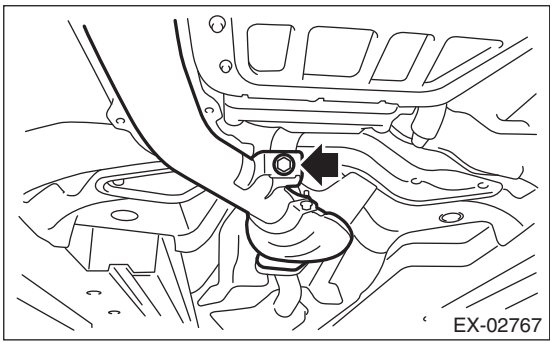


14) Remove the bolt which holds center exhaust pipe to transmission.



15) Remove the bolt which holds center exhaust pipe to hanger bracket, and remove the center exhaust pipe.

CAUTION:
Be careful not to drop the center exhaust pipe.



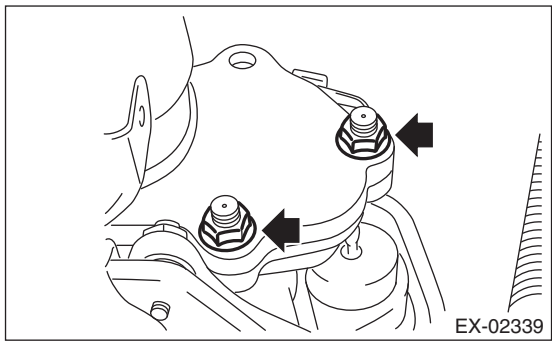
16) Remove the turbocharger lower cover.

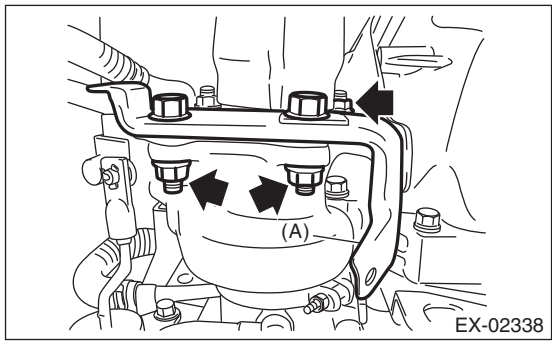
B: INSTALLATION

1) Set the turbocharger lower cover, and temporarily tighten the bolts that hold the lower side of the turbocharger lower cover.
2) Install the center exhaust pipe and temporarily tighten the bolt which holds center exhaust pipe to hanger bracket.
3) Temporarily tighten the bolt which holds the center exhaust pipe to the transmission.
4) Install the center exhaust pipe along with the turbocharger cover stay (A) to the turbocharger.

NOTE:
Use a new gasket.

Tightening torque:
42.5 N·m (4.3 kgf-m, 31.3 ft-lb)

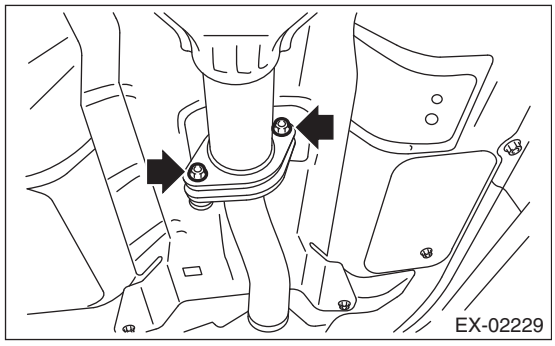




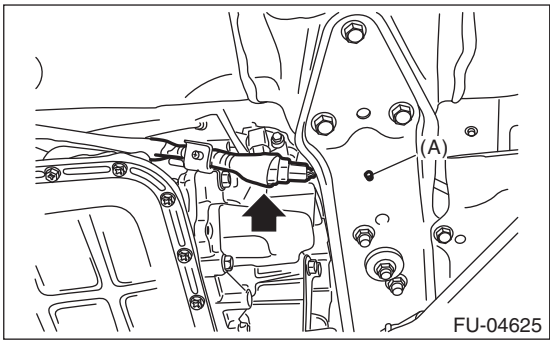
5) Install the rear exhaust pipe to center exhaust pipe.

NOTE:
Use a new gasket.

Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)

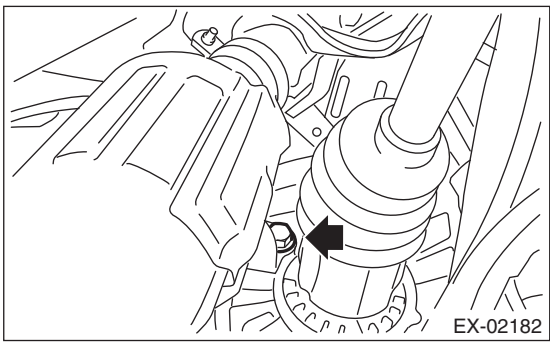


6) Connect the connector to the rear oxygen sensor, and hold the rear oxygen sensor harness with the clip (A).



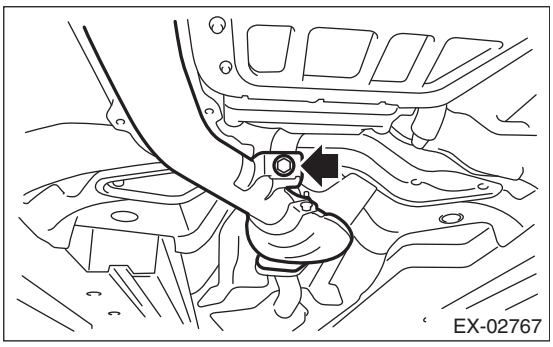
7) Tighten the bolt which holds center exhaust pipe to transmission.

Tightening torque:
30 N·m (3.1 kgf-m, 22.1 ft-lb)



8) Tighten the bolts which secure the center exhaust pipe to the hanger bracket.

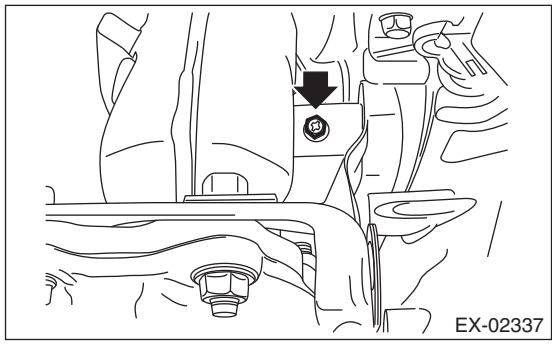
Tightening torque:
35 N·m (3.6 kgf-m, 25.8 ft-lb)



9) Lower the vehicle.

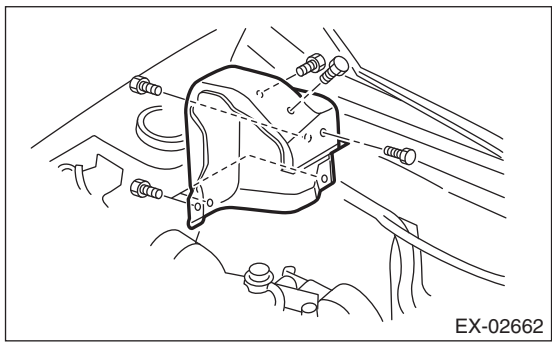
10) Attach the bolt which holds the upper side of the turbocharger lower cover.

Tightening torque:
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)



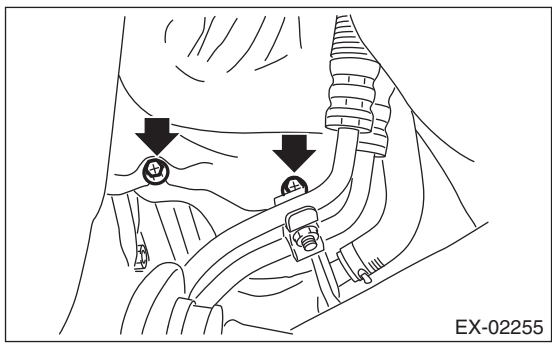
11) Attach the turbocharger upper cover.

Tightening torque:
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)



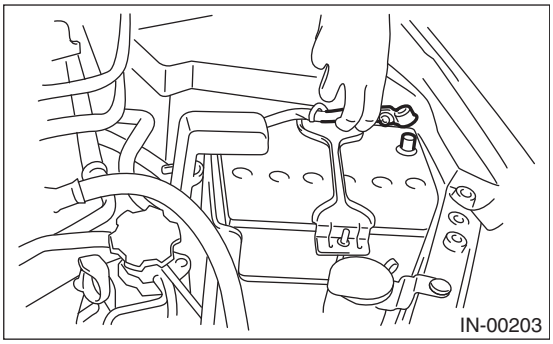
12) Lift up the vehicle.
13) Tighten the bolts that secure the lower side of the turbocharger lower cover.

Tightening torque:
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)



14) Lower the vehicle.
15) Install the intercooler. <Ref. to IN(H4DOTC)-13, INSTALLATION, Intercooler.>

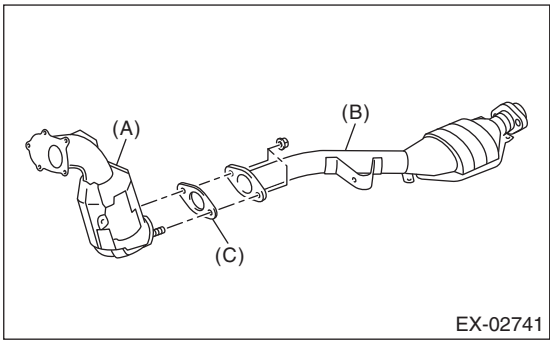
16) Connect the battery ground terminal.



17) Install the collector cover.

C: DISASSEMBLY

1) Remove the rear oxygen sensor from the center exhaust pipe (rear). <Ref. to FU(H4DOTC)-55, REMOVAL, Rear Oxygen Sensor.>
2) Remove the center exhaust pipe upper cover.
3) Remove the center exhaust pipe (rear) from the center exhaust pipe (front).



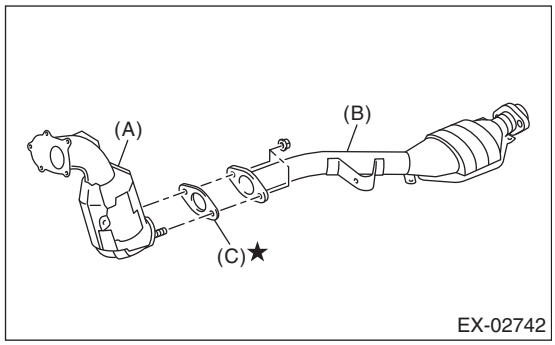
(A) Center exhaust pipe (Front)
(B) Center exhaust pipe (Rear)
(C) Gasket

D: ASSEMBLY

1) Assemble the center exhaust pipe (rear) to the center exhaust pipe (front).

NOTE:
Use a new gasket.

Tightening torque:
42.5 N·m (4.3 kgf-m, 31.3 ft-lb)



(A) Center exhaust pipe (Front)
(B) Center exhaust pipe (Rear)
(C) Gasket

2) Install the center exhaust pipe upper cover.

Tightening torque:
13 N·m (1.3 kgf-m, 9.6 ft-lb)

3) Install the rear oxygen sensor to the center exhaust pipe (rear). <Ref. to FU(H4DOTC)-55, INSTALLATION, Rear Oxygen Sensor.>

E: INSPECTION

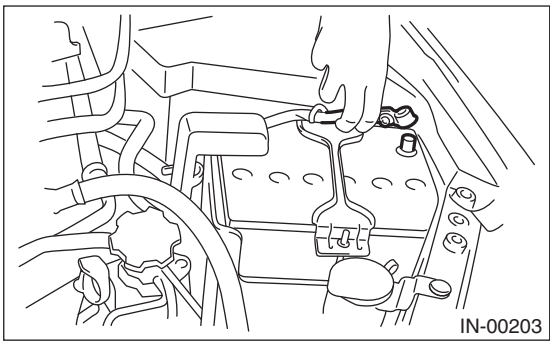
1) Check the connections and welds for exhaust leaks.
2) Make sure there are no holes or rusting.

4. Joint Pipe

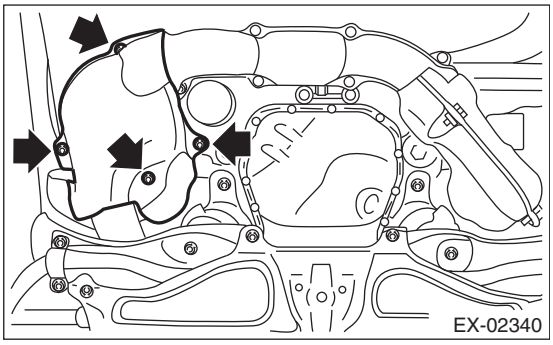
A: REMOVAL

CAUTION:
Vehicle components are extremely hot after driving. Be wary of receiving burns from heated parts.

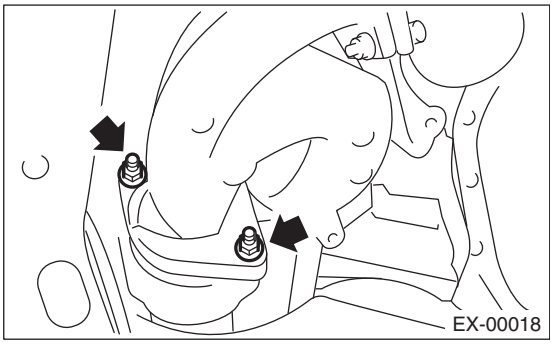
1) Remove the collector cover.
2) Disconnect the ground cable from battery.



3) Lift up the vehicle.
4) Remove the under cover. <Ref. to EI-26, REMOVAL, Front Under Cover.>
5) Remove the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-53, REMOVAL, Front Oxygen (A/F) Sensor.>
6) Remove the exhaust manifold RH lower cover.



7) Remove the bolts and nuts which hold exhaust manifold RH onto joint pipe.



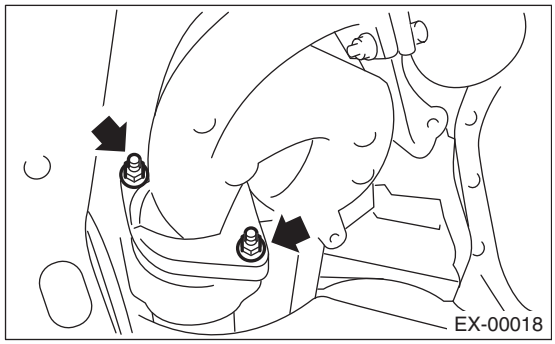
8) Remove the center exhaust pipe. <Ref. to EX(H4DOTC)-7, REMOVAL, Center Exhaust Pipe.>
9) Remove the turbocharger. <Ref. to IN(H4DOTC)-15, REMOVAL, Turbocharger.>
10) Take off the joint pipe in the upward direction.

B: INSTALLATION

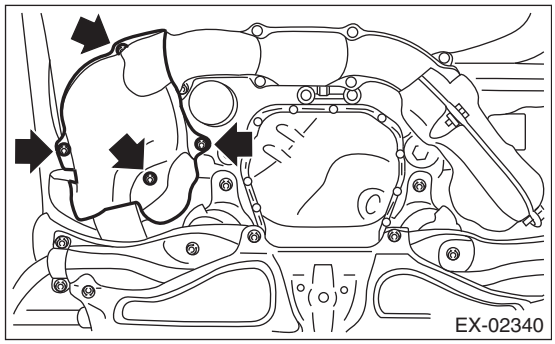
Install in the reverse order of removal.

NOTE:
Use a new gasket.

Tightening torque:
42.5 N·m (4.3 kgf-m, 31.3 ft-lb)



Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)



C: INSPECTION

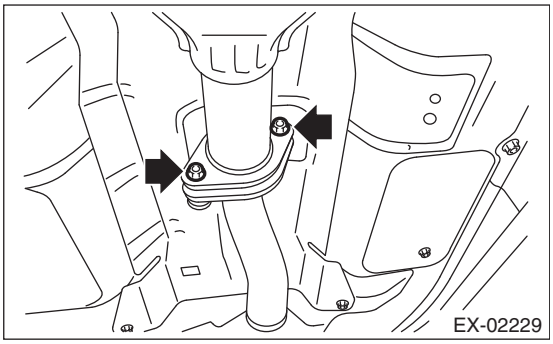
1) Check the connections and welds for exhaust leaks.
2) Make sure there are no holes or rusting.

5. Rear Exhaust Pipe

A: REMOVAL

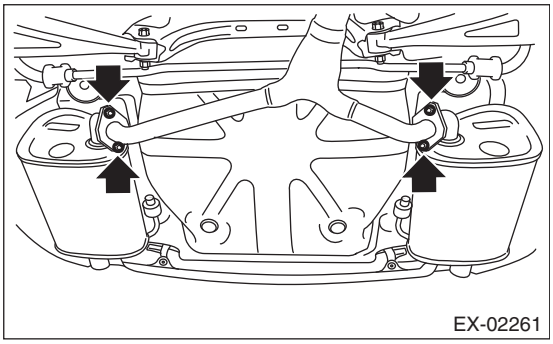
CAUTION:
Vehicle components are extremely hot after driving. Be wary of receiving burns from heated parts.

1) Lift up the vehicle.
2) Remove the center exhaust pipe from rear exhaust pipe.



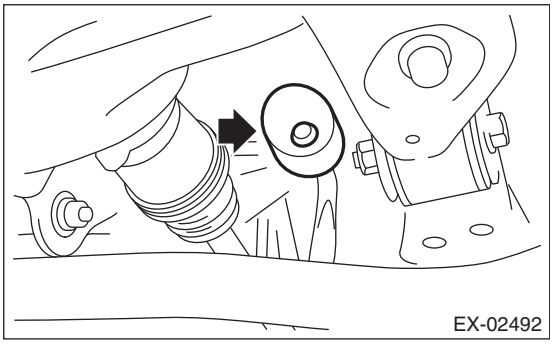
3) Remove the muffler from rear exhaust pipe.

CAUTION:
Be careful not to drop the rear exhaust pipe.



4) Apply a coat of spray type lubricant to the mating area of cushion rubber.
5) Remove the rear exhaust pipe from the cushion rubber.

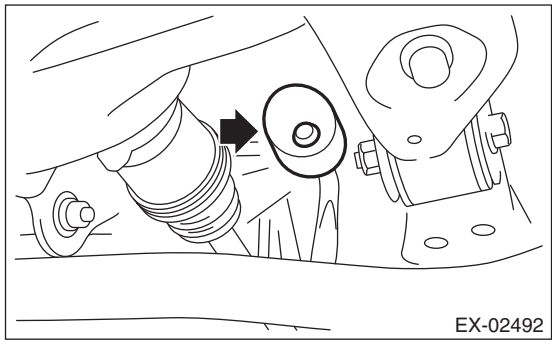
CAUTION:
Be careful not to let the muffler contact the rear bumper.



B: INSTALLATION

1) Apply a coat of spray type lubricant to the mating area of cushion rubber.
2) Install the rear exhaust pipe to the cushion rubber.

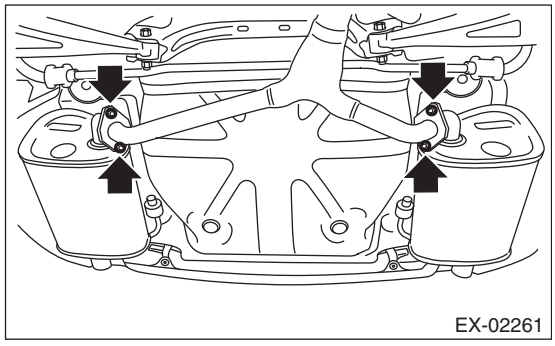
NOTE:
After assembling, degrease the lubricant which was applied to the cushion rubber while removing/installing.



3) Install the muffler to the rear exhaust pipe.

NOTE:
Use a new gasket and self-locking nut.

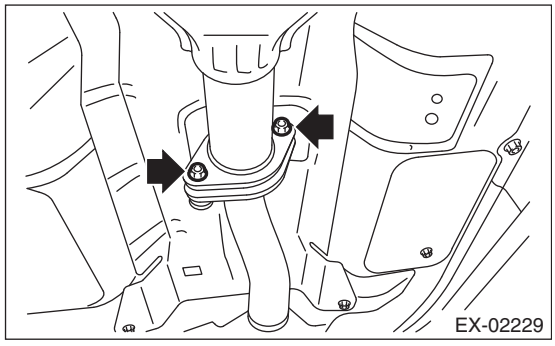
Tightening torque:
48 N·m (4.9 kgf-m, 35.4 ft-lb)



4) Install the center exhaust pipe to rear exhaust pipe.

NOTE:
Use a new gasket.

Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)



5) Lower the vehicle.

C: INSPECTION

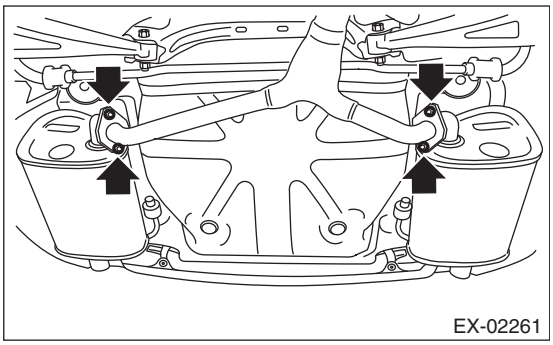
1) Check the connections and welds for exhaust leaks.
2) Make sure there are no holes or rusting.
3) Check the cushion rubber for wear or crack.

6. Muffler

A: REMOVAL

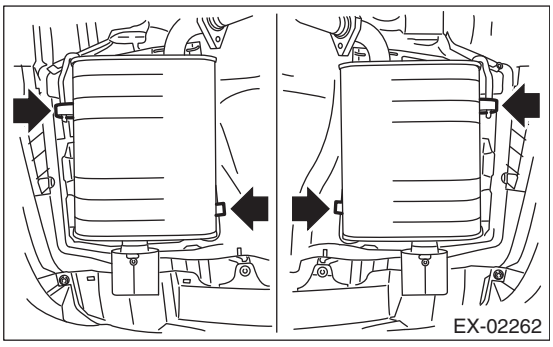
CAUTION:
Vehicle components are extremely hot after driving. Be wary of receiving burns from heated parts.

1) Lift up the vehicle.
2) Remove the rear exhaust pipe from the muffler.



3) Apply a coat of spray type lubricant to the mating area of cushion rubber.
4) Remove the muffler from the cushion rubber.

CAUTION:
Be careful not to drop the muffler during removal.

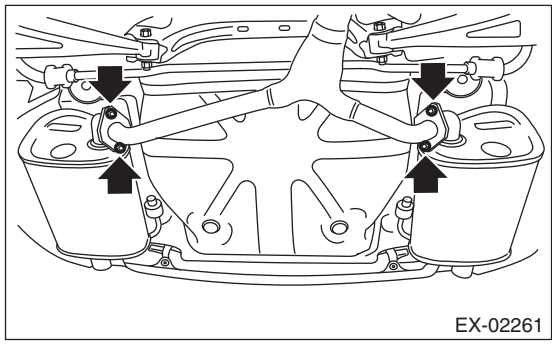


B: INSTALLATION

Install in the reverse order of removal.

NOTE:
- Use a new gasket and self-locking nut.
- After assembling, degrease the lubricant which was applied to the cushion rubber while removing/installing.

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.

COOLING

CO(H4DOTC)

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9. Radiator Sub Fan and Fan Motor 26
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1. General Description

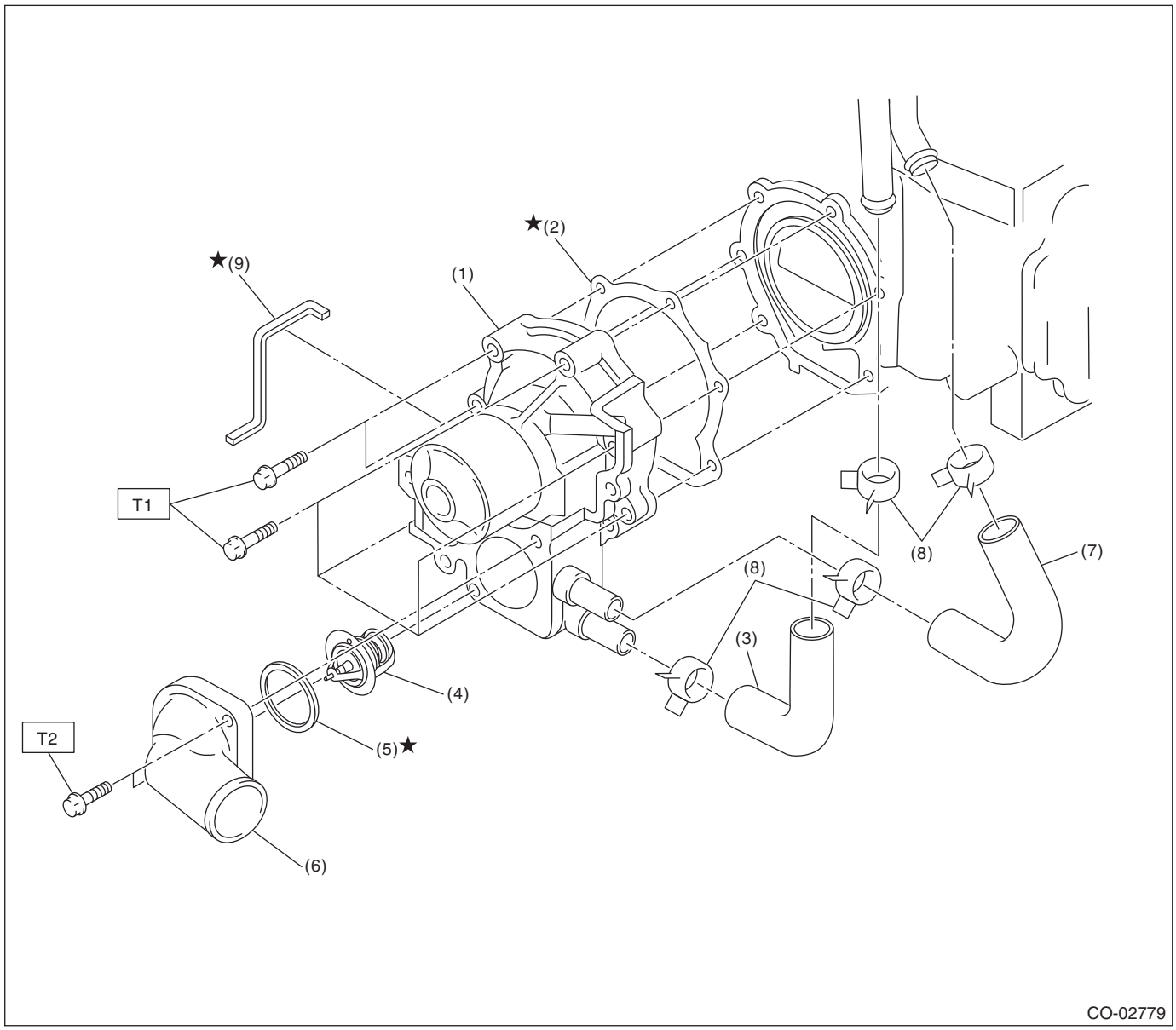
A: SPECIFICATION

Cooling system					Electric fan + Forced engine coolant circulation system
Total engine coolant capacity			ℓ (US qt, Imp qt)		Approx. 8.0 (8.5, 7.0)
Water pump	Type				Centrifugal impeller type
	Discharge performance	Discharge rate	ℓ (US gal, Imp gal) /min.		200 (52.8, 44.0)
		Pump speed — Discharge pressure			6,000 rpm — 225.4 kPa (23.0 mAq)
		Engine coolant temperature			80°C (176°F)
	Impeller diameter		mm (in)		76 (2.99)
	Number of impeller vanes				8
	Pump pulley diameter		mm (in)		60 (2.36)
	Clearance between impeller and pump case		mm (in)	Standard	0.5 — 1.5 (0.020 — 0.059)
Thermostat	Type				Wax pellet type
	Starting temperature to open				76 — 80°C (169 — 176°F)
	Fully opens				91°C (196°F)
	Valve lift		mm (in)		9.0 (0.354) or more
	Valve bore		mm (in)		35 (1.38)
Radiator fan	Motor input	Main fan	W		120
		Sub fan	W		120
	Fan diameter / Blade	Main fan			318.5 mm (12.54 in)/9
		Sub fan			318.5 mm (12.54 in)/11
Radiator	Type				Down flow
	Core dimensions	Width × Height × Thickness	mm (in)		687.4 × 340 × 16 (27.06 × 13.39 × 0.63)
	Pressure range in which cap valve is open	Coolant filler tank side	kPa (kg/cm^2, psi)	Positive pressure side	Standard	93 — 123 (0.95 — 1.25, 14 — 18)
					Limit	83 (0.85, 12)
				Negative pressure side	Standard	–1.0 — –4.9 (–0.01 — –0.05, –0.1 — –0.7)
		Radiator side	kPa (kg/cm^2, psi)	Positive pressure side only	Standard	122 — 152 (1.24 — 1.55, 18 — 22)
					Limit	112 (1.14, 16)
	Fins				Corrugated fin type
Reservoir tank	Capacity		ℓ (US qt, Imp qt)		0.45 (0.48, 0.40)

	Recommended materials	Item number	Alternative
Coolant	SUBARU SUPER COOLANT (Concentrated type)	—	—
	SUBARU SUPER COOLANT (Diluted type)	K0670Y0001	
Water for dilution	Distilled water	—	Soft water or tap water
Cooling system protective agent	Cooling system conditioner	SOA345001	—

B: COMPONENT

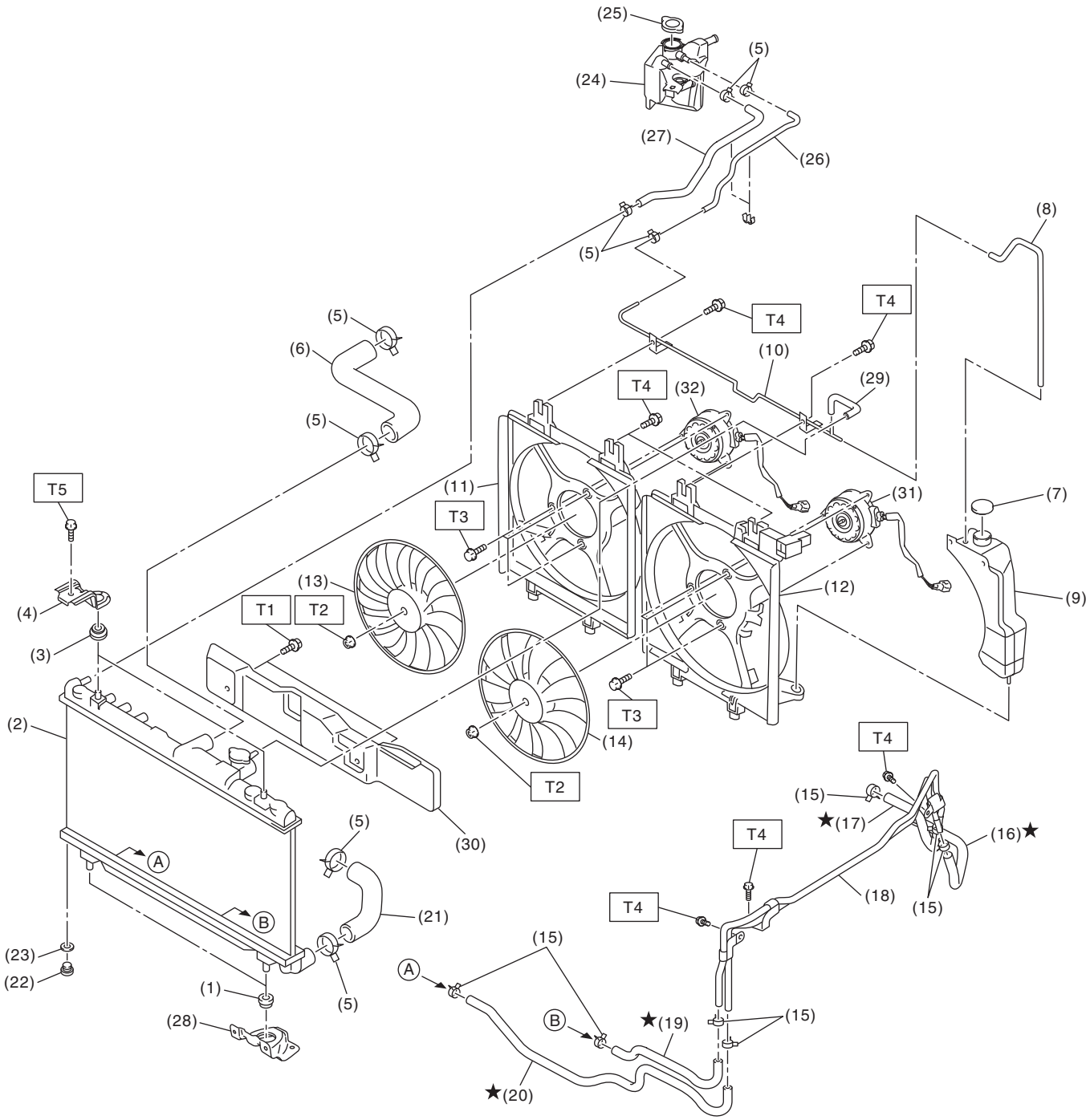
1. WATER PUMP



(1) Water pump ASSY
(2) Gasket
(3) Heater by-pass hose
(4) Thermostat
(5) Gasket
(6) Thermostat cover
(7) Coolant filler by-pass hose
(8) Clip
(9) Water pump sealing

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)

2. RADIATOR AND RADIATOR FAN



CO-02760

(1) Radiator lower cushion
(2) Radiator
(3) Radiator upper cushion
(4) Radiator upper bracket
(5) Clip
(6) Radiator inlet hose
(7) Engine coolant reservoir tank cap
(8) Over flow hose A
(9) Engine coolant reservoir tank
(10) Over flow pipe
(11) Radiator sub fan shroud
(12) Radiator main fan shroud
(13) Radiator sub fan
(14) Radiator main fan
(15) ATF hose clip
(16) ATF hose A
(17) ATF hose B
(18) ATF pipe
(19) ATF hose C
(20) ATF hose D
(21) Radiator outlet hose
(22) Radiator drain plug
(23) O-ring
(24) Coolant filler tank
(25) Radiator cap (Coolant filler tank cap)
(26) Engine coolant hose A
(27) Engine coolant hose B
(28) Radiator lower bracket
(29) Over flow hose B
(30) Heat shield cover
(31) Main fan motor
(32) Sub fan motor

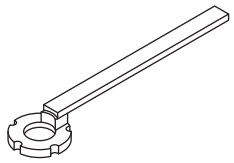
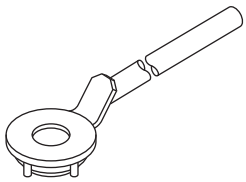
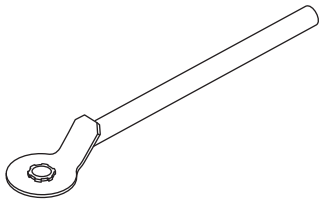
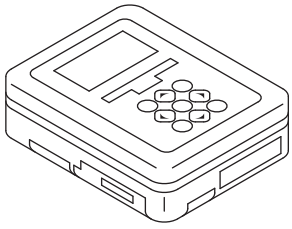
Tightening torque:N·m (kgf-m, ft-lb)
T1: 3 (0.3, 2.2)
T2: 3.4 (0.3, 2.5)
T3: 4.41 (0.45, 3.25)
T4: 7.5 (0.8, 5.5)
T5: 12 (1.2, 8.9)

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.
- 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 engine coolant.

D: PREPARATION TOOL

1. SPECIAL TOOL

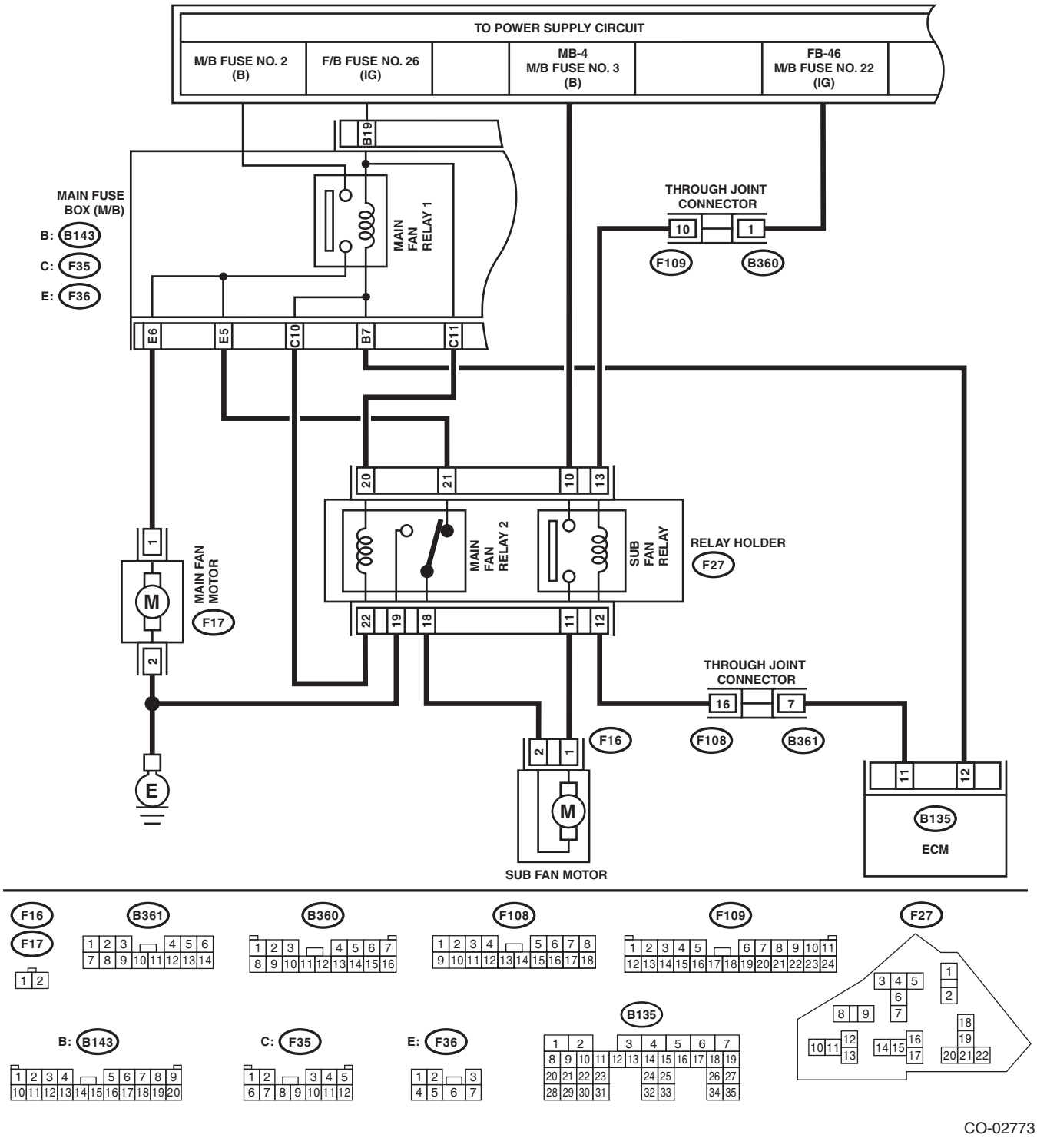
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499207400	499207400	CAM SPROCKET WRENCH	Used for removing and installing exhaust cam sprocket.
 ST-499977400	499977400	CRANK PULLEY WRENCH	Used for removing and installing the crank pulley.
 ST-499977500	499977500	CAM SPROCKET WRENCH	Used for removing and installing intake cam sprocket.
 ST1B022XU0	1B022XU0	SUBARU SELECT MONITOR III KIT	Used for troubleshooting the electrical system.

2. GENERAL TOOL

TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance and voltage.
Radiator cap tester	Used for checking radiator and radiator cap.

2. Radiator Fan System

A: WIRING DIAGRAM



CO-02773

B: INSPECTION

OPERATING CONDITION:

Vehicle speed	A/C compressor load	Engine coolant temperature		
		Increase: 94°C (201°F) or less Decrease: 93°C (199°F) or less	Increase: 95 — 96°C (203 — 205°F) Decrease: 94°C (201°F)	Increase: 97°C (207°F) or more Decrease: 95°C (203°F) or more
		Radiator fan operation	Radiator fan operation	Radiator fan operation
During acceleration: 19 km/h (12 MPH) or less During deceleration: 10 km/h (6 MPH) or less	OFF	OFF	Low-Speed	High-Speed
	Low	Low-Speed	Low-Speed	High-Speed
	High	High-Speed	High-Speed	High-Speed
During acceleration: 20 — 69 km/h (12 — 43 MPH) During deceleration: 11 — 64 km/h (7 — 40 MPH)	OFF	OFF	Low-Speed	High-Speed
	Low	High-Speed	High-Speed	High-Speed
	High	High-Speed	High-Speed	High-Speed
During acceleration: 70 — 105 km/h (43 — 65 MPH) During deceleration: 65 — 100 km/h (40 — 62 MPH)	OFF	OFF	Low-Speed	High-Speed
	Low	High-Speed	High-Speed	High-Speed
	High	High-Speed	High-Speed	High-Speed
During acceleration: 106 km/h (66 MPH) or more During deceleration: 101 km/h (63 MPH) or more	OFF	OFF	High-Speed	High-Speed
	Low	High-Speed	High-Speed	High-Speed
	High	High-Speed	High-Speed	High-Speed

DIAGNOSIS:

Radiator main fan and radiator sub fans do not rotate under the above operating conditions.

	Step	Check	Yes	No
1	**CHECK OPERATION OF RADIATOR FAN.** 1) Connect the delivery (test) mode connector. 2) Turn the ignition switch to ON. 3) Using the Subaru Select Monitor, check the forced operation of the radiator fan relay. NOTE: • When performing a forced operation radiator fan relay check using the Subaru Select Monitor, the radiator main fan and radiator sub fan will repeat low speed revolution → high speed revolution → OFF in this order. • Subaru Select Monitor Refer to “Compulsory Valve Operation Check Mode” for detailed procedures. <Ref. to EN(H4DOTC)(diag)-57, Compulsory Valve Operation Check Mode.>	Do the radiator main fans and radiator sub fans rotate at low speed?	Go to step **2**.	Go to step **3**.

Step		Check	Yes	No
2	**CHECK OPERATION OF RADIATOR FAN.** 1) Connect the delivery (test) mode connector. 2) Turn the ignition switch to ON. 3) Using the Subaru Select Monitor, check the forced operation of the radiator fan relay. NOTE: • When performing a forced operation radiator fan relay check using the Subaru Select Monitor, the radiator main fan and radiator sub fan will repeat low speed revolution → high speed revolution → OFF in this order. • Subaru Select Monitor Refer to "Compulsory Valve Operation Check Mode" for detailed procedures. <Ref. to EN(H4DOTC)(diag)-57, Compulsory Valve Operation Check Mode.>	Do the radiator main fans and radiator sub fans rotate at high speed?	Radiator main fan system is normal.	Go to step **27**.
3	**CHECK POWER SUPPLY TO SUB FAN RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the sub fan relay from the relay holder. 3) Measure the voltage between sub fan relay connector and chassis ground. ***Connector & terminal*** ***(F27) No. 10 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **4**.	Go to step **5**.
4	**CHECK POWER SUPPLY TO SUB FAN RELAY.** 1) Turn the ignition switch to ON. 2) Measure the voltage between sub fan relay connector and chassis ground. ***Connector & terminal*** ***(F27) No. 13 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **7**.	Go to step **6**.
5	**CHECK FUSE.** 1) Turn the ignition switch to OFF. 2) Remove the fuse No. 3. 3) Check the condition of fuse.	Is the fuse blown out?	Replace the fuse.	Repair the power supply line.
6	**CHECK FUSE.** 1) Turn the ignition switch to OFF. 2) Remove the fuse No. 22. 3) Check the condition of fuse.	Is the fuse blown out?	Replace the fuse.	Repair the power supply line.
7	**CHECK SUB FAN RELAY.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between sub fan relay terminals. ***Terminals*** ***No. 10 — No. 11:***	Is the resistance 1 MΩ or more?	Go to step **8**.	Replace the sub fan relay.
8	**CHECK SUB FAN RELAY.** 1) Connect the battery to terminals No. 12 and No. 13 of the sub fan relay. 2) Measure the resistance between sub fan relay terminals. ***Terminals*** ***No. 10 — No. 11:***	Is the resistance less than 1 Ω?	Go to step **9**.	Replace the sub fan relay.

	Step	Check	Yes	No
9	**CHECK HARNESS BETWEEN SUB FAN RELAY CONNECTOR AND SUB FAN MOTOR CONNECTOR.** 1) Disconnect the connector from the sub fan motor. 2) Measure the resistance of harness between sub fan relay connector and sub fan motor connector. ***Connector & terminal*** ***(F16) No. 1 — (F27) No. 11:***	Is the resistance less than 1 Ω?	Go to step **10**.	Repair the open circuit of harness between sub fan relay connector and sub fan motor connector.
10	**CHECK HARNESS BETWEEN SUB FAN MOTOR CONNECTOR AND MAIN FAN RELAY 2 CONNECTOR.** 1) Remove main fan relay 2 from the relay holder. 2) Measure the resistance of harness between sub fan motor connector and main fan relay 2 connector. ***Connector & terminal*** ***(F16) No. 2 — (F27) No. 18:***	Is the resistance less than 1 Ω?	Go to step **11**.	Repair the open circuit of the harness between sub fan motor connector and main fan relay 2 connector.
11	**CHECK FOR POOR CONTACT.** Check poor contact of sub fan motor connector.	Is there poor contact of the sub fan motor connector?	Repair the poor contact of sub fan motor connector.	Go to step **12**.
12	**CHECK SUB FAN MOTOR.** Connect the battery positive (+) terminal to terminal No. 1 of the sub fan motor, and the ground (–) terminal to terminal No. 2.	Does the radiator sub fan rotate?	Go to step **13**.	Replace the sub fan motor.
13	**CHECK MAIN FAN RELAY 2.** Measure the resistance between main fan relay 2 terminals. ***Terminals*** ***No. 21 — No. 18:***	Is the resistance less than 1 Ω?	Go to step **14**.	Replace the main fan relay 2.
14	**CHECK HARNESS BETWEEN MAIN FAN RELAY 2 CONNECTOR AND MAIN FAN MOTOR CONNECTOR.** 1) Disconnect the connector from the main fan motor. 2) Measure the resistance of the harness between main fan relay 2 connector and main fan motor connector. ***Connector & terminal*** ***(F17) No. 1 — (F27) No. 21:***	Is the resistance less than 1 Ω?	Go to step **15**.	Repair the open circuit of the harness between main fan relay 2 connector and main fan motor connector.
15	**CHECK MAIN FAN MOTOR AND GROUND CIRCUIT.** Measure the resistance between main fan motor connector and chassis ground. ***Connector & terminal*** ***(F17) No. 2 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **16**.	Repair the open circuit of the harness between main fan motor connector and chassis ground.
16	**CHECK FOR POOR CONTACT.** Check poor contact of main fan motor connector.	Is there poor contact of the main fan motor connector?	Repair the poor contact of main fan motor connector.	Go to step **17**.
17	**CHECK MAIN FAN MOTOR.** Connect the battery positive (+) terminal to terminal No. 1 of the main fan motor, and the ground (–) terminal to terminal No. 2.	Does the radiator main fan rotate?	Go to step **18**.	Replace the main fan motor.

	Step	Check	Yes	No
18	**CHECK HARNESS BETWEEN SUB FAN RELAY CONNECTOR AND ECM.** 1) Disconnect the connector from ECM. 2) Measure the resistance between the sub fan relay connector and ECM connector. ***Connector & terminal*** ***(B135) No. 11 — (F27) No. 12:***	Is the resistance less than 1 Ω?	Go to step **19**.	Repair the open circuit of harness between sub fan relay connector and ECM.
19	**CHECK FOR POOR CONTACT.** Check for poor contact of ECM connector.	Is there poor contact of ECM connector?	Repair the poor contact of ECM connector.	Check the DTC. Repair the trouble cause. <Ref. to EN(H4DOTC)(diag)-44, Read Diagnostic Trouble Code (DTC).>
20	**CHECK MAIN FAN RELAY 1.** 1) Turn the ignition switch to OFF. 2) Remove main fan relay 1 from the main fuse box. 3) Measure the resistance between terminals of main fan relay 1 switch.	Is the resistance 1 MΩ or more?	Go to step **21**.	Replace the main fan relay 1.
21	**CHECK MAIN FAN RELAY 1.** 1) Connect the main fan relay 1 coil side terminal to the battery. 2) Measure the resistance between terminals of main fan relay 1 switch.	Is the resistance less than 1 Ω?	Go to step **22**.	Replace the main fan relay 1.
22	**CHECK HARNESS BETWEEN MAIN FAN RELAY 1 CONNECTOR AND MAIN FAN MOTOR CONNECTOR.** 1) Disconnect the connector from the main fan motor. 2) Measure the resistance of the harness between main fan relay 1 connector and main fan motor connector. ***Connector & terminal*** ***(F17) No. 1 — (F36) No. 6:***	Is the resistance less than 1 Ω?	Go to step **23**.	Repair the open circuit of the harness between main fan relay 1 connector and main fan motor connector.
23	**CHECK HARNESS BETWEEN MAIN FAN RELAY 1 CONNECTOR AND ECM.** 1) Disconnect the connector from ECM. 2) Measure the resistance between the main fan relay 1 connector and ECM connector. ***Connector & terminal*** ***(B135) No. 12 — (B143) No. 7:***	Is the resistance less than 1 Ω?	Go to step **24**.	Repair the open circuit of the harness between main fan relay 1 connector and ECM.
24	**CHECK HARNESS BETWEEN MAIN FAN RELAY 2 CONNECTOR AND ECM.** Measure the resistance between the main fan relay 2 connector and ECM connector. ***Connector & terminal*** ***(B135) No. 12 — (F27) No. 22:***	Is the resistance less than 1 Ω?	Go to step **25**.	Repair the open circuit of the harness between main fan relay 2 connector and ECM.
25	**CHECK FUSE.** 1) Turn the ignition switch to OFF. 2) Remove the fuse No. 2 and No. 26. 3) Check the condition of fuse.	Is the fuse blown out?	Replace the fuse.	Go to step **26**.
26	**CHECK FOR POOR CONTACT.** Check for poor contact of ECM connector.	Is there poor contact of ECM connector?	Repair the poor contact of ECM connector.	Repair the power supply circuit to the main fuse box.
27	**CHECK OPERATION OF RADIATOR FAN.** If the both fans do not rotate at high speed in the condition of step 2, check whether the radiator sub fan is rotating.	Does the radiator sub fan rotate?	Go to step **20**.	Go to step **28**.

	Step	Check	Yes	No
28	**CHECK GROUND CIRCUIT OF MAIN FAN RELAY 2.** 1) Remove main fan relay 2 from the relay holder. 2) Measure the resistance between main fan relay 2 connector and chassis ground. ***Connector & terminal*** ***(F27) No. 19 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **29**.	Repair the open circuit of harness between main fan relay 2 connector and chassis ground.
29	**CHECK POWER SUPPLY TO MAIN FAN RELAY 2.** 1) Turn the ignition switch to ON. 2) Measure the voltage between main fan relay 2 connector and chassis ground. ***Connector & terminal*** ***(F27) No. 20 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **30**.	Repair the power supply line.
30	**CHECK MAIN FAN RELAY 2.** 1) Turn the ignition switch to OFF. 2) Remove the main fan relay 2. 3) Measure the resistance between main fan relay 2 terminals. ***Terminals*** ***No. 18 — No. 19:***	Is the resistance 1 MΩ or more?	Go to step **31**.	Replace the main fan relay 2.
31	**CHECK MAIN FAN RELAY 2.** 1) Connect the battery to terminals No. 20 and No. 22 of the main fan relay 2. 2) Measure the resistance between main fan relay 2 terminals. ***Terminals*** ***No. 18 — No. 19:***	Is the resistance less than 1 Ω?	Go to step **23**.	Replace the main fan relay 2.

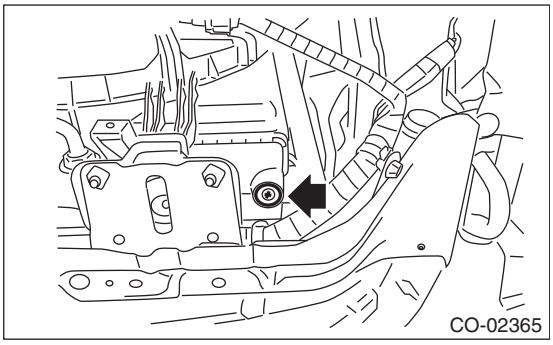
3. Engine Coolant

A: REPLACEMENT

1. DRAINING OF ENGINE COOLANT

1) Lift up the vehicle.
2) Remove the under cover. <Ref. to EI-26, REMOVAL, Front Under Cover.>
3) Remove the drain plug to drain engine coolant into container.

NOTE:
Remove the coolant filler tank cap so that engine coolant will drain faster.



4) Install the drain plug.
5) Install the under cover. <Ref. to EI-26, INSTALLATION, Front Under Cover.>

2. FILLING OF ENGINE COOLANT

1) Pour cooling system conditioner through the filler neck of coolant filler tank.

Cooling system protective agent:
Refer to "SPECIFICATION" for cooling system protective agent. <Ref. to CO(H4DOTC)-2, SPECIFICATION, General Description.>

2) Fill the engine coolant into coolant filler tank up to the filler neck position.

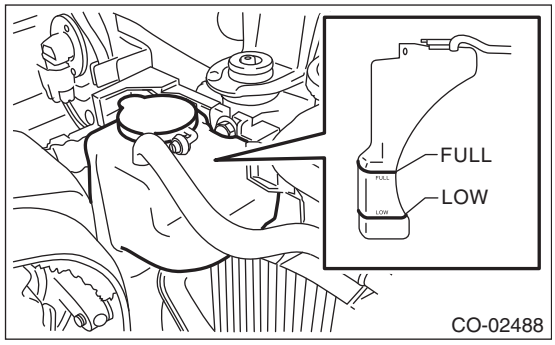
Recommended engine coolant:
Refer to "SPECIFICATION" for recommended engine coolant. <Ref. to CO(H4DOTC)-2, SPECIFICATION, General Description.>

Engine coolant level:
Refer to "SPECIFICATION" for engine coolant level. <Ref. to CO(H4DOTC)-2, SPECIFICATION, General Description.>

Engine coolant concentration:
Refer to "ADJUSTMENT" for the recommended engine coolant concentration. <Ref. to CO(H4DOTC)-14, ADJUSTMENT, Engine Coolant.>

CAUTION:
Do not confuse the cap of coolant filler tank and cap of radiator.

NOTE:
• When pouring the engine coolant, the radiator side cap must not be removed.
• The SUBARU Super Coolant contains anti-freeze and anti-rust agents, and is especially made for Subaru engines with an aluminum cylinder block. Be sure to use SUBARU Super Coolant, since other coolant may cause corrosion.
3) Fill engine coolant into the reservoir tank up to "FULL" level.



4) Close the coolant filler tank cap, and start the engine. Race 5 to 6 times at 3,000 rpm or less, then stop the engine. (Complete this operation within 40 seconds.)
5) Wait for one minute after the engine stops, then open the coolant filler tank cap. If the engine coolant level drops, add engine coolant into coolant filler tank up to the filler neck position.
6) Perform the procedures 4) and 5) again.
7) Install the coolant filler tank cap and reservoir tank cap properly.
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) or less.
11) Open the coolant filler tank cap. If the engine coolant level drops, add engine coolant into the coolant filler tank up to the filler neck position and the reservoir tank to "FULL" level.
12) Install the coolant filler tank cap and reservoir tank cap properly.
13) Set the heater setting to maximum hot position and the blower speed setting to "LO" and start the engine. Perform racing at 3,000 rpm or less. If the flowing sound is heard from the heater core, repeat the procedures from step 9).

B: ADJUSTMENT

1. PROCEDURE TO ADJUST THE CONCENTRATION OF THE SUBARU SUPER COOLANT

CAUTION:
SUBARU Super Coolant concentration must be used from 50 to 60 % to assure the best performance of the anti-freeze and anti-rust agents.
To adjust the concentration of SUBARU Super Coolant according to temperature, find the proper SUBARU Super Coolant concentration from the table and adjust SUBARU Super Coolant (concentrated type) to the concentration with water for dilution.

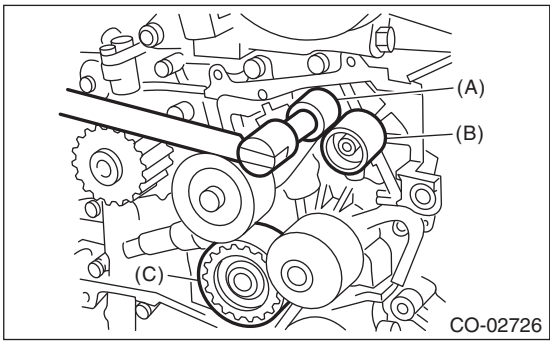
RELATIONSHIP OF SUBARU SUPER COOLANT CONCENTRATION AND FREEZING TEMPERATURE			
Concentration of SUBARU Super Coolant	50%	55%	60%
Freezing temperature	–36°C (–33°F)	–41°C (–42°F)	–50°C (–58°F)

Recommended Engine Coolant and Water for Dilution:
Refer to "SPECIFICATION" for the recommended engine coolant and water for dilution. <Ref. to CO(H4DOTC)-2, SPECIFICATION, General Description.>

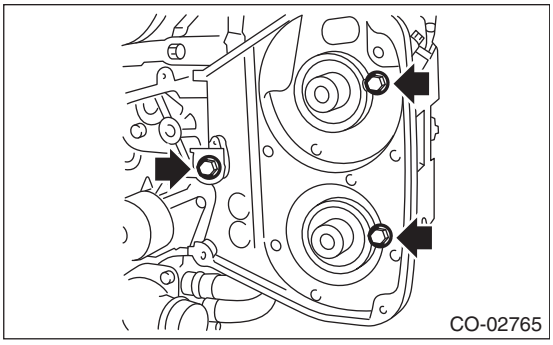
4. Water Pump

A: REMOVAL

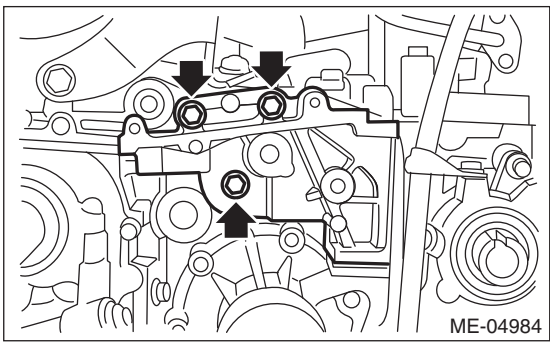
1) Remove the collector cover.
2) Remove the radiator. <Ref. to CO(H4DOTC)-19, REMOVAL, Radiator.>
3) Remove the V-belts. <Ref. to ME(H4DOTC)-38, REMOVAL, V-belt.>
4) Remove the crank pulley. <Ref. to ME(H4DOTC)-46, REMOVAL, Crank Pulley.>
5) Remove the timing belt cover. <Ref. to ME(H4DOTC)-48, REMOVAL, Timing Belt Cover.>
6) Remove the timing belt. <Ref. to ME(H4DOTC)-49, REMOVAL, Timing Belt.>
7) Remove the automatic belt tension adjuster (A).
8) Remove the belt idler (B).
9) Remove the belt idler No. 2 (C).



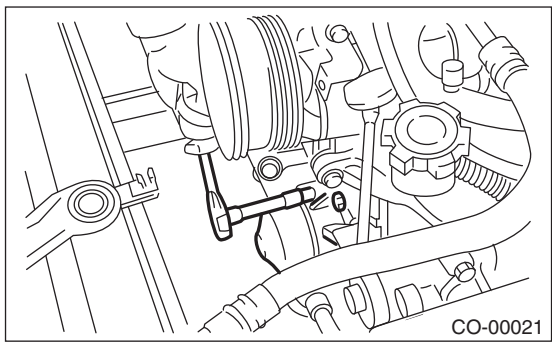
10) Remove the cam sprocket LH. <Ref. to ME(H4DOTC)-56, REMOVAL, Cam Sprocket.>
11) Remove the belt cover No. 2 LH.



12) Remove the tensioner bracket.



13) Disconnect the hose from water pump.
14) Remove the water pump.

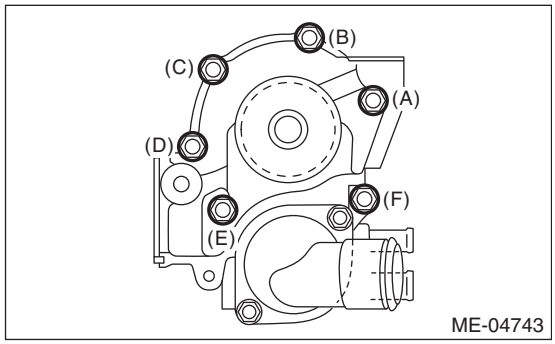


B: INSTALLATION

1) Install the water pump onto cylinder block LH.

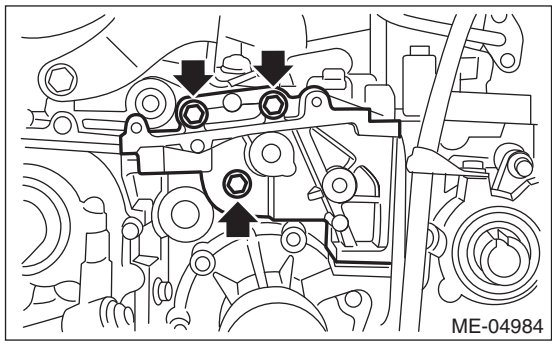
NOTE:
- Use a new gasket.
- When installing the water pump, tighten the bolts in two stages in alphabetical sequence as shown in figure.

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)



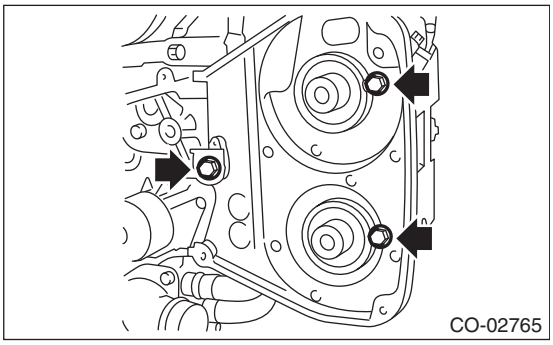
2) Install the hose to water pump.
3) Install the tensioner bracket.

Tightening torque:
24.5 N·m (2.5 kgf-m, 18.1 ft-lb)



4) Install the belt cover No. 2 LH.

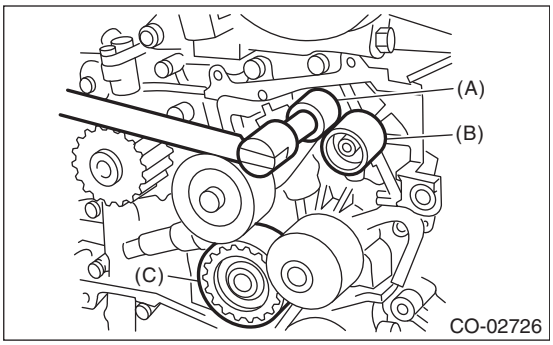
Tightening torque:
5 N·m (0.5 kgf-m, 3.7 ft-lb)



5) Install the cam sprocket LH. <Ref. to ME(H4DOTC)-56, INSTALLATION, Cam Sprocket.>
6) Install the belt idler No. 2 (C).

Tightening torque:
39 N·m (4.0 kgf-m, 28.8 ft-lb)
7) Install the belt idler (B).

Tightening torque:
25 N·m (2.5 kgf-m, 18.4 ft-lb)
8) Install the automatic belt tension adjuster (A) with the tension rod held by a pin. <Ref. to ME(H4DOTC)-50, AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER, INSTALLATION, Timing Belt.>

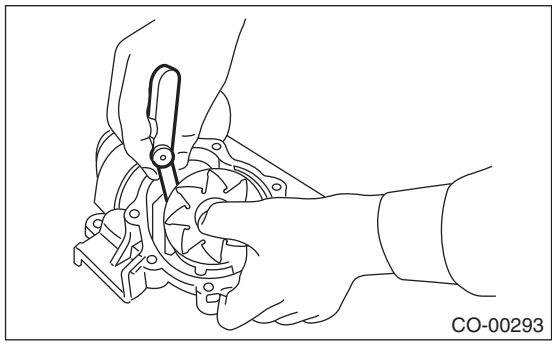


9) Install the timing belt. <Ref. to ME(H4DOTC)-51, TIMING BELT, INSTALLATION, Timing Belt.>
10) Install the timing belt cover. <Ref. to ME(H4DOTC)-48, INSTALLATION, Timing Belt Cover.>
11) Install the crank pulley. <Ref. to ME(H4DOTC)-46, INSTALLATION, Crank Pulley.>
12) Install the V-belts. <Ref. to ME(H4DOTC)-38, INSTALLATION, V-belt.>
13) Install the radiator. <Ref. to CO(H4DOTC)-20, INSTALLATION, Radiator.>
14) Install the collector cover.

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 abnormally deformed or damaged.
4) Inspect the clearance between impeller and pump case.

Clearance between impeller and pump case:
Standard
0.5 — 1.5 mm (0.020 — 0.059 in)

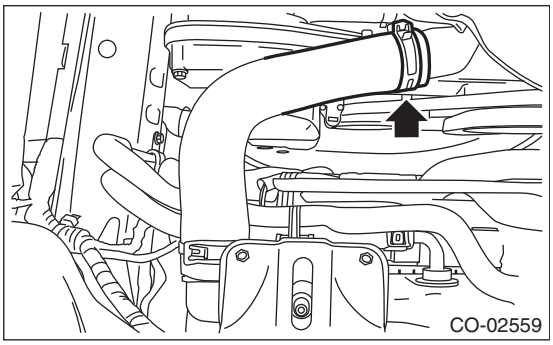


5) After water pump installation, check pulley shaft for engine coolant leaks or noise. If leaks or noise are noted, replace the water pump assembly.

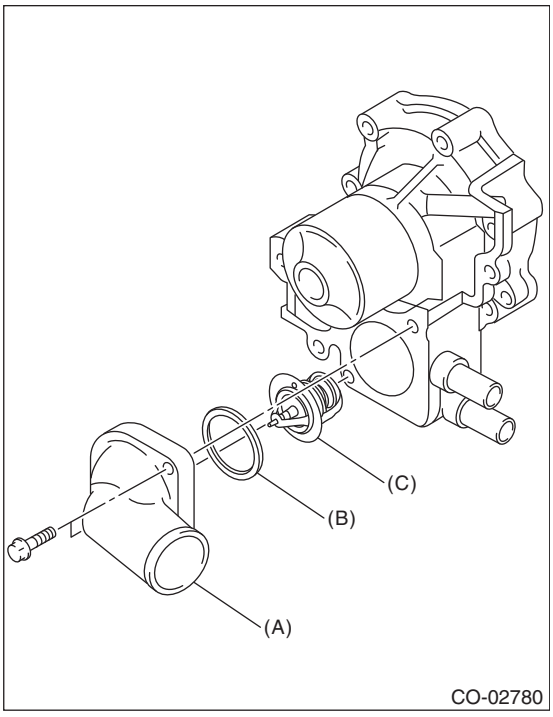
5. Thermostat

A: REMOVAL

1) Lift up the vehicle.
2) Remove the under cover. <Ref. to EI-26, REMOVAL, Front Under Cover.>
3) Drain engine coolant. <Ref. to CO(H4DOTC)-13, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
4) Disconnect the radiator outlet hose from thermostat cover.



5) Remove the thermostat cover, and then remove the gasket and thermostat.



(A) Thermostat cover
(B) Gasket
(C) Thermostat

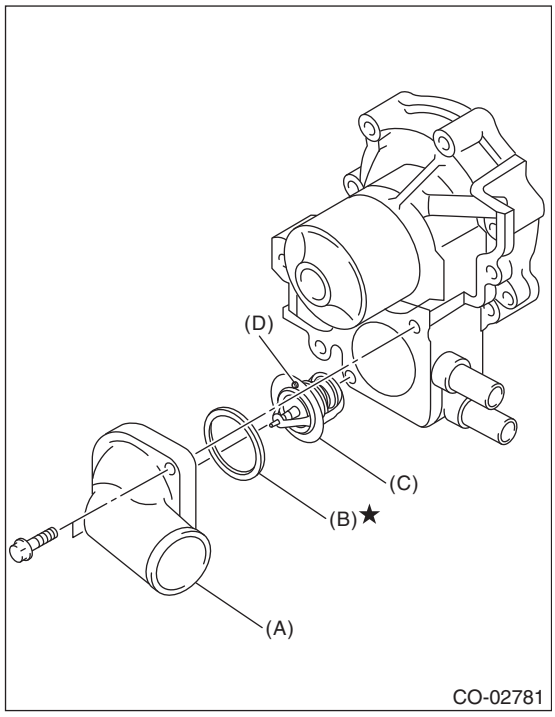
B: INSTALLATION

1) Install a gasket to thermostat.

NOTE:
Use a new gasket.
2) Install the thermostat and thermostat cover.

NOTE:
Install the parts 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

3) Connect the radiator outlet hose to thermostat cover.
4) Install the under cover. <Ref. to EI-26, INSTALLATION, Front Under Cover.>
5) Lower the vehicle.
6) Fill engine coolant. <Ref. to CO(H4DOTC)-13, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

C: INSPECTION

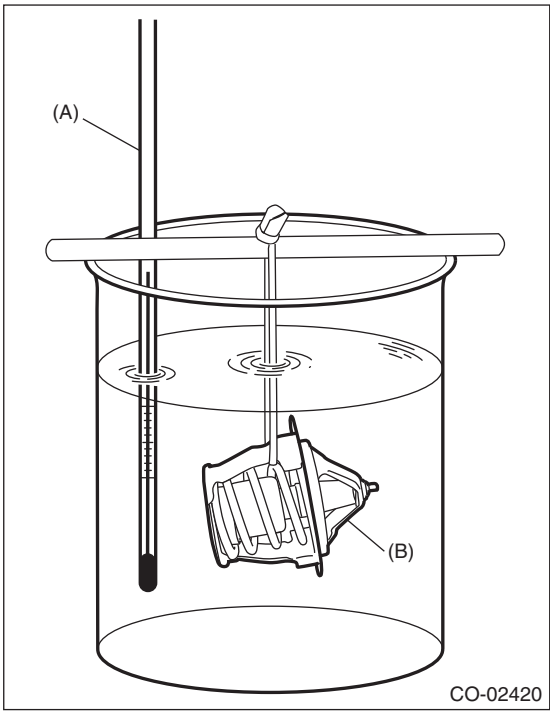
1) Check that the thermostat does not have deformation, cracks or damage.
2) Check that the thermostat valve closes completely at an ambient temperature.
3) Immerse the thermostat and a thermometer in water. Raise water temperature gradually, and check the temperature and valve lift when the valve begins to open and when the valve is fully opened. Replace the thermostat if faulty.

NOTE:
• During the test, agitate the water for even temperature distribution.
• Leave the thermostat in the boiling water for five minutes or more before measuring the valve lift.
• Hold the thermostat with a wire or the like to avoid contacting the container.

Starting temperature to open:
76 — 80°C (169 — 176°F)

Full open temperature:
91°C (196°F)

Total valve lift:
9.0 mm (0.354 in) or more



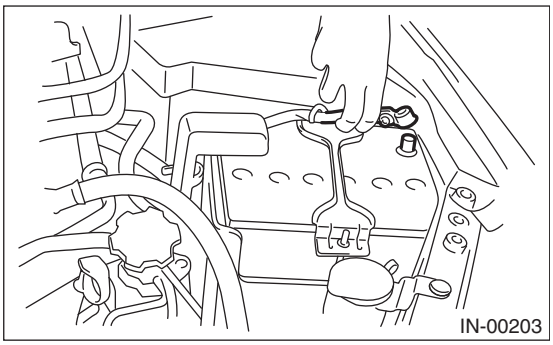
(A) Thermometer
(B) Thermostat

6. Radiator

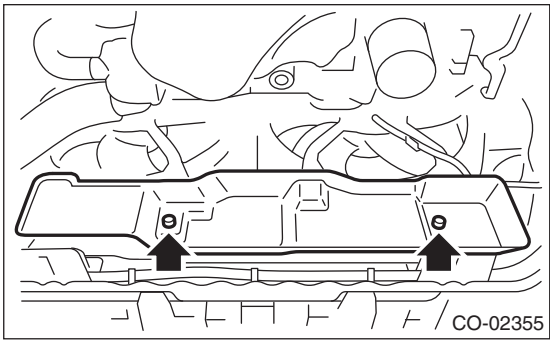
A: REMOVAL

CAUTION:
The radiator is pressurized when the engine and radiator are hot. Wait until engine and radiator cool down before working on the radiator.

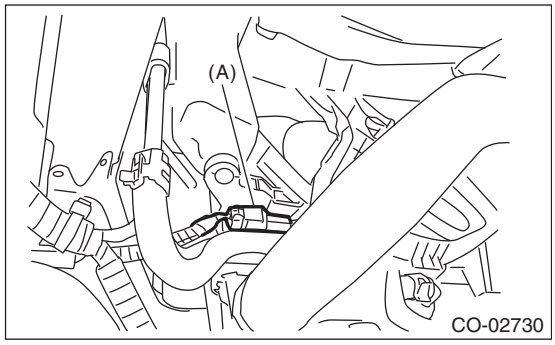
1) Remove the collector cover.
2) Disconnect the ground cable from battery.

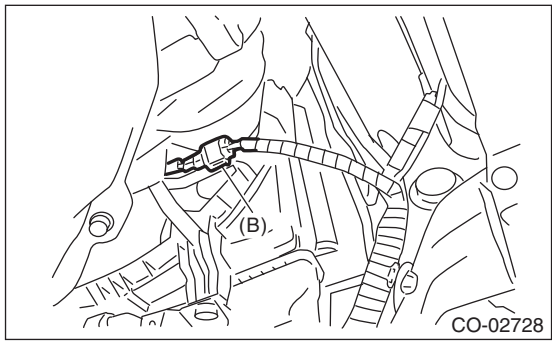


3) Lift up the vehicle.
4) Remove the under cover. <Ref. to EI-26, REMOVAL, Front Under Cover.>
5) Remove the heat shield cover from radiator.

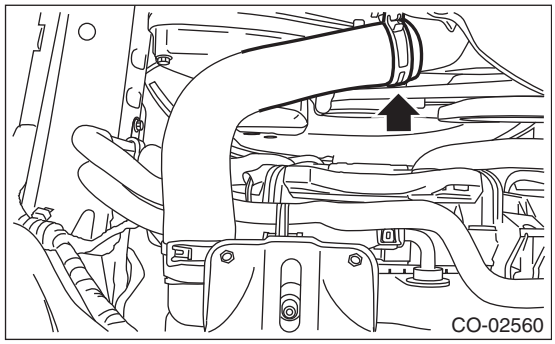


6) Drain engine coolant. <Ref. to CO(H4DOTC)-13, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
7) Disconnect the connector (A) from the main fan motor and the connector (B) from the sub fan motor.



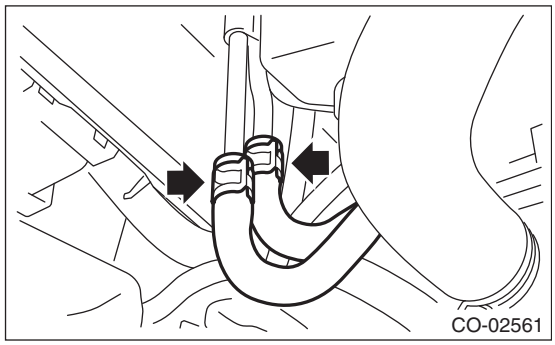


8) Disconnect the radiator outlet hose from thermostat cover.



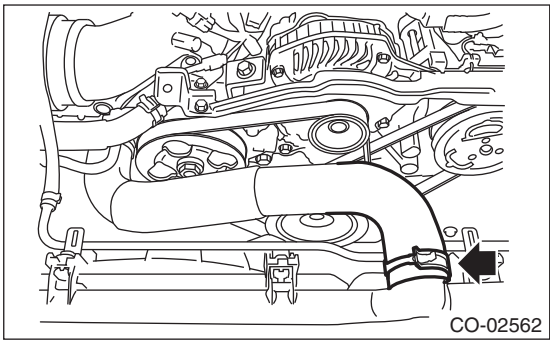
9) Disconnect the ATF hoses from ATF pipes.

NOTE:
Plug the ATF pipe to prevent ATF from leaking.

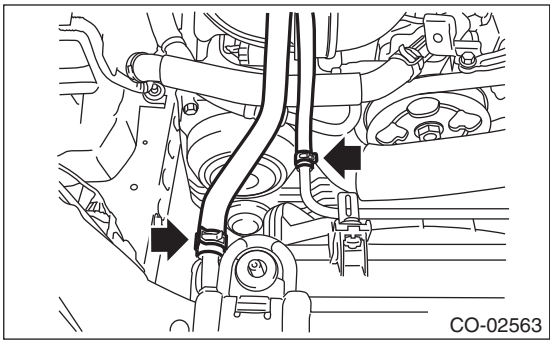


10) Lower the vehicle.
11) Remove the air intake duct. <Ref. to IN(H4DOTC)-10, REMOVAL, Air Intake Duct.>
12) Remove the reservoir tank. <Ref. to CO(H4DOTC)-28, REMOVAL, Reservoir Tank.>

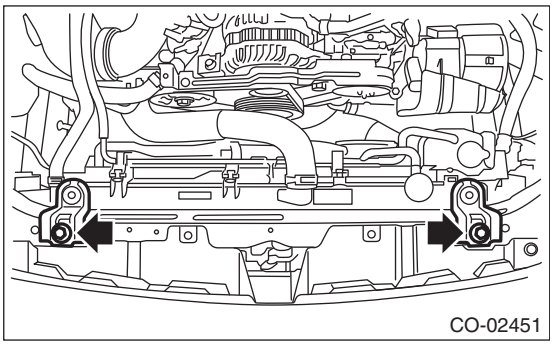
13) Disconnect the radiator inlet hose from the radiator.



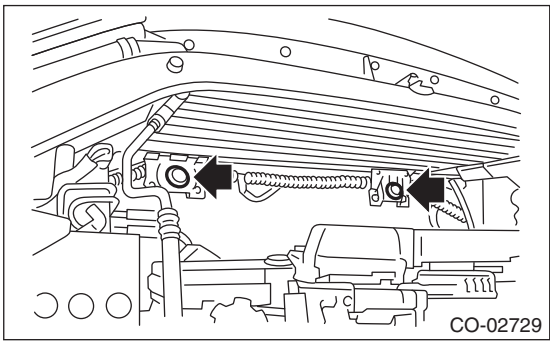
14) Disconnect the two engine coolant hoses from the radiator.



15) Remove the radiator upper brackets.

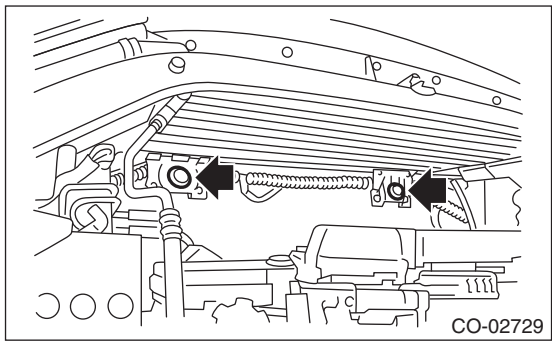


16) Move the radiator to the left while lifting it upward.
17) Lift the radiator up and remove the radiator from vehicle.
18) Remove the radiator lower cushion from the radiator lower bracket.



B: INSTALLATION

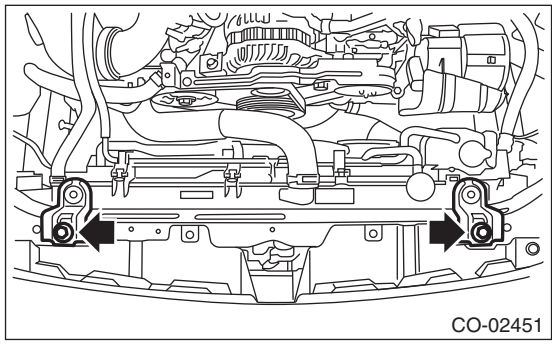
1) Attach the radiator lower cushion to the radiator lower bracket.



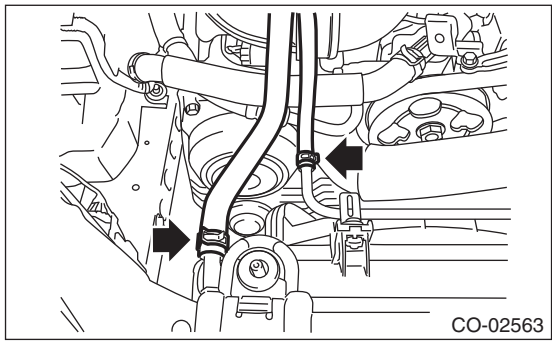
2) Install the radiator to vehicle.

NOTE:
Make pins on the lower side of radiator be fitted into the radiator lower cushions.
3) Install the radiator upper brackets.

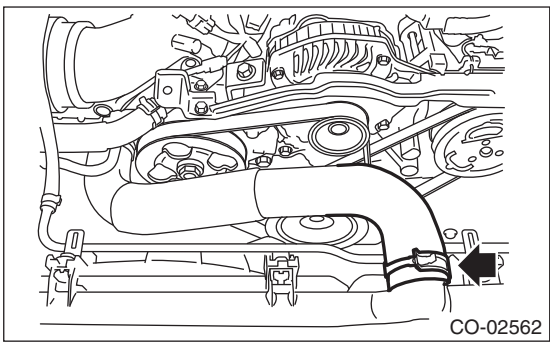
Tightening torque:
12 N·m (1.2 kgf-m, 8.9 ft-lb)



4) Connect the two engine coolant hoses to the radiator.

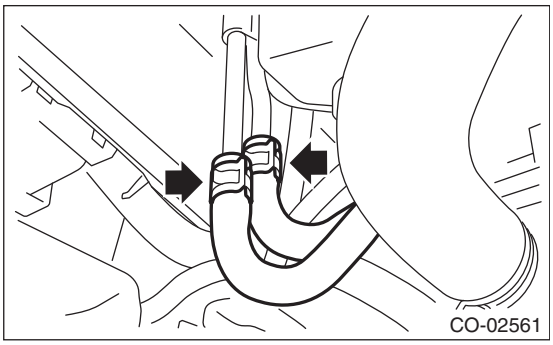


5) Connect the radiator inlet hose.

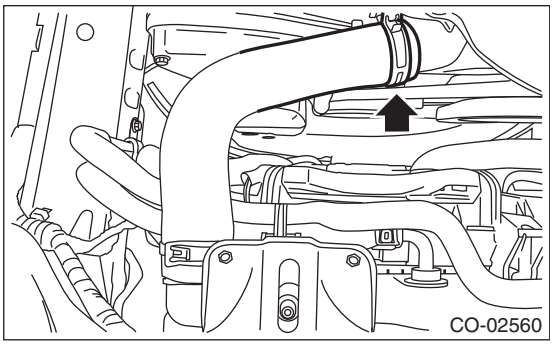


6) Install the reservoir tank. <Ref. to CO(H4DOTC)-28, INSTALLATION, Reservoir Tank.>
7) Install the air intake duct. <Ref. to IN(H4DOTC)-10, INSTALLATION, Air Intake Duct.>
8) Lift up the vehicle.
9) Connect the ATF hoses.

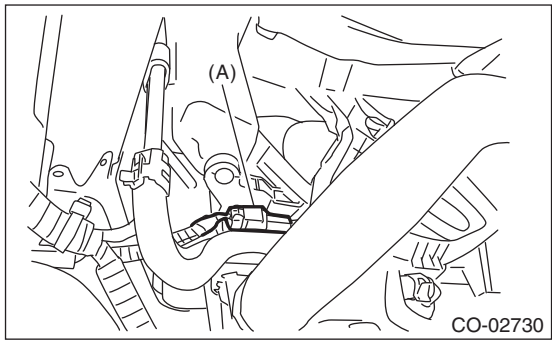
NOTE:
Use a new ATF hose.

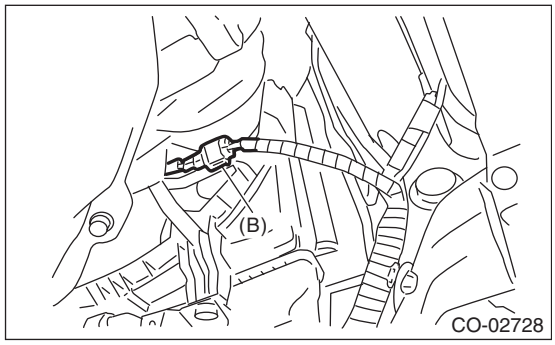


10) Connect the radiator outlet hose.



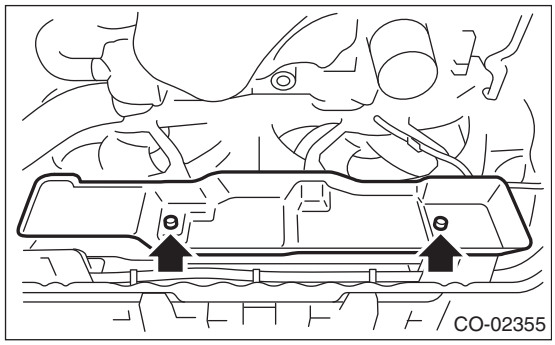
11) Connect the connector (A) to the main fan motor and the connector (B) to the sub fan motor.



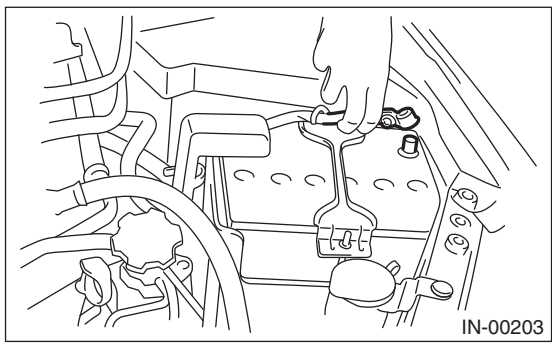


12) Install the heat shield cover to the radiator.

Tightening torque:
3 N·m (0.3 kgf-m, 2.2 ft-lb)



13) Install the under cover. <Ref. to EI-26, INSTALLATION, Front Under Cover.>
14) Lower the vehicle.
15) Connect the battery ground terminal.

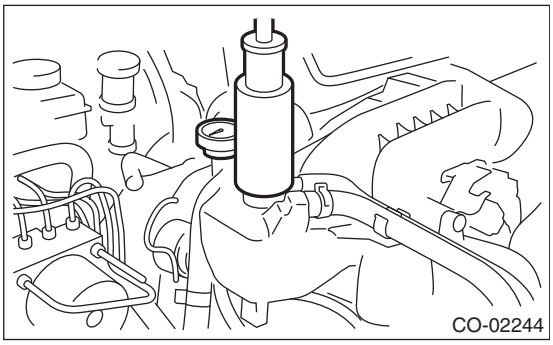


16) Fill engine coolant. <Ref. to CO(H4DOTC)-13, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

17) Check the ATF level. <Ref. to 4AT-27, INSPECTION, Automatic Transmission Fluid.>
18) Install the collector cover.

C: INSPECTION

1) Check that the radiator does not have deformation, cracks or damage.
2) Check that the hose has no cracks, damage or loose part.
3) Remove the coolant filler tank cap, fill the coolant filler tank with engine coolant, then install the radiator cap tester to the filler neck of coolant filler tank.



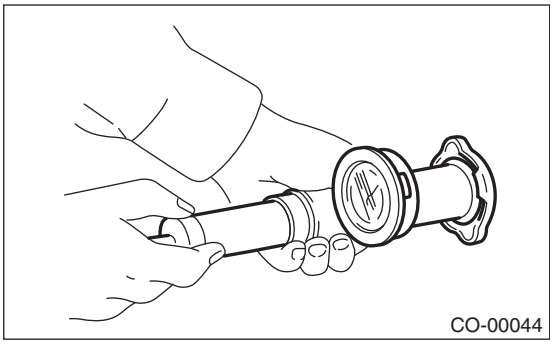
4) Apply a pressure of 122 kPa (1.2 kg/cm^2, 18 psi) to the radiator and check the following points:
- Leakage from the radiator or its vicinity
- Leakage from the hose or its connections

CAUTION:
• Inspection must be carried out at the side of coolant filler tank, not at the side of radiator.
• Engine should be turned off.
• Wipe engine coolant from check points in advance.
• Be careful of the spurt of engine coolant when removing the radiator cap tester.
• Be careful not to deform the filler neck of the coolant filler tank when installing and removing the radiator cap tester.

7. Radiator Cap

A: INSPECTION

1) Check that the radiator cap does not have deformation, cracks or damage.
2) Attach the radiator cap tester to radiator cap.



3) Increase pressure until the radiator cap tester gauge needle stops. Radiator cap is functioning properly if it holds the service limit pressure for 5 — 6 seconds. Replace the radiator cap if its valve opens at less than the service limit.

Coolant filler tank side:
Standard
93 — 123 kPa (0.95 — 1.25 kg/cm^2, 14 — 18 psi)
Service limit
83 kPa (0.85 kg/cm^2, 12 psi)

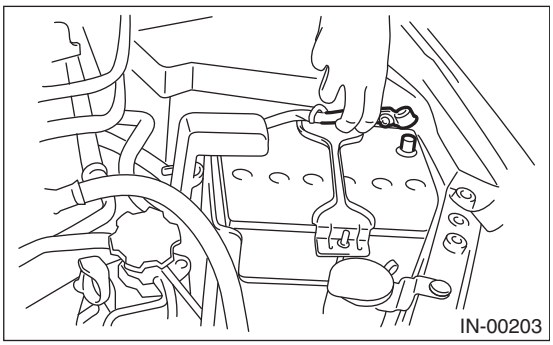
Radiator side:
Standard
122 — 152 kPa (1.24 — 1.55 kg/cm^2, 18 — 22 psi)
Service limit
112 kPa (1.14 kg/cm^2, 16 psi)

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.

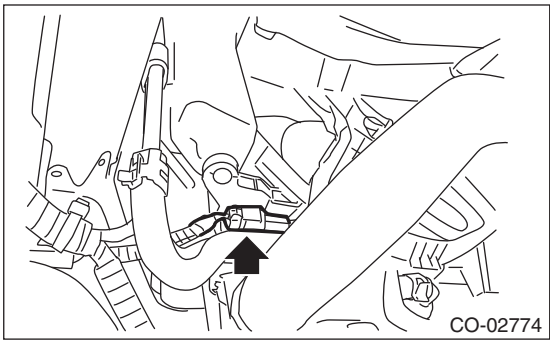
8. Radiator Main Fan and Fan Motor

A: REMOVAL

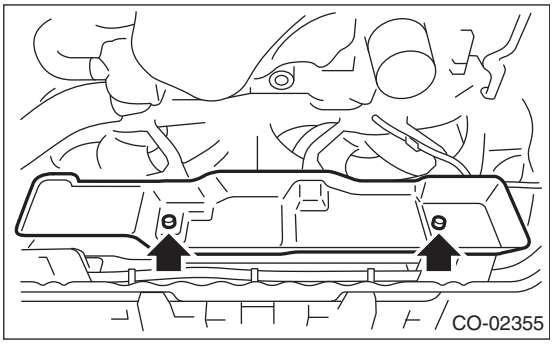
1) Remove the collector cover.
2) Disconnect the ground cable from battery.



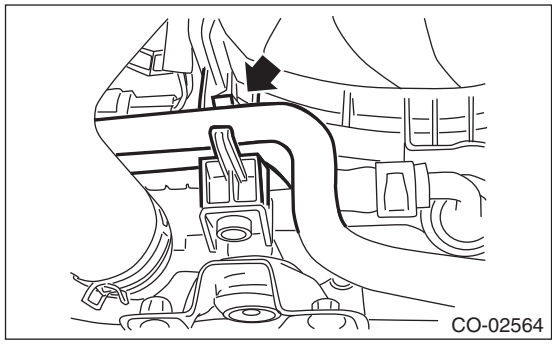
3) Lift up the vehicle.
4) Remove the under cover. <Ref. to EI-26, REMOVAL, Front Under Cover.>
5) Disconnect the connector from the main fan motor.



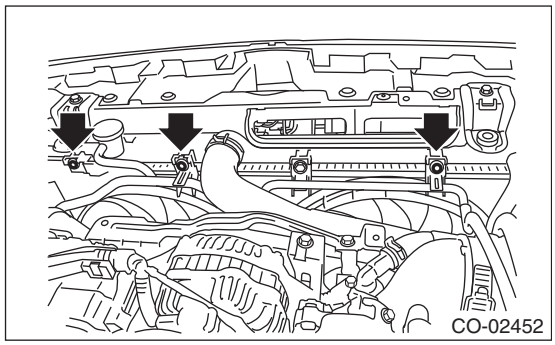
6) Remove the heat shield cover from radiator.



7) Remove the ATF hose from the hose clip of the radiator main fan motor assembly.



8) Lower the vehicle.
9) Remove the air intake duct (Rear). <Ref. to IN(H4DOTC)-10, REMOVAL, Air Intake Duct.>
10) Remove the reservoir tank. <Ref. to CO(H4DOTC)-28, REMOVAL, Reservoir Tank.>
11) Remove the bolts which secure the radiator main fan motor assembly and the over flow pipe.



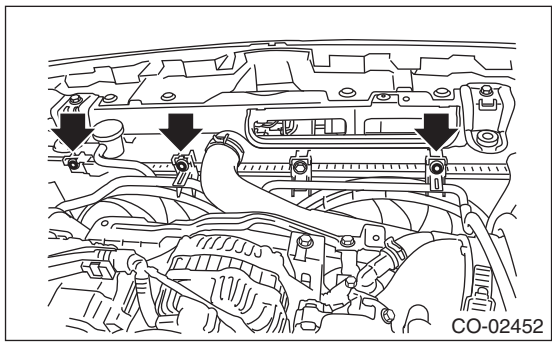
12) Remove the radiator main fan motor assembly from the upper side of the vehicle.

B: INSTALLATION

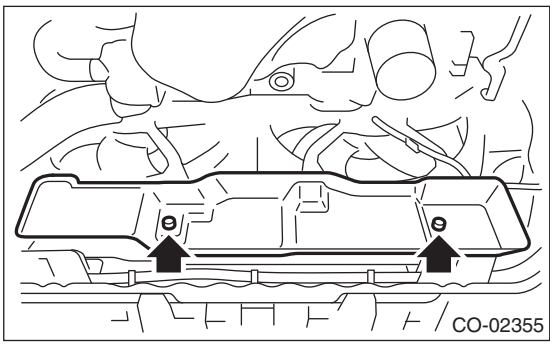
Install in the reverse order of removal.

CAUTION:
Check if the radiator hose and the over flow hose are properly connected.

Tightening torque:
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)

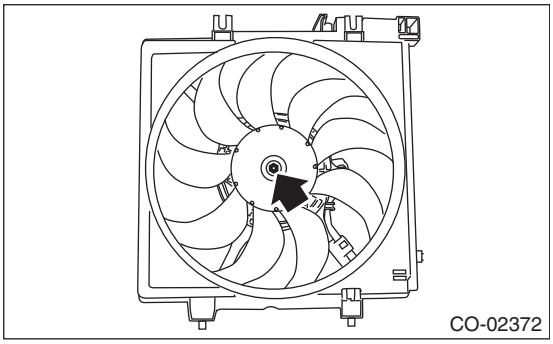


Tightening torque:
3 N·m (0.3 kgf-m, 2.2 ft-lb)

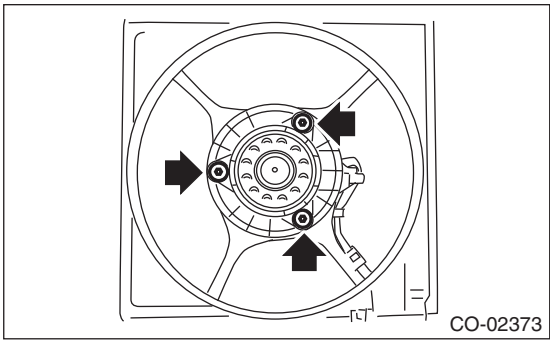


C: DISASSEMBLY

1) Remove the clip which secures the main fan motor connector onto the radiator main fan shroud.
2) Remove the radiator main fan from the main fan motor.



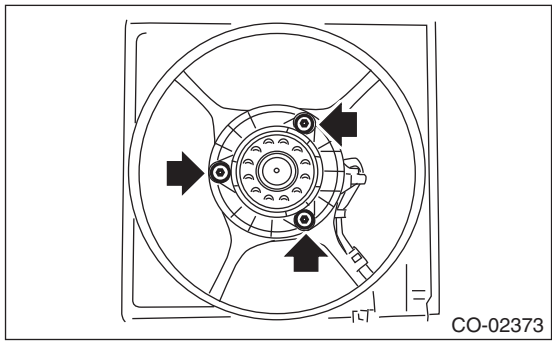
3) Remove the main fan motor from the radiator main fan shroud.



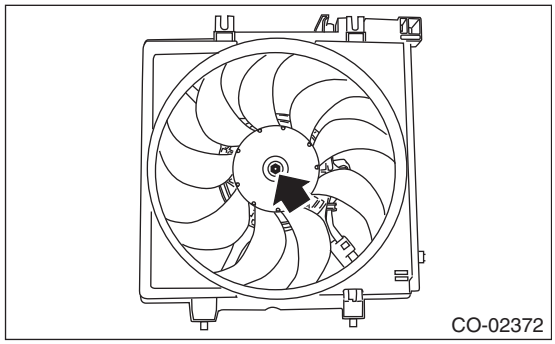
D: ASSEMBLY

Assemble in the reverse order of disassembly.

Tightening torque:
4.41 N·m (0.45 kgf-m, 3.25 ft-lb)



Tightening torque:
3.4 N·m (0.3 kgf-m, 2.5 ft-lb)



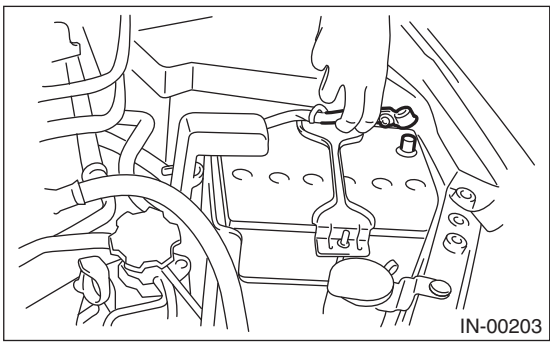
E: INSPECTION

Check that the radiator main fan, radiator main fan shroud and main fan motor do not have deformation, cracks or damage.

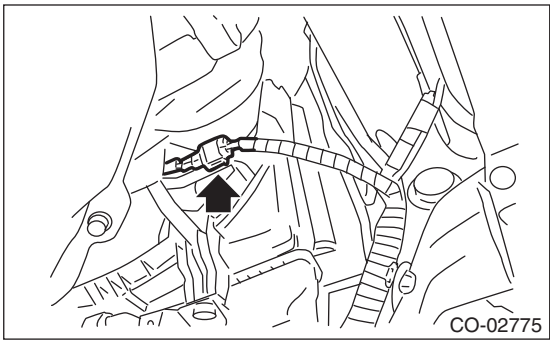
9. Radiator Sub Fan and Fan Motor

A: REMOVAL

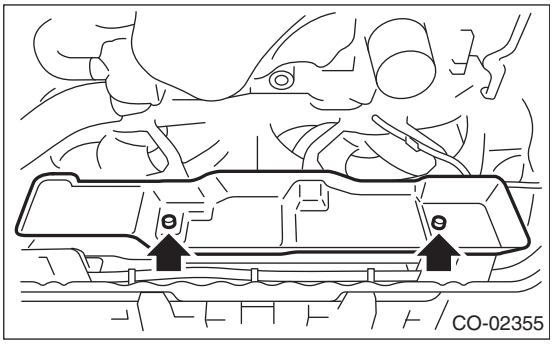
1) Remove the collector cover.
2) Disconnect the ground cable from battery.



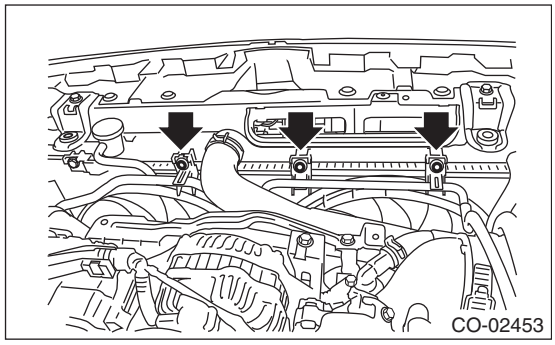
3) Lift up the vehicle.
4) Remove the under cover. <Ref. to EI-26, REMOVAL, Front Under Cover.>
5) Disconnect the connector from the sub fan motor.



6) Remove the heat shield cover from radiator.



7) Lower the vehicle.
8) Remove the air intake duct (Rear). <Ref. to IN(H4DOTC)-10, REMOVAL, Air Intake Duct.>
9) Remove the bolts which secure the radiator sub fan motor assembly and the over flow pipe.



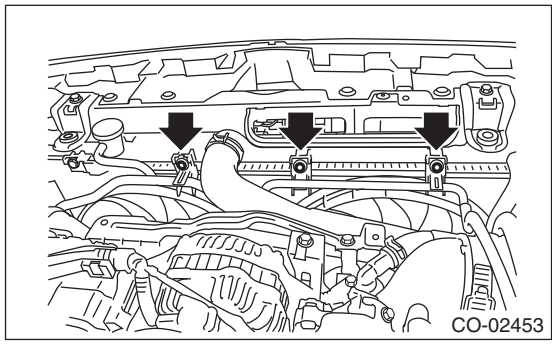
10) Raise the radiator sub fan motor assembly slightly, remove the pin at the lower part of the radiator sub fan motor assembly from the radiator hole, and remove the radiator sub fan motor assembly from the lower side of the vehicle.

B: INSTALLATION

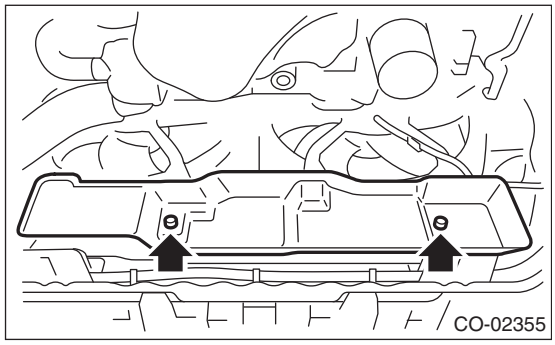
Install in the reverse order of removal.

CAUTION:
Check if the radiator hose and the over flow hose are properly connected.

Tightening torque:
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)

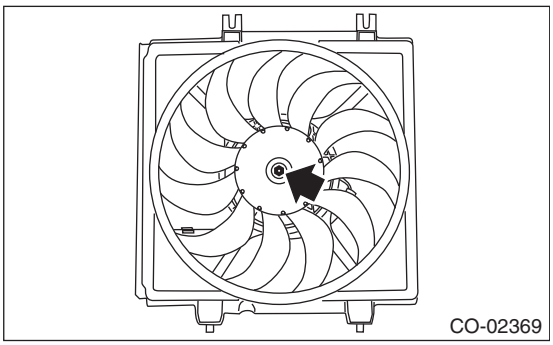


Tightening torque:
3 N·m (0.3 kgf-m, 2.2 ft-lb)

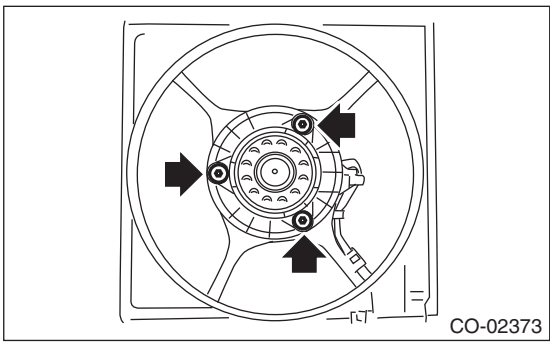


C: DISASSEMBLY

1) Remove the clip which secures the sub fan motor connector onto the radiator sub fan shroud.
2) Remove the radiator sub fan from the sub fan motor.



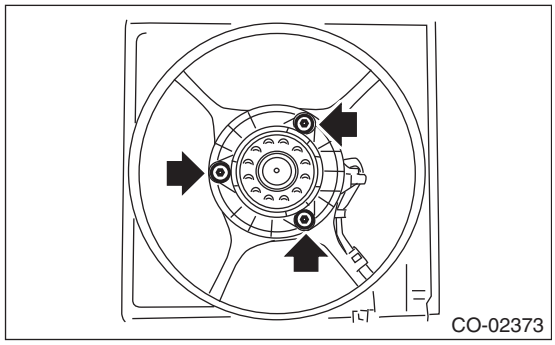
3) Remove the sub fan motor from the radiator sub fan shroud.



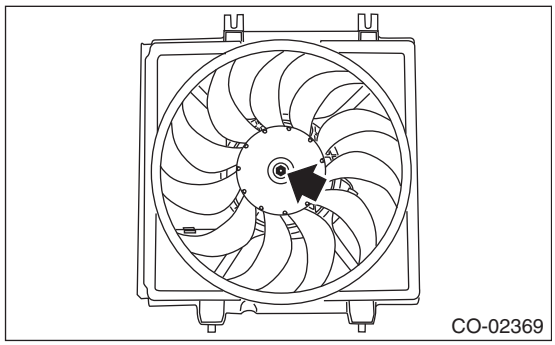
D: ASSEMBLY

Assemble in the reverse order of disassembly.

Tightening torque:
4.41 N·m (0.45 kgf-m, 3.25 ft-lb)



Tightening torque:
3.4 N·m (0.3 kgf-m, 2.5 ft-lb)



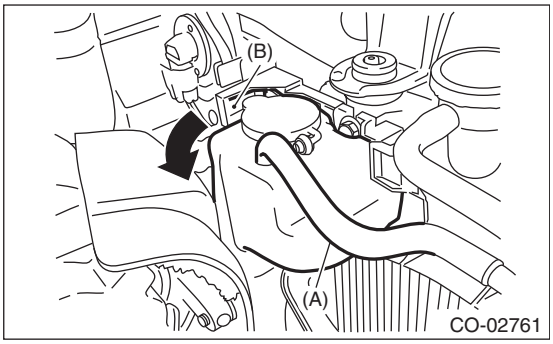
E: INSPECTION

Check that the radiator sub fan, radiator sub fan shroud and sub fan motor do not have deformation, cracks or damage.

10.Reservoir Tank

A: REMOVAL

1) Pull out the over flow hose (A).
2) Pull out the reservoir tank to the arrow direction while pushing the claw (B).



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

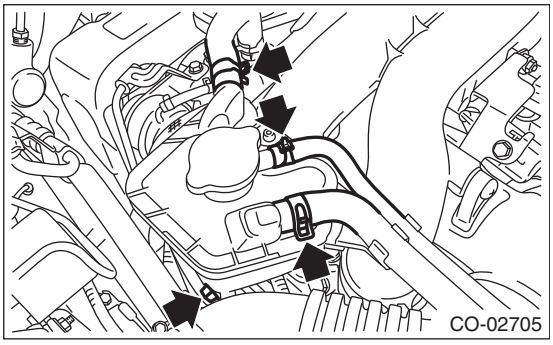
1) Check that the reservoir tank does not have deformation, cracks or damage.
2) Check the over flow hose for cracks or damage.
3) Make sure the engine coolant level is between “FULL” and “LOW”.

11.Coolant Filler Tank

A: REMOVAL

CAUTION:
The coolant filler tank is pressurized when the engine and radiator are hot. Wait until engine and radiator cool down before working on the coolant filler tank.

1) Remove the collector cover.
2) Drain approximately 3.0 ℓ (3.2 US qt, 2.6 Imp qt) of coolant. <Ref. to CO(H4DOTC)-13, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
3) Disconnect the engine coolant hoses from coolant filler tank.
4) Remove the bolts which secure the coolant filler tank.



5) Disconnect the engine coolant hose which connects the under side of coolant filler tank.
6) Remove the coolant filler tank.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
16 N·m (1.6 kgf-m, 11.8 ft-lb)

C: INSPECTION

1) Check that the coolant filler tank does not have deformation, cracks or damage.
2) Check that the engine coolant hose has no cracks, damage or loose part.

12.Engine Cooling System Trouble in General

A: INSPECTION

Trouble	Possible cause	Corrective action
Over-heating	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 ignition control system. <Ref. to EN(H4DOTC)(diag)-2, PROCEDURE, Basic Diagnostic Procedure.>
	h. Clogged or leaking radiator	Clean, repair or replace.
	i. Defective radiator fan	Replace.
	j. Improper engine oil in engine coolant	Replace the engine coolant. If ineffective, check, repair or replace engine components.
	k. Air/fuel mixture ratio too lean	Inspect and repair the fuel injection system. <Ref. to EN(H4DOTC)(diag)-2, PROCEDURE, Basic Diagnostic Procedure.>
	l. Excessive back pressure in exhaust system	Clean or replace.
	m. Insufficient clearance between piston and cylinder	Adjust 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	Repair or replace.
	b. Leakage from water pump	Replace.
	c. Leakage from water pipe	Repair or replace.
	d. Leakage around cylinder head gasket	Retighten cylinder head bolts or replace cylinder head gasket.
	e. Damaged or cracked cylinder head and cylinder block	Repair or replace.
	f. Damaged or cracked thermostat cover	Repair or replace.
	g. Leakage from radiator	Repair or replace.
Noise	a. Timing belt problem	Replace.
	b. Defective radiator fan	Replace.
	c. Defective water pump bearing	Replace water pump.
	d. Defective water pump mechanical seal	Replace water pump.

LUBRICATION

LU(H4DOTC)

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4. Oil Pump 11
5. Oil Pan and Strainer 15
6. Oil Pressure Switch 19
7. Oil Pipe 21
8. Engine Oil Filter 26
9. Engine Lubrication System Trouble in General 27

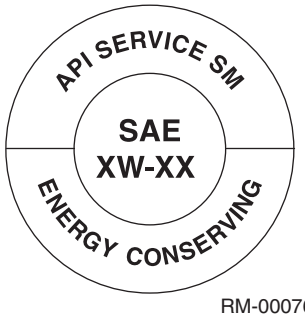
1. General Description

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			mm (in)	76 × 10 (2.99 × 0.39)
	Tip clearance between inner and outer rotors			mm (in) Standard	0.04 — 0.14 (0.0016 — 0.0055)
	Case clearance between outer rotor and pump case			mm (in) Standard	0.10 — 0.175 (0.0039 — 0.0069)
	Side clearance between inner rotor and pump case			mm (in) Standard	0.02 — 0.07 (0.0008 — 0.0028)
	Relief valve spring	Free length		mm (in)	73.7 (2.902)
		Installed length		mm (in)	54.7 (2.154)
		Load when installed		N (kgf, lbf)	93.1 (9.49, 20.93)
	Performance (Oil temperature 80°C (176°F))	600 rpm	Discharge pressure	kPa (kgf/cm^2, psi)	98 (1.0, 14)
			Discharge rate	ℓ (US qt, Imp qt)/min.	4.6 (4.9, 4.0) or more
		5,000 rpm	Discharge pressure	kPa (kgf/cm^2, psi)	294 (3.0, 43)
			Discharge rate	ℓ (US qt, Imp qt)/min.	47.0 (49.7, 41.4) or more
	Relief valve working pressure			kPa (kgf/cm^2, psi)	588 (6.0, 85)
Oil filter	Filter type				Full-flow filter type
	Filtration area cm^2 (sq in)		Outer diameter: 68 mm (2.68 in) (Black)		800 (124)
			Outer diameter: 67.4 mm (2.65 in) (Blue)		555 (86)
	By-pass valve opening pressure			kPa (kgf/cm^2, psi)	160 (1.63, 23.2)
	Outer diameter × width mm (in)		Outer diameter: 68 mm (2.68 in) (Black)		68 × 65 (2.68 × 2.56)
			Outer diameter: 67.4 mm (2.65 in) (Blue)		67.4 × 65.3 (2.65 × 2.57)
	Installation screw specifications				M 20 × 1.5
Oil pressure switch	Type				Immersed contact point type
	Operating voltage — power consumption				12 V — 3.4 W or less
	Warning light operating pressure			kPa (kgf/cm^2, psi)	14.7 (0.15, 2.1)
	Proof pressure			kPa (kgf/cm^2, psi)	981 (10, 142) or more
Engine oil	Total capacity (at overhaul)			ℓ (US qt, Imp qt)	5.0 (5.3, 4.4)
	When replacing engine oil and oil filter			ℓ (US qt, Imp qt)	4.2 (4.4, 3.7)
	When replacing engine oil only			ℓ (US qt, Imp qt)	4.0 (4.2, 3.5)

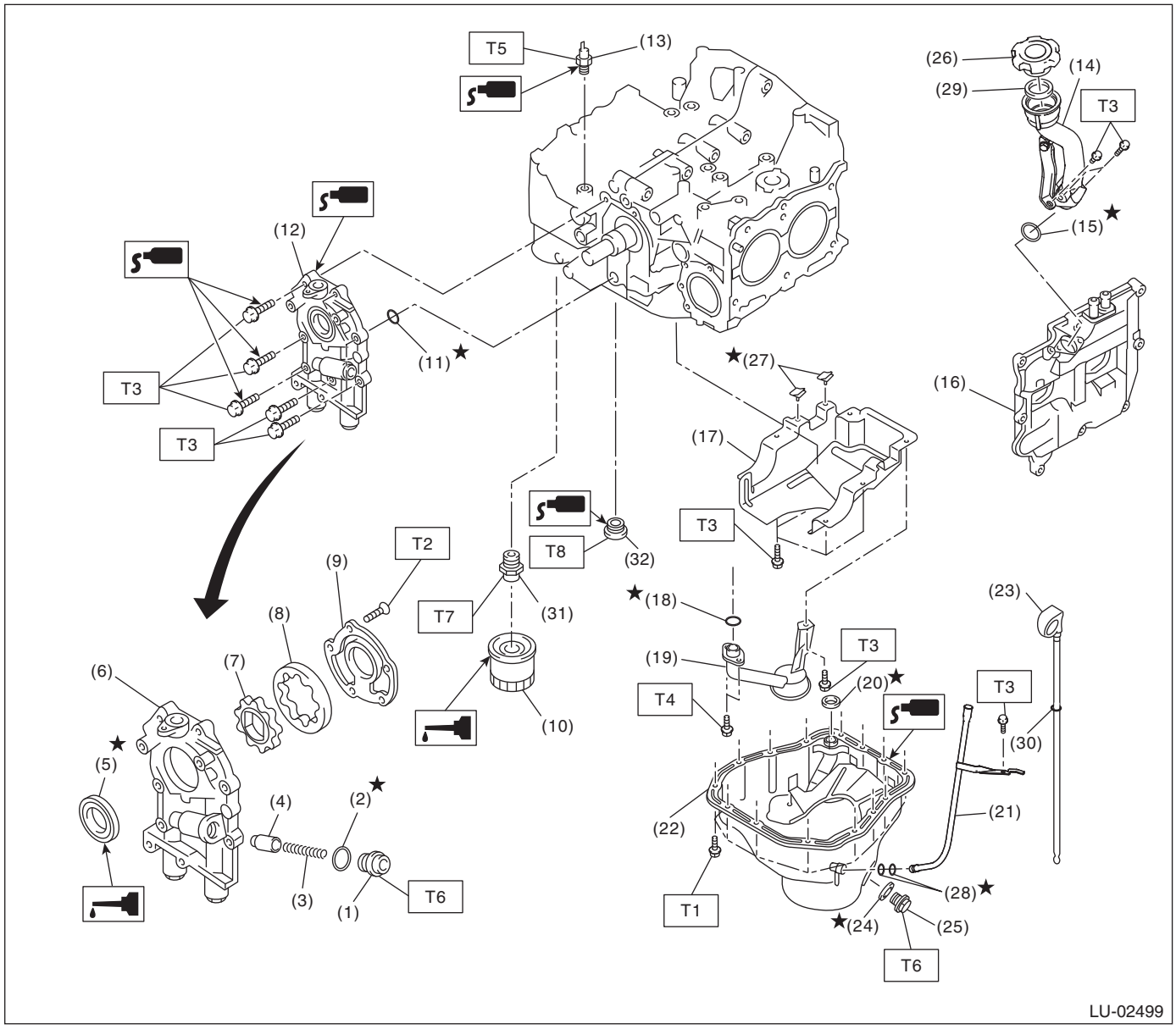
Required oil:

CAUTION:
- **Use 5W-30 (synthetic oil).**
- **It is acceptable to fill an engine with oil of another brand when replacing the oil, but make sure to use following oil specified by Subaru.**

Engine oil standard		SAE viscosity No.
 RM-00076 For API standard, oil with SM "Energy Conserving" or SN "Resource Conserving" logo.	or	 RM-00002 Those with the ILSAC standard GF-4 or GF-5 "starburst mark" displayed on top of the container.	5W-30 (synthetic oil)

NOTE:
The proper viscosity oil helps the engine maintain its ideal temperature, and cranking speed increased by reducing viscosity friction in hot condition.

B: COMPONENT


T5
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LU-02499

(1) Plug
(2) Gasket
(3) Relief valve spring
(4) Relief valve
(5) Front oil seal
(6) Oil pump case
(7) Inner rotor
(8) Outer rotor
(9) Oil pump cover
(10) Oil filter
(11) O-ring
(12) Oil pump ASSY
(13) Oil pressure switch
(14) Oil filler duct
(15) O-ring
(16) Rocker cover
(17) Baffle plate
(18) O-ring
(19) Oil strainer
(20) Gasket
(21) Oil level gauge guide
(22) Oil pan
(23) Oil level gauge
(24) Drain plug gasket
(25) Drain plug
(26) Oil filler cap
(27) Seal
(28) O-ring
(29) Gasket
(30) O-ring
(31) Oil filter connector
(32) Plug

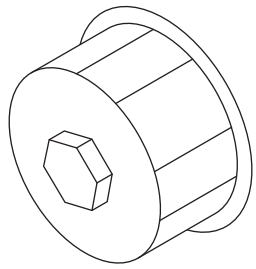
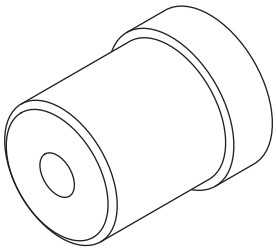
Tightening torque:N·m (kgf-m, ft-lb)	
T1:	***5 (0.5, 3.7)***
T2:	***5.4 (0.6, 4.0)***
T3:	***6.4 (0.7, 4.7)***
T4:	***10 (1.0, 7.0)***
T5:	***25 (2.5, 18.4)***
T6:	***44 (4.5, 32.5)***
T7:	***45 (4.6, 33.2)***
T8:	***70 (7.1, 51.6)***

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 battery.
- If the engine oil is spilt over exhaust pipe or the under cover, wipe it off with cloth to avoid emitting smoke or causing a fire.
- 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 of oil.

D: PREPARATION TOOL

1. SPECIAL TOOL

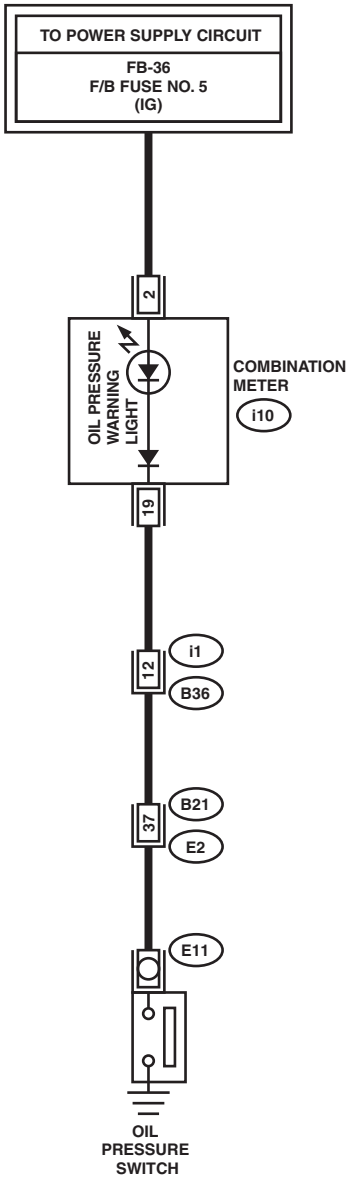
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18332AA000	18332AA000	OIL FILTER WRENCH	Used for removing and installing oil filter (Black). (outer diameter: 68 mm (2.68 in))
 ST-499587100	499587100	OIL SEAL INSTALLER	Used for installing oil seal into oil pump.

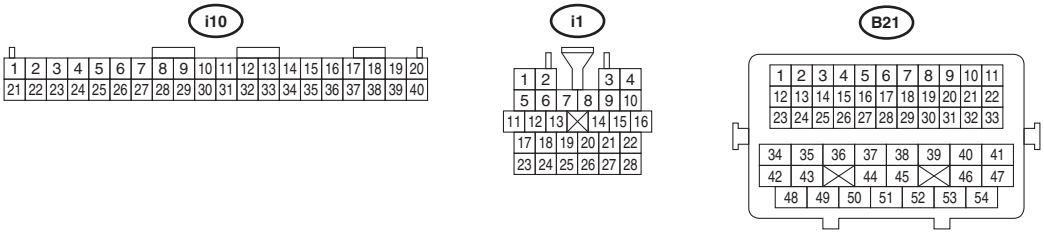
2. GENERAL TOOL

TOOL NAME	REMARKS
Oil filter wrench (65/67 mm 14 Flutes)	Used for removing and installing oil filter (Blue). (outer diameter: 67.4 mm (2.65 in))
Circuit tester	Used for measuring resistance and voltage.

2. Oil Pressure System

A: WIRING DIAGRAM





LU-02702

B: INSPECTION

	Step	Check	Yes	No
1	**CHECK COMBINATION METER.** 1) Turn the ignition switch to ON. (engine OFF) 2) Check the warning light in the combination meter.	Does the warning light illuminate?	Go to step **2**.	Repair or replace the combination meter. <Ref. to IDI-5, INSPECTION, Combination Meter System.>
2	**CHECK HARNESS CONNECTOR BETWEEN COMBINATION METER AND 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. <Ref. to LU(H4DOTC)-19, 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*** ***No. 2 — No. 19:***	Is the resistance less than 10 Ω?	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between combination meter and oil pressure switch • Poor contact of combination meter connector • Poor contact of oil pressure switch connector • Poor contact of coupling connector	Repair or replace the combination meter. <Ref. to IDI-5, INSPECTION, Combination Meter System.>

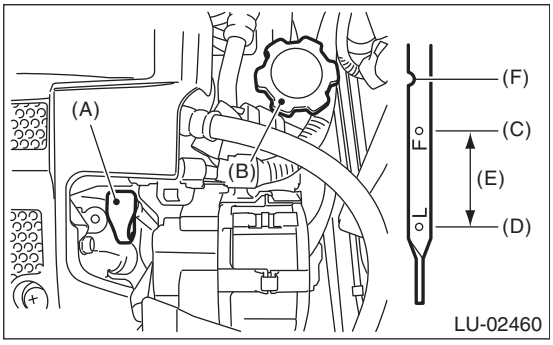
3. Engine Oil

A: INSPECTION

CAUTION:
If the engine oil is spilt over exhaust pipe or the under cover, wipe it off with cloth to avoid emitting smoke or causing a fire.

1) Park the vehicle on a level surface.
2) Remove the oil level gauge and wipe away the oil.
3) Reinsert the oil level gauge all the way. Be sure that the oil level gauge is correctly inserted and properly orientated.
4) Pull out the oil level gauge again, and check the oil level. If the engine oil level is below "L" line, check for oil leakage from engine and add oil to bring the level up to "F" line.
5) Start the engine to circulate the oil in engine room.
6) After turning off the engine, wait a few minutes for the oil to return to the oil pan before checking the level.

NOTE:
• Just after driving or while the engine is warm, engine oil level shows in the range between the "F" line and the notch mark. This is caused by thermal expansion of engine oil.
• To prevent overfilling of engine oil, do not add oil above "F" line when the engine is cold.
• As the oil level gauge is used for daily maintenance, "F" line and "L" line is set assuming that the engine is cold.



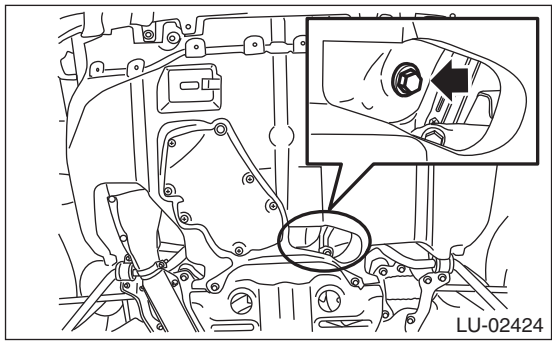
(A) Oil level gauge
(B) Engine oil filler cap
(C) "F" line
(D) "L" line
(E) Approx. 1.0 ℓ (1.1 US qt, 0.9 Imp qt)
(F) Notch mark

B: REPLACEMENT

CAUTION:
If the engine oil is spilt over exhaust pipe or the under cover, wipe it off with cloth to avoid emitting smoke or causing a fire.

1) Open the engine oil filler cap for quick draining of engine oil.
2) Lift up the vehicle.
3) Drain engine oil by loosening the engine oil drain plug.

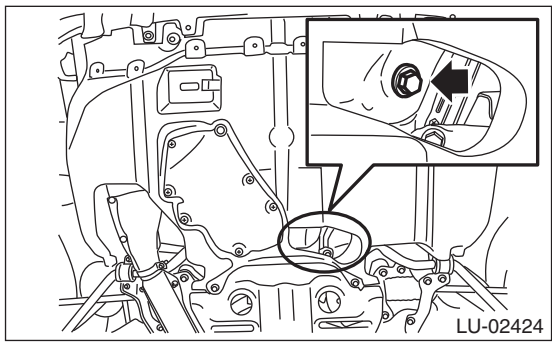
NOTE:
Prepare the container for draining of engine oil.



4) 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)



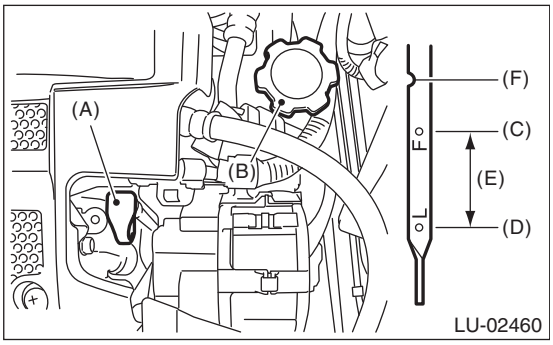
5) Lower the vehicle.
6) Using engine oil of proper quality and viscosity, fill engine oil through the filler duct to the "F" line on the oil level gauge. Make sure that the vehicle is parked on a level surface when checking oil level.

Recommended oil:
Refer to "SPECIFICATION" for recommended oil. <Ref. to LU(H4DOTC)-2, SPECIFICATION, General Description.>

Engine oil capacity:
Refer to "SPECIFICATION" for engine oil capacity. <Ref. to LU(H4DOTC)-2, SPECIFICATION, General Description.>

7) Close the engine oil filler cap.

8) Start the engine to circulate the oil in engine room.
9) After stopping the engine, recheck the oil level. If necessary, add engine oil up to the “F” line on oil level gauge.

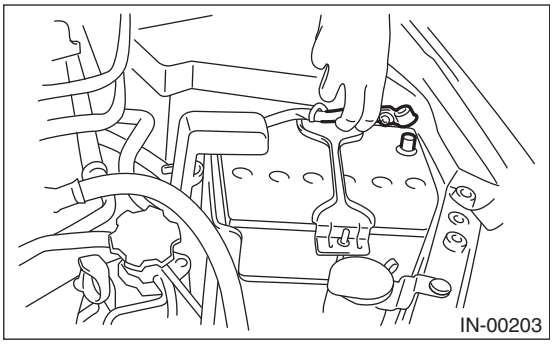


(A) Oil level gauge
(B) Engine oil filler cap
(C) “F” line
(D) “L” line
(E) Approx. 1.0 ℓ (1.1 US qt, 0.9 Imp qt)
(F) Notch mark

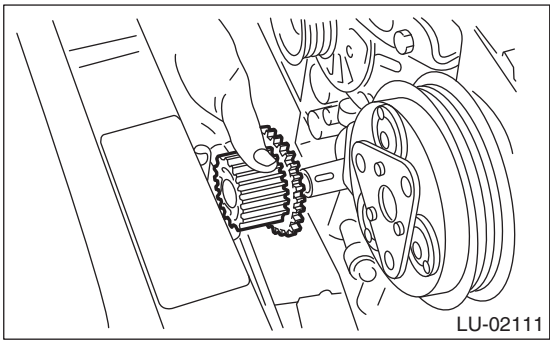
4. Oil Pump

A: REMOVAL

1) Remove the collector cover.
2) Disconnect the ground cable from battery.

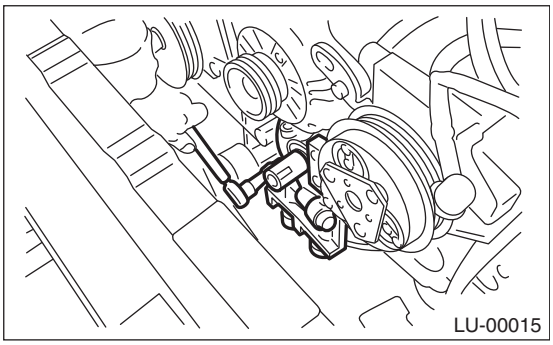

IN-00203

3) Remove the radiator. <Ref. to CO(H4DOTC)-19, REMOVAL, Radiator.>
4) Remove the crankshaft position sensor. <Ref. to FU(H4DOTC)-35, REMOVAL, Crankshaft Position Sensor.>
5) Remove the water pump. <Ref. to CO(H4DOTC)-15, REMOVAL, Water Pump.>
6) Remove the crank sprocket. <Ref. to ME(H4DOTC)-57, REMOVAL, Crank Sprocket.>


LU-02111

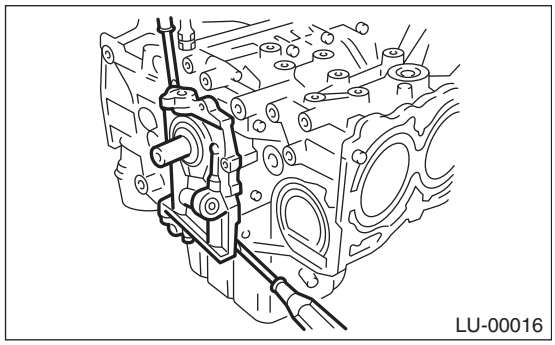
7) Remove the bolts which secure oil pump to cylinder block.

NOTE:
When disassembling and checking the oil pump, loosen the relief valve plug before removing the oil pump.


LU-00015

8) Remove the oil pump by using flat tip screwdriver.

CAUTION:
Be careful not to scratch the mating surface of the cylinder block and oil pump.

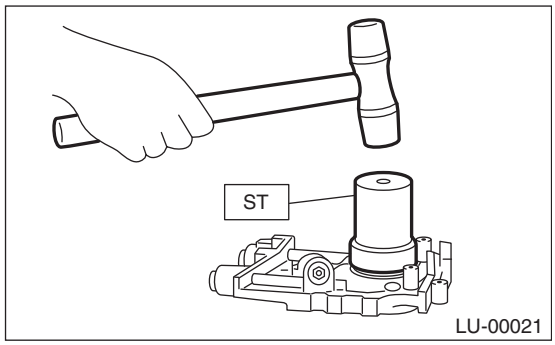

LU-00016

9) Remove the front oil seal from the oil pump.

B: INSTALLATION

1) Using the ST, install the front oil seal.
ST 499587100 OIL SEAL INSTALLER

NOTE:
Use a new front oil seal.

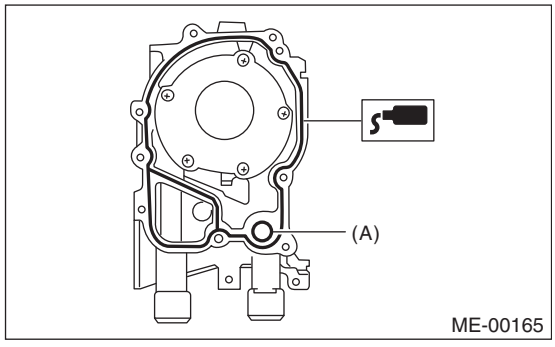


LU-00021

2) Apply liquid gasket to the mating surfaces of oil pump.

NOTE:
Install within 5 min. after applying liquid gasket.

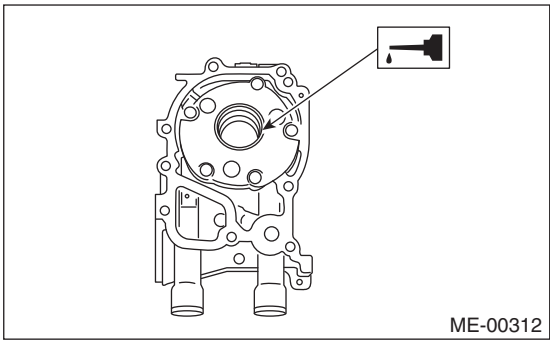
Liquid gasket:
THREE BOND 1217G (Part No. K0877Y0100) or equivalent



ME-00165

(A) O-ring

3) Apply a coat of engine oil to the inside of front oil seal.



4) Install the oil pump to cylinder block.

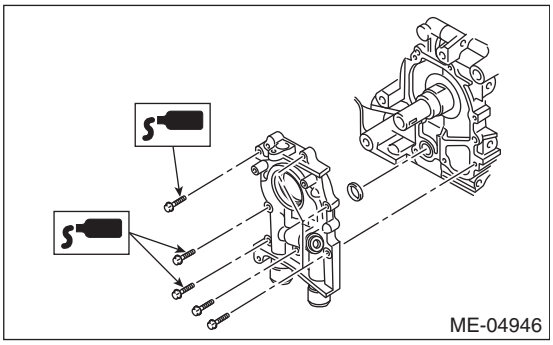
CAUTION:
• Be careful not to damage the front oil seal during installation.
• Make sure the front oil seal lip is not folded.

NOTE:
• Align the flat surface of oil pump's inner rotor with that of crankshaft before installation.
• Use new O-rings.
• Do not forget to assemble O-rings.

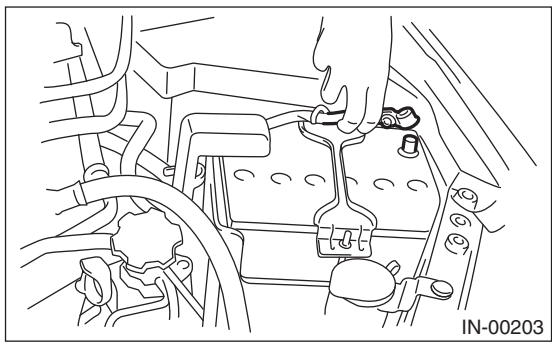
5) Apply liquid gasket to the three bolts thread shown in figure. (when reusing bolts)

Liquid gasket:
THREE BOND 1324 (Part No. 004403042) or equivalent

Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)



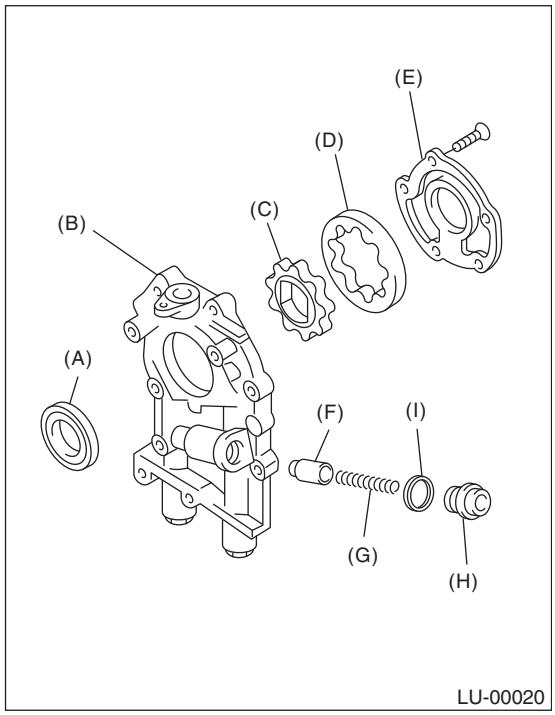
6) Install the crank sprocket. <Ref. to ME(H4DOTC)-57, INSTALLATION, Crank Sprocket.>
7) Install the water pump. <Ref. to CO(H4DOTC)-15, INSTALLATION, Water Pump.>
8) Install the crankshaft position sensor. <Ref. to FU(H4DOTC)-35, INSTALLATION, Crankshaft Position Sensor.>
9) Install the radiator. <Ref. to CO(H4DOTC)-20, INSTALLATION, Radiator.>
10) Connect the battery ground terminal.



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.

NOTE:
Before disassembling the oil pump, remove the relief valve.

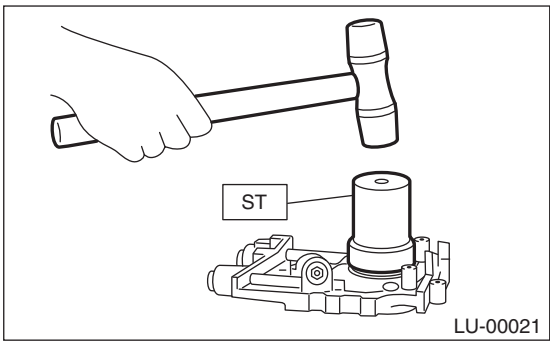


(A) Front oil seal
(B) Oil pump case
(C) Inner rotor
(D) Outer rotor
(E) Oil pump cover
(F) Relief valve
(G) Relief valve spring
(H) Plug
(I) Gasket

D: ASSEMBLY

1) Using the ST, install the front oil seal.
ST 499587100 OIL SEAL INSTALLER

NOTE:
Use a new front oil seal.

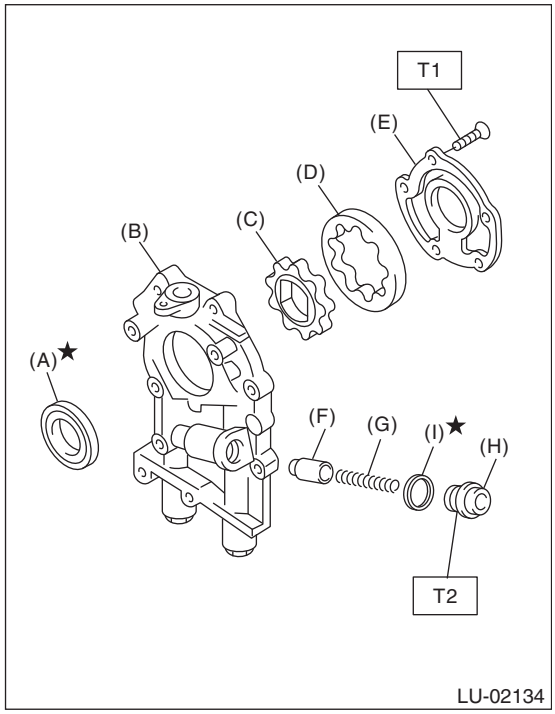


2) Apply a coat of engine oil to inner and outer rotors.
3) Install the inner and outer rotors.
4) Assemble the oil relief valve and install relief valve spring and plug.

NOTE:
Use a new gasket.

5) Install the oil pump cover.

Tightening torque:
T1: 5.4 N·m (0.6 kgf-m, 4.0 ft-lb)
T2: 44 N·m (4.5 kgf-m, 32.5 ft-lb)



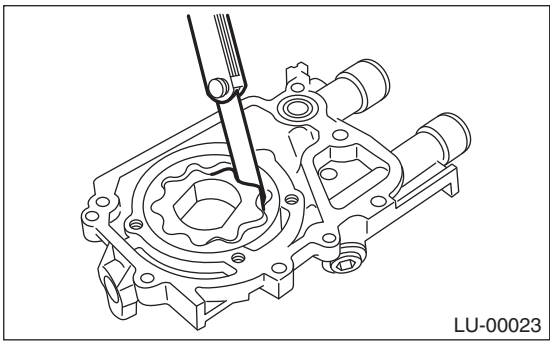
(A) Front oil seal
(B) Oil pump case
(C) Inner rotor
(D) Outer rotor
(E) Oil pump cover
(F) Relief valve
(G) Relief valve spring
(H) Plug
(I) Gasket

E: INSPECTION

1. TIP CLEARANCE

Measure the tip clearance of rotors. If the clearance is out of standard, replace the rotors as a set.

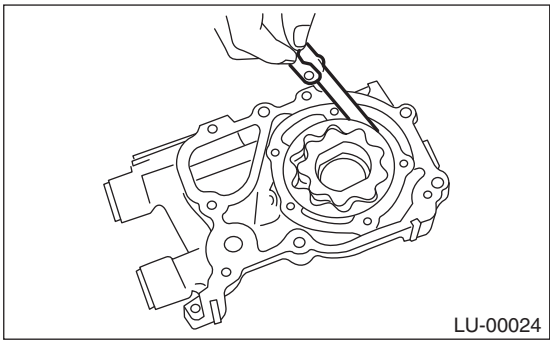
Tip clearance between inner and outer rotors:
Standard
0.04 — 0.14 mm (0.0016 — 0.0055 in)



2. CASE CLEARANCE

Measure the clearance between outer rotor and oil pump case. If clearance exceeds the standard, replace the oil pump case.

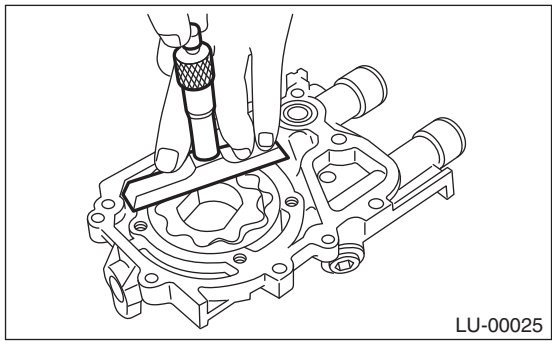
Case clearance between outer rotor and pump case:
Standard
0.10 — 0.175 mm (0.0039 — 0.0069 in)



3. SIDE CLEARANCE

Measure the gap between the inner rotor and the oil pump case to measure the clearance between the inner rotor and the oil pump cover as shown in the figure. If clearance is out of standard, replace the rotor or the oil pump case.

Side clearance between inner rotor and pump case:
Standard
0.02 — 0.07 mm (0.0008 — 0.0028 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, 20.93 lbf)

5. OIL PUMP CASE

Check for worn shaft hole, clogged oil passage, worn rotor chamber, cracks and other faults.

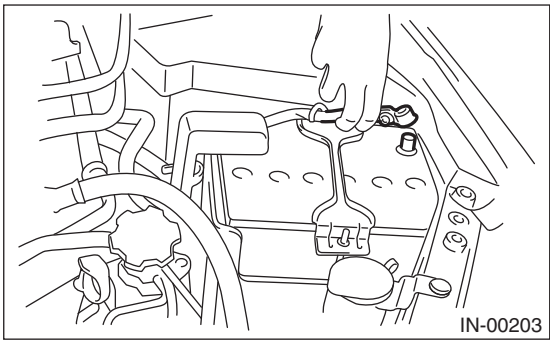
6. FRONT OIL SEAL

Check the front oil seal lips for deformation, hardening, wear, etc. and replace if defective.

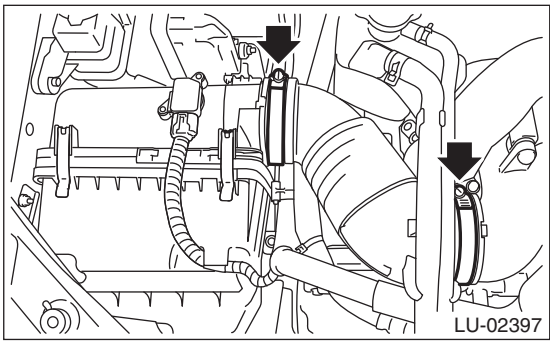
5. Oil Pan and Strainer

A: REMOVAL

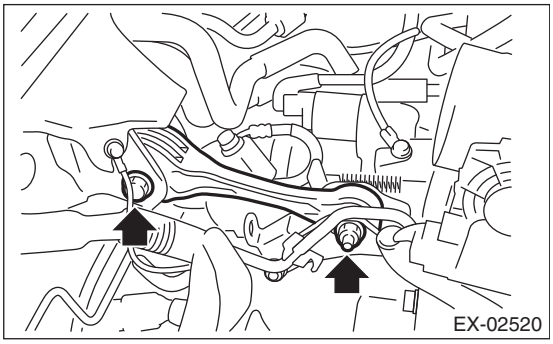
1) Remove the collector cover.
2) Disconnect the ground cable from battery.


IN-00203

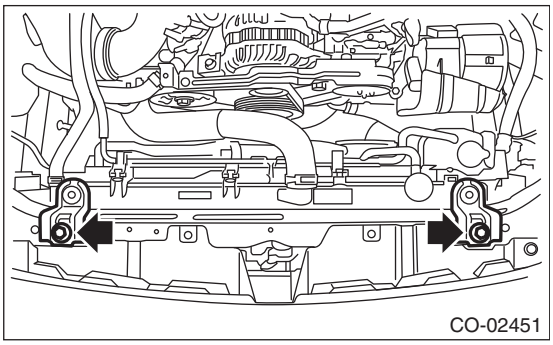
3) Remove the air intake duct (Rear). <Ref. to IN(H4DOTC)-10, REMOVAL, Air Intake Duct.>
4) Remove the air intake boot.


LU-02397

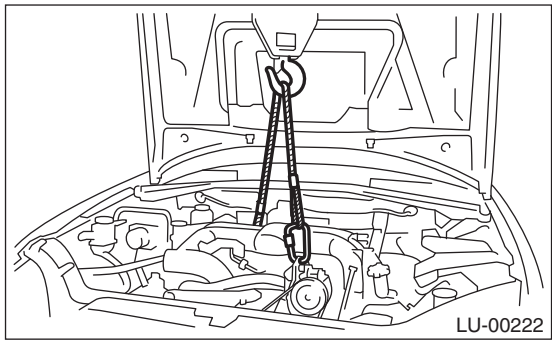
5) Remove the intercooler. <Ref. to IN(H4DOTC)-13, REMOVAL, Intercooler.>
6) Remove the pitching stopper.


EX-02520

7) Remove the radiator upper brackets.


CO-02451

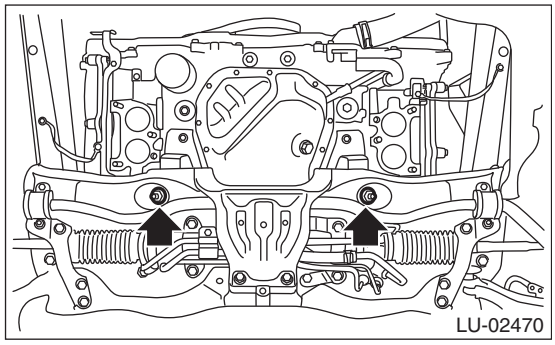
8) Support the engine with a lifting device and wire ropes.


LU-00222

9) Lift up the vehicle.

CAUTION:
When lifting up the vehicle, raise up wire ropes at the same time.

10) Remove the under cover. <Ref. to EI-26, REMOVAL, Front Under Cover.>
11) Drain the engine oil. <Ref. to LU(H4DOTC)-9, REPLACEMENT, Engine Oil.>
12) Remove the front exhaust pipe. <Ref. to EX(H4DOTC)-5, REMOVAL, Front Exhaust Pipe.>
13) Remove the nuts which secure the engine mounting to the front crossmember.

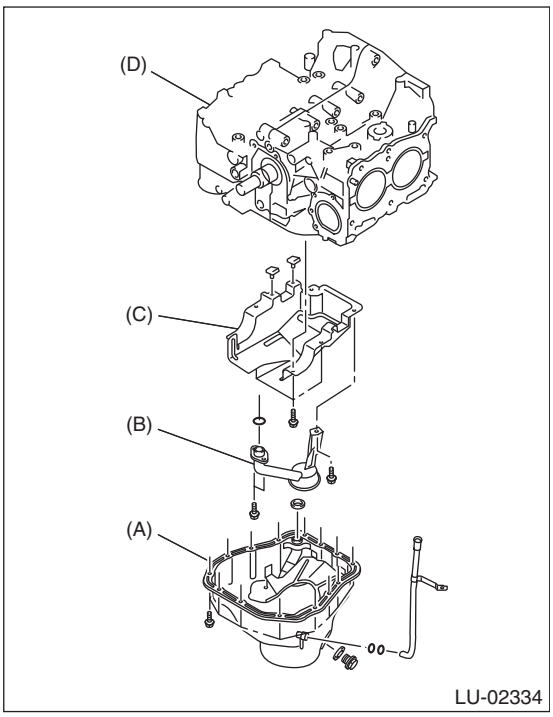

LU-02470

14) Remove the bolts which secure oil pan on cylinder block with the engine raised up.
15) 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.

16) Remove the oil strainer.

17) Remove the baffle plate.

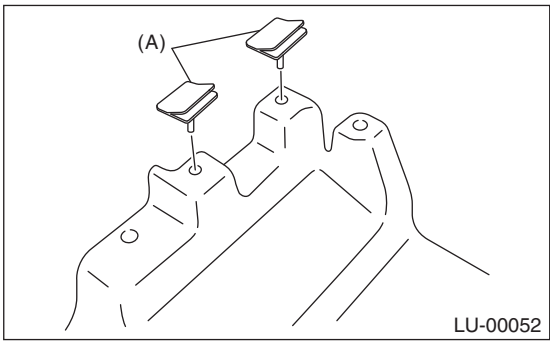


(A) Oil pan
(B) Oil strainer
(C) Baffle plate
(D) Cylinder block

B: INSTALLATION

NOTE:
Before installing the oil pan, clean the mating surface of oil pan and cylinder block.
1) Make sure that the seals (A) are installed securely on the baffle plate in a direction as shown in the figure below.

NOTE:
Use a new seal.



2) Install the baffle plate.

Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)

3) Install the oil strainer to cylinder block.

NOTE:
Use new O-rings.

Tightening torque:
10 N·m (1.0 kgf-m, 7.4 ft-lb)

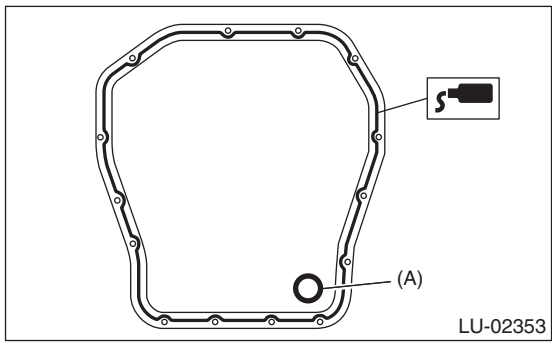
4) Tighten the oil strainer stay together with the baffle plate.

Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)

5) Apply liquid gasket to the mating surfaces of oil pan, and install the oil pan.

NOTE:
- Use a new gasket.
- Install within 5 min. after applying liquid gasket.

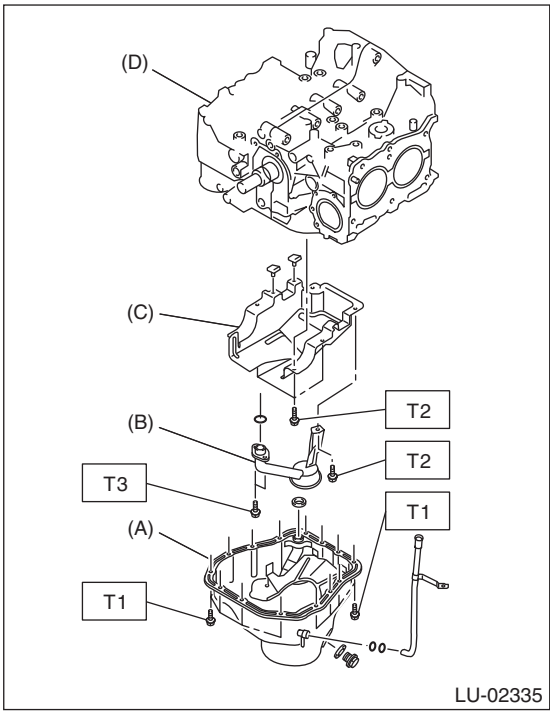
Liquid gasket:
THREE BOND 1217G (Part No. K0877Y0100) or equivalent



(A) Gasket

6) Tighten the bolts which install oil pan to cylinder block.

Tightening torque:
T1: 5 N·m (0.5 kgf-m, 3.7 ft-lb)
T2: 6.4 N·m (0.7 kgf-m, 4.7 ft-lb)
T3: 10 N·m (1.0 kgf-m, 7.4 ft-lb)

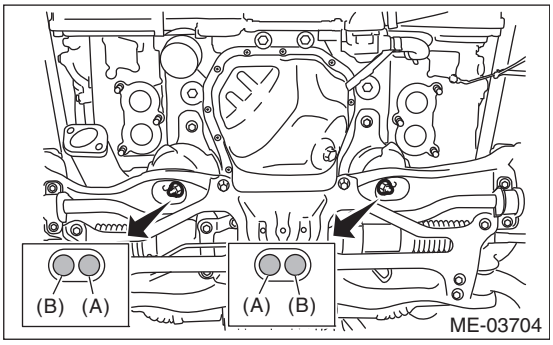


(A) Oil pan
(B) Oil strainer
(C) Baffle plate
(D) Cylinder block

7) Lower the engine onto front crossmember.
8) Install the nuts which hold the engine mounting to the front crossmember.

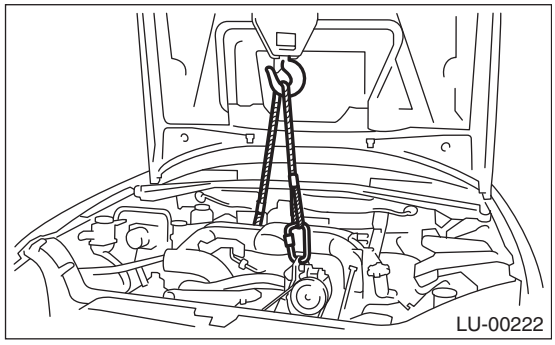
NOTE:
Make sure that the engine mounting nuts (A) and locator (B) are securely installed.

Tightening torque:
85 N·m (8.7 kgf-m, 62.7 ft-lb)



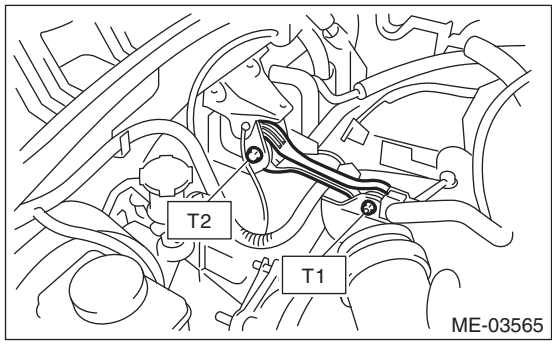
9) Install the front exhaust pipe. <Ref. to EX(H4DOTC)-5, INSTALLATION, Front Exhaust Pipe.>
10) Install the under cover. <Ref. to EI-26, INSTALLATION, Front Under Cover.>
11) Lower the vehicle.

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.



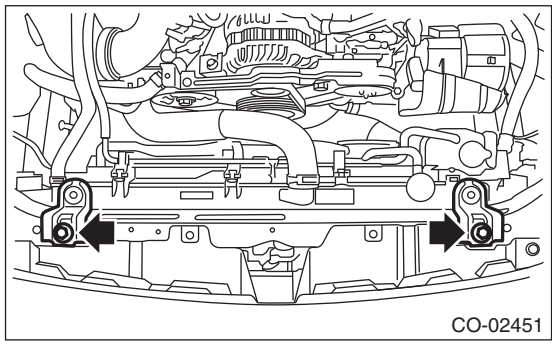
13) Install the pitching stopper.

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.

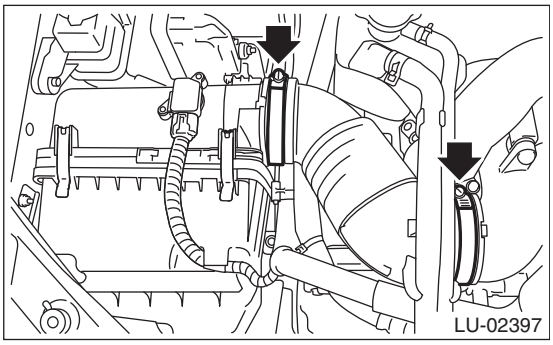
Tightening torque:
12 N·m (1.2 kgf-m, 8.9 ft-lb)



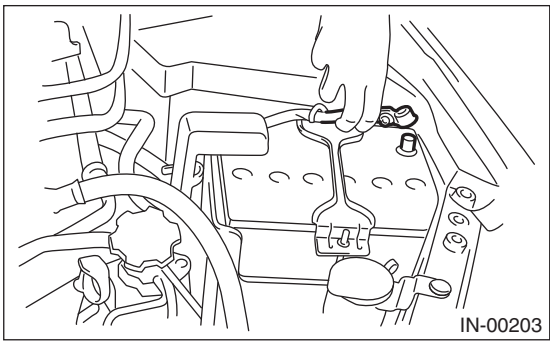
15) Install the intercooler. <Ref. to IN(H4DOTC)-13, INSTALLATION, Intercooler.>

16) Install the air intake boot.

Tightening torque:
2.5 N·m (0.3 kgf-m, 1.8 ft-lb)



17) Install the air intake duct (rear). <Ref. to IN(H4DOTC)-10, INSTALLATION, Air Intake Duct.>
18) Connect the battery ground terminal.



19) Install the collector cover.
20) Refill the engine oil. <Ref. to LU(H4DOTC)-9, REPLACEMENT, Engine Oil.>

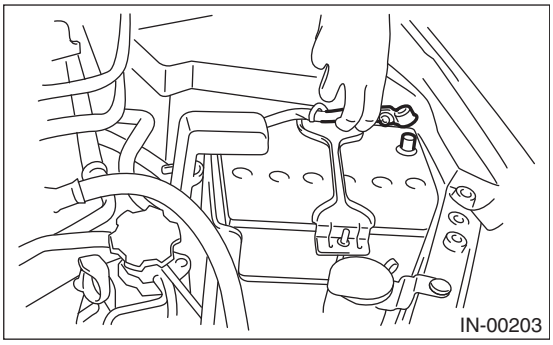
C: INSPECTION

Check that the oil pan, oil strainer and baffle plate do not have deformation, cracks or damage.

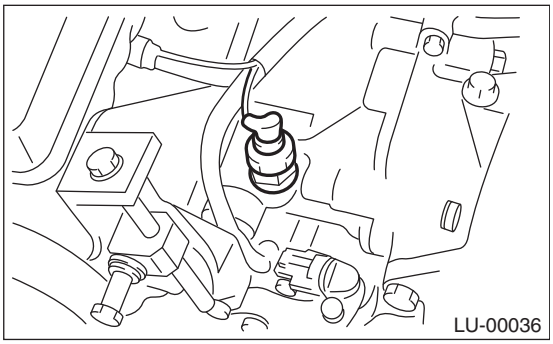
6. Oil Pressure Switch

A: REMOVAL

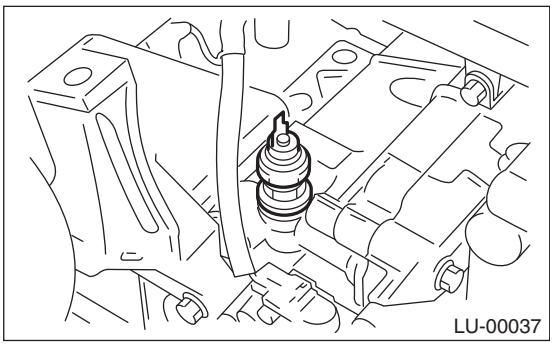
1) Remove the collector cover.
2) Disconnect the ground cable from battery.



3) Remove the generator from the bracket. <Ref. to SC(H4DO)-33, REMOVAL, Generator.>
4) Disconnect the terminal from oil pressure switch.



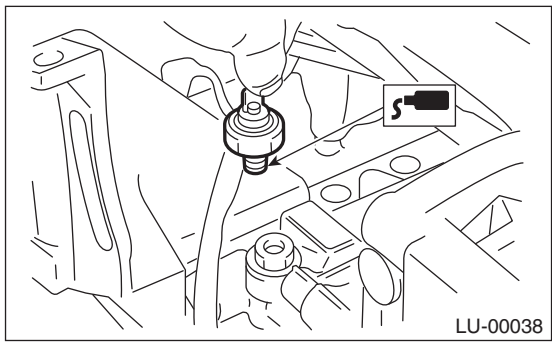
5) Remove the oil pressure switch.



B: INSTALLATION

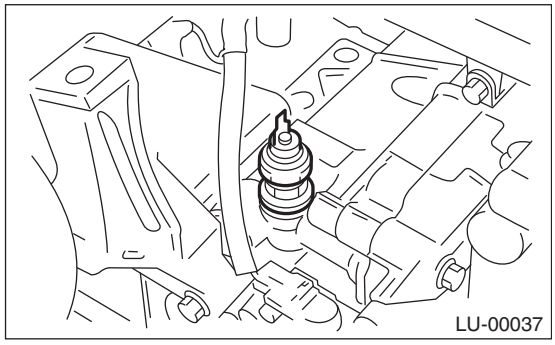
1) Apply liquid gasket to the oil pressure switch threads.

Liquid gasket:
THREE BOND 1324 (Part No. 004403042) or equivalent

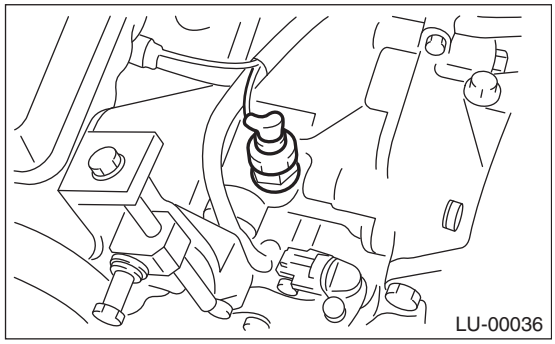


2) Install the oil pressure switch to cylinder block.

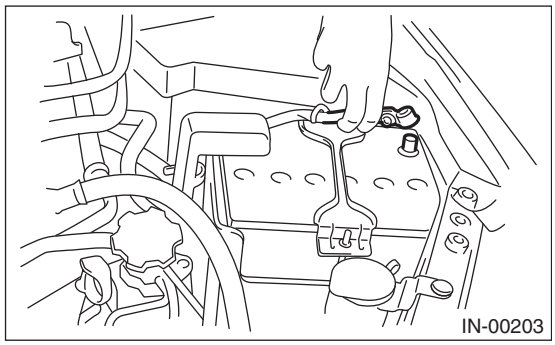
Tightening torque:
25 N·m (2.5 kgf-m, 18.4 ft-lb)



3) Connect the terminal to the oil pressure switch.



4) Install the generator to the bracket. <Ref. to SC(H4DO)-38, INSTALLATION, Generator.>
5) Connect the battery ground terminal.



6) Install the collector cover.

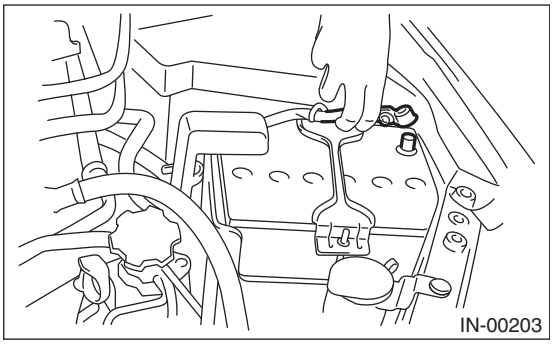
C: INSPECTION

1) Check that the oil pressure switch does not have deformation, cracks or damage.
2) Check the oil pressure switch installation portion for oil leakage and oil seepage.

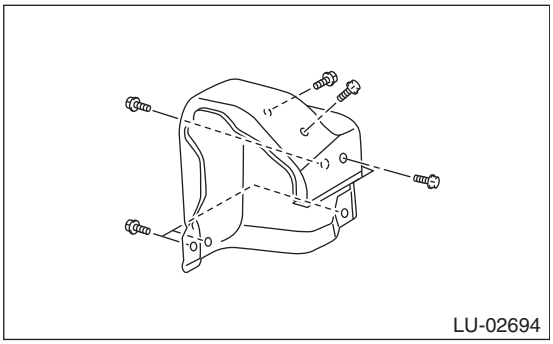
7. Oil Pipe

A: REMOVAL

1) Remove the collector cover.
2) Disconnect the ground cable from battery.

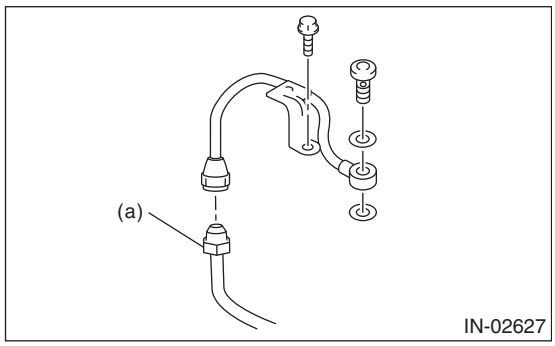


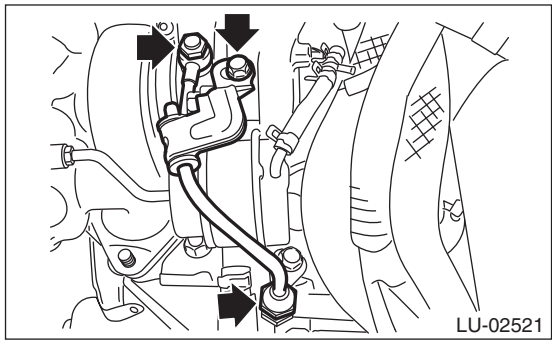
3) Remove the intercooler. <Ref. to IN(H4DOTC)-13, REMOVAL, Intercooler.>
4) Remove the turbocharger upper cover.



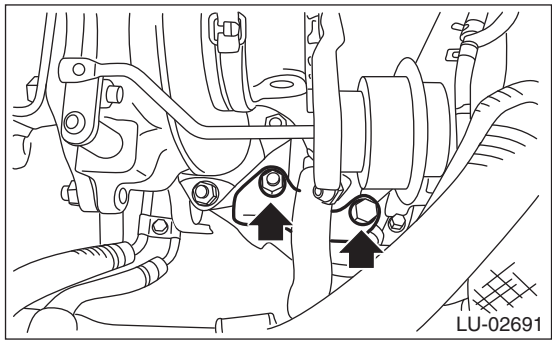
5) Remove the oil inlet pipe from the turbocharger.

CAUTION:
In order to prevent damaging the oil pipe on the cylinder head side, fix the section (a) shown in the figure when loosing the oil inlet pipe flare nut, and avoid the part from rotating together while loosening the nut.

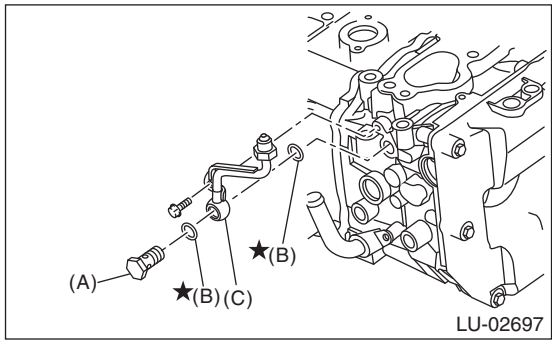




6) Remove the turbocharger stay.



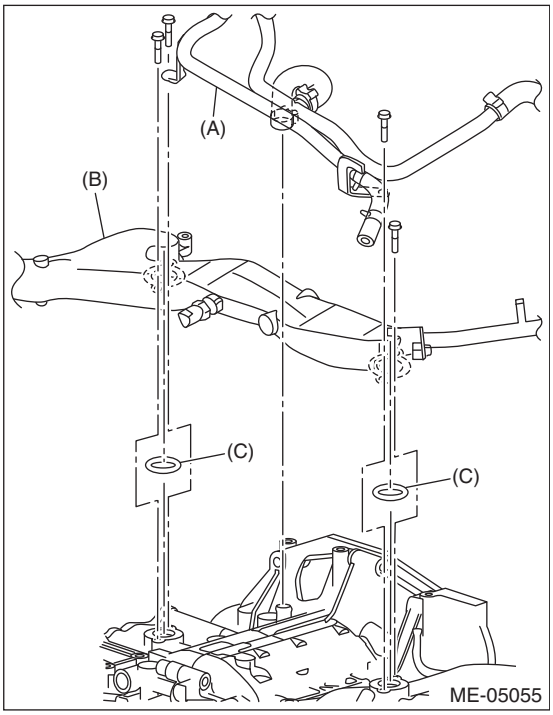
7) Remove the turbocharger oil pipe.



(A) Union bolt without filter (without protrusion)
(B) Gasket
(C) Turbocharger oil pipe

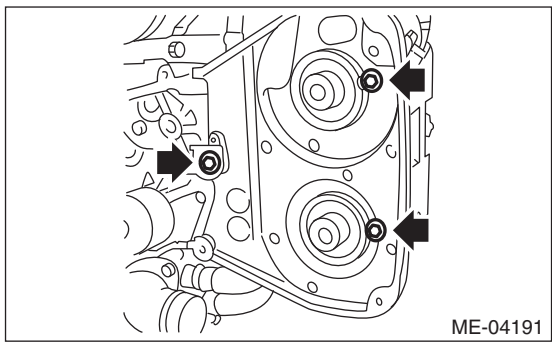
8) Remove the intake manifold. <Ref. to FU(H4DOTC)-18, REMOVAL, Intake Manifold.>
9) Remove the secondary air pump. (Oil pipe LH only) <Ref. to EC(H4DOTC)-29, REMOVAL, Secondary Air Pump.>
10) Remove the blow-by pipe and water pipe assembly. (Oil pipe RH only)

NOTE:
Do not remove the vacuum hose, radiator inlet hose, and heater outlet hose.

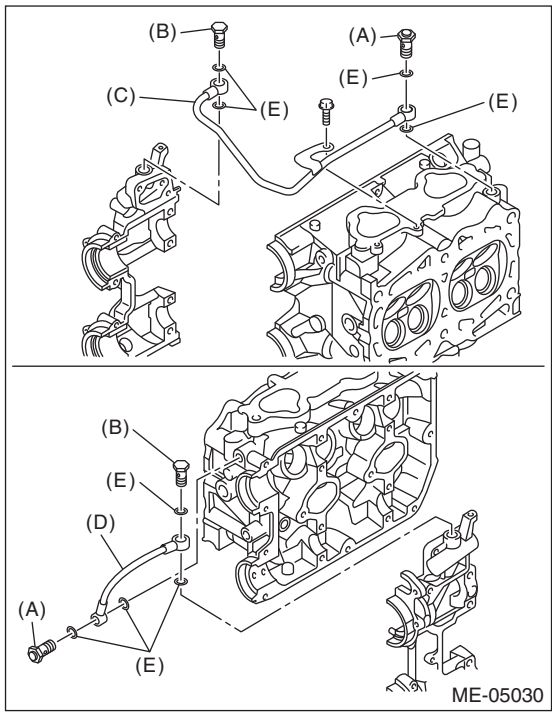


(A) Water tank pipe ASSY
(B) Water pipe ASSY
(C) O-ring

11) Remove the radiator main fan and radiator sub fan. <Ref. to CO(H4DOTC)-24, REMOVAL, Radiator Main Fan and Fan Motor.> <Ref. to CO(H4DOTC)-26, REMOVAL, Radiator Sub Fan and Fan Motor.>
12) Remove the V-belts. <Ref. to ME(H4DOTC)-38, REMOVAL, V-belt.>
13) Remove the crank pulley. <Ref. to ME(H4DOTC)-46, REMOVAL, Crank Pulley.>
14) Remove the timing belt cover. <Ref. to ME(H4DOTC)-48, REMOVAL, Timing Belt Cover.>
15) Remove the timing belt. <Ref. to ME(H4DOTC)-49, TIMING BELT, REMOVAL, Timing Belt.>
16) Remove the cam sprocket LH. <Ref. to ME(H4DOTC)-56, REMOVAL, Cam Sprocket.>
17) Remove the timing belt cover No. 2 LH.



18) Remove the oil pipe.



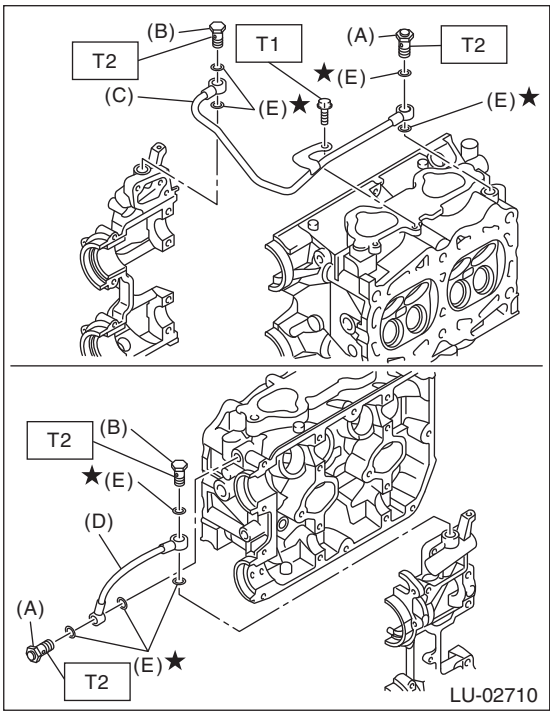
(A) Union bolt with filter (with protrusion)
(B) Union bolt without filter (without protrusion)
(C) Oil pipe RH
(D) Oil pipe LH
(E) Gasket

B: INSTALLATION

1) Inspect the union bolt with filter. <Ref. to LU(H4DOTC)-25, INSPECTING UNION BOLT WITH FILTER, INSPECTION, Oil Pipe.>
2) Install the oil pipe.

NOTE:
• Be careful of the install location of the union bolt; the location will differ depending on the presence of filter.
• Use a new gasket.

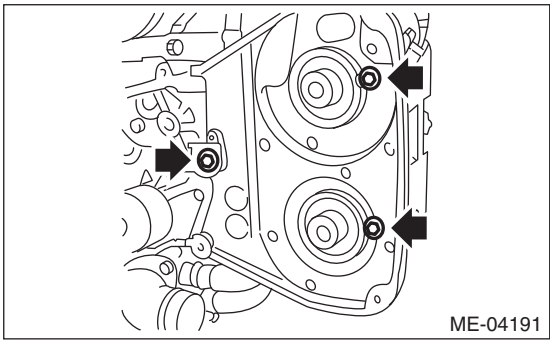
Tightening torque:
T1: 6.4 N·m (0.7 kgf-m, 4.7 ft-lb)
T2: 29 N·m (3.0 kgf-m, 21.4 ft-lb)



(A) Union bolt with filter (with protrusion)
(B) Union bolt without filter (without protrusion)
(C) Oil pipe RH
(D) Oil pipe LH
(E) Gasket

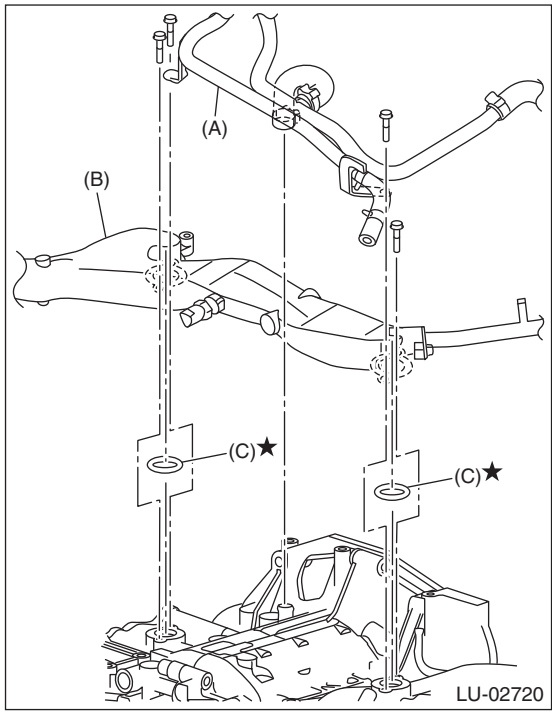
3) Install the timing belt cover No. 2 LH.

Tightening torque:
5 N·m (0.5 kgf-m, 3.7 ft-lb)



4) Install the cam sprocket LH. <Ref. to ME(H4DOTC)-56, INSTALLATION, Cam Sprocket.>
5) Install the timing belt. <Ref. to ME(H4DOTC)-51, TIMING BELT, INSTALLATION, Timing Belt.>
6) Install the timing belt cover. <Ref. to ME(H4DOTC)-48, INSTALLATION, Timing Belt Cover.>
7) Install the crank pulley. <Ref. to ME(H4DOTC)-46, INSTALLATION, Crank Pulley.>
8) Install the V-belts. <Ref. to ME(H4DOTC)-38, INSTALLATION, V-belt.>
9) Install the radiator main fan and the radiator sub fan. <Ref. to CO(H4DOTC)-24, INSTALLATION, Radiator Main Fan and Fan Motor.> <Ref. to CO(H4DOTC)-26, INSTALLATION, Radiator Sub Fan and Fan Motor.>
10) Install the blow-by pipe and water pipe assembly. (Oil pipe RH only)

Tightening torque:
6.5 N·m (0.7 kgf-m, 4.8 ft-lb)



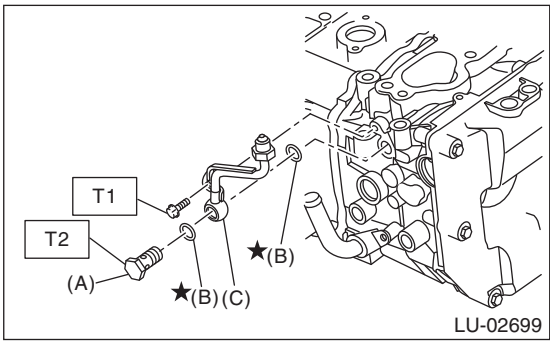
(A) Water tank pipe ASSY
(B) Water pipe ASSY
(C) O-ring

11) Install the secondary air pump. (Oil pipe LH only) <Ref. to EC(H4DOTC)-29, INSTALLATION, Secondary Air Pump.>
12) Install the intake manifold. <Ref. to FU(H4DOTC)-23, INSTALLATION, Intake Manifold.>

13) Install the turbocharger oil pipe.

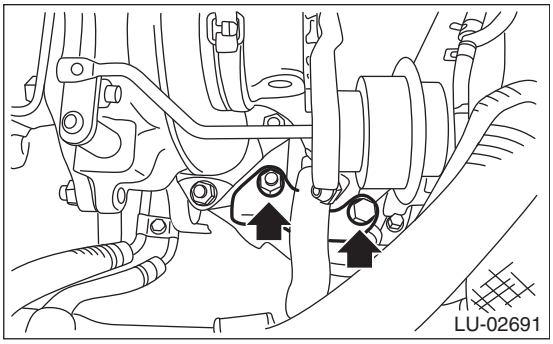
NOTE:
Use a new gasket.

Tightening torque:
T1: 6.4 N·m (0.7 kgf-m, 4.7 ft-lb)
T2: 29 N·m (3.0 kgf-m, 21.4 ft-lb)



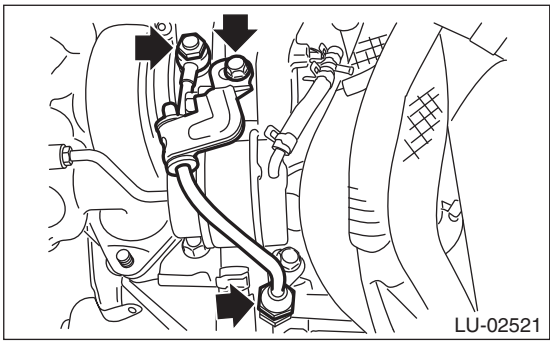
(A) Union bolt without filter (without protrusion)
(B) Gasket
(C) Turbocharger oil pipe

14) Install the turbocharger stay.



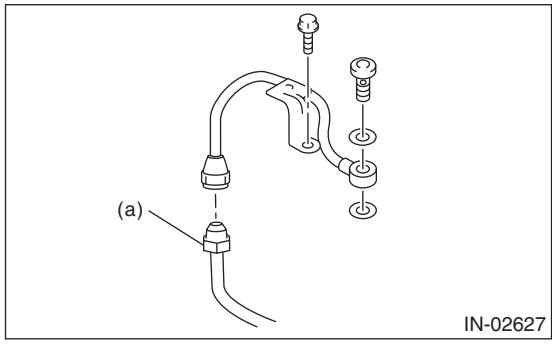
15) Temporarily tighten the bolts and flare nuts which secure the oil inlet pipe to the turbocharger.

NOTE:
Use a new gasket.

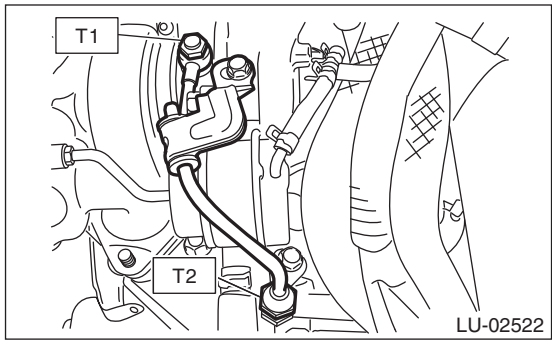


16) Tighten the union bolts and flare nuts which secure the oil inlet pipe to the turbocharger.

CAUTION:
In order to prevent damaging the oil pipe on the cylinder head side, fix the section (a) shown in the figure when tightening the oil inlet pipe flare nut, and avoid the part from rotating together while tightening the nut.

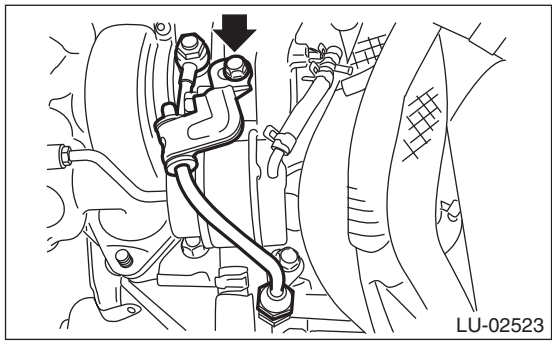


Tightening torque:
T1: 16 N·m (1.6 kgf-m, 11.8 ft-lb)
T2: 20 N·m (2.0 kgf-m, 14.8 ft-lb)



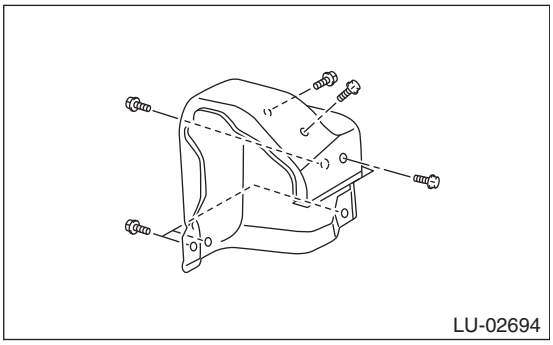
17) Tighten the bolts which hold the oil inlet pipe stay to the turbocharger.

Tightening torque:
5 N·m (0.5 kgf-m, 3.7 ft-lb)

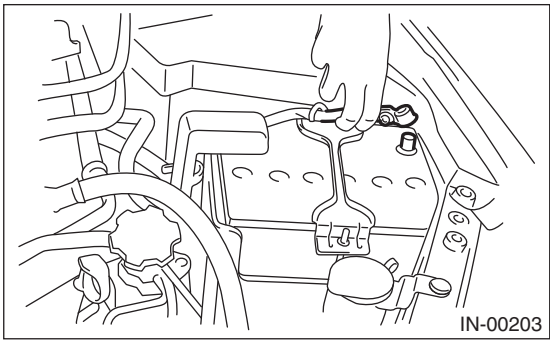


18) Attach the turbocharger upper cover.

Tightening torque:
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)



19) Install the intercooler. <Ref. to IN(H4DOTC)-13, INSTALLATION, Intercooler.>
20) Connect the battery ground terminal.

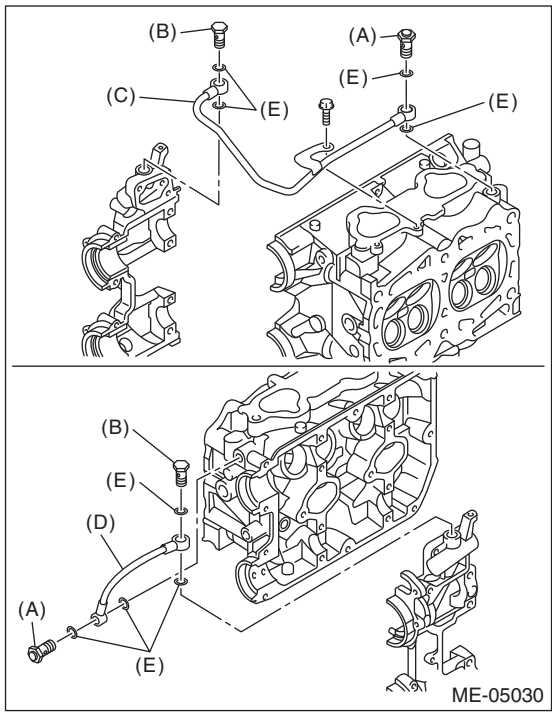


21) Install the collector cover.

C: INSPECTION

1. INSPECTING UNION BOLT WITH FILTER

Check the filter part of union bolt for clogging or damage, and if defective, replace the union bolt with filter with the new part.



(A) Union bolt with filter (with protrusion)
(B) Union bolt without filter (without protrusion)
(C) Oil pipe RH
(D) Oil pipe LH
(E) Gasket

2. OTHER INSPECTIONS

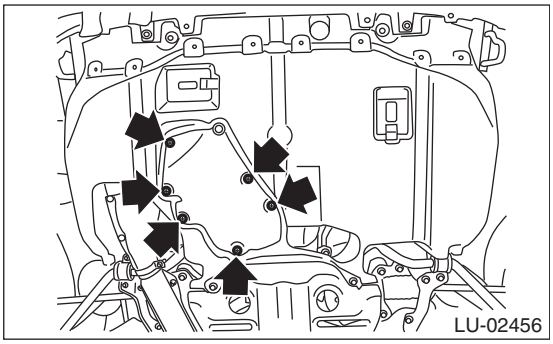
1) Check that the oil pipe and union bolt have no deformation, cracks and other damages.
2) Check that there are no oil leaks or oil oozing from the oil pipe attachment section.

8. Engine Oil Filter

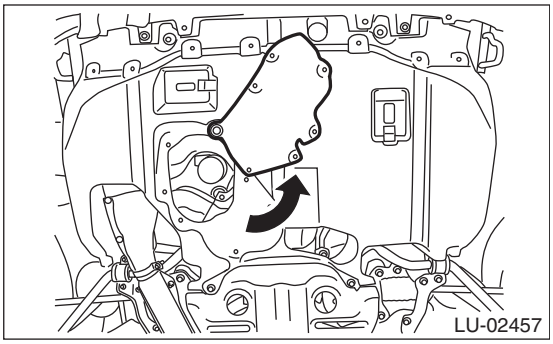
A: REMOVAL

CAUTION:
If the engine oil is spilt over exhaust pipe or the under cover, wipe it off with cloth to avoid emitting smoke or causing a fire.

1) Lift up the vehicle.
2) Remove the service hole cover clip located on the under cover.



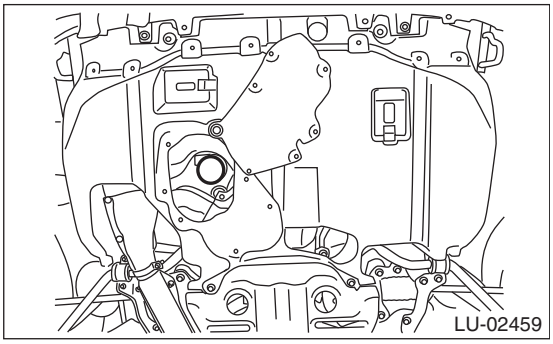
3) Rotate the service hole cover in the arrow direction.



4) Remove the oil filter.
• Oil filter (Black)
Remove using the ST.

ST 18332AA000 OIL FILTER WRENCH (OUTER DIAMETER: 68 MM (2.68 IN) FOR OIL FILTER)

• Oil filter (Blue)
Remove using a general tool (65/67 mm 14 Flutes).



B: INSTALLATION

CAUTION:
Do not tighten excessively, or oil may leak.

1) Clean the oil filter installing surface of cylinder block.
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 of the oil filter.
• Tighten the oil filter (Black) with an outer diameter of 68 mm (2.68 in) (approx. 1 rotation) after the seal rubber of the oil filter comes in contact with cylinder block. When using a torque wrench, tighten to 14 N·m (1.4 kgf-m, 10.3 ft-lb).
• Tighten the oil filter (Blue) with an outer diameter of 67.4 mm (2.65 in) (approx. 7/8 rotation) after the seal rubber of the oil filter comes in contact with cylinder block. When using a torque wrench, tighten to 12 N·m (1.2 kgf-m, 8.9 ft-lb).
4) Return the service hole cover to its original position. (turbo model)
5) Lower the vehicle.
6) After installing, check the engine oil level and replenish it if necessary. <Ref. to LU(H4DOTC)-9, INSPECTION, Engine Oil.>

C: INSPECTION

1) After installing the oil filter, run the engine and check for oil leakage 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(H4DOTC)-9, 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
Warning light remains ON.	a. Oil pressure switch failure	
	❍ Cracked diaphragm or oil leakage within switch	Replace.
	❍ Broken spring or seized contacts	Replace.
	b. Low oil pressure	
	❍ Clogging of oil filter	Replace.
	❍ Malfunction of oil by-pass valve in oil filter	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	Replace.
	❍ Clogged oil strainer or broken pipe	Clean or replace.
	c. No oil pressure	
	❍ Insufficient engine oil (degradation, etc.)	Replace.
	❍ Broken pipe of oil strainer	Replace.
	❍ Stuck oil pump rotor	Replace.
Warning light does not illuminate.	a. Malfunction of combination meter	Replace.
	b. Poor contact of switch contact points	Replace.
	c. Disconnection of wiring	Repair.
Warning light flickers momentarily.	a. Defective terminal contact	Repair.
	b. Defective wiring harness	Repair.
	c. Oil pressure switch failure	
	❍ Cracked diaphragm or oil leakage within switch	Replace.
	❍ Broken spring or seized contacts	Replace.
	d. Low oil pressure	
	❍ Clogging of oil filter	Replace.
	❍ Malfunction of oil by-pass valve in oil filter	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	Replace.
	❍ Clogged oil strainer or broken pipe	Clean or replace.

SPEED CONTROL SYSTEMS

SP(H4DOTC)

Page

1. General Description 2

1. General Description

A: SPECIFICATION

Specifications for the turbo model are the same as the non-turbo model. <Ref. to SP(H4DO)-2, General Description.>

IGNITION

IG(H4DOTC)

Page

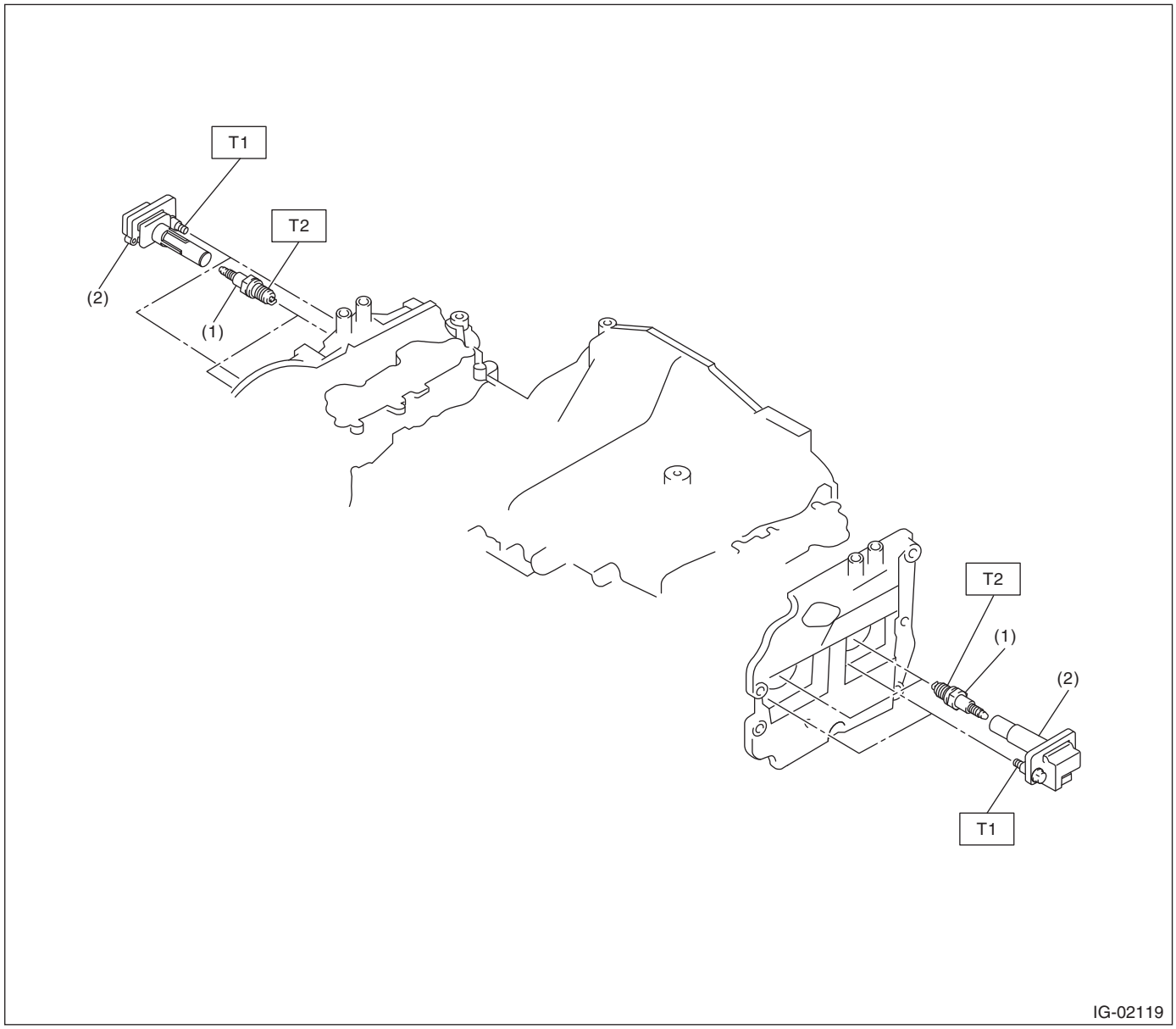
1. General Description 2
2. Spark Plug 4
3. Ignition Coil 7

1. General Description

A: SPECIFICATION

Item				Specifications
Ignition coil	Type			FK0368
	Ignition system			Independent ignition coil
	Manufacturer			Diamond Electric
Spark plug	Manufacturer and type			NGK: SILFR6A
	Thread size (diameter, pitch, length)	mm		14, 1.25, 26.5
	Spark plug gap	mm (in)	Standard	0.7 — 0.8 (0.028 — 0.031)
	Electrode			Iridium

B: COMPONENT



(1) Spark plug
(2) Ignition coil

Tightening torque:N·m (kgf-m, ft-lb)
T1: 16 (1.6, 11.8)
T2: 21 (2.1, 15.5)

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.
• 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.

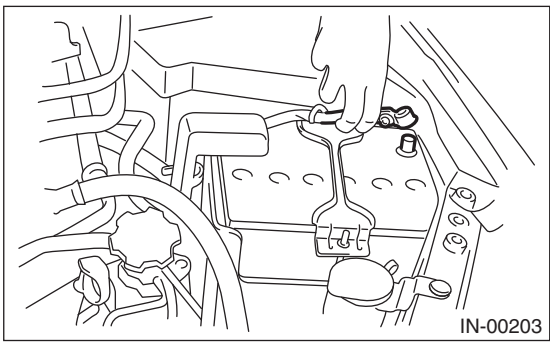
2. Spark Plug

A: REMOVAL

Spark plug:
Refer to "SPECIFICATION" for the spark plug. <Ref. to IG(H4DOTC)-2, SPECIFICATION, General Description.>

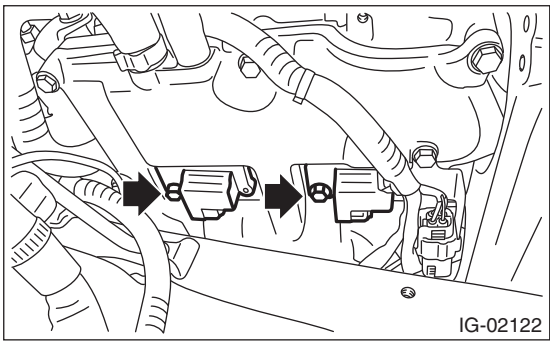
1. RH SIDE

1) Remove the collector cover.
2) Disconnect the ground cable from battery.


IN-00203

3) Remove the air cleaner case. <Ref. to IN(H4DOTC)-8, REMOVAL, Air Cleaner Case.>
4) Disconnect the connector from ignition coil.
5) Remove the ignition coil.

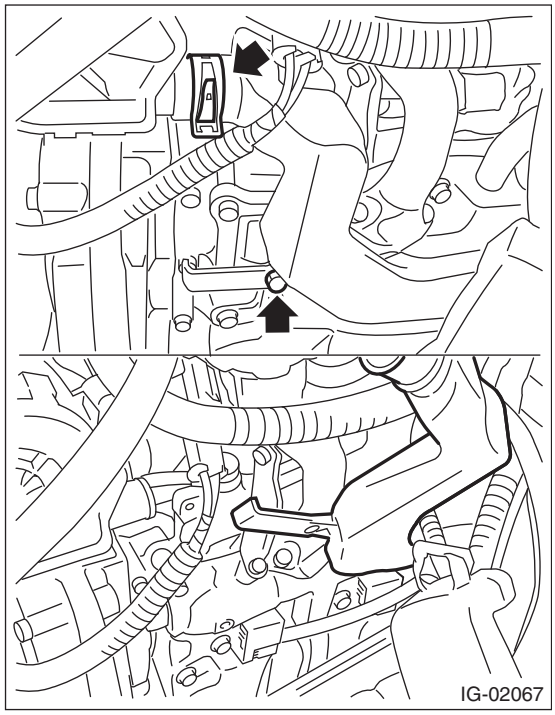
NOTE:
Turn #3 ignition coil by 180 degrees to remove it.


IG-02122

6) Remove the spark plug with a spark plug socket.

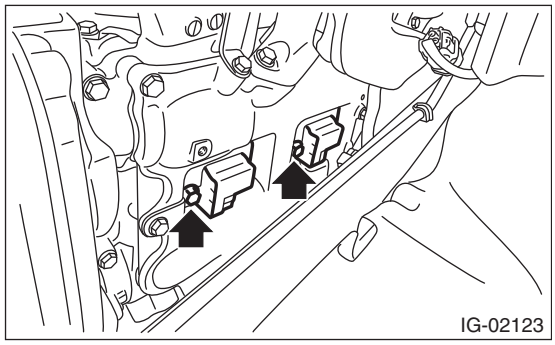
2. LH SIDE

1) Remove the collector cover.
2) Remove the battery. <Ref. to SC(H4DO)-59, REMOVAL, Battery.>
3) Disconnect the air duct from the secondary air pump.
4) Remove the bolts that secure the air duct to the rocker cover LH, and lift the air duct.


IG-02067

5) Disconnect the connector from ignition coil.
6) Remove the ignition coil.

NOTE:
Turn #4 ignition coil by 180 degrees to remove it.


IG-02123

7) 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, 15.5 ft-lb)

Tightening torque (Ignition coil):
16 N·m (1.6 kgf-m, 11.8 ft-lb)

2. LH SIDE

Install in the reverse order of removal.

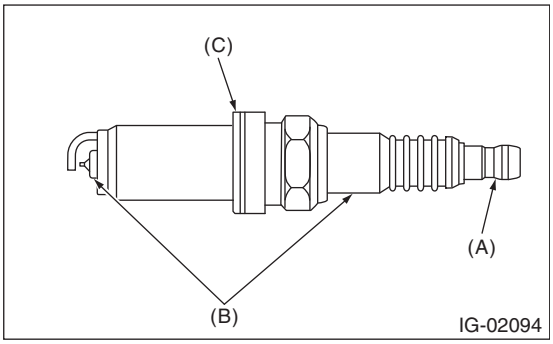
Tightening torque (Spark plug):
21 N·m (2.1 kgf-m, 15.5 ft-lb)

Tightening torque (Ignition coil):
16 N·m (1.6 kgf-m, 11.8 ft-lb)

Tightening torque (Air duct):
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)

C: INSPECTION

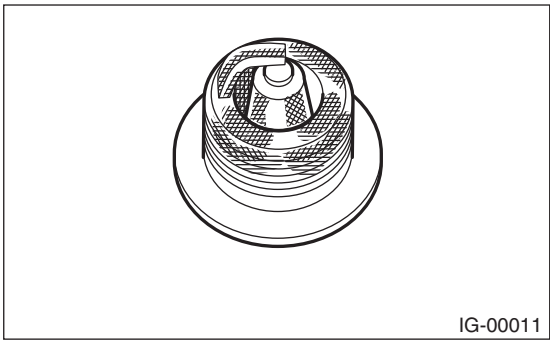
1) Check the spark plug for abnormalities. If defective, replace the spark plug.



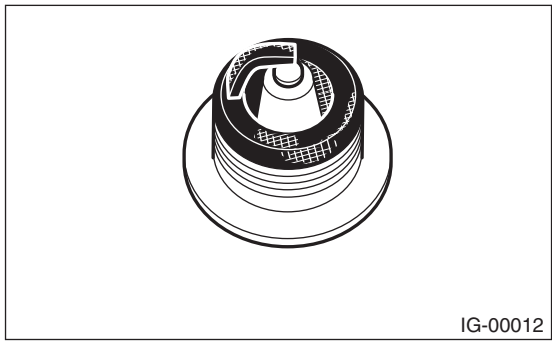
(A) Terminal damage
(B) Crack or damage in insulator
(C) Damaged gasket

2) Check the spark plug electrode and condition of the insulator. If abnormal, check and repair the cause and replace the spark plug.

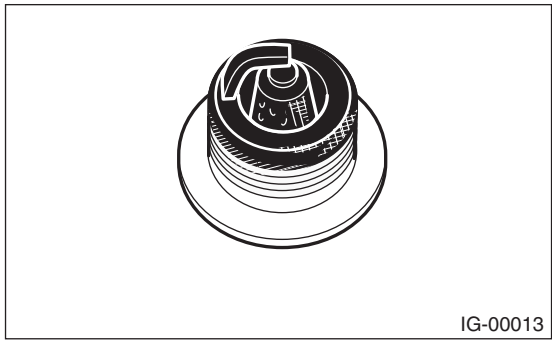
(1) Normal:
Brown to grayish-tan deposits and slight electrode wear indicate correct spark plug heat range.



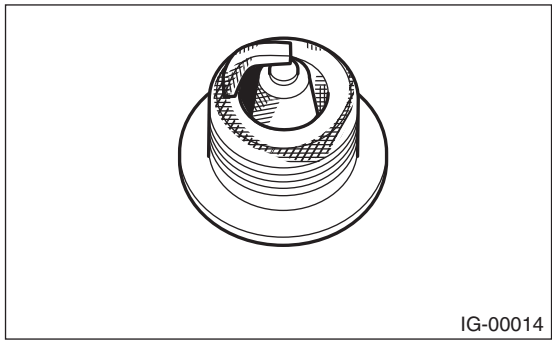
(2) Carbon fouled:
Dry fluffy carbon deposits on insulator and electrode are mostly caused by slow speed driving in the city, weak ignition, too rich fuel mixture, etc.



(3) Oil fouled:
Wet black deposits show oil entrance into combustion chamber through worn piston rings or increased clearance between valve guides and valve stems.



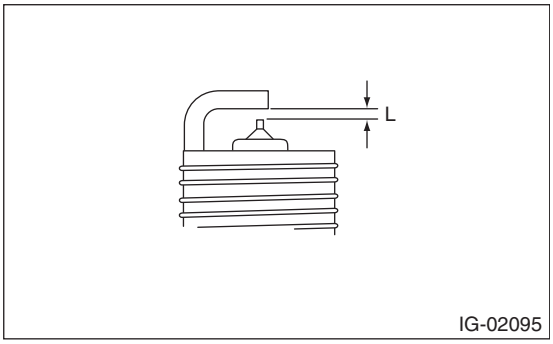
(4) Overheating:
A white or light gray insulator with black or brown spots and bluish burnt electrodes indicate engine overheating, wrong selection of fuel, or loose spark plugs.



3) Using a nylon brush, etc., clean and remove the carbon or oxide deposits from the spark plug. If deposits are too stubborn, replace the spark plugs. After cleaning the spark plugs, check the spark plug gap “L” using a gap gauge. If it is not within the standard, replace the spark plug.

NOTE:
- Never use a plug cleaner.
- Do not use a metal brush as it may damage the electrode area.

Spark plug gap L:
Standard
0.7 — 0.8 mm (0.028 — 0.031 in)



3. Ignition Coil

A: REMOVAL

Direct ignition type is adopted. Refer to “Spark Plug” for removal procedure. <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, 11.8 ft-lb)

C: INSPECTION

For inspection procedure, refer to “Diagnostics for Engine Starting Failure”. <Ref. to EN(H4DOTC)(diag)-75, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>

STARTING/CHARGING SYSTEMS

SC(H4DOTC)

Page
1. General Description 2

1. General Description

A: SPECIFICATION

Specifications for the turbo model are included in the SC(H4DO) section. <Ref. to SC(H4DO)-2, General Description.>

ENGINE (DIAGNOSTICS)

EN(H4DOTC)(diag)

		Page
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1. Basic Diagnostic Procedure

A: PROCEDURE

1. ENGINE

	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)-4, 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)-69, 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)-368, General Diagnostic Table.>
3	**CHECK COMMUNICATION STATUS.** 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. NOTE: • Subaru Select Monitor For detailed procedures, refer to "Subaru Select Monitor". <Ref. to EN(H4DOTC)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Does Subaru Select Monitor or general scan tool communicate with vehicle normally?	Go to step **4**.	Inspection using "Diagnostics Procedure for Subaru Select Monitor Communication". <Ref. to EN(H4DOTC)(diag)-80, Diagnostic Procedure for Subaru Select Monitor Communication.>
4	**CHECK DTC.** Read DTC using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor Refer to "Read Diagnostic Trouble Code" for detailed operation procedure. <Ref. to EN(H4DOTC)(diag)-44, Read Diagnostic Trouble Code (DTC).> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is DTC displayed on Subaru Select Monitor or general scan tool?	Record the DTC. Repair the trouble cause. <Ref. to EN(H4DOTC)(diag)-82, List of Diagnostic Trouble Code (DTC).> Go to step **5**.	Repair the related parts. NOTE: If DTC is not shown on the screen although the malfunction indicator light illuminates, perform the diagnosis of malfunction indicator light circuit or combination meter. <Ref. to EN(H4DOTC)(diag)-60, Malfunction Indicator Light.>

	Step	Check	Yes	No
5	**CHECK FREEZE FRAME DATA.** Check the freeze frame data using the Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed procedures, refer to "Subaru Select Monitor". <Ref. to EN(H4DOTC)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is freeze frame data displayed on Subaru Select Monitor or general scan tool?	Record the freeze frame data. Repair the trouble cause. Go to step **6**.	Go to step **6**.
6	**PERFORM DIAGNOSIS.** 1) Perform the Clear Memory Mode. <Ref. to EN(H4DOTC)(diag)-56, Clear Memory Mode.> 2) Perform the Inspection Mode or Drive Cycle. <Ref. to EN(H4DOTC)(diag)-45, Inspection Mode.> <Ref. to EN(H4DOTC)(diag)-50, Drive Cycle.>	Is DTC displayed on Subaru Select Monitor or general scan tool?	Inspect using "Diagnostic Procedure with Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-90, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

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.

<table>
<tr><td>Customer's name</td><td></td><td>Engine No.</td><td></td></tr>
<tr><td>Date of purchase</td><td></td><td>Fuel type</td><td></td></tr>
<tr><td>Date of repair</td><td></td><td rowspan="2">Odometer reading</td><td>km</td></tr>
<tr><td>V.I.N.</td><td></td><td>miles</td></tr>
<tr><td>Weather</td><td colspan="3">❑ Fine
❑ Cloudy
❑ Rainy
❑ Snowy
❑ Various/Others:</td></tr>
<tr><td rowspan="2">Ambient air temperature</td><td>°C (°F)</td><td colspan="2"></td></tr>
<tr><td colspan="3">❑ Hot
❑ Warm
❑ Cool
❑ Cold</td></tr>
<tr><td>Place</td><td colspan="3">❑ Highway
❑ Suburbs
❑ Inner city
❑ Uphill
❑ Downhill
❑ Rough road
❑ Others:</td></tr>
<tr><td>Engine temperature</td><td colspan="3">❑ Cold
❑ Warming-up
❑ After warming-up
❑ Any temperature
❑ Others:</td></tr>
<tr><td>Engine speed</td><td>rpm</td><td colspan="2"></td></tr>
<tr><td>Vehicle speed</td><td>km/h (MPH)</td><td colspan="2"></td></tr>
<tr><td>Driving conditions</td><td colspan="3">❑ Not affected
❑ At starting
❑ While idling
❑ At racing
❑ While accelerating
❑ While cruising
❑ While decelerating
❑ While turning (RH/LH)</td></tr>
<tr><td>Headlight</td><td>❑ ON/❑ OFF</td><td>Rear defogger</td><td>❑ ON/❑ OFF</td></tr>
<tr><td>Blower</td><td>❑ ON/❑ OFF</td><td>Audio</td><td>❑ ON/❑ OFF</td></tr>
<tr><td>A/C compressor</td><td>❑ ON/❑ OFF</td><td>Rear entertainment system</td><td>❑ ON/❑ OFF</td></tr>
<tr><td>Radiator fan</td><td>❑ ON/❑ OFF</td><td>Car phone</td><td>❑ ON/❑ OFF</td></tr>
<tr><td>Front wiper</td><td>❑ ON/❑ OFF</td><td>Wireless device</td><td>❑ ON/❑ OFF</td></tr>
<tr><td>Rear wiper</td><td>❑ ON/❑ OFF</td><td colspan="2"></td></tr>
</table>

2. CHECK LIST NO. 2

Check the following item about the vehicle's state when the malfunction indicator light turns on.

NOTE:
Use copies of this page for interviewing customers.

a) Other warning lights or indicators illuminate. ❑ Yes / ❑ No
❑ Low fuel warning light ❑ Charge warning light ❑ Engine coolant temperature warning light ❑ Oil pressure warning light ❑ ATF temperature warning light or SPORT indicator light ❑ Driver's control center differential indicator light ❑ ABS warning light ❑ VDC warning light ❑ Cruise indicator light ❑ SI-CRUISE warning light ❑ Immobilizer indicator light ❑ STEERING warning light ❑ Electronic parking brake warning light ❑ Glow indicator ❑ Sedimentor warning light ❑ Others:
b) Fuel level
• Lack of fuel: ❑ Yes / ❑ No • Indicator position of fuel gauge: • Experienced running out of fuel: ❑ Yes / ❑ No
c) Intentional connecting or disconnecting of harness connectors or spark plug cords: ❑ Yes / ❑ No
• What:
d) Intentional connecting or disconnecting of hoses: ❑ Yes / ❑ No
• What:
e) Installing of other parts except genuine parts: ❑ Yes / ❑ No
• What: • Where:
f) Occurrence of noise: ❑ Yes / ❑ No
• From where: • What kind:
g) Occurrence of smell: ❑ Yes / ❑ No
• From where: • What kind:
h) Intrusion of water into engine compartment or passenger compartment: ❑ Yes / ❑ No
i) Troubles occurred
❑ Engine does not start. ❑ Engine stalls during idling. ❑ Engine stalls while driving. ❑ Engine speed decreases. ❑ Engine speed does not decrease. ❑ Rough idling ❑ Poor acceleration ❑ Back fire ❑ After fire ❑ Does not shift. ❑ 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:
• Do not use electrical test equipment on the airbag system 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. Doing so will damage the ECM instantly, and other parts will also 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. Perform the Clear Memory Mode after connecting the connectors. <Ref. to EN(H4DOTC)(diag)-56, Clear Memory Mode.>

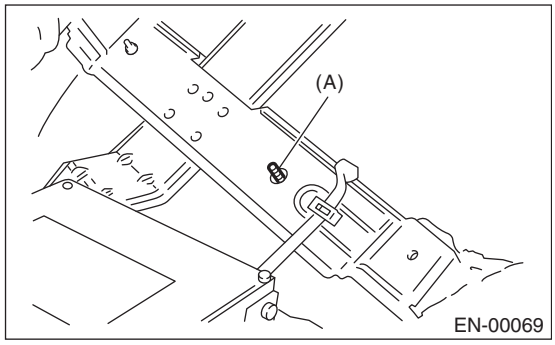
5) When measuring the voltage or resistance of individual sensor or all electrical control modules, use a tapered pin with a diameter of less than 0.6 mm (0.024 in). Do not insert the pin 4 mm (0.16 in) or more into the part.

CAUTION:
When replacing the ECM, be careful not to use the wrong spec. ECM to avoid any damage on the fuel injection system.

NOTE:
When replacing the ECM of the models with Immobilizer, immobilizer system must be registered. To do so, all ignition keys and ID cards need to be prepared. For detailed operation procedures, refer to "PC application help for Subaru Select Monitor".

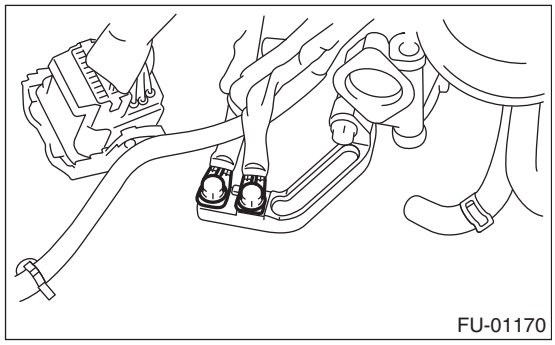
6) Take care not to allow water to get into the connectors when servicing or washing the vehicle in rainy weather. Avoid exposure to water even if the connectors are waterproof.

7) Use ECM mounting stud bolts at the body side grounding point when measuring voltage and resistance inside the passenger compartment.



(A) Stud bolt

8) Use the engine ground terminal or engine assembly as the grounding point to chassis when measuring the voltage and resistance in engine compartment.



9) Every engine control system-related part is a precision part. Do not drop them.

10) Observe the following cautions when installing a radio in vehicle.

CAUTION:
• The antenna must be kept as far apart as possible from control module. (ECM is installed under the passenger's side floor mat.)
• The antenna feeder must be placed as far apart as possible from the ECM and engine control system 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.

11) When disconnecting the fuel hose, release the fuel pressure. <Ref. to FU(H4DOTC)-65, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>

12) Warning lights 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 VDC memory clear procedure of self-diagnosis function. <Ref. to VDC(diag)-25, Clear Memory Mode.>

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 the electrolyte.

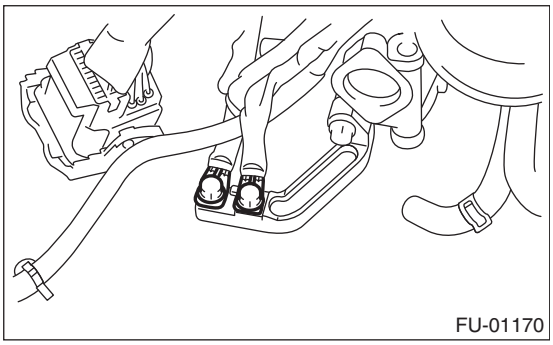
Standard voltage: 12 V

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

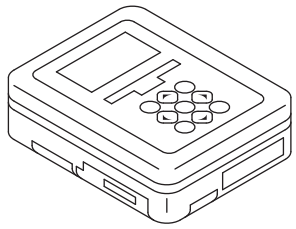
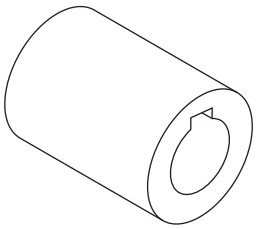
Make sure that the engine ground terminal is properly connected to the engine.



C: NOTE

- The on-board diagnostic (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 of 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 when it detects a malfunction.
- The freeze frame engine condition data are stored until DTCs are cleared. However, if any faults concerning fuel trim or misfiring are detected while the freeze frame engine condition data are stored, these data are rewritten to those concerning fuel trim or misfiring.
- 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.

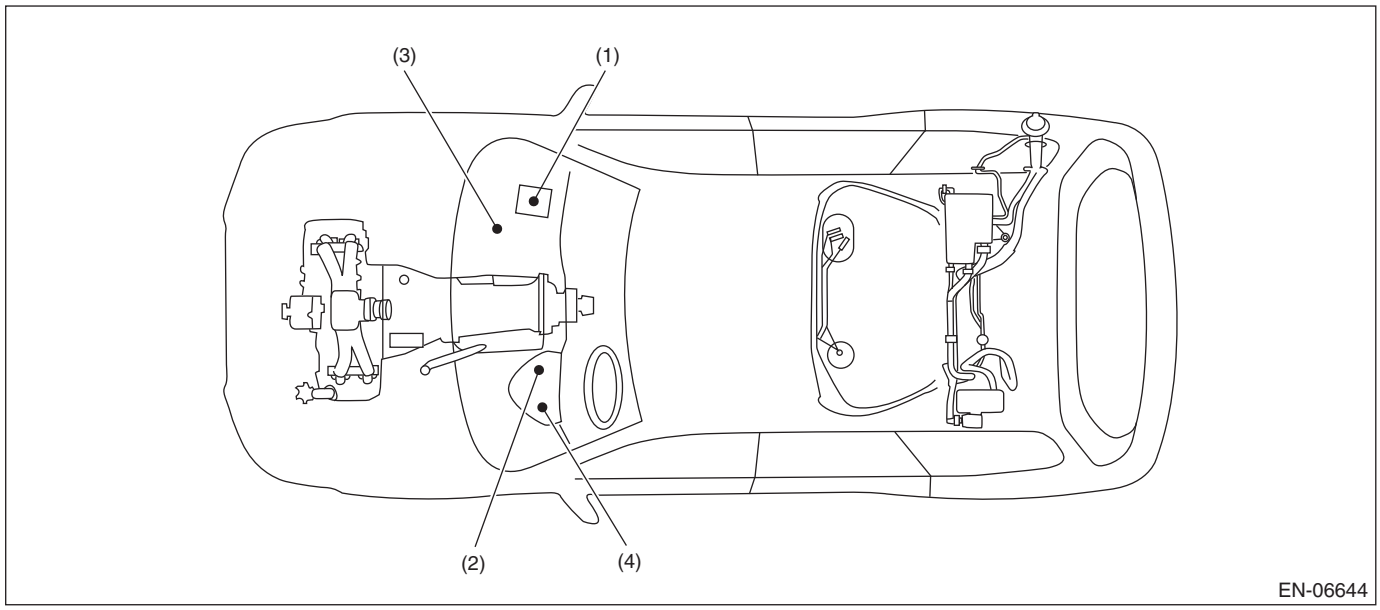
D: PREPARATION TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST1B022XU0	1B022XU0	SUBARU SELECT MONITOR III KIT	Used for troubleshooting the electrical system.
 ST-499987500	499987500	CRANKSHAFT SOCKET	Used for rotating crankshaft.

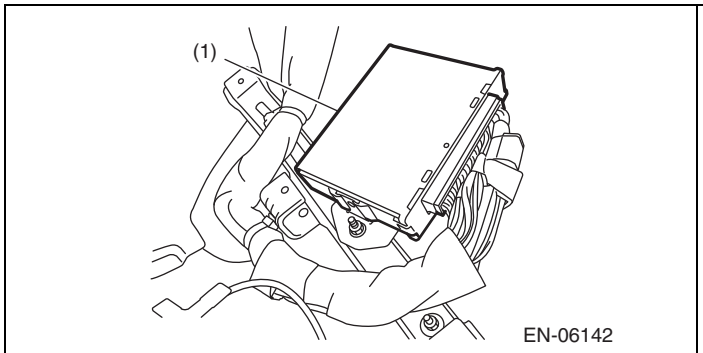
4. Electrical Component Location

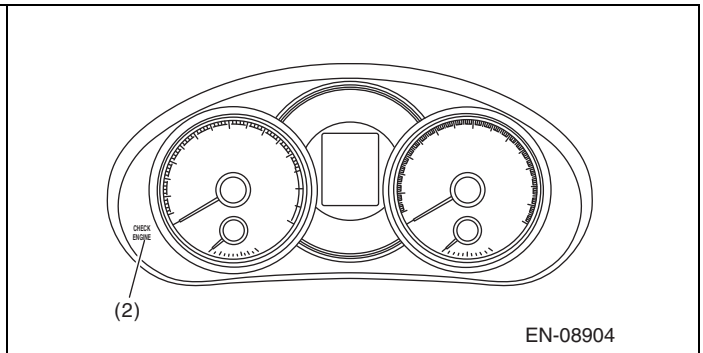
A: LOCATION

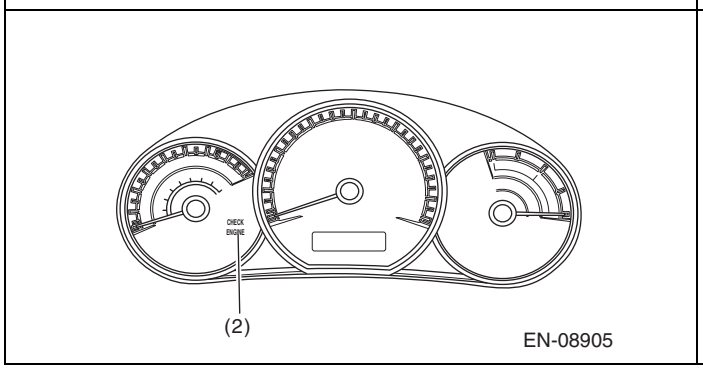
1. CONTROL MODULE

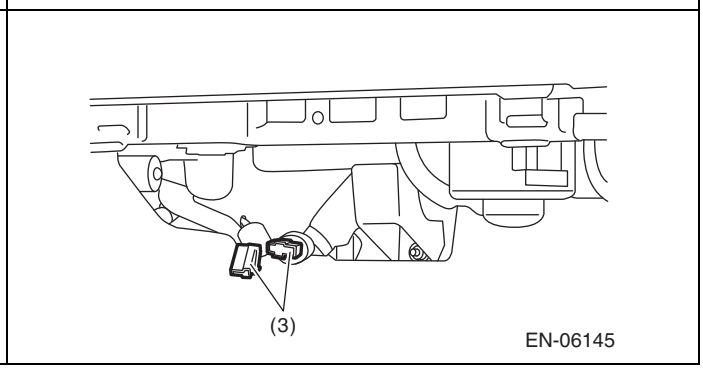


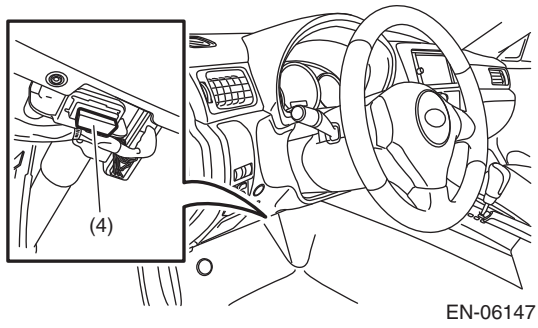
(1) Engine control module (ECM)
(2) Malfunction indicator light
(3) Delivery (test) mode connector
(4) Data link connector







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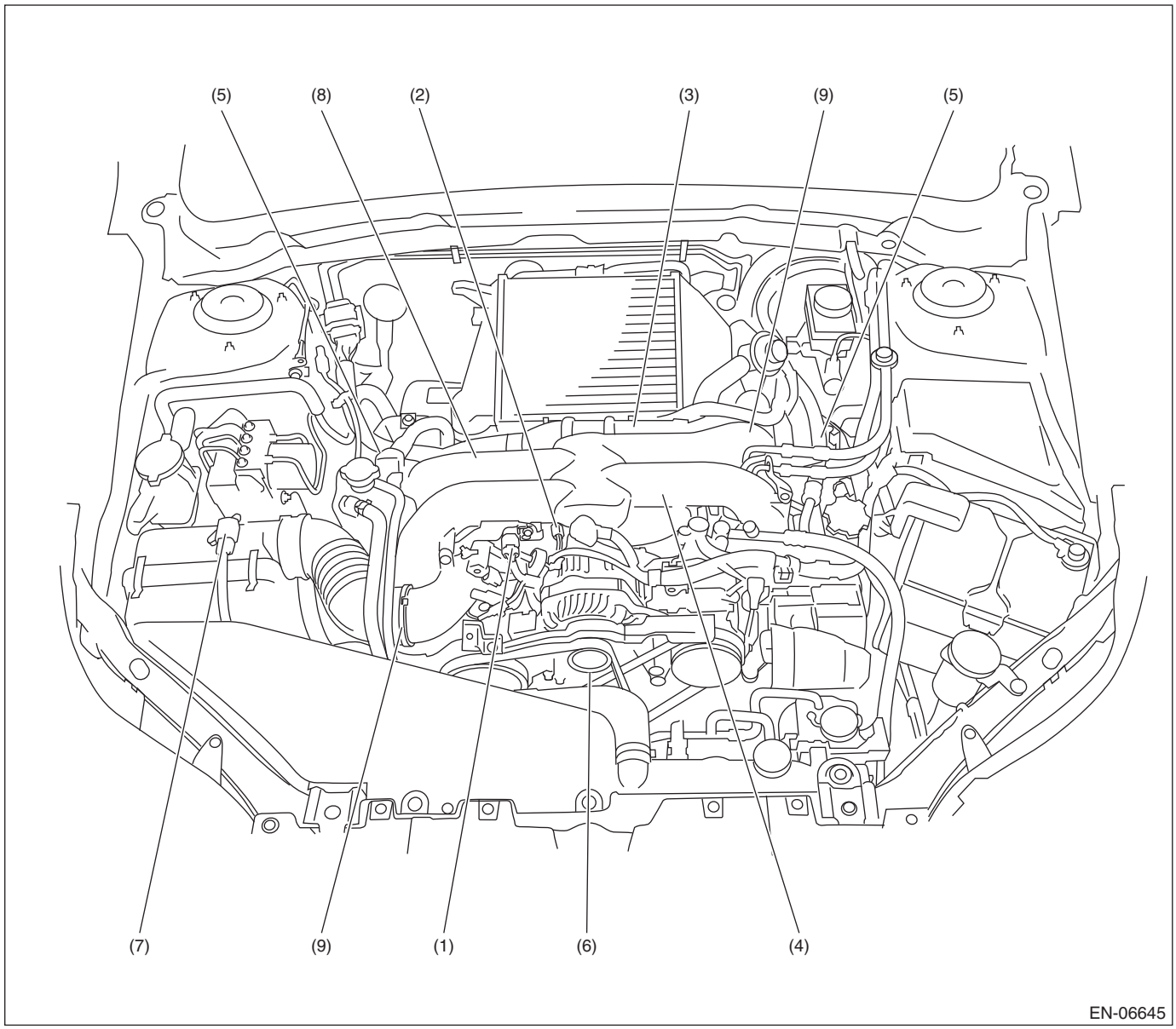
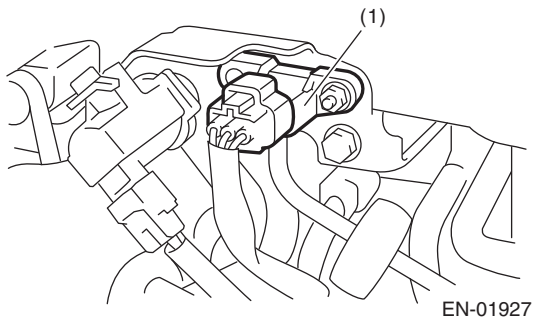
EN-06147

2. SENSOR



(1) Manifold absolute pressure sensor
(2) Engine coolant temperature sensor
(3) Electronic throttle control
(4) Knock sensor
(5) Intake camshaft position sensor
(6) Crankshaft position sensor
(7) Mass air flow and intake air temperature sensor
(8) Secondary air pipe pressure sensor (with built-in secondary air combination valve RH)
(9) Tumble generator valve position sensor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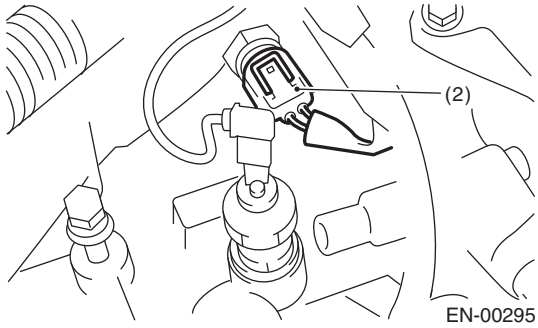
EN-01927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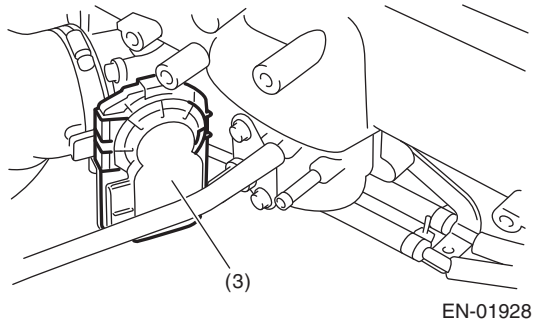
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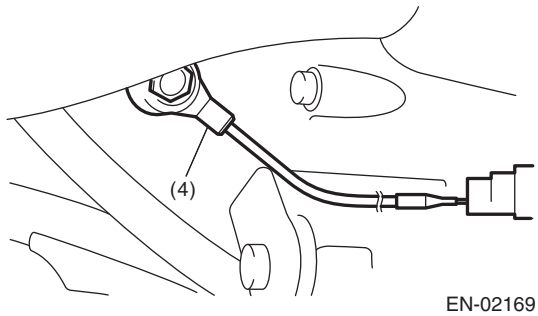
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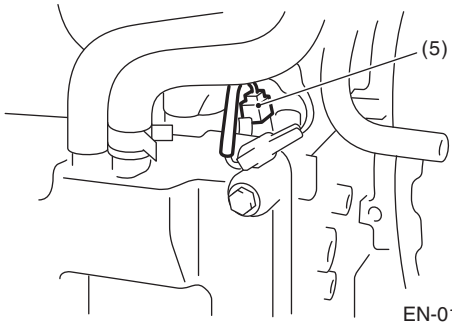
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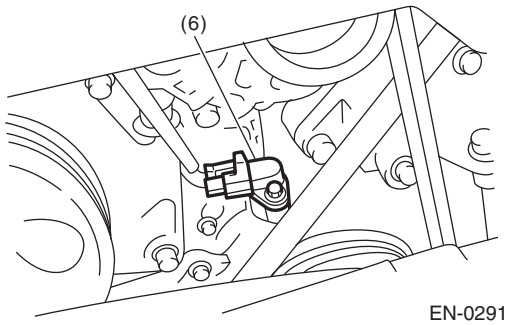
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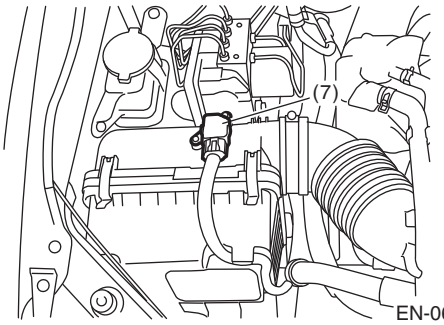
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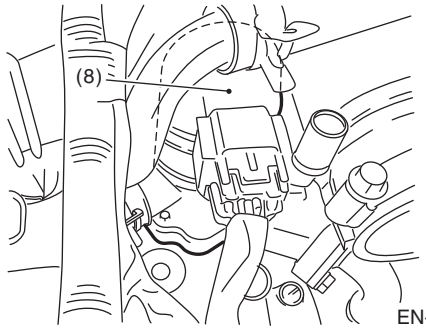
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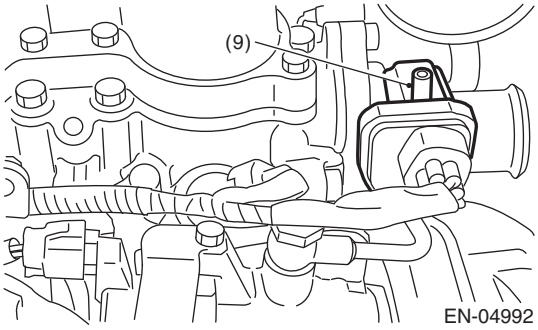
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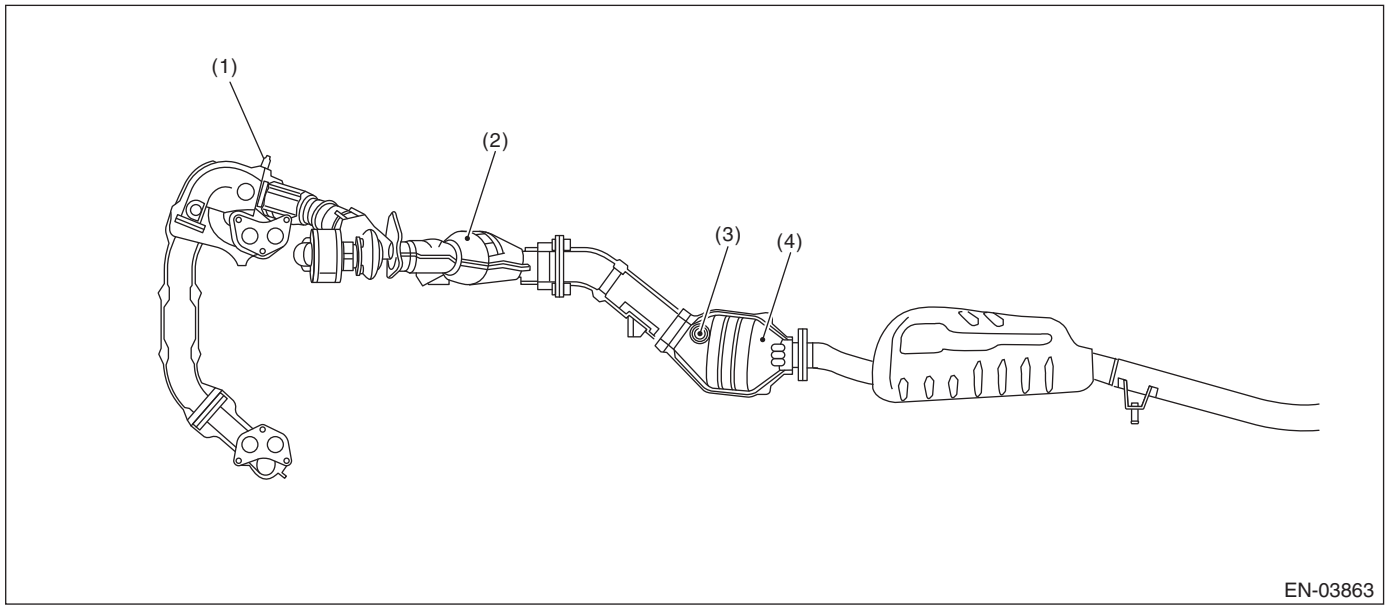
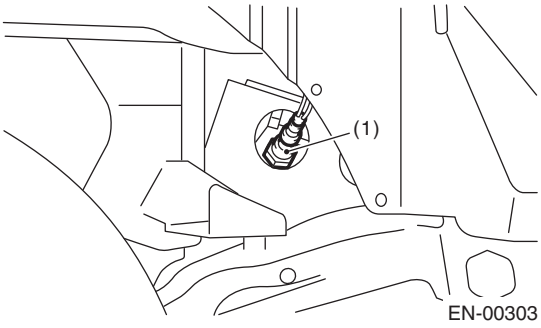
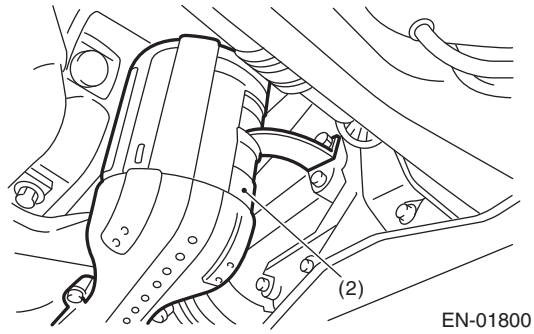
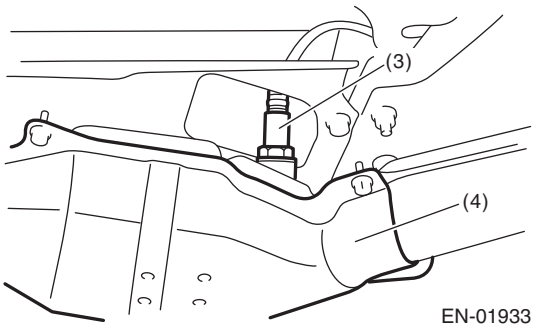
EN-04992

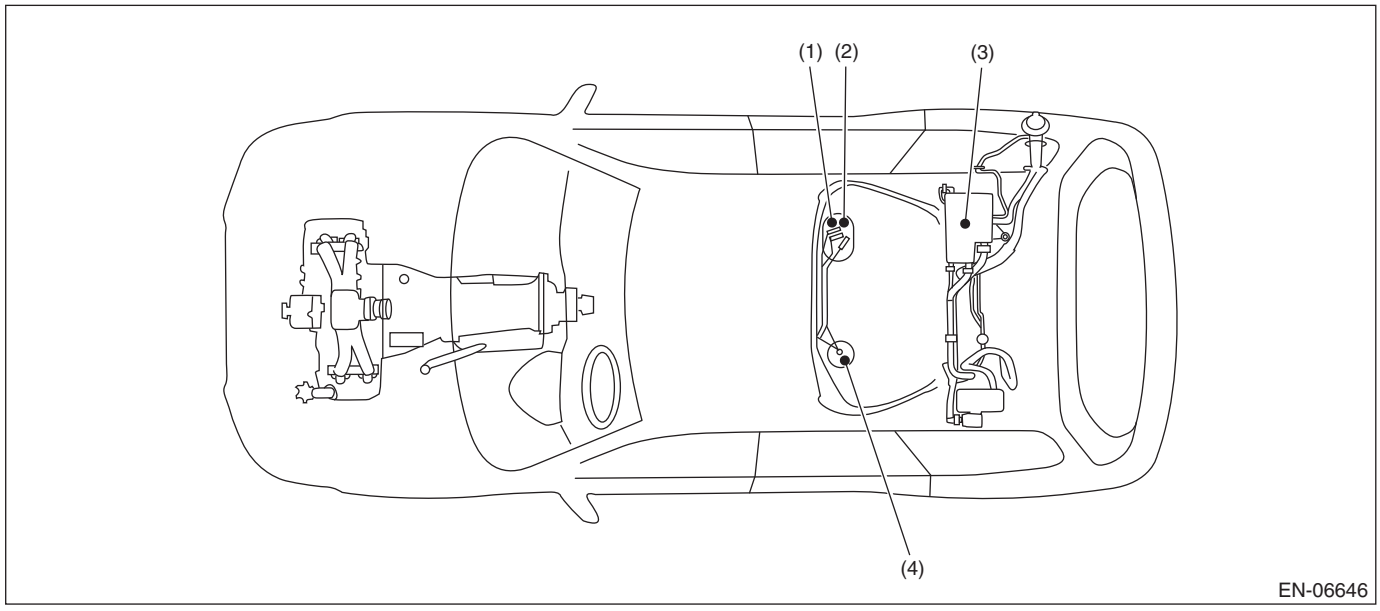


(1) Front oxygen (A/F) sensor
(2) Front catalytic converter
(3) Rear oxygen sensor
(4) Rear catalytic converter

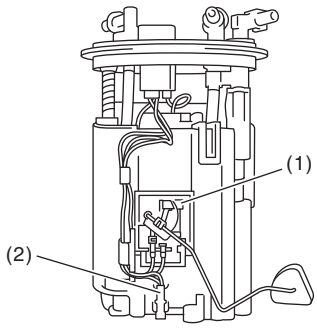


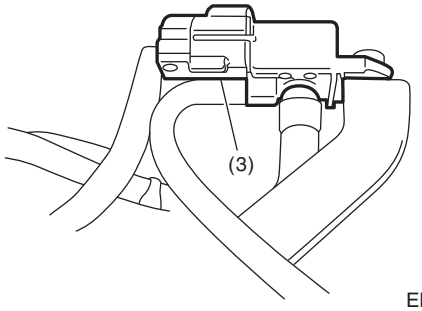


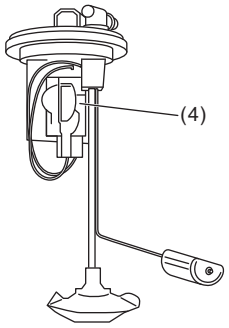




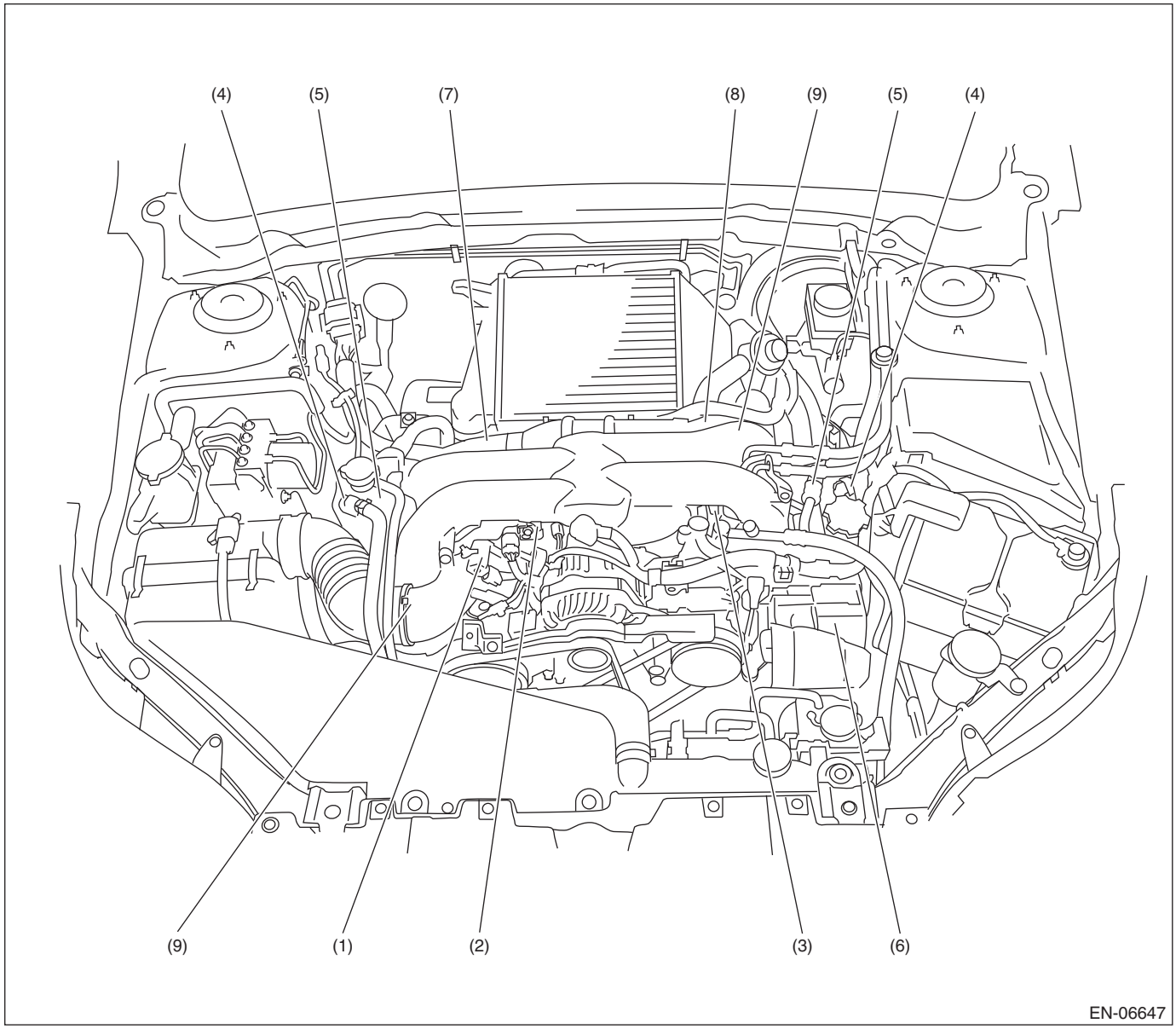
(1) Fuel level sensor
(2) Fuel temperature sensor
(3) Fuel tank pressure sensor
(4) Fuel sub level sensor



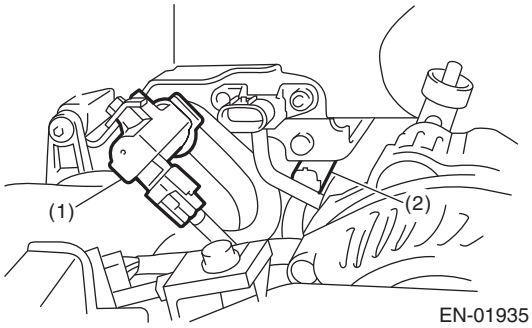


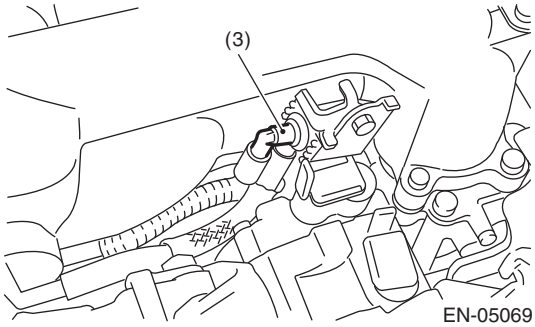


3. SOLENOID VALVE, ACTUATOR, EMISSION CONTROL SYSTEM PARTS AND IGNITION SYSTEM PARTS



(1)	Wastegate control solenoid valve	(4)	Ignition coil	(7)	Secondary air combination valve RH
(2)	Purge control solenoid valve 2	(5)	Intake oil flow control solenoid valve	(8)	Secondary air combination valve LH
(3)	Purge control solenoid valve 1	(6)	Secondary air pump	(9)	Tumble generator valve ASSY


(1)
(2)
EN-01935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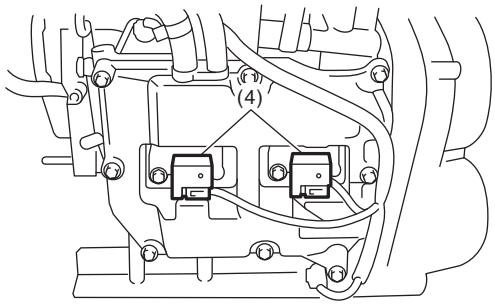
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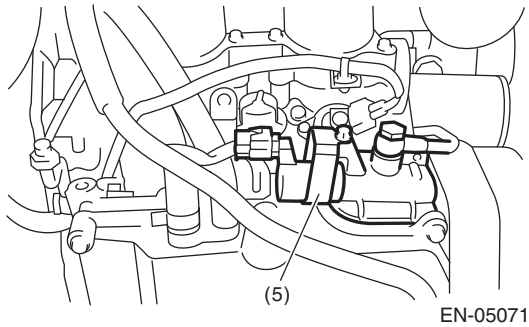
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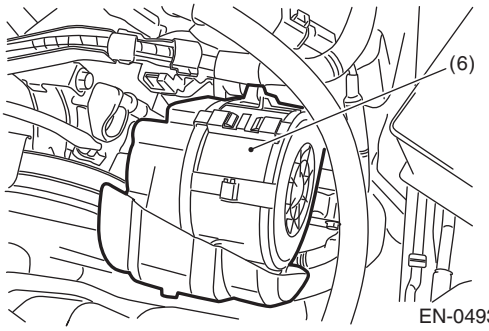
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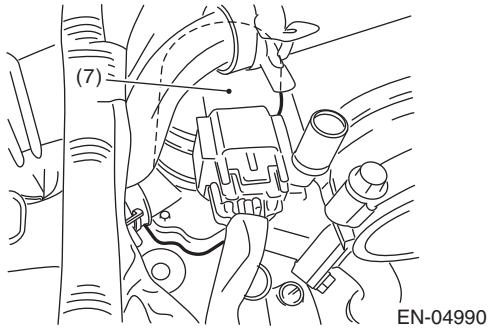
EN-04936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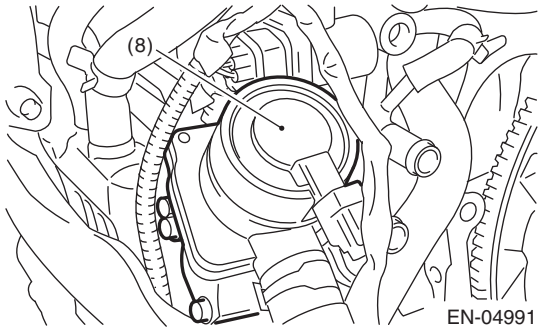
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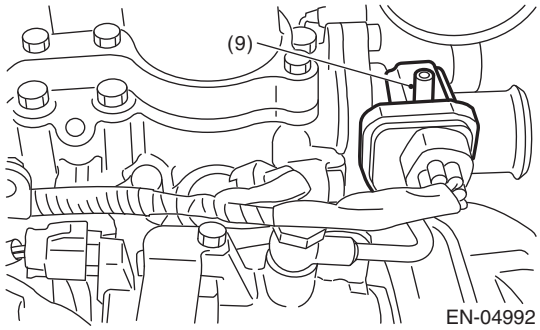
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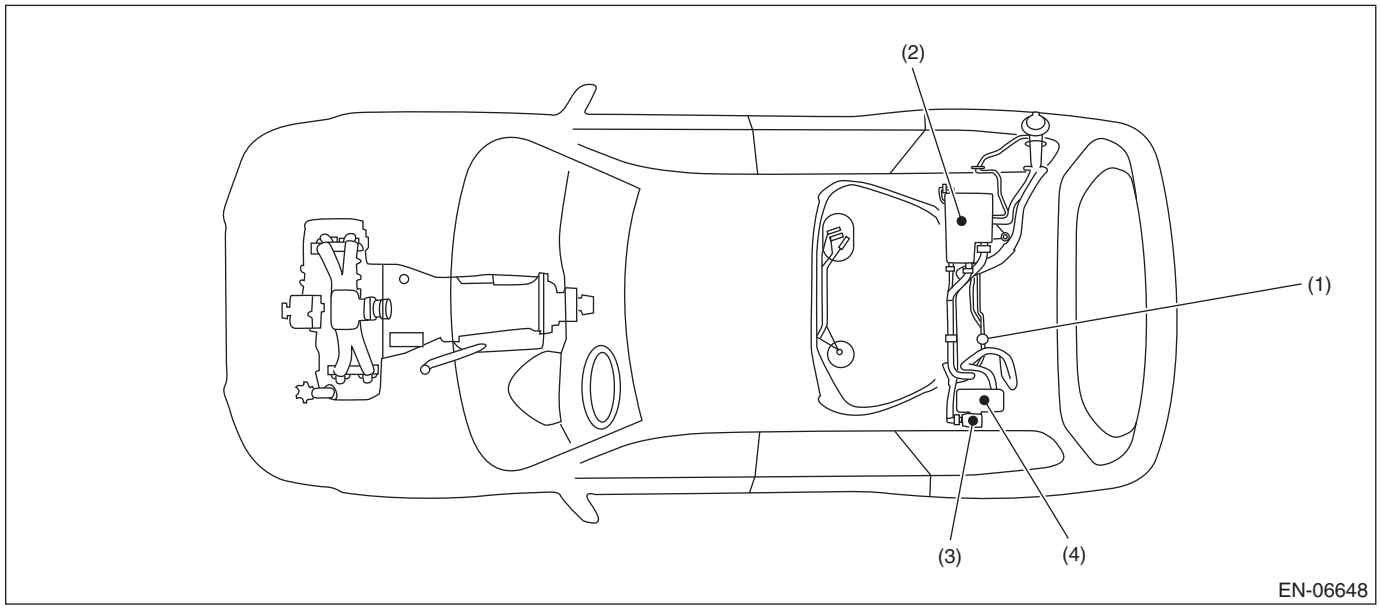
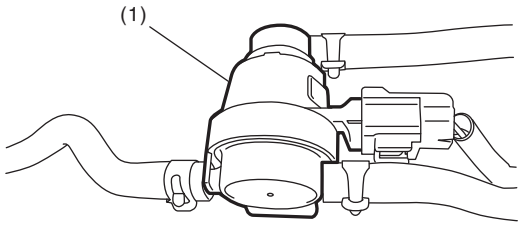
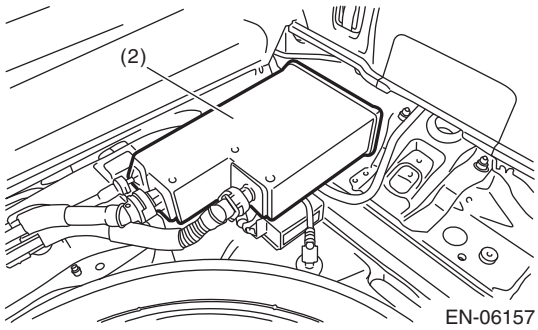
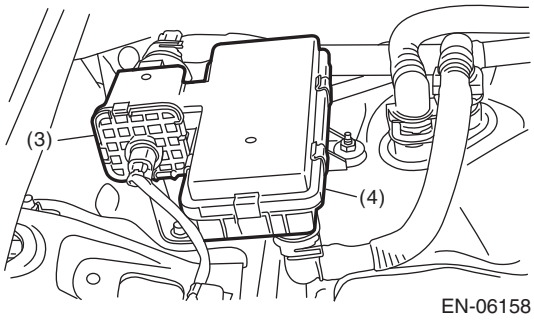


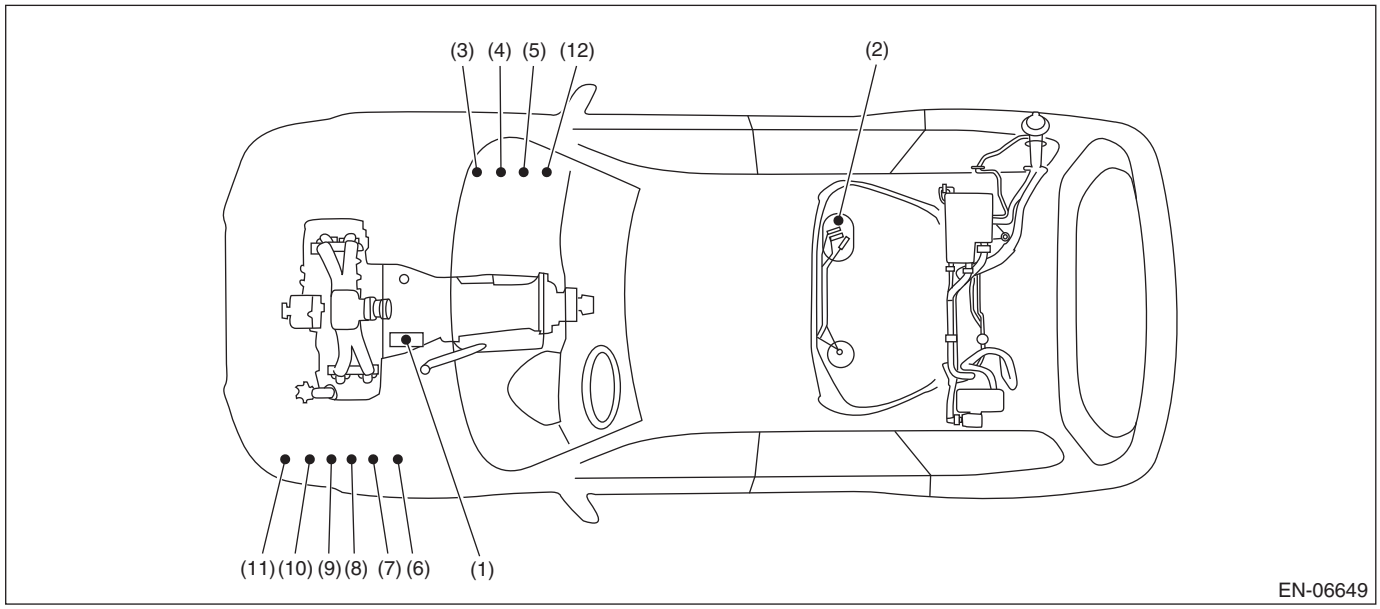
(1) Pressure control solenoid valve
(2) Canister
(3) Drain valve
(4) Drain filter



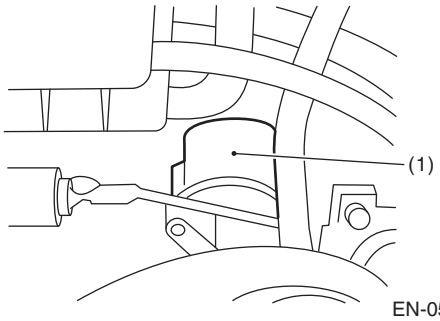


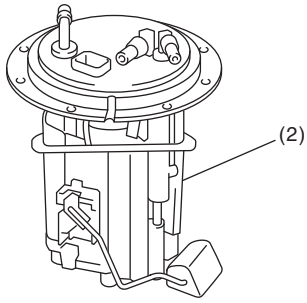


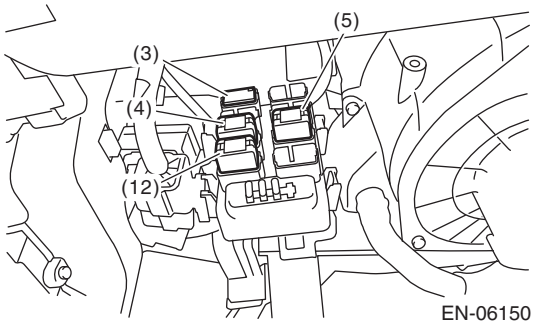
Electrical Component Location

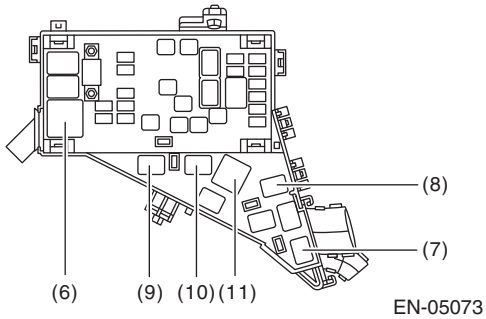


(1)	Starter	(5)	Electronic throttle control relay	(9)	Secondary air combination valve relay 1
(2)	Fuel pump	(6)	Radiator main fan relay 1	(10)	Secondary air combination valve relay 2
(3)	Main relay	(7)	Radiator sub fan relay	(11)	Secondary air pump relay
(4)	Fuel pump relay	(8)	Radiator main fan relay 2	(12)	A/F, oxygen sensor relay



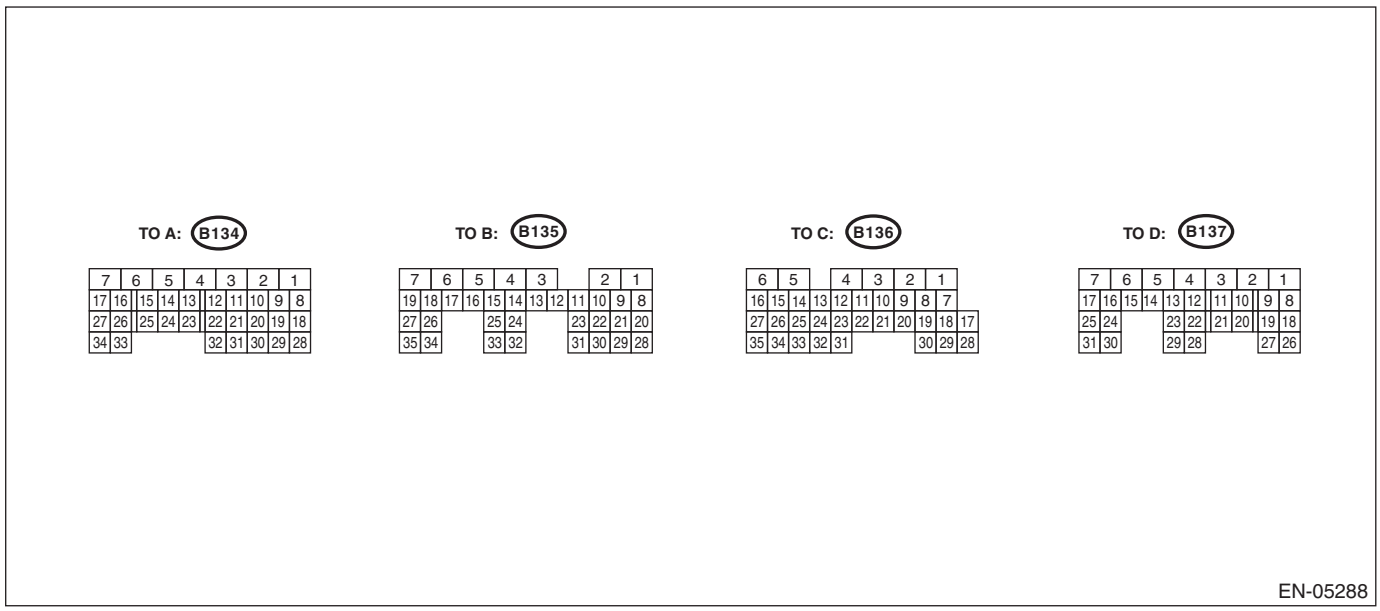






5. Engine Control Module (ECM) I/O Signal

A: ELECTRICAL SPECIFICATION



Description		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (engine OFF)	Engine ON (idling)	
Crankshaft position sensor	Signal (+)	B137	17	0	–7 — +7	Waveform
	Signal (–)	B137	25	0	0	—
	Shield	B137	31	0	0	—
Rear oxygen sensor	Signal	B136	20	0	0 — 0.9	—
	Shield	B136	9	0	0	—
	Ground (sensor)	B135	30	0	0	—
Front oxygen (A/F) sensor heater	Signal 1	B136	6	—	—	Waveform
	Signal 2	B136	5	—	—	Waveform
Rear oxygen sensor heater signal		B135	6	0 — 13	12 — 14	Waveform
Engine coolant temperature sensor	Signal	B137	22	1.0 — 1.4	1.0 — 1.4	After engine is warmed up.
	Ground (sensor)	B134	29	0	0	After engine is warmed up.
Air flow sensor	Signal	B136	22	—	0.3 — 4.5	—
	Shield	B136	10	0	0	—
	Ground	B136	11	0	0	—
Intake air temperature sensor signal		B136	31	0.3 — 4.6	0.3 — 4.6	—
Wastegate control solenoid valve		B134	33	0 or 10 — 13	0 or 12 — 14	Waveform
Starter switch		B136	16	0	0	Cranking: 8 — 14
A/C switch		B136	29	ON: 10 — 13 OFF: 0	ON: 12 — 14 OFF: 0	—
Ignition switch		B136	30	10 — 13	12 — 14	—
Neutral position switch		B136	35	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	—
Delivery (test) mode connector		B136	34	10 — 13	13 — 14	When connected: 0

Description		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (engine OFF)	Engine ON (idling)	
Knock sensor	Signal	B137	2	2.8	2.8	—
	Shield	B137	8	0	0	—
Back-up power supply		B136	2	10 — 13	12 — 14	Ignition switch “OFF”: 10 — 13
Control module power supply		B136	1	10 — 13	12 — 14	—
		B137	7	10 — 13	12 — 14	—
Sensor power supply		B134	19	5	5	—
Ignition control	#1	B134	21	0	0 or 5	Waveform
	#2	B134	22	0	0 or 5	Waveform
	#3	B134	31	0	0 or 5	Waveform
	#4	B134	32	0	0 or 5	Waveform
Fuel injector	#1	B134	10	10 — 13	1 — 14	Waveform
	#2	B134	11	10 — 13	1 — 14	Waveform
	#3	B134	12	10 — 13	1 — 14	Waveform
	#4	B134	13	10 — 13	1 — 14	Waveform
Fuel pump control unit	Control	B136	33	0 or 5	0 or 5	Waveform
	Diagnostic signal	B135	10	10 — 13	12 — 14	—
A/C relay control		B135	35	ON: 0.5 or less OFF: 10 — 13	ON: 0.5 or less OFF: 12 — 14	—
Radiator fan relay 1 control		B135	11	ON: 0.5 or less OFF: 10 — 13	ON: 0.5 or less OFF: 12 — 14	—
Radiator fan relay 2 control		B135	12	ON: 0.5 or less OFF: 10 — 13	ON: 0.5 or less OFF: 12 — 14	Model with A/C only
Malfunction indicator light		B135	33	—	—	Light “ON”: 1 or less Light “OFF”: 10 — 14
Engine speed output		B135	15	—	0 — 13 or more	Waveform
Purge control solenoid valve 1		B137	6	ON: 1 or less OFF: 10 — 13	ON: 1 or less OFF: 12 — 14	Waveform
Purge control solenoid valve 2		B137	15	ON: 1 or less OFF: 10 — 13	ON: 1 or less OFF: 12 — 14	Waveform
Manifold absolute pressure sensor	Signal	B137	20	1.7 — 2.4	1.1 — 1.6	—
	Power supply	B134	19	5	5	
	Ground (sensor)	B134	29	0	0	
Power steering oil pressure switch		B137	28	10 — 13	ON: 0 OFF: 12 — 14	—
Front oxygen (A/F) sensor signal (+)		B136	19	2.8 — 3.2	2.8 — 3.2	—
Front oxygen (A/F) sensor signal (–)		B136	18	2.4 — 2.7	2.4 — 2.7	—
Front oxygen (A/F) sensor shield		B136	9	0	0	—
SSM/GST communication line		B135	14	1 or less ←→ 4 or more	1 or less ←→ 4 or more	—
Intake camshaft position sensor (LH)		B137	16	0 or 5	0 or 5	Waveform
Intake camshaft position sensor (RH)		B137	24	0 or 5	0 or 5	Waveform
Intake camshaft position sensor ground		B137	30	0	0	—

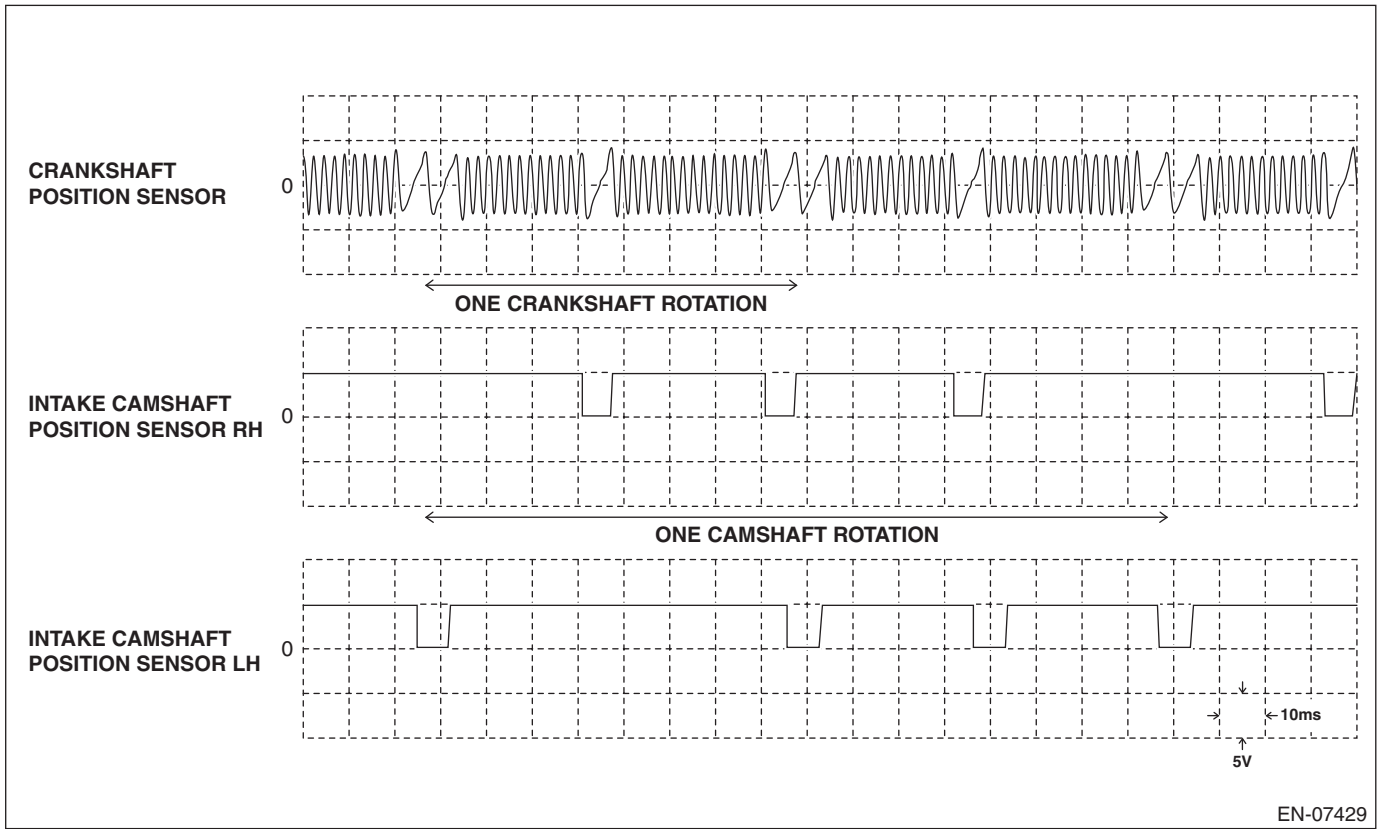
Description		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (engine OFF)	Engine ON (idling)	
Electronic throttle control	Main	B134	18	Approx. 0.9 (After engine is warmed up.)	Approx. 0.6 — 0.7 (After engine is warmed up.)	Fully closed: Approx. 0.6 Fully open: Approx. 4.0
	Sub	B134	28	Approx. 1.7 (After engine is warmed up.)	Approx. 1.5 — 1.6 (After engine is warmed up.)	Fully closed: Approx. 1.5 Fully open: Approx. 4.2
	Power supply	B134	19	5	5	—
	Ground (sensor)	B134	29	0	0	—
Electronic throttle control motor (+)		B134	2	Duty waveform	Duty waveform	Drive frequency: 500 Hz
Electronic throttle control motor (–)		B134	1	Duty waveform	Duty waveform	Drive frequency: 500 Hz
Electronic throttle control motor power supply		B135	7	10 — 13	12 — 14	—
Electronic throttle control motor relay		B135	17	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	When ignition switch is turned to ON: ON
Intake oil flow control solenoid valve (LH)	Signal (+)	B134	17	ON: 10 — 13 OFF: 0	ON: 12 — 14 OFF: 0	—
	Signal (–)	B134	16	0	0	—
Intake oil flow control solenoid valve (RH)	Signal (+)	B134	34	ON: 10 — 13 OFF: 0	ON: 12 — 14 OFF: 0	—
	Signal (–)	B134	27	0	0	—
Accelerator pedal position sensor	Main sensor signal	B135	23	Fully closed: 1 Fully opened: 3.3	Fully closed: 1 Fully opened: 3.3	—
	Main power supply	B135	21	5	5	—
	Ground (main sensor)	B135	29	0	0	—
	Shield	B136	4	0	0	—
	Sub sensor signal	B135	31	Fully closed: 1 Fully opened: 3.3	Fully closed: 1 Fully opened: 3.3	—
	Sub power supply	B135	22	5	5	—
	Ground (sub sensor)	B135	30	0	0	—
Starter relay		B135	26	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	ON: cranking
A/C middle pressure switch		B136	7	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	—
Blower fan switch		B135	19	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	Manual A/C model
Brake switch 1		B136	15	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		B136	3	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	—

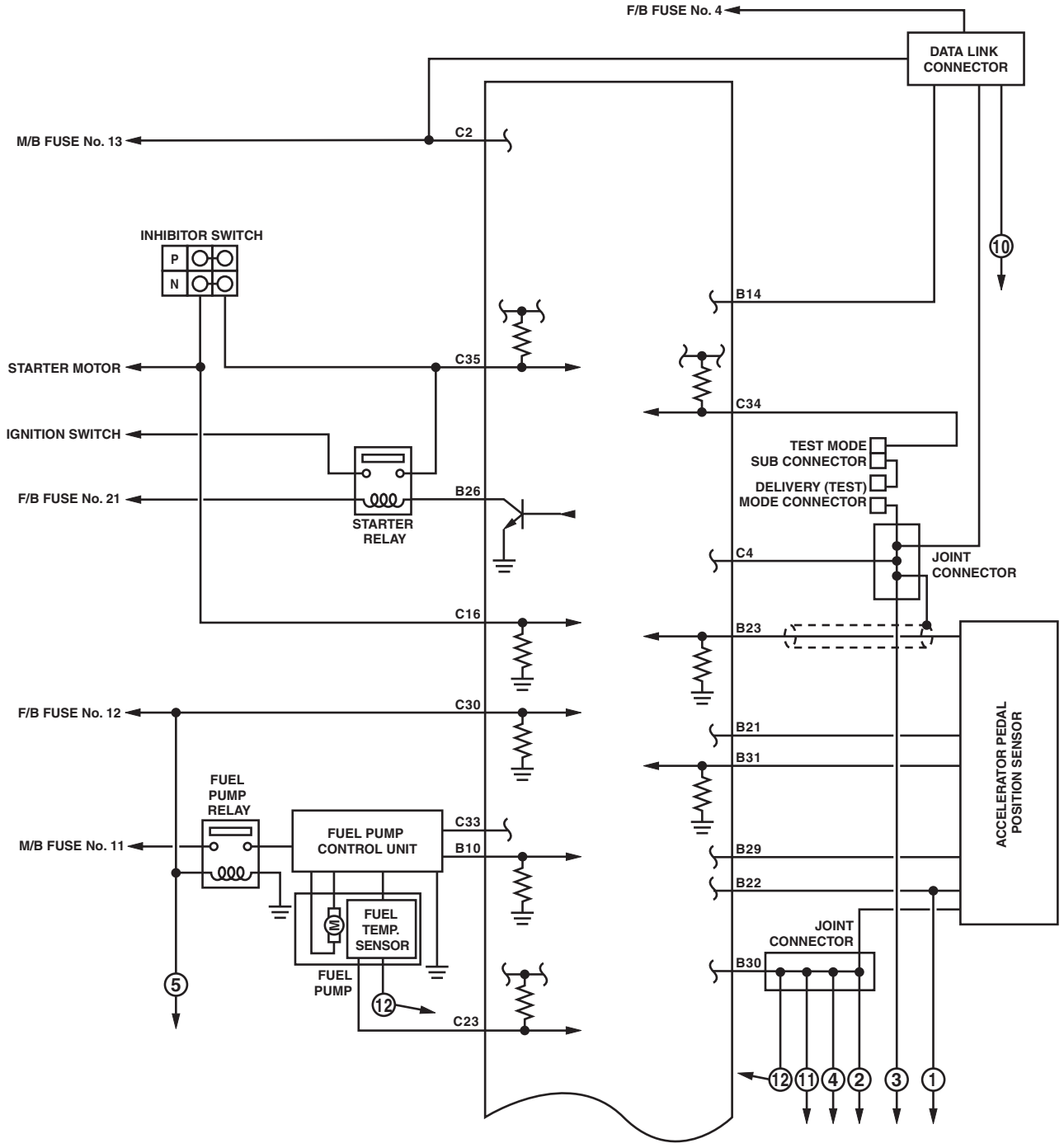
Description		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (engine OFF)	Engine ON (idling)	
Cruise control command switch		B136	12	When operating nothing: 3.5 — 4.5 When operating RES/ACC: 2.5 — 3.5 When operating SET/COAST: 0.5 — 1.5 When operating CANCEL: 0 — 0.5	When operating nothing: 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		B136	13	ON: 0 OFF: 5	ON: 0 OFF: 5	—
Fuel tank pressure sensor		B136	21	2.3 — 2.7	2.3 — 2.7	—
Pressure control solenoid valve		B135	3	ON: 1 or less OFF: 10 — 13	ON: 1 or less OFF: 12 — 14	—
Drain valve		B135	4	ON: 1 or less OFF: 10 — 13	ON: 1 or less OFF: 12 — 14	—
Fuel temperature sensor		B136	23	2.5 — 3.8	2.5 — 3.8	Ambient temperature: 25°C (77°F)
Immobilizer	Signal 1	B135	25	—	—	—
	Signal 2	B135	24	—	—	—
CAN communication (Hi)		B136	17	—	—	—
CAN communication (Lo)		B136	28	—	—	—
Blow-by leak diagnosis		B137	12	0	0	At the time of open circuit (fault): 5
Tumble generator valve position sensor signal (RH)		B137	11	Fully closed: 0.4 — 1.2 Fully opened: 2.8 — 4.6	Fully closed: 0.4 — 1.2 Fully opened: 2.8 — 4.6	—
Tumble generator valve position sensor signal (LH)		B137	10	Fully closed: 0.4 — 1.2 Fully opened: 2.8 — 4.6	Fully closed: 0.4 — 1.2 Fully opened: 2.8 — 4.6	—
Tumble generator valve (RH closed)		B134	26	0 or 10 — 13	0 or 12 — 14	—
Tumble generator valve (LH closed)		B134	24	0 or 10 — 13	0 or 12 — 14	—
Tumble generator valve (RH open)		B134	25	0 or 10 — 13	0 or 12 — 14	—
Tumble generator valve (LH open)		B134	23	0 or 10 — 13	0 or 12 — 14	—
Secondary air pipe pressure sensor	Signal	B137	9	2.2 — 2.8	2.2 — 2.8	When secondary air is inducted: 3.2 — 4.9
	Power supply	B134	19	5.12	5.12	—
	Ground (sensor)	B134	29	0	0	—
Secondary air combination valve relay 1		B135	8	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	—
Secondary air combination valve relay 2		B135	20	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	—
Secondary air pump relay		B135	27	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	—
Self-shutoff control		B135	13	10 — 13	12 — 14	—
Ground (engine 1)		B134	6	0	0	—
Ground (engine 2)		B134	4	0	0	—

Description	Connector No.	Terminal No.	Signal (V)		Note
			Ignition SW ON (engine OFF)	Engine ON (idling)	
Ground (engine 3)	B134	3	0	0	—
Ground (engine 4)	B137	1	0	0	—
Ground (engine 5)	B137	3	0	0	—
Ground (body)	B136	4	0	0	—

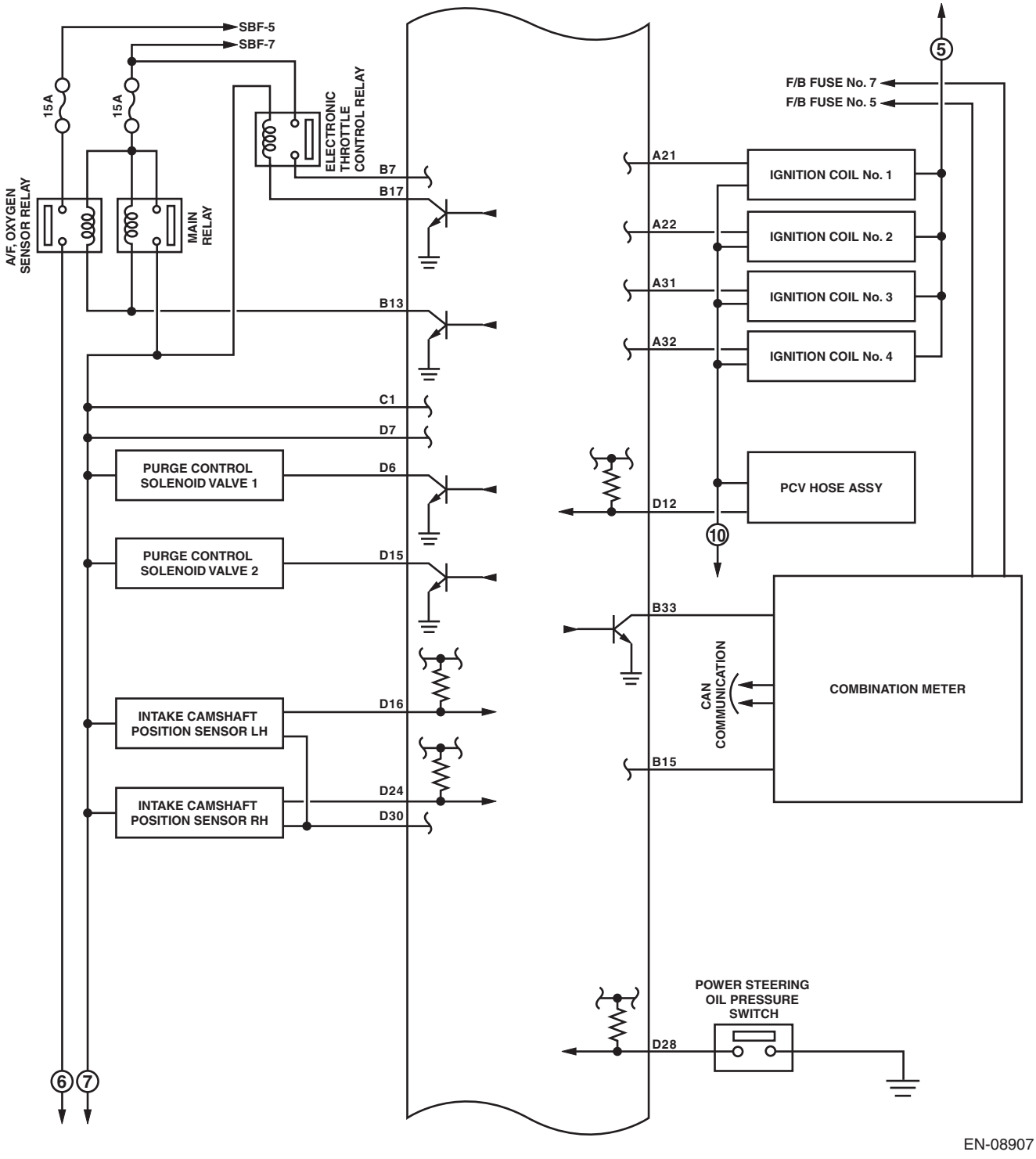
Input/output name:
- Crankshaft position sensor
- Intake camshaft position sensor RH
- Intake camshaft position sensor LH

Measuring condition:
- After warming-up
- At idling

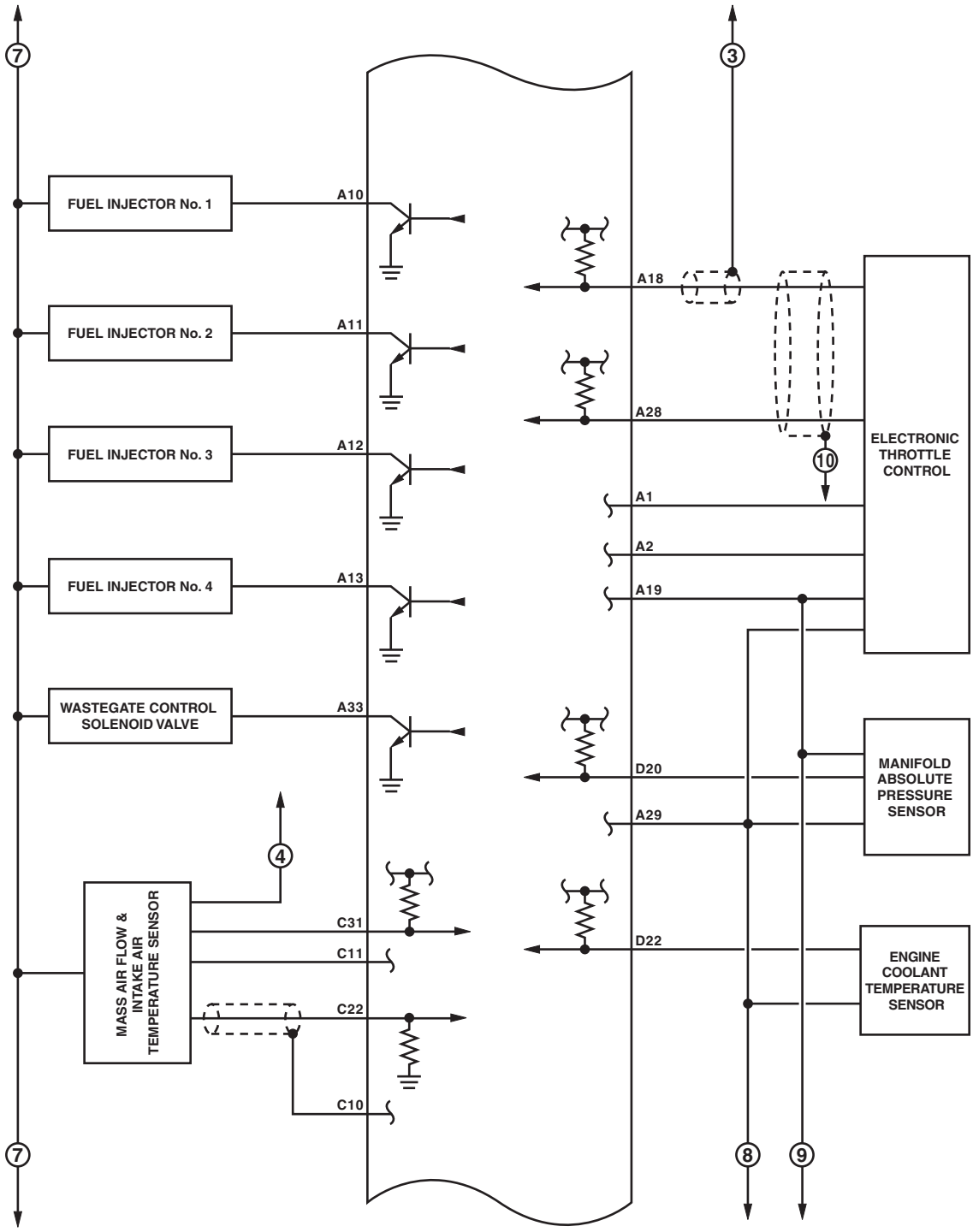


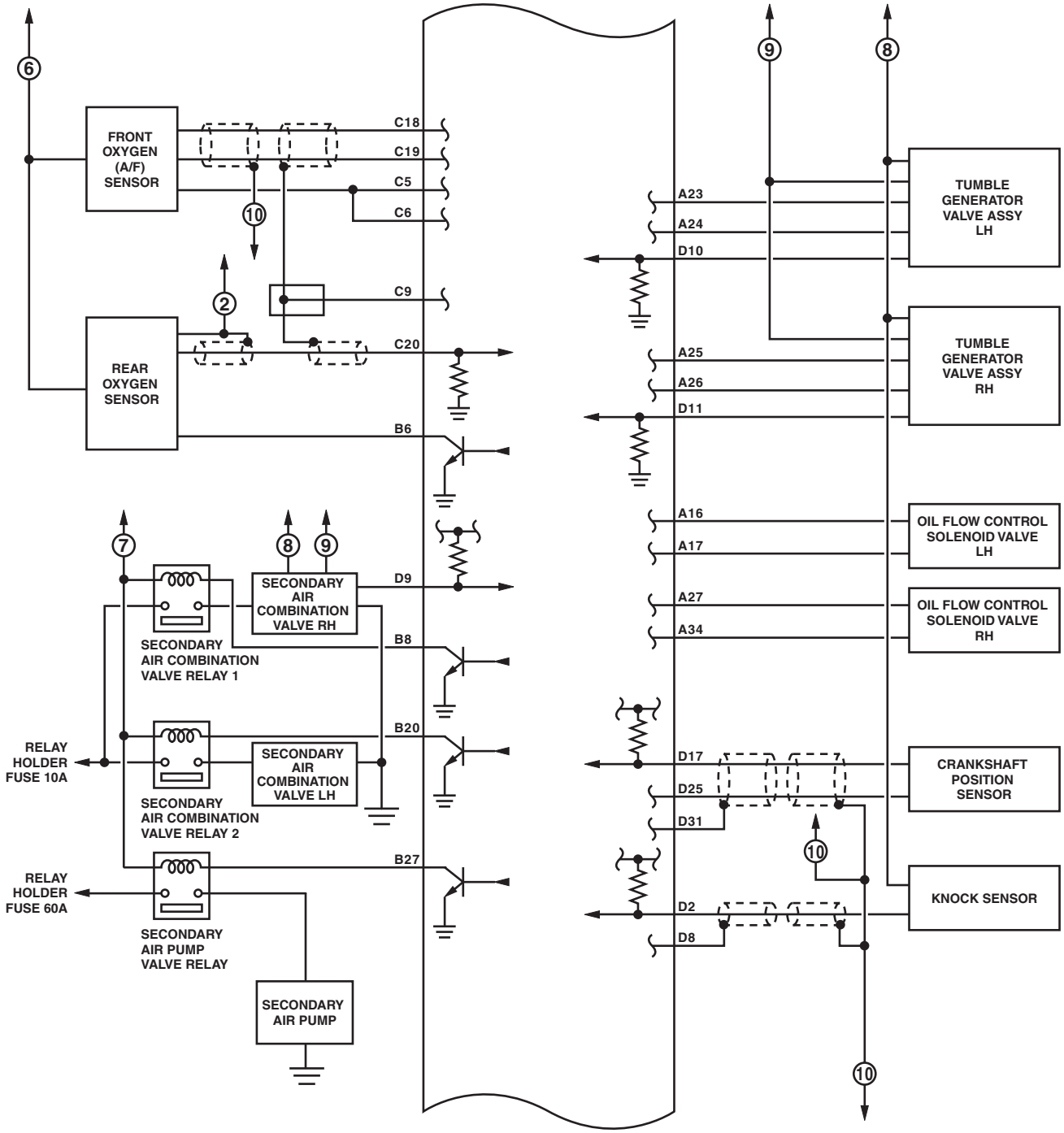

F/B FUSE No. 4
DATA LINK CONNECTOR
M/B FUSE No. 13
C2
INHIBITOR SWITCH
P
N
10
B14
STARTER MOTOR
C35
C34
IGNITION SWITCH
TEST MODE SUB CONNECTOR
DELIVERY (TEST) MODE CONNECTOR
F/B FUSE No. 21
B26
STARTER RELAY
C4
JOINT CONNECTOR
C16
B23
F/B FUSE No. 12
C30
B21
B31
ACCELERATOR PEDAL POSITION SENSOR
FUEL PUMP RELAY
FUEL PUMP CONTROL UNIT
C33
M/B FUSE No. 11
B10
B29
B22
FUEL TEMP. SENSOR
JOINT CONNECTOR
FUEL PUMP
B30
5
12
C23
12
11
4
2
3
1

EN-08906

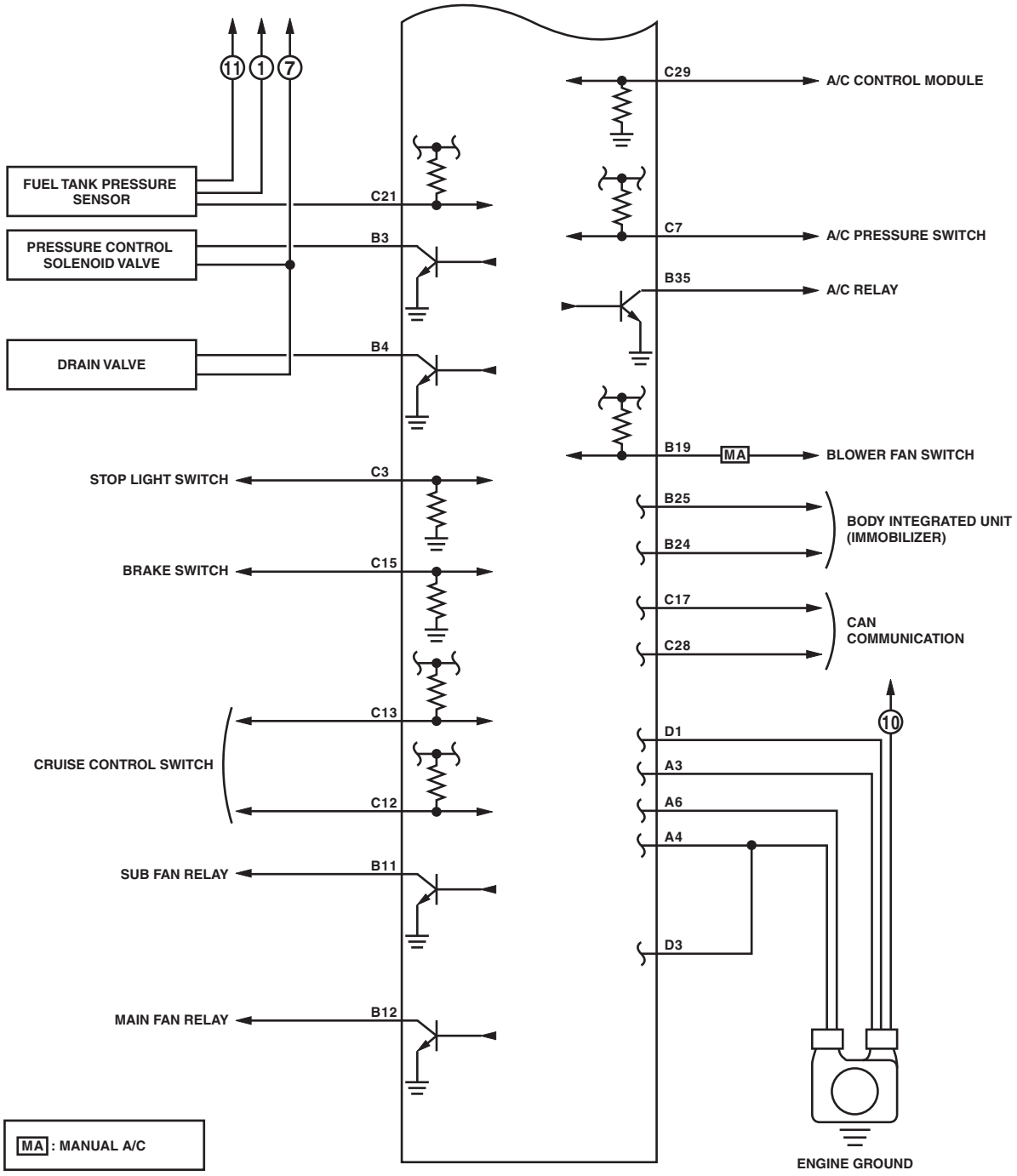

SBF-5
SBF-7
15A
15A
A/F, OXYGEN SENSOR RELAY
MAIN RELAY
ELECTRONIC THROTTLE CONTROL RELAY
B7
B17
B13
C1
D7
PURGE CONTROL SOLENOID VALVE 1
D6
PURGE CONTROL SOLENOID VALVE 2
D15
INTAKE CAMSHAFT POSITION SENSOR LH
D16
INTAKE CAMSHAFT POSITION SENSOR RH
D24
D30
6
7
5
F/B FUSE No. 7
F/B FUSE No. 5
A21
IGNITION COIL No. 1
A22
IGNITION COIL No. 2
A31
IGNITION COIL No. 3
A32
IGNITION COIL No. 4
PCV HOSE ASSY
D12
10
B33
CAN COMMUNICATION
COMBINATION METER
B15
POWER STEERING OIL PRESSURE SWITCH
D28

EN-08907


7
3
FUEL INJECTOR No. 1
A10
FUEL INJECTOR No. 2
A11
FUEL INJECTOR No. 3
A12
FUEL INJECTOR No. 4
A13
WASTEGATE CONTROL SOLENOID VALVE
A33
A18
A28
10
A1
A2
A19
ELECTRONIC THROTTLE CONTROL
D20
A29
MANIFOLD ABSOLUTE PRESSURE SENSOR
D22
ENGINE COOLANT TEMPERATURE SENSOR
4
MASS AIR FLOW & INTAKE AIR TEMPERATURE SENSOR
C31
C11
C22
C10
7
8
9
EN-08908


6
FRONT OXYGEN (A/F) SENSOR
C18
C19
C5
C6
10
2
C9
REAR OXYGEN SENSOR
C20
B6
7
8
9
SECONDARY AIR COMBINATION VALVE RH
D9
SECONDARY AIR COMBINATION VALVE RELAY 1
B8
RELAY HOLDER FUSE 10A
B20
SECONDARY AIR COMBINATION VALVE LH
SECONDARY AIR COMBINATION VALVE RELAY 2
RELAY HOLDER FUSE 60A
B27
SECONDARY AIR PUMP VALVE RELAY
SECONDARY AIR PUMP
9
8
A23
A24
D10
TUMBLE GENERATOR VALVE ASSY LH
A25
A26
D11
TUMBLE GENERATOR VALVE ASSY RH
A16
A17
OIL FLOW CONTROL SOLENOID VALVE LH
A27
A34
OIL FLOW CONTROL SOLENOID VALVE RH
D17
D25
D31
CRANKSHAFT POSITION SENSOR
10
D2
D8
KNOCK SENSOR
10

EN-08909


11
1
7
FUEL TANK PRESSURE SENSOR
C21
PRESSURE CONTROL SOLENOID VALVE
B3
DRAIN VALVE
B4
STOP LIGHT SWITCH
C3
BRAKE SWITCH
C15
C13
CRUISE CONTROL SWITCH
C12
SUB FAN RELAY
B11
MAIN FAN RELAY
B12
MA : MANUAL A/C
C29
A/C CONTROL MODULE
C7
A/C PRESSURE SWITCH
B35
A/C RELAY
B19
MA
BLOWER FAN SWITCH
B25
B24
BODY INTEGRATED UNIT (IMMOBILIZER)
C17
C28
CAN COMMUNICATION
10
D1
A3
A6
A4
D3
ENGINE GROUND

EN-08910

6. Engine Condition Data

A: ELECTRICAL SPECIFICATION

Contents	Specification
Engine Load	17.6 — 35.64 (%): Idling
	13.2 — 26.73 (%): 2,500 rpm racing

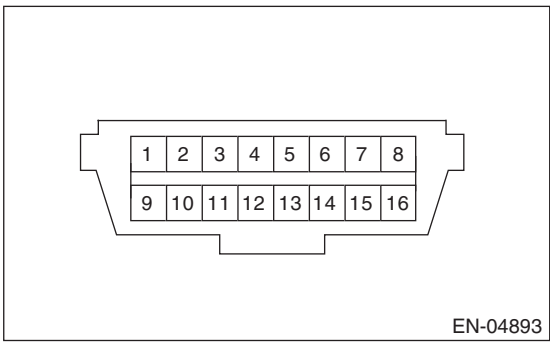
Measuring condition:
- After engine is warmed up.
- Place the select lever in “P” range or “N” range.
- Turn the A/C to OFF.
- Turn all the accessory switches to OFF.

7. Data Link Connector

A: NOTE

This connector is used for Subaru Select Monitor.

CAUTION:
Do not connect any scan tools except Subaru Select Monitor or general scan tool because the circuit for Subaru Select Monitor may be damaged.



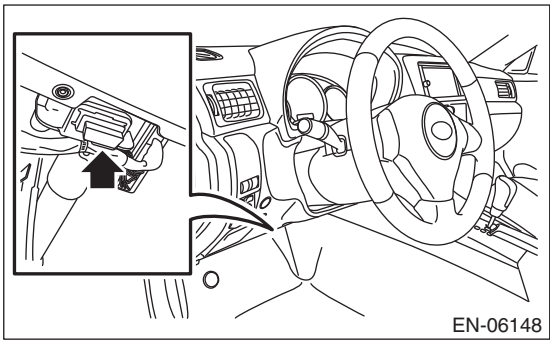
Terminal No.	Contents	Terminal No.	Contents
1	Power supply	9	Empty
2	Empty	10	Empty
3	Empty	11	Empty
4	Ground	12	Empty
5	Ground	13	Empty
6	CAN communication (+)	14	CAN communication (–)
7	Subaru Select Monitor signal	15	Empty
8	Empty	16	Power supply

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 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(H4DOTC)(diag)-82, List of Diagnostic Trouble Code (DTC).>

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	MPH
$0E	Ignition timing advance	°
$0F	Intake air temperature	°C
$10	Amount of intake air	g/s
$11	Throttle valve absolute opening angle	%
$12	Secondary air control status	—
$13	Check whether oxygen sensor is installed.	—

PID	Data	Unit of measure
$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 the engine	sec
$21	Running distance after MIL turns on	miles
$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	miles
$32	Fuel tank pressure	Pa
$33	Atmospheric pressure	kPa
$34	A/F sensor λ value, current	— and mA
$3C	Catalytic temperature	°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 acceleration opening angle 1	%
$4A	Absolute acceleration opening angle 2	%
$4C	Target throttle opening angle	%
$4D	Engine operation time during MIL on	min
$4E	Elapsed time after DTC clear	min
$51	Fuel used	—
$5A	Relative acceleration opening angle	%
$65	Neutral status	—

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	MPH
$0E	Ignition timing advance	°
$0F	Intake air temperature	°C
$10	Amount of intake air	g/s
$11	Throttle valve absolute opening angle	%
$12	Secondary air control status	—
$13	Air fuel ratio sensor	—
$15	Rear oxygen sensor voltage, compensation value	V and %
$1C	Supporting OBD system	—
$1F	Elapsed time after starting the engine	sec
$2E	Evaporative purge	%
$2F	Fuel level	%
$32	Fuel tank pressure	Pa
$33	Atmospheric pressure	kPa
$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 acceleration opening angle 1	%
$4A	Absolute acceleration opening angle 2	%
$4C	Target throttle opening angle	%
$65	Neutral status	—

NOTE:
Refer to general scan tool manufacturer's operation manual to access freeze frame data (MODE $02).

4. MODE $03 (EMISSION-RELATED POWERTRAIN DTC)

Refer to "List of Diagnostic Trouble Code (DTC)" for information about data denoting emission-related powertrain DTC. <Ref. to EN(H4DOTC)(diag)-82, 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).

6. MODE $06

Refer to test value of troubleshooting and data of test limit indicated 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 continuity failure (Bank 1 Sensor 1)
	$82	$8D	
	$83	$14	
	$84	$1E	A/F sensor range failure (Bank 1 Sensor 1)
	$85	$1E	
	$86	$20	A/F sensor response failure (Bank 1 Sensor 1)
$02	$87	$0B	Oxygen sensor circuit failure (Bank 1 Sensor 2)
	$88	$0B	
	$07	$0B	Oxygen sensor drop failure (Bank 1 Sensor 2)
	$08	$0B	
	$A5	$0B	
	$05	$10	Oxygen sensor response failure (Bank 1 Sensor 2)
	$06	$10	
$21	$89	$20	Catalyst deterioration diagnosis (Bank 1)
$35	$8B	$9D	VVT monitor (Bank 1)
	$8C	$9D	
	$8D	$9D	
	$8E	$9D	
$36	$8B	$9D	VVT monitor (Bank 2)
	$8C	$9D	
	$8D	$9D	
	$8E	$9D	
$39	$93	$FE	Evaporative emission control system leak detected (Fuel filler cap off)
$3B	$94	$FE	Evaporative emission control system (0.04 inch leak)
	$95	$FE	
	$A6	$FE	
$3C	$96	$FE	Evaporative emission control system (0.02 inch leak)
	$97	$FE	
$3D	$98	$FE	Evaporative emission control system (Purge flow)
$41	$99	$24	A/F sensor heater failure (Bank 1 Sensor 1)
	$9A	$24	
	$9B	$14	A/F sensor heater characteristics failure (Bank 1 Sensor 1)
$71	$9E	$17	Secondary air system (all systems)
	$9F	$0B	
	$A0	$0B	
	$B0	$17	Secondary air system (relay 2 — combination valve 2)
	$B1	$0B	
	$B2	$0B	
	$B3	$0B	
	$B4	$0B	
	$B5	$0B	
	$B6	$31	
	$B7	$31	
$A1	$0B	$24	Misfire monitoring (All cylinders)
	$0C	$24	
$A2	$0B	$24	Misfire monitoring (#1 cylinder)
	$0C	$24	

OBDMID	TID	SID	Diagnostic item
$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

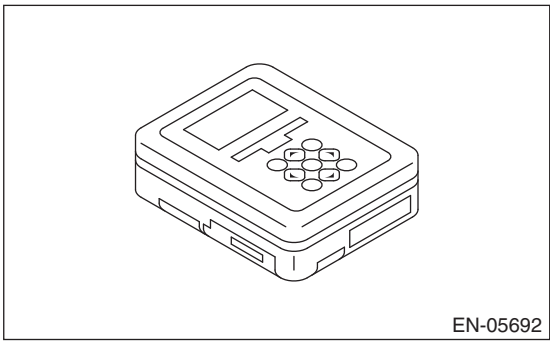
Refer to the data of vehicle specification (V.I.N., calibration ID, etc.).

9. Subaru Select Monitor

A: OPERATION

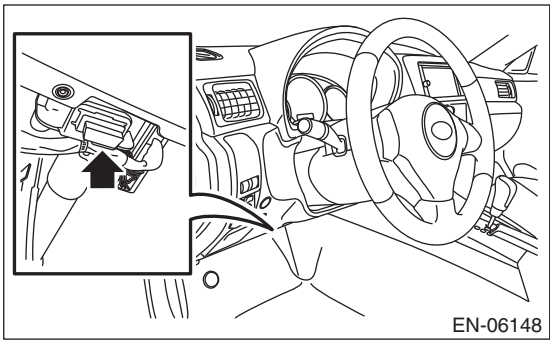
1. HOW TO USE THE SUBARU SELECT MONITOR

1) Prepare the Subaru Select Monitor kit. <Ref. to EN(H4DOTC)(diag)-8, PREPARATION TOOL, General Description.>


EN-05692

2) Prepare the personal computer which has been installed the Subaru Select Monitor.
3) Connect the USB cable between SDI (Subaru Diagnosis Interface) and USB port on the personal computer (dedicated port for the Subaru Select Monitor).

NOTE:
The dedicated port for the Subaru Select Monitor means the USB port which was used to install the Subaru Select Monitor.
4) Connect the diagnosis cable to the SDI.
5) Connect the SDI to data link connector located in the lower portion of the instrument panel (on the driver's side).


EN-06148

CAUTION:
Do not connect the scan tools except for Subaru Select Monitor and general scan tool.
6) Start up the personal computer.
7) Turn the ignition switch to ON (engine OFF), and run the "PC application for Subaru Select Monitor".
8) Call up DTC and data, then record them.

NOTE:
For detailed operation procedure, refer to the "PC application help for Subaru Select Monitor".

2. READ CURRENT DATA FOR ENGINE (NORMAL MODE)

1) On «Main Menu» display, select {Each System Check}.
2) On «System Selection Menu» display, select {Engine Control System}.
3) Click the [OK] button after the information of engine type has been displayed.
4) On «Engine Diagnosis» display, select {Current Data Display & Save}.
5) On «Current Data Display & Save» display, select {Normal sampling}.
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	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	630 — 770 rpm (Agree with the tachometer indication)
Meter vehicle speed signal	Vehicle Speed	km/h or MPH	0 km/h or 0 MPH (at parking)
Ignition timing signal	Ignition Timing	deg	10 — 15 deg
Intake air temperature signal	Intake Air Temp.	°C or °F	20 — 50°C or 68 — 122°F
Intake air amount	Mass Air Flow	g/s or lb/m	2.1 — 3.1 g/s or 0.35 — 0.40 lb/m
Throttle opening angle signal	Throttle Opening Angle	%	2.0 — 2.4%
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	Atmosphere Pressure	mmHg, kPa, inHg or psig	—
Intake manifold relative pressure	Mani. Relative Pressure	mmHg, kPa, inHg or psig	Air intake absolute pressure — Atmospheric pressure
Learned ignition timing	Learned Ignition Timing	deg	0 deg
Acceleration opening angle signal	Accel. Opening Angle	%	0.0%
Fuel temperature signal	Fuel Temp.	°C or °F	+28°C or 82°F
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	0.81 V
Tumble generator valve LH opening signal	TGV Position Sensor L	V	0.81 V
Fuel pump duty ratio	Fuel Pump Duty	%	30 — 40%
AVCS advance angle amount RH	VVT Adv. Ang. Amount R	deg	±5 deg
AVCS advance angle amount LH	VVT Adv. Ang. Amount L	deg	±5 deg
Oil flow control solenoid valve duty RH (AVCS)	OCV Duty R	%	0 — 20%
Oil flow control solenoid valve duty LH (AVCS)	OCV Duty L	%	0 — 20%
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 mA
A/F sensor output lambda 1	A/F Sensor #1	—	1.0
A/F correction #3	A/F Correction #3	%	0.00%

Contents	Display	Unit of measure	Note (at idling)
A/F learning #3	A/F Learning #3	%	0.00%
Throttle motor duty	Throttle Motor Duty	%	–5%
Throttle motor voltage	Throttle Motor Voltage	V	12 — 15 V
Sub throttle sensor voltage	Sub-Throttle Sensor	V	1.5 V
Main throttle sensor voltage	Main-Throttle Sensor	V	0.6 V
Sub accelerator sensor voltage	Sub-Accelerator Sensor	V	1.1 V
Main acceleration sensor voltage	Main-Accelerator Sensor	V	1.0 V
Secondary air supply piping pressure signal	Sec. Air Piping Pressure	mmHg, kPa, inHg or psig	765 mmHg, 102 kPa, 30.1 inHg or 14.8 psig
Secondary airflow signal	Sec. Air Flow	g/s or lb/m	0.00 g/s or 0.00 lb/m
Memory vehicle speed	Memorized Cruise Speed	km/h or MPH	—
Fuel level sensor resistance	Fuel level resistance	Ω	4 — 96 Ω
Odometer	Odometer	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	Knocking 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 vehicle ID signal	AT Vehicle ID Signal	—	ON/OFF
D-check require Flag	D-check Require Flag	—	OFF
Delivery (test) mode terminal	Delivery Mode Connector (Test Mode Connector)	—	OFF
Neutral position switch signal	Neutral Position Switch	—	ON
Soft idle switch signal	Idle Switch Signal	—	ON
Ignition switch signal	Ignition Switch	—	ON
Power steering switch signal	P/S Switch	—	OFF (when OFF)
Air conditioning switch signal	A/C Switch	—	OFF (when OFF)
Starter switch signal	Starter Switch	—	OFF
Rear oxygen monitor	Rear O2 Rich Signal	—	Rich/Lean
Knocking signal	Knocking Signal	—	OFF
Crankshaft position sensor signal	Crankshaft Position Sig.	—	ON
Camshaft position sensor signal	Camshaft Position Sig.	—	ON
Rear defogger switch signal	Rear Defogger SW	—	OFF (when OFF)
Blower fan switch signal	Blower Fan SW	—	OFF (when OFF)
Light switch signal	Light Switch	—	OFF (when OFF)
A/C middle pressure switch signal	A/C Mid Pressure Switch	—	OFF (when OFF)
Air conditioner compressor relay output signal	A/C Compressor Signal	—	OFF (when OFF)
Radiator fan relay 1 signal	Radiator Fan Relay #1	—	OFF (when OFF)
Radiator fan relay 2 signal	Radiator Fan Relay #2	—	OFF (when OFF)
PCV hose assembly diagnosis signal	Blow-by leak Connector	—	Connected
Pressure control solenoid valve signal	PCV Solenoid Valve	—	OFF (when OFF)
Tumble generator valve output signal	TGV Output	—	OFF
Tumble generator valve driving signal	TGV Drive	—	Closing direction
Drain valve signal	Vent. Solenoid Valve	—	OFF (when OFF)
Purge control solenoid valve 2 signal	CPC Solenoid 2	—	OFF (when OFF)
AT coordinate retard angle demand signal	Retard Signal from AT	—	OFF

Contents	Display	Unit of measure	Note (at idling)
AT coordinate fuel cut demand signal	Fuel Cut signal from AT	—	OFF
Vehicle dynamics control (VDC) torque down prohibition output	Ban of Torque Down	—	ON
Vehicle dynamics control (VDC) torque down demand	Request Torque Down VDC	—	OFF
AT coordinate permission signal	Torque permission signal	—	ON/OFF
ETC motor relay signal	ETC Motor Relay	—	ON
Clutch switch signal	Clutch Switch	—	OFF (when OFF)
Stop light switch signal	Stop Light Switch	—	OFF (when OFF)
SET/COAST switch signal	SET/COAST Switch	—	OFF (when OFF)
RES/ACC switch signal	RESUME/ACCEL Switch	—	OFF (when OFF)
Brake switch signal*	Brake Switch	—	OFF (when OFF)
Main switch signal	Main Switch	—	OFF (when OFF)
Secondary air combination valve relay 2 signal	Sec. Air Combi V Relay 2	—	OFF (when OFF)
Secondary air pump relay signal	Secondary Air Pump Relay	—	OFF (when OFF)
Secondary air combination valve relay 1 signal	Sec. Air Combi V Relay 1	—	OFF (when OFF)
Cruise control cancel switch signal	CC Cancel SW	—	OFF (when OFF)
Malfunction indicator light signal	MIL On Flag	—	OFF (when unlit)

NOTE:
- For detailed operation procedures, refer to “PC application help for Subaru Select Monitor”.
- *: For models without cruise control, the brake switch signal does not change.

3. READ CURRENT DATA FOR ENGINE (OBD MODE)

1) On «Main Menu» display, select {Each System Check}.
2) On «System Selection Menu» display, select {Engine Control System}.
3) Click the [OK] button after the information of engine type has been displayed.
4) On «Engine Diagnosis» display, select {OBD System}.
5) On «OBD Menu» display, select {Current Data Display & Save}.
6) On «Current Data Display & Save» display, select {All 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	Note (at idling)	Unit of measure
Number of diagnosis code	Number of Diag. Code:	0	—
Condition of malfunction indicator light	MI(MIL)	OFF	—
Monitoring test of misfire	Misfire monitoring (Supp)	YES	—
Monitoring test of misfire	Misfire monitoring (Rdy)	YES	—
Monitoring test of fuel system	Fuel system monitoring (Supp)	YES	—
Monitoring test of fuel system	Fuel system monitoring (Rdy)	YES	—
Monitoring test of comprehensive component	Component monitoring (Supp)	YES	—
Monitoring test of comprehensive component	Component monitoring (Rdy)	YES	—
Test of catalyst	Catalyst Diagnosis (Supp)	YES	—
Test of catalyst	Catalyst Diagnosis (Rdy)	NO	—
Test of heating-type catalyst	Heated catalyst (Supp)	NO	—
Test of heating-type catalyst	Heated catalyst (Rdy)	N/A	—
Test of evaporative emission purge control system	Evaporative purge system (Supp)	YES	—
Test of evaporative emission purge control system	Evaporative purge system (Rdy)	NO	—
Secondary air system test	Secondary air system (Supp)	YES	—
Secondary air system test	Secondary air system (Rdy)	NO	—
Test of air conditioning system refrigerant	A/C system refrigerant (Supp)	NO	—
Test of air conditioning system refrigerant	A/C system refrigerant (Rdy)	N/A	—
Test of oxygen sensor	Oxygen sensor (Supp)	YES	—
Test of oxygen sensor	Oxygen sensor (Rdy)	NO	—
Test of oxygen sensor heater	O2 Heater Diagnosis (Supp)	YES	—
Test of oxygen sensor heater	O2 Heater Diagnosis (Rdy)	YES	—
Test of EGR system	EGR system (Supp)	NO	—
Test of EGR system	EGR system (Rdy)	N/A	—
Air fuel ratio control system for bank 1	Fuel system for Bank 1	Cl_normal	—
Engine load data	Calculated load value	19.2	%
Engine coolant temperature signal	Coolant Temp.	96	°C
Short term fuel trim by front oxygen (A/F) sensor (Bank 1)	Short term fuel trim B1	17.2	%
Long term fuel trim by front oxygen (A/F) sensor (Bank 1)	Long term fuel trim B1	5.5	%
Intake manifold absolute pressure signal	Mani. Absolute Pressure	248	mmHg

Contents	Display	Note (at idling)	Unit of measure
Engine speed signal	Engine Speed	846	rpm
Vehicle speed signal	Vehicle Speed	0	km/h
#1 Cylinder ignition timing	Ignition timing adv. #1	13.5	°
Intake air temperature signal	Intake Air Temp.	44	°C
Intake air amount	Mass Air Flow	3.6	g/s
Throttle position signal	Throttle Opening Angle	13	%
Secondary air control status	Secondary air system	Stop	—
Oxygen sensor (Bank 1 Sensor 2)	Oxygen sensor #12	0.1 — 0.7	V
A/F correction (Bank 1 Sensor 2)	Short term fuel trim #12	0.0	%
On-board diagnostic system	OBD System	OBD/OBD2	—
Front oxygen (A/F) sensor (Bank 1 Sensor 1)	Oxygen sensor #11	Supported	—
Oxygen sensor (Bank 1 Sensor 2)	Oxygen sensor #12	Supported	—
Elapsed time after engine start	Time Since Engine Start	—	sec
Travel distance after the malfunction indicator light illuminates	Lighted MI lamp history	—	km
A/F lambda signal (Bank 1 Sensor 1)	A/F Sensor #11	0.951	—
A/F sensor output signal (Bank 1 Sensor 1)	A/F Sensor #11	2.468	V
Evaporative purge	Commanded Evap Purge	0	%
Fuel level signal	Fuel Level	—	%
Number of warm ups after DTC clear	Number of warm-ups	—	—
Travel distance after DTC clear	Meter since DTC cleared	—	km
Fuel tank pressure signal	Fuel Tank Pressure	9.664	mmHg
Atmospheric pressure signal	Atmosphere Pressure	Atmospheric pressure	mmHg
A/F lambda signal (Bank 1 Sensor 1)	A/F Sensor #11	0.957	—
A/F sensor output signal (Bank 1 Sensor 1)	A/F Sensor #11	–0.18	mA
Catalytic temperature #1	Catalyst Temperature #11	—	°C
Monitoring test of misfire	Misfire monitoring (Enable)	YES	—
Monitoring test of misfire	Misfire monitoring (Comp)	YES	—
Monitoring test of fuel system	Fuel system monitoring (Enable)	YES	—
Monitoring test of fuel system	Fuel system monitoring (Comp)	NO	—
Monitoring test of comprehensive component	Component monitoring (Enable)	NO	—
Monitoring test of comprehensive component	Component monitoring (Comp)	NO	—
Test of catalyst	Catalyst Diagnosis (Enable)	YES	—
Test of catalyst	Catalyst Diagnosis (Comp)	NO	—
Test of heating-type catalyst	Heated catalyst (Enable)	N/A	—
Test of heating-type catalyst	Heated catalyst (Comp)	N/A	—
Test of evaporative emission purge control system	Evaporative purge system (Enable)	YES	—
Test of evaporative emission purge control system	Evaporative purge system (Comp)	NO	—
Secondary air system test	Secondary air system (Enable)	YES	—

Contents	Display	Note (at idling)	Unit of measure
Secondary air system test	Secondary air system (Comp)	NO	—
Test of air conditioning system refrigerant	A/C system refrigerant (Enable)	N/A	—
Test of air conditioning system refrigerant	A/C system refrigerant (Comp)	N/A	—
Test of oxygen sensor	Oxygen sensor (Enable)	YES	—
Test of oxygen sensor	Oxygen sensor (Comp)	NO	—
Test of oxygen sensor heater	O2 Heater Diagnosis (Enable)	YES	—
Test of oxygen sensor heater	O2 Heater Diagnosis (Comp)	YES	—
Test of EGR system	EGR system (Enable)	N/A	—
Test of EGR system	EGR system (Comp)	N/A	—
ECM power supply voltage	Control module voltage	13.848	V
Absolute load	Absolute Load Value	21	%
A/F target lambda	Target Equivalence Ratio	0.993	—
Relative throttle opening angle	Relative Throttle Pos.	2	%
Ambient temperature	Ambient Temperature	Ambient temperature	°C
Absolute throttle opening angle 2	Absolute Throttle Pos.#2	31	%
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 while malfunction indicator light lit	Time while MIL lighted	—	min
Elapsed time after DTC clear	Time since DTC cleared	—	min
Type of fuel	Type of fuel	GAS	—
Relative acceleration opening angle	Relative Accelera. Pos.	0	%
Neutral condition	AT drive status	NEUT	—

NOTE:
For detailed operation procedures, refer to “PC application help for Subaru Select Monitor”.

4. READ FREEZE FRAME DATA FOR ENGINE (OBD MODE)

1) On «Main Menu» display, select {Each System Check}.
2) On «System Selection Menu» display, select {Engine Control System}.
3) Click the [OK] button after the information of engine type has been displayed.
4) On «Engine Diagnosis» display, select {OBD System}.
5) On «OBD Menu» display, select {Freeze Frame Data Display}.

- A list of the support data is shown in the following table.

Contents	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	—
Engine load data	Calculated load value	%
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 psi
Engine speed signal	Engine Speed	rpm
Vehicle speed signal	Vehicle Speed	km/h or MPH
Ignition timing adv. #1	Ignition timing adv. #1	°
Intake air temperature	Intake Air Temp.	°C

Contents	Display	Unit of measure
Amount of intake air	Mass Air Flow	g/s
Throttle valve angle	Throttle Opening Angle	%
Secondary air control status	Secondary air system	—
Oxygen sensor #12	Oxygen sensor #12	V
A/F correction #12	Short term fuel trim #12	%
OBD system	OBD System	—
Oxygen sensor #11	Oxygen sensor #11	Supported
Oxygen sensor #12	Oxygen sensor #12	Supported
Elapsed time after starting engine	Time Since Engine Start	sec
Evaporative purge	Commanded Evap Purge	%
Fuel level	Fuel Level	%
Fuel tank pressure	Fuel Tank Pressure	mmHg, kPa, inHg or psig
Atmospheric pressure	Atmosphere Pressure	mmHg, kPa, inHg or psig
ECM power supply voltage	Control module voltage	V
Absolute load	Absolute Load Value	%
A/F target lambda	Target Equivalence Ratio	—
Relative throttle opening angle	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.	%
Neutral condition	AT drive status	—

NOTE:
For detailed operation procedures, refer to “PC application help for Subaru Select Monitor”.

5. V.I.N. REGISTRATION

1) On «Main Menu» display, select {Each System Check}.
2) On «System Selection Menu» display, select {Engine Control System}.
3) Click the [OK] button after the information of engine type has been displayed.
4) On the «Engine Diagnosis» display, select {Entry VIN}.
5) Perform the procedures shown on the display screen.

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) Click the [OK] button after the information of engine type has been displayed.
4) On the «Engine Diagnosis» display screen, select the {Diagnostic Code(s) Display}.
5) On the «Diagnostic Code(s) Display» screen, select the {Temporary Diagnostic Code(s)} or {Memorized Diagnostic Code(s)}.

NOTE:
• For detailed operation procedure, refer to the “PC application help for Subaru Select Monitor”.
• For details concerning DTC, refer to “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4DOTC)(diag)-82, 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) Click the [OK] button 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 “PC application help for Subaru Select Monitor”.
• For details concerning DTC, refer to “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4DOTC)(diag)-82, 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(H4DOTC)(diag)-82, 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

Perform the diagnosis shown in the following DTC table.
When performing the diagnosis not listed in “List of Diagnostic Trouble Code (DTC)”, refer to the item on the drive cycle. <Ref. to EN(H4DOTC)(diag)-50, Drive Cycle.>

DTC	Item	Condition
P0011	Intake Camshaft Position - Timing Over-Advanced or System Performance (Bank 1)	—
P0016	Crankshaft Position - Camshaft Position Correlation (Bank1)	—
P0018	Crankshaft Position - Camshaft Position Correlation (Bank2)	—
P0021	Intake 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	—
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 (Bank1 Sensor2)	—
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 (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	—
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	—

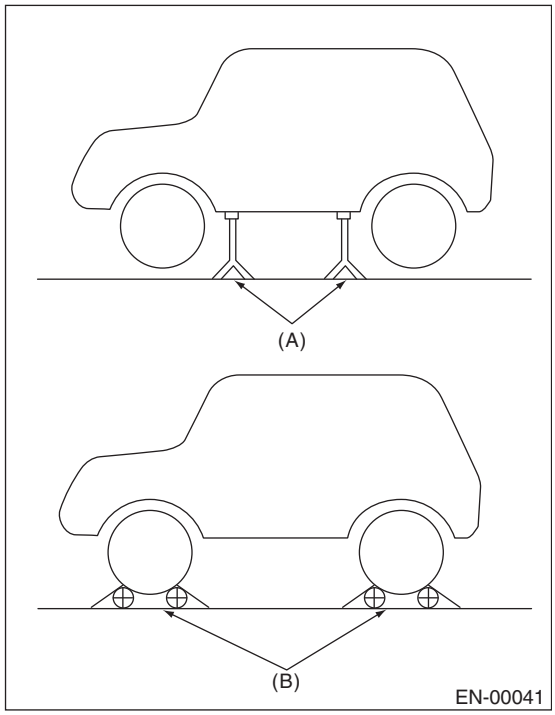
DTC	Item	Condition
P0458	Evaporative Emission System Purge Control Valve Circuit Low	—
P0462	Fuel Level Sensor “A” Circuit Low	—
P0463	Fuel Level Sensor “A” Circuit High	—
P0500	Vehicle Speed Sensor “A”	—
P0512	Starter Request Circuit	—
P0513	Incorrect Immobilizer Key	—
P0604	Internal Control Module Random Access Memory (RAM) Error	—
P0605	Internal Control Module Read Only Memory (ROM) Error	—
P0607	Throttle Control System Circuit Range/Performance	—
P0638	Throttle Actuator Control Range/Performance (Bank 1)	—
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) (Bank1 Sensor1)	—
P1153	O2 Sensor Circuit Range/Performance (High) (Bank1 Sensor1)	—
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 (Blow-by) Function Problem	—
P1518	Starter Switch Circuit Low Input	—
P1560	Back-Up Voltage Circuit Malfunction	—
P1570	Antenna	—
P1571	Reference Code Incompatibility	—
P1572	IMM Circuit Failure (Except Antenna Circuit)	—
P1574	Key Communication Failure	—
P1576	EGI Control Module EEPROM	—
P1577	IMM Control Module EEPROM	—
P1578	Meter Failure	—
P2006	Intake Manifold Runner Control Stuck Closed (Bank 1)	—
P2007	Intake Manifold Runner Control Stuck Closed (Bank 2)	—
P2008	Intake Manifold Runner Control Circuit / Open (Bank 1)	—
P2009	Intake Manifold Runner Control Circuit Low (Bank 1)	—
P2011	Intake Manifold Runner Control Circuit / Open (Bank 2)	—
P2012	Intake Manifold Runner Control Circuit Low (Bank 2)	—
P2016	Intake Manifold Runner Position Sensor / Switch Circuit Low (Bank 1)	—
P2017	Intake Manifold Runner Position Sensor / Switch Circuit High (Bank 1)	—
P2021	Intake Manifold Runner Position Sensor / Switch Circuit Low (Bank 2)	—
P2022	Intake Manifold Runner Position Sensor / Switch Circuit High (Bank 2)	—
P2088	Intake Camshaft Position Actuator Control Circuit Low (Bank 1)	—
P2089	Intake Camshaft Position Actuator Control Circuit High (Bank 1)	—
P2092	Intake Camshaft Position Actuator Control Circuit Low (Bank 2)	—
P2093	Intake Camshaft Position Actuator Control Circuit High (Bank 2)	—
P2101	Throttle Actuator Control Motor Circuit Range/Performance	—
P2102	Throttle Actuator Control Motor Circuit Low	—
P2103	Throttle Actuator Control Motor Circuit High	—
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	—

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 Emission System Switching Valve Control Circuit Low	—
P2420	Evaporative Emission System Switching Valve Control 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	—
U0073	CAN Failure, Bus “OFF” Detection	—
U0101	CAN (TCU) Data not Loaded	—
U0122	CAN (VDC) Data not Loaded	—
U0140	CAN (BCU) Data not Loaded	—
U0402	CAN (TCU) Data Abnormal	—
U0416	CAN (VDC) Data Abnormal	—
U0422	CAN (BCU) Data Abnormal	—

1. PREPARATION FOR THE INSPECTION MODE

1) Check that the battery voltage is 12 V or more and fuel remains approx. 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.

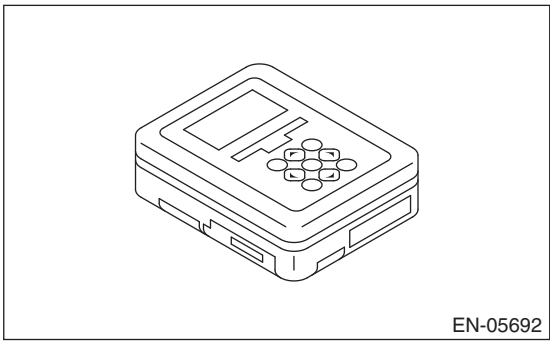
WARNING:
• Before raising the vehicle, ensure parking brakes are applied.
• Do not use a pantograph jack in place of a rigid rack.
• Secure a rope or wire to the front or rear towing hooks to prevent the lateral runout of front wheels.
• Before rotating the wheels, make sure that there is no one in front of the vehicle. Besides while the wheels are rotating, make sure that no one approaches the vehicle front side.
• Make sure that there is nothing around the wheels. For AWD model, pay special attention to all four wheels.
• While servicing, do not depress or release the clutch pedal or accelerator pedal quickly regardless of the engine speed. Quick operation may cause the vehicle to drop off the free roller.
• To prevent the vehicle from slipping due to vibration, do not place anything between rigid rack and the vehicle.



(A) Rigid racks
(B) Free rollers

2. SUBARU SELECT MONITOR

1) Check that no DTC remains after clearing memory. <Ref. to EN(H4DOTC)(diag)-56, Clear Memory Mode.>
2) Warm up the engine.
3) Prepare the Subaru Select Monitor kit. <Ref. to EN(H4DOTC)(diag)-8, PREPARATION TOOL, General Description.>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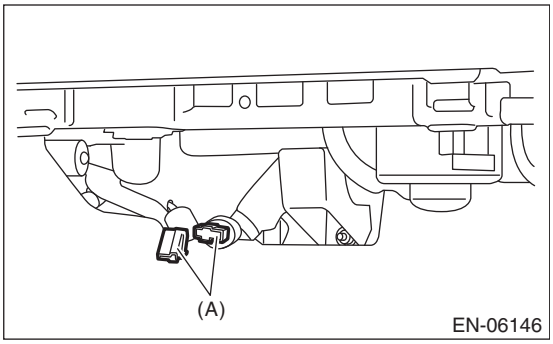
4) Prepare PC with Subaru Select Monitor installed.
5) Connect the USB cable to SDI (Subaru Diagnosis Interface) and USB port on the personal computer (dedicated port for the Subaru Select Monitor).

NOTE:
The dedicated port for the Subaru Select Monitor means the USB port which was used to install the Subaru Select Monitor.
6) Connect the diagnosis cable to SDI.
7) Connect the delivery (test) mode connector (A) located under the glove box.



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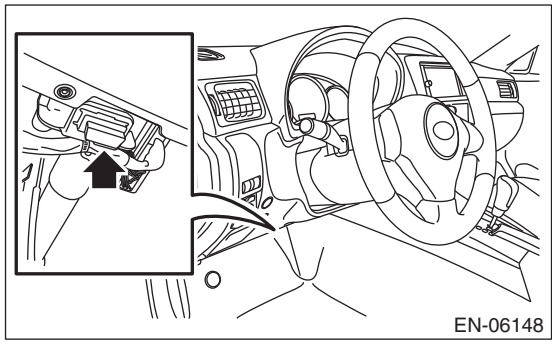
8) Connect SDI to data link connector located in the lower portion of the instrument panel (on the driver's side).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CAUTION:
Do not connect the scan tools except for Subaru Select Monitor and general scan tool.
9) Start the PC.
10) Turn the ignition switch to ON (engine OFF) and run the "PC application for Subaru Select Monitor".
11) On «Main Menu» display, select {Each System Check}.
12) On «System Selection Menu» display, select {Engine Control System}.
13) Click the [OK] button after the information of engine type has been displayed.
14) On «Engine Diagnosis» display, select {Dealer Check Mode Procedure}.
15) When the «Perform Inspection (Dealer Check) Mode ?» is shown on the screen, click the [Next] button.
16) Perform subsequent procedures as instructed on the display screen.

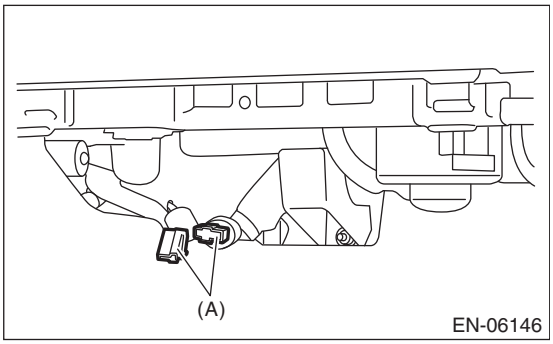
- If trouble still remains in the memory, the corresponding DTC appears on the display screen.

NOTE:
- For detailed operation procedures, refer to "PC application help for Subaru Select Monitor".
- For details concerning DTC, refer to "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-82, 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 system diagnosis is finished, perform the VDC memory clearance procedure of self-diagnosis function. <Ref. to VDC(diag)-25, Clear Memory Mode.>

3. GENERAL SCAN TOOL

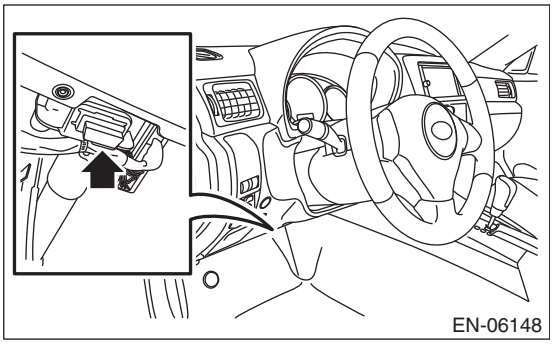
1) Check that no DTC remains after clearing memory. <Ref. to EN(H4DOTC)(diag)-56, Clear Memory Mode.>

2) Warm up the engine.
3) Connect the delivery (test) mode connector (A) located under the glove box.



4) 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 the scan tools except for Subaru Select Monitor and general scan tool.



5) Start the engine.

NOTE:
Ensure the selector lever is placed in the "P" range before starting.
6) Turn the neutral position switch to ON using select lever.
7) Depress the brake pedal to turn the brake switch ON.
8) Keep the engine speed in 2,500 — 3,000 rpm range for 40 seconds.
9) Shift the select lever in the "D" range 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 system diagnosis is finished, perform the VDC memory clearance procedure of self-diagnosis function. <Ref. to VDC(diag)-25, Clear Memory Mode.>
10) Using the general scan tool, check for DTC and record the result(s).

NOTE:
• For detailed operation procedures, refer to the general scan tool operation manual.
• For details concerning DTC, refer to "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-82, List of Diagnostic Trouble Code (DTC).>

12.Drive Cycle

A: PROCEDURE

It is necessary to perform the drive cycle listed below if DTC is not found in the Inspection Mode. It is possible to complete diagnosis of the DTC by performing the indicated drive cycle. After the repair for the DTC, perform a necessary drive cycle and make sure the function recovers and the DTC is recorded.

1. PREPARATION FOR DRIVE CYCLE

1) Check that the battery voltage is 12 V or more and fuel remains approx. half [20 — 40 ℓ (5.3 — 10.6 US gal, 4.4 — 8.8 Imp gal)].
2) After performing the diagnostics and Clear Memory Mode, check that no DTC remains. <Ref. to EN(H4DOTC)(diag)-56, Clear Memory Mode.>
3) Check the delivery (test) mode connector is disconnected.

NOTE:
• Perform the drive cycle after warming up the engine except when the engine coolant temperature at engine start is specified.
• Perform the drive cycle twice if the DTC in the list is marked with *. After completing the first drive cycle, stop the engine and perform second diagnosis in same condition.

2. DRIVE CYCLE A

DTC	Item	Condition
*P0125	Insufficient Coolant Temperature for Closed Loop Fuel Control	Engine coolant temperature at engine start is less than 20°C (68°F).
*P0126	Insufficient Engine Coolant Temperature for Stable Operation	—
*P0128	Coolant Thermostat (Engine Coolant Temperature Below Thermostat Regulating Temperature)	Engine coolant temperature at engine start is less than 55°C (131°F).
*P0133	O2 Sensor Circuit Slow Response (Bank 1 Sensor 1)	—
*P0141	O2 Sensor Heater Circuit (Bank1 Sensor2)	—
*P0171	System Too Lean (Bank 1)	Complete diagnosis with drive cycle B or C as well.
*P0172	System Too Rich (Bank 1)	Complete diagnosis with drive cycle B or C as well.
*P0301	Cylinder 1 Misfire Detected	Complete diagnosis with drive cycle B or C as well.
*P0302	Cylinder 2 Misfire Detected	Complete diagnosis with drive cycle B or C as well.
*P0303	Cylinder 3 Misfire Detected	Complete diagnosis with drive cycle B or C as well.
*P0304	Cylinder 4 Misfire Detected	Complete diagnosis with drive cycle B or C as well.
*P0420	Catalyst System Efficiency Below Threshold (Bank 1)	—
*P0442	Evaporative Emission Control System Leak Detected (Small Leak)	Engine coolant temperature at engine 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)	Engine coolant temperature at engine start is less than 25°C (77°F).
*P0457	Evaporative Emission Control System Leak Detected (Fuel Cap Loose/Off)	Engine coolant temperature at engine start is less than 25°C (77°F).
*P0459	Evaporative Emission System Purge Control Valve Circuit High	—
P1443	Vent Control Solenoid Valve Function Problem	—

DTC	Item	Condition
*P2096	Post Catalyst Fuel Trim System Too Lean (Bank 1)	Complete diagnosis with drive cycle B or C as well.
*P2097	Post Catalyst Fuel Trim System Too Rich (Bank 1)	Complete diagnosis with drive cycle B or C as well.

Diagnostic procedure:
1) Drive for 20 minutes or more at a constant speed of 80 km/h (50 MPH) or more.
2) Stop the vehicle and idle for one minute.

3. DRIVE CYCLE B

DTC	Item	Condition
*P0171	System Too Lean (Bank 1)	Complete diagnosis with drive cycle A or C as well.
*P0172	System Too Rich (Bank 1)	Complete diagnosis with drive cycle A or C as well.
*P0301	Cylinder 1 Misfire Detected	Complete diagnosis with drive cycle A or C as well.
*P0302	Cylinder 2 Misfire Detected	Complete diagnosis with drive cycle A or C as well.
*P0303	Cylinder 3 Misfire Detected	Complete diagnosis with drive cycle A or C as well.
*P0304	Cylinder 4 Misfire Detected	Complete diagnosis with drive cycle A or C as well.
*P0464	Fuel Level Sensor Circuit Intermittent	—
*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)	Complete diagnosis with drive cycle A or C as well.
*P2097	Post Catalyst Fuel Trim System Too Rich (Bank 1)	Complete diagnosis with drive cycle A or C as well.
*P219A	Bank 1 Air-Fuel Ratio Imbalance	Complete diagnosis with drive cycle C as well.

Diagnostic procedure:
1) Drive at 10 km/h (6 MPH) or more.
2) Stop the vehicle and idle for ten minutes.

4. DRIVE CYCLE C

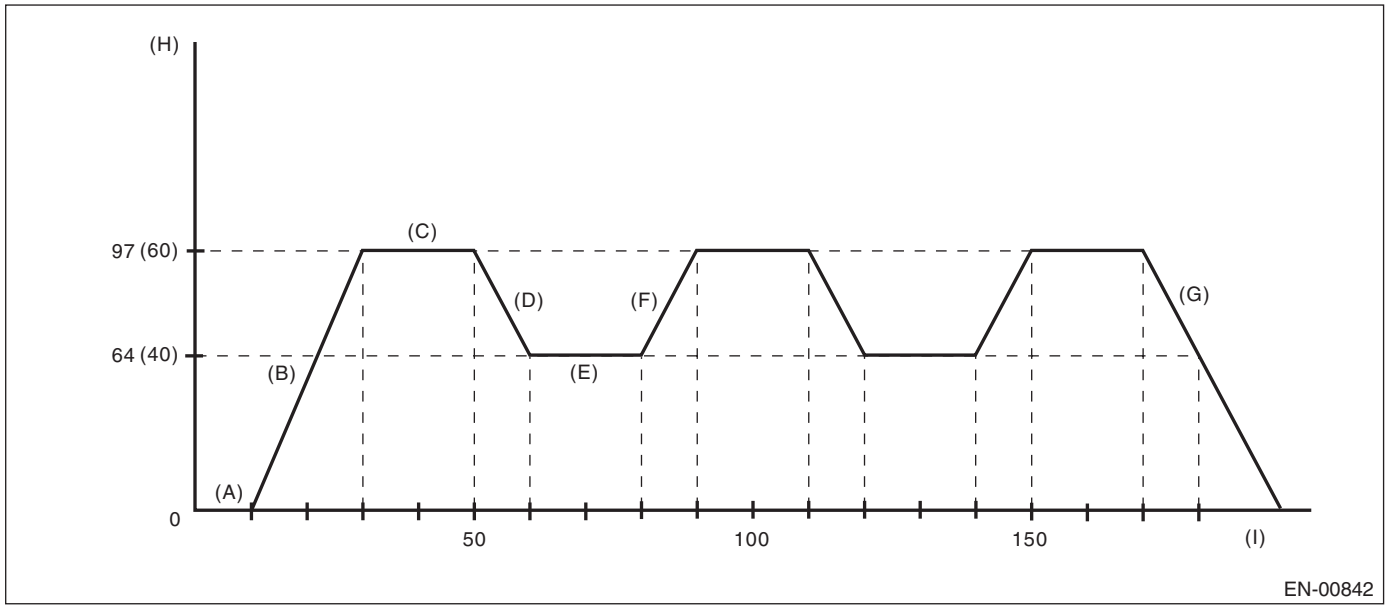
DTC	Item	Condition
*P0030	HO2S Heater Control Circuit (Bank 1 Sensor 1)	—
*P0068	MAP/MAF - Throttle Position Correlation	—
*P0101	Mass or Volume Air Flow Circuit Range/Performance	—
P0134	O2 Sensor Circuit No Activity Detected (Bank 1 Sensor 1)	—
*P0139	O2 Sensor Circuit Slow Response (Bank 1 Sensor 2)	—
*P0171	System Too Lean (Bank 1)	Complete diagnosis with drive cycle A or B as well.
*P0172	System Too Rich (Bank 1)	Complete diagnosis with drive cycle A or B as well.
P0244	Turbo/Super Charger Wastegate Solenoid “A” Range/Performance	—
P0246	Turbo/Super Charger Wastegate Solenoid “A” High	—
*P0301	Cylinder 1 Misfire Detected	Complete diagnosis with drive cycle A or B as well.
*P0302	Cylinder 2 Misfire Detected	Complete diagnosis with drive cycle A or B as well.

Drive Cycle

DTC	Item	Condition
*P0303	Cylinder 3 Misfire Detected	Complete diagnosis with drive cycle A or B as well.
*P0304	Cylinder 4 Misfire Detected	Complete diagnosis with 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)	Complete diagnosis with drive cycle A or B as well.
*P2097	Post Catalyst Fuel Trim System Too Rich (Bank 1)	Complete diagnosis with drive cycle A or B as well.
*P219A	Bank 1 Air-Fuel Ratio Imbalance	Complete diagnosis with drive cycle B as well.

Diagnostic procedure:

Drive according to the drive pattern described below.



(A) Idle the engine for 10 seconds or more.

(B) Accelerate to 97 km/h (60 MPH) or more within 20 seconds.

(C) Drive for 20 seconds or more at 97 km/h (60 MPH) or more.

(D) Decelerate with fully closed throttle to 64 km/h (40 MPH) or less.

(E) Drive for 20 seconds or more at 64 km/h (40 MPH) or less.

(F) Accelerate to 97 km/h (60 MPH) or more within 10 seconds.

(G) Stop the vehicle with throttle fully closed.

(H) Vehicle speed km/h (MPH)

(I) Sec.

5. DRIVE CYCLE D

DTC	Item	Condition
*P0181	Fuel Temperature Sensor “A” Circuit Range/Performance	—

NOTE:
In drive cycle D, one drive cycle will be established when both the drift diagnosis and stuck diagnosis have completed.

Diagnostic procedure:

DRIFT DIAGNOSIS

1) Make sure of the items below before starting the engine.
- Engine coolant temperature is less than 30°C (86°F).
- Remaining fuel is 10 ℓ (2.6 US gal, 2.2 Imp gal) or more.
- Battery voltage is 10.9 V or more.

2) Idle the engine until engine coolant temperature is at least 10°C (18°F) higher than it was when engine started.
3) After the engine has reached the state of procedure 2), idle the engine for another 5 minutes or more.

STUCK DIAGNOSIS

1) Make sure that the battery voltage is 10.9 V or more.
2) Perform the Clear Memory Mode. <Ref. to EN(H4DOTC)(diag)-56, 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 battery terminals during stuck diagnosis. (Data will be cleared by disconnecting the battery terminals.)

6. DRIVE CYCLE E

DTC	Item	Condition
*P0461	Fuel Level Sensor “A” Circuit Range/Performance	—

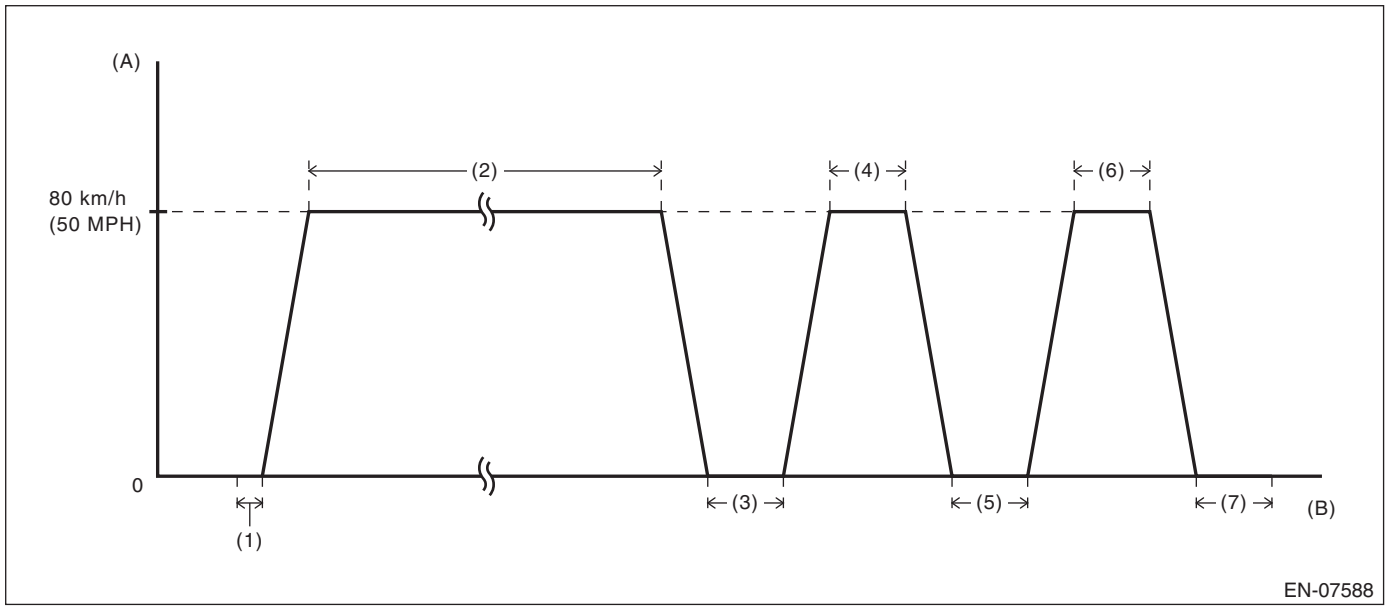
Diagnostic procedure:
1) Make sure that the battery voltage is 10.9 V or more.
2) Perform the Clear Memory Mode. <Ref. to EN(H4DOTC)(diag)-56, Clear Memory Mode.>
3) Drive the vehicle for the distance equal to the fuel of 30 ℓ (7.9 US gal, 6.6 Imp gal).

NOTE:
- It is acceptable to drive the vehicle intermittently.
- Do not disconnect the battery terminals while diagnosing. (Data will be cleared by disconnecting the battery terminals.)

7. DRIVE CYCLE F

DTC	Item	Condition
*P0111	Intake Air Temperature Sensor 1 Circuit Range/Performance	—

Diagnostic procedure:
1) Make sure that the engine coolant temperature is less than 30°C (86°F).
2) Drive according to the drive pattern described below.



(A) Vehicle speed
(B) Elapsed time
(1) Idle the engine for 10 seconds or more after engine start.
(2) Drive for 8 minutes or more at a constant speed of 80 km/h (50 MPH) or more.
(3) Stop the vehicle and idle for 30 seconds or more.
(4) Drive for 30 seconds or more at a constant speed of 80 km/h (50 MPH) or more.
(5) Stop the vehicle and idle for 30 seconds or more.
(6) Drive for 30 seconds or more at a constant speed of 80 km/h (50 MPH) or more.
(7) Stop the vehicle and idle for 30 seconds.

NOTE:
- There is no given transition time between idling and cruising.
- Driving at constant speed only on a downhill causes smaller engine load and may result in failure to obtain a right diagnostic result.
- When the engine stops while performing drive cycle F, perform it again from the state of procedure 1).

8. DRIVE CYCLE G

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 (Bank1)	—
*P2441	Secondary Air Injection System Switching Valve Stuck Closed (Bank1)	—
*P2442	Secondary Air Injection System Switching Valve Stuck Open (Bank2)	—
*P2443	Secondary Air Injection System Switching Valve Stuck Closed (Bank2)	—

Diagnostic procedure:
1) Disconnect the battery negative terminal, and reconnect after at least 10 seconds have passed.
2) Idle the engine until engine coolant temperature is 80°C (176°F).
3) Stop the engine to decrease the engine coolant temperature down to 40°C (104°F) or less.

NOTE:
Do not let engine coolant temperature drop to 5°C (41°F) or less.
4) Idle the engine until engine coolant temperature is 80°C (176°F).
5) Stop the engine to decrease the engine coolant temperature down to 40°C (104°F) or less.

NOTE:
Do not let engine coolant temperature drop to 5°C (41°F) or less.
6) Idle the engine.

9. DRIVE CYCLE H

DTC	Item	Condition
*P050A	Cold Start Idle Air Control System Performance	—
*P050B	Cold Start Ignition Timing Performance	—

Diagnostic procedure:
1) Perform the Clear Memory Mode. <Ref. to EN(H4DOTC)(diag)-56, Clear Memory Mode.>
2) With the ignition switch ON (engine OFF), read the engine coolant temperature, intake air temperature and fuel temperature. <Ref. to EN(H4DOTC)(diag)-37, READ CURRENT DATA FOR ENGINE (NORMAL MODE), OPERATION, Subaru Select Monitor.>
3) If the values from step 2) satisfy the following two conditions, idle the engine for one minute.

Condition:
|Engine coolant temperature — Intake air temperature| ≤ 5°C (9°F)
|Engine coolant temperature — Fuel temperature| ≤ 2°C (3.6°F)

NOTE:
- If the conditions are not satisfied, turn the ignition switch to OFF and wait until the parameters are satisfied.
- Hold the select lever in “P” range or “N” range at idling.

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) Click the [OK] button after the information of engine type has been displayed.
4) On the «Engine Diagnosis» display screen, select the {Clear Memory}.
5) When the “Clear Memory?” is shown on the screen, click the [Yes] button.
6) When “Done” and “Turn ignition switch to OFF” is shown on the display screen, turn the ignition switch to OFF.

NOTE:
• Initial diagnosis of electronic throttle control is performed after memory clearance. For this reason, start the engine after 10 seconds or more have elapsed since the ignition switch was turned to ON.
• For detailed operation procedure, refer to the “PC application help for Subaru Select Monitor”.

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) Click the [OK] button 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 {Clear Diagnostic Code(s)}.
6) When the “Clear Diagnostic Code?” is shown on the screen, click the [Yes] button.
7) When “Done” and “Turn ignition switch to OFF” is shown on the display screen, turn the ignition switch to OFF.

NOTE:
• Initial diagnosis of electronic throttle control is performed after memory clearance. For this reason, start the engine after 10 seconds or more have elapsed since the ignition switch was turned to ON.
• For detailed operation procedure, refer to the “PC application help for Subaru Select Monitor”.

3. GENERAL SCAN TOOL

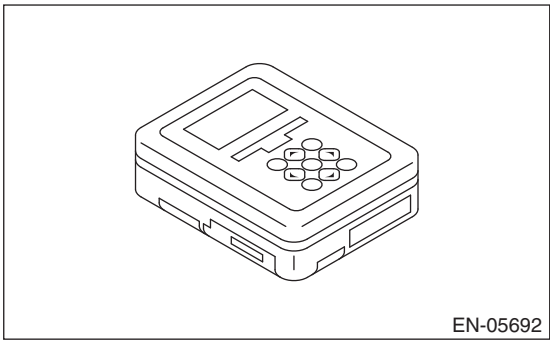
For procedures clearing memory using the general scan tool, refer to the general scan tool operation manual.

NOTE:
Initial diagnosis of electronic throttle control is performed after memory clearance. For this reason, start the engine after 10 seconds or more have elapsed since the ignition switch was turned to ON.

14. Compulsory Valve Operation Check Mode

A: OPERATION

1) Prepare the Subaru Select Monitor kit. <Ref. to EN(H4DOTC)(diag)-8, PREPARATION TOOL, General Description.>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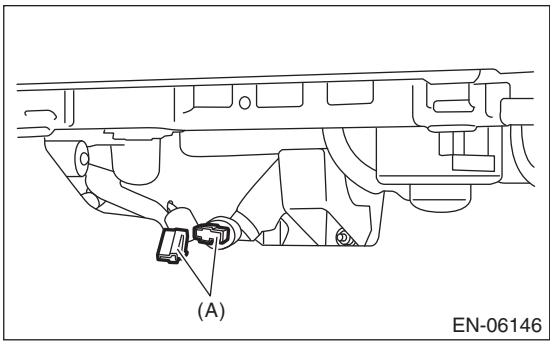
2) Prepare PC with Subaru Select Monitor installed.
3) Connect the USB cable to SDI (Subaru Diagnosis Interface) and USB port on the personal computer (dedicated port for the Subaru Select Monitor).

NOTE:
The dedicated port for the Subaru Select Monitor means the USB port which was used to install the Subaru Select Monitor.

4) Connect the diagnosis cable to SDI.
5) Connect the delivery (test) mode connector (A) located under the glove box.



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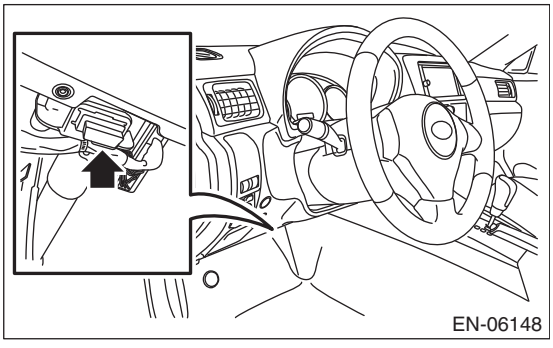
6) Connect SDI to data link connector located in the lower portion of the instrument panel (on the driver's side).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CAUTION:
Do not connect any scan tools except Subaru Select Monitor or general scan tool.

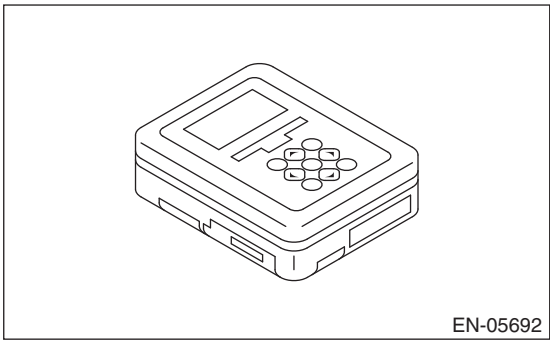
7) Start the PC.
8) Turn the ignition switch to ON (engine OFF) and run the "PC application for Subaru Select Monitor".
9) On «Main Menu» display, select {Each System Check}.
10) On «System Selection Menu» display, select {Engine Control System}.
11) Click the [OK] button after the information of engine type has been displayed.
12) On «Engine Diagnosis» display, select {System Operation Check Mode}.
13) On «System Operation Check Mode» display, select {Actuator ON/OFF Dr.}.
14) Select the actuator to be forcibly driven on the «Actuator ON/OFF Operation» display and click the [Next] button.
15) Clicking the [Finished] button completes the compulsory drive mode of actuator. The display will then return to the «Actuator ON/OFF Operation» screen.

NOTE:
For detailed operation procedures, refer to "PC application help for Subaru Select Monitor".

15.System Operation Check Mode

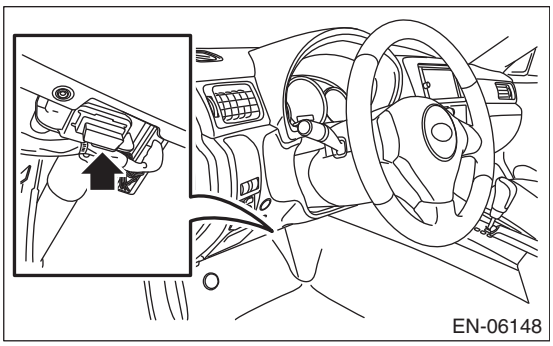
A: OPERATION

1) Prepare the Subaru Select Monitor kit. <Ref. to EN(H4DOTC)(diag)-8, PREPARATION TOOL, General Description.>


EN-05692

2) Prepare PC with Subaru Select Monitor installed.
3) Connect the USB cable to SDI (Subaru Diagnosis Interface) and USB port on the personal computer (dedicated port for the Subaru Select Monitor).

NOTE:
The dedicated port for the Subaru Select Monitor means the USB port which was used to install the Subaru Select Monitor.
4) Connect the diagnosis cable to SDI.
5) Connect SDI to data link connector located in the lower portion of the instrument panel (on the driver's side).


EN-06148

CAUTION:
Do not connect any scan tools except Subaru Select Monitor or general scan tool.
6) Start the PC.
7) Turn the ignition switch to ON (engine OFF) and run the "PC application for Subaru Select Monitor".
8) On «Main Menu» display, select {Each System Check}.
9) On «System Selection Menu» display, select {Engine Control System}.
10) Click the [OK] button after the information of engine type has been displayed.
11) On «Engine Diagnosis» display, select {System Operation Check Mode}.
12) The following items are displayed on the display.

Display
Actuator ON/OFF Operation
Immobilizer System
Fuel Pump Control
Fixed Idle Ignition Timing
Idle Speed Control
Injector Control

1. FUEL PUMP CONTROL (OFF DRIVE)

CAUTION:
After executing the system operation check mode, execute the Clear Memory Mode. <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>
1) On «System Operation Check Mode» display, select {Fuel Pump Control}.
2) On «Fuel Pump Control» display, select {OFF Drive}.
3) On «Start the Engine» display, start the engine and click the [OK] button.
4) On «OFF Drive» display, click the [Execution] button and execute the OFF drive.
5) Click the [Cancel] button to stop the OFF drive.
6) Click the [F12 Exit] button to end the OFF drive. The screen will return to the «Fuel Pump Control» screen.

NOTE:
For detailed operation procedures, refer to "PC application help for Subaru Select Monitor".

2. FUEL PUMP CONTROL (ON/OFF DRIVE)

CAUTION:
After executing the system operation check mode, execute the Clear Memory Mode. <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>
1) On «System Operation Check Mode» display, select {Fuel Pump Control}.
2) On «Fuel Pump Control» display, select {ON/OFF Dr.}.
3) On «Turn Ignition Switch ON with Engine OFF» display, turn the ignition switch to ON and click the [OK] button.
4) On «ON/OFF Dr.» display, click the [Execution] button and execute the ON/OFF drive.
5) Click the [Cancel] button to stop the ON/OFF drive.
6) Click the [F12 Exit] button to end the ON/OFF drive. The screen will return to the «Fuel Pump Control» screen.

NOTE:
For detailed operation procedures, refer to “PC application help for Subaru Select Monitor”.

3. IDLING IGNITION TIMING FIXED

CAUTION:
After executing the system operation check mode, execute the Clear Memory Mode. <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>
1) On «System Operation Check Mode» display, select {Fixed Idle Ignition Timing}.
2) On «Start the Engine» display, start the engine and click the [OK] button.
3) On «Fixed Idle Ignition Timing» display, click the [Execution] button and execute the idling ignition timing fixed.
4) Click the [Cancel] button to stop the idling ignition timing fixed.
5) Click the [F12 Exit] button to end the idling ignition timing fixed. The screen will return to the «System Operation Check Mode» screen.

NOTE:
For detailed operation procedures, refer to “PC application help for Subaru Select Monitor”.

4. IDLE SPEED CONTROL

CAUTION:
After executing the system operation check mode, execute the Clear Memory Mode. <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>
1) On «System Operation Check Mode» display, select {Idle Speed Control}.
2) On «Start the Engine» display, start the engine and click the [OK] button.
3) In the «Idle Speed Control» display, click the [△] button or the [▽] button to change the setting values, then click the [OK] button.
Setting is possible in a range between 500 rpm — 2,000 rpm, in increments of 50 rpm. However, the engine speed that can actually be controlled will vary depending on the vehicle.
4) Click the [Cancel] button to stop the idle speed control.
5) Click the [F12 Exit] button to end the idle speed control. The screen will return to the «System Operation Check Mode» screen.

NOTE:
For detailed operation procedures, refer to “PC application help for Subaru Select Monitor”.

5. INJECTOR CONTROL (INJECTION STOP MODE)

CAUTION:
After executing the system operation check mode, execute the Clear Memory Mode. <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>
1) On «System Operation Check Mode» display, select {Injector Control}.
2) On «Injector Control» display, select {Injection Stop Mode}.
3) On «Injection Stop Mode» display, select the fuel injector to be stopped.
4) On «Start the Engine» display, start the engine and click the [OK] button.
5) On «Fuel Injector #» display, click the [Execution] button and execute the injection stop mode.
6) Click the [Cancel] button to stop the injection stop mode.
7) Click the [F12 Exit] button to return to the «Injection Stop Mode» display screen.
8) On «Injection Stop Mode» display, click the [Return] button to end the «Injection Stop Mode». The screen will return to the «Injector Control» screen.

NOTE:
For detailed operation procedures, refer to “PC application help for Subaru Select Monitor”.

6. INJECTOR CONTROL (INJECTION QUANTITY CONTROL)

CAUTION:
After executing the system operation check mode, execute the Clear Memory Mode. <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>
1) On «System Operation Check Mode» display, select {Injector Control}.
2) On «Injector Control» display, select {Injection Quantity Control}.
3) On «Start the Engine» display, start the engine and click the [OK] button.
4) In the «Injection Quantity Control» display, click the [△] button or the [▽] button to change the setting values, then click the [OK] button.
Setting is possible in a range between 0 — 20%, in increments of 1%.
5) Click the [Cancel] button to stop the injection quantity control.
6) Click the [F12 Exit] button to end the injection quantity control. The screen will return to the «Injector Control» screen.

NOTE:
For detailed operation procedures, refer to “PC application help for Subaru Select Monitor”.

16.Malfunction Indicator Light

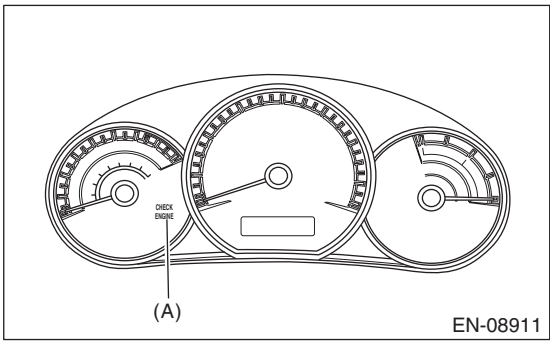
A: PROCEDURE

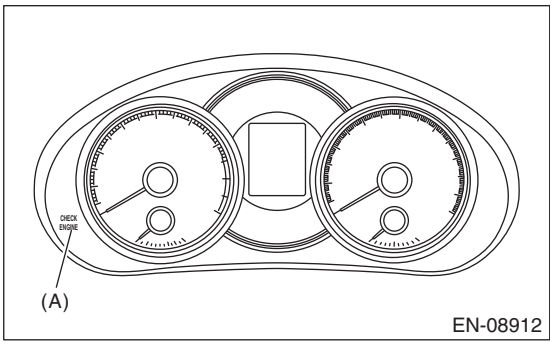
1. Activation of malfunction indicator light. <Ref. to EN(H4DOTC)(diag)-60, ACTIVATION OF MALFUNCTION INDICATOR LIGHT, Malfunction Indicator Light.>
↓
2. Malfunction indicator light does not come on. <Ref. to EN(H4DOTC)(diag)-62, MALFUNCTION INDICATOR LIGHT DOES NOT COME ON, Malfunction Indicator Light.>
↓
3. Malfunction indicator light does not go off. <Ref. to EN(H4DOTC)(diag)-64, MALFUNCTION INDICATOR LIGHT DOES NOT GO OFF, Malfunction Indicator Light.>
↓
4. Malfunction indicator light does not blink. <Ref. to EN(H4DOTC)(diag)-65, MALFUNCTION INDICATOR LIGHT DOES NOT BLINK, Malfunction Indicator Light.>
↓
5. Malfunction indicator light remains blinking. <Ref. to EN(H4DOTC)(diag)-67, MALFUNCTION INDICATOR LIGHT REMAINS BLINKING, Malfunction Indicator Light.>

B: ACTIVATION OF MALFUNCTION INDICATOR LIGHT

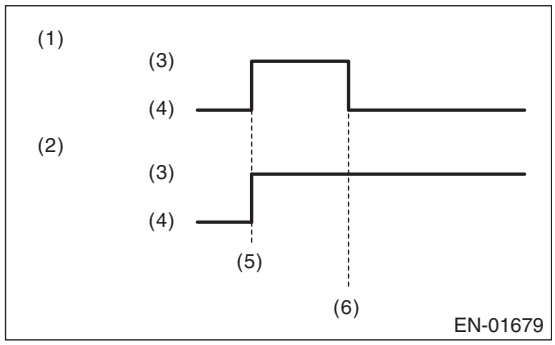
1) When the ignition switch is turned to ON (engine OFF), the malfunction indicator light (A) in the combination meter illuminates.

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(H4DOTC)(diag)-62, MALFUNCTION INDICATOR LIGHT DOES NOT COME ON, Malfunction Indicator Light.>



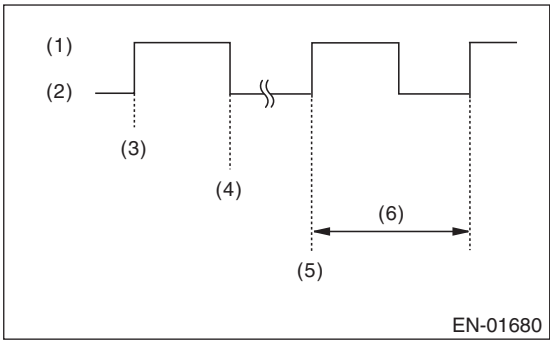


2) After starting the engine, the malfunction indicator light goes out. If it does not go off, any of the engine and emission control system has malfunction.



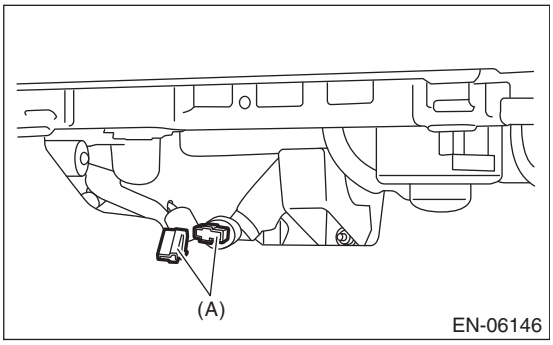
(1) No DTC
(2) Trouble occurs
(3) ON
(4) OFF
(5) Ignition switch ON
(6) Engine start

3) If the diagnostic system detects a misfire which could damage the catalyst, the malfunction indicator light will blink at a cycle of 1 Hz.



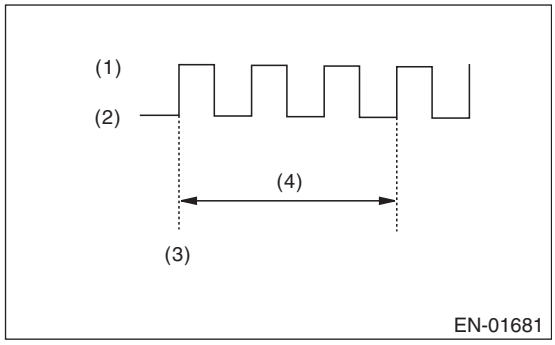
(1) ON
(2) OFF
(3) Ignition switch ON
(4) Engine start
(5) Misfire start
(6) 1 second

4) Turn the ignition switch to OFF and connect the delivery (test) mode connector (A).



(1) When the ignition switch is turned to ON (engine OFF), the malfunction indicator light illuminates.
(2) After the engine starts, malfunction indicator light blinks in a cycle of 0.5 Hz. (During diagnosis)

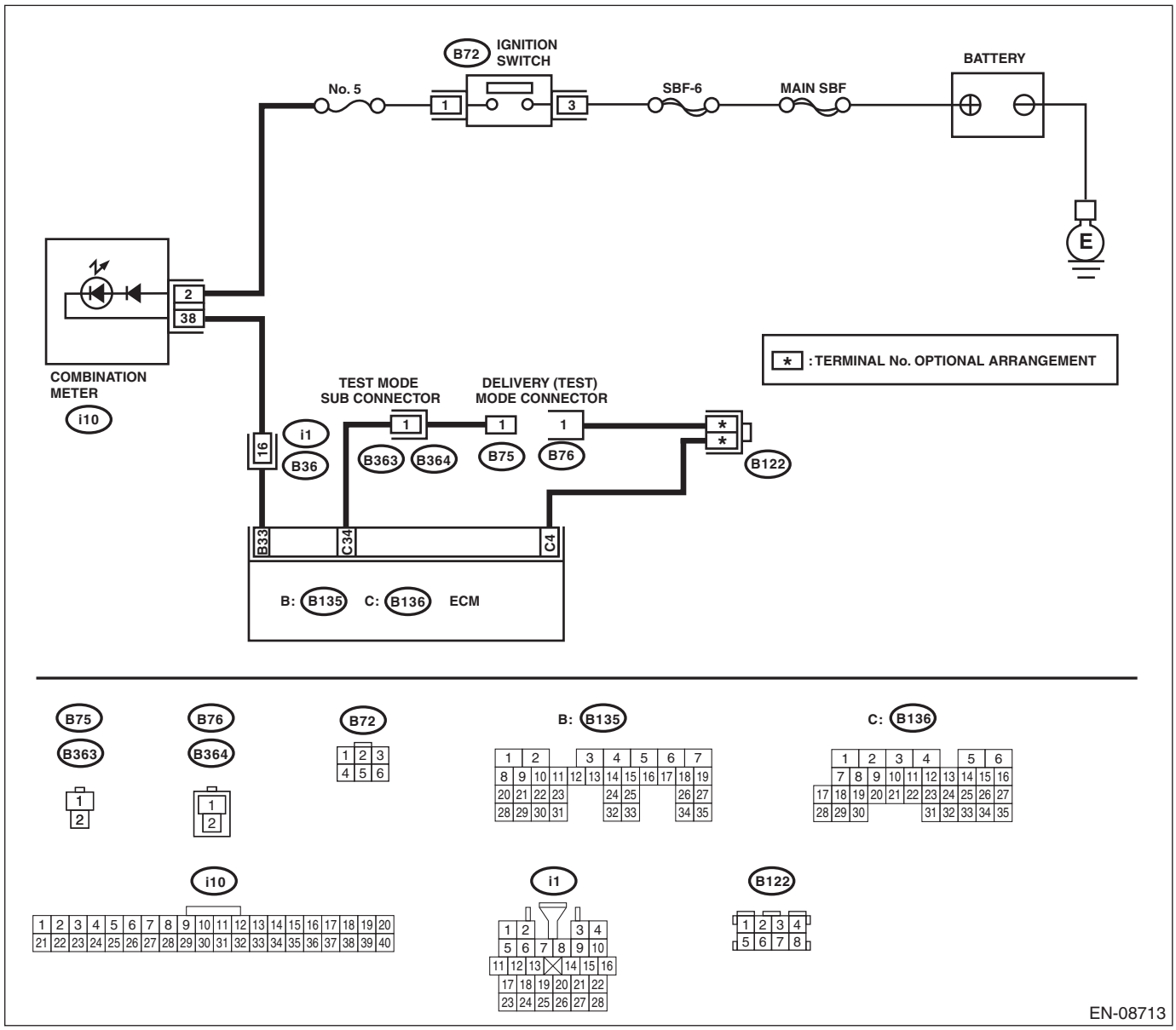
(3) Malfunction indicator light blinks at a cycle of 3 Hz after diagnosis if there is no trouble. Malfunction indicator light illuminates if faulty.



(1) ON
(2) OFF
(3) Ignition switch ON
(4) 1 second

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 illuminate.
WIRING DIAGRAM:



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*** ***(B135) No. 33 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **5**.	Go to step **2**.

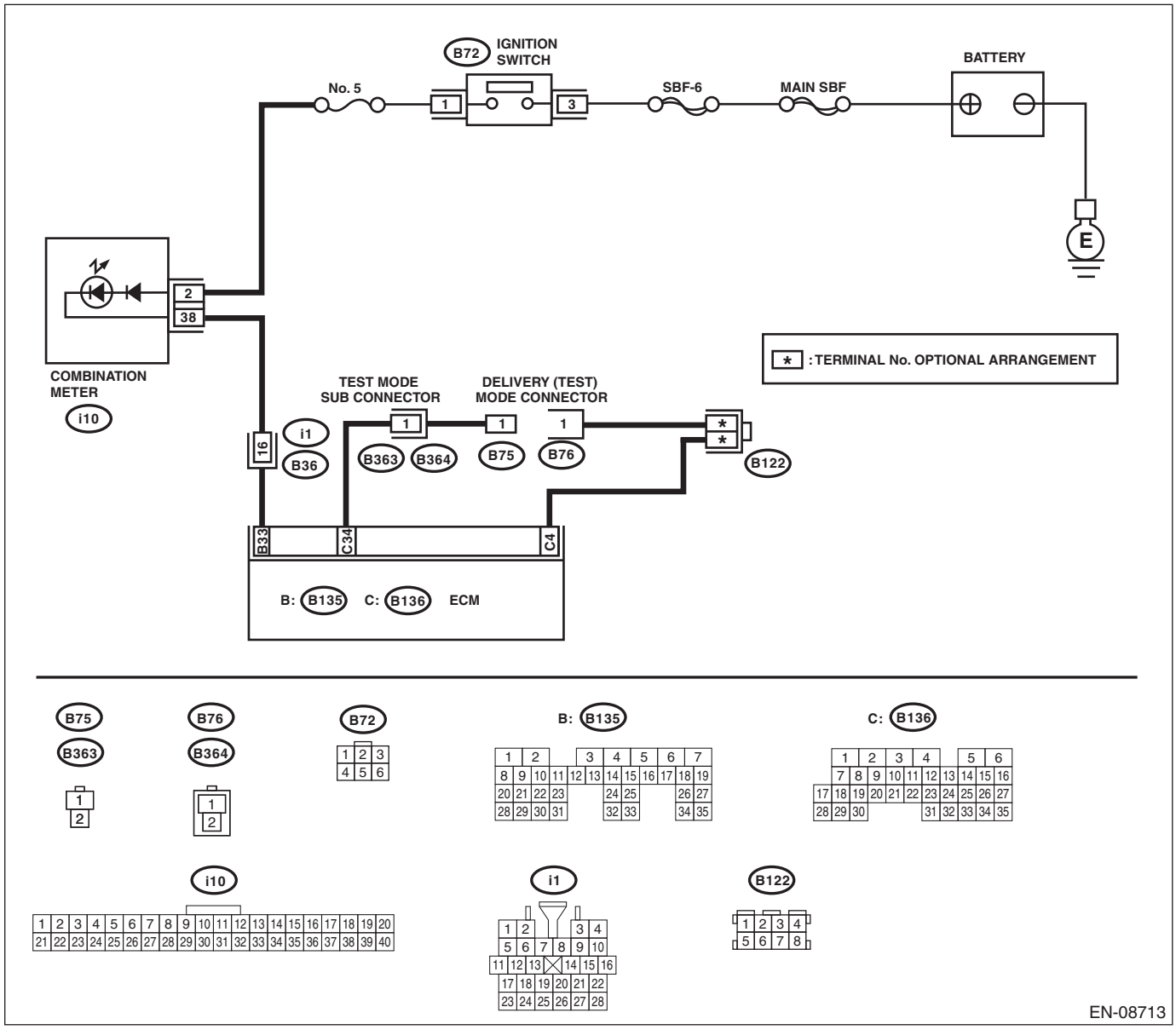
	Step	Check	Yes	No
2	**CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Remove the combination meter. <Ref. to IDI-21, Combination Meter.> 3) Disconnect the connectors from ECM and combination meter. 4) Measure the resistance of harness between ECM and combination meter connector. ***Connector & terminal*** ***(B135) No. 33 — (i10) No. 38:***	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 combination meter connector • Poor contact of coupling connector
3	**CHECK FOR POOR CONTACT.** Check for poor contact of combination meter connector.	Is there poor contact of combination meter connector?	Repair the poor contact of combination meter connector.	Go to step **4**.
4	**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. ***Connector & terminal*** ***(i10) No. 2 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Replace the combination meter. <Ref. to IDI-21, Combination Meter.>	Check the following item and repair if necessary. NOTE: • Blown out of fuse (No. 5) • Open or short circuit in harness between fuse (No. 5) and battery terminal • Poor contact of ignition switch connector
5	**CHECK FOR POOR CONTACT.** Check for poor connection by shaking or pulling ECM connector and harness.	Does the malfunction indicator light illuminate?	Repair the poor contact of ECM connector.	Go to step **6**.
6	**CHECK ECM CONNECTOR.** Check the connection of ECM connector.	Is the ECM connector correctly connected?	Replace the ECM. <Ref. to FU(H4DOTC)-57, Engine Control Module (ECM).>	Repair the connection of ECM 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 display.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND COMBINATION METER CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Turn the ignition switch to ON.	Does the malfunction indicator light illuminate?	Repair the ground short circuit of harness between combination meter and ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-57, Engine Control Module (ECM).>

E: MALFUNCTION INDICATOR LIGHT DOES NOT BLINK

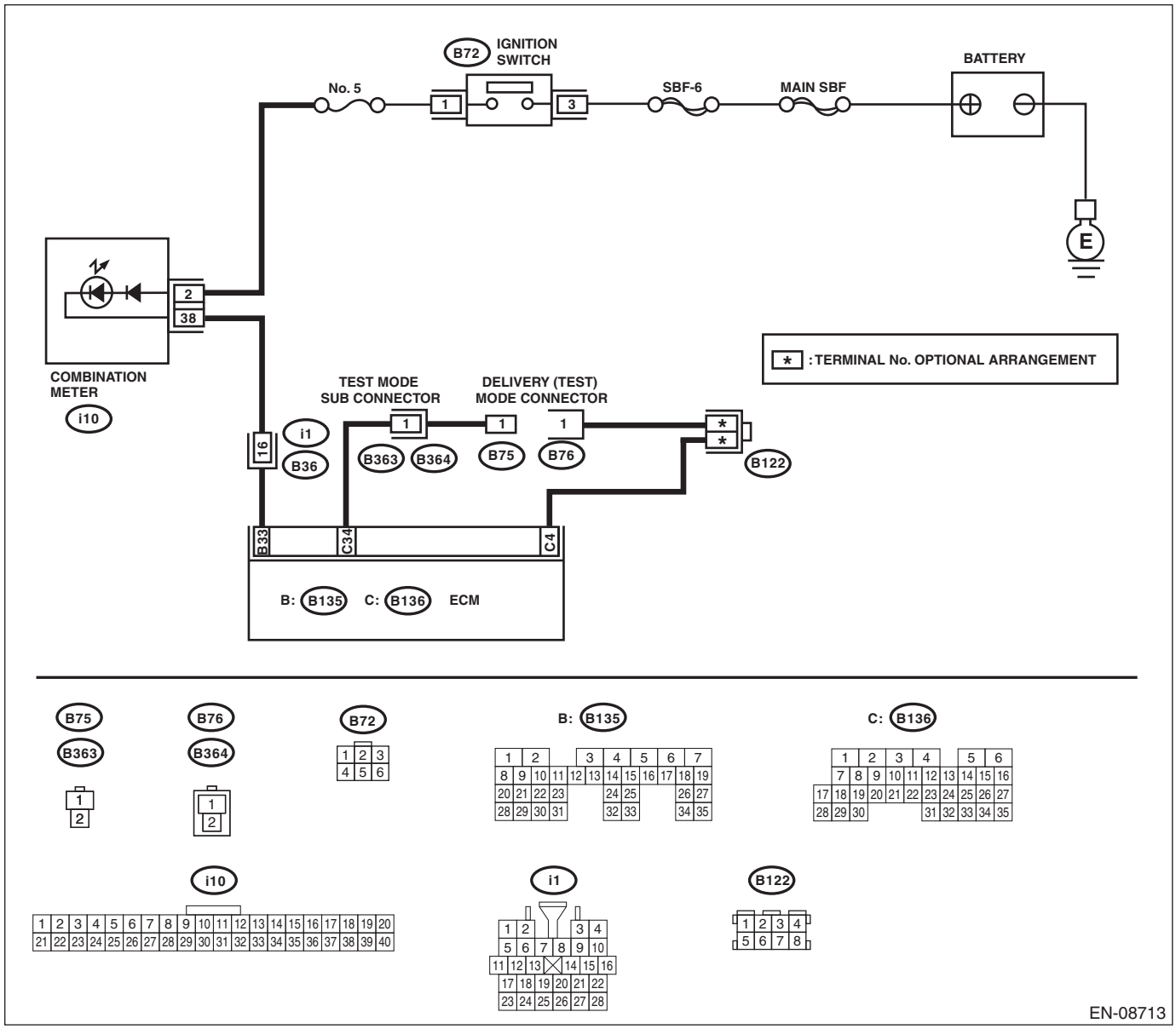
DIAGNOSIS:

- The malfunction indicator light circuit is open or shorted.
- The delivery (test) mode connector circuit is open.

TROUBLE SYMPTOM:

Malfunction indicator light does not blink during Inspection Mode.

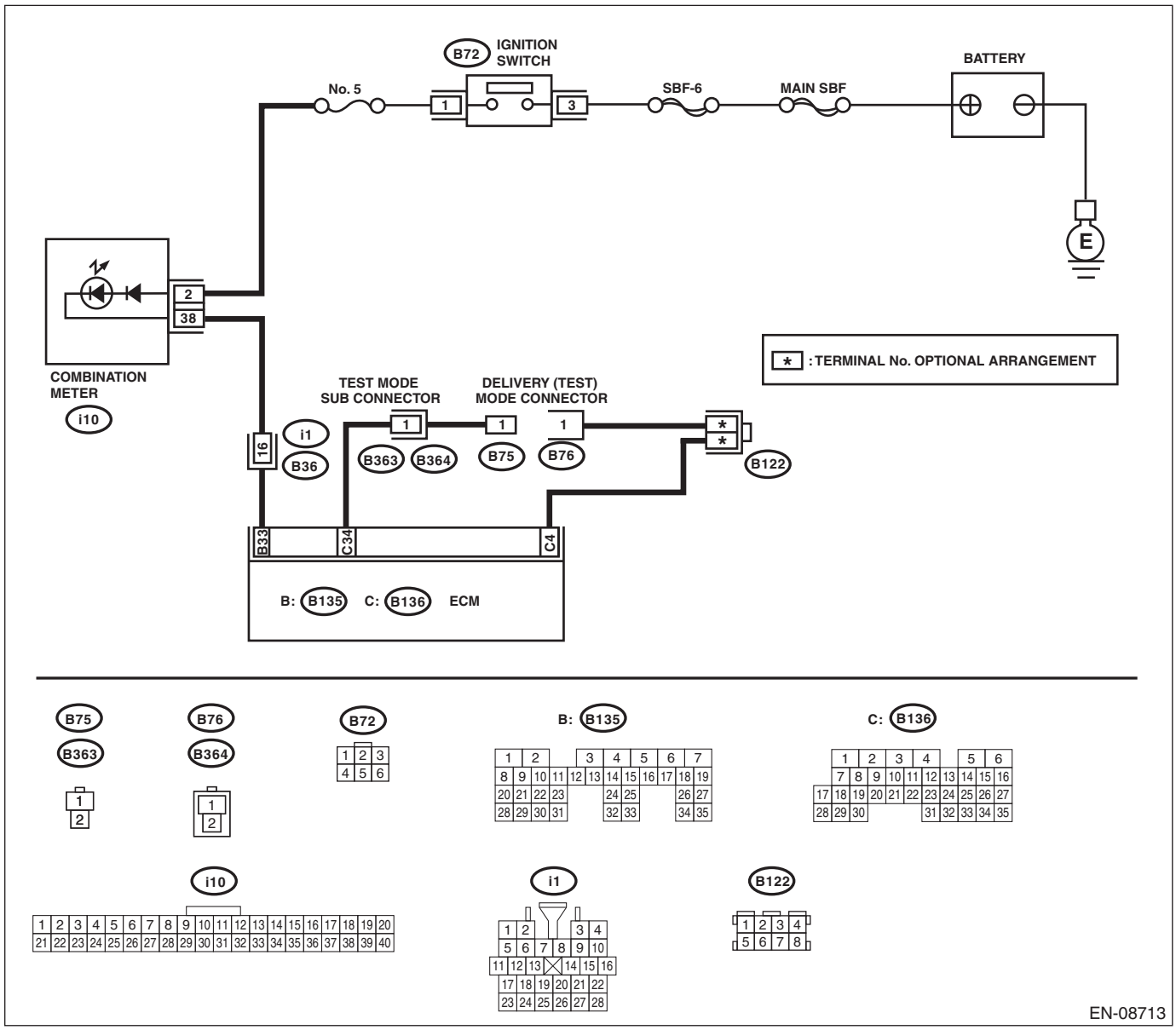
WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK STATUS OF MALFUNCTION INDICATOR LIGHT.** 1) Turn the ignition switch to OFF. 2) Check the delivery (test) mode connector is disconnected. 3) Turn the ignition switch to ON. (engine OFF)	Does the malfunction indicator light illuminate?	Go to step **2**.	Repair the malfunction indicator light circuit. <Ref. to EN(H4DOTC)(diag)-62, MALFUNCTION INDICATOR LIGHT DOES NOT COME ON, Malfunction Indicator Light.>
2	**CHECK HARNESS BETWEEN ECM AND COMBINATION METER CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Turn the ignition switch to ON.	Does the malfunction indicator light illuminate?	Repair the ground short circuit of harness between ECM and combination meter connector.	Go to step **3**.
3	**CHECK HARNESS BETWEEN ECM AND DELIVERY (TEST) MODE CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Connect the delivery (test) mode connector. 3) Measure the resistance of harness between ECM connectors. ***Connector & terminal*** ***(B136) No. 34 — (B136) 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: • Open circuit in harness between ECM connector • Poor contact of each connector between ECM connector.
4	**CHECK FOR POOR CONTACT.** Check for poor contact of ECM connector.	Is there poor contact of ECM connector?	Repair the poor contact of ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-57, Engine Control Module (ECM).>

F: MALFUNCTION INDICATOR LIGHT REMAINS BLINKING

DIAGNOSIS:
The delivery (test) mode connector circuit is shorted.
TROUBLE SYMPTOM:
Malfunction indicator light blinks when delivery (test) mode connector is not connected.
WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK DELIVERY (TEST) MODE CONNECTOR.** 1) Check the delivery (test) mode connector is disconnected. 2) Turn the ignition switch to ON.	Does the malfunction indicator light blink?	Go to step **2**.	System is normal. NOTE: Malfunction indicator light blinks when delivery (test) mode connector is connected.

	Step	Check	Yes	No
2	**CHECK HARNESS BETWEEN ECM AND CHASSIS GROUND TERMINAL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 34 — Chassis ground:***	Is the resistance less than 5 Ω?	Repair the short circuit to ground in harness between ECM and delivery (test) mode connector.	Replace the ECM. <Ref. to FU(H4DOTC)-57, Engine Control Module (ECM).>

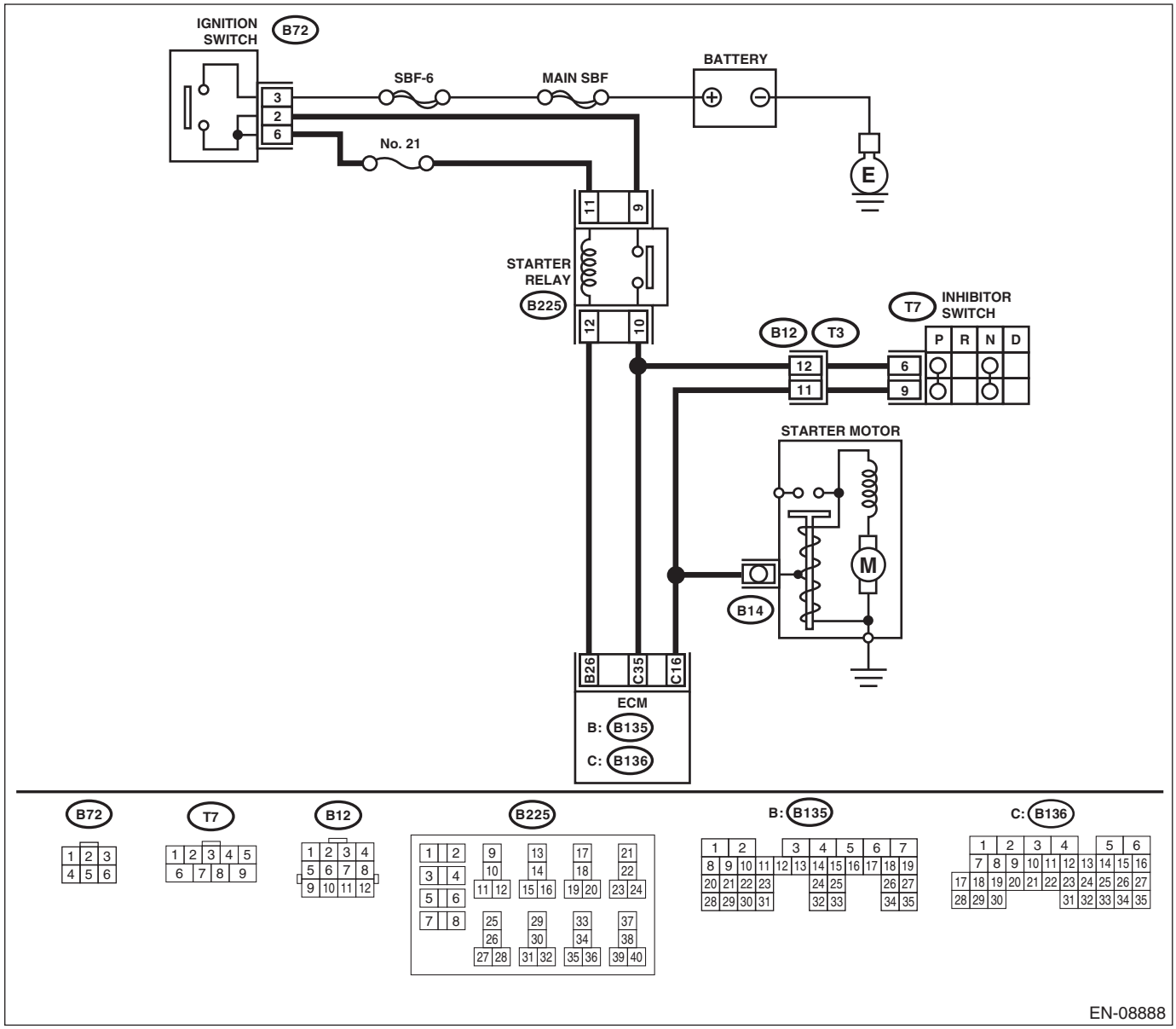
17.Diagnostics for Engine Starting Failure

A: PROCEDURE

1. Check for fuel amount.
↓
2. Inspection of starter motor circuit. <Ref. to EN(H4DOTC)(diag)-70, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
3. Inspection of ECM power supply and ground line. <Ref. to EN(H4DOTC)(diag)-73, 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)-75, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>
↓
5. Inspection of fuel pump circuit. <Ref. to EN(H4DOTC)(diag)-77, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
6. Inspection of fuel injector circuit. <Ref. to EN(H4DOTC)(diag)-78, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

B: STARTER MOTOR CIRCUIT

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.
WIRING DIAGRAM:



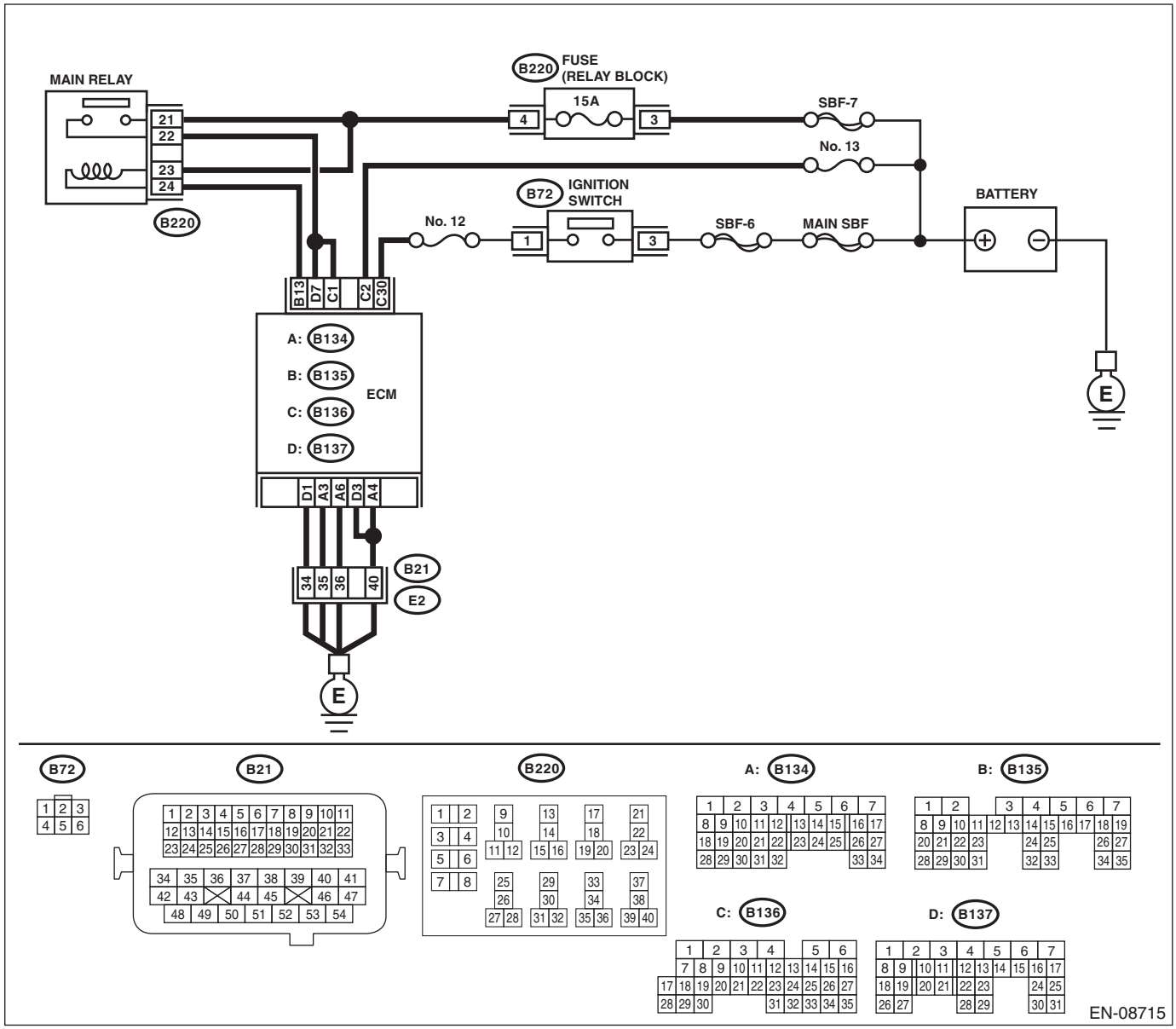
Step		Check	Yes	No
1	**CHECK BATTERY.** Check the battery voltage.	Is the voltage 12 V or more?	Go to step **2**.	Charge or replace the battery.
2	**CHECK OPERATION OF STARTER MOTOR.**	Does the starter motor operate?	Go to step **3**.	Go to step **4**.

	Step	Check	Yes	No
3	**CHECK DTC.**	Is DTC displayed? <Ref. to EN(H4DOTC)(diag)-44, OPERATION, Read Diagnostic Trouble Code (DTC).>	Check the appropriate DTC using the "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-82, List of Diagnostic Trouble Code (DTC).>	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, temporary open or short circuit of harness may be the cause.
4	**CHECK INPUT SIGNAL FOR STARTER MOTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from starter motor. 3) Place the select lever in "P" range or "N" range. 4) Turn the ignition switch to START. 5) Measure the voltage between the starter motor connector and the engine ground. ***Connector & terminal*** ***(B14) No. 1 (+) — Engine ground (–):***	Is the voltage 10 V or more?	Check the starter motor. <Ref. to SC(H4DO)-9, Starter.>	Go to step **5**.
5	**CHECK HARNESS BETWEEN BATTERY AND IGNITION SWITCH CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ignition switch. 3) Measure the voltage between ignition switch connector and chassis ground. ***Connector & terminal*** ***(B72) No. 3 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **6**.	Check the following item and repair if necessary. • Blown out of fuse • Open or short circuit to ground in harness between ignition switch connector and battery
6	**CHECK IGNITION SWITCH.** Measure the resistance between ignition switch terminals after turning the ignition switch to START position. ***Terminals*** ***No. 3 — No. 2:*** ***No. 3 — No. 6:***	Is the resistance less than 1 Ω?	Go to step **7**.	Replace the ignition switch. <Ref. to SL-40, REPLACEMENT, Ignition Key Lock.>
7	**CHECK INPUT VOLTAGE OF STARTER RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the starter relay. 3) Connect the connector to ignition switch. 4) Measure the voltage between starter relay connector and chassis ground after turning the ignition switch to START position. ***Connector & terminal*** ***(B225) No. 9 (+) — Chassis ground (–):*** ***(B225) No. 11 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **8**.	Check the following item and repair if necessary. • Open or short circuit to ground in harness between starter relay connector and ignition switch connector • Blown out of fuse

	Step	Check	Yes	No
8	**CHECK STARTER RELAY.** 1) Connect the battery to starter relay terminals No. 11 and No. 12. 2) Measure the resistance between starter relay terminals. ***Terminals*** ***No. 9 — No. 10:***	Is the resistance less than 1 Ω?	Go to step **9**.	Replace the starter relay. <Ref. to EN(H4DOTC)(diag)-9, Electrical Component Location.>
9	**CHECK HARNESS BETWEEN ECM AND STARTER RELAY CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM and starter relay connector. ***Connector & terminal*** ***(B135) No. 26 — (B225) No. 12:***	Is the resistance less than 1 Ω?	Go to step **10**.	Repair the open circuit of harness between ECM and starter relay connector.
10	**CHECK HARNESS BETWEEN STARTER RELAY AND INHIBITOR SWITCH CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from inhibitor switch. 3) Measure the resistance of harness between starter relay connector and inhibitor relay connector. ***Connector & terminal*** ***(B225) No. 10 — (T7) No. 6:***	Is the resistance less than 1 Ω?	Go to step **11**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between starter relay connector and inhibitor switch connector • Poor contact of coupling connector
11	**CHECK HARNESS BETWEEN INHIBITOR SWITCH AND STARTER MOTOR.** Measure the resistance of harness between the inhibitor switch connector and starter motor. ***Connector & terminal*** ***(T7) No. 9 — (B14) 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 inhibitor switch connector and starter motor • Poor contact of coupling connector
12	**CHECK INHIBITOR SWITCH.** 1) Place the select lever in “P” range and “N” range. 2) Measure the resistance between inhibitor switch terminals. ***Terminals*** ***No. 6 — No. 9:***	Is the resistance less than 1 Ω?	Check the engine control module (ECM) power supply and ground line. <Ref. to EN(H4DOTC)(diag)-73, CHECK POWER SUPPLY AND GROUND LINE OF ENGINE CONTROL MODULE (ECM), Diagnostics for Engine Starting Failure.>	Replace the inhibitor switch. <Ref. to 4AT-52, Inhibitor Switch.>

C: CHECK POWER SUPPLY AND GROUND LINE OF ENGINE CONTROL MODULE (ECM)

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.
WIRING DIAGRAM:

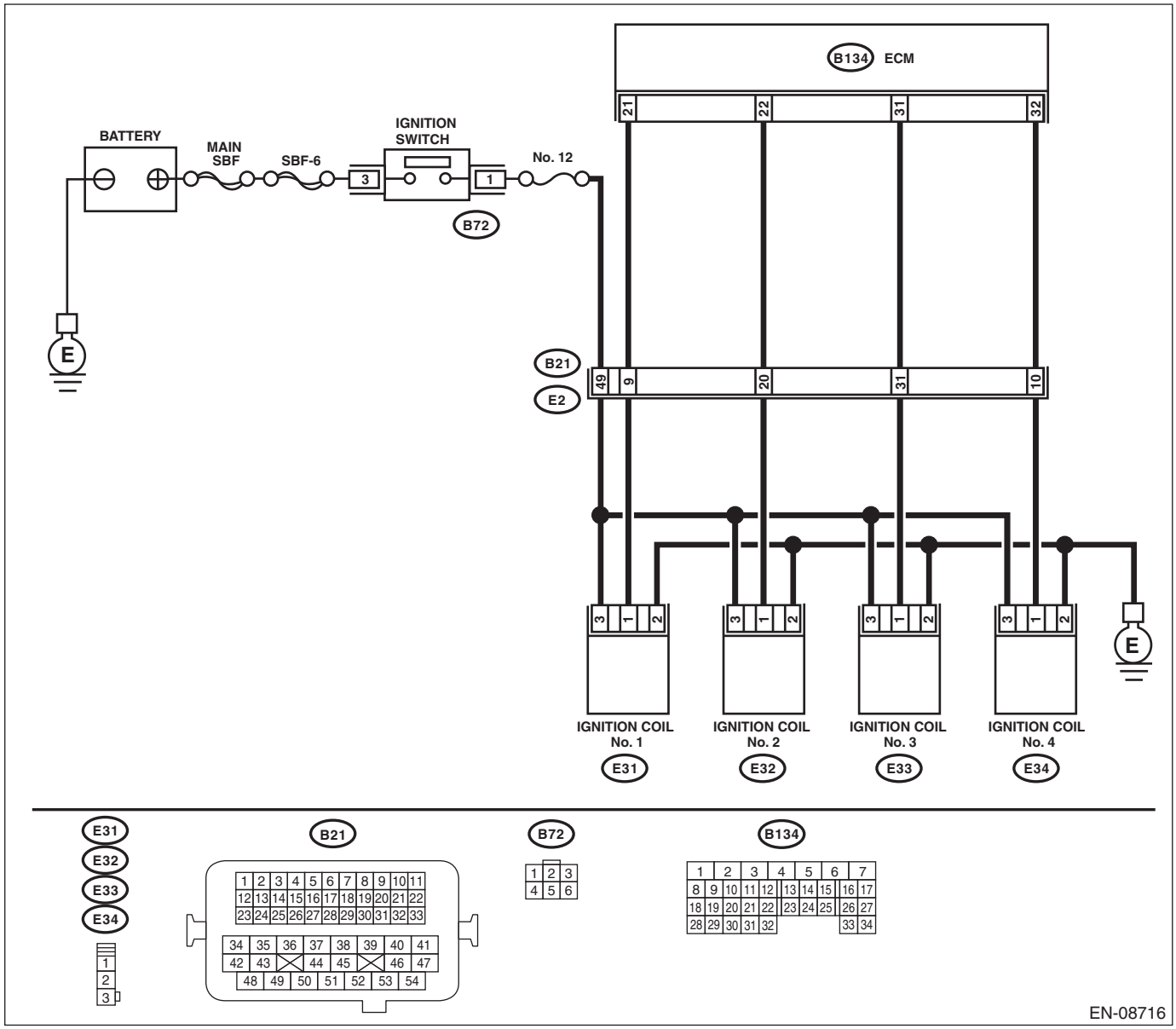


Step		Check	Yes	No
1	**CHECK MAIN RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the main relay. 3) Connect the battery to main relay terminals No. 23 and No. 24. 4) Measure the resistance between main relay terminals. ***Terminals*** ***No. 21 — No. 22:***	Is the resistance less than 1 Ω?	Go to step **2**.	Replace the main relay. <Ref. to EN(H4DOTC)(diag)-9, Electrical Component Location.>

	Step	Check	Yes	No
2	**CHECK GROUND CIRCUIT FOR ECM.** 1) Disconnect the connector from ECM. 2) Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 3 — Chassis ground:*** ***(B134) No. 4 — Chassis ground:*** ***(B134) No. 6 — Chassis ground:*** ***(B137) No. 1 — Chassis ground:*** ***(B137) No. 3 — Chassis ground:***	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 of harness between ECM connector and engine ground • Poor contact of coupling connector
3	**CHECK INPUT VOLTAGE OF ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 2 (+) — Chassis ground (–):*** ***(B136) No. 30 (+) — 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*** ***(B220) No. 21 (+) — Chassis ground (–):*** ***(B220) No. 23 (+) — 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) Turn the ignition switch to OFF. 2) Install the main relay. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 13 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **6**.	Repair the open or ground short circuit of harness between ECM and main relay connector.
6	**CHECK INPUT VOLTAGE OF ECM.** 1) Turn the ignition switch to OFF. 2) Connect the connector to ECM. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 1 (+) — Chassis ground (–):*** ***(B137) No. 7 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Check ignition control system. <Ref. to EN(H4DOTC)(diag)-75, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit or short circuit to ground in harness between ECM and main relay connector • Poor contact of main relay connector

D: IGNITION CONTROL SYSTEM

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.
WIRING DIAGRAM:



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 normal?	Go to step **2**.	Replace the spark plug. <Ref. to IG(H4DOTC)-4, Spark Plug.>

	Step	Check	Yes	No
2	**CHECK IGNITION SYSTEM FOR SPARKS.** 1) Connect the spark plug to ignition coil. 2) Release the fuel pressure. <Ref. to FU(H4DOTC)-65, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.> 3) Contact the spark plug thread portion to 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)-77, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>	Go to step **3**.
3	**CHECK IGNITION COIL POWER SUPPLY CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ignition coil. 3) Turn the ignition switch to ON. 4) Measure the power supply voltage between ignition coil connector and engine ground. ***Connector & terminal*** ***(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 ignition coil connector and ignition switch connector • Poor contact of coupling connector • Blown out of fuse
4	**CHECK HARNESS OF IGNITION COIL GROUND CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between ignition coil connector and engine ground. ***Connector & terminal*** ***(E31) No. 2 — Engine ground:*** ***(E32) No. 2 — Engine ground:*** ***(E33) No. 2 — Engine ground:*** ***(E34) No. 2 — Engine ground:***	Is the resistance less than 1 Ω?	Go to step **5**.	Repair the open circuit in harness between ignition coil connector and engine ground.
5	**CHECK HARNESS BETWEEN ECM AND IGNITION COIL CONNECTOR.** 1) Disconnect the connector from ECM. 2) Measure the resistance of harness between ECM and ignition coil connector. ***Connector & terminal*** ***(B134) No. 21 — (E31) No. 1:*** ***(B134) No. 22 — (E32) No. 1:*** ***(B134) No. 31 — (E33) No. 1:*** ***(B134) No. 32 — (E34) 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 of harness between ECM and ignition coil connector • Poor contact of coupling connector
6	**CHECK HARNESS BETWEEN ECM AND IGNITION COIL CONNECTOR.** Measure the resistance between ECM and engine ground. ***Connector & terminal*** ***(B134) No. 21 — Engine ground:*** ***(B134) No. 22 — Engine ground:*** ***(B134) No. 31 — Engine ground:*** ***(B134) No. 32 — Engine ground:***	Is the resistance 1 MΩ or more?	Go to step **7**.	Repair the ground short circuit of harness between ECM and ignition coil connector.
7	**CHECK FOR POOR CONTACT.** Check for poor contact of ECM connector.	Is there poor contact of ECM connector?	Repair the poor contact of ECM connector.	Replace the ignition coil. <Ref. to IG(H4DOTC)-7, Ignition Coil.>

E: FUEL PUMP CIRCUIT

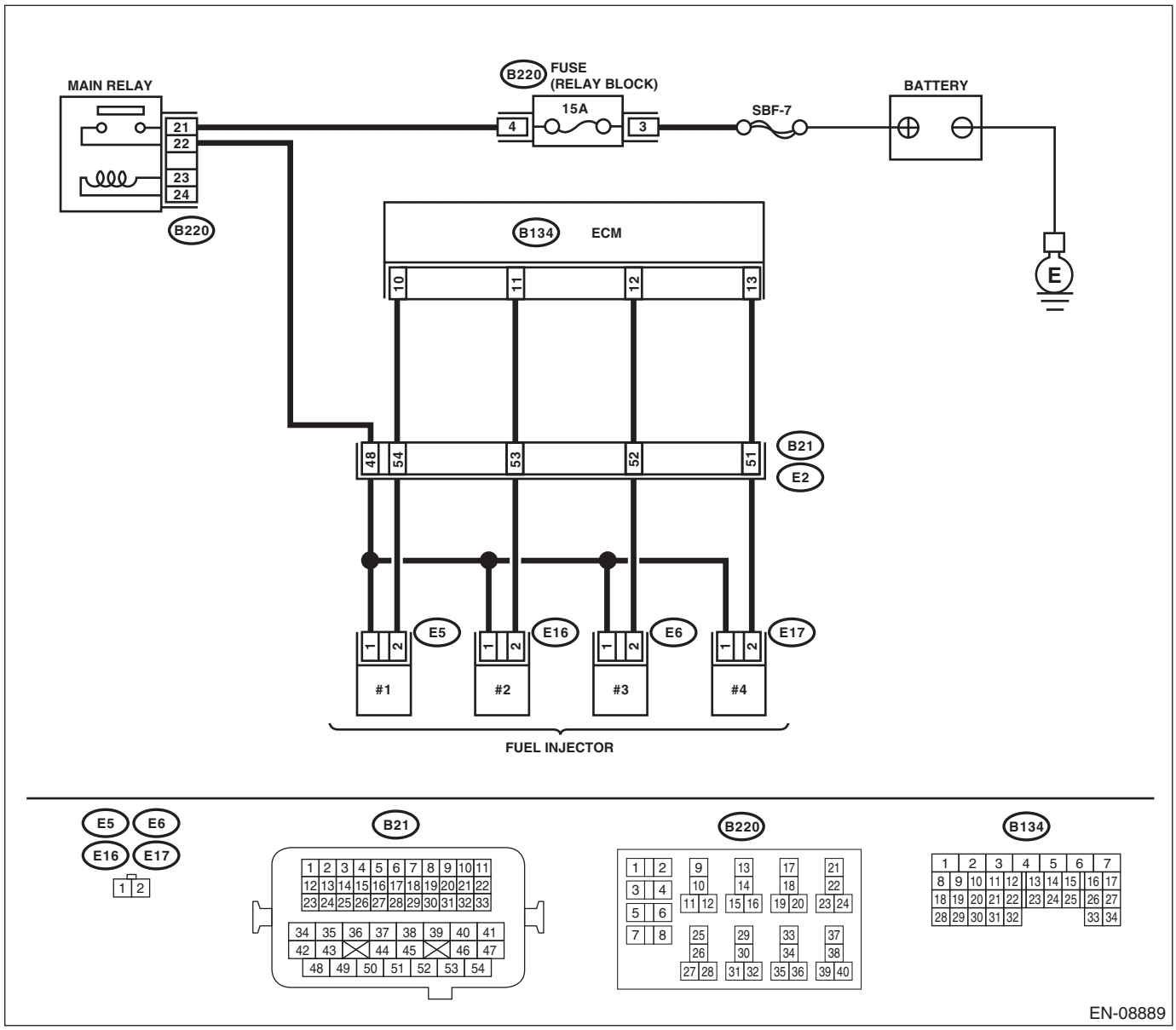
CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

Step		Check	Yes	No
1	**CHECK OPERATING SOUND OF FUEL PUMP.** Make sure that the fuel pump operates for two seconds when turning the ignition switch to ON. NOTE: Fuel pump operation can be executed using the Subaru Select Monitor. For the procedures, refer to “Compulsory Valve Operation Check Mode”. <Ref. to EN(H4DOTC)(diag)-57, Compulsory Valve Operation Check Mode.>	Does the fuel pump emit operating sound?	Check the fuel injector circuit. <Ref. to EN(H4DOTC)(diag)-78, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>	Display the DTC. <Ref. to EN(H4DOTC)(diag)-44, OPERATION, Read Diagnostic Trouble Code (DTC).>

F: FUEL INJECTOR CIRCUIT

CAUTION:
- **Check or repair only faulty parts.**
- **After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.**

WIRING DIAGRAM:



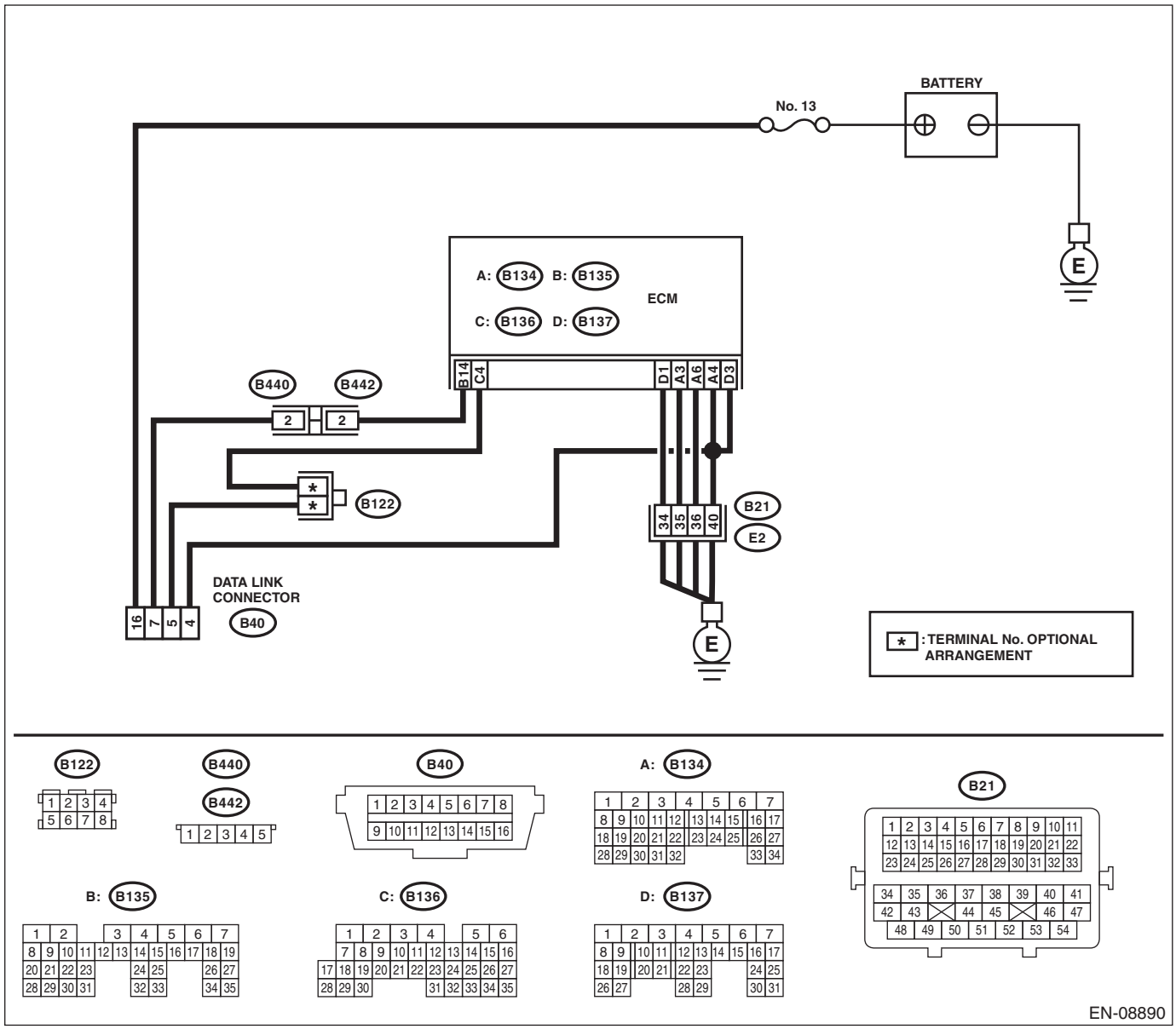
Step		Check	Yes	No
1	**CHECK OPERATION OF EACH FUEL INJECTOR.** While cranking the engine, check each fuel injector emits operating sound. Use a sound scope or attach a screwdriver to the injector for this check.	Does the fuel injector emit operating sound?	Check the fuel pressure. <Ref. to ME(H4DOTC)-25, INSPECTION, Fuel Pressure.>	Go to step **2**.

	Step	Check	Yes	No
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 connector and the engine ground. ***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 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 connector and fuel injector connector • Poor contact of main relay connector • Poor contact of coupling connector
3	**CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM and fuel injector connector. ***Connector & terminal*** ***(B134) No. 10 — (E5) No. 2:*** ***(B134) No. 11 — (E16) No. 2:*** ***(B134) No. 12 — (E6) No. 2:*** ***(B134) No. 13 — (E17) 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: • Open circuit in harness between ECM and fuel injector connector • Poor contact of coupling connector
4	**CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR.** Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 10 — Chassis ground:*** ***(B134) No. 11 — Chassis ground:*** ***(B134) No. 12 — Chassis ground:*** ***(B134) No. 13 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **5**.	Repair the short circuit to ground in harness between ECM and fuel injector connector.
5	**CHECK EACH FUEL INJECTOR.** Measure the resistance between each fuel injector terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 5 — 20 Ω?	Go to step **6**.	Replace the faulty fuel injector. <Ref. to FU(H4DOTC)-45, Fuel Injector.>
6	**CHECK FOR POOR CONTACT.** Check for poor contact of ECM connector.	Is there poor contact of ECM connector?	Repair the poor contact of ECM connector.	Inspection using “General Diagnostic Table”. <Ref. to EN(H4DOTC)(diag)-368, INSPECTION, General Diagnostic Table.>

18.Diagnostic Procedure for Subaru Select Monitor Communication

A: COMMUNICATION FOR INITIALIZING IMPOSSIBLE

DIAGNOSIS:
Open or short circuit in data link connector
TROUBLE SYMPTOM:
Subaru Select Monitor communication failure
WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK POWER SUPPLY CIRCUIT.** Connect the SDI (Subaru Diagnosis Interface) or general scan tool to data link connector.	Does SDI or general scan tool turn ON?	Go to step **4**.	Go to step **2**.

	Step	Check	Yes	No
2	**CHECK 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 the power supply circuit. NOTE: In this case, repair the following item: • Open or ground short circuit of harness between battery and data link connector • Blown out of fuse (M/B No. 13)
3	**CHECK HARNESS BETWEEN DATA LINK CONNECTOR AND CHASSIS GROUND.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between data link connector and chassis ground. ***Connector & terminal*** ***(B40) No. 4 — Chassis ground:*** ***(B40) No. 5 — Chassis ground:***	Is the resistance less than 5 Ω?	Repair the poor contact of data link connector.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and data link connector • Open circuit of harness between ECM and engine ground • Poor contact of ECM connector • Poor contact of coupling connector
4	**CHECK HARNESS BETWEEN ECM AND DATA LINK CONNECTOR.** 1) Disconnect the connectors from ECM, TCM, VDC CM, airbag CM, impact sensor, TPMS & keyless entry CM, and body integrated unit. **CAUTION:** **When disconnecting the connector from airbag CM, always follow the precautions on AB section. <Ref. to AB-5, CAUTION, General Description.>** 2) Measure the resistance of harness between ECM and data link connector. ***Connector & terminal*** ***(B135) No. 14 — (B40) No. 7:***	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 of harness between ECM and data link connector • Poor contact of coupling connector
5	**CHECK HARNESS BETWEEN ECM AND DATA LINK CONNECTOR.** Measure the resistance between data link connector and chassis ground. ***Connector & terminal*** ***(B40) No. 7 — Chassis ground:***	Is the resistance 1 MΩ or more?	Repair the poor contact of the ECM or data link connector.	Repair the ground short circuit of harness between ECM and data link connector.

19.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)-90, 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 (Bank1)	<Ref. to EN(H4DOTC)(diag)-91, DTC P0016 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0018	Crankshaft Position - Camshaft Position Correlation (Bank2)	<Ref. to EN(H4DOTC)(diag)-92, DTC P0018 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0021	Intake Camshaft Position - Timing Over-Advanced or System Performance (Bank 2)	<Ref. to EN(H4DOTC)(diag)-93, 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)-94, 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)-96, 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)-98, 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)-100, 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)-102, 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)-104, 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)-105, 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)-106, 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)-108, 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)-110, 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)-112, 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)-114, 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)-115, DTC P0112 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Note
P0113	Intake Air Temperature Sensor 1 Circuit High	<Ref. to EN(H4DOTC)(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(H4DOTC)(diag)-119, 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)-121, 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)-123, 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)-125, 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)-127, 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)-127, 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)-128, 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)-129, 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)-131, 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)-133, 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)-138, 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)-140, 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 (Bank1 Sensor2)	<Ref. to EN(H4DOTC)(diag)-142, DTC P0140 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK1 SENSOR2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0141	O2 Sensor Heater Circuit (Bank1 Sensor2)	<Ref. to EN(H4DOTC)(diag)-144, DTC P0141 O2 SENSOR HEATER CIRCUIT (BANK1 SENSOR2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0171	System Too Lean (Bank 1)	<Ref. to EN(H4DOTC)(diag)-144, 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)-145, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Note
P0181	Fuel Temperature Sensor “A” Circuit Range/Performance	<Ref. to EN(H4DOTC)(diag)-147, 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(H4DOTC)(diag)-148, 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)-150, 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)-152, 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)-154, 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)-156, 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)-159, 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)-160, 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)-163, 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)-164, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0302	Cylinder 2 Misfire Detected	<Ref. to EN(H4DOTC)(diag)-164, DTC P0302 CYLINDER 2 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0303	Cylinder 3 Misfire Detected	<Ref. to EN(H4DOTC)(diag)-164, DTC P0303 CYLINDER 3 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0304	Cylinder 4 Misfire Detected	<Ref. to EN(H4DOTC)(diag)-165, 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)-170, 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)-172, 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)-174, 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)-176, 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)-177, 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)-179, 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)-181, DTC P0410 SECONDARY AIR INJECTION SYSTEM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Note
P0411	Secondary Air Injection System Incorrect Flow Detected	<Ref. to EN(H4DOTC)(diag)-185, DTC P0411 SECONDARY AIR INJECTION SYSTEM INCORRECT FLOW DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0413	Secondary Air Injection System Switching Valve “A” Circuit Open	<Ref. to EN(H4DOTC)(diag)-186, 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)-189, 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)-192, 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)-195, 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	<Ref. to EN(H4DOTC)(diag)-198, DTC P0418 SECONDARY AIR INJECTION SYSTEM CONTROL “A” CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0420	Catalyst System Efficiency Below Threshold (Bank 1)	<Ref. to EN(H4DOTC)(diag)-201, DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0442	Evaporative Emission Control System Leak Detected (Small Leak)	<Ref. to EN(H4DOTC)(diag)-205, 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)-207, 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)-209, 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)-211, 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)-212, 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)-214, 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)-218, 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)-220, 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)-222, 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)-224, 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)-226, 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)-226, DTC P0462 FUEL LEVEL SENSOR “A” CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

List of Diagnostic Trouble Code (DTC)

DTC	Item	Note
P0463	Fuel Level Sensor “A” Circuit High	<Ref. to EN(H4DOTC)(diag)-226, 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)-227, DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0500	Vehicle Speed Sensor “A”	<Ref. to EN(H4DOTC)(diag)-227, DTC P0500 VEHICLE SPEED SENSOR “A”, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0506	Idle Air Control System RPM Lower Than Expected	<Ref. to EN(H4DOTC)(diag)-228, 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)-229, DTC P0507 IDLE AIR CONTROL SYSTEM RPM HIGHER THAN EXPECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P050A	Cold Start Idle Air Control System Performance	<Ref. to EN(H4DOTC)(diag)-230, DTC P050A COLD START IDLE AIR CONTROL SYSTEM PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P050B	Cold Start Ignition Timing Performance	<Ref. to EN(H4DOTC)(diag)-238, DTC P050B COLD START IGNITION TIMING PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0512	Starter Request Circuit	<Ref. to EN(H4DOTC)(diag)-239, DTC P0512 STARTER REQUEST CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0513	Incorrect Immobilizer Key	<Ref. to IM(diag)-15, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0604	Internal Control Module Random Access Memory (RAM) Error	<Ref. to EN(H4DOTC)(diag)-241, 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)-241, DTC P0605 INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0607	Throttle Control System Circuit Range/Performance	<Ref. to EN(H4DOTC)(diag)-242, DTC P0607 THROTTLE CONTROL SYSTEM CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0638	Throttle Actuator Control Range/Performance (Bank 1)	<Ref. to EN(H4DOTC)(diag)-243, DTC P0638 THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0700	Transmission Control System (MIL Request)	<Ref. to EN(H4DOTC)(diag)-243, 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)-244, DTC P0851 PARK/NEUTRAL SWITCH INPUT CIRCUIT LOW (AT MODEL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0852	Park/Neutral Switch Input Circuit High (AT Model)	<Ref. to EN(H4DOTC)(diag)-246, DTC P0852 PARK/NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT MODEL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1152	O2 Sensor Circuit Range/Performance (Low) (Bank1 Sensor1)	<Ref. to EN(H4DOTC)(diag)-248, DTC P1152 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK1 SENSOR1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1153	O2 Sensor Circuit Range/Performance (High) (Bank1 Sensor1)	<Ref. to EN(H4DOTC)(diag)-250, DTC P1153 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1160	Return Spring Failure	<Ref. to EN(H4DOTC)(diag)-251, 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)-252, DTC P1400 FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Note
P1410	Secondary Air Injection System Switching Valve Stuck Open	<Ref. to EN(H4DOTC)(diag)-254, 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)-255, 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)-258, 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)-260, 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)-261, 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)-263, 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)-265, DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1570	Antenna	<Ref. to IM(diag)-16, DTC P1570 ANTENNA, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1571	Reference Code Incompatibility	<Ref. to IM(diag)-18, DTC P1571 REFERENCE CODE INCOMPATIBILITY, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1572	IMM Circuit Failure (Except Antenna Circuit)	<Ref. to IM(diag)-19, DTC P1572 IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1574	Key Communication Failure	<Ref. to IM(diag)-22, DTC P1574 KEY COMMUNICATION FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1576	EGI Control Module EEPROM	<Ref. to IM(diag)-23, DTC P1576 EGI CONTROL MODULE EEPROM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1577	IMM Control Module EEPROM	<Ref. to IM(diag)-24, DTC P1577 IMM CONTROL MODULE EEPROM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1578	Meter Failure	<Ref. to IM(diag)-25, DTC P1578 METER FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2004	Intake Manifold Runner Control Stuck Open (Bank 1)	<Ref. to EN(H4DOTC)(diag)-267, DTC P2004 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2005	Intake Manifold Runner Control Stuck Open (Bank 2)	<Ref. to EN(H4DOTC)(diag)-268, 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)-269, 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)-270, 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)-271, 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)-273, 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)-275, DTC P2011 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Note
P2012	Intake Manifold Runner Control Circuit Low (Bank 2)	<Ref. to EN(H4DOTC)(diag)-277, 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)-279, 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)-281, 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)-283, 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)-285, DTC P2022 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT HIGH (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2088	Intake Camshaft Position Actuator Control Circuit Low (Bank 1)	<Ref. to EN(H4DOTC)(diag)-287, DTC P2088 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2089	Intake Camshaft Position Actuator Control Circuit High (Bank 1)	<Ref. to EN(H4DOTC)(diag)-289, DTC P2089 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2092	Intake Camshaft Position Actuator Control Circuit Low (Bank 2)	<Ref. to EN(H4DOTC)(diag)-291, DTC P2092 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2093	Intake Camshaft Position Actuator Control Circuit High (Bank 2)	<Ref. to EN(H4DOTC)(diag)-293, 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)-295, 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)-302, 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)-309, 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)-314, 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(H4DOTC)(diag)-316, 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)-317, 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)-318, 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)-320, 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)-322, 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)-324, DTC P2128 THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Note
P2135	Throttle/Pedal Position Sensor/ Switch “A”/“B” Voltage Correlation	<Ref. to EN(H4DOTC)(diag)-326, 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)-329, DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D”/“E” VOLTAGE CORRELATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P219A	Bank 1 Air-Fuel Ratio Imbalance	<Ref. to EN(H4DOTC)(diag)-331, DTC P219A BANK 1 AIR-FUEL RATIO IMBALANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2419	Evaporative Emission System Switching Valve Control Circuit Low	<Ref. to EN(H4DOTC)(diag)-343, 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)-345, 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)-347, 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)-348, 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)-351, 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 (Bank1)	<Ref. to EN(H4DOTC)(diag)-354, DTC P2440 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2441	Secondary Air Injection System Switching Valve Stuck Closed (Bank1)	<Ref. to EN(H4DOTC)(diag)-358, DTC P2441 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK CLOSED (BANK1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2442	Secondary Air Injection System Switching Valve Stuck Open (Bank2)	<Ref. to EN(H4DOTC)(diag)-359, DTC P2442 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2443	Secondary Air Injection System Switching Valve Stuck Closed (Bank2)	<Ref. to EN(H4DOTC)(diag)-363, DTC P2443 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK CLOSED (BANK2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2444	Secondary Air Injection System Pump Stuck On	<Ref. to EN(H4DOTC)(diag)-364, DTC P2444 SECONDARY AIR INJECTION SYSTEM PUMP STUCK ON, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
U0073	CAN Failure, Bus “OFF” Detection	<Ref. to EN(H4DOTC)(diag)-367, DTC U0073 CAN FAILURE, BUS ‘OFF’ DETECTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
U0101	CAN (TCU) Data not Loaded	<Ref. to EN(H4DOTC)(diag)-367, DTC U0101 CAN (TCU) DATA NOT LOADED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
U0122	CAN (VDC) Data not Loaded	<Ref. to EN(H4DOTC)(diag)-367, DTC U0122 CAN (VDC) DATA NOT LOADED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
U0140	CAN (BCU) Data not Loaded	<Ref. to EN(H4DOTC)(diag)-367, DTC U0140 CAN (BCU) DATA NOT LOADED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
U0402	CAN (TCU) Data Abnormal	<Ref. to EN(H4DOTC)(diag)-367, DTC U0402 CAN (TCU) DATA ABNORMAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
U0416	CAN (VDC) Data Abnormal	<Ref. to EN(H4DOTC)(diag)-367, DTC U0416 CAN (VDC) DATA ABNORMAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
U0422	CAN (BCU) Data Abnormal	<Ref. to EN(H4DOTC)(diag)-367, DTC U0422 CAN (BCU) DATA ABNORMAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

20.Diagnostic Procedure with Diagnostic Trouble Code (DTC)

A: DTC P0011 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1)

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-10, 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 servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine and let it idle. 2) Check the AVCS system operating angle 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)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the AVCS system operating angle approximately 0°?	Go to step **2**.	Check the following item and repair or replace if necessary. • Oil pipe (clog) • Oil flow control solenoid valve (clog or dirt of oil routing, setting of spring) • Intake camshaft (dirt, damage of camshaft)
2	**CHECK CURRENT DATA.** 1) Drive with acceleration and deceleration at 80 km/h (50 MPH) or less. NOTE: Drive to an extent that the duty output of oil flow control solenoid valve increases. 2) Measure the AVCS system operating angle and oil flow control solenoid valve duty output 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)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	When the oil flow control solenoid valve duty output exceeds 10%, is the AVCS system operating angle approx. 0°?	Check the following item and repair or replace if necessary. • Oil pipe (clog) • Oil flow control solenoid valve (clog or dirt of oil routing, setting of spring) • Intake camshaft (dirt, damage of camshaft)	Perform the following procedures, 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. <Ref. to LU(H4DOTC)-9, REPLACEMENT, Engine Oil.> <Ref. to LU(H4DOTC)-26, Engine Oil Filter.>

B: DTC P0016 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK1)

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-12, DTC P0016 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Engine stalls.
- Improper idling

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine and let it idle. 2) Measure the AVCS system operating angle and oil flow control solenoid valve duty output 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)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the AVCS system operating angle approx. 0°, and oil flow control solenoid valve duty output approx. 10%?	Perform the following procedures, 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. <Ref. to LU(H4DOTC)-9, REPLACEMENT, Engine Oil.> <Ref. to LU(H4DOTC)-26, Engine Oil Filter.>	Check the following item and repair or replace if necessary. • Oil pipe (clog) • Oil flow control solenoid valve (clog or dirt of oil routing, setting of spring) • Intake camshaft (dirt, damage of camshaft) • Timing belt (matching of timing mark)

C: DTC P0018 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK2)

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-14, DTC P0018 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Engine stalls.
- Improper idling

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine and let it idle. 2) Measure the AVCS system operating angle and oil flow control solenoid valve duty output 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)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the AVCS system operating angle approx. 0°, and oil flow control solenoid valve duty output approx. 10%?	Perform the following procedures, 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. <Ref. to LU(H4DOTC)-9, REPLACEMENT, Engine Oil.> <Ref. to LU(H4DOTC)-26, Engine Oil Filter.>	Check the following item and repair or replace if necessary. • Oil pipe (clog) • Oil flow control solenoid valve (clog or dirt of oil routing, setting of spring) • Intake camshaft (dirt, damage of camshaft) • Timing belt (matching of timing mark)

D: DTC P0021 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 2)

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-14, 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 servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine and let it idle. 2) Check the AVCS system operating angle 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)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the AVCS system operating angle approximately 0°?	Go to step **2**.	Check the following item and repair or replace if necessary. • Oil pipe (clog) • Oil flow control solenoid valve (clog or dirt of oil routing, setting of spring) • Intake camshaft (dirt, damage of camshaft)
2	**CHECK CURRENT DATA.** 1) Drive with acceleration and deceleration at 80 km/h (50 MPH) or less. NOTE: Drive to an extent that the duty output of oil flow control solenoid valve increases. 2) Measure the AVCS system operating angle and oil flow control solenoid valve duty output 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)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	When the oil flow control solenoid valve duty output exceeds 10%, is the AVCS system operating angle approx. 0°?	Check the following item and repair or replace if necessary. • Oil pipe (clog) • Oil flow control solenoid valve (clog or dirt of oil routing, setting of spring) • Intake camshaft (dirt, damage of camshaft)	Perform the following procedures, 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. <Ref. to LU(H4DOTC)-9, REPLACEMENT, Engine Oil.> <Ref. to LU(H4DOTC)-26, Engine Oil Filter.>

E: DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1)

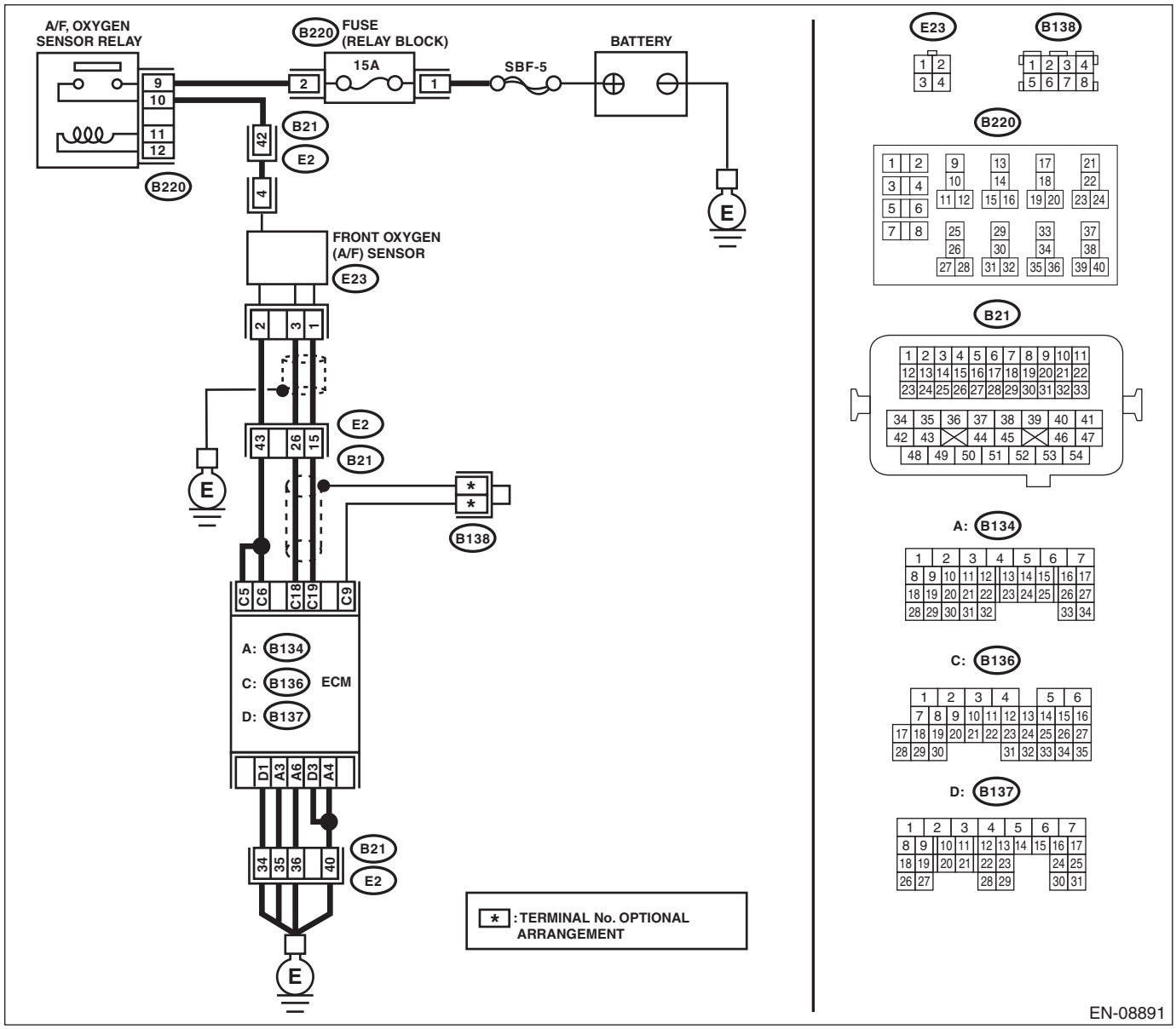
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-15, DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	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. ***Connector & terminal*** ***(B136) No. 5 — (E23) No. 2:*** ***(B136) No. 6 — (E23) No. 2:*** ***(B136) No. 19 — (E23) No. 1:*** ***(B136) No. 18 — (E23) No. 3:***	Is the resistance less than 1 Ω?	Go to step **2**.	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 of coupling connector
2	**CHECK FRONT OXYGEN (A/F) SENSOR.** Measure the resistance between front oxygen (A/F) sensor terminals. ***Terminals*** ***No. 2 — No. 4:***	Is the resistance less than 2 — 3 Ω?	Go to step **3**.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-53, Front Oxygen (A/F) Sensor.>
3	**CHECK FOR POOR CONTACT.** Check for poor contact of ECM and front oxygen (A/F) sensor connector.	Is there poor contact of ECM or front oxygen (A/F) sensor connector?	Repair the poor contact of ECM or front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-53, Front Oxygen (A/F) Sensor.>

F: DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1)

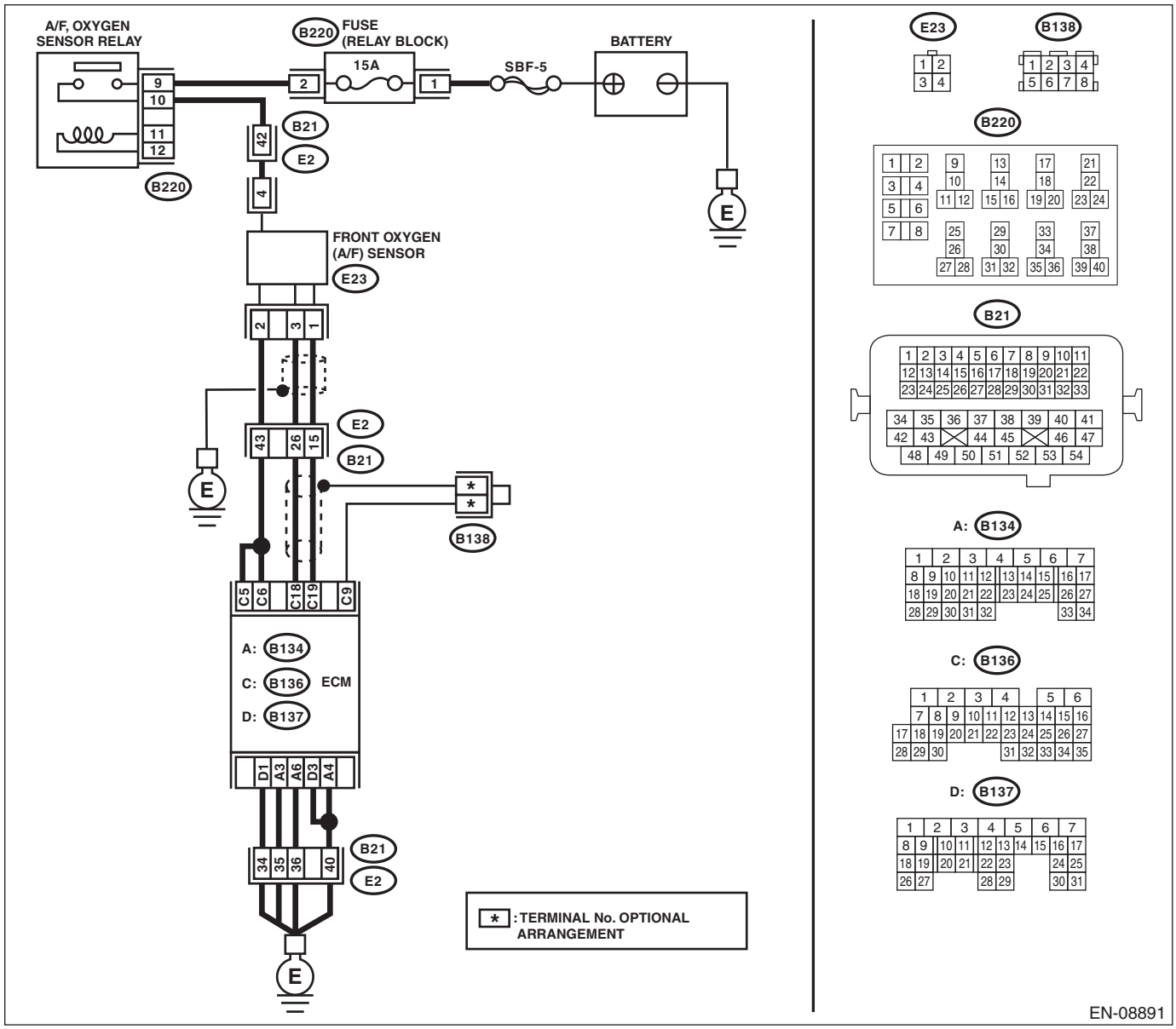
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-17, DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK POWER SUPPLY TO FRONT OXYGEN (A/F) SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors 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. 4 (+) — Engine ground (–):***	Is the voltage 10 V or more?	Go to step **2**.	Repair the power supply line. NOTE: In this case, repair the following item: • Open circuit in harness between A/F, oxygen sensor relay and front oxygen (A/F) sensor connector • Poor contact of A/F, oxygen sensor relay connector • Poor contact of coupling connector
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. 3) Measure the resistance between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B136) No. 5 — (E23) No. 2:*** ***(B136) No. 6 — (E23) No. 2:***	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 of coupling connector
3	**CHECK GROUND CIRCUIT FOR ECM.** Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 3 — Chassis ground:*** ***(B134) No. 4 — Chassis ground:*** ***(B134) No. 6 — Chassis ground:*** ***(B137) No. 1 — Chassis ground:*** ***(B137) No. 3 — 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 of harness between ECM and engine ground • Poor contact of coupling connector
4	**CHECK FRONT OXYGEN (A/F) SENSOR.** Measure the resistance between front oxygen (A/F) sensor terminals. ***Terminals*** ***No. 2 — No. 4:***	Is the resistance 2 — 3 Ω?	Repair the poor contact of ECM connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-53, Front Oxygen (A/F) Sensor.>

G: DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1)

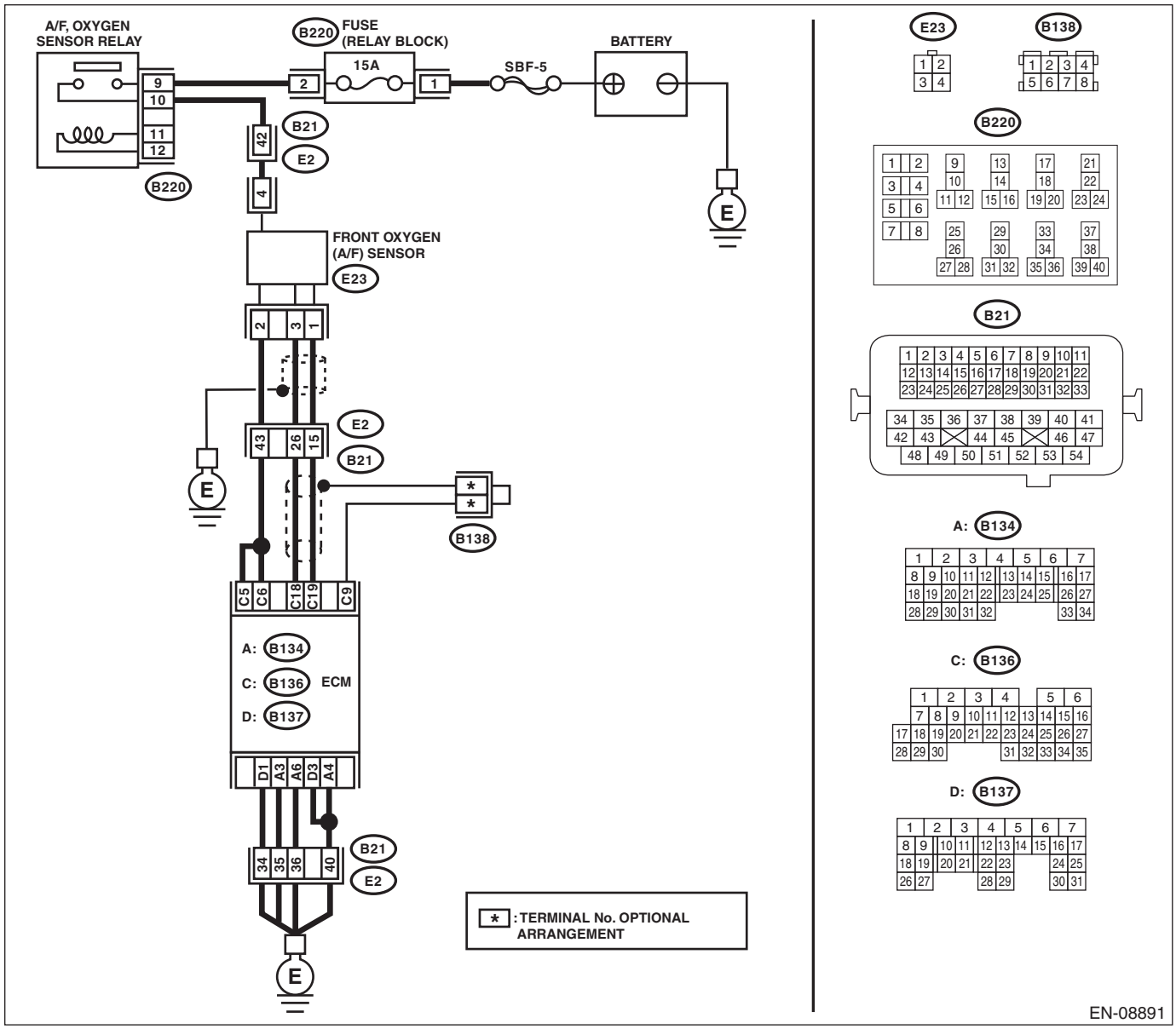
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-19, DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 5 (+) — Chassis ground (–):*** ***(B136) No. 6 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the short circuit to power in the harness between ECM and front oxygen (A/F) sensor connector.	Go to step **2**.
2	**CHECK GROUND CIRCUIT FOR ECM.** 1) Disconnect the connector from ECM. 2) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 3 — Chassis ground:*** ***(B134) No. 4 — Chassis ground:*** ***(B134) No. 6 — Chassis ground:*** ***(B137) No. 1 — Chassis ground:*** ***(B137) No. 3 — Chassis ground:***	Is the resistance less than 5 Ω?	Repair the poor contact of ECM connector.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and engine ground • Poor contact of coupling connector

H: DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2)

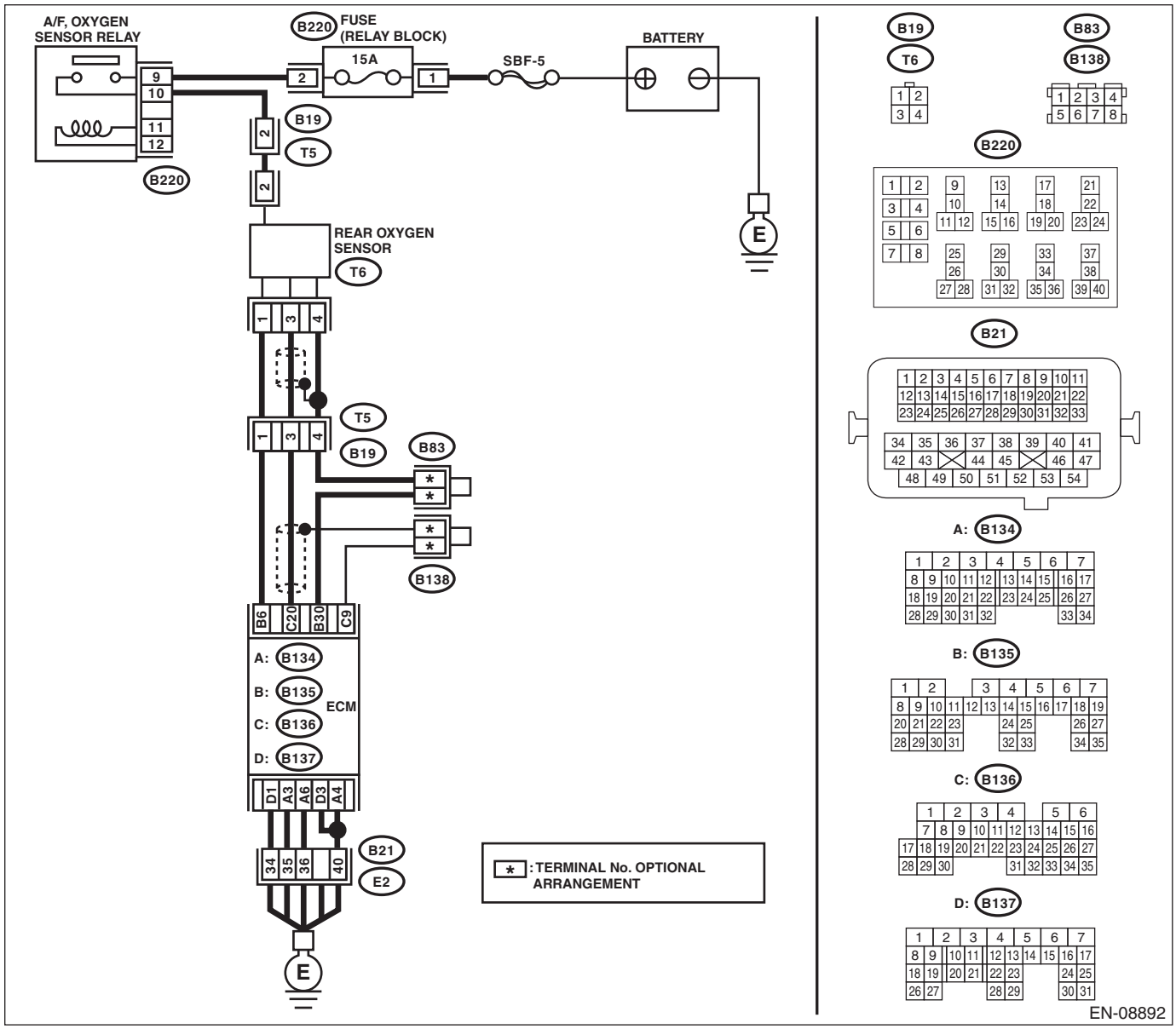
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-21, DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK POWER SUPPLY TO REAR OXYGEN SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from rear oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between rear oxygen sensor connector and engine ground. ***Connector & terminal*** ***(T6) No. 2 (+) — Engine ground (–):***	Is the voltage 10 V or more?	Go to step **2**.	Repair the power supply line. NOTE: In this case, repair the following item: • Open circuit in harness between A/F, oxygen sensor relay and rear oxygen sensor connector • Poor contact of A/F, oxygen sensor relay connector • Poor contact of coupling connector
2	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between the ECM and rear oxygen sensor connector. ***Connector & terminal*** ***(B135) No. 6 — (T6) No. 1:***	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 rear oxygen sensor connector • Poor contact of coupling connector
3	**CHECK GROUND CIRCUIT FOR ECM.** Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 3 — Chassis ground:*** ***(B134) No. 4 — Chassis ground:*** ***(B134) No. 6 — Chassis ground:*** ***(B137) No. 1 — Chassis ground:*** ***(B137) No. 3 — 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 of harness between ECM and engine ground • Poor contact of coupling connector
4	**CHECK REAR OXYGEN SENSOR.** Measure the resistance between rear oxygen sensor terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 5 — 7 Ω?	Repair the poor contact of ECM connector.	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-55, Rear Oxygen Sensor.>

I: DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2)

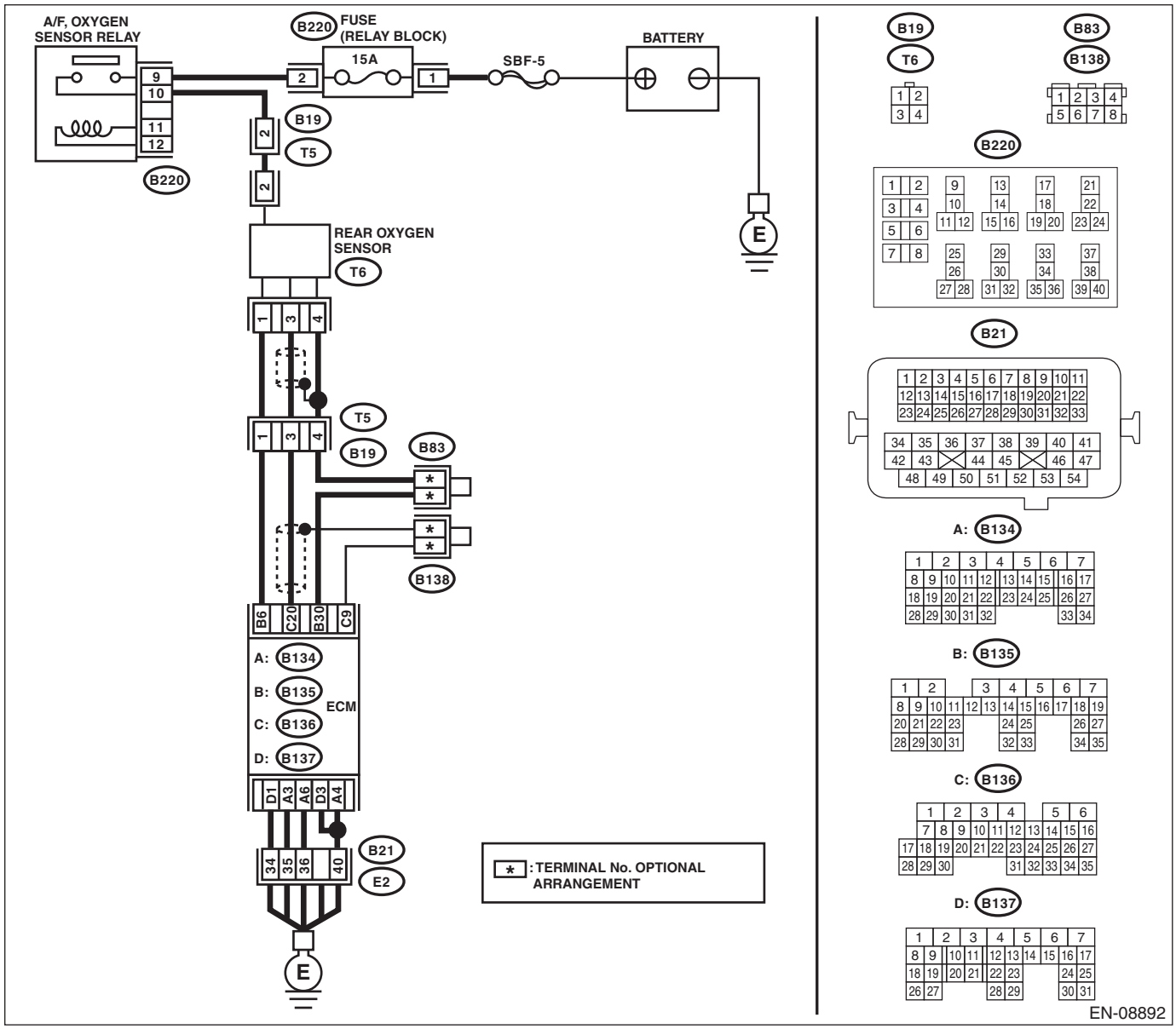
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-23, DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 6 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the short circuit to power in the harness between ECM and rear oxygen sensor connector.	Go to step **2**.

	Step	Check	Yes	No
2	**CHECK GROUND CIRCUIT FOR ECM.** 1) Disconnect the connector from ECM. 2) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 3 — Chassis ground:*** ***(B134) No. 4 — Chassis ground:*** ***(B134) No. 6 — Chassis ground:*** ***(B137) No. 1 — Chassis ground:*** ***(B137) No. 3 — Chassis ground:***	Is the resistance less than 5 Ω?	Repair the poor contact of ECM connector.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and engine ground • Poor contact of coupling connector

J: DTC P0068 MAP/MAF - THROTTLE POSITION CORRELATION

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-25, DTC P0068 MAP/MAF - THROTTLE POSITION CORRELATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**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 **2**.
2	**CHECK MANIFOLD ABSOLUTE PRESSURE SENSOR.** 1) Start the engine and warm up engine until coolant temperature is higher than 75°C (167°F). 2) Place the select lever in “P” range 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 procedures, refer to “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H4DOTC)(diag)-36, 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 **3**.	Replace the manifold absolute pressure sensor. <Ref. to FU(H4DOTC)-43, Manifold Absolute Pressure Sensor.>
3	**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 procedures, refer to “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H4DOTC)(diag)-36, 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 **4**.	Replace the electronic throttle control. <Ref. to FU(H4DOTC)-16, Throttle Body.>
4	**CHECK THROTTLE OPENING ANGLE.**	Is the measured value 85% or more when throttle is fully open?	Replace the manifold absolute pressure sensor. <Ref. to FU(H4DOTC)-43, Manifold Absolute Pressure Sensor.>	Replace the electronic throttle control. <Ref. to FU(H4DOTC)-16, Throttle Body.>

K: DTC P0101 MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-27, 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 servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK FOR 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)-82, List of Diagnostic Trouble Code (DTC).>	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-42, Mass Air Flow and Intake Air Temperature Sensor.>

L: DTC P0102 MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

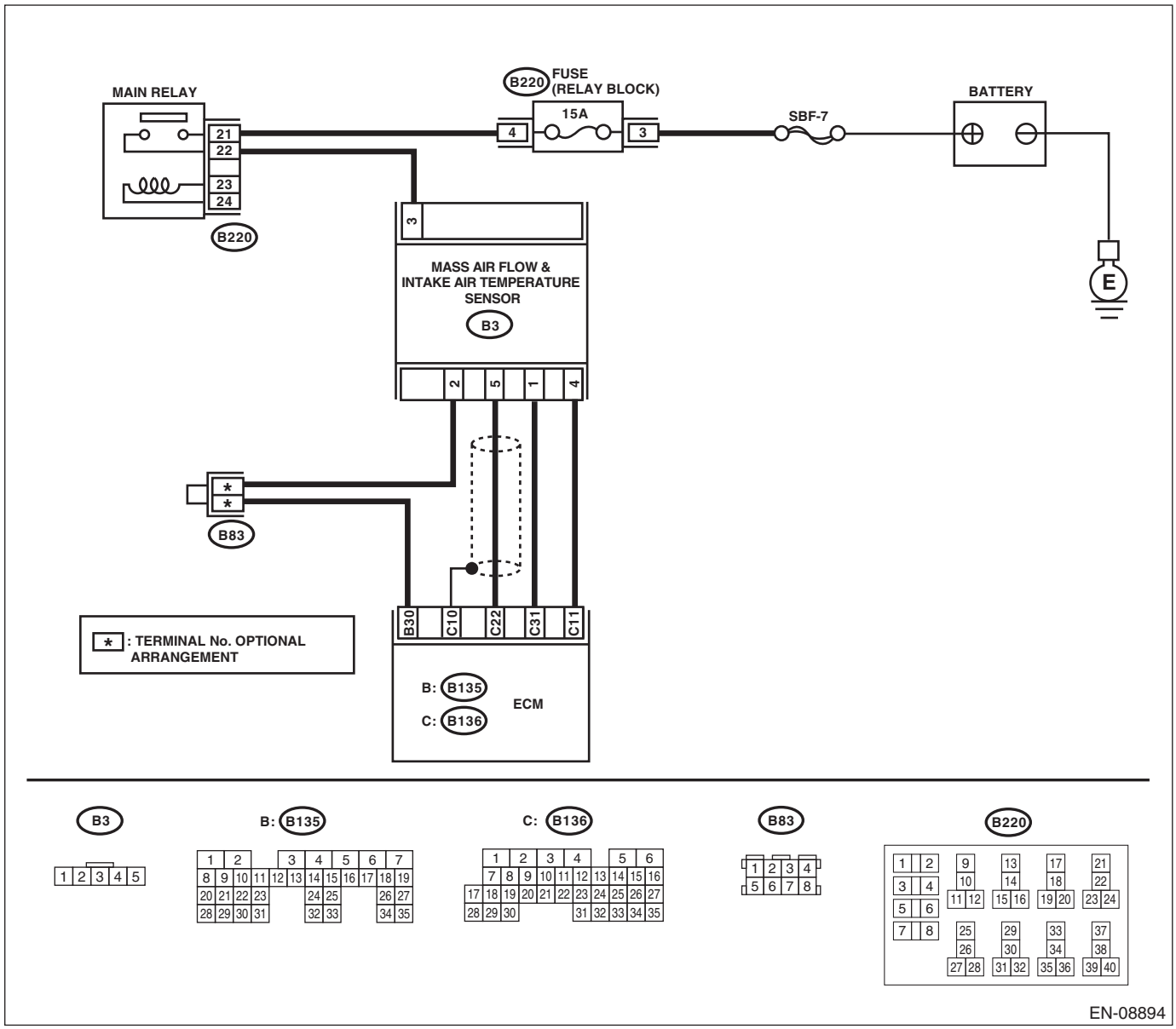
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-29, DTC P0102 MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Improper idling
- Engine stalls.
- Poor driving performance

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of air flow 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)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the voltage less than 0.2 V?	Go to step **2**.	Even if DTC is detected, 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, temporary open or short circuit of harness may be the cause.
2	**CHECK POWER SUPPLY OF MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the mass air flow and intake air temperature sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between mass air flow and intake air temperature sensor connector and engine ground. ***Connector & terminal*** ***(B3) No. 3 (+) — 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 connector and mass air flow and intake air temperature sensor connector • Poor contact of main relay connector
3	**CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM and the mass air flow and intake air temperature sensor connector. ***Connector & terminal*** ***(B136) No. 22 — (B3) No. 5:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the open circuit in harness between ECM and the mass air flow and intake air temperature sensor connector.
4	**CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR CONNECTOR.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 22 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **5**.	Repair the short circuit to ground in harness between ECM and mass air flow and intake air temperature sensor connector.
5	**CHECK FOR POOR CONTACT.** Check for poor contact of ECM and mass air flow and intake air temperature sensor connector.	Is there poor contact of ECM or mass air flow and intake air temperature sensor connector?	Repair the poor contact of ECM or mass air flow and intake air temperature sensor connector.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-42, Mass Air Flow and Intake Air Temperature Sensor.>

M: DTC P0103 MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:

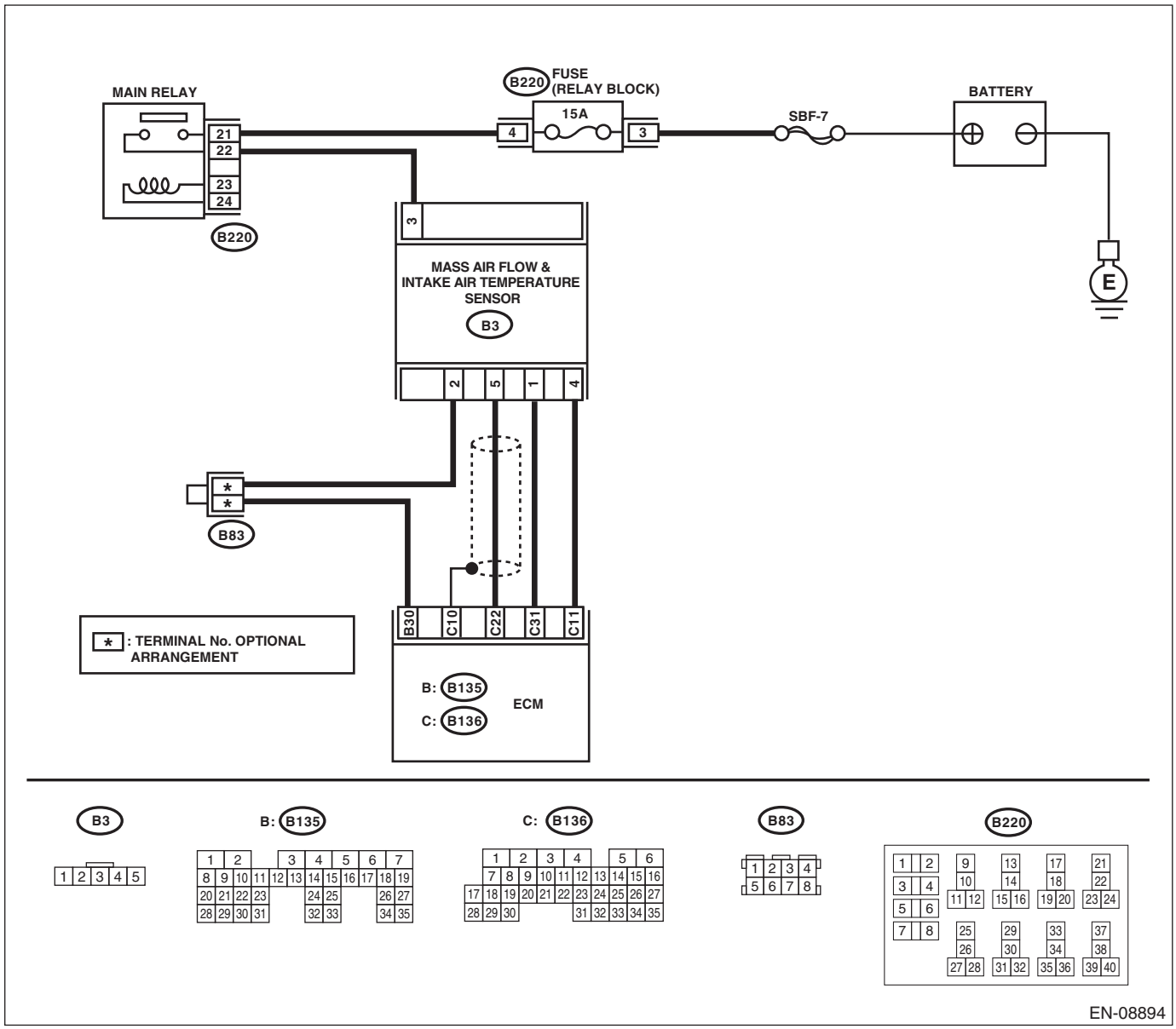
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-31, DTC P0103 MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Improper idling
- Engine stalls.
- Poor driving performance

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of air flow 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)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the voltage 5 V or more?	Go to step **2**.	Even if DTC is detected, 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, temporary open or short circuit of harness may be the cause.
2	**CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the mass air flow and intake air temperature sensor. 3) Start the engine. 4) Read the data of air flow 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)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the voltage 5 V or more?	Repair the short circuit of harness to power supply between ECM and mass air flow and intake air temperature sensor connector.	Go to step **3**.
3	**CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between mass air flow and intake air temperature sensor connector and engine ground. ***Connector & terminal*** ***(B3) No. 4 — Engine 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 mass air flow and intake air temperature sensor connector • Poor contact of ECM connector
4	**CHECK FOR POOR CONTACT.** Check for poor contact of mass air flow and intake air temperature sensor connector.	Is there poor contact of mass air flow and intake air temperature sensor connector?	Repair the poor contact of mass air flow and intake air temperature sensor connector.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-42, Mass Air Flow and Intake Air Temperature Sensor.>

N: DTC P0107 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT

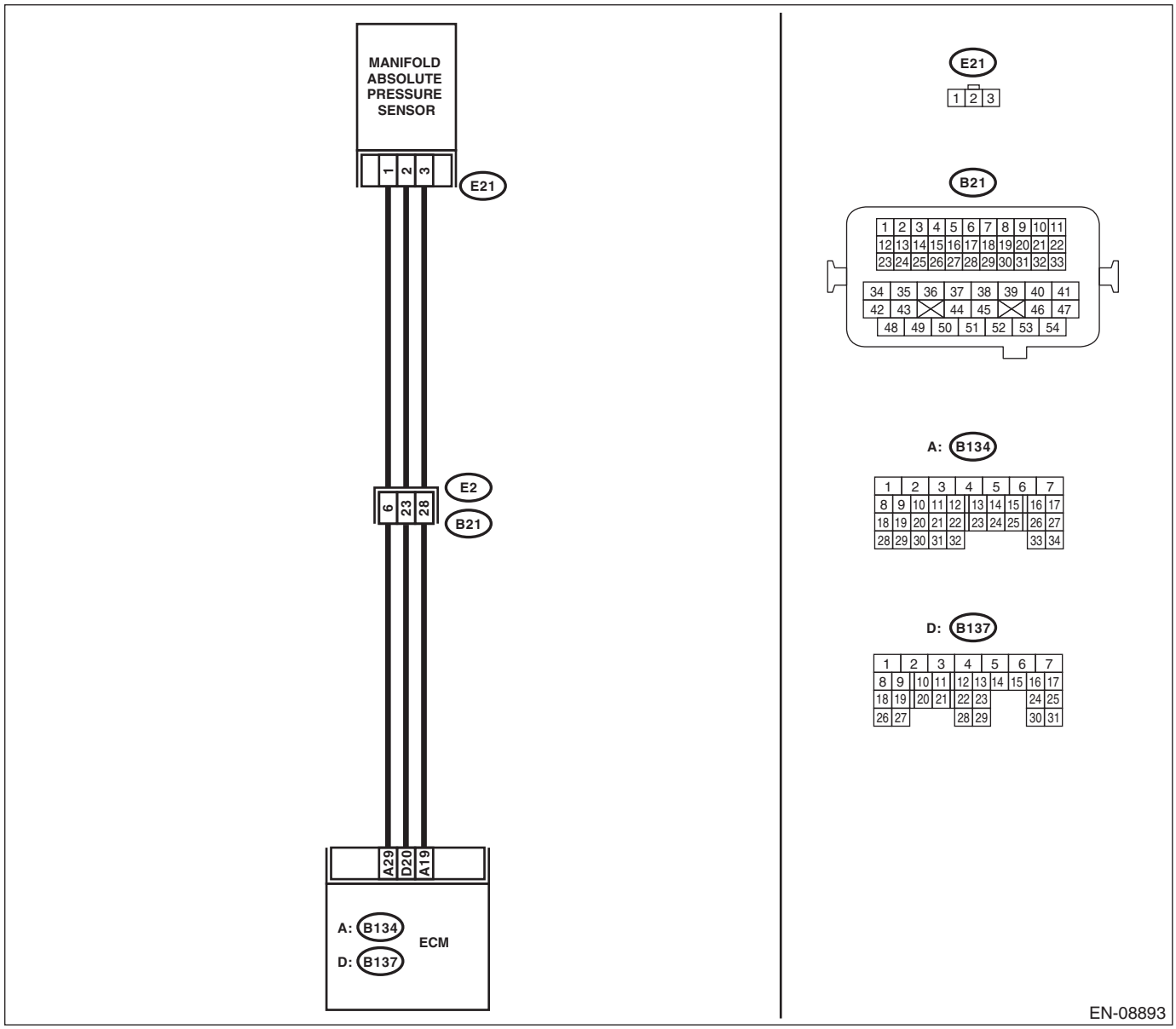
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-33, DTC P0107 MANIFOLD ABSOLUTE PRESSURE/ BAROMETRIC PRESSURE CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	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 procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the measured value less than 13.3 kPa (100 mmHg, 3.94 inHg)?	Go to step **2**.	Even if DTC is detected, 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, temporary open or short circuit of harness may be the cause.
2	**CHECK POWER SUPPLY OF MANIFOLD ABSOLUTE PRESSURE SENSOR.** 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. ***Connector & terminal*** ***(E21) No. 3 (+) — Engine ground (–):***	Is the voltage 4.5 V or more?	Go to step **3**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and manifold absolute pressure sensor connector. • Poor contact of ECM connector • Poor contact of coupling connector
3	**CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM and manifold absolute pressure sensor connector. ***Connector & terminal*** ***(B137) No. 20 — (E21) 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: • Open circuit of harness between ECM and manifold absolute pressure sensor connector. • Poor contact of coupling connector
4	**CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 20 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **5**.	Repair ground short circuit of harness between ECM and manifold absolute pressure sensor connector.
5	**CHECK FOR POOR CONTACT.** Check for poor contact of ECM and manifold absolute pressure sensor connector.	Is there poor contact of ECM or manifold absolute pressure sensor connector?	Repair the poor contact of ECM or manifold absolute pressure sensor connector.	Replace the manifold absolute pressure sensor. <Ref. to FU(H4DOTC)-43, Manifold Absolute Pressure Sensor.>

O: DTC P0108 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT

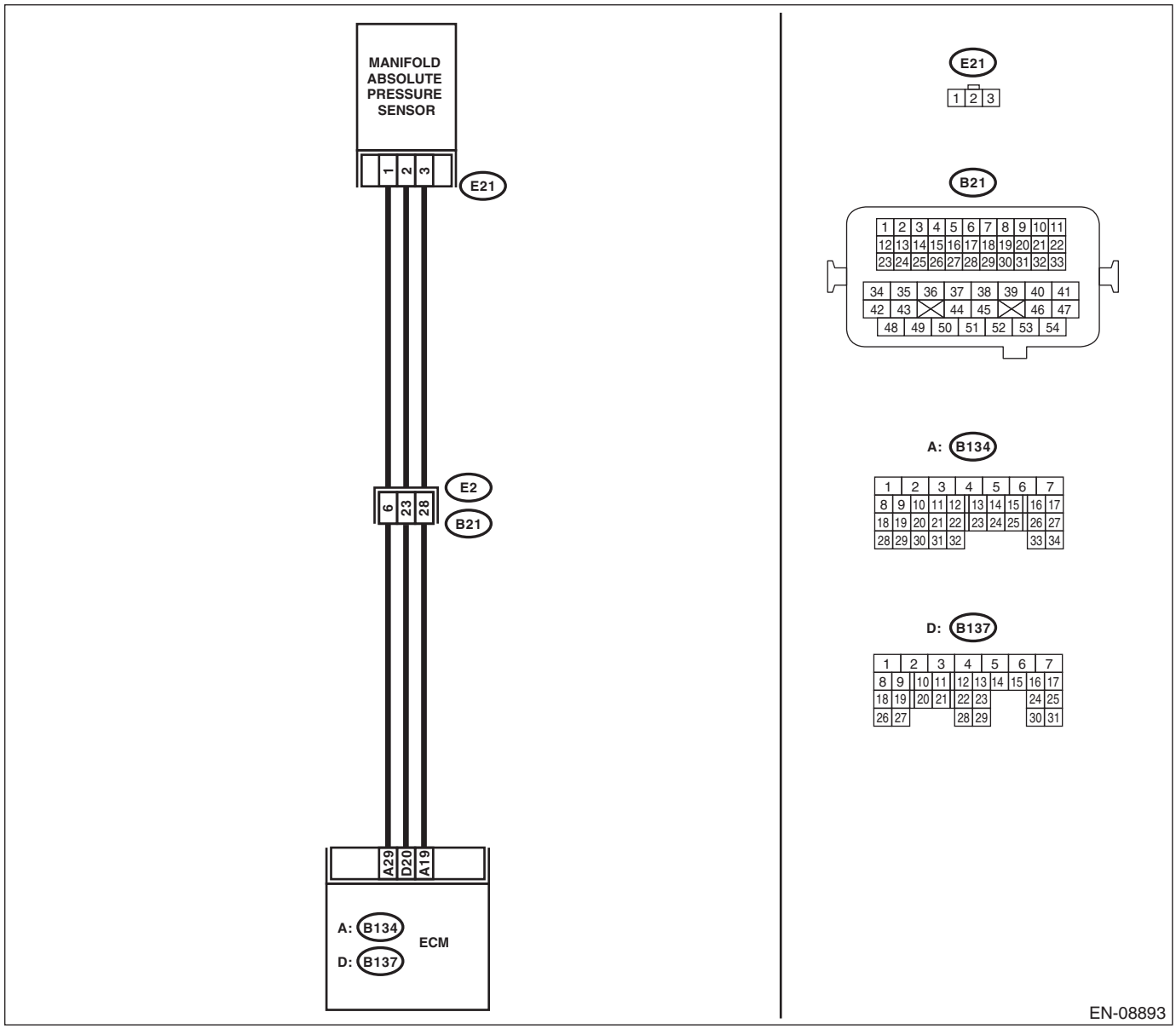
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-35, DTC P0108 MANIFOLD ABSOLUTE PRESSURE/ BAROMETRIC PRESSURE CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	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 procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the measured value 119.5 kPa (896.5 mmHg, 35.29 inHg) or more?	Go to step **2**.	Even if DTC is detected, 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, temporary open or short circuit of harness may be the cause.
2	**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) Start the engine. 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 procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the measured value 119.5 kPa (896.5 mmHg, 35.29 inHg) or more?	Repair the short circuit to power in harness between ECM and manifold absolute pressure sensor connector.	Go to step **3**.
3	**CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between manifold absolute pressure sensor connector and engine ground. ***Connector & terminal*** ***(E21) No. 1 — Engine 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 of harness between ECM and manifold absolute pressure sensor connector. • Poor contact of ECM connector • Poor contact of coupling connector
4	**CHECK FOR POOR CONTACT.** Check for poor contact of manifold absolute pressure sensor connector.	Is there 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(H4DOTC)-43, Manifold Absolute Pressure Sensor.>

P: DTC P0111 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT RANGE/PERFORMANCE

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-37, 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 servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**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)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the engine coolant temperature 75°C (167°F) or higher?	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-42, Mass Air Flow and Intake Air Temperature Sensor.>	Check DTC P0125 using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4DOTC)(diag)-82, List of Diagnostic Trouble Code (DTC).>

Q: DTC P0112 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT LOW

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-40, DTC P0112 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

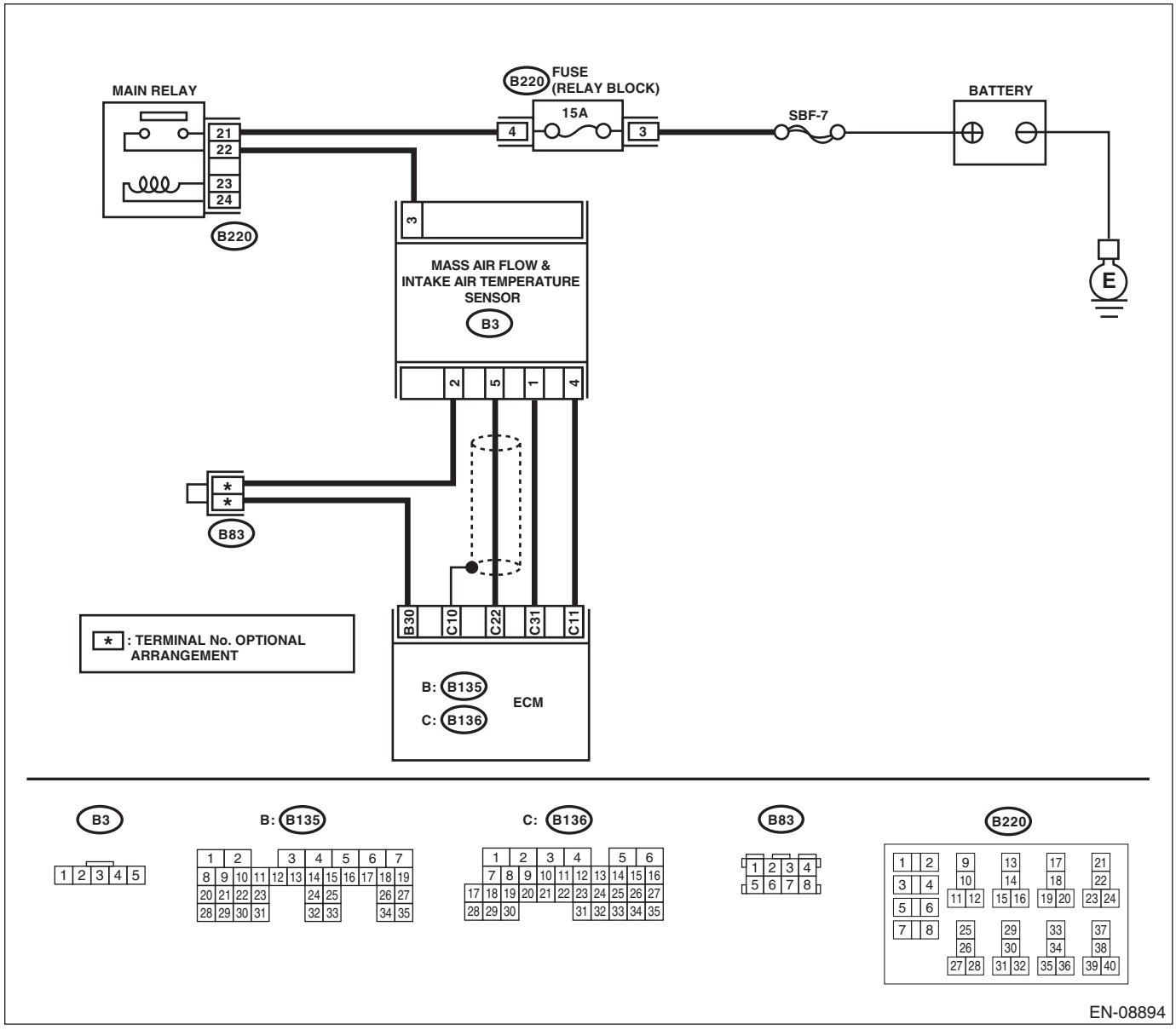
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of 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)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the intake air temperature 120°C (248°F) or more?	Go to step **2**.	Even if DTC is detected, 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, temporary open or short circuit of harness may be the cause.
2	**CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and the mass air flow and intake air temperature sensor. 3) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 31 — Chassis ground:***	Is the resistance 1 MΩ or more?	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-42, Mass Air Flow and Intake Air Temperature Sensor.>	Repair the short circuit to ground in harness between ECM and mass air flow and intake air temperature sensor connector.

R: DTC P0113 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT HIGH

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-42, DTC P0113 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

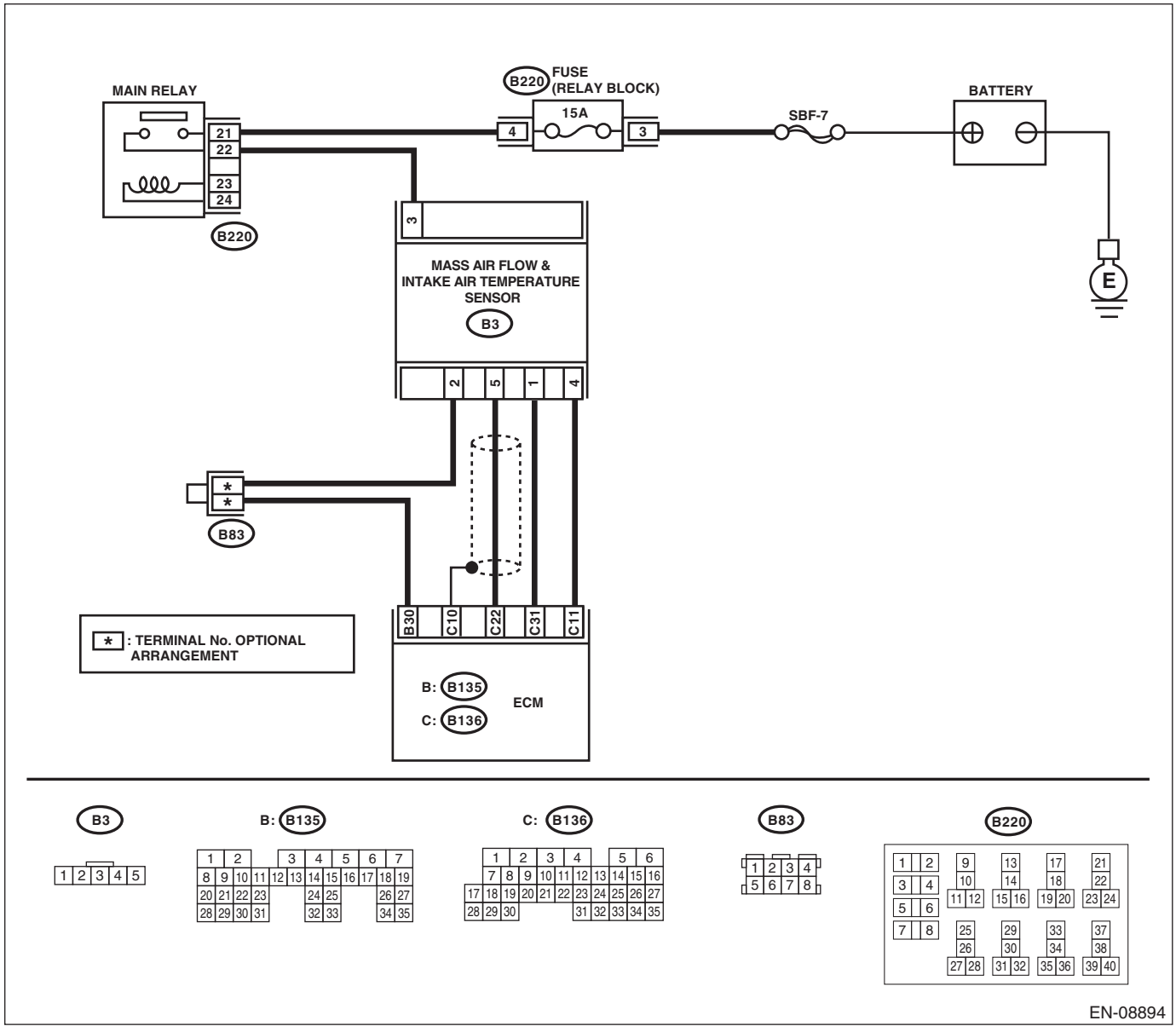
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



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	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of 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)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the intake air temperature less than –40°C (–40°F)?	Go to step **2**.	Even if DTC is detected, 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, temporary open or short circuit of harness may be the cause.
2	**CHECK FOR POOR CONTACT.** Check for poor contact of ECM and mass air flow and intake air temperature sensor connector.	Is there poor contact of ECM or mass air flow and intake air temperature sensor connector?	Repair the poor contact of ECM or mass air flow and intake air temperature sensor connector.	Go to step **3**.
3	**CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and the mass air flow and intake air temperature sensor. 3) Measure the resistance of harness between ECM and the mass air flow and intake air temperature sensor connector. ***Connector & terminal*** ***(B136) No. 31 — (B3) No. 1:*** ***(B135) No. 30 — (B3) 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: • Open circuit in harness between ECM and mass air flow and intake air temperature sensor connector • Poor contact of coupling connector
4	**CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR CONNECTOR.** 1) Connect all connectors. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 31 (+) — Chassis ground (–):***	Is the voltage 5 V or more?	Repair the short circuit of harness to power supply between ECM and mass air flow and intake air temperature sensor connector.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-42, Mass Air Flow and Intake Air Temperature Sensor.>

S: DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW

DTC DETECTING CONDITION:

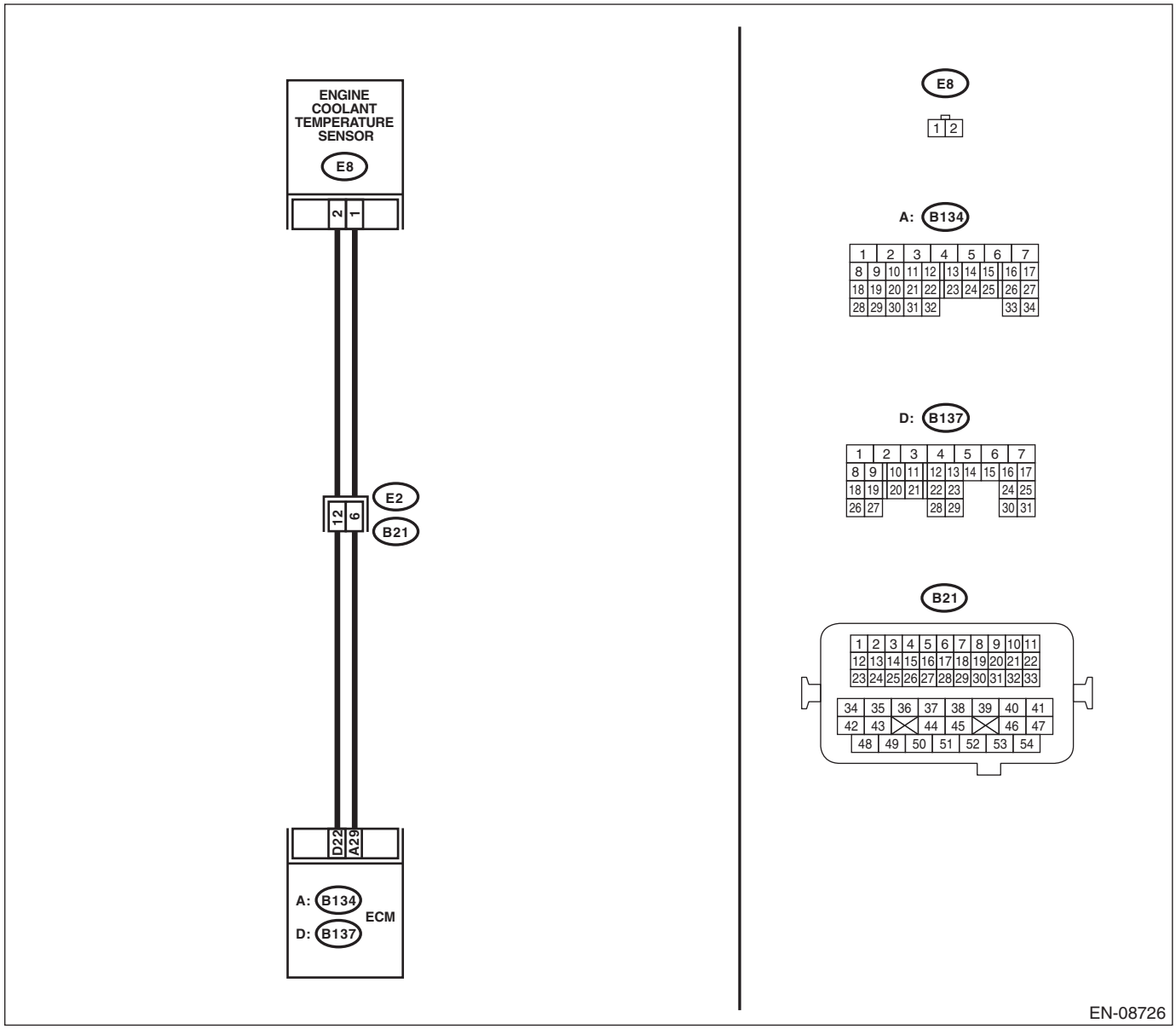
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-44, DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Hard to start
- Improper idling
- Poor driving performance

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 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)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the engine coolant temperature 150°C (302°F) or higher?	Go to step **2**.	Even if DTC is detected, 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, temporary open or short circuit of harness may be the cause.
2	**CHECK HARNESS BETWEEN ECM AND ENGINE COOLANT TEMPERATURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and engine coolant temperature sensor. 3) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 22 — Chassis ground:***	Is the resistance 1 MΩ or more?	Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC)-34, Engine Coolant Temperature Sensor.>	Repair short circuit in harness to ground between ECM and engine coolant temperature sensor connector.

T: DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH

DTC DETECTING CONDITION:

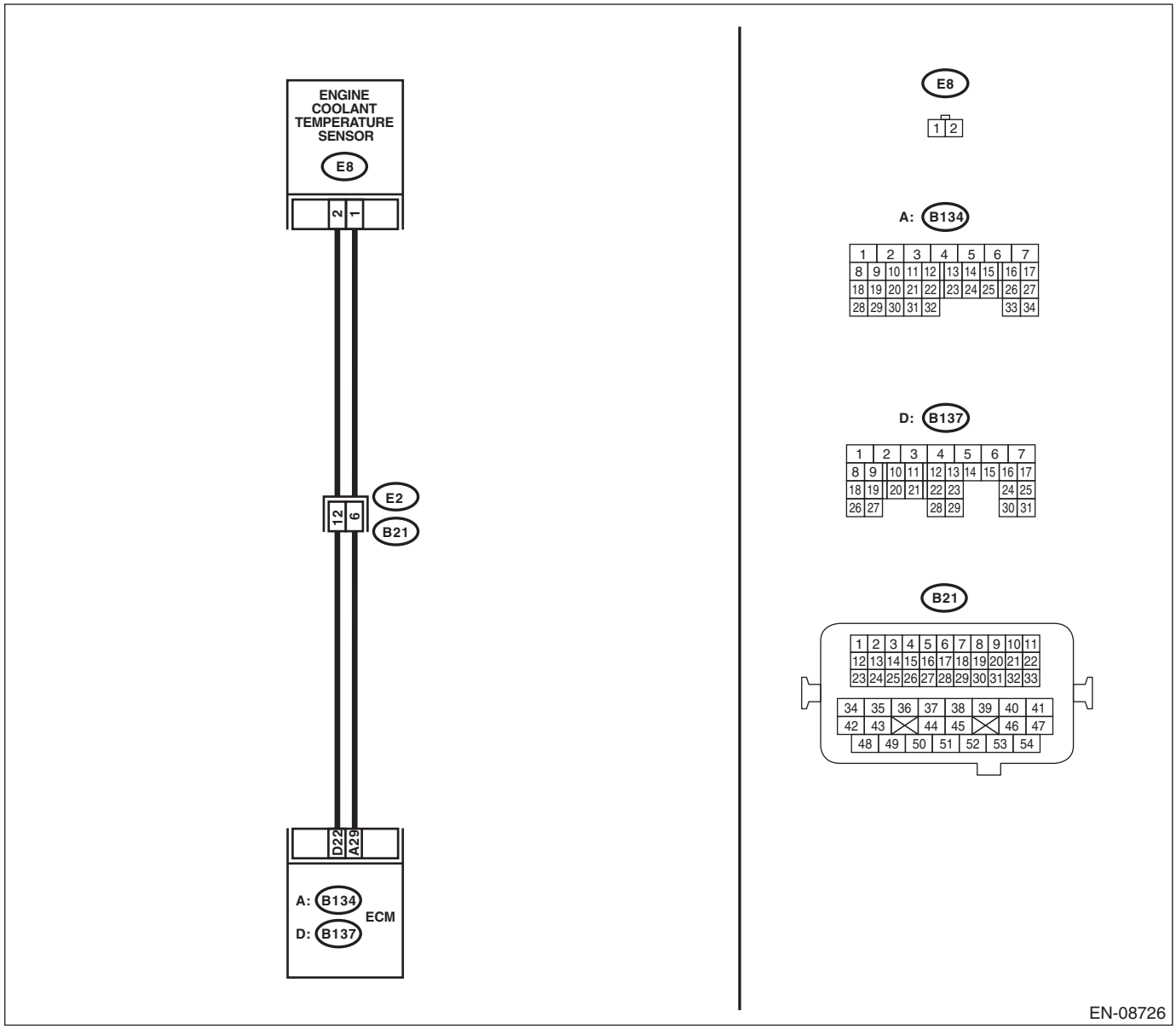
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-46, DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Hard to start
- Improper idling
- Poor driving performance

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 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)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the engine coolant temperature less than –40°C (–40°F)?	Go to step **2**.	Even if DTC is detected, 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, temporary open or short circuit of harness may be the cause.
2	**CHECK FOR POOR CONTACT.** Check for poor contact of ECM and engine coolant temperature sensor connector.	Is there poor contact of ECM or engine coolant temperature sensor connector?	Repair the poor contact of ECM or engine coolant temperature sensor connector.	Go to step **3**.
3	**CHECK HARNESS BETWEEN ECM AND ENGINE COOLANT TEMPERATURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and engine coolant temperature sensor. 3) Measure the resistance of harness between ECM and engine coolant temperature sensor connector. ***Connector & terminal*** ***(B137) No. 22 — (E8) No. 2:*** ***(B134) No. 29 — (E8) 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 engine coolant temperature sensor connector • Poor contact of coupling connector
4	**CHECK HARNESS BETWEEN ECM AND ENGINE COOLANT TEMPERATURE SENSOR CONNECTOR.** 1) Connect all connectors. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 22 (+) — Chassis ground (–):***	Is the voltage 5 V or more?	Repair the short circuit to power in harness between ECM and engine coolant temperature sensor connector.	Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC)-34, Engine Coolant Temperature Sensor.>

U: DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT LOW

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-48, DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

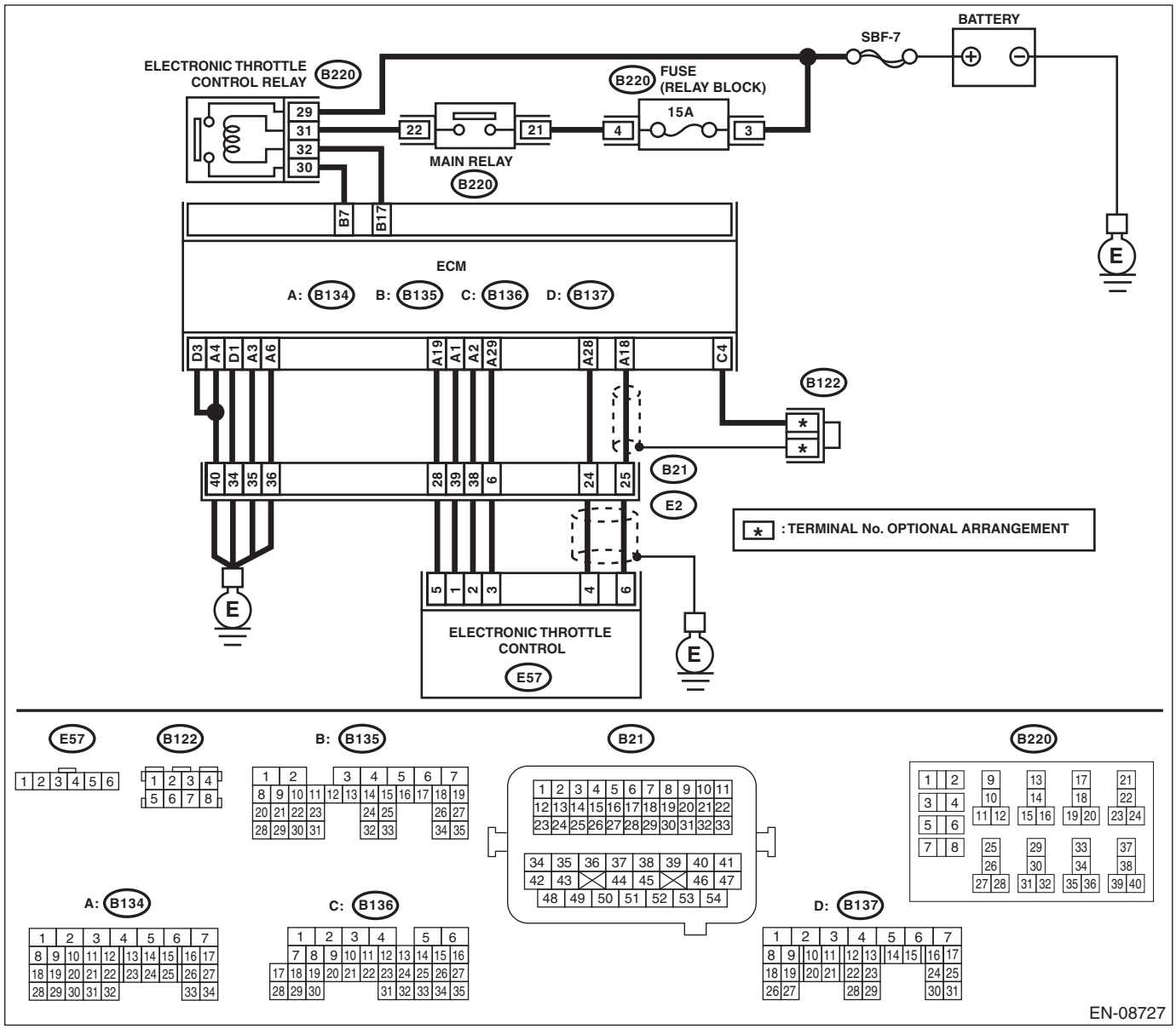
TROUBLE SYMPTOM:

- Improper idling
- Engine stalls.
- Poor driving performance

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and electronic throttle control. 3) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 19 — Chassis ground:*** ***(B134) No. 18 — Chassis ground:*** ***(B134) No. 18 — (B136) No. 4:***	Is the resistance 1 MΩ or more?	Go to step **2**.	Repair the short circuit to ground in harness between ECM and electronic throttle control connector.
2	**CHECK SHORT CIRCUIT INSIDE THE ECM.** 1) Connect the connector to ECM. 2) Measure the resistance between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 6 — Engine ground:***	Is the resistance 1 MΩ or more?	Replace the electronic throttle control. <Ref. to FU(H4DOTC)-16, Throttle Body.>	Repair the short circuit to ground in harness between ECM and electronic throttle control connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-57, Engine Control Module (ECM).>

V: DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT HIGH

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-50, DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

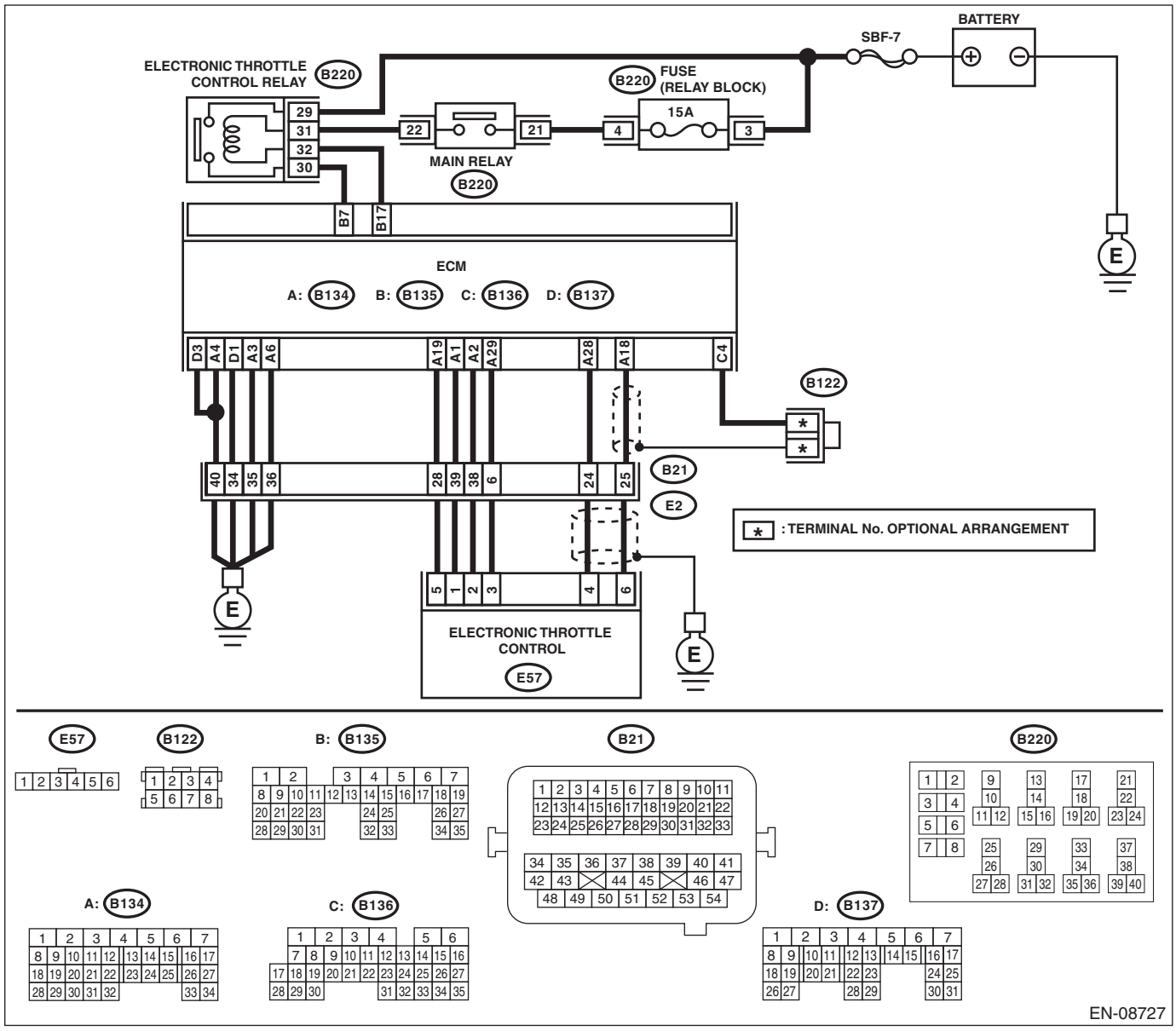
TROUBLE SYMPTOM:

- Improper idling
- Engine stalls.
- Poor driving performance

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and electronic throttle control. 3) Measure the resistance of harness between ECM 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 **2**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and electronic throttle control connector • Poor contact of coupling connector
2	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL CONNECTOR.** 1) Connect the connector to ECM. 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 **3**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and engine ground • Poor contact of ECM connector • Poor contact of coupling connector
3	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 6 (+) — Engine ground (–):***	Is the voltage 5 V or more?	Repair the short circuit to power in harness between ECM and electronic throttle control connector.	Go to step **4**.
4	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between ECM connectors. ***Connector & terminal*** ***(B134) No. 19 — (B134) No. 18:***	Is the resistance 1 MΩ or more?	Repair the poor contact of electronic throttle control connector. Replace the electronic throttle control if defective. <Ref. to FU(H4DOTC)-16, Throttle Body.>	Repair the short circuit to power in harness between ECM and electronic throttle control connector.

W: DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-52, 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 servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK TIRE SIZE.**	Is the tire size as specified and the same size as three other wheels?	Go to step **2**.	Replace the tire.
2	**CHECK ENGINE COOLANT.** Check the following items: • Amount of engine coolant • Engine coolant freeze • Contamination of engine coolant	Is the engine coolant normal?	Go to step **3**.	Fill or replace the engine coolant. <Ref. to CO(H4DOTC)-13, Engine Coolant.>
3	**CHECK THERMOSTAT.**	Does the thermostat remain opened?	Replace the thermostat. <Ref. to CO(H4DOTC)-17, Thermostat.>	Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC)-34, Engine Coolant Temperature Sensor.>

X: DTC P0126 INSUFFICIENT ENGINE COOLANT TEMPERATURE FOR STABLE OPERATION

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-54, DTC P0126 INSUFFICIENT ENGINE COOLANT TEMPERATURE FOR STABLE OPERATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Hard to start
- Improper idling
- Poor driving performance

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK ENGINE COOLANT TEMPERATURE SENSOR.** 1) Disconnect the connectors from the engine coolant temperature sensor. 2) Measure the resistance between engine coolant temperature sensor terminals when the engine coolant is cold and after warmed up. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance of engine coolant temperature sensor different between when engine coolant is cold and after warmed up?	Repair the poor contact of ECM connector.	Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC)-34, Engine Coolant Temperature Sensor.>

Y: DTC P0128 COOLANT THERMOSTAT (ENGINE COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE)

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-56, DTC P0128 COOLANT THERMOSTAT (ENGINE COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

Thermostat remains open.

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK ENGINE COOLANT.**	Is the engine coolant amount normal?	Go to step **2**.	Refill the engine coolant. <Ref. to CO(H4DOTC)-13, Engine Coolant.>
2	**CHECK RADIATOR FAN.** 1) Start the engine. 2) Check the radiator fan operation.	Does the radiator fan continuously rotate for 3 minutes or more during idling?	Repair radiator fan circuit. <Ref. to CO(H4DOTC)-24, Radiator Main Fan and Fan Motor.> <Ref. to CO(H4DOTC)-26, Radiator Sub Fan and Fan Motor.>	Replace the thermostat. <Ref. to CO(H4DOTC)-17, Thermostat.>

Z: DTC P0131 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1)

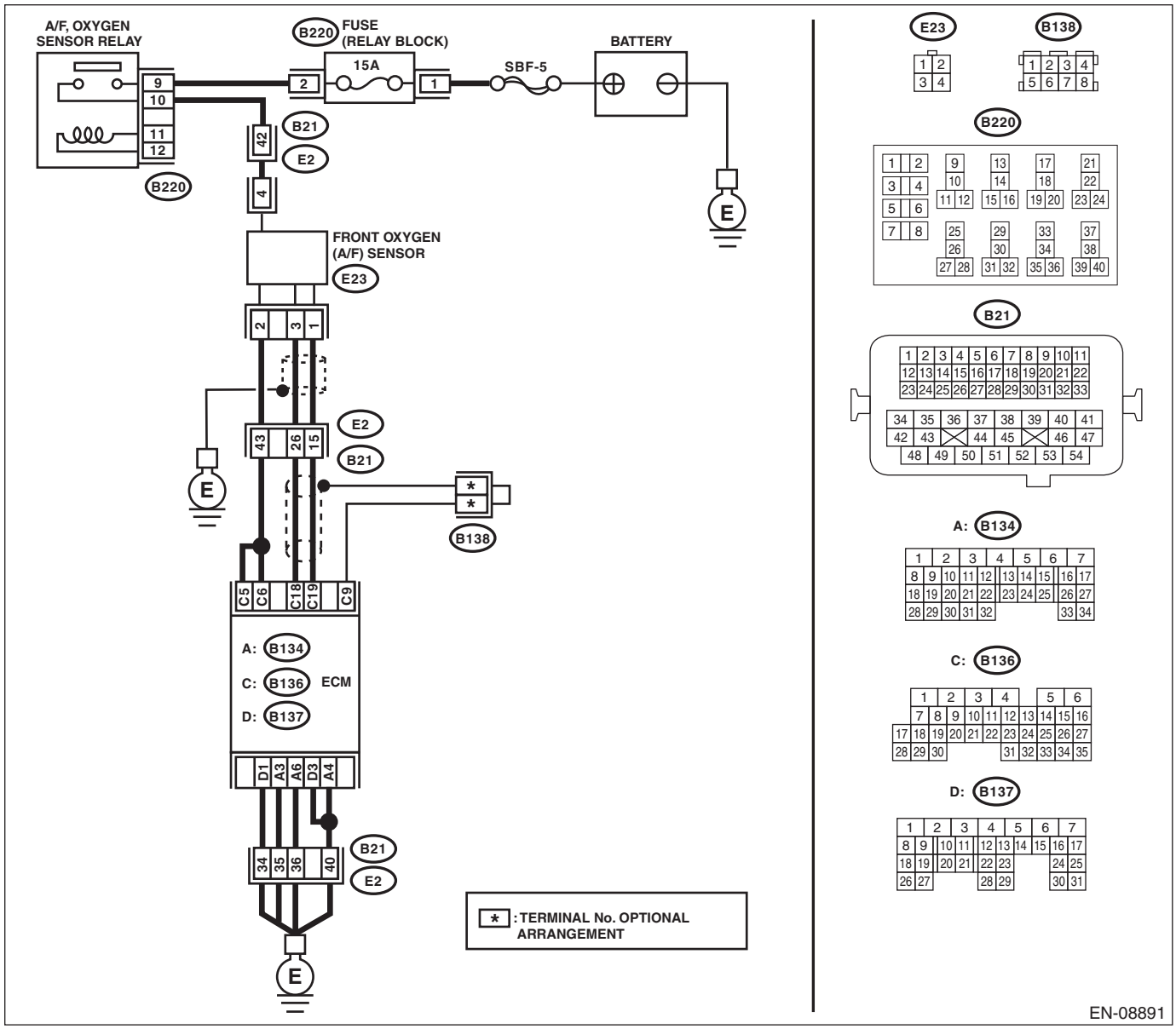
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-59, DTC P0131 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Has water entered the connector?	Completely remove any water inside.	Go to step **2**.

	Step	Check	Yes	No
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 and front oxygen (A/F) sensor connector. 3) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 18 — Chassis ground:*** ***(B136) No. 19 — 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 FOR POOR CONTACT.** Check for poor contact of the front oxygen (A/F) sensor connector.	Is there poor contact of front oxygen (A/F) sensor connector?	Repair the poor contact of front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-53, Front Oxygen (A/F) Sensor.>

AA:DTC P0132 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1)

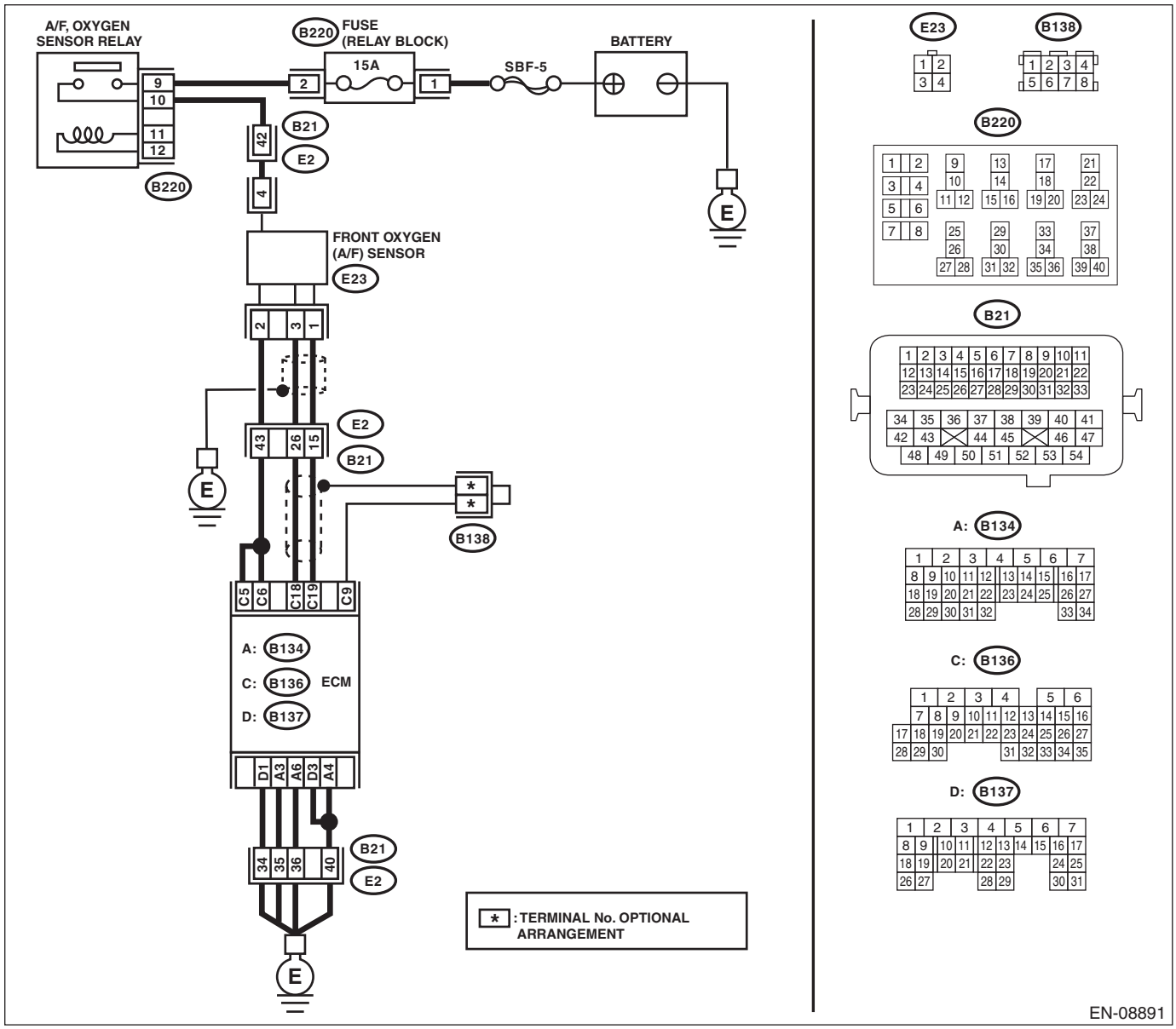
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-61, DTC P0132 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Has water entered the connector?	Completely remove any water inside.	Go to step **2**.

	Step	Check	Yes	No
2	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from front oxygen (A/F) sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 18 (+) — Chassis ground (–):*** ***(B136) No. 19 (+) — Chassis ground (–):***	Is the voltage 8 V or more?	Repair the short circuit to power in the harness between ECM and front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-53, Front Oxygen (A/F) Sensor.>

AB:DTC P0133 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1)

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-63, DTC P0133 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK EXHAUST SYSTEM.** NOTE: Check the following items. • 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(H4DOTC)-53, Front Oxygen (A/F) Sensor.>

AC:DTC P0134 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1)

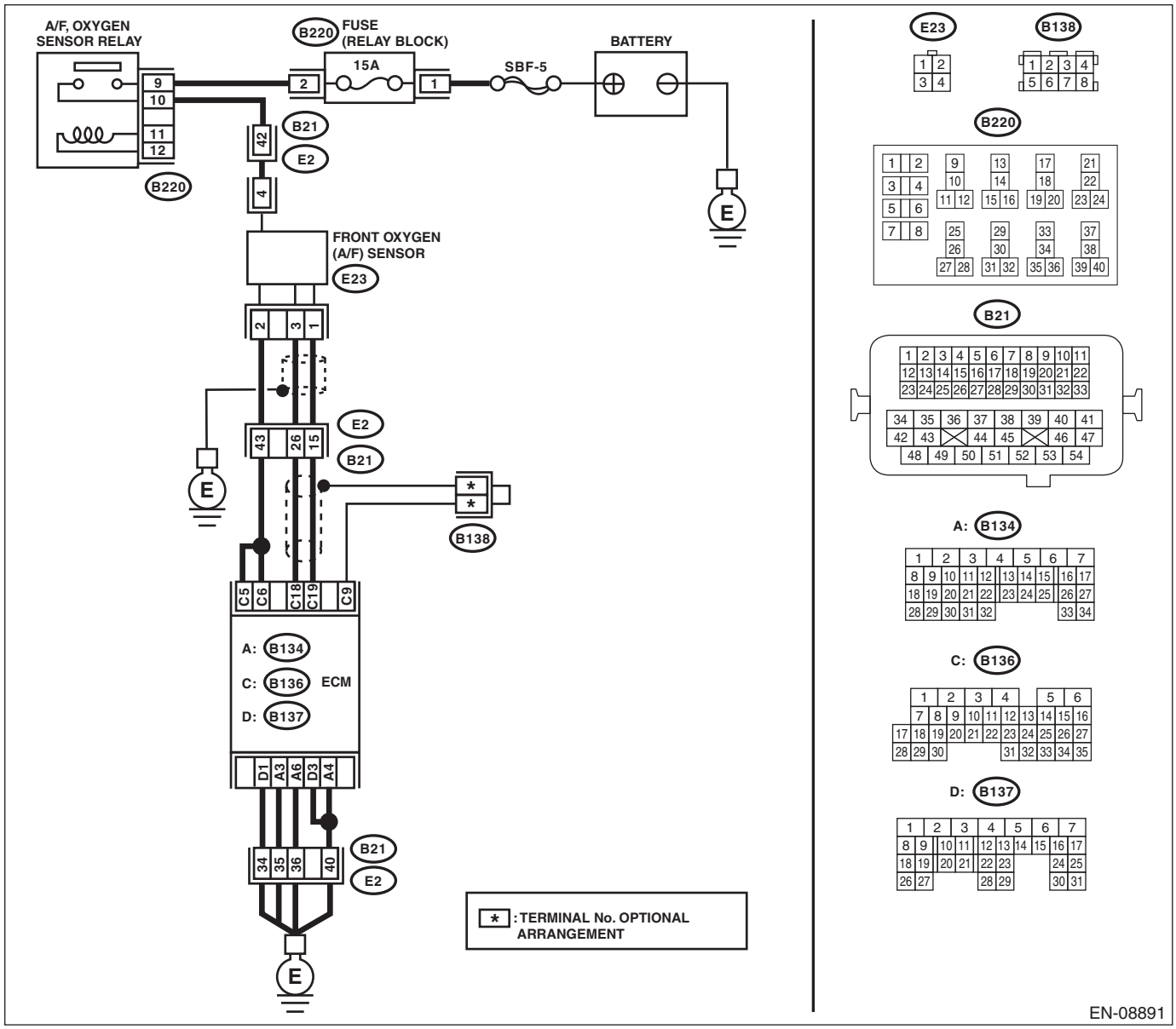
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-66, DTC P0134 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors 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*** ***(B136) No. 19 — (E23) No. 1:*** ***(B136) No. 18 — (E23) No. 3:***	Is the resistance less than 1 Ω?	Go to step **2**.	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 of coupling connector
2	**CHECK FOR POOR CONTACT.** Check for poor contact of ECM and front oxygen (A/F) sensor connector.	Is there poor contact of ECM or front oxygen (A/F) sensor connector?	Repair the poor contact of ECM or front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-53, Front Oxygen (A/F) Sensor.>

AD:DTC P0137 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2)

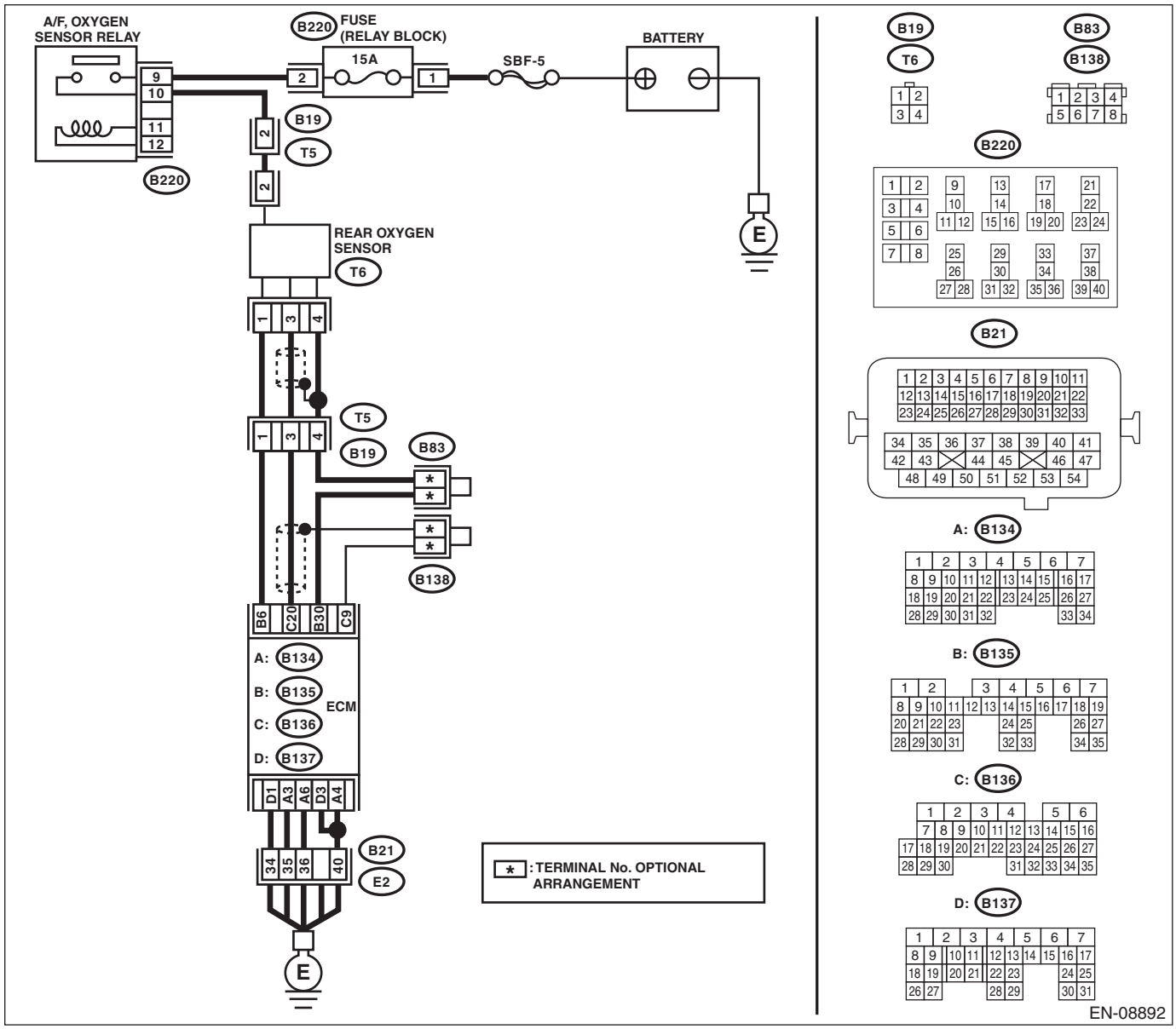
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-68, DTC P0137 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm up the engine until engine coolant temperature is higher than 75°C (167°F), and keep the engine speed at 3,000 rpm. (2 minutes maximum) 2) Read the data of rear oxygen 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)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the voltage 490 mV or more?	Go to step **5**.	Go to step **2**.
2	**CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Has water entered the connector?	Completely remove any water inside.	Go to step **3**.
3	**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*** ***(B136) No. 20 — (T6) No. 3:*** ***(B135) No. 30 — (T6) 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: • Open circuit in harness between ECM and rear oxygen sensor connector • Poor contact of coupling connector
4	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between rear oxygen sensor connector and chassis ground. ***Connector & terminal*** ***(T6) No. 3 (+) — Chassis ground (–):***	Is the voltage 0.2 — 0.5 V?	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-55, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and rear oxygen sensor connector • Poor contact of ECM connector • Poor contact of coupling connector
5	**CHECK EXHAUST SYSTEM.** Check exhaust system parts. NOTE: Check the following items. • Looseness and improper fitting of exhaust system parts • Damage (crack, hole etc.) of parts • Loose part and improper installation 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)-55, Rear Oxygen Sensor.>

AE:DTC P0138 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2)

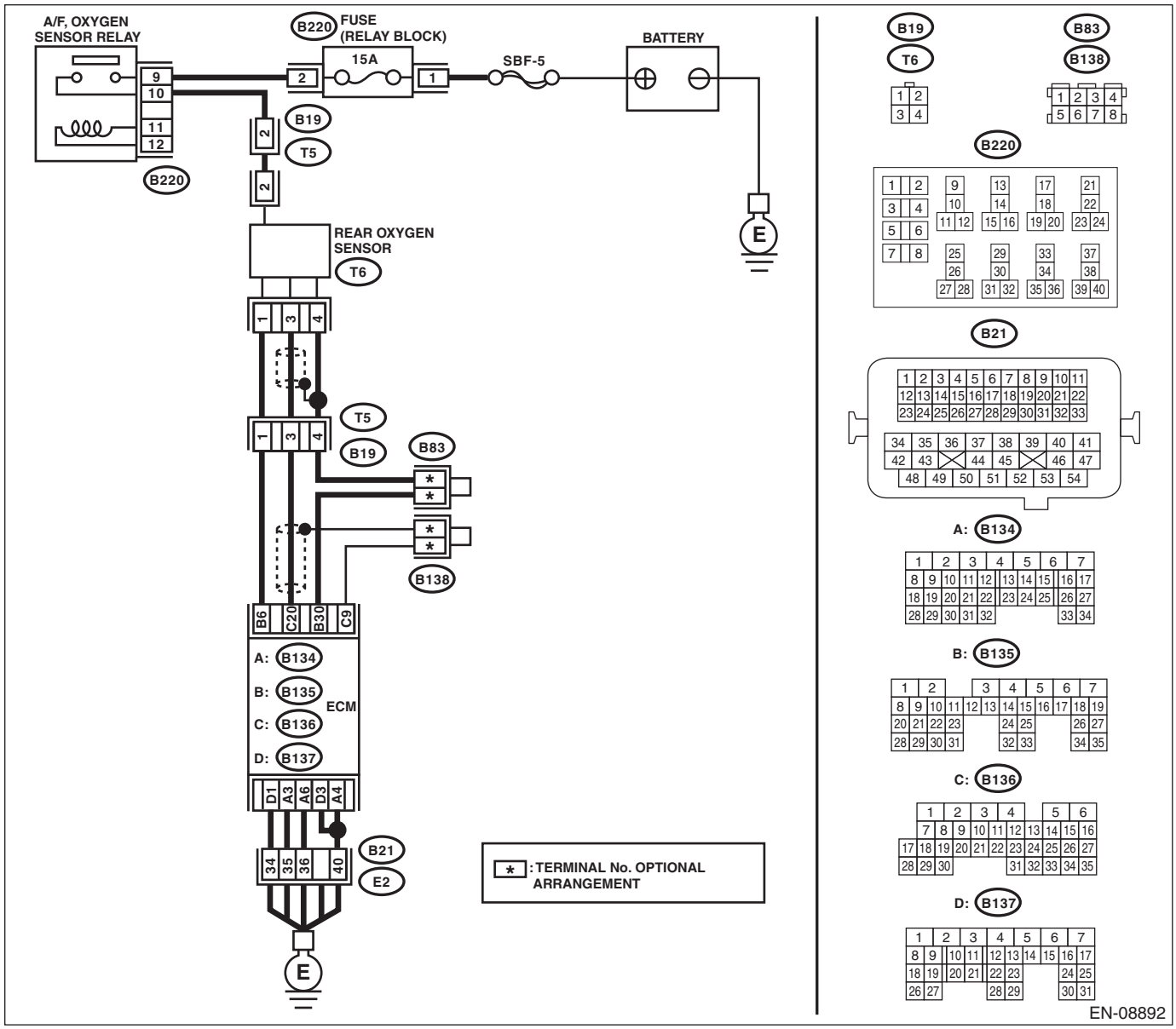
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-71, DTC P0138 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm up the engine until engine coolant temperature is higher than 75°C (167°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: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the voltage 250 mV or less?	Go to step **5**.	Go to step **2**.
2	**CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Has water entered the connector?	Completely remove any water inside.	Go to step **3**.
3	**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*** ***(B136) No. 20 — (T6) No. 3:*** ***(B135) No. 30 — (T6) 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: • Open circuit in harness between ECM and rear oxygen sensor connector • Poor contact of coupling connector
4	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between rear oxygen sensor connector and chassis ground. ***Connector & terminal*** ***(T6) No. 3 (+) — Chassis ground (–):***	Is the voltage 0.2 — 0.5 V?	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-55, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and rear oxygen sensor connector • Poor contact of ECM connector • Poor contact of coupling connector
5	**CHECK EXHAUST SYSTEM.** Check exhaust system parts. NOTE: Check the following items. • Looseness and improper fitting of exhaust system parts • Damage (crack, hole etc.) of parts • Loose part and improper installation 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)-55, Rear Oxygen Sensor.>

AF:DTC P0139 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2)

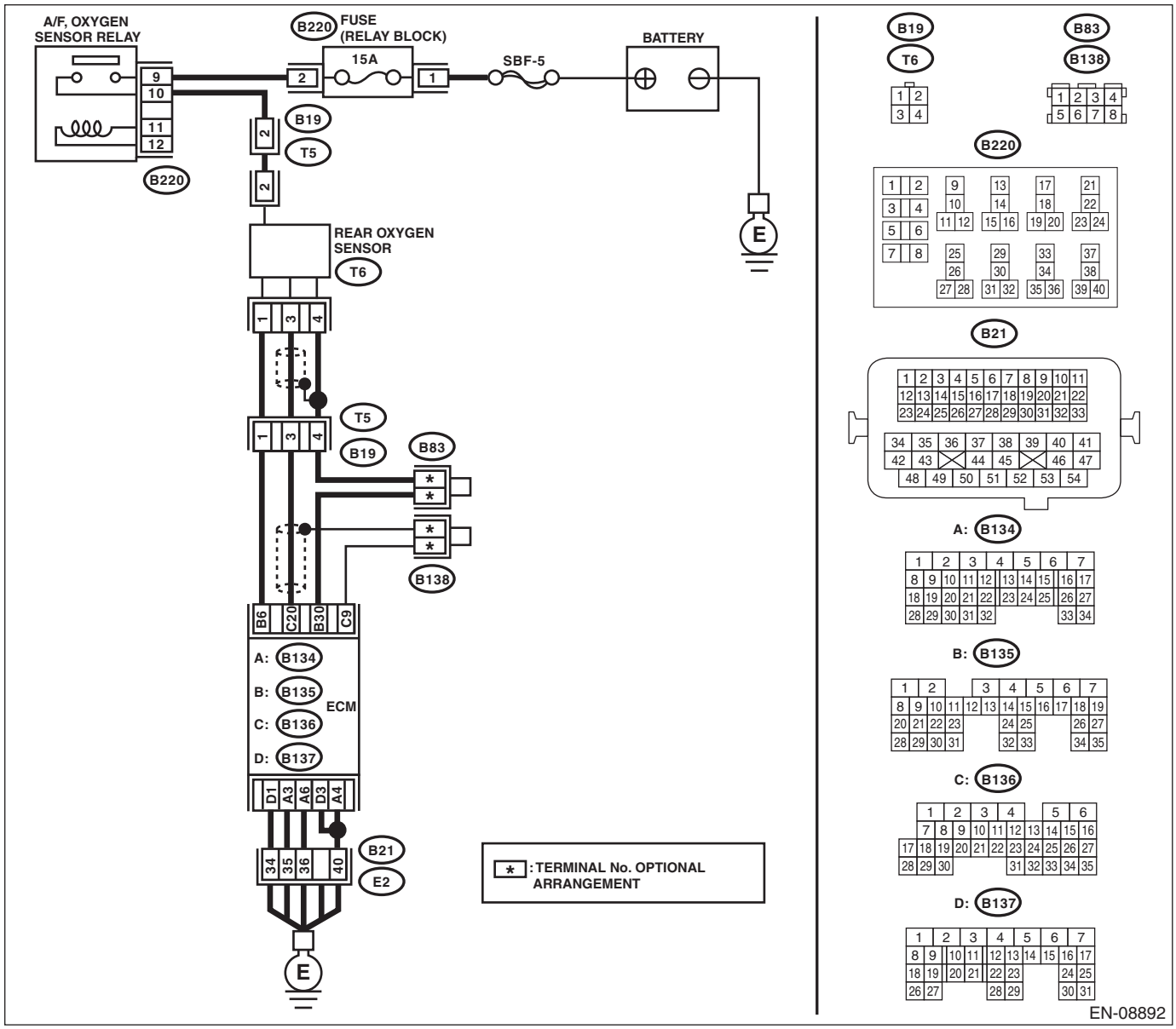
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-72, DTC P0139 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**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*** ***(B136) No. 20 — (T6) No. 3:***	Is the resistance less than 1 Ω?	Go to step **2**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and rear oxygen sensor connector • Poor contact of coupling connector
2	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** Measure the resistance between rear oxygen sensor connector and chassis ground. ***Connector & terminal*** ***(T6) No. 3 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **3**.	Repair the ground short circuit of harness between ECM and rear oxygen sensor connector.
3	**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)-55, Rear Oxygen Sensor.>	Even if DTC is detected, 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, temporary open or short circuit of harness may be the cause.

AG:DTC P0140 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK1 SENSOR2)

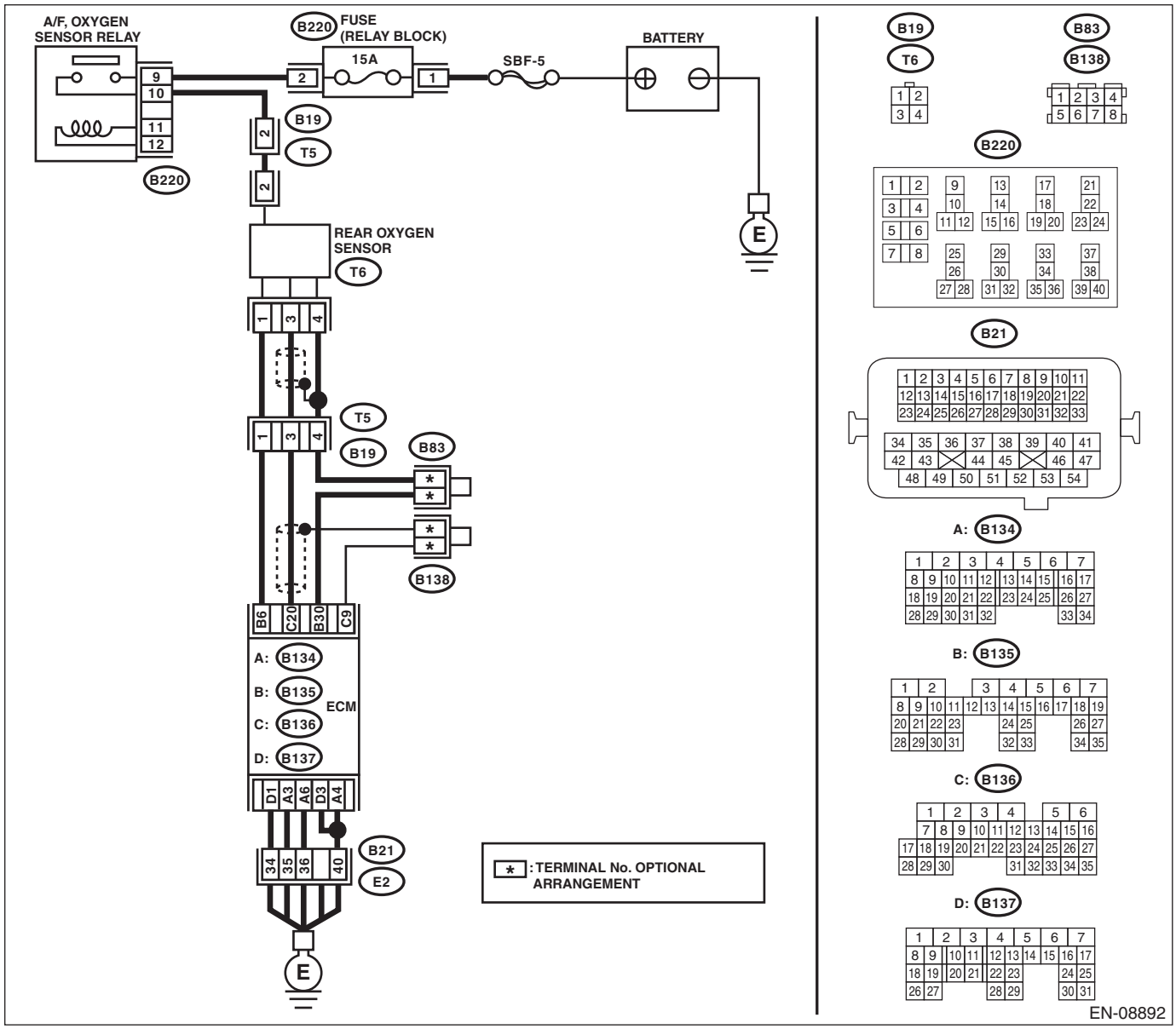
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-80, DTC P0140 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK1 SENSOR2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm up the engine until engine coolant temperature is higher than 75°C (167°F), and keep the engine speed at 3,000 rpm. (2 minutes maximum) 2) Read the data of rear oxygen 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)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the voltage 490 mV or more?	Go to step **6**.	Go to step **2**.
2	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm up the engine until engine coolant temperature is higher than 75°C (167°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: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation 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.**	Has water entered the connector?	Completely remove any water inside.	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*** ***(B136) No. 20 — (T6) No. 3:*** ***(B135) No. 30 — (T6) No. 4:***	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 rear oxygen sensor connector • Poor contact of coupling connector

	Step	Check	Yes	No
5	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR.** 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between rear oxygen sensor connector and chassis ground. ***Connector & terminal*** ***(T6) No. 3 (+) — Chassis ground (–):***	Is the voltage 0.2 — 0.5 V?	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-55, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and rear oxygen sensor connector • Poor contact of ECM connector • Poor contact of coupling connector
6	**CHECK EXHAUST SYSTEM.** Check exhaust system parts. NOTE: Check the following items. • Looseness and improper fitting of exhaust system parts • Damage (crack, hole etc.) of parts • Loose part and improper installation 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)-55, Rear Oxygen Sensor.>

AH:DTC P0141 O2 SENSOR HEATER CIRCUIT (BANK1 SENSOR2)

For the diagnostic procedure, refer to DTC P0037. <Ref. to EN(H4DOTC)(diag)-100, DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AI: DTC P0171 SYSTEM TOO LEAN (BANK 1)

Refer to DTC P0172 for diagnostic procedure. <Ref. to EN(H4DOTC)(diag)-145, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AJ:DTC P0172 SYSTEM TOO RICH (BANK 1)

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-85, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Improper idling
- Engine stalls.
- Poor driving performance

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, 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 OPEN FLAMES" signs near the working area.** **CAUTION:** **Be careful not to spill fuel.** Measure the fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold. <Ref. to ME(H4DOTC)-25, INSPECTION, Fuel Pressure.> **CAUTION:** **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 kg/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)-25, INSPECTION, Fuel Pressure.> **CAUTION:** **Release fuel pressure before removing the fuel pressure gauge.** NOTE: • 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 kg/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

	Step	Check	Yes	No
5	**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)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the engine coolant temperature 75°C (167°F) or higher?	Go to step **6**.	Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC)-34, Engine Coolant Temperature Sensor.>
6	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.** 1) Start the engine and warm up engine until coolant temperature is higher than 75°C (167°F). 2) Place the select lever in "P" range or "N" range. 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)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the measured value 2.0 — 5.0 g/s (0.26 — 0.66 lb/m)?	Go to step **7**.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-42, Mass Air Flow and Intake Air Temperature Sensor.>
7	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.** 1) Start the engine and warm up engine until coolant temperature is higher than 75°C (167°F). 2) Place the select lever in "P" range or "N" range. 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. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Subtract ambient temperature from intake air temperature. Is the obtained value –10 — 50°C (–18 — 90°F)?	Repair the poor contact of ECM connector.	Check the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-42, Mass Air Flow and Intake Air Temperature Sensor.>

AK:DTC P0181 FUEL TEMPERATURE SENSOR “A” CIRCUIT RANGE/PERFORMANCE

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-87, DTC P0181 FUEL TEMPERATURE SENSOR “A” CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

Step	Check	Yes	No
1 **CHECK FOR 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)-82, List of Diagnostic Trouble Code (DTC).>	Replace the fuel temperature sensor. <Ref. to EC(H4DOTC)-16, Fuel Temperature Sensor.>

AL:DTC P0182 FUEL TEMPERATURE SENSOR “A” CIRCUIT LOW INPUT

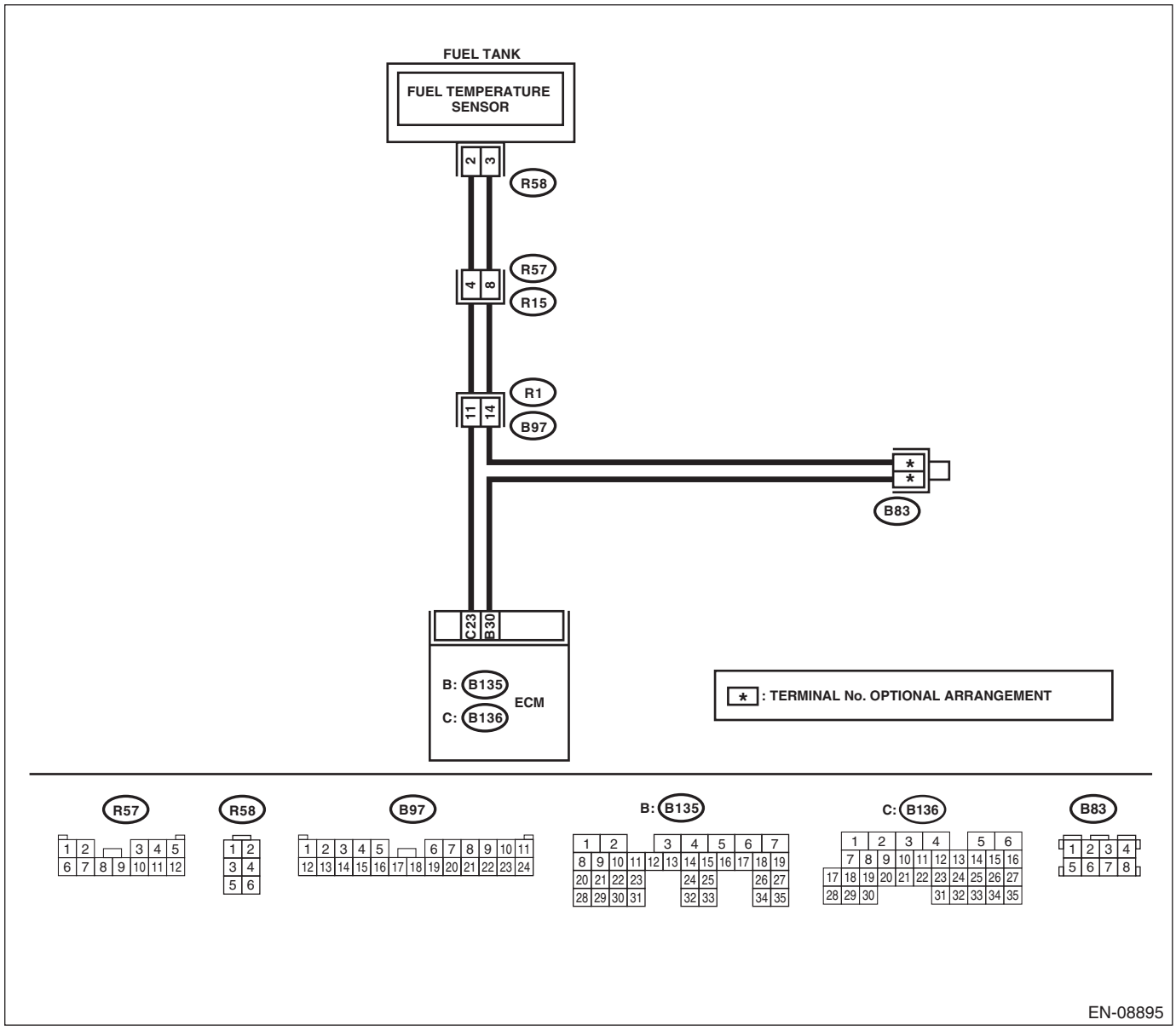
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-90, DTC P0182 FUEL TEMPERATURE SENSOR “A” CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of fuel temperature sensor signal using Subaru Select Monitor. NOTE: For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-36, Subaru Select Monitor.>	Is the temperature 120°C (248°F) or higher?	Go to step **2**.	Even if DTC is detected, 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, temporary open or short circuit of harness may be the cause.
2	**CHECK HARNESS BETWEEN ECM AND FUEL TEMPERATURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and fuel temperature sensor. 3) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 23 — Chassis ground:***	Is the resistance 1 MΩ or more?	Replace the fuel temperature sensor. <Ref. to EC(H4DOTC)-16, Fuel Temperature Sensor.>	Repair the ground short circuit of harness between ECM and fuel pump connector.

AM:DTC P0183 FUEL TEMPERATURE SENSOR “A” CIRCUIT HIGH INPUT

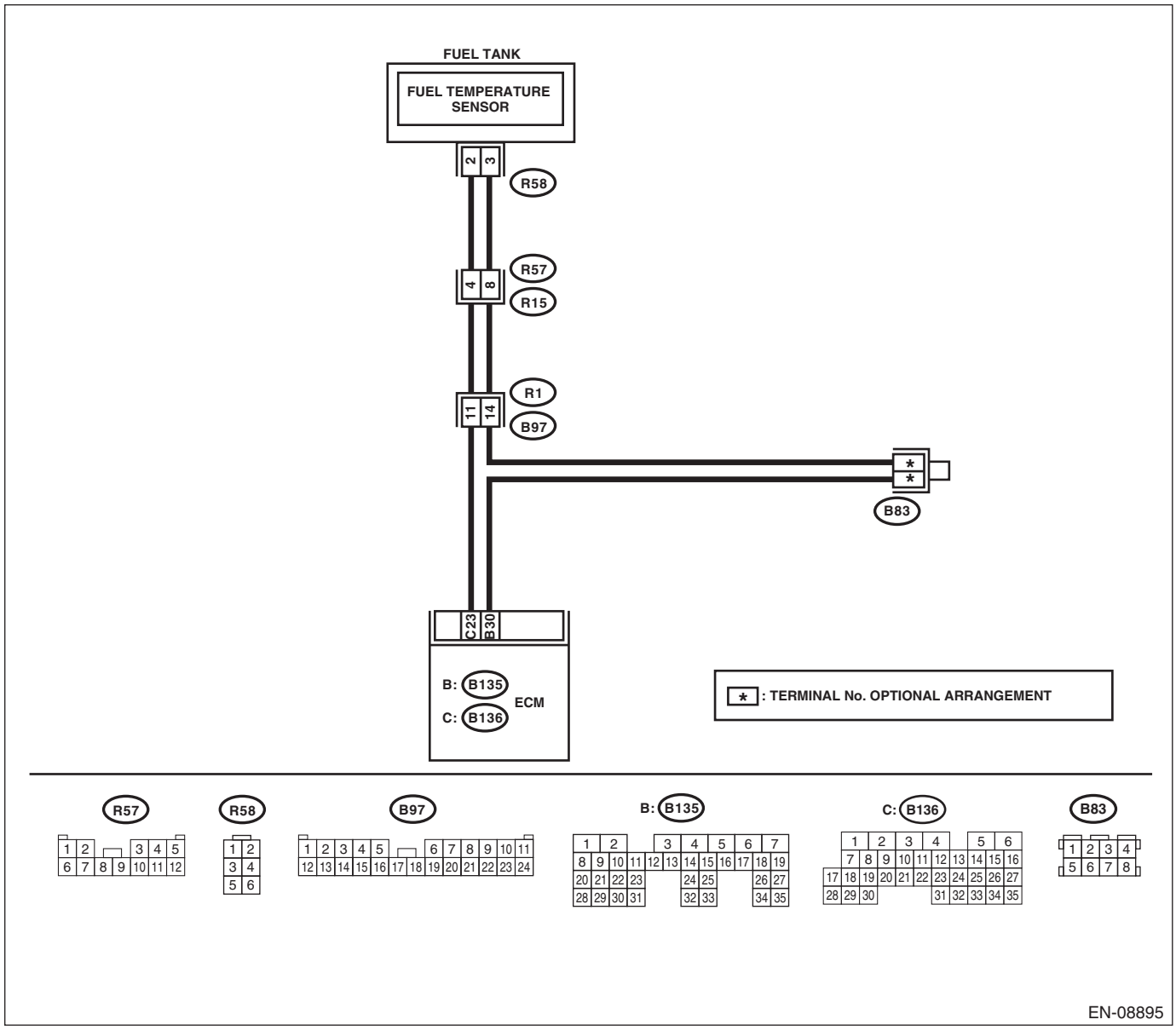
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-92, DTC P0183 FUEL TEMPERATURE SENSOR “A” CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of fuel temperature sensor signal using Subaru Select Monitor. NOTE: For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-36, Subaru Select Monitor.>	Is the temperature less than –40°C (–40°F)?	Go to step **2**.	Even if DTC is detected, 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, temporary open or short circuit of harness may be the cause.
2	**CHECK FOR POOR CONTACT.** Repair any poor contact between the ECM and fuel temperature sensor connectors.	Is there poor contact of the ECM or fuel temperature sensor connectors?	Repair any poor contact between the ECM and fuel temperature sensor connectors.	Go to step **3**.
3	**CHECK HARNESS BETWEEN ECM AND FUEL TEMPERATURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and fuel temperature sensor. 3) Measure the resistance of the harness between the ECM and fuel temperature sensor connector. ***Connector & terminal*** ***(B136) No. 23 — (R58) No. 2:*** ***(B135) No. 30 — (R58) 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: • Open circuit in harness between ECM and fuel temperature sensor connector • Poor contact of coupling connector
4	**CHECK HARNESS BETWEEN ECM AND FUEL TEMPERATURE SENSOR CONNECTOR.** 1) Connect all connectors. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 23 (+) — Chassis ground (–):***	Is the voltage 5 V or more?	Repair the short circuit to power in the harness between the ECM and fuel temperature sensor connector.	Replace the fuel temperature sensor. <Ref. to EC(H4DOTC)-16, Fuel Temperature Sensor.>

AN:DTC P0222 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT LOW

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-94, DTC P0222 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

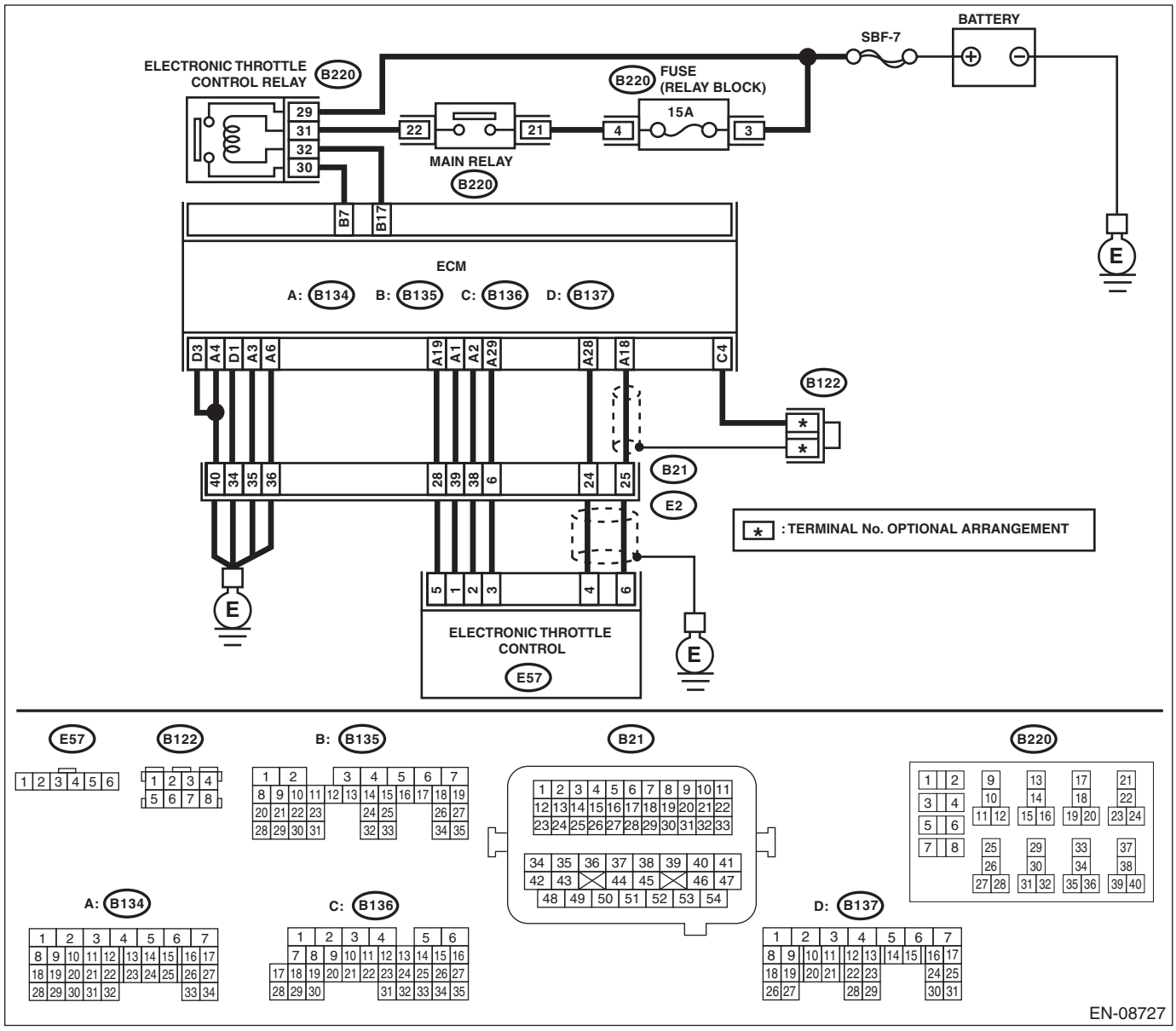
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance
- Engine stalls.

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and electronic throttle control. 3) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 19 — Chassis ground:*** ***(B134) No. 28 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **2**.	Repair the short circuit to ground in harness between ECM and electronic throttle control connector.
2	**CHECK SHORT CIRCUIT INSIDE THE ECM.** 1) Connect the connector to ECM. 2) Measure the resistance between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 4 — Engine ground:***	Is the resistance 1 MΩ or more?	Replace the electronic throttle control. <Ref. to FU(H4DOTC)-16, Throttle Body.>	Repair the short circuit to ground in harness between ECM and electronic throttle control connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-57, Engine Control Module (ECM).>

AO:DTC P0223 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT HIGH

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-96, DTC P0223 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

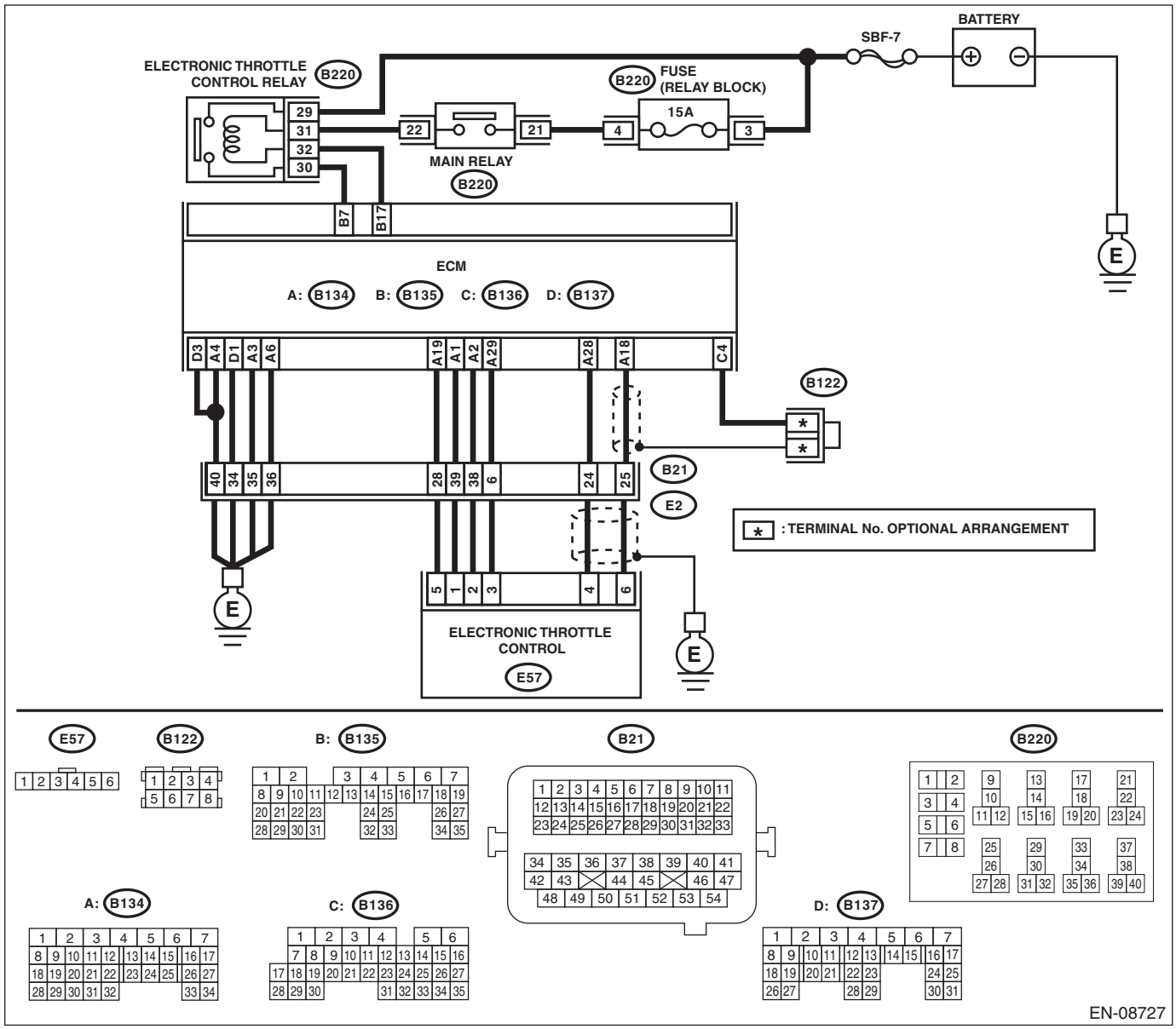
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance
- Engine stalls.

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and electronic throttle control. 3) Measure the resistance of harness between ECM 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 **2**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and electronic throttle control connector • Poor contact of coupling connector
2	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL CONNECTOR.** 1) Connect the connector to ECM. 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 **3**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and engine ground • Poor contact of ECM connector • Poor contact of coupling connector
3	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 4 (+) — Engine ground (–):***	Is the voltage 5 V or more?	Repair the short circuit to power in harness between ECM and electronic throttle control connector.	Go to step **4**.
4	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between ECM connectors. ***Connector & terminal*** ***(B134) No. 19 — (B134) No. 28:***	Is the resistance 1 MΩ or more?	Repair the poor contact of electronic throttle control connector. Replace the electronic throttle control if defective. <Ref. to FU(H4DOTC)-16, Throttle Body.>	Repair the short circuit to power in harness between ECM and electronic throttle control connector.

AP:DTC P0230 FUEL PUMP PRIMARY CIRCUIT

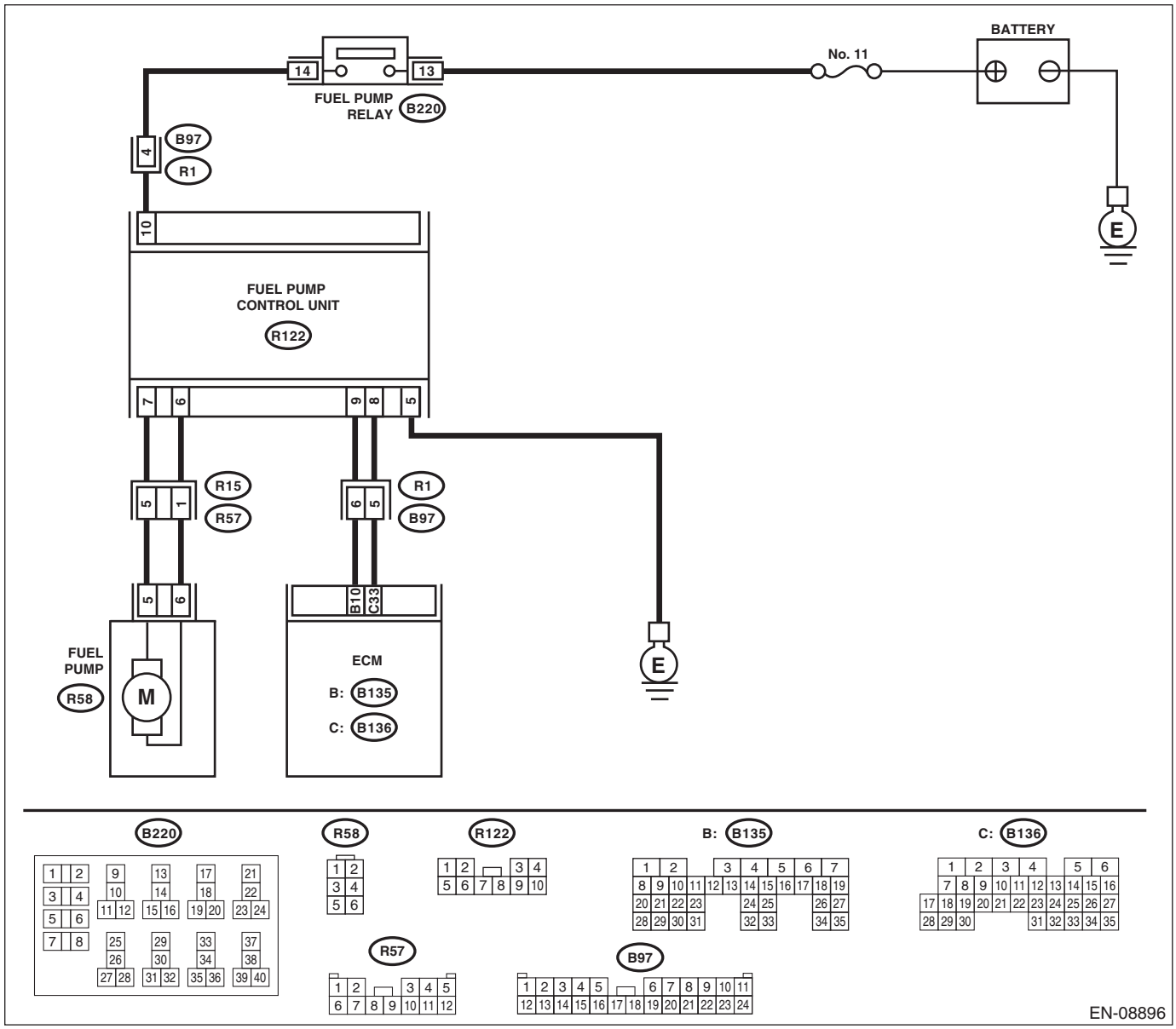
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-98, DTC P0230 FUEL PUMP PRIMARY CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK POWER SUPPLY CIRCUIT TO FUEL PUMP CONTROL UNIT.** 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. ***Connector & terminal*** ***(R122) No. 10 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **2**.	Repair the power supply circuit. NOTE: In this case, repair the following item: • Open circuit or short circuit to ground in harness between fuel pump relay connector and fuel pump control unit connector • Poor contact of fuel pump relay connector • Poor contact of coupling connector
2	**CHECK GROUND CIRCUIT OF FUEL PUMP CONTROL UNIT.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between fuel pump control unit connector and chassis ground. ***Connector & terminal*** ***(R122) No. 5 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **3**.	Repair the open circuit in harness between fuel pump control unit connector and chassis ground.
3	**CHECK HARNESS BETWEEN FUEL PUMP CONTROL UNIT AND FUEL PUMP CONNECTOR.** 1) Disconnect the connector from fuel pump. 2) Measure the resistance of harness between fuel pump control unit and fuel pump connector. ***Connector & terminal*** ***(R122) No. 7 — (R58) No. 5:*** ***(R122) No. 6 — (R58) No. 6:***	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 fuel pump control unit connector and fuel pump connector • Poor contact of coupling connector
4	**CHECK HARNESS BETWEEN FUEL PUMP CONTROL UNIT AND FUEL PUMP CONNECTOR.** Measure the resistance between fuel pump control unit connector and chassis ground. ***Connector & terminal*** ***(R122) No. 7 — Chassis ground:*** ***(R122) No. 6 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **5**.	Repair the short circuit to ground in harness between fuel pump control unit connector and fuel pump connector.
5	**CHECK HARNESS BETWEEN ECM AND FUEL PUMP CONTROL UNIT CONNECTOR.** 1) Disconnect the connector from ECM. 2) Measure the resistance of harness between ECM and fuel pump control unit connector. ***Connector & terminal*** ***(B135) No. 10 — (R122) No. 9:*** ***(B136) No. 33 — (R122) No. 8:***	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 fuel pump control unit connector • Poor contact of coupling connector

	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN ECM AND FUEL PUMP CONTROL UNIT CONNECTOR.** Measure the resistance between fuel pump control unit connector and chassis ground. ***Connector & terminal*** ***(R122) No. 9 — Chassis ground:*** ***(R122) No. 8 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **7**.	Repair the short circuit to ground in harness between ECM and fuel pump control unit connector.
7	**CHECK FOR POOR CONTACT.** Check for poor contact of ECM and fuel pump control unit connector.	Is there poor contact of ECM or fuel pump control unit connector?	Repair the poor contact of ECM or fuel pump control unit connector.	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)-64, Fuel Pump Control Unit.>

AQ:DTC P0244 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” RANGE/PERFORMANCE

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-100, DTC P0244 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

Poor driving performance

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK FOR 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)-82, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK WASTEGATE ACTUATOR PIPING AND WASTEGATE CONTROL SOLENOID VALVE PIPING.**	Are there any damage or disconnection of hose in wastegate actuator piping or wastegate control solenoid valve piping?	Connect the wastegate actuator pipe or wastegate control solenoid valve pipe properly. If defective, replace the hose.	Replace the wastegate control solenoid valve. <Ref. to FU(H4DOTC)-51, Wastegate Control Solenoid Valve.>

AR:DTC P0245 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” LOW

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-102, DTC P0245 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

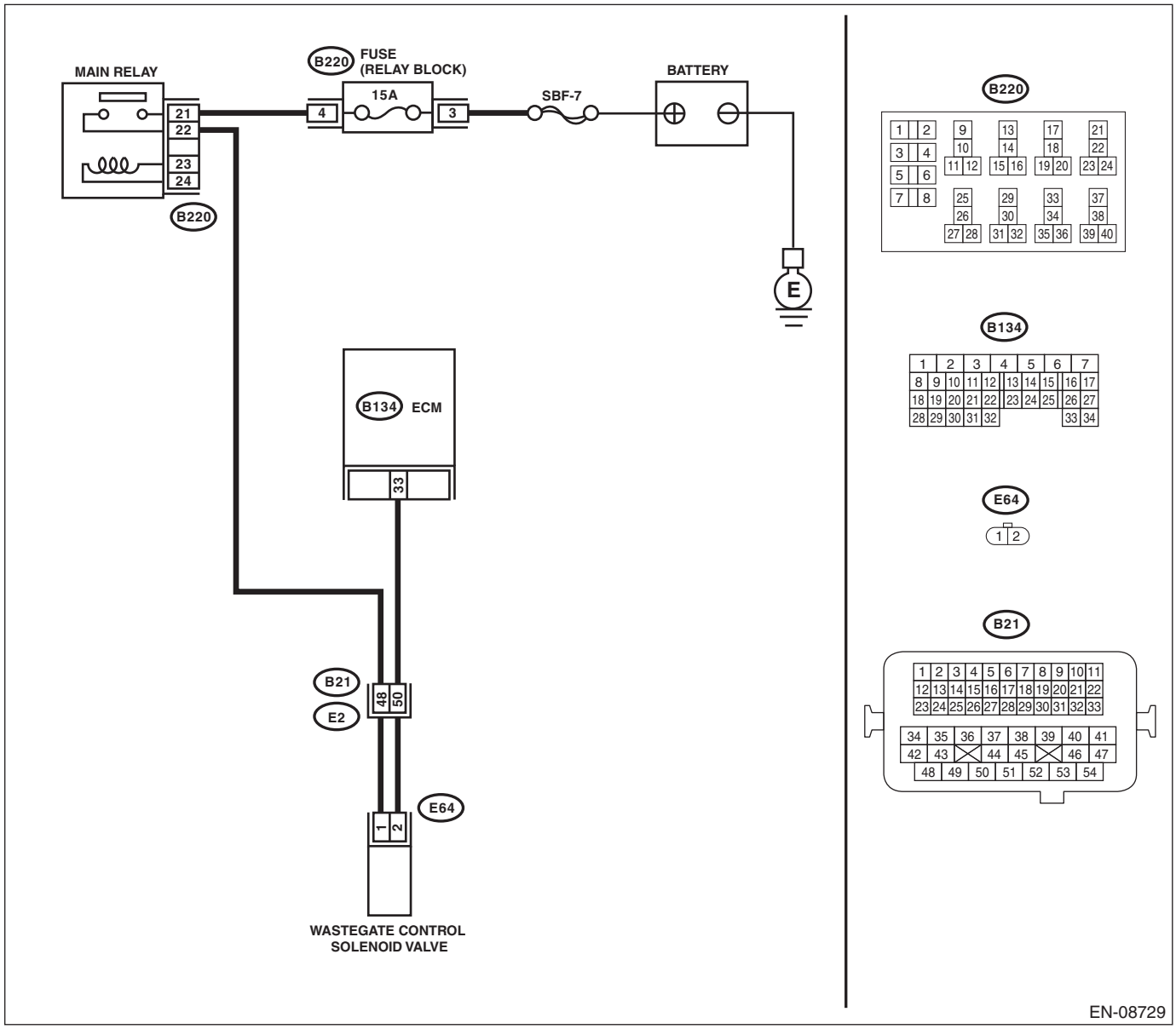
TROUBLE SYMPTOM:

Poor driving performance

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	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*** ***(B134) No. 33 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **2**.	Go to step **3**.
2	**CHECK FOR POOR CONTACT.** Check for poor contact of ECM connector.	Is there poor contact of ECM connector?	Repair the poor contact of ECM connector.	Even if DTC is detected, 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 open or short circuit of harness or temporary poor contact of connector may be the cause.
3	**CHECK POWER SUPPLY TO WASTEGATE CONTROL SOLENOID VALVE.** Measure the voltage between wastegate control solenoid valve connector and engine ground. ***Connector & terminal*** ***(E64) No. 1 (+) — Engine ground (–):***	Is the voltage 10 V or more?	Go to step **4**.	Repair the power supply circuit.
4	**CHECK HARNESS BETWEEN ECM AND WASTEGATE CONTROL SOLENOID VALVE CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and wastegate control solenoid valve. 3) Measure the resistance between wastegate control solenoid valve connector and engine ground. ***Connector & terminal*** ***(E64) No. 2 — Engine ground:***	Is the resistance 1 MΩ or more?	Go to step **5**.	Repair ground short circuit of harness between ECM and wastegate control solenoid valve connector.
5	**CHECK HARNESS BETWEEN ECM AND WASTEGATE CONTROL SOLENOID VALVE CONNECTOR.** Measure the resistance of harness between ECM and wastegate control solenoid valve connector. ***Connector & terminal*** ***(B134) No. 33 — (E64) No. 2:***	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 of harness between ECM and wastegate control solenoid valve connector • Poor contact of coupling connector

	Step	Check	Yes	No
6	**CHECK WASTEGATE CONTROL SOLENOID VALVE.** 1) Remove the wastegate control solenoid valve. 2) Measure the resistance between wastegate control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 10 — 100 Ω?	Repair poor contact of wastegate control solenoid valve connector.	Replace the wastegate control solenoid valve. <Ref. to FU(H4DOTC)-51, Wastegate Control Solenoid Valve.>

AS:DTC P0246 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” HIGH

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-103, DTC P0246 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

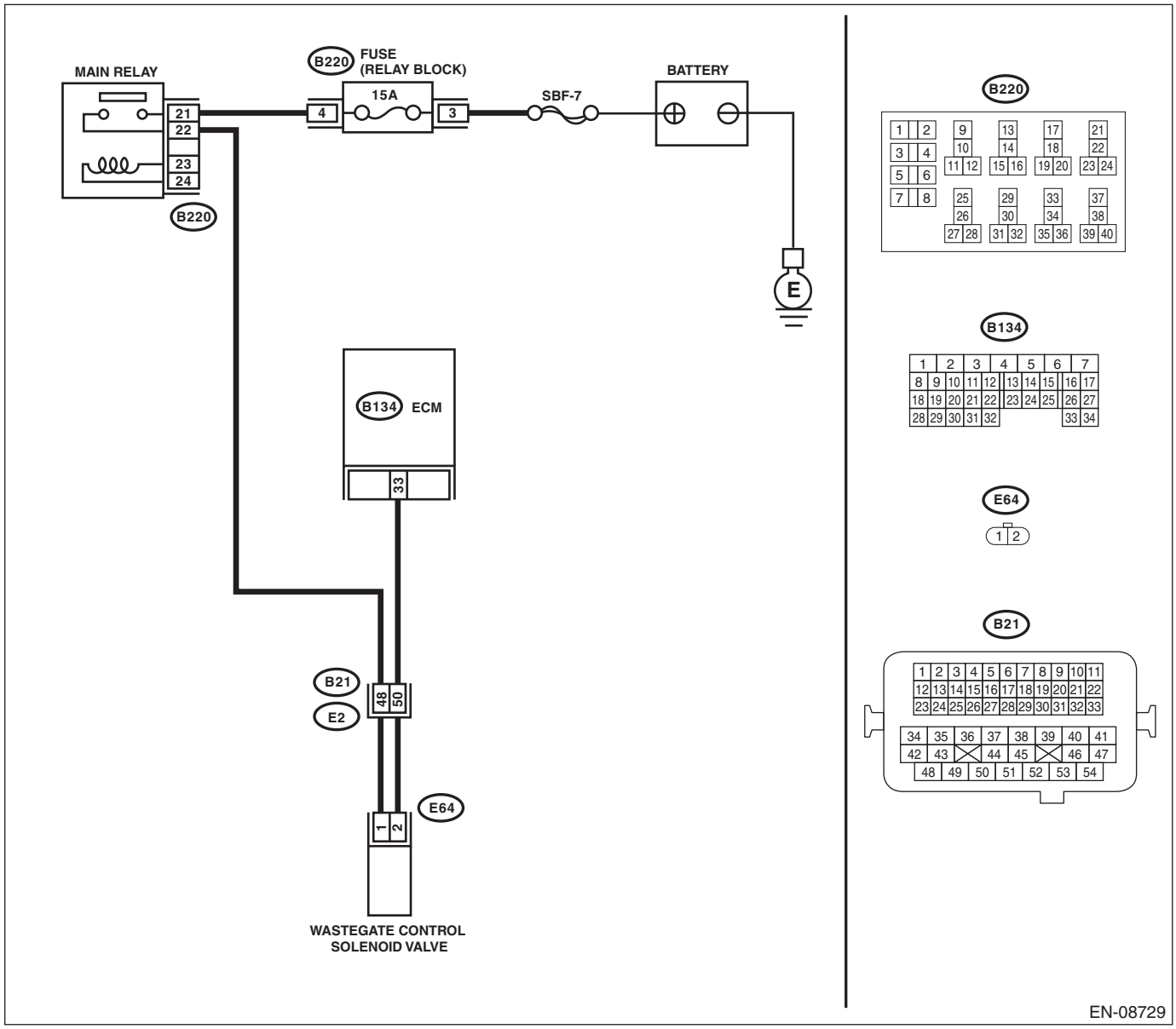
TROUBLE SYMPTOM:

Poor driving performance

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND WASTEGATE CONTROL SOLENOID VALVE CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and wastegate control solenoid valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 33 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair short circuit to power in the harness between ECM and wastegate control solenoid valve connector.	Go to step **2**.
2	**CHECK WASTEGATE CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between wastegate control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 1 Ω?	Replace the wastegate control solenoid valve. <Ref. to FU(H4DOTC)-51, Wastegate Control Solenoid Valve.>	Repair the poor contact of ECM connector.

AT:DTC P0301 CYLINDER 1 MISFIRE DETECTED

NOTE:
For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(H4DOTC)(diag)-165, 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(H4DOTC)(diag)-165, 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(H4DOTC)(diag)-165, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AW:DTC P0304 CYLINDER 4 MISFIRE DETECTED

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- Immediately at fault recognition (A misfire which could damage catalyst occurs.)
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-109, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

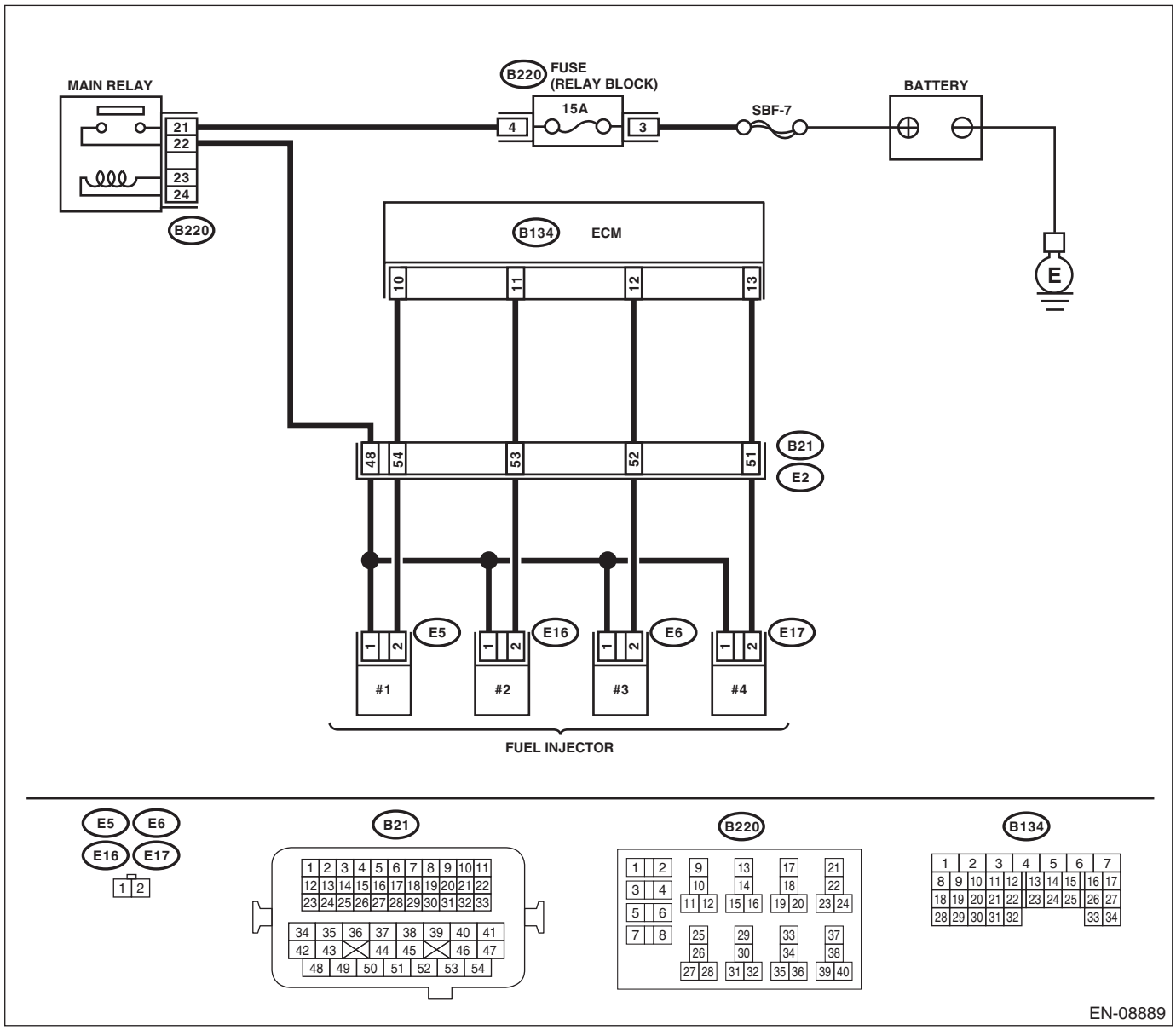
TROUBLE SYMPTOM:

- Engine stalls.
- Improper idling
- Rough driving

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	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 on faulty cylinders. ***Connector & terminal*** ***#1 (B134) No. 10 (+) — Chassis ground (–):*** ***#2 (B134) No. 11 (+) — Chassis ground (–):*** ***#3 (B134) No. 12 (+) — Chassis ground (–):*** ***#4 (B134) No. 13 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **6**.	Go to step **2**.
2	**CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel injector on faulty cylinders. 3) Measure the resistance between fuel injector connector 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 resistance 1 MΩ or more?	Go to step **3**.	Repair the short circuit to ground in harness between ECM and fuel injector connector.
3	**CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR.** Measure the resistance of harness between ECM and fuel injector connector on faulty cylinders. ***Connector & terminal*** ***#1 (B134) No. 10 — (E5) No. 2:*** ***#2 (B134) No. 11 — (E16) No. 2:*** ***#3 (B134) No. 12 — (E6) No. 2:*** ***#4 (B134) No. 13 — (E17) 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: • Open circuit in harness between ECM and fuel injector connector • Poor contact of coupling connector
4	**CHECK FUEL INJECTOR.** Measure the resistance between fuel injector terminals on faulty cylinder. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 5 — 20 Ω?	Go to step **5**.	Replace the faulty fuel injector. <Ref. to FU(H4DOTC)-45, Fuel Injector.>
5	**CHECK POWER SUPPLY LINE.** 1) Turn the ignition switch to ON. 2) Measure the voltage between fuel injector connector of faulty cylinders and engine ground. ***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 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 the main relay connector and fuel injector connector on faulty cylinders • Poor contact of coupling connector • Poor contact of main relay connector

	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR 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 and chassis ground on faulty cylinders. ***Connector & terminal*** ***#1 (B134) No. 10 (+) — Chassis ground (–):*** ***#2 (B134) No. 11 (+) — Chassis ground (–):*** ***#3 (B134) No. 12 (+) — Chassis ground (–):*** ***#4 (B134) No. 13 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the short circuit to power in harness between ECM and fuel injector connector.	Go to step **7**.
7	**CHECK FUEL INJECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between fuel injector terminals on faulty cylinder. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 5 — 20 Ω?	Go to step **8**.	Replace the faulty fuel injector. <Ref. to FU(H4DOTC)-45, Fuel Injector.>
8	**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 **9**.
9	**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(H4DOTC)-57, Crank Sprocket.>	Go to step **10**.
10	**CHECK INSTALLATION CONDITION OF TIMING BELT.** Turn the crankshaft, and align 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(H4DOTC)-49, Timing Belt.>	Go to step **11**.
11	**CHECK FUEL LEVEL.**	Is the fuel meter indication higher than the “Lower” level?	Go to step **12**.	Refill the fuel so that the fuel meter indication is higher than the “Lower” level, and proceed to the next step. Go to step **12**.
12	**CHECK STATUS OF MALFUNCTION INDICATOR LIGHT.** 1) Clear the memory using the Subaru Select Monitor or general scan tool. <Ref. to EN(H4DOTC)(diag)-56, Clear Memory Mode.> 2) Start the engine, and drive the vehicle 10 minutes or more.	Does the malfunction indicator light illuminate or blink?	Go to step **14**.	Go to step **13**.

Step		Check	Yes	No
13	**CHECK CAUSE OF MISFIRE.**	Was the cause of misfire identified when the engine is running?	Finish diagnostics operation, if the engine has no abnormality.	Repair the poor contact of connector. NOTE: In this case, repair the following item: • Poor contact of ignition coil connector • Poor contact of fuel injector connector on faulty cylinders • Poor contact of ECM connector • Poor contact of coupling connector
14	**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 **15**.
15	**CHECK MISFIRE SYMPTOM.** 1) Turn the ignition switch to ON. 2) Check for DTC. <Ref. to EN(H4DOTC)(diag)-44, Read Diagnostic Trouble Code (DTC).>	Does the Subaru Select Monitor or general scan tool indicate only one DTC?	Go to step **18**.	Go to step **16**.
16	**CHECK DTC.**	Is DTC P0301 and P0303 displayed on the Subaru Select Monitor or general scan tool?	Go to step **19**.	Go to step **17**.
17	**CHECK DTC.**	Is DTC P0302 and P0304 displayed on the Subaru Select Monitor or general scan tool?	Go to step **20**.	Go to step **21**.
18	**ONLY ONE CYLINDER.**	Is there any fault in the cylinder?	Repair or replace faulty parts. NOTE: Check the following items. • Spark plug • Ignition coil • Fuel injector • Compression ratio	Go to DTC P0171. <Ref. to EN(H4DOTC)(diag)-144, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

	Step	Check	Yes	No
19	**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. • Spark plug • Fuel injector • Ignition coil • Compression ratio • Skipping timing belt teeth	Go to DTC P0171. <Ref. to EN(H4DOTC)(diag)-144, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
20	**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. • Spark plug • Ignition coil • Fuel injector • Compression ratio • Skipping timing belt teeth	Go to DTC P0171. <Ref. to EN(H4DOTC)(diag)-144, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
21	**CYLINDER AT RANDOM.**	Is the engine idle rough?	Go to DTC P0171. <Ref. to EN(H4DOTC)(diag)-144, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Repair or replace faulty parts. NOTE: Check the following items. • Spark plug • Ignition coil • Fuel injector • Compression ratio

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(H4DOTC)-110, DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

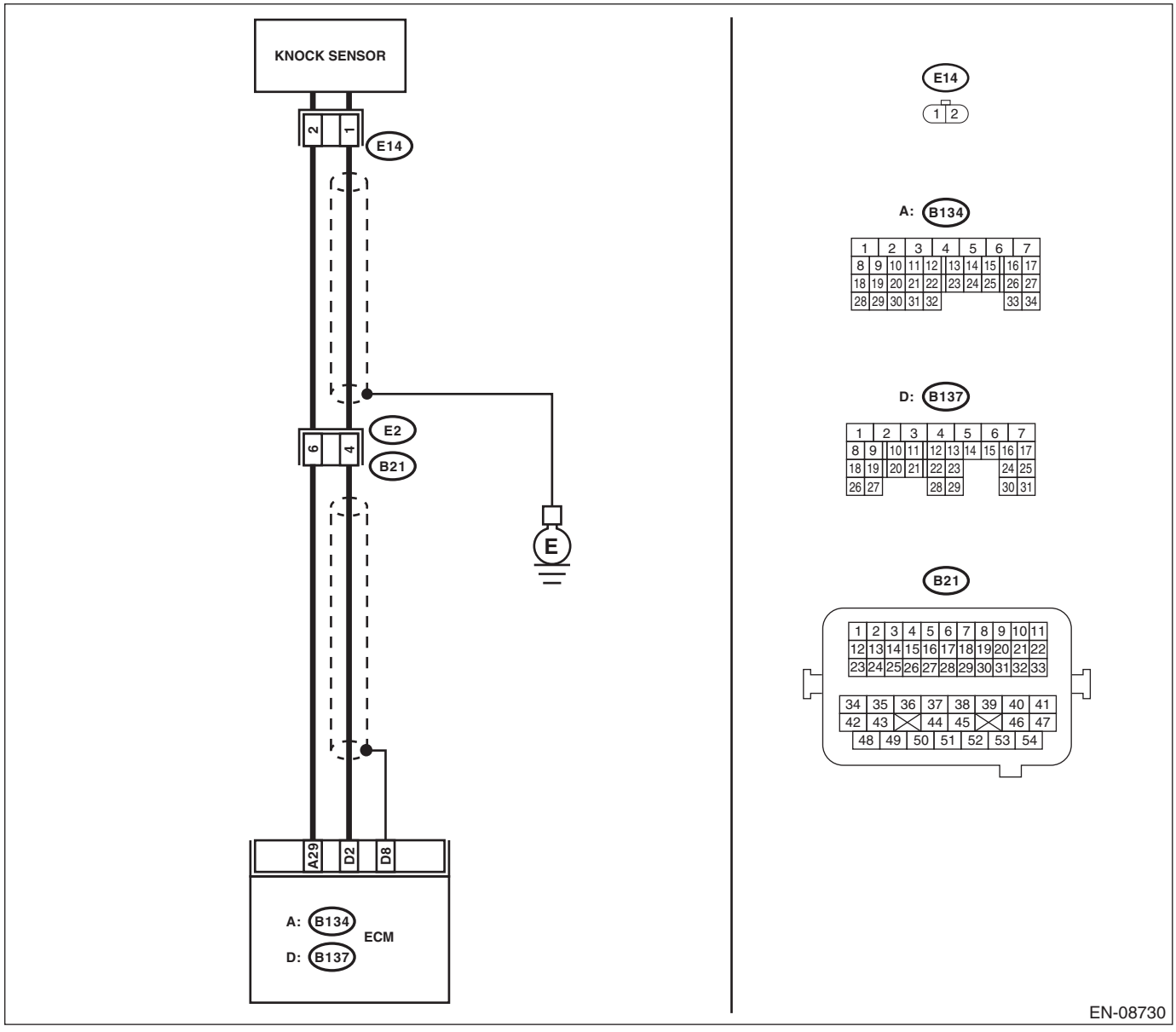
TROUBLE SYMPTOM:

- Poor driving performance
- Knocking occurs.

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND KNOCK SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between ECM connectors. ***Connector & terminal*** ***(B137) No. 2 — (B134) No. 29:***	Is the resistance 600 kΩ or more?	Go to step **2**.	Repair the poor contact of ECM connector.
2	**CHECK KNOCK SENSOR.** 1) Disconnect the connector from the knock sensor. 2) Measure the resistance between knock sensor terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 600 kΩ or more?	Replace the knock sensor. <Ref. to FU(H4DOTC)-39, Knock Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and knock sensor connector • Poor contact of knock sensor connector • Poor contact of coupling connector

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(H4DOTC)-112, DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

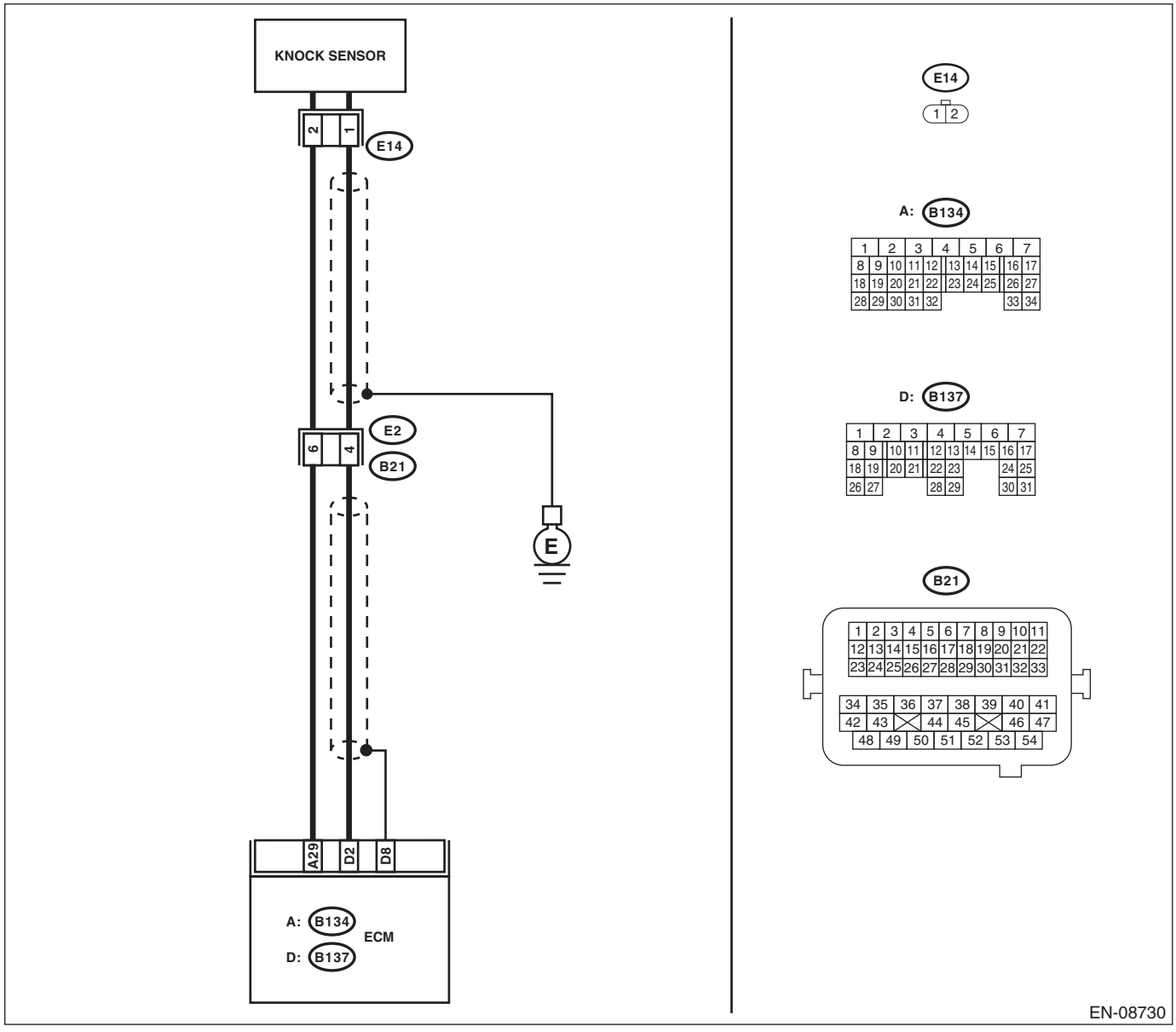
TROUBLE SYMPTOM:

- Poor driving performance
- Knocking occurs.

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND KNOCK SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between ECM connectors. ***Connector & terminal*** ***(B137) No. 2 — (B134) No. 29:***	Is the resistance less than 500 kΩ?	Go to step **2**.	Go to step **3**.
2	**CHECK KNOCK SENSOR.** 1) Disconnect the connector from the knock sensor. 2) Measure the resistance between knock sensor connectors. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 500 kΩ?	Replace the knock sensor. <Ref. to FU(H4DOTC)-39, Knock Sensor.>	Repair the short circuit to ground in harness between ECM and knock sensor 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 connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 2 (+) — Chassis ground (–):***	Is the voltage 2 V or more?	Even if DTC is detected, 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, temporary open or short circuit of harness may be the cause.	Repair the poor contact of ECM connector.

AZ:DTC P0335 CRANKSHAFT POSITION SENSOR “A” CIRCUIT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-114, DTC P0335 CRANKSHAFT POSITION SENSOR “A” CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

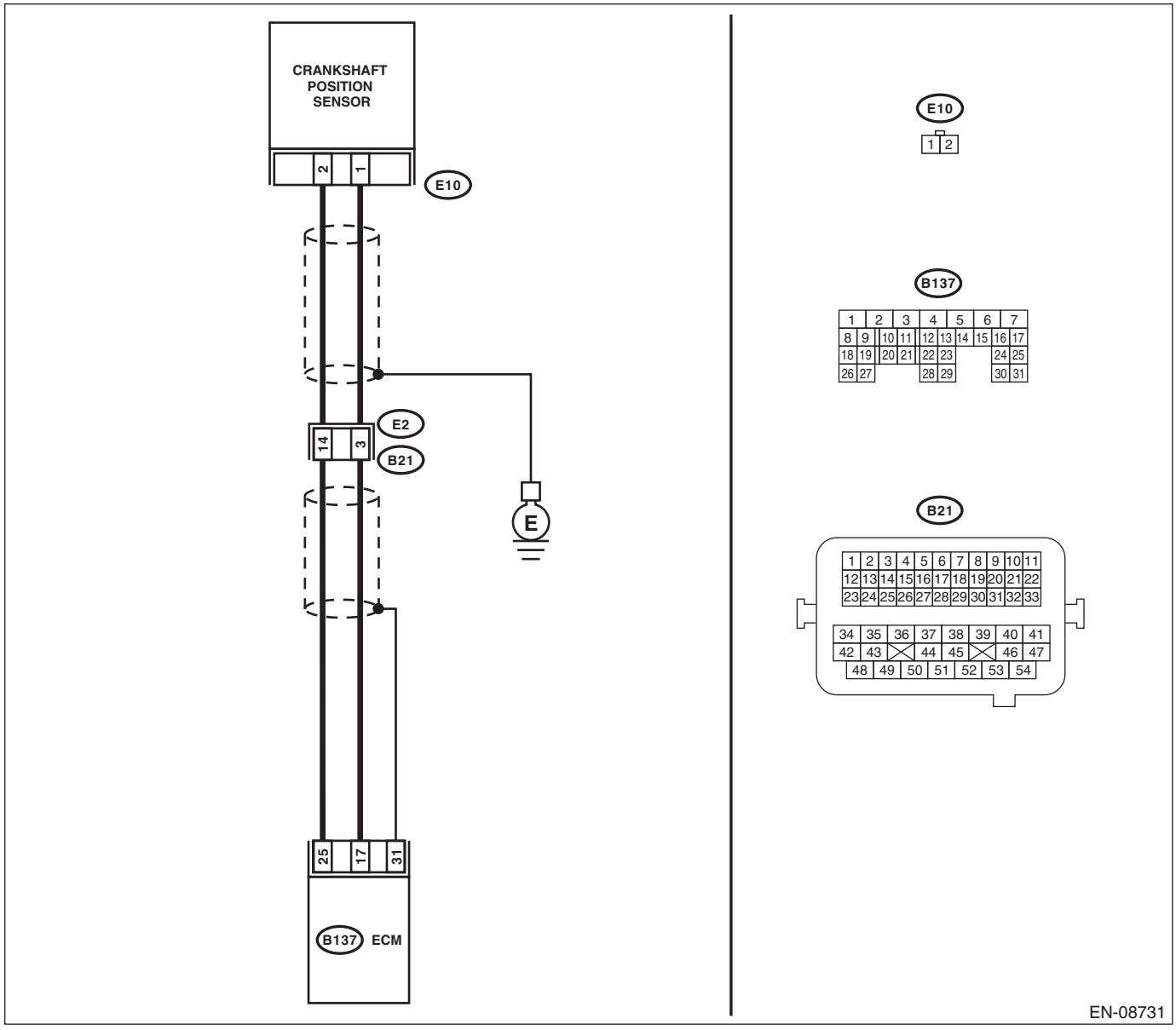
TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CONDITION OF CRANKSHAFT POSITION SENSOR.**	Is the crankshaft position sensor installation bolt tightened securely?	Go to step **2**.	Tighten the crankshaft position sensor installation bolt securely.
2	**CHECK CRANKSHAFT POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Remove the crankshaft position sensor. 3) Measure the resistance between terminals of crankshaft position sensor. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance between 1 and 4 kΩ?	Go to step **3**.	Replace the crankshaft position sensor. <Ref. to FU(H4DOTC)-35, Crankshaft Position Sensor.>
3	**CHECK HARNESS BETWEEN ECM AND CRANKSHAFT POSITION SENSOR CONNECTOR.** 1) Disconnect the connector from ECM. 2) Measure the resistance of harness between ECM and crankshaft position sensor connector. ***Connector & terminal*** ***(B137) No. 17 — (E10) No. 1:*** ***(B137) No. 25 — (E10) No. 2:***	Is the resistance less than 1 Ω?	Repair the poor contact of ECM and crankshaft position sensor connector.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and crankshaft position sensor connector • Poor contact of coupling connector

BA:DTC P0336 CRANKSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-116, 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 servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK CONDITION OF CRANKSHAFT POSITION SENSOR.** Turn the ignition switch to OFF.	Is the crankshaft position sensor installation bolt tightened securely?	Go to step **2**.	Tighten the crankshaft position sensor installation bolt securely. <Ref. to FU(H4DOTC)-35, Crankshaft Position Sensor.>
2	**CHECK CRANK SPROCKET.** Remove the timing belt cover.	Are crank sprocket teeth cracked or damaged?	Replace the crank sprocket. <Ref. to ME(H4DOTC)-57, Crank Sprocket.>	Go to step **3**.
3	**CHECK INSTALLATION CONDITION OF TIMING BELT.** Turn the crankshaft, and align 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(H4DOTC)-49, Timing Belt.>	Replace the crankshaft position sensor. <Ref. to FU(H4DOTC)-35, Crankshaft Position Sensor.>

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(H4DOTC)-118, DTC P0340 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

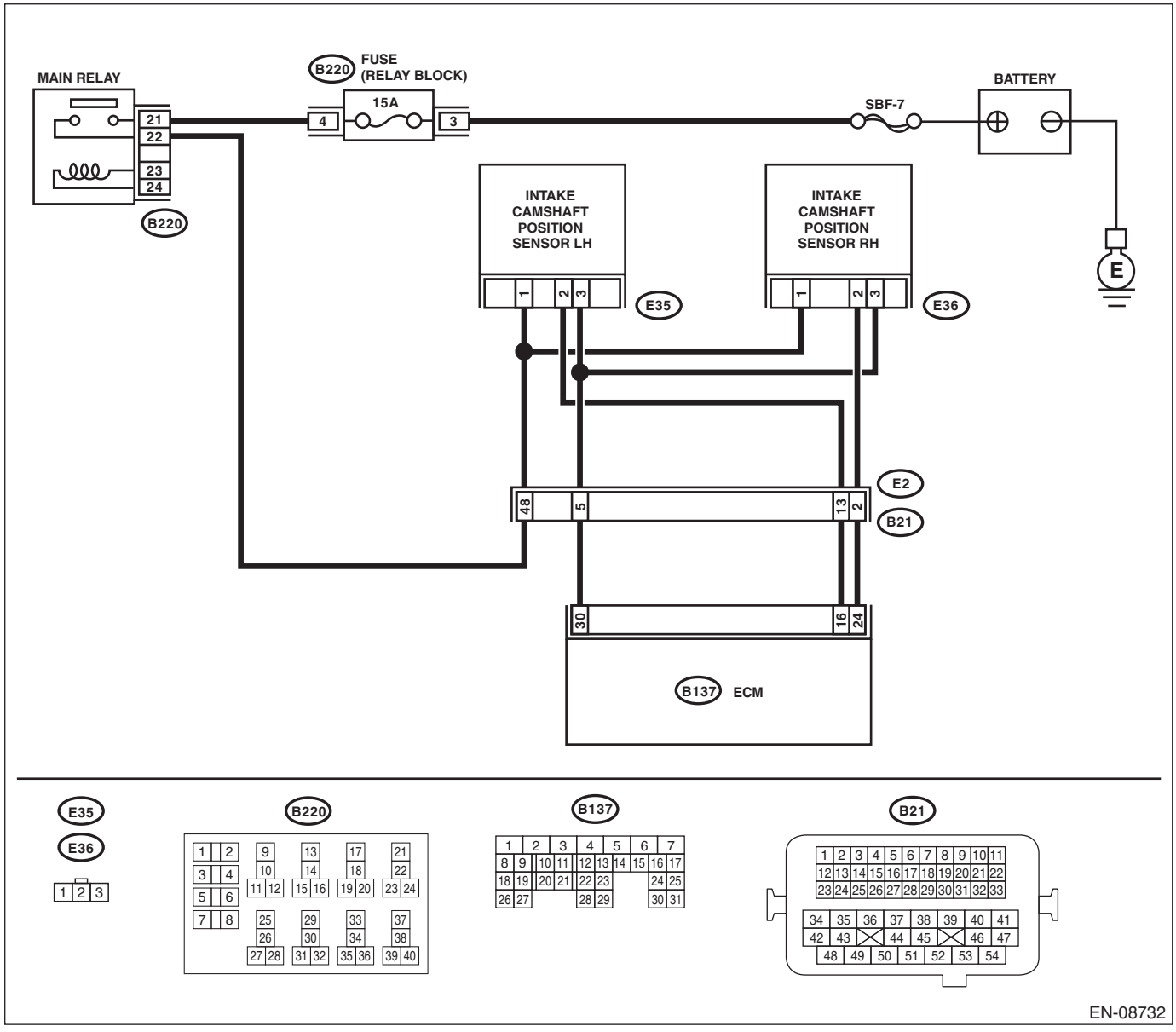
TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	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) Turn the ignition switch to ON. 4) Measure the voltage between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E36) No. 1 (+) — 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: • Open circuit or short circuit to ground in harness between main relay connector and camshaft position sensor connector • Poor contact of coupling connector
2	**CHECK HARNESS BETWEEN ECM AND CAMSHAFT POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between ECM and camshaft position sensor connector. ***Connector & terminal*** ***(B137) No. 24 — (E36) No. 2:*** ***(B137) No. 30 — (E36) 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 ECM and camshaft position sensor connector • Poor contact of coupling connector
3	**CHECK HARNESS BETWEEN ECM AND CAMSHAFT POSITION SENSOR CONNECTOR.** Measure the resistance between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E36) No. 2 — Engine ground:***	Is the resistance 1 MΩ or more?	Go to step **4**.	Repair short circuit to ground in harness between ECM and camshaft position sensor connector.
4	**CHECK HARNESS BETWEEN ECM AND CAMSHAFT POSITION SENSOR CONNECTOR.** Measure the voltage between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E36) No. 2 (+) — Engine ground (–):***	Is the voltage 5 V or more?	Repair the short circuit to power in the harness between ECM and camshaft position sensor connector.	Go to step **5**.
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. <Ref. to FU(H4DOTC)-37, Camshaft Position Sensor.>
6	**CHECK CAMSHAFT POSITION SENSOR.** Check the waveform of the camshaft position sensor. <Ref. to EN(H4DOTC)(diag)-19, Engine Control Module (ECM) I/O Signal.>	Is there any abnormality in waveform?	Replace the camshaft position sensor. <Ref. to FU(H4DOTC)-37, Camshaft Position Sensor.>	Repair the following item. • Poor contact of ECM connector • Poor contact of camshaft position sensor connector • Poor contact of coupling connector

BC:DTC P0345 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 2)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-120, DTC P0345 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

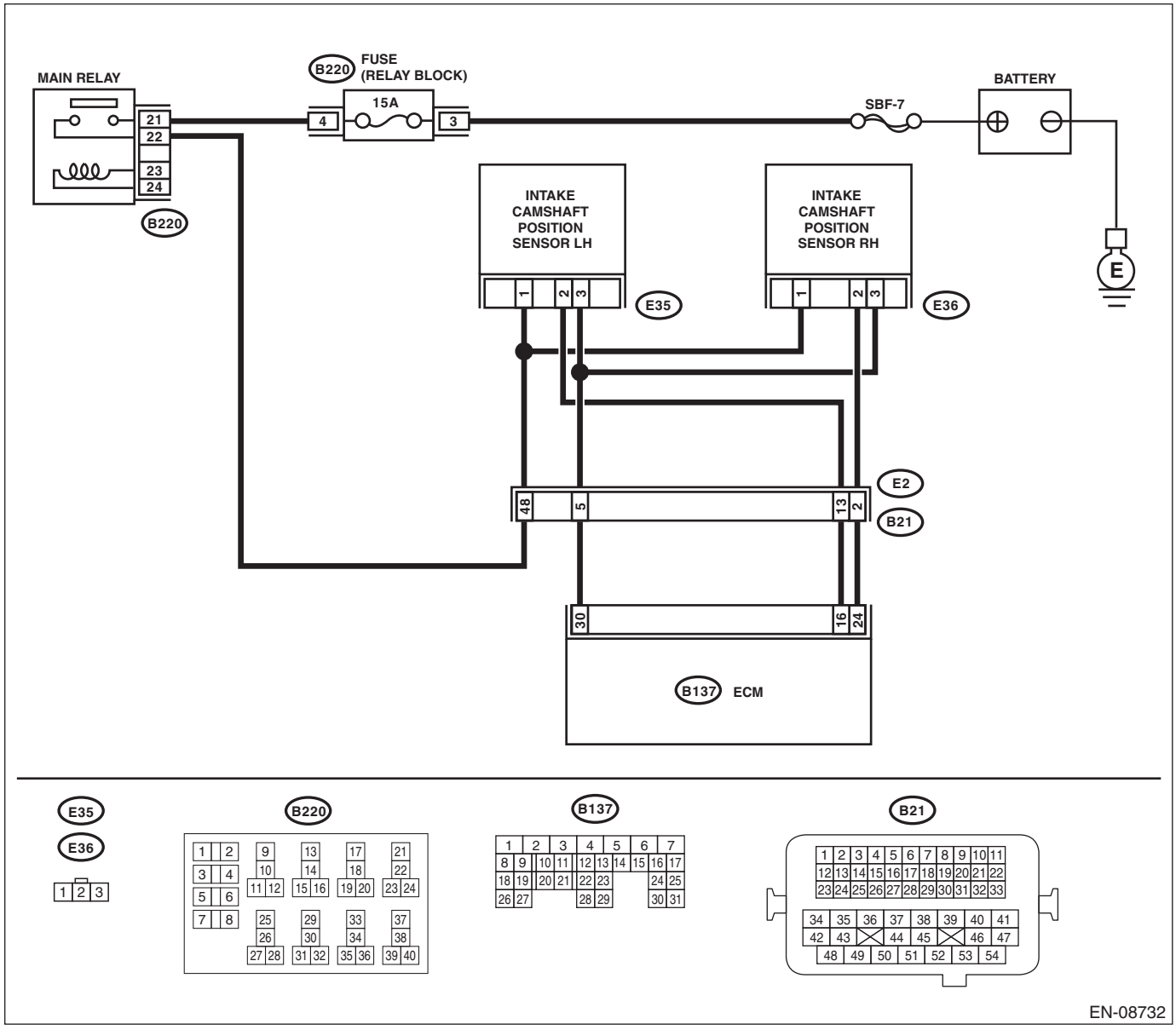
TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	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) Turn the ignition switch to ON. 4) Measure the voltage between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E35) No. 1 (+) — 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: • Open circuit or short circuit to ground in harness between main relay connector and camshaft position sensor connector • Poor contact of coupling connector
2	**CHECK HARNESS BETWEEN ECM AND CAMSHAFT POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between ECM and camshaft position sensor connector. ***Connector & terminal*** ***(B137) No. 16 — (E35) No. 2:*** ***(B137) No. 30 — (E35) 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 ECM connector and camshaft position sensor connector • Poor contact of coupling connector
3	**CHECK HARNESS BETWEEN ECM AND CAMSHAFT POSITION SENSOR CONNECTOR.** Measure the resistance between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E35) No. 2 — Engine ground:***	Is the resistance 1 MΩ or more?	Go to step **4**.	Repair short circuit to ground in harness between ECM and camshaft position sensor connector.
4	**CHECK HARNESS BETWEEN ECM AND CAMSHAFT POSITION SENSOR CONNECTOR.** Measure the voltage between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E35) No. 2 (+) — Engine ground (–):***	Is the voltage 5 V or more?	Repair the short circuit to power in the harness between ECM and camshaft position sensor connector.	Go to step **5**.
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. <Ref. to FU(H4DOTC)-37, Camshaft Position Sensor.>
6	**CHECK CAMSHAFT POSITION SENSOR.** Check the waveform of the camshaft position sensor. <Ref. to EN(H4DOTC)(diag)-19, Engine Control Module (ECM) I/O Signal.>	Is there any abnormality in waveform?	Replace the camshaft position sensor. <Ref. to FU(H4DOTC)-37, Camshaft Position Sensor.>	Repair the following item. • Poor contact of ECM connector • Poor contact of camshaft position sensor connector • Poor contact of coupling connector

BD:DTC P0410 SECONDARY AIR INJECTION SYSTEM

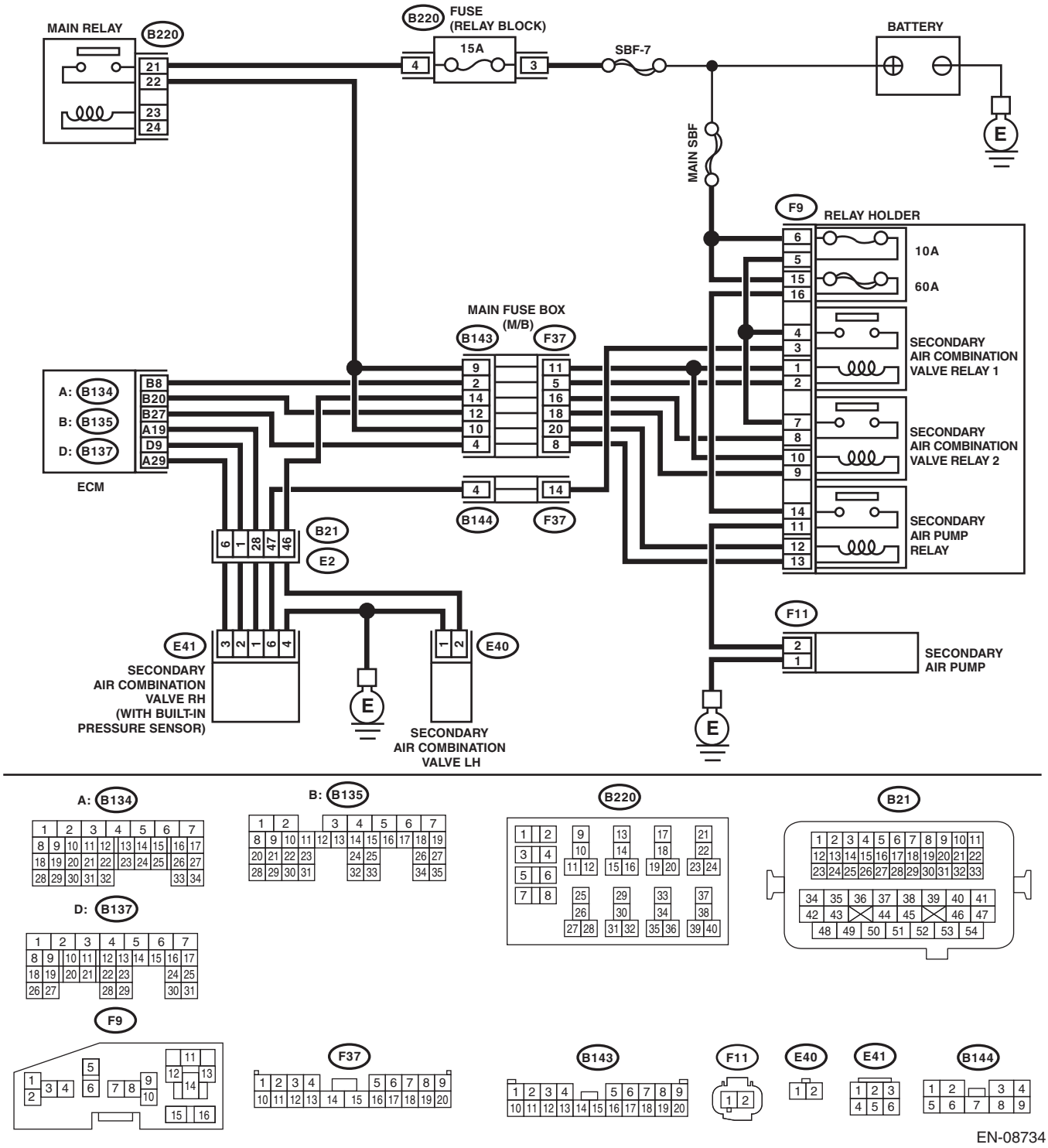
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-121, DTC P0410 SECONDARY AIR INJECTION SYSTEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK SECONDARY AIR PUMP FUSE.** Check if the secondary air pump fuse (60 A) is blown out.	Is the fuse blown out?	Go to step **2**.	Go to step **3**.

	Step	Check	Yes	No
2	**CHECK HARNESS BETWEEN RELAY HOLDER AND SECONDARY AIR PUMP CONNECTOR.** 1) Remove the secondary air pump fuse from the relay holder. 2) Disconnect the secondary air pump connector. 3) Measure the resistance between the secondary air pump fuse and secondary air pump connector, and chassis ground. ***Connector & terminal*** ***(F9) No. 16 — Chassis ground:*** ***(F11) No. 2 — Chassis ground:***	Is the resistance 1 MΩ or more?	Replace the fuse with a new part, and connect the secondary air pump connector. Go to step **3**.	Repair the short circuit to ground in harness between relay holder and secondary air pump connector.
3	**CHECK SECONDARY AIR PUMP OPERATION.** 1) Connect the delivery (test) mode connector. 2) Turn the ignition switch to ON. 3) Perform the Clear Memory Mode. 4) Perform operation check for the secondary air pump using the Subaru Select Monitor. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "Clear Memory Mode" <Ref. to EN(H4DOTC)(diag)-56, Clear Memory Mode.> and "Compulsory Valve Operation Check Mode" <Ref. to EN(H4DOTC)(diag)-57, Compulsory Valve Operation Check Mode.>. • The compulsory operation using the Subaru Select Monitor is performed only for 5 seconds in order to protect the secondary air pump. When operating again, perform the Clear Memory Mode.	Does the secondary air pump operate?	Go to step **4**.	Go to step **5**.
4	**CHECK DUCT BETWEEN SECONDARY AIR PUMP AND COMBINATION VALVE.** Check the duct between secondary air pump and combination valve.	Is there damage, clog or disconnection of the duct?	Replace, clean or connect the duct.	Replace the secondary air combination valve RH. <Ref. to EC(H4DOTC)-30, Secondary Air Combination Valve.>
5	**CHECK POWER SUPPLY TO SECONDARY AIR PUMP.** 1) Perform the Clear Memory Mode. 2) Turn the ignition switch to OFF. 3) Disconnect the secondary air pump connector. 4) In the condition of step 3, measure the voltage between the secondary air pump connector and the chassis ground. NOTE: For detailed procedures, refer to "Clear Memory Mode". <Ref. to EN(H4DOTC)(diag)-56, Clear Memory Mode.> ***Connector & terminal*** ***(F11) No. 2 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Replace the secondary air pump. <Ref. to EC(H4DOTC)-29, Secondary Air Pump.>	Go to step **6**.

	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN SECONDARY AIR PUMP RELAY AND SECONDARY AIR PUMP CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Remove the secondary air pump relay. 3) Measure the resistance of harness between secondary air pump relay connector and secondary air pump connector. ***Connector & terminal*** ***(F9) No. 11 — (F11) No. 2:***	Is the resistance less than 1 Ω?	Go to step **7**.	Repair the open circuit in harness between secondary air pump relay connector and secondary air pump connector.
7	**CHECK HARNESS BETWEEN SECONDARY AIR PUMP CONNECTOR AND CHASSIS GROUND.** Measure the resistance of the harness between secondary air pump connector and chassis ground. ***Connector & terminal*** ***(F11) No. 1 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **8**.	Repair the open circuit of the harness between secondary air pump connector and chassis ground.
8	**CHECK SECONDARY AIR PUMP RELAY.** 1) Connect the battery to terminals No. 12 and No. 13 of the secondary air pump relay. 2) Measure the resistance between secondary air pump relay terminals. ***Terminals*** ***No. 14 — No. 11:***	Is the resistance less than 1 Ω?	Go to step **9**.	Replace the secondary air pump relay. <Ref. to EN(H4DOTC)(diag)-9, Electrical Component Location.>
9	**CHECK SECONDARY AIR PUMP RELAY POWER SUPPLY.** 1) Turn the ignition switch to ON. 2) Measure the voltage between the secondary air pump relay connector and chassis ground. ***Connector & terminal*** ***(F9) No. 14 (+) — Chassis ground (–):*** ***(F9) No. 12 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **10**.	Repair the open or ground short circuit of power supply circuit.
10	**CHECK HARNESS BETWEEN ECM AND SECONDARY AIR PUMP RELAY CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the ECM connector. 3) Measure the resistance of harness between ECM and secondary air pump relay connector. ***Connector & terminal*** ***(B135) No. 27 — (F9) No. 13:***	Is the resistance less than 1 Ω?	Repair the poor contact of ECM connector.	Repair the harness and connector. NOTE: In this case, repair the following item: • Repair the open circuit in harness between ECM connector and secondary air pump relay connector. • Poor contact of coupling connector

BE:DTC P0411 SECONDARY AIR INJECTION SYSTEM INCORRECT FLOW DETECTED

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-131, DTC P0411 SECONDARY AIR INJECTION SYSTEM INCORRECT FLOW DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK SECONDARY AIR COMBINATION VALVE.** Check the pipe between the secondary air combination valve and cylinder head.	Is there damage or disconnection of the pipe?	Replace the pipe between secondary air combination valve and cylinder head.	Go to step **2**.
2	**CHECK SECONDARY AIR COMBINATION VALVE.** Race the engine at 2,000 rpm to check whether or not the exhaust leak is heard.	Is there any exhaust leak?	Replace the pipe between secondary air combination valve and cylinder head.	Repair the poor contact of ECM connector.

BF:DTC P0413 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “A” CIRCUIT OPEN

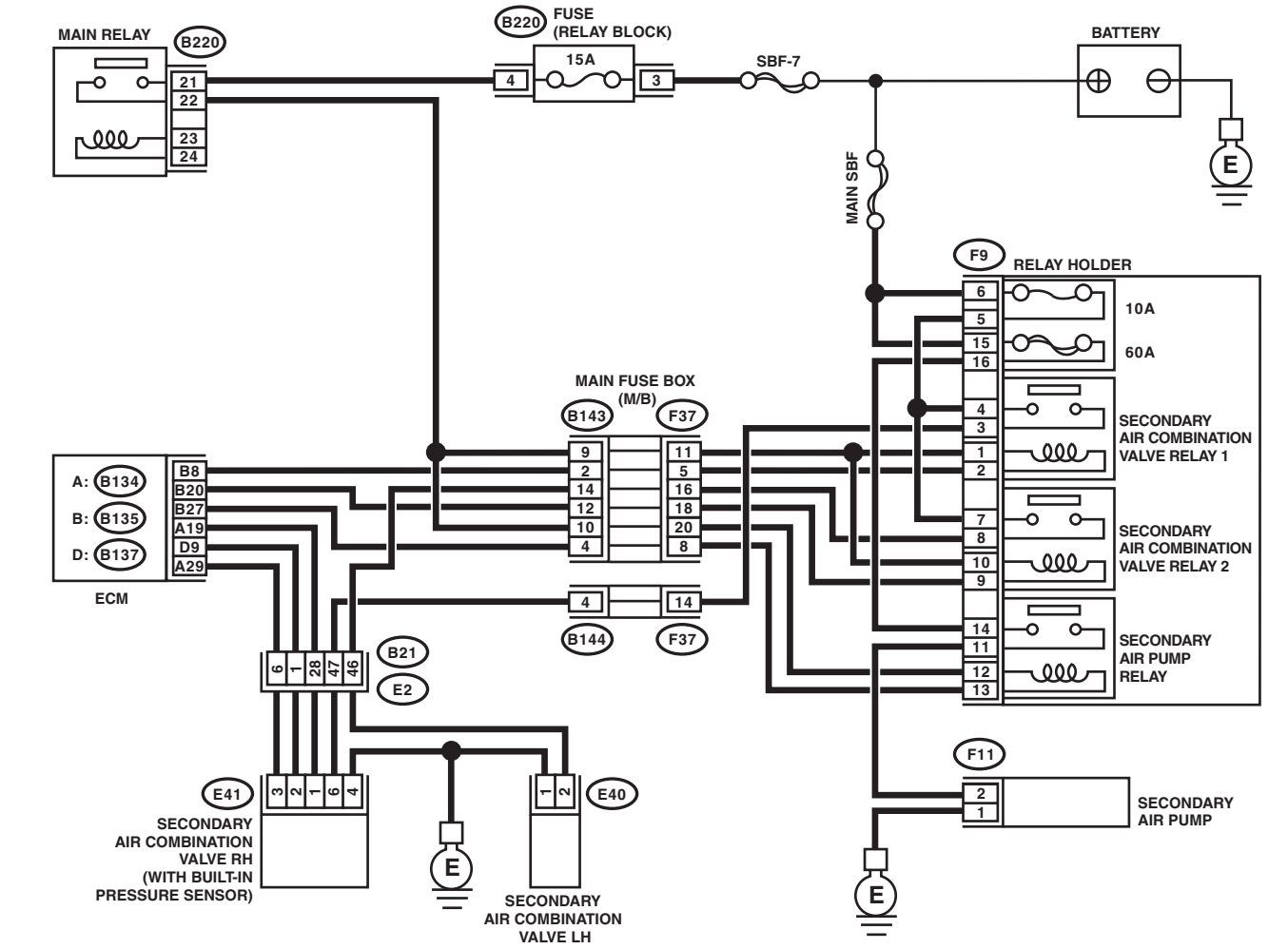
DTC DETECTING CONDITION:

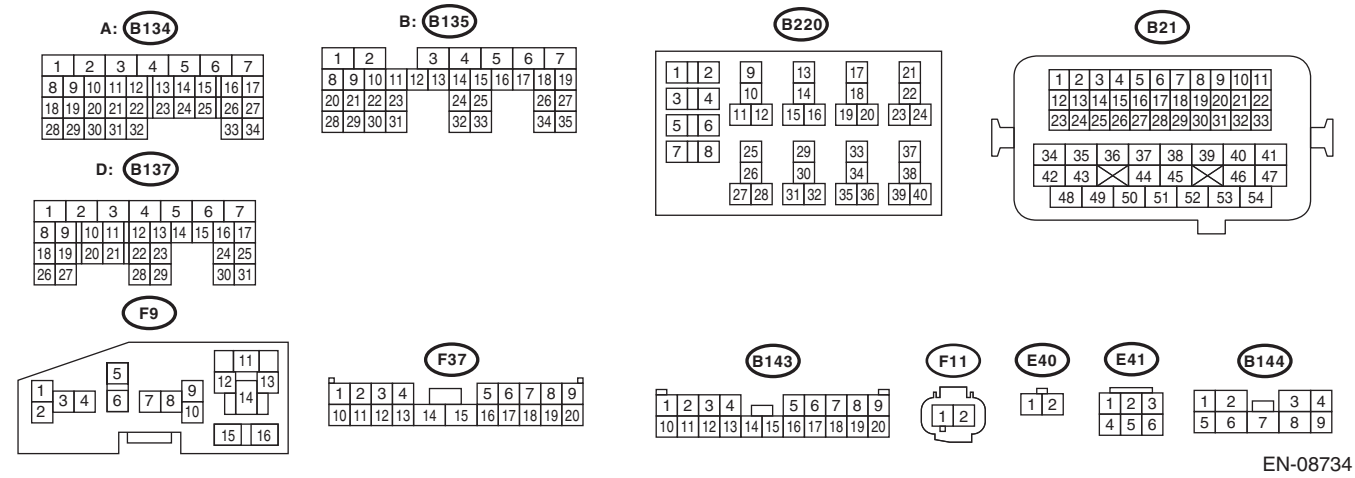
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-132, DTC P0413 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “A” CIRCUIT OPEN, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





EN-08734

	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBINATION VALVE RELAY 1 CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Remove the secondary air combination valve relay 1. 4) Measure the resistance of harness between ECM and secondary air combination valve relay 1 connector. ***Connector & terminal*** ***(B135) No. 8 — (F9) No. 2:***	Is the resistance less than 1 Ω?	Go to step **2**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and secondary air combination valve relay 1 connector • Poor contact of coupling connector
2	**CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBINATION VALVE RELAY 1 CONNECTOR.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 8 — Chassis ground:***	Is the resistance 1 MΩ or more?	Even if DTC is detected, 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, temporary open or short circuit of harness may be the cause.	Repair the short circuit to ground in harness between ECM and secondary air combination valve relay 1 connector.

BG:DTC P0414 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “A” CIRCUIT SHORTED

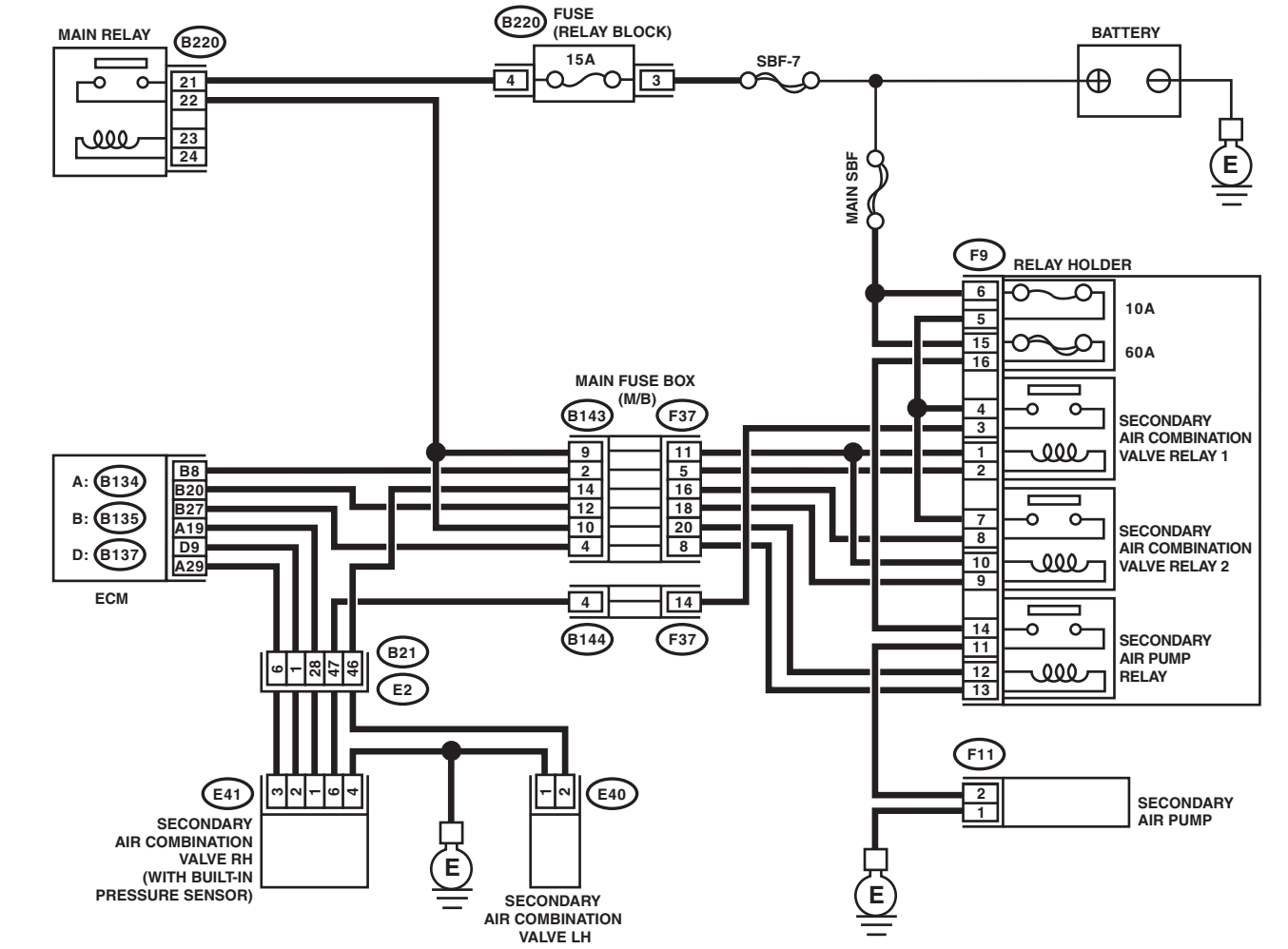
DTC DETECTING CONDITION:

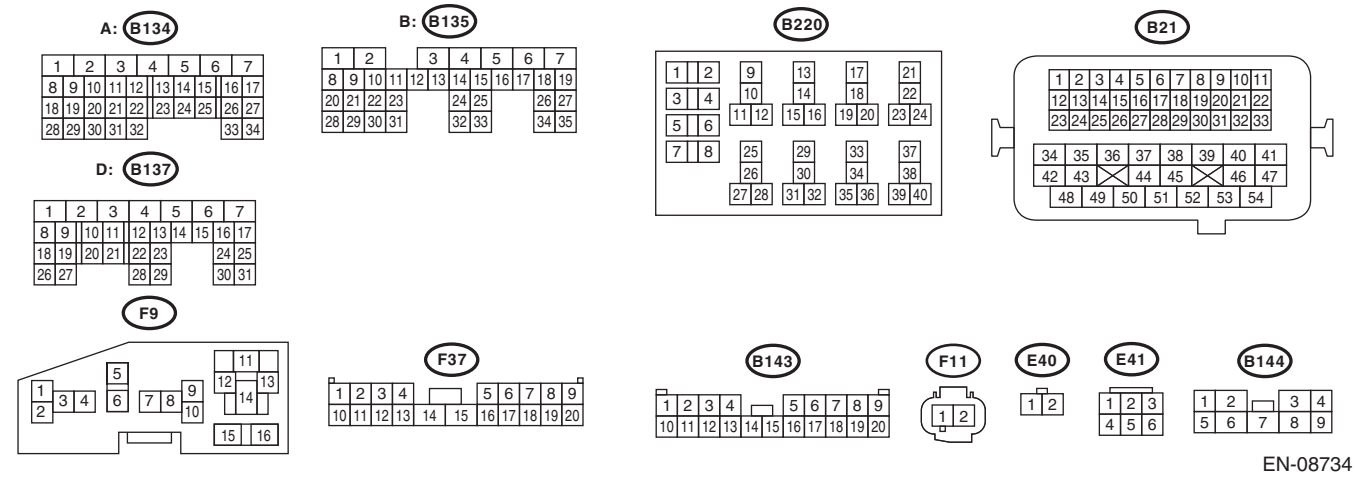
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-133, DTC P0414 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “A” CIRCUIT SHORTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





EN-08734

	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBINATION VALVE RELAY 1 CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Remove the secondary air combination valve relay 1. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 8 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the short circuit to power in harness between ECM and secondary air combination valve relay 1 connector.	Repair the poor contact of ECM connector.

BH:DTC P0416 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “B” CIRCUIT OPEN

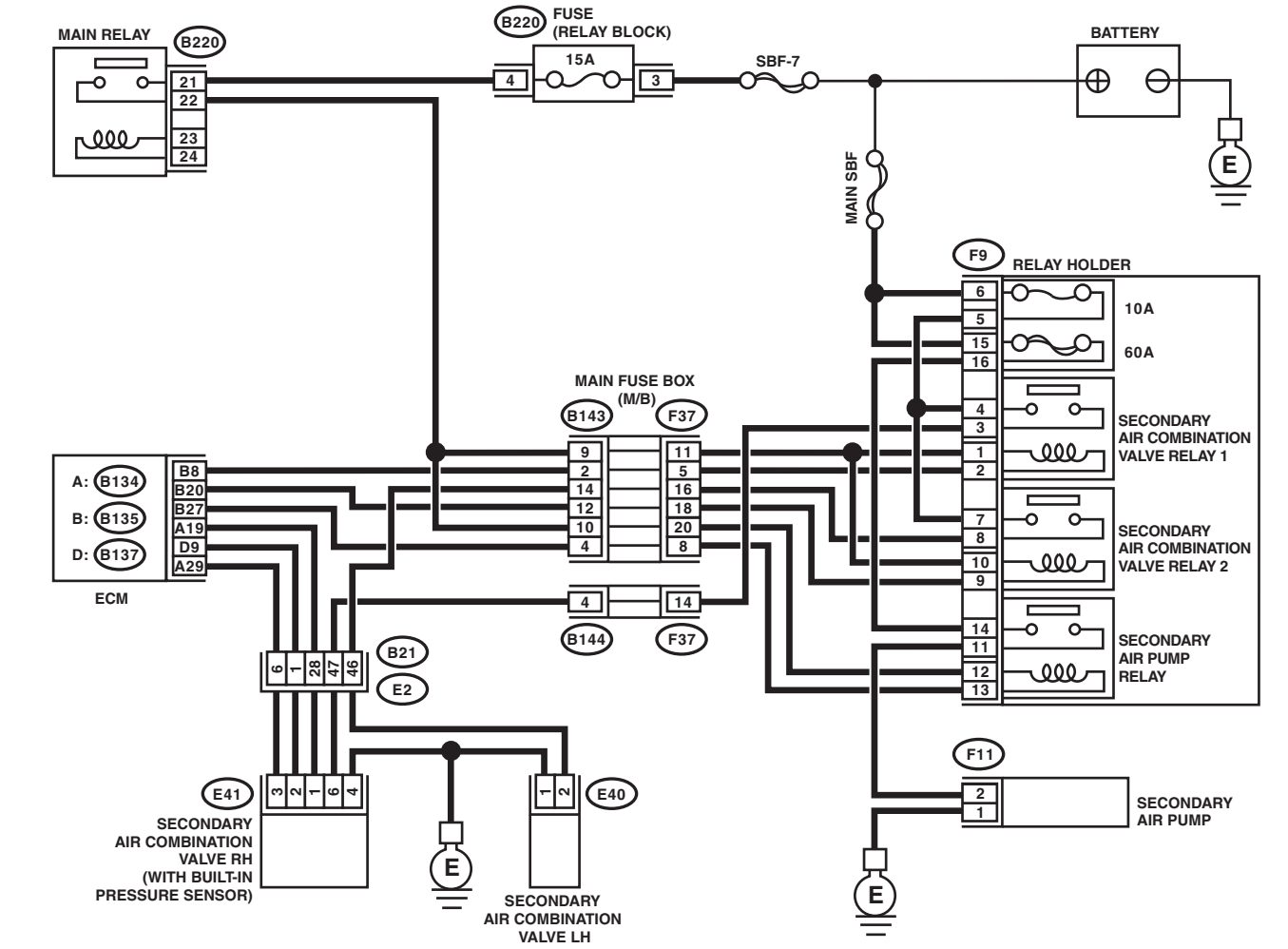
DTC DETECTING CONDITION:

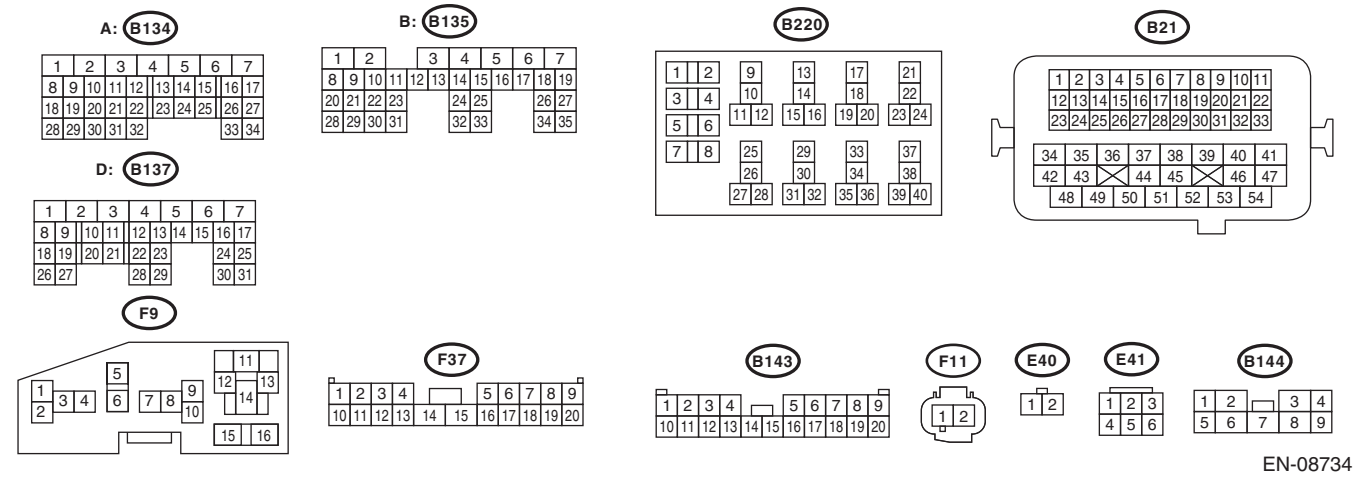
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-134, DTC P0416 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “B” CIRCUIT OPEN , Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





EN-08734

	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBINATION VALVE RELAY 2 CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Remove the secondary air combination valve relay 2. 4) Measure the resistance of harness between ECM and secondary air combination valve relay 2 connector. ***Connector & terminal*** ***(B135) No. 20 — (F9) No. 9:***	Is the resistance less than 1 Ω?	Go to step **2**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and secondary air combination valve relay 2 connector • Poor contact of coupling connector
2	**CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBINATION VALVE RELAY 2 CONNECTOR.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 20 — Chassis ground:***	Is the resistance 1 MΩ or more?	Even if DTC is detected, 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, temporary open or short circuit of harness may be the cause.	Repair the short circuit to ground in harness between ECM and secondary air combination valve relay 2 connector.

BI: DTC P0417 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “B” CIRCUIT SHORTED

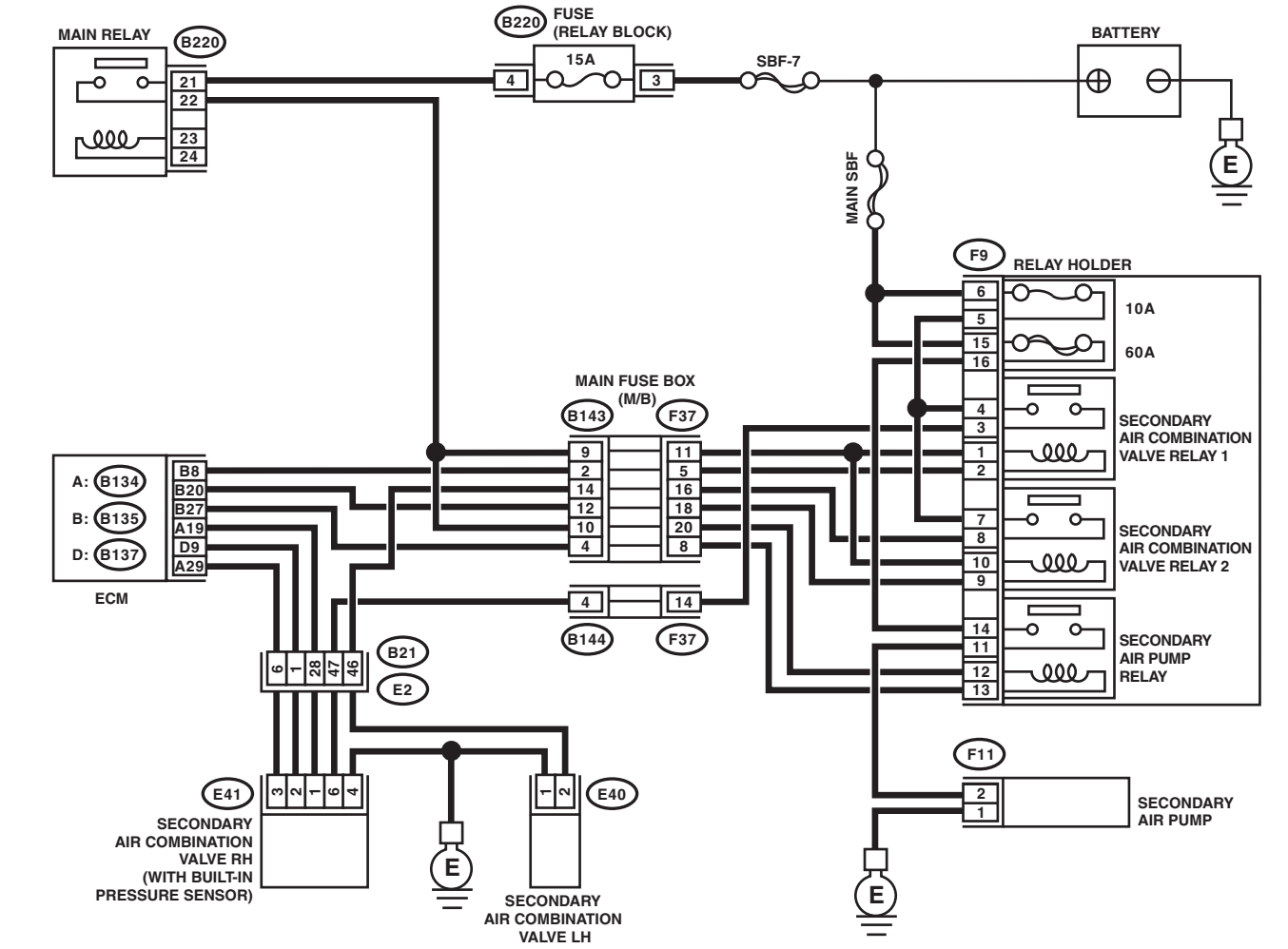
DTC DETECTING CONDITION:

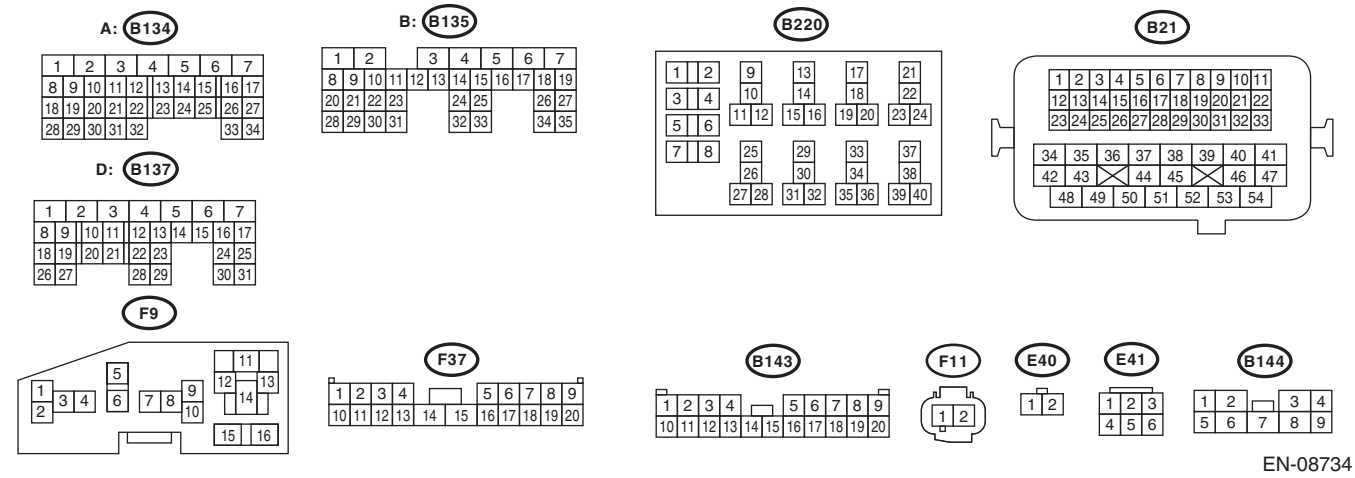
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-134, DTC P0417 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “B” CIRCUIT SHORTED , Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





EN-08734

	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBINATION VALVE RELAY 2 CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Remove the secondary air combination valve relay 2. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 20 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the short circuit to power in harness between ECM and secondary air combination valve relay 2 connector.	Repair the poor contact of ECM connector.

BJ:DTC P0418 SECONDARY AIR INJECTION SYSTEM CONTROL “A” CIRCUIT

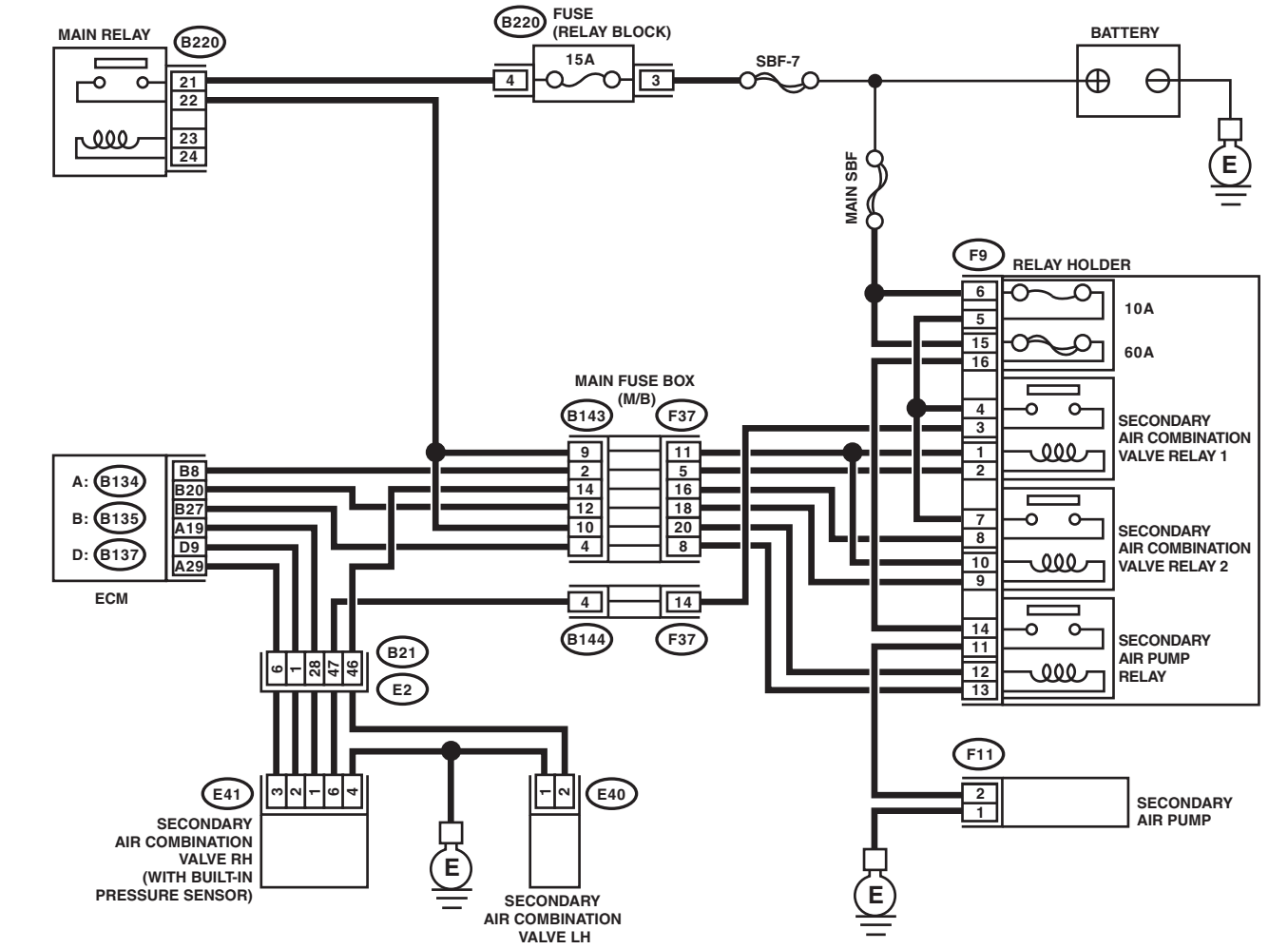
DTC DETECTING CONDITION:

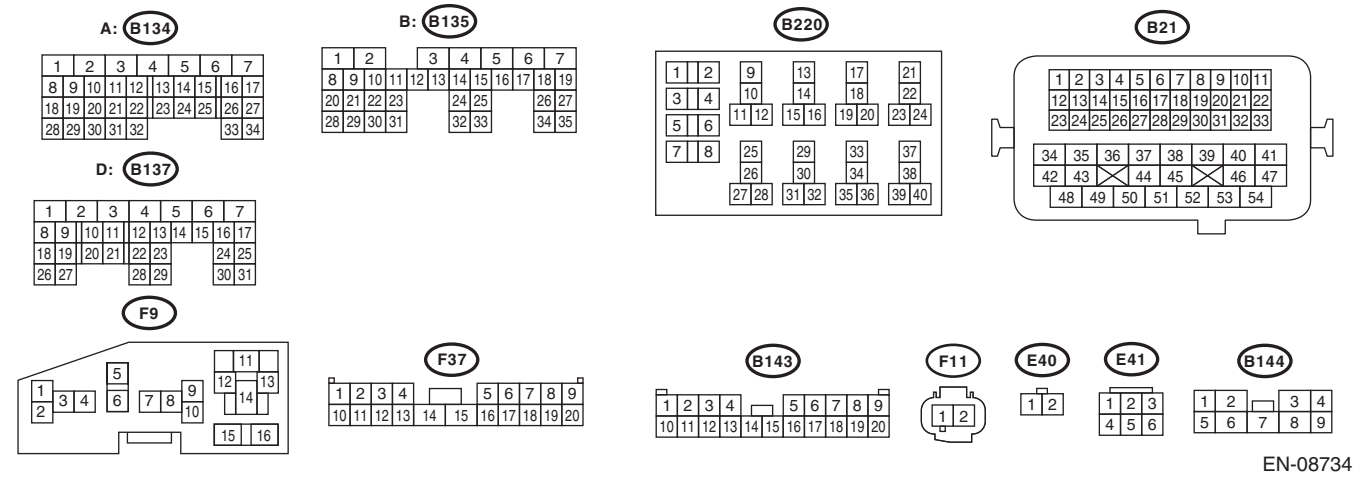
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-135, DTC P0418 SECONDARY AIR INJECTION SYSTEM CONTROL “A” CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





EN-08734

	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND SECONDARY AIR PUMP RELAY CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Remove the secondary air pump relay. 4) Measure the resistance of harness between ECM and secondary air pump relay connector. ***Connector & terminal*** ***(B135) No. 27 — (F9) No. 13:***	Is the resistance less than 1 Ω?	Go to step **2**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and secondary air pump relay connector • Poor contact of coupling connector
2	**CHECK HARNESS BETWEEN ECM AND SECONDARY AIR PUMP RELAY CONNECTOR.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 27 — Chassis ground:***	Is the resistance 1 MΩ or more?	Even if DTC is detected, 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, temporary open or short circuit of harness may be the cause.	Repair the short circuit to ground in harness between ECM and secondary air pump relay connector.

BK:DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1)

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-136, DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

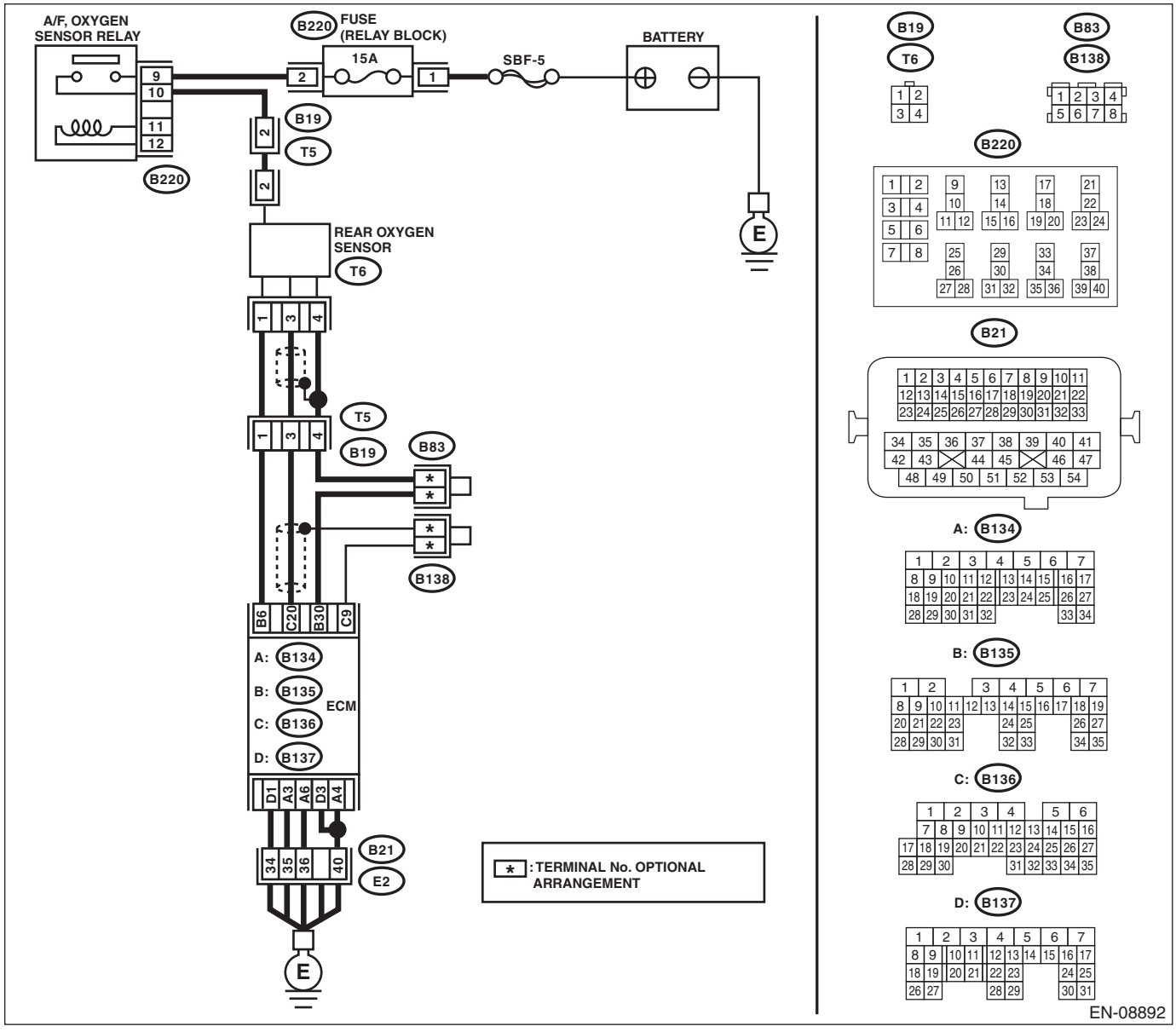
TROUBLE SYMPTOM:

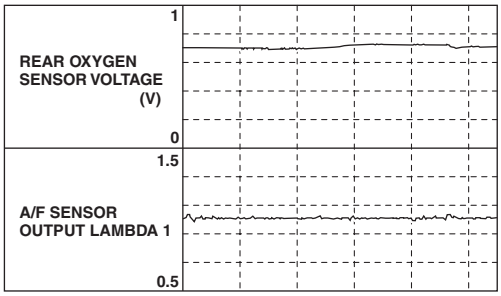
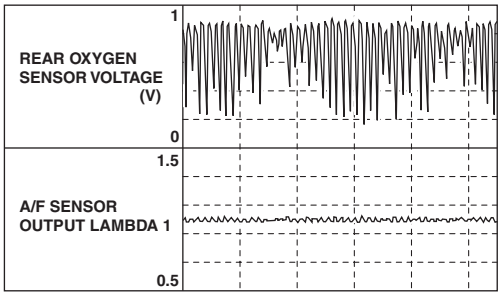
- Engine stalls.
- Idle mixture is out of specifications.

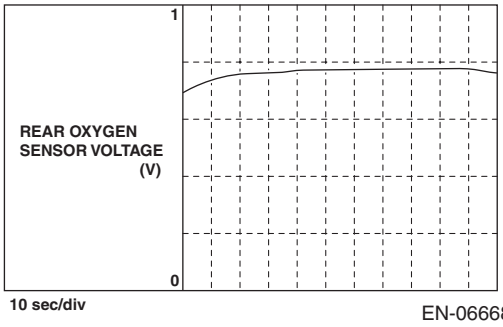
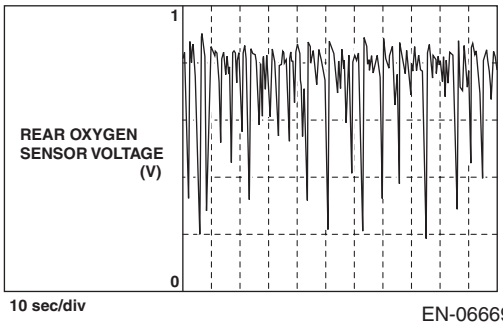
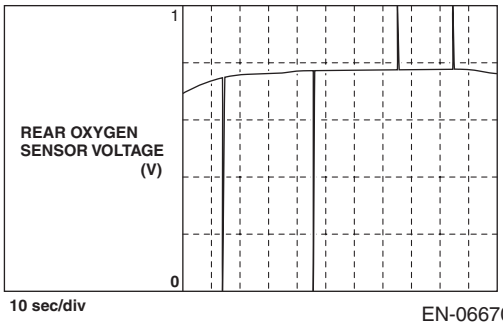
CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK EXHAUST SYSTEM.** Check for gas leaks or air suction caused by loose or dislocated nuts and bolts, and open hole at exhaust pipes. NOTE: Check the following positions. • Between cylinder head and front exhaust pipe • Between front exhaust pipe and front catalytic converter • Between front catalytic converter and rear catalytic converter • Loose or improperly attached 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(H4DOTC)-2, General Description.>	Go to step **2**.
2	**CHECK WAVEFORM DATA ON THE SUBARU SELECT MONITOR (WHILE DRIVING).** 1) Drive at a constant speed between 80 — 112 km/h (50 — 70 MPH). 2) After 5 minutes have elapsed in the condition of step 1), use the Subaru Select Monitor while still driving to read the waveform data. • At normal condition  EN-06666 • At abnormal condition (numerous inversion)  EN-06667	Is a normal waveform displayed?	Even if DTC is detected, 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, temporary open or short circuit of harness may be the cause.	Go to step **3**.

	Step	Check	Yes	No
3	**CHECK WAVEFORM DATA ON THE SUBARU SELECT MONITOR (WHILE IDLING).** 1) Run the engine at idle. 2) In the condition of step 1), use the Subaru Select Monitor to read the waveform data. • At normal condition  EN-06668 • At abnormal condition 1 (numerous inversion)  EN-06669 • At abnormal condition 2 (noise input)  EN-06670	Is a normal waveform displayed?	Go to step **4**.	• The waveform is displayed at abnormal condition 1: Go to step **4**. • The waveform is displayed at abnormal condition 2: Go to step **5**.
4	**CHECK CATALYTIC CONVERTER.**	Is the catalytic converter damaged?	Replace the catalytic converter. <Ref. to EC(H4DOTC)-5, Front Catalytic Converter.>	Go to step **5**.
5	**CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Has water entered the connector?	Completely remove any water inside.	Go to step **6**.

	Step	Check	Yes	No
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*** ***(B136) No. 20 — (T6) No. 3:*** ***(B135) No. 30 — (T6) No. 4:***	Is the resistance less than 1 Ω?	Go to step **7**.	Repair the harness and connector. NOTE: Repair the following locations. • Open circuit in harness between ECM and rear oxygen sensor connector • Poor contact of coupling connector
7	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between rear oxygen sensor connector and chassis ground. ***Connector & terminal*** ***(T6) No. 3 (+) — Chassis ground (–):***	Is the voltage 0.2 — 0.5 V?	Go to step **8**.	Repair the harness and connector. NOTE: Repair the following locations. • Open circuit in harness between ECM and rear oxygen sensor connector • Poor contact of ECM connector • Poor contact of coupling connector
8	**CHECK REAR OXYGEN SENSOR SHIELD.** 1) Turn the ignition switch to OFF. 2) Expose the rear oxygen sensor connector body side harness sensor shield. 3) Measure the resistance between sensor shield and chassis ground.	Is the resistance less than 1 Ω?	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-55, Rear Oxygen Sensor.>	Repair the open circuit of rear oxygen sensor harness.

BL:DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK)

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-138, 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 servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**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 has caught while tightening.	Is the fuel filler cap tightened securely?	Go to step **2**.	Tighten fuel filler cap securely.
2	**CHECK FUEL FILLER CAP.**	Is the fuel filler cap genuine?	Go to step **3**.	Replace with a genuine fuel filler cap.
3	**CHECK FUEL FILLER PIPE GASKET.**	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)-74, Fuel Filler Pipe.>	Go to step **4**.
4	**CHECK DRAIN VALVE.** 1) Connect the delivery (test) mode connector. 2) Turn the ignition switch to ON. 3) Operate the drain valve using the Subaru Select Monitor. NOTE: The drain valve can be operated using Subaru Select Monitor. For the procedures, refer to “Compulsory Valve Operation Check Mode”. <Ref. to EN(H4DOTC)(diag)-57, Compulsory Valve Operation Check Mode.>	Does the drain valve operate?	Go to step **5**.	Replace the drain valve. <Ref. to EC(H4DOTC)-23, Drain Valve.>
5	**CHECK PURGE CONTROL SOLENOID VALVE.** Operate the purge control solenoid valve using the Subaru Select Monitor. NOTE: Purge control solenoid valve operation can be executed using Subaru Select Monitor. For the procedures, refer to “Compulsory Valve Operation Check Mode”. <Ref. to EN(H4DOTC)(diag)-57, Compulsory Valve Operation Check Mode.>	Does the purge control solenoid valve operate?	Go to step **6**.	Replace the purge control solenoid valve. <Ref. to EC(H4DOTC)-11, Purge Control Solenoid Valve.>

	Step	Check	Yes	No
6	**CHECK PRESSURE CONTROL SOLENOID VALVE.** Operate the pressure control solenoid valve using the Subaru Select Monitor. NOTE: The pressure control solenoid valve operation can be executed using the Subaru Select Monitor. For the procedures, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-57, Compulsory Valve Operation Check Mode.>	Does the pressure control solenoid valve operate?	Go to step **7**.	Replace the pressure control solenoid valve. <Ref. to EC(H4DOTC)-20, Pressure Control Solenoid Valve.>
7	**CHECK EVAPORATIVE EMISSION CONTROL SYSTEM LINE.** 1) Turn the ignition switch to OFF. 2) Check the delivery (test) mode connector is disconnected.	Is there any hole of more than 1.0 mm (0.04 in) dia. on evaporation line?	Repair or replace the evaporation line. <Ref. to FU(H4DOTC)-88, Fuel Delivery, Return and Evaporation Lines.>	Go to step **8**.
8	**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 **9**.
9	**CHECK FUEL TANK.** Remove the fuel tank. <Ref. to FU(H4DOTC)-67, 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)-67, Fuel Tank.>	Go to step **10**.
10	**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 disconnection, bend, misconnection of hoses or pipes in evaporative emission control system?	Repair or replace the hoses or pipes.	Repair the poor contact of ECM connector.

BM:DTC P0447 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN

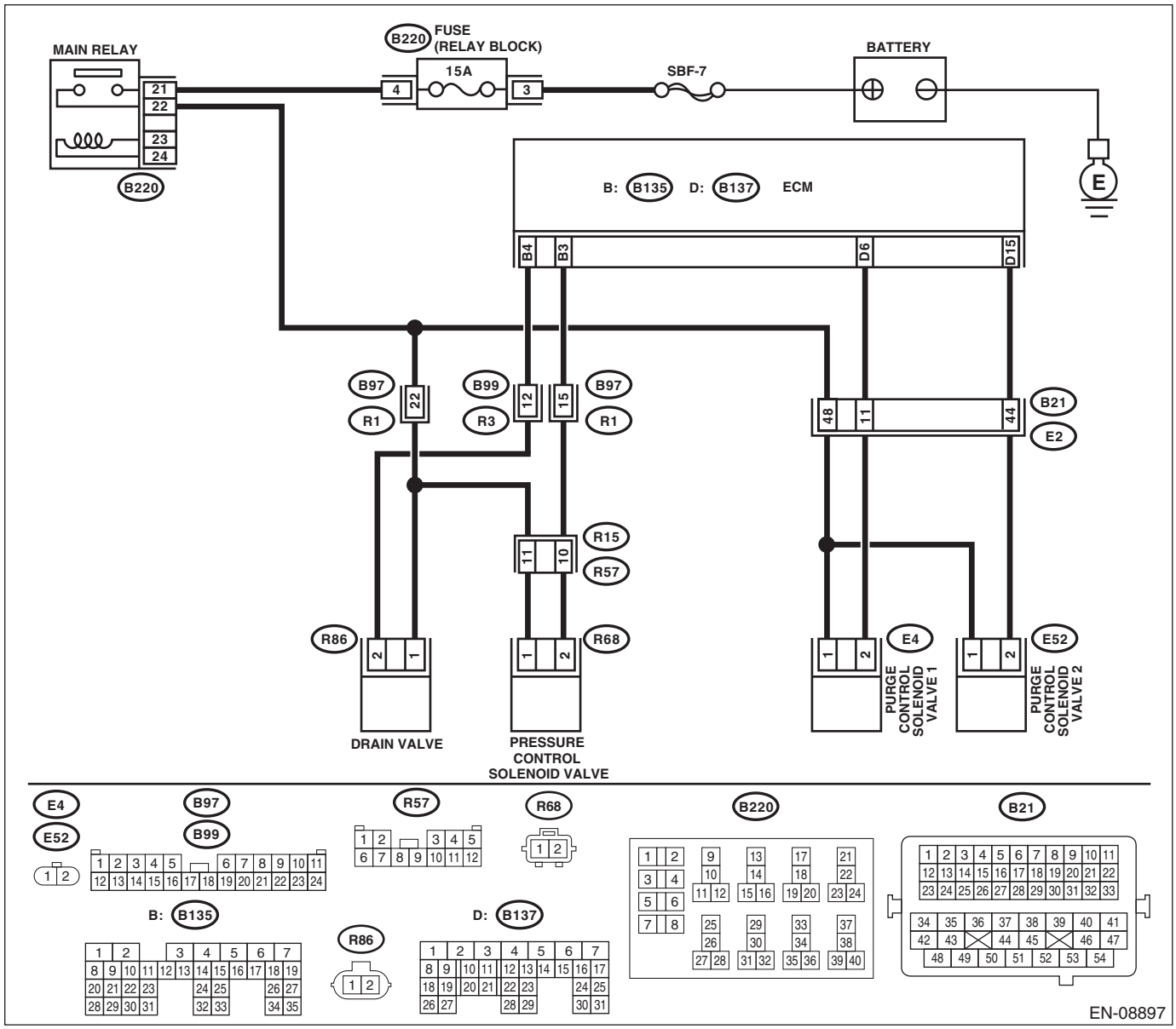
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-155, DTC P0447 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	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*** ***(B135) No. 4 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **2**.	Go to step **3**.
2	**CHECK FOR POOR CONTACT.** Check for poor contact of ECM connector.	Is there poor contact of ECM connector?	Repair the poor contact of ECM connector.	Even if DTC is detected, 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 open or short circuit of harness or temporary poor contact of connector may be the cause.
3	**CHECK POWER SUPPLY TO DRAIN VALVE.** Measure the voltage between drain valve and chassis ground. ***Connector & terminal*** ***(R86) No. 1 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **4**.	Repair the power supply circuit.
4	**CHECK HARNESS BETWEEN ECM AND DRAIN VALVE CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM and drain valve. 3) Measure the resistance between the drain valve connector and chassis ground. ***Connector & terminal*** ***(R86) No. 2 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **5**.	Repair the ground short circuit of harness between ECM and drain valve connector.
5	**CHECK HARNESS BETWEEN ECM AND DRAIN VALVE CONNECTOR.** Measure the resistance of harness between ECM and drain valve connector. ***Connector & terminal*** ***(B135) No. 4 — (R86) No. 2:***	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 of harness between ECM and drain valve connector • Poor contact of coupling connector
6	**CHECK DRAIN VALVE.** Measure the resistance between drain valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 10 — 100 Ω?	Repair the poor contact of drain valve connector.	Replace the drain valve. <Ref. to EC(H4DOTC)-23, Drain Valve.>

BN:DTC P0448 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED

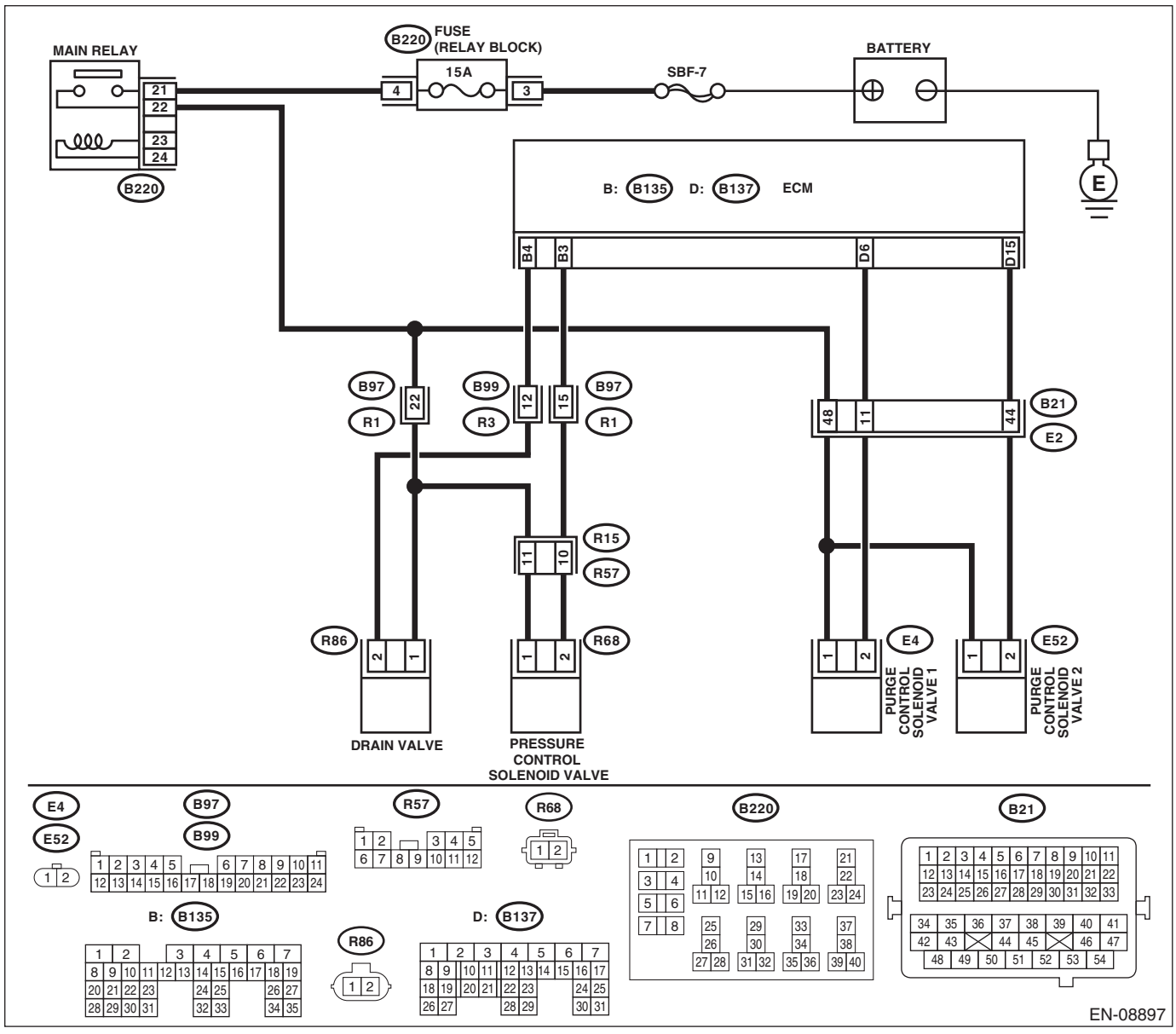
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-157, DTC P0448 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND DRAIN VALVE CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM and drain valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 4 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the short circuit to power in the harness between ECM and drain valve connector.	Go to step **2**.
2	**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)-23, Drain Valve.>	Repair the poor contact of ECM connector.

BO:DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-159, DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**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 **2**.	Tighten fuel filler cap securely.
2	**CHECK PRESSURE VACUUM LINE.** NOTE: Check the following items. • Disconnection, leakage and clogging of the vacuum hoses and pipes between fuel tank pressure sensor and fuel tank • Disconnection, leakage and clogging of 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(H4DOTC)-18, Fuel Tank Pressure Sensor.>

BP:DTC P0452 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT

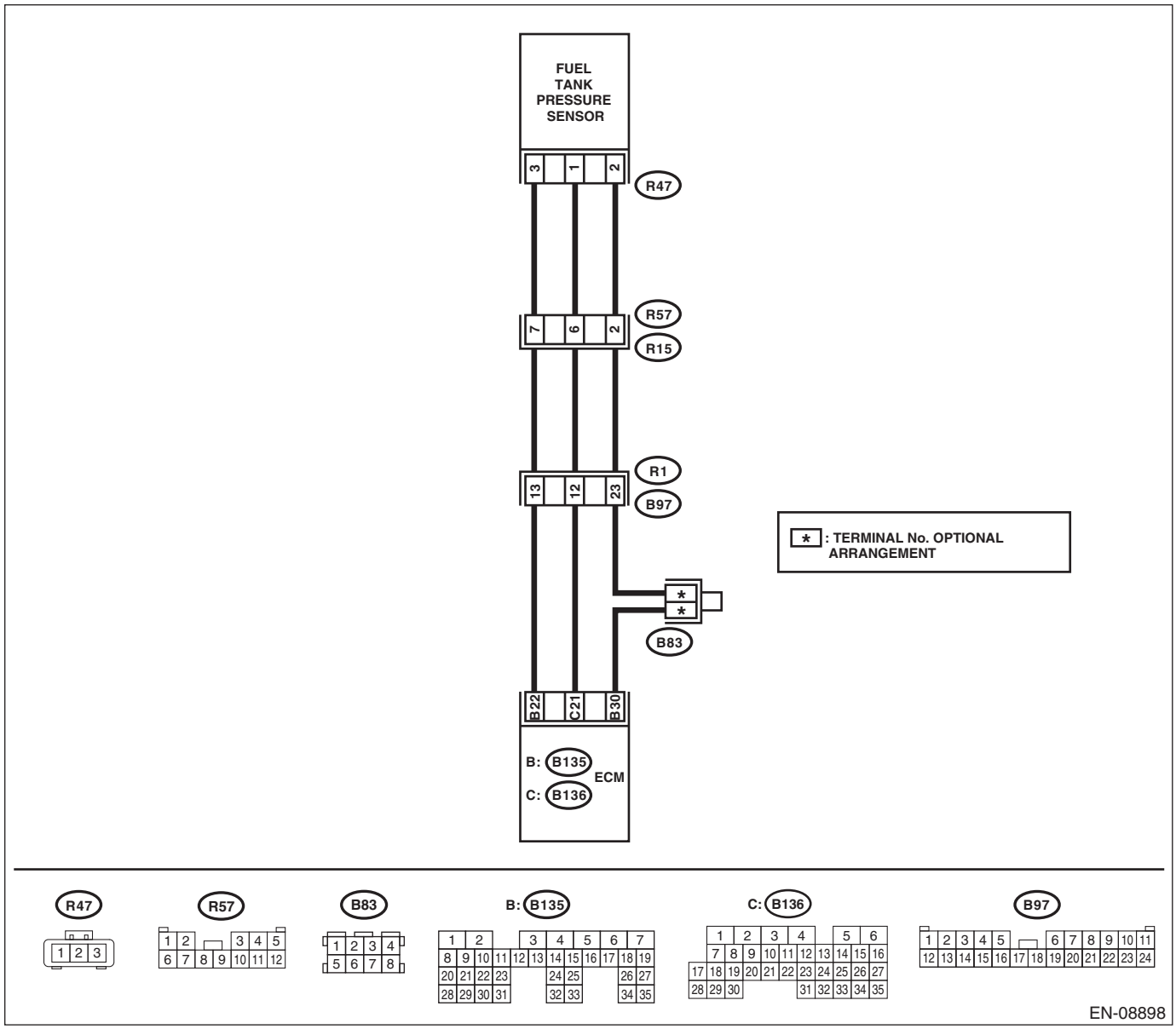
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-161, DTC P0452 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Turn the ignition switch to ON. 2) Read the data of fuel tank pressure sensor signal 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)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the measured value less than –7.45 kPa (–55.89 mmHg, –2.2003 inHg)?	Go to step **2**.	Even if DTC is detected, 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, temporary open or short circuit of harness may be the cause.
2	**CHECK FUEL TANK PRESSURE SENSOR POWER SUPPLY.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the fuel tank pressure sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between the fuel tank pressure sensor connector and chassis ground. ***Connector & terminal*** ***(R47) No. 3 (+) — Chassis ground (–):***	Is the voltage 4.5 V or more?	Go to step **3**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and fuel tank pressure sensor connector • Poor contact of ECM connector • Poor contact of coupling connector
3	**CHECK HARNESS BETWEEN ECM AND FUEL TANK PRESSURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between the ECM and fuel tank pressure sensor connector. ***Connector & terminal*** ***(B136) No. 21 — (R47) 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 of harness between ECM and fuel tank pressure sensor connector • Poor contact of coupling connector
4	**CHECK HARNESS BETWEEN ECM AND FUEL TANK PRESSURE SENSOR CONNECTOR.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 21 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **5**.	Repair the ground short circuit of harness between ECM and fuel tank pressure sensor connector.
5	**CHECK FOR POOR CONTACT.** Check for poor contact between the ECM and fuel tank pressure sensor connector.	Is there poor contact of the ECM or fuel tank pressure sensor connector?	Repair the poor contact of the ECM or fuel tank pressure sensor connector.	Replace the fuel tank pressure sensor. <Ref. to EC(H4DOTC)-18, Fuel Tank Pressure Sensor.>

BQ:DTC P0453 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT

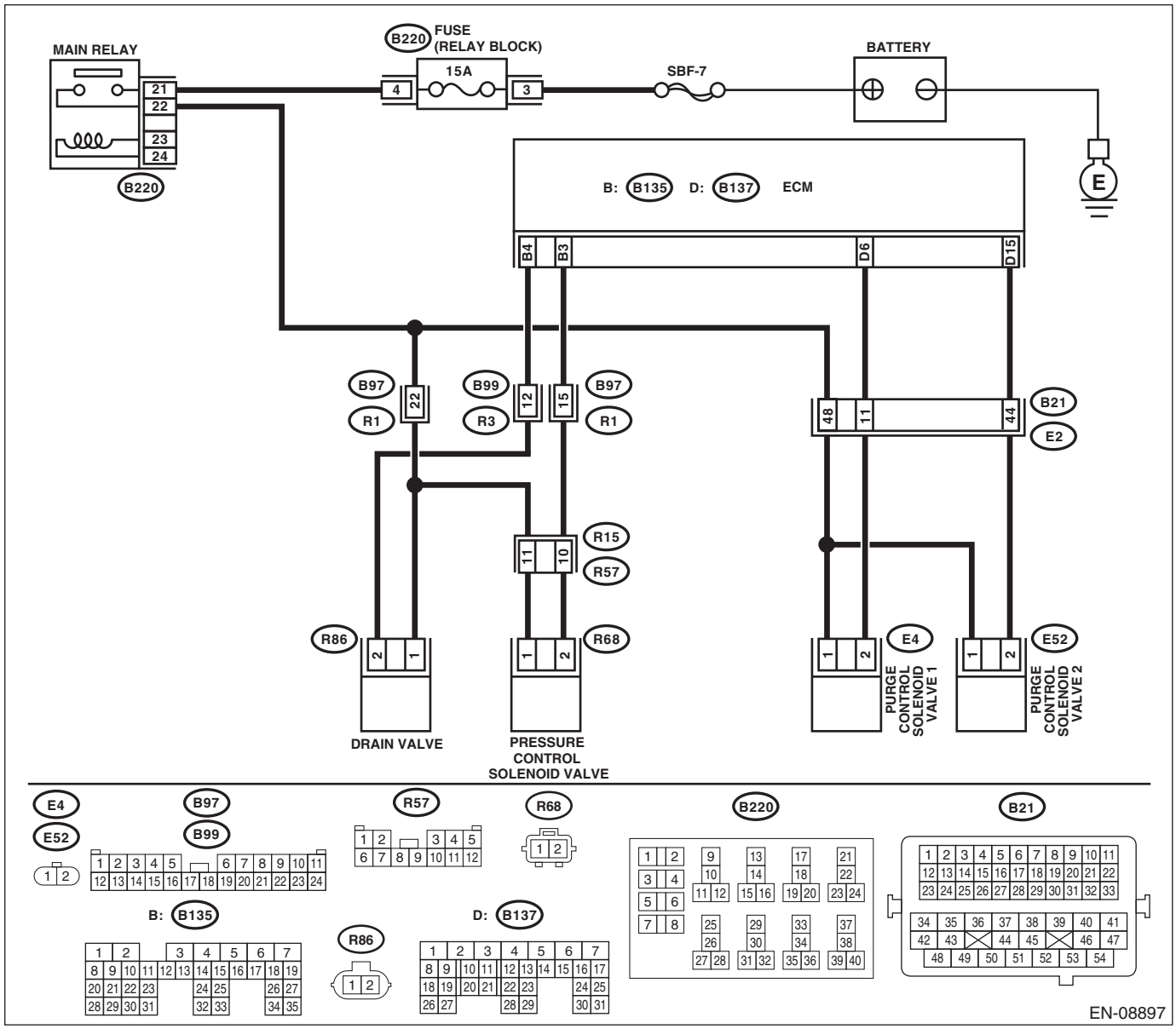
DTC DETECTING CONDITION:

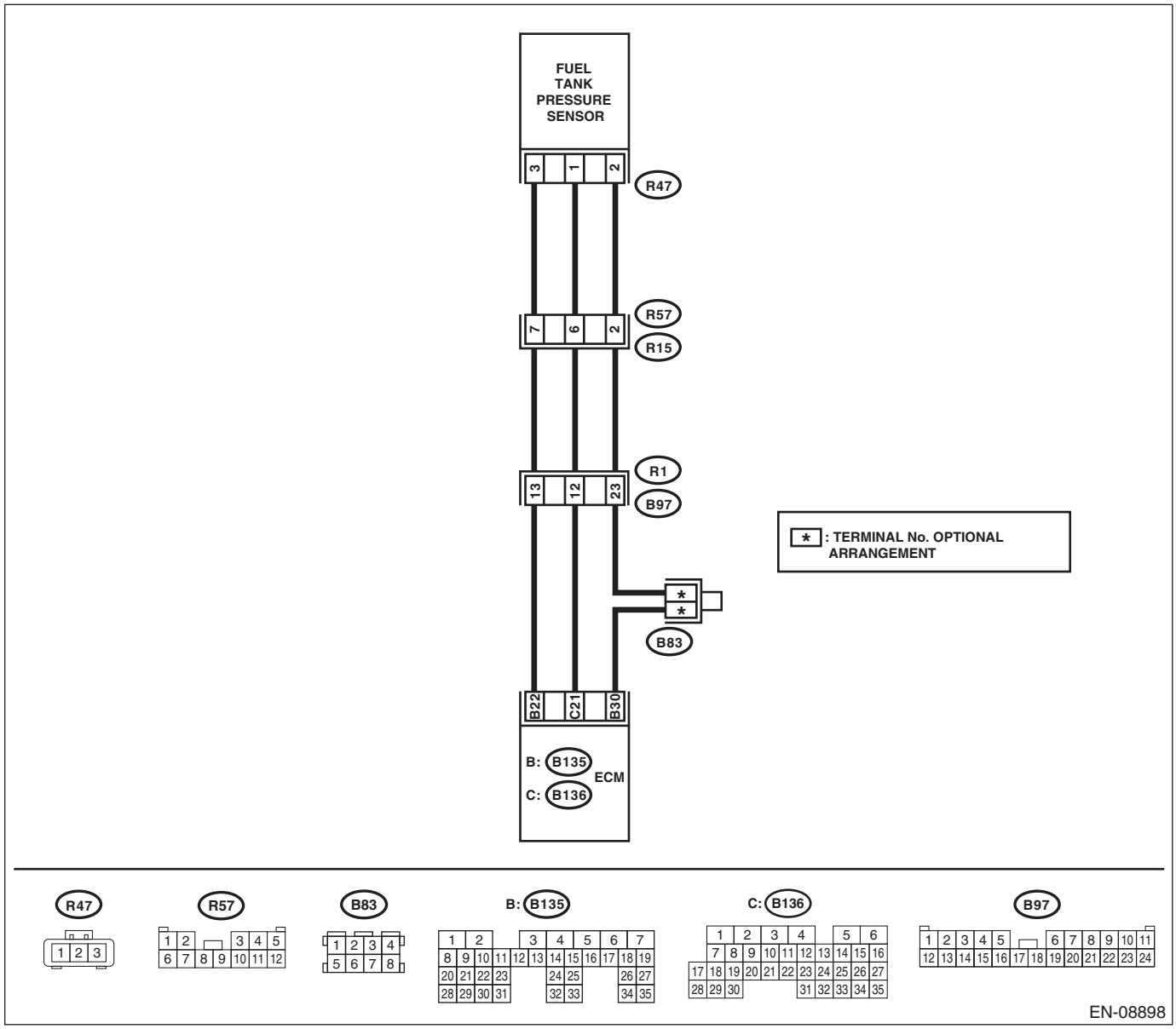
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-163, DTC P0453 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





Step		Check	Yes	No
1	**CHECK PRESSURE CONTROL SOLENOID VALVE AND EVAPORATION HOSE.** Check the pressure control solenoid valve and the evaporation hose. <Ref. to EC(H4DOTC)-20, INSPECTION, Pressure Control Solenoid Valve.>	Is the pressure control solenoid valve and the evaporation hose normal?	Go to step **2**.	Replace the pressure control solenoid valve or the evaporation hose. <Ref. to EC(H4DOTC)-20, Pressure Control Solenoid Valve.>
2	**CHECK HARNESS BETWEEN ECM AND PRESSURE CONTROL SOLENOID VALVE CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the ECM and pressure control solenoid valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 3 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the short circuit to power in the harness between ECM and pressure control solenoid valve connector.	Go to step **3**.

	Step	Check	Yes	No
3	**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 20 — 30 Ω?	Go to step **4**.	Replace the pressure control solenoid valve. <Ref. to EC(H4DOTC)-20, Pressure Control Solenoid Valve.>
4	**CHECK FOR POOR CONTACT.** Check for poor contact of ECM connector.	Is there poor contact of ECM connector?	Repair the poor contact of ECM connector.	Go to step **5**.
5	**CHECK CURRENT DATA.** 1) Turn the ignition switch to ON. 2) Read the data of fuel tank pressure sensor signal 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)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the measured value 7.95 kPa (59.6 mmHg, 2.347 inHg) or more?	Go to step **6**.	Even if DTC is detected, 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, temporary open or short circuit of harness may be the cause.
6	**CHECK HARNESS BETWEEN ECM AND FUEL TANK PRESSURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the fuel tank pressure sensor. 3) Turn the ignition switch to ON. 4) Read the data of fuel tank pressure sensor signal 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)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the measured value 7.95 kPa (59.6 mmHg, 2.347 inHg) or more?	Repair the short circuit to power in the harness between ECM and fuel tank pressure sensor connector.	Go to step **7**.
7	**CHECK HARNESS BETWEEN ECM AND FUEL TANK PRESSURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between fuel tank pressure sensor connector and engine ground. ***Connector & terminal*** ***(R47) No. 2 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **8**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and fuel tank pressure sensor connector • Poor contact of ECM connector • Poor contact of coupling connector

	Step	Check	Yes	No
8	**CHECK FOR POOR CONTACT.** Check for poor contact of the fuel tank pressure sensor connector.	Is there poor contact of fuel tank pressure sensor connector?	Repair the poor contact of fuel tank pressure sensor connector.	Replace the fuel tank pressure sensor. <Ref. to EC(H4DOTC)-18, Fuel Tank Pressure Sensor.>

BR:DTC P0456 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK)

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-165, 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 servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**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 has caught while tightening.	Is the fuel filler cap tightened securely?	Go to step **2**.	Tighten fuel filler cap securely.
2	**CHECK FUEL FILLER CAP.**	Is the fuel filler cap genuine?	Go to step **3**.	Replace with a genuine fuel filler cap.
3	**CHECK FUEL FILLER PIPE GASKET.**	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)-74, Fuel Filler Pipe.>	Go to step **4**.
4	**CHECK DRAIN VALVE.** 1) Connect the delivery (test) mode connector. 2) Turn the ignition switch to ON. 3) Operate the drain valve using the Subaru Select Monitor. NOTE: Drain valve can be operated using the Subaru Select Monitor. For the procedures, refer to “Compulsory Valve Operation Check Mode”. <Ref. to EN(H4DOTC)(diag)-57, Compulsory Valve Operation Check Mode.>	Does the drain valve operate?	Go to step **5**.	Replace the drain valve. <Ref. to EC(H4DOTC)-23, Drain Valve.>
5	**CHECK PURGE CONTROL SOLENOID VALVE.** Operate the purge control solenoid valve using the Subaru Select Monitor. NOTE: Purge control solenoid valve operation can be executed using Subaru Select Monitor. For the procedures, refer to “Compulsory Valve Operation Check Mode”. <Ref. to EN(H4DOTC)(diag)-57, Compulsory Valve Operation Check Mode.>	Does the purge control solenoid valve operate?	Go to step **6**.	Replace the purge control solenoid valve. <Ref. to EC(H4DOTC)-11, Purge Control Solenoid Valve.>

	Step	Check	Yes	No
6	**CHECK PRESSURE CONTROL SOLENOID VALVE.** Operate the pressure control solenoid valve using the Subaru Select Monitor. NOTE: The pressure control solenoid valve operation can be executed using the Subaru Select Monitor. For the procedures, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-57, Compulsory Valve Operation Check Mode.>	Does the pressure control solenoid valve operate?	Go to step **7**.	Replace the pressure control solenoid valve. <Ref. to EC(H4DOTC)-20, Pressure Control Solenoid Valve.>
7	**CHECK EVAPORATIVE EMISSION CONTROL SYSTEM LINE.** 1) Turn the ignition switch to OFF. 2) Check the delivery (test) mode connector is disconnected.	Is there any hole of more than 0.5 mm (0.020 in) dia. on evaporation line?	Repair or replace the evaporation line. <Ref. to FU(H4DOTC)-88, Fuel Delivery, Return and Evaporation Lines.>	Go to step **8**.
8	**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 **9**.
9	**CHECK FUEL TANK.** Remove the fuel tank. <Ref. to FU(H4DOTC)-67, 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)-67, Fuel Tank.>	Go to step **10**.
10	**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 disconnection, bend, misconnection of hoses or pipes in evaporative emission control system?	Repair or replace the hoses or pipes.	Repair the poor contact of ECM connector.

BS:DTC P0457 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF)

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-165, 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 loose or lost

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**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 has caught while tightening.	Is the fuel filler cap tightened securely?	Go to step **2**.	Tighten fuel filler cap securely.
2	**CHECK FUEL FILLER CAP.**	Is the fuel filler cap genuine?	Go to step **3**.	Replace with a genuine fuel filler cap.
3	**CHECK FUEL FILLER PIPE GASKET.**	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)-74, Fuel Filler Pipe.>	Go to step **4**.
4	**CHECK DRAIN VALVE.** 1) Connect the delivery (test) mode connector. 2) Turn the ignition switch to ON. 3) Operate the drain valve using the Subaru Select Monitor. NOTE: Drain valve can be operated using the Subaru Select Monitor. For the procedures, refer to “Compulsory Valve Operation Check Mode”. <Ref. to EN(H4DOTC)(diag)-57, Compulsory Valve Operation Check Mode.>	Does the drain valve operate?	Go to step **5**.	Replace the drain valve. <Ref. to EC(H4DOTC)-23, Drain Valve.>
5	**CHECK PURGE CONTROL SOLENOID VALVE.** Operate the purge control solenoid valve using the Subaru Select Monitor. NOTE: Purge control solenoid valve operation can be executed using Subaru Select Monitor. For the procedures, refer to “Compulsory Valve Operation Check Mode”. <Ref. to EN(H4DOTC)(diag)-57, Compulsory Valve Operation Check Mode.>	Does the purge control solenoid valve operate?	Go to step **6**.	Replace the purge control solenoid valve. <Ref. to EC(H4DOTC)-11, Purge Control Solenoid Valve.>

	Step	Check	Yes	No
6	**CHECK PRESSURE CONTROL SOLENOID VALVE.** Operate the pressure control solenoid valve using the Subaru Select Monitor. NOTE: The pressure control solenoid valve operation can be executed using the Subaru Select Monitor. For the procedures, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-57, Compulsory Valve Operation Check Mode.>	Does the pressure control solenoid valve operate?	Go to step **7**.	Replace the pressure control solenoid valve. <Ref. to EC(H4DOTC)-20, Pressure Control Solenoid Valve.>
7	**CHECK EVAPORATIVE EMISSION CONTROL SYSTEM LINE.** 1) Turn the ignition switch to OFF. 2) Check the delivery (test) mode connector is disconnected.	Is there any disconnection, damage or clogging on the evaporation line?	Repair or replace the evaporation line. <Ref. to FU(H4DOTC)-88, Fuel Delivery, Return and Evaporation Lines.>	Go to step **8**.
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)-67, Fuel Tank.>	Is the fuel tank damaged?	Repair or replace the fuel tank. <Ref. to FU(H4DOTC)-67, Fuel Tank.>	Go to step **10**.
10	**CHECK ANY OTHER MECHANICAL TROUBLE IN EVAPORATIVE EMISSION CONTROL SYSTEM.**	Are there holes, cracks, clogging, or disconnection, misconnection of hoses or pipes in evaporative emission control system?	Repair or replace the hoses or pipes.	Repair the poor contact of ECM connector.

BT:DTC P0458 EVAPORATIVE EMISSION SYSTEM PURGE CONTROL VALVE CIRCUIT LOW

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-166, DTC P0458 EVAPORATIVE EMISSION SYSTEM PURGE CONTROL VALVE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

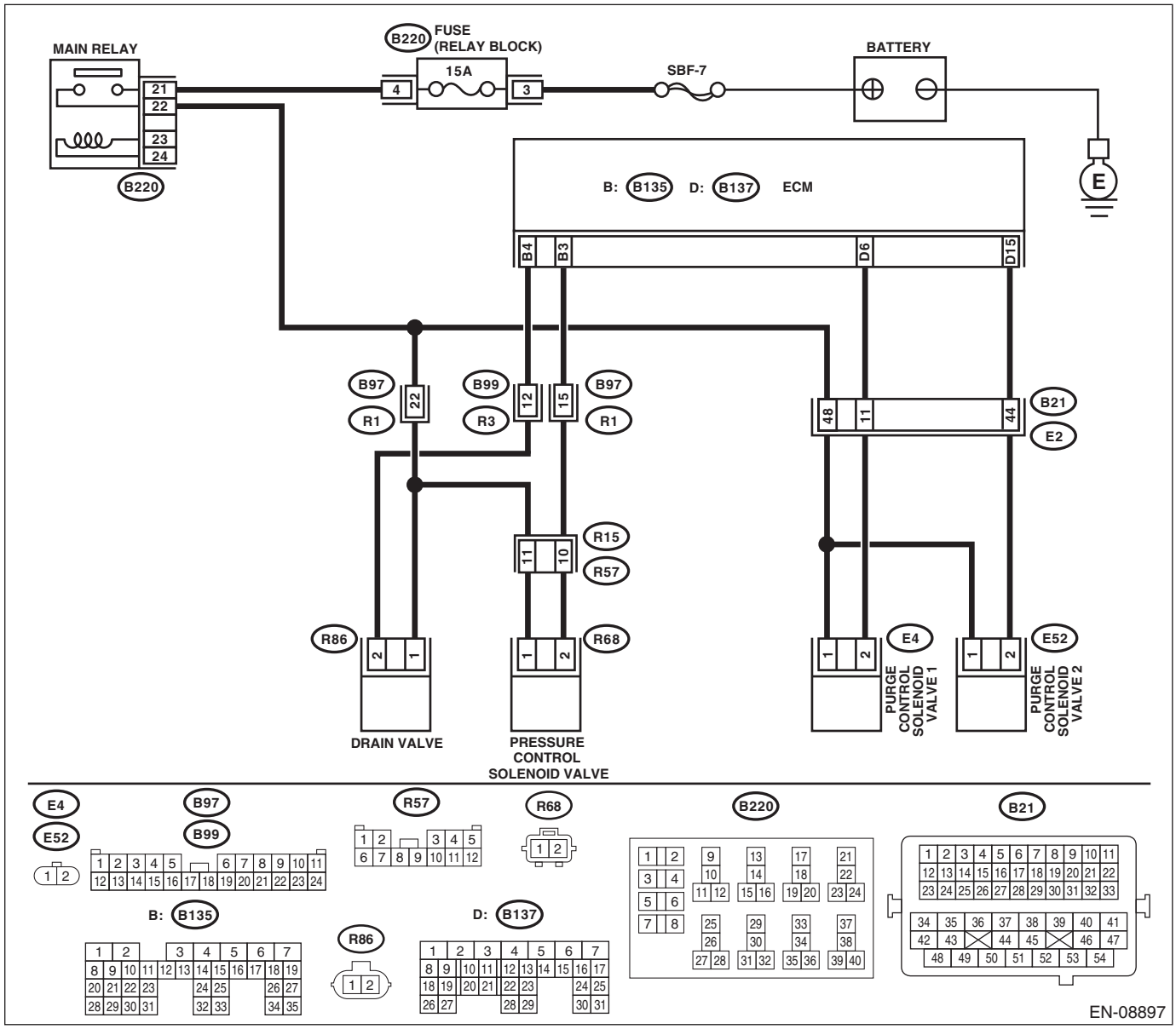
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	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. 6 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **2**.	Go to step **3**.
2	**CHECK FOR POOR CONTACT.** Check for poor contact of ECM connector.	Is there poor contact of ECM connector?	Repair the poor contact of ECM connector.	Even if DTC is detected, 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 open or short circuit of harness or temporary poor contact of connector may be the cause.
3	**CHECK POWER SUPPLY TO PURGE CONTROL SOLENOID VALVE CONNECTOR.** Measure the voltage between purge control solenoid valve connector and engine ground. ***Connector & terminal*** ***(E4) No. 1 (+) — Engine ground (–):***	Is the voltage 10 V or more?	Go to step **4**.	Repair the power supply circuit.
4	**CHECK HARNESS BETWEEN ECM AND PURGE CONTROL SOLENOID VALVE CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and purge control solenoid valve. 3) Measure the resistance between the purge control solenoid valve connector and engine ground. ***Connector & terminal*** ***(E4) No. 2 — Engine ground:***	Is the resistance 1 MΩ or more?	Go to step **5**.	Repair the ground short circuit of harness between ECM and purge control solenoid valve connector.
5	**CHECK HARNESS BETWEEN ECM AND PURGE CONTROL SOLENOID VALVE CONNECTOR.** Measure the resistance of harness between ECM and purge control solenoid valve connector. ***Connector & terminal*** ***(B137) No. 6 — (E4) No. 2:***	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 purge control solenoid valve connector • Poor contact of coupling connector
6	**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 10 — 100 Ω?	Repair the poor contact of purge control solenoid valve connector.	Replace the purge control solenoid valve. <Ref. to EC(H4DOTC)-11, Purge Control Solenoid Valve.>

BU:DTC P0459 EVAPORATIVE EMISSION SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-168, DTC P0459 EVAPORATIVE EMISSION SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

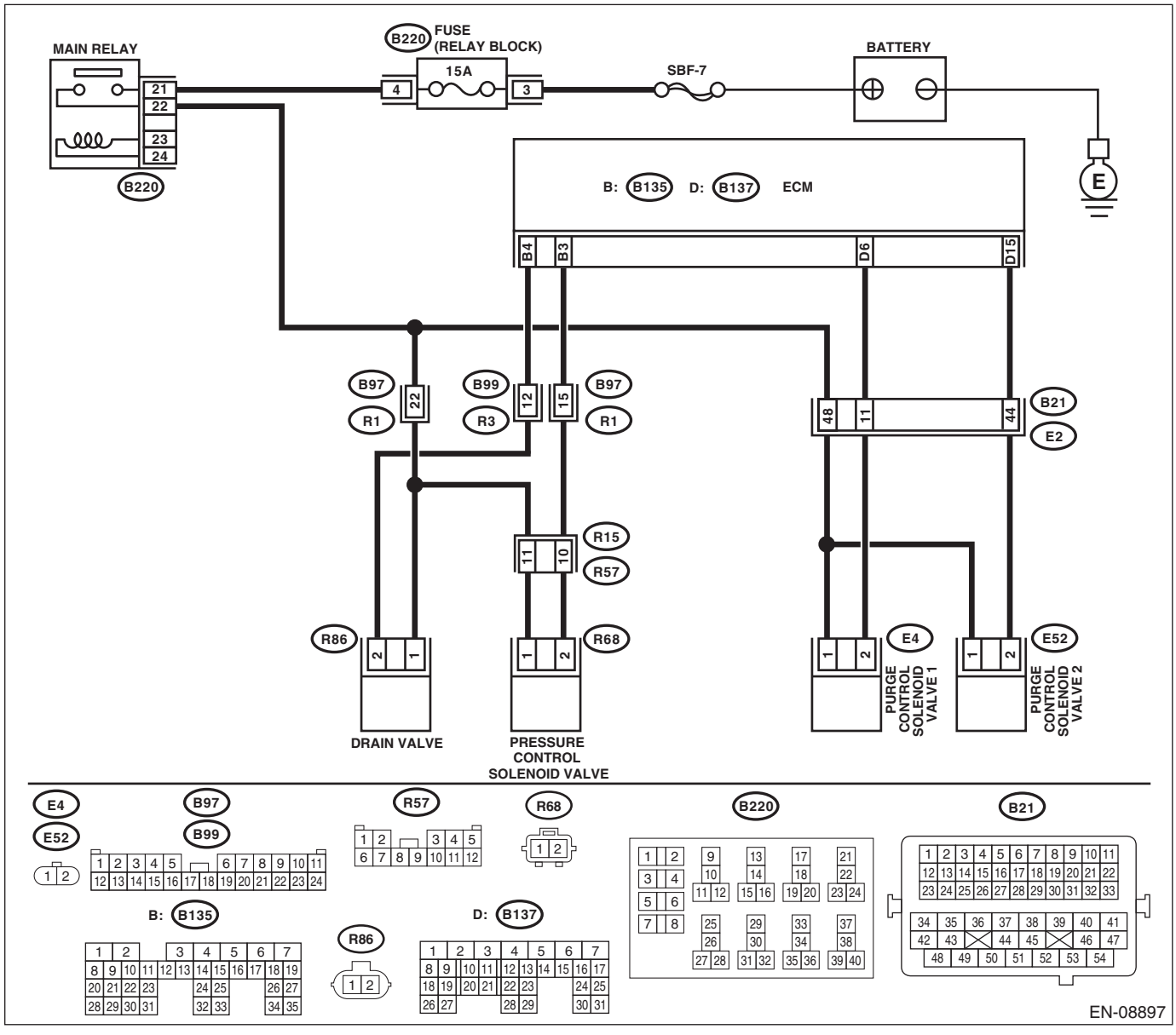
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND PURGE CONTROL SOLENOID VALVE CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and purge control solenoid valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 6 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the short circuit to power in the harness between ECM and purge control solenoid valve connector.	Go to step **2**.
2	**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(H4DOTC)-11, Purge Control Solenoid Valve.>	Repair the poor contact of ECM connector.

BV:DTC P0461 FUEL LEVEL SENSOR “A” CIRCUIT RANGE/PERFORMANCE

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-170, DTC P0461 FUEL LEVEL SENSOR “A” CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

Step	Check	Yes	No
1 **CHECK FOR 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)-82, List of Diagnostic Trouble Code (DTC).>	Replace the fuel level sensor and fuel sub level sensor. <Ref. to FU(H4DOTC)-79, Fuel Level Sensor.> <Ref. to FU(H4DOTC)-80, Fuel Sub Level Sensor.>

BW:DTC P0462 FUEL LEVEL SENSOR “A” CIRCUIT LOW

NOTE:
For the diagnostic procedure, refer to DTC P0463. <Ref. to EN(H4DOTC)(diag)-226, DTC P0463 FUEL LEVEL SENSOR “A” CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BX:DTC P0463 FUEL LEVEL SENSOR “A” CIRCUIT HIGH

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-174, DTC P0463 FUEL LEVEL SENSOR “A” CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

Step	Check	Yes	No
1 **CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is DTC P0462 or P0463 displayed on the Subaru Select Monitor?	Check the combination meter. <Ref. to IDI-11, CHECK FUEL LEVEL SENSOR, INSPECTION, Combination Meter System.>	Even if DTC is detected, 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, temporary open or short circuit of harness may be the cause.

BY:DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-176, DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

Step		Check	Yes	No
1	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is DTC P0464 displayed on the display?	Check the combination meter. <Ref. to IDI-11, CHECK FUEL LEVEL SENSOR, INSPECTION, Combination Meter System.>	Even if DTC is detected, 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, temporary open or short circuit of harness may be the cause.

BZ:DTC P0500 VEHICLE SPEED SENSOR “A”

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-179, DTC P0500 VEHICLE SPEED SENSOR “A”, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

Step		Check	Yes	No
1	**CHECK DTC OF VDC.** Check DTC of VDC.	Is DTC of VDC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Repair the poor contact of ECM connector.

CA:DTC P0506 IDLE AIR CONTROL SYSTEM RPM LOWER THAN EXPECTED

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-180, 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 servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK FOR 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)-82, List of Diagnostic Trouble Code (DTC).>	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(H4DOTC)-7, Air Cleaner Element.>	Go to step **3**.
3	**CHECK ELECTRONIC THROTTLE CONTROL.** 1) Remove the electronic throttle control. 2) 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. <Ref. to EN(H4DOTC)(diag)-309, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CB:DTC P0507 IDLE AIR CONTROL SYSTEM RPM HIGHER THAN EXPECTED

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-181, 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 servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK FOR 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)-82, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK AIR INTAKE SYSTEM.** 1) Start and idle the engine. 2) Check the following items. • 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. <Ref. to EN(H4DOTC)(diag)-309, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CC:DTC P050A COLD START IDLE AIR CONTROL SYSTEM PERFORMANCE

DTC DETECTING CONDITION:

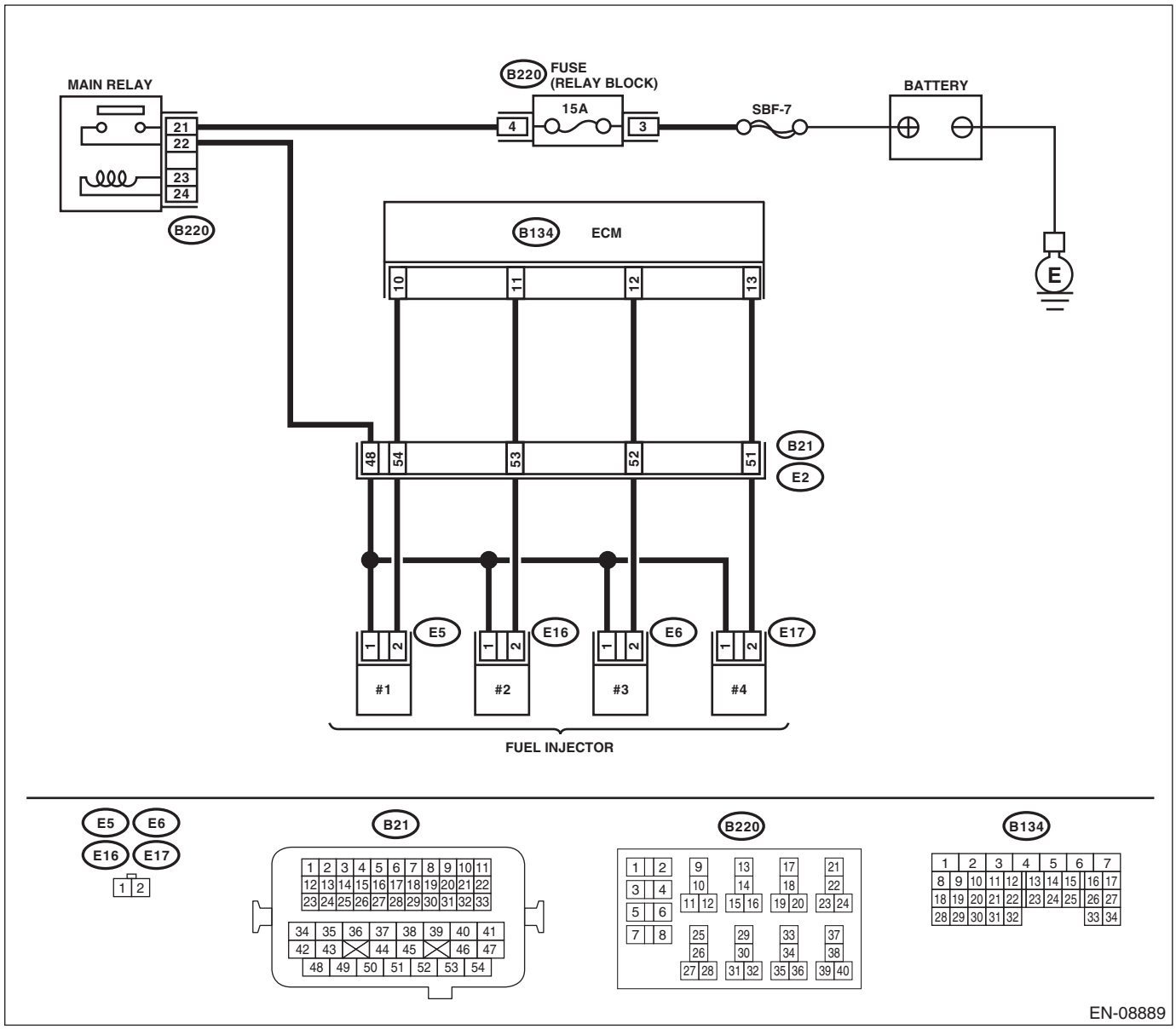
- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-182, DTC P050A COLD START IDLE AIR CONTROL SYSTEM PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

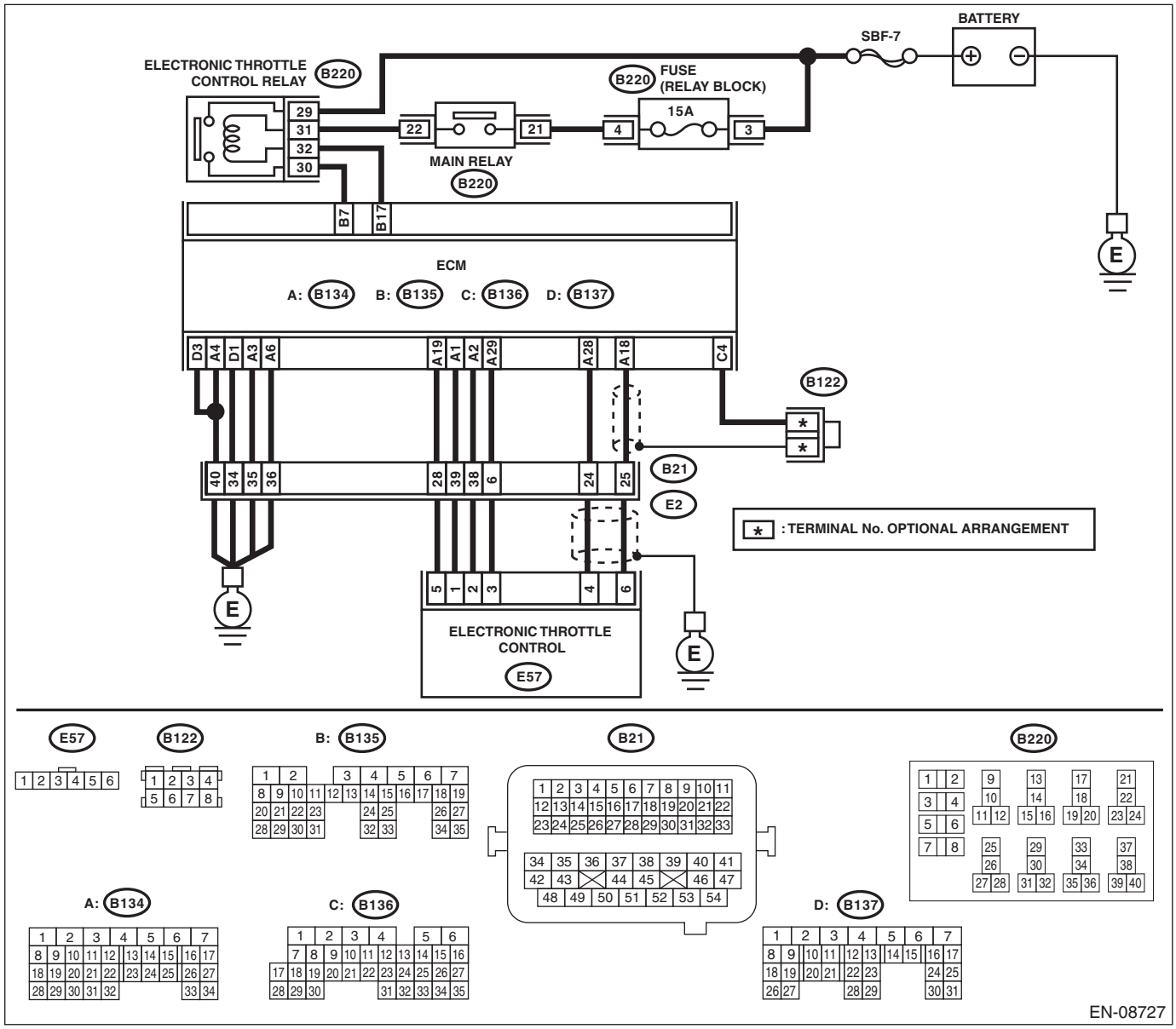
TROUBLE SYMPTOM:

- Engine keeps running at higher speed than specified idle speed.
- Engine keeps running at a lower speed than the specified idle speed.
- Engine stalls.

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





Step		Check	Yes	No
1	**CHECK FOR 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)-82, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK ENGINE OIL.**	Is there a proper amount of engine oil?	Go to step **3**.	Replace engine oil. <Ref. to LU(H4DOTC)-9, REPLACEMENT, Engine Oil.>
3	**CHECK EXHAUST SYSTEM.**	Are there holes or loose bolts on exhaust system?	Repair the exhaust system.	Go to step **4**.

	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 OPEN FLAMES" signs near the working area.** **CAUTION:** **Be careful not to spill fuel.** Measure the fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold. <Ref. to ME(H4DOTC)-25, INSPECTION, Fuel Pressure.> **CAUTION:** **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 kg/cm^2, 41 — 46 psi)?	Go to step **6**.	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
6	**CHECK FUEL PRESSURE.** After connecting the pressure regulator vacuum hose, measure fuel pressure. <Ref. to ME(H4DOTC)-25, INSPECTION, Fuel Pressure.> **CAUTION:** **Release fuel pressure before removing the fuel pressure gauge.** NOTE: • 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 kg/cm^2, 33 — 38 psi)?	Go to step **7**.	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
7	**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)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the engine coolant temperature 75°C (167°F) or higher?	Go to step **8**.	Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC)-34, Engine Coolant Temperature Sensor.>

	Step	Check	Yes	No
8	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.** 1) Start the engine and warm up engine until coolant temperature is higher than 75°C (167°F). 2) Place the select lever in "P" range or "N" range. 3) Turn the A/C switch to OFF. 4) Turn all the accessory switches to OFF. 5) Read the data of the 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)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the measured value 2.0 — 5.0 g/s (0.26 — 0.66 lb/m)?	Go to step **9**.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-42, Mass Air Flow and Intake Air Temperature Sensor.>
9	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.** 1) Start the engine and warm up engine until coolant temperature is higher than 75°C (167°F). 2) Place the select lever in "P" range or "N" range. 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 the 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)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Subtract ambient temperature from intake air temperature. Is the obtained value –10 — 50°C (–18 — 90°F)?	Go to step **10**.	Check the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-42, Mass Air Flow and Intake Air Temperature Sensor.>
10	**CHECK OUTPUT SIGNAL OF ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground on faulty cylinders. ***Connector & terminal*** ***#1 (B134) No. 10 (+) — Chassis ground (–):*** ***#2 (B134) No. 11 (+) — Chassis ground (–):*** ***#3 (B134) No. 12 (+) — Chassis ground (–):*** ***#4 (B134) No. 13 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **15**.	Go to step **11**.

	Step	Check	Yes	No
11	**CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel injector on faulty cylinders. 3) Measure the resistance between fuel injector 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 **12**.	Repair the short circuit to ground in harness between ECM and fuel injector connector.
12	**CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR.** Measure the resistance of harness between ECM and fuel injector connector on faulty cylinders. ***Connector & terminal*** ***#1 (B134) No. 10 — (E5) No. 1:*** ***#2 (B134) No. 11 — (E16) No. 1:*** ***#3 (B134) No. 12 — (E6) No. 1:*** ***#4 (B134) No. 13 — (E17) No. 1:***	Is the resistance less than 1 Ω?	Go to step **13**.	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 of coupling connector
13	**CHECK FUEL INJECTOR.** Measure the resistance between fuel injector terminals on faulty cylinder. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 5 — 20 Ω?	Go to step **14**.	Replace the faulty fuel injector. <Ref. to FU(H4DOTC)-45, Fuel Injector.>
14	**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 the main relay connector and fuel injector connector on faulty cylinders • Poor contact of coupling connector • Poor contact of main relay connector
15	**CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR 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 and chassis ground on faulty cylinders. ***Connector & terminal*** ***#1 (B134) No. 10 (+) — Chassis ground (–):*** ***#2 (B134) No. 11 (+) — Chassis ground (–):*** ***#3 (B134) No. 12 (+) — Chassis ground (–):*** ***#4 (B134) No. 13 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the short circuit to power in harness between ECM and fuel injector connector.	Go to step **16**.

	Step	Check	Yes	No
16	**CHECK FUEL INJECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between fuel injector terminals on faulty cylinder. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 5 — 20 Ω?	Go to step **17**.	Replace the faulty fuel injector. <Ref. to FU(H4DOTC)-45, Fuel Injector.>
17	**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 **18**.
18	**CHECK CRANK SPROCKET.** Remove the timing belt cover. <Ref. to ME(H4DOTC)-48, REMOVAL, Timing Belt Cover.>	Is the crank sprocket rusted or does it have broken teeth?	Replace the crank sprocket. <Ref. to ME(H4DOTC)-57, Crank Sprocket.>	Go to step **19**.
19	**CHECK INSTALLATION CONDITION OF TIMING BELT.** Turn the crankshaft, and align 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(H4DOTC)-49, Timing Belt.>	Go to step **20**.
20	**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. 31 and No. 32 of electronic throttle control relay. 4) Measure the resistance between electronic throttle control relay terminals. ***Terminals*** ***No. 29 — No. 30:***	Is the resistance less than 1 Ω?	Go to step **21**.	Replace the electronic throttle control relay. <Ref. to FU(H4DOTC)-62, Electronic Throttle Control Relay.>
21	**CHECK POWER SUPPLY OF ELECTRONIC THROTTLE CONTROL RELAY.** Measure the voltage between electronic throttle control relay connector and chassis ground. ***Connector & terminal*** ***(B220) No. 29 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **22**.	Repair the open or ground short circuit of power supply circuit.
22	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY CONNECTOR.** 1) Disconnect the connector from ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control relay connector and chassis ground. ***Connector & terminal*** ***(B220) No. 32 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the short circuit to power in the harness between ECM and electronic throttle control relay connector.	Go to step **23**.
23	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between electronic throttle control relay connector and chassis ground. ***Connector & terminal*** ***(B220) No. 32 — Chassis ground:*** ***(B220) No. 30 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **24**.	Repair the short circuit in harness to ground between ECM and electronic throttle control relay connector.

	Step	Check	Yes	No
24	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY CONNECTOR.** Measure the resistance between ECM and electronic throttle control relay connector. ***Connector & terminal*** ***(B135) No. 17 — (B220) No. 32:*** ***(B135) No. 7 — (B220) No. 30:***	Is the resistance less than 1 Ω?	Go to step **25**.	Repair the open circuit in harness between ECM and electronic throttle control relay connector.
25	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and electronic throttle control. 3) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 19 — Chassis ground:*** ***(B134) No. 18 — Chassis ground:*** ***(B134) No. 18 — (B136) No. 4:*** ***(B134) No. 28 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **26**.	Repair the short circuit to ground in harness between ECM and electronic throttle control connector.
26	**CHECK SHORT CIRCUIT INSIDE THE ECM.** 1) Connect the connector to ECM. 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 1 MΩ or more?	Go to step **27**.	Repair the short circuit to ground in harness between ECM and electronic throttle control connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-57, Engine Control Module (ECM).>
27	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL CONNECTOR.** 1) Disconnect the connector from ECM. 2) Measure the resistance of harness between ECM and electronic throttle control connector. ***Connector & terminal*** ***(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 **28**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and electronic throttle control connector • Poor contact of coupling connector
28	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL CONNECTOR.** 1) Connect the connector to ECM. 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 **29**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and engine ground • Poor contact of ECM connector • Poor contact of coupling connector

	Step	Check	Yes	No
29	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 6 (+) — Engine ground (–):*** ***(E57) No. 4 (+) — Engine ground (–):***	Is the voltage 4.85 V or more?	Repair the short circuit to power in harness between ECM and electronic throttle control connector.	Go to step **30**.
30	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between ECM connectors. ***Connector & terminal*** ***(B134) No. 19 — (B134) No. 18:*** ***(B134) No. 19 — (B134) No. 28:***	Is the resistance 1 MΩ or more?	Go to step **31**.	Repair the short circuit of harness between ECM and electronic throttle control 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)-36, Subaru Select Monitor.>	Is the voltage 0.81 — 0.87 V?	Go to step **32**.	Repair the poor contact of electronic throttle control connector. Replace the electronic throttle control if defective. <Ref. to FU(H4DOTC)-16, Throttle Body.>
32	**CHECK SENSOR OUTPUT.** Read the data of sub throttle sensor signal using Subaru Select Monitor. NOTE: Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-36, Subaru Select Monitor.>	Is the voltage 1.64 — 1.70 V?	Go to step **33**.	Repair the poor contact of electronic throttle control connector. Replace the electronic throttle control if defective. <Ref. to FU(H4DOTC)-16, Throttle Body.>
33	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL MOTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and electronic throttle control. 3) Measure the resistance between ECM and electronic throttle control connector. ***Connector & terminal*** ***(B134) No. 2 — (E57) No. 2:*** ***(B134) No. 1 — (E57) No. 1:***	Is the resistance less than 1 Ω?	Go to step **34**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and electronic throttle control connector • Poor contact of coupling connector

	Step	Check	Yes	No
34	**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 5 V or more?	Repair the short circuit to power in harness between ECM and electronic throttle control connector.	Go to step **35**.
35	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL MOTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector 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 **36**.	Repair the short circuit to ground in harness between ECM and electronic throttle control connector.
36	**CHECK ELECTRONIC THROTTLE CONTROL MOTOR HARNESS.** Measure the resistance between electronic throttle control connectors. ***Connector & terminal*** ***(E57) No. 2 — (E57) No. 1:***	Is the resistance 1 MΩ or more?	Go to step **37**.	Repair the short circuit of harness between ECM and electronic throttle control connector.
37	**CHECK ELECTRONIC THROTTLE CONTROL GROUND CIRCUIT.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 3 — Chassis ground:*** ***(B134) No. 4 — Chassis ground:*** ***(B134) No. 6 — Chassis ground:*** ***(B137) No. 1 — Chassis ground:*** ***(B137) No. 3 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **38**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and engine ground • Poor contact of coupling connector
38	**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 **39**.	Replace the electronic throttle control. <Ref. to FU(H4DOTC)-16, Throttle Body.>
39	**CHECK ELECTRONIC THROTTLE CONTROL.** Move the throttle valve to the fully open 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 the poor contact of ECM connector.	Replace the electronic throttle control. <Ref. to FU(H4DOTC)-16, Throttle Body.>

CD:DTC P050B COLD START IGNITION TIMING PERFORMANCE

NOTE:
For the diagnostic procedure, refer to DTC P050A. <Ref. to EN(H4DOTC)(diag)-230, DTC P050A COLD START IDLE AIR CONTROL SYSTEM PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CE:DTC P0512 STARTER REQUEST CIRCUIT

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-185, DTC P0512 STARTER REQUEST CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

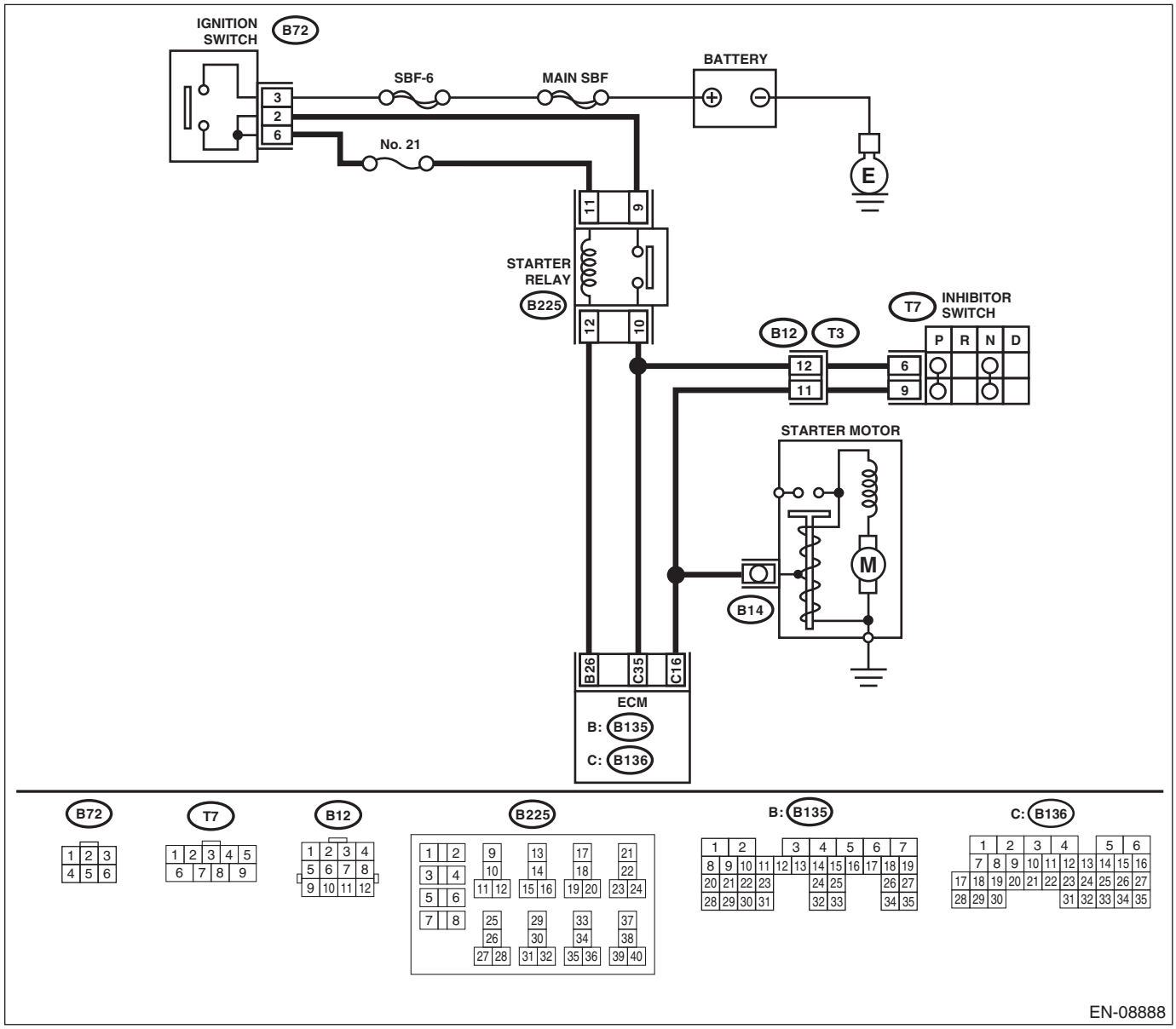
TROUBLE SYMPTOM:

Failure of engine to start

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK FOR 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)-82, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK HARNESS BETWEEN ECM AND IGNITION SWITCH CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 16 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the short circuit to power in harness between ECM and ignition switch connector.	Repair the poor contact of ECM connector.

CF:DTC P0604 INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-187, 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 servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

Step	Check	Yes	No
1 **CHECK FOR 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)-82, List of Diagnostic Trouble Code (DTC).>	Even if DTC is detected, 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, temporary open or short circuit of harness may be the cause.

CG:DTC P0605 INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR

NOTE:
For the diagnostic procedure, refer to DTC P0607. <Ref. to EN(H4DOTC)(diag)-242, DTC P0607 THROTTLE CONTROL SYSTEM CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CH:DTC P0607 THROTTLE CONTROL SYSTEM CIRCUIT RANGE/PERFORMANCE

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-189, DTC P0607 THROTTLE CONTROL SYSTEM CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

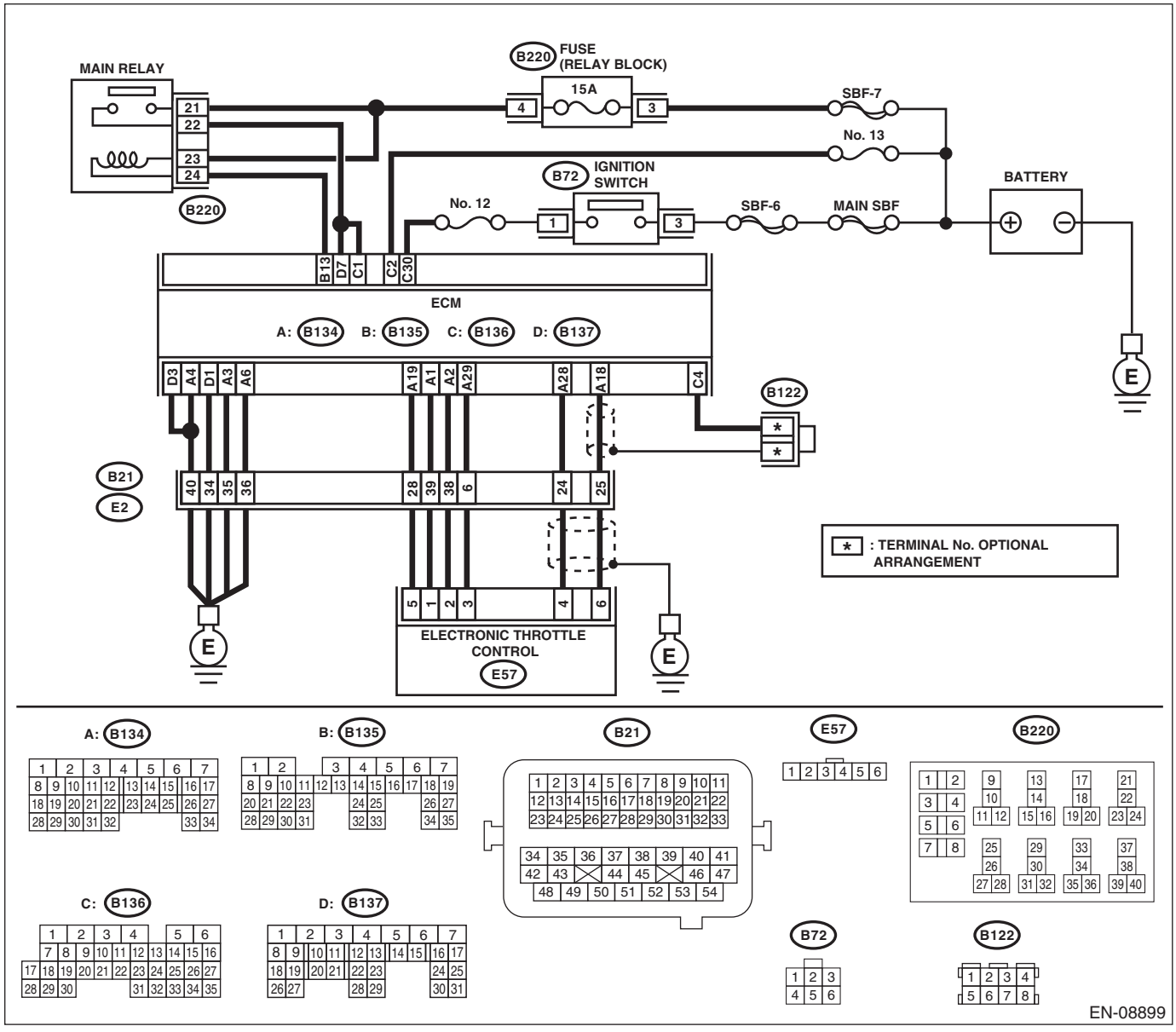
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK INPUT VOLTAGE OF ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 1 (+) — Chassis ground (–):*** ***(B137) No. 7 (+) — 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 and chassis ground. ***Connector & terminal*** ***(B136) No. 1 (+) — Chassis ground (–):*** ***(B137) No. 7 (+) — 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 CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and electronic throttle control. 3) Measure the resistance of harness between ECM and electronic throttle control connector. ***Connector & terminal*** ***(B134) No. 19 — (E57) No. 5:*** ***(B134) No. 29 — (E57) 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: • Open circuit in harness between ECM and electronic throttle control connector • Poor contact of coupling connector
4	**CHECK ECM GROUND HARNESS.** 1) Connect all connectors. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 3 (+) — Chassis ground (–):*** ***(B134) No. 4 (+) — Chassis ground (–):*** ***(B134) No. 6 (+) — Chassis ground (–):*** ***(B137) No. 1 (+) — Chassis ground (–):*** ***(B137) No. 3 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Repair the poor contact of ECM connector.	Repair the following item. • Open circuit in ground circuit • Further tightening of the engine ground terminal • Poor contact of coupling connector

CI: DTC P0638 THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1)

NOTE:
For the diagnostic procedure, refer to DTC P2101. <Ref. to EN(H4DOTC)(diag)-309, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CJ:DTC P0700 TRANSMISSION CONTROL SYSTEM (MIL REQUEST)

NOTE:
For the diagnostic procedure, refer to AT section. <Ref. to 4AT(diag)-2, Basic Diagnostic Procedure.>

CK:DTC P0851 PARK/NEUTRAL SWITCH INPUT CIRCUIT LOW (AT MODEL)

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-194, DTC P0851 PARK/NEUTRAL SWITCH INPUT CIRCUIT LOW (AT MODEL), Diagnostic Trouble Code (DTC) Detecting Criteria.>

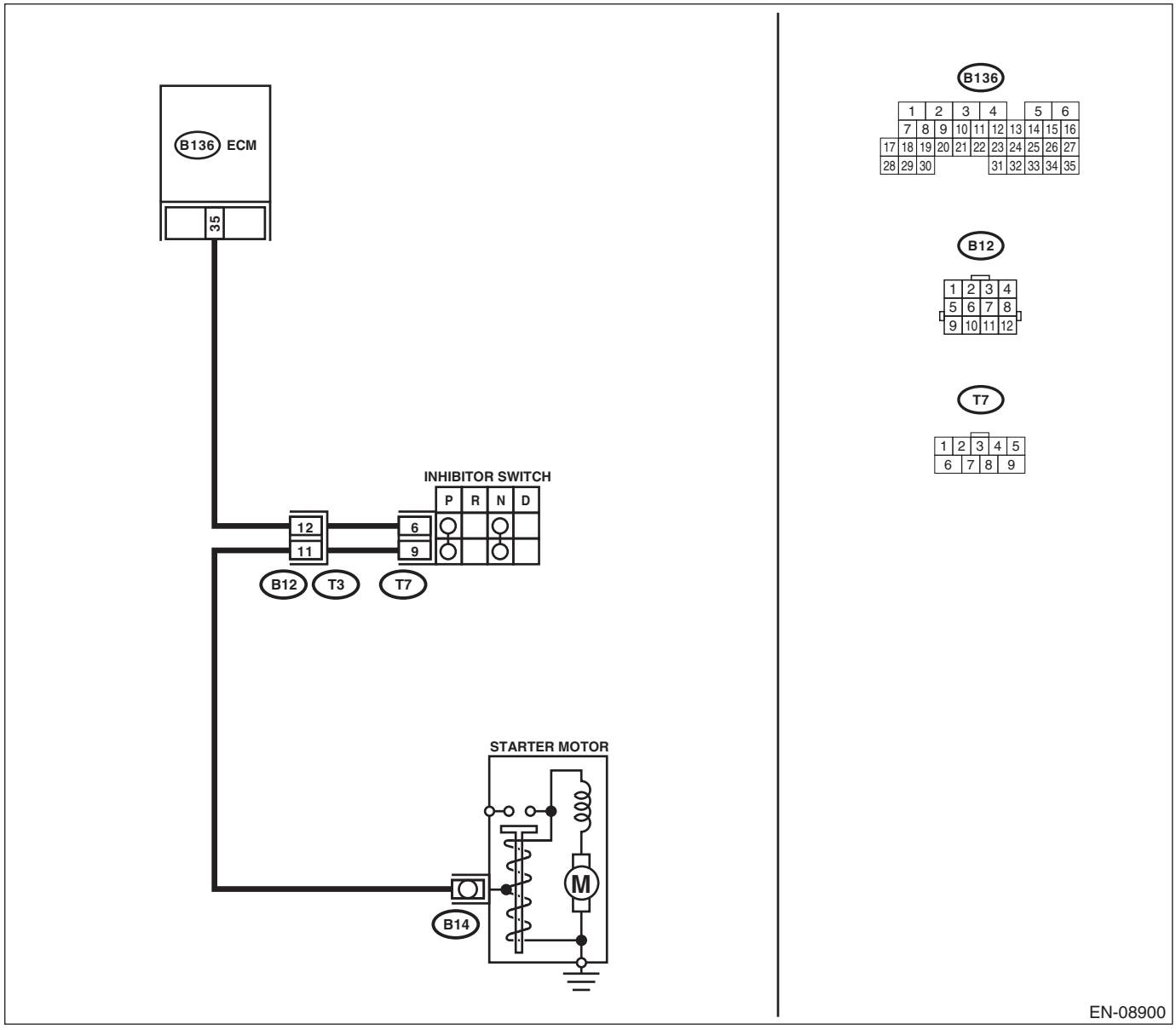
TROUBLE SYMPTOM:

- Improper idling
- Start failure

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK SELECT CABLE.**	Is there any fault in select cable?	Repair or adjust the select 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 in other than "P" range and "N" range. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 35 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the poor contact of 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 between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 35 — 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 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-52, Inhibitor Switch.>	Repair short circuit to ground in harness between transmission harness connector and inhibitor switch connector.

CL:DTC P0852 PARK/NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT MODEL)

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-195, DTC P0852 PARK/NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT MODEL), Diagnostic Trouble Code (DTC) Detecting Criteria.>

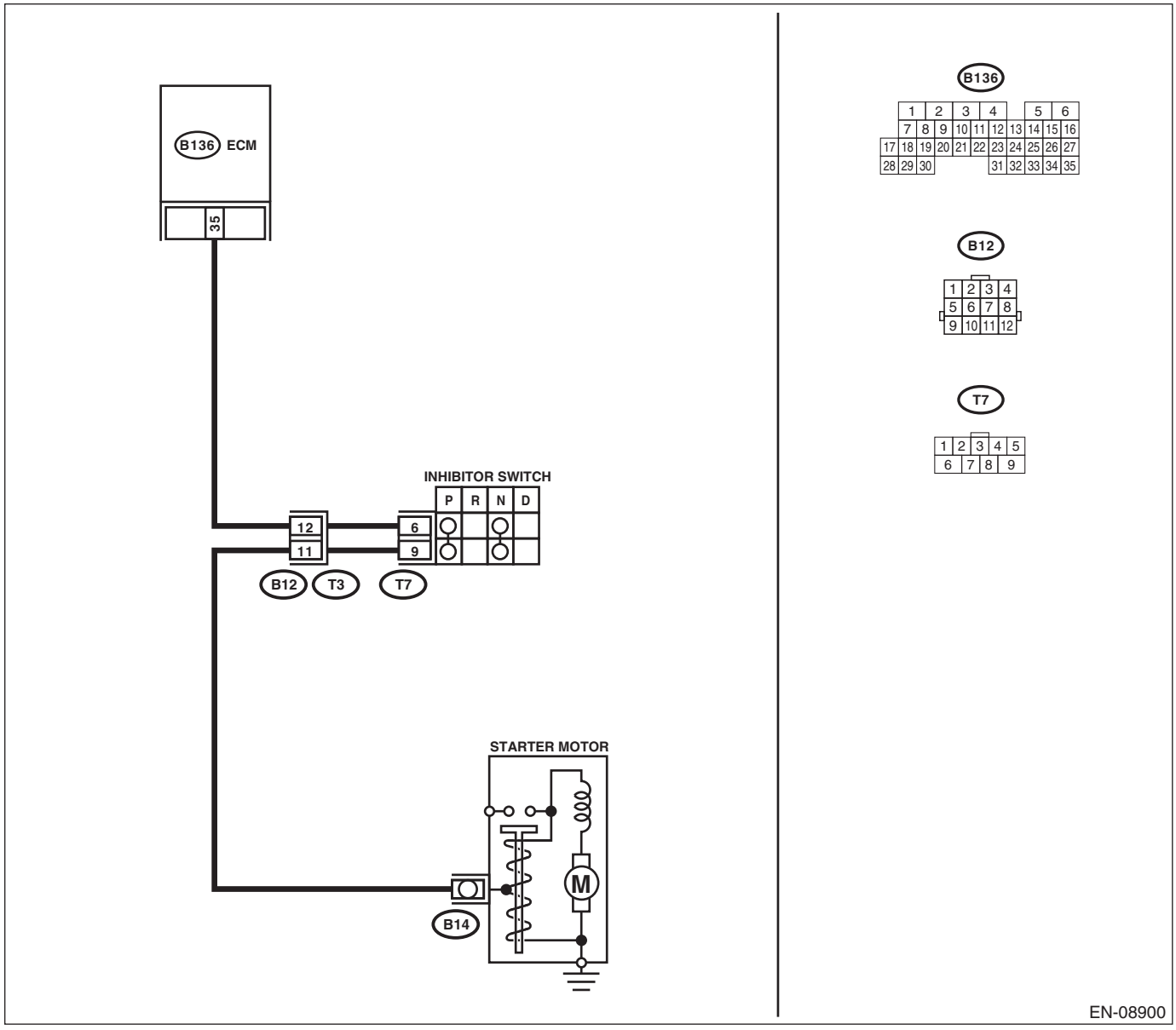
TROUBLE SYMPTOM:

- Improper idling
- Start failure

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK SELECT CABLE.**	Is there any fault in select cable?	Repair or adjust the select 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) Measure the voltage between ECM and chassis ground with select lever at "P" range and "N" range. ***Connector & terminal*** ***(B136) No. 35 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Repair the poor contact of ECM connector.	Go to step **3**.
3	**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. 35 — (T7) No. 6:***	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 inhibitor switch connector • Poor contact of coupling connector
4	**CHECK INHIBITOR SWITCH GROUND LINE.** Measure the resistance of harness between inhibitor switch connector and engine ground. ***Connector & terminal*** ***(T7) No. 9 — Engine ground:***	Is the resistance less than 5 Ω?	Replace the inhibitor switch. <Ref. to 4AT-52, Inhibitor Switch.>	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between inhibitor switch connector and starter motor • Poor contact of coupling connector • Poor contact of starter motor connector • Poor contact of starter motor ground • Starter motor

CM:DTC P1152 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK1 SENSOR1)

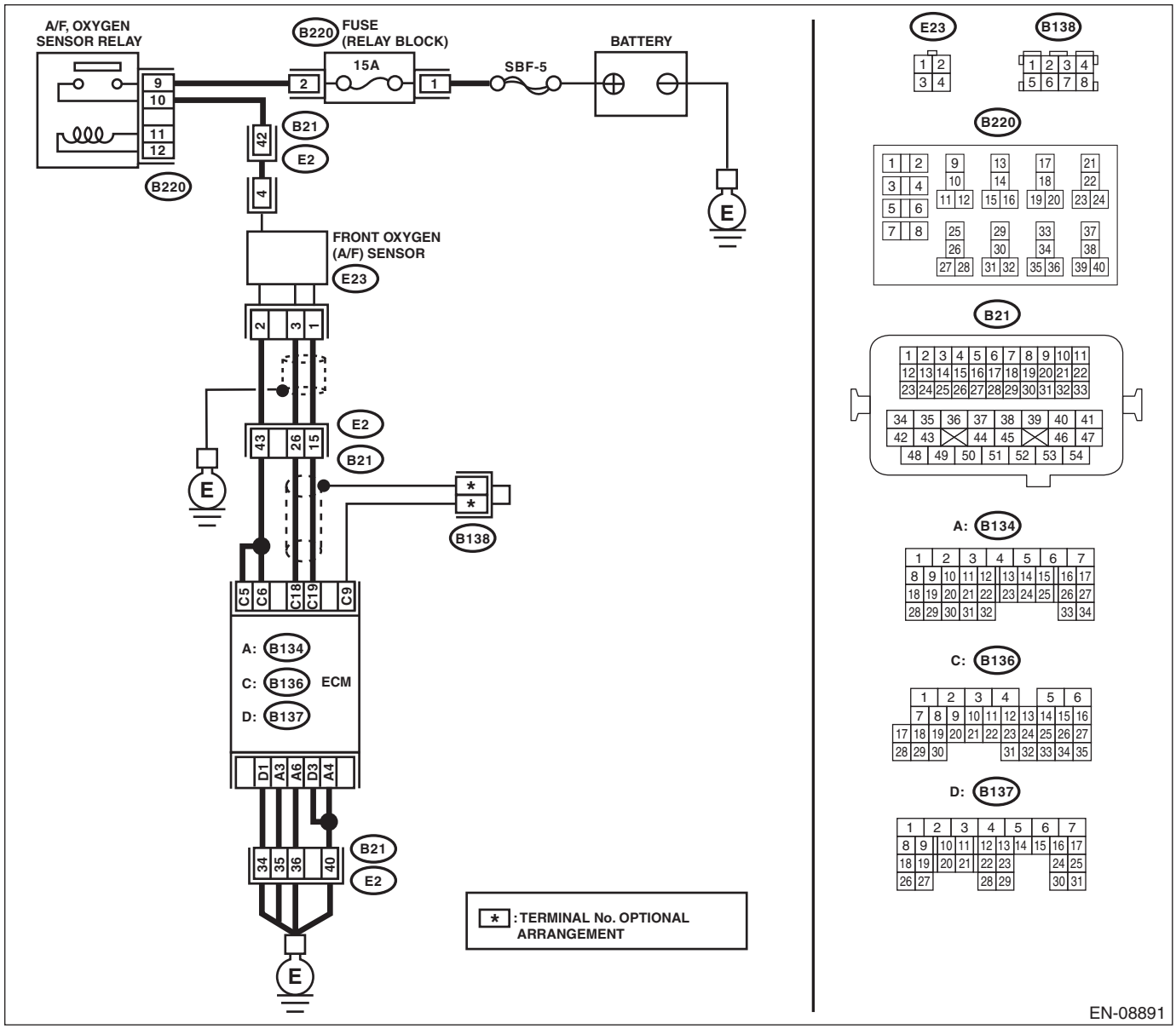
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-196, DTC P1152 O2 SENSOR CIRCUIT RANGE/ PERFORMANCE (LOW) (BANK1 SENSOR1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Has water entered the connector?	Completely remove any water inside.	Go to step **2**.

	Step	Check	Yes	No
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 and front oxygen (A/F) sensor. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B136) No. 19 — (E23) No. 1:*** ***(B136) No. 18 — (E23) 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 ECM and front oxygen (A/F) sensor connector • Poor contact of coupling connector
3	**CHECK FOR POOR CONTACT.** Check for poor contact of the front oxygen (A/F) sensor connector.	Is there poor contact of front oxygen (A/F) sensor connector?	Repair the poor contact of front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-53, Front Oxygen (A/F) Sensor.>

CN:DTC P1153 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1)

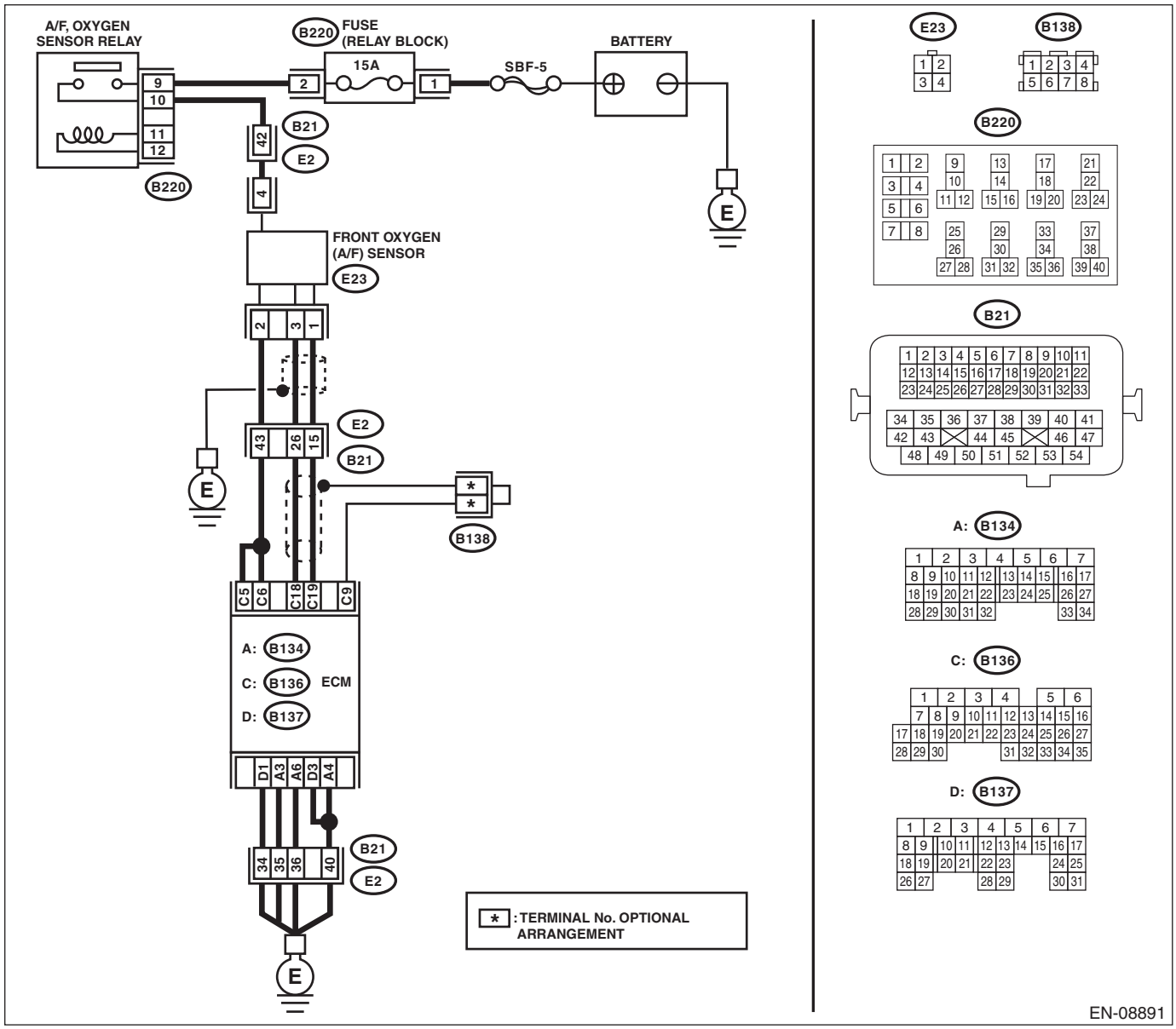
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-198, DTC P1153 O2 SENSOR CIRCUIT RANGE/ PERFORMANCE (HIGH) (BANK1 SENSOR1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Has water entered the connector?	Completely remove any water inside.	Go to step **2**.

	Step	Check	Yes	No
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. 3) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 19 — Chassis ground:*** ***(B136) No. 18 — 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 OUTPUT SIGNAL FOR ECM.** 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 19 (+) — Chassis ground (–):***	Is the voltage 4.5 V or more?	Go to step **5**.	Go to step **4**.
4	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 18 (+) — Chassis ground (–):***	Is the voltage 4.95 V or more?	Go to step **5**.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-53, Front Oxygen (A/F) Sensor.>
5	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 19 (+) — Chassis ground (–):*** ***(B136) No. 18 (+) — Chassis ground (–):***	Is the voltage 8 V or more?	Repair the short circuit to power in the harness between ECM and front oxygen (A/F) sensor connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-57, Engine Control Module (ECM).>	Repair the poor contact of ECM connector.

CO:DTC P1160 RETURN SPRING FAILURE

NOTE:
For the diagnostic procedure, refer to DTC P2101. <Ref. to EN(H4DOTC)(diag)-309, 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

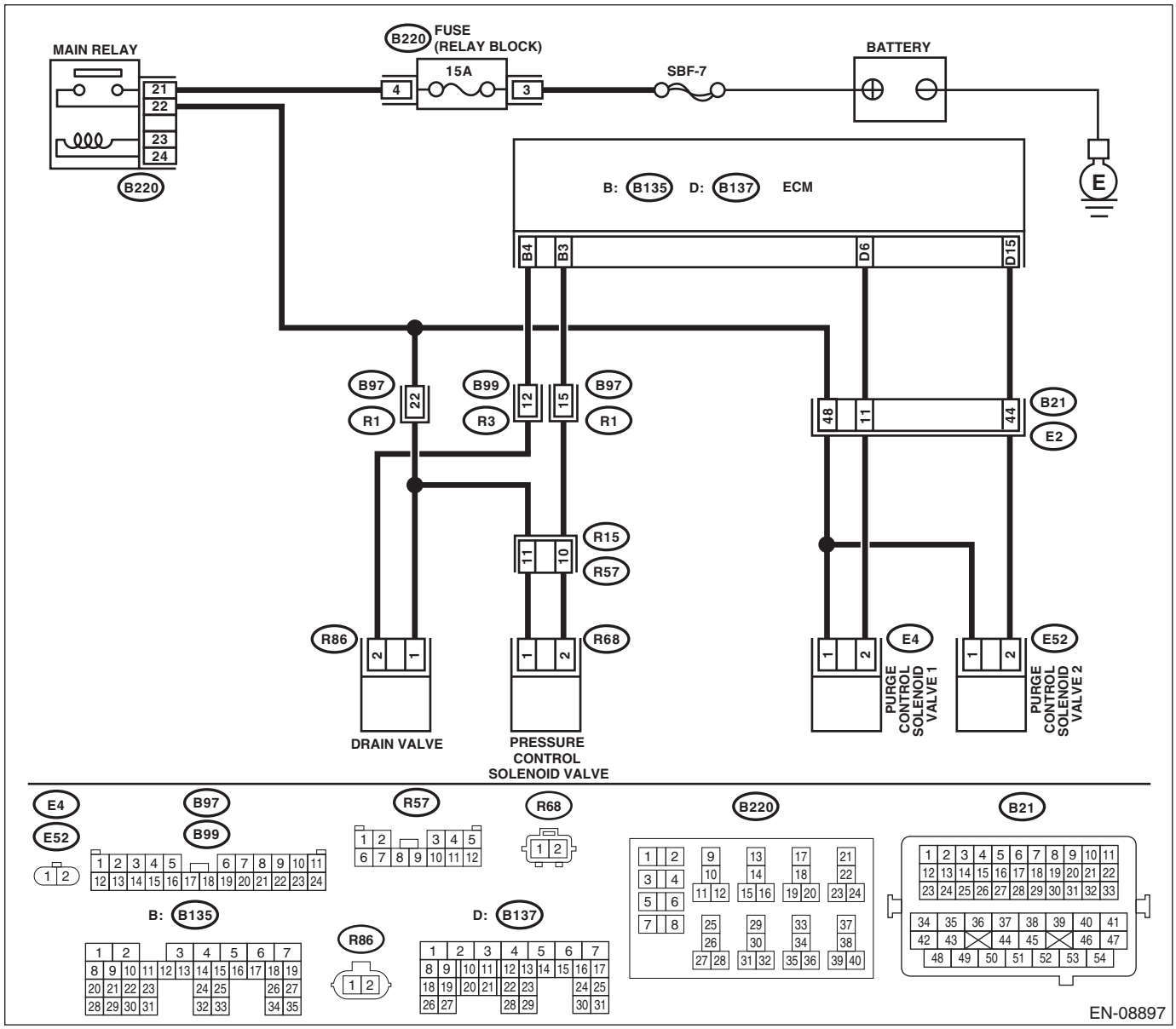
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- 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 servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	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*** ***(B135) No. 3 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **2**.	Go to step **3**.
2	**CHECK FOR POOR CONTACT.** Check for poor contact of ECM connector.	Is there poor contact of ECM connector?	Repair the poor contact of ECM connector.	Even if DTC is detected, 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 open or short circuit of harness or temporary poor contact of connector may be the cause.
3	**CHECK POWER SUPPLY TO THE PRESSURE CONTROL SOLENOID VALVE.** Measure the voltage between pressure control solenoid valve and chassis ground. ***Connector & terminal*** ***(R68) No. 1 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **4**.	Repair the power supply circuit.
4	**CHECK HARNESS BETWEEN ECM AND PRESSURE CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the ECM and pressure control solenoid valve. 3) Measure the resistance between pressure control solenoid valve and chassis ground. ***Connector & terminal*** ***(R68) No. 2 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **5**.	Repair the ground short circuit of harness between ECM and pressure control solenoid valve connector.
5	**CHECK HARNESS BETWEEN ECM AND PRESSURE CONTROL SOLENOID VALVE.** Measure the resistance of harness between ECM and pressure control solenoid valve connector. ***Connector & terminal*** ***(B135) No. 3 — (R68) No. 2:***	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 pressure control solenoid valve connector • Poor contact of coupling connector
6	**CHECK PRESSURE CONTROL SOLENOID VALVE.** Measure the resistance between pressure control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 10 — 100 Ω?	Repair the poor contact of pressure control solenoid valve connector.	Replace the pressure control solenoid valve. <Ref. to EC(H4DOTC)-20, Pressure Control Solenoid Valve.>

CQ: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 servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK SECONDARY AIR COMBINATION VALVE.** 1) Remove the secondary air combination valve. <Ref. to EC(H4DOTC)-30, Secondary Air Combination 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)-30, Secondary Air Combination Valve.>	Perform the diagnostic procedure of P2440. <Ref. to EN(H4DOTC)(diag)-354, DTC P2440 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CR:DTC P1418 SECONDARY AIR INJECTION SYSTEM CONTROL “A” CIRCUIT SHORTED

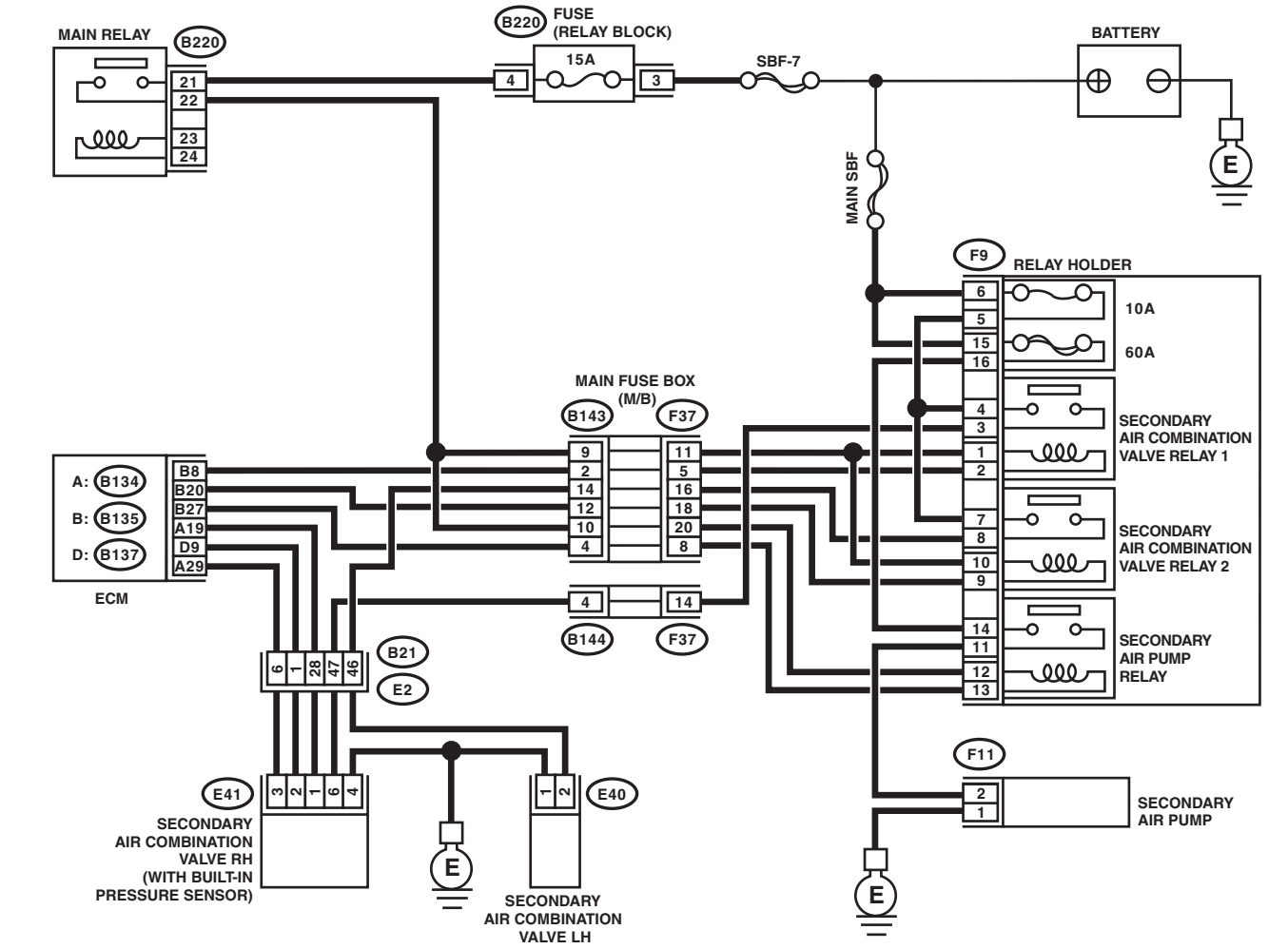
DTC DETECTING CONDITION:

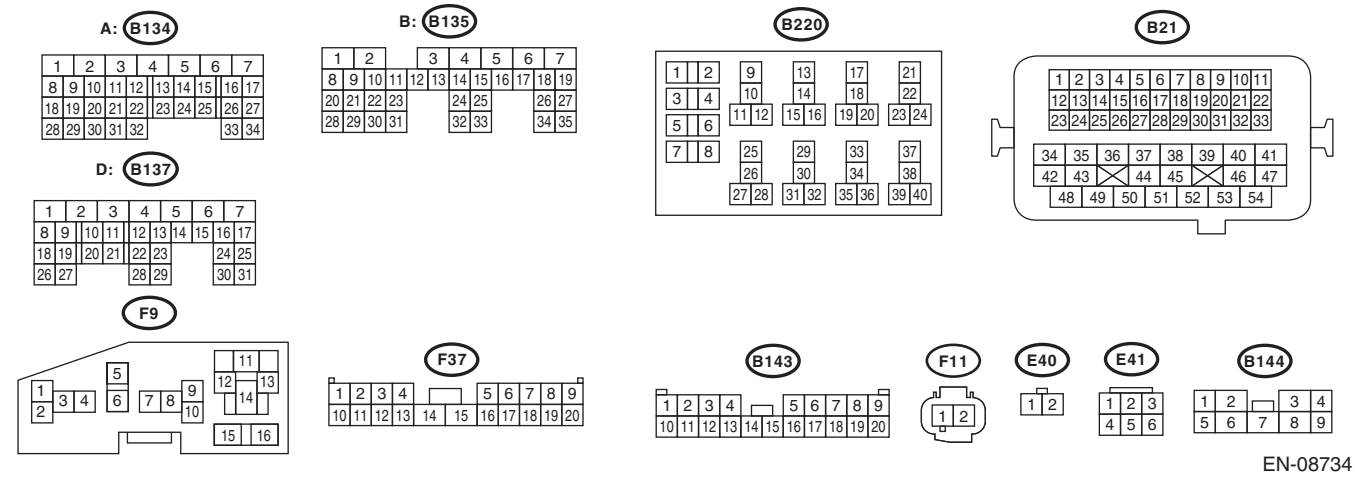
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-206, DTC P1418 SECONDARY AIR INJECTION SYSTEM CONTROL “A” CIRCUIT SHORTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





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	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND SECONDARY AIR PUMP RELAY CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Remove the secondary air pump relay. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 27 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the short circuit to power in the harness between ECM and secondary air pump relay connector.	Even if DTC is detected, 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, temporary open or short circuit of harness may be the cause.

CS:DTC P1420 FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH

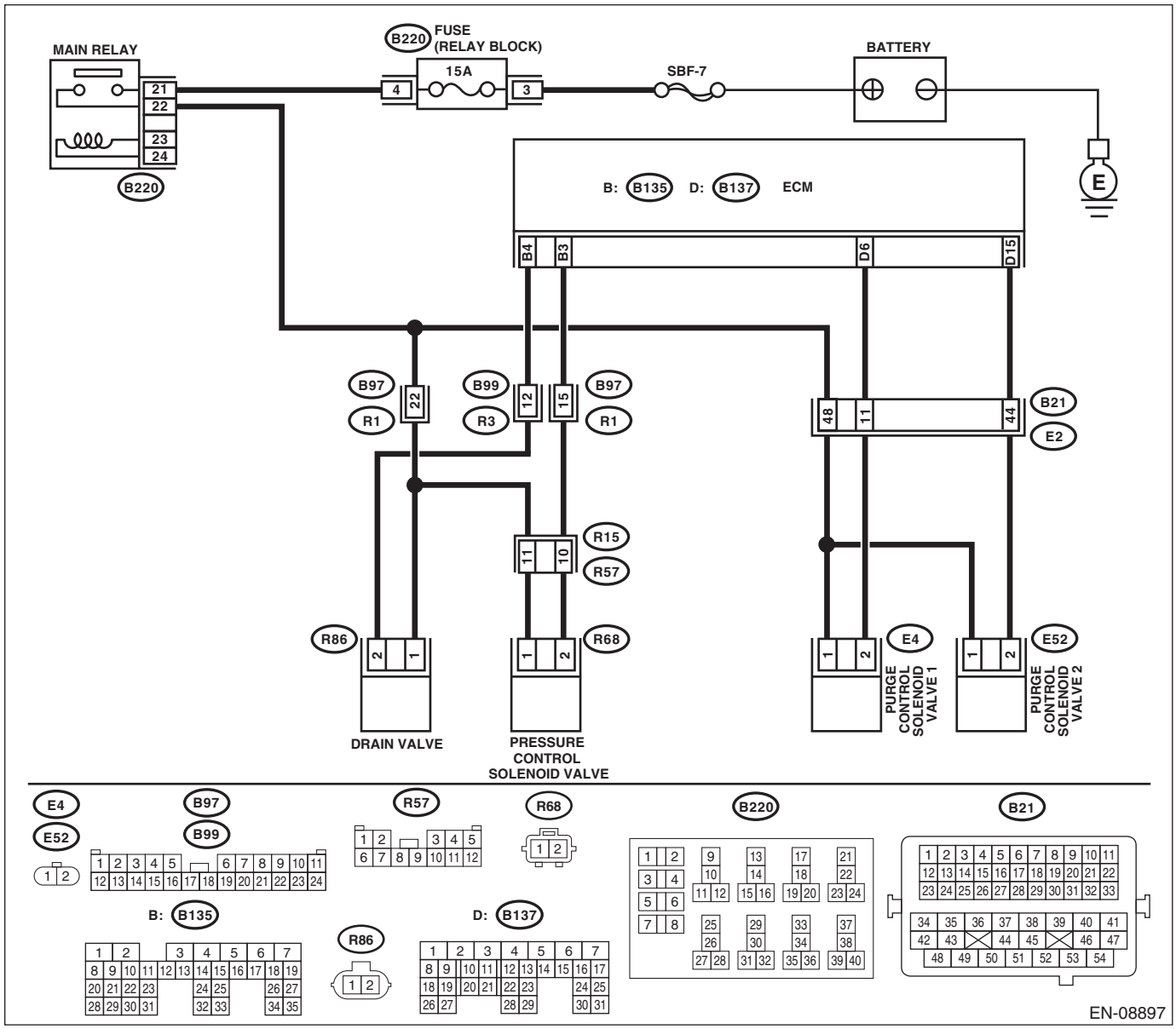
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-207, DTC P1420 FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND PRESSURE CONTROL SOLENOID VALVE CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the ECM and pressure control solenoid valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 3 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the short circuit to power in the harness between ECM and pressure control solenoid valve connector.	Go to step **2**.
2	**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(H4DOTC)-20, Pressure Control Solenoid Valve.>	Repair the poor contact of ECM connector.

CT:DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-209, DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

Improper fuel supply

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK FOR 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)-82, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK DRAIN HOSE.** Check the drain hose for clogging.	Is there clogging in the drain hose?	Replace the drain hose.	Go to step **3**.
3	**CHECK DRAIN VALVE OPERATION.** 1) Turn the ignition switch to OFF. 2) Connect the delivery (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 can be operated using the Subaru Select Monitor. For the procedures, refer to “Compulsory Valve Operation Check Mode”. <Ref. to EN(H4DOTC)(diag)-57, Compulsory Valve Operation Check Mode.>	Does the drain valve operate?	Repair the poor contact of ECM connector.	Replace the drain valve. <Ref. to EC(H4DOTC)-23, Drain Valve.>

CU:DTC P1491 POSITIVE CRANKCASE VENTILATION (BLOW-BY) FUNCTION PROBLEM

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-211, DTC P1491 POSITIVE CRANKCASE VENTILATION (BLOW-BY) FUNCTION PROBLEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

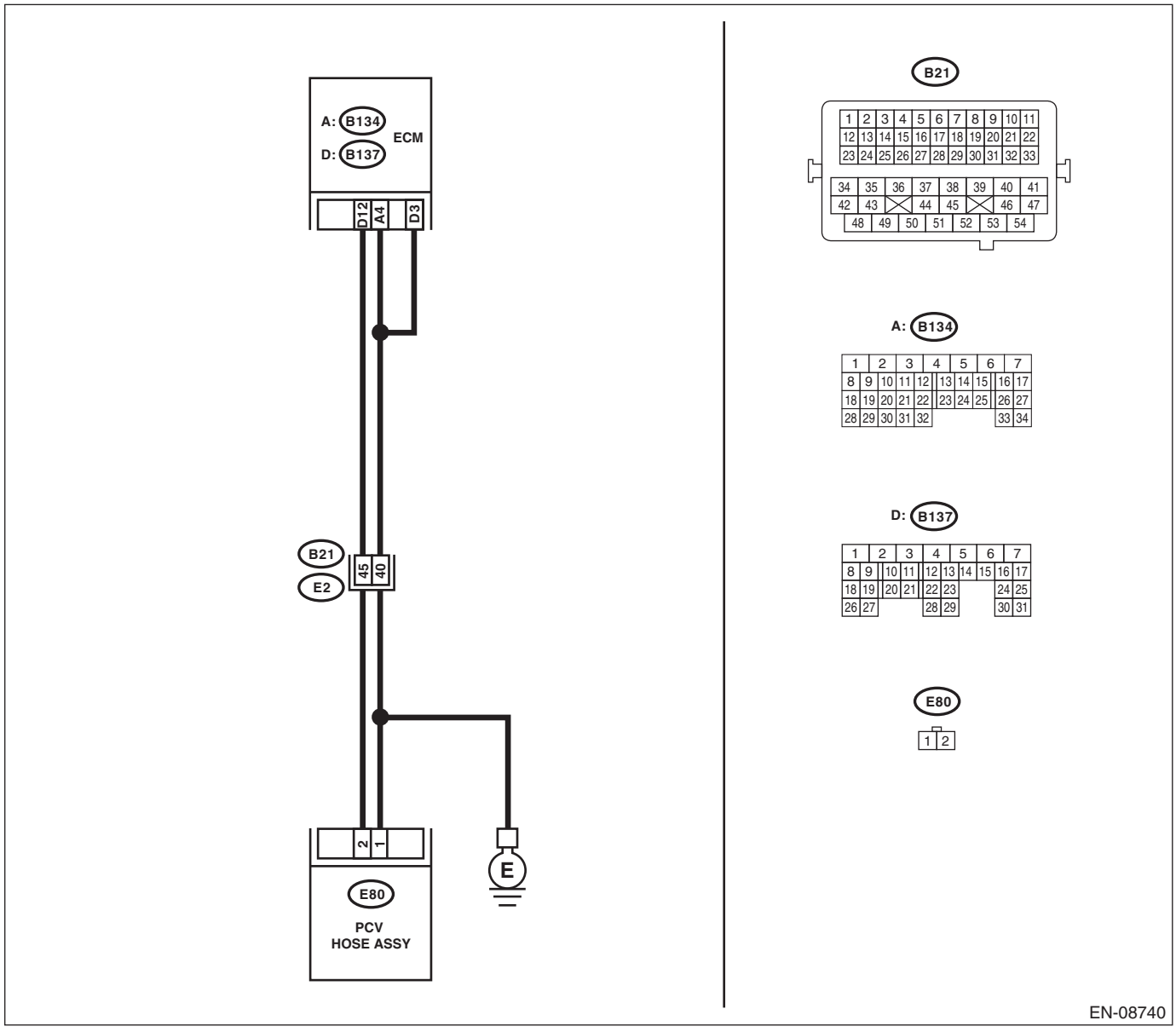
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



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?	Repair or replace the blow-by hose.	Go to step **2**.

	Step	Check	Yes	No
2	**CHECK HARNESS BETWEEN ECM AND PCV HOSE ASSEMBLY CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM and PCV hose assembly. 3) Measure the resistance of harness between ECM and PCV hose assembly connector. ***Connector & terminal*** ***(B137) No. 12 — (E80) No. 2:***	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 PCV hose assembly connector • Poor contact of coupling connector
3	**CHECK HARNESS BETWEEN ECM AND PCV HOSE ASSEMBLY CONNECTOR.** Measure the resistance between PCV hose assembly connector and chassis ground. ***Connector & terminal*** ***(B137) No. 12 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **4**.	Repair the short circuit to ground in harness between ECM and PCV hose assembly connector.
4	**CHECK GROUND CIRCUIT OF PCV HOSE ASSEMBLY.** Measure the resistance of harness between PCV hose assembly connector and engine ground. ***Connector & terminal*** ***(E80) No. 1 — Engine ground:***	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 PCV hose assembly connector and engine ground • Poor contact of coupling connector
5	**CHECK PCV HOSE ASSEMBLY.** Measure the resistance between the PCV hose assembly terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 1 Ω?	Repair the poor contact of ECM and PCV hose assembly connector.	Replace the PCV hose assembly.

CV:DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-213, DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

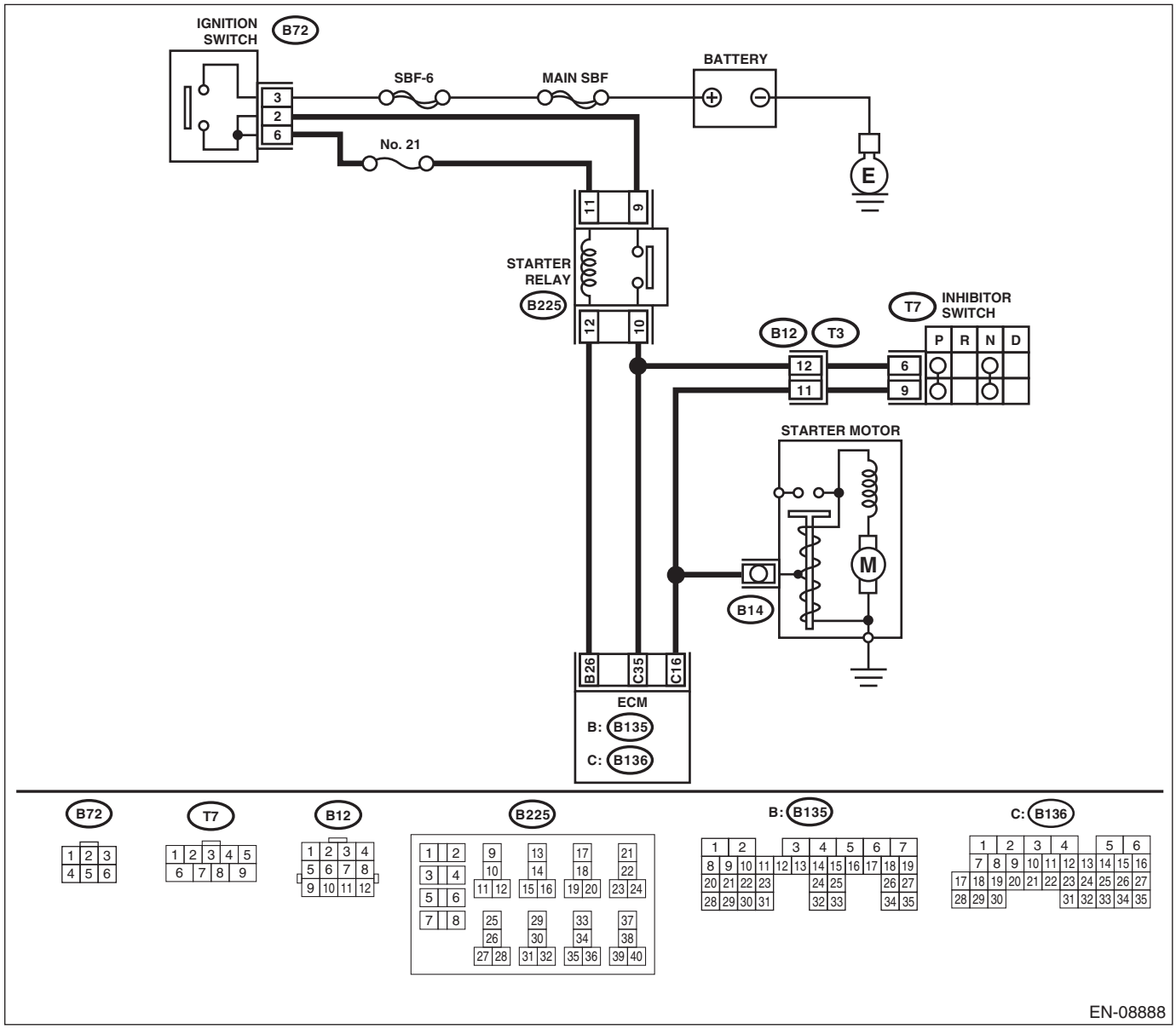
TROUBLE SYMPTOM:

Failure of engine to start

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-82, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK HARNESS BETWEEN ECM AND STARTER RELAY CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and starter motor. 3) Remove the starter relay. 4) Measure the resistance of harness between ECM and starter relay connector. ***Connector & terminal*** ***(B136) No. 16 — (B225) No. 10:***	Is the resistance less than 1 Ω?	Go to step **3**.	Repair the open circuit of harness between ECM and starter relay connector.
3	**CHECK HARNESS BETWEEN ECM AND STARTER RELAY CONNECTOR.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 16 — Chassis ground:***	Is the resistance 1 MΩ or more?	Repair the poor contact of ECM connector.	Repair the short circuit to ground in harness between ECM and starter relay connector.

CW:DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION

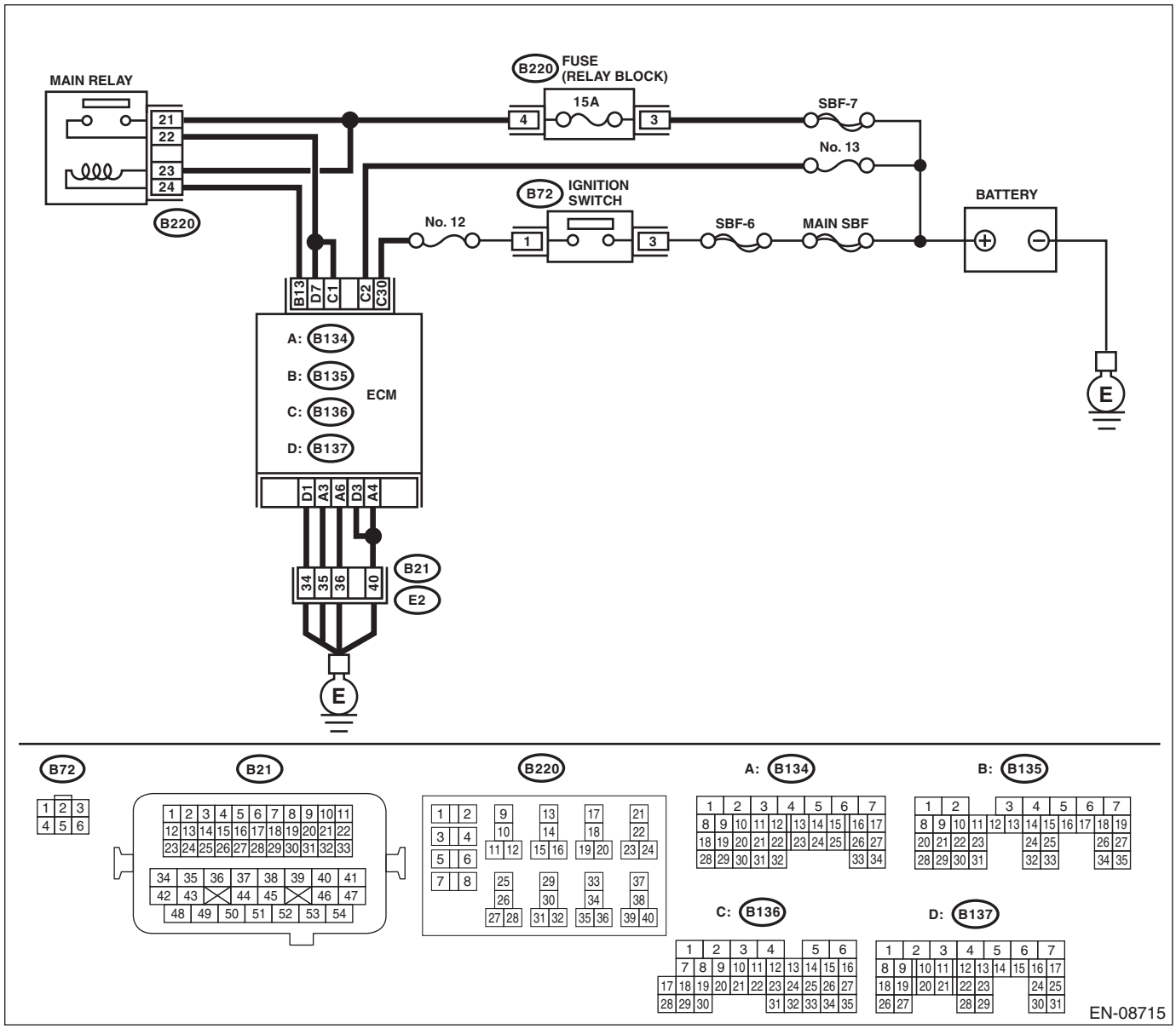
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-214, DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



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. ***Connector & terminal*** ***(B136) No. 2 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the poor contact of ECM connector.	Go to step **2**.

	Step	Check	Yes	No
2	**CHECK HARNESS BETWEEN ECM AND MAIN FUSE BOX CONNECTOR.** 1) Disconnect the connector from ECM. 2) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 2 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **3**.	Repair the ground short circuit of harness between ECM and battery terminal.
3	**CHECK FUSE NO. 13.**	Is the fuse blown out?	Replace the fuse.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and battery • Poor contact of ECM connector • Poor contact of battery terminal

CX:DTC P2004 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-216, DTC P2004 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK FOR 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)-82, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK TUMBLE GENERATOR VALVE RH.** 1) Remove the tumble generator valve assembly RH. 2) Check the tumble generator valve body.	Is there any dirt or clogging with foreign objects in the tumble generator valve?	Clean the tumble generator valve.	Replace the tumble generator valve assembly RH. <Ref. to FU(H4DOTC)-48, Tumble Generator Valve Assembly.>

CY:DTC P2005 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 2)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-217, DTC P2005 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK FOR 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)-82, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK TUMBLE GENERATOR VALVE LH.** 1) Remove the tumble generator valve assembly LH. 2) Check the tumble generator valve body.	Is there any dirt or clogging with foreign objects in the tumble generator valve?	Clean the tumble generator valve.	Replace the tumble generator valve assembly LH. <Ref. to FU(H4DOTC)-48, Tumble Generator Valve Assembly.>

CZ:DTC P2006 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-218, DTC P2006 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK FOR 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)-82, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK TUMBLE GENERATOR VALVE RH.** 1) Remove the tumble generator valve assembly RH. 2) Check the tumble generator valve body.	Is there any dirt or clogging with foreign objects in the tumble generator valve?	Clean the tumble generator valve.	Replace the tumble generator valve assembly RH. <Ref. to FU(H4DOTC)-48, Tumble Generator Valve Assembly.>

DA:DTC P2007 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 2)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-219, DTC P2007 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK FOR 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)-82, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK TUMBLE GENERATOR VALVE LH.** 1) Remove the tumble generator valve assembly LH. 2) Check the tumble generator valve body.	Is there any dirt or clogging with foreign objects in the tumble generator valve?	Clean the tumble generator valve.	Replace the tumble generator valve assembly LH. <Ref. to FU(H4DOTC)-48, Tumble Generator Valve Assembly.>

DB:DTC P2008 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 1)

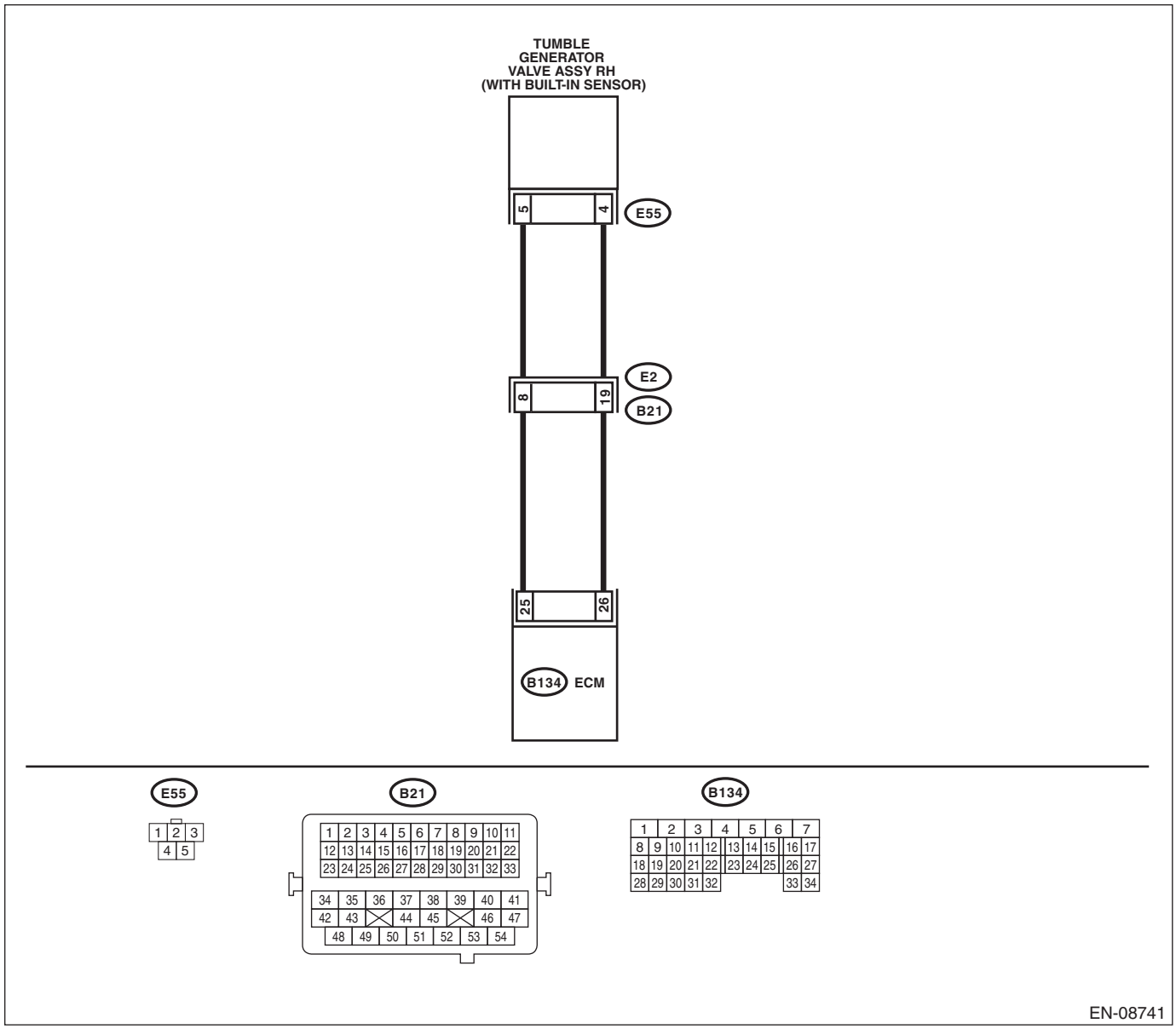
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-220, DTC P2008 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ASSEMBLY RH CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM and tumble generator valve assembly RH. 3) Measure the resistance of harness between ECM and tumble generator valve assembly RH. ***Connector & terminal*** ***(B134) No. 25 — (E55) No. 5:*** ***(B134) No. 26 — (E55) No. 4:***	Is the resistance less than 1 Ω?	Go to step **2**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and tumble generator valve assembly RH connector • Poor contact of coupling connector
2	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ASSEMBLY RH CONNECTOR.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 25 — Chassis ground:*** ***(B134) No. 26 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **3**.	Repair the short circuit to ground in harness between ECM and tumble generator valve assembly RH connector.
3	**CHECK FOR POOR CONTACT.** Check for poor contact of tumble generator valve assembly RH connector.	Is there poor contact of the tumble generator valve assembly RH connector?	Repair the poor contact of tumble generator valve assembly RH connector.	Replace the tumble generator valve assembly RH. <Ref. to FU(H4DOTC)-48, Tumble Generator Valve Assembly.>

DC:DTC P2009 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 1)

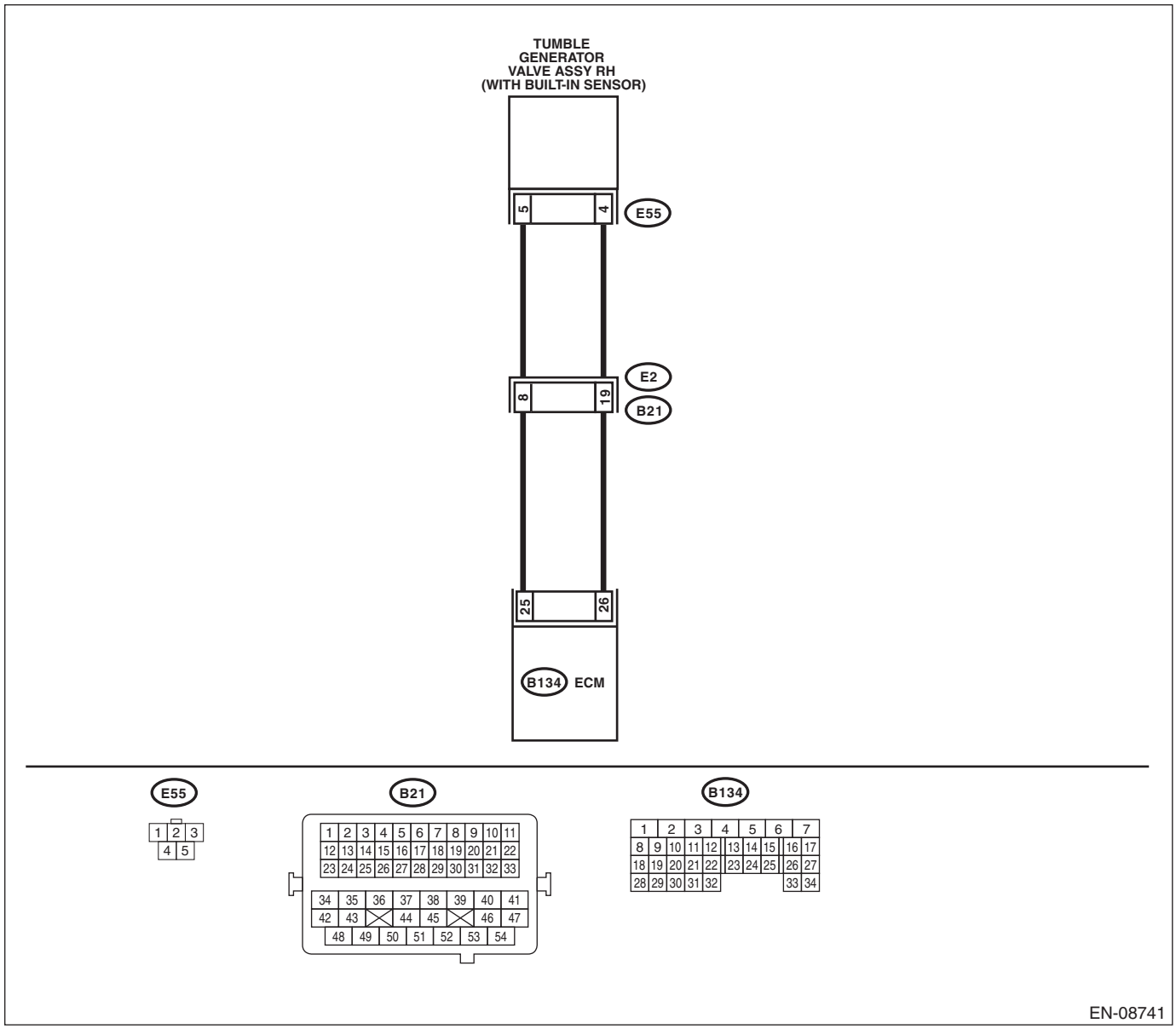
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-222, DTC P2009 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ASSEMBLY RH CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 25 (+) — Chassis ground (–):*** ***(B134) No. 26 (+) — Chassis ground (–):***	Is the voltage 5 V or more?	Repair the short circuit to power in harness between ECM and tumble generator valve assembly RH connector.	Replace the tumble generator valve assembly RH. <Ref. to FU(H4DOTC)-48, Tumble Generator Valve Assembly.>

DD:DTC P2011 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 2)

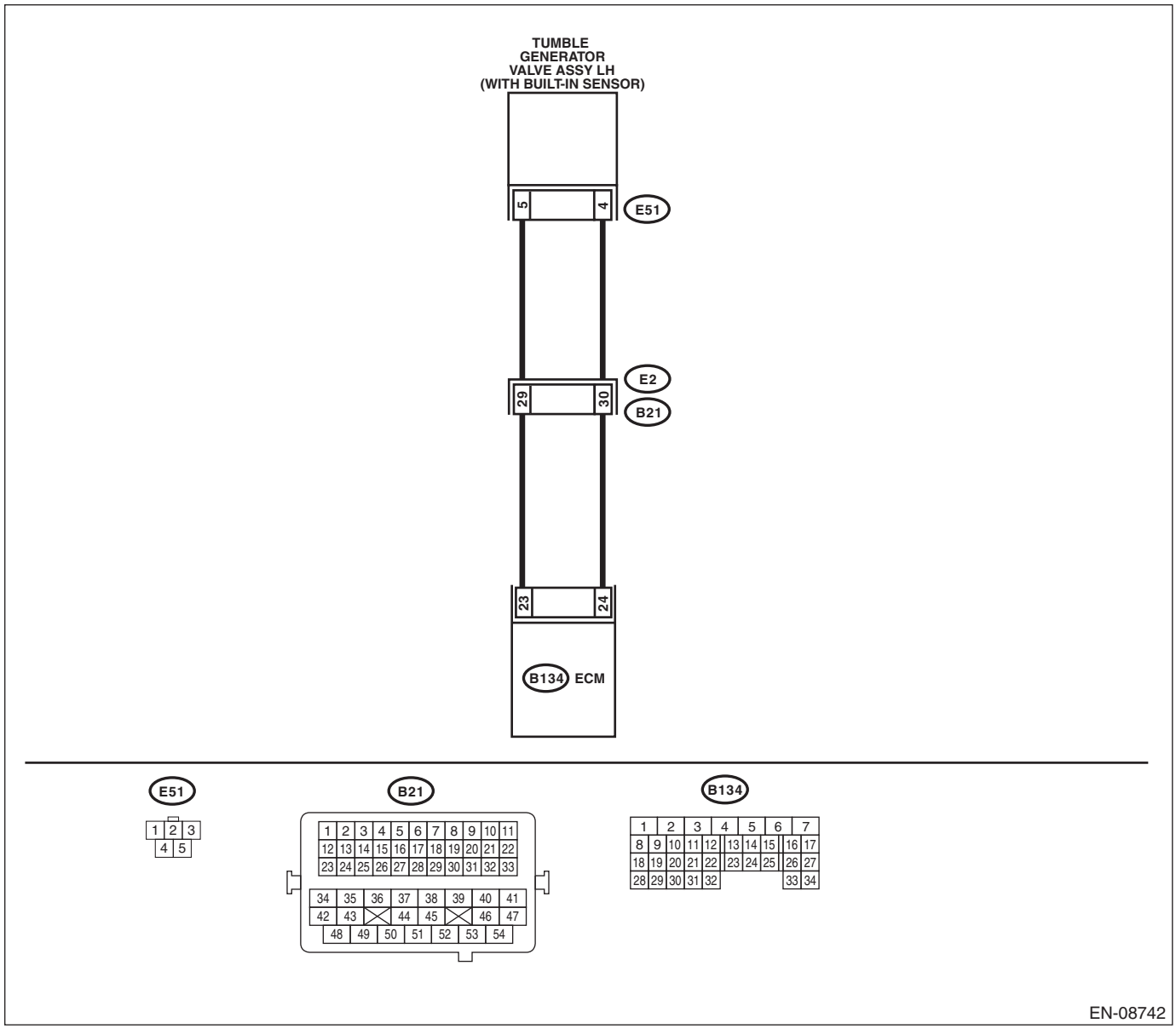
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-224, DTC P2011 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ASSEMBLY LH CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and tumble generator valve assembly LH. 3) Measure the resistance of harness between ECM and tumble generator valve assembly LH. ***Connector & terminal*** ***(B134) No. 23 — (E51) No. 5:*** ***(B134) No. 24 — (E51) No. 4:***	Is the resistance less than 1 Ω?	Go to step **2**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and tumble generator valve assembly LH connector • Poor contact of coupling connector
2	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ASSEMBLY LH CONNECTOR.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 23 — Chassis ground:*** ***(B134) No. 24 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **3**.	Repair the short circuit to ground in harness between ECM and tumble generator valve assembly LH connector.
3	**CHECK FOR POOR CONTACT.** Check for poor contact of tumble generator valve assembly LH connector.	Is there poor contact of the tumble generator valve assembly LH connector?	Repair the poor contact of tumble generator valve assembly LH connector.	Replace the tumble generator valve assembly LH. <Ref. to FU(H4DOTC)-48, Tumble Generator Valve Assembly.>

DE:DTC P2012 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 2)

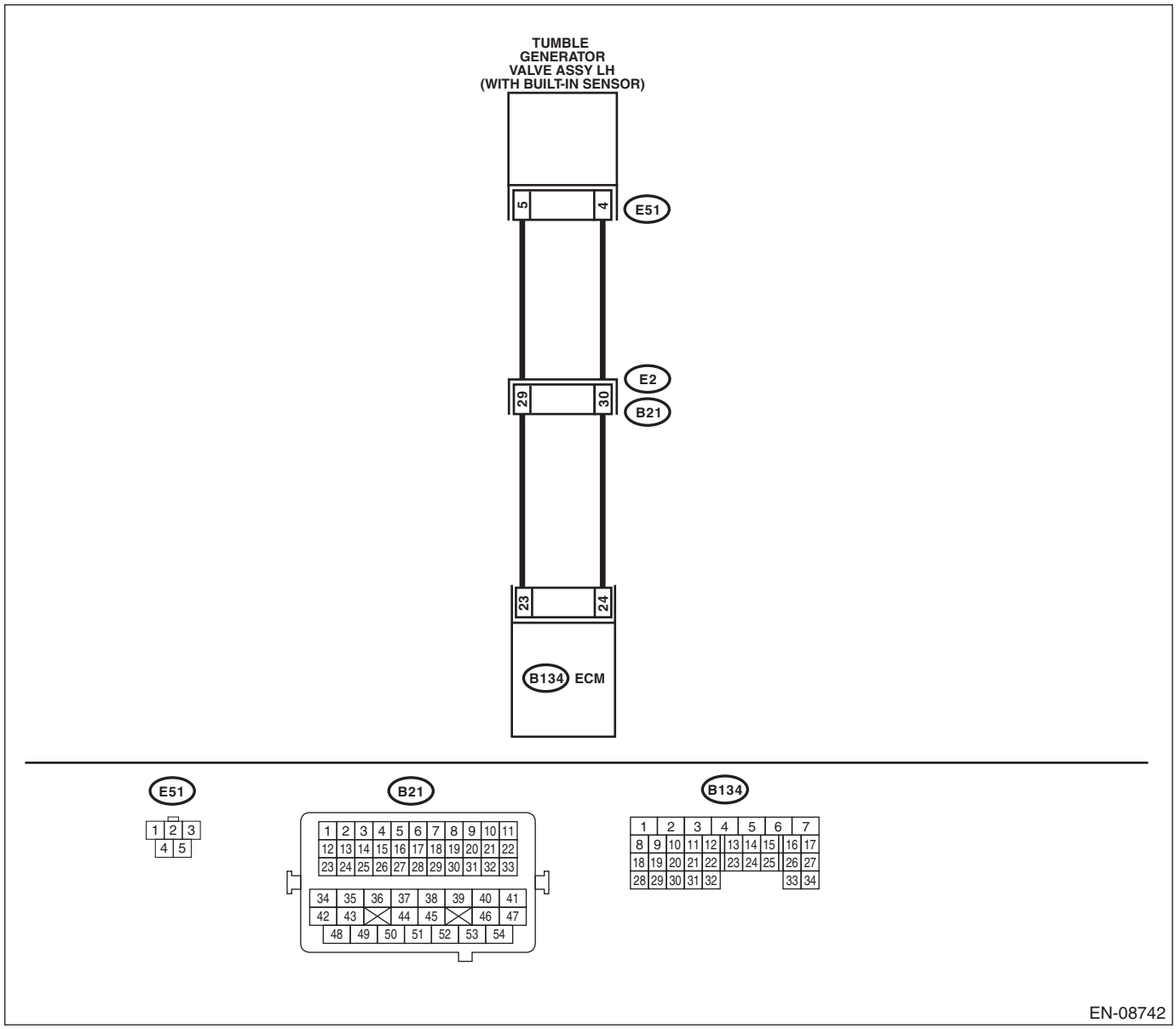
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-226, DTC P2012 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ASSEMBLY LH CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 23 (+) — Chassis ground (–):*** ***(B134) No. 24 (+) — Chassis ground (–):***	Is the voltage 5 V or more?	Repair the short circuit to power in harness between ECM and tumble generator valve assembly LH connector.	Replace the tumble generator valve assembly LH. <Ref. to FU(H4DOTC)-48, Tumble Generator Valve Assembly.>

DF:DTC P2016 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT LOW (BANK 1)

DTC DETECTING CONDITION:

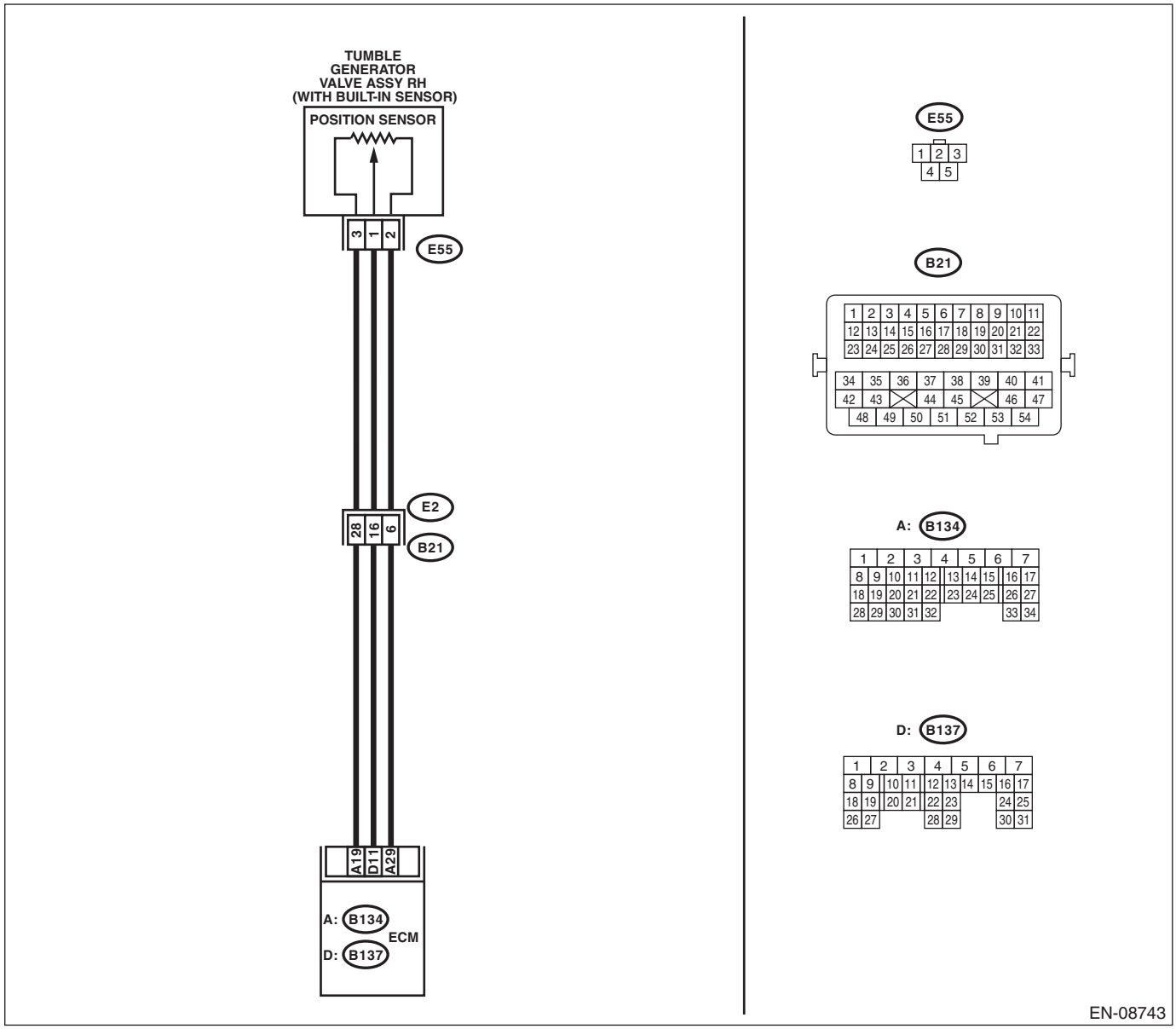
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-228, DTC P2016 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT LOW (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Improper idling
- Engine stalls.
- Poor driving performance

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of tumble generator valve position sensor signal (RH) 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)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the voltage less than 0.2 V?	Go to step **2**.	Even if DTC is detected, 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, temporary open or short circuit of harness may be the cause.
2	**CHECK POWER SUPPLY OF TUMBLE GENERATOR VALVE ASSEMBLY RH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from tumble generator valve assembly RH. 3) Turn the ignition switch to ON. 4) Measure the voltage between tumble generator valve assembly RH connector and engine ground. ***Connector & terminal*** ***(E55) No. 3 (+) — Engine ground (–):***	Is the voltage 4.5 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 ECM and tumble generator valve assembly RH connector • Poor contact of ECM connector • Poor contact of coupling connector
3	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ASSEMBLY RH CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM and tumble generator valve assembly RH. ***Connector & terminal*** ***(B137) No. 11 — (E55) 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 tumble generator valve assembly RH connector • Poor contact of coupling connector
4	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ASSEMBLY RH CONNECTOR.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 11 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **5**.	Repair the short circuit to ground in harness between ECM and tumble generator valve assembly RH connector.
5	**CHECK FOR POOR CONTACT.** Check for poor contact of ECM and tumble generator valve assembly RH connector.	Is there poor contact of ECM or the tumble generator valve assembly RH connector?	Repair the poor contact of ECM or tumble generator valve assembly RH connector.	Replace the tumble generator valve assembly RH. <Ref. to FU(H4DOTC)-48, Tumble Generator Valve Assembly.>

DG: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)-230, DTC P2017 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT HIGH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

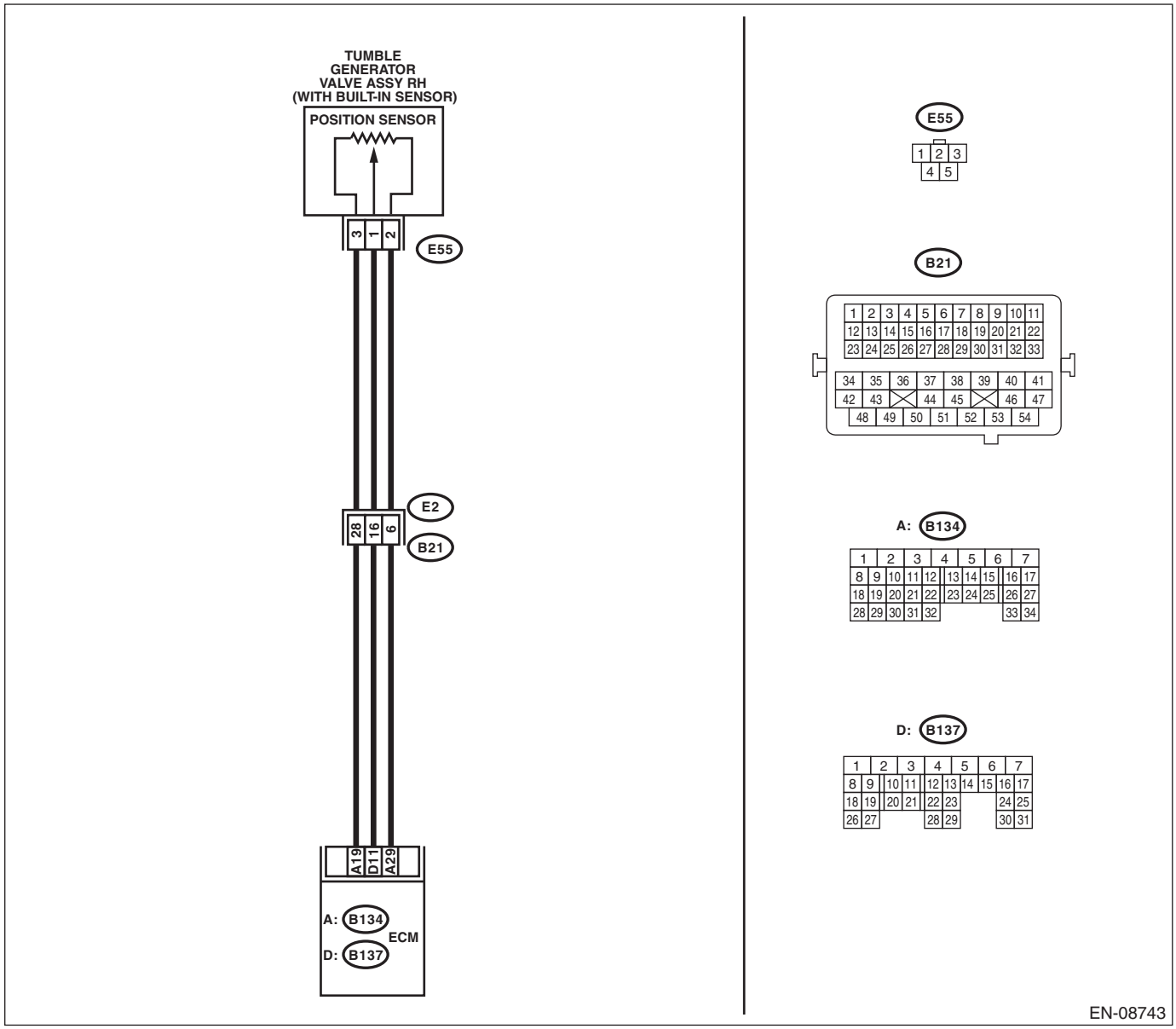
TROUBLE SYMPTOM:

- Improper idling
- Engine stalls.
- Poor driving performance

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of tumble generator valve position sensor signal (RH) 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)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the voltage 5 V or more?	Go to step **2**.	Even if DTC is detected, 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, temporary open or short circuit of harness may be the cause.
2	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ASSEMBLY RH CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from tumble generator valve assembly RH. 3) Start the engine. 4) Read the data of tumble generator valve position sensor signal (RH) 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)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the voltage 5 V or more?	Repair the short circuit to power in harness between ECM and tumble generator valve assembly RH connector.	Go to step **3**.
3	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ASSEMBLY RH CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between tumble generator valve assembly RH connector and engine ground. ***Connector & terminal*** ***(E55) No. 2 — Engine 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 tumble generator valve assembly RH connector • Poor contact of ECM connector • Poor contact of coupling connector
4	**CHECK FOR POOR CONTACT.** Check for poor contact of tumble generator valve assembly RH connector.	Is there poor contact of the tumble generator valve assembly RH connector?	Repair the poor contact of tumble generator valve assembly RH connector.	Replace the tumble generator valve assembly RH. <Ref. to FU(H4DOTC)-48, Tumble Generator Valve Assembly.>

DH:DTC P2021 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT LOW (BANK 2)

DTC DETECTING CONDITION:

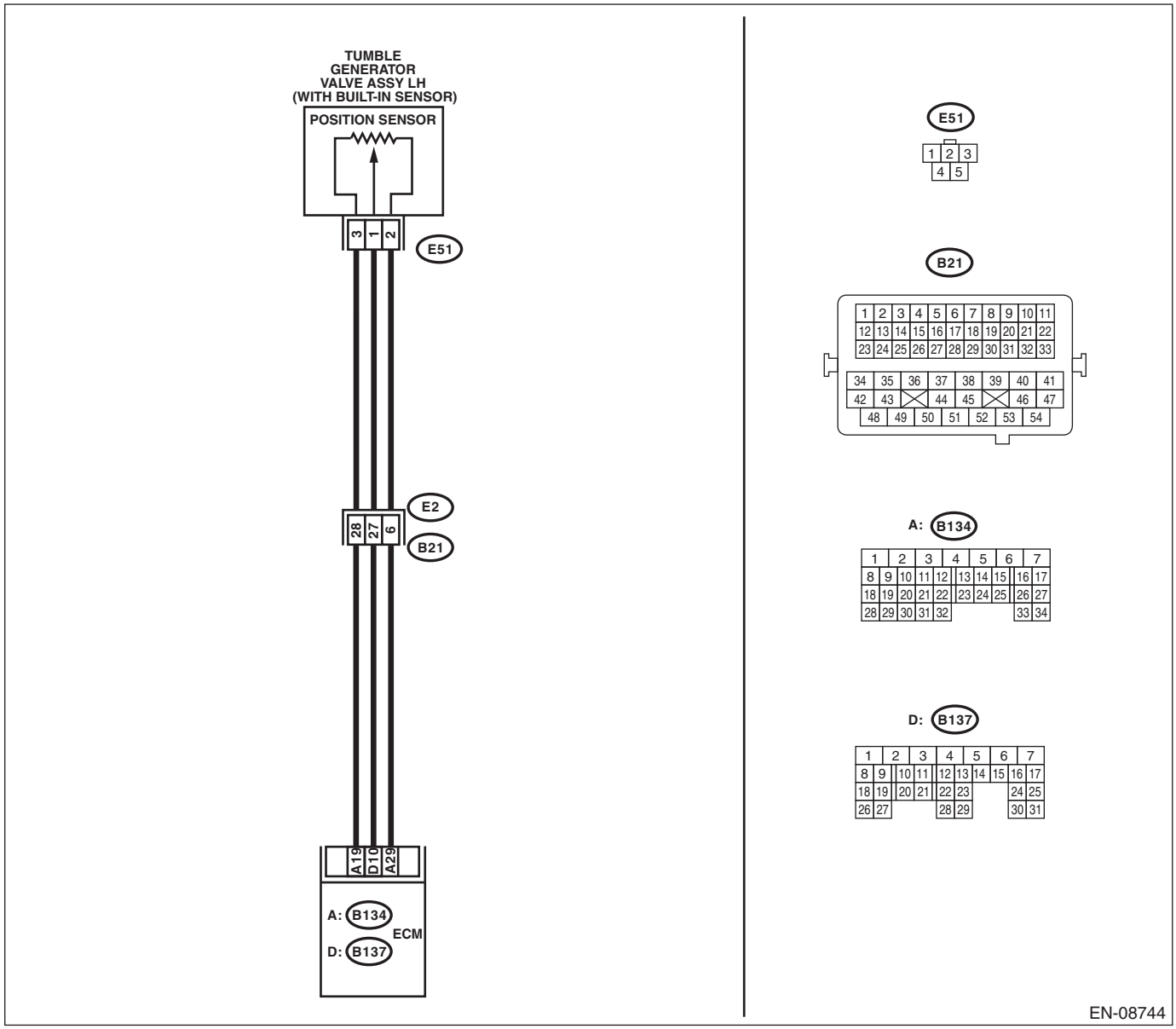
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-232, DTC P2021 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT LOW (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Improper idling
- Engine stalls.
- Poor driving performance

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of tumble generator valve position sensor signal (LH) 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)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the voltage less than 0.2 V?	Go to step **2**.	Even if DTC is detected, 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, temporary open or short circuit of harness may be the cause.
2	**CHECK POWER SUPPLY OF TUMBLE GENERATOR VALVE ASSEMBLY LH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from tumble generator valve assembly LH. 3) Turn the ignition switch to ON. 4) Measure the voltage between tumble generator valve assembly LH connector and engine ground. ***Connector & terminal*** ***(E51) No. 3 (+) — Engine ground (–):***	Is the voltage 4.5 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 ECM and tumble generator valve assembly LH connector • Poor contact of ECM connector • Poor contact of coupling connector
3	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ASSEMBLY LH CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM and tumble generator valve assembly LH. ***Connector & terminal*** ***(B137) No. 10 — (E51) 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 tumble generator valve assembly LH connector • Poor contact of coupling connector
4	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ASSEMBLY LH CONNECTOR.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 10 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **5**.	Repair the short circuit to ground in harness between ECM and tumble generator valve assembly LH connector.
5	**CHECK FOR POOR CONTACT.** Check for poor contact of ECM and tumble generator valve assembly LH connector.	Is there poor contact of ECM or the tumble generator valve assembly LH connector?	Repair the poor contact of ECM or tumble generator valve assembly LH connector.	Replace the tumble generator valve assembly LH. <Ref. to FU(H4DOTC)-48, Tumble Generator Valve Assembly.>

DI: DTC P2022 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT HIGH (BANK 2)

DTC DETECTING CONDITION:

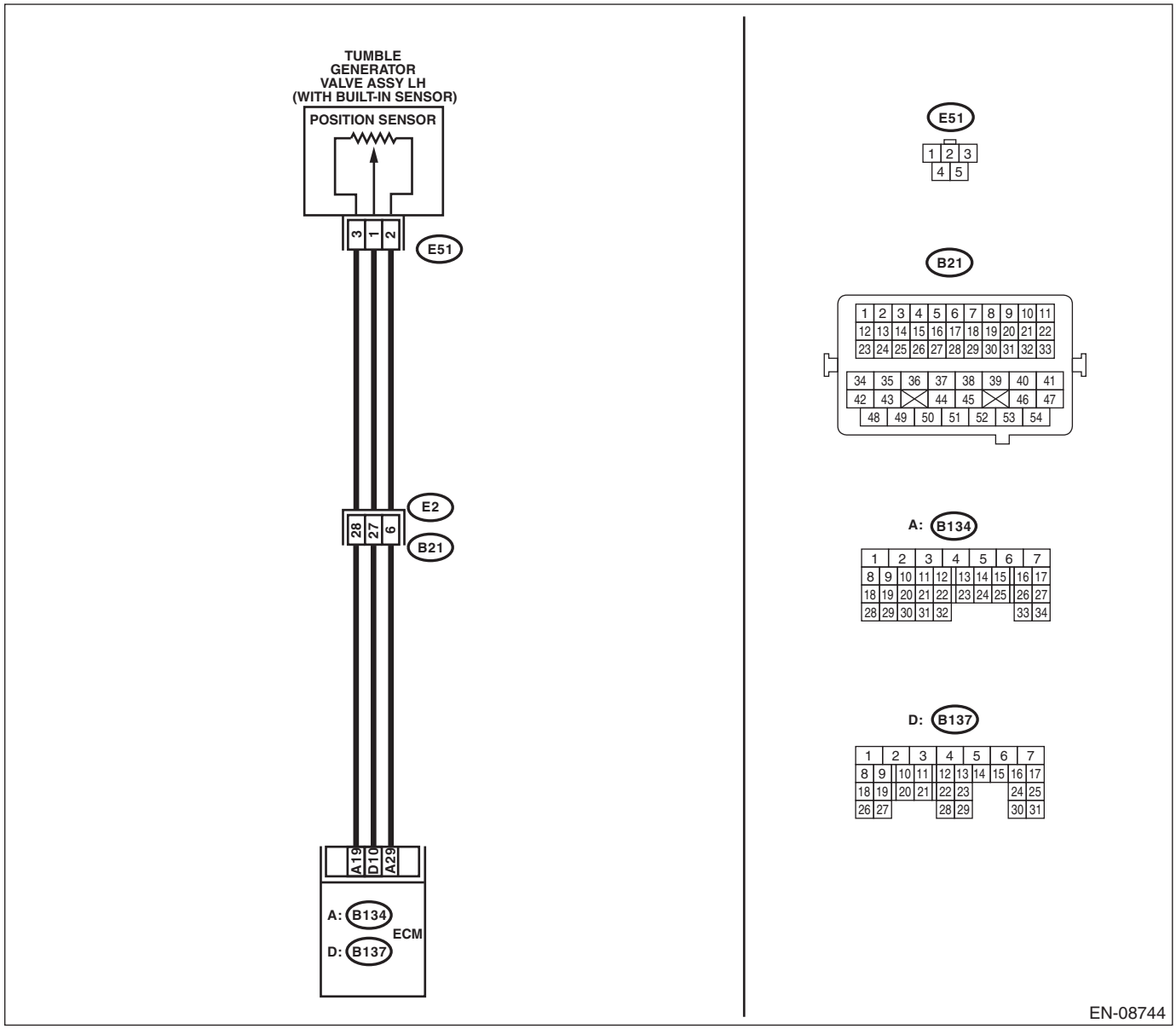
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-234, DTC P2022 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT HIGH (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Improper idling
- Engine stalls.
- Poor driving performance

CAUTION:
After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of tumble generator valve position sensor signal (LH) 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)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the voltage 5 V or more?	Go to step **2**.	Even if DTC is detected, 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, temporary open or short circuit of harness may be the cause.
2	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ASSEMBLY LH CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from tumble generator valve assembly LH. 3) Start the engine. 4) Read the data of tumble generator valve position sensor signal (LH) 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)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the voltage 5 V or more?	Repair the short circuit to power in harness between ECM and tumble generator valve assembly LH connector.	Go to step **3**.
3	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ASSEMBLY LH CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between tumble generator valve assembly LH connector and engine ground. ***Connector & terminal*** ***(E51) No. 2 — Engine 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 tumble generator valve assembly LH connector • Poor contact of ECM connector • Poor contact of coupling connector
4	**CHECK FOR POOR CONTACT.** Check for poor contact of tumble generator valve assembly LH connector.	Is there poor contact of the tumble generator valve assembly LH connector?	Repair the poor contact of tumble generator valve assembly LH connector.	Replace the tumble generator valve assembly LH. <Ref. to FU(H4DOTC)-48, Tumble Generator Valve Assembly.>

DJ:DTC P2088 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-236, DTC P2088 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

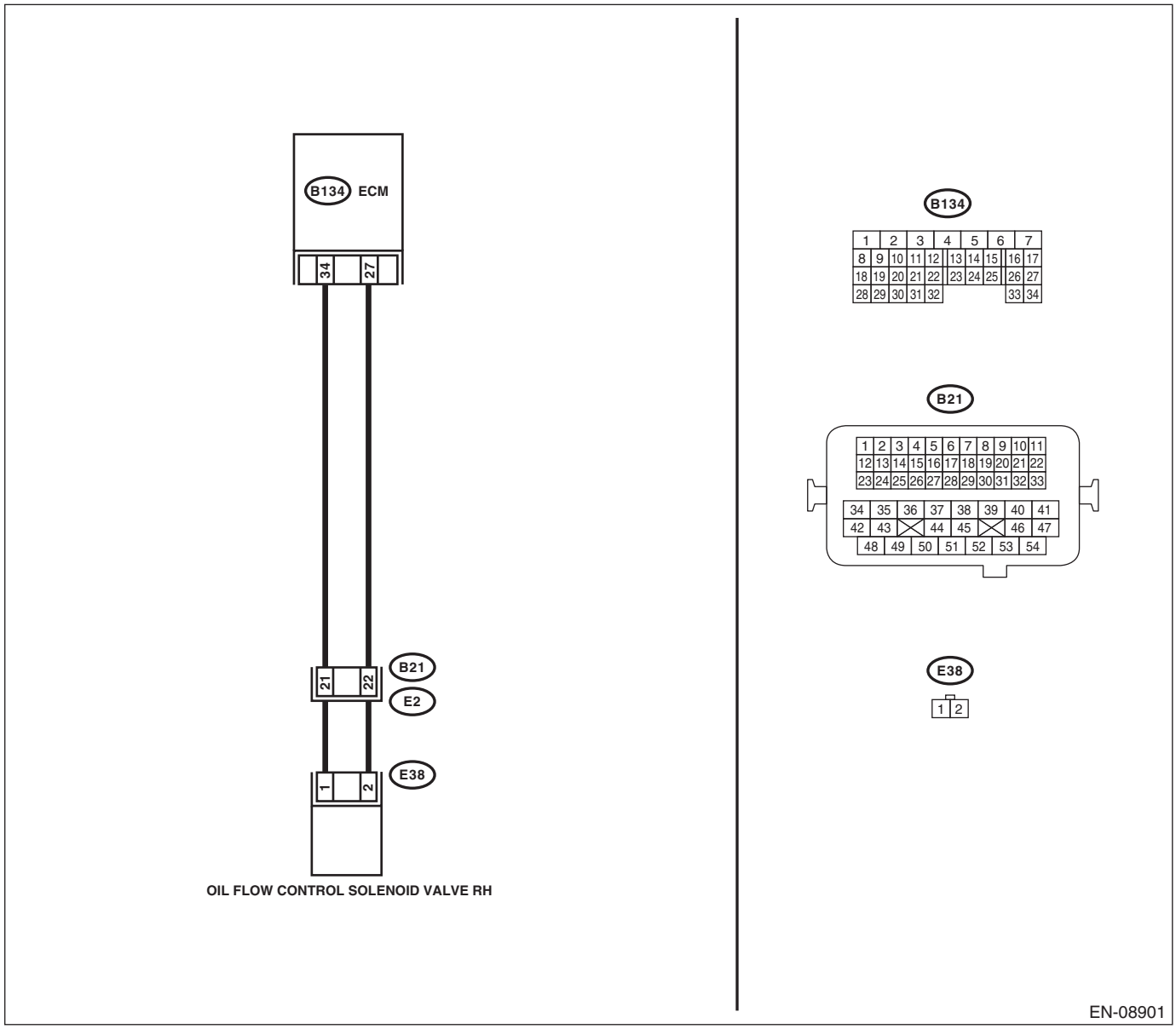
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE RH CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and oil flow control solenoid valve RH. 3) Measure the resistance of harness between ECM and oil flow control solenoid valve RH connector. ***Connector & terminal*** ***(B134) No. 34 — (E38) No. 1:*** ***(B134) No. 27 — (E38) No. 2:***	Is the resistance less than 1 Ω?	Go to step **2**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and oil flow control solenoid valve RH connector • Poor contact of coupling connector
2	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE RH CONNECTOR.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 34 — Chassis ground:*** ***(B134) No. 27 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **3**.	Repair the short circuit to ground in harness between ECM and oil flow control solenoid valve RH connector.
3	**CHECK OIL FLOW CONTROL SOLENOID VALVE.** Measure the resistance between oil flow control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 6 — 12 Ω?	Repair the poor contact of ECM and oil flow control solenoid valve RH connector RH.	Replace the oil flow control solenoid valve RH. <Ref. to ME(H4DOTC)-58, Camshaft.>

DK:DTC P2089 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-237, DTC P2089 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

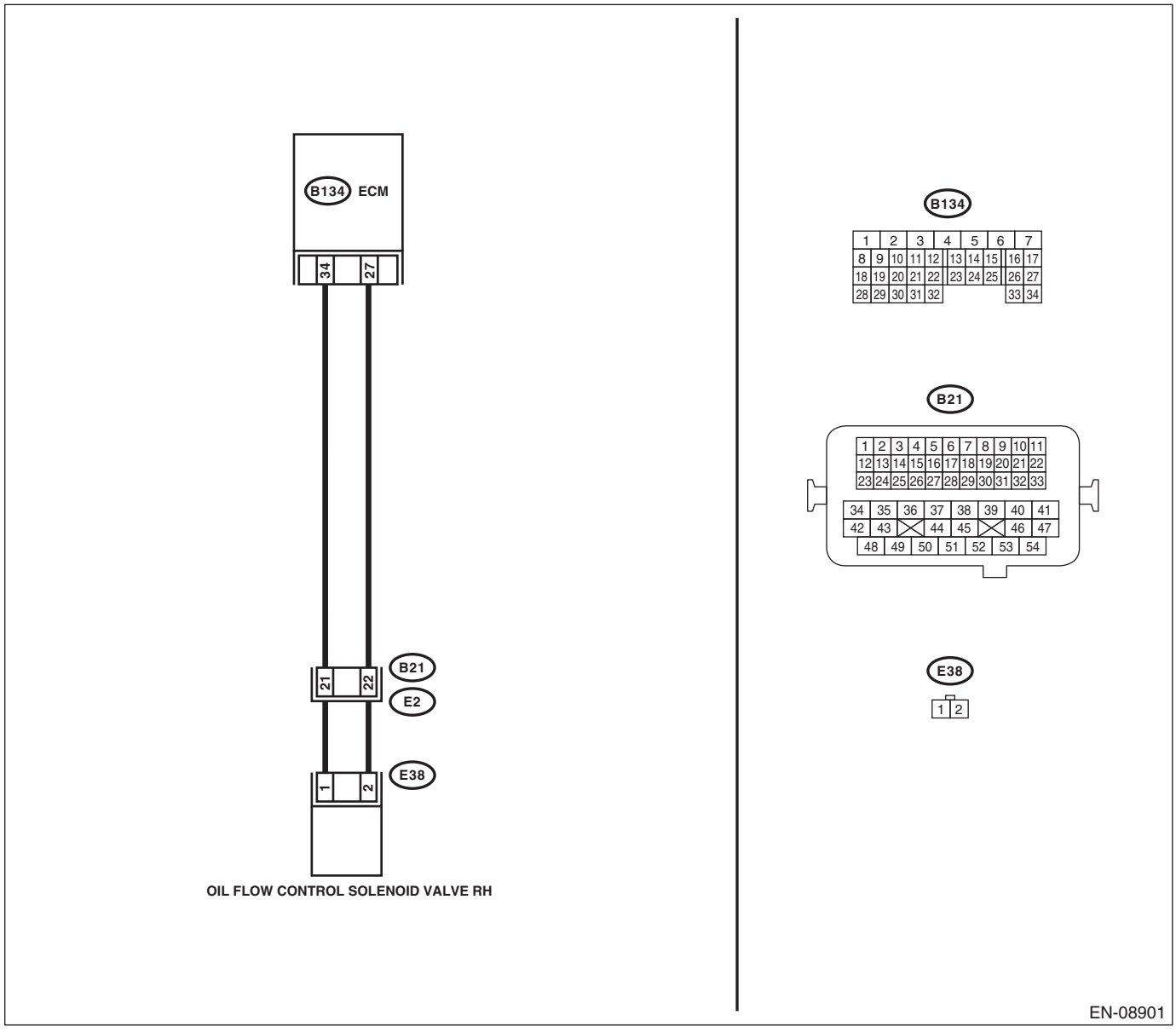
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE RH CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and oil flow control solenoid valve RH. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 34 (+) — Chassis ground (–):*** ***(B134) No. 27 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **2**.	Repair the short circuit to power supply in harness between ECM and oil flow control solenoid valve RH connector.
2	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE RH CONNECTOR.** Measure the resistance of harness between ECM and oil flow control solenoid valve RH connector. ***Connector & terminal*** ***(B134) No. 34 — (E38) No. 1:*** ***(B134) No. 27 — (E38) No. 2:***	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 oil flow control solenoid valve RH connector • Poor contact of coupling connector
3	**CHECK OIL FLOW CONTROL SOLENOID VALVE.** Measure the resistance between oil flow control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 6 — 12 Ω?	Repair the poor contact of ECM and oil flow control solenoid valve RH connector RH.	Replace the oil flow control solenoid valve RH. <Ref. to ME(H4DOTC)-58, Camshaft.>

DL:DTC P2092 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 2)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-238, DTC P2092 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

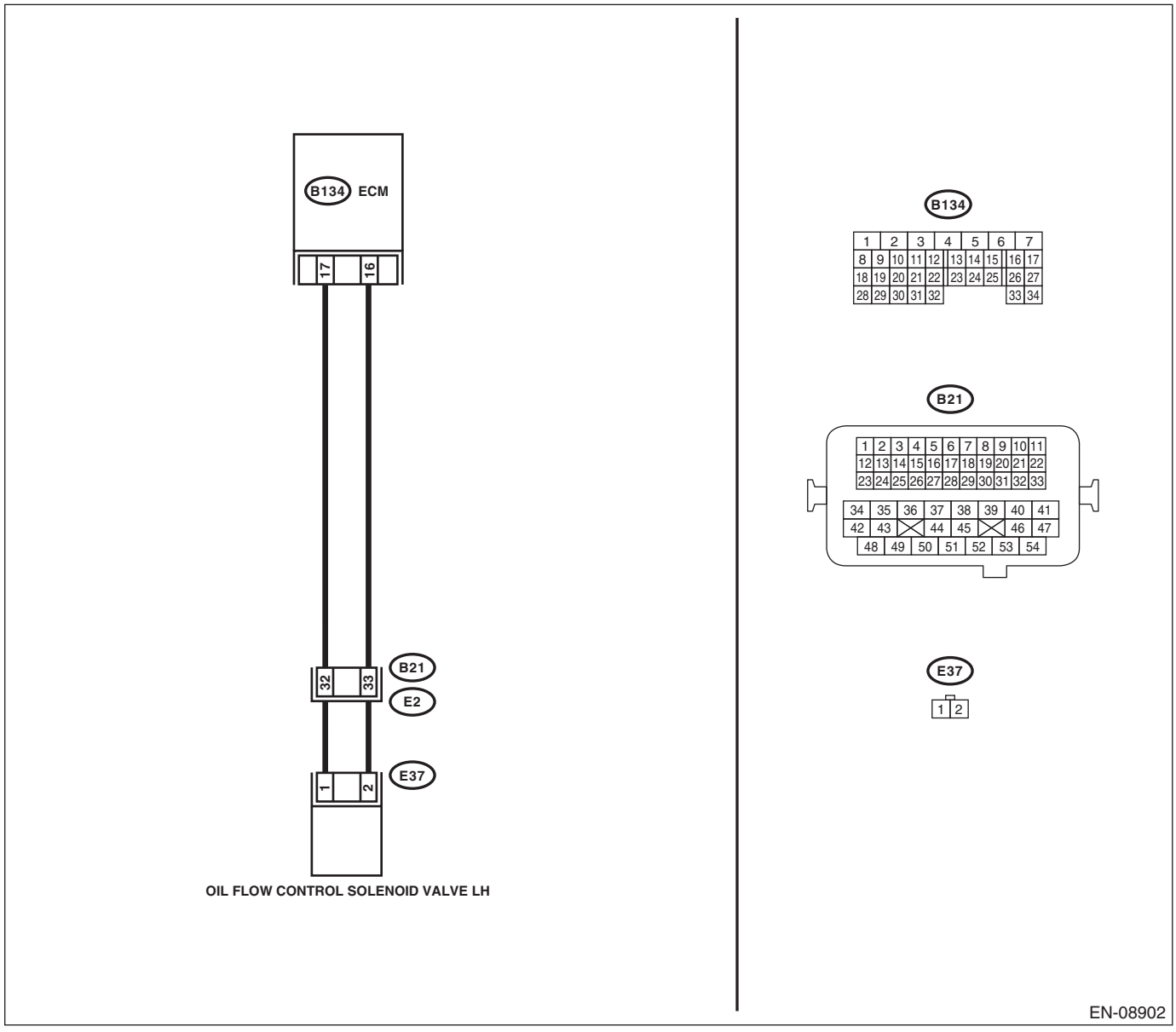
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE LH CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and oil flow control solenoid valve LH. 3) Measure the resistance of harness between ECM and oil flow control solenoid valve LH connector. ***Connector & terminal*** ***(B134) No. 17 — (E37) No. 1:*** ***(B134) No. 16 — (E37) No. 2:***	Is the resistance less than 1 Ω?	Go to step **2**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and oil flow control solenoid valve LH connector • Poor contact of coupling connector
2	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE LH CONNECTOR.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 17 — Chassis ground:*** ***(B134) No. 16 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **3**.	Repair the short circuit to ground in harness between ECM and oil flow control solenoid valve LH connector.
3	**CHECK OIL FLOW CONTROL SOLENOID VALVE.** Measure the resistance between oil flow control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 6 — 12 Ω?	Repair the poor contact of ECM and oil flow control solenoid valve LH connector.	Replace the oil flow control solenoid valve LH. <Ref. to ME(H4DOTC)-58, Camshaft.>

DM:DTC P2093 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 2)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-238, DTC P2093 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

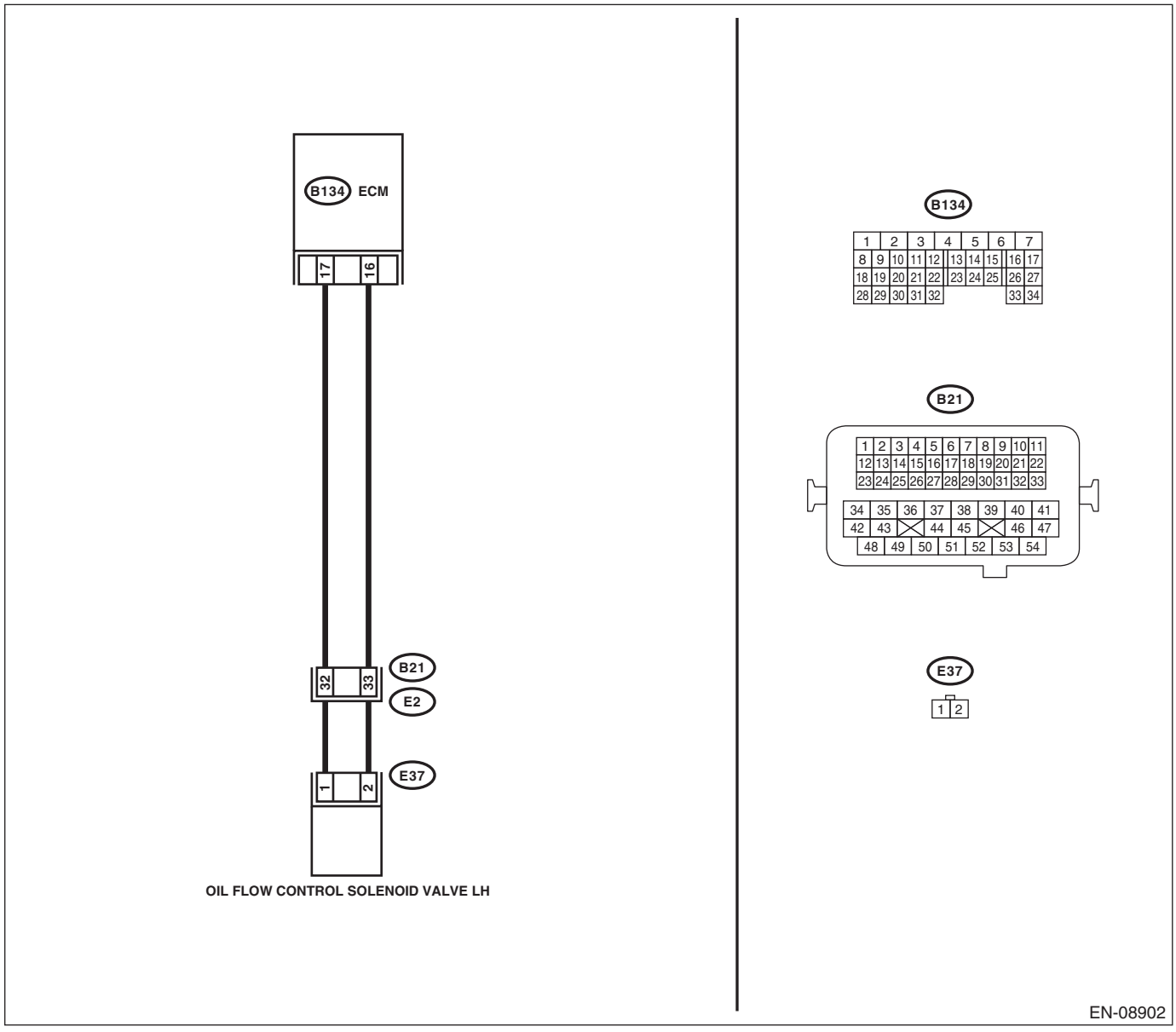
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE LH CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and oil flow control solenoid valve LH. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 17 (+) — Chassis ground (–):*** ***(B134) No. 16 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **2**.	Repair the short circuit to power supply in harness between ECM and oil flow control solenoid valve LH connector.
2	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE LH CONNECTOR.** Measure the resistance of harness between ECM and oil flow control solenoid valve LH connector. ***Connector & terminal*** ***(B134) No. 17 — (E37) No. 1:*** ***(B134) No. 16 — (E37) No. 2:***	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 oil flow control solenoid valve LH connector • Poor contact of coupling connector
3	**CHECK OIL FLOW CONTROL SOLENOID VALVE.** Measure the resistance between oil flow control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 6 — 12 Ω?	Repair the poor contact of ECM and oil flow control solenoid valve LH connector.	Replace the oil flow control solenoid valve LH. <Ref. to ME(H4DOTC)-58, Camshaft.>

DN:DTC P2096 POST CATALYST FUEL TRIM SYSTEM TOO LEAN (BANK 1)

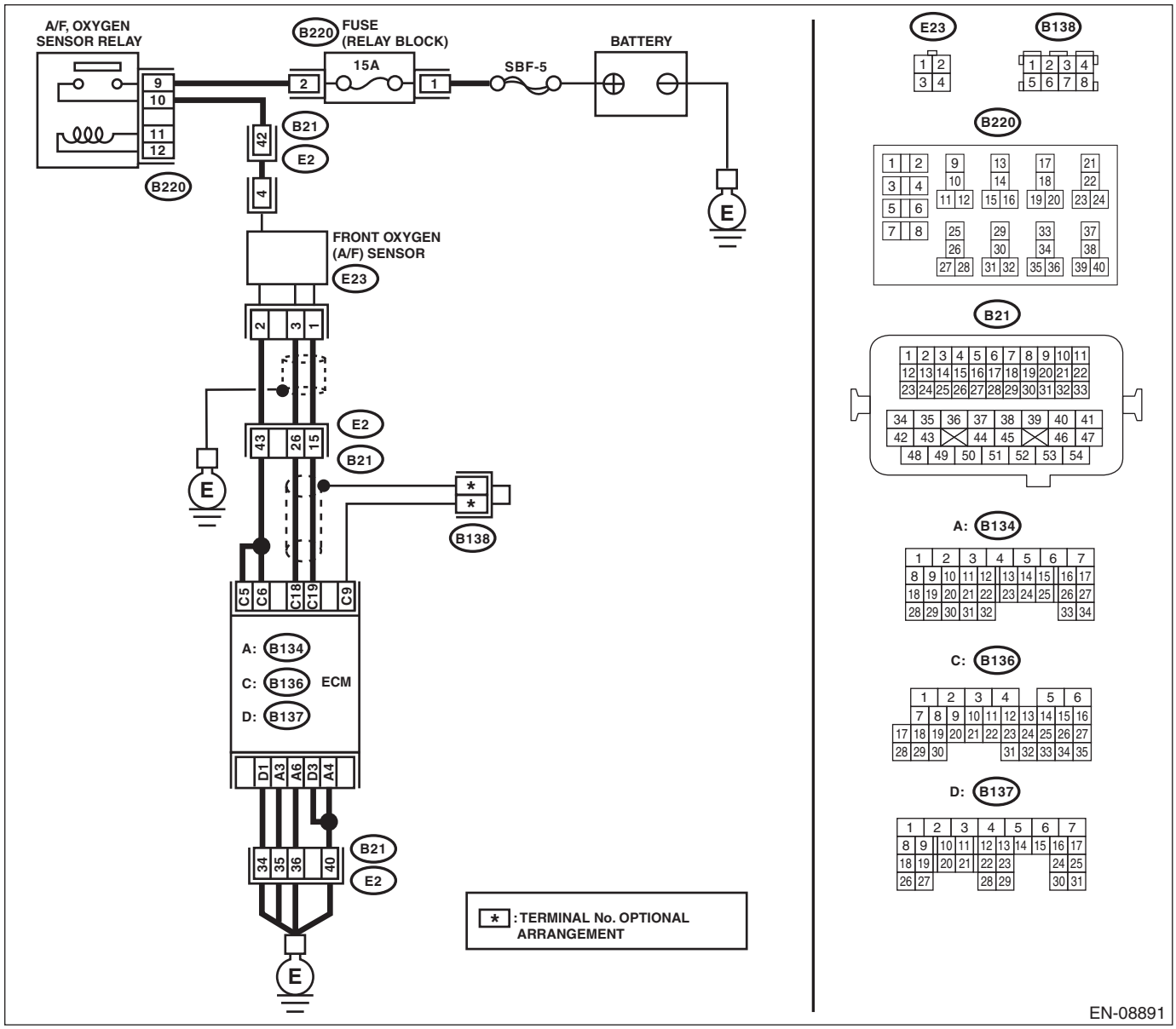
DTC DETECTING CONDITION:

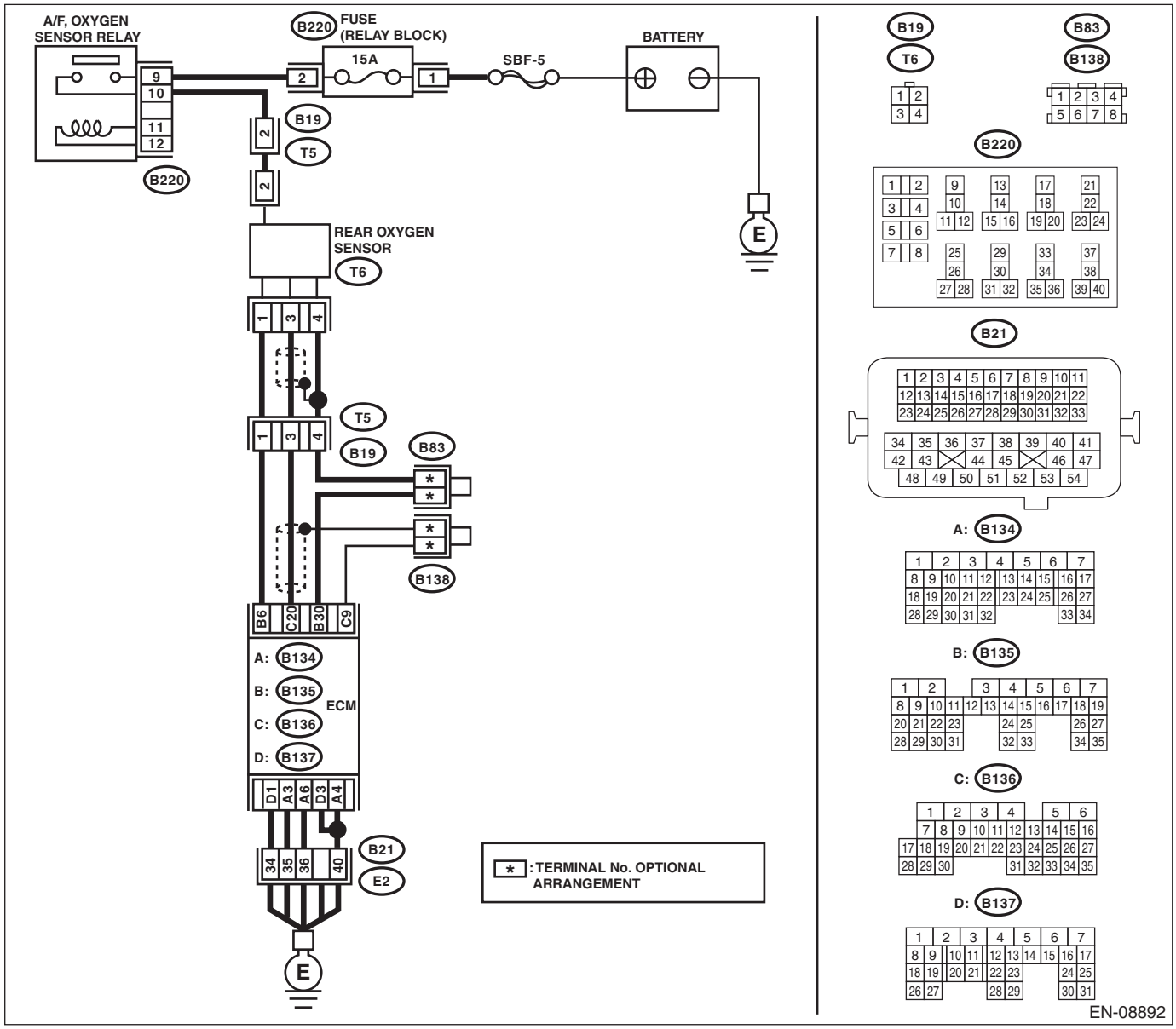
- Detected when two consecutive driving cycles with fault occur.
- <Ref. to GD(H4DOTC)-239, DTC P2096 POST CATALYST FUEL TRIM SYSTEM TOO LEAN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





Step		Check	Yes	No
1	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-82, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Has water entered the connector?	Completely remove any water inside.	Go to step **3**.

	Step	Check	Yes	No
3	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and front oxygen (A/F) sensor. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B136) No. 19 — (E23) No. 1:*** ***(B136) No. 18 — (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: • Open circuit in harness between ECM and front oxygen (A/F) sensor connector • Poor contact of coupling connector
4	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 19 — Chassis ground:*** ***(B136) No. 18 — 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 front oxygen (A/F) sensor connector and chassis ground. ***Connector & terminal*** ***(E23) No. 1 (+) — Chassis ground (–):***	Is the voltage 4.5 V or more?	Go to step **7**.	Go to step **6**.
6	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between front oxygen (A/F) sensor connector and chassis ground. ***Connector & terminal*** ***(E23) No. 3 (+) — Chassis ground (–):***	Is the voltage 4.95 V or more?	Go to step **7**.	Go to step **8**.
7	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between front oxygen (A/F) sensor connector and chassis ground. ***Connector & terminal*** ***(E23) No. 3 (+) — Chassis ground (–):*** ***(E23) No. 1 (+) — Chassis ground (–):***	Is the voltage 8 V or more?	Repair the short circuit to power in the harness between ECM and front oxygen (A/F) sensor connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-57, Engine Control Module (ECM).>	Repair the poor contact of ECM connector.
8	**CHECK EXHAUST SYSTEM.**	Are there holes or loose bolts on exhaust system?	Repair the exhaust system.	Go to step **9**.
9	**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 **10**.

	Step	Check	Yes	No
10	**CHECK FUEL PRESSURE.** **WARNING:** **Place "NO OPEN FLAMES" signs near the working area.** **CAUTION:** **Be careful not to spill fuel.** 1) Connect the front oxygen (A/F) sensor connector. 2) Measure the fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold. <Ref. to ME(H4DOTC)-25, INSPECTION, Fuel Pressure.> **CAUTION:** **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 **11**.	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
11	**CHECK FUEL PRESSURE.** After connecting the pressure regulator vacuum hose, measure fuel pressure. <Ref. to ME(H4DOTC)-25, INSPECTION, Fuel Pressure.> **CAUTION:** **Release fuel pressure before removing the fuel pressure gauge.** NOTE: • 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 **12**.	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
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: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the engine coolant temperature 75°C (167°F) or higher?	Go to step **13**.	Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC)-34, Engine Coolant Temperature Sensor.>

	Step	Check	Yes	No
13	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.** 1) Start the engine and warm up engine until coolant temperature is higher than 75°C (167°F). 2) Place the select lever in "P" range or "N" range. 3) Turn the A/C switch to OFF. 4) Turn all the accessory switches to OFF. 5) Read the data of the 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)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the measured value 2.0 — 5.0 g/s (0.26 — 0.66 lb/s)?	Go to step **14**.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-42, Mass Air Flow and Intake Air Temperature Sensor.>
14	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.** 1) Start the engine and warm up engine until coolant temperature is higher than 75°C (167°F). 2) Place the select lever in "P" range or "N" range. 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 the 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)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Subtract ambient temperature from intake air temperature. Is the obtained value –10 — 50°C (–18 — 90°F)?	Go to step **15**.	Check the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-42, Mass Air Flow and Intake Air Temperature Sensor.>

	Step	Check	Yes	No
15	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm up the engine until engine coolant temperature is higher than 75°C (167°F), and keep the engine speed at 3,000 rpm. (2 minutes maximum) 2) Read the data of rear oxygen 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)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the voltage 490 mV or more?	Go to step **16**.	Go to step **17**.
16	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm up the engine until engine coolant temperature is higher than 75°C (167°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: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the voltage 250 mV or less?	Go to step **18**.	Go to step **17**.
17	**CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Has water entered the connector?	Completely remove any water inside.	Go to step **19**.
18	**CHECK FRONT OXYGEN (A/F) SENSOR USING REAR OXYGEN SENSOR SIGNAL.** 1) Warm up the engine until engine coolant temperature is higher than 75°C (167°F), then keep the engine idling for 5 minutes or more. 2) Read the data of rear oxygen 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)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is a voltage of 250 mV or less maintained for 5 minutes or more?	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-53, Front Oxygen (A/F) Sensor.>	Go to step **19**.

	Step	Check	Yes	No
19	**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*** ***(B136) No. 20 — (T6) No. 3:*** ***(B135) No. 30 — (T6) No. 4:***	Is the resistance less than 1 Ω?	Go to step **20**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and rear oxygen sensor connector • Poor contact of coupling connector
20	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between rear oxygen sensor connector and chassis ground. ***Connector & terminal*** ***(T6) No. 3 (+) — Chassis ground (–):***	Is the voltage 0.2 — 0.5 V?	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-55, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and rear oxygen sensor connector • Poor contact of ECM connector • Poor contact of coupling connector

DO:DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH (BANK 1)

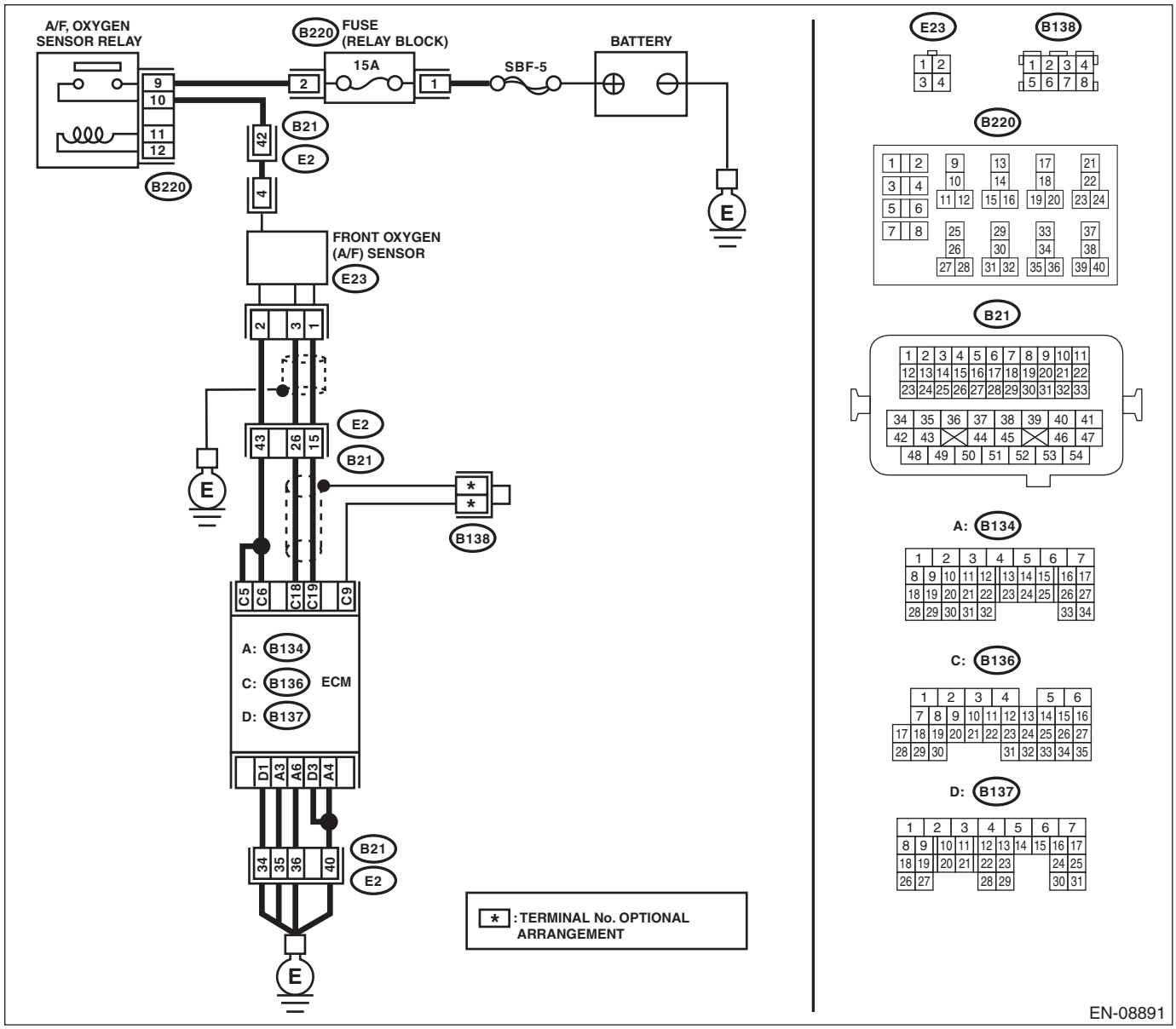
DTC DETECTING CONDITION:

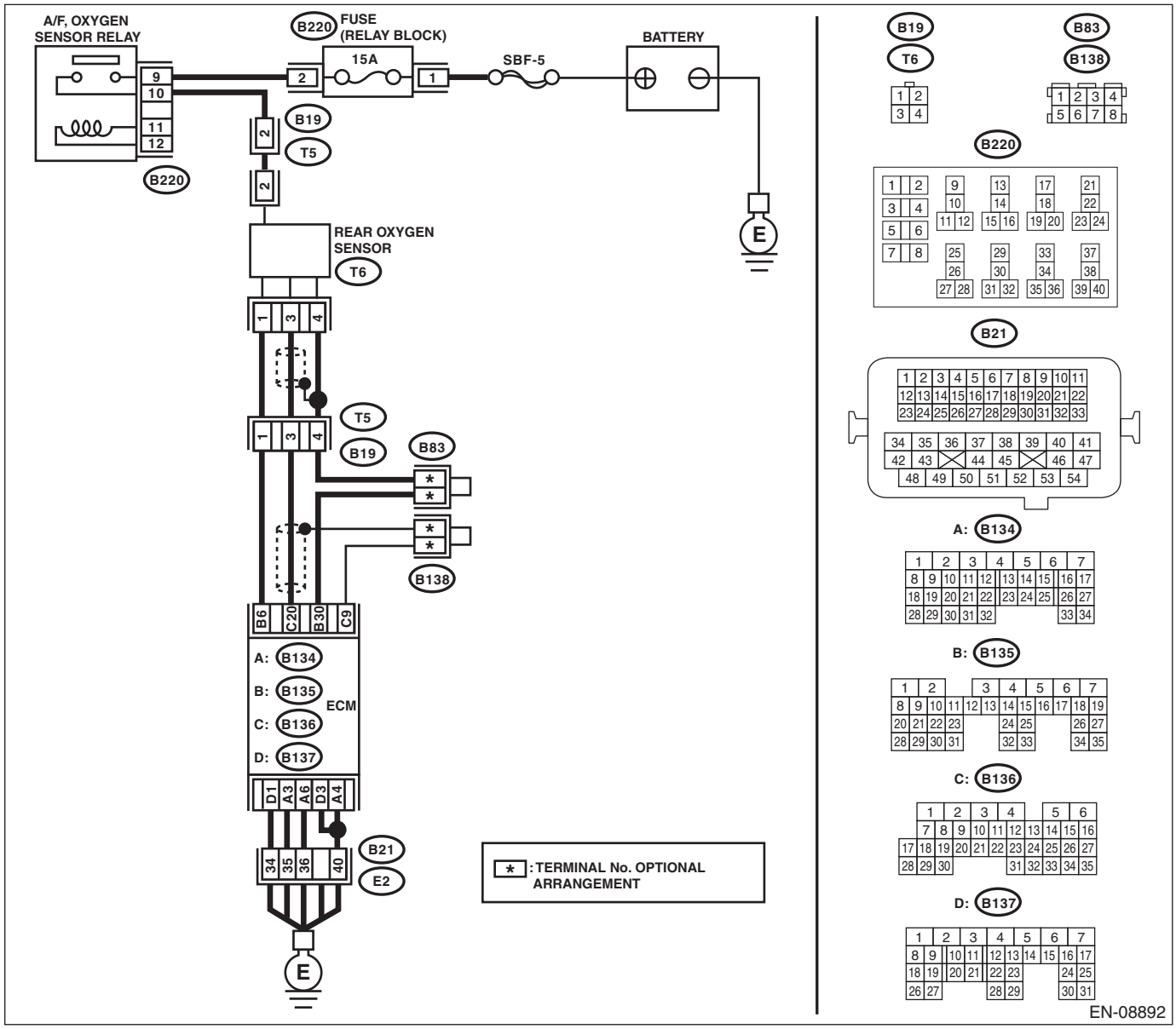
- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-241, DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





Step		Check	Yes	No
1	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-82, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Has water entered the connector?	Completely remove any water inside.	Go to step **3**.

	Step	Check	Yes	No
3	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and front oxygen (A/F) sensor. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B136) No. 19 — (E23) No. 1:*** ***(B136) No. 18 — (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: • Open circuit in harness between ECM and front oxygen (A/F) sensor connector • Poor contact of coupling connector
4	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 19 — Chassis ground:*** ***(B136) No. 18 — 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 front oxygen (A/F) sensor connector and chassis ground. ***Connector & terminal*** ***(E23) No. 1 (+) — Chassis ground (–):***	Is the voltage 4.5 V or more?	Go to step **7**.	Go to step **6**.
6	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between front oxygen (A/F) sensor connector and chassis ground. ***Connector & terminal*** ***(E23) No. 3 (+) — Chassis ground (–):***	Is the voltage 4.95 V or more?	Go to step **7**.	Go to step **8**.
7	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between front oxygen (A/F) sensor connector and chassis ground. ***Connector & terminal*** ***(E23) No. 3 (+) — Chassis ground (–):*** ***(E23) No. 1 (+) — Chassis ground (–):***	Is the voltage 8 V or more?	Repair the short circuit to power in the harness between ECM and front oxygen (A/F) sensor connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-57, Engine Control Module (ECM).>	Repair the poor contact of ECM connector.
8	**CHECK EXHAUST SYSTEM.**	Are there holes or loose bolts on exhaust system?	Repair the exhaust system.	Go to step **9**.
9	**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 **10**.

	Step	Check	Yes	No
10	**CHECK FUEL PRESSURE.** **WARNING:** **Place "NO OPEN FLAMES" signs near the working area.** **CAUTION:** **Be careful not to spill fuel.** 1) Connect the front oxygen (A/F) sensor connector. 2) Measure the fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold. <Ref. to ME(H4DOTC)-25, INSPECTION, Fuel Pressure.> **CAUTION:** **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 **11**.	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
11	**CHECK FUEL PRESSURE.** After connecting the pressure regulator vacuum hose, measure fuel pressure. <Ref. to ME(H4DOTC)-25, INSPECTION, Fuel Pressure.> **CAUTION:** **Release fuel pressure before removing the fuel pressure gauge.** NOTE: • 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 **12**.	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
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: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the engine coolant temperature 75°C (167°F) or higher?	Go to step **13**.	Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC)-34, Engine Coolant Temperature Sensor.>

	Step	Check	Yes	No
13	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.** 1) Start the engine and warm up engine until coolant temperature is higher than 75°C (167°F). 2) Place the select lever in "P" range or "N" range. 3) Turn the A/C switch to OFF. 4) Turn all the accessory switches to OFF. 5) Read the data of the 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)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the measured value 2.0 — 5.0 g/s (0.26 — 0.66 lb/s)?	Go to step **14**.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-42, Mass Air Flow and Intake Air Temperature Sensor.>
14	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.** 1) Start the engine and warm up engine until coolant temperature is higher than 75°C (167°F). 2) Place the select lever in "P" range or "N" range. 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 the 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)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Subtract ambient temperature from intake air temperature. Is the obtained value –10 — 50°C (–18 — 90°F)?	Go to step **15**.	Check the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-42, Mass Air Flow and Intake Air Temperature Sensor.>

	Step	Check	Yes	No
15	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm up the engine until engine coolant temperature is higher than 75°C (167°F), and keep the engine speed at 3,000 rpm. (2 minutes maximum) 2) Read the data of rear oxygen 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)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the voltage 490 mV or more?	Go to step **16**.	Go to step **17**.
16	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm up the engine until engine coolant temperature is higher than 75°C (167°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: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the voltage 250 mV or less?	Go to step **18**.	Go to step **17**.
17	**CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Has water entered the connector?	Completely remove any water inside.	Go to step **19**.
18	**CHECK FRONT OXYGEN (A/F) SENSOR USING REAR OXYGEN SENSOR SIGNAL.** 1) Warm up the engine until engine coolant temperature is higher than 75°C (167°F), then keep the engine idling for 5 minutes or more. 2) Read the data of rear oxygen 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)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is a voltage of 0.8 V or more maintained for 5 minutes or more?	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-53, Front Oxygen (A/F) Sensor.>	Go to step **19**.

	Step	Check	Yes	No
19	**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*** ***(B136) No. 20 — (T6) No. 3:*** ***(B135) No. 30 — (T6) No. 4:***	Is the resistance less than 1 Ω?	Go to step **20**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and rear oxygen sensor connector • Poor contact of coupling connector
20	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between rear oxygen sensor connector and chassis ground. ***Connector & terminal*** ***(T6) No. 3 (+) — Chassis ground (–):***	Is the voltage 0.2 — 0.5 V?	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-55, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and rear oxygen sensor connector • Poor contact of ECM connector • Poor contact of coupling connector

DP:DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/ PERFORMANCE

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-243, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

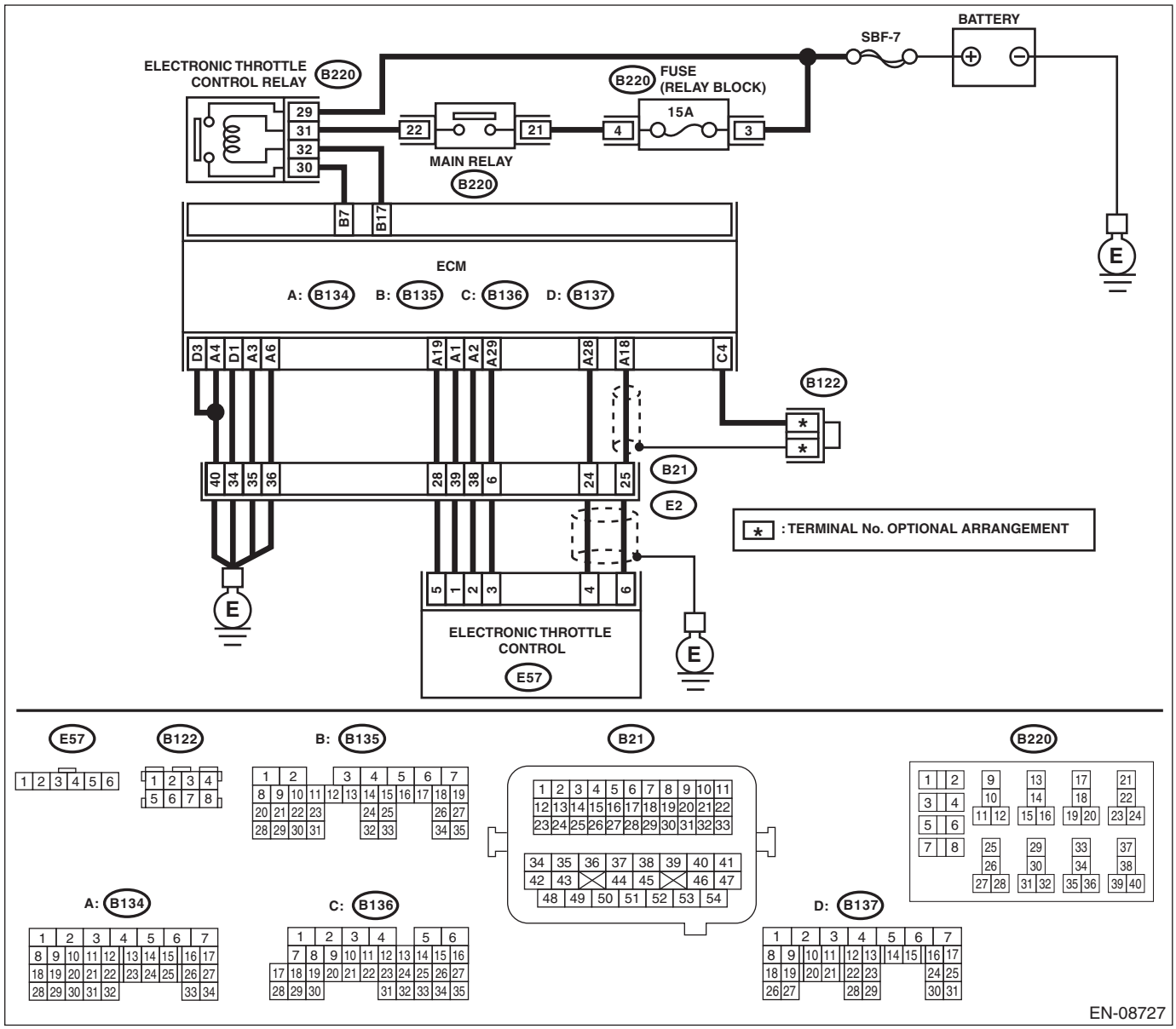
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance
- Engine stalls.

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ELECTRONIC THROTTLE CONTROL RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the electronic throttle control relay. <Ref. to FU(H4DOTC)-62, REMOVAL, Electronic Throttle Control Relay.> 3) Connect the battery to terminals No. 31 and No. 32 of electronic throttle control relay. 4) Measure the resistance between electronic throttle control relay terminals. ***Terminals*** ***No. 29 — No. 30:***	Is the resistance less than 1 Ω?	Go to step **2**.	Replace the electronic throttle control relay. <Ref. to FU(H4DOTC)-62, Electronic Throttle Control Relay.>
2	**CHECK POWER SUPPLY OF ELECTRONIC THROTTLE CONTROL RELAY.** Measure the voltage between electronic throttle control relay connector and chassis ground. ***Connector & terminal*** ***(B220) No. 29 (+) — Chassis ground (–):***	Is the voltage 10 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 CONNECTOR.** 1) Disconnect the connector from ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control relay connector and chassis ground. ***Connector & terminal*** ***(B220) No. 32 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the short circuit to power in the harness between ECM and electronic throttle control relay connector.	Go to step **4**.
4	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between electronic throttle control relay connector and chassis ground. ***Connector & terminal*** ***(B220) No. 32 — Chassis ground:*** ***(B220) No. 30 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **5**.	Repair the short circuit in harness to ground between ECM and electronic throttle control relay connector.
5	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY CONNECTOR.** Measure the resistance between ECM and electronic throttle control relay connector. ***Connector & terminal*** ***(B135) No. 17 — (B220) No. 32:*** ***(B135) No. 7 — (B220) No. 30:***	Is the resistance less than 1 Ω?	Go to step **6**.	Repair the open circuit in harness between ECM and electronic throttle control relay connector.
6	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from electronic throttle control. 3) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 19 — Chassis ground:*** ***(B134) No. 18 — Chassis ground:*** ***(B134) No. 18 — (B136) No. 4:*** ***(B134) No. 28 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **7**.	Repair the short circuit to ground in harness between ECM and electronic throttle control connector.

	Step	Check	Yes	No
7	**CHECK SHORT CIRCUIT INSIDE THE ECM.** 1) Connect the connector to ECM. 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 1 MΩ or more?	Go to step **8**.	Repair the short circuit to ground in harness between ECM and electronic throttle control connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-57, Engine Control Module (ECM).>
8	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL CONNECTOR.** 1) Disconnect the connector from ECM. 2) Measure the resistance of harness between ECM and electronic throttle control connector. ***Connector & terminal*** ***(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 **9**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and electronic throttle control connector • Poor contact of coupling connector
9	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL CONNECTOR.** 1) Connect the connector to ECM. 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 **10**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and engine ground • Poor contact of ECM connector • Poor contact of coupling connector
10	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 6 (+) — Engine ground (–):*** ***(E57) No. 4 (+) — Engine ground (–):***	Is the voltage 5 V or more?	Repair the short circuit to power in harness between ECM and electronic throttle control connector.	Go to step **11**.
11	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between ECM connectors. ***Connector & terminal*** ***(B134) No. 19 — (B134) No. 18:*** ***(B134) No. 19 — (B134) No. 28:***	Is the resistance 1 MΩ or more?	Go to step **12**.	Repair the short circuit of harness between ECM and electronic throttle control connector.

	Step	Check	Yes	No
12	**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)-36, Subaru Select Monitor.>	Is the voltage 0.81 — 0.87 V?	Go to step **13**.	Repair the poor contact of electronic throttle control connector. Replace the electronic throttle control if defective. <Ref. to FU(H4DOTC)-16, Throttle Body.>
13	**CHECK SENSOR OUTPUT.** Read the data of sub throttle sensor signal using Subaru Select Monitor. NOTE: Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-36, Subaru Select Monitor.>	Is the voltage 1.64 — 1.70 V?	Go to step **14**.	Repair the poor contact of electronic throttle control connector. Replace the electronic throttle control if defective. <Ref. to FU(H4DOTC)-16, Throttle Body.>
14	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL MOTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and electronic throttle control. 3) Measure the resistance between ECM and electronic throttle control connector. ***Connector & terminal*** ***(B134) No. 2 — (E57) No. 2:*** ***(B134) No. 1 — (E57) No. 1:***	Is the resistance less than 1 Ω?	Go to step **15**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and electronic throttle control connector • Poor contact of coupling connector
15	**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 5 V or more?	Repair the short circuit to power in harness between ECM and electronic throttle control connector.	Go to step **16**.
16	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL MOTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector 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 **17**.	Repair the short circuit to ground in harness between ECM and electronic throttle control connector.
17	**CHECK ELECTRONIC THROTTLE CONTROL MOTOR HARNESS.** Measure the resistance between electronic throttle control connectors. ***Connector & terminal*** ***(E57) No. 2 — (E57) No. 1:***	Is the resistance 1 MΩ or more?	Go to step **18**.	Repair the short circuit of harness between ECM and electronic throttle control connector.

	Step	Check	Yes	No
18	**CHECK ELECTRONIC THROTTLE CONTROL GROUND CIRCUIT.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 3 — Chassis ground:*** ***(B134) No. 4 — Chassis ground:*** ***(B134) No. 6 — Chassis ground:*** ***(B137) No. 1 — Chassis ground:*** ***(B137) No. 3 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **19**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and engine ground • Poor contact of coupling connector
19	**CHECK ELECTRONIC THROTTLE CONTROL.** Measure the resistance between electronic throttle control terminals. ***Terminals*** ***No. 2 — No. 1:***	Is the resistance 50 Ω or less?	Go to step **20**.	Replace the electronic throttle control. <Ref. to FU(H4DOTC)-16, Throttle Body.>
20	**CHECK ELECTRONIC THROTTLE CONTROL.** Move the throttle valve to the fully open 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 the poor contact of ECM connector.	Replace the electronic throttle control. <Ref. to FU(H4DOTC)-16, Throttle Body.>

DQ:DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-244, DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

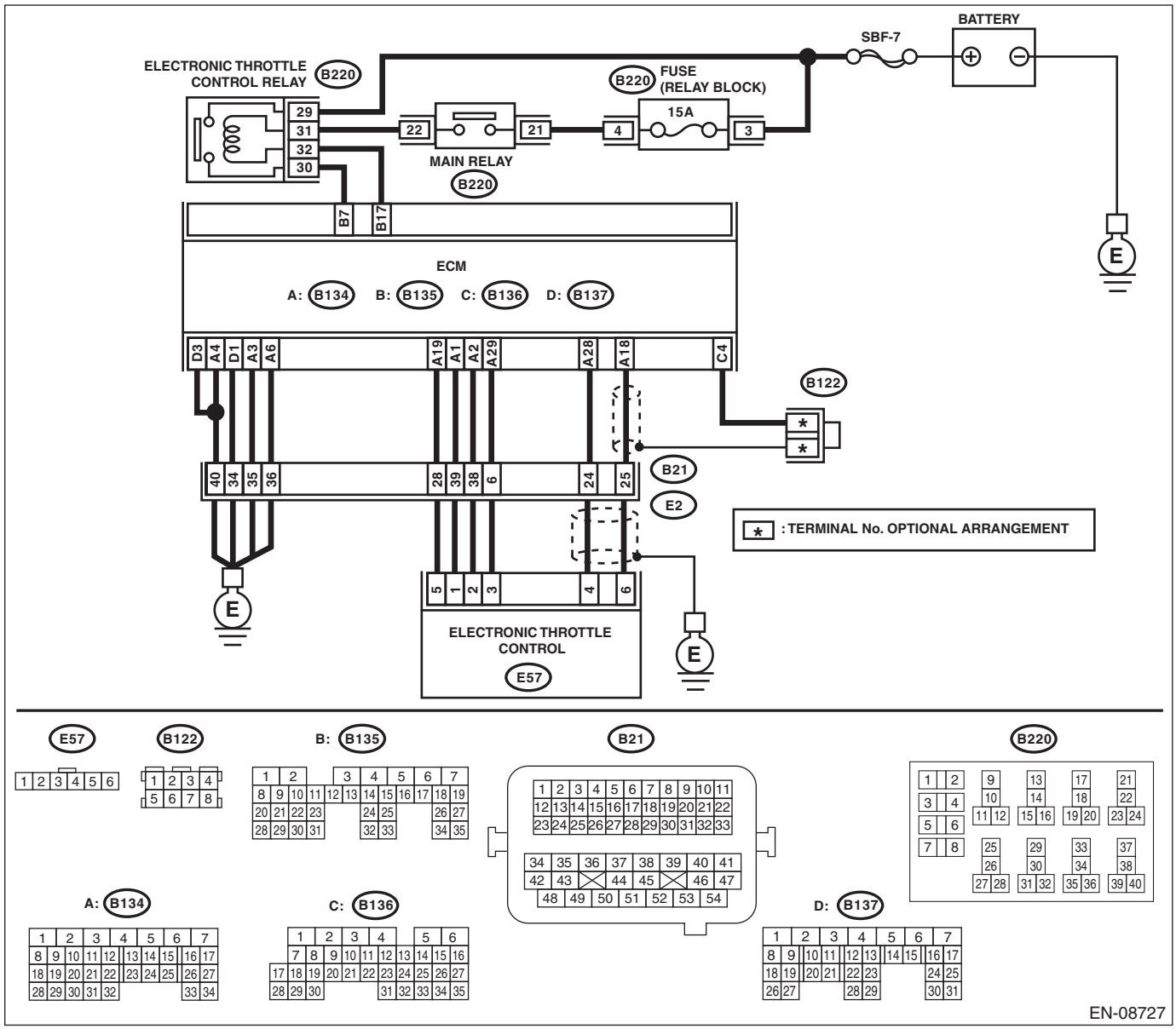
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance
- Engine stalls.

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ELECTRONIC THROTTLE CONTROL RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the electronic throttle control relay. <Ref. to FU(H4DOTC)-62, Electronic Throttle Control Relay.> 3) Connect the battery to terminals No. 31 and No. 32 of electronic throttle control relay. 4) Measure the resistance between electronic throttle control relay terminals. ***Terminals*** ***No. 29 — No. 30:***	Is the resistance less than 1 Ω?	Go to step **2**.	Replace the electronic throttle control relay. <Ref. to FU(H4DOTC)-62, Electronic Throttle Control Relay.>
2	**CHECK POWER SUPPLY OF ELECTRONIC THROTTLE CONTROL RELAY.** Measure the voltage between electronic throttle control relay connector and chassis ground. ***Connector & terminal*** ***(B220) No. 29 (+) — Chassis ground (–):***	Is the voltage 10 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 CONNECTOR.** 1) Disconnect the connector from ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control relay connector and chassis ground. ***Connector & terminal*** ***(B220) No. 32 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the short circuit to power in the harness between ECM and electronic throttle control relay connector.	Go to step **4**.
4	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between electronic throttle control relay connector and chassis ground. ***Connector & terminal*** ***(B220) No. 32 — Chassis ground:*** ***(B220) No. 30 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **5**.	Repair the short circuit in harness to ground between ECM and electronic throttle control relay connector.
5	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY CONNECTOR.** Measure the resistance between ECM and electronic throttle control relay connector. ***Connector & terminal*** ***(B135) No. 17 — (B220) No. 32:*** ***(B135) No. 7 — (B220) No. 30:***	Is the resistance less than 1 Ω?	Repair the poor contact of ECM connector.	Repair the open circuit in harness between ECM and electronic throttle control relay connector.

DR:DTC P2103 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH

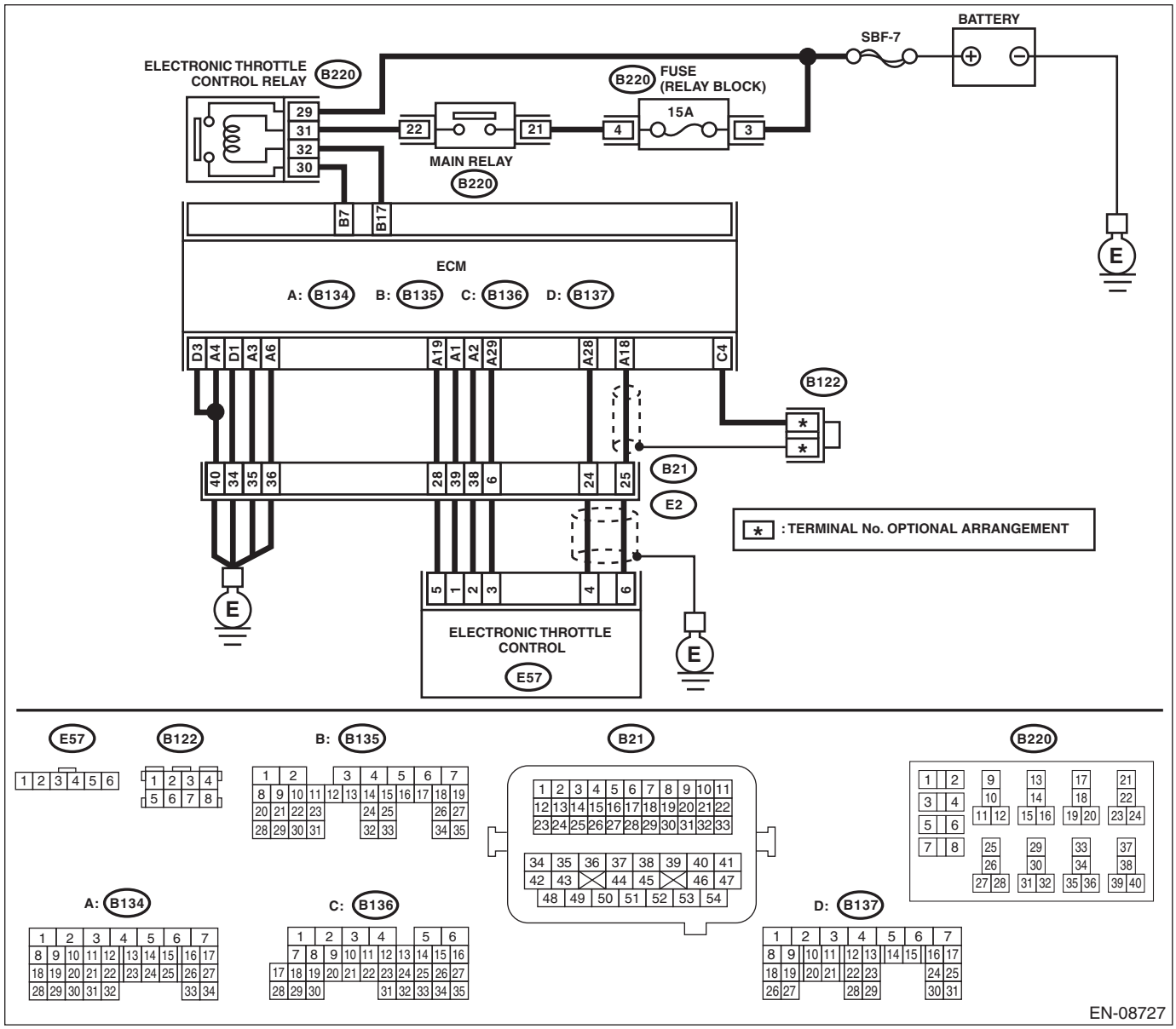
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-245, DTC P2103 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ELECTRONIC THROTTLE CONTROL RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the electronic throttle control relay. <Ref. to FU(H4DOTC)-62, Electronic Throttle Control Relay.> 3) Measure the resistance between electronic throttle control relay terminals. ***Terminals*** ***No. 29 — No. 30:***	Is the resistance 1 MΩ or more?	Go to step **2**.	Replace the electronic throttle control relay. <Ref. to FU(H4DOTC)-62, 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. ***Connector & terminal*** ***(B220) No. 30 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the short circuit to power in the harness between ECM and electronic throttle control relay connector.	Go to step **3**.
3	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 17 — Chassis ground:***	Is the resistance 1 MΩ or more?	Repair the poor contact of ECM connector.	Repair the short circuit in harness to ground between ECM and electronic throttle control relay connector.

DS:DTC P2109 THROTTLE/PEDAL POSITION SENSOR “A” MINIMUM STOP PERFORMANCE

NOTE:
For the diagnostic procedure, refer to DTC P2101. <Ref. to EN(H4DOTC)(diag)-309, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DT:DTC P2122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-247, DTC P2122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

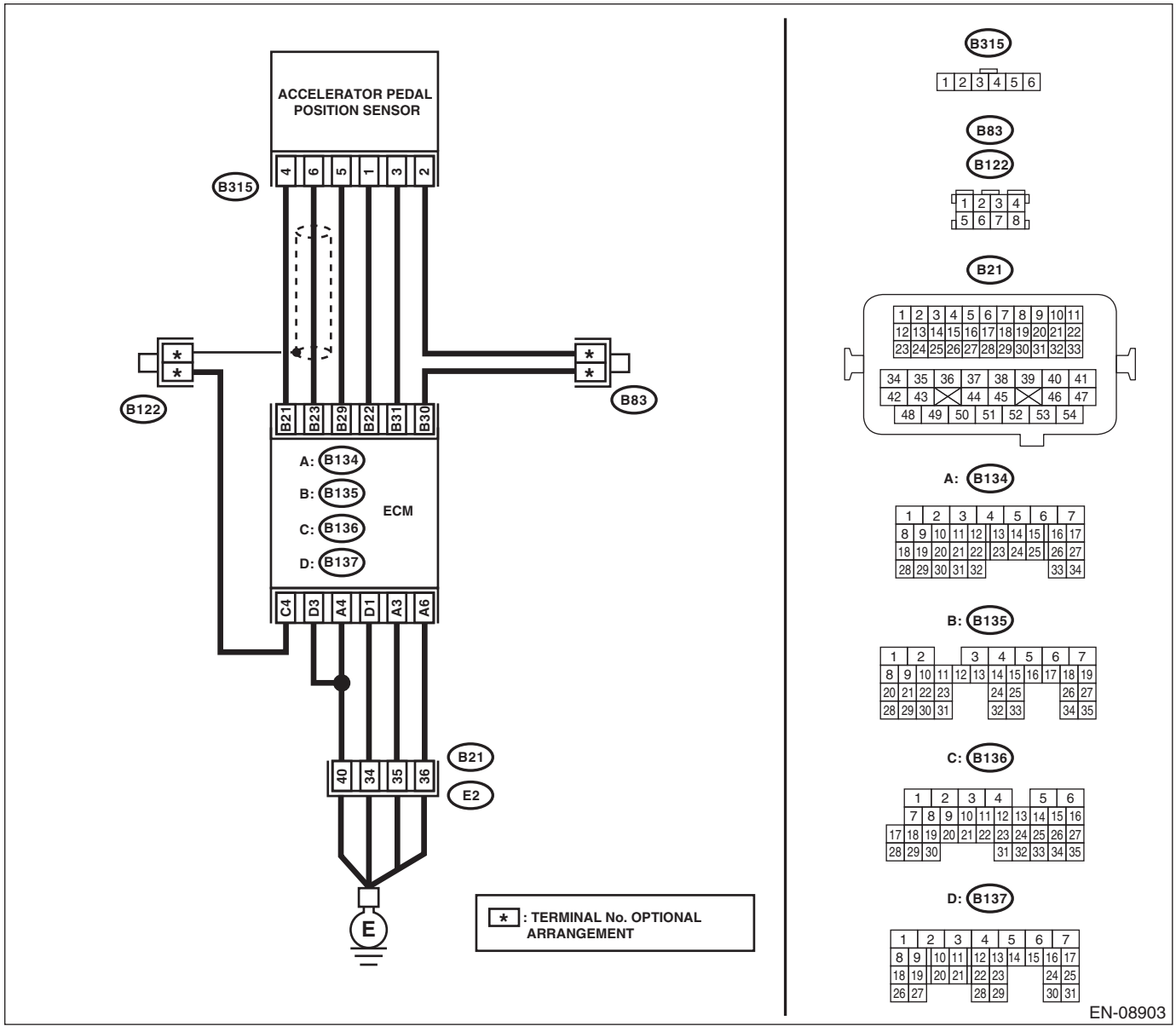
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and accelerator pedal position sensor. 3) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 21 — Chassis ground:*** ***(B135) No. 23 — Chassis ground:*** ***(B135) No. 23 — (B136) No. 4:***	Is the resistance 1 MΩ or more?	Go to step **2**.	Repair the short circuit to ground in harness between ECM and accelerator pedal position sensor connector.
2	**CHECK SHORT CIRCUIT INSIDE THE ECM.** 1) Connect the connector to ECM. 2) Measure the resistance between accelerator pedal position sensor connector and chassis ground. ***Connector & terminal*** ***(B315) No. 6 — Chassis ground:***	Is the resistance 1 MΩ or more?	Replace the accelerator pedal. <Ref. to SP(H4DO)-4, Accelerator Pedal.>	Repair the short circuit to ground in harness between ECM and accelerator pedal position sensor connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-57, Engine Control Module (ECM).>

DU:DTC P2123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-249, DTC P2123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

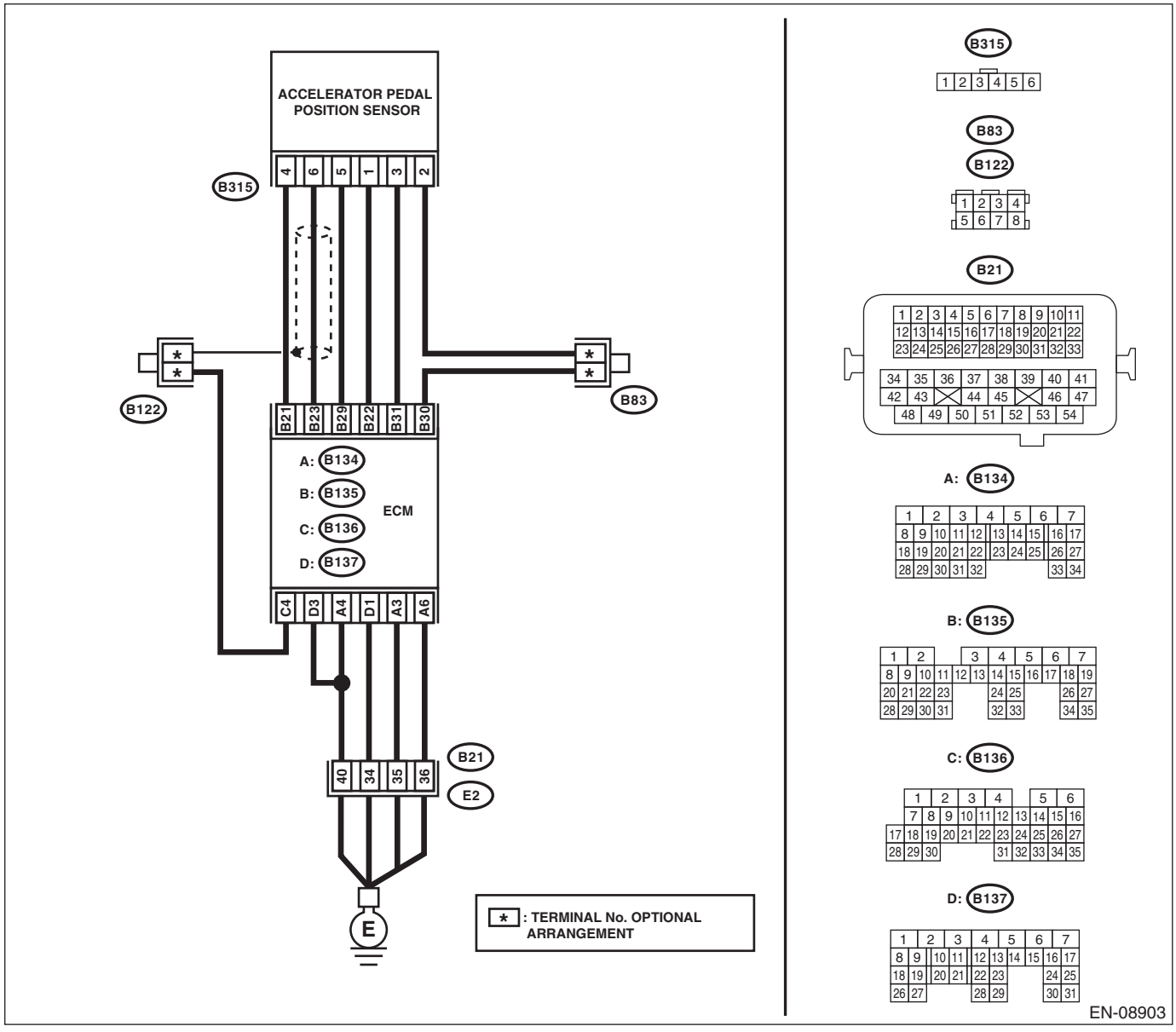
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and accelerator pedal position sensor. 3) Measure the resistance of harness between ECM and accelerator pedal position sensor connector. ***Connector & terminal*** ***(B135) No. 23 — (B315) No. 6:*** ***(B135) No. 29 — (B315) No. 5:***	Is the resistance less than 1 Ω?	Go to step **2**.	Repair the open circuit in harness between ECM and accelerator pedal position sensor connector.
2	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR CONNECTOR.** 1) Connect the connector to ECM. 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 **3**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and engine ground • Poor contact of ECM connector • Poor contact of coupling connector
3	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between accelerator pedal position sensor connector and chassis ground. ***Connector & terminal*** ***(B315) No. 6 (+) — Chassis ground (–):***	Is the voltage 5 V or more?	Repair the short circuit to power supply in the harness between the ECM and accelerator pedal position sensor connector.	Go to step **4**.
4	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between ECM connectors. ***Connector & terminal*** ***(B135) No. 21 — (B135) No. 23:***	Is the resistance 1 MΩ or more?	Repair the poor contact of accelerator pedal position sensor connector. Replace the accelerator pedal if defective. <Ref. to SP(H4DO)-4, Accelerator Pedal.>	Repair the short circuit to power supply in the harness between the ECM and accelerator pedal position sensor connector.

DV:DTC P2127 THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-251, DTC P2127 THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

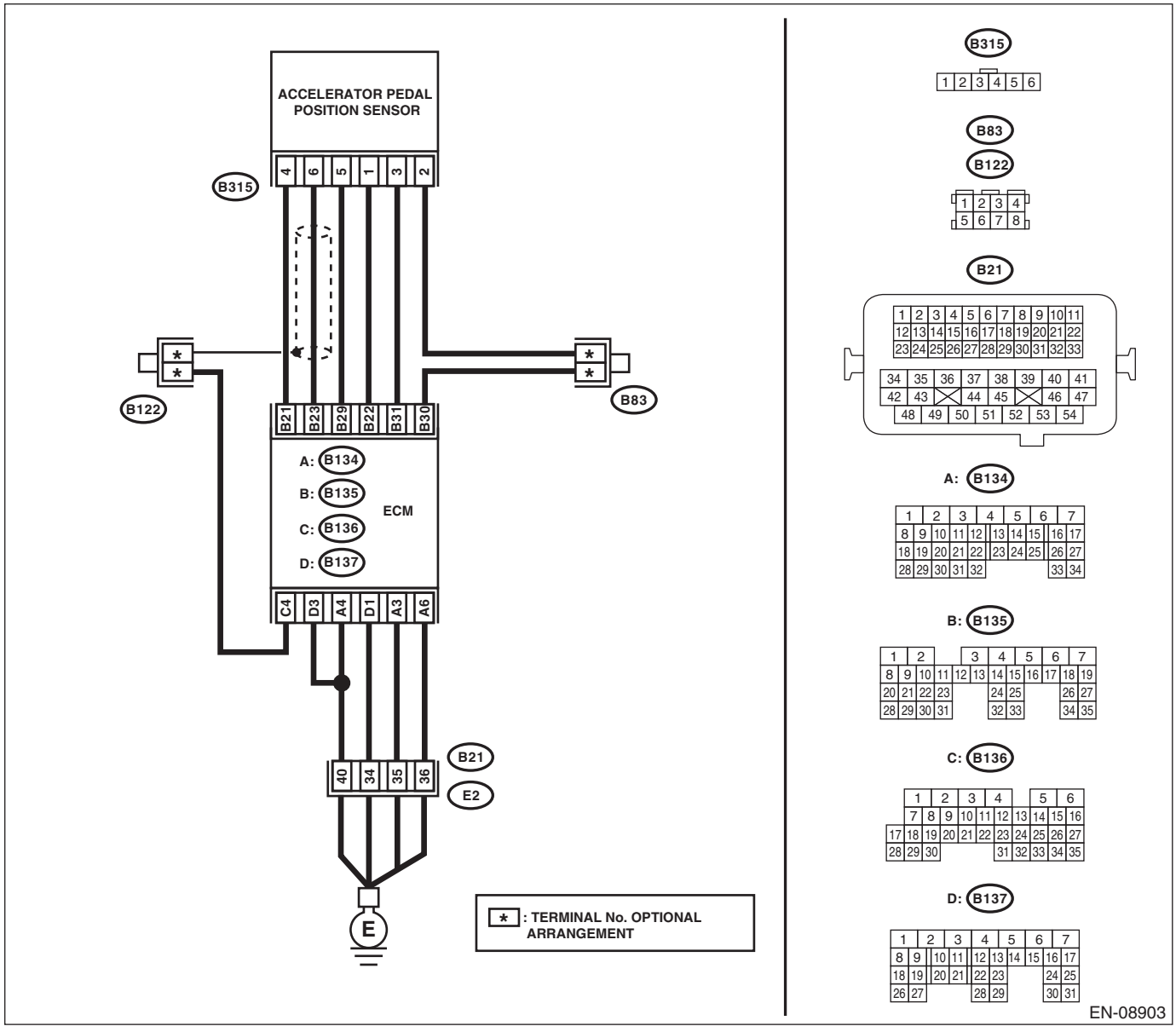
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and accelerator pedal position sensor. 3) Measure the resistance between ECM 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 **2**.	Repair the short circuit to ground in harness between ECM and accelerator pedal position sensor connector.
2	**CHECK SHORT CIRCUIT INSIDE THE ECM.** 1) Connect the connector to ECM. 2) Measure the resistance between accelerator pedal position sensor connector and chassis ground. ***Connector & terminal*** ***(B315) No. 3 — Chassis ground:***	Is the resistance 1 MΩ or more?	Replace the accelerator pedal. <Ref. to SP(H4DO)-4, Accelerator Pedal.>	Repair the short circuit to ground in harness between ECM and accelerator pedal position sensor connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-57, Engine Control Module (ECM).>

DW:DTC P2128 THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-253, DTC P2128 THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

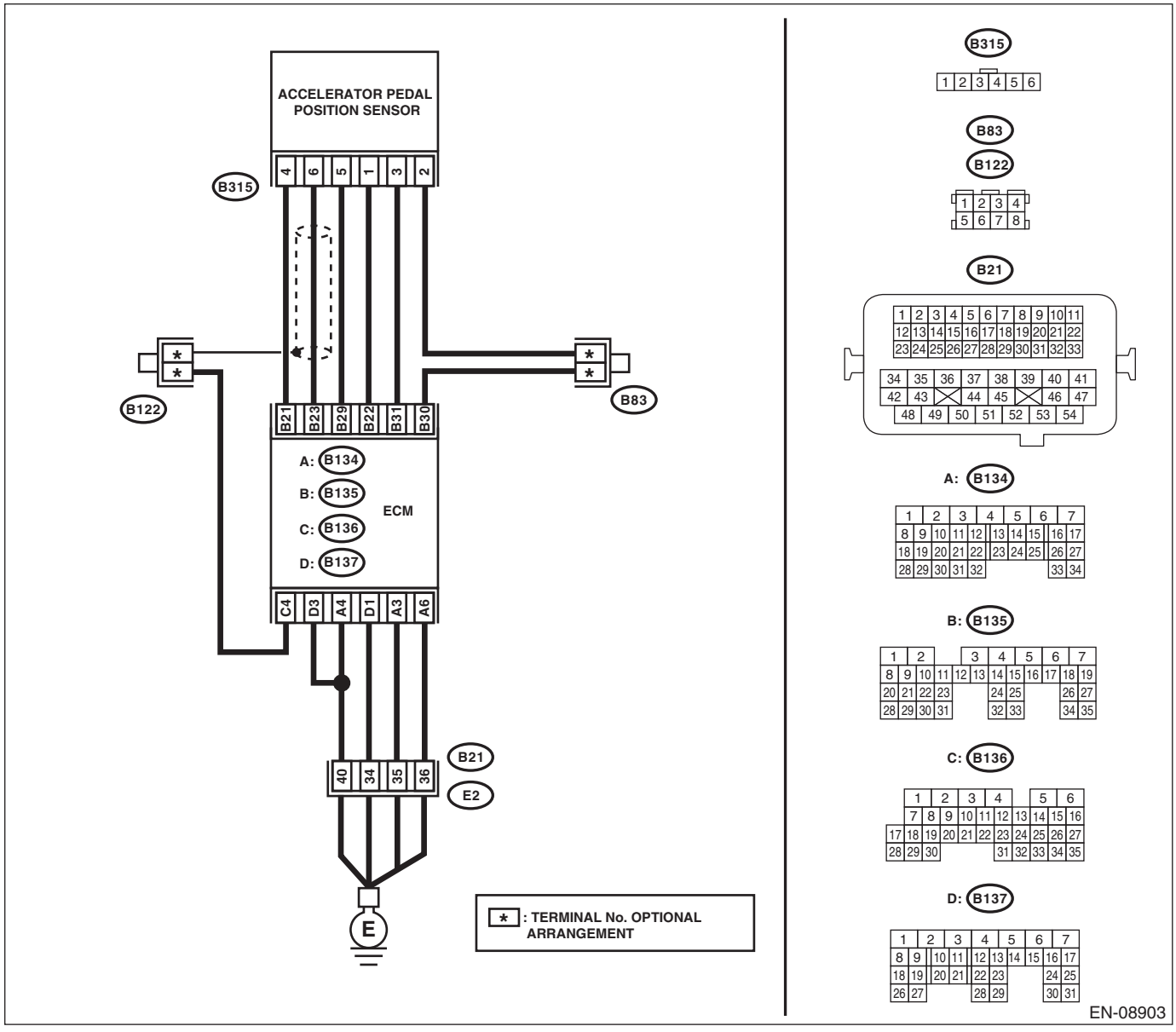
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and accelerator pedal position sensor. 3) Measure the resistance of harness between ECM and accelerator pedal position sensor connector. ***Connector & terminal*** ***(B135) No. 31 — (B315) No. 3:*** ***(B135) No. 30 — (B315) No. 2:***	Is the resistance less than 1 Ω?	Go to step **2**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and accelerator pedal position sensor connector • Poor contact of coupling connector
2	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR CONNECTOR.** 1) Connect the connector to ECM. 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 1 Ω?	Go to step **3**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and engine ground • Poor contact of ECM connector • Poor contact of coupling connector
3	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between accelerator pedal position sensor connector and chassis ground. ***Connector & terminal*** ***(B315) No. 3 (+) — Chassis ground (–):***	Is the voltage 5 V or more?	Repair the short circuit to power supply in the harness between the ECM and accelerator pedal position sensor connector.	Go to step **4**.
4	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between ECM connectors. ***Connector & terminal*** ***(B135) No. 22 — (B135) No. 31:***	Is the resistance 1 MΩ or more?	Repair the poor contact of accelerator pedal position sensor connector. Replace the accelerator pedal if defective. <Ref. to SP(H4DO)-4, Accelerator Pedal.>	Repair the short circuit to power supply in the harness between the ECM and accelerator pedal position sensor connector.

DX:DTC P2135 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A”/“B” VOLTAGE CORRELATION

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-255, DTC P2135 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A”/“B” VOLTAGE CORRELATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

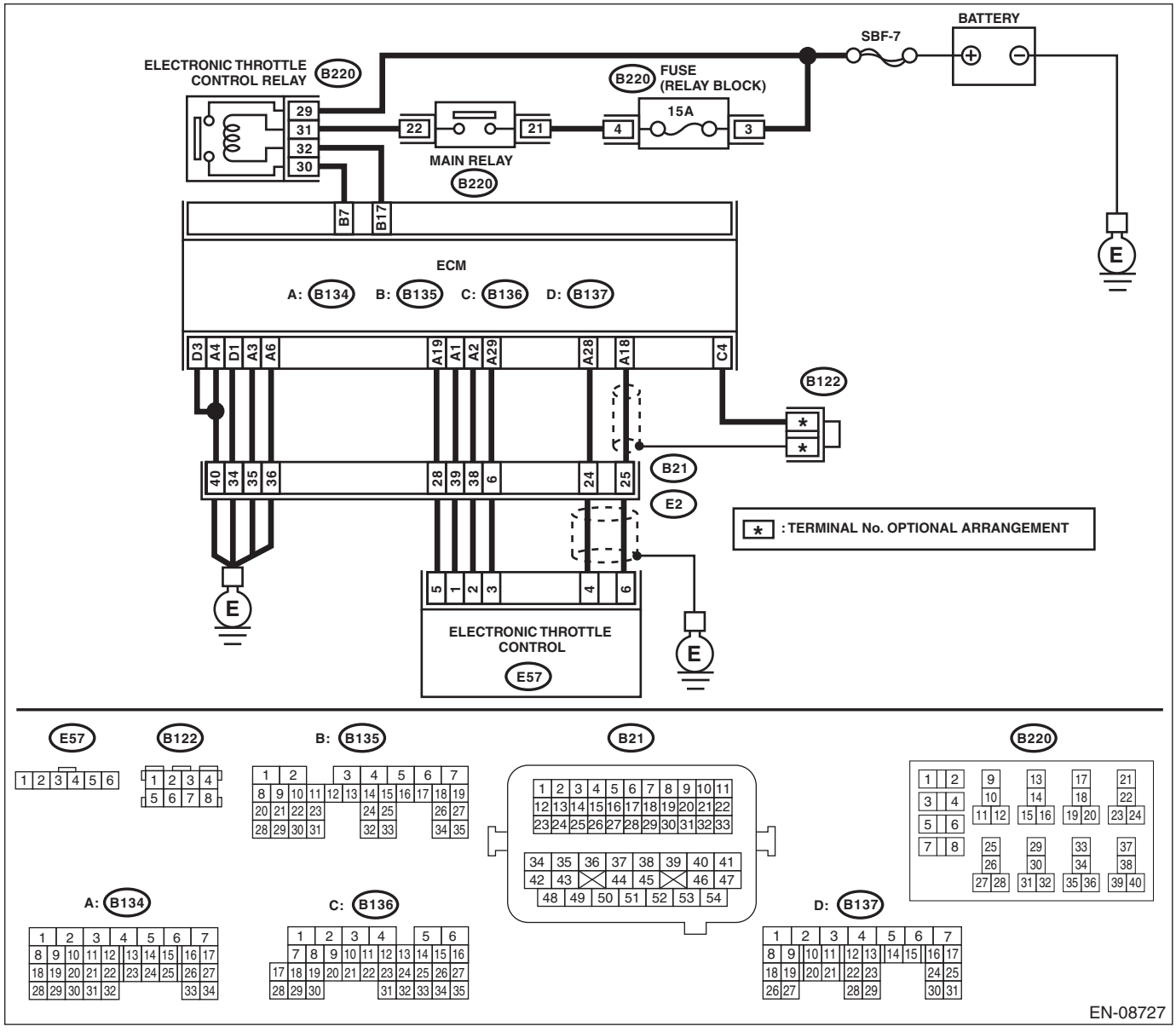
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and electronic throttle control. 3) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 19 — Chassis ground:*** ***(B134) No. 18 — Chassis ground:*** ***(B134) No. 18 — (B136) No. 4:*** ***(B134) No. 28 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **2**.	Repair the short circuit to ground in harness between ECM and electronic throttle control connector.
2	**CHECK SHORT CIRCUIT INSIDE THE ECM.** 1) Connect the connector to ECM. 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 1 MΩ or more?	Go to step **3**.	Repair the short circuit to ground in harness between ECM and electronic throttle control connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-57, Engine Control Module (ECM).>
3	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL CONNECTOR.** 1) Disconnect the connector from ECM. 2) Measure the resistance of harness between ECM and electronic throttle control connector. ***Connector & terminal*** ***(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 **4**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and electronic throttle control connector • Poor contact of coupling connector
4	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL CONNECTOR.** 1) Connect the connector to ECM. 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 the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and engine ground • Poor contact of ECM connector • Poor contact of coupling connector
5	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 6 (+) — Engine ground (–):*** ***(E57) No. 4 (+) — Engine ground (–):***	Is the voltage 5 V or more?	Repair the short circuit to power in harness between ECM and electronic throttle control connector.	Go to step **6**.

Step		Check	Yes	No
6	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between ECM connectors. ***Connector & terminal*** ***(B134) No. 19 — (B134) No. 18:*** ***(B134) No. 19 — (B134) No. 28:***	Is the resistance 1 MΩ or more?	Repair the poor contact of electronic throttle control connector. Replace the electronic throttle control if defective. <Ref. to FU(H4DOTC)-16, Throttle Body.>	Repair the short circuit to power in harness between ECM and electronic throttle control connector.

DY:DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D”/“E” VOLTAGE CORRELATION

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-257, DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D”/“E” VOLTAGE CORRELATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

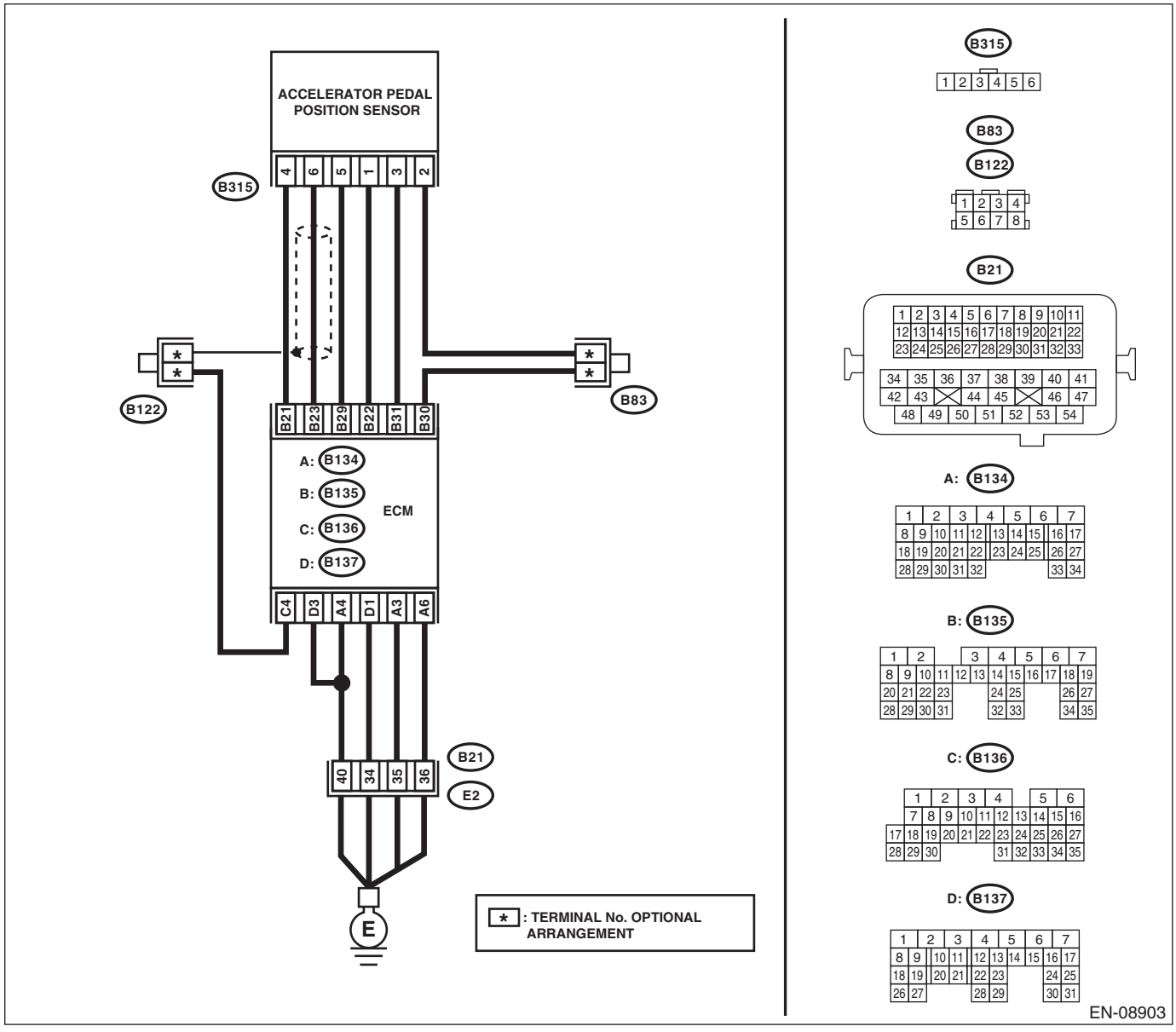
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ACCELERATOR PEDAL POSITION SENSOR OUTPUT.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***Main accelerator pedal position sensor signal*** ***(B135) No. 23 (+) — Chassis ground (–):*** ***Sub accelerator pedal position sensor signal*** ***(B135) No. 31 (+) — Chassis ground (–):***	Is the difference in measured values for the main accelerator pedal position sensor signal and the sub accelerator pedal position sensor signal 0 V?	Go to step **3**.	Go to step **2**.
2	**CHECK ACCELERATOR PEDAL POSITION SENSOR OUTPUT.** 1) Measure the voltage between accelerator pedal position sensor connector and chassis ground. ***Connector & terminal*** ***(B315) No. 6 (+) — Chassis ground (–):*** ***(B315) No. 3 (+) — Chassis ground (–):***	Is the difference in measured values for the main accelerator pedal position sensor signal and the sub accelerator pedal position sensor signal 0 V?	Replace the accelerator pedal. <Ref. to SP(H4DO)-4, Accelerator Pedal.>	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and accelerator pedal position sensor connector • Short circuit to ground in harness between ECM and accelerator pedal position sensor connector • Poor contact of joint connector
3	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR CONNECTOR.** Measure the resistance of harness between accelerator pedal position sensor connector and chassis ground. ***Connector & terminal*** ***(B315) No. 5 — Chassis ground:*** ***(B315) No. 2 — Chassis ground:***	Is the resistance less than 5 Ω?	Repair the poor contact of ECM connector.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and accelerator pedal position sensor connector • Open circuit of harness between ECM and engine ground • Poor contact of ECM connector • Poor contact of coupling connector

DZ:DTC P219A BANK 1 AIR-FUEL RATIO IMBALANCE

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-259, DTC P219A BANK 1 AIR-FUEL RATIO IMBALANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

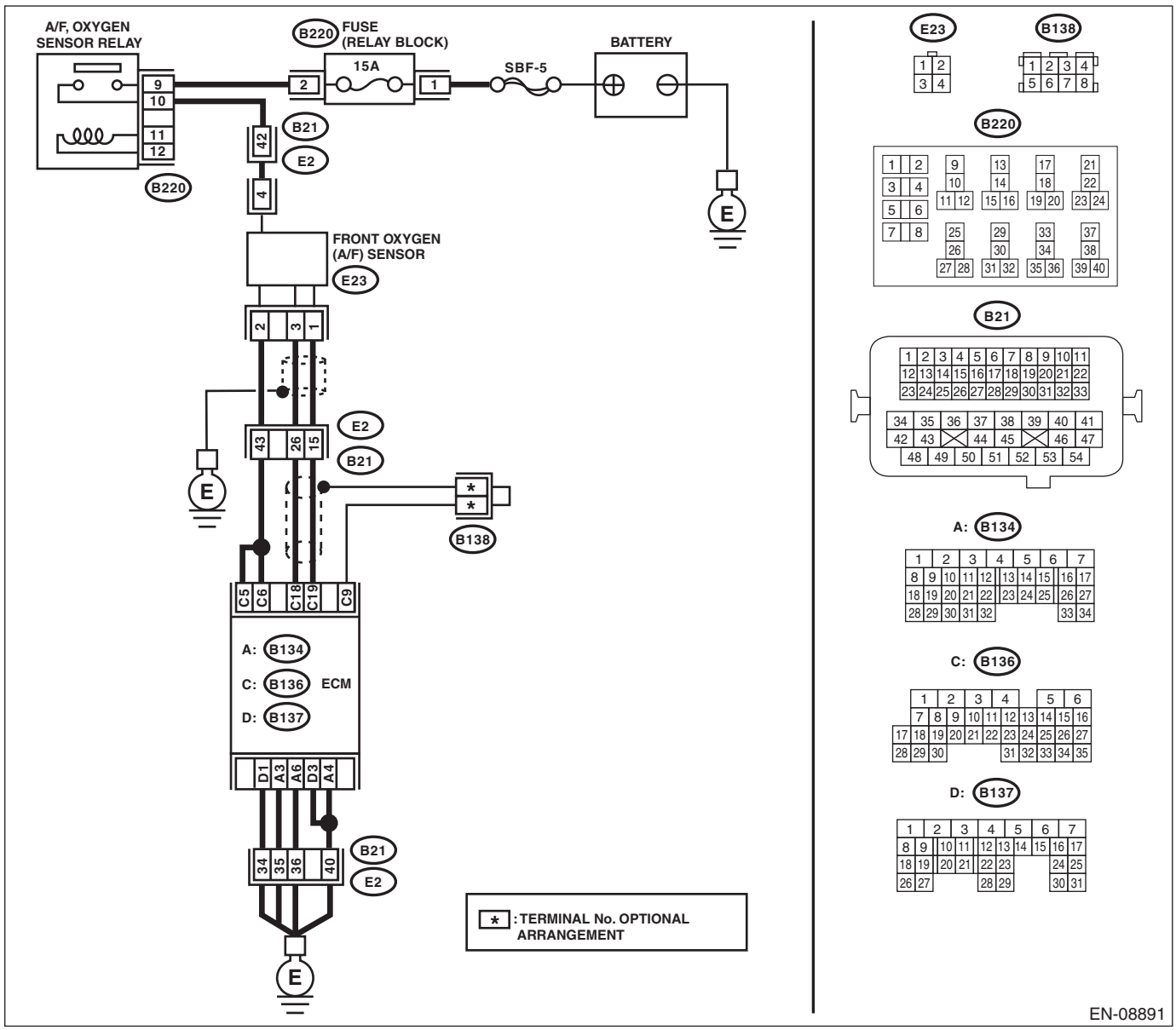
TROUBLE SYMPTOM:

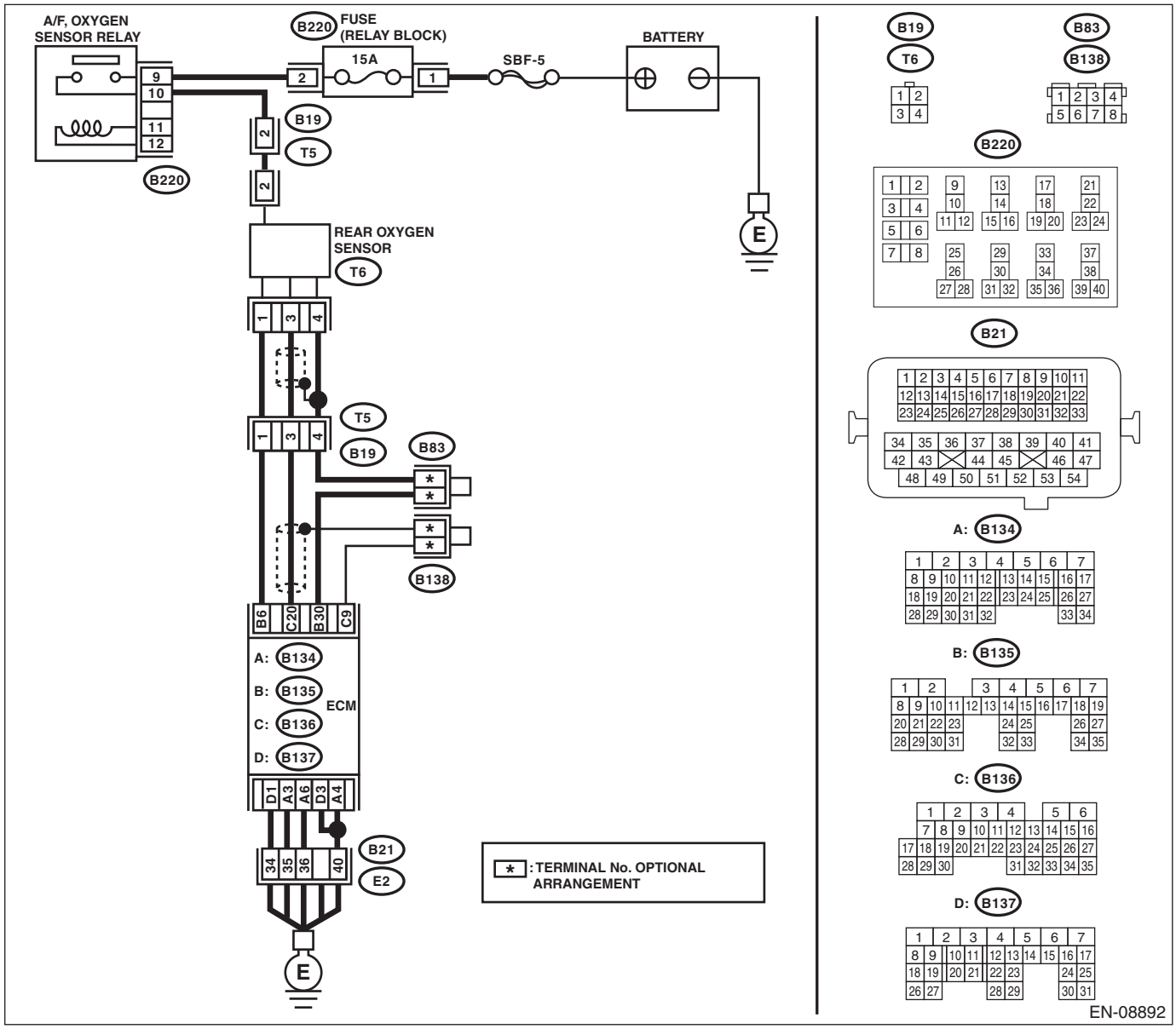
- Engine stalls.
- Improper idling

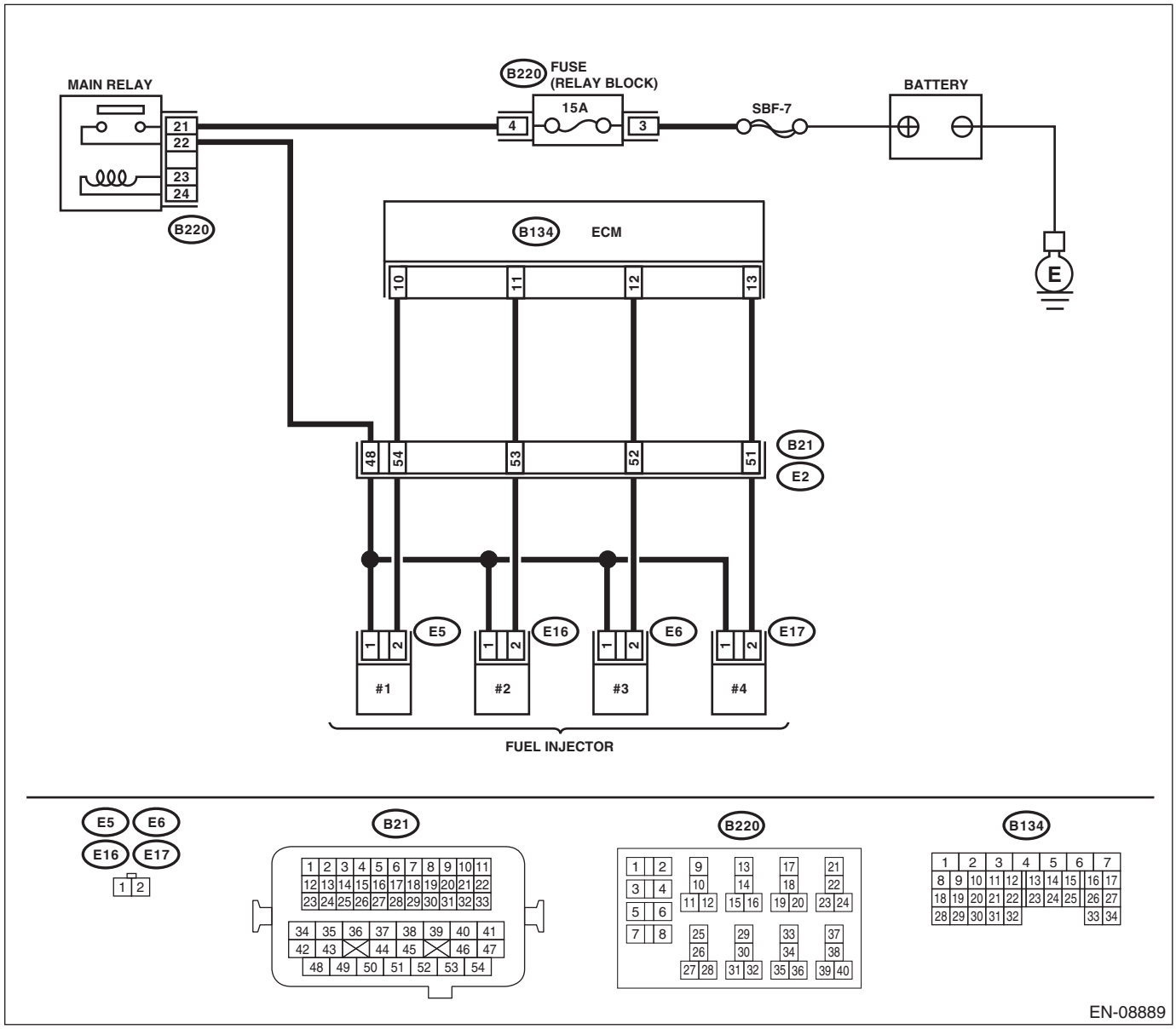
CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:




A/F, OXYGEN SENSOR RELAY
B220
FUSE (RELAY BLOCK)
15A
SBF-5
BATTERY
B19
T5
REAR OXYGEN SENSOR
T6
B83
B138
E
B6
C20
B30
C9
A: B134
B: B135
C: B136
D: B137
ECM
D1
A3
A6
D3
A4
B21
E2
* : TERMINAL No. OPTIONAL ARRANGEMENT
B19
T6
B83
B138
B220
B21
A: B134
B: B135
C: B136
D: B137
EN-08892



	Step	Check	Yes	No
1	**CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Has water entered the connector?	Completely remove any water inside.	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 and front oxygen (A/F) sensor. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B136) No. 19 — (E23) No. 1:*** ***(B136) No. 18 — (E23) 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 ECM and front oxygen (A/F) sensor connector • Poor contact of coupling connector

	Step	Check	Yes	No
3	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 19 — Chassis ground:*** ***(B136) No. 18 — 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 front oxygen (A/F) sensor connector and chassis ground. ***Connector & terminal*** ***(E23) No. 1 (+) — Chassis ground (–):***	Is the voltage 4.5 V or more?	Go to step **6**.	Go to step **5**.
5	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between front oxygen (A/F) sensor connector and chassis ground. ***Connector & terminal*** ***(E23) No. 3 (+) — Chassis ground (–):***	Is the voltage 4.95 V or more?	Go to step **6**.	Go to step **7**.
6	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between front oxygen (A/F) sensor connector and chassis ground. ***Connector & terminal*** ***(E23) No. 3 (+) — Chassis ground (–):*** ***(E23) No. 1 (+) — Chassis ground (–):***	Is the voltage 8 V or more?	Repair the short circuit to power in the harness between ECM and front oxygen (A/F) sensor connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-57, Engine Control Module (ECM).>	Repair the poor contact of ECM connector.
7	**CHECK EXHAUST SYSTEM.**	Are there holes or loose bolts on exhaust system?	Repair the exhaust system.	Go to step **8**.
8	**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 **9**.
9	**CHECK FUEL PRESSURE.** **WARNING:** **Place "NO OPEN FLAMES" signs near the working area.** **CAUTION:** **Be careful not to spill fuel.** 1) Connect the front oxygen (A/F) sensor connector. 2) Measure the fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold. <Ref. to ME(H4DOTC)-25, INSPECTION, Fuel Pressure.> **CAUTION:** **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 kg/cm^2, 41 — 46 psi)?	Go to step **10**.	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 supply line

	Step	Check	Yes	No
10	**CHECK FUEL PRESSURE.** After connecting the pressure regulator vacuum hose, measure fuel pressure. <Ref. to ME(H4DOTC)-25, INSPECTION, Fuel Pressure.> **CAUTION:** **Release fuel pressure before removing the fuel pressure gauge.** NOTE: • 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 vacuum hose.	Is the measured value 230 — 260 kPa (2.35 — 2.65 kg/cm^2, 33 — 38 psi)?	Go to step **11**.	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
11	**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)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the engine coolant temperature 75°C (167°F) or higher?	Go to step **12**.	Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC)-34, Engine Coolant Temperature Sensor.>
12	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.** 1) Start the engine and warm up engine until coolant temperature is higher than 75°C (167°F). 2) Place the select lever in "P" range or "N" range. 3) Turn the A/C switch to OFF. 4) Turn all the accessory switches to OFF. 5) Read the data of the 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)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the measured value 2.0 — 5.0 g/s (0.26 — 0.66 lb/m)?	Go to step **13**.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-42, Mass Air Flow and Intake Air Temperature Sensor.>

	Step	Check	Yes	No
13	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.** 1) Start the engine and warm up engine until coolant temperature is higher than 75°C (167°F). 2) Place the select lever in "P" range or "N" range. 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 the 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)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Subtract ambient temperature from intake air temperature. Is the obtained value –10 — 50°C (–18 — 90°F)?	Go to step **14**.	Check the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-42, Mass Air Flow and Intake Air Temperature Sensor.>
14	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm up the engine until engine coolant temperature is higher than 75°C (167°F), and keep the engine speed at 3,000 rpm. (2 minutes maximum) 2) Read the data of rear oxygen 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)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the voltage 490 mV or more?	Go to step **15**.	Go to step **16**.
15	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm up the engine until engine coolant temperature is higher than 75°C (167°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: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the voltage 250 mV or less?	Go to step **17**.	Go to step **16**.
16	**CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Has water entered the connector?	Completely remove any water inside.	Go to step **18**.

	Step	Check	Yes	No
17	**CHECK FRONT OXYGEN (A/F) SENSOR USING REAR OXYGEN SENSOR SIGNAL.** 1) Warm up the engine until engine coolant temperature is higher than 75°C (167°F), then keep the engine idling for 5 minutes or more. 2) Read the data of rear oxygen 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)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is a voltage of 250 mV or less maintained for 5 minutes or more?	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-53, Front Oxygen (A/F) Sensor.>	Go to step **18**.
18	**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*** ***(B136) No. 20 — (T6) No. 3:*** ***(B135) No. 30 — (T6) No. 4:***	Is the resistance less than 1 Ω?	Go to step **19**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and rear oxygen sensor connector • Poor contact of coupling connector
19	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between rear oxygen sensor connector and chassis ground. ***Connector & terminal*** ***(T6) No. 3 (+) — Chassis ground (–):***	Is the voltage 0.2 — 0.5 V?	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-55, Rear Oxygen Sensor.>	Go to step **20**.
20	**CHECK OUTPUT SIGNAL OF ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground on faulty cylinders. ***Connector & terminal*** ***#1 (B134) No. 10 (+) — Chassis ground (–):*** ***#2 (B134) No. 11 (+) — Chassis ground (–):*** ***#3 (B134) No. 12 (+) — Chassis ground (–):*** ***#4 (B134) No. 13 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **25**.	Go to step **21**.
21	**CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel injector on faulty cylinders. 3) Measure the resistance between fuel injector connector 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 resistance 1 MΩ or more?	Go to step **22**.	Repair the short circuit to ground in harness between ECM and fuel injector connector.

	Step	Check	Yes	No
22	**CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR.** Measure the resistance of harness between ECM and fuel injector connector on faulty cylinders. ***Connector & terminal*** ***#1 (B134) No. 10 — (E5) No. 2:*** ***#2 (B134) No. 11 — (E16) No. 2:*** ***#3 (B134) No. 12 — (E6) No. 2:*** ***#4 (B134) No. 13 — (E17) No. 2:***	Is the resistance less than 1 Ω?	Go to step **23**.	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 of coupling connector
23	**CHECK FUEL INJECTOR.** Measure the resistance between fuel injector terminals on faulty cylinder. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 5 — 20 Ω?	Go to step **24**.	Replace the faulty fuel injector. <Ref. to FU(H4DOTC)-45, Fuel Injector.>
24	**CHECK POWER SUPPLY LINE.** 1) Turn the ignition switch to ON. 2) Measure the voltage between fuel injector connector of faulty cylinders and engine ground. ***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 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 the main relay and fuel injector connector on faulty cylinders • Poor contact of coupling connector • Poor contact of main relay connector
25	**CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR 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 and chassis ground on faulty cylinders. ***Connector & terminal*** ***#1 (B134) No. 10 (+) — Chassis ground (–):*** ***#2 (B134) No. 11 (+) — Chassis ground (–):*** ***#3 (B134) No. 12 (+) — Chassis ground (–):*** ***#4 (B134) No. 13 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the short circuit to power in harness between ECM and fuel injector connector.	Go to step **26**.
26	**CHECK FUEL INJECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between fuel injector terminals on faulty cylinder. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 5 — 20 Ω?	Go to step **27**.	Replace the faulty fuel injector. <Ref. to FU(H4DOTC)-45, Fuel Injector.>

	Step	Check	Yes	No
27	**CHECK INSTALLATION CONDITION 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. <Ref. to FU(H4DOTC)-37, Camshaft Position Sensor.> <Ref. to FU(H4DOTC)-35, Crankshaft Position Sensor.>	Go to step **28**.
28	**CHECK CRANK SPROCKET.** Remove the timing belt cover. <Ref. to ME(H4DOTC)-48, REMOVAL, Timing Belt Cover.>	Is the crank sprocket rusted or does it have broken teeth?	Replace the crank sprocket. <Ref. to ME(H4DOTC)-57, Crank Sprocket.>	Go to step **29**.
29	**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(H4DOTC)-49, Timing Belt.>	Go to step **30**.
30	**CHECK FUEL LEVEL.**	Is the fuel meter indication higher than the “Lower” level?	Go to step **31**.	Refill the fuel so that the fuel meter indication is higher than the “Lower” level, and proceed to the next step. Go to step **31**.
31	**CHECK STATUS OF MALFUNCTION INDICATOR LIGHT.** 1) Clear the memory using the Subaru Select Monitor or general scan tool. <Ref. to EN(H4DOTC)(diag)-56, Clear Memory Mode.> 2) Start the engine, and drive the vehicle 10 minutes or more.	Does the malfunction indicator light illuminate or blink?	Go to step **33**.	Go to step **32**.
32	**CHECK CAUSE OF MISFIRE.**	Was the cause of misfire identified when the engine is running?	Finish diagnostics operation, if the engine has no abnormality.	Repair the poor contact of connector. NOTE: In this case, repair the following item: • Poor contact of ignition coil connector • Poor contact of fuel injector connector on faulty cylinders • Poor contact of ECM connector • Poor contact of coupling connector

	Step	Check	Yes	No
33	**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 **34**.
34	**CHECK MISFIRE SYMPTOM.** 1) Turn the ignition switch to ON. 2) Check for DTC. <Ref. to EN(H4DOTC)(diag)-44, Read Diagnostic Trouble Code (DTC).>	Does the Subaru Select Monitor or general scan tool indicate only one DTC?	Go to step **37**.	Go to step **35**.
35	**CHECK DTC.**	Is DTC P0301 and P0303 displayed on the Subaru Select Monitor or general scan tool?	Go to step **38**.	Go to step **36**.
36	**CHECK DTC.**	Is DTC P0302 and P0304 displayed on the Subaru Select Monitor or general scan tool?	Go to step **39**.	Go to step **40**.
37	**ONLY ONE CYLINDER.**	Is there any fault in the cylinder?	Repair or replace faulty parts. NOTE: Check the following items. • Spark plug • Ignition coil • Fuel injector • Compression ratio	Go to DTC P0171. <Ref. to EN(H4DOTC)(diag)-144, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
38	**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. • Spark plug • Ignition coil • Fuel injector • Compression ratio • Skipping timing belt teeth	Go to DTC P0171. <Ref. to EN(H4DOTC)(diag)-144, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
39	**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. • Spark plug • Ignition coil • Fuel injector • Compression ratio • Skipping timing belt teeth	Go to DTC P0171. <Ref. to EN(H4DOTC)(diag)-144, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Step		Check	Yes	No
40	CYLINDER AT RANDOM.	Is the engine idle rough?	Go to DTC P0171. <Ref. to EN(H4DOTC)(diag)-144, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Repair or replace faulty parts. NOTE: Check the following items. • Spark plug • Ignition coil • Fuel injector • Compression ratio

EA:DTC P2419 EVAPORATIVE EMISSION SYSTEM SWITCHING VALVE CONTROL CIRCUIT LOW

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-261, DTC P2419 EVAPORATIVE EMISSION SYSTEM SWITCHING VALVE CONTROL CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

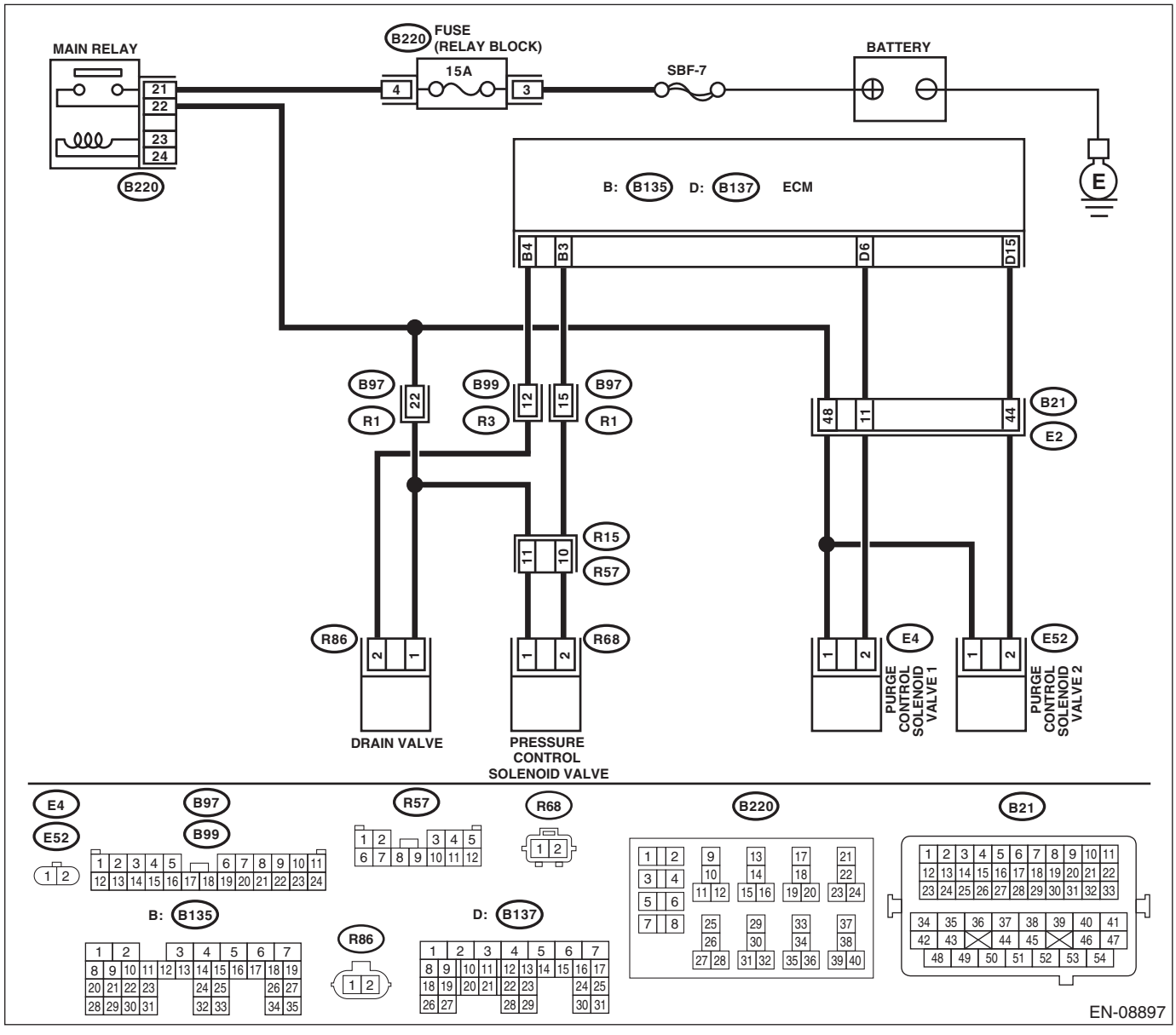
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	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. 15 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **2**.	Go to step **3**.
2	**CHECK FOR POOR CONTACT.** Check for poor contact of ECM connector.	Is there poor contact of ECM connector?	Repair the poor contact of ECM connector.	Even if DTC is detected, 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 open or short circuit of harness or temporary poor contact of connector may be the cause.
3	**CHECK POWER SUPPLY TO PURGE CONTROL SOLENOID VALVE 2.** Measure the voltage between purge control solenoid valve 2 connector and engine ground. ***Connector & terminal*** ***(E52) No. 1 (+) — Engine ground (–):***	Is the voltage 10 V or more?	Go to step **4**.	Repair the power supply circuit.
4	**CHECK HARNESS BETWEEN ECM AND PURGE CONTROL SOLENOID VALVE 2 CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and purge control solenoid valve 2. 3) Measure the resistance between the purge control solenoid valve 2 connector and engine ground. ***Connector & terminal*** ***(E52) No. 2 — Engine ground:***	Is the resistance 1 MΩ or more?	Go to step **5**.	Repair the ground short circuit of harness between ECM and purge control solenoid valve 2 connector.
5	**CHECK HARNESS BETWEEN ECM AND PURGE CONTROL SOLENOID VALVE 2 CONNECTOR.** Measure the resistance of harness between ECM and purge control solenoid valve 2 connector. ***Connector & terminal*** ***(B137) No. 15 — (E52) No. 2:***	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 of harness between ECM and purge control solenoid valve 2 connector • Poor contact of coupling connector
6	**CHECK PURGE CONTROL SOLENOID VALVE 2.** 1) Remove the purge control solenoid valve 2. 2) Measure the resistance between purge control solenoid valve 2 terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 10 — 100 Ω?	Repair the poor contact of the purge control solenoid valve 2 connector.	Replace the purge control solenoid valve 2. <Ref. to EC(H4DOTC)-11, Purge Control Solenoid Valve.>

EB:DTC P2420 EVAPORATIVE EMISSION SYSTEM SWITCHING VALVE CONTROL CIRCUIT HIGH

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-262, DTC P2420 EVAPORATIVE EMISSION SYSTEM SWITCHING VALVE CONTROL CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

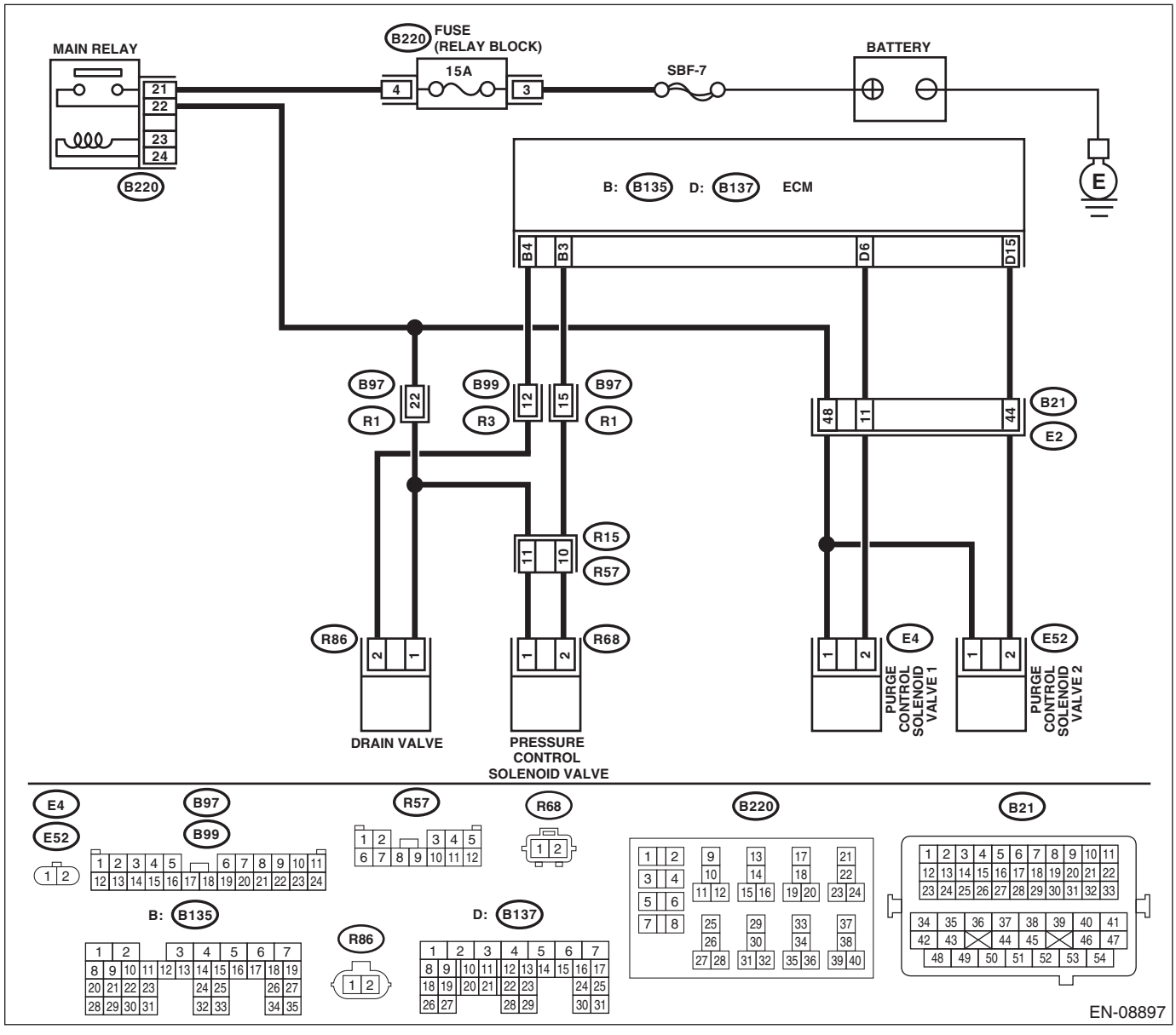
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND PURGE CONTROL SOLENOID VALVE 2 CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and purge control solenoid valve 2. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 15 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the short to power in the harness between 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)-11, Purge Control Solenoid Valve.>	Repair the poor contact of ECM connector.

EC:DTC P2431 SECONDARY AIR INJECTION SYSTEM AIR FLOW /PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-263, DTC P2431 SECONDARY AIR INJECTION SYSTEM AIR FLOW /PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK FOR 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)-82, List of Diagnostic Trouble Code (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 pipe absolute pressure and atmospheric pressure, and compare with the actual atmospheric pressure. NOTE: For detailed operation procedures, refer to “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H4DOTC)(diag)-36, Subaru Select Monitor.>	Is the actual difference with atmospheric pressure 200 mmHg (27 kPa, 8 inHg, 3.9 psig) or more?	Replace the secondary air combination valve RH. <Ref. to EC(H4DOTC)-30, Secondary Air Combination Valve.>	Even if DTC is detected, 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, temporary open or short circuit of harness may be the cause.

ED:DTC P2432 SECONDARY AIR INJECTION SYSTEM AIR FLOW /PRESSURE SENSOR CIRCUIT LOW

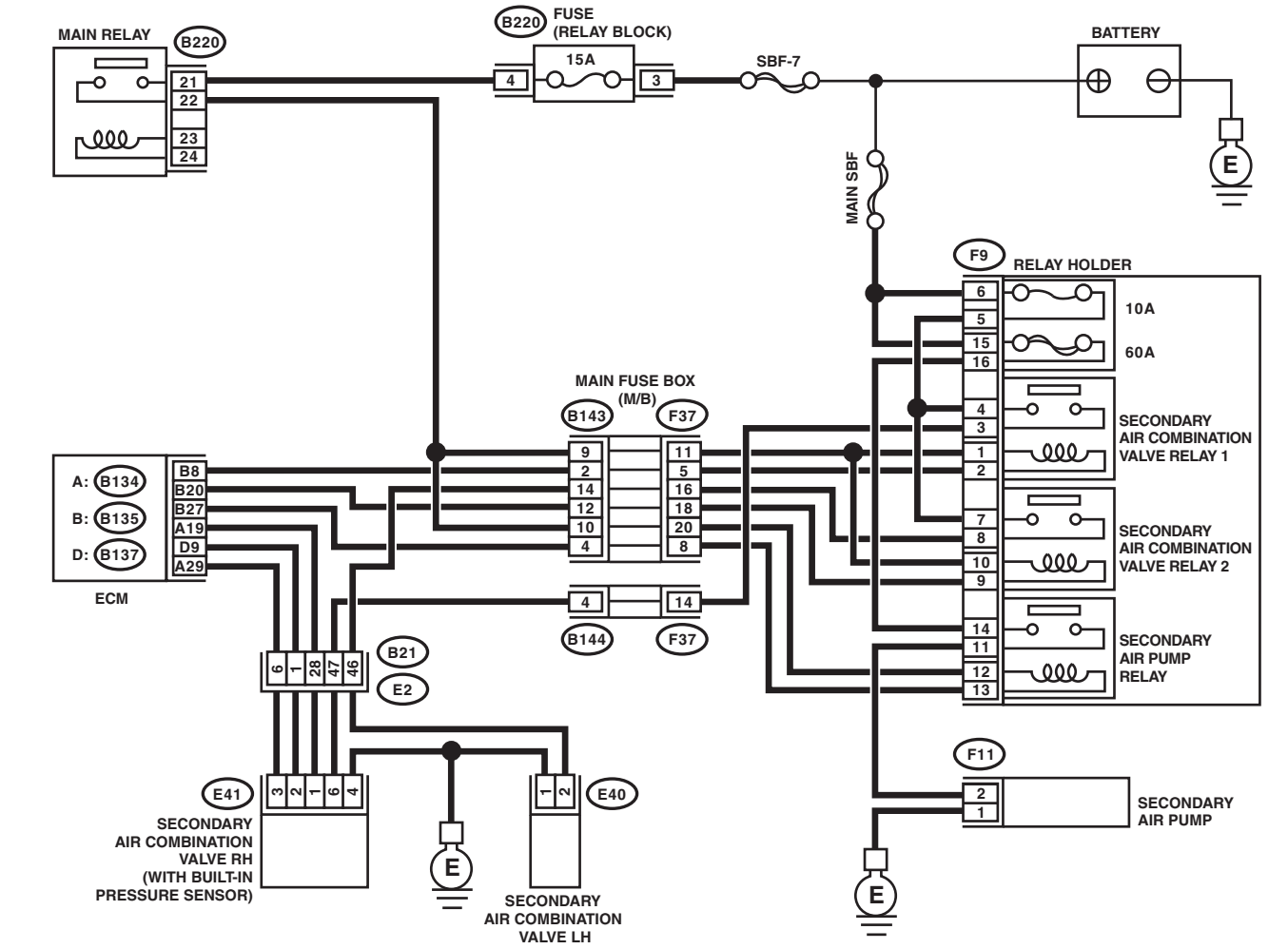
DTC DETECTING CONDITION:

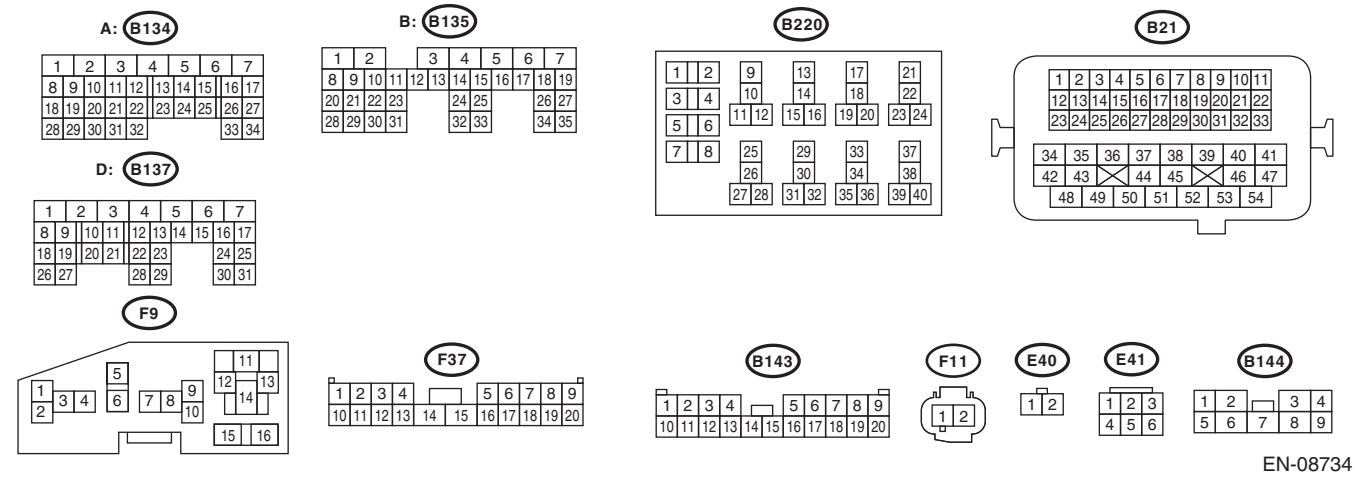
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-264, DTC P2432 SECONDARY AIR INJECTION SYSTEM AIR FLOW /PRESSURE SENSOR CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





EN-08734

	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Turn the ignition switch to ON. 2) Read the data of secondary air piping pressure 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)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the measured value less than 53.3 kPa (400 mmHg, 15.8 inHg)?	Go to step **2**.	Even if DTC is detected, 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, temporary open or short circuit of harness may be the cause.
2	**CHECK POWER SUPPLY OF SECONDARY AIR COMBINATION VALVE RH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the secondary air combination valve RH. 3) Turn the ignition switch to ON. 4) Measure the voltage between the secondary air combination valve RH connector and chassis ground. ***Connector & terminal*** ***(E41) No. 1 (+) — Chassis ground (–):***	Is the voltage 4.5 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 ECM and secondary air combination valve RH connector • Poor contact of ECM connector • Poor contact of coupling connector
3	**CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBINATION VALVE RH CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of the harness between the ECM and secondary air combination valve RH connector. ***Connector & terminal*** ***(B137) No. 9 — (E41) 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: • Open circuit in harness between ECM and secondary air combination valve RH connector • Poor contact of coupling connector
4	**CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBINATION VALVE RH CONNECTOR.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B137) 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 secondary air combination valve RH connector.
5	**CHECK FOR POOR CONTACT.** Check for poor contact of ECM and secondary air combination valve RH connector.	Is there poor contact of ECM or secondary air combination valve RH connector?	Repair the poor contact of ECM or secondary air combination valve RH connector.	Replace the secondary air combination valve RH. <Ref. to EC(H4DOTC)-30, Secondary Air Combination Valve.>

EE:DTC P2433 SECONDARY AIR INJECTION SYSTEM AIR FLOW /PRESSURE SENSOR CIRCUIT HIGH

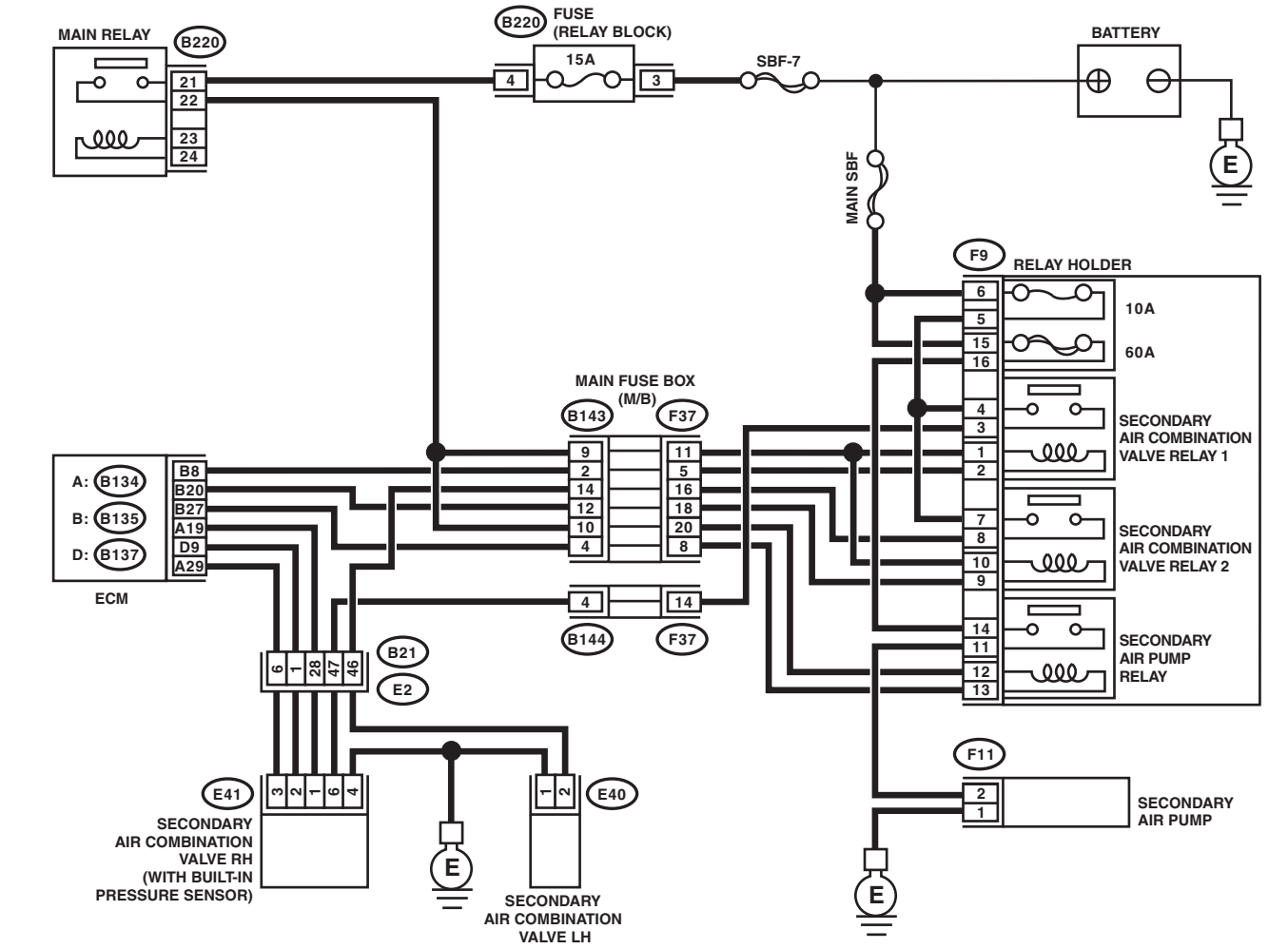
DTC DETECTING CONDITION:

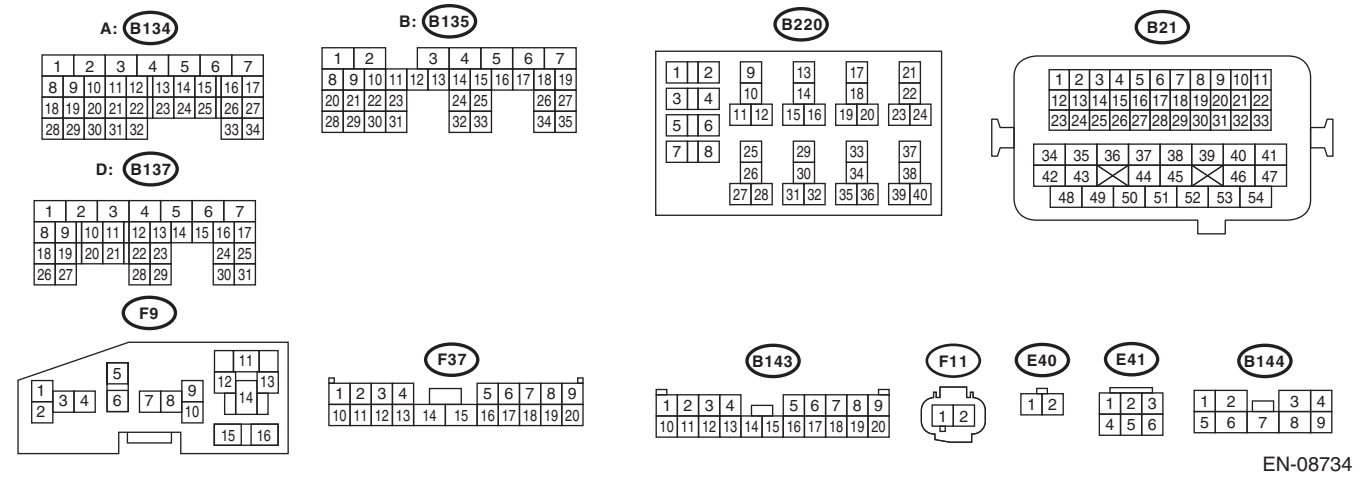
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-265, DTC P2433 SECONDARY AIR INJECTION SYSTEM AIR FLOW /PRESSURE SENSOR CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





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	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Turn the ignition switch to ON. 2) Read the data of secondary air piping pressure 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)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the measured value 133.3 kPa (1000 mmHg, 39.4 inHg) or more?	Go to step **2**.	Even if DTC is detected, 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, temporary open or short circuit of harness may be the cause.
2	**CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBINATION VALVE RH CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the secondary air combination valve RH. 3) Turn the ignition switch to ON. 4) Read the data of secondary air piping pressure 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)-36, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the general scan tool operation manual.	Is the measured value 133.3 kPa (1000 mmHg, 39.4 inHg) or more?	Repair the short circuit to power in the harness between ECM and secondary air combination valve RH connectors.	Go to step **3**.
3	**CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBINATION VALVE RH CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of the harness between the secondary air combination valve RH connector and engine ground. ***Connector & terminal*** ***(E41) No. 3 — Engine 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 secondary air combination valve RH connector • Poor contact of ECM connector • Poor contact of coupling connector
4	**CHECK FOR POOR CONTACT.** Check for poor contact of secondary air combination valve RH connector.	Is there poor contact of secondary air combination valve RH connector?	Repair the poor contact of secondary air combination valve RH connector.	Replace the secondary air combination valve RH. <Ref. to EC(H4DOTC)-30, Secondary Air Combination Valve.>

EF:DTC P2440 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK1)

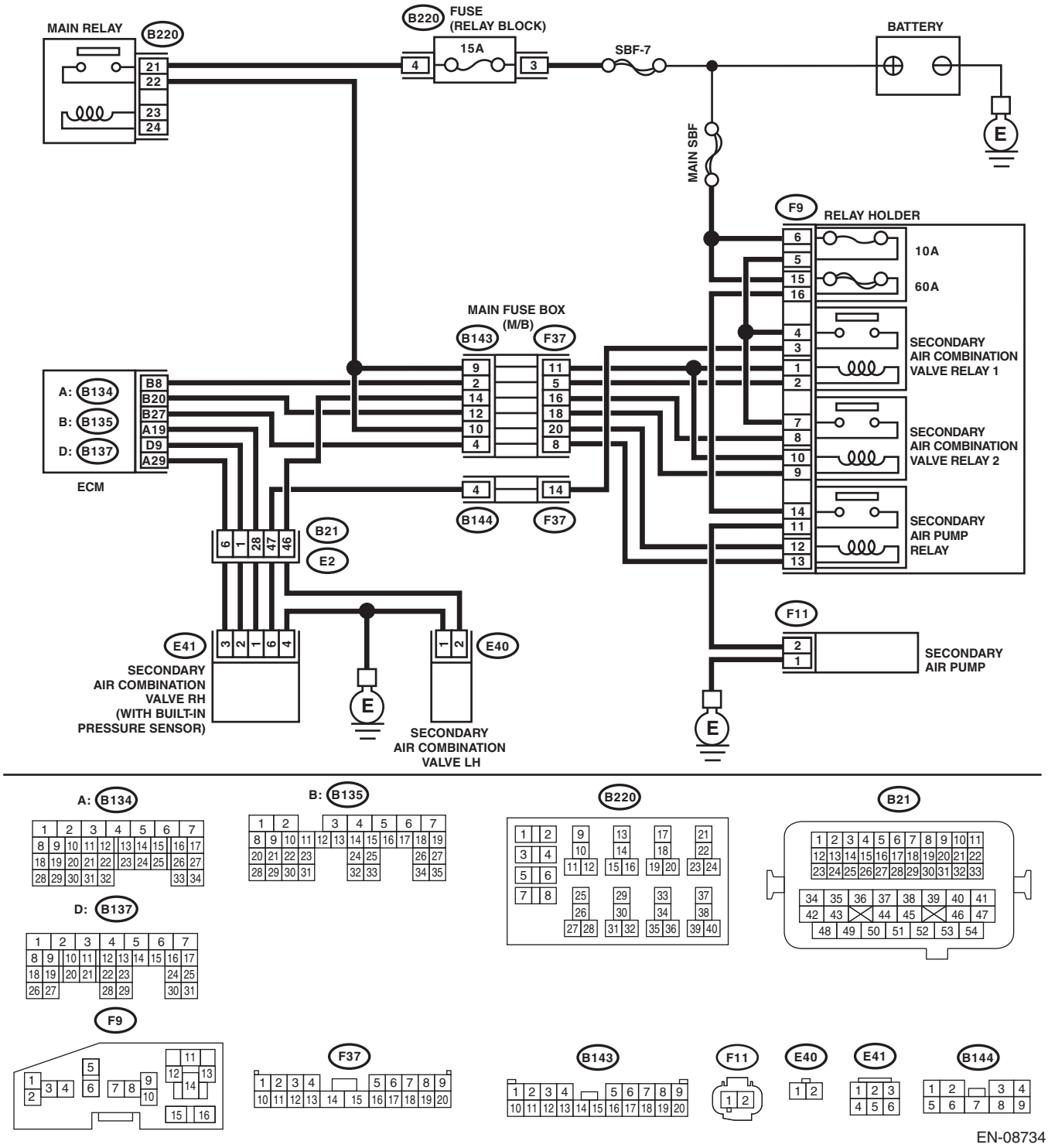
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-266, DTC P2440 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-08734

Step		Check	Yes	No
1	**CHECK SECONDARY AIR COMBINATION VALVE FUSE.** Check if the secondary air combination valve fuse (10 A) is blown out.	Is the fuse blown out?	Go to step **2**.	Go to step **3**.

	Step	Check	Yes	No
2	**CHECK HARNESS BETWEEN RELAY HOLDER AND SECONDARY AIR COMBINATION VALVE RH CONNECTOR.** 1) Remove the secondary air combination valve fuse (10 A) from the relay holder. 2) Disconnect the connector from the secondary air combination valve RH. 3) Measure the resistance between the secondary air combination valve fuse and secondary air combination valve RH connector, and chassis ground. ***Connector & terminal*** ***(F9) No. 5 — Chassis ground:*** ***(E41) No. 6 — Chassis ground:***	Is the resistance 1 MΩ or more?	Replace the fuse with a new part, and connect the secondary air combination valve RH connector. Go to step **3**.	Repair the short circuit to ground in harness between relay holder and secondary air combination valve RH connector.
3	**CHECK SECONDARY AIR COMBINATION VALVE RH OPERATION.** 1) Connect the delivery (test) mode connector. 2) Turn the ignition switch to ON. 3) Perform operation check for the secondary air combination valve RH using the Subaru Select Monitor. NOTE: Refer to "Compulsory Valve Operation Check Mode" for more operation procedures. <Ref. to EN(H4DOTC)(diag)-57, Compulsory Valve Operation Check Mode.>	Does the secondary air combination valve RH repeatedly switch to ON and OFF?	Go to step **4**.	Go to step **6**.
4	**CHECK DUCT BETWEEN SECONDARY AIR PUMP AND SECONDARY AIR COMBINATION VALVE RH.** Check the duct between the secondary air pump and secondary air combination valve RH.	Is there damage, clog or disconnection of the duct?	Replace, clean or connect the duct.	Go to step **5**.
5	**CHECK PIPE BETWEEN SECONDARY AIR COMBINATION VALVE RH AND CYLINDER HEAD.** Check the pipe between the secondary air combination valve RH and cylinder head.	Is there damage, clog or disconnection of the pipe?	Replace, clean or connect the pipe.	Even if DTC is detected, 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, temporary open or short circuit of harness may be the cause.
6	**CHECK POWER SUPPLY TO SECONDARY AIR COMBINATION VALVE RH.** 1) Disconnect the connector from the secondary air combination valve RH. 2) In the condition of step 3, measure the voltage between secondary air combination valve RH connector and chassis ground. ***Connector & terminal*** ***(E41) No. 6 (+) — Chassis ground (–):***	Does the voltage repeatedly change between 10 V and 0 V?	Replace the secondary air combination valve RH. <Ref. to EC(H4DOTC)-30, Secondary Air Combination Valve.>	Go to step **7**.

	Step	Check	Yes	No
7	**CHECK HARNESS BETWEEN SECONDARY AIR COMBINATION VALVE RH AND CHASSIS GROUND.** Measure the resistance between the secondary air combination valve RH connector and chassis ground. ***Connector & terminal*** ***(E41) No. 4 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **8**.	Repair the open circuit in harness between secondary air combination valve RH connector and chassis ground.
8	**CHECK HARNESS BETWEEN SECONDARY AIR COMBINATION VALVE RELAY 1 AND SECONDARY AIR COMBINATION VALVE RH CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Remove the secondary air combination valve relay 1 from the relay holder. 3) Measure the resistance of the harness between secondary air combination valve relay 1 connector and secondary air combination valve RH connector. ***Connector & terminal*** ***(F9) No. 3 — (E41) No. 6:***	Is the resistance less than 1 Ω?	Go to step **9**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between secondary air combination valve relay 1 connector and secondary air combination valve RH connector • Poor contact of coupling connector
9	**CHECK SECONDARY AIR COMBINATION VALVE RELAY 1.** 1) Connect the battery to terminals No. 1 and No. 2 of the secondary air combination valve relay 1. 2) Measure the resistance between the secondary air combination valve relay 1 terminals. ***Terminals*** ***No. 3 — No. 4:***	Is the resistance less than 1 Ω?	Go to step **10**.	Replace the secondary air combination valve relay 1. <Ref. to EN(H4DOTC)(diag)-9, Electrical Component Location.>
10	**CHECK SECONDARY AIR COMBINATION VALVE RELAY 1.** Measure the resistance between the secondary air combination valve relay 1 terminals with the battery disconnected. ***Terminals*** ***No. 3 — No. 4:***	Is the resistance 1 MΩ or more?	Go to step **11**.	Replace the secondary air combination valve relay 1. <Ref. to EN(H4DOTC)(diag)-9, Electrical Component Location.>
11	**CHECK SECONDARY AIR COMBINATION VALVE RELAY 1 POWER SUPPLY.** 1) Turn the ignition switch to ON. 2) Measure the voltage between the secondary air combination valve relay 1 connector and chassis ground. ***Connector & terminal*** ***(F9) No. 4 (+) — Chassis ground (–):*** ***(F9) No. 1 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **12**.	Repair the open or ground short circuit of power supply circuit.

	Step	Check	Yes	No
12	**CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBINATION VALVE RELAY 1 CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the ECM connector. 3) Measure the resistance of harness between ECM and secondary air combination valve relay 1 connector. ***Connector & terminal*** ***(B135) No. 8 — (F9) No. 2:***	Is the resistance less than 1 Ω?	Go to step **13**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and secondary air combination valve relay 1 connector • Poor contact of coupling connector
13	**CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBINATION VALVE RELAY 1 CONNECTOR.** Measure the resistance between the secondary air combination valve relay 1 connector and chassis ground. ***Connector & terminal*** ***(F9) No. 2 — Chassis ground:***	Is the resistance 1 MΩ or more?	Repair the poor contact of ECM connector.	Repair the short circuit to ground in harness between ECM and secondary air combination valve relay 1 connector.

EG:DTC P2441 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK CLOSED (BANK1)

NOTE:
For the diagnostic procedure, refer to DTC P2440. <Ref. to EN(H4DOTC)(diag)-354, DTC P2440 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

EH:DTC P2442 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK2)

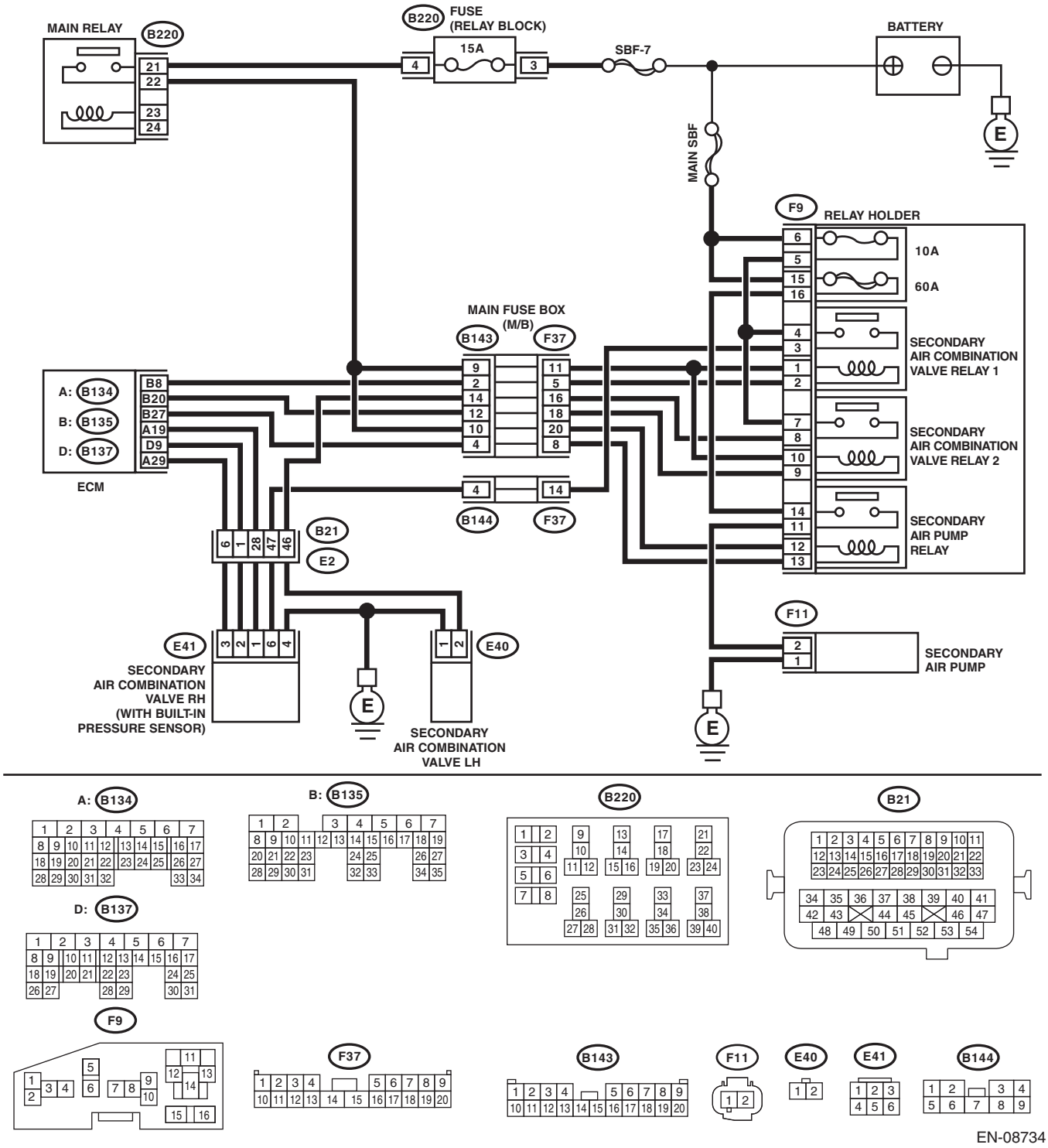
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-266, DTC P2442 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK SECONDARY AIR COMBINATION VALVE FUSE.** Check if the secondary air combination valve fuse (10 A) is blown out.	Is the fuse blown out?	Go to step **2**.	Go to step **3**.

	Step	Check	Yes	No
2	**CHECK HARNESS BETWEEN RELAY HOLDER AND SECONDARY AIR COMBINATION VALVE LH CONNECTOR.** 1) Remove the secondary air combination valve fuse (10 A) from the relay holder. 2) Disconnect the connector from the secondary air combination valve LH. 3) Measure the resistance between the secondary air combination valve fuse and secondary air combination valve LH connector, and chassis ground. ***Connector & terminal*** ***(F9) No. 5 — Chassis ground:*** ***(E40) No. 2 — Chassis ground:***	Is the resistance 1 MΩ or more?	Replace the fuse with a new part, and connect the secondary air combination valve LH connector. Go to step **3**.	Repair the ground short circuit of harness between relay holder and secondary air combination valve LH connector.
3	**CHECK SECONDARY AIR COMBINATION VALVE LH OPERATION.** 1) Connect the delivery (test) mode connector. 2) Turn the ignition switch to ON. 3) Perform operation check for the secondary air combination valve LH using the Subaru Select Monitor. NOTE: Refer to "Compulsory Valve Operation Check Mode" for more operation procedures. <Ref. to EN(H4DOTC)(diag)-57, Compulsory Valve Operation Check Mode.>	Does the secondary air combination valve LH repeatedly switch to ON and OFF?	Go to step **4**.	Go to step **6**.
4	**CHECK DUCT BETWEEN SECONDARY AIR PUMP AND SECONDARY AIR COMBINATION VALVE LH.** Check the duct between the secondary air pump and secondary air combination valve LH.	Is there damage, clog or disconnection of the duct?	Replace, clean or connect the duct.	Go to step **5**.
5	**CHECK PIPE BETWEEN SECONDARY AIR COMBINATION VALVE LH AND CYLINDER HEAD.** Check the pipe between the secondary air combination valve LH and cylinder head.	Is there damage, clog or disconnection of the pipe?	Replace, clean or connect the pipe.	Even if DTC is detected, 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, temporary open or short circuit of harness may be the cause.
6	**CHECK POWER SUPPLY TO SECONDARY AIR COMBINATION VALVE LH.** 1) Disconnect the connector from the secondary air combination valve LH. 2) In the condition of step 3, measure the voltage between secondary air combination valve LH connector and chassis ground. ***Connector & terminal*** ***(E40) No. 2 (+) — Chassis ground (–):***	Does the voltage repeatedly change between 10 V and 0 V?	Replace the secondary air combination valve LH. <Ref. to EC(H4DOTC)-30, Secondary Air Combination Valve.>	Go to step **7**.

	Step	Check	Yes	No
7	**CHECK HARNESS BETWEEN SECONDARY AIR COMBINATION VALVE LH AND CHASSIS GROUND.** Measure the resistance between the secondary air combination valve LH connector and chassis ground. ***Connector & terminal*** ***(E40) No. 1 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **8**.	Repair the open circuit in harness between secondary air combination valve LH connector and chassis ground.
8	**CHECK HARNESS BETWEEN SECONDARY AIR COMBINATION VALVE RELAY 2 AND SECONDARY AIR COMBINATION VALVE LH CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Remove the secondary air combination valve relay 2 from the relay holder. 3) Measure the resistance of the harness between the secondary air combination valve relay 2 and secondary air combination valve LH connector. ***Connector & terminal*** ***(F9) No. 8 — (E40) No. 2:***	Is the resistance less than 1 Ω?	Go to step **9**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between secondary air combination valve relay 2 connector and secondary air combination valve LH connector • Poor contact of coupling connector
9	**CHECK SECONDARY AIR COMBINATION VALVE RELAY 2.** 1) Connect the battery to terminals No. 10 and No. 9 of the secondary air combination valve relay 2. 2) Measure the resistance between the secondary air combination valve relay 2 terminals. ***Terminals*** ***No. 7 — No. 8:***	Is the resistance less than 1 Ω?	Go to step **10**.	Replace the secondary air combination valve relay 2. <Ref. to EN(H4DOTC)(diag)-9, Electrical Component Location.>
10	**CHECK SECONDARY AIR COMBINATION VALVE RELAY 2.** Measure the resistance between the secondary air combination valve relay 2 terminals with the battery disconnected. ***Terminals*** ***No. 7 — No. 8:***	Is the resistance 1 MΩ or more?	Go to step **11**.	Replace the secondary air combination valve relay 2. <Ref. to EN(H4DOTC)(diag)-9, Electrical Component Location.>
11	**CHECK SECONDARY AIR COMBINATION VALVE RELAY 2 POWER SUPPLY.** 1) Turn the ignition switch to ON. 2) Measure the voltage between the secondary air combination valve relay 2 connector and chassis ground. ***Connector & terminal*** ***(F9) No. 7 (+) — Chassis ground (–):*** ***(F9) No. 10 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **12**.	Repair the open or ground short circuit of power supply circuit.

	Step	Check	Yes	No
12	**CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBINATION VALVE RELAY 2 CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the ECM connector. 3) Measure the resistance of harness between ECM and secondary air combination valve relay 2 connector. ***Connector & terminal*** ***(B135) No. 20 — (F9) No. 9:***	Is the resistance less than 1 Ω?	Go to step **13**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and secondary air combination valve relay 2 connector • Poor contact of coupling connector
13	**CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBINATION VALVE RELAY 2 CONNECTOR.** Measure the resistance between the secondary air combination valve relay 2 connector and chassis ground. ***Connector & terminal*** ***(F9) No. 9 — Chassis ground:***	Is the resistance 1 MΩ or more?	Repair the poor contact of ECM connector.	Repair the short circuit to ground in harness between ECM and secondary air combination valve relay 2 connector.

EI: DTC P2443 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK CLOSED (BANK2)

NOTE:
For the diagnostic procedure, refer to DTC P2442. <Ref. to EN(H4DOTC)(diag)-359, DTC P2442 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

EJ: DTC P2444 SECONDARY AIR INJECTION SYSTEM PUMP STUCK ON

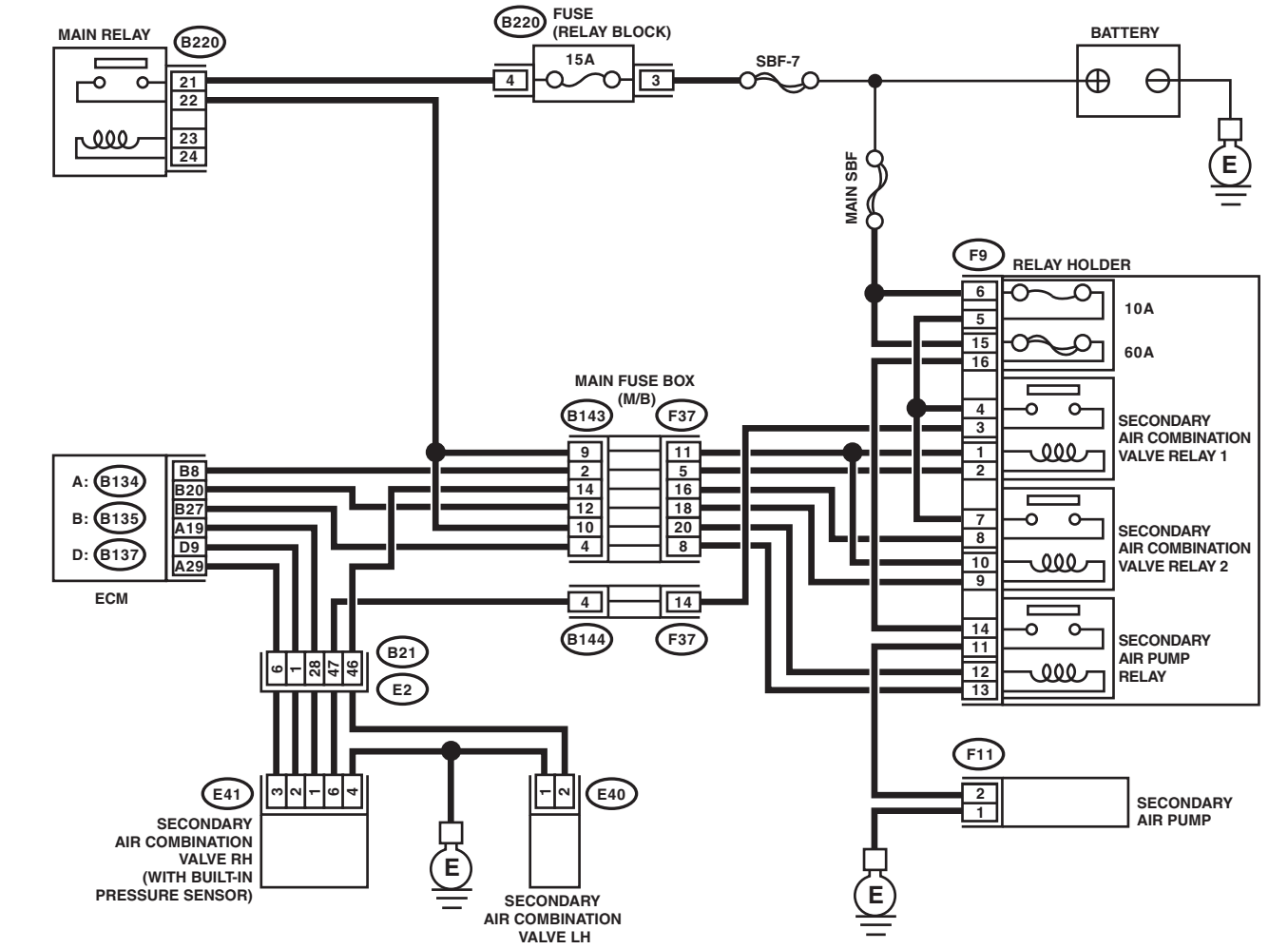
DTC DETECTING CONDITION:

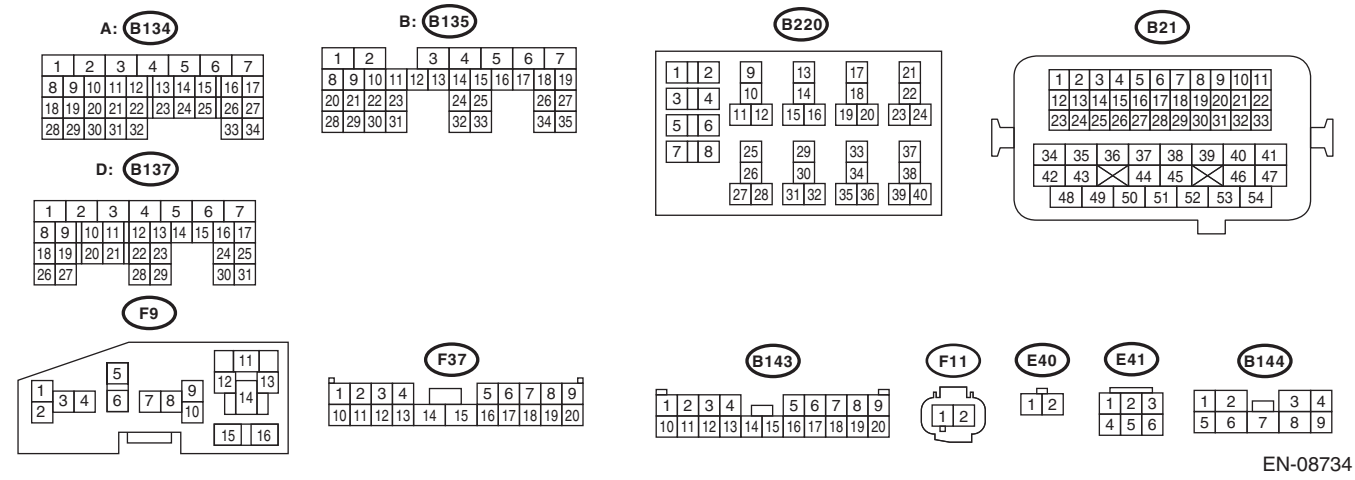
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-267, DTC P2444 SECONDARY AIR INJECTION SYSTEM PUMP STUCK ON, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After servicing or replacing faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>, and Inspection Mode <Ref. to EN(H4DOTC)(diag)-45, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





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	Step	Check	Yes	No
1	**CHECK SECONDARY AIR PIPING PRESSURE.** 1) Turn the ignition switch to ON. 2) Using the Subaru Select Monitor, read secondary air piping pressure data, and compare with the actual atmospheric pressure. NOTE: For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-36, Subaru Select Monitor.>	Is the actual difference with atmospheric pressure 50 mmHg (6.7 kPa, 2.0 inHg, 0.97 psig) or more?	Go to step **2**.	Even if DTC is detected, 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, temporary open or short circuit of harness may be the cause.
2	**CHECK SECONDARY AIR PUMP.** 1) Start the engine and warm up engine until coolant temperature is higher than 75°C (167°F). 2) Check whether the secondary air pump is operating.	Is the secondary air pump operating?	Go to step **3**.	Replace the secondary air combination valve RH. <Ref. to EC(H4DOTC)-30, Secondary Air Combination Valve.>
3	**CHECK HARNESS BETWEEN ECM AND SECONDARY AIR PUMP RELAY CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Remove the secondary air pump relay from the relay holder. 3) Measure the resistance between the secondary air pump relay connector and engine ground terminals. ***Connector & terminal*** ***(F9) No. 13 — Engine ground:***	Is the resistance 1 MΩ or more?	Go to step **4**.	Repair the short circuit to ground in harness between ECM and secondary air pump relay connector.
4	**CHECK SECONDARY AIR PUMP RELAY.** Measure the resistance between the secondary air pump relay terminals. ***Terminals*** ***No. 14 — No. 11:***	Is the resistance 1 MΩ or more?	Repair the short circuit to power in the harness between secondary air pump relay and secondary air pump connector.	Replace the secondary air pump relay. <Ref. to EN(H4DOTC)(diag)-9, Electrical Component Location.>

EK:DTC U0073 CAN FAILURE, BUS 'OFF' DETECTION

NOTE:
For the diagnostic procedure, refer to LAN section. <Ref. to LAN(diag)-2, Basic Diagnostic Procedure.>

EL:DTC U0101 CAN (TCU) DATA NOT LOADED

NOTE:
For the diagnostic procedure, refer to LAN section. <Ref. to LAN(diag)-2, Basic Diagnostic Procedure.>

EM:DTC U0122 CAN (VDC) DATA NOT LOADED

NOTE:
For the diagnostic procedure, refer to LAN section. <Ref. to LAN(diag)-2, Basic Diagnostic Procedure.>

EN:DTC U0140 CAN (BCU) DATA NOT LOADED

NOTE:
For the diagnostic procedure, refer to LAN section. <Ref. to LAN(diag)-2, Basic Diagnostic Procedure.>

EO:DTC U0402 CAN (TCU) DATA ABNORMAL

NOTE:
For the diagnostic procedure, refer to LAN section. <Ref. to LAN(diag)-2, Basic Diagnostic Procedure.>

EP:DTC U0416 CAN (VDC) DATA ABNORMAL

NOTE:
For the diagnostic procedure, refer to LAN section. <Ref. to LAN(diag)-2, Basic Diagnostic Procedure.>

EQ:DTC U0422 CAN (BCU) DATA ABNORMAL

NOTE:
For the diagnostic procedure, refer to LAN section. <Ref. to LAN(diag)-2, Basic Diagnostic Procedure.>

21.General Diagnostic Table

A: INSPECTION

1. ENGINE

NOTE:
Malfunction of parts other than those listed is also possible. <Ref. to ME(H4DOTC)-100, Engine Trouble in General.>

Symptoms	Faulty 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 and intake air temperature sensor 5) Accelerator pedal position 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 relay 10) Engine torque control signal circuit 11) Ignition parts (*1) 12) Accelerator pedal position sensor
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 9) Electronic throttle control

Symptoms	Faulty parts
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) Electronic throttle control 8) Fuel pump and fuel pump relay
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 burning 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 spark plug.
*2: Indicate the symptom occurring only in cold temperatures.
*3: Ensure secure installation.
*4: Check fuel injector, fuel pressure regulator and fuel filter.
*5: Inspect for air leak in air intake system.

GENERAL DESCRIPTION

GD(H4DOTC)

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2. Diagnostic Trouble Code (DTC) Detecting Criteria 10

1. List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Item	Index
P0011	Intake Camshaft Position - Timing Over-Advanced or System Performance (Bank 1)	<Ref. to GD(H4DOTC)-10, 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 (Bank1)	<Ref. to GD(H4DOTC)-12, DTC P0016 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0018	Crankshaft Position - Camshaft Position Correlation (Bank2)	<Ref. to GD(H4DOTC)-14, DTC P0018 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0021	Intake Camshaft Position - Timing Over-Advanced or System Performance (Bank 2)	<Ref. to GD(H4DOTC)-14, 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)-15, 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)-17, 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)-19, 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)-21, 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)-23, 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)-25, 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)-27, 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)-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(H4DOTC)-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(H4DOTC)-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(H4DOTC)-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(H4DOTC)-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(H4DOTC)-40, 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)-42, 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)-44, DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0118	Engine Coolant Temperature Circuit High	<Ref. to GD(H4DOTC)-46, DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DTC	Item	Index
P0122	Throttle/Pedal Position Sensor/ Switch “A” Circuit Low	<Ref. to GD(H4DOTC)-48, 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)-50, 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(H4DOTC)-52, 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)-54, 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)-56, 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)-59, 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)-61, 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)-63, 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)-66, 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)-68, 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)-71, 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)-72, DTC P0139 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0140	O2 Sensor Circuit No Activity Detected (Bank1 Sensor2)	<Ref. to GD(H4DOTC)-80, DTC P0140 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK1 SENSOR2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0141	O2 Sensor Heater Circuit (Bank1 Sensor2)	<Ref. to GD(H4DOTC)-82, DTC P0141 O2 SENSOR HEATER CIRCUIT (BANK1 SENSOR2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0171	System Too Lean (Bank 1)	<Ref. to GD(H4DOTC)-84, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0172	System Too Rich (Bank 1)	<Ref. to GD(H4DOTC)-85, 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)-87, 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)-90, 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)-92, 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)-94, DTC P0222 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

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P0223	Throttle/Pedal Position Sensor/ Switch “B” Circuit High	<Ref. to GD(H4DOTC)-96, 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)-98, 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)-100, 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)-102, 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)-103, DTC P0246 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0301	Cylinder 1 Misfire Detected	<Ref. to GD(H4DOTC)-104, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0302	Cylinder 2 Misfire Detected	<Ref. to GD(H4DOTC)-109, DTC P0302 CYLINDER 2 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0303	Cylinder 3 Misfire Detected	<Ref. to GD(H4DOTC)-109, DTC P0303 CYLINDER 3 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0304	Cylinder 4 Misfire Detected	<Ref. to GD(H4DOTC)-109, 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)-110, 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)-112, 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)-114, 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)-116, 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)-118, 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)-120, DTC P0345 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0410	Secondary Air Injection System	<Ref. to GD(H4DOTC)-121, DTC P0410 SECONDARY AIR INJECTION SYSTEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0411	Secondary Air Injection System Incorrect Flow Detected	<Ref. to GD(H4DOTC)-131, 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)-132, 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)-133, 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)-134, 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)-134, DTC P0417 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “B” CIRCUIT SHORTED , Diagnostic Trouble Code (DTC) Detecting Criteria.>

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P0418	Secondary Air Injection System Control “A” Circuit	<Ref. to GD(H4DOTC)-135, DTC P0418 SECONDARY AIR INJECTION SYSTEM CONTROL “A” CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0420	Catalyst System Efficiency Below Threshold (Bank 1)	<Ref. to GD(H4DOTC)-136, 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(H4DOTC)-138, 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)-155, 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)-157, 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(H4DOTC)-159, 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)-161, 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)-163, 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)-165, 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)-165, 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)-166, 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)-168, 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)-170, 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)-172, 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)-174, DTC P0463 FUEL LEVEL SENSOR “A” CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0464	Fuel Level Sensor Circuit Intermittent	<Ref. to GD(H4DOTC)-176, DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0500	Vehicle Speed Sensor “A”	<Ref. to GD(H4DOTC)-179, DTC P0500 VEHICLE SPEED SENSOR “A”, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0506	Idle Air Control System RPM Lower Than Expected	<Ref. to GD(H4DOTC)-180, 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)-181, DTC P0507 IDLE AIR CONTROL SYSTEM RPM HIGHER THAN EXPECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P050A	Cold Start Idle Air Control System Performance	<Ref. to GD(H4DOTC)-182, DTC P050A COLD START IDLE AIR CONTROL SYSTEM PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

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P050B	Cold Start Ignition Timing Performance	<Ref. to GD(H4DOTC)-184, DTC P050B COLD START IGNITION TIMING PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0512	Starter Request Circuit	<Ref. to GD(H4DOTC)-185, DTC P0512 STARTER REQUEST CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0513	Incorrect Immobilizer Key	<Ref. to GD(H4DOTC)-186, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0604	Internal Control Module Random Access Memory (RAM) Error	<Ref. to GD(H4DOTC)-187, 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)-188, DTC P0605 INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0607	Throttle Control System Circuit Range/Performance	<Ref. to GD(H4DOTC)-189, DTC P0607 THROTTLE CONTROL SYSTEM CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0638	Throttle Actuator Control Range/Performance (Bank 1)	<Ref. to GD(H4DOTC)-191, DTC P0638 THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0700	Transmission Control System (MIL Request)	<Ref. to GD(H4DOTC)-193, 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)-194, DTC P0851 PARK/NEUTRAL SWITCH INPUT CIRCUIT LOW (AT MODEL), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0852	Park/Neutral Switch Input Circuit High (AT Model)	<Ref. to GD(H4DOTC)-195, DTC P0852 PARK/NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT MODEL), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1152	O2 Sensor Circuit Range/Performance (Low) (Bank1 Sensor1)	<Ref. to GD(H4DOTC)-196, DTC P1152 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK1 SENSOR1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1153	O2 Sensor Circuit Range/Performance (High) (Bank1 Sensor1)	<Ref. to GD(H4DOTC)-198, DTC P1153 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1), 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)-206, 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)-207, 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)-209, 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)-211, 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)-213, DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1560	Back-Up Voltage Circuit Malfunction	<Ref. to GD(H4DOTC)-214, DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

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P1570	Antenna	<Ref. to GD(H4DOTC)-215, DTC P1570 ANTENNA, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1571	Reference Code Incompatibility	<Ref. to GD(H4DOTC)-215, DTC P1571 REFERENCE CODE INCOMPATIBILITY, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1572	IMM Circuit Failure (Except Antenna Circuit)	<Ref. to GD(H4DOTC)-215, DTC P1572 IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1574	Key Communication Failure	<Ref. to GD(H4DOTC)-215, DTC P1574 KEY COMMUNICATION FAILURE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1576	EGI Control Module EEPROM	<Ref. to GD(H4DOTC)-215, DTC P1576 EGI CONTROL MODULE EEPROM, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1577	IMM Control Module EEPROM	<Ref. to GD(H4DOTC)-215, DTC P1577 IMM CONTROL MODULE EEPROM, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1578	Meter Failure	<Ref. to GD(H4DOTC)-215, DTC P1578 METER FAILURE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2004	Intake Manifold Runner Control Stuck Open (Bank 1)	<Ref. to GD(H4DOTC)-216, 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)-217, 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)-218, 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)-219, 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)-220, 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)-222, 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)-224, 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)-226, 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)-228, 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)-230, 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)-232, 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)-234, DTC P2022 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT HIGH (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2088	Intake Camshaft Position Actuator Control Circuit Low (Bank 1)	<Ref. to GD(H4DOTC)-236, DTC P2088 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2089	Intake Camshaft Position Actuator Control Circuit High (Bank 1)	<Ref. to GD(H4DOTC)-237, DTC P2089 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

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P2092	Intake Camshaft Position Actuator Control Circuit Low (Bank 2)	<Ref. to GD(H4DOTC)-238, DTC P2092 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2093	Intake Camshaft Position Actuator Control Circuit High (Bank 2)	<Ref. to GD(H4DOTC)-238, 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)-239, 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)-241, 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)-243, 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(H4DOTC)-244, 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)-245, 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)-246, 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)-247, 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)-249, 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)-251, 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)-253, 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)-255, 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)-257, DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D”/“E” VOLTAGE CORRELATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P219A	Bank 1 Air-Fuel Ratio Imbalance	<Ref. to GD(H4DOTC)-259, DTC P219A BANK 1 AIR-FUEL RATIO IMBALANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2419	Evaporative Emission System Switching Valve Control Circuit Low	<Ref. to GD(H4DOTC)-261, 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)-262, 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)-263, 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)-264, DTC P2432 SECONDARY AIR INJECTION SYSTEM AIR FLOW /PRESSURE SENSOR CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

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P2433	Secondary Air Injection System Air Flow /Pressure Sensor Circuit High	<Ref. to GD(H4DOTC)-265, 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 (Bank1)	<Ref. to GD(H4DOTC)-266, DTC P2440 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2441	Secondary Air Injection System Switching Valve Stuck Closed (Bank1)	<Ref. to GD(H4DOTC)-266, DTC P2441 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK CLOSED (BANK1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2442	Secondary Air Injection System Switching Valve Stuck Open (Bank2)	<Ref. to GD(H4DOTC)-266, DTC P2442 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2443	Secondary Air Injection System Switching Valve Stuck Closed (Bank2)	<Ref. to GD(H4DOTC)-266, DTC P2443 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK CLOSED (BANK2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2444	Secondary Air Injection System Pump Stuck On	<Ref. to GD(H4DOTC)-267, DTC P2444 SECONDARY AIR INJECTION SYSTEM PUMP STUCK ON, Diagnostic Trouble Code (DTC) Detecting Criteria.>
U0073	CAN Failure, Bus ‘OFF’ Detection	<Ref. to GD(H4DOTC)-268, DTC U0073 CAN FAILURE, BUS ‘OFF’ DETECTION, Diagnostic Trouble Code (DTC) Detecting Criteria.>
U0101	CAN (TCU) Data not Loaded	<Ref. to GD(H4DOTC)-270, DTC U0101 CAN (TCU) DATA NOT LOADED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
U0122	CAN (VDC) Data not Loaded	<Ref. to GD(H4DOTC)-270, DTC U0122 CAN (VDC) DATA NOT LOADED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
U0140	CAN (BCU) Data not Loaded	<Ref. to GD(H4DOTC)-270, DTC U0140 CAN (BCU) DATA NOT LOADED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
U0402	CAN (TCU) Data Abnormal	<Ref. to GD(H4DOTC)-270, DTC U0402 CAN (TCU) DATA ABNORMAL, Diagnostic Trouble Code (DTC) Detecting Criteria.>
U0416	CAN (VDC) Data Abnormal	<Ref. to GD(H4DOTC)-270, DTC U0416 CAN (VDC) DATA ABNORMAL, Diagnostic Trouble Code (DTC) Detecting Criteria.>
U0422	CAN (BCU) Data Abnormal	<Ref. to GD(H4DOTC)-270, DTC U0422 CAN (BCU) DATA ABNORMAL, Diagnostic Trouble Code (DTC) Detecting Criteria.>

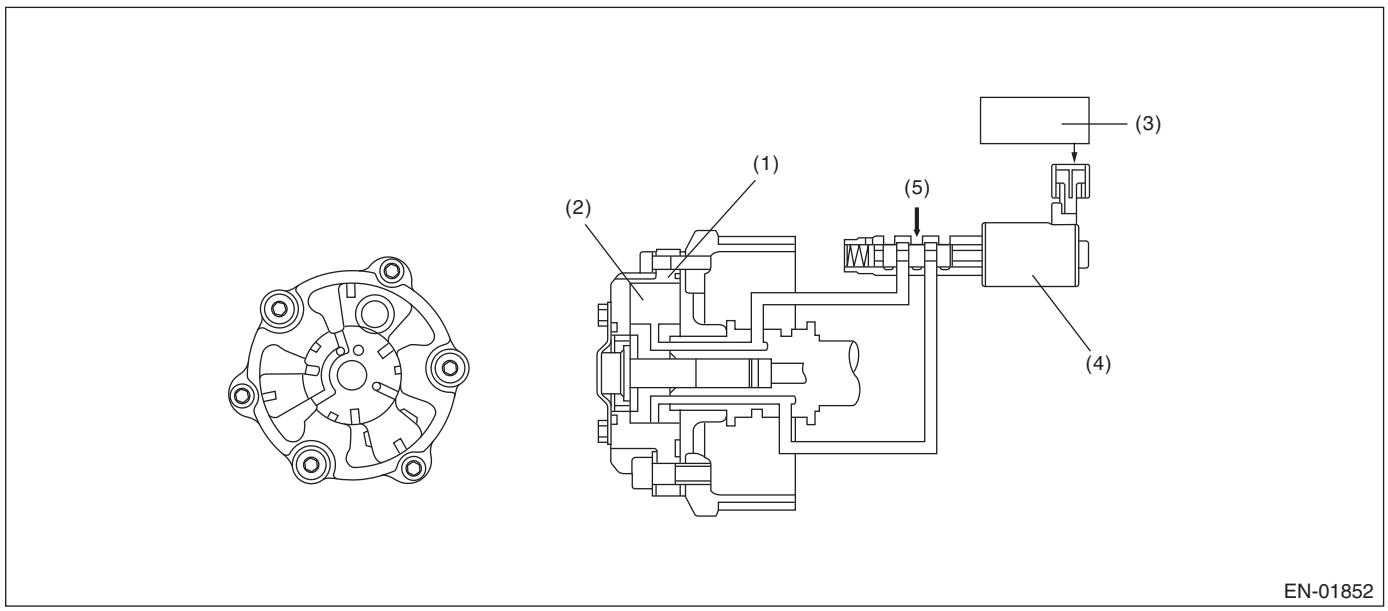
2. Diagnostic Trouble Code (DTC) Detecting Criteria

A: DTC P0011 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect the AVCS system malfunction.
Judge NG when the amount of AVCS actual timing advance does not approach to the amount of AVCS target timing advance.

2. COMPONENT DESCRIPTION



(1) AVCS timing controller
(2) Vane
(3) Engine control module (ECM)
(4) Oil flow control solenoid valve
(5) Oil pressure

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Time of establishing all secondary parameter conditions	≥ 3000 ms
Battery voltage	≥ 10.9 V
Engine speed	≥ 1300 rpm
Engine coolant temperature	≥ 60 °C (140 °F)
AVCS control	Operation
Target timing advance change amount (per 64 ms)	< 1.07 °CA

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after warming up when the engine speed increases and AVCS operates.

5. DIAGNOSTIC METHOD

1) When the conditions during which the differences of AVCS target timing advance amount and AVCS actual timing advance amount is large continues for certain amount of time.
2) When the differences of target timing advance amount and actual timing advance amount is calculated during AVCS control, and the difference per predetermined time is the specified value or larger.

• Abnormality Judgment

Judge as NG when the following conditions are established within the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Σ(Target position – Actual position)	> 8000 °CA (Bank 1) > 8000 °CA (Bank 2)
or	
Σ(Target position – Actual position)	< –8000 °CA (Bank 1) < –8000 °CA (Bank 2)

Time Needed for Diagnosis: 30000 ms
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG if the following conditions are established within the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Σ(Target position – Actual position)	≤ 8000 °CA (Bank 1) ≤ 8000 °CA (Bank 2) and ≥ –8000 °CA (Bank 1) ≥ –8000 °CA (Bank 2)

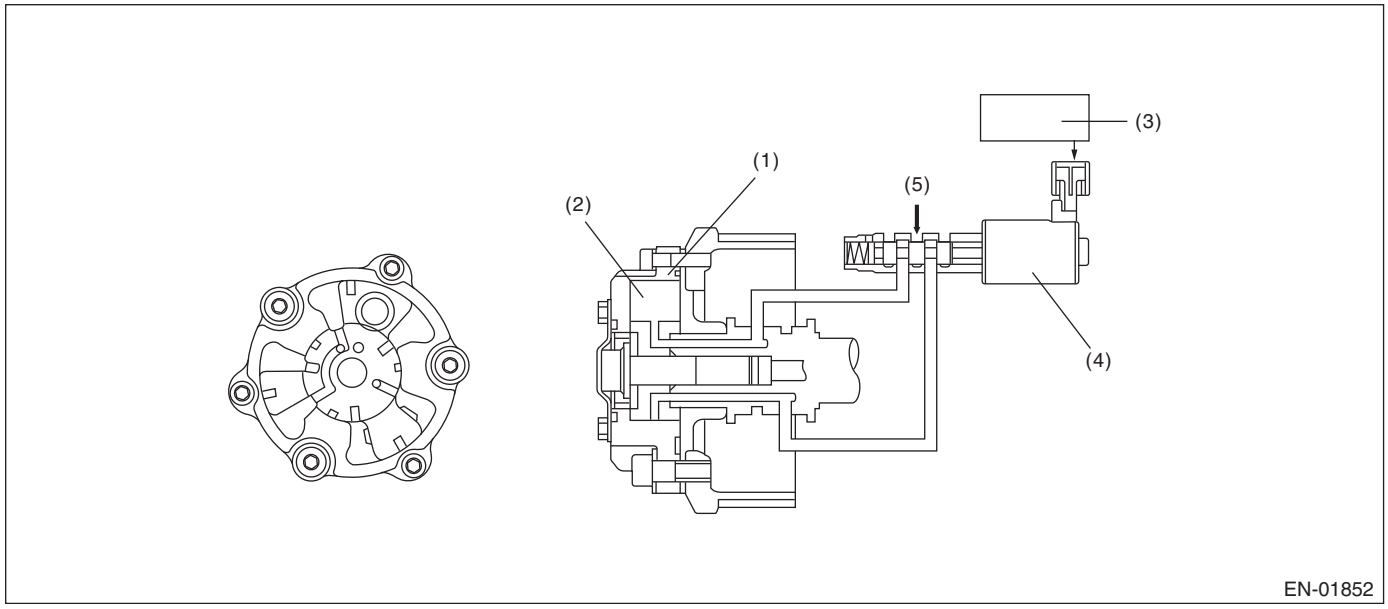
Time Needed for Diagnosis: 30000 ms

B: DTC P0016 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK1)

1. OUTLINE OF DIAGNOSIS

Detect the AVCS system malfunction.
Judge as NG when standard timing advance amount is far from learning angle.

2. COMPONENT DESCRIPTION



(1) AVCS timing controller
(2) Vane
(3) Engine control module (ECM)
(4) Oil flow control solenoid valve
(5) Oil pressure

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Engine speed	≥ 600 rpm and < 1000 rpm
Engine coolant temperature	≥ 70 °C (158 °F)
AVCS control	Not in operation
Target timing advance	0°CA

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting engine and while AVCS is not operating.

5. DIAGNOSTIC METHOD

Judge as NG when the absolute value of the difference between cam signal input position and learning value is out of specification.

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
|Crankshaft position when camshaft position sensor signal is input – Learning value|	> 8.5 °CA

Time Needed for Diagnosis: 20000 ms
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

NOTE:
Initial standard learning value is the value of crank angle initially input at the production plant. And then it will be updated every time normal judgment has been completed. Learning value will not be updated if NG judgment occurs because timing belt or chain derails suddenly in process or because wrong assembly occurs during servicing.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
|Crankshaft position when camshaft position sensor signal is input – Learning value|	≤ 8.5 °CA

Time Needed for Diagnosis: Less than 1 second

C: DTC P0018 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK2)

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0016. <Ref. to GD(H4DOTC)-12, DTC P0016 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

D: DTC P0021 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 2)

1. OUTLINE OF DIAGNOSIS

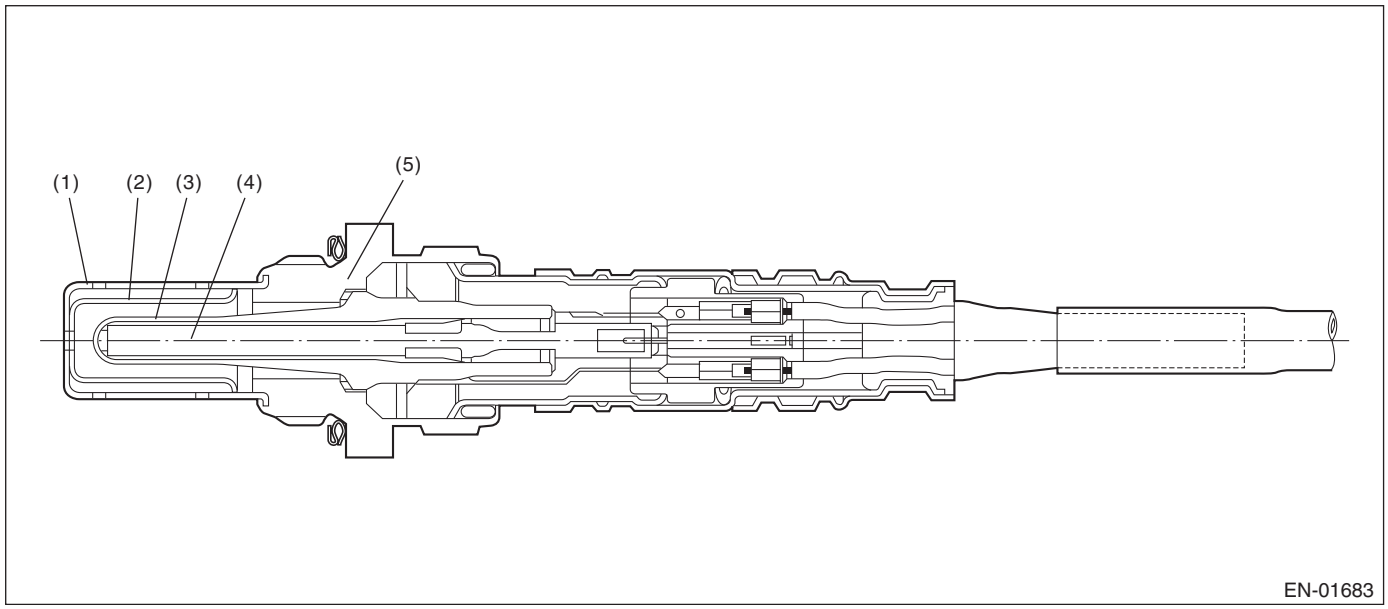
NOTE:
For the detection standard, refer to DTC P0011. <Ref. to GD(H4DOTC)-10, DTC P0011 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

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 when looking at engine status such as deceleration fuel cut.

2. COMPONENT DESCRIPTION



(1) Element cover (outer)
(2) Element cover (inner)
(3) Sensor element
(4) Ceramic heater
(5) Sensor housing

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Condition established time	≥ 42000 ms
Battery voltage	≥ 10.9 V
Heater current	Permitted
Control duty ≥ 35 %	Experienced
After fuel cut	≥ 20000 ms

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after 42000 ms seconds or more have passed since the engine started.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Front oxygen (A/F) sensor impedance	> 50 Ω

Time Needed for Diagnosis: 10000 ms
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Front oxygen (A/F) sensor impedance	≤ 50 Ω

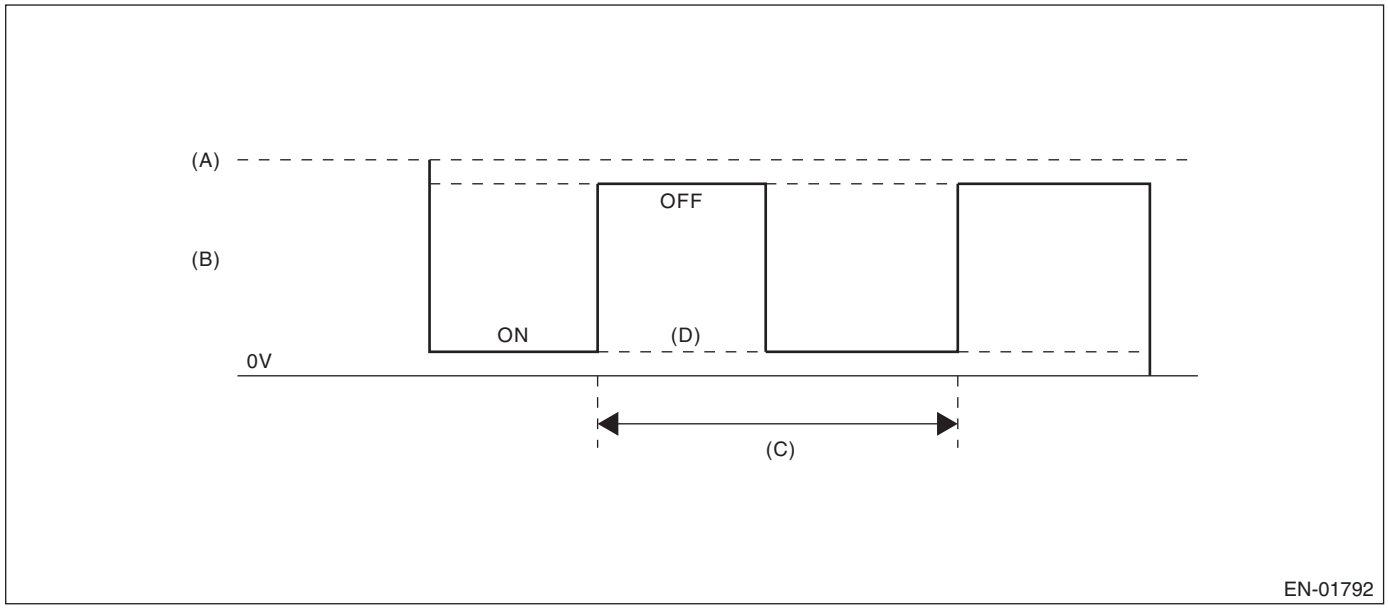
Time Needed for Diagnosis: 10000 ms

F: DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

Detect front oxygen (A/F) sensor heater open or short circuit.
The front oxygen (A/F) 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 as 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.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	Low
Front oxygen (A/F) sensor heater control duty	< 87.5 %

Time Needed for Diagnosis: 4 ms × 250 time(s)
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	High

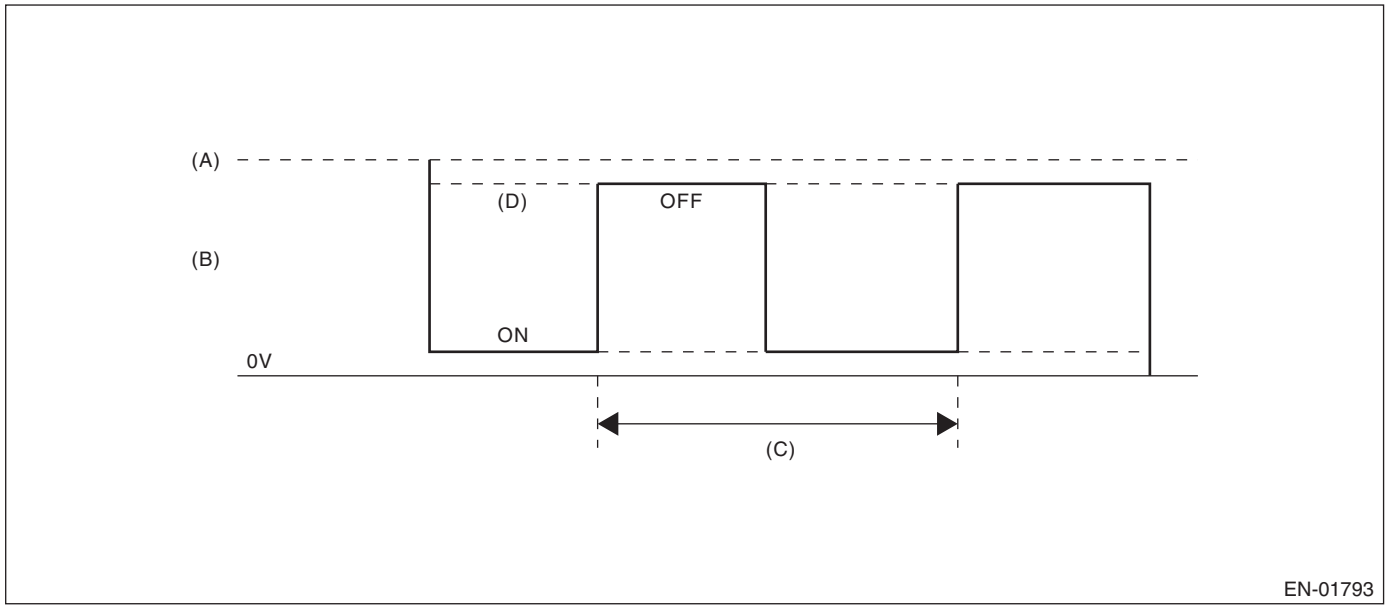
Time Needed for Diagnosis: Less than 1 second

G: DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

Detect front oxygen (A/F) sensor heater open or short circuit.
The front oxygen (A/F) 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 as 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 error

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	High
Front oxygen (A/F) sensor heater control duty	≥ 12.5 %

Time Needed for Diagnosis: 4 ms × 500 time(s)
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	Low

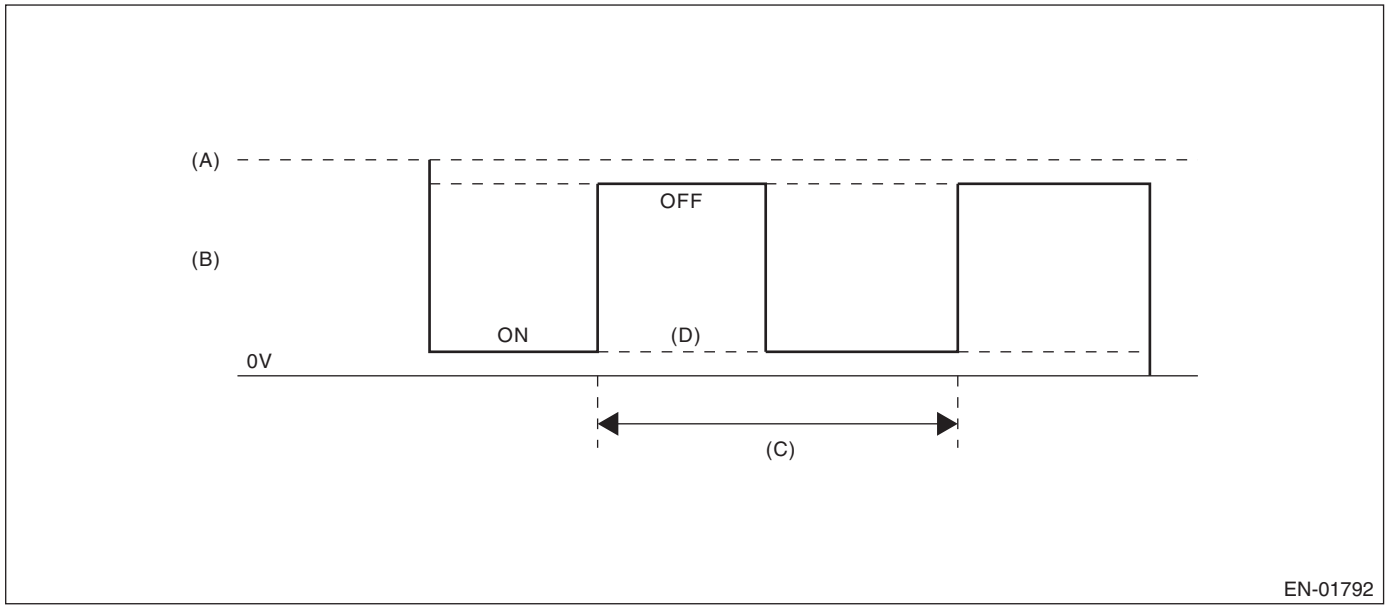
Time Needed for Diagnosis: Less than 1 second

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 as NG when the terminal voltage remains Low.

2. COMPONENT DESCRIPTION



(A) Battery voltage
(B) Output voltage of the rear oxygen sensor heater
(C) 256 milliseconds (cycles)
(D) Low error

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Elapsed time after starting the engine	≥ 1 second
Engine speed	< 8000 rpm

4. GENERAL DRIVING CYCLE

After starting the engine, perform the diagnosis continuously when engine speed is low.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	Low
Rear oxygen sensor heater control duty	< 75 %

Time Needed for Diagnosis: 8 ms × 1250 time(s)
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	High

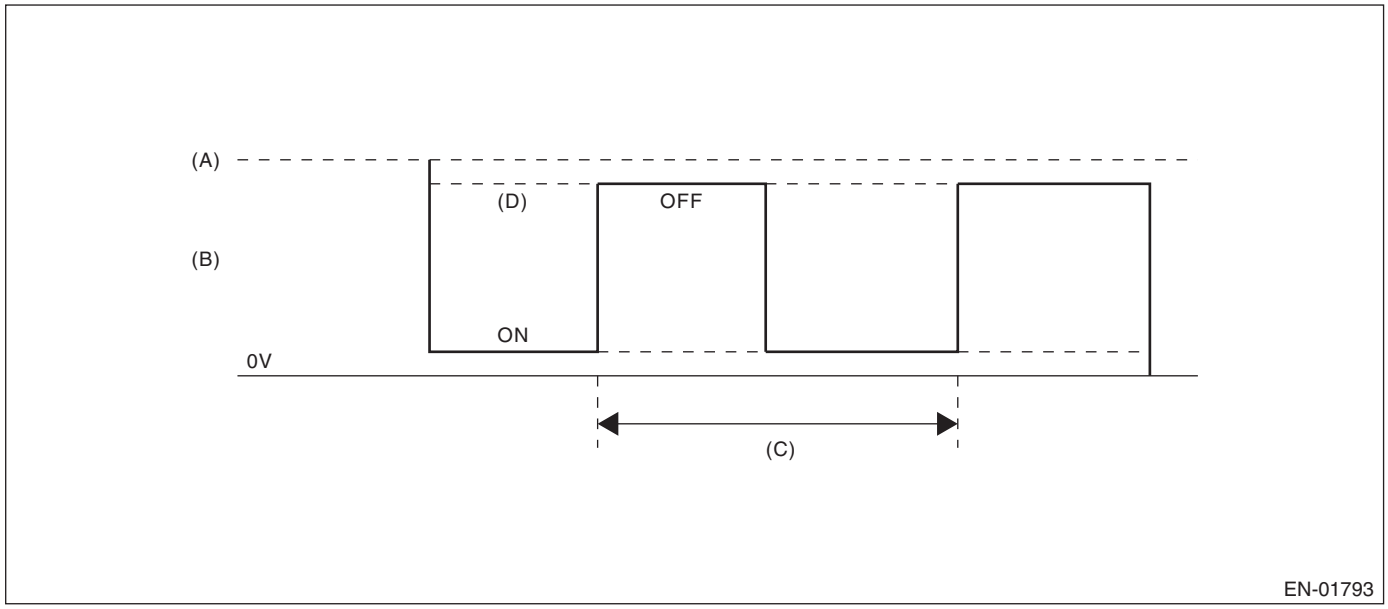
Time Needed for Diagnosis: Less than 1 second

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 as NG when the terminal voltage remains High.

2. COMPONENT DESCRIPTION



(A) Battery voltage
(B) Output voltage of the rear oxygen sensor heater
(C) 256 milliseconds (cycles)
(D) High error

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Elapsed time after starting the engine	≥ 1 second
Engine speed	< 8000 rpm

4. GENERAL DRIVING CYCLE

After starting the engine, perform the diagnosis continuously when engine speed is low.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	High
Rear oxygen sensor heater control duty	≥ 25 %

Time Needed for Diagnosis: 8 ms × 1250 time(s)
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	Low

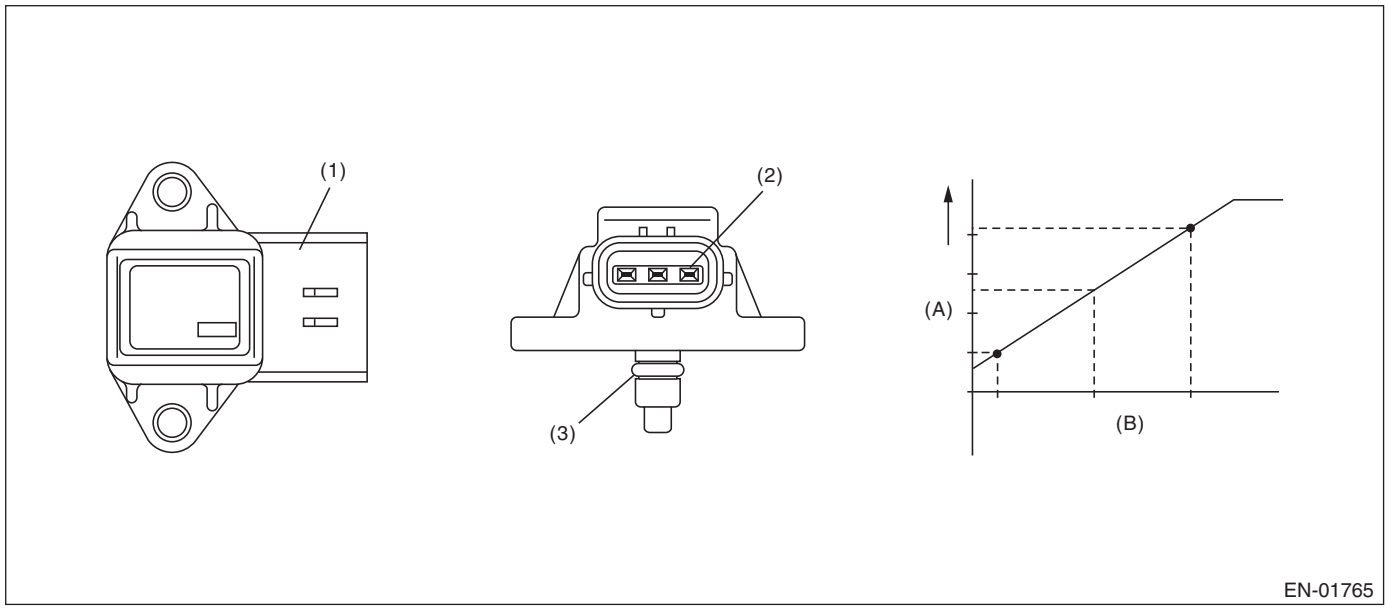
Time Needed for Diagnosis: Less than 1 second

J: DTC P0068 MAP/MAF - THROTTLE POSITION CORRELATION

1. OUTLINE OF DIAGNOSIS

Detect problems in the intake manifold pressure sensor output properties.
Judge as 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



(A) Output voltage
(B) Absolute pressure
(1) Connector
(2) Terminals
(3) O-ring

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	≥ 70 °C (158 °F)

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after idling.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when Low side or High side becomes NG.
If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Low	
Engine speed	< 2500 rpm
Throttle position	≥ 10 °
Output voltage	< 1 V
Engine load	> 1.356 g/rev (0.05 oz/rev)
High	
Engine speed	600 rpm — 900 rpm
Throttle position	< 2.75 °
Output voltage	≥ 2.36 V
Engine load	< 0.4 g/rev (0.01 oz/rev)

Time Needed for Diagnosis:
Low side: 3000 ms
High side: 3000 ms
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.
If the duration of time while the following conditions are met is longer than the time indicated, judge as OK.

Judgment Value

Malfunction Criteria	Threshold Value
Low	
Engine speed	< 2500 rpm
Throttle position	≥ 10 °
Output voltage	≥ 1 V
Engine load	> 1.356 g/rev (0.05 oz/rev)
High	
Engine speed	600 rpm — 900 rpm
Throttle position	< 2.75 °
Output voltage	< 2.36 V
Engine load	< 0.4 g/rev (0.01 oz/rev)

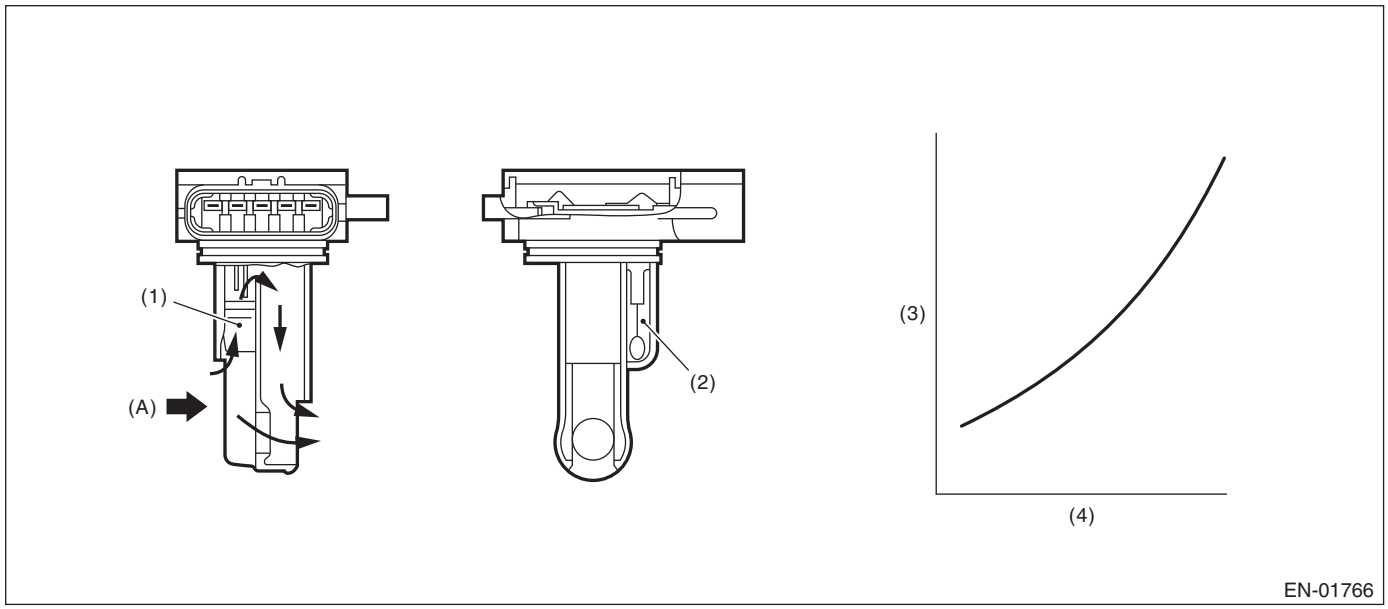
Time Needed for Diagnosis:
Low side: Less than 1 second
High side: Less than 1 second

K: DTC P0101 MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of air flow sensor output properties.
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



(A) Air

(1) Air flow sensor
(2) Intake air temperature sensor
(3) Voltage (V)
(4) Amount of intake air (kg (lb)/s)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	≥ 70 °C (158 °F)

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after idling.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when Low side or High side becomes NG.
If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Low	
Output voltage	< 1.5 V
Engine speed	≥ 2500 rpm
Throttle opening angle	≥ 15 °
Intake manifold pressure	≥ 53.3 kPa (400 mmHg, 15.7 inHg)
High (1)	
Output voltage	≥ 1.95 V
Engine speed	600 rpm — 900 rpm
Throttle opening angle	< 4.1 °
Intake manifold pressure	< 52.7 kPa (395 mmHg, 15.6 inHg)
High (2)	
Output voltage	≥ 1.70 V
Engine speed	600 rpm — 900 rpm
Throttle opening angle	< 4.1 °
Intake manifold pressure	< 52.7 kPa (395 mmHg, 15.6 inHg)
Fuel system diagnosis	Rich side malfunction

Time Needed for Diagnosis:
Low: 3000 ms
High: 10000 ms
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 and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Low	
Output voltage	≥ 1.5 V
Engine speed	≥ 2500 rpm
Throttle opening angle	≥ 15 °
Intake manifold pressure	≥ 53.3 kPa (400 mmHg, 15.7 inHg)
High	
Output voltage	< 1.95 V
Engine speed	600 rpm — 900 rpm
Throttle opening angle	< 4.1 °
Intake manifold pressure	< 52.7 kPa (395 mmHg, 15.6 inHg)
Fuel system diagnosis	Rich side normal

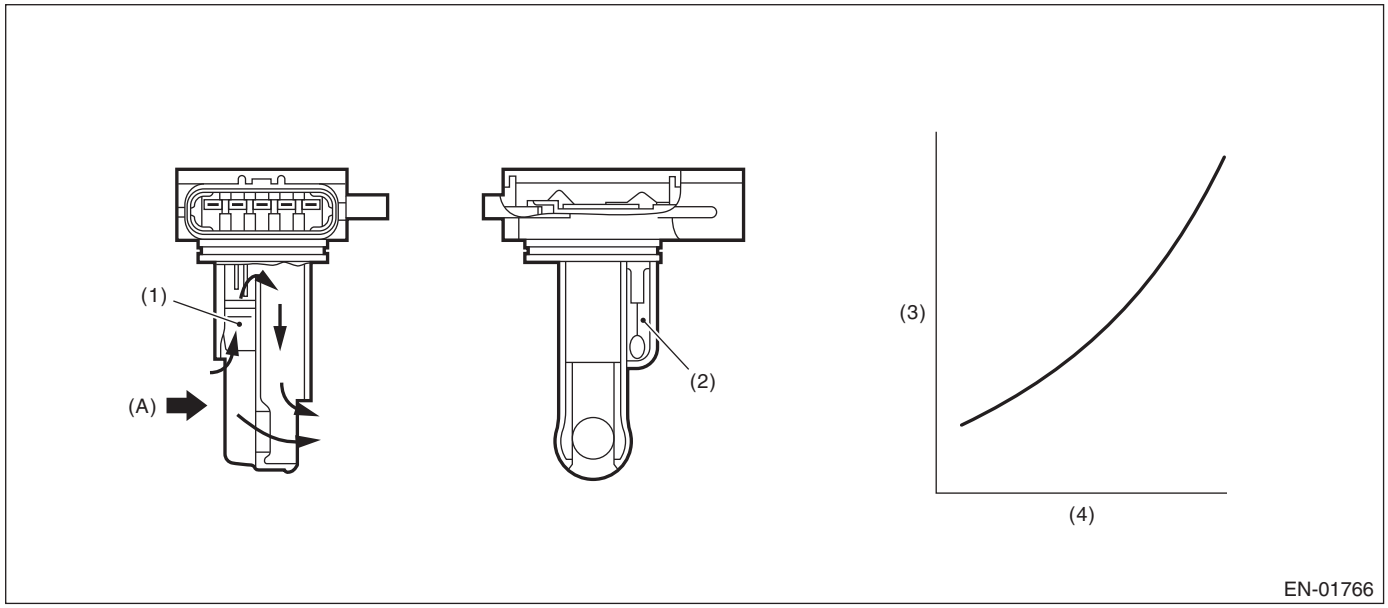
Time Needed for Diagnosis:
Low: Less than 1 second
High: Less than 1 second

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 out of specification.

2. COMPONENT DESCRIPTION



(A) Air

(1) Air flow sensor
(2) Intake air temperature sensor
(3) Voltage (V)
(4) Amount of intake air (kg (lb)/s)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≤ 0.22 V

Time Needed for Diagnosis: 500 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	> 0.22 V

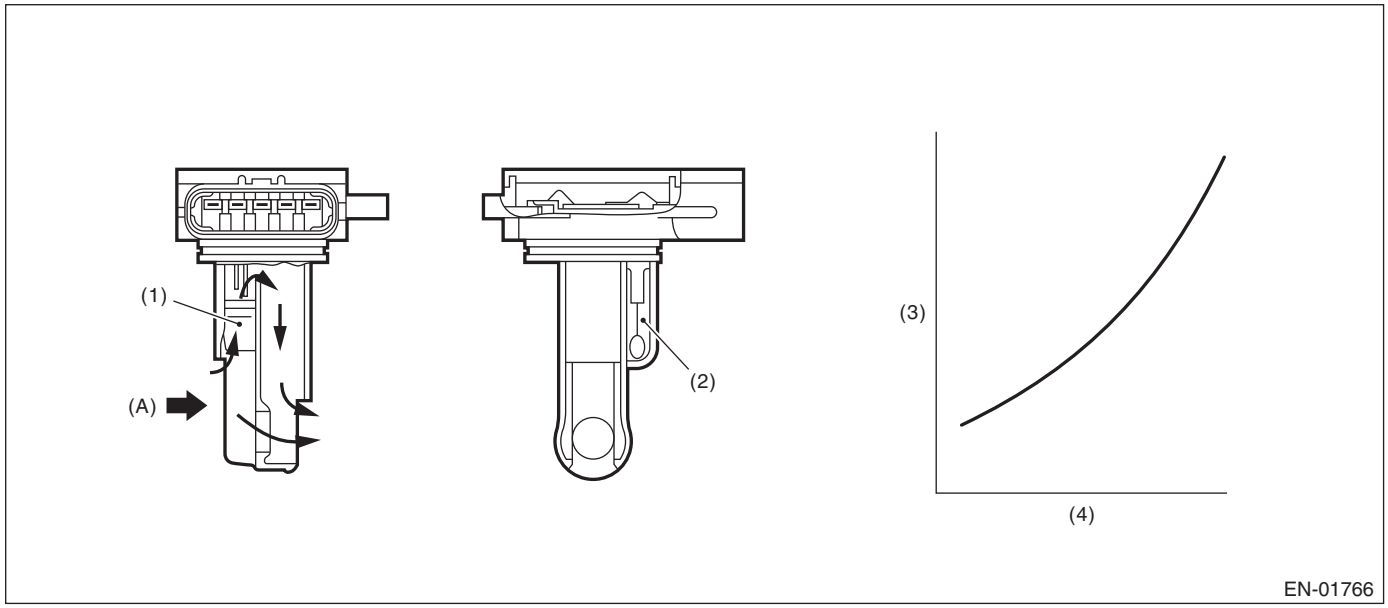
Time Needed for Diagnosis: Less than 1 second

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 out of specification.

2. COMPONENT DESCRIPTION



(A) Air

(1) Air flow sensor
(2) Intake air temperature sensor
(3) Voltage (V)
(4) Amount of intake air (kg (lb)/s)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.98 V

Time Needed for Diagnosis: 500 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 4.98 V

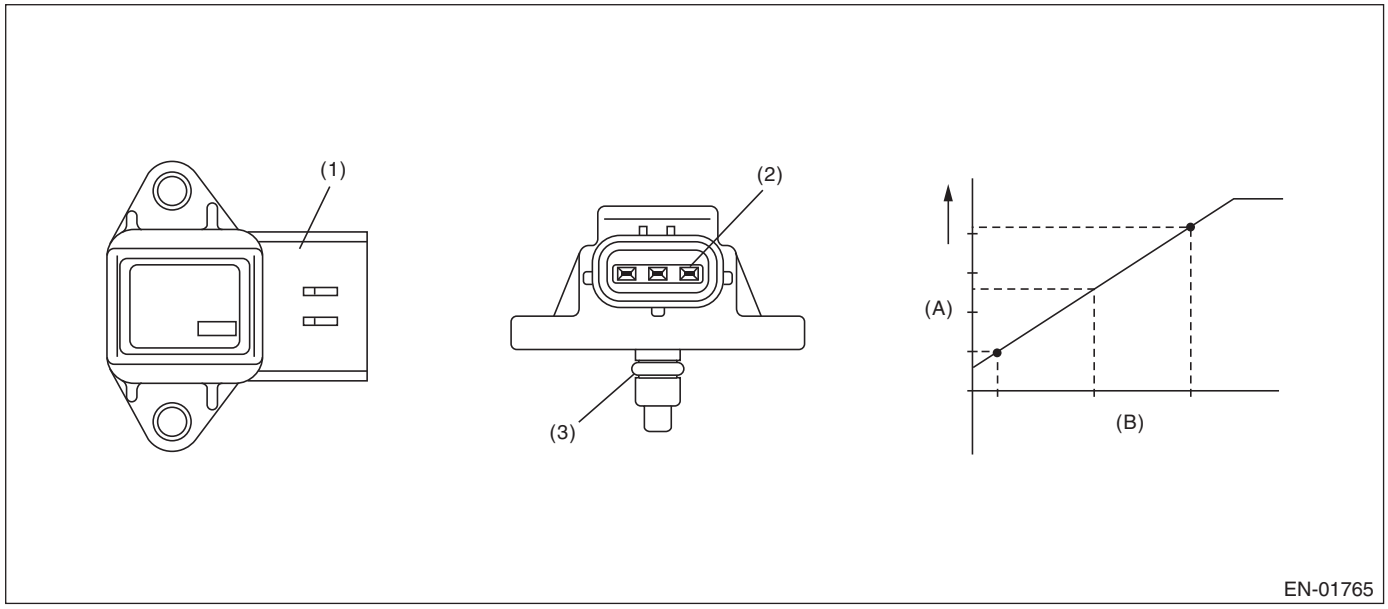
Time Needed for Diagnosis: Less than 1 second

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 out of specification.

2. COMPONENT DESCRIPTION



(A) Output voltage
(B) Absolute pressure
(1) Connector
(2) Terminals
(3) O-ring

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≤ 0.573 V

Time Needed for Diagnosis: 500 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	> 0.573 V

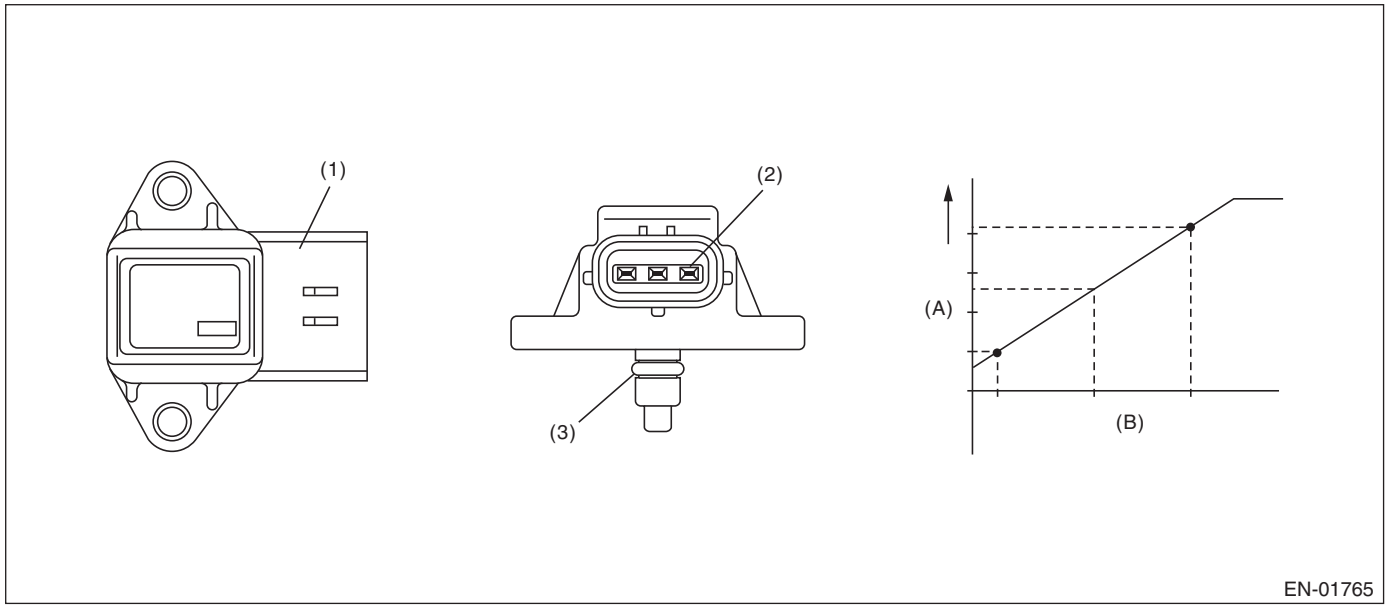
Time Needed for Diagnosis: Less than 1 second

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 out of specification.

2. COMPONENT DESCRIPTION



(A) Output voltage
(B) Absolute pressure
(1) Connector
(2) Terminals
(3) O-ring

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.597 V

Time Needed for Diagnosis: 500 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 4.597 V

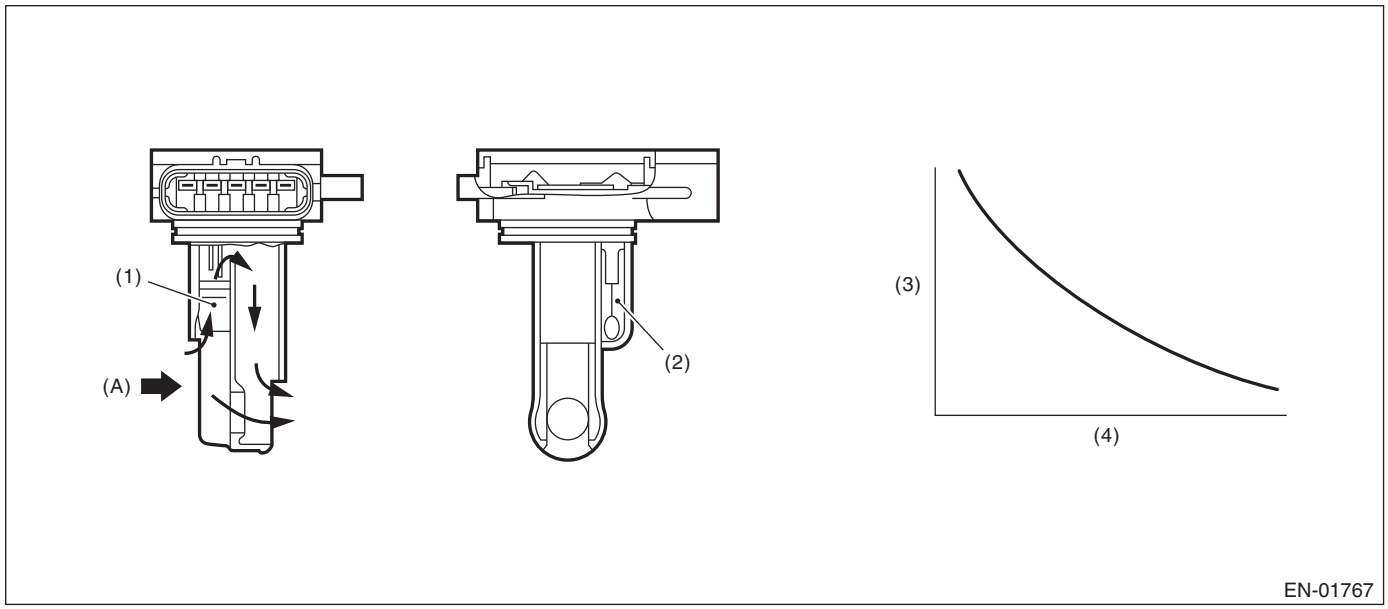
Time Needed for Diagnosis: Less than 1 second

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



(A) Air

(1) Air flow sensor
(2) Intake air temperature sensor
(3) Resistance value (Ω)
(4) Intake air temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature at engine starting	< 35 °C (95 °F)
Battery voltage	≥ 10.9 V
Continuous time when the vehicle speed is less than 140 km/h (87 MPH)	≥ 610 s
Engine coolant temperature	≥ 70 °C (158 °F)
Intake air amount sum value	≥ Value of Map 1
Number of experiences under conditions below	≥ 3 time(s)
• Continuous time when vehicle speed is less than 4 km/h (2.5 MPH)	≥ Value from Map 2
• Continuous time when vehicle speed is 40 km/h (24.9 MPH) or more and	≥ 15 s
Establishing time of 1, 2	≥ 15 s
1. Intake air amount	≥ 15 g/s (0.53 oz/s)
2. Vehicle speed	≥ 4 km/h (2.5 MPH)

Map 1

Engine coolant temperature °C (°F)	–20 (–4)	–10 (14)	0 (32)	10 (50)	20 (68)
Intake air amount sum value g (oz)	76000 (2680.52)	10192 (359.47)	9028 (318.42)	7864 (277.36)	6700 (236.31)

Map 2

Engine coolant temperature °C (°F)	–20 (–4)	–10 (14)	5 (41)	20 (68)
Continuous time (s) when vehicle speed is less than 4 km/h (2.5 MPH)	250	40	32	24

4. GENERAL DRIVING CYCLE

Perform the diagnosis when the vehicle speed condition is met after warming up from a cold condition.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage difference between Max. and Min.	< 0.02 V(Equivalent to approximately 0.5°C (0.9°F) near 25°C)

Time Needed for Diagnosis: Less than 1 second
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage difference between Max. and Min.	≥ 0.02 V

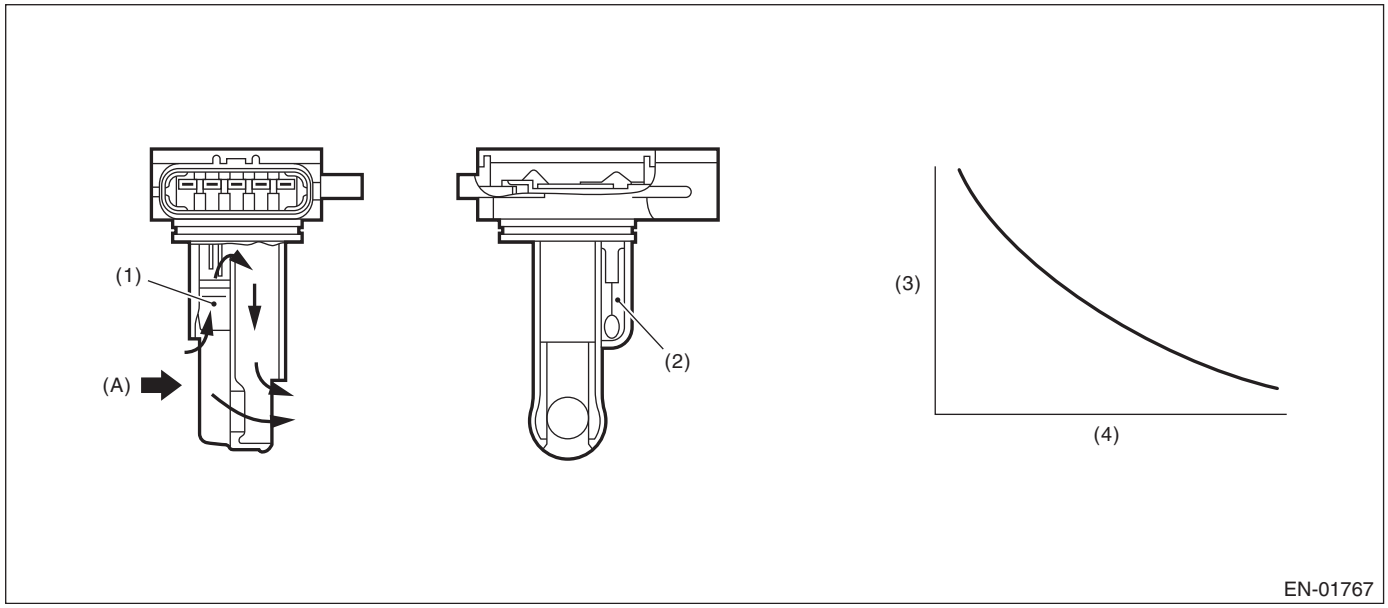
Time Needed for Diagnosis: Less than 1 second

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 out of specification.

2. COMPONENT DESCRIPTION



(A) Air

(1) Air flow sensor
(2) Intake air temperature sensor
(3) Resistance value (Ω)
(4) Intake air 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**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.231 V

Time Needed for Diagnosis: 500 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 0.231 V

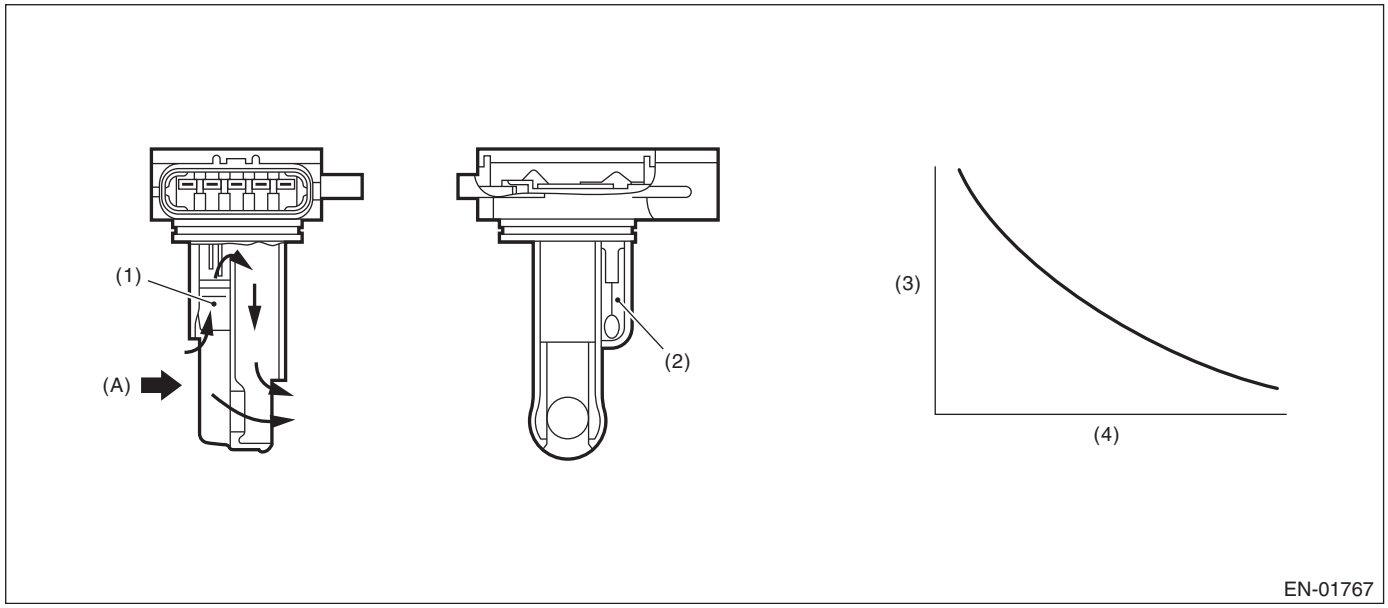
Time Needed for Diagnosis: Less than 1 second

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 out of specification.

2. COMPONENT DESCRIPTION



(A) Air

(1) Air flow sensor
(2) Intake air temperature sensor
(3) Resistance value (Ω)
(4) Intake air 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**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.716 V

Time Needed for Diagnosis: 500 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 4.716 V

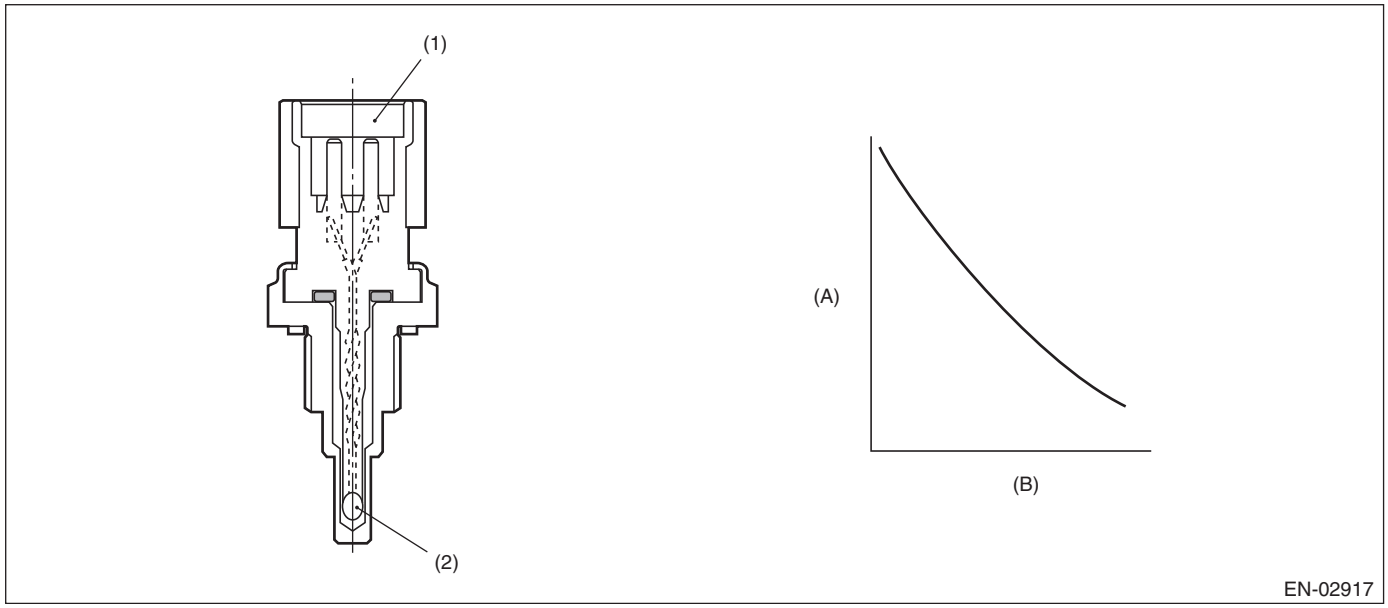
Time Needed for Diagnosis: Less than 1 second

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 out of specification.

2. COMPONENT DESCRIPTION



(A) Resistance value (kΩ)
(B) Temperature °C (°F)
(1) Connector
(2) Thermistor element

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.275 V

Time Needed for Diagnosis: 500 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 0.275 V

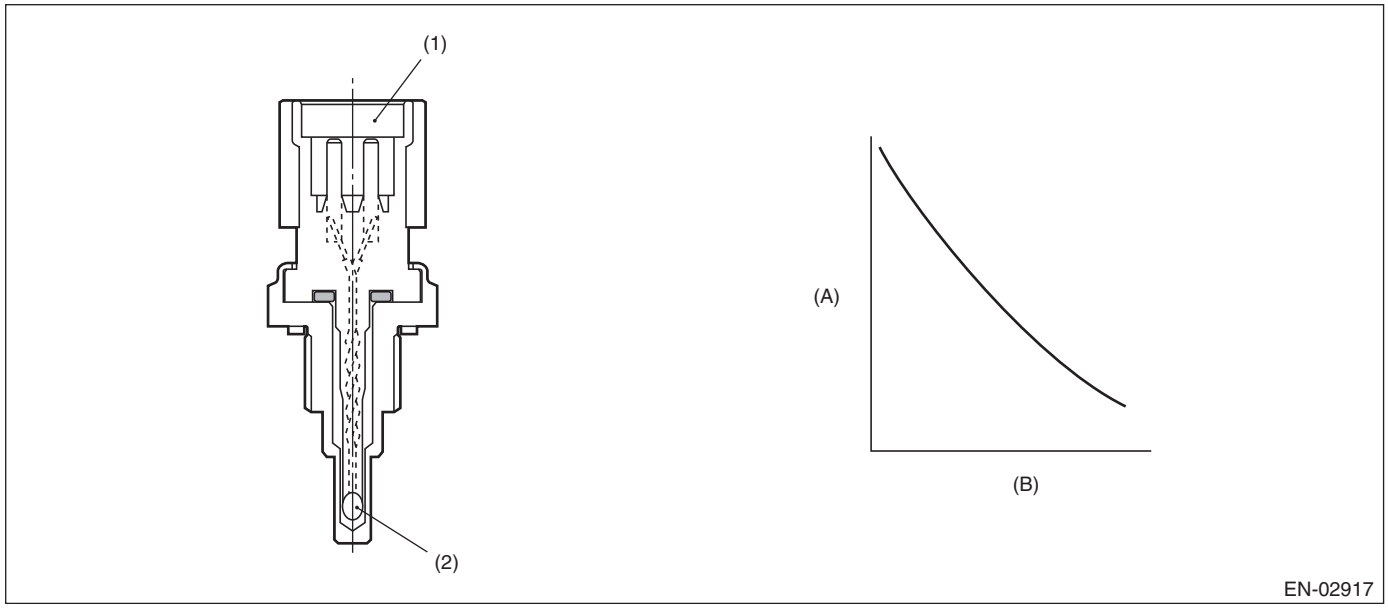
Time Needed for Diagnosis: Less than 1 second

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 out of specification.

2. COMPONENT DESCRIPTION



(A) Resistance value (kΩ)
(B) Temperature °C (°F)
(1) Connector
(2) Thermistor element

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.716 V

Time Needed for Diagnosis: 500 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 4.716 V

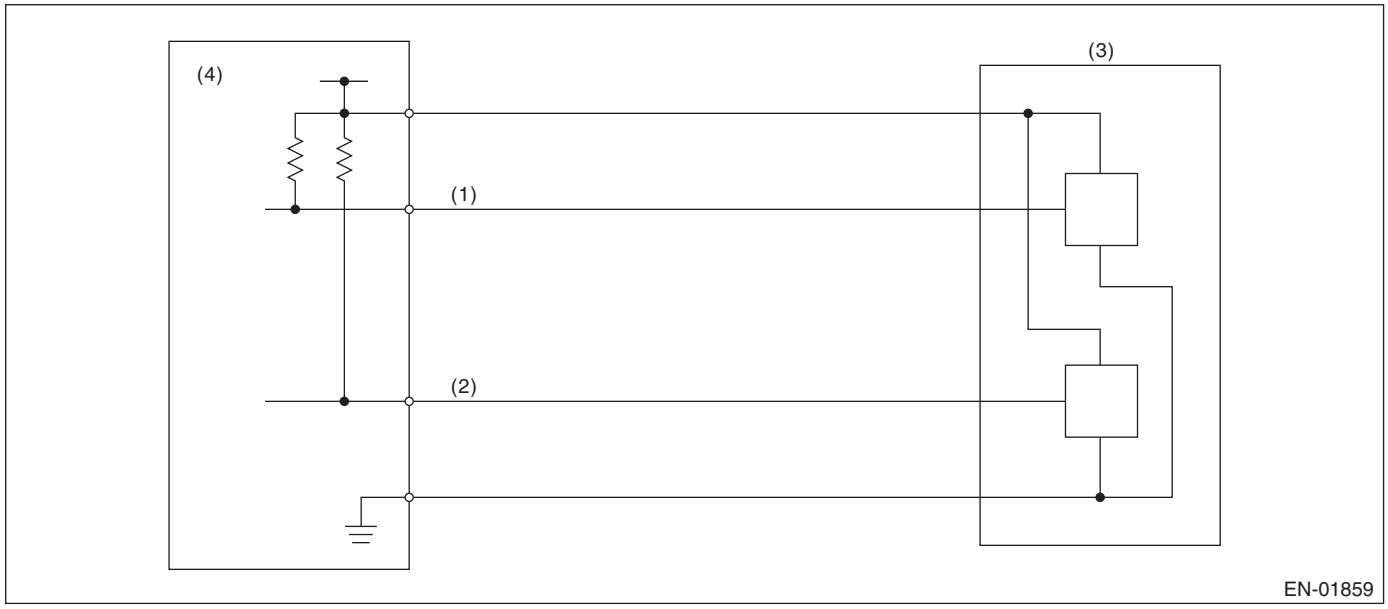
Time Needed for Diagnosis: Less than 1 second

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 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
Battery voltage	≥ 6 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	≤ 0.217 V

Time Needed for Diagnosis: 24 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	> 0.217 V

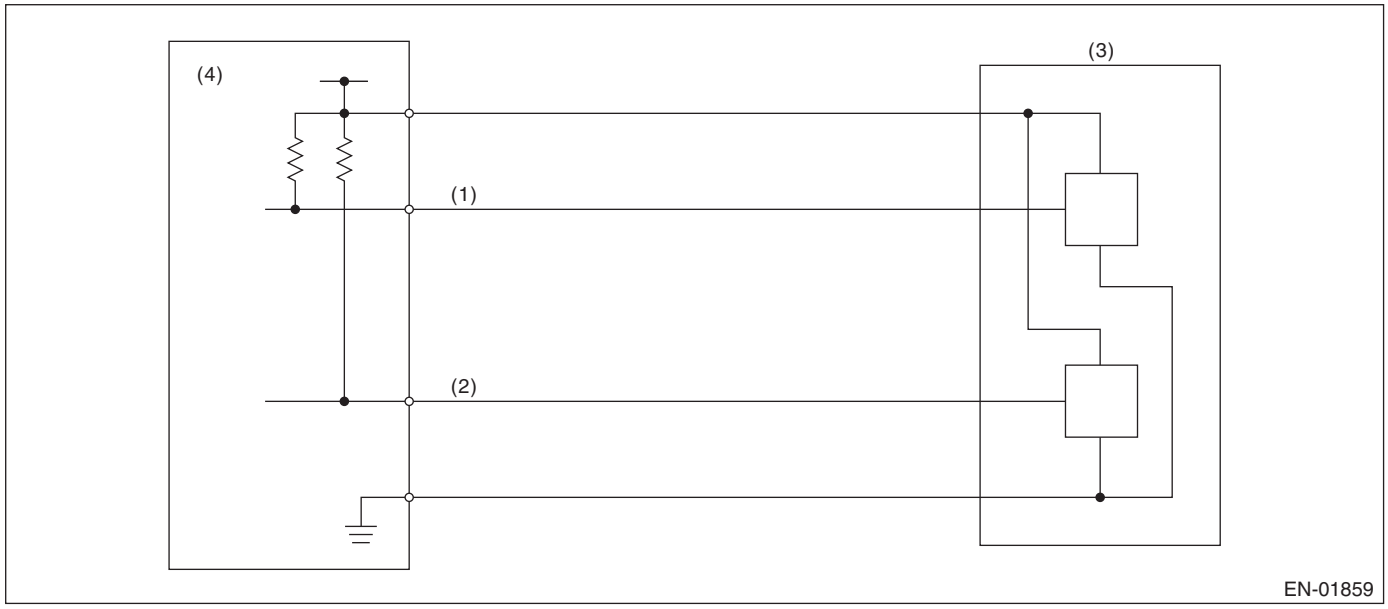
Time Needed for Diagnosis: 24 ms

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 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
Battery voltage	≥ 6 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	≥ 4.858 V

Time Needed for Diagnosis: 24 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	< 4.858 V

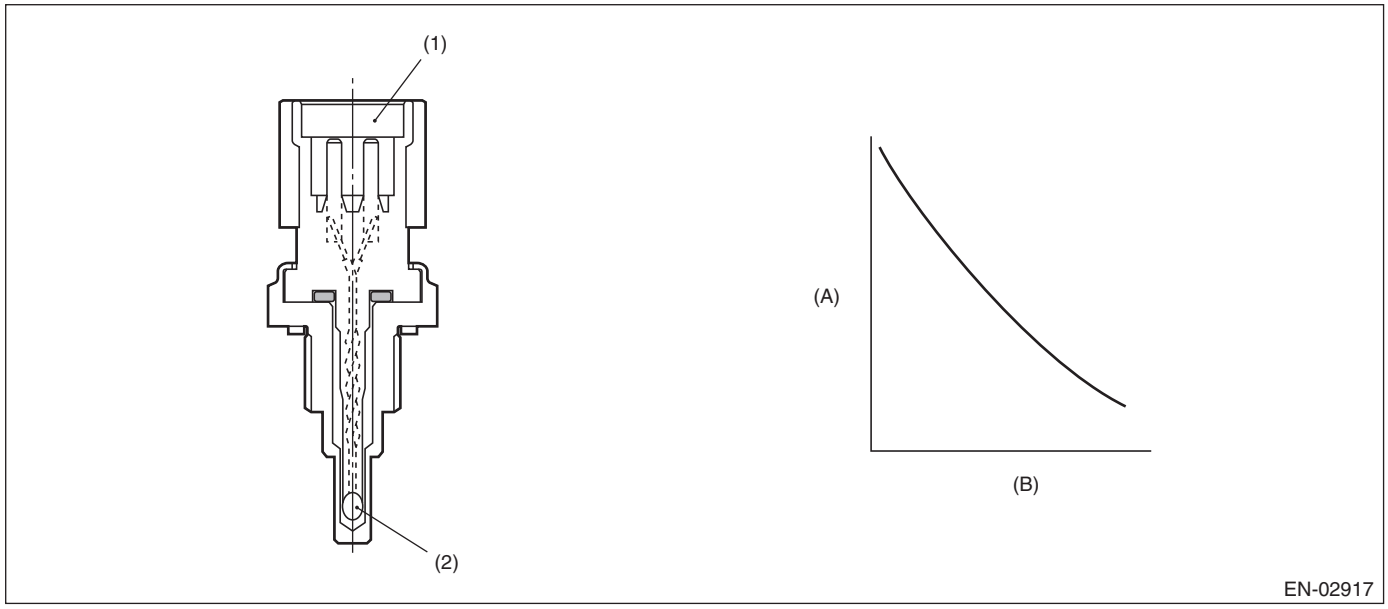
Time Needed for Diagnosis: 24 ms

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



(A) Resistance value (kΩ)
(B) Temperature °C (°F)
(1) Connector
(2) Thermistor element

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	≥ Value from Map
Battery voltage	≥ 10.9 V

Map

Engine coolant temperature °C (°F)	–40 (–40)	–30 (–22)	–20 (–4)	–10 (14)	0 (32)	10 (50)	20 (68)	30 (86)
Engine speed rpm	500	500	500	500	500	500	500	500

Engine coolant temperature °C (°F)	40 (104)	50 (122)	60 (140)	70 (158)	80 (176)	90 (194)	100 (212)	110 (230)
Engine speed rpm	500	500	500	500	500	500	500	500

4. GENERAL DRIVING CYCLE

Perform the diagnosis only once after engine start.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG if the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature	< 20 °C (68 °F)
Timer for diagnosis after engine start	≥ Judgment value of timer after engine start

Timer for diagnosis after engine start
a. Timer stop at fuel cut
b. During the driving conditions except a) above, timer counts up as follows.
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.

		Vehicle speed km/h (MPH)							
		0 (0)	8 (5)	16 (9.9)	24 (14.9)	32 (19.9)	40 (24.9)	48 (29.8)	56 (34.8)
Temperature °C (°F)	–20 (–4)	0 ms	37.136 ms	74.272 ms	111.41 ms	126.66 ms	141.91 ms	163.59 ms	185.26 ms
	–10 (14)	0 ms	27.391 ms	54.782 ms	82.173 ms	99.65 ms	117.13 ms	135.96 ms	154.8 ms
	0 (32)	0 ms	17.646 ms	35.292 ms	52.938 ms	72.64 ms	92.341 ms	108.34 ms	124.33 ms
	10 (50)	0 ms	7.9012 ms	15.802 ms	23.704 ms	45.63 ms	67.556 ms	80.711 ms	93.867 ms
	20 (68)	0 ms	7.9012 ms	15.802 ms	23.704 ms	45.63 ms	67.556 ms	80.711 ms	93.867 ms

Judgment value of timer after engine starting
t = 451056 ms – 25870 ms × Ti
Ti : The lowest coolant temperature after engine start
Time Needed for Diagnosis: Less than 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
Engine coolant temperature	≥ 20 °C (68 °F)

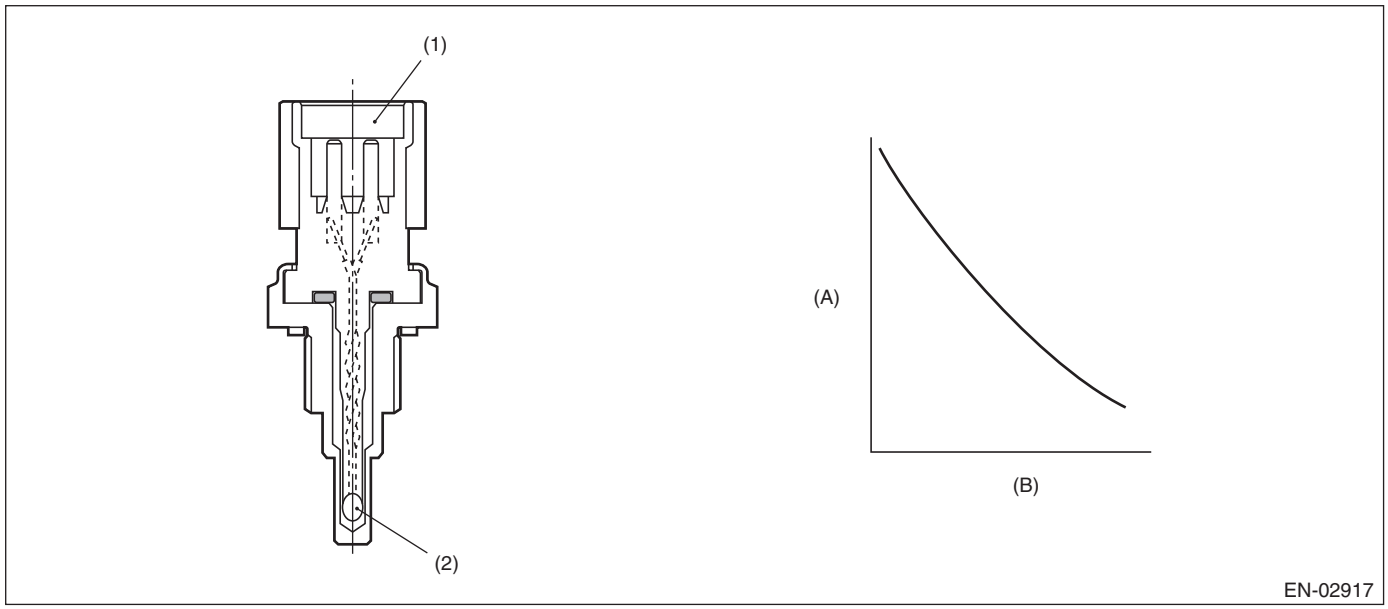
Time Needed for Diagnosis: Less than 1 second

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



(A) Resistance value (kΩ)
(B) Temperature °C (°F)
(1) Connector
(2) Thermistor element

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	≥ 56.5 °C (133.7 °F)

4. GENERAL DRIVING CYCLE

Perform the diagnosis only once after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

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)

Time Needed for Diagnosis: 2500 ms
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

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)

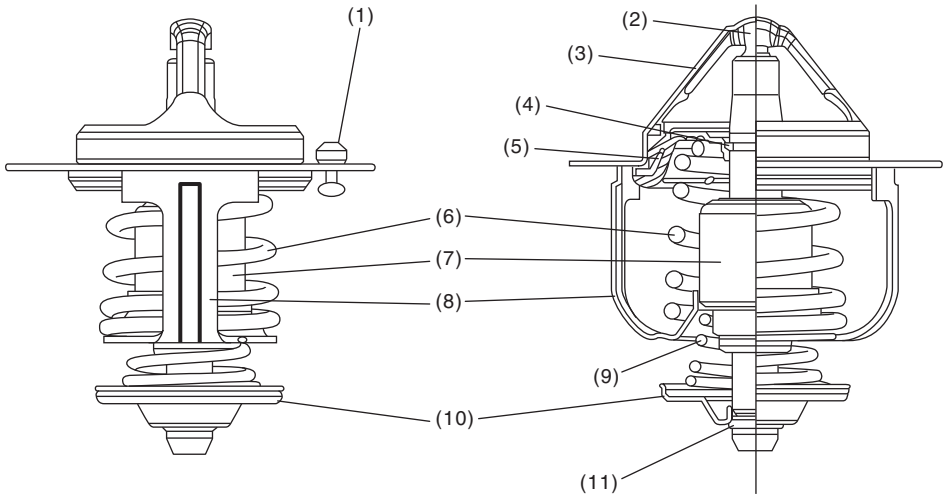
Time Needed for Diagnosis: Less than 1 second

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 any one of the following conditions is established.
• Actual engine coolant temperature does not reach the highest temperature which is necessary to perform other OBDII diagnoses. (Judgment 1)
• Actual engine coolant temperature is not within the range of the regulated temperature to –11°C (–19.8°F). (Judgment 2)
• Difference between the estimated engine coolant temperature and actual engine coolant temperature exceeds the specified value. (Judgment 3)

2. COMPONENT DESCRIPTION



EN-08985

(1) Jiggle valve
(2) Piston
(3) Flange
(4) Stop ring
(5) Dust seal
(6) Main spring
(7) Wax element
(8) Frame
(9) Bypass spring
(10) Bypass valve
(11) Stop ring

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
<Judgment 1 and judgment 2>	
Battery voltage	≥ 10.9 V
Estimate ambient temperature	≥ –7 °C (19.4 °F)
Vehicle speed	≥ 30 km/h (18.6 MPH)
Estimated engine coolant temperature > Regulated coolant temperature – 0 °C (0°F) has been experienced, Estimated engine coolant temperature > Regulated coolant temperature – (0 °C (0°F) + 4 °C (7.2°F))	Completed
Intake air amount sum value	≥ Value of Map 1
<Judgment 3>	
Battery voltage	≥ 10.9 V
Estimate ambient temperature	≥ –7 °C (19.4 °F)
Vehicle speed	≥ 30 km/h (18.6 MPH)
Estimated coolant temperature	≥ Value from Map 2

Map 1

Engine coolant temperature at engine starting °C (°F)	–7 (19.4)	0 (32)	10 (50)	25 (77)
Intake air amount sum value g (oz)	10000 (352.7)	9600 (338.59)	9200 (324.48)	8800 (310.38)

Map 2

Estimate ambient temperature °C (°F)	–7 (19.4)	25 (77)
Estimated coolant temperature °C (°F)	70 (158)	70 (158)

4. GENERAL DRIVING CYCLE

Perform the diagnosis only once after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
When any one of the followings is established.	
•Actual engine coolant temperature (Judgment 1)	< Value of Map 3
•Actual engine coolant temperature (Judgment 2)	<(Regulated temperature or alternative threshold value) – 11.1°C (20°F)
•Estimated engine coolant temperature – Actual engine coolant temperature (Judgment 3)	> Value of Map 4

Map 3

Estimate ambient temperature °C (°F)	–7 (19.4)	0 (32)	10 (50)	25 (77)
Actual engine coolant temperature °C (°F)	66.9 (152.4)	70 (158)	70 (158)	70 (158)

Map 4

Estimate ambient temperature °C (°F)	–7 (19.4)	25 (77)
Estimated engine coolant temperature – Actual engine coolant temperature °C (°F)	20 (36°F)	20 (36°F)

Time Needed for Diagnosis: 16 — 30 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
All following conditions are established.	
•Engine coolant temperature at engine starting	< 56.5 °C (133.7 °F)
•Actual engine coolant temperature	> Value of Map 3
•Actual engine coolant temperature	>(Regulated temperature or alternative threshold value) – 11.1°C (20°F)
•Estimated engine coolant temperature – Actual engine coolant temperature	< Value of Map 4

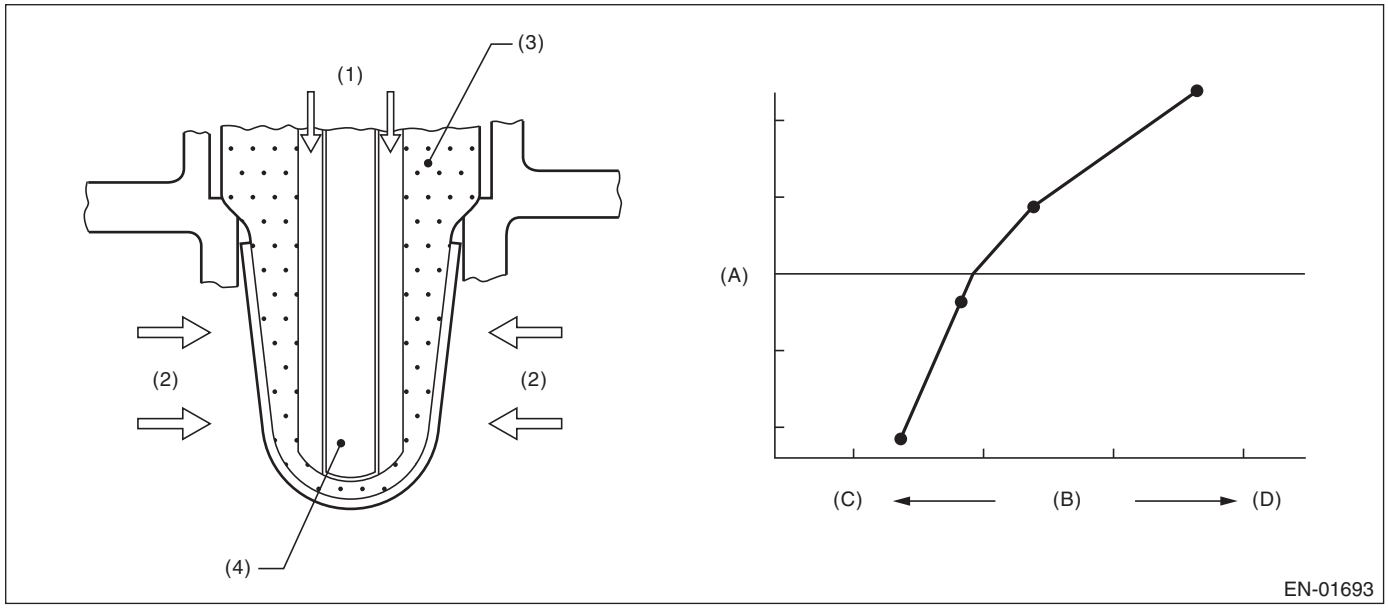
Time Needed for Diagnosis: Less than 1 second

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 voltage is out of the specified range.

2. COMPONENT DESCRIPTION



(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich

(1) Atmosphere
(2) Exhaust gas
(3) ZrO_2
(4) Ceramic heater

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Input voltage (+)	< 1.128 V
or	
Input voltage (–)	< 0.23 V
or	
|Input voltage (+) – Input voltage (–)|	< 0.644 V

Time Needed for Diagnosis:
Input voltage (+): 1000 ms
Input voltage (–): 1000 ms
|Input voltage (+) – Input voltage (–)|: 1000 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Input voltage (+)	≥ 1.128 V
Input voltage (–)	≥ 0.23 V
|Input voltage (+) – Input voltage (–)|	≥ 0.644 V

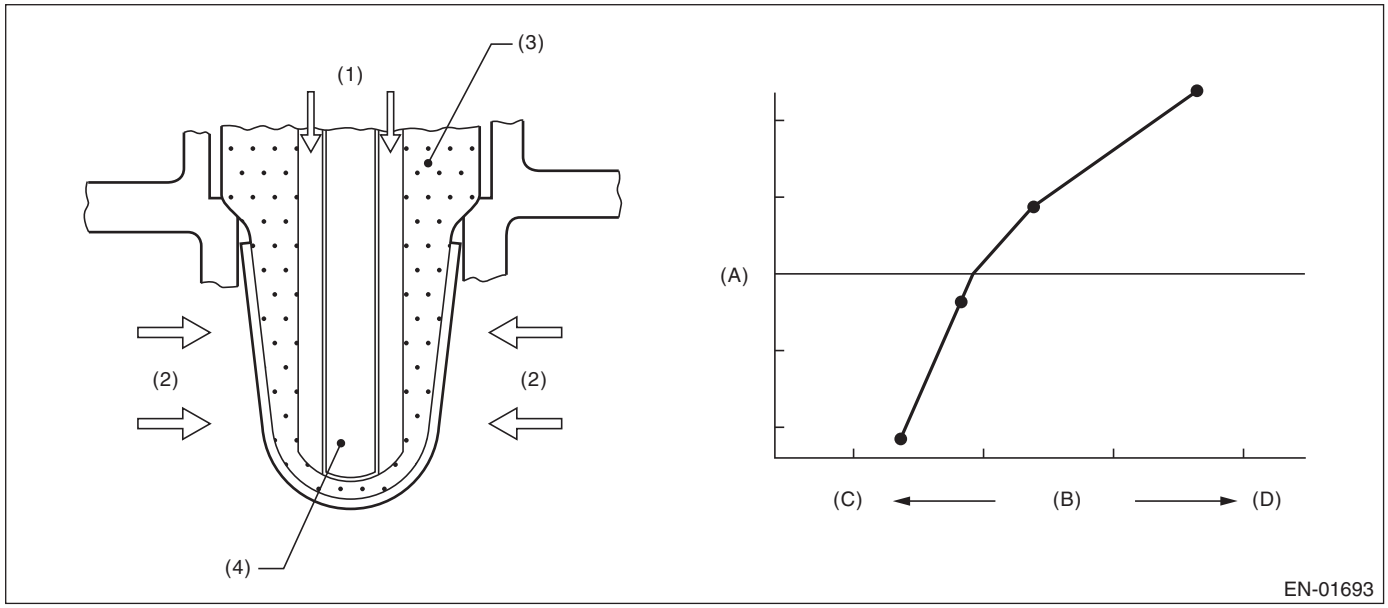
Time Needed for Diagnosis: Less than 1 second

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 voltage is out of the specified range.

2. COMPONENT DESCRIPTION



(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich

(1) Atmosphere
(2) Exhaust gas
(3) ZrO_2
(4) Ceramic heater

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Input voltage (+)	> 3.589 V
or	
Input voltage (–)	> 3.541 V

Time Needed for Diagnosis:
Input voltage (+): 1000 ms
Input voltage (–): 1000 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

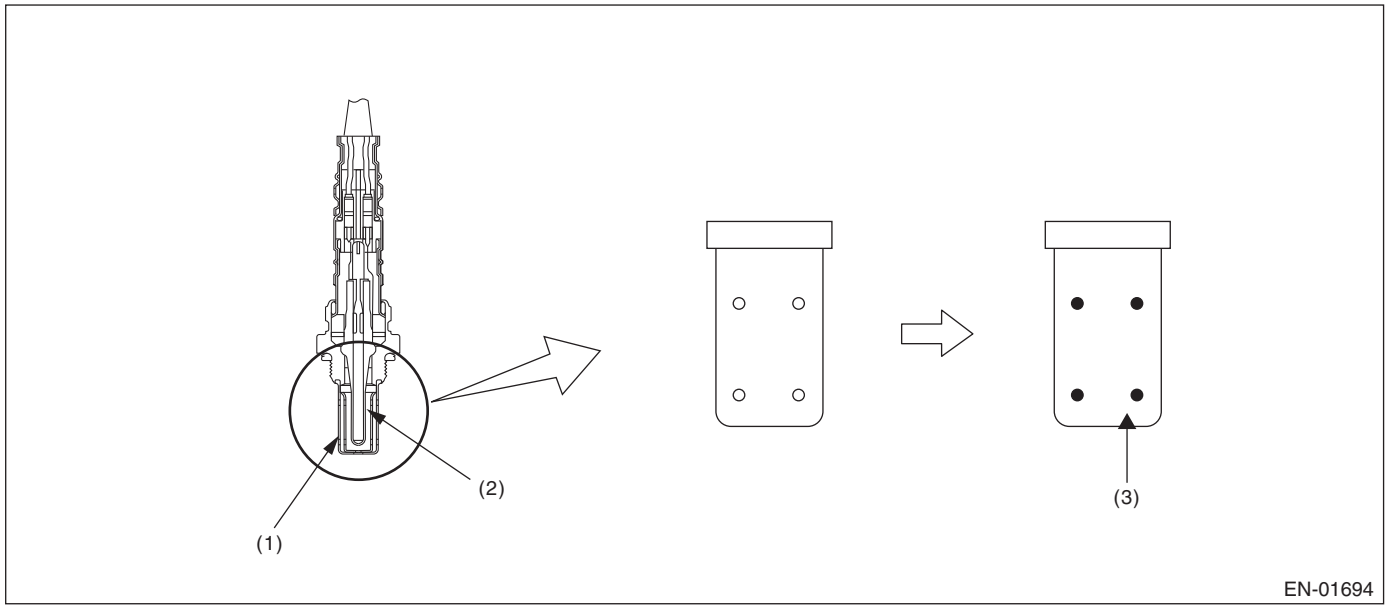
Malfunction Criteria	Threshold Value
Input voltage (+)	≤ 3.589 V
Input voltage (–)	≤ 3.541 V

Time Needed for Diagnosis: Less than 1 second

AB:DTC P0133 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1)

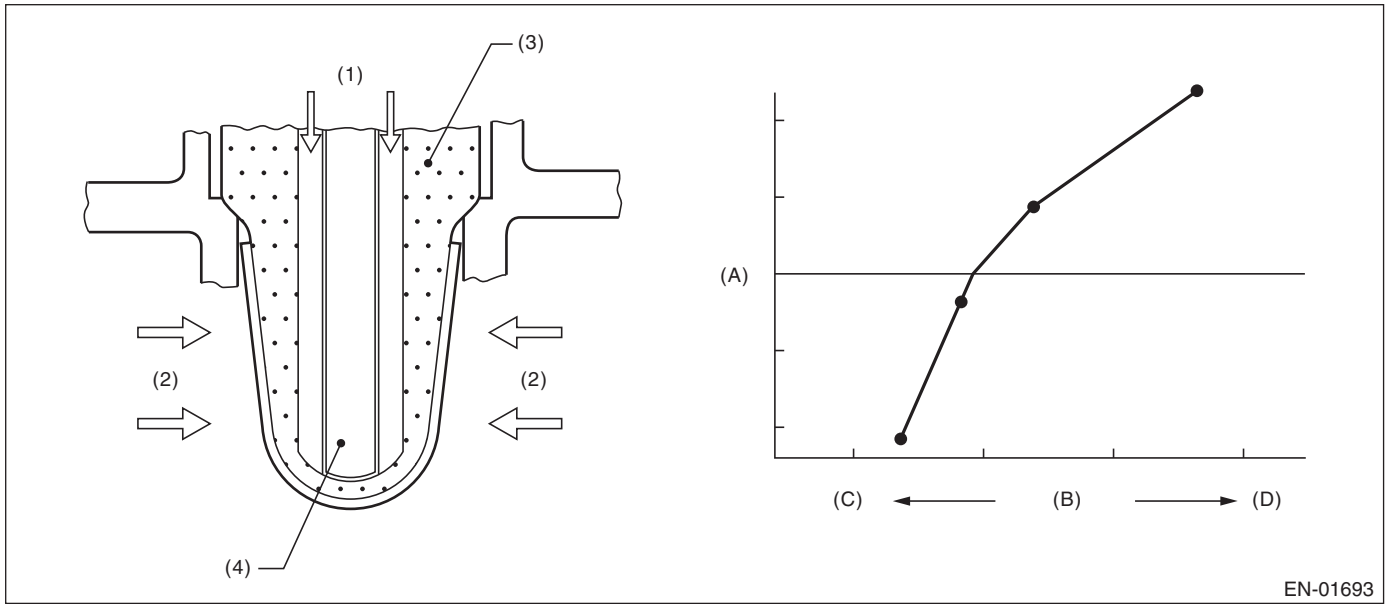
1. OUTLINE OF DIAGNOSIS

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 actual change from rich to lean occurs.
Judge as NG when the actual movement in comparison to the ECM control amount is slow.



(1) Cover (2) Zirconia (3) Clogging

2. COMPONENT DESCRIPTION



(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich

(1) Atmosphere
(2) Exhaust gas
(3) ZrO_2
(4) Ceramic heater

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Time needed for all secondary parameters to be in enable conditions	≥ 1024 ms
Battery voltage	≥ 10.9 V
Barometric pressure	> 75 kPa (563 mmHg, 22.2 inHg)
Closed loop control with main feedback	Operation
Front oxygen (A/F) sensor impedance	0 Ω — 50 Ω
Elapsed time after starting the engine	≥ 120000 ms
Engine coolant temperature	≥ 70 °C (158 °F)
Engine speed	1000 rpm — 3200 rpm
Vehicle speed	10 km/h — 120 km/h (6.2 MPH — 74.6 MPH)
Amount of intake air	10 g/s — 31 g/s (0.35 oz/s — 1.09 oz/s)
Engine load	< 0.02 g/rev (0 oz/rev)
Learning value of EVAP conc. during purge	< 0.2
Total time of operating canister purge	≥ 19.9 s

4. GENERAL DRIVING CYCLE

Perform diagnosis only once at a constant speed of 10 km/h — 120 km/h (6.2 MPH — 74.6 MPH) 120000 ms or more after starting the engine.

5. DIAGNOSTIC METHOD

Calculate faf difference every 32 ms × 4 , and the λ value difference. Calculate the diagnosis value after calculating 820 time(s).

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
parafca = td2faf/td2lmd where, td2faf (N) = td2faf (n–1) + |d2faf (n)| td2lmd (N) = td2lmd (n–1) + |d2lmd (n)| add up to 32 ms × 4 × 820 time(s). d2faf (n) = (faf (n) – faf (n–1)) – (faf (n–1) – faf (n–2)) d2lmd (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	> 0.22

Time Needed for Diagnosis: 32 ms × 4 × 820 time(s)
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
parafca = td2faf/td2lmd where, td2faf (N) = td2faf (n–1) + |d2faf (n)| td2lmd (N) = td2lmd (n–1) + |d2lmd (n)| add up to 32 ms × 4 × 820 time(s). d2faf (n) = (faf (n) – faf (n–1)) – (faf (n–1) – faf (n–2)) d2lmd (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	≤ 0.22

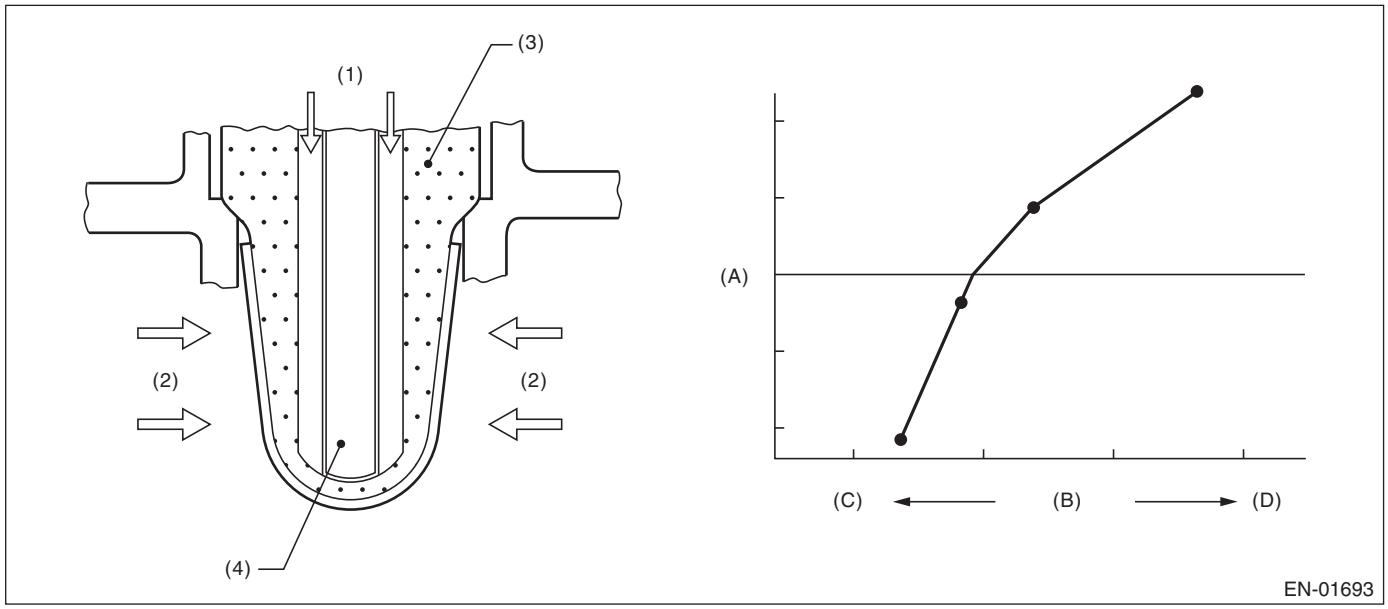
Time Needed for Diagnosis: 32 ms × 4 × 820 time(s)

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



(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich

(1) Atmosphere
(2) Exhaust gas
(3) ZrO_2
(4) Ceramic heater

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Time of heater control duty at 70 % or more	≥ 36000 ms
Front oxygen (A/F) sensor impedance.	> 500 Ω

Time Needed for Diagnosis: 5000 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Front oxygen (A/F) sensor impedance.	≤ 500 Ω

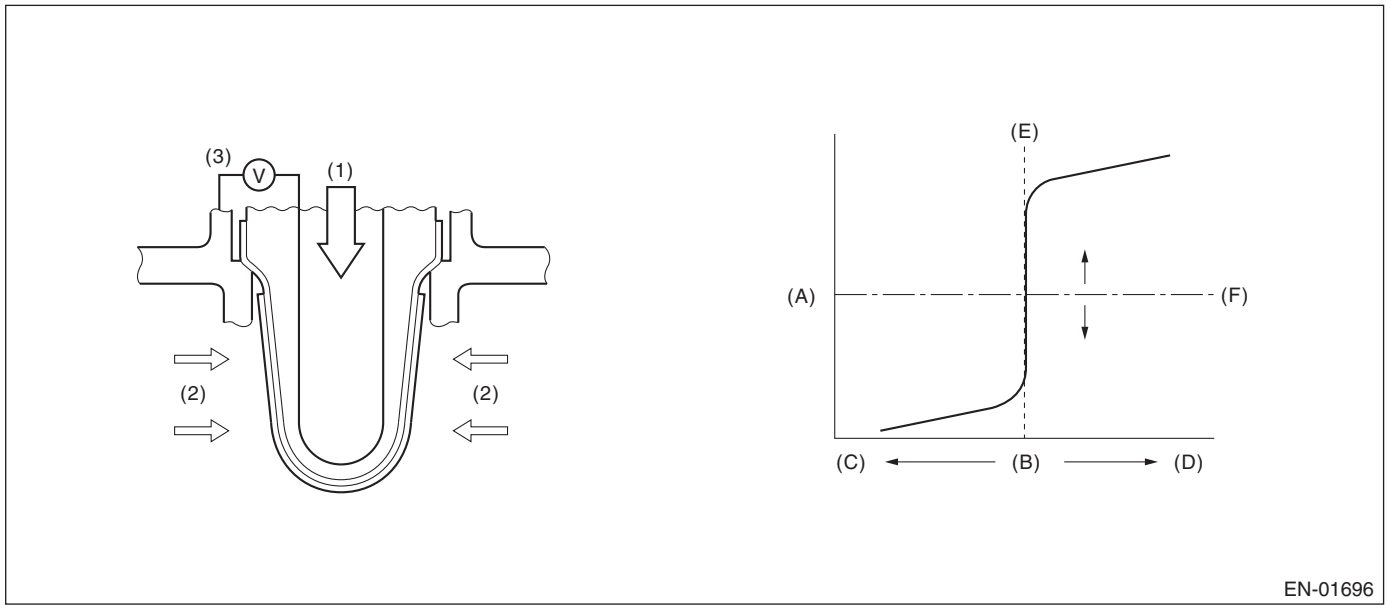
Time Needed for Diagnosis: Less than 1 second

AD:DTC P0137 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2)

1. OUTLINE OF DIAGNOSIS

Detect continuity NG of the oxygen sensor. If the oxygen sensor voltage reading is not within the probable range considering the operating conditions, judge as NG.

2. COMPONENT DESCRIPTION



(A)	Electromotive force	(B)	Air fuel ratio	(C)	Rich
(D)	Lean	(E)	Theoretical air fuel ratio	(F)	Comparative voltage
(1)	Atmosphere	(2)	Exhaust gas	(3)	Electromotive force

3. ENABLE CONDITION

Used for abnormality judgment

Secondary Parameters	Enable Conditions
High	
Secondary air system	Not in operation
Closed loop control at the oxygen sensor	In operation
Misfire detection every 200 rotations	< 5 time(s)
Front oxygen (A/F) sensor compensation coefficient	Not in limit value
Battery voltage	≥ 10.9 V
Engine coolant temperature	≥ 70 °C (158 °F)
Low (1)	
Secondary air system	Not in operation
Closed loop control at the oxygen sensor	In operation
Misfire detection every 200 rotations	< 5 time(s)
Front oxygen (A/F) sensor compensation coefficient	Not in limit value
Battery voltage	≥ 10.9 V
Engine coolant temperature	≥ 70 °C (158 °F)
Amount of intake air	≥ 10 g/s (0.35 oz/s)
Low (2)	
Secondary air system	Not in operation
Closed loop control at the oxygen sensor	In operation
Misfire detection every 200 rotations	< 5 time(s)
Front oxygen (A/F) sensor compensation coefficient	Not in limit value
Battery voltage	≥ 10.9 V
Engine coolant temperature	≥ 70 °C (158 °F)
Amount of intake air	< 10 g/s (0.35 oz/s)
Current continuation time of the rear oxygen sensor heater	≥ 25000 ms
Low (3)	
Secondary air system	Not in operation
Closed loop control at the oxygen sensor	In operation
Misfire detection every 200 rotations	< 5 time(s)
Front oxygen (A/F) sensor compensation coefficient	Not in limit value
Battery voltage	≥ 10.9 V
Engine coolant temperature	≥ 70 °C (158 °F)
Amount of intake air	< 10 g/s (0.35 oz/s)
Current continuation time of the rear oxygen sensor heater	≥ 25000 ms
Fuel cut	Experienced

Used for normality judgment

Secondary Parameters	Enable Conditions
Secondary air system	Not in operation
Closed loop control at the oxygen sensor	In operation
Misfire detection every 200 rotations	< 5 time(s)
Front oxygen (A/F) sensor compensation coefficient	Not in limit value
Battery voltage	≥ 10.9 V
Engine coolant temperature	≥ 70 °C (158 °F)

4. GENERAL DRIVING CYCLE

After starting the engine, continuously perform the diagnosis with the same engine condition.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
High Sensor output voltage	> 1.2 V	P0138
Low Sensor output voltage	< 0.03 V	P0137

Time Needed for Diagnosis

High: 2500 ms
Low (1): 20000 ms
Low (2): 150000 ms
Low (3): Value from Map

Map

Fuel Cut Time (second)	0	2000	10000
Time Needed for Diagnosis (second)	150000	150000	150000

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
High Sensor output voltage	≤ 1.2 V	P0138
Low Sensor output voltage	≥ 0.03 V	P0137

Time Needed for Diagnosis

High: Less than 1 second
Low (1): Less than 1 second
Low (2): Less than 1 second
Low (3): Less than 1 second

AE:DTC P0138 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2)

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0137. <Ref. to GD(H4DOTC)-68, DTC P0137 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

AF:DTC P0139 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2)

1. OUTLINE OF DIAGNOSIS

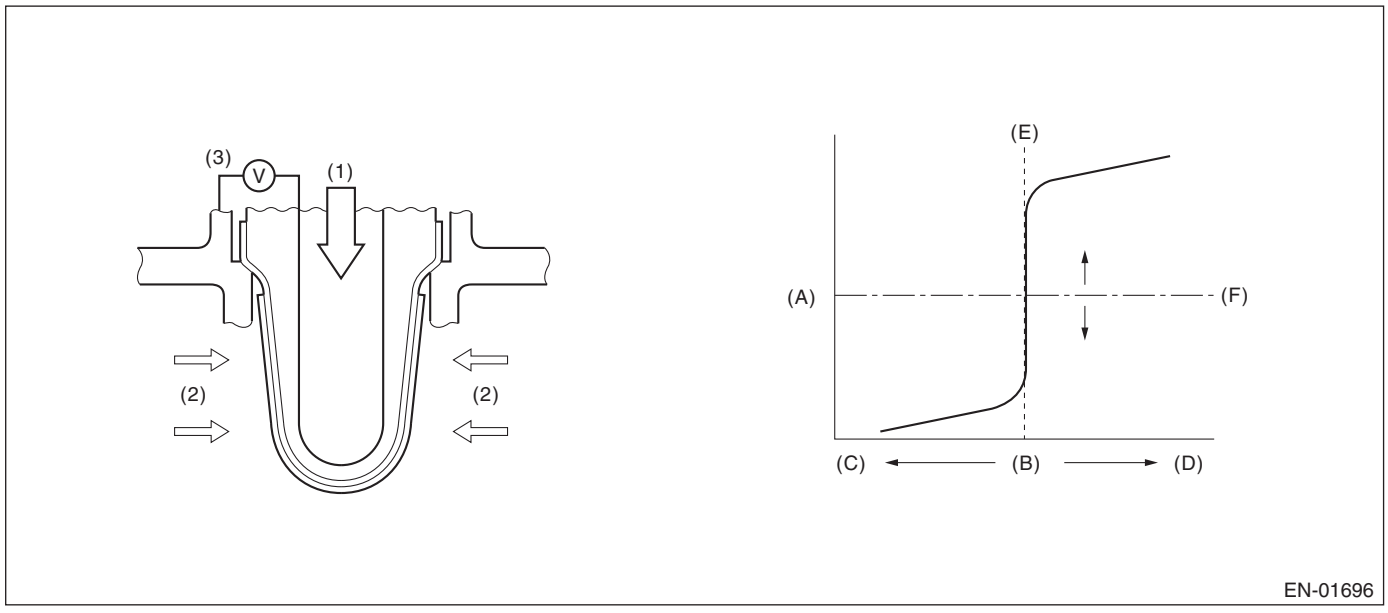
Detect the slow response of the oxygen sensor.
Judge as NG if either the rich to lean response diagnosis or lean to rich response diagnosis is NG, and judge as OK if both are OK.
[Rich → lean diagnosis response]
1. Measure the response time for oxygen sensor output changes when the A/F ratio changes 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. Response time calculation is categorized in two by voltage difference.
   - Response time in small voltage difference: Intermediate
   - Response time in large voltage difference: Wide
2. Judge as NG when the oxygen sensor voltage is large (rich) even after deceleration fuel cut has occurred.

[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



(A)	Electromotive force	(B)	Air fuel ratio	(C)	Rich
(D)	Lean	(E)	Theoretical air fuel ratio	(F)	Comparative voltage
(1)	Atmosphere	(2)	Exhaust gas	(3)	Electromotive force

3. ENABLE CONDITION

Rich → lean diagnosis response

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
A/F main feedback control condition	Completed
Deceleration fuel cut time of 5000 ms or more (intermediate) Deceleration fuel cut time of 5000 ms or more (wide)	Experienced
After fuel cut	≥ 2000 ms (Intermediate) ≥ 2000 ms (Wide)
Estimated temperature of the rear oxygen sensor element	≥ 450 °C (842 °F) (Intermediate) ≥ 450 °C (842 °F) (Wide)
Number of deceleration fuel cut	≥ 1 time(s)

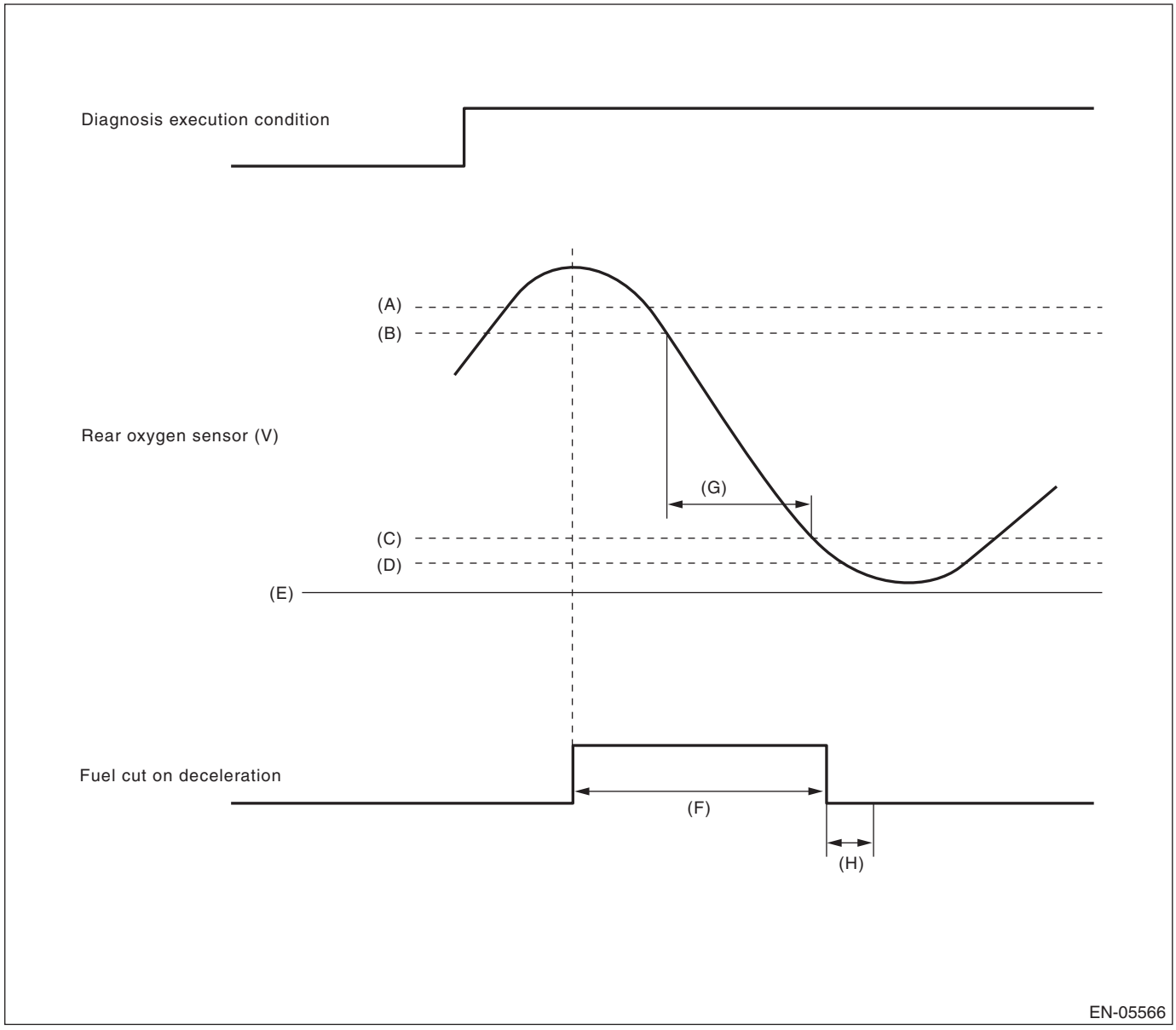
4. GENERAL DRIVING CYCLE

Perform diagnosis once during deceleration fuel cut from a constant and high speed driving, when rear oxygen sensor is warmed up sufficiently. (Pay attention to the oxygen sensor voltage for the timing of the deceleration.)

5. DIAGNOSTIC METHOD

- Intermediate

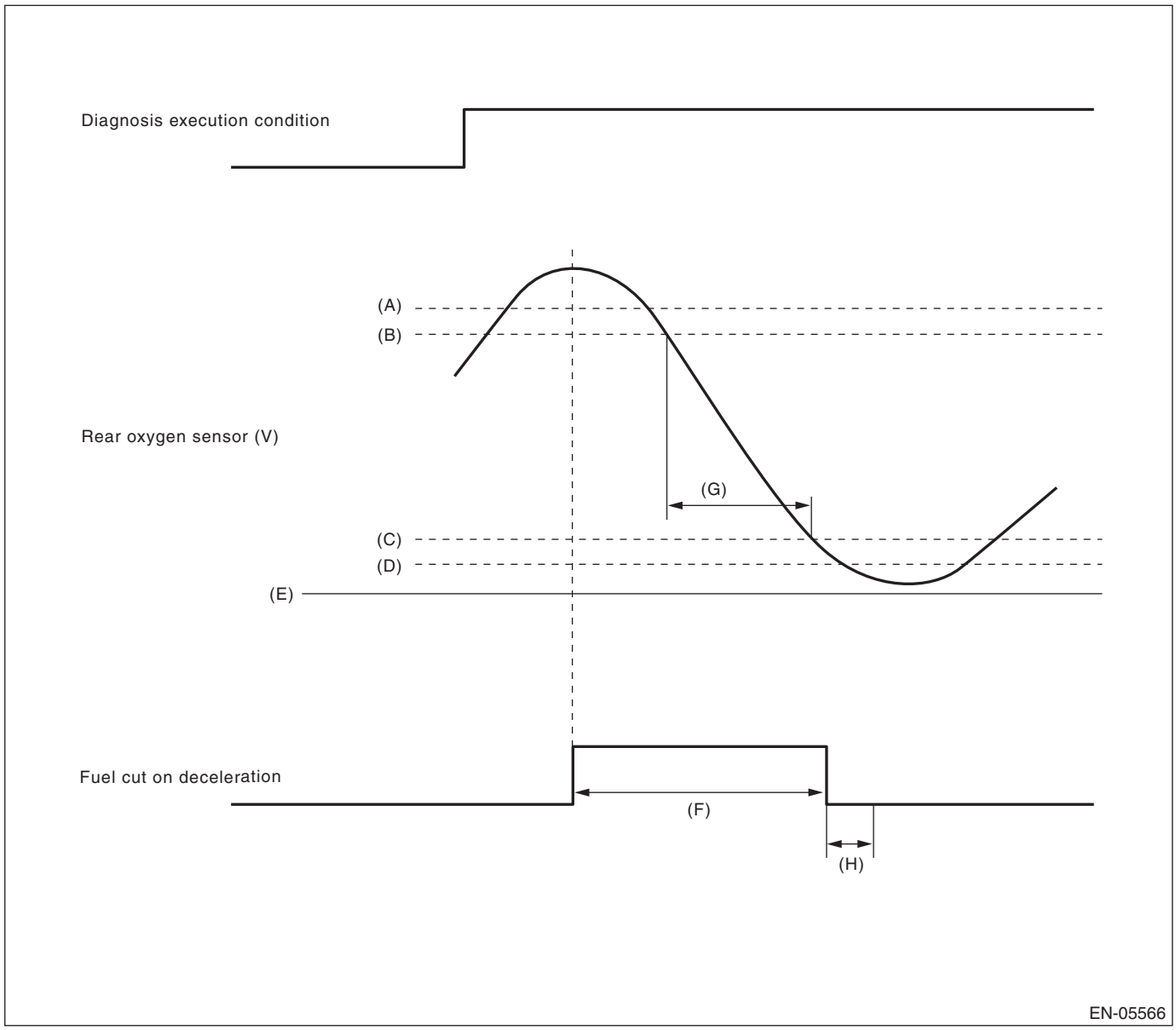
When the oxygen sensor output voltage changes from 0.55 V (rich) to 0.15 V (lean), calculate the minimum response time for output change between 0.5 V and 0.2 V for the judgment criteria.



(A) 0.55 V
(B) 0.5 V
(C) 0.2 V
(D) 0.15 V
(E) 0 V
(F) More than 5000 ms
(G) Measure the response time.
(H) Execute the malfunction judgment in 2000 ms from the recovery of fuel cut on deceleration.

- Wide

When the oxygen sensor output voltage changes from 0.65 V (rich) to 0.05 V (lean), calculate the minimum response time for output change between 0.6 V and 0.1 V for the judgment criteria.



(A) 0.65 V
(B) 0.6 V
(C) 0.1 V
(D) 0.05 V
(E) 0 V
(F) More than 5000 ms
(G) Measure the response time.
(H) Execute the malfunction judgment in 2000 ms from the recovery of fuel cut on deceleration.

- **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:
Perform NG judgment only during fuel cut, when exhaust gas apparently changes from rich → lean. Even without deceleration fuel cut, judge as OK if the value is below the threshold.
2) Judge as NG when the oxygen sensor voltage at a deceleration fuel cut is large.
Judge as NG when oxygen sensor voltage is large even after a long period of deceleration fuel cut has completed.

Judgment value (intermediate)

Malfunction Criteria	Threshold Value
Shortest time change from rich (0.5 V O_2 output) to lean (0.2 V) when voltage reduces from 0.55 V to 0.15 V	> 837 ms
or	
Longest time over 0.55 V	≥ 2000 ms

Judgment value (Wide)

Malfunction Criteria	Threshold Value
Shortest time change from rich (0.6 V O_2 output) to lean (0.1 V) when voltage reduces from 0.65 V to 0.05 V	> Value from Map
or	
Longest time over 0.65 V	≥ 2000 ms

Map

Estimated temperature of rear oxygen sensor element when fuel cut starts °C (°F)	0 (32)	450 (842)	480 (896)	500 (932)	1000 (1832)
Longest time in rich status after fuel cut (ms)	5000	5000	3000	2000	2000

Time Needed for Diagnosis: 1 time(s)
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 and clear the NG if the following conditions are established.

Judgment value (intermediate)

Malfunction Criteria	Threshold Value
Shortest time change from rich (0.5 V O_2 output) to lean (0.2 V) when voltage reduces from 0.55 V to 0.15 V	≤ 837 ms

Judgment value (Wide)

Malfunction Criteria	Threshold Value
Shortest time change from rich (0.6 V O_2 output) to lean (0.1 V) when voltage reduces from 0.65 V to 0.05 V	≤ 2000 ms

Time Needed for Diagnosis: 1 time(s)

6. ENABLE CONDITION

Lean → rich response diagnosis

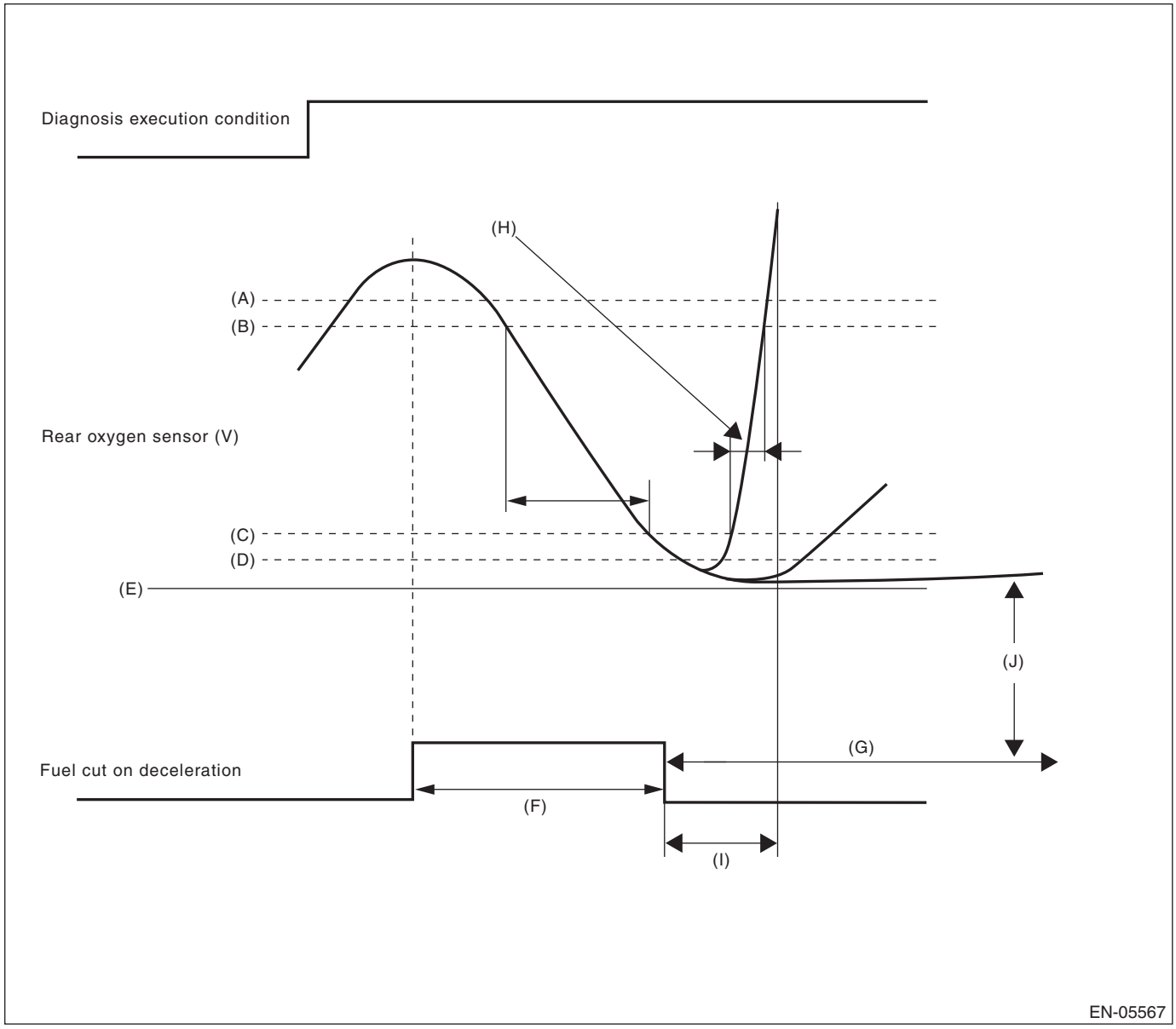
Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
A/F main feedback control condition	Completed
Deceleration fuel cut time is 6000 ms or more.	Experienced
After fuel cut	≥ 2000 ms
Number of deceleration fuel cut	≥ 1 time(s)

7. GENERAL DRIVING CYCLE

Perform diagnosis once during deceleration fuel cut from a constant and high speed driving, when rear oxygen sensor is warmed up sufficiently. (Pay attention to the oxygen sensor voltage for the timing of the deceleration.)

8. DIAGNOSTIC METHOD

When the oxygen sensor output voltage changes from 0.25 V (lean) to 0.55 V (rich), calculate the minimum response time for output change between 0.3 V and 0.5 V for the judgment criteria.



(A) 0.55 V
(B) 0.5 V
(C) 0.3 V
(D) 0.25 V
(E) 0 V
(F) More than 5 seconds
(G) More than 120000 ms
(H) Measure the response time (diagnostic value).
(I) Execute the malfunction judgment in 4000 ms from the recovery of fuel cut on deceleration.
(J) Judge NG when the voltage of rear oxygen sensor is 0.25 V or less for 120000 ms or more after recovery of fuel cut on deceleration.

• 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
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 changes from 0.25 V to 0.55 V	> 4000 ms
or	
Longest time under 0.25 V	≥ 120000 ms

Time Needed for Diagnosis: 1 time(s)
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 and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Shortest time change from lean (0.3 V O_2 output) to rich (0.5 V) when voltage changes from 0.25 V to 0.55 V	≤ 4000 ms

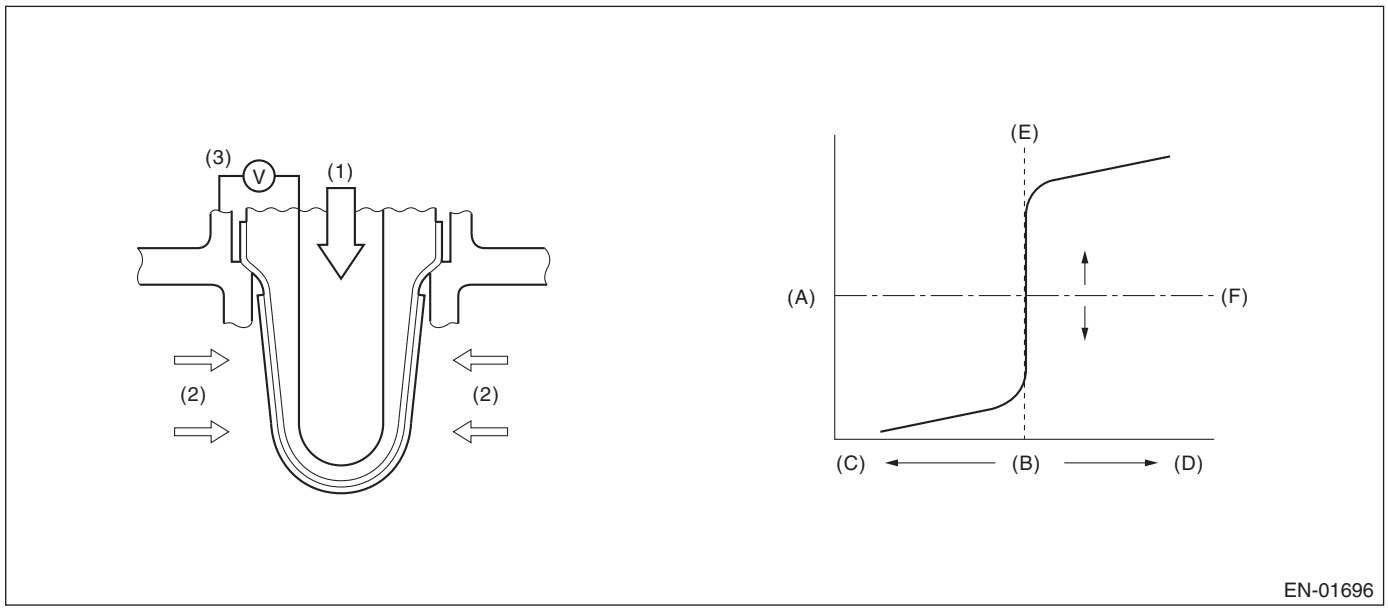
Time Needed for Diagnosis: 1 time(s)

AG:DTC P0140 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK1 SENSOR2)

1. OUTLINE OF DIAGNOSIS

Detect the rear oxygen sensor open or short circuit. Judge as NG when the rear oxygen sensor voltage can be determined to be abnormal considering conditions such as intake air amount, engine coolant temperature, main feedback control and deceleration fuel cut.

2. COMPONENT DESCRIPTION



(A)	Electromotive force	(B)	Air fuel ratio	(C)	Rich
(D)	Lean	(E)	Theoretical air fuel ratio	(F)	Comparative voltage
(1)	Atmosphere	(2)	Exhaust gas	(3)	Electromotive force

3. ENABLE CONDITION (USED ONLY FOR MALFUNCTION JUDGMENT)

Secondary Parameters	Enable Conditions
Closed loop control at the rear oxygen sensor	In operation
Target output voltage of rear oxygen sensor	≥ 0.55 V + 0.05 V
Amount of intake air	≥ 10 g/s (0.35 oz/s)
Engine coolant temperature	≥ 70 °C (158 °F)
Misfire detection every 200 rotations	< 5 time(s)
Front oxygen (A/F) sensor compensation coefficient	Not in limit value
Battery voltage	≥ 10.9 V
Deceleration fuel cut of 5000 ms or more.	Experienced

4. GENERAL DRIVING CYCLE

Perform the diagnosis once after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Minimum output voltage	> 0.15 V
or	
Maximum output voltage	< 0.55 V

Time Needed for Diagnosis: 200000 ms
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Diagnosis of the rear oxygen sensor voltage low side	Incomplete
Minimum output voltage	≤ 0.15 V
Maximum output voltage	≥ 0.55 V

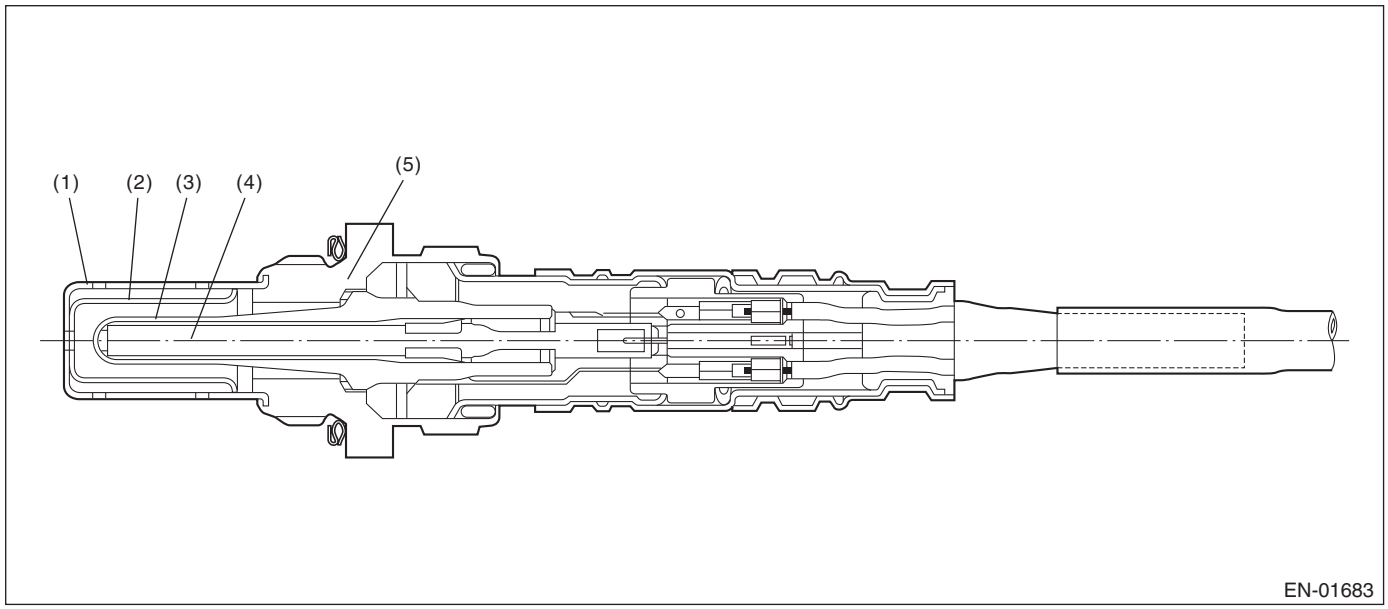
Time Needed for Diagnosis: Less than 1 second

AH:DTC P0141 O2 SENSOR HEATER CIRCUIT (BANK1 SENSOR2)

1. OUTLINE OF DIAGNOSIS

Detect malfunction of the rear oxygen sensor heater.
Judge as NG if it is determined that the rear oxygen sensor impedance is large by observing the engine conditions.

2. COMPONENT DESCRIPTION



(1) Element cover (outer)
(2) Element cover (inner)
(3) Sensor element
(4) Ceramic heater
(5) Sensor housing

3. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Elapsed time after starting the engine	≥ 1000 ms
Engine coolant temperature	≥ 70 °C (158 °F)
A/F sensor element impedance	≤ 50 Ω
A/F sensor heater control duty	≤ 75 %
Rear oxygen sensor heater control duty	< 30 %

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after 1000 ms seconds or more have passed since the engine started.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Output terminal for heater characteristics failure detection	Low

Time Needed for Diagnosis: 4 ms × 2500 time(s)
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output terminal for heater characteristics failure detection	High

Time Needed for Diagnosis: 4 ms × 2500 time(s)

AI: 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

Secondary Parameters	Enable Conditions
A/F main learning system	In operation
Engine coolant temperature	≥ 70 °C (158 °F)
Engine load change	< 0.02 g/rev (0 oz/rev)
Engine load	≥ Value of Map 1

MAP 1

Engine speed (rpm)	Idling	800	1200	1600	2000	2400	2800	3200	3600	4000	4400
Measured value (g(oz)/rev)	na	0.228 (0.01)	0.22 (0.01)	0.22 (0.01)	0.22 (0.01)	0.228 (0.01)	0.23 (0.01)	0.234 (0.01)	0.242 (0.01)	0.25 (0.01)	0.25 (0.01)

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 meeting the malfunction criteria below continues for 10 s × 5 time(s) or more, judge that there is a fault in the fuel system.

Judgment Value

Malfunction Criteria	Threshold Value
fsobd = (sglmd – tglmda) + faf + flaf In this case: sglmd = measured lambda tglmda = target lambda faf = main feedback compensation coefficient every 64 milliseconds flaf = main feedback learning compensation coefficient	≥ Value of Map 2

MAP 2

Amount of air (g (oz)/s)	0 (0)	2.34375 (0.08)	4.6875 (0.17)	7.03125 (0.25)	9.375 (0.33)	11.71875 (0.41)	14.0625 (0.5)
fsobdL1 (%)	1.4	1.4	1.368623	1.319185	1.26975	1.265	1.265

Time Needed for Diagnosis: 10 s × 5 time(s)
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
fsobd = (sglmd – tglmda) + faf + flaf	< 1.2

Time Needed for Diagnosis: 10 s

AJ: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	≥ 70 °C (158 °F)
Engine load change	≤ 0.02 g/rev (0 oz/rev)
Learning value of EVAP conc.	< 0.1
Cumulative time of canister purge after engine start	≥ 20 s
Continuous period after canister purge starting	≥ 29884 ms
Engine load	≥ Value of Map 1

MAP 1

Engine speed (rpm)	Idling	800	1200	1600	2000	2400	2800	3200	3600	4000	4400
Measured value (g(oz)/rev)	na	0.228 (0.01)	0.22 (0.01)	0.22 (0.01)	0.22 (0.01)	0.228 (0.01)	0.23 (0.01)	0.234 (0.01)	0.242 (0.01)	0.25 (0.01)	0.25 (0.01)

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 meeting the malfunction criteria below continues for 10 s × 5 time(s) or more, judge that there is a fault in the fuel system.

Judgment Value

Malfunction Criteria	Threshold Value
fsobd = (sglmd – tglmda) + faf + flaf In this case: sglmd = measured lambda tglmda = target lambda faf = main feedback compensation coefficient every 64 milliseconds flaf = main feedback learning compensation coefficient	< Value of Map 2

MAP 2

Amount of air (g (oz)/s)	0 (0)	2.34375 (0.08)	4.6875 (0.17)	7.03125 (0.25)	9.375 (0.33)	11.71875 (0.41)	14.0625 (0.5)
fsobdL1 (%)	0.6	0.6	0.63137	0.68082	0.71025	0.72525	0.73025

Time Needed for Diagnosis: 10 s × 5 time(s)
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	≥ 0.8

Time Needed for Diagnosis: 10 s

AK: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.

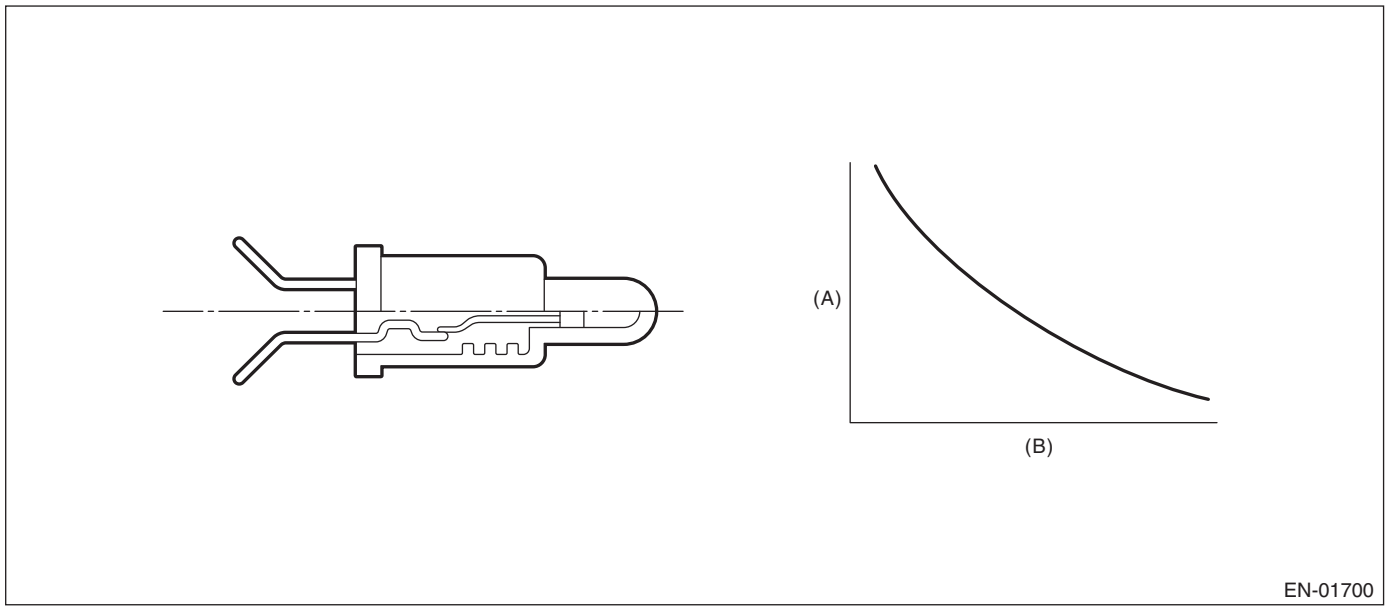
DRIFT DIAGNOSIS

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.

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.

2. COMPONENT DESCRIPTION



(A) Resistance value (Ω) (B) Fuel temperature °C (°F)

3. ENABLE CONDITION

DRIFT DIAGNOSIS

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel level	≥ 9.6 ℓ (2.54 US gal, 2.11 Imp gal)
Elapsed time after starting the engine	≥ 20 s
Engine coolant temperature – Engine coolant temperature at engine start	> 10 °C (18°F)
Fuel temperature – Engine coolant temperature	≥ 10 °C (18°F)
Battery voltage	≥ 10.9 V

Time Needed for Diagnosis: 120 s
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel level	≥ 9.6 ℓ (2.54 US gal, 2.11 Imp gal)
Elapsed time after starting the engine	≥ 20 s
Engine coolant temperature – Engine coolant temperature at engine start	> 10 °C (18°F)
Fuel temperature – Engine coolant temperature	< 10 °C (18°F)
Battery voltage	≥ 10.9 V
Engine coolant temperature	< 70 °C (158 °F)

Time Needed for Diagnosis: Less than 1 second

6. ENABLE CONDITION

STUCK DIAGNOSIS

Secondary Parameters	Enable Conditions
Elapsed time after starting the engine	≥ 20000 ms
Battery voltage	≥ 10.9 V

7. GENERAL DRIVING CYCLE

Always perform diagnosis after 20 seconds have passed since the engine started.

8. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Accumulated amount of intake air	≥ 551043 g (19435.29 oz)
Fuel temperature difference between Max. and Min.	< 2 °C (3.6°F)

Time Needed for Diagnosis: Less than 1 second
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel temperature difference between Max. and Min.	≥ 2 °C (3.6°F)

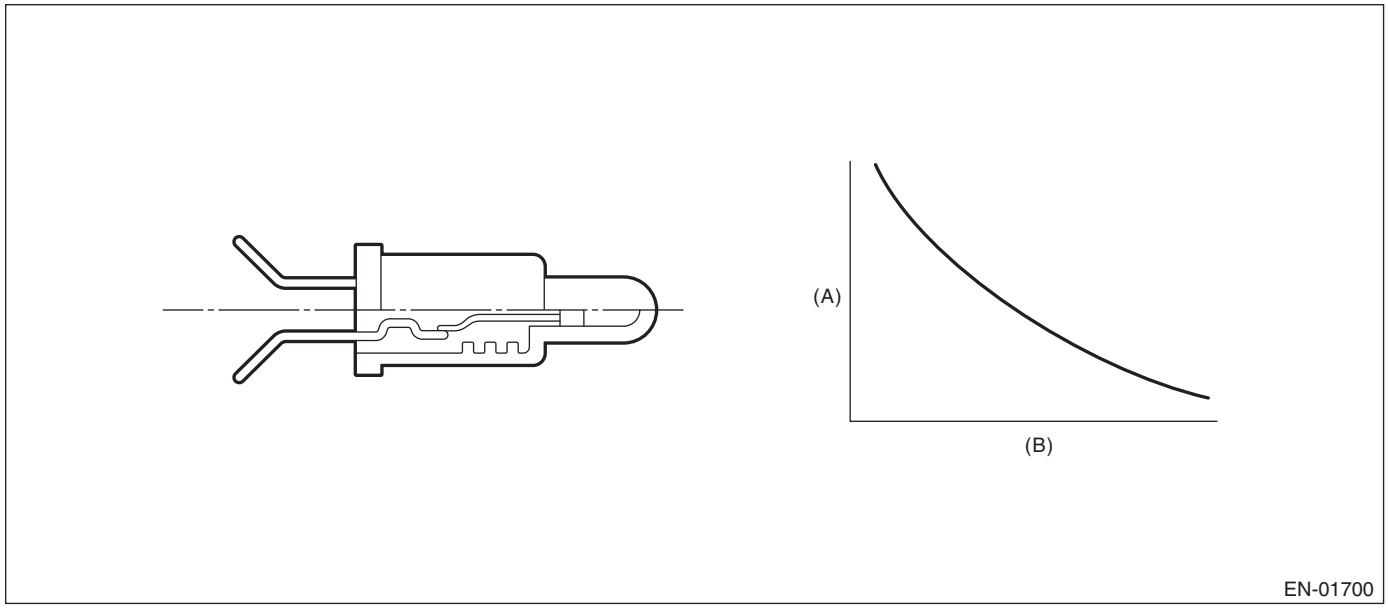
Time Needed for Diagnosis: Less than 1 second

AL: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 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.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.343951474 V
Battery voltage	≥ 10.9 V

Time Needed for Diagnosis: 2500 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 0.343951474 V
Battery voltage	≥ 10.9 V

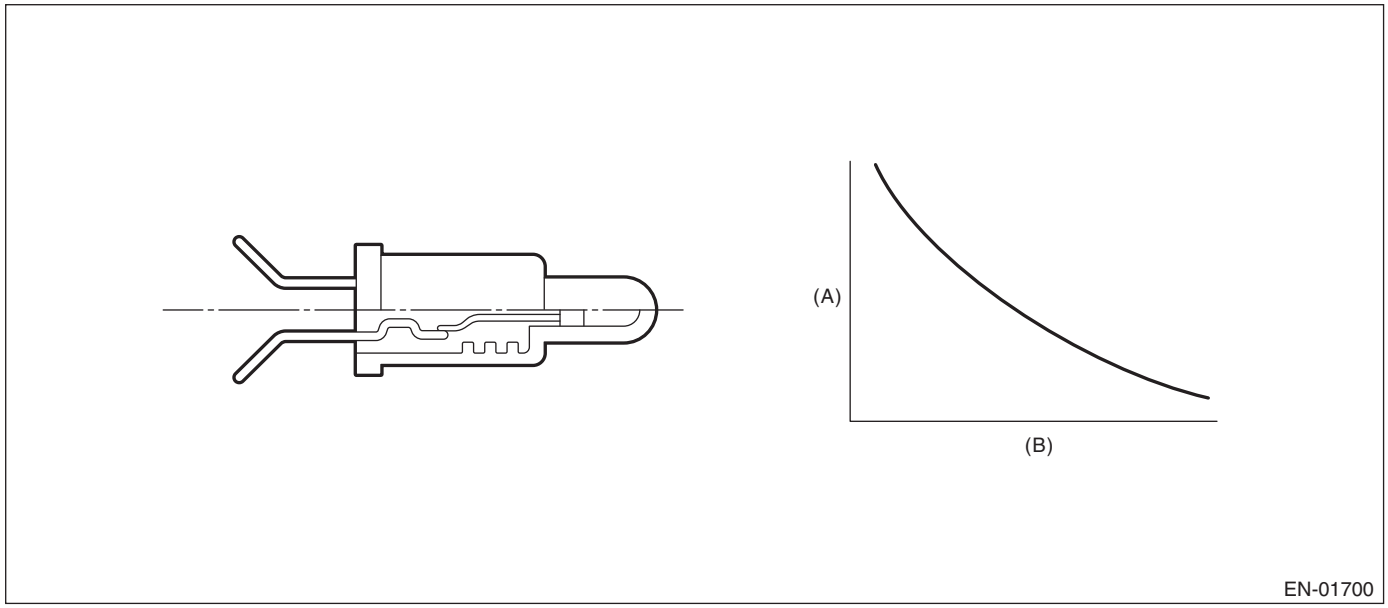
Time Needed for Diagnosis: Less than 1 second

AM: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 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.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.716 V
Battery voltage	≥ 10.9 V

Time Needed for Diagnosis: 2500 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 4.716 V
Battery voltage	≥ 10.9 V

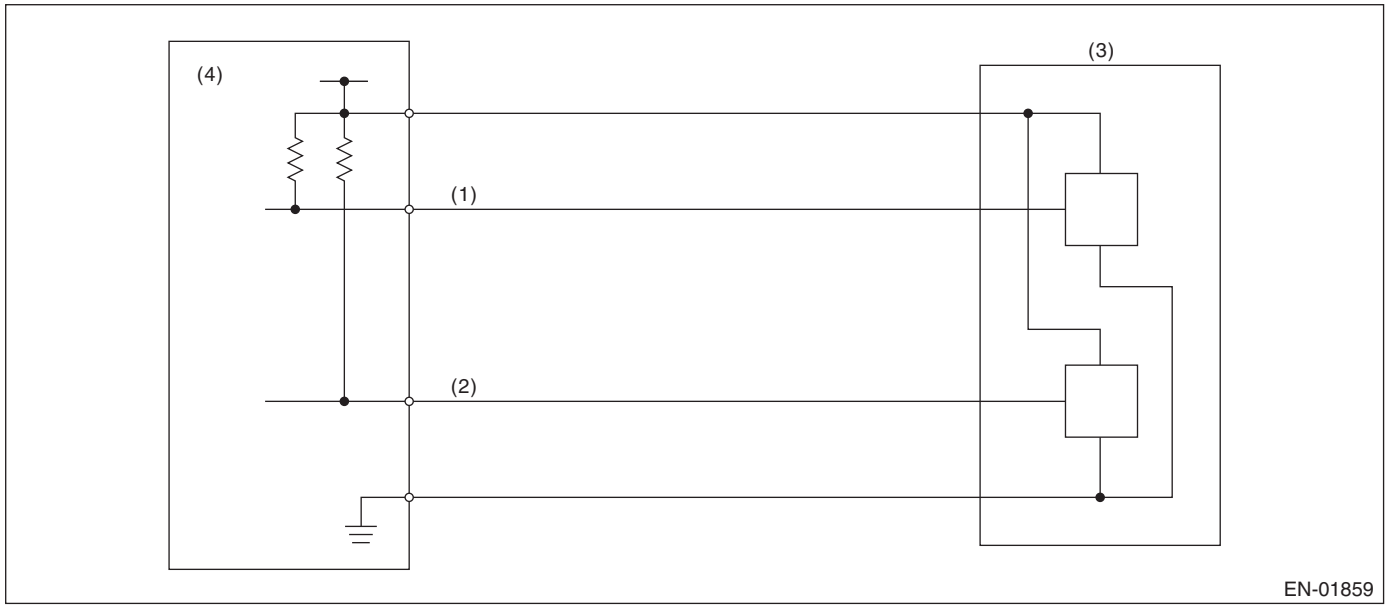
Time Needed for Diagnosis: Less than 1 second

AN: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 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
Battery voltage	≥ 6 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 2 input voltage	≤ 0.926 V

Time Needed for Diagnosis: 24 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 2 input voltage	> 0.926 V

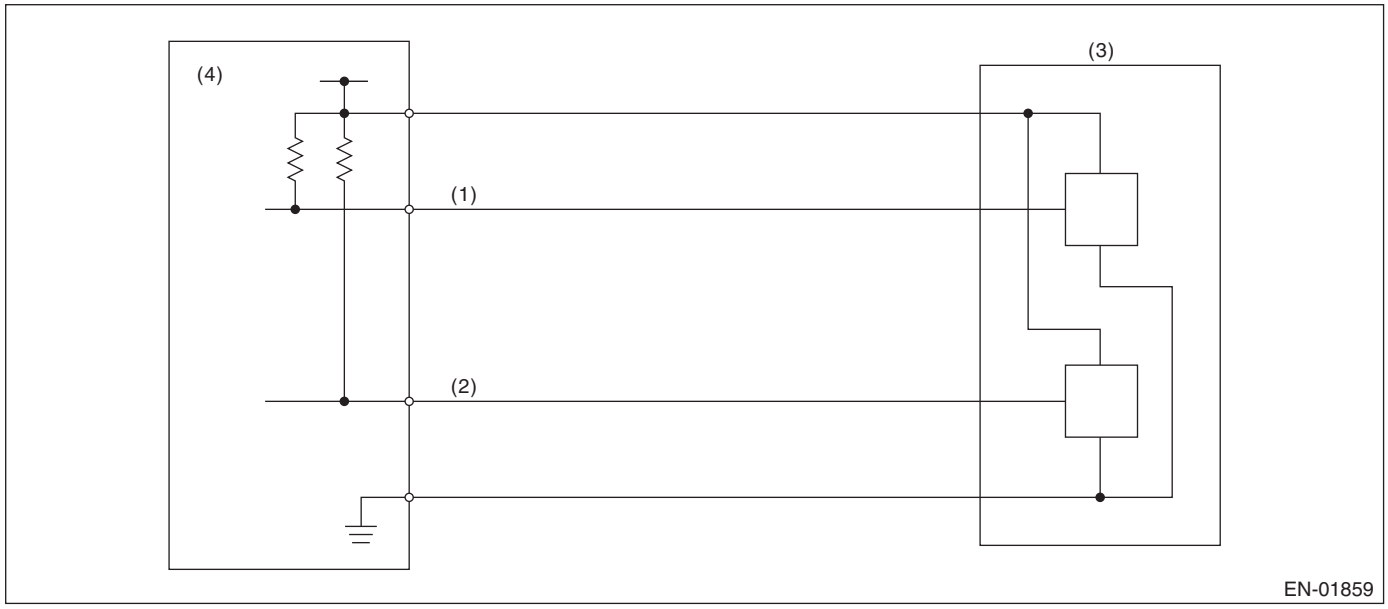
Time Needed for Diagnosis: 24 ms

AO: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 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
Battery voltage	≥ 6 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 2 input voltage	≥ 4.858 V

Time Needed for Diagnosis: 24 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 2 input voltage	< 4.858 V

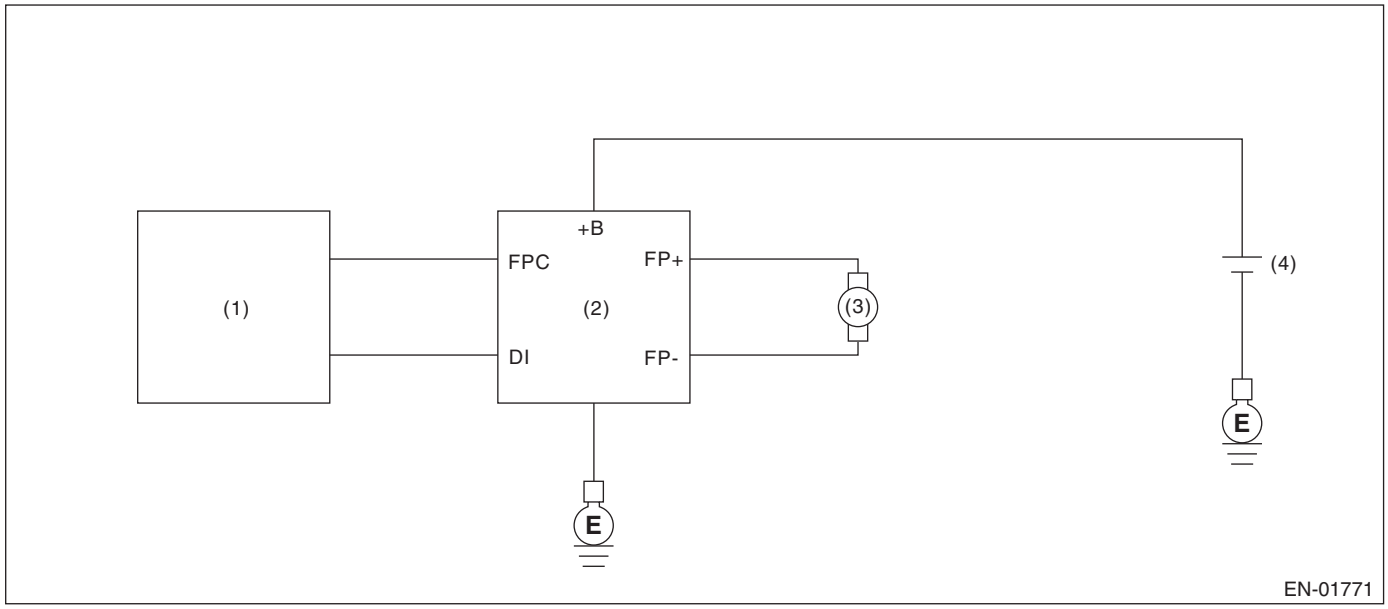
Time Needed for Diagnosis: 24 ms

AP: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.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 8 V
Elapsed time after starting the engine	≥ 180000 ms
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: 2500 ms
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 8 V
Elapsed time after starting the engine	≥ 180000 ms
Fuel pump control	ON
Fuel pump control unit output diagnosis signal	High
Fuel level	≥ 10 ℓ (2.64 US gal, 2.2 Imp gal)

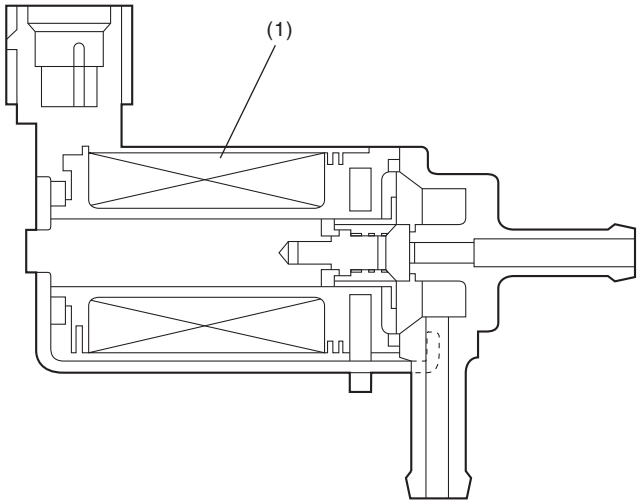
Time Needed for Diagnosis: Less than 1 second

AQ:DTC P0244 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” RANGE/PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of wastegate control solenoid valve function.
Judge as NG when becoming high wastegate pressure.

2. COMPONENT DESCRIPTION



EN-01772

(1) Coil

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Intake manifold pressure	≥ Value from Map

Map

		Barometric pressure (kPa (mmHg, inHg))					
		58.7 (440, 17.3)	77.3 (580, 22.8)	89.3 (670, 26.4)	96 (720, 28.3)	98.6 (740, 29.1)	101.3 (760, 29.9)
Engine speed (rpm)	1000	113.4 (851, 33.5)	132.2 (992, 39.1)	144 (1080, 42.5)	144 (1080, 42.5)	144 (1080, 42.5)	144 (1080, 42.5)
	2000	159.8 (1199, 47.2)	188.6 (1415, 55.7)	206.6 (1550, 61)	206.6 (1550, 61)	206.6 (1550, 61)	206.6 (1550, 61)
	3000	159.8 (1199, 47.2)	188.6 (1415, 55.7)	206.6 (1550, 61)	206.6 (1550, 61)	206.6 (1550, 61)	206.6 (1550, 61)
	4000	159.8 (1199, 47.2)	188.6 (1415, 55.7)	206.6 (1550, 61)	206.6 (1550, 61)	206.6 (1550, 61)	206.6 (1550, 61)
	5000	133.4 (1001, 39.4)	160.1 (1201, 47.3)	179.7 (1348, 53.1)	186.9 (1402, 55.2)	204.6 (1535, 60.4)	204.6 (1535, 60.4)
	6000	123.4 (926, 36.5)	147.7 (1108, 43.6)	165.4 (1241, 48.9)	171.8 (1289, 50.7)	188 (1410, 55.5)	188 (1410, 55.5)
kPa (mmHg, inHg)							

Time Needed for Diagnosis: 2000 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Intake manifold pressure	< Value from Map – 22.4 kPa (168 mmHg, 6.6 inHg)

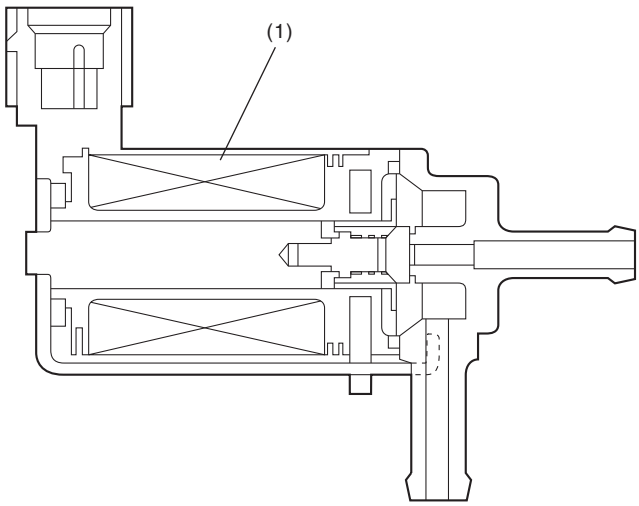
Time Needed for Diagnosis: Less than 1 second

AR:DTC P0245 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” LOW

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the wastegate control solenoid valve.
Judge as NG when the terminal output voltage remains Low during outputting the duty signal.

2. COMPONENT DESCRIPTION



EN-01772

(1) Coil

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Elapsed time after starting the engine	≥ 1 second

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

5. DIAGNOSTIC METHOD

Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage	Low
Duty ratio of wastegate control	< 75%

Time Needed for Diagnosis: 640 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage	High

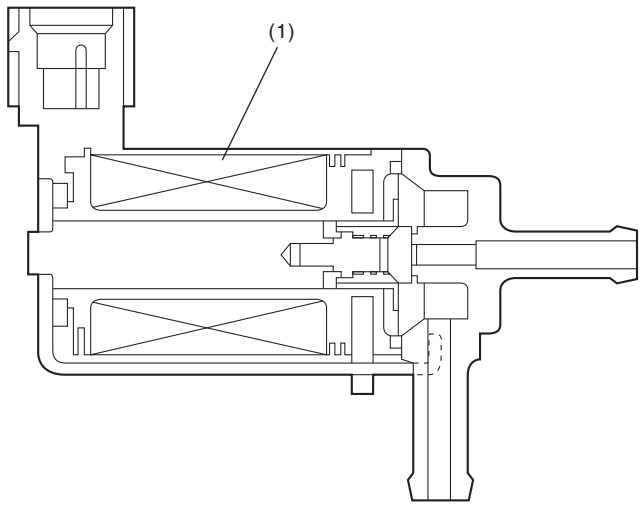
Time Needed for Diagnosis: Less than 1 second

AS:DTC P0246 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” HIGH

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the wastegate control solenoid valve.
Judge as NG when the terminal output voltage remains Low or High during outputting the duty signal.

2. COMPONENT DESCRIPTION



EN-01772

(1) Coil

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Elapsed time after starting the engine	≥ 1 second

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

5. DIAGNOSTIC METHOD

Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage	High
Duty ratio of wastegate control	≥ 25%

Time Needed for Diagnosis: 640 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage	Low

Time Needed for Diagnosis: Less than 1 second

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
- 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
All secondary parameters enable conditions	≥ 1024 ms
Intake manifold pressure change at 180°CA	< Value of Map 1
Throttle position change during 16 milliseconds	< 14 °
Fuel shut-off function	Not in operation
Fuel level	≥ 9.6 ℓ (2.54 US gal, 2.11 Imp gal)
Vehicle dynamic control or AT torque control	Not in operation
Evaporative system leak check	Not in operation
Engine speed	450 rpm — 6650 rpm
Intake manifold pressure	≥ Value of Map 2
Battery voltage	≥ 8 V
Fuel parameter determination	Not extremely low volatility
Elapsed time after starting the engine	≥ 0 ms
Engine load change during 32 milliseconds	< 1000 rpm

MAP 1

rpm	700	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	6700
kPa (mmHg, inHg)	26.7 (200, 7.9)	26.7 (200, 7.9)	26.7 (200, 7.9)	26.7 (200, 7.9)	26.7 (200, 7.9)	26.7 (200, 7.9)	26.7 (200, 7.9)	26.7 (200, 7.9)	26.7 (200, 7.9)	26.7 (200, 7.9)	26.7 (200, 7.9)	26.7 (200, 7.9)	26.7 (200, 7.9)	26.7 (200, 7.9)

MAP 2

- Tumble generator valve open

rpm	700	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	6700
kPa (mmHg, inHg)	29.3 (220, 8.7)	26.7 (200, 7.9)	26.7 (200, 7.9)	26.7 (200, 7.9)	26.7 (200, 7.9)	26.9 (202, 8)	29.5 (221.5, 8.7)	31.3 (235, 9.3)	32.7 (245.5, 9.7)	34.1 (256, 10.1)	38.2 (286.5, 11.3)	44 (330, 13)	49.5 (371.5, 14.6)	53.3 (400, 15.7)

- Tumble generator valve closed

rpm	700	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	6700
kPa (mmHg, inHg)	29.3 (220, 8.7)	26.7 (200, 7.9)	26.7 (200, 7.9)	26.7 (200, 7.9)	26.7 (200, 7.9)	26.9 (202, 8)	29.5 (221.5, 8.7)	31.3 (235, 9.3)	32.7 (245.5, 9.7)	34.1 (256, 10.1)	38.2 (286.5, 11.3)	44 (330, 13)	49.5 (371.5, 14.6)	53.3 (400, 15.7)

3. GENERAL DRIVING CYCLE

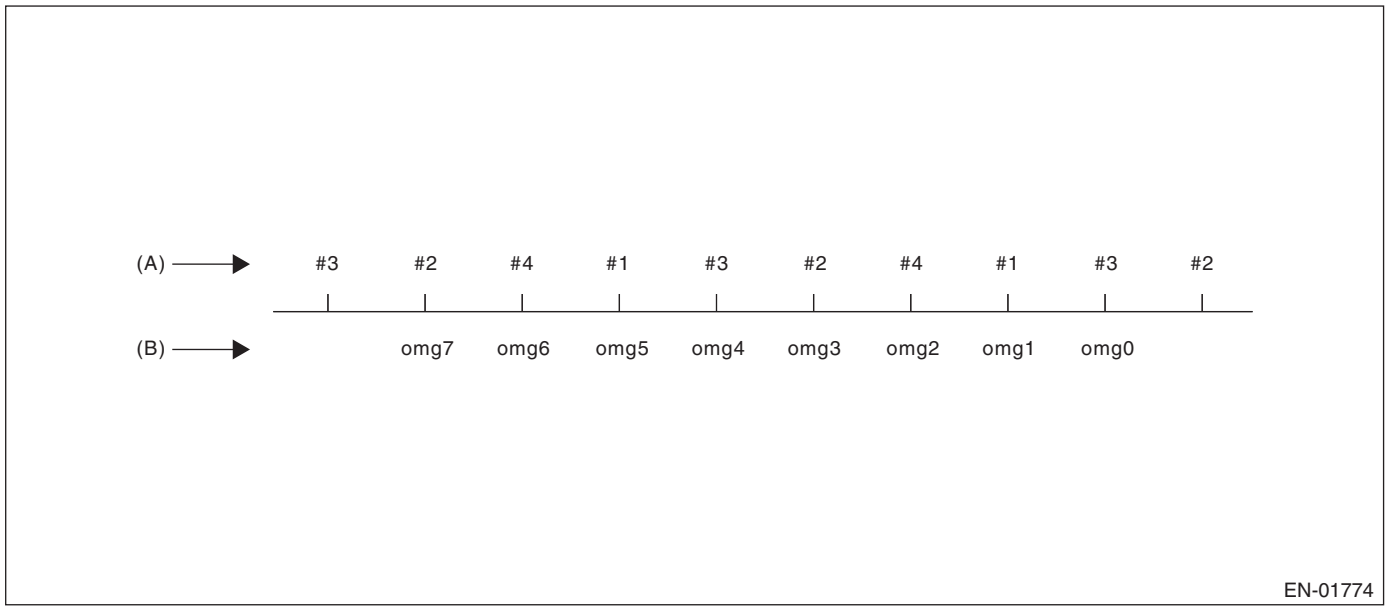
- If conditions are met, it is possible to detect the misfires from idling to high engine speed. However, in case any engine load or breakage occurs, perform with the engine at idle.
- Perform the diagnosis continuously.

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 revs. or 200 revs., 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)
	• 180° Interval Difference Method • 360° Interval Difference Method • 720° Interval Difference Method	• FTP 1.5 times misfire NG judgment • Catalyst damage misfire NG judgment

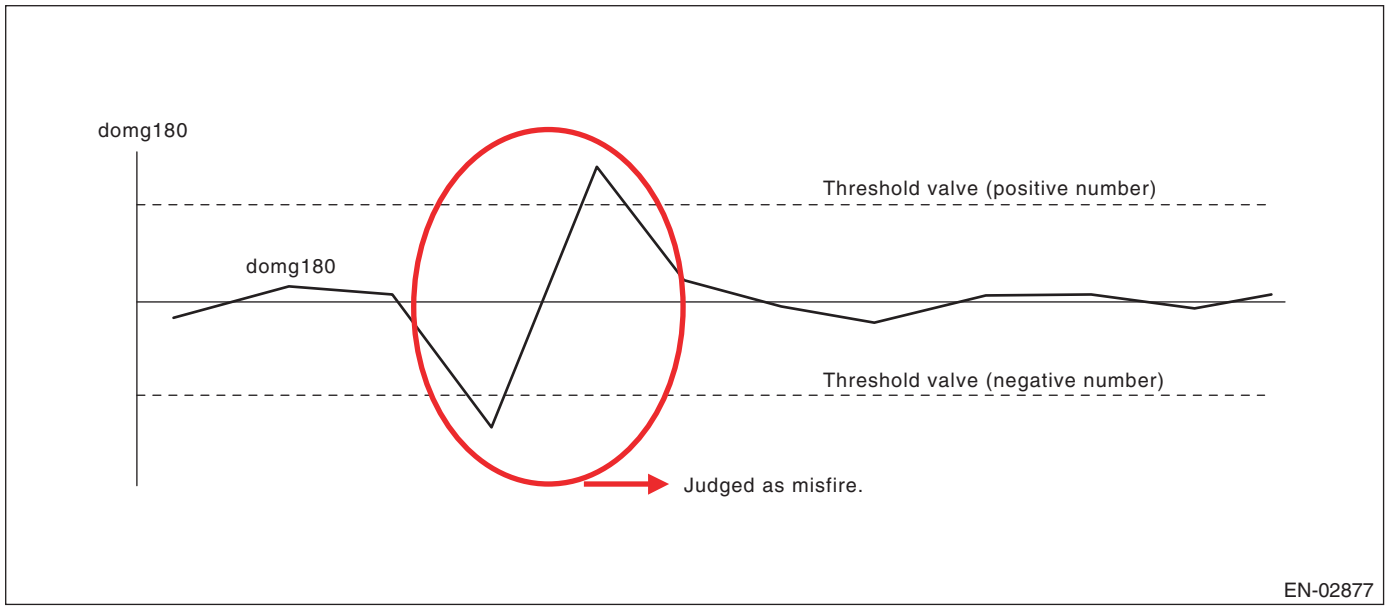
As shown in the following figure, pick a cylinder as the standard and name it omg 0. And the former crankshaft position speed is named omg 1, the second former crankshaft position speed is named omg 2, the third is named omg 3, etc.



(A) Ignition order (B) Crankshaft position speed

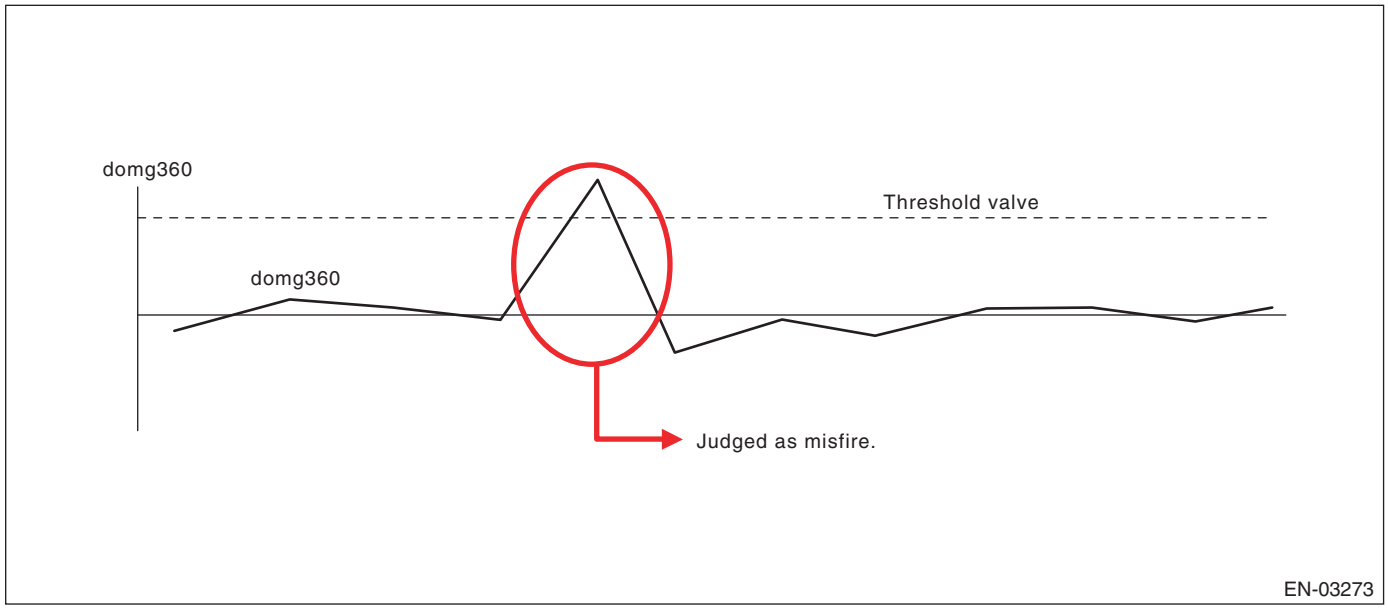
180° Interval Difference Method

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 ≤ judgment value of negative side (Judgment value before 180° CA)	



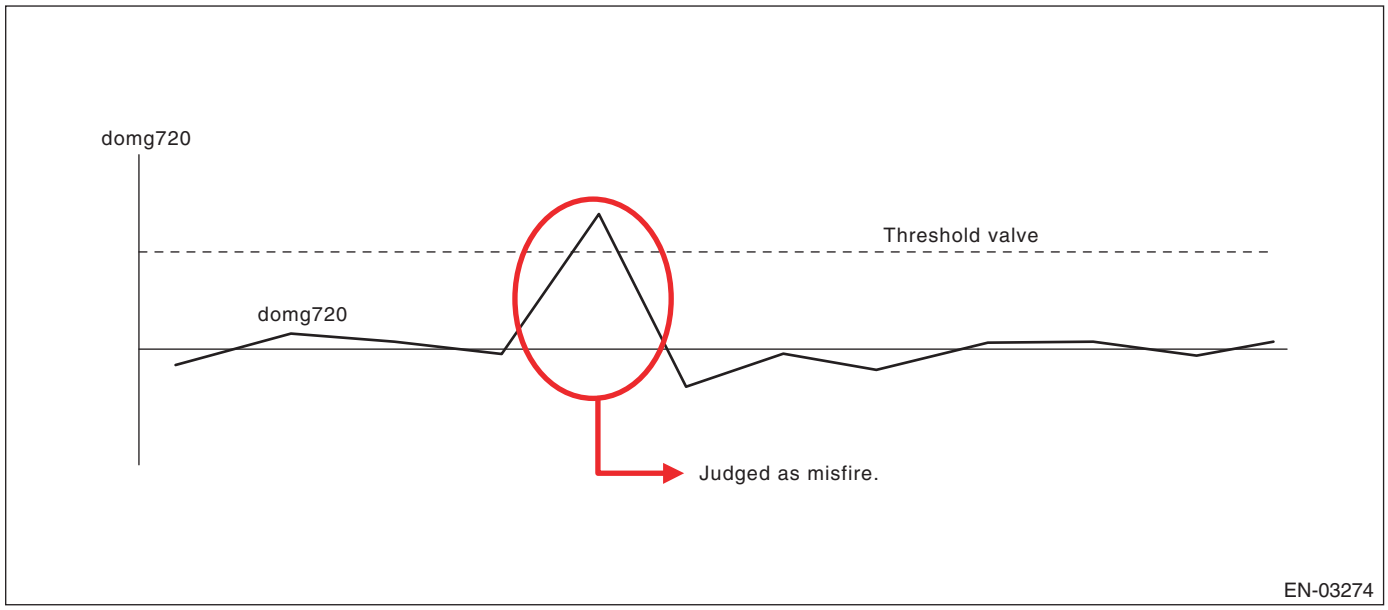
360° Interval Difference Method

Diagnostic value	domg 360 = (omg 1 – omg 0) – (omg 3 – omg 2)
Misfire judgment	domg 360 > Judgment value → Judge as misfire



720° Interval Difference Method

Diagnostic value	domg 720 = (omg 1 – omg 0) – (omg 5 – omg 4)
Misfire judgment	domg 720 > Judgment value → Judge as misfire



- **FTP 1.5 times misfire (Misfire occurrence level which influences exhaust gas)**
- **Abnormality Judgment**

Judgment Value (Judge that malfunction occurs when the misfire ratio is high in 1000 engine revs.)

Malfunction Criteria	Threshold Value
FTP emission judgment value	≥ 20 × 100/2000% in 1000 revs.

Time Needed for Diagnosis: 1000 engine revs.
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

- **Normality Judgment**

Judgment Value

Malfunction Criteria	Threshold Value
FTP emission judgment value	< 20 × 100/2000% in 1000 revs.

Time Needed for Diagnosis: 1000 engine revs.

- **Catalyst damage misfire (Misfire occurrence level damaging catalyst)**
- **Abnormality Judgment**

Judgment Value

Malfunction Criteria	Threshold Value
Catalyst damage misfire judgment value	≥ Value of Map 3

Map 3

		Intake air (g(oz)/rev)									
		0.2 (0.01)	0.4 (0.01)	0.6 (0.02)	0.8 (0.03)	1 (0.04)	1.2 (0.04)	1.4 (0.05)	1.6 (0.06)	1.8 (0.06)	2 (0.07)
Engine speed (rpm)	700	148	128	116	106	100	90	90	90	90	90
	1000	148	128	114	104	92	85	85	85	85	85
	1500	140	118	102	90	85	85	85	72	72	72
	2000	128	90	90	73	58	43	40	36	32	20
	2500	116	87	57	45	39	36	34	32	30	20
	3000	108	87	58	39	36	36	32	30	28	20
	3500	98	74	43	27	23	22	20	20	20	20
	4000	69	61	40	27	22	20	20	20	20	20
	4500	60	55	34	25	20	20	20	20	20	20
	5000	55	55	34	23	20	20	20	20	20	20
	5500	54	54	33	22	20	20	20	20	20	20
	6000	52	52	32	21	20	20	20	20	20	20
	6500	50	50	30	20	20	20	20	20	20	20
	6700	50	50	30	20	20	20	20	20	20	20

Time Needed for Diagnosis: 200 engine revs.
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judgment Value

Malfunction Criteria	Threshold Value
Catalyst damage misfire judgment value	< Value of Map 3

Time Needed for Diagnosis: 200 engine revs.

AU:DTC P0302 CYLINDER 2 MISFIRE DETECTED

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0301. <Ref. to GD(H4DOTC)-104, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

AV:DTC P0303 CYLINDER 3 MISFIRE DETECTED

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0301. <Ref. to GD(H4DOTC)-104, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

AW:DTC P0304 CYLINDER 4 MISFIRE DETECTED

1. OUTLINE OF DIAGNOSIS

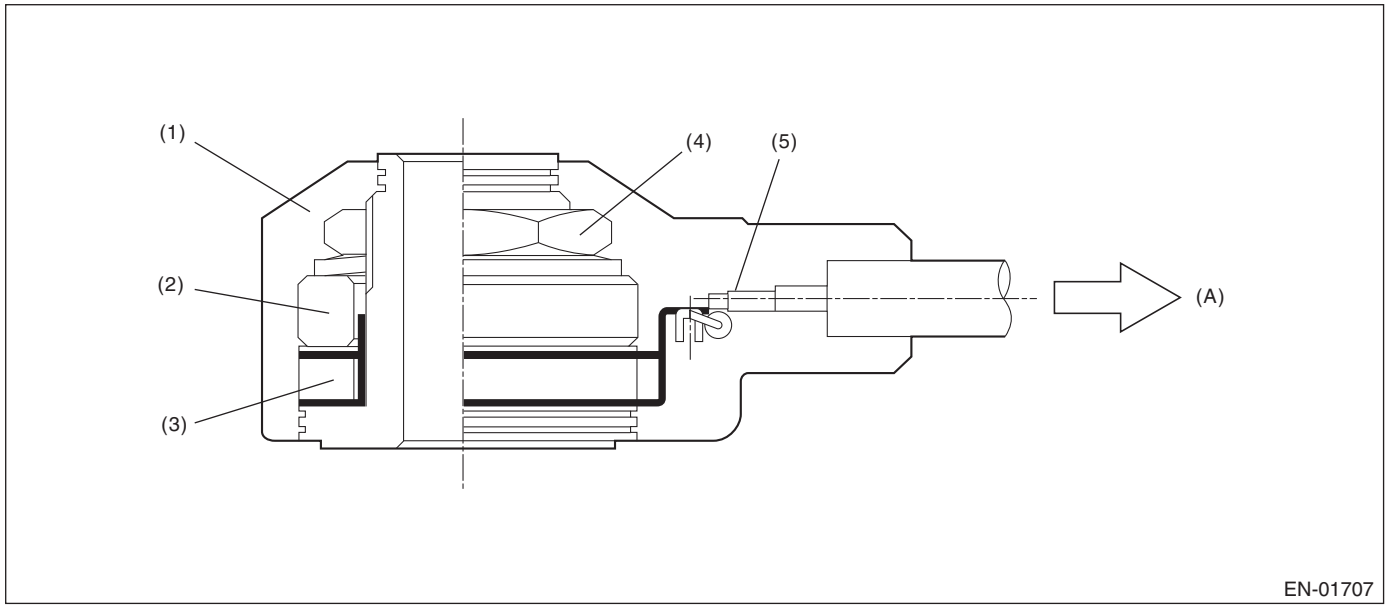
NOTE:
For the detection standard, refer to DTC P0301. <Ref. to GD(H4DOTC)-104, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

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 out of specification.

2. COMPONENT DESCRIPTION



(A) To knock sensor harness

(1) Case
(2) Weight
(3) Piezoelectric element
(4) Nut
(5) Resistance

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.243 V

Time Needed for Diagnosis: 1000 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 0.243 V

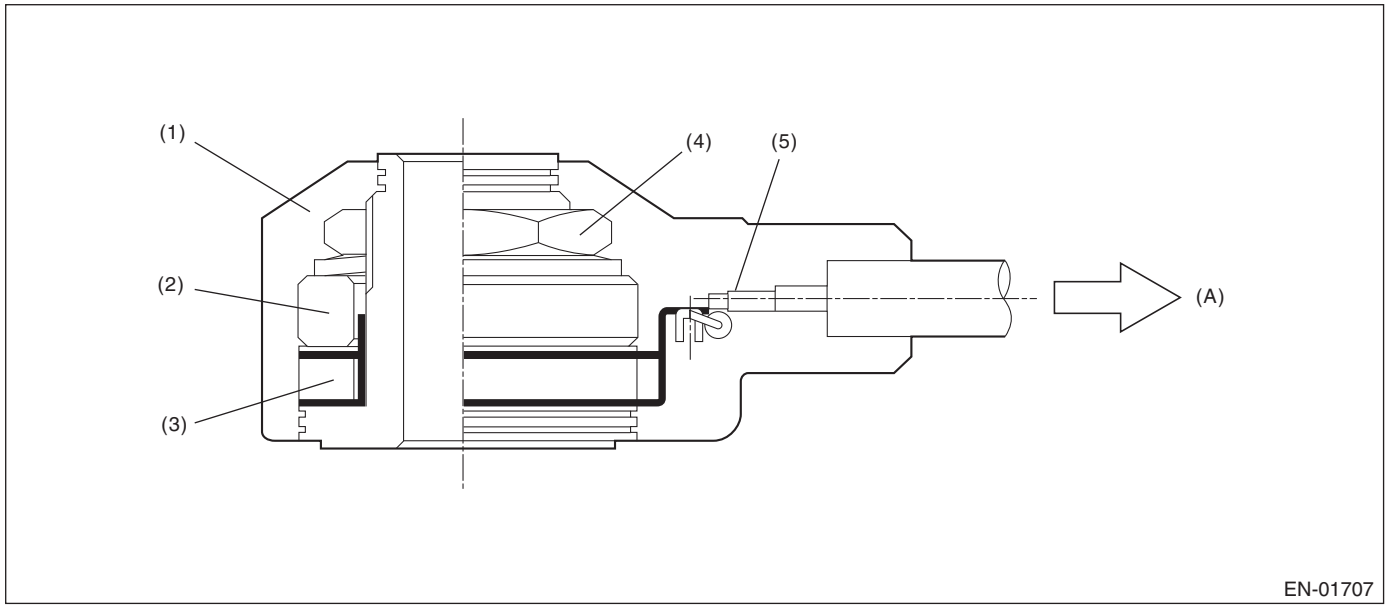
Time Needed for Diagnosis: Less than 1 second

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 out of specification.

2. COMPONENT DESCRIPTION



(A) To knock sensor harness

(1) Case
(2) Weight
(3) Piezoelectric element
(4) Nut
(5) Resistance

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.709 V

Time Needed for Diagnosis: 1000 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 4.709 V

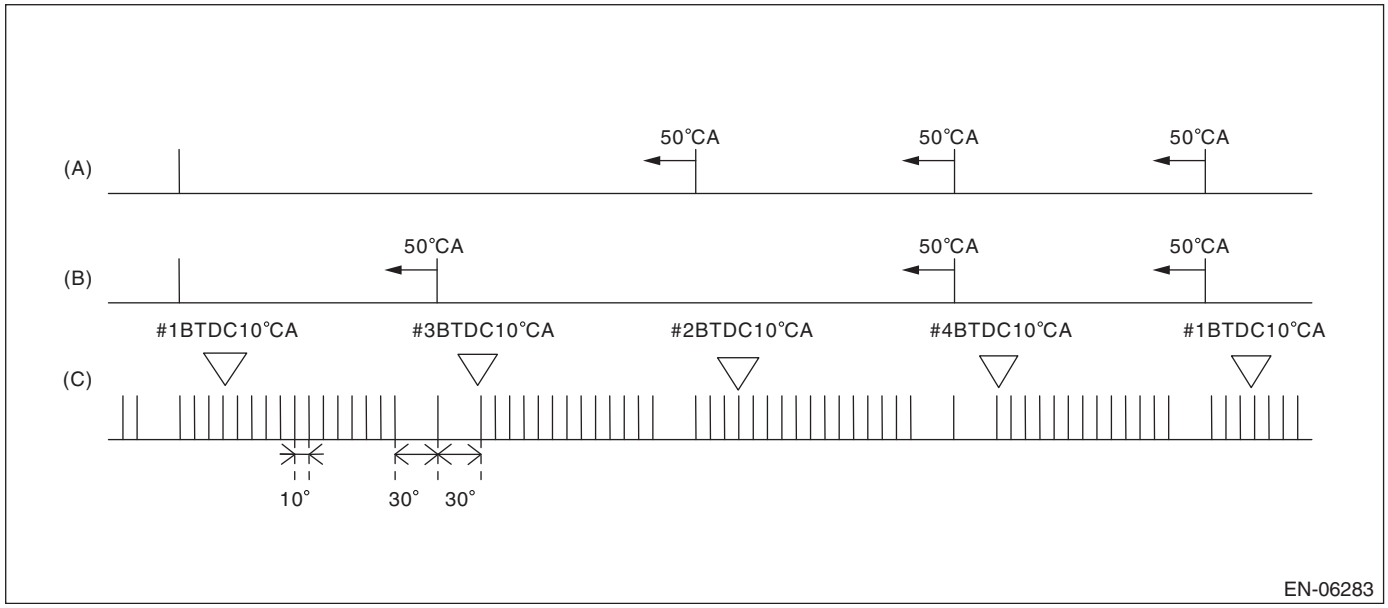
Time Needed for Diagnosis: Less than 1 second

AZ:DTC P0335 CRANKSHAFT POSITION SENSOR “A” CIRCUIT

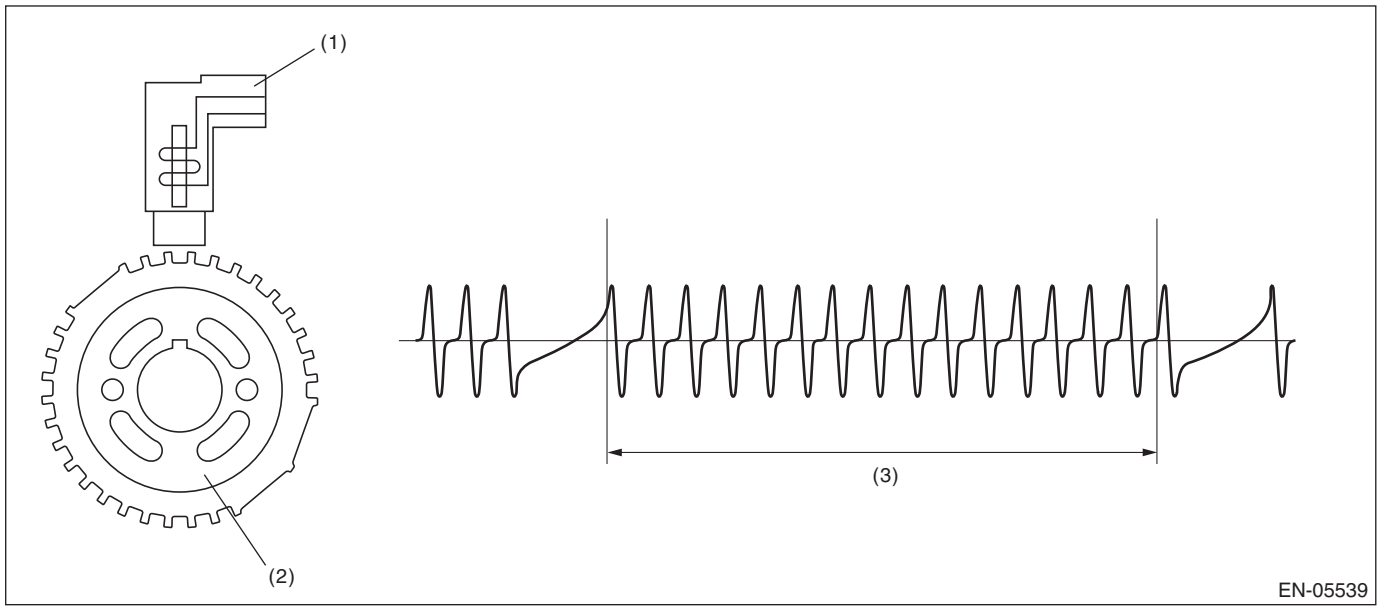
1. OUTLINE OF DIAGNOSIS

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 rotated.

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	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Starter switch	ON
Crankshaft position sensor signal	Not detected
Battery voltage	≥ 8 V

Time Needed for Diagnosis: 3000 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Crankshaft position sensor signal	Input exists
Battery voltage	≥ 8 V

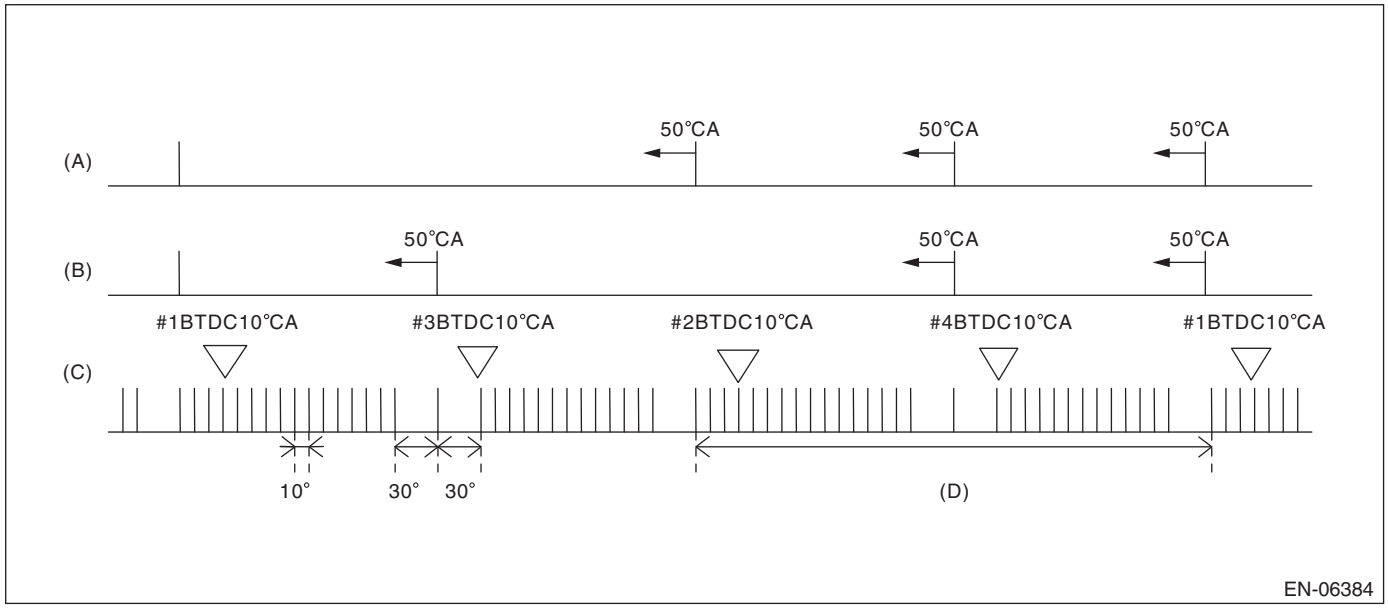
Time Needed for Diagnosis: Less than 1 second

BA:DTC P0336 CRANKSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE

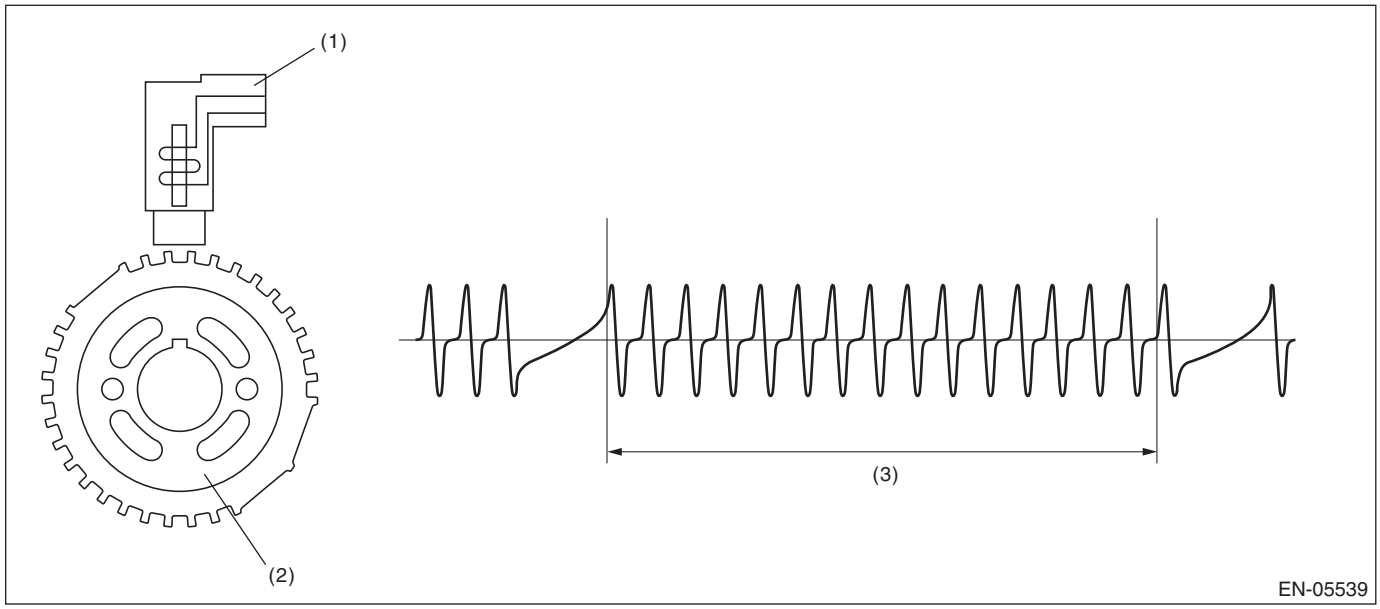
1. OUTLINE OF DIAGNOSIS

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 of crankshaft.

2. COMPONENT DESCRIPTION



(A) Camshaft signal (RH)
(B) Camshaft signal (LH)
(C) Crankshaft signal
(D) Number of crankshaft signals = 30 is normal



(1) Crankshaft position sensor
(2) Crank sprocket
(3) Crankshaft half-turn

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 revs.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Cylinder number identification	Completed
Amount of crank sensor signal during 1 rev of crankshaft.	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 if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Cylinder number identification	Completed
Amount of crank sensor signal during 1 rev of crankshaft.	= 30

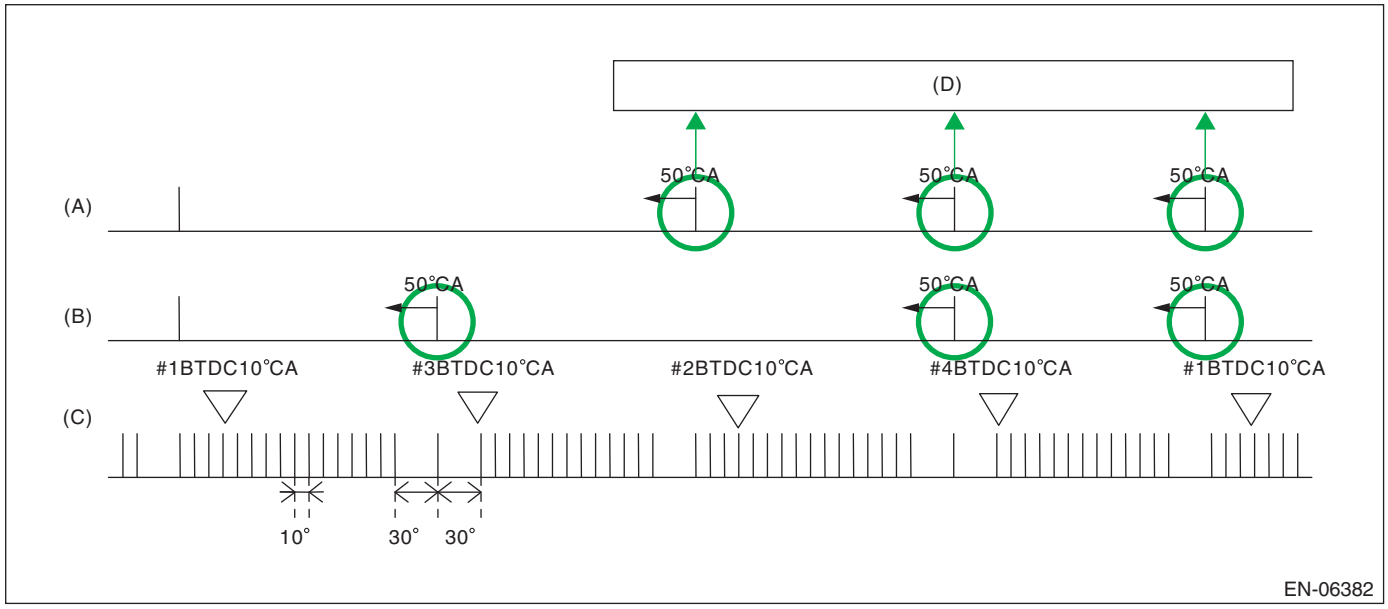
Time Needed for Diagnosis: Less than 1 second

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 (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 crankshaft revolutions.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 8 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment 1

Judge as NG when the condition where the number of camshaft position sensor signals are less than 3 time(s) during 2 revs of crankshaft.

Judgment Value

Malfunction Criteria	Threshold Value
Amount of camshaft sensor signal during 2 revs of crankshaft.	< 3 time(s)

Time Needed for Diagnosis: Engine two revolutions × 50 time(s)
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment 1

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Camshaft position sensor signal	≥ 3 time(s)

Time Needed for Diagnosis: 2 engine revs.

• Abnormality Judgment 2

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Starter	ON
Camshaft position sensor signal	No input

Time Needed for Diagnosis: 3000 ms

• Normality Judgment 2

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Camshaft position sensor signal	Input exists

Time Needed for Diagnosis: Less than 1 second

BC:DTC P0345 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 2)

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0340. <Ref. to GD(H4DOTC)-118, DTC P0340 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

BD:DTC P0410 SECONDARY AIR INJECTION SYSTEM

1. OUTLINE OF DIAGNOSIS

Detect NG judging from secondary air delivery pipe pressure, pulse of secondary air delivery pipe pressure and secondary air pipe airflow amount.

2. ENABLE CONDITION

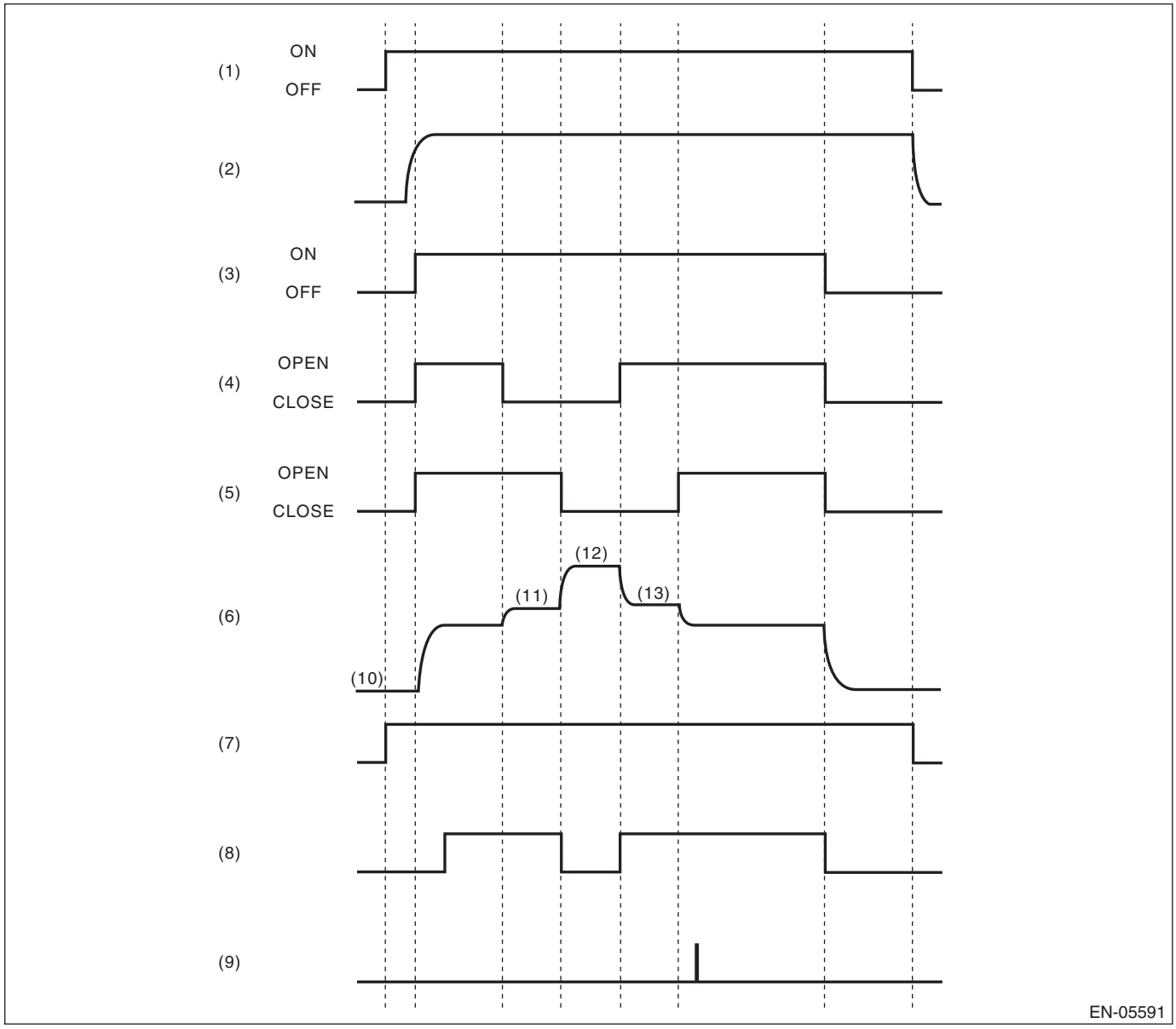
Secondary Parameters	Enable Conditions
Pump supply pressure check	
Estimate ambient temperature	≥ 4.4 °C
Battery voltage	≥ 10.9 V
Barometric pressure	≥ 75 kPa (563 mmHg, 22.2 inHg)
Engine	In operation
Amount of intake air	≥ 2 g/s (0.07 oz/s)
Secondary air pump	Operating
Combination valve	Bank open (Except with both banks closed)
Combination valve one side closed pulse diagnosis	
Estimate ambient temperature	≥ 4.4 °C
Battery voltage	≥ 10.9 V
Barometric pressure	≥ 75 kPa (563 mmHg, 22.2 inHg)
Engine	In operation
Feasible area for diagnosis	Value of Map 10 ≥ 1
After fuel cut	≥ 0 ms
Combination valve both closed pulse diagnosis	
Estimate ambient temperature	≥ 4.4 °C
Battery voltage	≥ 10.9 V
Barometric pressure	≥ 75 kPa (563 mmHg, 22.2 inHg)
Engine	In operation
Engine load	≥ 0.2 g/rev (0.01 oz/rev)
After fuel cut	≥ 1000 ms
Combination valve changeover pressure diagnosis	
Estimate ambient temperature	≥ 4.4 °C
Battery voltage	≥ 10.9 V
Barometric pressure	≥ 75 kPa (563 mmHg, 22.2 inHg)
Engine	In operation
Amount of intake air	> 2 g/s (0.07 oz/s) and < 25 g/s (0.88 oz/s)
Engine speed	< 4000 rpm
After fuel cut	≥ 1000 ms
Overflow diagnosis	
Estimate ambient temperature	≥ 4.4 °C
Battery voltage	≥ 10.9 V
Barometric pressure	≥ 75 kPa (563 mmHg, 22.2 inHg)
Engine	In operation

3. GENERAL DRIVING CYCLE

Perform diagnosis during secondary air pump operation

4. DIAGNOSTIC METHOD

Measure secondary air delivery pipe pressure, pulse of secondary air delivery pipe pressure and secondary air pipe airflow amount.



(1) IG
(2) Ne
(3) Secondary air pump operating status
(4) E-COMB valve (right hand) status
(5) E-COMB valve (left hand) status
(6) Secondary air delivery pipe pressure (psi)
(7) Diagnosis enable condition
(8) Pump supply pressure check (judgment)
(9) Flow amount check (judgment)
(10) Barometric pressure (Pas) measurement before secondary air control
(11) Right bank all closed pressure (P0R) measurement
(12) Both banks all closed pressure (P0RL) measurement
(13) Left bank all closed pressure (P0L) measurement

Pump supply pressure check

Perform the system function diagnosis with how much the pressure rises when the secondary air pump is turned from OFF to ON.
Judge as NG if delivery pipe pressure does not rise though it should when the secondary air pump turns OFF → ON.

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
Secondary air supply pipe pressure (after barometric pressure compensation)	< 0.9 kPa (7 mmHg, 0.3 inHg)	P0410

Time Needed for Diagnosis: 2000 ms + 2800 ms
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
Secondary air supply pipe pressure (after barometric pressure compensation)	≥ 0.9 kPa (7 mmHg, 0.3 inHg)	P0410

Time Needed for Diagnosis: 2000 ms + 2800 ms

Combination valve one side closed pulse diagnosis

Perform close stuck diagnosis of the LH combination valve using delivery pipe pressure pulse when the RH combination valve is closed.
Calculate the voltage pulse of the pump delivery pipe pressure when the RH combination valve is closed and the LH combination valve is open. The calculation of delivery pipe pressure should be large when the LH combination valve is open. Judge that the LH combination valve is close stuck if the calculation is small.

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
Pulse calculated value when the RH combination valve is closed	< Value of Map 1	P2443

Time Needed for Diagnosis: 4000 ms + 992 ms + 992 ms + 992 ms
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
Pulse calculated value when the RH combination valve is closed	≥ Value of Map 1	P2443

Time Needed for Diagnosis: 4000 ms + 992 ms + 992 ms + 992 ms
Perform close stuck diagnosis of the RH combination valve using delivery pipe pressure pulse when the LH combination valve is closed.
Calculate the voltage pulse of the pump delivery pipe pressure when the LH combination valve is closed and the RH combination valve is open. The calculation of delivery pipe pressure should be large when the RH combination valve is open. Judge that the RH combination valve is close stuck if the calculation is small.

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
Pulse calculated value when the LH combination valve is closed	< Value of Map 2	P2441

Time Needed for Diagnosis: 4000 ms + 992 ms + 992 ms + 992 ms
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
Pulse calculated value when the LH combination valve is closed	≥ Value of Map 2	P2441

Time Needed for Diagnosis: 4000 ms + 992 ms + 992 ms + 992 ms

Combination valve both closed pulse diagnosis

Perform open stuck diagnosis of both combination valves using delivery pipe pressure pulse when both combination valves are closed. Determine which side of valves is stuck open by comparing secondary air flow amount when RH combination valve is closed with that when LH combination valve is closed.
Calculate voltage pulse of the pump delivery pipe pressure when both combination valves are closed. The calculation should be small because there is no pulse from supply pipe pressure with both combination valves closed. When the calculation is large, determine that either of the combination valves is stuck open. Determine which side of valves is stuck open by comparing secondary air flow amount when the RH combination valve is closed with that when the LH combination valve is closed. Air flow amount is larger on the open stuck valve.

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
Pulse calculation value when both combination valves are closed	> Value from Map 3	P2440
Air flow amount when the right bank is closed (value from Map 4)	≥ Air flow amount when the left bank is closed (value from Map 5)	
Pulse calculation value when both combination valves are closed	> Value from Map 3	P2442
Air flow amount when the left bank is closed (value from Map 5)	> Air flow amount when the right bank is closed (value from Map 4)	

Time Needed for Diagnosis: 4000 ms + 992 ms + 992 ms + 992 ms
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
Pulse calculation value when both combination valves are closed	≤ Value from Map 3	P2440, P2442

Time Needed for Diagnosis: 4000 ms + 992 ms + 992 ms + 992 ms

Combination valve changeover pressure diagnosis

Perform the RH combination valve stuck closed diagnosis with the variation of delivery pipe pressure when the RH combination valve turns closed → open.
Delivery pipe pressure should vary when the RH combination valve turns closed → open. When the variation is small, determine that the RH combination valve is stuck closed.

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
Pressure variation value when the RH combination valve is switched	< Value of Map 6	P2441

Time Needed for Diagnosis: 4000 ms + 992 ms + 992 ms + 992 ms
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
Pressure variation value when the RH combination valve is switched	≥ Value of Map 6	P2441

Time Needed for Diagnosis: 4000 ms + 992 ms + 992 ms + 992 ms
Perform the LH combination valve stuck closed diagnosis with the variation of delivery pipe pressure when the LH combination valve turns open → closed.
Delivery pipe pressure should vary when the LH combination valve turns open → closed. When the variation is small, determine that the LH combination valve is stuck closed.

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
Pressure variation value when the LH combination valve is switched	< Value of Map 7	P2443

Time Needed for Diagnosis: 4000 ms + 992 ms + 992 ms + 992 ms
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
Pressure variation value when the LH combination valve is switched	≥ Value of Map 7	P2443

Time Needed for Diagnosis: 4000 ms + 992 ms + 992 ms + 992 ms

Overflow diagnosis

Perform secondary air system flow abnormality diagnosis using both sides of combination valves secondary air amount when both are closed.
Judge as secondary air system flow abnormality either if there is excessive secondary air flow amount with the RH combination valve closed, or if there is excessive secondary air flow amount with the LH combination valve closed.

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
Air flow amount when the right bank is closed (value from Map 4)	> Value of Map 8	P0411
or		
Air flow amount when the left bank is closed (value from Map 5)	> Value of Map 9	
Voltage at P0RL measurement – Voltage at P0R measurement	≤ 4 V	
Voltage at P0RL measurement – Voltage at P0L measurement	≤ 4 V	

P0RL: Both banks all closed pressure
P0R: Right bank all closed pressure
P0L: Left bank all closed pressure

Time Needed for Diagnosis: 4000 ms + 992 ms + 992 ms + 992 ms
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
Air flow amount when the right bank is closed (value from Map 4) or Air flow amount when the left bank is closed (value from Map 5)	≤ Value of Map 8 ≤ Value of Map 9	P0411
Voltage at P0RL measurement – Voltage at P0R measurement	≤ 4 V	
Voltage at P0RL measurement – Voltage at P0L measurement	≤ 4 V	

P0RL: Both banks all closed pressure
P0R: Right bank all closed pressure
P0L: Left bank all closed pressure

Time Needed for Diagnosis: 4000 ms + 992 ms + 992 ms + 992 ms

Map 1

Amount of intake air (g (oz)/s) Engine speed (rpm)	0 (0)	60 (2.12)
0	0	0
10000	0	0
		(V)

Map 2

Amount of intake air (g (oz)/s) Engine speed (rpm)	0 (0)	60 (2.12)
0	0	0
10000	0	0
		(V)

Map 3

Intake air (g (oz)/rev)	0.1 (0)	0.25 (0.01)	0.3 (0.01)	1 (0.04)
Threshold value (V)	13	13	3.25	3.25

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, 20.5)	74.6 (560, 22)	80 (600, 23.6)	85.3 (640, 25.2)	90.6 (680, 26.8)	96 (720, 28.3)	101.3 (760, 29.9)	106.6 (800, 31.5)	112 (840, 33.1)	117.3 (880, 34.6)	122.6 (920, 36.2)	128 (960, 37.8)	133.3 (1000, 39.4)	138.6 (1040, 40.9)	144 (1080, 42.5)	149.3 (1120, 44.1)
69.3 (520, 20.5)	0	200	400	600	800	1000	1200	1400	1600	1800	2000	2200	2400	2400	2400	2400
74.6 (560, 22)	–200	0	200	400	600	800	1000	1200	1400	1600	1800	2000	2200	2400	2400	2400
80 (600, 23.6)	–400	–200	0	200	400	600	800	1000	1200	1400	1600	1800	2000	2200	2400	2400
85.3 (640, 25.2)	–600	–400	–200	0	200	400	600	800	1000	1200	1400	1600	1800	2000	2200	2400
90.6 (680, 26.8)	–800	–600	–400	–200	0	200	400	600	800	1000	1200	1400	1600	1800	2000	2200
96 (720, 28.3)	–1000	–800	–600	–400	–200	0	200	400	600	800	1000	1200	1400	1600	1800	2000
101.3 (760, 29.9)	–1200	–1000	–800	–600	–400	–200	0	200	400	600	800	1000	1200	1400	1600	1800
106.6 (800, 31.5)	–1400	–1200	–1000	–800	–600	–400	–200	0	200	400	600	800	1000	1200	1400	1600
112 (840, 33.1)	–1600	–1400	–1200	–1000	–800	–600	–400	–200	0	200	400	600	800	1000	1200	1400
117.3 (880, 34.6)	–1800	–1600	–1400	–1200	–1000	–800	–600	–400	–200	0	200	400	600	800	1000	1200
122.6 (920, 36.2)	–2000	–1800	–1600	–1400	–1200	–1000	–800	–600	–400	–200	0	200	400	600	800	1000
128 (960, 37.8)	–2200	–2000	–1800	–1600	–1400	–1200	–1000	–800	–600	–400	–200	0	200	400	600	800
133.3 (1000, 39.4)	–2400	–2200	–2000	–1800	–1600	–1400	–1200	–1000	–800	–600	–400	–200	0	200	400	600
138.6 (1040, 40.9)	–2400	–2400	–2200	–2000	–1800	–1600	–1400	–1200	–1000	–800	–600	–400	–200	0	200	400
144 (1080, 42.5)	–2400	–2400	–2400	–2200	–2000	–1800	–1600	–1400	–1200	–1000	–800	–600	–400	–200	0	200
149.3 (1120, 44.1)	–2400	–2400	–2400	–2400	–2200	–2000	–1800	–1600	–1400	–1200	–1000	–800	–600	–400	–200	0
																(L/min)

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, 20.5)	74.6 (560, 22)	80 (600, 23.6)	85.3 (640, 25.2)	90.6 (680, 26.8)	96 (720, 28.3)	101.3 (760, 29.9)	106.6 (800, 31.5)	112 (840, 33.1)	117.3 (880, 34.6)	122.6 (920, 36.2)	128 (960, 37.8)	133.3 (1000, 39.4)	138.6 (1040, 40.9)	144 (1080, 42.5)	149.3 (1120, 44.1)
69.3 (520, 20.5)	0	200	400	600	800	1000	1200	1400	1600	1800	2000	2200	2400	2400	2400	2400
74.6 (560, 22)	–200	0	200	400	600	800	1000	1200	1400	1600	1800	2000	2200	2400	2400	2400
80 (600, 23.6)	–400	–200	0	200	400	600	800	1000	1200	1400	1600	1800	2000	2200	2400	2400
85.3 (640, 25.2)	–600	–400	–200	0	200	400	600	800	1000	1200	1400	1600	1800	2000	2200	2400
90.6 (680, 26.8)	–800	–600	–400	–200	0	200	400	600	800	1000	1200	1400	1600	1800	2000	2200
96 (720, 28.3)	–1000	–800	–600	–400	–200	0	200	400	600	800	1000	1200	1400	1600	1800	2000
101.3 (760, 29.9)	–1200	–1000	–800	–600	–400	–200	0	200	400	600	800	1000	1200	1400	1600	1800
106.6 (800, 31.5)	–1400	–1200	–1000	–800	–600	–400	–200	0	200	400	600	800	1000	1200	1400	1600
112 (840, 33.1)	–1600	–1400	–1200	–1000	–800	–600	–400	–200	0	200	400	600	800	1000	1200	1400
117.3 (880, 34.6)	–1800	–1600	–1400	–1200	–1000	–800	–600	–400	–200	0	200	400	600	800	1000	1200
122.6 (920, 36.2)	–2000	–1800	–1600	–1400	–1200	–1000	–800	–600	–400	–200	0	200	400	600	800	1000
128 (960, 37.8)	–2200	–2000	–1800	–1600	–1400	–1200	–1000	–800	–600	–400	–200	0	200	400	600	800
133.3 (1000, 39.4)	–2400	–2200	–2000	–1800	–1600	–1400	–1200	–1000	–800	–600	–400	–200	0	200	400	600
138.6 (1040, 40.9)	–2400	–2400	–2200	–2000	–1800	–1600	–1400	–1200	–1000	–800	–600	–400	–200	0	200	400
144 (1080, 42.5)	–2400	–2400	–2400	–2200	–2000	–1800	–1600	–1400	–1200	–1000	–800	–600	–400	–200	0	200
149.3 (1120, 44.1)	–2400	–2400	–2400	–2400	–2200	–2000	–1800	–1600	–1400	–1200	–1000	–800	–600	–400	–200	0
																(L/min)

Map 6

Amount of intake air when RH comb. valve switches (g (oz)/s) Battery voltage when RH comb. valve switches (V)	10 (0.35)	15 (0.53)	20 (0.71)	25 (0.88)	26 (0.92)
11	0.025	0.025	0.025	0.005	0
12	0.035	0.035	0.035	0.015	0
13	0.05	0.05	0.05	0.025	0
14	0.05	0.05	0.05	0.025	0
					(V)

Map 7

Amount of intake air when LH comb. valve switches (g (oz)/s) Battery voltage when LH comb. valve switches (V)	10 (0.35)	15 (0.53)	20 (0.71)	25 (0.88)	26 (0.92)
11	0.025	0.025	0.025	0.005	0
12	0.035	0.035	0.035	0.015	0
13	0.05	0.05	0.05	0.025	0
14	0.05	0.05	0.05	0.025	0
					(V)

Map 8

Amount of intake air when P0R is measuring (g (oz)/s) Battery voltage when P0R measuring (V)	2 (0.07)	25 (0.88)
11.5	345	345
12.5	345	345
13.5	345	345
14.5	390	390
15.5	420	420
		(L/min)

Map 9

Amount of intake air when P0L is measuring (g (oz)/s) Battery voltage when P0L measuring (V)	2 (0.07)	25 (0.88)
11.5	345	345
12.5	345	345
13.5	345	345
14.5	390	390
15.5	420	420
		(L/min)

Map 10

Amount of intake air (g (oz)/s) Engine speed (rpm)	0 (0)	60 (2.12)
500	0	0
5000	0	0

BE:DTC P0411 SECONDARY AIR INJECTION SYSTEM INCORRECT FLOW DETECTED

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0410. <Ref. to GD(H4DOTC)-121, DTC P0410 SECONDARY AIR INJECTION SYSTEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

BF: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**

If the duration of time while the following conditions are met is longer than the time indicated, judge 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: 2500 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Ignition	ON
Terminal output voltage when ECM outputs OFF signal	HIGH

Time Needed for Diagnosis: Less than 1 second

BG: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**

If the duration of time while the following conditions are met is longer than the time indicated, judge 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: 2500 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Ignition	ON
Terminal output voltage when ECM outputs ON signal	LOW

Time Needed for Diagnosis: Less than 1 second

BH:DTC P0416 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “B” CIRCUIT OPEN

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0413. <Ref. to GD(H4DOTC)-132, DTC P0413 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “A” CIRCUIT OPEN, Diagnostic Trouble Code (DTC) Detecting Criteria.>

BI: DTC P0417 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “B” CIRCUIT SHORTED

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0414. <Ref. to GD(H4DOTC)-133, DTC P0414 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “A” CIRCUIT SHORTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

BJ:DTC P0418 SECONDARY AIR INJECTION SYSTEM CONTROL "A" CIRCUIT

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

If the duration of time while the following conditions are met is longer than the time indicated, judge 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: 2500 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Ignition	ON
Terminal output voltage when ECM outputs OFF signal	HIGH

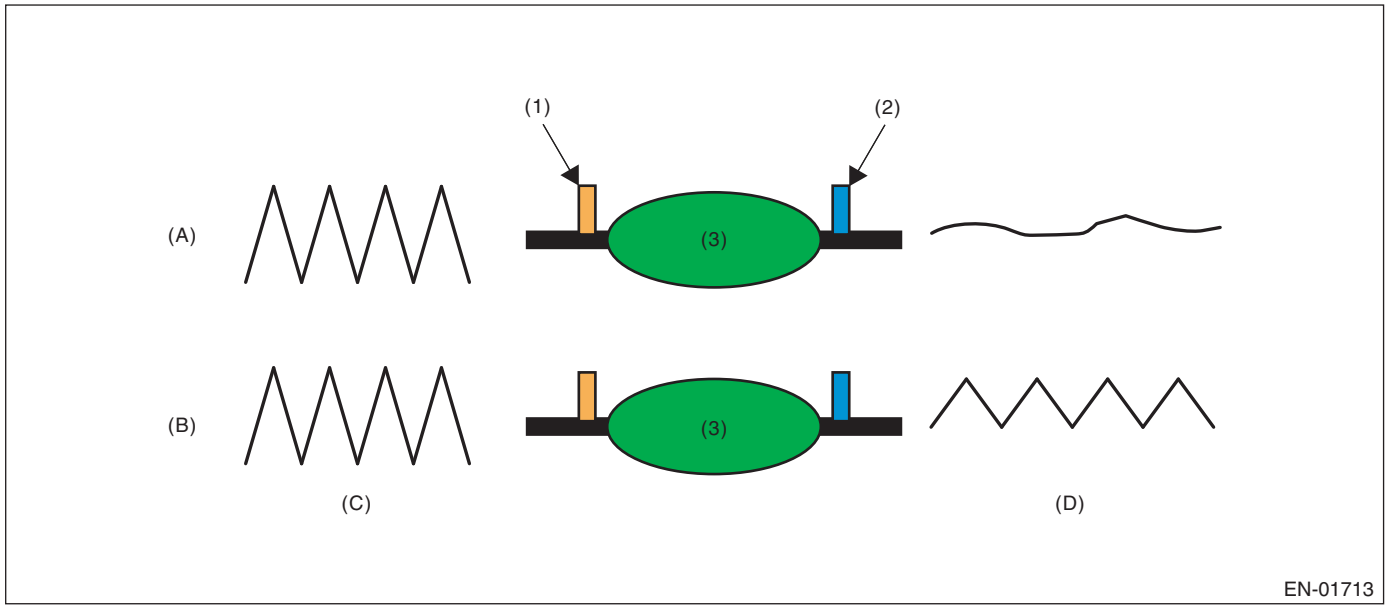
Time Needed for Diagnosis: Less than 1 second

BK:DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect the deterioration of the catalyst 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



(A) Normal
(B) Deterioration
(C) Output waveform from the front oxygen (A/F) sensor
(D) Output waveform from the rear oxygen Sensor
(1) Front oxygen (A/F) sensor
(2) Front oxygen sensor
(3) Catalytic converter

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Atmospheric pressure	≥ 75 kPa (563 mmHg, 22.2 inHg)
Engine coolant temperature	≥ 70 °C (158 °F)
Estimated catalyst temperature	≥ 460 °C (860 °F)
Misfire detection every 200 rotations	< 5 time(s)
Learning value of evaporation gas density	< 0.2
Sub feedback	In operation
Evaporative system diagnosis	Not in operation
Time of difference (< 0.10) between actual lambda and target lambda	≥ 1000 ms
Vehicle speed	> 60 km/h (37.3 MPH)
Amount of intake air	≥ 7 g/s (0.25 oz/s) and < 50 g/s (1.76 oz/s)
Engine load change every 0.5 engine revs.	< 0.02 g/rev (0 oz/rev)
Rear oxygen output change from 660 mV or less to 660 mV or more	Experienced after fuel cut
Elapsed time after starting the engine	≥ 230 second
Purge execution calculated time	≥ 5 s

4. GENERAL DRIVING CYCLE

Perform the diagnosis only once at a constant 60 km/h (37.3 MPH) or higher.

5. DIAGNOSTIC METHOD

After the enable conditions have been established, calculate the front oxygen (A/F) sensor lambda value deviation sum value (Σ |(sglmd$_n$ – sglmd$_{n-1}$)|), and rear oxygen sensor output voltage deviation sum value (Σ |(ro2sad$_n$ – ro2sad$_{n-1}$)|) in every 32 ms × 4 times. If the front oxygen (A/F) sensor lambda value deviation sum value (Σ |(sglmd$_n$ – sglmd$_{n-1}$)|) is the predetermined value or more, calculate the judgment value.

• Abnormality Judgment

If the duration of time while the following conditions are met is within the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Σ |(ro2sad$_n$ – ro2sad$_{n-1}$)| / Σ |(sglmd$_n$ – sglmd$_{n-1}$)|	> 8.75

Time Needed for Diagnosis: 30 — 55 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is within the predetermined time.

Judgment Value

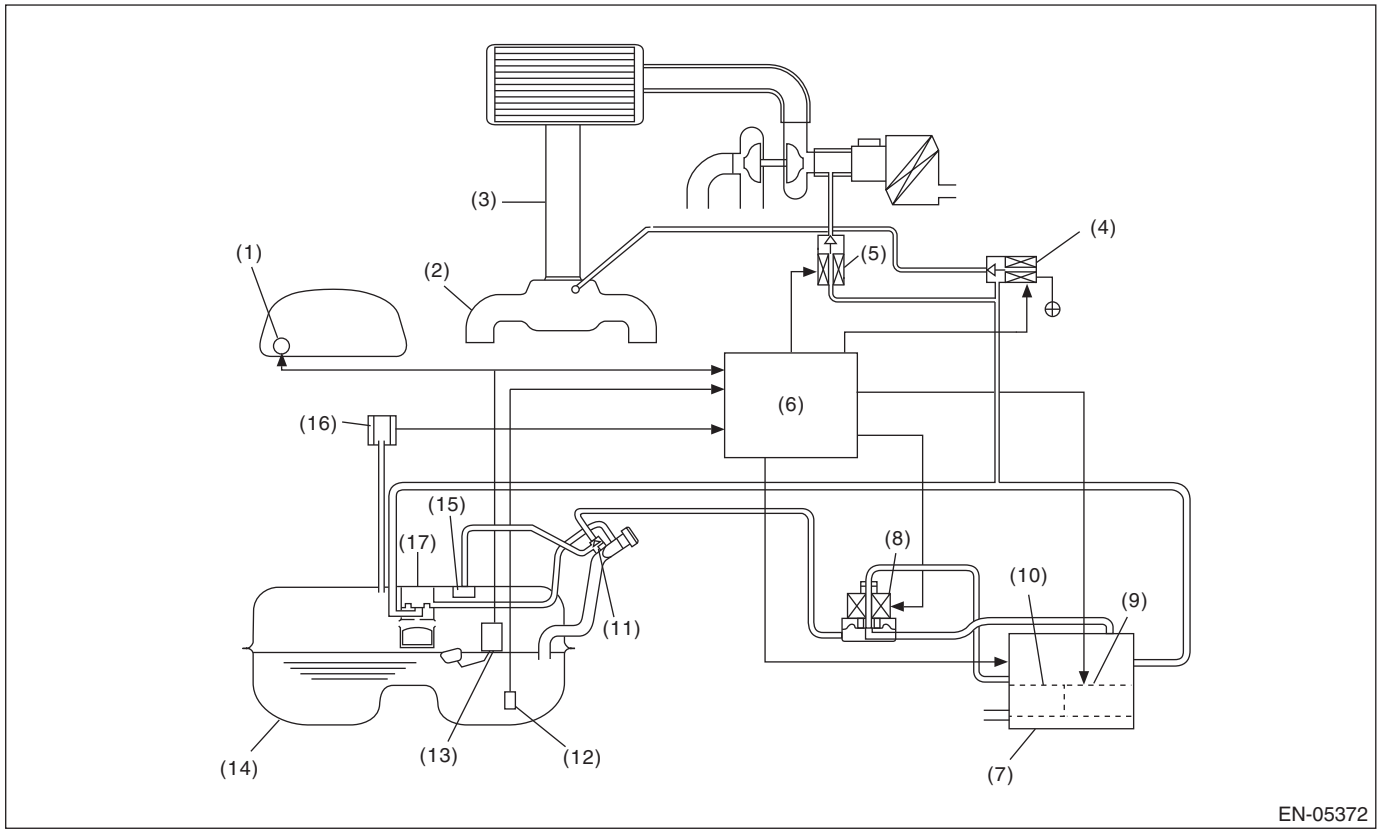
Malfunction Criteria	Threshold Value
Σ |(ro2sad$_n$ – ro2sad$_{n-1}$)| / Σ |(sglmd$_n$ – sglmd$_{n-1}$)|	≤ 8.75

Time Needed for Diagnosis: 30 — 55 seconds

BL:DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK)

1. OUTLINE OF DIAGNOSIS

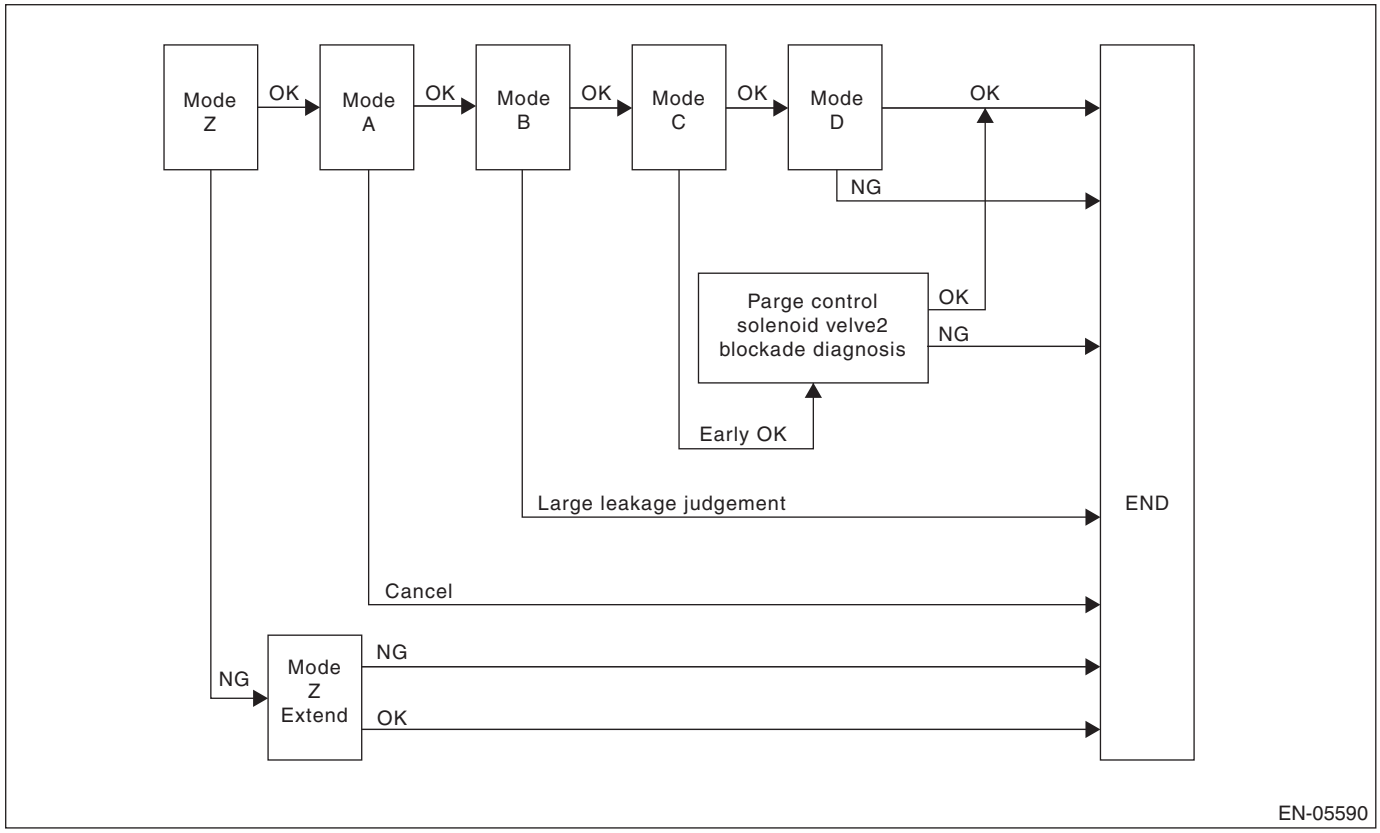
Check if there is a leakage in fuel system or not, and perform the function diagnosis of valve.



(1)	Fuel gauge	(7)	Canister	(13)	Fuel level sensor
(2)	Intake manifold	(8)	Pressure control solenoid valve	(14)	Fuel tank
(3)	Throttle body	(9)	Drain valve	(15)	Fuel cut valve
(4)	Purge control solenoid valve	(10)	Drain filter	(16)	Fuel tank pressure sensor
(5)	Purge control solenoid valve 2	(11)	Shut-off valve	(17)	Vent valve
(6)	Engine control module (ECM)	(12)	Fuel temperature sensor		

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.

0.04-inch Diagnosis

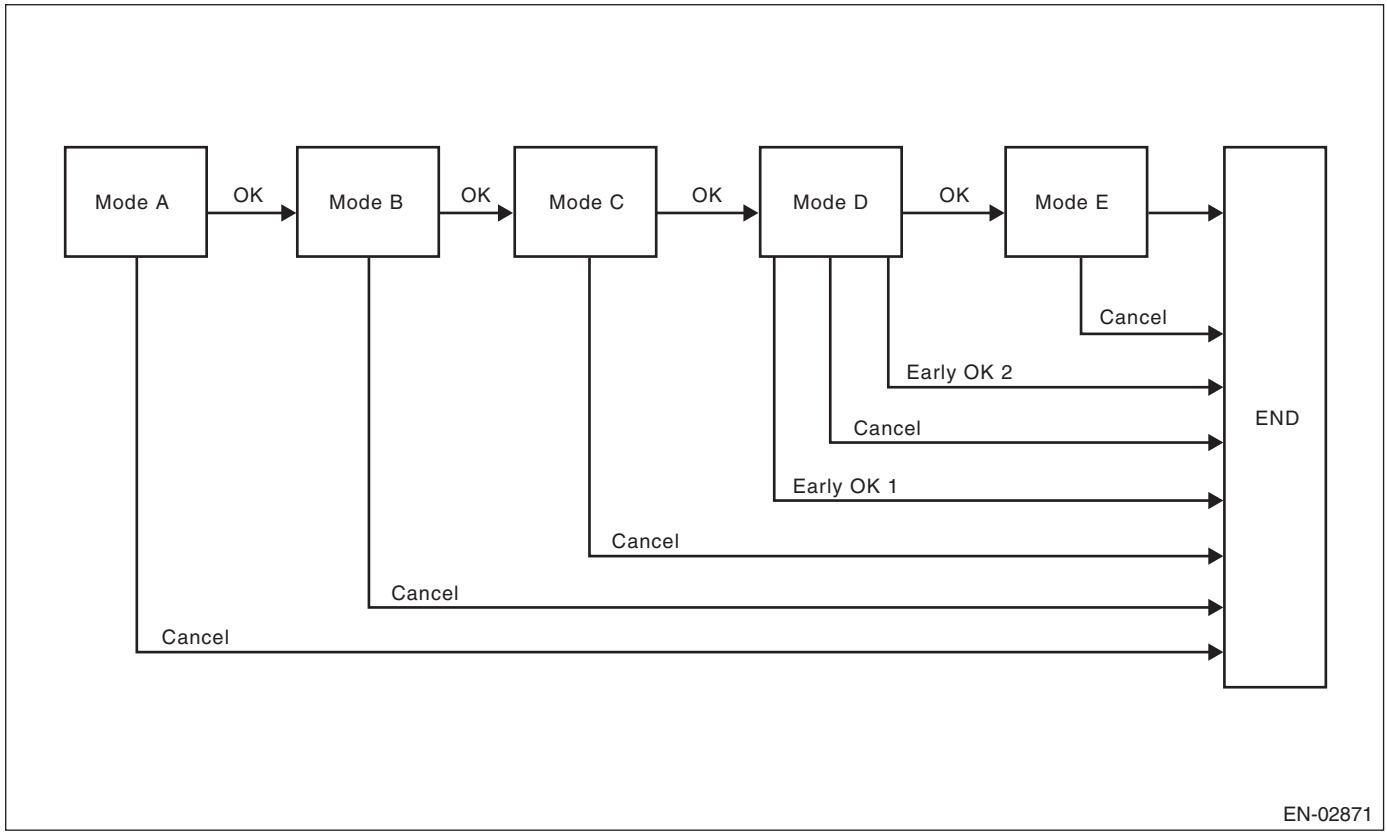


Mode	Mode Description	Diagnosis Period
Mode Z (Purge control solenoid valve opening failure diagnosis)	Perform purge control solenoid valve opening failure diagnosis from the size of tank pressure variation from diagnosis start.	0 ms + 3000 ms — 0 ms + 3000 ms + 13000 ms
Mode A (Estimated evaporation amount)	Calculate the tank pressure change amount (P1).	10000 ms
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.	0 — 10000 ms + 25000 ms
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.	0 — 18600 ms
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.	0 ms + 10000 ms

Mode Table for Evaporative Emission Control System Diagnosis

Mode	Behavior of tank internal pressure under normal conditions	Diagnostic item	DTC
Mode Z	Roughly the same as barometric 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.	—	None
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



Mode	Mode Description	Diagnosis Period
Mode A (0 point compensation)	When the pressure in the tank is not near 0 mmHg, wait until it returns to 0 point (near 0 mmHg).	0 — Value of Map 1
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 — Value of Map 2
Mode C (Negative pressure maintained)	Wait until the tank pressure returns to the target (start level of P2 calculation).	0 — 22820 ms + 0 + Value from Map 2
Mode D (Negative pressure change calculated)	Calculate the time it takes for the tank pressure to change to the Mode E shifting pressure. If the tank pressure does not change to the Mode E shifting pressure, make advanced OK judgment.	0 — 0 ms + 200000 ms
Mode E (Evaporation generated amount calculation)	Calculate the amount of evaporation (P1).	0 — 0 ms + 200000 ms + Value from Map 3

MAP 1

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
Time Needed for Diagnosis (ms)	13800	13800	11400	9000	7000	5000	5000

MAP 2

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
Time Needed for Diagnosis (ms)	19520	19520	19850	20180	19975	19770	19770

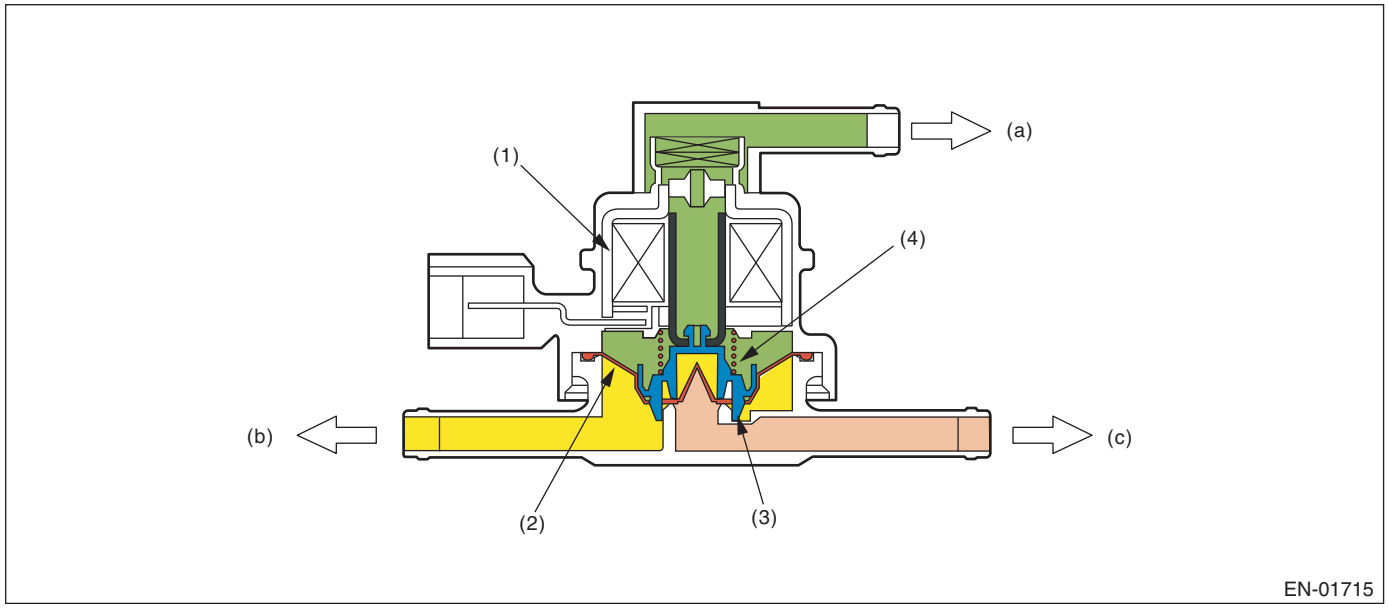
Map 3

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
Time Needed for Diagnosis (ms)	80000	80000	70000	60000	60000	60000	60000

2. COMPONENT DESCRIPTION

Pressure control solenoid valve

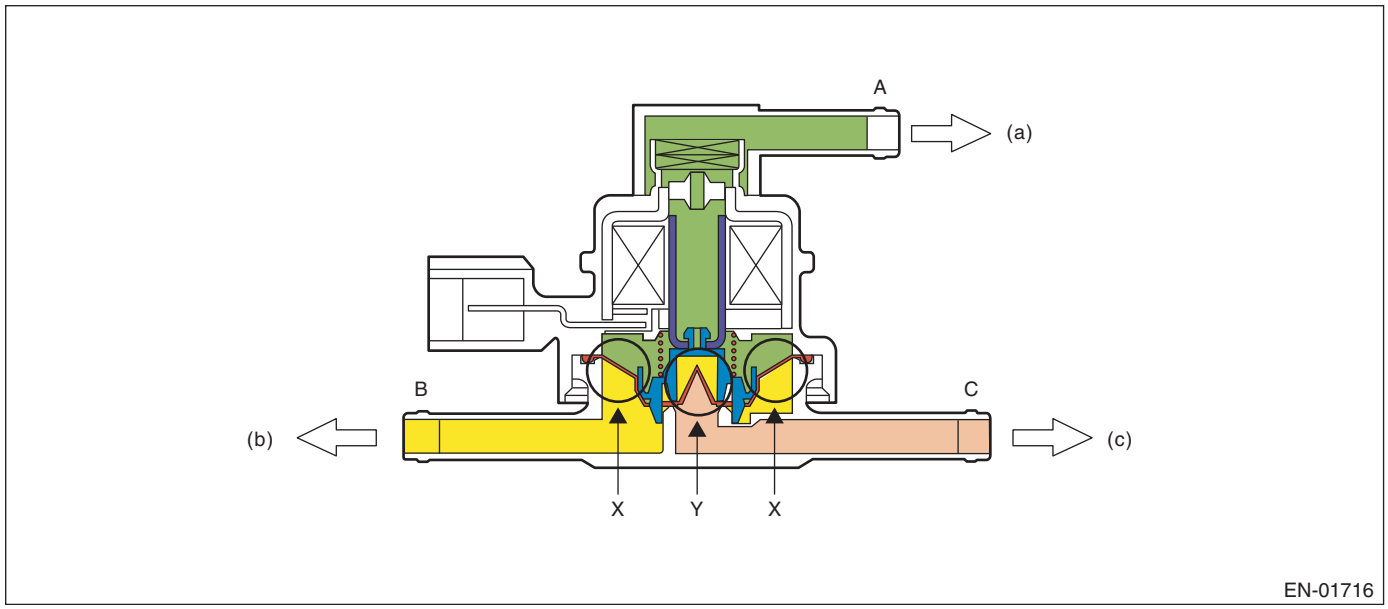
PCV controls the fuel tank pressure to be equal to the atmospheric air pressure. Normally, the solenoid is set to OFF. The valve opens and closes mechanically in accordance with the pressure difference between tank and atmospheric air, or tank and canister.
The valve is forcibly opened by setting the solenoid to ON at the time of diagnosis.



(a)	Barometric pressure	(b)	Fuel tank	(c)	Canister
(1)	Solenoid	(3)	Valve	(4)	Spring
(2)	Diaphragm				

Valve Operation and Air Flow

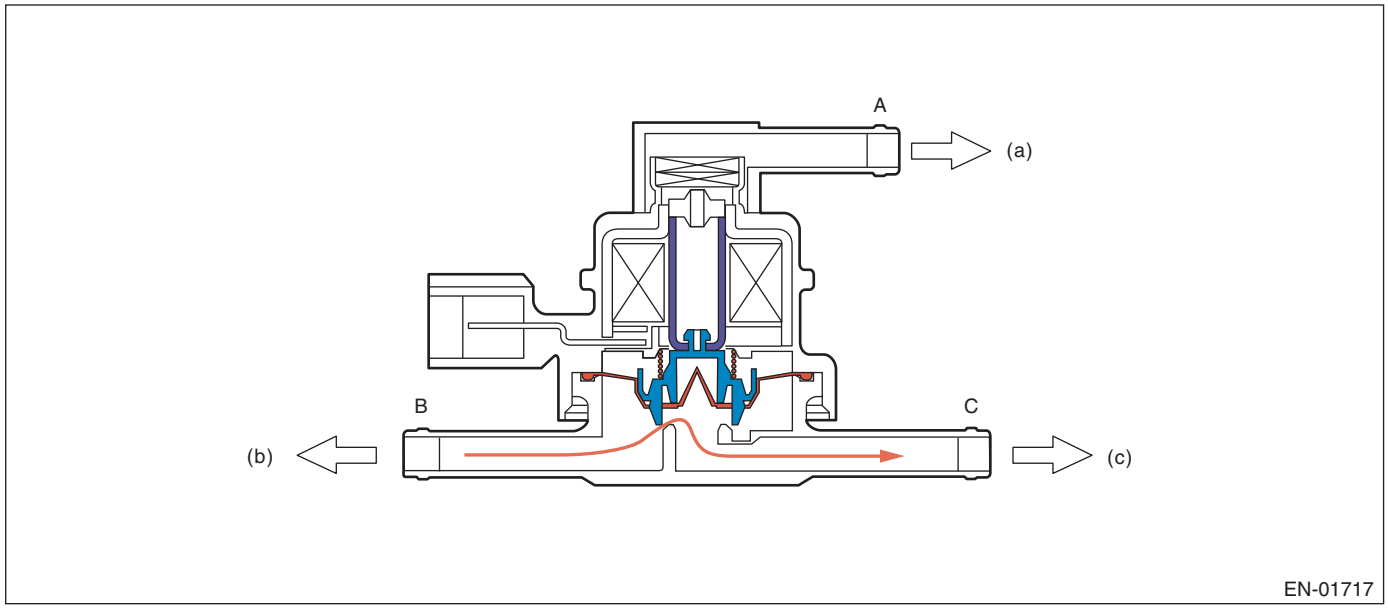
In the figure below, divided by the diaphragm, the part above X is charged with atmospheric air pressure, and the part below X is charged with tank pressure. Also, the part above Y is charged with tank pressure, and the part below Y is charged with canister pressure.
If the atmospheric air pressure port 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.



(a) Barometric pressure (b) Fuel tank (c) Canister

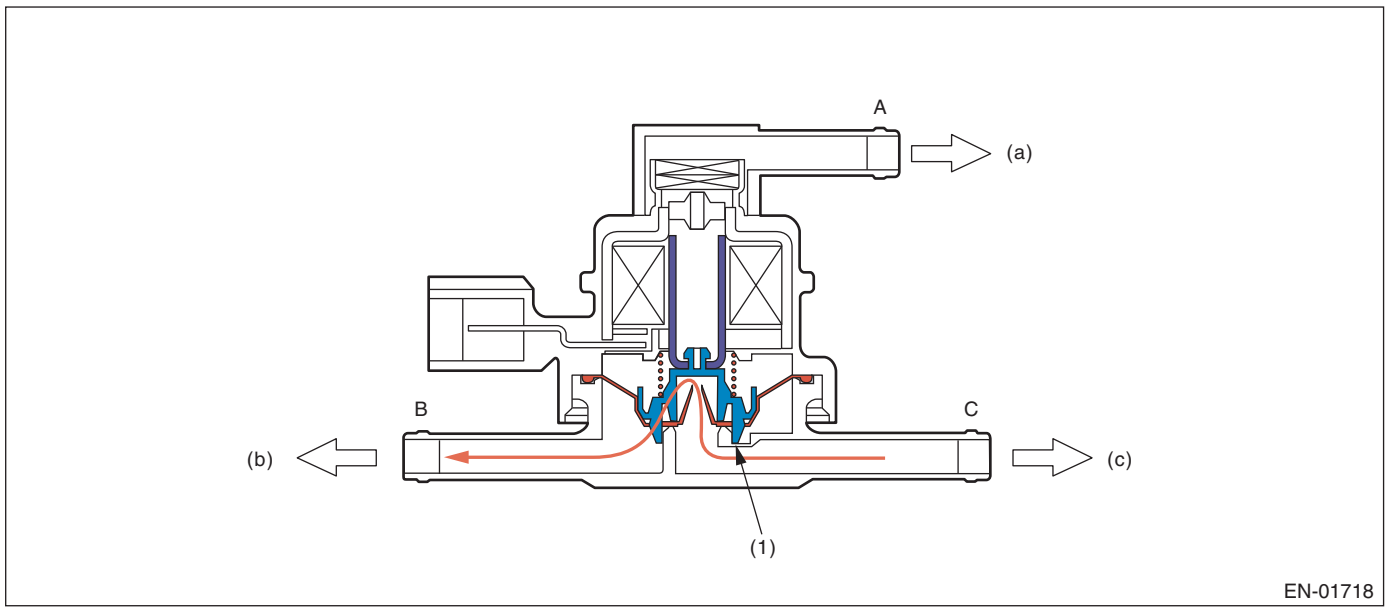
Condition of pressure	Flow
A < B (solenoid OFF)	B → C
B < C (solenoid OFF)	C → B
Solenoid ON	B ←→ C

When A < B (solenoid OFF)



(a) Barometric pressure (b) Fuel tank (c) Canister

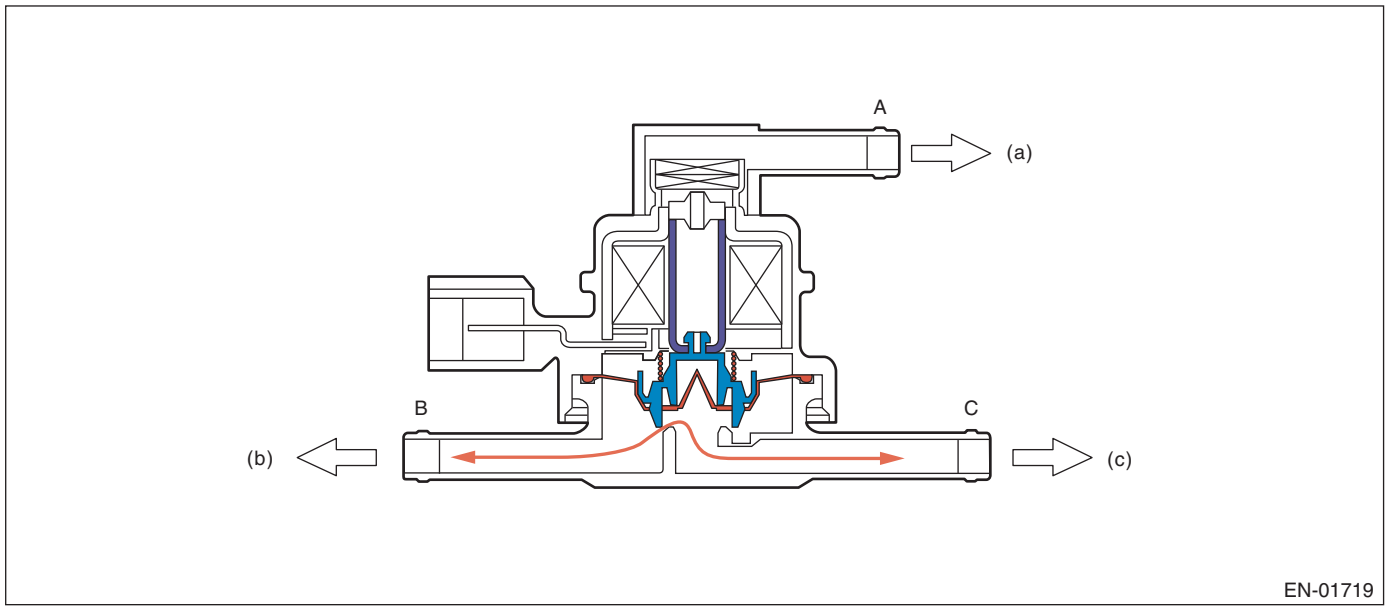
When B < C (solenoid OFF)



(a) Barometric pressure (b) Fuel tank (c) Canister

(1) Valve

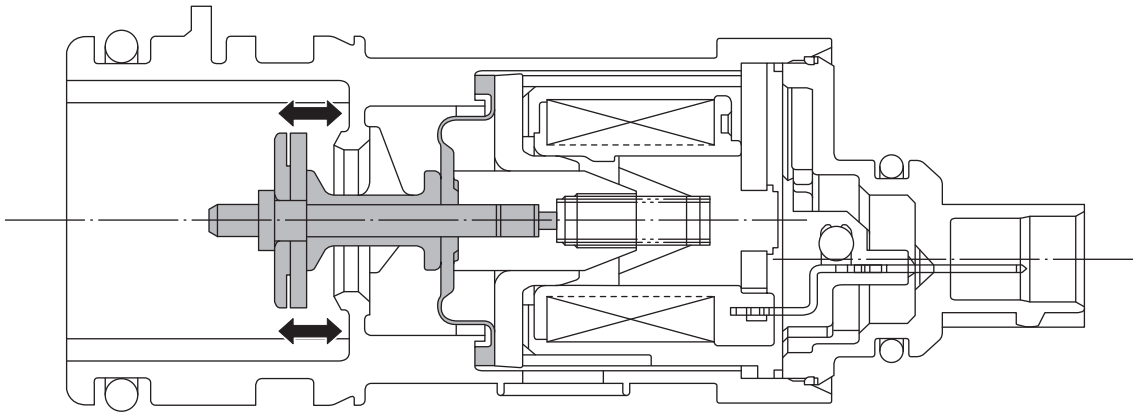
When Solenoid is ON



(a) Barometric pressure (b) Fuel tank (c) Canister

Drain valve

Drain valve controls the ambient air to be introduced to the canister.



3. ENABLE CONDITION

0.04-inch Diagnosis

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Barometric pressure	≥ 75 kPa (563 mmHg, 22.2 inHg)
Total time of canister purge operation	≥ 120000 ms
Elapsed time after starting the engine	≥ 856 s
Learning value of evaporation gas density	< 0.08
Engine speed	1050 rpm — 6500 rpm
Fuel tank pressure	≥ –4 kPa (–30 mmHg, –1.2 inHg)
Intake manifold relative vacuum (relative pressure)	≥ – 13.3 kPa (– 100 mmHg, – 3.9 inHg)
Vehicle speed	≥ 32 km/h (19.9 MPH)
Fuel level	9.6 ℓ (2.54 US gal, 2.11 Imp gal) — 54.4 ℓ (14.37 US gal, 11.97 Imp gal)
Closed air/fuel ratio control	In operation
Fuel temperature	–10 °C (14 °F) — 45 °C (113 °F)
Intake air temperature	≥ –10 °C (14 °F)
Pressure change every one second	< 1.7 mmHg (Mode A)
	< 1.7 mmHg (Mode D)
Minimum pressure change value every one second – Maximum pressure change value every one second	< 1.7 mmHg (Mode A)
	< 1.7 mmHg (Mode D)
Change of fuel level per 128 milliseconds	< 3 ℓ (0.79 US gal, 0.66 Imp gal)
Air fuel ratio	0.76 — 1.25

0.02-inch Diagnosis

Secondary Parameters	Enable Conditions
At starting a diagnosis	
Evap. diagnosis	Incomplete
Battery voltage	≥ 10.9 V
Barometric pressure	≥ 75 kPa (563 mmHg, 22.2 inHg)
Time since last incomplete 0.02-inch leakage diagnosis	
When cancelling in mode A	> 120000 ms
When cancelling in other than mode A	> 240000 ms
Total time of canister purge operation	≥ 120000 ms
Elapsed time after starting the engine	≥ 120 s
Fuel temperature	–10 °C (14 °F) — 55 °C (131 °F)
Fuel level	9.6 ℓ (2.54 US gal, 2.11 Imp gal) — 54.4 ℓ (14.37 US gal, 11.97 Imp gal)
Intake manifold relative vacuum (relative pressure)	≥ – 13.3 kPa (– 100 mmHg, – 3.9 inHg)
Fuel tank pressure	–0.7 kPa (–5 mmHg, –0.2 inHg) — 1.4 kPa (10.7 mmHg, 0.4 inHg)
Vehicle speed	50 km/h (31.1 MPH) — 510 km/h (316.9 MPH) continues for 125000 ms
Closed air/fuel ratio control	In operation
Engine speed	1050 rpm — 6000 rpm
During diagnosis	
Change of fuel level	≤ Value of Map 4
Pressure change every one second	< 0.1 kPa (0.44 mmHg, 0 inHg)
Minimum pressure change value every one second – Maximum pressure change value every one second	< 0.1 kPa (0.51 mmHg, 0 inHg) (Mode D)
| Pressure change in tank every second |	≤ 0.1 kPa (0.75 mmHg, 0 inHg)
Barometric pressure change	–0.5 kPa (–3.6 mmHg, –0.1 inHg) — 0.3 kPa (2.4 mmHg, 0.1 inHg) (Mode D) –0.3 kPa (–2.4 mmHg, –0.1 inHg) — 0.3 kPa (2.4 mmHg, 0.1 inHg) (Mode E)

MAP 4

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)	5, 1.32, 1.1	5, 1.32, 1.1	5, 1.32, 1.1	5, 1.32, 1.1	5, 1.32, 1.1	5, 1.32, 1.1	5, 1.32, 1.1

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 (20 MPH) or more.
- Pay attention to the fuel temperature and fuel level.

0.02-inch Diagnosis

- Perform the diagnosis 125 seconds or more at a constant engine speed of 50 km/h (31 MPH) or higher to judge as NG or OK.
- If judgment cannot be made, repeat the diagnosis.
- Pay attention to the 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.

- **Abnormality Judgment**

If OK judgment cannot be made, extend Mode Z, and Judge as NG when the following conditions are established after predetermined amount of time.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
evptez – evptezha	> 0.9 kPa (6.5 mmHg, 0.3 inHg)	P0457
evptezini	≤ 1.4 kPa (10.7 mmHg, 0.4 inHg)	
Time of 2 ℓ (0.53 US gal, 0.44 Imp gal) or more fuel no sloshing	≥ 40000 ms	

Time Needed for Diagnosis: 0 ms + 3000 ms + 13000 ms

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.

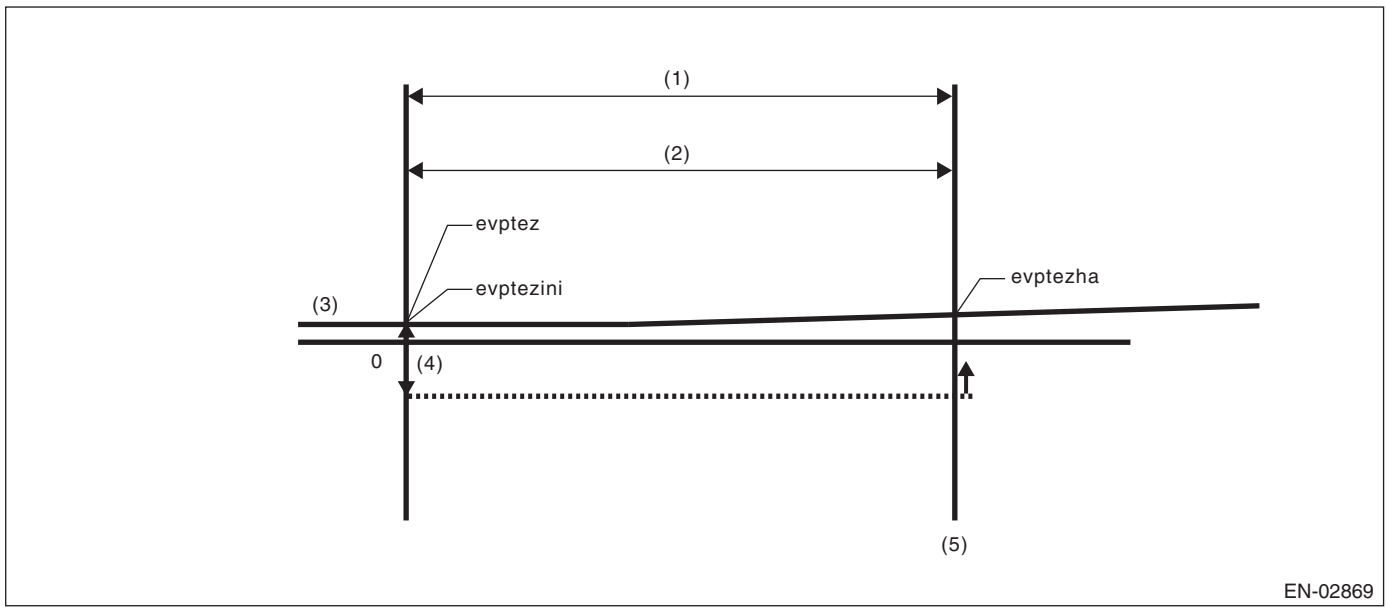
- **Normality Judgment**

Judge as OK and change to Mode A when the following conditions are established after predetermined time has passed since Mode Z started.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
evptez – evptezha	≤ 0.4 kPa (3 mmHg, 0.1 inHg)	P0457

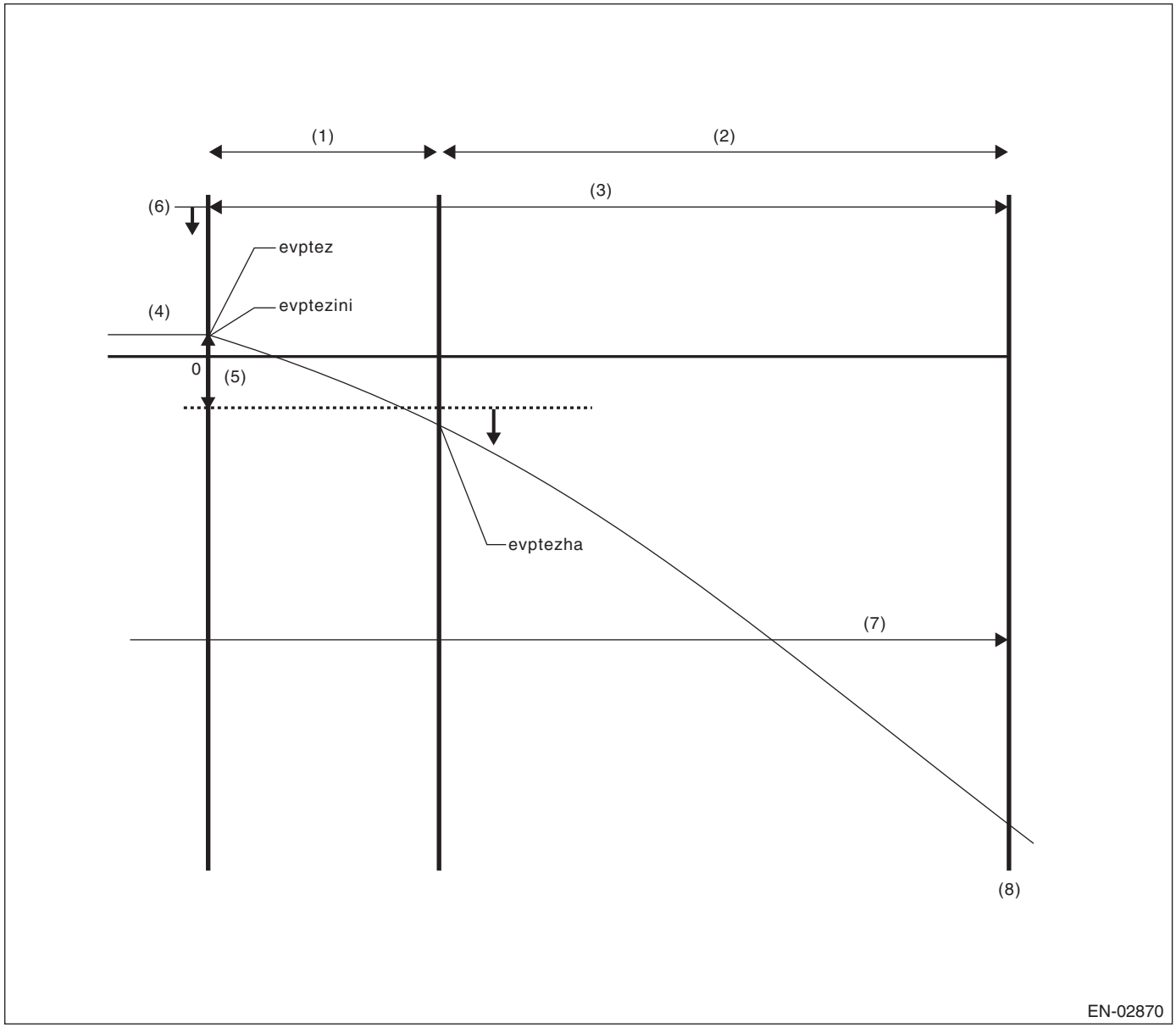
Normal



(1) Mode Z
(2) 3000 ms
(3) Fuel tank pressure
(4) 0.4 kPa (3 mmHg, 0.1 inHg)
(5) OK judgment

evptez – evptezha ≤ 0.4 kPa (3 mmHg, 0.1 inHg) Normal when above is established
Time Needed for Diagnosis: 0 ms + 3000 ms

Purge control solenoid valve Open Fixation



(1)	Mode Z	(4)	Fuel tank pressure	(7)	40000 ms no fuel sloshing
(2)	Extended mode Z	(5)	0.9 kPa (6.5 mmHg, 0.3 inHg)	(8)	NG judgment
(3)	3000 ms + 13000 ms	(6)	1.4 kPa (10.7 mmHg, 0.4 inHg)		

- evptezini ≤ 1.4 kPa (10.7 mmHg, 0.4 inHg)
- evptez – evptezha > 0.9 kPa (6.5 mmHg, 0.3 inHg)
- No fuel sloshing of over 2 ℓ (0.53 US gal, 0.44 Imp gal) lasts for more than 40000 ms.

Judge as abnormal when all are established.

Leak Diagnosis

DTC
P0442 Evaporative Emission Control System Leak Detected (Small Leak)
P0457 Evaporative Emission Control System Leak Detected (Fuel Cap Loose/Off)

- The diagnostic 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 barometric 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.
Approx. 0 → –1.4 kPa (0 → –10.5 mmHg, 0 → –0.4 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 in the system and terminate the evaporative emission control system diagnosis.
Abnormality Judgment
Judge as NG (large leakage) when the following conditions are established.
Judgment Value

Malfunction Criteria	Threshold Value	DTC
Time to reach target negative pressure	≥ 10000 ms + 25000 ms	P0457
or		
Mode B time	≥ 10000 ms	
(Min. pressure value in tank when in mode B) – (Tank pressure when mode B started)	> –0.3 kPa (–2.5 mmHg, –0.1 inHg)	

Time Needed for Diagnosis: 0 ms + 3000 ms + 10000 ms + 10000 ms + 25000 ms
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 advanced 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	Time for advanced OK judgment
–1.4 kPa (–10.5 mmHg, –0.4 inHg)	18600 ms

Time Needed for Diagnosis: 0 ms + 3000 ms + 10000 ms + 10000 ms + 25000 ms + 18600 ms

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 barometric 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.

Abnormality Judgment

Judge as NG when the following conditions are established within the predetermined time. Judge as OK and clear the NG if the following conditions are not established within the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
P2 – 1.5 – × P1 P2: Tank pressure that changes every 10000 ms in mode D P1: Tank pressure that changes every 10000 ms in mode A	> Value of Map 5	P0442

*1.5 –: Evaporation amount compensation value when below negative pressure (Amount of evaporation occurrence increases as a vacuum condition increases.)

Map 5 Malfunction criteria limit for evaporation diagnosis

Fuel temperature vs. Fuel level	25 °C (77 °F)	30 °C (86 °F)	35 °C (95 °F)	40 °C (104 °F)	45 °C (113 °F)
0 ℓ (0 US gal, 0 Imp gal)	0.3 kPa (2.1 mmHg, 0.1 inHg)	0.3 kPa (2.2 mmHg, 0.1 inHg)	0.3 kPa (2.3 mmHg, 0.1 inHg)	0.3 kPa (2.35 mmHg, 0.1 inHg)	0.3 kPa (2.4 mmHg, 0.1 inHg)
10 ℓ (2.64 US gal, 2.2 Imp gal)	0.3 kPa (2.1 mmHg, 0.1 inHg)	0.3 kPa (2.2 mmHg, 0.1 inHg)	0.3 kPa (2.3 mmHg, 0.1 inHg)	0.3 kPa (2.35 mmHg, 0.1 inHg)	0.3 kPa (2.4 mmHg, 0.1 inHg)
20 ℓ (5.28 US gal, 4.4 Imp gal)	0.3 kPa (2.3 mmHg, 0.1 inHg)	0.3 kPa (2.4 mmHg, 0.1 inHg)	0.3 kPa (2.5 mmHg, 0.1 inHg)	0.3 kPa (2.6 mmHg, 0.1 inHg)	0.4 kPa (2.7 mmHg, 0.1 inHg)
30 ℓ (7.93 US gal, 6.6 Imp gal)	0.4 kPa (2.9 mmHg, 0.1 inHg)	0.4 kPa (3.05 mmHg, 0.1 inHg)	0.4 kPa (3.15 mmHg, 0.1 inHg)	0.4 kPa (3.25 mmHg, 0.1 inHg)	0.4 kPa (3.35 mmHg, 0.1 inHg)
40 ℓ (10.57 US gal, 8.8 Imp gal)	0.4 kPa (2.9 mmHg, 0.1 inHg)	0.4 kPa (3.15 mmHg, 0.1 inHg)	0.4 kPa (3.3 mmHg, 0.1 inHg)	0.5 kPa (3.4 mmHg, 0.1 inHg)	0.5 kPa (3.5 mmHg, 0.1 inHg)
50 ℓ (13.21 US gal, 11 Imp gal)	0.4 kPa (3.2 mmHg, 0.1 inHg)	0.4 kPa (3.3 mmHg, 0.1 inHg)	0.5 kPa (3.5 mmHg, 0.1 inHg)	0.5 kPa (3.6 mmHg, 0.1 inHg)	0.5 kPa (3.7 mmHg, 0.1 inHg)
60 ℓ (15.85 US gal, 13.2 Imp gal)	0.4 kPa (3.2 mmHg, 0.1 inHg)	0.4 kPa (3.3 mmHg, 0.1 inHg)	0.5 kPa (3.5 mmHg, 0.1 inHg)	0.5 kPa (3.6 mmHg, 0.1 inHg)	0.5 kPa (3.7 mmHg, 0.1 inHg)

Leak Diagnosis

DTC
P0456 Evaporative Emission Control System Leak Detected (very small leak)

- The diagnostic 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 barometric pressure.
- The diagnosis is divided into the following five phases.

Mode A: (0 point compensation)
When the pressure in the tank is not near 0 mmHg, 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.
Approx. 0 → –2 kPa (0 → –15 mmHg, 0 → –0.6 inHg)
When the pressure above (desired negative pressure) is reached, enters Mode C.
When the tank internal pressure does not reach the target negative 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 predetermined amount of time has passed.
Mode D: (Calculate the amount of negative pressure change)
Monitor the tank pressure in mode D, calculate the pressure change in the tank (P2), and measure the time (evpdset) for the tank pressure to change to the Mode E shifting pressure. When the Mode E shifting pressure is reached, Mode E is entered. If it does not change to the Mode E shifting pressure after the predetermined amount of time has passed, make advanced OK judgment or cancel the diagnosis according to the value of P2.
Normality Judgment
Judge as OK when the following conditions are established.
Judgment Value

Malfunction Criteria	Threshold Value
Advanced OK judgment 1	
Mode D time	≥ 0 ms + 10000 ms
Tank internal pressure	≤ Value of Map 6
Advanced OK judgment 2	
Mode D time	≥ 0 ms + 200000 ms
P2	≤ Value of Map 7

Map 6

Fuel level (ℓ , US gal, Imp gal)	0, 0, 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
Tank pressure (kPa, mmHg, inHgl)	–1.9, –14.62, –0.6	–1.9, –14.62, –0.6	–1.9, –14.59, –0.6	–1.9, –14.56, –0.6	–1.9, –14.42, –0.6	–1.9, –14.28, –0.6	–1.9, –14.28, –0.6

Map 7

Fuel level (ℓ , US gal, Imp gal)	0, 0, 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
Tank pressure (kPa, mmHg, inHgl)	0.9, 7, 0.3	0.9, 7, 0.3	0.9, 7.05, 0.3	0.9, 7.1, 0.3	1.1, 8.2, 0.3	1.3, 9.6, 0.4	1.3, 9.6, 0.4

Mode E: (Evaporation occurrence amount calculation)
Calculate the change of tank pressure with the time evpdset (P1) to judge as NG/OK according to the value of P1. (ambiguous determination acceptable).

- **Abnormality Judgment**

Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
P1	< Value of Map 8

Map 8 Malfunction criteria limit for evaporation diagnosis

Time (evpdset) vs. Fuel level	0 ms	30000 ms	50000 ms	100000 ms	160000 ms	200000 ms
0 ℓ (0 US gal, 0 Imp gal)	0 kPa (0 mmHg, 0 inHg)	0.1 kPa (0.5 mmHg, 0 inHg)	0.2 kPa (1.7 mmHg, 0.1 inHg)	0.4 kPa (2.7 mmHg, 0.1 inHg)	0.4 kPa (2.7 mmHg, 0.1 inHg)	0.4 kPa (2.7 mmHg, 0.1 inHg)
10 ℓ (2.64 US gal, 2.2 Imp gal)	0 kPa (0 mmHg, 0 inHg)	0.1 kPa (0.5 mmHg, 0 inHg)	0.2 kPa (1.7 mmHg, 0.1 inHg)	0.4 kPa (2.7 mmHg, 0.1 inHg)	0.4 kPa (2.7 mmHg, 0.1 inHg)	0.4 kPa (2.7 mmHg, 0.1 inHg)
20 ℓ (5.28 US gal, 4.4 Imp gal)	0 kPa (0 mmHg, 0 inHg)	0.1 kPa (0.5 mmHg, 0 inHg)	0.2 kPa (1.7 mmHg, 0.1 inHg)	0.4 kPa (2.7 mmHg, 0.1 inHg)	0.4 kPa (2.7 mmHg, 0.1 inHg)	0.4 kPa (2.7 mmHg, 0.1 inHg)
30 ℓ (7.93 US gal, 6.6 Imp gal)	0 kPa (0 mmHg, 0 inHg)	0.1 kPa (0.5 mmHg, 0 inHg)	0.2 kPa (1.7 mmHg, 0.1 inHg)	0.4 kPa (2.7 mmHg, 0.1 inHg)	0.4 kPa (2.7 mmHg, 0.1 inHg)	0.4 kPa (2.7 mmHg, 0.1 inHg)
40 ℓ (10.57 US gal, 8.8 Imp gal)	0 kPa (0 mmHg, 0 inHg)	0.1 kPa (0.5 mmHg, 0 inHg)	0.2 kPa (1.85 mmHg, 0.1 inHg)	0.3 kPa (2.5 mmHg, 0.1 inHg)	0.3 kPa (2.5 mmHg, 0.1 inHg)	0.3 kPa (2.5 mmHg, 0.1 inHg)
50 ℓ (13.21 US gal, 11 Imp gal)	0 kPa (0 mmHg, 0 inHg)	0.1 kPa (0.5 mmHg, 0 inHg)	0.3 kPa (2 mmHg, 0.1 inHg)	0.3 kPa (2.3 mmHg, 0.1 inHg)	0.3 kPa (2.3 mmHg, 0.1 inHg)	0 kPa (0 mmHg, 0 inHg)
60 ℓ (15.85 US gal, 13.2 Imp gal)	0 kPa (0 mmHg, 0 inHg)	0.1 kPa (0.5 mmHg, 0 inHg)	0.3 kPa (2 mmHg, 0.1 inHg)	0.3 kPa (2.3 mmHg, 0.1 inHg)	0.3 kPa (2.3 mmHg, 0.1 inHg)	0 kPa (0 mmHg, 0 inHg)

Time Needed for Diagnosis: Value of MAP 1+ Value of MAP 2 + 22820 ms + 0 + Value of MAP 2 + 0 ms + 200000 ms + Value of MAP 3 + 0 ms + 200000 ms
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

- **Normality Judgment**

Judge as OK when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
P1	> Value of Map 9

Map 9 Malfunction criteria limit for evaporation diagnosis

Time (evpdset) vs. Fuel level	0 ms	30000 ms	50000 ms	100000 ms	160000 ms	200000 ms
0 ℓ (0 US gal, 0 Imp gal)	0.1 kPa (1 mmHg, 0 inHg)	0.5 kPa (3.5 mmHg, 0.1 inHg)	0.6 kPa (4.2 mmHg, 0.2 inHg)	0.6 kPa (4.2 mmHg, 0.2 inHg)	0.6 kPa (4.2 mmHg, 0.2 inHg)	0.6 kPa (4.2 mmHg, 0.2 inHg)
10 ℓ (2.64 US gal, 2.2 Imp gal)	0.1 kPa (1 mmHg, 0 inHg)	0.5 kPa (3.5 mmHg, 0.1 inHg)	0.6 kPa (4.2 mmHg, 0.2 inHg)	0.6 kPa (4.2 mmHg, 0.2 inHg)	0.6 kPa (4.2 mmHg, 0.2 inHg)	0.6 kPa (4.2 mmHg, 0.2 inHg)
20 ℓ (5.28 US gal, 4.4 Imp gal)	0.1 kPa (1 mmHg, 0 inHg)	0.4 kPa (3.25 mmHg, 0.1 inHg)	0.5 kPa (4.1 mmHg, 0.2 inHg)	0.5 kPa (4.1 mmHg, 0.2 inHg)	0.5 kPa (4.1 mmHg, 0.2 inHg)	0.5 kPa (4.1 mmHg, 0.2 inHg)
30 ℓ (7.93 US gal, 6.6 Imp gal)	0.1 kPa (1 mmHg, 0 inHg)	0.4 kPa (3 mmHg, 0.1 inHg)	0.5 kPa (3.9 mmHg, 0.2 inHg)	0.5 kPa (3.9 mmHg, 0.2 inHg)	0.5 kPa (3.9 mmHg, 0.2 inHg)	0.5 kPa (3.9 mmHg, 0.2 inHg)
40 ℓ (10.57 US gal, 8.8 Imp gal)	0.1 kPa (1 mmHg, 0 inHg)	0.3 kPa (2.25 mmHg, 0.1 inHg)	0.5 kPa (3.4 mmHg, 0.1 inHg)	0.5 kPa (3.4 mmHg, 0.1 inHg)	0.5 kPa (3.4 mmHg, 0.1 inHg)	0.5 kPa (3.4 mmHg, 0.1 inHg)
50 ℓ (13.21 US gal, 11 Imp gal)	0.1 kPa (1 mmHg, 0 inHg)	0.2 kPa (1.5 mmHg, 0.1 inHg)	0.4 kPa (2.9 mmHg, 0.1 inHg)	0.4 kPa (2.9 mmHg, 0.1 inHg)	0.4 kPa (2.9 mmHg, 0.1 inHg)	0.4 kPa (2.9 mmHg, 0.1 inHg)
60 ℓ (15.85 US gal, 13.2 Imp gal)	0.1 kPa (1 mmHg, 0 inHg)	0.2 kPa (1.5 mmHg, 0.1 inHg)	0.4 kPa (2.9 mmHg, 0.1 inHg)	0.4 kPa (2.9 mmHg, 0.1 inHg)	0.4 kPa (2.9 mmHg, 0.1 inHg)	0.4 kPa (2.9 mmHg, 0.1 inHg)

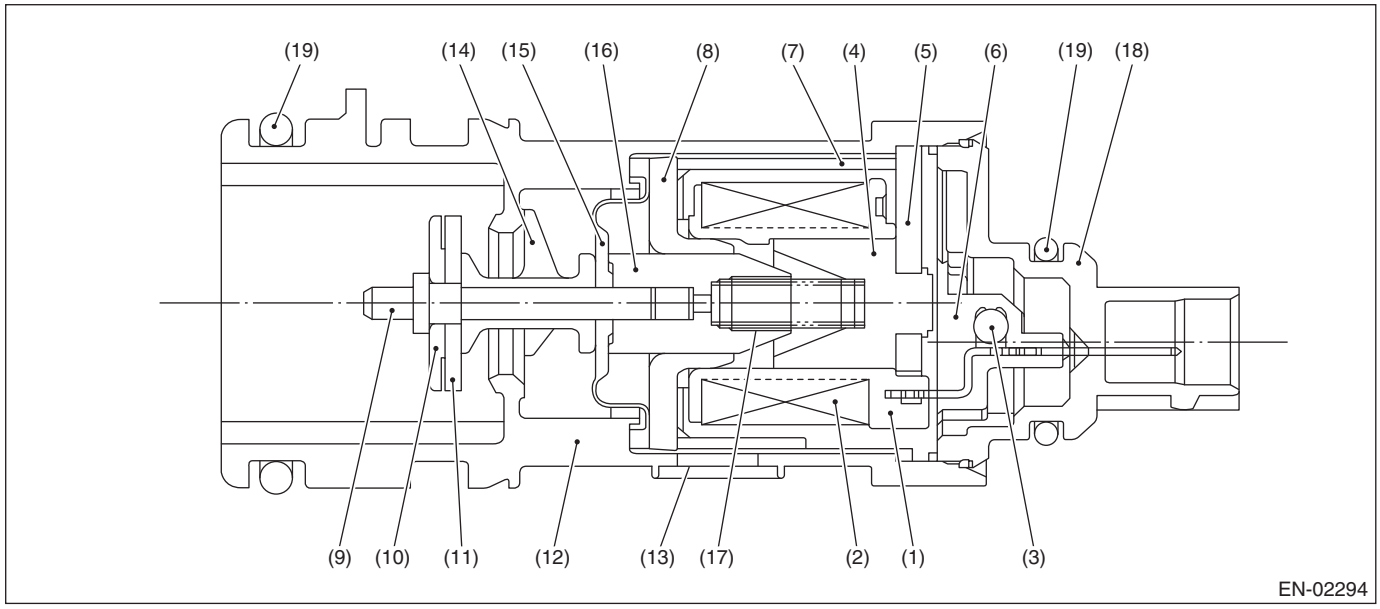
Time Needed for Diagnosis: Value of MAP 1+ Value of MAP 2 + 22820 ms + 0 + Value of MAP 2 + 0 ms + 200000 ms + Value of MAP 3 + 0 ms + 200000 ms

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



(1) Bobbin
(2) Coil
(3) Diode
(4) Stator core
(5) End plate
(6) Body
(7) Yoke
(8) Magnetic plate
(9) Shaft
(10) Plate
(11) Valve
(12) Housing
(13) Filter
(14) Retainer
(15) Diaphragm
(16) Movable core
(17) Spring
(18) Cover
(19) O-ring

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Elapsed time after starting the engine	≥ 1 second
Terminal output voltage when ECM outputs OFF signal	Low

Time Needed for Diagnosis: 2500 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Elapsed time after starting the engine	≥ 1 second
Terminal output voltage when ECM outputs OFF signal	High

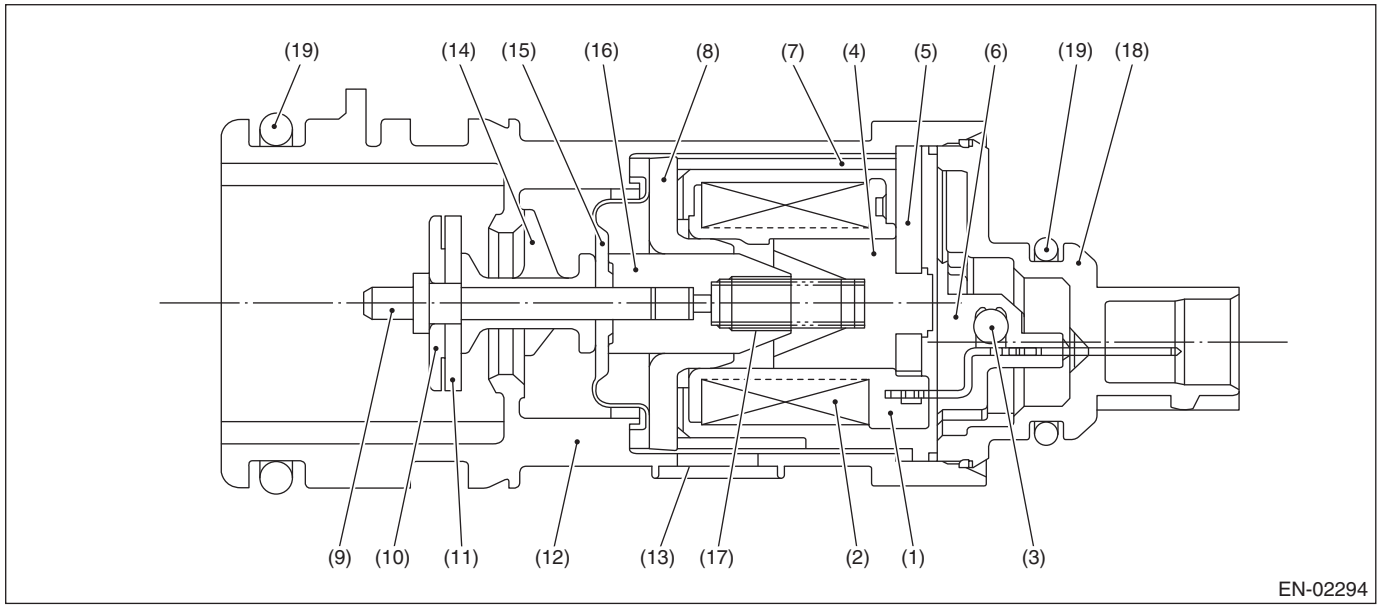
Time Needed for Diagnosis: Less than 1 second

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) Bobbin
(2) Coil
(3) Diode
(4) Stator core
(5) End plate
(6) Body
(7) Yoke
(8) Magnetic plate
(9) Shaft
(10) Plate
(11) Valve
(12) Housing
(13) Filter
(14) Retainer
(15) Diaphragm
(16) Movable core
(17) Spring
(18) Cover
(19) O-ring

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Elapsed time after starting the engine	≥ 1 second
Terminal output voltage when ECM outputs ON signal	High

Time Needed for Diagnosis: 2500 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Elapsed time after starting the engine	≥ 1 second
Terminal output voltage when ECM outputs ON signal	Low

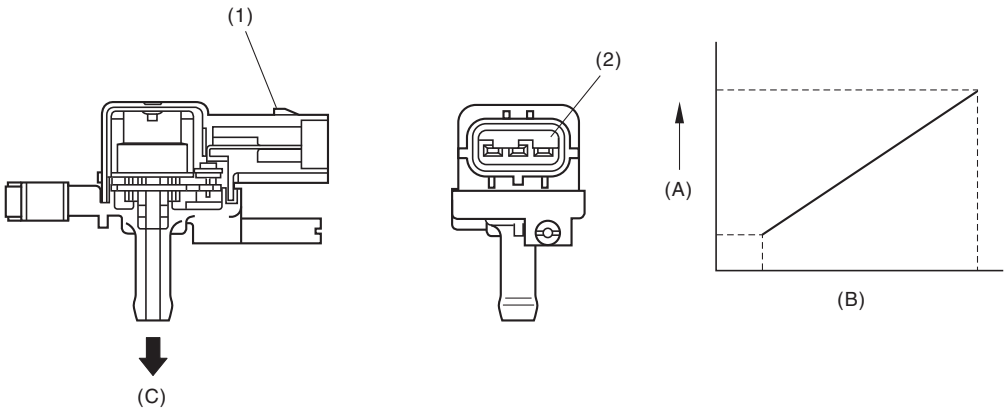
Time Needed for Diagnosis: Less than 1 second

BO:DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR

1. OUTLINE OF DIAGNOSIS

Detect the tank pressure sensor output property abnormality.
Judge as NG when there is no pressure variation, which should exist in the tank, considering the engine status.

2. COMPONENT DESCRIPTION



(A) Output voltage
(B) Input voltage
(C) To fuel tank
(1) Connector
(2) Terminals

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Elapsed time after starting the engine	≥ 60 s
Fuel level	≥ 9.6 ℓ (2.54 US gal, 2.11 Imp gal)
Fuel temperature	< 35 °C (95 °F)
Battery voltage	≥ 10.9 V
Barometric pressure	≥ 75 kPa (563 mmHg, 22.2 inHg)

4. GENERAL DRIVING CYCLE

- Perform the diagnosis continuously after 60 s have passed since the engine started.
- Pay attention to the fuel level and temperature.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Number of times that the difference between the Max. fuel level every 60 s and Min. fuel level every 60 s is 2 ℓ (0.53 US gal, 0.44 Imp gal) or more (with enable condition established)	≥ 16 time(s)
Maximum – Minimum tank pressure (with enable condition completed)	< 0 kPa (0.375 mmHg, 0 inHg)
Maximum – Minimum fuel temperature (with enable condition completed)	≥ 7 °C (12.6°F)

If the difference between the Max. fuel level every 60 s and Min. fuel level every 60 s is less than 2 ℓ (0.53 US gal, 0.44 Imp gal), extend 60 s and make judgment with the Max. and Min. values for the fuel level in 60 s × 2. 60 s If a difference does not appear, extend the time (60 s × 3, 60 s × 4, 60 s × 5) and continue the judgment. If the difference between the Max. fuel level every 60 s and Min. fuel level every 60 s is 2 ℓ (0.53 US gal, 0.44 Imp gal) or more, the diagnosis counter counts up.

Time Needed for Diagnosis: 60 s × 16 time(s) or more

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Maximum – Minimum tank pressure	≥ 0 kPa (0.375 mmHg, 0 inHg)

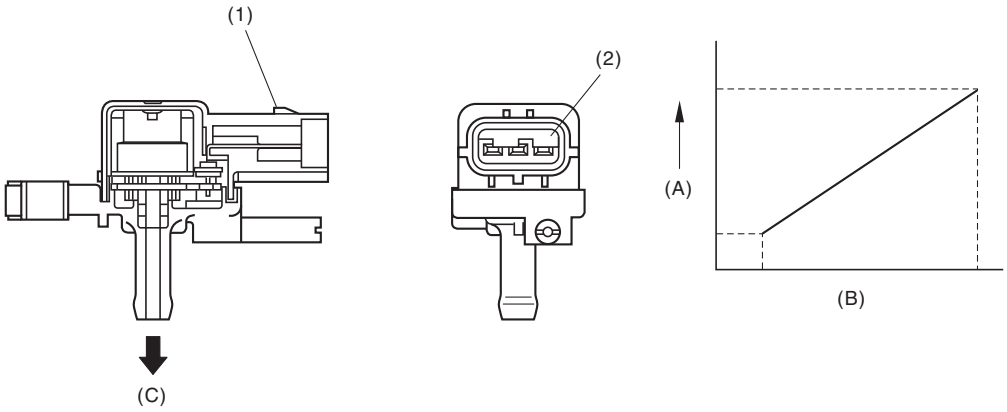
Time Needed for Diagnosis: Less than 1 second

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 out of specification.

2. COMPONENT DESCRIPTION



EN-03875

(A) Output voltage
(B) Input voltage
(C) To fuel tank
(1) Connector
(2) Terminals

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	< –7.5 kPa (–55.9 mmHg, –2.2 inHg)
Battery voltage	≥ 10.9 V

Time Needed for Diagnosis: 15000 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	≥ –7.5 kPa (–55.9 mmHg, –2.2 inHg)
Battery voltage	≥ 10.9 V

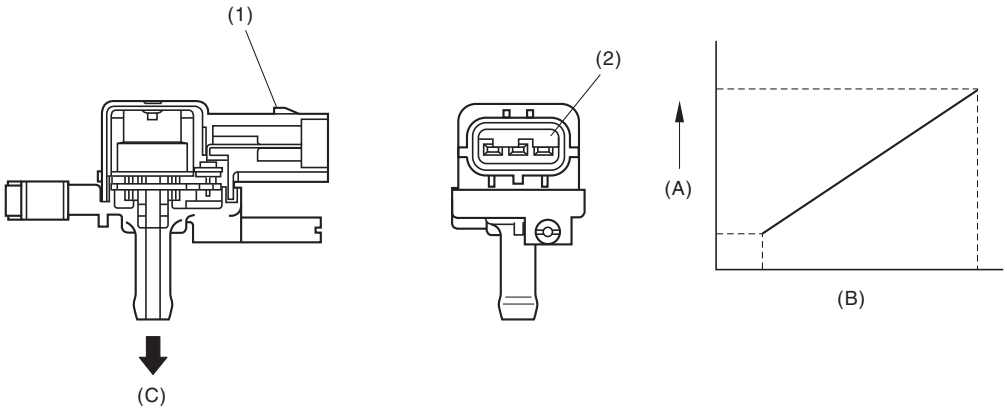
Time Needed for Diagnosis: Less than 1 second

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 out of specification.

2. COMPONENT DESCRIPTION



(A) Output voltage
(B) Input voltage
(C) To fuel tank
(1) Connector
(2) Terminals

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Time needed for all secondary parameters to be in enable conditions	≥ 5000 ms
Vehicle speed	≥ 2 km/h (1.2 MPH)
All conditions of EVAP canister purge	Completed
Learning value of evaporation gas concentration (left and right)	< 0.08
Main feedback compensation coefficient (left and right)	≥ 0.9
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Perform the diagnosis when purging enable conditions are met without idling.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	≥ 7.9 kPa (59.6 mmHg, 2.3 inHg)
Fuel temperature	< 35 °C (95 °F)
Barometric pressure	≥ 75 kPa (563 mmHg, 22.2 inHg)

Time Needed for Diagnosis: 15000 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	< 7.9 kPa (59.6 mmHg, 2.3 inHg)

Time Needed for Diagnosis: Less than 1 second

BR:DTC P0456 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK)

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0442. <Ref. to GD(H4DOTC)-138, 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)

1. OUTLINE OF DIAGNOSIS

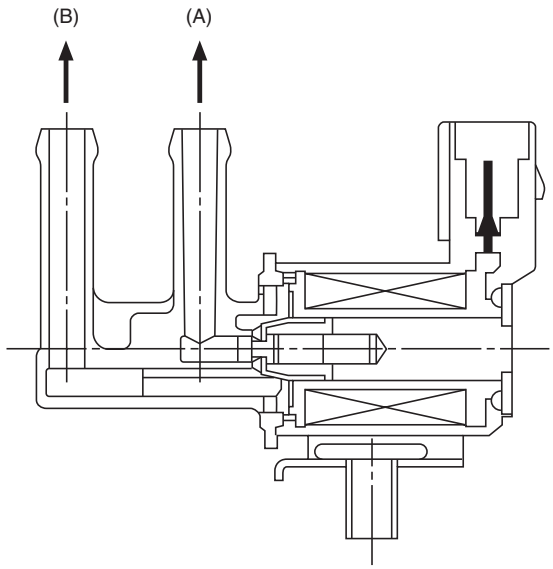
NOTE:
For the detection standard, refer to DTC P0442. <Ref. to GD(H4DOTC)-138, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

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



EN-02197

(A) To canister
(B) To intake manifold

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Elapsed time after starting the engine	≥ 1 second

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Duty ratio of “ON”	< 0.75
Terminal output voltage	Low

Time Needed for Diagnosis: 2500 ms
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage	High

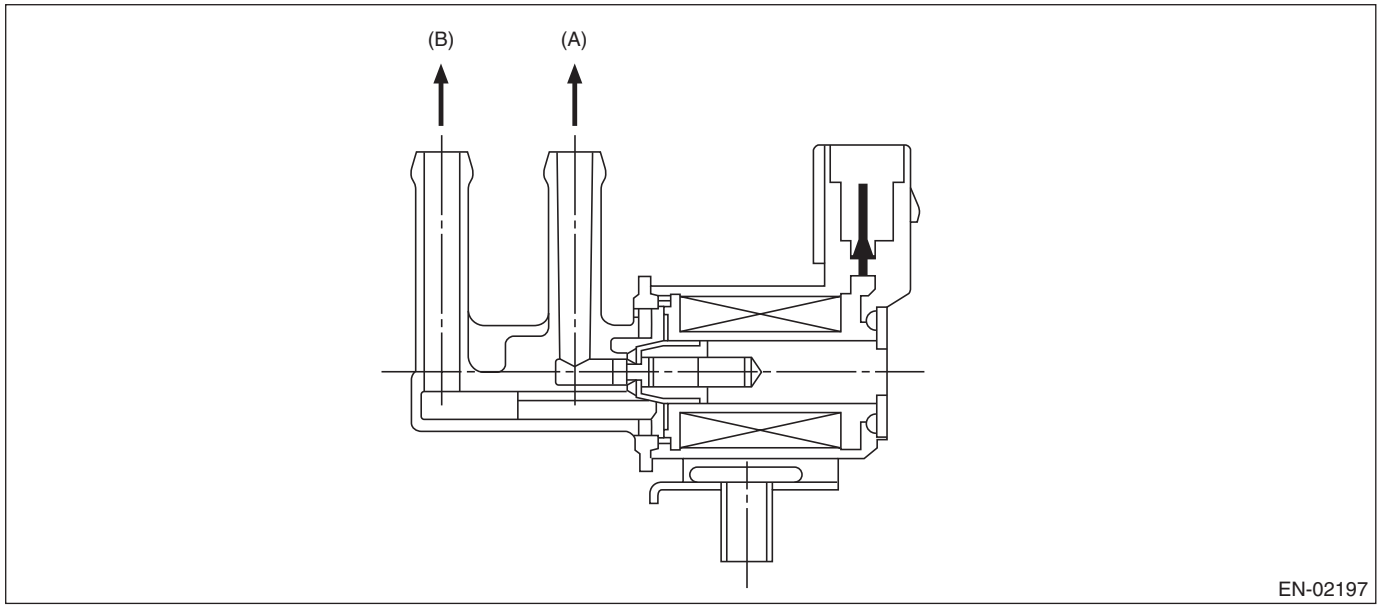
Time Needed for Diagnosis: Less than 1 second

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
Battery voltage	≥ 10.9 V
Elapsed time after starting the engine	≥ 1 second

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Duty ratio of "ON"	≥ 0.25
Terminal output voltage	High

Time Needed for Diagnosis: 2500 ms
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage	Low

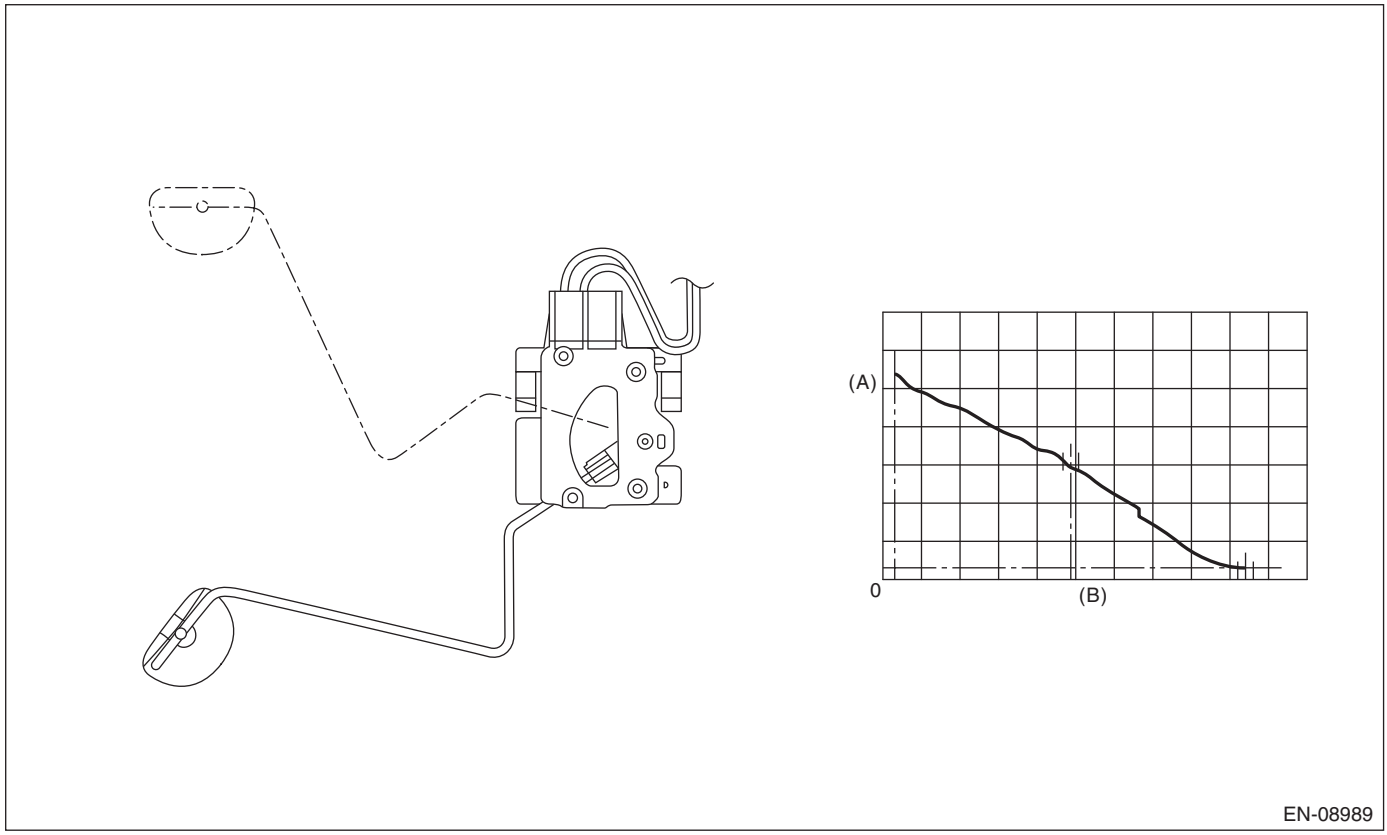
Time Needed for Diagnosis: Less than 1 second

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 (B) Resistance

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 following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Accumulated amount of intake air	≥ 330957 g (11672.85 oz)
Max. – Min. values of fuel level output	< 2.6 ℓ (0.69 US gal, 0.57 Imp gal)
Battery voltage	≥ 10.9 V
Engine speed	< 6500 rpm
Elapsed time after starting the engine	≥ 5000 ms

Time Needed for Diagnosis: Less than 1 second
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Accumulated amount of intake air	≥ 330957 g (11672.85 oz)
Max. – Min. values of fuel level output	≥ 2.6 ℓ (0.69 US gal, 0.57 Imp gal)
Battery voltage	≥ 10.9 V
Engine speed	< 6500 rpm
Elapsed time after starting the engine	≥ 5000 ms

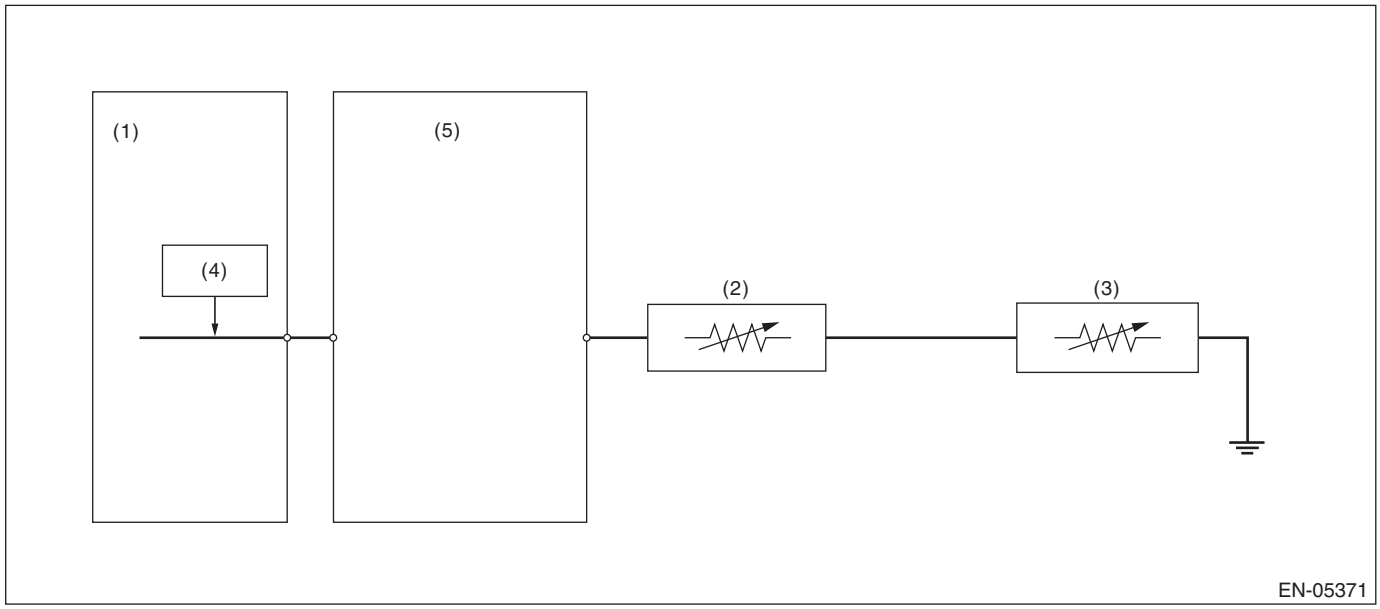
Time Needed for Diagnosis: Less than 1 second

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 out of specification.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Fuel level sensor
(3) Fuel sub level sensor
(4) Detecting circuit
(5) Body integrated unit

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Elapsed time after starting the engine	≥ 3000 ms
Output voltage	< 0.173 V

Time Needed for Diagnosis: 2500 ms
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Elapsed time after starting the engine	≥ 3000 ms
Output voltage	≥ 0.173 V

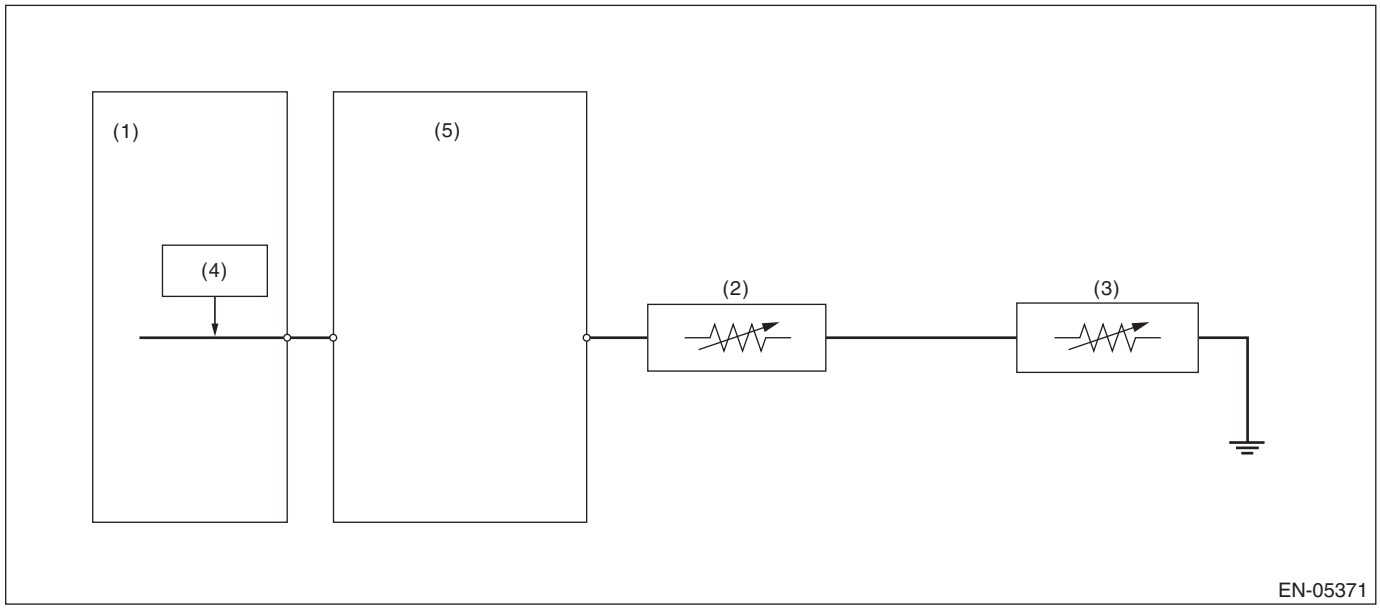
Time Needed for Diagnosis: Less than 1 second

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 out of specification.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Fuel level sensor
(3) Fuel sub level sensor
(4) Detecting circuit
(5) Body integrated unit

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Elapsed time after starting the engine	≥ 3000 ms
Output voltage	≥ 7.212 V

Time Needed for Diagnosis: 1000 ms
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Elapsed time after starting the engine	≥ 3000 ms
Output voltage	< 7.212 V

Time Needed for Diagnosis: Less than 1 second

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

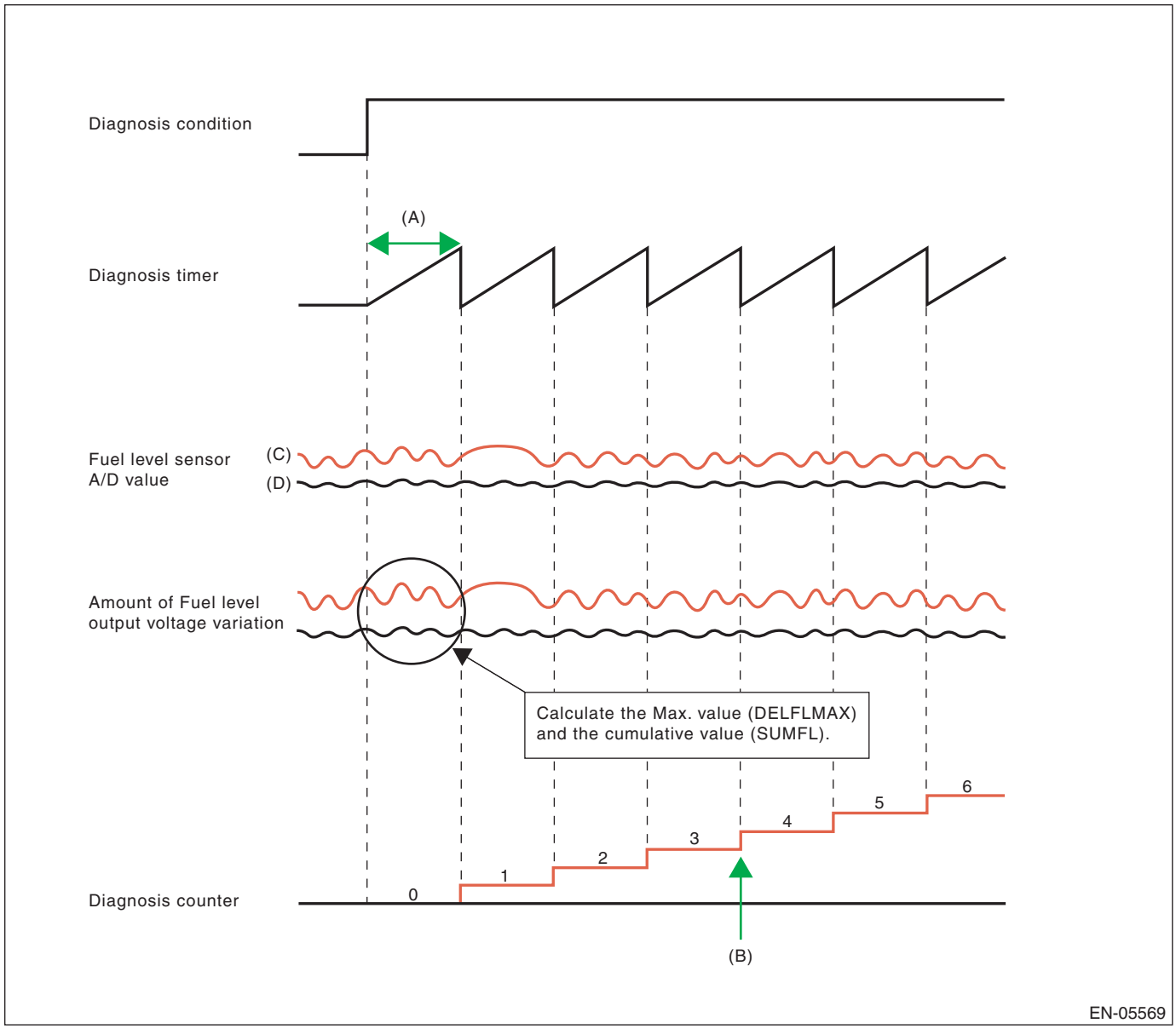
Malfunction Criteria	Threshold Value
Engine speed	≥ 500 rpm
Elapsed time after starting the engine	≥ 1 second
Battery voltage	≥ 10.9 V
Idle switch	ON
Fuel level	≥ 9.6 ℓ (2.54 US gal, 2.11 Imp gal) and < 54.4 ℓ (14.37 US gal, 11.97 Imp gal)
Vehicle speed = 0 km/h (0 MPH)	≥ 10000 ms

3. GENERAL DRIVING CYCLE

- Always perform the diagnosis continuously at idle speed.
- Pay attention to the fuel level.

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 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 time(s).



(A) 12288 ms (B) NG at 4 time(s) (C) Malfunction
(D) Normal

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Integrated times of the condition reaching follows,	≥ 4 time(s)
DELFLMAX	≥ Value from Map
or	
SUMFL	≥ 25.92 V
At this time, DELFLMAX: Maximum difference of sensor output for 12288 ms SUMFL: Integrated value of the sensor output deviation for 12288 ms	

Map

Fuel level (ℓ , US gal, Imp gal)	0, 0, 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
Measured voltage (V)	0.27	0.27	0.426	0.582	0.738	0.894	0.894

The diagnosis counter does not count up when the following conditions are completed within 12288 ms.

Maximum value – minimum value of change of tank pressure during 12288 ms	≥ 0 kPa (0.375 mmHg, 0 inHg)
Maximum value – minimum value of battery voltage during 12288 ms	≥ 0.969 V

Time Needed for Diagnosis: 12288 ms × 4 time(s)
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
DELFLMAX	< Value from Map
SUMFL	< 25.92 V
At this time, DELFLMAX: Maximum difference of sensor output for 12288 ms SUMFL: Integrated value of the sensor output deviation for 12288 ms	

Time Needed for Diagnosis: 12288 ms

BZ:DTC P0500 VEHICLE SPEED SENSOR “A”

1. OUTLINE OF DIAGNOSIS

Judge as NG when outside of the judgment value.
Judge NG when the received data from ABSCM&H/U is abnormal vehicle speed, and the vehicle speed data is impossible.

2. COMPONENT DESCRIPTION

Vehicle speed signals are taken in to the ABS control module and hydraulic control unit, and normal/erroneous data of the ABS wheel speed sensor is received by CAN communication from the ABS control module and hydraulic control unit.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Elapsed time after starting the engine	≥ 2000 ms

4. GENERAL DRIVING CYCLE

Always perform diagnosis more than 2000 ms after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Front ABS wheel speed sensor status	Malfunction
Either of the following is established	
Front left wheel speed	≥ 300 km/h (186.4 MPH)
Front right wheel speed	≥ 300 km/h (186.4 MPH)

Time Needed for Diagnosis: 512 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Front left wheel speed	> 0 km/h (0 MPH) and < 300 km/h (186.4 MPH)
Front right wheel speed	> 0 km/h (0 MPH) and < 300 km/h (186.4 MPH)

Time Needed for Diagnosis: 512 ms

CA: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	≥ 70 °C (158 °F)
Battery voltage	≥ 10.9 V
Barometric pressure	≥ 75 kPa (563 mmHg, 22.2 inHg)
Fuel level	≥ 9.6 ℓ (2.54 US gal, 2.11 Imp gal)
Elapsed time after starting the engine	≥ 10.49 s
Feedback of ISC	In operation
Lambda value (left and right)	≥ 0.9 and < 1.1
After switching air conditioner to ON/OFF	≥ 5.1 s
After intake manifold pressure changes by 4 kPa (30 mmHg, 1.2 inHg) or more.	> 5.1 s
Elapsed time after switching neutral position switch to ON/OFF	> 5.1 s
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

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Actual engine speed – Targeted engine speed	< –100 rpm
Feedback compensation for ISC	Max.

Time Needed for Diagnosis: 10 s × 3 time(s)
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Actual engine speed – Targeted engine speed	≥ –100 rpm

Time Needed for Diagnosis: 10 s

CB: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
Barometric pressure	≥ 75 kPa (563 mmHg, 22.2 inHg)
Fuel level	≥ 9.6 ℓ (2.54 US gal, 2.11 Imp gal)
Elapsed time after starting the engine	≥ 10.49 s
Feedback of ISC	In operation
Lambda value (left and right)	≥ 0.9 and < 1.1
After switching air conditioner to ON/OFF	≥ 5.1 s
After intake manifold pressure changes by 4 kPa (30 mmHg, 1.2 inHg) or more.	> 5.1 s
Elapsed time after switching neutral position switch to ON/OFF	> 5.1 s
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**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Actual – Target engine speed	≥ 200 rpm
Feedback value for ISC	Min.

Time Needed for Diagnosis: 10 s × 3 time(s)
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Actual – Target engine speed	< 200 rpm

Time Needed for Diagnosis: 10 s

CC:DTC P050A COLD START IDLE AIR CONTROL SYSTEM PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect malfunctions of the catalyst advanced idling retard angle control.
Judge as NG when ECM is not controlling the angle properly during catalyst advanced idling retard angle control.
Judge as NG if there is exhaust gas temperature diagnosis and idle speed diagnosis, and if any one of them is NG.

- Exhaust gas temperature diagnosis

Judge as NG when the estimated exhausted gas temperature in 14 seconds after the cold start is below the specified value.

- Idle speed diagnosis

Judge as NG when actual engine speed is not close to target engine speed after terminating the retard angle control.

2. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
Atmospheric pressure	≥ 75 kPa (563 mmHg, 22.2 inHg)
Battery voltage	≥ 10.9 V
Cold start diagnosis	Incomplete
Vehicle speed	< 3 km/h (1.9 MPH)
Misfire in 200 engine revs.	< 5
Time after starting	= 14 s

3. GENERAL DRIVING CYCLE

Perform the diagnosis at cold start.

4. DIAGNOSTIC METHOD

• Exhaust gas temperature diagnosis

Abnormality Judgment

Calculate the estimated exhaust gas temperature when the diagnostic enable condition is established. Judge as NG when the following conditions are established after engine starting within the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Estimated exhaust gas temperature	< Value from Map

Map

Coolant temperature after starting the engine	–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)	45 °C (113 °F)
Estimated exhaust gas temperature	200 °C (392 °F)	200 °C (392 °F)	200 °C (392 °F)	200 °C (392 °F)	95 °C (203 °F)	95 °C (203 °F)	89 °C (192.2 °F)	83 °C (181.4 °F)	79 °C (174.2 °F)	79 °C (174.2 °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 and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Estimated exhaust gas temperature	≥ Value from Map

Time Needed for Diagnosis: Less than 1 second

- **Idle speed diagnosis**

Abnormality Judgment
Judge as NG when the following conditions are established after the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Continuous time of (Target engine speed – Actual engine speed > –100 rpm)	≥ 6000 ms
Continuous time of (actual retard amount > 30 °CA)	≥ 0 ms

Time Needed for Diagnosis: 14 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.
Normality Judgment
Judge as OK and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Continuous time of (Target engine speed – Actual engine speed > –100 rpm)	< 6000 ms
Continuous time of (actual retard amount > 30 °CA)	< 0 ms

Time Needed for Diagnosis: Less than 1 second

CD:DTC P050B COLD START IGNITION TIMING PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect malfunctions of the catalyst advanced idling retard angle control.
Judge as NG when ECM is not controlling the angle properly during catalyst advanced idling retard angle control.
Judge as NG when actual retard amount is under the specified value at cold start.

2. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
Atmospheric pressure	≥ 75 kPa (563 mmHg, 22.2 inHg)
Battery voltage	≥ 10.9 V
Cold start diagnosis	Incomplete
Vehicle speed	< 3 km/h (1.9 MPH)
Misfire in 200 engine revs.	< 5
Time after starting	= 14 s

3. GENERAL DRIVING CYCLE

Perform the diagnosis at cold start.

4. DIAGNOSTIC METHOD

- **Abnormality Judgment**

Judge as NG when the following conditions are established with diagnosis enable conditions successful.

Judgment Value

Malfunction Criteria	Threshold Value
Duration time of (Standard ignition timing – Actual ignition timing ≤ 0 °CA)	> 5000 ms

Time Needed for Diagnosis: 5000 ms
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

- **Normality Judgment**

Judge as OK and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Duration time of (Standard ignition timing – Actual ignition timing > 0 °CA)	> 5000 ms

Time Needed for Diagnosis: 5000 ms

CE:DTC P0512 STARTER REQUEST CIRCUIT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of starter SW.
Judge as 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**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Engine condition	After engine starting
Starter OFF signal	Not detected
Battery voltage	≥ 8 V

Time Needed for Diagnosis: 60000 ms
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Starter OFF signal	Detected
Battery voltage	≥ 8 V

Time Needed for Diagnosis: Less than 1 second

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 body integrated unit)
P1570	Antenna	Faulty antenna
P1571	Reference Code Incompatibility	Reference code incompatibility between body integrated unit and ECM
P1572	IMM Circuit Failure (Except Antenna Circuit)	Communication failure between body integrated unit and ECM
P1574	Key Communication Failure	Failure of body integrated unit to verify key (transponder) ID code or transponder failure
P1576	EGI Control Module EEPROM	ECM malfunctioning
P1577	IMM Control Module EEPROM	Body integrated unit malfunctioning
P1578	Meter Failure	Reference code incompatibility between body integrated unit and combination meter

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 for the outline of the diagnosis of the top are established.

CG: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 CPU normal RAM, judge as NG.
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 following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Write the specified value into the RAM.	The written value cannot be read.

Time Needed for Diagnosis: Less than 1 second
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Write the specified value into the RAM.	The written value can be read.

Time Needed for Diagnosis: Less than 1 second

CH: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 if the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
SUM value of ROM	Standard

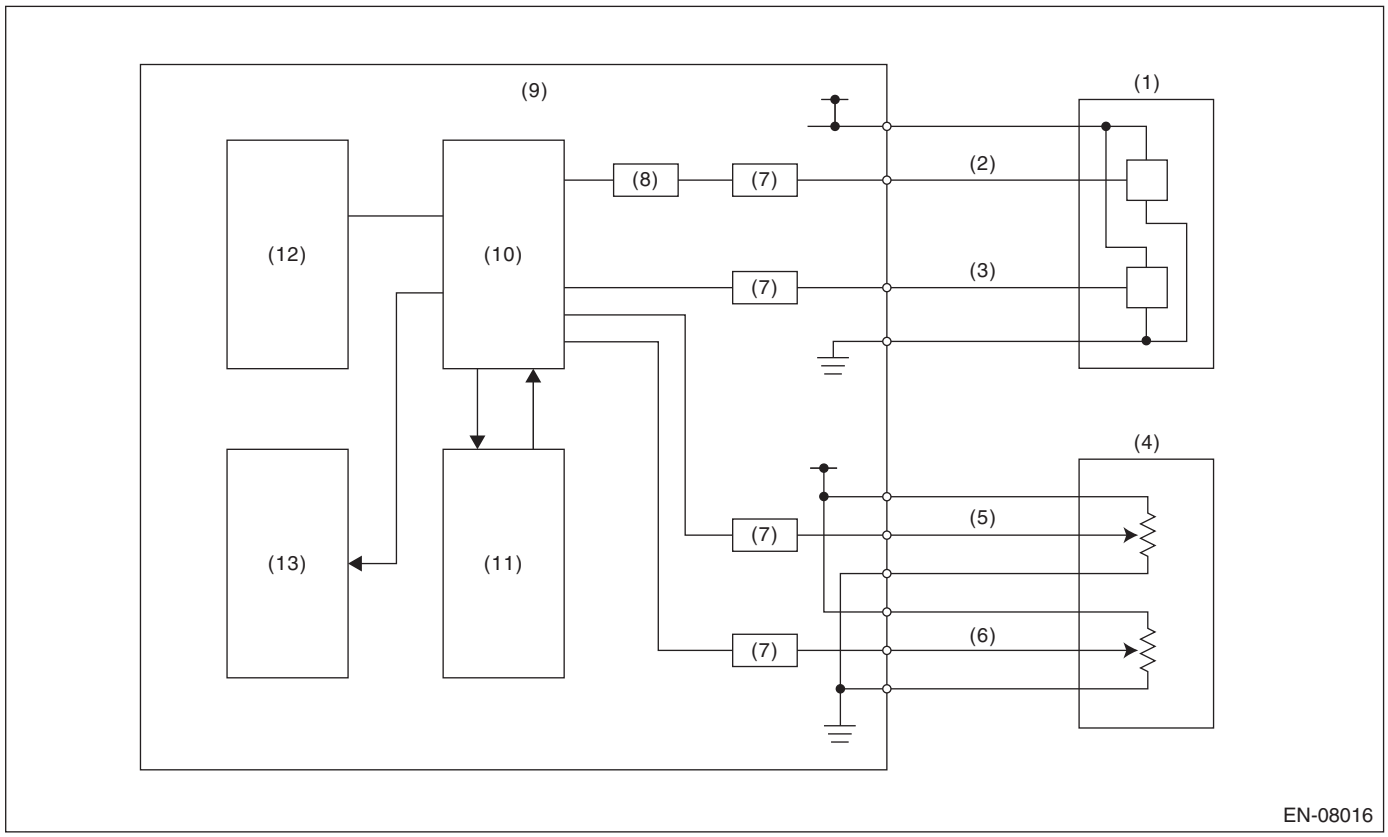
Time Needed for Diagnosis: Undetermined
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

CI: DTC P0607 THROTTLE CONTROL SYSTEM CIRCUIT RANGE/PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Judge as NG when any one of the followings is established.
(1) If the monitoring IC operation is abnormal (monitoring IC malfunction).
(2) If the input amplifier circuit of throttle position sensor 1 is abnormal (quadruple amplification problem).
(3) If the CPU operation is abnormal (instruction/flow check).
(4) If the A/D converter operation is abnormal (ADC malfunction).
(5) If the EEPROM operation is abnormal (EEPROM malfunction).
(6) If the output IC operation is abnormal (output driver malfunction).

2. COMPONENT DESCRIPTION



(1)	Throttle position sensor	(6)	Accelerator pedal position sensor 2	(10)	CPU
(2)	Throttle position sensor 1	(7)	I/F circuit	(11)	Monitoring IC
(3)	Throttle position sensor 2	(8)	Amplifier circuit	(12)	EEPROM
(4)	Accelerator pedal position sensor	(9)	Engine control module (ECM)	(13)	Output IC
(5)	Accelerator pedal position sensor 1				

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
(1) Battery voltage	≥ 6 V
(2) Ignition switch	ON
(2) Battery voltage	≥ 6 V
(3) Ignition switch	ON
(3) ETC control	Permission
(4) Ignition switch	ON
(4) Battery voltage	≥ 6 V
(5) Starter switch	OFF
(5) Battery voltage	> 6 V
(6) Ignition switch	ON
(6) Battery voltage	≥ 10.9 V

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
(1) Monitoring IC operation	The result and expected value match.
(2) | Throttle position sensor 1 opening angle – (Throttle position sensor 1 opening angle after passing amplifier/4) |	< 3 °
(3) Main CPU calculation result	The result and expected value match.
(4) | standard voltage – read voltage value |	< 0.078125 V
(5) EEPROM writing	Writing completed
(6) Communication between output ICs	Possible to communicate

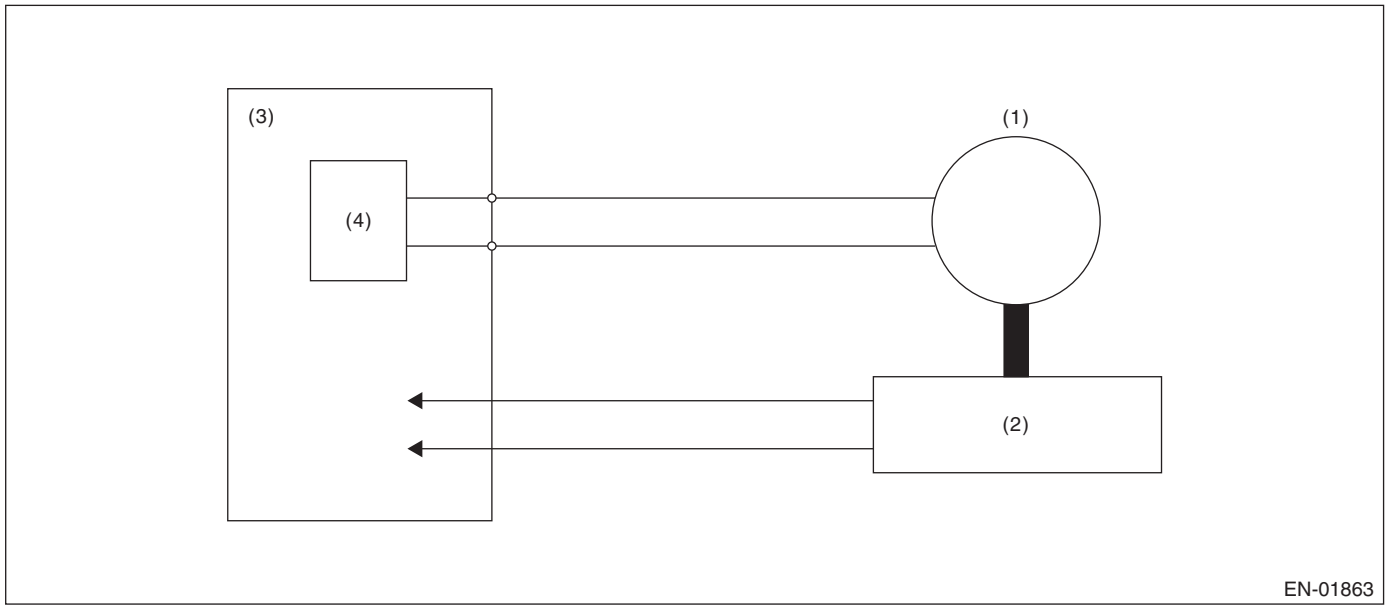
Time Needed for Diagnosis:
(1): 200 ms
(2): 24 ms
(3): 192 ms
(4): 200 ms
(5): 48 ms
(6): 2500 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

CJ: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 the specified duty or more 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 electronic throttle control	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously when the electronic throttle control is operating.

5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

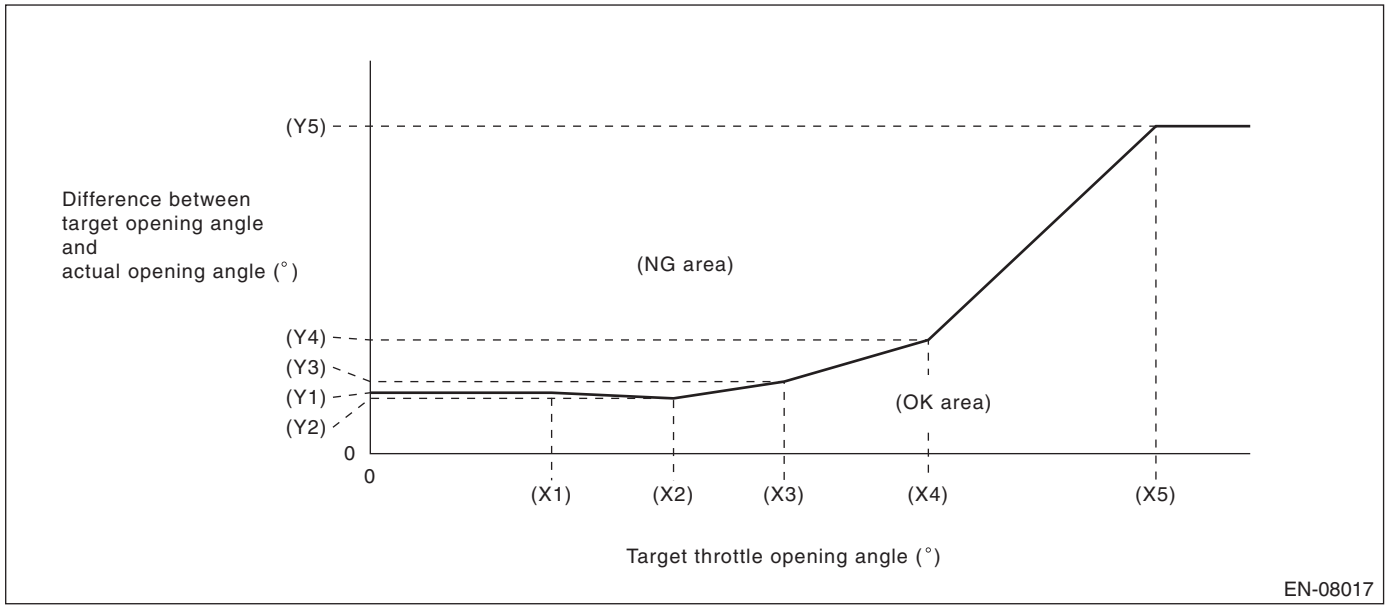
Judgment Value

Malfunction Criteria	Threshold Value
Difference between target opening angle and actual opening angle	Within OK range of **Details of Judgment value**
Output duty to drive circuit	< 95 %

Time Needed for Diagnosis:

- Difference between target opening angle and actual opening angle:
  - NG judgment: See **Details of Judgment time**
  - OK judgment: 2000 ms
- Output duty to drive circuit: 2000 ms

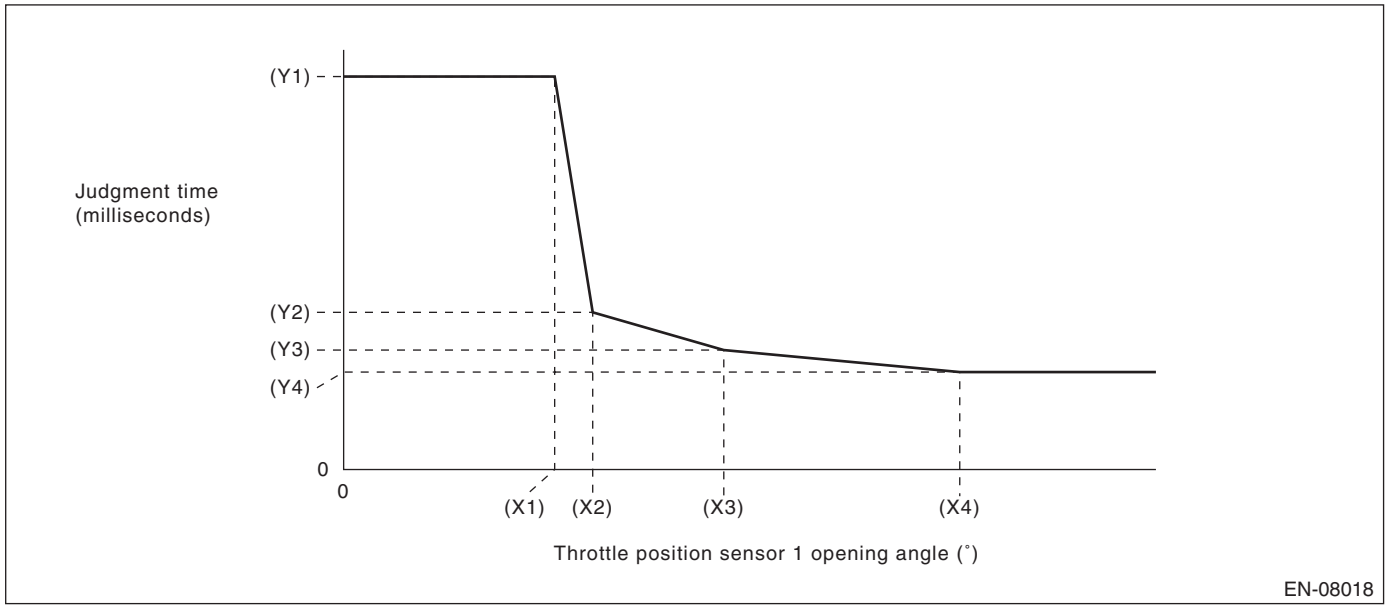
Details of Judgment Value



(X1) 6.915 °
(X2) 11.565 °
(X3) 15.785 °
(X4) 21.285 °
(X5) 29.965 °

(Y1) 4.65 °
(Y2) 4.22 °
(Y3) 5.5 °
(Y4) 8.68 °
(Y5) 25 °

Details of Judgment time



(X1) 8.049999237 °
(X2) 9.5 °
(X3) 14.5 °
(X4) 23.5 °

(Y1) 1000 ms
(Y2) 400 ms
(Y3) 304 ms
(Y4) 248 ms

NOTE:
Judgment time when actual opening angle ≤ target opening angle is always 1000 milliseconds.
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

CK:DTC P0700 TRANSMISSION CONTROL SYSTEM (MIL REQUEST)

1. OUTLINE OF DIAGNOSIS

Judge as NG when there is CAN communication with the TCM and there is a MIL lighting request.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
MIL lighting request from TCM	Yes

Time Needed for Diagnosis: 2500 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
MIL lighting request from TCM	None

Time Needed for Diagnosis: Less than 1 second

CL:DTC P0851 PARK/NEUTRAL SWITCH INPUT CIRCUIT LOW (AT MODEL)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of neutral SW.
Judge as NG when the ECM neutral terminal input differs from the reception data from TCM.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Starter relay	OFF

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds after starting the engine.

4. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Neutral switch signal in ECM when “P”/“N” range in TCM are “OFF” and when the other switches are “ON”	LOW (ON)

Time Needed for Diagnosis: 100 time(s)
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Neutral switch signal in ECM when “P”/“N” range in TCM are “OFF” and when the other switches are “ON”	HIGH (OFF)

Time Needed for Diagnosis: Less than 1 second

CM: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 as NG when the ECM neutral terminal input differs from the reception data from TCM.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Starter relay	OFF

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds after starting the engine.

4. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Neutral switch signal in ECM when “P”/“N” range in TCM are “ON” and when the other switches are “OFF”	HIGH (OFF)

Time Needed for Diagnosis: 100 time(s)
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Neutral switch signal in ECM when “P”/“N” range in TCM are “ON” and when the other switches are “OFF”	LOW (ON)

Time Needed for Diagnosis: Less than 1 second

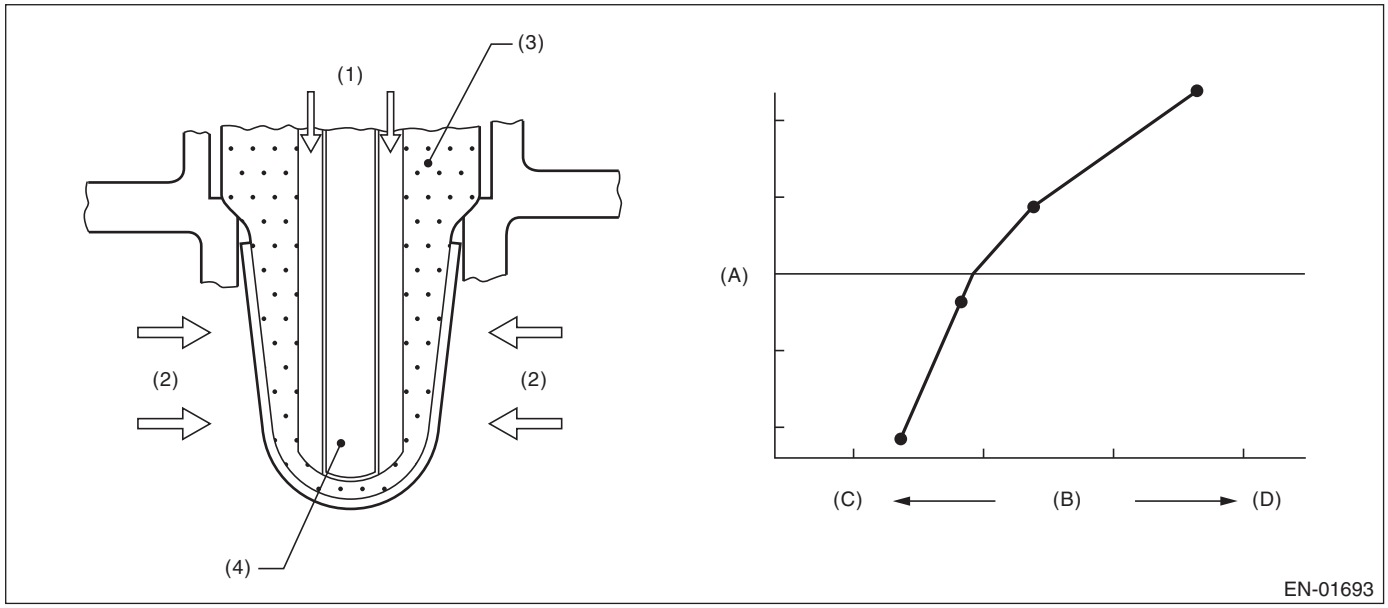
CN:DTC P1152 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK1 SENSOR1)

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
λ > 1: Lean
λ < 1: Rich

2. COMPONENT DESCRIPTION



(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich

(1) Atmosphere
(2) Exhaust gas
(3) ZrO_2
(4) Ceramic heater

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Time needed for all secondary parameters to be in enable conditions	≥ 4096 ms
Battery voltage	≥ 10.9 V
Atmospheric pressure	≥ 75 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.
Elapsed time after starting the engine	≥ 60000 ms
Engine coolant temperature	≥ 70 °C (158 °F)
Vehicle speed	≥ 20 km/h (12.4 MPH)
Amount of intake air	≥ 6 g/s (0.21 oz/s)
Load change at 180°CA	< 0.02 g/rev (0 oz/rev)
Front oxygen (A/F) sensor impedance	0 Ω — 50 Ω
Learning value of evaporation gas density	< 0.2
Total time of operating canister purge	≥ 19.9 s
Targeted lambda value load compensation coefficient	–1 — 1

4. GENERAL DRIVING CYCLE

Perform diagnosis continuously at a constant speed of 20 km/h (12.4 MPH) or more after 60000 ms have passed since the engine started.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
λ value	< 0.85

Time Needed for Diagnosis: 10000 ms
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
λ value	≥ 0.85

Time Needed for Diagnosis: Less than 1 second

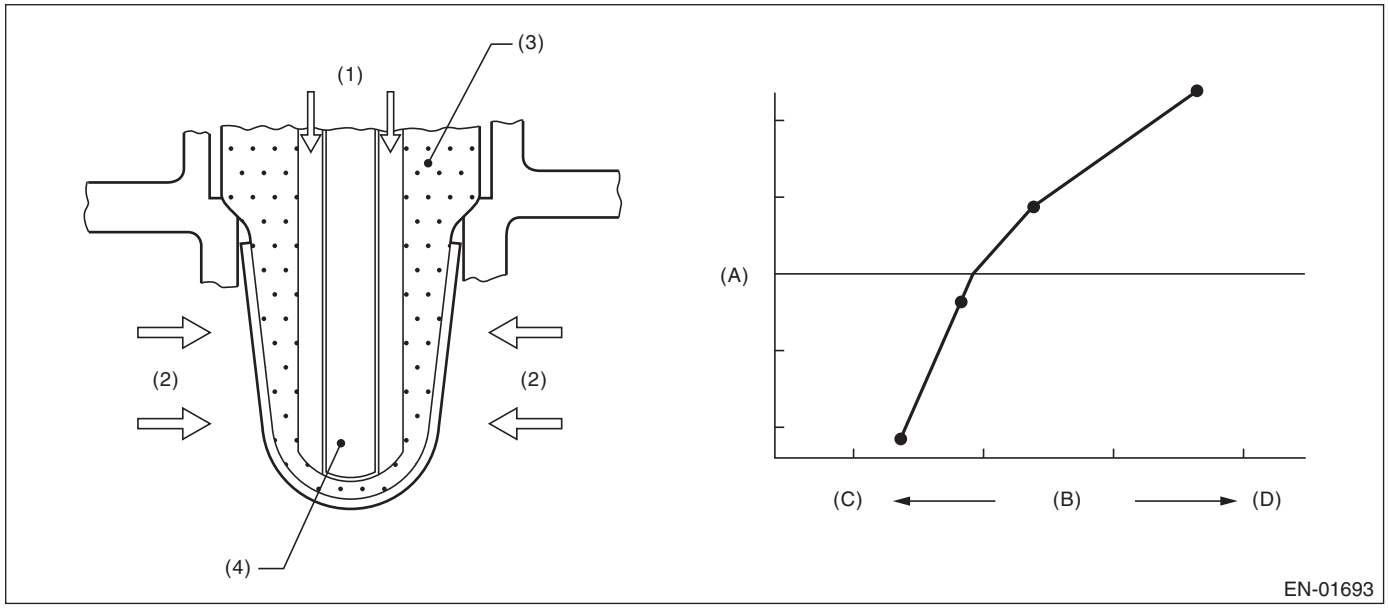
CO:DTC P1153 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1)

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
λ > 1: Lean
λ < 1: Rich

2. COMPONENT DESCRIPTION



(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich

(1) Atmosphere
(2) Exhaust gas
(3) ZrO_2
(4) Ceramic heater

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Time needed for all secondary parameters to be in enable conditions	≥ 4096 ms
Battery voltage	≥ 10.9 V
Atmospheric pressure	≥ 75 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.
Elapsed time after starting the engine	≥ 60000 ms
Engine coolant temperature	≥ 70 °C (158 °F)
Vehicle speed	≥ 20 km/h (12.4 MPH)
Amount of intake air	≥ 6 g/s (0.21 oz/s)
Load change at 180°CA	< 0.02 g/rev (0 oz/rev)
Front oxygen (A/F) sensor impedance	0 Ω — 50 Ω
Learning value of evaporation gas density	< 0.2
Total time of operating canister purge	≥ 19.9 s
Targeted lambda value load compensation coefficient	–1 — 1

4. GENERAL DRIVING CYCLE

Perform diagnosis continuously at a constant speed of 20 km/h (12.4 MPH) or more after 60000 ms have passed since the engine started.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
λ value	> 1.15

Time Needed for Diagnosis: 10000 ms
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
λ value	≤ 1.15

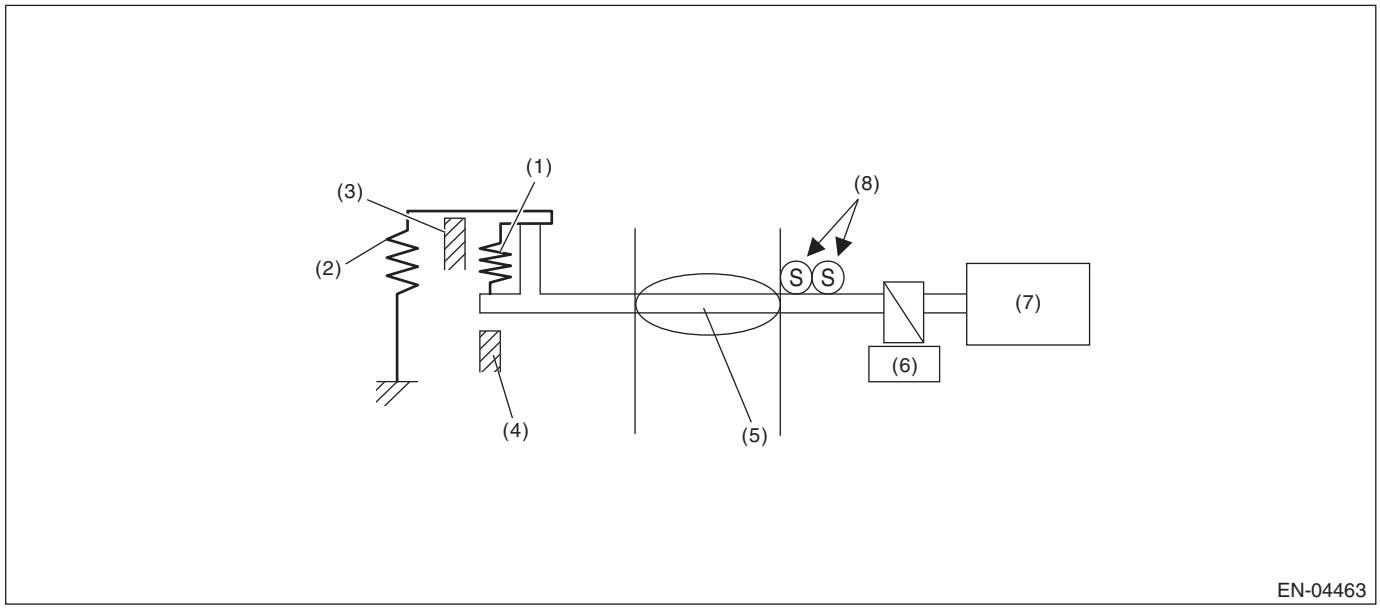
Time Needed for Diagnosis: Less than 1 second

CP:DTC P1160 RETURN SPRING FAILURE

1. OUTLINE OF DIAGNOSIS

Judge as NG when the valve is opened more than the default opening angle, but does not move to the close direction with the motor power stopped.

2. COMPONENT DESCRIPTION



(1) Opener spring
(2) Return spring
(3) Intermediate stopper
(4) Full closed stopper
(5) Throttle valve
(6) Gear
(7) DC motor
(8) Main and sub throttle position sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 6 V
Throttle position sensor	Normal

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 following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Opening variation after continuity is set to OFF	< 2 °

Time Needed for Diagnosis: 24 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Opening variation after continuity is set to OFF	≥ 2 °

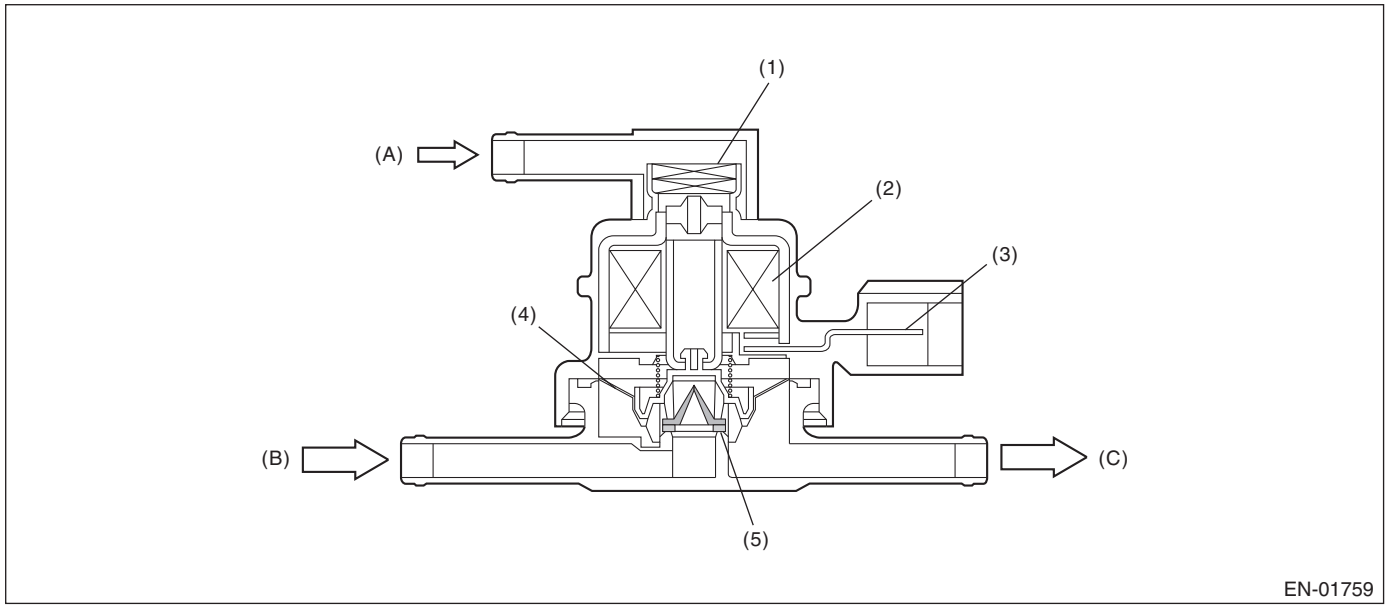
Time Needed for Diagnosis: 3400 ms

CQ: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



(A)	Barometric pressure	(B)	Shut-off valve	(C)	To fuel tank
(1)	Filter	(3)	Connector terminal	(5)	Valve
(2)	Coil	(4)	Diaphragm		

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Elapsed time after starting the engine	≥ 1 second
Terminal output voltage when ECM outputs OFF signal	Low

Time Needed for Diagnosis: 2500 ms
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Elapsed time after starting the engine	≥ 1 second
Terminal output voltage when ECM outputs OFF signal	High

Time Needed for Diagnosis: Less than 1 second

CR:DTC P1410 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN

1. OUTLINE OF DIAGNOSIS

Always detect abnormality that both combination valve electromagnetic valve and the reed valve are open failure.
Calculate the integrated value of Max./Min. value and output voltage deviation of the secondary air delivery pipe pressure sensor output voltage in a given time after engine start. Judge as NG if the integrated value and the difference between Max. and Min. values are large.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	≥ 500 rpm and < 10000 rpm
Elapsed time after starting the engine	≥ 9000 ms
After secondary air system stops	≥ 9000 ms
Amount of intake air	≥ 2 g/s (0.07 oz/s) and < 400 g/s (14.11 oz/s)
Battery voltage	≥ 10.9 V
Engine load	> 0 g/rev
After fuel cut	≥ 1000 ms

3. GENERAL DRIVING CYCLE

Perform continuous diagnosis when air flow amount is large during the secondary air pump stop after engine start.

4. DIAGNOSTIC METHOD

When both combination valve electromagnetic valve and the reed valve are open failure, the failure appears as pulses in the secondary air delivery pipe pressure sensor output. Detect abnormality by capturing these pulses using the following method.

- **Abnormality Judgment**

Calculate Max./Min. value of the secondary air delivery pipe pressure sensor output voltage and the sum of the output voltage deviation for the given time. Compare the difference between Max. and Min. values with threshold value and also compare the sum value with the threshold value. If both values exceed the threshold value, count up NG counter and then judge as NG if the counter reaches the given times.

Judgment Value

Malfunction Criteria	Threshold Value
Pipe inner pressure difference between Max. and Min.	> 0.05 V
Sum of the pipe inner pressure variation value every 4 ms	> 5 V
Barometric pressure variation value	< 26.7 kPa (200 mmHg, 7.9 inHg)

Time Needed for Diagnosis: 2000 ms × 20 time(s)
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear NG if neither exceeds the threshold value, or if either of the two exceeds the threshold value.

Judgment Value

Malfunction Criteria	Threshold Value
Pipe inner pressure difference between Max. and Min.	≤ 0.05 V
Sum of the pipe inner pressure variation value every 4 ms	≤ 5 V

Time Needed for Diagnosis: 2000 ms

CS: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**

If the duration of time while the following conditions are met is longer than the time indicated, judge 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: 2500 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Ignition	ON
Terminal output voltage when ECM outputs ON signal	LOW

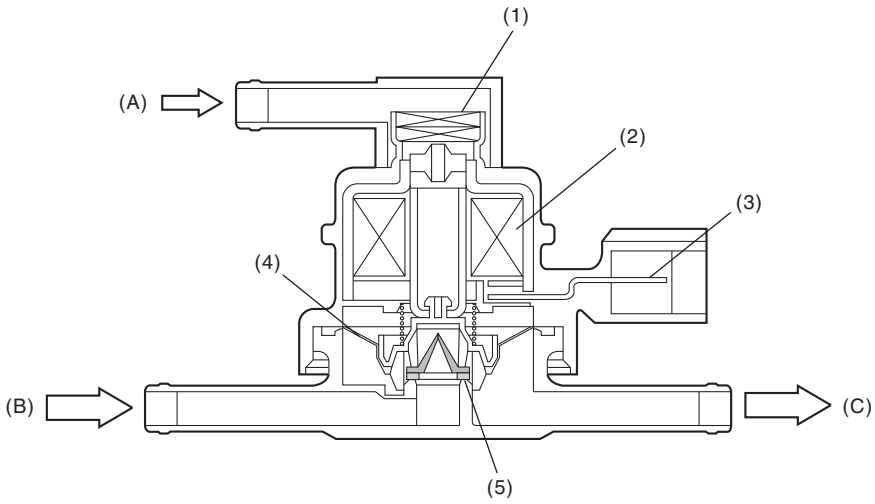
Time Needed for Diagnosis: Less than 1 second

CT: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



(A)	Barometric pressure	(B)	Shut-off valve	(C)	To fuel tank
(1)	Filter	(3)	Connector terminal	(5)	Valve
(2)	Coil	(4)	Diaphragm		

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Elapsed time after starting the engine	≥ 1 second
Terminal output voltage when ECM outputs ON signal	High

Time Needed for Diagnosis: 2500 ms
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Elapsed time after starting the engine	≥ 1 second
Terminal output voltage when ECM outputs ON signal	Low

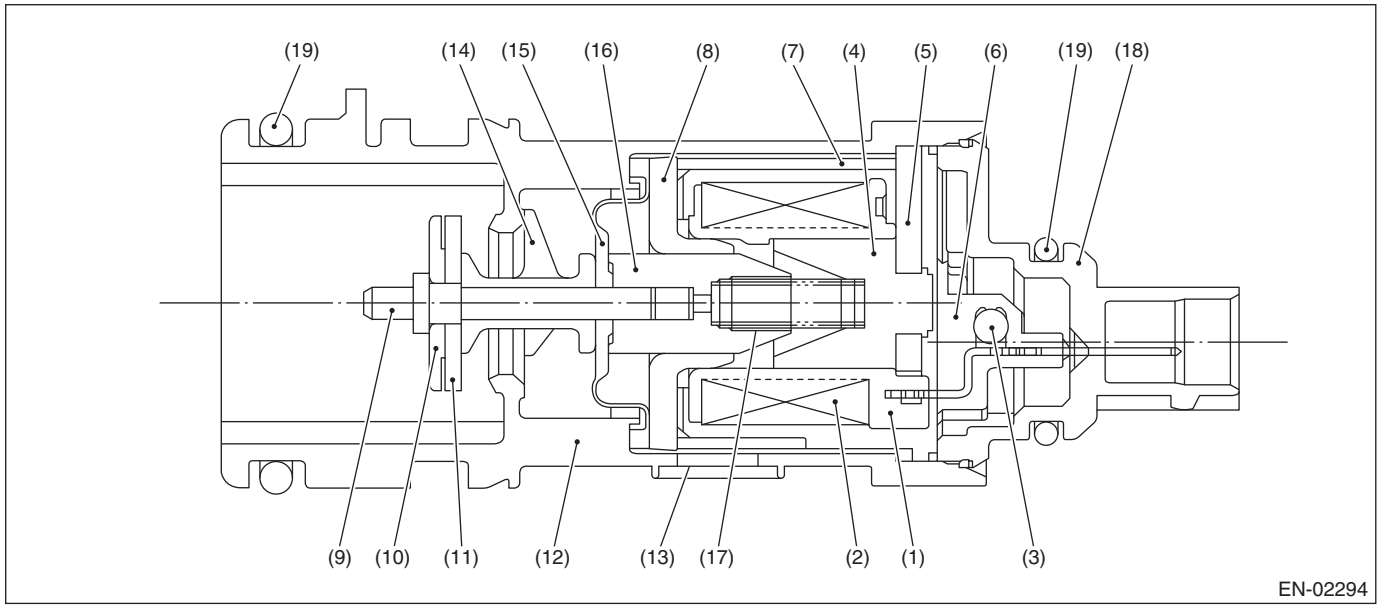
Time Needed for Diagnosis: Less than 1 second

CU: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
(2) Coil
(3) Diode
(4) Stator core
(5) End plate
(6) Body
(7) Yoke
(8) Magnetic plate
(9) Shaft
(10) Plate
(11) Valve
(12) Housing
(13) Filter
(14) Retainer
(15) Diaphragm
(16) Movable core
(17) Spring
(18) Cover
(19) O-ring

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Drain valve	Open
Battery voltage	≥ 10.9 V
Barometric pressure	≥ 75 kPa (563 mmHg, 22.2 inHg)
Tank pressure when starter is OFF → ON	–0.7 kPa (–5 mmHg, –0.2 inHg) and 1.4 kPa (10.7 mmHg, 0.4 inHg)

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	≤ –4 kPa (–30 mmHg, –1.2 inHg)

Time Needed for Diagnosis: 3000 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	> –4 kPa (–30 mmHg, –1.2 inHg)
Cumulative time when all the malfunction criteria below are met.	≥ 30000 ms
Purge control solenoid valve duty	Not = 0
Fuel temperature	–10 °C (14 °F) — 55 °C (131 °F)
Intake manifold relative pressure	≥ – 26.7 kPa (– 200 mmHg, – 7.9 inHg)

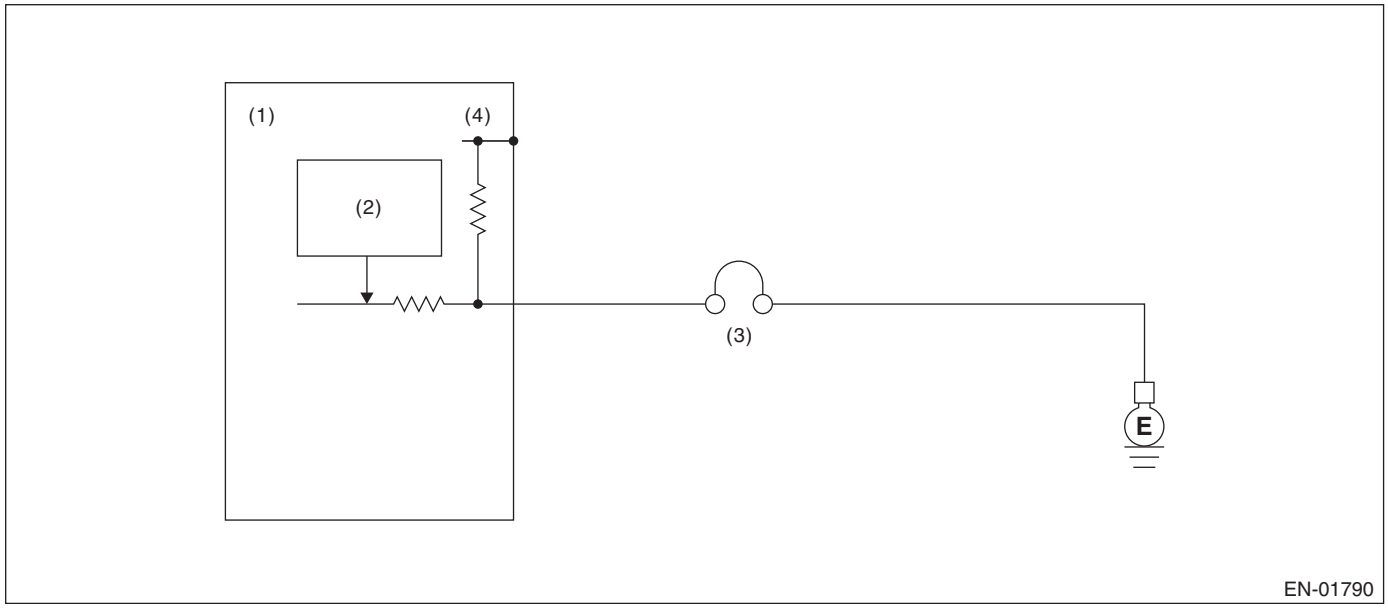
Time Needed for Diagnosis: Less than 1 second

CV:DTC P1491 POSITIVE CRANKCASE VENTILATION (BLOW-BY) FUNCTION PROBLEM

1. OUTLINE OF DIAGNOSIS

Detect the blow-by hose disconnection 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.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Engine condition	After engine starting
Positive crankcase ventilation diagnosis voltage	High

Time Needed for Diagnosis: 2500 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Engine condition	After engine starting
Positive crankcase ventilation diagnosis voltage	Low

Time Needed for Diagnosis: Less than 1 second

CW:DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of starter SW.
If the status becomes post engine start although the starter has not been turned to ON, judge as OFF NG.

2. ENABLE CONDITIONS

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 (0.6 MPH)
Starter ON signal	Not detected
Engine condition	Change from pre-start to post-start
Battery voltage	≥ 8 V

Time Needed for Diagnosis: Less than 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 if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Starter ON	Experienced
Starter ON diagnosis	No diagnosis experience
Battery voltage	≥ 8 V

Time Needed for Diagnosis: Less than 1 second

CX: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 power voltage is low.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Voltage of back-up power supply	Low
Battery voltage	≥ 10.9 V
Engine condition	After engine starting

Time Needed for Diagnosis: 2500 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Voltage of back-up power supply	High
Battery voltage	≥ 10.9 V
Engine condition	After engine starting

Time Needed for Diagnosis: Less than 1 second

CY:DTC P1570 ANTENNA

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0513. <Ref. to GD(H4DOTC)-186, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CZ:DTC P1571 REFERENCE CODE INCOMPATIBILITY

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0513. <Ref. to GD(H4DOTC)-186, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DA:DTC P1572 IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT)

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0513. <Ref. to GD(H4DOTC)-186, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DB:DTC P1574 KEY COMMUNICATION FAILURE

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0513. <Ref. to GD(H4DOTC)-186, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DC:DTC P1576 EGI CONTROL MODULE EEPROM

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0513. <Ref. to GD(H4DOTC)-186, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DD:DTC P1577 IMM CONTROL MODULE EEPROM

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0513. <Ref. to GD(H4DOTC)-186, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DE:DTC P1578 METER FAILURE

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0513. <Ref. to GD(H4DOTC)-186, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DF: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	≥ 10.9 V
Engine coolant temperature	≥ –30 °C (–22 °F)
Ambient air temperature	≥ –30 °C (–22 °F)

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generator valve opening	≥ 64.3 °
Tumble generator valve “close” signal output	≥ 3200 ms

Time Needed for Diagnosis: 3000 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generator valve opening	< 64.3 °
Tumble generator valve “close” signal output	≥ 3200 ms

Time Needed for Diagnosis: Less than 1 second

DG: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	≥ 10.9 V
Engine coolant temperature	≥ –30 °C (–22 °F)
Ambient air temperature	≥ –30 °C (–22 °F)

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generator valve opening	≥ 64.3 °
Tumble generator valve “close” signal output	≥ 3200 ms

Time Needed for Diagnosis: 3000 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generator valve opening	< 64.3 °
Tumble generator valve “close” signal output	≥ 3200 ms

Time Needed for Diagnosis: Less than 1 second

DH: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	≥ –30 °C (–22 °F)
Ambient air temperature	≥ –30 °C (–22 °F)

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generator valve opening	< 64.3 °
Tumble generator valve “open” signal output	≥ 4600 ms

Time Needed for Diagnosis: 3000 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generator valve opening	≥ 64.3 °
Tumble generator valve “open” signal output	≥ 4600 ms

Time Needed for Diagnosis: Less than 1 second

DI: 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	≥ –30 °C (–22 °F)
Ambient air temperature	≥ –30 °C (–22 °F)

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generator valve opening	< 64.3 °
Tumble generator valve “open” signal output	≥ 4600 ms

Time Needed for Diagnosis: 3000 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generator valve opening	≥ 64.3 °
Tumble generator valve “open” signal output	≥ 4600 ms

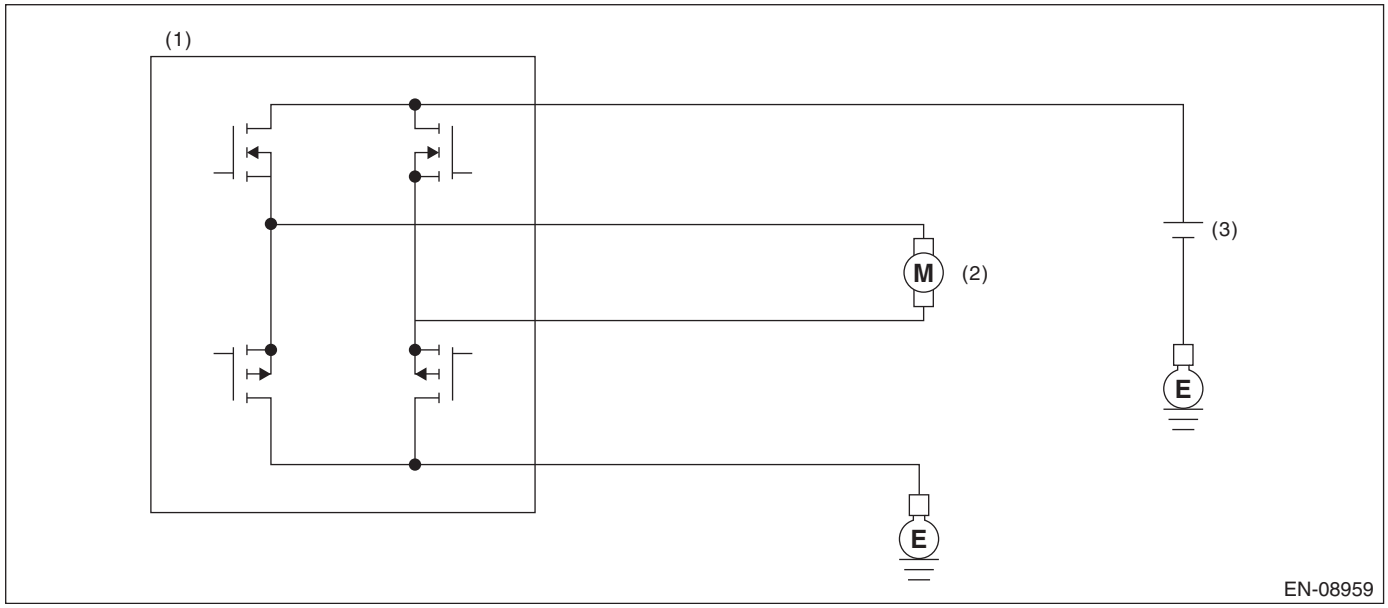
Time Needed for Diagnosis: Less than 1 second

DJ: 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 as 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	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

At the main IC, check the sent signal at each timing which occurs immediately after the tumble generator valve output is set to OFF → ON, and judge open NG when the open NG signal is sent 96 ms × 20 time(s) in a row.

Judgment Value

Malfunction Criteria	Threshold Value
Open NG signal input	Low

Time Needed for Diagnosis: 96 ms × 20 time(s)
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG when the OK signal is sent.

Judgment Value

Malfunction Criteria	Threshold Value
Open NG signal input	High

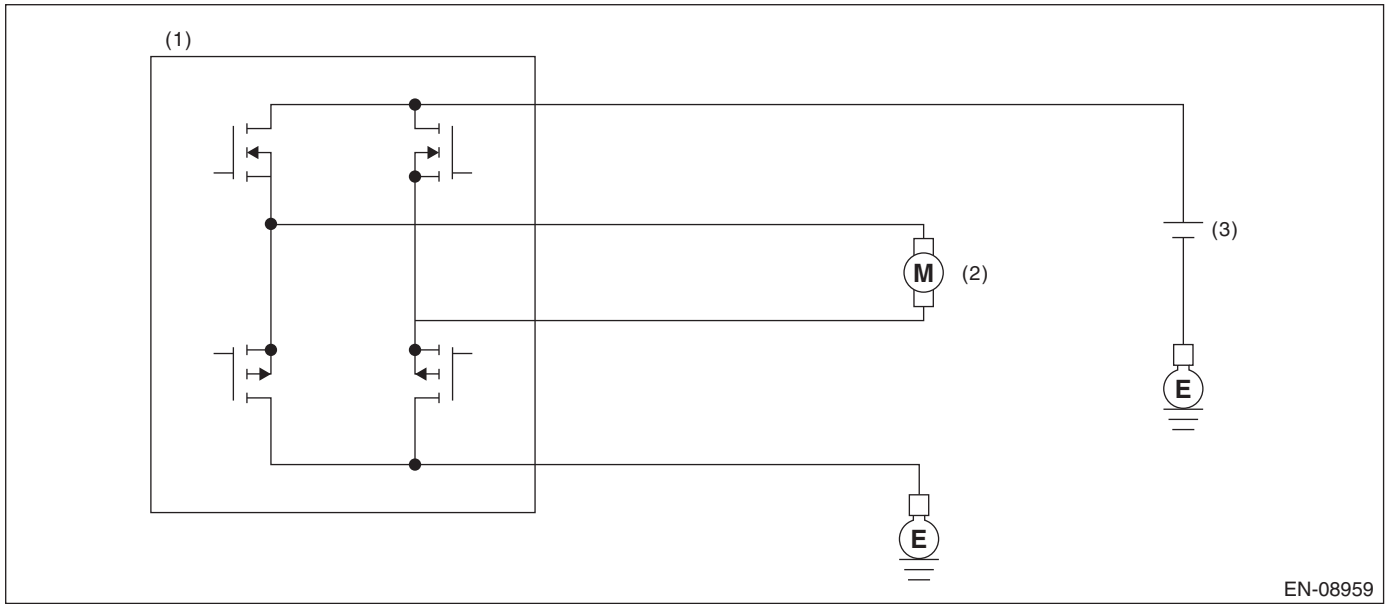
Time Needed for Diagnosis: Less than 1 second

DK: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 as 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

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

At the main IC, check the sent signal at each timing which occurs immediately after the tumble generator valve output is set to OFF → ON, and judge overcurrent NG when the overcurrent NG signal is sent 96 ms × 10 time(s) in a row.

Judgment Value

Malfunction Criteria	Threshold Value
Overcurrent NG signal input	Low

Time Needed for Diagnosis: 96 ms × 10 time(s)
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG when the OK signal is sent.

Judgment Value

Malfunction Criteria	Threshold Value
Overcurrent NG signal input	High

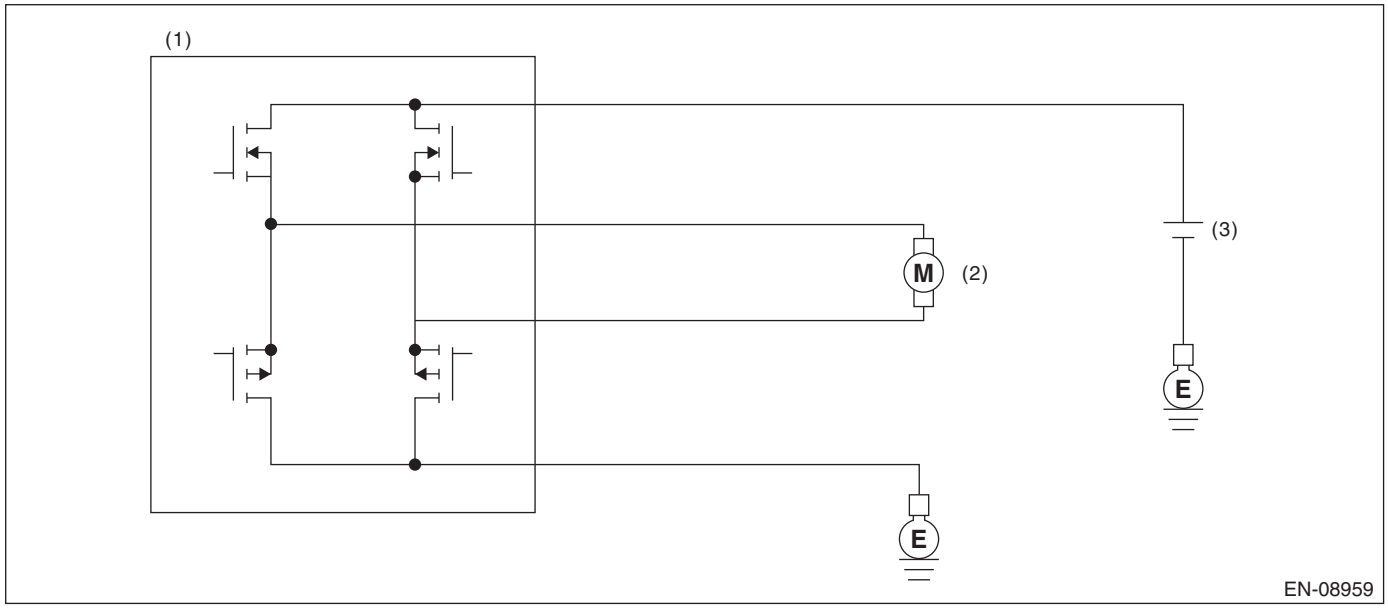
Time Needed for Diagnosis: Less than 1 second

DL: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 as 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	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

At the main IC, check the sent signal at each timing which occurs immediately after the tumble generator valve output is set to OFF → ON, and judge open NG when the open NG signal is sent 96 ms × 20 time(s) in a row.

Judgment Value

Malfunction Criteria	Threshold Value
Open NG signal input	Low

Time Needed for Diagnosis: 96 ms × 20 time(s)
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG when the OK signal is sent.

Judgment Value

Malfunction Criteria	Threshold Value
Open NG signal input	High

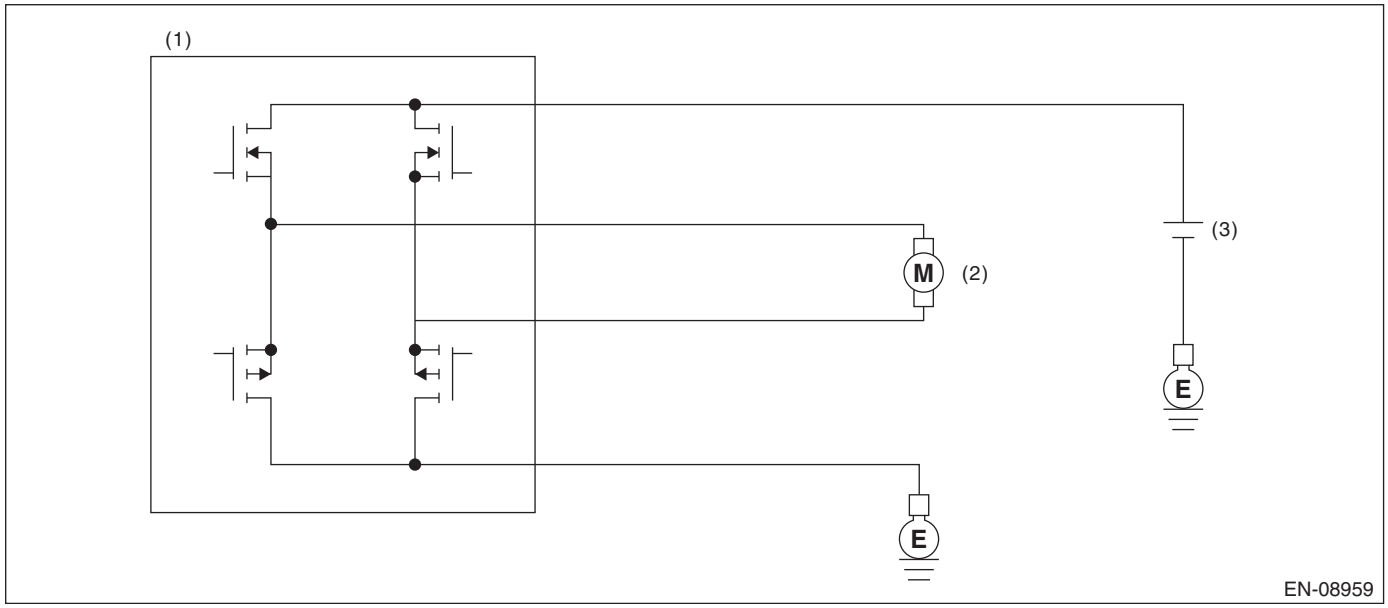
Time Needed for Diagnosis: Less than 1 second

DM: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 as 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

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

At the main IC, check the sent signal at each timing which occurs immediately after the tumble generator valve output is set to OFF → ON, and judge overcurrent NG when the overcurrent NG signal is sent 96 ms × 10 time(s) in a row.

Judgment Value

Malfunction Criteria	Threshold Value
Overcurrent NG signal input	Low

Time Needed for Diagnosis: 96 ms × 10 time(s)
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG when the OK signal is sent.

Judgment Value

Malfunction Criteria	Threshold Value
Overcurrent NG signal input	High

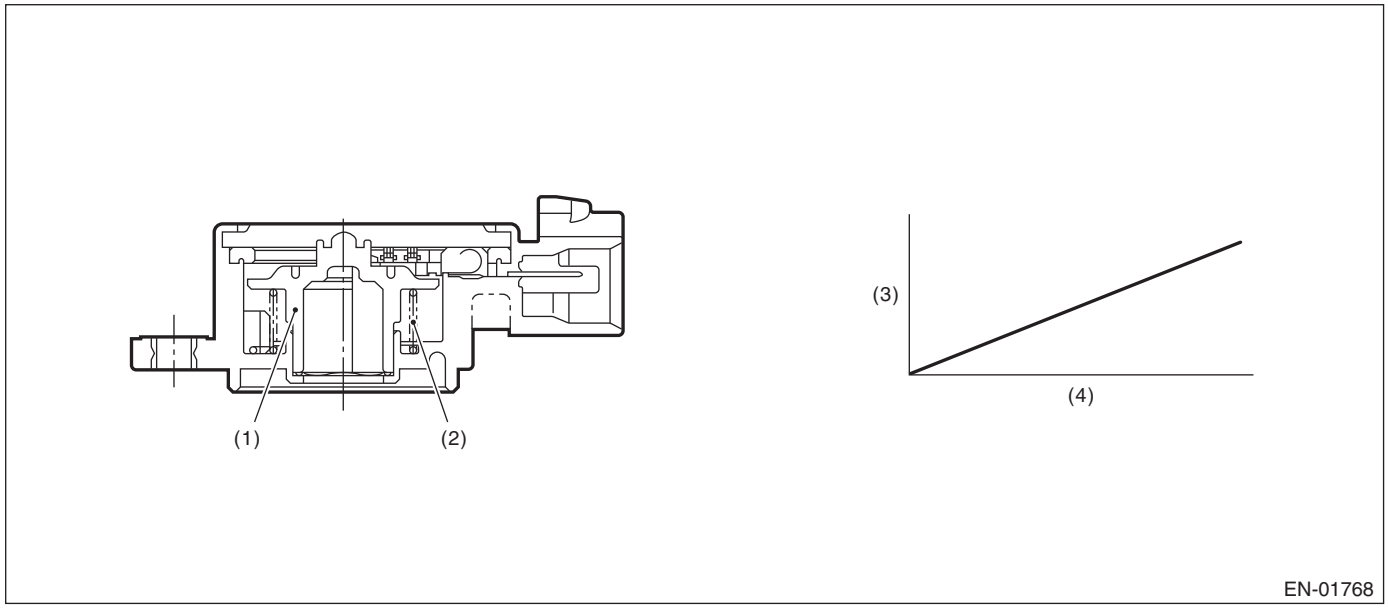
Time Needed for Diagnosis: Less than 1 second

DN: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 out of specification.

2. COMPONENT DESCRIPTION



(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

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.217 V

Time Needed for Diagnosis: 500 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 0.217 V

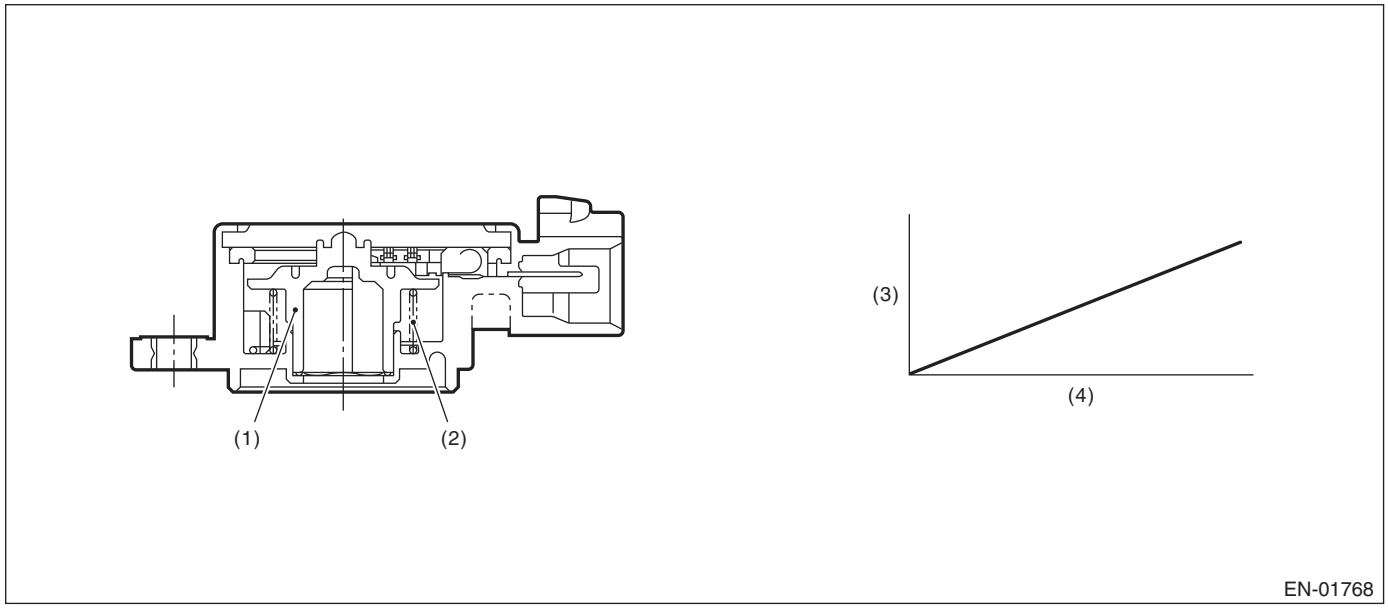
Time Needed for Diagnosis: Less than 1 second

DO: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 out of specification.

2. COMPONENT DESCRIPTION



(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

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.783 V

Time Needed for Diagnosis: 500 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 4.783 V

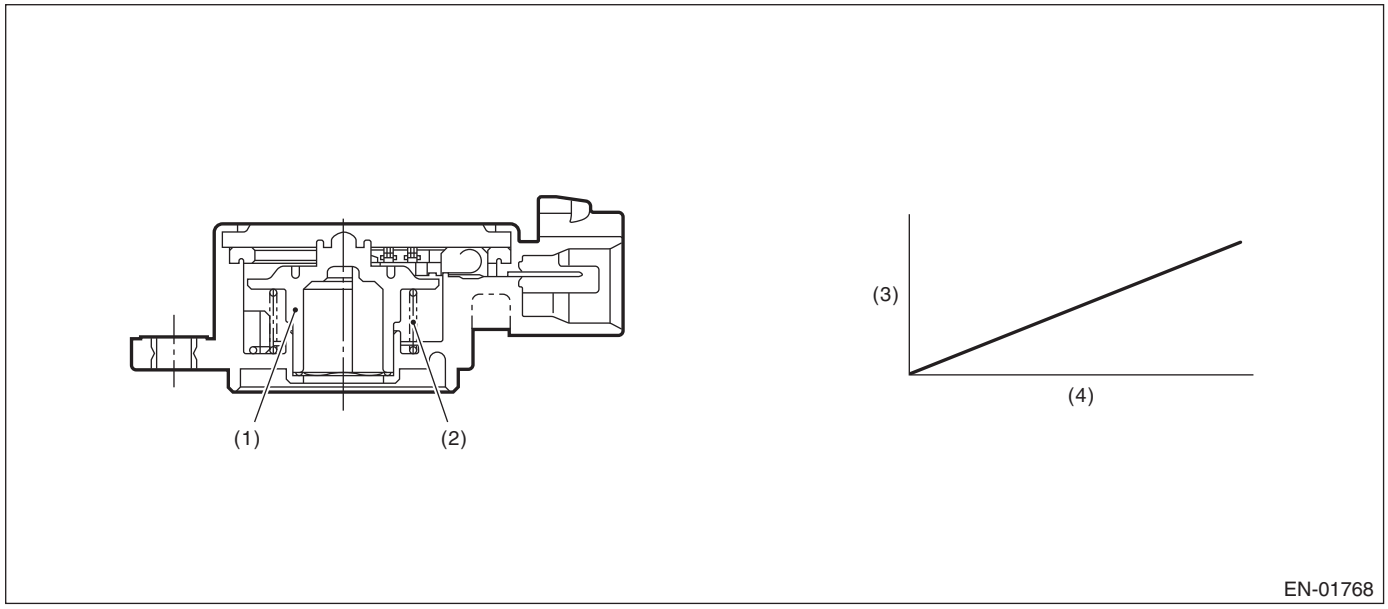
Time Needed for Diagnosis: Less than 1 second

DP: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 out of specification.

2. COMPONENT DESCRIPTION



(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

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.217 V

Time Needed for Diagnosis: 500 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 0.217 V

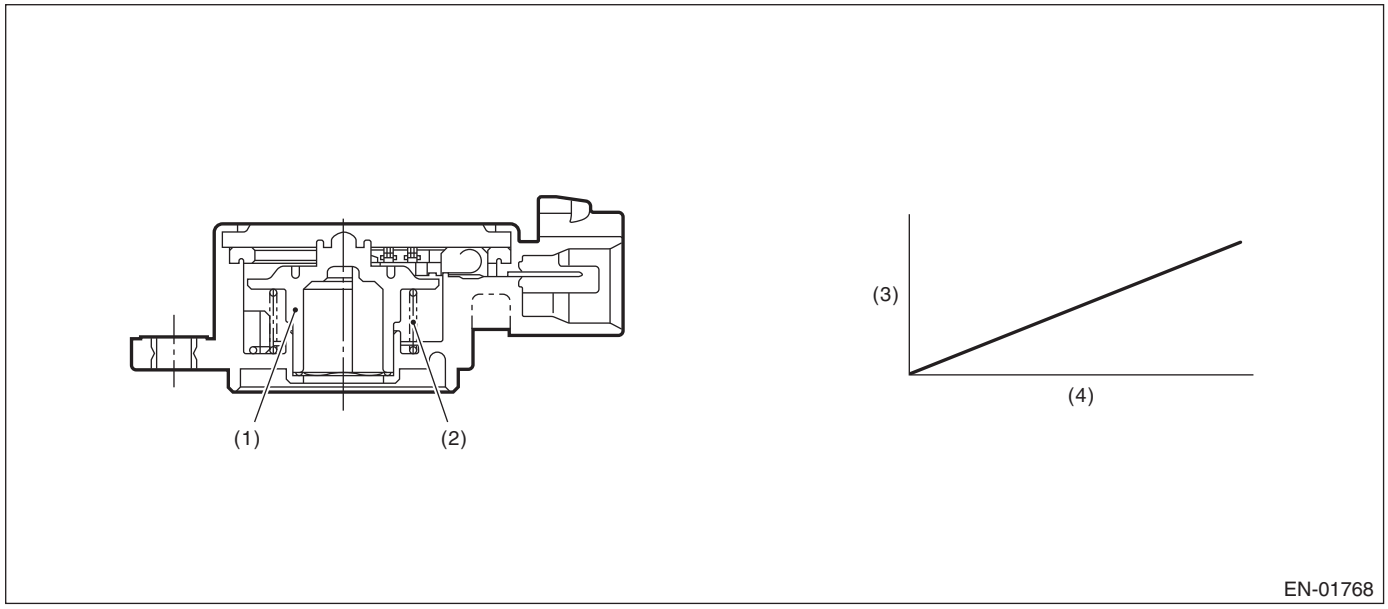
Time Needed for Diagnosis: Less than 1 second

DQ: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 out of specification.

2. COMPONENT DESCRIPTION



(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

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.783 V

Time Needed for Diagnosis: 500 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 4.783 V

Time Needed for Diagnosis: Less than 1 second

DR:DTC P2088 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the oil flow control solenoid valve.
Judge as NG when the current is small even though the duty signal is large.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Oil flow control solenoid valve control duty	≥ 99.61 %
Oil control solenoid valve control present current	< 0.306 A

Time Needed for Diagnosis: 2000 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Target current value of the oil flow control solenoid valve	≥ 0.14 A
|Target current value of the oil flow control solenoid valve – Oil flow control solenoid valve control current value|	< 0.08 A

Time Needed for Diagnosis: 2000 ms

DS:DTC P2089 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of oil flow control solenoid valve.
Judge as NG when the current is large even though the duty signal is small.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Oil flow control solenoid valve control duty	< 0.39 %
Oil control solenoid valve control present current	≥ 0.306 A

Time Needed for Diagnosis: 2000 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
|Target current value of the oil flow control solenoid valve – Oil flow control solenoid valve control current value|	< 0.08 A

Time Needed for Diagnosis: 2000 ms

DT:DTC P2092 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 2)

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P2088. <Ref. to GD(H4DOTC)-236, DTC P2088 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

DU:DTC P2093 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 2)

1. OUTLINE OF DIAGNOSIS

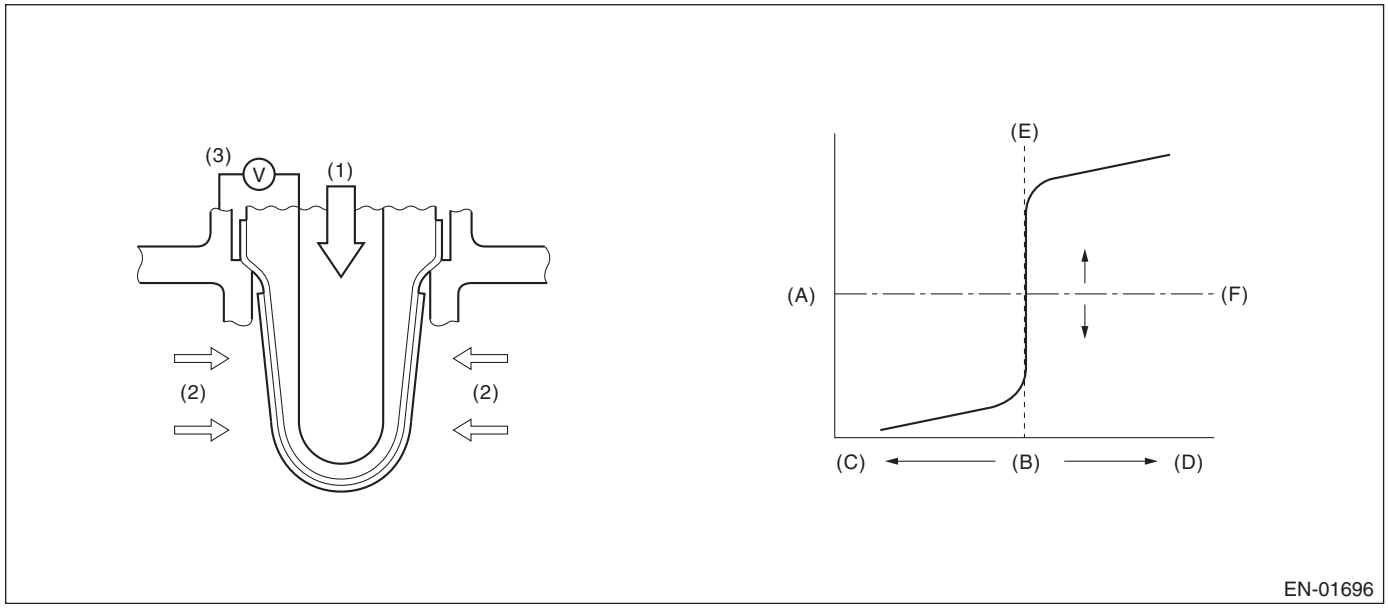
NOTE:
For the detection standard, refer to DTC P2089. <Ref. to GD(H4DOTC)-237, DTC P2089 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

DV:DTC P2096 POST CATALYST FUEL TRIM SYSTEM TOO LEAN (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel system from the size of the sub feedback learning value.
Control the sub feedback learning and judge as NG when the learning value is in the lean zone.

2. COMPONENT DESCRIPTION



(A)	Electromotive force	(B)	Air fuel ratio	(C)	Rich
(D)	Lean	(E)	Theoretical air fuel ratio	(F)	Comparative voltage
(1)	Atmosphere	(2)	Exhaust gas	(3)	Electromotive force

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Conditions for carrying out the sub feedback learning	Completed
Continuous time when all conditions are established.	≥ 1 s

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when the vehicle is idling or running at a constant speed of 80 km/h (50 MPH) or more.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Sub feedback learning value	< –0.04

Time Needed for Diagnosis: 5 s × 1 time(s)
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Sub feedback learning value	≥ –0.04 + 0.005

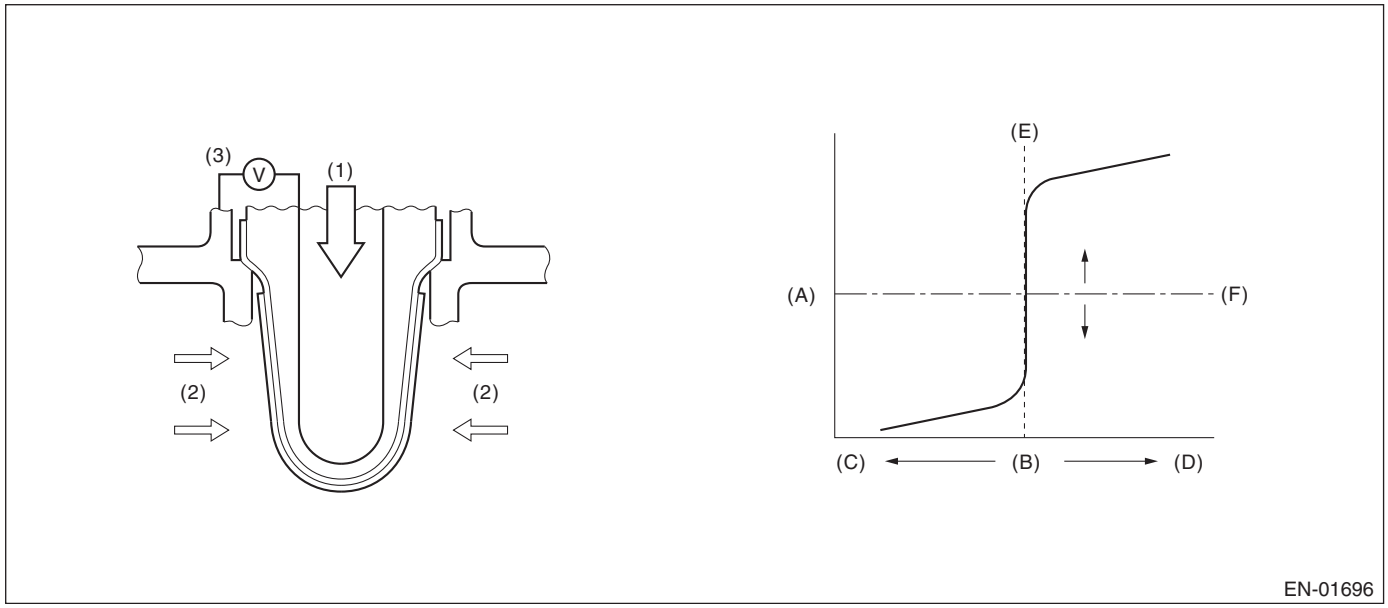
Time Needed for Diagnosis: 5 s

DW:DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel system from the size of the sub feedback learning value.
Sub feedback learning is being performed. When the learning value goes to the rich side, judge as NG.

2. COMPONENT DESCRIPTION



(A)	Electromotive force	(B)	Air fuel ratio	(C)	Rich
(D)	Lean	(E)	Theoretical air fuel ratio	(F)	Comparative voltage
(1)	Atmosphere	(2)	Exhaust gas	(3)	Electromotive force

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Conditions for carrying out the sub feedback learning	Completed
Continuous time when all conditions are established.	≥ 1 s

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when the vehicle is idling or running at a constant speed of 80 km/h (50 MPH) or more.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Sub feedback learning value	≥ 0.04

Time Needed for Diagnosis: 5 s × 1 time(s)
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Sub feedback learning value	< 0.04 + –0.005

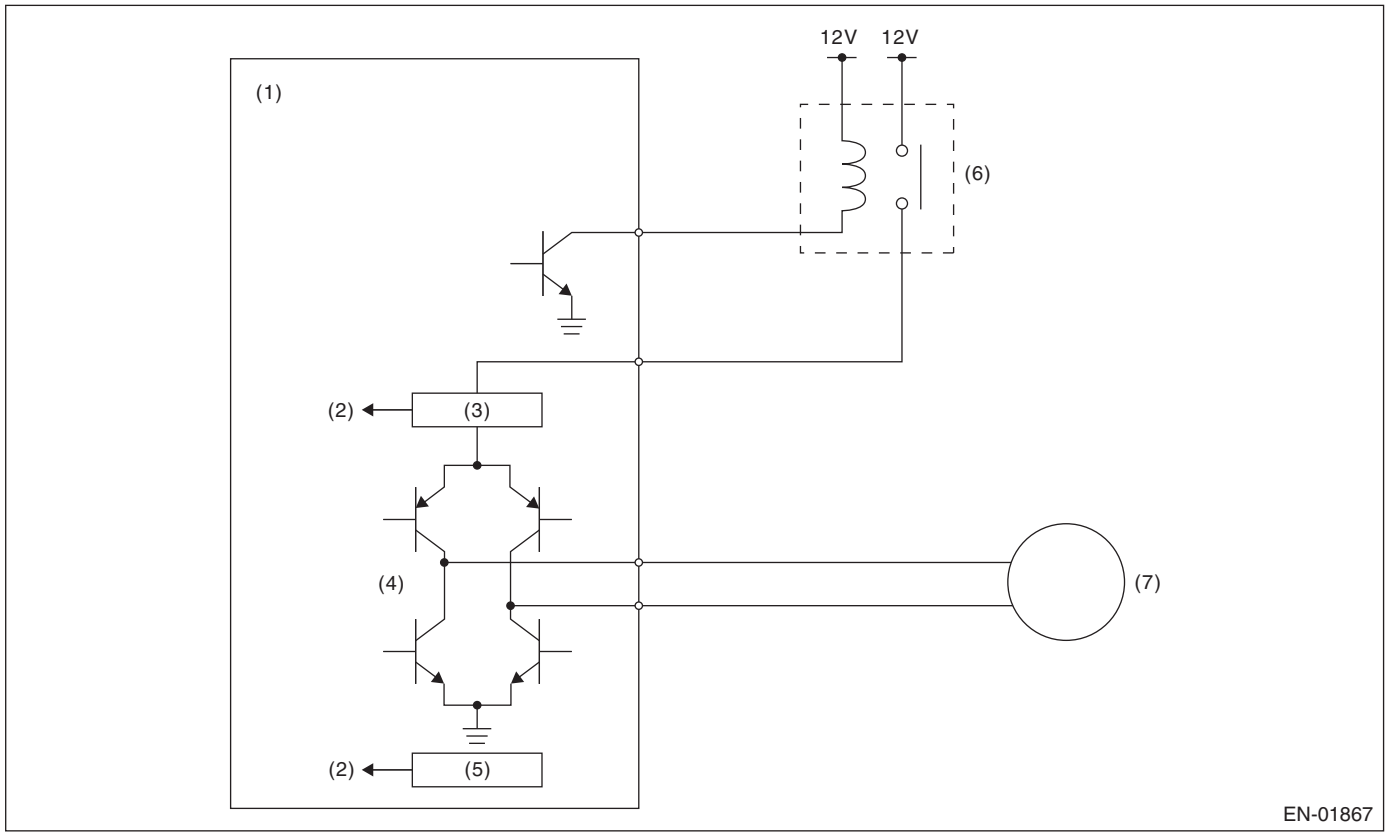
Time Needed for Diagnosis: 5 s

DX:DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/ PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Judge as NG when the motor current becomes 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

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 current	≤ 8 A
Drive circuit inner temperature	≤ 175°C (347°F)

Time Needed for Diagnosis:

- 500 milliseconds (For NG)
- 2000 milliseconds (For OK)

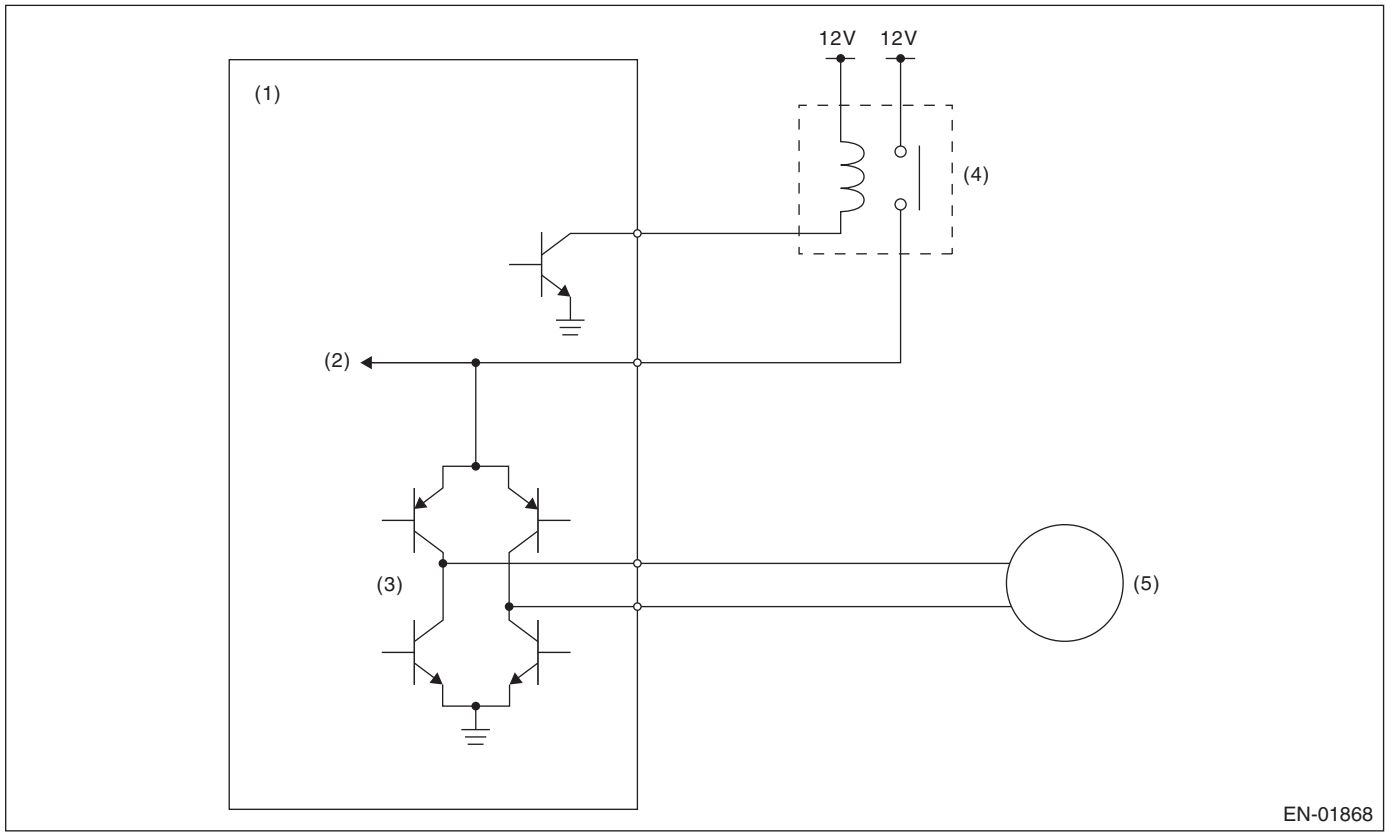
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

DY: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



(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 control relay throttle 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)

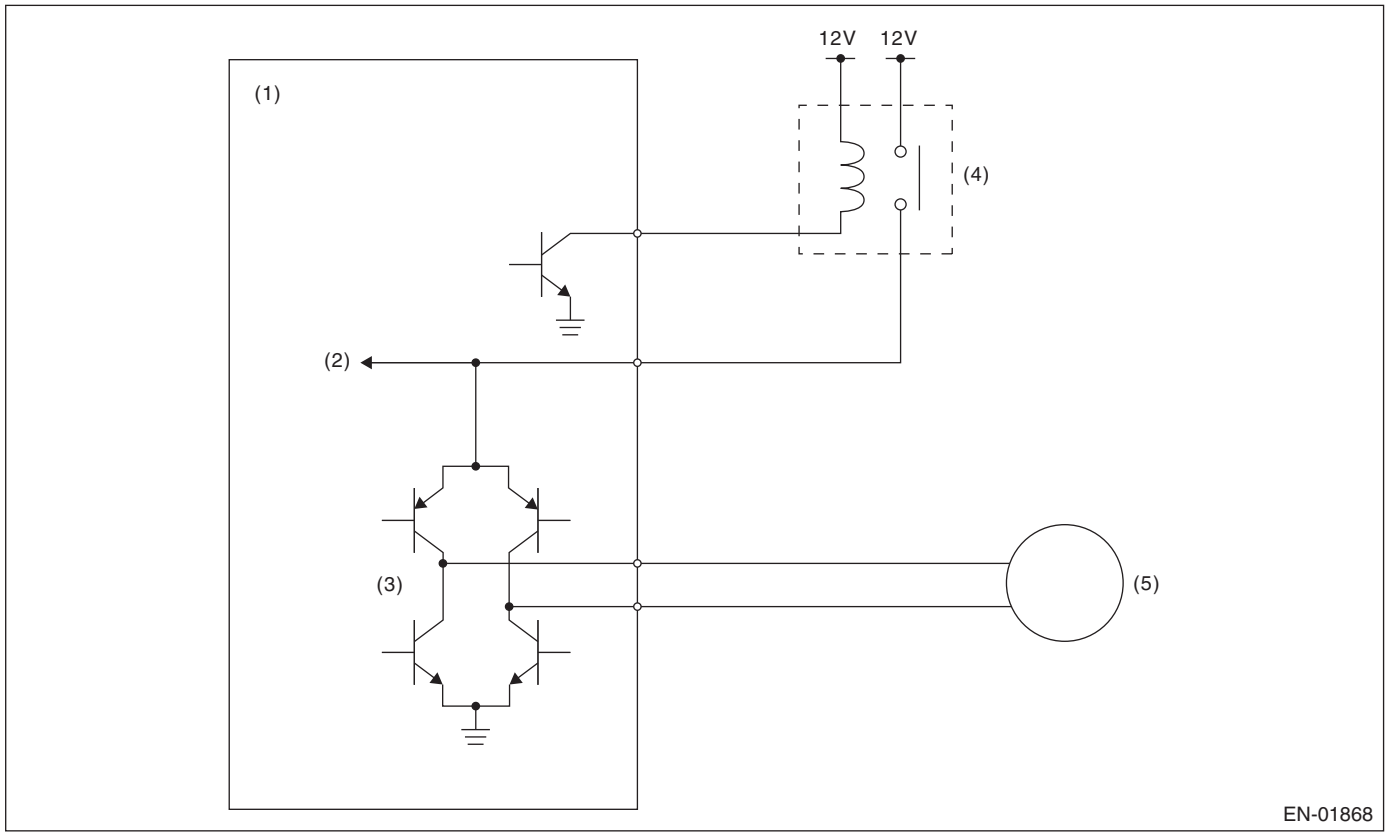
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

DZ: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 control relay to OFF.

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	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)

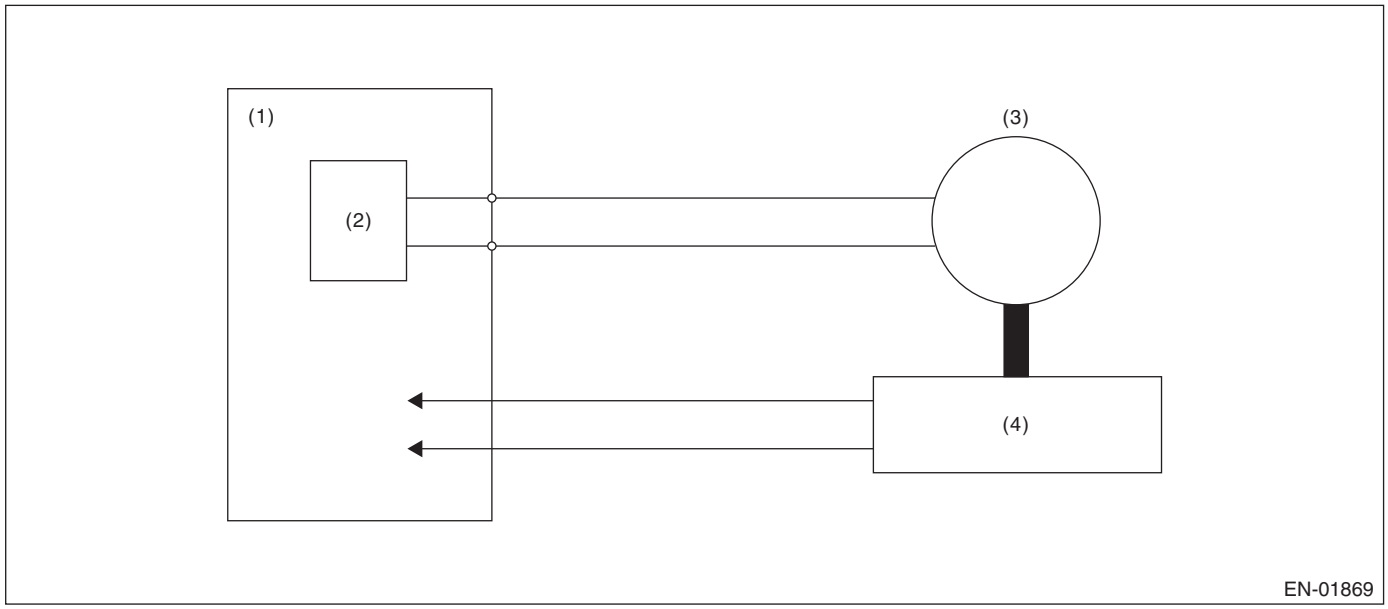
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

EA:DTC P2109 THROTTLE/PEDAL POSITION SENSOR “A” MINIMUM STOP PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Judge as NG when full close point learning cannot conducted or abnormal value is detected.

2. COMPONENT DESCRIPTION



(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 clear 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 full 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°

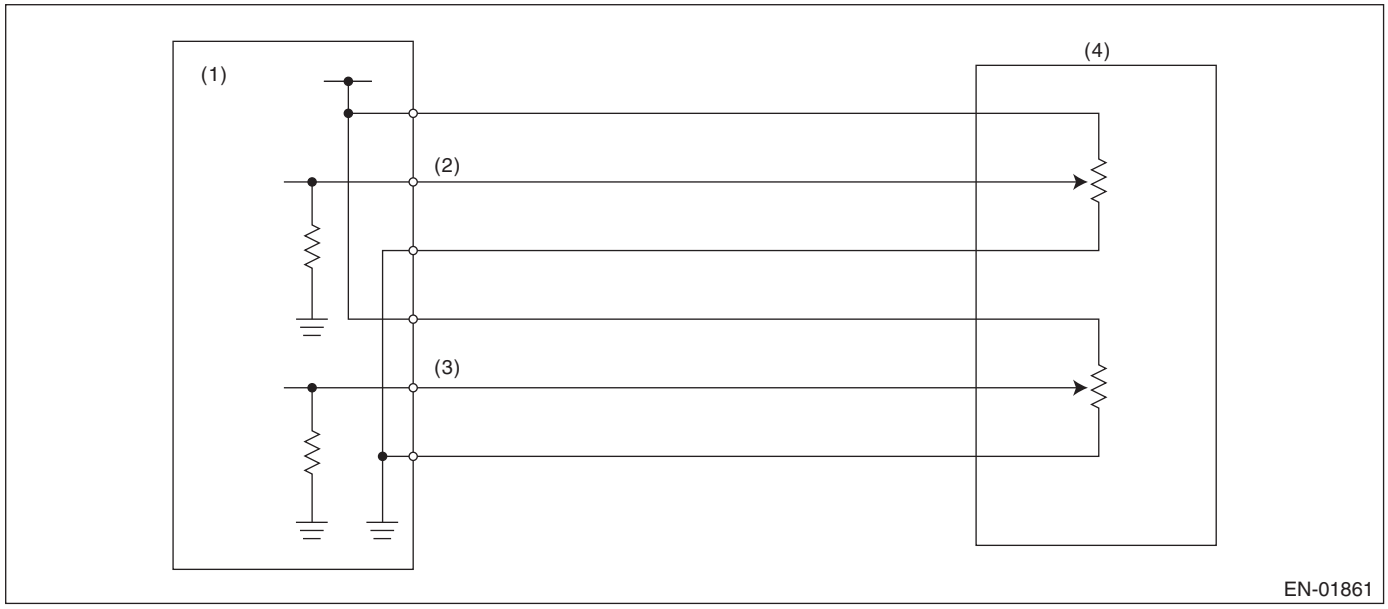
Time Needed for Diagnosis: 8 — 80 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

EB: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 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
Battery voltage	≥ 6 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	< 0.217 V

Time Needed for Diagnosis: 100 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	≥ 0.217 V

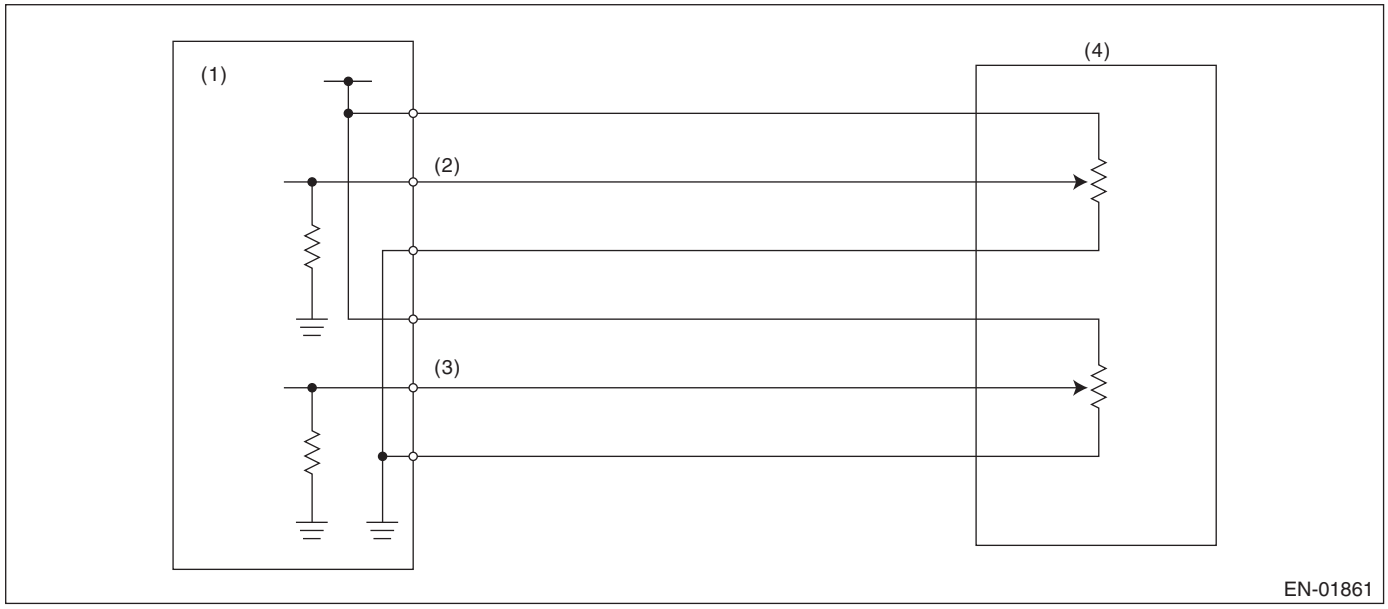
Time Needed for Diagnosis: 100 ms

EC: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 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
Battery voltage	≥ 6 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	≥ 4.783 V

Time Needed for Diagnosis: 32 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	< 4.783 V

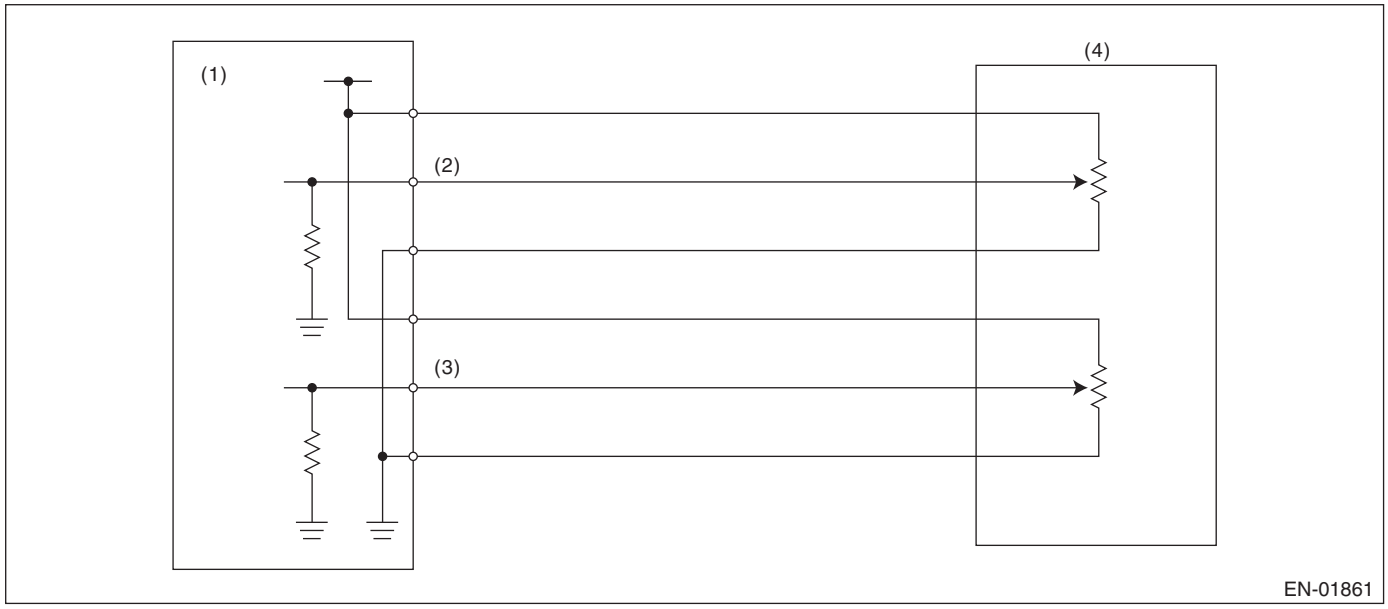
Time Needed for Diagnosis: 32 ms

ED: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 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
Battery voltage	≥ 6 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 2 input voltage	< 0.217 V

Time Needed for Diagnosis: 100 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 2 input voltage	≥ 0.217 V

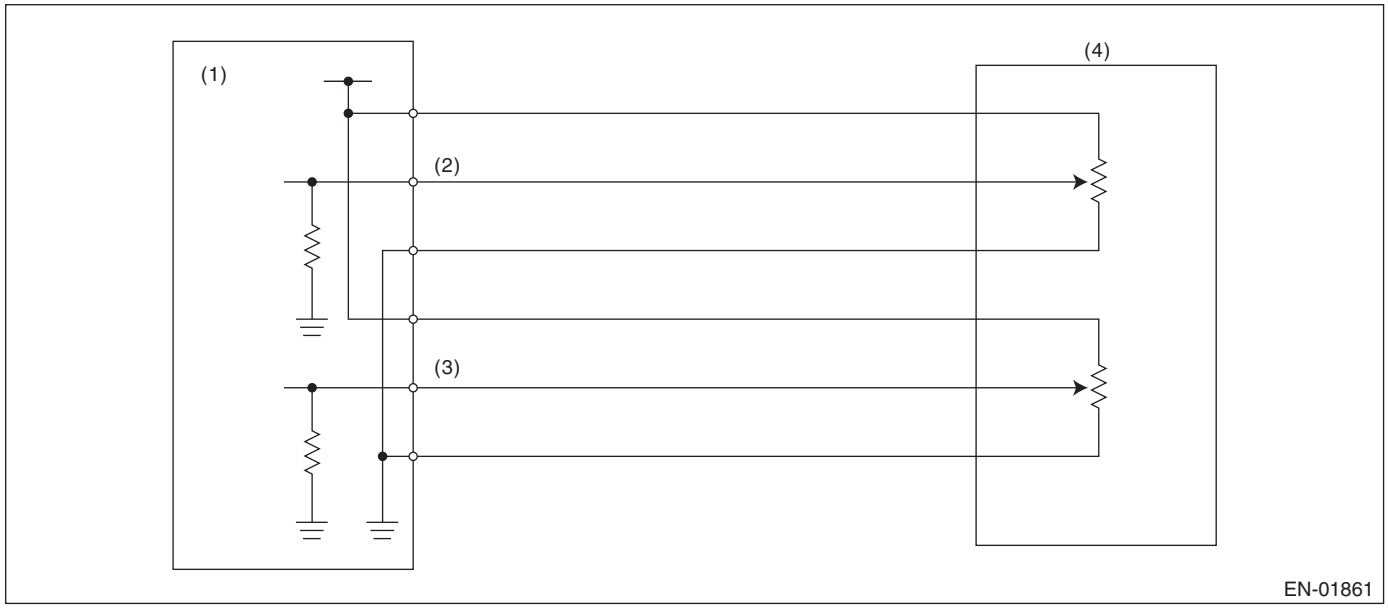
Time Needed for Diagnosis: 100 ms

EE: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 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
Battery voltage	≥ 6 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 2 input voltage	≥ 4.783 V

Time Needed for Diagnosis: 100 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 2 input voltage	< 4.783 V

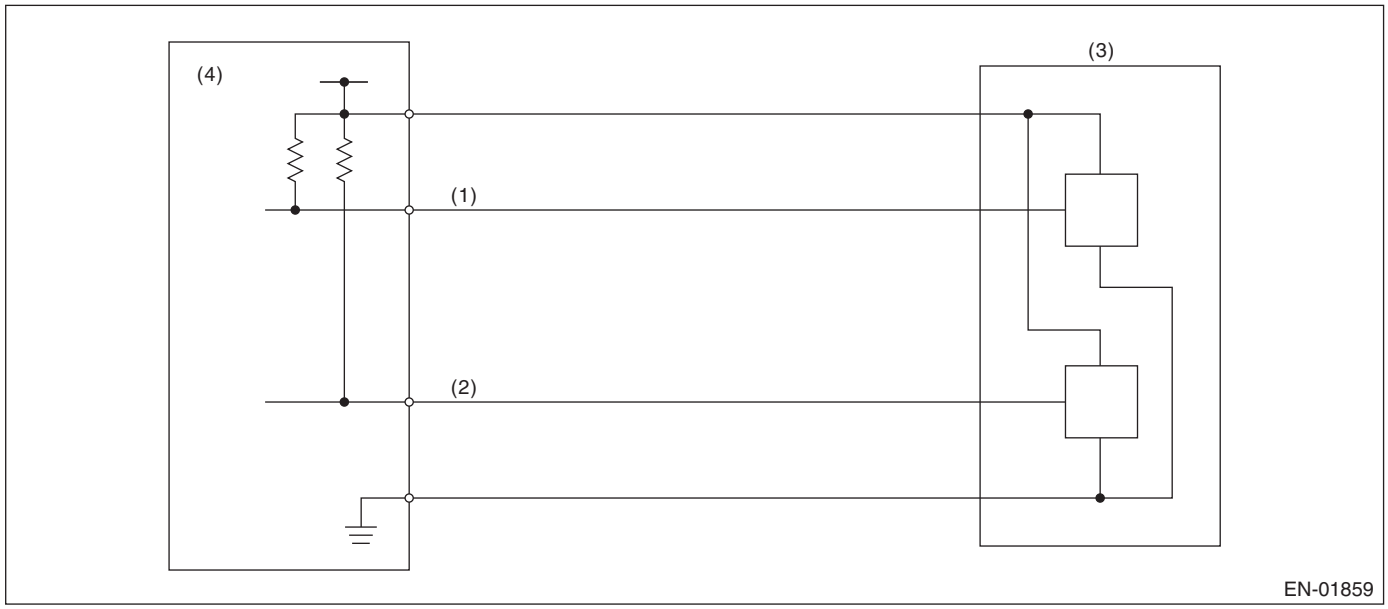
Time Needed for Diagnosis: 100 ms

EF: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
(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
Battery voltage	≥ 6 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

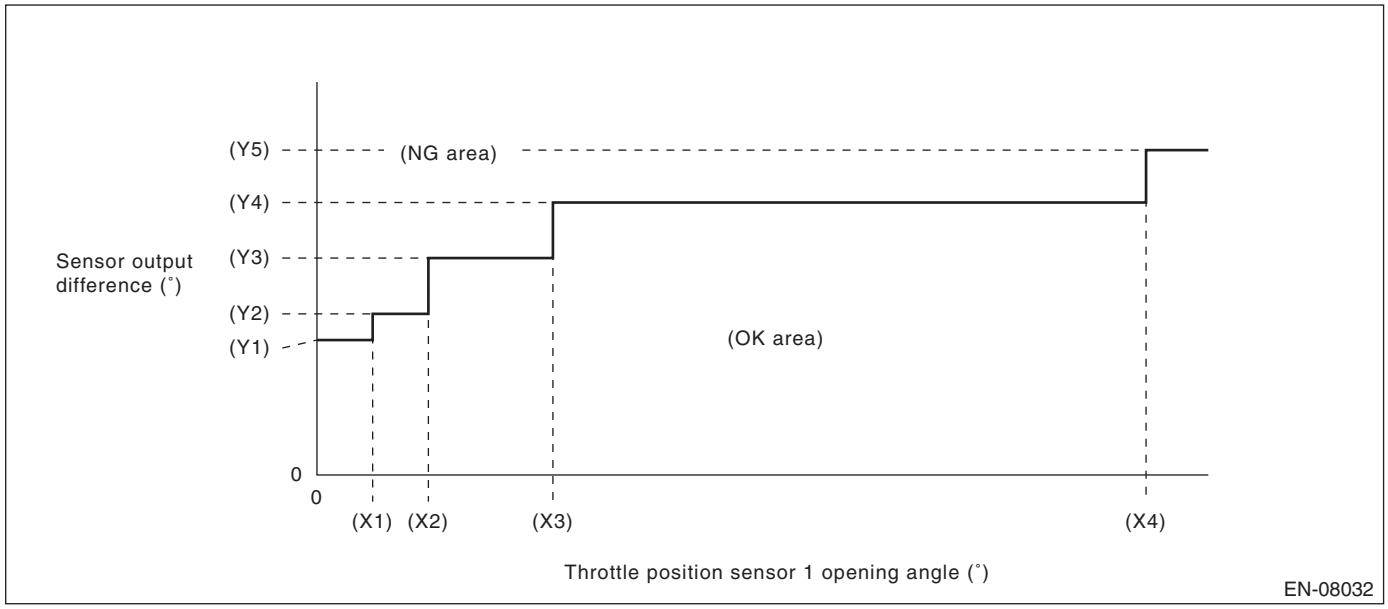
• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Signal difference between two sensors	Within NG range of **Details of Judgment value**

Details of Judgment Value



(X1) 2.125 °
(X2) 4.25 °
(X3) 9 °
(X4) 31.625 °

(Y1) 5.15 °
(Y2) 6.15 °
(Y3) 8.28 °
(Y4) 10.4 °
(Y5) 12.4 °

Time Needed for Diagnosis: 212 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Signal difference between two sensors	Within OK range of **Details of Judgment value**

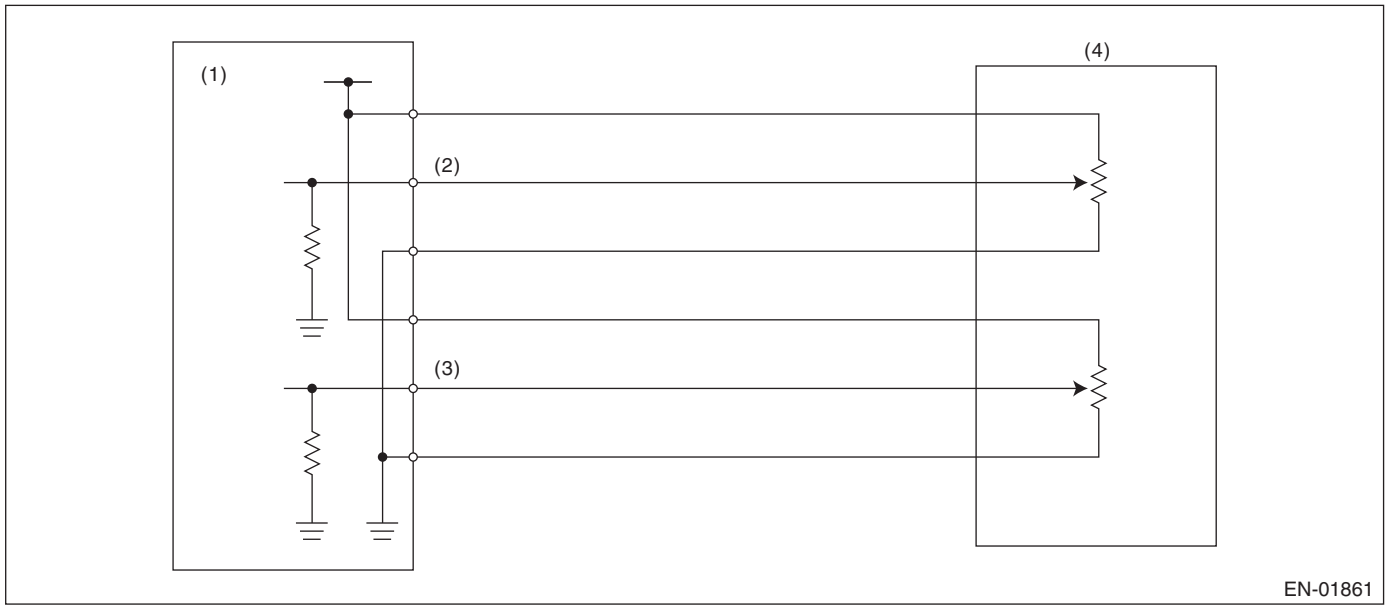
Time Needed for Diagnosis: 24 ms

EG: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
Battery voltage	≥ 6 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

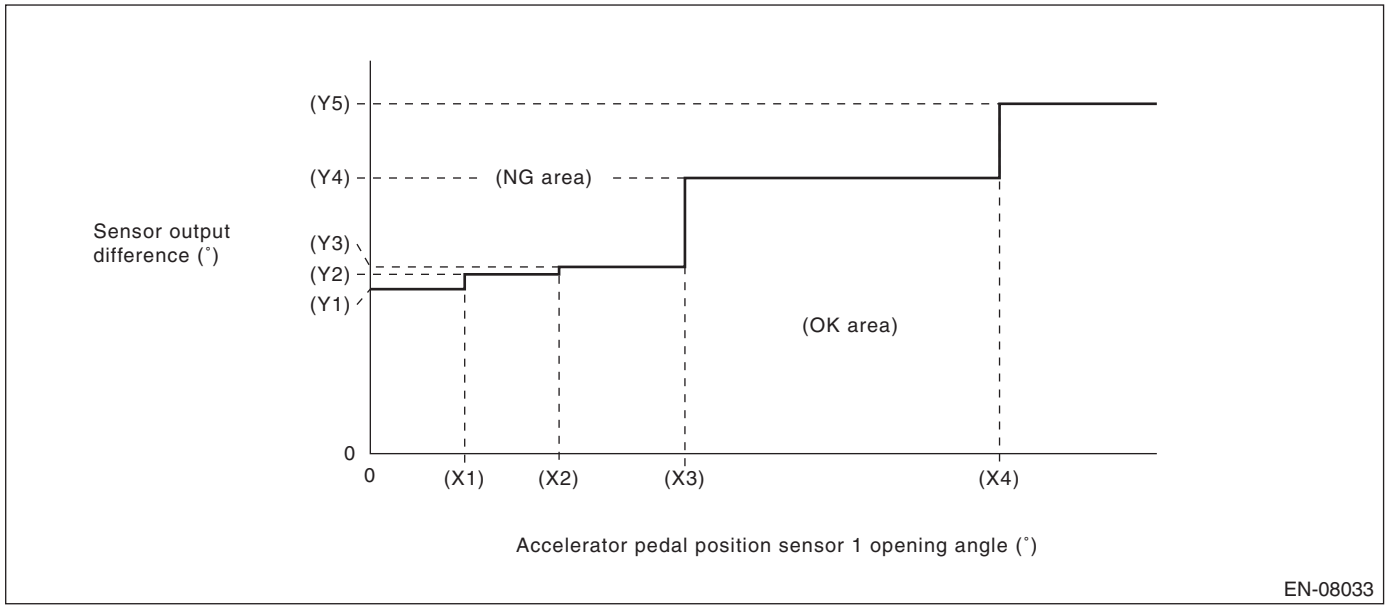
- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Signal difference between two sensors	Within NG range of **Details of Judgment value**

Details of Judgment Value



(X1) 0.6 °
(X2) 1.2 °
(X3) 2 °
(X4) 4 °

(Y1) 1.465 °
(Y2) 1.597 °
(Y3) 1.663 °
(Y4) 2.455 °
(Y5) 3.116 °

Time Needed for Diagnosis: 116 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Signal difference between two sensors	Within OK range of **Details of Judgment value**

Time Needed for Diagnosis: 116 ms

EH:DTC P219A BANK 1 AIR-FUEL RATIO IMBALANCE

1. OUTLINE OF DIAGNOSIS

Detect malfunction of air fuel ratio deviation between cylinders from main feedback learning value, sub feedback learning value and engine speed variation.

2. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
Atmospheric pressure	> 75 kPa (563 mmHg, 22.2 inHg)
A/F main learning system	In operation
Engine speed	> 450 rpm
Engine coolant temperature	> 70 °C (158 °F)
Intake air temperature	< 70 °C (158 °F)
Engine load	> Value of Map 1
Engine load change	< 0.02 g/rev (0 oz/rev)
Evaporative system leak check	Not in operation
Cumulative time of canister purge after engine start	≥ 20 s
Learning value of EVAP conc.	< 0.2
Vehicle dynamic control or AT torque control	Not in operation
Intake manifold pressure change at 180°CA	< Value of Map 2
Throttle position change during 16 milliseconds	< 14 °
Fuel shut-off function	Not in operation

Map 1

Engine speed (rpm)	Idling	800	1200	1600	2000	2400	2800	3200	3600	4000
Measured value (g (oz)/rev)	na	0.228 (0.01)	0.22 (0.01)	0.22 (0.01)	0.22 (0.01)	0.228 (0.01)	0.23 (0.01)	0.234 (0.01)	0.242 (0.01)	0.25 (0.01)

Map 2

rpm	700	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500
kPa (mmHg, inHg)	26.7 (200, 7.9)	26.7 (200, 7.9)	26.7 (200, 7.9)	26.7 (200, 7.9)	26.7 (200, 7.9)	26.7 (200, 7.9)	26.7 (200, 7.9)	26.7 (200, 7.9)	26.7 (200, 7.9)	26.7 (200, 7.9)	26.7 (200, 7.9)	26.7 (200, 7.9)	26.7 (200, 7.9)

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Rich	
Main feedback learning value	< –0.124
Sub feedback learning value	< –0.043
When any one of the followings is established.	
• any one of the rich side misfire counters for each cylinder when in idling	> 9 time(s)
• total of the rich side misfire counters for each cylinder when in idling	> 9 time(s)
• any one of the rich side misfire counters for each cylinder when not in idling	> 20 time(s)
• total of the rich side misfire counters for each cylinder when not in idling	> 20 time(s)
Lean	
Main feedback learning value	> 0.021
Sub feedback learning value	< –0.013
When any one of the followings is established.	
• any one of the lean side misfire counters for each cylinder when in idling	> 115 time(s)
• total of the lean side misfire counters for each cylinder when in idling	> 65535 time(s)
• any one of the lean side misfire counters for each cylinder when not in idling	> 45 time(s)
• total of the lean side misfire counters for each cylinder when not in idling	> 65535 time(s)

Time Needed for Diagnosis: 1000 engine revs.
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge as OK and clear the NG if the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Rich	
Main feedback learning value	≥ –0.124
or	
Sub feedback learning value	≥ –0.043
or	
All following conditions are established.	
• any one of the rich side misfire counters for each cylinder when in idling	≤ 9 time(s)
• total of the rich side misfire counters for each cylinder when in idling	≤ 9 time(s)
• any one of the rich side misfire counters for each cylinder when not in idling	≤ 20 time(s)
• total of the rich side misfire counters for each cylinder when not in idling	≤ 20 time(s)
Lean	
Main feedback learning value	≤ 0.021
or	
Sub feedback learning value	≥ –0.013
or	
All following conditions are established.	
• any one of the lean side misfire counters for each cylinder when in idling	≤ 115 time(s)
• total of the lean side misfire counters for each cylinder when in idling	≤ 65535 time(s)
• any one of the lean side misfire counters for each cylinder when not in idling	≤ 45 time(s)
• total of the lean side misfire counters for each cylinder when not in idling	≤ 65535 time(s)

Time Needed for Diagnosis: 1000 engine revs.

EI: 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**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Elapsed time after starting the engine	≥ 1 second
Terminal output voltage when ECM outputs OFF signal	Low

Time Needed for Diagnosis: 2500 ms
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Elapsed time after starting the engine	≥ 1 second
Terminal output voltage when ECM outputs OFF signal	High

Time Needed for Diagnosis: Less than 1 second

EJ: 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**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Elapsed time after starting the engine	≥ 1 second
Terminal output voltage when ECM outputs ON signal	High

Time Needed for Diagnosis: 2500 ms
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Elapsed time after starting the engine	≥ 1 second
Terminal output voltage when ECM outputs ON signal	Low

Time Needed for Diagnosis: Less than 1 second

EK:DTC P2431 SECONDARY AIR INJECTION SYSTEM AIR FLOW /PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of secondary air pressure sensor output property.
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	< 300 rpm
Vehicle speed	< 1 km/h (0.6 MPH)
After secondary air system stops	≥ 2976 ms

3. GENERAL DRIVING CYCLE

Perform the diagnosis with ignition switch ON.

4. DIAGNOSTIC METHOD

- **Abnormality Judgment**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
|Secondary air pipe pressure – Intake manifold pressure|	≥ 26.7 kPa (200 mmHg, 7.9 inHg)
|Intake manifold pressure at engine start – Intake manifold pressure|	< 1.3 kPa (9.99 mmHg, 0.4 inHg)

Time Needed for Diagnosis: 328 ms
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
|Secondary air pipe pressure – Intake manifold pressure|	< 26.7 kPa (200 mmHg, 7.9 inHg)

Time Needed for Diagnosis: 262 ms

EL:DTC P2432 SECONDARY AIR INJECTION SYSTEM AIR FLOW /PRESSURE SENSOR CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Judge as NG if 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**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Output voltage	< 0.573 V

Time Needed for Diagnosis: 500 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Output voltage	≥ 0.573 V

Time Needed for Diagnosis: Less than 1 second

EM:DTC P2433 SECONDARY AIR INJECTION SYSTEM AIR FLOW /PRESSURE SENSOR CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Judge as NG if 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**

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Output voltage	> 4.916 V

Time Needed for Diagnosis: 500 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

- **Normality Judgment**

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Output voltage	≤ 4.916 V

Time Needed for Diagnosis: Less than 1 second

EN:DTC P2440 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK1)

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0410. <Ref. to GD(H4DOTC)-121, DTC P0410 SECONDARY AIR INJECTION SYSTEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

EO:DTC P2441 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK CLOSED (BANK1)

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0410. <Ref. to GD(H4DOTC)-121, DTC P0410 SECONDARY AIR INJECTION SYSTEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

EP:DTC P2442 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK2)

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0410. <Ref. to GD(H4DOTC)-121, DTC P0410 SECONDARY AIR INJECTION SYSTEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

EQ:DTC P2443 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK CLOSED (BANK2)

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC P0410. <Ref. to GD(H4DOTC)-121, DTC P0410 SECONDARY AIR INJECTION SYSTEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

ER:DTC P2444 SECONDARY AIR INJECTION SYSTEM PUMP STUCK ON

1. OUTLINE OF DIAGNOSIS

Detect the secondary air pump malfunction (always ON).
After the secondary air pump turns to OFF, judge as NG if the secondary air pipe pressure is higher than that before the secondary air pump operation.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 7 V
Engine	In operation

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

If the duration of time while the following conditions are met is longer than the time indicated, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Time since secondary air control completion	≥ 3000 ms and ≤ 8000 ms
Secondary air pipe pressure — Secondary air pressure before operation	> 6.7 kPa (50 mmHg, 2 inHg)

Time Needed for Diagnosis: 8000 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

• Normality Judgment

Judge as OK and clear the NG if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Time since secondary air control completion	≥ 3000 ms and ≤ 8000 ms
Secondary air pipe pressure — Secondary air pressure before operation	≤ 6.7 kPa (50 mmHg, 2 inHg)

Time Needed for Diagnosis: 8000 ms

ES:DTC U0073 CAN FAILURE, BUS 'OFF' DETECTION

1. OUTLINE OF DIAGNOSIS

Detect malfunction of CAN communication.
When CAN communications is not possible, and CAN communications with TCM, VDC CM and body integrated unit is not possible, judge as NG if data from the TCM, VDC CM and body integrated unit are not normal.

2. COMPONENT DESCRIPTION

ECM, TCM, VDC CM and body integrated unit 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 CONDITIONS

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge as NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	> 10.9 V
Starter switch	OFF
Engine	run
bus off flag or error warning flag	set (error)
or	
ID received from control module connected to driving system CAN	None during 500 milliseconds
or	
Data updated from control module connected to driving system CAN	None during 2000 milliseconds

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 if the continuous time while the following conditions are established is more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	> 10.9 V
Starter switch	OFF
Engine	run
bus off flag or error warning flag	clear (No error)
ID received from control module connected to driving system CAN	Yes
Data updated from control module connected to driving system CAN	Yes

Time Needed for Diagnosis: 1000 ms
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

ET:DTC U0101 CAN (TCU) DATA NOT LOADED

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC U0073. <Ref. to GD(H4DOTC)-268, DTC U0073 CAN FAILURE, BUS 'OFF' DETECTION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

EU:DTC U0122 CAN (VDC) DATA NOT LOADED

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC U0073. <Ref. to GD(H4DOTC)-268, DTC U0073 CAN FAILURE, BUS 'OFF' DETECTION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

EV:DTC U0140 CAN (BCU) DATA NOT LOADED

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC U0073. <Ref. to GD(H4DOTC)-268, DTC U0073 CAN FAILURE, BUS 'OFF' DETECTION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

EW:DTC U0402 CAN (TCU) DATA ABNORMAL

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC U0073. <Ref. to GD(H4DOTC)-268, DTC U0073 CAN FAILURE, BUS 'OFF' DETECTION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

EX:DTC U0416 CAN (VDC) DATA ABNORMAL

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC U0073. <Ref. to GD(H4DOTC)-268, DTC U0073 CAN FAILURE, BUS 'OFF' DETECTION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

EY:DTC U0422 CAN (BCU) DATA ABNORMAL

1. OUTLINE OF DIAGNOSIS

NOTE:
For the detection standard, refer to DTC U0073. <Ref. to GD(H4DOTC)-268, DTC U0073 CAN FAILURE, BUS 'OFF' DETECTION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TRANSMISSION SECTION

CONTROL SYSTEMS	CS
AUTOMATIC TRANSMISSION	4AT
AUTOMATIC TRANSMISSION (DIAGNOSTICS)	4AT(diag)
MANUAL TRANSMISSION AND DIFFERENTIAL	5MT
CLUTCH SYSTEM	CL

This service manual has been prepared to provide SUBARU service personnel with the necessary information and data for the correct maintenance and repair of SUBARU vehicles.
This manual includes the procedures for maintenance, disassembling, reassembling, inspection and adjustment of components and diagnostics for guidance of experienced mechanics.
Please peruse and utilize this manual fully to ensure complete repair work for satisfying our customers by keeping their vehicle in optimum condition. When replacement of parts during repair work is needed, be sure to use SUBARU genuine parts.

All information, illustration and specifications contained in this manual are based on the latest product information available at the time of publication approval.

FUJI HEAVY INDUSTRIES LTD. G8160BE4

CONTROL SYSTEMS

CS

Page

1. General Description 2
2. AT Shift Lock Control System 6
3. Select Lever 20
4. Select Cable 25
5. AT Shift Lock Solenoid and “P” Range Switch 28
6. Body Integrated Unit 31
7. MT Gear Shift Lever 32
8. General Diagnostic Table 39

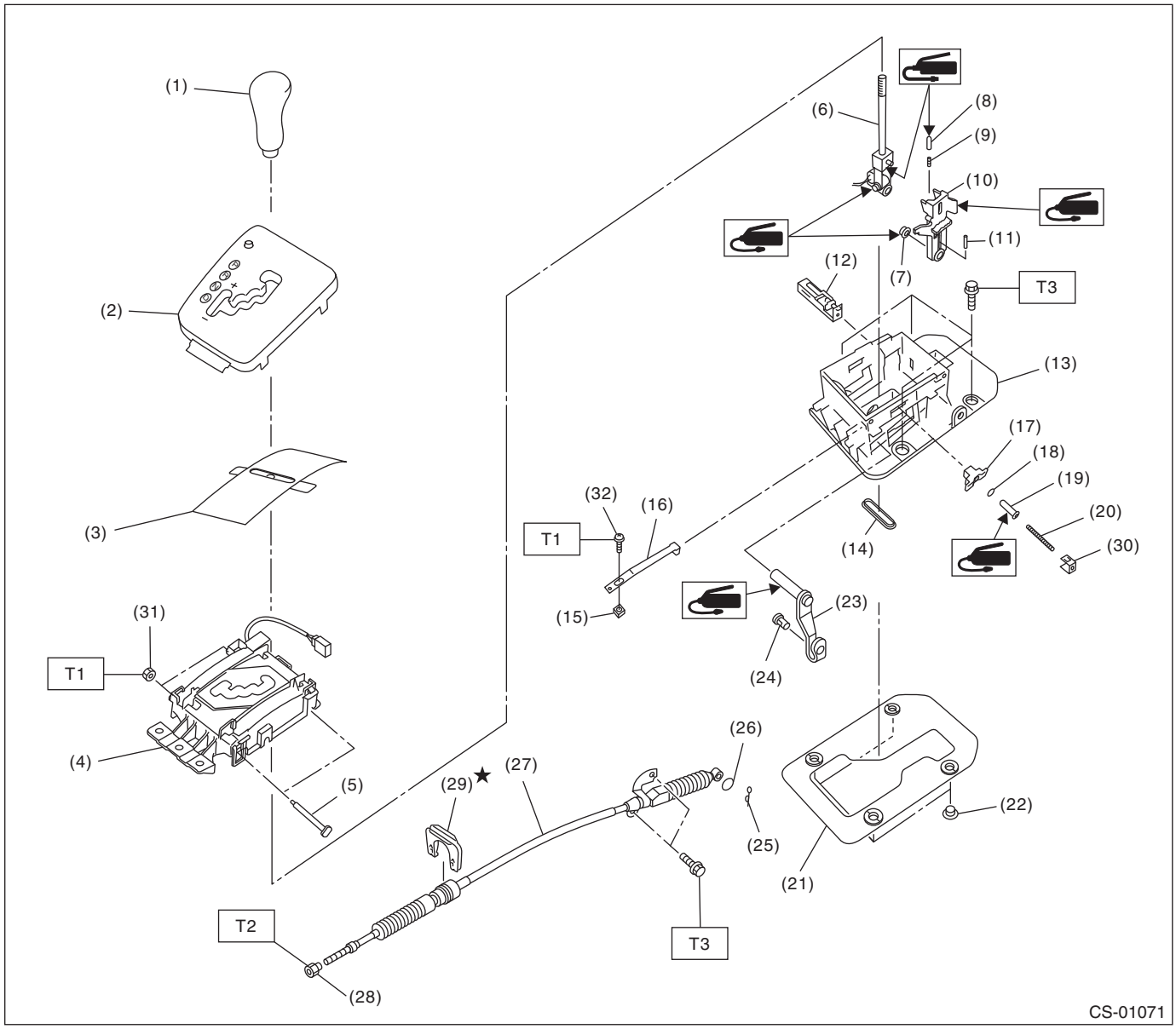
1. General Description

A: SPECIFICATION

Item	Specification
Swing torque of rod against lever N (kgf, lb)	3.7(0.38, 0.83) or less

B: COMPONENT

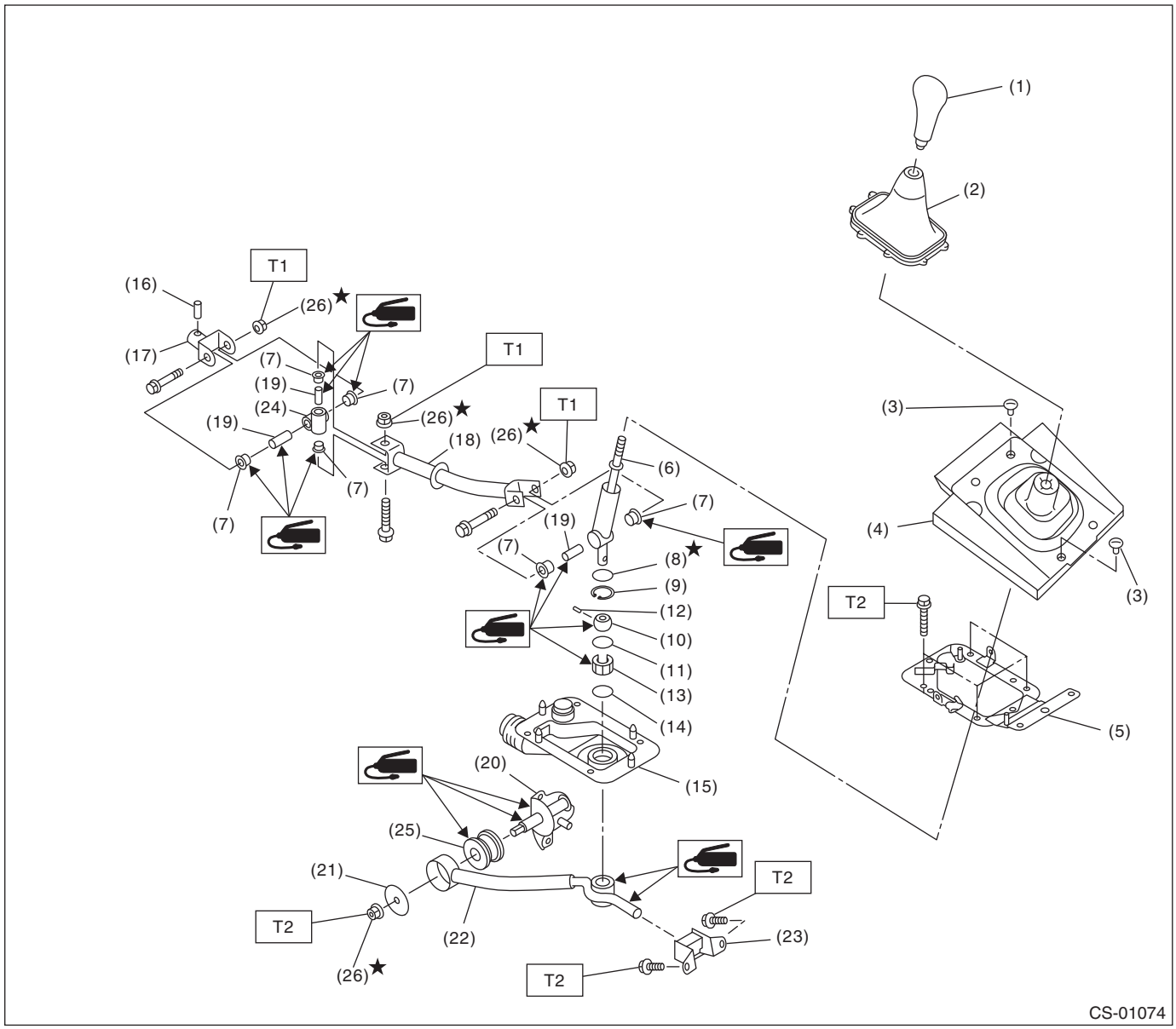
1. AT SELECT LEVER



(1) Grip ASSY
(2) Indicator ASSY
(3) Blind
(4) Plate guide COMPL
(5) Spacer bolt
(6) Selector lever COMPL
(7) Bushing
(8) Rod detent
(9) Spring detent
(10) Bracket arm detent
(11) Spring pin
(12) Solenoid unit
(13) Plate COMPL
(14) Grommet
(15) Plate nut
(16) Detent spring
(17) Bushing
(18) Lock plate cushion
(19) Select lever rod
(20) Spring A
(21) Gasket
(22) Spacer
(23) Arm COMPL
(24) Connector pin
(25) Snap pin
(26) Washer
(27) Select cable
(28) Nut A
(29) Clamp
(30) Shift lock clamp
(31) Nut
(32) Flange screw

Tightening torque:N·m (kgf-m, ft-lb)
T1: 2.2 (0.2, 1.6)
T2: 7.5 (0.8, 5.5)
T3: 18 (1.8, 13.3)

2. 5MT GEAR SHIFT LEVER

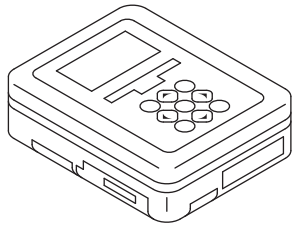


(1) Gear shift knob
(2) Console boot
(3) Clamp
(4) Boot and insulator ASSY
(5) Plate COMPL
(6) Lever
(7) Bushing
(8) Lock wire
(9) Snap ring
(10) Bushing
(11) O-ring
(12) Spring pin
(13) Bushing B
(14) O-ring
(15) Boot
(16) Spring pin
(17) Joint
(18) Rod
(19) Spacer
(20) Bracket
(21) Washer
(22) Stay
(23) Cushion rubber
(24) Boss
(25) Bushing
(26) Self-locking nut

Tightening torque:N·m (kgf-m, ft-lb)
T1: 12 (1.2, 8.9)
T2: 18 (1.8, 13.3)

C: PREPARATION TOOL

1. SPECIAL TOOL

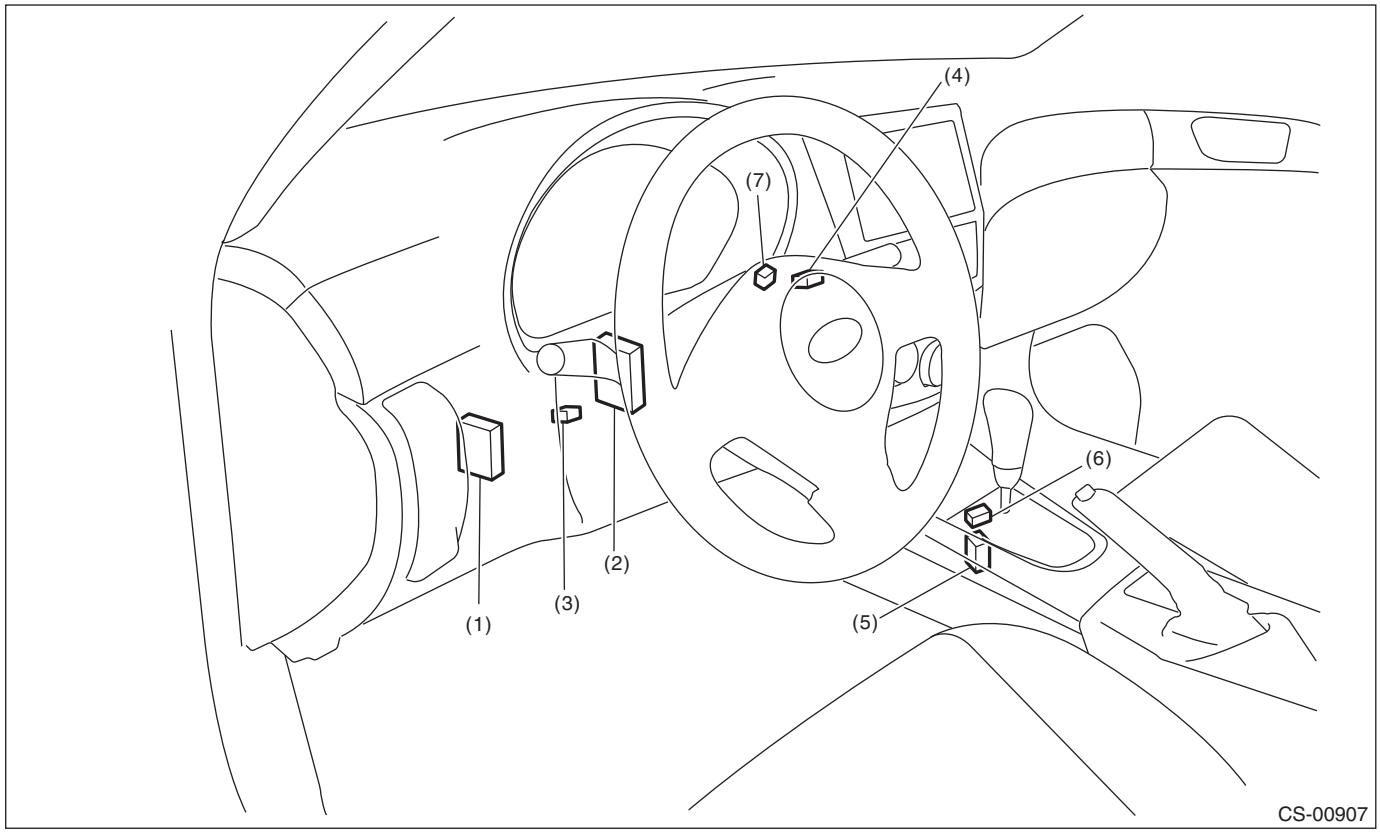
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST1B022XU0	1B022XU0	SUBARU SELECT MONITOR III KIT	Used for troubleshooting the electrical system.

D: CAUTION

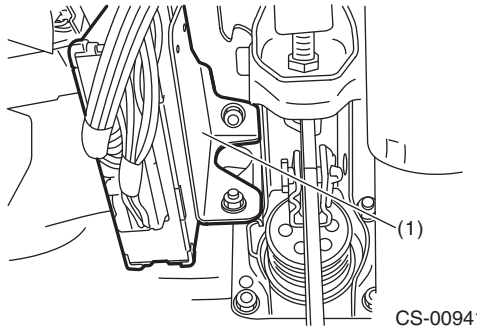
• Wear appropriate work clothing, including a cap, protective goggles and protective shoes when performing any work.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust and dirt.
• Before removal, 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 fluid to avoid damage and deformation.
• Before securing a part in a vise, place cushioning material such as wood blocks, aluminum plate or cloth between the part and the vise.
• Before disconnecting electrical connectors, be sure to disconnect the negative terminal from battery.

2. AT Shift Lock Control System

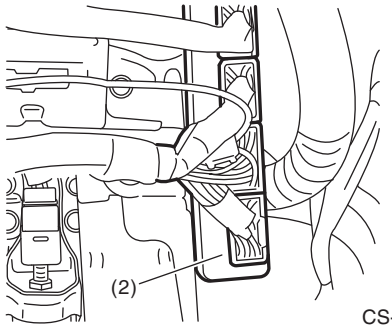
A: LOCATION



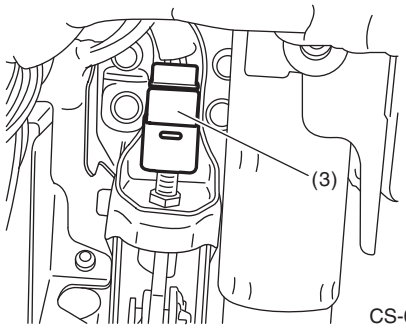
(1) TCM (“P” range)
(2) Body integrated unit
(3) Stop light switch
(4) Key cylinder (with built-in key warning switch)
(5) Solenoid unit
(6) “P” range switch
(7) Key lock solenoid



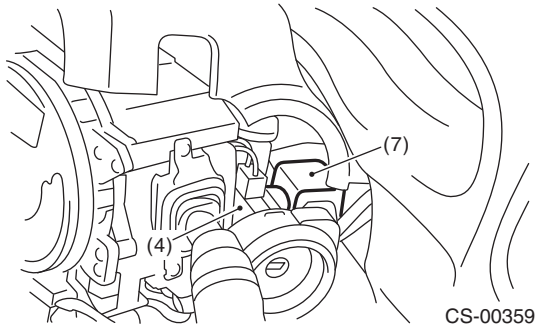
CS-00941



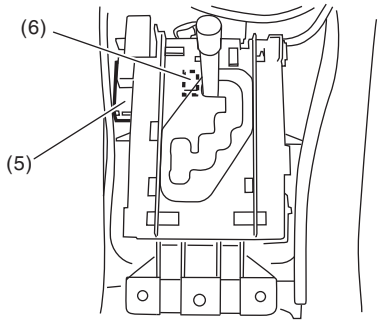
CS-00945



CS-00943

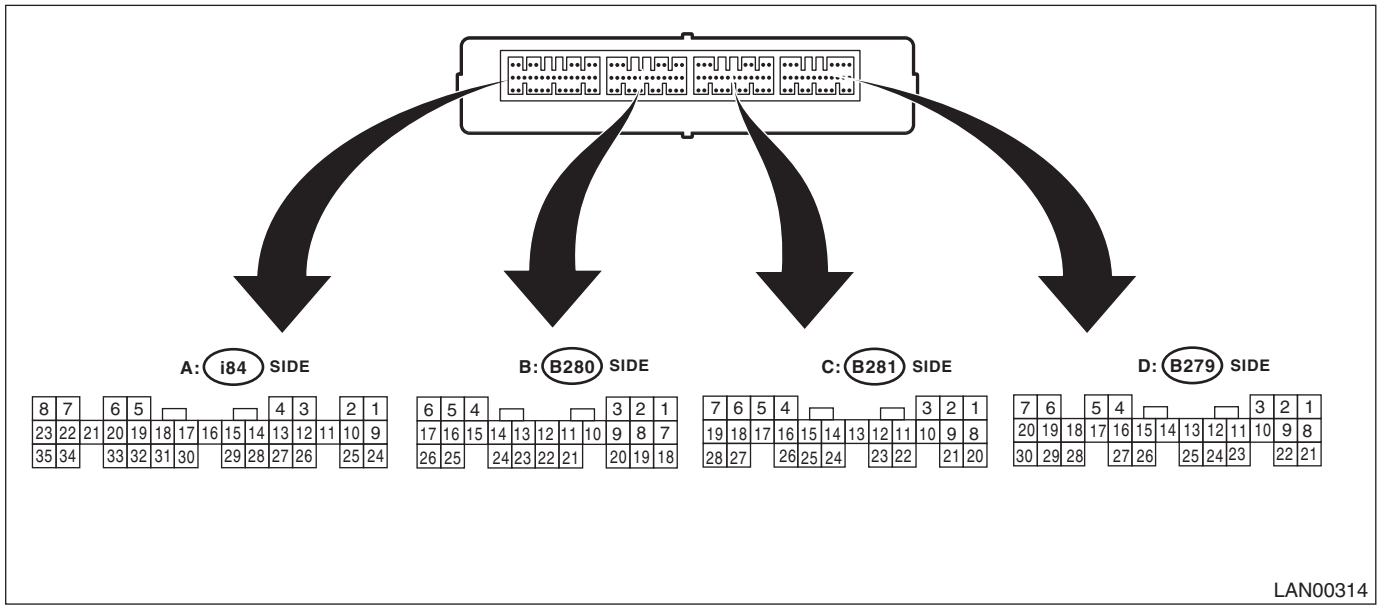


CS-00359



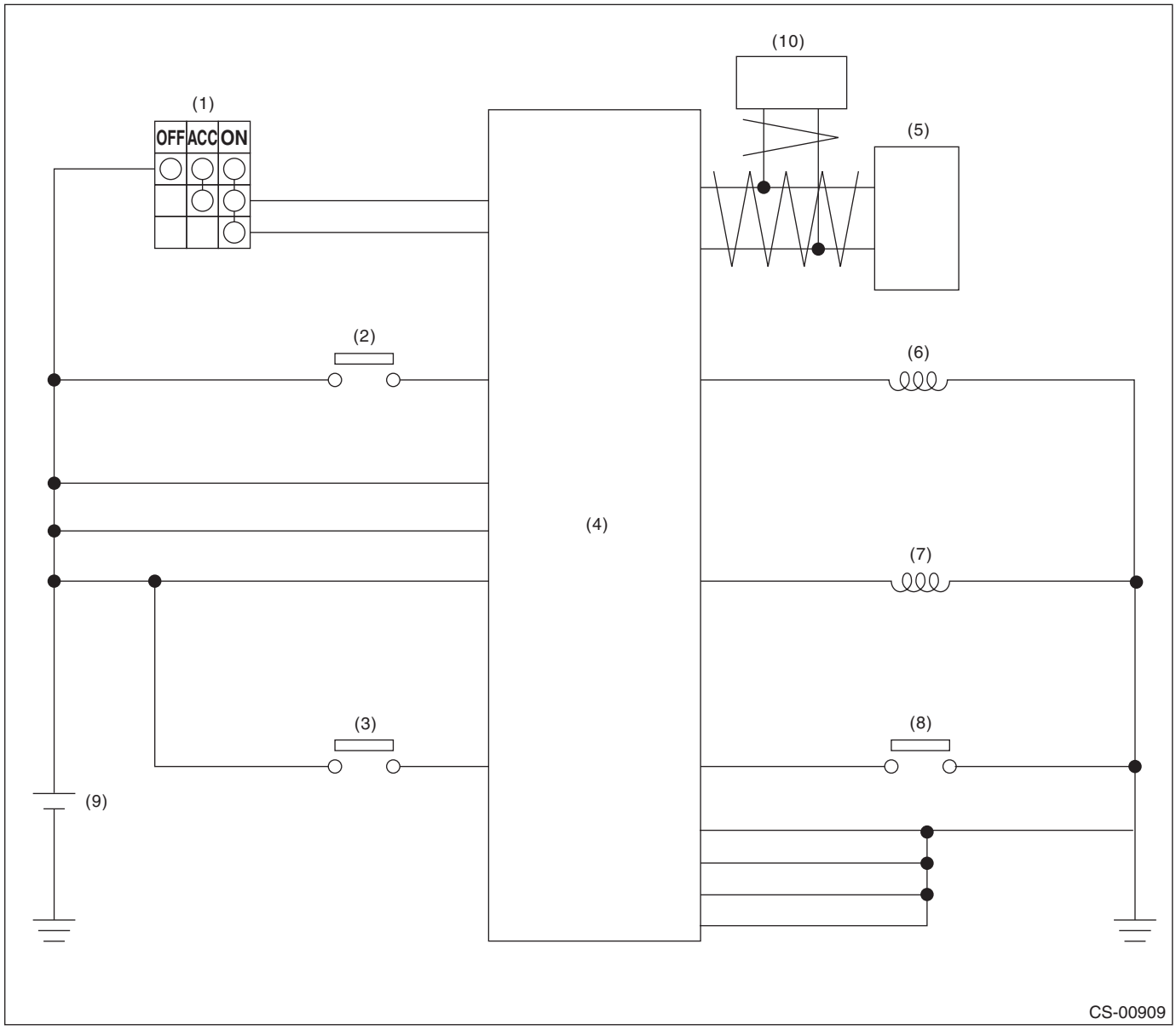
CS-01181

B: ELECTRICAL SPECIFICATION



Item	Connector No.	Terminal No.	Input/Output signal Measured value and measuring conditions
Battery power supply	B279	22	9 — 16 V
	B280	6	
Ignition power supply	B280	1	10 — 15 V when ignition switch is at ON or START.
		7	10 — 15 V when ignition switch is at ACC.
TCM (“P” range)	B280	3	Pulse signal
		9	
Stop light switch	B280	2	9 — 16 V when stop light switch is ON. Less than 1.5 V when stop light switch is OFF.
“P” range switch	B281	4	Less than 1.5 V when select lever is in “P” range. 9 — 16 V when select lever is in other positions than “P” range.
Shift lock solenoid signal	B279	12	8.5 — 16 V when shift lock is released. Less than 1.5 V when shift lock is operating.
Key warning switch signal	B279	2	9 — 16 V when key is inserted. Less than 1.5 V when key is removed.
Key lock solenoid signal	B279	11	7.5 — 16 V when ignition switch is turned ON, with select lever in “P” range and brake switch ON. Less than 1.5 V at other conditions than above.
Ground	i84	28	—
	B280	17	
	B281	20	
	B279	27	

C: WIRING DIAGRAM



(1) Ignition switch
(2) Stop light switch
(3) Key warning switch
(4) Body integrated unit
(5) TCM (shift range information)
(6) Key lock solenoid
(7) Shift lock solenoid
(8) “P” range switch
(9) Battery
(10) VDCCM (vehicle speed information)

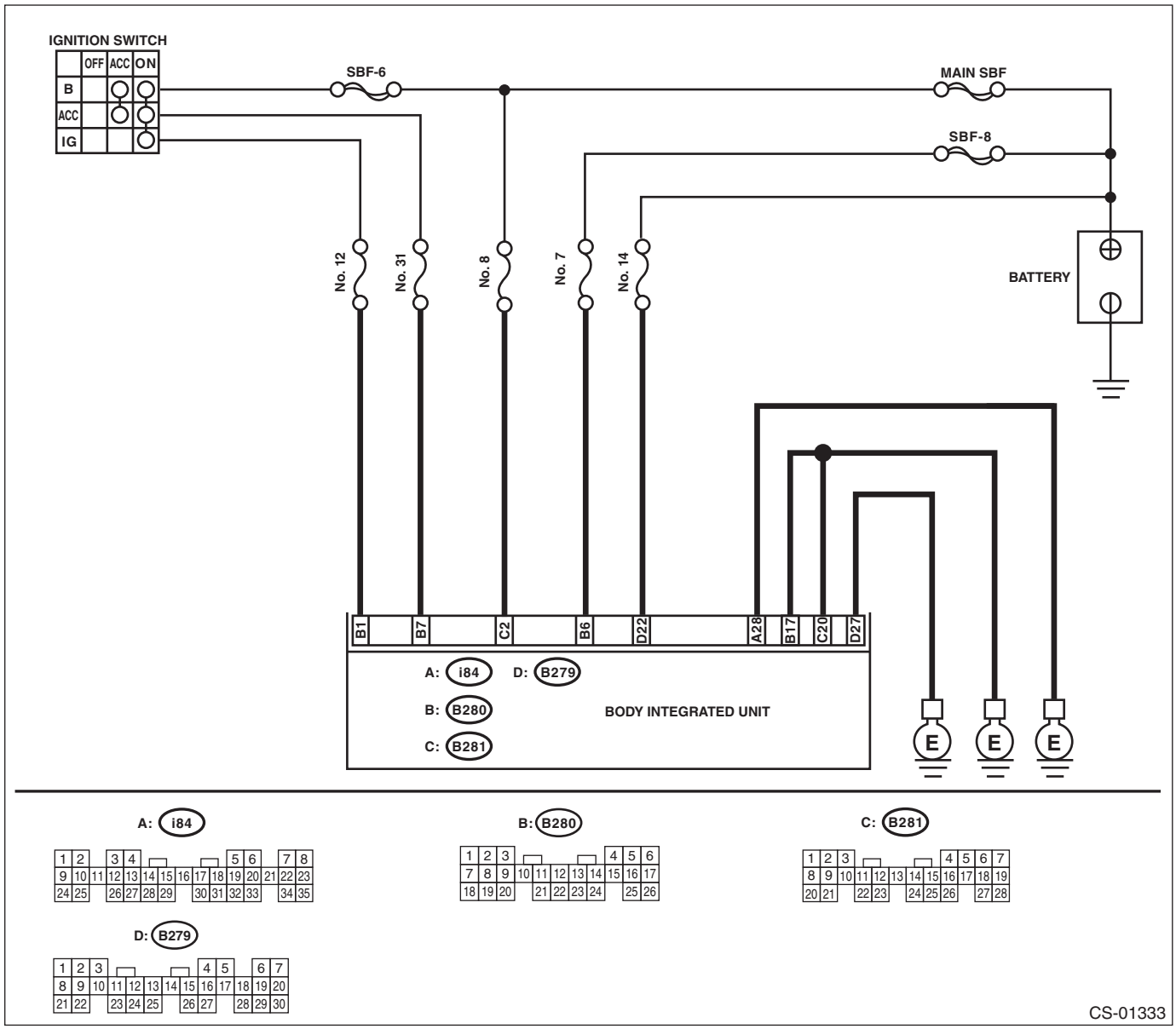
D: INSPECTION

1. SHIFT LOCK OPERATION

	Step	Check	Yes	No
1	**CHECK SUBARU SELECT MONITOR COMMUNICATION.** 1) Turn the ignition switch to ON. 2) Using the Subaru Select Monitor, check that communication is performed properly with all the systems.	Is the system name displayed?	Go to step **2**.	For diagnostic procedures, refer to the LAN section. <Ref. to LAN(diag)-2, Basic Diagnostic Procedure.>
2	**CHECK SHIFT LOCK.** 1) Turn the ignition switch to ON. 2) Shift the select lever to “P” range.	While brake pedal is not depressed, is it possible to move the select lever from the “P” range to other ranges?	Perform the inspection of “SELECT LEVER CANNOT BE LOCKED OR RELEASED”. <Ref. to CS-14, SELECT LEVER CANNOT BE LOCKED OR RELEASED, INSPECTION, AT Shift Lock Control System.>	Go to step **3**.
3	**CHECK SHIFT LOCK.**	While brake pedal is depressed, is it possible to move the select lever from the “P” range to other ranges?	Go to step **4**.	Perform the inspection of “SELECT LEVER CANNOT BE LOCKED OR RELEASED”. <Ref. to CS-14, SELECT LEVER CANNOT BE LOCKED OR RELEASED, INSPECTION, AT Shift Lock Control System.>
4	**CHECK SHIFT LOCK.** Shift the select lever to “N” range.	Is it possible to move the select lever from the “N” range to the “P” range?	Go to step **5**.	Perform the inspection of “SELECT LEVER CANNOT BE LOCKED OR RELEASED”. <Ref. to CS-14, SELECT LEVER CANNOT BE LOCKED OR RELEASED, INSPECTION, AT Shift Lock Control System.>

	Step	Check	Yes	No
5	**CHECK SHIFT LOCK.** 1) Shift the select lever to “N” range. 2) Turn the ignition switch to OFF.	While brake pedal is depressed, is it possible to move the select lever from the “N” range to the “P” range?	Go to step **6**.	Perform the inspection of “SELECT LEVER CANNOT BE LOCKED OR RELEASED”. <Ref. to CS-14, SELECT LEVER CANNOT BE LOCKED OR RELEASED, INSPECTION, AT Shift Lock Control System.>
6	**CHECK KEY INTERLOCK.** 1) Turn the ignition switch to OFF. 2) Shift the select lever to other than “P” range.	Can the ignition key be removed?	Perform the inspection of “KEY INTERLOCK CANNOT BE LOCKED OR RELEASED”. <Ref. to CS-17, KEY INTERLOCK CANNOT BE LOCKED OR RELEASED, INSPECTION, AT Shift Lock Control System.>	Go to step **7**.
7	**CHECK KEY INTERLOCK.** Shift the select lever to “P” range.	Can the ignition key be removed?	AT shift lock system is normal.	Perform the inspection of “KEY INTERLOCK CANNOT BE LOCKED OR RELEASED”. <Ref. to CS-17, KEY INTERLOCK CANNOT BE LOCKED OR RELEASED, INSPECTION, AT Shift Lock Control System.>

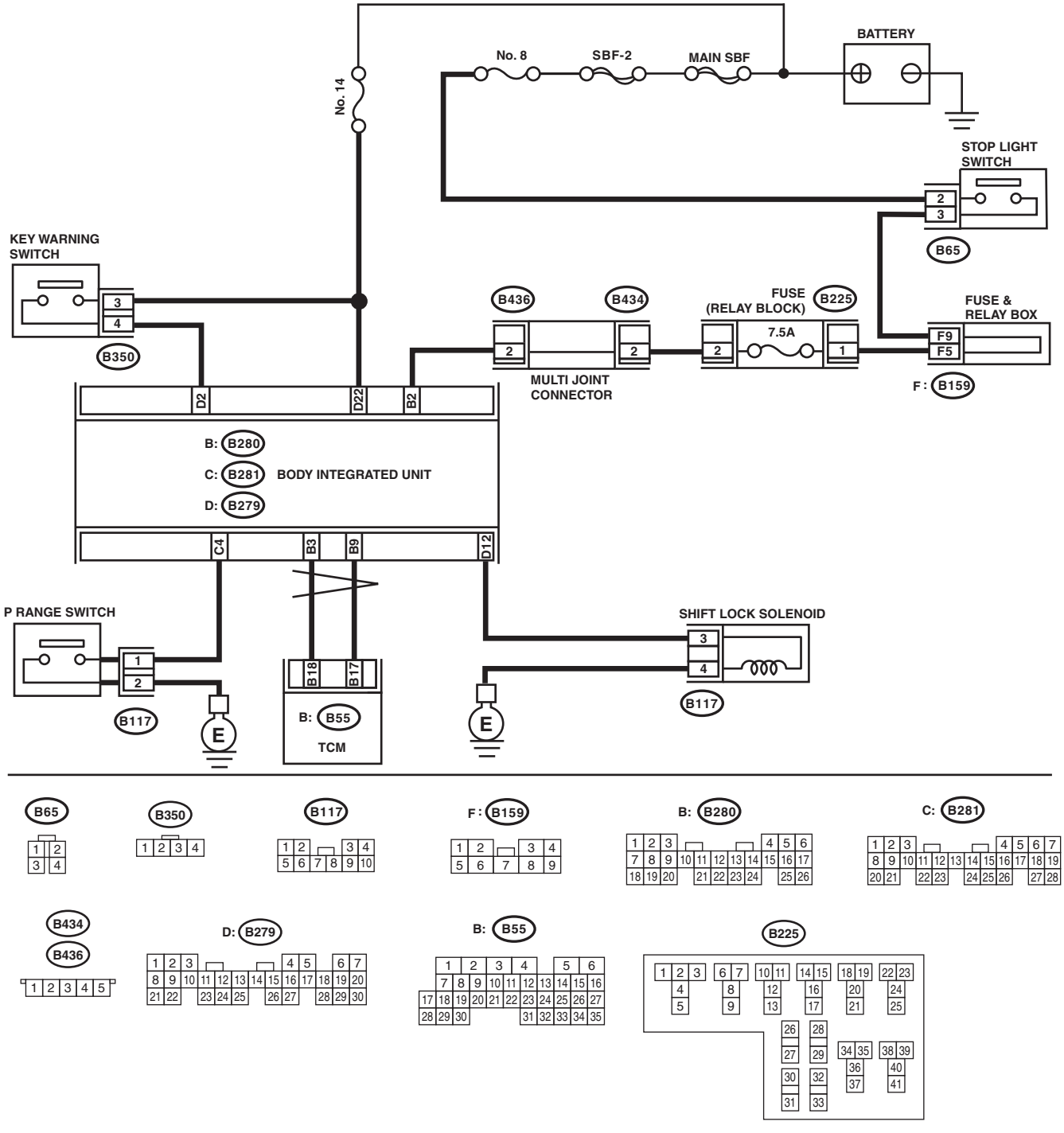
2. BODY INTEGRATED UNIT POWER SUPPLY AND GROUND CIRCUIT



Step		Check	Yes	No
1	**CHECK DTC OF BODY INTEGRATED UNIT.** Check DTC of body integrated unit. <Ref. to LAN(diag)-14, OPERATION, Subaru Select Monitor.>	Is the DTC of power line displayed on body integrated unit?	Repair or replace it according to the DTC.	Go to step **2**.
2	**CHECK HARNESS CONNECTOR BETWEEN BODY INTEGRATED UNIT AND CHASSIS GROUND.** 1) Turn the ignition switch to ON. 2) Measure the voltage between body integrated unit and chassis ground. ***Connector & terminal*** ***(B280) No. 1 (+) — Chassis ground (–):*** ***(B280) No. 6 (+) — Chassis ground (–):*** ***(B280) No. 7 (+) — Chassis ground (–):*** ***(B281) No. 2 (+) — Chassis ground (–):*** ***(B279) No. 22 (+) — Chassis ground (–):***	Is the voltage 9 — 16 V?	Go to step **3**.	Check harness for open circuit between the body integrated unit and the battery or a blown fuse.

	Step	Check	Yes	No
3	**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. ***Connector & terminal*** ***(i84) No. 28 — Chassis ground:*** ***(B279) No. 27 — Chassis ground:*** ***(B280) No. 17 — Chassis ground:*** ***(B281) No. 20 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the open circuit of harness between the body integrated unit and chassis ground.
4	**CHECK FOR POOR CONTACT.**	Is there poor contact of connector?	Repair the poor contact.	Check body integrated unit.

3. SELECT LEVER CANNOT BE LOCKED OR RELEASED



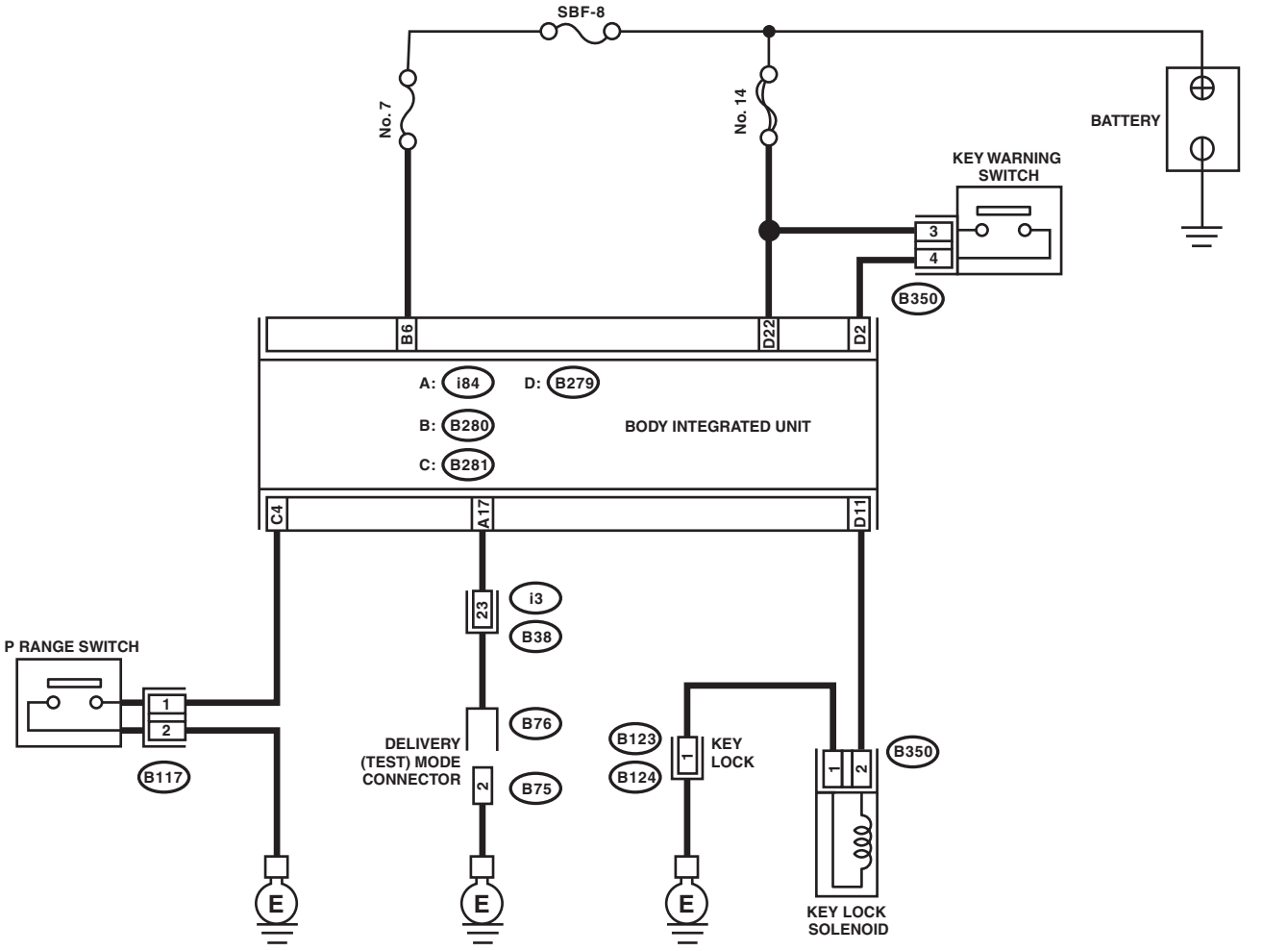
CS-01334

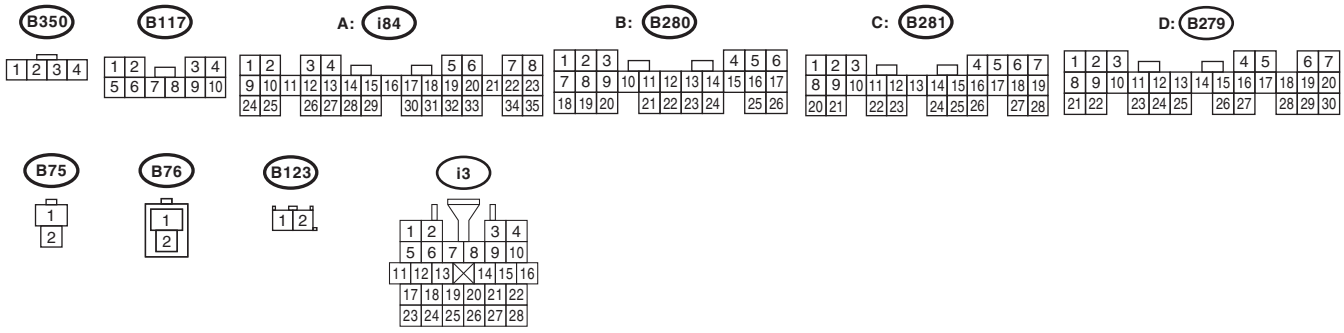
Step		Check	Yes	No
1	**CHECK BODY INTEGRATED UNIT POWER SUPPLY AND GROUND CIRCUIT.** <Ref. to CS-12, BODY INTEGRATED UNIT POWER SUPPLY AND GROUND CIRCUIT, INSPECTION, AT Shift Lock Control System.>	Is there any fault?	Follow the procedures to perform inspection and repair.	Go to step **2**.

Step		Check	Yes	No
2	**CHECK CURRENT DATA.** 1) Connect the Subaru Select Monitor. 2) Shift the select lever to "P" range. 3) Turn the ignition switch to ON. 4) Select the current data display and display «P SW». <Ref. to LAN(diag)-14, OPERATION, Subaru Select Monitor.>	Is the display "ON" in the "P" range and "OFF" in ranges other than "P"?	Go to step **3**.	Go to step **8**.
3	**CHECK CURRENT DATA.** Select the current data display and display «Stop Light Switch». <Ref. to LAN(diag)-14, OPERATION, Subaru Select Monitor.>	Is "ON" displayed when the brake pedal is depressed and "OFF" displayed when the brake pedal is released?	Go to step **4**.	Go to step **11**.
4	**CHECK BODY INTEGRATED UNIT DTC.** Check the DTC of the body integrated unit when the brake pedal is pressed and when it is released. (Hold each condition for 5 seconds or more.)	Is there a DTC of a current malfunction?	Follow the DTC to perform inspection and repair.	Go to step **5**.
5	**CHECK CURRENT DATA.** Select the current data display and display «Shift Lock Solenoid». <Ref. to LAN(diag)-14, OPERATION, Subaru Select Monitor.>	Is "ON" displayed when the brake pedal is depressed and "OFF" displayed when the brake pedal is released?	Go to step **6**.	Replace the body integrated unit.
6	**CHECK CURRENT DATA.** Select the current data display and display «Shift Position». <Ref. to LAN(diag)-14, OPERATION, Subaru Select Monitor.>	Is the display "7" in the "P" range and other than "7" in ranges other than "P"?	Go to step **7**.	Check the following items. • Inhibitor switch • Harness between inhibitor switch and TCM • TCM input signal • TCM CAN communication • Body integrated unit CAN receive
7	**CHECK CURRENT DATA.** 1) Select the current data display and display «Front Wheel Speed». <Ref. to LAN(diag)-14, OPERATION, Subaru Select Monitor.> 2) Start the engine. 3) Raise vehicle speed gradually up to approximately 20 km/h.	Is a figure equivalent to the speedometer being indicated?	Go to step **12**.	Check the following items. • Wheel speed sensor • VDCCM CAN communication • Body integrated unit CAN receive Replace the wheel speed sensor, VDC, or body integrated unit, as necessary.
8	**CHECK HARNESS BETWEEN BODY INTEGRATED UNIT AND "P" RANGE SWITCH.** 1) Disconnect the connector from body integrated unit. 2) Disconnect the connector of "P" range switch. 3) Check for open circuit of harness, short circuit to battery or short circuit to ground between the body integrated unit and "P" range switch. ***Connector & terminal*** ***(B281) No. 4 — (B117) No. 1:***	Is the harness normal?	Repair or replace the harness between the body integrated unit and the "P" range switch.	Go to step **9**.

	Step	Check	Yes	No
9	**CHECK HARNESS BETWEEN "P" RANGE SWITCH AND CHASSIS GROUND.** Measure the resistance of harness between "P" range switch and chassis ground. ***Connector & terminal*** ***(B117) No. 2 — Chassis ground:***	Is it less than 10 Ω?	Go to step **10**.	Repair the harness between the "P" range switch and chassis ground.
10	**CHECK "P" RANGE SWITCH.** Measure the resistance between "P" range switch connector terminals. ***Terminals*** ***No. 2 — No. 1:***	Is it less than 10 Ω in the "P" range, and 1 MΩ or more in ranges other than "P"?	Replace the body integrated unit.	Replace the "P" range switch.
11	**CHECK STOP LIGHT SWITCH INPUT SIGNAL.** 1) Disconnect the connector from body integrated unit. 2) Measure the voltage between the body integrated unit connector terminal and chassis ground. ***Connector & terminal*** ***(B280) No. 2 (+) — Chassis ground (–):***	Is the voltage 9 — 16 V when the brake pedal is depressed, and less than approx. 1.5 V when not depressed?	Replace the body integrated unit.	Check the stop light system.
12	**CHECK SHIFT LOCK SOLENOID OPERATION.** Connect the battery to the solenoid unit connector terminal, and operate the shift lock solenoid. ***Terminals*** ***No. 3 (+) — No. 4 (–):***	Does the shift lock solenoid operate normally?	Check the lock mechanism of the select lever body.	Replace the solenoid unit.

4. KEY INTERLOCK CANNOT BE LOCKED OR RELEASED





CS-01335

Step		Check	Yes	No
1	**CHECK DELIVERY (TEST) MODE CONNECTOR.** Check that the delivery (test) mode connector is disconnected.	Is the delivery (test) mode connector disconnected?	Go to step **2**.	Disconnect the delivery (test) mode connector.

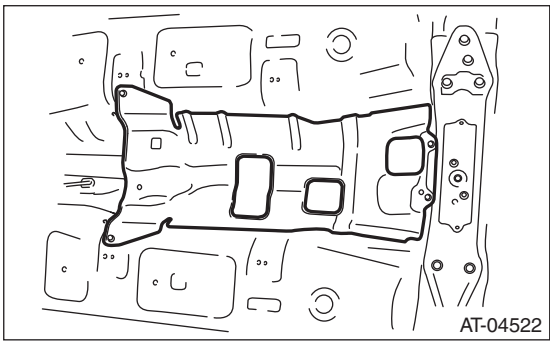
	Step	Check	Yes	No
2	**CHECK BODY INTEGRATED UNIT POWER SUPPLY AND GROUND CIRCUIT.** <Ref. to CS-12, BODY INTEGRATED UNIT POWER SUPPLY AND GROUND CIRCUIT, INSPECTION, AT Shift Lock Control System.>	Is there any fault?	Follow the procedures to inspect and repair.	Go to step **3**.
3	**CHECK CURRENT DATA.** 1) Connect the Subaru Select Monitor. 2) Shift the select lever to "P" range. 3) Turn the ignition switch to ON. 4) Select the current data display and display «P SW». <Ref. to LAN(diag)-14, OPERATION, Subaru Select Monitor.>	Is the display "ON" in the "P" range and "OFF" in ranges other than "P"?	Go to step **4**.	Go to step **7**.
4	**CHECK CURRENT DATA.** 1) Select the current data display and display the «Key-lock warning SW». <Ref. to LAN(diag)-14, OPERATION, Subaru Select Monitor.> 2) Turn the ignition switch to OFF.	Does the display change from "ON" to "OFF" when the key is inserted and removed?	Go to step **5**.	Go to step **10**.
5	**CHECK CURRENT DATA.** 1) Turn the ignition switch to ON. 2) Select the current data display and display «Key locking output». <Ref. to LAN(diag)-14, OPERATION, Subaru Select Monitor.>	Is the display "ON" in the "P" range and "OFF" in ranges other than "P"?	Go to step **12**.	Go to step **6**.
6	**CHECK DTC OF BODY INTEGRATED UNIT.** 1) Set the select lever to other than "P" range. 2) Check DTC of body integrated unit.	Is B1105 (key interlock circuit abnormal) a current malfunction?	Follow the DTC to perform inspection and repair.	Go to step **12**.
7	**CHECK HARNESS BETWEEN BODY INTEGRATED UNIT AND "P" RANGE SWITCH.** 1) Disconnect the connector from body integrated unit. 2) Disconnect the connector of "P" range switch. 3) Check for open circuit of harness, short circuit to battery or short circuit to ground between the body integrated unit and "P" range switch. ***Connector & terminal*** ***(B281) No. 4 — (B117) No. 1:***	Is the harness normal?	Repair or replace the harness between the body integrated unit and the "P" range switch.	Go to step **8**.
8	**CHECK HARNESS BETWEEN "P" RANGE SWITCH AND CHASSIS GROUND.** Measure the resistance of harness between "P" range switch and chassis ground. ***Connector & terminal*** ***(B117) No. 2 — Chassis ground:***	Is it less than 10 Ω?	Go to step **9**.	Repair the harness between the "P" range switch and chassis ground.
9	**CHECK "P" RANGE SWITCH.** Measure the resistance between "P" range switch connector terminals. ***Terminals*** ***No. 2 — No. 1:***	Is it less than 10 Ω in the "P" range, and over 1 MΩ in ranges other than "P"?	Replace the body integrated unit.	Replace the "P" range switch.
10	**CHECK HARNESS BETWEEN BATTERY AND KEY WARNING SWITCH AND BODY INTEGRATED UNIT.** 1) Disconnect the connector from body integrated unit. 2) Measure the voltage between body integrated unit and chassis ground. ***Connector & terminal*** ***(B279) No. 2 — Chassis ground:***	Is the display 9 — 16 V when the key is inserted, and less than 1.5 V with the key removed?	Replace the body integrated unit.	Check the following items. • Key warning switch • Harness/fuse • Ignition circuit

	Step	Check	Yes	No
11	**CHECK DELIVERY (TEST) MODE CONNECTOR HARNESS.** 1) Disconnect the connector of body integrated unit. 2) Measure the resistance between body integrated unit connector and the delivery (test) mode connector. ***Connector & terminal*** ***(I84) No. 17 — (I1) No. 1:***	Is it less than 10 Ω?	Go to step **12**.	Repair or replace the harness between the body integrated unit and delivery (test) mode connector.
12	**CHECK HARNESS BETWEEN BODY INTEGRATED UNIT AND KEY LOCK SOLENOID.** 1) Disconnect the connector from body integrated unit. 2) Disconnect the connector of key lock solenoid. 3) Check for open circuit of harness, short circuit to battery or short circuit to ground between the body integrated unit and key lock solenoid. ***Connector & terminal*** ***(B279) No. 11 — (B350) No. 2:***	Is the harness normal?	Repair or replace the harness between the body integrated unit and the key lock solenoid.	Go to step **13**.
13	**CHECK HARNESS BETWEEN KEY LOCK SOLENOID AND CHASSIS GROUND.** Measure the resistance of harness between key lock solenoid and chassis ground. ***Connector & terminal*** ***(B350) No. 1 — Chassis ground:***	Is it less than 10 Ω?	Go to step **14**.	Repair or replace the harness between the key lock solenoid and chassis ground.
14	**CHECK KEY LOCK SOLENOID OPERATION.** Connect the battery to the key lock solenoid connector terminal, and operate the solenoid.	Does the key lock solenoid operate normally?	Go to step **15**.	Replace the key lock solenoid.
15	**CHECK OUTPUT OF BODY INTEGRATED UNIT.** 1) Connect all connectors. 2) Insert the key. 3) Measure the voltage between body integrated unit and chassis ground. ***Connector & terminal*** ***(B279) No. 11 — Chassis ground:***	Is it 7.5 V to 16 V in ranges other than “P”, and less than 1.5 V in the “P” range?	Check the lock mechanism of the steering lock body.	Replace the body integrated unit.

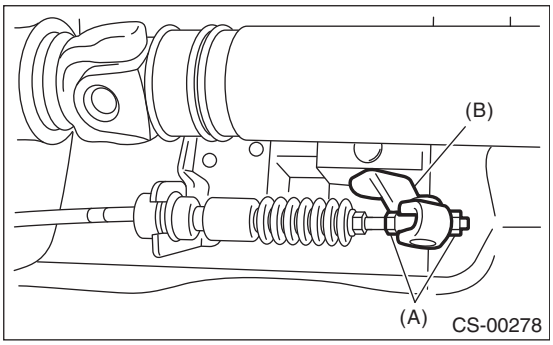
3. Select Lever

A: REMOVAL

1) Set the vehicle on a lift.
2) Shift the select lever to “N” range.
3) Disconnect the ground cable from battery.
4) Lift up the vehicle.
5) Remove the rear exhaust pipe. (non-turbo model) <Ref. to EX(H4DO)-13, REMOVAL, Rear Exhaust Pipe.>
6) Remove the center exhaust pipe (rear). (turbo model) <Ref. to EX(H4DOTC)-7, REMOVAL, Center Exhaust Pipe.>
7) Remove the heat shield cover.

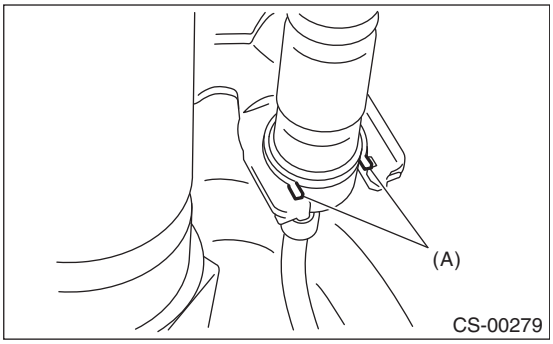


8) Disconnect the cable from the arm COMPL.



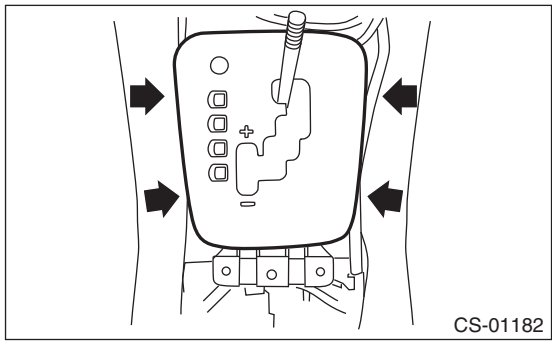
(A) Adjusting nut
(B) Arm COMPL

9) Raise the claw of clamp to remove the select cable.

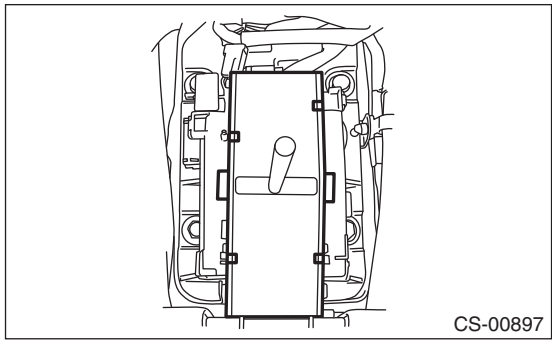


(A) Claw

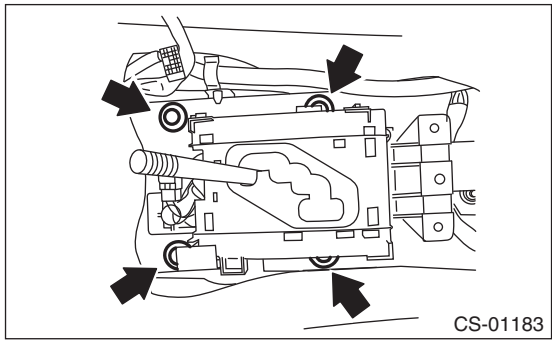
10) Lower the vehicle.
11) Remove the grip.
12) Remove the parking brake lever boot.
13) Remove the console box. <Ref. to EI-49, REMOVAL, Console Box.>
14) Remove the console side panel and console front panel. <Ref. to EI-50, CONSOLE FRONT PANEL, REMOVAL, Center Console.>
15) Remove the indicator assembly.



16) Remove the harness clips from the bracket.
17) Remove the blind.



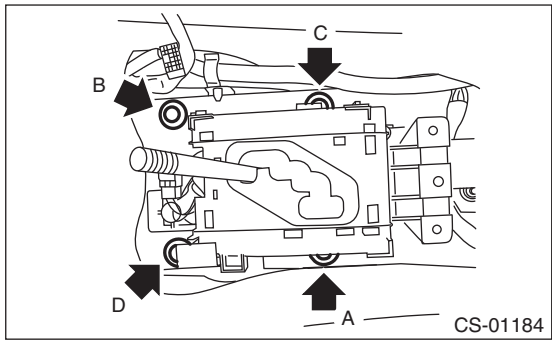
18) Disconnect the connectors, remove the four bolts and take out the select lever COMPL from vehicle body.



B: INSTALLATION

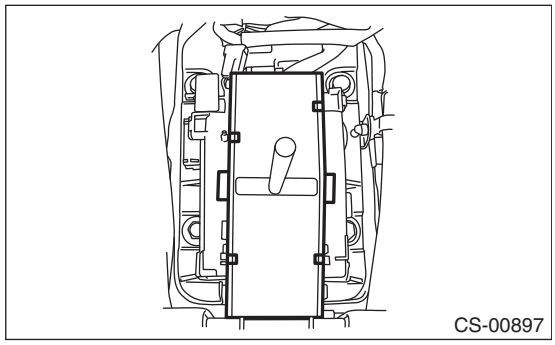
1) Set the select lever to vehicle body.
2) Tighten the four bolts to install the select lever to vehicle body, and then connect the connector.
(1) Temporarily tighten the bolt A.
(2) Tighten the bolt B.
(3) Tighten the bolt A.
(4) Tighten the bolts C and D.

Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)



3) Install the harness clips to the bracket.
4) Shift the select lever to “N” range.
5) Install the blind.

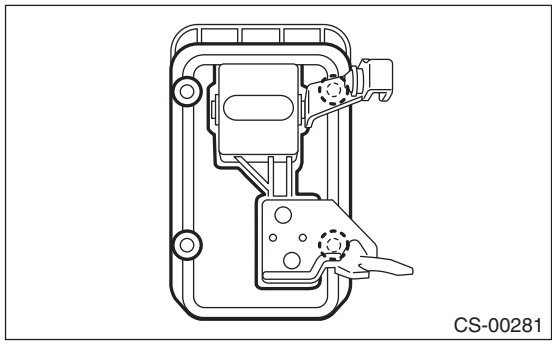
CAUTION:
The blind should be installed so that it is securely caught by tabs of the plate guide COMPL.



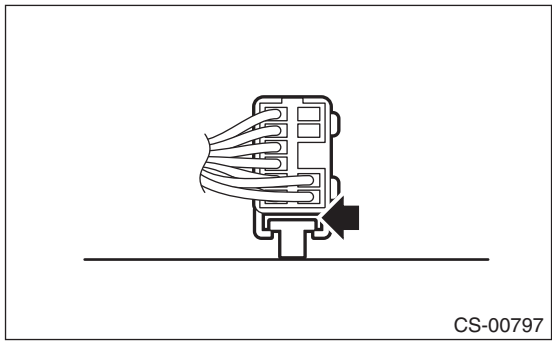
6) Install the indicator assembly.
7) Install the console side panel and console front panel. <Ref. to EI-52, INSTALLATION, Center Console.>
8) Install the console box. <Ref. to EI-49, INSTALLATION, Console Box.>
9) Install the parking brake lever boot.
10) Install the grip.
11) Lift up the vehicle.
12) Shift the range select lever to “N” range.
13) Secure the select cable to the bracket. <Ref. to CS-26, INSTALLATION, Select Cable.>
14) Adjust the select cable position. <Ref. to CS-27, ADJUSTMENT, Select Cable.>
15) After the completion of adjustment, confirm that the select lever operates properly at all range positions.
16) Install the heat shield cover. <Ref. to EI-70, INSTALLATION, Heat Shield Cover.>
17) Install the rear exhaust pipe. (non-turbo model) <Ref. to EX(H4DO)-14, INSTALLATION, Rear Exhaust Pipe.>
18) Remove the center exhaust pipe (rear). (turbo model) <Ref. to EX(H4DOTC)-8, INSTALLATION, Center Exhaust Pipe.>
19) Lower the vehicle.
20) Connect the battery ground terminal.
21) Inspect the following items. When a malfunction is found in the inspection, adjust the select cable and inhibitor switch. <Ref. to CS-27, ADJUSTMENT, Select Cable.> <Ref. to 4AT-52, ADJUSTMENT, Inhibitor Switch.>
(1) Engine starts when the select lever is in “P” and “N” range, but not in other ranges.
(2) Back-up light illuminates when the select lever is in the “R” range, but not in other ranges.
(3) Select lever and indicator positions are matched.

C: DISASSEMBLY

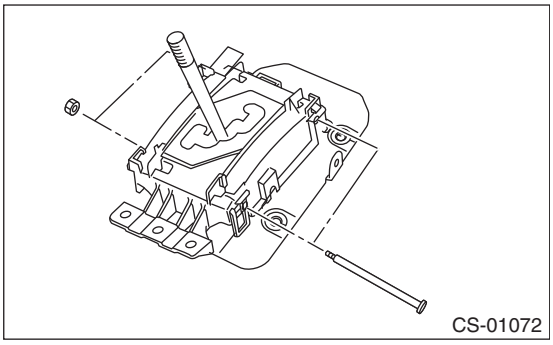
1) Remove the gasket and plate COMPL.



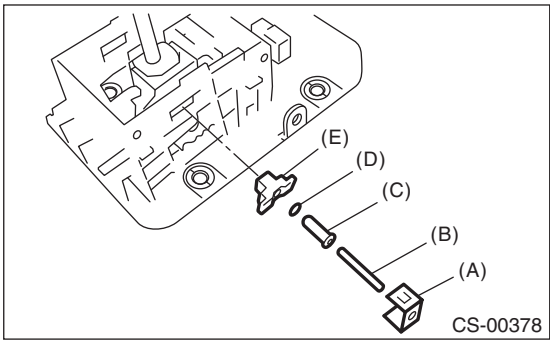
2) Insert a flat tip screwdriver with a thin tip under the connector and disconnect each connector from the plate COMPL.



3) Remove the spacer bolt and remove the plate guide COMPL.

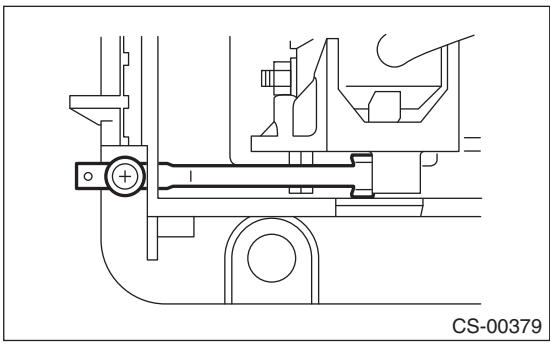


4) Remove the shift lock clamp, spring A, select lever rod, lock plate cushion, and bushing.

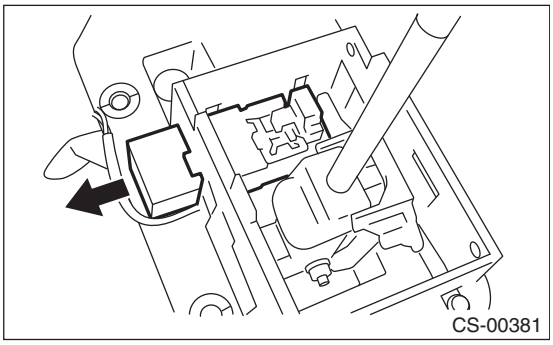


(A) Shift lock clamp
(B) Spring A
(C) Select lever rod
(D) Lock plate cushion
(E) Bushing

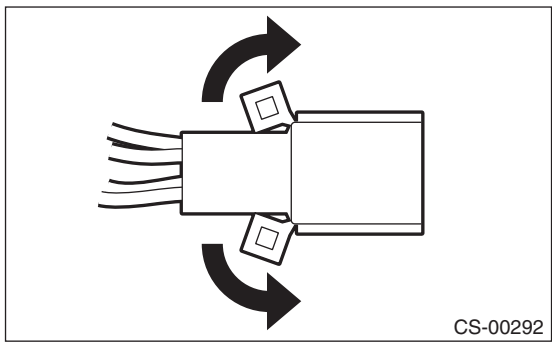
5) Remove the detent spring.



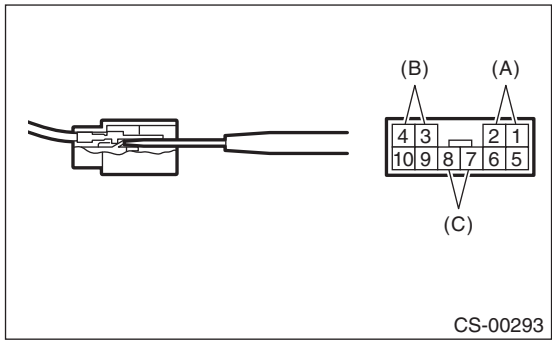
6) Remove the solenoid unit.



7) Raise the claw of connector.

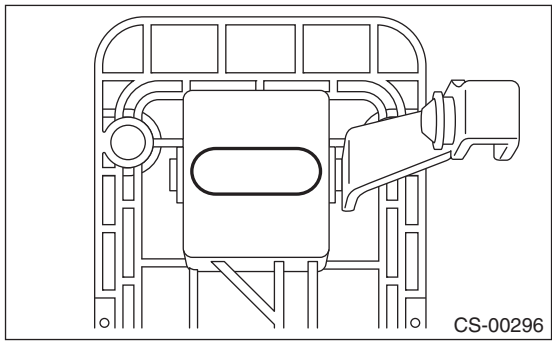


8) Disconnect the terminals of the SPORT mode switch, “P” range switch, and solenoid unit from the connector, using a flat tip screwdriver with a thin tip.

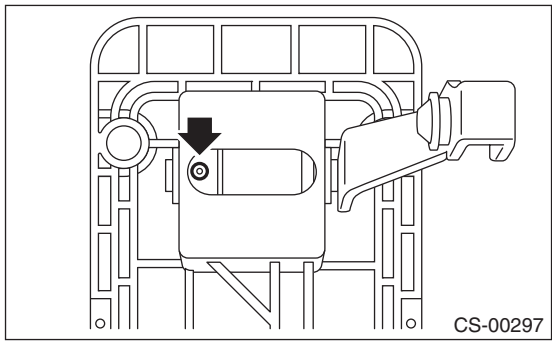


(A) “P” range switch terminal
(B) Solenoid unit terminals
(C) SPORT mode switch terminal

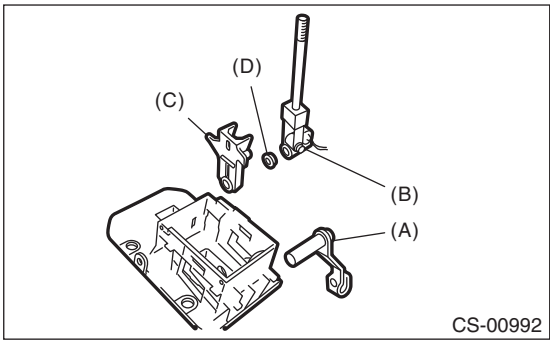
9) Remove the grommet.



10) Pull out the spring pin.

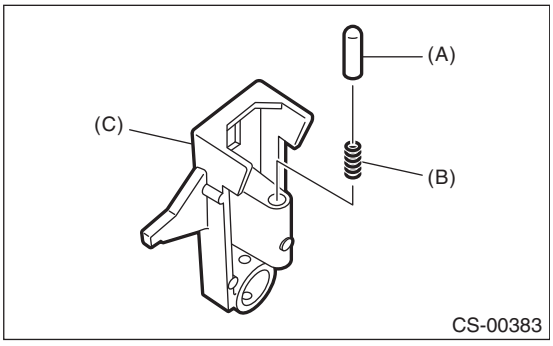


11) Pull out the arm COMPL, remove the select lever COMPL, and remove the bracket arm detent and bushing.



(A) Arm COMPL
(B) Selector lever COMPL
(C) Bracket arm detent
(D) Bushing

12) Remove the rod detent and spring detent from the bracket arm detent.



(A) Rod detent
(B) Spring detent
(C) Bracket arm detent

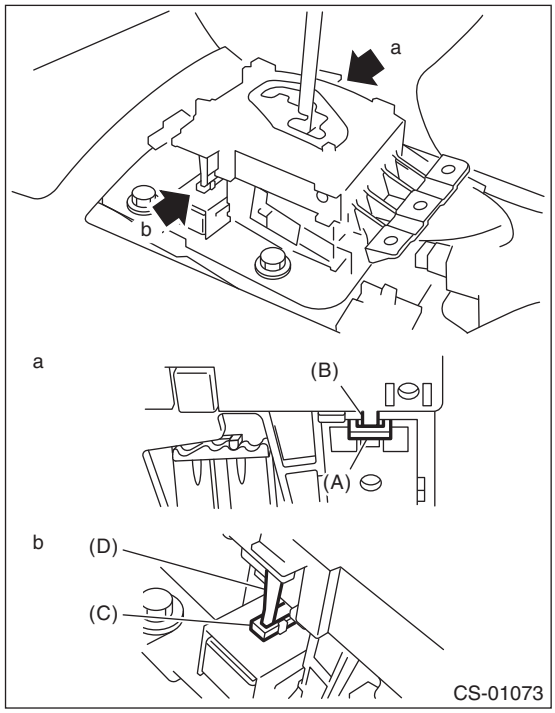
D: ASSEMBLY

1) Clean all the parts before assembly.
2) Apply grease to each part. <Ref. to CS-3, AT SELECT LEVER, COMPONENT, General Description.>

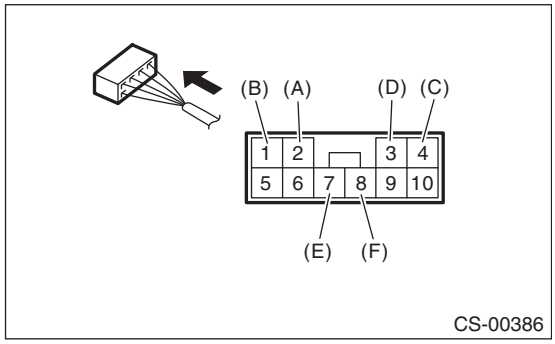
Grease:
Except for shift lock part:
NIGTIGHT LYW No. 2 grease or equivalent
Shift lock part:
SANKOL or equivalent

3) Assemble in the reverse order of disassembly.

NOTE:
• When installing the plate guide COMPL, set the select lever to the “D” range (normal mode position), and be careful for the following points.
  • Insert protrusion (B) of the plate guide COMPL into the hole on the solenoid unit (A).
  • Insert link (D) of the shift lock release into link (C) of the solenoid unit.



• Connect the switch and solenoid terminals to the connector.



(A) “P” range switch (color code: red)
(B) “P” range switch (color code: red)
(C) Solenoid unit (color code: black)
(D) Solenoid unit (color code: blue/red)
(E) SPORT mode switch (color code: white)
(F) SPORT mode switch (color code: black)

4) After completing installation, shift the select lever from “P” range to “D” range, then check whether the indicator and select lever matches, whether the pointer and position mark matches and whether the operating force occurs.

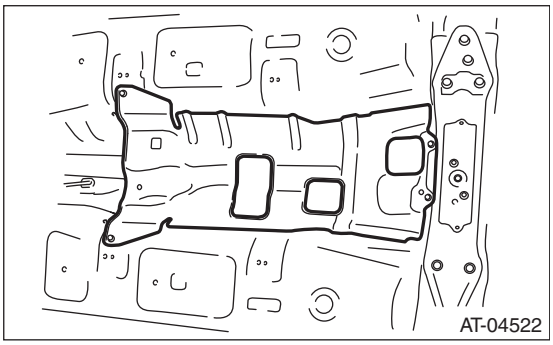
E: INSPECTION

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 assembly operating condition before assembly. Normal if it operates smoothly.

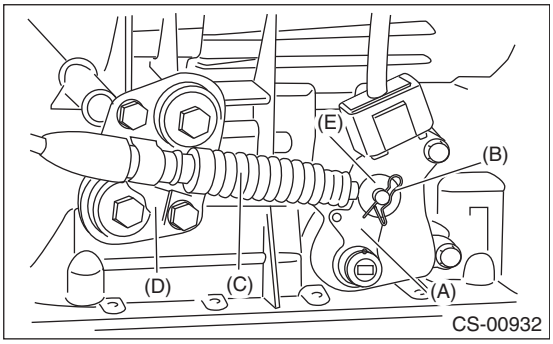
4. Select Cable

A: REMOVAL

1) Set the vehicle on a lift.
2) Shift the select lever to “N” range.
3) Disconnect the ground cable from battery.
4) Lift up the vehicle.
5) Remove the front exhaust pipe. (non-turbo model) <Ref. to EX(H4DO)-5, REMOVAL, Front Exhaust Pipe.>
6) Remove the center exhaust pipe (rear). (turbo model) <Ref. to EX(H4DOTC)-7, REMOVAL, Center Exhaust Pipe.>
7) Remove the heat shield cover.

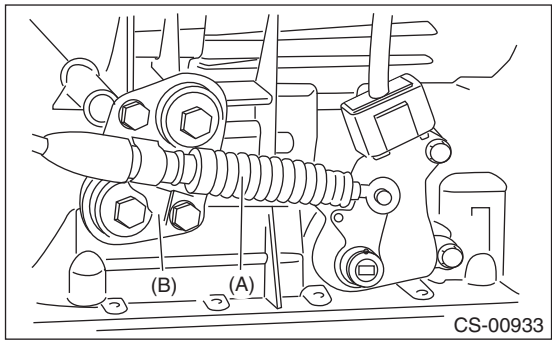


8) Remove the snap pin and washer from the shifter arm.



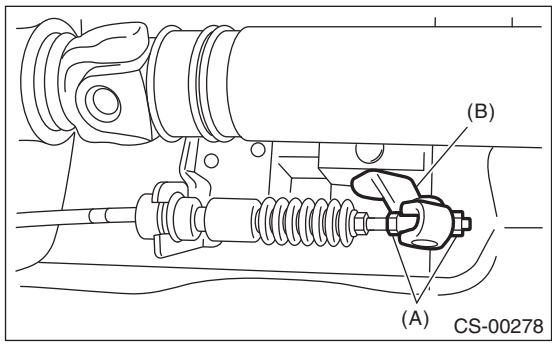
(A) Shifter arm
(B) Snap pin
(C) Select cable
(D) Plate ASSY
(E) Washer

9) Remove the plate assembly from the transmission case.



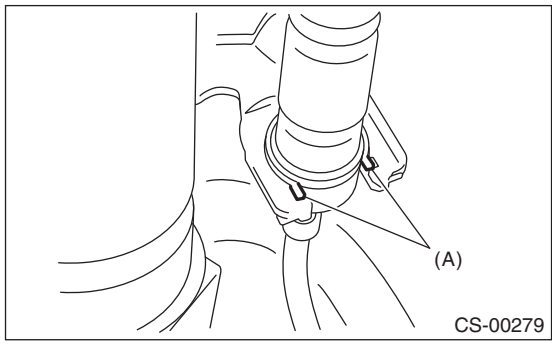
(A) Select cable
(B) Plate ASSY

10) Disconnect the cable from arm COMPL.



(A) Adjusting nut
(B) Arm COMPL

11) Raise the claw of clamp to remove the cable from bracket.



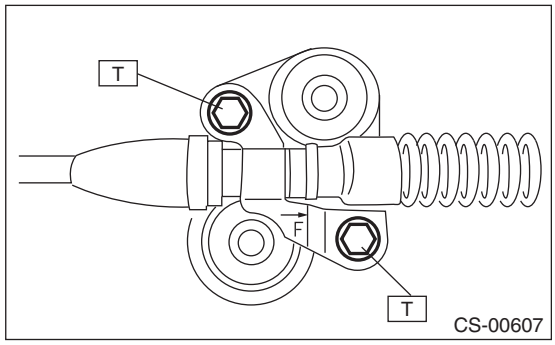
(A) Claw

12) Remove the select cable from plate assembly.

B: INSTALLATION

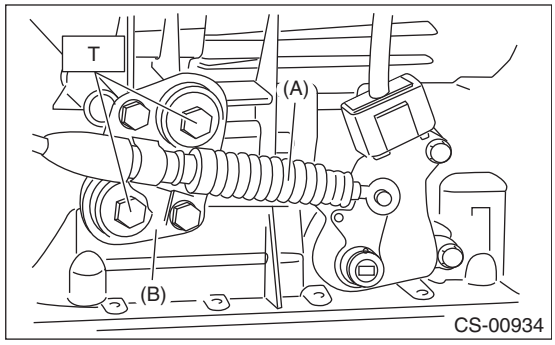
1) Install the select cable to plate assembly.

Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)



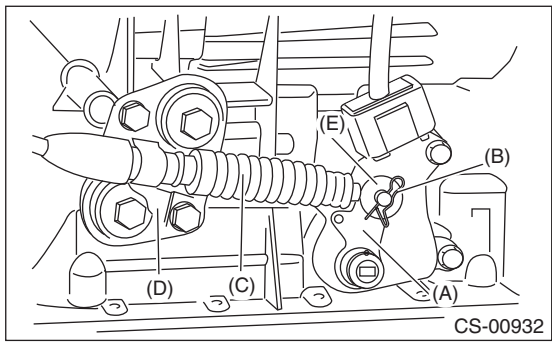
2) Install the select cable to the shifter arm.
3) Install the plate assembly to transmission.

Tightening torque:
T: 25 N·m (2.5 kgf-m, 18.4 ft-lb)



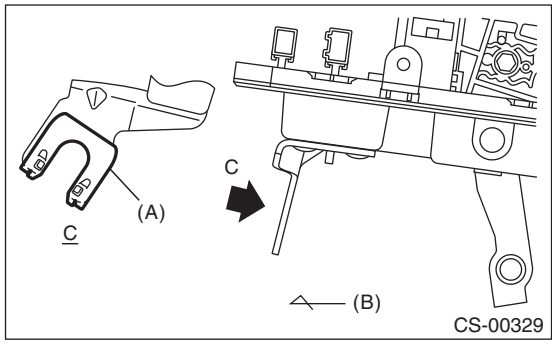
(A) Select cable
(B) Plate ASSY

4) Install the washer and snap pin to the shifter arm.



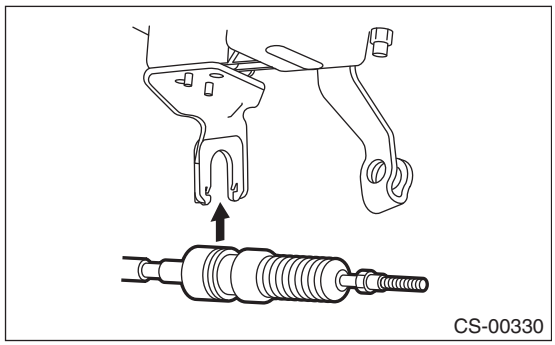
(A) Shifter arm
(B) Snap pin
(C) Select cable
(D) Plate ASSY
(E) Washer

5) Install new clamp paying attention to the installing direction.



(A) Clamp
(B) Forward

6) Insert the tip of inner cable into connector hole of select lever, and fix the cable to bracket.



7) Shift the select lever to the “N” range, and then adjust the select cable position. <Ref. to CS-27, ADJUSTMENT, Select Cable.>
8) Install the heat shield cover. <Ref. to EI-70, INSTALLATION, Heat Shield Cover.>
9) Install the front exhaust pipe. (non-turbo model) <Ref. to EX(H4DO)-8, INSTALLATION, Front Exhaust Pipe.>
10) Install the center exhaust pipe (rear). (turbo model) <Ref. to EX(H4DOTC)-8, INSTALLATION, Center Exhaust Pipe.>
11) Lower the vehicle.
12) Connect the battery ground terminal.

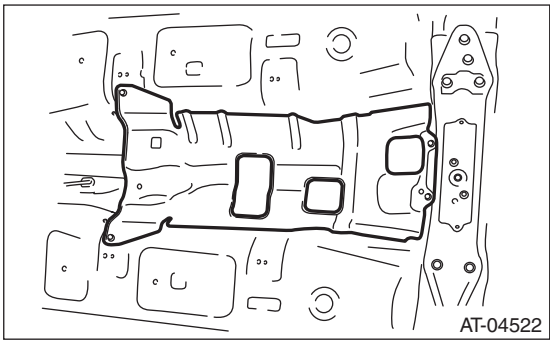
C: INSPECTION

Check the removed cable and replace or adjust if damaged, rusty or malfunctioning.
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.

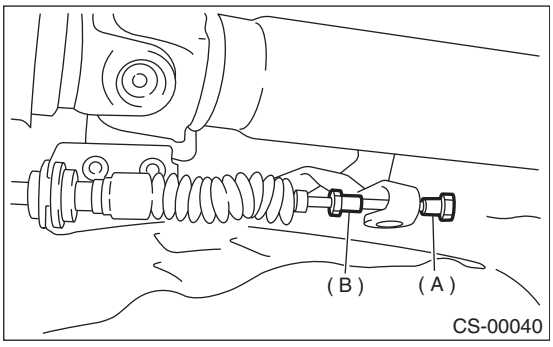
5) Move the select lever from “P” to “D” range. Check the existence of feel to contact the detents in each range. If the detents cannot be felt or the position pointer is improperly aligned, adjust the cable.
6) Check if the starter motor rotates when the select lever is set to “P” range.
7) Check the back-up light illumination when the select lever is in “R” range.
8) Check the parking lock operation when the select lever is in “P” range.

D: ADJUSTMENT

1) Set the vehicle on a lift.
2) Shift the select lever to “N” range.
3) Lift up the vehicle.
4) Remove the rear exhaust pipe. (non-turbo model) <Ref. to EX(H4DO)-13, REMOVAL, Rear Exhaust Pipe.>
5) Remove the center exhaust pipe (rear). (turbo model) <Ref. to EX(H4DOTC)-7, REMOVAL, Center Exhaust Pipe.>
6) Remove the heat shield cover.

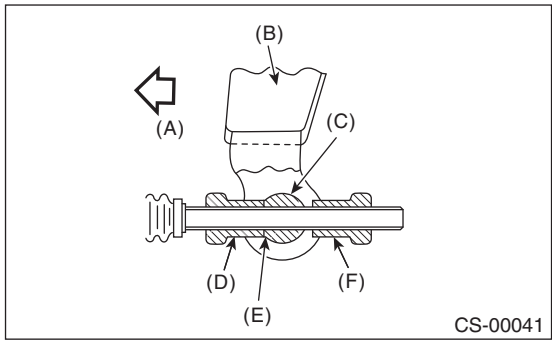


7) Loosen the adjusting nuts on both sides.



(A) Adjusting nut A
(B) Adjusting nut B

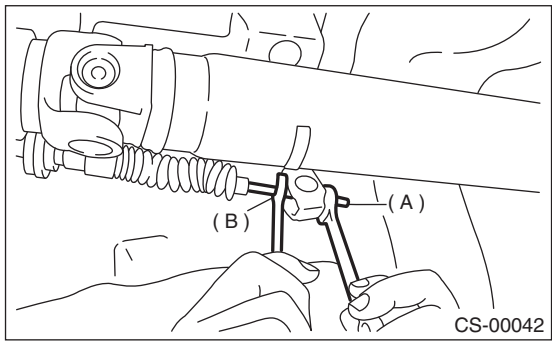
8) Turn adjusting nut B until it lightly touches the connector.



(A) Forward side
(B) Select lever
(C) Connector
(D) Adjusting nut B
(E) Contact point
(F) Adjusting nut A

9) 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 (0.8 kgf-m, 5.5 ft-lb)



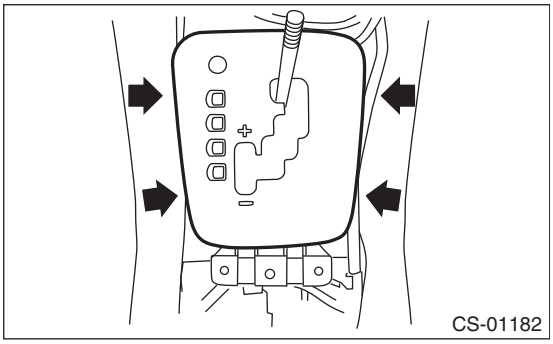
(A) Adjusting nut A
(B) Adjusting nut B

10) After the completion of adjustment, confirm that the select lever operates normally at all ranges.
11) Install in the reverse order of removal.

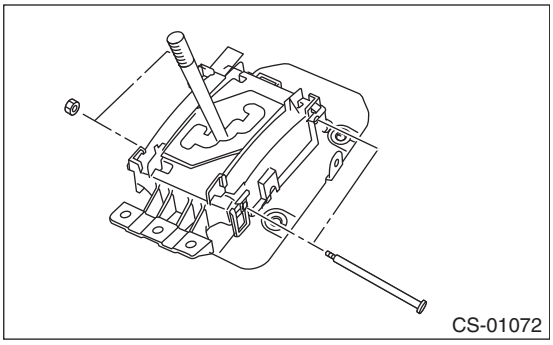
5. AT Shift Lock Solenoid and “P” Range Switch

A: REMOVAL

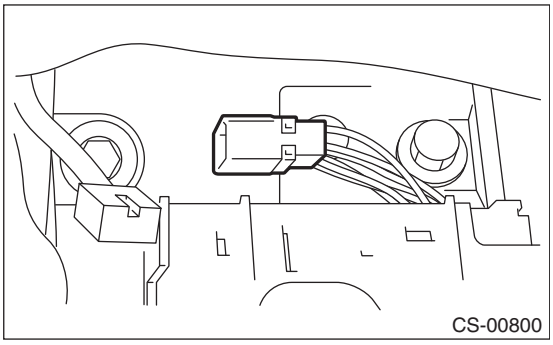
1) Disconnect the ground cable from battery.
2) Remove the grip.
3) Remove the parking brake lever boot.
4) Remove the console box. <Ref. to EI-49, REMOVAL, Console Box.>
5) Remove the console side panel and console front panel. <Ref. to EI-50, CONSOLE FRONT PANEL, REMOVAL, Center Console.>
6) Remove the indicator assembly.


CS-01182

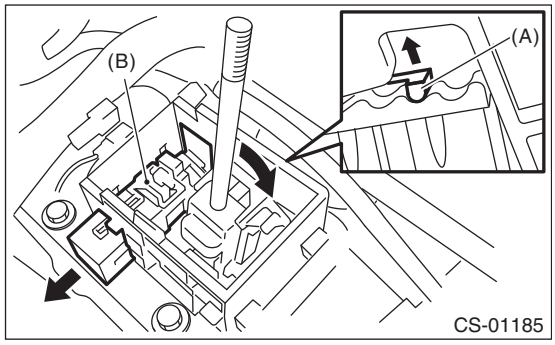
7) While pressing the shift lock release button, shift the select lever to the “N” range.
8) Remove the spacer bolt and remove the plate guide COMPL.


CS-01072

9) Using a flat tip screwdriver with a thin tip, remove the connector from the plate COMPL.


CS-00800

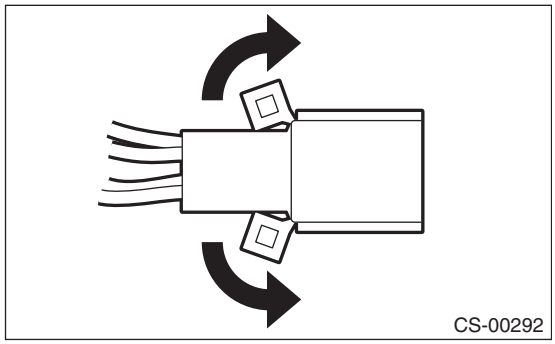
10) With detent spring lifted up, push the select lever backward and remove the solenoid unit.



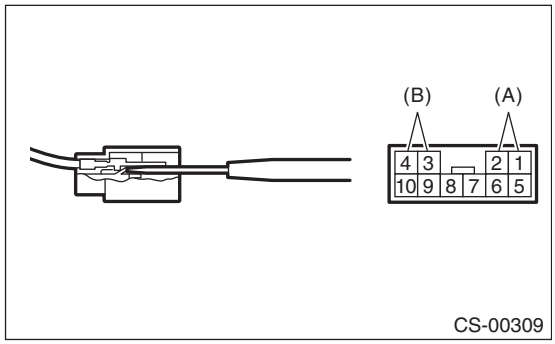
CS-01185

(A) Detent spring
(B) Solenoid unit

11) Raise the claw of connector.


CS-00292

12) Using a flat tip screwdriver with a thin tip, disconnect the terminals of “P” range switch and solenoid unit from the connector.



CS-00309

(A) “P” range switch terminal
(B) Solenoid unit terminals

B: INSTALLATION

Install in the reverse order of removal.

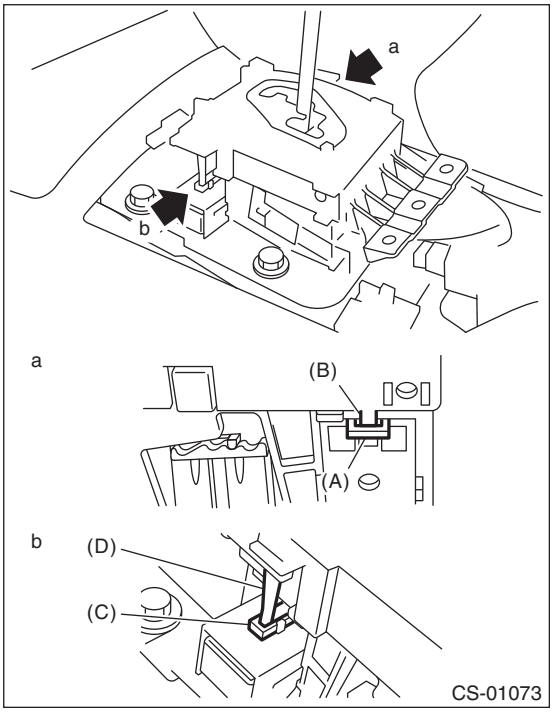
NOTE:

• Refer to “COMPONENT” for each tightening torque. <Ref. to CS-3, COMPONENT, General Description.>

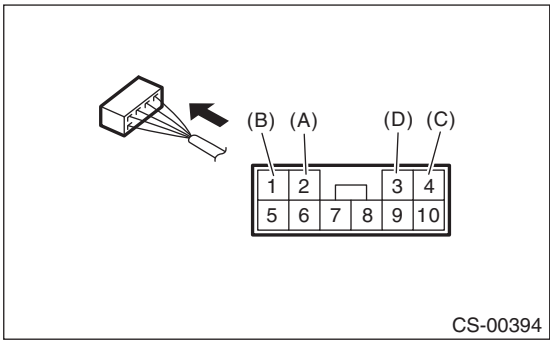
• When installing the plate guide COMPL, set the select lever to the “D” range (normal mode position), and be careful for the following points.

  • Insert protrusion (B) of the plate guide COMPL into the hole on the solenoid unit (A).

  • Insert link (D) of the shift lock release into link (C) of the solenoid unit.



• Connect the switch and solenoid unit terminals to the connector.



(A) “P” range switch (color code: red)
(B) “P” range switch (color code: red)
(C) Solenoid unit (color code: black)
(D) Solenoid unit (color code: blue/red)

C: INSPECTION

	Step	Check	Yes	No
1	**CHECK SHIFT LOCK SOLENOID.** Measure the resistance of solenoid unit connector terminals. ***Terminals*** ***No. 4 — No. 3:***	Is the resistance 19.8 — 24.2 Ω?	Go to step **2**.	Replace the solenoid unit.
2	**CHECK SHIFT LOCK SOLENOID.** Connect the battery to connector terminal of shift lock solenoid, and operate the shift lock solenoid. ***Terminals*** ***No. 3 (+) — No. 4 (–):***	Does the shift lock solenoid operate normally?	Go to step **3**.	Replace the solenoid unit.
3	**CHECK “P” RANGE SWITCH.** 1) Shift the select lever to “P” range. 2) Measure the resistance between “P” range switch connector terminals. ***Terminals*** ***No. 1 — No. 2:***	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. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 1 MΩ or more?	Normal	Replace the plate guide COMPL.

6. Body Integrated Unit

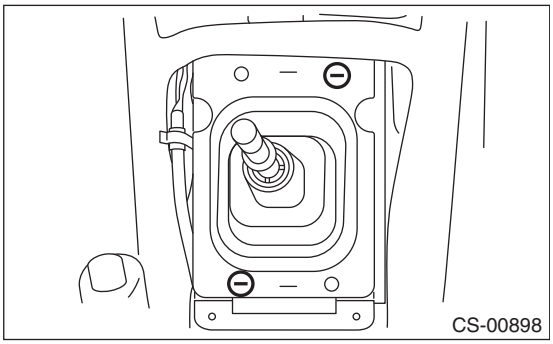
A: NOTE

Refer to “Body Integrated Unit” for removal and installation procedures. <Ref. to SL-46, Body Integrated Unit.>

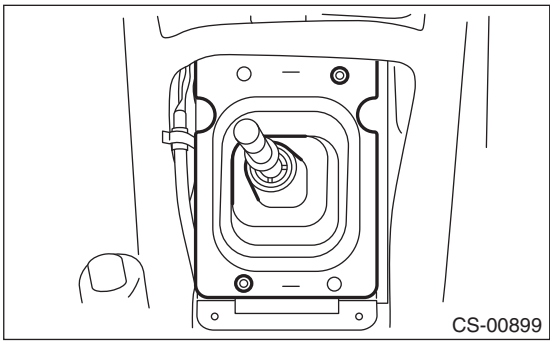
7. MT Gear Shift Lever

A: REMOVAL

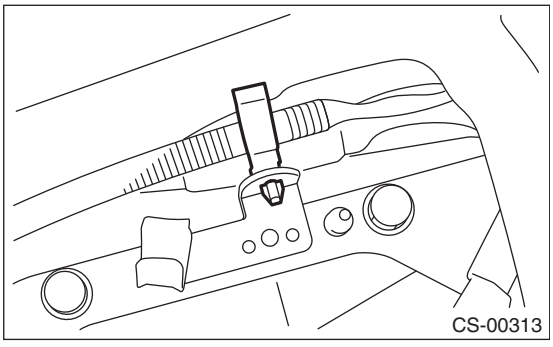
1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.
3) Remove the gear shift knob.
4) Remove the console box. <Ref. to EI-49, REMOVAL, Console Box.>
5) Remove the console side panel and console front panel. <Ref. to EI-50, CONSOLE FRONT PANEL, REMOVAL, Center Console.>
6) Remove the clamp.


CS-00898

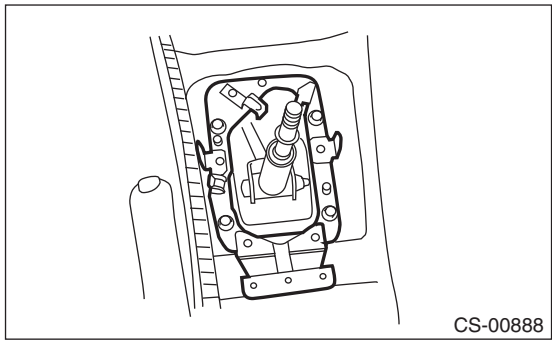
7) Remove the boot and insulator assembly.


CS-00899

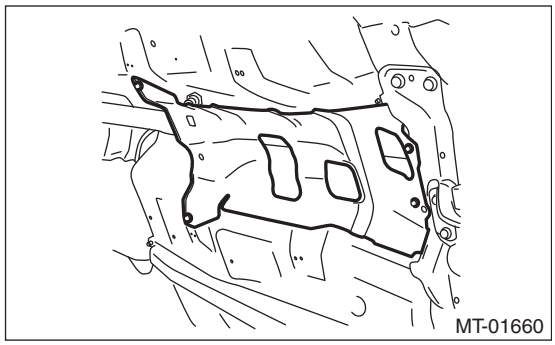
8) Remove the harness clamp from the plate COMPL.


CS-00313

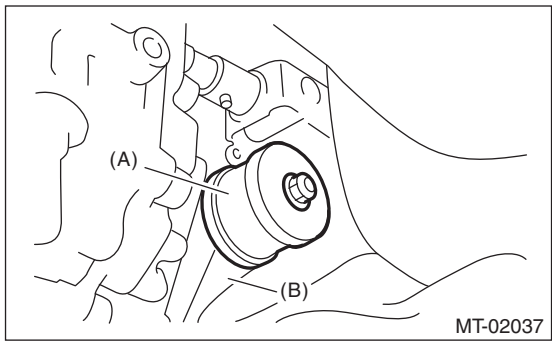
9) Remove the plate COMPL from the vehicle body.


CS-00888

10) Lift up the vehicle.
11) Remove the rear exhaust pipe. (non-turbo model) <Ref. to EX(H4DO)-13, REMOVAL, Rear Exhaust Pipe.>
12) Remove the center exhaust pipe (rear). (turbo model) <Ref. to EX(H4DOTC)-7, REMOVAL, Center Exhaust Pipe.>
13) Remove the heat shield cover.


MT-01660

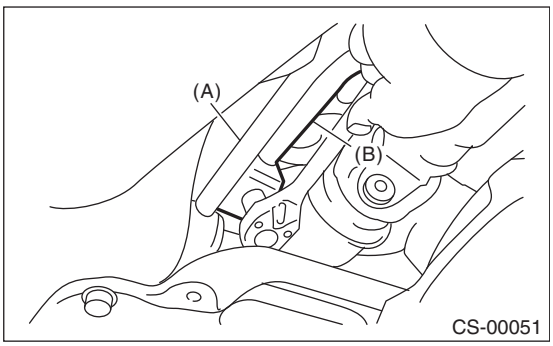
14) Remove the stay from transmission bracket.



MT-02037

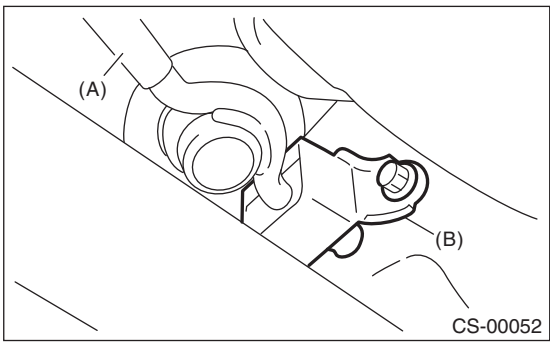
(A) Stay
(B) Transmission bracket

15) Remove the rod from joint.



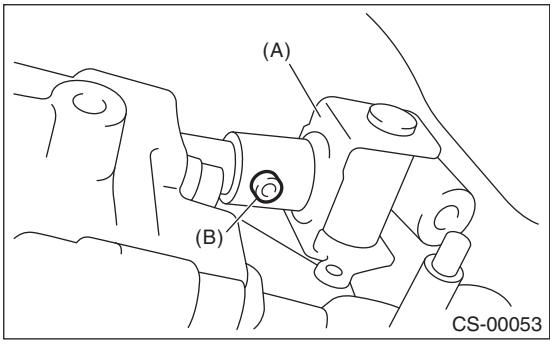
(A) Stay
(B) Rod

16) Remove the cushion rubber from the vehicle body.



(A) Stay
(B) Cushion rubber

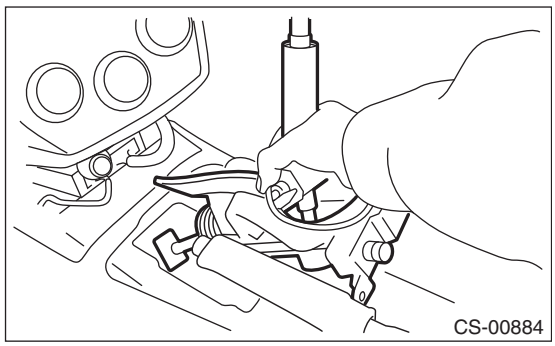
17) Extract the spring pin and remove the joint.



(A) Joint
(B) Spring pin

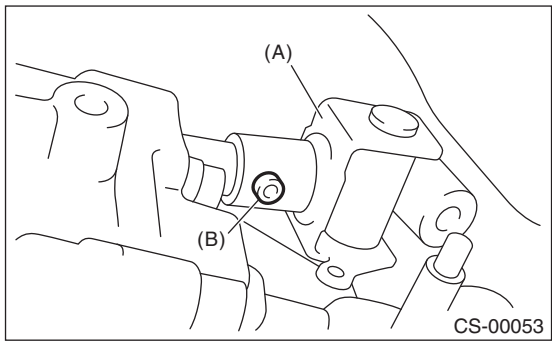
18) Lower the vehicle.

19) Remove the gear shift lever.



B: INSTALLATION

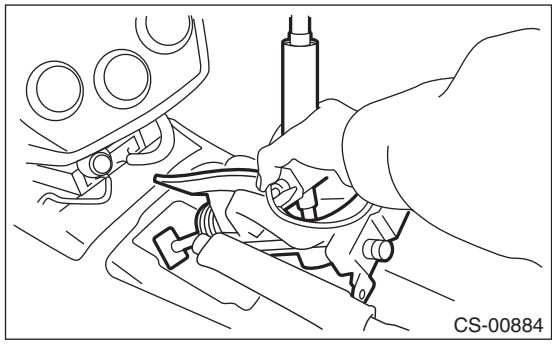
1) Install the joint to the transmission and secure with a spring pin.



(A) Joint
(B) Spring pin

2) Insert the gear shift lever from the room side.

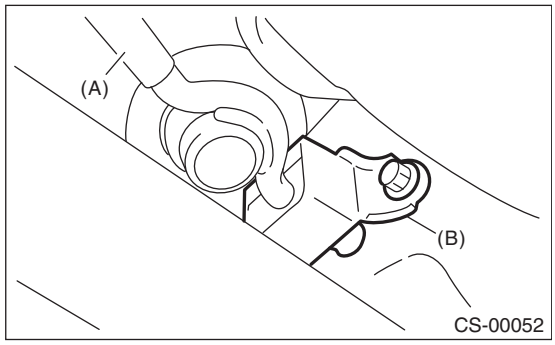
NOTE:
Insert the rod and the stay, and then temporarily set them onto the transmission mount.



3) Lift up the vehicle.

4) Mount the cushion rubber on the vehicle body.

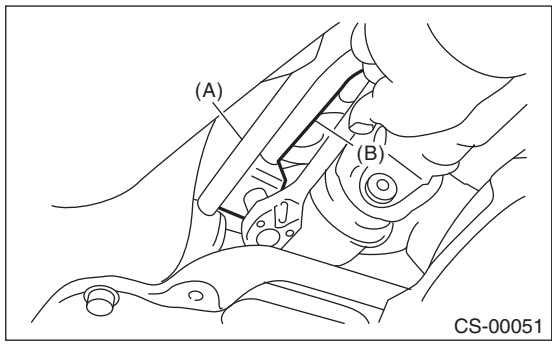
Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)



(A) Stay
(B) Cushion rubber

5) Using new self-locking nuts, connect the rod to the joint.

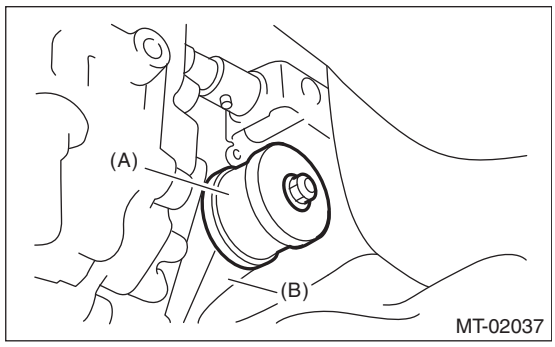
Tightening torque:
12 N·m (1.2 kgf-m, 8.9 ft-lb)



(A) Stay
(B) Rod

6) Using new self-locking nuts, connect the stay to the transmission bracket.

Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)

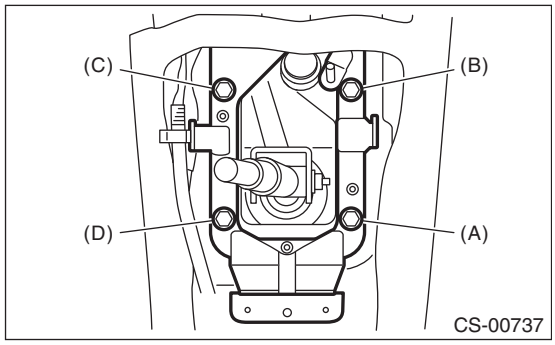


(A) Stay
(B) Transmission bracket

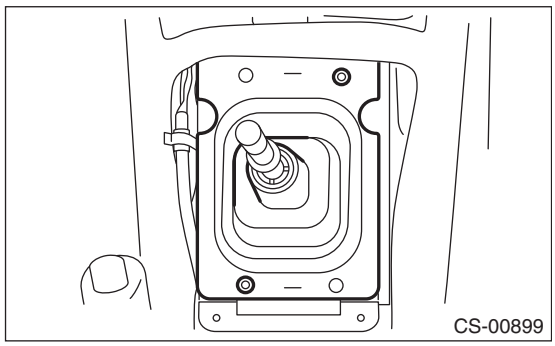
7) Install the heat shield cover. <Ref. to EI-70, INSTALLATION, Heat Shield Cover.>
8) Install the rear exhaust pipe and muffler. (non-turbo model) <Ref. to EX(H4DO)-14, INSTALLATION, Rear Exhaust Pipe.>
9) Remove the center exhaust pipe (rear). (turbo model) <Ref. to EX(H4DOTC)-8, INSTALLATION, Center Exhaust Pipe.>
10) Lower the vehicle.
11) Install the plate COMPL to the body.

Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)

(1) Set the plate COMPL to the vehicle.
(2) Temporarily tighten the bolt (A).
(3) Tighten the bolt (B).
(4) Tighten the bolt (A).
(5) Tighten the bolts (C) and (D).



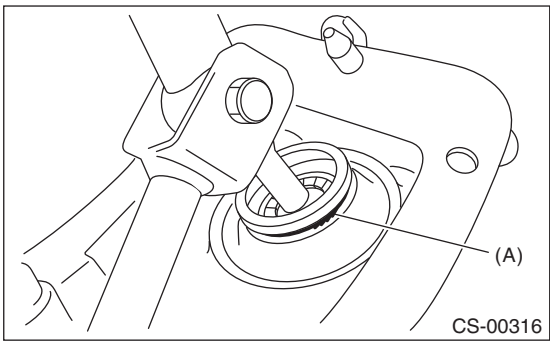
12) Install the harness clamp to the plate.
13) Install the boot and insulator assembly, and secure with a clamp.



14) Install the console box. <Ref. to EI-49, INSTALLATION, Console Box.>
15) Install the console side panel and console front panel. <Ref. to EI-52, INSTALLATION, Center Console.>
16) Install the gear shift knob.
17) Make sure the gears can be shifted accurately into each gear.
18) Connect the battery ground terminal.

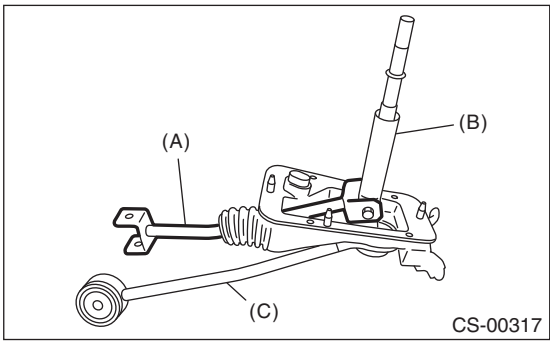
C: DISASSEMBLY

1) Remove the lock wires.



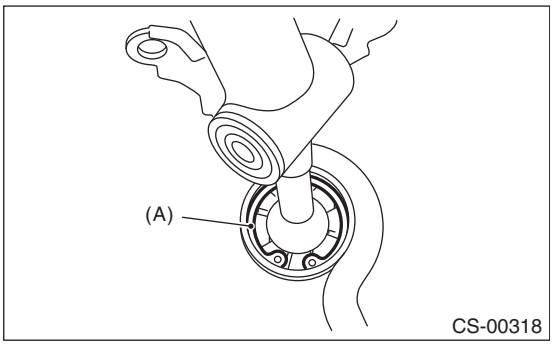
(A) Lock wire

2) Remove the rod from lever.



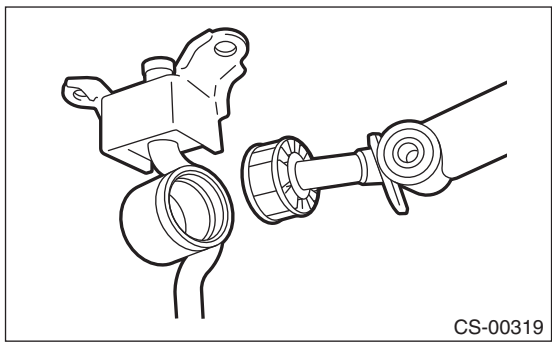
(A) Rod
(B) Lever
(C) Stay

3) Separate the rod and inner boot.
4) Remove the snap ring from the stay.

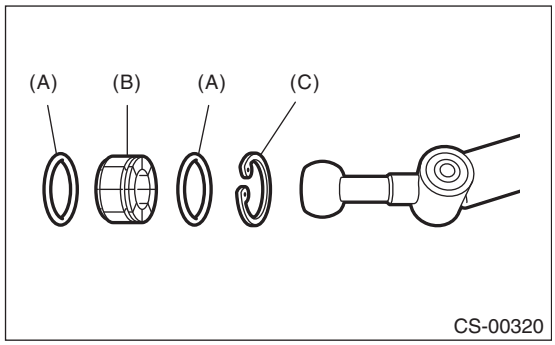


(A) Snap ring

5) Separate the gear shift lever and the stay.

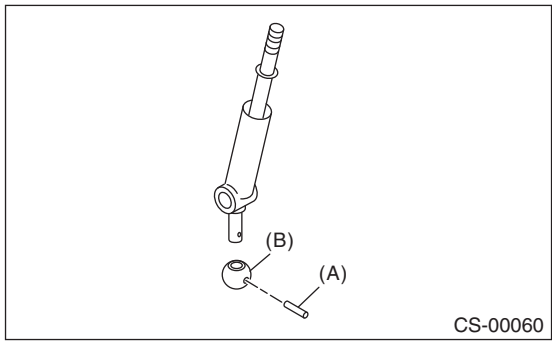


6) Remove the boot, bushing and snap ring from gear shift lever.



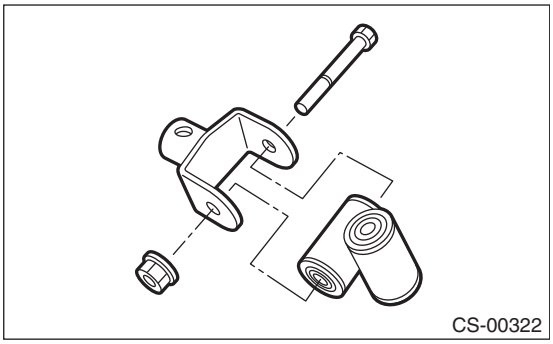
(A) O-ring
(B) Bushing
(C) Snap ring

7) Remove the spring pin, and then remove the bushing and snap ring.

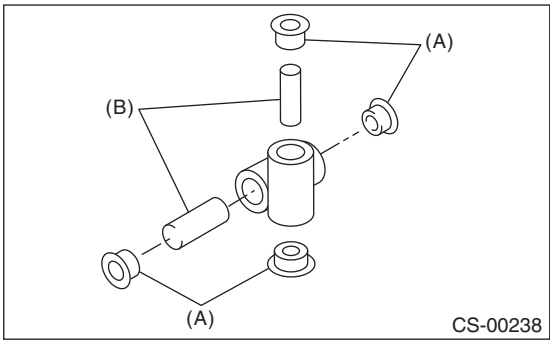


(A) Spring pin
(B) Bushing

8) Remove the boss from the joint.

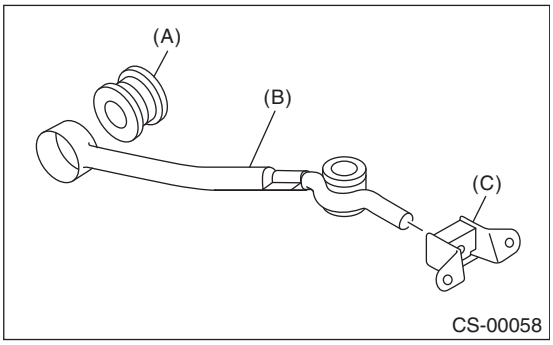


9) Remove the bushing and spacer from the boss.



(A) Bushing
(B) Spacer

10) Remove the bushing and cushion rubber from the stay.



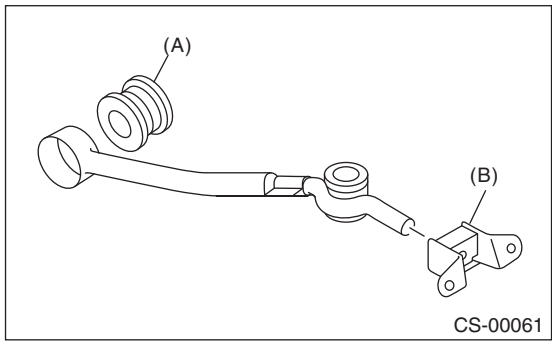
(A) Bushing B
(B) Stay
(C) Cushion rubber

D: ASSEMBLY

NOTE:
- Clean all the parts before assembly.
- Apply grease to each part. <Ref. to CS-4, 5MT GEAR SHIFT LEVER, COMPONENT, General Description.>

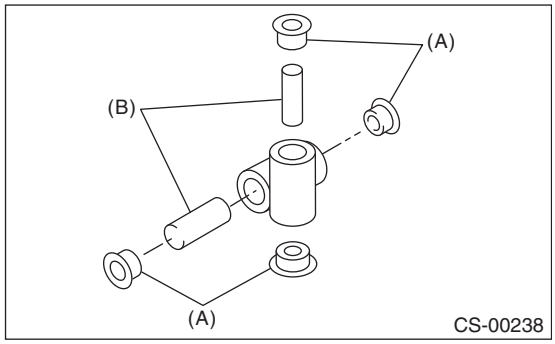
Grease:
NIGTIGHT LYW No. 2 grease or equivalent

1) Mount the bushing and cushion rubber to the stay.



(A) Bushing
(B) Cushion rubber

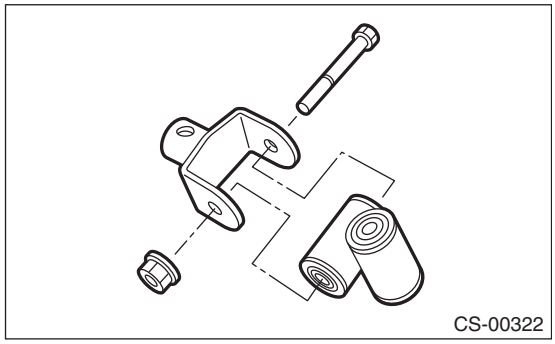
2) Install the bushing and spacer to boss.



(A) Bushing
(B) Spacer

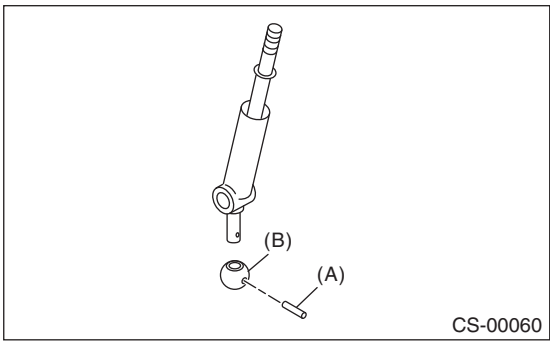
3) Using new self-locking nuts, install the boss to the joint.

Tightening torque:
12 N·m (1.2 kgf-m, 8.9 ft-lb)



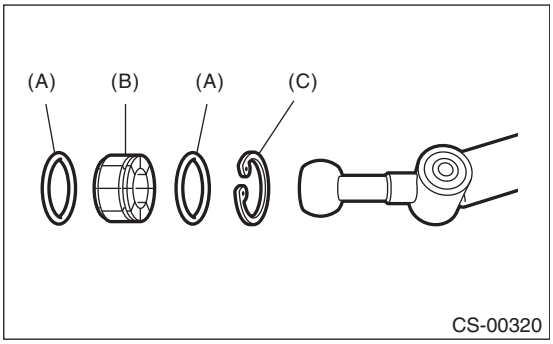
4) Install the snap ring to gear shift lever and install the bushing.

NOTE:
Apply grease to the bushing.



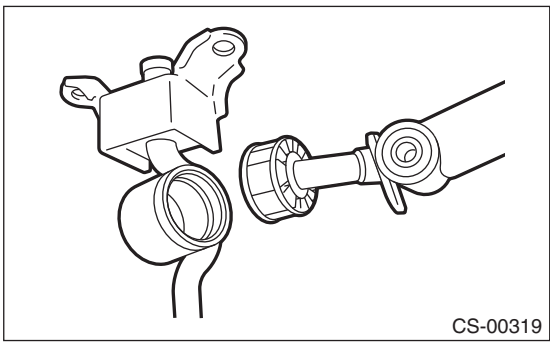
(A) Spring pin
(B) Bushing

5) Apply grease to the bushing and O-ring, and then install to gear shift lever.

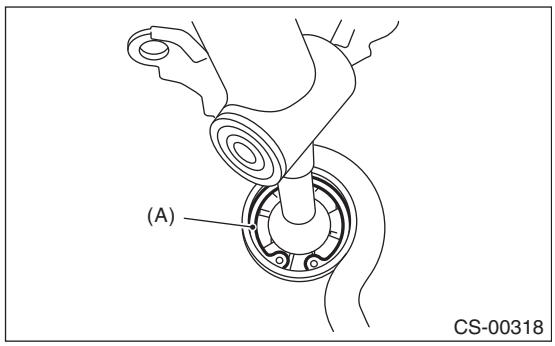


(A) O-ring
(B) Bushing
(C) Snap ring

6) Apply sufficient grease into boss, and then install the gear shift lever to the stay.



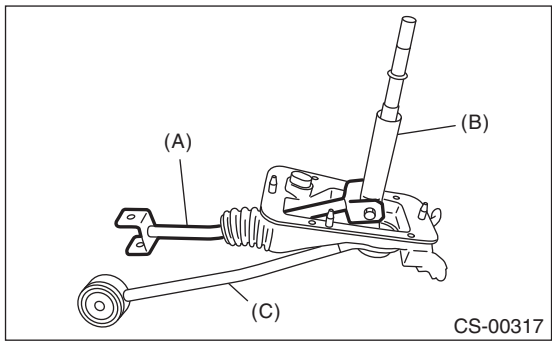
7) Install the washer and snap ring.



(A) Snap ring

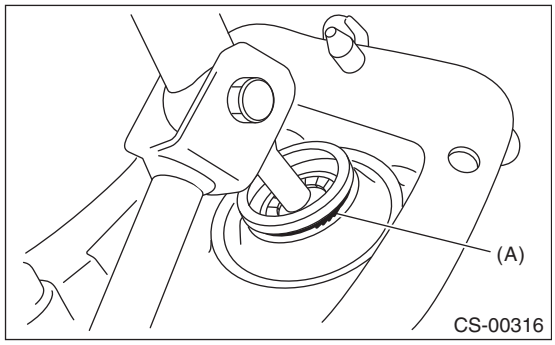
8) Insert the gear shift lever and rod into boot hole.
9) Install the rod.

Tightening torque:
12 N·m (1.2 kgf-m, 8.9 ft-lb)



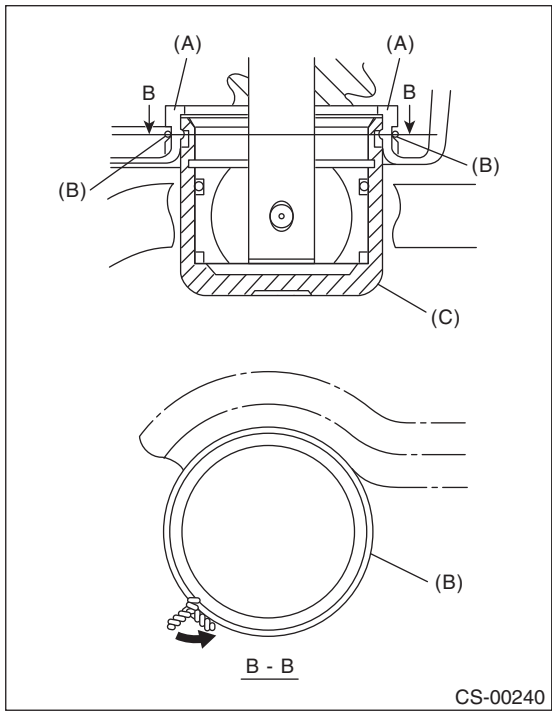
(A) Rod
(B) Lever
(C) Stay

10) Install a new lock wire.



(A) Lock wire

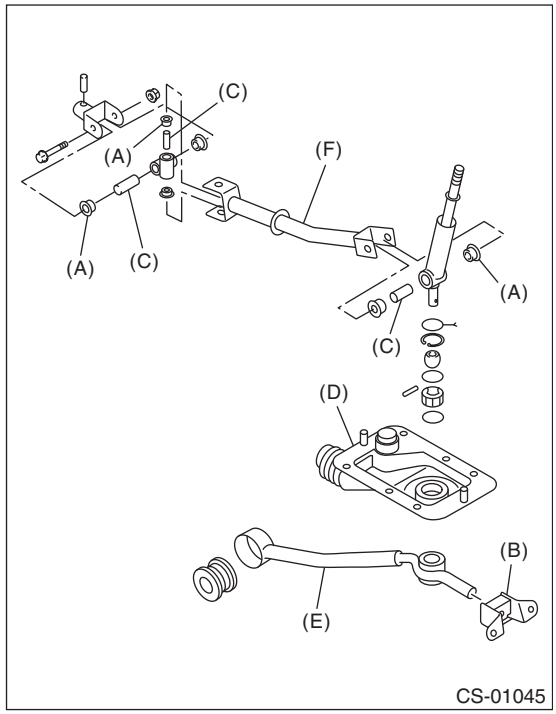
NOTE:
- Install the lock wire to the stay groove.
- Bend the extra wire to the same direction of lock wire winding.



(A) Inner boot
(B) Lock wire
(C) Stay

E: INSPECTION

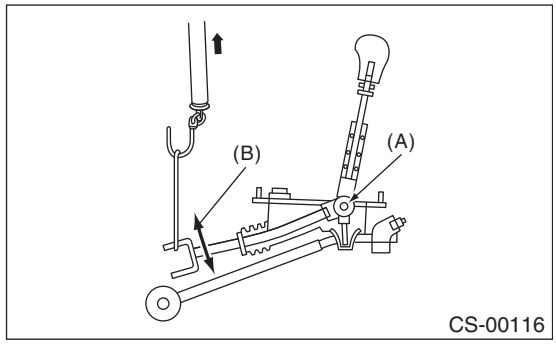
1) Check the parts (bushing, cushion rubber, spacer, boot, stay and rod, etc.) for deformation, damage and wear. If necessary, correct or replace faulty parts. Compare the removed parts with new parts to judge if there are damages or not.



(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:
3.7 N (0.38 kgf, 0.83 lbf) or less



(A) Pivot
(B) Swing torque

8. General Diagnostic Table

A: INSPECTION

Symptoms	Possible cause	Corrective action
Select lever	Starter does not run.	Adjust the select cable and inhibitor switch, or inspect the circuit.
	Back-up light does not illuminate.	Adjust the select cable and inhibitor switch, or inspect the circuit.
	AT shift lock system does not operate normally.	Adjust the select cable and inhibitor switch, or inspect the circuit.
	Manual mode can not be set.	Adjust the mode switch and select lever, or inspect the circuit.
	Up-shift is not engaged at manual mode.	Check the shift-up switch and circuit.
	Down-shift is not engaged at manual mode.	Check the shift-down switch and circuit.

AUTOMATIC TRANSMISSION

4AT

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1. General Description

A: SPECIFICATION

1. TORQUE CONVERTER

Model	2.5 L non-turbo	2.5 L Turbo
Type	Symmetric, 3-element, single stage, 2 phase torque converter	
Stall torque ratio	2.05 — 2.35	
Nominal diameter mm (in)	246 (9.69)	
Stall speed (at sea level)	2,200 — 2,700 rpm	2,800 — 3,300 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 (sprag type)	1 set

4. TRANSMISSION GEAR RATIO

1st	2.785
2nd	1.545
3rd	1.000
4th	0.694
Rev	2.272

5. PLANETARY GEAR AND PLATE

Model	2.5 L non-turbo	2.5 L 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 fixed, engine start is possible
R (Reverse)	Transmission is in reverse.
N (Neutral)	Transmission is in neutral and engine start is possible
D (Drive)	4-forward automatic gear change 1st ← → 2nd ← → 3rd ← → 4th
SPORT mode	4-forward automatic gear change 1st ← → 2nd ← → 3rd ← → 4th
Manual mode (+)	4-forward manual gear change (shift up) 1st → 2nd → 3rd → 4th
Manual mode (–)	4-forward manual gear change (shift down) 1st ← 2nd ← 3rd ← 4th
Control method	Wire cable type

7. HYDRAULIC CONTROL AND LUBRICATION

Type		Electronic hydraulic control [4 forward gear changes made by electronic signals of vehicle speed and accelerator (throttle) opening]
Fluid	Recommended materials	SUBARU ATF
	Alternative	IDEMITSU “ATF HP” **CAUTION:** **Be sure to use the recommended or equivalent ATF. Using material except recommended one or substitute would cause trouble.**
Fluid capacity ℓ (US qt, Imp qt)		9.3 — 9.6 (9.8 — 10.1, 8.2 — 8.4)
Lubrication system		Forced feed lubrication with oil pump
Oil		Automatic transmission fluid (see above)

8. COOLING AND HARNESS

Cooling system	Liquid-cooler
Inhibitor switch	12 poles
Transmission harness	20 poles

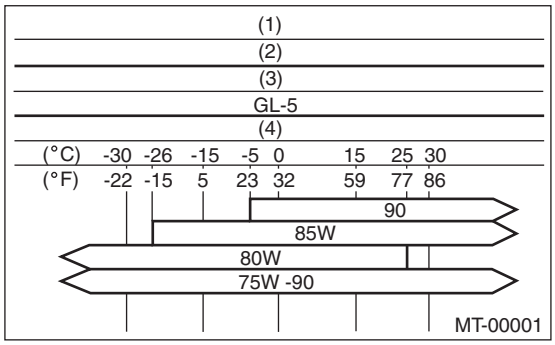
9. TRANSFER

Model	2.5 L non-turbo	2.5 L Turbo
Transfer type	Multi-plate transfer (MPT)	
Number of transfer clutch drives & driven plates	5	6
Control method	Electronic hydraulic type	
Lubricants	Same automatic transmission fluid as used in the automatic transmission	
Reduction gear ratio	1.000 (53/53)	

10.FINAL REDUCTION GEAR

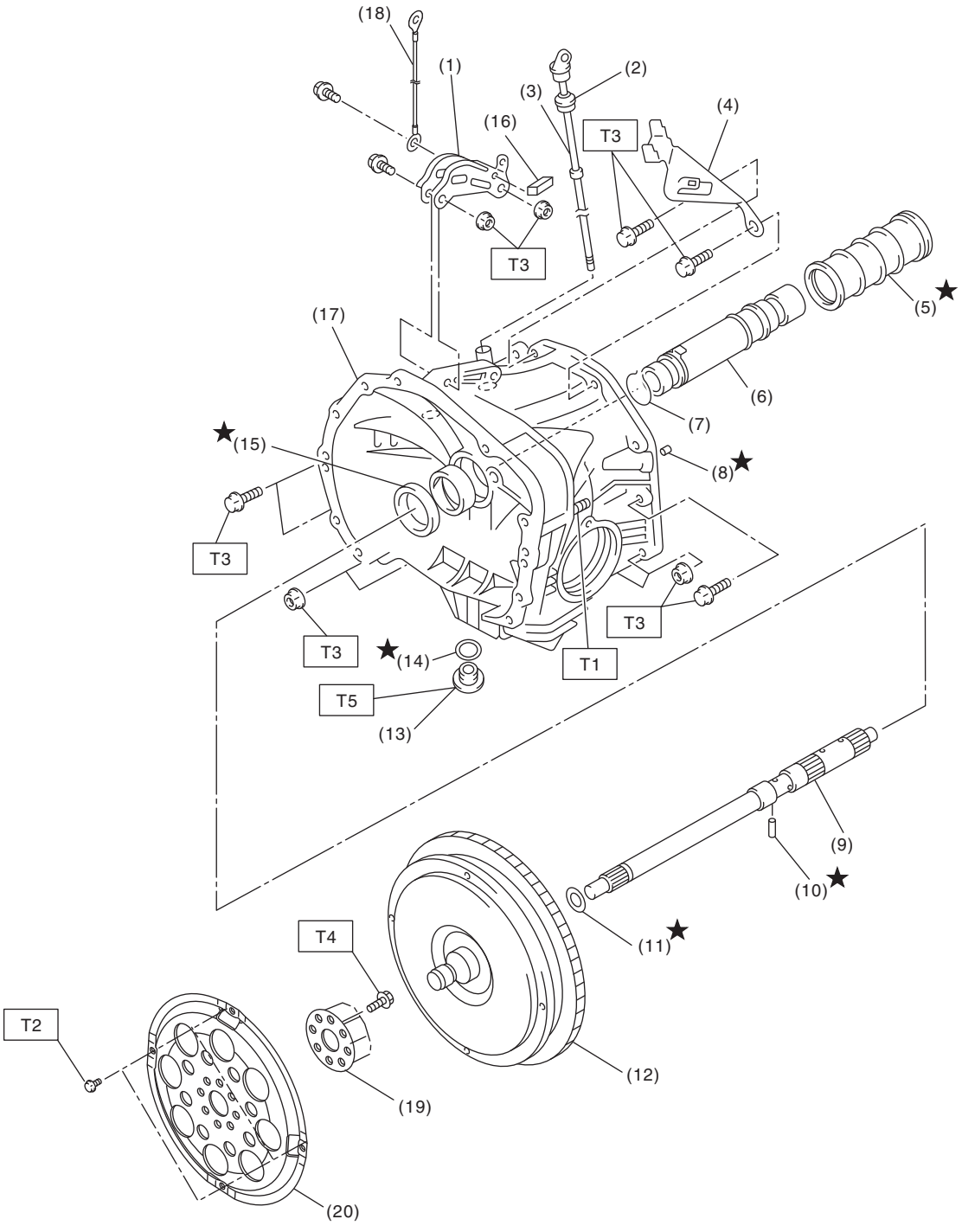
Model	2.5 L non-turbo	2.5 L Turbo
Front final reduction gear ratio	4.444 (40/9)	4.111 (37/9)

11.RECOMMENDED GEAR OIL

Lubrication oil	 (1) Item (2) Front differential gear oil (3) API standard (4) SAE viscosity No. and applicable temperature
Front differential oil capacity ℓ (US qt, Imp qt)	1.1 — 1.3 (1.2 — 1.4, 1.0 — 1.1)

B: COMPONENT

1. TORQUE CONVERTER AND CASE

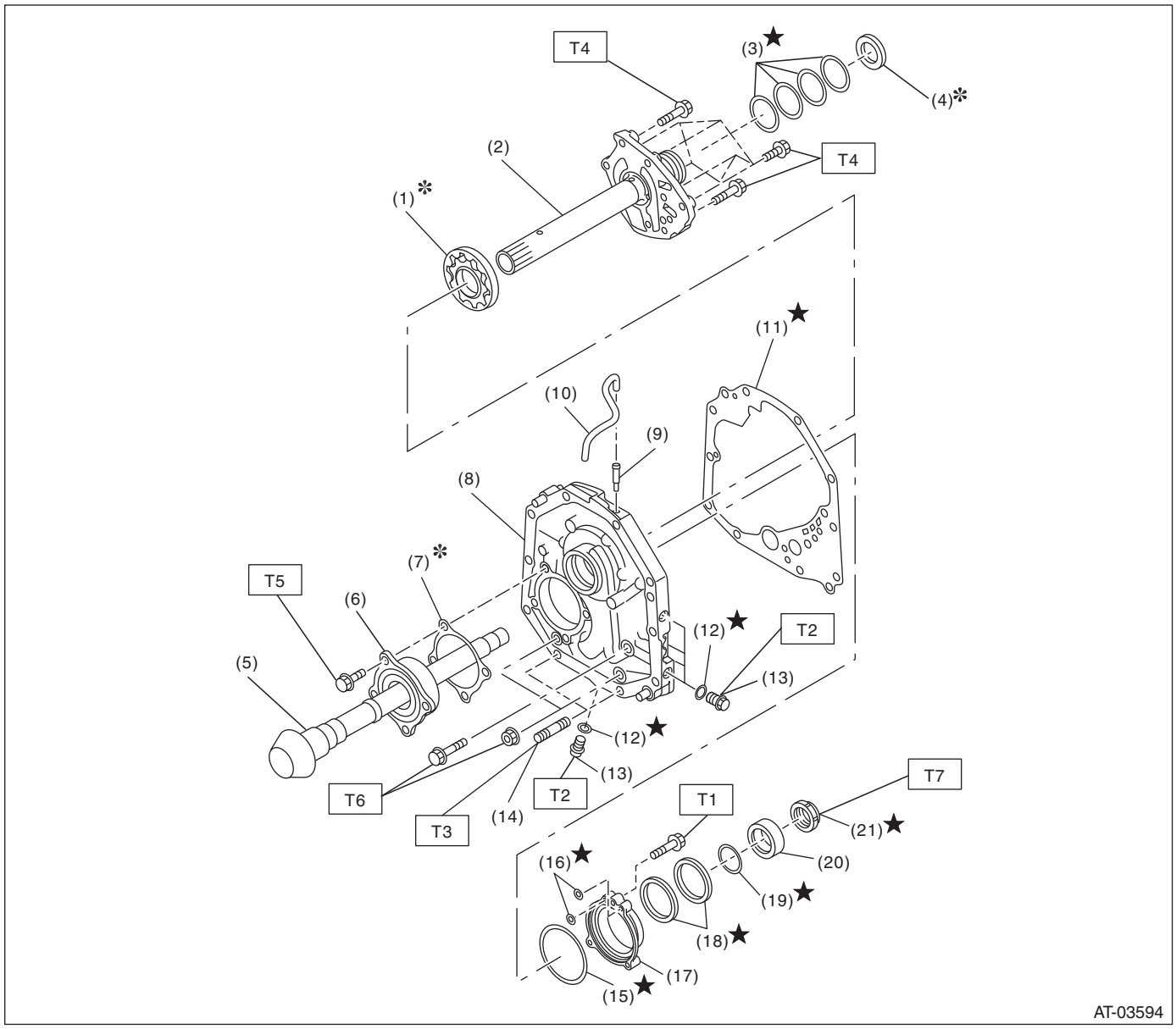


AT-06231

(1) Pitching stopper bracket
(2) O-ring
(3) Differential oil level gauge
(4) Stay
(5) Seal pipe
(6) Oil pump shaft
(7) Clip
(8) Oil drain pipe
(9) Input shaft
(10) Spring pin
(11) O-ring
(12) Torque converter clutch ASSY
(13) Differential gear oil drain plug
(14) Gasket
(15) Oil seal
(16) Clip
(17) Converter case
(18) Transmission radio ground cord
(19) Reinforcement drive plate
(20) Drive plate

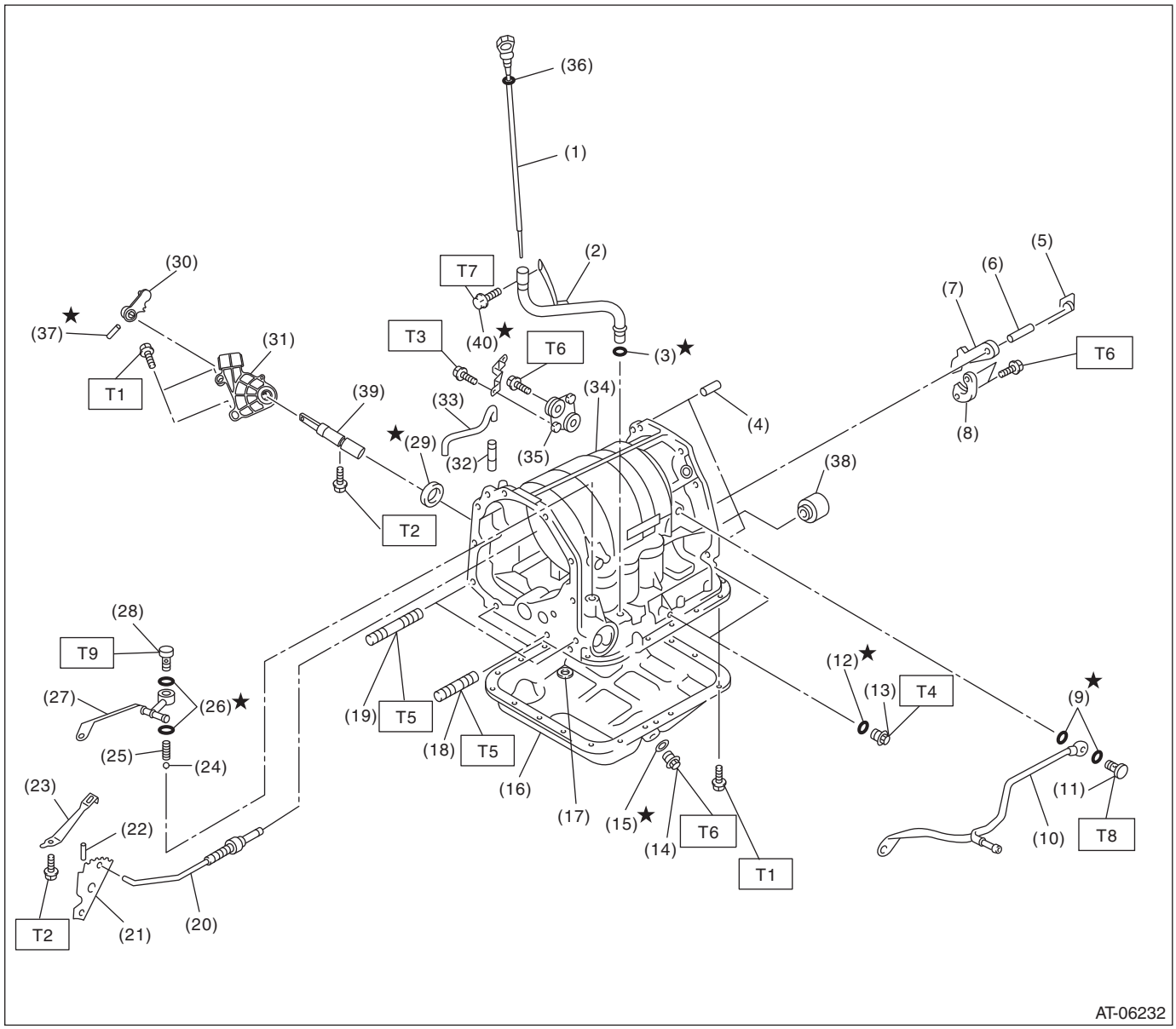
Tightening torque:N·m (kgf-m, ft-lb)	
T1:	*18 (1.8, 13.3)*
T2:	*25 (2.5, 18.4)*
T3:	*41 (4.2, 30.2)*
T4:	*<Ref. to 4AT-73, INSTALLATION, Drive Plate.>*
T5:	*44 (4.5, 32.5) (Aluminum gasket, silver)*
	70 (7.1, 51.6) (Copper gasket, brown)
	70 (7.1, 51.6) (Metal gasket, black)

2. OIL PUMP



(1)	Oil pump rotor	(11)	Gasket	(21)	Lock nut
(2)	Oil pump cover	(12)	O-ring		
(3)	Seal ring	(13)	Test plug	***Tightening torque:N·m (kgf-m, ft-lb)***	
(4)	Thrust needle bearing	(14)	Stud bolt	***T1:***	***7 (0.7, 5.2)***
(5)	Drive pinion shaft	(15)	O-ring	***T2:***	***13 (1.3, 9.6)***
(6)	Roller bearing	(16)	O-ring	***T3:***	***18 (1.8, 13.3)***
(7)	Shim	(17)	Oil seal retainer	***T4:***	***25 (2.5, 18.4)***
(8)	Oil pump housing	(18)	Oil seal	***T5:***	***40 (4.1, 29.5)***
(9)	Nipple	(19)	O-ring	***T6:***	***42 (4.3, 31.0)***
(10)	Air breather hose	(20)	Drive pinion collar	***T7:***	***116 (11.8, 85.6)***

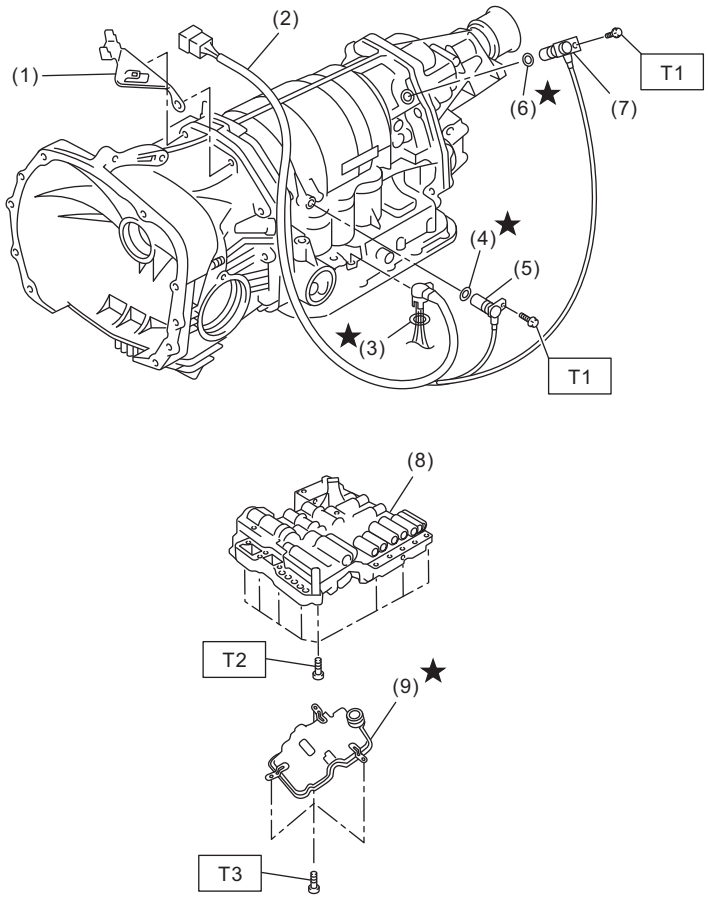
3. TRANSMISSION CASE AND CONTROL DEVICE



(1) ATF level gauge
(2) Oil charge pipe
(3) O-ring
(4) Straight pin
(5) Return spring
(6) Shaft
(7) Parking pawl
(8) Parking support
(9) Gasket
(10) ATF inlet pipe
(11) Union screw
(12) O-ring
(13) Test plug
(14) Drain plug (ATF)
(15) Gasket
(16) Oil pan
(17) Magnet
(18) Stud bolt (short)
(19) Stud bolt (long)
(20) Parking rod
(21) Manual plate
(22) Spring pin
(23) Detent spring
(24) Ball
(25) Spring
(26) Gasket
(27) ATF outlet pipe
(28) Union screw
(29) Oil seal
(30) Shifter arm
(31) Inhibitor switch ASSY
(32) Nipple
(33) Air breather hose
(34) Transmission case
(35) Plate ASSY
(36) O-ring
(37) Straight pin
(38) Transfer clutch seal
(39) Shifter arm shaft
(40) Bolt

Tightening torque:N·m (kgf-m, ft-lb)
T1: 5 (0.5, 3.7)
T2: 6 (0.6, 4.4)
T3: 12 (1.2, 8.9)
T4: 13 (1.3, 9.6)
T5: 18 (1.8, 13.3)
T6: 25 (2.5, 18.4)
T7: 38 (3.9, 28.0)
T8: 40 (4.1, 29.5)
T9: 45 (4.6, 33.2)

4. CONTROL VALVE AND HARNESS ROUTING

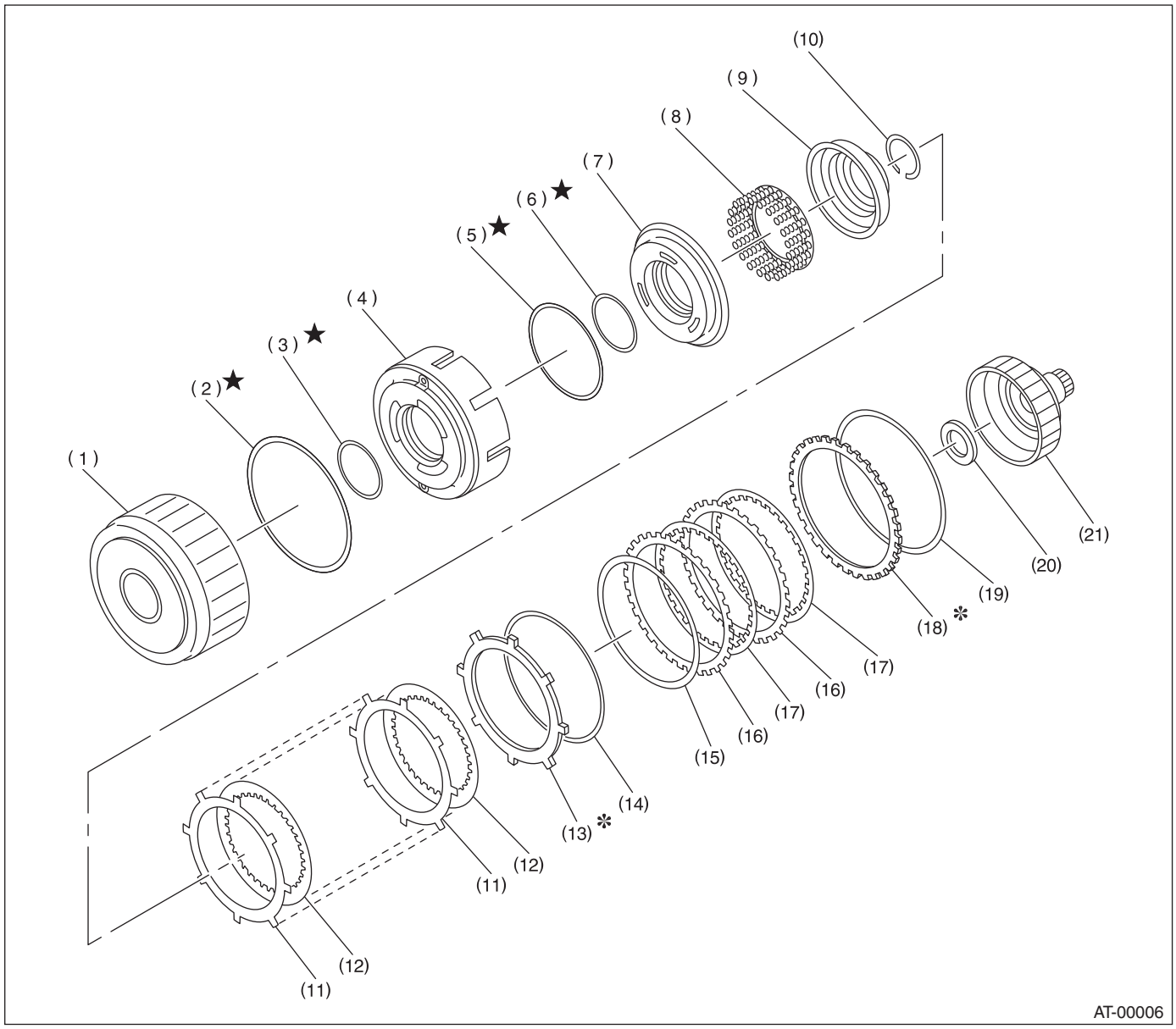


AT-06094

(1)	Stay	(6)	O-ring
(2)	Transmission harness	(7)	Front vehicle speed sensor
(3)	O-ring	(8)	Control valve body
(4)	O-ring	(9)	Control valve strainer
(5)	Torque converter turbine speed sensor		

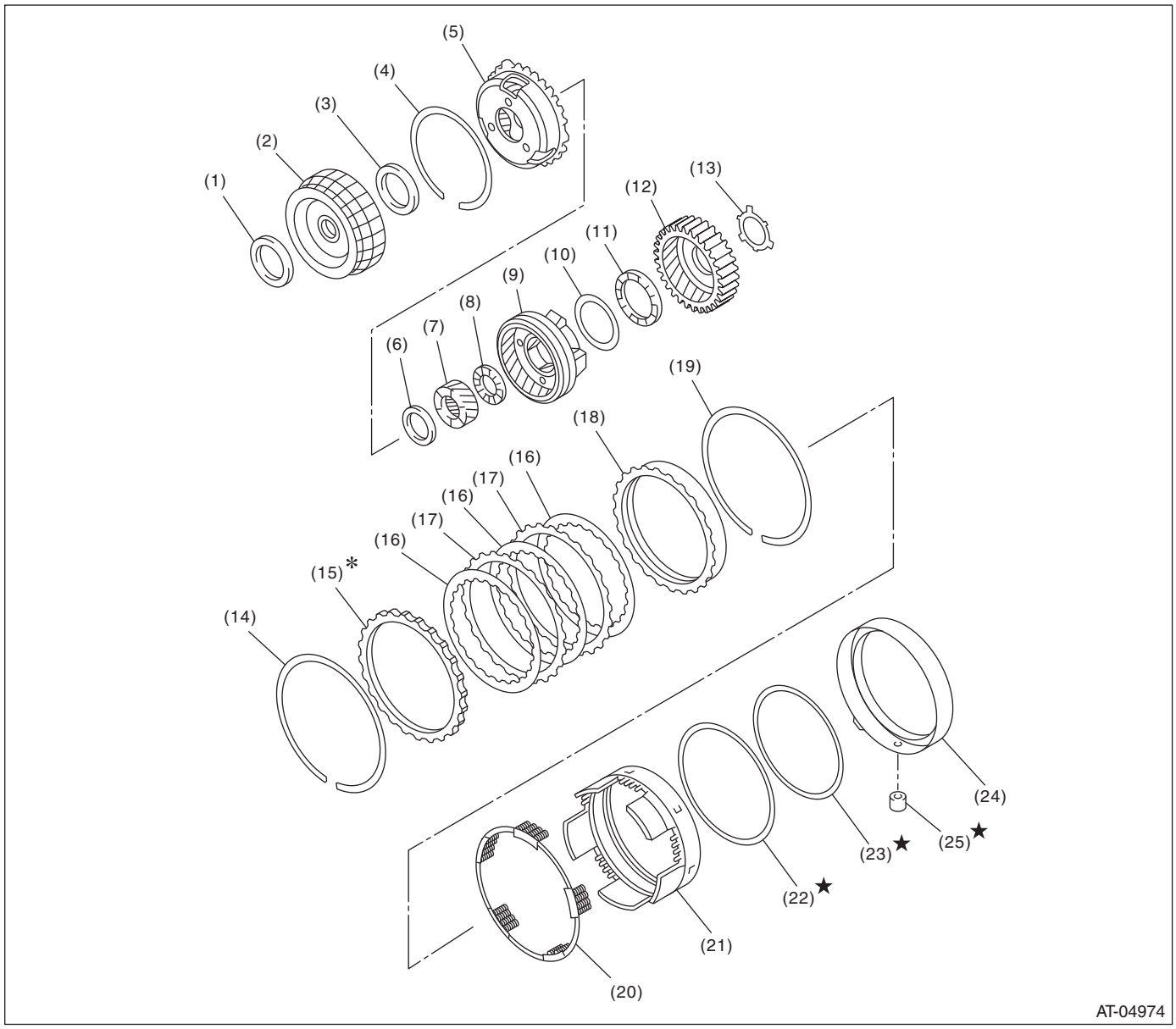
Tightening torque:N·m (kgf-m, ft-lb)
T1: 7 (0.7, 5.2)
T2: 8 (0.8, 5.9)
T3: 4.6 (0.5, 3.4)

5. HIGH CLUTCH AND REVERSE CLUTCH



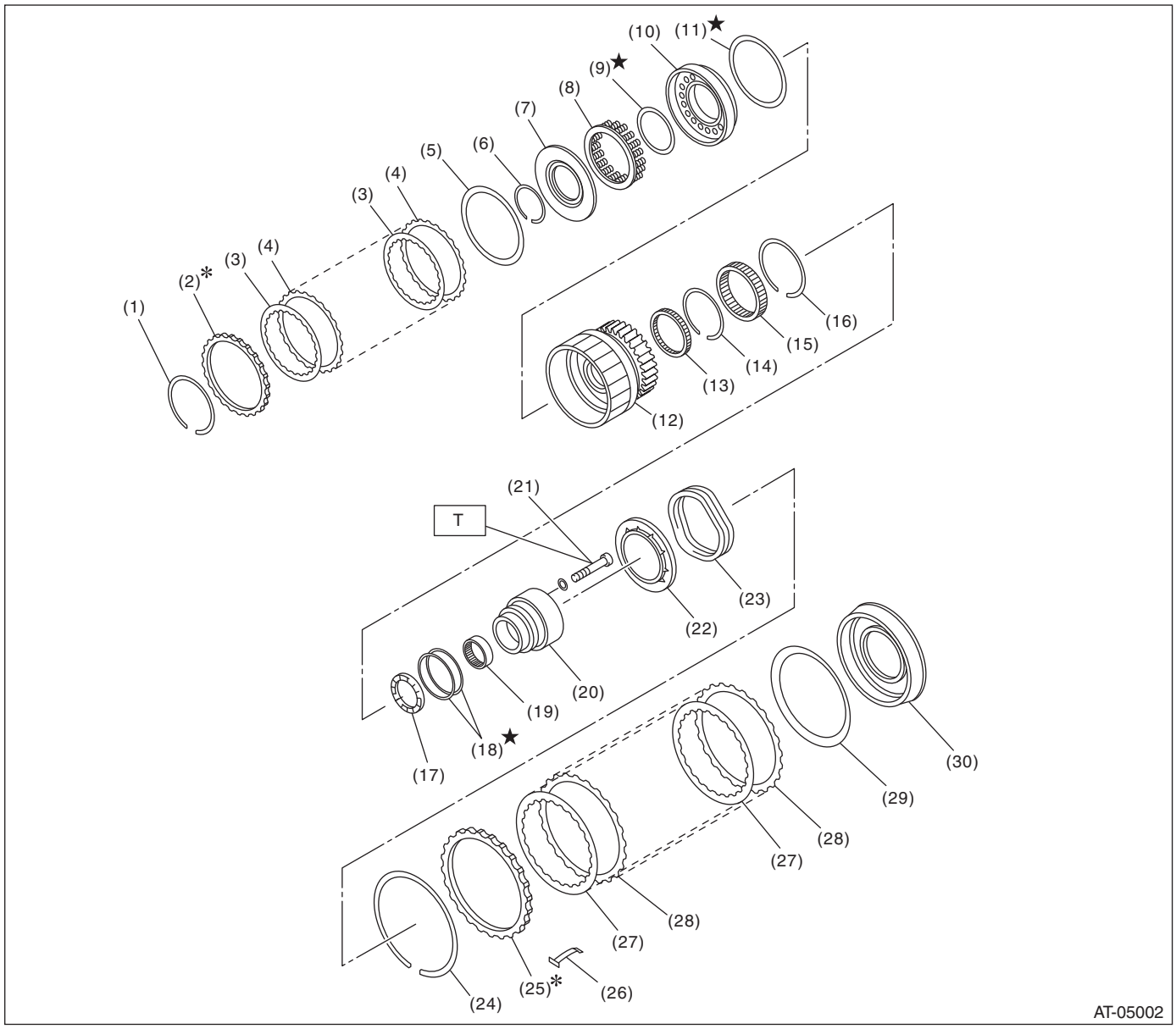
(1)	High clutch drum	(8)	Spring retainer	(15)	Dish plate
(2)	Lip seal	(9)	Clutch cover	(16)	Driven plate (reverse clutch)
(3)	D-ring	(10)	Snap ring	(17)	Drive plate (reverse clutch)
(4)	Reverse clutch piston	(11)	Driven plate (high clutch)	(18)	Retaining plate (reverse clutch)
(5)	D-ring	(12)	Drive plate (high clutch)	(19)	Snap ring
(6)	D-ring	(13)	Retaining plate (high clutch)	(20)	Thrust needle bearing
(7)	High clutch piston	(14)	Snap ring	(21)	High clutch hub

6. PLANETARY GEAR AND 2-4 BRAKE



(1) Thrust needle bearing
(2) Front sun gear
(3) Thrust needle bearing
(4) Snap ring
(5) Front planetary carrier
(6) Thrust needle bearing
(7) Rear sun gear
(8) Thrust needle bearing
(9) Rear planetary carrier
(10) Washer
(11) Thrust needle bearing
(12) Rear internal gear
(13) Washer
(14) Snap ring
(15) Retaining plate
(16) Drive plate
(17) Driven plate
(18) Pressure rear plate
(19) Snap ring
(20) Spring retainer
(21) 2-4 brake piston
(22) D-ring
(23) D-ring
(24) 2-4 brake piston retainer
(25) 2-4 brake seal

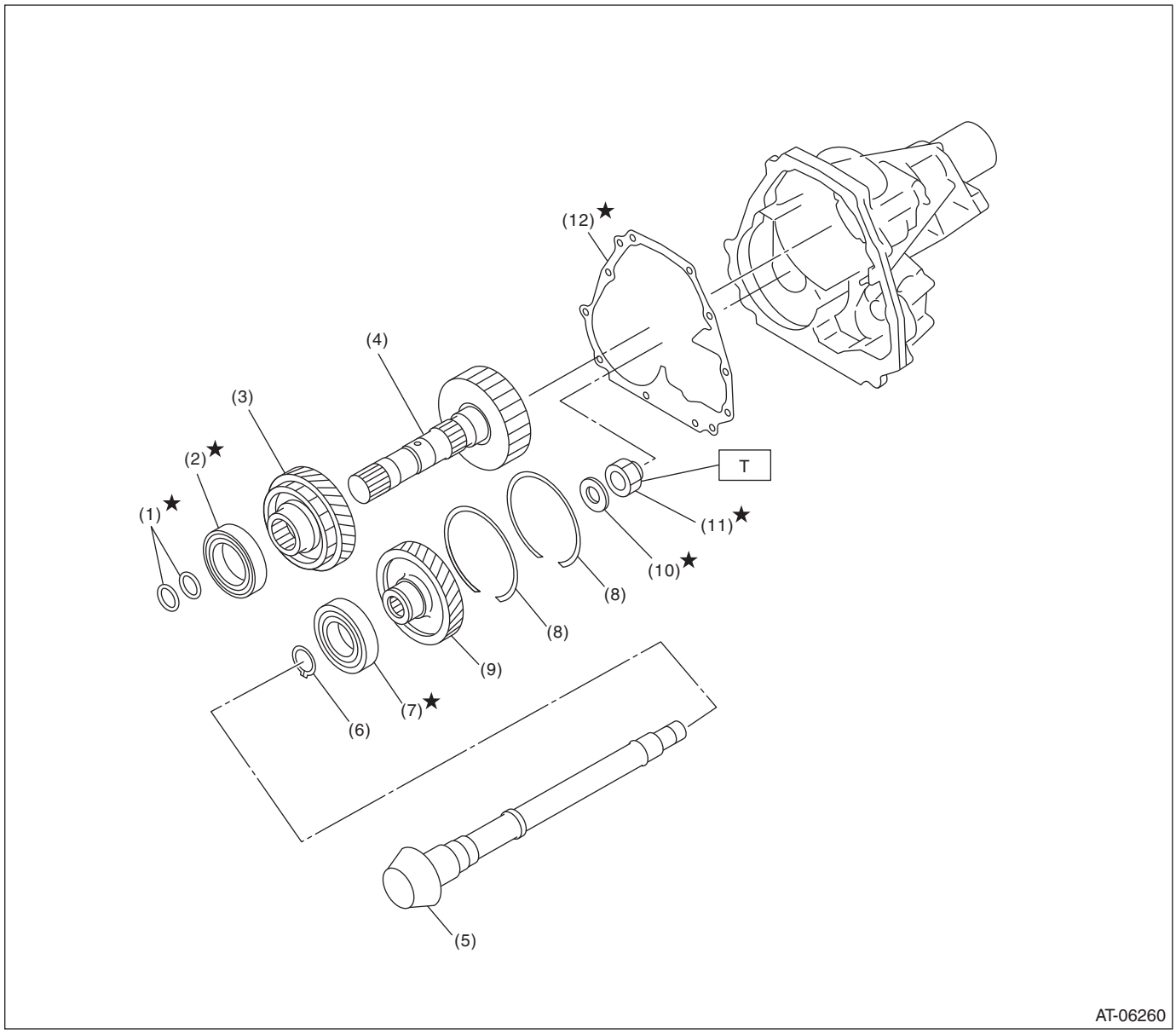
7. LOW CLUTCH AND LOW & REVERSE BRAKE



(1) Snap ring
(2) Retaining plate
(3) Drive plate
(4) Driven plate
(5) Dish plate
(6) Snap ring
(7) Cover
(8) Spring retainer
(9) D-ring
(10) Low clutch piston
(11) D-ring
(12) Low clutch drum
(13) Needle bearing
(14) Snap ring
(15) One-way clutch
(16) Snap ring
(17) Thrust needle bearing
(18) Seal ring
(19) Needle bearing
(20) One-way clutch inner race
(21) Socket bolt
(22) Spring retainer
(23) Return spring
(24) Snap ring
(25) Retaining plate
(26) Leaf spring
(27) Drive plate
(28) Driven plate
(29) Dish plate
(30) Low & reverse brake piston

Tightening torque:N·m (kgf-m, ft-lb)
T: 25 (2.5, 18.4)

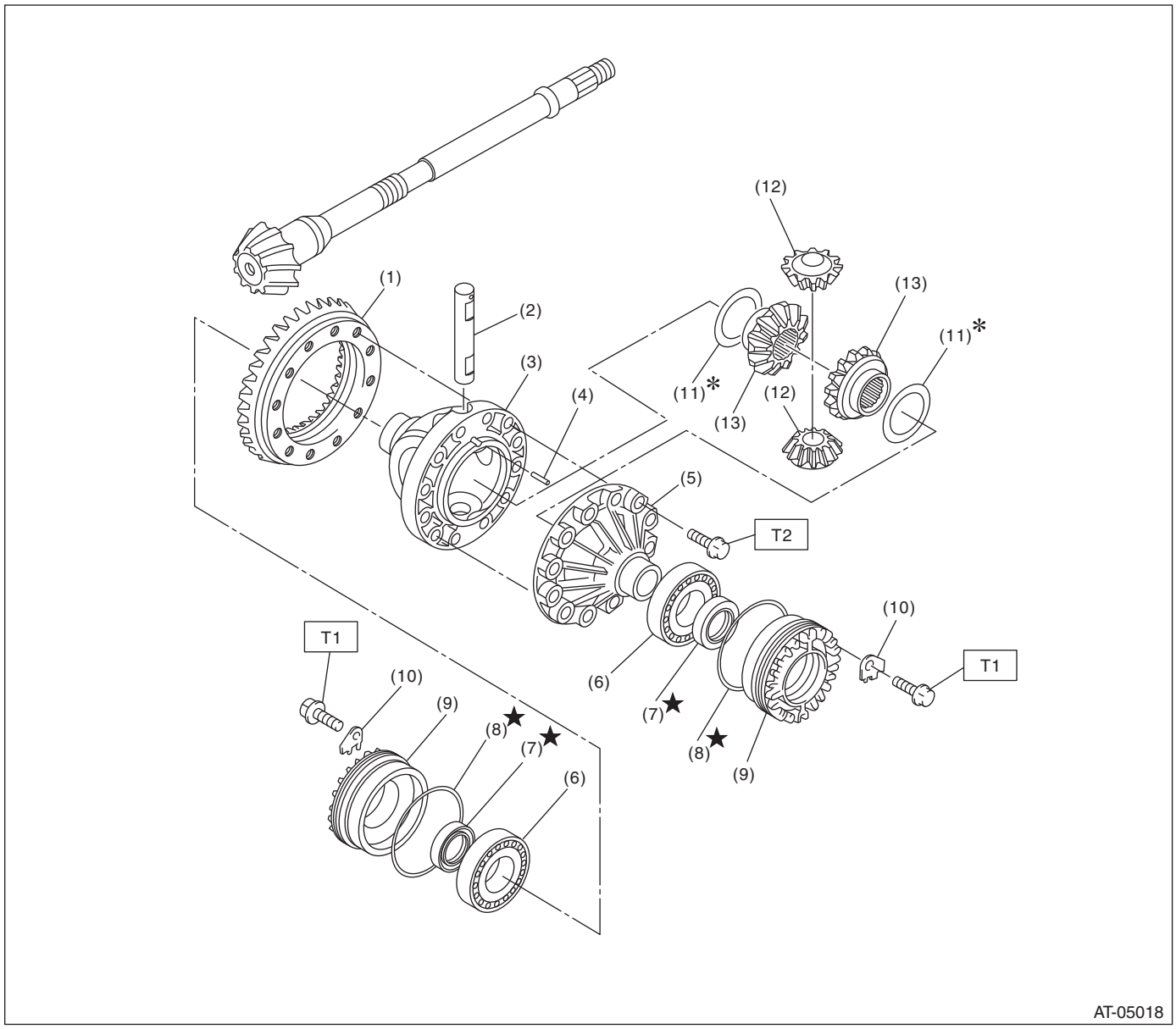
8. REDUCTION GEAR



(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
(12) Gasket

Tightening torque:N·m (kgf-m, ft-lb)
T: 100 (10.2, 73.8)

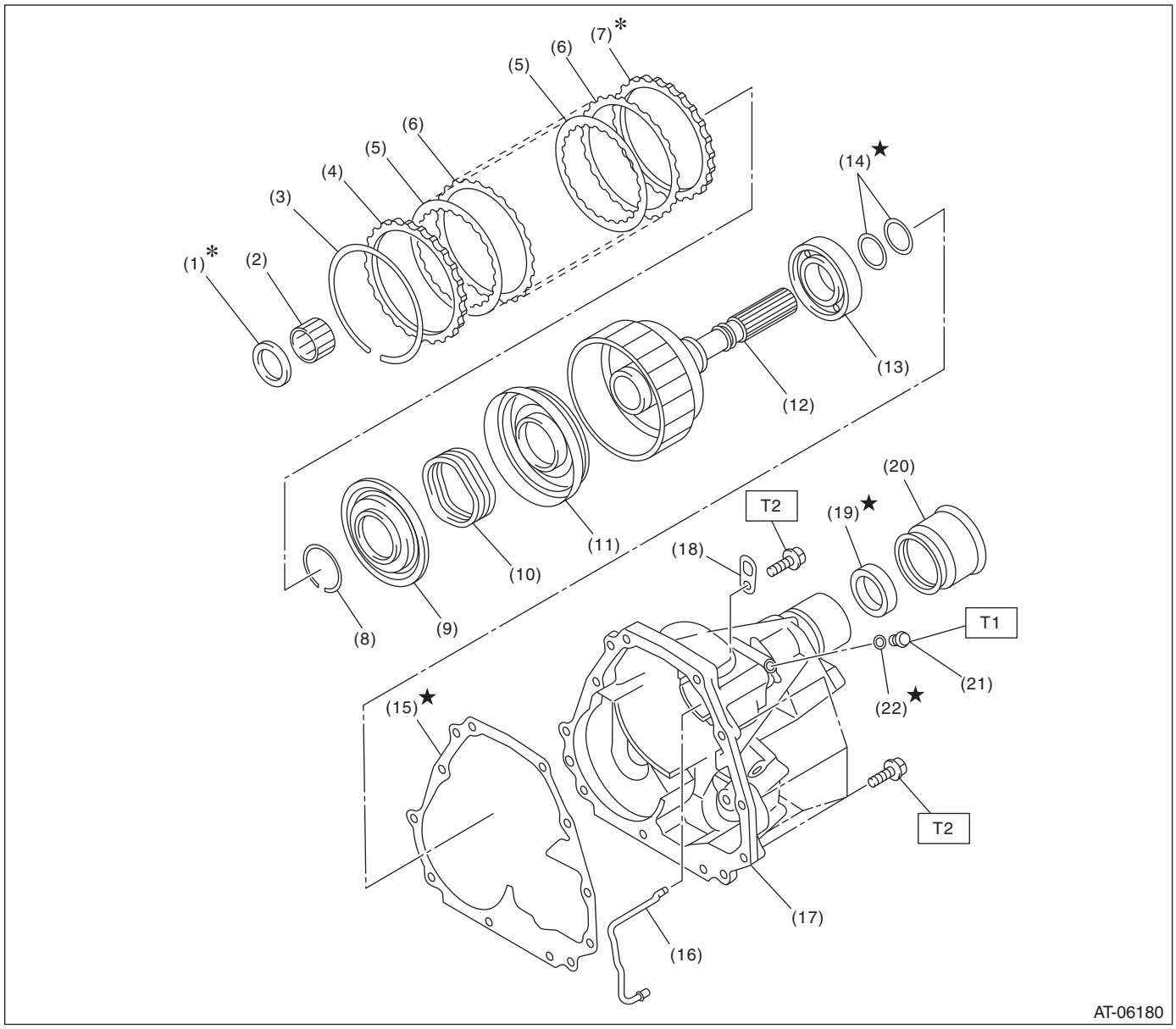
9. DIFFERENTIAL GEAR



(1) Hypoid driven gear
(2) Pinion shaft
(3) Differential case (RH)
(4) Straight pin
(5) Differential case (LH)
(6) Taper roller bearing
(7) Oil seal
(8) O-ring
(9) Differential side retainer
(10) Lock plate
(11) Washer
(12) Differential bevel pinion
(13) Differential bevel gear

Tightening torque:N·m (kgf-m, ft-lb)
T1: 25 (2.5, 18.4)
T2: 62 (6.3, 45.7)

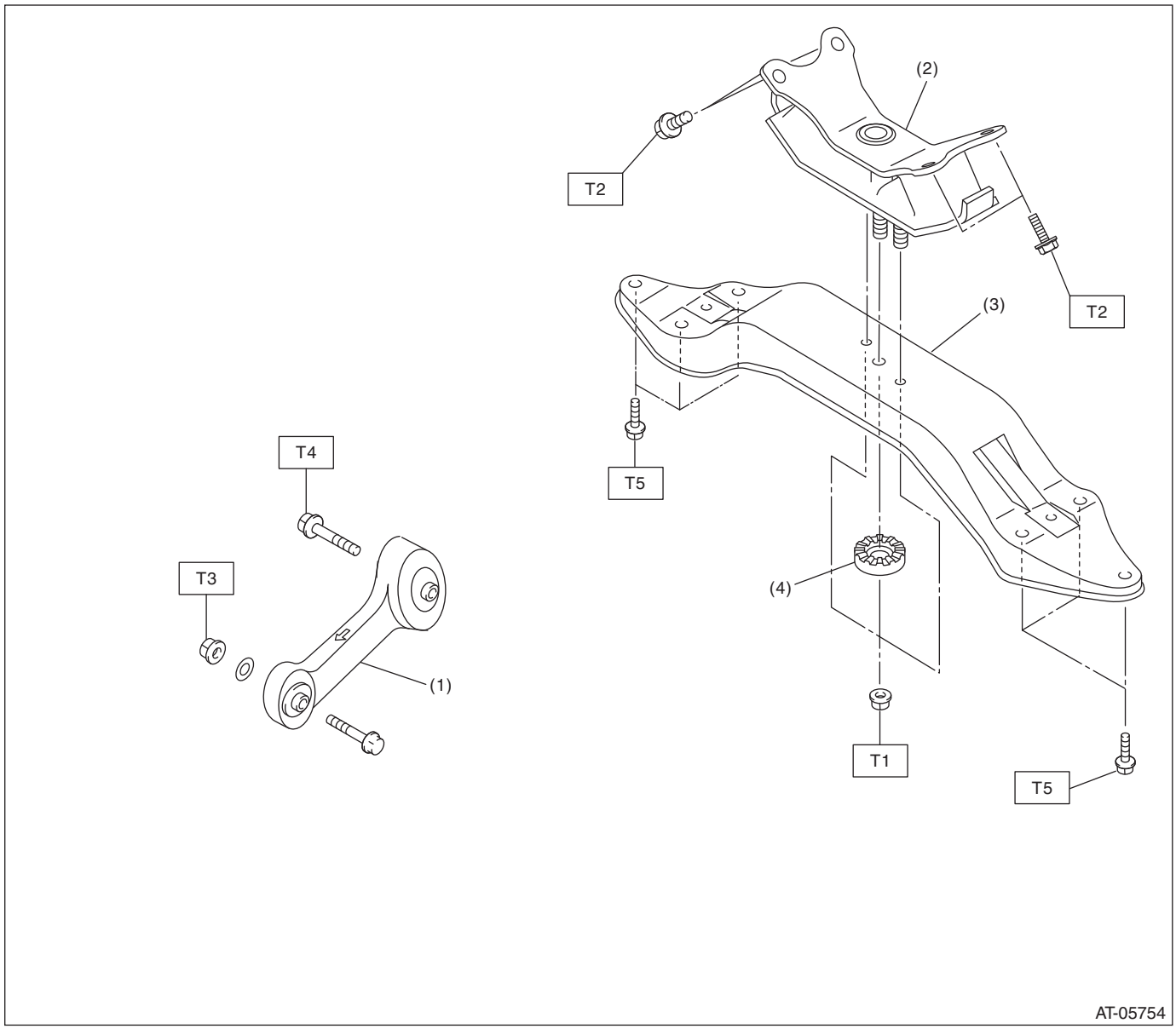
10.TRANSFER AND EXTENSION CASE



(1) Thrust needle bearing
(2) Needle bearing
(3) Snap ring
(4) Driven plate (Thick)
(5) Drive plate
(6) Driven plate (Thin)
(7) Retaining plate
(8) Snap ring
(9) Transfer clutch piston seal
(10) Return spring
(11) Transfer clutch piston
(12) Rear drive shaft
(13) Ball bearing
(14) Seal ring
(15) Gasket
(16) Transfer clutch pipe
(17) Extension case
(18) Transmission hanger
(19) Oil seal
(20) Dust cover
(21) Test plug
(22) O-ring

Tightening torque:N·m (kgf-m, ft-lb)
T1: 13 (1.3, 9.6)
T2: 25 (2.5, 18.4)

11.TRANSMISSION MOUNTING



(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, 25.8)
T2: 40 (4.1, 29.5)
T3: 50 (5.1, 36.9)
T4: 58 (5.9, 42.8)
T5: 70 (7.1, 51.6)

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.
• 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 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. of different grades or manufacturers.
• Be sure to tighten bolts and nuts to the specified torque.
• Place lifts, shop jacks or rigid racks at the specified points.
• Apply gear oil or ATF onto sliding or revolution surfaces before installation in view of components usage.
• 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 cushioning material such as wood blocks, aluminum plate, or cloth between the part and the vise.
• Avoid damaging the mating surface of the case.
• Before applying liquid gasket, completely remove the old gasket.
• 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

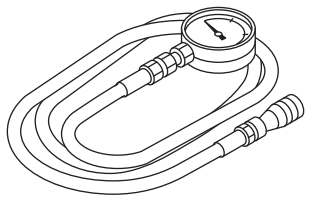
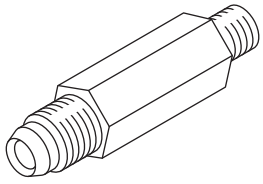
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498575400	498575400	OIL PRESSURE GAUGE ASSY	Used for measuring oil pressure.
 ST-498897200	498897200	OIL PRESSURE GAUGE ADAPTER	Used at the oil pump housing when measuring reverse clutch pressure and line pressure.

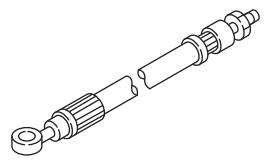
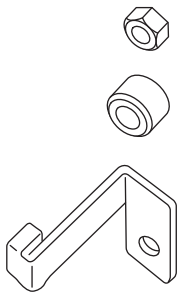
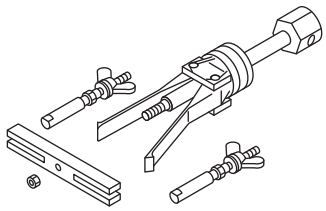
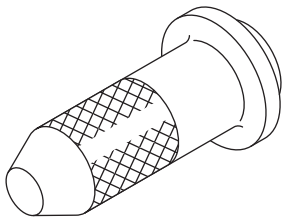
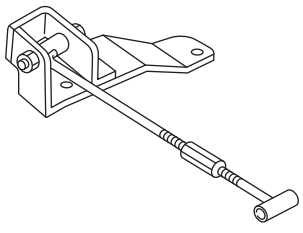
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498897700	498897700	OIL PRESSURE ADAPTER SET	Used for measuring transfer clutch pressure.
 ST-498277200	498277200	STOPPER SET	Used for removing and installing automatic transmission assembly to engine.
 ST-398527700	398527700	PULLER ASSY	• Used for removing 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.
 ST-498057300	498057300	INSTALLER	Used for installing the extension oil seal.
 ST41099AC000	41099AC000	ENGINE SUPPORT ASSY	• Used for supporting the engine. • For turbo models.

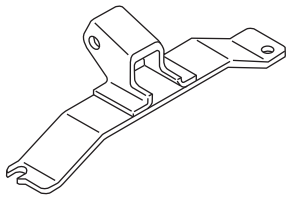
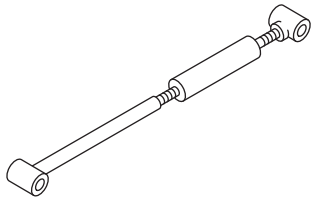
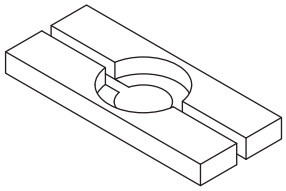
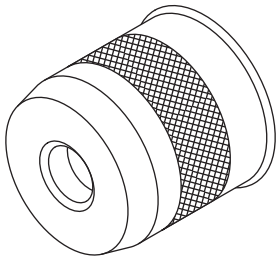
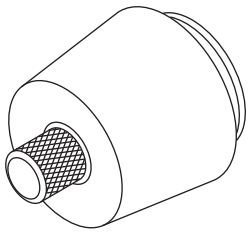
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-41099AA010	41099AA010	ENGINE SUPPORT BRACKET	• Used for supporting the engine. • For non-turbo models.
 ST41099AA020	41099AA020	ENGINE SUPPORT	• Used for supporting the engine. • For non-turbo models.
 ST-498077000	498077000	REMOVER	Used for removing the differential taper roller bearing.
 ST-499247400	499247400	INSTALLER	• Used for installing the transfer outer snap ring. • Used together with SNAP RING OUTER GUIDE (499257300).
 ST-499257300	499257300	SNAP RING OUTER GUIDE	• Used for installing the transfer outer snap ring. • Used together with INSTALLER (499247400).

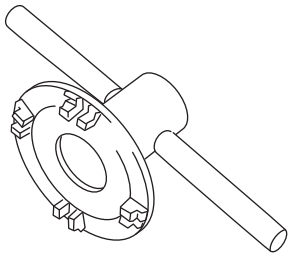
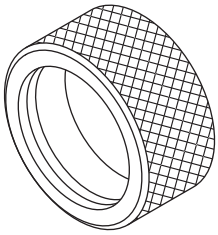
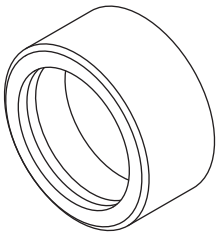
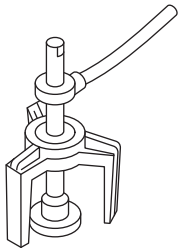
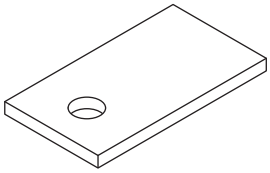
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18630AA010	18630AA010	WRENCH COMPL RETAINER	• Used for removing and installing the differential side retainer. • Used for adjusting backlash. • WRENCH ASSY (499787000) can also be used.
 ST-398437700	398437700	DRIFT	Used for installing the converter case oil seal.
 ST-398487700	398487700	INSTALLER	Used for installing the front differential taper roller bearing.
 ST-398673600	398673600	COMPRESSOR	Used for removing and installing snap ring of the clutch piston.
 ST-498255400	498255400	PLATE	Used for measuring the backlash of hypoid gear.

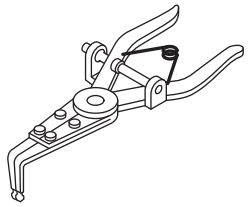
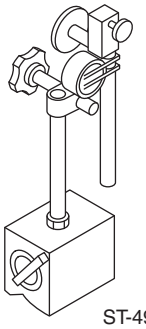
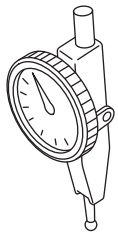
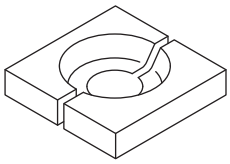
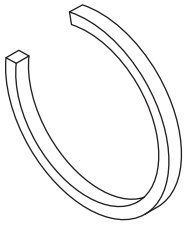
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-399893600	399893600	PLIER	Used for removing and installing snap ring of the clutch piston.
 ST-498247001	498247001	MAGNET BASE	• Used for measuring the gear backlash. • Used together with DIAL GAUGE (498247100).
 ST-498247100	498247100	DIAL GAUGE	• Used for measuring the gear backlash. • Used together with MAGNET BASE (498247001).
 ST-498517000	498517000	REPLACER	Used for removing the front roller bearing.
 ST-398623600	398623600	SEAT	Used for removing and installing snap ring of the clutch piston.

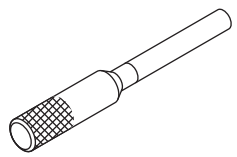
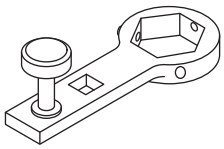
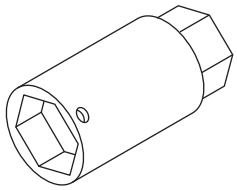
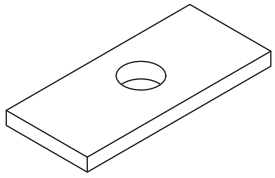
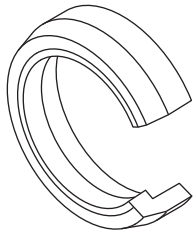
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499267300	499267300	STOPPER PIN	Used for installing and adjusting the inhibitor switch.
 ST-499787700	499787700	WRENCH	• Used for removing and installing the drive pinion lock nut. • Used for adjusting backlash.
 ST-499787500	499787500	ADAPTER	• Used for removing and installing the drive pinion lock nut. • Used for adjusting backlash.
 ST-398643600	398643600	GAUGE	Used for measuring total end play, extension end play and drive pinion height.
 ST-498627100	498627100	SEAT	Used for holding spring retainer of the clutch piston when removing and installing snap ring.

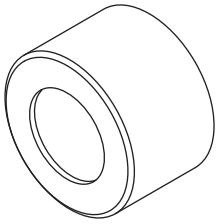
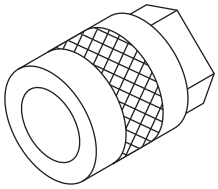
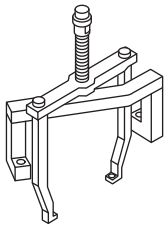
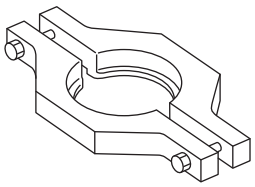
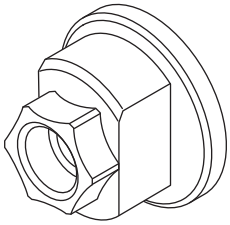
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499577000	499577000	GAUGE	Used for measuring the mating surface of the transmission to the end face of the reduction gear.
 ST-499737000	499737000	PULLER	Used for removing the reduction driven gear assembly.
 ST-499737100	499737100	PULLER SET	Used for removing the reduction drive gear assembly.
 ST-498077600	498077600	REMOVER	Used for removing the ball bearing.
 ST-498937110	498937110	HOLDER	• Used for removing and installing the drive pinion lock nut. • Used for adjusting backlash.

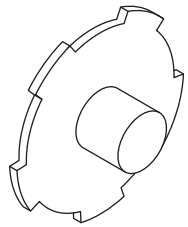
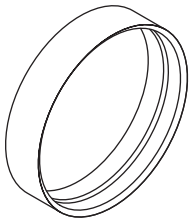
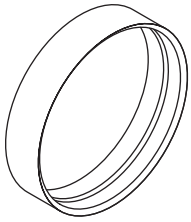
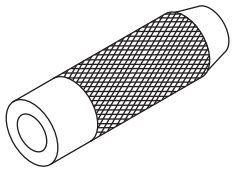
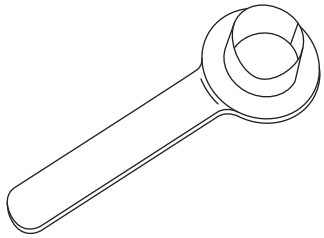
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498677100	498677100	COMPRESSOR	Used for installing the 2-4 brake snap ring.
 ST-498437000	498437000	HIGH CLUTCH PISTON GUIDE	Used for installing the high clutch piston.
 ST-498437100	498437100	LOW CLUTCH PISTON GUIDE	Used for installing the low clutch piston.
 ST-899580100	899580100	INSTALLER	Used for press-fitting the ball bearing of the transfer clutch.
 ST28399SA010	28399SA010	OIL SEAL PROTECTOR	Used for protecting the oil seal from damage when inserting the front drive shaft.

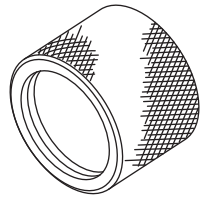
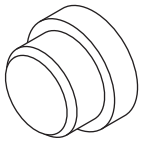
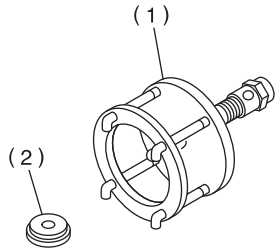
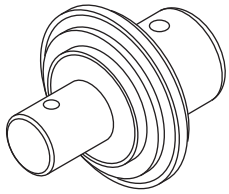
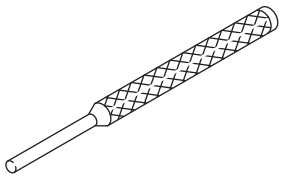
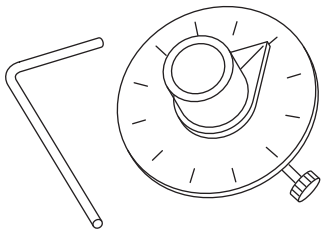
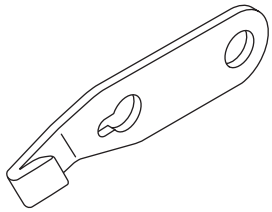
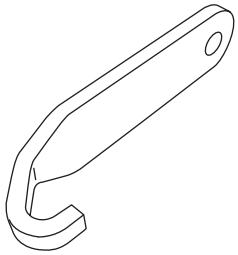
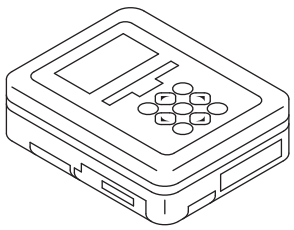
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18675AA000	18675AA000	DIFFERENTIAL SIDE OIL SEAL INSTALLER	Used for installing the differential side retainer oil seal.
 ST-398497701	398497701	INSTALLER	Used for installing the needle bearing.
 ST-899524100	899524100	PULLER SET	Use only the bolt. • Used together with PULLER SET (499737100). • Used together with PULLER (499737000). 1. Puller 2. Cap
 ST-499247300	499247300	INSTALLER	Used for installing the oil pump housing retainer oil seal.
 ST-398791600	398791600	REMOVER	Used for removing and installing the shifter arm spring pin.

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18854AA000	18854AA000	ANGLE GAUGE	Used for tightening the drive plate.
 ST-498497100	498497100	CRANKSHAFT STOPPER	• Used for stopping the drive plate rotation when removing and installing the drive plate. • For turbo models.
 ST-498497300	498497300	CRANKSHAFT STOPPER	• Used for stopping the drive plate rotation when removing and installing the drive plate. • For non-turbo models.
 ST1B022XU0	1B022XU0	SUBARU SELECT MONITOR III KIT	Used for troubleshooting the electrical system.

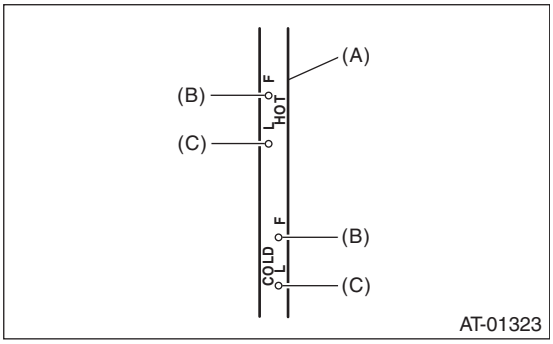
2. GENERAL TOOL

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 scale	Used for measuring the starting torque of the drive pinion.
Circuit tester	Used for measuring resistance and voltage.
TORX® T70	Used for removing and installing differential gear oil drain plug.
Push/pull gauge	Used for measuring the piston stroke of each clutch.

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). Otherwise, idle the engine to raise ATF temperature to 70 — 80°C (158 — 176°F) displayed on Subaru Select Monitor. <Ref. to 4AT(diag)-16, OPERATION, Read Current Data.>
2) Park the vehicle on a level surface.
3) After selecting all positions (P, R, N, D), set the select lever in "P" range. Idle the engine for 1 or 2 minutes, and measure the ATF level.



(A) ATF level gauge
(B) Upper level
(C) Lower level

4) Make sure that the ATF level is higher than mid level between the upper and lower marks of the HOT side. If the fluid level is below the lower mark, check the transmission for leaks. If there are leaks, it is necessary to repair or replace gaskets, oil seals, plugs or other parts.
5) If the ATF level is below the center point between upper and lower level marks, add the recommended ATF until the fluid level is above the center point between the upper and lower level marks.

CAUTION:
- **Be careful not to exceed the upper level.**
- **Be wary of the ATF level when filling. If the ATF is filled to the upper level while the transmission is cold, it is in an overfilled condition and the oil will over flow.**

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

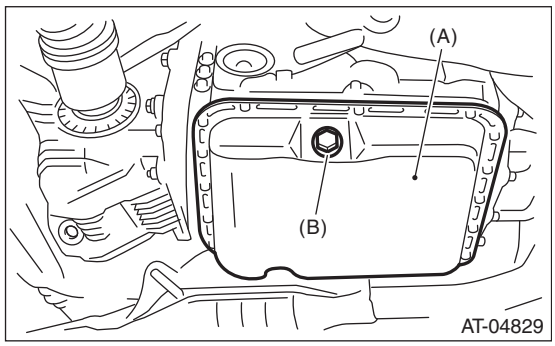
B: REPLACEMENT

1) Lift up the vehicle.
2) Remove the drain plug (ATF) and completely drain the ATF.

CAUTION:
Immediately after the vehicle has been running or after idling for a long time, the ATF will be hot. Be careful not to receive burns.
3) Check the ATF condition. <Ref. to 4AT-28, CONDITION CHECK, Automatic Transmission Fluid.>
4) Tighten the drain plug (ATF).

NOTE:
Use a new gasket.

Tightening torque:
25 N·m (2.5 kgf-m, 18.4 ft-lb)



(A) Oil pan
(B) Drain plug (ATF)

5) Lower the vehicle.
6) Pour ATF from the oil charge pipe.

CAUTION:
Be sure to use the recommended or equivalent ATF. Using material except recommended one or substitute would cause trouble.

Recommended fluid:
<Ref. to 4AT-3, HYDRAULIC CONTROL AND LUBRICATION, SPECIFICATION, General Description.>

Capacity:
Refill 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)

7) Bleed the air of control valve. <Ref. to 4AT-65, PROCEDURE, Air Bleeding of Control Valve.>
8) Check the level and leaks of ATF. <Ref. to 4AT-27, INSPECTION, Automatic Transmission Fluid.>

C: CONDITION CHECK

NOTE:
When replacing ATF, check the inside condition of transmission body by inspecting the drained ATF.

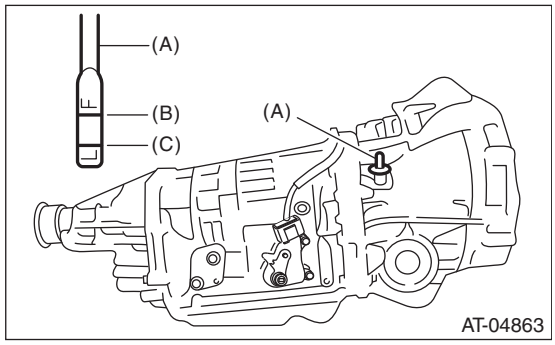
Fluid condition	Trouble and possible cause	Corrective action
Large amount of metallic pieces are found.	Excessive wear of the internal of the transmission body.	Replace ATF and check if AT operates correctly.
Thick and varnish-form fluid.	Burned clutch, etc.	Replace ATF and check the AT body or vehicle for faulty.
Clouded fluid or bubbles are found in fluid.	Water mixed in fluid.	Replace ATF and check the water entering point.

3. Differential Gear Oil

A: INSPECTION

1) Park the vehicle on a level surface.
2) Remove the differential 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) Remove the oil level gauge again, and check the level of differential gear oil. If the differential gear oil level is below “L” line, add oil to bring the level up to “F” line.

NOTE:
To prevent overfilling the differential gear oil, do not fill oil above the “F” line.



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

B: REPLACEMENT

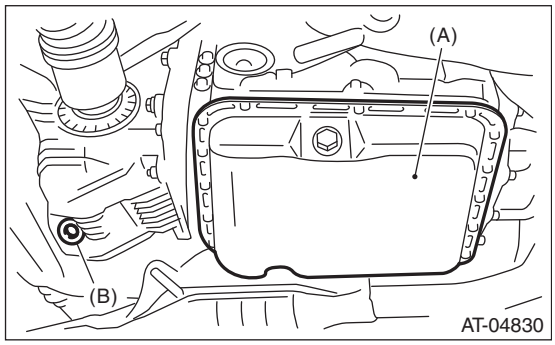
1) Lift up the vehicle.
2) Remove the differential gear oil drain plug using TORX® bit T70, and drain the differential gear oil completely.

CAUTION:
• Immediately after the vehicle has been running or after idling for a long time, the differential gear oil will be hot. Be careful not to receive burns.
• 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) Tighten the differential gear oil drain plug using TORX® bit T70.

NOTE:
Use a new gasket.

Tightening torque:
Aluminum gasket (silver)
44 N·m (4.5 kgf-m, 32.5 ft-lb)
Copper gasket (brown)
70 N·m (7.1 kgf-m, 51.6 ft-lb)
Metal gasket (black)
70 N·m (7.1 kgf-m, 51.6 ft-lb)



(A) Oil pan
(B) Differential gear oil drain plug

4) Lower the vehicle.
5) Fill the differential with differential gear oil from the level gauge hole.

Recommended gear oil:
<Ref. to 4AT-3, RECOMMENDED GEAR OIL, 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-29, 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 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

• Check the 3rd gear engine brake when shifting down from 4th to 3rd range while driving in 4th gear of manual mode [50 — 60 km/h (31 — 37 MPH)].
• Check the 2nd gear engine brake when shifting down from 3rd to 2nd range while driving in 3rd gear of manual mode [40 — 50 km/h (25 — 31 MPH)].
• Check the 1st gear engine brake when shifting down from 2nd to 1st range while driving in 2nd gear of manual mode [20 — 30 km/h (12 — 19 MPH)].

6. LOCK-UP FUNCTION

• When the accelerator is lightly depressed while driving on a flat road in “D” range, check that rpm does not change abruptly.
• 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.
• When checking on the free roller, the driving resistance will be slightly inadequate. It will be easier to judge if the foot brake is lightly applied while performing the check.

2) Connect the Subaru Select Monitor.
3) Check the ATF temperature using the Subaru Select Monitor.

NOTE:
• Make sure to perform the check with the ATF temperature 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 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.

Standard value
25 — 45%

NOTE:
• The reading may be slightly lower on a free roller.
• Slip lock-up control is not operating if the lock-up duty is 5% or less, 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. TRANSFER CLUTCH

Check for tight corner braking phenomenon when the vehicle is moved forward with the steering fully turned.

10.OIL LEAKAGE

After the driving test, inspect for oil leaks.

5. Stall Test

A: INSPECTION

NOTE:
The stall test is extremely important in diagnosing the condition of an automatic transmission and engine. The test is necessary to measure the engine stall speeds in “R” and “2nd gear of manual mode”.
Purposes of the stall test:
- Operational check of the automatic transmission clutch
- Operational check of the torque converter clutch
- Engine performance check

1) Check if throttle valve is operated using the Subaru Select Monitor.
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 the wheel chocks at the front and rear of all wheels and apply the parking brake.
8) Move the select lever to ensure it operates properly, then set to “2nd gear of manual mode”.
9) While stepping hard on the brake pedal, slowly depress the accelerator pedal to full throttle.
10) When the engine speed is stabilized, 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 one minute or more.
12) If the stall speed in “2nd gear of manual mode” is higher than specifications, low clutch slipping and 2-4 brake slipping may occur. 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 perform a stall test for over 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 of 1,200 rpm or less.
- 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
2,800 — 3,300 rpm

Stall speed (at sea level)	Range	Cause
Below specified value	2nd gear of manual mode, R	• Throttle valve is not fully open • Engine malfunction • One-way clutch of the torque converter is slipping
Over specified value	D	• Line pressure too low • Low clutch slipping • One-way clutch malfunctioning
	R	• Line pressure too low • Reverse clutch slipping • Low & reverse brake slipping
	2nd gear of manual mode	• 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 one minute or more 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
Specification: 1.2 seconds or less

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
Specification: 1.5 seconds or less

If “N” → “R” time lag is longer than specified:
- Line pressure too low
- Reverse clutch worn
- Low & reverse brake worn
- D-ring worn

7. Line Pressure Test

A: MEASUREMENT

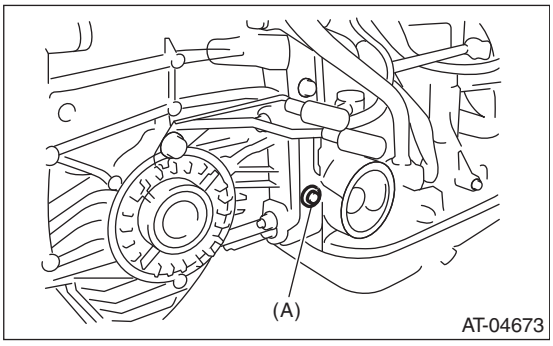
NOTE:
If the clutch or brake shows a signs of slipping or shift feel is not correct, check the line pressure.

• Excessive shock during up-shift 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, lift up the vehicle.
   (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 on both front and rear of all wheels. (Same conditions as for a stall test)
   (2) Measure the line pressure when the select lever is in “R” or 2nd gear of manual mode 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 temperature above after idling the engine for approx. 30 minutes with the select lever in “N” or “P”.)
3) Remove the test plug and attach the ST instead.

ST 498897200 OIL PRESSURE GAUGE ADAPTER



(A) Test plug

4) Connect the ST1 with ST2.

ST1 498897200 OIL PRESSURE GAUGE ADAPTER
ST2 498575400 OIL PRESSURE GAUGE ASSY

5) Check for duty ratio changes by adjusting the acceleration pedal position using the Subaru Select Monitor.

Standard line pressure			
Range position	Line pressure duty ratio (%)	Throttle valve opening angle	Line pressure kPa (kg/cm^2, psi)
Manual mode (2nd)	25 — 35	Full open	1,000 — 1,300 (10.2 — 13.3, 145 — 188)
R	15 — 25	Full open	1,500 — 1,850 (15.3 — 18.9, 217 — 268)
D	35 — 43	Full closed	500 — 800 (5.1 — 8.2, 72 — 116)

6) Remove the ST and install the test plug.

NOTE:
Use a new gasket.

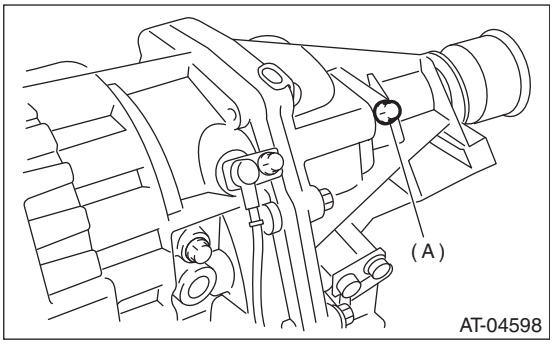
Tightening torque:
13 N·m (1.3 kgf-m, 9.6 ft-lb)

8. Transfer Clutch Pressure Test

A: INSPECTION

Check the transfer clutch pressure in accordance with the following chart in the same manner as for line pressure. <Ref. to 4AT-33, Line Pressure Test.>
ST 498897700 OIL PRESSURE ADAPTER SET
ST 498575400 OIL PRESSURE GAUGE ASSY

NOTE:
- Before setting to FWD mode, install the spare fuse on the FWD mode switch.



(A) Test plug

- If no oil pressure is produced or if it does not change in AWD mode, there may be a problem in the transfer duty solenoid or control valve body.
- If oil pressure is produced in FWD mode, there is the same problem as the AWD mode.

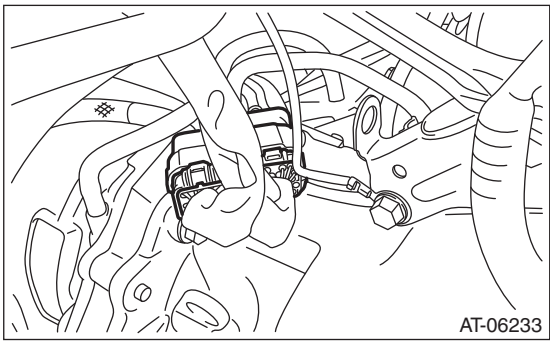
Range position	ON duty ratio (%)	Acceleration opening angle (%)	Standard transfer clutch pressure kPa (kg/cm^2, psi)	
			AWD mode	FWD mode
Manual mode (2nd)	95	Fully opened (100)	1,000 — 1,200 (10.2 — 12.2, 145 — 174)	—
	60	Adjust ON Duty ratio to 60%.	500 — 700 (5.1 — 7.1, 72 — 101)	—
	5	Fully closed (0)	—	0 (0, 0)
N or P	5	Fully closed (0)	0	—

9. Automatic Transmission Assembly

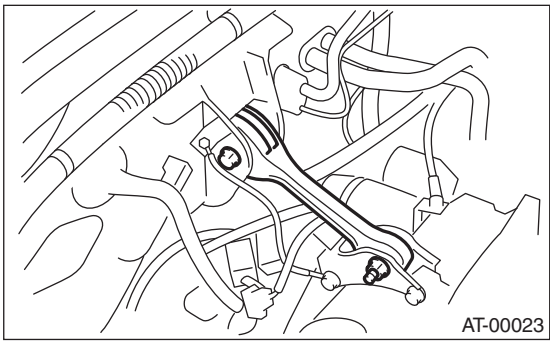
A: REMOVAL

1. NON-TURBO MODEL

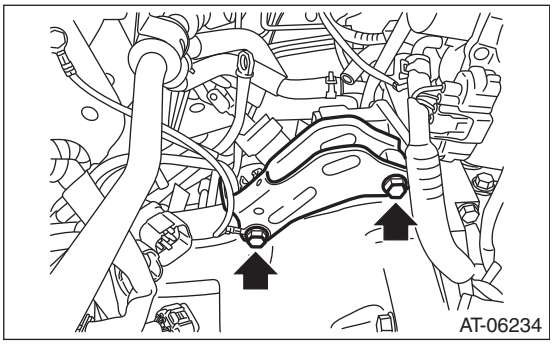
1) Set the vehicle on a lift.
2) Open the front hood.
3) Disconnect the ground cable from battery.
4) Remove the air intake boot assembly. <Ref. to IN(H4DO)-13, REMOVAL, Air Intake Boot.>
5) Disconnect the transmission harness connector and terminal.



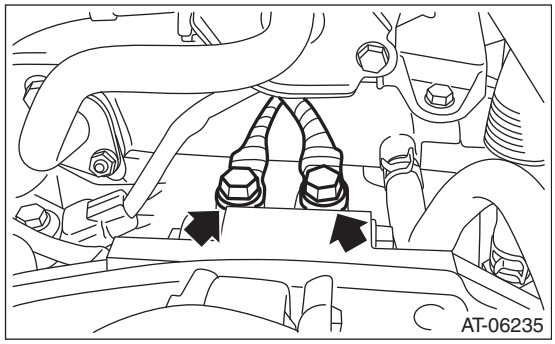
6) Remove the pitching stopper.



7) Remove the pitching stopper bracket.



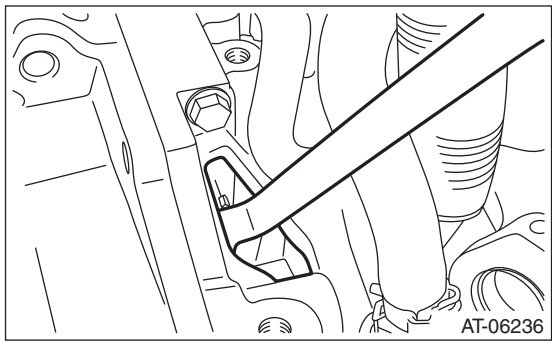
8) Remove the engine ground terminal.



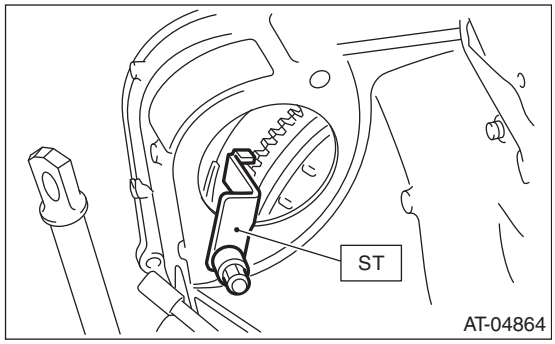
9) Remove the starter. <Ref. to SC(H4DO)-9, REMOVAL, Starter.>
10) Separate the torque converter clutch from the drive plate.

CAUTION:
- **Be careful not to damage the mounting bolts.**
- **Be careful not to drop bolts into the converter case.**

(1) Remove the service hole plug.
(2) Remove the bolts which hold the torque converter clutch assembly to the drive plate.

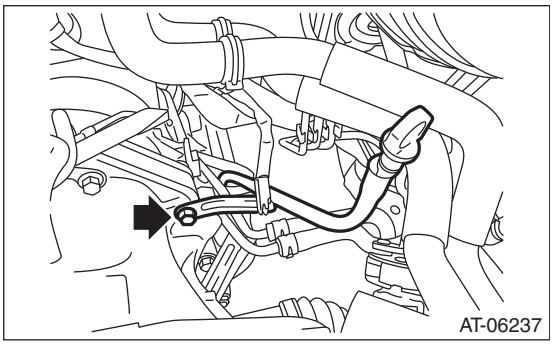


(3) Place the wrench on the crank pulley bolt, and remove all the bolts while rotating the crank pulley a little bit at a time.
(4) Make sure the torque converter moves freely by rotating with finger through the starter installation hole.
11) Attach the ST to the converter case.
ST 498277200 STOPPER SET

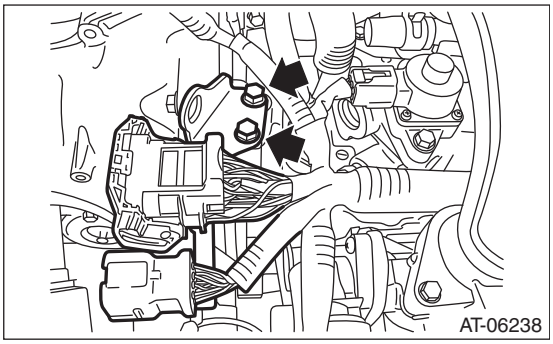


12) Remove the ATF level gauge and oil charge pipe.

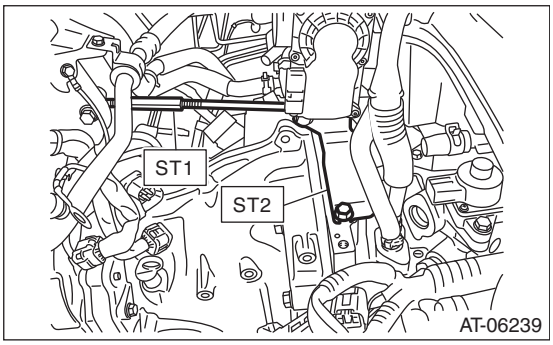
NOTE:
Plug the opening to prevent entry of foreign particles into the transmission fluid.



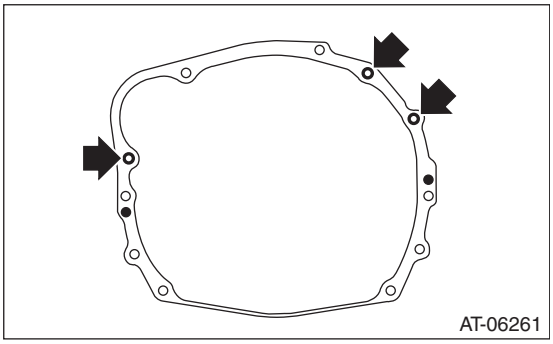
13) Separate the engine harness.
14) Remove the engine hanger rear.



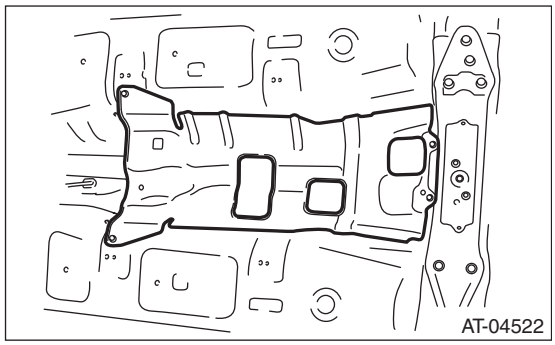
15) Set the ST.
ST1 41099AA010 ENGINE SUPPORT ASSY
ST2 41099AA020 ENGINE SUPPORT ASSY



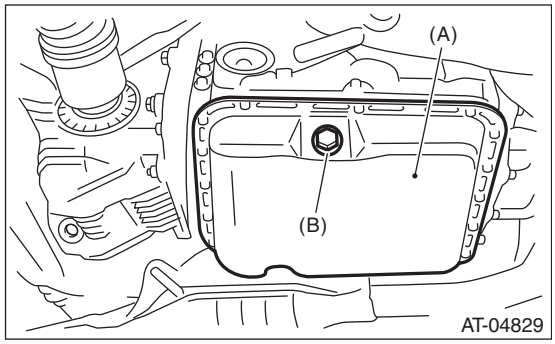
16) Remove the bolts which hold upper side of transmission to engine.



17) Lift up the vehicle.
18) Remove the under cover. <Ref. to EI-26, REMOVAL, Front Under Cover.>
19) Remove the center exhaust pipe. <Ref. to EX(H4DO)-12, REMOVAL, Center Exhaust Pipe.>
20) Remove the heat shield cover.

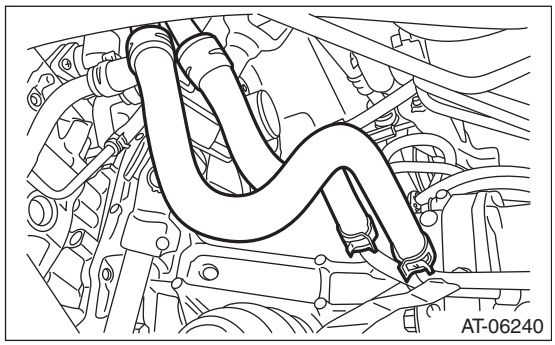


21) Remove the drain plug (ATF) to drain ATF.



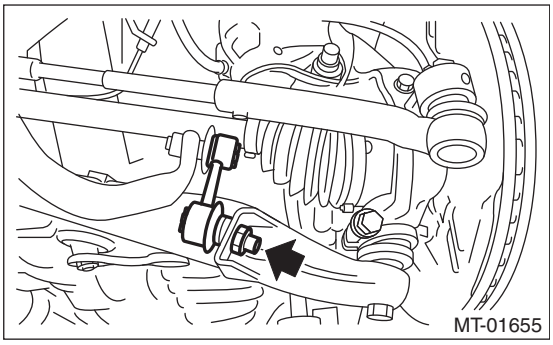
(A) Oil pan
(B) Drain plug (ATF)

22) Remove the ATF cooler hose.

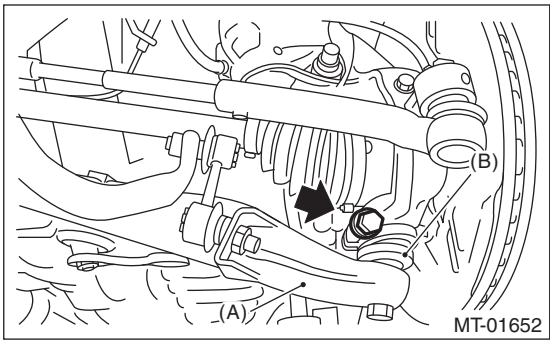


23) Remove the propeller shaft. <Ref. to DS-10, REMOVAL, Propeller Shaft.>
24) Remove the shift select cable from the inhibitor switch and the transmission. <Ref. to CS-25, REMOVAL, Select Cable.>

25) Disconnect the stabilizer link from the front arm.



26) Remove the bolts which secure the front arm ball joint to the front housing, and separate the front arm and housing.



(A) Front arm
(B) Ball joint

27) Pull out the front drive shaft from the transmission.

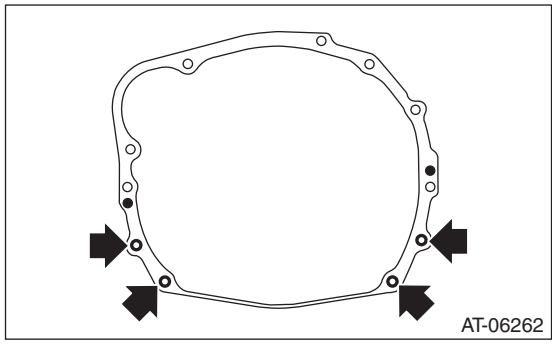
(1) Using a tire lever or a crow bar, etc., pull out until the front drive shaft transmission side joint slides move smoothly.

NOTE:
Place cloth between the tire lever or bar and the transmission in order to avoid damaging the transmission side retainer.

(2) Hold the transmission side joint of the front drive shaft by hand and extract the housing from the transmission while pressing the housing outward, so as not to stretch the boot.

28) Remove the bolts which hold the clutch housing cover.

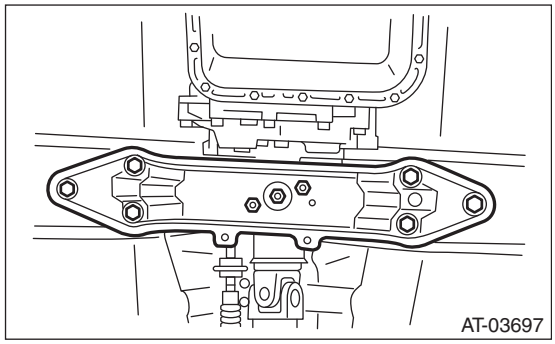
29) Remove the bolts and nuts which hold lower side of transmission to engine.



30) Place a transmission jack below the transmission.

NOTE:
Make sure that the support plates of transmission jack do not touch the oil pan.

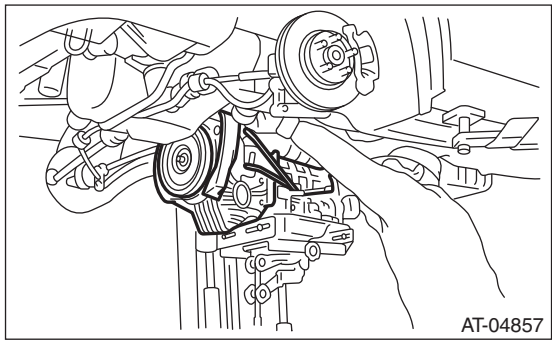
31) Remove the transmission rear crossmember from the vehicle.



32) While lowering the transmission jack gradually, fully retract the engine support, and then tilt the engine rearward.

33) Remove the transmission.

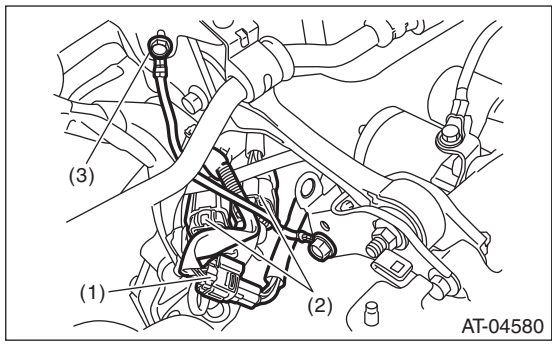
NOTE:
Remove the transmission and torque converter as a single unit from engine.



34) Remove the rear cushion rubber from the transmission assembly.

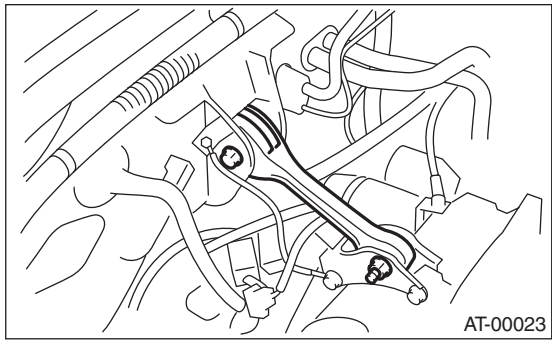
2. TURBO MODEL

1) Set the vehicle on a lift.
2) Open the front hood.
3) Disconnect the ground cable from battery.
4) Remove the intercooler. <Ref. to IN(H4DOTC)-13, REMOVAL, Intercooler.>
5) Disconnect the following connectors and terminals.



(1) Rear oxygen sensor connector
(2) Transmission harness connectors
(3) Transmission radio ground terminal

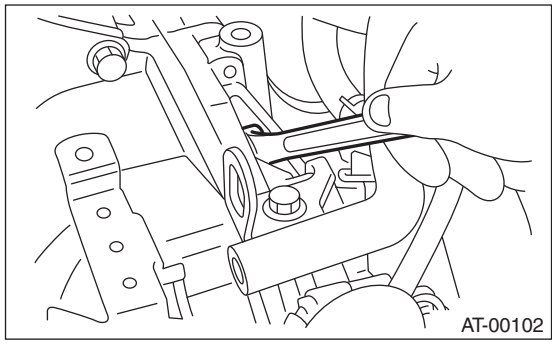
6) Remove the starter. <Ref. to SC(H4DO)-9, REMOVAL, Starter.>
7) Remove the pitching stopper.



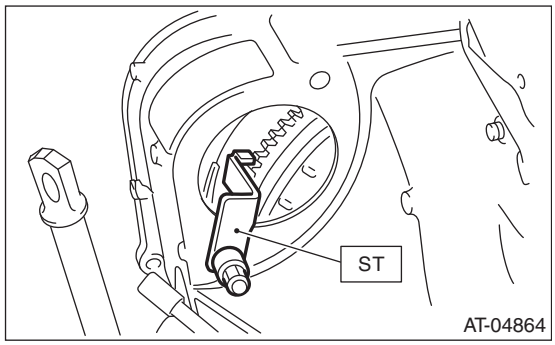
8) Separate the torque converter clutch from the drive plate.

CAUTION:
• Be careful not to damage the mounting bolts.
• Be careful not to drop bolts into the converter case.

(1) Remove the service hole plug.
(2) Remove the bolts which hold the torque converter clutch assembly to the drive plate.

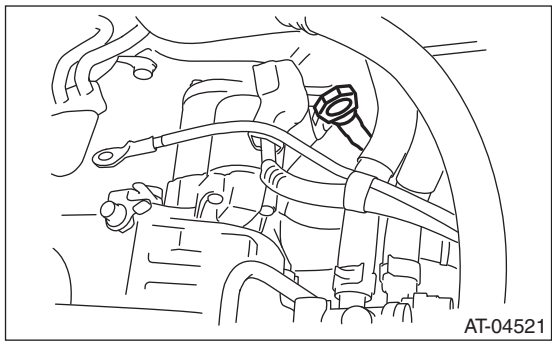


(3) Place the wrench on the crank pulley bolt, and remove all the bolts while rotating the crank pulley a little bit at a time.
(4) Make sure the torque converter moves freely by rotating with finger through the starter installation hole.
9) Attach the ST to the converter case.
ST 498277200 STOPPER SET



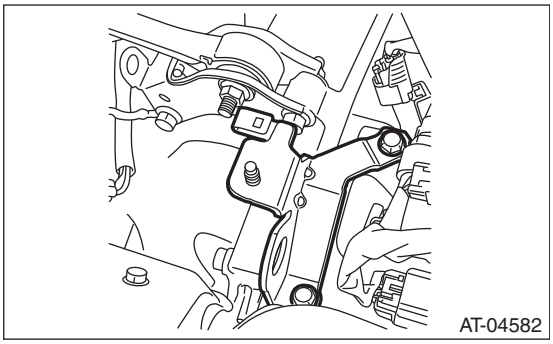
10) Remove the ATF level gauge.
11) Remove the oil charge pipe.

NOTE:
Plug the opening to prevent entry of foreign particles into the transmission fluid.



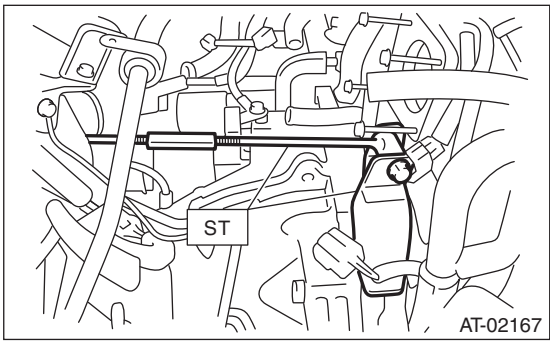
12) Remove the pitching stopper bracket.

13) Remove the engine hanger rear.



14) Set the ST.

ST 41099AC000 ENGINE SUPPORT ASSY

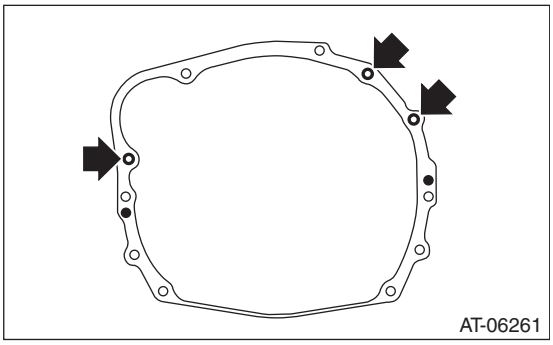


15) Lift up the vehicle.

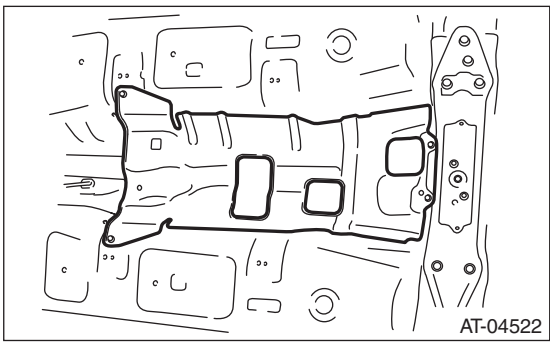
16) Remove the under cover. <Ref. to EI-26, REMOVAL, Front Under Cover.>

17) Remove the center exhaust pipe. <Ref. to EX(H4DOTC)-7, REMOVAL, Center Exhaust Pipe.>

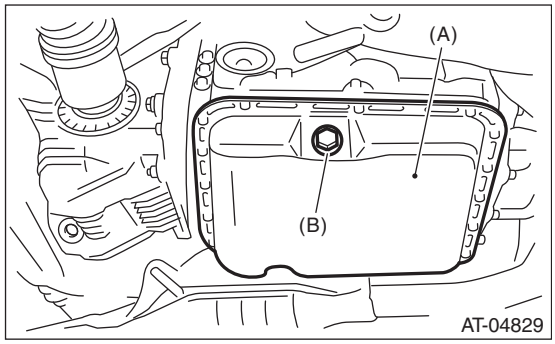
18) Remove the bolts which hold upper side of transmission to engine.



19) Remove the heat shield cover.

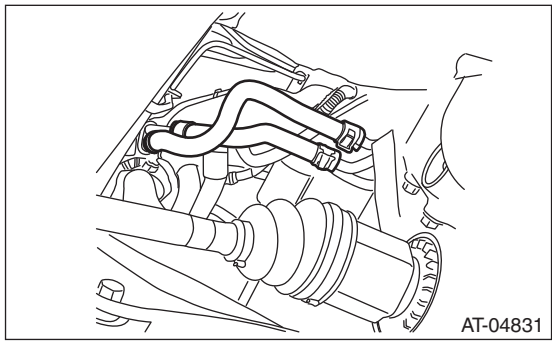


20) Remove the drain plug (ATF) to drain ATF.



(A) Oil pan
(B) Drain plug (ATF)

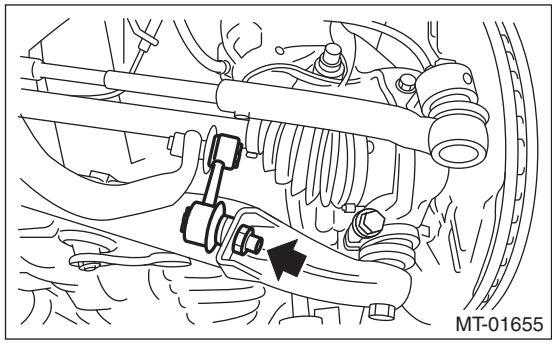
21) Remove the ATF cooler hose.



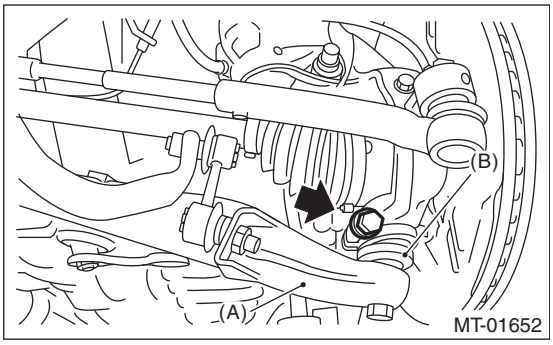
22) Remove the propeller shaft. <Ref. to DS-10, REMOVAL, Propeller Shaft.>

23) Remove the shift select cable from the inhibitor switch and the transmission. <Ref. to CS-25, REMOVAL, Select Cable.>

24) Disconnect the stabilizer link from the front arm.



25) Remove the bolts which secure the front arm ball joint to the front housing, and separate the front arm and housing.



(A) Front arm
(B) Ball joint

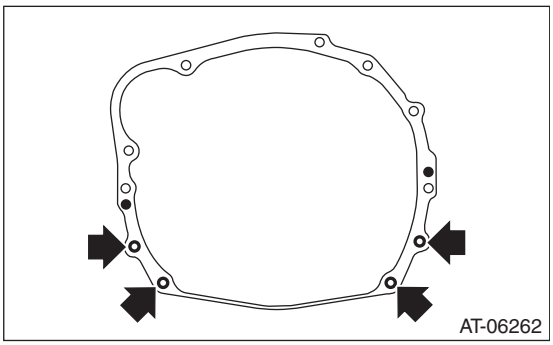
26) Pull out the front drive shaft from the transmission.

(1) Using a tire lever or a crow bar, etc., pull out until the front drive shaft transmission side joint slides move smoothly.

NOTE:
Place cloth between the tire lever or bar and the transmission in order to avoid damaging the transmission side retainer.

(2) Hold the transmission side joint of the front drive shaft by hand and extract the housing from the transmission while pressing the housing outward, so as not to stretch the boot.

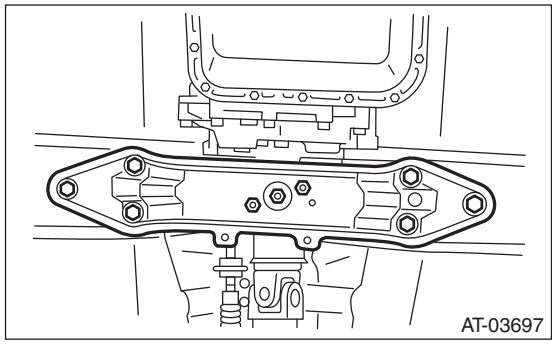
27) Remove the bolts which hold the clutch housing cover.
28) Remove the bolts and nuts which hold lower side of transmission to engine.



29) Place a transmission jack below the transmission.

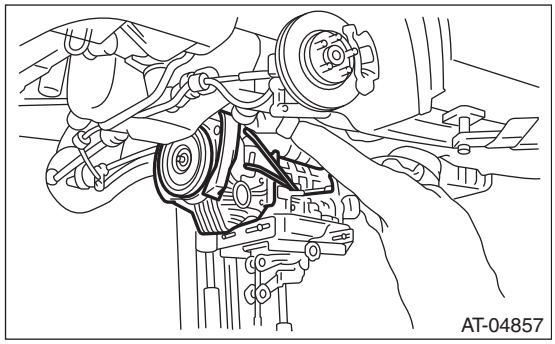
NOTE:
Make sure that the support plates of transmission jack do not touch the oil pan.

30) Remove the transmission rear crossmember from the vehicle.



31) While lowering the transmission jack gradually, fully retract the engine support, and then tilt the engine rearward.
32) Remove the transmission.

NOTE:
Remove the transmission and torque converter as a single unit from engine.



33) Remove the rear cushion rubber from the transmission assembly.

B: INSTALLATION

1. NON-TURBO MODEL

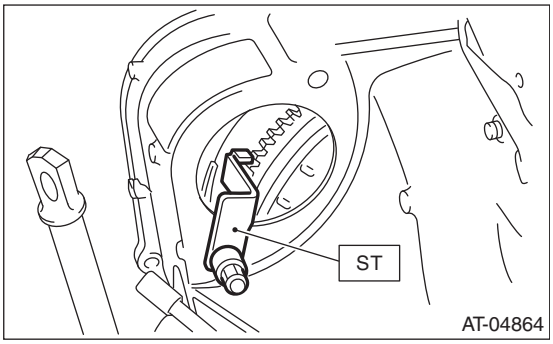
1) Replace the differential side oil seal with a new part. <Ref. to 4AT-51, Differential Side Retainer Oil Seal.>

NOTE:
When a new oil seal has been installed, replacement is not required.

2) Install the rear cushion rubber to the transmission assembly.

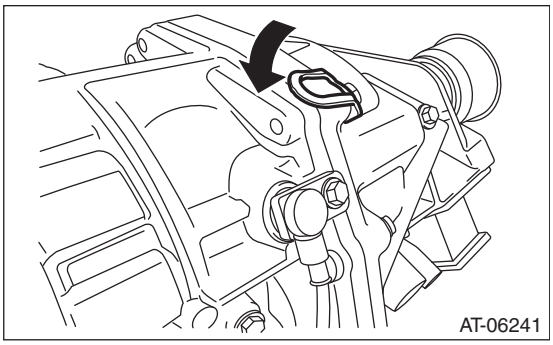
Tightening torque:
40 N·m (4.1 kgf-m, 29.5 ft-lb)

3) Attach the ST to the converter case.
ST 498277200 STOPPER SET

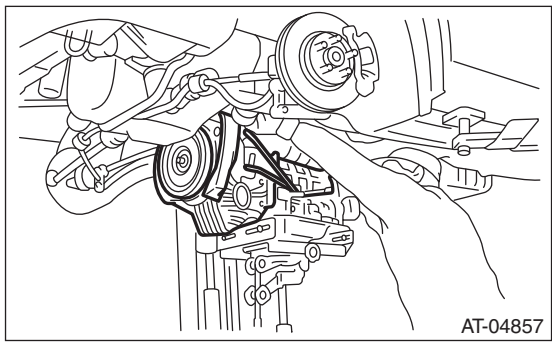


4) Strike and bend the transmission hanger of transmission rear with a rubber hammer etc. so that it gets in contact with the transmission case.

CAUTION:
Do not apply excessive load or impact to the transmission case.



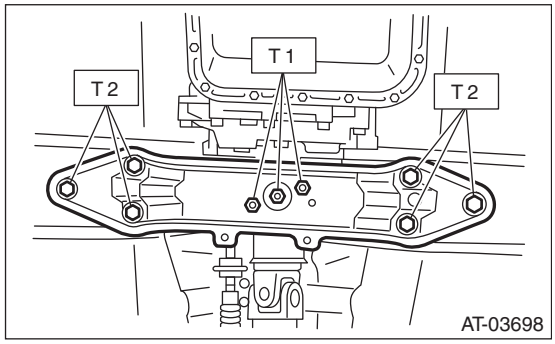
5) Install the transmission onto the engine.
(1) Lift up the transmission gradually using transmission jack.



(2) Insert the engine side stud bolt into the transmission bolt hole.
(3) While raising the transmission jack gradually, turn the screw of engine support, then tilt the engine forward and connect.

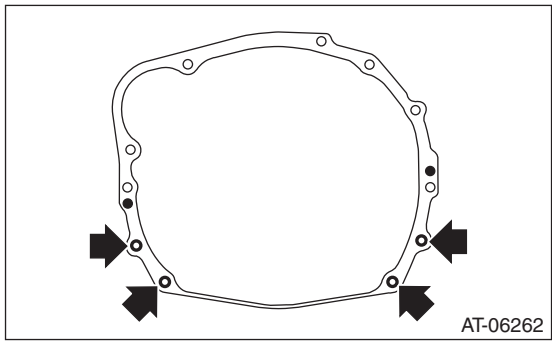
6) Install the transmission rear crossmember.

Tightening torque:
T1: 35 N·m (3.6 kgf-m, 25.8 ft-lb)
T2: 70 N·m (7.1 kgf-m, 51.6 ft-lb)



7) Remove the transmission jack.
8) Tighten the bolts and nuts which hold the lower side of transmission to the engine.

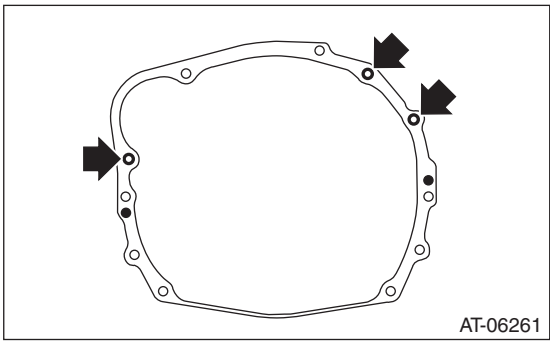
Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)



9) Lower the vehicle.

10) Tighten the bolts which hold the upper side of the transmission to the engine.

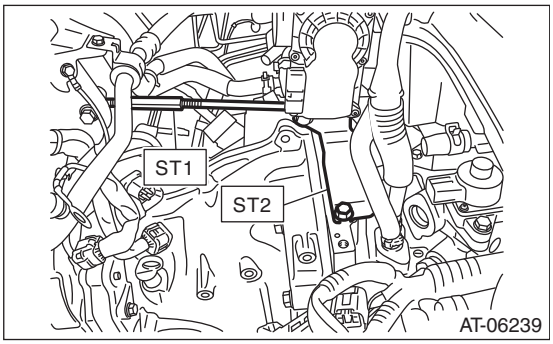
Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)



11) Remove the ST from converter case.

NOTE:
When removing the ST, be careful not to drop it into converter case.

12) Remove the ST.

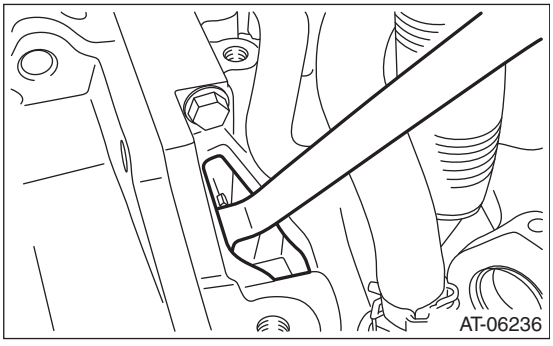


13) Install the torque converter clutch assembly to the drive plate.

CAUTION:
- **Be careful not to damage the mounting bolts.**
- **Be careful not to drop bolts into the converter case.**

(1) Tighten the bolts which hold the torque converter clutch to the drive plate.
(2) Place the wrench on the crank pulley bolt, and remove all the bolts while rotating the crank pulley a little bit at a time.

Tightening torque:
25 N·m (2.5 kgf-m, 18.4 ft-lb)

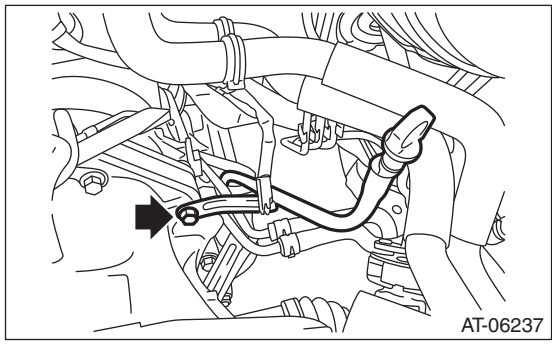


(3) Fit the plug to service hole.

14) Install the oil charge pipe.

NOTE:
Use new O-rings and bolts.

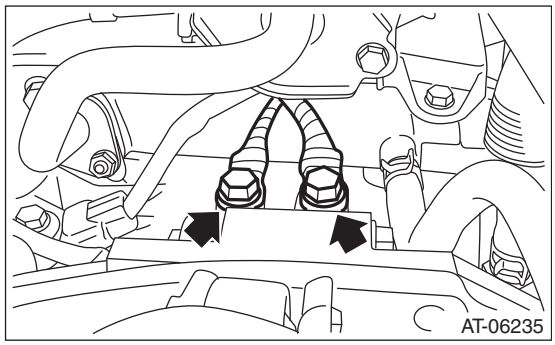
Tightening torque:
38 N·m (3.9 kgf-m, 28.0 ft-lb)



15) Install the starter. <Ref. to SC(H4DO)-10, INSTALLATION, Starter.>

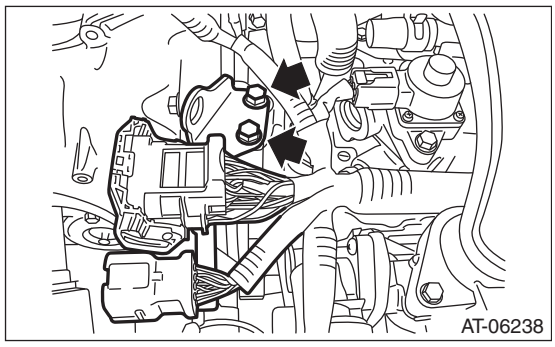
16) Install the engine ground terminals.

Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)



17) Install the engine hanger rear.

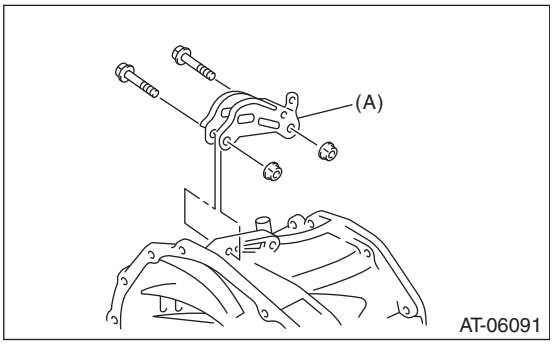
Tightening torque:
21 N·m (2.1 kgf-m, 15.5 ft-lb)



18) Connect the engine harness connector.

19) Install the pitching stopper bracket and transmission radio ground cord.

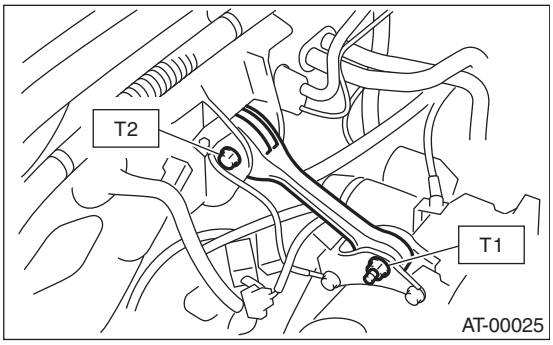
Tightening torque:
41 N·m (4.2 kgf-m, 30.2 ft-lb)



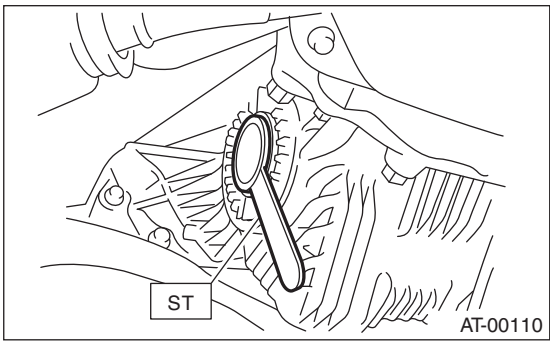
(A) Pitching stopper bracket

20) 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)

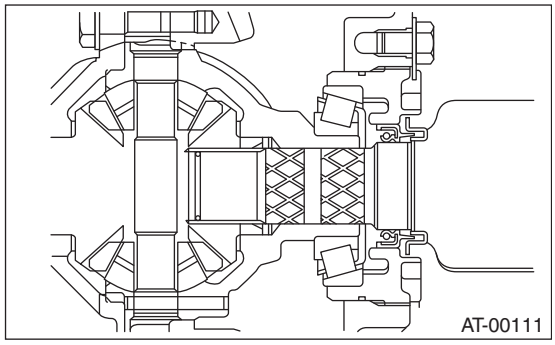


21) Lift up the vehicle.
22) Replace the circlip of the front drive shaft with a new part.
23) Apply grease to the oil seal lip.
24) Attach the ST to side retainer.
ST 28399SA010 OIL SEAL PROTECTOR



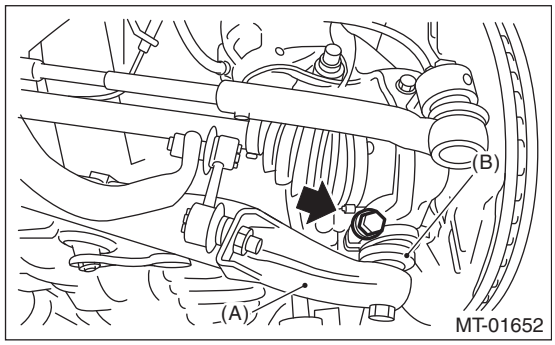
25) Align and insert the spline of the front drive shaft to the splines of the differential bevel gear, and remove the ST.

26) Insert the front drive shaft into the transmission securely by pressing the front housing from the outside.



27) Install the ball joint into the front housing.
28) Tighten the attachment bolts.

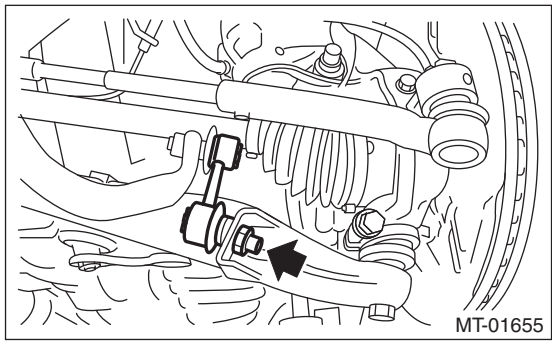
Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)



(A) Front arm
(B) Ball joint

29) Attach the stabilizer link to the front arm.

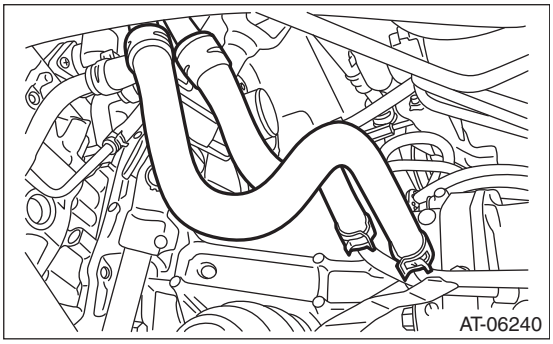
Tightening torque:
45 N·m (4.6 kgf-m, 33.2 ft-lb)



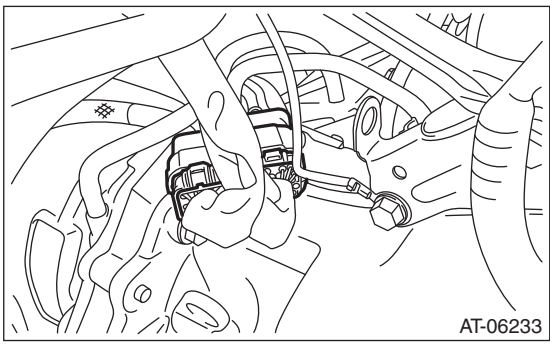
30) Install the shift select cable onto the select lever. <Ref. to CS-26, INSTALLATION, Select Cable.>

31) Install the ATF cooler hose.

NOTE:
Use a new ATF cooler hose.



32) Install the propeller shaft. <Ref. to DS-11, INSTALLATION, Propeller Shaft.>
33) Install the heat shield cover. <Ref. to EI-70, INSTALLATION, Heat Shield Cover.>
34) Install the center exhaust pipe. <Ref. to EX(H4DO)-12, INSTALLATION, Center Exhaust Pipe.>
35) Install the under cover. <Ref. to EI-26, INSTALLATION, Front Under Cover.>
36) Lower the vehicle.
37) Connect the transmission harness connector.



38) Fill transmission with ATF through the oil charge pipe until the fluid level is between the upper and lower level on the “COLD” side of the level gauge. <Ref. to 4AT-27, Automatic Transmission Fluid.>
39) Install the ATF level gauge.
40) Install the air intake boot assembly.
41) Connect the battery ground terminal.
42) Check the differential gear oil level. <Ref. to 4AT-29, INSPECTION, Differential Gear Oil.>
43) Check the select lever operation. <Ref. to 4AT-52, INSPECTION, Inhibitor Switch.>
44) Bleed the air of control valve. <Ref. to 4AT-65, PROCEDURE, Air Bleeding of Control Valve.>
45) Check the ATF level. <Ref. to 4AT-27, INSPECTION, Automatic Transmission Fluid.>
46) Perform the diagnosis again. <Ref. to 4AT(diag)-20, PROCEDURE, Learning Control.>
47) Perform the road test. <Ref. to 4AT-30, Road Test.>

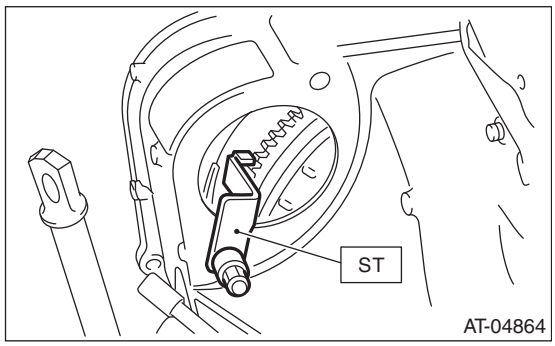
2. TURBO MODEL

1) Replace the differential side oil seal with a new part. <Ref. to 4AT-51, Differential Side Retainer Oil Seal.>

NOTE:
When a new oil seal has been installed, replacement is not required.
2) Install the rear cushion rubber to the transmission assembly.

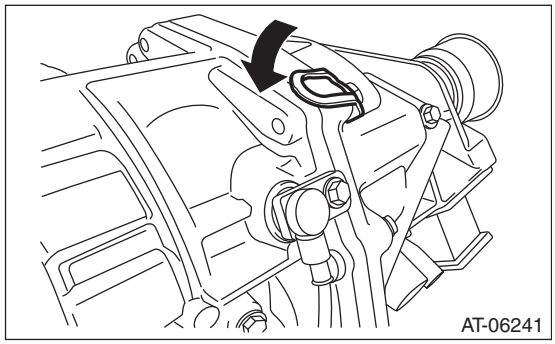
Tightening torque:
40 N·m (4.1 kgf-m, 29.5 ft-lb)

3) Attach the ST to the converter case.
ST 498277200 STOPPER SET

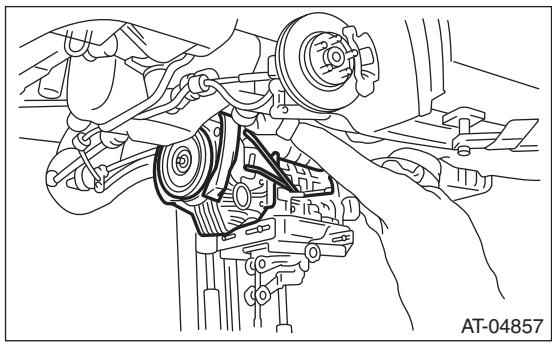


4) Strike and bend the transmission hanger of transmission rear with a rubber hammer etc. so that it gets in contact with the transmission case.

CAUTION:
Do not apply excessive load or impact to the transmission case.



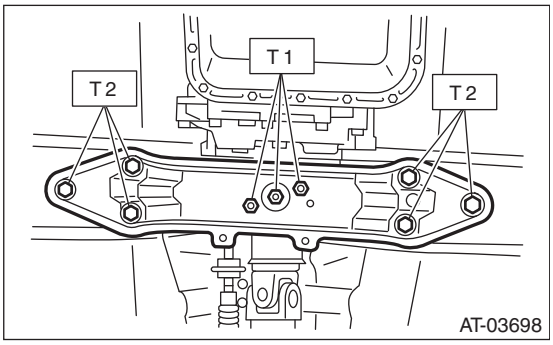
5) Install the transmission onto the engine.
(1) Lift up the transmission gradually using transmission jack.



(2) Insert the engine side stud bolt into the transmission bolt hole.
(3) While raising the transmission jack gradually, turn the screw of engine support, then tilt the engine forward and connect.

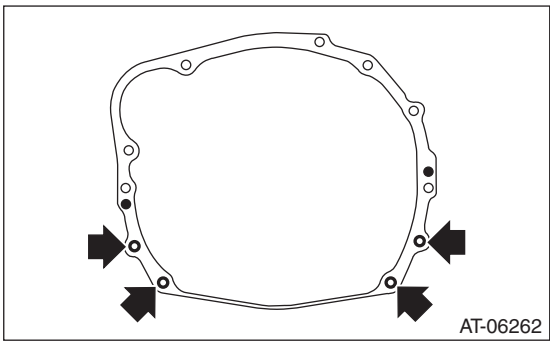
6) Install the transmission rear crossmember.

Tightening torque:
T1: 35 N·m (3.6 kgf-m, 25.8 ft-lb)
T2: 70 N·m (7.1 kgf-m, 51.6 ft-lb)



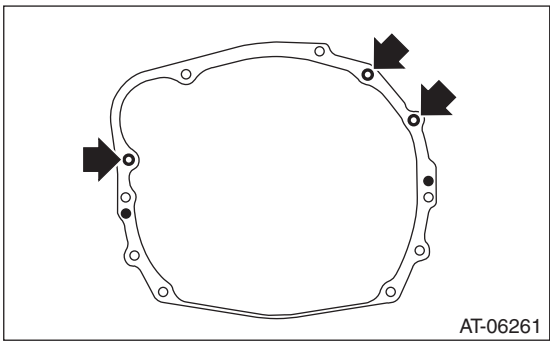
7) Remove the transmission jack.
8) Tighten the bolts and nuts which hold the lower side of transmission to the engine.

Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)



9) Install the clutch housing cover bolts.
10) Lower the vehicle.
11) Tighten the bolts which hold the upper side of the transmission to the engine.

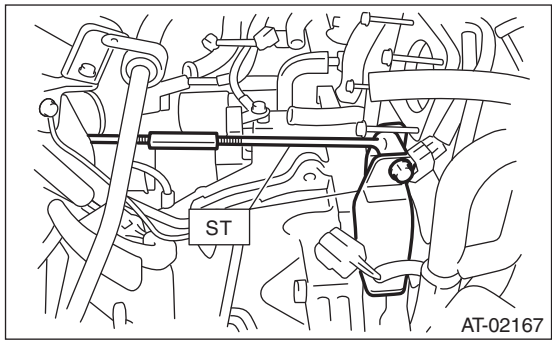
Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)



12) Remove the ST from converter case.

NOTE:
When removing the ST, be careful not to drop it into converter case.

13) Remove the ST.

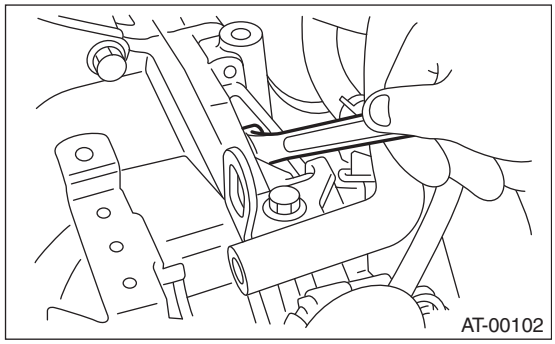


14) Install the torque converter clutch assembly to the drive plate.

CAUTION:
- **Be careful not to damage the mounting bolts.**
- **Be careful not to drop bolts into the converter case.**

(1) Tighten the bolts which hold the torque converter clutch to the drive plate.
(2) Place the wrench on the crank pulley bolt, and remove all the bolts while rotating the crank pulley a little bit at a time.

Tightening torque:
25 N·m (2.5 kgf-m, 18.4 ft-lb)



(3) Fit the plug to service hole.

15) Install the oil charge pipe.

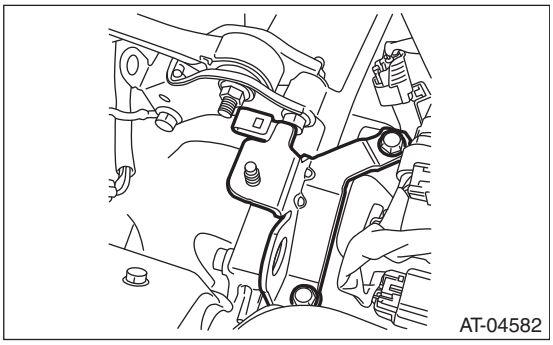
NOTE:
Use new O-rings.

Tightening torque:
38 N·m (3.9 kgf-m, 28.0 ft-lb)

16) Install the starter. <Ref. to SC(H4DO)-10, INSTALLATION, Starter.>

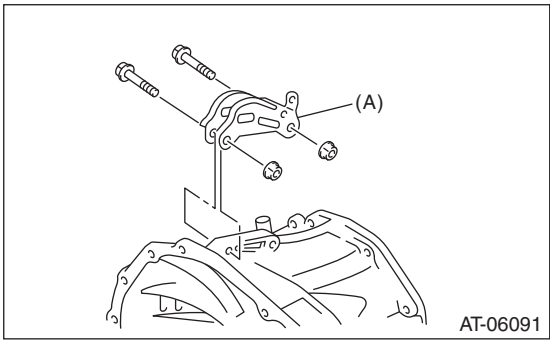
17) Install the engine hanger.

Tightening torque:
16 N·m (1.6 kgf-m, 11.8 ft-lb)



18) Install the pitching stopper bracket and transmission radio ground cord.

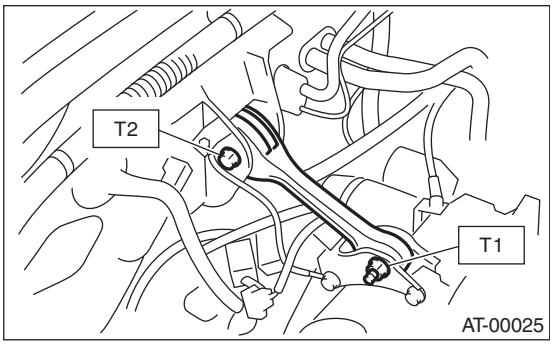
Tightening torque:
41 N·m (4.2 kgf-m, 30.2 ft-lb)



(A) Pitching stopper bracket

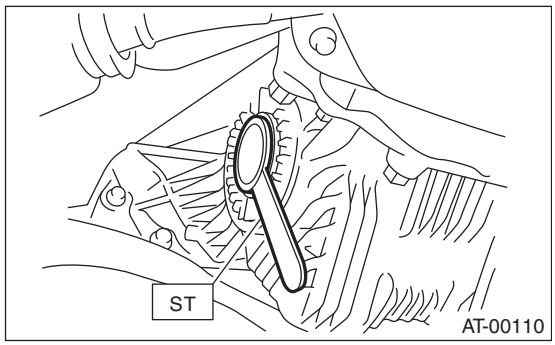
19) Install the pitching stopper.

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)

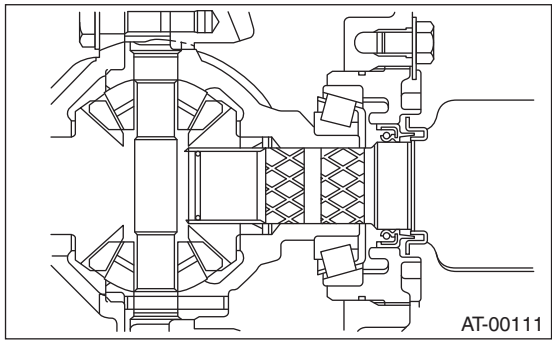


20) Lift up the vehicle.
21) Replace the circlip of the front drive shaft with a new part.
22) Apply grease to the oil seal lip.

23) Attach the ST to side retainer.
ST 28399SA010 OIL SEAL PROTECTOR

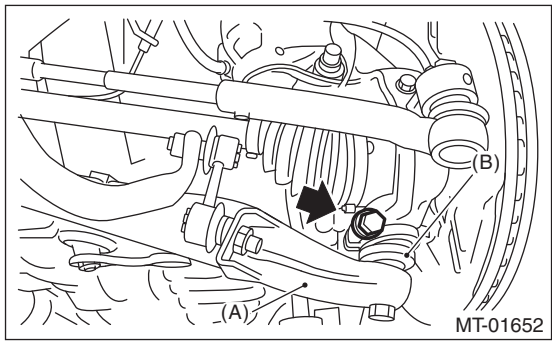


24) Align and insert the spline of the front drive shaft to the splines of the differential bevel gear, and remove the ST.
25) Insert the front drive shaft into the transmission securely by pressing the front housing from the outside.



26) Install the ball joint into the front housing.
27) Tighten the attachment bolts.

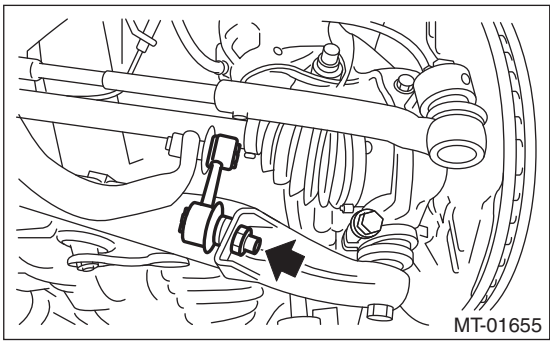
Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)



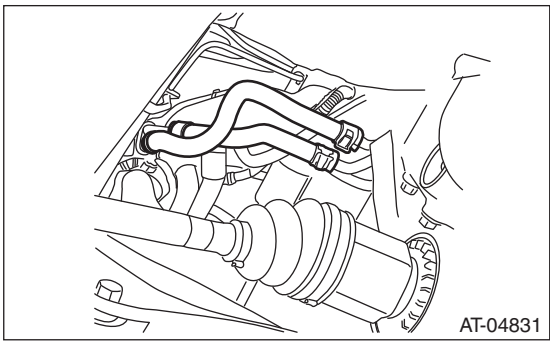
(A) Front arm
(B) Ball joint

28) Attach the stabilizer link to the front arm.

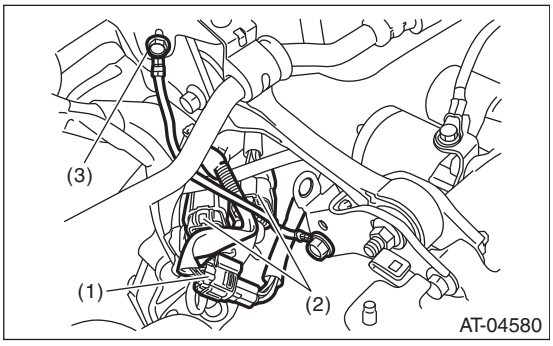
Tightening torque:
45 N·m (4.6 kgf-m, 33.2 ft-lb)



29) Install the shift select cable onto the select lever. <Ref. to CS-26, INSTALLATION, Select Cable.>
30) Connect the ATF cooler hose to the pipe.

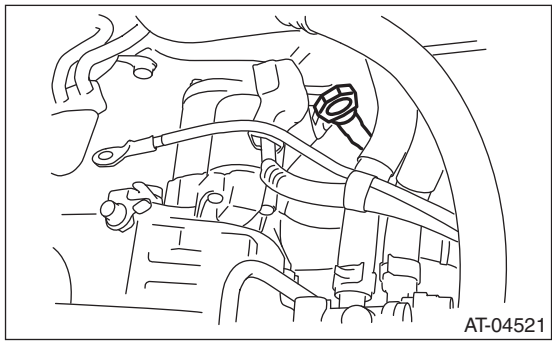


31) Install the propeller shaft. <Ref. to DS-11, INSTALLATION, Propeller Shaft.>
32) Install the heat shield cover. <Ref. to EI-70, INSTALLATION, Heat Shield Cover.>
33) Install the center exhaust pipe. <Ref. to EX(H4DOTC)-8, INSTALLATION, Center Exhaust Pipe.>
34) Install the under cover. <Ref. to EI-26, INSTALLATION, Front Under Cover.>
35) Lower the vehicle.
36) Connect the following connectors and terminals.



(1) Rear oxygen sensor connector
(2) Transmission harness connectors
(3) Transmission radio ground terminal

37) Fill transmission with ATF through the oil charge pipe until the fluid level is between the upper and lower level on the “COLD” side of the level gauge. <Ref. to 4AT-27, Automatic Transmission Fluid.>
38) Install the ATF level gauge.



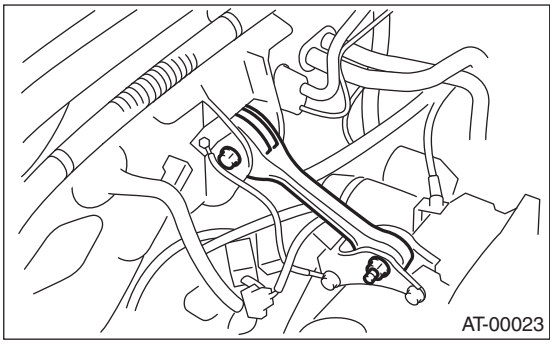
39) Install the intercooler.
40) Connect the battery ground terminal.
41) Check the differential gear oil level. <Ref. to 4AT-29, INSPECTION, Differential Gear Oil.>
42) Check the select lever operation. <Ref. to 4AT-52, INSPECTION, Inhibitor Switch.>
43) Bleed the air of control valve. <Ref. to 4AT-65, PROCEDURE, Air Bleeding of Control Valve.>
44) Check the ATF level. <Ref. to 4AT-27, INSPECTION, Automatic Transmission Fluid.>
45) Perform the diagnosis again. <Ref. to 4AT(diag)-20, PROCEDURE, Learning Control.>
46) Perform the road test. <Ref. to 4AT-30, Road Test.>

10. Transmission Mounting System

A: REMOVAL

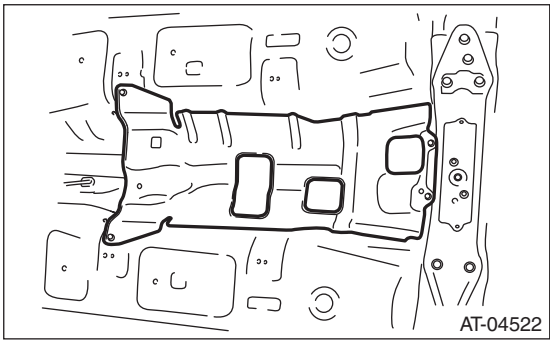
1. PITCHING STOPPER

1) Disconnect the ground cable from battery.
2) Remove the air intake boot assembly. (non-turbo model) <Ref. to IN(H4DO)-13, REMOVAL, Air Intake Boot.>
3) Remove the intercooler. (turbo model) <Ref. to IN(H4DOTC)-13, REMOVAL, Intercooler.>
4) Remove the pitching stopper.



2. TRANSMISSION REAR CROSSMEMBER AND REAR CUSHION RUBBER

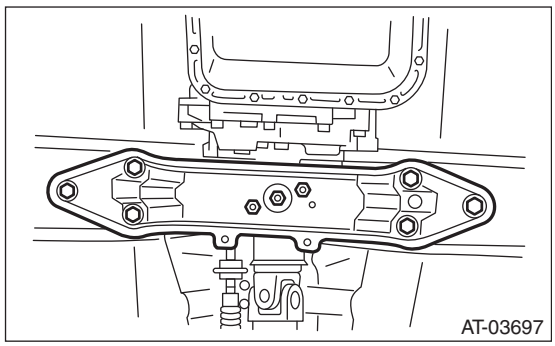
1) Disconnect the ground cable from battery.
2) Lift up the vehicle.
3) Remove the center exhaust pipe. (non-turbo model) <Ref. to EX(H4DO)-12, REMOVAL, Center Exhaust Pipe.>
4) Remove the center exhaust pipe (rear). (turbo model) <Ref. to EX(H4DOTC)-7, REMOVAL, Center Exhaust Pipe.>
5) Remove the heat shield cover.



6) Set the transmission jack under transmission.

NOTE:
Make sure that the support plate of transmission jack does not touch the oil pan.

7) Remove the transmission rear crossmember.



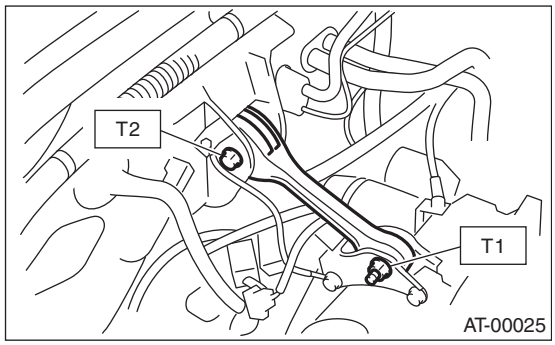
8) Remove the rear cushion rubber.

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, 42.8 ft-lb)



2) Install the air intake boot assembly. (non-turbo model) <Ref. to IN(H4DO)-13, INSTALLATION, Air Intake Boot.>
3) Install the intercooler. (turbo model) <Ref. to IN(H4DOTC)-13, INSTALLATION, Intercooler.>

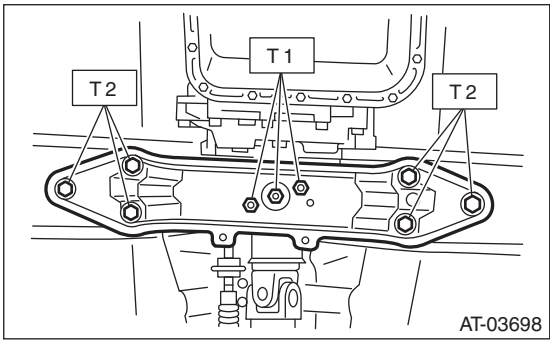
2. TRANSMISSION REAR CROSSMEMBER AND REAR CUSHION RUBBER

1) Install the rear cushion rubber.

Tightening torque:
40 N·m (4.1 kgf-m, 29.5 ft-lb)

2) Install the transmission rear crossmember.

Tightening torque:
T1: 35 N·m (3.6 kgf-m, 25.8 ft-lb)
T2: 70 N·m (7.1 kgf-m, 51.6 ft-lb)



3) Remove the transmission jack.
4) Install the heat shield cover. <Ref. to EI-70, INSTALLATION, Heat Shield Cover.>
5) Install the center exhaust pipe. (non-turbo model) <Ref. to EX(H4DO)-12, INSTALLATION, Center Exhaust Pipe.>
6) Install the center exhaust pipe (rear). (turbo model) <Ref. to EX(H4DOTC)-8, INSTALLATION, Center Exhaust Pipe.>
7) Lower the vehicle.
8) Connect the battery ground terminal.

C: INSPECTION

If problems are found in the following inspection, repair or replace the part.

1. PITCHING STOPPER

Check that there is no bend or damage on the pitching stopper. Check that there are no cracks, hardening or damage on rubber parts.

2. TRANSMISSION REAR CROSSMEMBER AND REAR CUSHION RUBBER

Check that there is no bend or damage on the crossmember. Check that there are no cracks, hardening, or damage on cushion rubbers.

11.Extension Case Oil Seal

A: INSPECTION

Inspect there is no ATF leakage from the joint of transmission and propeller shaft. If a leak is found, replace the oil seal and inspect the propeller shaft. <Ref. to 4AT-50, REPLACEMENT, Extension Case Oil Seal.>

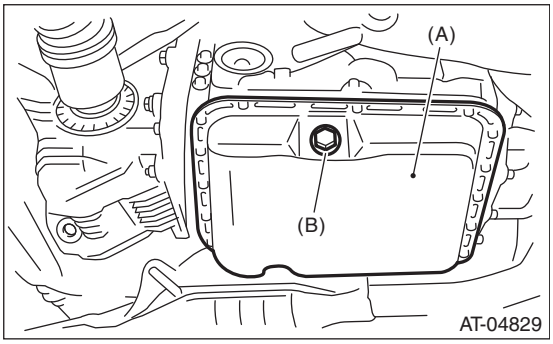
B: REPLACEMENT

1) Lift up the vehicle.
2) Clean the transmission exterior.
3) Remove the drain plug (ATF) to drain ATF.

CAUTION:
Directly after the vehicle has been running or the engine has been long idle running, the ATF is hot. Be careful not to burn yourself.
4) Tighten the drain plug (ATF).

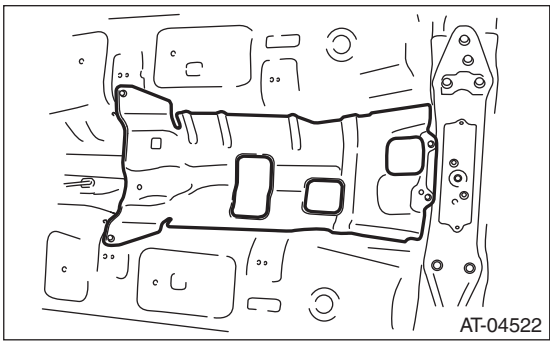
NOTE:
Use a new gasket.

Tightening torque:
25 N·m (2.5 kgf-m, 18.4 ft-lb)



(A) Oil pan
(B) Drain plug (ATF)

5) Remove the rear exhaust pipe. (non-turbo model) <Ref. to EX(H4DO)-13, REMOVAL, Rear Exhaust Pipe.>
6) Remove the center exhaust pipe (rear). (turbo model) <Ref. to EX(H4DOTC)-12, REMOVAL, Rear Exhaust Pipe.>
7) Remove the heat shield cover.



8) Remove the propeller shaft. <Ref. to DS-10, REMOVAL, Propeller Shaft.>
9) Using the ST, remove the oil seal.
ST 398527700 PULLER ASSY
10) Using the ST, install the oil seal.

NOTE:
Use a new oil seal.
ST 498057300 INSTALLER
11) Install the propeller shaft. <Ref. to DS-11, INSTALLATION, Propeller Shaft.>
12) Install the heat shield cover. <Ref. to EI-70, INSTALLATION, Heat Shield Cover.>
13) Install the rear exhaust pipe. (non-turbo model) <Ref. to EX(H4DO)-14, INSTALLATION, Rear Exhaust Pipe.>
14) Install the center exhaust pipe (rear). <Ref. to EX(H4DOTC)-12, INSTALLATION, Rear Exhaust Pipe.>
15) Lower the vehicle.
16) Fill with ATF. <Ref. to 4AT-27, Automatic Transmission Fluid.>
17) Bleed the air of control valve. <Ref. to 4AT-65, PROCEDURE, Air Bleeding of Control Valve.>
18) Check the level and leaks of the ATF. <Ref. to 4AT-27, INSPECTION, Automatic Transmission Fluid.>

12. Differential Side Retainer Oil Seal

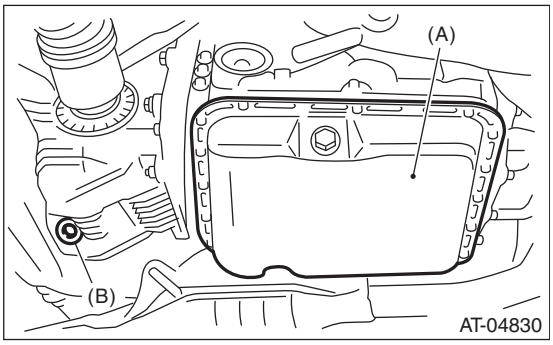
A: INSPECTION

Check for leakage of gear oil from differential side retainer oil seal part. If there is an oil leak, replace the oil seal and inspect the drive shaft.

B: REPLACEMENT

1) Lift up the vehicle.
2) Remove the center exhaust pipe.
• Non-turbo model
<Ref. to EX(H4DO)-12, REMOVAL, Center Exhaust Pipe.>
• Turbo model
<Ref. to EX(H4DOTC)-7, REMOVAL, Center Exhaust Pipe.>
3) Remove the differential gear oil drain plug using TORX® bit T70, and then drain differential gear oil.

CAUTION:
• The differential gear oil will be extremely hot after driving. Be careful not to receive burns.
• Be careful not to spill the differential gear oil on exhaust pipe to prevent it from emitting smoke or causing fires. If differential gear oil is spilled on the exhaust pipe, wipe it off completely.



(A) Oil pan
(B) Differential gear oil drain plug

4) Tighten the differential gear oil drain plug.

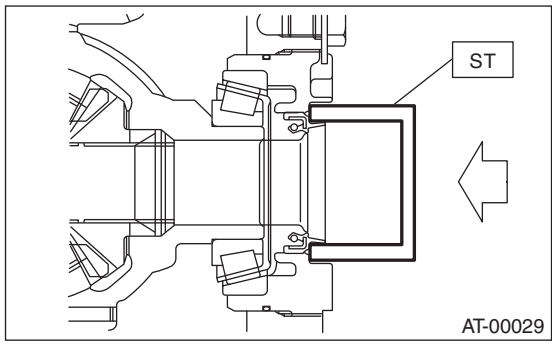
NOTE:
Use a new gasket.

Tightening torque:
Aluminum gasket (silver)
44 N·m (4.5 kgf-m, 32.5 ft-lb)
Copper gasket (brown)
70 N·m (7.1 kgf-m, 51.6 ft-lb)
Metal gasket (black)
70 N·m (7.1 kgf-m, 51.6 ft-lb)

5) Separate the front drive shaft from the transmission. <Ref. to DS-27, REMOVAL, Front Drive Shaft.>
6) Remove the differential side retainer oil seal using a screwdriver wrapped with vinyl tape etc.
7) Using the ST, install the differential side retainer oil seal by lightly tapping with a plastic hammer.

CAUTION:
Apply differential gear oil to the oil seal lips, and install the oil seal while being careful not to deform the lip.

NOTE:
Use a new oil seal.
ST 18675AA000 DIFFERENTIAL SIDE OIL SEAL INSTALLER



8) Using the ST, install the front drive shaft. <Ref. to DS-27, INSTALLATION, Front Drive Shaft.>
ST 28399SA010 OIL SEAL PROTECTOR
9) Install the center exhaust pipe.
• Non-turbo model
<Ref. to EX(H4DO)-12, INSTALLATION, Center Exhaust Pipe.>
• Turbo model
<Ref. to EX(H4DOTC)-8, INSTALLATION, Center Exhaust Pipe.>
10) Lower the vehicle.
11) Fill with differential gear oil through the oil level gauge hole. <Ref. to 4AT-29, 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.

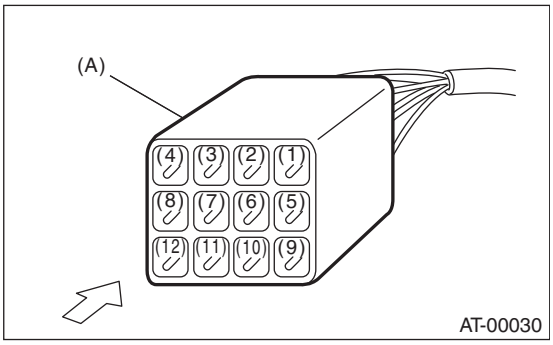
2) Check continuity in inhibitor switch circuits with the select lever moved to each position.

NOTE:

• Also check that there is no continuity in the ignition circuit when the select lever is in the “R” and “D” ranges.

• If the inhibitor switch does not operate, check for poor contact of the connector on transmission side.

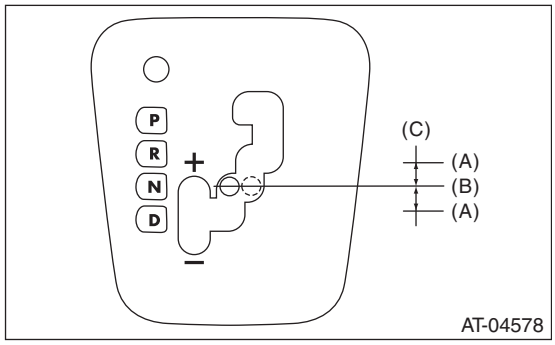
	Range	Pin No.
Signal sent to TCM	P	4 — 3
	R	4 — 2
	N	4 — 1
	D	4 — 8
Ignition circuit	P/N	12 — 11
Back-up light circuit	R	10 — 9



(A) Inhibitor switch connector

3) Check that there is continuity at equal points when the select lever is moved 1.5° in both directions from the “N” range.

If there is continuity in only one direction or in other points, adjust the inhibitor switch. <Ref. to 4AT-52, ADJUSTMENT, Inhibitor Switch.>



(A) Continuity does not exist.

(B) Continuity exists.

(C) 1.5°

4) Repeat the above inspection in other gear ranges. If NG, adjust the select cable. <Ref. to CS-27, ADJUSTMENT, Select Cable.>

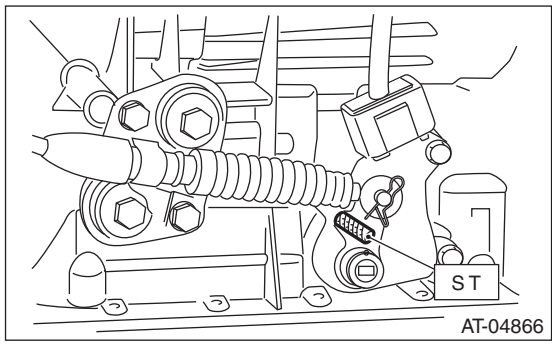
B: ADJUSTMENT

1) Set the select lever to “N” range.

2) Loosen the two bolts holding the inhibitor switch.

3) Insert the ST as vertical as possible into the holes of the shifter arm and switch body.

ST 499267300 STOPPER PIN



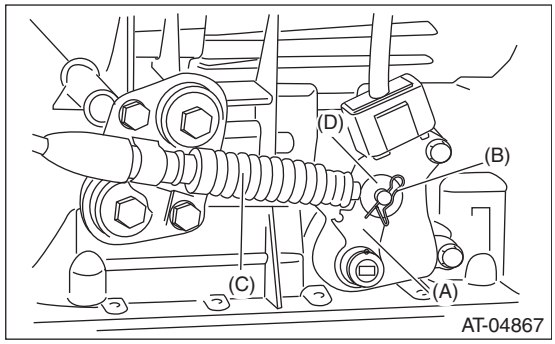
4) Tighten the two bolts holding the inhibitor switch.

Tightening torque:
5 N·m (0.5 kgf-m, 3.7 ft-lb)

5) Repeat the inspection of the inhibitor switch. If the inhibitor switch is determined to be “faulty”, replace it.

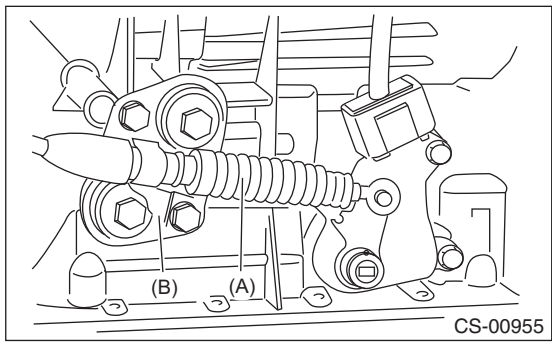
C: REMOVAL

1) Set the vehicle on a lift.
2) Set the select lever to “N” range.
3) Disconnect the ground cable from battery.
4) Lift up the vehicle.
5) Remove the center exhaust pipe. (non-turbo model) <Ref. to EX(H4DO)-12, REMOVAL, Center Exhaust Pipe.>
6) Remove the center exhaust pipe (rear). (turbo model) <Ref. to EX(H4DOTC)-7, REMOVAL, Center Exhaust Pipe.>
7) Remove the snap pin and washer from the shifter arm.



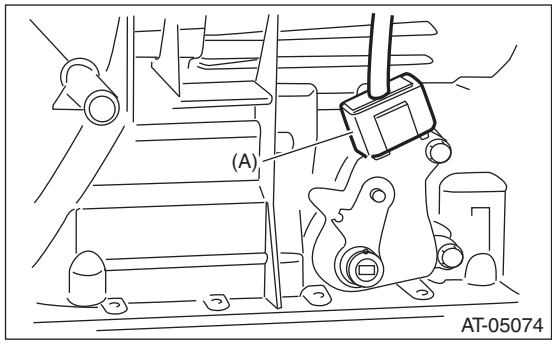
(A) Shifter arm
(B) Snap pin
(C) Select cable
(D) Washer

8) Remove the plate assembly from the transmission case.



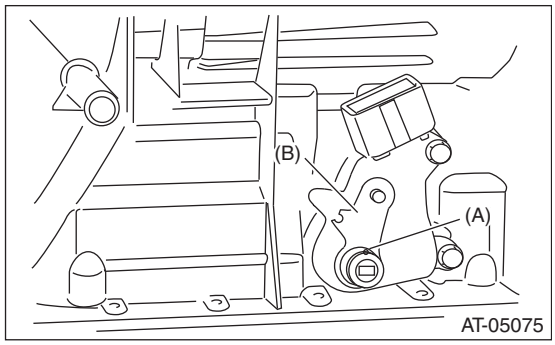
(A) Select cable
(B) Plate ASSY

9) Disconnect the inhibitor switch connector from the inhibitor switch.



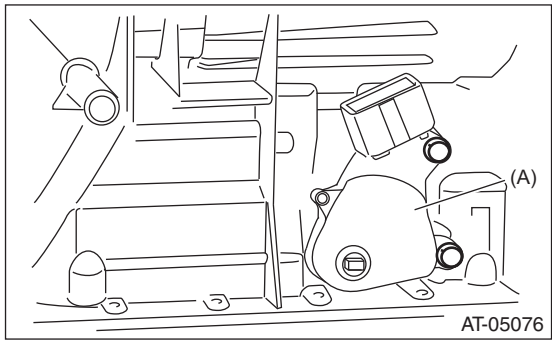
(A) Inhibitor switch connector

10) Using the ST, remove the spring pin and remove the shifter arm.
ST 398791600 REMOVER



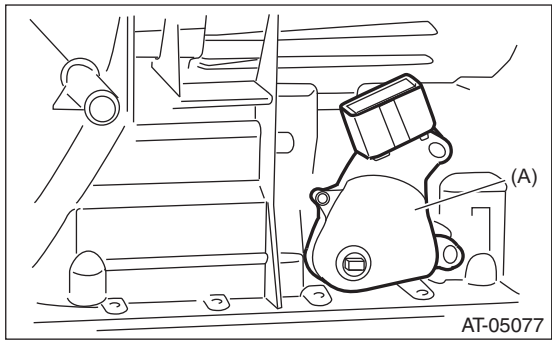
(A) Spring pin
(B) Shifter arm

11) Remove the two inhibitor switch securing bolts.



(A) Inhibitor switch

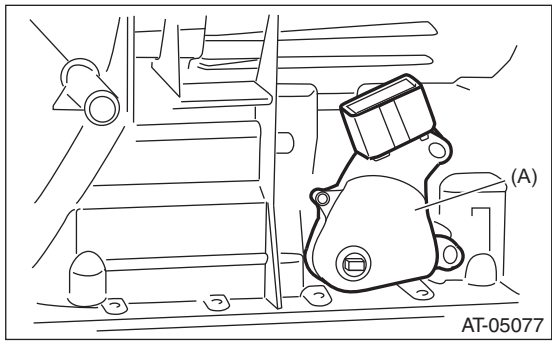
12) Remove the inhibitor switch from the transmission case.



(A) Inhibitor switch

D: INSTALLATION

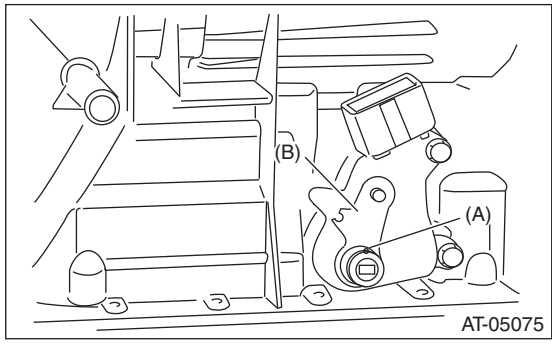
1) Install the inhibitor switch to the transmission case.



(A) Inhibitor switch

2) Install the shifter arm and fix with the spring pin.

NOTE:
Use new spring pin.
ST 398791600 REMOVER

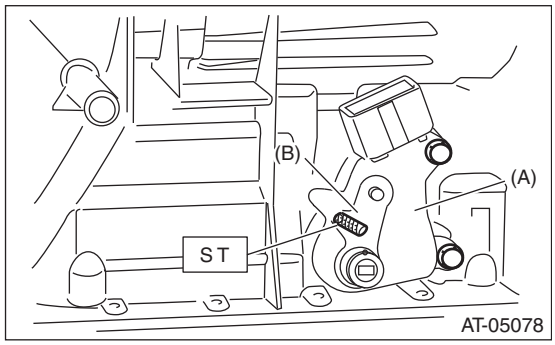


(A) Spring pin
(B) Shifter arm

3) Move the shifter arm to the neutral position.

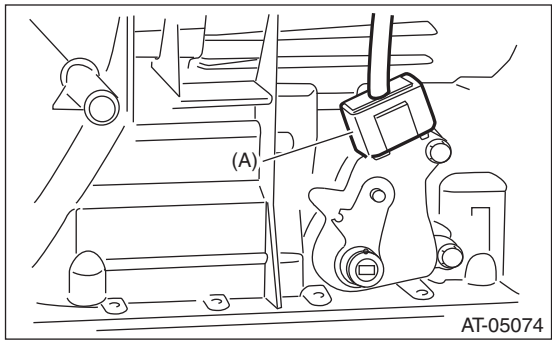
4) Using the ST, tighten the two bolts holding the inhibitor switch.

Tightening torque:
5 N·m (0.5 kgf-m, 3.7 ft-lb)
ST 499267300 STOPPER PIN



(A) Inhibitor switch
(B) Shifter arm

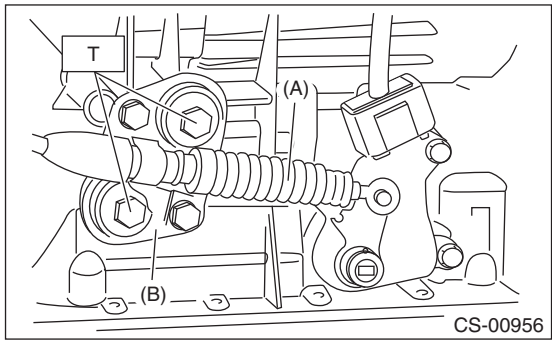
5) Connect the inhibitor switch connector to the inhibitor switch.



(A) Inhibitor switch connector

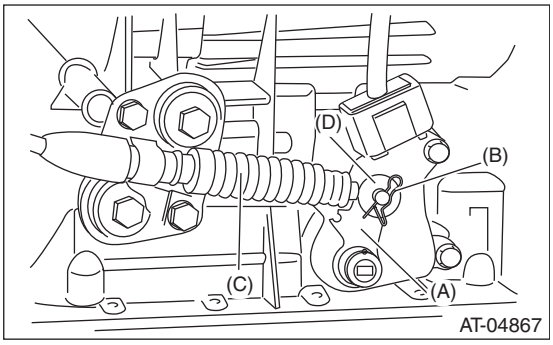
6) Install the select cable to the shifter arm.
7) Install the plate assembly to the transmission case.

Tightening torque:
T: 25 N·m (2.5 kgf-m, 18.4 ft-lb)



(A) Select cable
(B) Plate ASSY

8) Install the washer and snap pin to the shifter arm.



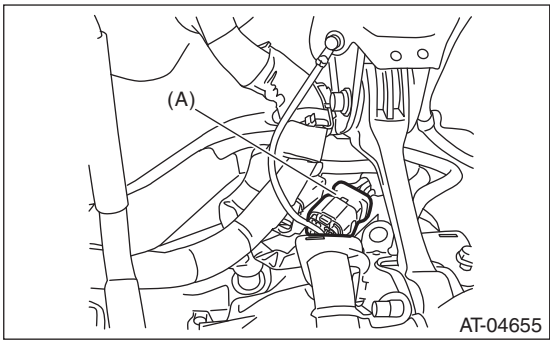
(A) Shifter arm
(B) Snap pin
(C) Select cable
(D) Washer

9) Install the center exhaust pipe. (non-turbo model) <Ref. to EX(H4DO)-12, INSTALLATION, Center Exhaust Pipe.>
10) Install the center exhaust pipe. (turbo model) <Ref. to EX(H4DOTC)-8, INSTALLATION, Center Exhaust Pipe.>
11) Lower the vehicle.
12) Connect the battery ground terminal.
13) Check the inhibitor switch. <Ref. to 4AT-52, 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 boot assembly. (non-turbo model) <Ref. to IN(H4DO)-13, REMOVAL, Air Intake Boot.>
4) Remove the intercooler. (turbo model) <Ref. to IN(H4DOTC)-13, REMOVAL, Intercooler.>
5) Disconnect the transmission harness connector.



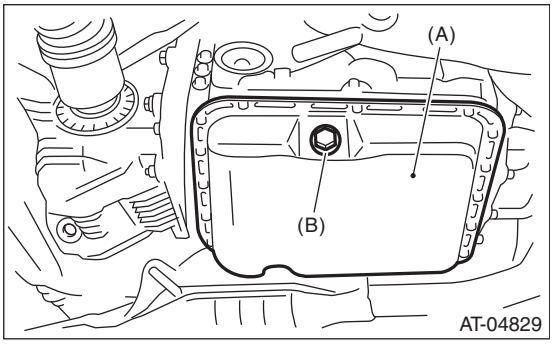
(A) Transmission harness connectors

6) Remove the pitching stopper. <Ref. to 4AT-48, REMOVAL, Transmission Mounting System.>
7) Remove the transmission harness connector from stay.
8) Lift up the vehicle.
9) Clean the transmission exterior.
10) Remove the drain plug (ATF) to drain ATF.

CAUTION:
Directly after the vehicle has been running or the engine has been long idle running, the ATF is hot. Be careful not to burn yourself.
11) Tighten the drain plug (ATF).

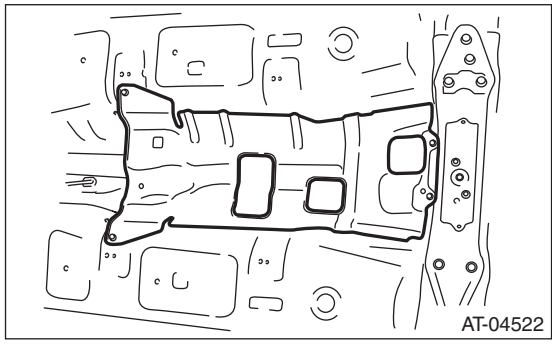
NOTE:
Use a new gasket.

Tightening torque:
25 N·m (2.5 kgf-m, 18.4 ft-lb)



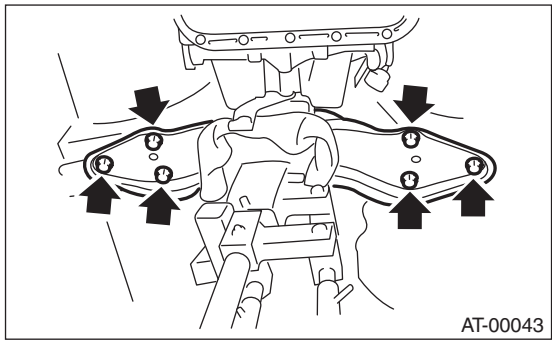
(A) Oil pan
(B) Drain plug (ATF)

12) Remove the center exhaust pipe. (non-turbo model) <Ref. to EX(H4DO)-12, REMOVAL, Center Exhaust Pipe.>
13) Remove the center exhaust pipe. (turbo model) <Ref. to EX(H4DOTC)-7, REMOVAL, Center Exhaust Pipe.>
14) Remove the heat shield cover.



15) Remove the propeller shaft. <Ref. to DS-10, REMOVAL, Propeller Shaft.>
16) Place the transmission jack under the transmission.

NOTE:
Make sure that the support plate of transmission jack does not touch the cross.
17) Remove the transmission rear crossmember bolt.

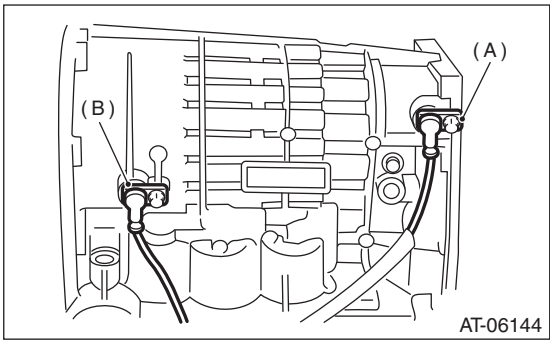


18) Lower the transmission jack.

NOTE:
Do not separate the transmission jack and transmission.
19) Remove the ATF cooler inlet pipe and outlet pipe.

CAUTION:
When removing the ATF cooler outlet pipe, be careful not to lose the ball and spring used together with the retaining screw.

20) Remove the front vehicle speed sensor and torque converter turbine speed sensor.

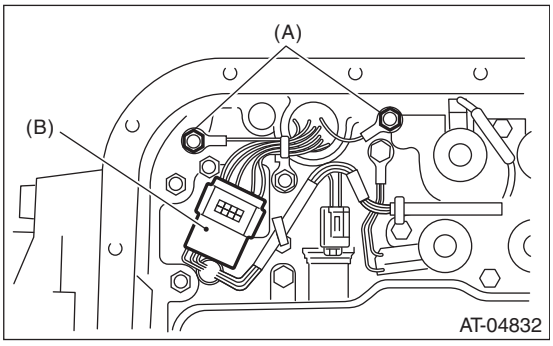


(A) Front vehicle speed sensor
(B) Torque converter turbine speed sensor

21) Remove the oil pan.

CAUTION:
Be careful not to allow foreign matter such as dust or dirt to enter the oil pan.

22) Disconnect the control valve connector and transmission ground terminal.

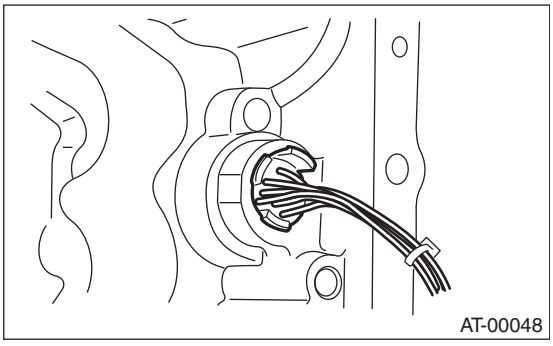


(A) Transmission ground
(B) Control valve connector

23) Remove the transmission harness assembly.

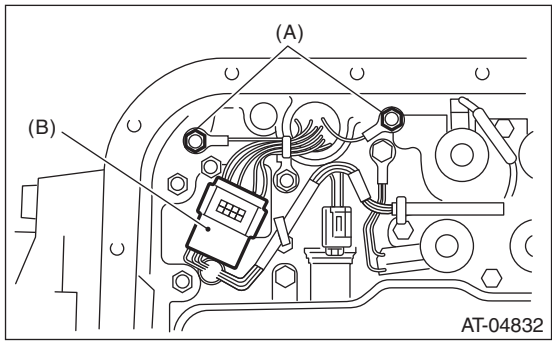
B: INSTALLATION

1) Pass the transmission harness assembly through the hole of the transmission case.



2) Connect the control valve connector and transmission ground.

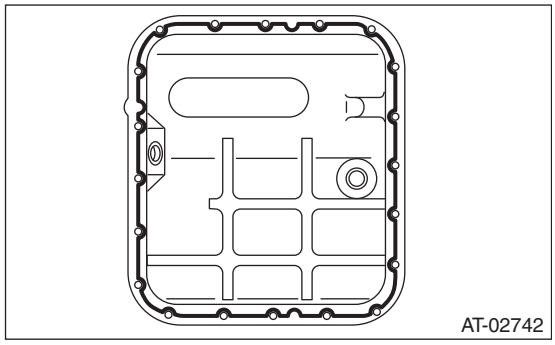
Tightening torque:
8 N·m (0.8 kgf-m, 5.9 ft-lb)



(A) Transmission ground
(B) Control valve connector

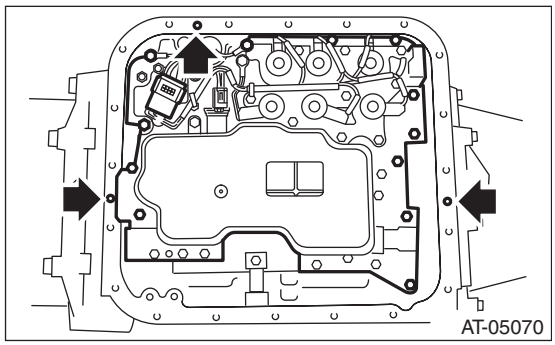
3) Apply proper amount of liquid gasket to the entire oil pan mating surface.

Liquid gasket:
THREE BOND 1217B (Part No. K0877YA020) or equivalent



4) Fill the 3 locations of the transmission case excluding the bolt holes with an ample amount of 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, 3.7 ft-lb)

6) Install the front vehicle speed sensor and torque converter turbine speed sensor.

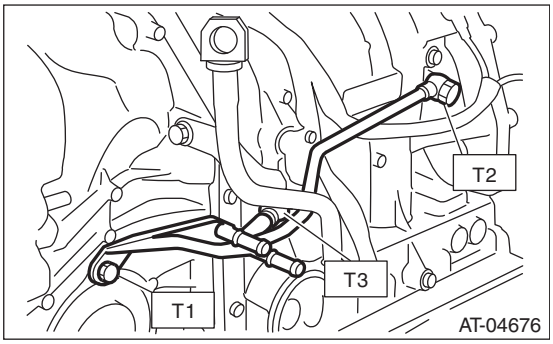
NOTE:
Use new O-rings.

Tightening torque:
7 N·m (0.7 kgf-m, 5.2 ft-lb)

7) Install the ATF cooler inlet and outlet pipes.

NOTE:
Use a new copper washer.

Tightening torque:
T1: 25 N·m (2.5 kgf-m, 18.4 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)



8) Install the transmission rear crossmember bolt.

Tightening torque:
70 N·m (7.1 kgf-m, 51.6 ft-lb)

9) Install the propeller shaft. <Ref. to DS-11, INSTALLATION, Propeller Shaft.>
10) Install the heat shield cover. <Ref. to EI-70, INSTALLATION, Heat Shield Cover.>
11) Install the center exhaust pipe. (non-turbo model) <Ref. to EX(H4DO)-12, INSTALLATION, Center Exhaust Pipe.>
12) Install the center exhaust pipe. (turbo model) <Ref. to EX(H4DOTC)-8, INSTALLATION, Center Exhaust Pipe.>
13) Lower the vehicle.
14) Install the transmission harness connector to the stay.
15) Install the pitching stopper. <Ref. to 4AT-48, INSTALLATION, Transmission Mounting System.>
16) Install the air intake boot assembly. (non-turbo model) <Ref. to IN(H4DO)-13, INSTALLATION, Air Intake Boot.>
17) Install the intercooler. (turbo model) <Ref. to IN(H4DOTC)-13, INSTALLATION, Intercooler.>
18) Connect the battery ground terminal.
19) Fill with the same amount of ATF as drained. <Ref. to 4AT-27, INSPECTION, Automatic Transmission Fluid.>
20) Bleed the air of control valve. <Ref. to 4AT-65, PROCEDURE, Air Bleeding of Control Valve.>
21) Inspect the level of ATF. <Ref. to 4AT-27, INSPECTION, Automatic Transmission Fluid.>
22) Perform the diagnosis again. <Ref. to 4AT(diag)-20, PROCEDURE, Learning Control.>

15. Torque Converter Turbine Speed Sensor

A: REMOVAL

When removing the torque converter turbine speed sensor, refer to “Front Vehicle Speed Sensor”. <Ref. to 4AT-56, REMOVAL, Front Vehicle Speed Sensor.>

B: INSTALLATION

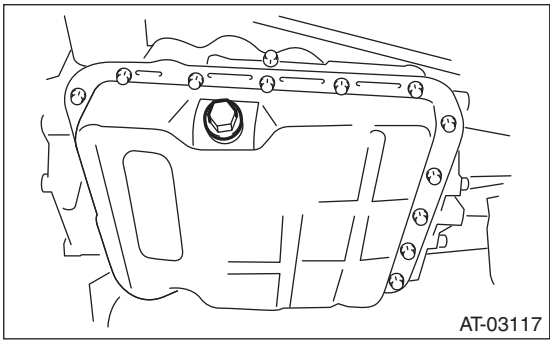
When installing the torque converter turbine speed sensor, refer to “Front Vehicle Speed Sensor”. <Ref. to 4AT-57, INSTALLATION, Front Vehicle Speed Sensor.>

16.Control Valve Strainer

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) to drain ATF.

CAUTION:
Directly after the vehicle has been running or the engine has been long idle running, the ATF is hot. Be careful not to burn yourself.


AT-03117

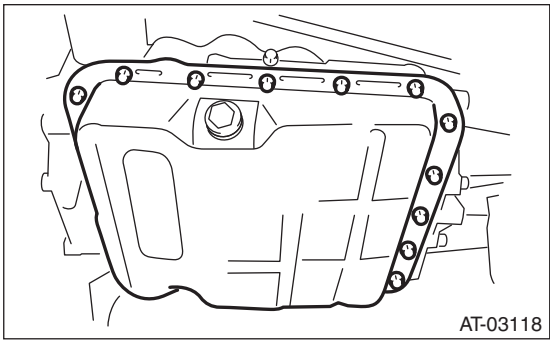
6) Tighten the drain plug (ATF).

NOTE:
Use a new gasket.

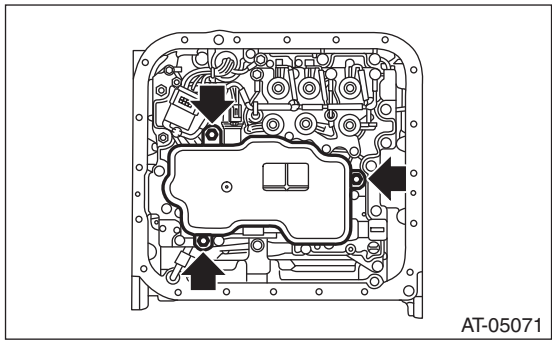
Tightening torque:
25 N·m (2.5 kgf-m, 18.4 ft-lb)

7) Remove the oil pan.

CAUTION:
Be careful not to allow foreign matter such as dust or dirt to enter the oil pan.


AT-03118

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 strainer tightening bolt, and remove control valve strainer from the control valve body.


AT-05071

B: INSTALLATION

1) Check the control valve body for dust and other foreign matter.
2) Attach the control valve strainer to the control valve body.

NOTE:
Use a new control valve strainer.

(1) Apply ATF to the entire perimeter of the O-ring on the control valve strainer.

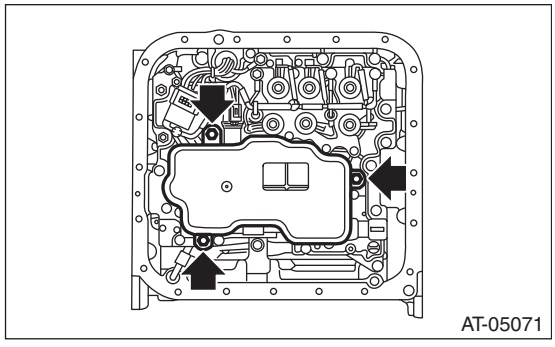
CAUTION:
When applying ATF, avoid adhesion of dust and foreign matter on the O-ring.

(2) Install the control valve strainer to the control valve body from the O-ring side.

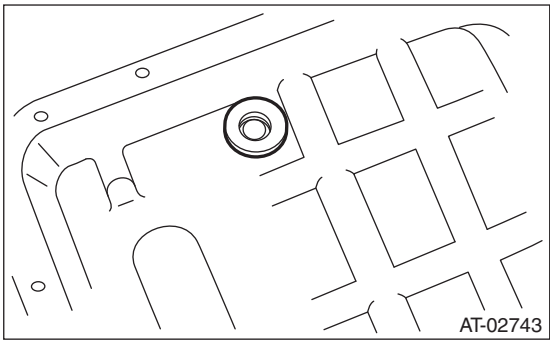
CAUTION:
If the control valve strainer is pushed in at an angle, the O-ring may be damaged. Be sure to push in the control valve strainer straight to install.

(3) Tighten the three bolts.

Tightening torque:
4.6 N·m (0.5 kgf-m, 3.4 ft-lb)

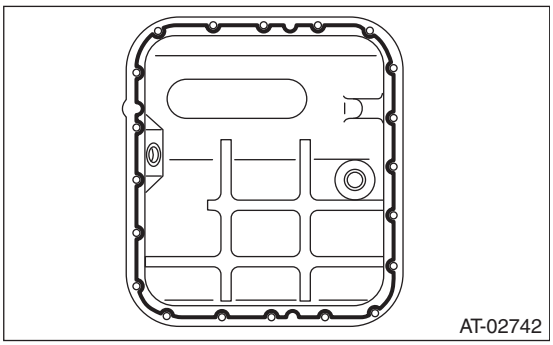

AT-05071

3) Attach the magnet at the specified position of the oil pan.



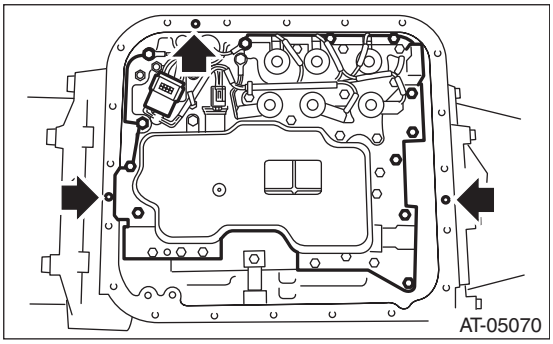
4) Apply proper amount of liquid gasket to the entire oil pan mating surface.

Liquid gasket:
THREE BOND 1217B (Part No. K0877YA020) or equivalent



5) Fill the three holes aside from the bolt holes in the transmission case, with liquid gasket.

Liquid gasket:
THREE BOND 1217B (Part No. K0877YA020) or equivalent



6) Install the oil pan by equally tightening the bolts.

Tightening torque:
5 N·m (0.5 kgf-m, 3.7 ft-lb)

7) Lower the vehicle.
8) Connect the ground cable to battery.
9) Fill ATF from the oil charge pipe. <Ref. to 4AT-27, Automatic Transmission Fluid.>
10) Bleed the air of control valve. <Ref. to 4AT-65, PROCEDURE, Air Bleeding of Control Valve.>
11) Check the ATF level. <Ref. to 4AT-27, INSPECTION, Automatic Transmission Fluid.>

C: INSPECTION

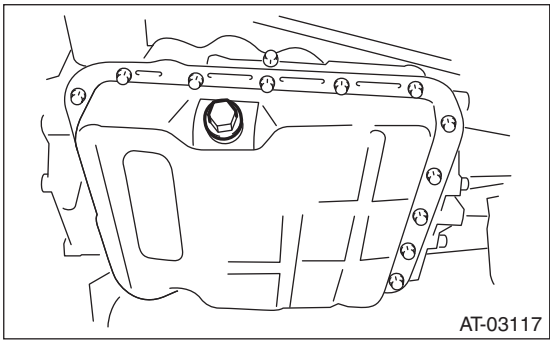
Check the control valve strainer for holes, damages or adhesion of dust and other foreign particles.

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) to drain ATF.

CAUTION:
Directly after the vehicle has been running or the engine has been long idle running, the ATF is hot. Be careful not to burn yourself.



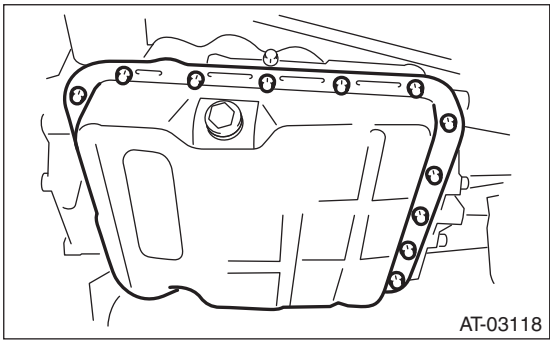
6) Tighten the drain plug (ATF).

NOTE:
Use a new gasket.

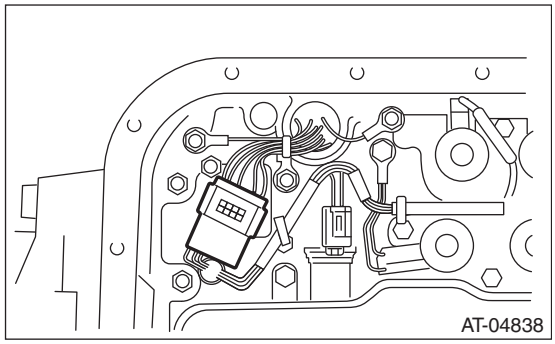
Tightening torque:
25 N·m (2.5 kgf-m, 18.4 ft-lb)

7) Remove the oil pan.

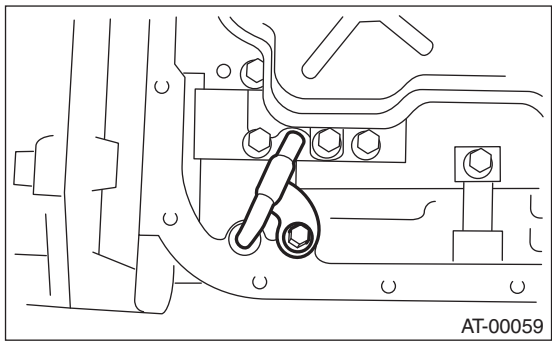
CAUTION:
Be careful not to allow foreign matter such as dust or dirt to enter the oil pan.



8) Remove the magnet.
9) Clean the magnet.
10) Completely remove the remaining liquid gasket on the transmission case and oil pan.
11) Disconnect the control valve connector.

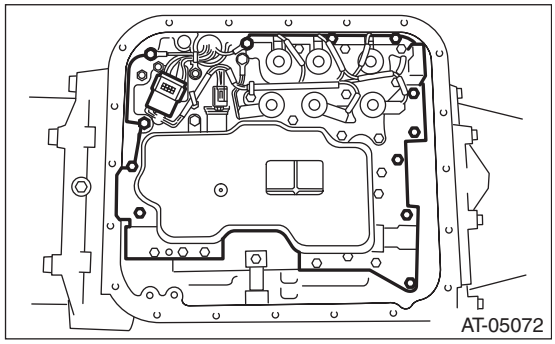


12) Remove the oil cooler pipe.



13) Remove the control valve body.

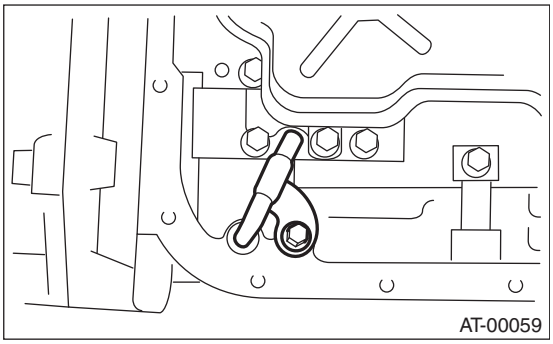
NOTE:
The control valve body is replaced as an assembly only, because it is a non-disassembly part.



B: INSTALLATION

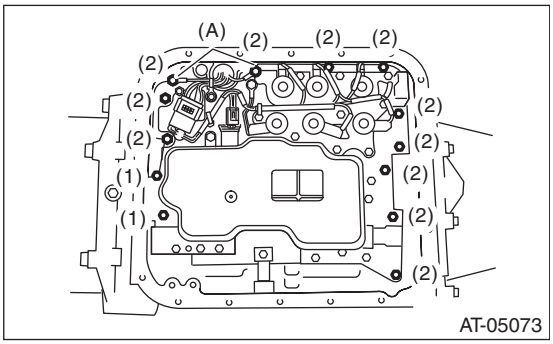
1) Check the control valve body for dust and other foreign matter.
2) Temporarily attach the control valve body to the transmission.
3) Install the oil cooler pipe.

Tightening torque:
8 N·m (0.8 kgf-m, 5.9 ft-lb)



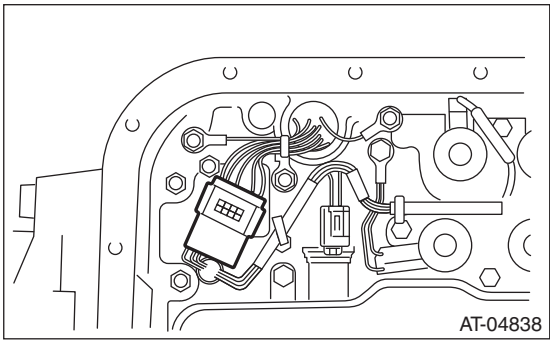
4) Tighten the bolts equally.

Tightening torque:
8 N·m (0.8 kgf-m, 5.9 ft-lb)

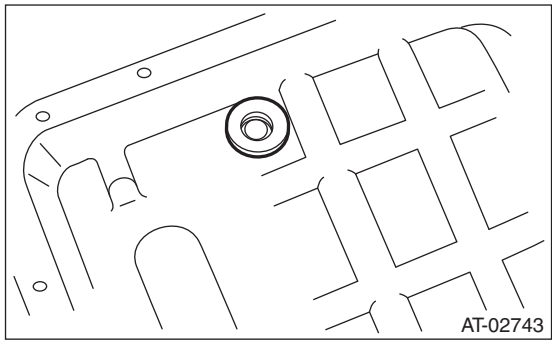


(A) Transmission ground
Bolt length mm (in)
(1) 35 (1.38)
(2) 30 (1.18)

5) Connect the control valve connector.

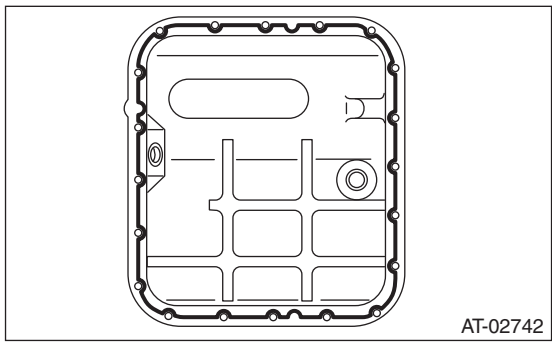


6) Attach the magnet at the specified position of the oil pan.



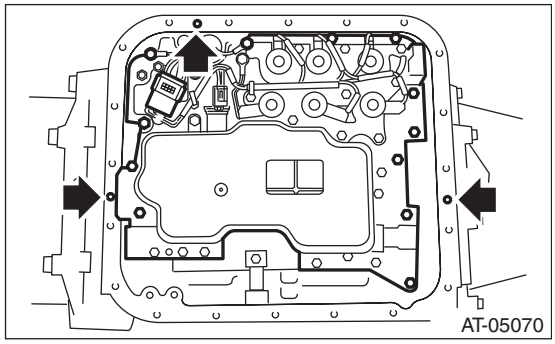
7) Apply proper amount of liquid gasket to the entire oil pan mating surface.

Liquid gasket:
THREE BOND 1217B (Part No. K0877YA020) or equivalent



8) Fill the three holes aside from the bolt holes in the transmission case, with liquid gasket.

Liquid gasket:
THREE BOND 1217B (Part No. K0877YA020) or equivalent



9) Install the oil pan by equally tightening the bolts.

Tightening torque:
5 N·m (0.5 kgf-m, 3.7 ft-lb)

10) Lower the vehicle.
11) Connect the ground cable to battery.
12) Fill ATF from the oil charge pipe. <Ref. to 4AT-27, Automatic Transmission Fluid.>
13) Bleed the air of control valve. <Ref. to 4AT-65, PROCEDURE, Air Bleeding of Control Valve.>

14) Check the ATF level. <Ref. to 4AT-27, INSPECTION, Automatic Transmission Fluid.>
15) Perform the diagnosis again. <Ref. to 4AT(diag)-20, PROCEDURE, Learning Control.>

C: INSPECTION

Check parts for holes, damages or adhesion of dust and other foreign particles

18.Air Bleeding of Control Valve

A: GENERAL DESCRIPTION

• When ATF is drained from the automatic transmission, make sure to bleed air from the control valve after filling with the specified amount of ATF.
• Follow the messages displayed on the Subaru Select Monitor when working.

B: PROCEDURE

1. PREPARATION FOR AIR BLEED

1) Cool down until the ATF temperature displayed on the Subaru Select Monitor is 60°C (140°F) or less.
2) Move the select lever to “P” range.
3) Fully apply the parking brake.
4) Lift up the vehicle.

CAUTION:
While working, be sure to keep the lower edge of the tires 30 cm or more above the ground as vehicle will vibrate.
5) Connect the Subaru Select Monitor to the data link connector.
6) Turn the ignition switch to ON.
7) Turn off all switches causing an electrical load, such as headlights, A/C, seat heater and rear defogger.

2. AIR BLEEDING PROCEDURES

CAUTION:
Do not turn the power of the Subaru Select Monitor OFF during work, and do not disconnect the data link connector.
1) Select {AT related learning & inspecting mode} in the «Transmission Diagnosis» screen of the Subaru Select Monitor.
2) Select {AT air bleed mode} in the «AT related learning/inspection mode» screen of the Subaru Select Monitor.
3) Follow the messages displayed on the Subaru Select Monitor screen when working.

NOTE:
When “AT air bleeding in progress”, the “SPORT” light in the combination meter will flash at 2 Hz, and air bleed will start. When the indicator light flashing at 2 Hz turns off, the following message will appear on the screen.
4) Air bleed is complete when a message “AT air bleeding normally ended.” is displayed.

NOTE:
• If a communication error occurs during air bleed, start the “AT air bleeding” over from the beginning.
• If the message “Execute AT learning again after fixing troubles of the vehicle” appears during air bleed, select [OK] and display the DTC list. After repairing the locations indicated by the DTC, start the “AT air bleeding” over from the beginning.
• If the message “AT air bleeding ended abnormally” is displayed, start the “AT air bleeding” over from the beginning.
• If a communication error occurs during air bleed, the select lever may not move. If the select lever does not move, turn the ignition switch to OFF once, and operate the select lever.

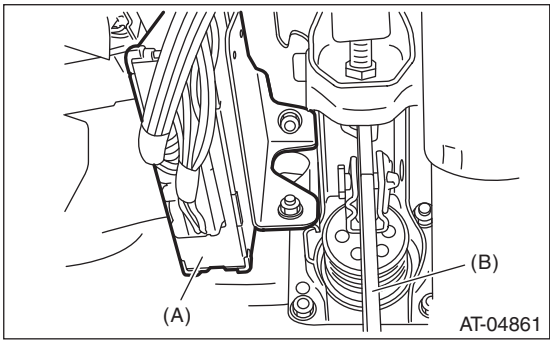
Message	Main reasons for abnormal termination
“AT air bleeding ended abnormally.”	• A failure was detected during AT air bleed • The accelerator was stepped on during AT air bleed. • An unspecified operation was performed during AT air bleed • Brake pedal not stepped on firmly enough. • Parking brake not applied strongly enough. • Abnormal idle speed increase, etc.

• For operation procedures, refer to the “PC application help for Subaru Select Monitor”.

19. Transmission Control Module (TCM)

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the instrument panel lower cover. <Ref. to EI-47, REMOVAL, Instrument Panel Lower Cover.>
3) Disconnect the connector from TCM.



(A) Transmission control module (TCM)
(B) Brake pedal

4) Remove the TCM.

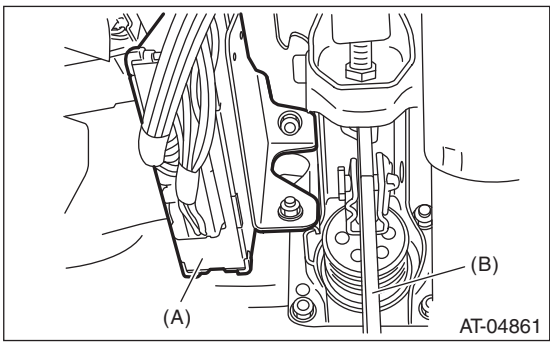
NOTE:
Replace the TCM and bracket as a set.

B: INSTALLATION

1) Install the TCM to the bracket.

CAUTION:
To avoid the damage to bracket and TCM, do not remove after installing TCM to bracket. If installed by mistake, the part must be replaced with a new part.
2) Install the TCM.

Tightening torque:
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)



(A) Transmission control module (TCM)
(B) Brake pedal

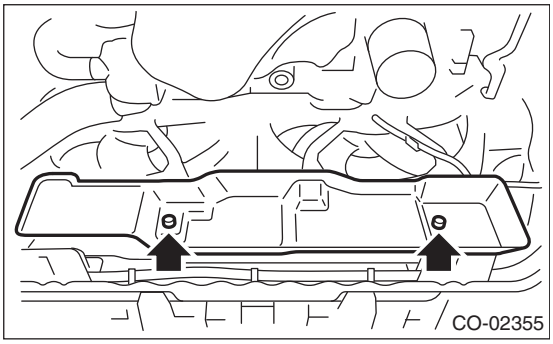
3) Connect the connector to TCM.
4) Install in the reverse order of removal.
5) Perform the diagnosis again. <Ref. to 4AT(diag)-20, PROCEDURE, Learning Control.>

20.ATF Cooler Pipe and Hose

A: REMOVAL

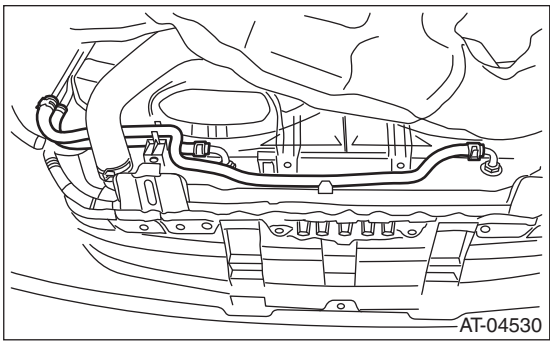
CAUTION:
• Immediately after the vehicle has been running or after idling for a long time, the ATF will be hot. Be careful not to burn yourself.
• If the ATF is spilt over exhaust pipe, wipe it off with cloth to avoid emitting smoke or causing a fire.
• When removing the ATF cooler pipe assembly on vehicle side, be careful not to bend the A/C pipe.

1) Set the vehicle on a lift.
2) Remove the battery.
3) Lift up the vehicle.
4) Remove the under cover. <Ref. to EI-26, REMOVAL, Front Under Cover.>
5) Remove the heat shield cover. (turbo model)



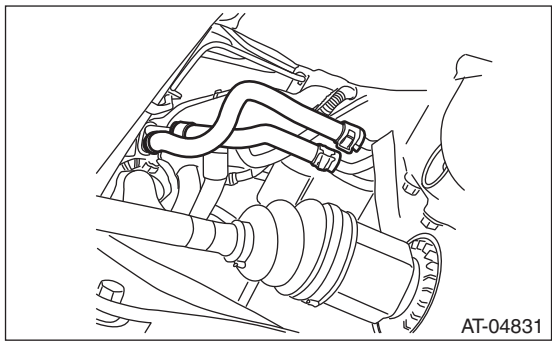
6) Disconnect the ATF cooler hose from the radiator.

NOTE:
• Do not use a screwdriver or other pointed tools.
• If it is hard to remove the ATF cooler hose, wrap the hose with cloth to prevent from damaging it, and while turning with pliers, pull straight out by hand.



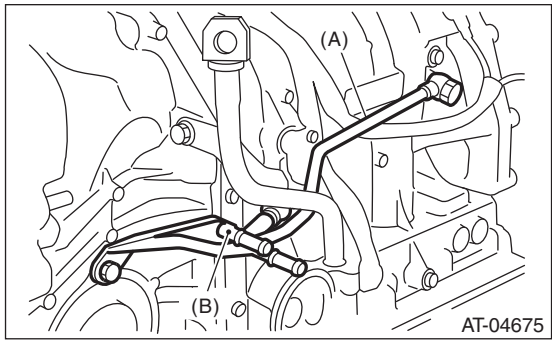
7) Remove the ATF cooler hoses from ATF cooler pipes.

NOTE:
• Do not use a screwdriver or other pointed tools.
• If it is hard to remove the ATF cooler hose, wrap the hose with cloth to prevent from damaging it, and while turning with pliers, pull straight out by hand.



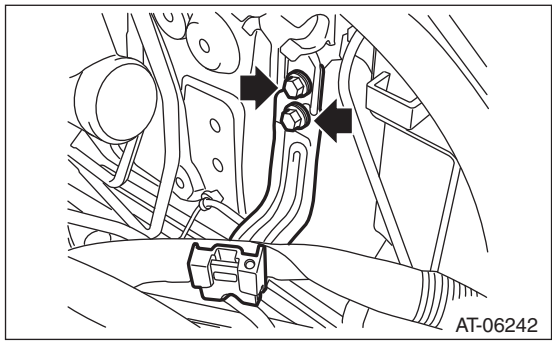
8) Remove the ATF cooler inlet pipe and outlet pipe.

CAUTION:
When disconnecting the ATF cooler outlet pipe, be careful not to lose the ball and spring used together with the retaining screw.

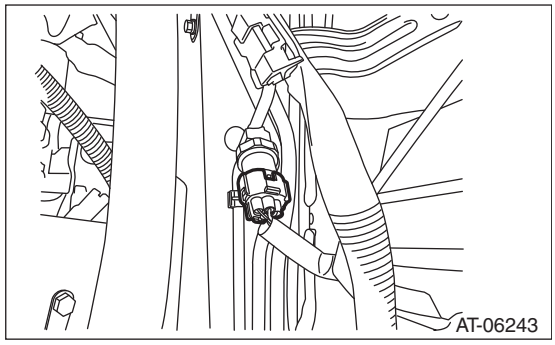


(A) ATF cooler inlet pipe
(B) ATF cooler outlet pipe

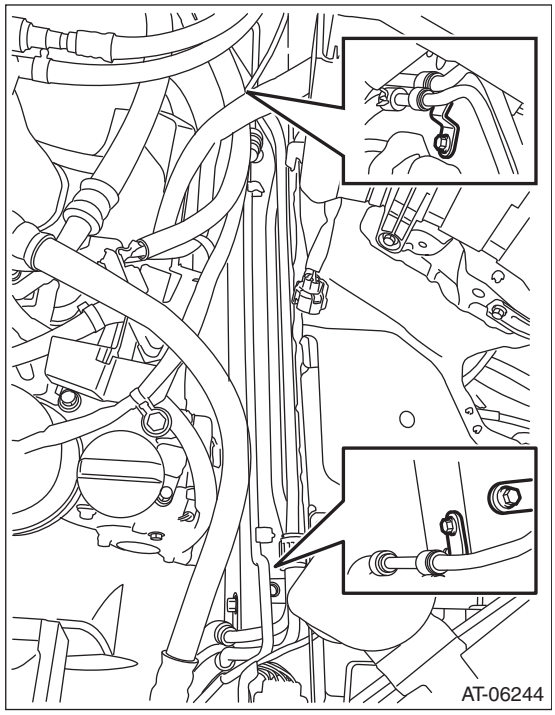
9) Lower the vehicle.
10) Remove the battery cable clip from the bracket, and remove the battery cable bracket.



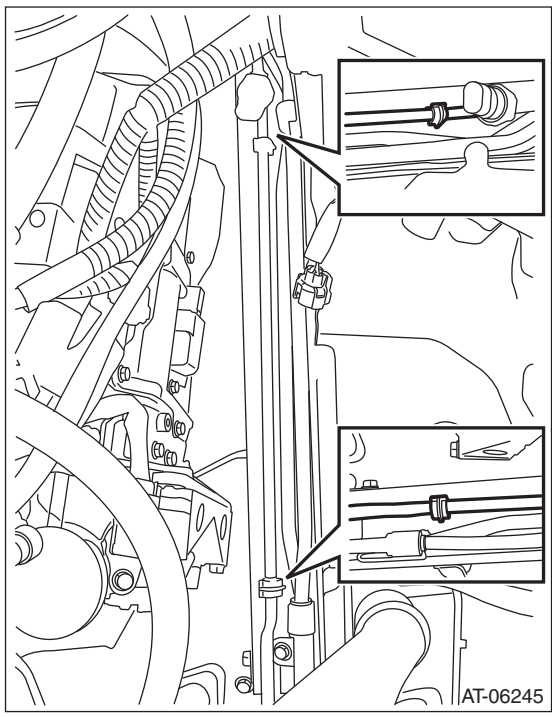
11) Remove the harness connector from the A/C pressure switch.



12) Remove the ATF cooler pipe assembly mounting bolt.



13) Detach the A/C pipe from clip.



14) Remove the ATF cooler pipe from the vehicle.

B: INSTALLATION

CAUTION:
When installing the ATF cooler pipe assembly on vehicle side, be careful not to bend the A/C pipe.

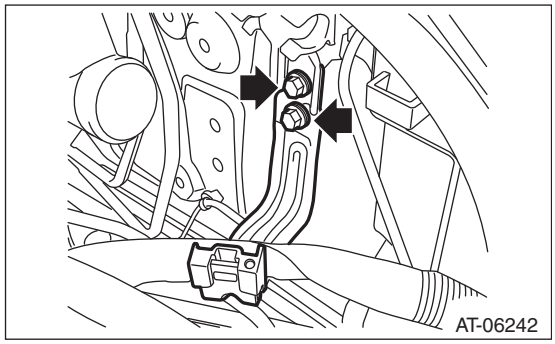
1) Install the ATF cooler pipe to the vehicle.

Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

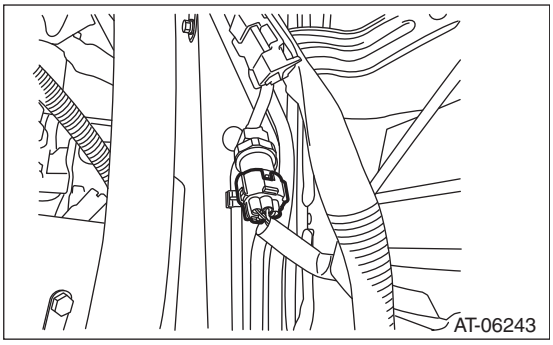
2) Install the A/C pipe to clip.

3) Install the battery cable bracket, and install the battery cable clip to the bracket.

Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)



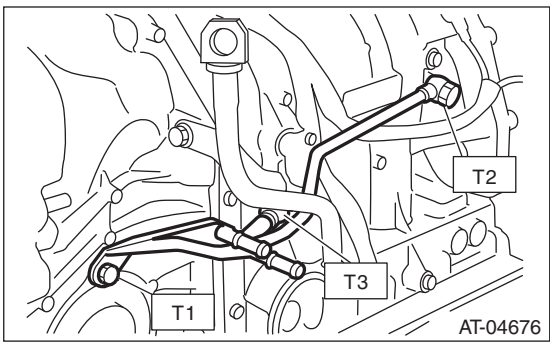
4) Connect the harness connector to the A/C pressure switch.



5) Lift up the vehicle.
6) Install the ATF cooler inlet and outlet pipes.

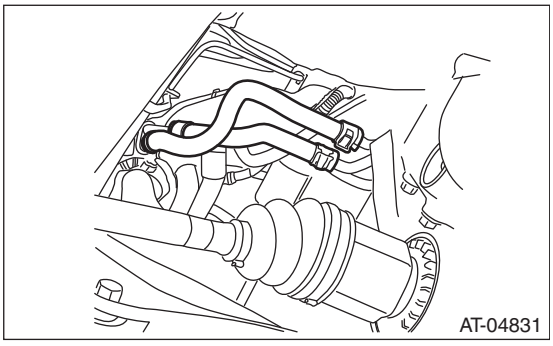
NOTE:
Use a new washer.

Tightening torque:
T1: 25 N·m (2.5 kgf-m, 18.4 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)



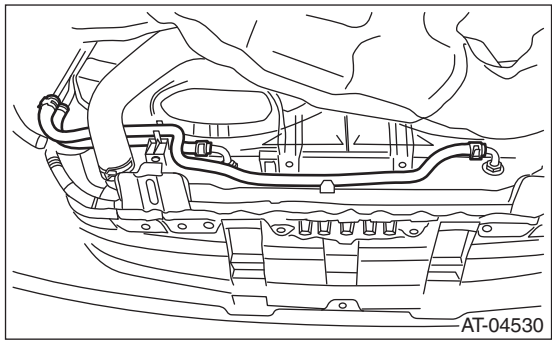
7) Connect the ATF cooler hose to the ATF cooler pipe on the transmission side.

NOTE:
- Use a new ATF cooler hose.
- Install so that the ATF cooler hose is not folded over, excessively bent or twisted.
- Insert the ATF cooler hose to the specified position.



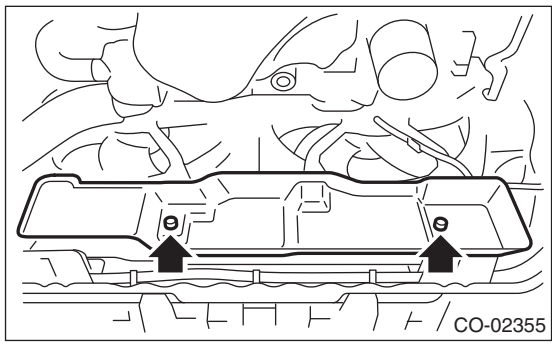
8) Connect the ATF cooler hose to the ATF cooler pipe on the radiator side.

NOTE:
- Use a new ATF cooler hose.
- Install so that the ATF cooler hose is not folded over, excessively bent or twisted.
- Insert the ATF cooler hose to the specified position.



9) Install the heat shield cover. (turbo model)

Tightening torque:
3 N·m (0.3 kgf-m, 2.2 ft-lb)



10) Install the under cover. <Ref. to EI-26, INSTALLATION, Front Under Cover.>
11) Install the battery.
12) Check the ATF level. <Ref. to 4AT-27, INSPECTION, Automatic Transmission Fluid.>

NOTE:
Make sure there are no ATF leaks in joints between the transmission, radiator, ATF cooler pipes, and ATF cooler hoses.

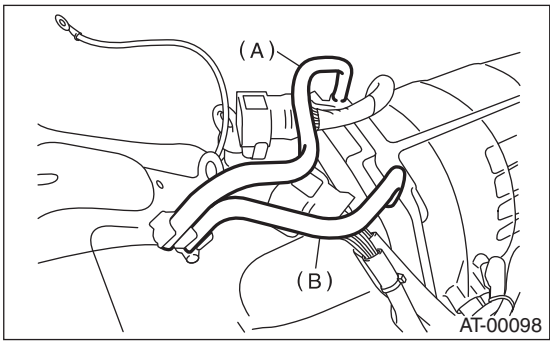
C: INSPECTION

Repair or replace any faulty ATF cooler hoses, ATF cooler pipes, clamps, and washers found in the inspection below.
1) Check for ATF leaks in joints between the transmission, radiator, ATF cooler pipes, and ATF cooler hoses.
2) Check the clamp for deformation.
3) Lightly bend the ATF cooler hose and check for cracks in the surface or other damages.
4) Pinch the ATF cooler 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 ATF cooler hose.

21.Air Breather Hose

A: REMOVAL

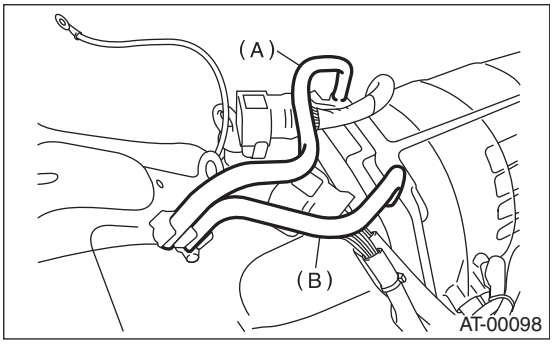
1) Remove the air intake boot assembly. (non-turbo model) <Ref. to IN(H4DO)-13, REMOVAL, Air Intake Boot.>
2) Remove the intercooler. (turbo model) <Ref. to IN(H4DOTC)-13, REMOVAL, Intercooler.>
3) Disconnect the air breather hose.



(A) Air breather hose (Transmission case)
(B) Air breather hose (Oil pump housing)

B: INSTALLATION

1) Install the air breather hose.



(A) Air breather hose (Transmission case)
(B) Air breather hose (Oil pump housing)

2) Install the air intake boot assembly. (non-turbo model) <Ref. to IN(H4DO)-13, INSTALLATION, Air Intake Boot.>
3) Install the intercooler. (turbo model) <Ref. to IN(H4DOTC)-13, INSTALLATION, Intercooler.>

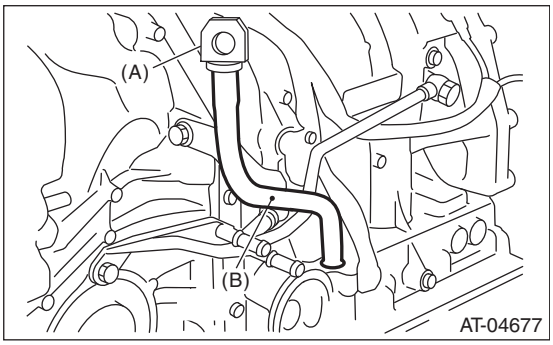
C: INSPECTION

Check that the air breather hose is not cracked or clogged.

22.Oil Charge Pipe

A: REMOVAL

1) Remove the air intake boot assembly. (non-turbo model) <Ref. to IN(H4DO)-13, REMOVAL, Air Intake Boot.>
2) Remove the intercooler. (turbo model) <Ref. to IN(H4DOTC)-13, REMOVAL, Intercooler.>
3) Remove the starter.
4) Remove the oil charge pipe, and then remove the O-ring from the flange side.



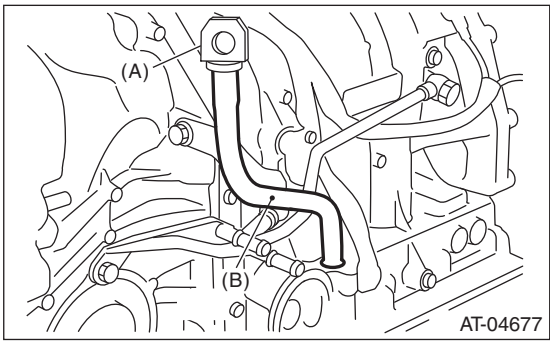
(A) ATF level gauge
(B) Oil charge pipe

B: INSTALLATION

1) Install the oil charge pipe with O-ring.

NOTE:
- Use new gaskets and O-rings.
- Apply ATF to the O-ring.

Tightening torque:
38 N·m (3.9 kgf-m, 28.0 ft-lb)



(A) ATF level gauge
(B) Oil charge pipe

2) Install the starter.
3) Install the air intake boot assembly. (non-turbo model) <Ref. to IN(H4DO)-13, INSTALLATION, Air Intake Boot.>
4) Install the intercooler. (turbo model) <Ref. to IN(H4DOTC)-13, INSTALLATION, Intercooler.>

C: INSPECTION

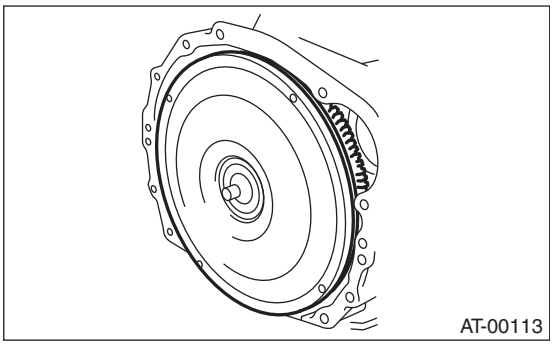
Make sure the oil charge pipe is not deformed or damaged.

23. Torque Converter Clutch Assembly

A: REMOVAL

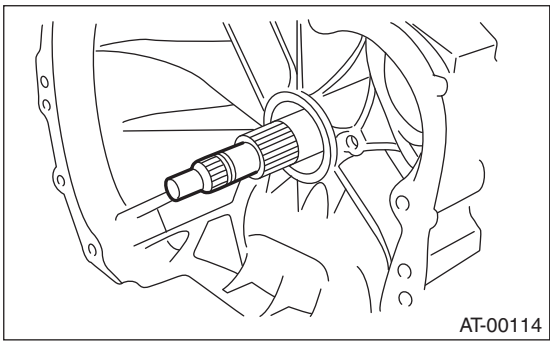
1) Remove the transmission assembly from the vehicle. <Ref. to 4AT-35, REMOVAL, Automatic Transmission Assembly.>
2) Pull out the torque converter clutch assembly and oil pump shaft horizontally.

NOTE:
Be sure not to scratch the inside of 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.



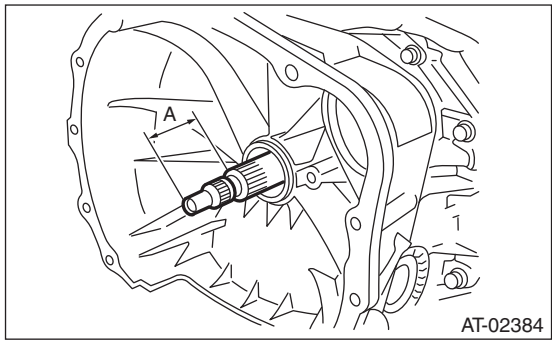
4) Remove the oil pump shaft from torque converter clutch assembly as necessary.

B: INSTALLATION

1) When the oil pump shaft is removed, install the shaft to converter case.
2) Install the oil pump shaft to the torque converter clutch assembly, and make sure the clip is secured on the groove.
3) Apply ATF to the O-ring, insert the input shaft while rotating the shaft slowly by hand, and check the amount of protrusion.

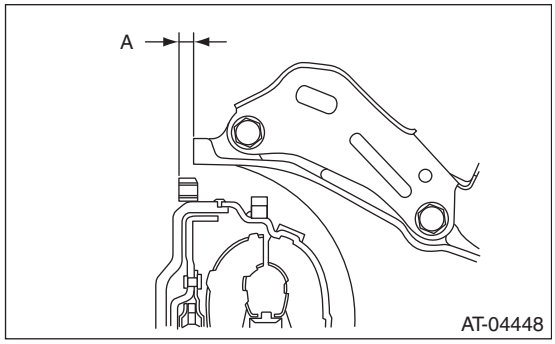
NOTE:
Use new O-rings.

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 stator shaft section of the oil pump cover inappropriately.
5) Slowly rotate the shaft by hand to engage the splines securely, then check that dimension “A” is within the specified range.

Dimension A:
2.7 — 2.9 mm (0.106 — 0.114 in)



6) Install the transmission assembly to the vehicle. <Ref. to 4AT-41, INSTALLATION, Automatic Transmission Assembly.>

C: INSPECTION

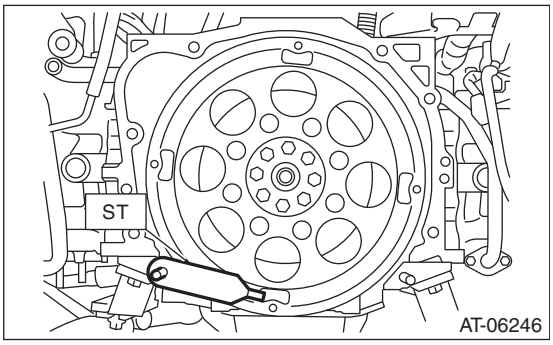
Make sure the ring gear and protrusion of the torque converter clutch assembly end are not deformed or damaged.

24.Drive Plate

A: REMOVAL

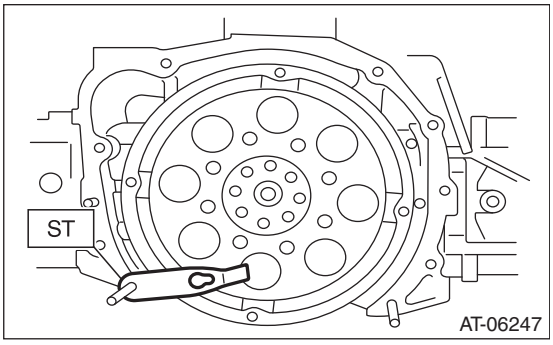
1. NON-TURBO MODEL

1) Remove the transmission assembly from the vehicle. <Ref. to 4AT-35, REMOVAL, Automatic Transmission Assembly.>
2) Use the ST to lock the crankshaft, and remove the drive plate.
ST 498497300 CRANKSHAFT STOPPER



2. TURBO MODEL

1) Remove the transmission assembly from the vehicle. <Ref. to 4AT-35, REMOVAL, Automatic Transmission Assembly.>
2) Use the ST to lock the crankshaft, and remove the drive plate.
ST 498497100 CRANKSHAFT STOPPER

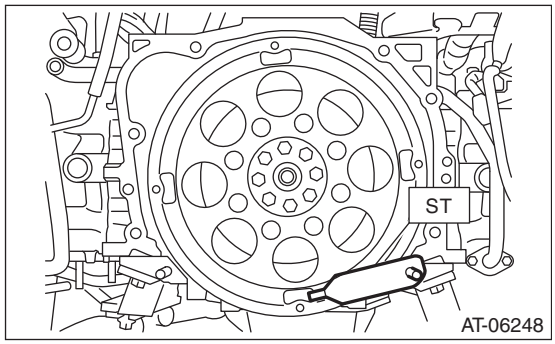


B: INSTALLATION

1. NON-TURBO MODEL

1) Temporarily tighten the crankshaft position sensor plate, drive plate and reinforcement drive plate.

NOTE:
Align the knock pin hole of the crankshaft position sensor plate to the crankshaft knock pin to secure the knock pin.
2) Set the ST.
ST 498497300 CRANKSHAFT STOPPER

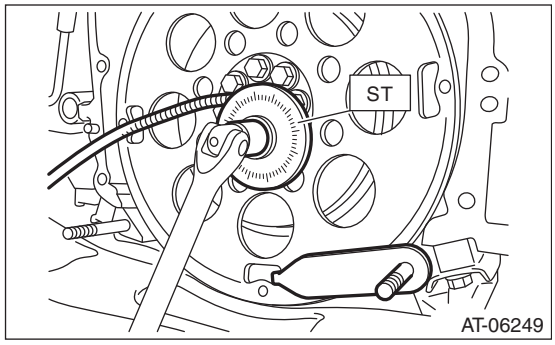


3) Tighten the drive plate mounting bolt in two stages.
(1) Tighten the drive plate mounting bolt.

Tightening torque:
30 N·m (3.1 kgf-m, 22.1 ft-lb)

(2) While checking the tightening angle with the ST, further tighten the drive plate mounting bolts.

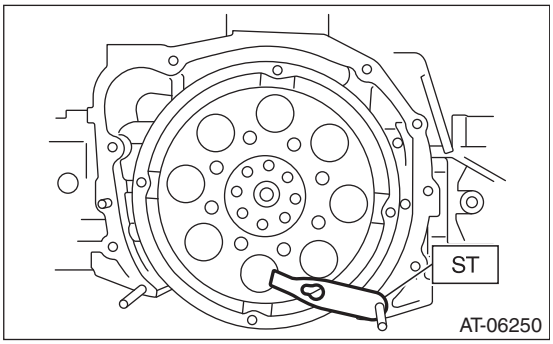
Tightening angle:
30° — 35°
ST 18854AA000 ANGLE GAUGE



4) Install the transmission assembly to the vehicle. <Ref. to 4AT-41, INSTALLATION, Automatic Transmission Assembly.>

2. TURBO MODEL

1) Temporarily tighten the drive plate and reinforcement drive plate.
2) Set the ST.
ST 498497100 CRANKSHAFT STOPPER



3) Tighten the drive plate mounting bolt in three stages.
(1) Tighten the drive plate mounting bolt.

Tightening torque:
10 N·m (1.0 kgf-m, 7.4 ft-lb)

(2) Additionally tighten the drive plate mounting bolts.

Tightening torque:
40 N·m (4.1 kgf-m, 29.5 ft-lb)

(3) While checking the tightening angle with the ST, further tighten the drive plate mounting bolts.

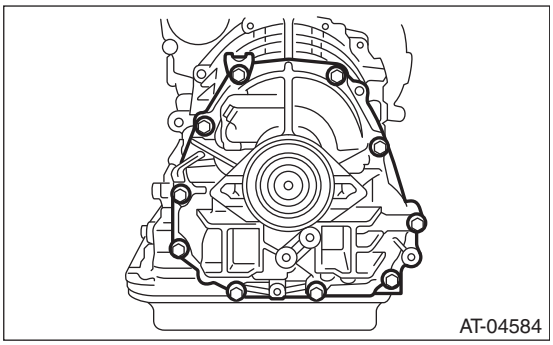
Tightening angle:
30°±5°

ST 18854AA000 ANGLE GAUGE
4) Install the transmission assembly to the vehicle. <Ref. to 4AT-41, INSTALLATION, Automatic Transmission Assembly.>

25.Extension Case

A: REMOVAL

1) Remove the transmission assembly. <Ref. to 4AT-35, REMOVAL, Automatic Transmission Assembly.>
2) Separate the transmission case and extension case section.

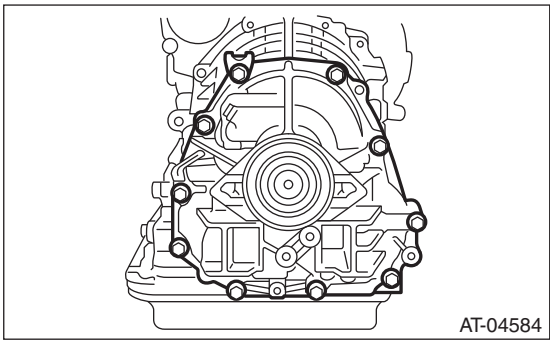


B: INSTALLATION

1) Apply vaseline to the contact surface, and attach the selected thrust needle bearing to the end surface of the reduction drive gear.

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, 18.4 ft-lb)

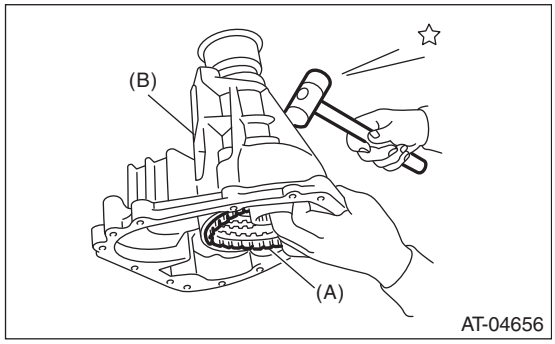


5) Install the transmission assembly. <Ref. to 4AT-41, INSTALLATION, Automatic Transmission Assembly.>

C: DISASSEMBLY

1) Hit the extension case lightly with a plastic hammer, and take out the transfer clutch.

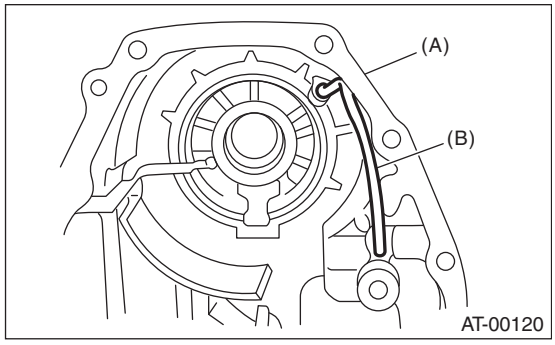
NOTE:
Be careful not to damage the oil seal of the extension case.



(A) Transfer clutch
(B) Extension case

2) Remove the transfer clutch pipe from the extension case.

NOTE:
Be careful not to deform the transfer clutch 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.

D: ASSEMBLY

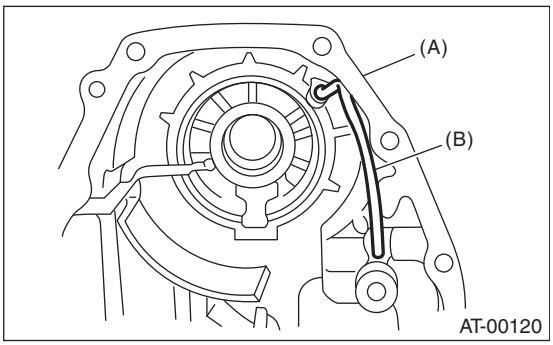
1) Press-fit the oil seal using the ST and press.

NOTE:
Use a new oil seal.
ST 498057300 INSTALLER

2) Press-fit the dust cover.

3) Install the transfer clutch pipe to the extension case.

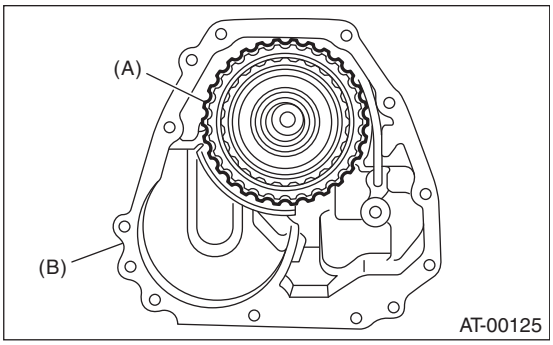
NOTE:
Be careful not to deform the transfer clutch pipe.



(A) Extension case
(B) Transfer clutch pipe

4) Install the transfer clutch assembly to the extension case.

NOTE:
- Be careful not to damage the seal ring.
- Insert the transfer clutch assembly all the way to the bottom of the bearing shoulder.



(A) Transfer clutch ASSY
(B) Extension case

E: INSPECTION

- Blow with compressed air to make sure the transfer clutch pipe and extension case routes are not clogged or leaking.
- Inspect the extension end play, and adjust it to within the standard value. <Ref. to 4AT-80, ADJUSTMENT, Transfer Clutch.>

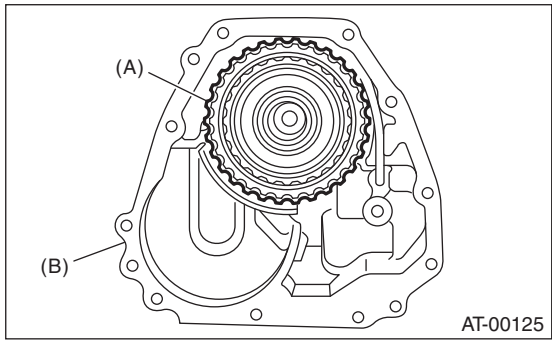
26.Transfer Clutch

A: REMOVAL

1) Remove the transmission assembly from vehicle body. <Ref. to 4AT-35, REMOVAL, Automatic Transmission Assembly.>
2) Remove the extension case, and then remove the transfer clutch. <Ref. to 4AT-75, REMOVAL, Extension Case.> <Ref. to 4AT-75, DISASSEMBLY, Extension Case.>

B: INSTALLATION

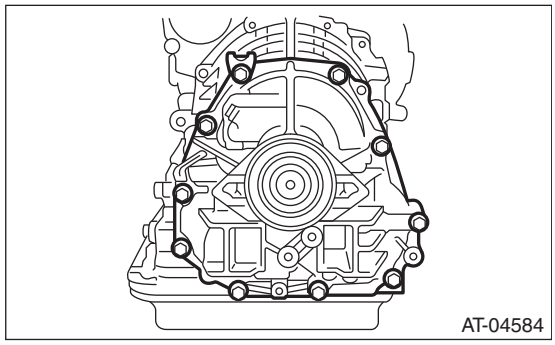
1) Select the thrust needle bearing. <Ref. to 4AT-80, ADJUSTMENT, Transfer Clutch.>
2) Install the transfer clutch assembly to the extension case.



(A) Transfer clutch ASSY
(B) Extension case

3) Tighten bolts to secure the extension case.

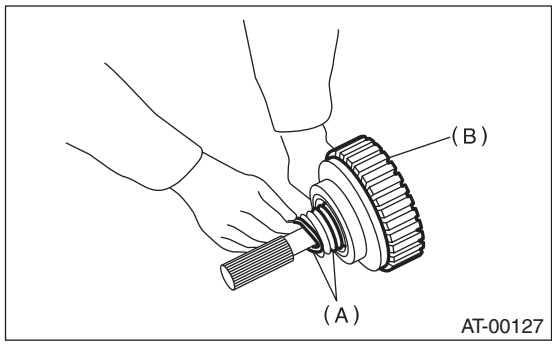
Tightening torque:
25 N·m (2.5 kgf-m, 18.4 ft-lb)



4) Install the transmission assembly to the vehicle. <Ref. to 4AT-41, INSTALLATION, Automatic Transmission Assembly.>

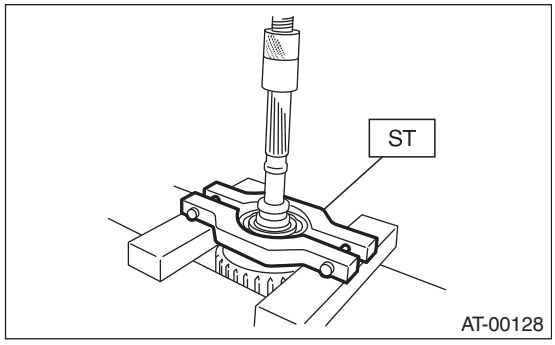
C: DISASSEMBLY

1) Remove the sealing from the rear drive shaft.

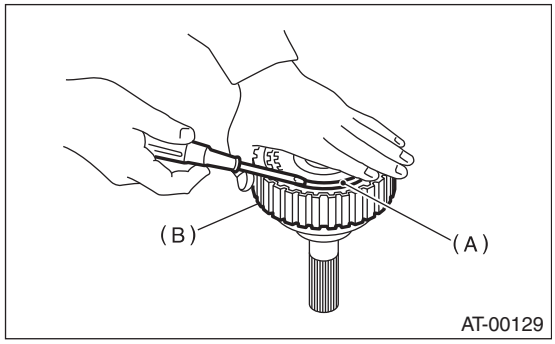


(A) Seal ring
(B) Rear drive shaft

2) Remove the ball bearing using the ST and the press.
ST 498077600 REMOVER

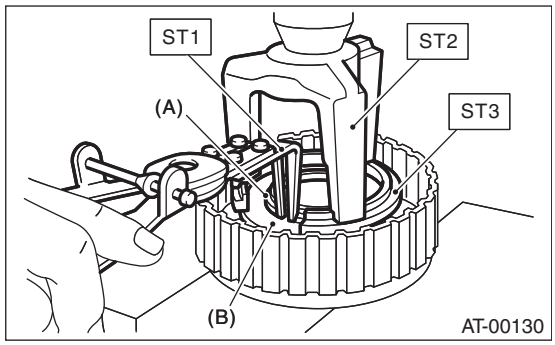


3) Using a flat tip screwdriver, etc. remove the snap ring, and take out the retaining plate, drive plate and driven plate.



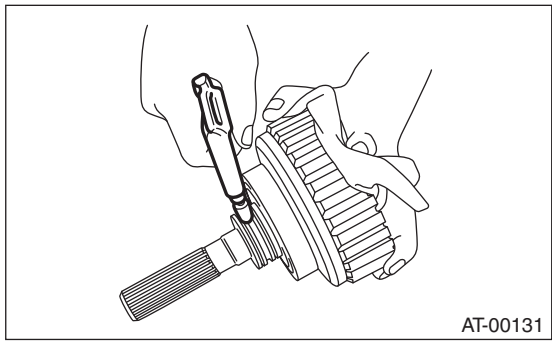
(A) Snap ring
(B) Rear drive shaft

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



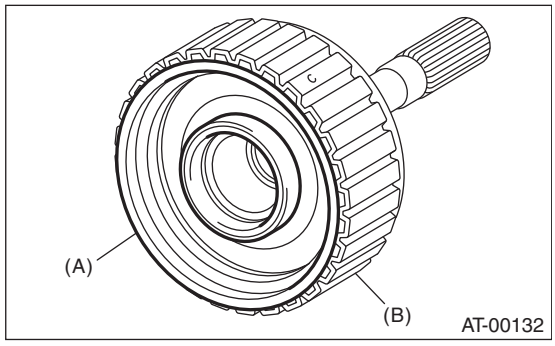
(A) Snap ring
(B) Transfer clutch piston seal

5) Apply compressed air to the rear drive shaft, to remove the transfer clutch piston.



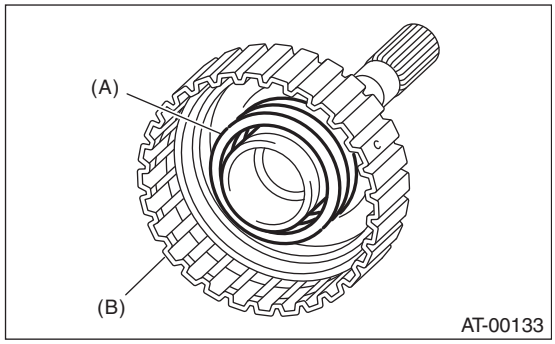
D: ASSEMBLY

1) Attach the transfer clutch piston to the rear drive shaft.



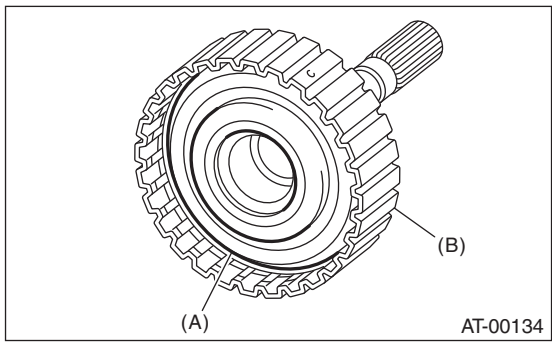
(A) Transfer clutch piston
(B) Rear drive shaft

2) Install the return spring to transfer clutch piston.



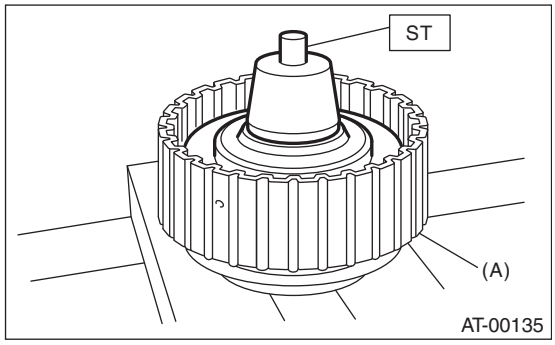
(A) Return spring
(B) Rear drive shaft

3) Apply ATF to the lip of transfer clutch piston seal, then install.



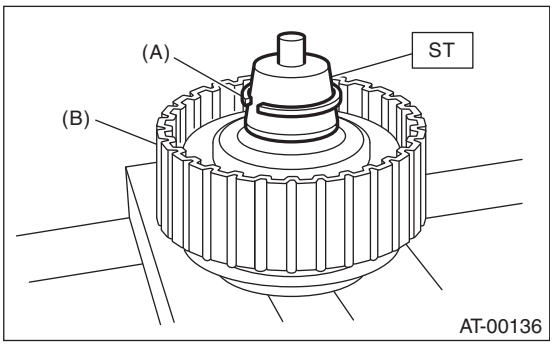
(A) Transfer clutch piston seal
(B) Rear drive shaft

4) Attach the ST to the rear drive shaft.
ST 499257300 SNAP RING OUTER GUIDE



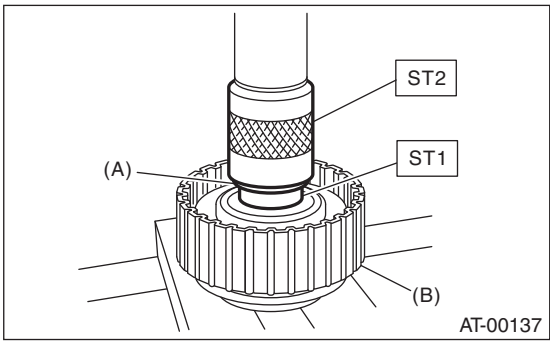
(A) Rear drive shaft

5) Install the snap ring to the ST.
ST 499257300 SNAP RING OUTER GUIDE



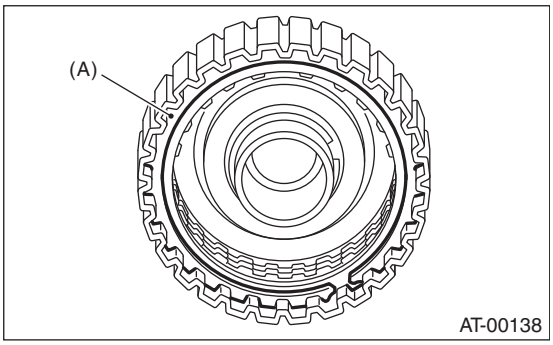
(A) Snap ring
(B) Rear drive shaft

6) Install the snap ring to the rear drive shaft using ST1 and ST2.
ST1 499257300 SNAP RING OUTER GUIDE
ST2 499247400 INSTALLER



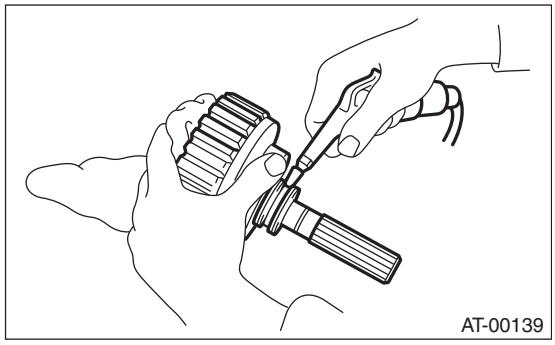
(A) Snap ring
(B) Rear drive shaft

7) Install the driven plate, drive plate, retaining plate and snap ring.



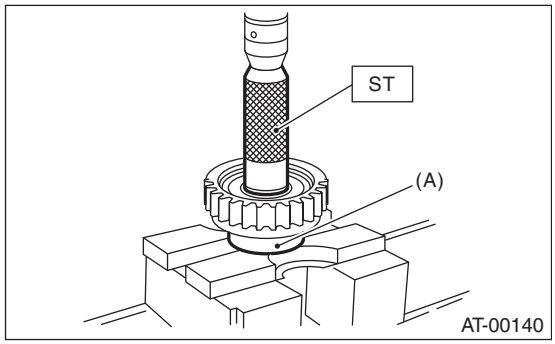
(A) Snap ring

8) Apply compressed air to see if the assembled parts move smoothly.



9) Check the clearance between the snap ring and retaining plate. <Ref. to 4AT-80, INSPECTION, Transfer Clutch.>
10) Press-fit the ball bearing using the ST.

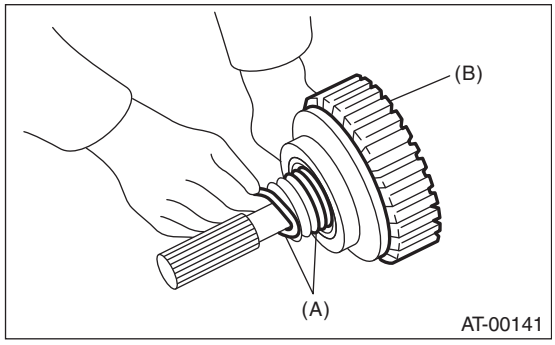
NOTE:
Use a new ball bearing.
ST 899580100 INSTALLER



(A) Ball bearing

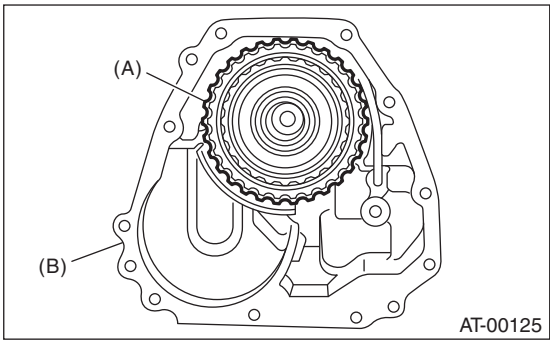
11) Apply vaseline to the seal ring and attach it to the seal ring groove of the rear drive shaft.

NOTE:
- Use a new seal ring.
- 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 ASSY
(B) Extension case

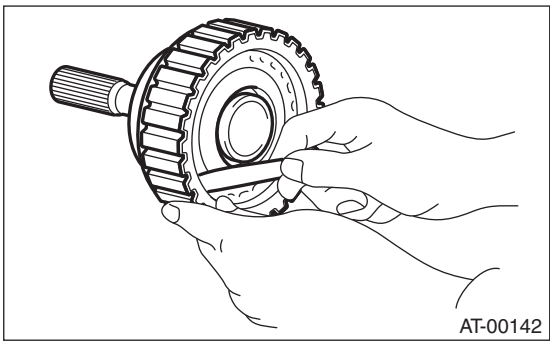
E: INSPECTION

- 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.
- Inspect the extension end play, and adjust it to within the standard value. <Ref. to 4AT-80, ADJUSTMENT, Transfer Clutch.>

1) Check the clearance between the snap ring and retaining plate.
2) Before measuring clearance, place same thickness shims on both sides to prevent the retaining plate from tilting.
3) If the clearance exceeds the service limits, replace the plate set (drive plate and driven plate), and select and adjust a retaining plate to be within the initial standard value.

Initial standard:
0.7 — 1.1 mm (0.028 — 0.043 in)

Limit thickness:
1.6 mm (0.063 in)

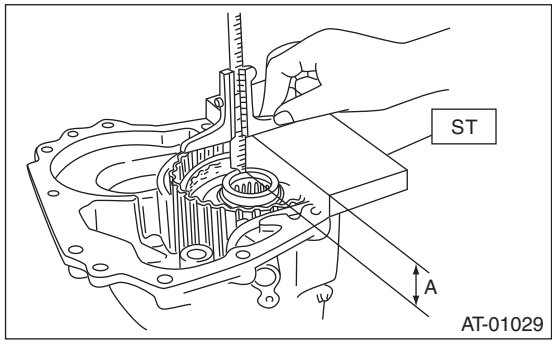


Retaining plate	
Part No.	Thickness mm (in)
31593AA151	3.3 (0.130)
31593AA161	3.7 (0.146)
31593AA171	4.1 (0.161)
31593AA181	4.5 (0.177)

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.

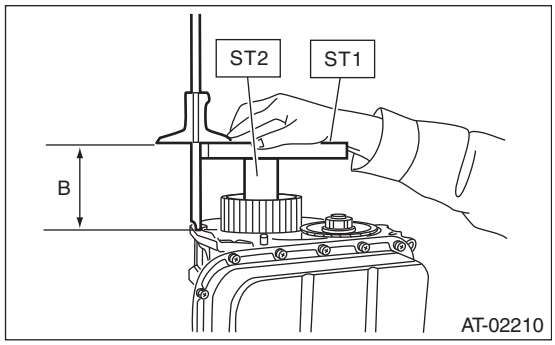
F: ADJUSTMENT

1) Measure the distance “A” from the end of ST to the rear drive shaft using the ST.
ST 398643600 GAUGE



A Measured value

2) Measure distance “B” from the transmission case mating surface to the end of ST using ST1 and ST2.
ST1 398643600 GAUGE
ST2 499577000 GAUGE



B Measured value

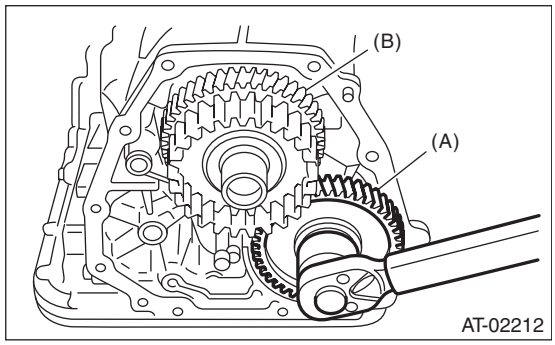
3) Calculation formula:
T = A – B + 35.4 mm
[T = A – B + 1.3937 in]
T: Thrust needle bearing thickness
A: Distance from the end of the ST to end of rear drive shaft
B: Distance from the mating surface of the transmission case to the end of the ST

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)

27.Reduction Driven Gear

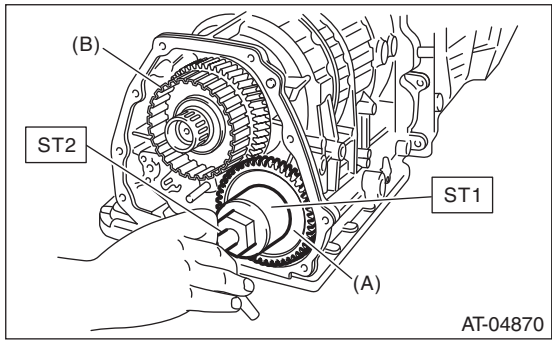
A: REMOVAL

1) Remove the transmission assembly from the vehicle. <Ref. to 4AT-35, REMOVAL, Automatic Transmission Assembly.>
2) Separate the extension case from the transmission case. <Ref. to 4AT-75, REMOVAL, Extension Case.>
3) Set the range select lever to the “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.
ST1 499737000 PULLER
ST2 899524100 PULLER SET



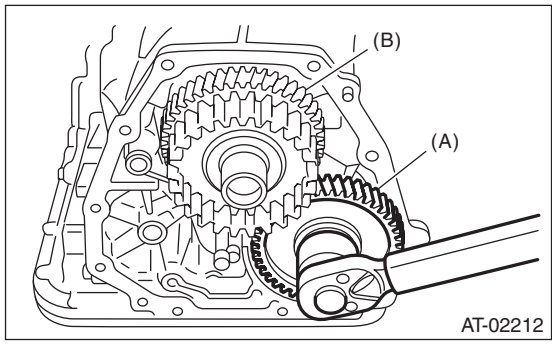
(A) Reduction driven gear
(B) Reduction drive gear

B: INSTALLATION

1) Set the range select lever to the “P” range.
2) Using a plastic hammer, install the reduction driven gear assembly and the new washer, and tighten the drive pinion lock nut.

NOTE:
Use a new washer and lock nut.

Tightening torque:
100 N·m (10.2 kgf-m, 73.8 ft-lb)

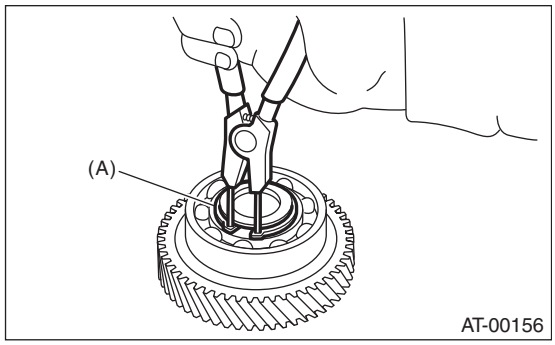


(A) Reduction driven gear
(B) Reduction drive gear

3) After tightening, stake the lock nut securely.
4) Connect the transmission case with the extension case. <Ref. to 4AT-75, INSTALLATION, Extension Case.>
5) Install the transmission assembly to the vehicle. <Ref. to 4AT-41, INSTALLATION, Automatic Transmission Assembly.>

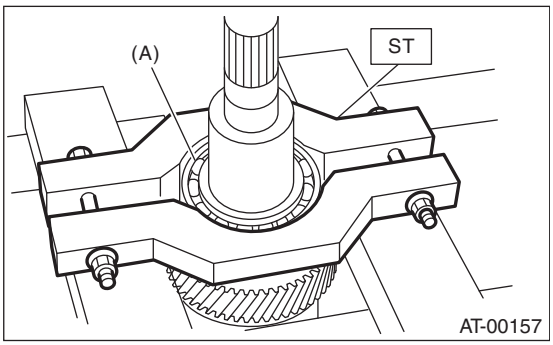
C: DISASSEMBLY

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



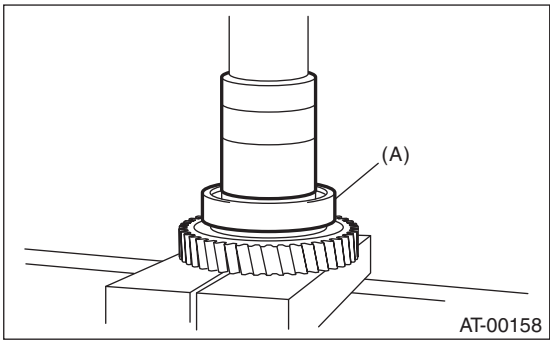
(A) Ball bearing

3) Remove the gear inner groove snap ring from the reduction driven gear.

D: ASSEMBLY

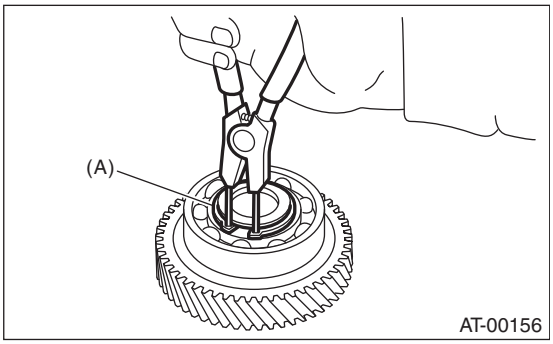
1) Install the snap ring to the gear inner grove on the reduction driven gear.
2) Install the ball bearing to the reduction driven gear using a press.

NOTE:
Use a new ball bearing.



(A) Ball bearing

3) Install the snap ring to reduction driven gear.



(A) Snap ring

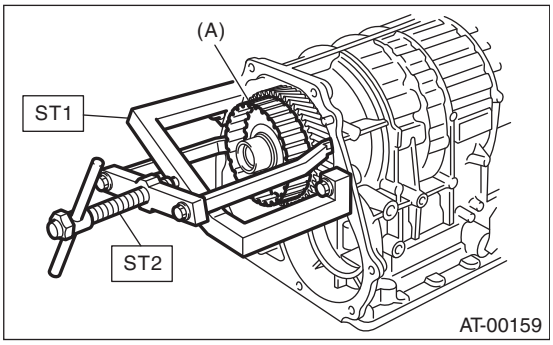
E: INSPECTION

Check the ball bearing and gear for break or damage.

28.Reduction Drive Gear

A: REMOVAL

1) Remove the transmission assembly from the vehicle. <Ref. to 4AT-35, REMOVAL, Automatic Transmission Assembly.>
2) Separate the extension case from the transmission case. <Ref. to 4AT-75, REMOVAL, Extension Case.>
3) Remove the reduction driven gear. <Ref. to 4AT-82, REMOVAL, Reduction Driven Gear.>
4) Using the ST, extract the reduction drive gear assembly.
ST1 499737100 PULLER SET
ST2 899524100 PULLER SET

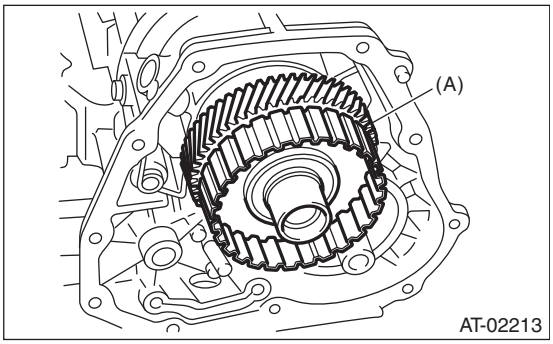


(A) Reduction drive gear ASSY

B: INSTALLATION

1) Install the reduction drive gear assembly.

NOTE:
Press-fit it to the bottom of bearing shoulder completely.

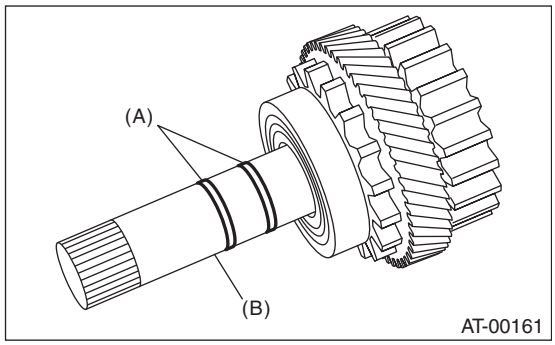


(A) Reduction drive gear ASSY

2) Install the reduction driven gear. <Ref. to 4AT-82, INSTALLATION, Reduction Driven Gear.>
3) Connect the transmission case with the extension case. <Ref. to 4AT-75, INSTALLATION, Extension Case.>
4) Install the transmission assembly to the vehicle. <Ref. to 4AT-41, INSTALLATION, Automatic Transmission Assembly.>

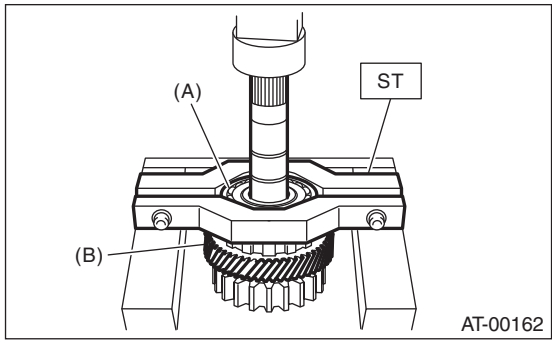
C: DISASSEMBLY

1) Remove the seal ring from the reduction drive shaft.



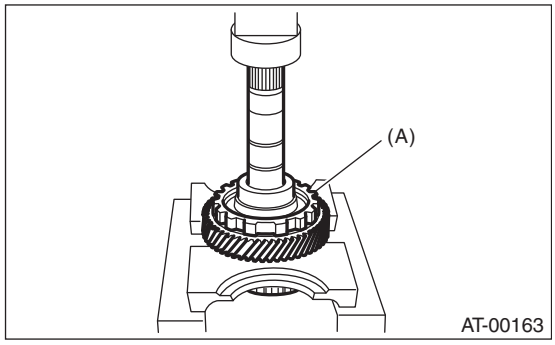
(A) Seal ring
(B) Reduction drive shaft

2) Remove the ball bearing from the reduction drive shaft using the ST.
ST 498077600 REMOVER



(A) Ball bearing
(B) Reduction drive gear

3) Remove the reduction drive gear from the reduction drive shaft using the press.



(A) Reduction drive gear

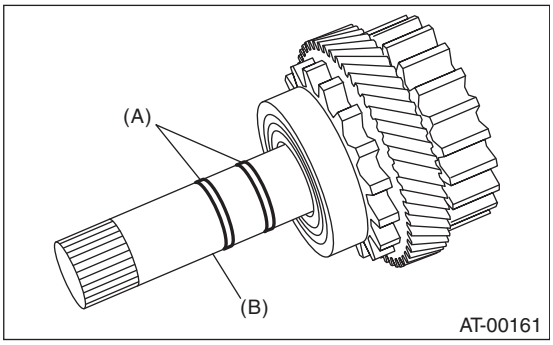
D: ASSEMBLY

1) Press-fit the reduction drive gear to the reduction drive shaft.
2) Press-fit the ball bearing to the reduction drive shaft.

NOTE:
Use a new ball bearing.

3) Apply vaseline onto the seal ring outer surface and shaft grooves.
4) Apply ATF to the seal ring and install it to the reduction drive shaft.

NOTE:
Use a new seal ring.



(A) Seal ring
(B) Reduction drive shaft

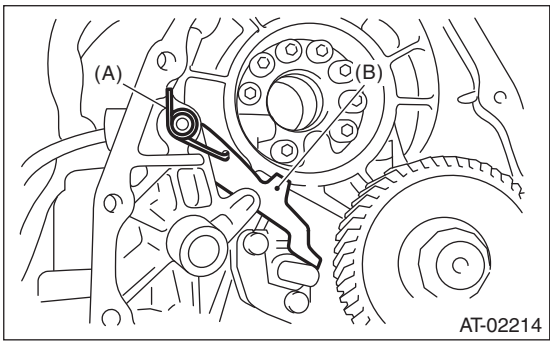
E: INSPECTION

- Rotate the bearing by hand, and check that it rotates smoothly.
- Check parts for holes, damage or adhesion of dust and other foreign particles.
- Inspect the extension end play, and adjust it to within the standard value. <Ref. to 4AT-80, ADJUSTMENT, Transfer Clutch.>

29.Parking Pawl

A: REMOVAL

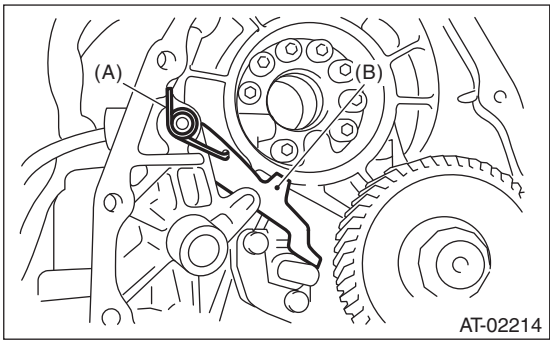
1) Remove the transmission assembly from the vehicle. <Ref. to 4AT-35, REMOVAL, Automatic Transmission Assembly.>
2) Separate the extension case from the transmission case. <Ref. to 4AT-75, REMOVAL, Extension Case.>
3) Remove the reduction drive gear. <Ref. to 4AT-84, REMOVAL, Reduction Drive Gear.>
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-84, INSTALLATION, Reduction Drive Gear.>
3) Install the extension case. <Ref. to 4AT-75, INSTALLATION, Extension Case.>
4) Install the transmission assembly to the vehicle. <Ref. to 4AT-41, INSTALLATION, Automatic Transmission Assembly.>

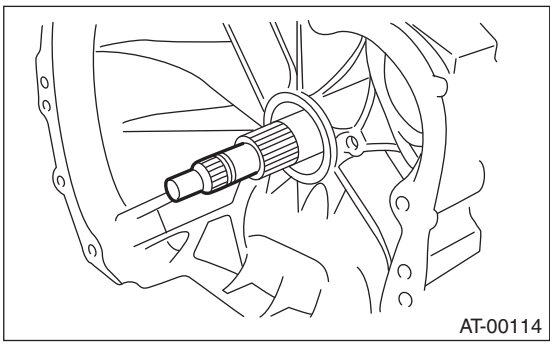
C: INSPECTION

Check the tab of the parking pole on the reduction gear for wear or other damage.

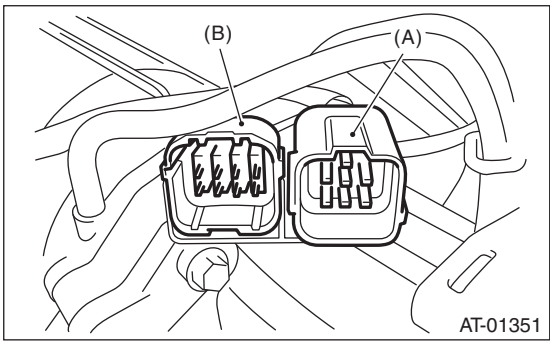
30.Converter Case

A: REMOVAL

1) Remove the transmission assembly from the vehicle. <Ref. to 4AT-35, REMOVAL, Automatic Transmission Assembly.>
2) Pull out the torque converter clutch assembly. <Ref. to 4AT-72, REMOVAL, Torque Converter Clutch Assembly.>
3) Remove the input shaft.



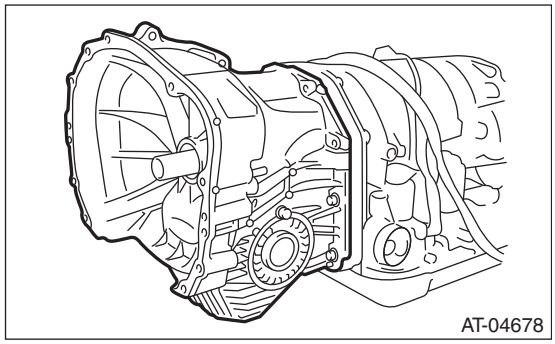
4) Lift up the lever on the rear side of transmission harness connector, and then disconnect it from the stay.
5) Disconnect the inhibitor switch connector from the stay.



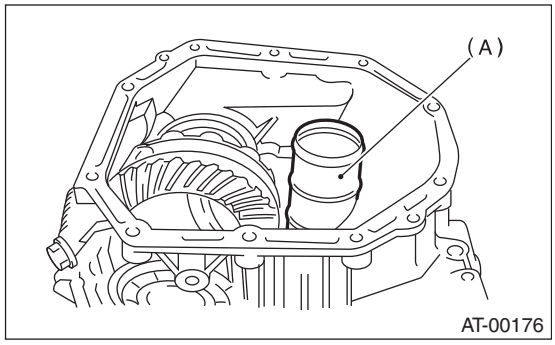
(A) Transmission harness connectors
(B) Inhibitor switch connector

6) Remove the air breather hose. <Ref. to 4AT-70, REMOVAL, Air Breather Hose.>
7) Remove the oil charge pipe. <Ref. to 4AT-71, REMOVAL, Oil Charge Pipe.>
8) Remove the ATF cooler inlet pipe and outlet pipe. <Ref. to 4AT-67, 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.
• Be careful not to loosen the rubber seal.



10) Remove the seal pipe.



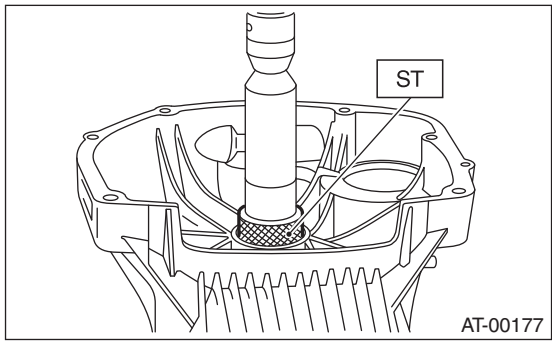
(A) Seal pipe

11) Remove the front differential assembly. <Ref. to 4AT-102, REMOVAL, Front Differential Assembly.>
12) Remove the oil seal from converter case.

B: INSTALLATION

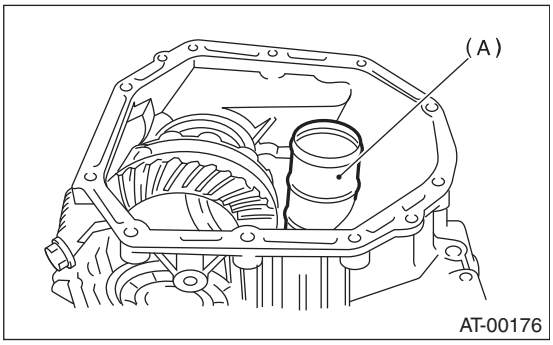
1) Check the appearance of each component and clean them.
2) Press-fit the oil seal to the converter case using ST.

NOTE:
Use a new oil seal.
ST 398437700 DRIFT



3) Install the front differential assembly to the case. <Ref. to 4AT-102, INSTALLATION, Front Differential Assembly.>
4) Install the right and left side retainers. <Ref. to 4AT-106, ADJUSTMENT, Front Differential Assembly.>
5) Install the seal pipe to the converter case.

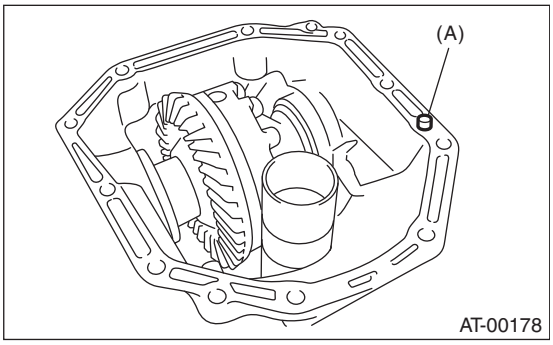
NOTE:
Use a new seal pipe.



(A) Seal pipe

6) Install the rubber seal to the converter case.

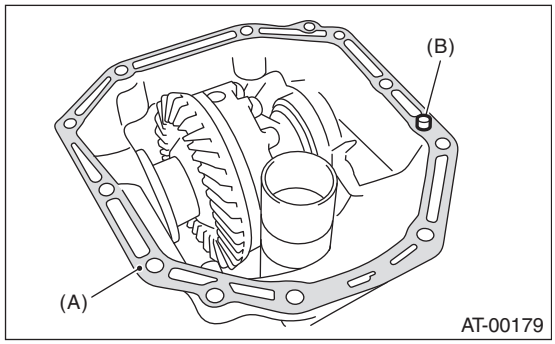
NOTE:
Use a new rubber seal.



(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

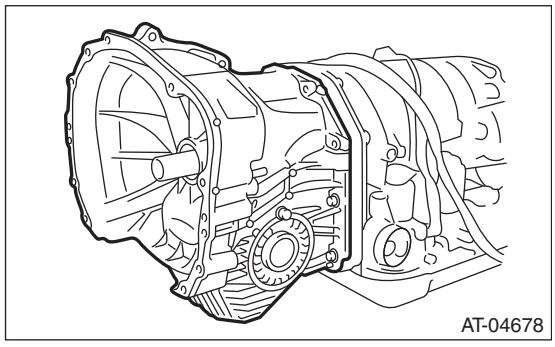


(A) THREE BOND 1215
(B) Rubber seal

8) Install the converter case without damaging bushing and oil seal.

NOTE:
Use new bolts for the oil charge pipe.

Tightening torque:
Oil charge pipe section
38 N·m (3.9 kgf-m, 28.0 ft-lb)
Excluding the oil charge pipe section
41 N·m (4.2 kgf-m, 30.2 ft-lb)

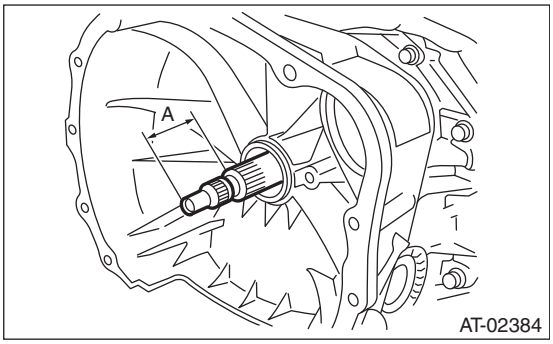


9) Insert the inhibitor switch connector and transmission harness connector onto the stay.
10) Install the air breather hose. <Ref. to 4AT-70, INSTALLATION, Air Breather Hose.>
11) Install the ATF cooler pipe. <Ref. to 4AT-68, INSTALLATION, ATF Cooler Pipe and Hose.>
12) Install the oil charge pipe with O-ring. <Ref. to 4AT-71, INSTALLATION, Oil Charge Pipe.>

13) Apply ATF to the O-ring, insert the input shaft while rotating the shaft slowly by hand, and check the amount of protrusion.

NOTE:
Use new O-rings.

Normal protrusion A:
50 — 55 mm (1.97 — 2.17 in)



14) Install the torque converter clutch assembly. <Ref. to 4AT-72, INSTALLATION, Torque Converter Clutch Assembly.>
15) Install the transmission assembly to the vehicle. <Ref. to 4AT-41, INSTALLATION, Automatic Transmission Assembly.>

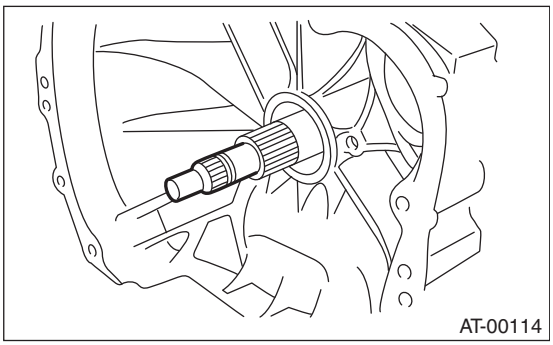
C: INSPECTION

Measure the backlash, and then adjust it to be within specification. <Ref. to 4AT-99, ADJUSTMENT, Drive Pinion Shaft Assembly.>

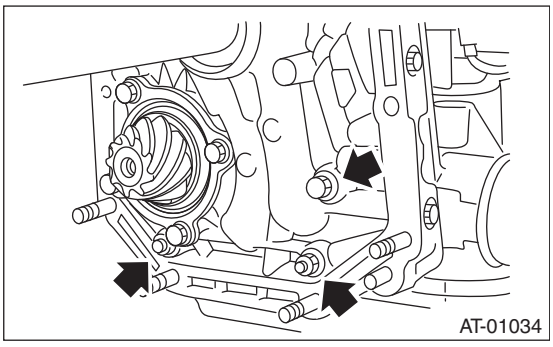
31.Oil Pump Housing

A: REMOVAL

1) Remove the transmission assembly from the vehicle. <Ref. to 4AT-35, REMOVAL, Automatic Transmission Assembly.>
2) Pull out the torque converter clutch assembly. <Ref. to 4AT-72, REMOVAL, Torque Converter Clutch Assembly.>
3) Remove the input shaft.

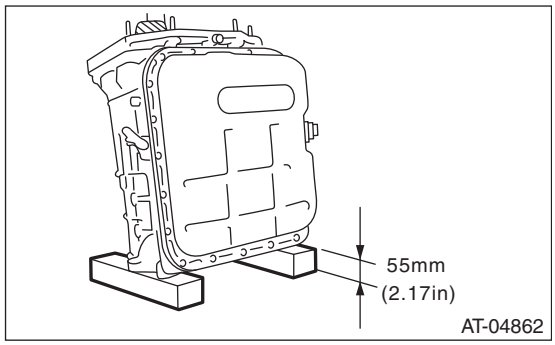


4) Lift up the lever on the rear side of transmission harness connector, and then remove it from the stay.
5) Remove the inhibitor switch connector from the stay.
6) Remove the oil charge pipe. <Ref. to 4AT-71, REMOVAL, Oil Charge Pipe.>
7) Remove the ATF cooler inlet pipe and outlet pipe. <Ref. to 4AT-67, 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-75, REMOVAL, Extension Case.>
10) Remove the reduction drive gear. <Ref. to 4AT-84, REMOVAL, Reduction Drive Gear.>
11) Remove the reduction driven gear. <Ref. to 4AT-82, REMOVAL, Reduction Driven Gear.>
12) Loosen the oil pump housing mounting bolts.

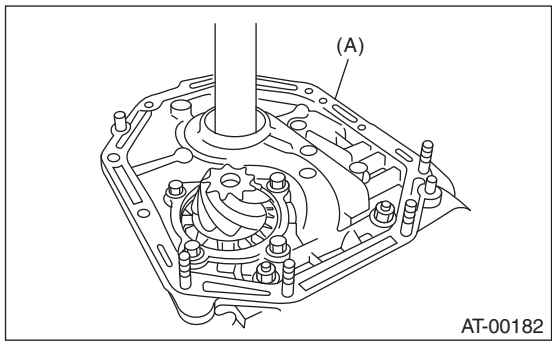


13) Place two wooden blocks on the workbench, and stand the transmission case with the rear end facing down.

NOTE:
- Be careful not to scratch the rear mating surface of the transmission case.
- Check the height of the wooden blocks to avoid damaging the parking rod and drive pinion that are protruding from the mating surface.



14) Remove the oil pump housing and adjusting thrust washer.

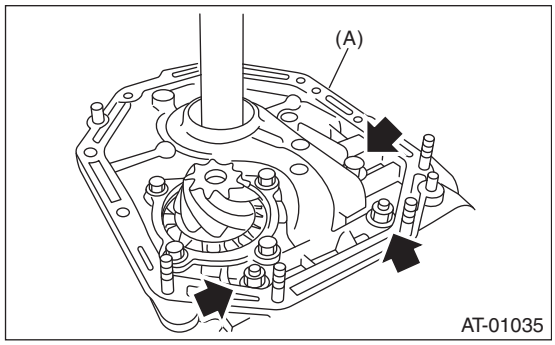


(A) Oil pump housing

B: INSTALLATION

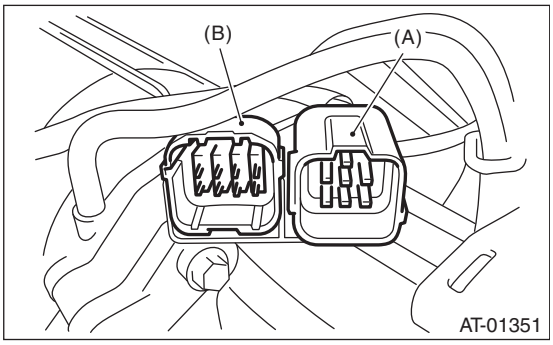
1) Secure the oil pump housing with two nuts and a bolt.

Tightening torque:
42 N·m (4.3 kgf-m, 31.0 ft-lb)



(A) Oil pump housing

2) Install the converter case assembly to the transmission case assembly. <Ref. to 4AT-87, INSTALLATION, Converter Case.>
3) Install the reduction driven gear. <Ref. to 4AT-82, INSTALLATION, Reduction Driven Gear.>
4) Install the reduction drive gear. <Ref. to 4AT-84, INSTALLATION, Reduction Drive Gear.>
5) Connect the transmission case with the extension case. <Ref. to 4AT-75, INSTALLATION, Extension Case.>
6) Insert the inhibitor switch connector and transmission harness connector onto the stay.

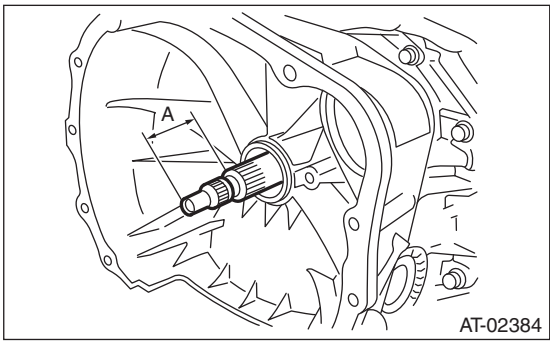


(A) Transmission harness connectors
(B) Inhibitor switch connector

7) Install the ATF cooler pipe. <Ref. to 4AT-68, INSTALLATION, ATF Cooler Pipe and Hose.>
8) Install the oil charge pipe together with an O-ring. <Ref. to 4AT-71, INSTALLATION, Oil Charge Pipe.>
9) Apply ATF to the O-ring, insert the input shaft while rotating the shaft slowly by hand, and check the amount of protrusion.

NOTE:
Use new O-rings.

Normal protrusion A:
50 — 55 mm (1.97 — 2.17 in)

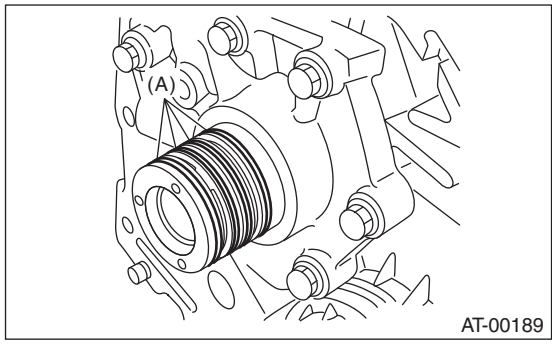


10) Install the torque converter clutch assembly. <Ref. to 4AT-72, INSTALLATION, Torque Converter Clutch Assembly.>
11) Install the transmission assembly to the vehicle. <Ref. to 4AT-41, INSTALLATION, Automatic Transmission Assembly.>

C: DISASSEMBLY

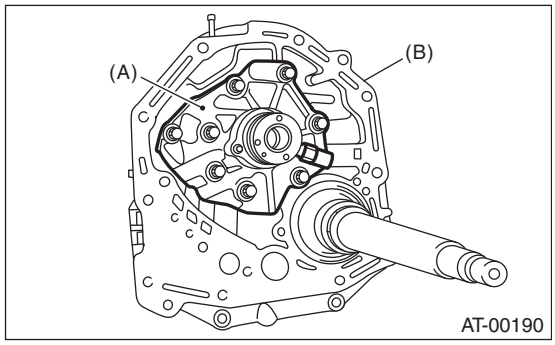
1. OIL PUMP COVER

1) Remove the four seal rings.



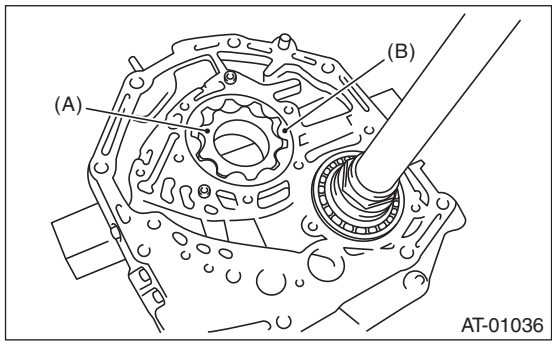
(A) Seal ring

2) Remove attachment bolts, then remove the oil pump cover by lightly tapping the end of the stator shaft.



(A) Oil pump cover
(B) Oil pump housing

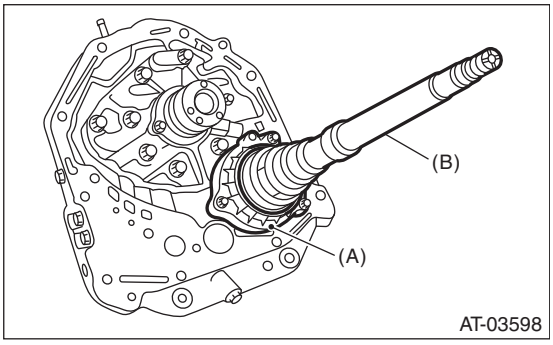
3) Remove the oil pump inner rotor and outer rotor.



(A) Inner rotor
(B) Outer rotor

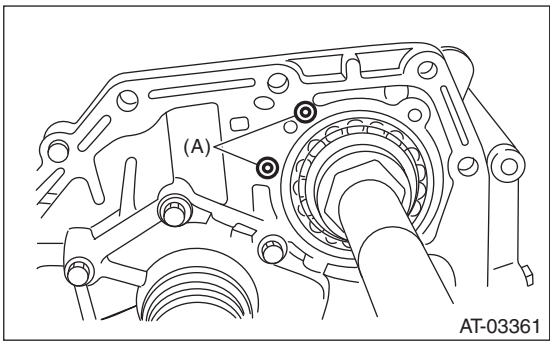
2. OIL SEAL RETAINER

1) Remove the oil seal retainer.



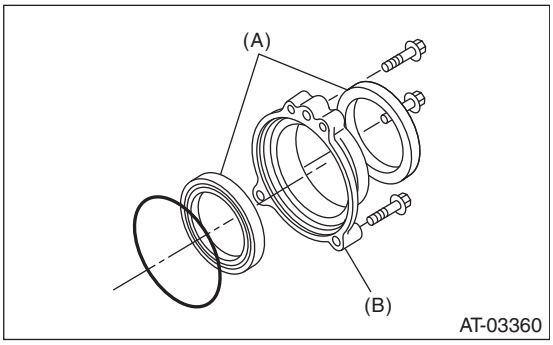
(A) Oil seal retainer
(B) Drive pinion shaft

2) Remove the O-ring.



(A) O-ring

3) Remove the oil seal from the oil seal retainer.

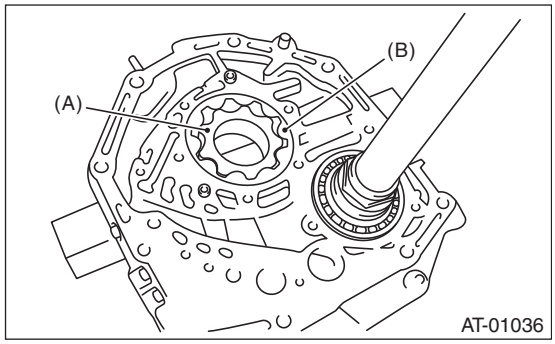


(A) Oil seal
(B) Oil seal retainer

D: ASSEMBLY

1. OIL PUMP COVER

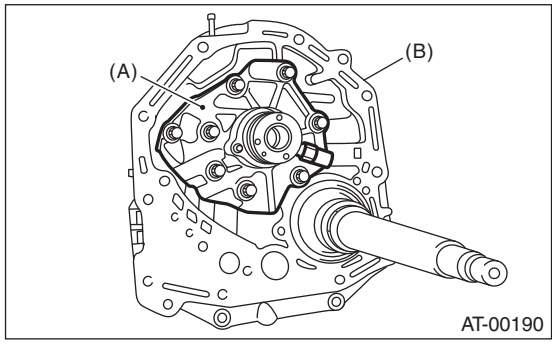
1) Install the oil pump rotor assembly to oil pump housing.



(A) Inner rotor
(B) 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, 18.4 ft-lb)

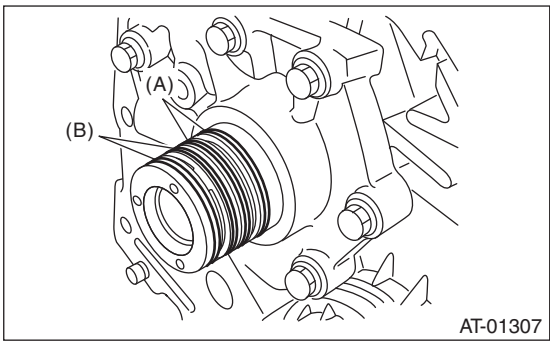


(A) Oil pump cover
(B) Oil pump housing

3) After assembling, turn the oil pump shaft to check for smooth rotation of rotor.

4) Apply vaseline to the oil seal retainer and seal rings, and install them. After installing, adjust the tooth contact with the drive pinion backlash. <Ref. to 4AT-94, ADJUSTMENT, Oil Pump Housing.>

NOTE:
- Use a new seal ring.
- There are two types of seal rings, and they are identified by color. Install at the proper positions by referring to the figure.



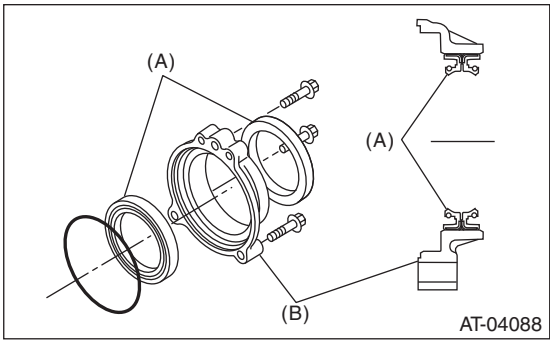
(A) Seal ring (Black)
(B) Seal ring (Brown)

2. OIL SEAL RETAINER

1) Apply ATF to the two oil seals and install them to the oil seal retainer using the ST.

NOTE:
- Use a new oil seal.
- Pay attention to the orientation of the oil seal.

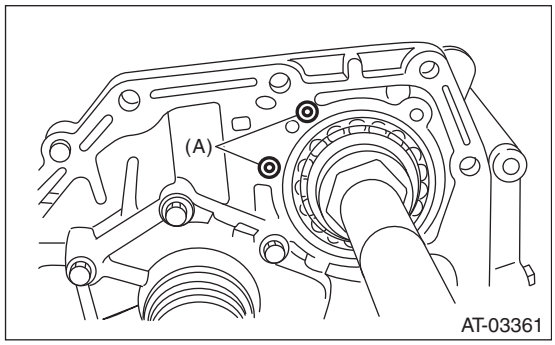
ST 499247300 INSTALLER



(A) Oil seal
(B) Oil seal retainer

2) Apply ATF to the O-ring and attach it to the oil seal retainer. Install the seal to the oil pump housing bore.

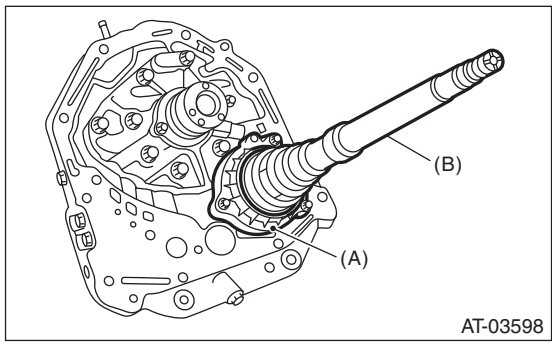
NOTE:
Use new O-rings.



(A) O-ring

3) Install the oil seal retainer being careful not to damage the oil seal lip, and secure it using three bolts.

Tightening torque:
7 N·m (0.7 kgf-m, 5.2 ft-lb)

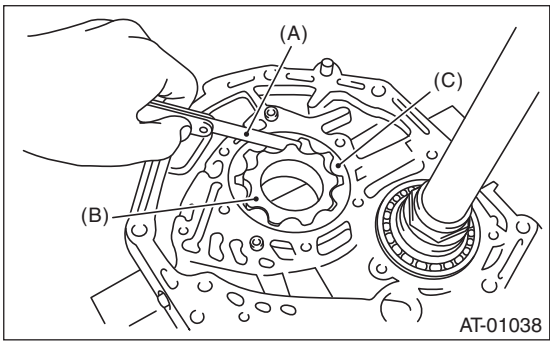


(A) Oil seal retainer
(B) Drive pinion shaft

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 inner rotor and outer rotor to the oil pump. With rotor gears facing each other, measure the crest-to-crest clearance.

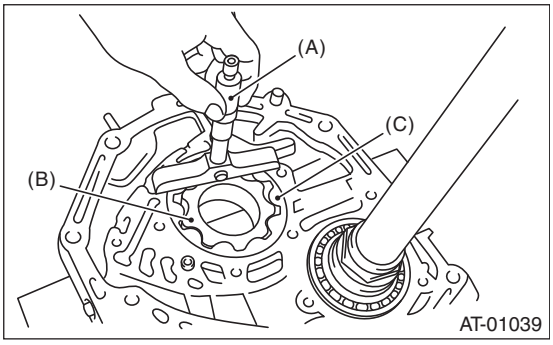
Tip clearance:
0.02 — 0.15 mm (0.0008 — 0.0059 in)



(A) Thickness gauge
(B) Inner rotor
(C) Outer rotor

   (2) Side clearance
   Set a depth gauge to oil pump housing, then measure the oil pump housing-to-rotor clearance.

Side clearance:
0.02 — 0.04 mm (0.0008 — 0.0016 in)



(A) Depth gauge
(B) Inner rotor
(C) Outer rotor

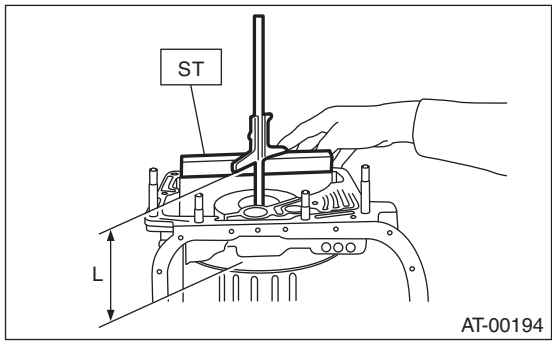
   (3) If the depth and side clearance are out of specification, replace the oil pump rotor assembly.

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)

Check the total end play and adjust it to be within specifications. <Ref. to 4AT-94, ADJUSTMENT, Oil Pump Housing.>

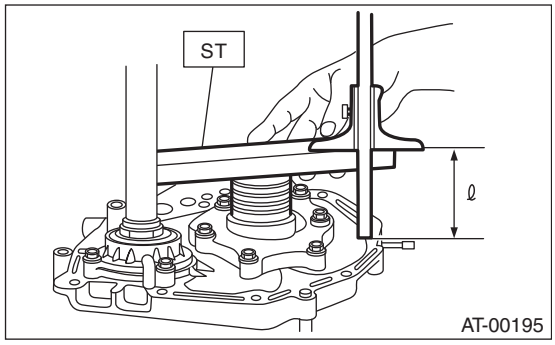
F: ADJUSTMENT

1) Using the ST, measure the length “L”, from the mating surface of the transmission case to the recessed portion of the high clutch drum.
ST 398643600 GAUGE



L Measured value

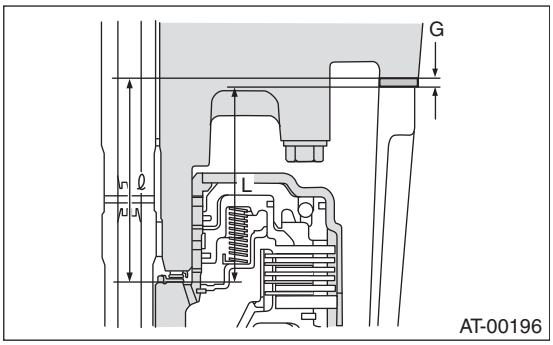
2) Using the ST, measure the length “ ℓ ” from the oil pump housing mating surface to the top surface of the oil pump cover with the thrust needle bearing.
ST 398643600 GAUGE



ℓ Measured value

3) Calculation of total end play
Select a suitable bearing race from the table below and adjust the clearance “C” so that it 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	Length from case mating surface to the concave portion of the 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 oil pump cover with 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 total end play adjustment, insert the bearing race into the high clutch race. Apply vaseline, and install the thrust needle bearing to the oil pump cover.
5) After correctly installing the gasket to the case mating surface, carefully install the oil pump housing assembly.

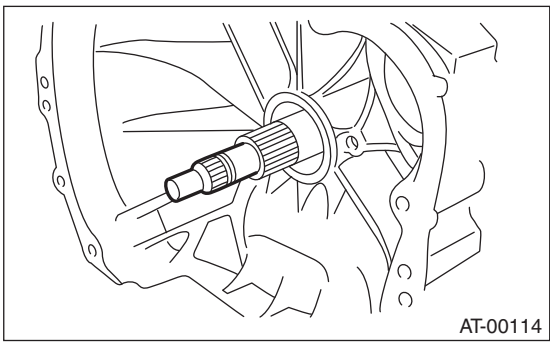
NOTE:
- Use a new gasket.
- Be careful to avoid hitting the drive pinion against the inside of case.

6) Install both parts with dowel pins aligned. Make sure there is no clearance at the mating surface.

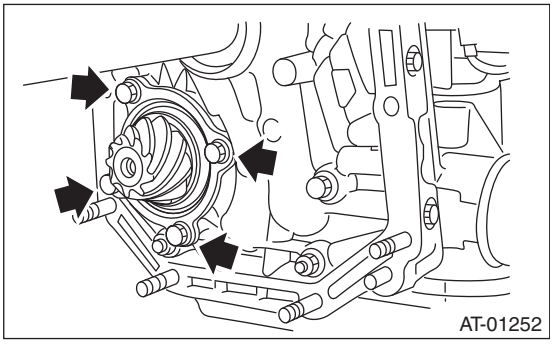
32.Drive Pinion Shaft Assembly

A: REMOVAL

1) Remove the transmission assembly from the vehicle. <Ref. to 4AT-35, REMOVAL, Automatic Transmission Assembly.>
2) Pull out the torque converter clutch assembly. <Ref. to 4AT-72, REMOVAL, Torque Converter Clutch Assembly.>
3) Remove the input shaft.


AT-00114

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-70, REMOVAL, Air Breather Hose.>
7) Remove the oil charge pipe. <Ref. to 4AT-71, REMOVAL, Oil Charge Pipe.>
8) Remove the ATF cooler inlet pipe and outlet pipe. <Ref. to 4AT-67, 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-75, REMOVAL, Extension Case.>
11) Remove the reduction drive gear. <Ref. to 4AT-84, REMOVAL, Reduction Drive Gear.>
12) Remove the reduction driven gear. <Ref. to 4AT-82, REMOVAL, Reduction Driven Gear.>
13) Remove the drive pinion shaft mounting bolt and remove the drive shaft assembly from oil pump housing.

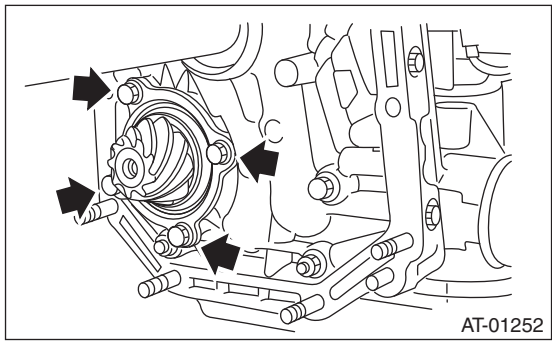

AT-01252

B: INSTALLATION

1) Assemble the drive pinion shaft 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 (4.0 kgf-m, 29.5 ft-lb)

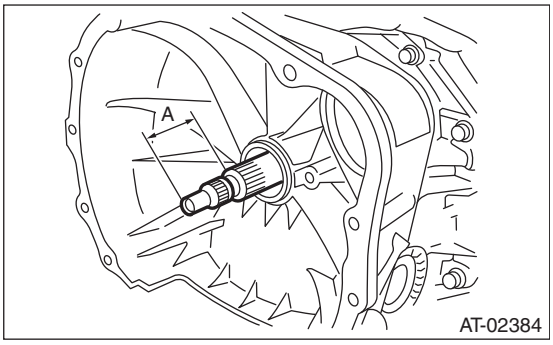

AT-01252

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-82, INSTALLATION, Reduction Driven Gear.>
4) Install the reduction drive gear. <Ref. to 4AT-84, INSTALLATION, Reduction Drive Gear.>
5) Connect the transmission case with the extension case. <Ref. to 4AT-75, INSTALLATION, Extension Case.>
6) Insert the inhibitor switch connector and transmission harness connector onto the stay.
7) Install the air breather hose. <Ref. to 4AT-70, INSTALLATION, Air Breather Hose.>
8) Install the ATF cooler inlet and outlet pipes. <Ref. to 4AT-68, INSTALLATION, ATF Cooler Pipe and Hose.>
9) Install the oil charge pipe with O-ring. <Ref. to 4AT-71, INSTALLATION, Oil Charge Pipe.>

10) Apply ATF to the O-ring, insert the input shaft while rotating the shaft slowly by hand, and check the amount of protrusion.

NOTE:
Use new O-rings.

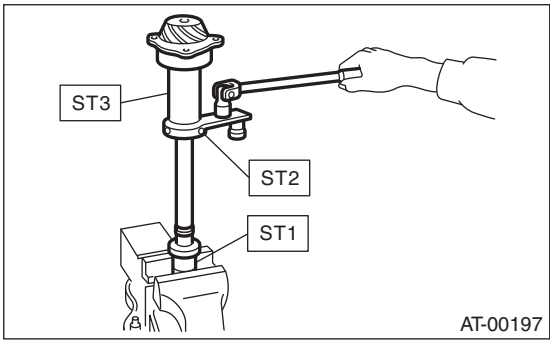
Normal protrusion A:
50 — 55 mm (1.97 — 2.17 in)



11) Install the torque converter clutch assembly. <Ref. to 4AT-72, INSTALLATION, Torque Converter Clutch Assembly.>
12) Install the transmission assembly to the vehicle. <Ref. to 4AT-41, INSTALLATION, Automatic Transmission Assembly.>

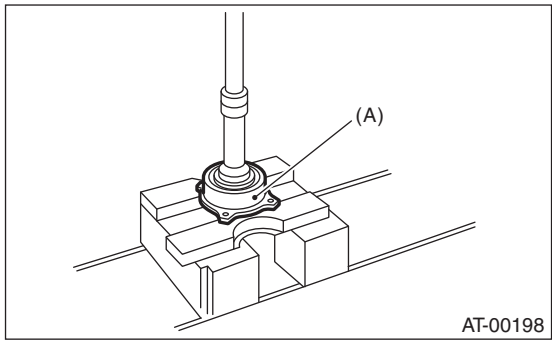
C: DISASSEMBLY

1) Flatten the lock nut tab, 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



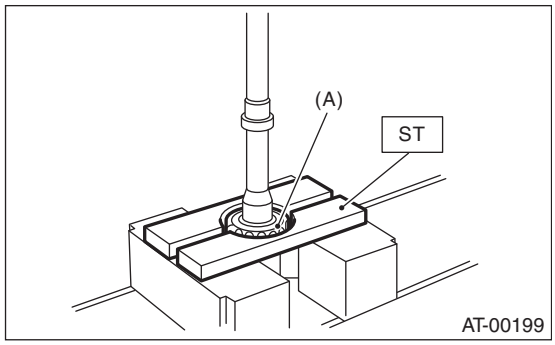
2) Remove the O-ring from the drive pinion shaft.

3) Separate the rear roller bearing and outer race from the drive pinion shaft using a press.



(A) Outer race

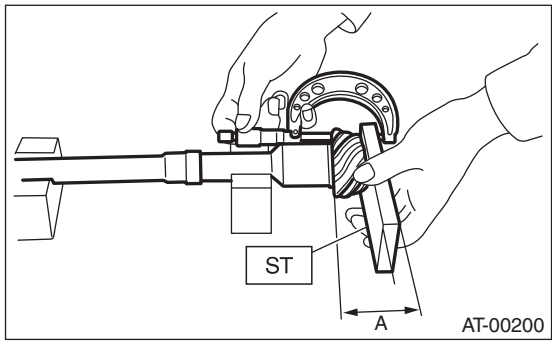
4) Separate the front roller bearing from the drive pinion shaft using a press and the ST.
ST 498517000 REPLACER



(A) Front roller bearing

D: ASSEMBLY

1) Measure the dimension “A” of drive pinion shaft.
ST 398643600 GAUGE

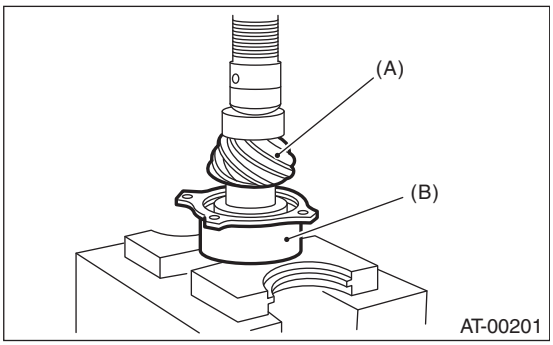


A Measured value

2) Using a press, press-fit the roller bearing to the drive pinion shaft.

CAUTION:
Damage may result if too much force is applied to the roller bearing.

NOTE:
Use a new roller bearing.



(A) Drive pinion shaft
(B) Roller bearing

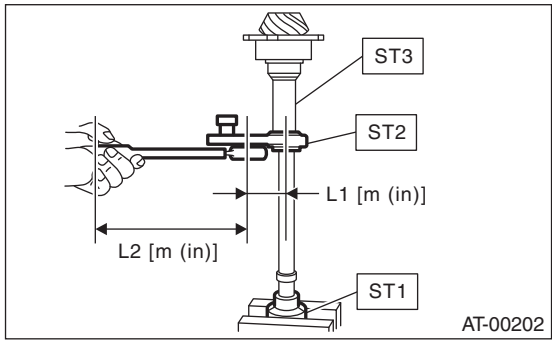
3) After applying ATF to the O-ring and attaching it to the drive pinion shaft, attach the drive pinion collar to the drive pinion shaft.

NOTE:
Use new O-rings.
4) Install the lock washer to drive pinion shaft in the proper direction.
5) Using the ST, tighten the lock nut.
Calculate the lock washer and lock nut specifications using following formula.
T2 = L2/(L1 + L2) × T1
T1: 116 N·m (11.8 kgf-m, 85.6 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, 73.8)
0.5 (19.69)	101 (10.3, 74.5)
0.55 (21.65)	102 (10.4, 75.2)

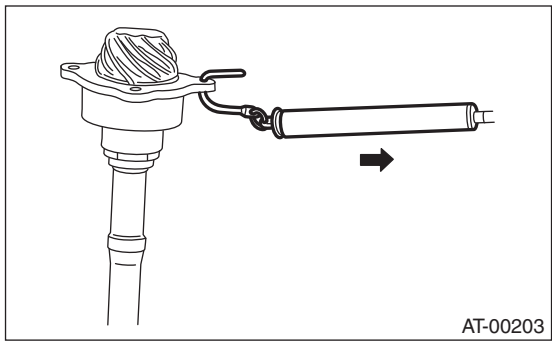
NOTE:
- Use a new lock nut.
- Attach ST2 to torque wrench as straight as possible.

ST1 498937110 HOLDER
ST2 499787700 WRENCH
ST3 499787500 ADAPTER



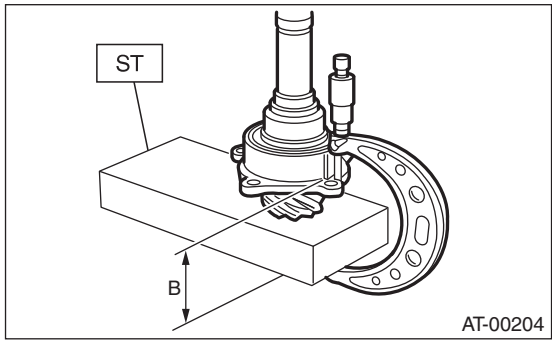
6) Measure the starting torque of the bearing. Make sure the starting torque is within the specified range. If the torque is not within specified range, replace the roller bearing.

Starting torque:
7.6 — 38.1 N (0.77 — 3.88 kgf, 1.7 — 8.6 lb)



7) Crimp the locknut in 2 locations.
8) Measure the dimension “B” of the drive pinion shaft.

ST 398643600 GAUGE



B Measured value

9) Calculate the thickness “t” mm (in) of the drive pinion shim.
t = 6.5 (0.256) ±0.0625 (0.0025) – (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

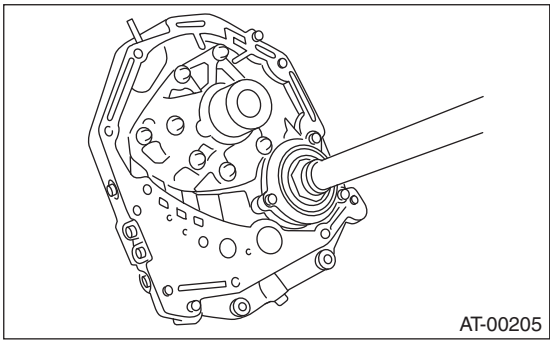
• Make sure that all component parts are free of scratches, holes and other faults.
• Adjust the tooth alignment. <Ref. to 4AT-99, ADJUSTMENT, Drive Pinion Shaft Assembly.>

F: ADJUSTMENT

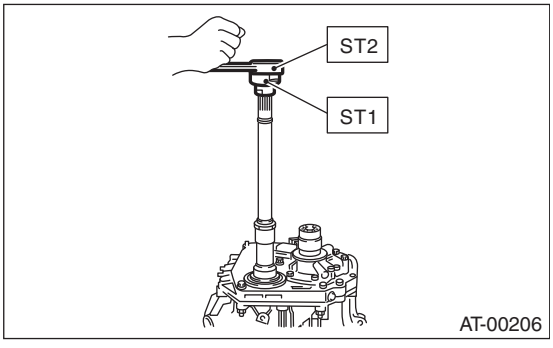
1) Remove the liquid gasket from the mating surface completely.
2) Install the oil pump housing assembly to the converter case, and secure them by tightening the four bolts evenly.

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, 30.2 ft-lb)

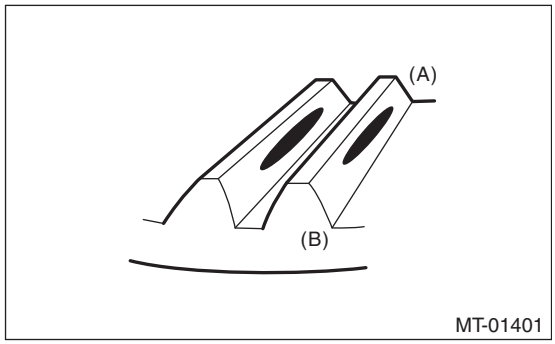

AT-00205

3) Rotate the drive pinion a few times using ST1 and ST2.
ST1 498937110 HOLDER
ST2 499787700 WRENCH



AT-00206

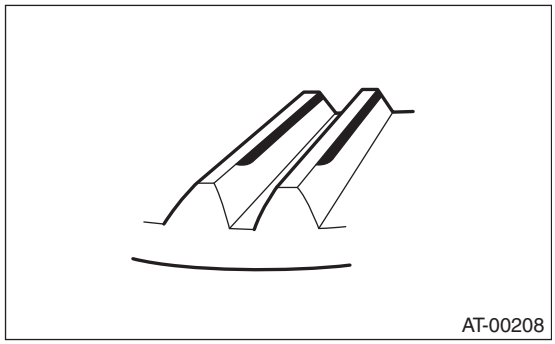
4) Adjust the drive pinion and hypoid driven gear backlash. <Ref. to 4AT-106, ADJUSTMENT, Front Differential Assembly.>
5) Apply lead-free red dye evenly on the surface of three to four teeth of the hypoid driven gear. Rotate the drive pinion back and forward several times. Remove the oil pump housing, and check the teeth contact pattern.
If the teeth contact is inappropriate, adjust the backlash and thickness of the drive pinion shim. <Ref. to 4AT-106, 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.)



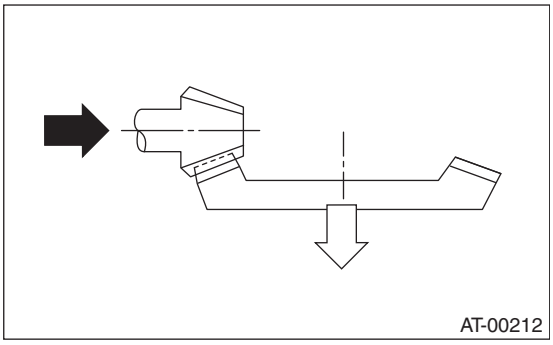
MT-01401

(A) Toe side
(B) Heel side

• Face contact
Check item: Backlash is too large.
Contact pattern

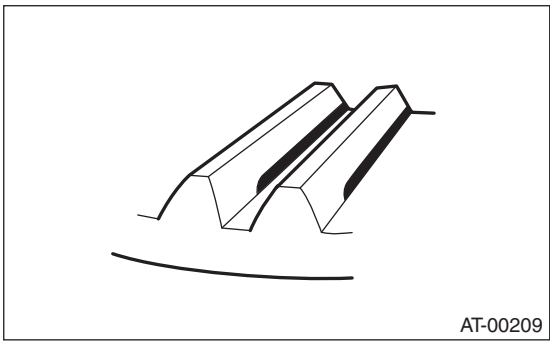

AT-00208

Corrective action: Increase thickness of drive pinion shim according to the procedures for moving the drive pinion shaft close to hypoid driven gear.

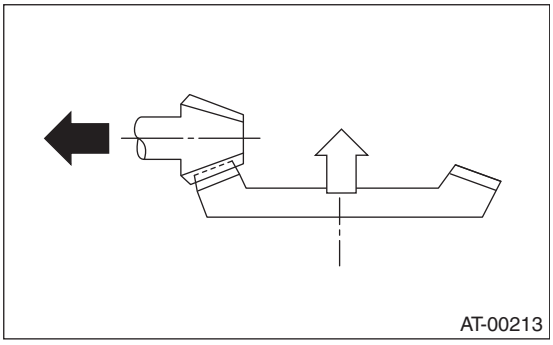


- Flank contact

Check item: Backlash is too small.
Contact pattern

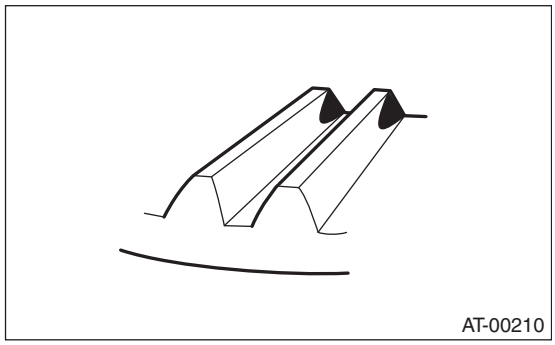


Corrective action: Reduce the thickness of the drive pinion shim according to the procedures for moving the drive pinion shaft away from the hypoid driven gear.

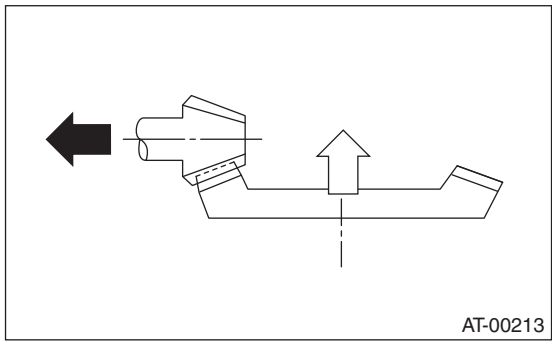


- Toe contact (inside contact)

Check item: Teeth contact area is too small.
Contact pattern

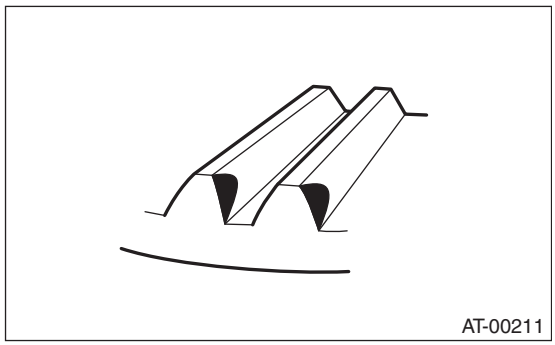


Corrective action: Reduce the thickness of the drive pinion shim according to the procedures for moving the drive pinion shaft away from the hypoid driven gear side.

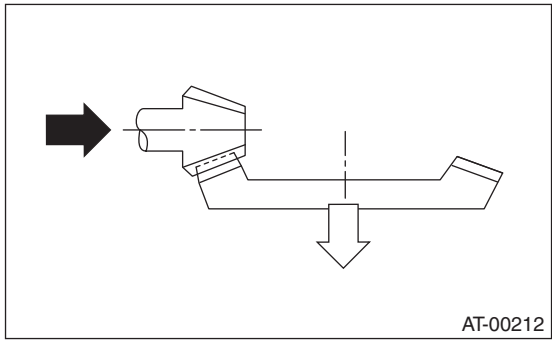


- Heel contact (outside end contact)

Check item: Teeth contact area is too small.
Contact pattern



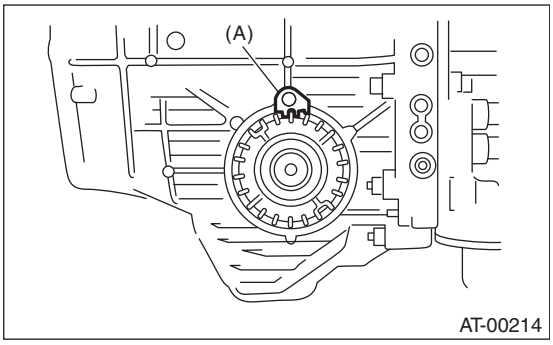
Corrective action: Increase thickness of drive pinion shim according to the procedures for moving the drive pinion shaft close to hypoid driven gear.



6) If tooth contact is correct, mark the differential side retainer position and loosen. After fitting the O-ring and oil seal, screw in the differential side retainer to the marked position. Tighten the lock plate with specified torque.

NOTE:
Use new O-rings and oil seals.

Tightening torque:
25 N·m (2.5 kgf-m, 18.4 ft-lb)

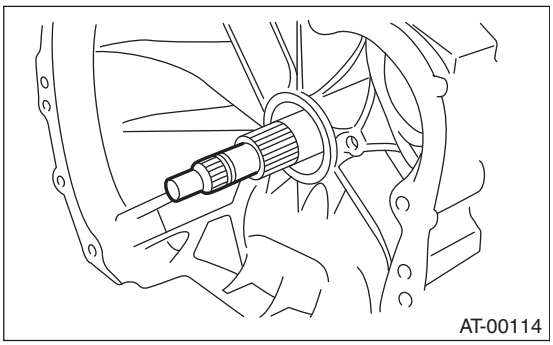


(A) Lock plate

33.Front Differential Assembly

A: REMOVAL

1) Remove the transmission assembly from the vehicle. <Ref. to 4AT-35, REMOVAL, Automatic Transmission Assembly.>
2) Pull out the torque converter clutch assembly. <Ref. to 4AT-72, 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 remove it from the stay.
5) Remove the inhibitor switch connector from the stay.
6) Remove the oil charge pipe. <Ref. to 4AT-71, REMOVAL, Oil Charge Pipe.>
7) Remove the ATF cooler inlet pipe and outlet pipe. <Ref. to 4AT-67, 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:
• ST WRENCH ASSY (499787000) can also be used.
• Hold the differential case assembly by hand to avoid damaging the retainer mounting hole of the converter case.

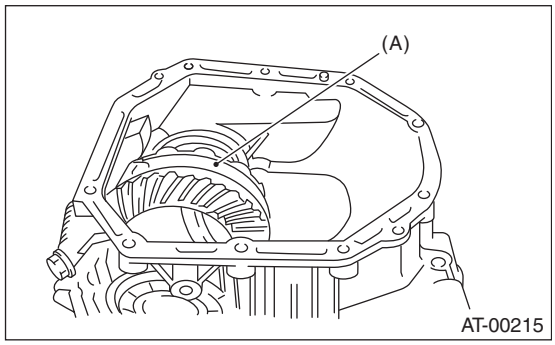
ST 18630AA010 WRENCH COMPL RETAINER

11) Remove the front differential assembly while being careful not to damage the attachment part of the retainer.

B: INSTALLATION

1) Install the front differential assembly to the converter case.

NOTE:
Be careful not to damage the inside of the converter case (especially the mating surface of the differential side retainer).



(A) Front differential ASSY

2) Install the O-rings to the left and right side differential retainers.

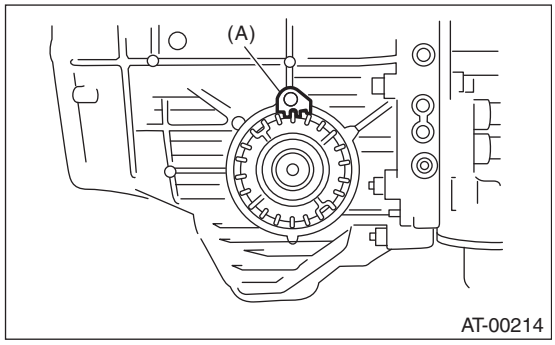
NOTE:
Use new O-rings.
3) Install the differential side retainers using ST. <Ref. to 4AT-106, ADJUSTMENT, Front Differential Assembly.>

NOTE:
ST WRENCH ASSY (499787000) can also be used.

ST 18630AA010 WRENCH COMPL RETAINER

4) Adjust the backlash of the front differential. <Ref. to 4AT-106, ADJUSTMENT, Front Differential Assembly.>
5) Install the lock plate.

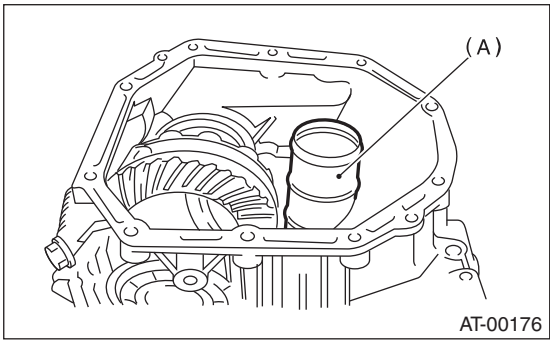
Tightening torque:
25 N·m (2.5 kgf-m, 18.4 ft-lb)



(A) Lock plate

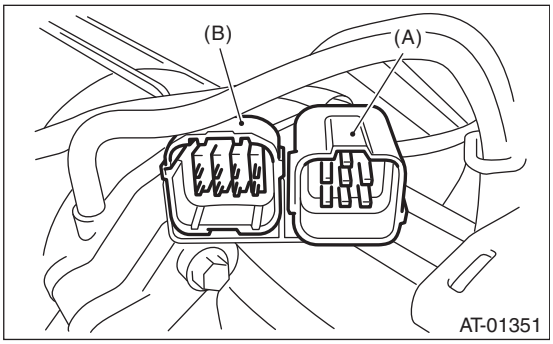
6) Install the seal pipe to the converter case.

NOTE:
Use a new seal pipe.



(A) Seal pipe

7) Install the converter case to the transmission case. <Ref. to 4AT-87, INSTALLATION, Converter Case.>
8) Insert the inhibitor switch connector and transmission harness connector onto the stay.



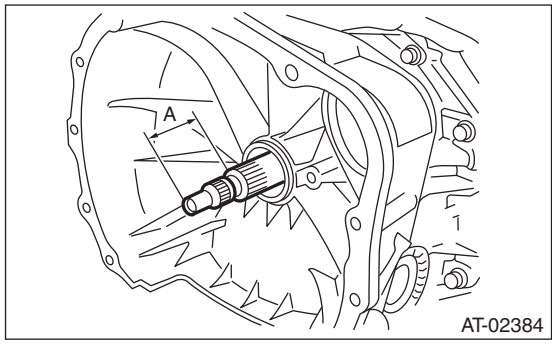
(A) Transmission harness connectors
(B) Inhibitor switch connector

9) Install the ATF cooler pipe. <Ref. to 4AT-68, INSTALLATION, ATF Cooler Pipe and Hose.>
10) Install the oil charge pipe together with an O-ring. <Ref. to 4AT-71, INSTALLATION, Oil Charge Pipe.>

11) Apply ATF to the O-ring, insert the input shaft while rotating the shaft slowly by hand, and check the amount of protrusion.

NOTE:
Use new O-rings.

Normal protrusion A:
50 — 55 mm (1.97 — 2.17 in)

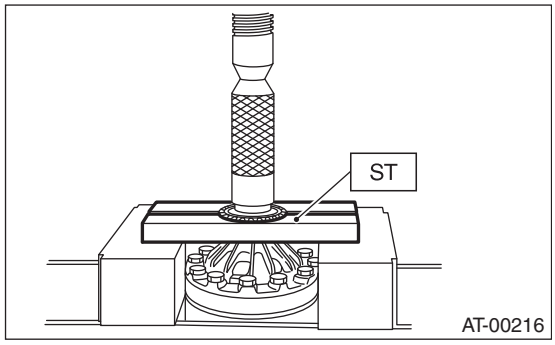


12) Install the torque converter clutch assembly. <Ref. to 4AT-72, INSTALLATION, Torque Converter Clutch Assembly.>
13) Install the transmission assembly to the vehicle. <Ref. to 4AT-41, INSTALLATION, Automatic Transmission Assembly.>

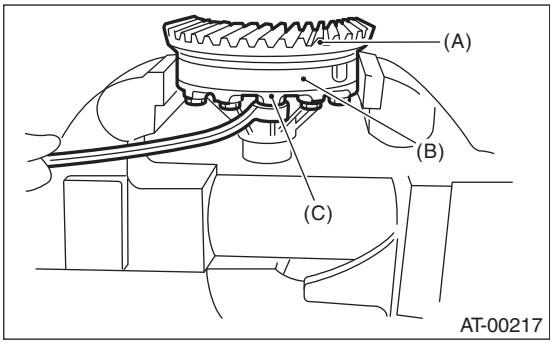
C: DISASSEMBLY

1. DIFFERENTIAL CASE ASSEMBLY

1) Remove the taper roller bearing using the ST and a press.
ST 498077000 REMOVER

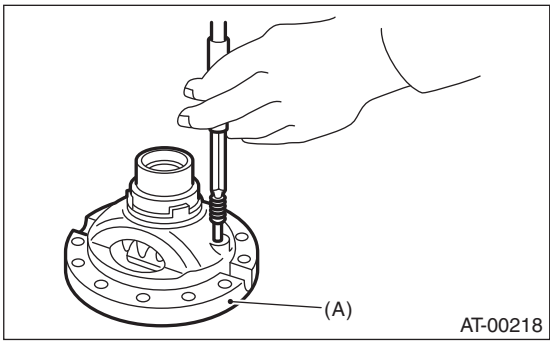


2) Secure the case in a vise, remove the hypoid driven gear tightening bolts, and then separate the hypoid driven gear into differential case (RH) and differential case (LH).



(A) Hypoid driven gear
(B) Differential case (RH)
(C) Differential case (LH)

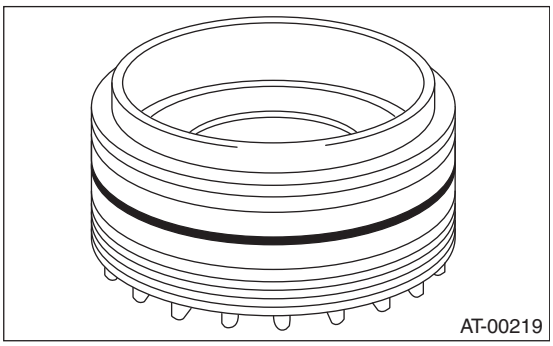
3) Pull out the straight pin and pinion shaft, then remove the differential bevel gear, washer and differential bevel pinion.



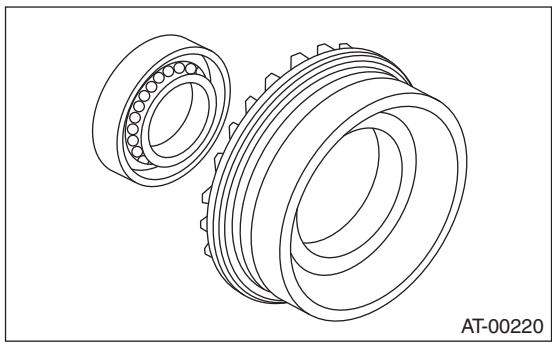
(A) Differential case (RH)

2. SIDE RETAINER

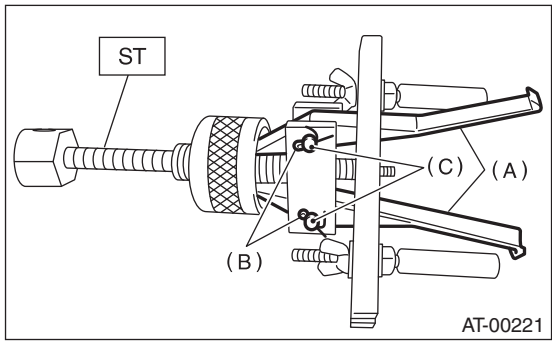
NOTE:
After adjusting the drive pinion backlash and tooth contact, remove and install the oil seal and O-ring.
1) Remove the O-ring.



2) Remove the oil seal.

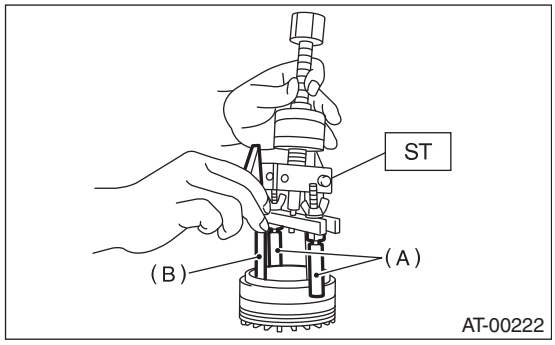


3) Remove the split pin, and then remove the claw.
ST 398527700 PULLER ASSY



(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

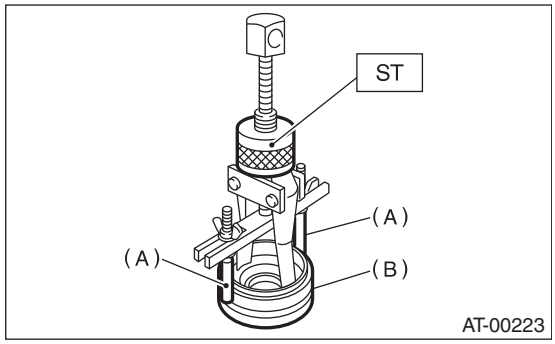


(A) Shaft
(B) Claw

5) Restore the removed claws to original position, and install the pin and split pin.

6) Hold the shaft of ST to avoid detachment from the differential side retainer, and remove the bearing outer race.

NOTE:
Replace the bearing inner and outer races as a single unit.
ST 398527700 PULLER ASSY

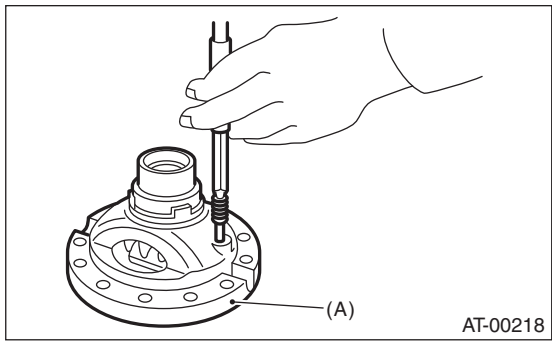


(A) Shaft
(B) Side retainer

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.

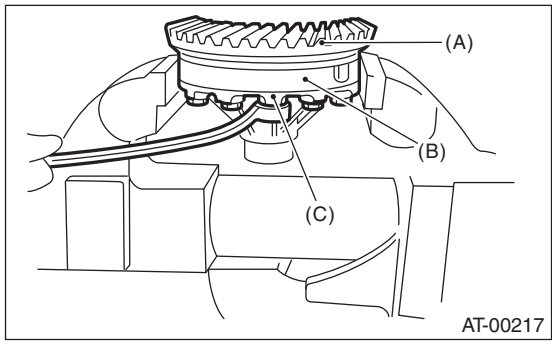


(A) Differential case (RH)

3) Install the washer and differential bevel gear to the differential case (LH). Put the differential case (LH) on the differential case (RH), and 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, 45.7 ft-lb)

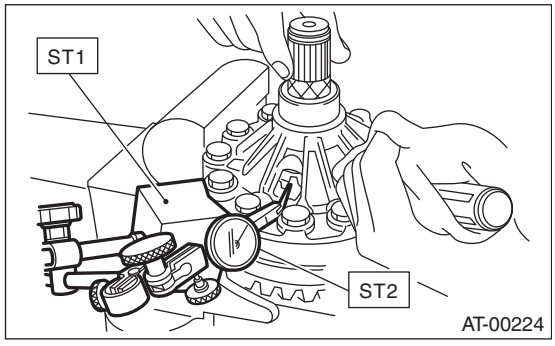


(A) Hypoid driven gear
(B) Differential case (RH)
(C) Differential case (LH)

5) Measurement of backlash (Selection of washer)
(1) Install the SUBARU genuine axle shaft to differential case.
Part No. 38415AA070 AXLE SHAFT
(2) Measure the gear backlash using ST1 and ST2, and then insert the ST2 though the access window of case.

NOTE:
• Measure the backlash by applying a differential bevel pinion tooth between two differential bevel gear teeth.
• When measuring, fix the differential bevel pinion gear in place with a screwdriver covered with cloth, or a similar tool.

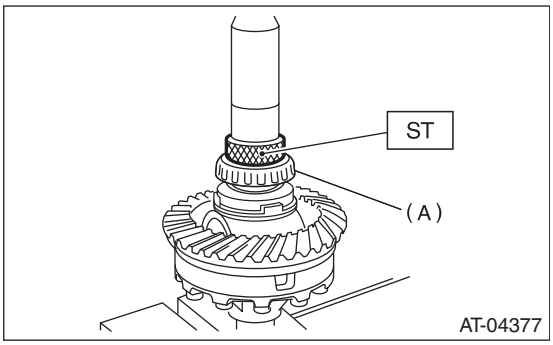
Standard:
0.13 — 0.18 mm (0.0051 — 0.0071 in)
ST1 498247001 MAGNET BASE
ST2 498247100 DIAL GAUGE



(3) If the backlash is not within 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



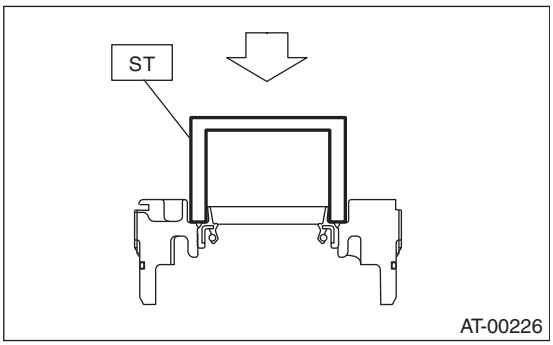
(A) Taper roller bearing

2. SIDE RETAINER

1) Install the bearing outer race to the differential side retainer.
2) Using the ST, install the differential side retainer oil seal by lightly tapping with a plastic hammer.

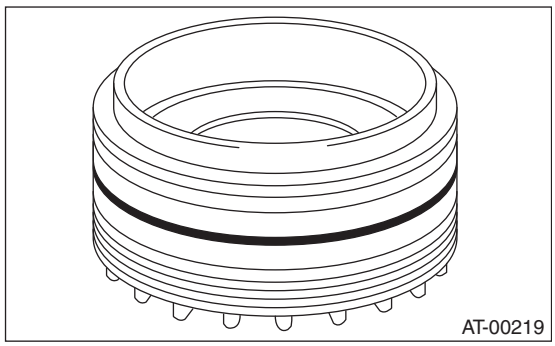
CAUTION:
Apply differential gear oil to the oil seal lips, and install the oil seal while being careful not to deform the lip.

NOTE:
Use a new oil seal.
ST 18675AA000 DIFFERENTIAL SIDE OIL SEAL INSTALLER



3) Apply gear oil to the O-ring and install.

NOTE:
- Use new O-rings.
- Apply gear oil to 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-106, ADJUSTMENT, Front Differential Assembly.>

F: ADJUSTMENT

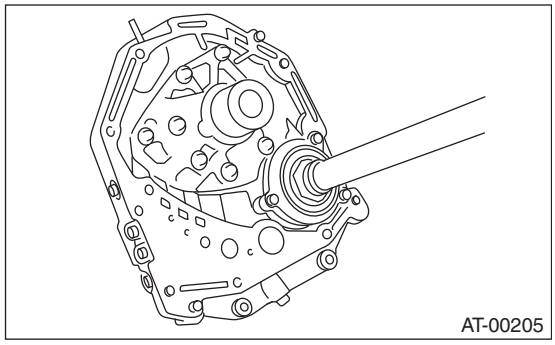
1) Using the ST, screw-in the differential side retainer until resistance is felt.

NOTE:
- Screw-in the RH side slightly deeper than the LH side.
- ST WRENCH ASSY (499787000) can also be used.

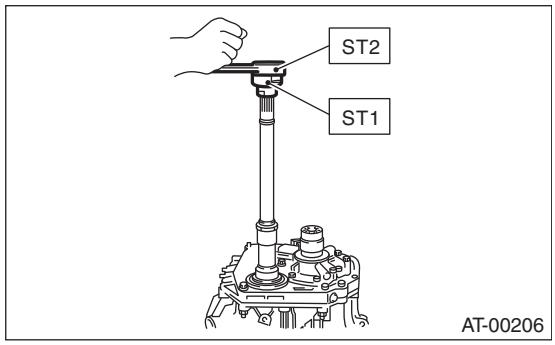
ST 18630AA010 WRENCH COMPL RETAINER
2) Remove the oil pump housing.
3) Remove the liquid gasket from the mating surface completely.
4) Install the oil pump housing assembly to the converter case, and secure them by tightening the four bolts evenly.

NOTE:
Use an old gasket or aluminum washer to prevent damaging the mating surface of the housing.

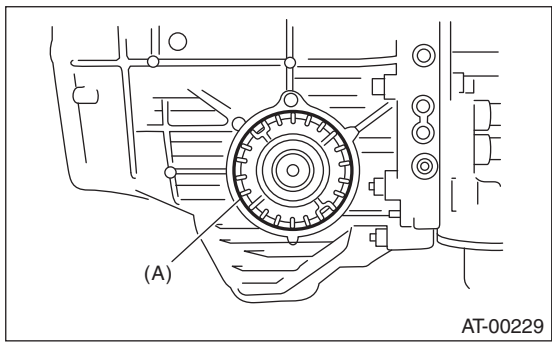
Tightening torque:
41 N·m (4.2 kgf-m, 30.2 ft-lb)



5) Rotate the drive pinion a few times using ST1 and ST2.
ST1 498937110 HOLDER
ST2 499787700 WRENCH

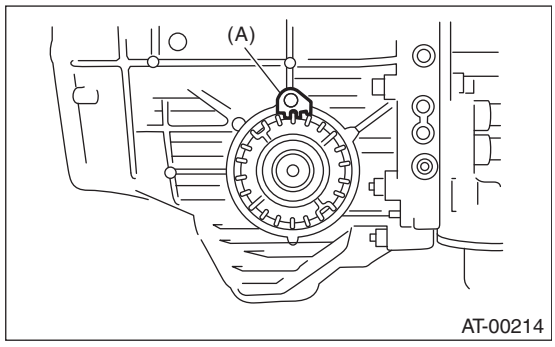


6) Tighten the LH differential side retainer by rotating the shaft until resistance is felt. Then loosen the RH side differential side retainer. Tighten the LH differential side retainer until the pinion shaft no longer turns, and continue to loosen the RH side. This is the “zero” state.



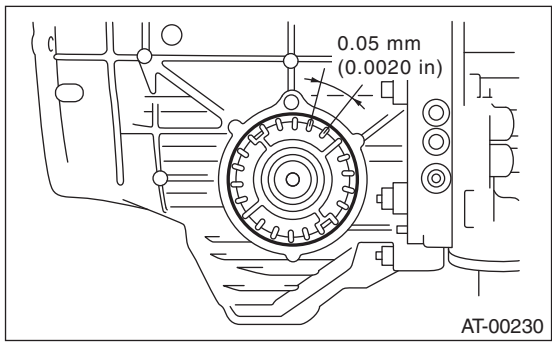
(A) Differential side retainer

7) After reaching the “zero” state, loosen the LH differential side retainer by 3 notches and secure it with the lock plate. Then after returning the RH differential side retainer, retighten until it stops. Rotate the drive pinion 2 or 3 times. Tighten the RH differential side retainer further by 1-3/4 notches. This sets the preload. Finally, secure the differential side retainer with the lock plate.



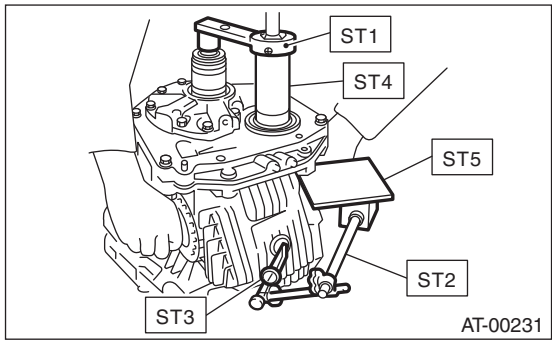
(A) Lock plate

NOTE:
Turning the differential side retainer by one notch changes the backlash approx. 0.05 mm (0.0020 in).



8) Install the SUBARU genuine axle shaft to the left and right sides of the front differential.
Part No. 38415AA000 AXLE SHAFT
9) 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)

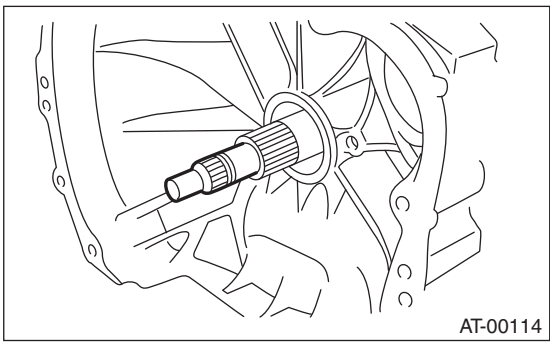


10) Adjust the teeth contact of the front differential and drive pinion shaft. <Ref. to 4AT-99, ADJUSTMENT, Drive Pinion Shaft Assembly.>

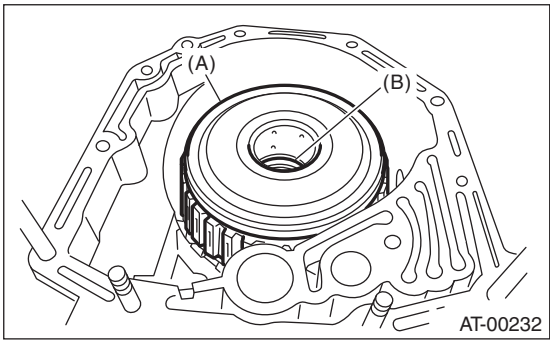
34.AT Main Case

A: REMOVAL

1) Remove the transmission assembly from the vehicle. <Ref. to 4AT-35, REMOVAL, Automatic Transmission Assembly.>
2) Pull out the torque converter clutch assembly. <Ref. to 4AT-72, REMOVAL, Torque Converter Clutch Assembly.>
3) Remove the input shaft.

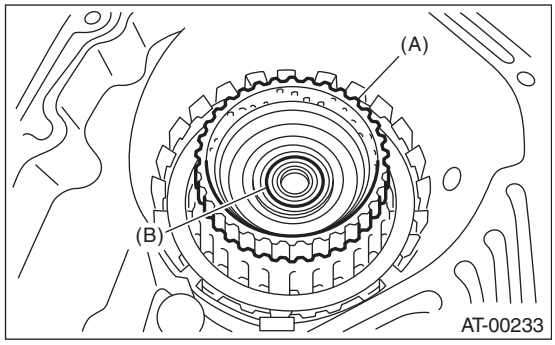


4) Lift up the lever on the rear side of transmission harness connector, and then disconnect it from the stay.
5) Disconnect the inhibitor switch connector from the stay.
6) Disconnect the air breather hose. <Ref. to 4AT-70, REMOVAL, Air Breather Hose.>
7) Remove the oil charge pipe. <Ref. to 4AT-71, REMOVAL, Oil Charge Pipe.>
8) Remove the ATF cooler inlet pipe and outlet pipe. <Ref. to 4AT-67, 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-90, REMOVAL, Oil Pump Housing.>
11) Take out the high clutch, thrust needle bearing and reverse clutch assembly.



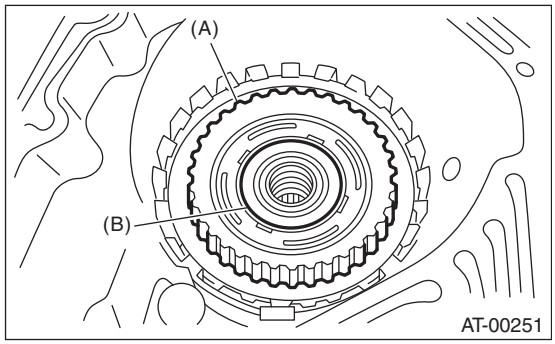
(A) High clutch and reverse clutch ASSY
(B) Thrust needle bearing

12) Take out the high clutch hub and thrust needle bearing.



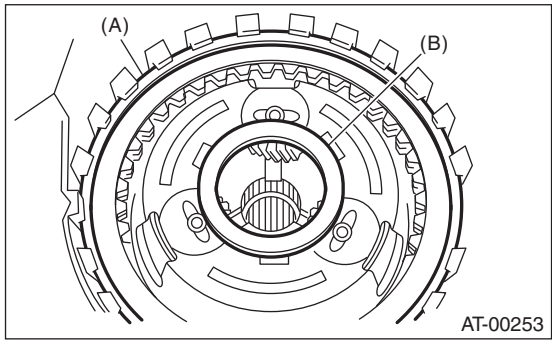
(A) High clutch hub
(B) Thrust needle bearing

13) Take out the front sun gear and thrust needle bearing.



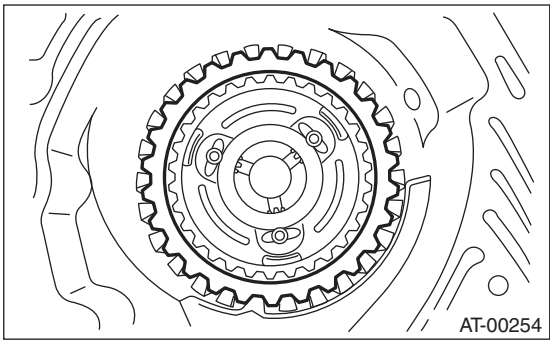
(A) Front sun gear
(B) Thrust needle bearing

14) Remove the snap ring and thrust needle bearing.

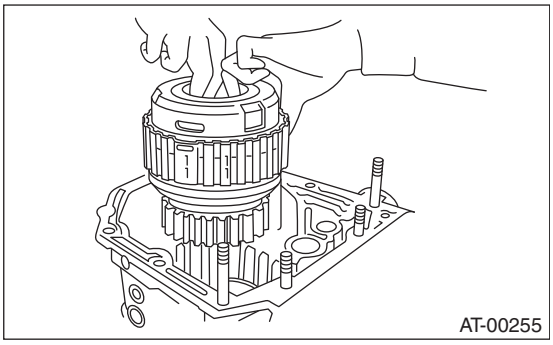


(A) Snap ring
(B) Thrust needle bearing

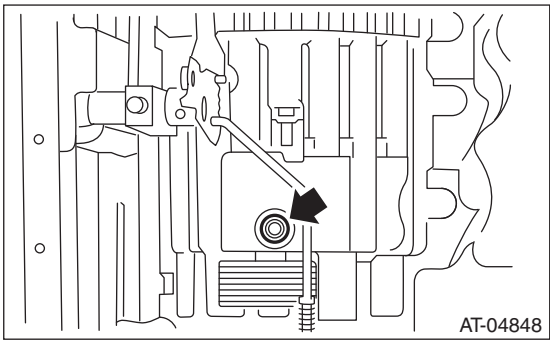
15) Take out the retaining plate, drive plate and driven plate of the 2-4 brake.



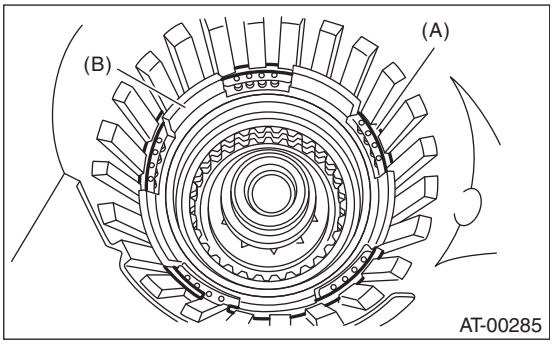
16) Take out the thrust needle bearing, planetary gear assembly and low clutch assembly.



17) Remove the 2-4 brake seal.

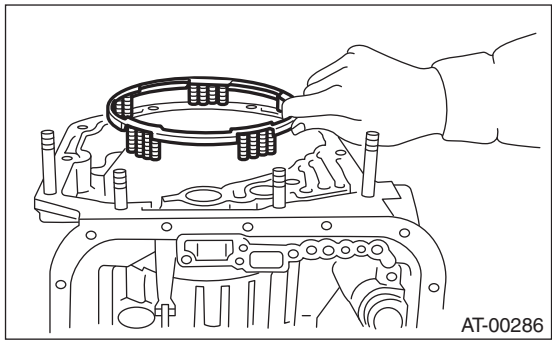


18) Remove the snap ring.

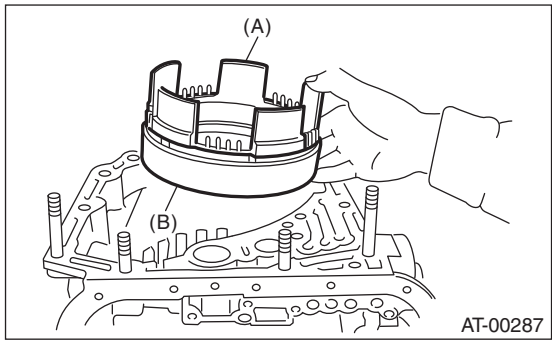


(A) Snap ring
(B) 2-4 brake piston

19) Take out the 2-4 brake spring retainer.

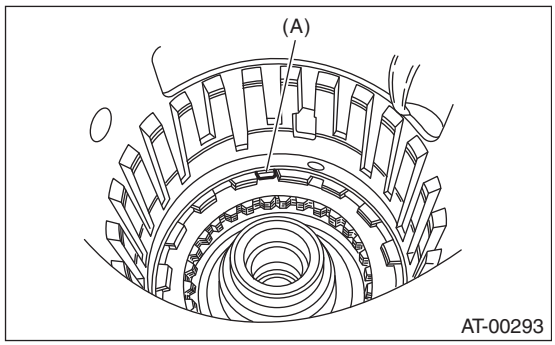


20) Remove the 2-4 brake piston and 2-4 brake piston retainer while taking care not to damage them.



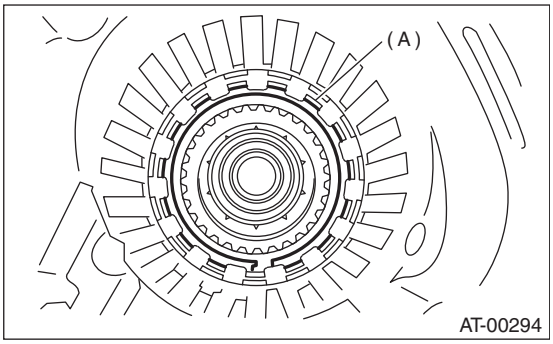
(A) 2-4 brake piston
(B) 2-4 brake piston retainer

21) Pull out the leaf spring of the low & reverse brake while being careful not to bend it.



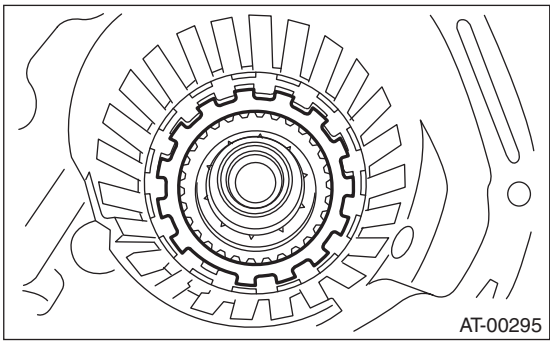
(A) Leaf spring

22) Remove the snap ring.

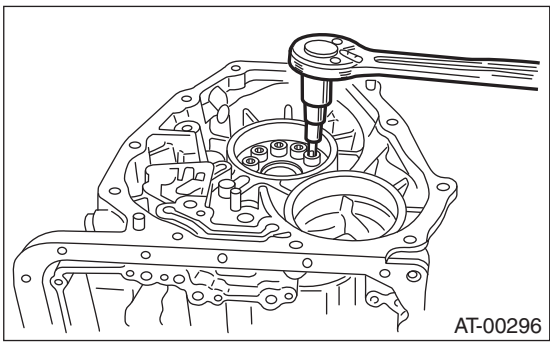


(A) Snap ring

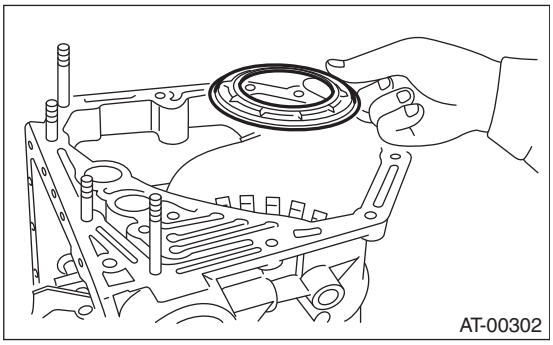
23) Take out the retaining plate, drive plate, driven plate and dish plate of the low & reverse brake.



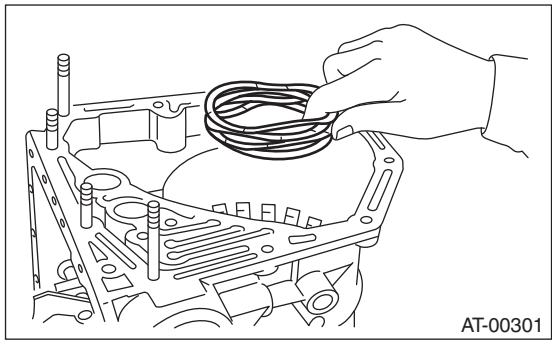
24) Turn the transmission case upside down, and then take out the socket bolts while holding the one-way clutch inner race by hand.



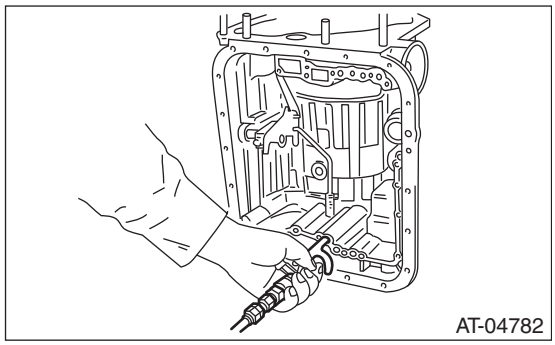
25) Remove the spring retainer.



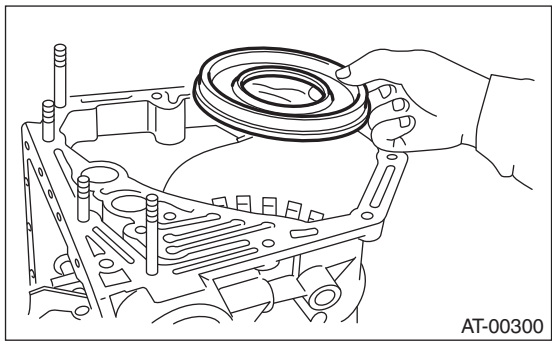
26) Take out the return spring.



27) Apply compressed air.



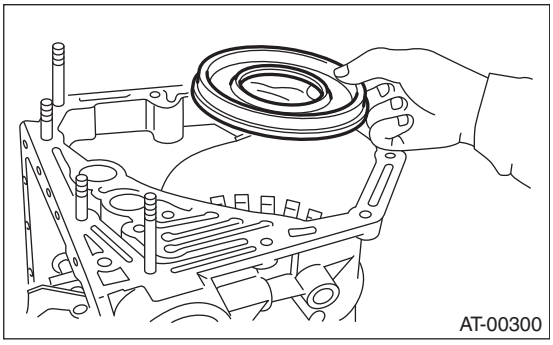
28) Take out the low & reverse brake piston.



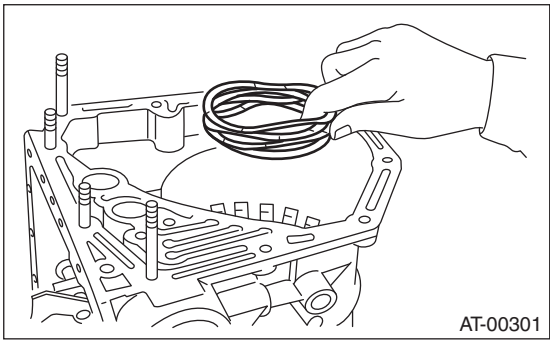
B: INSTALLATION

1) Apply ATF to the lips of the low & reverse brake piston, and install the piston.

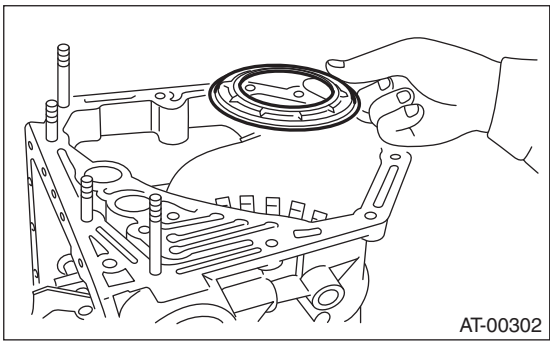
NOTE:
Take care not to damage the lip seal.


AT-00300

2) Install the return spring.

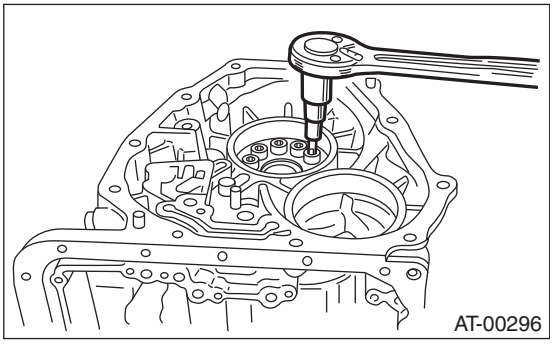

AT-00301

3) Install the spring retainer.


AT-00302

4) Install the one-way clutch inner race.
5) Tighten the socket head bolts evenly from the rear side of transmission case.

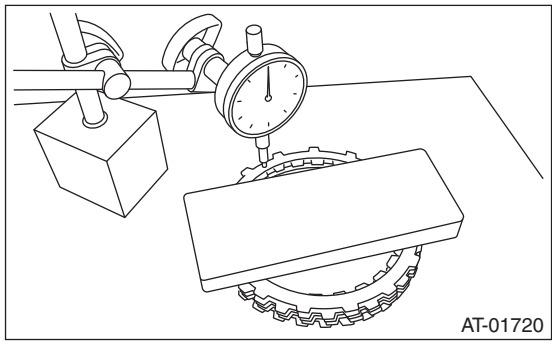
Tightening torque:
25 N·m (2.5 kgf-m, 18.4 ft-lb)


AT-00296

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 dial gauge to the retaining plate, and read its scale.

NOTE:
The value, which is read in the dial gauge at this time, is zero point.
10) Scale and record the weight "Z" of the flat board that will be placed on the retaining plate.

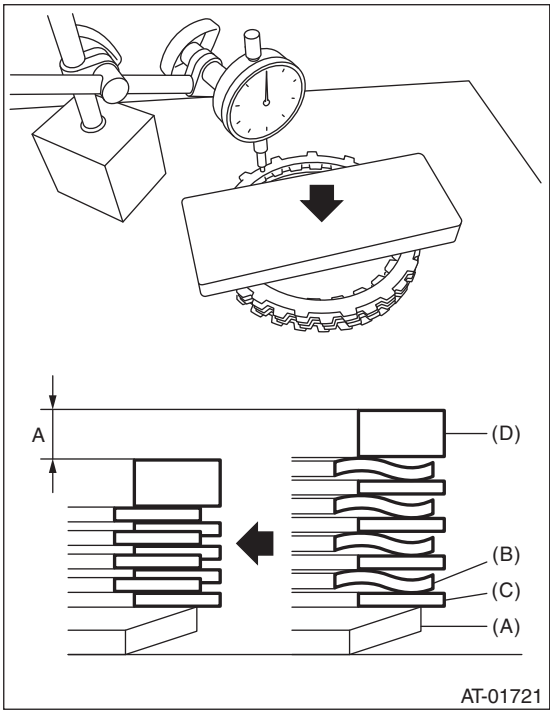
NOTE:
• Use a stiff board which does not bend against load as a flat board to be put on retaining plate.
• Use a flat board weighing less than 8.5 kgf (18.7 lb).
11) Put the flat board on retaining plate.


AT-01720

12) Using the following formula, read the push/pull gauge, and calculate "N".
N = 83 N (8.5 kgf, 18.7 lb) – Z
N: Value indicated on push/pull gauge
83 N (8.5 kgf, 18.7 lb) : Load applied to clutch plate
Z: Flat board weight

13) Press the center of retaining plate with a force of N using a push/pull gauge, and measure and record height “A”. Measure at three or more locations 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°.

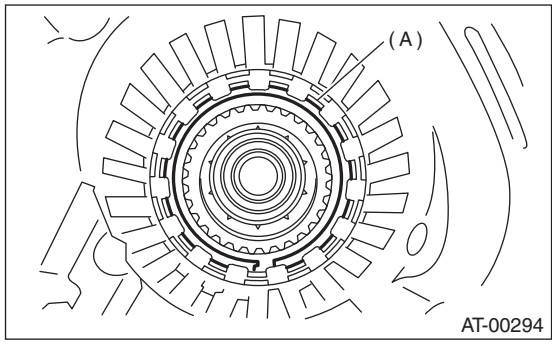


A Measured value

(A) Dish plate
(B) Drive plate
(C) Driven plate
(D) Retaining plate

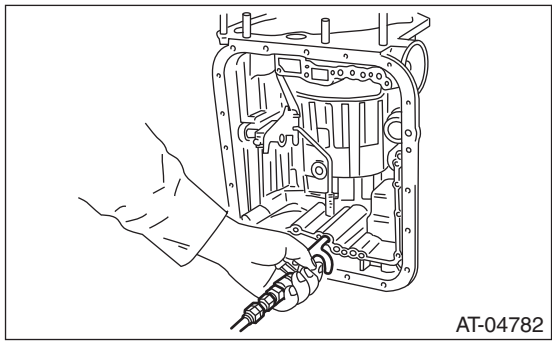
14) Installation of the low & reverse brake:
Install the dish plate, driven plate, drive plate and retaining plate, and then secure them with a snap ring.

NOTE:
Pay attention to the orientation of the dish plate.



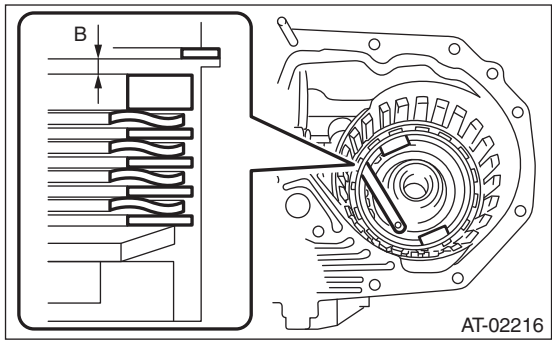
(A) Snap ring

15) Apply compressed air intermittently to check for operation.



16) Place same thickness shims on both sides to prevent plate from tilting, then measure and record the clearance “B”.

NOTE:
Do not push in the shim down with force to a point where the waves on the drive plate will be crushed.



B Measured value

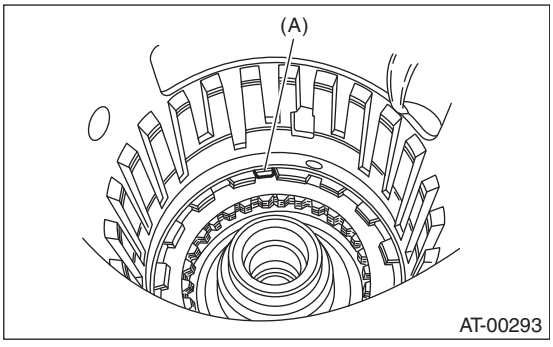
17) Piston stroke calculation
Calculate from the recorded dimension A and B, and if the service limit is exceeded, replace the drive plate with a new part, and select a retaining plate to make an adjustment so that it is within standard.
T = A + B
T: Piston stroke
A: Amount of drive plate compression
B: Clearance between retaining plate and snap ring

Non-turbo model
Initial standard:
2.15 — 2.65 mm (0.085 — 0.104 in)
Limit thickness:
2.95 mm (0.116 in)

Turbo model
Initial standard:
2.70 — 3.20 mm (0.106 — 0.126 in)
Limit thickness:
3.90 mm (0.154 in)

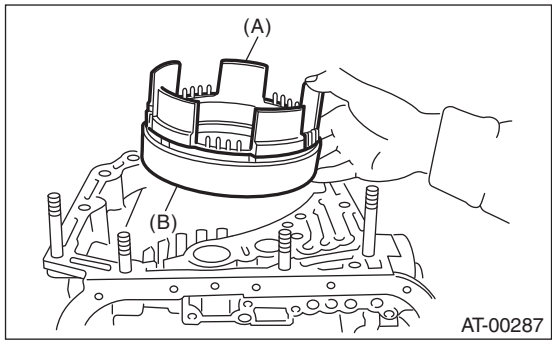
Retaining plate	
Part No.	Thickness mm (in)
31667AA420	3.8 (0.150)
31667AA320	4.1 (0.161)
31667AA330	4.4 (0.173)
31667AA340	4.7 (0.185)
31667AA350	5.0 (0.197)
31667AA360	5.3 (0.209)
31667AA370	5.6 (0.220)
31667AA380	5.9 (0.232)

18) Install the leaf spring of the low & reverse brake.



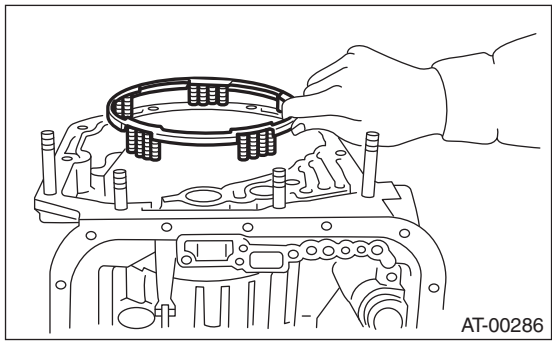
(A) Leaf spring

19) 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.

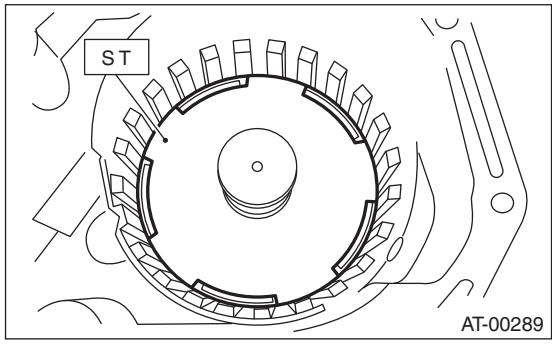


(A) 2-4 brake piston
(B) 2-4 brake piston retainer

20) Install the 2-4 brake piston spring retainer to the transmission case.

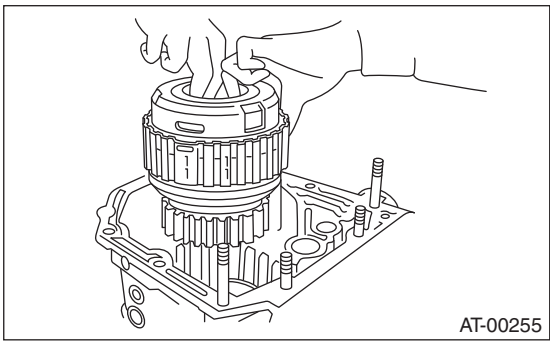


21) Position the snap ring in the transmission. Using ST, press the snap ring into the specified location.
ST 498677100 COMPRESSOR



22) 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, being careful not to damage the seal ring.



23) 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.

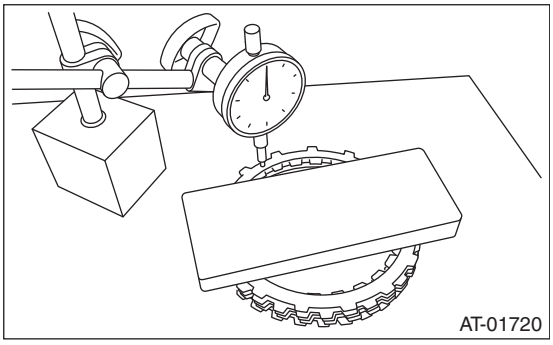
(2) Set the dial gauge to the clutch, and read its scale.

NOTE:
The value, which is read in the dial gauge at this time, is zero point.

(3) Scale and record the weight "Z" of the flat board that will be placed on the 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 10.2 kg (22.5 lb).

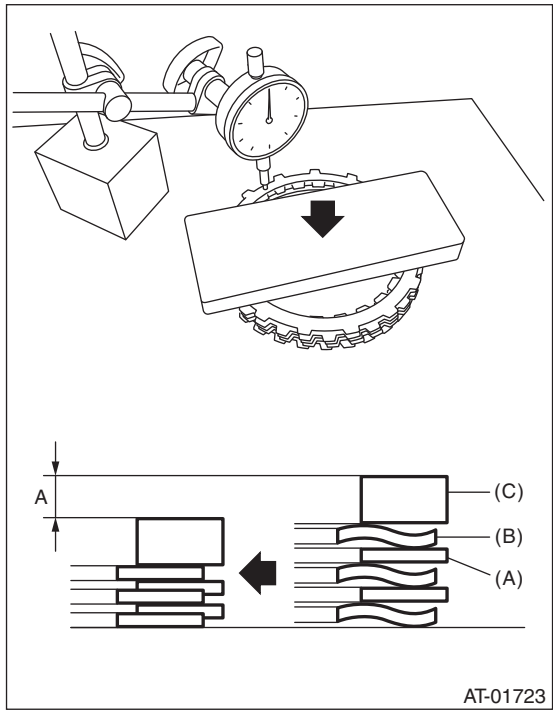
(4) Put the flat board on retaining plate.



(5) Using the following formula, read the push/pull gauge, and calculate "N".
N = 100 N (10.2 kgf, 22.5 lb) – Z
N: Value indicated on push/pull gauge
100 N (10.2 kgf, 22.5 lb) : Load applied to clutch plate
Z: Flat board weight

(6) Press the center of retaining plate with a force of N using a push/pull gauge, and measure and record height "A". Measure at three or more locations spaced by equal distances and take the average value.

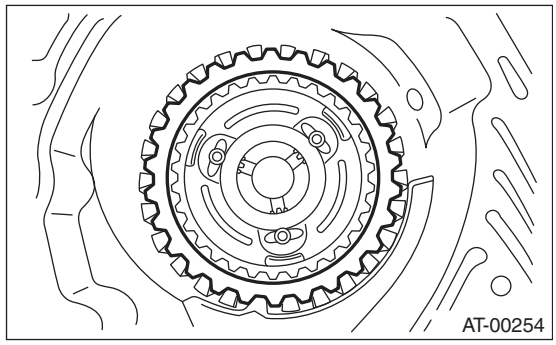
NOTE:
If measuring in three locations, measure every 120°. If measuring in four locations, measure every 90°.



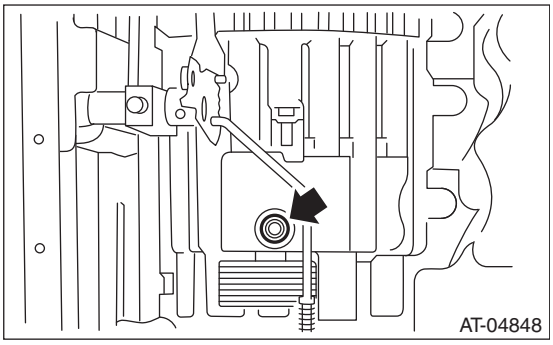
A Measured value

(A) Driven plate
(B) Drive plate
(C) Retaining plate

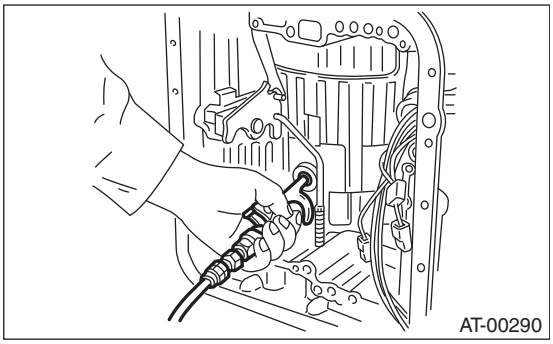
24) Install pressure rear plate, drive plate of 2-4 brake, driven plate, retaining plate, and snap ring.



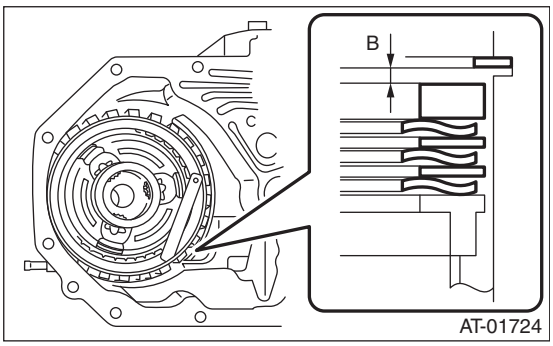
25) Install a new 2-4 brake seal to the transmission case.



26) After all 2-4 brake component parts have been installed, blow in air intermittently and confirm the operation of the brake.



27) Check the piston stroke. (non-turbo model)
(1) Measure clearance “B” between the retaining plate and snap ring.
At this time, do not press down the retaining plate.



B Measured value

(2) Piston stroke calculation
Calculate with A and B dimensions recorded before. If the calculated value exceeds the service limits, 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)

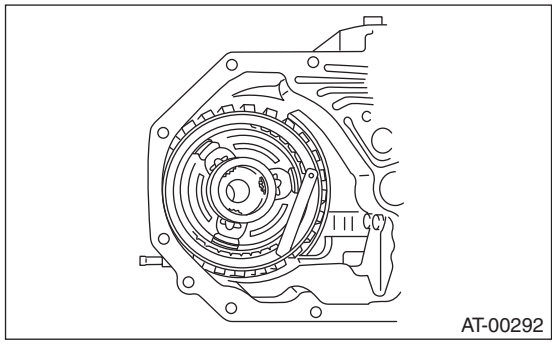
Retaining plate	
Part No.	Thickness mm (in)
31567AA991	5.6 (0.220)
31567AB001	5.8 (0.228)
31567AB011	6.0 (0.236)
31567AB021	6.2 (0.244)
31567AB031	6.4 (0.252)
31567AB041	6.6 (0.260)

28) Check the clearance between the retaining plate and snap ring. (turbo model)

NOTE:
If the clearance exceeds the service limits, replace the driven plate and select and adjust the retaining plate to make the clearance fall within initial standard values.

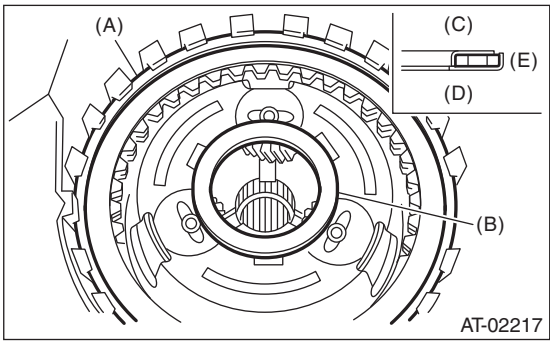
Initial standard:
0.8 — 1.2 mm (0.031 — 0.047 in)

Limit thickness:
1.5 mm (0.059 in)



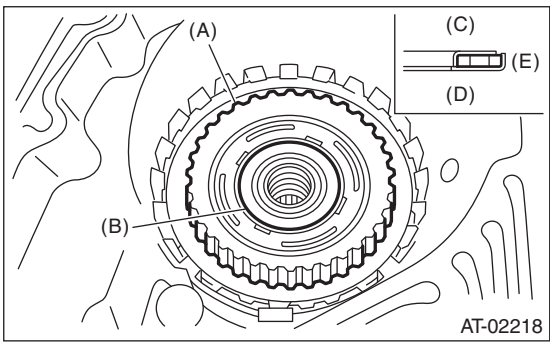
Retaining plate	
Part No.	Thickness mm (in)
31567AA991	5.6 (0.220)
31567AB001	5.8 (0.228)
31567AB011	6.0 (0.236)
31567AB021	6.2 (0.244)
31567AB031	6.4 (0.252)
31567AB041	6.6 (0.260)

29) Install the thrust needle bearing in the correct direction.



(A) Snap ring
(B) Thrust needle bearing
(C) Upside
(D) Downside
(E) Outside

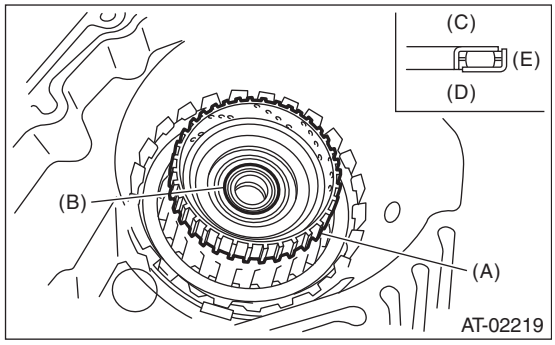
30) Install the front sun gear and the thrust needle bearing.



(A) Front sun gear
(B) Thrust needle bearing
(C) Upside
(D) Downside
(E) Outside

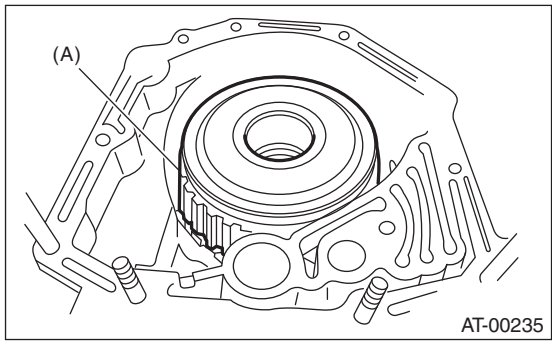
31) Apply vaseline, and attach the thrust needle bearing to the high clutch hub, then engage the splines of the front planetary carrier correctly to install the high clutch hub.

32) Install the thrust needle bearing in the correct direction.



(A) High clutch hub
(B) Thrust needle bearing
(C) Upside
(D) Downside
(E) Outside

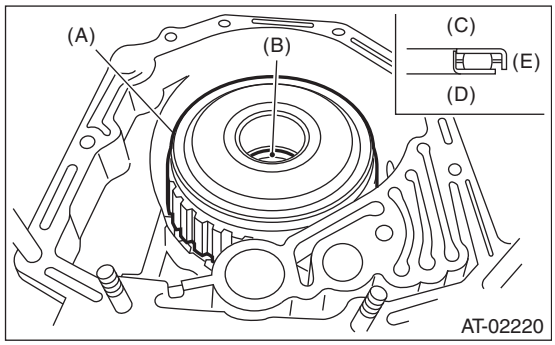
33) Install the high clutch assembly and reverse clutch assembly.



(A) High clutch ASSY and reverse clutch ASSY

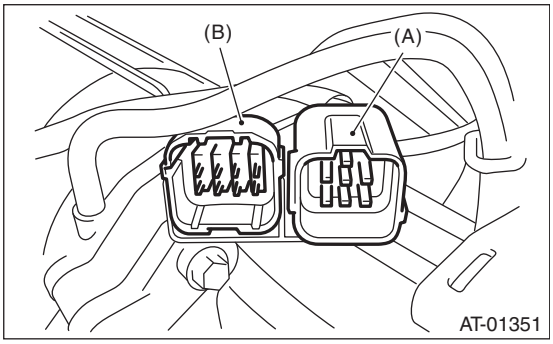
34) Adjust the total end play. <Ref. to 4AT-94, ADJUSTMENT, Oil Pump Housing.>

35) Install the thrust needle bearing in the correct direction.



(A) High clutch ASSY and reverse clutch ASSY
(B) Thrust needle bearing
(C) Upside
(D) Downside
(E) Outside

36) Install a new gasket along with the oil pump housing assembly. <Ref. to 4AT-90, INSTALLATION, Oil Pump Housing.>
37) Install the converter case to the transmission case assembly. <Ref. to 4AT-87, INSTALLATION, Converter Case.>
38) Insert the inhibitor switch connector and transmission harness connector onto the stay.

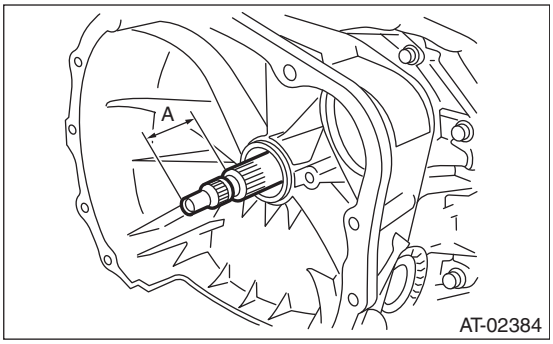


(A) Transmission harness connectors
(B) Inhibitor switch connector

39) Install the air breather hose. <Ref. to 4AT-70, INSTALLATION, Air Breather Hose.>
40) Install the ATF cooler pipe. <Ref. to 4AT-68, INSTALLATION, ATF Cooler Pipe and Hose.>
41) Install the oil charge pipe together with an O-ring. <Ref. to 4AT-71, INSTALLATION, Oil Charge Pipe.>
42) Apply ATF to the O-ring, insert the input shaft while rotating the shaft slowly by hand, and check the amount of protrusion.

NOTE:
Use new O-rings.

Normal protrusion A:
50 — 55 mm (1.97 — 2.17 in)

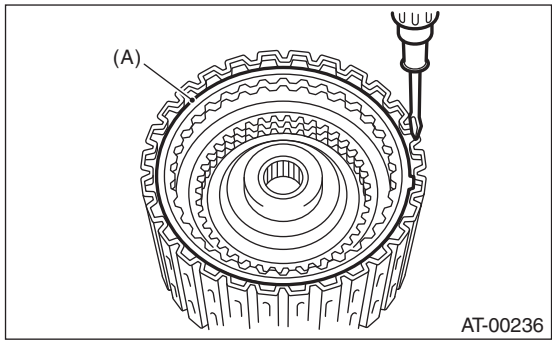


43) Install the torque converter clutch assembly. <Ref. to 4AT-72, INSTALLATION, Torque Converter Clutch Assembly.>
44) Install the transmission assembly to the vehicle. <Ref. to 4AT-41, INSTALLATION, Automatic Transmission Assembly.>

C: DISASSEMBLY

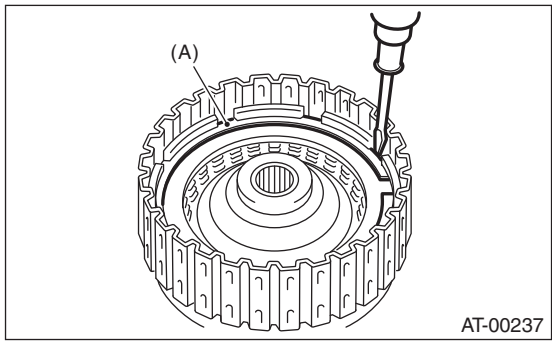
1. HIGH CLUTCH AND REVERSE CLUTCH

1) Remove the snap ring, and then take out the retaining plate, drive plate and driven plate.



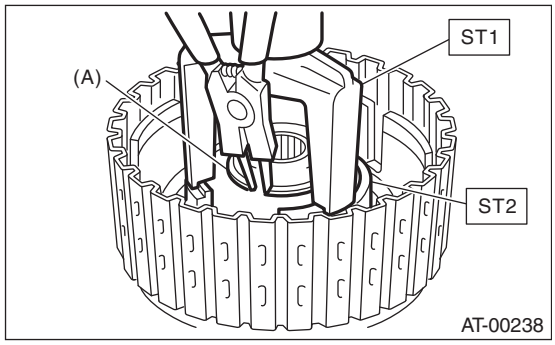
(A) Snap ring

2) Remove the snap ring, and then take out the retaining plate, drive plate and driven plate.



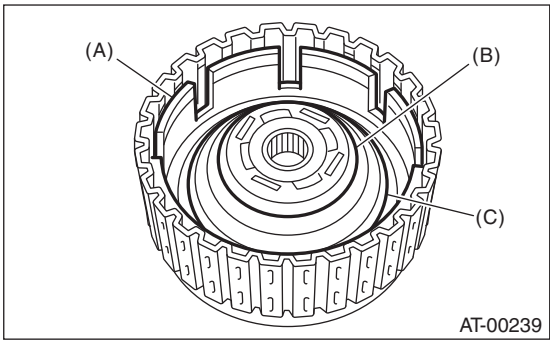
(A) Snap ring

3) Using the ST1 and ST2, remove the snap ring.
ST1 398673600 COMPRESSOR
ST2 498627100 SEAT



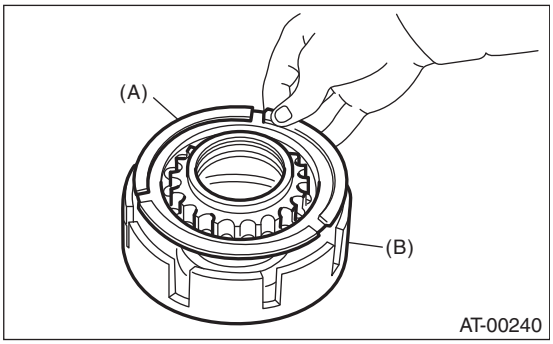
(A) Snap ring

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

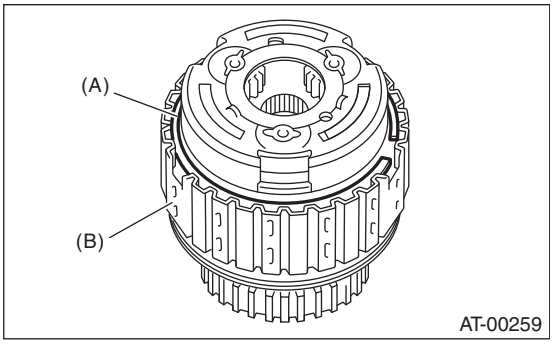
5) Remove the seal ring and lip seal from the high clutch piston and reverse clutch piston.



(A) High clutch piston
(B) Reverse clutch piston

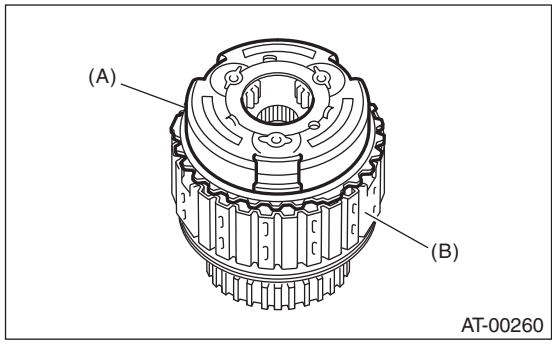
2. PLANETARY GEAR AND LOW CLUTCH

1) Remove the snap ring from low clutch drum.



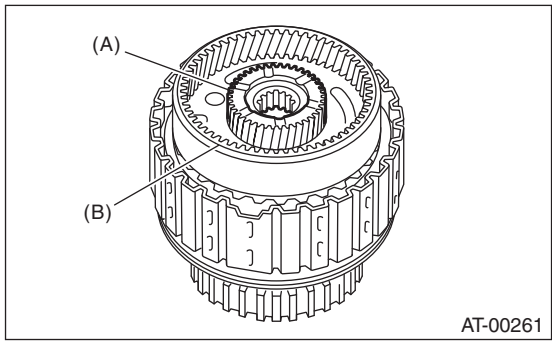
(A) Snap ring
(B) Low clutch drum

2) Take out the front planetary carrier.



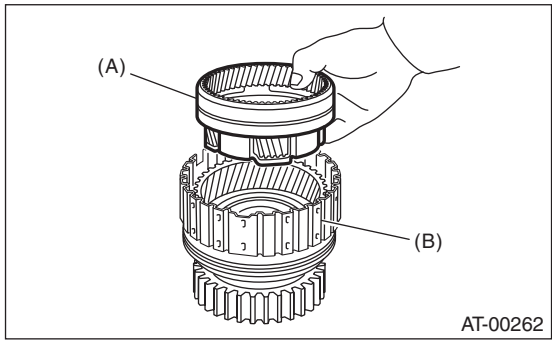
(A) Front planetary carrier
(B) Low clutch drum

3) Take out the rear sun gear.



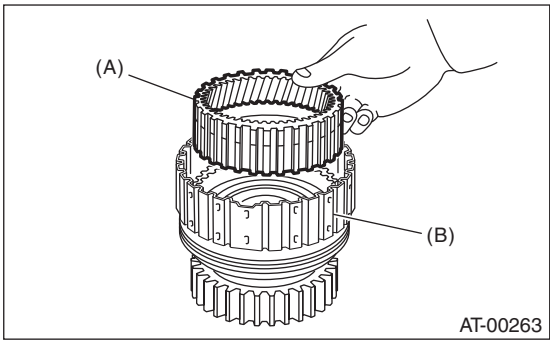
(A) Rear sun gear
(B) Rear planetary carrier

4) Take out the rear planetary carrier, washer and thrust needle bearing.



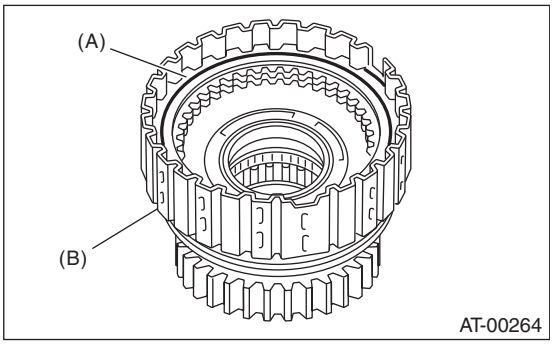
(A) Rear planetary carrier
(B) Low clutch drum

5) Take out the rear internal gear.



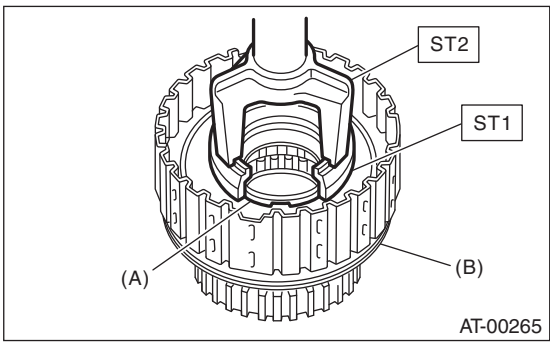
(A) Rear internal gear
(B) Low clutch drum

6) Remove the snap ring from low clutch drum.



(A) Snap ring
(B) Low clutch drum

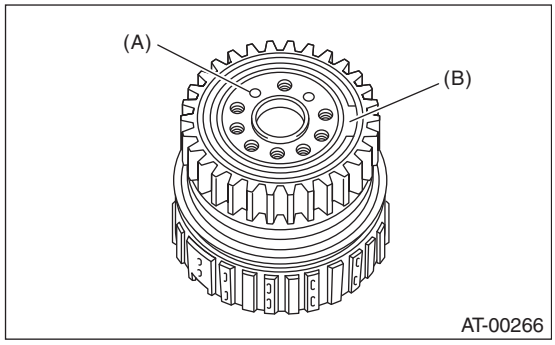
7) Compress the spring retainer of the low & reverse brake, and remove the snap ring from the low clutch drum using ST1 and ST2.
ST1 498627100 SEAT
ST2 398673600 COMPRESSOR



(A) Snap ring
(B) Low clutch drum

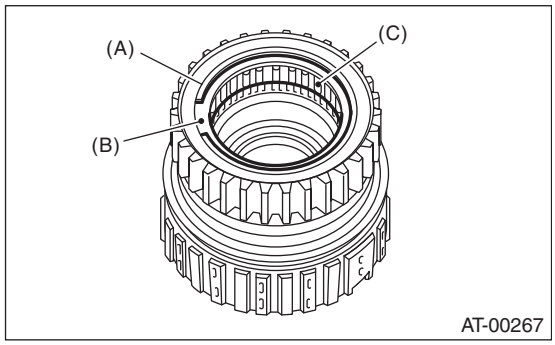
8) Remove the one-way clutch. <Ref. to 4AT-108, REMOVAL, AT Main Case.>

9) Install the one-way clutch inner race to the low clutch drum, and then apply compressed air to remove the low clutch piston.



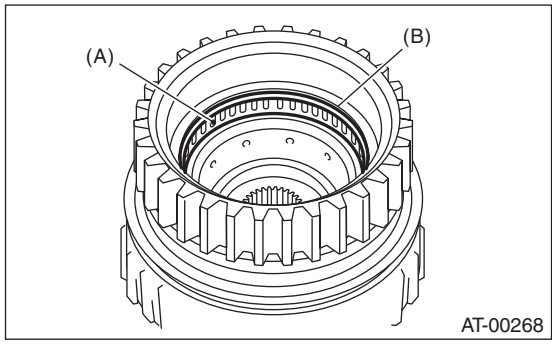
(A) Apply compressed air.
(B) One-way clutch inner race

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

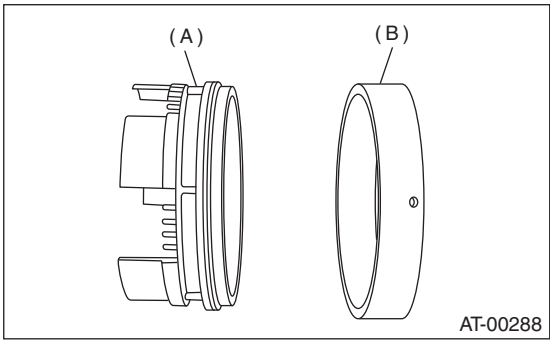
12) Remove the needle bearing after taking out the snap ring.



(A) Needle bearing
(B) Snap ring

3. 2-4 BRAKE

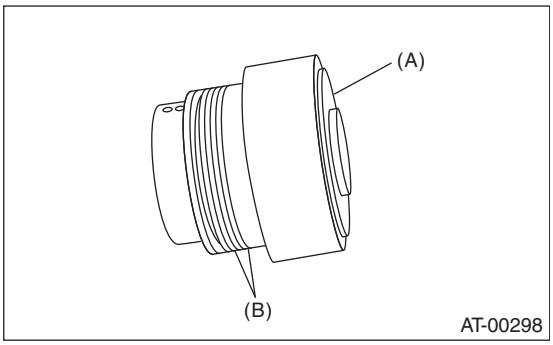
Separate the 2-4 brake piston and piston retainer.



(A) 2-4 brake piston
(B) 2-4 brake piston retainer

4. ONE-WAY CLUTCH INNER RACE

1) Remove the seal ring.

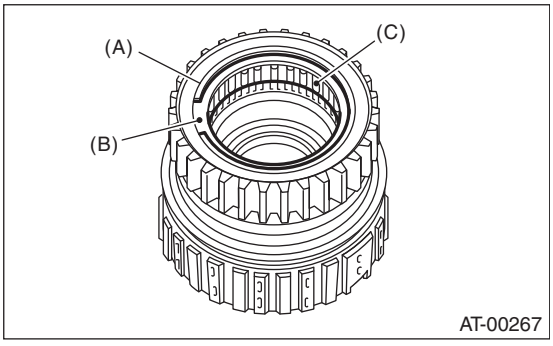


(A) One-way clutch inner race
(B) Seal ring

2) Remove the needle bearing using ST.
ST 398527700 PULLER ASSY

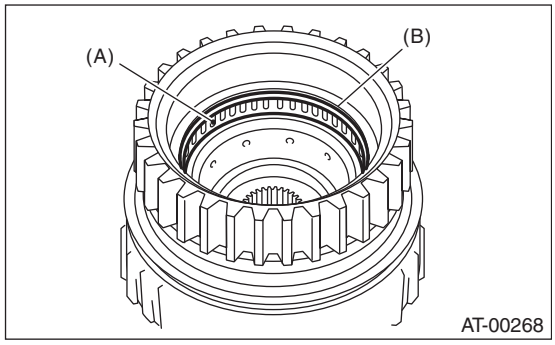
5. ONE-WAY CLUTCH OUTER RACE

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

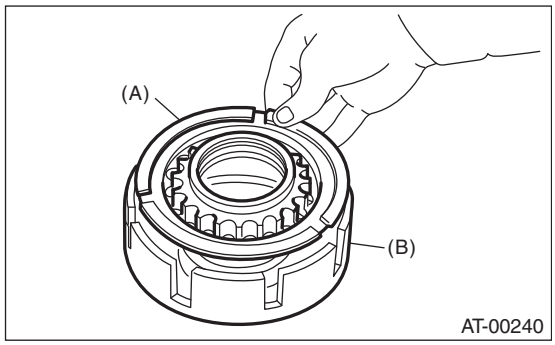
1. HIGH CLUTCH AND REVERSE CLUTCH

1) Install the seal ring and lip seal to the high clutch piston and reverse clutch piston.

NOTE:
Use a new seal ring and lip seal.

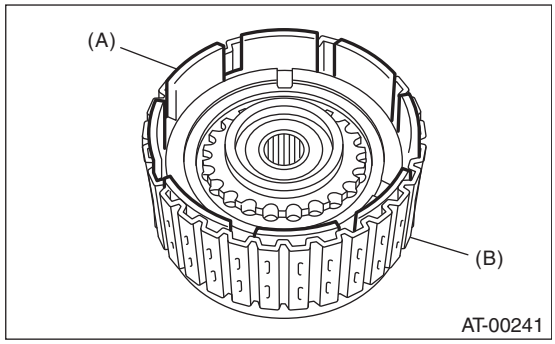
2) Install the high clutch piston to the reverse clutch piston.

NOTE:
Be careful not to damage the seal ring and lip seal.



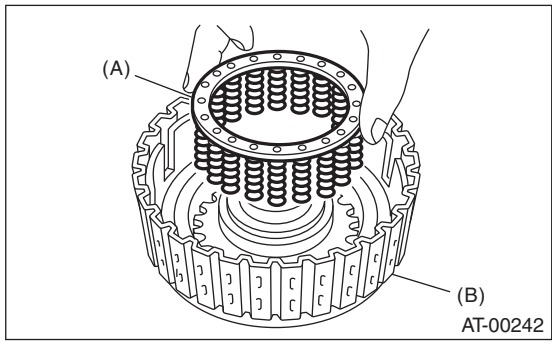
(A) High clutch piston
(B) Reverse clutch piston

3) Install the reverse clutch piston to the high clutch drum. Align the groove on reverse clutch piston with the groove on high clutch drum during installation.



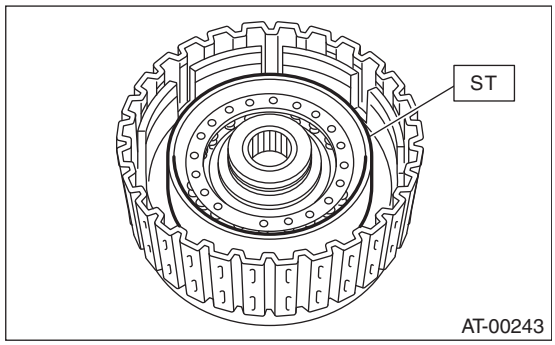
(A) Reverse clutch piston
(B) High clutch drum

4) Install the spring retainer to the high clutch piston.



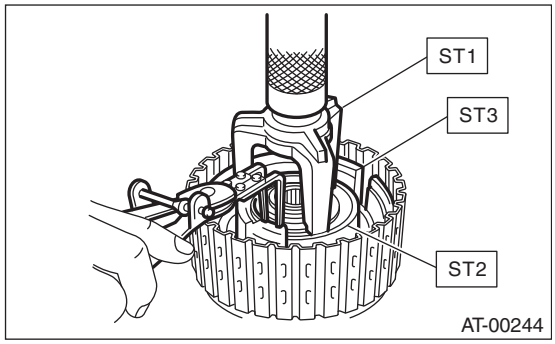
(A) Spring retainer
(B) High clutch drum

5) Attach the ST to the high clutch piston.
ST 498437000 HIGH CLUTCH PISTON GUIDE



6) Install the high clutch piston cover while making sure not to bend the high clutch piston seal.

7) Install the snap ring by using ST1, ST2 and ST3.
ST1 398673600 COMPRESSOR
ST2 498627100 SEAT
ST3 498437000 HIGH CLUTCH PISTON GUIDE



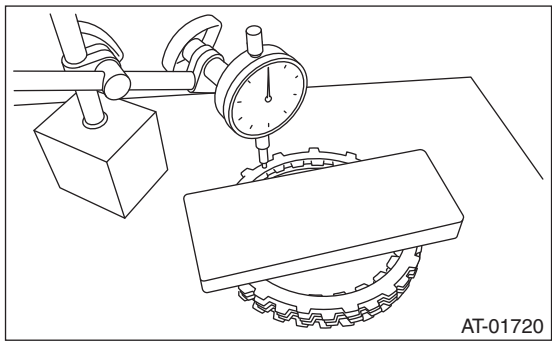
8) Measure the amount of drive plate compression and record that value. (non-turbo model)
(1) Place the dish plate, driven plate, drive plate and retaining plate neatly in this order on surface table.
(2) Set the dial gauge to the clutch, and read its scale.

NOTE:
The value, which is read in the dial gauge at this time, is zero point.

(3) Scale and record the weight “Z” of the flat board that will be placed on the 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).

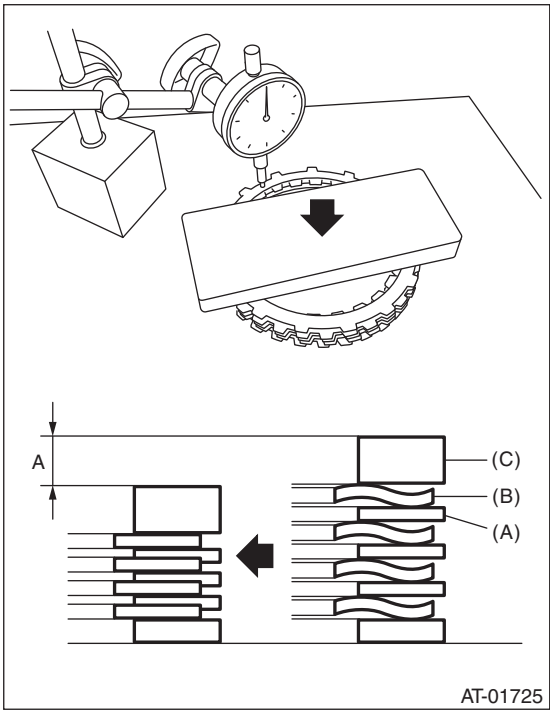
(4) Put the flat board on retaining plate.



(5) Using the following formula, read the push/pull gauge, and calculate “N”.
N = 250 N (25.5 kgf, 56.2 lb) – Z
N: Value indicated on push/pull gauge
250 N (25.5 kgf, 56.2 lb) : Load applied to clutch plate
Z: Flat board weight

(6) Press the center of retaining plate with a force of N using a push/pull gauge, and measure and record height “A”. Measure at three or more locations spaced by equal distances and take the average value.

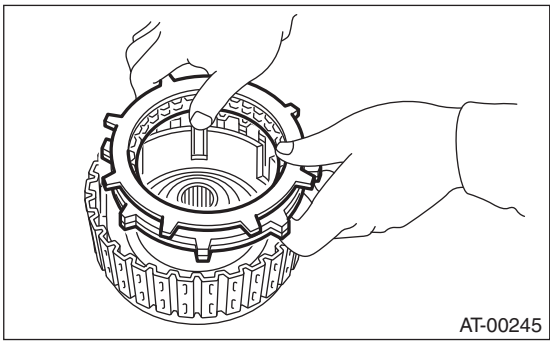
NOTE:
If measuring in three locations, measure every 120°. If measuring in four locations, measure every 90°.



A Measured value

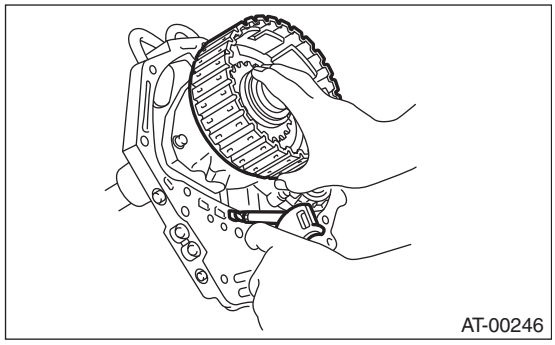
(A) Driven plate
(B) Drive plate
(C) Retaining plate

9) Install the thickest driven plate to piston side, and then install the driven plate, drive plate, retaining plate to high clutch drum.

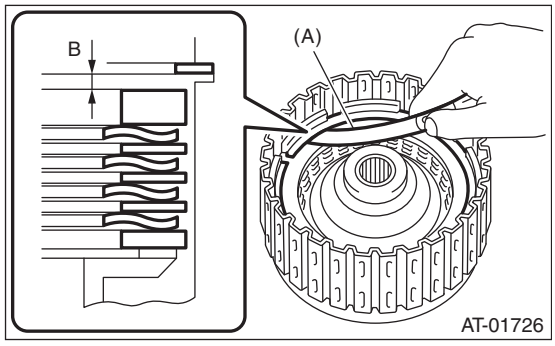


10) Install the snap ring to high clutch drum.

11) Apply compressed air intermittently to check for operation.



12) Check the piston stroke. (non-turbo model)
(1) Measure clearance “B” between the retaining plate and snap ring. (High clutch) At this time, do not press down the retaining plate.



B Measured value

(A) Thickness gauge

(2) Piston stroke calculation
Calculate with A and B dimensions recorded before. If the calculated value exceeds the service limits, replace the drive plate and select and adjust the retaining plate to be within initial 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 — 2.3 mm (0.079 — 0.091 in)

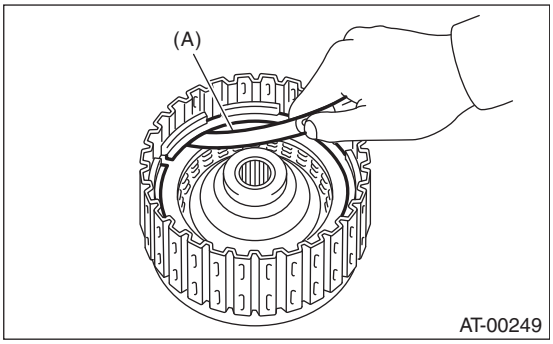
Limit thickness:
2.6 mm (0.102 in)

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)

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.

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)

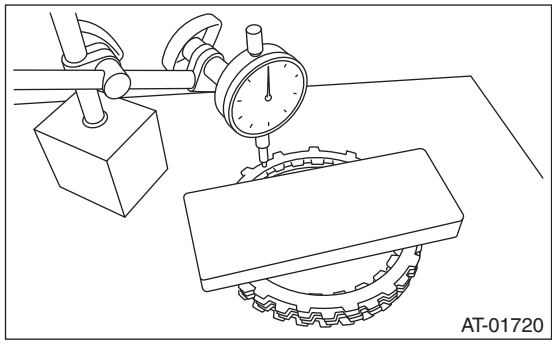
14) Selection of the reverse clutch retaining plate
(1) Place the dish plate, driven plate, drive plate and retaining plate neatly in this order on surface table.
(2) Set the dial gauge to the retaining plate, and read its scale.

NOTE:
The value, which is read in the dial gauge at this time, is zero point.

(3) Scale and record the weight “Z” of the flat board that will be placed on the 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 15.3 kg (33.7 lb).

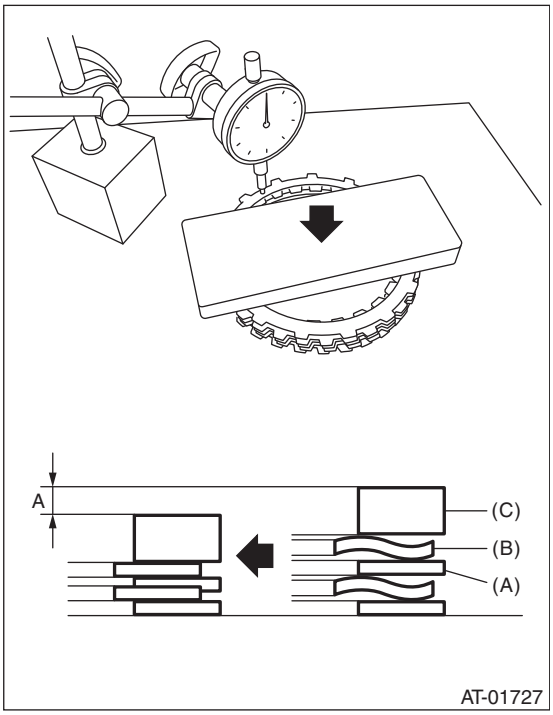
(4) Put the flat board on retaining plate.



(5) Using the following formula, read the push/pull gauge, and calculate “N”.
N = 150 N (15.3 kgf, 33.7 lbf) – Z
N: Value indicated on push/pull gauge
150 N (15.3 kgf, 33.7 lbf): Load applied to the clutch plate
Z: Flat board weight

(6) Press the center of retaining plate with a force of N using a push/pull gauge, and measure and record height “A”. Measure at three or more locations spaced by equal distances and take the average value.

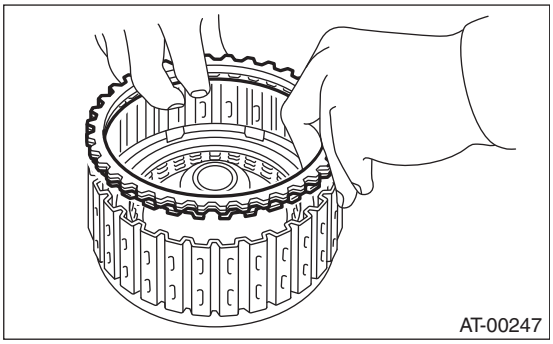
NOTE:
If measuring in three locations, measure every 120°. If measuring in four locations, measure every 90°.



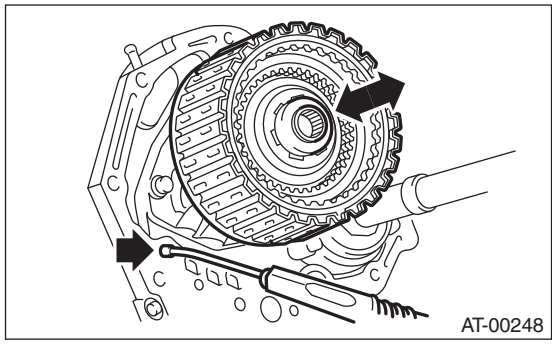
A Measured value

(A) Driven plate
(B) Drive plate
(C) Retaining plate

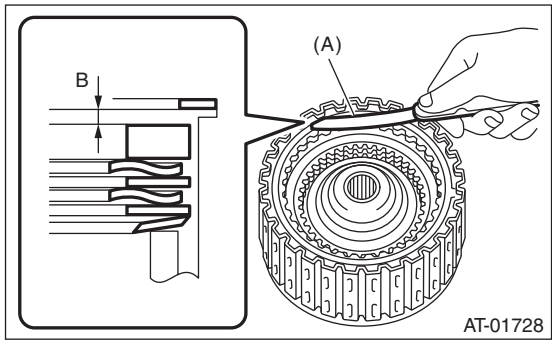
(7) Install the driven plate, drive plate, retaining plate and snap ring.



(8) Apply compressed air intermittently to check for operation.



(9) Measure and record the clearance “B” between the retaining plate and snap ring. (Reverse clutch) At this time, do not press down the retaining plate.



B Measured value

(A) Thickness gauge

(10) Piston stroke calculation
Calculate with A and B dimensions recorded before. If the calculated value exceeds the service limits, replace the drive plate and select and adjust the retaining plate to be within initial standard values.
T = A + B
T: Piston stroke
A: Amount of drive plate compression
B: Clearance between retaining plate and snap ring

Initial standard:
1.1 — 1.4 mm (0.043 — 0.055 in)

Limit thickness:
1.6 mm (0.063 in)

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)

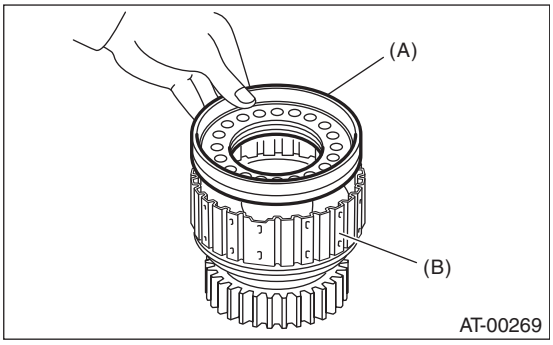
2. PLANETARY GEAR AND LOW CLUTCH

1) Apply ATF to the D-ring, and install it to the low clutch piston.

NOTE:
Use a new D-ring.

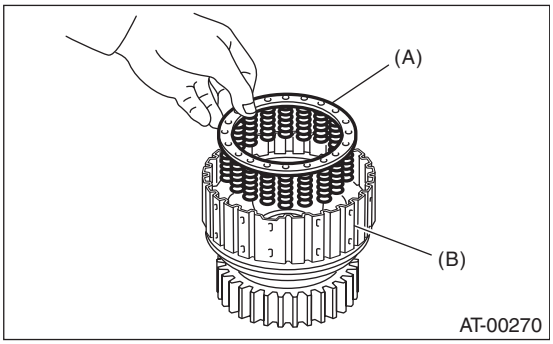
2) Install the low clutch piston to low clutch drum.

NOTE:
Be careful not to damage the D-ring.



(A) Low clutch piston
(B) Low clutch drum

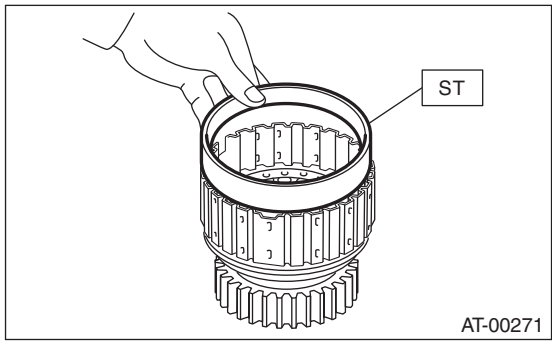
3) Install the spring retainer to low clutch piston.



(A) Spring retainer
(B) Low clutch drum

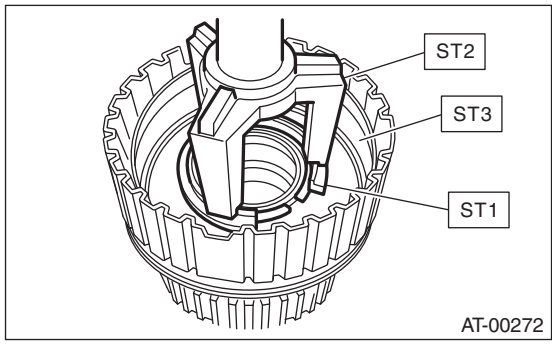
4) Attach the ST to the low clutch drum.

ST 498437100 LOW CLUTCH PISTON GUIDE

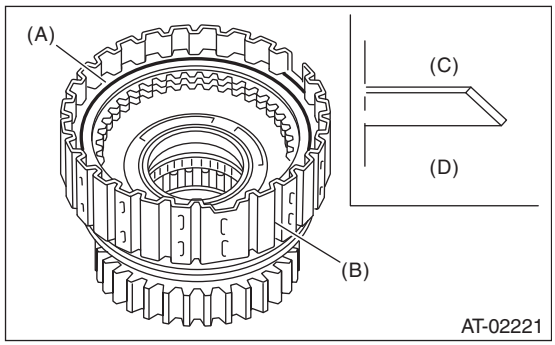


5) Using ST1, ST2 and ST3, set the cover on the piston and press against it, and attach the snap ring. At this time, be careful not to bend the cover seal.

ST1 498627100 SEAT
ST2 398673600 COMPRESSOR
ST3 498437100 LOW CLUTCH PISTON GUIDE

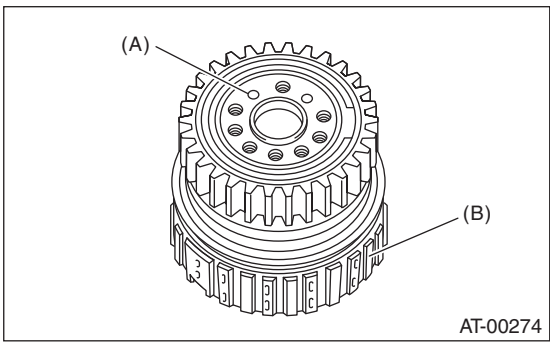


6) Install the dish plate, driven plate, drive plate and retaining plate, and then secure them with a snap ring.



(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-108, REMOVAL, AT Main Case.>
(2) Set the one-way clutch inner race, and apply compressed air for checking.

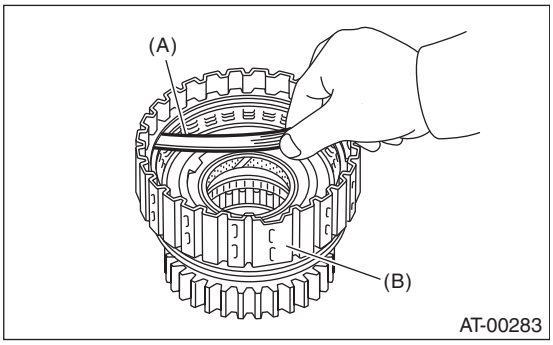


(A) Apply compressed air.
(B) Low clutch drum

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)

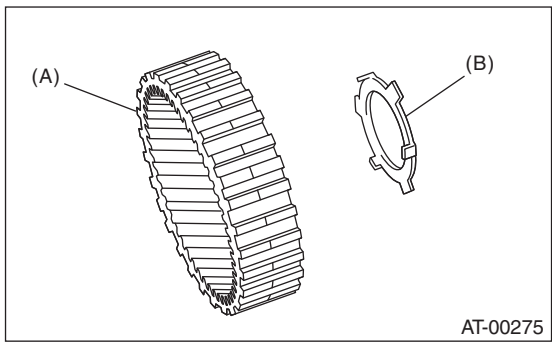


(A) Thickness gauge
(B) Low clutch drum

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.

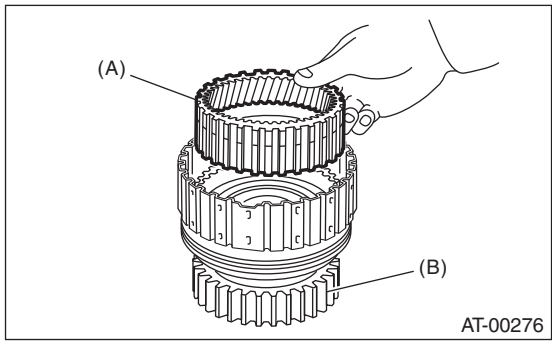
Retaining plate	
Part No.	Thickness mm (in)
31567AB050	3.8 (0.150)
31567AB060	4.0 (0.157)
31567AB070	4.2 (0.165)
31567AB080	4.4 (0.173)
31567AB090	4.6 (0.181)

9) Install the washer to the rear internal gear.



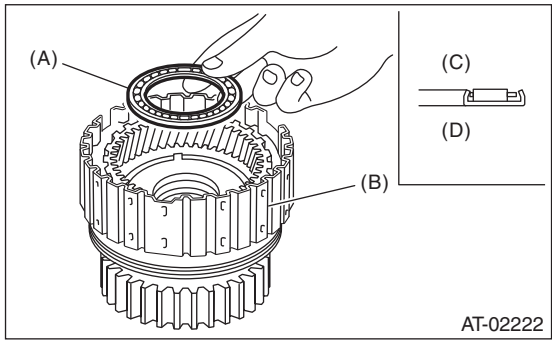
(A) Rear internal gear
(B) Washer

10) Install the rear internal gear.



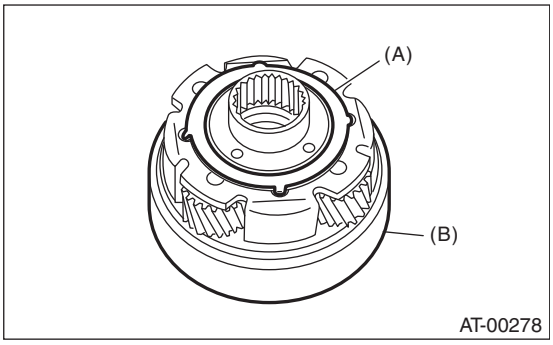
(A) Rear internal gear
(B) Low clutch drum

11) Install the thrust needle bearing in the correct direction.



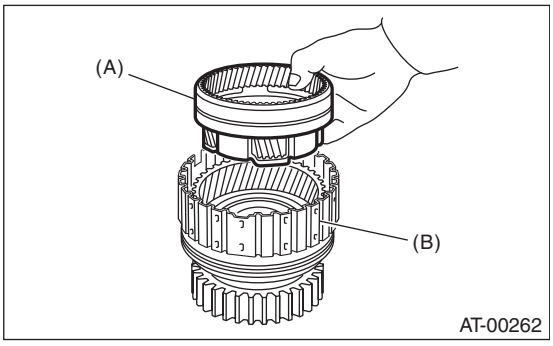
(A) Thrust needle bearing
(B) Low clutch drum
(C) Rear planetary carrier side
(D) Low clutch drum side

12) Install the washer by aligning the protrusion of the washer with the hole of the rear planetary carrier.



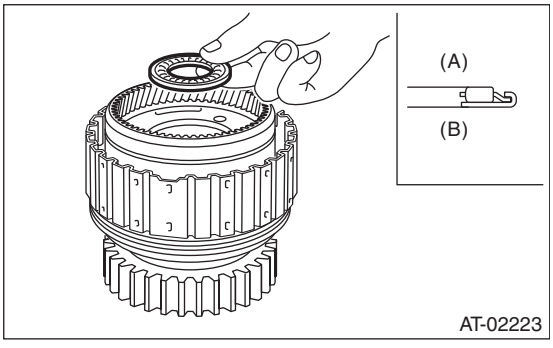
(A) Washer
(B) Rear planetary carrier

13) Install the rear planetary carrier to the low clutch drum.



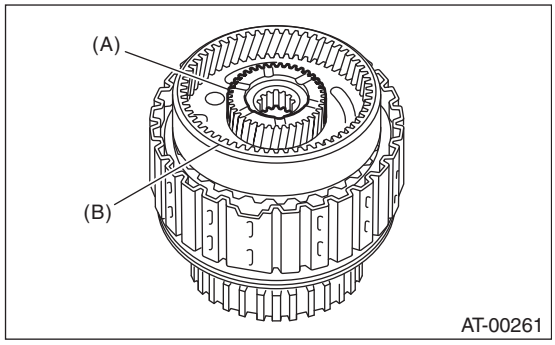
(A) Rear planetary carrier
(B) Low clutch drum

14) Install the thrust needle bearing in the correct direction.



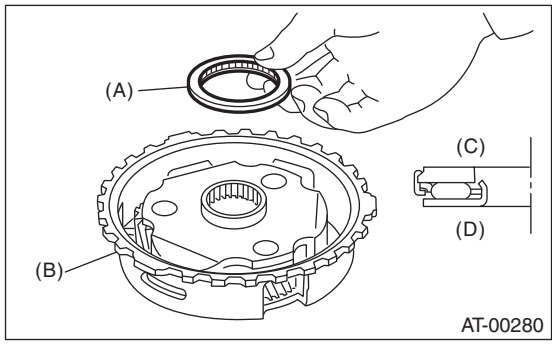
(A) Rear sun gear side
(B) Low clutch drum side

15) Install the rear sun gear in the correct direction.



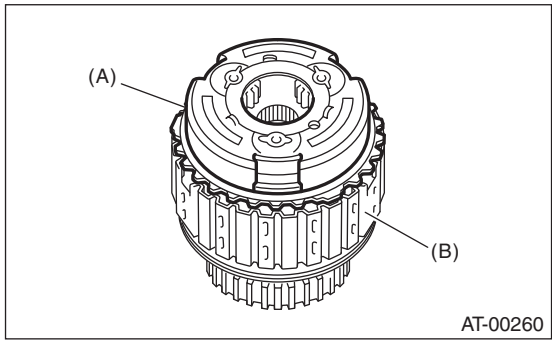
(A) Rear sun gear
(B) Rear planetary carrier

16) Install the thrust needle bearing in the correct direction.



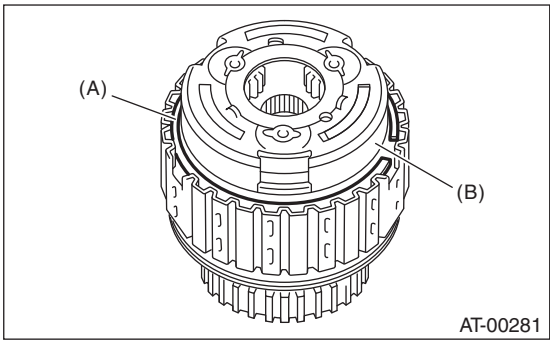
(A) Thrust needle bearing
(B) Front planetary carrier
(C) Rear sun gear side
(D) Front planetary carrier side

17) Install the front planetary carrier to the low clutch drum.



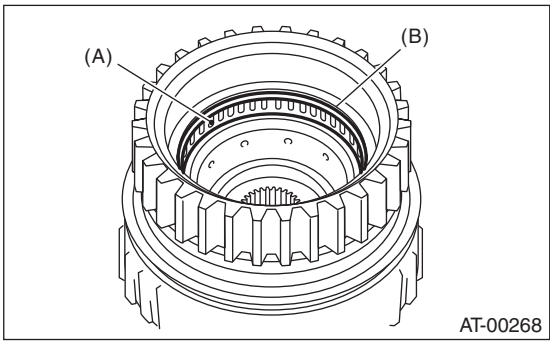
(A) Front planetary carrier
(B) Low clutch drum

18) Install the snap ring to the low clutch drum.



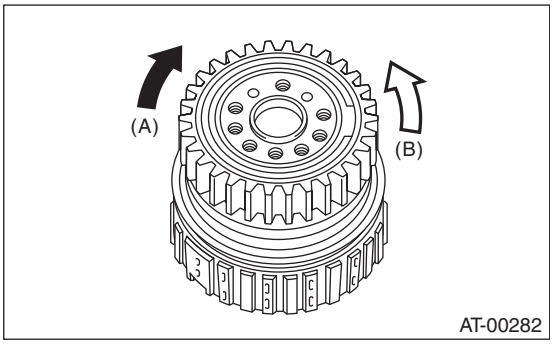
(A) Snap ring
(B) Front planetary carrier

19) Install the needle bearing, and then secure with the snap ring.



(A) Needle bearing
(B) Snap ring

20) Install the one-way clutch and one-way clutch inner race, then secure with the snap ring.
21) Set the inner race. Make sure that the clutch locks in the clockwise direction and rotates in the counterclockwise direction.



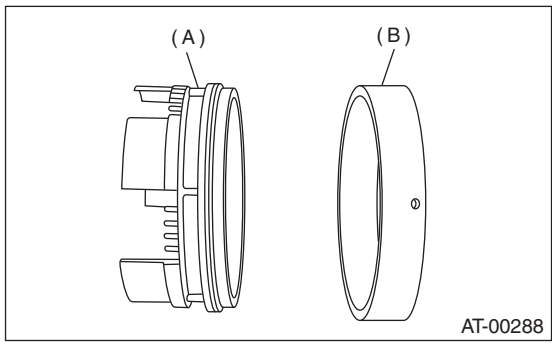
(A) Locked
(B) Rotates freely

3. 2-4 BRAKE

1) Apply ATF to the D-ring, then install to the 2-4 brake piston.

NOTE:
Use a new D-ring.
2) Install 2-4 brake piston to 2-4 brake piston retainer.

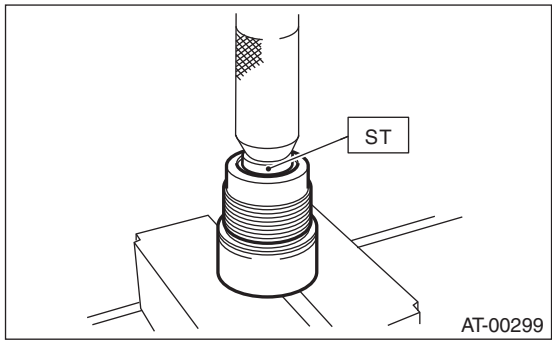
NOTE:
Be careful not to damage the D-ring.



(A) 2-4 brake piston
(B) 2-4 brake piston retainer

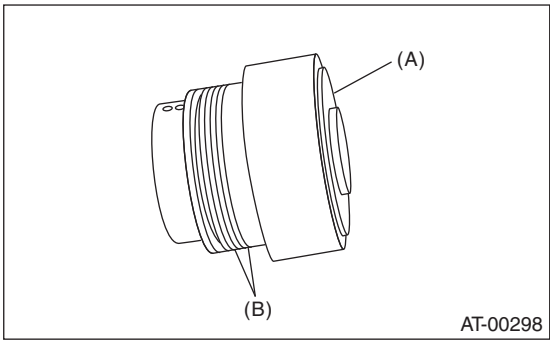
4. ONE-WAY CLUTCH INNER RACE

1) Install the needle bearing to the inner race using the ST and a press.
ST 398497701 INSTALLER



2) Install two seal rings to the one-way clutch inner race.

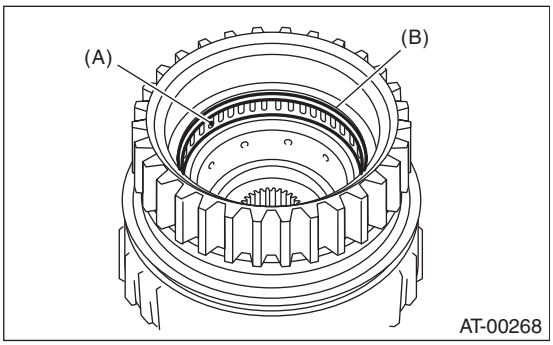
NOTE:
- Use a new seal ring.
- Apply vaseline to the groove of inner race and to the seal ring.



(A) One-way clutch inner race
(B) Seal ring

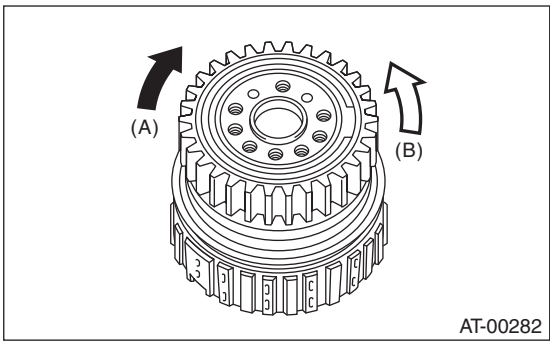
5. ONE-WAY CLUTCH OUTER RACE

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 one-way clutch inner race, then secure with the snap ring.
3) Set the inner race. Make sure that the clutch locks in the clockwise direction and rotates in the counterclockwise direction.



(A) Locked
(B) Rotates freely

E: INSPECTION

1. HIGH CLUTCH AND REVERSE CLUTCH

Check the following items.
- Drive plate facing for wear or damage
- Driven plate for discoloration (burned color)
- Snap ring wear and spring retainer deformation
- Wear and damage of the lip seal and D-ring
- Piston and piston check ball operation
- Check the total end play and adjust it to be within specifications. <Ref. to 4AT-94, ADJUSTMENT, Oil Pump Housing.>

2. PLANETARY GEAR AND LOW CLUTCH

Check the following items.
- Drive plate facing for wear or damage
- Driven plate for discoloration (burned color)
- Snap ring wear and spring retainer deformation
- Wear and damage of the lip seal and D-ring
- Check the total end play and adjust it to be within specifications. <Ref. to 4AT-94, ADJUSTMENT, Oil Pump Housing.>

3. 2-4 BRAKE

Check the following items.
- Drive plate facing for wear or damage
- Driven plate for discoloration (burned color)
- Snap ring wear, leaf spring setting and breakage, and spring retainer deformation
- Wear and damage of the lip seal and D-ring
- Check the total end play and adjust it to be within specifications. <Ref. to 4AT-94, ADJUSTMENT, Oil Pump Housing.>

4. ONE-WAY CLUTCH

- Snap ring wear and seal ring deformation
- Check the total end play and adjust it to be within specifications. <Ref. to 4AT-94, ADJUSTMENT, Oil Pump Housing.>

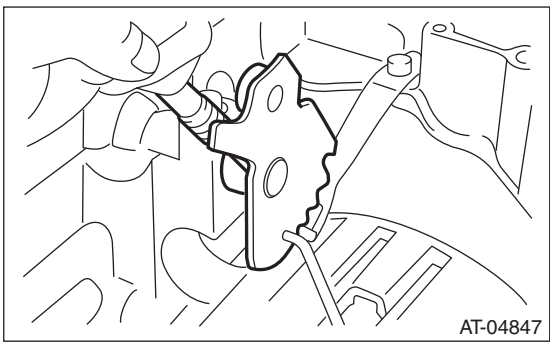
5. LOW & REVERSE BRAKE

Check the following items.
- Drive plate facing for wear or damage
- Driven plate for discoloration (burned color)
- Snap ring wear, leaf spring setting and breakage, and spring retainer deformation
- Lip seal wear and damage

35.Transmission Control Device

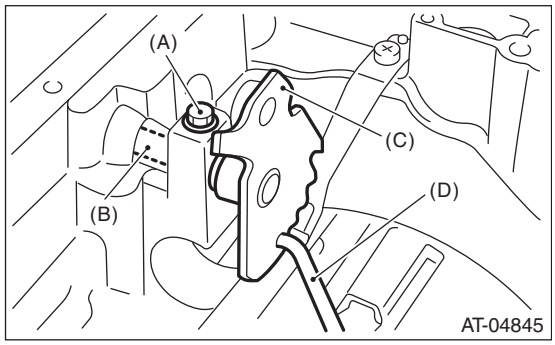
A: REMOVAL

1) Remove the transmission assembly from vehicle body. <Ref. to 4AT-35, REMOVAL, Automatic Transmission Assembly.>
2) Pull out the torque converter clutch assembly. <Ref. to 4AT-72, 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 remove it from the stay.
5) Disconnect the air breather hose. <Ref. to 4AT-70, REMOVAL, Air Breather Hose.>
6) Remove 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. <Ref. to 4AT-53, REMOVAL, Inhibitor Switch.>
10) Remove the control valve body assembly. <Ref. to 4AT-62, REMOVAL, Control Valve Body.>
11) Pull out the spring pin of manual plate.



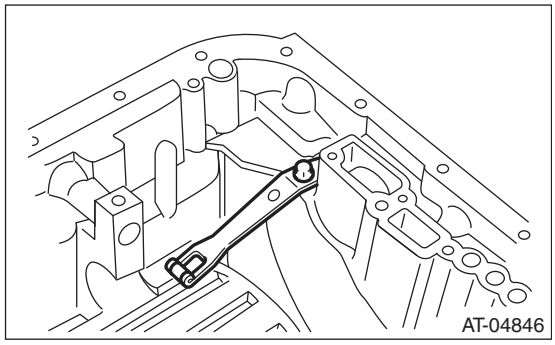
12) Remove the bolts securing select lever, and then remove the select lever, manual plate and parking rod.

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

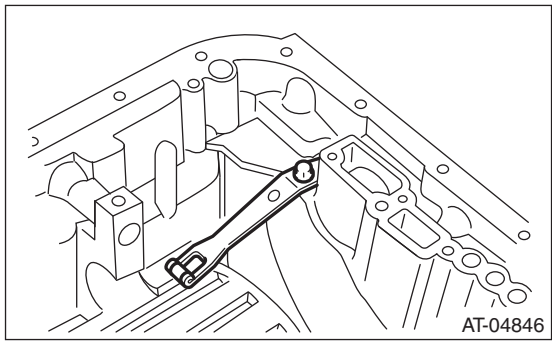
13) Remove the detent spring.



B: INSTALLATION

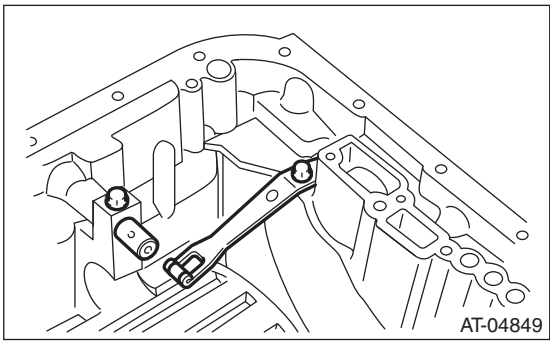
1) Install the detent spring to the transmission case.

Tightening torque:
6 N·m (0.6 kgf-m, 4.4 ft-lb)

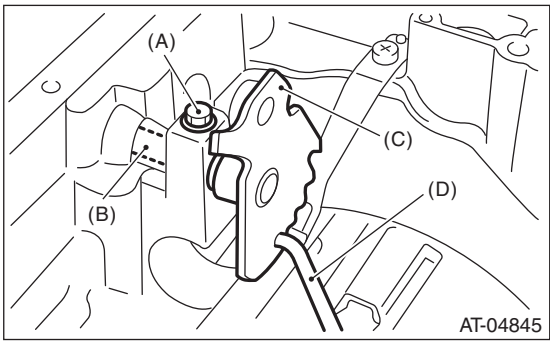


2) Insert the range select lever, and tighten the bolts.

Tightening torque:
6 N·m (0.6 kgf-m, 4.4 ft-lb)



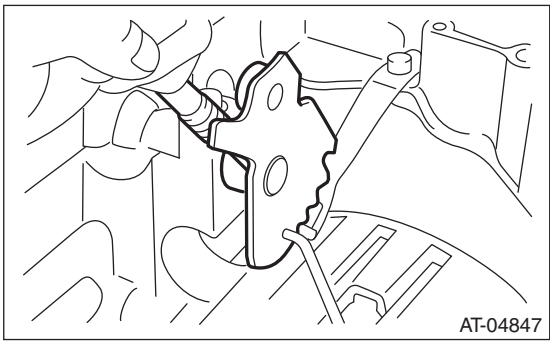
3) Insert the manual plate and parking rod.



(A) Bolt
(B) Range select lever
(C) Manual plate
(D) Parking rod

4) Insert the spring pin to the manual plate.

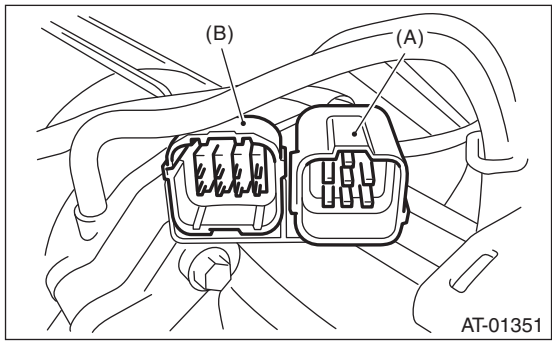
NOTE:
Use new spring pin.



5) Install the oil pan and the control valve assembly. <Ref. to 4AT-63, 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, 30.2 ft-lb)

8) Install and adjust the inhibitor switch. <Ref. to 4AT-52, Inhibitor Switch.>
9) Insert the inhibitor switch connector and transmission harness connector onto the stay.

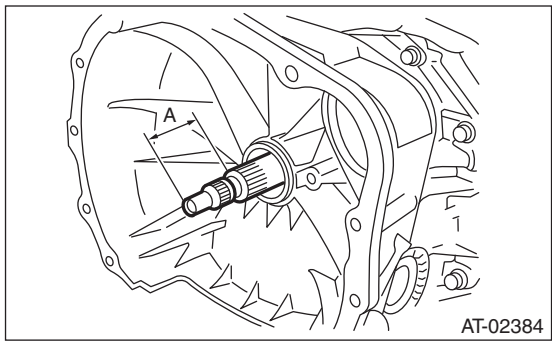


(A) Transmission harness connectors
(B) Inhibitor switch connector

10) Install the air breather hose. <Ref. to 4AT-70, INSTALLATION, Air Breather Hose.>
11) Apply ATF to the O-ring, insert the input shaft while rotating the shaft slowly by hand, and check the amount of protrusion.

NOTE:
Use new O-rings.

Normal protrusion A:
50 — 55 mm (1.97 — 2.17 in)



12) Install the torque converter clutch assembly. <Ref. to 4AT-72, INSTALLATION, Torque Converter Clutch Assembly.>
13) Install the transmission assembly to the vehicle. <Ref. to 4AT-41, INSTALLATION, Automatic Transmission Assembly.>

C: INSPECTION

Make sure that the manual lever and detent spring are not worn or otherwise damaged.

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

4AT(diag)

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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(diag)-4, Check List for Interview.> 2) Check the following items which may be affecting the AT trouble. • General inspection <Ref. to 4AT(diag)-5, INSPECTION, General Description.> • Disconnection of harness connector • Visual check for harness damage • Oil leakage • Stall speed test <Ref. to 4AT-31, Stall Test.> • Line pressure test <Ref. to 4AT-33, Line Pressure Test.> • Transfer clutch pressure test <Ref. to 4AT-34, Transfer Clutch Pressure Test.> • Time lag test <Ref. to 4AT-32, Time Lag Test.> • Road test <Ref. to 4AT-30, Road Test.> • Inhibitor switch <Ref. to 4AT-52, Inhibitor Switch.>	Is the item that might influence the AT problem normal?	Go to step **2**.	Repair or replace items which might affect the AT problem.
2	**CHECK AT OIL TEMP LIGHT.** Turn the ignition switch to ON and wait for at least 2 seconds.	Does the AT OIL TEMP light illuminate?	Go to step **3**.	Check the AT OIL TEMP light.
3	**CHECK AT OIL TEMP LIGHT.** Start the engine and wait for 2 seconds or more.	Does the AT OIL TEMP light blink?	Go to step **4**.	Go to step **6**.
4	**CHECK DTC.** Read the DTC. NOTE: If the communication function of Subaru Select Monitor cannot be executed normally, check the communication circuit. <Ref. to 4AT(diag)-28, COMMUNICATION FOR INITIALIZING IMPOSSIBLE, Diagnostic Procedure for Subaru Select Monitor Communication.>	Is DTC displayed on Subaru Select Monitor?	Record all DTC. Go to step **5**.	Go to step **6**.
5	**CHECK FREEZE FRAME DATA.** Using the Subaru Select Monitor, check the Freeze Frame Data.	Are freeze frame data recorded?	Record the freeze frame data. Go to step **7**.	Go to step **7**.
6	**PERFORM GENERAL DIAGNOSTICS.** 1) Inspect using “Diagnostic Procedure without Diagnostic Trouble Code (DTC)”. <Ref. to 4AT(diag)-78, Diagnostic Procedure without Diagnostic Trouble Code (DTC).> 2) Inspect by referring to “Diagnostics with Phenomenon”. <Ref. to 4AT(diag)-87, Diagnostics with Phenomenon.> 3) Perform the Inspection Mode. <Ref. to 4AT(diag)-19, Inspection Mode.> 4) Read the DTC.	Is DTC displayed on Subaru Select Monitor?	Go to step **7**.	Finish the diagnosis.

	Step	Check	Yes	No
7	**PERFORM DIAGNOSIS.** 1) Inspect by referring to “Diagnostic Procedure with Diagnostic Trouble Code (DTC)”. <Ref. to 4AT(diag)-34, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> NOTE: For the DTC table, refer to “List of Diagnostic Trouble Code (DTC)”. <Ref. to 4AT(diag)-32, List of Diagnostic Trouble Code (DTC).> 2) Repair the trouble cause. 3) Perform the Clear Memory Mode. 4) Perform the Inspection Mode. <Ref. to 4AT(diag)-19, Inspection Mode.> 5) Read the DTC.	Is DTC displayed on Subaru Select Monitor?	Inspect again using Diagnostic Procedure with Diagnostic Trouble Code (DTC). <Ref. to 4AT(diag)-34, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

2. Check List for Interview

A: CHECK

Check the following items when the problem occurs.

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	❑ Continuous ❑ Intermittent (times a day)		
Weather	❑ Fine ❑ Cloudy ❑ Rainy ❑ Snowy ❑ Other ( )		
Place	❑ Highland ❑ Suburbs ❑ Inner city ❑ Uphill ❑ Rough road ❑ Other ( )		
Ambient air temperature	❑ Hot ❑ Warm ❑ Cool ❑ Cold		
Vehicle speed	km/h (MPH)		
AT OIL TEMP light	❑ Blinks continuously	❑ Does not blink	
Select lever position	❑ P ❑ R ❑ N ❑ D ❑ SPORT mode		
Driving condition	❑ Not affected ❑ At racing ❑ While decelerating	❑ At starting ❑ While accelerating ❑ While turning (❑ RH/❑ LH)	❑ While idling ❑ When cruising
SPORT mode	❑ ON ❑ OFF		
Symptoms	❑ No up-shift		
	❑ No down-shift		
	❑ No kick down		
	❑ Vehicle does not move (❑ Any position ❑ Particular position)		
	❑ Lock-up malfunction		
	❑ Noise or vibration		
	❑ Shift shock or slip		
	❑ Select lever does not move		
	❑ Other ( )		

3. General Description

A: CAUTION

1. SUPPLEMENTAL RESTRAINT SYSTEM "AIRBAG"

The airbag system wiring harness is routed near the TCM.

CAUTION:
• All 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.

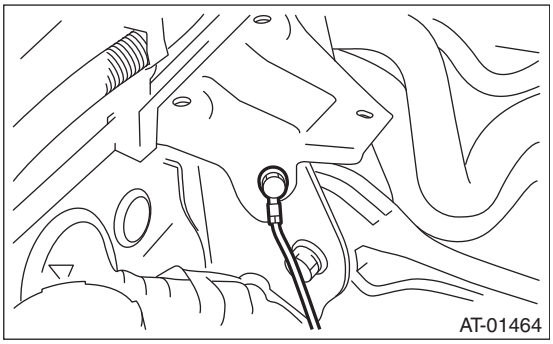
Standard voltage:
12 V or more

Specific gravity:
1.260 or more

2. TRANSMISSION GROUND

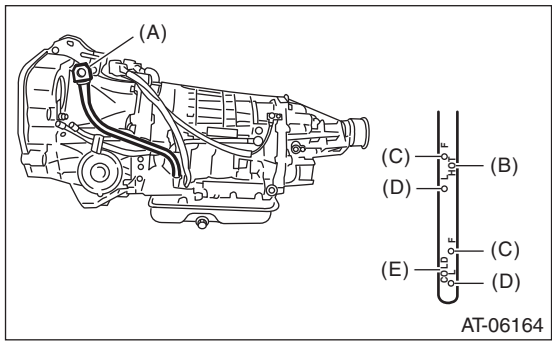
Make sure that the ground terminal bolt is tightened securely.
• Chassis side

Tightening torque:
13 N·m (1.3 kgf-m, 9.6 ft-lb)



3. ATF LEVEL

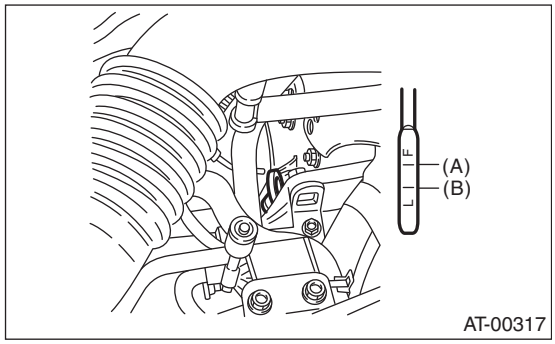
Make sure that ATF level is the specified amount. <Ref. to 4AT-27, INSPECTION, Automatic Transmission Fluid.>



(A) Level gauge
(B) Inspection position when "HOT"
(C) Upper level
(D) Lower level
(E) Inspection position when "COLD"

4. FRONT DIFFERENTIAL OIL LEVEL

Make sure the front differential oil level is at the specified amount. <Ref. to 4AT-29, INSPECTION, Differential Gear Oil.>



(A) Upper level
(B) Lower level

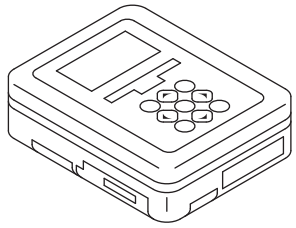
5. OPERATION OF SELECT LEVER

Make sure there is no noise, dragging or contact pattern in each select lever range.

WARNING:
Stop the engine while checking the operation of the select lever.

C: PREPARATION TOOL

1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST1B022XU0	1B022XU0	SUBARU SELECT MONITOR III KIT	Used for troubleshooting the electrical system.

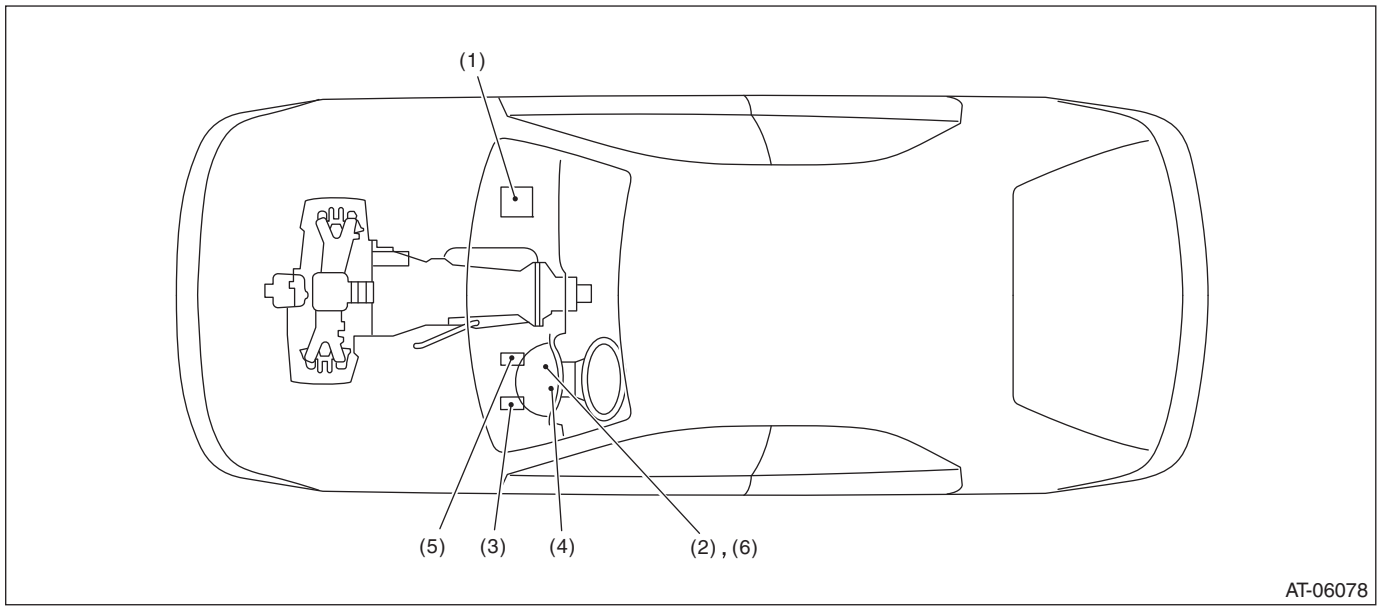
2. GENERAL TOOL

TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance, voltage and current.
Oscilloscope	Used for measuring the sensor.

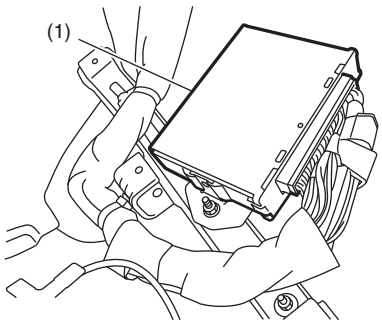
4. Electrical Component Location

A: LOCATION

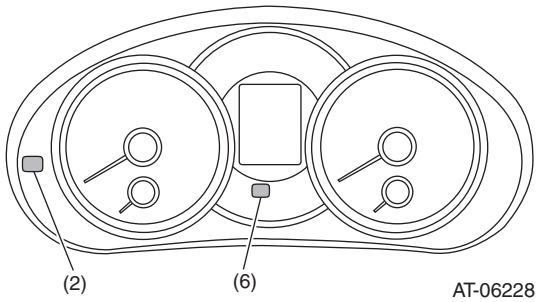
1. CONTROL MODULE



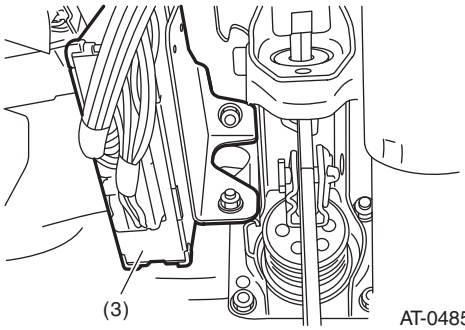
(1)	Engine control module (ECM)	(3)	Transmission control module (TCM)	(5)	Body integrated unit
(2)	AT OIL TEMP light	(4)	Data link connector	(6)	AWD light



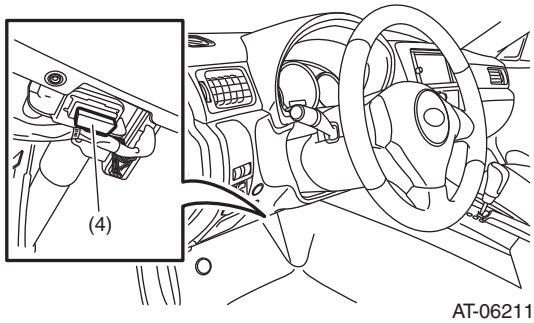
AT-06137



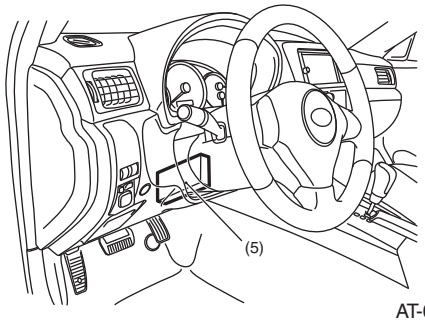
AT-06228



AT-04854

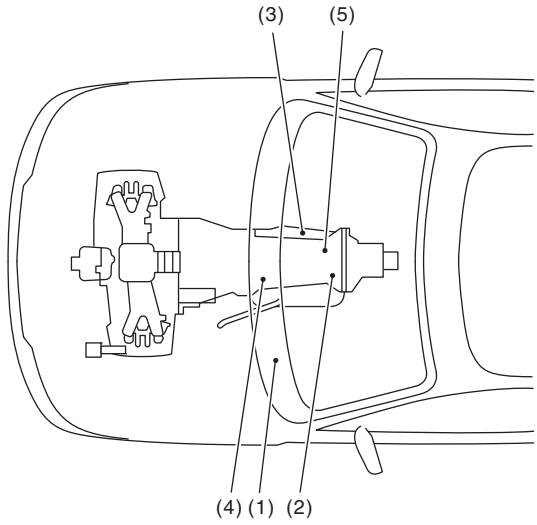


AT-06211



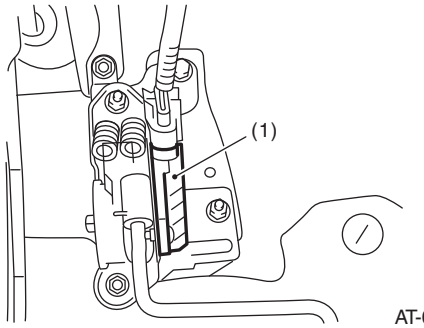
AT-04851

2. SENSOR

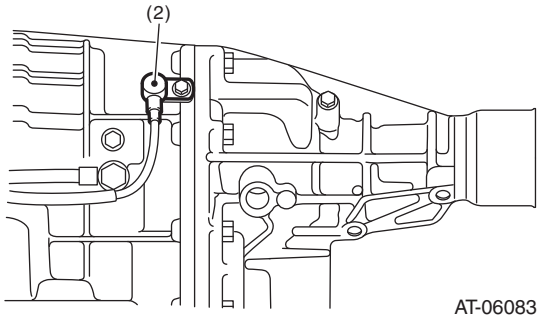


AT-06081

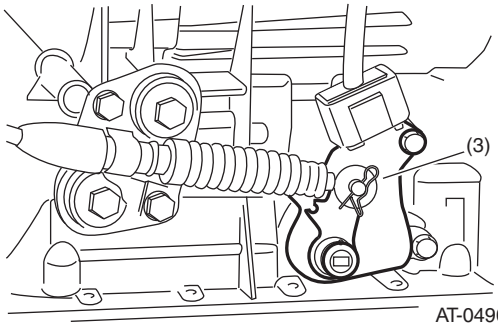
(1) Accelerator pedal position sensor
(2) Front vehicle speed sensor
(3) Inhibitor switch
(4) Torque converter turbine speed sensor
(5) ATF temperature sensor



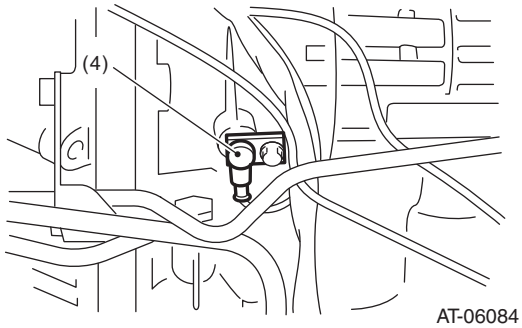
AT-00375



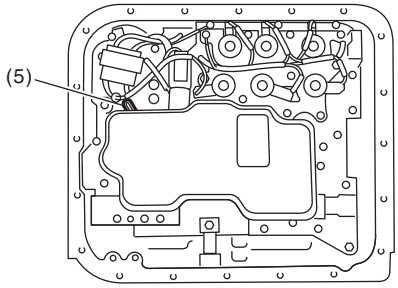
AT-06083



AT-04909

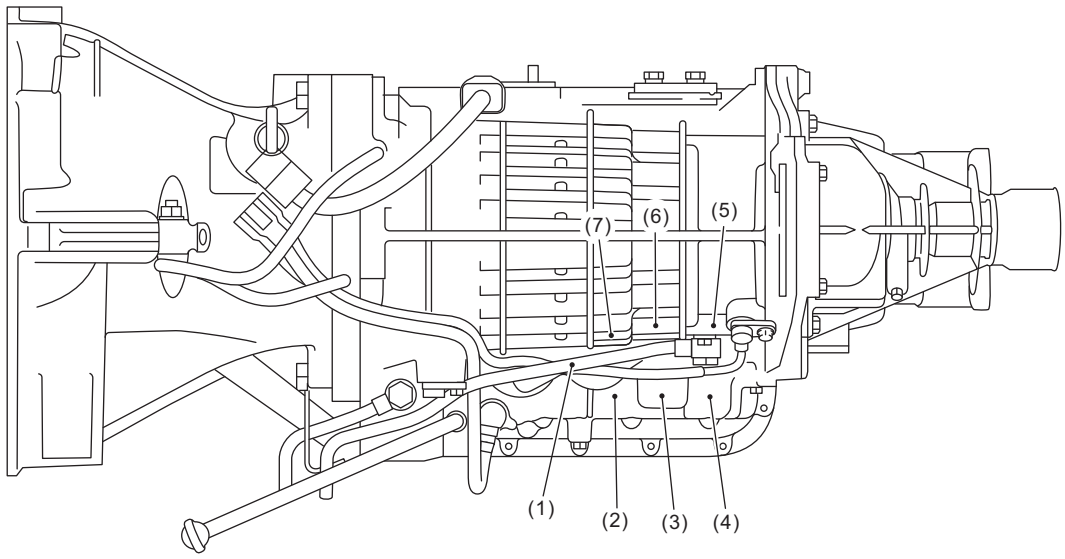


AT-06084

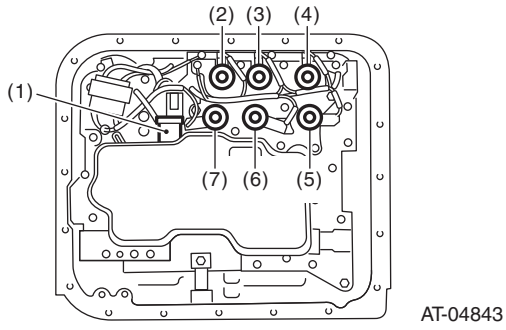


AT-06085

3. SOLENOID

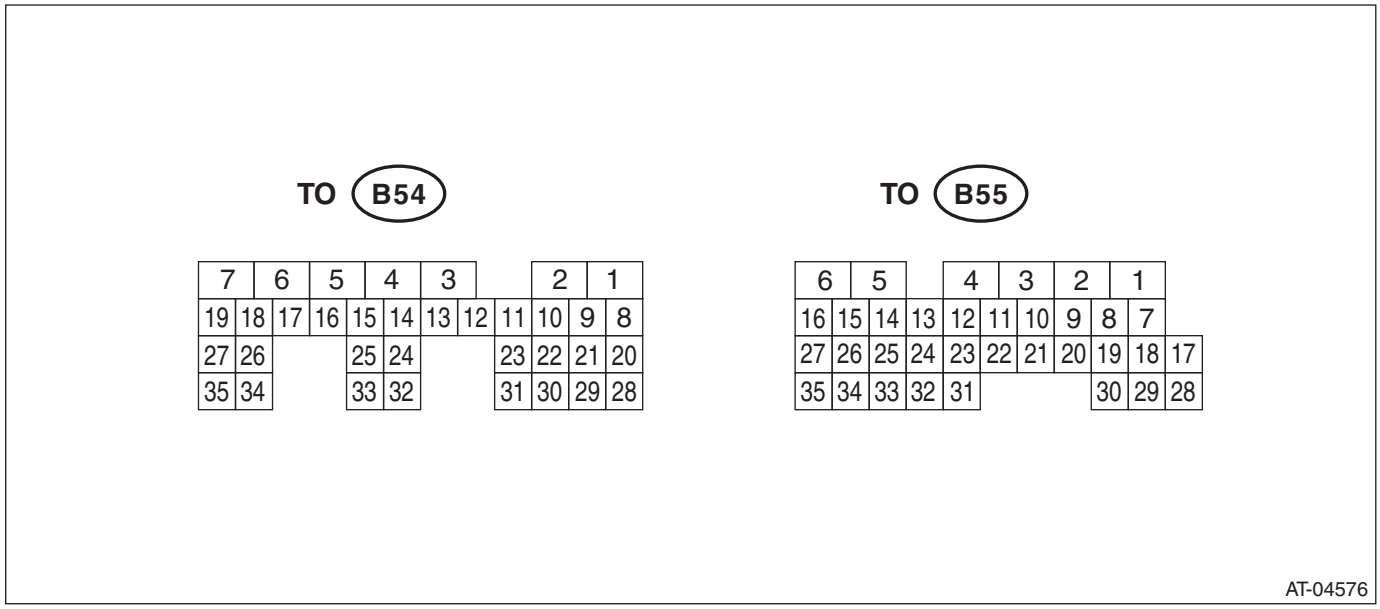


(1) Line pressure linear solenoid
(2) High clutch duty solenoid
(3) 2-4 brake duty solenoid
(4) Low & reverse duty solenoid
(5) Low clutch duty solenoid
(6) Transfer duty solenoid
(7) Lock-up duty solenoid



5. Transmission Control Module (TCM) I/O Signal

A: ELECTRICAL SPECIFICATION



Check with ignition switch ON.						
Item		Measured terminal (Connector & Terminal No.)		Measuring condition	Voltage (V)	Resistance (Ω)
		Positive terminal	Ground terminal			
Backup power supply		(B54) No. 25	Chassis ground	Ignition switch OFF	10 — 13	—
		(B54) No. 26				
		(B54) No. 27				
Ignition power supply		(B54) No. 1	Chassis ground	Ignition switch ON	10 — 13	—
		(B54) No. 2				
Inhibitor switch	“P” range Switch	(B55) No. 14	Chassis ground	Select lever in “P” range	Less than 1	—
				Select lever in any other than “P” range	8 or more	
	“R” range switch	(B55) No. 13	Chassis ground	Select lever in “R” range	Less than 1	—
				Select lever in any other than “R” range	8 or more	
	“N” range switch	(B55) No. 11	Chassis ground	Select lever in “N” range	Less than 1	—
				Select lever in any other than “N” range	8 or more	
	“D” range switch	(B55) No. 10	Chassis ground	Select lever in “D” range	Less than 1	—
				Select lever in any other than “D” range	8 or more	

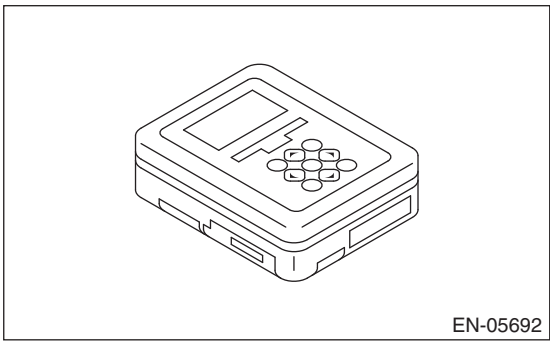
Check with ignition switch ON.					
Item	Measured terminal (Connector & Terminal No.)		Measuring condition	Voltage (V)	Resistance (Ω)
	Positive terminal	Ground terminal			
ATF temperature sensor	(B55) No. 23	(B55) No. 12	ATF temperature 20°C (68°F)	3.5 — 4.3	2.5 k — 7 k
			ATF temperature 80°C (176°F)	1.0 — 2.2	300 — 800
ATF temperature sensor ground	(B55) No. 12	Chassis ground	—	0	Less than 1
Front vehicle speed sensor	(B55) No. 27	(B55) No. 16	Vehicle stopped	0	450 — 650
			Vehicle speed 20 km/h (12 MPH) or more	1 or more (AC range)	
Front vehicle speed sensor ground	(B55) No. 16	Chassis ground	—	—	—
Torque converter turbine speed sensor	(B55) No. 1	(B55) No. 2	Engine idling after warm up (“D” range)	0	450 — 650
			Engine idling after warm up (“N” range)	1 or more (AC range)	
Torque converter turbine speed sensor ground	(B55) No. 2	Chassis ground	—	—	—
Line pressure linear solenoid	(B55) No. 4	(B55) No. 3	Ignition switch ON “R” range throttle fully closed after engine warm up.	3.7 — 7.7	4.0 — 6.0
			Ignition switch ON “R” range throttle fully open after engine warm up.	1.1 — 5.1	
Line pressure linear solenoid ground	(B55) No. 3	Chassis ground	—	Less than 1	Less than 1
Lock-up duty solenoid	(B55) 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	(B55) 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	
2-4 brake duty solenoid	(B54) No. 4	Chassis ground	2nd or 4th gear	Less than 1	2.0 — 4.5
			“P” or “N” range	5.0 or more	
High clutch duty solenoid	(B54) 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	(B54) 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	(B54) No. 5	Chassis ground	Except “1” range	5.0 or more	2.0 — 4.5
			“1” range signal	2.5 — 5.0	

Check with ignition switch ON.					
Item	Measured terminal (Connector & Terminal No.)		Measuring condition	Voltage (V)	Resistance (Ω)
	Positive terminal	Ground terminal			
FWD switch	(B54) No. 10	Chassis ground	Fuse removed	10.5 or more	—
			Fuse installed	Less than 1	
CAN communication signal (+)	(B55) No. 18	Chassis ground	Ignition switch ON	Pulse signal	—
CAN communication signal (–)	(B55) No. 17	Chassis ground		Pulse signal	
System ground	(B54) No. 20	Chassis ground	—	0	Less than 1
	(B54) No. 21	Chassis ground			
	(B54) No. 22	Chassis ground			
	(B54) No. 23	Chassis ground			
Data link signal (Subaru Select Monitor)	(B54) No. 8	Chassis ground	—	—	—
SPORT shift switch	(B54) No. 17	Chassis ground	Ignition switch ON SPORT shift mode switch is ON	Less than 1	—
			Ignition switch ON SPORT switch shift mode switch is OFF	8 or more	—
SPORT shift DOWN switch	(B54) No. 18	Chassis ground	Ignition switch ON SPORT shift down switch is ON	Less than 1	—
			Ignition switch ON When SPORT shift DOWN switch is OFF	8 or more	—
SPORT shift UP switch	(B54) No. 19	Chassis ground	Ignition switch ON When SPORT shift UP switch is ON	Less than 1	—
			Ignition switch ON When SPORT shift UP switch is OFF	8 or more	—

6. Subaru Select Monitor

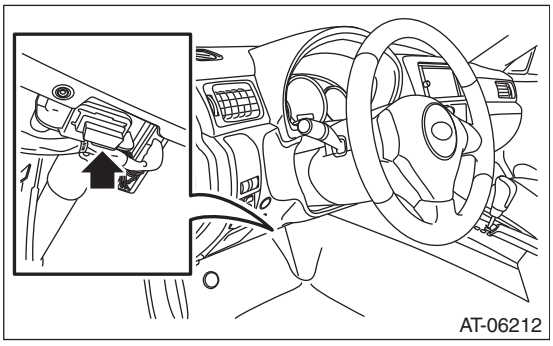
A: OPERATION

1) Prepare the Subaru Select Monitor kit.



2) Prepare PC with Subaru Select Monitor installed.
3) Connect the USB cable to SDI (Subaru Diagnosis Interface) and USB port on the personal computer (dedicated port for the Subaru Select Monitor).

NOTE:
The dedicated port for the Subaru Select Monitor means the USB port which was used to install the Subaru Select Monitor.
4) Connect the diagnosis cable to SDI.
5) Connect SDI to data link connector located in the lower portion of the instrument panel (on the driver's side).



CAUTION:
Do not connect scan tools other than the Subaru Select Monitor.
6) Start the PC.
7) Turn the ignition switch to ON.
8) Run the "PC application for Subaru Select Monitor".

7. Read Current Data

A: OPERATION

1) Using the Subaru Select Monitor, on the «Main Menu» display, select {Each System Check}.
2) On «System Selection Menu» display, select {Transmission Control System}.
3) After transmission type information pops up, select [OK].
4) On «Transmission Diagnosis» display, select {Current Data Display & Save}.
5) On «Current Data Display & Save» display, select {Normal sampling}.
6) Using the scroll key, scroll the display screen up or down until the desired data is shown.

- The support data list is as follows.

Item	Display	Unit of measure
Battery voltage	Battery Voltage	V
Front vehicle speed sensor signal	Front Wheel Speed	km/h or MPH
Engine speed signal	Engine Speed	rpm
Automatic transmission fluid temperature signal	ATF Temp.	°C or °F
Gear position	Gear Position	—
Line pressure control duty ratio	Line Pressure Duty Ratio	%
Lock up clutch control duty ratio	Lock Up Duty Ratio	%
Transfer clutch control duty ratio	Transfer Duty Ratio	%
Torque converter turbine speed signal	Turbine Revolution Speed	rpm
2-4 brake timing pressure control duty ratio	Brake Clutch Duty Ratio	%
Low clutch duty ratio	Low Clutch Duty	%
High clutch duty ratio	High Clutch Duty	%
Low & reverse brake duty ratio	L&R B Duty	%
Accelerator position	Accel. Opening Angle	%
FWD switch signal	FWD Switch	ON or OFF
Stop light switch signal	Stop Light Switch	ON or OFF
Anti lock brake system signal	ABS Signal	ON or OFF
Parking range signal	P Range	ON or OFF
Neutral range signal	N Range	ON or OFF
Reverse range signal	R Range Signal	ON or OFF
Drive range signal	D Range Signal	ON or OFF
AT diagnosis light output signal	Diagnosis Lamp	ON or OFF
ATF temperature light	ATF Temperature Lamp	ON or OFF
Up shift signal	Up Switch	ON or OFF
Down shift signal	Down Switch	ON or OFF
SPORT shift signal	Tiptronic Mode Switch	ON or OFF
Cruise control signal	Cruise Control Signal	ON or OFF

NOTE:
For detailed operation procedures, refer to “PC application help for Subaru Select Monitor”.

8. Read Diagnostic Trouble Code (DTC)

A: OPERATION

1) Using the Subaru Select Monitor, on the «Main Menu» display, select {Each System Check}.
2) On «Each System Check Menu» display, select {Transmission Control System}.
3) After transmission type information is displayed, select [OK].
4) On «Transmission Diagnosis» display, select {Diagnostic Code(s) Display}.
5) On «Diagnostic Code(s) Display» display, select {Temporary Diagnostic Code(s)} or {Memorized Diagnostic Code(s)}.

NOTE:
• For details concerning the work procedure, refer to the “PC application help for Subaru Select Monitor”.
• For details concerning DTC, refer to List of Diagnostic Trouble Code (DTC). <Ref. to 4AT(diag)-32, List of Diagnostic Trouble Code (DTC).>

9. Clear Memory Mode

A: OPERATION

1) Shift the select lever to “P” range.
2) Using the Subaru Select Monitor, on the «Main Menu» display, select {Each System Check}.
3) On «Each System Check Menu» display, select {Transmission Control System}.
4) After transmission type information is displayed, select [OK].
5) On «Transmission Diagnosis» display, select {Clear Memory}.
6) When “Done. Turn off the ignition switch.” is displayed, select [OK].
7) Turn the ignition switch to OFF. To turn the ignition switch to ON again, wait for 10 seconds or more.
8) Turn the Subaru Select Monitor to OFF.

NOTE:
• If {Clear Memories 2} is executed, DTCs and learned control memory are cleared.
• If {Clear Memories 2} is executed, perform learning. <Ref. to 4AT(diag)-20, Learning Control.>

10.Inspection Mode

A: PROCEDURE

WARNING:
Observe the traffic law when driving on public roads.
1) Shift the select lever to the “D” range, and then drive the vehicle at 60 km/h (37 MPH) for at least 10 seconds.
2) Drive the vehicle with manual mode.

11.Learning Control

A: GENERAL DESCRIPTION

- Follow the messages displayed on the Subaru Select Monitor when working.
- When the following work is performed, perform learning for the transmission.

TCM replacement/transmission assembly replacement or disassembly/control valve body replacement/if “memory clear 2” is executed.

B: PROCEDURE

1. PREPARATION FOR LEARNING

1) Warm up or cool down until the ATF temperature displayed on the Subaru Select Monitor is 60 — 80°C (140 — 176°F).
2) Shift the select lever to “P” range.
3) Fully apply the parking brake.
4) Lift up the vehicle.

CAUTION:
While working, be sure to keep the lower edge of the tires 30 cm or more above the ground as vehicle will vibrate.

5) Connect the Subaru Select Monitor to data link connector.
6) Turn the ignition switch to ON.
7) Turn off all switches causing an electrical load, such as headlights, A/C, seat heater and rear defogger.
8) On vehicles equipped with an ECO switch, turn the ECO switch to ON. On vehicles equipped with an SPORT mode, turn the SPORT mode to OFF. On vehicles equipped with an POWER/HOLD switch, turn the POWER/HOLD switch to OFF. On vehicles equipped with SI-DRIVE, set to I mode.

NOTE:
Error message is not displayed even when an incorrect mode is set. While the operation is continued, “AT learning promoting” is displayed, but it cannot end normally. If the message does not change after 2 minutes have passed, retry “AT learning mode” from the beginning.

2. SIMPLE LEARNING

NOTE:
Simple learning is performed with the vehicle lifted, without actually running the vehicle.

CAUTION:
Do not turn the power of the Subaru Select Monitor OFF during work, and do not disconnect the data link connector.

1) Select {AT related learning & inspecting mode} in the «Transmission Diagnosis» display screen of the Subaru Select Monitor.
2) Select {AT learning mode} in the «AT related learning & inspecting mode» screen of the Subaru Select Monitor.
3) Follow the messages displayed on the Subaru Select Monitor screen when working.

NOTE:
During AT learning in progress, SPORT indicator light in the combination meter starts flashing at 2 Hz and the learning operation starts. The following message is displayed on the screen when the SPORT indicator light blinking at 2 Hz turns off.

4) When “AT learning normally ended.” is displayed, simple AT learning is completed.

NOTE:
• If communication error occurs during learning, retry the “AT learning mode” from the beginning.
• If the message “Execute AT learning again after fixing troubles of the vehicle” appears, select [OK] and display the DTC list. After repairing the locations indicated by the DTC, start the “AT learning mode” over from the beginning.
• When communication error occurs during learning, select lever does not shift occasionally. If select lever does not shift, turn the ignition switch to OFF before operating the select lever.
• If the message “AT learning ended abnormally” is displayed, start the “AT learning mode” over from the beginning.

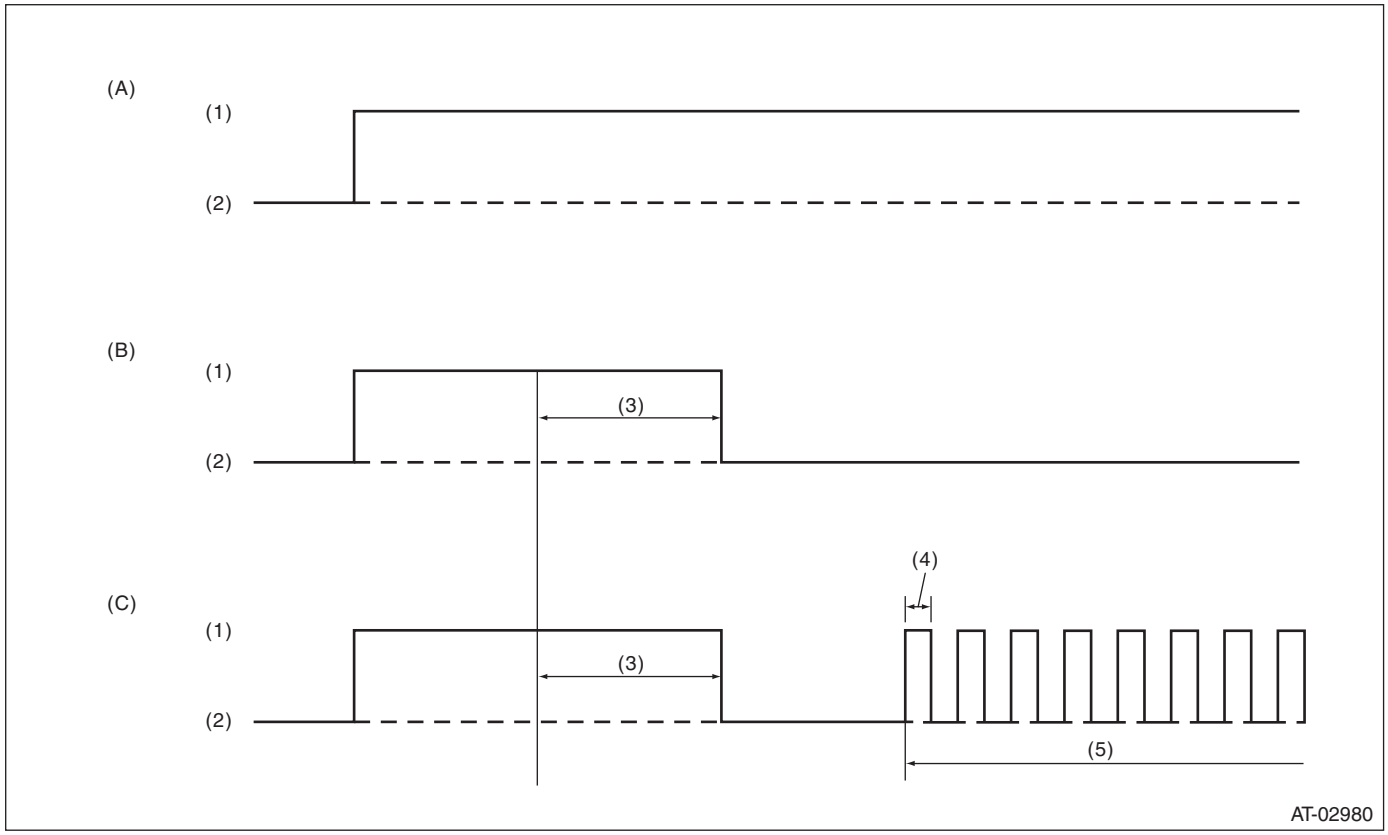
Message	Main causes for abnormal termination
AT learning ended abnormally.	• Fault is detected during AT learning. • The accelerator pedal is depressed during AT learning. • Operation which is not directed is performed during AT learning. • Brake pedal not stepped on firmly enough. • Parking brake not applied strongly enough. • Abnormal idle speed increase, etc.

• For detailed operation procedures, refer to “PC application help for Subaru Select Monitor”.

12.AT OIL TEMP Warning Light Display

A: OPERATION

When any on-board diagnostics item is malfunctioning, the AT OIL TEMP light blinks. The light keeps blinking from when the malfunction is detected after starting the engine, until the ignition switch is turned OFF. The faulty parts or unit can be identified by reading DTCs. Problems which occurred previously can also be identified through the memory function. If the AT OIL TEMP light does not blink although a problem is occurring, the problem can be determined by checking the performance characteristics of each sensor using the Subaru Select Monitor. Indicator light signal patterns are as shown in the figure.

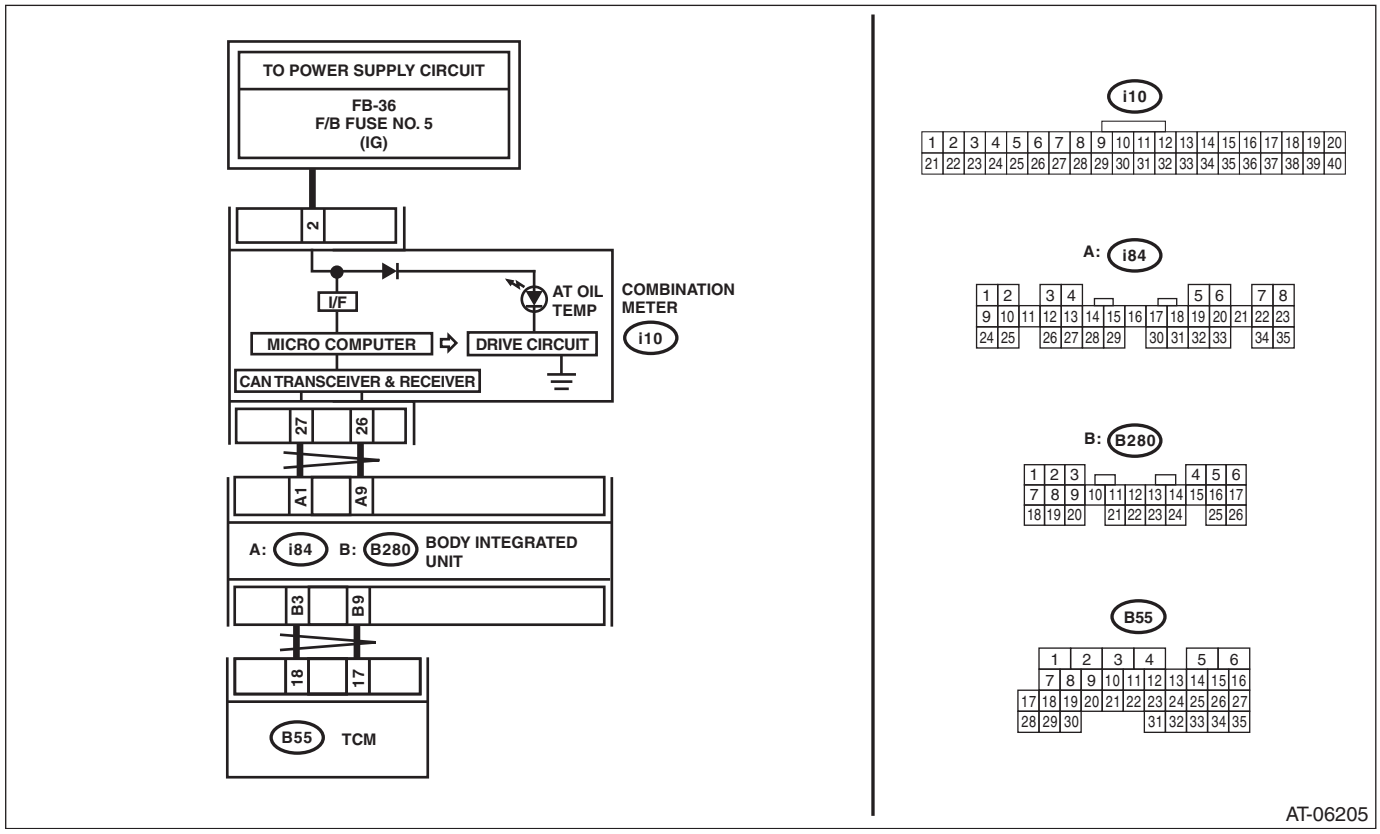


(A)	Ignition switch (engine OFF)	(B)	Normal (engine ON)	(C)	Faulty (engine ON)
(1)	ON	(3)	2 seconds	(5)	Blink
(2)	OFF	(4)	0.25 seconds		

When the AT OIL TEMP light does not operate normally, check the AT OIL TEMP light circuit. <Ref. to 4AT(diag)-23, INSPECTION, AT OIL TEMP Warning Light Display.>

B: INSPECTION

DIAGNOSIS:
AT OIL TEMP light circuit is open or shorted.
TROUBLE SYMPTOM:
When the ignition switch is turned to ON, the AT OIL TEMP light does not illuminate.
WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK AT OIL TEMP LIGHT.** Turn the ignition switch to ON.	Does the AT OIL TEMP light illuminate?	Go to step **2**.	Perform the self-diagnosis of combination meter. <Ref. to IDI-5, INSPECTION, Combination Meter System.>
2	**CHECK AT OIL TEMP LIGHT.** Turn the ignition switch to ON and wait for at least 2 seconds.	Does the AT OIL TEMP light illuminate?	Go to step **3**.	Go to step **4**.
3	**CHECK AT OIL TEMP LIGHT.** Start the engine.	Does the AT OIL TEMP light go off?	Normal. Go back to Basic Diagnostic Procedure. <Ref. to 4AT(diag)-2, Basic Diagnostic Procedure.>	Go to step **7**.

	Step	Check	Yes	No
4	**CHECK SUBARU SELECT MONITOR COMMUNICATION.** Connect the Subaru Select Monitor to data link connector.	Is the communication between Subaru Select Monitor and TCM normal?	Go to step **5**.	Check the power supply ground circuit of TCM and Subaru Select Monitor communication. <Ref. to 4AT(diag)-28, Diagnostic Procedure for Subaru Select Monitor Communication.>
5	**CHECK TCM.** 1) Display the current data of TCM using Subaru Select Monitor. <Ref. to 4AT(diag)-15, OPERATION, Subaru Select Monitor.> 2) Read the data of “Diagnosis Lamp” using Subaru Select Monitor.	Is “ON” displayed?	Go to step **6**.	Replace the TCM. <Ref. to 4AT-66, Transmission Control Module (TCM).>
6	**CHECK BODY INTEGRATED UNIT.** 1) Connect the Subaru Select Monitor, and display the current data of the body integrated unit. <Ref. to LAN(diag)-14, OPERATION, Subaru Select Monitor.> 2) Read the data of “ATF Temperature Lamp” using the Subaru Select Monitor.	Is “ON” displayed?	Replace the combination meter assembly. <Ref. to IDI-21, Combination Meter.>	Check DTC of body integrated unit. <Ref. to LAN(diag)-14, OPERATION, Subaru Select Monitor.>
7	**CHECK TCM.** NOTE: If the ATF temperature is 138°C or more, cool down ATF to 137°C or less. 1) Display the current data of TCM using Subaru Select Monitor. 2) Read the data of “Diagnosis Lamp” using Subaru Select Monitor.	Is “ON” displayed?	Replace the TCM. <Ref. to 4AT-66, Transmission Control Module (TCM).>	Go to step **8**.
8	**CHECK BODY INTEGRATED UNIT.** 1) Connect the Subaru Select Monitor, and display the current data of the body integrated unit. 2) Read the data of “ATF Temperature Lamp” using the Subaru Select Monitor.	Is “ON” displayed?	Check DTC of body integrated unit. Perform the diagnosis according to DTC. <Ref. to LAN(diag)-14, OPERATION, Subaru Select Monitor.>	Perform the self-diagnosis of combination meter. <Ref. to IDI-5, INSPECTION, Combination Meter System.>

13.AWD Warning Light Display

A: OPERATION

AWD warning light illuminates or blinks at start, or when AWD is faulty.

- If normal

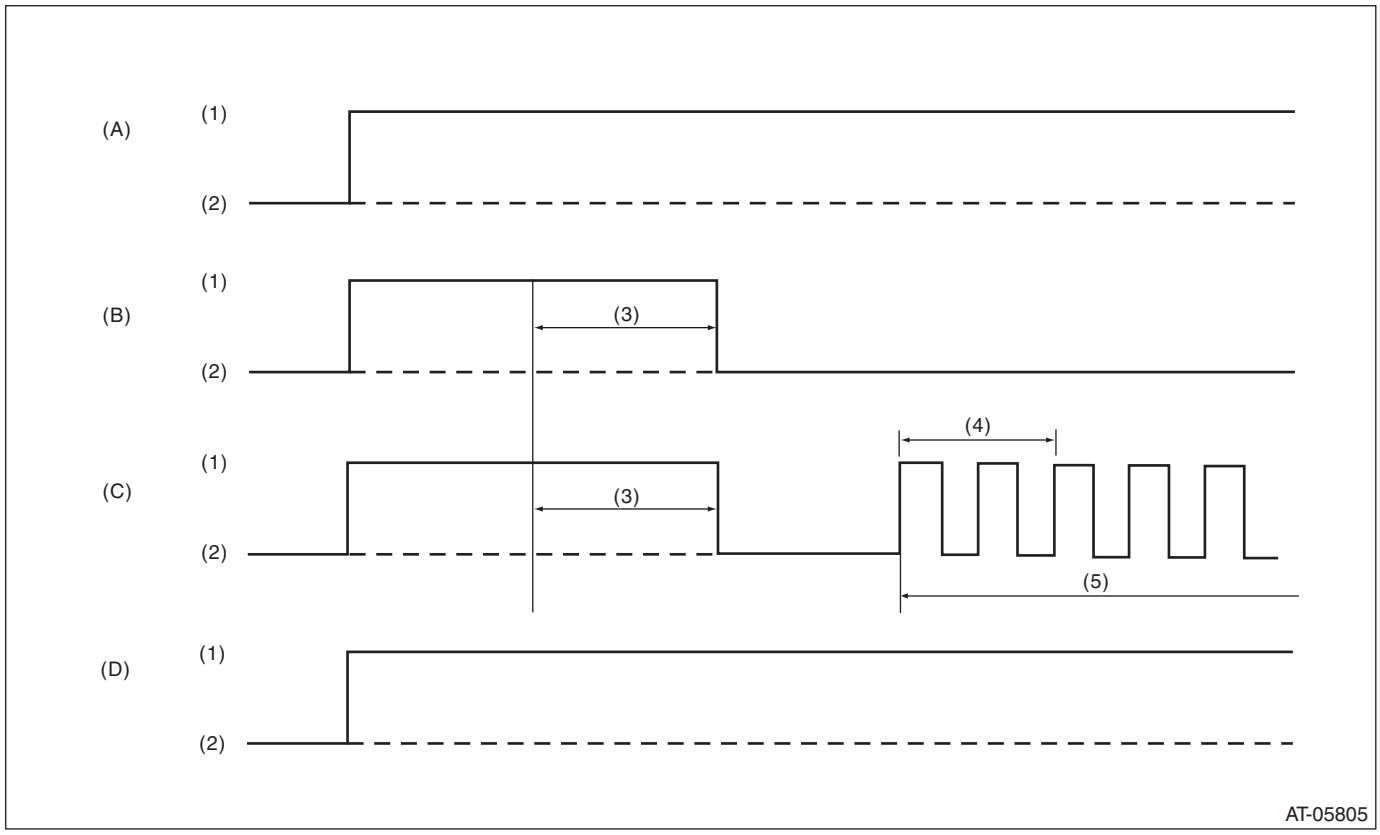
AWD light always illuminates when the ignition switch is ON (engine OFF). Light goes off after two seconds from engine ON.

- Faulty

AWD warning light blinks at 2 Hz, when tires with different diameters are installed, or when the vehicle is driven with air pressure of any of the four tires significantly low.

- When AWD is released

AWD warning light always illuminates when the fuse is installed on the FWD fuse holder and the AWD is released.



(A)	Ignition switch (engine OFF)	(C)	Faulty (engine ON)	(D)	When AWD is released (engine ON)
(B)	Normal (engine ON)				
(1)	ON	(3)	2 seconds	(5)	Blink
(2)	OFF	(4)	1 second		

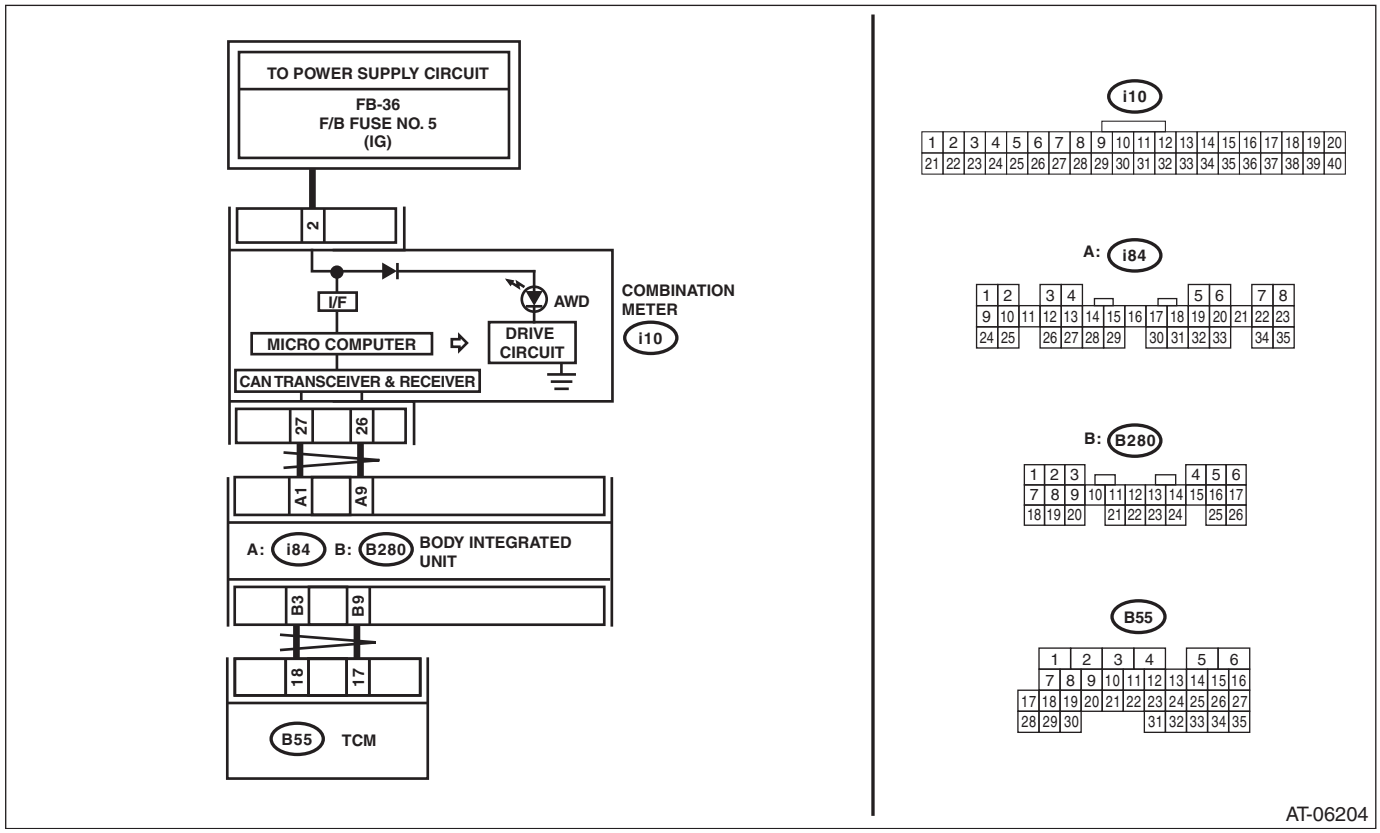
If the AWD light does not illuminate, or illumination patterns are not as above, check the AWD light circuit. <Ref. to 4AT(diag)-26, INSPECTION, AWD Warning Light Display.>

B: INSPECTION

DIAGNOSIS:
- AWD light circuit is open or shorted.
- Combination meter malfunction
- TCM malfunction

TROUBLE SYMPTOM:
- When the ignition switch is turned to ON, the AWD light does not illuminate.
- AWD light remains lit after engine start.

WIRING DIAGRAM:



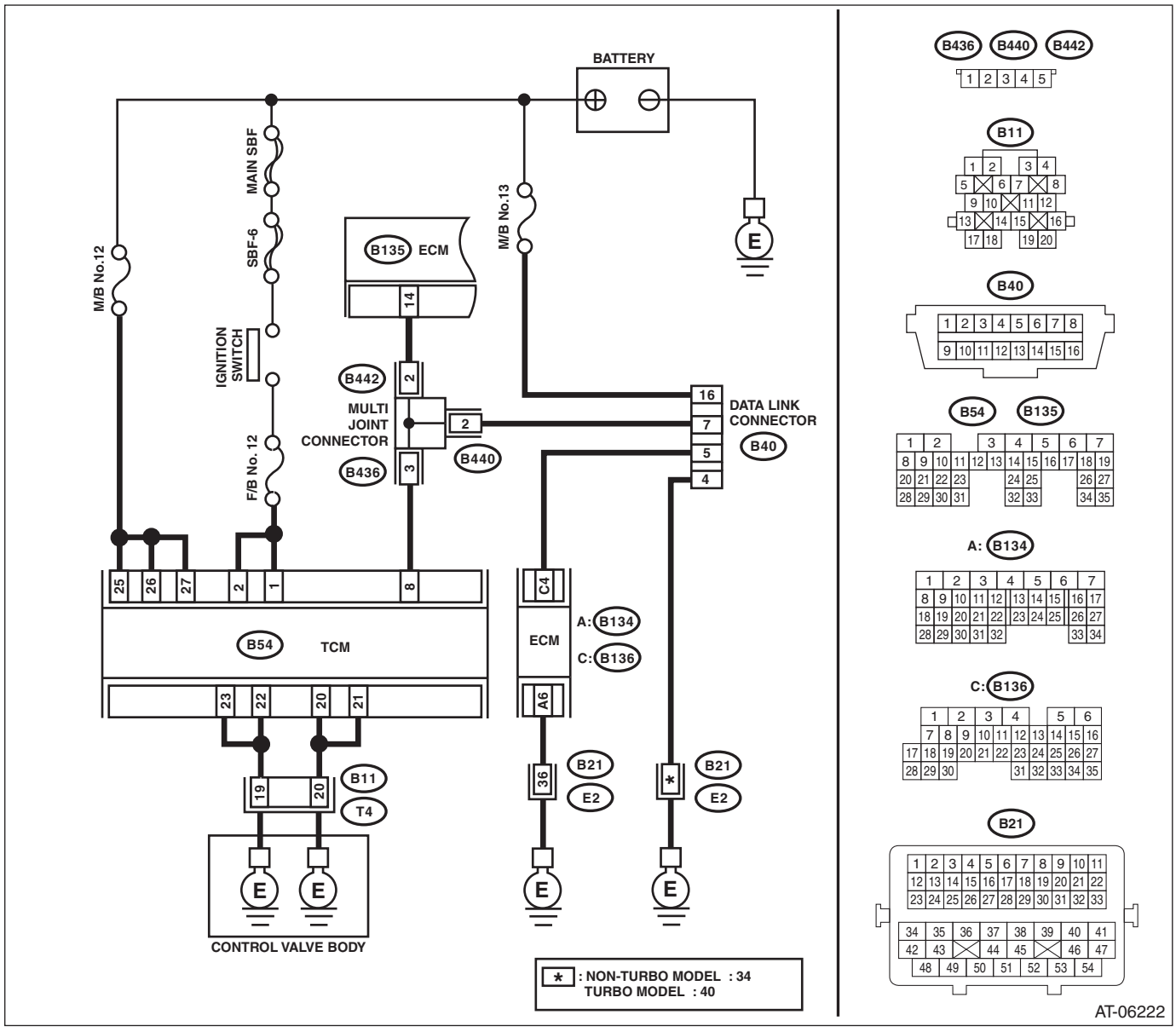
Step		Check	Yes	No
1	**CHECK AWD LIGHT.** Turn the ignition switch to ON.	Does the AWD light illuminate?	Go to step **2**.	Perform the self-diagnosis of combination meter. <Ref. to IDI-5, INSPECTION, Combination Meter System.>
2	**CHECK AWD LIGHT.** Start the engine.	Does AWD light go off after two seconds from engine start?	Current condition is normal. Go back to Basic Diagnostic Procedure. <Ref. to 4AT(diag)-2, Basic Diagnostic Procedure.>	Go to step **3**.
3	**CHECK DTC.**	Is DTC of CAN communication displayed?	Perform the diagnosis according to DTC.	Go to step **4**.

	Step	Check	Yes	No
4	**CHECK COMBINATION METER.** Perform the self-diagnosis of combination meter. <Ref. to IDI-5, INSPECTION, Combination Meter System.>	Is there any trouble with the combination meter?	Repair the combination meter.	Replace the TCM. <Ref. to 4AT-66, Transmission Control Module (TCM).>

14.Diagnostic Procedure for Subaru Select Monitor Communication

A: COMMUNICATION FOR INITIALIZING IMPOSSIBLE

DIAGNOSIS:
Defective harness connector
TROUBLE SYMPTOM:
Subaru Select Monitor communication failure
WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK INSTALLATION OF TCM CONNECTOR.** Turn the ignition switch to OFF.	Is TCM connector connected to TCM?	Go to step **2**.	Connect the TCM connector to TCM.

	Step	Check	Yes	No
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 connector from ECM. 2) Measure the resistance of harness between data link connector and ECM. ***Connector & terminal*** ***(B40) No. 4 — Chassis ground:*** ***(B40) No. 5 — (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 ECM.
4	**CHECK SUBARU SELECT MONITOR GROUND CIRCUIT.** Measure the resistance of harness between data link connector and chassis ground. ***Connector & terminal*** ***(B40) No. 16 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **5**.	Repair the short circuit of harness between data link connector and ground terminals.
5	**CHECK ENGINE GROUND CIRCUIT.** Check the engine ground circuit.	Is the engine ground circuit normal?	Go to step **6**.	Repair ground circuit of ECM.
6	**CHECK COMMUNICATION OF SUBARU SELECT MONITOR.** 1) Turn the ignition switch to ON. 2) Check communication with the transmission.	Is the name of system displayed on Subaru Select Monitor?	Go to step **11**.	Go to step **7**.
7	**CHECK COMMUNICATION OF SUBARU SELECT MONITOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the TCM connector. 3) Turn the ignition switch to ON. 4) Check communication with the engine system.	Is the name of system displayed on Subaru Select Monitor?	Go to step **9**.	Go to step **8**.
8	**CHECK OUTPUT SIGNAL OF TCM.** 1) Turn the ignition switch to OFF. 2) Connect the connector to TCM. 3) From the data link connector (B40) No. 7, disconnect the connectors of control modules other than the TCM and ECM. **CAUTION:** **When disconnecting the connector from air-bag control module, always follow the precautions on AB section. <Ref. to AB-5, CAUTION, General Description.>** 4) Turn the ignition switch to ON. 5) Check communication with the transmission system.	Is the name of system displayed on Subaru Select Monitor?	Check each control module.	Go to step **9**.

	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 connectors of all control modules connected to the data link connector (B40) No. 7. 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 **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*** ***(B40) No. 7 — (B54) No. 8:***	Is the resistance less than 1 Ω?	Go to step **12**.	Check the harness and connector between TCM and data link connector.
12	**CHECK INSTALLATION OF TRANSMISSION HARNESS CONNECTOR.**	Is the transmission harness connector connected to bulkhead harness connector?	Go to step **13**.	Connect the bulkhead harness connector to transmission harness connector.
13	**CHECK POOR CONTACT OF CONNECTORS.**	Is there poor contact of control module power supply and data link connector?	Repair the poor contact.	Go to step **14**.
14	**CHECK TCM POWER SUPPLY.** 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*** ***(B54) No. 25 (+) — Chassis ground (–):*** ***(B54) No. 26 (+) — Chassis ground (–):*** ***(B54) No. 27 (+) — Chassis ground (–):***	Is the voltage 10 — 13 V?	Go to step **16**.	Go to step **15**.
15	**CHECK M/B FUSE (No. 12).** 1) Turn the ignition switch to OFF. 2) Remove the fuse (No. 12).	Is the fuse (No. 12) blown out?	Replace the fuse. If the replaced fuse has blown out easily, repair short circuit of harness between fuse and TCM.	Repair the open circuit of harness between fuse and TCM, or fuse and battery, and poor contact of the connector.
16	**CHECK IGNITION POWER SUPPLY CIRCUIT.** 1) Turn the ignition switch to ON. 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**.

	Step	Check	Yes	No
17	**CHECK F/B FUSE (No. 12).** Remove the fuse (No. 12).	Is the fuse (No. 12) blown out?	Replace the fuse. If the replaced fuse has blown out easily, repair short circuit of harness between fuse and TCM.	Repair the open circuit of harness between fuse and TCM, or fuse 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. ***Connector & terminal*** ***(B54) No. 20 — (B11) No. 20:*** ***(B54) No. 21 — (B11) No. 20:*** ***(B54) No. 22 — (B11) No. 19:*** ***(B54) No. 23 — (B11) No. 19:***	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. ***Connector & terminal*** ***(T4) No. 19 — Transmission ground:*** ***(T4) No. 20 — Transmission ground:***	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 of TCM power supply, ground and data link connector?	Repair the connector.	Replace the TCM. <Ref. to 4AT-66, Transmission Control Module (TCM).>

15.List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Item	Content of diagnosis	Reference
P0705	Transmission Range Sensor Circuit (PRNDL Input)	Inhibitor switch malfunction or short circuit	<Ref. to 4AT(diag)-34, 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(diag)-41, 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(diag)-43, 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(diag)-45, DTC P0715 INPUT/TURBINE SPEED SENSOR CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0719	Brake Switch Circuit Low	Brake switch malfunction, open input signal circuit	<Ref. to 4AT(diag)-47, DTC P0719 BRAKE SWITCH 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(diag)-50, DTC P0720 OUTPUT SPEED SENSOR CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0724	Brake Switch Circuit High	Brake switch malfunction, shorted input signal circuit	<Ref. to 4AT(diag)-52, DTC P0724 BRAKE SWITCH CIRCUIT HIGH, 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(diag)-54, 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(diag)-54, 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(diag)-54, 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(diag)-54, 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(diag)-55, 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(diag)-56, DTC P0741 TORQUE CONVERTER CLUTCH CIRCUIT PERFORMANCE OR STUCK OFF, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0743	Torque Converter Clutch Circuit Electrical	Lock-up solenoid is faulty or output signal circuit is open or shorted.	<Ref. to 4AT(diag)-57, 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(diag)-60, DTC P0748 PRESSURE CONTROL SOLENOID “A” ELECTRICAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Content of diagnosis	Reference
P0753	Shift Solenoid “A” Electrical	Low clutch duty solenoid is faulty or output signal circuit is open or shorted.	<Ref. to 4AT(diag)-62, 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(diag)-64, 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(diag)-66, 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(diag)-69, 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(diag)-72, DTC P0801 REVERSE INHIBIT CONTROL CIRCUIT, 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(diag)-74, DTC P1707 AT AWD SOLENOID VALVE CIRCUIT MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1718	AT CAN Communication Circuit	CAN communication circuit is open or shorted.	<Ref. to 4AT(diag)-75, DTC P1718 AT CAN COMMUNICATION CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1817	Sports Mode Switch Circuit (Manual Switch)	SPORT shift switch is faulty or input signal circuit is open or shorted.	<Ref. to 4AT(diag)-76, DTC P1817 SPORTS MODE SWITCH CIRCUIT (MANUAL SWITCH), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

16.Diagnostic Procedure with Diagnostic Trouble Code (DTC)

A: DTC P0705 TRANSMISSION RANGE SENSOR CIRCUIT (PRNDL INPUT)

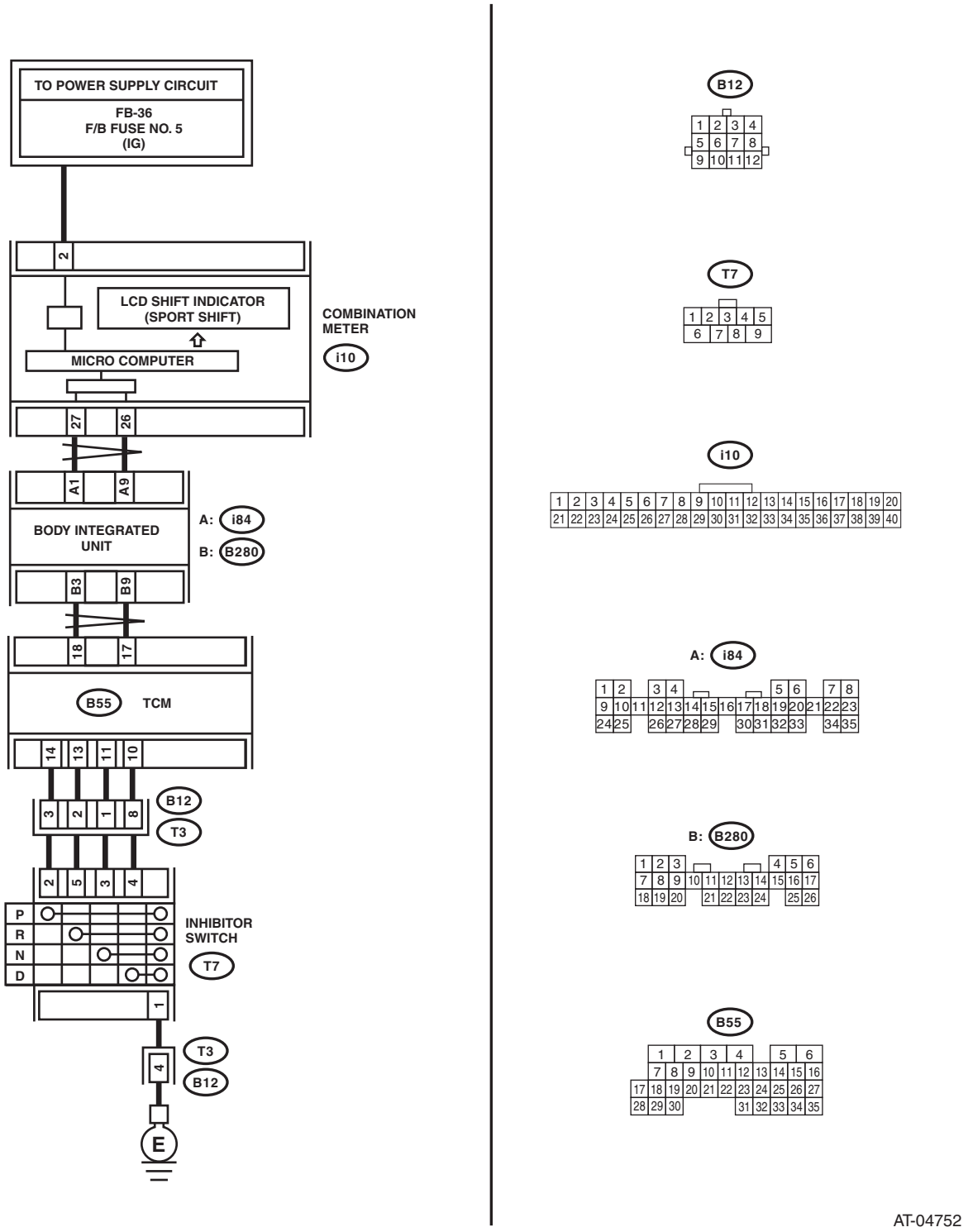
DTC DETECTING CONDITION:

- Inhibitor switch is faulty.
- No range signal is input.
- Multiple range signals are input at a time.

TROUBLE SYMPTOM:

The range position of the select lever and the select lever position indicator light on the combination meter do not match.

WIRING DIAGRAM:



AT-04752

Step		Check	Yes	No
1	**CHECK INDICATOR LIGHT.** 1) Turn the ignition switch to ON. 2) Shift the select lever to “P” range.	Does the combination meter “P” range indicator light illuminate?	Go to step **2**.	Go to step **6**.
2	**CHECK INDICATOR LIGHT.** Set the select lever to “R” range.	Does the combination meter “P” range indicator light illuminate?	Go to step **20**.	Go to step **3**.

	Step	Check	Yes	No
3	**CHECK INDICATOR LIGHT.** Shift the select lever to “P” range.	Does the combination meter “R” range indicator light illuminate?	Go to step **27**.	Go to step **4**.
4	**CHECK INDICATOR LIGHT.**	Does the combination meter “N” range indicator light illuminate?	Go to step **34**.	Go to step **5**.
5	**CHECK INDICATOR LIGHT.**	Does the combination meter “D” range indicator light illuminate?	Go to step **41**.	Go to step **7**.
6	**CHECK “P” RANGE SWITCH.** Read the data of “P range” using Subaru Select Monitor.	Is “ON” displayed?	Go to step **17**.	Go to step **13**.
7	**CHECK INDICATOR LIGHT.** Set the select lever to “R” range.	Does the combination meter “R” range indicator light illuminate?	Go to step **9**.	Go to step **8**.
8	**CHECK “R” RANGE SWITCH.** Read the data of “R range” using Subaru Select Monitor.	Is “ON” displayed?	Go to step **24**.	Go to step **21**.
9	**CHECK INDICATOR LIGHT.** Set the select lever to “N” range.	Does the combination meter “N” range indicator light illuminate?	Go to step **11**.	Go to step **10**.
10	**CHECK “N” RANGE SWITCH.** Read the data of “N range” using Subaru Select Monitor.	Is “ON” displayed?	Go to step **31**.	Go to step **28**.
11	**CHECK INDICATOR LIGHT.** Set the select lever to “D” range.	Does the combination meter “D” range indicator light illuminate?	Check the harnesses or connectors between TCM and transmission, and repair the defective part.	Go to step **12**.
12	**CHECK “D” RANGE SWITCH.** Read the data of “D range” using Subaru Select Monitor.	Is “ON” displayed?	Go to step **38**.	Go to step **35**.
13	**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. 1 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **14**.	Repair the open circuit of harness between inhibitor switch and chassis ground, and poor contact of the connector.
14	**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*** ***(B55) No. 14 — (T7) No. 2:***	Is the resistance less than 1 Ω?	Go to step **15**.	Repair the open circuit of harness between TCM and inhibitor switch connector, and poor contact of the connector.

	Step	Check	Yes	No
15	**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*** ***(B55) No. 14 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **16**.	Go to step **42**.
16	**CHECK INPUT SIGNAL FOR TCM.** 1) Set the select lever to other than "P" range. 2) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 14 (+) — Chassis ground (–):***	Is the voltage 8 V or more?	Go to step **42**.	Replace the TCM. <Ref. to 4AT-66, Transmission Control Module (TCM).>
17	**CHECK BODY INTEGRATED UNIT.** Read the data of "Shift Position" using Subaru Select Monitor. <Ref. to LAN(diag)-18, Read Diagnostic Trouble Code (DTC).>	Is "7" displayed?	Go to step **18**.	Check body integrated unit.
18	**CHECK BODY INTEGRATED UNIT.** Check DTC of body integrated unit.	Is DTC of CAN communication displayed?	Perform the diagnosis according to DTC.	Go to step **19**.
19	**CHECK COMBINATION METER.** Check the "P" range indicator light. <Ref. to IDI-5, INSPECTION, Combination Meter System.>	Is the "P" range indicator light bulb OK?	Go to step **42**.	Replace the combination meter assembly. <Ref. to IDI-21, Combination Meter.>
20	**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 harness between TCM connector and chassis ground. ***Connector & terminal*** ***(B55) No. 14 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **42**.	Repair ground short circuit in "P" range circuit.
21	**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*** ***(B55) No. 13 — (T7) No. 5:***	Is the resistance less than 1 Ω?	Go to step **22**.	Repair the open circuit of harness between TCM and inhibitor switch connector, and poor contact of the connector.
22	**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) Set the select lever to "R" range. 5) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 13 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **23**.	Go to step **42**.

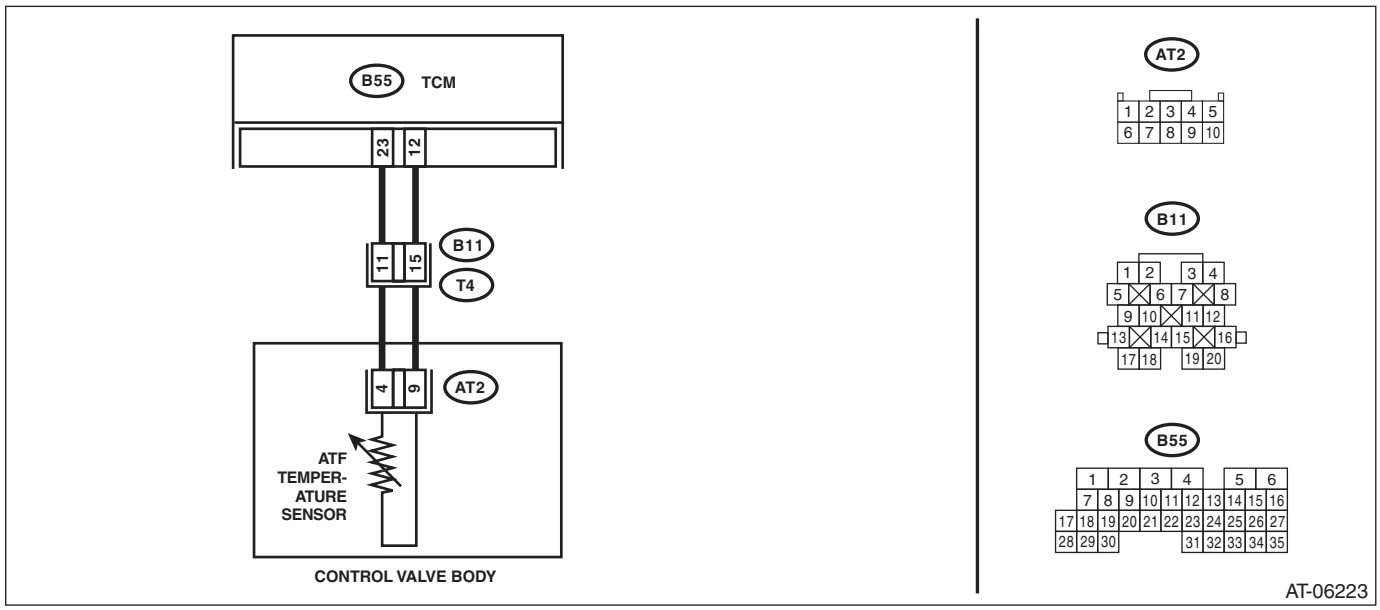
	Step	Check	Yes	No
23	**CHECK INPUT SIGNAL FOR TCM.** 1) Shift the select lever to other than "R" range. 2) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 13 (+) — Chassis ground (–):***	Is the voltage 8 V or more?	Go to step **42**.	Replace the TCM. <Ref. to 4AT-66, Transmission Control Module (TCM).>
24	**CHECK BODY INTEGRATED UNIT.** Read the data of "Shift Position" using Subaru Select Monitor. <Ref. to LAN(diag)-18, Read Diagnostic Trouble Code (DTC).>	Is "6" displayed?	Go to step **25**.	Check body integrated unit.
25	**CHECK BODY INTEGRATED UNIT.** Check DTC of body integrated unit.	Is DTC of CAN communication displayed?	Perform the diagnosis according to DTC.	Go to step **26**.
26	**CHECK COMBINATION METER.** Check the "R" range indicator light. <Ref. to IDI-5, INSPECTION, Combination Meter System.>	Is the "R" range indicator light OK?	Go to step **42**.	Replace the combination meter assembly. <Ref. to IDI-21, Combination Meter.>
27	**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 harness between TCM connector and chassis ground. ***Connector & terminal*** ***(B55) No. 13 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **42**.	Repair ground short circuit in "R" range circuit.
28	**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*** ***(B55) No. 11 — (T7) No. 3:***	Is the resistance less than 1 Ω?	Go to step **29**.	Repair the open circuit of harness between TCM and inhibitor switch connector, and poor contact of the connector.
29	**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) Set the select lever to "N" range. 5) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 11 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **30**.	Go to step **42**.
30	**CHECK INPUT SIGNAL FOR TCM.** 1) Shift the select lever to other than "N" range. 2) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 11 (+) — Chassis ground (–):***	Is the voltage 8 V or more?	Go to step **42**.	Replace the TCM. <Ref. to 4AT-66, Transmission Control Module (TCM).>
31	**CHECK BODY INTEGRATED UNIT.** Read the data of "Shift Position" using Subaru Select Monitor. <Ref. to LAN(diag)-18, Read Diagnostic Trouble Code (DTC).>	Is "5" displayed?	Go to step **32**.	Check body integrated unit.
32	**CHECK BODY INTEGRATED UNIT.** Check DTC of body integrated unit.	Is DTC of CAN communication displayed?	Perform the diagnosis according to DTC.	Go to step **33**.

	Step	Check	Yes	No
33	**CHECK COMBINATION METER.** Check the "N" range indicator light. <Ref. to IDI-5, INSPECTION, Combination Meter System.>	Is the "N" range indicator light OK?	Go to step **42**.	Replace the combination meter assembly. <Ref. to IDI-21, Combination Meter.>
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 harness between TCM connector and chassis ground. ***Connector & terminal*** ***(B55) No. 11 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **42**.	Repair the ground short circuit in "N" range circuit.
35	**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*** ***(B55) No. 10 — (T7) No. 4:***	Is the resistance less than 1 Ω?	Go to step **36**.	Repair the open circuit of harness between TCM and inhibitor switch connector, and poor contact of the connector.
36	**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) Set the select lever to "D" range. 5) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 10 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **37**.	Go to step **42**.
37	**CHECK INPUT SIGNAL FOR TCM.** 1) Shift the select lever to other than "D" range. 2) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 10 (+) — Chassis ground (–):***	Is the voltage 8 V or more?	Go to step **42**.	Replace the TCM. <Ref. to 4AT-66, Transmission Control Module (TCM).>
38	**CHECK BODY INTEGRATED UNIT.** Read the data of "Shift Position" using Subaru Select Monitor. <Ref. to LAN(diag)-18, Read Diagnostic Trouble Code (DTC).>	Is "4" displayed?	Go to step **39**.	Check body integrated unit.
39	**CHECK BODY INTEGRATED UNIT.** Check DTC of body integrated unit.	Is DTC of CAN communication displayed?	Perform the diagnosis according to DTC.	Go to step **40**.
40	**CHECK COMBINATION METER.** Check the "D" range indicator light. <Ref. to IDI-5, INSPECTION, Combination Meter System.>	Is the "D" range indicator light OK?	Go to step **42**.	Replace the combination meter assembly. <Ref. to IDI-21, Combination Meter.>

	Step	Check	Yes	No
41	**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 harness between TCM connector and chassis ground. ***Connector & terminal*** ***(B55) No. 10 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **42**.	Repair ground short circuit in "D" range circuit.
42	**CHECK FOR POOR CONTACT.**	Is there poor contact of the inhibitor switch circuit?	Repair the poor contact.	Go to step **43**.
43	**CHECK INHIBITOR SWITCH.**	Is the inhibitor switch in the normal position?	Replace the TCM. <Ref. to 4AT-66, Transmission Control Module (TCM).>	Adjust inhibitor switch and select cable. <Ref. to 4AT-52, Inhibitor Switch.> <Ref. to CS-25, Select Cable.>

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:

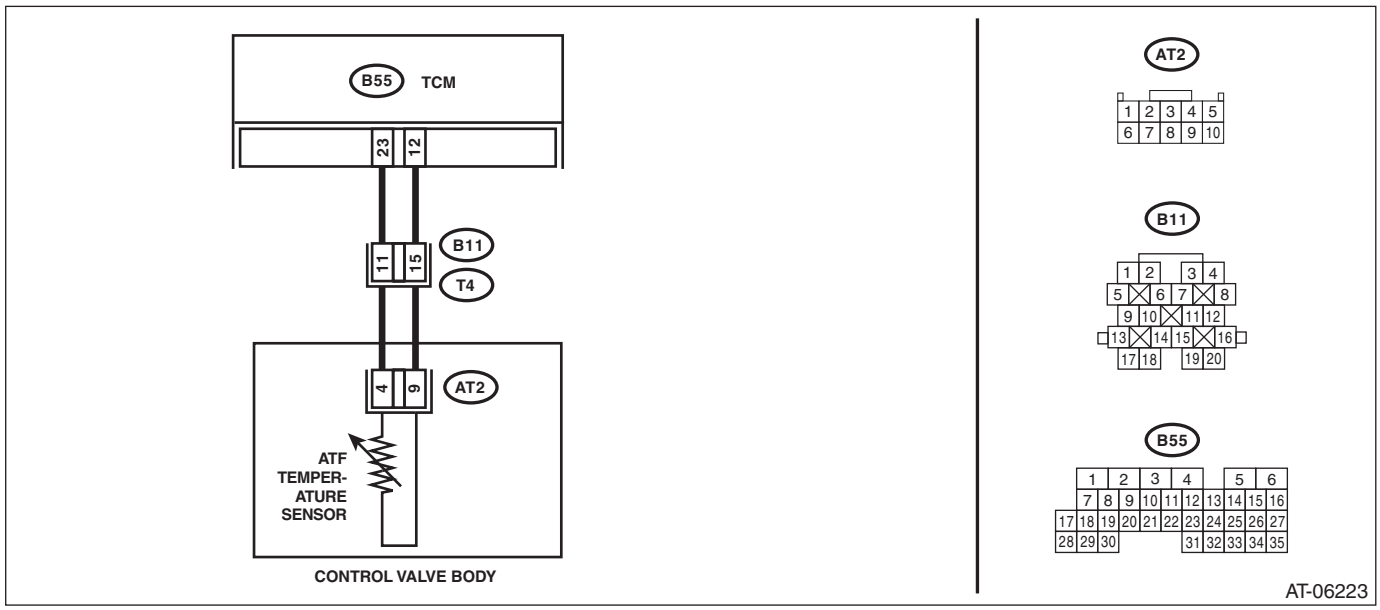


	Step	Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ATF TEMPERATURE SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM and transmission. 3) Measure the resistance of harness between TCM connector and transmission connector. ***Connector & terminal*** ***(B55) No. 12 — (B11) No. 15:*** ***(B55) No. 23 — (B11) No. 11:***	Is the resistance less than 1 Ω?	Go to step **2**.	Repair the open circuit of harness between TCM and transmission connector.
2	**CHECK ATF TEMPERATURE SENSOR.** 1) Turn the ignition switch to OFF. 2) Connect the connectors to TCM and transmission. 3) Start the engine. 4) Warm up the transmission until the ATF temperature exceeds 80°C (176°F). 5) Disconnect the connector from transmission. 6) Measure the resistance between transmission connector terminals. ***Connector & terminal*** ***(T4) No. 11 — No. 15:***	Is the resistance 300 — 800 Ω?	Go to step **3**.	Go to step **5**.
3	**CHECK ATF TEMPERATURE SENSOR.** Measure the resistance between transmission connector terminals. ***Connector & terminal*** ***(T4) No. 11 — No. 15:***	Does the resistance value increase gradually while the ATF temperature decreases?	Go to step **4**.	Go to step **5**.

	Step	Check	Yes	No
4	**CHECK INPUT SIGNAL FOR TCM.** 1) Connect the connector to transmission. 2) Connect the Subaru Select Monitor to data link connector. 3) Turn the ignition switch to ON. 4) Read the data of "ATF Temp." using the Subaru Select Monitor.	Does the ATF temperature gradually decrease?	Check for poor contact of the ATF temperature sensor and transmission connector harness, and repair the fault location.	Go to step **6**.
5	**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. 5) Drain the automatic transmission fluid. **CAUTION:** **Do not drain ATF until it cools down.** 6) Remove the oil pan. 7) Disconnect the connector from the control valve body. 8) Measure the resistance of harness between ATF temperature sensor and transmission connector. ***Connector & terminal*** ***(T4) No. 11 — (AT2) No. 4:*** ***(T4) No. 15 — (AT2) No. 9:***	Is the resistance less than 1 Ω?	Replace the control valve body. <Ref. to 4AT-62, Control Valve Body.>	Repair the open circuit of harness between ATF temperature sensor and transmission connector.
6	**CHECK FOR POOR CONTACT.**	Is there poor contact of ATF temperature sensor circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-66, Transmission Control Module (TCM).>

C: DTC P0713 TRANSMISSION FLUID TEMPERATURE SENSOR CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:
Input signal circuit to ATF temperature sensor is shorted.
TROUBLE SYMPTOM:
Excessive shift shock
WIRING DIAGRAM:

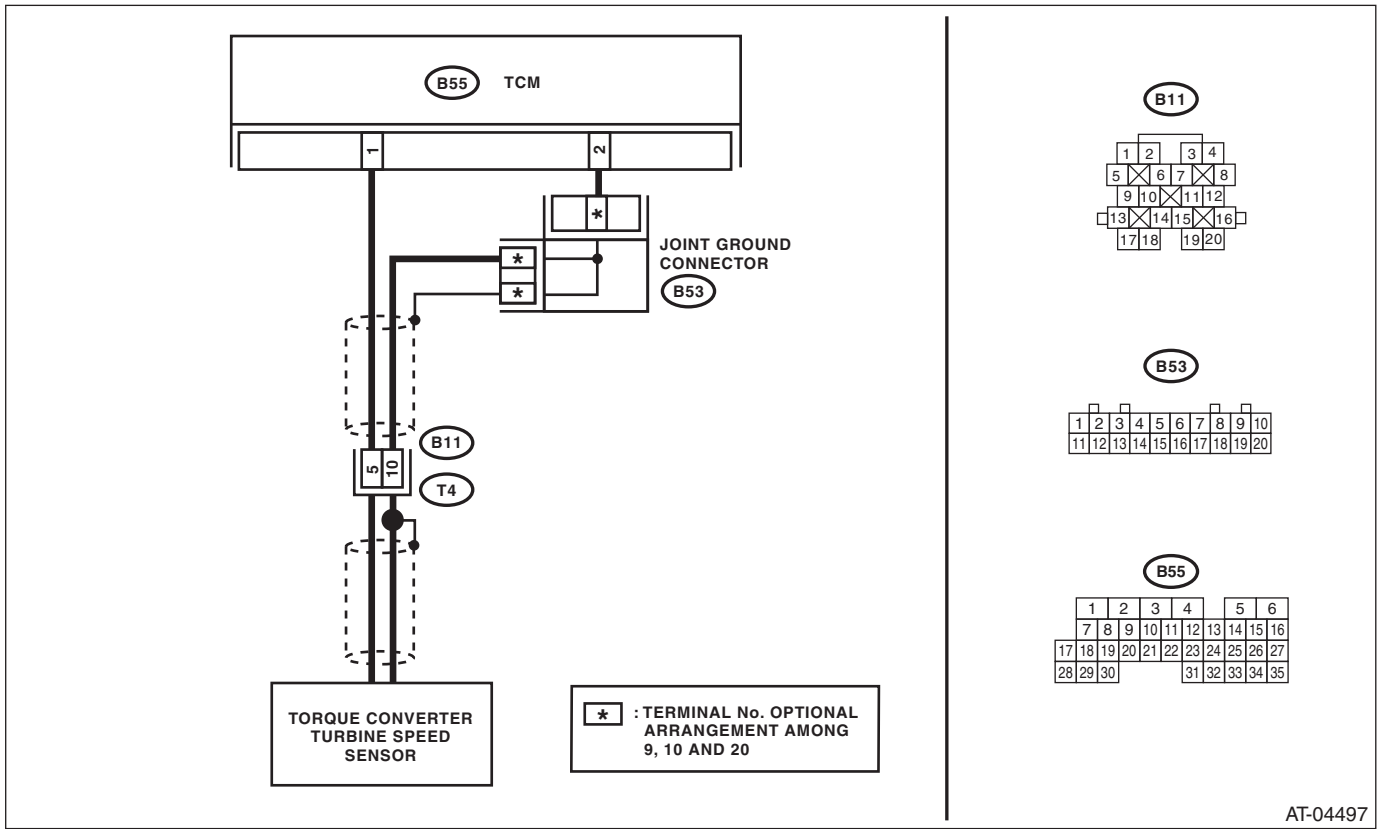


	Step	Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ATF TEMPERATURE SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM. 3) Measure the resistance between TCM connector terminals. ***Connector & terminal*** ***(B55) No. 23 — No. 12:***	Is the resistance 500 Ω or more?	Go to step **2**.	Go to step **4**.
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ATF TEMPERATURE SENSOR.** Measure the resistance of harness between TCM connector and chassis ground. ***Connector & terminal*** ***(B55) No. 23 — Chassis ground:***	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. ***Connector & terminal*** ***(B55) No. 23 — No. 12:***	Does the resistance change?	Go to step **4**.	Replace the TCM. <Ref. to 4AT-66, 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 harness between TCM connector and chassis ground. ***Connector & terminal*** ***(B55) No. 12 — Chassis ground:*** ***(B55) No. 23 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **5**.	Repair the short circuit of harness between TCM and transmission harness.

	Step	Check	Yes	No
5	**CHECK HARNESS CONNECTOR TO ATF TEMPERATURE SENSOR.** Measure the resistance between transmission connector terminals. ***Connector & terminal*** ***(T4) No. 11 — No. 15:***	Is the resistance 500 Ω or more?	Check short circuits in harnesses or connectors, and repair the defective part.	Go to step **6**.
6	**CHECK TRANSMISSION HARNESS.** 1) Lift up the vehicle. 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 the control valve body. 5) Measure the resistance between transmission connector and transmission ground. ***Connector & terminal*** ***(T4) No. 11 — Transmission ground:*** ***(T4) No. 15 — Transmission ground:***	Is the resistance 1 MΩ or more?	Go to step **7**.	Replace the transmission harness.
7	**CHECK ATF TEMPERATURE SENSOR.** Measure the resistance between control valve connector terminals. ***Connector & terminal*** ***(AT2) No. 4 — No. 9:***	Is the resistance 500 Ω or more?	Check short circuits in harnesses or connectors, and repair the defective part.	Replace the control valve body. <Ref. to 4AT-62, Control Valve Body.>

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:



	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 450 — 650 Ω?	Go to step **2**.	Replace the torque converter turbine speed sensor. <Ref. to 4AT-59, Torque Converter Turbine Speed Sensor.>
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1) Disconnect the connector from TCM. 2) Measure the resistance of harness between TCM connector and transmission connector. ***Connector & terminal*** ***(B55) No. 1 — (B11) No. 5:*** ***(B55) No. 2 — (B11) No. 10:***	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 harness between TCM connector and chassis ground. ***Connector & terminal*** ***(B55) No. 1 — Chassis ground:*** ***(B55) No. 2 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **4**.	Repair the short circuit of harness between TCM and transmission connector.

	Step	Check	Yes	No
4	**CHECK INPUT SIGNAL FOR TCM.** 1) Connect the connectors to TCM and transmission. 2) Connect the Subaru Select Monitor to data link connector. 3) Turn the ignition switch to ON. 4) Run the Subaru Select Monitor. 5) Start the engine. 6) Move the select lever to “P” or “N” range. 7) Read the data of “Turbine Revolution Speed” and “Engine Speed” using Subaru Select Monitor.	Are the “Turbine Revolution Speed” and “Engine Speed” almost the same?	Check the harnesses or connectors between TCM and transmission, and repair the defective part.	Go to step **5**.
5	**CHECK FOR POOR CONTACT.**	Is there poor contact of torque converter turbine speed sensor circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-66, Transmission Control Module (TCM).>

E: DTC P0719 BRAKE SWITCH CIRCUIT LOW

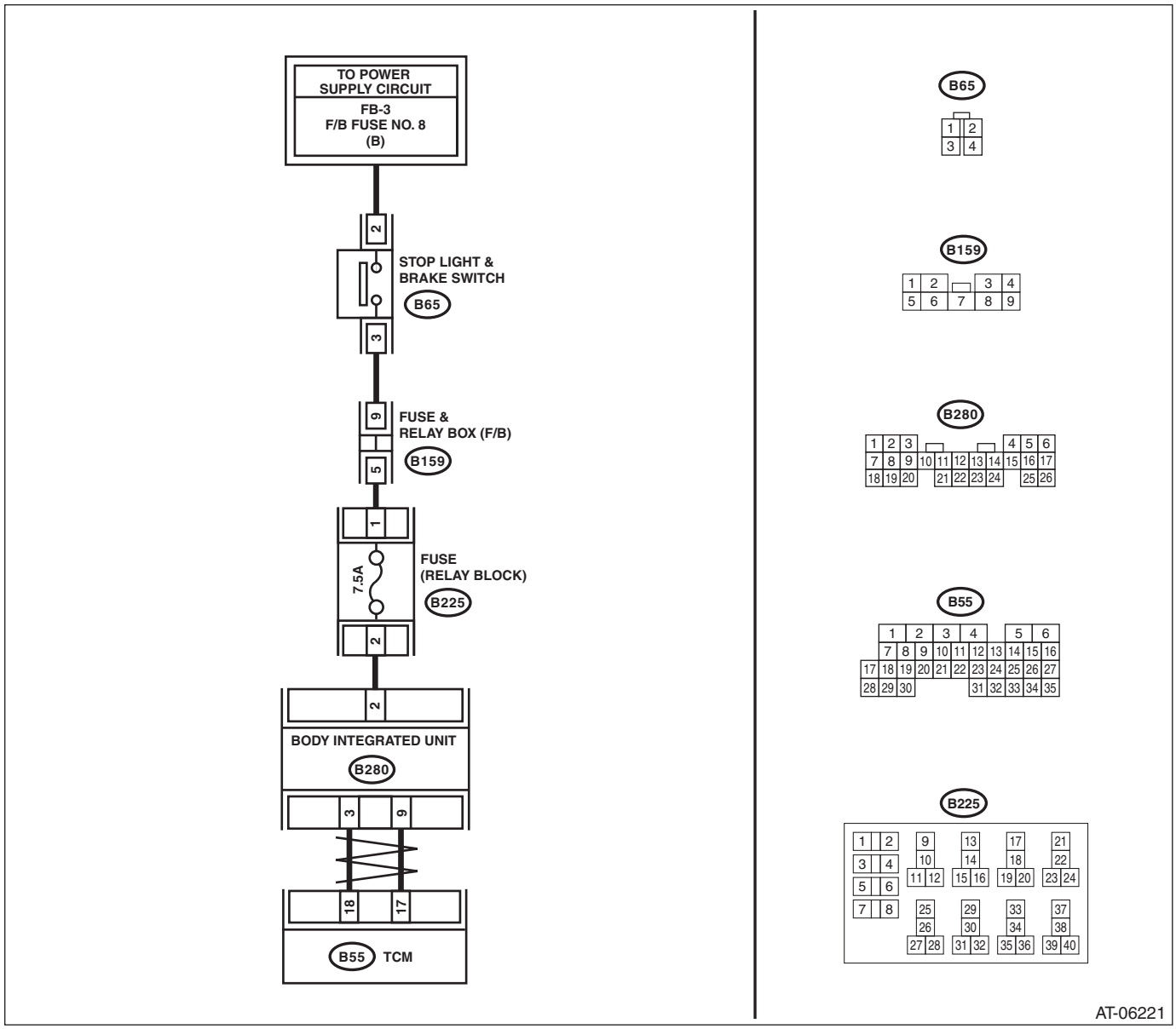
DTC DETECTING CONDITION:

Brake switch malfunction, open input signal circuit

TROUBLE SYMPTOM:

- Gear is not shifted down when driving a down hill.
- Neutral control does not operate.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK DTC.**	Is DTC of CAN communication displayed?	Perform the diagnosis according to DTC.	Go to step **2**.

	Step	Check	Yes	No
2	**CHECK FUSE (No. 8).** 1) Turn the ignition switch to OFF. 2) Remove the fuse (No. 8).	Is the fuse (No. 8) blown out?	Replace the fuse (No. 8). If the new fuse (No. 8) has blown out easily, repair the short circuit of harness between fuse (No. 8) and stop light switch.	Go to step **3**.
3	**CHECK FUSE (RELAY BLOCK)** Remove the fuse (7.5A) in the relay block.	Is the fuse (7.5A) blown out?	Replace the fuse (7.5A). If the replaced fuse (7.5A) blows out easily, repair the short circuit in the harness between the fuse (7.5A) and body integrated unit.	Go to step **4**.
4	**CHECK BODY INTEGRATED UNIT.** 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor to data link connector. 3) Turn the ignition switch to ON. 4) Run the Subaru Select Monitor. 5) Depress the brake pedal. 6) Read the data of "Stop Light Switch" using Subaru Select Monitor. <Ref. to LAN(diag)-14, OPERATION, Subaru Select Monitor.>	Is "ON" displayed?	Go to step **5**.	Go to step **6**.
5	**CHECK TCM.** Read the data of "Stop Light Switch" using Subaru Select Monitor. <Ref. to 4AT(diag)-15, OPERATION, Subaru Select Monitor.>	Is "ON" displayed?	Check for poor contact in connectors or harnesses, and repair the defective part.	Replace the TCM. <Ref. to 4AT-66, Transmission Control Module (TCM).>
6	**CHECK BODY INTEGRATED UNIT INPUT SIGNAL.** 1) Disconnect the connector from body integrated unit. 2) Depress the brake pedal. 3) Measure the voltage of harness between the body integrated unit and chassis ground. ***Connector & terminal*** ***(B280) No. 2 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **9**.	Go to step **7**.
7	**CHECK HARNESS CONNECTOR BETWEEN BODY INTEGRATED UNIT AND 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 body integrated unit and stop light switch. ***Connector & terminal*** ***(B280) No. 2 — (B65) No. 3:***	Is the resistance less than 1 Ω?	Go to step **8**.	Repair the open circuit of harness between body integrated unit and stop light switch.
8	**CHECK HARNESS CONNECTOR BETWEEN BODY INTEGRATED UNIT AND STOP LIGHT SWITCH.** Measure the harness resistance between the body integrated unit and chassis ground. ***Connector & terminal*** ***(B280) No. 2 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **9**.	Repair the short circuit of harness between body integrated unit and stop light switch.

Step		Check	Yes	No
9	CHECK FOR POOR CONTACT.	Is there poor contact of input signal of brake switch?	Repair the poor contact.	Check body integrated unit.

F: DTC P0720 OUTPUT SPEED SENSOR CIRCUIT

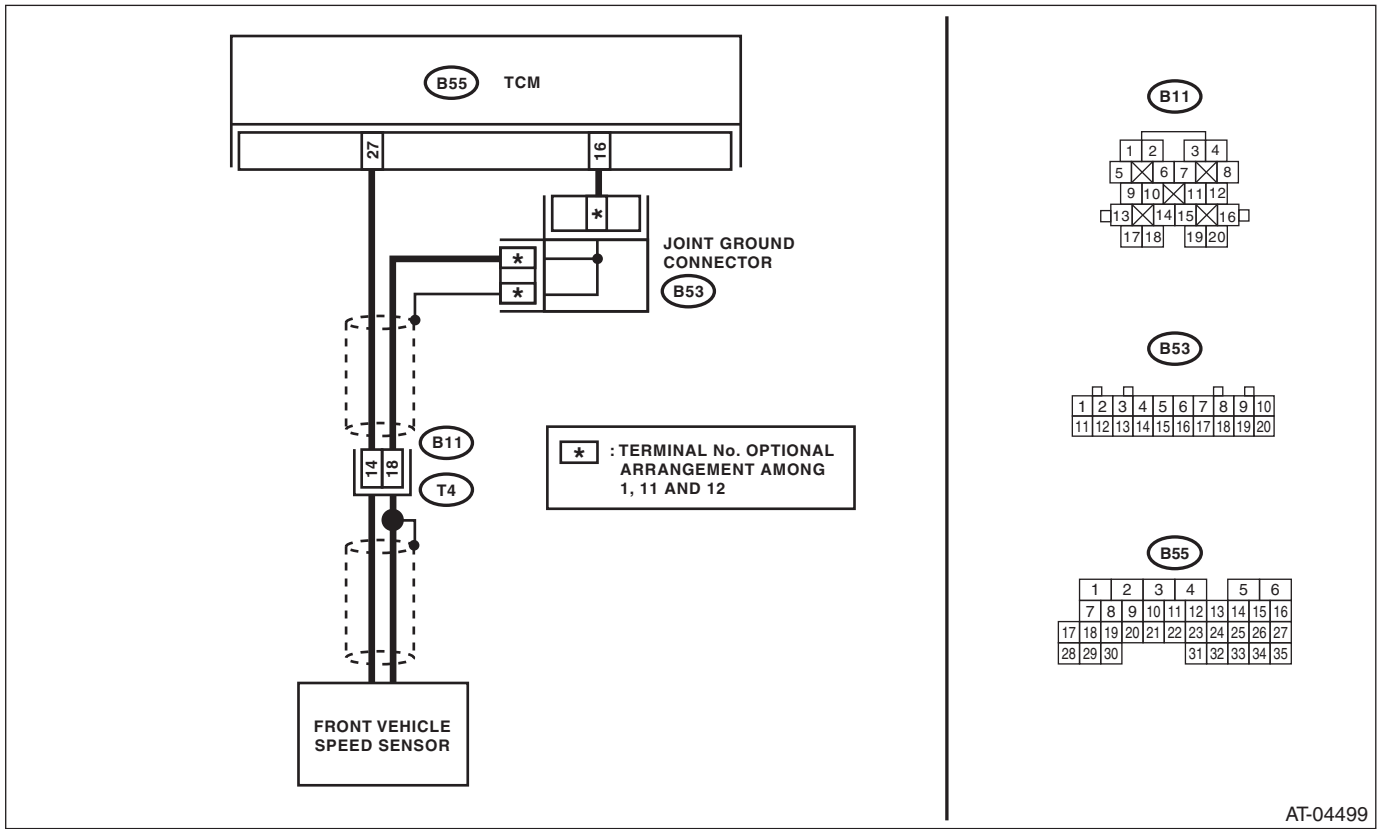
DTC DETECTING CONDITION:

- The vehicle speed signal is abnormal.
- The harness connector between TCM and vehicle speed sensor is shorted or open.

TROUBLE SYMPTOM:

- Neutral control does not operate.
- Slip lock up control does not operate.
- Driving performance is poor.

WIRING DIAGRAM:



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. ***Connector & terminal*** ***(B55) No. 16 — (B11) No. 18:*** ***(B55) No. 27 — (B11) No. 14:***	Is the resistance less than 1 Ω?	Go to step **2**.	Repair the open circuit of harness between TCM and transmission connector, and poor contact of the connector.
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of the harness between TCM connector and chassis ground. ***Connector & terminal*** ***(B55) No. 16 — Chassis ground:*** ***(B55) No. 27 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **3**.	Repair the short circuit of the harness and poor contact of connectors between the TCM and chassis ground.

	Step	Check	Yes	No
3	**CHECK FRONT VEHICLE SPEED SENSOR.** Measure the resistance between transmission connector receptacle's terminals. ***Connector & terminal*** ***(T4) No. 14 — No. 18:***	Is the resistance between 450 — 650 Ω?	Go to step **4**.	Replace the front vehicle speed sensor. <Ref. to 4AT-56, Front Vehicle Speed Sensor.>
4	**CHECK INPUT SIGNAL FOR TCM.** 1) Connect all connectors. 2) Connect the Subaru Select Monitor to data link connector. 3) Lift up the vehicle. 4) Turn the ignition switch to ON. 5) Run the Subaru Select Monitor. 6) Start the engine. 7) Slowly increase the vehicle speed to 60 km/h (37 MPH). 8) Read the data of "Front Wheel Speed" using Subaru Select Monitor. (Compare the speedometer with Subaru Select Monitor indications.) NOTE: The speed difference between the front and rear wheels will illuminate the ABS warning light or VDC warning light, but this does not indicate a malfunction. If the warning light illuminates, delete the ABS or VDC memory after completing the AT control diagnosis. <Ref. to VDC(diag)-25, Clear Memory Mode.>	Does the speedometer indication increase as the Subaru Select Monitor data increases?	Check for poor contact of the front vehicle speed sensor circuit harness and repair the fault location.	Go to step **5**.
5	**CHECK FOR POOR CONTACT.**	Is there poor contact of front vehicle speed sensor circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-66, Transmission Control Module (TCM).>

G: DTC P0724 BRAKE SWITCH CIRCUIT HIGH

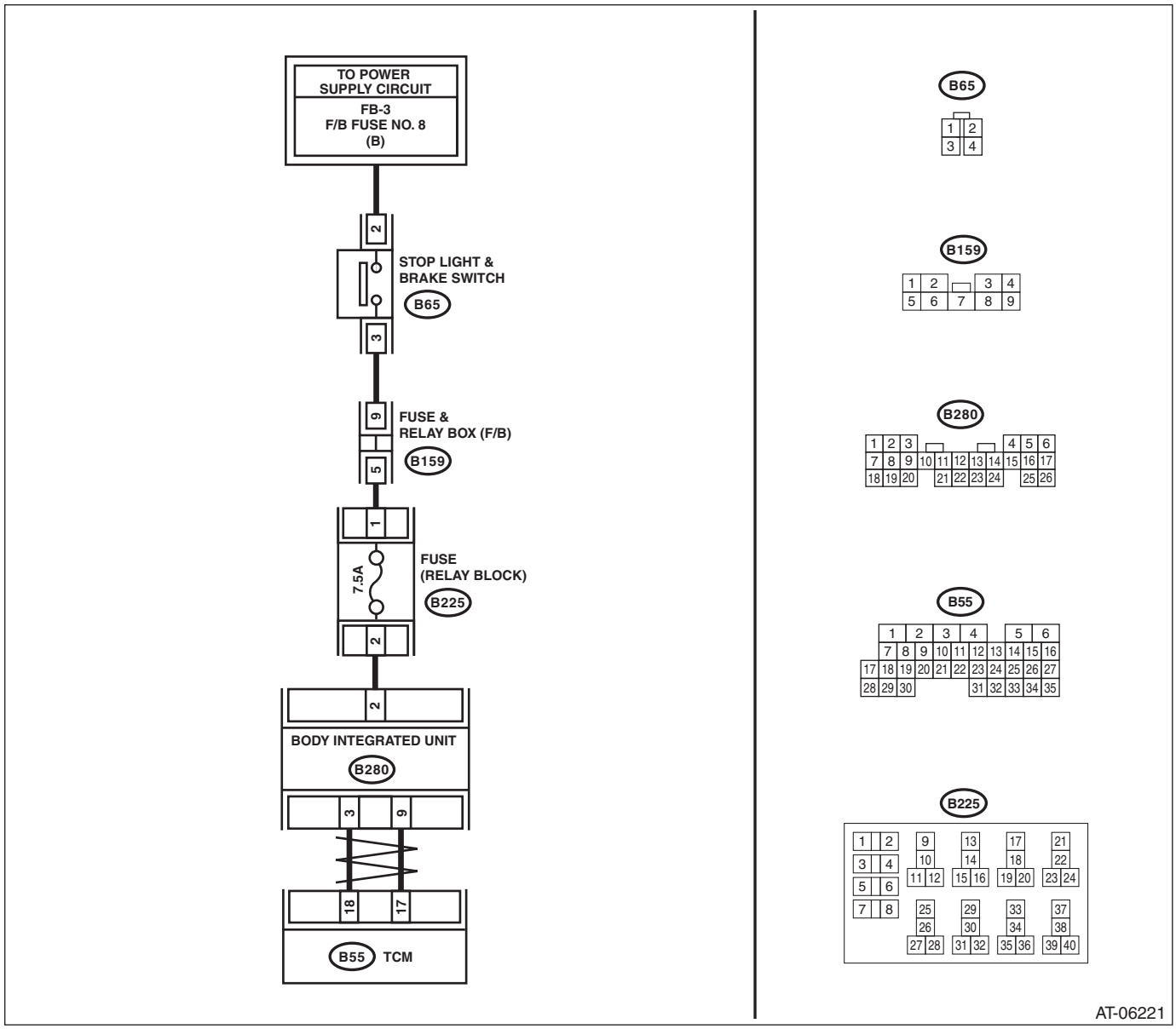
DTC DETECTING CONDITION:

Brake switch malfunction, open input signal circuit

TROUBLE SYMPTOM:

- Gear is not shifted down when driving a down hill.
- Neutral control does not operate.

WIRING DIAGRAM:



Step	Check	Yes	No
1 **CHECK DTC.**	Is DTC of CAN communication displayed?	Perform the diagnosis according to DTC.	Go to step **2**.

	Step	Check	Yes	No
2	**CHECK BODY INTEGRATED UNIT.** 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor to data link connector. 3) Turn the ignition switch to ON. 4) Run the Subaru Select Monitor. 5) Read the data of “Stop Light Switch” using Subaru Select Monitor. <Ref. to LAN(diag)-14, OPERATION, Subaru Select Monitor.>	Is “OFF” displayed?	Go to step **3**.	Go to step **4**.
3	**CHECK TCM.** Read the data of “Stop Light Switch” using Subaru Select Monitor. <Ref. to 4AT(diag)-15, OPERATION, Subaru Select Monitor.>	Is “OFF” displayed?	Check for poor contact in connectors or harnesses, and repair the defective part.	Replace the TCM. <Ref. to 4AT-66, Transmission Control Module (TCM).>
4	**CHECK BODY INTEGRATED UNIT.** 1) Disconnect the harness connector of body integrated unit. 2) Measure the voltage of harness between body integrated unit and stop light switch. ***Connector & terminal*** ***(B280) No. 2 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **5**.	Go to step **7**.
5	**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 **6**.	Replace the stop light switch.
6	**CHECK HARNESS CONNECTOR BETWEEN BODY INTEGRATED UNIT AND STOP LIGHT SWITCH.** 1) Turn the ignition switch to ON. 2) Measure the voltage of harness between the body integrated unit and chassis ground. ***Connector & terminal*** ***(B280) No. 2 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **7**.	Repair the short circuit of harness between body integrated unit and stop light switch.
7	**CHECK FOR POOR CONTACT.**	Is there poor contact of input signal of brake switch?	Repair the poor contact.	Check body integrated unit.

H: DTC P0731 GEAR 1 INCORRECT RATIO

NOTE:
Refer to DTC P0736 for diagnostic procedure. <Ref. to 4AT(diag)-55, DTC P0736 REVERSE INCORRECT RATIO, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

I: DTC P0732 GEAR 2 INCORRECT RATIO

NOTE:
Refer to DTC P0736 for diagnostic procedure. <Ref. to 4AT(diag)-55, DTC P0736 REVERSE INCORRECT RATIO, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

J: DTC P0733 GEAR 3 INCORRECT RATIO

NOTE:
Refer to DTC P0736 for diagnostic procedure. <Ref. to 4AT(diag)-55, DTC P0736 REVERSE INCORRECT RATIO, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

K: DTC P0734 GEAR 4 INCORRECT RATIO

NOTE:
Refer to DTC P0736 for diagnostic procedure. <Ref. to 4AT(diag)-55, DTC P0736 REVERSE INCORRECT RATIO, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

L: 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 THROTTLE OPENING ANGLE SENSOR.** Read the diagnostic trouble code (DTC) of engine using Subaru Select Monitor. <Ref. to EN(H4DOTC)(diag)-82, List of Diagnostic Trouble Code (DTC).> <Ref. to EN(H4DO)(diag)-86, List of Diagnostic Trouble Code (DTC).>	Is any of the following DTCs displayed: DTC P0122, P0123, P0222, P0223, P2109, P2135?	Perform the diagnosis according to DTC.	Go to step **2**.
2	**CHECK DTC.**	Is DTC P1718 displayed?	Perform the diagnosis according to DTC.	Go to step **3**.
3	**CHECK AT VEHICLE SPEED SENSOR CIRCUIT.** Perform the diagnosis according to DTC P0720. <Ref. to 4AT(diag)-50, DTC P0720 OUTPUT SPEED SENSOR CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble?	Check the harness of the front vehicle speed sensor circuit, and repair the defective part.	Go to step **4**.
4	**CHECK AT TURBINE REVOLUTION SPEED SENSOR CIRCUIT.** Perform the diagnosis according to DTC P0715. <Ref. to 4AT(diag)-45, DTC P0715 INPUT/TURBINE SPEED SENSOR CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble?	Check the torque converter turbine speed sensor circuit.	There are malfunctions in TCM, TCM connector poor contact, or transmission assembly mechanical malfunction.

M: 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 ENGINE SPEED SIGNAL.** 1) Idle the engine. 2) Read the data of “Engine Speed” using Subaru Select Monitor.	Does the value of “Engine Speed” almost coincide with the tachometer reading in the combination meter?	Go to step **2**.	Check the engine speed signal circuit.
2	**CHECK AT TURBINE SPEED SENSOR CIRCUIT.** Perform diagnosis according to the DTC P0715. <Ref. to 4AT(diag)-45, DTC P0715 INPUT/ TURBINE SPEED SENSOR CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble?	Check the torque converter turbine speed sensor circuit.	Go to step **3**.
3	**CHECK AT VEHICLE SPEED SENSOR CIRCUIT.** Perform diagnosis according to the DTC P0720. <Ref. to 4AT(diag)-50, DTC P0720 OUTPUT SPEED SENSOR CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble?	Check for poor contact of the front vehicle speed sensor circuit harness and repair the fault location.	There are malfunctions in TCM, TCM connector poor contact, or transmission assembly mechanical malfunction.

N: DTC P0743 TORQUE CONVERTER CLUTCH CIRCUIT ELECTRICAL

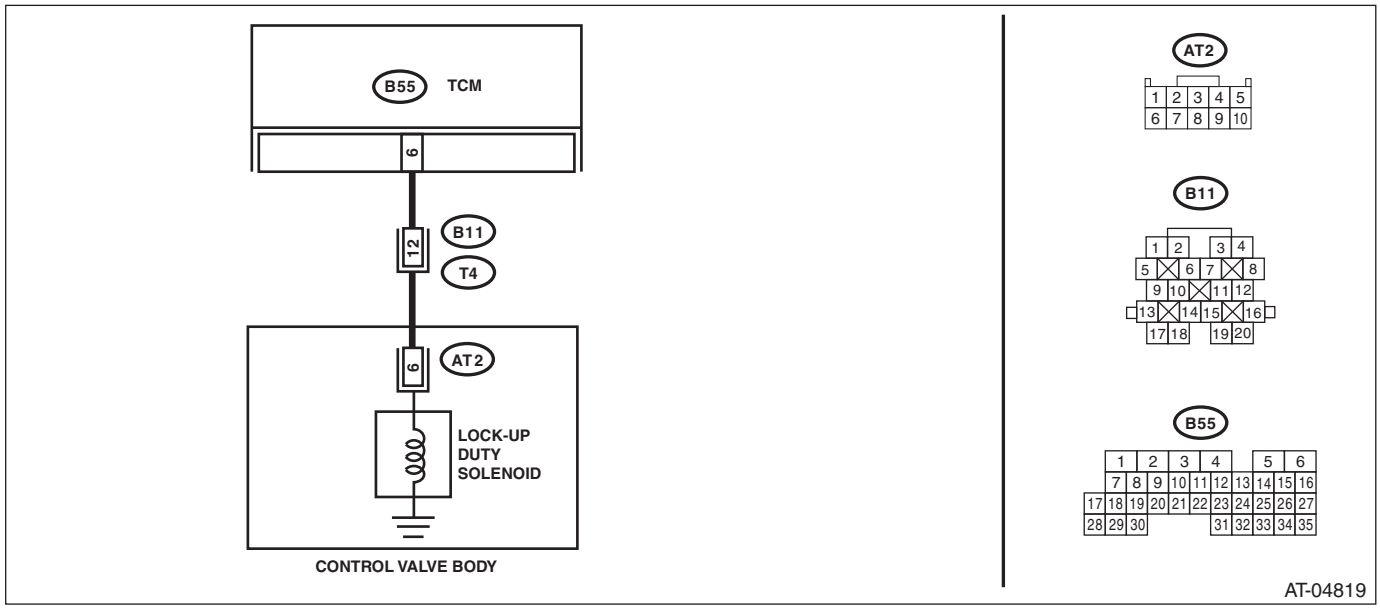
DTC DETECTING CONDITION:

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:



Step		Check	Yes	No
1	**CHECK DTC.**	Are DTCs other than P0743 displayed?	Perform the diagnosis according to DTC.	Go to step **2**.
2	**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 connector and transmission connector. ***Connector & terminal*** ***(B55) No. 6 — (B11) No. 12:***	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 connector between TCM connector and chassis ground. ***Connector & terminal*** ***(B55) No. 6 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **4**.	Repair the short circuit of harness between TCM and transmission connector.
4	**CHECK LOCK-UP DUTY SOLENOID.** Measure the resistance between transmission connector receptacle's terminals. ***Connector & terminal*** ***(T4) No. 12 — No. 20:***	Is the resistance 2.0 — 6.0 Ω?	Go to step **5**.	Go to step **8**.

	Step	Check	Yes	No
5	**CHECK OUTPUT SIGNAL OF TCM.** 1) Connect the connectors to TCM and transmission. 2) Lift up the vehicle. 3) Run the Subaru Select Monitor. 4) Start the engine. NOTE: If the ambient temperature is below 0°C (32°F), drive the vehicle until the ATF reaches its operating temperature. 5) Shift the select lever to "D" range, and slowly increase vehicle speed to 60 km/h (37 MPH). 6) Read the data of "Lock Up Duty Ratio" using Subaru Select Monitor. NOTE: The speed difference between the front and rear wheels will illuminate the ABS warning light or VDC warning light, but this does not indicate a malfunction. If the warning light illuminates, delete the ABS or VDC memory after completing the AT control diagnosis. <Ref. to VDC(diag)-25, Clear Memory Mode.>	Is the measured value 95%?	Go to step **6**.	Go to step **7**.
6	**CHECK OUTPUT SIGNAL OF TCM.** 1) Return the engine speed to idle. 2) Set the select lever to "N" range. 3) Read the data of "Lock Up Duty Ratio" using Subaru Select Monitor. NOTE: The speed difference between the front and rear wheels will illuminate the ABS warning light or VDC warning light, but this does not indicate a malfunction. If the warning light illuminates, delete the ABS or VDC memory after completing the AT control diagnosis. <Ref. to VDC(diag)-25, Clear Memory Mode.>	Is the measured value 0%?	Check the harnesses or connectors between TCM and transmission, and repair the defective part.	Go to step **7**.
7	**CHECK FOR POOR CONTACT.**	Is there poor contact of lock-up duty solenoid circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-66, Transmission Control Module (TCM).>
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. 4) Disconnect the connector from the control valve body. 5) Measure the resistance between lock-up duty solenoid and transmission ground. ***Connector & terminal*** ***(AT2) No. 6 — Transmission ground:***	Is the resistance 2.0 — 6.0 Ω?	Go to step **9**.	Replace the control valve body. <Ref. to 4AT-62, Control Valve Body.>

	Step	Check	Yes	No
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 — (AT2) No. 6:***	Is the resistance less than 1 Ω?	Go to step **10**.	Repair the open circuit of harness between lock-up duty solenoid and transmission connector.
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:***	Is the resistance 1 MΩ or more?	Check the harnesses or connectors between lock-up duty solenoid and transmission, and repair the defective part.	Repair the short circuit of harness between lock-up duty solenoid and transmission connector.

O: DTC P0748 PRESSURE CONTROL SOLENOID "A" ELECTRICAL

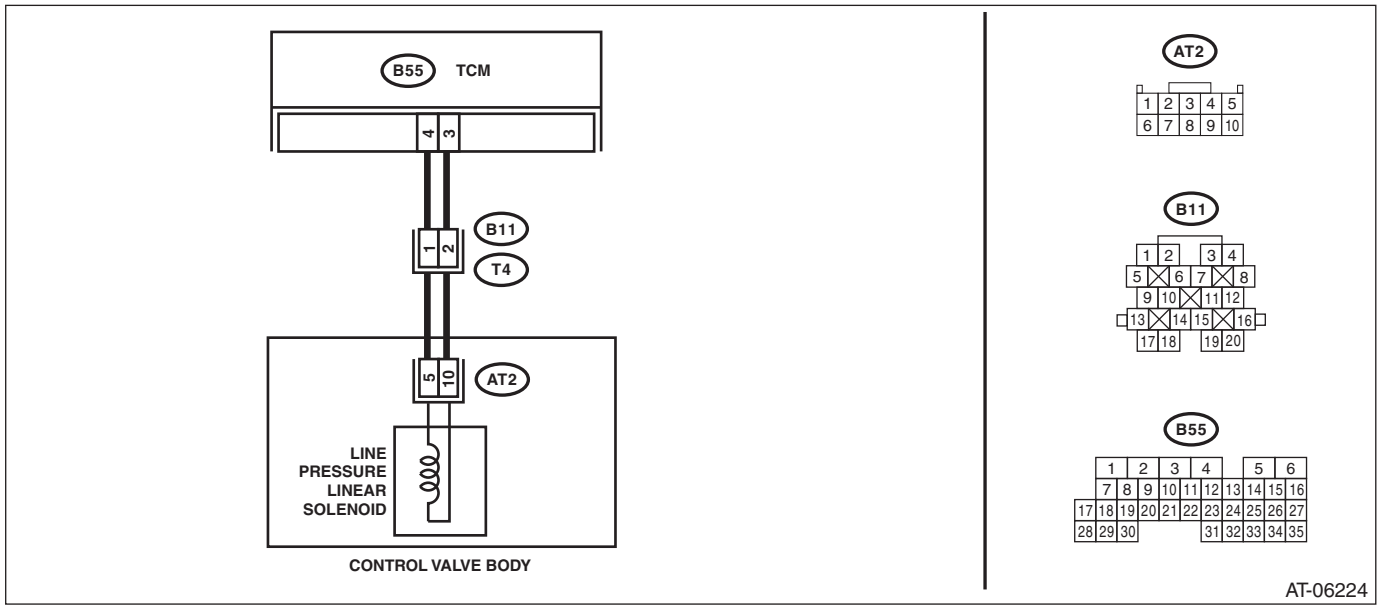
DTC DETECTING CONDITION:

Output signal circuit of line pressure linear solenoid is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock

WIRING DIAGRAM:

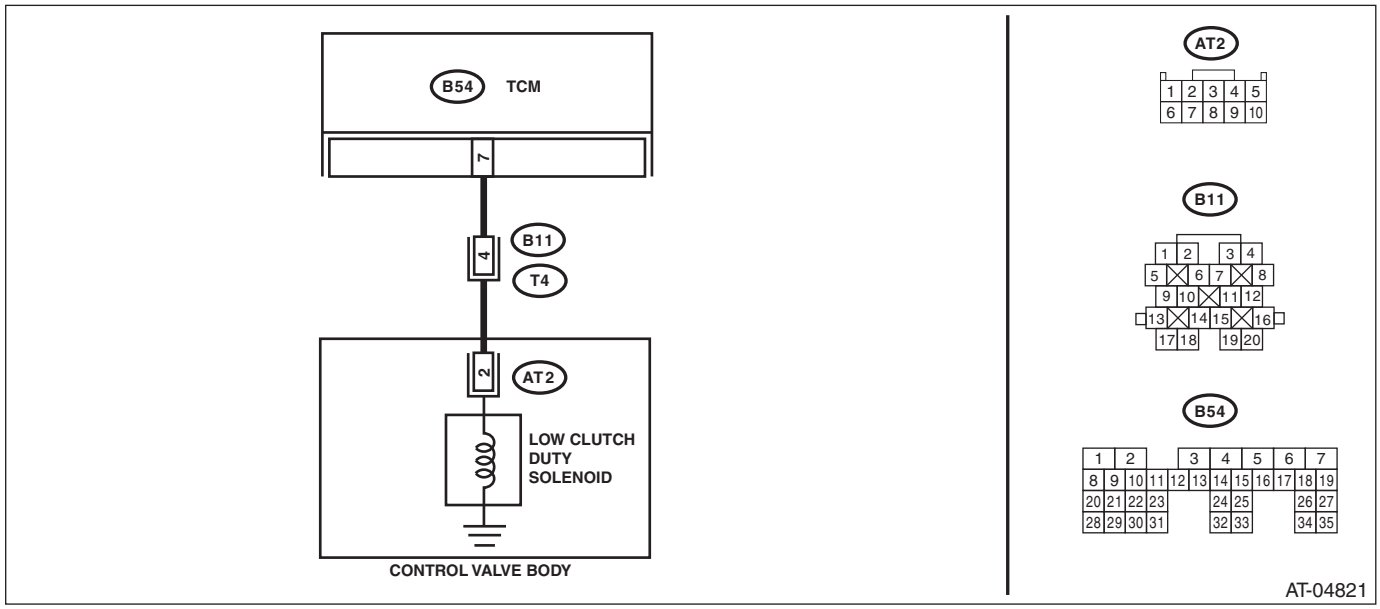


	Step	Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM and transmission. 3) Measure the resistance of harness between TCM connector and transmission connector. ***Connector & terminal*** ***(B55) No. 3 — (B11) No. 2:*** ***(B55) No. 4 — (B11) No. 1:***	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 harness between TCM connector and chassis ground. ***Connector & terminal*** ***(B55) No. 3 — Chassis ground:*** ***(B55) No. 4 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **3**.	Repair the short circuit of harness between TCM and transmission connector.
3	**CHECK LINE PRESSURE LINEAR SOLENOID.** Measure the resistance between transmission connector receptacle's terminals. ***Connector & terminal*** ***(T4) No. 1 — No. 2:***	Is the resistance 4.0 — 8.0 Ω?	Replace the TCM. <Ref. to 4AT-66, Transmission Control Module (TCM).>	Go to step **4**.

	Step	Check	Yes	No
4	**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. 4) Disconnect the connector from the control valve body. 5) Measure the resistance of line pressure linear solenoid connector terminals. ***Connector & terminal*** ***(AT2) No. 5 — No. 10:***	Is the resistance 4.0 — 8.0 Ω?	Go to step **5**.	Replace the control valve body. <Ref. to 4AT-62, Control Valve Body.>
5	**CHECK HARNESS CONNECTOR BETWEEN LINE PRESSURE LINEAR SOLENOID AND TRANSMISSION.** Measure the resistance of harness between line pressure linear solenoid and transmission connector. ***Connector & terminal*** ***(T4) No. 1 — (AT2) No. 5:*** ***(T4) No. 2 — (AT2) No. 10:***	Is the resistance less than 1 Ω?	Go to step **6**.	Repair the open circuit of harness between line pressure linear solenoid and transmission connector.
6	**CHECK HARNESS CONNECTOR BETWEEN LINE PRESSURE LINEAR SOLENOID AND TRANSMISSION.** 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 MΩ or more?	Check the harnesses or connectors between line pressure linear solenoid and transmission, and repair the defective part.	Repair the short circuit of harness between line pressure linear solenoid and transmission connector.

P: 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:

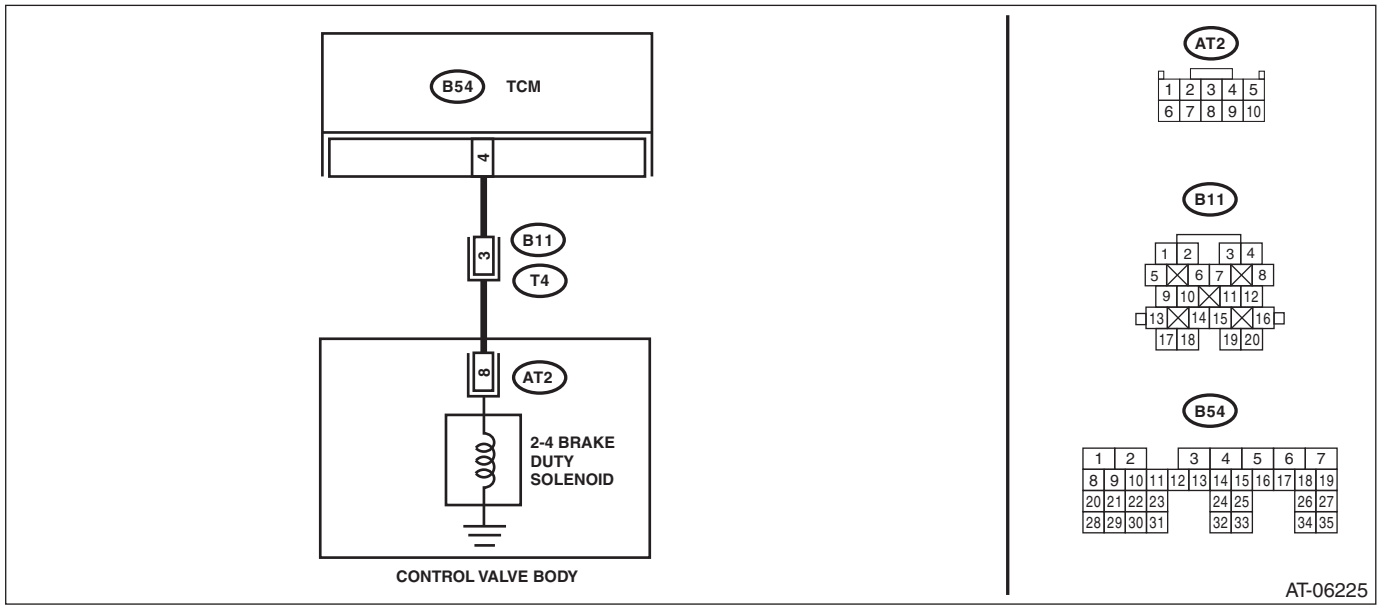


Step		Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM and transmission. 3) Measure the resistance of harness between TCM connector and transmission connector. ***Connector & terminal*** ***(B54) No. 7 — (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.
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness between TCM connector and transmission ground. ***Connector & terminal*** ***(B54) No. 7 — Chassis ground:***	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. ***Connector & terminal*** ***(T4) No. 4 — No. 20:***	Is the resistance 2.0 — 6.0 Ω?	Go to step **4**.	Go to step **7**.

	Step	Check	Yes	No
4	**CHECK OUTPUT SIGNAL OF TCM.** 1) Connect the connectors to TCM and transmission. 2) Connect the Subaru Select Monitor to data link connector. 3) Start the engine. 4) Run the Subaru Select Monitor. 5) Warm up the transmission until the ATF temperature exceeds approximately 80°C (176°F). 6) Stop the engine. 7) Turn the ignition switch to ON. 8) Shift the select lever to "P" or "N" range, and depress the accelerator pedal. 9) Read the data of "Low Clutch Duty" using Subaru Select Monitor.	Is the measured value 100%?	Go to step **5**.	Go to step **6**.
5	**CHECK OUTPUT SIGNAL OF TCM.** 1) Turn the ignition switch to ON. 2) Set the select lever to "D" range. 3) Read the data of "Low Clutch Duty" using Subaru Select Monitor.	Is the measured value 0%?	Check the harnesses or connectors between TCM and transmission, and repair the defective part.	Go to step **6**.
6	**CHECK FOR POOR CONTACT.**	Is there poor contact of low clutch duty solenoid circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-66, Transmission Control Module (TCM).>
7	**CHECK LOW 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. 4) Disconnect the connector from the control valve body. 5) Measure the resistance between low clutch duty solenoid connector and transmission ground. ***Connector & terminal*** ***(AT2) No. 2 — Transmission ground:***	Is the resistance 2.0 — 6.0 Ω?	Go to step **8**.	Replace the control valve body. <Ref. to 4AT-62, Control Valve Body.>
8	**CHECK HARNESS CONNECTOR BETWEEN LOW CLUTCH DUTY SOLENOID AND TRANSMISSION.** Measure the resistance of harness between low clutch duty solenoid and transmission connector. ***Connector & terminal*** ***(T4) No. 4 — (AT2) No. 2:***	Is the resistance less than 1 Ω?	Go to step **9**.	Repair the open circuit of harness between low clutch duty solenoid and transmission connector.
9	**CHECK HARNESS CONNECTOR BETWEEN LOW CLUTCH DUTY SOLENOID AND TRANSMISSION.** Measure the resistance of harness between transmission connector and transmission ground. ***Connector & terminal*** ***(T4) No. 4 — Transmission ground:***	Is the resistance 1 MΩ or more?	Check the harnesses or connectors between low clutch duty solenoid and transmission, and repair the defective part.	Repair the short circuit of harness between low clutch duty solenoid and transmission connector.

Q: 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:

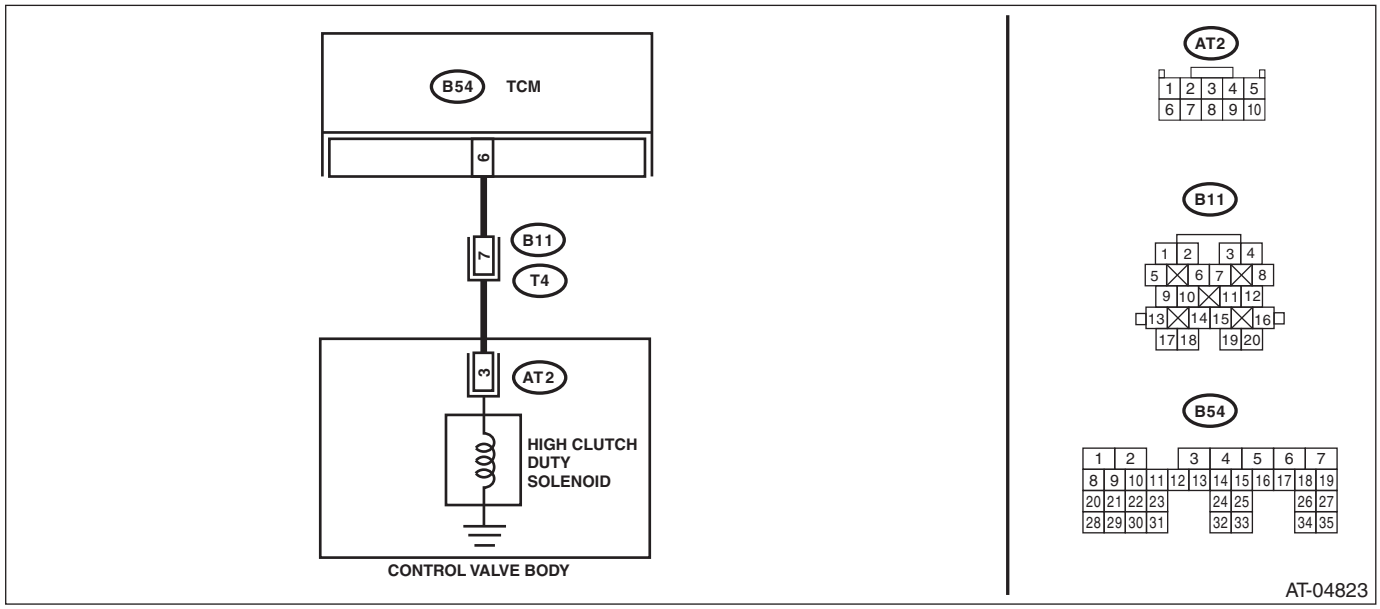


Step		Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM and transmission. 3) Measure the resistance of harness between TCM connector and transmission connector. ***Connector & terminal*** ***(B54) No. 4 — (B11) No. 3:***	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 harness between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 4 — Chassis ground:***	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. ***Connector & terminal*** ***(T4) No. 3 — No. 20:***	Is the resistance 2.0 — 6.0 Ω?	Go to step **4**.	Go to step **7**.

	Step	Check	Yes	No
4	**CHECK OUTPUT SIGNAL OF TCM.** 1) Connect all connectors. 2) Connect the Subaru Select Monitor to data link connector. 3) Start the engine. 4) Run the Subaru Select Monitor. 5) Warm up the transmission until the ATF temperature exceeds approximately 80°C (176°F). 6) Stop the engine. 7) Turn the ignition switch to ON. 8) Shift the select lever to "N", and depress the accelerator pedal. 9) Read the data of "Brake Clutch Duty Ratio" using Subaru Select Monitor.	Is the measured value 100%?	Go to step **5**.	Go to step **6**.
5	**CHECK OUTPUT SIGNAL OF TCM.** 1) Shift the select lever to "D" range. (2nd gear in manual mode). 2) Read the data of "Brake Clutch Duty Ratio" using Subaru Select Monitor.	Is the measured value 0%?	Check the harnesses or connectors between TCM and transmission, and repair the defective part.	Go to step **6**.
6	**CHECK FOR POOR CONTACT.**	Is there poor contact of 2-4 brake duty solenoid circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-66, Transmission Control Module (TCM).>
7	**CHECK 2-4 BRAKE 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. 4) Disconnect the connector from the control valve body. 5) Measure the resistance of harness between 2-4 brake duty solenoid connector and transmission ground. ***Connector & terminal*** ***(AT2) No. 8 — Transmission ground:***	Is the resistance 2.0 — 6.0 Ω?	Go to step **8**.	Replace the control valve body. <Ref. to 4AT-62, Control Valve Body.>
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. ***Connector & terminal*** ***(T4) No. 3 — (AT2) No. 8:***	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.
9	**CHECK HARNESS CONNECTOR BETWEEN 2-4 BRAKE DUTY SOLENOID AND TRANSMISSION.** Measure the resistance of harness between transmission connector and transmission ground. ***Connector & terminal*** ***(T4) No. 3 — Transmission ground:***	Is the resistance 1 MΩ or more?	Check the harnesses or connectors between 2-4 brake duty solenoid and transmission, and repair the defective part.	Repair the short circuit of harness between 2-4 brake duty solenoid and transmission connector.

R: 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:



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 connector and transmission connector. ***Connector & terminal*** ***(B54) No. 6 — (B11) No. 7:***	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 connector between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 6 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **3**.	Repair the short circuit of harness between TCM and transmission connector.
3	**CHECK HIGH CLUTCH DUTY SOLENOID.** Measure the resistance between transmission connector receptacle's terminals. ***Connector & terminal*** ***(T4) No. 7 — No. 20:***	Is the resistance 2.0 — 6.0 Ω?	Go to step **4**.	Go to step **7**.

	Step	Check	Yes	No
4	**CHECK OUTPUT SIGNAL OF TCM.** 1) Connect the connectors to TCM and transmission. 2) Lift up the vehicle. 3) Connect the Subaru Select Monitor to data link connector. 4) Start the engine. 5) Run the Subaru Select Monitor. 6) Warm up the engine until the ATF temperature exceeds 80°C (176°F). 7) Shift the select lever to "D", and slowly increase vehicle speed to measure at 3rd or 4th. 8) Read the data of "High Clutch Duty" using Subaru Select Monitor. NOTE: The speed difference between the front and rear wheels will illuminate the ABS warning light or VDC warning light, but this does not indicate a malfunction. If the warning light illuminates, delete the ABS or VDC memory after completing the AT control diagnosis. <Ref. to VDC(diag)-25, Clear Memory Mode.>	Is the measured value 0%?	Go to step **5**.	Go to step **6**.
5	**CHECK OUTPUT SIGNAL OF TCM.** 1) Return the engine speed to idle. 2) Set the select lever to "N" range. 3) Read the data of "High Clutch Duty" using Subaru Select Monitor. NOTE: The speed difference between the front and rear wheels will illuminate the ABS warning light or VDC warning light, but this does not indicate a malfunction. If the warning light illuminates, delete the ABS or VDC memory after completing the AT control diagnosis. <Ref. to VDC(diag)-25, Clear Memory Mode.>	Is the measured value 100%?	Check the harnesses or connectors between TCM and transmission, and repair the defective part.	Go to step **6**.
6	**CHECK FOR POOR CONTACT.**	Is there poor contact of high clutch duty solenoid circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-66, 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. 4) Disconnect the connector from the control valve body. 5) Measure the resistance between high clutch duty solenoid connector and transmission ground. ***Connector & terminal*** ***(AT2) No. 3 — Transmission ground:***	Is the resistance 2.0 — 6.0 Ω?	Go to step **8**.	Replace the control valve body. <Ref. to 4AT-62, Control Valve Body.>

	Step	Check	Yes	No
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 — (AT2) No. 3:***	Is the resistance less than 1 Ω?	Go to step **9**.	Repair the open circuit of harness between high clutch duty solenoid and transmission connector.
9	**CHECK HARNESS CONNECTOR BETWEEN HIGH CLUTCH DUTY SOLENOID AND TRANSMISSION.** Measure the resistance of harness between high clutch duty solenoid and transmission ground. ***Connector & terminal*** ***(T4) No. 7 — Transmission ground:***	Is the resistance 1 MΩ or more?	Check the harnesses or connectors between high clutch duty solenoid and transmission, and repair the defective part.	Repair the short circuit of harness between high clutch duty solenoid and transmission connector.

S: DTC P0768 SHIFT SOLENOID "D" ELECTRICAL

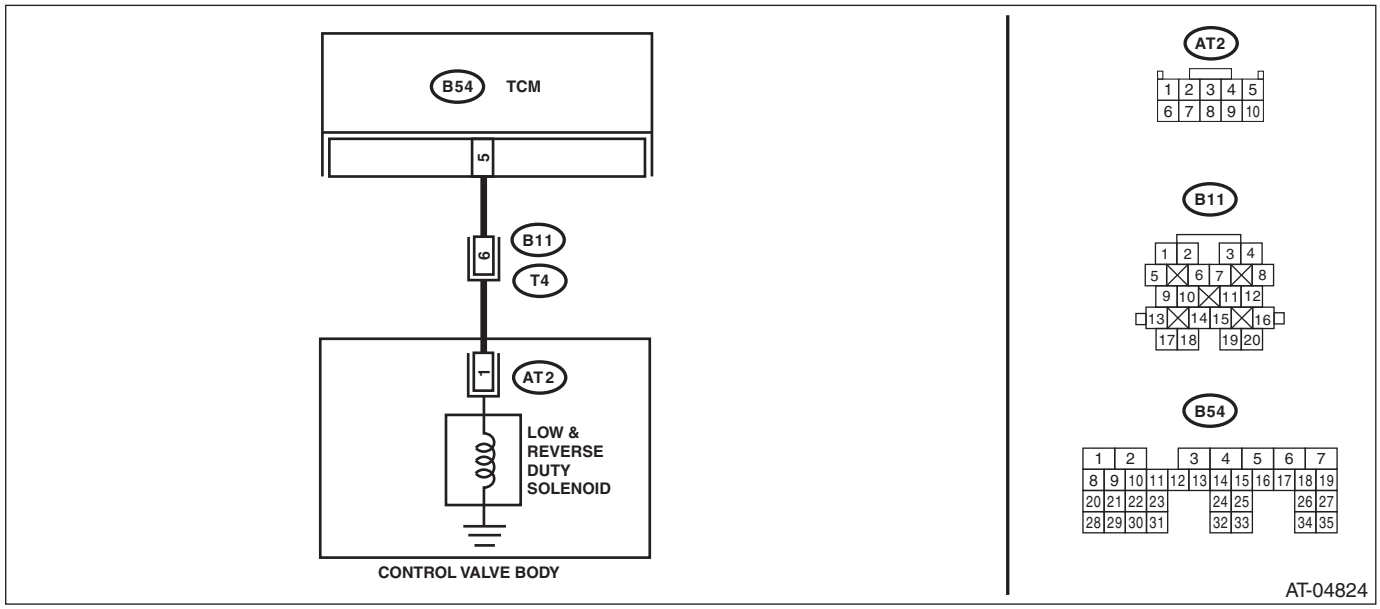
DTC DETECTING CONDITION:

The output signal circuit of low & reverse duty solenoid is open or shorted.

TROUBLE SYMPTOM:

Gear is not changed.

WIRING DIAGRAM:



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 connector and transmission connector. ***Connector & terminal*** ***(B54) No. 5 — (B11) No. 6:***	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 harness between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 5 — Chassis ground:***	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 DUTY SOLENOID.** Measure the resistance between transmission connector terminals. ***Connector & terminal*** ***(T4) No. 6 — No. 20:***	Is the resistance 2.0 — 6.0 Ω?	Go to step **4**.	Go to step **7**.

	Step	Check	Yes	No
4	**CHECK OUTPUT SIGNAL OF TCM.** 1) Connect all connectors. 2) Connect the Subaru Select Monitor to data link connector. 3) Start the engine. 4) Run the Subaru Select Monitor. 5) Warm up the transmission until the ATF temperature exceeds approximately 80°C (176°F). 6) Stop the engine. 7) Turn the ignition switch to ON. 8) Set the select lever to "N" range. 9) Read the data of "L&R B Duty" using Subaru Select Monitor.	Is the measured value 100%?	Go to step **5**.	Go to step **6**.
5	**CHECK OUTPUT SIGNAL OF TCM.** 1) Lift up the vehicle. 2) Shift the select lever to manual mode, and then hold it on 1st. 3) Slowly increase the vehicle speed up to 15 km/h (9 MPH), and then return the accelerator pedal. 4) Read the data of "L&R B Duty" using Subaru Select Monitor. NOTE: The speed difference between the front and rear wheels will illuminate the ABS warning light or VDC warning light, but this does not indicate a malfunction. If the warning light illuminates, delete the ABS or VDC memory of the on-board diagnosis system after completing the AT control diagnosis. <Ref. to VDC(diag)-25, Clear Memory Mode.>	Is the measured value 55%?	Check the harnesses or connectors between TCM and transmission, and repair the defective part.	Go to step **6**.
6	**CHECK FOR POOR CONTACT.**	Is there poor contact of the low & reverse duty solenoid circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-66, Transmission Control Module (TCM).>
7	**CHECK LOW & REVERSE BRAKE 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. 4) Disconnect the connector from the control valve body. 5) Measure the resistance between low & reverse duty solenoid connector and transmission ground. ***Connector & terminal*** ***(AT2) No. 1 — Transmission ground:***	Is the resistance 2.0 — 6.0 Ω?	Go to step **8**.	Replace the control valve body. <Ref. to 4AT-62, Control Valve Body.>
8	**CHECK HARNESS CONNECTOR BETWEEN LOW & REVERSE DUTY SOLENOID AND TRANSMISSION.** Measure the resistance of harness between low & reverse duty solenoid and transmission connector. ***Connector & terminal*** ***(T4) No. 6 — (AT2) No. 1:***	Is the resistance less than 1 Ω?	Go to step **9**.	Repair open circuit of harness between low & reverse duty solenoid and transmission connector.

	Step	Check	Yes	No
9	**CHECK HARNESS CONNECTOR BETWEEN LOW & REVERSE DUTY SOLENOID AND TRANSMISSION.** Measure the resistance of harness between transmission connector and transmission ground. ***Connector & terminal*** ***(T4) No. 6 — Transmission ground:***	Is the resistance 1 MΩ or more?	Check the harnesses or connectors between low & reverse duty solenoid and transmission, and repair the defective part.	Repair the short circuit of the harness between the low & reverse duty solenoid and the transmission connector.

T: DTC P0801 REVERSE INHIBIT CONTROL CIRCUIT

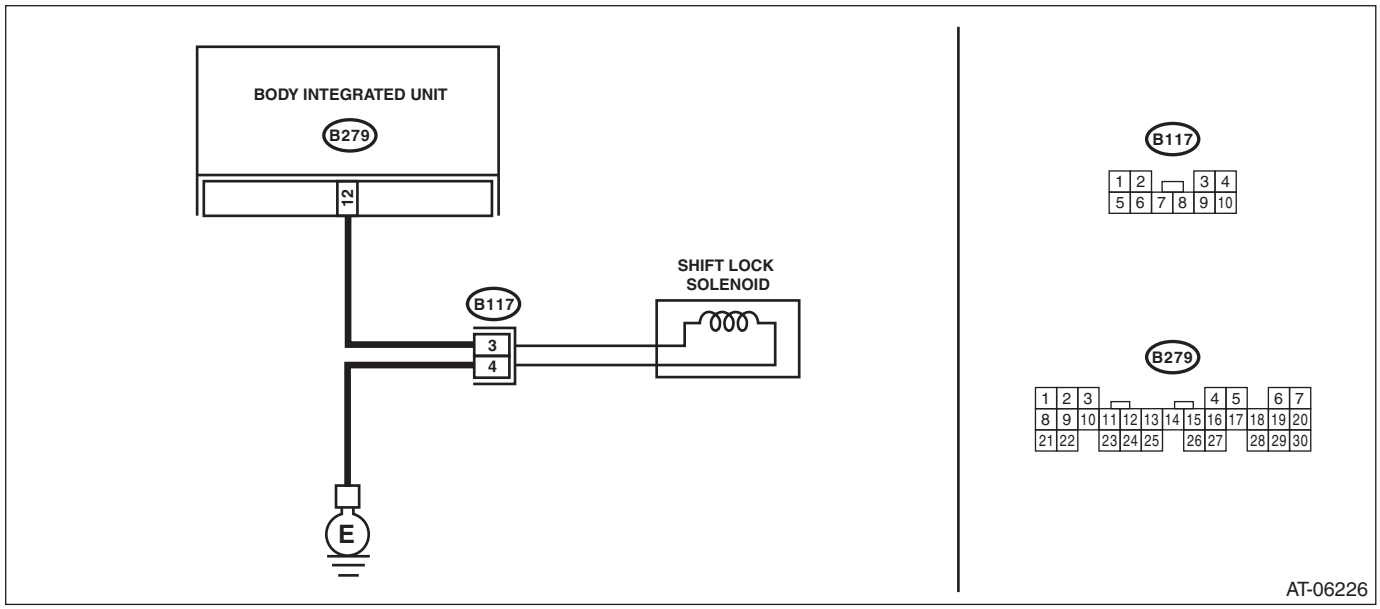
DTC DETECTING CONDITION:

Shift lock solenoid malfunction, open or short reverse inhibitor control circuit

TROUBLE SYMPTOM:

- Gear is shifted from “N” range to “R” range during driving at 20 km/h (12 MPH) or more.
- Gear cannot be shifted from “N” range to “R” range.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK SHIFT LOCK SOLENOID.** 1) Forcibly activate the body integrated unit to check the operation of shift lock solenoid. <Ref. to LAN(diag)-14, OPERATION, Subaru Select Monitor.> 2) Move the select lever without depressing the brake pedal.	Does the select lever shift?	Go to step **2**.	Go to step **3**.
2	**CHECK OUTPUT SIGNAL OF BODY INTEGRATED UNIT.** 1) Display the following items using Subaru Select Monitor. <Ref. to LAN(diag)-20, Read Current Data.> • Key-lock warning SW • Shift position • P SW • Stop light switch 2) Set the select lever to the “P” range while stepping on the brake pedal.	Do the units of measure of items displayed change?	Go to step **3**.	Check the circuits of the items whose values do not change.
3	**CHECK HARNESS CONNECTOR BETWEEN BODY INTEGRATED UNIT AND SHIFT LOCK SOLENOID.** Measure the harness resistance between the body integrated unit and chassis ground. ***Connector & terminal*** ***(B279) No. 12 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **4**.	Repair the short circuit of harness between body integrated unit and shift lock solenoid connector.

	Step	Check	Yes	No
4	**CHECK HARNESS BETWEEN SHIFT LOCK SOLENOID AND CHASSIS GROUND TERMINAL.** 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?	Go to step **5**.	Repair the open circuit of harness between chassis ground and shift lock solenoid connector.
5	**CHECK SHIFT LOCK SOLENOID.** Measure the resistance of shift lock solenoid terminals. ***Connector & terminal*** ***(B117) No. 3 — No. 4:***	Is the resistance 7.0 — 21.0 Ω?	Go to step **6**.	Replace the shift lock solenoid.
6	**CHECK OUTPUT SIGNAL OF BODY INTEGRATED UNIT.** 1) Connect all connectors. 2) Turn the ignition switch to ON. 3) With the brake pedal depressed, shift the select lever to “D” range. 4) Measure the voltage between body integrated unit and chassis ground. ***Connector & terminal*** ***(B279) No. 12 (+) — Chassis ground (–):***	Is the voltage 10.5 V or more?	Go to step **7**.	Go to step **8**.
7	**CHECK OUTPUT SIGNAL OF BODY INTEGRATED UNIT.** 1) Lift up the vehicle. 2) Start the engine. 3) Set the select lever to the “D” range and slowly increase vehicle speed to above 20 km/h (12 MPH). NOTE: The speed difference between the front and rear wheels will illuminate the ABS warning light or VDC warning light, but this does not indicate a malfunction. If the warning light illuminates, delete the ABS or VDC memory after completing the AT control diagnosis. <Ref. to VDC(diag)-25, Clear Memory Mode.> 4) Measure the voltage between body integrated unit and chassis ground. ***Connector & terminal*** ***(B279) No. 12 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Check the harnesses or connectors in reverse inhibitor control circuit, and repair the defective part.	Go to step **8**.
8	**CHECK FOR POOR CONTACT.**	Is there poor contact of the reverse inhibitor control circuit?	Repair the poor contact.	Replace the body integrated unit. <Ref. to SL-46, Body Integrated Unit.>

U: DTC P1707 AT AWD SOLENOID VALVE CIRCUIT MALFUNCTION

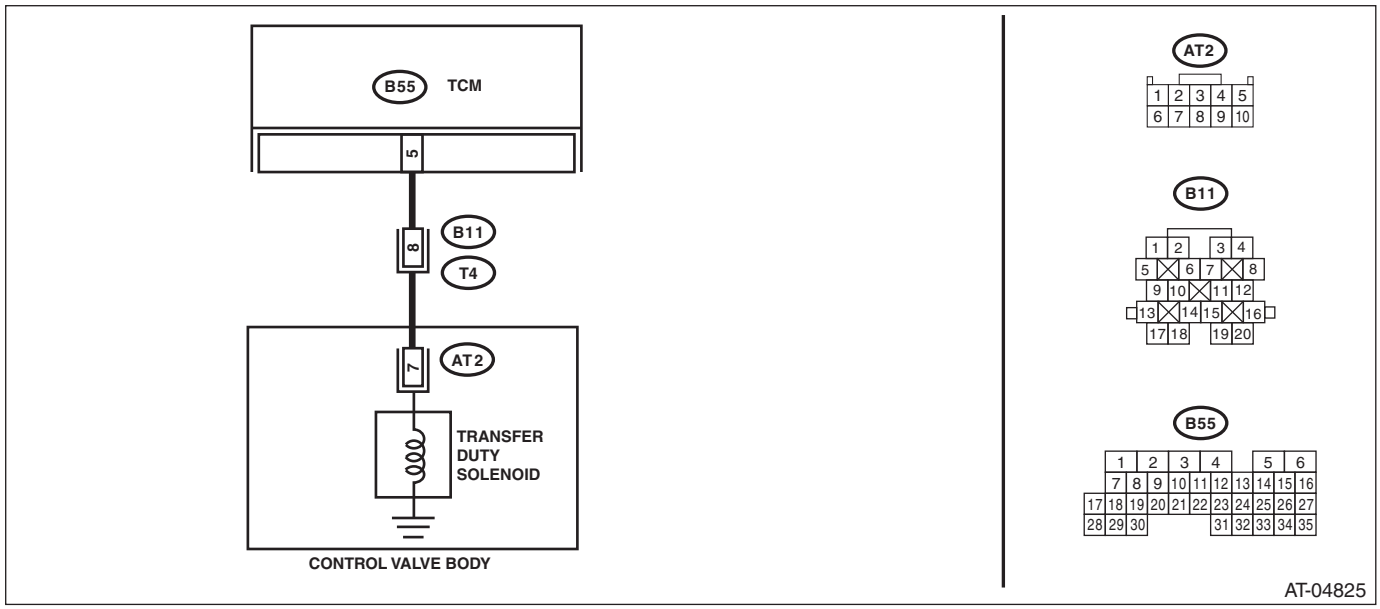
DTC DETECTING CONDITION:

Output signal circuit of transfer duty solenoid is open or shorted.

TROUBLE SYMPTOM:

- Tight corner braking phenomenon occurs.
- Front wheel slips on the slippery road.

WIRING DIAGRAM:



	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 connector and transmission connector. ***Connector & terminal*** ***(B55) No. 5 — (B11) No. 8:***	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 connector between TCM connector and chassis ground. ***Connector & terminal*** ***(B55) No. 5 — Chassis ground:***	Is the resistance 1 MΩ 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 2.0 — 6.0 Ω?	Go to step **4**.	Go to step **7**.

	Step	Check	Yes	No
4	**CHECK OUTPUT SIGNAL OF TCM.** 1) Connect the connectors to TCM and transmission. 2) Connect the Subaru Select Monitor to data link connector. 3) Turn the ignition switch to ON. 4) Run the Subaru Select Monitor. 5) Shift the select lever to the "N" range, and fully close the throttle pedal. (Vehicle speed is 0 km/h (0 MPH)) 6) Read the data of "Transfer Duty Ratio" using Subaru Select Monitor.	Is the value approx. 5%?	Go to step **5**.	Go to step **6**.
5	**CHECK OUTPUT SIGNAL OF TCM.** 1) Set the select lever to "D" range. 2) Read the data of "Transfer Duty Ratio" using Subaru Select Monitor.	Is the measured value approx. 18 — 35%?	Check the harnesses or connectors between TCM and transmission, and repair the defective part.	Go to step **6**.
6	**CHECK FOR POOR CONTACT.**	Is there poor contact of transfer duty solenoid circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-66, Transmission Control Module (TCM).>
7	**CHECK TRANSFER 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. 4) Disconnect the connector from the control valve body. 5) Measure the resistance between transfer duty solenoid connector and transmission ground. ***Connector & terminal*** ***(AT2) No. 7 — Transmission ground:***	Is the resistance 2.0 — 6.0 Ω?	Go to step **8**.	Replace the control valve body. <Ref. to 4AT-62, Control Valve Body.>
8	**CHECK HARNESS CONNECTOR BETWEEN TRANSFER DUTY SOLENOID AND TRANSMISSION.** Measure the resistance of harness between transfer duty solenoid and transmission connector. ***Connector & terminal*** ***(T4) No. 8 — (AT2) No. 7:***	Is the resistance less than 1 Ω?	Go to step **9**.	Repair the open circuit of harness between transfer duty solenoid and transmission connector.
9	**CHECK HARNESS CONNECTOR BETWEEN TRANSFER DUTY SOLENOID AND TRANSMISSION.** Measure the resistance of harness between transmission connector and transmission ground. ***Connector & terminal*** ***(T4) No. 8 — Transmission ground:***	Is the resistance 1 MΩ or more?	Check the connectors and harnesses between transfer duty solenoid and transmission for poor contact, and repair the defective part.	Repair short circuit of the harness between the transfer duty solenoid and transmission connector.

V: DTC P1718 AT CAN COMMUNICATION CIRCUIT

NOTE:
Refer to "Body Integrated Unit" for diagnosis of P1718. <Ref. to LAN(diag)-18, Read Diagnostic Trouble Code (DTC).>

W: DTC P1817 SPORTS MODE SWITCH CIRCUIT (MANUAL SWITCH)

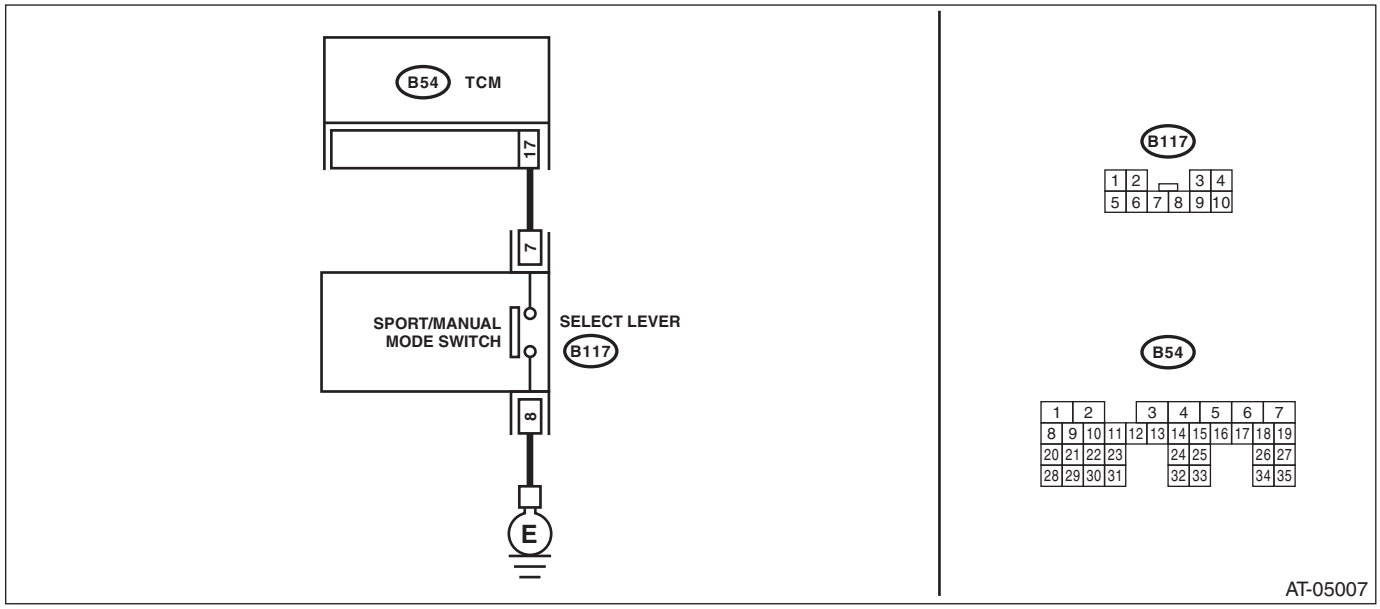
DTC DETECTING CONDITION:

Input signal circuit of SPORT shift switch is shorted.

TROUBLE SYMPTOM:

- Manual mode can not be set.
- The AT OIL TEMP light does not illuminate.
- No SPORT mode occurs.

WIRING DIAGRAM:



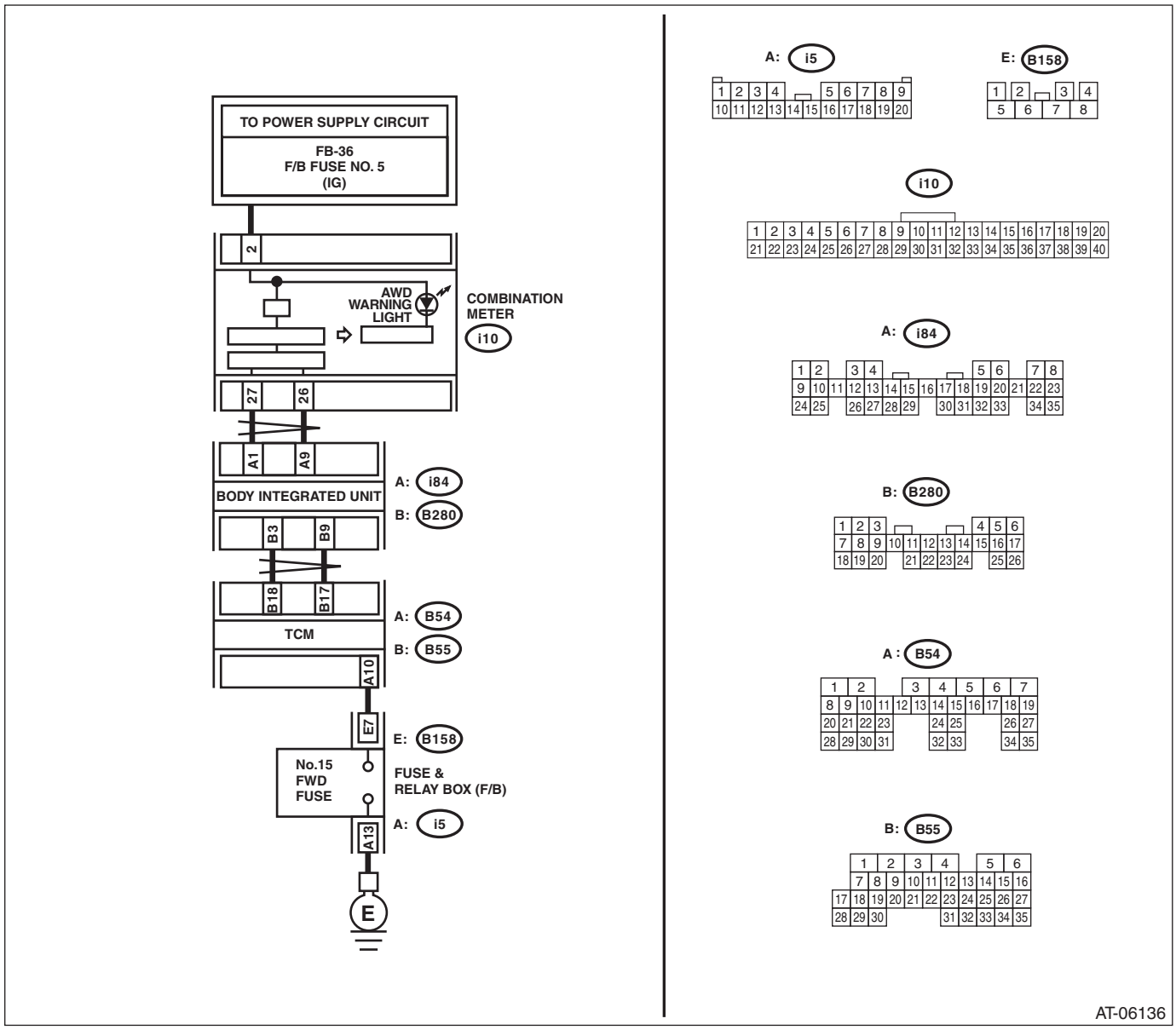
	Step	Check	Yes	No
1	**CHECK SPORT MODE SWITCH GROUND CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the SPORT shift switch. 3) Measure the resistance of harness between SPORT shift switch connector and chassis ground. ***Connector & terminal*** ***(B117) No. 8 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **2**.	Repair the open circuit of harness between the SPORT shift switch and chassis ground.
2	**CHECK SPORT SHIFT SWITCH.** Measure the resistance between SPORT shift switch terminals. ***Connector & terminal*** ***(B117) No. 7 — No. 8:***	Is the resistance 1 MΩ or more?	Go to step **3**.	Replace the select lever assembly. <Ref. to CS-20, Select Lever.>
3	**CHECK SPORT SHIFT SWITCH.** 1) Shift the select lever to SPORT mode. 2) Measure the resistance between SPORT shift switch terminals. ***Connector & terminal*** ***(B117) No. 7 — No. 8:***	Is the resistance less than 1 Ω?	Go to step **4**.	Replace the select lever assembly. <Ref. to CS-20, Select Lever.>
4	**CHECK HARNESS CONNECTOR BETWEEN TCM AND SPORT SHIFT SWITCH.** 1) Disconnect the connector from TCM. 2) Measure the resistance of harness between TCM connector and SPORT shift switch connector. ***Connector & terminal*** ***(B117) No. 7 — (B54) No. 17:***	Is the resistance less than 1 Ω?	Go to step **5**.	Repair the open circuit of harness between TCM and SPORT shift switch connector.

	Step	Check	Yes	No
5	**CHECK HARNESS CONNECTOR BETWEEN TCM AND SPORT SHIFT SWITCH.** 1) Disconnect the connector from TCM. 2) Measure the resistance of harness between TCM connector and chassis ground. ***Connector & terminal*** ***(B117) No. 7 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **6**.	Repair the short circuit of the harness between TCM and SPORT shift switch connector.
6	**CHECK INPUT SIGNAL FOR TCM.** 1) Connect the connector to TCM and SPORT shift switch. 2) Turn the ignition switch to ON. 3) Shift the select lever to normal mode. 4) Measure the voltage of signal to TCM. ***Connector & terminal*** ***(B54) No. 17 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **7**.	Replace the TCM. <Ref. to 4AT-66, Transmission Control Module (TCM).>
7	**CHECK FOR POOR CONTACT.**	Is there poor contact in the SPORT shift switch circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-66, Transmission Control Module (TCM).>

17.Diagnostic Procedure without Diagnostic Trouble Code (DTC)

A: CHECK FWD SWITCH

DIAGNOSIS:
FWD signal circuit is open or shorted.
TROUBLE SYMPTOM:
LED does not illuminate even if FWD switch is ON.
WIRING DIAGRAM:

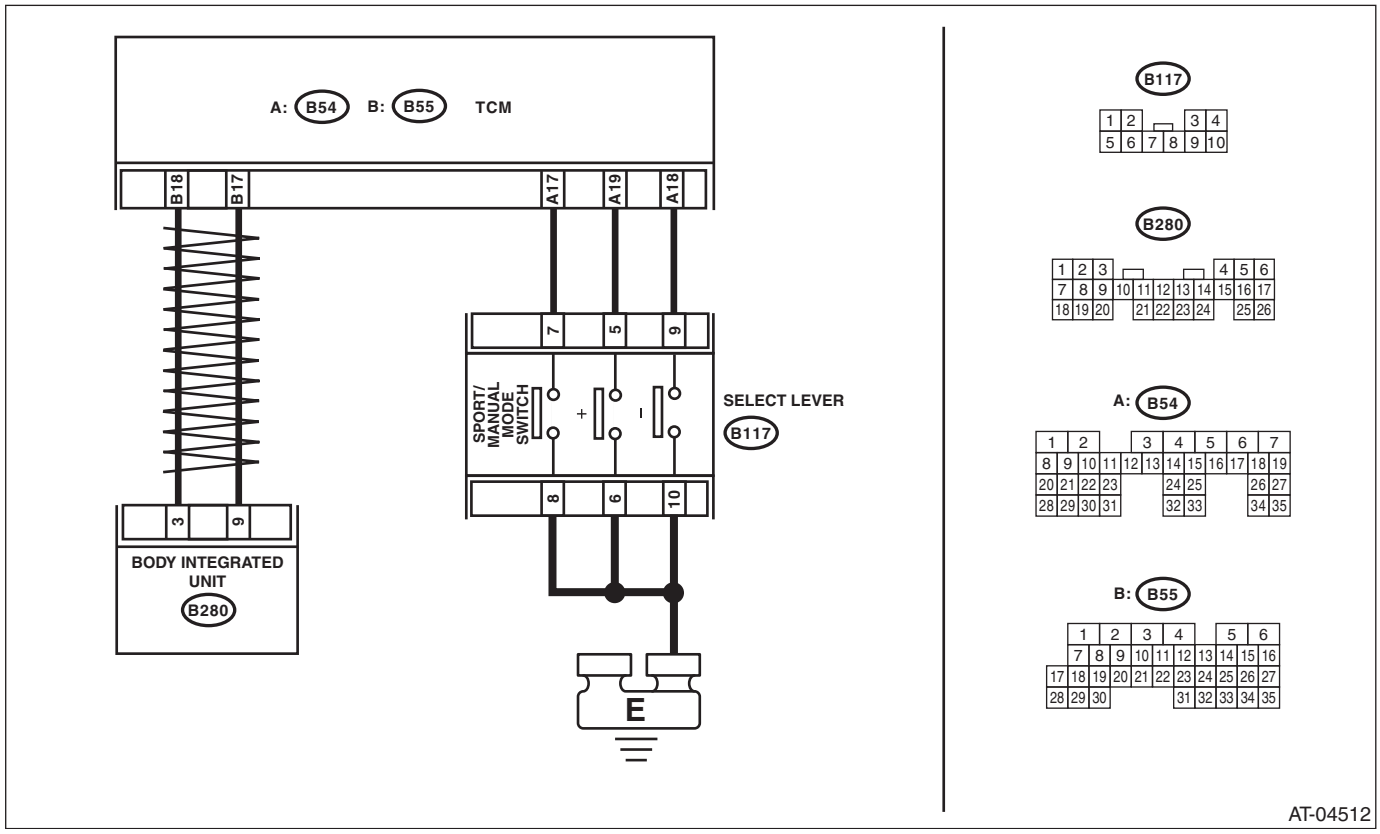


	Step	Check	Yes	No
1	**CHECK INDICATOR.** Turn the ignition switch to ON.	Is the AWD warning light illuminated?	Go to step **2**.	Perform the self-diagnosis of combination meter.
2	**CHECK INDICATOR.** Turn the ignition switch to ON and wait for at least 2 seconds.	Is the AWD warning light illuminated?	Go to step **3**.	Go to step **6**.
3	**CHECK INDICATOR.** Start the engine and wait for 2 seconds or more.	Does the AWD warning light go off?	Go to step **4**.	Go to step **11**.
4	**CHECK SPARE FUSE.**	Is the spare fuse OK?	Go to step **5**.	Replace the fuse.

	Step	Check	Yes	No
5	**CHECK INDICATOR.** 1) Turn the ignition switch to OFF. 2) Install a fuse to the FWD fuse holder. 3) Start the engine and wait for 2 seconds or more.	Is the AWD warning light illuminated?	Normal. Finish the diagnosis.	Go to step **6**.
6	**CHECK BODY INTEGRATED UNIT.**	Is DTC of CAN communication displayed?	Perform the diagnosis according to DTC.	Go to step **7**.
7	**CHECK TCM.** 1) Turn the ignition switch to OFF. 2) Install a fuse to the FWD fuse holder. 3) Connect the Subaru Select Monitor to data link connector. 4) Turn the ignition switch to ON. 5) Read the data of “FWD Switch” using Subaru Select Monitor.	Is “ON” displayed?	Perform the self-diagnosis of combination meter.	Go to step **8**.
8	**CHECK HARNESS CONNECTOR BETWEEN TCM AND FUSE BOX.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM and fuse box. 3) Measure the resistance of the harness between TCM connector and fuse box. ***Connector & terminal*** ***(B54) No. 10 — (B158) No. 7:***	Is the resistance less than 1 Ω?	Go to step **9**.	Repair the open circuit of harness between TCM and fuse box.
9	**CHECK HARNESS CONNECTOR BETWEEN FUSE BOX AND CHASSIS GROUND.** Measure the resistance of the harness between fuse box and chassis ground. ***Connector & terminal*** ***(i5) No. 13 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **10**.	Repair the open circuit of harness between fuse box and chassis ground.
10	**CHECK FOR POOR CONTACT.** Check poor contact of FWD switch circuit.	Is there poor contact of FWD switch circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-66, Transmission Control Module (TCM).>
11	**CHECK TCM.** 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor to data link connector. 3) Start the engine. 4) Read the data of “Engine Speed” using Subaru Select Monitor.	Is the measured value 400 rpm or more?	Go to step **12**.	Inspect the ECM.
12	**CHECK TCM.** Read the data of “FWD Switch” using Subaru Select Monitor.	Is “OFF” displayed?	Perform the self-diagnosis of combination meter.	Go to step **13**.
13	**CHECK HARNESS CONNECTOR BETWEEN TCM AND FUSE BOX.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM and fuse box. 3) Measure the resistance of harness connector between TCM and chassis ground. ***Connector & terminal*** ***(B54) No. 10 — Chassis ground:***	Is the resistance 1 MΩ or more?	Replace the TCM. <Ref. to 4AT-66, Transmission Control Module (TCM).>	Repair the short circuit of harness between TCM and fuse box.

B: CHECK SPORT SHIFT SWITCH

DIAGNOSIS:
Input signal circuit of SPORT shift switch is open or shorted.
TROUBLE SYMPTOM:
Does not shift on manual mode.
WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK SPORT SHIFT INDICATOR.** 1) Turn the ignition switch to ON. 2) Shift the select lever to SPORT mode. 3) Set the select lever to + side. 4) Read the SPORT shift indicator display in combination meter.	Is the gear position displayed?	Go to step **2**.	Go to step **3**.
2	**CHECK SPORT SHIFT INDICATOR.** Read the SPORT shift indicator display in combination meter.	Is “2” displayed?	Go to step **17**.	Go to step **9**.
3	**CHECK BODY INTEGRATED UNIT.**	Is DTC of CAN communication displayed?	Perform the diagnosis according to DTC.	Go to step **4**.
4	**CHECK TCM.** Read the data of “Tiptronic Mode Switch” using the Subaru Select Monitor.	Is “ON” displayed?	Go to step **9**.	Go to step **5**.

	Step	Check	Yes	No
5	**CHECK HARNESS CONNECTOR BETWEEN TCM AND SPORT SHIFT SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM and SPORT shift switch. 3) Measure the resistance of harness between TCM connector and SPORT shift switch connector. ***Connector & terminal*** ***(B54) No. 17 — (B117) No. 7:***	Is the resistance less than 1 Ω?	Go to step **6**.	Repair the open circuit of harness between TCM and SPORT shift switch.
6	**CHECK SPORT SHIFT SWITCH.** Measure the resistance between SPORT shift switch terminals. ***Connector & terminal*** ***(B117) No. 7 — No. 8:***	Is the resistance less than 1 Ω?	Go to step **7**.	Replace the guide plate assembly.
7	**CHECK HARNESS CONNECTOR BETWEEN SPORT SHIFT SWITCH AND CHASSIS GROUND.** Measure the resistance of harness between SPORT shift switch and chassis ground. ***Connector & terminal*** ***(B117) No. 8 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **8**.	Repair the open circuit of harness between the SPORT shift switch and chassis ground.
8	**CHECK FOR POOR CONTACT.** Check poor contact of SPORT shift switch circuit.	Is there poor contact of the SPORT shift switch circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-66, Transmission Control Module (TCM).>
9	**CHECK TCM.** 1) Shift and hold the select lever to + side. 2) Read the data of “Up Switch” using the Subaru Select Monitor.	Is “ON” displayed?	Go to step **14**.	Go to step **10**.
10	**CHECK HARNESS CONNECTOR BETWEEN TCM AND + SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and + switch. 3) Measure the resistance of harness between TCM and + switch. ***Connector & terminal*** ***(B54) No. 19 — (B117) No. 5:***	Is the resistance less than 1 Ω?	Go to step **11**.	Repair the open circuit of harness between TCM and + switch.
11	**CHECK + SWITCH.** 1) Shift and hold the select lever to + side. 2) Measure the resistance between + switch terminals. ***Connector & terminal*** ***(B117) No. 5 — No. 6:***	Is the resistance less than 1 Ω?	Go to step **12**.	Replace the guide plate assembly.
12	**CHECK HARNESS CONNECTOR BETWEEN + SWITCH AND CHASSIS GROUND.** Measure the resistance of harness between + switch and chassis ground. ***Connector & terminal*** ***(B117) No. 6 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **13**.	Repair the open circuit of harness between + switch and chassis ground.
13	**CHECK FOR POOR CONTACT.** Check poor contact of + switch circuit.	Is there poor contact of + switch circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-66, Transmission Control Module (TCM).>

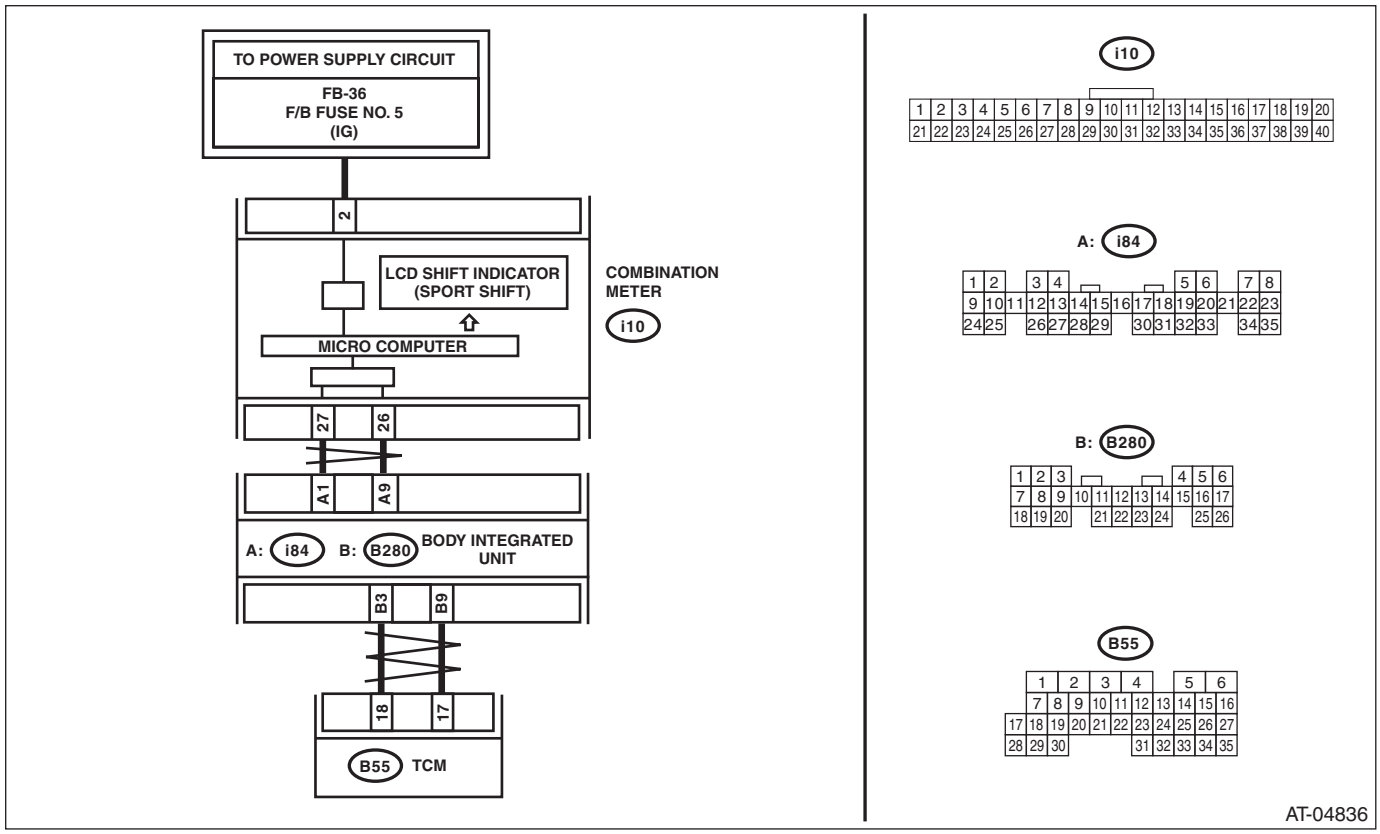
	Step	Check	Yes	No
14	**CHECK TCM.** 1) Set the select lever to the center position. (Tilt the select lever to SPORT mode, and release the hold.) 2) Read the data of "Up Switch" using the Subaru Select Monitor.	Is "OFF" displayed?	Perform the self-diagnosis of combination meter.	Go to step **15**.
15	**CHECK HARNESS CONNECTOR BETWEEN TCM AND + SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and + switch. 3) Measure the resistance of harness between TCM and + switch. ***Connector & terminal*** ***(B54) No. 19 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **16**.	Repair the short circuit of harness between TCM and + switch.
16	**CHECK + SWITCH.** Measure the resistance between + switch terminals. ***Connector & terminal*** ***(B117) No. 5 — No. 6:***	Is the resistance 1 MΩ or more?	Replace the TCM. <Ref. to 4AT-66, Transmission Control Module (TCM).>	Replace the guide plate assembly.
17	**CHECK SPORT SHIFT INDICATOR.** 1) Set the select lever to – side. 2) Read the SPORT shift indicator display in combination meter.	Is "1" displayed?	Normal. Finish the diagnosis.	Go to step **18**.
18	**CHECK TCM.** 1) Shift and hold the select lever to – side. 2) Read the data of "Down Switch" using the Subaru Select Monitor.	Is "ON" displayed?	Go to step **23**.	Go to step **19**.
19	**CHECK HARNESS CONNECTOR BETWEEN TCM AND – SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and – switch. 3) Measure the resistance of harness between TCM and – switch. ***Connector & terminal*** ***(B54) No. 18 — (B117) No. 9:***	Is the resistance less than 1 Ω?	Go to step **20**.	Repair the open circuit of harness between TCM and – switch.
20	**CHECK – SWITCH.** 1) Shift and hold the select lever to – side. 2) Measure the resistance between – switch terminals. ***Connector & terminal*** ***(B117) No. 9 — No. 10:***	Is the resistance less than 1 Ω?	Go to step **21**.	Replace the guide plate assembly.
21	**CHECK HARNESS CONNECTOR BETWEEN – SWITCH AND CHASSIS GROUND.** Measure the resistance of harness between – switch and chassis ground. ***Connector & terminal*** ***(B117) No. 10 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **22**.	Repair the open circuit of harness between – switch and chassis ground.
22	**CHECK FOR POOR CONTACT.** Check poor contact of – switch circuit.	Is there poor contact of – switch circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-66, Transmission Control Module (TCM).>

	Step	Check	Yes	No
23	**CHECK TCM.** 1) Set the select lever to the center position. (Tilt the select lever to SPORT mode, and release the hold.) 2) Read the data of “Down Switch” using the Subaru Select Monitor.	Is “OFF” displayed?	Perform the self-diagnosis of combination meter.	Go to step **24**.
24	**CHECK HARNESS CONNECTOR BETWEEN TCM AND – SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and – switch. 3) Measure the resistance of harness between TCM and – switch. ***Connector & terminal*** ***(B54) No. 18 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **25**.	Repair the short circuit of harness between TCM and – switch.
25	**CHECK – SWITCH.** Measure the resistance between – switch terminals. ***Connector & terminal*** ***(B117) No. 9 — No. 10:***	Is the resistance 1 MΩ or more?	Replace the TCM. <Ref. to 4AT-66, Transmission Control Module (TCM).>	Replace the guide plate assembly.

C: CHECK SPORT SHIFT INDICATOR

DIAGNOSIS:
Output signal circuit of SPORT shift indicator is open or shorted.
TROUBLE SYMPTOM:
- SPORT shift indicator does not display or remains displayed.
- SPORT shift indicator display does not change.

WIRING DIAGRAM:

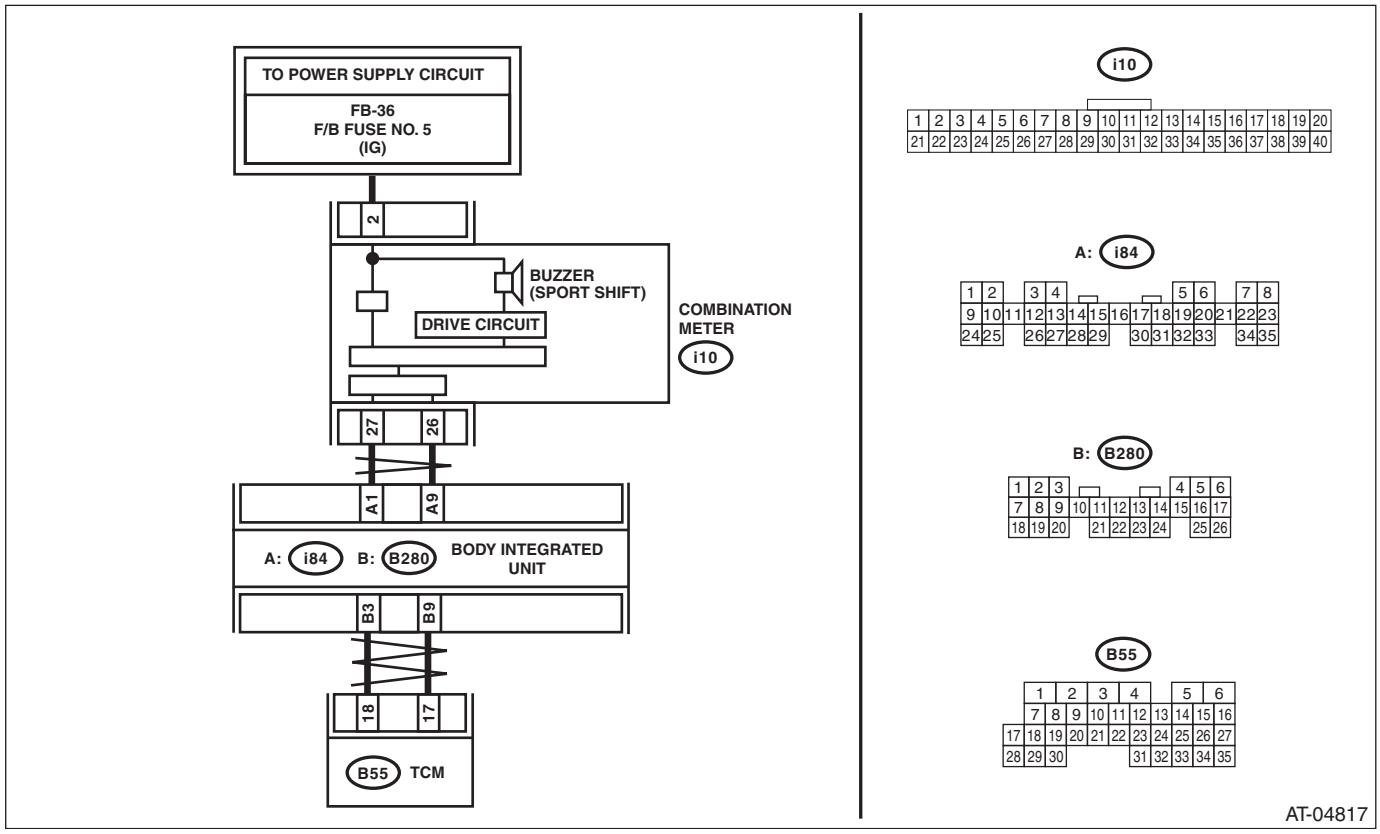


	Step	Check	Yes	No
1	**CHECK BODY INTEGRATED UNIT.** Check the DTC of the body integrated unit.	Is DTC of CAN communication displayed?	Perform diagnosis according to the DTC.	Go to step **2**.
2	**CHECK TCM.** 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor to data link connector. 3) Turn the ignition switch to ON. 4) Run the Subaru Select Monitor. 5) Shift the select lever to the SPORT mode side. 6) Read the “Gear Position” data of TCM using Subaru Select Monitor.	Is the gear position “1”?	Go to step **3**.	Replace the TCM. <Ref. to 4AT-66, Transmission Control Module (TCM).>
3	**CHECK TCM.** 1) Shift the select lever up. 2) Read the “Gear Position” data of TCM using Subaru Select Monitor.	Is the gear position “2”?	Go to step **4**.	Replace the TCM. <Ref. to 4AT-66, Transmission Control Module (TCM).>
4	**CHECK BODY INTEGRATED UNIT.** Using the Subaru Select Monitor, read the data of “Shift Position”.	Is “2” displayed?	Go to step **5**.	Check body integrated unit.

	Step	Check	Yes	No
5	**CHECK COMBINATION METER.** <Ref. to IDI-5, INSPECTION, Combination Meter System.>	Is the SPORT shift indicator OK?	Check the buzzer. <Ref. to 4AT(diag)-86, CHECK BUZZER, Diagnostic Procedure without Diagnostic Trouble Code (DTC).>	Replace the combination meter assembly. <Ref. to IDI-21, Combination Meter.>

D: CHECK BUZZER

DIAGNOSIS:
Output signal circuit of buzzer is open or shorted.
TROUBLE SYMPTOM:
Buzzer remains beeping.
WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK BODY INTEGRATED UNIT.** 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor to data link connector. 3) Turn the ignition switch to ON. 4) Run the Subaru Select Monitor. 5) Using the Subaru Select Monitor, read the data of “SPORT shift (buzzer 1)” and “SPORT shift (buzzer 2)”.	Is “ON” displayed?	Replace the TCM. <Ref. to 4AT-66, Transmission Control Module (TCM).>	Go to step **2**.
2	**CHECK COMBINATION METER.** <Ref. to IDI-5, INSPECTION, Combination Meter System.>	Is the buzzer OK?	Refer to “Diagnostics with Phenomenon”. <Ref. to 4AT(diag)-87, Diagnostics with Phenomenon.>	Replace the combination meter assembly. <Ref. to IDI-21, Combination Meter.>

18.Diagnostics with Phenomenon

A: INSPECTION

Symptoms	Faulty parts
Starter does not operate when select lever is in “P” or “N” range. Starter operates when select lever is in “R” or “D” range.	• Inhibitor switch • Select cable • Select lever • Starter motor and harness
Abnormal noise when select lever is in “P” or “N”.	• Strainer • Transfer duty solenoid • Oil pump • Drive plate • ATF level too high or too low
Hissing noise occurs during standing start.	• Strainer • ATF level too high or too low
Noise occurs while driving in “D1”.	• 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”.	• Final gear • Low & reverse brake • Reduction gear • Differential gear oil level too high or too low
Noise occurs while driving in “D4”.	• Final gear • Low & reverse brake • Planetary gear • Reduction gear • Differential gear oil level too high or too low
Vehicle moves when select lever is in “N” range.	• Select cable • Inhibitor switch • TCM • Low clutch
Shock occurs when select lever is shifted from “N” to “D” range.	• Accelerator pedal position sensor • ATF temperature sensor • Line pressure linear 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.	• Control valve • Low clutch • Line pressure linear solenoid • Seal ring • Front gasket of transmission case
Shock occurs when select lever is shifted from “N” to “R” range.	• Accelerator pedal position sensor • ATF temperature sensor • Line pressure linear solenoid • TCM • Harness • Control valve • ATF deterioration
Excessive time lag occurs when select lever is shifted from “N” to “R” range.	• Control valve • Low & reverse clutch • Reverse clutch • Line pressure linear solenoid • Seal ring • Front gasket of transmission case

Symptoms	Faulty parts
Vehicle does not start in any shift range. (Engine stalls)	• Parking brake mechanism • Planetary gear
Vehicle does not start in any shift range. (Engine operates)	• Strainer • Line pressure linear 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)	• Select cable • Select lever • Line pressure linear solenoid • Control valve • Low & reverse clutch • Reverse clutch
Vehicle does not start in “R” range only. (Engine stalls)	• Low clutch • 2-4 brake • Planetary gear • Parking brake mechanism
Vehicle does not start in “D” range. (Engine operates)	• Low clutch • One-way clutch
Vehicle does not start in “D” 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)	• 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)	• Oil pump • Torque converter one-way clutch • Engine performance
Acceleration is poor when select lever is in “D” range. (Normal rpm stall)	• TCM • Control valve • High clutch • 2-4 brake • Planetary gear
Acceleration is poor when select lever is in “R” range. (Normal rpm stall)	• Control valve • High clutch • 2-4 brake • Planetary gear
Will not shift from 1st to 2nd gear.	• TCM • Front vehicle speed sensor • Accelerator pedal position sensor • Control valve • 2-4 brake
Will not shift from 2nd to 3rd gear.	• TCM • Control valve • High clutch

Symptoms	Faulty parts
Will not shift from 3rd to 4th gear.	• TCM • ATF temperature sensor • Control valve • 2-4 brake
Engine brake is not effected when select lever is shifted from 4th gear to 3rd gear.	• Inhibitor switch • TCM • Accelerator pedal position sensor • Control valve
Engine brake is not effected when select lever is shifted from 3rd gear to 2nd gear.	• Control valve
Engine brake is not effected when select lever is shifted from 2nd gear to 1st gear.	• Control valve • Low & reverse brake
Shift characteristics are erroneous.	• Inhibitor switch • TCM • Front vehicle speed sensor • Accelerator pedal position sensor • Control valve • Ground
No lock-up occurs.	• TCM • Accelerator pedal position sensor • ATF temperature sensor • Control valve • Lock-up facing • Engine speed signal
Parking brake does not function.	• 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.	• Seal pipe • Double oil seal
Odor is produced from ATF supply pipe.	• High clutch • 2-4 brake • Low & reverse clutch • Reverse clutch • Lock-up facing • ATF deterioration
Shock occurs when shifting from 1st to 2nd gear.	• TCM • Torque converter turbine speed sensor • Accelerator pedal position sensor • 2-4 brake duty solenoid • ATF temperature sensor • Line pressure linear solenoid • Control valve • 2-4 brake • ATF deterioration • Engine performance • Low & reverse duty solenoid
Slippage occurs when shifting from 1st to 2nd gear.	• TCM • Accelerator pedal position sensor • 2-4 brake duty solenoid • ATF temperature sensor • Line pressure linear solenoid • Control valve • 2-4 brake

Symptoms	Faulty parts
Shock occurs when shifting from 2nd to 3rd gear.	• TCM • Torque converter turbine speed sensor • Accelerator pedal position sensor • 2-4 brake duty solenoid • ATF temperature sensor • Line pressure linear 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.	• TCM • Accelerator pedal position sensor • 2-4 brake duty solenoid • ATF temperature sensor • Line pressure linear solenoid • Control valve • High clutch • 2-4 brake • Low & reverse duty solenoid
Shock occurs when shifting from 3rd to 4th gear.	• TCM • Torque converter turbine speed sensor • Accelerator pedal position sensor • 2-4 brake duty solenoid • ATF temperature sensor • Line pressure linear solenoid • Control valve • Low clutch duty solenoid • 2-4 brake • ATF deterioration • Engine performance
Slippage occurs when shifting from 3rd to 4th gear.	• TCM • Accelerator pedal position sensor • 2-4 brake duty solenoid • ATF temperature sensor • Line pressure linear solenoid • Control valve • 2-4 brake
Shock occurs when shifting from 3rd to 2nd gear.	• TCM • Torque converter turbine speed sensor • Accelerator pedal position sensor • ATF temperature sensor • Line pressure linear solenoid • Control valve • 2-4 brake duty solenoid • 2-4 brake • ATF deterioration • High clutch duty solenoid
Shock occurs when shifting from 2nd to 1st gear.	• TCM • Torque converter turbine speed sensor • Accelerator pedal position sensor • ATF temperature sensor • Line pressure linear solenoid • Control valve • Low & reverse clutch • ATF deterioration • 2-4 brake duty solenoid • Low & reverse brake duty solenoid

Symptoms	Faulty parts
Shock occurs when accelerator pedal is released from medium speed.	• TCM • Accelerator pedal position sensor • ATF temperature sensor • Line pressure linear solenoid • Control valve • Lock-up damper • Engine performance
Vibration occurs during straight-forward operation.	• TCM • Lock-up duty solenoid • Lock-up facing • Lock-up damper
Vibration occurs during turns. (Tight corner braking phenomenon)	• TCM • Front vehicle speed sensor • Accelerator pedal position sensor • ATF temperature sensor • Transfer clutch • Control valve • Transfer duty solenoid • ATF deterioration • Harness
Front wheel slippage occurs during standing starts.	• TCM • Front vehicle speed sensor • Accelerator pedal position sensor • ATF temperature sensor • Control valve • Transfer clutch • Control valve • Transfer pipe • Transfer duty solenoid
It is not set in FWD mode.	• TCM • Transfer clutch • Control valve • Transfer duty solenoid
Select lever does not shift smoothly.	• Select cable • Select lever • Detent spring • Manual plate
Select lever is excessively hard to move. (Unreasonable resistance)	• Detent spring • Manual plate
Select lever slips out of selected shift position during acceleration or while driving on rough terrain.	• Select cable • Select lever • Detent spring • Manual plate
Manual mode can not be set.	• SPORT shift switch • TCM • Body integrated unit
Gear does not change though the select lever is operated in manual mode.	• Up shift switch • Down shift switch • TCM • Body integrated unit

MANUAL TRANSMISSION AND DIFFERENTIAL

5MT

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1. General Description

A: SPECIFICATION

1. MANUAL TRANSMISSION AND DIFFERENTIAL

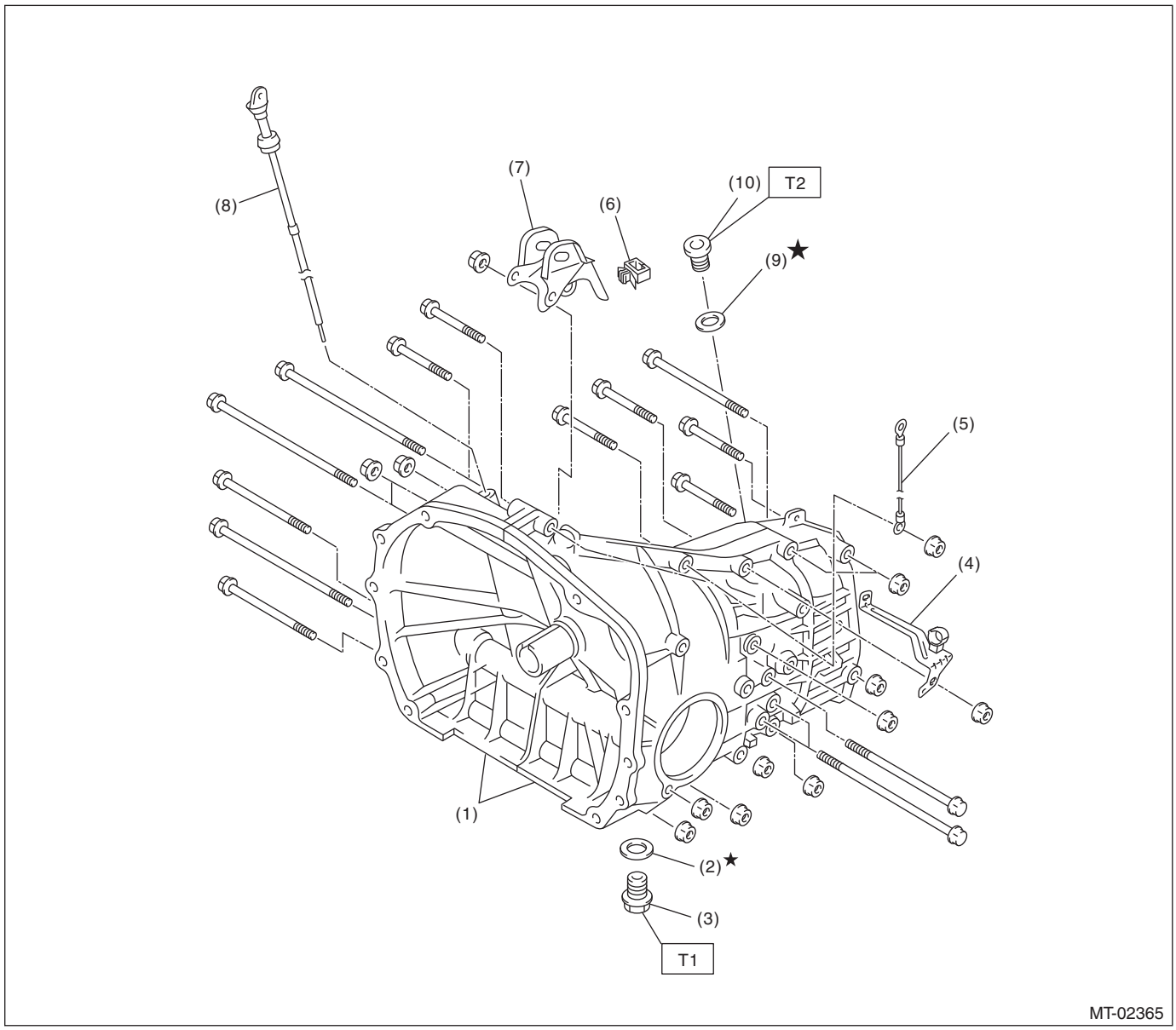
Model			2.5 L non-turbo
Type			5-forward speeds and 1-reverse (all stage with synchromesh)
Transmission gear ratio		1st	3.454
		2nd	2.062
		3rd	1.448
		4th	1.088
		5th	0.780
		Rev.	3.333
Front reduction gear	Final	Type of gear	Hypoid
		Gear ratio	4.111
Rear reduction gear	Transfer	Type of gear	Helical
		Gear ratio	1.000
	Final	Type of gear	Hypoid
		Gear ratio	4.111
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:
GL-5 (75W-90) or equivalent

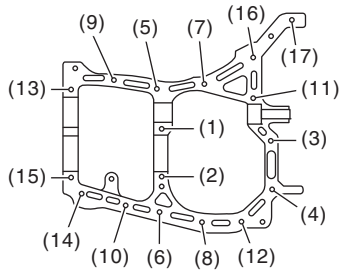
B: COMPONENT

1. TRANSMISSION CASE



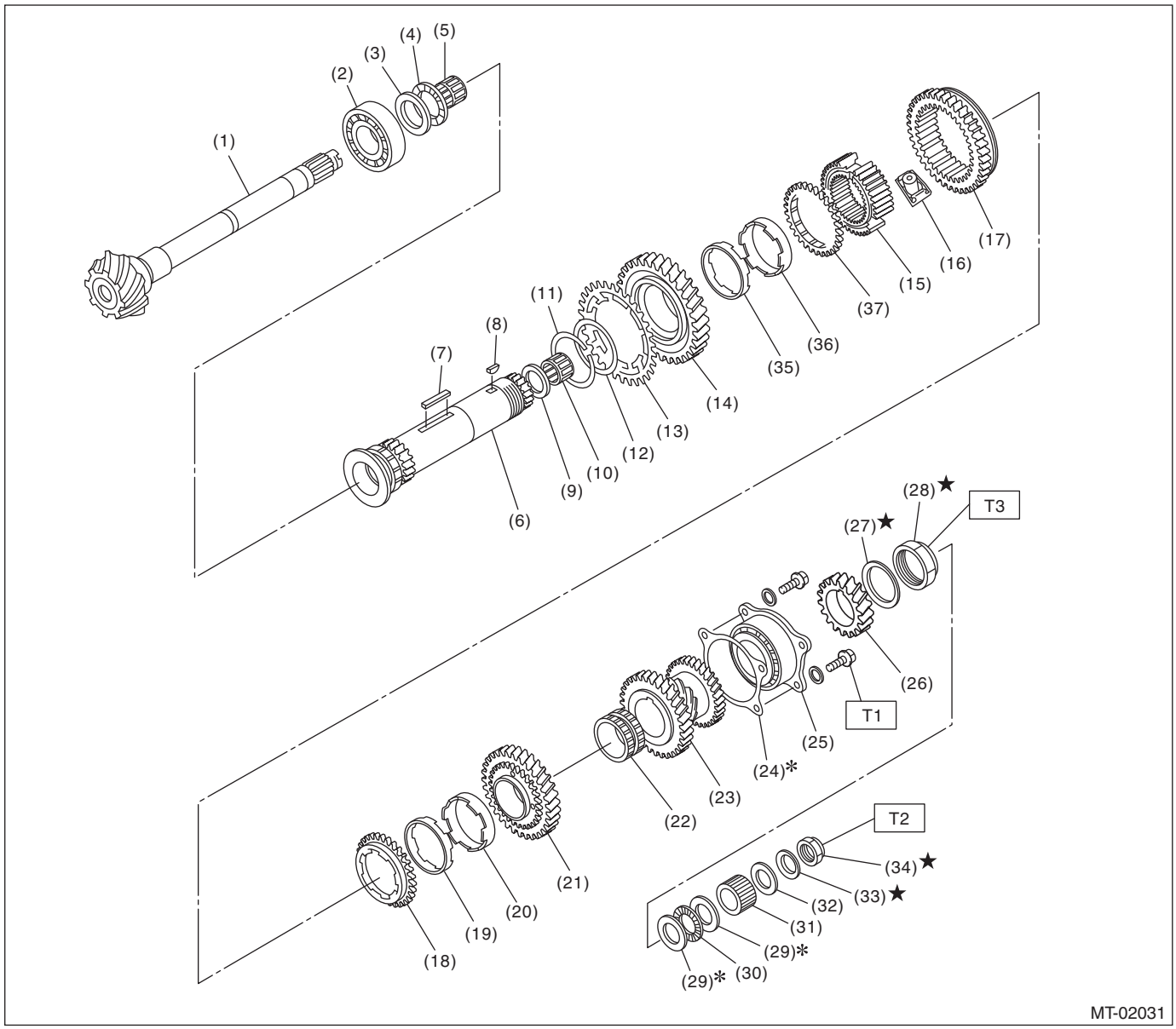
(1)	Transmission case ASSY	(6)	Clamp	***Tightening torque:N·m (kgf-m, ft-lb)***
(2)	Gasket	(7)	Pitching stopper bracket	***T1: 44 (4.5, 32.5) (Aluminum gasket, silver)***
(3)	Drain plug	(8)	Oil level gauge	***70 (7.1, 51.6) (Copper gasket, brown)***
(4)	Harness bracket	(9)	Gasket	***70 (7.1, 51.6) (Metal gasket, black)***
(5)	Transmission radio ground cord	(10)	Plug	***T2: 60 (6.1, 44.3)***

Transmission case tightening torque



Bolt No.	Bolt size mm	Tightening torque: N·m (kgf-m, ft-lb)
(5) — (15)	8	25 (2.5, 18.4)
(1) — (4) (16), (17)	10	39 (4.0, 28.8)

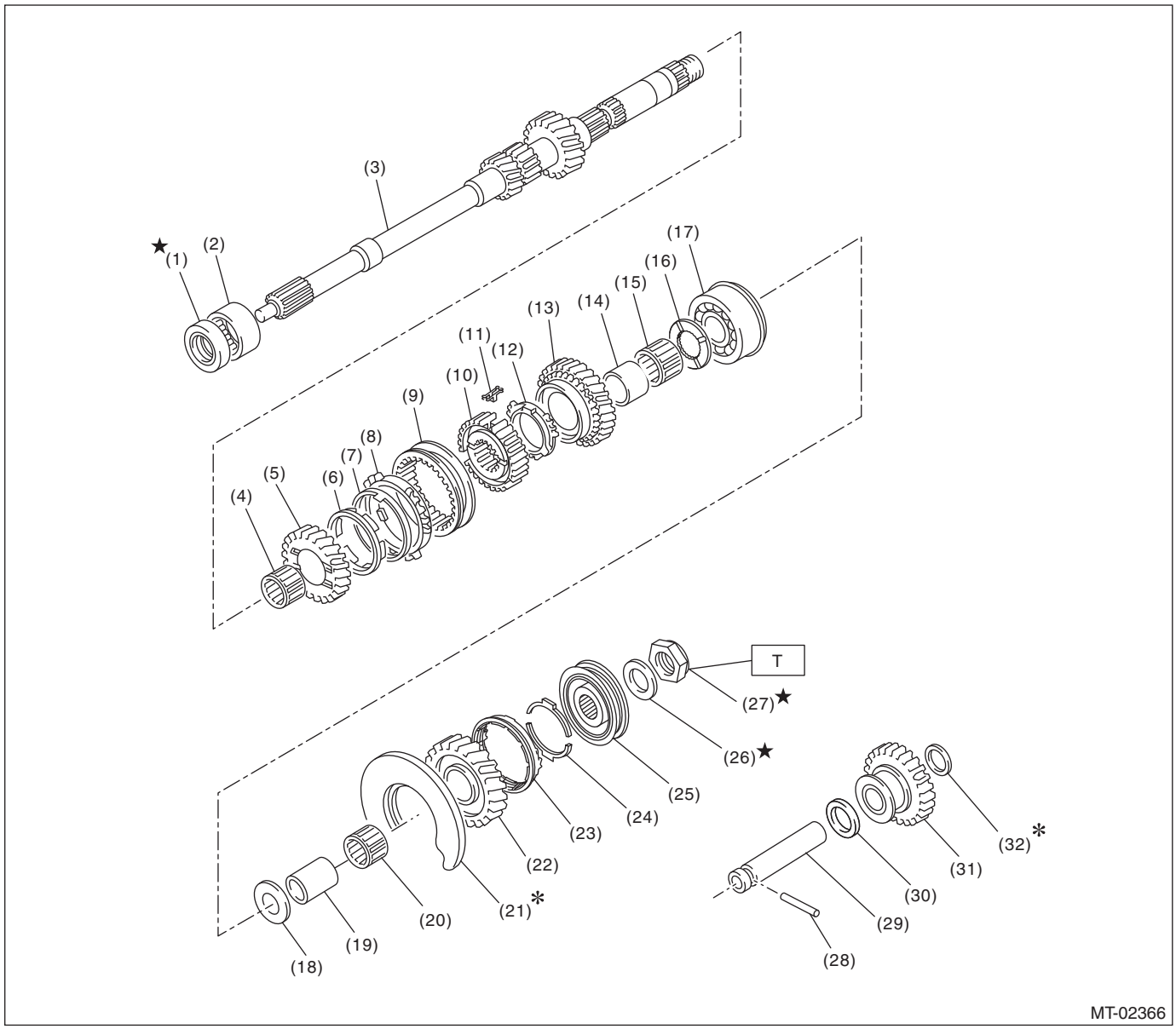
2. DRIVE PINION ASSEMBLY



(1) Drive pinion shaft
(2) Roller bearing
(3) Washer
(4) Thrust bearing
(5) Needle bearing
(6) Driven shaft
(7) Key
(8) Woodruff key
(9) Drive pinion collar
(10) Needle bearing
(11) Snap ring (Outer)
(12) Washer
(13) Sub gear
(14) 1st driven gear
(15) 1st-2nd synchronizer hub
(16) Ball detent
(17) Reverse driven gear
(18) Outer baulk ring
(19) Synchro cone
(20) Inner baulk ring
(21) 2nd driven gear
(22) 2nd driven gear bushing
(23) 3rd-4th driven gear
(24) Driven pinion shim
(25) Roller bearing
(26) 5th driven gear
(27) Lock washer
(28) Lock nut
(29) Adjusting washer
(30) Thrust bearing
(31) Differential bevel gear sleeve
(32) Washer
(33) Lock washer
(34) Lock nut
(35) Inner baulk ring
(36) Synchro cone
(37) Outer baulk ring

Tightening torque:N·m (kgf-m, ft-lb)
T1: 30 (3.1, 22.1)
T2: 120 (12.2, 88.5)
T3: 260 (26.5, 191.8)

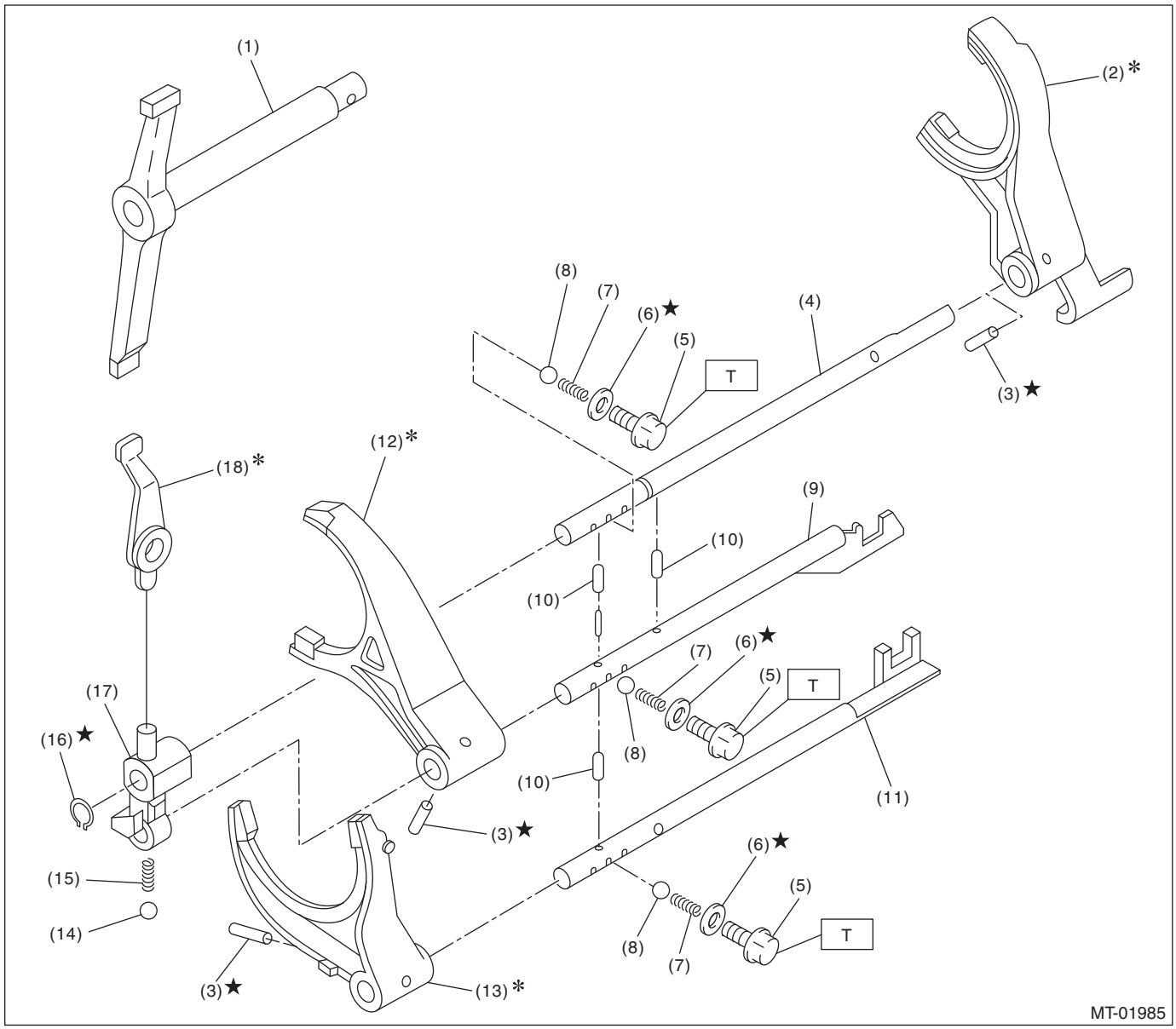
3. MAIN SHAFT FOR SINGLE-RANGE



(1) Oil seal
(2) Needle bearing
(3) Transmission main shaft
(4) Needle bearing
(5) 3rd drive gear
(6) Inner baulk ring
(7) 3rd synchro cone
(8) Outer baulk ring
(9) 3rd-4th coupling sleeve
(10) 3rd-4th synchronizer hub
(11) 3rd-4th shifting insert key
(12) 4th baulk ring
(13) 4th drive gear
(14) 4th needle bearing race
(15) Needle bearing
(16) 4th gear thrust washer
(17) Ball bearing
(18) 5th gear thrust washer
(19) 5th needle bearing race
(20) Needle bearing
(21) Main shaft rear plate
(22) 5th drive gear
(23) 5th baulk ring
(24) Baulk lever
(25) 5th hub & sleeve No. 2
(26) Lock washer
(27) Lock nut
(28) Straight pin
(29) Reverse idler gear shaft
(30) Washer
(31) Reverse idler gear
(32) Washer

Tightening torque:N·m (kgf-m, ft-lb)
T: 120 (12.2, 88.5)

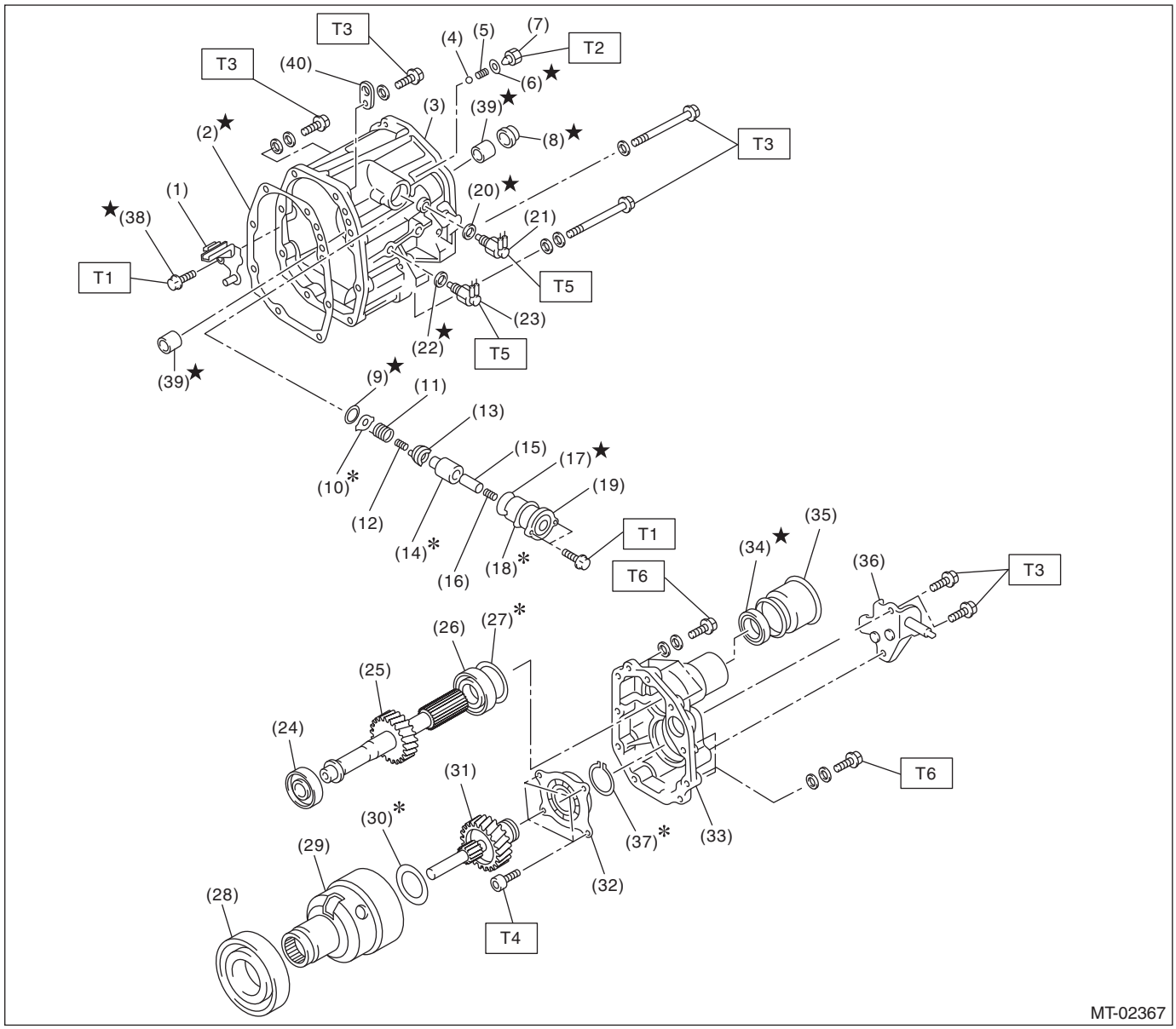
4. SHIFTER FORK AND SHIFTER ROD



(1) Shifter arm
(2) 5th shifter fork
(3) Straight pin
(4) Reverse fork rod
(5) Checking ball plug
(6) Gasket
(7) Checking ball spring
(8) Ball
(9) 3rd-4th fork rod
(10) Interlock plunger
(11) 1st-2nd fork rod
(12) 3rd-4th shifter fork
(13) 1st-2nd shifter fork
(14) Ball
(15) Spring
(16) Snap ring (Outer)
(17) Reverse fork rod arm
(18) Reverse shifter lever

Tightening torque:N·m (kgf-m, ft-lb)
T: 20 (2.0, 14.8)

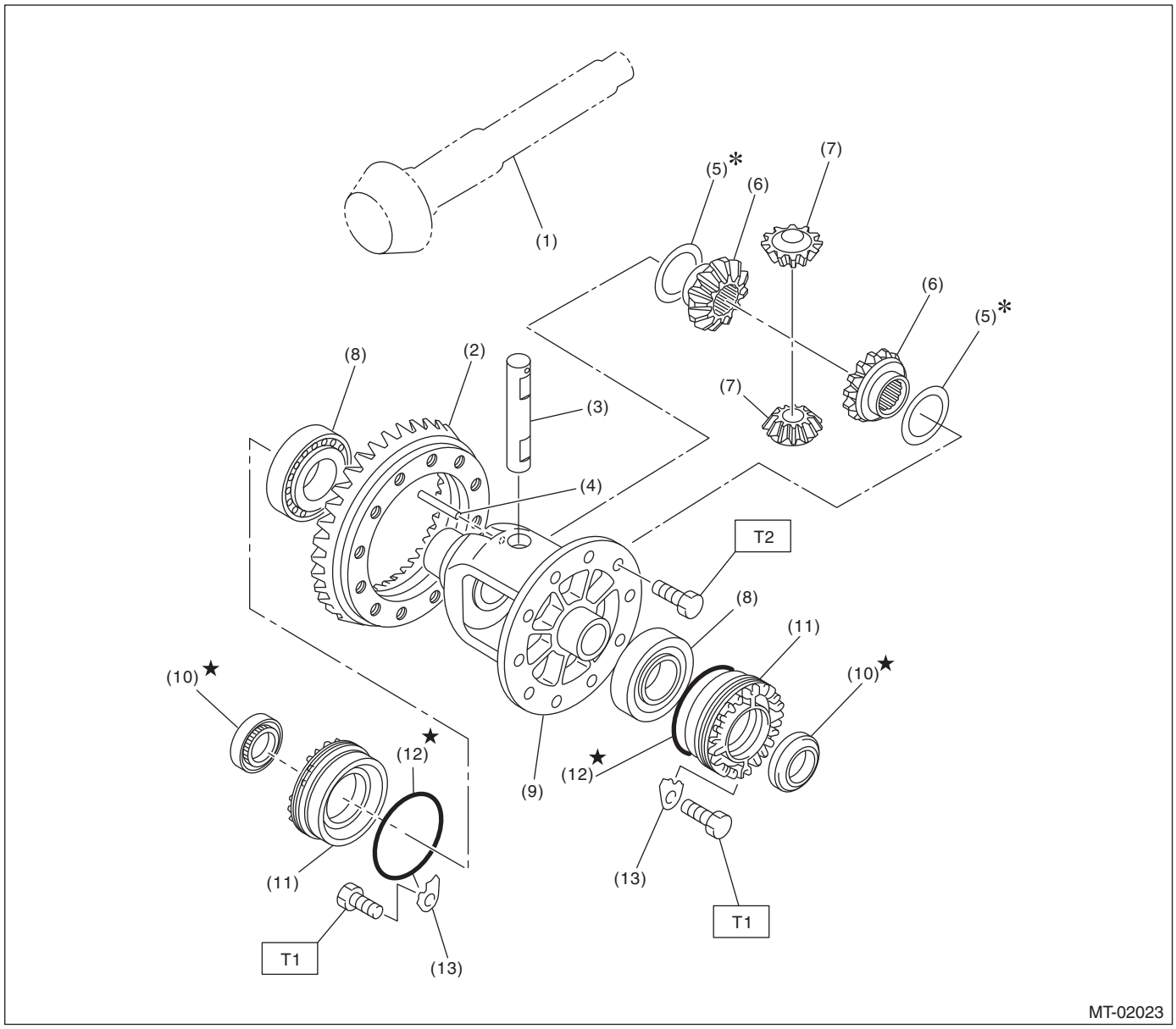
5. TRANSFER CASE AND EXTENSION



(1) Oil guide
(2) Gasket
(3) Transfer case
(4) Ball
(5) Reverse accent spring
(6) Gasket
(7) Plug
(8) Oil seal
(9) Snap ring (inner)
(10) Reverse check plate
(11) Reverse check spring
(12) Reverse return spring
(13) Reverse check cam
(14) Reverse accent shaft
(15) Return spring cap
(16) Return spring
(17) O-ring
(18) Adjusting select shim
(19) Reverse check sleeve
(20) Gasket
(21) Neutral position switch
(22) Gasket
(23) Back-up light switch
(24) Roller bearing
(25) Transfer driven gear
(26) Roller bearing
(27) Adjusting washer
(28) Ball bearing
(29) Center differential
(30) Adjusting washer
(31) Transfer drive gear
(32) Ball bearing
(33) Extension case
(34) Oil seal
(35) Dust cover
(36) Shift bracket
(37) Snap ring
(38) Precoat bolt
(39) Roller bearing
(40) Transmission hanger

Tightening torque:N·m (kgf-m, ft-lb)	
T1:	***6.4 (0.7, 4.7)***
T2:	***9.75 (1.0, 7.2)***
T3:	***24.5 (2.5, 18.1)***
T4:	***26 (2.7, 19.2)***
T5:	***32.3 (3.3, 23.8)***
T6:	***40 (4.1, 29.5)***

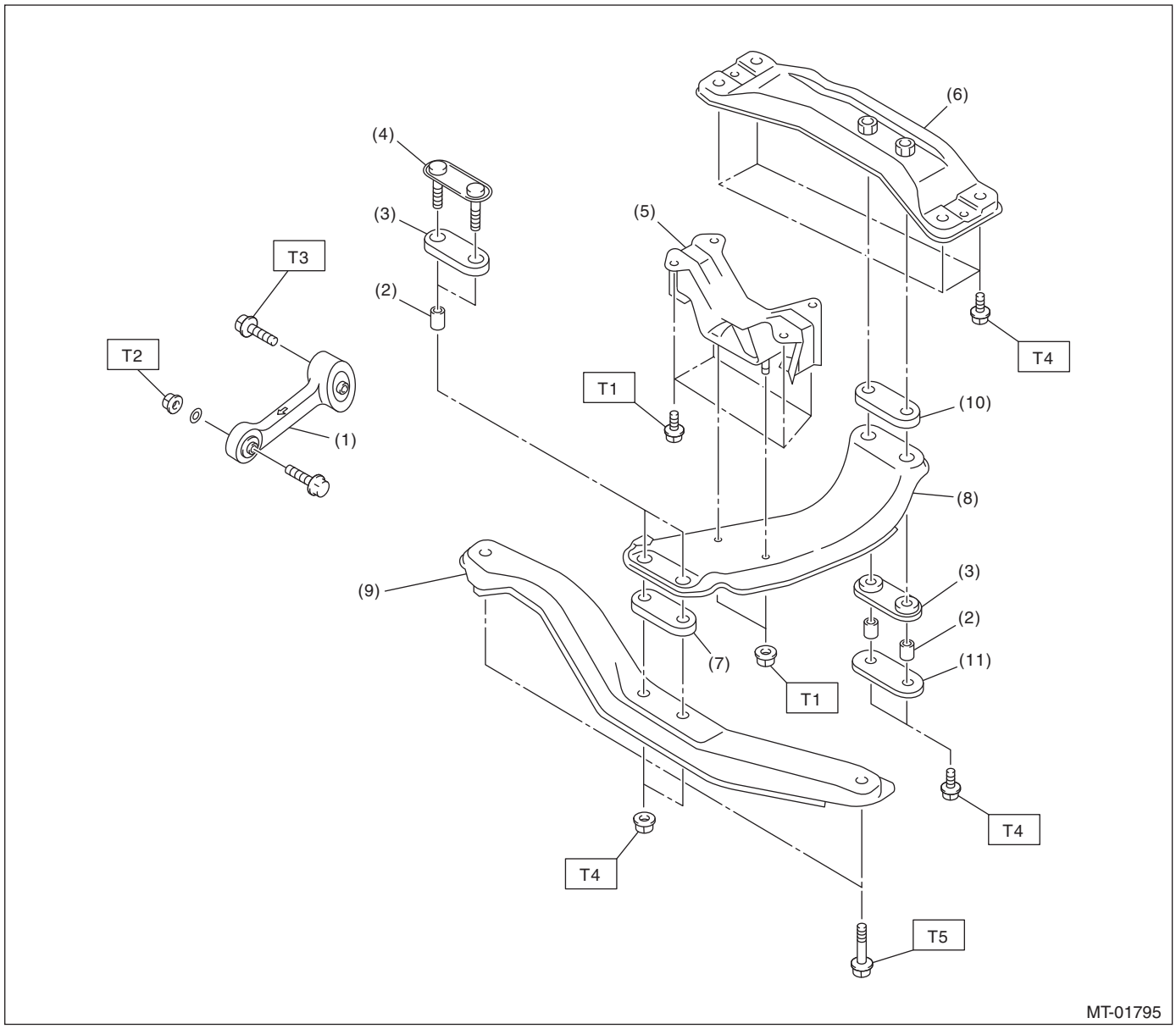
6. FRONT DIFFERENTIAL



(1) Drive pinion shaft
(2) Hypoid driven gear
(3) Pinion shaft
(4) Straight pin
(5) Washer
(6) Differential bevel gear
(7) Differential bevel pinion
(8) Roller bearing
(9) Differential case
(10) Oil seal
(11) Differential side retainer
(12) O-ring
(13) Retainer lock plate

Tightening torque:N·m (kgf-m, ft-lb)
T1: 25 (2.5, 18.4)
T2: 62 (6.3, 45.7)

7. TRANSMISSION MOUNTING



(1)	Pitching stopper	(7)	Cushion rubber
(2)	Spacer	(8)	Center crossmember
(3)	Cushion rubber	(9)	Front crossmember
(4)	Front plate	(10)	Rear cushion rubber
(5)	Transmission cushion rubber	(11)	Rear plate
(6)	Rear crossmember		

Tightening torque:N·m (kgf-m, ft-lb)
T1: 35 (3.6, 25.8)
T2: 50 (5.1, 36.9)
T3: 58 (5.9, 42.8)
T4: 70 (7.1, 51.6)
T5: 140 (14.3, 103.3)

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 equivalent. Do not mix gear oil, 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 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 cloth between the part and the vise.
• Avoid damaging the mating surface of the case.
• Before applying liquid gasket, completely remove the old liquid gasket.

D: PREPARATION TOOL

1. SPECIAL TOOL

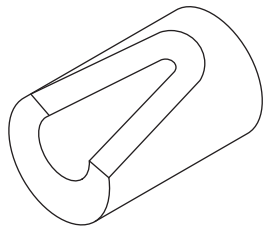
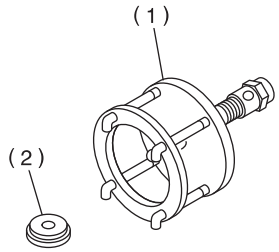
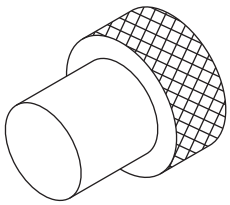
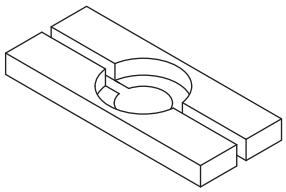
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-399411700	399411700	ACCENT BALL INSTALLER	Used for installing reverse shifter rail arm.
 ST-899524100	899524100	PULLER SET	Used for removing and installing the roller bearing (differential). (1) Puller (2) Cap
 ST-399780104	399780104	WEIGHT	Used for measuring preload on the roller bearing.
 ST-498077000	498077000	REMOVER	• Used for removing the roller bearing of the drive pinion shaft. • Used for removing the roller bearing of the transfer driven gear.

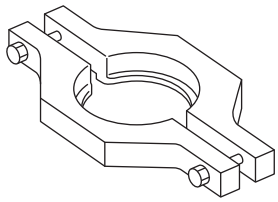
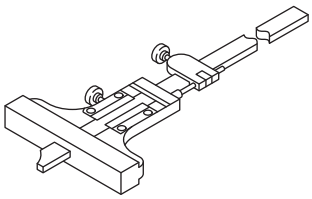
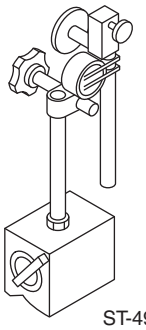
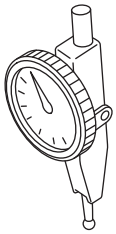
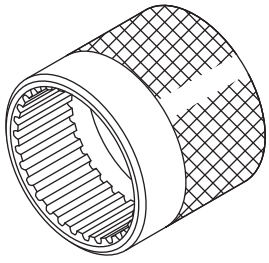
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498077300	498077300	CENTER DIFFERENTIAL BEARING REMOVER	Used for removing the center differential cover ball bearing.
 ST-498147001	498147001	DEPTH GAUGE	Used for adjusting the main shaft end play.
 ST-498247001	498247001	MAGNET BASE	• Used for measuring backlash between the differential bevel gear and bevel pinion, and the hypoid gear. • Used together with DIAL GAUGE (498247100).
 ST-498247100	498247100	DIAL GAUGE	• Used for measuring backlash between the differential bevel gear and bevel pinion, and the hypoid gear. • Used together with MAGNET BASE (498247001).
 ST-498427100	498427100	STOPPER	Used for securing the drive pinion shaft assembly and the driven gear assembly when removing and installing the drive pinion shaft assembly lock nut.

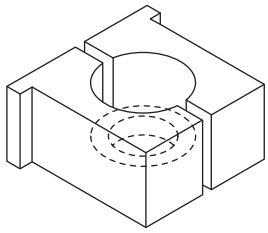
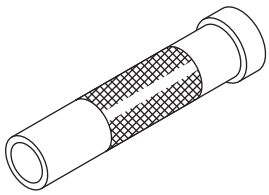
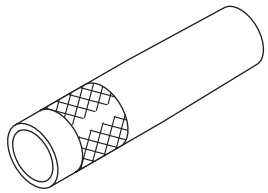
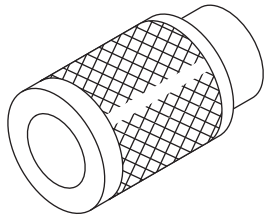
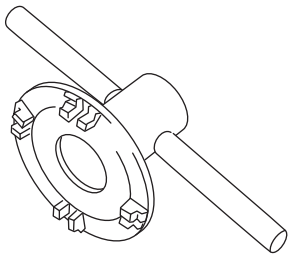
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498937000	498937000	TRANSMISSION HOLDER	Used for removing and installing the lock nut of the transmission main shaft.
 ST-499277100	499277100	BUSHING 1-2 INSTALLER	• Used for installing the 1st driven gear thrust plate and the 1st-2nd driven gear bushing. • Used for installing the roller bearing outer race to the differential case.
 ST-499277200	499277200	INSTALLER	Used for press-fitting the 2nd driven gear bushing, roller bearings, 3rd-4th driven gears and 5th driven gear onto the driven shaft.
 ST-499757002	499757002	INSTALLER	• Used for removing the roller bearing and driven gear of the drive pinion shaft. • Used for installing the roller bearing of transfer driven gear (extension case side).
 ST18630AA010	18630AA010	WRENCH COMPL RETAINER	• Used for removing and installing the differential side retainer. • Used for adjusting the backlash of hypoid gear.

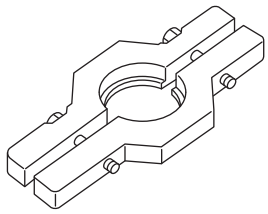
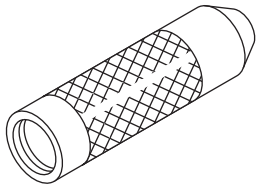
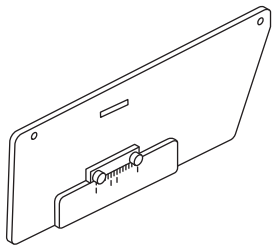
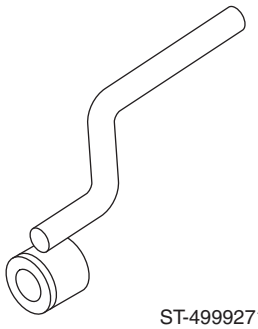
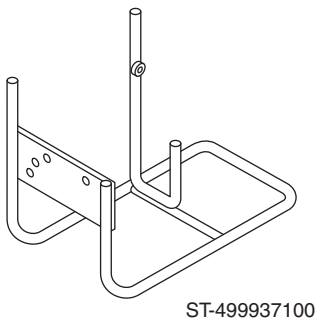
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499857000	499857000	5TH DRIVEN GEAR REMOVER	Used for removing the 5th driven gear.
 ST-499877000	499877000	RACE 4-5 INSTALLER	• Used for installing the 4th and 5th needle bearing races and ball bearings onto the transmission main shaft. • Used together with REMOVER (899714110).
 ST-499917500	499917500	DRIVE PINION GAUGE ASSY	Used for adjusting the drive pinion shim.
 ST-499927100	499927100	HANDLE	Used for adjusting the backlash of hypoid gear.
 ST-499937100	499937100	TRANSMISSION STAND SET	Used for disassembling and assembling the transmission.

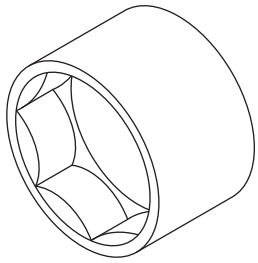
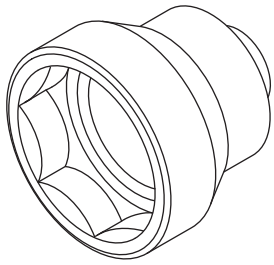
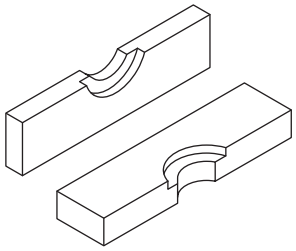
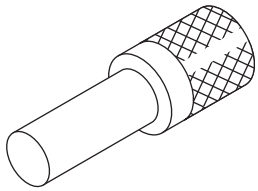
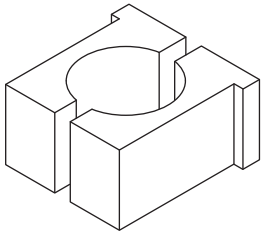
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499987003	499987003	SOCKET WRENCH (35)	Used for removing and installing the main shaft lock nut.
 ST-499987300	499987300	SOCKET WRENCH (50)	Used for removing and installing the driven gear assembly lock nut.
 ST-899714110	899714110	REMOVER	Used for removing and installing the parts of transmission main shaft and drive pinion shaft.
 ST-899864100	899864100	REMOVER	• Used for removing transmission main shaft parts. • Used for installing the roller bearing of transfer driven gear (extension case side).
 ST-899884100	899884100	HOLDER	Used for removing and installing the drive pinion shaft lock nut.

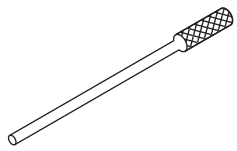
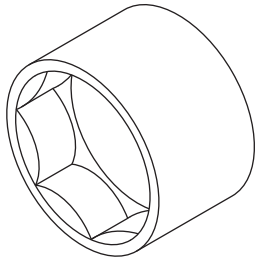
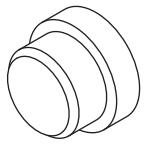
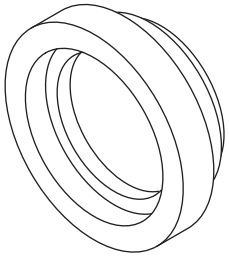
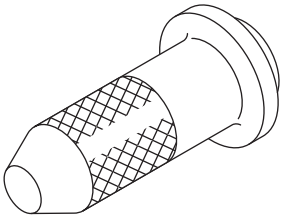
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-899904100	899904100	STRAIGHT PIN REMOVER	Used for removing and installing the straight pin.
 ST-899988608	899988608	SOCKET WRENCH (27)	Used for removing and installing the drive pinion shaft lock nut.
 ST-398497701	398497701	ADAPTER	• Used for installing roller bearing onto the differential case. • Used together with BUSHING 1-2 INSTALLER (499277100).
 ST-499587000	499587000	INSTALLER	Used for installing the driven gears to the driven shaft.
 ST-498057300	498057300	INSTALLER	Used for installing the oil seal of extension case.

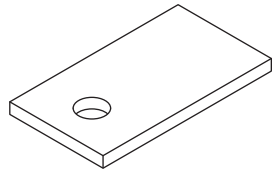
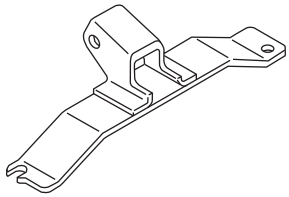
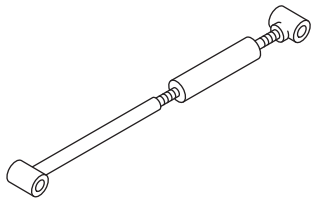
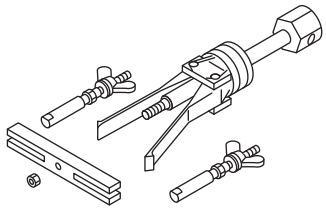
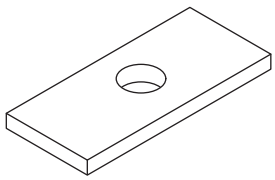
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498255400	498255400	PLATE	Used for measuring backlash.
 ST-41099AA010	41099AA010	ENGINE SUPPORT BRACKET	Used for supporting engine.
 ST41099AA020	41099AA020	ENGINE SUPPORT	Used for supporting engine.
 ST-398527700	398527700	PULLER ASSY	• Used for removing the extension case roller bearing and extension oil seal. • Used for removing the bearing outer race and oil seal of front differential side retainer.
 ST-398643600	398643600	GAUGE	Used for measuring total end play, extension end play and drive pinion height.

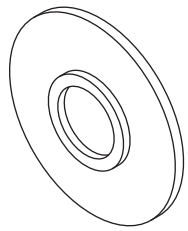
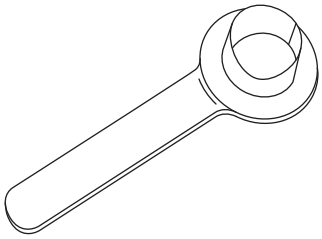
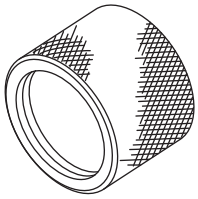
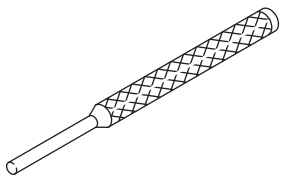
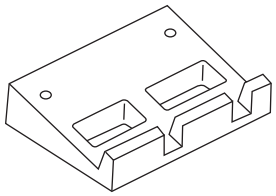
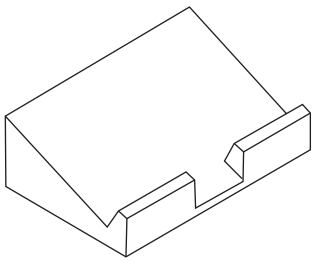
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-398177700	398177700	INSTALLER	• Used for installing the roller bearing of transfer driven gear (extension case side). • Used for installing the ball bearing of the transfer drive gear.
 ST28399SA010	28399SA010	OIL SEAL PROTECTOR	Used for protecting the oil seal from damage when inserting the front drive shaft.
 ST18675AA000	18675AA000	DIFFERENTIAL SIDE OIL SEAL INSTALLER	Used for installing the differential side retainer oil seal.
 ST-398791700	398791700	STRAIGHT PIN REMOVER 2	Used for removing and installing the straight pin.
 ST-498267200	498267200	CYLINDER HEAD TABLE	Used for installing and removing the roller bearing of the transfer case.

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498267300	498267300	CYLINDER HEAD TABLE	Used for installing and removing the roller bearing of the transfer case.

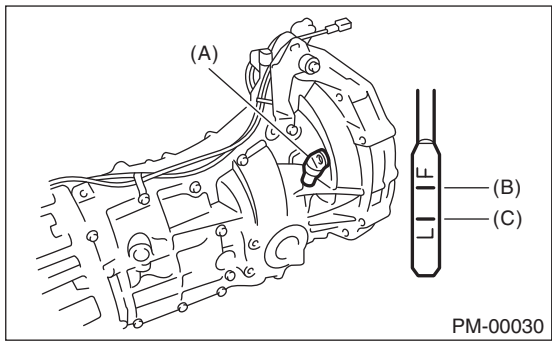
2. GENERAL TOOL

TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance, voltage and current.
TORX® bit T70	Used for removing and installing differential gear oil drain plug.

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 oil level gauge all the way. Be sure that the oil level gauge is correctly inserted in the proper direction.
5) Pull out the oil level gauge again, and check the oil level. If it is at the lower level or less, 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

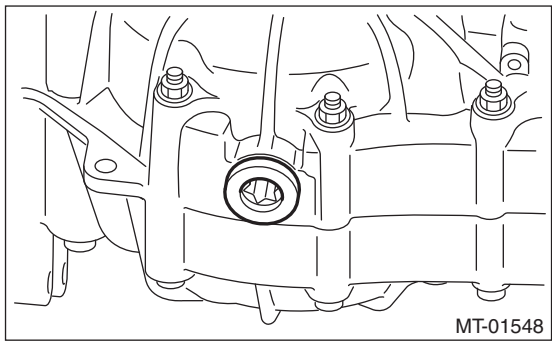
1) Pull out the oil level gauge.
2) Lift up the vehicle.
3) Using the TORX® bit T70, remove the drain plug, and drain the transmission gear oil completely.

CAUTION:
• Immediately after the vehicle has been running or after idling for a long time, the transmission gear oil will be hot. Be careful not to receive burns.
• Be careful not to spill the transmission gear oil on the exhaust pipe, to prevent emission of smoke or causing a fire. If gear oil is spilled, wipe it off completely.

4) Tighten the drain plug using TORX® bit T70.

NOTE:
• Tighten the drain plug of the transmission gear oil after draining the transmission gear oil.
• Use a new gasket.

Tightening torque:
44 N·m (4.5 kgf-m, 32.5 ft-lb) (Aluminum gasket silver)
70 N·m (7.1 kgf-m, 51.6 ft-lb) (Copper gasket brown)
70 N·m (7.1 kgf-m, 51.6 ft-lb) (Metal gasket black)



5) Lower the vehicle.
6) Pour gear oil through the oil level gauge hole.

Recommended gear oil:
GL-5 (75W-90) or equivalent

Gear oil capacity:
3.5 ℓ (3.7 US qt, 3.1 Imp qt)

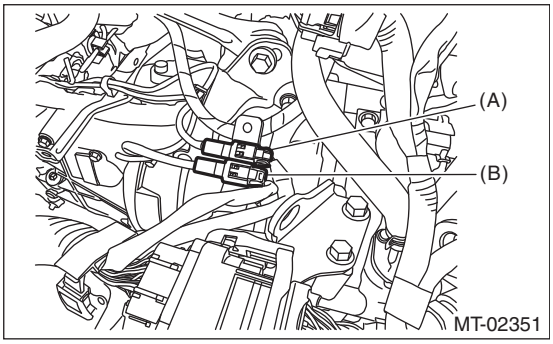
7) Measure the transmission gear oil amount, and check that it is within the specification.

CAUTION:
When inserting the oil level gauge into transmission, align the protrusion on the top part of the oil level gauge with the notch in the oil level gauge hole.

3. Manual Transmission Assembly

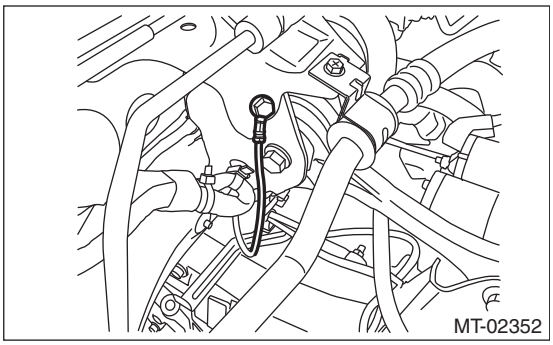
A: REMOVAL

1) Set the vehicle on a lift.
2) Open the front hood.
3) Disconnect the ground cable from battery.
4) Drain transmission gear oil completely. <Ref. to 5MT-22, REPLACEMENT, Transmission Gear Oil.>
5) Remove the air intake boot. <Ref. to IN(H4DO)-13, REMOVAL, Air Intake Boot.>
6) Disconnect the following connector.

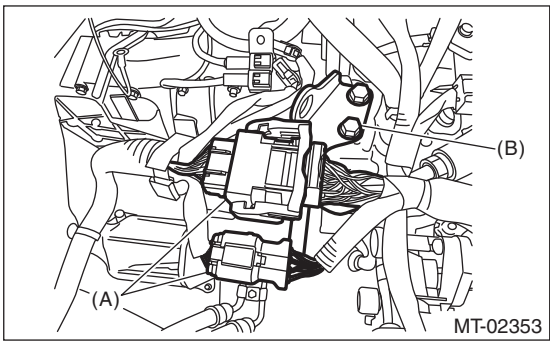


(A) Neutral position switch connector (Brown)
(B) Back-up light switch connector (Gray)

7) Disconnect the ground cord.

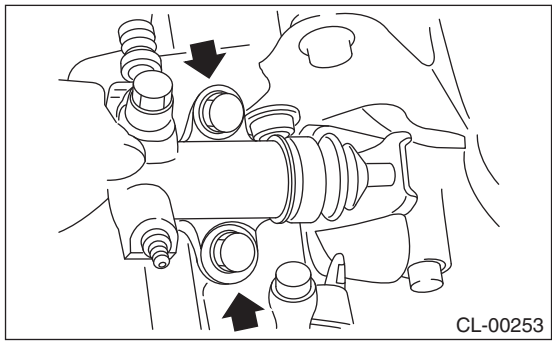


8) Disconnect the engine harness connectors, and then remove the engine hanger rear.

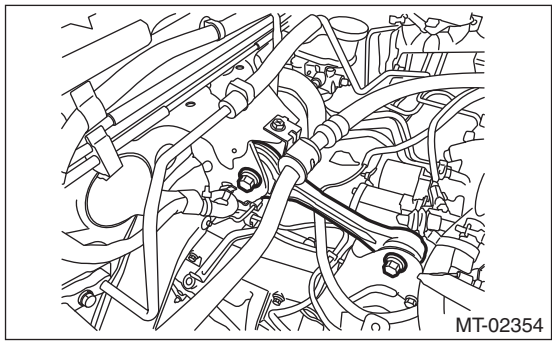


(A) Engine harness connectors
(B) Engine hanger rear

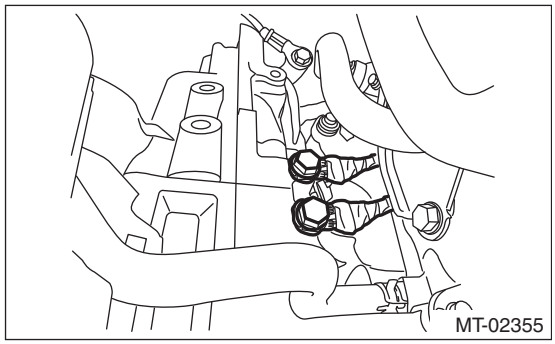
9) Remove the starter. <Ref. to SC(H4DO)-9, REMOVAL, Starter.>
10) Remove the operating cylinder from the transmission, and suspend on a wire.



11) Remove the pitching stopper.

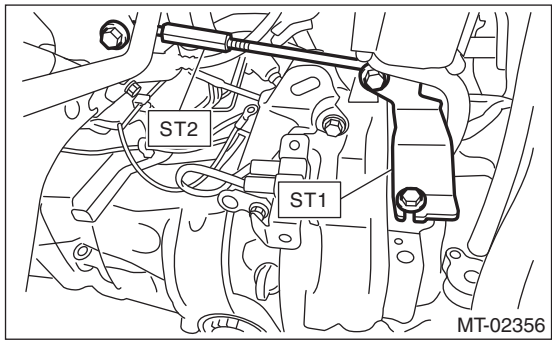


12) Disconnect two ground cables from rear end of the engine.



13) Set the ST.

ST1	41099AA010	ENGINE SUPPORT BRACKET
ST2	41099AA020	ENGINE SUPPORT

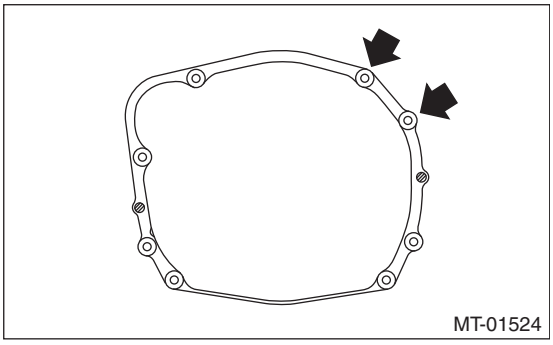


14) Lift up the vehicle.

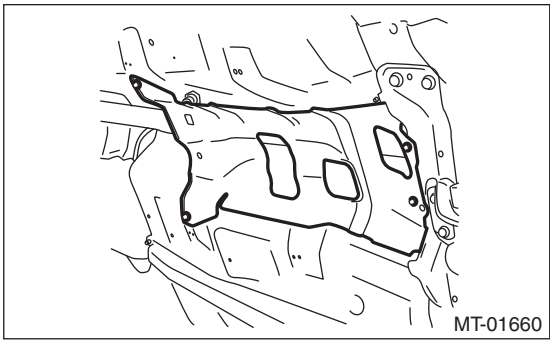
15) Remove the under cover. <Ref. to EI-26, REMOVAL, Front Under Cover.>
16) Remove the front and center exhaust pipes. <Ref. to EX(H4DO)-5, REMOVAL, Front Exhaust Pipe.> <Ref. to EX(H4DO)-12, REMOVAL, Center Exhaust Pipe.>
17) Remove the rear exhaust pipe and muffler. <Ref. to EX(H4DO)-13, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4DO)-16, REMOVAL, Muffler.>

CAUTION:
When removing the exhaust pipes, make sure that each exhaust pipe does not drop off.

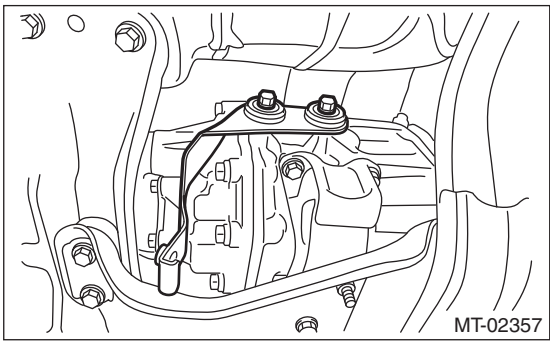
18) Remove the bolts which hold upper side of transmission to engine.


MT-01524

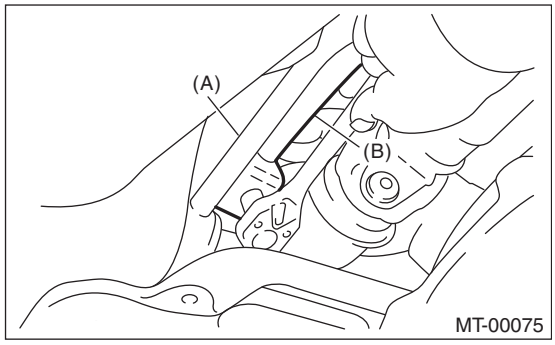
19) Remove the heat shield cover.


MT-01660

20) Remove the hanger bracket from the right side of transmission.


MT-02357

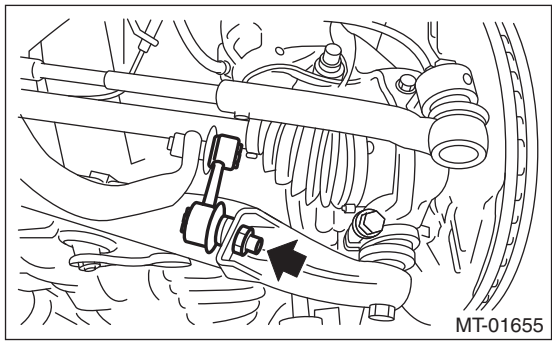
21) Remove the propeller shaft. <Ref. to DS-10, REMOVAL, Propeller Shaft.>
22) Disconnect the gear shift rod and the stay from the transmission.
(1) Disconnect the stay from the transmission.
(2) Disconnect the gear shift rod from the transmission.



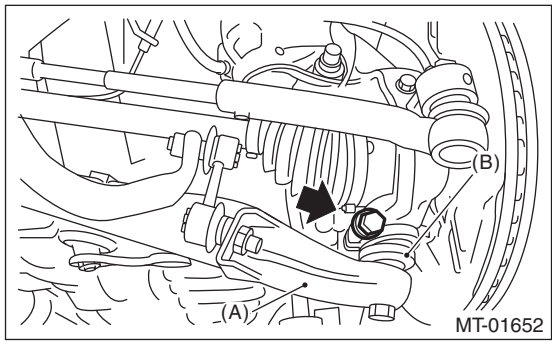
MT-00075

(A) Stay
(B) Gear shift rod

23) Disconnect the stabilizer link from the front arm.


MT-01655

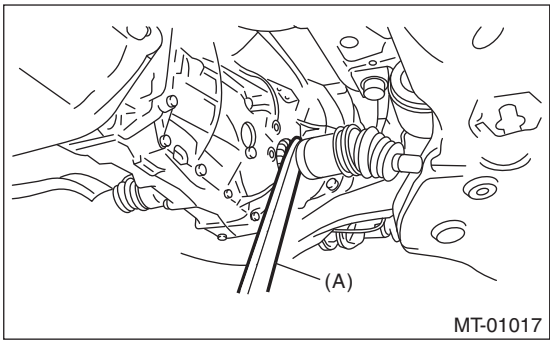
24) Remove the bolt securing the ball joint of the front arm to the housing, then separate the front arms and the housing.



MT-01652

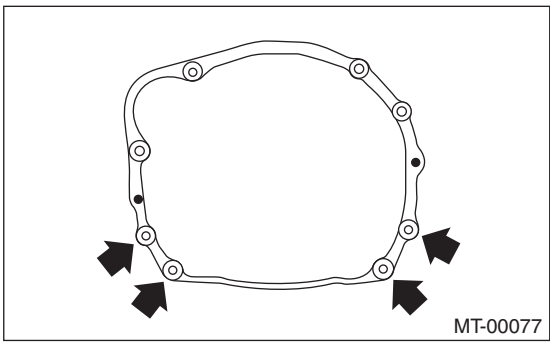
(A) Front arm
(B) Ball joint

25) Using a crowbar, remove the left and right front drive shaft from the transmission.



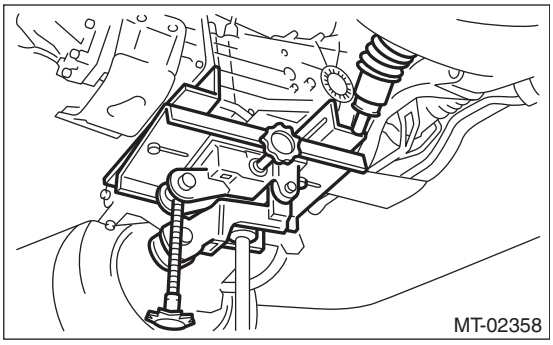
(A) Crowbar

26) Remove the bolts and nuts which hold lower side of transmission to engine.

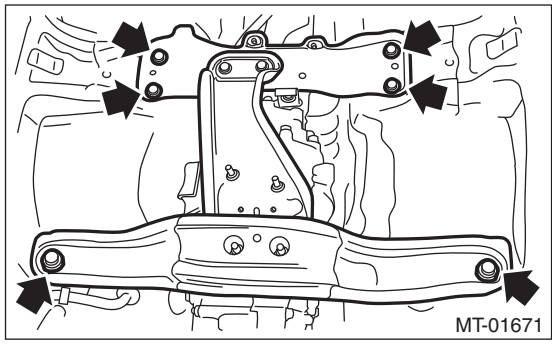


27) Place the transmission jack under the transmission.

CAUTION:
Always support the transmission case with a transmission jack.



28) Remove the front crossmember and rear crossmember from the vehicle.



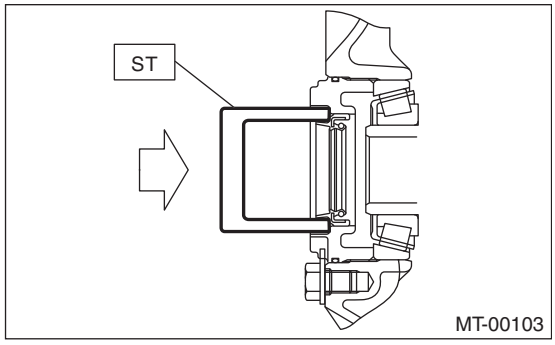
29) While lowering the transmission jack, tighten the turnbuckle of the ST, and incline the engine unit rearward.
30) Remove the transmission.

NOTE:
Move the transmission jack towards the rear until the main shaft is withdrawn from the clutch disc.
31) Separate the transmission assembly from the transmission cushion rubber.

B: INSTALLATION

1) Replace the differential side retainer oil seal. <Ref. to 5MT-33, REPLACEMENT, Differential Side Retainer Oil Seal.>

NOTE:
Be sure to replace the differential side retainer oil seal after removing the front drive shaft.
ST 18675AA000 DIFFERENTIAL SIDE OIL SEAL INSTALLER

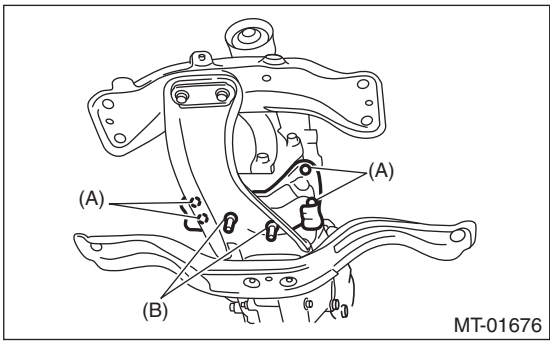


2) Tap the transmission hanger in the rear side of transmission with a rubber hammer to bend it until it is in close contact with the transmission case.

CAUTION:
Do not apply excessive load or impact to the transmission case.
3) Install the transmission cushion rubber to the transmission assembly, and tighten bolt (A).

4) Install the transmission cushion rubber to the center crossmember, and tighten the nut (B).

Tightening torque:
Bolt (A)
35 N·m (3.6 kgf-m, 25.8 ft-lb)
Nut (B)
35 N·m (3.6 kgf-m, 25.8 ft-lb)



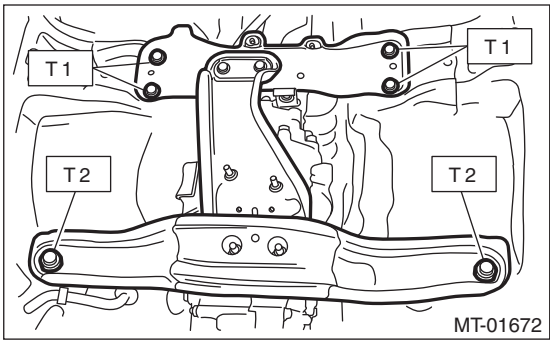
5) Install the transmission onto the engine.
(1) Lift up the transmission gradually using a transmission jack.
(2) Engage at the spline section.

NOTE:
Be careful not to hit the main shaft against the clutch cover.

6) While raising the transmission jack, loosen the turnbuckle of the ST, and set the engine unit to the original position.

7) Install the front crossmember and rear crossmember.

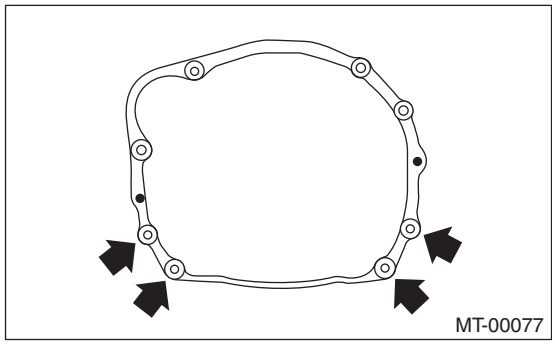
Tightening torque:
T1: 70 N·m (7.1 kgf-m, 51.6 ft-lb)
T2: 140 N·m (14.3 kgf-m, 103.3 ft-lb)



8) Take out the transmission jack.

9) Tighten the bolts and nuts which hold the lower side of transmission to the engine.

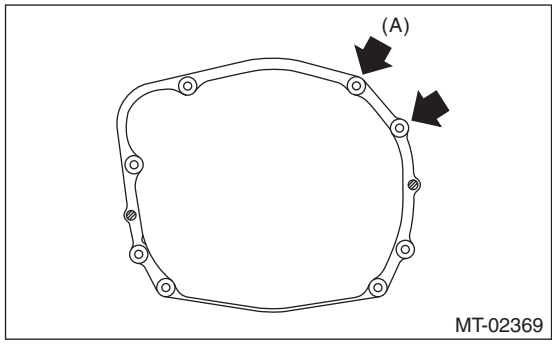
Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)



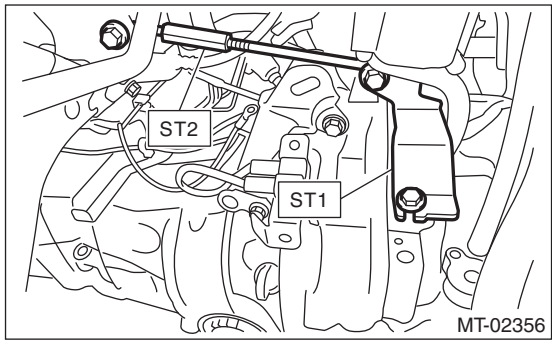
10) Connect the transmission to the engine.
(1) Install the starter. <Ref. to SC(H4DO)-10, INSTALLATION, Starter.>
(2) Tighten the bolts which hold the upper side of the transmission to the engine.

NOTE:
Long bolts are used in the section indicated by the arrows (A) in the figure below.

Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)

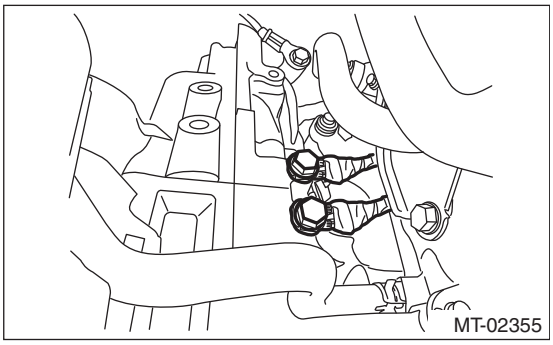


11) Remove the ST.



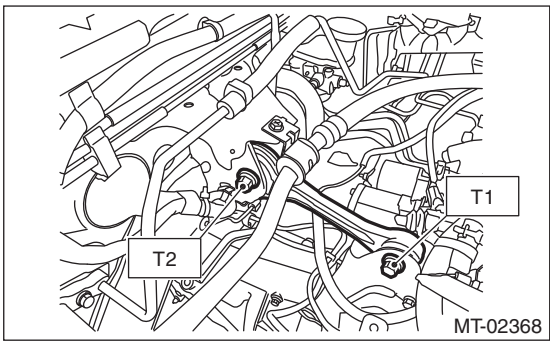
12) Install two ground cables.

Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)

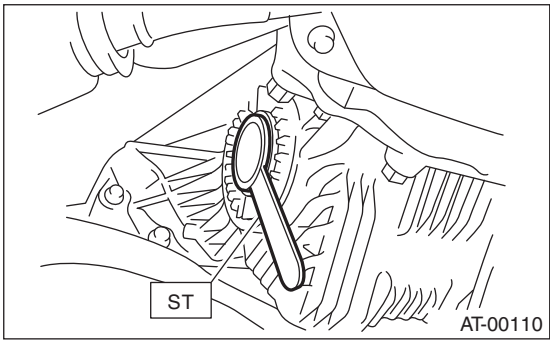


13) Install the pitching stopper.

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)

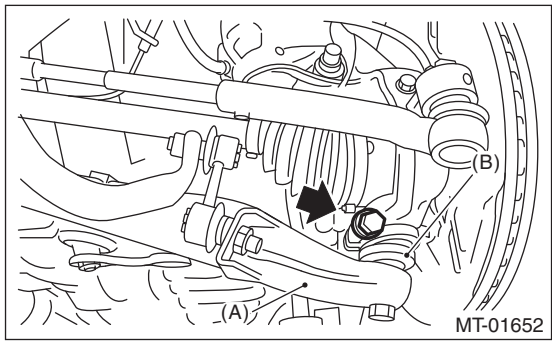


14) Lift up the vehicle.
15) Install the front drive shaft into the transmission.
ST 28399SA010 OIL SEAL PROTECTOR



16) Insert the front arm ball joint into the housing lower part, and tighten the mounting bolt.

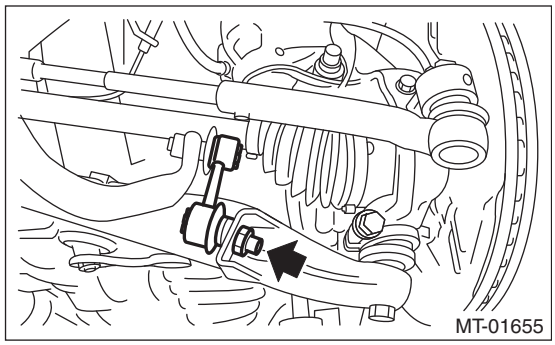
Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)



(A) Front arm
(B) Ball joint

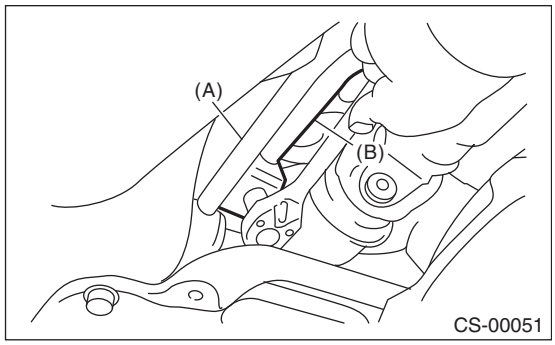
17) Attach the stabilizer link to the front arm.

Tightening torque:
30 N·m (3.1 kgf-m, 22.1 ft-lb)



18) Attach the gear shift rod and stay.
(1) Attach the gear shift rod to the transmission.

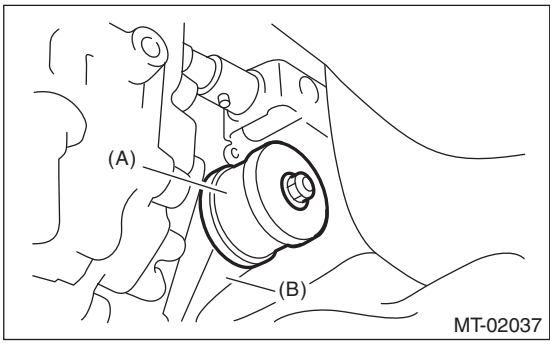
Tightening torque:
12 N·m (1.2 kgf-m, 8.9 ft-lb)



(A) Stay
(B) Gear shift rod

(2) Install the stay to the transmission bracket.

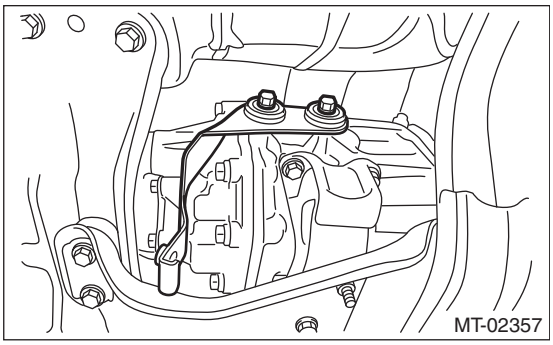
Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)



(A) Stay
(B) Transmission bracket

19) Install the propeller shaft. <Ref. to DS-11, INSTALLATION, Propeller Shaft.>
20) Install the heat shield cover. <Ref. to EI-70, INSTALLATION, Heat Shield Cover.>
21) Install the hanger bracket to the transmission.

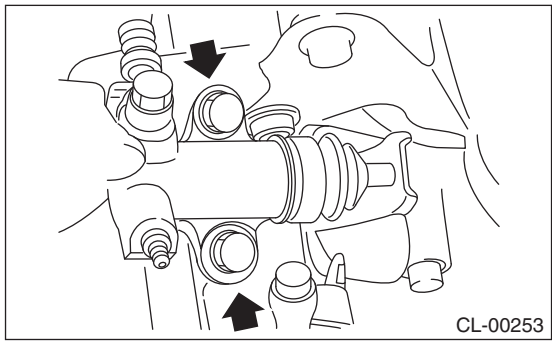
Tightening torque:
30 N·m (3.1 kgf-m, 22.1 ft-lb)



22) Install the rear exhaust pipe and muffler. <Ref. to EX(H4DO)-14, INSTALLATION, Rear Exhaust Pipe.> <Ref. to EX(H4DO)-17, INSTALLATION, Muffler.>
23) Install the front and center exhaust pipe. <Ref. to EX(H4DO)-8, INSTALLATION, Front Exhaust Pipe.> <Ref. to EX(H4DO)-12, INSTALLATION, Center Exhaust Pipe.>
24) Install the under cover. <Ref. to EI-26, INSTALLATION, Front Under Cover.>
25) Lower the vehicle.

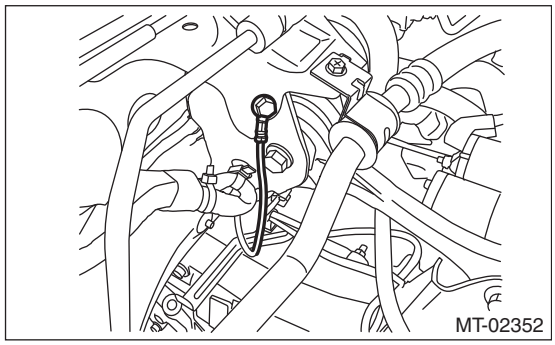
26) Install the operating cylinder.

Tightening torque:
37 N·m (3.8 kgf-m, 27.3 ft-lb)



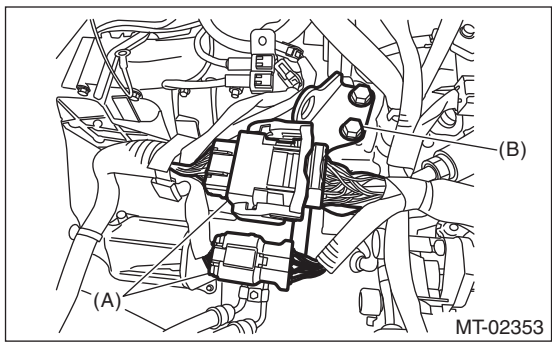
27) Install the ground cord.

Tightening torque:
13 N·m (1.3 kgf-m, 9.6 ft-lb)



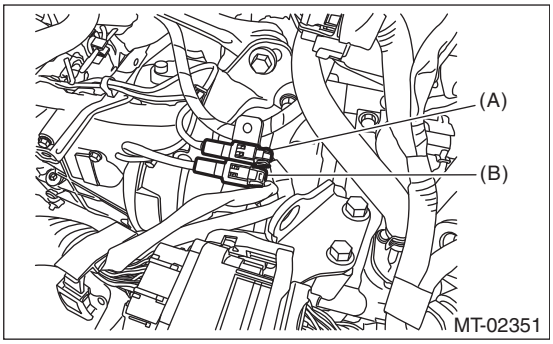
28) Install the engine hanger rear, and then connect the engine harness connector.

Tightening torque:
21 N·m (2.1 kgf-m, 15.5 ft-lb)



(A) Engine harness connectors
(B) Engine hanger rear

29) Connect the following connectors.



(A) Neutral position switch connector (Brown)
(B) Back-up light switch connector (Gray)

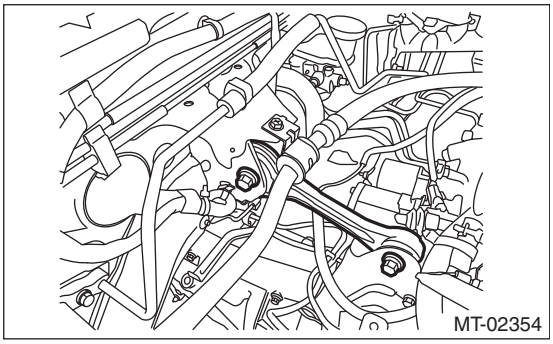
30) Install the air intake boot. <Ref. to IN(H4DO)-13, INSTALLATION, Air Intake Boot.>
31) Connect the battery ground terminal.
32) Remove the lift arm from vehicle.

4. Transmission Mounting System

A: REMOVAL

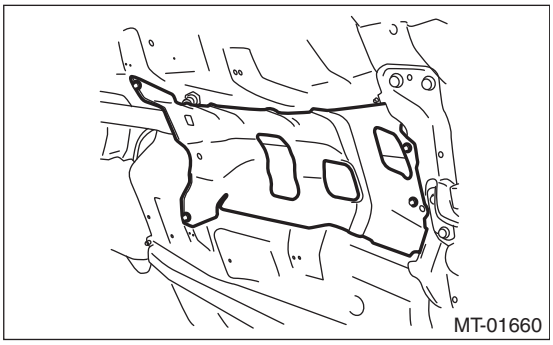
1. PITCHING STOPPER

1) Disconnect the ground cable from battery.
2) Remove the air intake boot. <Ref. to IN(H4DO)-13, REMOVAL, Air Intake Boot.>
3) Remove the pitching stopper.



2. CROSSMEMBER AND CUSHION RUBBER

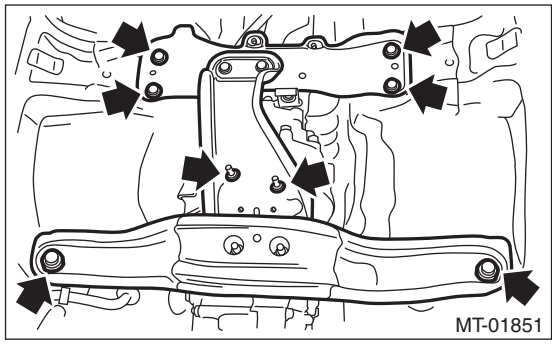
1) Disconnect the ground cable from battery.
2) Lift up the vehicle.
3) Remove the front and center exhaust pipes. <Ref. to EX(H4DO)-5, REMOVAL, Front Exhaust Pipe.> <Ref. to EX(H4DO)-12, REMOVAL, Center Exhaust Pipe.>
4) Remove the rear exhaust pipe and muffler. <Ref. to EX(H4DO)-13, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4DO)-16, REMOVAL, Muffler.>
5) Remove the heat shield cover.



6) Set the transmission jack under transmission.

CAUTION:
Always support the transmission case with a transmission jack.

7) Remove the front crossmember and the rear crossmember.



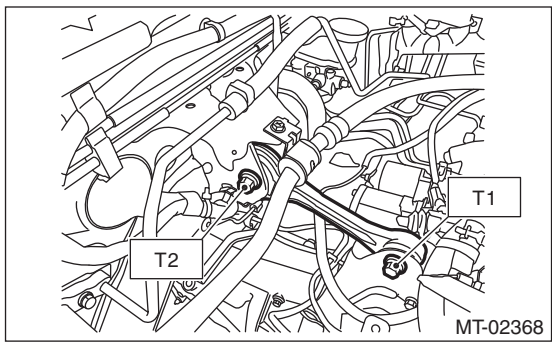
8) Remove the transmission cushion rubber.

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, 42.8 ft-lb)

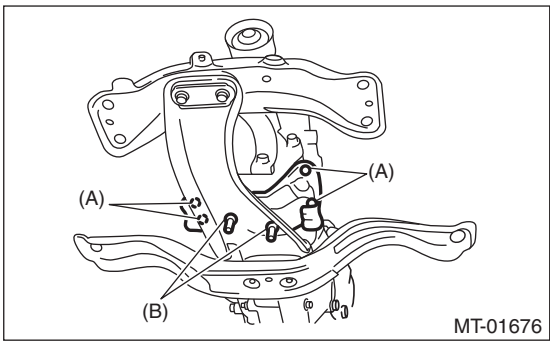


2) Install the air intake boot. <Ref. to IN(H4DO)-13, INSTALLATION, Air Intake Boot.>
3) Connect the battery ground terminal.

2. CROSSMEMBER AND CUSHION RUBBER

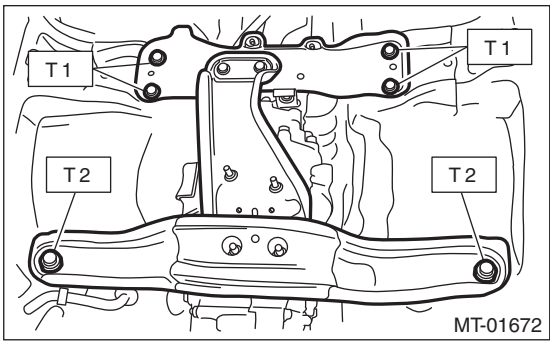
1) Install the transmission cushion rubber to the transmission, and tighten the bolt (A).
2) Install the transmission cushion rubber to the center crossmember, and tighten the nut (B).

Tightening torque:
Bolt (A)
35 N·m (3.6 kgf-m, 25.8 ft-lb)
Nut (B)
35 N·m (3.6 kgf-m, 25.8 ft-lb)



3) Install the front crossmember and rear crossmember.

Tightening torque:
T1: 70 N·m (7.1 kgf-m, 51.6 ft-lb)
T2: 140 N·m (14.3 kgf-m, 103.3 ft-lb)



4) Remove the transmission jack.
5) Install the heat shield cover. <Ref. to EI-70, INSTALLATION, Heat Shield Cover.>
6) Install the front and center exhaust pipe. <Ref. to EX(H4DO)-8, INSTALLATION, Front Exhaust Pipe.> <Ref. to EX(H4DO)-12, INSTALLATION, Center Exhaust Pipe.>
7) Install the rear exhaust pipe and muffler. <Ref. to EX(H4DO)-14, INSTALLATION, Rear Exhaust Pipe.> <Ref. to EX(H4DO)-17, INSTALLATION, Muffler.>
8) Lower the vehicle.
9) Connect the battery ground terminal.

C: INSPECTION

Perform the following inspection procedures and repair or replace faulty parts.

1. PITCHING STOPPER

Check the pitching stopper for bends or damage. Check that the rubber is not stiff, cracked or otherwise damaged.

2. CROSSMEMBER AND CUSHION RUBBER

Check the crossmember for bends or damage. Check that the cushion rubber is not stiff, cracked or otherwise damaged.

5. Oil Seal

A: INSPECTION

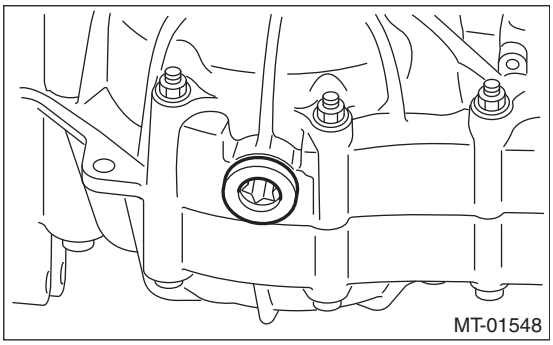
Check for transmission gear oil leaks at oil seal area. If there is oil leakage, replace the oil seal with the new part and check the propeller shaft.

B: REPLACEMENT

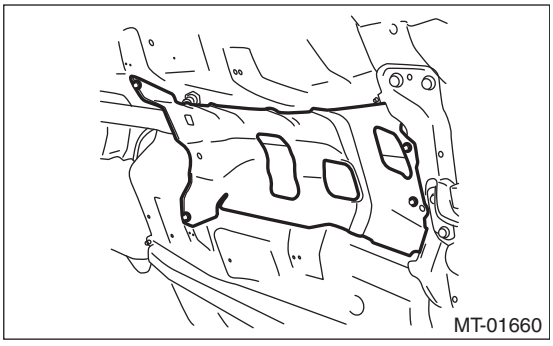
1) Lift up the vehicle.
2) Clean the transmission exterior.
3) Using the TORX® bit T70, remove the drain plug, and drain the transmission gear oil completely.
4) Using the TORX® bit T70, tighten the transmission gear oil drain plug.

NOTE:
Use a new gasket.

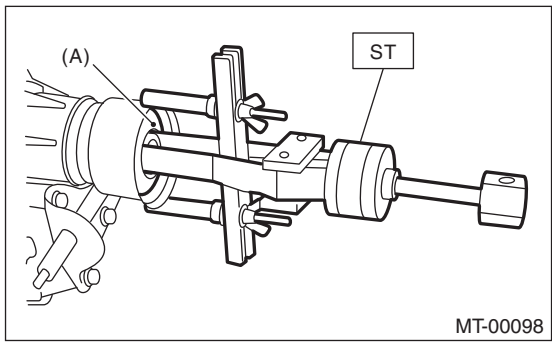
Tightening torque:
44 N·m (4.5 kgf-m, 32.5 ft-lb) (Aluminum gasket silver)
70 N·m (7.1 kgf-m, 51.6 ft-lb) (Copper gasket brown)
70 N·m (7.1 kgf-m, 51.6 ft-lb) (Metal gasket black)


MT-01548

5) Remove the rear exhaust pipe and muffler. <Ref. to EX(H4DO)-13, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4DO)-16, REMOVAL, Muffler.>
6) Remove the heat shield cover.


MT-01660

7) Remove the propeller shaft. <Ref. to DS-10, REMOVAL, Propeller Shaft.>
8) Using the ST, remove the oil seal.
ST 398527700 PULLER ASSY

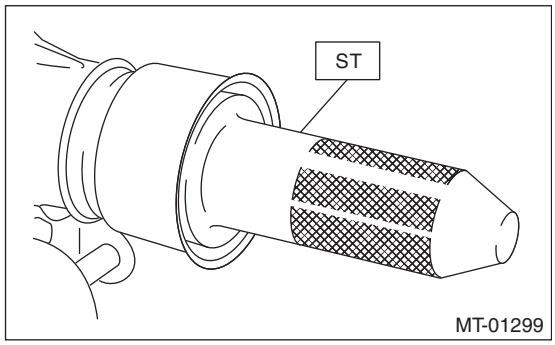


MT-00098

(A) Oil seal

9) Using the ST, install the oil seal.

NOTE:
When grease is not applied to the oil seal lips, apply the transmission gear oil to the oil seal lips.
ST 498057300 INSTALLER



MT-01299

10) Install the propeller shaft. <Ref. to DS-11, INSTALLATION, Propeller Shaft.>
11) Install the heat shield cover. <Ref. to EI-70, INSTALLATION, Heat Shield Cover.>
12) Install the rear exhaust pipe and muffler. <Ref. to EX(H4DO)-14, INSTALLATION, Rear Exhaust Pipe.> <Ref. to EX(H4DO)-17, INSTALLATION, Muffler.>
13) Lower the vehicle.
14) Pour in transmission gear oil and check the oil level. <Ref. to 5MT-22, Transmission Gear Oil.>

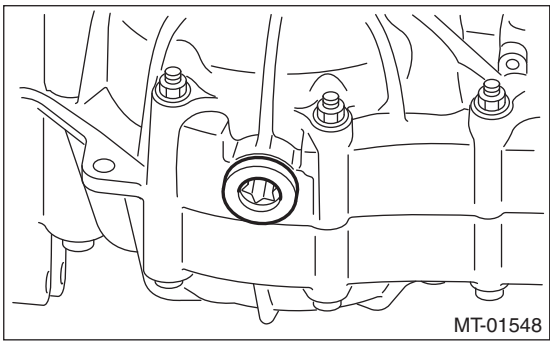
6. Differential Side Retainer Oil Seal

A: INSPECTION

Check for transmission gear oil leaks at differential side retainer oil seal area. If there is oil leakage, replace the oil seal with the new part and check the drive shaft.

B: REPLACEMENT

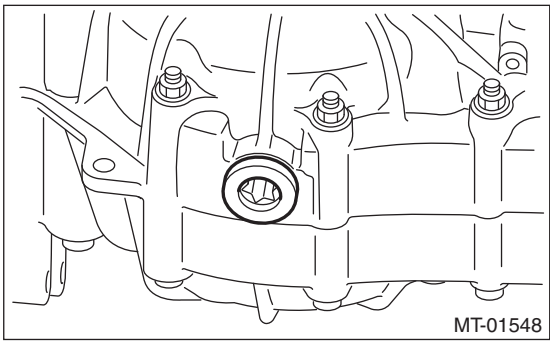
1) Lift up the vehicle.
2) Remove the transmission gear oil drain plug using TORX® bit T70, and drain the transmission gear oil completely.



3) Tighten the transmission gear oil drain plug using TORX® bit T70.

NOTE:
Use a new gasket.

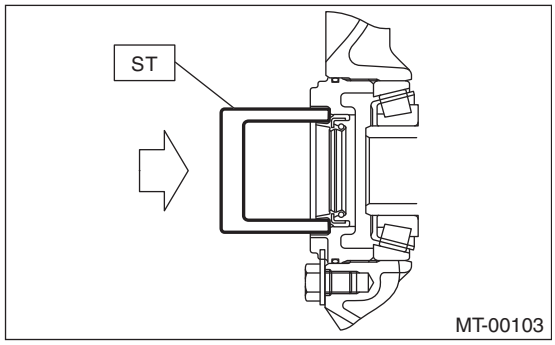
Tightening torque:
44 N·m (4.5 kgf-m, 32.5 ft-lb) (Aluminum gasket silver)
70 N·m (7.1 kgf-m, 51.6 ft-lb) (Copper gasket brown)
70 N·m (7.1 kgf-m, 51.6 ft-lb) (Metal gasket black)



4) Remove the front and center exhaust pipes. <Ref. to EX(H4DO)-5, REMOVAL, Front Exhaust Pipe.> <Ref. to EX(H4DO)-12, REMOVAL, Center Exhaust Pipe.>
5) Separate the front drive shaft from the transmission. <Ref. to DS-27, REMOVAL, Front Drive Shaft.>
6) Remove the differential side retainer oil seal.

NOTE:
• Be sure to replace the differential side retainer oil seal whenever the front drive shaft is removed from the transmission.
• Use the ST 398527700 PULLER ASSY to remove the oil seal. If removing the oil seal with a flat tip screwdriver, be careful not to scratch the differential side retainer.
7) Using the ST, install the differential side retainer oil seal by lightly tapping with a plastic hammer.

CAUTION:
Apply transmission gear oil to the oil seal lips, and install the oil seal while being careful not to deform the lip.
ST 18675AA000 DIFFERENTIAL SIDE OIL SEAL INSTALLER



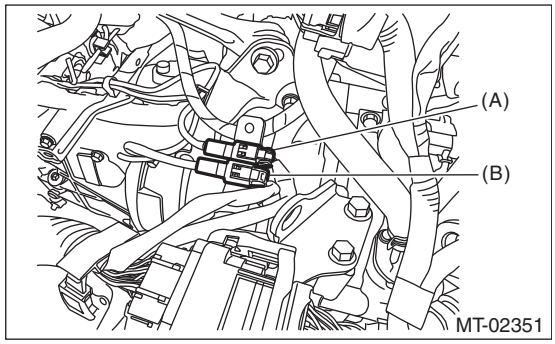
8) Install the front drive shaft. <Ref. to DS-27, INSTALLATION, Front Drive Shaft.>
ST 28399SA010 OIL SEAL PROTECTOR
9) Install the front and center exhaust pipe. <Ref. to EX(H4DO)-8, INSTALLATION, Front Exhaust Pipe.> <Ref. to EX(H4DO)-12, INSTALLATION, Center Exhaust Pipe.>
10) Lower the vehicle.
11) Add the transmission gear oil through the oil level gauge hole. <Ref. to 5MT-22, REPLACEMENT, Transmission Gear Oil.>

7. Switches and Harness

A: REMOVAL

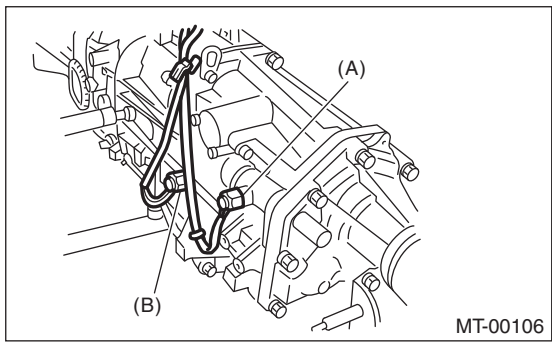
1. BACK-UP LIGHT SWITCH & NEUTRAL POSITION SWITCH

1) Disconnect the ground cable from battery.
2) Remove the air intake boot. <Ref. to IN(H4DO)-13, REMOVAL, Air Intake Boot.>
3) Disconnect the connector back-up light switch & neutral position switch.



(A) Neutral position switch connector (Brown)
(B) Back-up light switch connector (Gray)

4) Lift up the vehicle.
5) Remove the back-up light switch & neutral position switch with the harness.



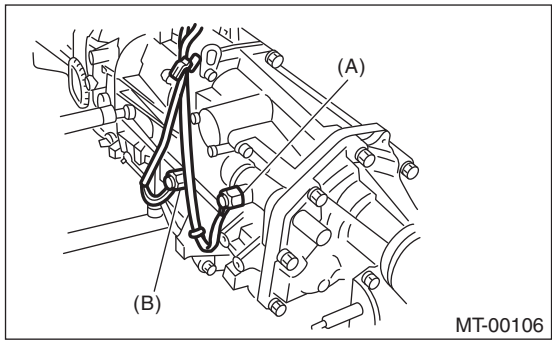
(A) Neutral position switch
(B) Back-up light switch

B: INSTALLATION

1. BACK-UP LIGHT SWITCH & NEUTRAL POSITION SWITCH

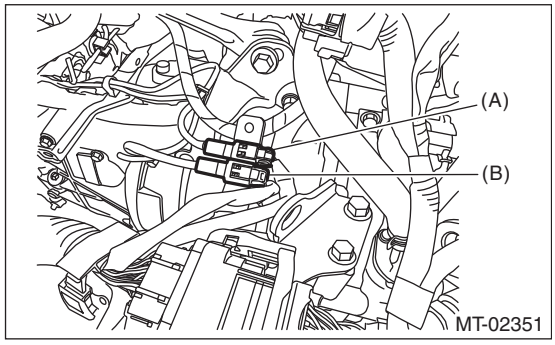
1) Install the back-up light switch & neutral position switch with the harness.

Tightening torque:
32.3 N·m (3.3 kgf-m, 23.8 ft-lb)



(A) Neutral position switch
(B) Back-up light switch

2) Lower the vehicle.
3) Connect the connectors of back-up light switch & neutral position switch.



(A) Neutral position switch connector (Brown)
(B) Back-up light switch connector (Gray)

4) Install the air intake boot. <Ref. to IN(H4DO)-13, INSTALLATION, Air Intake Boot.>
5) Connect the battery ground terminal.

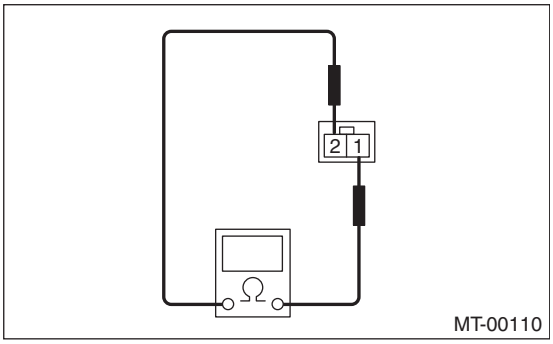
C: INSPECTION

1. BACK-UP LIGHT SWITCH

Check the back-up light switch. <Ref. to LI-7, 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.



Gear shift position	Terminal No.	Specified resistance
Neutral position	1 and 2	Less than 1 Ω
Other positions		1 MΩ or more

4) Replace faulty parts.

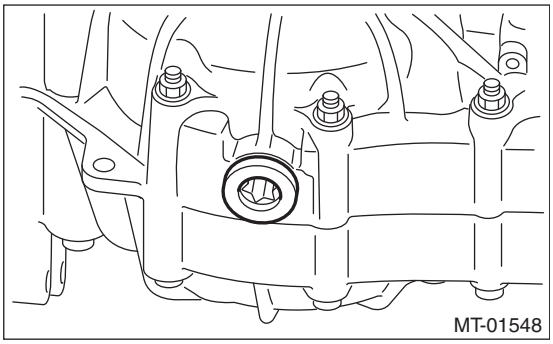
8. Preparation for Overhaul

A: PROCEDURE

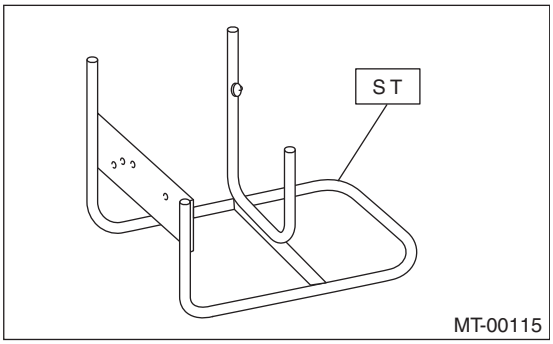
1) Clean oil, grease, dirt and dust from the transmission.
2) Using the TORX® bit T70, remove the transmission gear oil drain plug, and drain the transmission gear oil completely.
3) Using the TORX® bit T70, tighten the transmission gear oil drain plug.

NOTE:
Use a new gasket.

Tightening torque:
44 N·m (4.5 kgf-m, 32.5 ft-lb) (Aluminum gasket silver)
70 N·m (7.1 kgf-m, 51.6 ft-lb) (Copper gasket brown)
70 N·m (7.1 kgf-m, 51.6 ft-lb) (Metal gasket black)



4) Attach the transmission to the ST.
ST 499937100 TRANSMISSION STAND

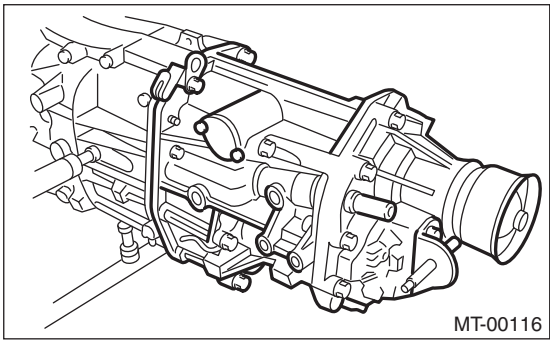


5) Apply transmission gear oil to rotating parts before assembly.
6) All disassembled parts, if to be reused, should be reinstalled in the original positions and directions.
7) Gaskets, lock washers and lock nuts must be replaced with new parts.
8) Apply liquid gasket to the specified areas to prevent leakage.

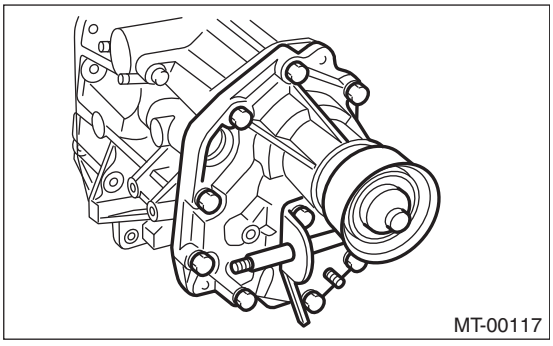
9. Transfer Case and Extension Case Assembly

A: REMOVAL

1) Remove the manual transmission assembly from the vehicle. <Ref. to 5MT-23, REMOVAL, Manual Transmission Assembly.>
2) Remove the back-up light switch & neutral position switch. <Ref. to 5MT-34, REMOVAL, Switches and Harness.>
3) Remove the transfer case together with the extension case assembly.

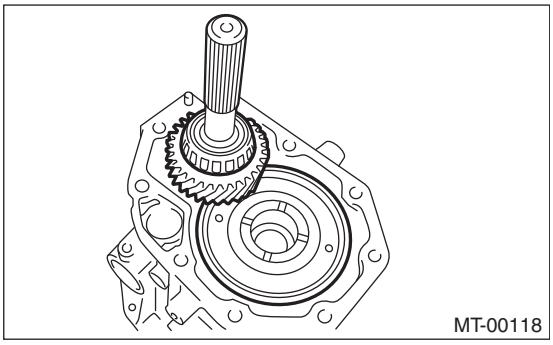

MT-00116

4) Remove the shifter arm.
5) Remove the extension case assembly.

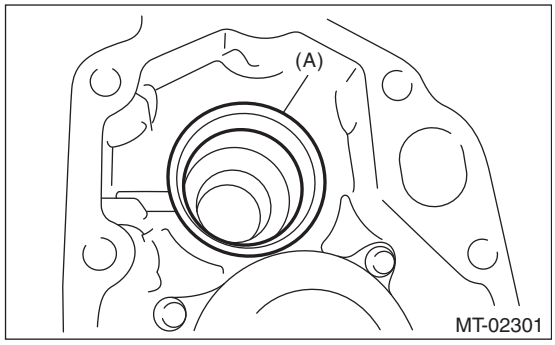

MT-00117

B: INSTALLATION

1) Install the center differential and transfer driven gear into the transfer case.


MT-00118

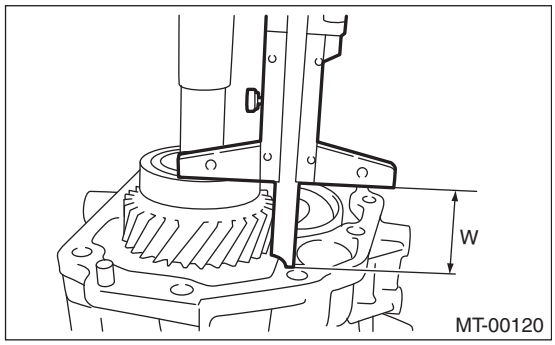
2) Remove the bearing outer race from the extension case.



MT-02301

(A) Bearing outer race

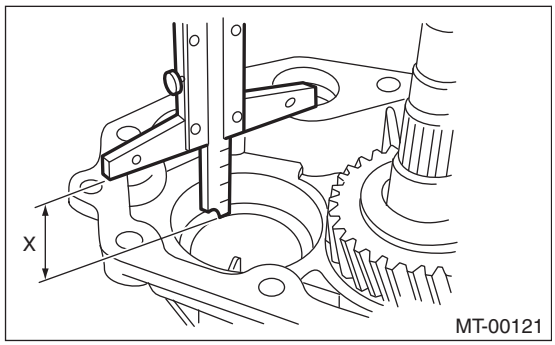
3) While pressing the bearing outer race horizontally, rotate the driven shaft for ten turns.
4) Measure the height “W” between transfer case and taper roller bearing on the transfer driven gear.



MT-00120

5) Measure depth “X” on bearing insertion part of the extension case.

NOTE:
Measure with bearing outer race and thrust washer removed.



MT-00121

6) Calculate the thrust washer thickness “t” mm (in) using the following calculation.
t = X – W + (0.15 — 0.20 mm (0.006 — 0.008 in))

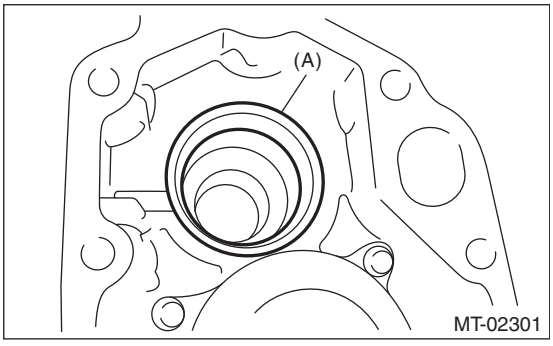
7) Select the washer with the nearest value in the following table.

Preload of the taper roller bearing (amount of standard protrusion):
0.15 — 0.20 mm (0.006 — 0.008 in)

NOTE:
Be sure that it is always within the preload.

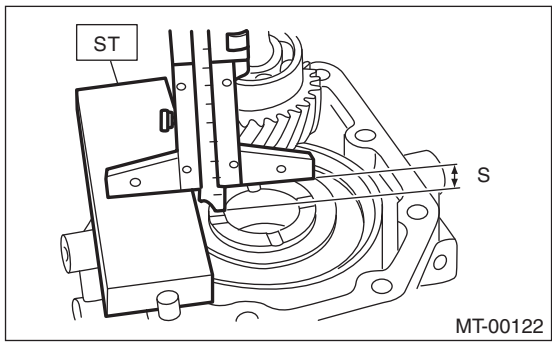
Thrust washer (50 × 61 × t)	
Part No.	Thickness mm (in)
803050060	0.50 (0.0197)
803050061	0.55 (0.0217)
803050062	0.60 (0.0236)
803050063	0.65 (0.0256)
803050064	0.70 (0.0276)
803050065	0.75 (0.0295)
803050066	0.80 (0.0315)
803050067	0.85 (0.0335)
803050068	0.90 (0.0354)
803050069	0.95 (0.0374)
803050070	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) Install the selected thrust washer and bearing outer race into the extension case.

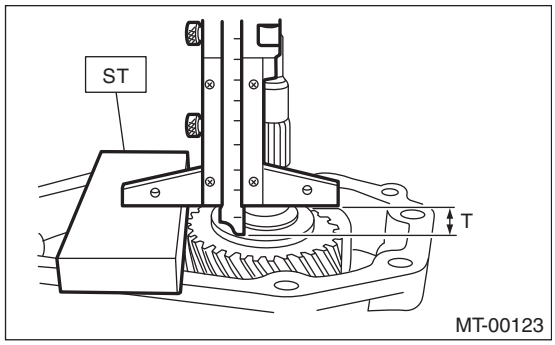


(A) Bearing outer race

9) Measure the depth “S” between transfer case and center differential.
ST 398643600 GAUGE



10) Measure the height “T” between the extension case and transfer drive gear.
ST 398643600 GAUGE



11) Calculate the thrust washer thickness “U” mm (in) using the following calculation.
U = S + T – 30 mm (1.18 in) [Thickness of ST]

NOTE:
Thickness of ST: 15 mm (0.59 in)
12) Select a suitable washer in the following table.

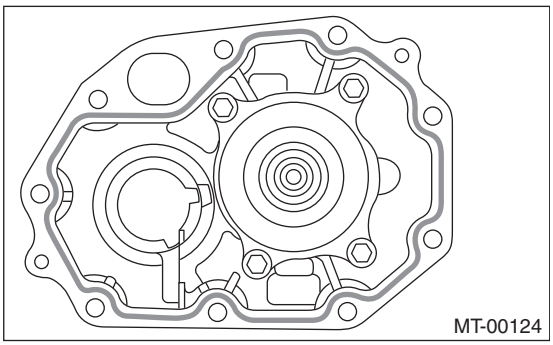
Standard clearance:
0.15 — 0.35 mm (0.0059 — 0.0138 in)

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)

13) Fit the thrust washer onto the center differential.

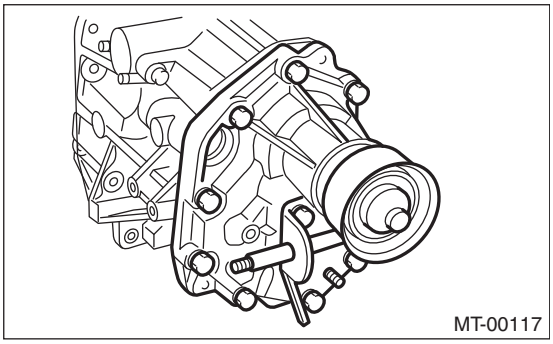
14) Apply a proper amount of liquid gasket to the transfer case mating surface.

Liquid gasket:
THREE BOND 1215 (Part No. 004403007) or equivalent

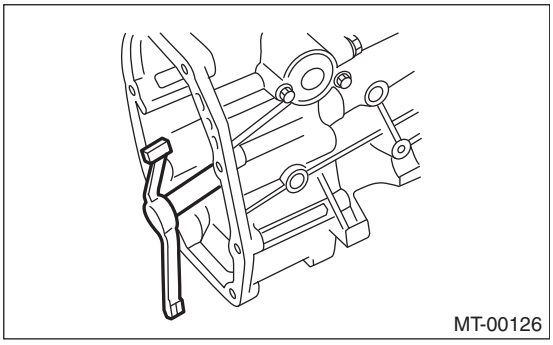

MT-00124

15) Attach the extension assembly to the transfer case.

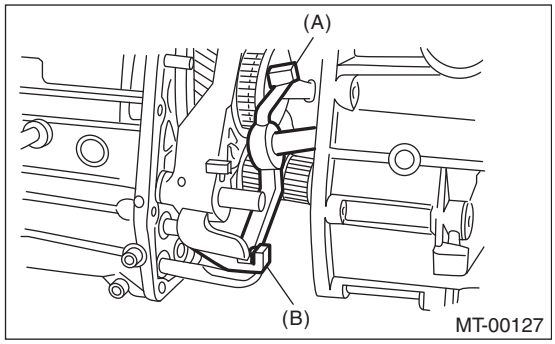
Tightening torque:
40 N·m (4.1 kgf-m, 29.5 ft-lb)


MT-00117

16) Attach the shifter arm to transfer case.


MT-00126

17) Hang the shifter arm on 3rd-4th fork rod.

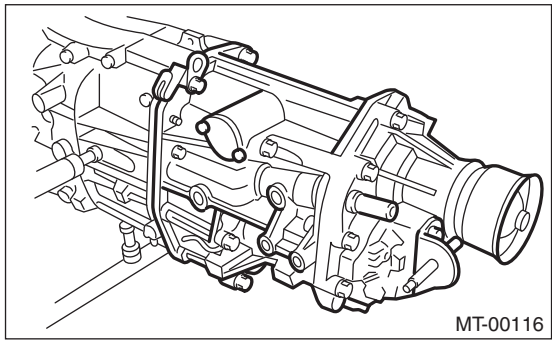


MT-00127

(A) Shifter arm
(B) 3rd-4th fork rod

18) Install the transfer case along with the extension case assembly to the transmission case.

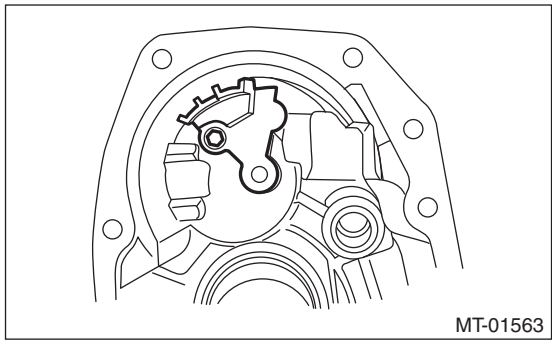
Tightening torque:
24.5 N·m (2.5 kgf-m, 18.1 ft-lb)


MT-00116

C: DISASSEMBLY

1. TRANSFER CASE

1) Remove the reverse check sleeve assembly. <Ref. to 5MT-48, REMOVAL, Reverse Check Sleeve.>
2) Remove the oil guide.

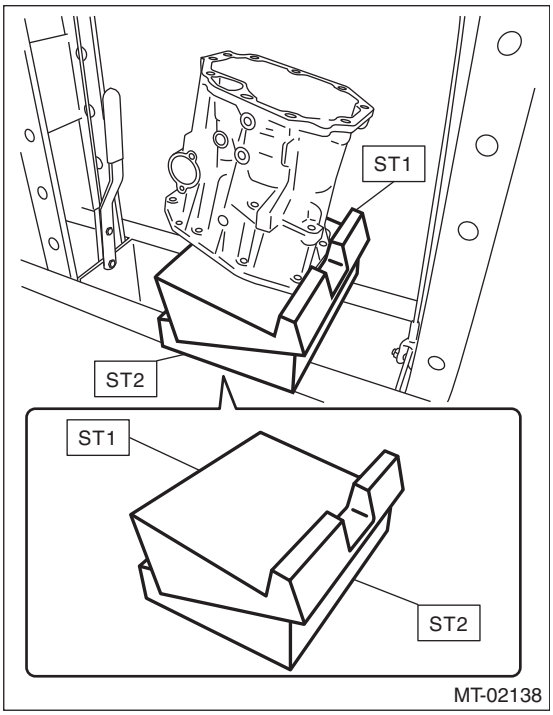

MT-01563

3) Remove the oil seal.

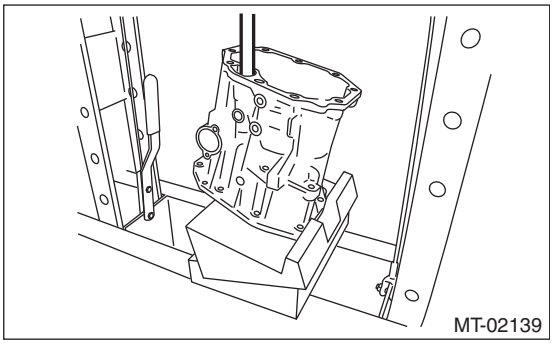
4) Set ST1, ST2 and transfer case to a press.

NOTE:
- Set the ST2 under ST1.
- Set the transfer case so that the hole for shifter arm is positioned vertically.

ST1 498267300 CYLINDER HEAD TABLE
ST2 498267200 CYLINDER HEAD TABLE

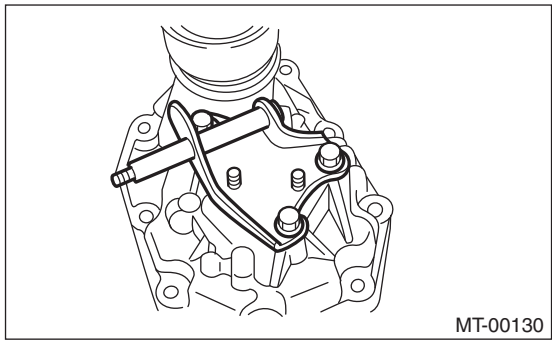


5) Using the round bar with diameter of 22 mm (0.87 in) or 23 mm (0.91 in), remove the roller bearing.



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-32, Oil Seal.>

D: ASSEMBLY

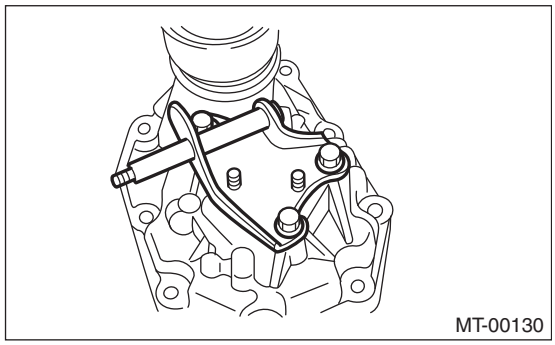
1. EXTENSION CASE

1) Using the ST, install the oil seal to the extension case. <Ref. to 5MT-32, Oil Seal.>

NOTE:
Use a new oil seal.

2) Install the shift bracket to extension case.

Tightening torque:
24.5 N·m (2.5 kgf-m, 18.1 ft-lb)



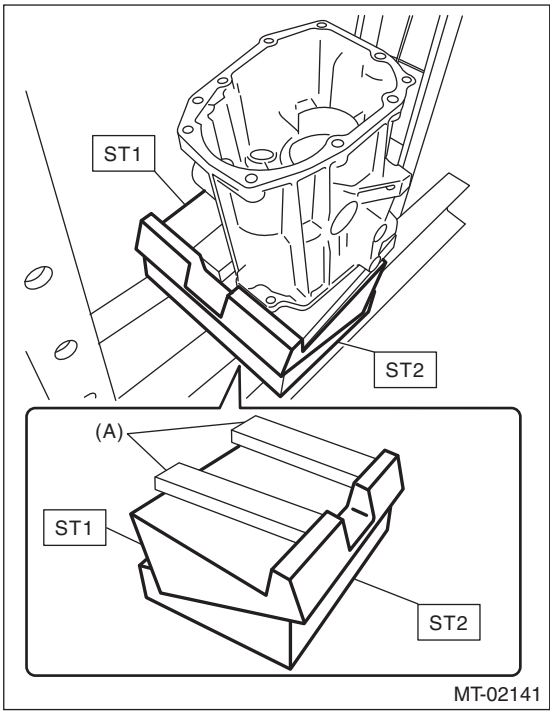
3) Install the transfer drive gear to the extension case. <Ref. to 5MT-43, INSTALLATION, Transfer Drive Gear.>

2. TRANSFER CASE

1) Set the ST1, ST2, iron plate and the transfer case to the press.

NOTE:
- Set the ST2 under ST1.
- Set the transfer case so that the hole for shifter arm is positioned vertically.
- Insert the iron plate which is thicker than the exposed length of the transfer case knock pin between the ST and transfer case.
- Set the iron plate so that the transfer case knock pin does not ride on the iron plate.

ST1 498267300 CYLINDER HEAD TABLE
ST2 498267200 CYLINDER HEAD TABLE

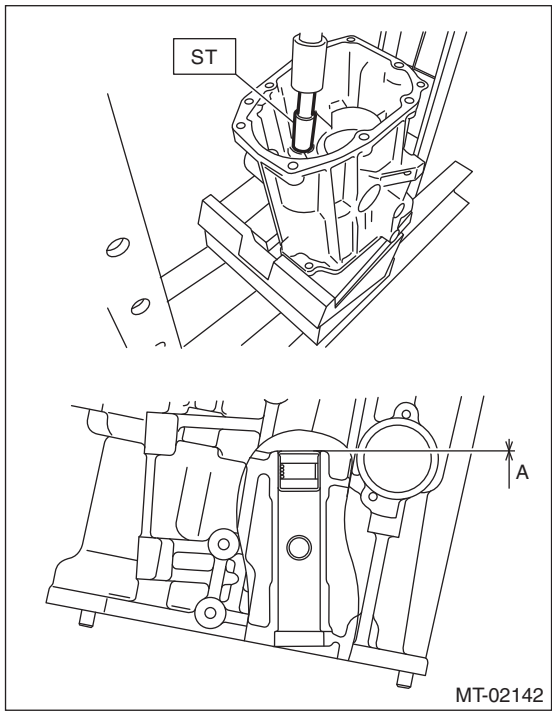


(A) Iron plate

2) Press-fit the roller bearing using the ST.

Press-fit depth of needle bearing:
A: 0±0.2 mm (0±0.01 in) from the end of transfer case

ST 899864100 REMOVER



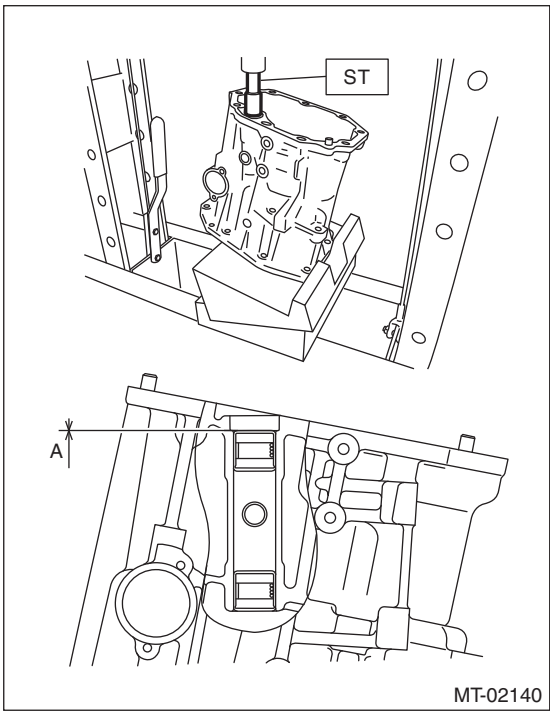
3) Remove the iron plate, and turn over the transfer case.

NOTE:
Set the transfer case so that the hole for shifter arm is positioned vertically.

4) Press-fit the roller bearing using the ST.

Press-fit depth of needle bearing:
A: 0±0.2 mm (0±0.01 in) from the end of transfer case

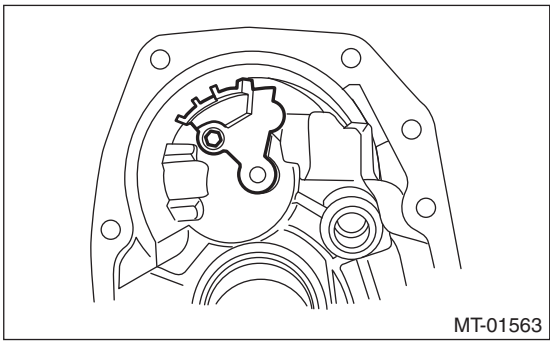
ST 899864100 REMOVER



5) Install the shifter arm to the transfer case, and make sure that the shift arm moves smoothly.
6) Install the oil guide to the transfer case.

NOTE:
Use a new installing bolt.

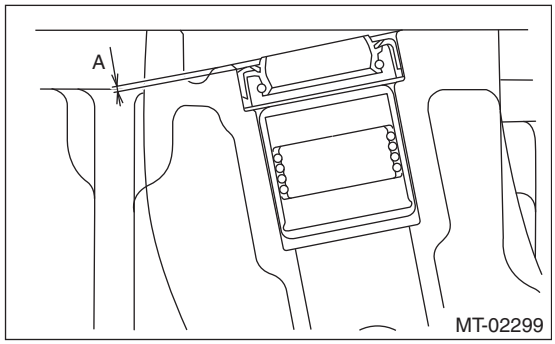
Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)



7) Install the reverse check sleeve assembly to the transfer case. <Ref. to 5MT-48, INSTALLATION, Reverse Check Sleeve.>

8) Install the oil seal.

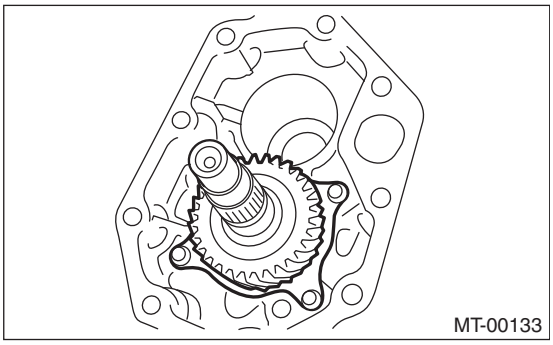
Press-fit depth of oil seal:
A: 1±0.2 mm (0.04±0.01 in) from the end of transfer case



10.Transfer Drive Gear

A: REMOVAL

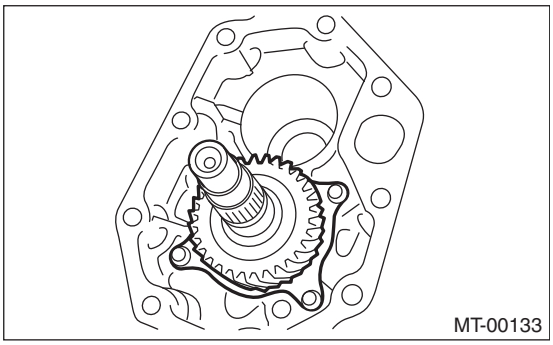
1) Remove the manual transmission assembly from the vehicle. <Ref. to 5MT-23, REMOVAL, Manual Transmission Assembly.>
2) Remove the back-up light switch & neutral position switch. <Ref. to 5MT-34, REMOVAL, Switches and Harness.>
3) Remove the transfer case together with the extension case assembly. <Ref. to 5MT-37, 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.


MT-00133

B: INSTALLATION

1) Install the transfer drive gear.

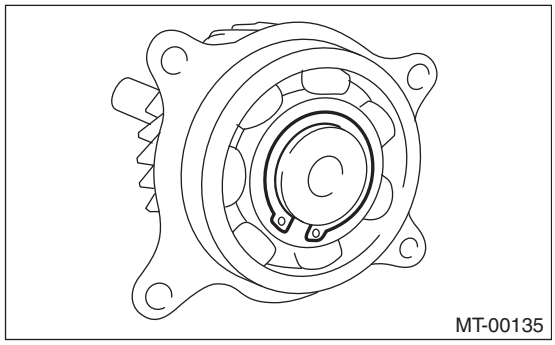
Tightening torque:
26 N·m (2.7 kgf-m, 19.2 ft-lb)


MT-00133

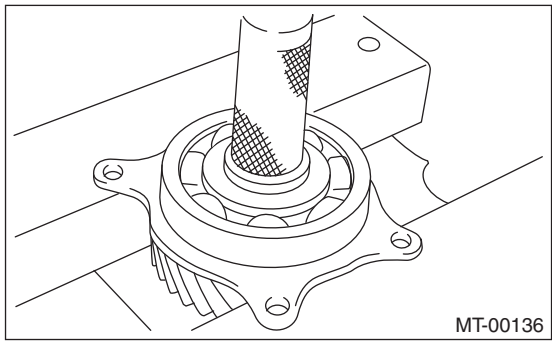
2) Install the transfer driven gear.
3) Select a thrust washer. <Ref. to 5MT-37, INSTALLATION, Transfer Case and Extension Case Assembly.>
4) Install the extension case assembly. <Ref. to 5MT-37, INSTALLATION, Transfer Case and Extension Case Assembly.>
5) Install the transfer case and the extension case assembly. <Ref. to 5MT-37, INSTALLATION, Transfer Case and Extension Case Assembly.>
6) Install the back-up light switch and the neutral position switch. <Ref. to 5MT-34, INSTALLATION, Switches and Harness.>
7) Install the manual transmission assembly to the vehicle. <Ref. to 5MT-25, INSTALLATION, Manual Transmission Assembly.>

C: DISASSEMBLY

1) Remove the snap ring.


MT-00135

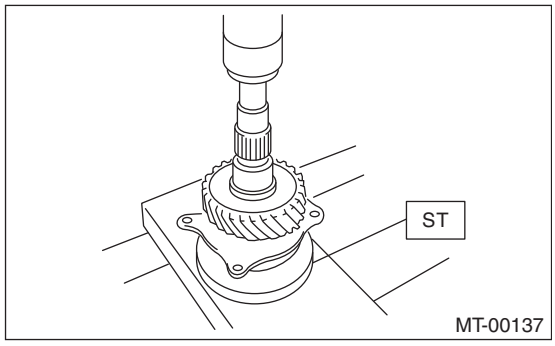
2) Remove the ball bearing.


MT-00136

D: ASSEMBLY

1) Set the ST against the inner race of the bearing, and install the drive shaft.

CAUTION:
Do not apply a load in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).
ST 398177700 INSTALLER



MT-00137

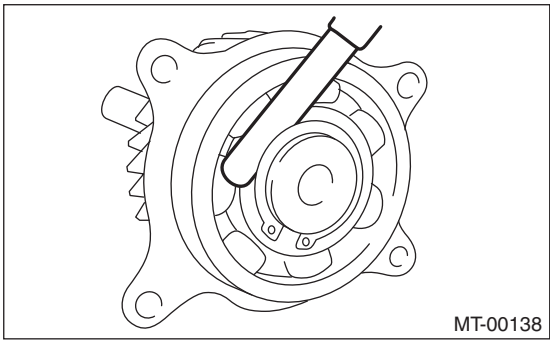
2) Install the snap ring on the transfer drive shaft.
3) Inspect the clearance between the snap ring and the ball bearing. <Ref. to 5MT-44, INSPECTION, Transfer Drive Gear.>

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
- When the bearings fail to turn smoothly or emit noise in rotation after gear oil lubrication.

2) Drive gear
If the drive gear tooth surface and shaft are excessively broken or damaged, replace the drive gear.
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)



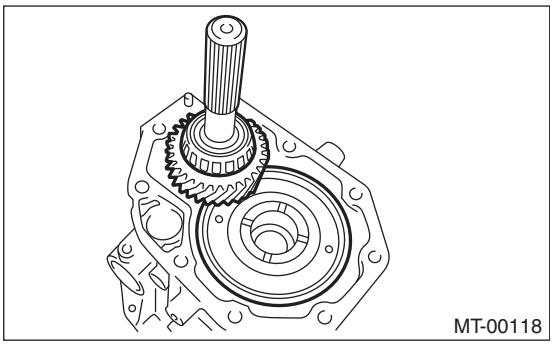
If the measurement is not within specification, select a suitable snap ring and replace it.

Snap ring (Outer-30)	
Part No.	Thickness mm (in)
805030041	1.53 (0.0602)
805030042	1.65 (0.0650)
805030043	1.77 (0.0697)

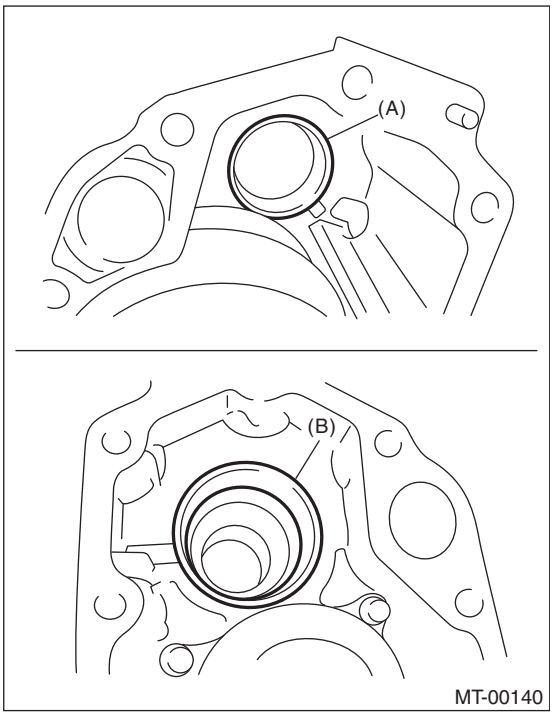
11.Transfer Driven Gear

A: REMOVAL

1) Remove the manual transmission assembly from the vehicle. <Ref. to 5MT-23, REMOVAL, Manual Transmission Assembly.>
2) Remove the back-up light switch & neutral position switch. <Ref. to 5MT-34, REMOVAL, Switches and Harness.>
3) Remove the transfer case together with the extension case assembly. <Ref. to 5MT-37, REMOVAL, Transfer Case and Extension Case Assembly.>
4) Remove the extension case assembly.
5) Remove the transfer driven gear.


MT-00118

6) Remove bearing outer races from the extension case and transfer case.

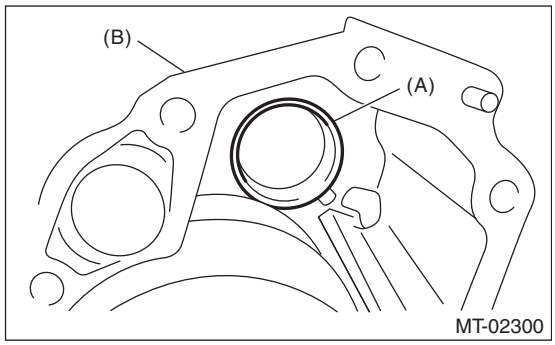


MT-00140

(A) Bearing outer race (Transfer case side)
(B) Bearing outer race (Extension case side)

B: INSTALLATION

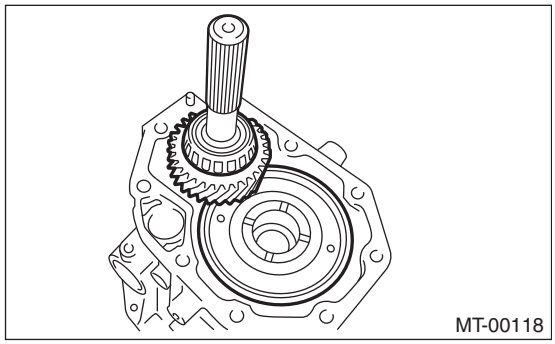
1) Install the bearing outer race to transfer case.



MT-02300

(A) Bearing outer race
(B) Transfer case

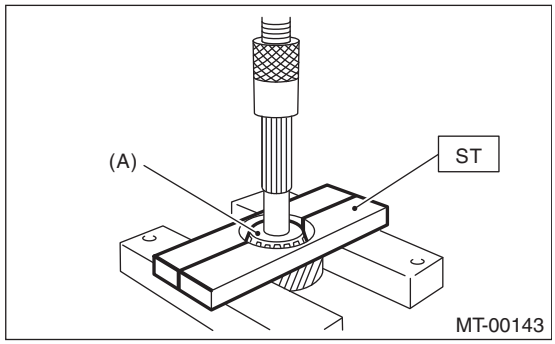
2) Install the transfer driven gear.


MT-00118

3) Select a thrust washer. <Ref. to 5MT-37, INSTALLATION, Transfer Case and Extension Case Assembly.>
4) Install the transfer case and the extension case assembly. <Ref. to 5MT-37, INSTALLATION, Transfer Case and Extension Case Assembly.>
5) Install the back-up light switch and the neutral position switch. <Ref. to 5MT-34, INSTALLATION, Switches and Harness.>
6) Install the manual transmission assembly to the vehicle. <Ref. to 5MT-25, INSTALLATION, Manual Transmission Assembly.>

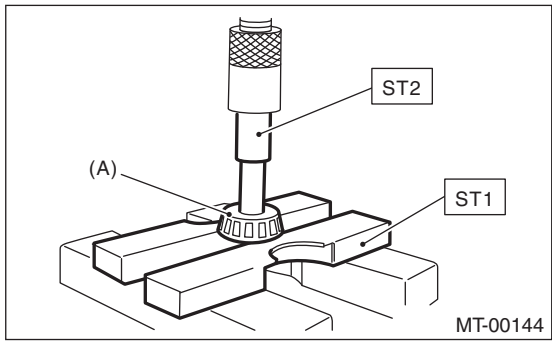
C: DISASSEMBLY

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

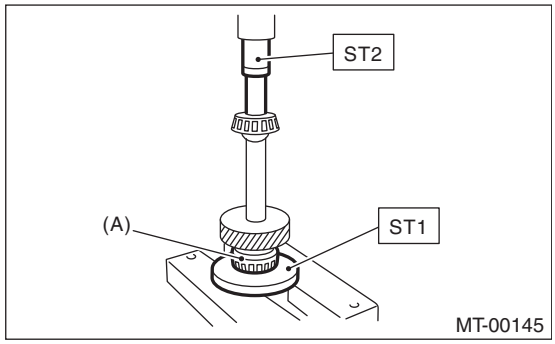


(A) Roller bearing

D: ASSEMBLY

1) Using the ST, install the roller bearing (extension case side).

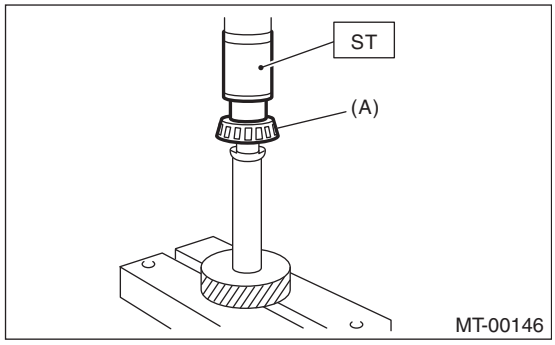
CAUTION:
Do not apply a load in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).
ST1 398177700 INSTALLER
ST2 899864100 REMOVER



(A) Roller bearing

2) Using ST, install the roller bearing (transfer case side).

CAUTION:
Do not apply a load in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).
ST 499757002 INSTALLER



(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
- When the bearings fail to turn smoothly or emit noise in rotation after gear oil lubrication.

2) Driven gear
If the tooth face of driven gear and the shaft are excessively broken or damaged, replace the driven gear.

12.Center Differential

A: REMOVAL

1) Remove the manual transmission assembly from the vehicle. <Ref. to 5MT-23, REMOVAL, Manual Transmission Assembly.>
2) Remove the back-up light switch & neutral position switch. <Ref. to 5MT-34, REMOVAL, Switches and Harness.>
3) Remove the transfer case together with the extension case assembly. <Ref. to 5MT-37, REMOVAL, Transfer Case and Extension Case Assembly.>
4) Remove the extension case assembly. <Ref. to 5MT-37, REMOVAL, Transfer Case and Extension Case Assembly.>
5) Remove the transfer driven gear. <Ref. to 5MT-45, REMOVAL, Transfer Driven Gear.>
6) Remove the center differential.

B: INSTALLATION

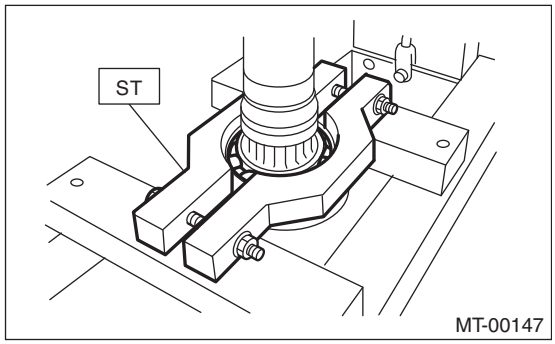
1) Install the center differential into transfer case.
2) Install the transfer driven gear. <Ref. to 5MT-45, INSTALLATION, Transfer Driven Gear.>
3) Install the extension case assembly. <Ref. to 5MT-37, INSTALLATION, Transfer Case and Extension Case Assembly.>
4) Install the transfer case together with the extension case assembly. <Ref. to 5MT-37, INSTALLATION, Transfer Case and Extension Case Assembly.>
5) Install the back-up light switch and the neutral position switch. <Ref. to 5MT-34, INSTALLATION, Switches and Harness.>
6) Install the manual transmission assembly to the vehicle. <Ref. to 5MT-25, INSTALLATION, Manual Transmission Assembly.>

C: DISASSEMBLY

Remove the ball bearing using ST.

NOTE:
• Center differential is a non-disassembled part which should not be disassembled.
• Do not reuse the ball bearing.

ST 498077300 CENTER DIFFERENTIAL BEARING REMOVER

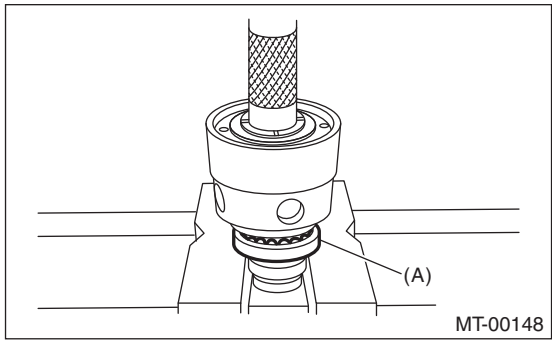


D: ASSEMBLY

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).

NOTE:
Use a new ball bearing.



(A) Ball bearing

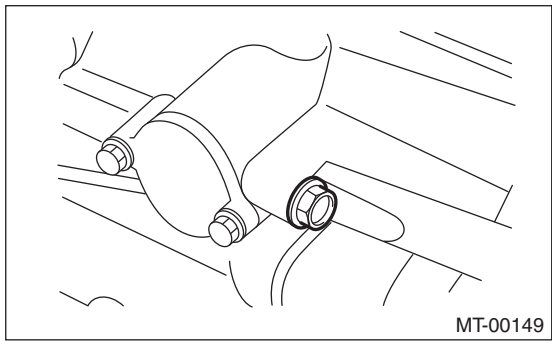
E: INSPECTION

1) Bearing
Replace the bearings in the following cases.
• In case of broken or rusty bearings
• In case of worn or damaged bearings
• When the bearings fail to turn smoothly or emit noise in rotation after gear oil lubrication.
• When bearing has other defects.
2) Center differential
If there is wear or damage, replace the center differential case assembly.

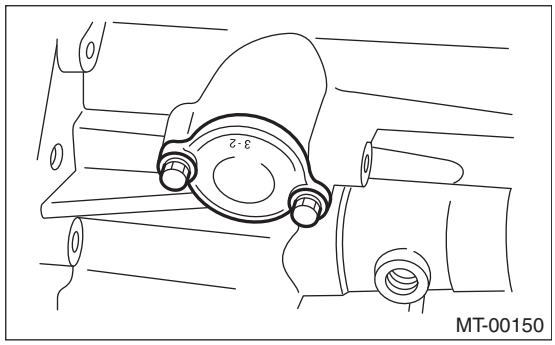
13.Reverse Check Sleeve

A: REMOVAL

1) Remove the manual transmission assembly from the vehicle. <Ref. to 5MT-23, REMOVAL, Manual Transmission Assembly.>
2) Remove the transfer case together with the extension case assembly. <Ref. to 5MT-37, REMOVAL, Transfer Case and Extension Case Assembly.>
3) Remove the shifter arm.
4) Remove the plug, gasket, reverse accent spring, and ball.


MT-00149

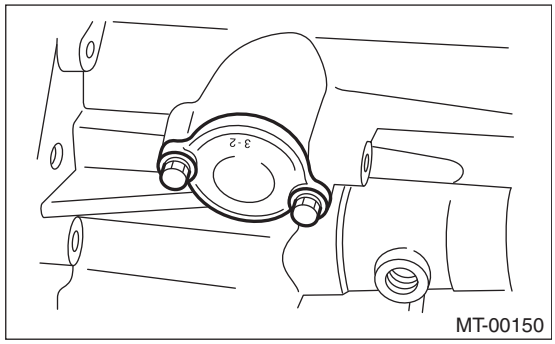
5) Remove the reverse check sleeve assembly.


MT-00150

B: INSTALLATION

1) Install the reverse check sleeve assembly.

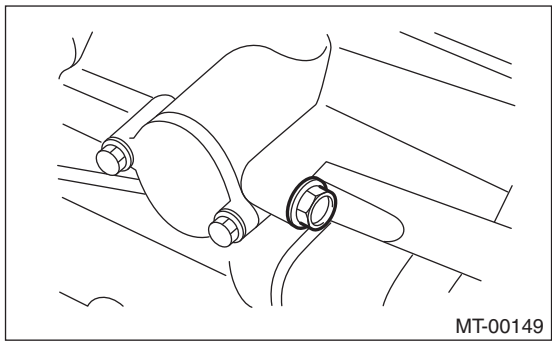
Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)


MT-00150

2) Install the ball, reverse accent spring, gasket and plug to the transfer case.

NOTE:
Use a new gasket.

Tightening torque:
9.75 N·m (1.0 kgf-m, 7.2 ft-lb)

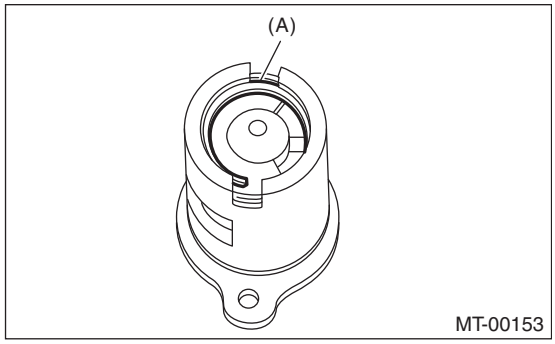

MT-00149

3) Attach the shifter arm to the transfer case assembly.
4) Install the transfer case together with the extension case assembly. <Ref. to 5MT-37, INSTALLATION, Transfer Case and Extension Case Assembly.>
5) Install the manual transmission assembly to the vehicle. <Ref. to 5MT-25, INSTALLATION, Manual Transmission Assembly.>

C: DISASSEMBLY

1) Cover the reverse check sleeve with cloth, and remove the snap ring by using screwdriver.

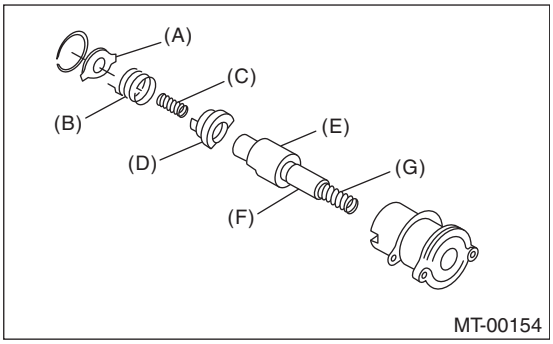
NOTE:
If the snap ring is deformed or the spring repulsive force is not enough, replace with a new snap ring.



MT-00153

(A) Snap ring

2) Remove the reverse check plate, reverse check spring, reverse check cam, return spring (5th-Reverse), reverse accent shaft, return spring cap, and return spring (1st-2nd).



(A) Reverse check plate
(B) Reverse check spring
(C) Return spring (5th-Reverse)
(D) Reverse check cam
(E) Reverse accent shaft
(F) Return spring cap
(G) Return spring (1st-2nd)

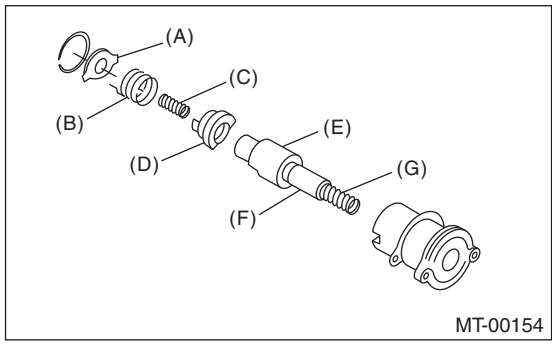
3) Remove the O-ring.

NOTE:
• Do not reuse the O-ring.
• Be careful not to damage the adjusting select shim between reverse check sleeve assembly and case.

D: ASSEMBLY

1) Install the return spring (1st-2nd), return spring cap, reverse accent shaft, reverse check cam, return spring (5th-Rev) and reverse 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.



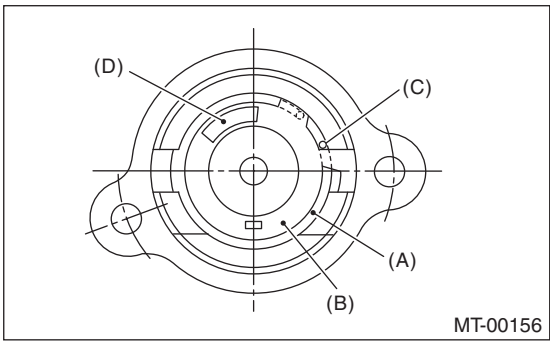
(A) Reverse check plate
(B) Reverse check spring
(C) Return spring (5th-Rev)
(D) Reverse check cam
(E) Reverse accent shaft
(F) Return spring cap
(G) Return spring (1st-2nd)

2) Hook the curved section of the reverse check spring over the 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 reverse check plate onto the reverse check sleeve and hold in place with the snap ring.
5) Insert the O-ring into the sleeve groove.

NOTE:
Use new O-rings.

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) Reverse check spring
(D) Reverse 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 adjusting select shim between the sleeve assembly and the case to adjust the clearance.

CAUTION:
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.

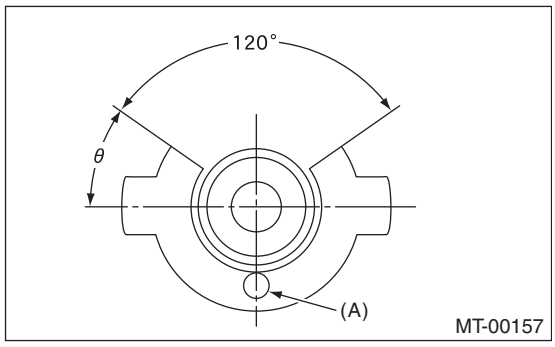
Adjusting select shim	
Part No.	Thickness mm (in)
32190AA000	0.15 (0.0059)
32190AA010	0.30 (0.0118)

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.

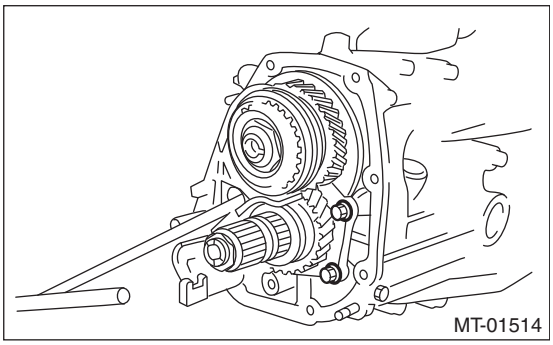
Reverse check plate			
Part No.	(A): No.	Angleθ	Remarks
32189AA001	0	28°	Arm stops closer to 5th gear.
32189AA011	1	31°	Arm stops closer to 5th gear.
32189AA021	2	34°	Arm stops in the center.
32189AA031	3	37°	Arm stops closer to reverse gear.
32189AA041	4	40°	Arm stops closer to reverse gear.



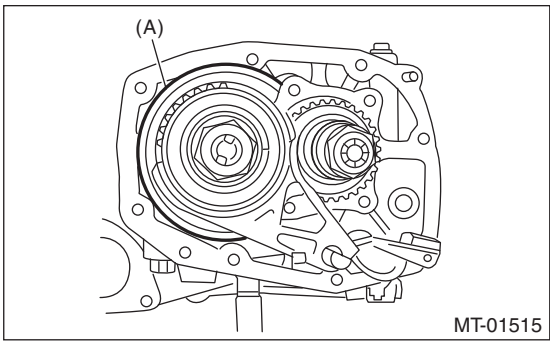
14.Transmission Case

A: REMOVAL

1) Remove the manual transmission assembly from the vehicle. <Ref. to 5MT-23, REMOVAL, Manual Transmission Assembly.>
2) Remove the clutch release lever. <Ref. to CL-13, REMOVAL, Release Bearing and Lever.>
3) Remove the transfer case together with the extension case assembly. <Ref. to 5MT-37, REMOVAL, Transfer Case and Extension Case Assembly.>
4) Remove the bearing mounting bolt.


MT-01514

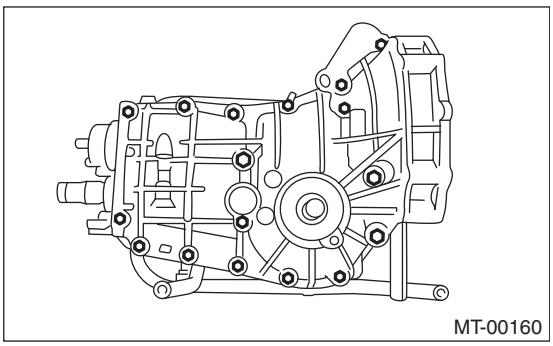
5) Remove the main shaft rear plate.



MT-01515

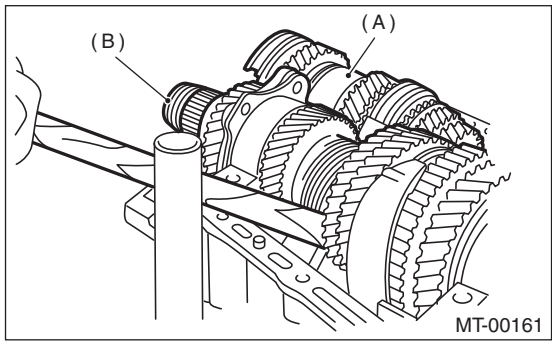
(A) Main shaft rear plate

6) Remove the coupling bolts and nuts, and separate the transmission case into the right and left cases.


MT-00160

7) Remove the drive pinion shaft assembly from the left side of the transmission case.

NOTE:
Use a hammer handle, etc. to remove if too tight.

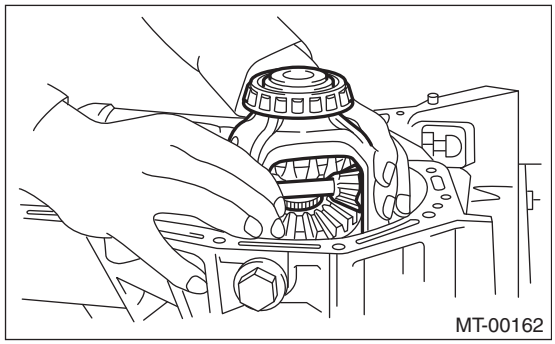


MT-00161

(A) Main shaft ASSY for single-range
(B) Drive pinion shaft ASSY

8) Remove the main shaft assembly for single-range.
9) Remove the front differential assembly.

NOTE:
• Do not confuse the right and left roller bearing outer races.
• Be careful not to damage the oil seal of retainer.


MT-00162

B: INSTALLATION

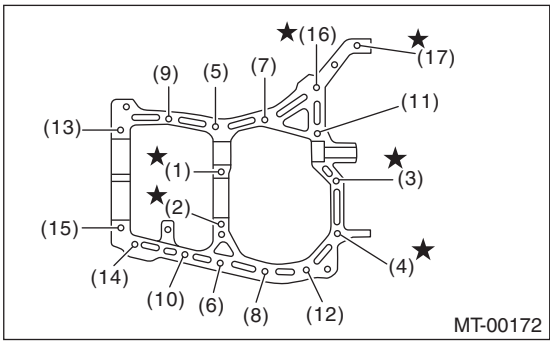
1) Wipe off grease, oil and dust on the mating surfaces of transmission cases with cleaning solvent.
2) Install the front differential assembly.
3) Install the main shaft assembly for single-range. Install the transmission case knock pin into the knock pin hole of needle bearing.
4) Install the drive pinion shaft assembly. Install the transmission case knock pin into the roller bearing knock pin hole.
5) Apply liquid gasket, then join the right side and left side of the case together.

Liquid gasket:
THREE BOND 1215 (Part No. 004403007) or equivalent

6) With brackets and clips as shown in the figure, tighten the seventeen bolts.

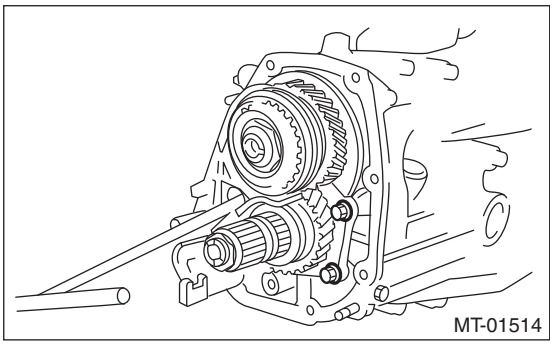
NOTE:
• Insert the bolts from the bottom and tighten the nuts at the top.
• Match the cases together so that the drive pinion shims are not caught between the cases.

Tightening torque:
8 mm bolt
25 N·m (2.5 kgf-m, 18.4 ft-lb)
★ ***10 mm bolt***
39 N·m (4.0 kgf-m, 28.8 ft-lb)



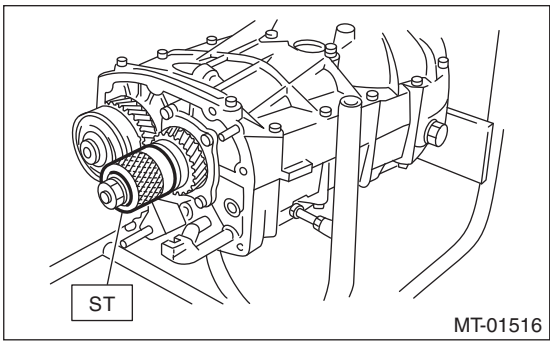
7) Tighten the roller bearing mounting bolts.

Tightening torque:
30 N·m (3.1 kgf-m, 22.1 ft-lb)



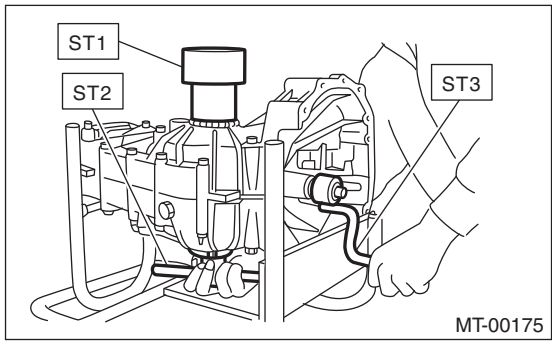
8) Perform backlash adjustment of the hypoid gear and preload measurement of the roller bearing:

NOTE:
Attach the ST on drive pinion assembly.
ST 498427100 STOPPER



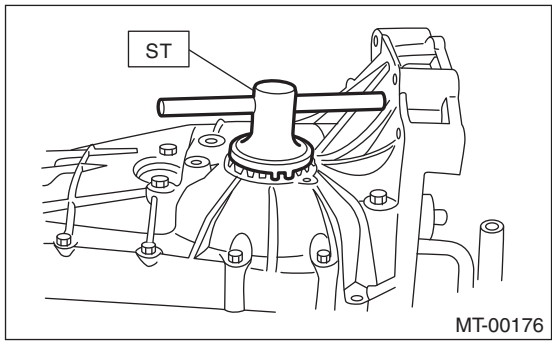
9) Place the transmission with the left side of case facing downward, and put ST1 on bearing cup.

10) Screw the side retainer 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



11) Remove the weight, and screw in the retainer without the O-ring on the upper side, and stop at the point where a slight resistance is felt.

NOTE:
In this condition, the backlash between hypoid gear and drive pinion shaft is zero.
ST 18630AA010 WRENCH COMPL RETAINER



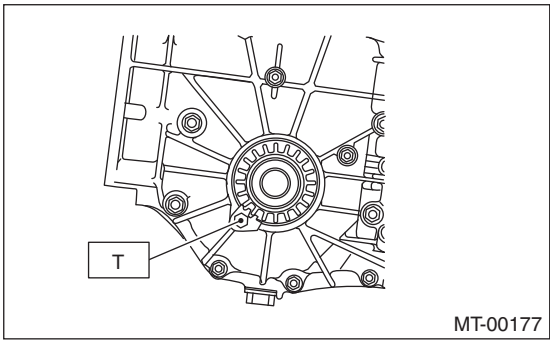
12) Loosen the retainer on the lower side by 3 notches, and turn the retainer on the upper side by the same amount in order to apply backlash.
13) Rotate the retainer of the upper side additionally by 1 notch in order to apply preload on taper roller bearing.
14) Temporarily attach both the upper and lower lock plates, and put marks both the retainer and lock plate for later readjustment.

NOTE:
If it is hard to install the lock plates, reverse the sides and install them.

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-72, 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 tighten the retainer into the position before it was loosened.
Install the lock plate.

NOTE:
• When loosening the retainer, record the number of the turns made.
• Perform this operation for both upper and lower retainers.
• Use new O-rings.

Tightening torque:
T: 25 N·m (2.5 kgf-m, 18.4 ft-lb)



18) Select a 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-13, INSTALLATION, Release Bearing and Lever.>
20) Install the transfer case together with the extension case assembly. <Ref. to 5MT-37, INSTALLATION, Transfer Case and Extension Case Assembly.>
21) Install the manual transmission assembly to the vehicle. <Ref. to 5MT-25, INSTALLATION, Manual Transmission Assembly.>

C: INSPECTION

Check the transmission case for cracks, damage, or oil leaks.

15.Main Shaft Assembly for Single-Range

A: REMOVAL

1) Remove the manual transmission assembly from the vehicle. <Ref. to 5MT-23, REMOVAL, Manual Transmission Assembly.>
2) Remove the transfer case together with the extension case assembly. <Ref. to 5MT-37, 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. <Ref. to 5MT-59, REMOVAL, Drive Pinion Shaft Assembly.>
5) Remove the main shaft assembly for single-range.

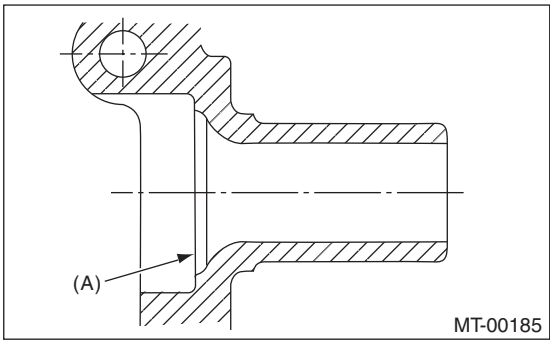
B: INSTALLATION

1) Install the needle bearing and oil seal to the front of the transmission single-range main shaft assembly.

NOTE:
• Wrap the clutch splined section with vinyl tape to prevent damage to the oil seal.
• Apply NICHIMOLY N-130 (or equivalent) to the sealing lip of the oil seal.
• Use a new oil seal.

2) Install the transmission case knock pin into the knock pin hole of the needle bearing outer race.

NOTE:
Align the end face of the seal with surface (A) when installing the oil seal.



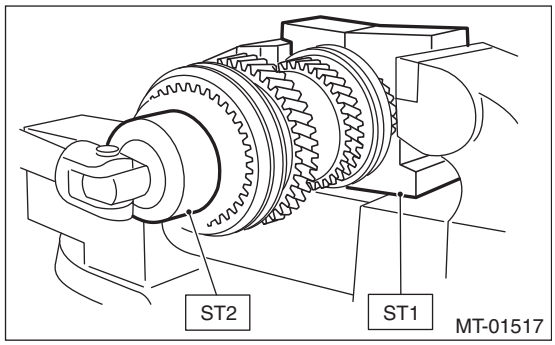
3) Install the drive pinion shaft assembly. <Ref. to 5MT-59, INSTALLATION, Drive Pinion Shaft Assembly.>
4) Install the transmission case. <Ref. to 5MT-51, INSTALLATION, Transmission Case.>
5) Install the transfer case together with the extension case assembly. <Ref. to 5MT-37, INSTALLATION, Transfer Case and Extension Case Assembly.>
6) Install the manual transmission assembly to the vehicle. <Ref. to 5MT-25, INSTALLATION, Manual Transmission Assembly.>

C: DISASSEMBLY

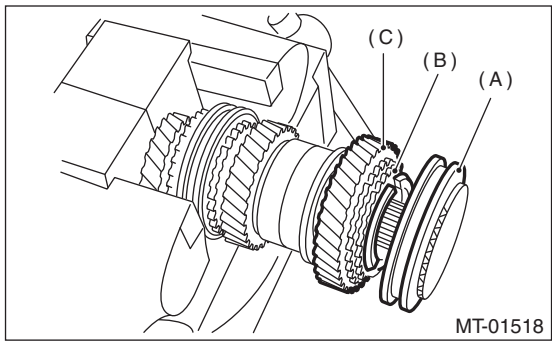
1) Put vinyl tape around main shaft spline to protect the oil seal from damage. Then pull out the oil seal and needle bearing by hand.
2) Remove the lock nut from transmission main shaft assembly for single range.

NOTE:
Flatten the lock nut tab before removing the lock nut.

ST1 498937000 TRANSMISSION HOLDER
ST2 499987003 SOCKET WRENCH (35)



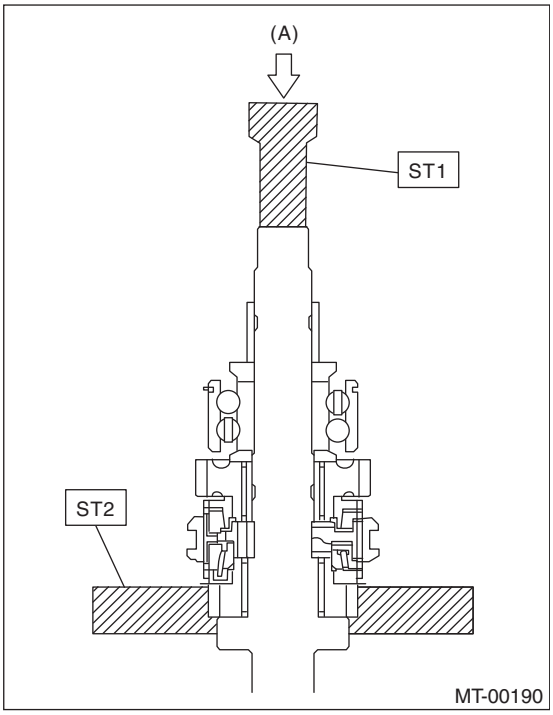
3) Remove the 5th hub & sleeve No. 2, baulk lever, baulk ring, and the 5th drive gear & needle bearing.



(A) 5th hub & sleeve No. 2
(B) Baulk ring
(C) 5th drive gear

4) Using ST1 and ST2, remove the rest of the parts.

NOTE:
• When replacing the sleeve & hub, replace them as a set.
• Do not disassemble the sleeve & hub; the aligning position is pre-matched.
• If it is necessary to disassemble, mark the engaging points on the splines beforehand.
ST1 899864100 REMOVER
ST2 899714110 REMOVER

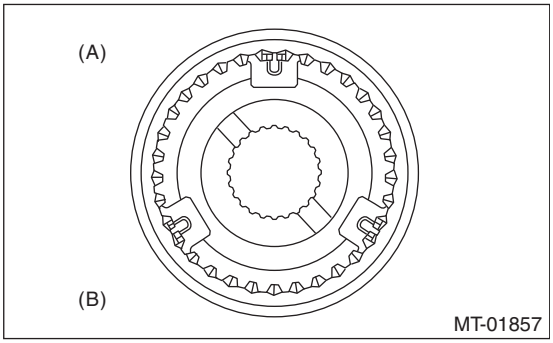


(A) Press

D: ASSEMBLY

1) When the sleeve & hub assemblies have been disassembled, reassemble by aligning the alignment marks.

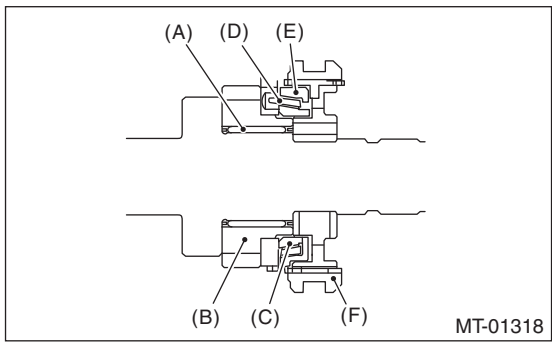
NOTE:
Position the open ends of the spring 120° apart.



(A) 3rd-4th hub ASSY
(B) 3rd gear side

2) Install the 3rd drive gear, outer baulk ring, synchro cone, inner baulk ring, sleeve & hub assembly for the 3rd needle bearing, on the transmission main shaft.

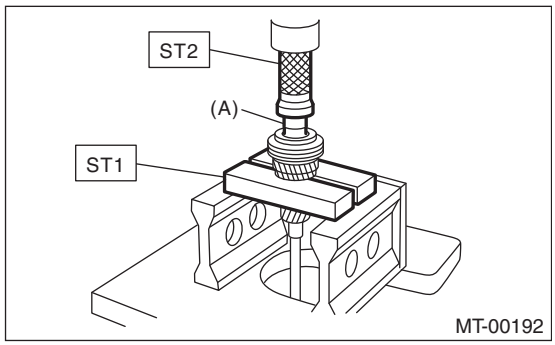
NOTE:
Align the groove in baulk ring with the shifting insert.



(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.

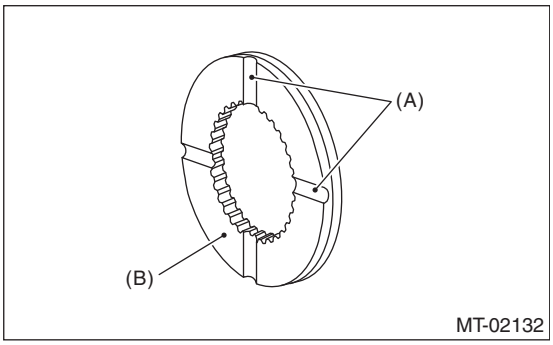
CAUTION:
Do not apply a load in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).
ST1 899714110 REMOVER
ST2 499877000 RACE 4-5 INSTALLER



(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.

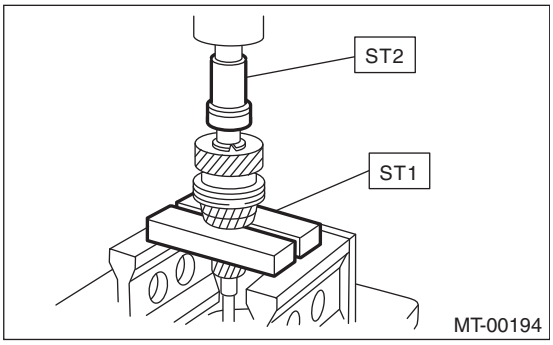
NOTE:
Align the baulk ring and sleeve & hub assembly with the key groove.



(A) Groove
(B) Face this surface to the 4th gear side.

5) Press-fit the ball bearing into the rear section of transmission main shaft using ST1, ST2 and a press.

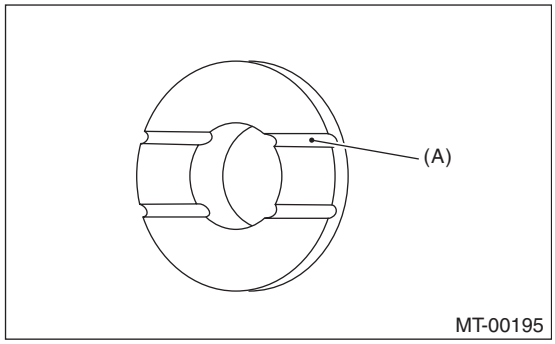
CAUTION:
Do not apply a load in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).
ST1 899714110 REMOVER
ST2 499877000 RACE 4-5 INSTALLER



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).

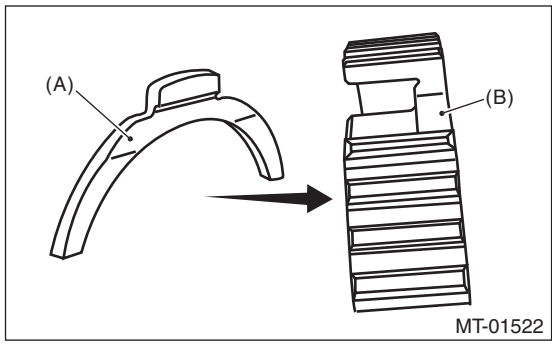
NOTE:
Make sure the thrust washer is facing the correct direction.
ST1 899714110 REMOVER
ST2 499877000 RACE 4-5 INSTALLER



(A) Face this surface to the 5th gear side.

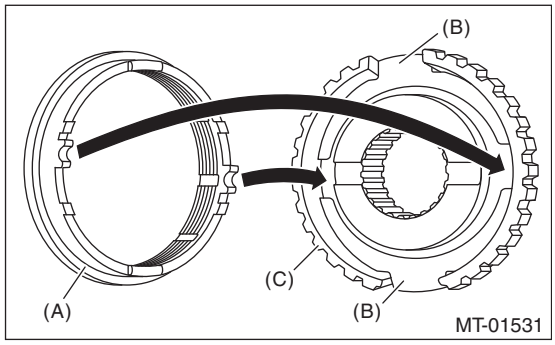
7) Install rest of the parts to the rear section of the transmission main shaft.

CAUTION:
• Install the baulk lever so that the concave side faces toward the 5th hub.

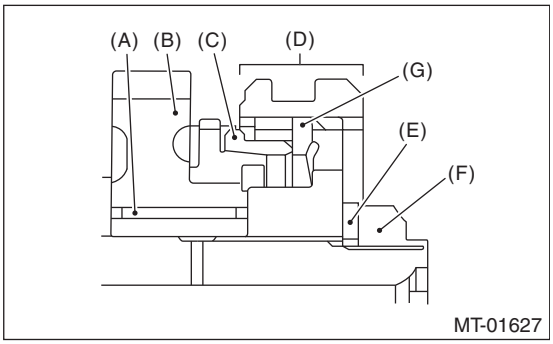


(A) Baulk lever
(B) 5th hub

• Align the protruded section of baulk ring between the baulk levers.



(A) Baulk ring
(B) Baulk lever
(C) 5th hub



(A) Needle bearing
(B) 5th drive gear
(C) Baulk ring
(D) 5th hub & sleeve No. 2
(E) Lock washer
(F) Lock nut
(G) Baulk lever

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

NOTE:
Use new lock nuts and lock washers.

Tightening torque:
120 N·m (12.2 kgf-m, 88.5 ft-lb)

ST1 499987003 SOCKET WRENCH (35)
ST2 498937000 TRANSMISSION HOLDER

9) Crimp lock nuts in two locations after tightening.

E: INSPECTION

Disassembled parts should be washed clean first with cleaning solvent and then inspected carefully.

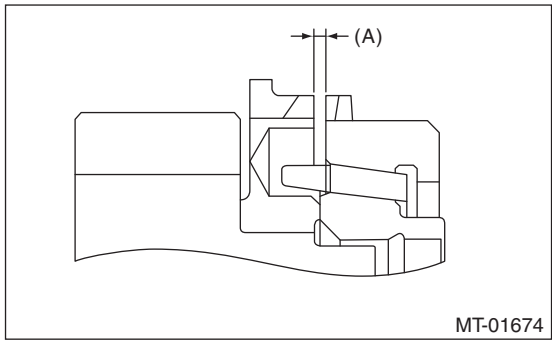
1) Bearing
Replace the bearings in the following cases.
• When the bearing balls, outer races and inner races are broken or rusty.
• When the bearing is worn.
• When the bearings fail to turn smoothly or emit noise in rotation after gear oil lubrication.
• When bearing has other defects.

2) Bushing (each gear)
Replace the bushing in following cases.
• When the sliding surface is damaged or abnormally worn.
• When the inner wall is abnormally worn.

3) Gear
Replace gears in the following cases.
• Replace 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.
• Repair or replace if the inner surface or end face is damaged.

4) Baulk ring
Replace the baulk rings in the following cases.
• When the inner surface and end face are damaged.
• When the ring inner surface is abnormally or partially worn down.
• When the contact surface of synchronizer ring insert is cracked or abnormally worn.
• If the gap between the end faces of the ring and the gear splined part is excessively small, check the clearance (A) while pressing the ring against the cone.

Clearance (A):
0.5 mm (0.020 in) or more



5) Shifting insert key
Replace the insert key if deformed, excessively worn or defective in any way.

6) Oil seal
Replace the oil seal if the lip is deformed, hardened, worn or defective in any way.

7) O-ring
Replace the O-ring if the sealing face is deformed, hardened, damaged, worn or defective in any way.

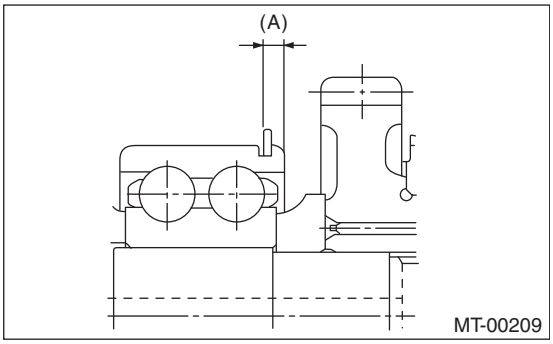
8) Gearshift mechanism
Repair or replace the gearshift mechanism if excessively worn, bent or defective in any way.

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 498147001 DEPTH GAUGE

Dimension (A) mm (in)	Part No.	Mark
4.00 — 4.13 (0.1575 — 0.1626)	32294AA041	1
3.87 — 4.00 (0.1524 — 0.1575)	32294AA051	2

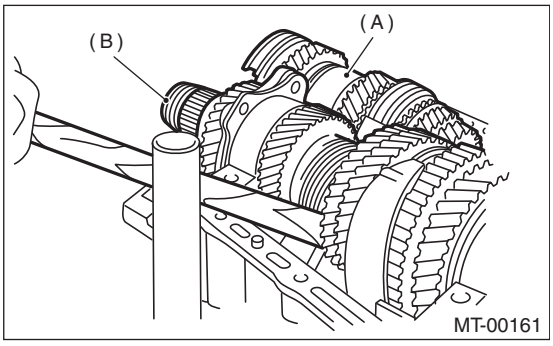


16.Drive Pinion Shaft Assembly

A: REMOVAL

1) Remove the manual transmission assembly from the vehicle. <Ref. to 5MT-23, REMOVAL, Manual Transmission Assembly.>
2) Remove the transfer case together with the extension case assembly. <Ref. to 5MT-37, 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.

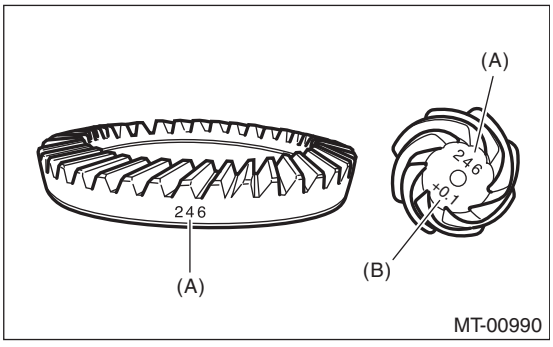
NOTE:
Use a hammer handle, etc. to remove if too tight.



(A) Main shaft ASSY for single-range
(B) Drive pinion shaft ASSY

B: INSTALLATION

1) Remove the front differential assembly.
2) Hypoid gear set match mark/No.: The number (A) on top of the drive pinion, and the number on the hypoid driven gear are set numbers for the two gears. Use a pair having the same numbers.
The figure (B) below shows a number for shim adjustment. If no number is shown, the value is zero.

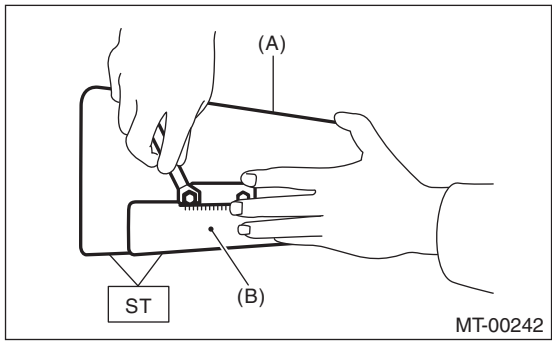


(A) Set number
(B) Number for shim adjustment

3) Place the drive pinion shaft assembly on transmission main case RH without shim and tighten the bearing mounting bolts.
4) Check and adjust the 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



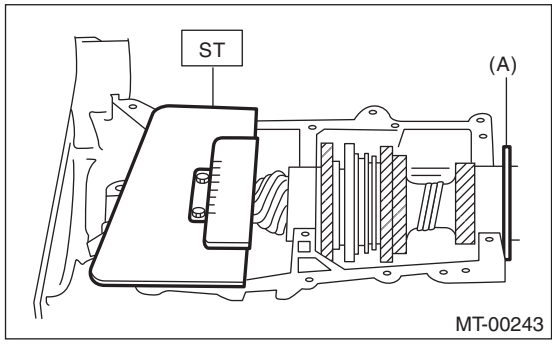
(A) Plate
(B) Scale

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

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.

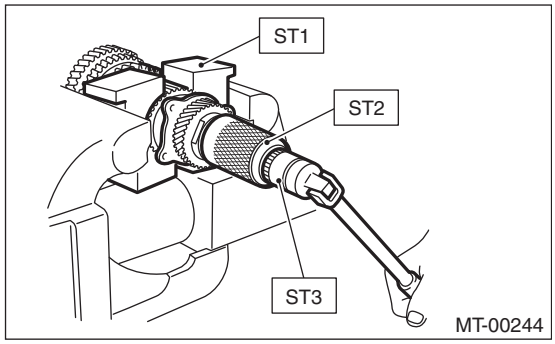
Drive pinion shim	
Part No.	Thickness mm (in)
32295AA031	0.150 (0.0059)
32295AA041	0.175 (0.0069)
32295AA051	0.200 (0.0079)
32295AA061	0.225 (0.0089)
32295AA071	0.250 (0.0098)
32295AA081	0.275 (0.0108)
32295AA091	0.300 (0.0118)
32295AA101	0.500 (0.0197)

9) Install the front differential assembly. <Ref. to 5MT-68, INSTALLATION, Front Differential Assembly.>
10) Set the transmission main shaft assembly for single-range and drive pinion shaft assembly in position. Inspect a suitable 1st-2nd, 3rd-4th and 5th shifter fork so that the coupling sleeve and reverse driven gear are positioned in the center of the synchronizing mechanism. <Ref. to 5MT-79, INSPECTION, Shifter Fork and Rod.>
11) Install the transmission case. <Ref. to 5MT-51, INSTALLATION, Transmission Case.>
12) Install the transfer case together with the extension case assembly. <Ref. to 5MT-37, INSTALLATION, Transfer Case and Extension Case Assembly.>
13) Install the manual transmission assembly to the vehicle. <Ref. to 5MT-25, INSTALLATION, Manual Transmission Assembly.>

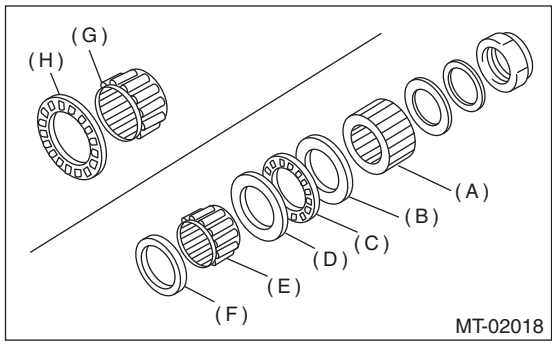
C: DISASSEMBLY

NOTE:
Attach a cloth to the end of driven shaft (on the frictional side of the thrust needle bearing) to prevent damage during disassembly or reassembly.

1) Flatten the tab of the lock nut. Remove the lock nut with ST1, ST2 and ST3.
ST1 899884100 HOLDER
ST2 498427100 STOPPER
ST3 899988608 SOCKET WRENCH (27)



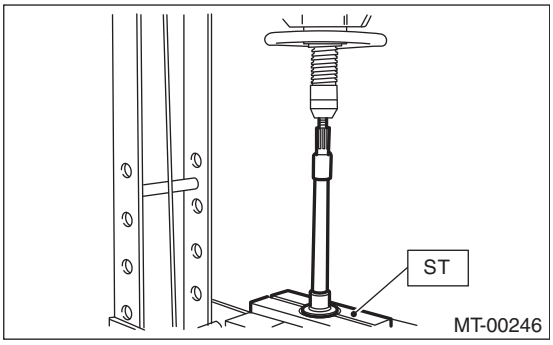
2) Draw out the drive pinion shaft from driven shaft. Remove the differential bevel gear sleeve, adjusting washer No. 1, adjusting washer No. 2, thrust bearing, needle bearing and drive pinion collar.



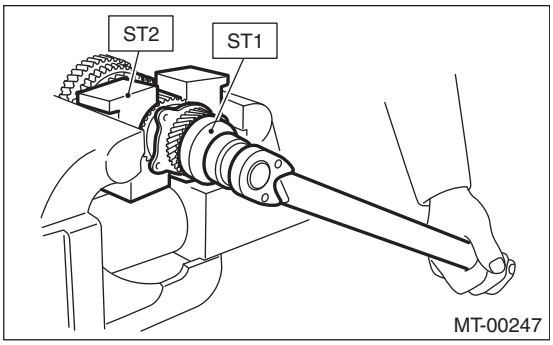
(A) Differential bevel gear sleeve
(B) Adjusting washer No. 1 (25 × 37.5 × t)
(C) Thrust bearing (25 × 37.5 × 3)
(D) Adjusting washer No. 2 (25 × 37.5 × t)
(E) Needle bearing (25 × 30 × 20)
(F) Drive pinion collar
(G) Needle bearing (30 × 37 × 23)
(H) Thrust bearing (33 × 50 × 3)

3) Remove the roller bearing and washer using ST and a press.

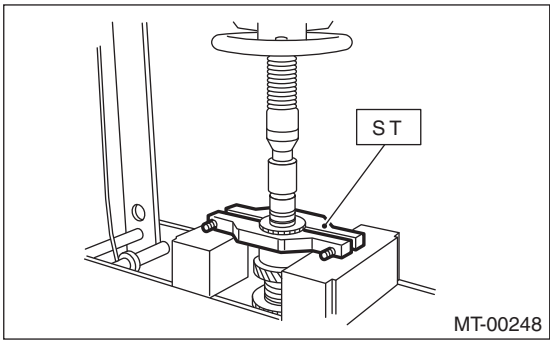
NOTE:
Do not reuse the roller bearing.
ST 498077000 REMOVER



4) Flatten the tab of the lock nut. Remove the lock nut using ST1 and ST2.
ST1 499987300 SOCKET WRENCH (50)
ST2 899884100 HOLDER

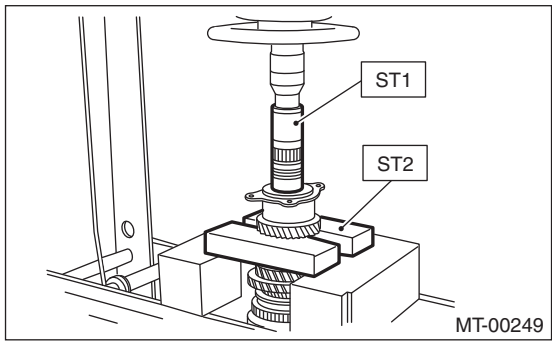


5) Remove the 5th driven gear using ST.
ST 499857000 5TH DRIVEN GEAR REMOVER

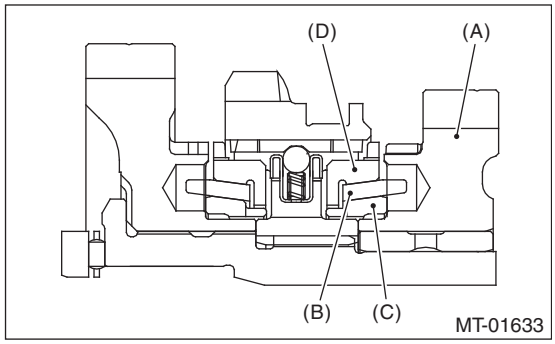


6) Remove the woodruff key.

7) Remove the roller bearing and 3rd-4th driven gear using ST1 and ST2.
ST1 499757002 INSTALLER
ST2 899714110 REMOVER

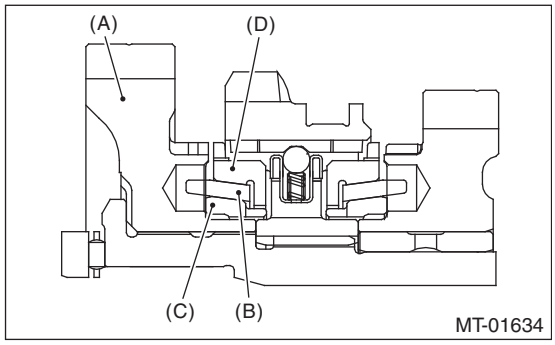


8) Remove the key.
9) Remove the 2nd driven gear, inner baulk ring, synchro cone and outer baulk ring.



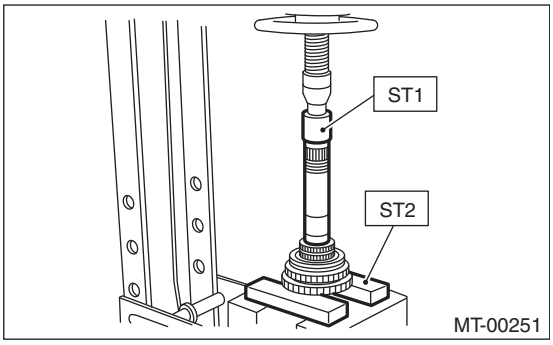
(A) 2nd driven gear
(B) Synchro cone
(C) Inner baulk ring
(D) Outer baulk ring

10) Remove the 1st driven gear, inner baulk ring, synchro cone, outer baulk ring, 2nd gear bushing, gear and hub using ST1 and ST2.



(A) 1st driven gear
(B) Synchro cone
(C) Inner baulk ring
(D) Outer baulk ring

NOTE:
If necessary, use a new gear and hub assembly as a set, when replacing the gear or hub. Because these must engage at the specified point, avoid disassembly as much as possible. If it must be disassembled, mark the engaging point on the spline beforehand.
ST1 499757002 INSTALLER
ST2 899714110 REMOVER

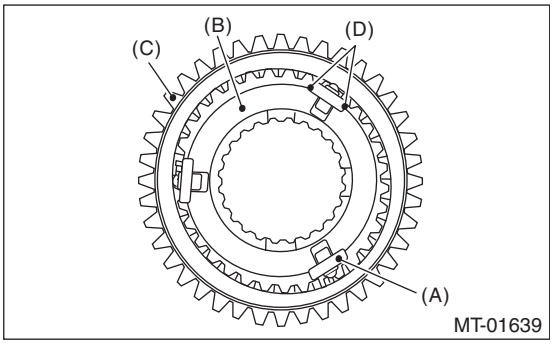


11) Remove the sub gear, washer and snap ring (outer) of the 1st driven gear.

D: ASSEMBLY

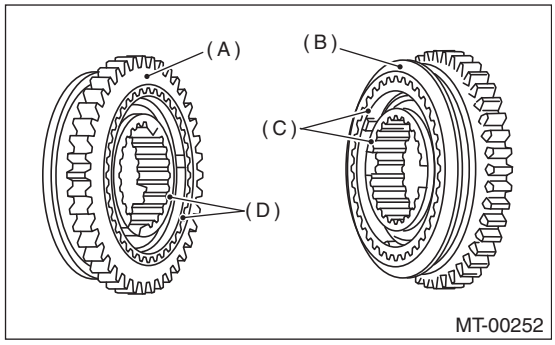
1) Install the sleeve and the gear & hub assembly by matching the alignment marks.

NOTE:
• Make sure that there is no large clearance at both sides of ball detent after assembly.



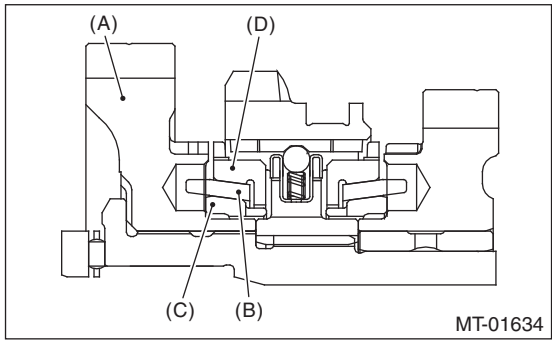
(A) Ball detent
(B) 1st-2nd synchronizer hub
(C) Reverse driven gear
(D) There is no large clearance at this part.

• Use the new gear & hub assembly, if replacing the gear or hub.



(A) 1st gear side
(B) 2nd gear side
(C) Flush surface
(D) Stepped surface

2) Install the washer, snap ring (outer) and sub gear onto the 1st driven gear.
3) Install the 1st driven gear, inner baulk ring, synchro cone, outer baulk ring, and gear & hub assembly onto driven shaft.

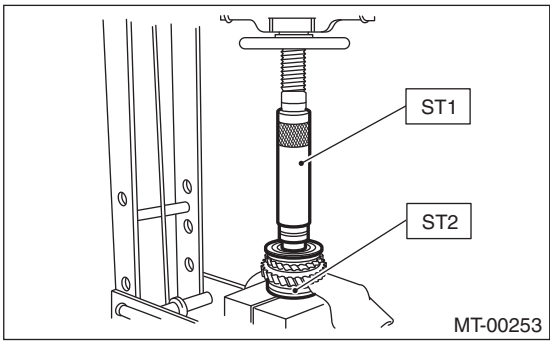


(A) 1st driven gear
(B) Synchro cone
(C) Inner baulk ring
(D) Outer baulk ring

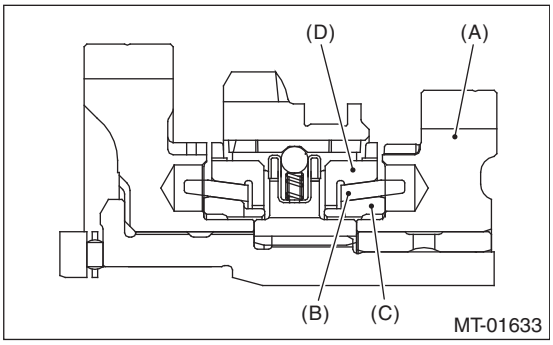
NOTE:
• Take care to install the gear and hub assembly in proper direction.
• Align the baulk ring and gear & hub assembly with the key groove.
4) Install the 2nd driven gear bushing onto driven shaft using ST1, ST2 and a press.

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 the driven shaft to prevent damage.
• When press fitting, align the oil holes of the shaft and bushing
ST1 499277200 INSTALLER
ST2 499587000 INSTALLER



5) Install the 2nd driven gear, inner baulk ring, synchro cone and outer baulk ring, and insert them onto driven shaft.

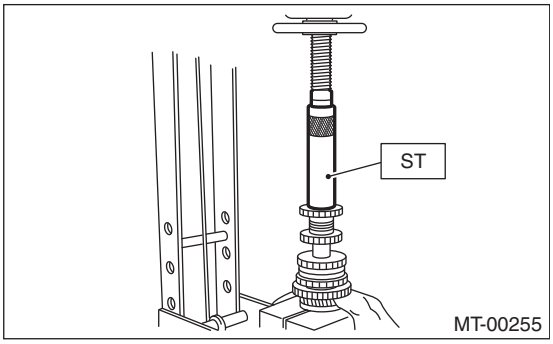


(A) 2nd driven gear
(B) Synchro cone
(C) Inner baulk ring
(D) Outer baulk ring

6) After installing key on driven shaft, install the 3rd-4th driven gear using an ST and a press.

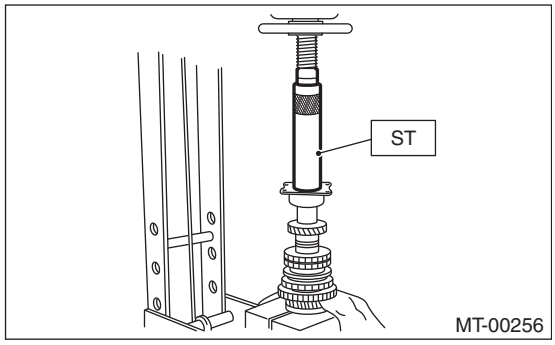
CAUTION:
Do not apply a load in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

NOTE:
Align the groove in baulk ring with the insert.
ST 499277200 INSTALLER



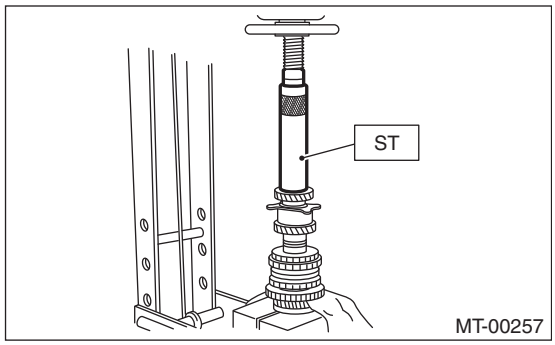
7) Install a set of roller bearings onto the driven shaft using ST and a press.

CAUTION:
Do not apply a load in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).
ST 499277200 INSTALLER



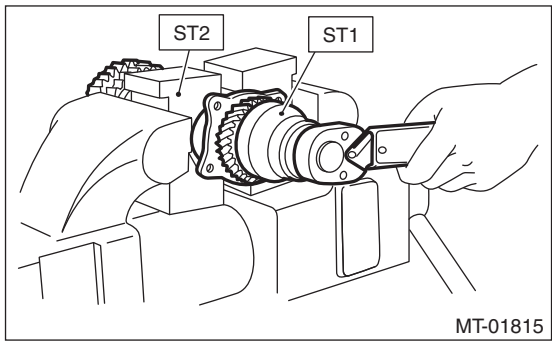
8) Position the woodruff key in groove of the rear of driven shaft. Install the 5th driven gear onto driven shaft using ST and a press.

CAUTION:
Do not apply a load in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).
ST 499277200 INSTALLER

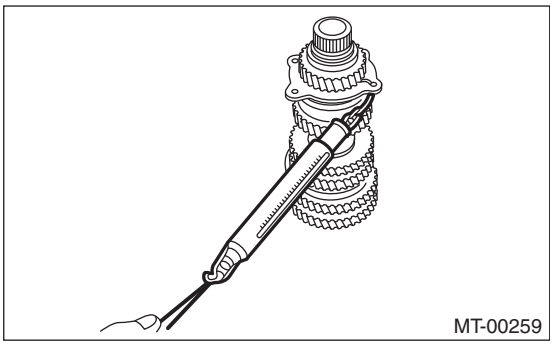


9) Install the lock washer. Tighten the lock nuts to the specified torque using ST1 and ST2.

Tightening torque:
260 N·m (26.5 kgf-m, 191.8 ft-lb)
ST1 499987300 SOCKET WRENCH (50)
ST2 899884100 HOLDER

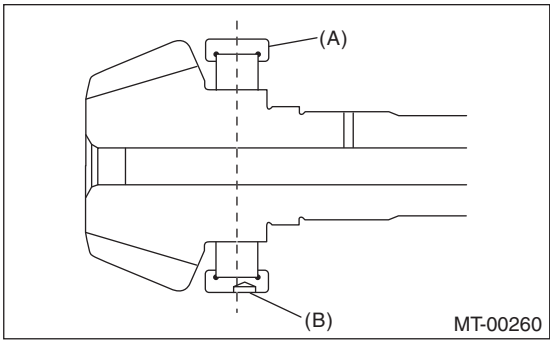


NOTE:
- Use new lock nuts and lock washers.
- Crimp the locknut in 2 locations.
- Using a spring scale, check that starting torque of the roller bearing is 0.1 to 1.5 N (0.01 to 0.15 kgf, 0.02 to 0.34 lbf).



10) Install the roller bearing onto the drive pinion shaft.

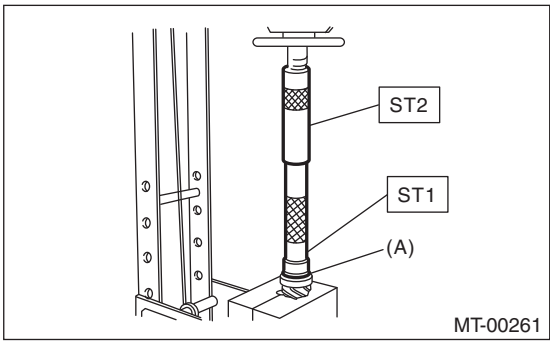
NOTE:
When installing the roller bearing, note its directions (front and rear) because the knock pin hole of outer race is offset.



(A) Roller bearing
(B) Knock pin hole

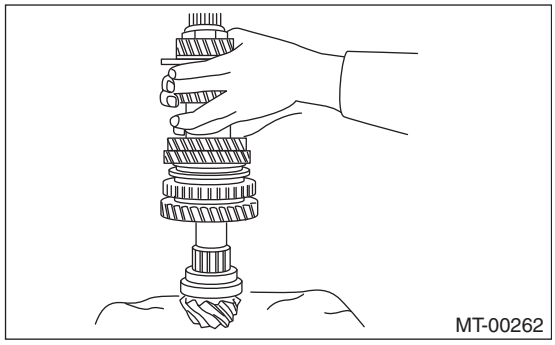
11) Install the washer using ST1, ST2 and a press.

CAUTION:
Do not apply a load in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).
ST1 499277100 BUSHING 1-2 INSTALLER
ST2 499277200 INSTALLER

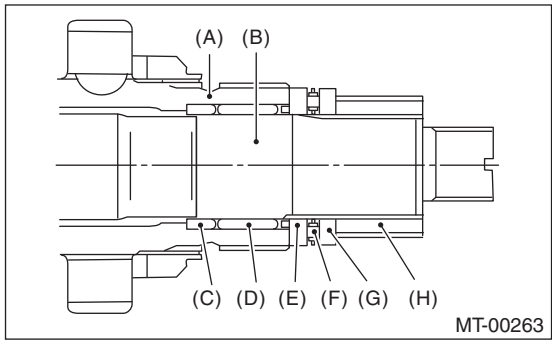


(A) Washer

12) Install the thrust bearing and needle bearing. Install the driven shaft assembly.



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.

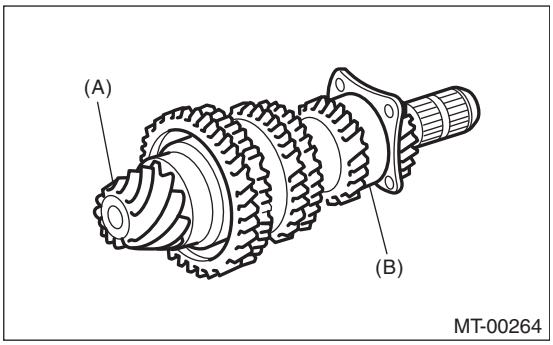


(A) Driven shaft
(B) Drive pinion shaft
(C) Drive pinion collar
(D) Needle bearing (25 × 30 × 20)
(E) Adjusting washer No. 2 (25 × 36 × t)
(F) Thrust bearing (25 × 37.5 × 3)
(G) Adjusting washer No. 1 (25 × 36 × t)
(H) Differential bevel gear sleeve

14) Adjust the thrust bearing preload. <Ref. to 5MT-65, THRUST BEARING PRELOAD, ADJUSTMENT, Drive Pinion Shaft Assembly.>

E: INSPECTION

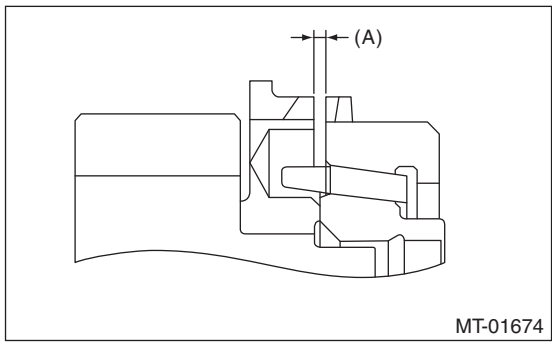
Disassembled parts should be washed clean first with cleaning solvent and then inspected carefully.
1) Bearing
Replace the bearings in the following cases.
• When the bearing balls, outer races and inner races are broken or rusty.
• When the bearing is worn.
• When the bearings fail to turn smoothly or emit noise in rotation after gear oil lubrication.
• The bearing on the rear side of the drive pinion shaft should be checked for smooth rotation before the drive pinion shaft 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.



(A) Drive pinion shaft
(B) Ball bearing

• When bearing has other defects.
2) Bushing (each gear)
Replace the bushing in following cases.
• When the sliding surface is damaged or abnormally worn.
• When the inner wall is abnormally worn.
3) Gear
Replace gears in the following cases.
• Replace 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.
• Repair or replace if the inner surface or end face is damaged.
4) Baulk ring
Replace the baulk rings in the following cases.
• When the inner surface or end face is damaged.
• When the ring inner surface is abnormally or partially worn down.
• When the contact surface of the synchronizer ring insert section is scratched or abnormally worn.
• If the gap between the end faces of the ring and the gear splined part is excessively small, check the clearance (A) while pressing the ring against the cone.

Clearance (A):
0.5 mm (0.020 in) or more

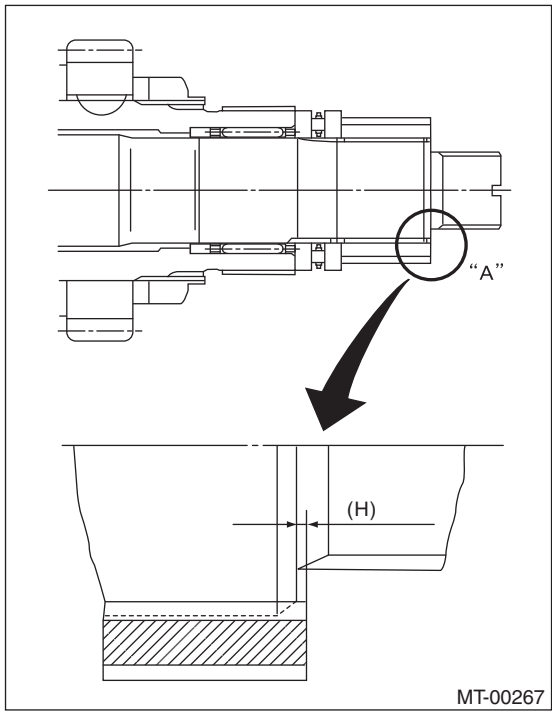


5) Ball detent
Replace the ball detent if deformed, excessively worn or defective in any way.
6) Oil seal
Replace the oil seal if the lip is deformed, hardened, worn or defective in any way.
7) O-ring
Replace the O-ring if the sealing face is deformed, hardened, damaged, worn or defective in any way.

F: ADJUSTMENT

1. THRUST BEARING PRELOAD

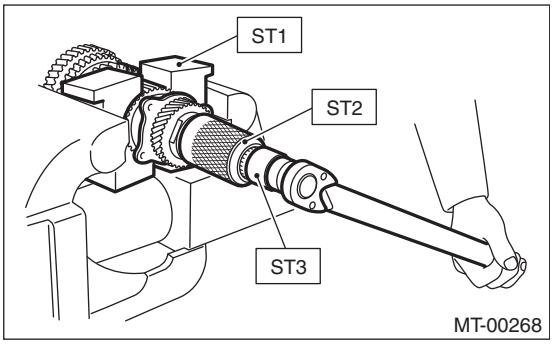
1) Select a suitable adjusting washer No. 1 so that dimension (H) will be zero in a visual check. Position the washer (18.3 × 30 × 4) and lock washer (18 × 30 × 2) and attach the lock nut. (18 × 13.5)



2) Using the ST1, ST2 and ST3, tighten the lock nut to the specified torque.

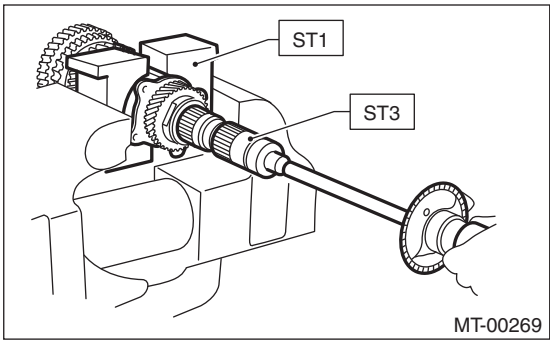
NOTE:
Use new lock nuts and lock washers.

Tightening torque:
120 N·m (12.2 kgf-m, 88.5 ft-lb)
ST1 899884100 HOLDER
ST2 498427100 STOPPER
ST3 899988608 SOCKET WRENCH (27)

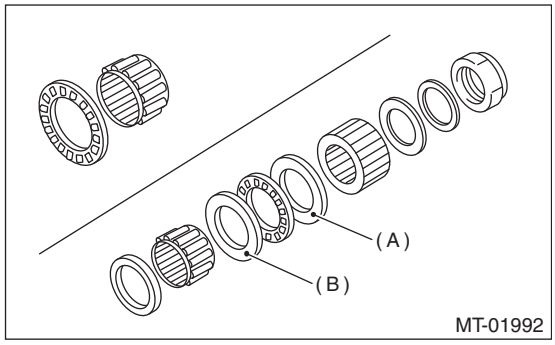


3) After removing the ST2, measure the starting torque using torque driver.

Starting torque:
0.3 — 0.8 N·m (0.03 — 0.08 kgf-m, 0.2 — 0.6 ft-lb)
ST1 899884100 HOLDER
ST3 899988608 SOCKET WRENCH (27)



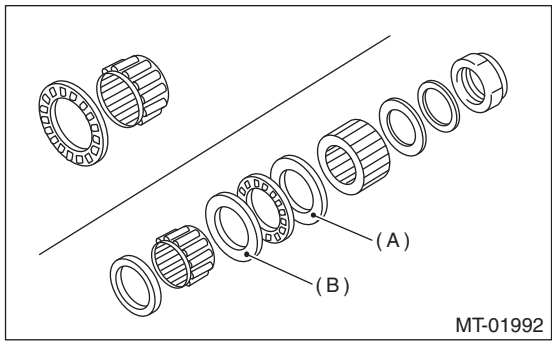
4) If the starting torque is not within the specified limit, select new adjusting washer No. 1 and re-check starting torque.



(A) Adjusting washer No. 1
(B) Adjusting washer No. 2

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)

5) If the specified starting torque cannot be obtained by the selection of adjusting washer No. 1, select adjusting washer No. 2 from the list below. Repeat steps 1) through 4) to adjust starting torque.



(A) Adjusting washer No. 1
(B) Adjusting washer No. 2

Starting torque	Dimension H	Adjusting 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)

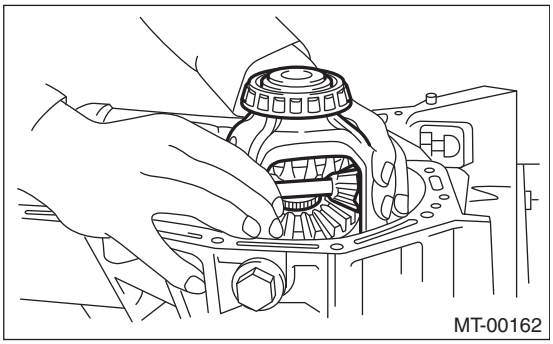
6) Recheck that the starting torque is within the specified range, then crimp the lock nut at four positions.

17.Front Differential Assembly

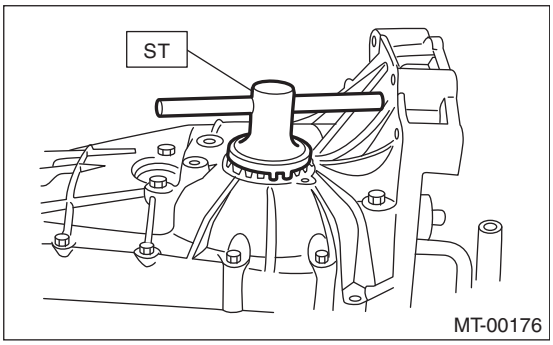
A: REMOVAL

1) Remove the manual transmission assembly from the vehicle. <Ref. to 5MT-23, REMOVAL, Manual Transmission Assembly.>
2) Remove the transfer case together with the extension case assembly. <Ref. to 5MT-37, 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. <Ref. to 5MT-59, REMOVAL, Drive Pinion Shaft Assembly.>
5) Remove the main shaft assembly for single-range. <Ref. to 5MT-54, REMOVAL, Main Shaft Assembly for Single-Range.>
6) Remove the front differential assembly.

NOTE:
• Do not confuse the right and left roller bearing outer races.
• Be careful not to damage the oil seal of retainer.



7) Remove the differential side retainers using ST.
ST 18630AA010 WRENCH COMPL RETAINER

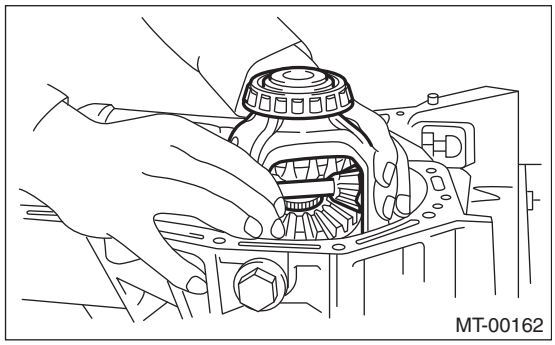


8) Remove the bearing outer race from the transmission case.
ST 398527700 PULLER ASSY

B: INSTALLATION

1) Install the differential side retainers using ST.
ST 18630AA010 WRENCH COMPL RETAINER
2) Install the bearing outer race to the transmission case.
3) Install the front differential assembly.

NOTE:
Be careful not to fold the sealing lip of oil seal.

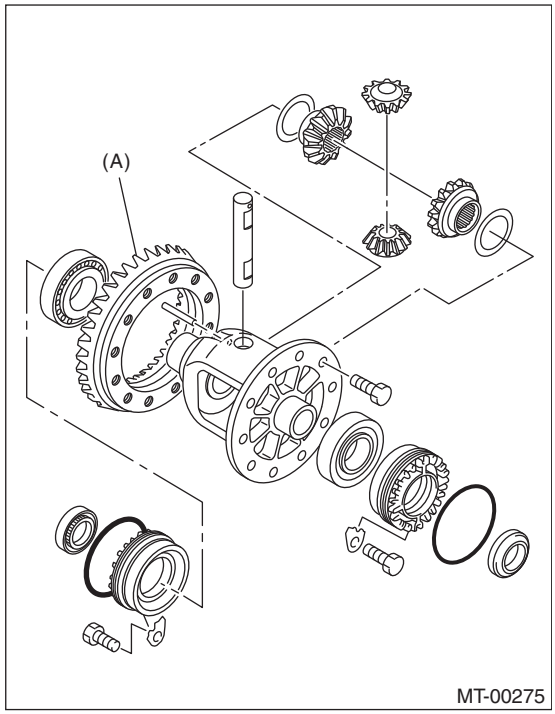


4) Install the main shaft assembly for single-range. <Ref. to 5MT-54, INSTALLATION, Main Shaft Assembly for Single-Range.>
5) Install the drive pinion shaft assembly. <Ref. to 5MT-59, INSTALLATION, Drive Pinion Shaft Assembly.>
6) Install the transmission case. <Ref. to 5MT-51, INSTALLATION, Transmission Case.>
7) Install the transfer case together with the extension case assembly. <Ref. to 5MT-37, INSTALLATION, Transfer Case and Extension Case Assembly.>
8) Install the manual transmission assembly to the vehicle. <Ref. to 5MT-25, INSTALLATION, Manual Transmission Assembly.>

C: DISASSEMBLY

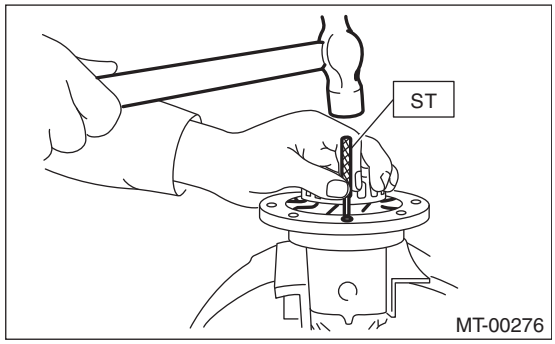
1. DIFFERENTIAL CASE ASSEMBLY

1) Loosen the twelve bolts and remove hypoid driven gear.

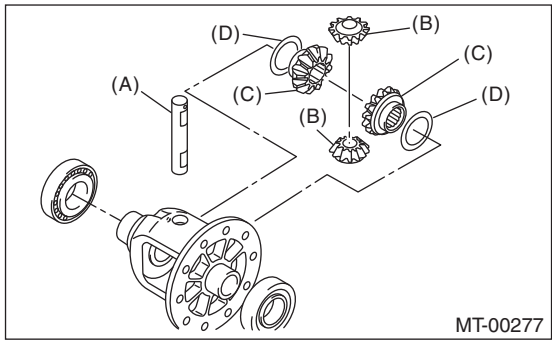


(A) Hypoid driven gear

2) Drive out the straight pin from differential assembly toward hypoid driven gear side.
ST 899904100 STRAIGHT PIN REMOVER

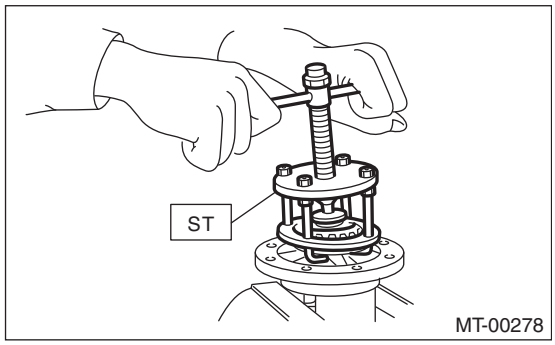


3) Pull out the pinion shaft, and remove the differential bevel pinion, differential bevel gear and washer.



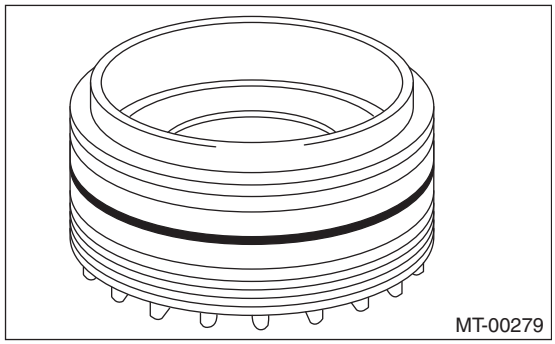
(A) Pinion shaft
(B) Differential bevel pinion
(C) Differential bevel gear
(D) Washer

4) Using the ST, remove the roller bearing.
ST 899524100 PULLER SET



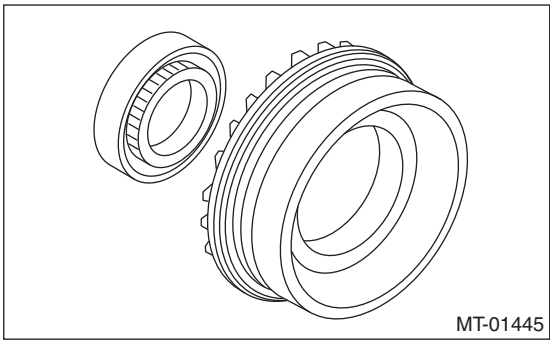
2. SIDE RETAINER

1) Remove the O-ring.



2) Remove the oil seal.

NOTE:
• Remove using the flat tip screwdriver.
• Do not reuse the oil seal. Replace the oil seal with a new part.

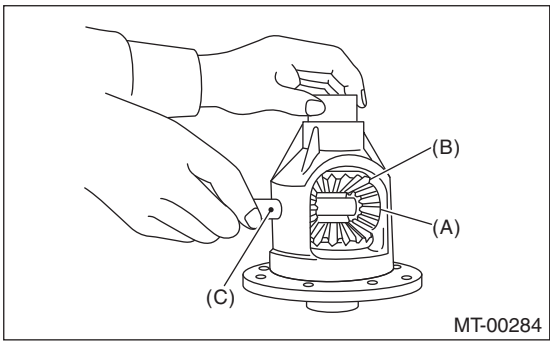


D: ASSEMBLY

1. DIFFERENTIAL CASE ASSEMBLY

1) Install the differential bevel gear and differential bevel pinion together with washer, and insert the pinion shaft.

NOTE:
Face the chamfered side of washer toward gear.



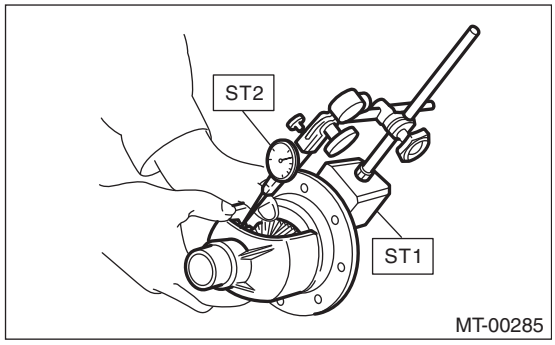
(A) Differential bevel pinion
(B) Differential bevel gear
(C) Pinion shaft

2) Measure the backlash between differential bevel gear and differential bevel pinion. If backlash is not within specified value, install a suitable washer to adjust. <Ref. to 5MT-72, BEVEL PINION GEAR BACKLASH, INSPECTION, Front Differential Assembly.>

NOTE:
Be sure the pinion gear teeth contacts adjacent gear teeth during measurement.

Standard backlash
0.13 — 0.18 mm (0.0051 — 0.0071 in)

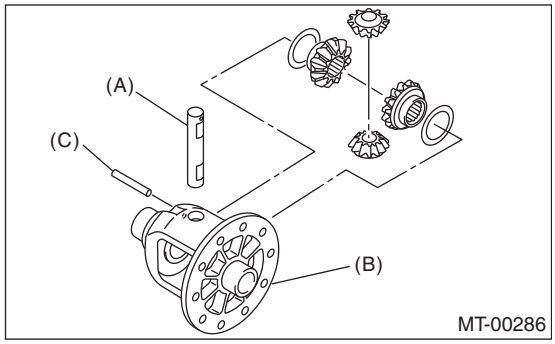
ST1 498247001 MAGNET BASE
ST2 498247100 DIAL GAUGE



3) Align the pinion shaft and differential case with each hole, and drive the straight pin into the holes from the hypoid driven gear using the ST.

NOTE:
Lock the straight pin after installing.

ST 899904100 STRAIGHT PIN REMOVER

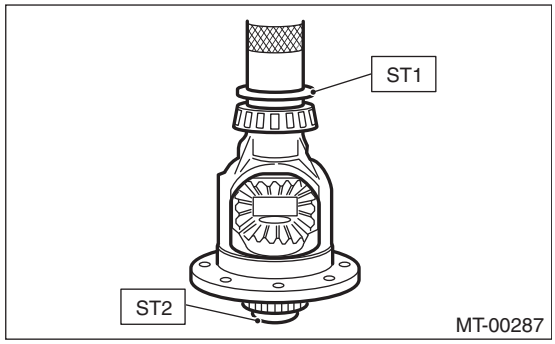


(A) Pinion shaft
(B) Differential case
(C) Straight pin

4) Install the roller bearing to differential case.

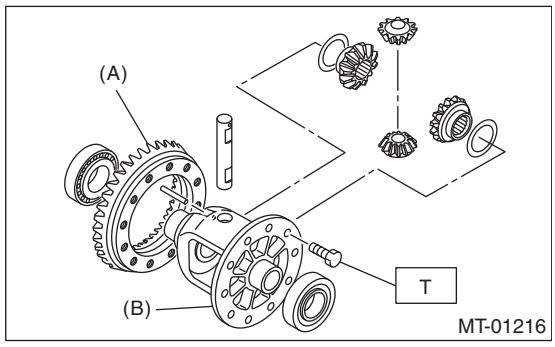
CAUTION:
Do not apply a load in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

NOTE:
Be careful because the roller bearing outer races are used as a set.
ST1 499277100 BUSHING 1-2 INSTALLER
ST2 398497701 ADAPTER



5) Install the hypoid driven gear to the differential case using twelve bolts.

Tightening torque:
T: 62 N·m (6.3 kgf-m, 45.7 ft-lb)



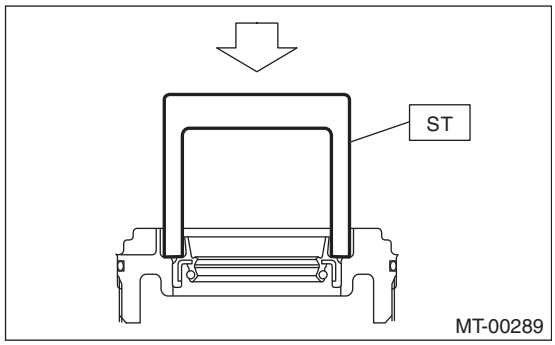
(A) Hypoid driven gear
(B) Differential case

2. SIDE RETAINER

1) Install the oil seal.

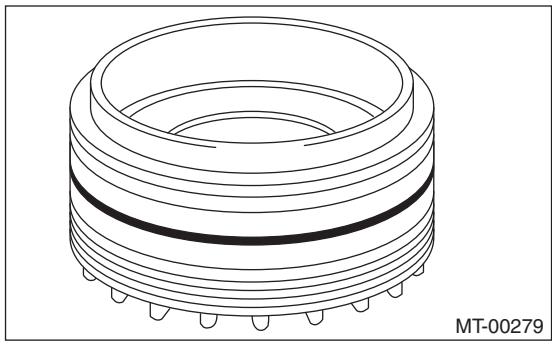
CAUTION:
• Apply transmission gear oil to the oil seal lips, and install the oil seal while being careful not to deform the lip.
• When press-fitting the oil seal to the side retainer, tap with a plastic hammer etc. to press in.
• Never use a press.

NOTE:
Use a new oil seal.
ST 18675AA000 DIFFERENTIAL SIDE OIL SEAL INSTALLER



2) Install the O-ring.

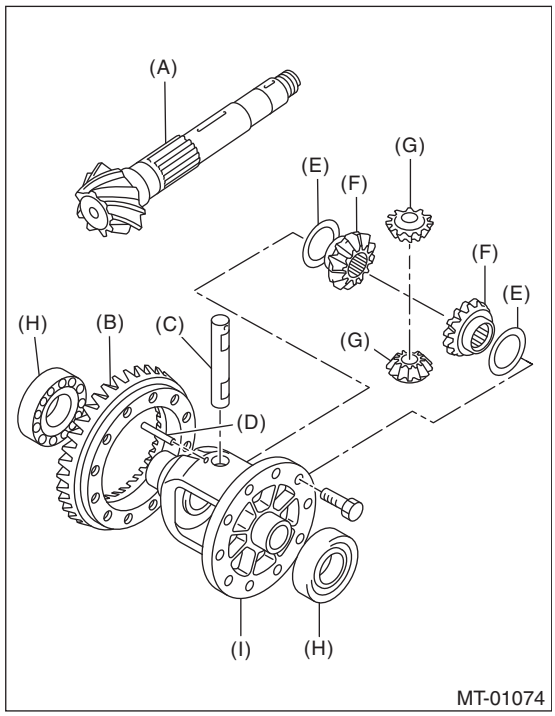
NOTE:
• Use new O-rings.
• Do not stretch or damage the O-ring.



E: INSPECTION

Repair or replace the differential gear in the following cases:

- When the hypoid drive gear and drive pinion shaft tooth surfaces are damaged, excessively worn, or seized.
- When the roller bearing on the drive pinion shaft has a worn or damaged roller path.
- When there is damage, wear or seizure of the differential bevel pinion, differential bevel gear, washer, pinion shaft or straight pin.
- When the differential case sliding surfaces are worn or damaged.



(A) Drive pinion shaft
(B) Hypoid driven gear
(C) Pinion shaft
(D) Straight pin
(E) Washer
(F) Differential bevel gear
(G) Differential bevel pinion
(H) Roller bearing
(I) Differential case

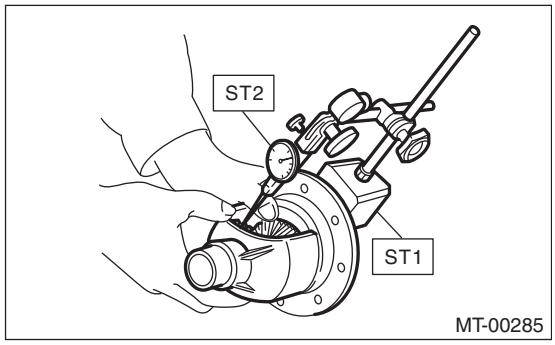
1. BEVEL PINION GEAR BACKLASH

Measure the backlash between differential bevel gear and differential bevel pinion. If backlash is not within specified value, install a suitable washer to adjust. <Ref. to 5MT-73, ADJUSTMENT, Front Differential Assembly.>

NOTE:
Be sure the pinion gear teeth contacts adjacent gear teeth during measurement.

Standard backlash
0.13 — 0.18 mm (0.0051 — 0.0071 in)

ST1 498247001 MAGNET BASE
ST2 498247100 DIAL GAUGE



2. HYPOID GEAR BACKLASH

1) Set the ST1, ST2 and ST3. Insert the needle through transmission oil drain plug hole so that the needle comes in contact with the tooth surface on the right corner, and check the backlash.

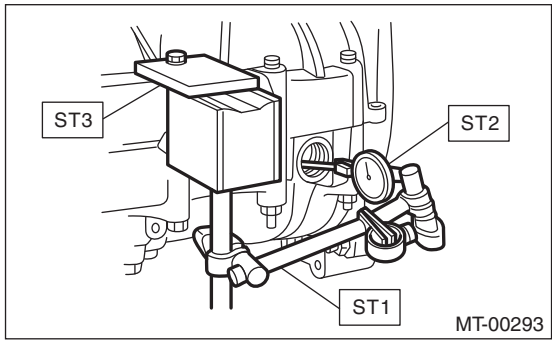
ST1 498247001 MAGNET BASE
ST2 498247100 DIAL GAUGE
ST3 498255400 PLATE

2) Install SUBARU genuine axle shafts to both sides, rotate in the inversion direction so that the gauge contacts the tooth surface, and read the dial gauge

NOTE:
If the backlash is outside the specified range, adjust it by turning the side retainer in the right side case.

Backlash
0.13 — 0.18 mm (0.0051 — 0.0071 in)

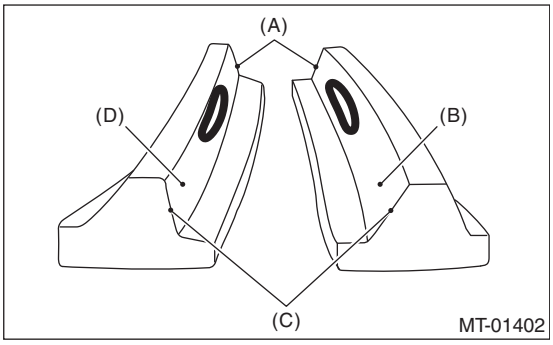
Part No. 38415AA100 AXLE SHAFT



3. TOOTH CONTACT OF HYPOID GEAR

Check tooth contact of hypoid gear as follows: Apply a thin uniform coat of red lead on both teeth surfaces on 3 or 4 teeth of the hypoid gear. Move the hypoid gear back and forth by turning the transmission main shaft until a definite contact pattern is developed on the hypoid gear, and judge whether face contact is correct. When the contact pattern is not correct, adjust it. <Ref. to 5MT-73, ADJUSTMENT, Front Differential Assembly.>

- Tooth contact is correct.



(A) Toe
(B) Coast side
(C) Heel
(D) Drive side

F: ADJUSTMENT

1. BEVEL PINION GEAR BACKLASH

1) Disassemble the front differential assembly. <Ref. to 5MT-69, DISASSEMBLY, Front Differential Assembly.>
2) Select a different washer from the table and install.

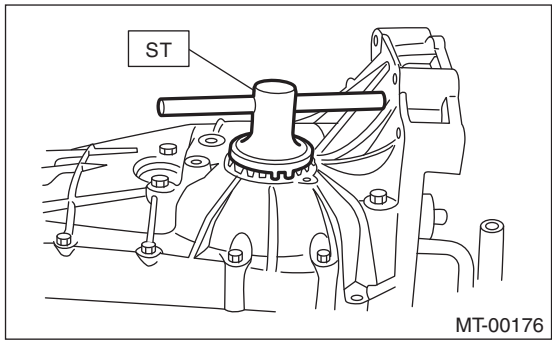
Washer	
Part No.	Thickness mm (in)
803038021	0.925 — 0.950 (0.0364 — 0.0374)
803038022	0.975 — 1.000 (0.0384 — 0.0394)
803038023	1.025 — 1.050 (0.0404 — 0.0413)

3) Adjust until the standard value is obtained.

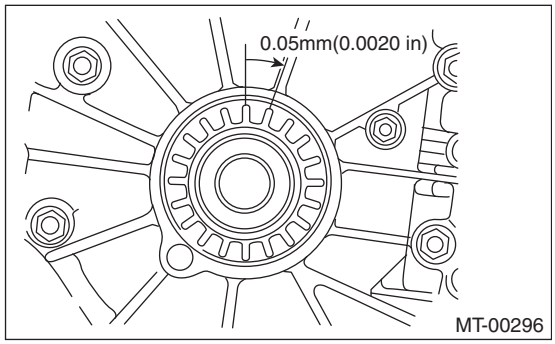
Backlash:
Standard
0.13 — 0.18 mm (0.0051 — 0.0071 in)

2. HYPOID GEAR BACKLASH

Adjust the backlash by turning the side retainer in the RH side case.
ST 18630AA010 WRENCH COMPL RETAINER



NOTE:
Each time side retainer rotates one tooth, backlash changes by 0.05 mm (0.0020 in).

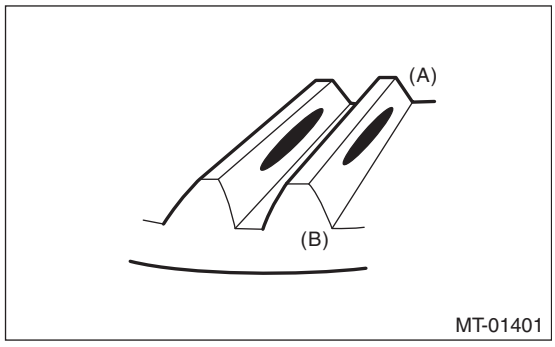


3. TOOTH CONTACT OF HYPOID GEAR

1) Adjust until correct teeth contact is obtained.
2) Check tooth contact, and perform the adjustment as follows.

- Tooth contact

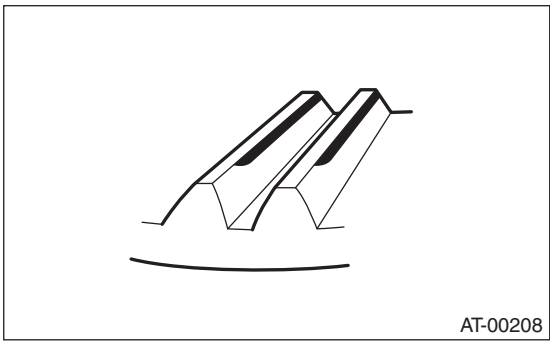
Check item: Tooth contact surface is slightly shifted toward the toe side under a no-load condition. (When driving, it moves towards the heel side.)



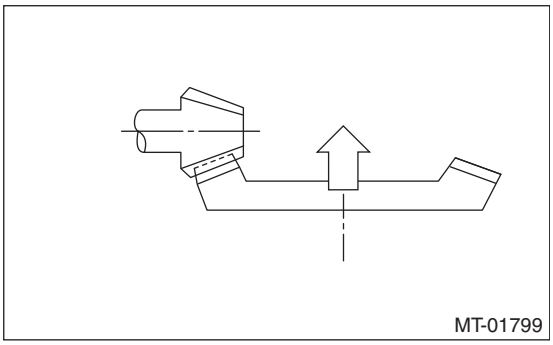
(A) Toe side
(B) Heel side

- Face contact

Check item: Backlash is too large.
Contact pattern

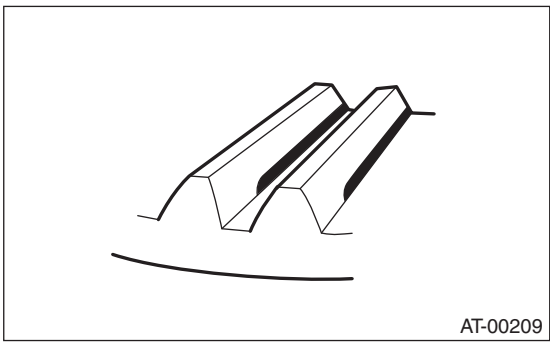


Corrective action: Tighten the side retainer to move the driven gear closer to the drive pinion shaft.

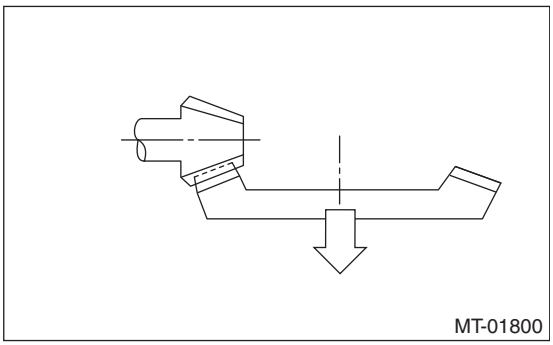


- Flank contact

Check item: Backlash is too small.
Contact pattern

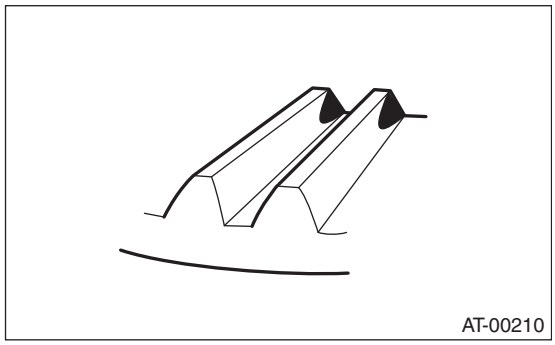


Corrective action: Loosen the side retainer to move the driven gear away from the drive pinion shaft.

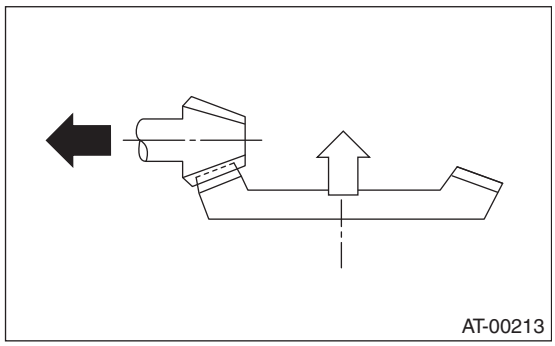


- Toe contact (inside contact)

Check item: Teeth contact area is too small.
Contact pattern



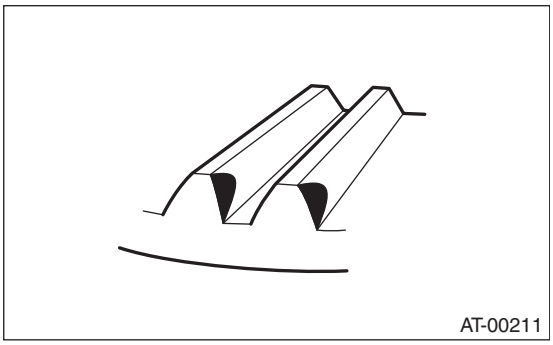
Corrective action: Increase thickness of the drive pinion shim according to the procedures for moving the drive pinion away from the driven gear. Also tighten the side retainer to move the driven gear closer to the drive pinion shaft.



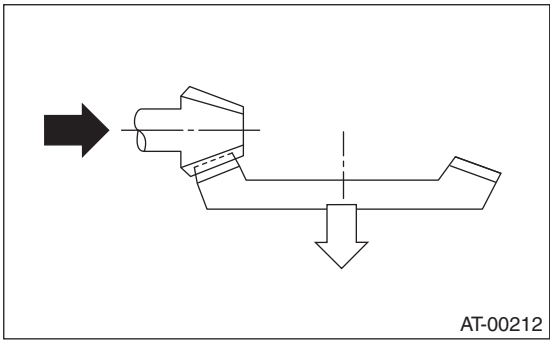
- Heel contact (outside end contact)

Check item: Teeth contact area is too small.

Contact pattern



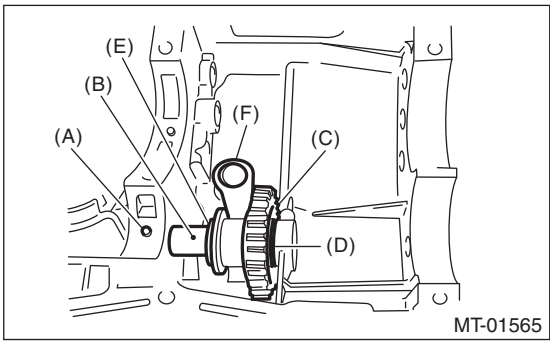
Corrective action: Reduce thickness of the drive pinion shim according to the procedures for moving the drive pinion closer to driven gear. Also loosen the side retainer to move the driven gear away from the drive pinion shaft.



18.Reverse Idler Gear

A: REMOVAL

1) Remove the manual transmission assembly from the vehicle. <Ref. to 5MT-23, REMOVAL, Manual Transmission Assembly.>
2) Remove the back-up light switch & neutral position switch. <Ref. to 5MT-34, REMOVAL, Switches and Harness.>
3) Remove the transfer case together with the extension case assembly. <Ref. to 5MT-37, 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 for single-range. <Ref. to 5MT-54, REMOVAL, Main Shaft Assembly for Single-Range.>
7) Remove the front differential assembly. <Ref. to 5MT-68, REMOVAL, Front Differential Assembly.>
8) Remove the shifter forks and rods. <Ref. to 5MT-78, REMOVAL, Shifter Fork and Rod.>
9) Pull out the straight pin, and remove the reverse idler gear shaft, washer, reverse idler gear and washer.



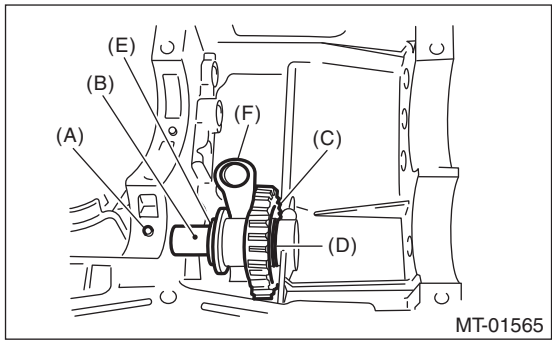
(A) Straight pin
(B) Reverse idler gear shaft
(C) Reverse idler gear
(D) Washer
(E) Washer
(F) Reverse shifter lever

10) Remove the reverse shifter lever.

B: INSTALLATION

1) Install the reverse shifter lever, washer, reverse idler gear, washer and reverse idler gear shaft, and secure them with the straight pin.

NOTE:
- Use a new straight pin.
- Be sure to install the reverse idler gear shaft from rear side.



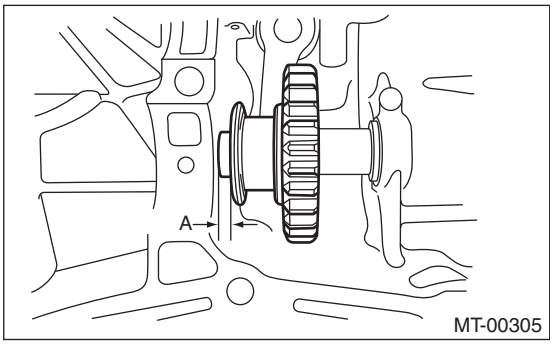
(A) Straight pin
(B) Reverse idler gear shaft
(C) Reverse idler gear
(D) Washer
(E) Washer
(F) Reverse shifter lever

2) Check and adjust clearance between the reverse idler gear and the timing case wall surface. <Ref. to 5MT-76, INSTALLATION, Reverse Idler Gear.> <Ref. to 5MT-77, ADJUSTMENT, Reverse Idler Gear.>
3) Install the shifter forks and rods. <Ref. to 5MT-78, INSTALLATION, Shifter Fork and Rod.>
4) Install the front differential assembly. <Ref. to 5MT-68, INSTALLATION, Front Differential Assembly.>
5) Install the main shaft assembly for single-range. <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-51, INSTALLATION, Transmission Case.>
8) Install the transfer case together with the extension case assembly. <Ref. to 5MT-37, INSTALLATION, Transfer Case and Extension Case Assembly.>
9) Install the back-up light switch and the neutral position switch. <Ref. to 5MT-34, INSTALLATION, Switches and Harness.>
10) Install the manual transmission assembly to the vehicle. <Ref. to 5MT-25, INSTALLATION, Manual Transmission Assembly.>

C: INSPECTION

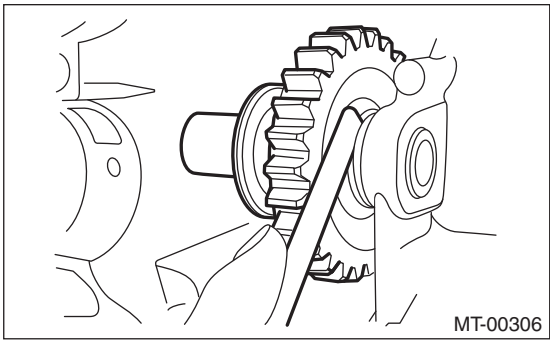
1) Move the reverse shifter rod toward the reverse side. Check the clearance between the reverse idler gear and the transmission case wall surface. If out of specification, select the appropriate reverse shifter lever and adjust.

Clearance A:
6.0 — 7.5 mm (0.236 — 0.295 in)



2) After installing a suitable reverse shifter lever, shift into neutral. Check the clearance between the reverse idler gear and the transmission case wall surface. If out of specification, select the appropriate washer and adjust.

Clearance:
0 — 0.5 mm (0 — 0.020 in)

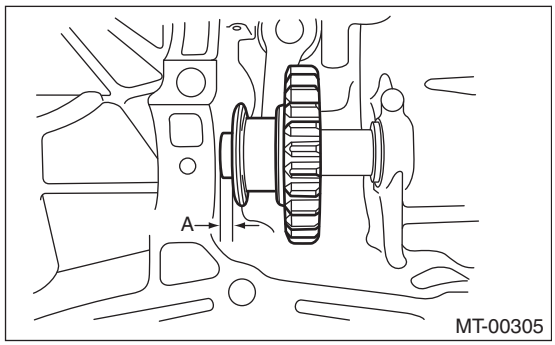


3) Check the reverse idler gear and shaft for damage. Replace if it is damaged.

D: ADJUSTMENT

1) Select the appropriate reverse shifter lever from the table below, and adjust until the clearance between the reverse idler gear and transmission case wall is within specification.

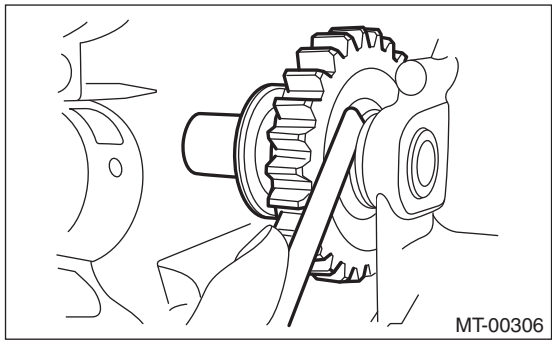
Clearance A:
6.0 — 7.5 mm (0.236 — 0.295 in)



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 clearance between the reverse idler gear and transmission case wall is within specification.

Clearance:
0 — 0.5 mm (0 — 0.020 in)

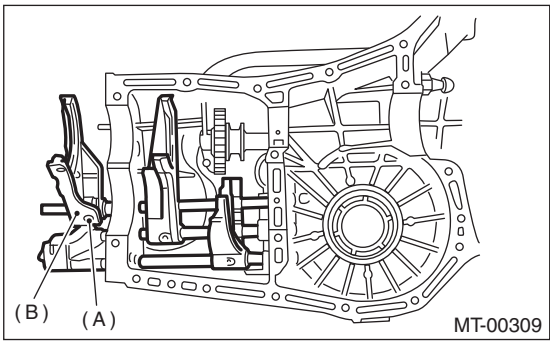


Washer	
Part No.	Thickness mm (in)
803020151	0.4 (0.016)
803020152	1.1 (0.043)
803020153	1.5 (0.059)
803020154	1.9 (0.075)
803020155	2.3 (0.091)

19.Shifter Fork and Rod

A: REMOVAL

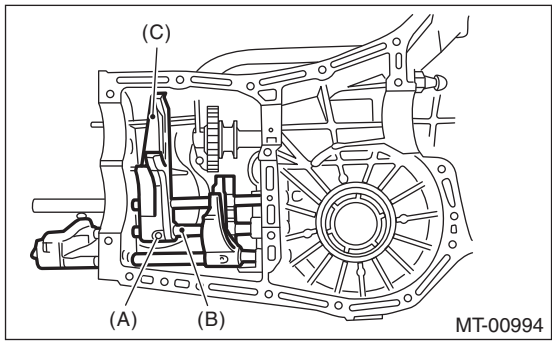
1) Remove the manual transmission assembly from the vehicle. <Ref. to 5MT-23, REMOVAL, Manual Transmission Assembly.>
2) Remove the back-up light switch & neutral position switch. <Ref. to 5MT-34, REMOVAL, Switches and Harness.>
3) Remove the transfer case together with the extension case assembly. <Ref. to 5MT-37, 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 for single-range. <Ref. to 5MT-54, REMOVAL, Main Shaft Assembly for Single-Range.>
7) Remove the front differential assembly. <Ref. to 5MT-68, 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 2



(A) Straight pin
(B) 5th shifter fork

9) Remove the plugs, springs and check balls.
10) Drive out the straight pin by tapping with the ST, and pull out the 3rd – 4th fork rod and shifter fork.

NOTE:
• When removing the rod, keep other rods in neutral.
• When pulling out the straight pin, remove it toward the inside of case so that it does not hit against the case.
ST 398791700 STRAIGHT PIN REMOVER 2



(A) Straight pin
(B) 3rd-4th fork rod
(C) Shifter fork

11) Drive out the straight pin by tapping with the ST, and pull out the 1st – 2nd fork rod and shifter fork.
ST 398791700 STRAIGHT PIN REMOVER 2
12) Remove the snap ring (outer), and pull out the reverse fork rod from reverse fork rod arm. Then take out the ball, spring and interlock plunger from the rod. And then remove the rod.

NOTE:
When pulling out the reverse fork rod arm, be careful not to let the ball pop out of arm.
13) Remove the reverse shifter lever.

B: INSTALLATION

1) 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.

NOTE:
Apply grease to the plunger to prevent it from falling.
ST 399411700 ACCENT BALL INSTALLER
2) Position the ball, spring and gasket in the reverse fork rod hole on the left side of transmission case, and tighten the checking ball plug.

NOTE:
Use a new gasket.
3) Install the 1st-2nd fork rod into 1st-2nd shifter fork through the hole on the rear of transmission case.

4) Align the holes in the rod and the fork, and drive the straight pin into these holes using the ST.

NOTE:
- Use a new straight pin.
- Set other rods to neutral.
- Make sure the interlock plunger is on the 3rd-4th fork rod side.

ST 398791700 STRAIGHT PIN REMOVER 2

5) Attach the interlock plunger on 3rd-4th fork rod.

NOTE:
Apply grease to the plunger to prevent it from falling.

6) Attach the 3rd-4th fork rod into 3rd-4th shifter fork through the hole on the rear of transmission case.

7) Align the holes in the rod and the fork, and drive the straight pin into these holes.

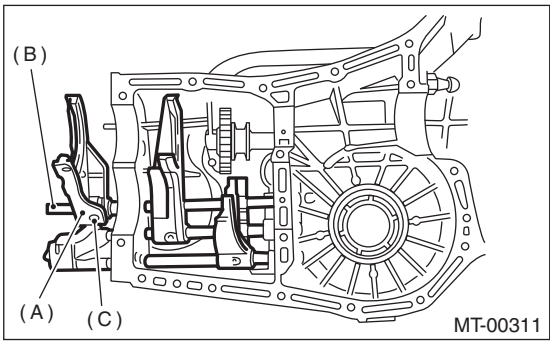
NOTE:
- Use a new straight pin.
- Set the reverse fork rod to neutral.
- Make sure the interlock plunger (before installation) is on the reverse fork rod side.

ST 398791700 STRAIGHT PIN REMOVER 2

8) Install the 5th shifter fork onto the rear of reverse fork rod. Align the holes in the two parts and drive straight pin into the specified place.

NOTE:
Use a new straight pin.

ST 398791700 STRAIGHT PIN REMOVER 2

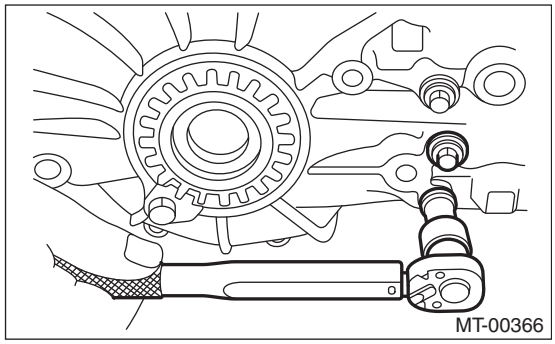


(A) 5th shifter fork
(B) Reverse fork rod
(C) Straight pin

9) Position the balls, checking ball springs and gaskets to the 3rd – 4th fork rod and 1st – 2nd fork rod holes, and install plugs.

NOTE:
Use a new gasket.

Tightening torque:
20 N·m (2.0 kgf-m, 14.8 ft-lb)



10) Install the front differential assembly. <Ref. to 5MT-68, INSTALLATION, Front Differential Assembly.>

11) Install the main shaft assembly for single-range. <Ref. to 5MT-54, INSTALLATION, Main Shaft Assembly for Single-Range.>

12) Install the drive pinion shaft assembly. <Ref. to 5MT-59, INSTALLATION, Drive Pinion Shaft Assembly.>

13) Install the transmission case. <Ref. to 5MT-51, INSTALLATION, Transmission Case.>

14) Install the transfer case together with the extension case assembly. <Ref. to 5MT-37, INSTALLATION, Transfer Case and Extension Case Assembly.>

15) Install the back-up light switch and the neutral position switch. <Ref. to 5MT-34, INSTALLATION, Switches and Harness.>

16) Install the manual transmission assembly to the vehicle. <Ref. to 5MT-25, INSTALLATION, Manual Transmission Assembly.>

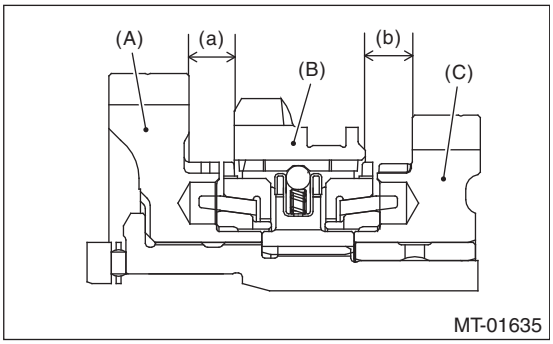
C: INSPECTION

1) Check the fork and rod for damage. Replace if it is damaged.

2) Gearshift mechanism
Repair or replace the gearshift mechanism if excessively worn, bent or defective 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)

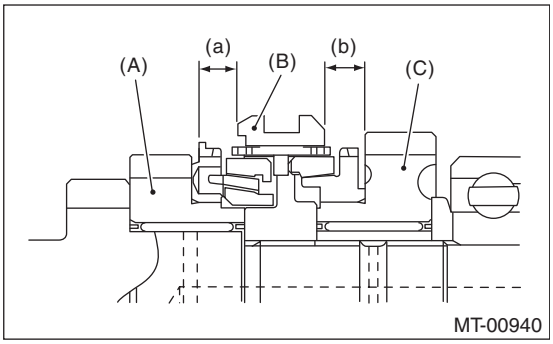


(A) 1st driven gear
(B) Reverse driven gear
(C) 2nd driven gear

1st-2nd shifter fork		
Part No.	Mark	Remarks
32804AA060	1	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)

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):
9.3 mm (0.366 in)

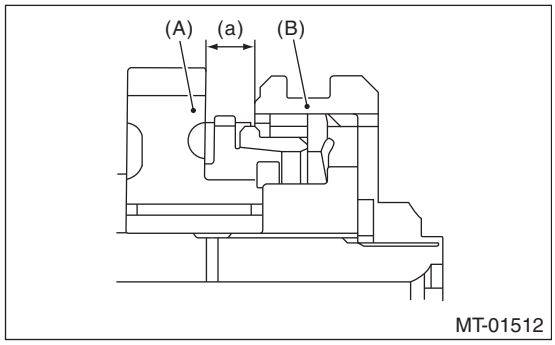


(A) 3rd drive gear
(B) Coupling sleeve
(C) 4th drive gear

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).

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)



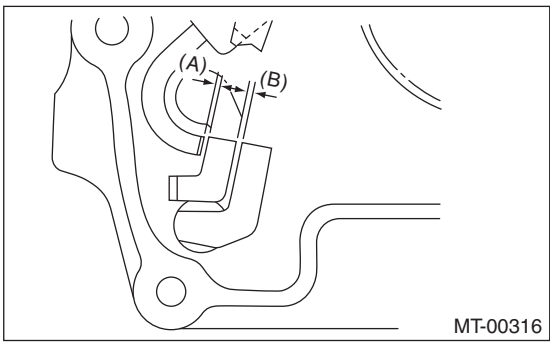
(A) 5th drive gear
(B) Coupling sleeve

5th shifter fork		
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).

6) Inspect the rod end clearances (A) and (B). If any clearance is not within specifications, replace the rod or fork as required.

Clearance (A):
3rd-4th — 5th
0.5 — 1.3 mm (0.020 — 0.051 in)

Clearance (B):
1st-2nd — 3rd-4th
0.4 — 1.4 mm (0.016 — 0.055 in)



20.General Diagnostic Table

A: INSPECTION

1. MANUAL TRANSMISSION

Symptoms	Possible cause	Corrective action
1. Gears are difficult to intermesh. NOTE: The cause for difficulty in shifting gears can be classified into two types: One is a defective gear shift system and the other is defective transmission. However, if the operation is heavy and engagement of the gears is difficult, a defective 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 the 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	Repair or replace.
2. Gear slip-out • Gear slips out when coasting on rough road. • Gear slips out during acceleration.	(a) Defective pitching stopper adjustment	Replace.
	(b) Loose engine mounting bolts	Tighten or replace.
	(c) Worn fork shifter or 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) Worn tooth step of synchronizer hub (caused by slip-out of 3rd gear)	Replace.
	(g) Worn 1st driven gear and driven shaft	Replace.
	(h) Worn 2nd driven gear and bushing	Replace.
	(i) Worn 3rd drive gear and needle bearing	Replace.
	(j) Worn 4th drive gear and needle bearing	Replace.
	(k) Worn reverse idler gear and bushing	Replace.
3. Noise emitted 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	Add recommended oil or replace the oil.
	(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.

2. DIFFERENTIAL

Symptoms	Possible cause	Corrective action
1. Broken differential (case, gear, bearing, etc.) NOTE: Noise will occur, and eventually the differential will not be able to operate due to broken pieces obstructing the gear revolution.	(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 or 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 tightening bolts	Tighten.
2. Differential and hypoid gear noises Troubles of the differential and hypoid gear always appear as noise problems. Therefore noise is the first indication of trouble. 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. • 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	Add recommended oil to the specified level.
	(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.

CLUTCH SYSTEM

CL

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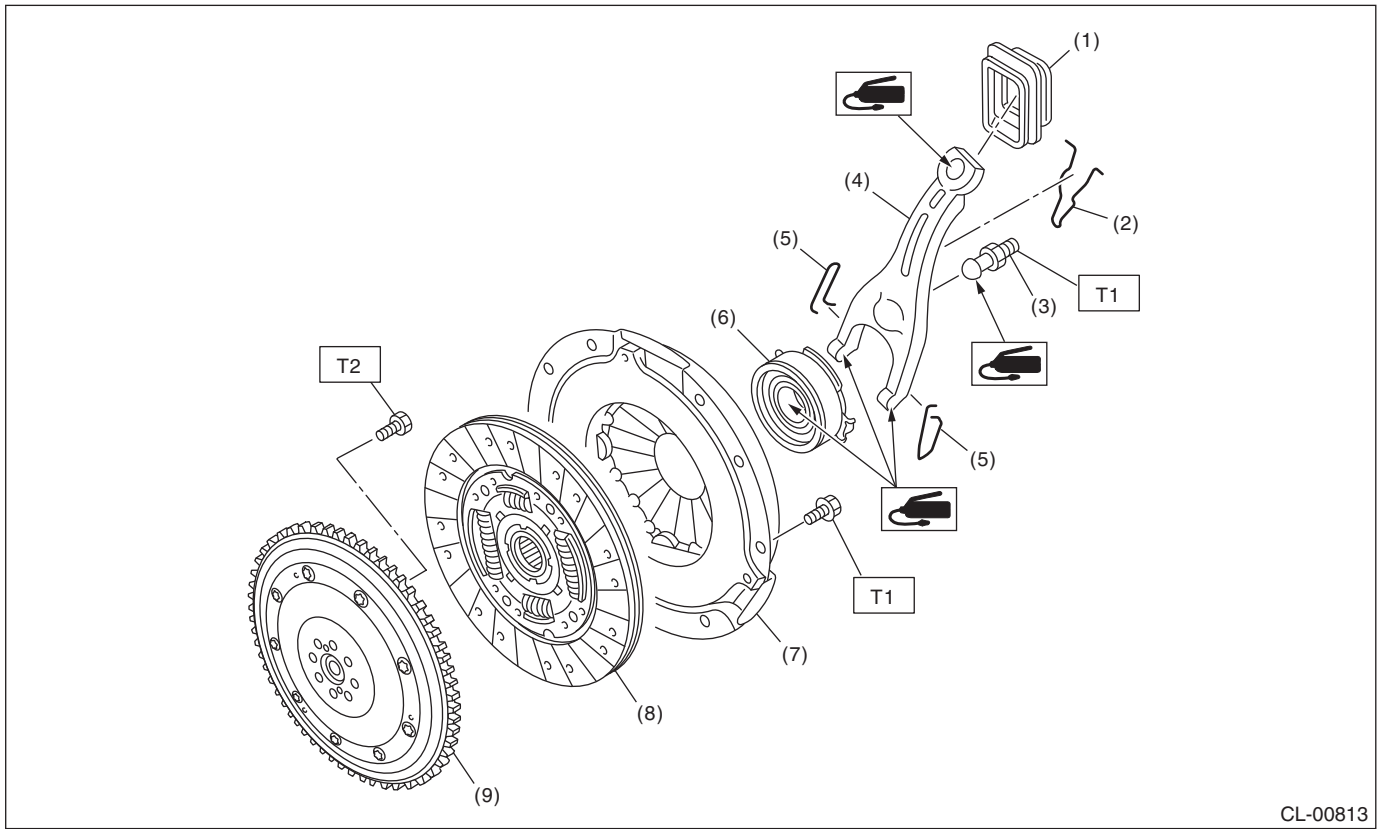
1. General Description

A: SPECIFICATION

Model			2.5 L non-turbo
Transmission type			5MT
Clutch cover	Type		Push type
	Diaphragm set load N (kgf, lbf)		5,688 (580, 1,279)
Clutch disc	Facing material		Woven (Non-asbestos)
	O.D. × I.D. × thickness mm (in)	Clutch cover side	225 × 150 × 3.5 (8.86 × 5.91 × 0.138)
		Flywheel side	
	Spline outer diameter mm (in)		25.2 (0.992), (Number of teeth: 24)
	Depth of rivet head mm (in)	Clutch cover side	1.65 — 2.25 (0.065 — 0.089)
		Flywheel side	
		Limit of sinking	0.3 (0.012)
	Deflection limit mm (in)		0.7 (0.028) at R = 110 (4.33)
Clutch release lever ratio			1.6
Release bearing			Grease-packed self-aligning
Clutch pedal	Full stroke mm (in)		130 — 135 (5.12 — 5.31)
	Free play mm (in)		5 — 15 (0.20 — 0.59)
Flywheel	Type		Flexible

B: COMPONENT

1. CLUTCH ASSEMBLY



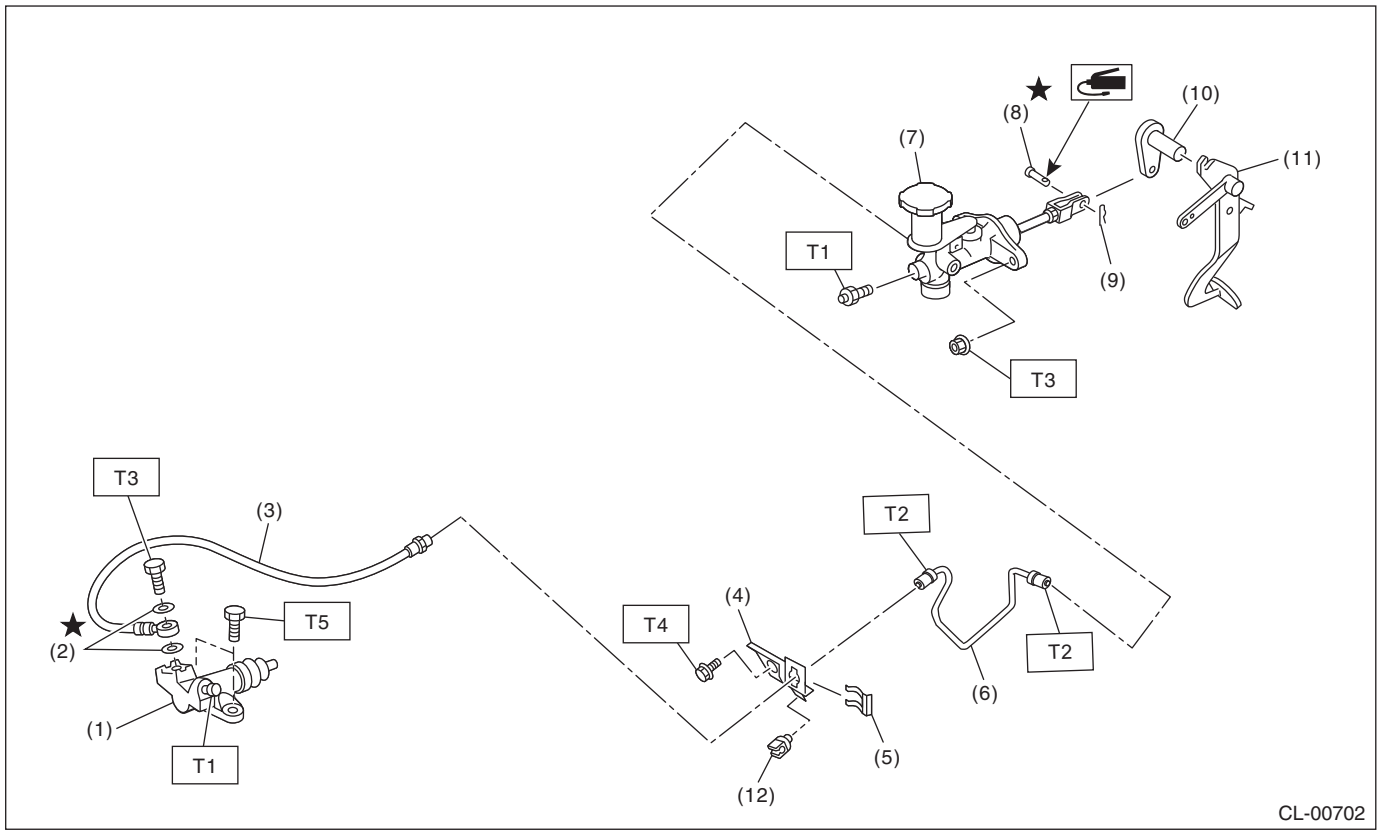
(1)	Dust cover	(6)	Release bearing
(2)	Lever spring	(7)	Clutch cover
(3)	Pivot	(8)	Clutch disc
(4)	Release lever	(9)	Flywheel
(5)	Clip		

Tightening torque:N·m (kgf-m, ft-lb)

T1: 16 (1.6, 11.8)

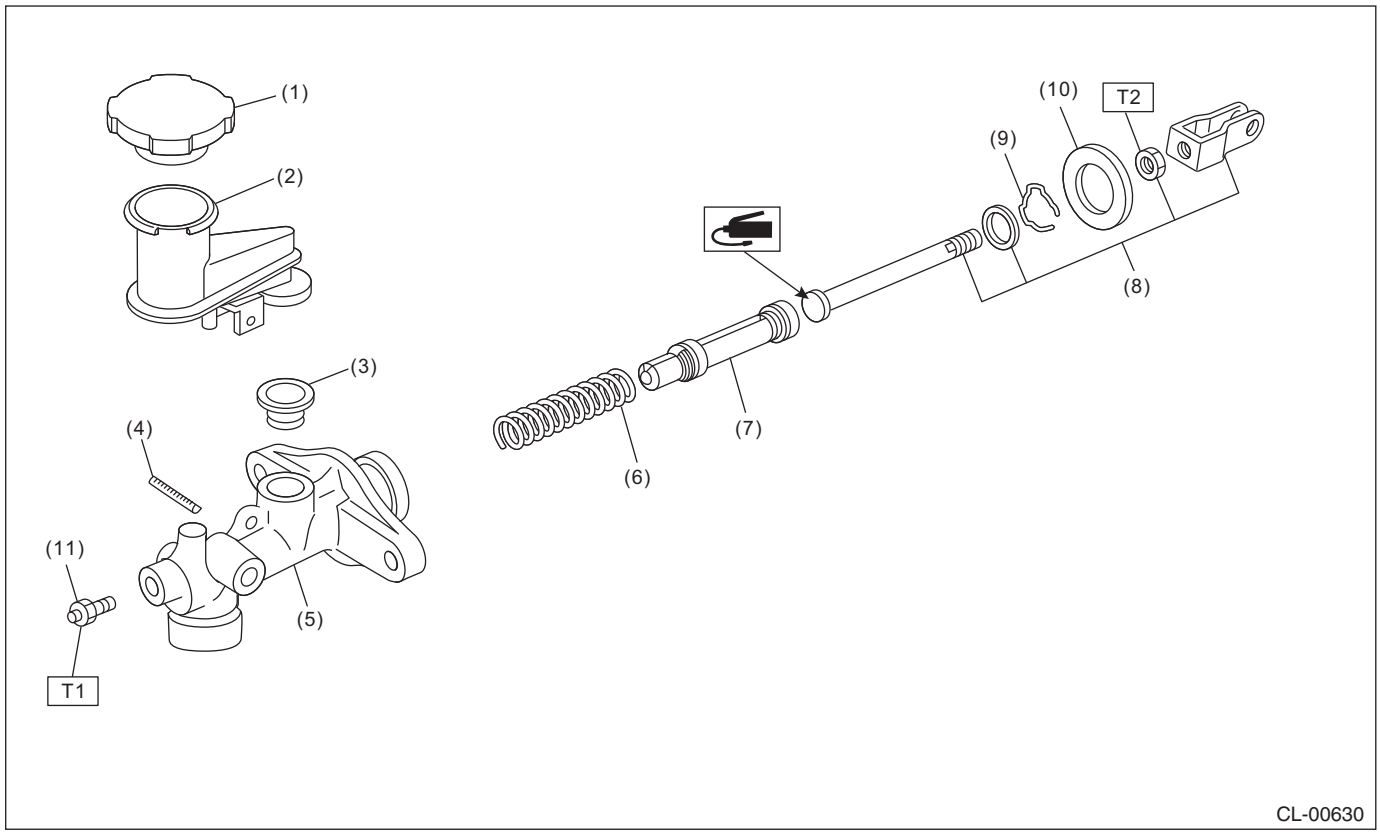
T2: <Ref. to CL-12, INSTALLATION, Flywheel.>

2. CLUTCH PIPE AND HOSE



(1)	Operating cylinder	(7)	Master cylinder ASSY	***Tightening torque:N·m (kgf-m, ft-lb)***
(2)	Washer	(8)	Clevis pin	***T1: 7.8 (0.8, 5.8)***
(3)	Clutch hose	(9)	Snap pin	***T2: 15 (1.5, 11.1)***
(4)	Bracket	(10)	Lever	***T3: 18 (1.8, 13.3)***
(5)	Clamp	(11)	Clutch pedal	***T4: 25 (2.5, 18.4)***
(6)	Clutch pipe	(12)	Clip	***T5: 37 (3.8, 27.3)***

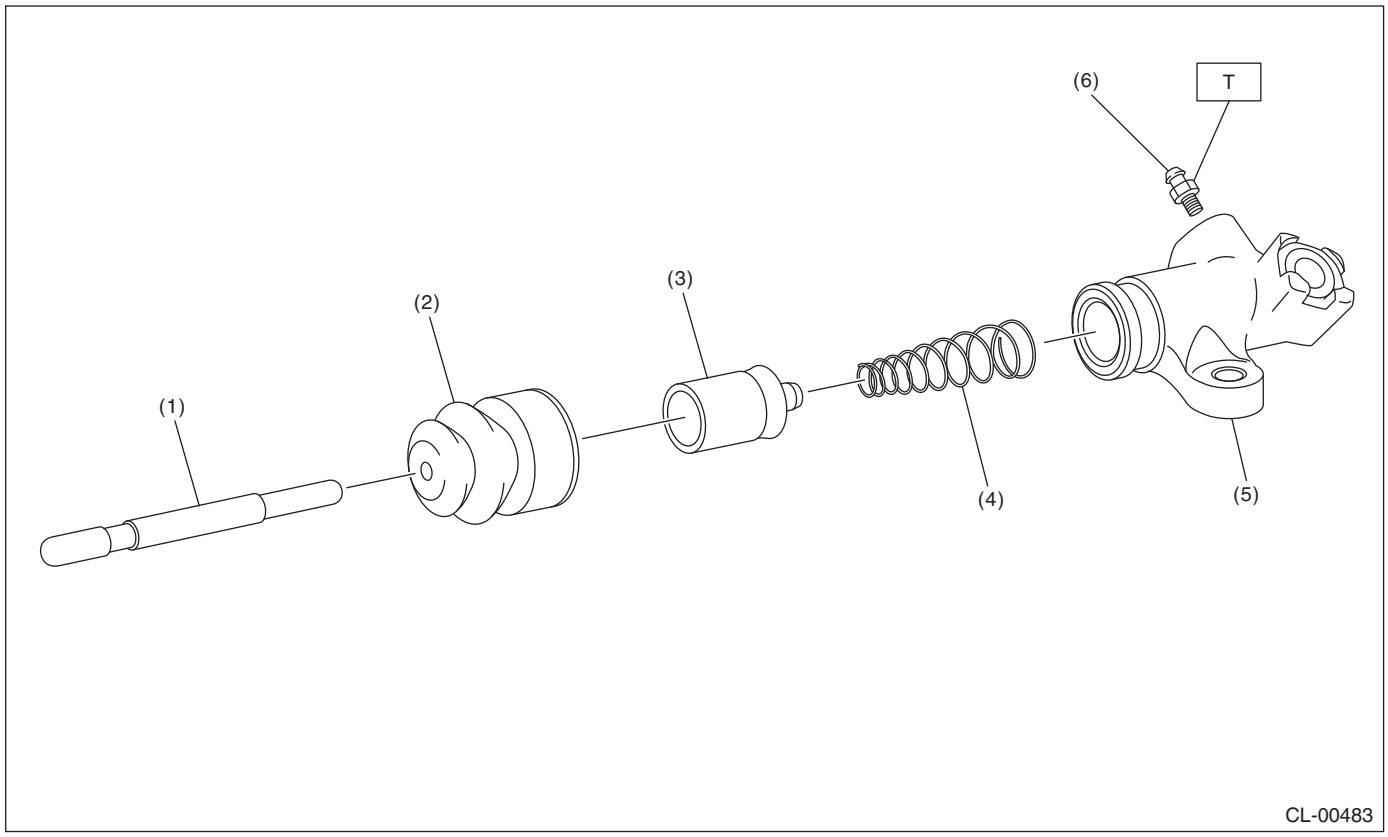
3. MASTER CYLINDER



(1) Reservoir cap
(2) Reservoir tank
(3) Oil seal
(4) Straight pin
(5) Master cylinder
(6) Return spring
(7) Piston
(8) Push rod ASSY
(9) Piston stop ring
(10) Seat
(11) Bleeder screw

Tightening torque:N·m (kgf-m, ft-lb)
T1: 7.8 (0.8, 5.8)
T2: 10 (1.0, 7.4)

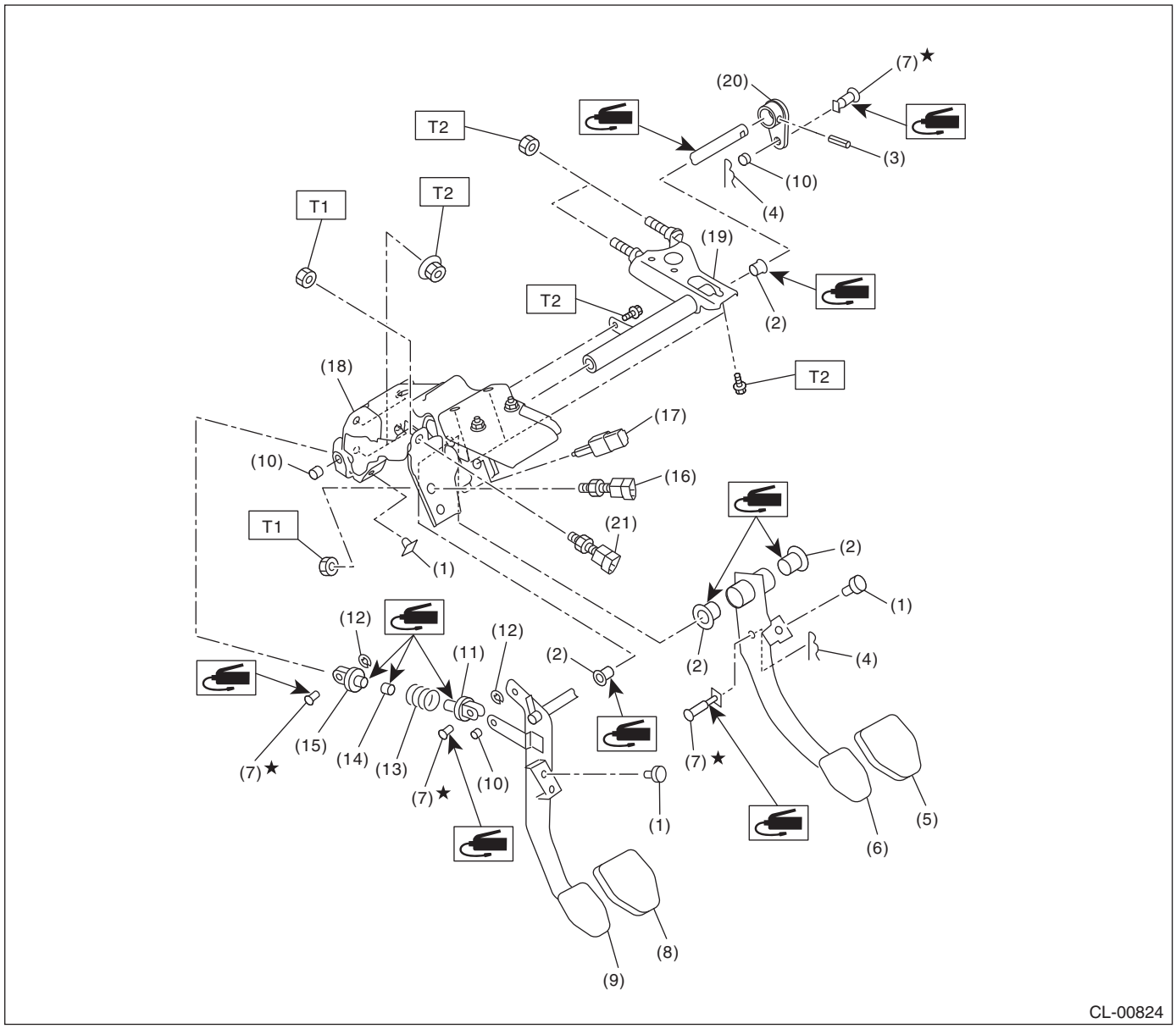
4. OPERATING CYLINDER



(1) Push rod
(2) Boot
(3) Piston
(4) Piston spring
(5) Operating cylinder
(6) Bleeder screw

Tightening torque:N·m (kgf-m, ft-lb)
T: 7.8 (0.8, 5.8)

5. CLUTCH PEDAL



(1) Stopper
(2) Pedal bushing
(3) Spring pin
(4) Snap pin
(5) Brake pedal pad
(6) Brake pedal
(7) Clevis pin
(8) Clutch pedal pad
(9) Clutch pedal
(10) Bushing
(11) Assist rod A
(12) Clip
(13) Assist spring
(14) Assist bushing
(15) Assist rod B
(16) Clutch switch
(17) Stop light switch
(18) Pedal bracket
(19) Clutch master cylinder bracket
(20) Lever
(21) Clutch start switch

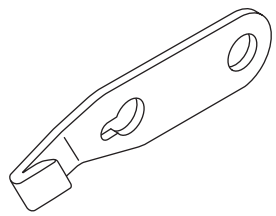
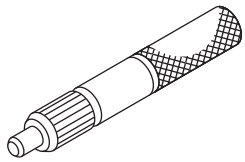
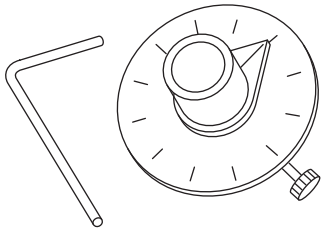
Tightening torque:N·m (kgf-m, ft-lb)
T1: 8 (0.8, 5.9)
T2: 18 (1.8, 13.3)

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 in a vise, place cushioning material such as wood blocks, aluminum plate or 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 for installing the clutch disc to the flywheel.
 ST18854AA000	18854AA000	ANGLE GAUGE	Used for tightening the flywheel.

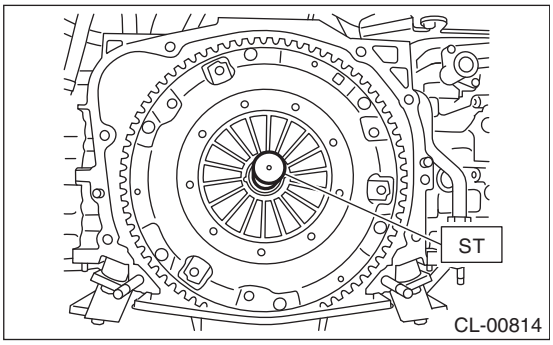
2. GENERAL TOOL

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.

2. Clutch Disc and Cover

A: REMOVAL

1) Remove the transmission assembly from the vehicle. <Ref. to 5MT-23, REMOVAL, Manual Transmission Assembly.>
2) Attach the ST on the flywheel.
ST 499747100 CLUTCH DISC GUIDE



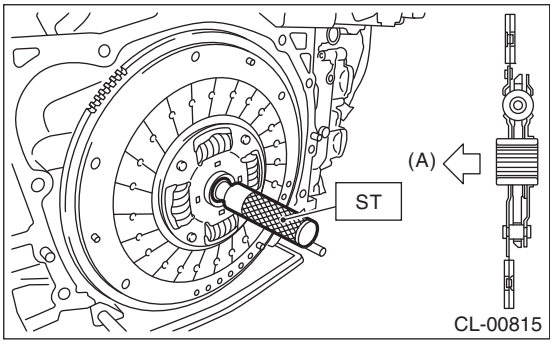
3) Remove the clutch cover and clutch disc.

NOTE:
• Take care not to allow oil to touch the clutch disc face.
• Do not disassemble the clutch cover or clutch disc.

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

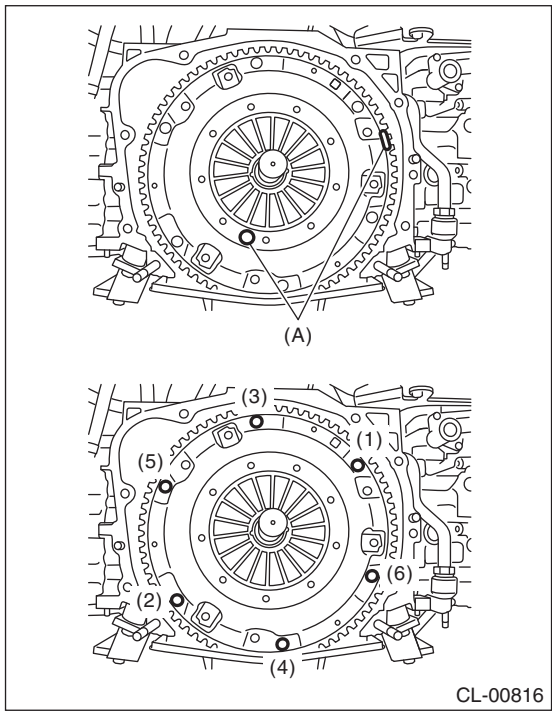


(A) Flywheel side

2) Install the clutch cover to the flywheel and tighten the bolts to the specified torque.

NOTE:
• When installing a clutch cover to the flywheel, position the clutch cover so that the spacing between the unbalance marks (paint mark) on the flywheel and clutch cover is 120° or more apart. (The unbalance mark indicates the direction of residual unbalance.)
• Note the front and rear of the clutch disc when installing.
• Temporarily tighten the bolts by hand. Each bolt should be tightened to the specified torque in a crisscross order.

Tightening torque:
16 N·m (1.6 kgf-m, 11.8 ft-lb)



(A) Unbalance mark (paint)

3) Remove the ST (CLUTCH DISC GUIDE).
4) Install the transmission assembly. <Ref. to 5MT-25, INSTALLATION, Manual Transmission Assembly.>

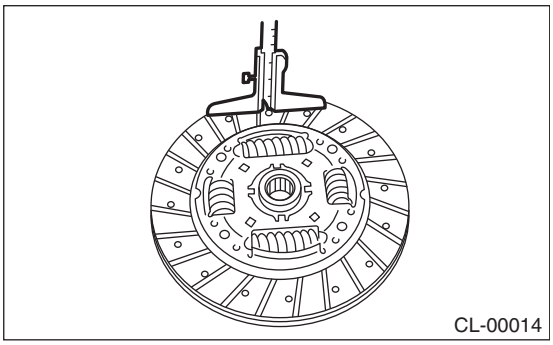
C: INSPECTION

1. CLUTCH DISC

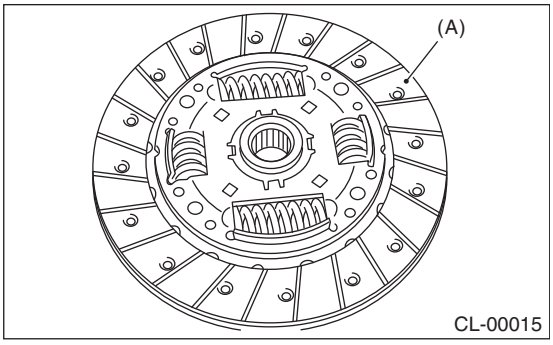
1) Facing wear
Measure the depth from the facing surface to the rivet head. Replace if the face is worn locally or worn down to less than the specified value.

NOTE:
Do not wash the clutch disc with any type of cleaning fluid.

Depth to rivet head:
Limit of sinking
0.3 mm (0.012 in)



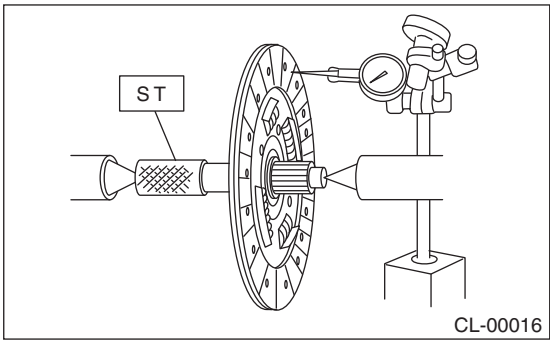
2) Hardened facing
Replace the clutch disc.
3) Oil soakage on facing
Replace the clutch disc and inspect the transmission front oil seal, transmission case mating surface, engine rear oil seal and other locations for oil leakage.



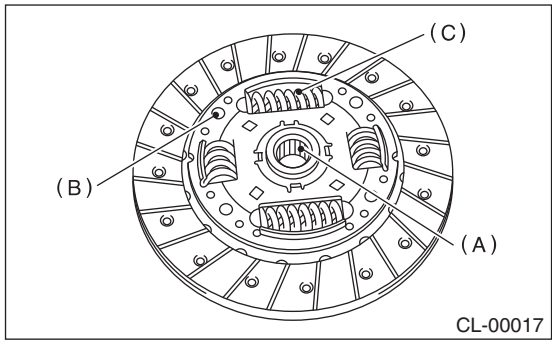
(A) Clutch facing

4) Deflection on facing
If deflection exceeds the specified value at the outer circumference of the facing, replace the clutch disc.

Limit for deflection:
0.7 mm (0.028 in) at R = 110 mm (4.33 in)
ST 499747100 CLUTCH DISC GUIDE



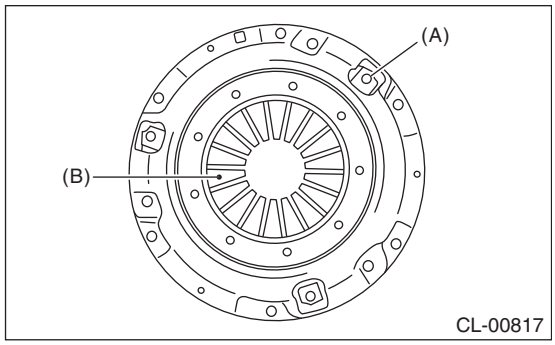
5) If there is spline wear, loose rivets, failed damper springs, etc., replace the clutch disc.



(A) Spline
(B) Rivet
(C) Damper spring

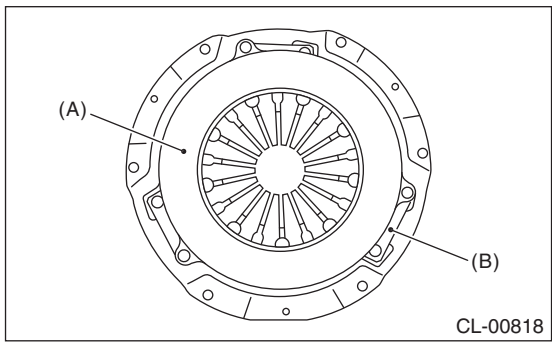
2. CLUTCH COVER

NOTE:
Visually check the following items without disassembling, and replace or repair if defective.
1) Loose thrust rivet
2) Damaged or worn bearing contact area at the center of diaphragm spring



(A) Thrust rivet
(B) Diaphragm spring

3) Damaged or worn disc contact surface of the pressure plate
4) Loose strap plate installation area
5) Worn diaphragm sliding area

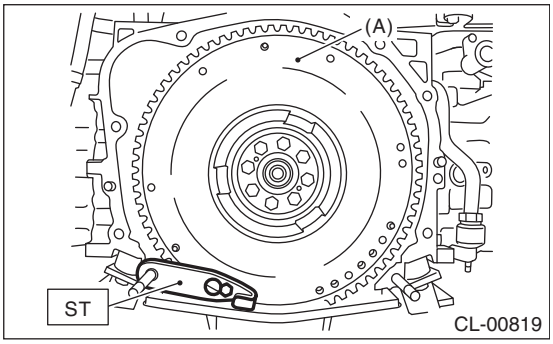


(A) Pressure plate
(B) Strap plate

3. Flywheel

A: REMOVAL

1) Remove the transmission assembly. <Ref. to 5MT-23, REMOVAL, Manual Transmission Assembly.>
2) Remove the clutch cover and clutch disc. <Ref. to CL-10, REMOVAL, Clutch Disc and Cover.>
3) Attach the ST.
ST 498497100 CRANKSHAFT STOPPER



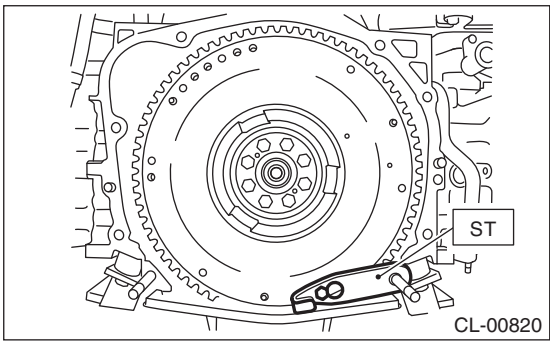
(A) Flywheel

4) Remove the flywheel and crankshaft position sensor plate.

B: INSTALLATION

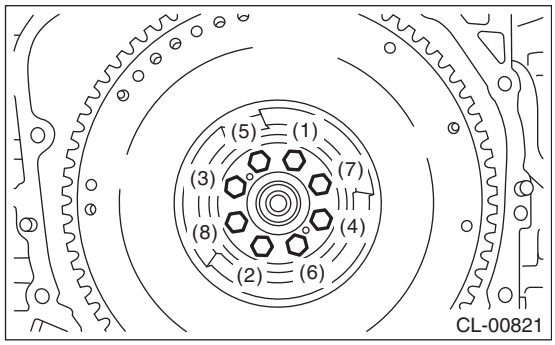
1) Temporarily tighten the crankshaft position sensor plate and flywheel.

NOTE:
Align the knock pin hole of the crankshaft position sensor plate to the knock pin of the crankshaft to secure the knock pin.
2) Attach the ST.
ST 498497100 CRANKSHAFT STOPPER



3) Tighten the flywheel mounting bolts in two stages.
(1) Tighten the flywheel attachment bolts.

Tightening torque:
30 N·m (3.1 kgf-m, 22.1 ft-lb)



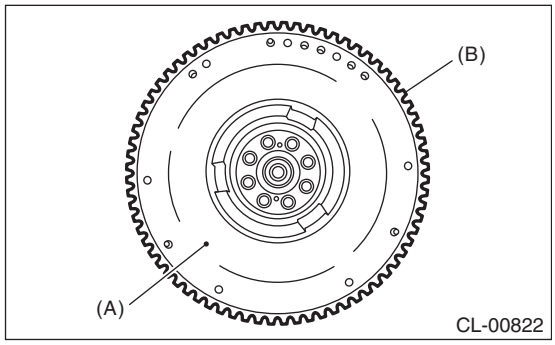
(2) While checking the tightening angle with the ST, further tighten the flywheel mounting bolts.

Tightening angle:
30° — 35°

ST 18854AA000 ANGLE GAUGE
4) Install the clutch disc and cover. <Ref. to CL-10, INSTALLATION, Clutch Disc and Cover.>
5) Install the transmission assembly. <Ref. to 5MT-25, INSTALLATION, Manual Transmission Assembly.>

C: INSPECTION

CAUTION:
Because this bearing is grease-sealed and is a non-lubrication type, do not wash with gasoline or solvents.
1) If there is damage or defectiveness in the facing sliding surface or ring gear, replace the flywheel.



(A) Flywheel
(B) Ring gear

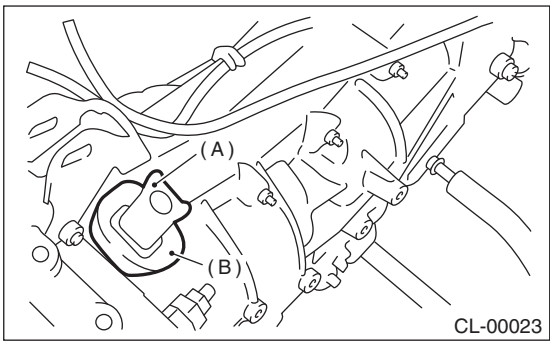
2) Smoothness of rotation
Rotate the ball bearing while applying pressure in the thrust direction.
3) If noise or excessive play is noted, replace the flywheel.

4. Release Bearing and Lever

A: REMOVAL

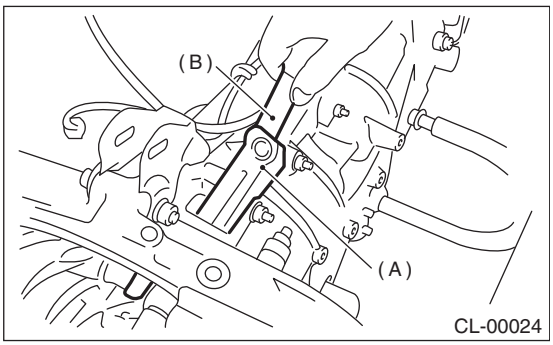
1) Remove the transmission assembly from the vehicle. <Ref. to 5MT-23, REMOVAL, Manual Transmission Assembly.>
2) Remove the two clips from the release lever and remove the release bearing.

CAUTION:
Be careful not to deform the clips.
3) Remove the dust cover.



(A) Release lever
(B) Dust cover

4) Remove the lever spring from the pivot with a screwdriver by accessing it through the clutch housing release lever hole. Then remove the release lever.



(A) Release lever
(B) Screwdriver

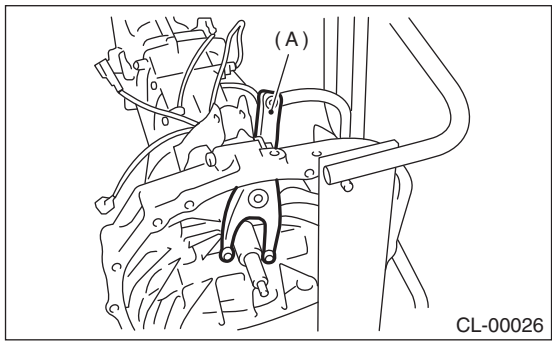
B: INSTALLATION

NOTE:
Apply the specified grease to lubricate to the following points before installation.
- Contact surface of lever and pivot
- Contact surface of lever and bearing
- Transmission main shaft spline
- Contact surface of release bearing and transmission case

Grease:
NICHIMOLY N-130 or equivalent

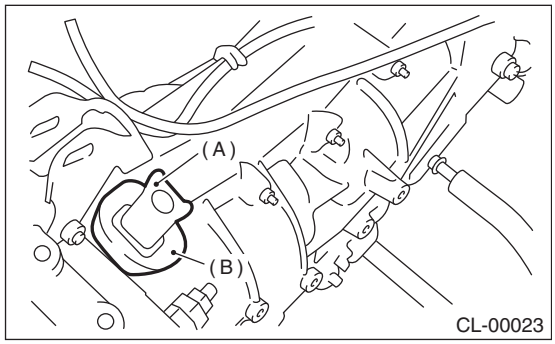
1) While pushing the release lever to the pivot and twisting it to both sides, fit the lever spring onto the raised portion of the pivot.

NOTE:
Observing from the main case hole, check that the lever spring is installed securely.



(A) Release lever

2) Install the release bearing and fasten it with two clips.
3) Install the dust cover.



(A) Release lever
(B) Dust cover

4) Check the bearing for smooth movement by operating the release lever.
5) Apply grease to the contact point of the release lever and operating cylinder.

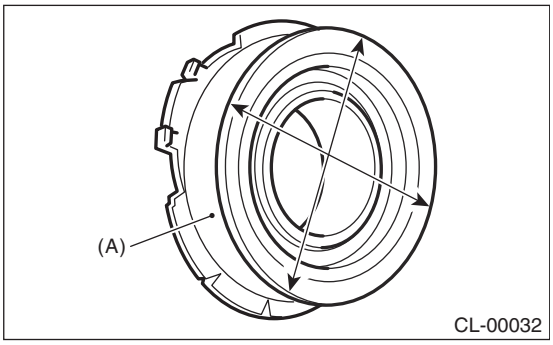
Grease:
NICHIMOLY N-130 or equivalent
6) Install the transmission assembly. <Ref. to 5MT-25, INSTALLATION, Manual Transmission Assembly.>

C: INSPECTION

1. RELEASE BEARING

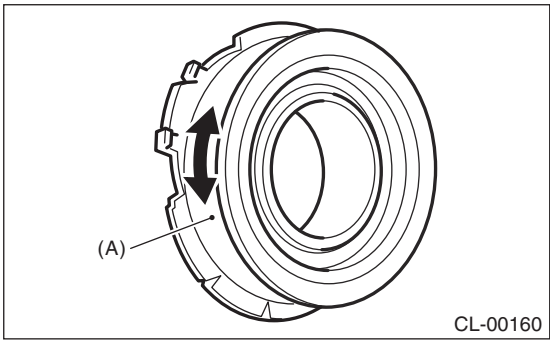
CAUTION:
Since this bearing is grease-sealed and is a non-lubrication type, do not wash with gasoline or any other solvent when servicing the clutch.
1) Check the bearing for smooth movement by applying force to the bearing in the radial direction.

Radial direction stroke:
1.6 mm (0.063 in)



(A) Bearing case

2) While applying force to the bearing in the rotational direction, check the bearing for smooth rotation.

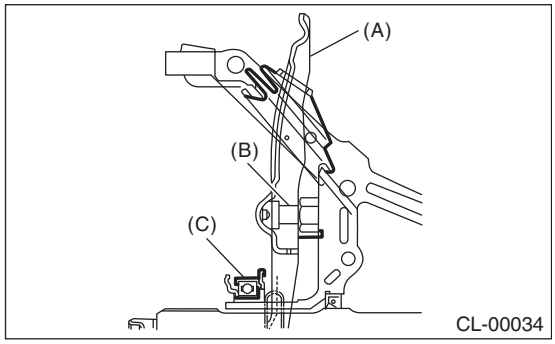


(A) Bearing case

3) Check for wear and damage at 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.



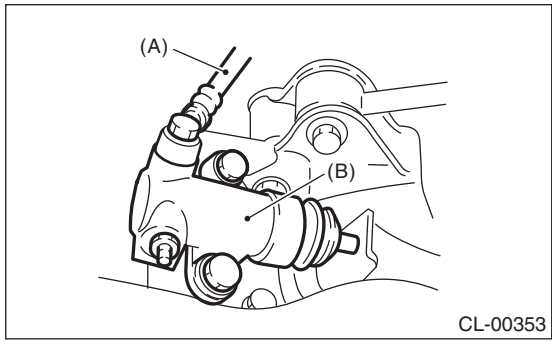
(A) Release lever
(B) Pivot
(C) Release bearing

5. Operating Cylinder

A: REMOVAL

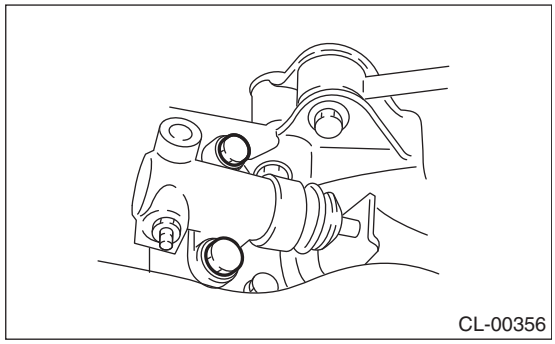
1) Remove the air intake boot assembly. <Ref. to IN(H4DO)-13, REMOVAL, Air Intake Boot.>
2) Disconnect the clutch hose from the operating cylinder.

CAUTION:
Cover the hose joint to prevent the clutch fluid from flowing out.



(A) Clutch hose
(B) Operating cylinder

3) Remove the operating cylinder from the transmission.



B: INSTALLATION

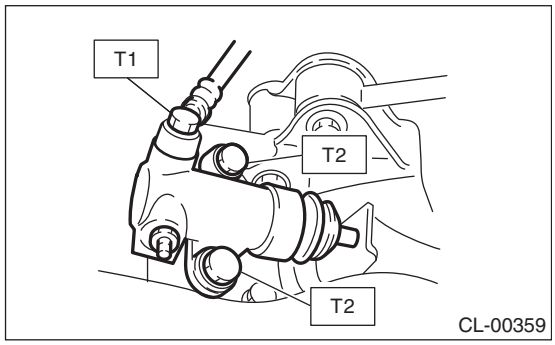
1) Install in the reverse order of removal.

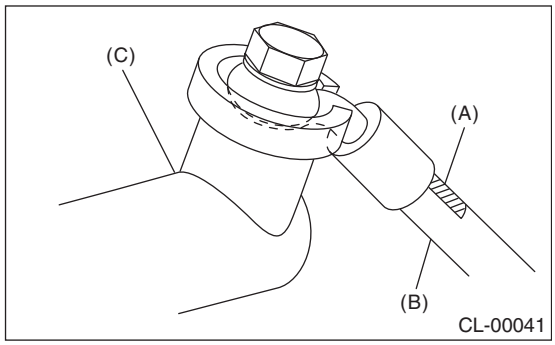
NOTE:
• Before installing the operating cylinder, apply grease to the contact point of the release lever and operating cylinder.

Grease:
NICHIMOLY N-130 or equivalent

• Be sure to install the clutch hose with the mark side facing upward.
• Be careful not to twist the clutch hose during installation.

Tightening torque:
T1: 18 N·m (1.8 kgf-m, 13.3 ft-lb)
T2: 37 N·m (3.8 kgf-m, 27.3 ft-lb)



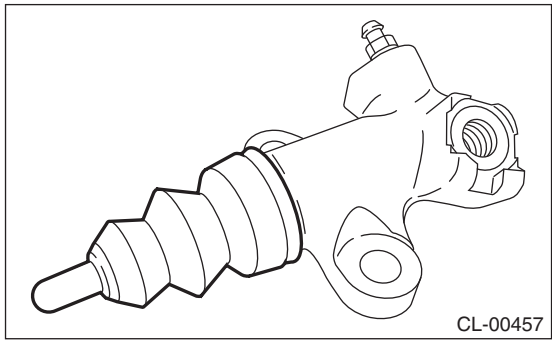


(A) Mark
(B) Clutch hose
(C) Operating cylinder

2) After bleeding air from the operating cylinder, ensure that the clutch operates properly. <Ref. to CL-21, Clutch Fluid Air Bleeding.>

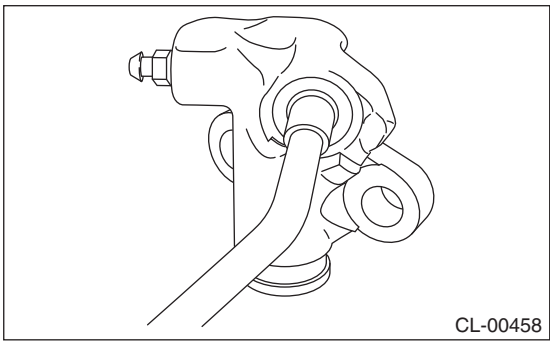
C: DISASSEMBLY

1) Remove the boots and push rod assembly.

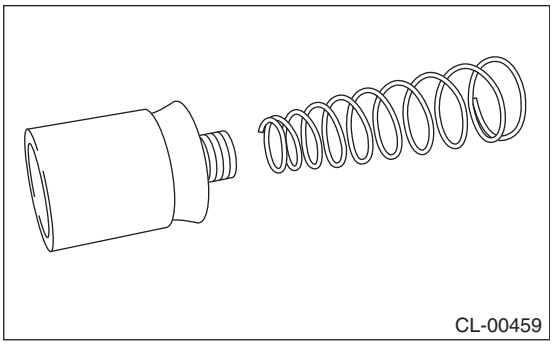


2) Apply compressed air through clutch hose attaching port.

NOTE:
Face the piston port down and place a piece of wood underneath to prevent the piston from popping out.


CL-00458

3) Separate the piston and piston spring.

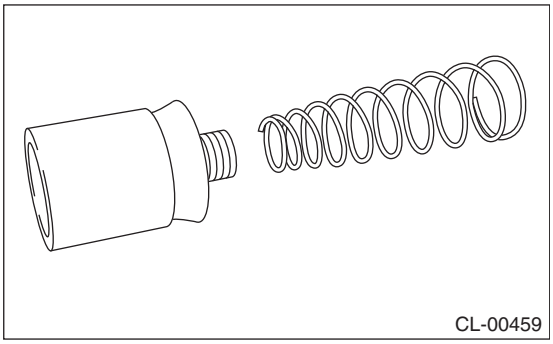

CL-00459

D: ASSEMBLY

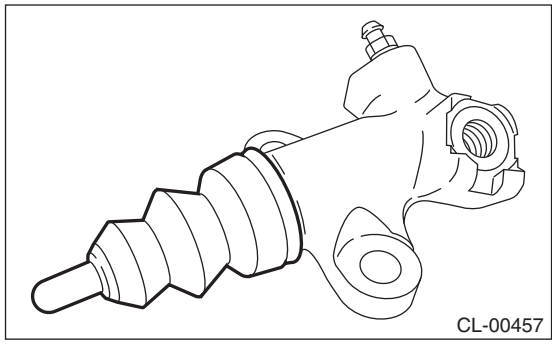
NOTE:
During assembly, apply hydraulic oil to all parts.

Recommended clutch fluid:
New FMVSS No. 116 DOT3 or DOT4

1) Install the piston spring onto the piston.


CL-00459

2) Insert piston into the operating cylinder.
3) Install push rod to the boot.
4) Install boot and push rod to the operating cylinder.


CL-00457

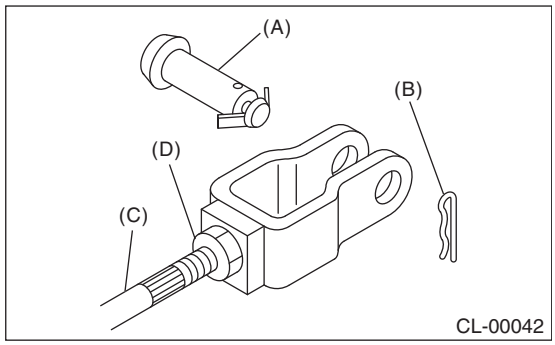
E: INSPECTION

1) Check the operating cylinder for damage. Replace the operating cylinder if it is damaged.
2) Check the clutch fluid leakage on the operating cylinder or the boot for damage. Replace the operating cylinder if clutch fluid leaks or boot damages are noted.

6. Master Cylinder

A: REMOVAL

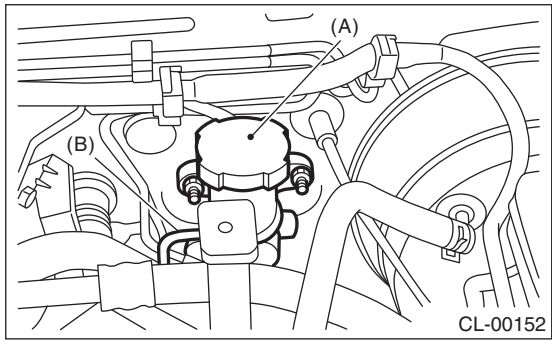
1) Thoroughly drain the clutch fluid from the reservoir tank.
2) Remove the snap pin and clevis pin, and then separate the push rod of the master cylinder from clutch pedal.



(A) Clevis pin
(B) Snap pin
(C) Push rod
(D) Lock nut

3) Remove the air intake boot assembly. <Ref. to IN(H4DO)-13, REMOVAL, Air Intake Boot.>
4) Remove the clutch pipe from the master cylinder.
5) Remove the master cylinder and reservoir tank as a unit.

CAUTION:
Be careful not to spill the clutch fluid. Clutch fluid spilled on the vehicle body will harm the paint surface; wash it off with water and wipe clean quickly if spilled.

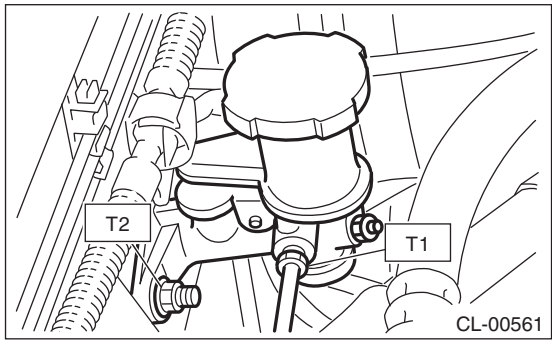


(A) Master cylinder
(B) Clutch pipe

B: INSTALLATION

1) Install the master cylinder to the vehicle body, and connect the clutch pipe to the master cylinder.

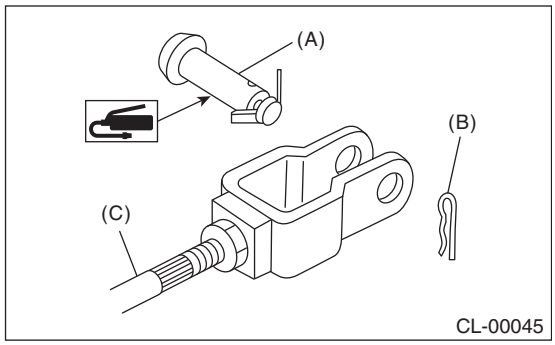
Tightening torque:
T1: 15 N·m (1.5 kgf-m, 11.1 ft-lb)
T2: 18 N·m (1.8 kgf-m, 13.3 ft-lb)



2) Connect the push rod of the master cylinder to the clutch pedal, and install the clevis pin and snap pin.

CAUTION:
Always use a new clevis pin.

NOTE:
Apply grease to the clevis pin.

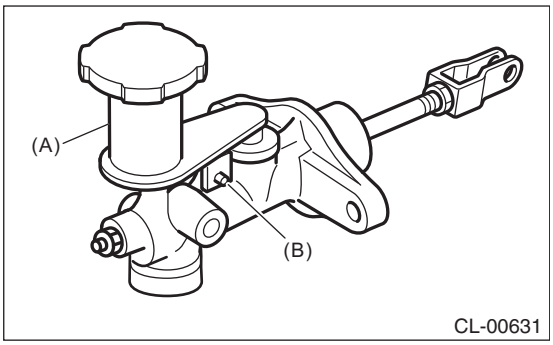


(A) Clevis pin
(B) Snap pin
(C) Push rod

3) After bleeding air from the clutch system, ensure that the clutch operates properly. <Ref. to CL-21, Clutch Fluid Air Bleeding.>
4) Install the air intake boot assembly. <Ref. to IN(H4DO)-13, INSTALLATION, Air Intake Boot.>

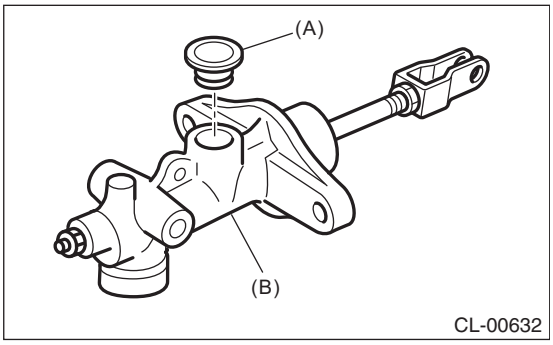
C: DISASSEMBLY

1) Remove the straight pin and reservoir tank.



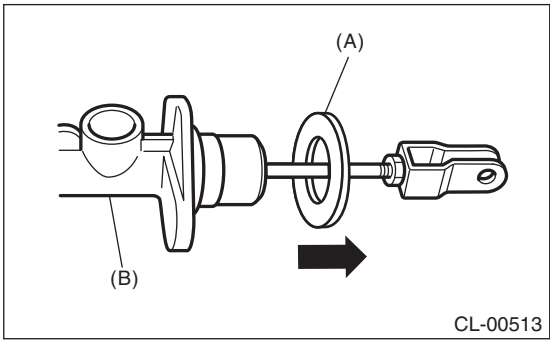
(A) Reservoir tank
(B) Straight pin

2) Remove the oil seal.



(A) Oil seal
(B) Master cylinder

3) Move the seat towards the rear.



(A) Seat
(B) Master cylinder

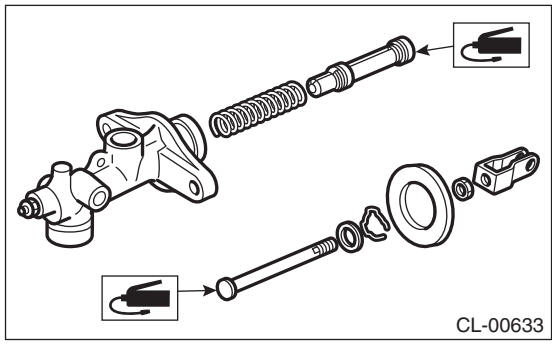
4) Remove the piston stop ring.

CAUTION:
When removing the piston stop ring, be careful to prevent the rod, washer, piston and return spring from coming out.

D: ASSEMBLY

1) Apply a coat of grease to the contact surfaces of the push rod and piston before installation.

Grease:
SILICONE GREASE G-40M (Part No. 004404003) or equivalent

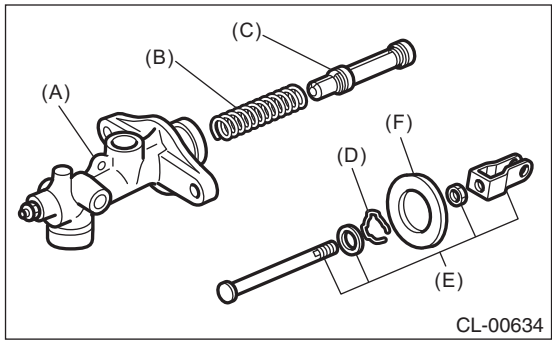


2) Assemble in the reverse order of disassembly.

Tightening torque:
10 N·m (1.0 kgf-m, 7.4 ft-lb)

E: INSPECTION

If any damage, deformation, wear, swelling, rust or other faults are found on the cylinder, piston, push rod, reservoir tank, return spring, bleeder screw, seat or clutch hose, replace the faulty part.

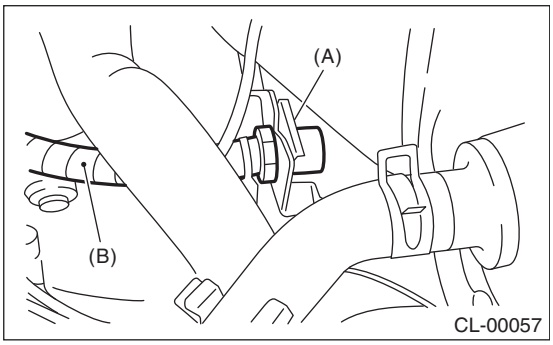


(A) Master cylinder body
(B) Return spring
(C) Piston
(D) Piston stop ring
(E) Push rod ASSY
(F) Seat

7. Clutch Pipe and Hose

A: REMOVAL

1) Remove the air intake boot assembly. <Ref. to IN(H4DO)-13, REMOVAL, Air Intake Boot.>
2) Drain the clutch fluid. <Ref. to CL-20, Clutch Fluid.>
3) Disconnect the clutch pipe from the clutch hose and master cylinder.
4) Pull out the clamp, then disconnect the clutch hose from the bracket.



(A) Clamp
(B) Clutch hose

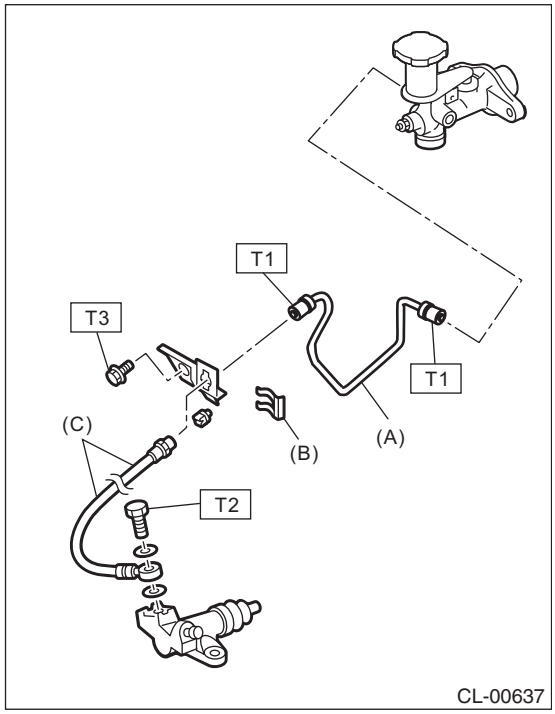
5) Remove the clutch hose from operating cylinder.
6) Remove the bracket.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Bleed air from the clutch fluid. <Ref. to CL-21, Clutch Fluid Air Bleeding.>

Tightening torque:
T1: 15 N·m (1.5 kgf-m, 11.1 ft-lb)
T2: 18 N·m (1.8 kgf-m, 13.3 ft-lb)
T3: 25 N·m (2.5 kgf-m, 18.4 ft-lb)



(A) Clutch pipe
(B) Clamp
(C) Clutch hose

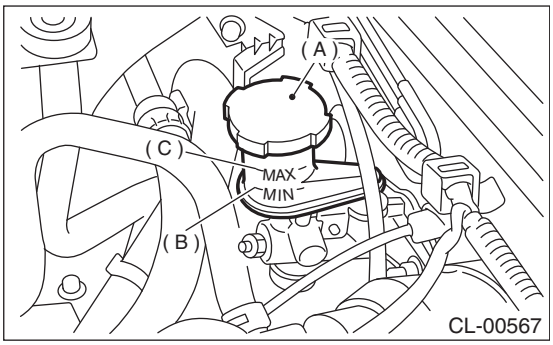
C: INSPECTION

Check the clutch pipe and clutch hose for breaks and damage. Check the joint for clutch fluid leakage. If crack, breakage or damage is found, repair or replace the faulty clutch pipe or clutch hose.

8. Clutch Fluid

A: INSPECTION

1) Park the vehicle on a level surface.
2) Check the clutch fluid level using the scale on the outside of the reservoir tank. If the level is below “MIN”, fill the clutch fluid up to “MAX” level, and make sure that there is no leakage.



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

B: REPLACEMENT

CAUTION:
• Use new FMVSS No. 116 DOT3 or DOT4.
• Cover the air breather with cloth to prevent clutch fluid from being splashed on surrounding parts when loosening the breather.
• Avoid mixing clutch fluid of different brands to prevent fluid performance from degrading.
• Be careful not to allow dirt or dust to enter the reservoir tank.

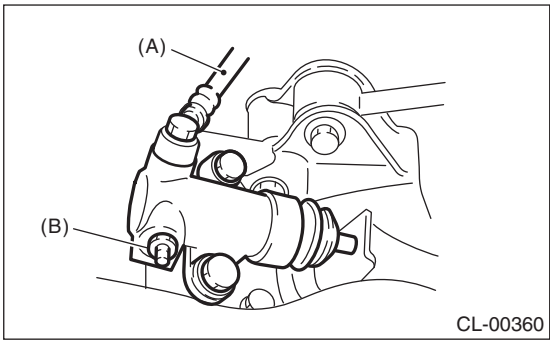
NOTE:
• During bleeding operation, keep the reservoir tank filled with clutch fluid to prevent entry of air.
• Clutch pedal must be operated very slowly.
• Bleed air from the oil line with help of a co-worker.
• The amount of clutch fluid required is approximately 70 m ℓ (2.4 US fl oz, 2.5 Imp fl oz) for total clutch system.
1) Remove the air intake boot assembly. <Ref. to IN(H4DO)-13, REMOVAL, Air Intake Boot.>
2) Drain the clutch fluid from the reservoir tank.
3) Refill the reservoir tank with recommended clutch fluid.

Recommended clutch fluid:
New FMVSS No. 116 DOT3 or DOT4
4) If necessary, bleed air from the clutch fluid. <Ref. to CL-21, Clutch Fluid Air Bleeding.>

9. Clutch Fluid Air Bleeding

A: PROCEDURE

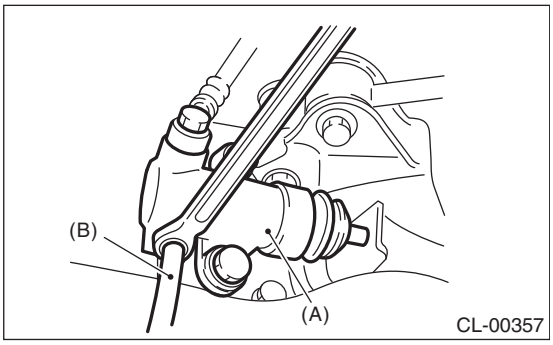
NOTE:
Bleed air from the oil line with help of a co-worker.
1) Remove the air intake boot assembly. <Ref. to IN(H4DO)-13, REMOVAL, Air Intake Boot.>
2) Fit one end of a vinyl tube into the air breather of the operating cylinder, and put the other end into a clutch fluid container.



(A) Clutch hose
(B) Air breather

3) Slowly depress the clutch pedal several times and keep it depressed. Open the air breather to discharge air together with the clutch fluid.
Release the air breather for 1 or 2 seconds. Next, close the air breather, and slowly release the clutch pedal.

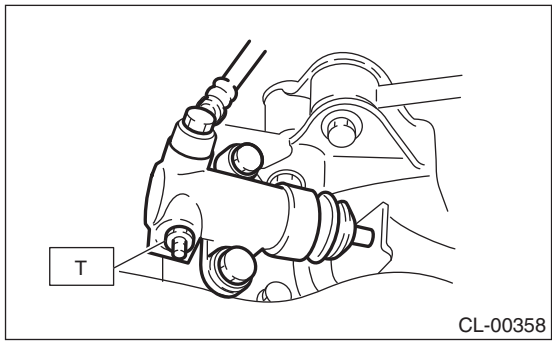
CAUTION:
Cover the air breather with cloth to prevent clutch fluid from being splashed on surrounding parts when loosening the breather.



(A) Operating cylinder
(B) Vinyl tube

4) Repeat procedure 3), until there are no more air bubbles appearing from the air breather.
5) Tighten the air breather.

Tightening torque:
T: 7.8 N·m (0.8 kgf-m, 5.8 ft-lb)

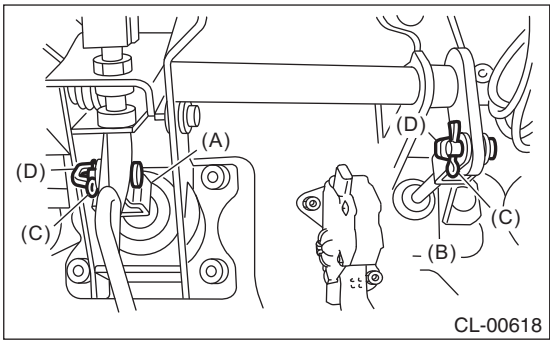


6) After stepping on the clutch pedal, make sure that there are no leaks evident in the entire clutch system.
7) After bleeding the air from clutch system, ensure that the clutch operates properly.
8) Install the air intake boot assembly. <Ref. to IN(H4DO)-13, INSTALLATION, Air Intake Boot.>

10.Clutch Pedal

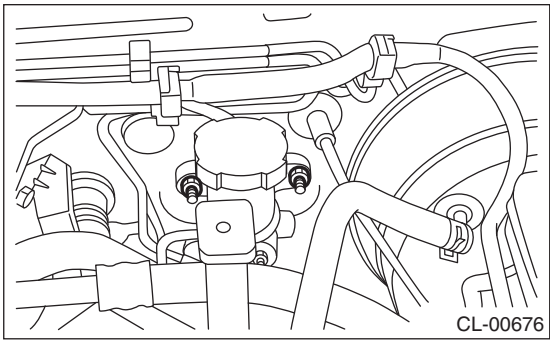
A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the steering column. <Ref. to PS-16, REMOVAL, Steering Column.>
3) Disconnect the connector from the stop light switch and clutch switch.
4) Remove the snap pins from clevis pins which secure the lever to the push rod and operating rod.
5) Pull out the clevis pins which secures the lever to the push rod and operating rod.



(A) Operating rod
(B) Push rod
(C) Snap pin
(D) Clevis pin

6) Remove the air intake boot assembly. <Ref. to IN(H4DO)-13, REMOVAL, Air Intake Boot.>
7) Remove the nut which secures the clutch master cylinder.



8) Remove the bolts and nuts which secure the brake pedal and clutch pedal, and remove the pedal assembly.

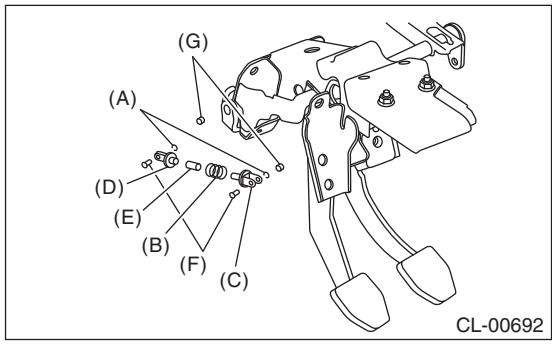
B: INSTALLATION

1) Install in the reverse order of removal.

CAUTION:
Always use a new clevis pin.
2) Adjust the clutch pedal after installation. <Ref. to CL-23, ADJUSTMENT, Clutch Pedal.>
3) Adjust the clutch switch. <Ref. to CL-28, ADJUSTMENT, Clutch Switch.>

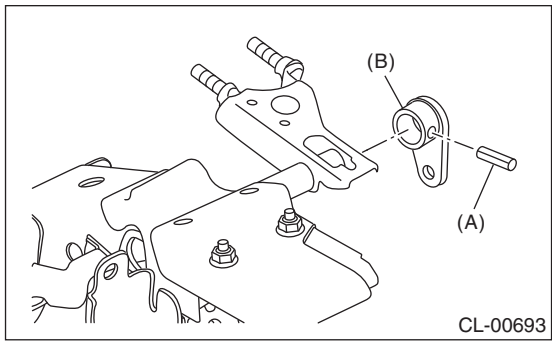
C: DISASSEMBLY

1) Remove the clutch switches.
2) Remove the clip, assist spring, assist rod A, assist rod B, assist bushing, clevis pin and bushing.



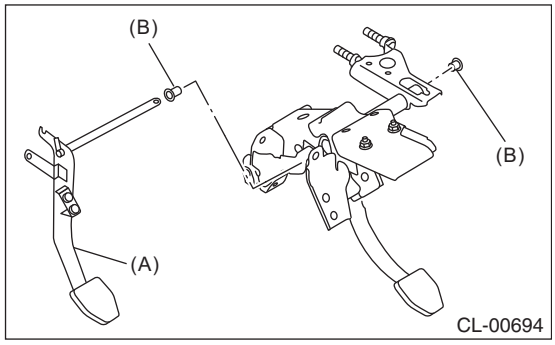
(A) Clip
(B) Assist spring
(C) Assist rod A
(D) Assist rod B
(E) Assist bushing
(F) Clevis pin
(G) Bushing

3) Remove the spring pin and lever.



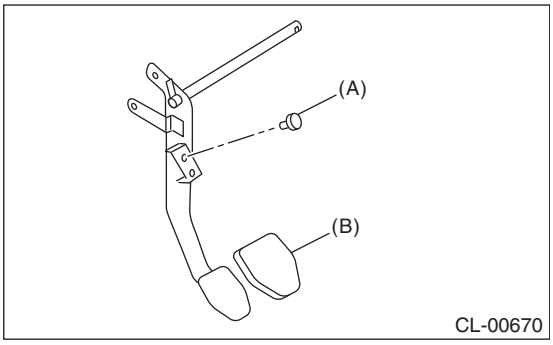
(A) Spring pin
(B) Lever

4) Remove the clutch pedal and pedal bushings.



(A) Clutch pedal
(B) Pedal bushing

5) Remove the stopper and clutch pedal pad from the clutch pedal.



(A) Stopper
(B) Clutch pedal pad

D: ASSEMBLY

1) Attach the stopper and pedal pad to the clutch pedal.
2) Install the clutch switch to the pedal bracket.
3) Clean the pedal bushing holes of the clutch pedal and brake pedal, apply grease, and install the pedal bushings.
4) Install the clutch pedal, brake pedal and lever to the pedal bracket, then secure with a spring pin.
5) Install the assist rod A, assist rod B, assist bushing and assist spring to the clutch pedal and pedal bracket.

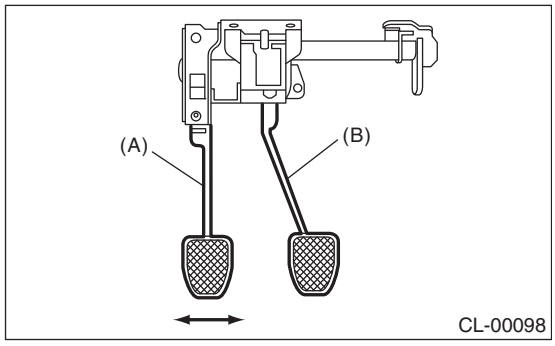
CAUTION:
Always use a new clevis pin.

E: INSPECTION

Move the clutch pedal in the lateral direction with a force of approximately 10 N (1 kgf, 2 lbf) to check that the clutch pedal deflection is within the service limit.

CAUTION:
If the deflection exceeds the service limit, replace the clutch pedal assembly with a new part.

Deflection of the clutch pedal:
Service limit
4.0 mm (0.157 in) or less



(A) Clutch pedal
(B) Brake pedal

F: ADJUSTMENT

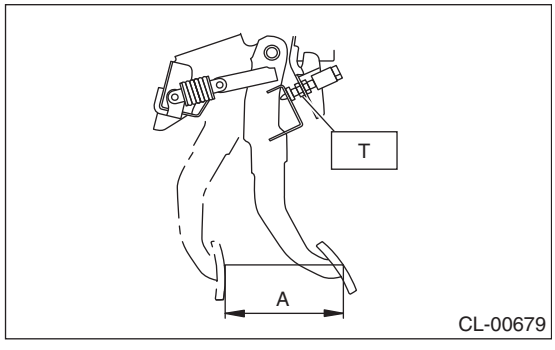
1) If the full stroke of the clutch pedal is not within the specified value, loosen the lock nuts of the clutch switch and adjust the full stroke of the clutch pedal with the clutch switch.

CAUTION:
When adjusting the full stroke of clutch pedal, do not turn the clutch switch.

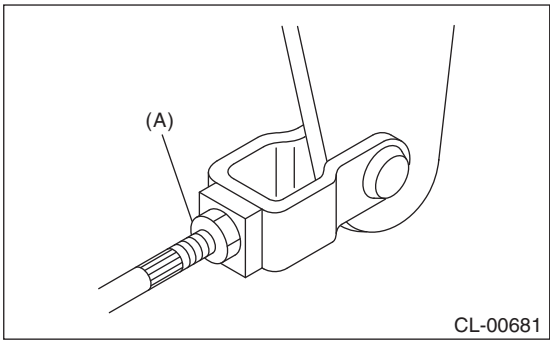
NOTE:
If the clutch switch cannot adjust the full stroke of clutch pedal to the specified value, adjust it by turning the master cylinder push rod.

Clutch pedal full stroke A:
130 — 135 mm (5.12 — 5.31 in)

Tightening torque:
T: 8 N·m (0.8 kgf-m, 5.9 ft-lb)

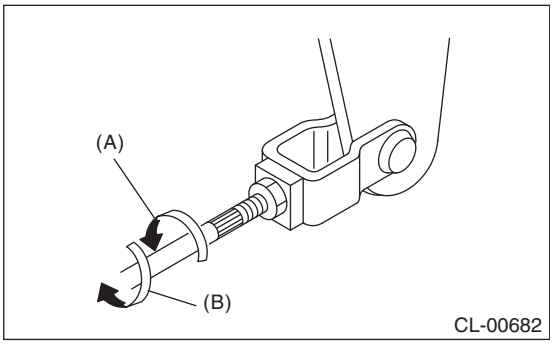


2) Loosen the push rod lock nuts of the master cylinder.



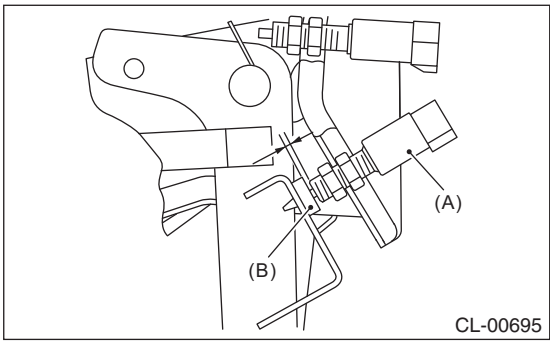
(A) Push rod lock nut

3) Rotate the push rod to adjust.



(A) In the longer direction
(B) In the shorter direction

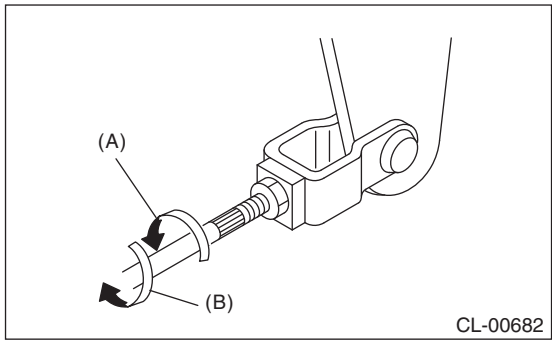
4) Make sure that the clutch pedal contacts the clutch pedal bracket stopper when the clutch pedal is at the maximum stroke position.
5) Make sure that the clutch pedal contacts the clutch switch side when the pedal is released.
6) Turn the push rod to shorten until a clearance is gained on the clutch switch side.



(A) Clutch switch
(B) Stopper

7) Turn the push rod to lengthen until clutch pedal contacts the clutch switch.

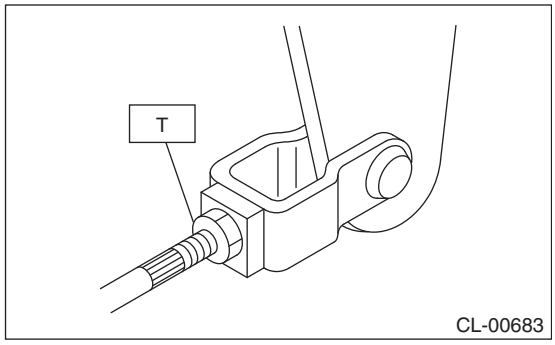
8) Turn further in the direction that will shorten the push rod by 270°.



(A) In the longer direction
(B) In the shorter direction

9) Check that the clevis pin moves smoothly by moving it in the left and right directions.
10) Tighten the push rod lock nut of the master cylinder.

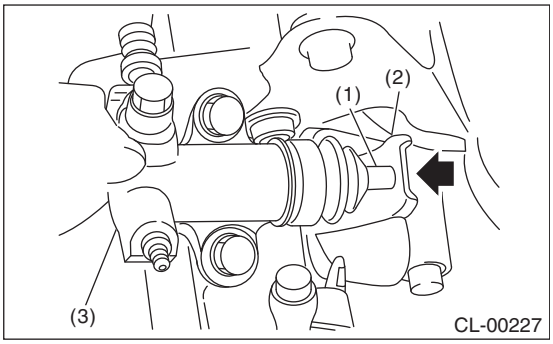
Tightening torque:
T: 10 N·m (1.0 kgf-m, 7.4 ft-lb)



11) Depress and release the clutch pedal two or three times to ensure that the clutch pedal and release lever operate smoothly. If the clutch pedal and release lever do not operate smoothly, bleed air from the clutch hydraulic system. <Ref. to CL-21, Clutch Fluid Air Bleeding.>
12) Measure the clutch pedal full stroke length again to ensure that it is within specifications. If it is not within specifications, repeat adjustment procedures again from the beginning.

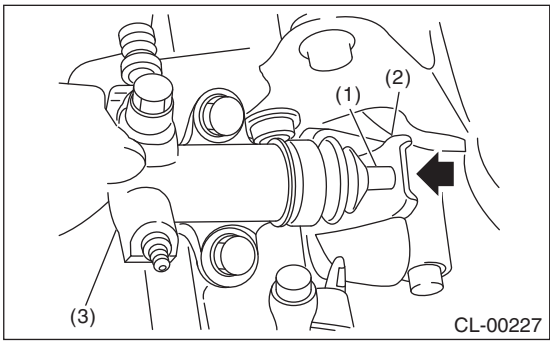
Clutch pedal full stroke:
130 — 135 mm (5.12 — 5.31 in)

13) Push the release lever until the operating cylinder push rod retracts. Make sure that the clutch fluid level in the reservoir tank increases. If the clutch fluid level increases, the hydraulic clutch is properly adjusted. If the clutch fluid level does not increase or the push rod does not retract, replace the master cylinder with a new part. <Ref. to CL-17, Master Cylinder.>



(1) Push rod
(2) Release lever
(3) Operating cylinder

14) Push the release lever until the operating cylinder push rod retracts. Check that the clutch fluid level in the reservoir tank increases.

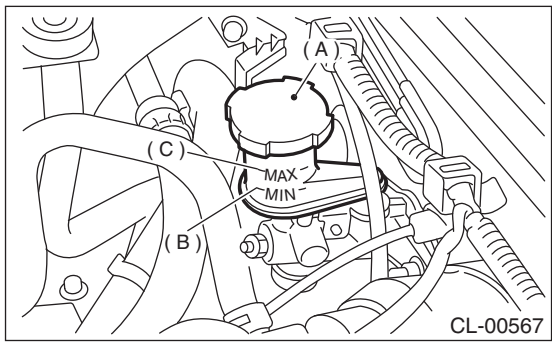


(1) Push rod
(2) Release lever
(3) Operating cylinder

15) If the clutch fluid level increases, hydraulic clutch play is correct.
16) If the clutch fluid level does not increase or push rod does not retract, readjust the clutch pedal.

17) Check the clutch fluid level using the scale on the outside of the reservoir tank. If the clutch fluid level is below “MIN”, fill the clutch fluid up to “MAX” level.

Recommended clutch fluid:
New FMVSS No. 116 DOT3 or DOT4



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

11.Clutch Switch

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the instrument panel lower cover.
3) Disconnect the connector of clutch switch.
4) Remove the clutch switches.

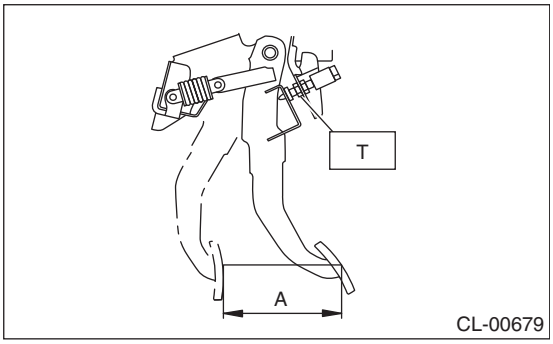
B: INSTALLATION

1. CLUTCH SWITCH

1) Move the clevis pin of push rod to left and right, retain it at the position where it moves smoothly, and measure the clutch pedal stroke.

Clutch pedal full stroke A:
130 — 135 mm (5.12 — 5.31 in)

Tightening torque:
T: 8 N·m (0.8 kgf-m, 5.9 ft-lb)

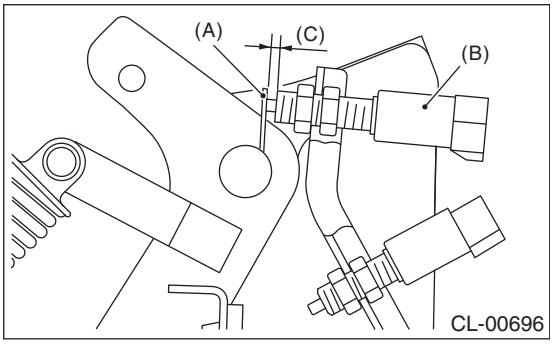


2) If the clutch pedal stroke is out of specification, adjust the stroke. <Ref. to CL-23, ADJUSTMENT, Clutch Pedal.>
3) Connect the clutch switch connector.

2. CLUTCH START SWITCH

1) Fully depress the clutch pedal and hold it.
2) Install the clutch pedal plate and clutch switch so that the gap between them is 2.0 — 2.5 mm (0.08 — 0.10 in), and then tighten the lock nut.

Tightening torque:
8 N·m (0.8 kgf-m, 5.9 ft-lb)



(A) Plate
(B) Clutch start switch
(C) 2.0 — 2.5 mm (0.08 — 0.10 in)

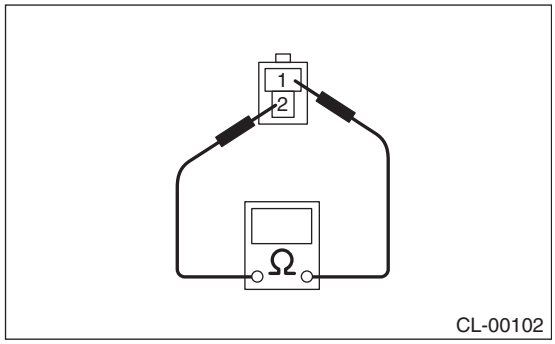
3) Connect the clutch switch connector.
4) Make sure that engine does not start with clutch pedal not depressed.
5) Make sure that engine starts with clutch pedal fully depressed.

C: INSPECTION

1. CLUTCH START SWITCH

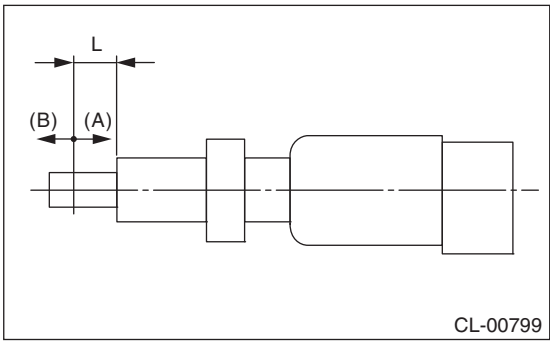
1) Perform the following inspections. If the clutch start switch does not operate normally, adjust the switch, and check it again. <Ref. to CL-28, ADJUSTMENT, Clutch Switch.>
• Make sure that engine does not start with clutch pedal not depressed.
• Make sure that engine starts with clutch pedal fully depressed.
2) When the clutch start switch does not operate normally even if it is adjusted, check the clutch start switch for continuity.
(1) Remove the clutch start switch. <Ref. to CL-26, REMOVAL, Clutch Switch.>
(2) Measure the resistance between terminal 1 and 2 of the switch. If the resistance is not at the standard value, replace the switch.

Condition	Terminal No.	Specified resistance
ON	No. 1 — No. 2	Less than 1 Ω
OFF	No. 1 — No. 2	1 MΩ or more



(3) Check that the switch is turned on and off in Dimension L.

Dimension L:
4 — 5.5 mm (0.16 — 0.22 in)

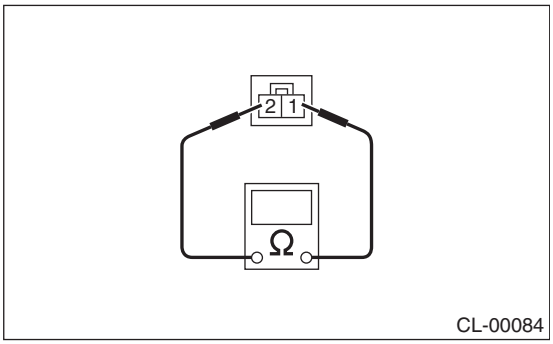


(A) ON
(B) OFF

2. CLUTCH SWITCH

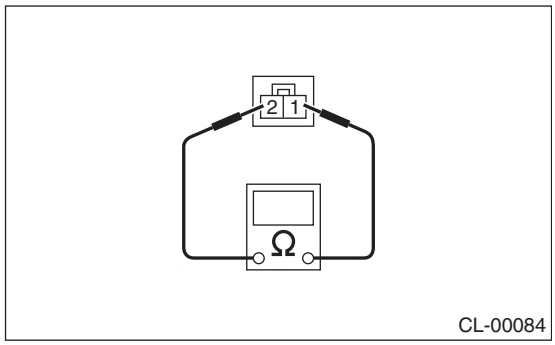
1) Check the clutch switch for continuity.
(1) Disconnect the connector of clutch switch.
(2) Measure the resistance between terminal 1 and 2 of the switch. If the resistance is not within the specification, check the clutch stroke and installation condition, and check the clutch switch again.

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



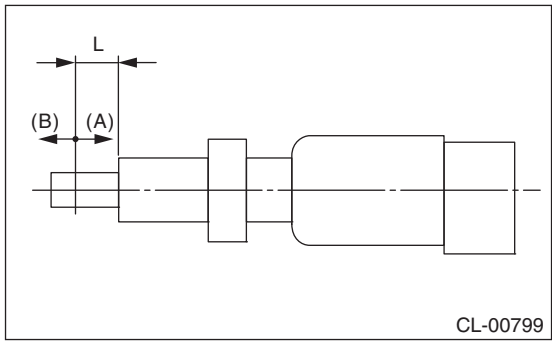
2) When the clutch switch does not operate normally even if the clutch stroke and installation condition are normal, check the clutch switch for continuity.
(1) Remove the clutch switches. <Ref. to CL-26, REMOVAL, Clutch Switch.>
(2) Measure the resistance between terminal 1 and 2 of the switch. If the resistance is not at the standard value, replace the switch.

Condition	Terminal No.	Specified resistance
ON	No. 1 — No. 2	Less than 1 Ω
OFF	No. 1 — No. 2	1 MΩ or more



(3) Check that the switch is turned on and off in Dimension L.

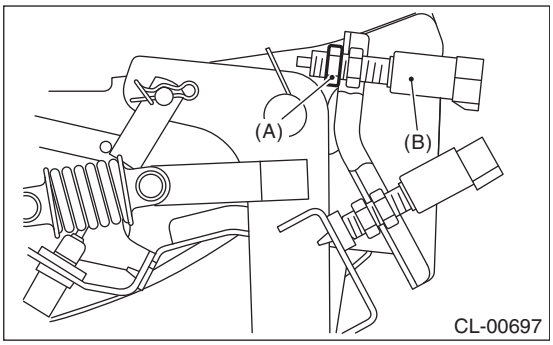
Dimension L:
5 — 6.5 mm (0.2 — 0.26 in)



(A) ON
(B) OFF

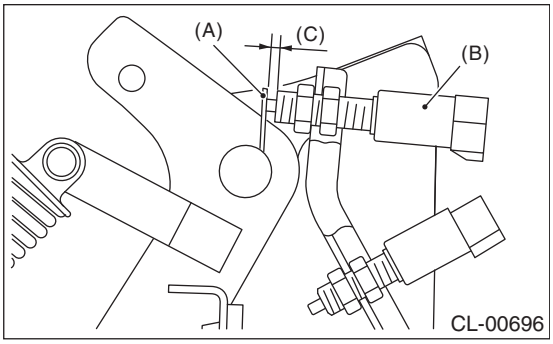
D: ADJUSTMENT

1) Loosen the lock nut of clutch switch (clutch start).



(A) Lock nut
(B) Clutch switch (clutch start)

2) Fully depress the clutch pedal and hold it.
3) Adjust the gap of the clutch pedal plate and the clutch switch to be 2.0 — 2.5 mm (0.08 — 0.10 in).



(A) Plate
(B) Clutch switch (clutch start)
(C) 2.0 — 2.5 mm (0.08 — 0.10 in)

4) Tighten the lock nut.

Tightening torque:
8 N·m (0.8 kgf-m, 5.9 ft-lb)

12.General Diagnostic Table

A: INSPECTION

1. CLUTCH

Symptoms	Possible cause	Corrective action
1. Clutch slippage. It is hard to perceive clutch slippage in the early stage, but pay attention to the following symptoms. • 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	Repair or replace.
	(e) Defective release bearing holder	Repair or replace.
2. Clutch drags. As a symptom of this trouble, 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. • Method of testing: <Ref. to CL-30, DIAGNOSTIC DIAGRAM OF CLUTCH DRAG, INSPECTION, General Diagnostic Table.> The problem is caused by insufficient disengagement of the clutch if an abnormal noise occurs during this test.	(a) Worn or rusty clutch disc hub spline	Replace the clutch disc.
	(b) Excessive deflection of clutch disc face	Repair or replace.
	(c) Crankshaft pilot needle bearing sticking	Replace.
	(d) Cracked clutch disc face	Replace.
	(e) Stuck clutch disc (smeared by oil or water)	Replace.
3. Clutch chatters. Clutch chattering is an unpleasant vibration to the whole vehicle when the vehicle is just started with clutch partially engaged.	(a) Adhesion of oil on the clutch face	Replace the clutch disc.
	(b) Weak or broken damper spring	Replace the clutch disc.
	(c) Poor contact of the disc surface or excessively worn disc	Replace the faulty clutch disc.
	(d) Warped pressure plate or flywheel	Repair or replace.
	(e) Loose disc rivets	Replace the clutch disc.
	(f) Loose engine mounting	Retighten or replace mounting.
	(g) Faulty pitching stopper	Replace.

Symptoms	Possible cause	Corrective action
4. Noisy clutch Noise occurs 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 damper spring retainer	Replace the clutch disc.
	(e) Deteriorated or broken damper 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 damper 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 clutch pedal free play	Adjust the free play of the pedal.
Excessively worn and damaged pedal shaft and/or bushing	Replace the bushing or shaft with a new part.

3. DIAGNOSTIC DIAGRAM OF CLUTCH DRAG

	Step	Check	Yes	No
1	**CHECK GEAR NOISE.** 1) Start the engine. 2) Disengage the clutch and shift quickly from neutral to reverse in idling condition.	Is there any abnormal noise from the transmission gear?	Go to step **2**.	Clutch is normal.
2	**CHECK GEAR NOISE.** Disengage the clutch at idle and shift from neutral to reverse within 0.5 — 1.0 seconds.	Is there any abnormal noise from the transmission gear?	Go to step **3**.	Defective transmission or excessive clutch drag. Inspect pilot bearing, clutch disc, transmission and clutch disc hub spline.
3	**CHECK GEAR NOISE.** 1) Disengage the clutch at idle and shift from neutral to reverse within 0.5 — 1.0 seconds. 2) With the clutch disengaged, 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, clutch release, and clutch pedal free play.	Clutch and flywheel seizure. Inspect the clutch disc and the spline of the clutch disc hub.

CHASSIS SECTION

This service manual has been prepared to provide SUBARU service personnel with the necessary information and data for the correct maintenance and repair of SUBARU vehicles.
This manual includes the procedures for maintenance, disassembling, reassembling, inspection and adjustment of components and diagnostics for guidance of experienced mechanics.
Please peruse and utilize this manual fully to ensure complete repair work for satisfying our customers by keeping their vehicle in optimum condition. When replacement of parts during repair work is needed, be sure to use SUBARU genuine parts.

All information, illustration and specifications contained in this manual are based on the latest product information available at the time of publication approval.

FRONT SUSPENSION	FS
REAR SUSPENSION	RS
WHEEL AND TIRE SYSTEM	WT
TIRE PRESSURE MONITORING SYSTEM (DIAGNOSTICS)	TPM(diag)
DIFFERENTIALS	DI
TRANSFER CASE	TC
DRIVE SHAFT SYSTEM	DS
VEHICLE DYNAMICS CONTROL (VDC)	VDC
VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)	VDC(diag)
BRAKE	BR
PARKING BRAKE	PB
POWER ASSISTED SYSTEM (POWER STEERING)	PS

FRONT SUSPENSION

FS

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2. Wheel Alignment 6
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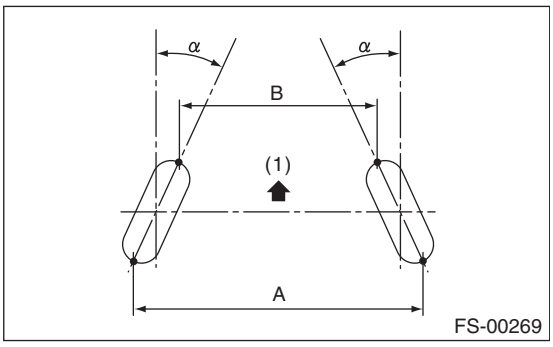
4. Front Stabilizer 14
5. Front Ball Joint 15
6. Front Arm 17
7. Front Strut 20
8. Front Crossmember 24
9. General Diagnostic Table 25

1. General Description

A: SPECIFICATION

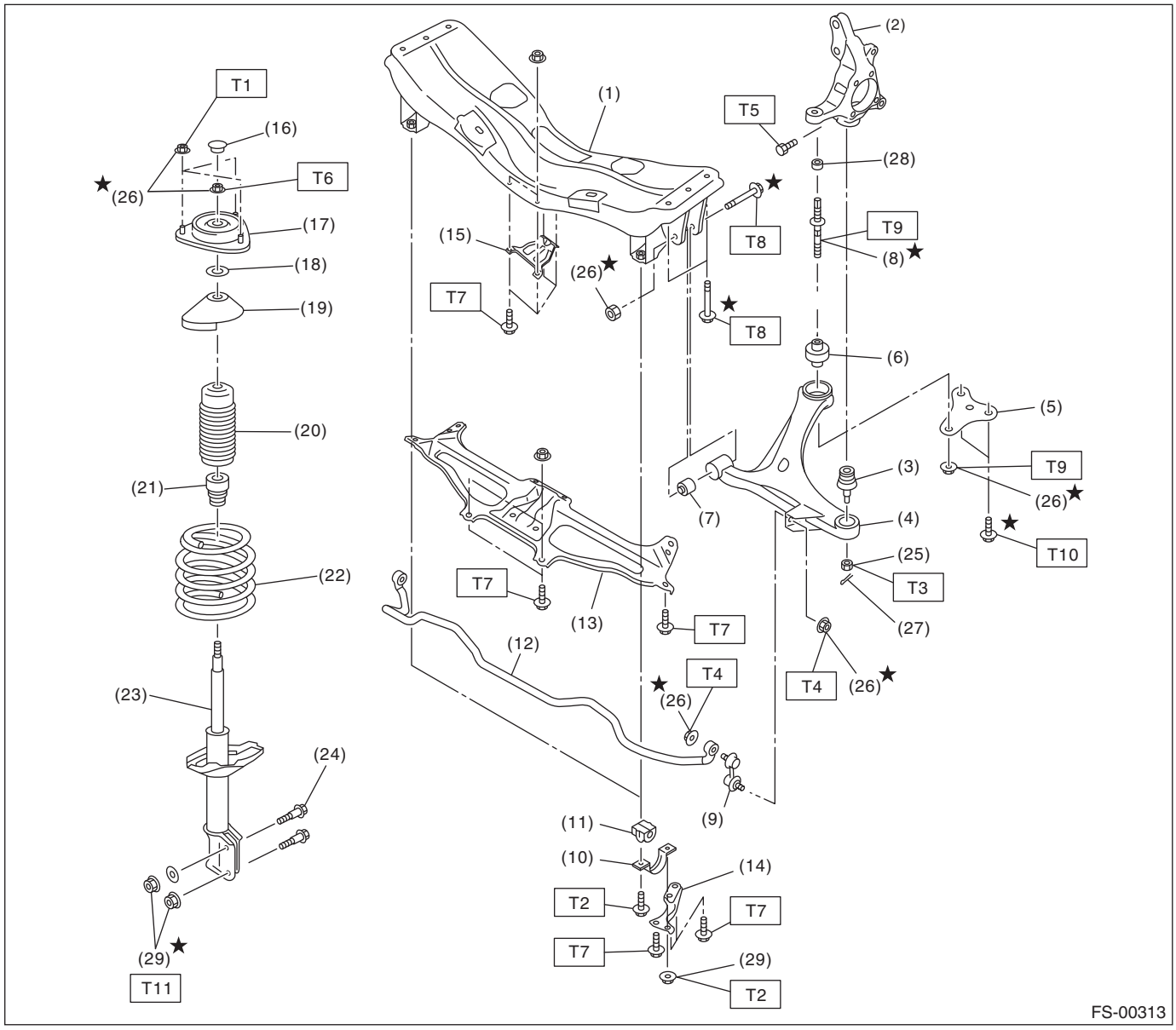
Model			All models
Front	Wheel arch height (Tolerance: $^{+12\ mm}_{-24\ mm}$ ($^{+0.47\ in}_{-0.94\ in}$)) mm (in)		445 (17.5)
	Camber (Tolerance: ±0°45′ Differences between RH and LH: 45′ or less)		0°00′
	Caster (Referential Value)		5°25′
	Steering angle (Tolerance: ±1.5°)	Inner wheel	38.3°
		Outer wheel	33.8°
	Toe-in mm (in)		0±3 (0±0.12) Toe angle (sum of both wheels): 0°±0°15′
	Kingpin angle (Referential Value)		13°20′
Rear	Wheel arch height (Tolerance: $^{+12\ mm}_{-24\ mm}$ ($^{+0.47\ in}_{-0.94\ in}$)) mm (in)		448 (17.6)
	Camber (Tolerance: ±0°45′ Differences between RH and LH: 45′ or less)		0°00′
	Toe-in mm (in)		0±3 (0±0.12) Toe angle (sum of both wheels): 0°±0°15′
	Thrust angle (Tolerance: ±0°30′)		0°

NOTE:
• Front and rear toe-in and front camber can be adjusted. Adjust if the toe-in or camber tolerance exceeds specifications.
• Other items indicated in the specifications is not equipped with adjustment mechanisms. If other items exceed specifications, check the suspension parts and connections for deformation. If defective, replace with new parts.



(1) Front
A – B = Positive: Toe-in, Negative: Toe-out
α = Individual toe angles

B: COMPONENT


T1
(16)
★(26)
T6
(17)
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(21)
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(24)
★(29)
T11
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★(26)
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(4)
★
T10
(25)
T3
(27)
T4
T4
(26)★
FS-00313

(1) Front crossmember
(2) Housing
(3) Ball joint
(4) Front arm
(5) Support plate
(6) Rear bushing
(7) Front bushing
(8) Stud bolt
(9) Stabilizer link
(10) Bracket
(11) Bushing
(12) Stabilizer
(13) Crossmember support plate (Large type - 2.5 L turbo model)
(14) Crossmember support plate (Small type - 2.5 L non-turbo model)
(15) Jack-up plate
(16) Dust seal
(17) Strut mount
(18) Spacer
(19) Upper spring seat
(20) Dust cover
(21) Helper
(22) Coil spring
(23) Strut
(24) Adjusting bolt
(25) Castle nut
(26) Self-locking nut
(27) Cotter pin
(28) Stopper
(29) Flange nut

Tightening torque:N·m (kgf-m, ft-lb)	
T1:	*20 (2.04, 14.8)*
T2:	*25 (2.55, 18.4)*
T3:	*39 (3.98, 28.8)*
T4:	*45 (4.59, 33.2)*
T5:	*50 (5.10, 36.9)*
T6:	*55 (5.61, 40.6)*
T7:	*60 (6.12, 44.3)*
T8:	*95 (9.69, 70.1)*
T9:	*110 (11.22, 81.1)*
T10:	*150 (15.30, 110.6)*
T11:	*155 (15.81, 114.3)*

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 etc. of different grades or manufacturers.
• Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or 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

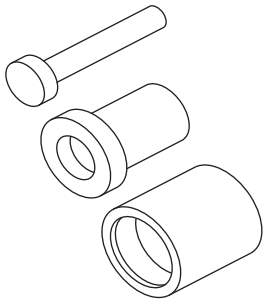
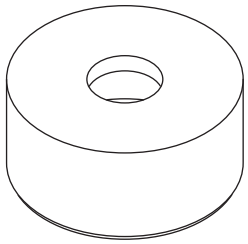
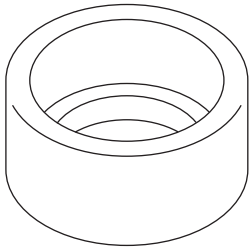
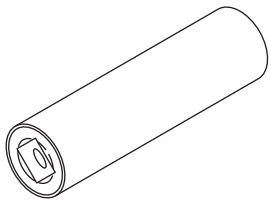
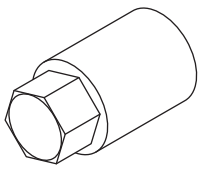
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-927680000	927680000	INSTALLER & REMOVER SET	Used for replacing front arm front bushing.

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST20299AG000	20299AG000	REMOVER	• Used for replacing front arm rear bushing. • Used together with BASE (20999AG010).
 ST20299AG010	20299AG010	BASE	• Used for replacing front arm rear bushing. • Used together with REMOVER (20999AG000).
 ST20299AG020	20299AG020	STUD BOLT SOCKET	Used for removing and installing the stud bolt for front arm installing portion.
 ST20399AG000	20399AG000	STRUT MOUNT SOCKET	Used for disassembling and assembling strut 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.
Side slip tester	Used for measuring side slip

2. Wheel Alignment

A: INSPECTION

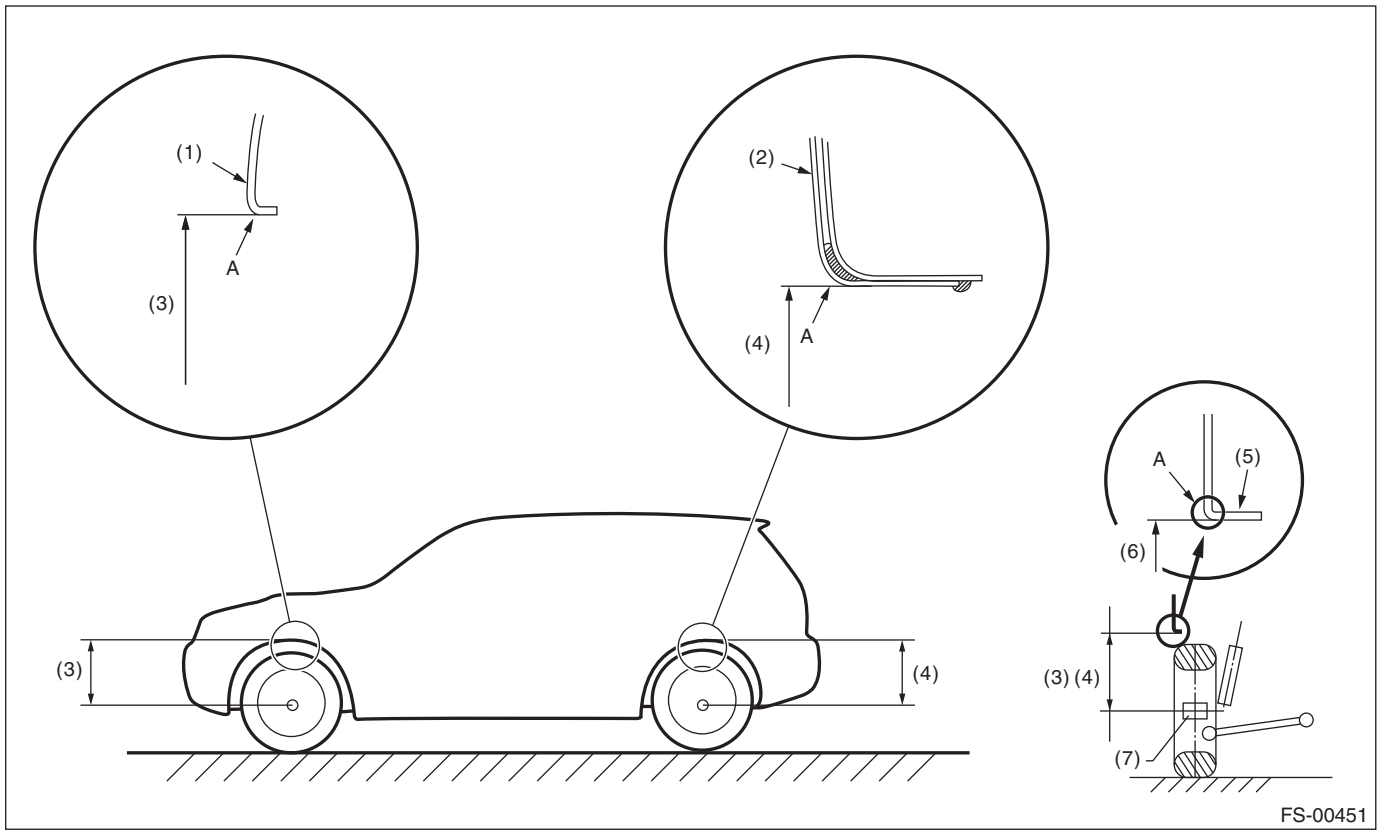
Check the following items before performing the wheel alignment measurement.
- Tire inflation pressure
- Uneven wear of RH and LH tires, or difference of sizes
- Tire runout
- Excessive play and wear of ball joint
- Excessive play and wear of tie-rod end
- Excessive play of wheel bearing
- Right and 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.

Wheel arch height (front and rear wheels) <Ref. to FS-7, WHEEL ARCH HEIGHT, INSPECTION, Wheel Alignment.>
↓
Camber (front and rear wheels) <Ref. to FS-8, CAMBER, INSPECTION, Wheel Alignment.>
↓
Caster (front wheel) <Ref. to FS-9, CASTER, INSPECTION, Wheel Alignment.>
↓
Steering angle <Ref. to FS-10, STEERING ANGLE, INSPECTION, Wheel Alignment.>
↓
Front wheel toe-in <Ref. to FS-10, FRONT WHEEL TOE-IN, INSPECTION, Wheel Alignment.>
↓
Rear wheel toe-in <Ref. to FS-11, REAR WHEEL TOE-IN, INSPECTION, Wheel Alignment.>
↓
Thrust angle <Ref. to FS-12, THRUST ANGLE, INSPECTION, Wheel Alignment.>

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 suspension by moving the vehicle in a straight line for 5 m (16 ft) or more.
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.
5) Measure the distance between the point “A” and the center of wheel.



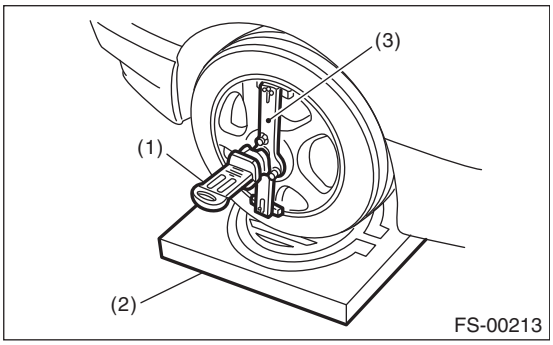
(1) Front fender
(2) Rear quarter
(3) Front wheel arch height
(4) Rear wheel arch height
(5) Flange bend line
(6) Point of measurement
(7) End of spindle

Wheel arch height specification mm (in) (Tolerance: $^{+12\ mm}_{-24\ mm}$ ($^{+0.47\ in}_{-0.94\ in}$))	
Model	All models
Front	445 (17.5)
Rear	448 (17.6)

2. CAMBER

• INSPECTION

1) Place the front wheel on the turning radius gauge. Make sure the ground contact 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 camber angle in accordance with the operation manual for wheel alignment gauge.

Model	Camber (Difference between RH and LH 45′ or less)
All models	0°00′±0°45′

• Front camber adjustment

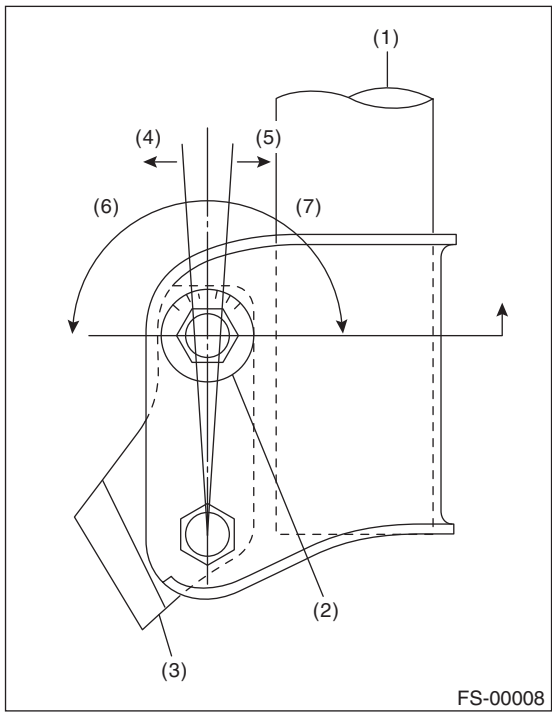
1) When adjusting the camber, adjust it to the following value.

Model	Camber (Difference between RH and LH 45′ or less)
All models	0°00′±0°30′

2) Loosen the two flange nuts located at the front lower section of the strut.

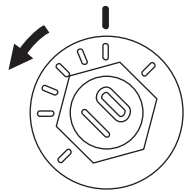
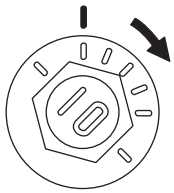
NOTE:
When the adjusting bolt needs to be loosened or tightened, hold its head with a wrench and turn the flange nut.
3) Turn the camber adjusting bolt so that the camber is set at specification.

NOTE:
Moving the adjusting bolt by one scale changes the camber by approximately 0°15′.

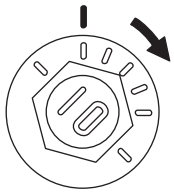
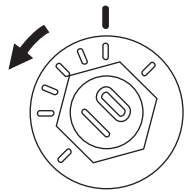


(1) Strut
(2) Adjusting bolt
(3) Housing
(4) Outer
(5) Inner
(6) Camber is increased.
(7) Camber is decreased.

• To increase camber.

Rotate the left side counterclockwise.
 FS-00009
Rotate the right side clockwise.
 FS-00010

• To decrease camber.

Rotate the left side clockwise.
 FS-00010
Rotate the right side counterclockwise.
 FS-00009

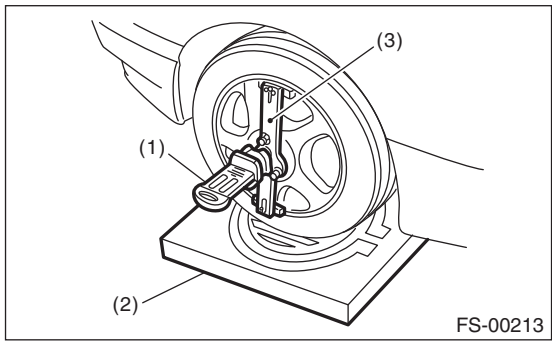
4) Tighten two new flange nuts.

Tightening torque:
155 N·m (15.81 kgf-m, 114.3 ft-lb)

3. CASTER

• INSPECTION

1) Place the front wheel on the turning radius gauge. Make sure the ground contact 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
All models	5°25′

4. STEERING ANGLE

• INSPECTION

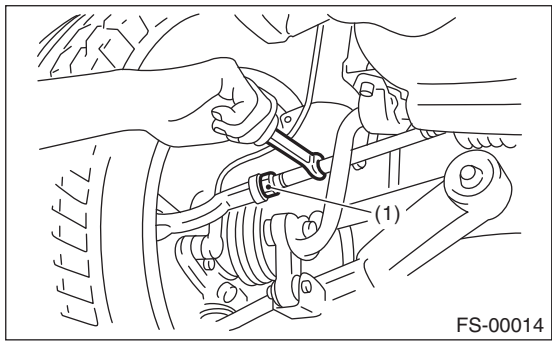
1) Place the vehicle on turning radius gauge.
2) While depressing the brake pedal, turn the steering wheel fully to the left and right. With the steering wheel held at each fully turned position, measure both the inner and outer wheel steering angles.

Model	Inner wheel	Outer wheel
All models	38.3°±1.5°	33.8°±1.5°

• 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

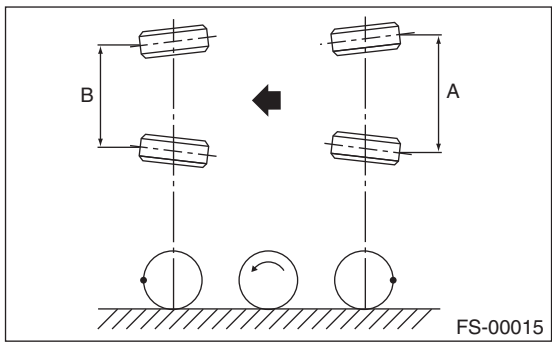
Toe-in:
0±3 mm (0±0.12 in)

1) Set the toe-in gauge in the position at wheel axis center height behind the right and left front tires.
2) Place a mark at the center of both left and right tires, and measure 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 calculation:

A – B = Toe-in

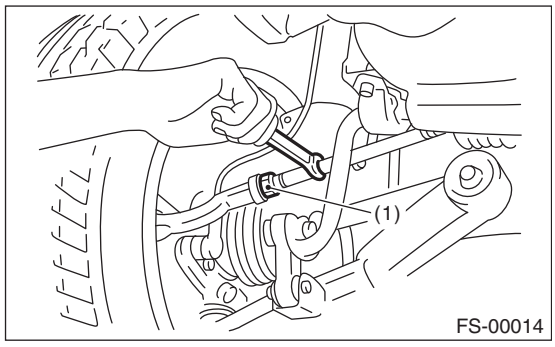


• ADJUSTMENT

When adjusting the toe-in, adjust it to the following value.

Toe-in:
0±2 mm (0±0.08 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 specification.
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 N·m (8.67 kgf-m, 62.7 ft-lb)

NOTE:
Check and correct the tie-rod boot if twisted.

6. REAR WHEEL TOE-IN

• INSPECTION

Toe-in:
0±3 mm (0±0.12 in)

Refer to FRONT WHEEL TOE-IN for rear toe-in inspection procedures. <Ref. to FS-10, FRONT WHEEL TOE-IN, INSPECTION, Wheel Alignment.>

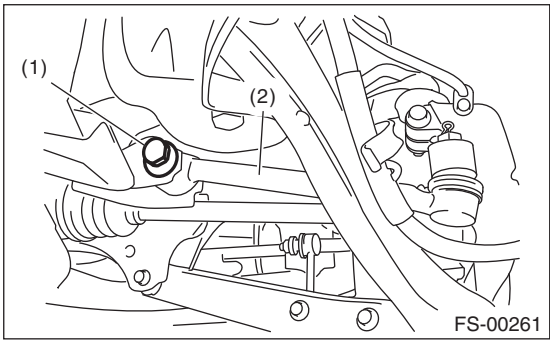
• ADJUSTMENT

When adjusting, adjust it to the following value.

Toe-in:
0±2 mm (0±0.08 in)

1) Loosen the self-locking nut on the inner side of front lateral ink.

NOTE:
When loosening or tightening the adjusting bolt, hold the bolt head and turn the self-locking nut.

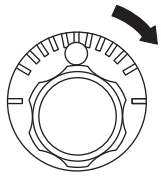
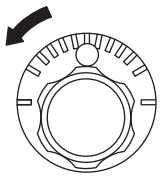


(1) Adjusting bolt
(2) Lateral link

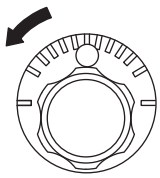
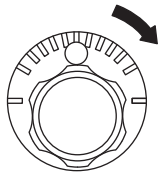
2) Turn the adjusting bolt until toe-in is within the specification.

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. 1.3 mm (0.05 in).

• To increase toe-in.

Rotate the left side clockwise.
 FS-00018
Rotate the right side counterclockwise.
 FS-00019

• To decrease toe-in.

Rotate the left side counterclockwise.
 FS-00019
Rotate the right side clockwise.
 FS-00018

3) Attach and tighten a new self-locking nut.

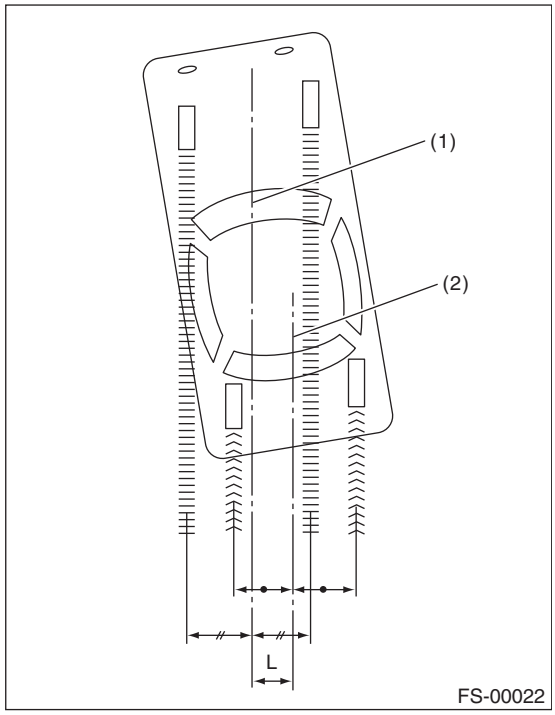
Tightening torque:
100 N·m (10.20 kgf-m, 73.8 ft-lb)

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
0°±30′
Less than 30′ when “L” is 23 mm (0.9 in) or less



(1) Center line of loci (front axle)
(2) Center line of loci (rear axle)

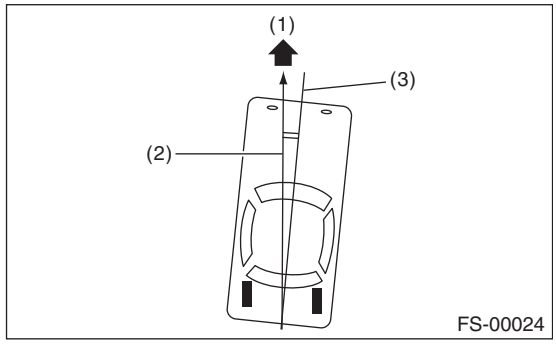
• ADJUSTMENT

When adjusting, adjust it to the following value.

Thrust angle
0°±20′
Less than 20′ when “L” is 15 mm (0.6 in) or less

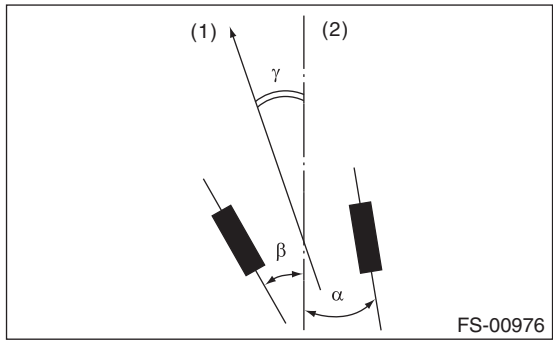
1) Make thrust angle adjustments by turning the toe-in adjusting bolts of the rear suspension equally in the same direction.
2) When one rear wheel is adjusted in a toe-in direction, adjust the other rear wheel equally in toe-out direction, in order to make the thrust angle adjustment.
3) When the left and right adjusting bolts are turned by one graduation, the thrust angle will change approx. 15′. (“L” is approx. 11 mm (0.43 in)).

NOTE:
Thrust angle is a mean value of left and right wheel toe angles in relation to the vehicle body center line. Vehicle is driven straight in the thrust angle direction while slanting in the oblique direction depending on the degree of the mean thrust angle.



(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 calculation.



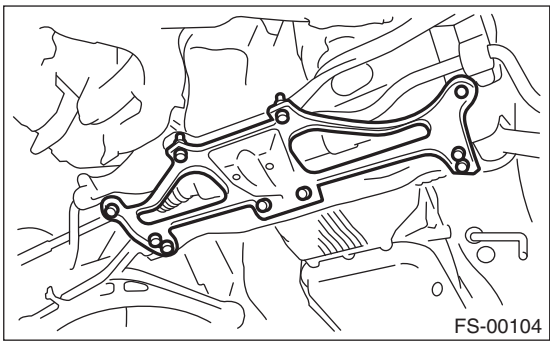
(1) Front
(2) Body center line

3. Front Crossmember Support Plate

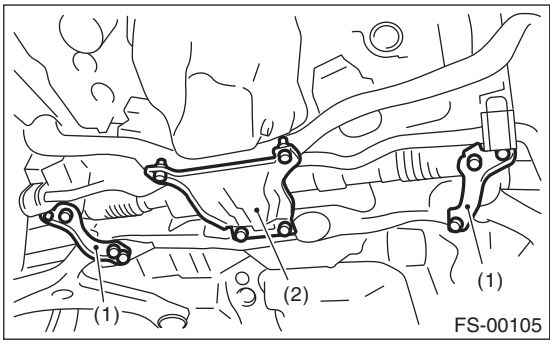
A: REMOVAL

1) Lift up the vehicle
2) Remove the front under cover. <Ref. to EI-26, REMOVAL, Front Under Cover.>
3) Remove the bolt and remove front crossmember support plate.

- Large type



- Small type



(1) Crossmember support plate
(2) Jack-up plate

B: INSTALLATION

Install each part in the reverse order of removal.

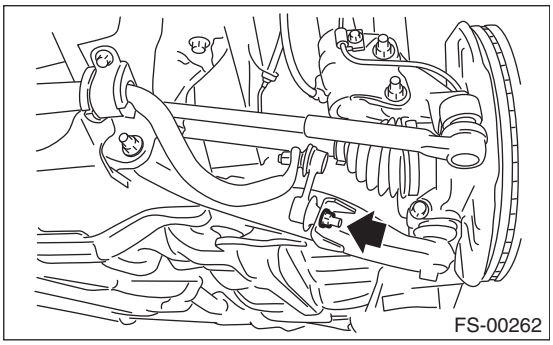
NOTE:
Tighten the small type crossmember support plate together with stabilizer bracket.
After attaching the stabilizer bracket to the crossmember, tighten the crossmember support plate together with the bracket.

Tightening torque:
Crossmember support plate:
60 N·m (6.12 kgf-m, 44.3 ft-lb)
Crossmember support plate (sections tightened together with the stabilizer bracket):
25 N·m (2.55 kgf-m, 18.4 ft-lb)
Jack-up plate:
60 N·m (6.12 kgf-m, 44.3 ft-lb)

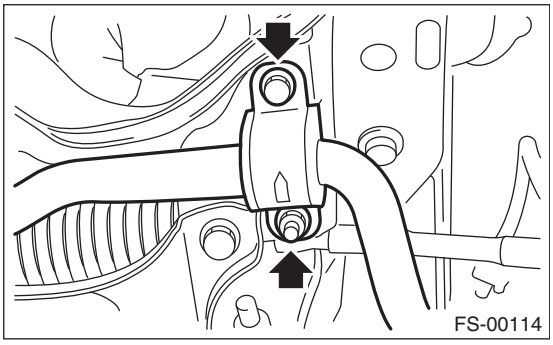
4. Front Stabilizer

A: REMOVAL

1) Lift up the vehicle, and then remove the front wheels.
2) Remove the front under cover. <Ref. to EI-26, REMOVAL, Front Under Cover.>
3) Remove the front crossmember support plate. <Ref. to FS-13, REMOVAL, Front Crossmember Support Plate.>
4) Remove the stabilizer link.

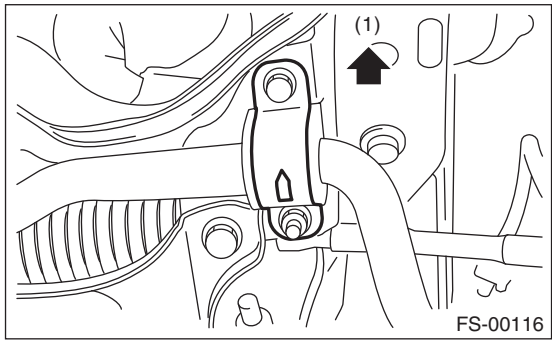


5) Remove the stabilizer bracket.



B: INSTALLATION

CAUTION:
• Use a new self-locking nut.
• Ensure the stabilizer bushing and stabilizer have the same identification colors.
• Install the stabilizer bushing (front crossmember side) while aligning it with the paint mark on stabilizer.
• The stabilizer bracket has a set orientation. Install it with the arrow mark facing the upper side of the vehicle.



(1) Front side of vehicle

Install each part in the reverse order of removal.

Tightening torque:
Stabilizer link:
45 N·m (4.59 kgf-m, 33.2 ft-lb)
Stabilizer bracket:
25 N·m (2.55 kgf-m, 18.4 ft-lb)

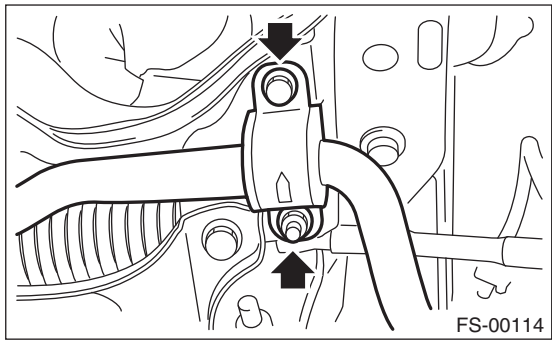
C: INSPECTION

1) Check the bushing for abnormal cracks, fatigue or damages.
2) Check the stabilizer link for damage.

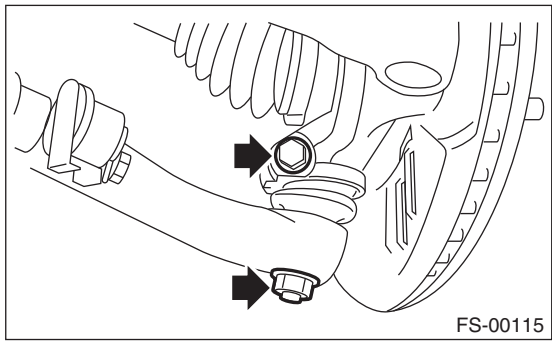
5. Front Ball Joint

A: REMOVAL

1) Lift up the vehicle, and then remove the front wheels.
2) Remove the both sides of stabilizer bracket.



3) Pull out the pin from ball stud, remove the castle nut, and extract the ball stud from front arm.
4) Remove the bolt installing ball joint to housing.



5) Extract the ball joint from housing.

B: INSTALLATION

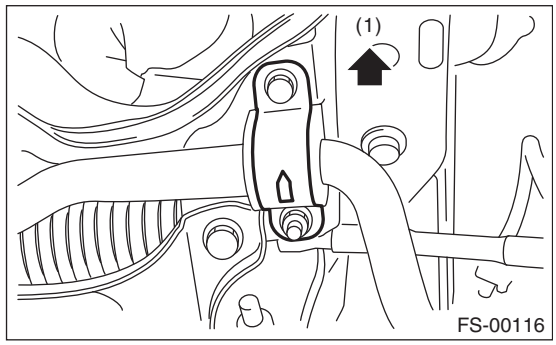
1) Insert the ball joint into housing.

CAUTION:
Do not apply grease to the tapered portion of ball stud.

Tightening torque (Bolt):
50 N·m (5.10 kgf-m, 36.9 ft-lb)
2) Install the ball joint into front arm.

Tightening torque (Castle nut):
39 N·m (3.98 kgf-m, 28.8 ft-lb)
3) Retighten the castle nut further up to 60° until the hole in the 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 stabilizer bracket.

NOTE:
The stabilizer bracket has a set orientation. Install it with the arrow mark facing the upper side of the vehicle.

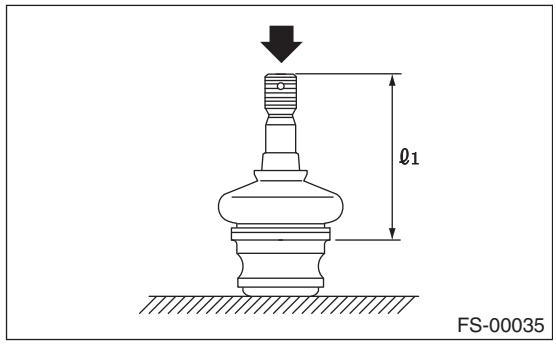


(1) Front side of vehicle

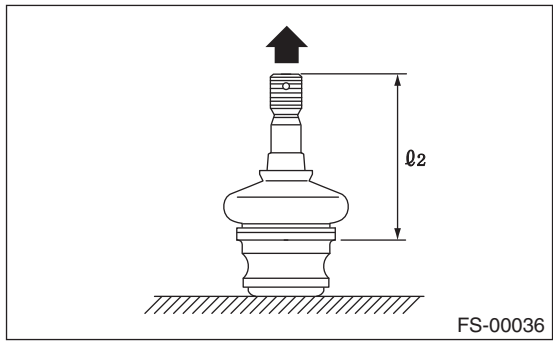
Tightening torque:
25 N·m (2.55 kgf-m, 18.4 ft-lb)
5) Install the front wheels.

C: INSPECTION

1) Measure the play of the ball joint using the following procedures. Replace with a new part if the play exceeds specification.
(1) With 686 N (70 kgf, 154 lbf) loaded in direction shown in the figure, measure the length ℓ_1.



(2) With 686 N (70 kgf, 154 lbf) loaded in direction shown in the figure, measure the length ℓ_2.



(3) Determine free play using the following formula.
$S = \ell_2 - \ell_1$
(4) Replace with a new part if the play exceeds specification.

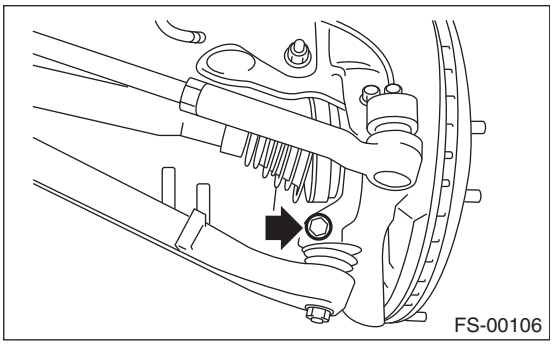
Front ball joint
Specification for replacement S:
Less than 0.3 mm (0.012 in)

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.

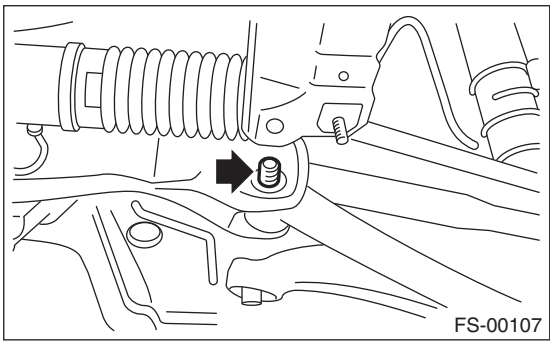
6. Front Arm

A: REMOVAL

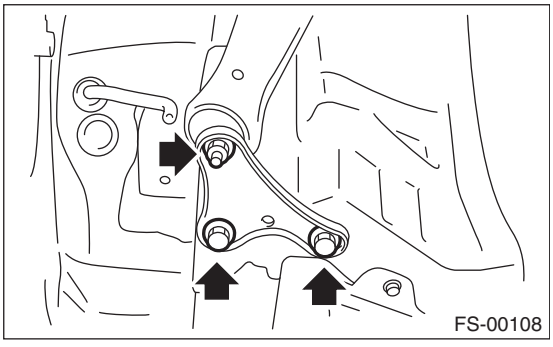
1) Lift up the vehicle, and then remove the front wheels.
2) Remove the front crossmember support plate. <Ref. to FS-13, REMOVAL, Front Crossmember Support Plate.>
3) Remove the front stabilizer. <Ref. to FS-14, REMOVAL, Front Stabilizer.>
4) Remove the ball joint of front arm.


FS-00106

5) Remove the nut securing the front arm to the crossmember. (Do not remove the bolt.)

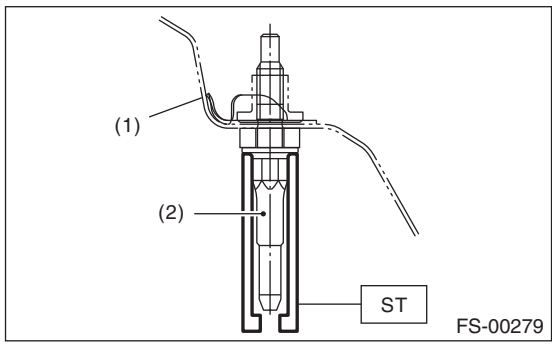

FS-00107

6) Remove the front arm support plate.


FS-00108

7) Remove the bolt securing front arm to crossmember and pull the front arm out of the crossmember.
8) To remove the stud bolt, use the ST.

CAUTION:
Do not remove the stud bolt unnecessarily. Always replace the parts with new parts when removed.
ST 20299AG020 STUD BOLT SOCKET



(1) Vehicle body
(2) Stud bolt

B: INSTALLATION

1) Using the ST, install the stud bolt.
ST 20299AG020 STUD BOLT SOCKET

Tightening torque:
110 N·m (11.22 kgf-m, 81.1 ft-lb)
2) Using new bolts and self-locking nuts, temporarily tighten the front arm to crossmember.
3) Secure the front arm to body, and then install the support plate with new bolts and self-locking nuts.

Tightening torque:
Support plate to Front arm:
110 N·m (11.22 kgf-m, 81.1 ft-lb)
Support plate to Body:
150 N·m (15.30 kgf-m, 110.6 ft-lb)
4) Install the ball joint into housing.

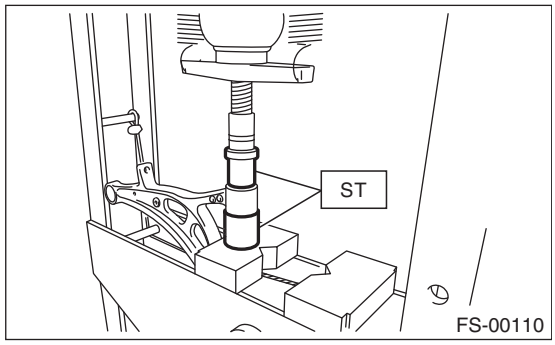
Tightening torque:
50 N·m (5.10 kgf-m, 36.9 ft-lb)
5) Install the stabilizer. <Ref. to FS-14, INSTALLATION, Front Stabilizer.>
6) Install the front wheels.
7) Lower the vehicle from lift, and tighten the bolt which secures the front arm to crossmember with wheels in full contact with the ground and the vehicle at curb weight.

Tightening torque:
95 N·m (9.69 kgf-m, 70.1 ft-lb)
8) Connect the battery ground terminal.
9) Inspect the wheel alignment and adjust if necessary. <Ref. to FS-6, INSPECTION, Wheel Alignment.>
10) Perform reinitialization of the auto headlight beam leveler system. (model with auto headlight beam leveler) <Ref. to LI-16, PROCEDURE, Auto Headlight Beam Leveler System.>

C: DISASSEMBLY

1. FRONT BUSHING

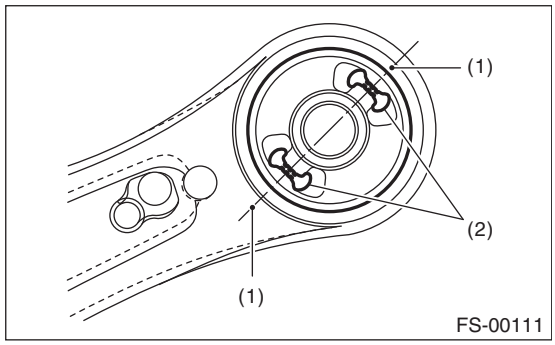
Using the ST and a press, remove the front bushing.
ST 927680000 INSTALLER & REMOVER SET



2. REAR BUSHING

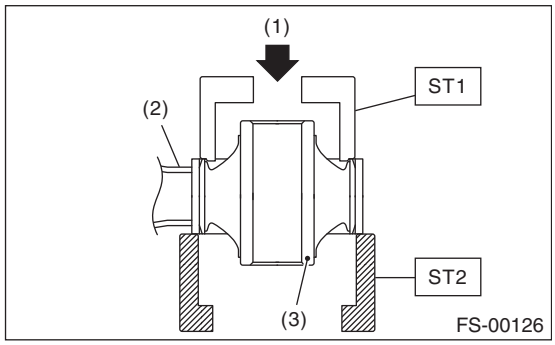
1) Put an alignment mark on the front arm based on the center of rear bushing recess portion.

CAUTION:
Always put an alignment mark for aligning the position on bushing installation.



(1) Put an alignment mark.
(2) Recess section

2) Using the ST and a press, remove the rear bushing.
ST1 20299AG000 REMOVER
ST2 20299AG010 BASE



(1) Press
(2) Front arm
(3) Rear bushing

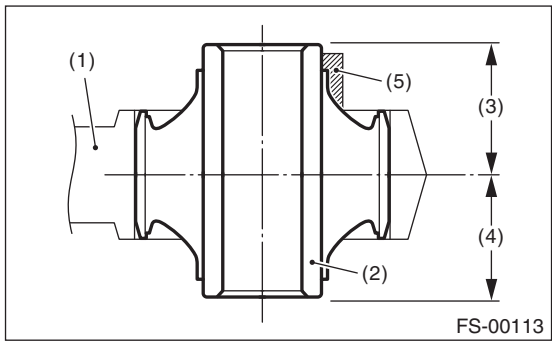
D: ASSEMBLY

1. FRONT BUSHING

Assemble each part in the reverse order of disassembly.

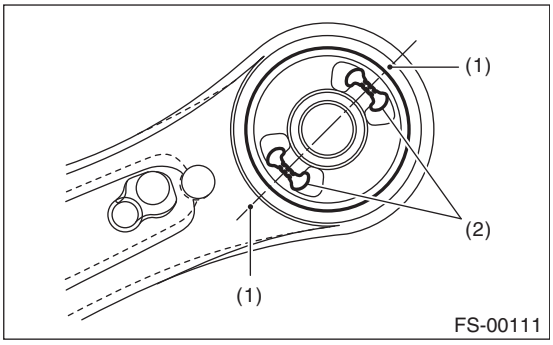
2. REAR BUSHING

1) Install the rear bushing with its longer inner cylinder facing upward and the shorter facing downward and protruding part rearward as shown in the figure.



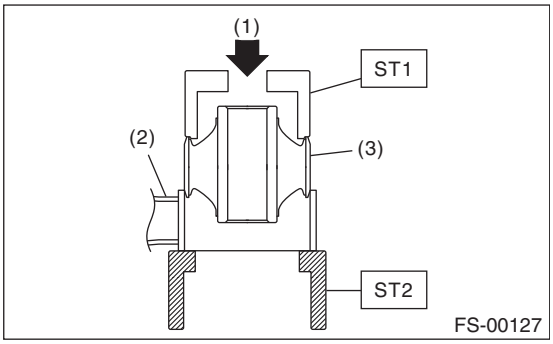
(1) Front arm
(2) Bushing inner cylinder
(3) Longer
(4) Shorter
(5) Protrusion portion

2) Align the center of rear bushing recess portion with the aligning mark on the front arm.



(1) Alignment mark
(2) Recess section

3) Using the ST and a press, install the rear bushing.
ST1 20299AG000 REMOVER
ST2 20299AG010 BASE



(1) Press
(2) Front arm
(3) Rear bushing

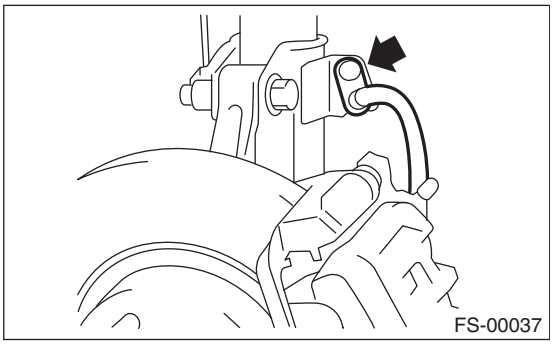
E: INSPECTION

1) Check the front arm for damage or cracks, and correct or replace if defective.
2) Check the bushing for abnormal fatigue or damage.

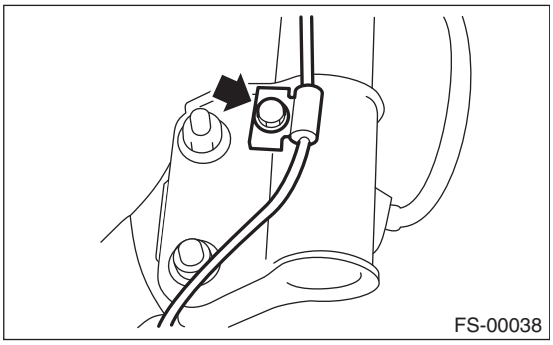
7. Front Strut

A: REMOVAL

1) Lift up the vehicle, and then remove the front wheels.
2) Place an alignment mark on the camber adjusting bolt and strut.
3) Remove the bolt securing the brake hose from the strut.



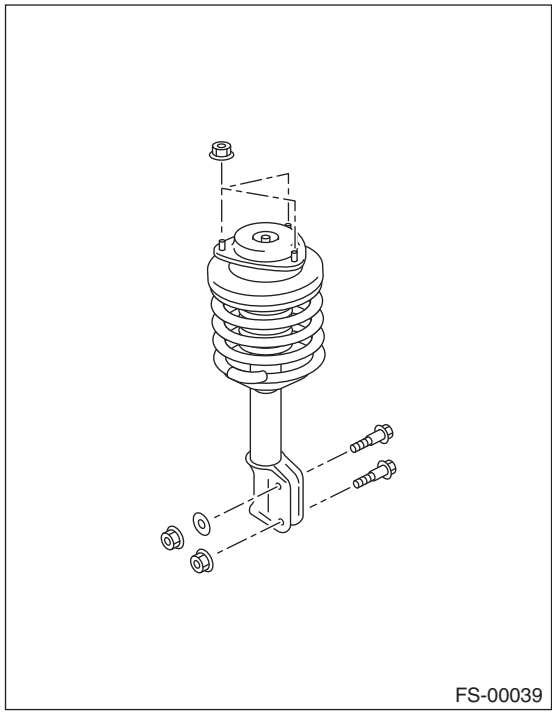
4) Remove the bolt securing the ABS wheel speed sensor harness.



5) Remove the two bolts securing the housing to the strut.

NOTE:
While holding the head of the adjusting bolt, loosen the flange nut.

6) Remove the three nuts securing strut mount to body.



B: INSTALLATION

1) Install the strut mount at the upper side of strut to body, and tighten it with new self-locking nuts.

Tightening torque:
20 N·m (2.04 kgf-m, 14.8 ft-lb)

2) Align alignment marks on the camber adjusting bolt and strut.
Using new flange nuts, install the strut to the housing.

NOTE:
While holding the head of adjusting bolt, tighten the flange nut.

Tightening torque:
155 N·m (15.81 kgf-m, 114.3 ft-lb)

3) Secure the ABS wheel speed sensor harness to the strut.

Tightening torque:
33 N·m (3.36 kgf-m, 24.3 ft-lb)

4) Install the bolts which secure the brake hose to the strut.

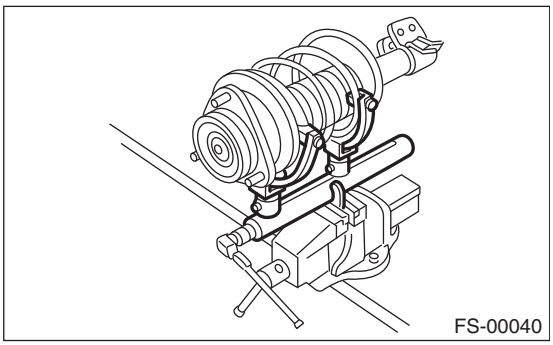
Tightening torque:
33 N·m (3.36 kgf-m, 24.3 ft-lb)

5) Install the front wheels.
6) Inspect the wheel alignment and adjust if necessary. <Ref. to FS-6, INSPECTION, Wheel Alignment.>

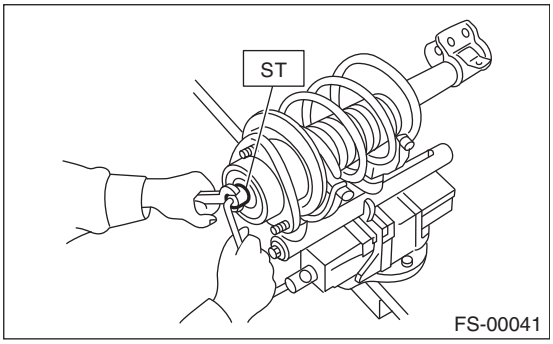
7) Perform reinitialization of the auto headlight beam leveler system. (model with auto headlight beam leveler) <Ref. to LI-16, PROCEDURE, Auto Headlight Beam Leveler System.>

C: DISASSEMBLY

1) Using a coil spring compressor, compress the coil spring.



2) Using the ST, remove the self-locking nut.
ST 20399AG000 STRUT MOUNT SOCKET

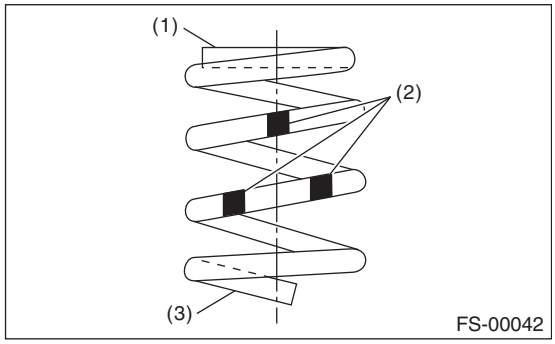


3) Remove the strut mount and upper spring seat from strut.
4) Gradually decrease the compression force of compressor, and remove the coil spring.
5) Remove the dust cover and helper.

D: ASSEMBLY

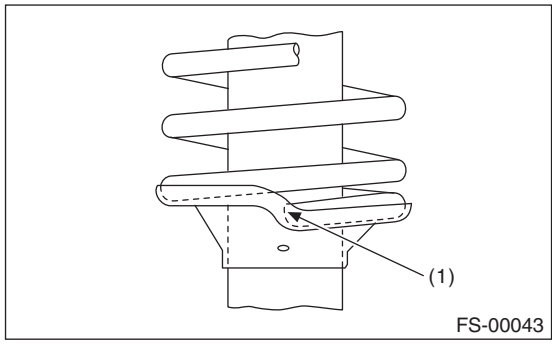
1) Using a coil spring compressor, compress the coil spring.

NOTE:
Make sure that the vertical install direction of the coil spring is as shown in the figure.



(1) Diameter is small (Upper part)
(2) Identification paint
(3) Diameter is large (Bottom part)

2) Set the coil spring correctly so that its end face seats well in the spring seat as shown in the figure.

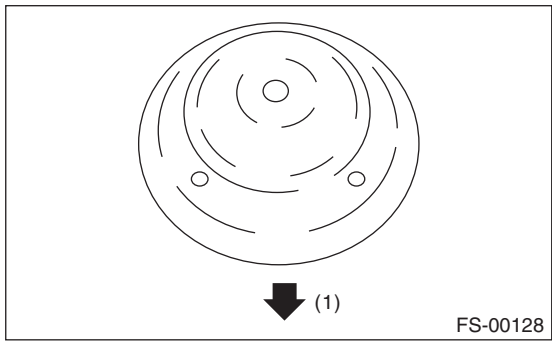


(1) Coil spring end face

3) Install the helper and dust cover to the piston rod.

4) Pull the piston rod fully upward, and install the spring seat.

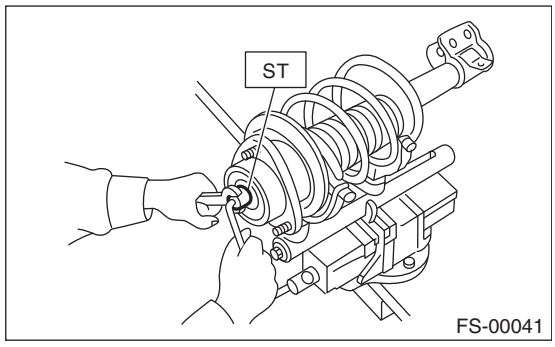
NOTE:
Position the upper spring seat as shown in the figure.



(1) Outside of body

5) Install the strut mount to piston rod, and temporarily attach and tighten a new self locking nut.
6) Using a hexagon wrench to prevent strut rod from turning, tighten the new self-locking nut with ST.
ST 20399AG000 STRUT MOUNT SOCKET

Tightening torque:
55 N·m (5.61 kgf-m, 40.6 ft-lb)



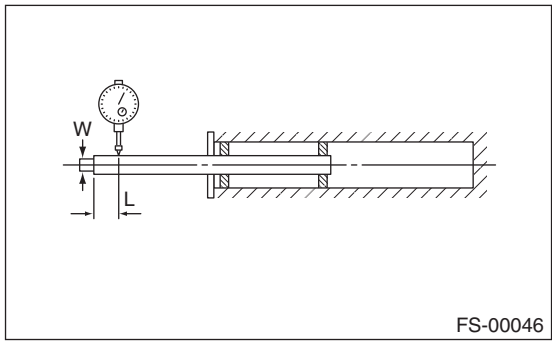
7) Loosen the coil spring compressor carefully.

E: INSPECTION

Check the removed part for wear, damage and cracks, and then repair or replace it if defective.

1. STRUT

1) Check for oil leaks.
2) Move the piston rod up and down to check that it operates smoothly without any hitch.
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 lbf)] to the threaded portion. Apply a force of 20 N (2 kgf, 4 lbf) 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 limit, replace the strut.

2. STRUT MOUNT

Check the rubber part for deformation, cracks or deterioration, and then replace it with a new part if defective.

3. DUST COVER

If cracks or damage are found, replace it with a new part.

4. COIL SPRING

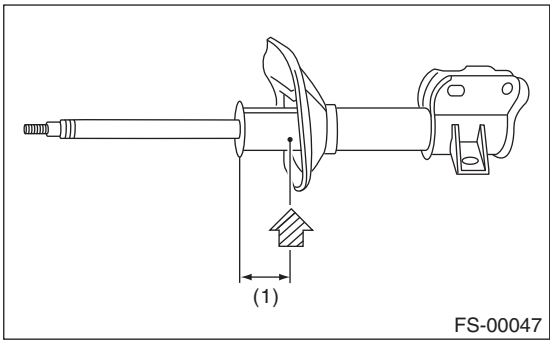
If a permanent strain is found, replace it with a new part.

5. HELPER

If major cracks or damage are found, replace it with a new part.

F: DISPOSAL

CAUTION:
• Before handling struts, be sure to wear goggles to protect eyes from gas, oil and cutting powder.
• Do not disassemble the strut or throw into flames.
• When discarding gas filled struts, drill holes in them to purge the gas.
1) Place the strut on a level surface with the piston rod fully expanded.
2) Using a 2 — 3 mm (0.08 — 0.12 in) dia. drill, make holes in areas shown in the figure.

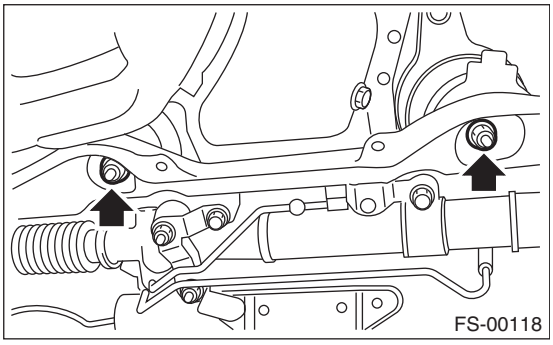


(1) 40 mm (1.57 in)

8. Front Crossmember

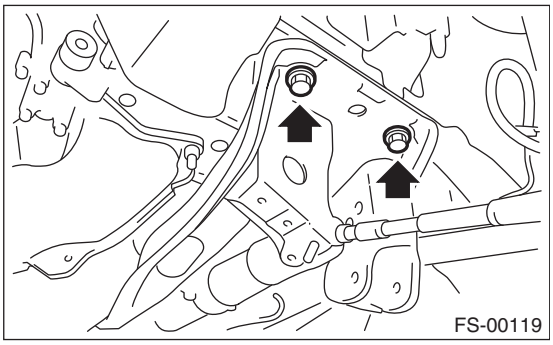
A: REMOVAL

1) Lift up the vehicle, and then remove the front wheels.
2) Remove the front exhaust pipe.
3) Remove the front crossmember support plate. <Ref. to FS-13, REMOVAL, Front Crossmember Support Plate.>
4) Remove the front stabilizer. <Ref. to FS-14, REMOVAL, Front Stabilizer.>
5) Disconnect the tie-rod end from housing.
6) Remove the front arm. <Ref. to FS-17, REMOVAL, Front Arm.>
7) Remove the nuts attaching the engine mounting cushion rubber to crossmember.


FS-00118

8) Remove the steering universal joint.
9) Disconnect the power steering hose from steering gearbox.
10) Lift the engine approx. 10 mm (0.39 in) using a chain block.
11) Support the crossmember with a jack, remove the bolts securing crossmember to body, and then gradually lower the crossmember with steering gearbox as a unit.

CAUTION:
When removing the crossmember downward, be careful that the tie-rod end does not interfere with drive shaft boot.


FS-00119

B: INSTALLATION

1) Install each part in the reverse order of removal.

CAUTION:
• Use a new bolt and self-locking nut. For parts which are not reusable, refer to "COMPONENT". <Ref. to FS-3, COMPONENT, General Description.>
• Always tighten the bushing in the state where the vehicle is at curb weight and the wheels are in full contact with the ground.

Tightening torque:
Crossmember to Body:
95 N·m (9.69 kgf-m, 70.1 ft-lb)
Engine mounting to Crossmember:
85 N·m (8.67 kgf-m, 62.7 ft-lb)
Front arm to Crossmember:
95 N·m (9.69 kgf-m, 70.1 ft-lb)
Front arm to Support plate:
110 N·m (11.22 kgf-m, 81.1 ft-lb)
Support plate body:
150 N·m (15.30 kgf-m, 110.6 ft-lb)
Tie-rod end to Housing:
27 N·m (2.75 kgf-m, 19.9 ft-lb)

After tightening to the specified torque, tighten the castle nut further but within 60° until the hole in the ball stud is aligned with a slot in castle nut

Tightening torque:
Universal joint:
24 N·m (2.45 kgf-m, 17.7 ft-lb)
Stabilizer bracket:
25 N·m (2.55 kgf-m, 18.4 ft-lb)
Stabilizer link:
45 N·m (4.59 kgf-m, 33.2 ft-lb)
Power steering hose to Steering gearbox:
15 N·m (1.53 kgf-m, 11.1 ft-lb)

2) Purge air from the power steering system.
3) Inspect the wheel alignment and adjust if necessary. <Ref. to FS-6, INSPECTION, Wheel Alignment.>
4) Perform reinitialization of the auto headlight beam leveler system. (model with auto headlight beam leveler) <Ref. to LI-16, PROCEDURE, Auto Headlight Beam Leveler System.>

C: INSPECTION

Check the crossmember for damage or cracks, and correct or replace if defective.

9. General Diagnostic Table

A: INSPECTION

1. IMPROPER VEHICLE POSTURE OR IMPROPER WHEEL ARCH HEIGHT

Possible cause	Corrective action
(1) Permanent distortion or damage of the coil spring	Replace.
(2) Rough operation of strut or shock absorber	Replace.
(3) Improper installation of strut or shock absorber	Replace with appropriate parts.
(4) Installation of the wrong coil spring	Replace with appropriate parts.

2. POOR RIDE COMFORT

1) Large rebound shock
2) Rocking of the vehicle continues too long after running over bump and 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	Replace the coil springs with new parts.
(4) Fault in operation of strut or shock absorber	Replace.
(5) Damage or deformation of strut mount or shock absorber mount	Replace.
(6) Unsuitable length (maximum or minimum) of strut or shock absorber	Replace with appropriate parts.
(7) Abnormal deformation or loss of bushing	Replace.
(8) Deformation or damage of helper in strut assembly or shock absorber	Replace.
(9) Oil leakage from the strut or shock absorber	Replace.

3. NOISE

Possible cause	Corrective action
(1) Wear or damage of strut or shock absorber component parts	Replace.
(2) Loosening of the suspension link installing bolt	Tighten to the specified torque.
(3) Deformation or loss of bushing	Replace.
(4) Unsuitable length (maximum or minimum) of strut or shock absorber	Replace with appropriate parts.
(5) Damaged coil spring	Replace.
(6) Wear or damage of the ball joint	Replace.
(7) Deformation of the stabilizer clamp	Replace.

REAR SUSPENSION

RS

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1. General Description 2
2. Wheel Alignment 8
3. Rear Stabilizer 9
4. Rear Trailing Link 10
5. Upper Arm 13
6. Rear Shock Absorber 14
7. Front Lateral Link 16
8. Rear Lateral Link 17
9. Rear Sub Frame 18
10. General Diagnostic Table 20

1. General Description

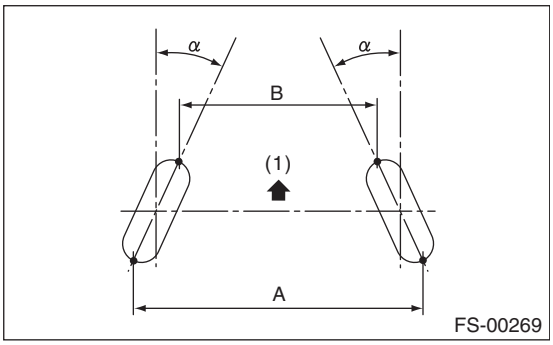
A: SPECIFICATION

Refer to “Front Suspension” section for rear suspension specifications. <Ref. to FS-2, SPECIFICATION, General Description.>

NOTE:

• Front and rear toe-in and front camber can be adjusted. Adjust if the toe-in or camber tolerance exceeds specifications.

• Other items indicated in the specifications is not equipped with adjustment mechanisms. If other items exceed specifications, check the suspension parts and connections for deformation. If defective, replace with new parts.



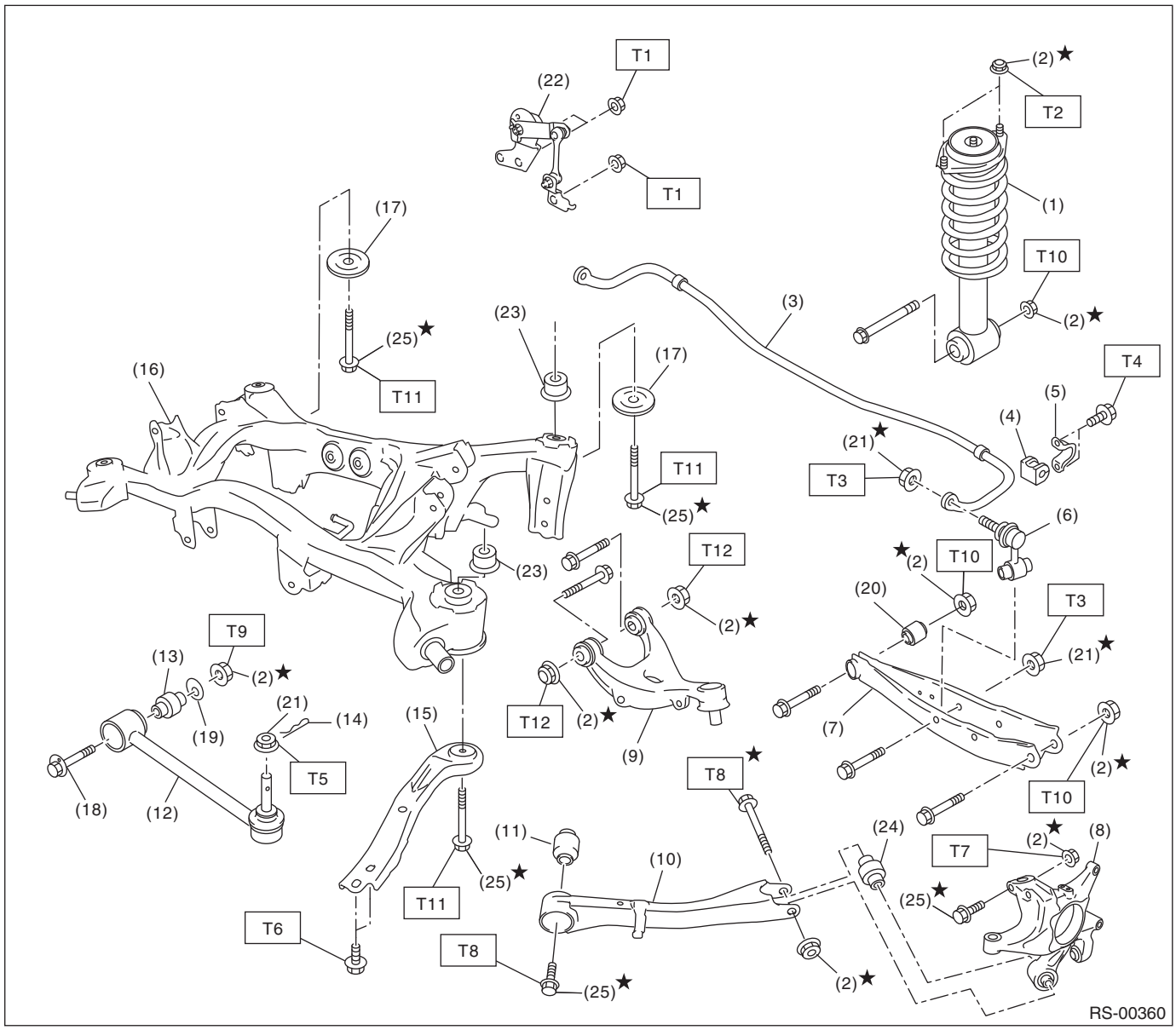
(1) Front

A – B = Positive: Toe-in, Negative: Toe-out

α = Individual toe angles

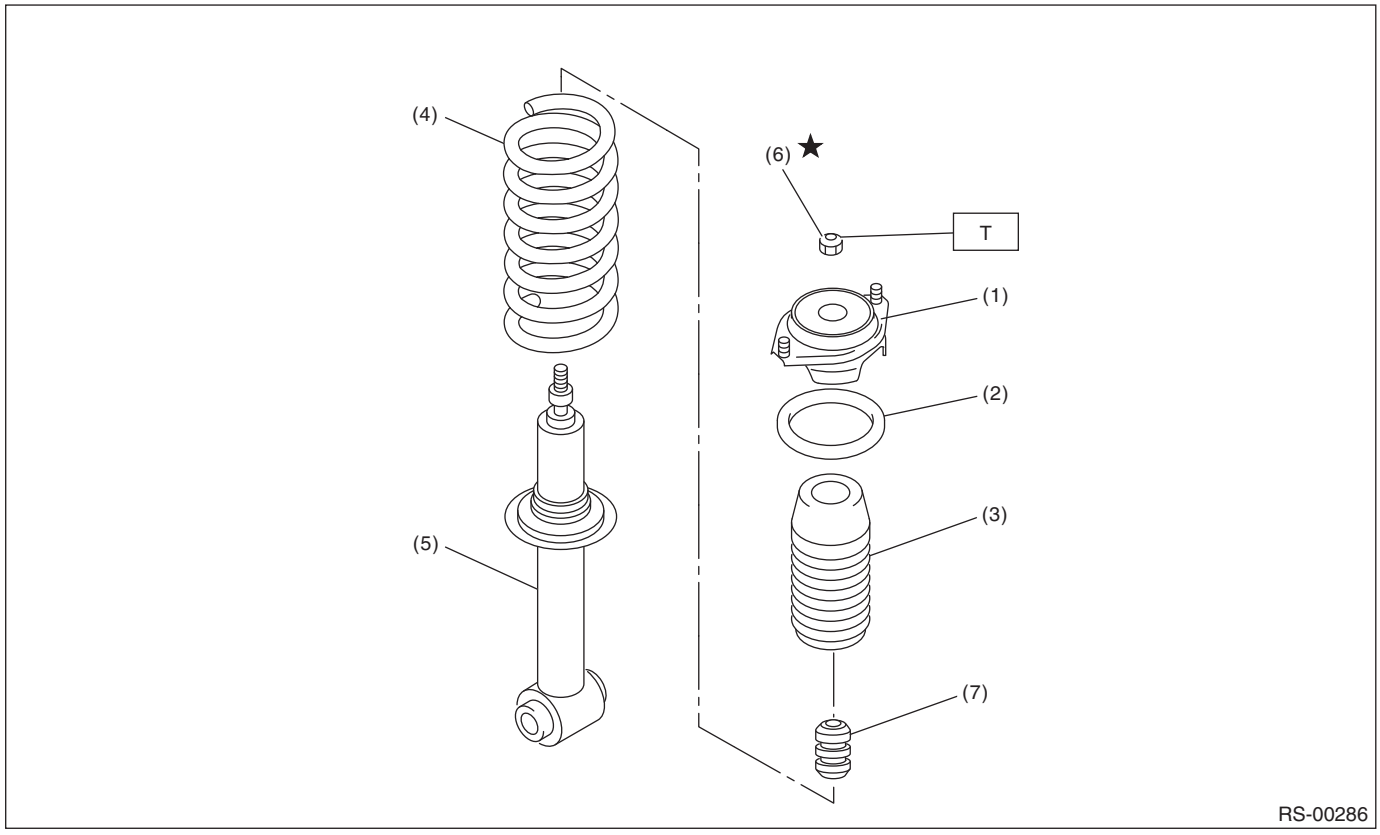
B: COMPONENT

1. REAR SUSPENSION



(1)	Shock absorber	(14)	Snap pin	***Tightening torque:N·m (kgf-m, ft-lb)***
(2)	Self-locking nut	(15)	Front sub frame support plate	***T1: 7.5 (0.76, 5.5)***
(3)	Rear stabilizer	(16)	Rear sub frame	***T2: 30 (3.06, 22.1)***
(4)	Stabilizer bushing	(17)	Rear sub frame stopper plate (lower)	***T3: 38 (3.87, 28.0)***
(5)	Stabilizer clamp	(18)	Adjusting bolt	***T4: 40 (4.08, 29.5)***
(6)	Stabilizer link	(19)	Adjusting washer	***T5: 60 (6.12, 44.3)***
(7)	Rear lateral link	(20)	Rear lateral link bushing	***T6: 70 (7.14, 51.6)***
(8)	Rear housing	(21)	Flange nut	***T7: 80 (8.16, 59.0)***
(9)	Upper arm	(22)	Rear vehicle height sensor (models with auto headlight beam leveler only)	***T8: 90 (9.18, 66.4)***
(10)	Trailing link	(23)	Rear sub frame stopper plate (upper)	***T9: 100 (10.20, 73.8)***
(11)	Trailing link bushing	(24)	Rear housing bushing	***T10: 120 (12.24, 88.5)***
(12)	Front lateral link	(25)	Bolt	***T11: 145 (14.79, 106.9)***
(13)	Front lateral link bushing			***T12: 150 (15.30, 110.6)***

2. SHOCK ABSORBER



(1)	Mount	(5)	Shock absorber	***Tightening torque:N·m (kgf-m, ft-lb)***
(2)	Upper rubber sheet	(6)	Self-locking nut	***T: 25 (2.55, 18.4)***
(3)	Dust cover	(7)	Helper	
(4)	Coil spring			

C: CAUTION

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

1. CAUTIONS

• 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 etc. of different grades or manufacturers.
• Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or 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.

2. OIL

When handling oil, adhere to the following to prevent unexpected accident.
• Prepare container and waste cloths when performing work which oil could possibly spill. If oil spills, wipe it off immediately to prevent from penetrating into floor or flowing outside, for environmental protection.
• Follow all government regulations concerning disposal of refuse when disposing.

D: PREPARATION TOOL

1. SPECIAL TOOL

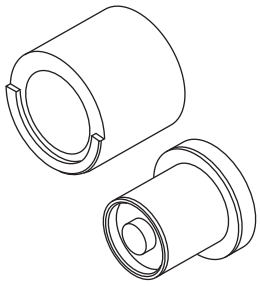
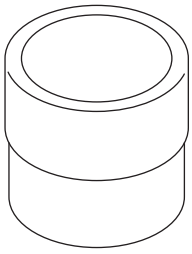
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST20099AE000	20099AE000	INSTALLER & REMOVER	Used for replacing the front lateral link bushing.
 ST-499755602	499755602	PRESS	Used for replacing the rear trailing link bushing.

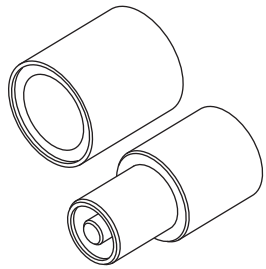
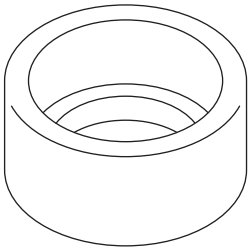
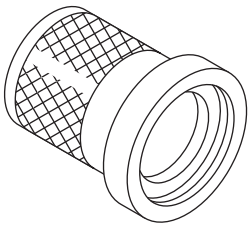
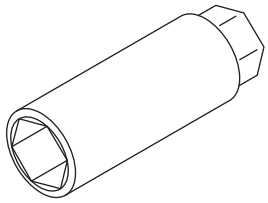
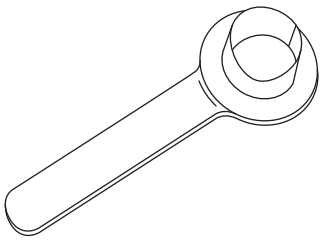
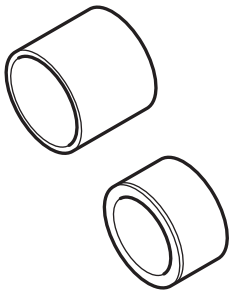
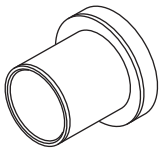
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST20099AE010	20099AE010	INSTALLER & REMOVER	Used for replacing the rear lateral link bushing.
 ST20299AG010	20299AG010	BASE	Used for replacing the rear trailing link bushing.
 ST-899874100	899874100	INSTALLER	Used for replacing the rear trailing link bushing.
 ST20399FG000	20399FG000	STRUT MOUNT SOCKET	• Used for removing and installing shock mount. • Used for checking torque of shock mount center nut.
 ST28099PA090	28099PA090	OIL SEAL PROTECTOR	• Used for installing the rear drive shaft to the rear differential. • For oil seal protection

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST20099PA010	20099PA010	INSTALLER & REMOVER	• Used for replacing the bushing of the rear housing. • Used together with BUSHING REMOVER (20099FG000).
 ST20099FG000	20099FG000	BUSHING REMOVER	• Used for replacing the bushing of the rear housing. • Used together with base part of INSTALLER & REMOVER (20099PA010).

2. GENERAL TOOL

TOOL NAME	REMARKS
Alignment tester	Used for measuring wheel alignment.
Toe-in gauge	Used for toe-in measurement.
Jack	Used for removing and installing suspension.
Bearing puller	Used for removing bushings.
Coil spring compressor	Used for disassembling and assembling shock absorber.

2. Wheel Alignment

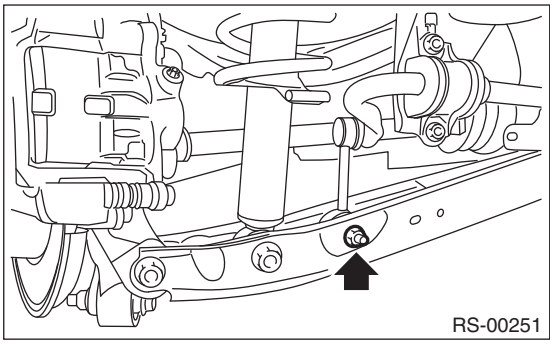
A: INSPECTION

NOTE:
Measure and adjust the front and rear wheel alignment at a time. Refer to “Front Suspension” section for measurement and adjustment of wheel alignment. <Ref. to FS-6, INSPECTION, Wheel Alignment.>

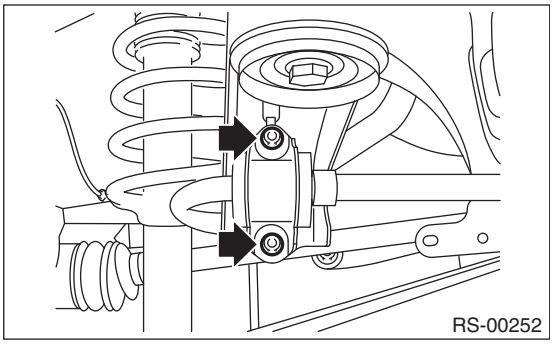
3. Rear Stabilizer

A: REMOVAL

1) Lift up the vehicle, and then remove the rear wheels.
2) Remove the stabilizer link.

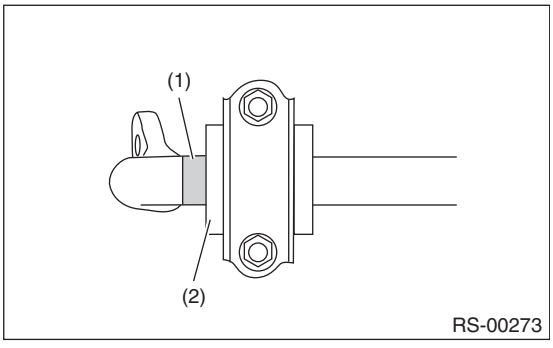


3) Remove the stabilizer clamp.



B: INSTALLATION

CAUTION:
• Be sure to use a new flange nut and self-locking nut.
• Always tighten the bushing in the state where the vehicle is at curb weight and the wheels are in full contact with the ground.
• Align the paint mark end of stabilizer to the end of bushing when installing.



(1) Identification paint
(2) Bushing

Install each part in the reverse order of removal.

Tightening torque:
Stabilizer link
38 N·m (3.87 kgf-m, 28.0 ft-lb)
Stabilizer clamp
40 N·m (4.08 kgf-m, 29.5 ft-lb)

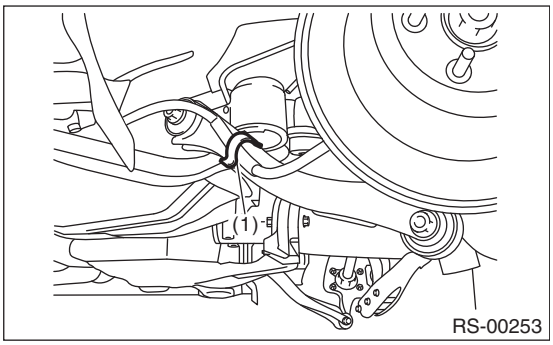
C: INSPECTION

1) Check the bushing for abnormal cracks, fatigue or damage.
2) Check the stabilizer link for damage.

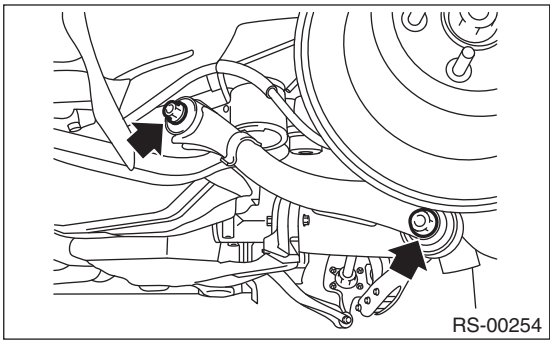
4. Rear Trailing Link

A: REMOVAL

1) Lift up the vehicle, and then remove the rear wheels.
2) Remove the bracket, and remove the parking brake cable from the guide (1).



3) Remove the trailing link.



B: INSTALLATION

CAUTION:
- **Be sure to use a new self-locking nut.**
- **Always tighten the bushing in the state where the vehicle is at curb weight and the wheels are in full contact with the ground.**

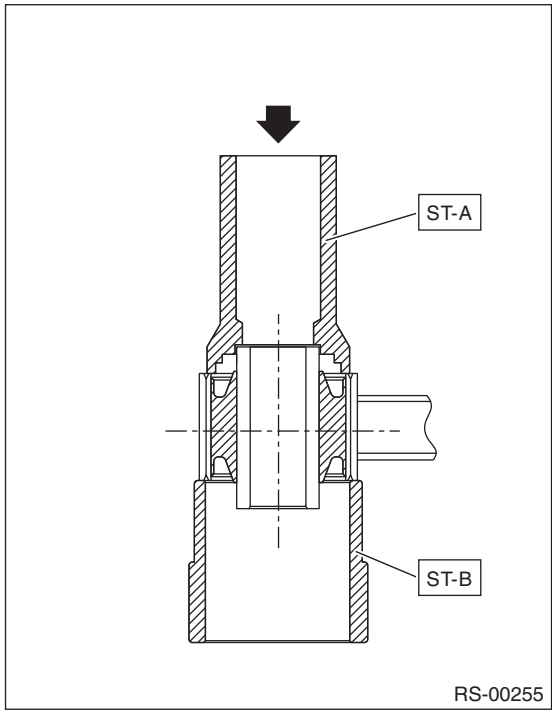
Install each part in the reverse order of removal.

Tightening torque:
90 N·m (9.18 kgf-m, 66.4 ft-lb)

C: DISASSEMBLY

1. REAR TRAILING LINK BUSHING

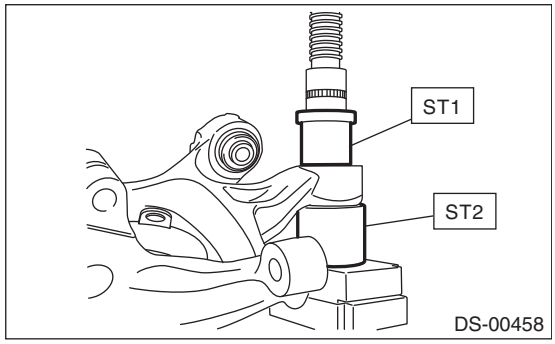
Using the ST A and ST B, press the bushing out.
STA 8998741000 INSTALLER
STB 499755602 PRESS

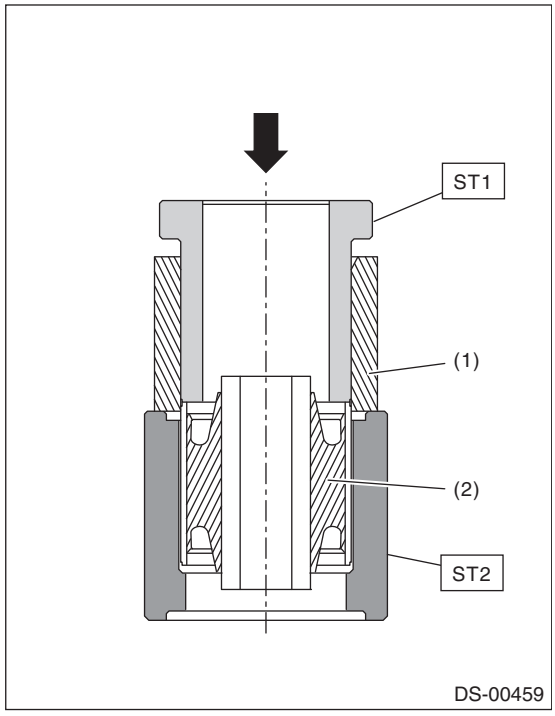


2. REAR HOUSING BUSHING

1) Remove the rear housing. <Ref. to DS-19, REMOVAL, Rear Axle.>
2) Using the ST and a hydraulic press, push out the bushing.

ST1 20099FG000 BUSHING REMOVER
ST2 20099PA010 INSTALLER & REMOVER (BASE)





(1) Rear housing
(2) Bushing

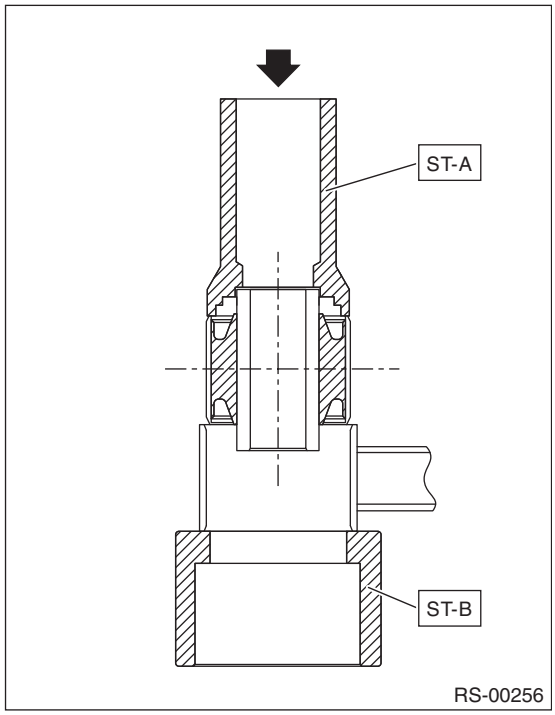
D: ASSEMBLY

1. REAR TRAILING LINK BUSHING

Using the ST A and ST B, press-fit the bushing.

CAUTION:
Make sure to press the bushing straight in.

ST A 8998741000 INSTALLER
ST B 20299AG010 BASE

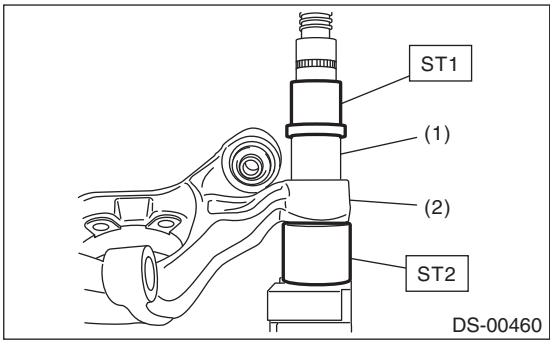


2. REAR HOUSING BUSHING

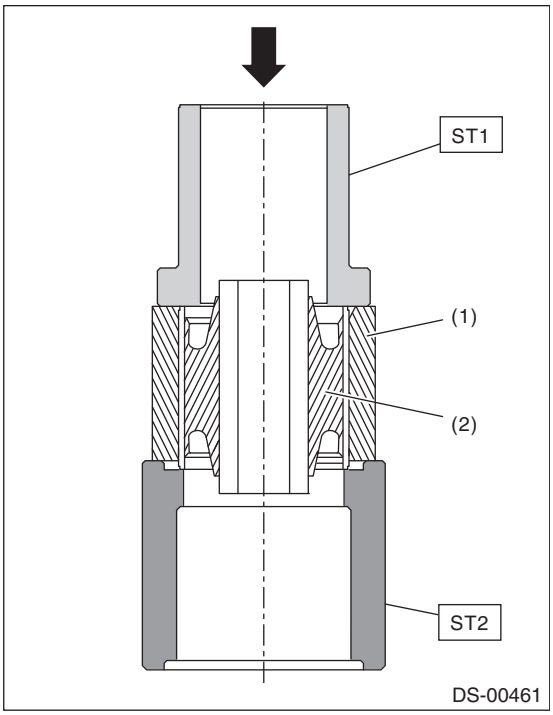
Press-fit the bushing using ST and the hydraulic press.

CAUTION:
Make sure to press the bushing straight in.

ST 1 20099FG000 BUSHING REMOVER
ST 2 20099PA010 INSTALLER & REMOVER (BASE)



(1) Bushing
(2) Rear housing



(1) Rear housing
(2) Bushing

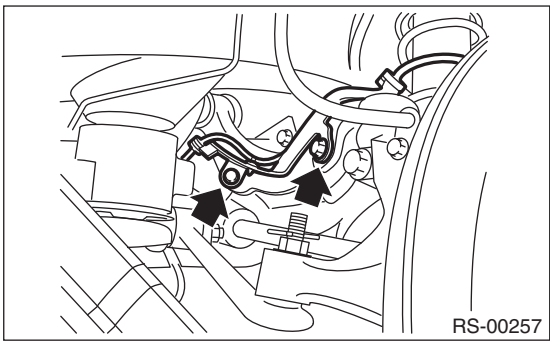
E: INSPECTION

Visually check the trailing link for damage and deformation.

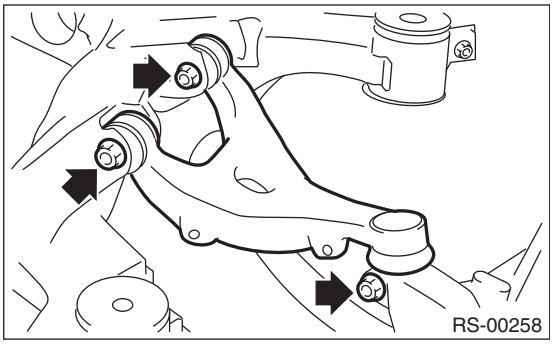
5. Upper Arm

A: REMOVAL

1) Lift up the vehicle, and then remove the rear wheels.
2) Remove the rear ABS wheel speed sensor bracket.



3) Remove the bolts, then remove the upper arm.



B: INSTALLATION

CAUTION:
- **Use a new self-locking nut.**
- **Always tighten the bushing when the arm is positioned in the state where the vehicle is at curb weight and the wheels are in full contact with the ground.**

1) Install each part in the reverse order of removal.
2) Inspect the wheel alignment and adjust if necessary. <Ref. to FS-6, INSPECTION, Wheel Alignment.>

Tightening torque:
Upper arm — Rear sub frame
150 N·m (15.30 kgf-m, 110.6 ft-lb)
Upper arm — Rear housing
80 N·m (8.16 kgf-m, 59.0 ft-lb)
Rear ABS wheel speed sensor bracket
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

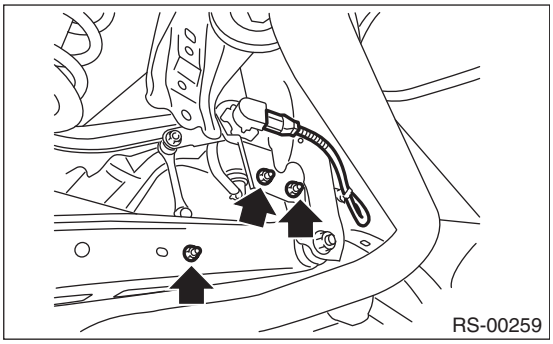
C: INSPECTION

1) Visually check the upper arm for damage and deformation.
2) Visually check the bushing for abnormal cracks, fatigue or damage.

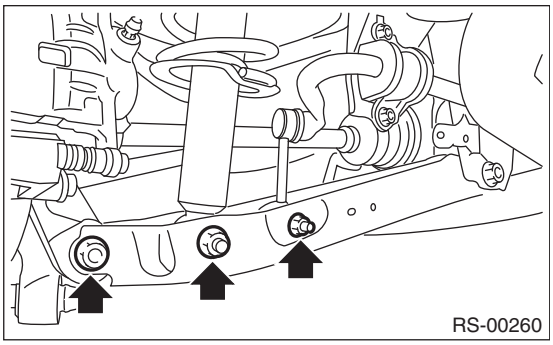
6. Rear Shock Absorber

A: REMOVAL

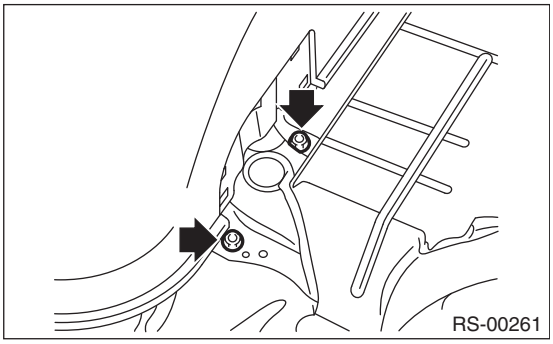
1) Disconnect the ground cable from battery.
2) Remove the luggage floor mat.
3) Remove the strut cap of the quarter trim.
4) Lift up the vehicle, and then remove the rear wheels.
5) Disconnect the connector, and then remove the nut to remove the rear vehicle height sensor. (model with auto headlight beam leveler, left side only)


RS-00259

6) Remove the nut and disconnect the rear stabilizer link.
7) Remove the shock absorber lower bolt.
8) Disconnect the rear lateral link.


RS-00260

9) Remove the shock absorber mount nut.


RS-00261

10) Remove the shock absorber.

B: INSTALLATION

CAUTION:
• Be sure to use a new self-locking nut.
• Always tighten the bushing in the state where the vehicle is at curb weight and the wheels are in full contact with the ground.
1) Install each part in the reverse order of removal.

Tightening torque:
Refer to "COMPONENT" of "General Description" for the tightening torque. <Ref. to RS-3, COMPONENT, General Description.>
2) Check the wheel alignment and adjust it if necessary. <Ref. to FS-6, INSPECTION, Wheel Alignment.>
3) Perform reinitialization of the auto headlight beam leveler system. (model with auto headlight beam leveler) <Ref. to LI-16, PROCEDURE, Auto Headlight Beam Leveler System.>

C: DISASSEMBLY

Refer to "Front Strut" for disassembly procedure. <Ref. to FS-21, DISASSEMBLY, Front Strut.>

D: ASSEMBLY

Refer to "Front Strut" for installation procedures. <Ref. to FS-21, ASSEMBLY, Front Strut.>

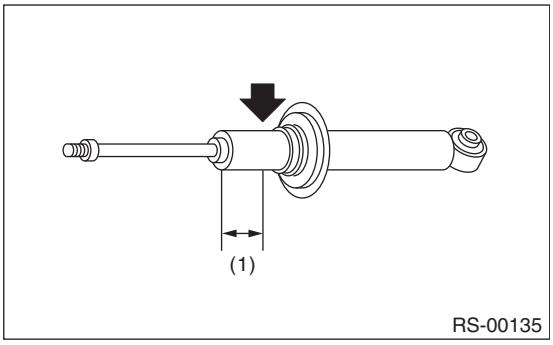
E: INSPECTION

Refer to "Front Strut" for inspection procedures. <Ref. to FS-22, INSPECTION, Front Strut.>

F: DISPOSAL

CAUTION:
• Before handling the shock absorber, be sure to wear goggles to protect eyes from gas, oil and cutting powder.
• Do not disassemble the shock absorber or place it into a fire.
• Drill a hole into shock absorbers in case of discarding shock absorbers filled with gas.
1) Place the shock absorber on a level surface with the piston rod fully expanded.

2) Make a hole into the specified position 30 mm (1.18 in) deep using a drill with 2 — 3 mm (0.08 — 0.12 in) diameter.

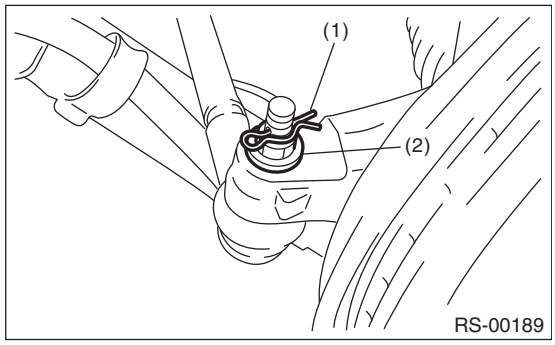


(1) 40 mm (1.57 in)

7. Front Lateral Link

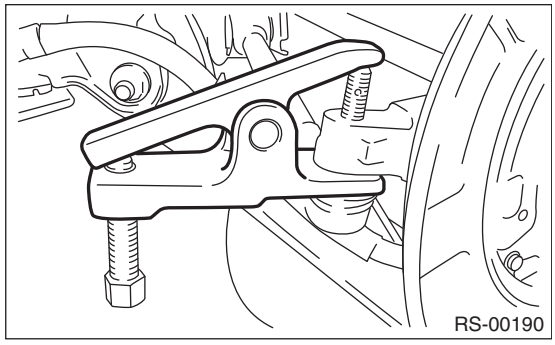
A: REMOVAL

1) Lift up the vehicle, and then remove the rear wheels.
2) Remove the rear trailing link. <Ref. to RS-10, REMOVAL, Rear Trailing Link.>
3) Remove the snap pin and nut.



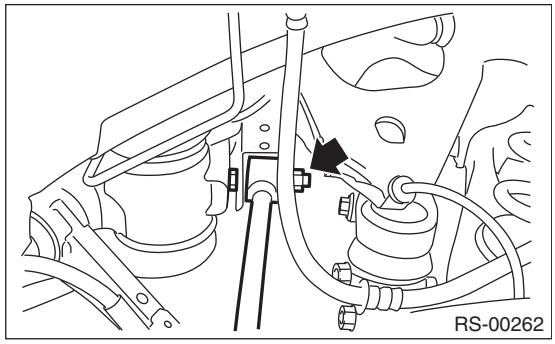
(1) Snap pin
(2) Nut

4) Using a puller, remove the ball joint.



5) Scribe an alignment mark on the front lateral link adjusting bolt and rear sub frame.
6) Remove the adjusting bolt, and remove the front lateral link.

CAUTION:
When removing the adjusting bolt, make sure to fix the bolt head in place when loosening the nut.



B: INSTALLATION

CAUTION:
- **Be sure to use a new self-locking nut.**
- **Always tighten the bushing in the state where the vehicle is at curb weight and the wheels are in full contact with the ground.**

1) Install each part in the reverse order of removal.

Tightening torque:
Front lateral link — Sub frame
100 N·m (10.20 kgf-m, 73.8 ft-lb)
Front lateral link — Rear axle housing
60 N·m (6.12 kgf-m, 44.3 ft-lb)

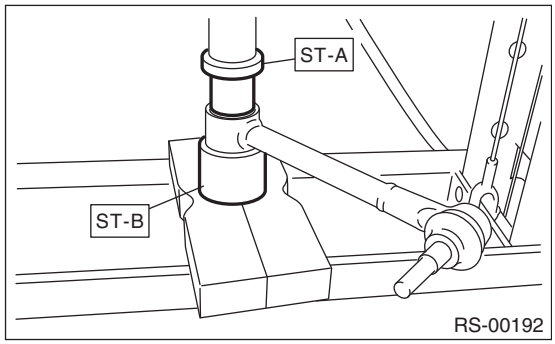
2) Inspect the wheel alignment and adjust if necessary. <Ref. to FS-6, INSPECTION, Wheel Alignment.>

C: INSPECTION

Visually check the front lateral link for damage and deformation.

D: DISASSEMBLY

Using the ST A and ST B, press the bushing out.
STA 20099AE000 INSTALLER & REMOVER
STB 20099AE000 INSTALLER & REMOVER



E: ASSEMBLY

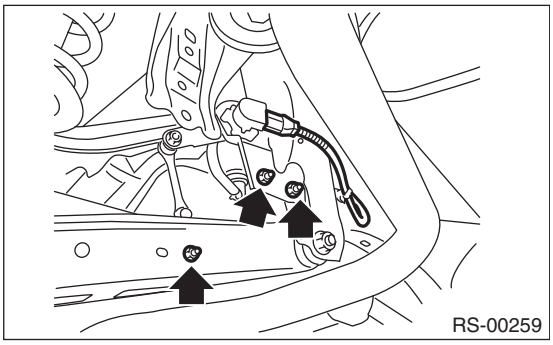
Using the ST A and ST B, press-fit the bushing.

CAUTION:
Make sure to press the bushing straight in.
ST A 20099AE000 INSTALLER & REMOVER
ST B 20099AE000 INSTALLER & REMOVER

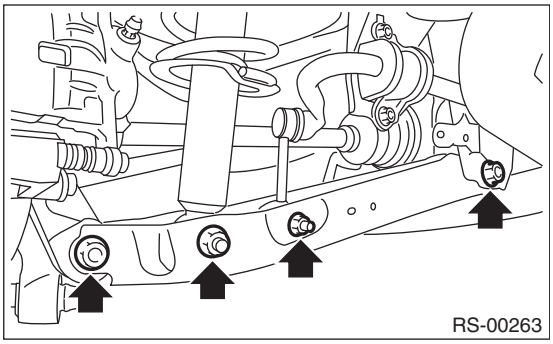
8. Rear Lateral Link

A: REMOVAL

1) Disconnect the ground cable from the battery.
2) Lift up the vehicle, and then remove the rear wheels.
3) Disconnect the connector, and remove the rear vehicle height sensor (models with auto headlight beam leveler, left side only).



4) Remove the nut and disconnect the stabilizer link.
5) Remove the shock absorber lower bolt.
6) Remove the bolt, and remove rear lateral link.



B: INSTALLATION

CAUTION:
- **Be sure to use a new self-locking nut.**
- **Always tighten the bushing in the state where the vehicle is at curb weight and the wheels are in full contact with the ground.**

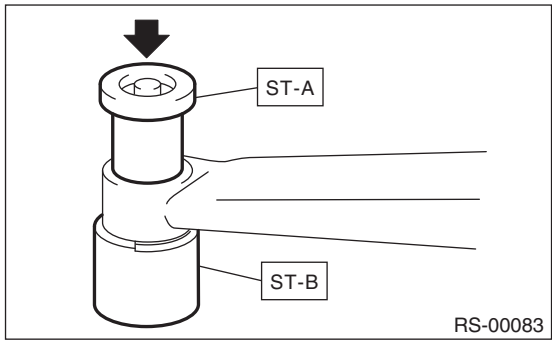
1) Install each part in the reverse order of removal.

Tightening torque:
Rear lateral link
120 N·m (12.24 kgf-m, 88.5 ft-lb)
Shock absorber
120 N·m (12.24 kgf-m, 88.5 ft-lb)
Stabilizer link
38 N·m (3.87 kgf-m, 28.0 ft-lb)
Rear vehicle height sensor (models with auto headlight beam leveler, left side only)
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

2) Inspect the wheel alignment and adjust if necessary. <Ref. to FS-6, INSPECTION, Wheel Alignment.>
3) Perform reinitialization of the auto headlight beam leveler system. (model with auto headlight beam leveler) <Ref. to LI-16, PROCEDURE, Auto Headlight Beam Leveler System.>

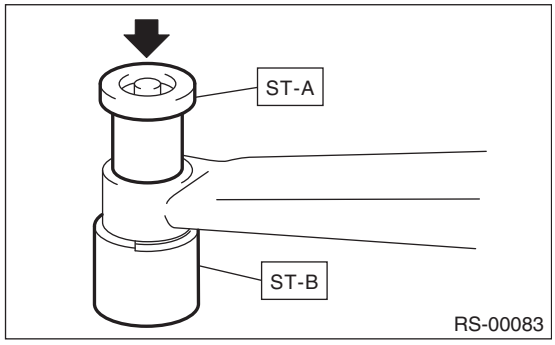
C: DISASSEMBLY

Using the ST A and ST B, press the bushing out.
STA 20099AE010 INSTALLER & REMOVER
STB 20099AE010 INSTALLER & REMOVER



D: ASSEMBLY

Using the ST A and ST B, press-fit the bushing.
STA 20099AE010 INSTALLER & REMOVER
STB 20099AE010 INSTALLER & REMOVER



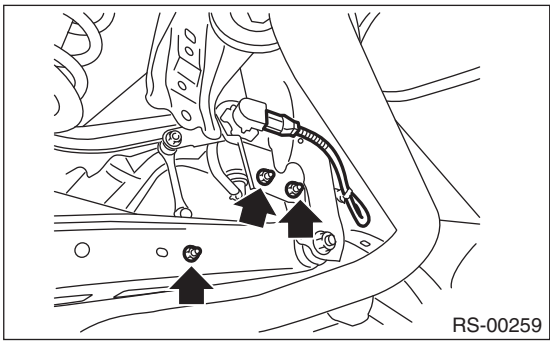
E: INSPECTION

Visually check the rear lateral link for damage and deformation.

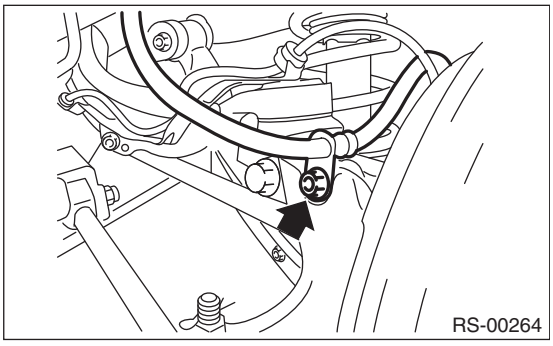
9. Rear Sub Frame

A: REMOVAL

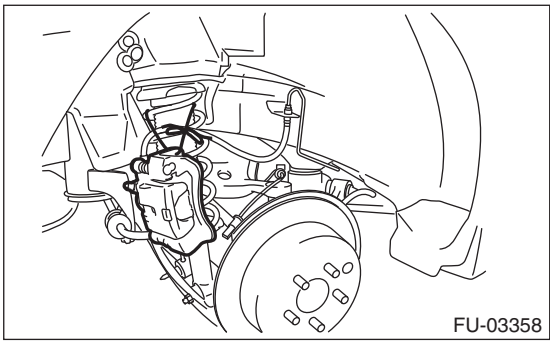
1) Disconnect the ground cable from battery.
2) Lift up the vehicle, and then remove the rear wheels.
3) Disconnect the connector, and then remove the rear vehicle height sensor. (model with auto headlight beam leveler, left side only)



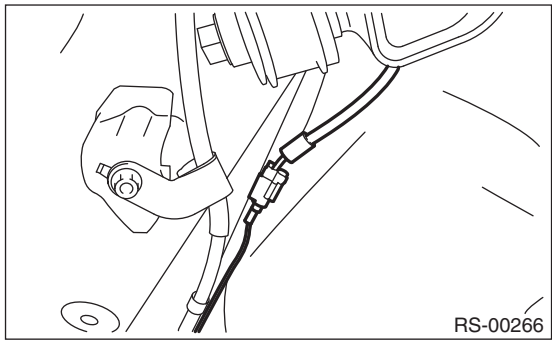
4) Separate the front exhaust pipe and rear exhaust pipe.
5) Remove the rear exhaust pipe and muffler.
6) Remove the propeller shaft. <Ref. to DS-10, REMOVAL, Propeller Shaft.>
7) Remove the brake hose bracket.



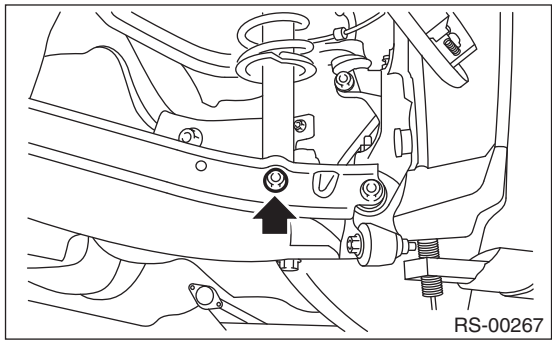
8) Remove the rear disc brake caliper, and suspend it from the shock absorber.



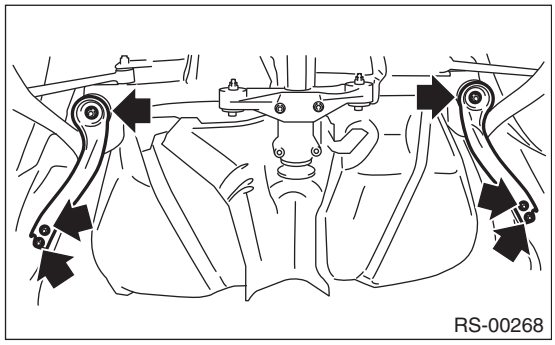
9) Remove the rear parking brake cable from the parking brake assembly. <Ref. to PB-6, REMOVAL, Parking Brake Assembly (Rear Disc Brake).>
10) Disconnect the ABS wheel speed sensor connector.



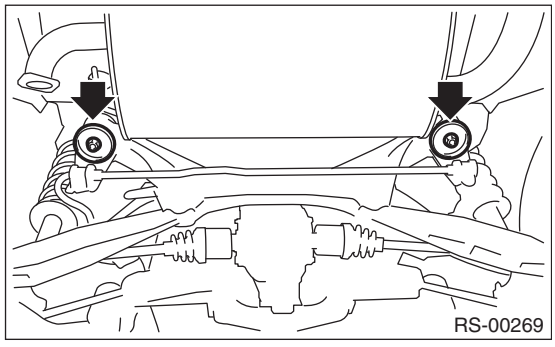
11) Remove the shock absorber lower bolt.



12) Support the sub frame using a jack.
13) Remove the support plate.



14) Remove the rear sub frame.



B: INSTALLATION

CAUTION:
- **Be sure to use a new self-locking nut.**
- **Always tighten the bushing in the state where the vehicle is at curb weight and the wheels are in full contact with the ground.**

1) Install each part in the reverse order of removal.

Tightening torque:
Refer to "COMPONENT" of "General Description" for the tightening torque. <Ref. to RS-3, COMPONENT, General Description.>

2) Inspect the wheel alignment and adjust if necessary. <Ref. to FS-6, INSPECTION, Wheel Alignment.>

3) Perform reinitialization of the auto headlight beam leveler system. (model with auto headlight beam leveler) <Ref. to LI-16, PROCEDURE, Auto Headlight Beam Leveler System.>

C: INSPECTION

Check the removed parts for wear, damage and crack, and repair or replace them if faulty.

10.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 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 the vehicle continues too long after running over bump and 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	Replace the coil springs with new parts.
(4) Fault in operation of strut or shock absorber	Replace.
(5) Damage or deformation of strut mount or shock absorber mount	Replace.
(6) Unsuitable length (maximum or minimum) of strut or shock absorber	Replace with appropriate parts.
(7) Deformation or loss of bushing	Replace.
(8) Deformation or damage of helper in strut assembly or shock absorber	Replace.
(9) Oil leakage from the strut or shock absorber	Replace.

3. NOISE

Possible cause	Corrective action
(1) Wear or damage of strut or shock absorber component parts	Replace.
(2) Loosening of the suspension link installing bolt	Tighten to the specified torque.
(3) Deformation or loss of bushing	Replace.
(4) Unsuitable length (maximum or minimum) of strut or shock absorber	Replace with appropriate parts.
(5) Damaged coil spring	Replace.
(6) Wear or damage of the ball joint	Replace.
(7) Deformation of the stabilizer clamp	Replace.

WHEEL AND TIRE SYSTEM

WT

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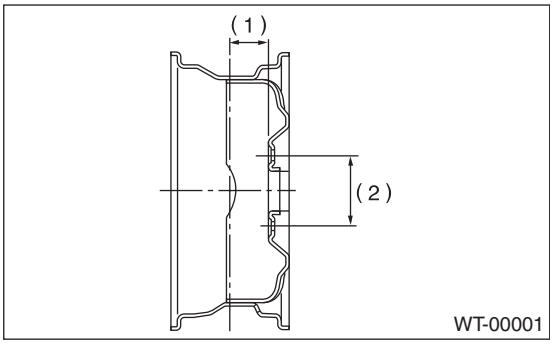
2. Tire and Wheel 4
3. “T-type” Tire 7
4. Full Wheel Cap 8
5. Tire Pressure Monitoring System 9
6. General Diagnostic Table 11

1. General Description

A: SPECIFICATION



(1) Offset
(2) P.C.D.

Tire size	Wheel size	Offset mm (in)	P.C.D. mm (in)	Tire inflation pressure kPa (kgf/cm^2, psi)	
				Front wheel	Rear wheel
P215/65R16 96H	16 × 6$^1/_2$J 16 × 6$^1/_2$JJ	48 (1.89)	100 (3.94)	*1	
P225/55R17 95H	17 × 7J 17 × 7JJ				

Spare tire size	Wheel size	Offset mm (in)	P.C.D. mm (in)	Tire inflation pressure kPa (kgf/cm^2, psi)	
				Front wheel	Rear wheel
T155/70D17 110M	17 × 4T	40 (1.57)	100 (3.94)	*1	
P215/65R16 96H (C4 only)	16 × 6$^1/_2$J 16 × 6$^1/_2$JJ	48 (1.89)			
P225/55R17 95H (C4 only)	17 × 7J 17 × 7JJ				

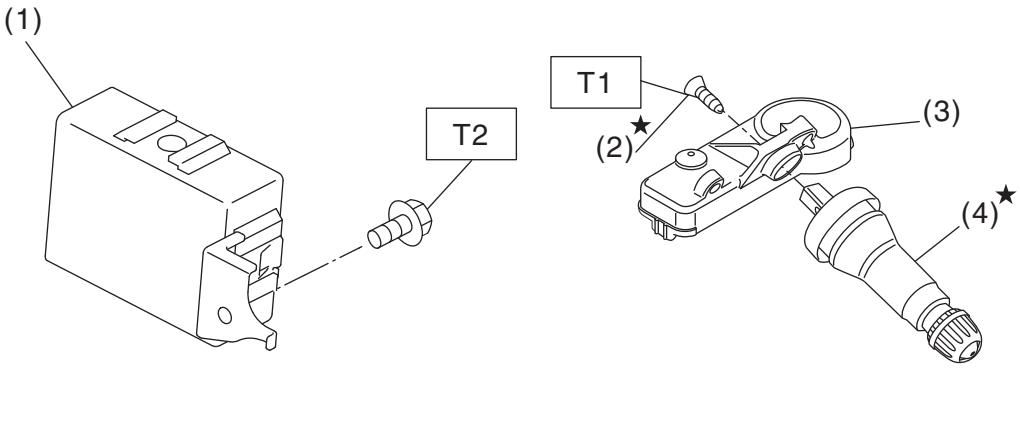
*1: Size and inflation pressure of the standard equipment tire, spare tire for emergency and appropriate tire for equipment are described on the “Tire inflation pressure” label attached to the body side of the driver’s door.

NOTE:
- T-type tire is prepared for temporary use as a spare tire.
- Depending on the model destination, the equipped spare tire will differ.

1. SERVICE DATA

Part	Axial runout	Radial runout
Steel wheel	1.5 mm (0.059 in)	
Aluminum wheel	1.0 mm (0.039 in)	

B: COMPONENT



(1) TPMS & keyless entry control module
(2) Screw
(3) Transmitter (Snap in type)
(4) Valve

Tightening torque:N·m (kgf-m, ft-lb)

T1: 1.4 (0.14, 1.0)
T2: 13 (1.33, 9.6)

C: PREPARATION TOOL

1. GENERAL TOOL

TOOL NAME	REMARKS
Air pressure gauge	Used for measuring tire air pressure.
Dial gauge	Used for measuring wheel runout.
Wheel balancer	Used for adjusting wheel balance.

2. Tire and Wheel

A: REMOVAL

1) Remove the hubcap. (model with hubcap) <Ref. to WT-8, REMOVAL, Full Wheel Cap.>
2) Lift up the vehicle.
3) Remove the wheel nut.
4) Remove the wheels.

NOTE:
When removing the wheels, be careful not to damage the hub bolts.

B: INSTALLATION

1) Install the wheels to vehicle.
2) Tighten the wheel nuts to the specified torque.

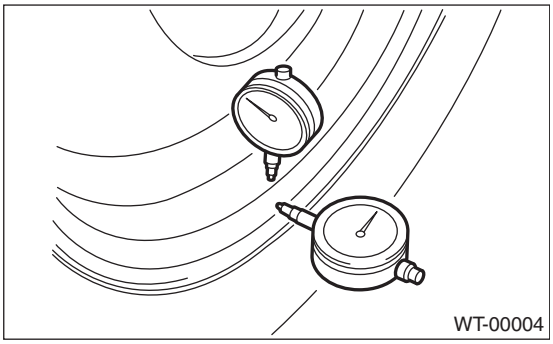
Tightening torque:
100 N·m (10.20 kgf-m, 73.8 ft-lb)

C: INSPECTION

1. TIRES

CAUTION:
When replacing a tire, make sure to use only tires of the same size, construction and load range as originally installed.

1) Tire size and tire inflation pressure check <Ref. to WT-2, SPECIFICATION, General Description.>
2) Cracks, damage and wear check
3) Tire runout check
   (1) Lift up the vehicle.
   (2) Slowly rotate the wheel to check rim “runout” using a dial gauge.



- Aluminum wheel

Axial runout limit	Radial runout limit
1.0 mm (0.039 in)	

- Steel wheel

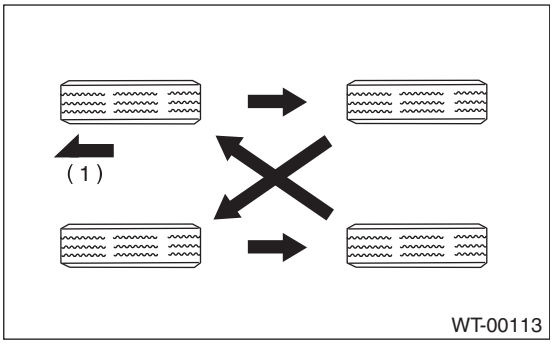
Axial runout limit	Radial runout limit
1.5 mm (0.059 in)	

   (3) If the rim runout exceeds service limit, replace the wheel.

2. TIRE ROTATION

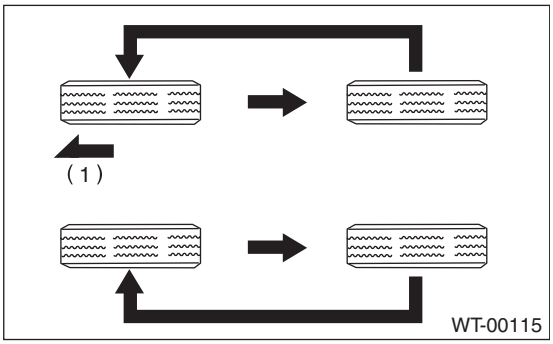
NOTE:
Rotate tires periodically (12,500 km/7,500 miles) in order to prolong life and to prevent uneven wear.
Rotate tires as shown in the figure depending on whether or not the direction of the tire rotation is specified.

- When the direction of tire rotation is not specified



(1) Front side of vehicle

- When the direction of tire rotation is specified

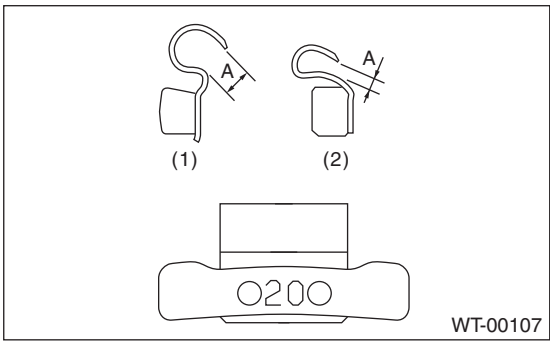


(1) Front side of vehicle

3. WHEEL BALANCING

1) Using the wheel balancer, measure wheel balance.
2) Adjust the wheel balancing.

NOTE:
- Unbalance after adjusting the wheel balancing should be 5 g (0.18 oz) or less.
- When using the adhesive type weight, degrease the surface where the adhesive type weight will be applied securely.
- After applying the adhesive type weight, apply a force to the weight and attain full adhesion.
- Using the knock-on type weight, check the size of the knock-on part.



(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)

3. "T-type" Tire

A: NOTE

CAUTION:
• The "T-type" tire is only for temporary use. Replace with a conventional tire as soon as possible.
• Do not use tire chains for "T-type Tire". Because tire size is small, tire chains can not be installed and will damage the vehicle and tires.
• Do not drive at a speed greater than 80 km/h (50 MPH).
• Drive the vehicle as slowly as possible and avoid bumps on the road.
"T-type" tire for temporary use is prepared as a spare tire.

B: REPLACEMENT

CAUTION:
The "T-type" tire is only for temporary use. Replace with a conventional tire as soon as possible.
Refer to "Tire & Wheel" for removal and installation of the "T-type" tire. <Ref. to WT-4, Tire and Wheel.>

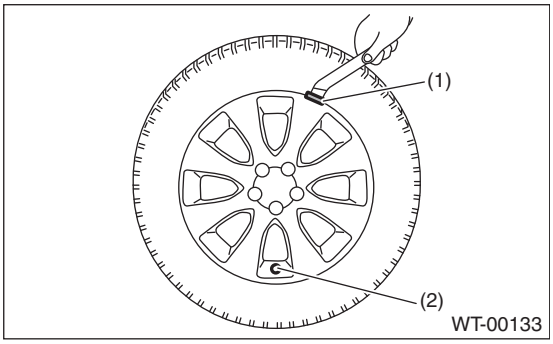
C: INSPECTION

Refer to "Tire & Wheel" for inspection of the "T-type" tire. <Ref. to WT-4, TIRES, INSPECTION, Tire and Wheel.>

4. Full Wheel Cap

A: REMOVAL

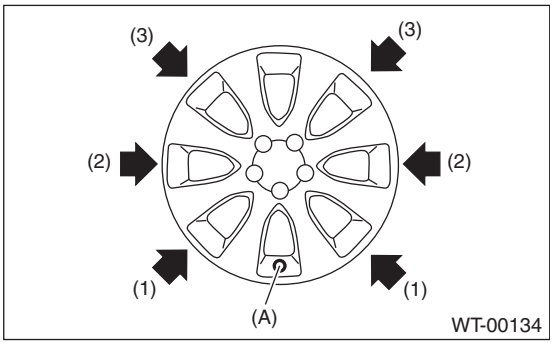
Insert a remover into the notch located diagonally to the valve hole, and remove the cap by prying the remover to the tire side.



(1) Cutout portion
(2) Valve hole

B: INSTALLATION

1) Align the valve with the valve hole in the hubcap.
2) Install the hubcap by tapping it in the order from (1) to (3) described in the figure.



(A) Valve hole

C: INSPECTION

Check the hubcap for damage.

5. Tire Pressure Monitoring System

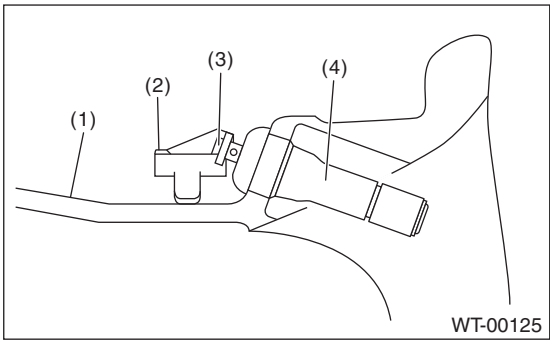
A: REMOVAL

1. TRANSMITTER (SNAP IN TYPE)

1) Remove the wheels from the vehicle. <Ref. to WT-4, REMOVAL, Tire and Wheel.>
2) Remove the tires from wheels.

CAUTION:
Use a tire changer when removing the tire from the wheel.
3) Loosen the screw to remove the transmitter from the valve stem.

NOTE:
Replace the valve and screw with a new part when reusing transmitter.

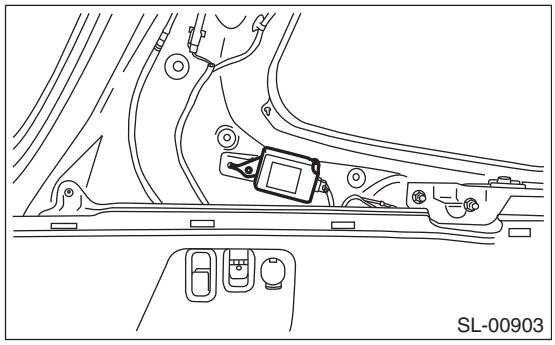


(1) Wheel
(2) Transmitter
(3) Screw
(4) Valve

4) Remove the valve from the wheel.

2. TPMS & KEYLESS ENTRY CONTROL MODULE

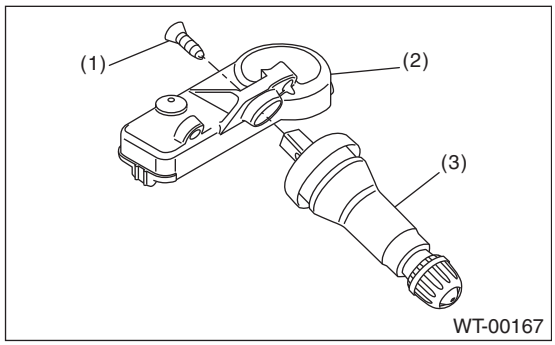
NOTE:
TPMS control module is integrated into keyless entry control module.
1) Disconnect the ground cable from battery.
2) Remove the left rear quarter trim. <Ref. to EI-60, REMOVAL, Rear Quarter Trim.>
3) Disconnect the harness connector.
4) Remove the bolt and then remove the TPMS & keyless entry control module.



B: INSTALLATION

1. TRANSMITTER (SNAP IN TYPE)

CAUTION:
Use the new transmitter assembly or replace the new valve and screw, when installing.
1) Replace the valve and screw with a new part when reusing transmitter.



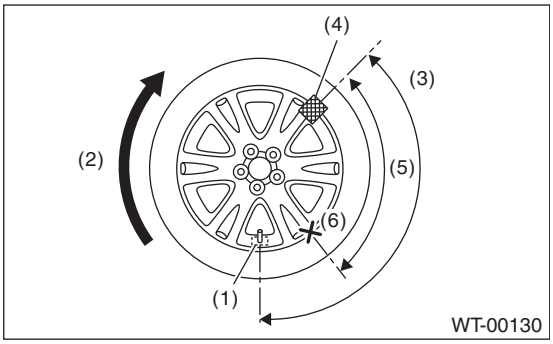
(1) Screw
(2) Transmitter
(3) Valve

Tightening torque:
1.4 N·m (0.14 kgf-m, 1.0 ft-lb)
2) Install the transmitter to the wheel by aligning it with valve hole.

NOTE:
When using the jig that pulls the valve cap by hooking its neck part, use another short-type cap.

3) Install the tires to wheels.

CAUTION:
• Use a tire changer when installing tire to wheel.
• To prevent damaging the transmitter, set the tire changer boom in the position as shown in the figure.



(1) Transmitter
(2) Direction of turn table rotation
(3) 135°
(4) Tire changer boom
(5) 90°
(6) Starting point for fitting the bead to the rim

4) Install the wheels to vehicle. <Ref. to WT-4, INSTALLATION, Tire and Wheel.>
5) Register the transmitter ID to the tire pressure monitoring control module. <Ref. to TPM(diag)-13, Register Transmitter (ID).>

2. TPMS & KEYLESS ENTRY CONTROL MODULE

Install each part in the reverse order of removal.

Tightening torque:
13 N·m (1.33 kgf-m, 9.6 ft-lb)

C: ADJUSTMENT

Re-register the transmitter ID when transmitter has been replaced. <Ref. to TPM(diag)-13, Register Transmitter (ID).>
Re-register the keyless transmitter when TPMS & keyless entry control module has been replaced. <Ref. to SL-47, REGISTRATION OF KEYLESS TRANSMITTER WITH SUBARU SELECT MONITOR, REPLACEMENT, Transmitter.>

6. General Diagnostic Table

A: INSPECTION

Symptoms	Possible cause	Corrective action
Wheel is out of balance.	Improperly inflated tire.	Adjust the tire pressure.
	Uneven wear	Check the tire referring to Abnormal tire wear in this table, carry out the procedure 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-8, INSPECTION, Wheel Alignment.>
	Front strut	Check the front strut. <Ref. to FS-22, INSPECTION, Front Strut.>
	Rear shock absorber	Check the rear shock absorber. <Ref. to RS-14, INSPECTION, Rear Shock Absorber.>
	Front axle	Check the front axle. <Ref. to DS-16, INSPECTION, Front Axle.>
	Front hub unit bearing	Check the front hub unit bearing. <Ref. to DS-18, INSPECTION, Front Hub Unit Bearing.>
	Rear hub unit bearing	Check the rear hub unit bearing. <Ref. to DS-26, INSPECTION, Rear Hub Unit Bearing.>
Vehicle is abnormally out of balance.	Improperly inflated tire.	Adjust the tire pressure.
	Uneven wear	Check the tire referring to Abnormal tire wear in this table, carry out the procedure and replace the tire.
	Front stabilizer	Inspect the front stabilizer. <Ref. to FS-14, 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-8, INSPECTION, Wheel Alignment.>
Abnormal wheel vibration	Improperly inflated tire.	Adjust the tire pressure.
	Uneven wear	Check the tire referring to Abnormal tire wear in this table, carry out the procedure and replace the tire.
	Improper wheel balancing	Check the wheel balance. <Ref. to WT-6, Wheel balancing, INSPECTION, Tire and Wheel.>
	Front axle	Check the front axle. <Ref. to DS-16, INSPECTION, Front Axle.>
	Front hub unit bearing	Check the front hub unit bearing. <Ref. to DS-18, INSPECTION, Front Hub Unit Bearing.>
	Rear hub unit bearing	Check the rear hub unit bearing. <Ref. to DS-26, INSPECTION, Rear Hub Unit Bearing.>

Symptoms	Possible cause	Corrective action
Abnormal tire wear	Improperly inflated tire.	Adjust the tire pressure.
	Improper wheel balancing	Check the wheel balance. <Ref. to WT-6, Wheel balancing, INSPECTION, Tire and Wheel.>
	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-8, INSPECTION, Wheel Alignment.>

TIRE PRESSURE MONITORING SYSTEM (DIAGNOSTICS)

TPM(diag)

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8.	Read Current Data	12
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1. Basic Diagnostic Procedure

A: PROCEDURE

CAUTION:
Remove foreign matter (dust, water, oil etc.) from the TPMS & keyless entry control module connector when removing and installing.

NOTE:
To check harness for open or short circuits, shake the suspected trouble spot or connector.

	Step	Check	Yes	No
1	**CHECK PRE-INSPECTION.** 1) Check with the user regarding when the warning light lit or started blinking. 2) Before performing diagnostics, check all components which may adversely affect the tire pressure monitor system. <Ref. to TPM(diag)-3, INSPECTION, General Description.>	Is the component that might affect the tire pressure monitor system normal?	Go to step **2**.	Repair or replace each component.
2	**CHECK DIAGNOSTIC TROUBLE CODE (DTC).** 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor to data link connector. 3) Turn the ignition switch to ON and run the Subaru Select Monitor. NOTE: If the communication function of the Subaru Select Monitor cannot be executed normally, check the communication circuit. <Ref. to TPM(diag)-7, INSPECTION, Subaru Select Monitor.> 4) Read the DTC. <Ref. to TPM(diag)-10, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is DTC displayed?	Go to step **4**.	Go to step **3**.
3	**PERFORM GENERAL DIAGNOSTICS.** 1) Perform the inspection by referring to “General Diagnostic Table”. <Ref. to TPM(diag)-32, General Diagnostic Table.> 2) Perform the Clear Memory Mode. <Ref. to TPM(diag)-11, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to TPM(diag)-15, Inspection Mode.> 4) Read the DTC. <Ref. to TPM(diag)-10, Read Diagnostic Trouble Code (DTC).> Check the DTC is not displayed.	Does the tire pressure warning light illuminates for about 2 seconds and then foes off after turning on the ignition switch, and then go out?	Finish the diagnosis.	Check the tire inflation pressure warning light blinking patterns. <Ref. to TPM(diag)-16, INSPECTION, Tire Pressure Warning Light / Trouble Indicator Light Illumination Pattern.>
4	**CHECK FREEZE FRAME DATA** Using the Subaru Select Monitor, check the freeze frame data.	Are freeze frame data recorded?	Record the freeze frame data. Go to step **5**.	Go to step **5**.
5	**PERFORM DIAGNOSIS.** 1) Refer to “List of Diagnostic Trouble Code (DTC)”. 2) Correct the cause of trouble. 3) Perform the Clear Memory Mode. <Ref. to TPM(diag)-11, Clear Memory Mode.> 4) Perform the drive test. Drive the vehicle at 40 km/h (25 MPH) or faster for at least 10 minutes. 5) Read the DTC. <Ref. to TPM(diag)-10, Read Diagnostic Trouble Code (DTC).>	Is DTC displayed?	Repeat steps 1 to 4 until DTC is not shown.	Finish the diagnosis.

2. General Description

A: CAUTION

1. SUPPLEMENTAL RESTRAINT SYSTEM "AIRBAG"

Airbag system wiring harness is routed near the TPM control module.

CAUTION:
• Do not use electrical test equipment on any of the airbag system wiring harness circuits.
• Be careful not to damage the wiring harness of the airbag system when servicing the TPMS & keyless entry control module.

2. TPMS & KEYLESS ENTRY CONTROL MODULE

• If the transmitter is replaced, ID registration for the transmitter is required. <Ref. to TPM(diag)-13, Register Transmitter (ID).>
• When adjusting tire pressure indoors in winter, there is a big temperature difference between the indoor facilities and outside. Once the car is outside where the temperature is lower, the air pressure in the tires will drop, causing the tire pressure warning light to illuminate, even if the pressure in the tires was adjusted to standard values indoors. To avoid this, it is necessary to adjust the tire pressure to the high side in consideration of the difference in temperature between inside and outside according to the following table.
• 215/65R16

Temperature °C (°F)	Indoor temperature	15.5 (60)		
	Ambient temperature	–1 (30)	–12 (10)	–23 (–10)
Air pressure kPa (psi)	Front	230 (33)	240 (35)	255 (37)
	Rear	220 (32)	235 (34)	250 (36)

• 225/55R17

Temperature °C (°F)	Indoor temperature	15.5 (60)		
	Ambient temperature	–1 (30)	–12 (10)	–23 (–10)
Air pressure kPa (psi)	Front	240 (32)	255 (37)	270 (39)
	Rear	230 (33)	240 (35)	255 (37)

B: INSPECTION

Before performing diagnosis, check the following item which might affect the quality of the tire pressure monitoring system.

1. TIRE

• Inspect that the tire pressure is within the specification while the tire is cool. (Refer to Tire Caution Label.)
• Check the tires for damage or the insertion of foreign matters.

2. BATTERY

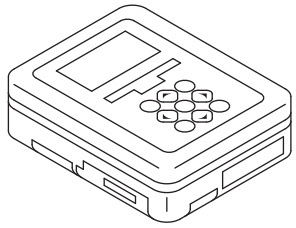
Check that amount of battery fluid, gravity and voltage are within the specifications.

Standard voltage: 12 V or more

Specific gravity: 1.260 or more

C: PREPARATION TOOL

1. SPECIAL TOOL

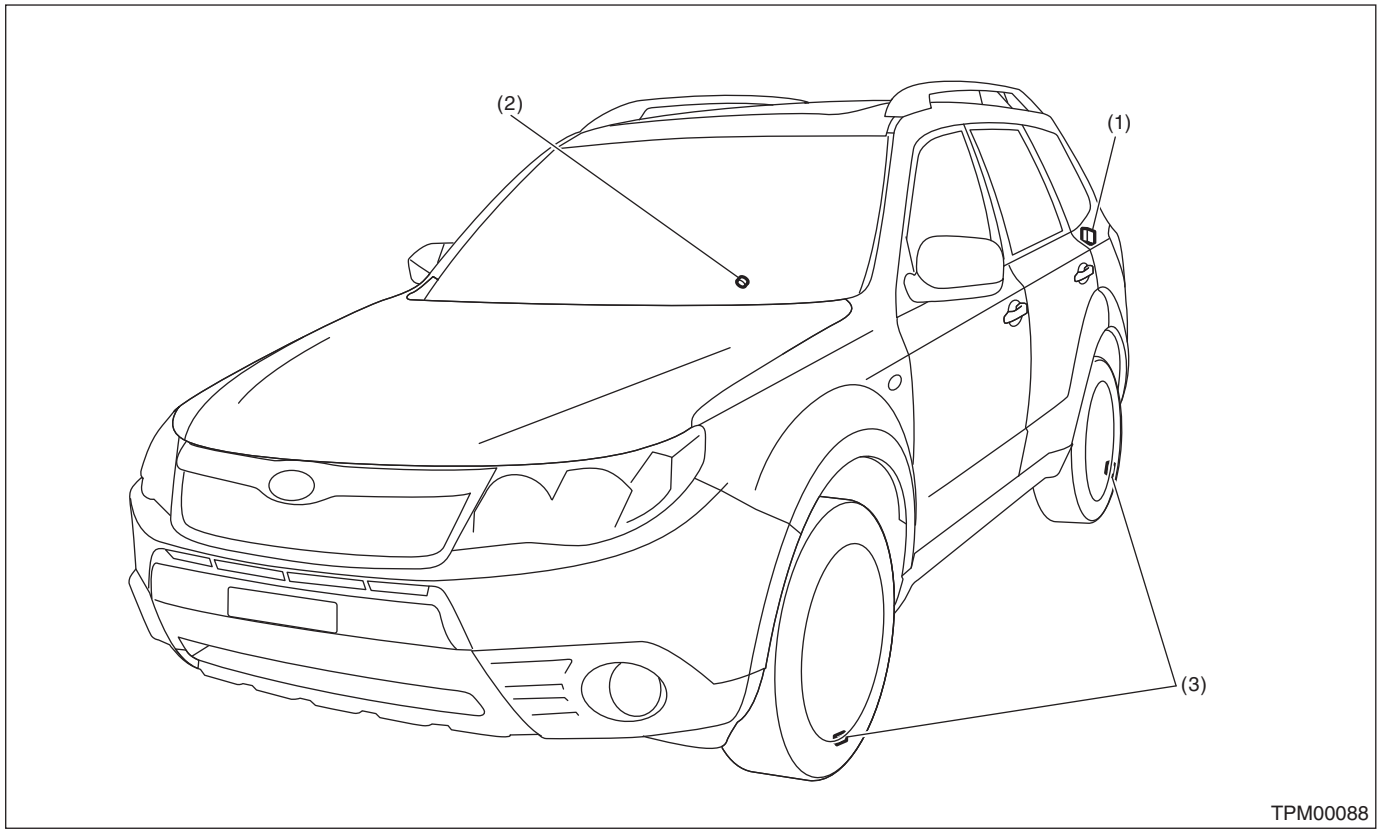
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST1B022XU0	1B022XU0	SUBARU SELECT MONITOR III KIT	Used for troubleshooting the electrical system.

2. GENERAL TOOL

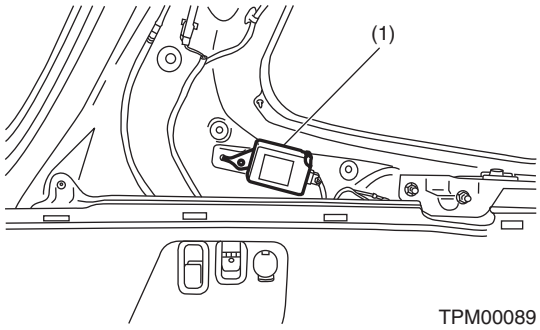
TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance, voltage and current.
Transmitter registration tool	Used to register the transmitter ID. Manufacturer: Kent-Moore Item number: J45295

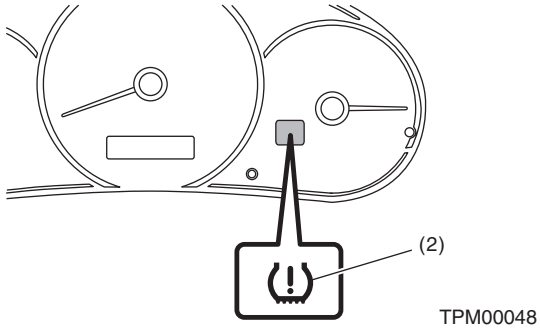
3. Electrical Component Location

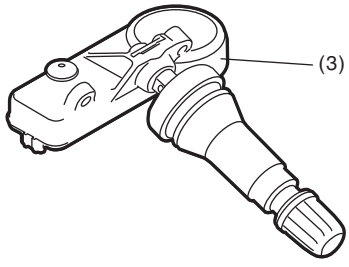
A: LOCATION



(1) TPMS & keyless entry control module
(2) Tire pressure warning light
(3) Snap-in type transmitter

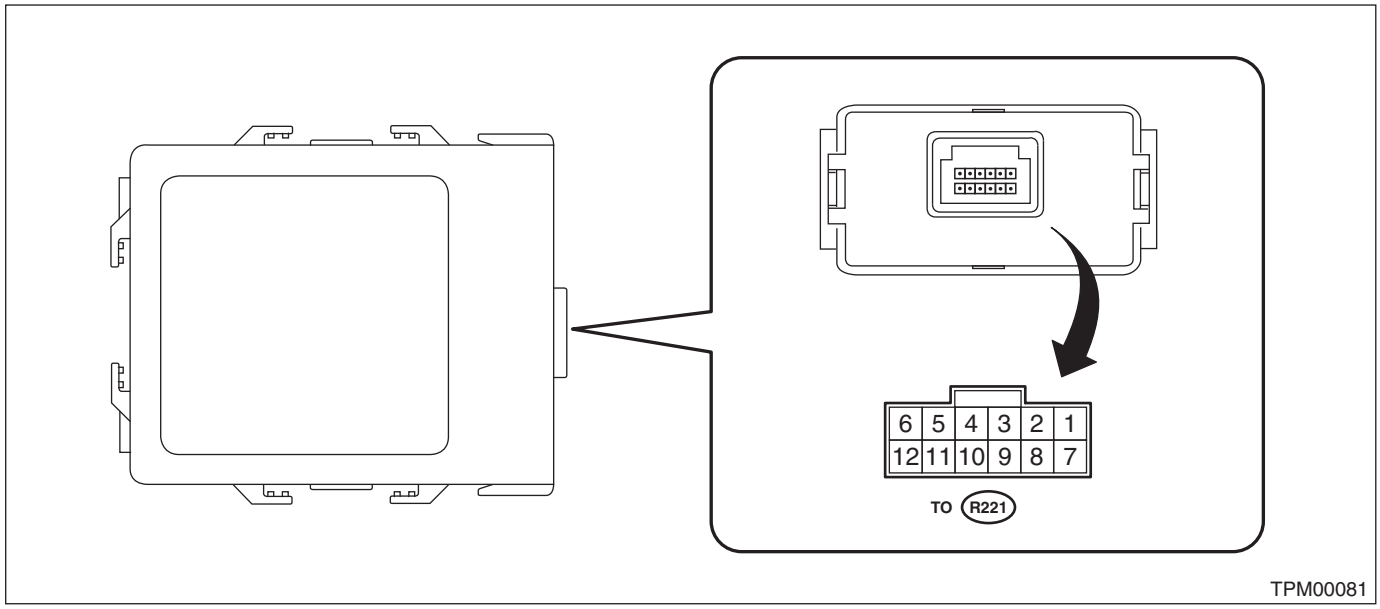






4. Control Module I/O Signal

A: ELECTRICAL SPECIFICATION



Terminal No.	Content	Measured value and measuring conditions	Remarks
1	—	—	—
2	Tire pressure warning light output	Illuminate when malfunction occurs, or tire pressure decreases	System failure: blinks 25 times → illuminates Tire pressure decreases: turns on
3	Speed sensor signal	While driving (Pulse signal)	Change according to vehicle speed
4	Ignition power supply	IG switch ON (Battery voltage)	—
5	GND	0 V (Always)	—
6	Battery power supply	Battery voltage (Always)	—
7	—	—	—
8	—	—	—
9	—	—	—
10	—	—	—
11	Body integrated unit	—	—
12	Select monitor communication	Serial communication	—

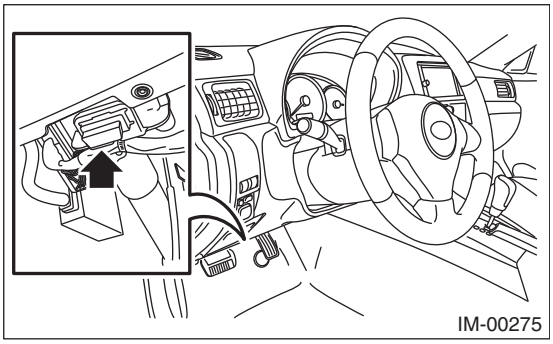
B: WIRING DIAGRAM

<Ref. to WI-82, WIRING DIAGRAM, Tire Pressure Monitoring System.>

5. Subaru Select Monitor

A: OPERATION

1) Prepare the Subaru Select Monitor kit. <Ref. to TPM(diag)-4, SPECIAL TOOL, PREPARATION TOOL, General Description.>
2) Connect the diagnosis cable to Subaru Select Monitor.
3) Connect the Subaru Select Monitor to data link connector.
(1) Data link connector is located in the lower portion of instrument panel (on the driver's side).

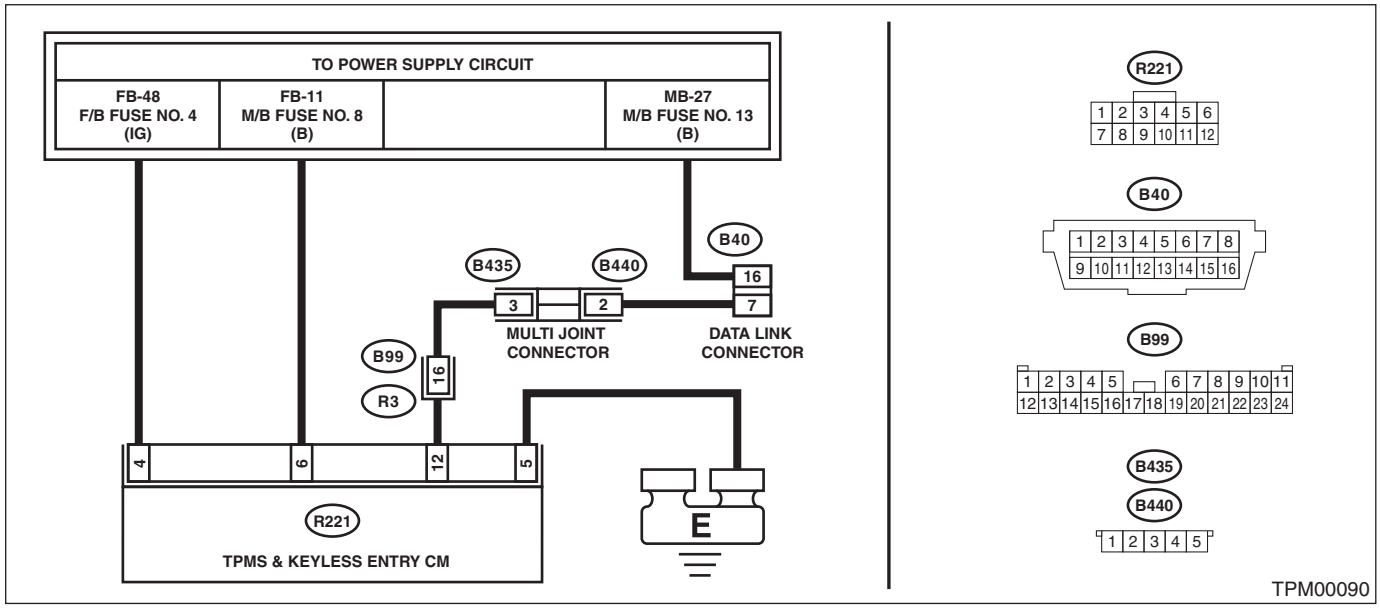


(2) Connect the diagnosis cable to data link connector.

CAUTION:
Do not connect scan tools other than the Subaru Select Monitor.
4) Turn the ignition switch to ON and run the Subaru Select Monitor.

B: INSPECTION

COMMUNICATION FOR INITIALIZING IMPOSSIBLE
DETECTING CONDITION:
Defective harness connector
TROUBLE SYMPTOM:
Communication is impossible between the TPMS & keyless entry control module and the Subaru Select Monitor.
WIRING DIAGRAM:



	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 TPM mode using Subaru Select Monitor.
2	**CHECK BATTERY.**	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 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.	Is the system name 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 TPMS & keyless entry control module connector. 3) Turn the ignition switch to ON. 4) Check whether communication to other systems can be executed normally.	Is the system name displayed on Subaru Select Monitor?	Replace the TPMS & keyless entry control module. <Ref. to WT-9, TPMS & keyless entry control module, REMOVAL, Tire Pressure Monitoring System.>	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 TPMS & keyless entry control module. 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 TO TPMS & KEYLESS ENTRY CONTROL MODULE.** 1) Turn the ignition switch to ON. 2) Measure the voltage between TPMS & keyless entry control module 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 TPMS & KEYLESS ENTRY CONTROL MODULE AND DATA LINK CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between the TPMS & keyless entry control module connector and the data link connector. ***Connector & terminal*** ***(R221) No. 12 — (B40) No. 7:***	Is the resistance less than 0.5 Ω?	Go to step **9**.	Repair the harness and connector between TPMS & keyless entry control module and data link connector.
9	**CHECK TPMS & KEYLESS ENTRY CONTROL MODULE CONNECTOR.** Turn the ignition switch to OFF.	Is TPMS & keyless entry control module connector inserted into the TPMS & keyless entry control module until it locks?	Go to step **10**.	Insert the TPMS & keyless entry control module connector into the TPMS & keyless entry control module.

Step		Check	Yes	No
10	**CHECK POWER SUPPLY CIRCUIT.** 1) Turn the ignition switch to ON. 2) Measure the ignition power supply voltage between TPMS & keyless entry control module connector and chassis ground. ***Connector & terminal*** ***(R221) No. 4 (+) — Chassis ground (–):***	Is the voltage 10 — 15 V?	Go to step **11**.	Repair open circuit of the harness between TPMS & keyless entry control module and battery.
11	**CHECK HARNESS CONNECTOR BETWEEN TPMS & KEYLESS ENTRY CONTROL MODULE AND CHASSIS GROUND.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the TPMS & keyless entry control module. 3) Measure the resistance of harness between TPMS & keyless entry control module and chassis ground. ***Connector & terminal*** ***(R221) No. 5 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **12**.	Repair open circuit of the harness of the TPMS & keyless entry control module.
12	**CHECK POOR CONTACT OF CONNECTOR.**	Is there poor contact of TPMS & keyless entry control module power supply, ground circuit and data link connector?	Repair the connector.	Replace the TPMS & keyless entry control module. <Ref. to WT-9, TPMS & keyless entry control module, REMOVAL, Tire Pressure Monitoring System.>

6. Read Diagnostic Trouble Code (DTC)

A: OPERATION

1) On «Main Menu» display, select {Each System Check}.
2) On «System Selection Menu» display, select {Tire pressure monitor}.
3) After {System Name} is displayed, select [OK].
4) On «Tire pressure monitor diagnosis» display, select {Diagnostic Code(s) Display}.

NOTE:
• For detailed operation procedures, refer to “PC application help for Subaru Select Monitor”.
• For details concerning DTCs, refer to List of Diagnostic Trouble Code (DTC). <Ref. to TPM(diag)-20, List of Diagnostic Trouble Code (DTC).>
• All DTCs detected will be displayed.
• If a particular DTC is not properly stored in memory (due to a voltage drop of the TPMS & keyless entry control module power supply, etc.) when a problem occurs, a DTC suffixed with a question mark will appears on the Subaru Select Monitor display. This shows it may be an unreliable reading.

5) If TPMS & keyless entry control module and Subaru Select Monitor cannot communicate, check the communication circuit. <Ref. to TPM(diag)-7, INSPECTION, Subaru Select Monitor.>
6) When DTC is not displayed, check the indicator circuit and communication circuit. <Ref. to TPM(diag)-16, Tire Pressure Warning Light / Trouble Indicator Light Illumination Pattern.>

7. Clear Memory Mode

A: OPERATION

1) On «Main Menu» display, select {Each System Check}.
2) On «System Selection Menu» display, select {Tire pressure monitor}.
3) After the {Tire pressure monitor} is displayed, select [OK].
4) On «Tire pressure monitor diagnosis» display, select {Clear Memory}.
5) When “Done” and “Turn off the ignition switch.” are shown on the display screen, turn the Subaru Select Monitor and the ignition switch to OFF.

NOTE:
For detailed operation procedures, refer to “PC application help for Subaru Select Monitor”.

8. Read Current Data

A: OPERATION

1) On the «Main Menu», select {Each System Check}.
2) On the «System Selection Menu», select {Tire pressure monitor}.
3) After the {Tire pressure monitor} is displayed, select [OK].
4) On the «Tire pressure monitor diagnosis», select the {Data Display}, and then necessary data will be displayed.

B: LIST

Display	Contents to be displayed	Unit of measure
Tire 1 FN code	LEARN, LOW BAT, OFF, WAKE, RE ME, NORMAL	LEARN: Transmitted transmitter ID using the transmitter registration tool LOW BAT: Transmitter battery voltage running low OFF: Transmitter function stops (no data transmission) RE ME: Tire air changes ±8.4 kPa WAKE: When data transmission is started from a stopped state. NORMAL: Conditions other than above
Tire 2 FN code		
Tire 3 FN code		
Tire 4 FN code		
Tire 1 air pressure	Value converted to tire pressure from data delivered from transmitter is displayed. (The figure may differ from the actual measured values.)	kPa, psig, mmHg, inHg
Tire 2 air pressure		kPa, psig, mmHg, inHg
Tire 3 air pressure		kPa, psig, mmHg, inHg
Tire 4 air pressure		kPa, psig, mmHg, inHg
Vehicle Speed	Vehicle speed signal which is input in control module	km/h, MPH
Pressure warning	Threshold where tire pressure warning light illuminates	kPa, psig, mmHg, inHg
Return pressure	Threshold where tire pressure warning light goes out	kPa, psig, mmHg, inHg

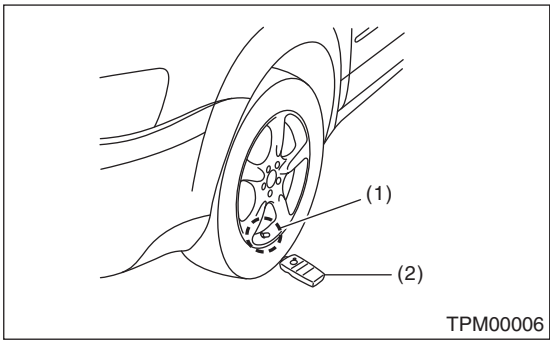
9. Register Transmitter (ID)

A: OPERATION

Perform the registration procedure of the transmitter in the following cases:
- Transmitter replaced.
- TPMS & keyless entry control module replaced.

NOTE:
- If registration of the transmitter ID is not possible after 2 attempts, replace TPMS & keyless entry control module. <Ref. to WT-9, TPMS & keyless entry control module, REMOVAL, Tire Pressure Monitoring System.> <Ref. to WT-10, TPMS & keyless entry control module, INSTALLATION, Tire Pressure Monitoring System.>
- During the registration, turn the ignition switch to OFF and end the Subaru Select Monitor. Or if the registration is not performed for 5 minutes or more, the registration mode is cancelled.
- When rotating tires, there is no affect on the performance or functions of the tire pressure monitoring control module even if the transmitter (ID) is not registered, however, the tire position displayed on the Subaru Select Monitor will be incorrect.

1) Adjust all tire pressures to the specifications.
2) Connect Subaru Select Monitor and select the {Each System Check} on the «Main Menu».
3) On «System Selection Menu» display, select {Tire pressure monitor}.
4) After the {Tire pressure monitor} is displayed, select [OK].
5) On «Tire pressure monitor diagnosis» display, select {Transmitter ID regist confirm}.
6) {ID registration mode When execute Registered ID is deleted. Continue?} is displayed, select [OK].
7) Contact the transmitter registration tool to the side wall area near the air valve on the front left tire, and press the switch. The transmitter ID is sent to the TPMS & keyless entry control module. (At this time, the tire pressure warning light blinks to confirm that the registration has started.)



(1) Air valve (transmitter)
(2) Transmitter registration tool

NOTE:
- The registration order of transmitter ID is not specified.
- The transmitter registration tool is used by touching the side wall area near the transmitter.
- If registration procedure stop in the halfway (turning ignition switch to OFF, wrong registration order, etc), proceed from step 5).

8) When ID registration is completed, the tire pressure warning light remains lit for approximately 2 seconds, to end the registration. Switch to the screen displaying the transmitter ID on the Subaru Select Monitor display. <Ref. to TPM(diag)-14, Display Transmitter (ID).>
9) Check the transmitter ID that was registered, then perform a driving test. <Ref. to TPM(diag)-15, Inspection Mode.>

10.Display Transmitter (ID)

A: OPERATION

1) On «Main Menu» display, select {Each System Check}.
2) On «System Selection Menu» display, select {Tire pressure monitor}.
3) After the {Tire pressure monitor} is displayed, select [OK].
4) On «Tire pressure monitor diagnosis» display, select {Transmitter ID regist confirm}.
5) Select the {Transmitter ID monitor} and then select [OK] to display the transmitter ID.

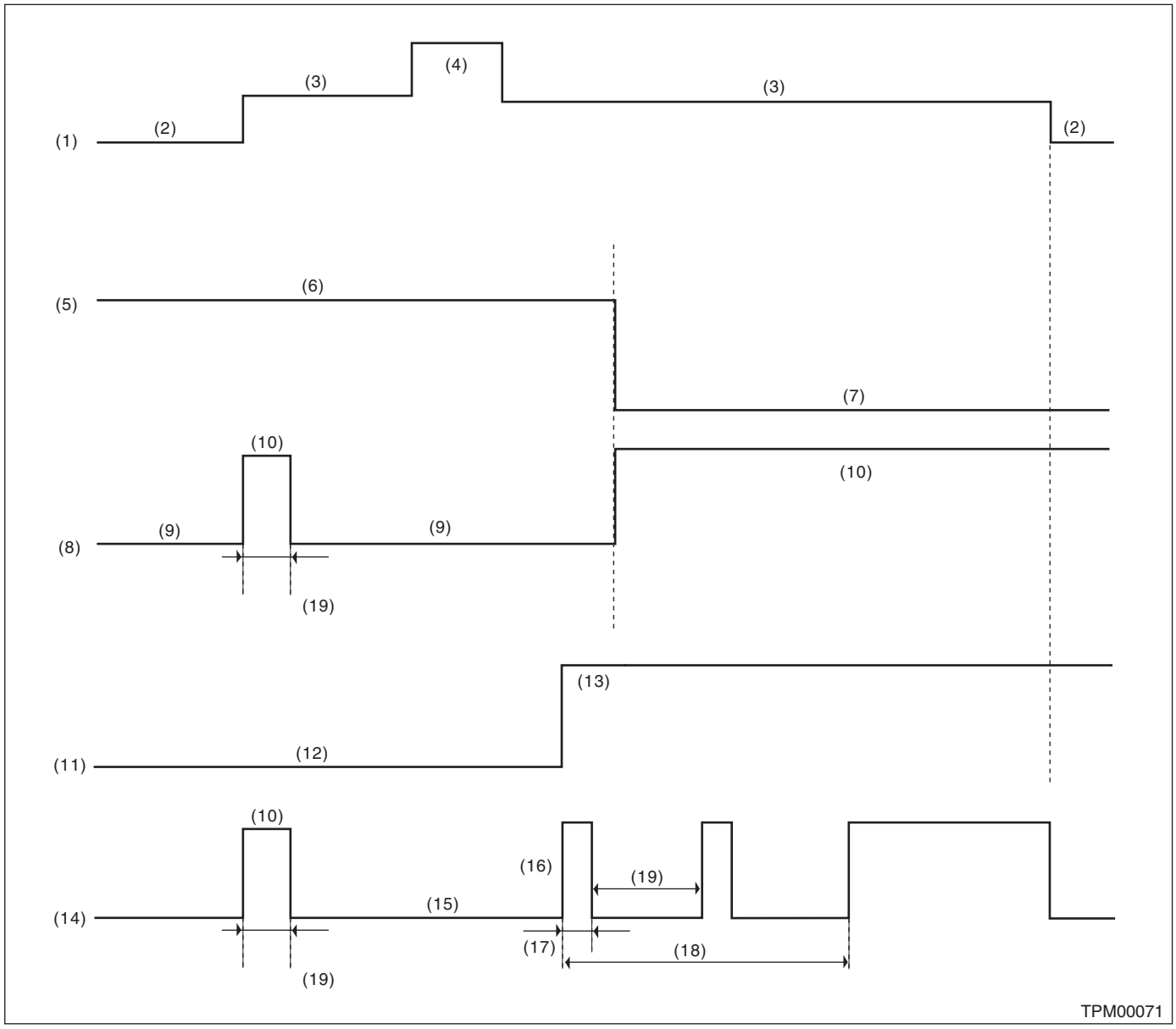
11.Inspection Mode

A: PROCEDURE

• Reproduce the malfunction occurrence condition as much as possible.
• Drive the vehicle at 40 km/h (25 MPH) or faster for approx. ten minutes.

12. Tire Pressure Warning Light / Trouble Indicator Light Illumination Pattern

A: INSPECTION



(1) Ignition switch
(2) OFF
(3) ON
(4) Start
(5) Tire inflation pressure
(6) Meet the specification
(7) Less than standard value (For the pressure warning level, refer to "CURRENT DATA".) <Ref. to TPM(diag)-12, LIST, Read Current Data.>
(8) Tire inflation pressure warning light (pressure condition)
(9) Light OFF
(10) Light ON
(11) System status
(12) Normal
(13) Malfunction
(14) Tire inflation pressure warning light (system condition)
(15) Light OFF
(16) Blink
(17) 1 second
(18) Blinks 25 times
(19) 2 seconds

1) When the tire pressure warning light does not illuminate in accordance with this illumination pattern, there must be an electrical malfunction.
2) If the tire pressure warning light does not go off, check the TPMS & keyless entry control module/warning light circuit and the combination meter circuit. <Ref. to TPM(diag)-17, TIRE PRESSURE WARNING LIGHT DOES NOT COME OFF, Tire Pressure Warning Light / Trouble Indicator Light Illumination Pattern.>

NOTE:
If the problem is fixed while driving at approximately 40 km/h (25 MPH) after the tire pressure warning light blinks/lights, the warning light goes out and the tire pressure monitor system operates normally. (If there is a decrease in tire pressure, or a malfunction of the system, the malfunction history is displayed.)

B: TIRE PRESSURE WARNING LIGHT DOES NOT COME ON

DETECTING CONDITION:
Defective combination meter
TROUBLE SYMPTOM:
When the ignition switch is turned to ON, the tire pressure warning light does not turn on (for approx. 2 seconds).

	Step	Check	Yes	No
1	**CHECK DIAGNOSTIC TROUBLE CODE (DTC).** Connect the Subaru Select Monitor, and read the Diagnostic Trouble Code. <Ref. to TPM(diag)-10, Read Diagnostic Trouble Code (DTC).>	Is diagnostics code (DTC) displayed?	Perform the diagnosis according to the DTC. <Ref. to TPM(diag)-20, List of Diagnostic Trouble Code (DTC).>	Replace the combination meter. <Ref. to IDI-21, REMOVAL, Combination Meter.>

C: TIRE PRESSURE WARNING LIGHT DOES NOT COME OFF

DETECTING CONDITION:
- Defective combination meter
- Tires pressure drop
- Transmitter ID not registered

TROUBLE SYMPTOM:
Tire pressure warning light remains illuminating after engine starts.

	Step	Check	Yes	No
1	**CHECK DTC.** Connect the Subaru Select Monitor, and read the Diagnostic Trouble Code. <Ref. to TPM(diag)-10, Read Diagnostic Trouble Code (DTC).>	Is a DTC displayed?	Perform the diagnosis according to the DTC. <Ref. to TPM(diag)-20, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK TRANSMITTER (ID).** Display the transmitter ID of the tire pressure monitor system. <Ref. to TPM(diag)-14, Display Transmitter (ID).>	Is the transmitter ID registered?	Go to step **3**.	Register the transmitter ID. <Ref. to TPM(diag)-13, Register Transmitter (ID).>
3	**CHECK TRANSMITTER DATA OUTPUT.** 1) Select data display of the tire pressure monitoring. 2) Start the engine and check the tire pressure warning light output.	Is the warning light output ON?	Replace the TPMS & keyless entry control module. <Ref. to WT-9, TPMS & keyless entry control module, REMOVAL, Tire Pressure Monitoring System.>	Replace the combination meter. <Ref. to IDI-21, REMOVAL, Combination Meter.>

D: TIRE PRESSURE WARNING LIGHT IS 25 TIMES BLINKING AND TURN ON

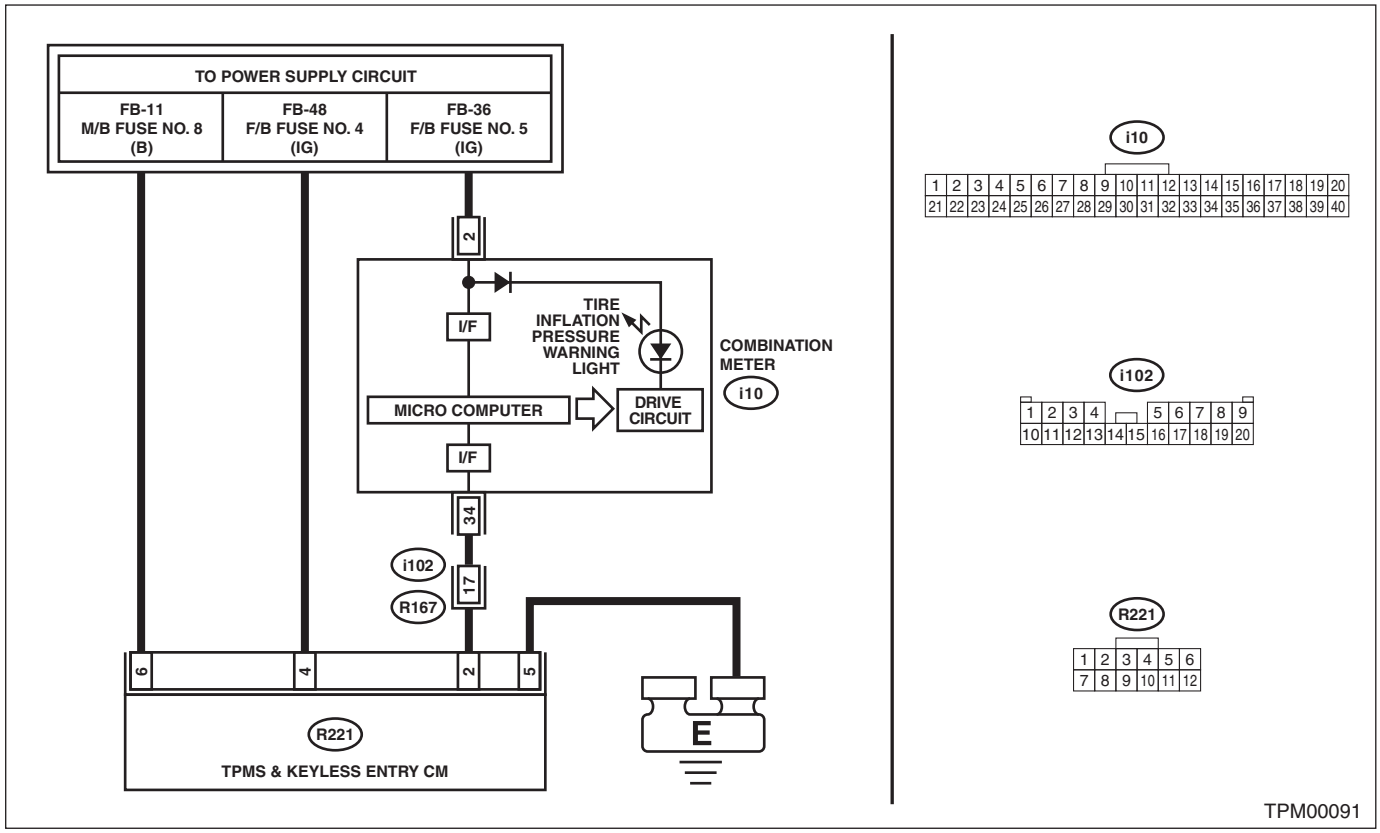
DETECTING CONDITION:

- Defective TPMS & keyless entry control module
- Defective harness
- Transmitter is faulty.

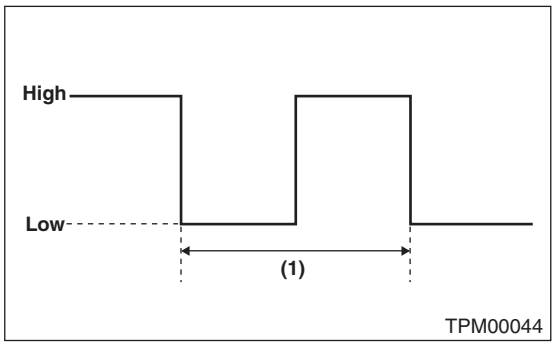
TROUBLE SYMPTOM:

Every time the engine starts, tire pressure warning light blinks 25 times and then illuminates.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK DTC.** Connect the Subaru Select Monitor, and read the Diagnostic Trouble Code. <Ref. to TPM(diag)-10, Read Diagnostic Trouble Code (DTC).>	Is diagnostics code (DTC) displayed?	Perform the diagnosis according to the DTC. <Ref. to TPM(diag)-20, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK HARNESS.** 1) Connect the Subaru Select Monitor to the terminal No. 2 of the TPMS & keyless entry control module connector (R221). ***Connector & terminal (R221) No. 2 (+) — Chassis ground (–):*** 2) Turn the ignition switch to ON, and select "Oscilloscope" from the Main Menu of Subaru Select Monitor. 3) Check the voltage displayed.	Is the voltage 10 V or more?	Go to step **3**.	Go to step **4**.

Step	Check	Yes	No
3 **CHECK HARNESS.** 1) Check the output waveform displayed in the oscilloscope of Subaru Select Monitor. 	Is the pattern the same output waveform as shown in the figure? (1) 400±9 ms Duty 50% High: Battery voltage Low:1.5 V or less	Check the combination meter. <Ref. to IDI-5, INSPECTION, Combination Meter System.>	Replace the TPMS & keyless entry control module. <Ref. to WT-9, REMOVAL, Tire Pressure Monitoring System.>
4 **CHECK HARNESS.** 1) Disconnect the TPMS & keyless entry control module connector. 2) Connect the Subaru Select Monitor to the terminal No. 2 of the TPMS & keyless entry control module connector (R221). ***Connector & terminal*** ***(R221) No. 2 (+) — Chassis ground (–):*** 3) Turn the ignition switch to ON, and select “Oscilloscope” from the Main Menu of Subaru Select Monitor. 4) Check the voltage displayed.	Is the voltage 10 V or more?	Replace the TPMS & keyless entry control module. <Ref. to WT-9, REMOVAL, Tire Pressure Monitoring System.>	The harness between the combination meter connector and the TPMS & keyless entry control module connector is shorted or open. Repair or replace the harness.

13.List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Contents	Contents of diagnosis	Remarks
11	Tire 1 Air Pressure Decrease	Tire pressure of tire 1 is reduced.	<Ref. to TPM(diag)-22, DTC 11 TIRE 1 AIR PRESSURE DECREASE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
12	Tire 2 Air Pressure Decrease	Tire pressure of tire 2 is reduced.	<Ref. to TPM(diag)-22, DTC 12 TIRE 2 AIR PRESSURE DECREASE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
13	Tire 3 Air Pressure Decrease	Tire pressure of tire 3 is reduced.	<Ref. to TPM(diag)-22, DTC 13 TIRE 3 AIR PRESSURE DECREASE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
14	Tire 4 Air Pressure Decrease	Tire pressure of tire 4 is reduced.	<Ref. to TPM(diag)-23, DTC 14 TIRE 4 AIR PRESSURE DECREASE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
21	Transmitter 1 No Data	Data cannot be received from transmitter 1.	<Ref. to TPM(diag)-23, DTC 21 TRANSMITTER 1 NO DATA, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
22	Transmitter 2 No Data	Data cannot be received from transmitter 2.	<Ref. to TPM(diag)-23, DTC 22 TRANSMITTER 2 NO DATA, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
23	Transmitter 3 No Data	Data cannot be received from transmitter 3.	<Ref. to TPM(diag)-23, DTC 23 TRANSMITTER 3 NO DATA, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
24	Transmitter 4 No Data	Data cannot be received from transmitter 4.	<Ref. to TPM(diag)-24, DTC 24 TRANSMITTER 4 NO DATA, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
31	Transmitter 1 Pressure Data Abnormal	Transmitter 1 data contents are abnormal.	<Ref. to TPM(diag)-25, DTC 31 TRANSMITTER 1 PRESSURE DATA ABNORMAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
32	Transmitter 2 Pressure Data Abnormal	Transmitter 2 data contents are abnormal.	<Ref. to TPM(diag)-25, DTC 32 TRANSMITTER 2 PRESSURE DATA ABNORMAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
33	Transmitter 3 Pressure Data Abnormal	Transmitter 3 data contents are abnormal.	<Ref. to TPM(diag)-25, DTC 33 TRANSMITTER 3 PRESSURE DATA ABNORMAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
34	Transmitter 4 Pressure Data Abnormal	Transmitter 4 data contents are abnormal.	<Ref. to TPM(diag)-26, DTC 34 TRANSMITTER 4 PRESSURE DATA ABNORMAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
41	Transmitter 1 Function Code Abnormal	Function code has error.	<Ref. to TPM(diag)-27, DTC 41 TRANSMITTER 1 FUNCTION CODE ABNORMAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Contents	Contents of diagnosis	Remarks
42	Transmitter 2 Function Code Abnormal	Function code has error.	<Ref. to TPM(diag)-27, DTC 42 TRANSMITTER 2 FUNCTION CODE ABNORMAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
43	Transmitter 3 Function Code Abnormal	Function code has error.	<Ref. to TPM(diag)-27, DTC 43 TRANSMITTER 3 FUNCTION CODE ABNORMAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
44	Transmitter 4 Function Code Abnormal	Function code has error.	<Ref. to TPM(diag)-28, DTC 44 TRANSMITTER 4 FUNCTION CODE ABNORMAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
51	Transmitter 1 Battery Voltage Decrease	Transmitter battery voltage is low.	<Ref. to TPM(diag)-29, DTC 51 TRANSMITTER 1 BATTERY VOLTAGE DECREASE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
52	Transmitter 2 Battery Voltage Decrease	Transmitter battery voltage is low.	<Ref. to TPM(diag)-29, DTC 52 TRANSMITTER 2 BATTERY VOLTAGE DECREASE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
53	Transmitter 3 Battery Voltage Decrease	Transmitter battery voltage is low.	<Ref. to TPM(diag)-29, DTC 53 TRANSMITTER 3 BATTERY VOLTAGE DECREASE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
54	Transmitter 4 Battery Voltage Decrease	Transmitter battery voltage is low.	<Ref. to TPM(diag)-30, DTC 54 TRANSMITTER 4 BATTERY VOLTAGE DECREASE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
61	Vehicle Speed is Abnormal	Vehicle speed signal is not input to the control module when the vehicle speed is 6 km/h (3.7 MPH) or more.	<Ref. to TPM(diag)-31, DTC 61 VEHICLE SPEED IS ABNORMAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

14.Diagnostic Procedure with Diagnostic Trouble Code (DTC)

A: DTC 11 TIRE 1 AIR PRESSURE DECREASE

NOTE:
Refer to DTC 14 for diagnostic procedure. <Ref. to TPM(diag)-23, DTC 14 TIRE 4 AIR PRESSURE DECREASE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

B: DTC 12 TIRE 2 AIR PRESSURE DECREASE

NOTE:
Refer to DTC 14 for diagnostic procedure. <Ref. to TPM(diag)-23, DTC 14 TIRE 4 AIR PRESSURE DECREASE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

C: DTC 13 TIRE 3 AIR PRESSURE DECREASE

NOTE:
Refer to DTC 14 for diagnostic procedure. <Ref. to TPM(diag)-23, DTC 14 TIRE 4 AIR PRESSURE DECREASE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

D: DTC 14 TIRE 4 AIR PRESSURE DECREASE

DTC DETECTING CONDITION:
Inflation pressure of tires dropped below the specified value.

NOTE:
For the specifications, refer to “CURRENT DATA”. <Ref. to TPM(diag)-12, LIST, Read Current Data.>
TROUBLE SYMPTOM:
Tire pressure warning light illuminates.

	Step	Check	Yes	No
1	**CHECK TIRES.** Lift up the vehicle and check for damage in the tires.	Are there cracks or damage?	Replace the tire. <Ref. to WT-4, Tire and Wheel.>	Go to step **2**.
2	**CHECK TIRES.** Check the tire air pressure.	Is the tire pressure in the specifications?	Go to step **3**.	Adjust the air pressure.
3	**CHECK TRANSMITTER.** Drive the vehicle at 40 km/h (25 MPH) or faster and compare the data from the transmitter on the four wheels.	Is there a transmitter with different data?	Replace the transmitter (tire pressure sensor). <Ref. to WT-9, Tire Pressure Monitoring System.>	Go to step **4**.
4	**PERFORM DRIVING TEST.** 1) Perform the Clear Memory Mode. <Ref. to TPM(diag)-11, Clear Memory Mode.> 2) Perform a driving test. <Ref. to TPM(diag)-15, PROCEDURE, Inspection Mode.> 3) Read the DTC. <Ref. to TPM(diag)-10, Read Diagnostic Trouble Code (DTC).>	Is DTC displayed?	Inspect by referring to “Diagnostic Procedure with Diagnostic Trouble Code (DTC)”. <Ref. to TPM(diag)-22, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

CAUTION:
When driving vehicle to perform driving test, there should be always 2 persons (driver and checker) to check.

E: DTC 21 TRANSMITTER 1 NO DATA

NOTE:
Refer to DTC 24 for diagnostic procedure. <Ref. to TPM(diag)-24, DTC 24 TRANSMITTER 4 NO DATA, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

F: DTC 22 TRANSMITTER 2 NO DATA

NOTE:
Refer to DTC 24 for diagnostic procedure. <Ref. to TPM(diag)-24, DTC 24 TRANSMITTER 4 NO DATA, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

G: DTC 23 TRANSMITTER 3 NO DATA

NOTE:
Refer to DTC 24 for diagnostic procedure. <Ref. to TPM(diag)-24, DTC 24 TRANSMITTER 4 NO DATA, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

H: DTC 24 TRANSMITTER 4 NO DATA

DTC DETECTING CONDITION:
Data from each transmitter is not received for 8 minutes.
TROUBLE SYMPTOM:
Tire pressure warning light blinks 25 times and then illuminates.

	Step	Check	Yes	No
1	**START FL TRANSMITTER.** 1) Connect the Subaru Select Monitor and then turn the ignition switch to ON. 2) Select “Transmitter ID”. <Ref. to TPM(diag)-14, Display Transmitter (ID).> 3) Use the transmitter registration tool and transmit the ID from the FL transmitter to check “Latest reception ID”.	Is “Latest reception ID” updated?	Go to step **2**.	Replace front left transmitter.
2	**CHECK FL TRANSMITTER ID.** Check the ID displayed in the updated ID display and the tire 1 registered ID.	Are the two IDs same?	Go to step **3**.	Record the received ID update as the FL transmitter. Go to step **3**.
3	**START FR TRANSMITTER.** Use the transmitter registration tool and transmit the ID from the FR transmitter to check “Latest reception ID”.	Is “Latest reception ID” updated?	Go to step **4**.	Replace the front right transmitter.
4	**CHECK FR TRANSMITTER ID.** Check the ID displayed in the updated ID display and the tire 2 registered ID.	Are the two IDs same?	Go to step **5**.	Record the received ID update as the FR transmitter. Go to step **5**.
5	**START RR TRANSMITTER.** Use the transmitter registration tool and transmit the ID from the RR transmitter to check “Latest reception ID”.	Is “Latest reception ID” updated?	Go to step **6**.	Replace the RR transmitter.
6	**CHECK RR TRANSMITTER ID.** Check the ID displayed in the updated ID display and the tire 3 registered ID.	Are the two IDs same?	Go to step **7**.	Record the received ID update as the RR transmitter. Go to step **7**.
7	**START RL TRANSMITTER.** Use the transmitter registration tool and transmit the ID from the RL transmitter to check “Latest reception ID”.	Is “Latest reception ID” updated?	Go to step **8**.	Replace the RL transmitter.
8	**CHECK RL TRANSMITTER ID.** Check the ID displayed in the updated ID display and the tire 4 registered ID.	Are the two IDs same?	Go to step **9**.	Record the received ID update as the RL transmitter. Go to step **9**.
9	**CHECK MALFUNCTION TRANSMITTER.**	Is ID recorded by this procedure?	Go to step **10**.	Go to step **1**.
10	**CHECK MALFUNCTION TRANSMITTER.** Check the registered ID of the transmitter indicated by DTC.	Is there checked ID in the record?	Replace the transmitter of the recorded position.	Replace the transmitter showing the latest ID that is not included in the registered IDs.

CAUTION:
When driving vehicle to perform driving test, there should be always 2 persons (driver and checker) to check.

I: DTC 31 TRANSMITTER 1 PRESSURE DATA ABNORMAL

NOTE:
Refer to DTC 34 for diagnostic procedure. <Ref. to TPM(diag)-26, DTC 34 TRANSMITTER 4 PRESSURE DATA ABNORMAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

J: DTC 32 TRANSMITTER 2 PRESSURE DATA ABNORMAL

NOTE:
Refer to DTC 34 for diagnostic procedure. <Ref. to TPM(diag)-26, DTC 34 TRANSMITTER 4 PRESSURE DATA ABNORMAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

K: DTC 33 TRANSMITTER 3 PRESSURE DATA ABNORMAL

NOTE:
Refer to DTC 34 for diagnostic procedure. <Ref. to TPM(diag)-26, DTC 34 TRANSMITTER 4 PRESSURE DATA ABNORMAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

L: DTC 34 TRANSMITTER 4 PRESSURE DATA ABNORMAL

DTC DETECTING CONDITION:

- When comparing the data from each transmitter to the previous data, the change is large.
- The pressure exceeds what the transmitter can measure. (Excessive pressure)

TROUBLE SYMPTOM:

Tire pressure warning light blinks 25 times and then illuminates.

	Step	Check	Yes	No
1	**START FL TRANSMITTER.** 1) Connect the Subaru Select Monitor and then turn the ignition switch to ON. 2) Select “Transmitter ID display”. <Ref. to TPM(diag)-14, Display Transmitter (ID).> 3) Use the transmitter registration tool and transmit the ID from the FL transmitter to check “Latest reception ID”.	Is “Latest reception ID” updated?	Go to step **2**.	Replace front left transmitter.
2	**CHECK FL TRANSMITTER ID.** Check the ID displayed in the updated ID display and the tire 1 registered ID.	Are the two IDs same?	Go to step **3**.	Record the received ID update as the FL transmitter. Go to step **3**.
3	**START FR TRANSMITTER.** Use the transmitter registration tool and transmit the ID from the FR transmitter to check “Latest reception ID”.	Is “Latest reception ID” updated?	Go to step **4**.	Replace the front right transmitter.
4	**CHECK FR TRANSMITTER ID.** Check the ID displayed in the updated ID display and the tire 2 registered ID.	Are the two IDs same?	Go to step **5**.	Record the received ID update as the FR transmitter. Go to step **5**.
5	**START RR TRANSMITTER.** Use the transmitter registration tool and transmit the ID from the RR transmitter to check “Latest reception ID”.	Is “Latest reception ID” updated?	Go to step **6**.	Replace the RR transmitter.
6	**CHECK RR TRANSMITTER ID.** Check the ID displayed in the updated ID display and the tire 3 registered ID.	Are the two IDs same?	Go to step **7**.	Record the received ID update as the RR transmitter. Go to step **7**.
7	**START RL TRANSMITTER.** Use the transmitter registration tool and transmit the ID from the RL transmitter to check “Latest reception ID”.	Is “Latest reception ID” updated?	Go to step **8**.	Replace the RL transmitter.
8	**CHECK RL TRANSMITTER ID.** Check the ID displayed in the updated ID display and the tire 4 registered ID.	Are the two IDs same?	Go to step **9**.	Record the received ID update as the RL transmitter. Go to step **9**.
9	**CHECK MALFUNCTION TRANSMITTER.**	Is ID recorded by this procedure?	Go to step **10**.	Go to step **1**.
10	**CHECK MALFUNCTION TRANSMITTER.** Check the registered ID of the transmitter indicated by DTC.	Is there checked ID in the record?	Replace the transmitter of the recorded position.	Replace the transmitter showing the latest ID that is not included in the registered IDs.

M: DTC 41 TRANSMITTER 1 FUNCTION CODE ABNORMAL

NOTE:
Refer to DTC 44 for diagnostic procedure. <Ref. to TPM(diag)-28, DTC 44 TRANSMITTER 4 FUNCTION CODE ABNORMAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

N: DTC 42 TRANSMITTER 2 FUNCTION CODE ABNORMAL

NOTE:
Refer to DTC 44 for diagnostic procedure. <Ref. to TPM(diag)-28, DTC 44 TRANSMITTER 4 FUNCTION CODE ABNORMAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

O: DTC 43 TRANSMITTER 3 FUNCTION CODE ABNORMAL

NOTE:
Refer to DTC 44 for diagnostic procedure. <Ref. to TPM(diag)-28, DTC 44 TRANSMITTER 4 FUNCTION CODE ABNORMAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

P: DTC 44 TRANSMITTER 4 FUNCTION CODE ABNORMAL

DTC DETECTING CONDITION:
Unexpected function codes received from each transmitter.
TROUBLE SYMPTOM:
Tire pressure warning light blinks 25 times and then illuminates.

	Step	Check	Yes	No
1	**START FL TRANSMITTER.** 1) Connect the Subaru Select Monitor and then turn the ignition switch to ON. 2) Select “Transmitter ID”. <Ref. to TPM(diag)-14, Display Transmitter (ID).> 3) Use the transmitter registration tool and transmit the ID from the FL transmitter to check “Latest reception ID”.	Is “Latest reception ID” updated?	Go to step **2**.	Replace front left transmitter.
2	**CHECK FL TRANSMITTER ID.** Check the ID displayed in the updated ID display and the tire 1 registered ID.	Are the two IDs same?	Go to step **3**.	Record the received ID update as the FL transmitter. Go to step **3**.
3	**START FR TRANSMITTER.** Use the transmitter registration tool and transmit the ID from the FR transmitter to check “Latest reception ID”.	Is “Latest reception ID” updated?	Go to step **4**.	Replace the front right transmitter.
4	**CHECK FR TRANSMITTER ID.** Check the ID displayed in the updated ID display and the tire 2 registered ID.	Are the two IDs same?	Go to step **5**.	Record the received ID update as the FR transmitter. Go to step **5**.
5	**START RR TRANSMITTER.** Use the transmitter registration tool and transmit the ID from the RR transmitter to check “Latest reception ID”.	Is “Latest reception ID” updated?	Go to step **6**.	Replace the RR transmitter.
6	**CHECK RR TRANSMITTER ID.** Check the ID displayed in the updated ID display and the tire 3 registered ID.	Are the two IDs same?	Go to step **7**.	Record the received ID update as the RR transmitter. Go to step **7**.
7	**START RL TRANSMITTER.** Use the transmitter registration tool and transmit the ID from the RL transmitter to check “Latest reception ID”.	Is “Latest reception ID” updated?	Go to step **8**.	Replace the RL transmitter.
8	**CHECK RL TRANSMITTER ID.** Check the ID displayed in the updated ID display and the tire 4 registered ID.	Are the two IDs same?	Go to step **9**.	Record the received ID update as the RL transmitter. Go to step **9**.
9	**CHECK MALFUNCTION TRANSMITTER.**	Is ID recorded by this procedure?	Go to step **10**.	Check again. Go to step **1**.
10	**CHECK MALFUNCTION TRANSMITTER.** Check the registered ID of the transmitter indicated by DTC.	Is there checked ID in the record?	Replace the transmitter of the recorded position.	Replace the transmitter showing the latest ID that is not included in the registered IDs.

Q: DTC 51 TRANSMITTER 1 BATTERY VOLTAGE DECREASE

NOTE:
Refer to DTC 54 for diagnostic procedure. <Ref. to TPM(diag)-30, DTC 54 TRANSMITTER 4 BATTERY VOLTAGE DECREASE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

R: DTC 52 TRANSMITTER 2 BATTERY VOLTAGE DECREASE

NOTE:
Refer to DTC 54 for diagnostic procedure. <Ref. to TPM(diag)-30, DTC 54 TRANSMITTER 4 BATTERY VOLTAGE DECREASE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

S: DTC 53 TRANSMITTER 3 BATTERY VOLTAGE DECREASE

NOTE:
Refer to DTC 54 for diagnostic procedure. <Ref. to TPM(diag)-30, DTC 54 TRANSMITTER 4 BATTERY VOLTAGE DECREASE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

T: DTC 54 TRANSMITTER 4 BATTERY VOLTAGE DECREASE

DTC DETECTING CONDITION:
Low battery signals received 20 times from each transmitter.

TROUBLE SYMPTOM:
Tire pressure warning light blinks 25 times and then illuminates.

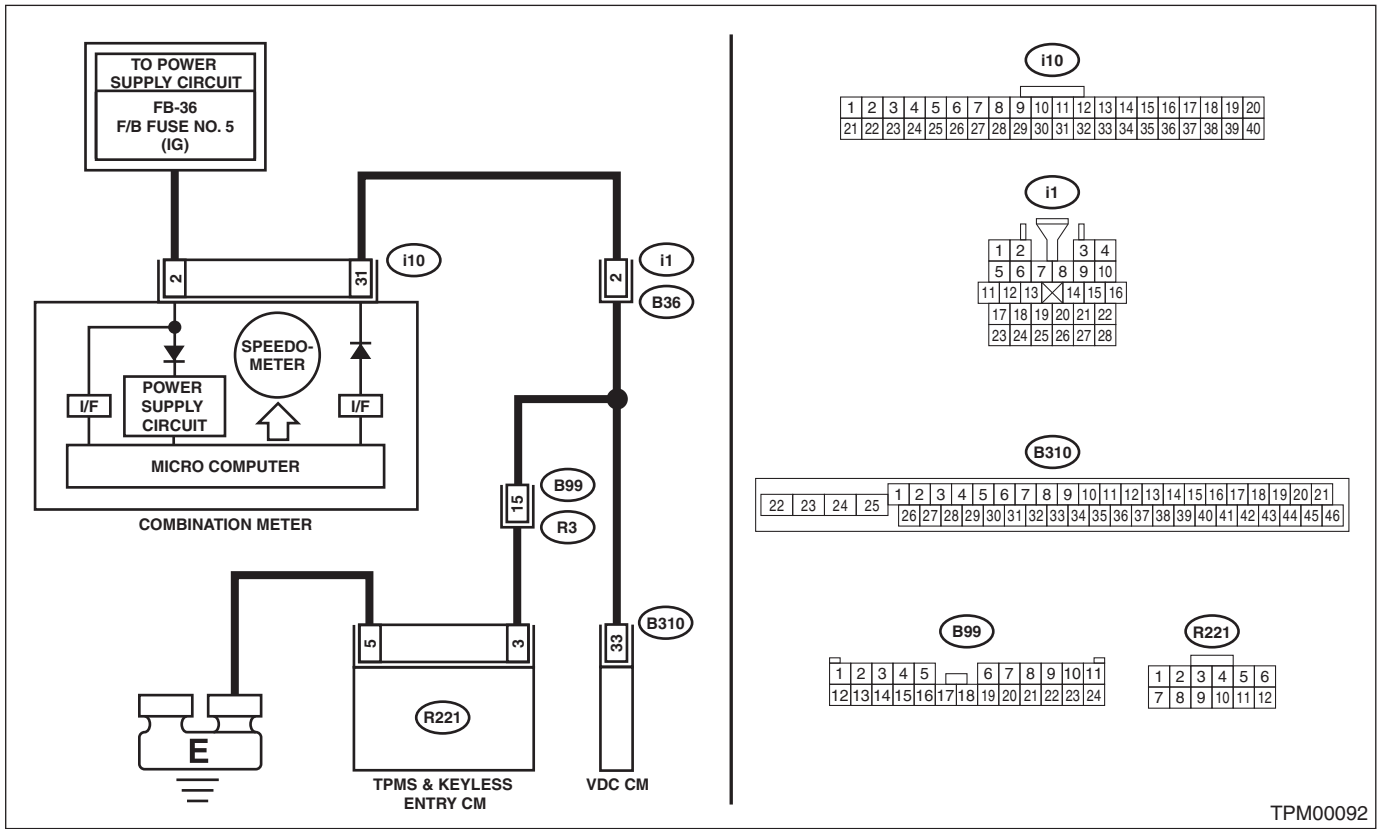
	Step	Check	Yes	No
1	**CHECK TRANSMITTER.** 1) Replace all transmitters and register their IDs. <Ref. to TPM(diag)-13, Register Transmitter (ID).> 2) Perform the Clear Memory Mode, and perform driving test.	Is the fault eliminated?	Internal battery of the transmitter had worn out.	Replace the TPMS & keyless entry control module. <Ref. to WT-9, TPMS & keyless entry control module, REMOVAL, Tire Pressure Monitoring System.>

U: DTC 61 VEHICLE SPEED IS ABNORMAL

DTC DETECTING CONDITION:
Vehicle speed function codes were received from the transmitter, but the vehicle speed signal was not input to the module.

TROUBLE SYMPTOM:
Tire pressure warning light blinks 25 times and then illuminates.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK TPMS & KEYLESS ENTRY CONTROL MODULE.** 1) Connect an oscilloscope to the terminal No. 3 of the TPMS & keyless entry control module connector (R221). ***Connector & terminal*** ***(R221) No. 3 (+) — Chassis ground (–):*** 2) Lift up the vehicle and then drive the vehicle at 40 km/h (25 MPH) and check the vehicle speed signal at that time.	Is the vehicle speed being input?	Replace the TPMS & keyless entry control module. <Ref. to WT-9, TPMS & keyless entry control module, REMOVAL, Tire Pressure Monitoring System.>	Go to step **2**.
2	**CHECK HARNESS.** 1) Disconnect the combination meter connector (i10). 2) Connect the tester to the TPMS & keyless entry control module connector (R221) and combination meter connector (i10), and measure the resistance. ***Connector & terminal*** ***(R221) No. 3 — (i10) No. 31:***	Is the resistance less than 0.5 Ω?	Check the combination meter. <Ref. to IDI-21, REMOVAL, Combination Meter.>	Repair or replace the open circuit of the harness.

15.General Diagnostic Table

A: INSPECTION

Symptoms		Faulty parts
Tire pressure warning light illuminates.	Tire pressure is reduced.	• Improper tire pressure adjustment. • Punctured tire
Tire pressure warning light blinks 25 times and then illuminates.	Tire pressure monitoring system has malfunction.	• Air pressure sensor malfunction • Air pressure sensor is out of battery. • Defective TPMS & keyless entry control module • Defective vehicle harness • Defective combination meter
Tire pressure is dropping but the warning light does not illuminate.	Tire pressure warning light does not illuminate.	• Air pressure sensor is faulty. • Defective TPMS & keyless entry control module • Defective combination meter

DIFFERENTIALS

DI

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1. General Description

A: SPECIFICATION

1. REAR DIFFERENTIAL

When replacing a rear differential assembly, select the correct one according to the following table.

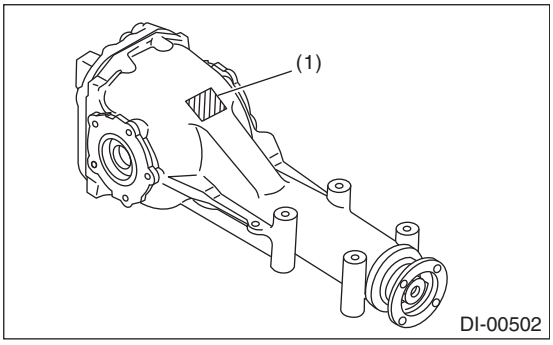
NOTE:
Using a different rear differential assembly will cause the drive train and tires to drag or emit abnormal noise.

Model	2.5 L non-turbo	
	4AT	5MT
Rear differential type	T-type	
Identification	TP	T2
Type of gear	Hypoid gear	
Gear ratio (Number of gear teeth)	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	

Model	2.5 L turbo
	4AT
Rear differential type	T-type
Identification	B1
Type of gear	Hypoid gear
Gear ratio (Number of gear teeth)	4.111 (37/9)
Oil capacity	0.8 ℓ (0.8 US qt, 0.7 Imp qt)
Rear differential gear oil	GL-5

2. IDENTIFICATION

Identification label positions are shown in the following figures. For details concerning identification, refer to the “ID” section.

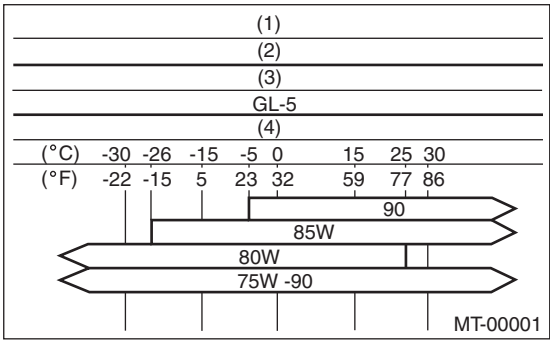


(1) Identification

3. REAR DIFFERENTIAL GEAR OIL

Recommended gear oil:
GL–5 (75W–90)

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



(1) Item
(2) Rear differential gear oil
(3) API classification
(4) SAE viscosity No. and applicable temperature

4. SERVICE DATA

Drive pinion bearing preload (For new bearing)	Measure with spring measurement. (Measured from the companion flange bolt)	N (kgf, lbf)	18.1 — 38.8 (1.8 — 4.0, 4.1 — 8.7)
	Measure with torque wrench	N·m (kgf-m, ft-lb)	0.69 — 1.47 (0.07 — 0.15, 0.51 — 1.08)
Side gear backlash		mm (in)	0.10 — 0.20 (0.004 — 0.008)
Hypoid driven gear to drive pinion backlash		mm (in)	0.10 — 0.20 (0.004 — 0.008)
Hypoid driven gear runout on its back surface		mm (in)	0.05 (0.002)
Total preload (Measured from the companion flange bolt hole)		N (kgf, lbf)	20.7 — 54.4 (2.1 — 5.5, 4.7 — 12.2)
Companion flange surface runout		mm (in)	0.08 (0.003)
Companion flange runout on its inner side		mm (in)	0.08 (0.003)

5. ADJUSTING PARTS

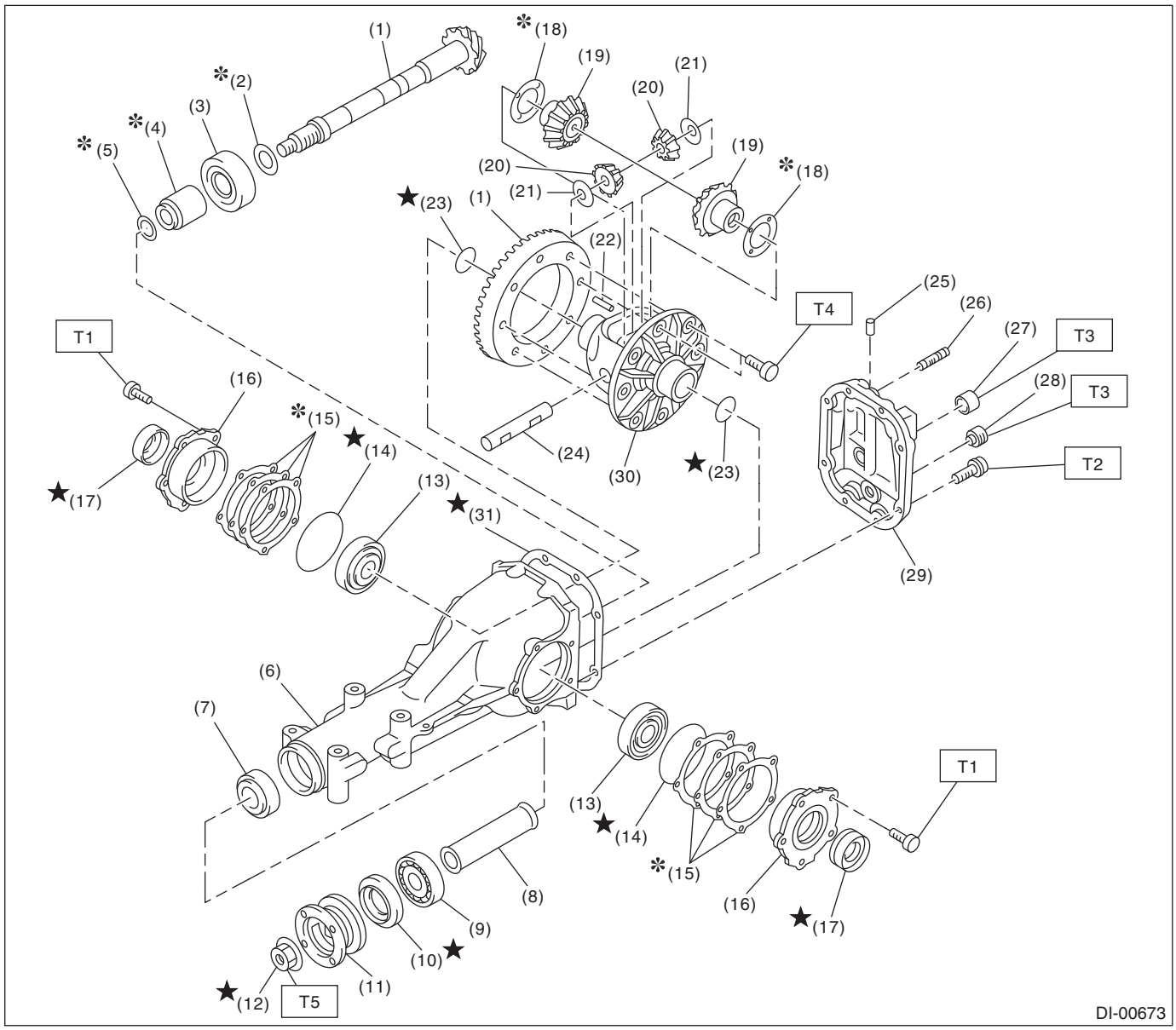
	Part No.	Length mm (in)
Preload adjusting spacer	383695201	56.2 (2.213)
	383695202	56.4 (2.220)
	383695203	56.6 (2.228)
	383695204	56.8 (2.236)
	383695205	57.0 (2.244)
	383695206	57.2 (2.252)

	Part No.	Thickness mm (in)
Preload adjusting washer	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)
Pinion height adjusting washer	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 thrust washer	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 retainer shim	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)

B: COMPONENT

1. REAR DIFFERENTIAL (T-TYPE)

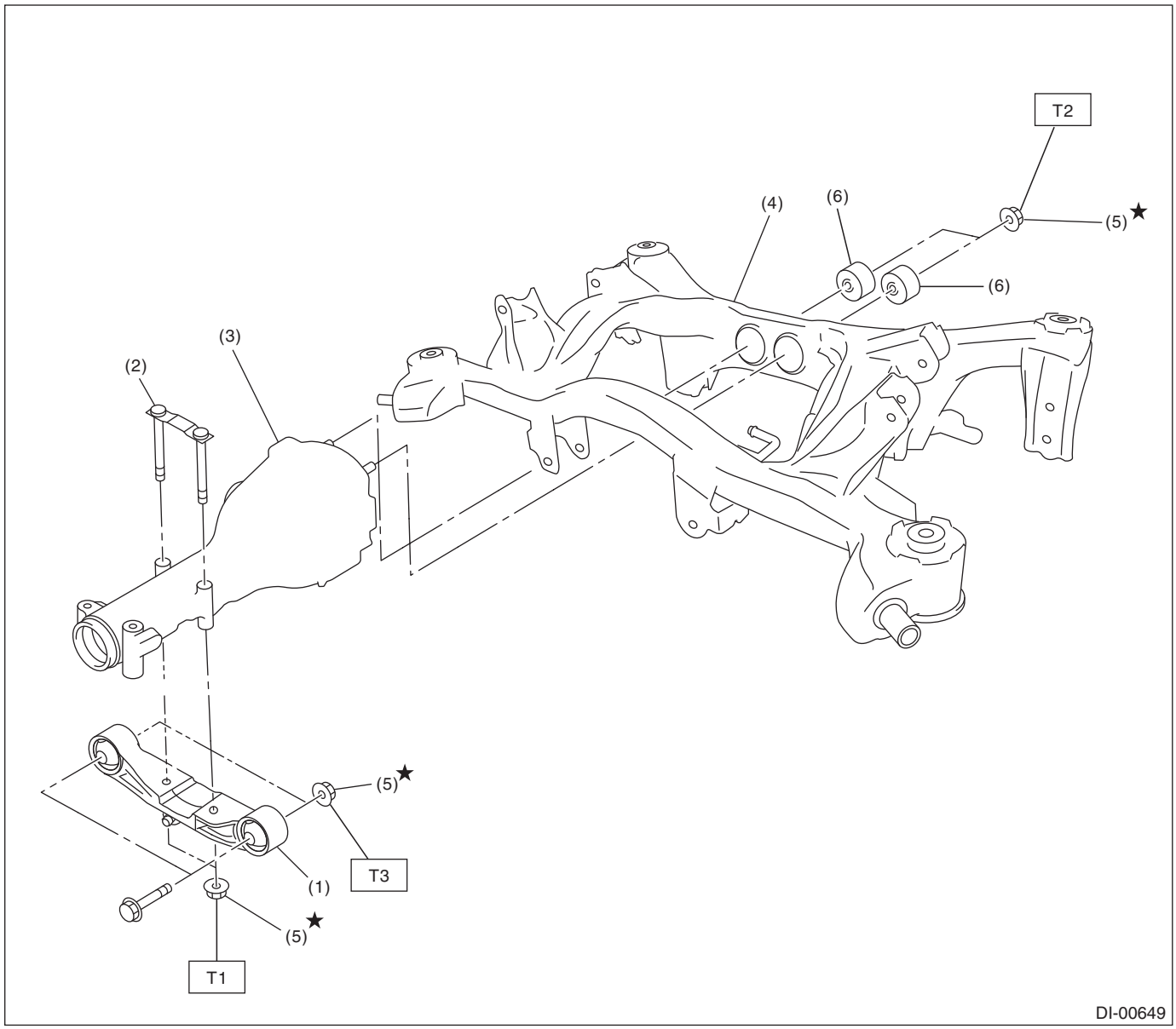


(1)	Hypoid driven gear and drive pinion set	(14)	O-ring	(27)	Filler plug
(2)	Pinion height adjusting washer	(15)	Side retainer shim	(28)	Drain plug
(3)	Rear bearing	(16)	Side retainer	(29)	Rear cover
(4)	Preload adjusting spacer	(17)	Side oil seal	(30)	Differential case
(5)	Preload adjusting washer	(18)	Side gear thrust washer	(31)	Gasket
(6)	Differential carrier	(19)	Side gear		
(7)	Front bearing	(20)	Pinion mate gear		
(8)	Spacer	(21)	Pinion mate gear washer		
(9)	Pilot bearing	(22)	Pinion shaft lock pin		
(10)	Front oil seal	(23)	Snap ring		
(11)	Companion flange	(24)	Pinion mate shaft		
(12)	Self-locking nut	(25)	Air breather cap		
(13)	Side bearing	(26)	Stud bolt		

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, 36.1)
T4: 103 (10.5, 76.0)
T5: 181.5 (18.5, 133.9)

2. REAR DIFFERENTIAL MOUNTING SYSTEM



(1) Rear differential front member
(2) Rear differential member plate
(3) Rear differential ASSY
(4) Sub frame
(5) Self-locking nut
(6) Rear differential mount bushing

Tightening torque:N·m (kgf-m, ft-lb)
T1: 50 (5.1, 36.9)
T2: 70 (7.1, 51.6)
T3: 110 (11.2, 81.1)

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. Do not mix gear oil, 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 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 cloth between the part and the vise.
- Avoid damaging the mating surface of the case.

D: PREPARATION TOOL

1. SPECIAL TOOL

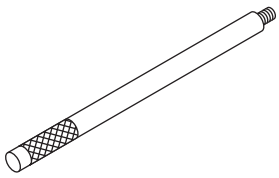
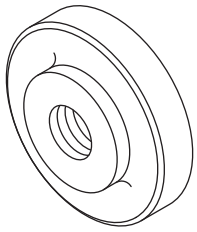
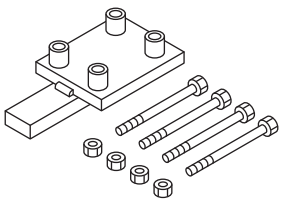
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-398477701	398477701	HANDLE	Used for installing the front and rear bearing races.
 ST-398477702	398477702	DRIFT	Used for press-fitting the bearing race (front) of the differential carrier.
 ST-398217700	398217700	ATTACHMENT SET	Stand for rear differential carrier disassembly and assembly.

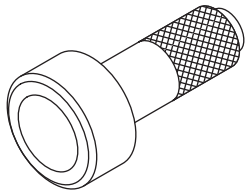
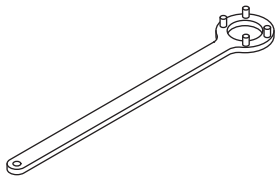
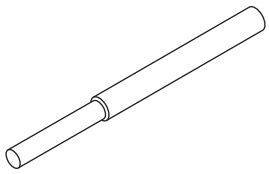
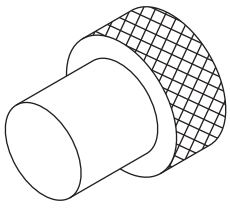
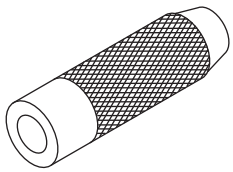
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498447120	498447120	INSTALLER	Used for installing the front oil seal.
 ST-498427200	498427200	FLANGE WRENCH	Used for preventing rotation of companion flange when loosening and tightening self-lock nut.
 ST-398467700	398467700	DRIFT	Used for removing drive pinion shaft, pilot bearing and front bearing cone.
 ST-399780104	399780104	WEIGHT	Used for installing the front bearing cone, pilot bearing and companion flange.
 ST-899580100	899580100	INSTALLER	Used for press-fitting the front bearing cone and pilot bearing.

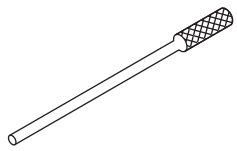
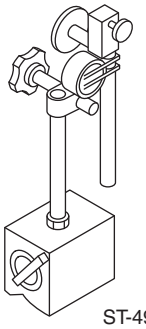
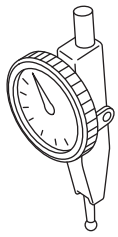
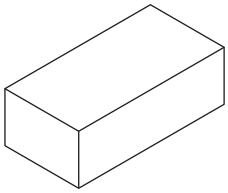
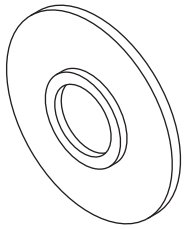
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-899904100	899904100	STRAIGHT PIN REMOVER	Used for removing pinion shaft lock pin.
 ST-498247001	498247001	MAGNET BASE	• Used for measuring backlash between side gear and pinion, and hypoid gear. • Used together with DIAL GAUGE (498247100).
 ST-498247100	498247100	DIAL GAUGE	• Used for measuring backlash between side gear and pinion, and hypoid gear. • Used together with MAGNET BASE (498247001).
 ST-398507704	398507704	BLOCK	Used for adjusting pinion height and preload.
 ST-398177700	398177700	INSTALLER	Used for installing the rear bearing cone.

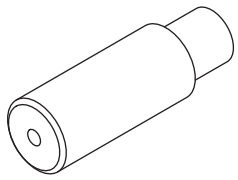
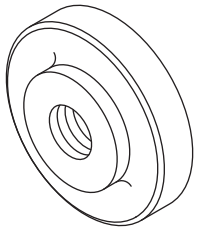
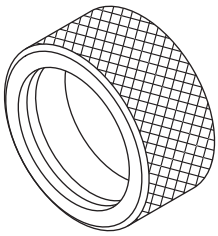
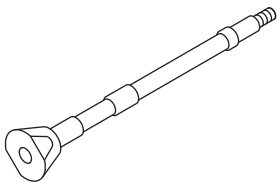
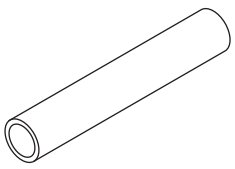
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-398457700	398457700	ATTACHMENT	Used for removing the side retainer.
 ST-398477703	398477703	DRIFT 2	Used for press-fitting bearing race (rear) of differential carrier.
 ST-398437700	398437700	DRIFT	Used for installing the side oil seal.
 ST-398507702	398507702	DUMMY SHAFT	Used for adjusting drive pinion height and preload.
 ST-398507703	398507703	DUMMY COLLAR	• Used for adjusting drive pinion height and preload. • Used for installing the front bearing cone.

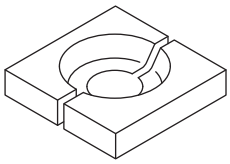
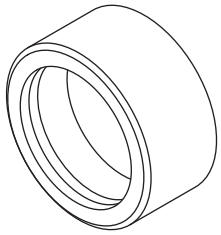
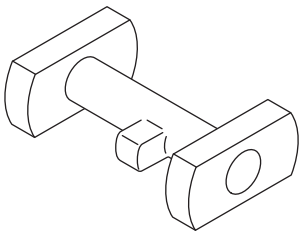
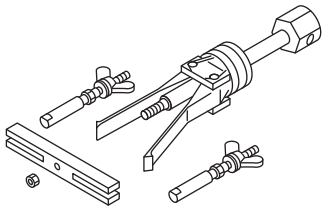
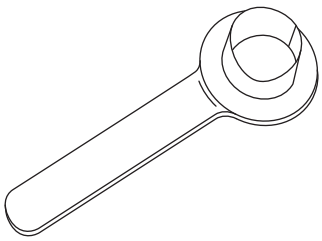
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-398517700	398517700	REPLACER	Used for removing rear bearing cone.
 ST-398487700	398487700	DRIFT	Used for press-fitting side bearing cone.
 ST-398507701	398507701	DIFFERENTIAL CARRIER GAUGE	Used for adjusting drive pinion height.
 ST-398527700	398527700	PULLER ASSY	• Used for removing front oil seal. • Used for removing side bearing cup.
 ST28099PA090	28099PA090	OIL SEAL PROTECTOR	• Used for installing the rear drive shaft to the rear differential. • For oil seal protection

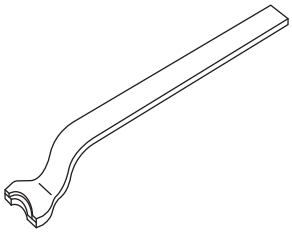
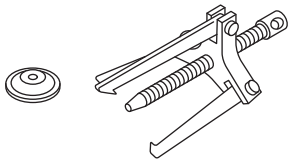
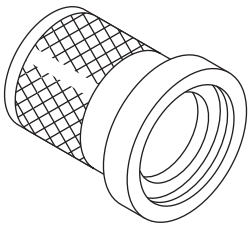
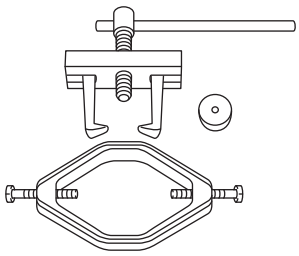
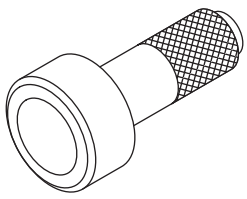
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST28099PA100	28099PA100	DRIVE SHAFT REMOVER	Used for removing the rear drive shaft from rear differential.
 ST-399703600	399703600	PULLER ASSY	Used for removing companion flange.
 ST-899874100	899874100	INSTALLER	Used for installing the companion flange.
 ST18759AA000	18759AA000	PULLER ASSY	Used for removing the differential side bearing cone.
 ST-398417700	398417700	DRIFT	Used for installing side bearing race.

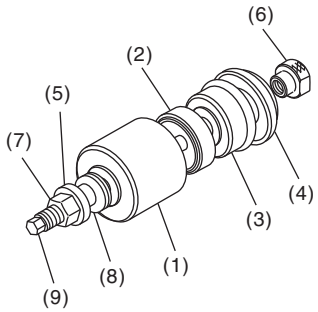
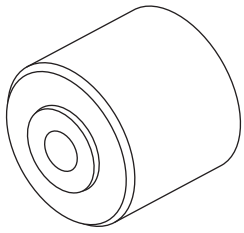
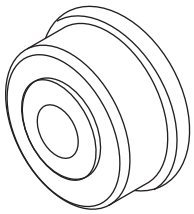
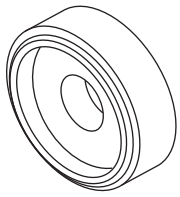
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST41399FG001	41399FG001	SPECIAL TOOL ASSY	• Used for removing and installing the rear differential mount bushing. • Use (1), (3), (5), (6), (7), (8) and (9) for removal. • Use (2), (4), (5), (6), (7), (8) and (9) for installation. (1) SPECIAL TOOL A (41399FG010) (2) SPECIAL TOOL B (41399FG020) (3) SPECIAL TOOL C (41399FG031) (4) SPECIAL TOOL D (41399FG041) (5) SPECIAL TOOL SLEEVE (41399FG050) (6) SPECIAL TOOL RING (41399FG061) (7) SPECIAL TOOL NUT (41399FG070) (8) SPECIAL TOOL BEARING (41399FG080) (9) SPECIAL TOOL SHAFT (41399FG091)
 ST41399FG010	41399FG010	SPECIAL TOOL A	• Used for removing the rear differential mount bushing. • For combination of tools for removal, refer to “SPECIAL TOOL ASSY (41399FG001)”.
 ST41399FG020	41399FG020	SPECIAL TOOL B	• Used for installing the rear differential mount bushing. • For combination of tools for installation, refer to “SPECIAL TOOL ASSY (41399FG001)”.
 ST41399FG031	41399FG031	SPECIAL TOOL C	• Used for removing the rear differential mount bushing. • For combination of tools for removal, refer to “SPECIAL TOOL ASSY (41399FG001)”.

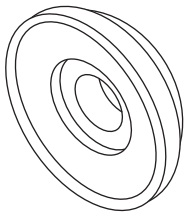
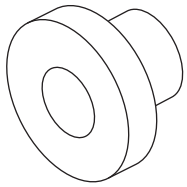
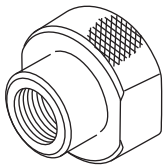
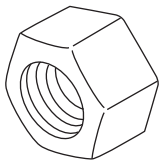
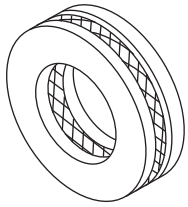
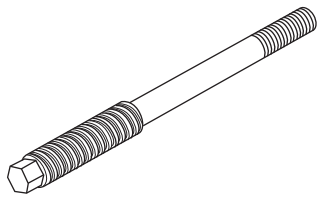
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST41399FG041	41399FG041	SPECIAL TOOL D	• Used for installing the rear differential mount bushing. • For combination of tools for installation, refer to “SPECIAL TOOL ASSY (41399FG001)”.
 ST41399FG050	41399FG050	SPECIAL TOOL SLEEVE	• Used for removing and installing the rear differential mount bushing. • For combination of tools for removal and installation, refer to “SPECIAL TOOL ASSY (41399FG001)”.
 ST41399FG061	41399FG061	SPECIAL TOOL RING	• Used for removing and installing the rear differential mount bushing. • For combination of tools for removal and installation, refer to “SPECIAL TOOL ASSY (41399FG001)”.
 ST41399FG070	41399FG070	SPECIAL TOOL NUT	• Used for removing and installing the rear differential mount bushing. • For combination of tools for removal and installation, refer to “SPECIAL TOOL ASSY (41399FG001)”.
 ST41399FG080	41399FG080	SPECIAL TOOL BEARING	• Used for removing and installing the rear differential mount bushing. • For combination of tools for removal and installation, refer to “SPECIAL TOOL ASSY (41399FG001)”.

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST41399FG091	41399FG091	SPECIAL TOOL SHAFT	• Used for removing and installing the rear differential mount bushing. • For combination of tools for removal and installation, refer to “SPECIAL TOOL ASSY (41399FG001)”.

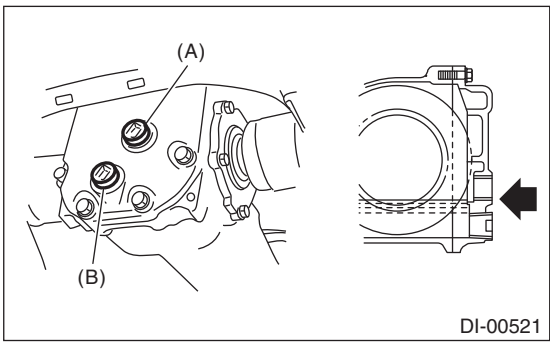
2. GENERAL TOOL

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.

2. Differential Gear Oil

A: INSPECTION

1) Lift up the vehicle.
2) Remove the filler plug, and then check the gear oil. Replace the gear oil if it is contaminated or deteriorated. <Ref. to DI-17, REPLACEMENT, Differential Gear Oil.>
3) Check that the gear oil level is within –5 mm (–0.2 in) from the bottom of the filler plug hole. If the level is low, refill up to the bottom of filler plug.

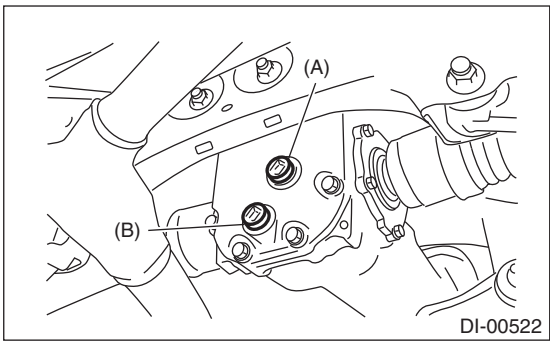


(A) Filler plug
(B) Drain plug

B: REPLACEMENT

1) Lift up the vehicle.
2) Remove the drain plug and filler plug, and drain the gear oil.

CAUTION:
• Gear oil is extremely hot just after driving. Be wary of receiving burns.
• Be careful not to spill the differential gear oil on exhaust pipe. If gear oil is spilt wipe it off completely.



(A) Filler plug
(B) Drain plug

3) Tighten the drain plug.

NOTE:
Apply liquid gasket to the drain plug.

Liquid gasket:
THREE BOND 1105 (Part No. 004403010) or equivalent

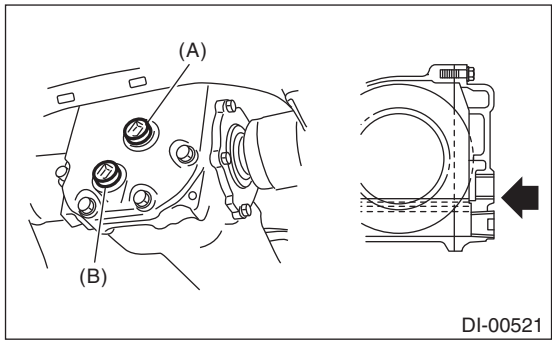
Tightening torque:
49 N·m (5.0 kgf-m, 36.1 ft-lb)

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.

Recommended gear oil:
<Ref. to DI-2, SPECIFICATION, General Description.>

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, 36.1 ft-lb)

6) Lower the vehicle.

3. Front Differential Assembly

A: NOTE

1. AT MODEL

For front differential of automatic transmissions, refer to the “4AT” section. <Ref. to 4AT-102, Front Differential Assembly.>

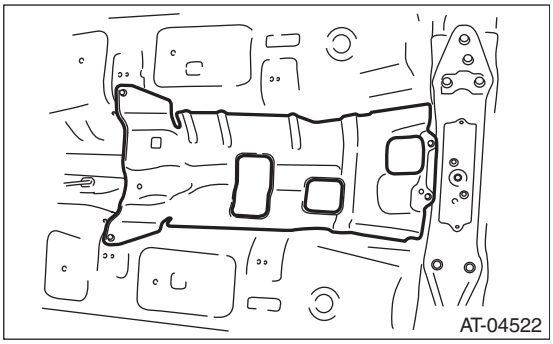
2. MT MODEL

For front differential of the manual transmission, refer to “5MT” section. <Ref. to 5MT-68, Front Differential Assembly.>

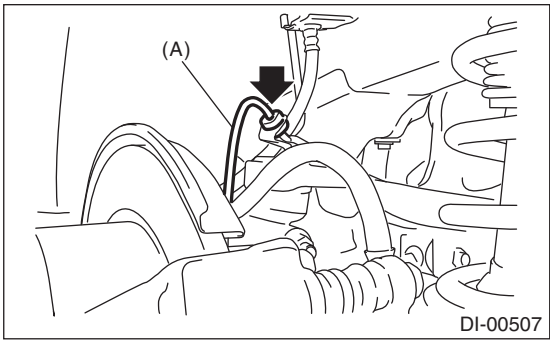
4. Rear Differential

A: REMOVAL

1) Set the vehicle on a lift.
2) Shift the select lever or gear shift lever to neutral.
3) Release the parking brake.
4) Disconnect the ground cable from battery.
5) Loosen the wheel nuts.
6) Lift up the vehicle.
7) Remove the wheels.
8) Drain differential gear oil. <Ref. to DI-17, REPLACEMENT, Differential Gear Oil.>
9) Remove the rear exhaust pipe and muffler.
• Non-turbo model
<Ref. to EX(H4DO)-13, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4DO)-16, REMOVAL, Muffler.>
• Turbo model
<Ref. to EX(H4DOTC)-12, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-14, REMOVAL, Muffler.>
10) Remove the heat shield cover.

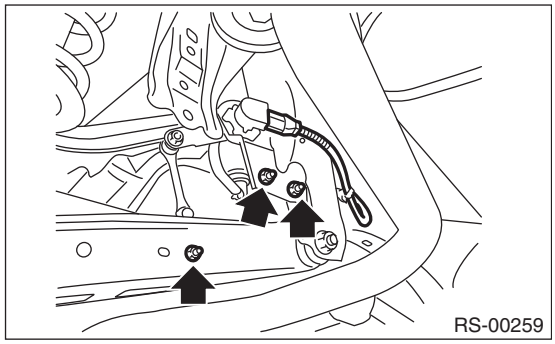


11) Remove the propeller shaft. <Ref. to DS-10, REMOVAL, Propeller Shaft.>
12) Remove the DOJ of rear drive shaft from rear differential.
(1) Remove the ABS wheel speed sensor cable from the clamp.

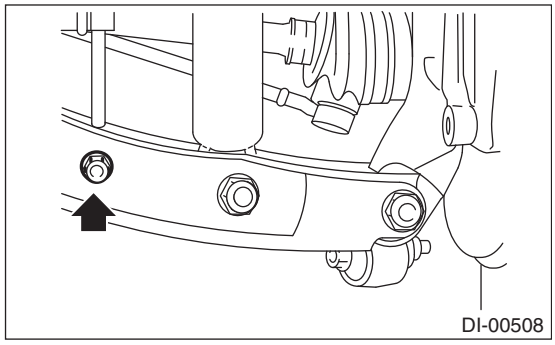


(A) ABS wheel speed sensor cable

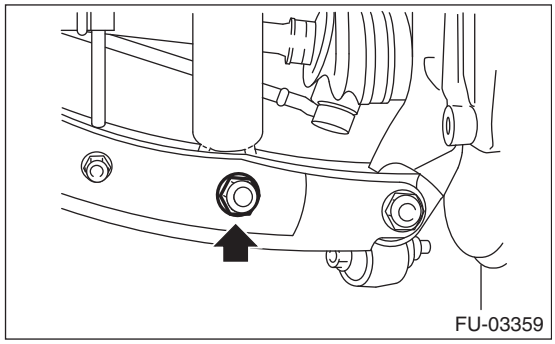
(2) Disconnect the connector, and then remove the nut to remove the rear vehicle height sensor. (model with auto headlight beam leveler, left side only)



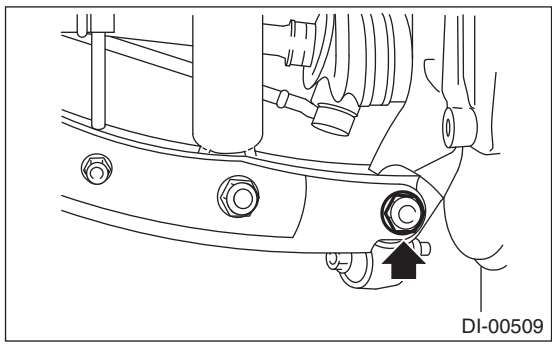
(3) Remove the bolts which secure the rear stabilizer link to the rear lateral link.



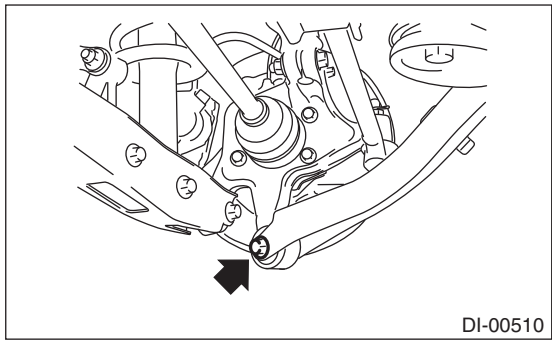
(4) Remove the bolts which secure the shock absorber to the rear lateral link.



(5) Remove the bolts which secure the rear lateral link to the housing.

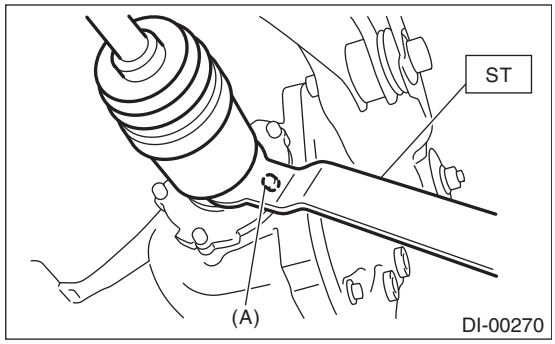


(6) Remove the bolts which secure the trailing link to the housing.



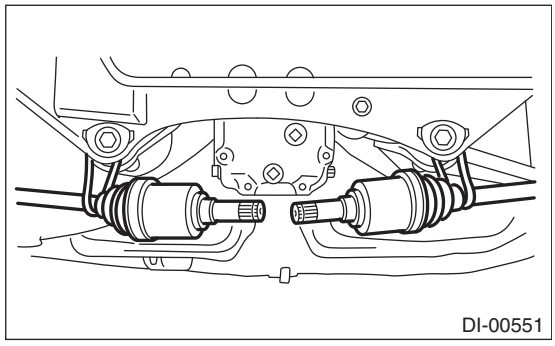
(7) Remove the DOJ from the rear differential by using ST.

NOTE:
When removing the DOJ from the rear differential, fit the ST to the bolts as shown in the figure so as not to damage the side retainer.
ST 28099PA100 DRIVE SHAFT REMOVER

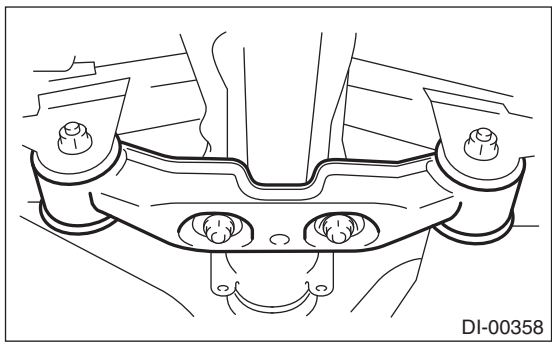


(A) Bolt

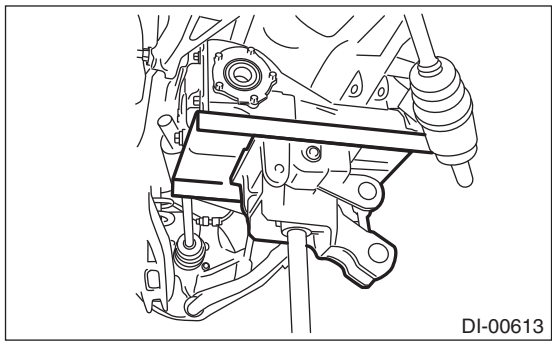
13) Suspend the rear drive shaft to the rear crossmember using wire.



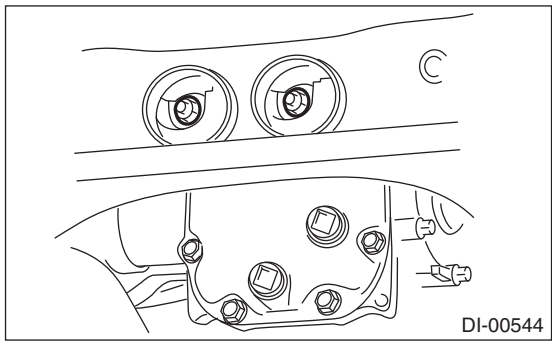
14) Remove the rear differential front member.



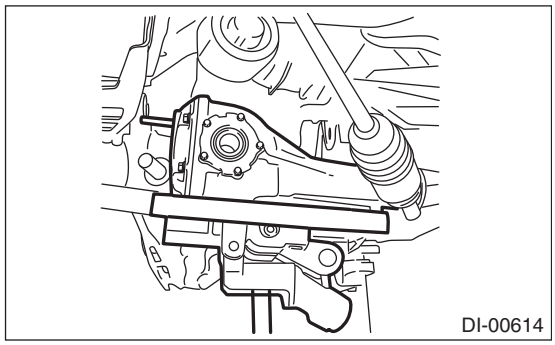
15) Support the rear differential with the transmission jack.



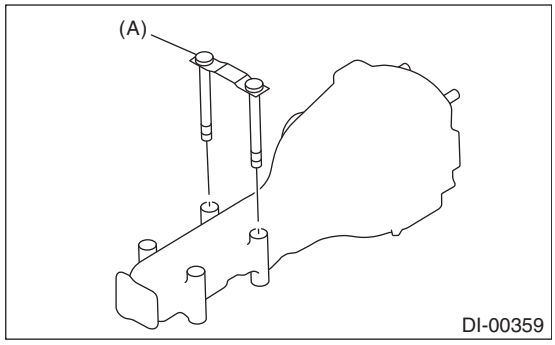
16) Remove the self-lock nuts which hold the rear differential to the rear crossmember.



17) While slowly lowering the transmission jack, move the rear differential forward, and remove the rear differential from the vehicle.



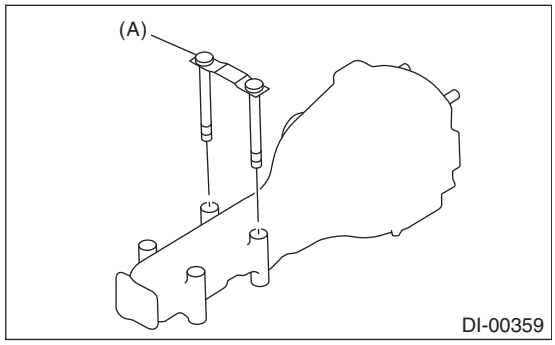
18) Remove the rear differential member plate from the rear differential.



(A) Rear differential member plate

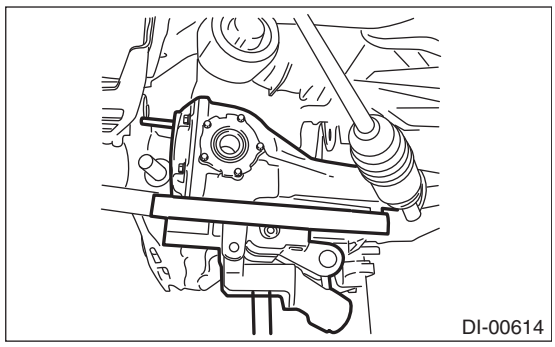
B: INSTALLATION

1) Install the rear differential member plate to the rear differential.

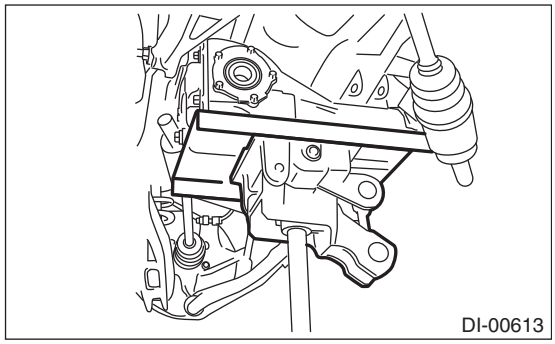


(A) Rear differential member plate

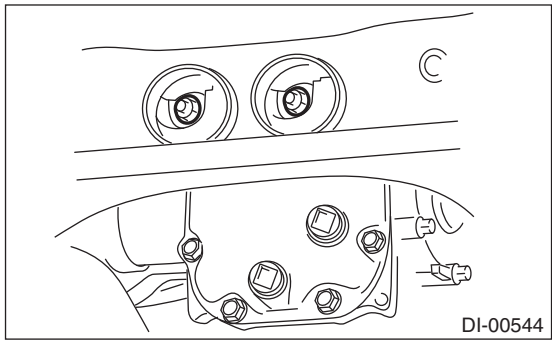
2) Set the rear differential to transmission jack.
3) Adjust the transmission jack, and insert the rear differential stud bolt into rear crossmember bushing properly.



4) After inserting the rear differential stud bolt into the rear crossmember bushing, lift up the transmission jack and align the rear differential to its attachment position.

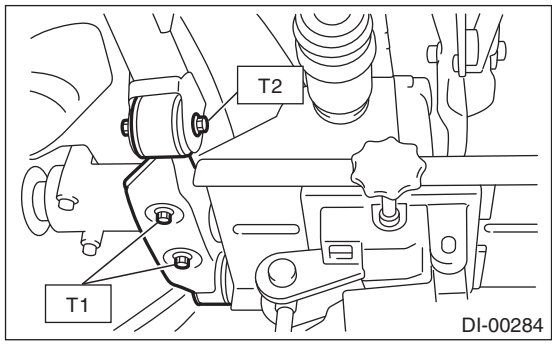


5) Tighten a new self-locking nut temporarily to rear crossmember.



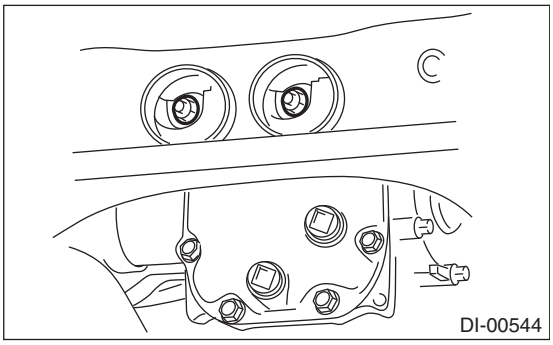
6) Install the rear differential front member with a new self-locking nut.

Tightening torque:
T1: 50 N·m (5.1 kgf-m, 36.9 ft-lb)
T2: 110 N·m (11.2 kgf-m, 81.1 ft-lb)

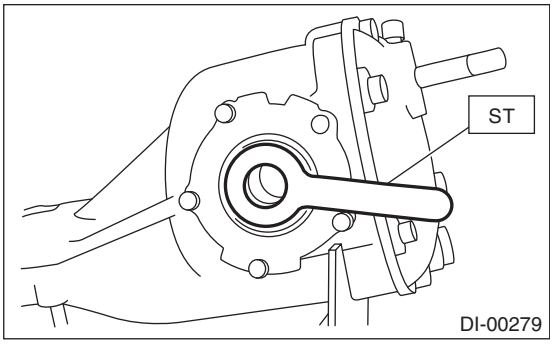


7) Tighten the self-locking nut.

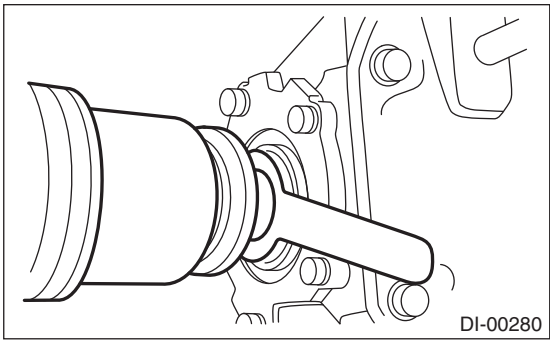
Tightening torque:
70 N·m (7.1 kgf-m, 51.6 ft-lb)



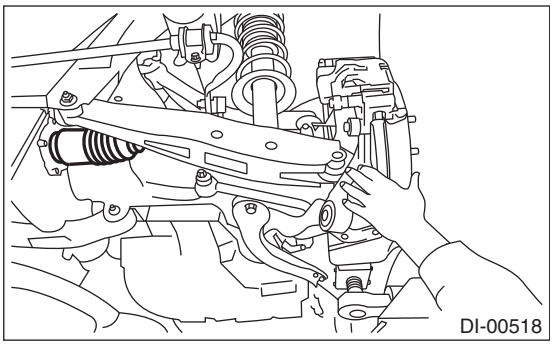
8) Attach the ST to rear differential.
ST 28099PA090 OIL SEAL PROTECTOR



9) Insert the spline shaft until the spline portion comes inside the side oil seal.



10) Remove ST from rear differential.
11) Push the housing to insert DOJ into rear differential.

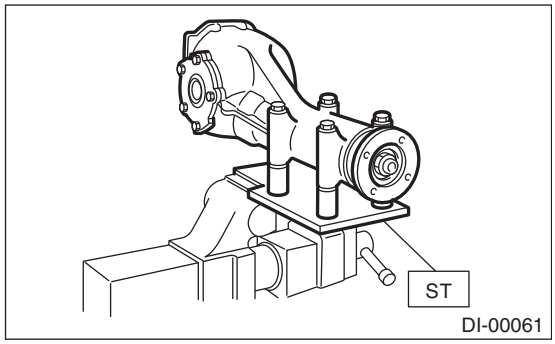


12) Lower the transmission jack.
13) Installing procedure hereafter is in the reverse order of removal.
14) After installing, fill the differential carrier with gear oil up to the bottom of the filler plug hole. <Ref. to DI-17, Differential Gear Oil.>
15) Inspect the wheel alignment and adjust if necessary. <Ref. to FS-6, Wheel Alignment.>
16) Perform reinitialization of the auto headlight beam leveler system. (model with auto headlight beam leveler) <Ref. to LI-16, PROCEDURE, Auto Headlight Beam Leveler System.>

C: DISASSEMBLY

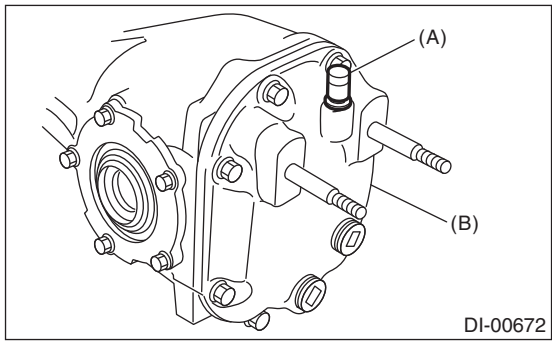
To detect the real cause of trouble, inspect the following items before disassembling.
- Tooth contact and backlash between hypoid driven gear and drive pinion
- Hypoid driven gear runout on its back surface
- Total preload of drive pinion

1) Set the ST on vise and install the differential assembly to ST.
ST 398217700 ATTACHMENT SET



2) Remove the drain plug and filler plug, and drain the gear oil.
3) Remove the air breather cap.

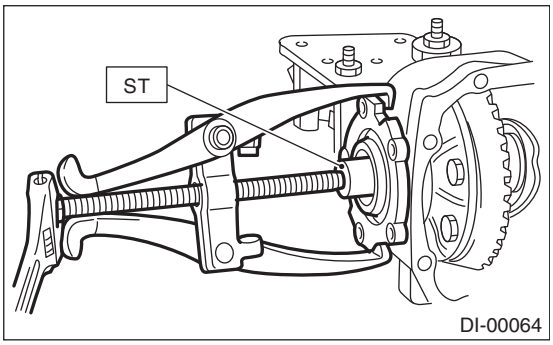
NOTE:
- Do not attempt to replace the air breather cap unless necessary.
- Whenever the air breather cap is removed, replace it with a new part.



(A) Air breather cap
(B) Rear cover

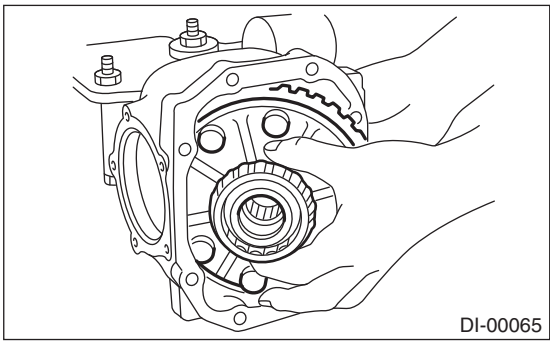
4) Remove the bolts, and then remove the rear cover.
5) Remove the side retainer attachment bolts, set the ST to differential case, and extract the side retainers RH and LH with a puller.

NOTE:
• Side retainer shim of each side should be kept together with its mating retainer.
• Keep the side retainers separate by attaching tags or in similar ways to make it possible to identify RH and LH sides.
ST 398457700 ATTACHMENT

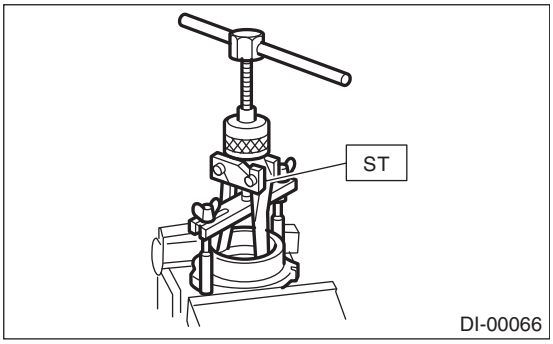


6) Pull out the differential case assembly from the differential carrier.

NOTE:
Be careful not to hit the teeth of hypoid driven gear against the differential carrier.

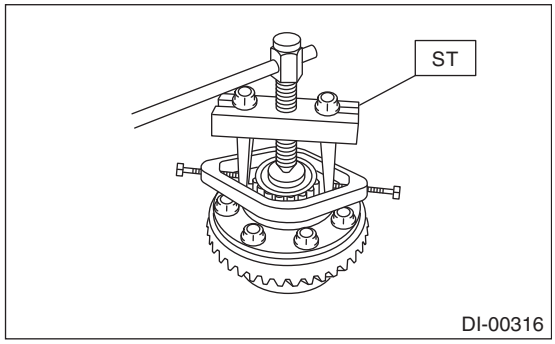


7) When replacing the side bearing, remove the bearing cup from the side retainer using ST.
ST 398527700 PULLER ASSY

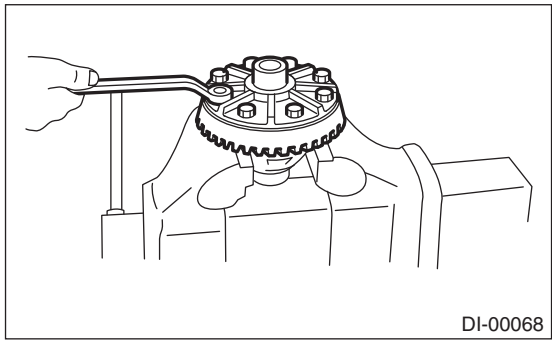


8) Using the ST, remove the bearing cone.

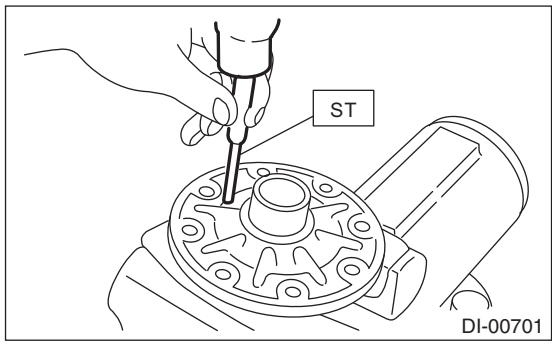
NOTE:
• Do not attempt to disassemble the parts unless necessary.
• Set the puller so that its claws catch the edge of the bearing cone.
• Never mix up the RH and LH bearing races and cones.
ST 18759AA000 PULLER ASSY



9) Remove the hypoid driven gear by loosening hypoid driven gear bolts.

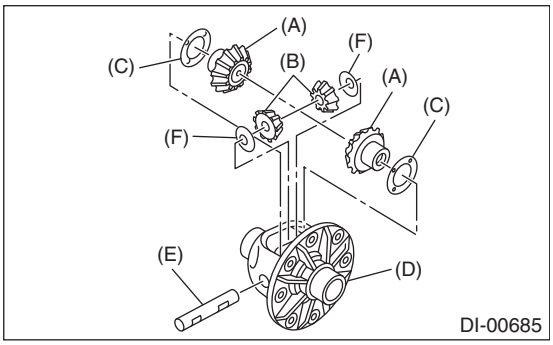


10) Remove the pinion shaft lock pin from driven gear side using ST.
ST 899904100 STRAIGHT PIN REMOVER



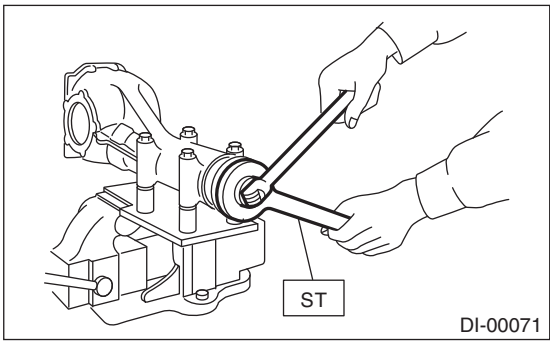
11) Draw out the pinion mate shaft and remove pinion mate gears, side gears and thrust washers.

NOTE:
The gears should be marked or kept separated right and left, and front and rear as well as thrust washers.

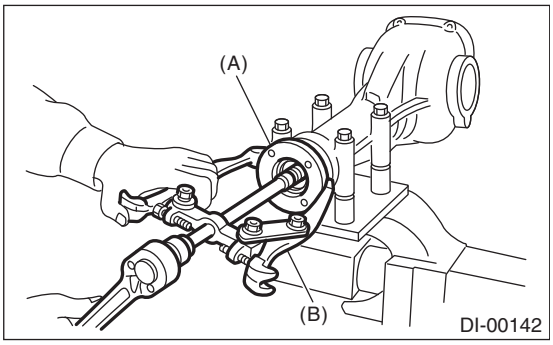


(A) Side gear
(B) Pinion mate gear
(C) Thrust washer
(D) Differential case
(E) Pinion mate shaft
(F) Pinion mate gear washer

12) Remove the self-locking nut while holding the companion flange with ST.
ST 498427200 FLANGE WRENCH



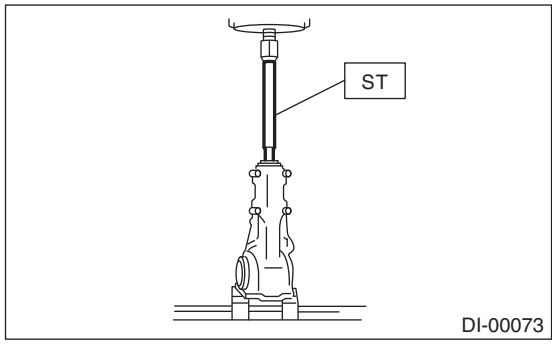
13) Extract the companion flange with a puller.



(A) Companion flange
(B) Puller

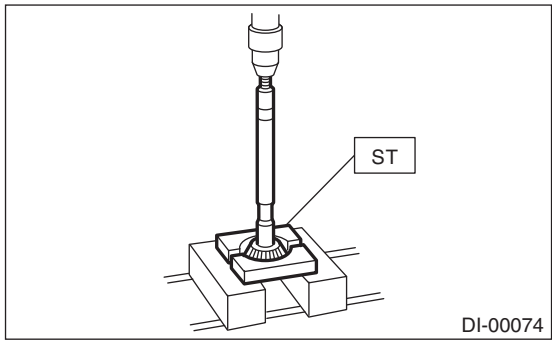
14) Press the end of drive pinion shaft by using the ST, and remove the drive pinion shaft, rear bearing cone, preload adjusting spacer and washer.

NOTE:
Hold the drive pinion so as not to drop it.
ST 398467700 DRIFT

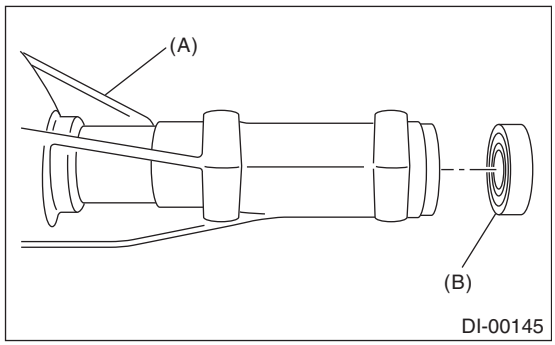


15) Remove the rear bearing cone from drive pinion by supporting the cone with ST.

NOTE:
Place the replacer so that its center-recessed side faces the pinion gear.
ST 398517700 REPLACER

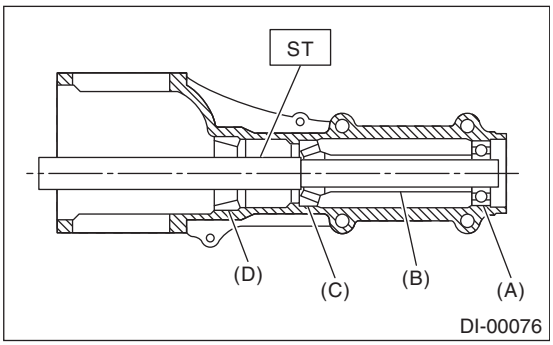


16) Remove the front oil seal from differential carrier using ST.
ST 398527700 PULLER ASSY



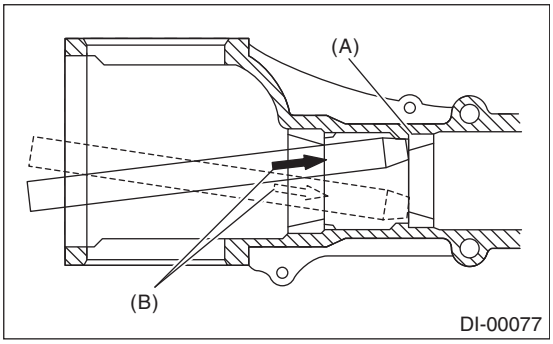
(A) Differential carrier
(B) Front oil seal

17) Remove the pilot bearing together with the front bearing cone and spacer using the ST.
ST 398467700 DRIFT



(A) Pilot bearing
(B) Spacer
(C) Front bearing
(D) Rear bearing cup

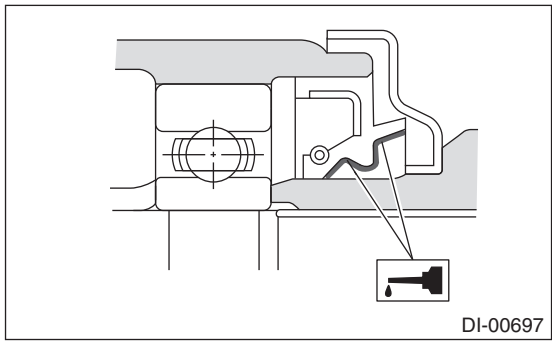
18) When replacing the bearings, use a brass bar to tap out the front bearing cup and rear bearing cup (in this order).



(A) 2 cutout portions along diagonal lines
(B) Tap alternately with brass bar.

D: ASSEMBLY

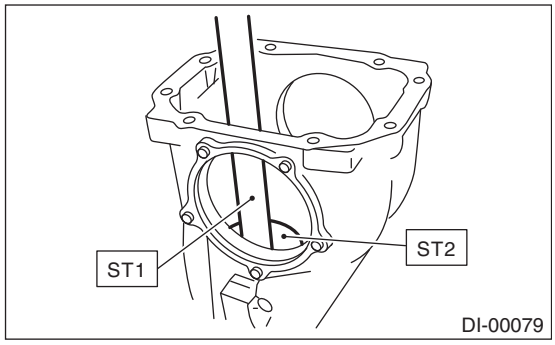
NOTE:
- Assemble in the reverse order of disassembly.
- Check and adjust each part during assembly.
- Keep the shims and washers in order, so that they are not improperly installed.
- Thoroughly clean the surfaces on which the shims, washers and bearings are to be installed.
- Apply differential gear 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.
- Apply differential gear oil to the lips when installing the oil seal.



1) Adjusting preload for front and rear bearings

NOTE:
Adjust the bearing preload between front and rear bearings with spacer 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 into the differential carrier using ST1 and ST2.
ST1 398477701 HANDLE
ST2 398477703 DRIFT 2



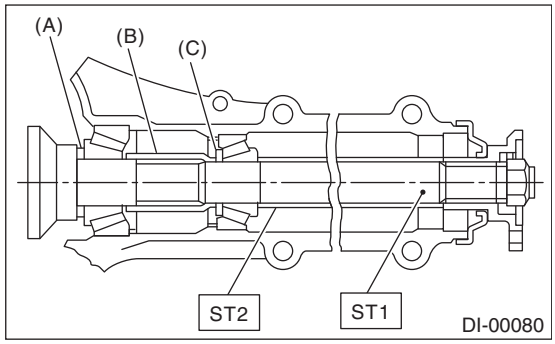
(2) Install the front bearing race to the differential carrier using ST1 and ST2.
ST1 398477701 HANDLE
ST2 398477702 DRIFT

(3) Insert the ST1 into carrier with the pinion height adjusting washer and rear bearing cone fitted onto it.

NOTE:
• If tooth contact (drive pinion, hypoid driven gear) 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 spacer and washer, front bearing cone, ST2, companion flange and self-locking nut.

ST1 398507702 DUMMY SHAFT
ST2 398507703 DUMMY COLLAR



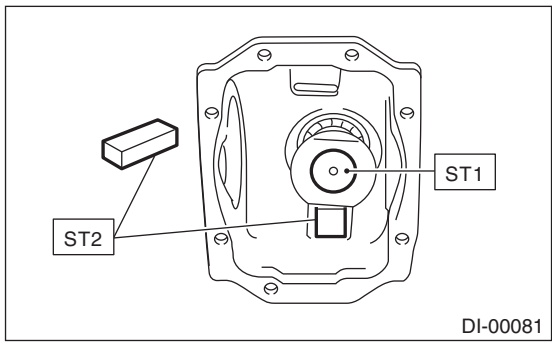
(A) Pinion height adjusting washer
(B) Preload adjusting spacer
(C) Preload adjusting washer

(5) Turn the ST1 by hand to smooth the bearing, and tighten the self-locking nut while measuring the initial load or initial torque with a spring scale or torque wrench. Select the preload adjusting washer and spacer so that the specified preload is obtained when nut is tightened to the specified torque.

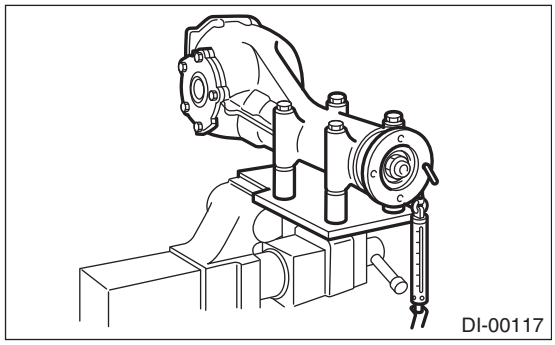
NOTE:
• Use a new self-locking nut.
• Measure the preload in direction of tangent to the flange.
• Be careful not to give excessive preload.
• When tightening the self-locking nut, lock ST1 with ST2 as shown in the figure.

ST1 398507702 DUMMY SHAFT
ST2 398507704 BLOCK

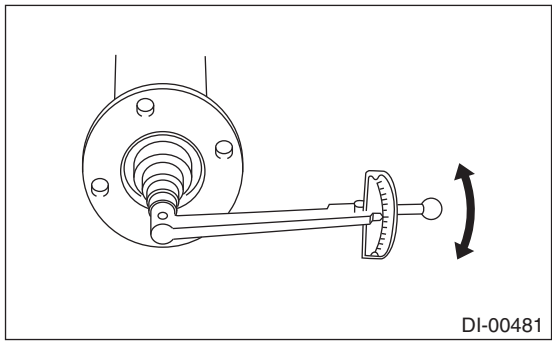
Tightening torque:
181.5 N·m (18.5 kgf-m, 133.9 ft-lb)



Initial load:
18.1 — 38.8 N (1.8 — 4.0 kgf, 4.1 — 8.7 lb)



Initial torque:
0.69 — 1.47 N·m (0.07 — 0.15 kgf-m, 0.51 — 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)

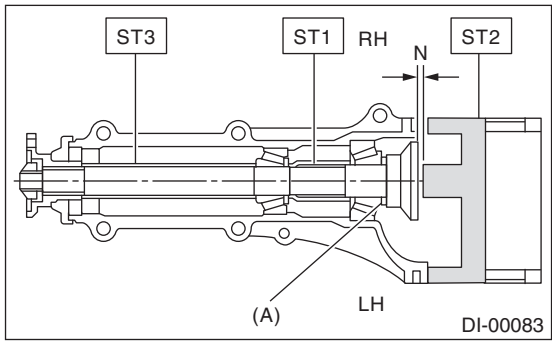
Preload adjusting spacer	
Part No.	Length mm (in)
383695201	56.2 (2.213)
383695202	56.4 (2.220)
383695203	56.6 (2.228)
383695204	56.8 (2.236)
383695205	57.0 (2.244)
383695206	57.2 (2.252)

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 the ST2.

NOTE:
At this time, install a provisionally selected or previously used pinion height adjusting washer. Measure and record the thickness.

ST1 398507702 DUMMY SHAFT
ST2 398507701 DIFFERENTIAL CARRIER GAUGE
ST3 398507703 DUMMY COLLAR



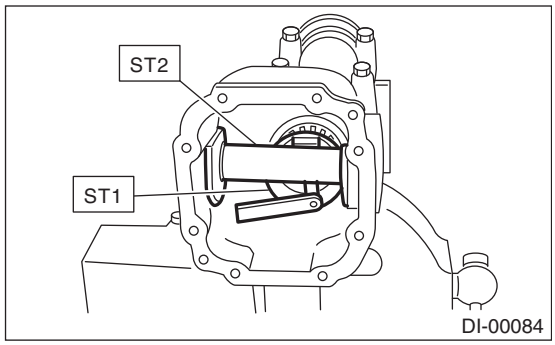
N Measured value

(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 = To + N – (H × 0.01) – 0.20 mm (0.0079 in)

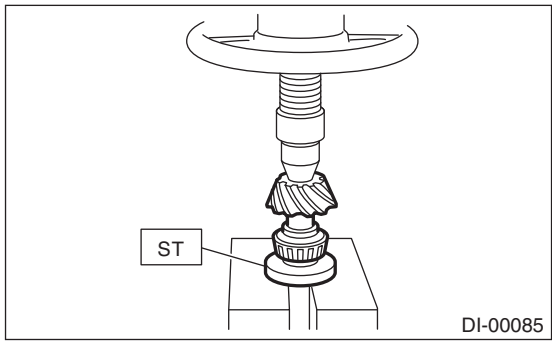
NOTE:
Use copies of this page.

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:	

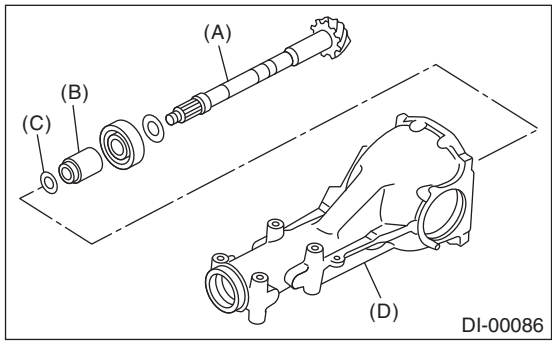
(Example of calculation)
To = 3.39 mm (0.1335 in)
N = 0.24 mm (0.0094 in)
H = + 1
T = 3.39 mm (0.1335 in) + 0.24 mm (0.0094 in) – 0.01 mm (0.0004 in) – 0.20 mm (0.0079 in) = 3.42 mm (0.1346 in)
Result: Thickness = 3.42 mm (0.1346 in)
Therefore use washer 383605200.

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

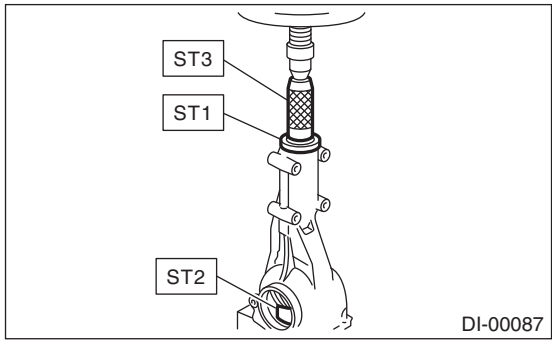


4) Insert the drive pinion into the differential carrier, and install the preselected preload adjusting spacer and washer.

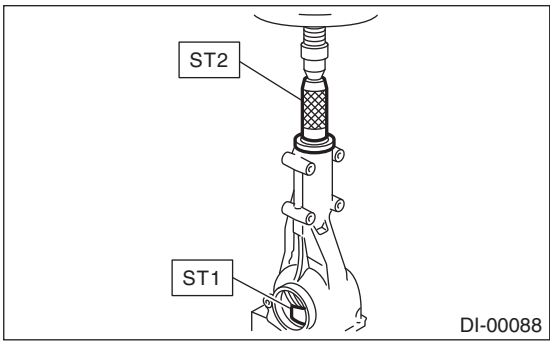


(A) Drive pinion
(B) Preload adjusting spacer
(C) Preload adjusting washer
(D) Differential carrier

5) Press-fit the front bearing cone into case with ST1, ST2 and ST3.
ST1 398507703 DUMMY COLLAR
ST2 399780104 WEIGHT
ST3 899580100 INSTALLER



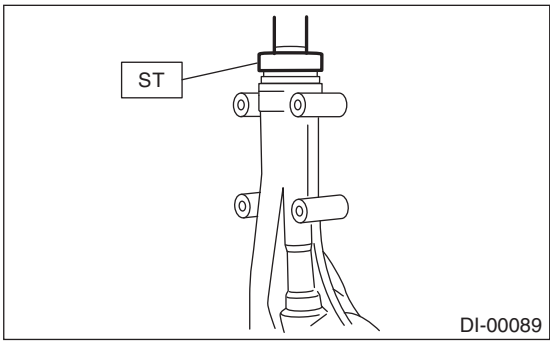
6) Insert the spacer, then press-fit the pilot bearing with ST1 and ST2.
ST1 399780104 WEIGHT
ST2 899580100 INSTALLER



7) Using the ST, install the oil seal.

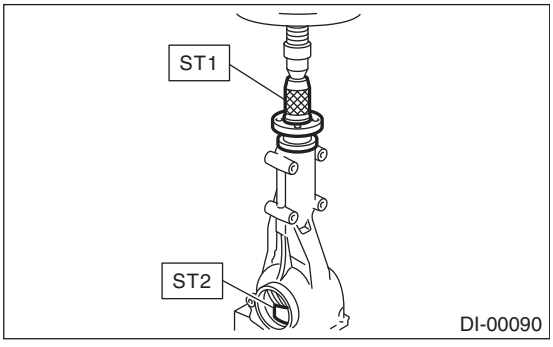
NOTE:
- Use a new oil seal.
- Press-fit until the oil seal end comes 1 mm (0.04 in) inward from end of carrier.
- Apply differential gear oil to the oil seal lips.

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

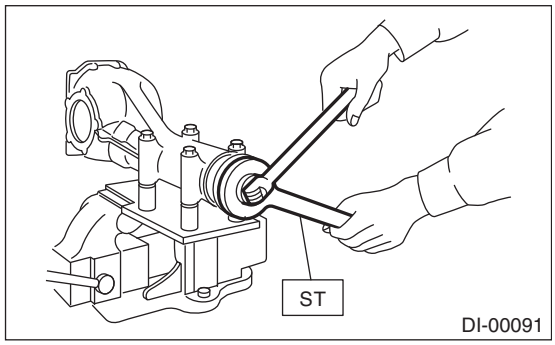


9) Apply seal material on the drive pinion shaft thread and new self-locking nut seat.

Seal material:
THREE BOND 1324 (Part No. 004403042) or equivalent

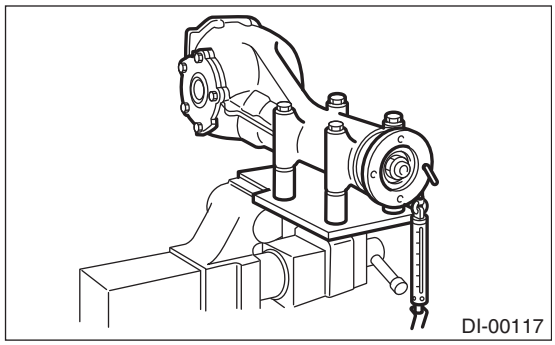
10) Attach the new self-locking nut and use the ST to fix the companion flange in place, then tighten the self-locking nut.

Tightening torque:
181.5 N·m (18.5 kgf-m, 133.9 ft-lb)
ST 498427200 FLANGE WRENCH

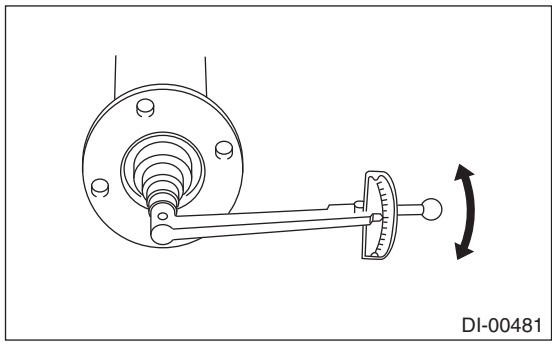


11) Check the initial torque or initial load.

Initial load:
18.1 — 38.8 N (1.8 — 4.0 kgf, 4.1 — 8.7 lbf)

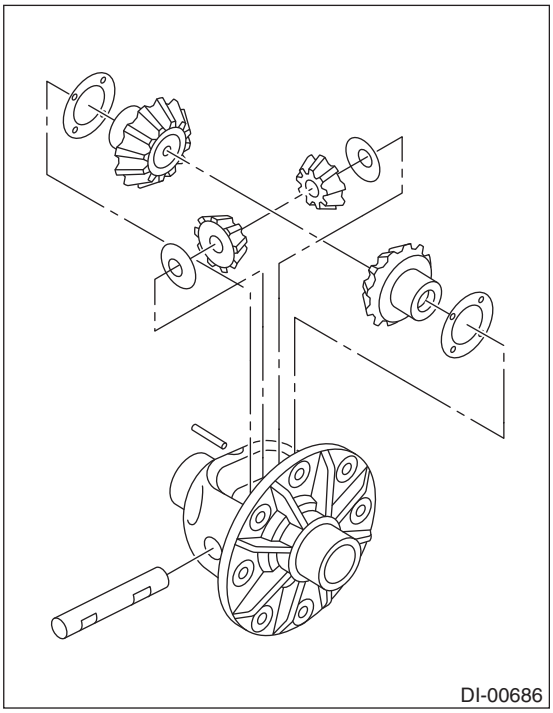


Initial torque:
0.67 — 1.47 N·m (0.07 — 0.15 kgf-m, 0.49 — 1.08 ft-lb)



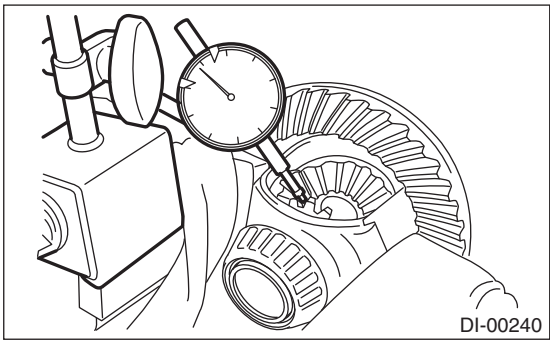
12) Assembling differential case
Install the side gears and pinion mate gears, with their thrust washers, pinion mate gear washer, and pinion mate shaft, into the differential case.

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 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 differential gear oil to the gear tooth surfaces and thrust washer surfaces.
(4) Drive the pinion shaft lock pin into the differential case.

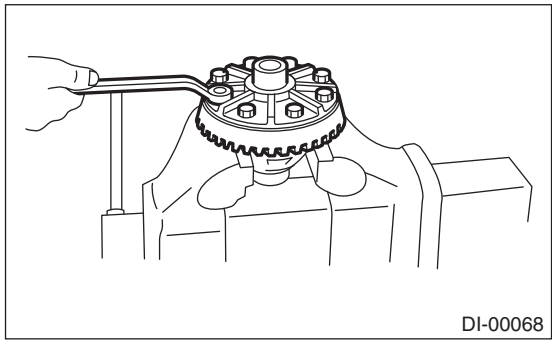
13) Install the driven gear to the differential case.

NOTE:
• Before installing bolts, apply seal material to bolt threads.

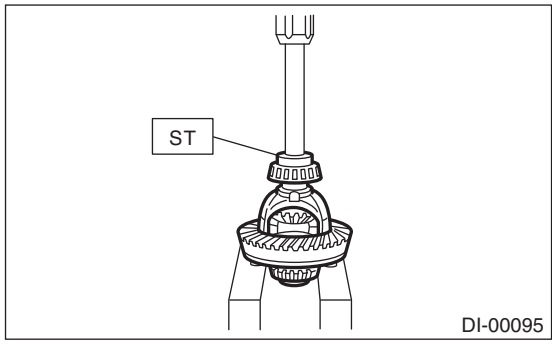
Seal material:
THREE BOND 1324 (Part No. 004403042) or equivalent

• Make sure there is no clearance between the differential case and driven gear.
• Tighten opposing bolts in order.

Tightening torque:
103 N·m (10.5 kgf-m, 76.0 ft-lb)



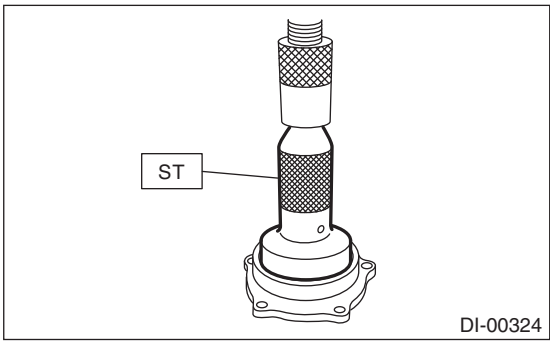
14) Using the ST, press-fit the side bearing cone to the differential case.
ST 398487700 DRIFT



15) Assembling side retainer

(1) Using the ST, press-fit the side bearing race to the side retainer.

ST 398417700 DRIFT



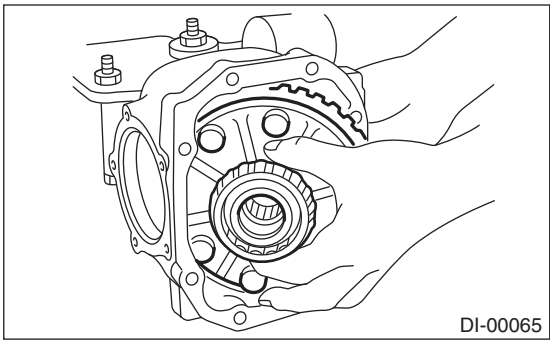
(2) Install the oil seal. <Ref. to DI-41, REPLACEMENT, Rear Differential Side Oil Seal.>

16) Side retainer shim adjustment

(1) The hypoid driven gear backlash and side bearing preload can be adjusted by the side retainer shim thickness.

(2) Install the differential case assembly into differential carrier in the reverse order of disassembly.

NOTE:
Be careful not to hit the teeth of hypoid driven gear against the differential carrier.



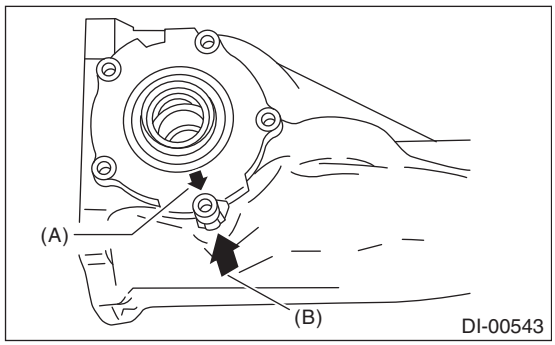
(3) Install the side retainer shim and O-ring.

NOTE:
- Use new O-rings.
- Be careful not to mix up the side retainer shim RH and LH.
- Replace broken or corroded side retainer shims with a new part of the same thickness.

Side 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 the differential carrier with the arrow mark on the side retainer when installing the side retainer.

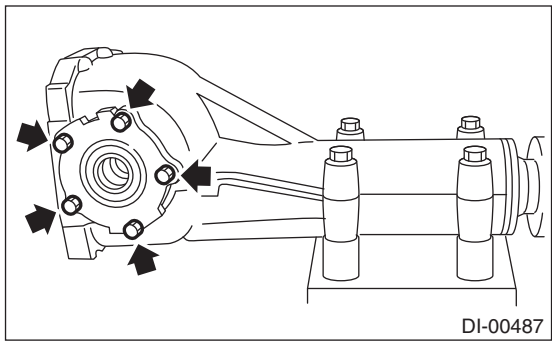
NOTE:
Be careful that the side bearing outer race is not damaged by the bearing roller.



(A) Arrow mark (on the side retainer)
(B) Arrow mark (on the differential carrier)

(5) Tighten the side retainer bolts.

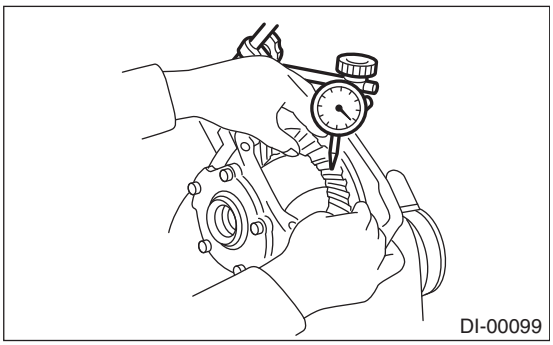
Tightening torque:
10.5 N·m (1.1 kgf-m, 7.7 ft-lb)



(6) Measure the hypoid driven gear to drive pinion backlash. Set the magnet base on differential carrier. Align the contact point of dial gauge with tooth face of hypoid driven gear, and move hypoid driven gear while holding drive pinion still. Read the value indicated on dial gauge. If the backlash is outside the standard range, adjust the side retainer shim by the following method.

•When backlash is less than 0.1 mm (0.004 in):
Reduce the thickness of shim on the back side of the hypoid driven gear and increase the thickness of shims on the teeth side of the hypoid driven gear.
•When backlash exceeds 0.2 mm (0.008 in):
Increase the thickness of shim on the back side of the hypoid driven gear and reduce the thickness of shims on the teeth side of the hypoid driven gear.

Backlash:
0.10 — 0.20 mm (0.004 — 0.008 in)

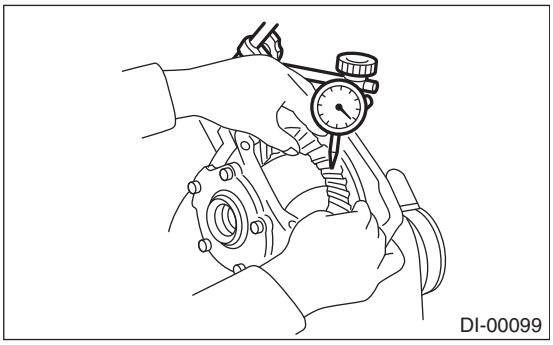


(7) Measure the total preload of the drive pinion. If the total preload is not within specification, adjust the thickness of side retainer shims, increasing/reducing both shims by an even amount at a time.

Total preload:
20.7 — 54.4 N (2.1 — 5.5 kgf, 4.7 — 12.2 lbf)

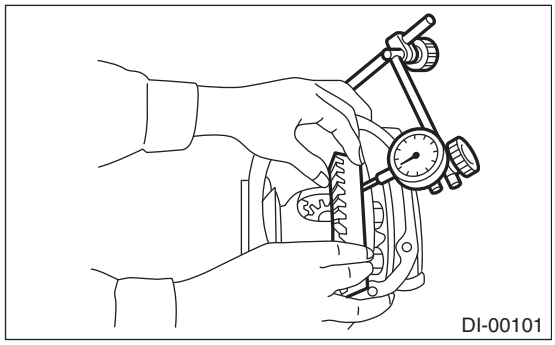
17) Recheck the hypoid driven gear to drive pinion backlash.

Backlash:
0.10 — 0.20 mm (0.004 — 0.008 in)



18) Check the runout on the back side of the hypoid driven gear, and make sure that the pinion and hypoid driven gears rotate smoothly. If the runout on the back side of the hypoid driven gear exceeds the specification, check for any foreign material between the hypoid driven gear and differential case, and for any deformation of the case or gear.

Hypoid driven gear back surface runout:
0.05 mm (0.002 in)

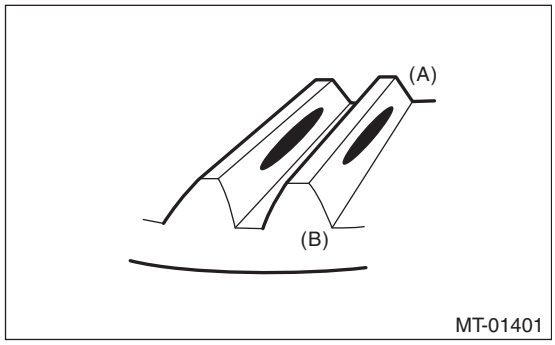


19) Checking and adjusting the tooth contact of hypoid driven gear
(1) Apply lead-free red dye evenly on the both sides of three to four teeth of the hypoid driven gear. Check the contact pattern after rotating the hypoid driven gear several revolutions back and forth until a definite contact pattern appears on the hypoid driven gear.
(2) When the contact pattern is not correct, adjust.

NOTE:
Be sure to wipe off the lead-free red dye completely after the adjustment is completed.

- Correct tooth contact

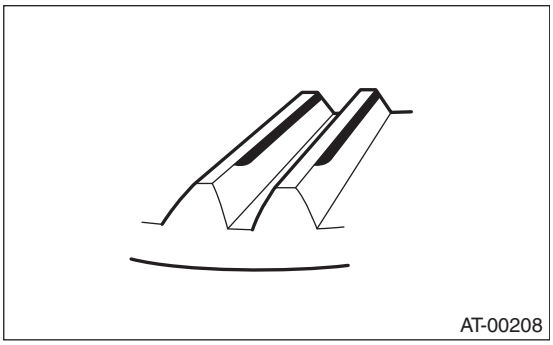
Check item: Tooth contact pattern is slightly shifted toward toe side under no-load rotation. (When driving, it moves towards the heel side.)



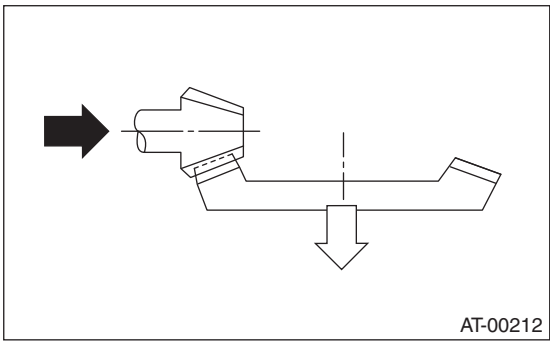
(A) Toe side
(B) Heel side

- Face contact

Check item: Backlash is too large.
Contact pattern

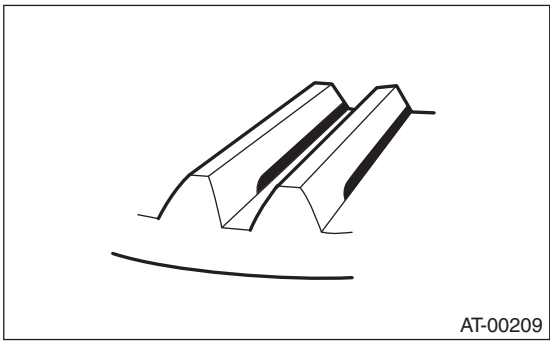


Corrective action: Increase thickness of pinion height adjusting washer according to the procedure for bringing drive pinion close to hypoid driven gear side.

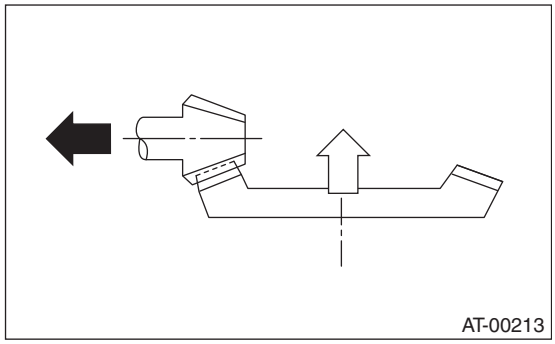


- Flank contact

Check item: Backlash is too small.
Contact pattern

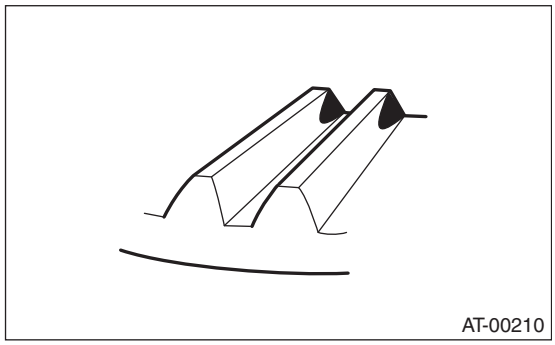


Corrective action: Reduce the thickness of pinion height adjusting washer according to the procedure for bringing drive pinion away from hypoid driven gear.

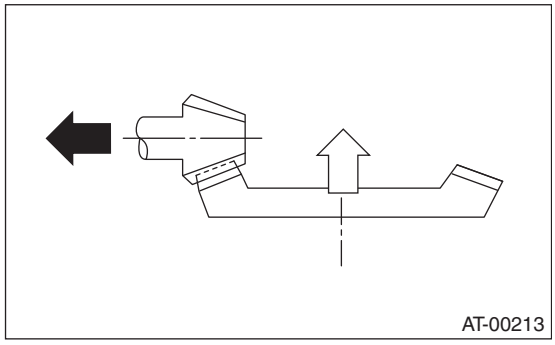


- Toe contact (inside contact)

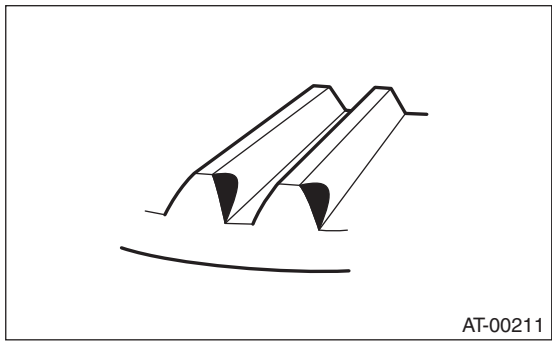
Check item: Teeth contact area is too small.
Contact pattern



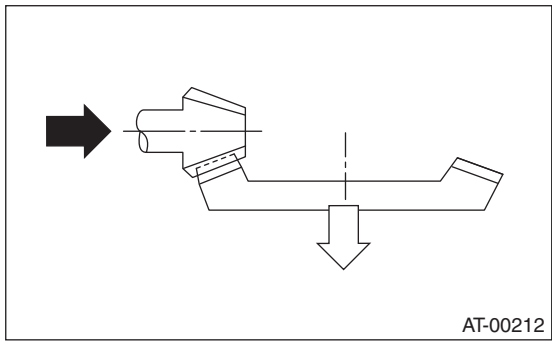
Corrective action: Reduce the thickness of pinion height adjusting washer according to the procedure for bringing drive pinion away from hypoid driven gear.



• Heel contact (outside end contact)
Check item: Teeth contact area is too small.
Contact pattern

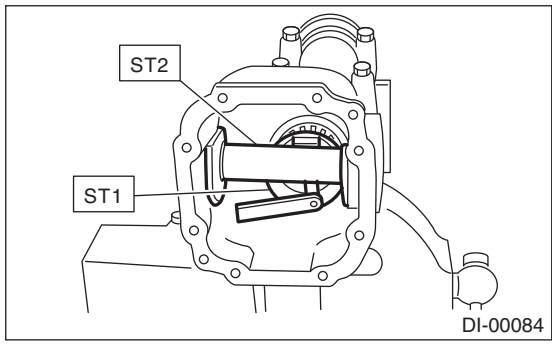


Corrective action: Increase thickness of pinion height adjusting washer according to the procedure for bringing drive pinion close to hypoid driven gear side.



20) If proper tooth contact is not obtained, adjust the tooth contact area by changing the thickness of RH and LH side retainer shims and the pinion height adjusting washers. After adjustment, check the hypoid gear backlash and readjust the tooth contact area as necessary.
(1) Drive pinion height

ST1 398507702 DUMMY SHAFT
ST2 398507701 DIFFERENTIAL CARRIER GAUGE

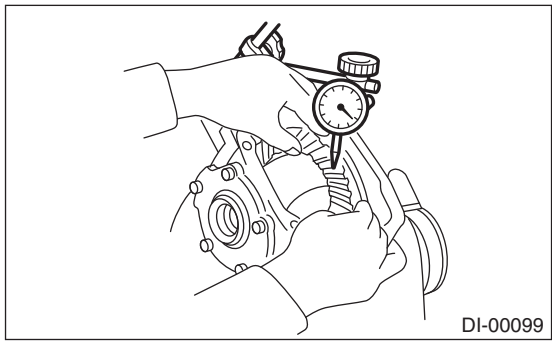


T = To + N – (H × 0.01) – 0.20 mm (0.008 in)

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

(2) Hypoid gear backlash

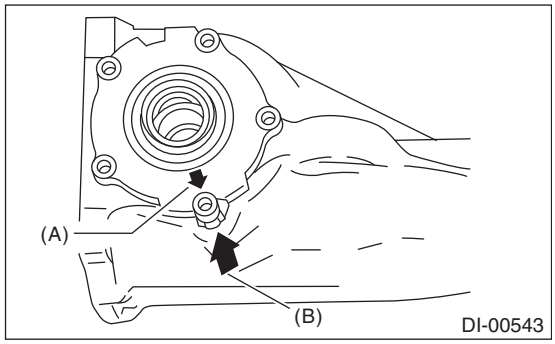
Backlash:
0.10 — 0.20 mm (0.004 — 0.008 in)



21) Remove the RH and LH side retainers.
22) Install the O-ring to left and right side retainers.

NOTE:
Use new O-rings.

23) Install the oil seal to the side retainer of both sides. <Ref. to DI-41, REPLACEMENT, Rear Differential Side Oil Seal.>
24) Align the arrow mark on the differential carrier with the arrow mark on the side retainer when installing the side retainer.

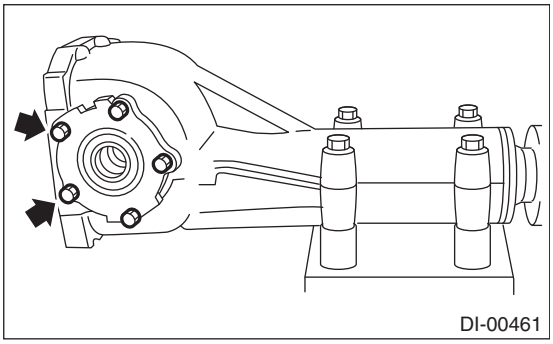


(A) Arrow mark (on the side retainer)
(B) Arrow mark (on the differential carrier)

25) Apply liquid gasket to the bolts indicated by arrows, and tighten the bolts to the specified torque.

Liquid gasket:
THREE BOND 1110B (Part No. K0879Y0020) or equivalent

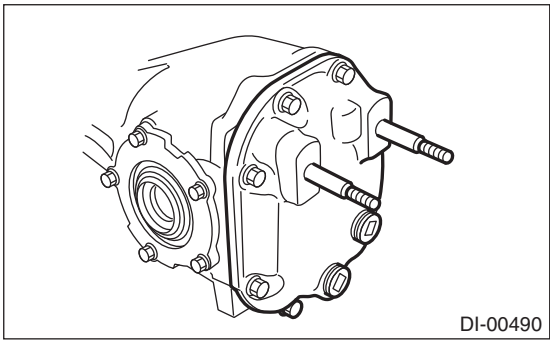
Tightening torque:
10.5 N·m (1.1 kgf-m, 7.7 ft-lb)



26) Install the gasket and rear cover, and tighten the bolts to specified torque.

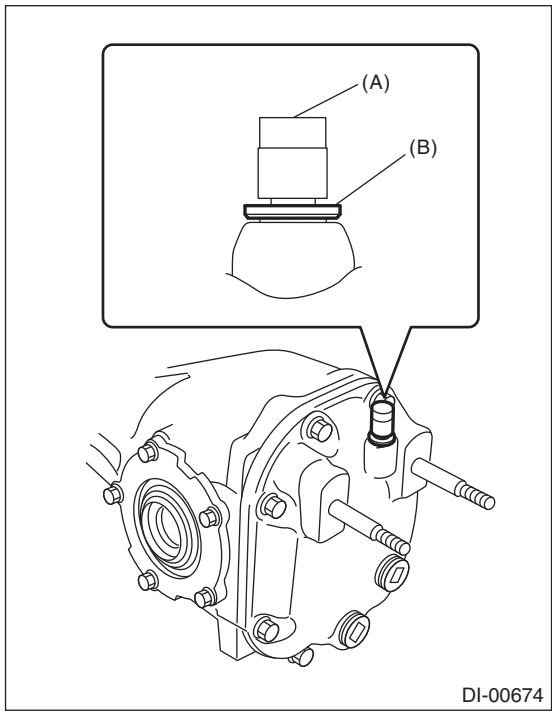
NOTE:
Use a new gasket.

Tightening torque:
29.5 N·m (3.0 kgf-m, 21.8 ft-lb)



27) Install the air breather cap.

NOTE:
When installing the air breather cap, do not tap section (A). Be sure to tap section (B) to install.



28) Install the 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, 36.1 ft-lb)

29) Install the filler plug.

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) Side gear and pinion mate gear

• Replace if cracks, scoring or other defects are evident on the tooth surface.

• Replace if thrust washer contact surface is worn or seized. Slight damages of the surface can be corrected by oil stones or equivalent.

3) Bearing

Replace if seizure, peeling, wear, rust, dragging during rotation, abnormal noise or other defect is evident.

4) Thrust washer of the side gear and pinion mate gear:

Replace if seized, flawed, abnormally worn or having other defects.

5) Oil seal

Replace if deformed or damaged, and at every disassembling.

6) Differential carrier

Replace if the bearing bores are worn or damaged.

7) Differential case

Replace if its sliding surfaces are abnormally worn, burned, or cracked.

8) Companion flange

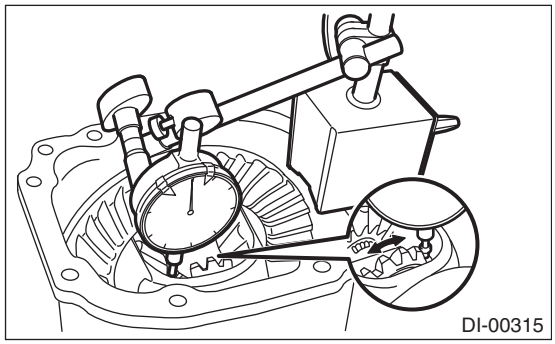
Replace if the oil seal lip contact surface shows cracking.

1. SIDE GEAR BACKLASH

Using a dial gauge, check the backlash of side gear.

Side gear backlash:
0.10 — 0.20 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.

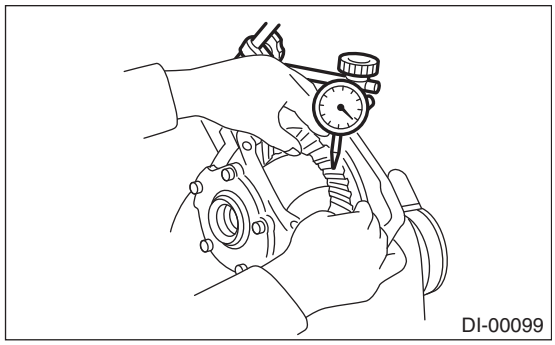

DI-00315

2. HYPOID DRIVEN GEAR BACKLASH

Using a dial gauge, check the backlash of hypoid driven gear.

Hypoid driven gear backlash:
0.10 — 0.20 mm (0.004 — 0.008 in)

If the hypoid driven gear backlash is not within the specification, adjust the side retainer shim or repair if necessary.

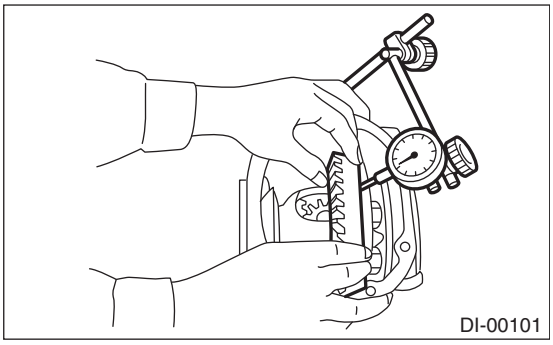

DI-00099

3. HYPOID DRIVEN GEAR RUNOUT ON ITS BACK SURFACE

Using a dial gauge, check the hypoid driven gear back surface runout.

Hypoid driven gear back surface runout:
0.05 mm (0.002 in)

If the hypoid driven gear runout exceeds specification, replace the hypoid driven gear.


DI-00101

4. TOOTH CONTACT BETWEEN HYPOID DRIVEN GEAR AND DRIVE PINION

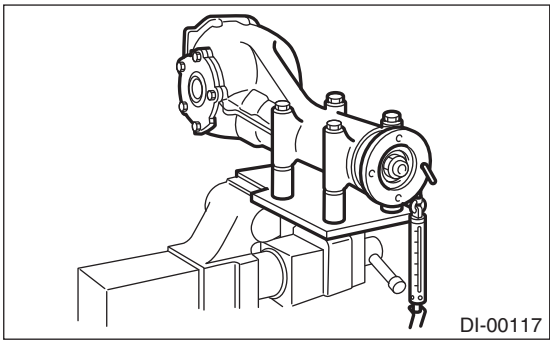
Inspect the tooth contact between the hypoid driven gear and drive pinion. <Ref. to DI-25, ASSEMBLY, Rear Differential.>

5. TOTAL PRELOAD

Using a spring scale, check the total preload.

Total preload:
20.7 — 54.4 N (2.1 — 5.5 kgf, 4.7 — 12.2 lbf)

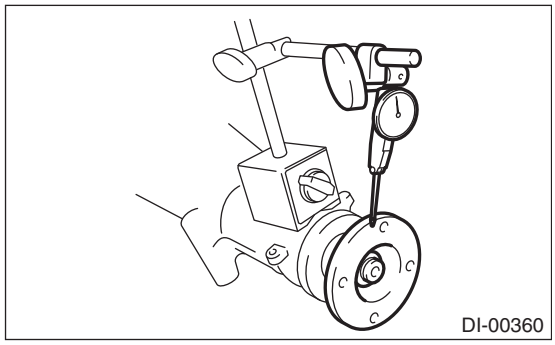
If the total preload is not within the specification, adjust the side retainer shim.


DI-00117

6. COMPANION FLANGE

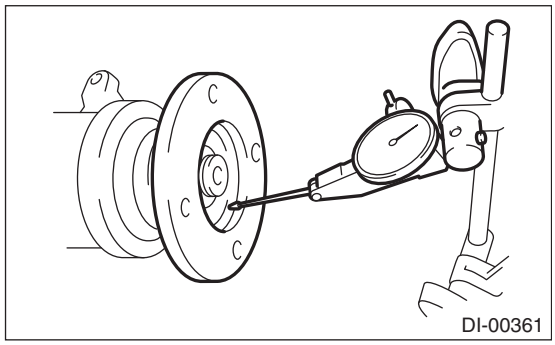
1) If rust or dirt is attached to the companion flange, remove them.
2) Set a dial gauge at a companion flange surface (mating surface of propeller shaft and companion flange), and then measure the companion flange runout.

Limit of runout:
0.08 mm (0.003 in)


DI-00360

3) Set the gauge inside of the companion flange, and measure the runout.

Limit of runout:
0.08 mm (0.003 in)


DI-00361

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-25, ASSEMBLY, Rear Differential.>

2. HYPOID DRIVEN GEAR BACKLASH

Adjust hypoid driven gear backlash. <Ref. to DI-25, 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-25, ASSEMBLY, Rear Differential.>

4. TOTAL PRELOAD

Adjust the side retainer shim. <Ref. to DI-25, ASSEMBLY, Rear Differential.>

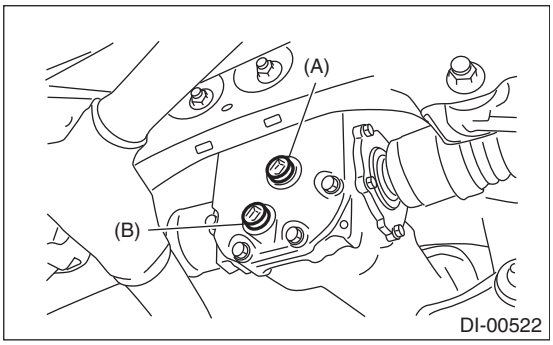
5. Rear Differential Front Oil Seal

A: INSPECTION

Check that there is no leakage from front oil seal portion. If there is any leakage replace the oil seal and inspect the propeller shaft.

B: REPLACEMENT

1) Shift the select lever or gear shift lever to neutral.
2) Release the parking brake.
3) Disconnect the ground cable from battery.
4) Lift up the vehicle.
5) Remove the drain plug and filler plug, and drain the gear oil.



(A) Filler plug
(B) Drain plug

6) Install the drain plug.

NOTE:
Apply liquid gasket to the drain plug.

Liquid gasket:
THREE BOND 1105 (Part No. 004403010) or equivalent

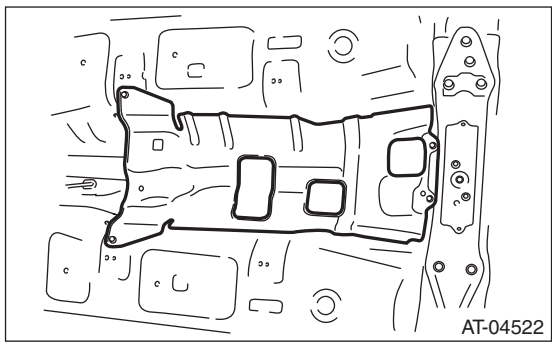
Tightening torque:
49 N·m (5.0 kgf-m, 36.1 ft-lb)

7) Remove the rear exhaust pipe and muffler.
- Non-turbo model

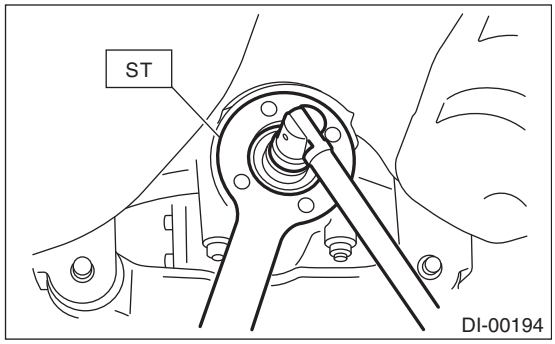
<Ref. to EX(H4DO)-13, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4DO)-16, REMOVAL, Muffler.>
- Turbo model

<Ref. to EX(H4DOTC)-12, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-14, REMOVAL, Muffler.>

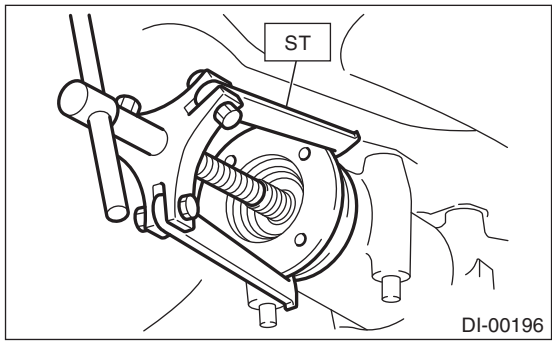
8) Remove the heat shield cover.



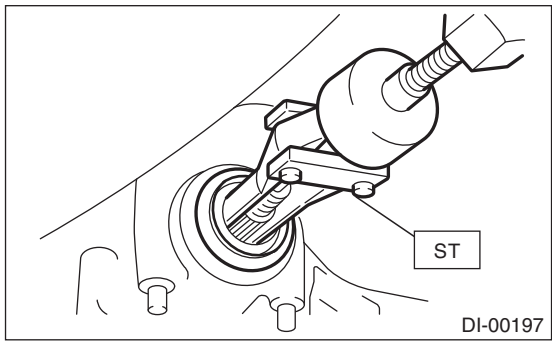
9) Remove the propeller shaft. <Ref. to DS-10, REMOVAL, Propeller Shaft.>
10) Check the initial torque and write it down.
11) Remove the self-locking nut while holding the companion flange with ST.
ST 498427200 FLANGE WRENCH



12) Extract the companion flange using ST.
ST 399703600 PULLER ASSY



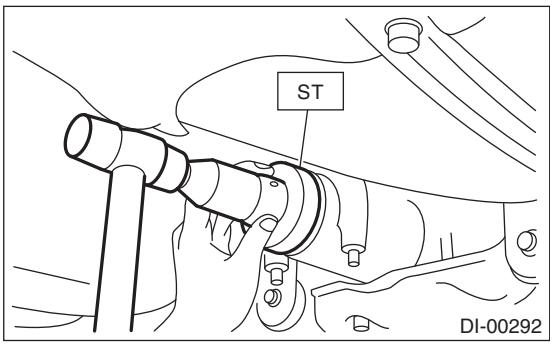
13) Remove the oil seal using ST or screwdriver.
ST 398527700 PULLER ASSY



14) Using the ST, install the oil seal.

NOTE:
- Use a new oil seal.
- Apply differential gear oil to the oil seal lips.

ST 498447120 INSTALLER



15) Install the companion flange.

NOTE:
Use a plastic hammer to install companion flange.

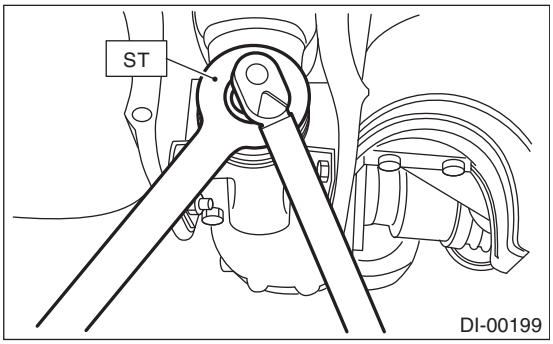
16) Tighten the self-locking nut to the specified torque so that the initial torque of the companion flange is the same value as that before replacing the oil seal.

NOTE:
- Use a new self-locking nut.
- Before installing the self-locking nut, apply seal material to self-locking nut threads.

Seal material:
THREE BOND 1324 (Part No. 004403042) or equivalent

Tightening torque:
167 — 196 N·m (17.0 — 20.0 kgf-m, 123.2 — 144.6 ft-lb)

ST 498427200 FLANGE WRENCH



17) Hereafter, reassemble in the reverse order of disassembly.

18) After installing, fill the differential carrier with gear oil up to the bottom of the filler plug hole. <Ref. to DI-17, REPLACEMENT, Differential Gear Oil.>

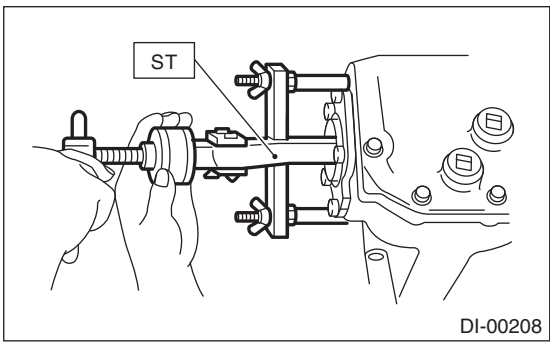
6. Rear Differential Side Oil Seal

A: INSPECTION

Inspect for oil leakage from the side oil seal. If there is oil leakage, replace the oil seal.

B: REPLACEMENT

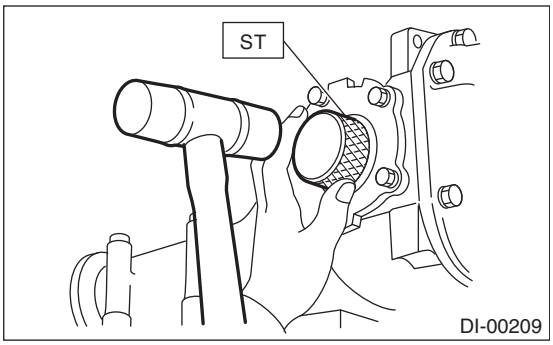
1) Remove the rear differential. <Ref. to DI-19, REMOVAL, Rear Differential.>
2) Remove the rear differential side oil seal using a ST or screwdriver wrapped with vinyl tape to prevent the side retainer from scratching.
ST 398527700 PULLER ASSY



3) Using the ST, install the oil seal to the side retainer.

NOTE:
- Use a new oil seal.
- Apply differential gear oil to the oil seal lips.

ST 398437700 DRIFT

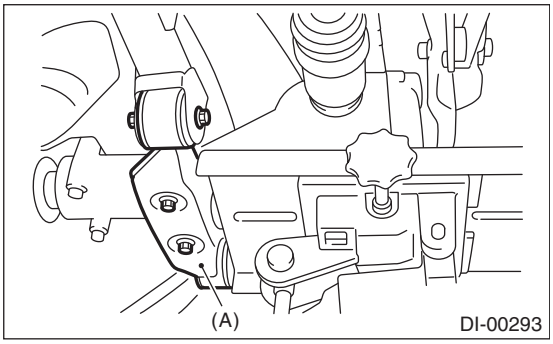


4) Install the rear differential. <Ref. to DI-21, INSTALLATION, Rear Differential.>

7. Rear Differential Front Member

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Lift up the vehicle.
3) Support the rear differential using transmission jack, and then remove the rear differential front member.

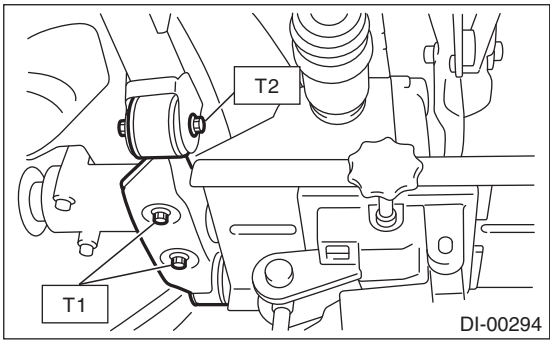


(A) Rear differential front member

B: INSTALLATION

Install the rear differential front member with a new self-locking nut.

Tightening torque:
T1: 50 N·m (5.1 kgf-m, 36.9 ft-lb)
T2: 110 N·m (11.2 kgf-m, 81.1 ft-lb)



C: INSPECTION

1) Check the rear differential front member for damage, bend and corrosion. If damage, bend or corrosion is excessive, replace the rear differential front member.
2) Check the bushings of rear differential member for cracking, hardening and damage. If cracking, hardening or damage is excessive, replace rear differential front member.

8. Rear Differential Mount Bushing

A: INSPECTION

Check the rear differential mount bushing for cracks, hardening or damage. If cracking, hardening or damage is excessive, replace rear differential mount bushing.

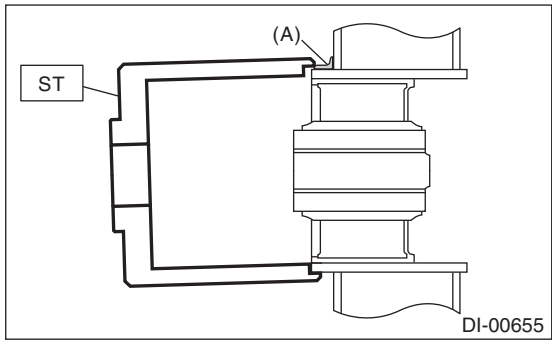
B: REPLACEMENT

CAUTION:
If there was so much rust in the rear differential mount bushing, remove the rust before starting work.

1) Remove the rear differential. <Ref. to DI-19, REMOVAL, Rear Differential.>

2) Fit the ST to the periphery of the sub frame cylinder, and make sure that the ST does not contact with welded spots or spatters.

ST 41399FG010 SPECIAL TOOL A



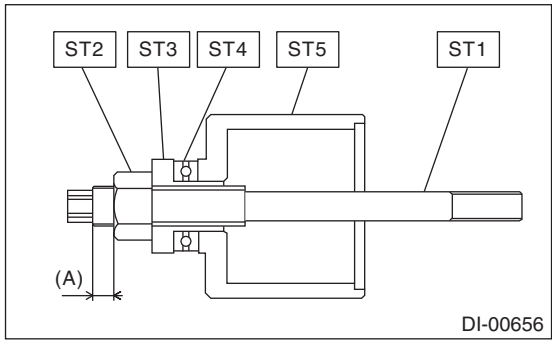
(A) Welded spot

3) If the ST contacts with welded spots or spatters, remove the excessive welds or spatters with sander or the equivalent so that the ST contacts the cylinder peripheral part.

CAUTION:
Performing the operation with the ST contacting with welded spots or spatters may break the ST. Be sure to remove excessive welds or spatters before the operation.

4) Set ST1, ST2, ST3, ST4 and ST5 as shown in the figure.

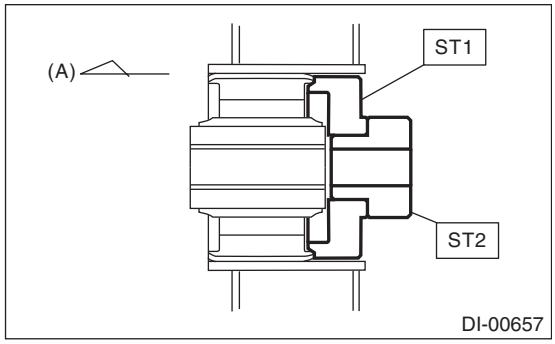
ST1 41399FG091 SPECIAL TOOL SHAFT
ST2 41399FG070 SPECIAL TOOL NUT
ST3 41399FG050 SPECIAL TOOL SLEEVE
ST4 41399FG080 SPECIAL TOOL BEARING
ST5 41399FG010 SPECIAL TOOL A



(A) 5 mm (0.2 in) or less

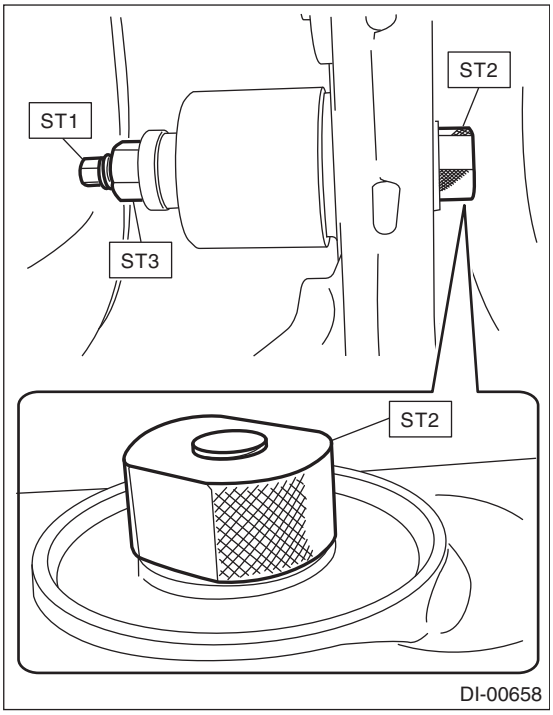
5) Fit and hold the ST1 and ST2 to the rear differential mount bushing from the rear side of vehicle.

ST1 41399FG031 SPECIAL TOOL C
ST2 41399FG061 SPECIAL TOOL RING



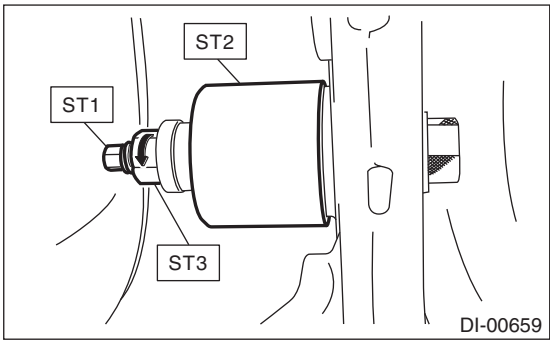
(A) Front side of vehicle

6) Insert the ST set in the step 4) through the rear differential mount bushing hole from the front side of vehicle, and screw in the ST2 by hand till the front end of ST3 comes out slightly from the rear end of ST1.
ST1 41399FG091 SPECIAL TOOL SHAFT
ST2 41399FG061 SPECIAL TOOL RING
ST3 41399FG070 SPECIAL TOOL NUT



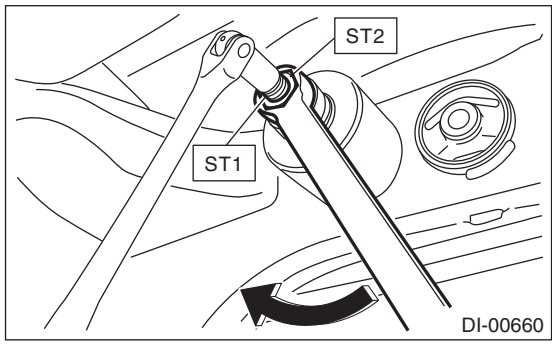
7) Hold the ST1 to prevent it from rotating, and screw in the ST3 by hand till there is no loose fit on the ST2.

CAUTION:
When setting the ST to the vehicle, always make sure that the ST2 fits the periphery of the sub frame cylinder and is not tilted.
ST1 41399FG091 SPECIAL TOOL SHAFT
ST2 41399FG010 SPECIAL TOOL A
ST3 41399FG070 SPECIAL TOOL NUT



8) Hold the ST1 with a tool to prevent it from rotating, and screw in the ST2 to remove the rear differential mount bushing.

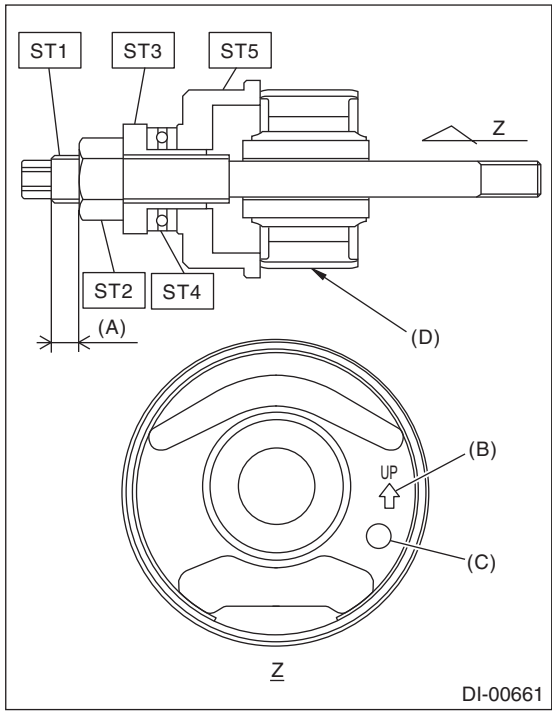
CAUTION:
• Rotation of ST1 will damage the screw of ST1 at the rear end of rear differential mount bushing. Never rotate the ST1.
• If the ST starts to tilt while removing the rear differential mount bushing, stop the work and set the ST again.
ST1 41399FG091 SPECIAL TOOL SHAFT
ST2 41399FG070 SPECIAL TOOL NUT



9) Set ST1, ST2, ST3, ST4, ST5 and rear differential mount bushing as shown in the figure.

NOTE:
- Set the ST2 nut near to the end of ST1 screw.
- Hold the rear differential mount bushing with the marked side facing toward the rear of the vehicle, and set the rear differential mount bushing to the ST so that the arrow mark faces upward.
- Mark the bottom end of rear differential mount bushing to identify the installing direction.

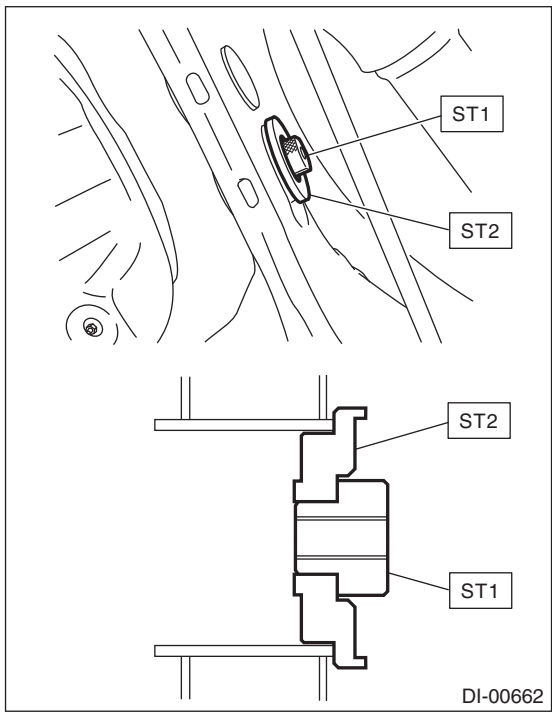
ST1 41399FG091 SPECIAL TOOL SHAFT
ST2 41399FG070 SPECIAL TOOL NUT
ST3 41399FG050 SPECIAL TOOL SLEEVE
ST4 41399FG080 SPECIAL TOOL BEARING
ST5 41399FG020 SPECIAL TOOL B



(A) 8 mm (0.31 in) or more
(B) Arrow mark
(C) Mark
(D) Marked position

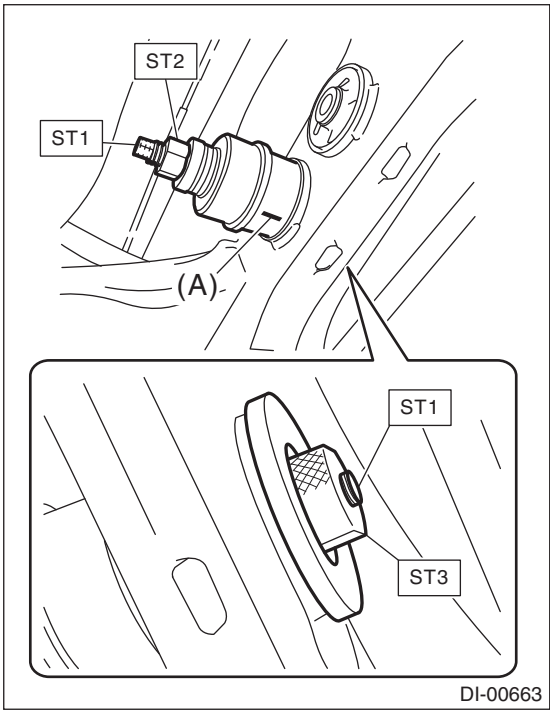
10) Attach ST1 to the ST2, and fit and hold the STs as a unit to the sub frame from the rear side of vehicle.

ST1 41399FG061 SPECIAL TOOL RING
ST2 41399FG041 SPECIAL TOOL D



11) Insert the ST set in the step 9) through the sub frame from the front side of vehicle, and screw in the ST1 by hand till the front end of ST1 comes out slightly from the rear end of ST3.

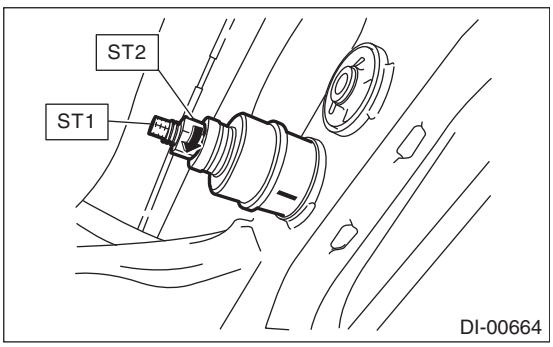
CAUTION:
Set the rear differential mount bushing with its mark facing the bottom end direction.
ST1 41399FG091 SPECIAL TOOL SHAFT
ST2 41399FG070 SPECIAL TOOL NUT
ST3 41399FG061 SPECIAL TOOL RING



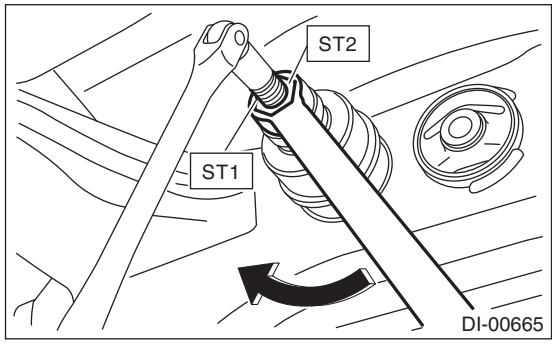
(A) Mark

12) Hold the ST1 to prevent it from rotating, and screw in the ST2 by hand till there is no loose fit on the ST and the rear differential mount bushing.

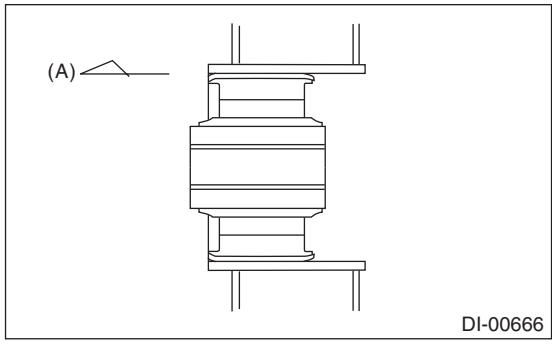
CAUTION:
Make sure that the ST and rear differential mount bushing are not tilted.
ST1 41399FG091 SPECIAL TOOL SHAFT
ST2 41399FG070 SPECIAL TOOL NUT



13) Screw in the ST2 while holding the ST1 with a tool to prevent it from rotating, and press-fit the rear differential mount bushing to the front end of sub frame cylinder.
ST1 41399FG091 SPECIAL TOOL SHAFT
ST2 41399FG070 SPECIAL TOOL NUT



14) Make sure that the rear differential mount bushing is inserted to the front end of sub frame cylinder.



(A) Front side of vehicle

15) Install the rear differential. <Ref. to DI-21, INSTALLATION, Rear Differential.>

9. 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. Scored, battered or excessively worn sliding surface of companion flange.	Repair or replace.
	(2) Clogged or damaged air breather cap.	Clean, repair or replace.
	(3) Loose bolts on the side retainer, or incorrectly fitted O-ring.	Tighten the bolts to specified torque. Replace the O-ring.
	(4) Loose rear cover attachment bolts or damaged gasket.	Tighten the bolts to specified torque. Replace gasket and apply liquid gasket.
	(5) Loose filler plug or drain plug.	Retighten and apply liquid gasket.
	(6) Wear, damage or incorrect fitting of drive shaft, side retainer or oil seal.	Repair or replace.
2. Seizure NOTE: Seized 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) Insufficient backlash for hypoid driven gear.	Readjust or replace.
	(2) Excessive preload for side, rear or front bearing.	Readjust or replace.
	(3) Insufficient or improper oil used.	Add recommended oil to the 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 driven gear.	Replace.
	(2) Insufficient or excessive preload for side, rear or front bearing.	Readjust or replace.
	(3) Excessive backlash for side 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. Find out what is actually making noise before disassembling.	(1) Improper tooth contact of hypoid driven gear and drive pinion	Readjust. (Drive pinion shim adjustment, backlash adjustment)
	(2) Excessive backlash for hypoid driven gear	Replace the gear or the pinion height adjusting washer.
	(3) Excessive backlash for side gear.	Replace gear or thrust washer.
	(4) Insufficient preload for front or rear bearing.	Readjust.
	(5) Loose drive pinion nut.	Tighten to the specified torque.
	(6) Loose bolts and nuts such as side retainer attachment 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) Stuck or damaged side bearing	Replace.

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 lifting-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 driven gear and drive pinion	Readjust or replace hypoid gear set.
	(2) Improper backlash for hypoid driven gear	Readjust.
	(3) Scored or chipped teeth of hypoid gear.	Replace hypoid gear set.
	(4) Scuffed hypoid gear	Replace hypoid gear set.
	(5) Improper preload for front or rear bearings.	Readjust.
	(6) Stuck, scored or damaged front or rear bearing	Replace.
	(7) Stuck, scored or damaged side bearing	Replace.
	(8) Vibrating differential gear.	Replace.

TRANSFER CASE

TC

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2. Transfer Case and Extension Case Assembly 3
3. Transfer Clutch 4
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5. Oil Seal 6
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7. Transfer Driven Gear 8
8. Reduction Drive Gear 9
9. Reduction Driven Gear 10
10. Center Differential 11
11. Transfer Clutch Pressure Test 12

1. General Description

A: NOTE

For general description, refer to “4AT” or “5MT” section.
4AT model:
<Ref. to 4AT-2, General Description.>
5MT 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-37, Transfer Case and Extension Case Assembly.>

3. Transfer Clutch

A: NOTE

For removal, installation and inspection, refer to the "4AT" section. <Ref. to 4AT-77, Transfer Clutch.>

4. Extension Case

A: NOTE

For removal, installation and inspection, refer to the "4AT" section. <Ref. to 4AT-75, Extension Case.>

5. Oil Seal

A: NOTE

For removal, installation and inspection, refer to the “4AT” or “5MT” section.
4AT model:
<Ref. to 4AT-50, Extension Case Oil Seal.> <Ref. to 4AT-51, Differential Side Retainer Oil Seal.>
5MT model:
<Ref. to 5MT-32, Oil Seal.> <Ref. to 5MT-33, Differential Side Retainer Oil Seal.>

6. Transfer Drive Gear

A: NOTE

For removal, installation and inspection, refer to the “5MT” section. <Ref. to 5MT-43, Transfer Drive Gear.>

7. Transfer Driven Gear

A: NOTE

For removal, installation and inspection, refer to the “5MT” section. <Ref. to 5MT-45, Transfer Driven Gear.>

8. Reduction Drive Gear

A: NOTE

For removal, installation and inspection, refer to the “4AT” section. <Ref. to 4AT-84, Reduction Drive Gear.>

9. Reduction Driven Gear

A: NOTE

For removal, installation and inspection, refer to the “4AT” section. <Ref. to 4AT-82, Reduction Driven Gear.>

10.Center Differential

A: NOTE

For removal, installation and inspection, refer to the “5MT” section. <Ref. to 5MT-47, Center Differential.>

11.Transfer Clutch Pressure Test

A: NOTE

For inspection, refer to the “4AT” section. <Ref. to 4AT-34, Transfer Clutch Pressure Test.>

DRIVE SHAFT SYSTEM

DS

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2.	Propeller Shaft	10
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4.	Front Hub Unit Bearing	17
5.	Rear Axle	19
6.	Rear Hub Unit Bearing	24
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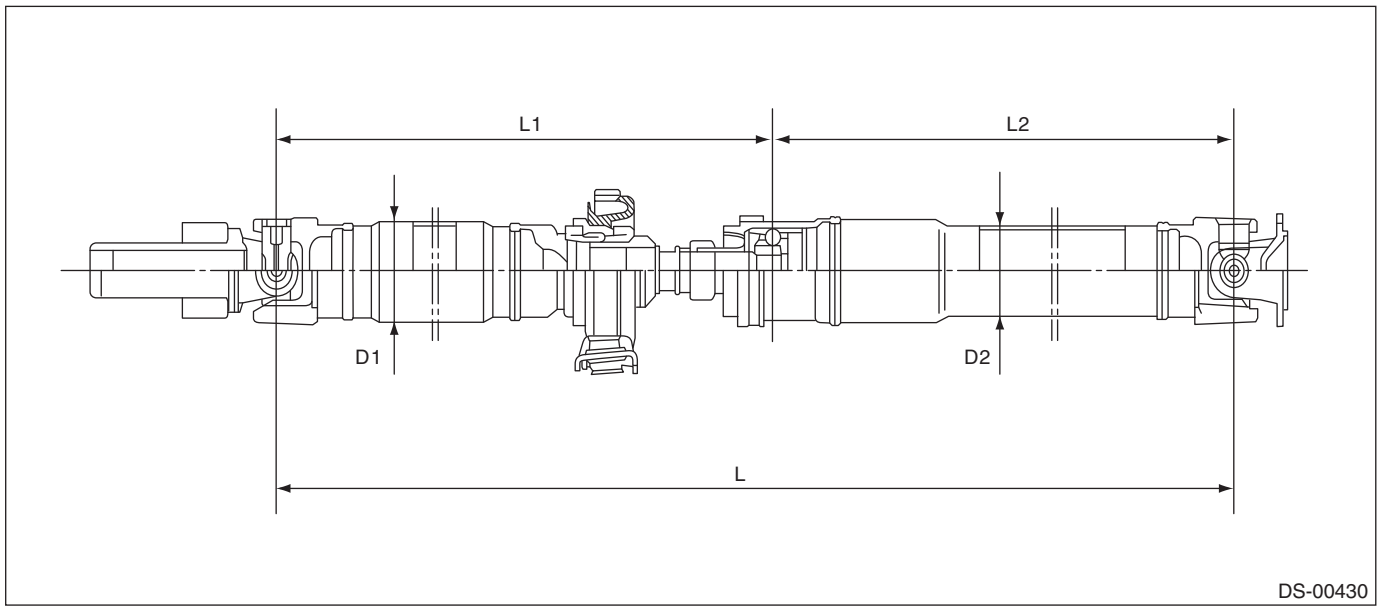
1. General Description

A: SPECIFICATION

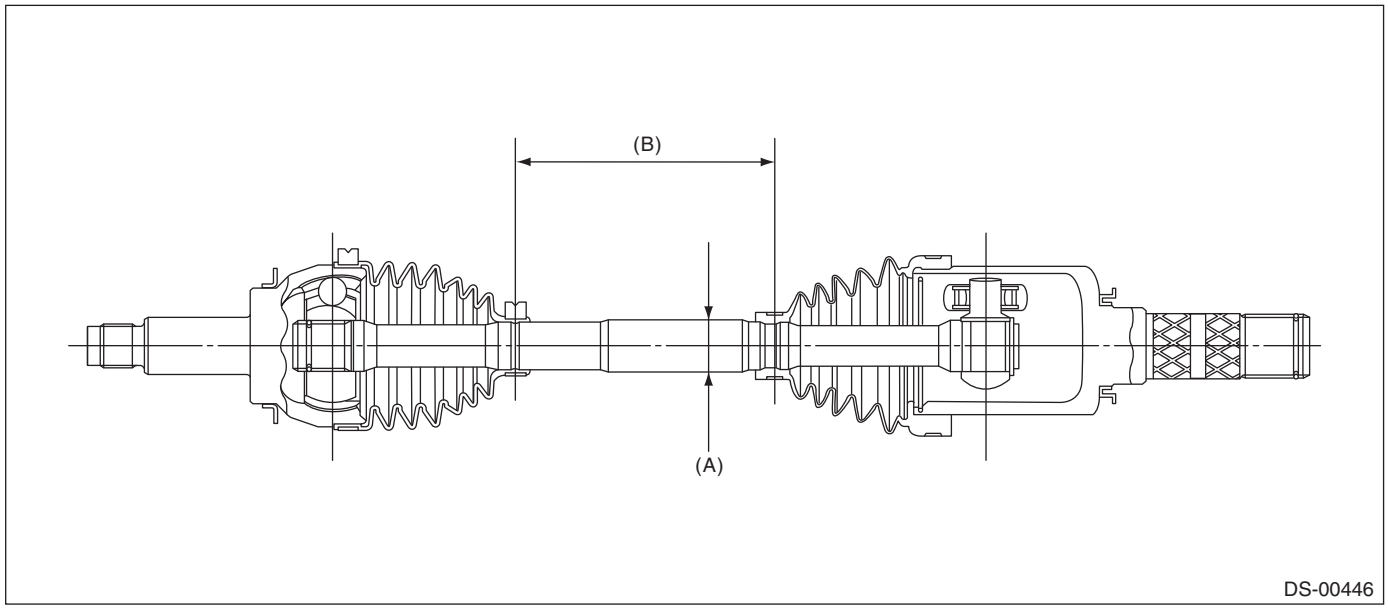
1. PROPELLER SHAFT

Car line			All models
Propeller shaft type			EDJ
Front propeller shaft Joint-to-joint length: L_1	mm (in)	AT	675.5 (26.59)
		MT	735.5 (28.96)
Rear propeller shaft Joint-to-Joint length: L_2		mm (in)	698 (27.48)
Outer diameter of tube:	mm (in)	D_1	63.5 (2.500)
		D_2	57.5 (2.264)



2. FRONT DRIVE SHAFT ASSEMBLY

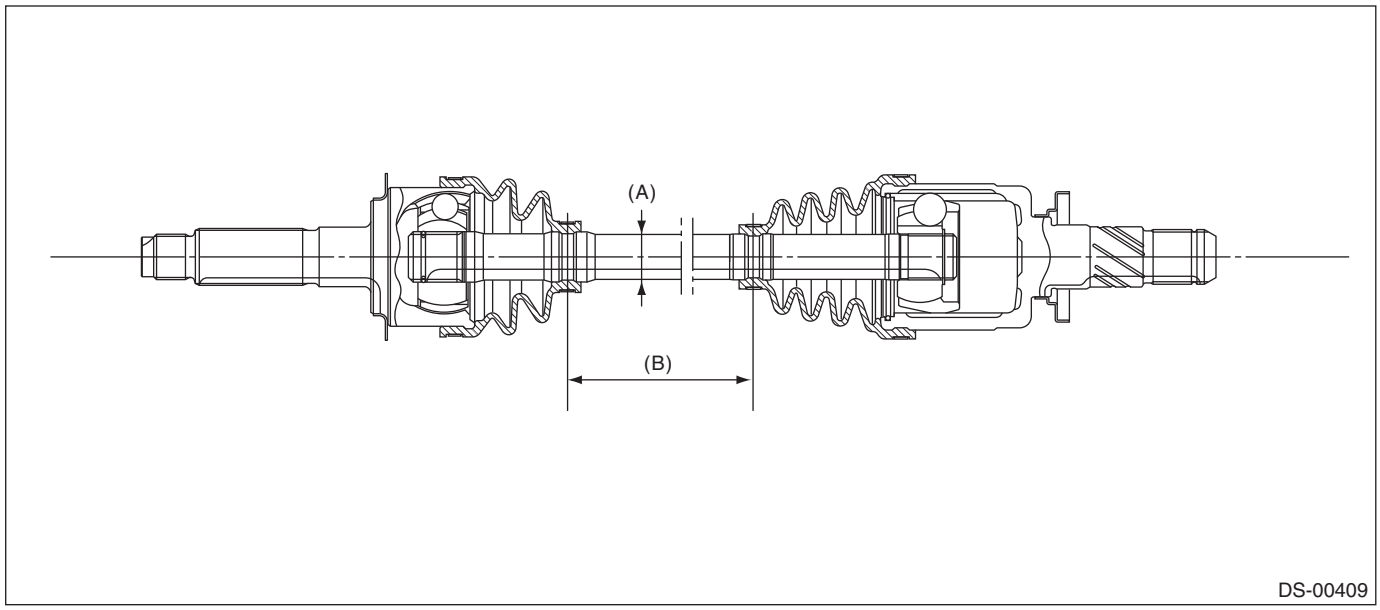
Model	Type of drive shaft	Axle diameterϕ mm (in)	Axle length mm (in)
All models	EBJ + PTJ	26 (1.02)	347 (13.66)



(A) Axle diameter (B) Axle length

3. REAR DRIVE SHAFT ASSEMBLY

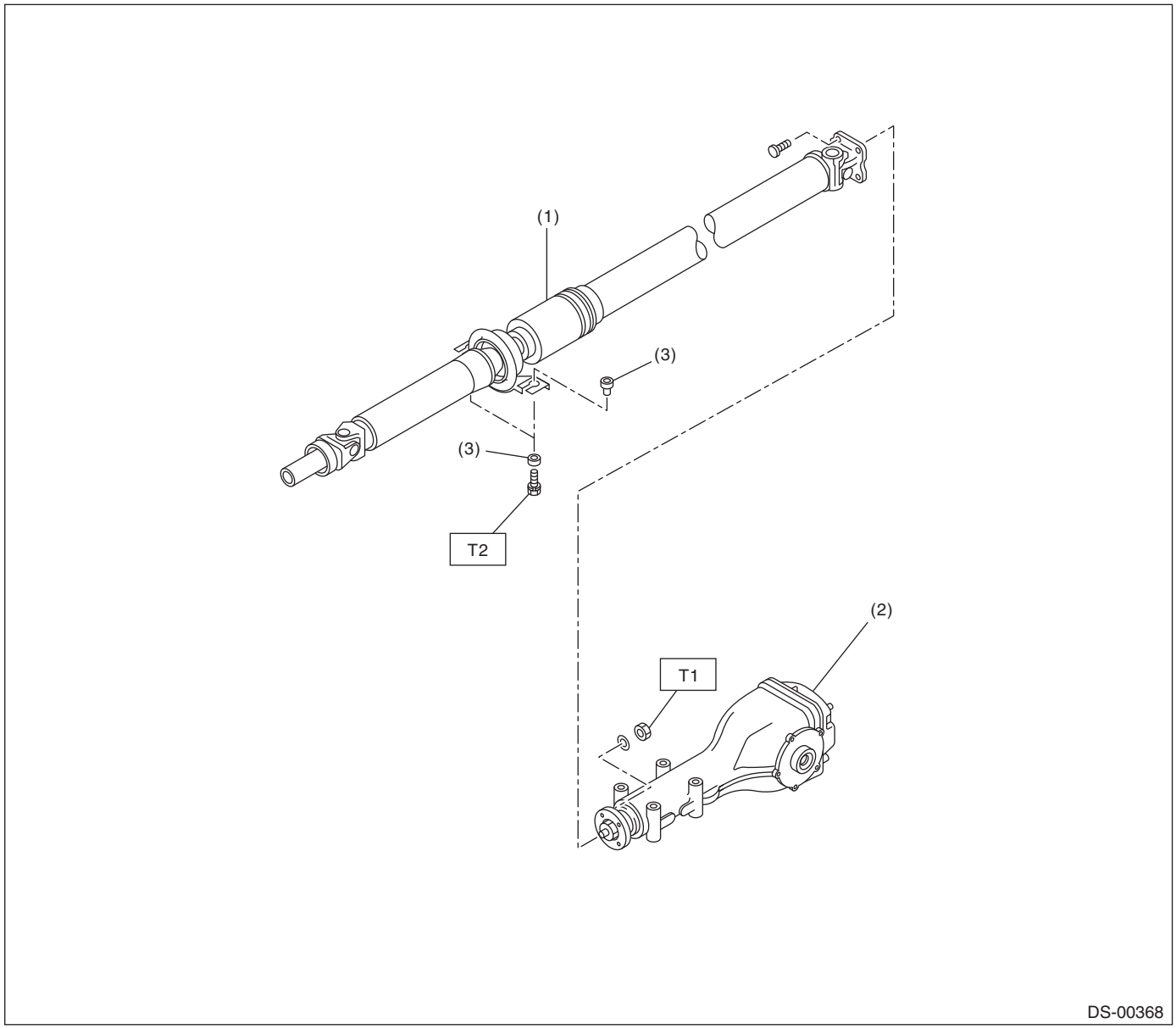
Model	Type of drive shaft	Axle diameterϕ mm (in)	Axle length mm (in)
All models	EBJ + DOJ	22 (0.87)	383.1 (15.08)



(A) Axle diameter (B) Axle length

B: COMPONENT

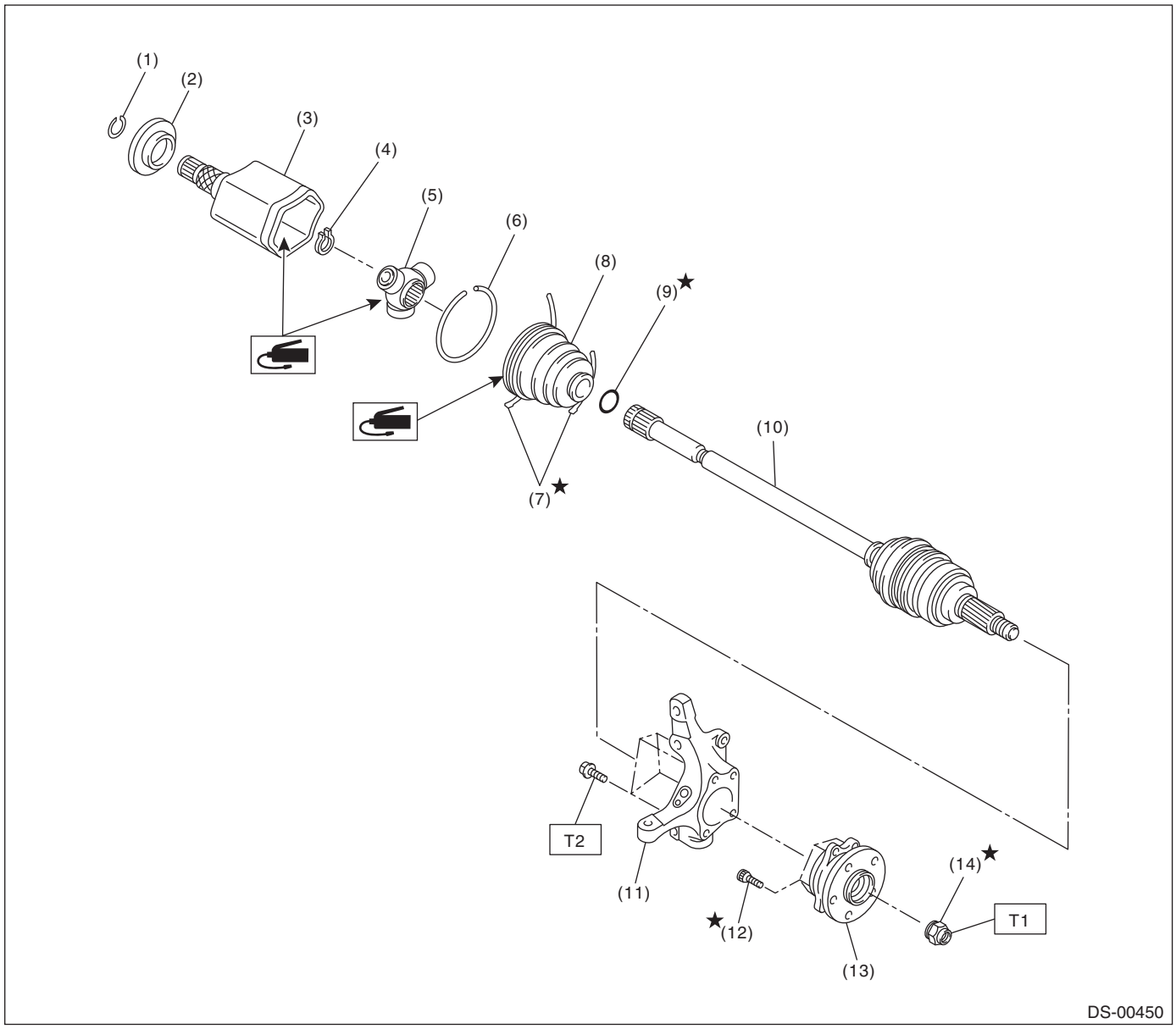
1. PROPELLER SHAFT



(1) Propeller shaft
(2) Rear differential
(3) Bushing

Tightening torque:N·m (kgf-m, ft-lb)
T1: 31 (3.16, 22.9)
T2: 52 (5.30, 38.4)

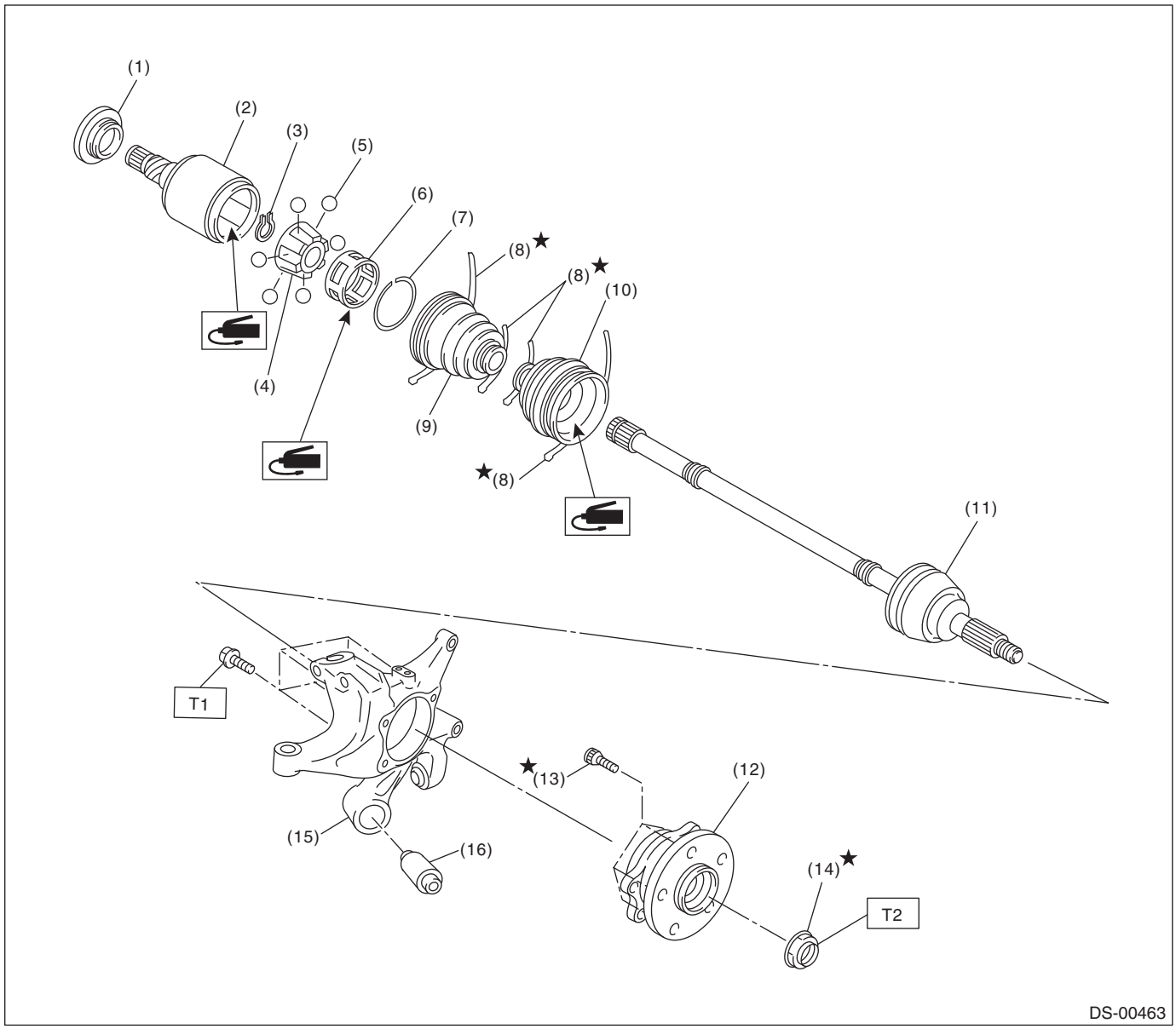
2. FRONT AXLE



(1) Circlip
(2) Baffle plate
(3) Outer race (PTJ)
(4) Snap ring
(5) Trunnion
(6) Snap ring
(7) Boot band
(8) Boot (PTJ)
(9) O-ring
(10) EBJ shaft ASSY
(11) Housing
(12) Hub bolt
(13) Front hub unit bearing
(14) Axle nut

Tightening torque:N·m (kgf-m, ft-lb)
T1: 220 (22.43, 162.3)
T2: 65 (6.63, 47.9)

3. REAR AXLE



(1) Baffle plate
(2) Outer race (DOJ)
(3) Snap ring
(4) Inner race
(5) Ball
(6) Cage
(7) Snap ring
(8) Boot band
(9) Boot (DOJ)
(10) Boot (EBJ)
(11) EBJ shaft ASSY
(12) Rear hub unit bearing
(13) Hub bolt
(14) Axle nut
(15) Rear axle housing
(16) Rear bushing

Tightening torque:N·m (kgf-m, ft-lb)
T1: 65 (6.63, 47.9)
T2: 190 (19.37, 140.1)

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 materials such as wood blocks, aluminum plates, or waste cloth between the part and the vise.

D: PREPARATION TOOL

1. SPECIAL TOOL

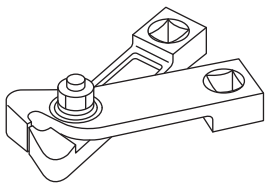
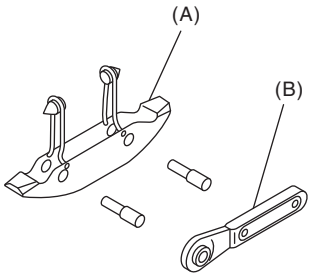
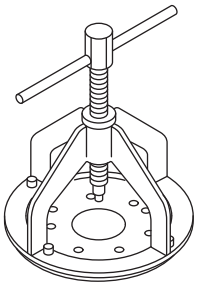
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST28099AC000	28099AC000	BOOT BAND PLIER	Used for tightening the boot band. (Front PTJ boot band)
 ST-925091000	925091000	BAND TIGHTENING TOOL	Used for tightening the boot band. (A) Jig for the band (B) Ratchet wrench
 ST-926470000	926470000	AXLE SHAFT PULLER	• Used for removing the axle shaft. • Used together with AXLE SHAFT PULLER PLATE (28099PA110).

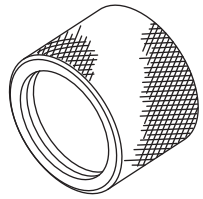
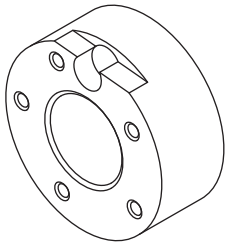
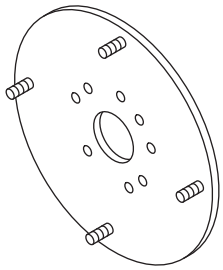
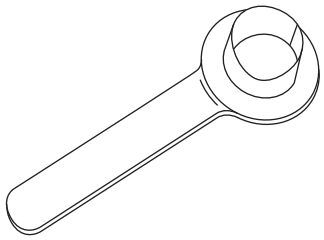
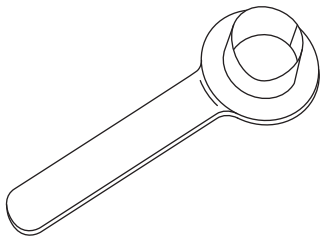
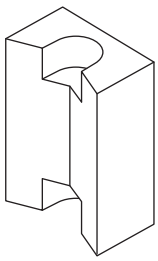
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18675AA000	18675AA000	DIFFERENTIAL SIDE OIL SEAL INSTALLER	Used for installing the differential side retainer oil seal.
 ST-927080000	927080000	HUB STAND	Used for assembling hub bolt in hub.
 ST28099PA110	28099PA110	AXLE SHAFT PULLER PLATE	Exchange with the plate of the AXLE SHAFT PULLER (926470000) to use.
 ST28099PA090	28099PA090	OIL SEAL PROTECTOR	• Used for installing the rear drive shaft to the rear differential. • For protecting the oil seal.
 ST28399SA010	28399SA010	OIL SEAL PROTECTOR	• Used for installing front drive shaft into front differential. • For protecting the oil seal.

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST28399AG000	28399AG000	HUB STAND	Used for extracting hub bolt.

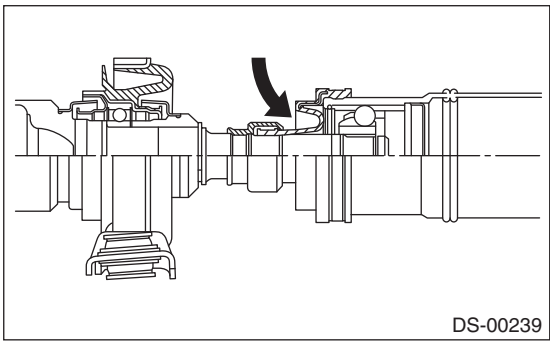
2. GENERAL TOOL

TOOL NAME	REMARKS
Puller	Used for removing the ball joint from knuckle arm.
Dial gauge	Used for inspecting the propeller shaft run-out.
Extension cap	Used for preventing leakage of gear oil or ATF.
Bar	Used for extracting drive shaft.

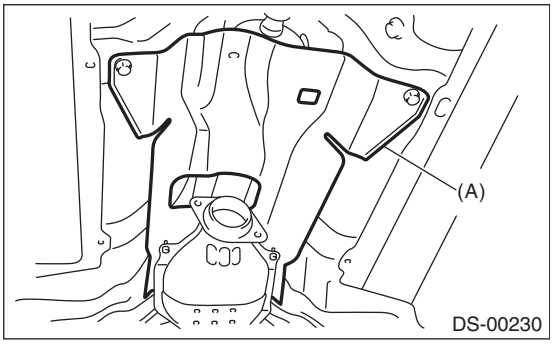
2. Propeller Shaft

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 center EDJ with a cloth or rubber material before removing propeller shaft, as shown in the figure. The rubber boot may be damaged due to interference with adjacent metal parts while bending the EDJ during removal.


DS-00239

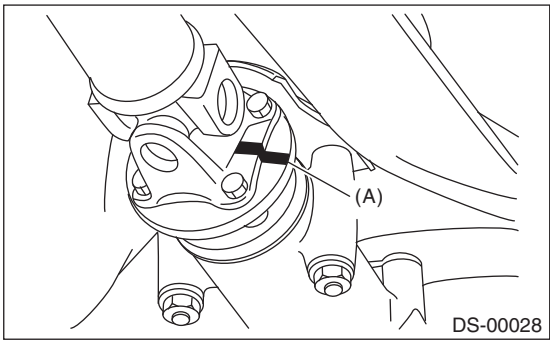
1) Disconnect the ground cable from battery.
2) Shift the select lever or gear shift lever to neutral.
3) Release the parking brake.
4) Lift up the vehicle.
5) Remove the center exhaust pipe.
6) Remove the rear exhaust pipe and muffler.
7) Remove the heat shield cover.



DS-00230

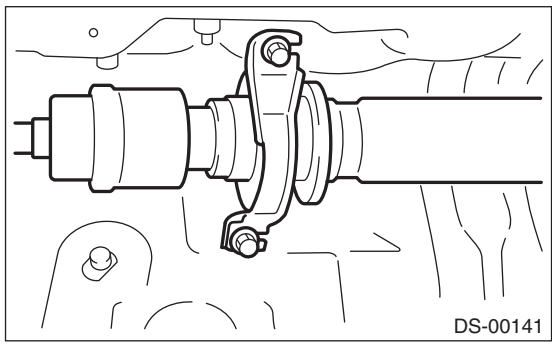
(A) Heat shield cover

8) Make alignment marks (A) on the flange yoke and rear differential before removal.



DS-00028

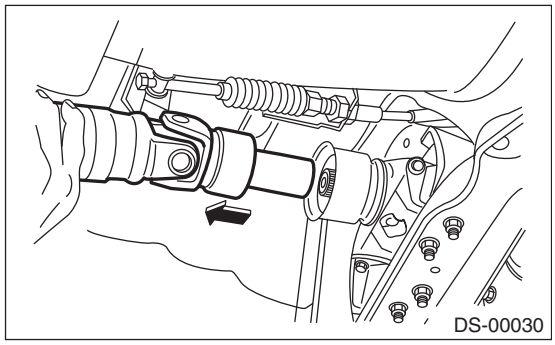
9) Remove the three bolts holding the propeller shaft to the rear differential.
10) Remove the remaining bolt.
11) Remove the two bolts which hold center bearing to vehicle body.


DS-00141

12) Remove the propeller shaft from transmission.

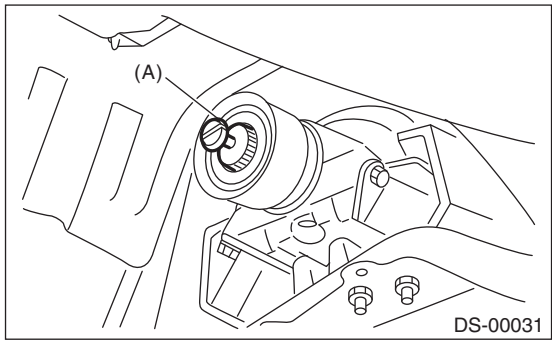
CAUTION:
• Be careful not to damage oil seals and contact surface of the sleeve yoke.
• Cover the center exhaust pipe with a cloth to keep off any ATF or oil spilled from transmission when removing propeller shaft.

NOTE:
Use a container to catch ATF or oil flowing from propeller shaft.


DS-00030

13) Install extension cap (A) to the transmission.

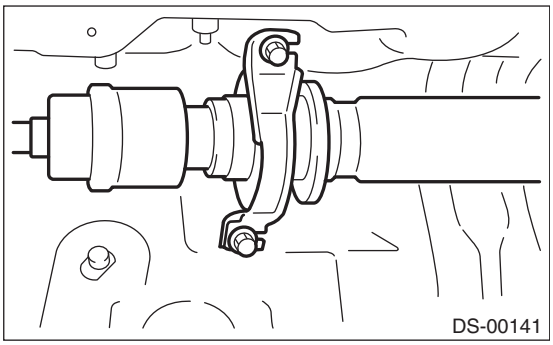
NOTE:
If extension cap (A) is not available, place vinyl bag over opening and fasten with string to prevent gear oil or ATF from leaking.



DS-00031

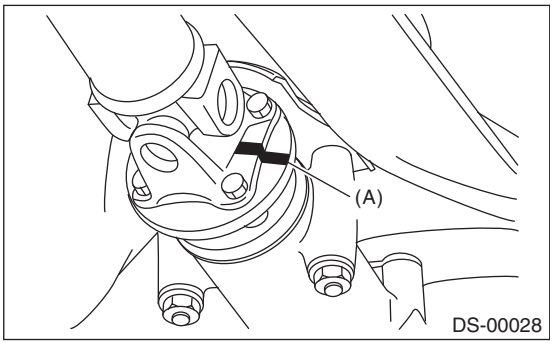
B: INSTALLATION

1) Insert the sleeve yoke into the transmission and attach center bearing to body.



Tightening torque:
52 N·m (5.30 kgf-m, 38.3 ft-lb)

2) Align the alignment marks (A), and connect the flange yoke and rear differential.



Tightening torque:
31 N·m (3.16 kgf-m, 22.9 ft-lb)

3) Install the heat shield cover.
4) Install the center exhaust pipe.
5) Install the rear exhaust pipe and muffler.
6) Lower the vehicle.
7) Connect the battery ground terminal.

C: INSPECTION

NOTE:
Do not disassemble propeller shaft. Check the following and replace if necessary.

- Dents or cracks on the tube surface
- Splines for deformation or abnormal wear
- Unsmooth joint operation or abnormal noise
- Center bearing for free play, noise or non-smooth operation.
- Oil seals for abnormal wear or damage
- Damaged center bearing

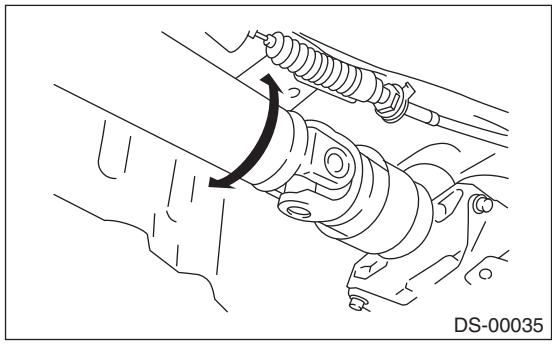
Check the following points with propeller shaft installed in vehicle.

1. JOINTS AND CONNECTORS

1) Remove the center exhaust pipe.
2) Remove the heat shield cover.
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

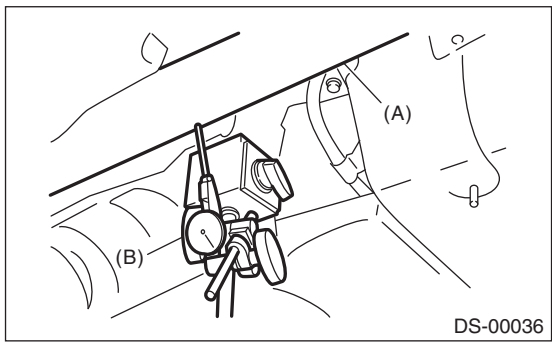
1) Remove the center exhaust pipe.
2) Remove the rear exhaust pipe and muffler.
3) Remove the heat shield cover.
4) Turn the propeller shaft by hand to see if abnormal free play exists at splines. Also move yokes to see if abnormal free play exists at spiders and bearings.



3. RUNOUT OF PROPELLER SHAFT

1) Remove the center exhaust pipe.
2) Remove the rear exhaust pipe and muffler.
3) Remove the heat shield cover.
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.

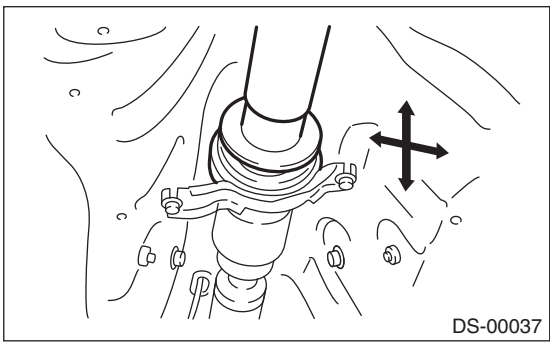
Runout:
Limit: 0.6 mm (0.024 in)



(A) Propeller shaft
(B) Dial gauge

4. CENTER BEARING FREE PLAY

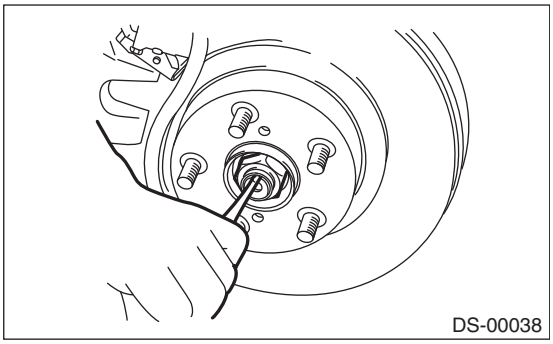
1) Remove the front and center exhaust pipes.
2) Remove the rear exhaust pipe and muffler.
3) Remove the heat shield cover.
4) Move the propeller shaft near the center bearing up, down, left, right by hand, to check for any abnormal free play of the bearings.



3. Front Axle

A: REMOVAL

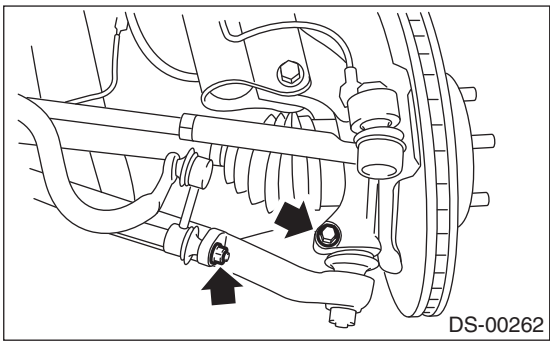
1) Lift up the vehicle, and then remove the front wheels.
2) Lift the crimped section of axle nut.



3) Remove the axle nut using a socket wrench while depressing the brake pedal.

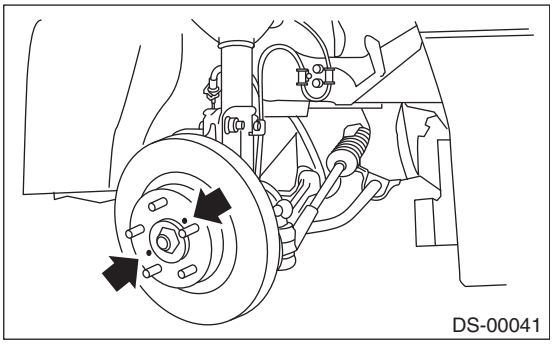
CAUTION:
Remove the wheel before loosening the axle nut. Failure to follow this rule may damage the hub bearings.

4) Remove the stabilizer link.

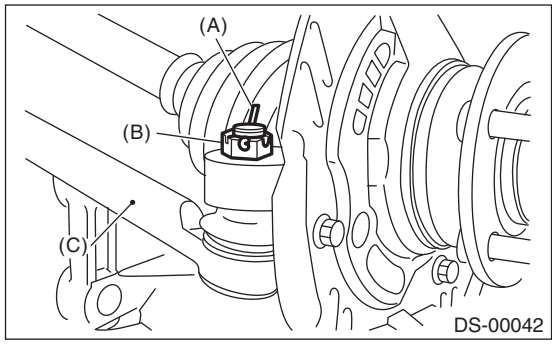


5) Remove the disc brake caliper from the housing, and suspend it from strut using a wire.
6) Remove the disc rotor from the hub.

NOTE:
If it is difficult to remove the disc rotor from the hub, drive the 8 mm bolt into the threaded end of rotor, and then remove the rotor.

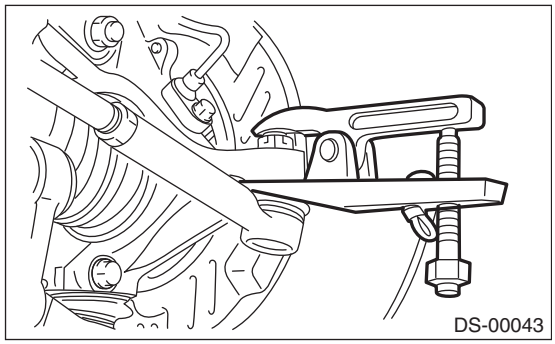


7) Remove the cotter pin and castle nut securing the tie-rod end to the housing knuckle arm.

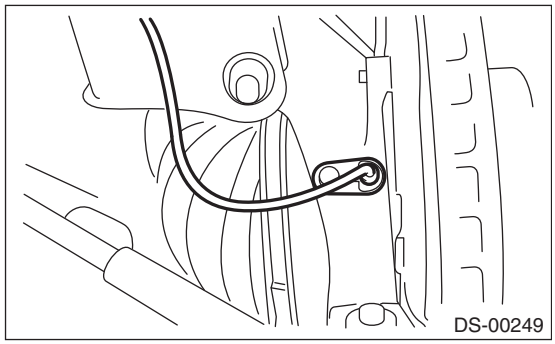


(A) Cotter pin
(B) Castle nut
(C) Tie-rod

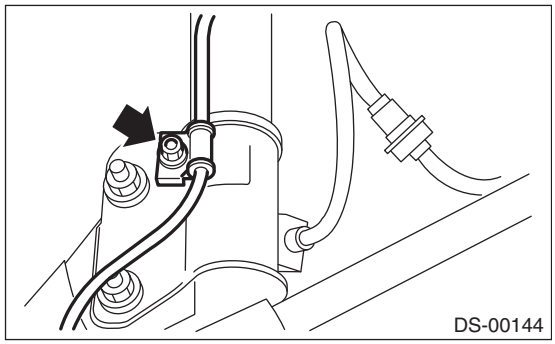
8) Using a puller, remove the tie-rod ball joint from knuckle arm.



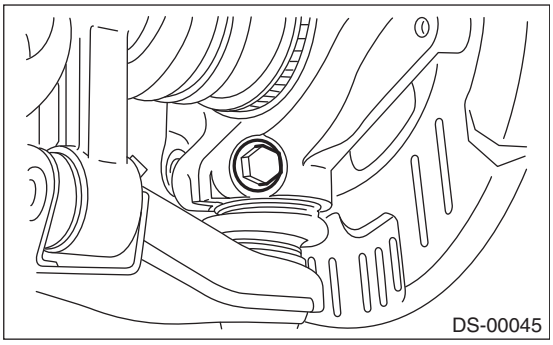
9) Remove the front ABS wheel speed sensor.



10) Remove the bolts which secure the sensor harness to the strut.

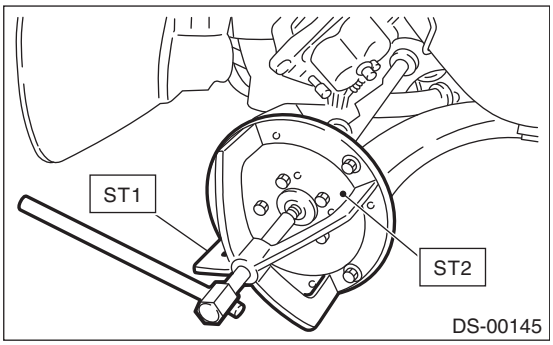


11) Remove the front arm ball joint from the housing.

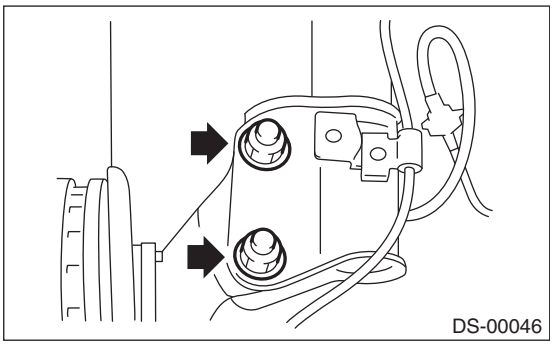


12) Remove the front drive shaft from the transmission.
13) Remove the front drive shaft assembly from the hub. If it is hard to remove, use the ST.

ST1	926470000	AXLE SHAFT PULLER
ST2	28099PA110	AXLE SHAFT PULLER PLATE



14) After scribing an alignment mark on camber adjusting bolt head, remove the bolts which connect the housing and strut, and disconnect the housing from strut.



B: INSTALLATION

1) Align the alignment mark on the camber adjusting bolt head, and tighten the housing and strut using a new self-locking nut.

Tightening torque:
155 N·m (15.81 kgf-m, 114.3 ft-lb)

2) Install the front drive shaft. <Ref. to DS-27, INSTALLATION, Front Drive Shaft.>
3) Install the front arm ball joint to the housing.

Tightening torque:
50 N·m (5.10 kgf-m, 36.9 ft-lb)

4) Install the front ABS wheel speed sensor harness to the strut.
5) Install the front ABS wheel speed sensor on the housing.

Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

6) Install the disc rotor to hub.
7) Install the disc brake caliper on the housing.

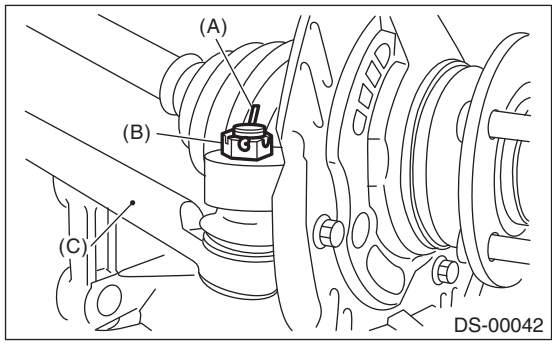
Tightening torque:
80 N·m (8.16 kgf-m, 59 ft-lb)

8) Install the stabilizer link.
9) Connect the tie-rod end ball joint to the knuckle arm with a castle nut.

CAUTION:
When connecting the tie-rod, do not hit the cap at bottom of tie-rod end with a hammer.

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

10) Tighten the castle nut to specified torque and tighten further within 60° until the pin hole is aligned with the slot in the nut. Bend the cotter pin to lock.



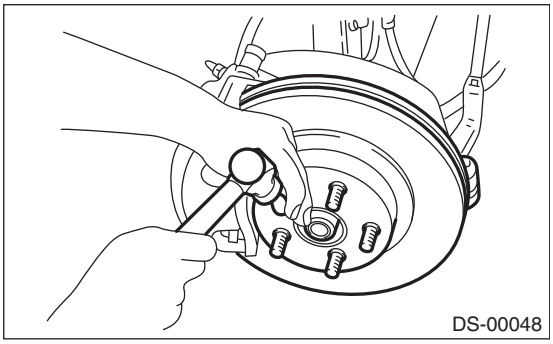
(A) Cotter pin
(B) Castle nut
(C) Tie-rod

11) While depressing the brake pedal, tighten a new axle nut to the specified torque and lock it securely.

CAUTION:
• Do not apply weight to the front axle before tightening the axle nut. Doing so may damage the hub bearing.
• Do not overtighten the nuts as this may damage the hub bearing.

Tightening torque:
220 N·m (22.43 kgf-m, 162.3 ft-lb)

12) After tightening the axle nut, lock it securely.


DS-00048

13) Install the wheel.

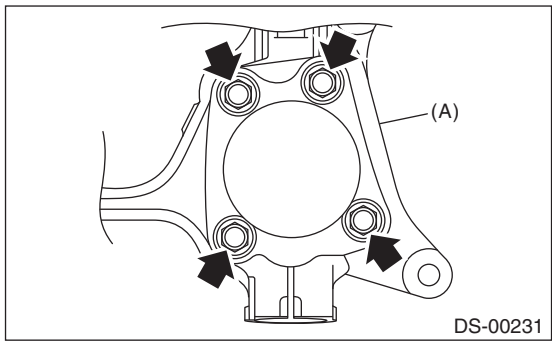
Tightening torque:
100 N·m (10.20 kgf-m, 73.8 ft-lb)

14) Inspect the wheel alignment and adjust if necessary. <Ref. to FS-6, INSPECTION, Wheel Alignment.>

15) Perform reinitialization of the auto headlight beam leveler system. (model with auto headlight beam leveler) <Ref. to LI-16, PROCEDURE, Auto Headlight Beam Leveler System.>

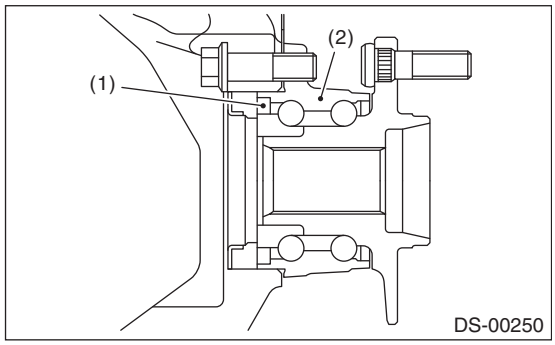
C: DISASSEMBLY

1) Remove the four bolts from the housing (A), and remove the front hub unit bearing and disc cover.



DS-00231

CAUTION:
• Do not get closer the tool which charged magnetism to magnetic encoder.
• Be careful not to damage the magnetic encoder.



DS-00250

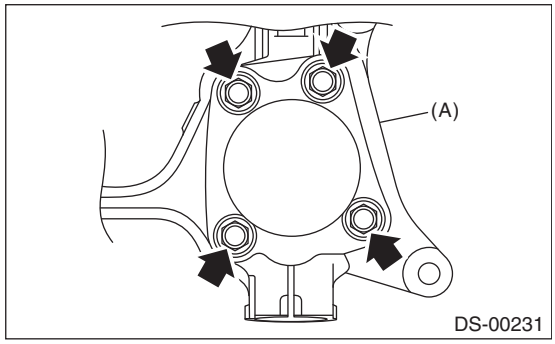
(1) Magnetic encoder
(2) Front hub unit bearing

2) Disassemble the front hub unit bearing. <Ref. to DS-18, DISASSEMBLY, Front Hub Unit Bearing.>

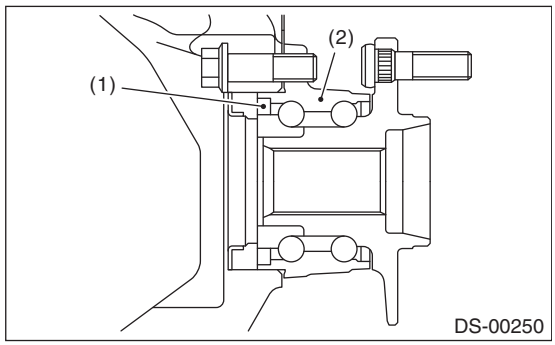
D: ASSEMBLY

1) Assemble the front hub unit bearing. <Ref. to DS-18, ASSEMBLY, Front Hub Unit Bearing.>
2) Place the disc cover between housing (A) and front hub unit, and tighten the four bolts.

Tightening torque:
65 N·m (6.63 kgf-m, 47.9 ft-lb)



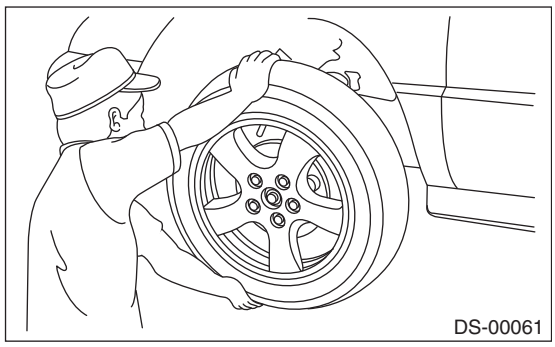
CAUTION:
• Do not get closer the tool which charged magnetism to magnetic encoder.
• Be careful not to damage the magnetic encoder.



(1) Magnetic encoder
(2) Front hub unit bearing

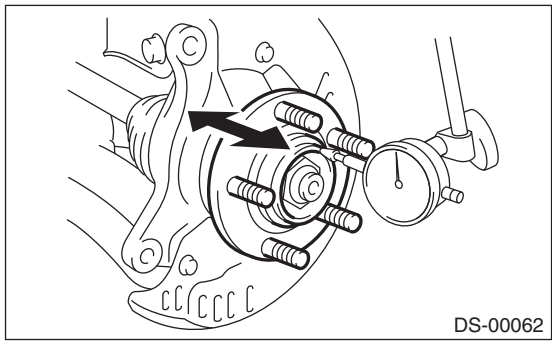
E: INSPECTION

1) Moving the front tire up and down by hand, check there is no play in bearing, and check the wheel rotates smoothly.



2) Inspect the lean of axis direction using a dial gauge. Replace the bearing if the load range exceeds the limitation.

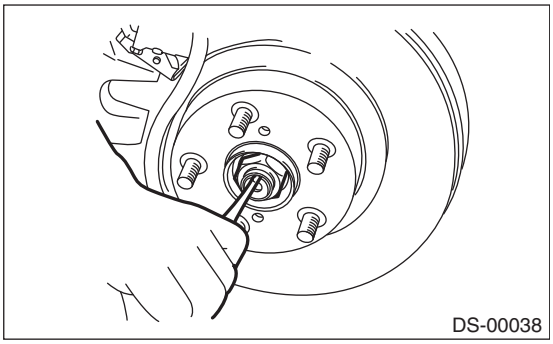
Service limit:
Maximum: 0.05 mm (0.0020 in)



4. Front Hub Unit Bearing

A: REMOVAL

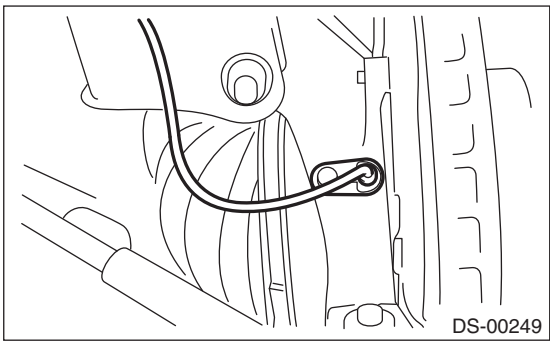
1) Lift up the vehicle, and then remove the front wheels.
2) Lift the crimped section of axle nut.



3) Remove the axle nut using a socket wrench while depressing the brake pedal.

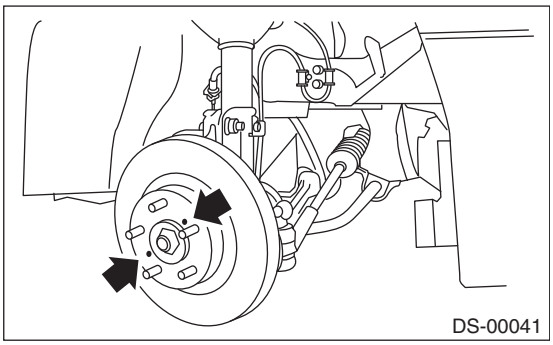
CAUTION:
Remove the wheel before loosening the axle nut. Failure to follow this rule may damage the wheel bearings.

4) Remove the front ABS wheel speed sensor.

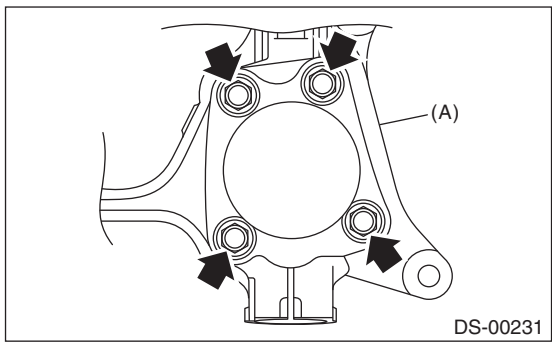


5) Remove the disc brake caliper from the housing, and suspend it from strut using a wire.
6) Remove the disc rotor from the hub.

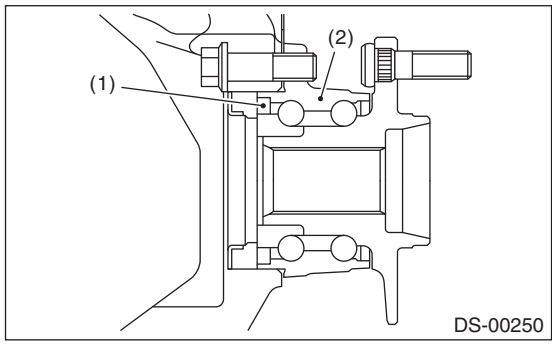
NOTE:
If it is difficult to remove the disc rotor from the hub, drive the 8 mm bolt into the threaded end of rotor, and then remove the rotor.



7) Remove the four bolts from the housing (A).



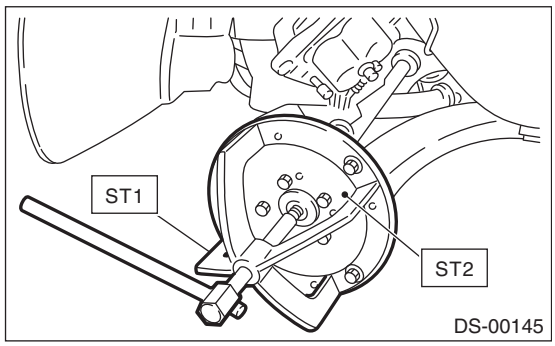
CAUTION:
• Do not get closer the tool which charged magnetism to magnetic encoder.
• Be careful not to damage the magnetic encoder.



(1) Magnetic encoder
(2) Front hub unit bearing

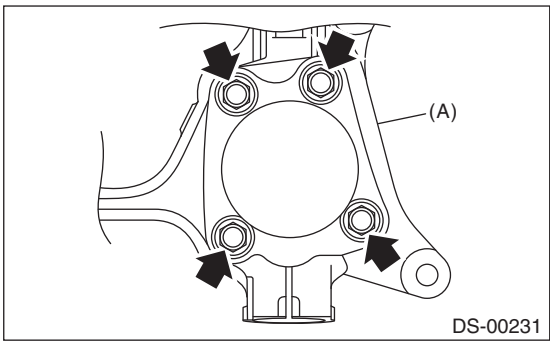
8) Remove the front hub unit bearing. If it is hard to remove, use the ST.

ST1	926470000	AXLE SHAFT PULLER
ST2	28099PA110	AXLE SHAFT PULLER PLATE



B: INSTALLATION

1) Place the disc cover between housing (A) and front hub unit, and tighten the four bolts.



Tightening torque:
65 N·m (6.63 kgf-m, 47.9 ft-lb)

2) Install the front drive shaft. <Ref. to DS-27, INSTALLATION, Front Drive Shaft.>
3) Tighten the axle nut temporarily.
4) Install the disc rotor to hub.
5) Install the disc brake caliper on the housing.

Tightening torque:
80 N·m (8.16 kgf-m, 59.0 ft-lb)

6) Install the front ABS wheel speed sensor on the housing.

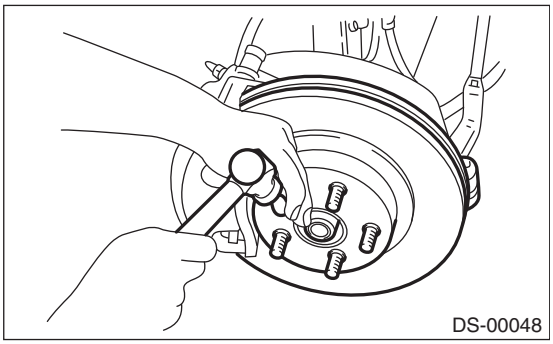
Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

7) While depressing the brake pedal, tighten a new axle nut to the specified torque and lock it securely.

CAUTION:
• Do not install wheel and let it touch the ground before tightening the axle nut. Failure to follow this rule may damage the axle bearing.
• Do not overtighten the nuts as this may damage the axle bearing.

Tightening torque:
220 N·m (22.43 kgf-m, 162.3 ft-lb)

8) After tightening the axle nut, lock it securely.



9) Install the wheel.

Tightening torque:
100 N·m (10.20 kgf-m, 73.8 ft-lb)

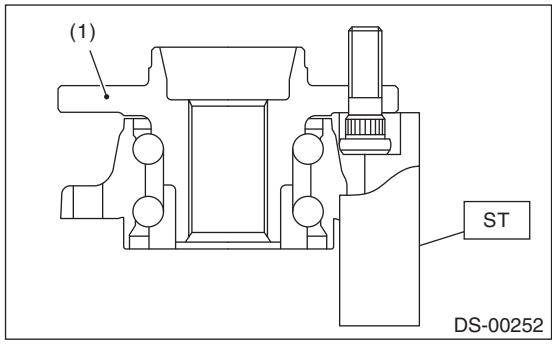
C: DISASSEMBLY

Using the ST and a hydraulic press, push out the hub bolts.

CAUTION:
• Be careful not to hammer the hub bolts. This may deform the hub.
• Do not reuse the hub bolt.

ST 28399AG000 HUB STAND

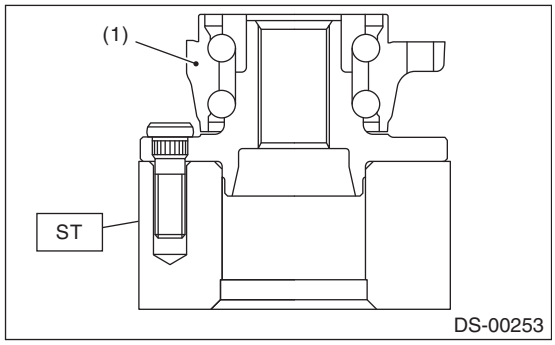
NOTE:
Since the hub unit bearing (1) can not be disassembled, only hub bolts can be removed.



D: ASSEMBLY

1) Attach the hub to the ST securely.

ST 927080000 HUB STAND



(1) Front hub unit bearing

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.

E: INSPECTION

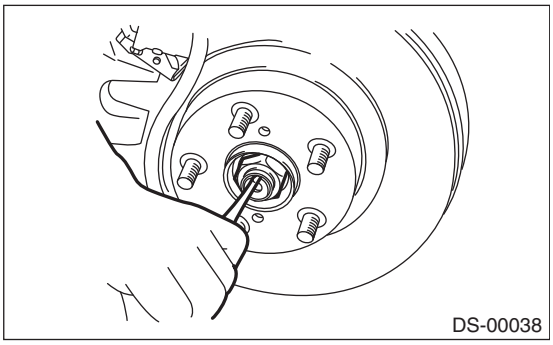
Refer to “Front Axle” for inspection procedures. <Ref. to DS-16, INSPECTION, Front Axle.>

CAUTION:
If there is any fault in the bearing, replace hub unit bearing.

5. Rear Axle

A: REMOVAL

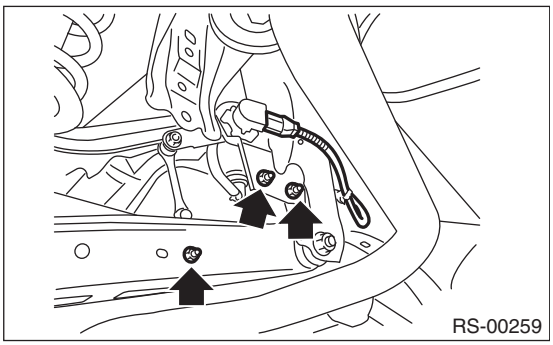
1) Disconnect the ground cable from battery.
2) Lift up the vehicle, and then remove the rear wheels.
3) Lift the crimped section of axle nut.



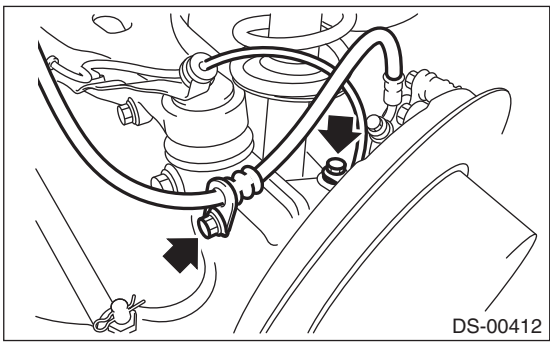
4) Remove the axle nut using a socket wrench while depressing the brake pedal.

CAUTION:
Remove the wheel before loosening the axle nut. Failure to follow this rule may damage the wheel bearings.

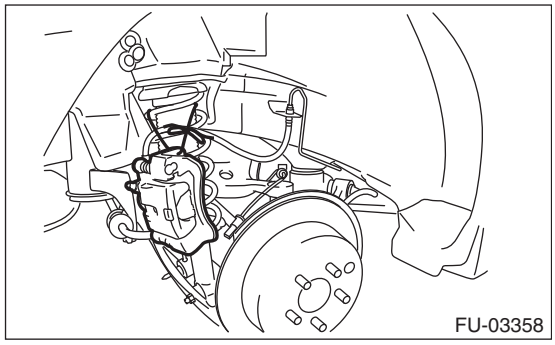
5) Disconnect the connector, and then remove the nut to remove the rear vehicle height sensor. (model with auto headlight beam leveler, left side only)



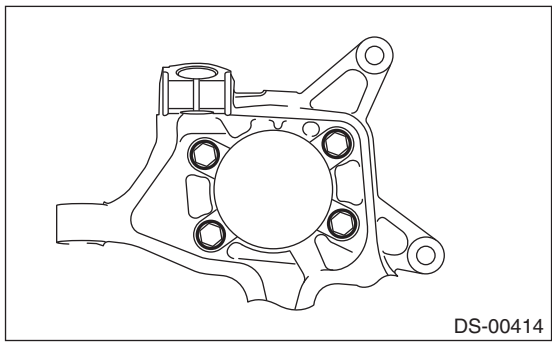
6) Remove the brake hose bracket and the rear ABS wheel speed sensor.



7) Remove the disc brake caliper from the rear housing, and suspend it from vehicle using a string.

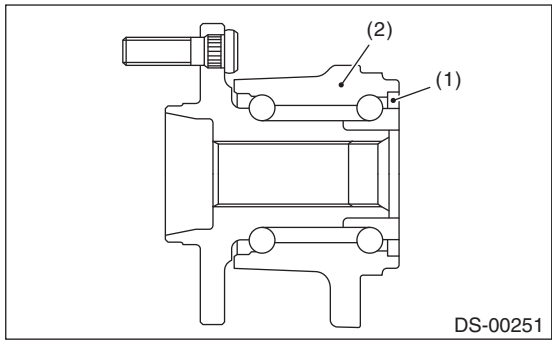


8) Remove the rear disc rotor.
9) Remove the four bolts from the rear housing.

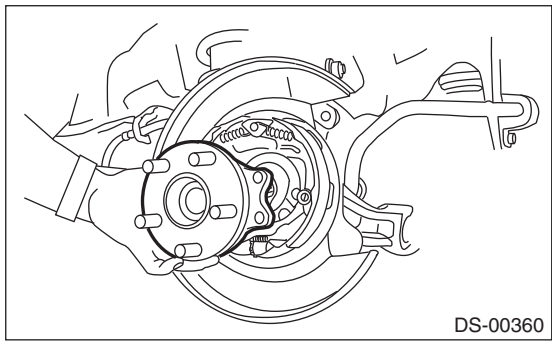


10) Remove the rear hub unit bearing.

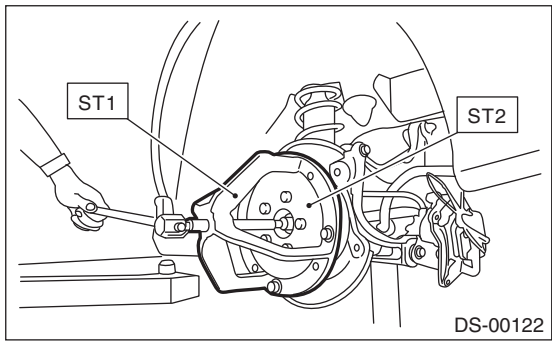
CAUTION:
• Be careful not to damage the magnetic encoder.
• Do not get closer the tool which charged magnetism to magnetic encoder.



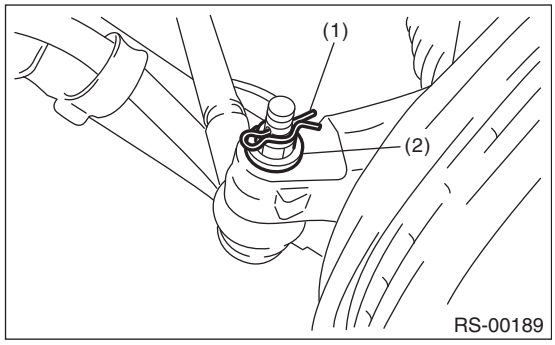
(1) Magnetic encoder
(2) Rear hub unit bearing



NOTE:
If it is hard to remove, use the ST.
ST1 926470000 AXLE SHAFT PULLER
ST2 28099PA110 AXLE SHAFT PULLER PLATE

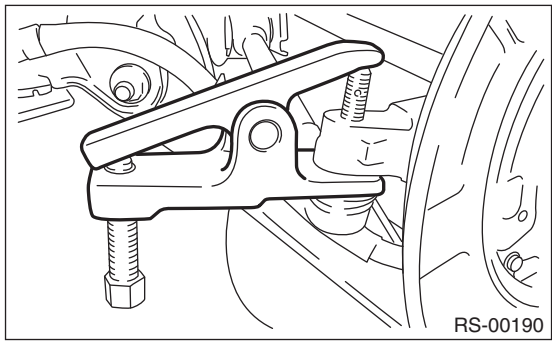


11) Remove the snap pin and nut from the front lateral link.

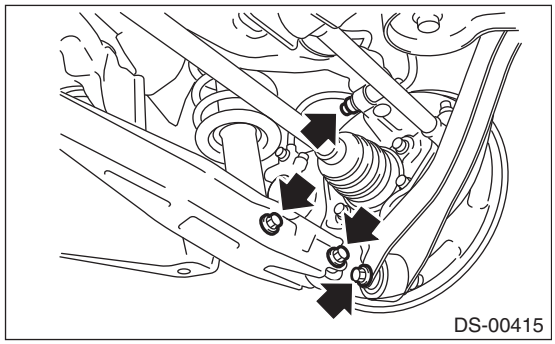


(1) Snap pin
(2) Nut

12) Separate the rear housing and the ball joint using the puller.



13) Separate the upper arm, trailing link and rear lateral link from the rear housing.

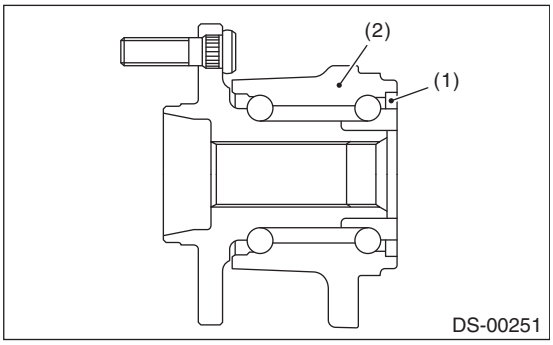


14) Remove the rear axle.

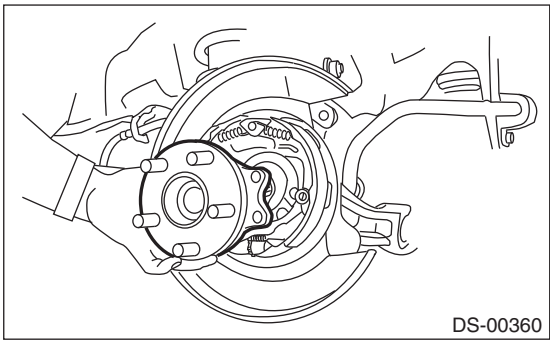
B: INSTALLATION

1) Temporarily tighten the rear housing to the upper arm.
2) Aligning with the mounting hole of the rear brake back plate, temporarily tighten the rear hub unit bearing to the rear housing.

CAUTION:
• Be careful not to damage the magnetic encoder.
• Do not get closer the tool which charged magnetism to magnetic encoder.



(1) Magnetic encoder
(2) Rear hub unit bearing



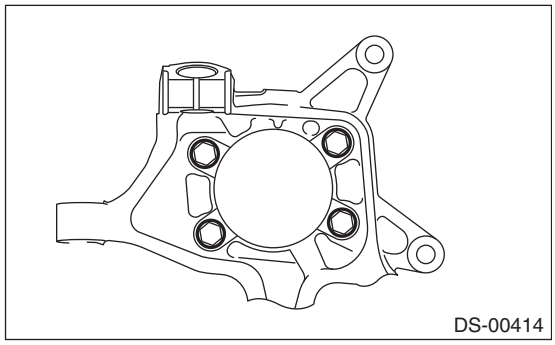
3) Attach the rear drive shaft to the rear hub unit bearing.
4) Tighten the new axle nut temporarily.

CAUTION:
Use new axle nuts.
5) Attach the links to the rear housing and tighten them to the specified torque.

Tightening torque:
Upper arm
80 N·m (8.16 kgf-m, 59.0 ft-lb)
Front lateral link
60 N·m (6.12 kgf-m, 44.3 ft-lb)
Rear lateral link
120 N·m (12.20 kgf-m, 88.5 ft-lb)
Trailing link
90 N·m (9.18 kgf-m, 66.4 ft-lb)

6) Tighten the four bolts of the rear housing.

Tightening torque:
65 N·m (6.63 kgf-m, 47.9 ft-lb)



7) Install the rear disc rotor.
8) Install the rear disc brake caliper on the rear housing.

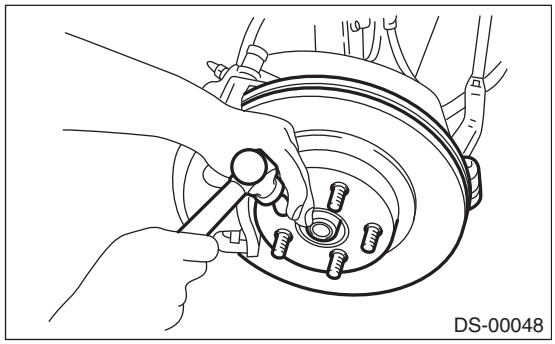
Tightening torque:
66 N·m (6.73 kgf-m, 48.7 ft-lb)
9) Install the brake hose bracket and rear ABS wheel speed sensor.

Tightening torque:
Brake hose bracket
33 N·m (3.36 kgf-m, 24.3 ft-lb)
Rear ABS wheel speed sensor
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)
10) Install the rear vehicle height sensor. (model with auto headlight beam leveler, left side only)

Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)
11) While pressing the brake pedal, tighten the new axle nuts to the specified torque.

CAUTION:
• Do not apply weight to the rear axle before tightening the axle nut. Doing so may damage the hub bearing.
• Do not overtighten the nuts as this may damage the hub bearing.

Tightening torque:
190 N·m (19.37 kgf-m, 140.1 ft-lb)
12) After tightening the axle nut, lock it securely.



13) Install the rear wheels.

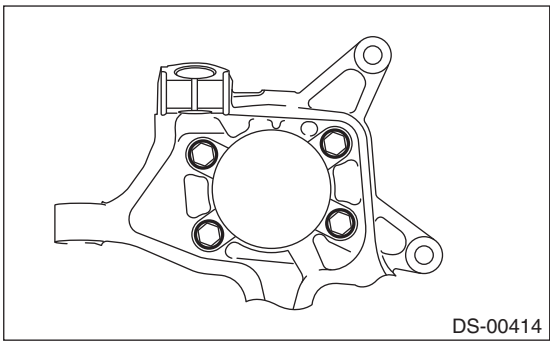
Tightening torque:
100 N·m (10.20 kgf-m, 73.8 ft-lb)

14) Connect the battery ground terminal.
15) Inspect the wheel alignment and adjust if necessary. <Ref. to FS-6, INSPECTION, Wheel Alignment.>
16) Perform reinitialization of the auto headlight beam leveler system. (model with auto headlight beam leveler) <Ref. to LI-16, PROCEDURE, Auto Headlight Beam Leveler System.>

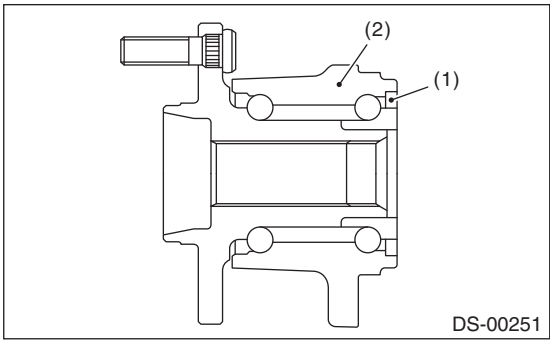
C: DISASSEMBLY

1. REAR HUB UNIT BEARING

1) Remove the four bolts from the rear housing, and remove the rear hub unit bearing and back plate.



CAUTION:
• Be careful not to damage the magnetic encoder.
• Do not get closer the tool which charged magnetism to magnetic encoder.



(1) Magnetic encoder
(2) Rear hub unit bearing

2) Disassemble the rear hub unit bearing. <Ref. to DS-25, DISASSEMBLY, Rear Hub Unit Bearing.>

2. BUSHING

For the removal procedure of bushing, refer to “Rear Trailing Link” in “REAR SUSPENSION”. <Ref. to RS-11, REAR HOUSING BUSHING, DISASSEMBLY, Rear Trailing Link.>

D: ASSEMBLY

1. REAR HUB UNIT BEARING

Assemble each part in the reverse order of disassembly.

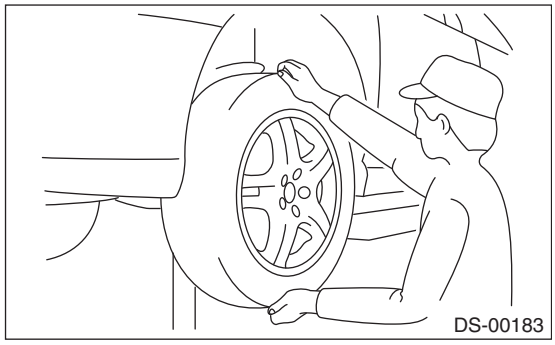
Tightening torque:
Rear hub unit bearing
65 N·m (6.63 kgf-m, 47.9 ft-lb)

2. BUSHING

For the installation procedure of bushing, refer to “Rear Trailing Link” in “REAR SUSPENSION”. <Ref. to RS-12, REAR HOUSING BUSHING, ASSEMBLY, Rear Trailing Link.>

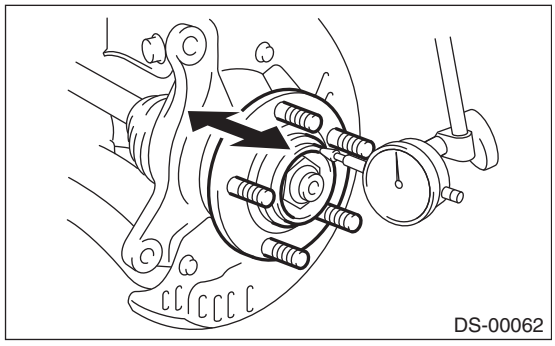
E: INSPECTION

1) Moving the rear tire up and down by hand, check that there is no backlash in bearing, and check that the wheel rotates smoothly.



2) Inspect the lean of axis direction using a dial gauge. Replace the bearing if the load range exceeds the limitation.

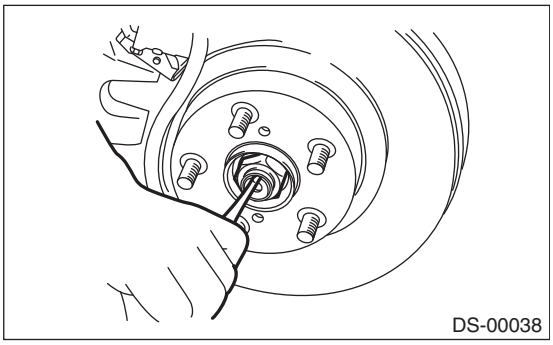
Service limit:
Maximum: 0.05 mm (0.0020 in)



6. Rear Hub Unit Bearing

A: REMOVAL

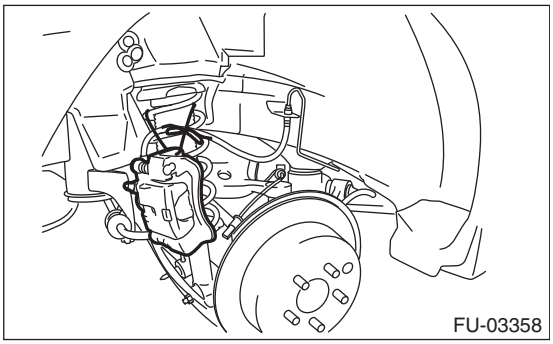
1) Disconnect the ground cable from battery.
2) Lift up the vehicle, and then remove the rear wheels.
3) Lift the crimped section of axle nut.



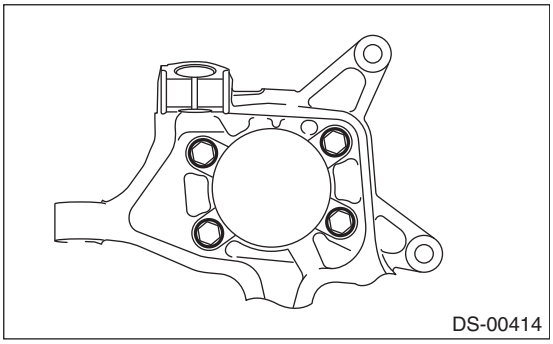
4) Remove the axle nut using a socket wrench while depressing the brake pedal.

CAUTION:
Remove the wheel before loosening the axle nut. Failure to follow this rule may damage the wheel bearings.

5) Remove the disc brake caliper from the rear housing, and suspend it from vehicle using a string.

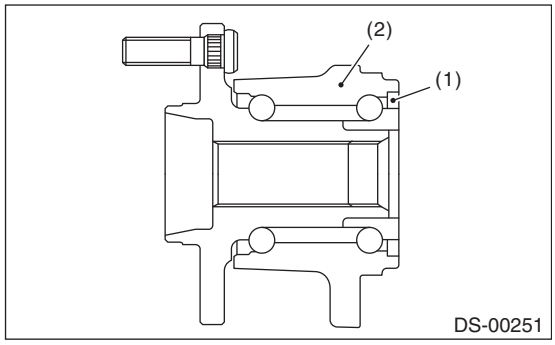


6) Remove the rear disc rotor.
7) Remove the four bolts from the rear housing.

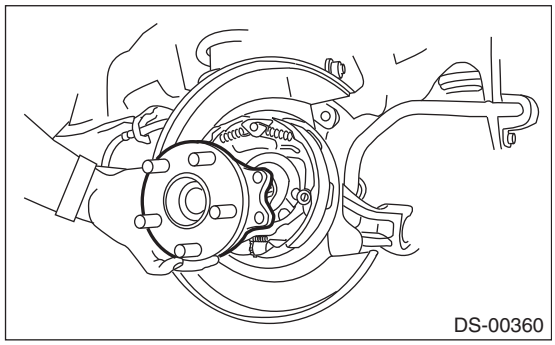


8) Remove the rear hub unit bearing.

CAUTION:
• Be careful not to damage the magnetic encoder.
• Do not get closer the tool which charged magnetism to magnetic encoder.

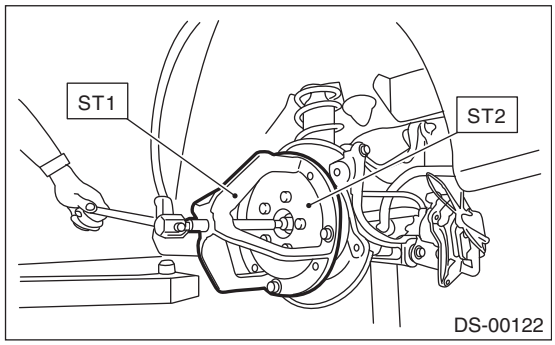


(1) Magnetic encoder
(2) Rear hub unit bearing



NOTE:
If it is hard to remove, use the ST.

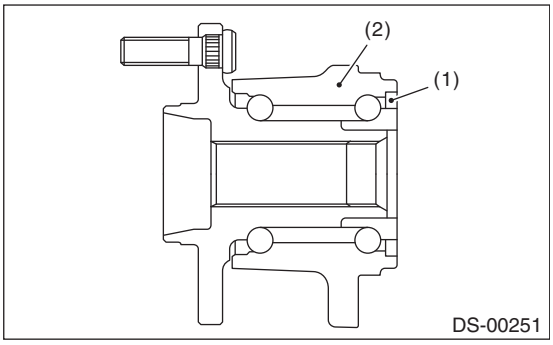
ST1	926470000	AXLE SHAFT PULLER
ST2	28099PA110	AXLE SHAFT PULLER PLATE



B: INSTALLATION

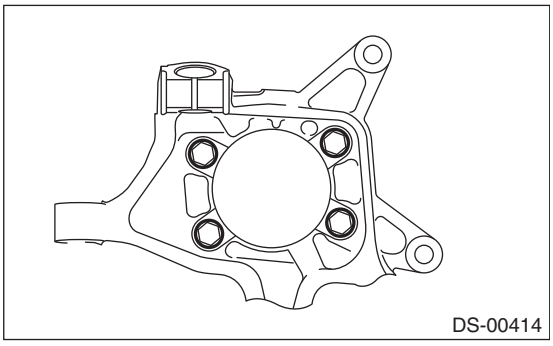
1) Aligning with the mounting hole of the rear brake back plate, temporarily tighten the rear hub unit bearing to the rear housing.

CAUTION:
• Be careful not to damage the magnetic encoder.
• Do not get closer the tool which charged magnetism to magnetic encoder.



(1) Magnetic encoder
(2) Rear hub unit bearing

2) Tighten the four bolts of the rear housing.



Tightening torque:
65 N·m (6.63 kgf-m, 47.9 ft-lb)

3) Tighten the new axle nut temporarily.

CAUTION:
Use new axle nuts.

4) Install the rear disc rotor.
5) Install the disc brake caliper on the rear housing.

Tightening torque:
66 N·m (6.73 kgf-m, 48.7 ft-lb)

6) Install the brake hose bracket and rear ABS wheel speed sensor.

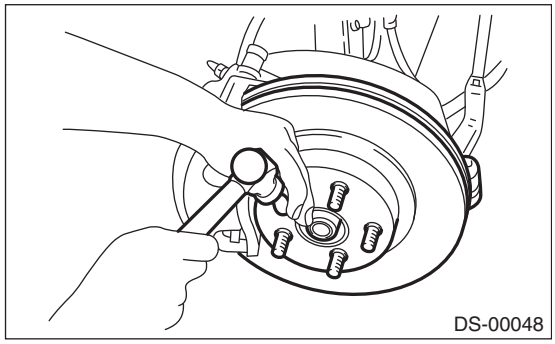
Tightening torque:
Brake hose bracket
33 N·m (3.36 kgf-m, 24.3 ft-lb)
Rear ABS wheel speed sensor
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

7) While pressing the brake pedal, tighten the new axle nuts to the specified torque.

CAUTION:
• Do not install wheel and let it touch the ground before tightening the axle nut. Failure to follow this rule may damage the axle bearing.
• Do not overtighten the nuts as this may damage the axle bearing.

Tightening torque:
190 N·m (19.37 kgf-m, 140.1 ft-lb)

8) After tightening the axle nut, lock it securely.



9) Install the rear wheels.

Tightening torque:
100 N·m (10.20 kgf-m, 73.8 ft-lb)

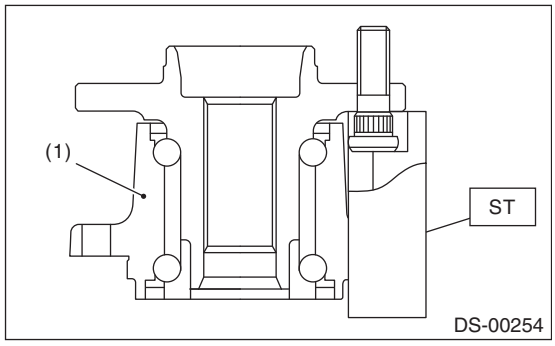
C: DISASSEMBLY

Using the ST and a hydraulic press, push out the hub bolts.

CAUTION:
• Be careful not to hammer the hub bolts. This may deform the hub.
• Do not reuse the hub bolt.

ST 28399AG000 HUB STAND

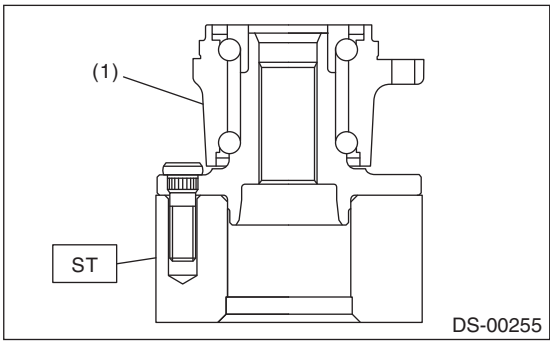
NOTE:
Since the hub unit bearing can not be disassembled, only hub bolts can be removed.



(1) Rear hub unit bearing

D: ASSEMBLY

1) Attach the hub to the ST securely.
ST 927080000 HUB STAND



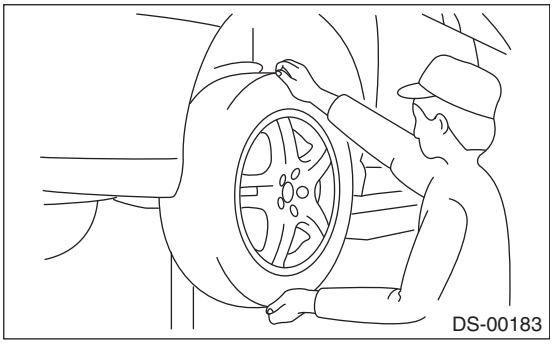
(1) Rear hub unit bearing

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.

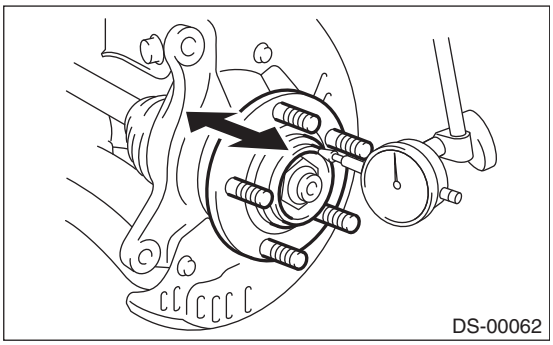
E: INSPECTION

1) Moving the rear tire up and down by hand, check there is no backlash in bearing, and check the wheel rotates smoothly.



2) Inspect the lean of axis direction using a dial gauge. Replace the hub bearing if the play exceeds the limit value.

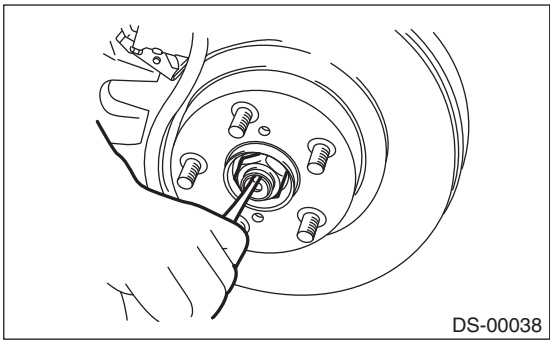
Service limit:
Maximum: 0.05 mm (0.0020 in)



7. Front Drive Shaft

A: REMOVAL

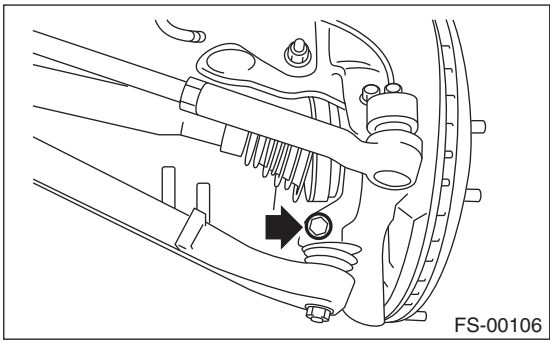
1) Lift up the vehicle, and then remove the front wheels.
2) Lift the crimped section of axle nut.



3) Remove the axle nut using a socket wrench while depressing the brake pedal.

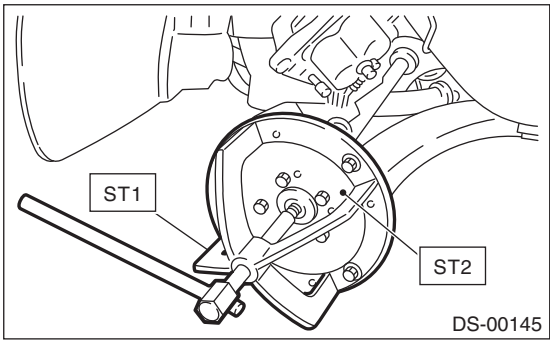
CAUTION:
Remove the wheel before loosening the axle nut. Failure to follow this rule may damage the wheel bearings.

4) Drain gear oil from the transmission. (MT model)
5) Drain differential gear oil from the transmission. (AT model)
6) Remove the stabilizer link from front arm.
7) Disconnect the front arm ball joint from the housing.



8) Remove the front drive shaft assembly. If it is hard to remove, use ST1 and ST2.

ST1 926470000 AXLE SHAFT PULLER
ST2 28099PA110 AXLE SHAFT PULLER PLATE



9) Using a bar, remove the front drive shaft from transmission.

CAUTION:
Be careful not to allow the bar to damage holder area.

B: INSTALLATION

1) Replace the differential side retainer oil seal with a new part.

NOTE:
After pulling out the drive shaft, be sure to replace with a new oil seal.

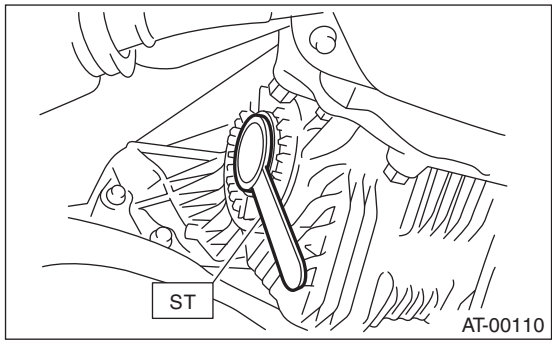
4AT model: <Ref. to 4AT-51, REPLACEMENT, Differential Side Retainer Oil Seal.>
5MT model: <Ref. to 5MT-33, REPLACEMENT, Differential Side Retainer Oil Seal.>

2) Insert the EBJ into the hub spline.
3) Draw the drive shaft into specified position.

CAUTION:
Do not hammer drive shaft when installing it.

4) Tighten the axle nut temporarily.
5) Using the ST, install the front drive shaft to transmission.

ST 28399SA010 OIL SEAL PROTECTOR



6) Connect the front arm ball joint to the housing.

Tightening torque:
50 N·m (5.10 kgf-m, 36.9 ft-lb)

7) Install the stabilizer link.

CAUTION:
Be sure to use a new self-locking nut.

Tightening torque:
45 N·m (4.59 kgf-m, 33.2 ft-lb)

8) While pressing the brake pedal, tighten the new axle nuts to the specified torque.

CAUTION:
• Do not install wheel and let it touch the ground before tightening the axle nut. Failure to follow this rule may damage the axle bearing.
• Do not overtighten the nuts as this may damage the axle bearing.

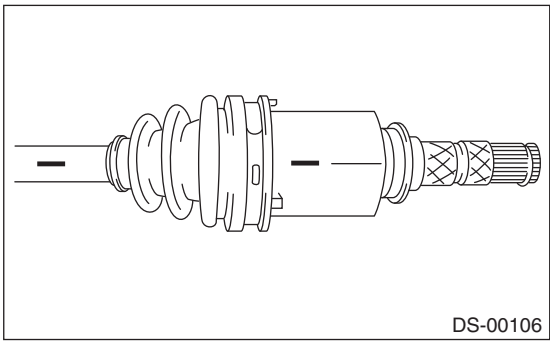
Tightening torque:
220 N·m (22.43 kgf-m, 162.3 ft-lb)

9) After tightening axle nut, lock it securely.
10) Fill the transmission with gear oil. (MT model)
11) Fill the transmission with differential gear oil. (AT model)
12) Install the front wheels.

Tightening torque:
100 N·m (10.20 kgf-m, 73.8 ft-lb)

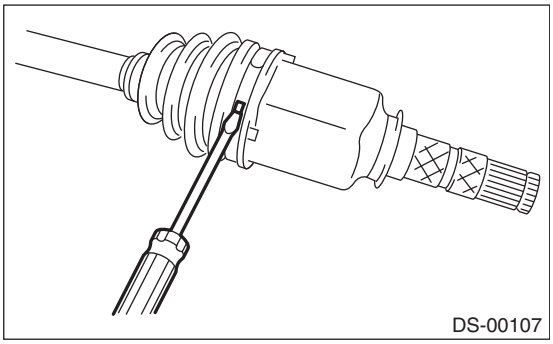
C: DISASSEMBLY

1) Place alignment marks on the shaft and outer race.

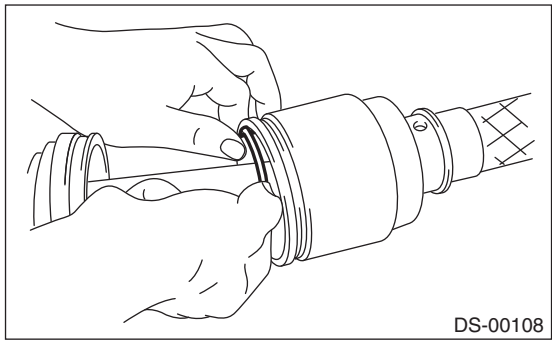

DS-00106

2) Remove the PTJ boot band and boot.

CAUTION:
Be careful not to damage the boot.


DS-00107

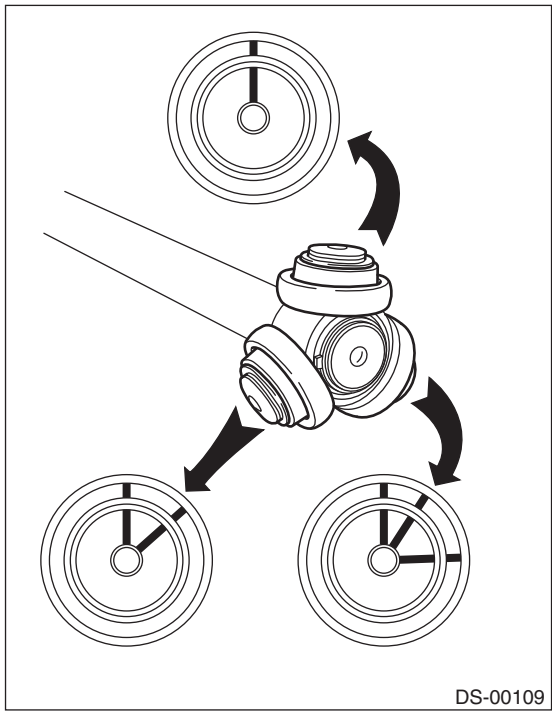
3) Remove the snap ring from PTJ outer race.


DS-00108

4) Remove the PTJ outer race from shaft assembly.
5) Wipe off grease.

CAUTION:
The grease is a special type of grease. Do not mix with other grease.

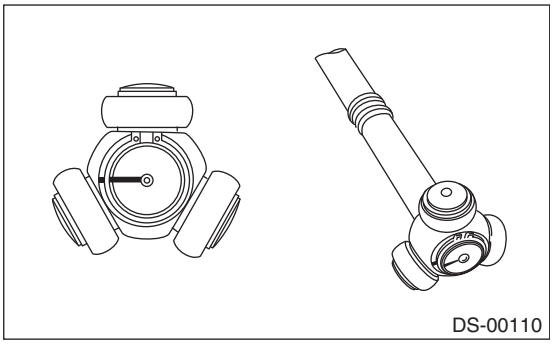
6) Place alignment marks on the roller kit and trunnion.


DS-00109

7) Remove the roller kit from trunnion.

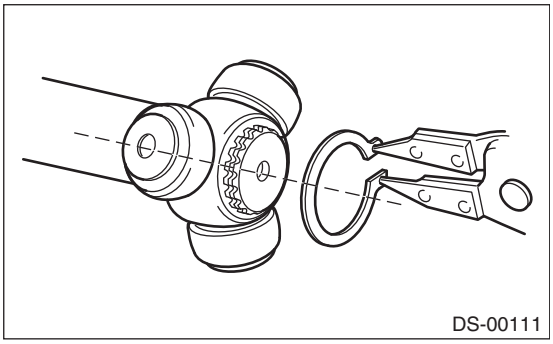
CAUTION:
Be careful with the roller kit position.

8) Place alignment marks on the trunnion and shaft.


DS-00110

9) Remove the snap ring and trunnion.

CAUTION:
Be sure to wrap shaft splines with vinyl tape to protect the boot from scratches.


DS-00111

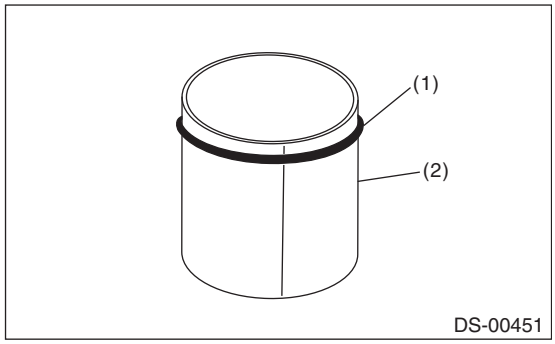
10) Remove the PTJ boot.
11) Remove the O-ring from the groove of the shaft.

NOTE:
The EBJ is a non-disassembly part, so the axle disassembly stops here.

D: ASSEMBLY

1) Roll up a thick piece of paper to a size where the shaft can pass through, and affix with tape to form a cylinder.
2) Attach a new O-ring on this cylinder.

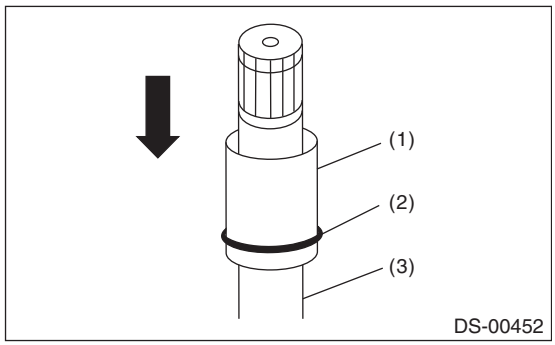
CAUTION:
- **Always use a new O-ring.**
- **Be careful that the O-ring does not become scratched and that there are no foreign objects attached to it.**
- **Make sure to install the O-ring so that it does not twist as much as possible.**
- **Do not stretch the O-ring to 30 mm (1.18 in) inner diameter or more.**



DS-00451

(1) O-ring
(2) Cylinder made with thick paper, etc.

3) Pass the cylinder material onto the shaft, and slide in the direction of the shaft axis.



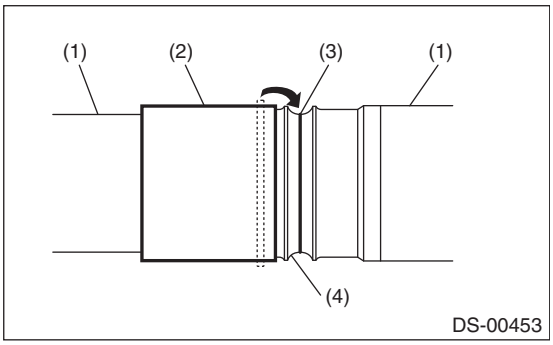
DS-00452

(1) Cylinder material
(2) O-ring
(3) Shaft

4) Clean the shaft boot groove, and wipe off the grease.

5) Slide the cylinder material near the shaft boot groove, and move the O-ring from the cylinder material onto the shaft boot groove.

CAUTION:
• Attach the O-ring to the shaft boot groove center.
• Be careful that the O-ring does not become scratched and that there are no foreign objects attached to it.
• Make sure to install the O-ring so that it does not twist as much as possible.
• With the O-ring attached, do not wash with kerosene, gasoline, etc.

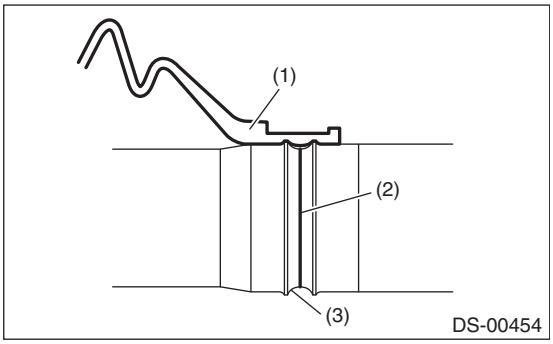


(1) Shaft
(2) Cylinder material
(3) O-ring
(4) Boot groove

6) Pass the PTJ small diameter boot band through the shaft.
7) Wrap vinyl tape around the splines of the shaft.

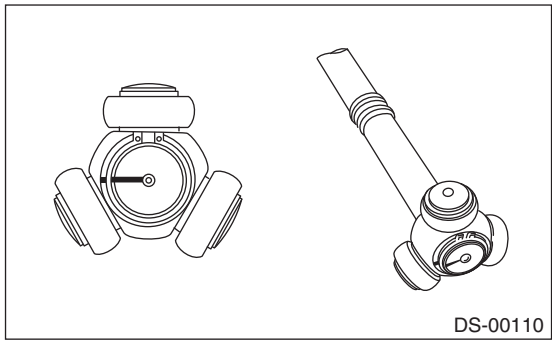
CAUTION:
To prevent damage to the boots, make sure to always wrap with vinyl tape for protection.
8) Install a new PTJ boot.

CAUTION:
Make sure to fit securely on the boot groove of the shaft.



(1) PTJ boot
(2) O-ring
(3) Boot groove

9) Match the alignment marks, and attach the trunnion onto the shaft.

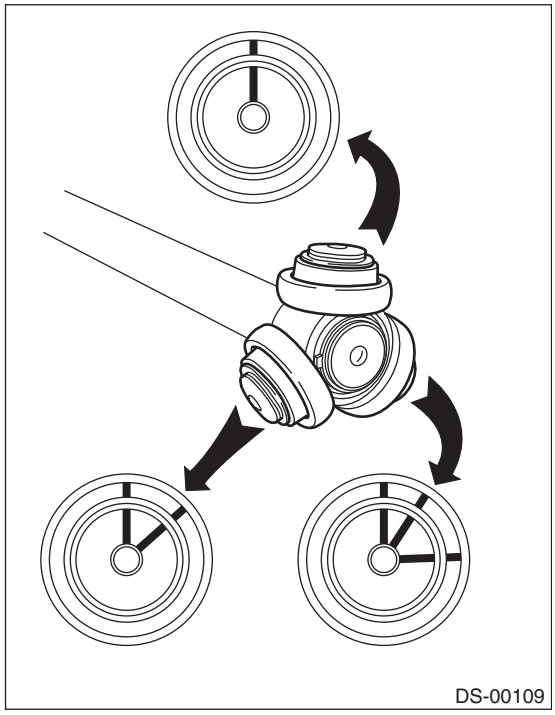


10) Attach the snap ring to the shaft.

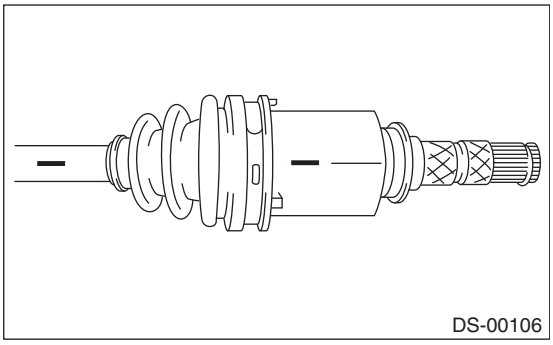
CAUTION:
Confirm that the snap ring is completely fitted in the shaft groove.
11) Fill 100 to 110 g (3.53 to 3.88 oz) of specified grease into the interior of the PTJ outer race.

Grease:
NKG302
12) Apply a thin coat of specified grease to the roller kit and trunnion.
13) Match the alignment marks of the roller kit and trunnion, and attach the roller kit.

CAUTION:
Be careful with the roller kit position.



14) Match the alignment marks of the shaft and outer race, and attach the outer race.



15) Install the snap ring in the groove of the PTJ outer race.

CAUTION:
Pull the shaft lightly and make sure that the snap ring is completely fitted in the groove.

16) 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.

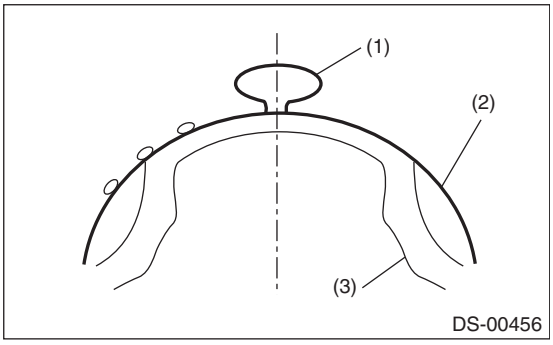
17) Attach the PTJ boot taking care not to twist it.

CAUTION:
• Clean the large end of PTJ boot and the boot groove well, and remove the grease and other substances.
• When installing the PTJ boot, position the outer race of the PTJ at center of the stroke.

18) Set the new boot band at the specified position.

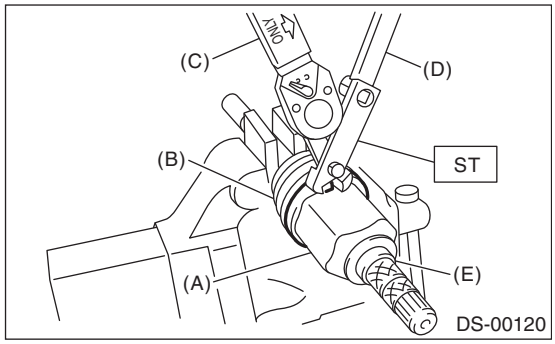
19) Tighten the boot bands using ST, torque wrench and socket flex handle.

CAUTION:
The large boot band is to be tightened so that the omega shaped part is at the position indicated in the figure below.



(1) Omega shaped part
(2) Boot band
(3) Outer race

ST 28099AC000 BOOT BAND PLIER



(A) Large boot band
(B) Boot
(C) Torque wrench
(D) Socket flex handle
(E) Outer race

Tightening torque:
Large boot band
178 N·m (18.15 kgf-m, 131.3 ft-lb)
Small boot band
145 N·m (14.79 kgf-m, 106.9 ft-lb)

20) Extend and retract the PTJ repeatedly so that grease is spread evenly.

E: INSPECTION

Check the removed parts for damage, wear, corrosion etc. If faulty, repair or replace.

• PTJ (pillow tripod joint)
Check for seizure, corrosion, damage, wear and excessive play.

• EBJ (high-efficiency compact ball fixed joint)
Check for seizure, corrosion, damage and excessive play.

• Shaft
Check for excessive bending, twisting, damage and wear.

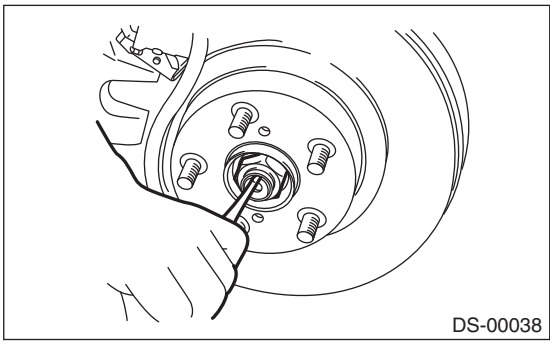
• Boot
Check for wear, warping, breakage and scratches.

• Grease
Check for discoloration and fluidity.

8. Rear Drive Shaft

A: REMOVAL

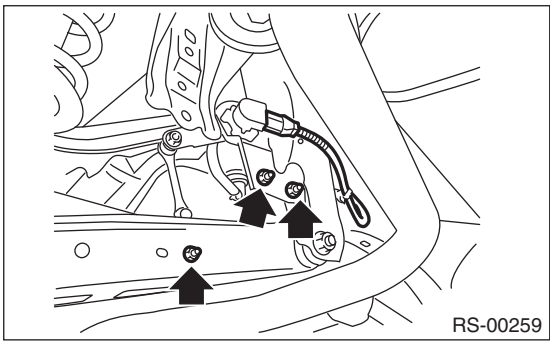
1) Disconnect the ground cable from battery.
2) Lift up the vehicle, and then remove the rear wheels.
3) Lift the crimped section of axle nut.



4) Remove the axle nut using a socket wrench while depressing the brake pedal.

CAUTION:
Remove the wheel before loosening the axle nut. Failure to follow this rule may damage the wheel bearings.

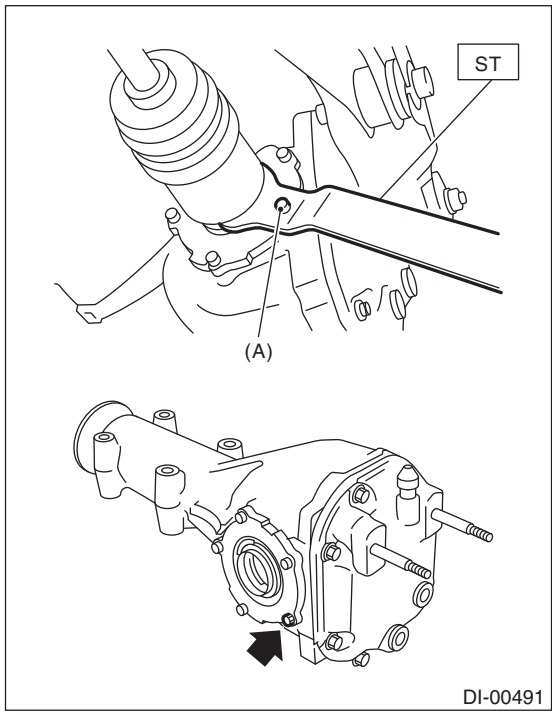
5) Drain differential gear oil.
6) Disconnect the connector, and then remove the nut to remove the rear vehicle height sensor. (model with auto headlight beam leveler, left side only)



7) Remove the rear trailing link. <Ref. to RS-10, REMOVAL, Rear Trailing Link.>
8) Remove the rear lateral link. <Ref. to RS-17, REMOVAL, Rear Lateral Link.>
9) Remove the rear drive shaft from the rear differential by using the ST.

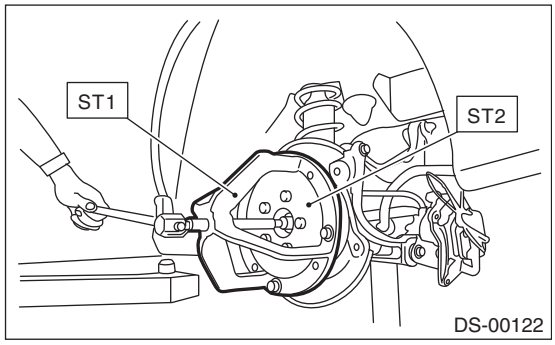
ST 28099PA100 DRIVE SHAFT REMOVER

NOTE:
Fit the ST to the bolts as shown in the figure to prevent damage of the side bearing retainer.



(A) Bolt

10) Remove the rear drive shaft from the rear axle. If it is hard to remove, use ST1 and ST2.
ST1 926470000 AXLE SHAFT PULLER
ST2 28099PA110 AXLE SHAFT PULLER PLATE

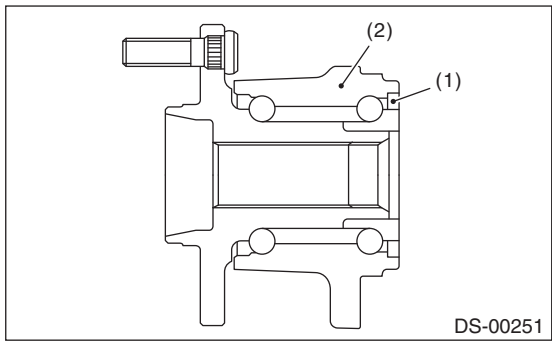


B: INSTALLATION

1) Replace the rear differential side oil seal. <Ref. to DI-41, REPLACEMENT, Rear Differential Side Oil Seal.>

NOTE:
After pulling out the drive shaft, be sure to replace with a new oil seal.
2) Insert the EBJ into rear hub splines.

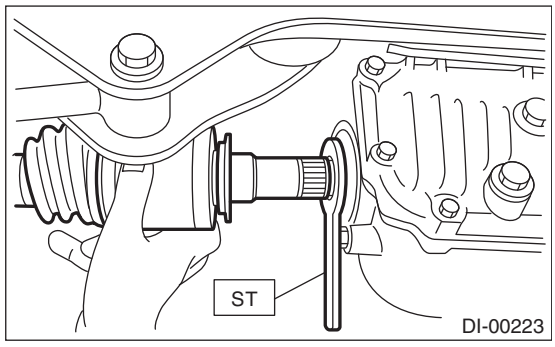
CAUTION:
• Be careful not to damage the magnetic encoder.
• Do not get closer the tool which charged magnetism to magnetic encoder.



(1) Magnetic encoder
(2) Rear hub unit bearing

3) Draw the rear drive shaft into specified position.

CAUTION:
Do not hammer drive shaft when installing it.
4) Tighten the axle nut temporarily.
5) Using the ST, install the rear drive shaft to the rear differential.
ST 28099PA090 OIL SEAL PROTECTOR



6) Attach the links to the rear housing and tighten them to the specified torque.

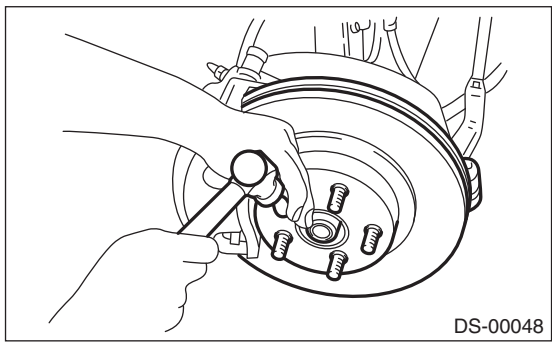
Tightening torque:
Stabilizer link
38 N·m (3.87 kgf-m, 28.0 ft-lb)
Shock absorber
120 N·m (12.24 kgf-m, 88.5 ft-lb)
Rear lateral link
120 N·m (12.24 kgf-m, 88.5 ft-lb)
Trailing link
90 N·m (9.18 kgf-m, 66.4 ft-lb)

7) While pressing the brake pedal, tighten the new axle nuts to the specified torque.

CAUTION:
• Do not apply weight to the rear axle before tightening the axle nut. Doing so may damage the hub bearing.
• Do not overtighten the nuts as this may damage the hub bearing.

Tightening torque:
190 N·m (19.37 kgf-m, 140.1 ft-lb)

8) Lock the axle nut securely.



9) Install the rear vehicle height sensor. (model with auto headlight beam leveler, left side only)

Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

10) Fill differential gear oil.
11) Install the rear wheels.

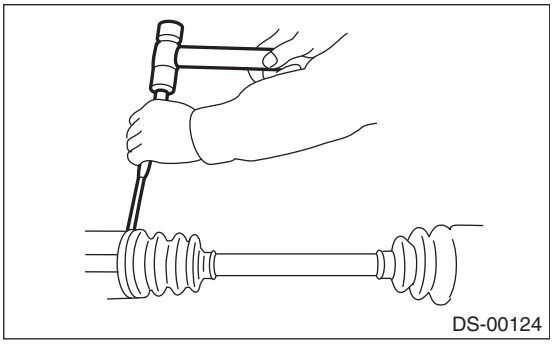
Tightening torque:
100 N·m (10.20 kgf-m, 73.8 ft-lb)

12) Connect the battery ground terminal.
13) Inspect the wheel alignment and adjust if necessary. <Ref. to FS-6, INSPECTION, Wheel Alignment.>
14) Perform reinitialization of the auto headlight beam leveler system. (model with auto headlight beam leveler) <Ref. to LI-16, PROCEDURE, Auto Headlight Beam Leveler System.>

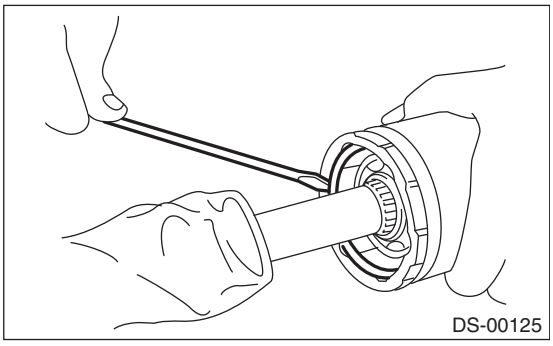
C: DISASSEMBLY

1) Using a flat tip screwdriver or plier, loosen the boot band on the large end of DOJ boot.

CAUTION:
Be careful not to damage the boot.



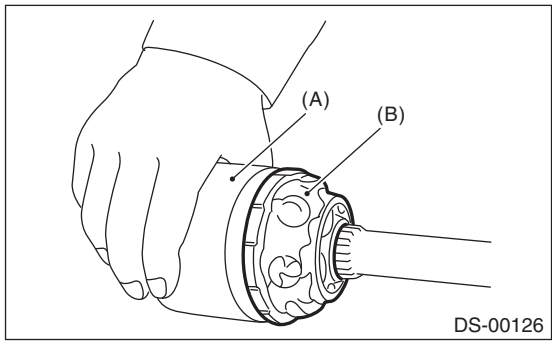
2) Remove the boot band on the small end of DOJ boot in the same manner.
3) Remove the larger end of DOJ boot from DOJ outer race.
4) Remove the round snap ring at the neck of DOJ outer race with a flat tip screwdriver.



5) Take out the DOJ outer race from the shaft assembly.
6) 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.

NOTE:
Disassemble exercising care not to lose balls (6 pcs).



(A) Outer race
(B) Grease

7) To remove the cage from inner race, turn the cage by a half pitch to the track groove of inner race and shift the cage.
8) Using pliers, remove the snap ring fixing the inner race to the shaft.
9) Take out the DOJ inner race.
10) Take off the DOJ cage from shaft and remove the DOJ boot.

CAUTION:
Wrap shaft splines with vinyl tape to protect the boot from scratches.
11) Remove the EBJ boot using the same procedures as for the DOJ boot.

NOTE:
The EBJ is a non-disassembly part, so the drive shaft disassembly stops here.

D: ASSEMBLY

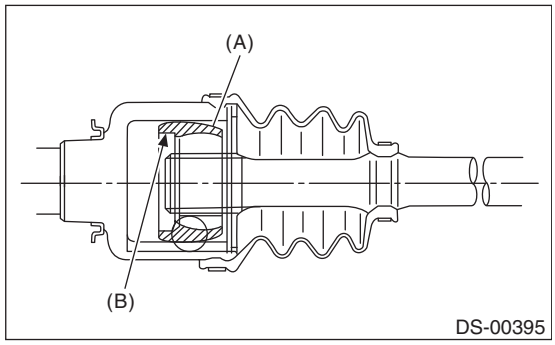
CAUTION:
Wrap shaft splines with vinyl tape to protect the boot from scratches.

NOTE:
Use specified grease.

Grease
EBJ side
NKG106
DOJ side:
NKG205

1) Install the EBJ boot to the specified position, and fill it with 50 to 60 g (1.76 to 2.12 oz) of specified grease.
2) Place the DOJ boot at the center of shaft.
3) Insert the DOJ cage onto shaft.

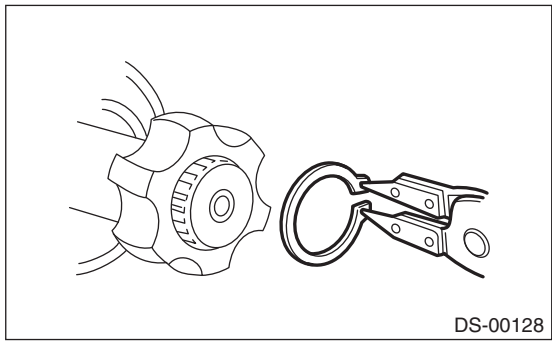
NOTE:
Insert the cage with the cutout portion facing the shaft end, since the cage has an orientation.



(A) Cage
(B) Cutout portion

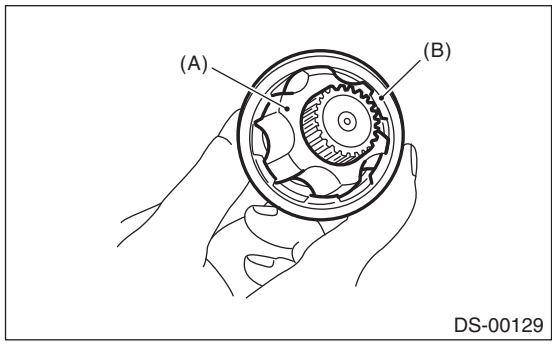
4) Install the DOJ inner race on shaft and fix the snap ring in place with pliers.

NOTE:
Confirm that the snap ring is completely fitted in the shaft groove.



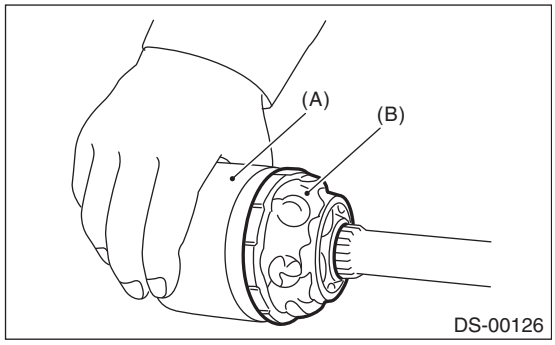
5) Install the cage to inner race fixed upon shaft.

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

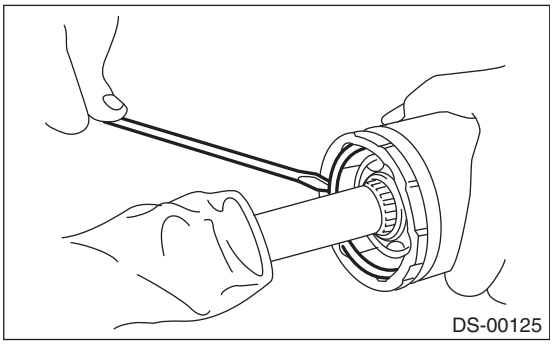
6) Fill 80 to 90 g (2.82 to 3.17 oz) of specified grease into the inner side of the DOJ outer race.
7) Apply a thin coat of specified grease to the cage pocket and six ball bearings.
8) Insert the six ball bearings into the cage pocket.
9) Align the outer race track and ball positions, and place the shaft, inner race, cage and ball bearings in the original positions, and then fix outer race in place.



(A) Outer race
(B) Grease

10) Install the snap ring in the groove on the DOJ outer race.

NOTE:
• Assure that the balls, cage and inner race are completely fitted in the outer race of DOJ.
• Use care not to place the matched position of snap ring in the ball groove of outer race.
• Pull the shaft lightly and assure that the circlip is completely fitted in the groove.

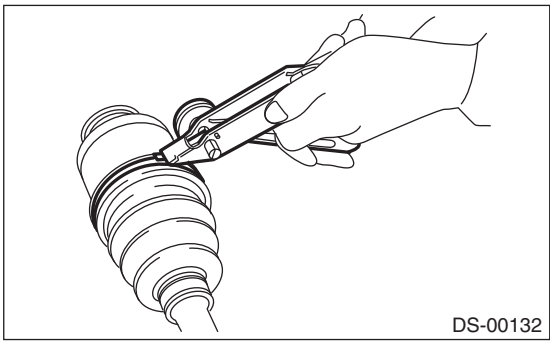

DS-00125

11) 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.
12) Install the DOJ boot taking care not to twist it.

NOTE:
• The inside of the larger end of DOJ boot and the boot groove shall be cleaned so as to be free from grease and other substances.
• When installing the DOJ boot, position the outer race of DOJ at center of the stroke.
13) Put a new band through the clip and wind twice in the band groove of the boot.
14) Pinch the end of band with pliers. Hold the clip and tighten securely.

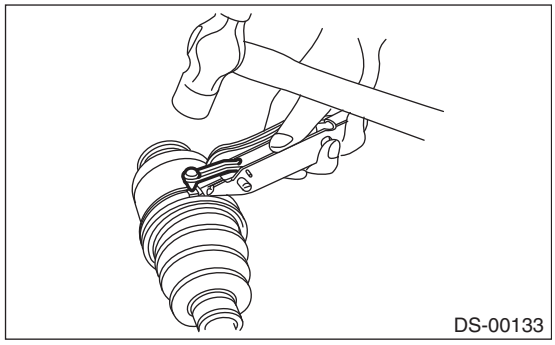
NOTE:
When tightening boot, use care so that the air within the boot is appropriate.
15) Tighten the band using the ST.
ST 925091000 BAND TIGHTENING TOOL

NOTE:
Tighten the band until it cannot be moved by hand.


DS-00132

16) Tap the clip with the punch provided at the end of the ST.
ST 925091000 BAND TIGHTENING TOOL

NOTE:
Tap to an extent that the boot underneath is not damaged.


DS-00133

17) 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.

NOTE:
Be careful so that the end of the band is in close contact with clip.
18) Install the EBJ boot using the same procedures as for the DOJ boot.
19) 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.
• **DOJ (Double Offset Joint)**
Check for seizure, corrosion, damage, wear and excessive play.
• **EBJ (high-efficiency compact ball fixed joint)**
Check for seizure, corrosion, damage, wear and excessive play.
• **Shaft**
Check for excessive bending, twisting, damage and wear.
• **Boot**
Check for wear, warping, breakage and scratches.
• **Grease**
Check for discoloration and fluidity.

9. General Diagnostic Table

A: INSPECTION

NOTE:
Vibration while cruising may be caused by an unbalanced tire, improper tire inflation pressure, improper wheel alignment, etc.

Symptoms	Possible cause	Corrective action
Noise or vibration from propeller shaft	Center bearing	Check the center bearing. <Ref. to DS-12, CENTER BEARING FREE PLAY, INSPECTION, Propeller Shaft.>
	Runout of propeller shaft	Check for deflection of the propeller shaft. <Ref. to DS-11, RUNOUT OF PROPELLER SHAFT, INSPECTION, Propeller Shaft.>
	Loose or gap at connections	Check the joints and connectors. <Ref. to DS-11, JOINTS AND CONNECTORS, INSPECTION, Propeller Shaft.>
		Check the spline and bearing. <Ref. to DS-11, SPLINES AND BEARING, INSPECTION, Propeller Shaft.>
Abnormal wheel vibration	Wheel is out of balance.	Check the wheel balance. <Ref. to WT-6, Wheel balancing, INSPECTION, Tire and Wheel.>
	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-8, INSPECTION, Wheel Alignment.>
	Front strut	Check the front strut. <Ref. to FS-22, INSPECTION, Front Strut.>
	Rear shock absorber	Check the rear shock absorber. <Ref. to RS-14, INSPECTION, Rear Shock Absorber.>
	Front drive shaft	Check the front drive shaft. <Ref. to DS-31, INSPECTION, Front Drive Shaft.>
	Rear drive shaft	Check the rear drive shaft. <Ref. to DS-36, INSPECTION, Rear Drive Shaft.>
	Front hub unit bearing	Check the front hub unit bearing. <Ref. to DS-18, INSPECTION, Front Hub Unit Bearing.>
	Rear hub unit bearing	Check the rear hub unit bearing. <Ref. to DS-26, INSPECTION, Rear Hub Unit Bearing.>
Noise from the underbody	Wheel is out of balance.	Check the wheel balance. <Ref. to WT-6, Wheel balancing, INSPECTION, Tire and Wheel.>
	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-8, INSPECTION, Wheel Alignment.>
	Front strut	Check the front strut. <Ref. to FS-22, INSPECTION, Front Strut.>
	Rear shock absorber	Check the rear shock absorber. <Ref. to RS-14, INSPECTION, Rear Shock Absorber.>

VEHICLE DYNAMICS CONTROL (VDC)

VDC

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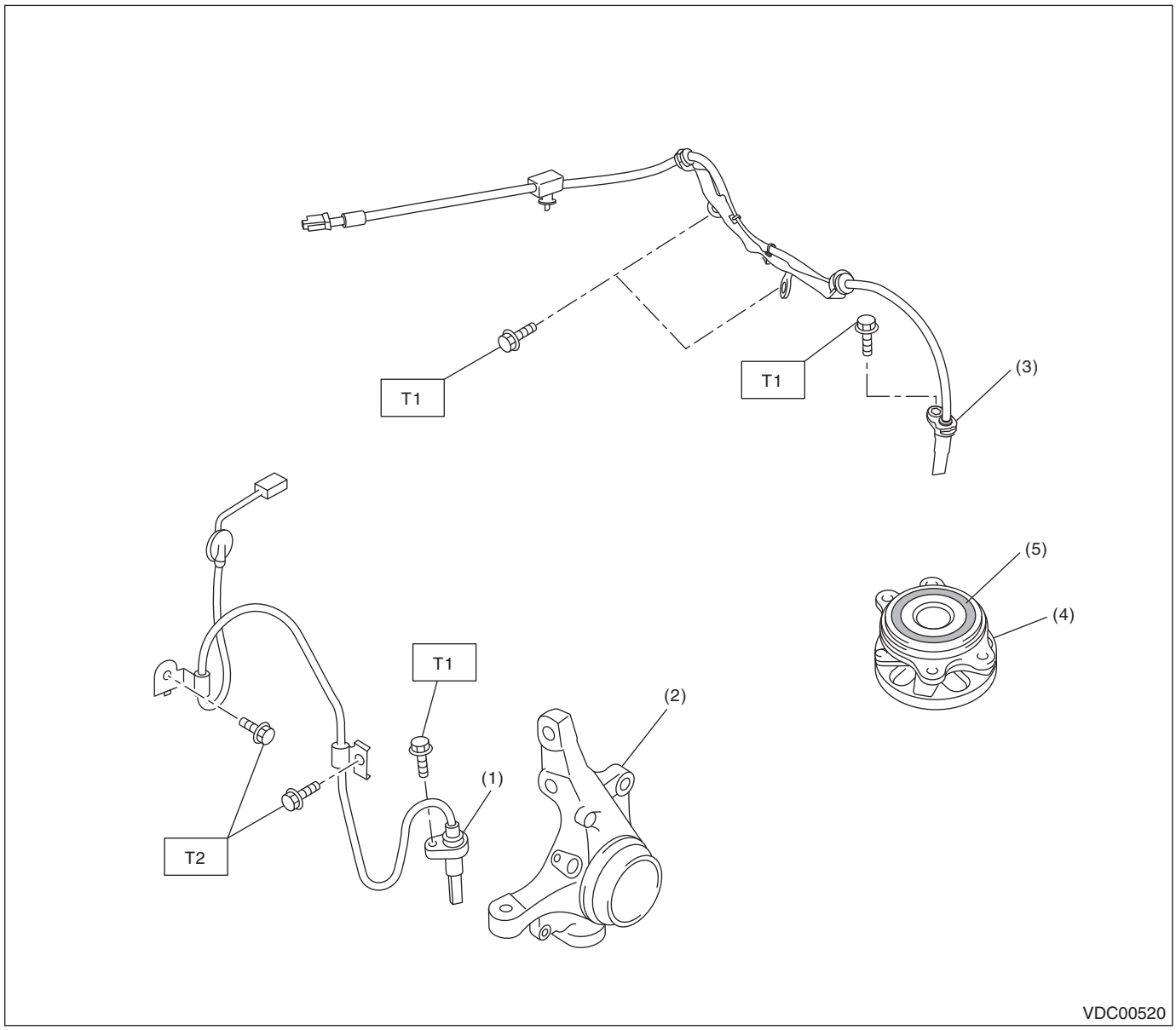
1. General Description

A: SPECIFICATION

Item				Specification or identification
ABS wheel speed sensor	ABS wheel speed sensor gap (for reference)	Front		0.77 — 1.43 mm (0.030 — 0.056 in)
		Rear		0.64 — 1.56 mm (0.025 — 0.061 in)
	Identifications of harness (marks, color)	Front	RH	K1 (White)
			LH	K2 (Yellow)
		Rear	RH	P3 (Aqua)
			LH	P4 (Brown)
VDCCM&H/U Identification		AT		Z6
		MT		Z7

B: COMPONENT

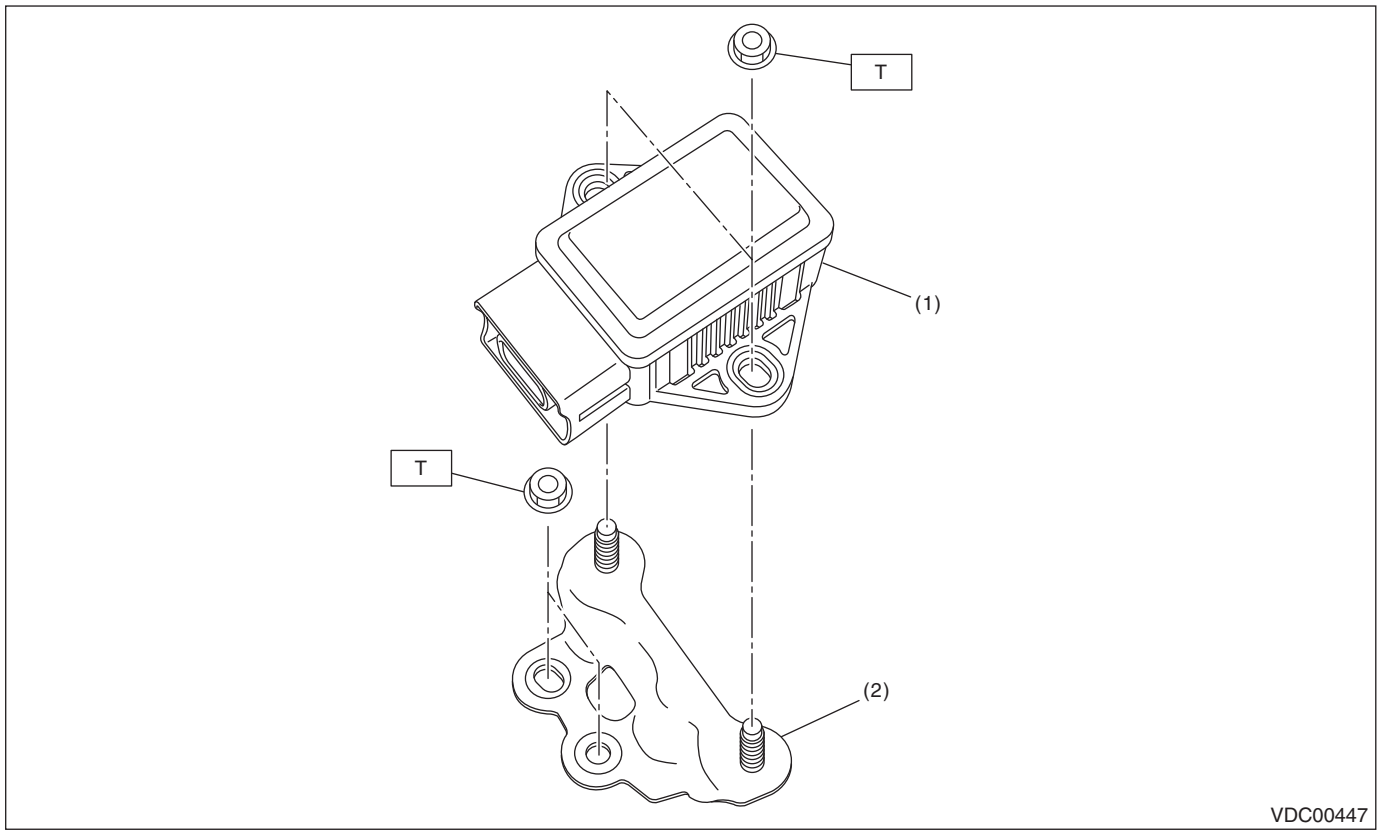
1. ABS WHEEL SPEED SENSOR



(1) Front ABS wheel speed sensor
(2) Front housing
(3) Rear ABS wheel speed sensor
(4) Hub unit bearing
(5) Magnetic encoder

Tightening torque:N·m (kgf-m, ft-lb)
T1: 7.5 (0.76, 5.5)
T2: 33 (3.36, 24.3)

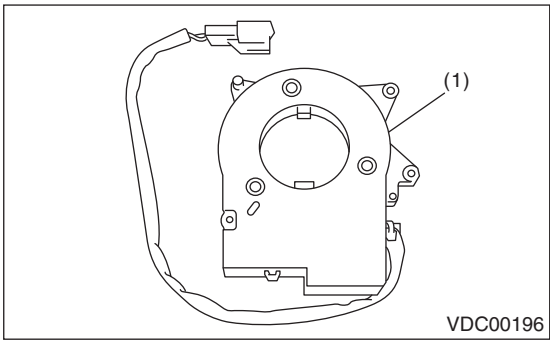
2. YAW RATE & G SENSOR



(1) Yaw rate & G sensor (2) Bracket

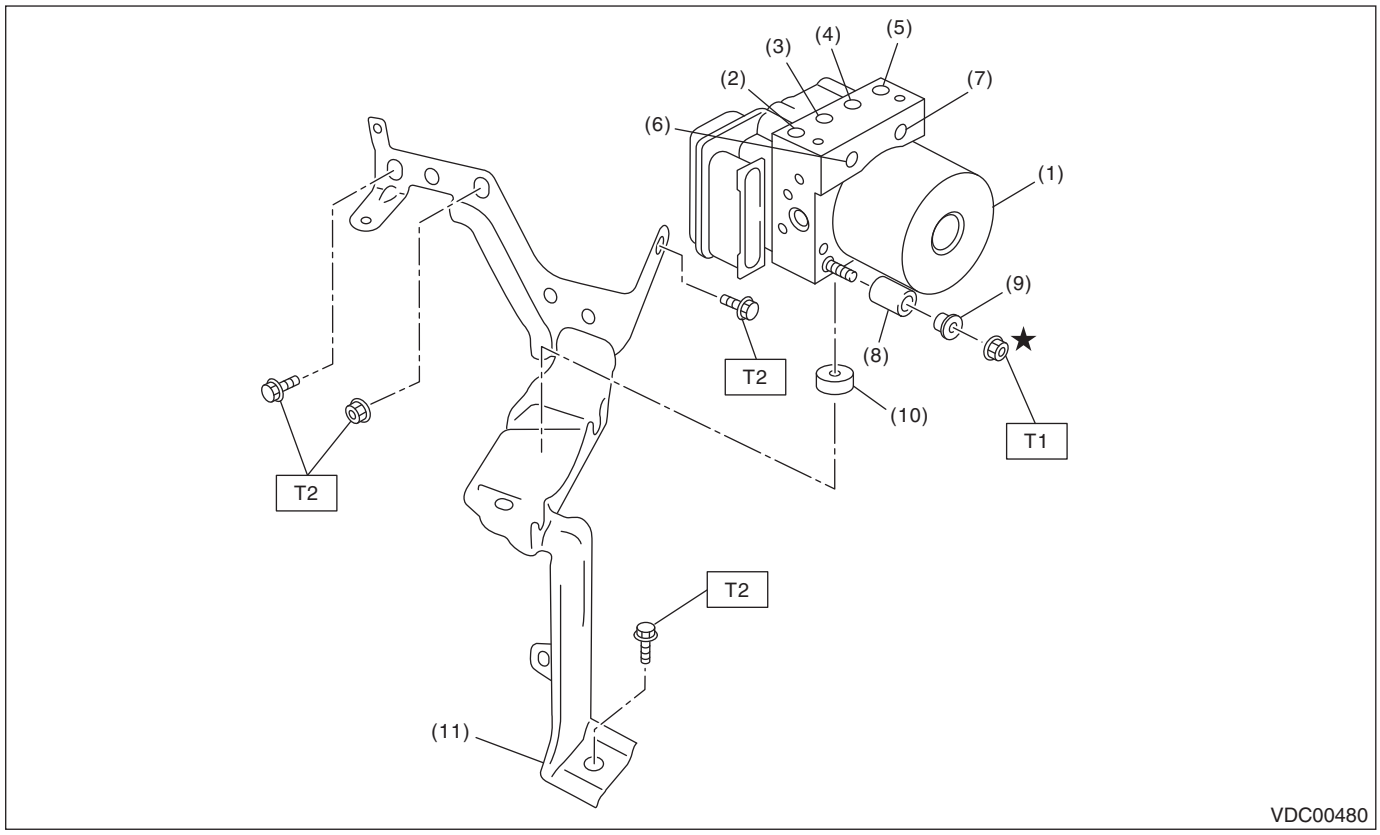
Tightening torque:N·m (kgf-m, ft-lb)
T: 7.5 (0.76, 5.5)

3. STEERING ANGLE SENSOR



(1) Steering angle sensor

4. VDC CONTROL MODULE & HYDRAULIC CONTROL UNIT (VDCCM&H/U)



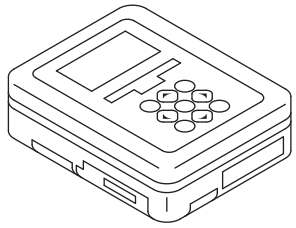
(1)	VDC control module and hydraulic control unit (VDCCM&H/U)	(6)	Primary inlet	(11)	Bracket
(2)	Front RH outlet	(7)	Secondary inlet	***Tightening torque:N·m (kgf-m, ft-lb)***	
(3)	Rear LH outlet	(8)	Damper		
(4)	Rear RH outlet	(9)	Spacer	***T1: 7.5 (0.76, 5.5)***	
(5)	Front LH outlet	(10)	Damper	***T2: 33 (3.36, 24.3)***	

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 disconnecting connectors of sensors or units, be sure to disconnect the ground cable from 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
 ST1B022XU0	1B022XU0	SUBARU SELECT MONITOR III KIT	Used for troubleshooting the electrical system.

2. GENERAL TOOL

TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance and voltage.
Pressure gauge	Used for measuring oil pressure.
Oscilloscope	Used for measuring the sensor.
TORX® bit E5	Used for replacing VDC control module.

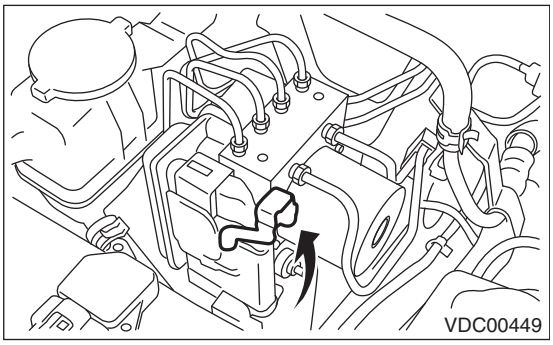
2. VDC Control Module and Hydraulic Control Unit (VDCCM&H/U)

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Use compressed air to remove moisture and dust around the VDCCM&H/U.

NOTE:
If the terminals become dirty, it may cause improper contact.
3) Lift the lock lever and Disconnect the VDCCM&H/U connector.

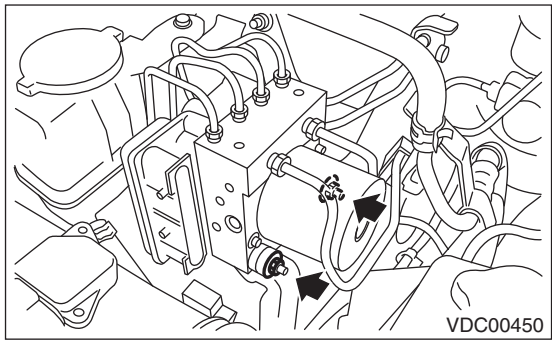
CAUTION:
Do not pull on the harness when disconnecting the connector.



4) Disconnect the brake pipes from the VDCCM&H/U.
5) 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.
6) Remove the nuts and remove the VDCCM&H/U.

CAUTION:
- **Do not drop or bump the VDCCM&H/U.**
- **Do not turn the VDCCM&H/U upside down or place it sideways for storage.**
- **Be careful not to let foreign matter enter the VDCCM&H/U.**
- **Be careful that no water enters the connectors.**



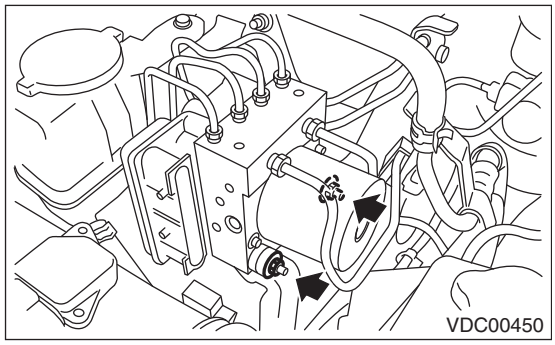
7) Remove the VDCCM&H/U bracket.

B: INSTALLATION

1) Install the VDCCM&H/U bracket.

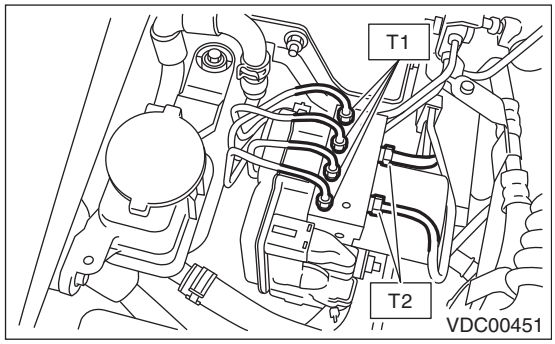
Tightening torque:
33 N·m (3.36 kgf-m, 24.3 ft-lb)
2) Install the VDCCM&H/U with a new nut (Part No. 023506000) by aligning the damper groove of the VDCCM&H/U to the bracket side claw.

Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)



3) Connect the brake pipes to their correct VDCCM&H/U positions.

Tightening torque:
T1: 15 N·m (1.53 kgf-m, 11.1 ft-lb)
T2: 19 N·m (1.94 kgf-m, 14 ft-lb)



4) Connect the VDCCM&H/U connector.

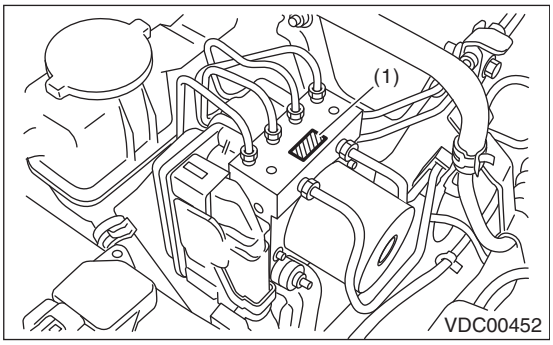
NOTE:
• Be sure to remove all foreign matter from inside the connector before connecting.
• Make sure the VDCCM&H/U connector is securely locked.

5) Bleed air from the brake system. <Ref. to BR-33, PROCEDURE, Air Bleeding.>
6) Check the parameter to confirm that the applied models and grades of the relevant vehicle are included. <Ref. to VDC(diag)-19, PARAMETER CHECK, OPERATION, Subaru Select Monitor.>
7) If the applied model and grade of the target vehicle are not included on the {Confirm on parameter} display screen, perform parameter selection and registration. <Ref. to VDC(diag)-19, PARAMETER SELECTION, OPERATION, Subaru Select Monitor.>

NOTE:
• When the VDCCM&H/U is replaced with a new part, be sure to perform the selection · registration operation.
• For the selection and registration of parameter, the Subaru Select Monitor is required.
• When the registration has not been performed, the DTC code “Parameter selection error” is detected together with the ABS/EBD/VDC warning light illumination.

C: INSPECTION

1) Check the condition of connection and settlement of connector.
2) Check the mark used for VDCCM&H/U identification.
Refer to “SPECIFICATION” for identification mark. <Ref. to VDC-2, SPECIFICATION, General Description.>



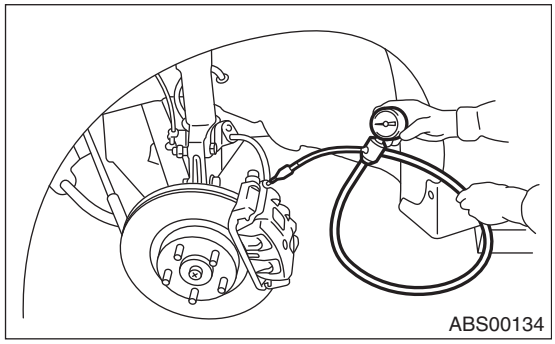
(1) Identification mark

1. CHECKING THE HYDRAULIC UNIT ABS OPERATION BY PRESSURE GAUGE

1) Lift up the vehicle, and then remove the wheel.
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 the pressure gauge used for the measurement of transmission oil. Doing so will cause the piston seal to expand and deform.

NOTE:
Wrap sealing tape around the pressure gauge.



4) Bleed air from the pressure gauges and the FL and FR caliper bodies.
5) Perform ABS sequence control. <Ref. to VDC-13, 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 values indicated on the pressure gauge and check if the fluctuation of the values between decompression and compression meets the standard values. Depress the brake pedal and check that the kick-back is normal, and tightness is normal.

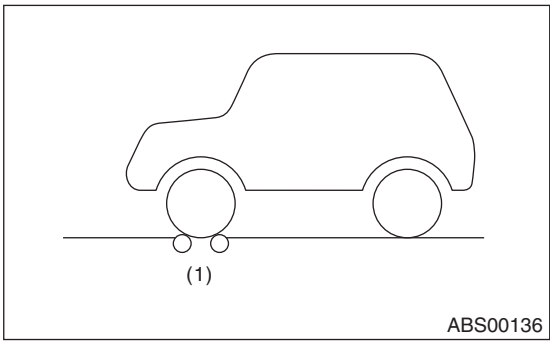
	Front wheel	Rear wheel
Initial value	3,500 kPa (36 kgf/cm^2, 511 psi)	3,500 kPa (36 kgf/cm^2, 511 psi)
When depressurized	500 kPa (5 kgf/cm^2, 73 psi) or less	500 kPa (5 kgf/cm^2, 73 psi) or less
When pressurized	3,500 kPa (36 kgf/cm^2, 511 psi) or more	3,500 kPa (36 kgf/cm^2, 511 psi) or more

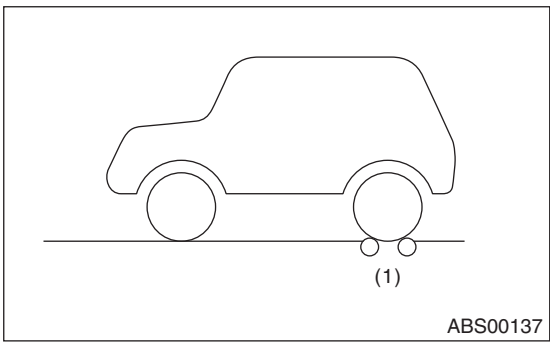
8) Disconnect the pressure gauges from FL and FR caliper bodies.
9) Install the air bleeder screws of FL and FR caliper bodies.
10) Remove the air bleeder screws from RL and RR caliper bodies.
11) Connect two pressure gauges to RL and RR caliper bodies.
12) Bleed air from the brake system. <Ref. to BR-33, PROCEDURE, Air Bleeding.>

13) Bleed air from RL and RR caliper bodies, and pressure gauge.
14) Perform ABS sequence control. <Ref. to VDC-13, ABS Sequence Control.>
15) 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.
16) Read values indicated on the pressure gauge and check if the fluctuation of the values between decompression and compression meets specification. Depress the brake pedal and check that the kick-back is normal, and tightness is normal.
17) Disconnect the pressure gauge from the RL and RR caliper bodies.
18) Install the air bleeder screws of RL and RR caliper bodies.
19) Bleed air from the brake system. <Ref. to BR-33, PROCEDURE, Air Bleeding.>

2. CHECKING THE HYDRAULIC UNIT ABS OPERATION BY BRAKE TESTER

1) Set wheels other than the one to measure on free rollers.
2) Prepare for the ABS sequence control operation. <Ref. to VDC-13, ABS Sequence Control.>
3) Set the front wheels or rear wheels on the brake tester and set the gear to neutral.





(1) Brake tester

4) Operate the brake tester.
5) Perform ABS sequence control. <Ref. to VDC-13, ABS Sequence Control.>
6) When the hydraulic unit begins to work, check the following work 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.
7) 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, 225 lb)	1,000 N (102 kgf, 225 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, 225 lb) or more	1,000 N (102 kgf, 225 lb) or more

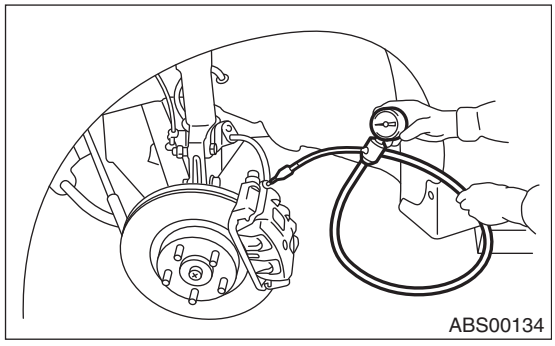
8) After the inspection, depress the brake pedal and check that it is not abnormally hard, and tightness is normal.

3. CHECKING THE HYDRAULIC UNIT VDC OPERATION USING A PRESSURE GAUGE

1) Lift up the vehicle, and then remove the wheel.
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 for the measuring 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-16, VDC Sequence Control.>

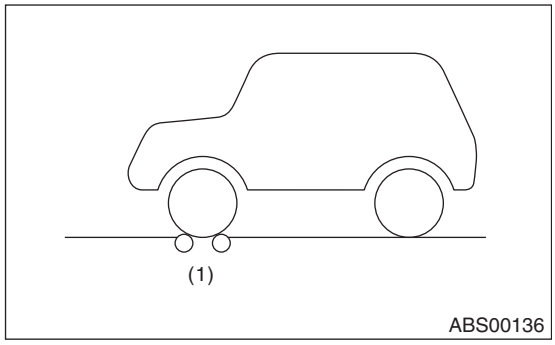
6) When the hydraulic unit begins to work, first the FL side performs compression, hold, and decompression, and then the FR side performs compression, hold, and decompression.
7) Read values indicated on the pressure gauge and check if the fluctuation of the values between decompression and compression meets specification. Depress the brake pedal and check that it is not abnormally hard, and tightness is normal.

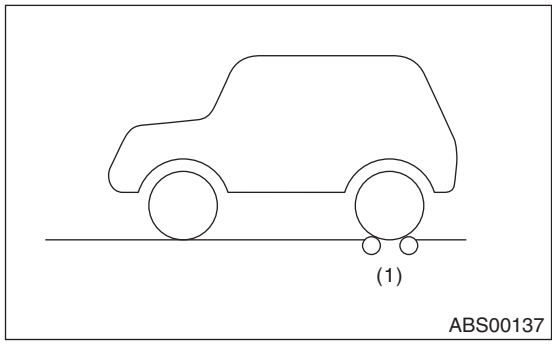
	Front wheel	Rear wheel
When pressurized	3,000 kPa (31 kgf/cm^2, 441 psi) or more	3,000 kPa (31 kgf/cm^2, 441 psi) or more
When depressurized	500 kPa (5 kgf/cm^2, 73 psi) or less	500 kPa (5 kgf/cm^2, 73 psi) or less

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 VDC sequence control. <Ref. to VDC-16, VDC Sequence Control.>
14) When the hydraulic unit begins to work, first the RR side performs compression, hold, and decompression, and then the RL side performs compression, hold, and decompression.
15) Read the values indicated on the pressure gauges and check if it is within specification. Depress the brake pedal and check that it is not abnormally hard, and tightness is normal.
16) Disconnect the pressure gauge from the RL and RR caliper bodies.
17) Install the air bleeder screws of RL and RR caliper bodies.
18) Bleed air from the brake system. <Ref. to BR-33, PROCEDURE, Air Bleeding.>

4. CHECKING THE HYDRAULIC UNIT VDC OPERATION WITH BRAKE TESTER

1) Set wheels other than the one to measure on free rollers.
2) Prepare to operate the VDC sequence control. <Ref. to VDC-16, VDC Sequence Control.>
3) Set the front wheels or rear wheels on the brake tester and set the gear to neutral.





(1) Brake tester

4) Operate the brake tester.
5) Perform VDC sequence control. <Ref. to VDC-16, VDC Sequence Control.>
6) When the hydraulic unit begins to work, check the following work sequence.
(1) The FL wheel performs compression, hold and decompression in sequence, and subsequently the FR wheel repeats the cycle.
(2) The RR wheel performs compression, hold and decompression in sequence, and subsequently the RL wheel repeats the cycle.
7) Read values indicated on the brake tester and check if the fluctuation of the values between decompression and compression meets specification.

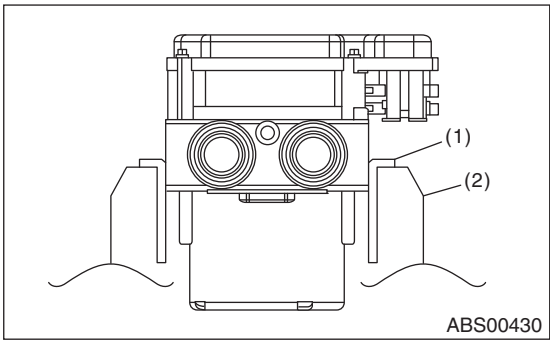
	Front wheel	Rear wheel
When pressurized	2,000 N (204 kgf, 450 lbf) or more	2,000 N (204 kgf, 450 lbf) or more
When depressurized	500 N (51 kgf, 112 lbf) or less	500 N (51 kgf, 112 lbf) or less

8) After the inspection, depress the brake pedal and check that it is not abnormally hard, and tightness is normal.

D: REPLACEMENT

CAUTION:
• Because the pressure sensor built into the H/U is easily damaged by static electricity, start the operation after performing static electricity measures.
• Be careful not to touch the sensors in the H/U to prevent damage.
• Because the seal of the VDCCM 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 VDCCM, always use new screws.
• When the sealing surface of the VDCCM or H/U is dirty or damaged and it cannot be cleaned or repaired, replace with a new part.
1) Remove the VDCCM&H/U. <Ref. to VDC-7, REMOVAL, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>
2) To prevent entry of foreign objects and brake fluid leakage, plug the oil pressure port of the VDCCM&H/U using a screw plug, etc.
3) Set the pump motor section of the removed VDCCM&H/U face down on a vise.

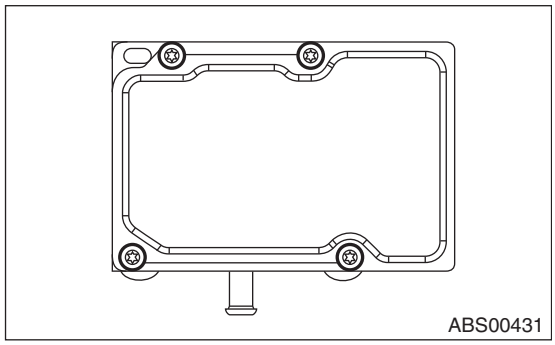
NOTE:
Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or cloth between the part and the vise.



(1) Aluminum plate, etc.
(2) Vise

4) Using TORX® bit E5, remove the four screws of VDCCM.

NOTE:
These screws cannot be reused.



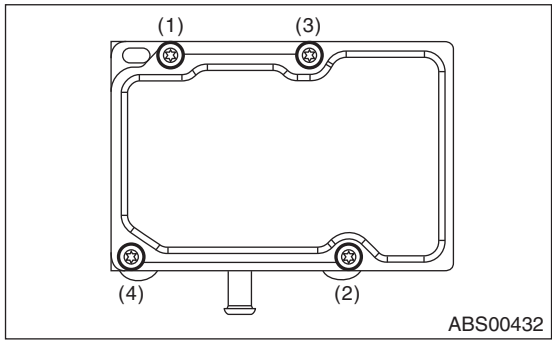
5) Slowly pull out the VDCCM upward from the H/U.

NOTE:
To prevent damaging of coil section, remove the VDCCM 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 VDCCM&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 VDCCM to align with the H/U valve.
8) To prevent deformation of the VDCCM housing cover, hold the corner of VDCCM 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 VDCCM&H/U.

11) Using a TORX® bit E5, tighten the screws in the order of (1) through (4) again.

Tightening torque:
3 N·m (0.31 kgf-m, 2.2 ft-lb)

12) Check that there is no gap in the mating surface between VDCCM&H/U.
13) Install the VDCCM&H/U to the vehicle.
14) Bleed air from the brake system. <Ref. to BR-33, PROCEDURE, Air Bleeding.>
15) Perform the selection · registration operation of parameter. <Ref. to VDC(diag)-19, PARAMETER SELECTION, OPERATION, Subaru Select Monitor.>

NOTE:
• After replacing the VDCCM, be sure to perform the selection · registration operation of parameter.
• For the selection and registration of parameter, the Subaru Select Monitor is required.
• When the registration has not been performed, the DTC code “Parameter selection error” is detected together with the ABS/EBD/VDC warning light illumination.

16) Check the parameter to confirm that the applied models and grades of the relevant vehicle are included. <Ref. to VDC(diag)-19, PARAMETER CHECK, OPERATION, Subaru Select Monitor.>
17) If the applied models and grades of the relevant vehicle are not included, perform the selection · registration operation of parameter with the {Confirm on parameter} screen again. <Ref. to VDC(diag)-19, PARAMETER SELECTION, OPERATION, Subaru Select Monitor.>
18) Execute Clear Memory after parameter selection and registration operations because the DTC for “Parameter selection error” is memorized.

E: ADJUSTMENT

When the following replacement, removal and installation are performed, be sure to perform the centering of the steering angle sensor and zero point setting of yaw rate & G sensor.
• VDCCM&H/U
• Steering angle sensor
• Yaw rate & G sensor
• Steering wheel parts (Including airbag)
• Suspension parts
• Wheel alignment adjustment

1) Park the vehicle straight on a level surface. (Engine operation in the “P” or “N” range)
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 the {Set mode Str.A.Sen.N&Lat.GSen.0p} in the «Function Check Sequence» screen. (Follow the steps on the display.)
4) On «Brake Control System» display, select {Current Data Display & Save}, and check that the steering angle sensor shows “0 deg”.
5) When the “0 deg” is not displayed, repeat the above steps and check that the “0 deg” is displayed.
6) Drive the vehicle for 10 minutes, and check that the ABS and VDC warning light is not illuminated.
7) Check that there is no unnecessary VDC operation or steering control loss. If there is a malfunction, repeat the steps above.

3. ABS Sequence Control

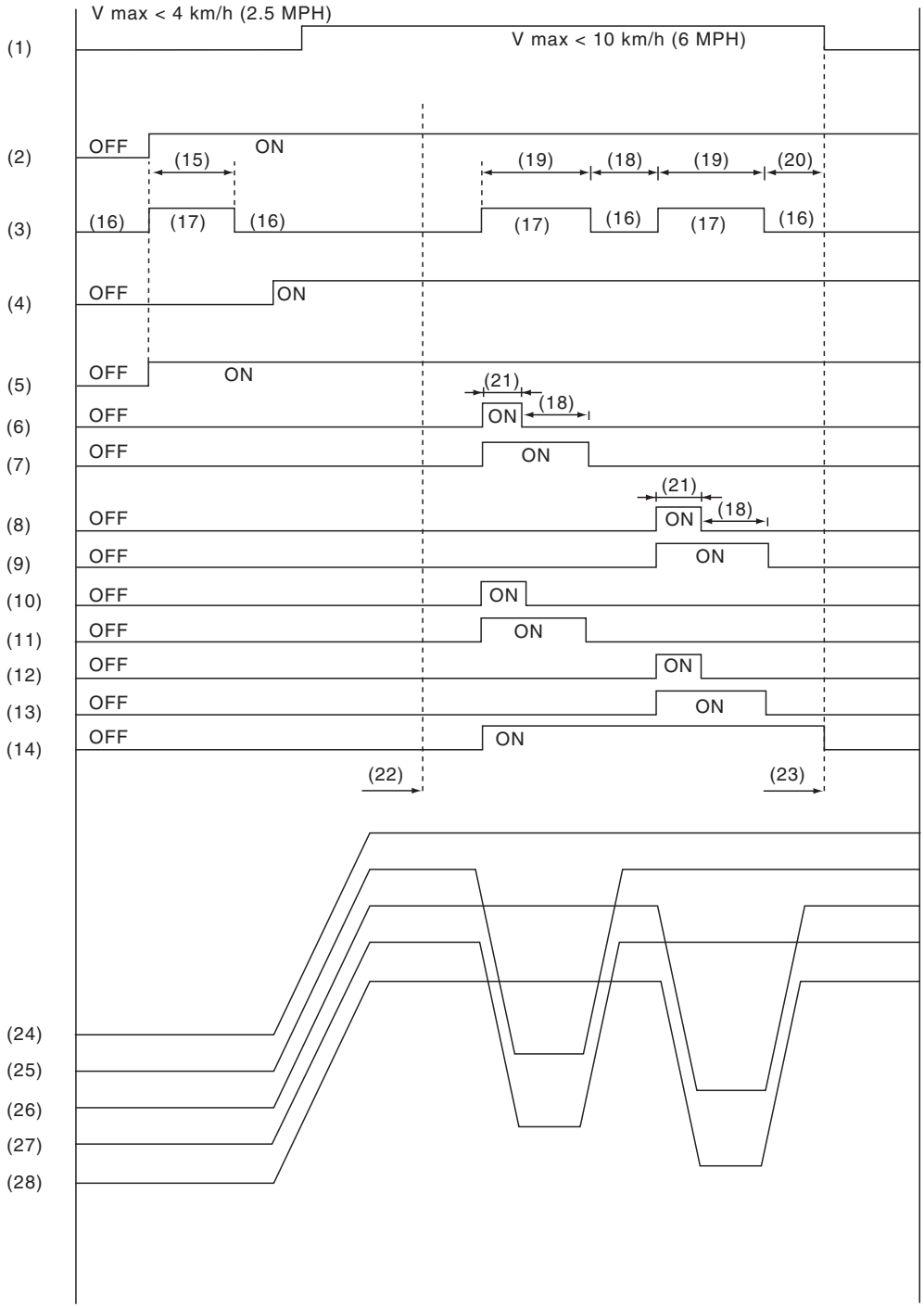
A: OPERATION

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 the Subaru Select Monitor.

1. ABS SEQUENCE CONTROL WITH SUBARU SELECT MONITOR

NOTE:
In the event of any trouble, the ABS sequence control will not operate.
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 "PC application for Subaru Select Monitor".
4) Set the Subaru Select Monitor to "Brake Control System" 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 1,000 N (102 kgf, 225 lbf).
   (2) When using a pressure gauge, press the brake pedal so that the pressure gauge indicates 3,500 kPa (36 kgf/cm^2, 511 psi).
7) Press "OK" after "Press OK" is displayed.
8) The brake system being operated is displayed on the Subaru Select Monitor.

2. CONDITIONS FOR ABS SEQUENCE CONTROL



ABS00943

(1) All wheel speed
(2) Ignition key
(3) ABS warning light
(4) Stop light switch
(5) Valve relay
(6) FL decompression valve
(7) FL compression valve
(8) FR decompression valve
(9) FR compression valve
(10) RR decompression valve
(11) RR compression valve
(12) RL decompression valve
(13) RL compression valve
(14) Pump motor
(15) 1.5 seconds
(16) Light OFF
(17) Light ON
(18) 1.0 seconds
(19) 1.4 seconds
(20) 0.6 seconds
(21) 0.4 seconds
(22) Point A
(23) Reset
(24) Master cylinder pressure
(25) FL wheel cylinder pressure
(26) FR wheel cylinder pressure
(27) RR wheel cylinder pressure
(28) RL wheel cylinder pressure

NOTE:
The control operation starts at 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 control mode.

- When the speed of at least one wheel reaches 10 km/h (6 MPH).
- When the brake pedal is released during ABS sequence control and the stop light switch is becomes OFF.
- After completion of ABS sequence control.
- When a malfunction is detected.

4. VDC Sequence Control

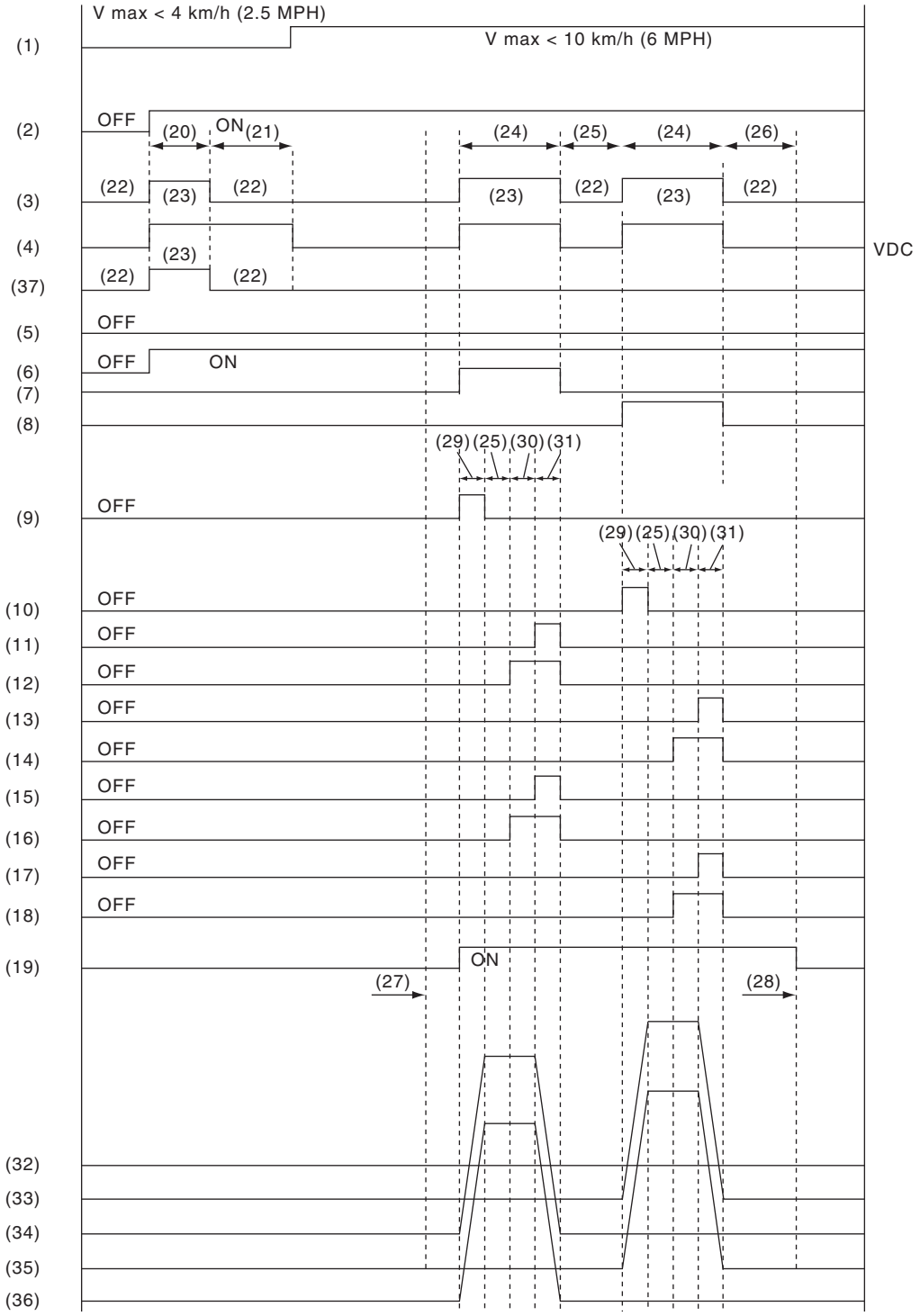
A: OPERATION

1) While the VDC sequence control is performed, the operation of the hydraulic unit can be checked using the brake tester or pressure gauge after the hydraulic unit solenoid valve is operated.
2) VDC sequence control can be started by Subaru Select Monitor.

1. VDC SEQUENCE CONTROL WITH SUBARU SELECT MONITOR

NOTE:
In the event of any trouble, sequence control will not operate.
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 "PC application for Subaru Select Monitor".
4) Set the Subaru Select Monitor to "Brake Control System" mode.
5) When the "VDC Inspection Mode" is selected from the "Function Check Sequence" menu, the "VDC sequence control" will start.
6) Press "OK" after "Press OK" is displayed.
7) Operation points will be displayed on Subaru Select Monitor.

2. CONDITIONS FOR VDC SEQUENCE CONTROL



VDC00607

(1) All wheel speed
(2) Ignition key
(3) ABS warning light
(4) VDC warning light
(5) Stop light switch
(6) Valve relay
(7) VDC switching valve 1 FL
(8) VDC switching valve 1 FR
(9) VDC switching valve 2 FL
(10) VDC switching valve 2 FR
(11) FL decompression valve
(12) FL compression valve
(13) FR decompression valve
(14) FR compression valve
(15) RR decompression valve
(16) RR compression valve
(17) RL decompression valve
(18) RL compression valve
(19) Pump motor
(20) 1.5 seconds
(21) Approx. 3 seconds
(22) Light OFF
(23) Light ON
(24) 3.4 seconds
(25) 1 second
(26) 1.6 seconds
(27) Point A
(28) Reset
(29) 0.8 seconds
(30) 1.2 seconds
(31) 0.4 seconds
(32) Master cylinder pressure
(33) FR wheel cylinder pressure
(34) FL wheel cylinder pressure
(35) RL wheel cylinder pressure
(36) RR wheel cylinder pressure
(37) Hill start assist warning light (MT vehicles only)

NOTE:
The control operation starts at point A.

B: SPECIFICATION

1. CONDITIONS FOR COMPLETION OF VDC SEQUENCE CONTROL

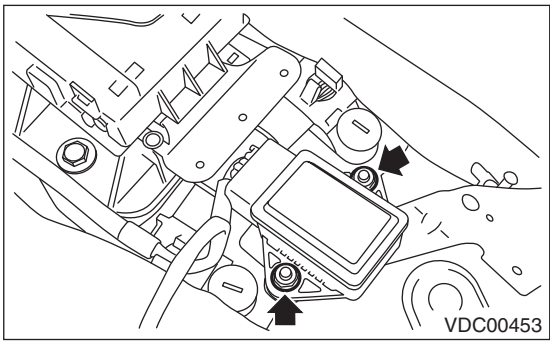
When the following conditions develop, the VDC sequence control stops and VDC operation is returned to the normal control mode.
- When the speed of at least one wheel reaches 10 km/h (6 MPH).
- When the brake pedal is pressed during sequence control and the stop light switch is set to ON.
- After completion of VDC sequence control.
- When a malfunction is detected.

5. Yaw Rate and G Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the console box. <Ref. to EI-49, Console Box.>
3) Disconnect the connector from yaw rate & G sensor.
4) Remove the nut and remove the yaw rate & G sensor.

CAUTION:
Do not drop or hit the yaw rate & G sensor.



B: INSTALLATION

CAUTION:
After completion of installation, set the following two positions.
• Positioning to the center of steering angle sensor
• Positioning the yaw rate & G sensors to zero
The above procedure is required VDCCM&H/U to identify the vehicle position afterward. For the setting procedures of the 2 steps above, refer to "VDC Control Module and Hydraulic Control Unit (VDCCM&H/U)". <Ref. to VDC-12, ADJUSTMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>
Install each part in the reverse order of removal.

Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

C: INSPECTION

1. YAW RATE & G SENSOR SIGNAL

	Step	Check	Yes	No
1	**CHECK YAW RATE & G SENSOR.** 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor connector to the data link connector. 3) Turn the ignition switch to ON. 4) Set the Subaru Select Monitor to “Brake Control System” mode. 5) Select {Current Data Display & Save}. 6) Read the output of yaw rate & G sensor.	Are the indicated values as follows when the vehicle is placed horizontally? Lateral G sensor: –1.5 — 1.5 m/s^2, Yaw rate sensor: –4 — 4 deg/s	Go to step **2**.	Repair the harness connector between yaw rate & G sensor and VDCCM&H/U. Or replace yaw rate & G sensor.
2	**CHECK VEHICLE.**	Is the vehicle an AT model?	Go to step **5**.	Go to step **3**.
3	**CHECK G SENSOR.** 1) Remove the console box. 2) Remove the yaw rate & G sensor from vehicle without disconnecting the connector. 3) Read the display of Subaru Select Monitor. NOTE: When the yaw rate & G sensor is moved with its power supply on, DTC of yaw rate & G sensor may be recorded.	Is the value 6.8 — 12.8 m/s^2 when the yaw rate & G sensor is inclined 90° to the forward?	Go to step **4**.	Repair the harness connector between yaw rate & G sensor and VDCCM&H/U. Or replace yaw rate & G sensor.
4	**CHECK G SENSOR.** Read the display of Subaru Select Monitor. NOTE: When the yaw rate & G sensor is moved with its power supply on, DTC of yaw rate & G sensor may be recorded.	Is the value –6.8 — –12.8 m/s^2 when the yaw rate & G sensor is inclined 90° to the rearward?	Go to step **5**.	Repair the harness connector between yaw rate & G sensor and VDCCM&H/U. Or replace yaw rate & G sensor.
5	**CHECK G SENSOR.** 1) Remove the console box. (AT model only) 2) Remove the yaw rate & G sensor from vehicle without disconnecting the connector. (AT model only) 3) Read the display of Subaru Select Monitor. NOTE: When the yaw rate & G sensor is moved with its power supply on, DTC of yaw rate & G sensor may be recorded.	Is the value 6.8 — 12.8 m/s^2 when the yaw rate & G sensor is inclined 90° to the right?	Go to step **6**.	Repair the harness connector between yaw rate & G sensor and VDCCM&H/U. Or replace yaw rate & G sensor.
6	**CHECK G SENSOR.** Read the display of Subaru Select Monitor. NOTE: When the yaw rate & G sensor is moved with its power supply on, DTC of yaw rate & G sensor may be recorded.	Is the value –6.8 — –12.8 m/s^2 when the yaw rate & G sensor is inclined 90° to the left?	Yaw rate & G sensors are normal.	Repair the harness connector between yaw rate & G sensor and VDCCM&H/U. Or replace yaw rate & G sensor.

6. Steering Angle Sensor

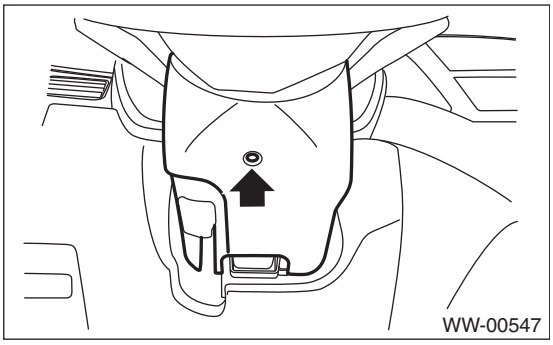
A: REPLACEMENT

CAUTION:
• Do not perform the removal except unless replacing.
• When replacing three times or more, replace by using the combination switch assembly to protect the threads.

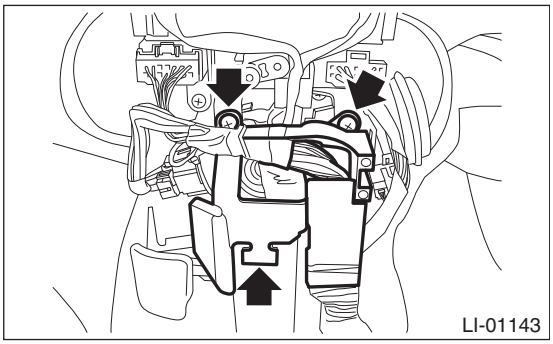
1) Set the steering wheel in a straight-ahead position.
2) Disconnect the ground cable from battery.
3) Remove the driver's airbag module. <Ref. to AB-18, REMOVAL, Driver's Airbag Module.>

CAUTION:
Before handling the airbag module, refer to "CAUTION" of "General Description" in "AIRBAG SYSTEM". <Ref. to AB-5, CAUTION, General Description.>

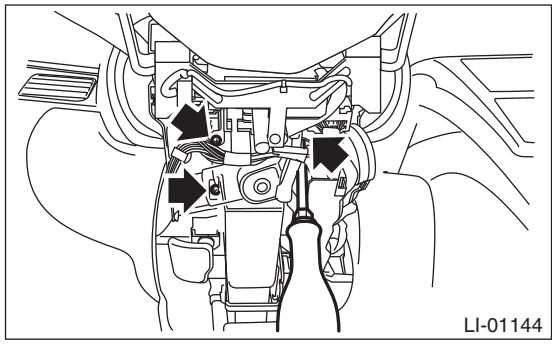
4) Remove the steering wheel. <Ref. to PS-13, REMOVAL, Steering Wheel.>
5) Remove the screws and remove the steering column lower cover.


WW-00547

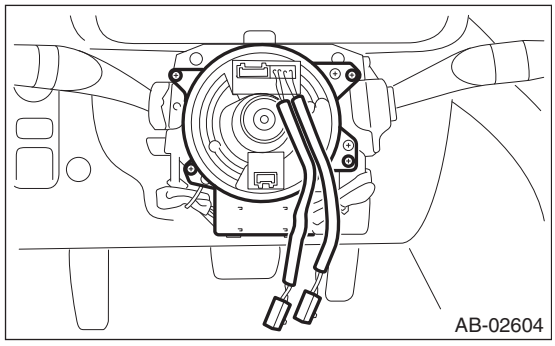
6) Remove the harness cover lock.
7) Remove the screws and detach the knee protector.


LI-01143

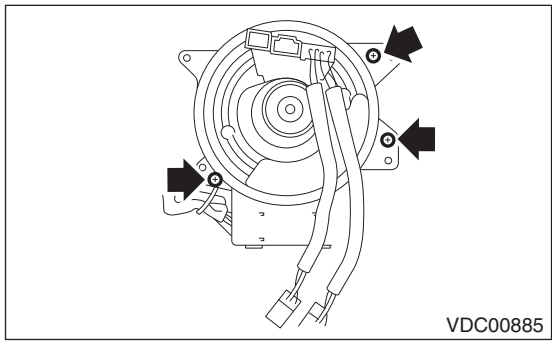
8) Remove the screws and remove the steering column cover upper.


LI-01144

9) Disconnect the connector of roll connector and steering angle sensor.
10) Remove the screws which secure the roll connector to steering column.

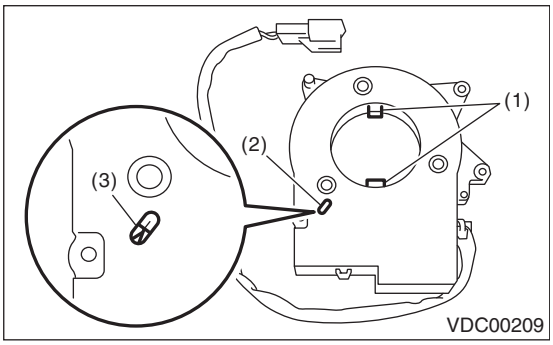

AB-02604

11) Remove the vinyl tape binding the harness, and remove the steering angle sensor from roll connector.


VDC00885

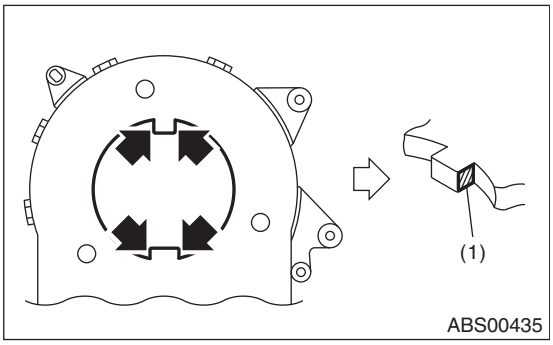
12) Turn the protrusion portion of new steering angle sensor to match the alignment mark of inspection hole.

CAUTION:
Be careful not to allow foreign matter to enter into inspection hole.



(1) Protrusion portion
(2) Inspection hole
(3) Alignment mark

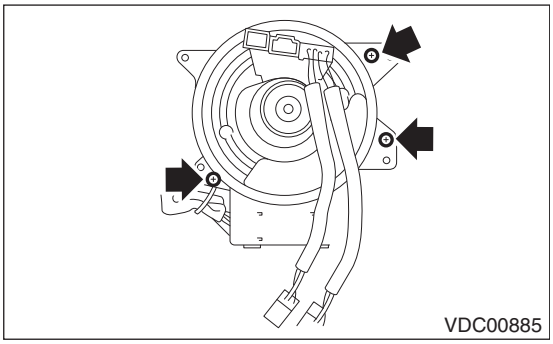
13) Align the center of roll connector. <Ref. to AB-29, INSTALLATION, Roll Connector.>
14) Apply the grease provided with the new part on the 4 locations of the protrusion on the steering angle sensor.



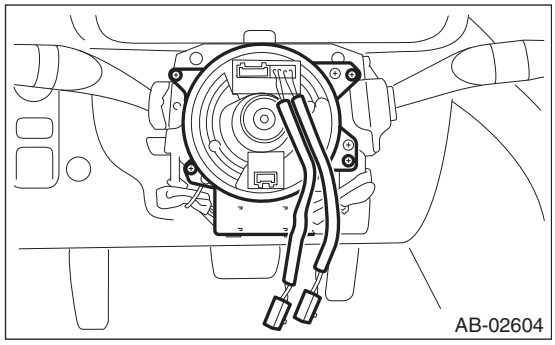
(1) Grease application location

15) Align the position of the protrusion and install roll connector to steering angle sensor.

Tightening torque:
0.5 N·m (0.05 kgf-m, 0.36 ft-lb)



16) Install the roll connector to combination switch and bind the harness with vinyl tape as originally bound.



17) Install the steering wheel. <Ref. to PS-13, INSTALLATION, Steering Wheel.>

Tightening torque:
39 N·m (3.98 kgf-m, 28.8 ft-lb)
18) Install the airbag module to the steering wheel. <Ref. to AB-18, INSTALLATION, Driver's Airbag Module.>

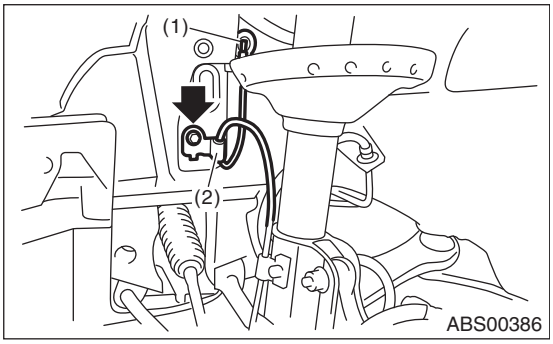
CAUTION:
Before handling the airbag module, refer to "CAUTION" of "General Description" in "AIRBAG SYSTEM". <Ref. to AB-5, CAUTION, General Description.>
19) Connect the ground cable to battery.

CAUTION:
After completion of installation, adjust the following two positions.
• Positioning to the center of steering angle sensor
• Positioning the yaw rate & G sensors to zero
The above procedure is required for the VDCCM to identify vehicle position afterward. For the setting procedures of the 2 steps above, refer to "VDC Control Module and Hydraulic Control Unit (VDCCM&H/U)". <Ref. to VDC-12, ADJUSTMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>

7. Front ABS Wheel Speed Sensor

A: REMOVAL

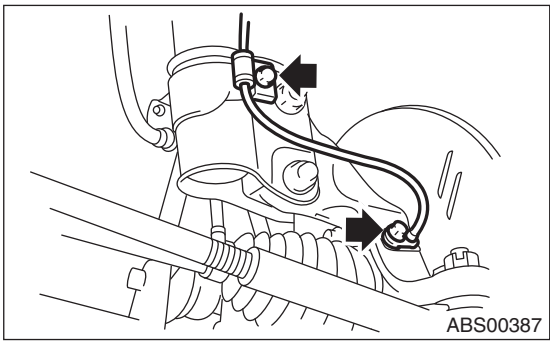
1) Disconnect the ground cable from battery.
2) Disconnect the ABS wheel speed sensor connector located next to the front strut mounting house in the engine compartment.
3) Remove the bolts and then remove the sensor harness bracket.



(1) To the front ABS wheel speed sensor connector
(2) Sensor harness bracket

4) Remove the bolts which secure the sensor harness to the front strut.
5) Remove the bolts, and remove the front ABS wheel speed sensor from the front housing.

CAUTION:
• Be careful not to damage the sensor.
• Do not apply excessive force to the sensor harness.



B: INSTALLATION

CAUTION:
Be careful not to damage the sensor.
Install each part in the reverse order of removal.

Tightening torque:
Sensor
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)
Bracket
33 N·m (3.36 kgf-m, 24.3 ft-lb)

NOTE:
• Check the identification (mark) on the harness to make sure there is no warpage. (RH: K1 (White), LH: K2 (Yellow))
• Check if the harness is not pulled and does not come in contact with the suspension or body during steering wheel effort.

C: INSPECTION

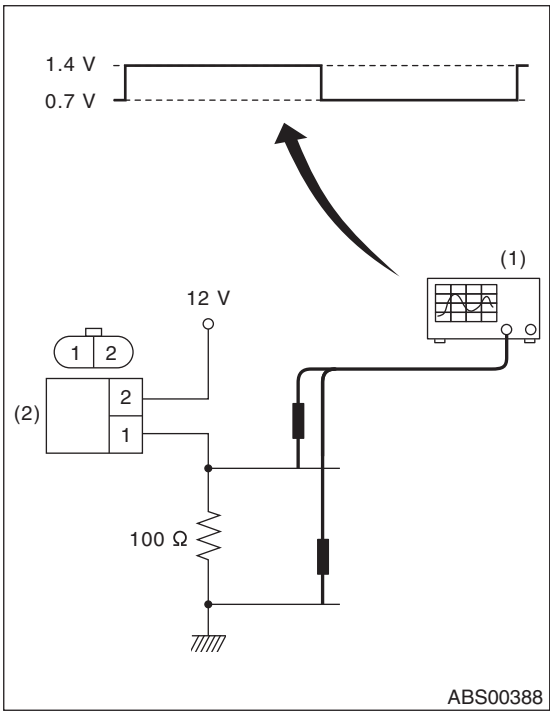
1. CHECK WITH SUBARU SELECT MONITOR

1) Connect the Subaru Select Monitor to the data link connector.
2) Select {Current Data Display & Save}. Check if the speed indicated on the display changes in the same manner as the speedometer reading during acceleration/deceleration when the steering wheel is in the straight-ahead position.
3) If the speed indicated on the display does not change, check the ABS wheel speed sensor. <Ref. to VDC-24, ABS WHEEL SPEED SENSOR, INSPECTION, Front ABS Wheel Speed Sensor.>

2. ABS WHEEL SPEED SENSOR

1) Check the tip of the ABS wheel speed sensor for foreign particles or damage. If necessary, clean the tip or replace the ABS wheel speed sensor.
2) Check the ABS wheel speed sensor cable for discontinuity. If defective, replace the ABS wheel speed sensor.
3) Connect a 12 V power supply to No. 2 terminal of sensor connector as shown in the figure, then attach resistance to the No. 1 terminal. Rotate the wheel at about 2.75 km/h (2 MPH), and measure the voltage using an oscilloscope.

Standard value of output voltage:
0.7 — 1.4 V



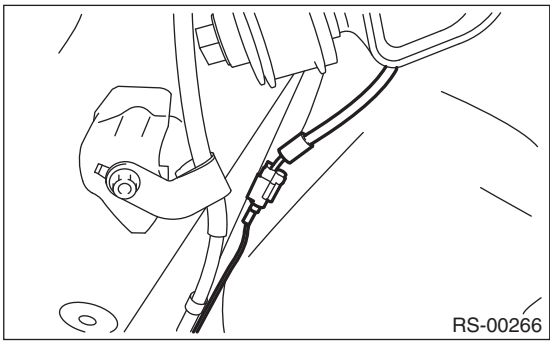
(1) Oscilloscope
(2) ABS wheel speed sensor

4) Replace the ABS wheel speed sensor if the inspection result is not within the standard value.

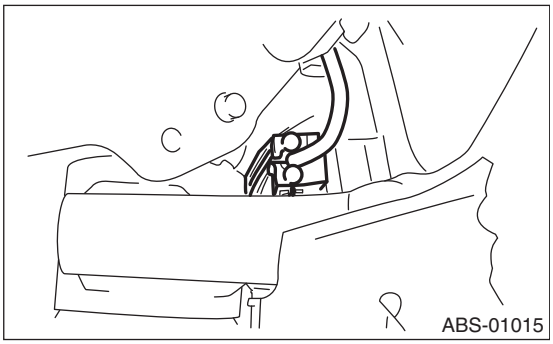
8. Rear ABS Wheel Speed Sensor

A: REMOVAL

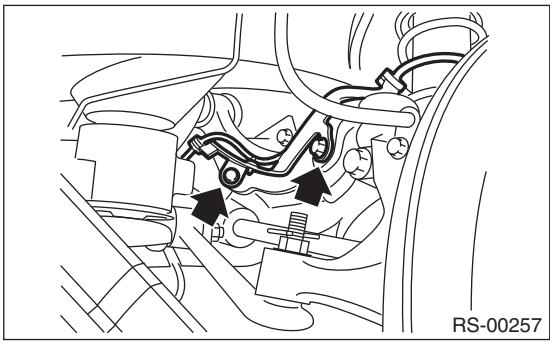
1) Disconnect the ground cable from battery.
2) Disconnect the connector from the rear ABS wheel speed sensor.



3) Remove the sensor harness clamp of the rear sub frame.

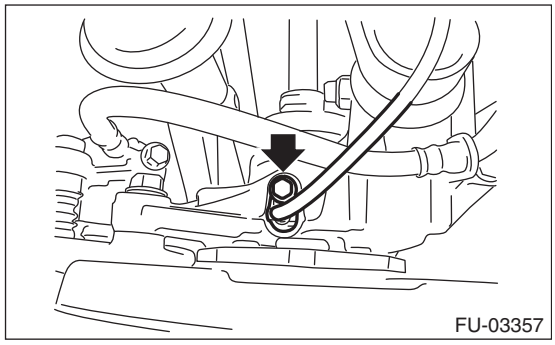


4) Remove the bolts and then remove the sensor harness bracket from the upper arm.



5) Remove the bolts, and remove the rear ABS wheel speed sensor from the rear axle.

CAUTION:
- **Be careful not to damage the sensor.**
- **Do not apply excessive force to the sensor harness.**



B: INSTALLATION

CAUTION:
Be careful not to damage the sensor.
Install each part in the reverse order of removal.

Tightening torque:
Sensor
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)
Bracket
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

NOTE:
Check the identification (mark) on the harness to make sure there is no warpage. (RH: P3 (Aqua), LH: P4 (Brown))

C: INSPECTION

1. ABS WHEEL SPEED SENSOR

Refer to “INSPECTION” in “Front ABS Wheel Speed Sensor”. <Ref. to VDC-24, ABS WHEEL SPEED SENSOR, INSPECTION, Front ABS Wheel Speed Sensor.>

9. Front Magnetic Encoder

A: REMOVAL

Refer to “Front Hub Bearing” for removal, because the front magnetic encoder is integrated with front hub bearing. <Ref. to DS-17, REMOVAL, Front Hub Unit Bearing.>

B: INSTALLATION

Refer to “Front Hub Bearing” for installation, because the front magnetic encoder is integrated with front hub bearing. <Ref. to DS-18, INSTALLATION, Front Hub Unit Bearing.>

C: INSPECTION

Visually check the magnetic encoder for any damage. If necessary, replace with a new hub unit bearing.

NOTE:
Because the magnetic encoder is integrated with hub unit bearing assembly, replace the hub unit bearing with a new part if there is any defect found on the magnetic encoder.

10.Rear Magnetic Encoder

A: REMOVAL

Refer to “Rear Hub Unit Bearing” for removal, because the rear magnetic encoder is integrated with rear hub unit bearing. <Ref. to DS-24, REMOVAL, Rear Hub Unit Bearing.>

B: INSTALLATION

Refer to “Rear Hub Unit Bearing” for installation, because the rear magnetic encoder is integrated with rear hub unit bearing. <Ref. to DS-25, INSTALLATION, Rear Hub Unit Bearing.>

C: INSPECTION

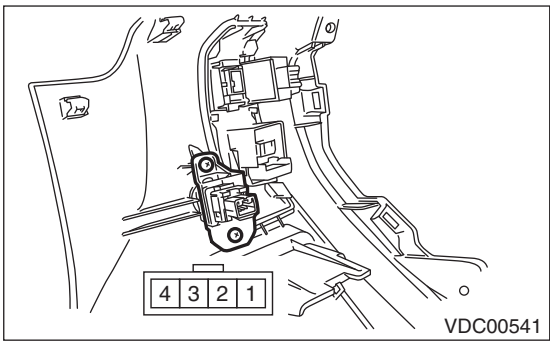
Visually check the magnetic encoder parts for any damage. If necessary, replace with a new hub unit bearing.

NOTE:
Because the magnetic encoder is integrated with hub unit bearing assembly, replace the hub unit bearing with a new part if there is any defect found on the magnetic encoder.

11.VDC OFF Switch

A: REMOVAL

1) Remove the instrument panel lower cover. <Ref. to EI-47, REMOVAL, Instrument Panel Lower Cover.>
2) Remove the screws, and then remove the VDC OFF switch.



B: INSTALLATION

Install each part in the reverse order of removal.

C: INSPECTION

1) Check the resistance between the VDC OFF switch terminals.

Switch position	Terminal No.	Standard
OFF	2 — 3	1 MΩ or more
ON	2 — 3	Less than 1 Ω

2) Replace the VDC OFF switch if the inspection result is not within the standard value.

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

VDC(diag)

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12.	Diagnostic Procedure with Diagnostic Trouble Code (DTC)	40
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1. Basic Diagnostic Procedure

A: PROCEDURE

CAUTION:
Remove foreign matter (dust, water, oil etc.) from the VDCCM&H/U connector during removal and installation.

NOTE:
- To check the harness for open or short circuits, shake problem spot or connector.
- Refer to “Check List for Interview”. <Ref. to VDC(diag)-4, Check List for Interview.>

	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 VDC(diag)-4, Check List for Interview.> 2) Before performing diagnostics, check the component which might affect VDC problems. <Ref. to VDC(diag)-8, INSPECTION, General Description.>	Is the component that might influence the VDC problem normal?	Go to step **2**.	Repair or replace each component.
2	**CHECK INDICATION OF DTC.** 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor to data link connector. 3) Turn the ignition switch to ON and run the Subaru Select Monitor. 4) Read the DTC using the Subaru Select Monitor. <Ref. to VDC(diag)-23, OPERATION, Read Diagnostic Trouble Code (DTC).> NOTE: If the communication function of the Subaru Select Monitor cannot be executed properly, check the communication circuit. <Ref. to VDC(diag)-20, COMMUNICATION FOR INITIALIZING IMPOSSIBLE, INSPECTION, Subaru Select Monitor.>	Is DTC displayed on Subaru Select Monitor?	Record the DTC. Go to step **4**.	Go to step **3**.
3	**PERFORM GENERAL DIAGNOSTICS.** 1) Perform the inspection by referring to “General Diagnostic Table”. <Ref. to VDC(diag)-106, INSPECTION, General Diagnostic Table.> 2) Perform the Clear Memory Mode. <Ref. to VDC(diag)-25, OPERATION, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to VDC(diag)-24, PROCEDURE, Inspection Mode.> 4) Read the DTC. <Ref. to VDC(diag)-23, OPERATION, Read Diagnostic Trouble Code (DTC).> 5) Check the DTC is not displayed.	Do the VDC warning light, VDC indicator light, and ABS warning light go off after starting the engine?	Finish the diagnosis.	Check the combination meter circuit. <Ref. to VDC(diag)-29, ABS WARNING LIGHT DOES NOT GO OFF, Warning Light Illumination Pattern.> <Ref. to VDC(diag)-30, VDC WARNING LIGHT AND VDC INDICATOR LIGHT DO NOT GO OFF, Warning Light Illumination Pattern.> <Ref. to VDC(diag)-31, VDC OFF INDICATOR LIGHT DOES NOT GO OFF, Warning Light Illumination Pattern.>

	Step	Check	Yes	No
4	**CHECK FREEZE FRAME DATA** Using the Subaru Select Monitor, check the freeze frame data of the VDC control module.	Are freeze frame data recorded?	Record the freeze frame data. Go to step **5**.	Go to step **5**.
5	**PERFORM DIAGNOSIS.** 1) Refer to “List of Diagnostic Trouble Code (DTC)”. NOTE: For the DTC list, refer to “List of Diagnostic Trouble Code (DTC)”. <Ref. to VDC(diag)-34, LIST, List of Diagnostic Trouble Code (DTC).> 2) Correct the cause of trouble. 3) Perform the Clear Memory Mode. <Ref. to VDC(diag)-25, OPERATION, Clear Memory Mode.> 4) Perform the Inspection Mode. <Ref. to VDC(diag)-24, PROCEDURE, Inspection Mode.> 5) Read the DTC. <Ref. to VDC(diag)-23, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is DTC displayed?	Repeat step 5 until DTC is not shown.	Finish the diagnosis.

2. Check List for Interview

A: CHECK

Check the following item about the vehicle's state.

1. STATE OF ABS WARNING LIGHT

ABS warning light illuminates.	❑ Always ❑ Sometimes ❑ Only once ❑ Does not come on • When/How long does it illuminate?		
Ignition key position	❑ LOCK ❑ ACC ❑ ON (before starting engine) ❑ START ❑ ON (after starting engine, engine is running) ❑ ON (after starting engine, engine is at a standstill)		
Timing	❑ Immediately after turning the ignition switch to ON ❑ Immediately after turning the ignition switch to START		
	❑ While accelerating	—	km/h
		—	MPH
	❑ While driving at a constant speed	km/h	MPH
	❑ While decelerating	—	km/h
		—	MPH
	❑ When turning to the right	Steering angle:	deg
		Steering time:	Sec.
	❑ When turning to the left	Steering angle:	deg
		Steering time:	Sec.
	❑ When other electrical parts are operating		
	• Part name: • Operating condition:		

2. STATE OF VDC WARNING LIGHT & VDC INDICATOR LIGHT

VDC warning light & VDC indicator light illuminates.	❑ Always ❑ Sometimes ❑ Only once ❑ Does not illuminate • When/How long does it illuminate?		
Ignition key position	❑ LOCK ❑ ACC ❑ ON (before starting engine) ❑ START ❑ ON (after starting engine, engine is running) ❑ ON (after starting engine, engine is at a standstill)		
Timing	❑ Immediately after turning the ignition switch to ON ❑ Immediately after turning the ignition switch to START		
	❑ While accelerating	—	km/h
		—	MPH
	❑ While driving at a constant speed	km/h	MPH
	❑ While decelerating	—	km/h
		—	MPH
	❑ When turning to the right	Steering angle:	deg
		Steering time:	Sec.
	❑ When turning to the left	Steering angle:	deg
		Steering time:	Sec.
	❑ When other electrical parts are operating		
	• Part name: • Operating condition:		

3. STATE OF VDC OFF INDICATOR LIGHT

VDC OFF indicator light comes on.	❑ Always ❑ Sometimes ❑ Only once ❑ Does not illuminate • When/How long does it illuminate?		
Ignition key position	❑ LOCK ❑ ACC ❑ ON (before starting engine) ❑ START ❑ ON (after starting engine, engine is running) ❑ ON (after starting engine, engine is at a standstill)		
Timing	❑ Immediately after turning the ignition switch to ON ❑ Immediately after turning the ignition switch to START		
	❑ While accelerating	—	km/h
		—	MPH
	❑ While driving at a constant speed	km/h	MPH
	❑ While decelerating	—	km/h
		—	MPH
	❑ When turning to the right	Steering angle:	deg
		Steering time:	Sec.
	❑ When turning to the left	Steering angle:	deg
		Steering time:	Sec.
	❑ When other electrical parts are operating		
	• Part name: • Operating condition:		

4. CONDITIONS UNDER WHICH TROUBLE OCCURS

Environment	a) Weather	❑ Fine ❑ Cloudy ❑ Rainy ❑ Snowy ❑ Others:
	b) Ambient temperature	°C (°F)
	c) Road	❑ Inner city ❑ Suburbs ❑ Highway ❑ Local street ❑ Uphill ❑ Downhill ❑ Paved road ❑ Gravel road ❑ Muddy road ❑ Sandy place ❑ Straight road ❑ Sharp curve ❑ Gentle curve ❑ S-curve ❑ Road with a slope on both sides ❑ Others:
	d) Road surface	❑ Dry ❑ Wet ❑ Covered with fresh snow ❑ Covered with hardened snow ❑ Frozen slope ❑ Others:

Condition	a) Brakes	Deceleration:	G
		❑ Continuous / ❑ Intermittent	
	b) Accelerator	Acceleration:	G
		❑ Continuous / ❑ Intermittent	
	c) Vehicle speed	km/h	MPH
		❑ Advancing ❑ While accelerating ❑ While decelerating ❑ At low speed ❑ When turning ❑ 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:	mm (in)
		Front LH tire:	mm (in)
		Rear RH tire:	mm (in)
		Rear LH tire:	mm (in)
	f) Steering wheel	❑ Sharp turning ❑ Gentle turning ❑ Straight forward motion ❑ Gentle return ❑ Sharp return	
	g) Tire/Wheel size	❑ Specified size ❑ Except specification ( )	
	h) Tire variation	❑ Summer tire ❑ Studless tire (Brand:)	
	i) Tire chain is attached: ❑ Yes / ❑ No		
	j) Using T-type tires: ❑ Yes / ❑ No		
	k) Condition of suspension alignment:		
	l) Load condition:		
	m) Repaired parts are used: ❑ Yes / ❑ No		
	• Contents:		
	n) Others:		

3. General Description

A: CAUTION

1. SUPPLEMENTAL RESTRAINT SYSTEM "AIRBAG"

Airbag system wiring harness is routed near the ABS wheel speed sensor and VDCCM&H/U.

CAUTION:
• Do not use electrical test equipment on the airbag system wiring harness and connector circuit.
• Be careful not to damage the airbag system wiring harness when servicing the ABS wheel speed sensor and VDCCM&H/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 torque of ground (GB-6) bolt of VDC.

Tightening torque:
13 N·m (1.3 kgf-m, 9.6 ft-lb)

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 VDC-9, CHECKING THE HYDRAULIC UNIT ABS OPERATION BY BRAKE TESTER, INSPECTION, VDC Control Module and Hydraulic Control Unit (VDC-CM&H/U).>
• Without brake tester <Ref. to VDC-8, CHECKING THE HYDRAULIC UNIT ABS OPERATION BY PRESSURE GAUGE, INSPECTION, VDC Control Module and Hydraulic Control Unit (VDC-CM&H/U).>

5. BRAKE DRAG

Check for brake drag.

6. BRAKE PAD AND ROTOR

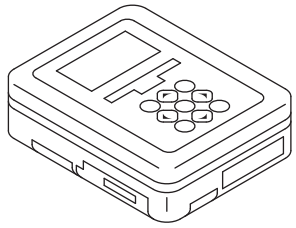
Check the brake pad and rotor.
• Front <Ref. to BR-13, INSPECTION, Front Brake Pad.> <Ref. to BR-14, INSPECTION, Front Disc Rotor.>
• Rear <Ref. to BR-20, INSPECTION, Rear Brake Pad.> <Ref. to BR-21, INSPECTION, Rear Disc Rotor.>

7. TIRE

Check the tire specifications, tire wear and air pressure. <Ref. to WT-2, SPECIFICATION, General Description.>

C: PREPARATION TOOL

1. SPECIAL TOOL

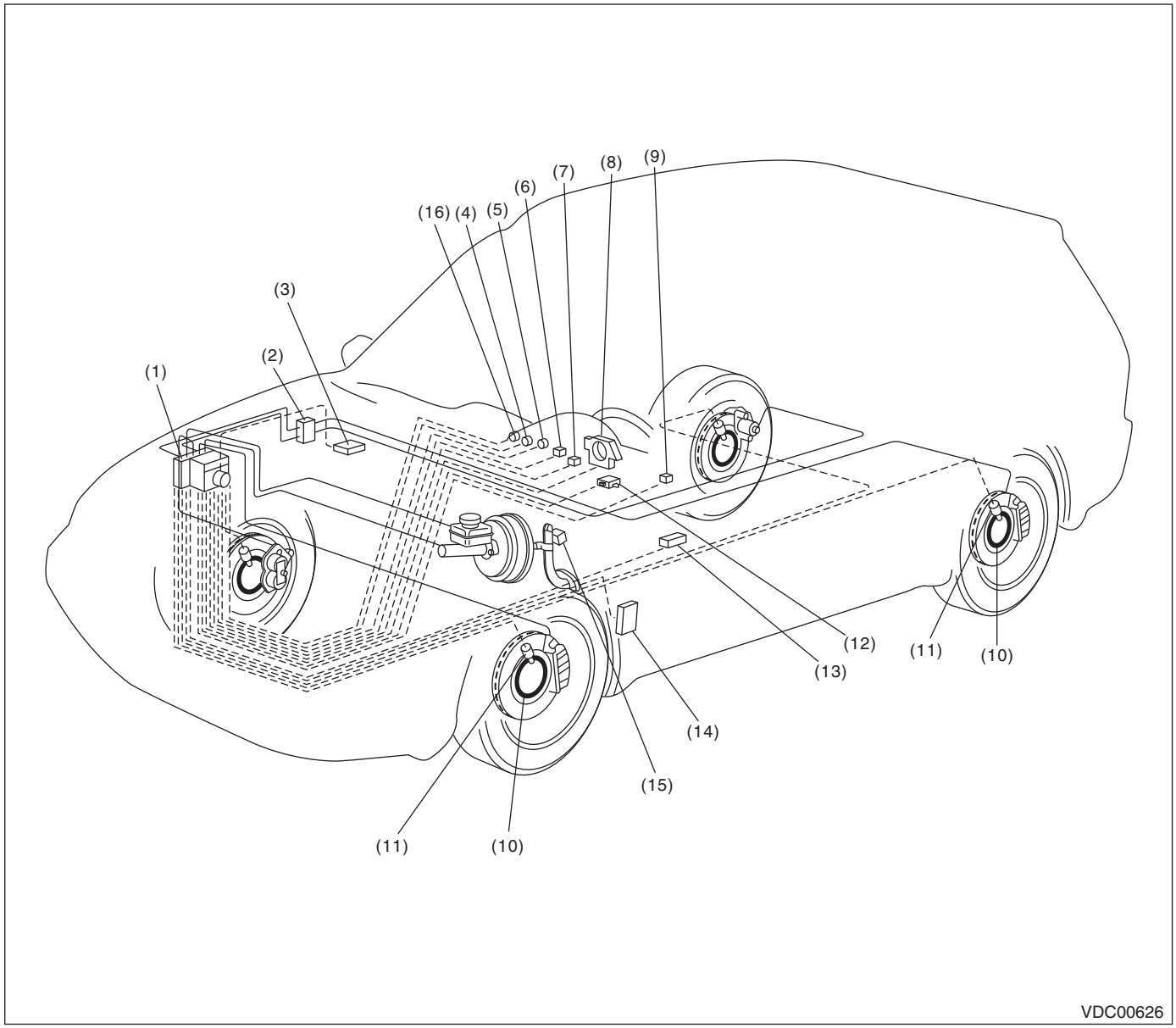
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST1B022XU0	1B022XU0	SUBARU SELECT MONITOR III KIT	Used for troubleshooting the electrical system.

2. GENERAL TOOL

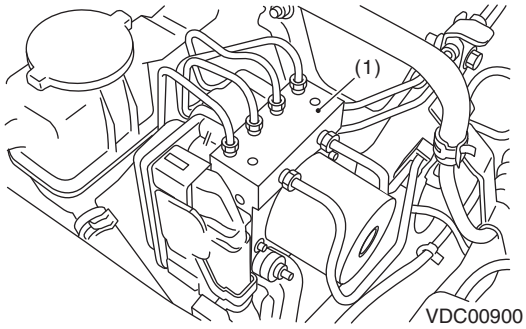
TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance, voltage and current.
Oscilloscope	Used for measuring the sensor.

4. Electrical Component Location

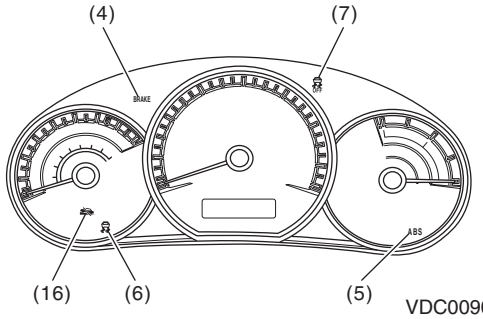
A: LOCATION



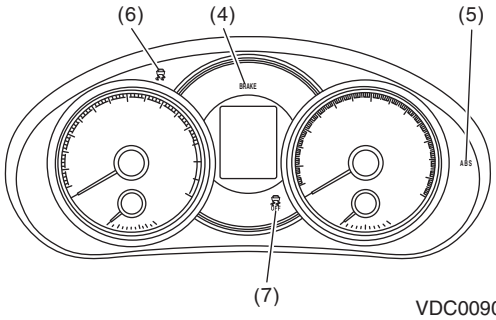
(1) VDC control module and hydraulic control unit (VDCCM&H/U)
(2) Connector
(3) Transmission control module (TCM)
(4) Brake warning light (EBD warning light)
(5) ABS warning light
(6) VDC warning light & VDC indicator light
(7) VDC OFF indicator light
(8) Steering angle sensor
(9) VDC OFF switch
(10) Magnetic encoder
(11) ABS wheel speed sensor
(12) Yaw rate & G sensor
(13) Data link connector
(14) Engine control module (ECM)
(15) Stop light and brake switch
(16) Hill start assist warning light (MT model only)



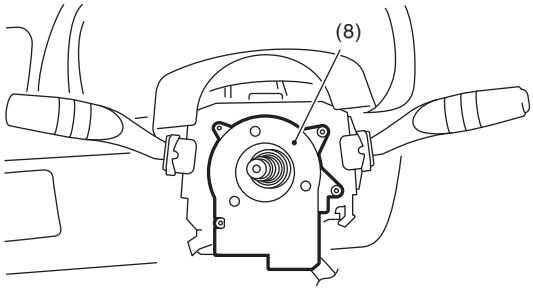
VDC00900



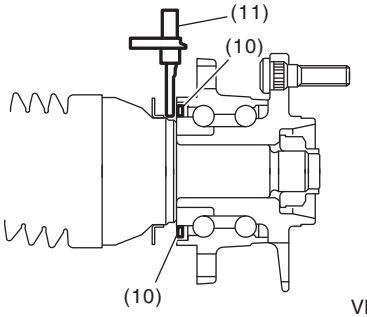
VDC00901



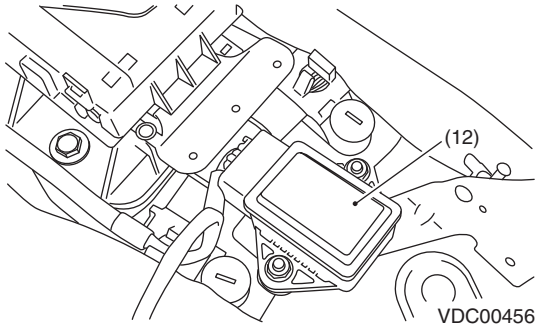
VDC00902



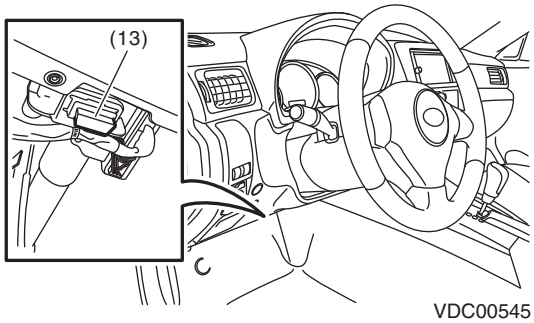
VDC00544



VDC00234



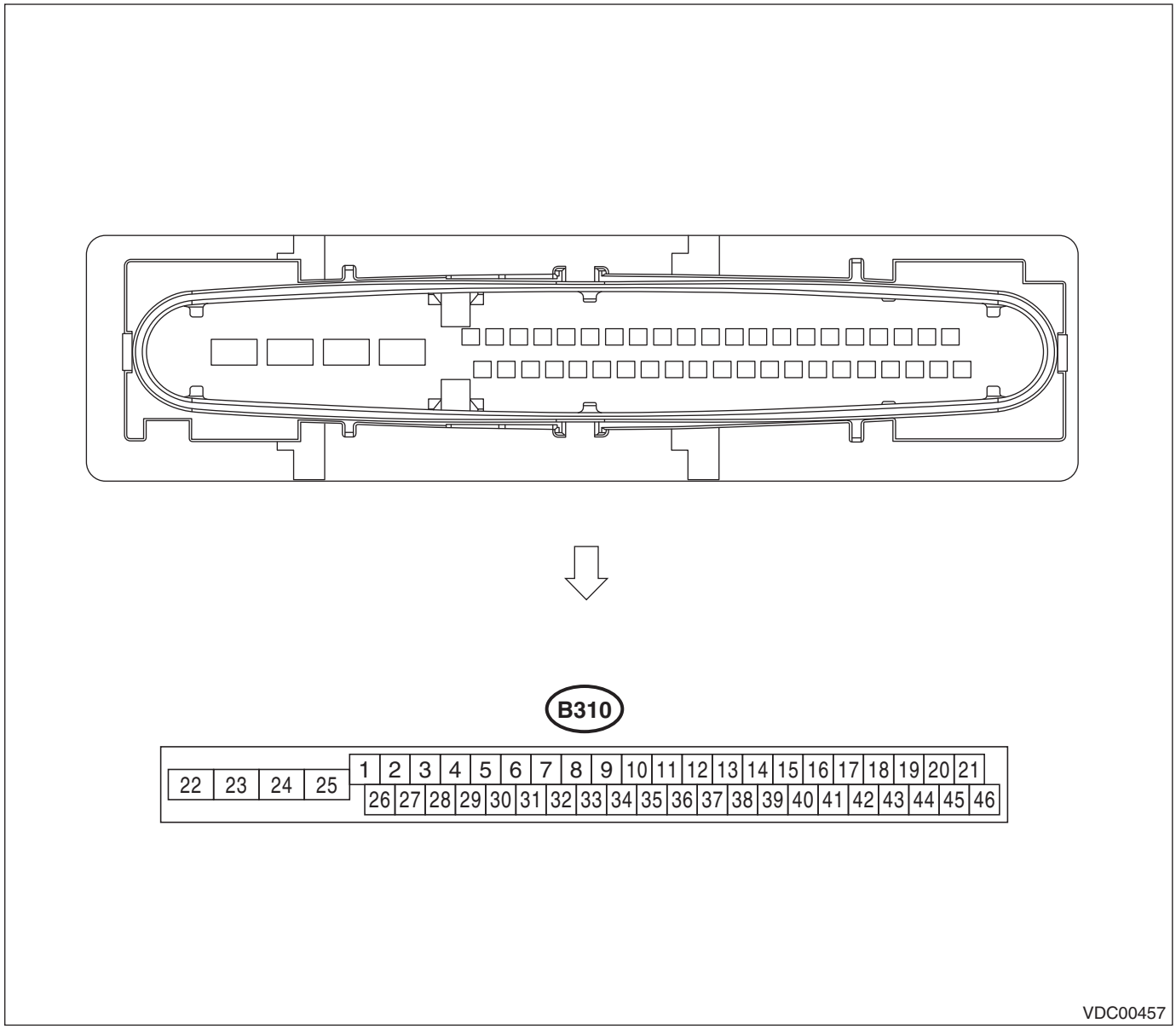
VDC00456



VDC00545

5. Control Module I/O Signal

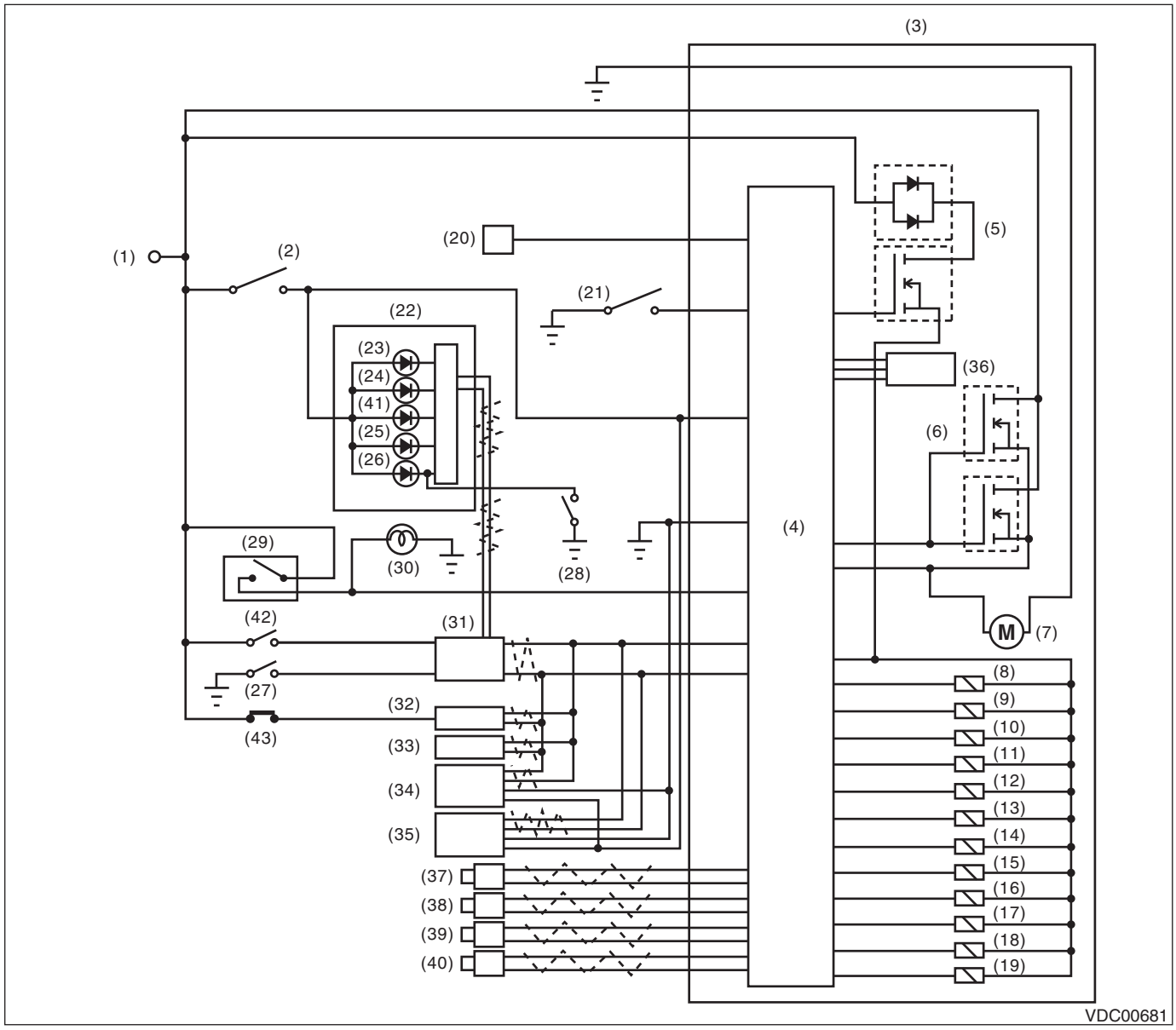
A: ELECTRICAL SPECIFICATION



NOTE:
- Terminal numbers in VDCCM&H/U connector are shown in the figure.
- When the connector is removed from the VDCCM&H/U, the brake warning light (EBD warning light), ABS warning light, VDC warning light & VDC indicator light, VDC OFF indicator light, and the hill start assist warning light illuminate.

Content			Terminal No. (+) — (–)	Input/Output signal
				Measured value and measuring conditions
Power supply			28 — 25	10 — 15 V when the ignition switch is ON.
ABS wheel speed sensor	Front LH wheel	Power supply	26 — 25	4.5 — 16.5 V
		Signal	1	5.9 — 16.8 mA: Rectangle waveform
	Front RH wheel	Power supply	5 — 25	4.5 — 16.5 V
		Signal	6	5.9 — 16.8 mA: Rectangle waveform
	Rear LH wheel	Power supply	2 — 25	4.5 — 16.5 V
		Signal	27	5.9 — 16.8 mA: Rectangle waveform
	Rear RH wheel	Power supply	3 — 25	4.5 — 16.5 V
		Signal	4	5.9 — 16.8 mA: Rectangle waveform
CAN communication line (+)			35	2.5 — 1.5 V pulse signal
CAN communication line (–)			10	3.5 — 2.5 V pulse signal
Valve relay power supply			24 — 25	10 — 15 V when the ignition switch is ON.
Motor relay power supply			23 — 22	10 — 15 V when the ignition switch is ON.
Stop light switch			30 — 25	1.5 V or less when the stop light is OFF; otherwise, 10 — 15 V when the stop light is ON.
Subaru Select Monitor			7 — 25	0 ←→ 12 V pulse (in communication)
Vehicle speed output signal			33	0 ←→ 12 V pulse
Ground			25	—
VDC OFF switch			31 — 25	0.5 Ω or less when the OFF switch is ON; 1 MΩ or more when the switch is OFF.

B: WIRING DIAGRAM



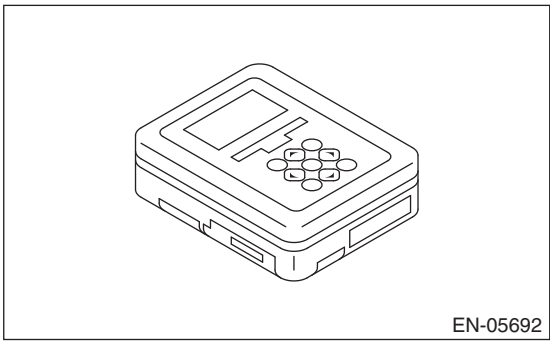
(1) Battery
(2) Ignition switch
(3) VDC control module and hydraulic control unit (VDCCM&H/U)
(4) VDC control module
(5) Valve relay
(6) Motor relay
(7) Motor
(8) Front inlet solenoid valve LH
(9) Front outlet solenoid valve LH
(10) Front inlet solenoid valve RH
(11) Front outlet solenoid valve RH
(12) Rear inlet solenoid valve LH
(13) Rear outlet solenoid valve LH
(14) Rear inlet solenoid valve RH
(15) Rear outlet solenoid valve RH
(16) Primary cut solenoid valve
(17) Primary suction solenoid valve
(18) Secondary cut solenoid valve
(19) Secondary suction solenoid valve
(20) Data link connector
(21) VDC OFF switch
(22) Combination meter
(23) VDC OFF indicator light
(24) VDC warning light & VDC indicator light
(25) ABS warning light
(26) Brake warning light (EBD warning light)
(27) Parking brake switch
(28) Brake fluid level switch
(29) Stop light and brake switch
(30) Stop light
(31) Body integrated unit
(32) Engine control module (ECM)
(33) Transmission control module (TCM)
(34) Steering angle sensor
(35) Yaw rate & G sensor
(36) Pressure sensor
(37) Front ABS wheel speed sensor LH
(38) Front ABS wheel speed sensor RH
(39) Rear ABS wheel speed sensor LH
(40) Rear ABS wheel speed sensor RH
(41) Hill start assist warning light (MT model only)
(42) Back-up light switch (MT model only)
(43) Clutch switch (MT model only)

6. Subaru Select Monitor

A: OPERATION

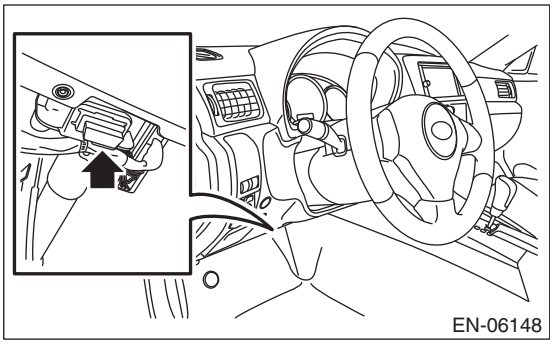
1. HOW TO USE SUBARU SELECT MONITOR

1) Prepare the Subaru Select Monitor kit. <Ref. to VDC(diag)-9, SPECIAL TOOL, PREPARATION TOOL, General Description.>


EN-05692

2) Prepare PC with Subaru Select Monitor installed.
3) Connect the SDI (Subaru Diagnostic Interface) to the PC USB port (exclusively for Subaru Selector Monitor) using a USB cable.

NOTE:
Port exclusively for Subaru Select Monitor refers to the USB port used when installing Subaru Select Monitor.
4) Connect the diagnosis cable to the SDI.
5) Connect the SDI to the data link connector located in the lower portion of the instrument panel (on the driver's side).


EN-06148

CAUTION:
Do not connect scan tools other than the Subaru Select Monitor.
6) Start the PC.
7) Turn the ignition switch to ON (engine OFF) and run the "PC application for Subaru Select Monitor".
8) Record the DTC and data.

NOTE:
For detailed operation procedure, refer to the "PC application help for Subaru Select Monitor".

9) If VDC and Subaru Select Monitor cannot communicate, check the communication circuit. <Ref. to VDC(diag)-20, COMMUNICATION FOR INITIALIZING IMPOSSIBLE, INSPECTION, Subaru Select Monitor.>

2. READ CURRENT DATA

1) On «Main Menu» display, select {Each System Check}.
2) On «System Selection Menu» display, select {Brake Control System}.
3) Click the [OK] button after the {VDC} is displayed.
4) On «Brake Control Diagnosis» display, select {Current Data Display & Save}.
5) On «Data Display Menu» display, 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 displayed	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
Steering Angle Sensor Op	Steering angle detected by steering angle sensor is displayed.	deg
Yaw Rate Sensor Output	Vehicle angular speed detected by yaw rate sensor is displayed.	deg/s
Pressure Sensor Output	Brake fluid pressure detected by pressure sensor is displayed.	bar
Lateral G sensor Output	Vehicle lateral acceleration detected by lateral G sensor is displayed.	m/s^2
IG power supply voltage	Voltage supplied to VDCCM&H/U is displayed.	V
E/G Control Stop Flag	Engine control command signal is displayed.	1 or 0
ABS Control Flag	ABS operation condition is displayed.	ON or OFF
EBD Control Flag	EBD operation condition is displayed.	ON or OFF
TCS Control Flag	TCS operation condition is displayed.	ON or OFF
VDC Control Flag	VDC operation condition is displayed.	ON or OFF
OFF Lamp	ON/OFF condition of VDC OFF indicator light is displayed.	ON or OFF
EBD Warning Light	ON operation of the EBD warning light is displayed.	ON or OFF
ABS Warning Light	ON operation of the ABS warning light is displayed.	ON or OFF
VDC Warning Light	ON operation of the VDC warning light is displayed.	ON or OFF
Valve Relay Signal	Valve relay operation signal is displayed.	ON or OFF
Motor Relay Signal	Motor relay operation signal is displayed.	ON or OFF
M. Relay monitor Voltage	Voltage applied to the motor relay is displayed.	V
OFF SW Signal	Operation condition of VDC OFF switch is displayed.	ON or OFF
Brake Switch	Brake ON/OFF is displayed.	ON or OFF
Longitudinal G sensor output	Vehicle longitudinal acceleration detected by longitudinal G sensor is displayed. (For MT vehicle only. For AT vehicle: At –0.1 m/s^2 constantly)	m/s^2
Clutch Switch	Clutch ON/OFF is displayed. (For MT vehicle only. For AT vehicle: OFF fixed)	ON or OFF
Reverse Signal	Reverse gear ON/OFF is displayed. (For MT vehicle only. For AT vehicle: OFF fixed)	ON or OFF

NOTE:
For detailed operation procedures, refer to “PC application help for Subaru Select Monitor”.

3. FUNCTION CHECK

Display	Contents of display	Index No.
ABS Sequence Control Mode	Operate the valve and pump motor continuously to perform the ABS sequence control.	<Ref. to VDC-13, ABS Sequence Control.>
VDC Check Mode	Operate the valve and pump motor continuously to perform the VDC sequence control.	<Ref. to VDC-16, VDC Sequence Control.>
Set up mode for Neutral of Steering Angle Sensor & Lateral G Sensor 0 point	Set the steering angle sensor neutral position and the lateral G sensor “0” point.	<Ref. to VDC-21, Steering Angle Sensor.>

4. FREEZE FRAME DATA

NOTE:
• Data stored at the time of trouble occurrence is shown on display.
• Each time a trouble occurs, the latest information is stored in the freeze frame data in memory.
• 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.

Display	Contents to be displayed
Steering Angle Sensor Op	Steering angle detected by steering angle sensor is displayed.
Yaw Rate Sensor Output	Vehicle angular speed detected by yaw rate sensor is displayed.
Lateral G sensor Output	Vehicle lateral acceleration detected by lateral G sensor is displayed.
Pressure Sensor Output	Brake fluid pressure detected by pressure sensor is displayed.
Vehicle Speed	Vehicle speed calculated by VDC control module is displayed.
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.
Accel. Opening Angle	Acceleration opening is displayed.
Engine Speed	Engine speed on malfunction occurrence is displayed.
Gear Position	Gear position on malfunction occurrence is displayed.
IG power supply voltage	Voltage supplied to VDC control module is displayed.
Steering angle flag	Whether the absolute angle of the steering angle sensor was determined is displayed.

Display	Contents to be displayed
E/G Control Stop Flag	Engine control command signal is displayed.
VDC Control Flag	VDC control condition is displayed.
EBD Control Flag	EBD control condition is displayed.
TCS Control Flag	TCS control condition is displayed.
ABS Control Flag	ABS control condition is displayed.
OFF Switch Detection	ON/OFF condition of the VDC operated by the driver is displayed.
Brake Switch	Brake ON/OFF is displayed.
Longitudinal G sensor output	Vehicle longitudinal acceleration detected by longitudinal G sensor is displayed. (For MT vehicle only. For AT vehicle: At –0.1 m/s^2 constantly)
Clutch Switch	Clutch ON/OFF is displayed. (For MT vehicle only. For AT vehicle: OFF fixed)
Reverse Signal	Reverse gear ON/OFF is displayed. (For MT vehicle only For AT vehicle: OFF fixed)

5. PARAMETER SELECTION

CAUTION:
• Subaru Select Monitor is required for parameter selection.
• This function can be used for the replacement part of VDCCM&H/U and VDCCM.

NOTE:
• When the VDCCM is replaced with a replacement part, be sure to perform the parameter selection/registration to the VDCCM using this function.
• To confirm the applied model, refer to the “model number plate” attached on the vehicle. <Ref. to ID-2, IDENTIFICATION, Identification.>
• When the applied model is entered wrong, re-entry is possible.
• When the registration has not been performed, the DTC code “Parameter selection error” is detected together with the ABS/EBD/VDC warning light illumination.
1) Connect the Subaru Select Monitor.
2) On «Main Menu» display, select {Each System Check}.
3) On «System Selection Menu» display, select {Brake Control System}.
4) When {VDC} is displayed, select the [OK] button.
5) On «Brake Control Diagnosis» display, select {Select Parameter}.
6) Check the applied model and option code indicated in the “Model number plate”. <Ref. to ID-2, IDENTIFICATION, Identification.>
7) Enter the applied model of 7-digit alphanumeric characters and press the [Enter] key.
8) When the option code input screen appears after entering the applied model, enter the option code consisting of 4-digit alphanumeric characters, and press the [Enter] key When the option code is 3 digits, add “0” in front and enter the code as 4 digits.
9) When the confirmation screen indicating the vehicle information appears, check that the correct applied model and grade are displayed and click the [OK] button.

NOTE:
When the displayed applied model and grade are different from those of the vehicle, perform registration operations again after clicking the [OK] button.
10) Execute Clear Memory after parameter selection and registration operations because the DTC for “Parameter selection error” is memorized.

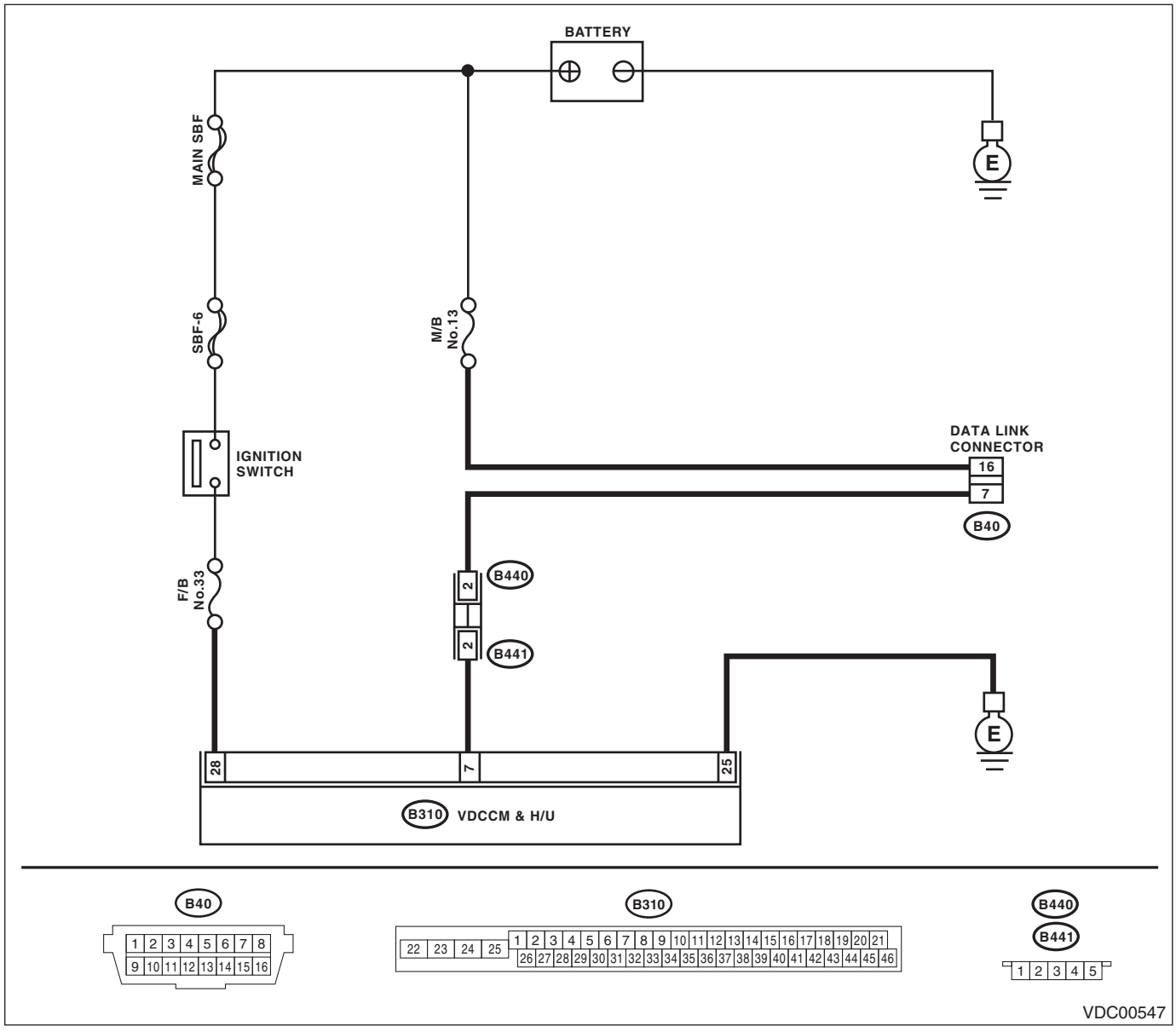
6. PARAMETER CHECK

NOTE:
The parameter data registered in the VDCCM is shown on the display.
1) Connect the Subaru Select Monitor.
2) On the «Main Menu» display, select {Each System Check}.
3) On the «System Selection Menu», select {Brake Control System}.
4) Click the [OK] button after the {VDC} is displayed.
5) On the «Brake Control Diagnosis», select {Confirm on parameter}.
6) On the {Confirm on parameter} display screen, check that the applied model and grade of the target vehicle are included, and click the [OK] button.
7) If the applied model and grade of the target vehicle are not included on the {Confirm on parameter} display screen, perform parameter selection and registration. <Ref. to VDC(diag)-19, PARAMETER SELECTION, OPERATION, Subaru Select Monitor.>

B: INSPECTION

1. COMMUNICATION FOR INITIALIZING IMPOSSIBLE

DETECTING CONDITION:
Defective harness connector
TROUBLE SYMPTOM:
Communication is impossible between VDC and Subaru Select Monitor.
WIRING DIAGRAM:



	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 VDC 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.

	Step	Check	Yes	No
3	**CHECK BATTERY TERMINAL.**	Is there poor contact at 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.	Is the system name 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&H/U connector. 3) Turn the ignition switch to ON. 4) Check whether communication to other systems can be executed normally.	Is the system name displayed on Subaru Select Monitor?	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&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 connectors from the ECM, TCM, airbag CM, TPMS & keyless entry CM, and impact sensor. **CAUTION:** **When disconnecting the connector from airbag CM, always follow the precautions on AB section. <Ref. to AB-5, CAUTION, General Description.>** 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 HARNESS CONNECTOR BETWEEN VDCCM&H/U AND DATA LINK CONNECTOR.** 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 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 VDCCM&H/U AND DATA LINK CONNECTOR.** Measure the resistance between VDCCM&H/U connector and data link connector. ***Connector & terminal*** ***(B310) No. 7 — (B40) No. 7:***	Is the resistance less than 1 Ω?	Go to step **9**.	Repair harness and connector between VDCCM&H/U and data link connector.
9	**CHECK INSTALLATION OF VDCCM&H/U CONNECTOR.** Turn the ignition switch to OFF.	Is the VDCCM&H/U connector inserted into VDCCM&H/U until the clamp locks onto it?	Go to step **10**.	Insert VDCCM&H/U connector into VDCCM&H/U.
10	**CHECK POWER SUPPLY CIRCUIT.** 1) Turn the ignition switch to ON. (engine OFF) 2) Measure the ignition power supply voltage between VDCCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B310) No. 28 (+) — Chassis ground (–):***	Is the voltage 10 — 15 V?	Go to step **11**.	Repair open circuit in harness between VDCCM&H/U and battery.

	Step	Check	Yes	No
11	**CHECK HARNESS CONNECTOR BETWEEN VDCCM&H/U AND CHASSIS GROUND.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the VDCCM&H/U. 3) Measure the resistance of harness between VDCCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B310) No. 25 — Chassis ground:***	Is the resistance less than 10 Ω?	Go to step **12**.	Repair the open circuit of VDCCM&H/U ground harness and poor contact of connector.
12	**CHECK POOR CONTACT OF CONNECTOR.**	Is there poor contact of control module power supply, ground circuit and data link connector?	Repair the connector.	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>

7. Read Diagnostic Trouble Code (DTC)

A: OPERATION

1) On «Main Menu» display, select {Each System Check}.
2) On «System Selection Menu» display, select {Brake Control System}.
3) Click the [OK] button after the {VDC} is displayed.
4) On «Brake Control Diagnosis» display, select {Diagnostic Code(s) Display}.
5) Record the DTC and data.

NOTE:
• For detailed operation procedures, refer to “PC application help for Subaru Select Monitor”.
• For details concerning DTCs, refer to “List of Diagnostic Trouble Code (DTC)”. <Ref. to VDC(diag)-34, 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 VDCCM&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 to be displayed
(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.
(Older)	The second latest DTC from the history of previous problems is displayed on the Subaru Select Monitor display screen.
(Before 3)	The third latest DTC from the history of previous problems is displayed on Subaru Select Monitor display screen.

8. Inspection Mode

A: PROCEDURE

Reproduce the malfunction occurrence condition as much as possible.
Drive the vehicle at least ten minutes.

NOTE:
Make sure the vehicle is not dragged to one side under usual driving condition.

9. Clear Memory Mode

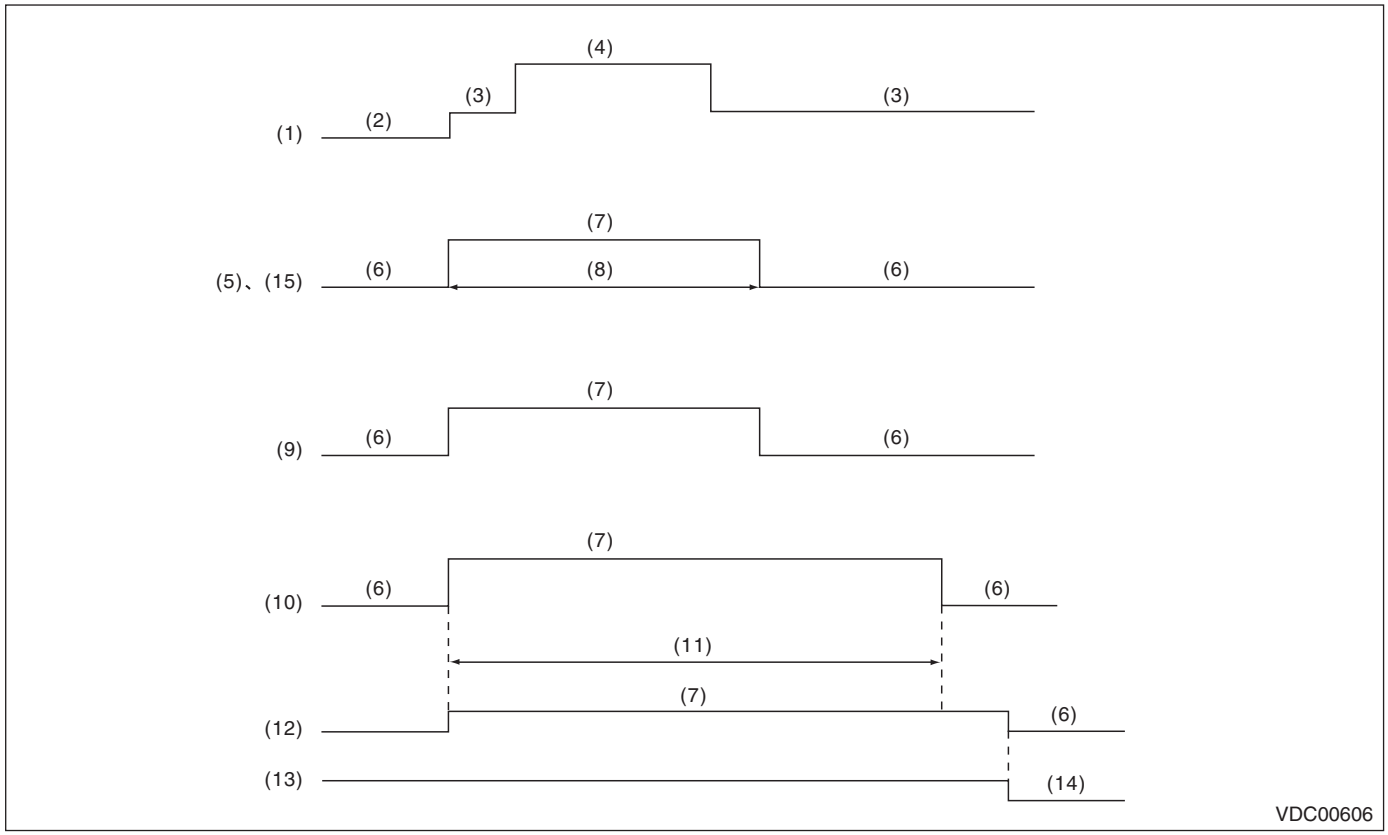
A: OPERATION

1) On the «Main Menu» display, select {Each System Check}.
2) On the «System Selection Menu», select {Brake Control System}.
3) Click the [OK] button after the {VDC} is displayed.
4) On the «Brake Control Diagnosis», select {Clear Memory}.
5) When the “Clear Memory?” is shown on the screen, click the [YES] button.
6) When “Done” and “Turn Ignition Switch OFF” are shown on the display screen, turn the ignition switch to OFF.

NOTE:
For detailed operation procedure, refer to the “PC application help for Subaru Select Monitor”.

10.Warning Light Illumination Pattern

A: INSPECTION



(1)	Ignition switch	(6)	Light OFF	(11)	Several seconds (depending on engine coolant temperature)
(2)	OFF	(7)	Light ON	(12)	Brake warning light (EBD warning light)
(3)	ON	(8)	2 seconds	(13)	Parking brake
(4)	Engine start	(9)	VDC OFF indicator light	(14)	Released
(5)	ABS warning light	(10)	VDC warning light & VDC indicator light	(15)	Hill start assist warning light (MT model only)

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, check the combination meter circuit or CAN communication circuit. <Ref. to VDC(diag)-28, ABS WARNING LIGHT, VDC OFF INDICATOR LIGHT, VDC WARNING LIGHT AND VDC INDICATOR LIGHT DO NOT COME ON, Warning Light Illumination Pattern.> <Ref. to VDC(diag)-28, HILL START ASSIST WARNING LIGHT DOES NOT COME ON, Warning Light Illumination Pattern.>
3) When the ABS warning light, VDC OFF indicator light, VDC warning light & VDC indicator light, and hill start assist warning light do not go off, check the combination meter circuit and CAN communication circuit. <Ref. to VDC(diag)-29, ABS WARNING LIGHT DOES NOT GO OFF, Warning Light Illumination Pattern.> <Ref. to VDC(diag)-31, VDC OFF INDICATOR LIGHT DOES NOT GO OFF, Warning Light Illumination Pattern.> <Ref. to VDC(diag)-30, VDC WARNING LIGHT AND VDC INDICATOR LIGHT DO NOT GO OFF, Warning Light Illumination Pattern.> <Ref. to VDC(diag)-29, HILL START ASSIST WARNING LIGHT DOES NOT GO OFF, Warning Light Illumination Pattern.>

NOTE:
• Even though the ABS warning light does not go off after 2 seconds from ABS warning light illumination, the ABS system 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.
• It may take several minutes before the VDC warning light & VDC indicator light goes off, if the vehicle is parked under low temperature for a specified time. This is not defective because it is resulted from low engine coolant temperature.
• With the vehicle jack-up/lift-up or set on free rollers, when the wheels lock or spin after starting the engine, ABS warning light, and VDC warning light & VDC indicator light may illuminate because VDC-CM&H/U detects the abnormal conditions from ABS wheel speed sensors. In this case, this is not a malfunction. Perform the Clear Memory Mode. <Ref. to VDC(diag)-25, Clear Memory Mode.>

B: ABS WARNING LIGHT, VDC OFF INDICATOR LIGHT, VDC WARNING LIGHT AND VDC INDICATOR LIGHT DO NOT COME ON

DETECTING CONDITION:

- Defective combination meter
- Defective CAN communication

TROUBLE SYMPTOM:

When the ignition switch is turned to ON (engine OFF), ABS warning light, VDC OFF indicator light, and VDC warning light & VDC indicator light do not illuminate.

NOTE:
When pressing the VDC OFF switch for 10 seconds or more, the VDC OFF indicator light goes off and cannot operate any more. When turning the ignition switch from OFF to ON, the OFF operation enabled status is restored.

	Step	Check	Yes	No
1	**CHECK OTHER INDICATOR LIGHT.** Turn the ignition switch to ON.	Does other indicator light illuminate soon after “ON”?	Go to step **2**.	Perform the self-diagnosis of combination meter. <Ref. to IDI-5, INSPECTION, Combination Meter System.>
2	**CHECK VDCCM.** When the engine does not start, display the current data of VDCCM using Subaru Select Monitor.	Is “EBD Warning Light” output set to ON?	Go to step **3**.	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>
3	**CHECK VDCCM.** Connect the Subaru Select Monitor, and start the engine. Press the VDC OFF switch to display the current data of VDCCM.	Is “OFF Lamp” output set to ON?	Go to step **4**.	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>
4	**CHECK LAN SYSTEM.** Perform the diagnosis for LAN system. <Ref. to LAN(diag)-18, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is there any fault in LAN system?	Perform the diagnosis according to DTC for LAN system. <Ref. to LAN(diag)-31, List of Diagnostic Trouble Code (DTC).>	Go to step **5**.
5	**CHECK COMBINATION METER.** Check the combination meter. <Ref. to IDI-5, INSPECTION, Combination Meter System.>	Is combination meter OK?	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Replace the combination meter. <Ref. to IDI-21, REMOVAL, Combination Meter.>

C: HILL START ASSIST WARNING LIGHT DOES NOT COME ON

For the diagnostic procedure, refer to "ABS WARNING LIGHT, VDC OFF INDICATOR LIGHT, VDC WARNING LIGHT AND VDC INDICATOR LIGHT DO NOT COME ON". <Ref. to VDC(diag)-28, ABS WARNING LIGHT, VDC OFF INDICATOR LIGHT, VDC WARNING LIGHT AND VDC INDICATOR LIGHT DO NOT COME ON, Warning Light Illumination Pattern.>

D: ABS WARNING LIGHT DOES NOT GO OFF

DETECTING CONDITION:

- Defective combination meter
- Defective CAN communication

TROUBLE SYMPTOM:

When starting the engine, the ABS warning light and hill start assist warning light are kept ON.

	Step	Check	Yes	No
1	**READ DTC.** Read the DTC. <Ref. to VDC(diag)-23, Read Diagnostic Trouble Code (DTC).>	Is DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK LAN SYSTEM.** Perform the diagnosis for LAN system. <Ref. to LAN(diag)-18, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is there any fault in LAN system?	Perform the diagnosis according to DTC for LAN system. <Ref. to LAN(diag)-31, List of Diagnostic Trouble Code (DTC).>	Go to step **3**.
3	**CHECK COMBINATION METER.** Check the combination meter. <Ref. to IDI-5, INSPECTION, Combination Meter System.>	Is combination meter OK?	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Replace the combination meter. <Ref. to IDI-21, Combination Meter.>

E: HILL START ASSIST WARNING LIGHT DOES NOT GO OFF

Refer to “ABS warning light does not go off” for diagnostic procedure. <Ref. to VDC(diag)-29, ABS WARNING LIGHT DOES NOT GO OFF, Warning Light Illumination Pattern.>

F: VDC WARNING LIGHT AND VDC INDICATOR LIGHT DO NOT GO OFF

DETECTING CONDITION:

- Defective combination meter
- Defective engine
- Defective CAN communication

TROUBLE SYMPTOM:

When starting the engine, the VDC warning light & VDC indicator light remains lit.

	Step	Check	Yes	No
1	**READ DTC.** Read the DTC. <Ref. to VDC(diag)-23, Read Diagnostic Trouble Code (DTC).>	Is DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK ENGINE.**	Does the malfunction indicator light illuminate?	Repair the engine. <Ref. to EN(H4DO)(diag)-42, Read Diagnostic Trouble Code (DTC).> <Ref. to EN(H4DOTC)(diag)-44, Read Diagnostic Trouble Code (DTC).>	Go to step **3**.
3	**CHECK ENGINE COOLANT TEMPERATURE.** Warm up the engine, and check if the VDC warning light & VDC indicator light illumination condition changes.	When the engine coolant temperature is too low, the VDC warning light & VDC indicator light illuminates. Do the lights go off when the engine is warmed up?	Normal If DTC is recorded, clear the memory. <Ref. to VDC(diag)-25, Clear Memory Mode.>	Go to step **4**.
4	**CHECK LAN SYSTEM.** Perform the diagnosis for LAN system. <Ref. to LAN(diag)-18, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is there any fault in LAN system?	Perform the diagnosis according to DTC for LAN system. <Ref. to LAN(diag)-31, List of Diagnostic Trouble Code (DTC).>	Go to step **5**.
5	**CHECK COMBINATION METER.** Check the combination meter. <Ref. to IDI-5, INSPECTION, Combination Meter System.>	Is combination meter OK?	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Replace the combination meter. <Ref. to IDI-21, REMOVAL, Combination Meter.>

G: VDC OFF INDICATOR LIGHT DOES NOT GO OFF

DETECTING CONDITION:

- Defective combination meter
- Defective CAN communication
- VDC OFF switch is shorted.

TROUBLE SYMPTOM:

When starting the engine, VDC OFF indicator light is kept ON.

NOTE:

When pressing the VDC OFF switch for 10 seconds or more, the VDC OFF indicator light goes off and cannot operate any more. When turning the ignition switch from OFF to ON, the OFF operation enabled status is restored.

	Step	Check	Yes	No
1	**READ DTC.** Read the DTC. <Ref. to VDC(diag)-23, Read Diagnostic Trouble Code (DTC).>	Is DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK VDC OFF SWITCH.** Remove and check VDC OFF switch. <Ref. to VDC-28, VDC OFF Switch.>	Is the VDC OFF switch normal?	Go to step **3**.	Replace the VDC OFF switch.
3	**CHECK LAN SYSTEM.** Perform the diagnosis for LAN system. <Ref. to LAN(diag)-18, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is there any fault in LAN system?	Perform the diagnosis according to DTC for LAN system. <Ref. to LAN(diag)-31, List of Diagnostic Trouble Code (DTC).>	Go to step **4**.
4	**CHECK COMBINATION METER.** Check the combination meter. <Ref. to IDI-5, INSPECTION, Combination Meter System.>	Is combination meter OK?	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Replace the combination meter. <Ref. to IDI-21, REMOVAL, Combination Meter.>

H: BRAKE WARNING LIGHT DOES NOT GO OFF

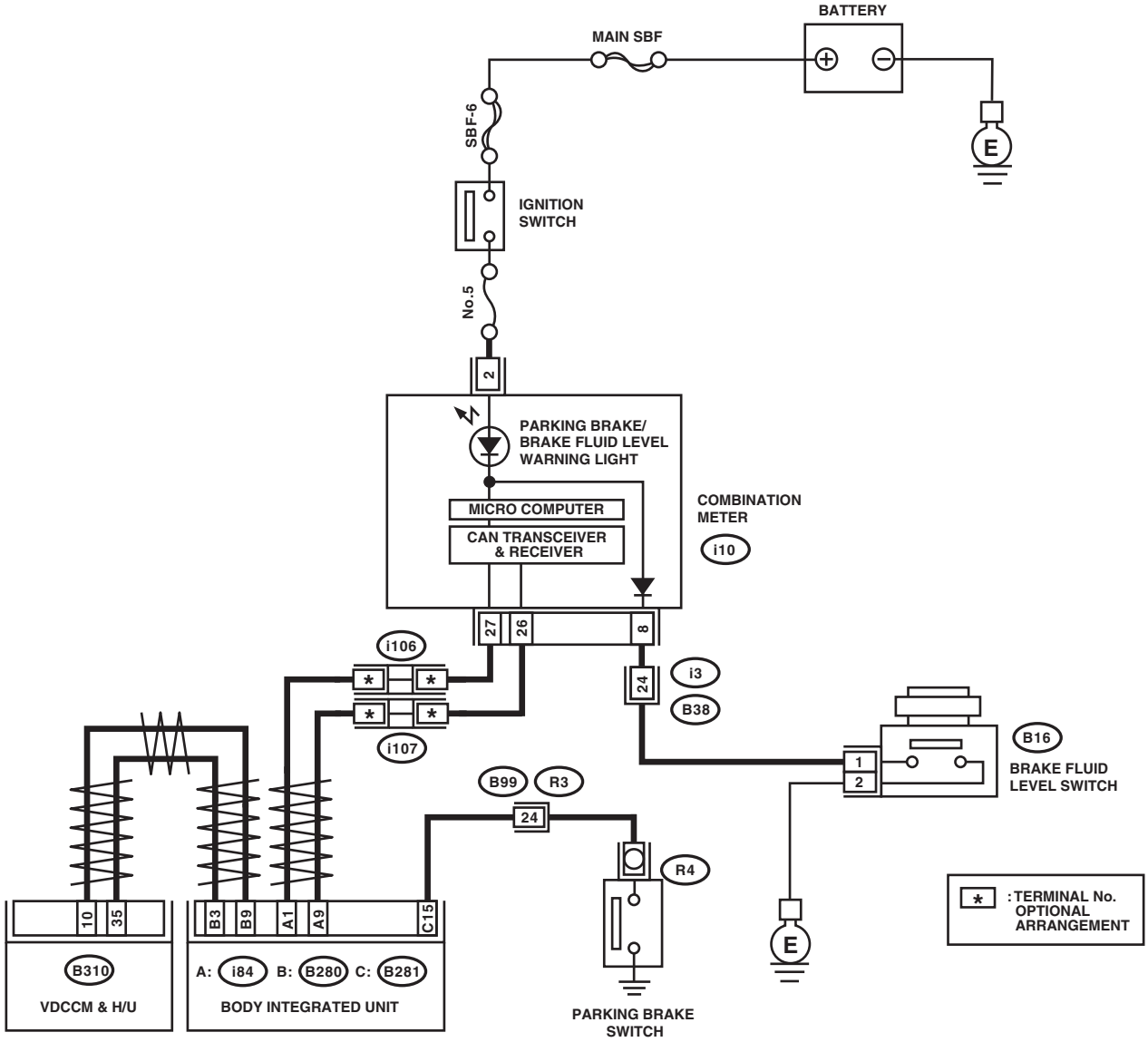
DETECTING CONDITION:

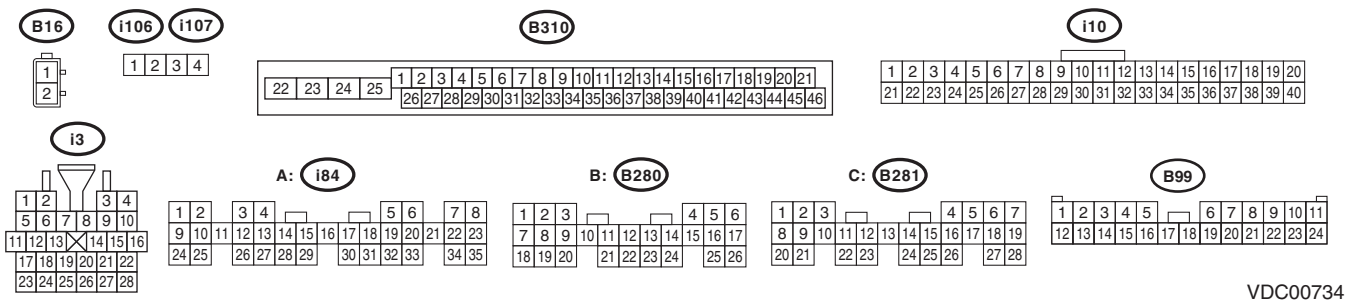
- Brake warning light circuit is shorted.
- Defective sensor/connector
- Defective CAN communication

TROUBLE SYMPTOM:

After starting the engine, the brake warning light remains lit though the parking lever is released.

WIRING DIAGRAM:





VDC00734

	Step	Check	Yes	No
1	**CHECK INSTALLATION OF VDCCM&H/U CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Check that the VDCCM&H/U connector is inserted until it is locked by clamp.	Is the connector firmly inserted?	Go to step **2**.	Insert the VDCCM&H/U connector until it is locked by clamp.
2	**READ DTC.** Read the DTC. <Ref. to VDC(diag)-23, Read Diagnostic Trouble Code (DTC).>	Is DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Go to step **3**.
3	**CHECK BRAKE FLUID AMOUNT.** Check the amount of brake fluid in the reservoir tank of 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) Turn the ignition switch to OFF. 2) Disconnect the level switch connector (B16) from master cylinder. 3) 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. <Ref. to BR-26, Master Cylinder.>
5	**CHECK GROUND SHORT OF HARNESS.** 1) Disconnect the connector (i10) from combination meter. 2) Measure the resistance between combination meter connector and chassis ground. ***Connector & terminal*** ***(i10) No. 8 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **6**.	Repair the ground short circuit in harness between combination meter and brake fluid level switch.
6	**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 **7**.	Replace the parking brake switch.
7	**CHECK GROUND SHORT OF HARNESS.** 1) Disconnect the connector (B281) from body integrated unit. 2) Measure the resistance between body integrated unit connector and chassis ground. ***Connector & terminal*** ***(B281) No. 15 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **8**.	Repair the ground short circuit of harness between body integrated unit and parking brake switch.
8	**CHECK POOR CONTACT OF CONNECTOR.** Check for poor contact of all connectors.	Is there poor contact?	Repair the connector.	Go to step **9**.
9	**CHECK LAN SYSTEM.** Perform the diagnosis for LAN system. <Ref. to LAN(diag)-18, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is there any fault in LAN system?	Perform the diagnosis according to DTC for LAN system. <Ref. to LAN(diag)-31, List of Diagnostic Trouble Code (DTC).>	Go to step **10**.
10	**CHECK COMBINATION METER.** Check the combination meter. <Ref. to IDI-5, INSPECTION, Combination Meter System.>	Is combination meter OK?	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Replace the combination meter. <Ref. to IDI-21, REMOVAL, Combination Meter.>

11.List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Detailed code	Display	Content of diagnosis	Reference
C0021	07B1H 07B2H 07C0H	Front Right ABS Sensor Circuit Open or Shorted Battery	Open/high input of front ABS wheel speed sensor RH	<Ref. to VDC(diag)-40, DTC C0021 FRONT RIGHT ABS SENSOR CIRCUIT OPEN OR SHORT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0022	0720H 072FH 0736H 0737H 0738H 073AH 073CH	Front Right ABS Sensor Signal	Front ABS wheel speed sensor RH signal malfunction	<Ref. to VDC(diag)-43, DTC C0022 FRONT RIGHT ABS SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0023	06B1H 06B2H 06C0H	Front Left ABS Sensor Circuit Open or Shorted Battery	Open/high input of front ABS wheel speed sensor LH	<Ref. to VDC(diag)-40, DTC C0023 FRONT LEFT ABS SENSOR CIRCUIT OPEN OR SHORT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0024	0620H 062FH 0636H 0637H 0638H 063AH 063CH	Front Left ABS Sensor Signal	Front ABS wheel speed sensor LH signal malfunction	<Ref. to VDC(diag)-43, DTC C0024 FRONT LEFT ABS SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0025	09B1H 09B2H 09C0H	Rear Righ ABS Sensor Circuit Open or Shorted Battery	Open/high input of rear ABS wheel speed sensor RH	<Ref. to VDC(diag)-40, DTC C0025 REAR RIGHT ABS SENSOR CIRCUIT OPEN OR SHORT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0026	0920H 092FH 0936H 0937H 0938H 093AH 093CH	Rear Right ABS Sensor Signal	Rear ABS wheel speed sensor RH signal malfunction	<Ref. to VDC(diag)-43, DTC C0026 REAR RIGHT ABS SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0027	08B1H 08B2H 08C0H	Rear Left ABS Sensor Circuit Open or Shorted Battery	Open/high input of rear ABS wheel speed sensor LH	<Ref. to VDC(diag)-41, DTC C0027 REAR LEFT ABS SENSOR CIRCUIT OPEN OR SHORT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0028	0820H 082FH 0836H 0837H 0838H 083AH 083CH	Rear Left ABS Sensor Signal	Rear ABS wheel speed sensor LH signal malfunction	<Ref. to VDC(diag)-44, DTC C0028 REAR LEFT ABS SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0029	0A10H 0A41H 0A4BH 0A4DH 0A52H 0A56H 0A60H	Any One of Four ABS Sensors Signal	ABS wheel speed sensor signal malfunction in one of four wheels	<Ref. to VDC(diag)-47, DTC C0029 ANY OF WHEEL SENSORS SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Detailed code	Display	Content of diagnosis	Reference
C0031	0DB8H 0DC0H 0DC1H 0DD0H	FR Hold Valve malfunction	Front inlet solenoid valve RH malfunction in VDCCM&H/U	<Ref. to VDC(diag)-49, DTC C0031 FR HOLD VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0032	0EB8H 0EC0H 0EC1H 0ED0H	FR Pressure Reducing Valve malfunction	Front outlet solenoid valve RH malfunction in VDCCM&H/U	<Ref. to VDC(diag)-49, DTC C0032 FR PRESSURE REDUCING VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0033	0BB8H 0BC0H 0BC1H 0BD0H	FL Hold Valve malfunction	Front inlet solenoid valve LH malfunction in VDCCM&H/U	<Ref. to VDC(diag)-49, DTC C0033 FL HOLD VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0034	0CB8H 0CC0H 0CC1H 0CD0H	FL Pressure Reducing Valve malfunction	Front outlet solenoid valve LH malfunction in VDCCM&H/U	<Ref. to VDC(diag)-49, DTC C0034 FL PRESSURE REDUCING VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0035	11B8H 11C0H 11C1H 11D0H	RR Hold Valve malfunction	Rear inlet solenoid valve RH malfunction in VDCCM&H/U	<Ref. to VDC(diag)-49, DTC C0035 RR HOLD VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0036	12B8H 12C0H 12C1H 12D0H	RR Pressure Reducing Valve malfunction	Rear outlet solenoid valve RH malfunction in VDCCM&H/U	<Ref. to VDC(diag)-49, DTC C0036 RR PRESSURE REDUCING VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0037	0FB8H 0FC0H 0FC1H 0FD0H	RL Hold Valve malfunction	Rear inlet solenoid valve LH malfunction in VDCCM&H/U	<Ref. to VDC(diag)-50, DTC C0037 RL HOLD VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0038	10B8H 10C0H 10C1H 10D0H	RL Pressure Reducing Valve malfunction	Rear outlet solenoid valve LH malfunction in VDCCM&H/U	<Ref. to VDC(diag)-50, DTC C0038 RL PRESSURE REDUCING VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0039	0FB5H 11B5H	Any One of Four Solenoid Valves	Solenoid valve malfunction in one of four wheels	<Ref. to VDC(diag)-50, DTC C0039 ANY ONE OF FOUR SOLENOID VALVES, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0041	—	Electrical Control Module	VDC control module malfunction	<Ref. to VDC(diag)-53, DTC C0041 ECM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	1630H 1645H 16C0H	Parameter selection error	VDC control module parameter selection failure	<Ref. to VDC(diag)-55, DTC C0041 PARAMETER SELECTION ERROR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0042	0316H 031CH 0322H 0324H	Power Supply Voltage Failure	Power voltage malfunction	<Ref. to VDC(diag)-56, DTC C0042 POWER SUPPLY VOLTAGE FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0044	2921H	TCM Communication Circuit	CAN communication failure of transmission control module	<Ref. to VDC(diag)-58, DTC C0044 TCM COMMUNICATION CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0045	2922H 2932H	Incorrect VDC Control Module specifications	Different VDC control module specification	<Ref. to VDC(diag)-59, DTC C0045 INCORRECT VDC CONTROL MODULE SPECIFICATIONS, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	2923H	TCM malfunction	AT control module malfunction	<Ref. to VDC(diag)-61, DTC C0045 TCM MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Detailed code	Display	Content of diagnosis	Reference
C0047	1504H 1505H 1506H 1507H 1508H 150EH 1512H 1514H 1518H 1519H 151AH 151DH 151EH 151FH 1520H 1531H 1540H 15C0H	Improper CAN Communication	Improper CAN communication	<Ref. to VDC(diag)-62, DTC C0047 CAN COMMUNICATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0051	021FH 0220H 0221H 0280H 0281H 02B0H 02B1H 02C0H	Valve Relay	Valve Relay	<Ref. to VDC(diag)-64, DTC C0051 VALVE RELAY, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0052	0562H 0574H 0580H	Motor and Motor Relay OFF Failure	Motor/motor relay OFF malfunction	<Ref. to VDC(diag)-66, DTC C0052 MOTOR AND MOTOR RELAY OFF FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	05A0H	Motor and Motor Relay ON Failure	Motor/motor relay ON malfunction	<Ref. to VDC(diag)-68, DTC C0052 MOTOR AND MOTOR RELAY ON FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	0560H	Motor malfunction	Motor	<Ref. to VDC(diag)-69, DTC C0052 MOTOR MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0054	04B0H	BLS Circuit Open	BLS open circuit	<Ref. to VDC(diag)-70, DTC C0054 BLS CIRCUIT OPEN, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	043CH	BLS ON malfunction	BLS ON malfunction	<Ref. to VDC(diag)-72, DTC C0054 BLS ON MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	04C1H	BLS OFF Malfunction	BLS OFF Malfunction	<Ref. to VDC(diag)-74, DTC C0054 BLS OFF MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0056	1760H 1770H 1780H	Longitudinal G Sensor Signal	Abnormal longitudinal G sensor output signal	<Ref. to VDC(diag)-76, DTC C0056 G SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0057	2931H	ECM Communication Circuit	CAN communication failure of engine control module	<Ref. to VDC(diag)-78, DTC C0057 ECM COMMUNICATION CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	2930H	ECM Control System	Coordinate control prohibition of engine control module	<Ref. to VDC(diag)-79, DTC C0057 ECM CONTROL SYSTEM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0061	19B8H 19C0H 19C1H 19D0H	Normal Opening Valve 1 malfunction	Secondary cut valve malfunction in VDCCM&H/U	<Ref. to VDC(diag)-50, DTC C0061 NORMAL OPENING VALVE 1 MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Detailed code	Display	Content of diagnosis	Reference
C0062	1AB8H 1AC0H 1AC1H 1AD0H	Normal Opening Valve 2 malfunction	Primary cut valve malfunction in VDCCM&H/U	<Ref. to VDC(diag)-50, DTC C0062 NORMAL OPENING VALVE 2 MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0063	1BB8H 1BC0H 1BC1H 1BD0H	Normal Closing Valve 1 malfunction	Secondary suction valve malfunction in VDCCM&H/U	<Ref. to VDC(diag)-50, DTC C0063 NORMAL CLOSING VALVE 1 MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0064	1CB8H 1CC0H 1CC1H 1CD0H	Normal Closing Valve 2 malfunction	Primary suction valve malfunction in VDCCM&H/U	<Ref. to VDC(diag)-51, DTC C0064 NORMAL CLOSING VALVE 2 MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0071	2130H	Steering Angle Sensor Offset is too big	Excessive steering angle sensor output offset	<Ref. to VDC(diag)-80, DTC C0071 STEERING ANGLE SENSOR OFFSET IS TOO BIG, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	2134H	Change range of Steering Angle Sensor is too big	Excessive variation amount of steering angle sensor output	<Ref. to VDC(diag)-82, DTC C0071 CHANGE RANGE OF STEERING ANGLE SENSOR IS TOO BIG, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	212EH 2132H 2136H 2138H 213CH 2150H 2151H 2152H 2153H 2154H 2155H 2156H 2157H 2158H 2159H 215AH	Steering Angle Sensor Op	Steering angle sensor output	<Ref. to VDC(diag)-84, DTC C0071 STEER ANGLE SENSOR OP, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	2104H	Steering angle sensor malfunction	Steering angle sensor power supply malfunction	<Ref. to VDC(diag)-86, DTC C0071 STEERING ANGLE SENSOR MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Detailed code	Display	Content of diagnosis	Reference
C0072	1E1AH 1E1EH 1E22H 1E26H 1E28H 1E2CH 1E34H 1E38H 1E3AH 1E3FH	Yaw Rate Sensor Output	Yaw rate sensor output	<Ref. to VDC(diag)-88, DTC C0072 ABNORMAL YAW RATE SENSOR OUTPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	1EB6H	Voltage inputted to Yaw Rate Sensor exceeds specification	Yaw rate sensor power supply/output	<Ref. to VDC(diag)-90, DTC C0072 VOLTAGE INPUTTED TO YAW RATE SENSOR EXCEEDS SPECIFICATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	1E30H	Change range of Yaw Rate Sensor Signal is too big	Excessive variation amount of yaw rate sensor output	<Ref. to VDC(diag)-92, DTC C0072 CHANGE RANGE OF YAW RATE SENSOR SIGNAL IS TOO BIG, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	1EB7H 1EBFH 1EB5H 1EBCH 1EBDH 1EBEH 1EC0H 1EC2H 1EC3H 1EC4H 1EC6H 1ECEH 1ECFH 1ED0H 1ED3H 1ED4H 1ED5H	Yaw Rate Sensor Communication	Yaw rate sensor communication	<Ref. to VDC(diag)-94, DTC C0072 YAW RATE SENSOR COMMUNICATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	1EB9H 1ED6H	Sensor Type Abnormal	Different yaw rate sensor specification	<Ref. to VDC(diag)-96, DTC C0072 SENSOR TYPE ABNORMAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0073	1D46H 1D47H	Lateral G Sensor offset is too big	Excessive amount of lateral G sensor output offset	<Ref. to VDC(diag)-96, DTC C0073 LATERAL G SENSOR OFFSET IS TOO BIG, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	1D44H 1D45H	Lateral G sensor Output	Lateral G sensor output	<Ref. to VDC(diag)-96, DTC C0073 ABNORMAL LATERAL G SENSOR OUTPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	1D49H	Excessive Lateral G Sensor signal	Excessive lateral G sensor output	<Ref. to VDC(diag)-97, DTC C0073 EXCESSIVE LATERAL G SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0074	1F4EH 1F4FH 1FB1H 1FC0H	Pressure Sensor	Pressure sensor	<Ref. to VDC(diag)-99, DTC C0074 PRESSURE SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0075	2510H 2520H	Reverse Signal	Abnormal reverse signal	<Ref. to VDC(diag)-100, DTC C0075 REVERSE SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
C0076	2610H 2620H	Clutch Signal	Abnormal clutch signal	<Ref. to VDC(diag)-102, DTC C0076 CLUTCH SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Detailed code	Display	Content of diagnosis	Reference
C0081	2201H 2202H	System Failure	System malfunction	<Ref. to VDC(diag)-105, DTC C0081 SYSTEM FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

12.Diagnostic Procedure with Diagnostic Trouble Code (DTC)

A: DTC C0021 FRONT RIGHT ABS SENSOR CIRCUIT OPEN OR SHORT

NOTE:
For the diagnostic procedure, refer to DTC C0027 “RL WHEEL SPEED SENSOR CIRCUIT OPEN/HIGH INPUT”. <Ref. to VDC(diag)-41, DTC C0027 REAR LEFT ABS SENSOR CIRCUIT OPEN OR SHORT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

B: DTC C0023 FRONT LEFT ABS SENSOR CIRCUIT OPEN OR SHORT

NOTE:
For the diagnostic procedure, refer to DTC C0027 “RL WHEEL SPEED SENSOR CIRCUIT OPEN/HIGH INPUT”. <Ref. to VDC(diag)-41, DTC C0027 REAR LEFT ABS SENSOR CIRCUIT OPEN OR SHORT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

C: DTC C0025 REAR RIGHT ABS SENSOR CIRCUIT OPEN OR SHORT

NOTE:
For the diagnostic procedure, refer to DTC C0027 “RL WHEEL SPEED SENSOR CIRCUIT OPEN/HIGH INPUT”. <Ref. to VDC(diag)-41, DTC C0027 REAR LEFT ABS SENSOR CIRCUIT OPEN OR SHORT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

D: DTC C0027 REAR LEFT ABS SENSOR CIRCUIT OPEN OR SHORT

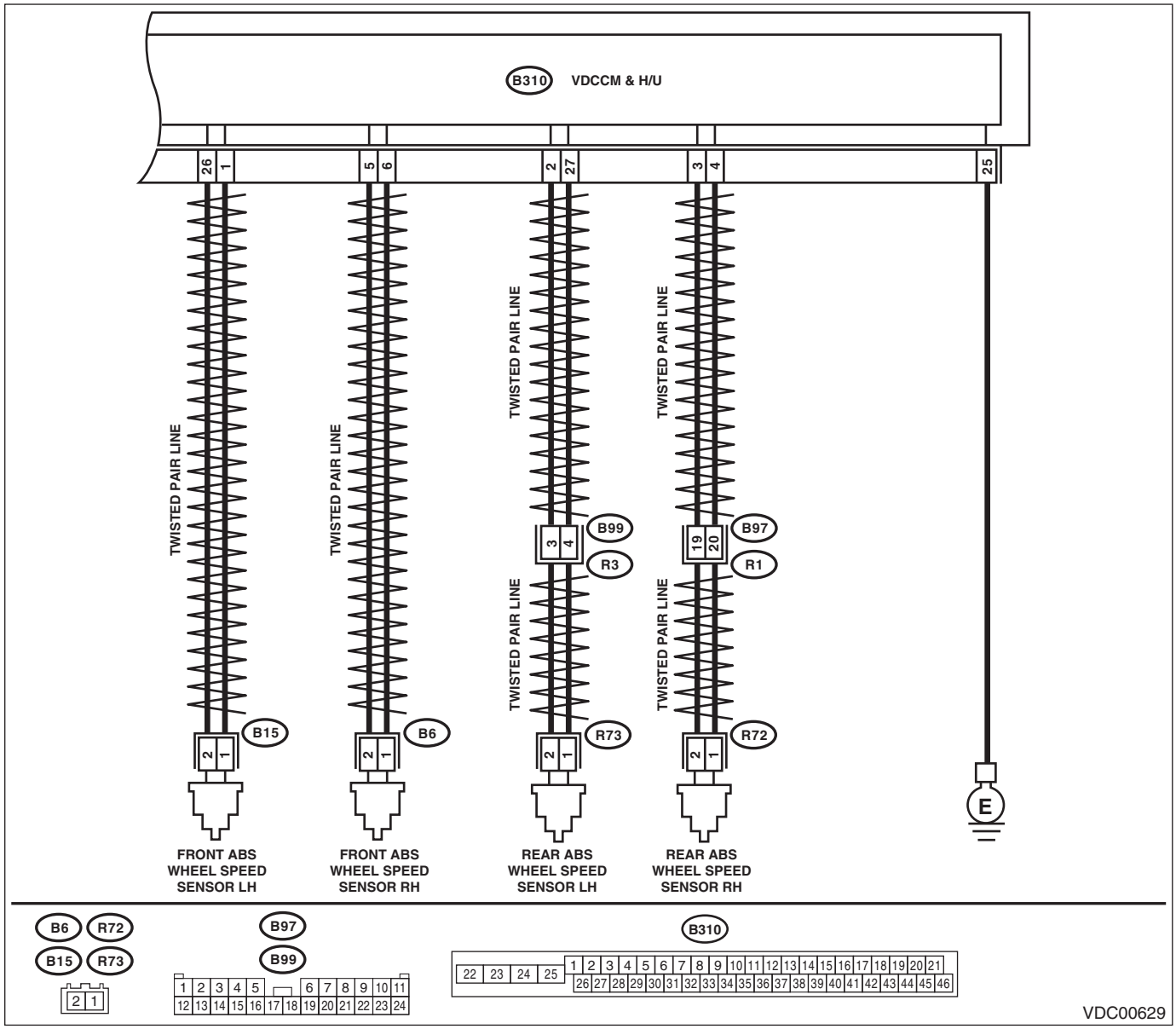
DTC DETECTING CONDITION:

- 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:



Step		Check	Yes	No
1	**CHECK POOR CONTACT OF CONNECTOR.** Check if there is poor contact between VDCCM&H/U and ABS wheel speed sensor.	Is there poor contact?	Repair the connector.	Go to step **2**.

	Step	Check	Yes	No
2	**CHECK HARNESS CONNECTOR BETWEEN VDCCM&H/U AND ABS WHEEL SPEED SENSOR.** 1) Disconnect the connector (B310) from the VDCCM&H/U. 2) Disconnect the connector from ABS wheel speed sensor. 3) Measure the resistance between VDCCM&H/U connector and ABS wheel speed sensor connector. ***Connector & terminal*** ***DTC C0021*** ***(B310) No. 6 — (B6) No. 1:*** ***(B310) No. 5 — (B6) No. 2:*** ***DTC C0023*** ***(B310) No. 1 — (B15) No. 1:*** ***(B310) No. 26 — (B15) No. 2:*** ***DTC C0025*** ***(B310) No. 4 — (R72) No. 1:*** ***(B310) No. 3 — (R72) No. 2:*** ***DTC C0027*** ***(B310) No. 27 — (R73) No. 1:*** ***(B310) No. 2 — (R73) No. 2:***	Is the resistance less than 1 Ω?	Go to step **3**.	Repair the harness connector between VDCCM&H/U and ABS wheel speed sensor.
3	**CHECK GROUND SHORT OF HARNESS.** Measure the resistance between VDCCM&H/U connector and chassis ground. ***Connector & terminal*** ***DTC C0021*** ***(B310) No. 6 — Chassis ground:*** ***DTC C0023*** ***(B310) No. 1 — Chassis ground:*** ***DTC C0025*** ***(B310) No. 4 — Chassis ground:*** ***DTC C0027*** ***(B310) No. 27 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **4**.	Repair the harness connector between VDCCM&H/U and ABS wheel speed sensor.
4	**CHECK ABS WHEEL SPEED SENSOR POWER SUPPLY CIRCUIT.** 1) Connect the VDCCM&H/U connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between ABS wheel speed sensor connector and chassis ground. ***Connector & terminal*** ***DTC C0021*** ***(B6) No. 2 (+) — Chassis ground (–):*** ***DTC C0023*** ***(B15) No. 2 (+) — Chassis ground (–):*** ***DTC C0025*** ***(R72) No. 2 (+) — Chassis ground (–):*** ***DTC C0027*** ***(R73) No. 2 (+) — Chassis ground (–):***	Is the voltage 5 — 16 V?	Go to step **6**.	Go to step **5**.
5	**CHECK VDCCM&H/U POWER SUPPLY CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the VDCCM&H/U connector. 3) Turn the ignition switch to ON. 4) Measure the voltage between VDCCM&H/U connector terminals. ***Connector & terminal*** ***(B310) No. 28 (+) — (B310) No. 25 (–):***	Is the voltage 10 — 15 V?	Go to step **6**.	Check the generator, battery and VDCCM&H/U power supply circuit.

	Step	Check	Yes	No
6	**CHECK ABS WHEEL SPEED SENSOR SIGNAL.** 1) Install the ABS wheel speed sensor. 2) Prepare an oscilloscope. 3) Check the ABS wheel speed sensor. <Ref. to VDC-24, ABS WHEEL SPEED SENSOR, INSPECTION, Front ABS Wheel Speed Sensor.>	Is the pattern the same waveform as shown in the figure?	Go to step **7**.	Replace the ABS wheel speed sensor. <Ref. to VDC-23, Front ABS Wheel Speed Sensor.>
7	**CHECK VDCCM&H/U.** 1) Connect all connectors. 2) Clear the memory. <Ref. to VDC(diag)-25, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to VDC(diag)-24, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **8**.
8	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	It results from a temporary noise interference.

E: DTC C0022 FRONT RIGHT ABS SENSOR SIGNAL

NOTE:
For the diagnostic procedure, refer to DTC C0028 “RL WHEEL SPEED SENSOR SIGNAL”. <Ref. to VDC(diag)-44, DTC C0028 REAR LEFT ABS SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

F: DTC C0024 FRONT LEFT ABS SENSOR SIGNAL

NOTE:
For the diagnostic procedure, refer to DTC C0028 “RL WHEEL SPEED SENSOR SIGNAL”. <Ref. to VDC(diag)-44, DTC C0028 REAR LEFT ABS SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

G: DTC C0026 REAR RIGHT ABS SENSOR SIGNAL

NOTE:
For the diagnostic procedure, refer to DTC C0028 “RL WHEEL SPEED SENSOR SIGNAL”. <Ref. to VDC(diag)-44, DTC C0028 REAR LEFT ABS SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

H: DTC C0028 REAR LEFT ABS SENSOR SIGNAL

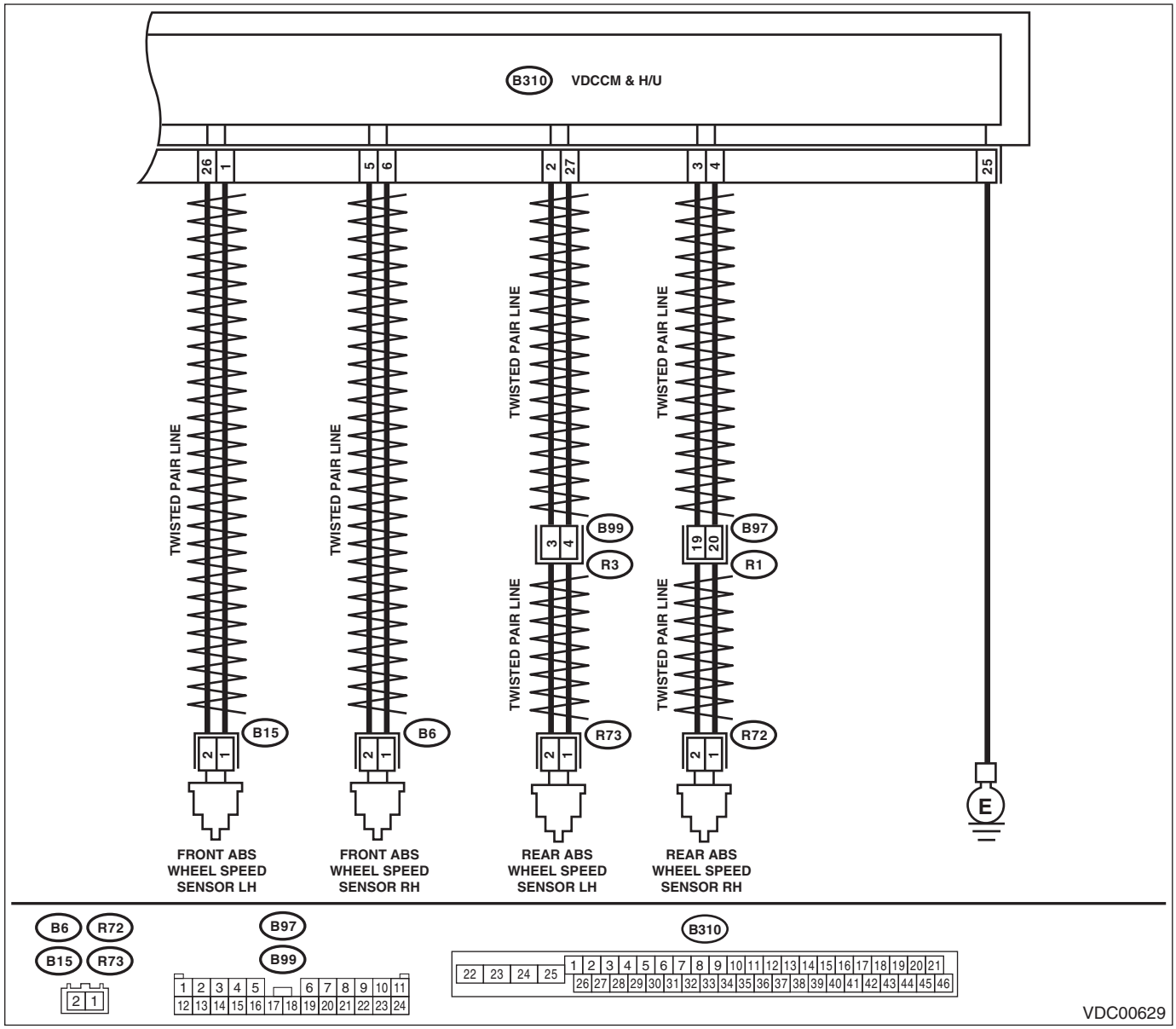
DTC DETECTING CONDITION:

- Defective ABS wheel speed sensor signal (noise, irregular signal, etc.)
- Defective harness connector

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



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 defective ABS wheel speed sensor output.	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 **7**.

	Step	Check	Yes	No
2	**CHECK POOR CONTACT OF CONNECTOR.** Turn the ignition switch to OFF.	Is there poor contact of connectors between VDCCM&H/U and ABS wheel speed sensor?	Repair the connector.	Go to step **3**.
3	**CHECK CAUSE OF SIGNAL NOISE.** Make sure the radio wave devices and electronic components are installed correctly.	Are the radio wave devices and electronic components installed correctly?	Go to step **4**.	Install the radio wave devices and electronic components properly.
4	**CHECK CAUSE OF SIGNAL NOISE.** Check if the noise sources (such as an antenna) are installed near the sensor harness.	Are noise sources installed?	Install the noise sources apart from sensor harness.	Go to step **5**.
5	**CHECK VDCCM&H/U.** 1) Connect all connectors. 2) Clear the memory. <Ref. to VDC(diag)-25, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to VDC(diag)-24, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **6**.
6	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (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 7.5 N·m (0.76 kgf-m, 5.5 ft-lb)?	Go to step **8**.	Tighten the ABS wheel speed sensor installation bolts.
8	**CHECK ABS WHEEL SPEED SENSOR SIGNAL.** 1) Install the ABS wheel speed sensor. 2) Prepare an oscilloscope. 3) Check the ABS wheel speed sensor. <Ref. to VDC-24, ABS WHEEL SPEED SENSOR, INSPECTION, Front ABS Wheel Speed Sensor.>	Does the oscilloscope indicate the waveform pattern like shown in the figure when the tire is slowly turned? Does the oscilloscope indication repeat the waveform pattern like shown in the figure when the tire is slowly turned in equal speed for one rotation or more?	Go to step **10**.	Go to step **9**.
9	**CHECK ABS WHEEL SPEED SENSOR OR MAGNETIC ENCODER.**	Are there foreign matter, breakage or damage at the tip of ABS wheel speed sensor or magnetic encoder?	Remove dirt thoroughly. Also replace the ABS wheel speed sensor or magnetic encoder as a unit with hub unit bearing if it is broken or damaged.	Go to step **10**.
10	**CHECK CAUSE OF SIGNAL NOISE.** Make sure the radio wave devices and electronic components are installed correctly.	Are the radio wave devices and electronic components installed correctly?	Go to step **11**.	Install the radio wave devices and electronic components properly.
11	**CHECK CAUSE OF SIGNAL NOISE.** Check if the noise sources (such as an antenna) are installed near the sensor harness.	Is the noise sources installed?	Go to step **12**.	Install the noise sources apart from sensor harness.

	Step	Check	Yes	No
12	**CHECK VDCCM&H/U.** 1) Connect all connectors. 2) Clear the memory. <Ref. to VDC(diag)-25, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to VDC(diag)-24, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **13**.
13	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (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 12 km/h (7 MPH) or more in order to turn ABS warning light off. Be sure to drive the vehicle and check that the warning light goes off.

I: DTC C0029 ANY OF WHEEL SENSORS SIGNAL

DTC DETECTING CONDITION:

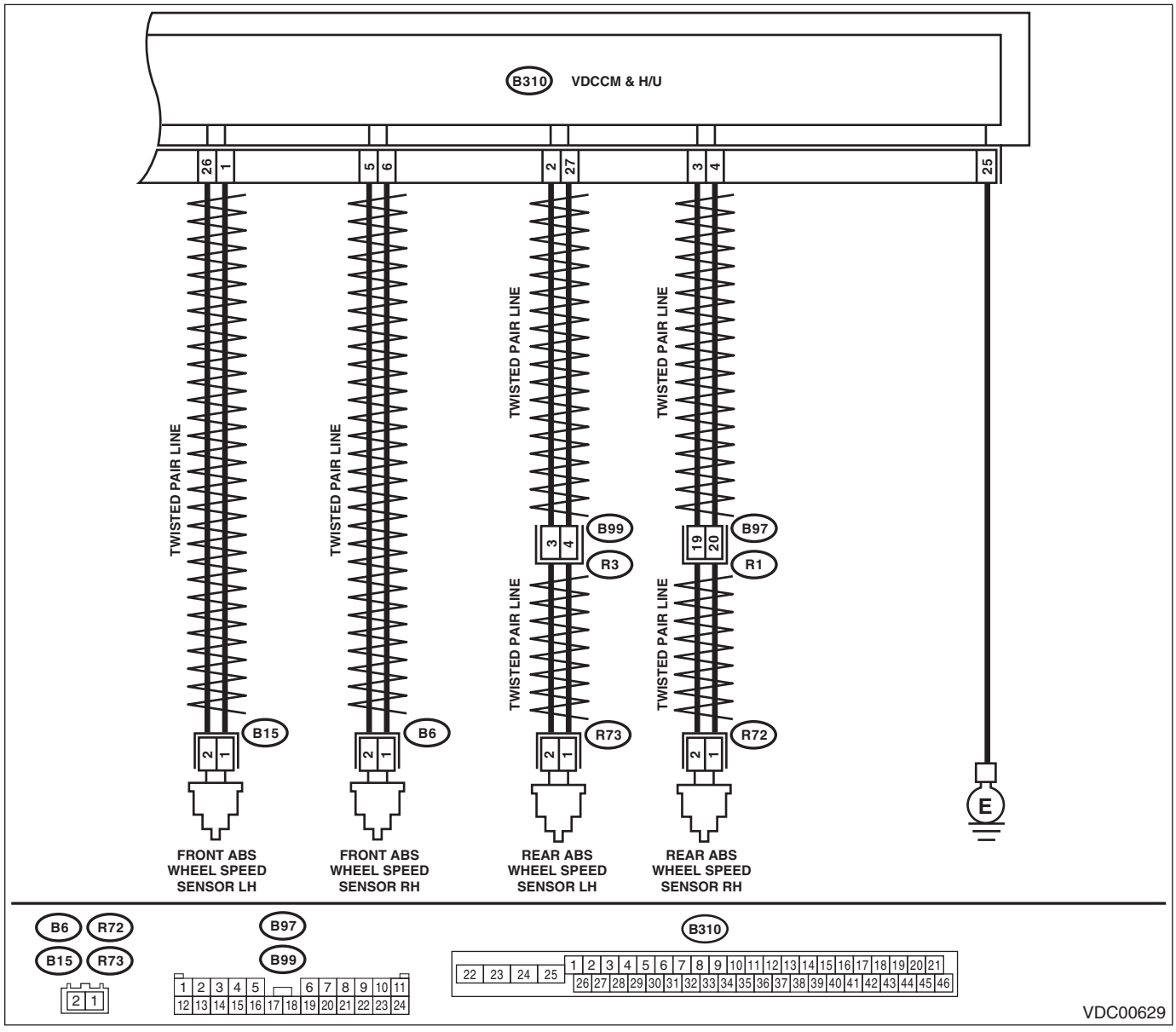
- Defective ABS wheel speed sensor signal (noise, irregular signal, etc.)
- Defective magnetic encoder
- When a wheel is turned freely for a long time

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.
- EBD may not operate.

NOTE:
Brake warning light comes on as well as ABS warning light when EBD does not operate.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**WHETHER A WHEEL TURNED FREELY OR NOT.** Check if the wheels have been turned freely for one minute or more, such as when the vehicle is jacked-up, under full-lock cornering or when the wheels are not in contact with road surface.	Did the wheels turn freely?	VDC is normal. Clear 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 INFLATION PRESSURE.**	Is the tire pressure correct?	Go to step **5**.	Adjust the tire pressure.
5	**CHECK INSTALLATION OF ABS WHEEL SPEED SENSOR.**	Are the ABS wheel speed sensor installation bolts tightened 7.5 N·m (0.76 kgf-m, 5.5 ft-lb)? (For four wheels)	Go to step **6**.	Tighten the ABS wheel speed sensor installation bolts.
6	**CHECK ABS WHEEL SPEED SENSOR SIGNAL.** 1) Install the ABS wheel speed sensor. 2) Prepare an oscilloscope. 3) Check the ABS wheel speed sensor. <Ref. to VDC-24, ABS WHEEL SPEED SENSOR, INSPECTION, Front ABS Wheel Speed Sensor.>	Does the oscilloscope indicate the waveform pattern like shown in the figure when the tire is slowly turned? Does the oscilloscope indication repeat the waveform pattern like shown in the figure when the tire is slowly turned in equal speed for one rotation or more?	Go to step **8**.	Go to step **7**.
7	**CHECK ABS WHEEL SPEED SENSOR OR MAGNETIC ENCODER.**	Are there foreign matter, breakage or damage at the tip of ABS wheel speed sensor or magnetic encoder?	Remove dirt thoroughly. Also replace the ABS wheel speed sensor or magnetic encoder as a unit with hub unit bearing if it is broken or damaged.	Go to step **8**.
8	**CHECK VDCCM&H/U.** 1) Connect all connectors. 2) Clear the memory. <Ref. to VDC(diag)-25, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to VDC(diag)-24, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **9**.

Step		Check	Yes	No
9	CHECK OTHER DTC DETECTION.	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (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 12 km/h (7 MPH) or more in order to turn ABS warning light off. Be sure to drive the vehicle and check that the warning light goes off.

J: DTC C0031 FR HOLD VALVE MALFUNCTION

NOTE:
For the diagnostic procedure, refer to DTC C0064 “NORMAL CLOSING VALVE 2 MALFUNCTION”. <Ref. to VDC(diag)-51, DTC C0064 NORMAL CLOSING VALVE 2 MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

K: DTC C0032 FR PRESSURE REDUCING VALVE MALFUNCTION

NOTE:
For the diagnostic procedure, refer to DTC C0064 “NORMAL CLOSING VALVE 2 MALFUNCTION”. <Ref. to VDC(diag)-51, DTC C0064 NORMAL CLOSING VALVE 2 MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

L: DTC C0033 FL HOLD VALVE MALFUNCTION

NOTE:
For the diagnostic procedure, refer to C0064 “NORMAL CLOSING VALVE 2 MALFUNCTION”. <Ref. to VDC(diag)-51, DTC C0064 NORMAL CLOSING VALVE 2 MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

M: DTC C0034 FL PRESSURE REDUCING VALVE MALFUNCTION

NOTE:
For the diagnostic procedure, refer to C0064 “NORMAL CLOSING VALVE 2 MALFUNCTION”. <Ref. to VDC(diag)-51, DTC C0064 NORMAL CLOSING VALVE 2 MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

N: DTC C0035 RR HOLD VALVE MALFUNCTION

NOTE:
For the diagnostic procedure, refer to C0064 “NORMAL CLOSING VALVE 2 MALFUNCTION”. <Ref. to VDC(diag)-51, DTC C0064 NORMAL CLOSING VALVE 2 MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

O: DTC C0036 RR PRESSURE REDUCING VALVE MALFUNCTION

NOTE:
For the diagnostic procedure, refer to C0064 “NORMAL CLOSING VALVE 2 MALFUNCTION”. <Ref. to VDC(diag)-51, DTC C0064 NORMAL CLOSING VALVE 2 MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

P: DTC C0037 RL HOLD VALVE MALFUNCTION

NOTE:
For the diagnostic procedure, refer to C0064 “NORMAL CLOSING VALVE 2 MALFUNCTION”. <Ref. to VDC(diag)-51, DTC C0064 NORMAL CLOSING VALVE 2 MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Q: DTC C0038 RL PRESSURE REDUCING VALVE MALFUNCTION

NOTE:
For the diagnostic procedure, refer to C0064 “NORMAL CLOSING VALVE 2 MALFUNCTION”. <Ref. to VDC(diag)-51, DTC C0064 NORMAL CLOSING VALVE 2 MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

R: DTC C0039 ANY ONE OF FOUR SOLENOID VALVES

NOTE:
For the diagnostic procedure, refer to C0064 “NORMAL CLOSING VALVE 2 MALFUNCTION”. <Ref. to VDC(diag)-51, DTC C0064 NORMAL CLOSING VALVE 2 MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

S: DTC C0061 NORMAL OPENING VALVE 1 MALFUNCTION

NOTE:
For the diagnostic procedure, refer to C0064 “NORMAL CLOSING VALVE 2 MALFUNCTION”. <Ref. to VDC(diag)-51, DTC C0064 NORMAL CLOSING VALVE 2 MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

T: DTC C0062 NORMAL OPENING VALVE 2 MALFUNCTION

NOTE:
For the diagnostic procedure, refer to C0064 “NORMAL CLOSING VALVE 2 MALFUNCTION”. <Ref. to VDC(diag)-51, DTC C0064 NORMAL CLOSING VALVE 2 MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

U: DTC C0063 NORMAL CLOSING VALVE 1 MALFUNCTION

NOTE:
For the diagnostic procedure, refer to C0064 “NORMAL CLOSING VALVE 2 MALFUNCTION”. <Ref. to VDC(diag)-51, DTC C0064 NORMAL CLOSING VALVE 2 MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

V: DTC C0064 NORMAL CLOSING VALVE 2 MALFUNCTION

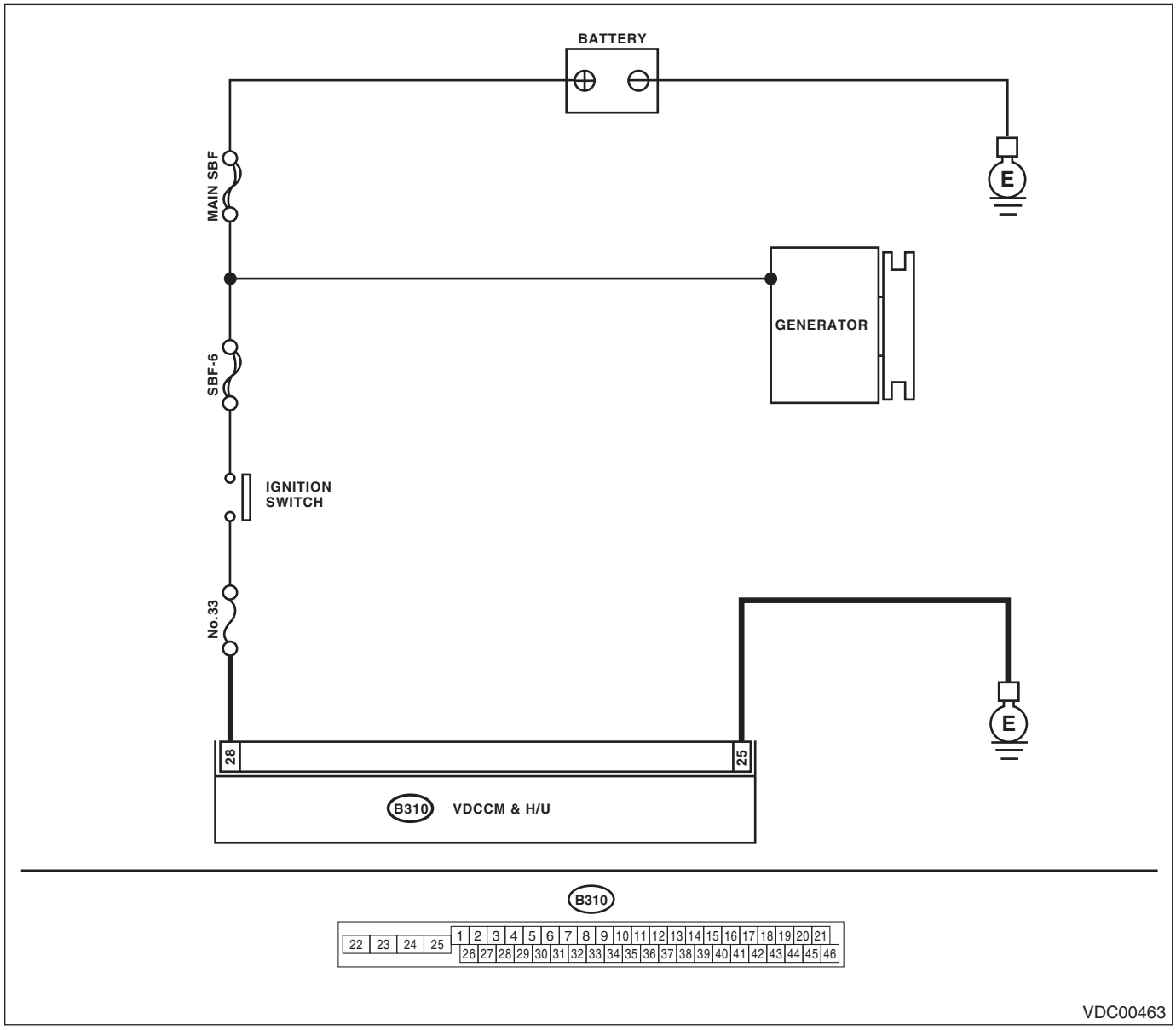
DTC DETECTING CONDITION:

- Defective harness connector
- Defective VDCH/U solenoid valve

TROUBLE SYMPTOM:

- ABS does not operate.
- EBD does not operate.
- VDC does not operate.

WIRING DIAGRAM:



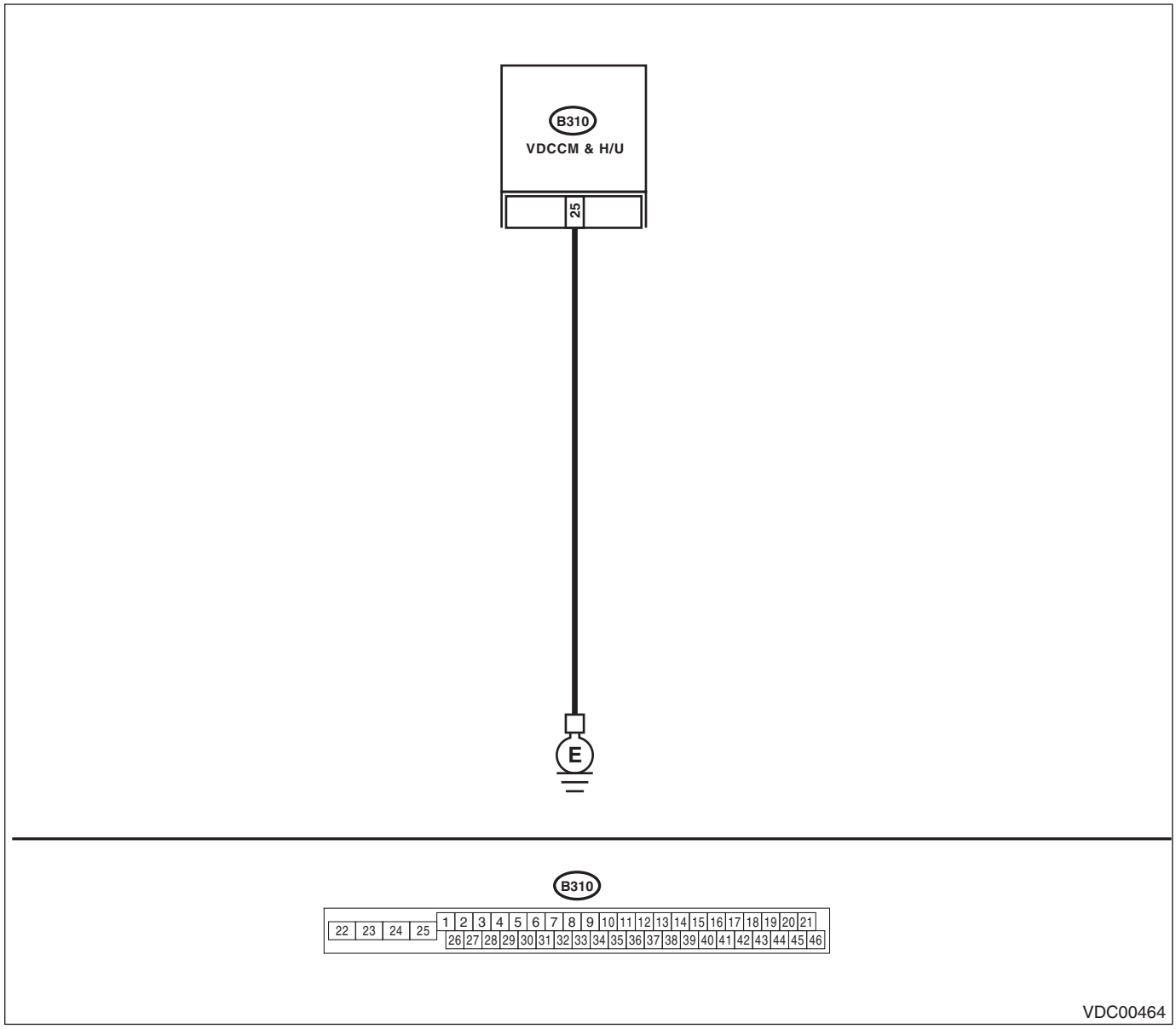
	Step	Check	Yes	No
1	**CHECK VDCCM&H/U INPUT VOLTAGE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the VDCCM&H/U. 3) Run the engine at idle. 4) Measure the voltage between VDCCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B310) No. 28 (+) — Chassis ground (–):***	Is the voltage 10 — 15 V?	Go to step **2**.	Repair the power supply circuit.
2	**CHECK VDCCM&H/U GROUND CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between VDCCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B310) No. 25 — Chassis ground:***	Is the resistance less than 10 Ω?	Go to step **3**.	Repair the VDCCM&H/U ground harness.
3	**CHECK POOR CONTACT OF CONNECTORS.**	Is there poor contact of connector between generator, battery and VDCCM&H/U?	Repair the connector.	Go to step **4**.
4	**CHECK VDCCM&H/U.** 1) Connect all connectors. 2) Clear the memory. <Ref. to VDC(diag)-25, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to VDC(diag)-24, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **5**.
5	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

W: DTC C0041 ECM

DTC DETECTING CONDITION:
Defective VDCCM&H/U

TROUBLE SYMPTOM:
- ABS does not operate.
- EBD does not operate.
- VDC does not operate.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK VDCCM&H/U GROUND CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the VDCCM&H/U. 3) Measure the resistance between VDCCM&H/U and chassis ground. ***Connector & terminal*** ***(B310) No. 25 — Chassis ground:***	Is the resistance less than 10 Ω?	Go to step **2**.	Repair the VDCCM&H/U ground harness.

	Step	Check	Yes	No
2	**CHECK POOR CONTACT OF CONNECTORS.**	Is there poor contact of the connector between the battery, ignition switch and VDCCM&H/U?	Repair the connector.	Go to step **3**.
3	**CHECK CAUSE OF SIGNAL NOISE.**	Are the radio wave devices and electronic components installed correctly?	Go to step **4**.	Install the radio wave devices and electronic components 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 VDCCM&H/U.** 1) Connect all connectors. 2) Clear the memory. <Ref. to VDC(diag)-25, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to VDC(diag)-24, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **6**.
6	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

X: DTC C0041 PARAMETER SELECTION ERROR

DTC DETECTING CONDITION:
VDCCM parameter selection error
TROUBLE SYMPTOM:
- ABS does not operate.
- EBD does not operate.
- VDC does not operate.

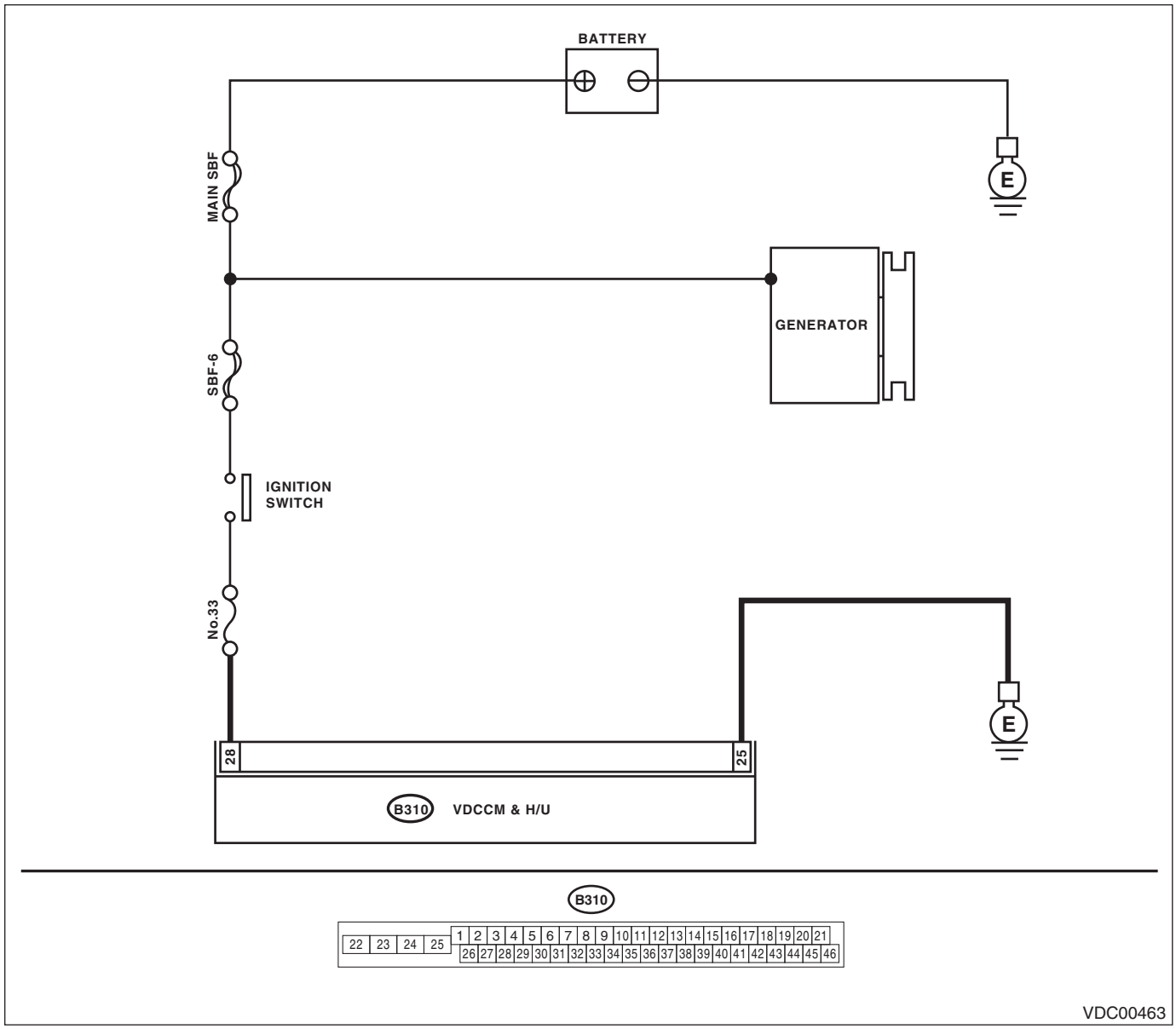
NOTE:
When the VDCCM or VDCCM&H/U is replaced, this DTC may be stored.

Step		Check	Yes	No
1	**CHECK VDCCM&H/U REPLACEMENT HISTORY.**	Is there history of VDCCM replacement by itself?	Go to step **2**.	Go to step **3**.
2	**CHECK VDCCM IDENTIFICATION SYMBOL.** Check the identification symbol of the seal attached on the side of the VDCCM.	Is the identification symbol correct? AT: Z6 MT: Z7	Go to step **4**.	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>
3	**CHECK VDCCM&H/U IDENTIFICATION SYMBOL.** Check the identification symbol stamped on the upper part of the H/U.	Is the identification symbol correct? AT: Z6 MT: Z7	Go to step **4**.	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>
4	**CHECK PARAMETER SELECTED IN VDCCM.** <Ref. to VDC(diag)-19, PARAMETER CHECK, OPERATION, Subaru Select Monitor.>	Does the parameter registered in the VDCCM match the relevant vehicle?	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Select and register the correct parameter. <Ref. to VDC(diag)-19, PARAMETER SELECTION, OPERATION, Subaru Select Monitor.>

Y: DTC C0042 POWER SUPPLY VOLTAGE FAILURE

DTC DETECTING CONDITION:
Improper VDCCM&H/U power supply voltage
TROUBLE SYMPTOM:
- ABS does not operate.
- EBD may not operate.
- VDC does not operate.

NOTE:
Warning lights go off if voltage returns.
WIRING DIAGRAM:



	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 terminal B (+) — 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 terminal.
3	**CHECK VDCCM&H/U INPUT VOLTAGE.** 1) Disconnect the connector from the VDCCM&H/U. 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 VDCCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B310) No. 28 (+) — Chassis ground (–):***	Is the voltage 10 — 15 V?	Go to step **4**.	Repair the power supply circuit.
4	**CHECK VDCCM&H/U GROUND CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between VDCCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B310) No. 25 — Chassis ground:***	Is the resistance less than 10 Ω?	Go to step **5**.	Repair the VDCCM&H/U ground harness.
5	**CHECK POOR CONTACT OF CONNECTORS.**	Is there poor contact of connector between generator, battery and VDCCM&H/U?	Repair the connector.	Go to step **6**.
6	**CHECK VDCCM&H/U.** 1) Connect all connectors. 2) Clear the memory. <Ref. to VDC(diag)-25, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to VDC(diag)-24, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **7**.
7	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

Z: DTC C0044 TCM COMMUNICATION CIRCUIT

DTC DETECTING CONDITION:

No CAN signal from TCM.

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

	Step	Check	Yes	No
1	**CHECK LAN SYSTEM.** Perform the diagnosis for LAN system. <Ref. to LAN(diag)-18, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is there any fault in LAN system?	Perform the diagnosis according to DTC for LAN system. <Ref. to LAN(diag)-31, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK POOR CONTACT OF CONNECTORS.**	Is there poor contact of TCM connector?	Repair the connector.	Go to step **3**.
3	**CHECK TCM.** Refer to the basic diagnostic procedure for Automatic Transmission (diagnostics).	Is the TCM normal?	Go to step **4**.	Replace the TCM. <Ref. to 4AT-66, Transmission Control Module (TCM).>
4	**CHECK VDCCM&H/U.** 1) Connect all connectors. 2) Clear the memory. <Ref. to VDC(diag)-25, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to VDC(diag)-24, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **5**.
5	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	It results from a temporary noise interference.

AA:DTC C0045 INCORRECT VDC CONTROL MODULE SPECIFICATIONS

DTC DETECTING CONDITION:
Different control module specification
TROUBLE SYMPTOM:
- ABS does not operate.
- VDC does not operate.

NOTE:
When parameter selection for VDCCM is improper, this DTC may be memorized.

	Step	Check	Yes	No
1	**CHECK VDCCM REPLACEMENT HISTORY.**	Is there history of VDCCM replacement by itself?	Go to step **2**.	Go to step **3**.
2	**CHECK VDCCM IDENTIFICATION SYMBOL.** Check the identification symbol of the seal attached on the side of the VDCCM.	Is the identification symbol correct? AT: Z6 MT: Z7	Go to step **4**.	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>
3	**CHECK VDCCM&H/U IDENTIFICATION SYMBOL.** Check the identification symbol stamped on the upper part of the H/U.	Is the identification symbol correct? AT: Z6 MT: Z7	Go to step **4**.	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>
4	**CHECK PARAMETER SELECTED IN VDCCM.** <Ref. to VDC(diag)-19, PARAMETER CHECK, OPERATION, Subaru Select Monitor.>	Does the parameter registered in the VDCCM match the relevant vehicle?	Go to step **5**.	Select and register the correct parameter. <Ref. to VDC(diag)-19, PARAMETER SELECTION, OPERATION, Subaru Select Monitor.>
5	**CHECK TCM SPECIFICATION.** Check the TCM specification.	Is the specification of TCM same as vehicle specification?	Go to step **6**.	Replace the TCM. <Ref. to 4AT-66, Transmission Control Module (TCM).>
6	**CHECK AT SYSTEM.** 1) Start the engine. 2) Check the DTC in AT system.	Is DTC of AT system displayed?	Repair the AT system. <Ref. to 4AT(diag)-32, List of Diagnostic Trouble Code (DTC).>	Go to step **7**.
7	**CHECK ECM SPECIFICATION.** Check the ECM specification.	Is the specification of ECM same as vehicle specification?	Go to step **8**.	Replace the ECM. <Ref. to FU(H4DO)-101, Engine Control Module (ECM).> <Ref. to FU(H4DOTC)-57, Engine Control Module (ECM).>

	Step	Check	Yes	No
8	**CHECK VDCCM&H/U.** 1) Connect all connectors. 2) Clear the memory. <Ref. to VDC(diag)-25, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to VDC(diag)-24, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **9**.
9	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	It results from a temporary noise interference.

AB:DTC C0045 TCM MALFUNCTION

DTC DETECTING CONDITION:

Defective TCM

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 DTC of AT system displayed?	Repair the AT system. <Ref. to 4AT(diag)-32, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK VDCCM&H/U.** 1) Connect all connectors. 2) Clear the memory. <Ref. to VDC(diag)-25, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to VDC(diag)-24, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **3**.
3	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	It results from a temporary noise interference.

AC:DTC C0047 CAN COMMUNICATION

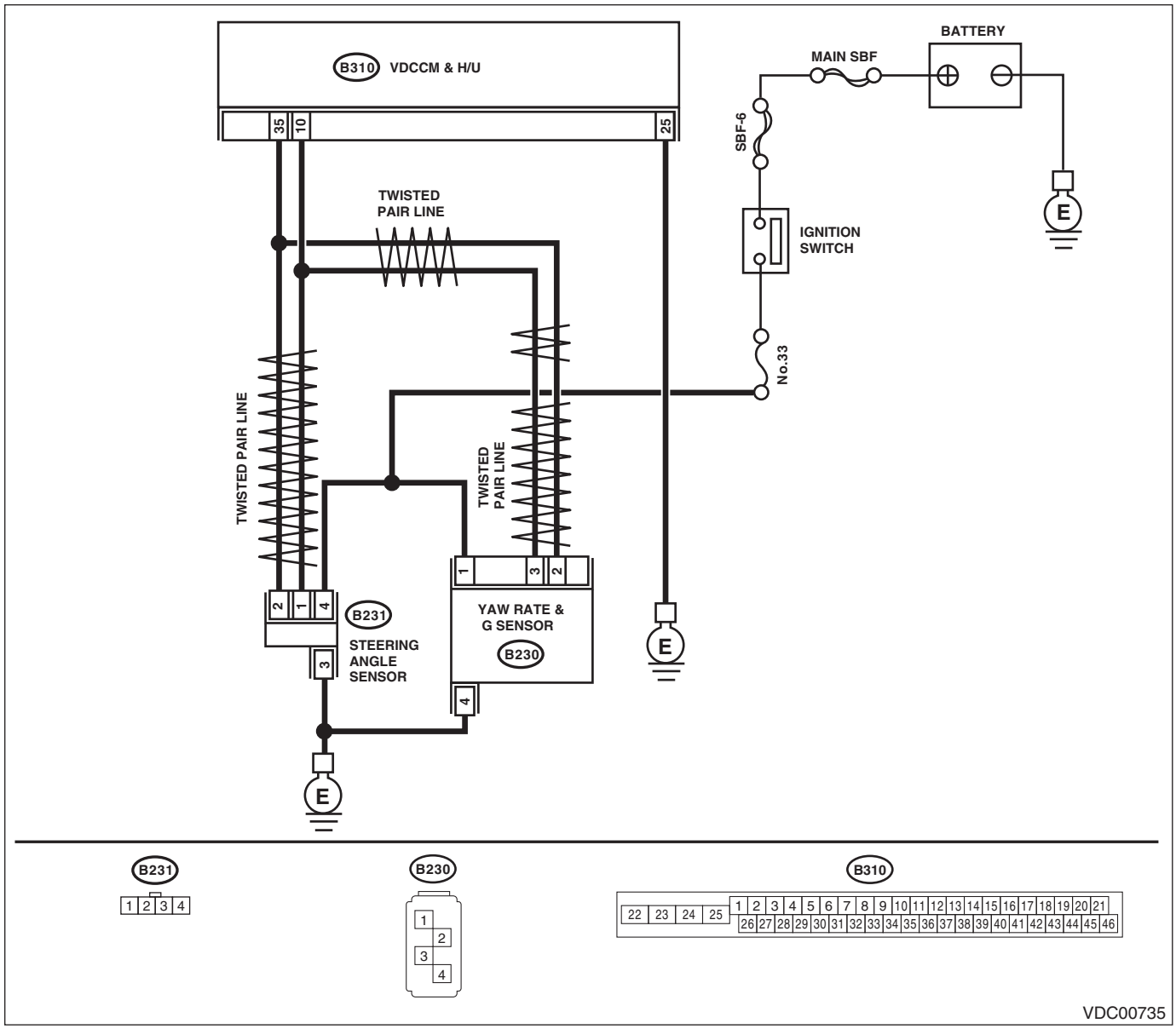
DTC DETECTING CONDITION:

CAN communication line circuit is open or shorted.

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK LAN SYSTEM.** Perform the diagnosis for LAN system. <Ref. to LAN(diag)-18, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is there any fault in LAN system?	Perform the diagnosis according to DTC for LAN system. <Ref. to LAN(diag)-31, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK POOR CONTACT OF CONNECTORS.**	Is there poor contact of VDCCM&H/U connector?	Repair the connector.	Go to step **3**.

	Step	Check	Yes	No
3	**CHECK OUTPUT OF STEERING ANGLE SENSOR WITH SUBARU SELECT MONITOR.** 1) Select “Current Data Display & Save” on the Subaru Select Monitor. 2) Check the steering angle sensor output.	Does the output signal change?	Go to step **4**.	Check output of the steering angle sensor. <Ref. to VDC(diag)-84, DTC C0071 STEER ANGLE SENSOR OP, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
4	**CHECK OUTPUT OF YAW RATE & G SENSOR WITH SUBARU SELECT MONITOR.** 1) Select “Current Data Display & Save” on the Subaru Select Monitor. 2) Check the yaw rate & G sensor output.	Does the output signal change?	Go to step **5**.	Check output of the yaw rate & G sensor. <Ref. to VDC(diag)-94, DTC C0072 YAW RATE SENSOR COMMUNICATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
5	**CHECK VDCCM&H/U.** 1) Connect all connectors. 2) Clear the memory. <Ref. to VDC(diag)-25, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to VDC(diag)-24, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Temporary poor contact occurs.

AD:DTC C0051 VALVE RELAY

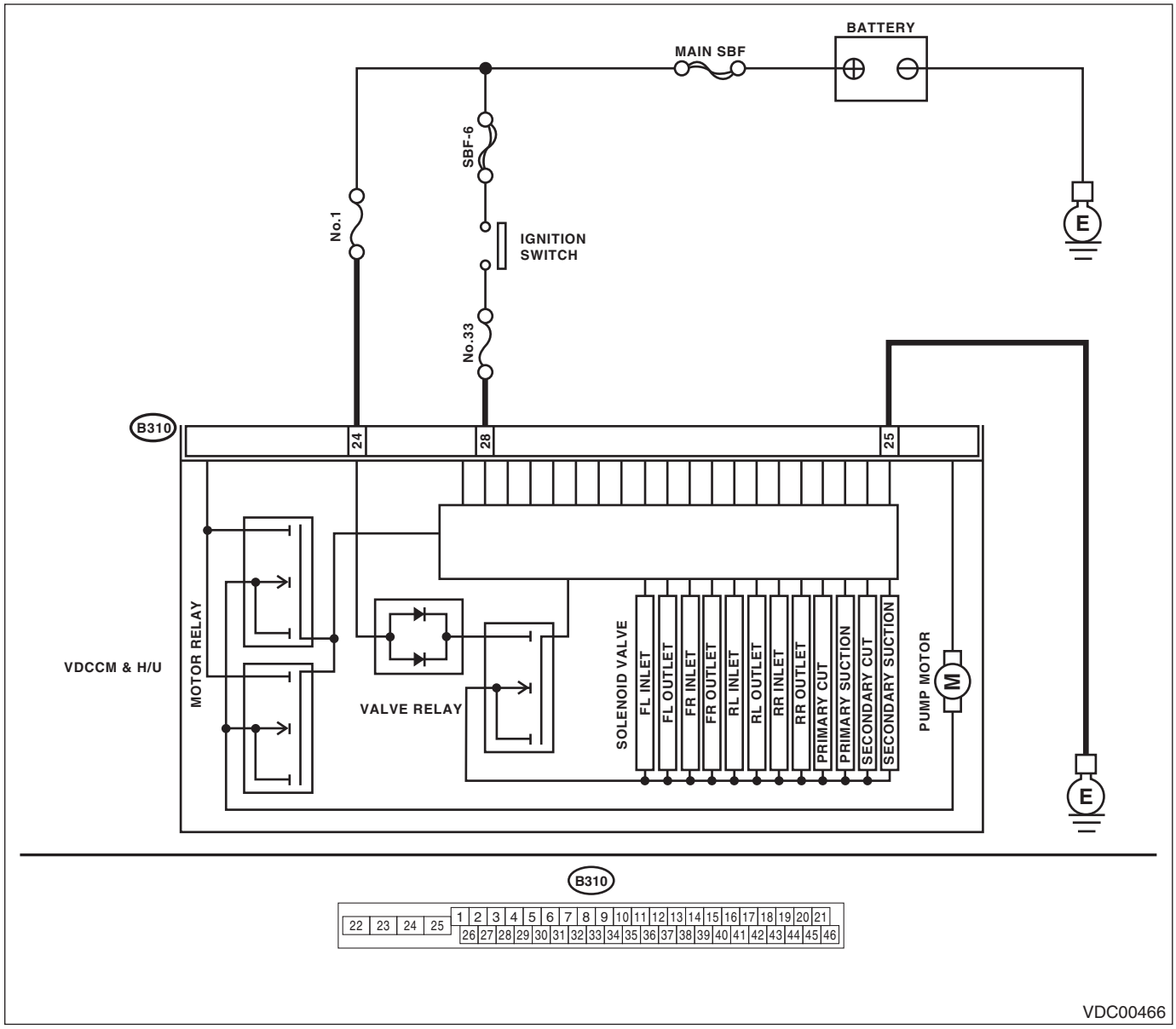
DTC DETECTING CONDITION:

Defective valve relay

TROUBLE SYMPTOM:

- ABS does not operate.
- EBD does not operate.
- VDC does not operate.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK VDCCM&H/U INPUT VOLTAGE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the VDCCM&H/U. 3) Run the engine at idle. 4) Measure the voltage between VDCCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B310) No. 28 (+) — Chassis ground (–):*** ***(B310) No. 24 (+) — Chassis ground (–):***	Is the voltage 10 — 15 V?	Go to step **2**.	Repair the power supply circuit.
2	**CHECK VDCCM&H/U INPUT VOLTAGE.** Calculate the voltage difference measured in step 1. A: (B310) No. 28 (+) — Chassis ground (–): B: (B310) No. 24 (+) — Chassis ground (–):	Is the voltage difference between A and B 2 V or more?	Repair the power supply circuit.	Go to step **3**.
3	**CHECK VDCCM&H/U GROUND CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between VDCCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B310) No. 25 — Chassis ground:***	Is the resistance less than 10 Ω?	Go to step **4**.	Repair the VDCCM&H/U ground harness.
4	**CHECK VDCCM&H/U VALVE RELAY.** Measure the resistance between VDCCM&H/U connector terminals. ***Connector & terminal*** ***(B310) No. 24 — (B310) No. 25:***	Is the resistance 1 MΩ or more?	Go to step **5**.	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>
5	**CHECK POOR CONTACT OF CONNECTORS.**	Is there poor contact of connector between generator, battery and VDCCM&H/U?	Repair the connector.	Go to step **6**.
6	**CHECK VDCCM&H/U.** 1) Connect all connectors. 2) Clear the memory. <Ref. to VDC(diag)-25, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to VDC(diag)-24, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **7**.
7	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

AE:DTC C0052 MOTOR AND MOTOR RELAY OFF FAILURE

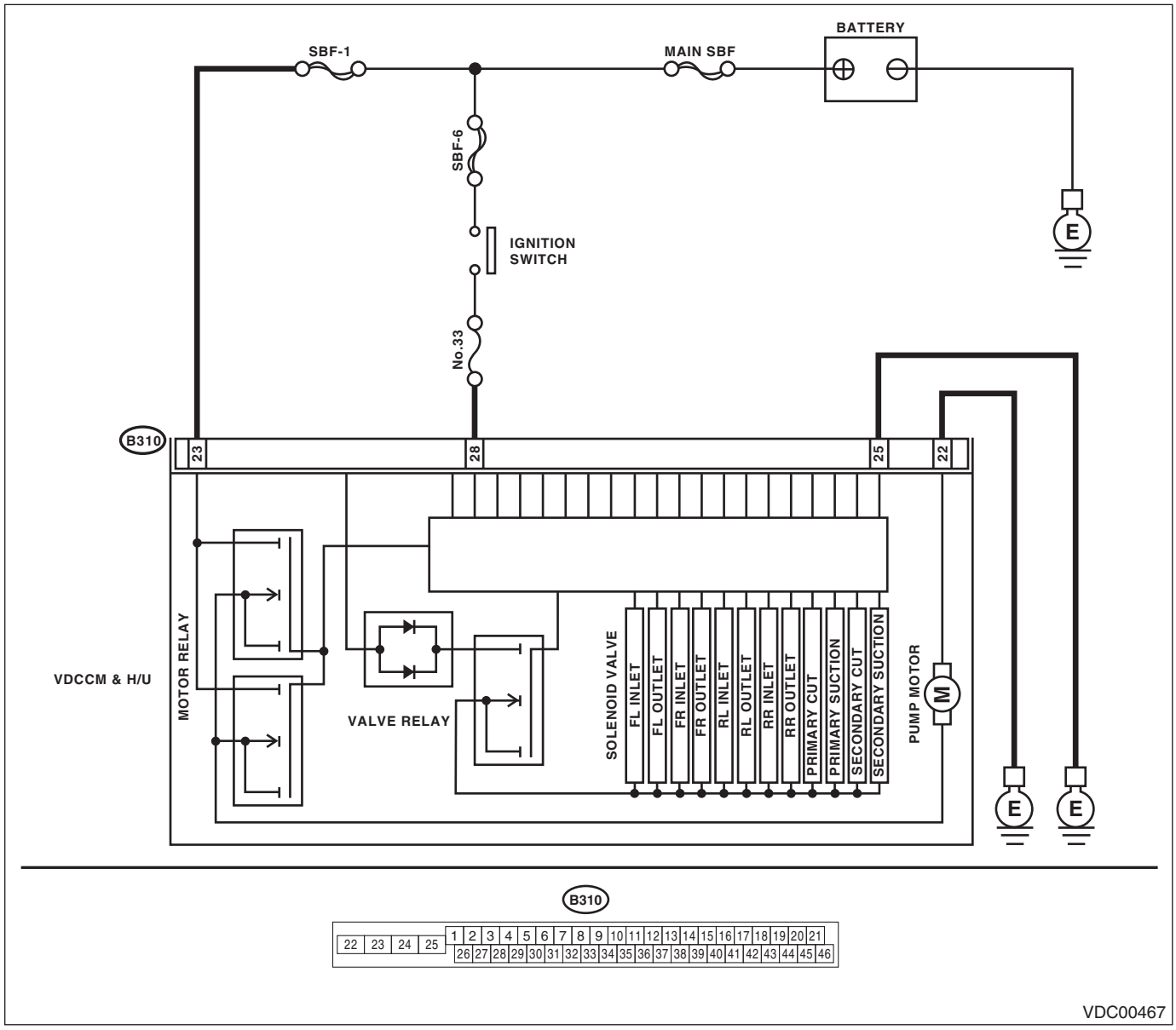
DTC DETECTING CONDITION:

- Defective motor and motor relay
- Defective harness connector

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.
- EBD may not operate.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK VDCCM&H/U INPUT VOLTAGE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the VDCCM&H/U. 3) Turn the ignition switch to ON. 4) Measure the voltage between VDCCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B310) No. 23 (+) — Chassis ground (–):*** ***(B310) No. 28 (+) — Chassis ground (–):***	Is the voltage 10 — 15 V?	Go to step **2**.	Repair the VDCCM&H/U power supply circuit.
2	**CHECK INSTALLATION OF MOTOR GROUND.**	Is the motor ground terminal installation bolt tightened 33 N·m (3.4 kgf-m, 24.3 ft-lb)?	Go to step **3**.	Tighten the motor ground terminal installation bolt.
3	**CHECK VDCCM&H/U GROUND CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between VDCCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B310) No. 25 — Chassis ground:*** ***(B310) No. 22 — Chassis ground:***	Is the resistance less than 10 Ω?	Go to step **4**.	Repair the VDCCM&H/U ground harness.
4	**CHECK VDCCM&H/U MOTOR RELAY.** Measure the resistance between VDCCM&H/U connector terminals. ***Terminals*** ***No. 23 — No. 22:***	Is the resistance 1 MΩ or more?	Go to step **5**.	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>
5	**CHECK POOR CONTACT OF CONNECTORS.** Turn the ignition switch to OFF.	Is there poor contact of connector between generator, battery and VDCCM&H/U?	Repair the connector.	Go to step **6**.
6	**CHECK VDCCM&H/U.** 1) Connect all connectors. 2) Clear the memory. <Ref. to VDC(diag)-25, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to VDC(diag)-24, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **7**.
7	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, 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 12 km/h (7 MPH) or more in order to turn ABS warning light off. Be sure to drive the vehicle and check that the warning light goes off.

AF:DTC C0052 MOTOR AND MOTOR RELAY ON FAILURE

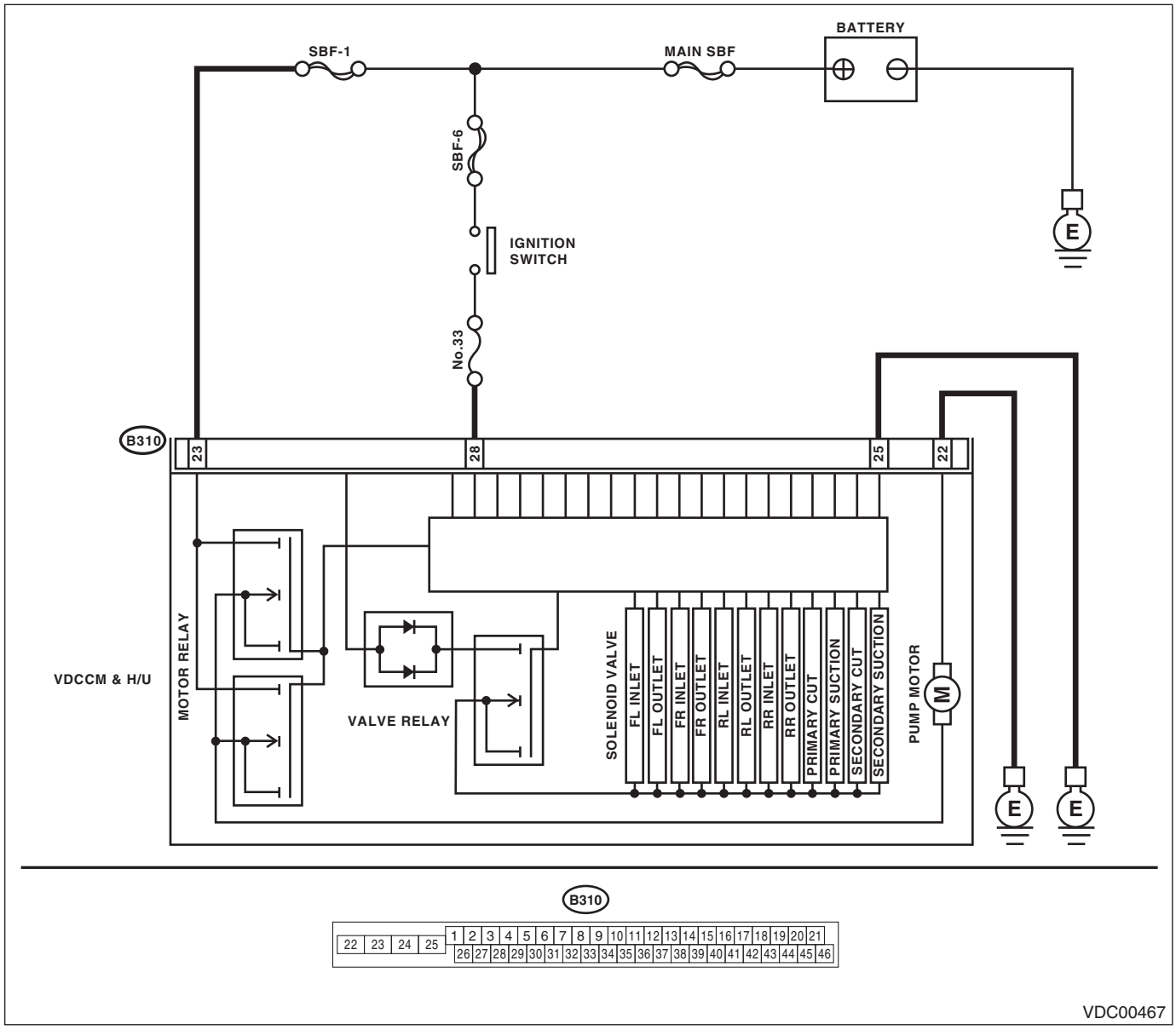
DTC DETECTING CONDITION:

- Defective motor relay
- Defective harness connector

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.
- EBD may not operate.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK INSTALLATION OF MOTOR GROUND.**	Is the motor ground terminal installation bolt tightened 33 N·m (3.4 kgf-m, 24.3 ft-lb)?	Go to step **2**.	Tighten the motor ground terminal installation bolt.

	Step	Check	Yes	No
2	**CHECK VDCCM&H/U MOTOR RELAY.** 1) Disconnect the connector from the VDCCM&H/U. 2) Measure the resistance between VDCCM&H/U connector terminals. ***Terminals*** ***No. 23 — No. 22:***	Is the resistance 1 MΩ or more?	Go to step **3**.	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>
3	**CHECK VDCCM&H/U.** 1) Connect all connectors. 2) Clear the memory. <Ref. to VDC(diag)-25, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to VDC(diag)-24, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **4**.
4	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, 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 12 km/h (7 MPH) or more in order to turn ABS warning light off. Be sure to drive the vehicle and check that the warning light goes off.

AG:DTC C0052 MOTOR MALFUNCTION

DTC DETECTING CONDITION:

- Defective motor
- Defective motor relay
- Defective harness connector

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.
- EBD may not operate.

NOTE:
For the diagnostic procedure, refer to DTC C0052 “MOTOR/MOTOR RELAY OFF FAILURE”. <Ref. to VDC(diag)-66, DTC C0052 MOTOR AND MOTOR RELAY OFF FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AH:DTC C0054 BLS CIRCUIT OPEN

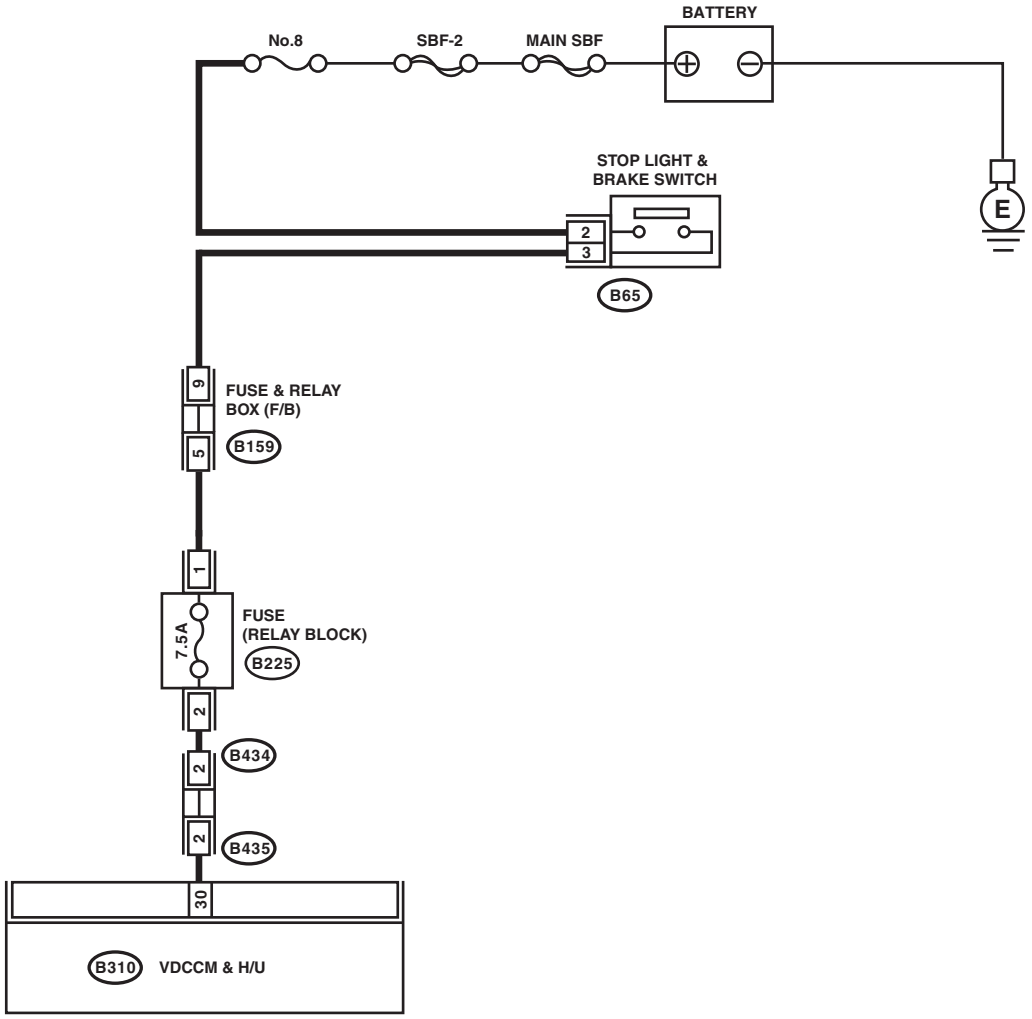
DTC DETECTING CONDITION:

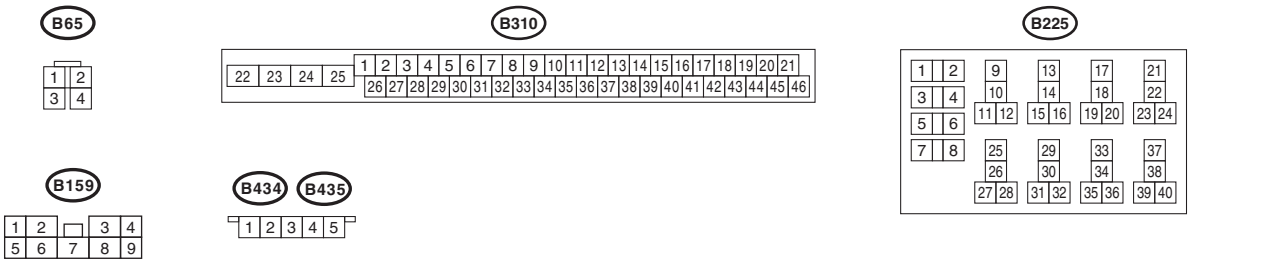
Defective stop light switch

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:





VDC00774

	Step	Check	Yes	No
1	**CHECK OUTPUT OF STOP LIGHT SWITCH WITH SUBARU SELECT MONITOR.** 1) Select {Current Data Display & Save} in Subaru Select Monitor. 2) Release the brake pedal. 3) Read the stop light switch output in Subaru Select Monitor.	Is OFF displayed on the display screen?	Go to step **2**.	Go to step **3**.
2	**CHECK OUTPUT OF STOP LIGHT SWITCH WITH SUBARU SELECT MONITOR.** 1) Depress the brake pedal. 2) Read the stop light switch output in Subaru Select Monitor.	Is ON displayed on the display screen?	Go to step **6**.	Go to step **3**.
3	**CHECK IF STOP LIGHTS ILLUMINATE.** Depress the brake pedal.	Does the stop light illuminate?	Go to step **4**.	Repair the stop light circuit.
4	**CHECK FUSE.** Check the fuse (B225) in the relay block.	Is the fuse OK?	Go to step **5**.	Replace the fuse.
5	**CHECK OPEN CIRCUIT OF HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the VDCCM&H/U. 3) Depress the brake pedal. 4) Measure the voltage between VDCCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B310) No. 30 (+) — Chassis ground (–):***	Is the voltage 10 — 15 V?	Go to step **6**.	Repair the harness between stop light switch and VDCCM&H/U connector.
6	**CHECK POOR CONTACT OF CONNECTORS.**	Is there poor contact of connector between stop light switch and VDCCM&H/U?	Repair the connector.	Go to step **7**.
7	**CHECK VDCCM&H/U.** 1) Connect all connectors. 2) Clear the memory. <Ref. to VDC(diag)-25, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to VDC(diag)-24, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **8**.
8	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

AI: DTC C0054 BLS ON MALFUNCTION

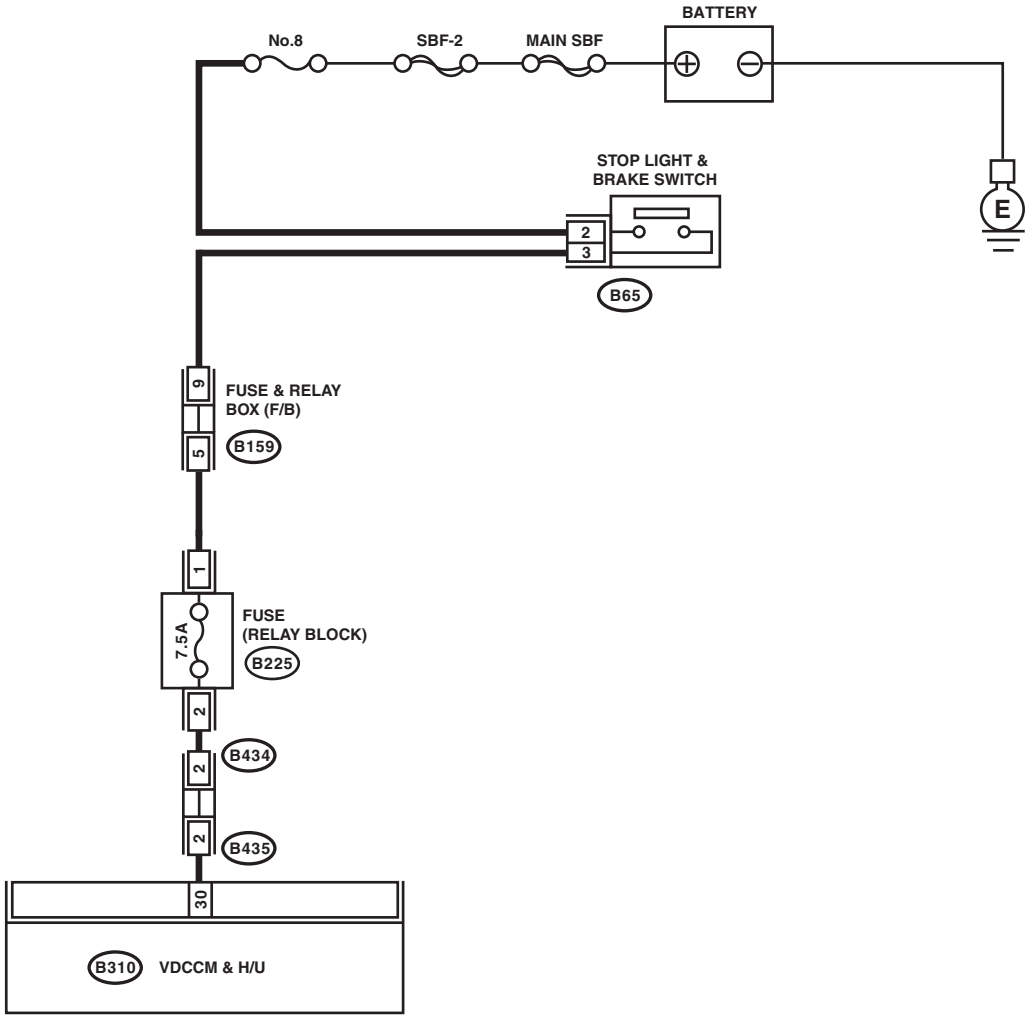
DTC DETECTING CONDITION:

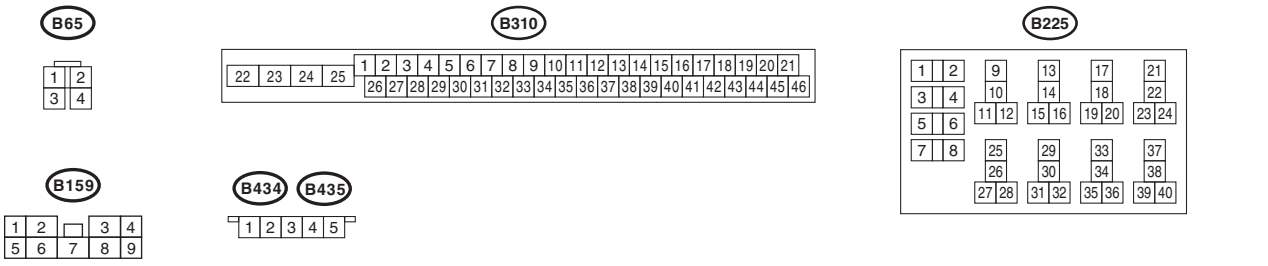
Defective stop light switch

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:





VDC00774

	Step	Check	Yes	No
1	**CHECK STOP LIGHT SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the stop light switch connector. 3) Measure the resistance of stop light switch terminals. ***Terminals*** ***No. 2 — No. 3:***	Is the resistance 1 MΩ or more when switch is OFF (when pedal is not depressed)?	Go to step **2**.	Replace the stop light switch. <Ref. to BR-40, Stop Light Switch.>
2	**INTERVIEW CUSTOMERS.** Make sure that the operation was performed in which accelerator pedal and brake pedal were depressed simultaneously (with depressing brake pedal with left foot).	Were the acceleration pedal and brake pedal depressed simultaneously?	System is normal. (DTC may be recorded while brake is applied during driving.)	Go to step **3**.
3	**CHECK VDCCM&H/U.** 1) Connect all connectors. 2) Clear the memory. <Ref. to VDC(diag)-25, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to VDC(diag)-24, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **4**.
4	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

AJ:DTC C0054 BLS OFF MALFUNCTION

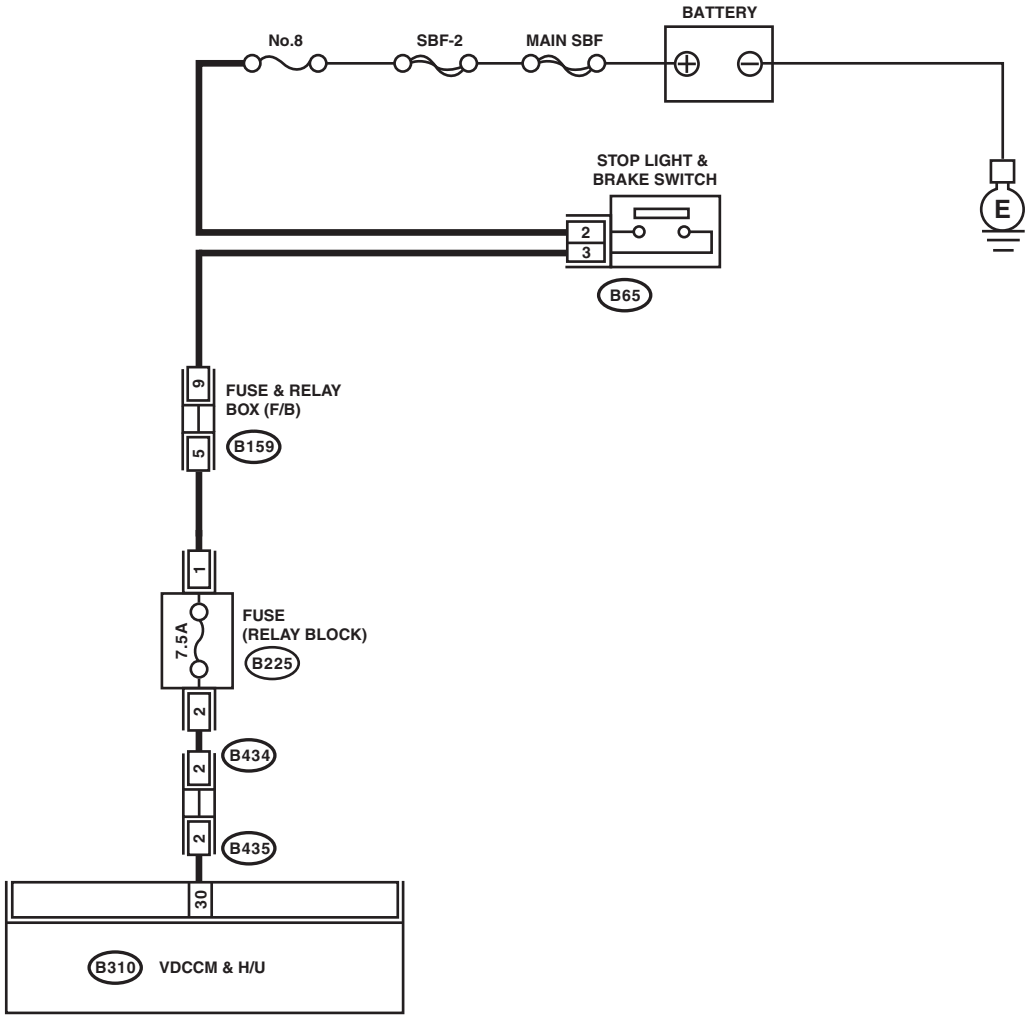
DTC DETECTING CONDITION:

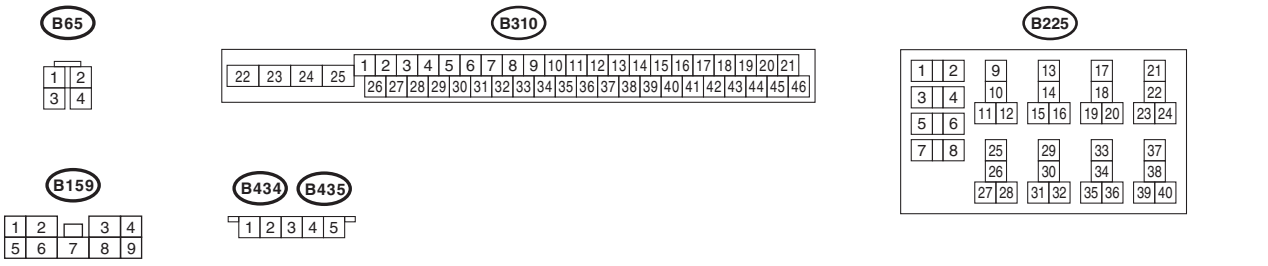
Defective stop light switch

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



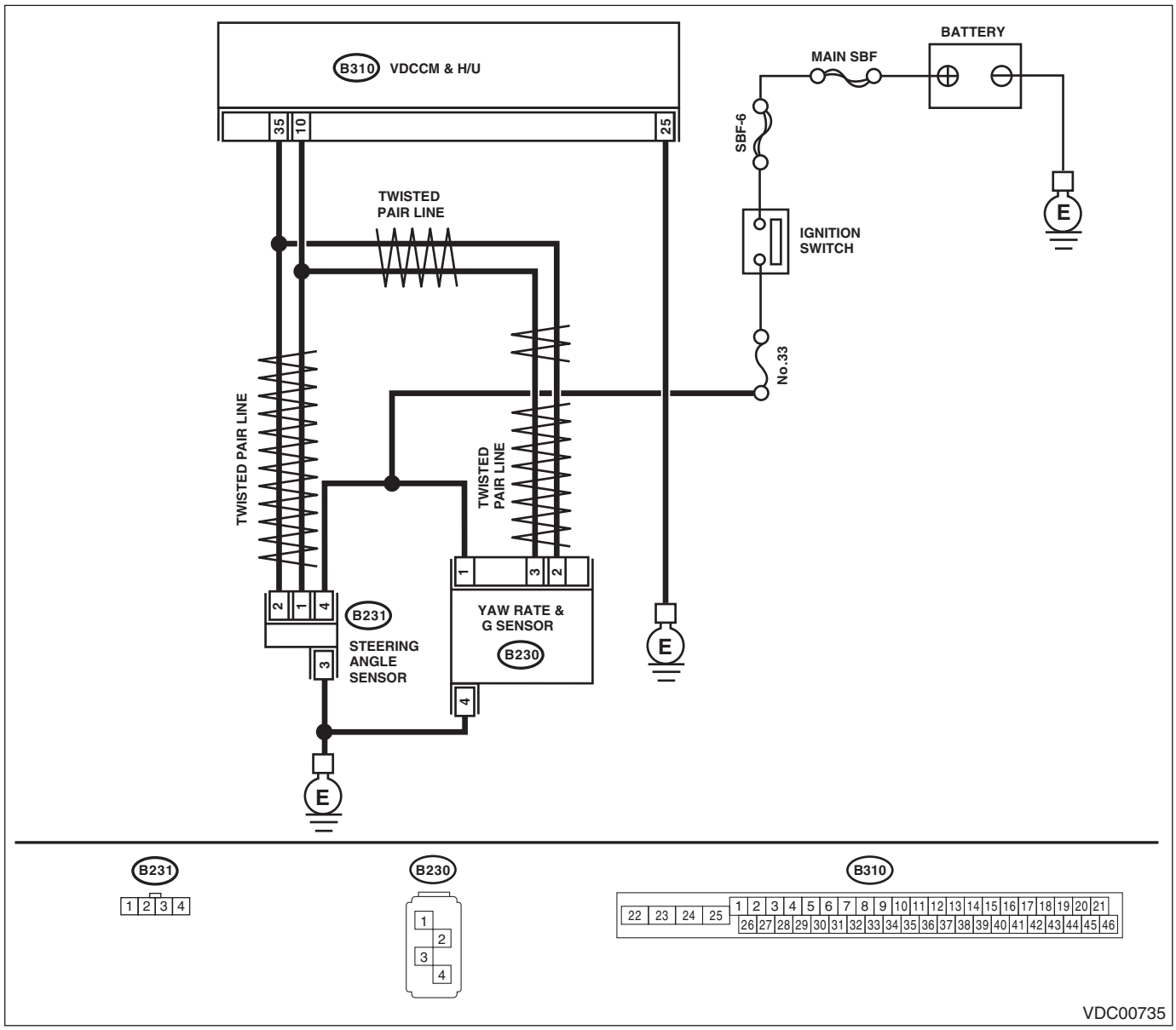


VDC00774

	Step	Check	Yes	No
1	**CHECK STOP LIGHT SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the stop light switch connector. 3) Measure the resistance of stop light switch terminals. ***Terminals*** ***No. 2 — No. 3:***	Is the resistance 1 Ω or less when the switch is ON (when pedal is depressed)?	Go to step **2**.	Replace the stop light switch. <Ref. to BR-40, Stop Light Switch.>
2	**CHECK STOP LIGHT POWER SUPPLY.** Measure the voltage between stop light switch terminal and chassis ground. ***Connector & terminal*** ***(B65) No. 2 (+) — Chassis ground (–):***	Is the voltage 10 — 15 V?	Go to step **3**.	Repair the stop light power supply circuit.
3	**CHECK STOP LIGHT SWITCH HARNESS.** 1) Disconnect the connector from the VDCCM&H/U. 2) Measure the resistance between VDCCM&H/U and stop light switch. ***Connector & terminal*** ***(B65) No. 3 — (B310) No. 30:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the stop light switch circuit.
4	**CHECK POOR CONTACT OF CONNECTORS.**	Is there poor contact of connector between stop light switch and VDCCM&H/U?	Repair the connector.	Go to step **5**.
5	**CHECK VDCCM&H/U.** 1) Connect all connectors. 2) Clear the memory. <Ref. to VDC(diag)-25, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to VDC(diag)-24, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **6**.
6	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

AK:DTC C0056 G SENSOR SIGNAL

DTC DETECTING CONDITION:
Defective longitudinal G sensor
TROUBLE SYMPTOM:
Hill start assist does not operate.
WIRING DIAGRAM:



Step		Check	Yes	No
1	**WHETHER A WHEEL TURNED FREELY OR NOT.** Check if the wheels have been turned freely for one minute or more, such as when the vehicle is jacked-up, under full-lock cornering or when the wheels are not in contact with road surface.	Did the wheels turn freely?	VDC is normal. Clear the memory.	Go to step **2**.

	Step	Check	Yes	No
2	**CHECK OUTPUT OF LONGITUDINAL G SENSOR USING SUBARU SELECT MONITOR.** 1) Park the vehicle on a level surface. 2) Select {Current Data Display & Save} in Subaru Select Monitor. 3) Read the display for the forward/reverse G sensor output.	Is the indicated reading on the monitor display –1.2 — 1.2 m/s^2?	Go to step **3**.	Replace the yaw rate & G sensor. <Ref. to VDC-19, Yaw Rate and G Sensor.>
3	**CHECK OUTPUT OF LONGITUDINAL G SENSOR USING SUBARU SELECT MONITOR.** 1) Turn the ignition switch to OFF. 2) Remove the yaw rate & G sensor from vehicle. <Ref. to VDC-19, Yaw Rate and G Sensor.> 3) Turn the ignition switch to ON, and select the {Current Data Display & Save} in Subaru Select Monitor. 4) Read the display for the forward/reverse G sensor output.	When the yaw rate & G sensor is inclined 90° to the front, is the indicated value 6.8 — 12.8 m/s^2?	Go to step **4**.	Replace the yaw rate & G sensor. <Ref. to VDC-19, Yaw Rate and G Sensor.>
4	**CHECK OUTPUT OF LONGITUDINAL G SENSOR USING SUBARU SELECT MONITOR.** Read the display for the forward/reverse G sensor output.	When the yaw rate & G sensor is inclined 90° to the rear, is the indicated value –6.8 — –12.8 m/s^2?	Go to step **5**.	Replace the yaw rate & G sensor. <Ref. to VDC-19, Yaw Rate and G Sensor.>
5	**CHECK POOR CONTACT OF CONNECTORS.** Turn the ignition switch to OFF.	Is there poor contact of connector between VDCCM&H/U and yaw rate & G sensor?	Repair the connector.	Go to step **6**.
6	**CHECK VDCCM&H/U.** 1) Connect all connectors. 2) Clear the memory. <Ref. to VDC(diag)-25, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to VDC(diag)-24, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **7**.
7	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

AL:DTC C0057 ECM COMMUNICATION CIRCUIT

DTC DETECTING CONDITION:

No CAN signal from ECM.

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

	Step	Check	Yes	No
1	**CHECK LAN SYSTEM.** Perform the diagnosis for LAN system. <Ref. to LAN(diag)-18, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is there any fault in LAN system?	Perform the diagnosis according to DTC for LAN system. <Ref. to LAN(diag)-31, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK POOR CONTACT OF CONNECTORS.**	Is there poor contact of ECM connector?	Repair the connector.	Go to step **3**.
3	**CHECK ECM.** Refer to the basic diagnostic procedure for each engine (diagnostics).	Is ECM normal?	Go to step **4**.	Replace the ECM. <Ref. to FU(H4DO)-101, Engine Control Module (ECM).> <Ref. to FU(H4DOTC)-57, Engine Control Module (ECM).>
4	**CHECK VDCCM&H/U.** 1) Connect all connectors. 2) Clear the memory. <Ref. to VDC(diag)-25, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to VDC(diag)-24, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **5**.
5	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	It results from a temporary noise interference.

AM:DTC C0057 ECM CONTROL SYSTEM

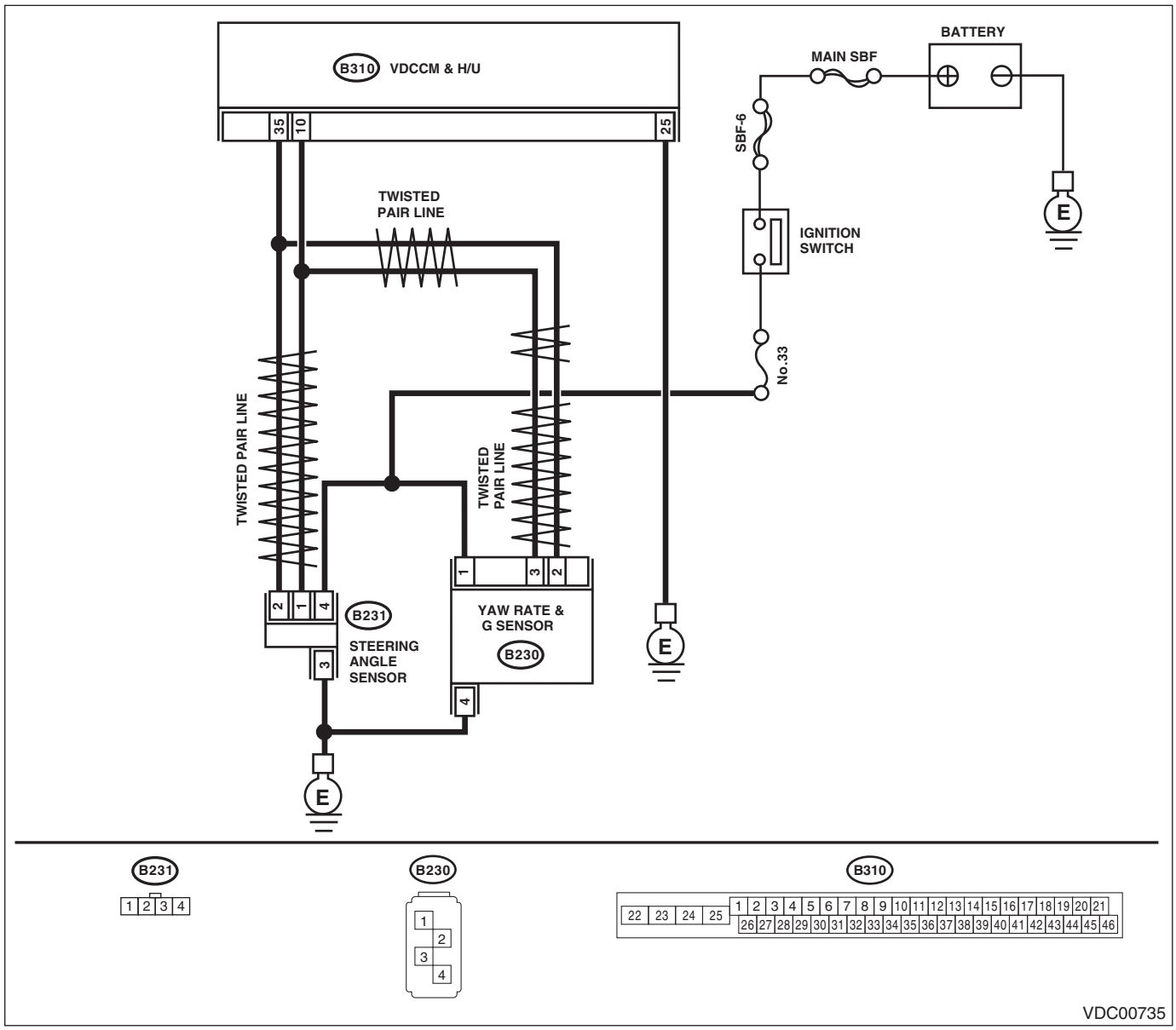
DTC DETECTING CONDITION:
Cooperation control prohibition of ECM
TROUBLE SYMPTOM:
- ABS does not operate.
- VDC does not operate.

NOTE:
Warning lights go off if the cooperation control of ECM returns.

	Step	Check	Yes	No
1	**CHECK WARNING LIGHT.** Check whether the VDC warning light illuminates after driving for 1 minute or more at a speed of 10 km/h or more.	Does the VDC warning light illuminate?	Go to step **2**.	VDC is normal. Perform the Clear Memory Mode. NOTE: DTC may be recorded if cranking is performed during driving.
2	**CHECK POOR CONTACT OF CONNECTORS.**	Is there poor contact of ECM connector?	Repair the connector.	Go to step **3**.
3	**CHECK ECM.** Refer to the basic diagnostic procedure for each engine (diagnostics).	Is ECM normal?	Go to step **4**.	Replace the ECM. <Ref. to FU(H4DO)-101, Engine Control Module (ECM).> <Ref. to FU(H4DOTC)-57, Engine Control Module (ECM).>
4	**CHECK VDCCM&H/U.** 1) Connect all connectors. 2) Clear the memory. <Ref. to VDC(diag)-25, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to VDC(diag)-24, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **5**.
5	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	It results from a temporary noise interference.

AN:DTC C0071 STEERING ANGLE SENSOR OFFSET IS TOO BIG

DTC DETECTING CONDITION:
Defective steering angle sensor
TROUBLE SYMPTOM:
VDC does not operate.
WIRING DIAGRAM:

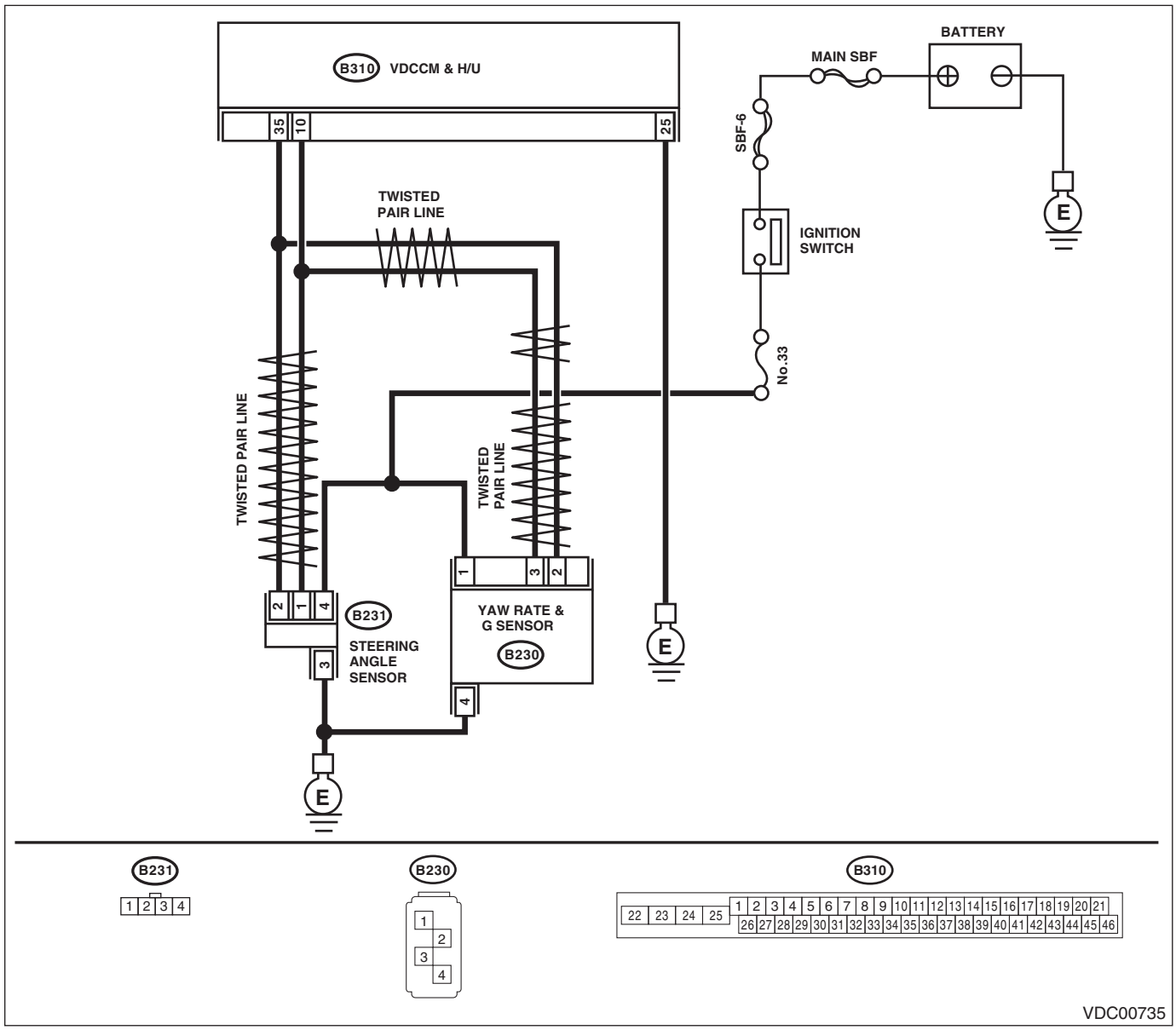


Step		Check	Yes	No
1	**CHECK STEERING WHEEL.** 1) Drive the vehicle on a flat road. 2) Park the vehicle straight. 3) Check the steering wheel for deviation from center.	Is the deviation from the center of steering wheel less than 5°?	Go to step **2**.	Perform the centering adjustment of steering wheel.

	Step	Check	Yes	No
2	**CHECK VDCCM&H/U.** 1) Turn the ignition switch to OFF. 2) Connect all connectors. 3) Clear the memory. <Ref. to VDC(diag)-25, Clear Memory Mode.> 4) Perform the Inspection Mode. <Ref. to VDC(diag)-24, Inspection Mode.> 5) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **3**.
3	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

AO:DTC C0071 CHANGE RANGE OF STEERING ANGLE SENSOR IS TOO BIG

DTC DETECTING CONDITION:
Defective steering angle sensor
TROUBLE SYMPTOM:
VDC does not operate.
WIRING DIAGRAM:

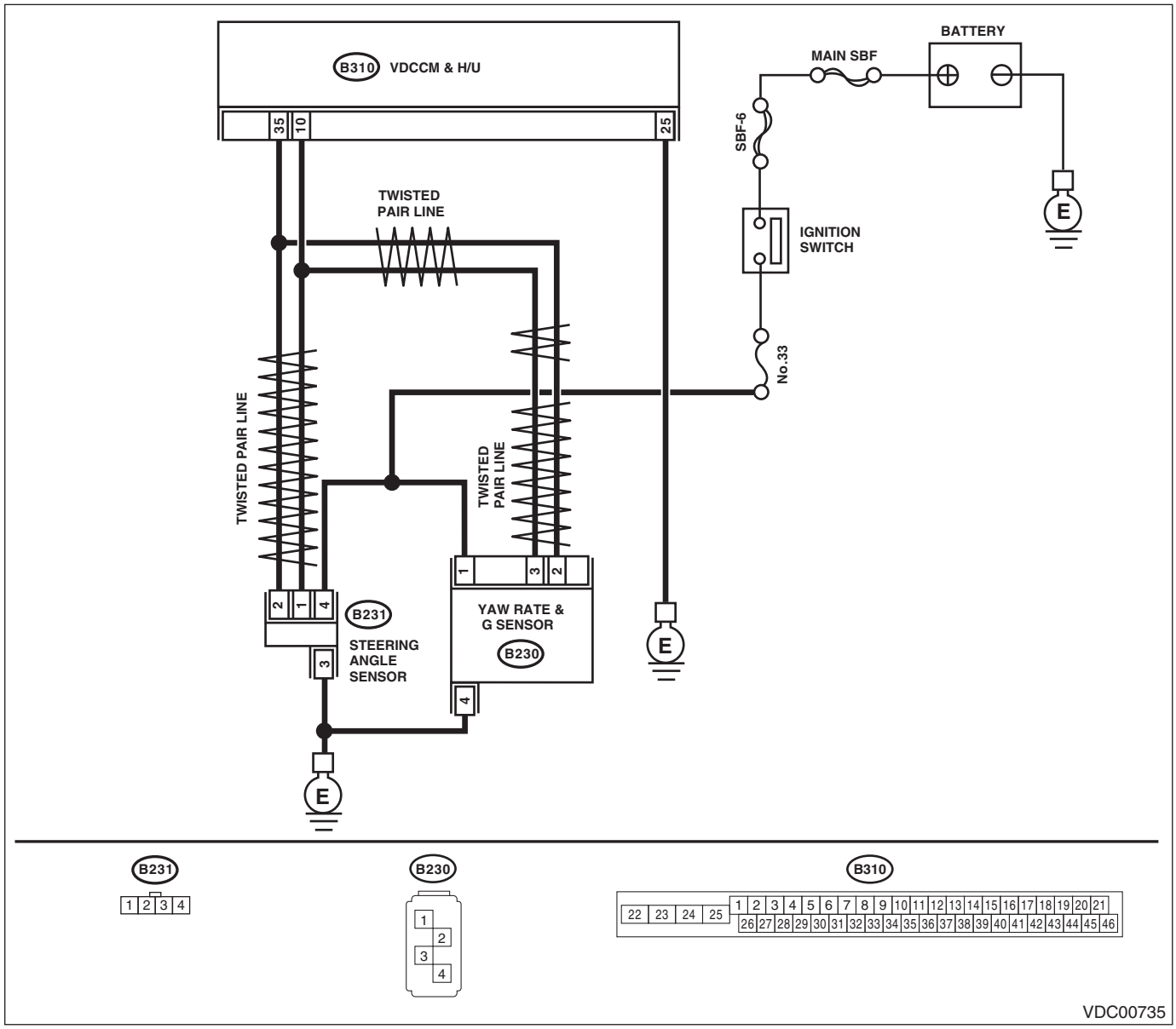


Step		Check	Yes	No
1	**CHECK VDCCM&H/U.** 1) Turn the ignition switch to OFF. 2) Connect all connectors. 3) Clear the memory. <Ref. to VDC(diag)-25, Clear Memory Mode.> 4) Perform the Inspection Mode. <Ref. to VDC(diag)-24, Inspection Mode.> 5) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **2**.

Step		Check	Yes	No
2	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

AP:DTC C0071 STEER ANGLE SENSOR OP

DTC DETECTING CONDITION:
Signal does not come from steering angle sensor.
TROUBLE SYMPTOM:
VDC does not operate.
WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK POWER SUPPLY FOR STEERING ANGLE SENSOR.** 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 steering angle sensor and chassis ground. ***Connector & terminal*** ***(B231) No. 4 (+) — Chassis ground (–):***	Is the voltage 10 — 15 V?	Go to step **2**.	Repair the steering angle sensor power supply circuit.

	Step	Check	Yes	No
2	**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 10 Ω?	Go to step **3**.	Repair ground circuit in the steering angle sensor.
3	**CHECK STEERING ANGLE SENSOR HARNESS.** 1) Disconnect the connector from the VDCCM&H/U. 2) Measure the resistance between VDCCM&H/U and steering angel sensor. ***Connector & terminal*** ***(B231) No. 1 — (B310) No. 10:*** ***(B231) No. 2 — (B310) No. 35:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the harness between the steering angle sensor and VDCCM&H/U.
4	**CHECK GROUND SHORT CIRCUIT OF STEERING ANGLE SENSOR HARNESS.** Measure the resistance between steering angle sensor and chassis ground. ***Connector & terminal*** ***(B231) No. 1 — Chassis ground:*** ***(B231) No. 2 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **5**.	Repair the harness between the steering angle sensor and VDCCM&H/U.
5	**CHECK STEERING ANGLE SENSOR.** 1) Turn the ignition switch to OFF. 2) Connect all connectors. 3) Clear the memory. <Ref. to VDC(diag)-25, Clear Memory Mode.> 4) Perform the Inspection Mode. <Ref. to VDC(diag)-24, Inspection Mode.> 5) Read the DTC.	Is the same DTC displayed?	Go to step **6**.	Go to step **7**.
6	**CHECK VDCCM&H/U.** 1) Turn the ignition switch to OFF. 2) Replace the steering angle sensor. <Ref. to VDC-21, Steering Angle Sensor.> 3) Clear the memory. <Ref. to VDC(diag)-25, Clear Memory Mode.> 4) Perform the Inspection Mode. <Ref. to VDC(diag)-24, Inspection Mode.> 5) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **8**.
7	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.
8	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Original steering angle sensor malfunction

AQ:DTC C0071 STEERING ANGLE SENSOR MALFUNCTION

DTC DETECTING CONDITION:

Defective steering angle sensor

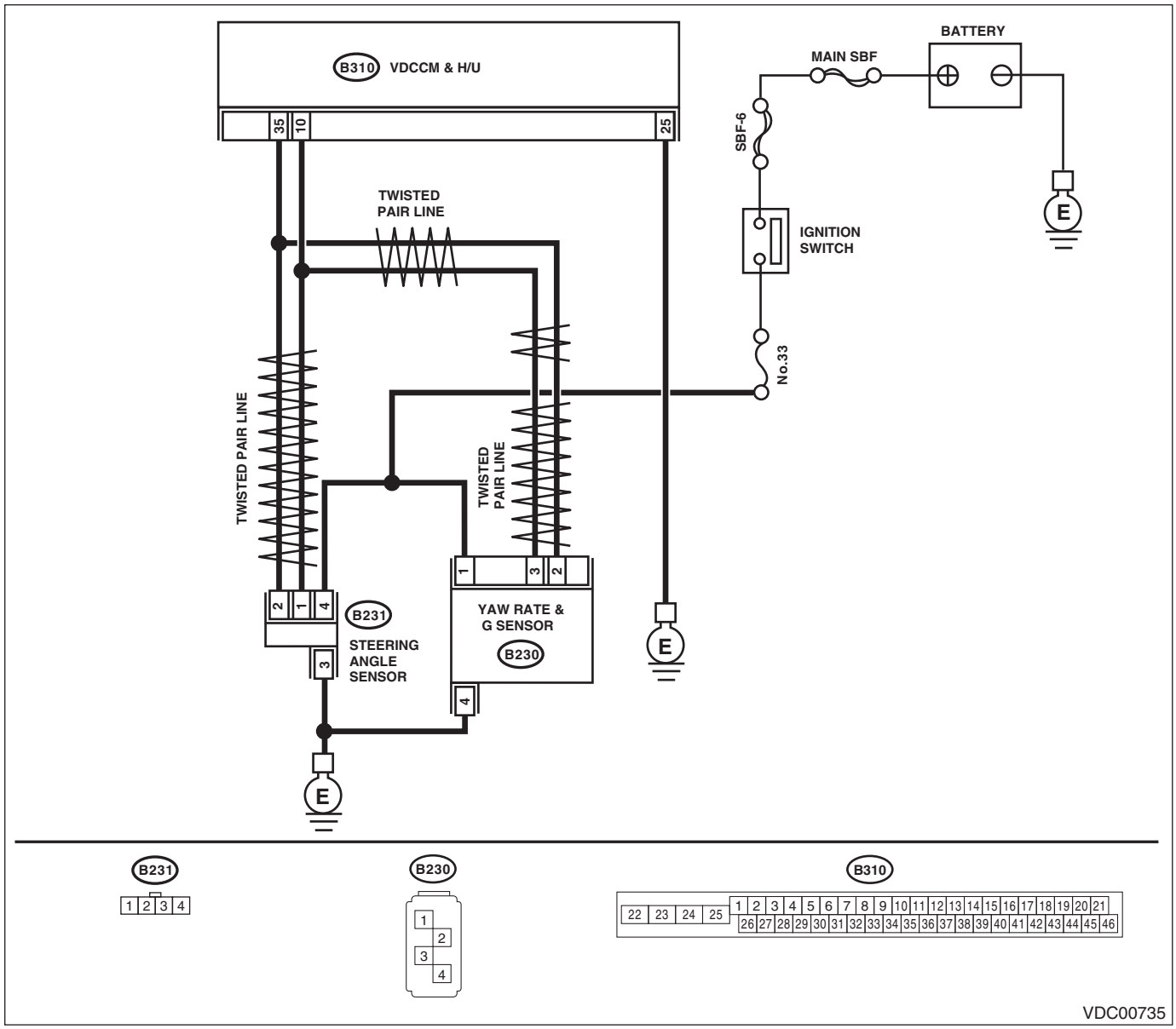
TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

NOTE:

- Warning light does not illuminate though problem is detected.
- The ABS and VDC operate normally if voltage returns.

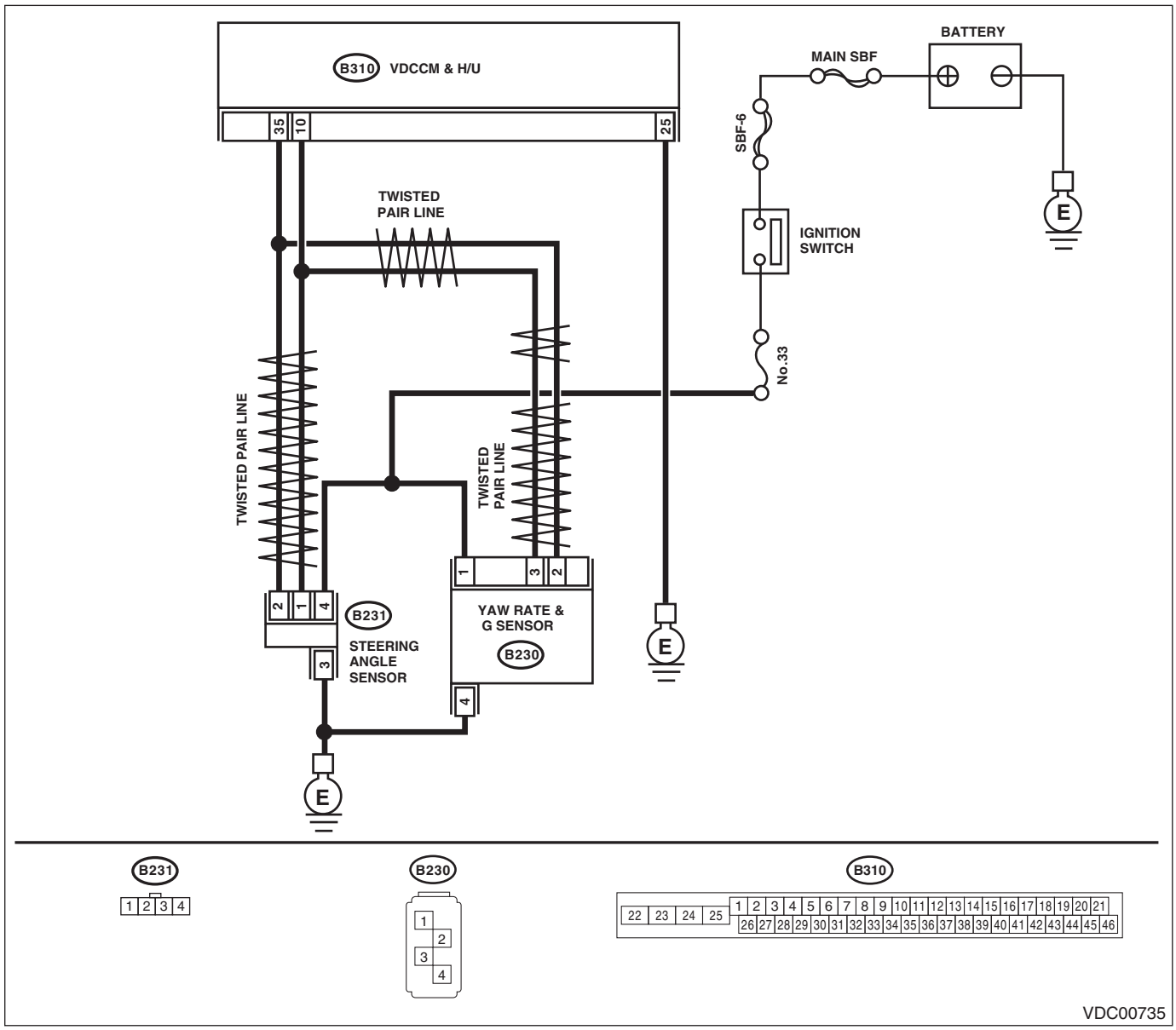
WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK POWER SUPPLY FOR STEERING ANGLE SENSOR.** 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 steering angle sensor and chassis ground. ***Connector & terminal*** ***(B231) No. 4 (+) — Chassis ground (–):***	Is the voltage 10 — 15 V?	Go to step **2**.	Repair the steering angle sensor power supply circuit.
2	**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 10 Ω?	Go to step **3**.	Repair ground circuit in the steering angle sensor.
3	**CHECK STEERING ANGLE SENSOR.** 1) Turn the ignition switch to OFF. 2) Connect all connectors. 3) Clear the memory. <Ref. to VDC(diag)-25, Clear Memory Mode.> 4) Perform the Inspection Mode. <Ref. to VDC(diag)-24, Inspection Mode.> 5) Read the DTC.	Is the same DTC displayed?	Go to step **4**.	Go to step **5**.
4	**CHECK VDCCM&H/U.** 1) Turn the ignition switch to OFF. 2) Replace the steering angle sensor. <Ref. to VDC-21, Steering Angle Sensor.> 3) Clear the memory. <Ref. to VDC(diag)-25, Clear Memory Mode.> 4) Perform the Inspection Mode. <Ref. to VDC(diag)-24, Inspection Mode.> 5) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **6**.
5	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.
6	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Original steering angle sensor malfunction

AR:DTC C0072 ABNORMAL YAW RATE SENSOR OUTPUT

DTC DETECTING CONDITION:
Defective yaw rate sensor
TROUBLE SYMPTOM:
VDC does not operate.
WIRING DIAGRAM:

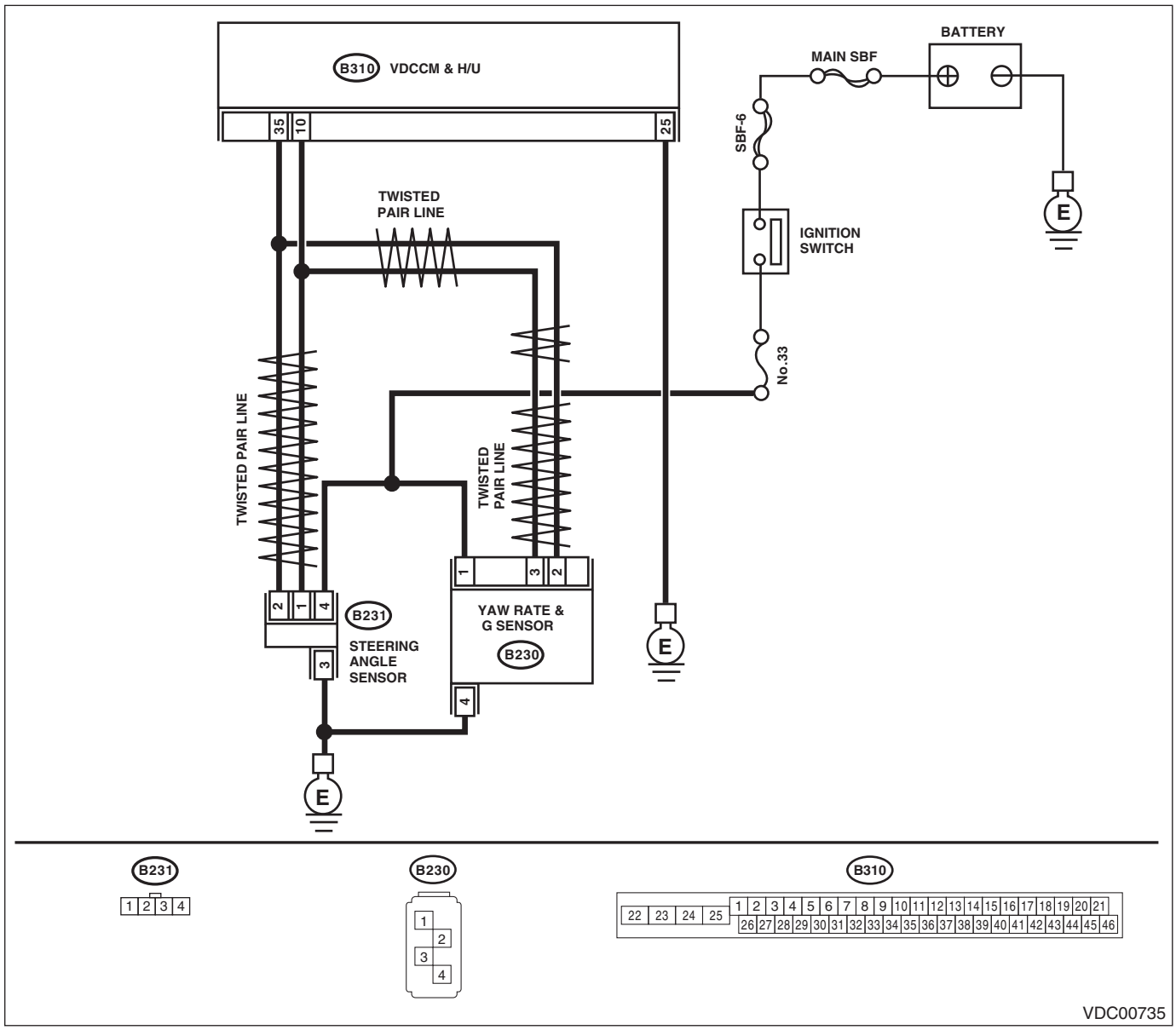


	Step	Check	Yes	No
1	**INTERVIEW CUSTOMERS.** Check if the vehicle ran the road with banks or sandy surface (which does not mean a dirt road).	Did the vehicle run the road with banks or sandy surface (which does not mean a dirt road)?	VDCCM&H/U may record DTC when the vehicle ran the road with banks or sandy surface (which does not mean a dirt road).	Go to step **2**.
2	**CHECK YAW RATE & G SENSOR INSTALLATION.**	Is the yaw rate & G sensor installation bolt tightened to 7.5 N·m (0.76 kgf-m, 5.5 ft-lb)?	Go to step **3**.	Tighten the yaw rate & G sensor attachment bolt.

	Step	Check	Yes	No
3	**CHECK OUTPUT OF YAW RATE & G SENSOR WITH SUBARU SELECT MONITOR.** 1) Drive the vehicle on a flat road. 2) Park the vehicle straight. 3) Select {Current Data Display & Save} in Subaru Select Monitor. 4) Read the yaw rate output displayed on display.	Is the reading indicated on monitor display –4 — 4 deg/s?	Go to step **4**.	Replace the yaw rate & G sensor. <Ref. to VDC-19, Yaw Rate and G Sensor.>
4	**CHECK OUTPUT OF STEERING ANGLE SENSOR WITH SUBARU SELECT MONITOR.** 1) Drive the vehicle on a flat road. 2) Park the vehicle straight. 3) Select {Current Data Display & Save} in Subaru Select Monitor. 4) Read the steering angle sensor output displayed on display.	Is the reading indicated on monitor display –5 — 5°?	Go to step **5**.	Perform the centering adjustment of steering wheel.
5	**CHECK YAW RATE & G SENSOR.** 1) Turn the ignition switch to OFF. 2) Connect all connectors. 3) Clear the memory. <Ref. to VDC(diag)-25, Clear Memory Mode.> 4) Perform the Inspection Mode. <Ref. to VDC(diag)-24, Inspection Mode.> 5) Read the DTC.	Is the same DTC displayed?	Go to step **6**.	Go to step **7**.
6	**CHECK VDCCM&H/U.** 1) Turn the ignition switch to OFF. 2) Replace the yaw rate & G sensor. <Ref. to VDC-19, Yaw Rate and G Sensor.> 3) Clear the memory. <Ref. to VDC(diag)-25, Clear Memory Mode.> 4) Perform the Inspection Mode. <Ref. to VDC(diag)-24, Inspection Mode.> 5) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **8**.
7	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.
8	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Malfunction is found in original yaw rate & G sensor.

AS:DTC C0072 VOLTAGE INPUTTED TO YAW RATE SENSOR EXCEEDS SPECIFICATION

DTC DETECTING CONDITION:
Defective yaw rate sensor
TROUBLE SYMPTOM:
VDC does not operate.
WIRING DIAGRAM:

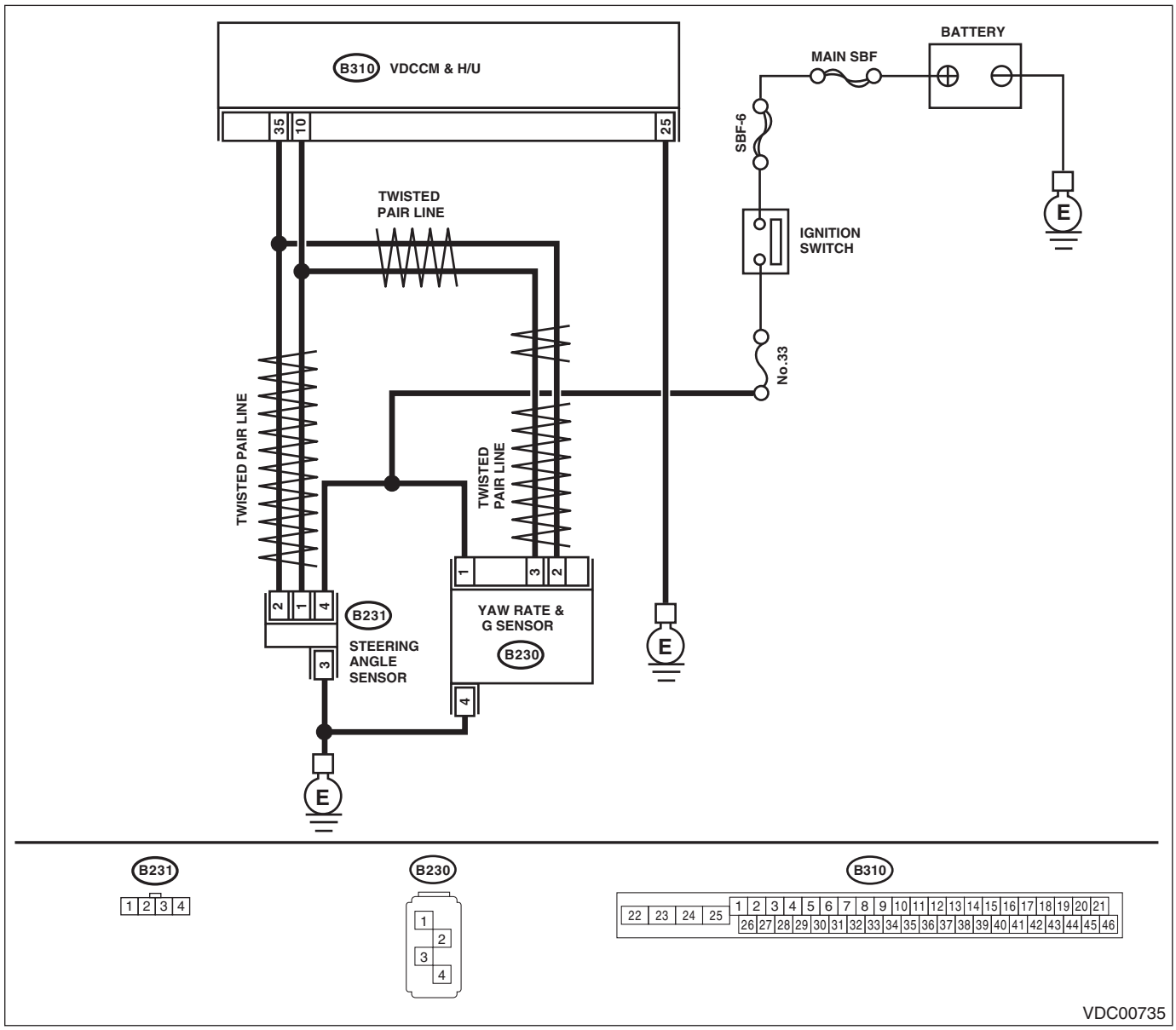


Step		Check	Yes	No
1	**CHECK POWER SUPPLY OF YAW RATE & G SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from yaw rate & G sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between yaw rate & G sensor and chassis ground. ***Connector & terminal*** ***(B230) No. 1 (+) — Chassis ground (–):***	Is the voltage 10 — 15 V?	Go to step **2**.	Repair the yaw rate & G sensor power supply circuit.

	Step	Check	Yes	No
2	**CHECK YAW RATE & G SENSOR GROUND CIRCUIT.** Measure the resistance between yaw rate & G sensor and chassis ground. ***Connector & terminal*** ***(B230) No. 4 — Chassis ground:***	Is the resistance less than 10 Ω?	Go to step **3**.	Repair the yaw rate & G sensor ground circuit.
3	**CHECK YAW RATE & G SENSOR.** 1) Turn the ignition switch to OFF. 2) Connect all connectors. 3) Clear the memory. <Ref. to VDC(diag)-25, Clear Memory Mode.> 4) Perform the Inspection Mode. <Ref. to VDC(diag)-24, Inspection Mode.> 5) Read the DTC.	Is the same DTC displayed?	Replace the yaw rate & G sensor. <Ref. to VDC-19, Yaw Rate and G Sensor.>	Go to step **4**.
4	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

AT:DTC C0072 CHANGE RANGE OF YAW RATE SENSOR SIGNAL IS TOO BIG

DTC DETECTING CONDITION:
Defective yaw rate sensor
TROUBLE SYMPTOM:
VDC does not operate.
WIRING DIAGRAM:



	Step	Check	Yes	No
1	**INTERVIEW CUSTOMERS.** Check if the vehicle ran the road with banks or sandy surface (which does not mean a dirt road).	Did the vehicle run the road with banks or sandy surface (which does not mean a dirt road)?	VDCCM&H/U may record DTC when the vehicle ran the road with banks or sandy surface (which does not mean a dirt road).	Go to step **2**.
2	**CHECK YAW RATE & G SENSOR INSTALLATION.**	Is the yaw rate & G sensor installation bolt tightened to 7.5 N·m (0.76 kgf-m, 5.5 ft-lb)?	Go to step **3**.	Tighten the yaw rate & G sensor attachment bolt.

	Step	Check	Yes	No
3	**CHECK POWER SUPPLY OF YAW RATE & G SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from yaw rate & G sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between yaw rate & G sensor and chassis ground. ***Connector & terminal*** ***(B230) No. 1 (+) — Chassis ground (–):***	Is the voltage 10 — 15 V?	Go to step **4**.	Repair the yaw rate & G sensor power supply circuit.
4	**CHECK YAW RATE & G SENSOR GROUND CIRCUIT.** Measure the resistance between yaw rate & G sensor and chassis ground. ***Connector & terminal*** ***(B230) No. 4 — Chassis ground:***	Is the resistance less than 10 Ω?	Go to step **5**.	Repair the yaw rate & G sensor ground circuit.
5	**CHECK OUTPUT OF YAW RATE & G SENSOR WITH SUBARU SELECT MONITOR.** 1) Drive the vehicle on a flat road. 2) Park the vehicle straight. 3) Select “Current Data Display & Save” on the Subaru Select Monitor. 4) Read the yaw rate output displayed on display.	Is the reading indicated on monitor display –4 — 4 deg/s?	Go to step **6**.	Replace the yaw rate & G sensor. <Ref. to VDC-19, Yaw Rate and G Sensor.>
6	**CHECK YAW RATE & G SENSOR.** 1) Turn the ignition switch to OFF. 2) Connect all connectors. 3) Clear the memory. <Ref. to VDC(diag)-25, Clear Memory Mode.> 4) Perform the Inspection Mode. <Ref. to VDC(diag)-24, Inspection Mode.> 5) Read the DTC.	Is the same DTC displayed?	Go to step **7**.	Go to step **8**.
7	**CHECK VDCCM&H/U.** 1) Turn the ignition switch to OFF. 2) Replace the yaw rate & G sensor. <Ref. to VDC-19, Yaw Rate and G Sensor.> 3) Clear the memory. <Ref. to VDC(diag)-25, Clear Memory Mode.> 4) Perform the Inspection Mode. <Ref. to VDC(diag)-24, Inspection Mode.> 5) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **9**.
8	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.
9	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Malfunction is found in original yaw rate & G sensor.

AU:DTC C0072 YAW RATE SENSOR COMMUNICATION

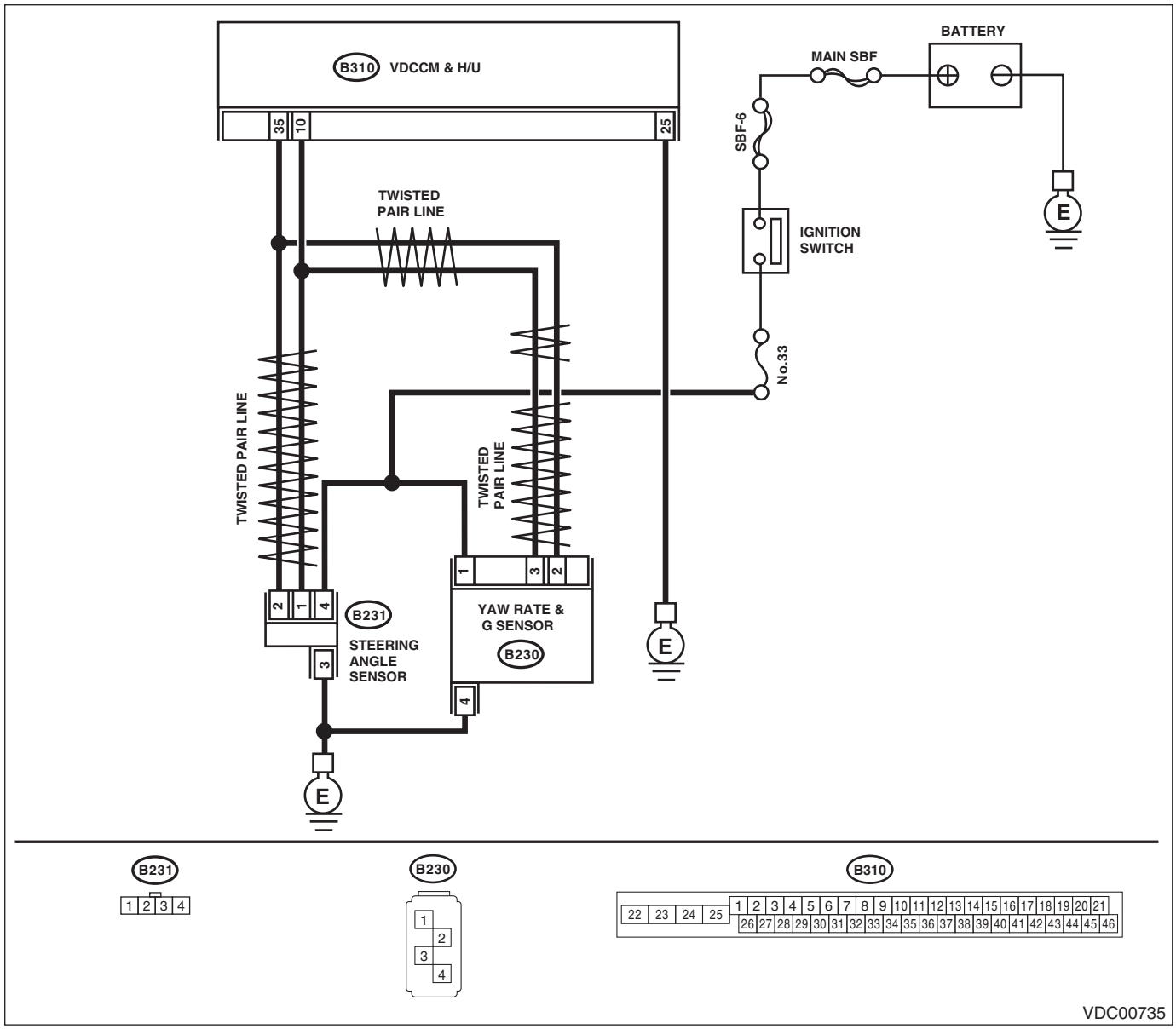
DTC DETECTING CONDITION:

Communication failure between yaw rate sensor and VDCCM

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK POWER SUPPLY FOR YAW RATE & G SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from yaw rate & G sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between yaw rate & G sensor and chassis ground. ***Connector & terminal*** ***(B230) No. 1 (+) — Chassis ground (–):***	Is the voltage 10 — 15 V?	Go to step **2**.	Repair the yaw rate & G sensor power supply circuit.

	Step	Check	Yes	No
2	**CHECK YAW RATE & G SENSOR GROUND CIRCUIT.** Measure the resistance between yaw rate & G sensor and chassis ground. ***Connector & terminal*** ***(B230) No. 4 — Chassis ground:***	Is the resistance less than 10 Ω?	Go to step **3**.	Repair the yaw rate & G sensor ground circuit.
3	**CHECK YAW RATE & G SENSOR HARNESS.** 1) Disconnect the connector from the VDCCM&H/U. 2) Measure the resistance between VDCCM&H/U and yaw rate & G sensor. ***Connector & terminal*** ***(B230) No. 3 — (B310) No. 10:*** ***(B230) No. 2 — (B310) No. 35:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the harness between yaw rate & G sensor and VDCCM&H/U.
4	**CHECK GROUND SHORT CIRCUIT IN YAW RATE & G SENSOR HARNESS.** Measure the resistance between yaw rate & G sensor and chassis ground. ***Connector & terminal*** ***(B230) No. 2 — Chassis ground:*** ***(B230) No. 3 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **5**.	Repair the harness between yaw rate & G sensor and VDCCM&H/U.
5	**CHECK YAW RATE & G SENSOR.** 1) Turn the ignition switch to OFF. 2) Connect all connectors. 3) Clear the memory. <Ref. to VDC(diag)-25, Clear Memory Mode.> 4) Perform the Inspection Mode. <Ref. to VDC(diag)-24, Inspection Mode.> 5) Read the DTC.	Is the same DTC displayed?	Go to step **6**.	Go to step **7**.
6	**CHECK YAW RATE & G SENSOR.** 1) Turn the ignition switch to OFF. 2) Replace the yaw rate & G sensor. <Ref. to VDC-19, Yaw Rate and G Sensor.> 3) Clear the memory. <Ref. to VDC(diag)-25, Clear Memory Mode.> 4) Perform the Inspection Mode. <Ref. to VDC(diag)-24, Inspection Mode.> 5) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **8**.
7	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.
8	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Malfunction is found in original yaw rate & G sensor.

AV:DTC C0072 SENSOR TYPE ABNORMAL

DTC DETECTING CONDITION:
Different yaw rate sensor specification
TROUBLE SYMPTOM:
- VDC does not operate.
- Hill start assist does not operate.

Step		Check	Yes	No
1	**CHECK YAW RATE & G SENSOR IDENTIFICATION MARK.** Check the identification mark on the sticker applied on the top of the yaw rate & G sensor.	Is the identification symbol correct? AT: S MT: R	Go to step **2**.	Replace the yaw rate & G sensor with a genuine part. <Ref. to VDC-19, Yaw Rate and G Sensor.>
2	**CHECK VDCCM&H/U IDENTIFICATION SYMBOL.** Check the identification symbol stamped on the upper part of the H/U.	Is the identification symbol correct? AT: Z6 MT: Z7	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>

AW:DTC C0073 LATERAL G SENSOR OFFSET IS TOO BIG

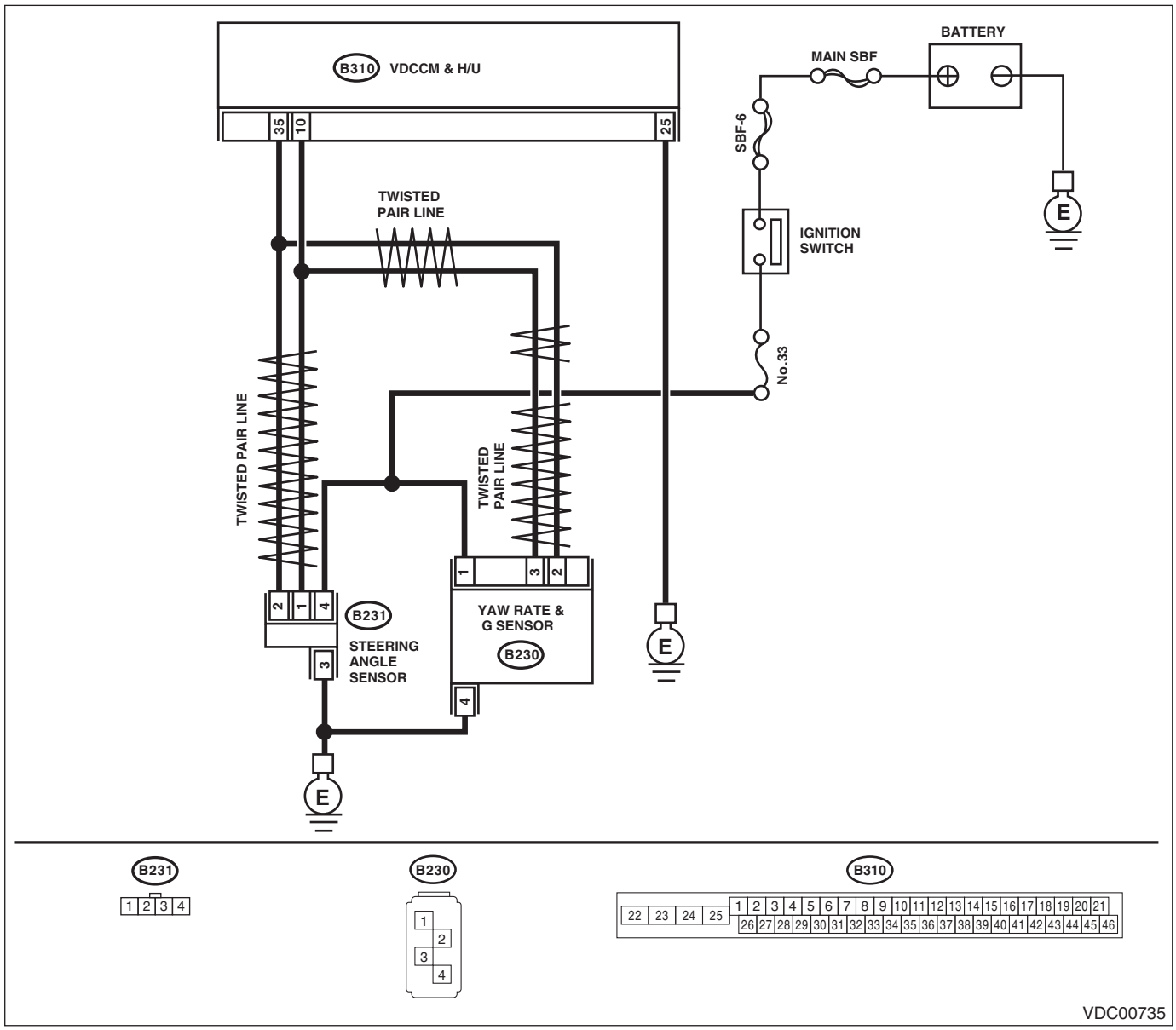
NOTE:
For the diagnostic procedure, refer to DTC C0073 “EXCESSIVE LATERAL G SENSOR SIGNAL”. <Ref. to VDC(diag)-97, DTC C0073 EXCESSIVE LATERAL G SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AX:DTC C0073 ABNORMAL LATERAL G SENSOR OUTPUT

NOTE:
For the diagnostic procedure, refer to DTC C0073 “EXCESSIVE LATERAL G SENSOR SIGNAL”. <Ref. to VDC(diag)-97, DTC C0073 EXCESSIVE LATERAL G SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AY:DTC C0073 EXCESSIVE LATERAL G SENSOR SIGNAL

DTC DETECTING CONDITION:
Defective lateral G sensor
TROUBLE SYMPTOM:
VDC does not operate.
WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK YAW RATE & G SENSOR INSTALLATION.**	Is the yaw rate & G sensor installation bolt tightened to 7.5 N·m (0.76 kgf-m, 5.5 ft-lb)?	Go to step **2**.	Tighten the yaw rate & G sensor attachment bolt.
2	**CHECK OUTPUT OF LATERAL G SENSOR WITH SUBARU SELECT MONITOR.** 1) Park the vehicle on a level surface. 2) Select {Current Data Display & Save} in Subaru Select Monitor. 3) Read the lateral G sensor output displayed on screen.	Is the indicated reading on the monitor display –1.5 — 1.5 m/s^2?	Go to step **3**.	Replace the yaw rate & G sensor. <Ref. to VDC-19, Yaw Rate and G Sensor.>

	Step	Check	Yes	No
3	**CHECK OUTPUT OF LATERAL G SENSOR WITH SUBARU SELECT MONITOR.** 1) Turn the ignition switch to OFF. 2) Remove the yaw rate & G sensor from vehicle. 3) Turn the ignition switch to ON, and select the {Current Data Display & Save} in Subaru Select Monitor. 4) Read the lateral G sensor output displayed on screen.	When the yaw rate & G sensor is inclined 90° to the right, is the indicated value 6.8 — 12.8 m/s^2?	Go to step **4**.	Replace the yaw rate & G sensor. <Ref. to VDC-19, Yaw Rate and G Sensor.>
4	**CHECK LATERAL G SENSOR WITH SUBARU SELECT MONITOR.** Read the lateral G sensor output displayed on screen.	When the yaw rate & G sensor is inclined 90° to the left, is the indicated value –6.8 — –12.8 m/s^2?	Go to step **5**.	Replace the yaw rate & G sensor. <Ref. to VDC-19, Yaw Rate and G Sensor.>
5	**CHECK POOR CONTACT OF CONNECTORS.** Turn the ignition switch to OFF.	Is there poor contact of connector between VDCCM&H/U and yaw rate & G sensor?	Repair the connector.	Go to step **6**.
6	**CHECK VDCCM&H/U.** 1) Connect all connectors. 2) Clear the memory. <Ref. to VDC(diag)-25, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to VDC(diag)-24, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **7**.
7	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

AZ:DTC C0074 PRESSURE SENSOR

DTC DETECTING CONDITION:

Defective pressure sensor

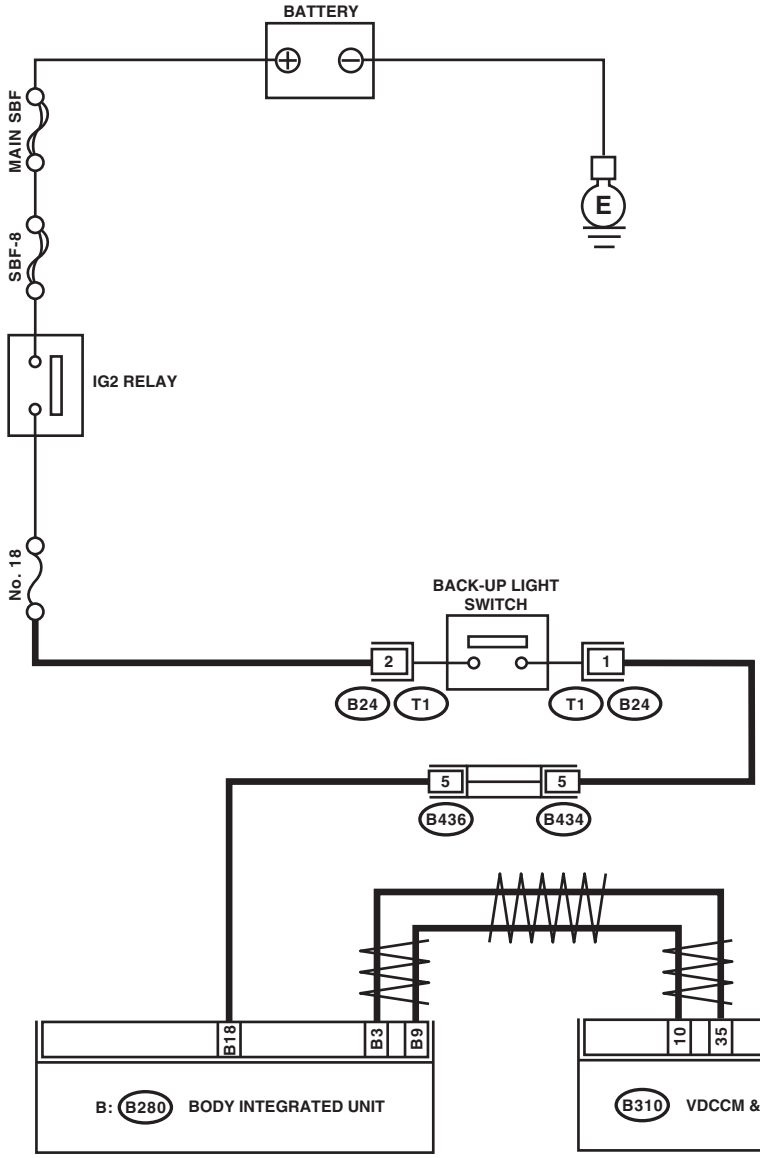
TROUBLE SYMPTOM:

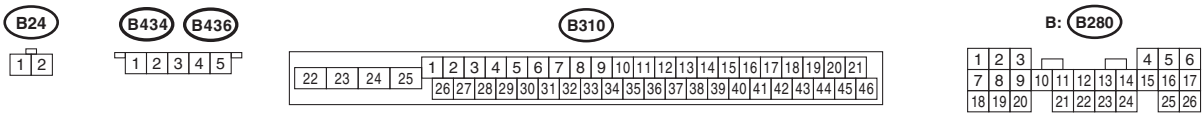
- ABS does not operate.
- VDC does not operate.

	Step	Check	Yes	No
1	**CHECK STOP LIGHT SWITCH CIRCUIT.** Check stop light switch open circuit.	Is the stop light switch circuit OK?	Go to step **2**.	Repair the stop light switch circuit. NOTE: If there is malfunction in the stop light circuit, DTC may be recorded in the memory.
2	**CHECK OUTPUT OF PRESSURE SENSOR WITH SUBARU SELECT MONITOR.** 1) Select {Current Data Display & Save} in Subaru Select Monitor. 2) Read the pressure sensor output displayed on display.	When the brake pedal is released, is the displayed value –40 — 40 bar?	Go to step **3**.	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>
3	**CHECK OUTPUT OF PRESSURE SENSOR WITH SUBARU SELECT MONITOR.** 1) Select {Current Data Display & Save} in Subaru Select Monitor. 2) Read the pressure sensor output displayed on display.	When the brake pedal is operated, does the pressure sensor output value displayed on the screen change in accordance with the brake pedal?	Go to step **4**.	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>
4	**CHECK PRESSURE SENSOR.** 1) Clear the memory. <Ref. to VDC(diag)-25, Clear Memory Mode.> 2) Perform the Inspection Mode. <Ref. to VDC(diag)-24, Inspection Mode.> 3) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **5**.
5	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	It results from a temporary noise interference.

BA:DTC C0075 REVERSE SIGNAL

DTC DETECTING CONDITION:
Abnormal reverse signal
TROUBLE SYMPTOM:
Hill start assist does not operate.
WIRING DIAGRAM:





VDC00631

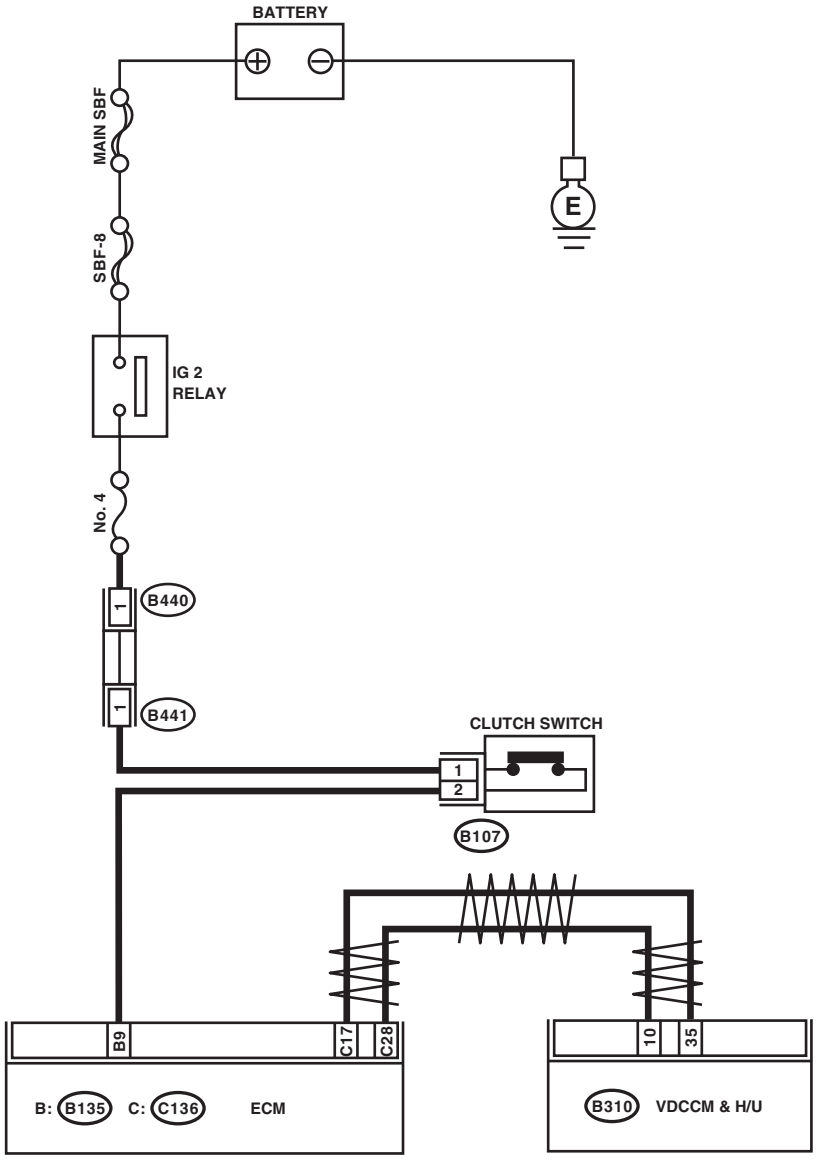
	Step	Check	Yes	No
1	**CHECK LAN SYSTEM.** Perform the diagnosis for LAN system. <Ref. to LAN(diag)-18, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is there any fault in LAN system?	Perform the diagnosis according to DTC for LAN system. <Ref. to LAN(diag)-31, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK REVERSE SIGNAL USING SUBARU SELECT MONITOR.** 1) Select "Current Data Display & Save" on the Subaru Select Monitor. 2) Read the indication of reverse signal.	Is OFF displayed when the shift lever is placed in any position other than reverse, and is ON displayed in reverse position?	Go to step **5**.	Go to step **3**.
3	**CHECK BACK-UP LIGHT ILLUMINATION.** 1) Turn the ignition switch to ON. 2) Place the shift lever in reverse position.	Does the back-up light illuminate?	Go to step **4**.	Repair the back-up light circuit.
4	**CHECK HARNESS BETWEEN BODY INTEGRATED UNIT AND BACK-UP LIGHT SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from body integrated unit and back-up light switch. 3) Measure the resistance of harness between body integrated unit and back-up light switch connector. ***Connector & terminal*** ***(B280) No. 18 — (B24) No. 1:***	Is the resistance less than 1 Ω?	Replace the back-up light switch. <Ref. to 5MT-34, Switches and Harness.>	Repair the harness between body integrated unit and back-up light switch connector.
5	**CHECK VDCCM&H/U.** 1) Connect all connectors. 2) Clear the memory. <Ref. to VDC(diag)-25, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to VDC(diag)-24, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **6**.
6	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

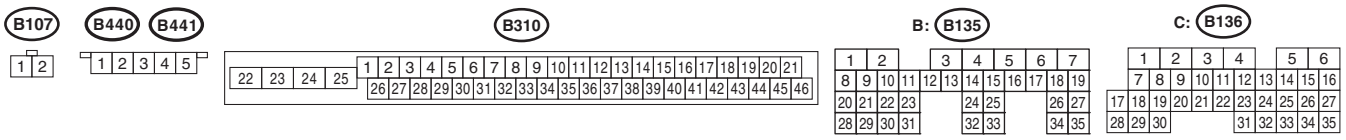
BB:DTC C0076 CLUTCH SIGNAL

DTC DETECTING CONDITION:
Abnormal clutch signal
TROUBLE SYMPTOM:
Hill start assist does not operate.

NOTE:
Depending on the user clutch operation patterns, the hill start assist warning light may illuminate for a while, and then go off.
Illumination condition:
While the vehicle speed is above 10 km/h, and the clutch switch signal ON (depressed) condition continues five minutes or more, if the vehicle speed lowers below 10 km/h, the module judge as abnormal (clutch switch stuck ON), and then turn on the warning light.
Turning off condition:
If the clutch switch signal OFF (foot released) condition continues one second, the module turns off the warning light.
The hill start assist function does not operate, while the warning light illuminates.

WIRING DIAGRAM:





VDC00899

Step		Check	Yes	No
1	**CHECK LAN SYSTEM.** Perform the diagnosis for LAN system. <Ref. to LAN(diag)-18, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is there any fault in LAN system?	Perform the diagnosis according to DTC for LAN system. <Ref. to LAN(diag)-31, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.

	Step	Check	Yes	No
2	**CHECK CLUTCH SIGNAL USING SUBARU SELECT MONITOR.** 1) Select "Current Data Display & Save" on the Subaru Select Monitor. 2) Read the indication of clutch switch signal.	Is OFF displayed when the clutch pedal is not depressed, and is ON displayed when depressed?	Go to step **5**.	Go to step **3**.
3	**CHECK CLUTCH SIGNAL OF ECM USING SUBARU SELECT MONITOR.** 1) Select {Current Data Display & Save} on Subaru Select Monitor. 2) Read the indication of clutch switch signal.	Is OFF displayed when the clutch pedal is not depressed, and is ON displayed when depressed?	Go to step **5**.	Go to step **4**.
4	**CHECK HARNESS BETWEEN ECM AND CLUTCH SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and clutch switch. 3) Measure the resistance of harness between ECM and clutch switch connector. ***Connector & terminal*** ***(B136) No. 25 — (B107) No. 2:***	Is the resistance less than 1 Ω?	Repair the power supply circuit of clutch switch. Or replace the clutch switch. <Ref. to CL-26, Clutch Switch.>	Repair the harness between ECM and clutch switch connector.
5	**CHECK VDCCM&H/U.** 1) Connect all connectors. 2) Clear the memory. <Ref. to VDC(diag)-25, Clear Memory Mode.> 3) Perform the Inspection Mode. <Ref. to VDC(diag)-24, Inspection Mode.> 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM only. <Ref. to VDC-11, REPLACEMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **6**.
6	**CHECK OTHER DTC DETECTION.**	Is any other DTC displayed?	Perform the diagnosis according to DTC. <Ref. to VDC(diag)-34, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

BC:DTC C0081 SYSTEM FAILURE

DTC DETECTING CONDITION:

VDC long time sequential control

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

	Step	Check	Yes	No
1	**CHECK POOR CONTACT OF CONNECTOR.**	Is there poor contact of the VDCCM&H/U and yaw rate & G sensor connector?	Repair the connector.	Go to step **2**.
2	**CHECK VDCCM&H/U.** 1) Replace the yaw rate & G sensor. <Ref. to VDC-19, Yaw Rate and G Sensor.> 2) Connect all connectors. 3) Clear the memory. <Ref. to VDC(diag)-25, Clear Memory Mode.> 4) Perform the Inspection Mode. <Ref. to VDC(diag)-24, Inspection Mode.> 5) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM&H/U. <Ref. to VDC-7, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Malfunction is found in original yaw rate & G sensor.

13.General Diagnostic Table

A: INSPECTION

Symptoms		Main probable cause	Other probable cause
Poor brake performance	Long braking/ stopping distance	• VDCCM&H/U • Brake pad • Aeration to brake line • Tire specifications, tire wear and air pressures • Incorrect wiring or piping connections	• Defective ABS wheel speed sensor or sensor gap • Defective steering angle sensor or improper neutral position • Defective yaw rate & G sensor or improper installation • Master cylinder • Brake caliper • Disc rotor • Brake pipe • Brake booster
	Wheel lock	• VDCCM&H/U • Defective ABS wheel speed sensor or sensor gap • Incorrect wiring or piping connections	• Defective steering angle sensor or improper neutral position • Defective yaw rate & G sensor or improper installation • Brake caliper • Brake pipe
	Brake drag	• VDCCM&H/U • Defective ABS wheel speed sensor or sensor gap • Master cylinder • Brake caliper • Parking brake • Axle and wheels • Brake pedal play	• Defective steering angle sensor or improper neutral position • Defective yaw rate & G sensor or improper installation • Brake pad • Brake pipe
	Long brake pedal stroke	• Aeration to brake line • Brake pedal play	• VDCCM&H/U • Master cylinder • Brake caliper • Brake pad • Brake pipe • Brake booster
	Vehicle vertical pitching	• VDCCM&H/U • Road surface (uneven) • Suspension play or fatigue (reduced damping) • Incorrect wiring or piping connections	• Defective ABS wheel speed sensor or sensor gap • Defective steering angle sensor or improper neutral position • Defective yaw rate & G sensor or improper installation
Poor brake performance	Unstable or uneven braking	• VDCCM&H/U • Defective ABS wheel speed sensor or sensor gap • Brake caliper • Brake pad • Road surface (uneven) • Tire specifications, tire wear and air pressures • Incorrect wiring or piping connections	• Defective ABS wheel speed sensor or sensor gap • Defective steering angle sensor or improper neutral position • Defective yaw rate & G sensor or improper installation • Master cylinder • Disc rotor • Brake pipe • Axle and wheels • Road with crowns or banks • Suspension play or fatigue (reduced damping)

General Diagnostic Table

Symptoms		Main probable cause	Other probable cause
Vibration or noise • When braking suddenly • When accelerating suddenly • While driving on a slippery road	Excessive brake pedal vibration	• Road surface (uneven) • Incorrect wiring or piping connections	• VDCCM&H/U • Brake booster • Suspension play or fatigue (reduced damping)
	Noise from VDCH/U	• VDCCM&H/U (mount bushing) • Defective ABS wheel speed sensor or sensor gap • Brake pipe	• VDCCM&H/U • Defective steering angle sensor or improper neutral position • Defective yaw rate & G sensor or improper installation
	Noise from the front side of vehicle	• VDCCM&H/U (mount bushing) • Defective ABS wheel speed sensor or sensor gap • Master cylinder • Brake caliper • Brake pad • Disc rotor • Brake pipe • Brake booster • Suspension play or fatigue (reduced damping)	• Axle and wheels • Tire specifications, tire wear and air pressures
	Noise from the rear side of vehicle	• Defective ABS wheel speed sensor or sensor gap • Brake caliper • Brake pad • Disc rotor • Parking brake • Brake pipe • Suspension play or fatigue (reduced damping)	• Axle and wheels • Tire specifications, tire wear and air pressures
Engine does not accelerate or goes into a stall when accelerating suddenly or driving on a slippery surface.		• VDCCM&H/U • Defective ABS wheel speed sensor or sensor gap • Master cylinder • Brake caliper • Parking brake • Incorrect wiring or piping	• Defective steering angle sensor or improper neutral position • Defective yaw rate & G sensor or improper installation • Brake pad • Brake pipe

General Diagnostic Table

Symptoms		Main probable cause	Other probable cause
Poor change-direction-operation stability of TCS	Deviation to right or left direction	• VDCCM&H/U • Defective ABS wheel speed sensor or sensor gap • Defective steering angle sensor or improper neutral position • Defective yaw rate & G sensor or improper installation • Brake caliper • Brake pad • Wheel alignment • Road surface (uneven) • Road with crowns or banks • Tire specifications, tire wear and air pressures • Incorrect wiring or piping connections	• Disc rotor • Brake pipe • Axle and wheels • Suspension play or fatigue (reduced damping)
	Vehicle spin	• VDCCM&H/U • Defective ABS wheel speed sensor or sensor gap • Defective steering angle sensor or improper neutral position • Defective yaw rate & G sensor or improper installation • Brake pad • Tire specifications, tire wear and air pressures • Incorrect wiring or piping connections	• Brake caliper • Brake pipe
Steering wheel drag while driving		• VDCCM&H/U • Defective ABS wheel speed sensor or sensor gap • Defective steering angle sensor or improper neutral position • Defective yaw rate & G sensor or improper installation • Incorrect wiring or piping connections • Power steering system	• Brake caliper • Brake pad • Disc rotor • Wheel alignment • Road surface (uneven) • Road with crowns or banks • Suspension play or fatigue (reduced damping) • Tire specifications, tire wear and air pressures
VDC operates while driving normally.		• VDCCM&H/U • Defective ABS wheel speed sensor or sensor gap • Defective steering angle sensor or improper neutral position • Defective yaw rate & G sensor or improper installation • Wheel alignment • Road surface (uneven) • Road with crowns or banks • Suspension play or fatigue (reduced damping) • Tire specifications, tire wear and air pressures • Incorrect wiring or piping connections • Power steering system	

Symptoms	Main probable cause	Other probable cause
VDC OFF indicator light does not illuminate when the VDC OFF switch is depressed. NOTE: When pressing VDC OFF switch for 10 seconds or more, VDC OFF indicator light goes off and cannot operate any more. When turning the ignition switch from OFF to ON, the previous status is restored.	• Harness • Indicator light bulb • VDC OFF switch	

BRAKE

BR

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1. General Description

A: SPECIFICATION

Front disc brake	Size		16-inch type
	Type		Disc (Floating type, ventilated)
	Effective disc diameter	mm (in)	244 (9.61)
	Disc thickness × Diameter	mm (in)	24 × 294 (0.94 × 11.57)
	Effective cylinder diameter	mm (in)	42.8 (1.685) × 2
	Pad dimensions (Length × Width × Thickness)	mm (in)	117.8 × 50.5 × 11.0 (4.638 × 1.988 × 0.433)
	Clearance adjustment		Automatic adjustment
Rear disc brake	Size		15-inch type
	Type		Disc (Floating type, solid)
	Effective disc diameter	mm (in)	250 (9.84)
	Disc thickness × Diameter	mm (in)	10 × 286 (0.39 × 11.26)
	Effective cylinder diameter	mm (in)	38.1 (1.500)
	Pad dimensions (Length × Width × Thickness)	mm (in)	92.0 × 33.0 × 9.0 (3.622 × 1.299 × 0.354)
	Clearance adjustment		Automatic adjustment
Master cylinder	Type		Tandem
	Effective diameter	mm (in)	23.8 (15/16)
	Reservoir type		Sealed type
	Brake fluid reservoir capacity	cm^3 (cu in)	205 (12.51)
Brake booster	Type		Vacuum suspended
	Effective diameter	mm (in)	208 + 229 (8.19 + 9.02)
Brake line			Dual circuit system
Brake fluid **CAUTION:** **• Avoid mixing brake fluid of different brands to prevent fluid performance from degrading.** **• When filling with brake fluid, be careful not to allow any dust to enter the reservoir.** **• Use new SUBARU genuine brake fluid when replacing or refilling the fluid.**			FMVSS No. 116, DOT3, or DOT4

NOTE:
Refer to “PARKING BRAKE” for parking brake specifications. <Ref. to PB-2, SPECIFICATION, General Description.>

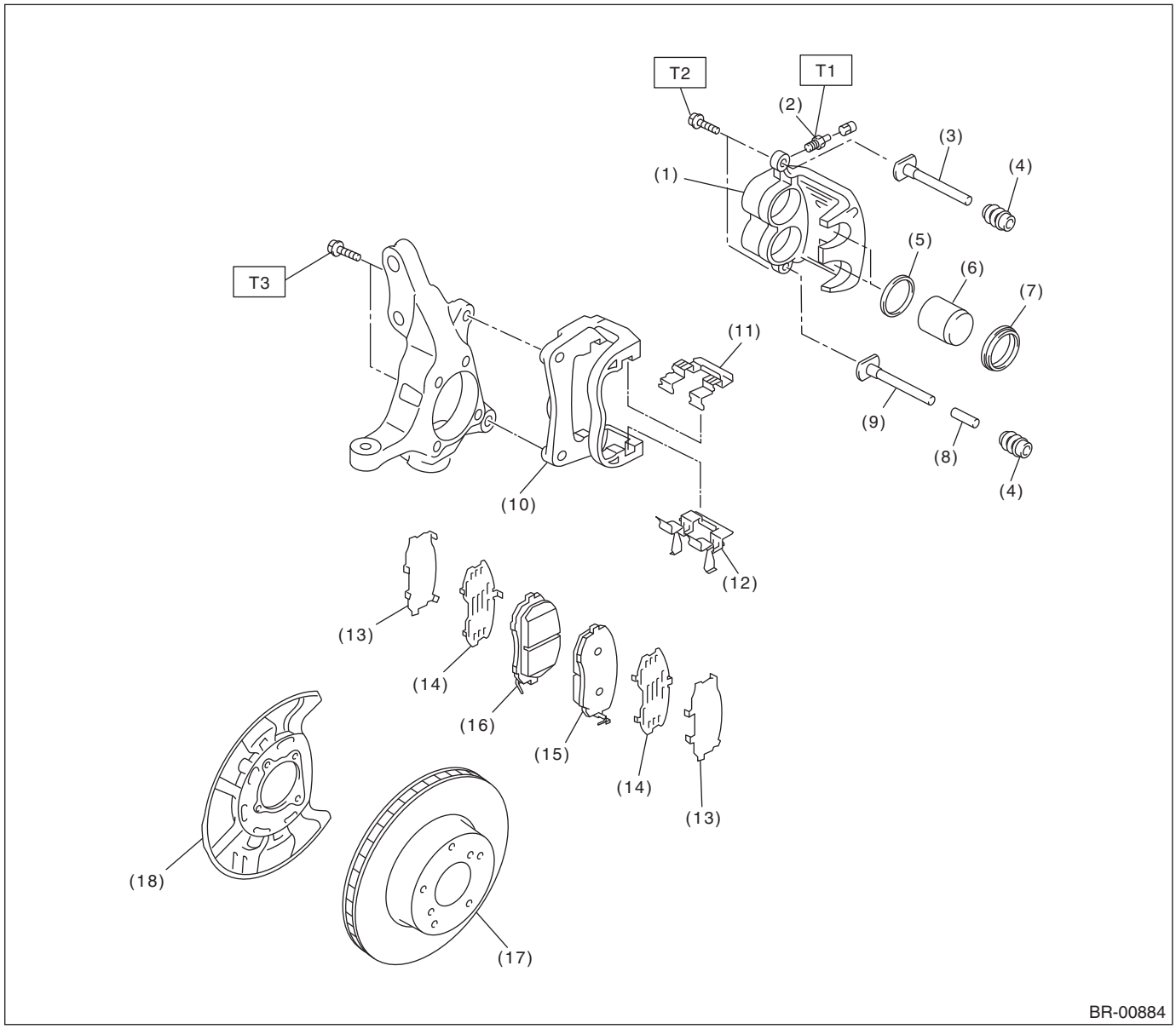
Item			Standard	Limit
Front brake	Pad thickness	mm (in)	11 (0.43)	1.5 (0.059)
	Disc thickness	mm (in)	24 (0.94)	22 (0.87)
	Disc runout	mm (in)	—	0.05 (0.0020)
Rear brake	Pad thickness	mm (in)	9.0 (0.354)	1.5 (0.059)
	Disc thickness	mm (in)	10 (0.39)	8.5 (0.335)
	Disc runout	mm (in)	—	0.05 (0.0020)
Parking brake	Inside diameter	mm (in)	190 (7.48)	191 (7.52)
	Lining thickness	mm (in)	2.8 (0.11)	1.5 (0.059)
	Lever stroke		7 — 8 notches/200 N (20 kgf, 45 lbf)	

		Brake pedal force N (kgf, lbf)	Fluid pressure kPa (kgf/cm^2, psi)
Brake booster	Brake fluid pressure with engine stopped	147 (15, 33)	545 (6, 79)
		294 (30, 66)	1,564 (16, 227)
	Brake fluid pressure with engine running and vacuum pressure at 66.7 kPa (500 mmHg, 19.69 inHg)	147 (15, 33)	6,400 (65, 928)
		294 (30, 66)	11,273 (115, 1,635)

Brake pedal	Free play mm (in)	0.5 — 2 (0.020 — 0.079) [When pulling the brake pedal upward with a force of less than 10 N (1 kgf, 2 lbf)]

B: COMPONENT

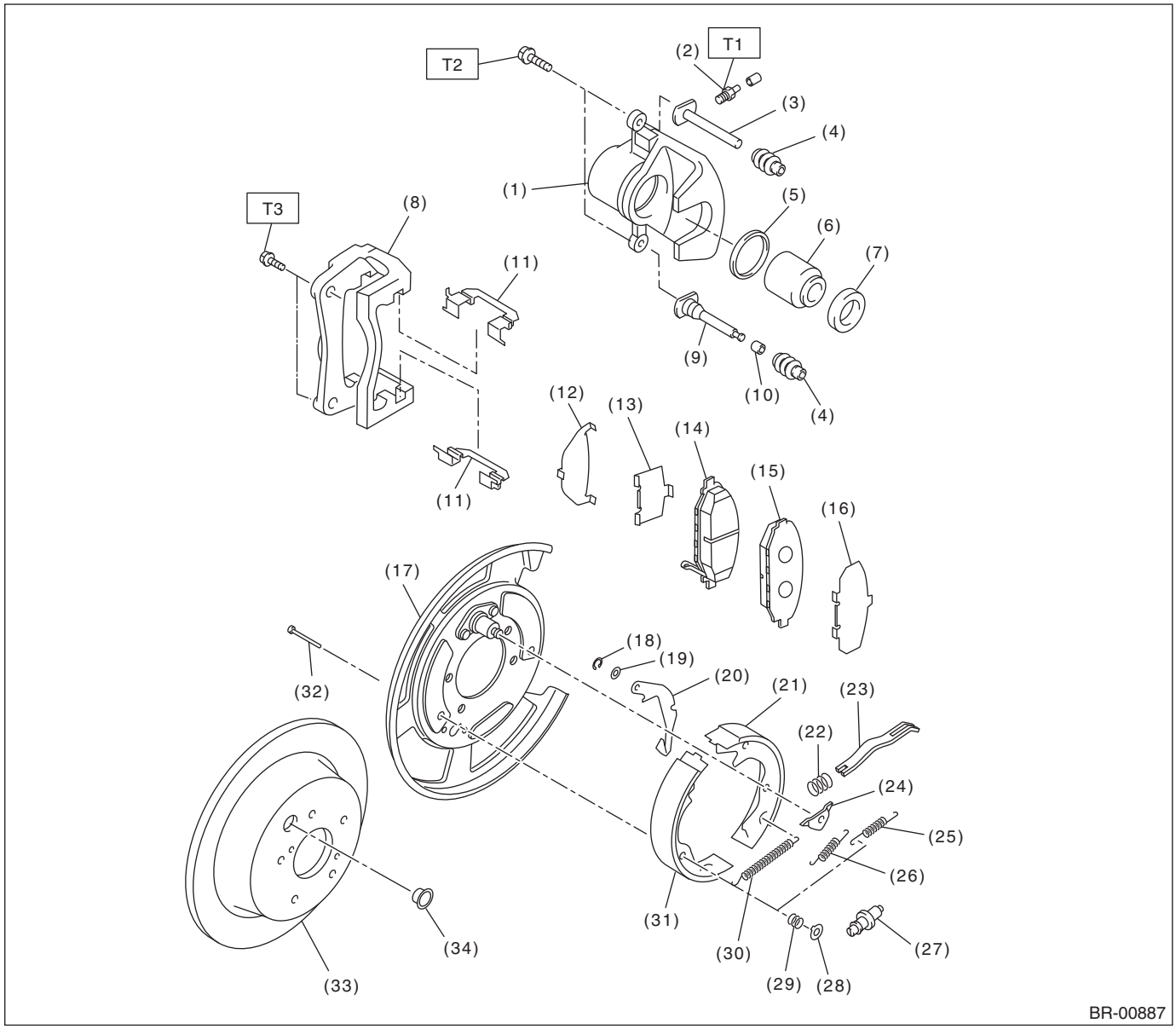
1. FRONT DISC BRAKE



(1) Caliper body
(2) Air bleeder screw
(3) Guide pin
(4) Pin boot
(5) Piston seal
(6) Piston
(7) Piston boot
(8) Bushing
(9) Lock pin
(10) Support
(11) Pad clip upper
(12) Pad clip lower
(13) Outer shim
(14) Inner shim
(15) Pad (Outside)
(16) Pad (Inside)
(17) Disc rotor
(18) Disc cover

Tightening torque:N·m (kgf-m, ft-lb)
T1: 8 (0.82, 5.9)
T2: 27 (2.75, 19.9)
T3: 80 (8.16, 59)

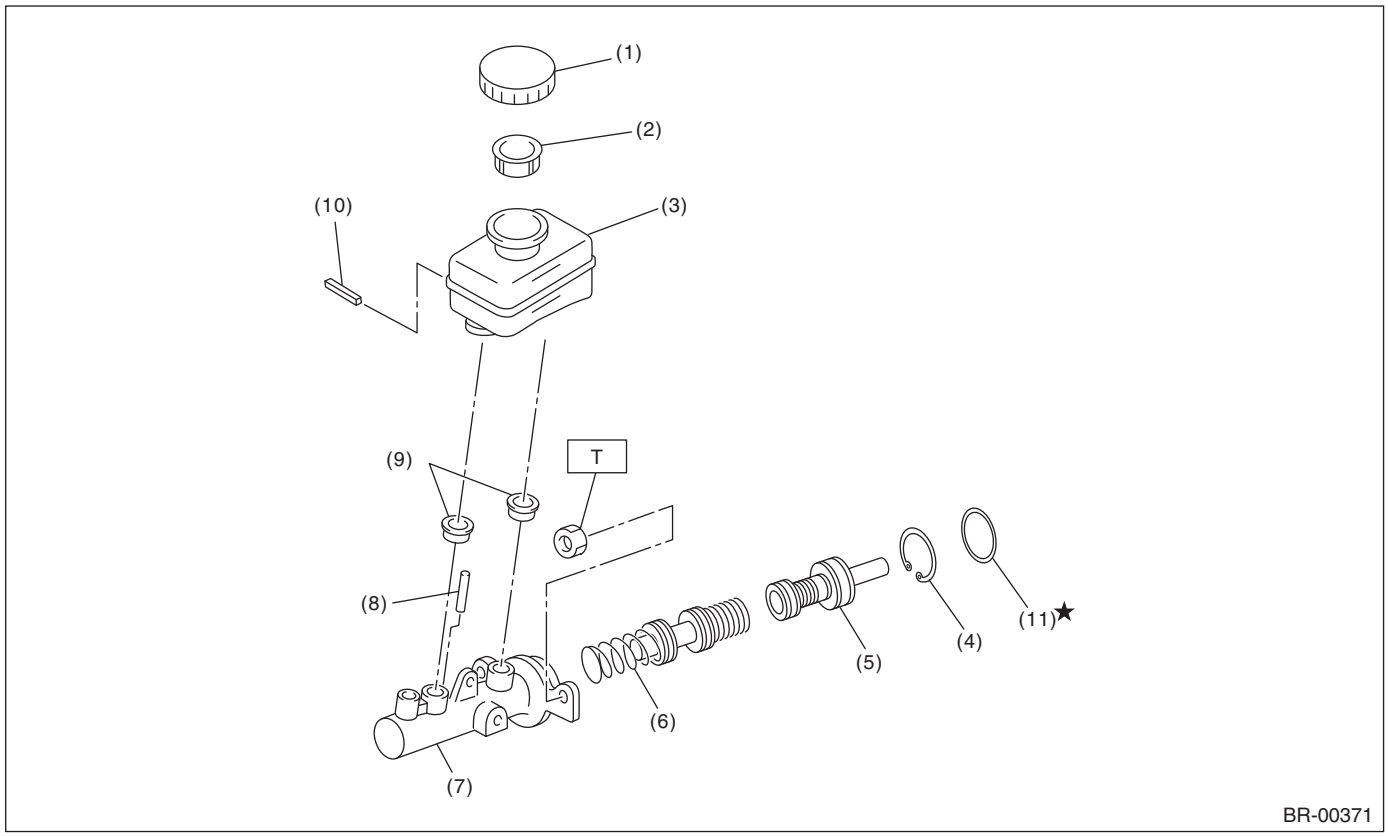
2. REAR DISC BRAKE



(1) Caliper body
(2) Air bleeder screw
(3) Guide pin (black)
(4) Pin boot
(5) Piston seal
(6) Piston
(7) Piston boot
(8) Support
(9) Lock pin (silver)
(10) Bushing
(11) Pad clip
(12) Outer shim
(13) Inner shim
(14) Inner pad
(15) Outer pad
(16) Shim
(17) Back plate
(18) Retainer
(19) Wave washer
(20) Lever
(21) Parking brake shoe (Secondary)
(22) Strut spring
(23) Strut
(24) Shoe guide plate
(25) Secondary shoe return spring
(26) Primary shoe return spring
(27) Adjusting screw
(28) Shoe hold-down cup
(29) Shoe hold-down spring
(30) Adjusting spring
(31) Parking brake shoe (Primary)
(32) Shoe hold-down pin
(33) Disc rotor
(34) Adjusting hole cover

Tightening torque:N·m (kgf-m, ft-lb)
T1: 8 (0.82, 5.9)
T2: 27 (2.75, 19.9)
T3: 66 (6.73, 48.7)

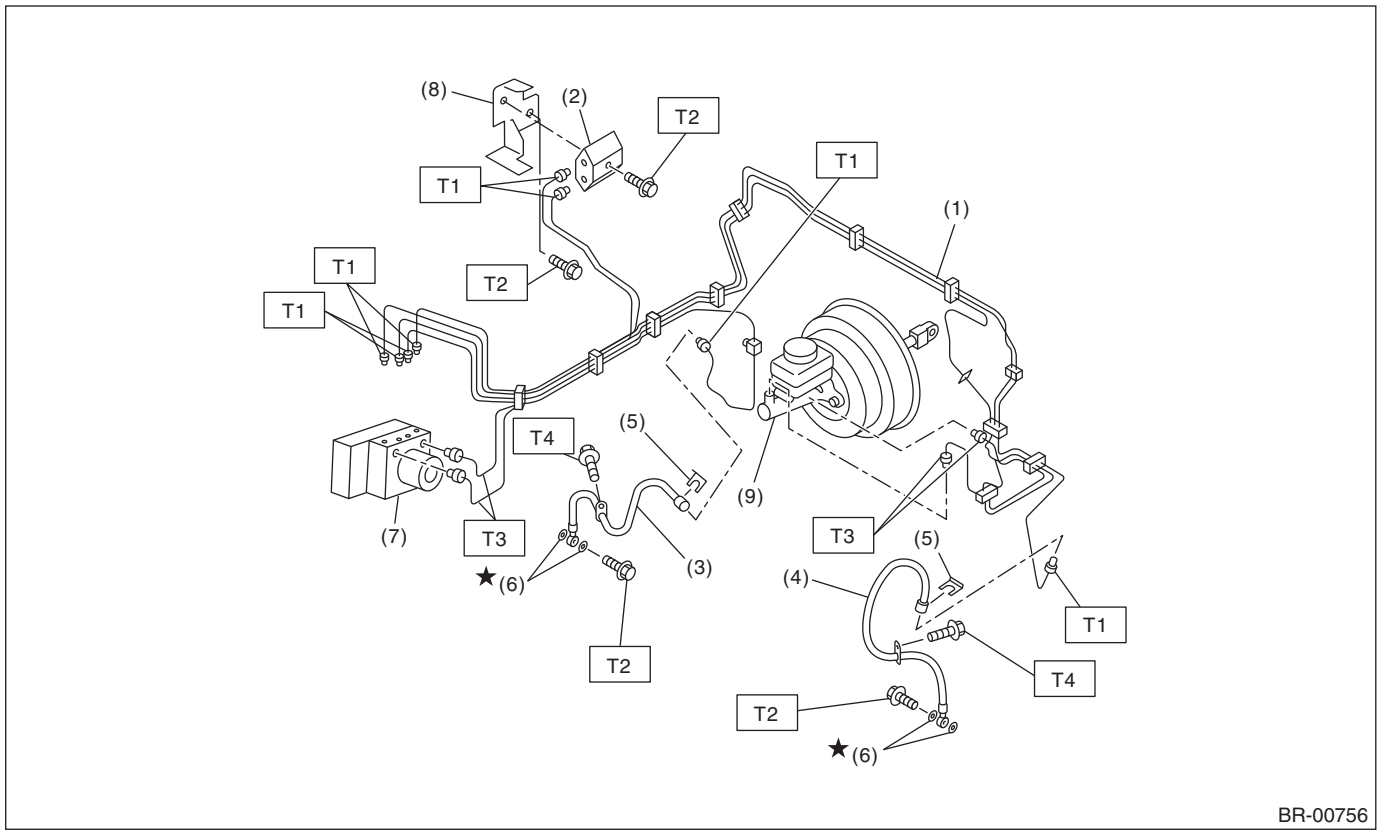
3. MASTER CYLINDER



(1) Cap
(2) Filter
(3) Reservoir tank
(4) C-ring
(5) Primary piston
(6) Secondary piston
(7) Cylinder body
(8) Cylinder pin
(9) Seal
(10) Pin
(11) O-ring

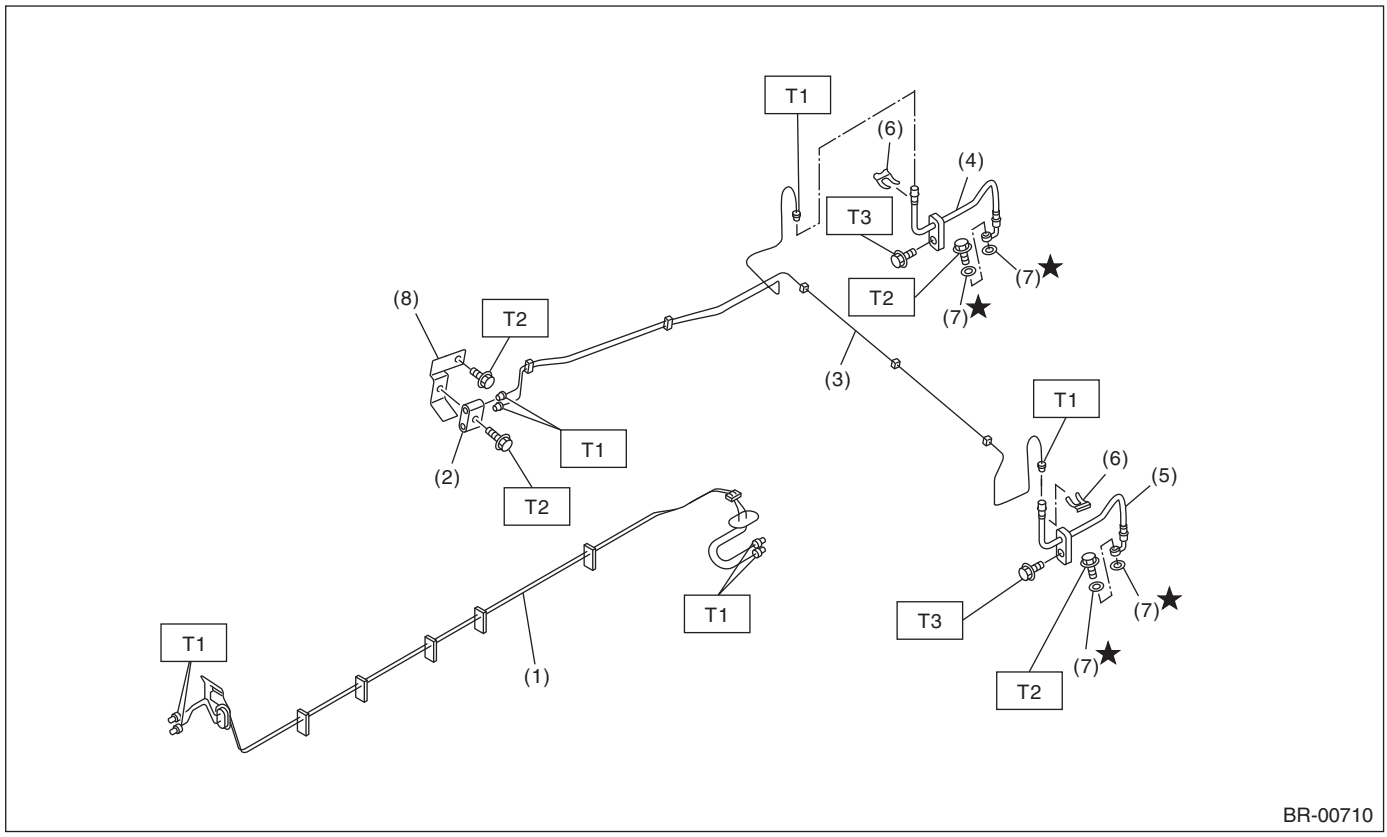
Tightening torque:N·m (kgf-m, ft-lb)
T: 13 (1.33, 9.6)

4. FRONT BRAKE PIPES AND HOSES



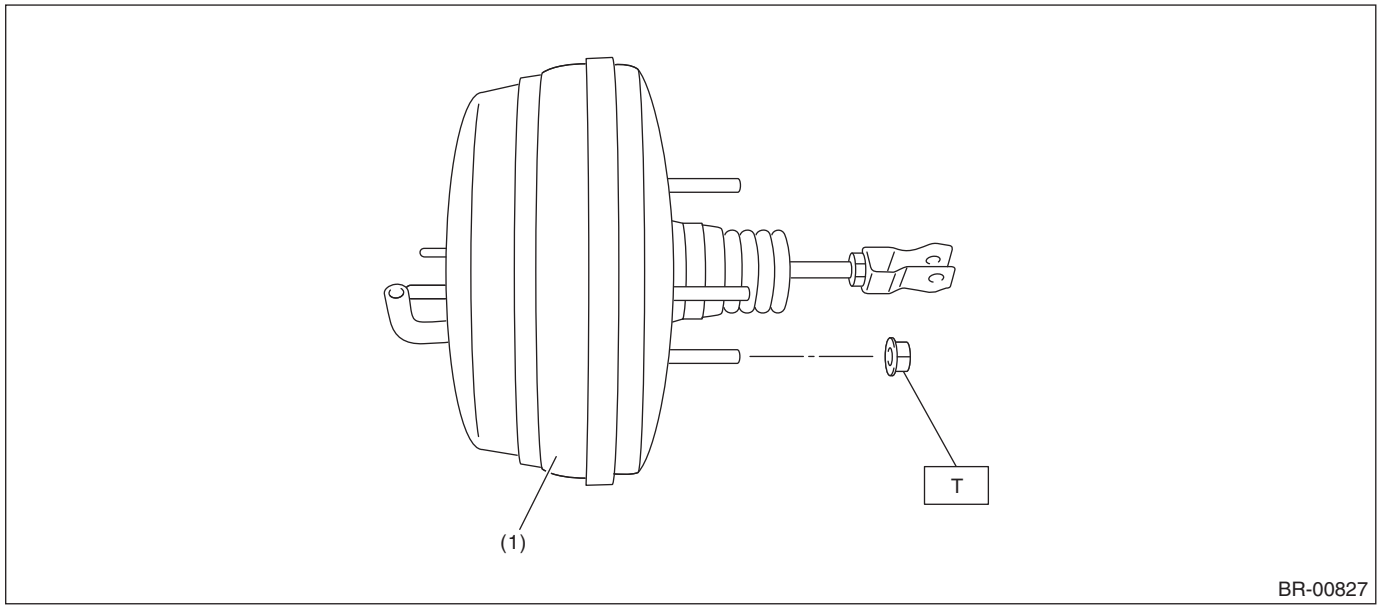
(1)	Front brake pipe ASSY	(6)	Gasket	***Tightening torque:N·m (kgf-m, ft-lb)***
(2)	Two-way connector	(7)	VDC control module and hydraulic control unit (VDCCM&H/U)	***T1: 15 (1.53, 11.1)***
(3)	Front brake hose RH	(8)	Bracket	***T2: 18 (1.84, 13.3)***
(4)	Front brake hose LH	(9)	Master cylinder	***T3: 19 (1.94, 14)***
(5)	Clamp			***T4: 33 (3.36, 24.3)***

5. CENTER AND REAR BRAKE PIPES & HOSES



(1)	Center brake pipe ASSY	(5)	Rear brake hose LH	***Tightening torque:N·m (kgf-m, ft-lb)***
(2)	Two-way connector	(6)	Clamp	***T1: 15 (1.53, 11.1)***
(3)	Rear brake pipe ASSY	(7)	Gasket	***T2: 18 (1.84, 13.3)***
(4)	Rear brake hose RH	(8)	Bracket	***T3: 33 (3.36, 24.3)***

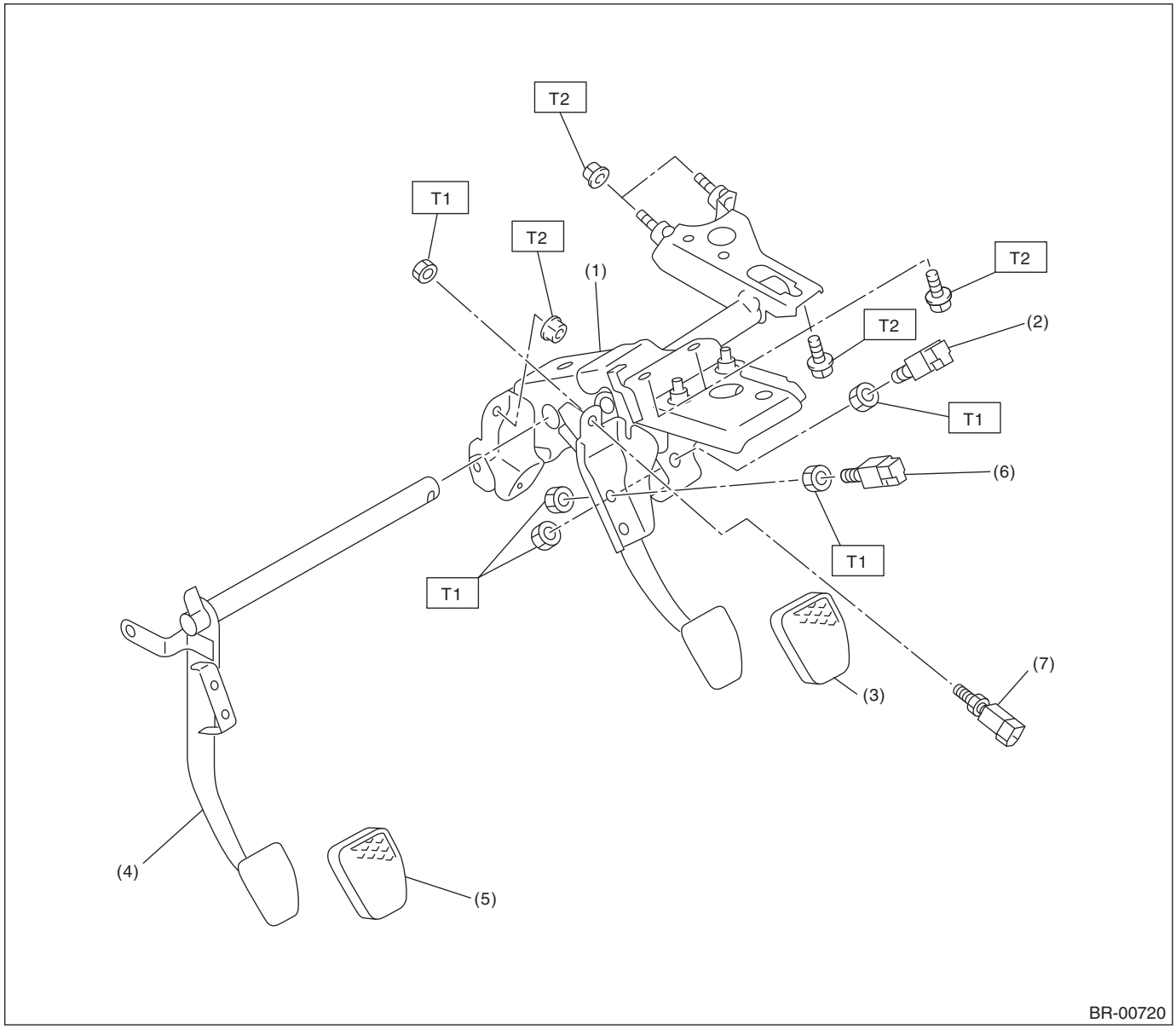
6. BRAKE BOOSTER



(1)	Brake booster	***Tightening torque:N·m (kgf-m, ft-lb)***
		T: 18 (1.84, 13.3)

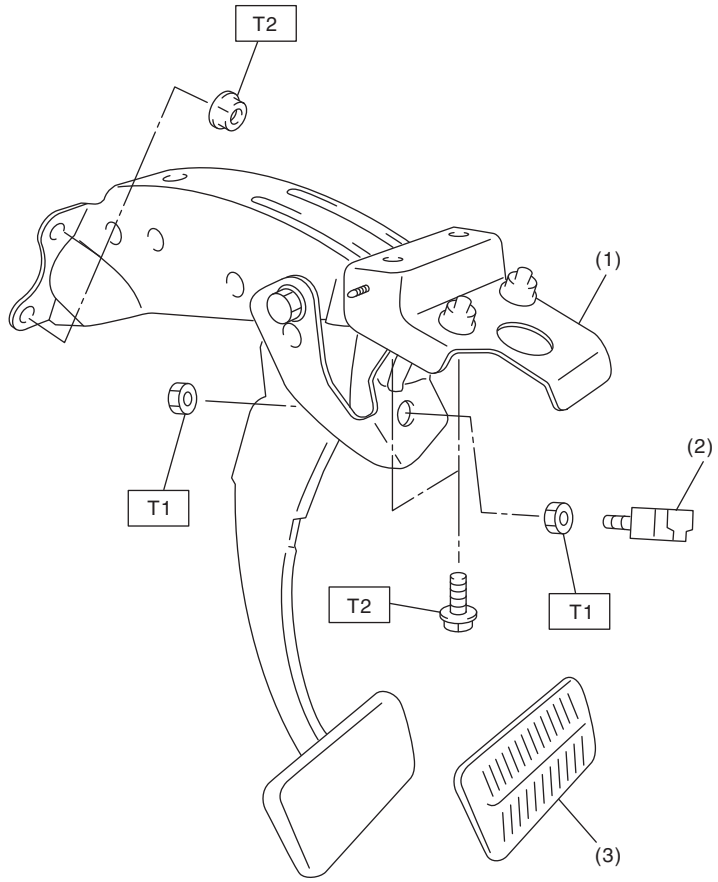
7. BRAKE PEDAL

- MT model



(1)	Brake pedal ASSY	(5)	Clutch pedal pad	***Tightening torque:N·m (kgf-m, ft-lb)***
(2)	Stop light switch	(6)	Clutch switch (cruise control)	***T1: 8 (0.82, 5.9)***
(3)	Brake pedal pad	(7)	Clutch switch (clutch start)	***T2: 18 (1.84, 13.3)***
(4)	Clutch pedal			

- AT model



BR-00580

(1) Brake pedal ASSY
(2) Stop light switch
(3) Brake pedal pad

Tightening torque:N·m (kgf-m, ft-lb)
T1: 8 (0.82, 5.9)
T2: 18 (1.84, 13.3)

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 etc. of different grades or manufacturers.
• Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or 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

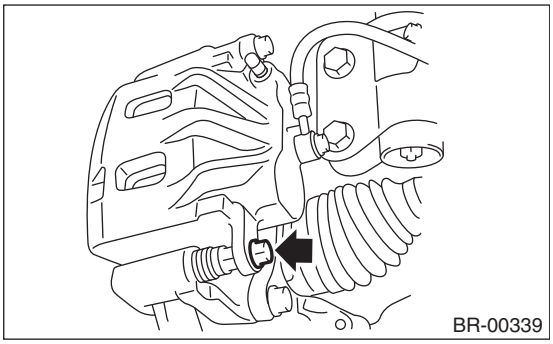
1. GENERAL TOOL

TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance and voltage.
Snap ring pliers	Used for removing and installing snap rings.

2. Front Brake Pad

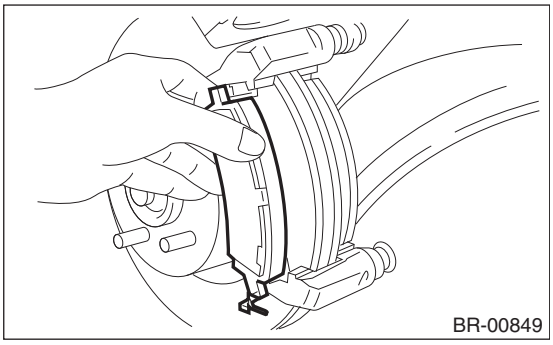
A: REMOVAL

1) Lift up the vehicle, and then remove the front wheels.
2) Remove the caliper bolt.



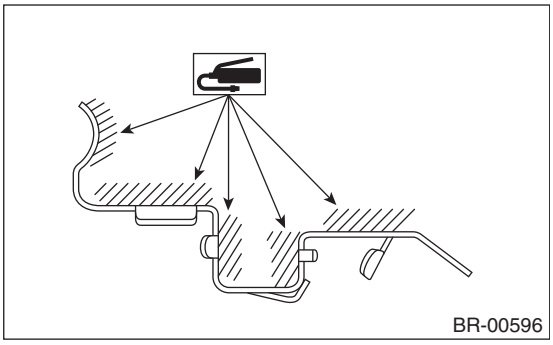
3) Raise the caliper body and support it.

NOTE:
Do not disconnect the brake hose from the caliper body.
4) Remove the pads.

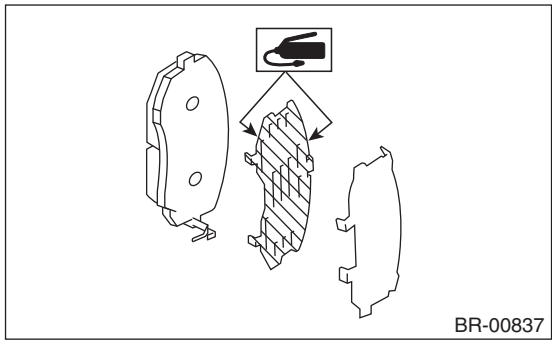


B: INSTALLATION

1) Apply a thin coat of Molykote M7439 (Part No. K0770YA000) or grease contained in the pad kit to the pad clip.

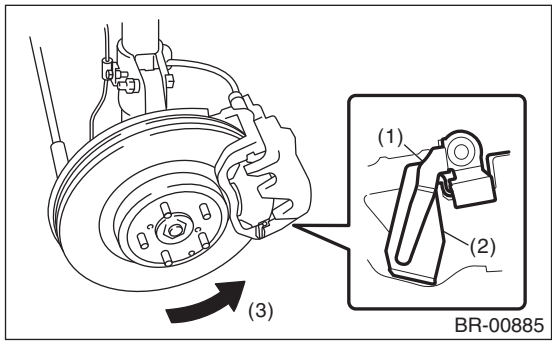


2) Apply a thin coat of Molykote AS880N (Part No. K0777YA010) or grease contained in the pad kit to both surfaces of the pad inner shim.



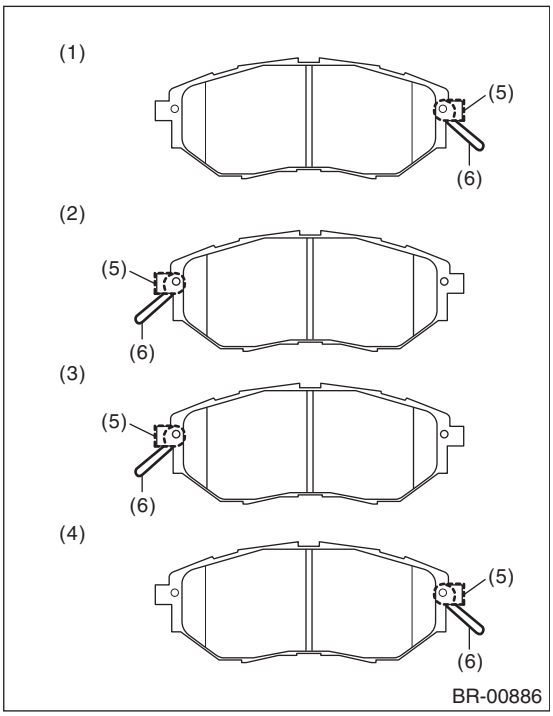
3) Install the pad to support.

CAUTION:
• Be sure to install so that the pad return spring faces the input side of the direction of brake rotor rotation, as shown in the figure.
• Correctly install the pad return spring to the supporting surface of the pad clip as shown in the figure.
• If the pad return spring is deformed or damaged, replace the brake pad.



(1) Pad return spring
(2) Supporting surface of pad clip
(3) Direction of brake rotor rotation

NOTE:
Install the pad indicator in proper direction.



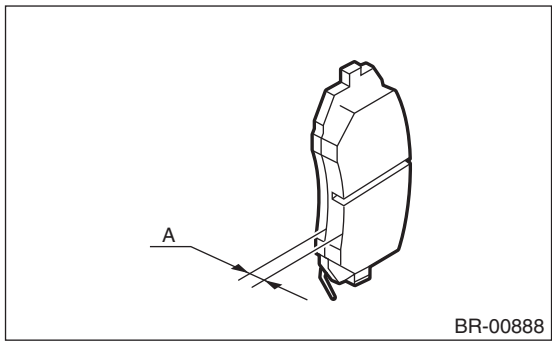
(1) LH — IN
(2) LH — OUT
(3) RH — IN
(4) RH — OUT
(5) Pad indicator
(6) Pad return spring

4) Install the caliper body to the support.

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

C: INSPECTION

Check the pad thickness A.



Pad thickness A mm (in)	Standard	11 (0.433)
	Wear limit	1.5 (0.059)

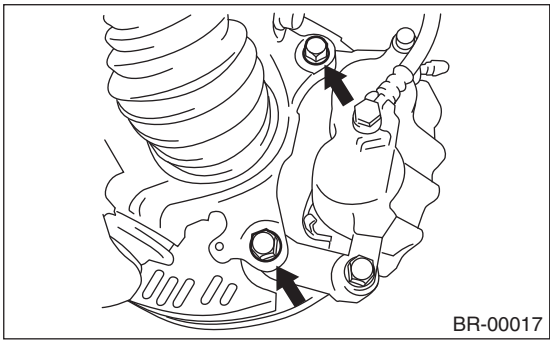
NOTE:
• Always replace the pads of both wheels and both sides as a set.
• Replace pad clips if they are twisted or worn.
• Wear indicators are installed on the inner and outer disc brake pads.
If the pad is worn to the limit, the end of wear indicator contacts disc rotor, and a squeaking sound is heard 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

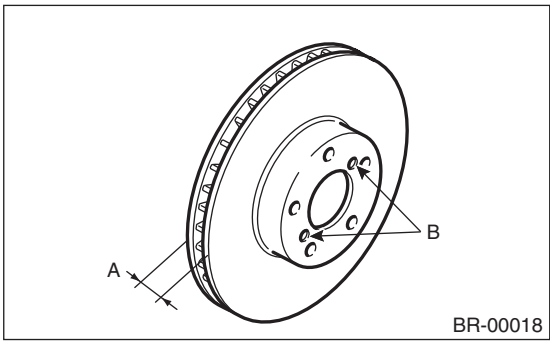
1) Lift up the vehicle, and then remove the front wheels.
2) Remove the caliper body assembly from housing, and suspend it from the strut using a wire.

CAUTION:
Be careful not to stretch the brake hose.



3) Remove the disc rotor.

NOTE:
If it is difficult to remove the disc rotor from the hub, drive an 8 mm bolt into the threaded section (B) of the rotor, then remove the rotor.



4) Remove mud and foreign matter from the caliper body assembly.

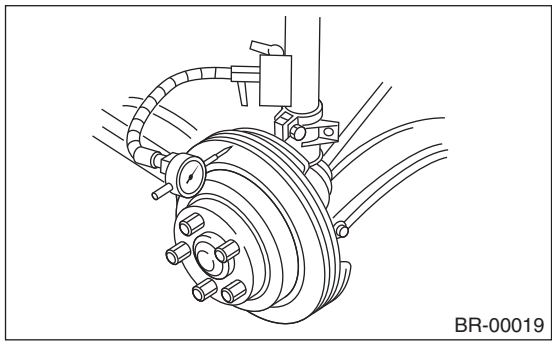
B: INSTALLATION

1) Install the disc rotor.
2) Install the caliper body assembly to the housing.

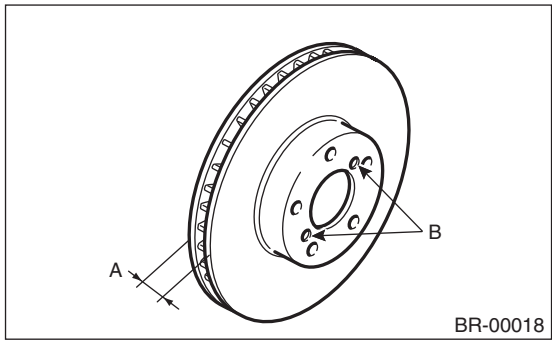
Tightening torque:
80 N·m (8.16 kgf-m, 59.0 ft-lb)
3) Install the front wheels.

C: INSPECTION

1) Check the front wheel bearing play and axle hub runout before the inspection of disc rotor runout limit. <Ref. to DS-16, 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 grinding, check the thickness of the disc rotor according to the procedure in step 4).



Disc rotor runout limit:
0.05 mm (0.0020 in)
4) Set a micrometer 10 mm (0.39 in) inward from the disc rotor outer perimeter, and then measure the disc rotor thickness. If the disc rotor thickness (A) exceeds the service limit, replace with a new disc rotor.



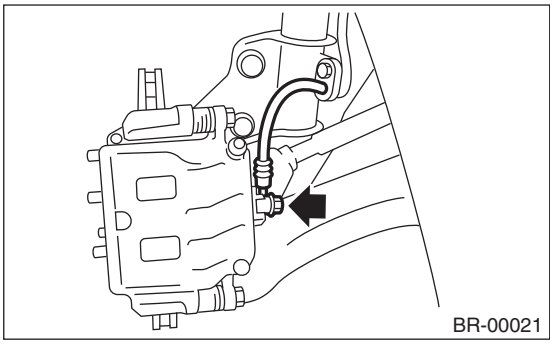
	Standard	Limit	Disc rotor diameter
Disc rotor thickness A mm (in)	24 (0.94)	22 (0.87)	294 (11.57)

4. Front Disc Brake Assembly

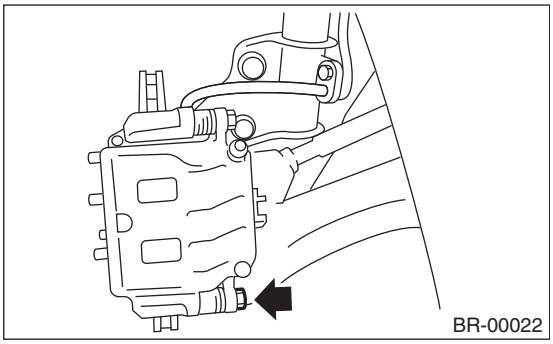
A: REMOVAL

CAUTION:
Do not allow brake fluid to come in contact with vehicle body. If it does, wash off with water and wipe away completely.

1) Lift up the vehicle, and then remove the front wheels.
2) Remove the union bolt, and disconnect the brake hose from the caliper body.

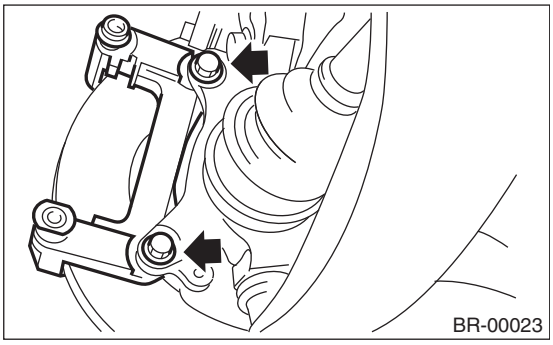


3) Remove the bolts which secure the caliper body.



4) Raise the caliper body, and then move it toward vehicle center to separate it from the support.
5) Remove the brake pad, and then remove the support from the housing.

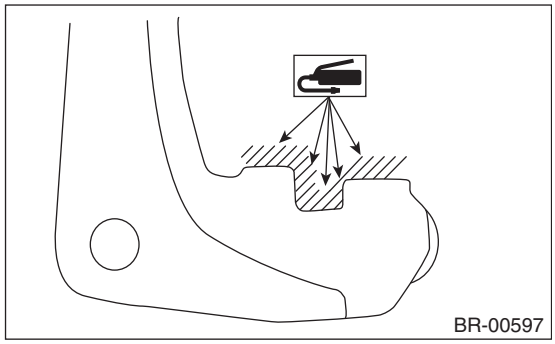
NOTE:
Remove the support only when replacing the rotor or support. It is not necessary to remove it when servicing the caliper body.



6) Remove mud and foreign matter from the caliper body and the support.

B: INSTALLATION

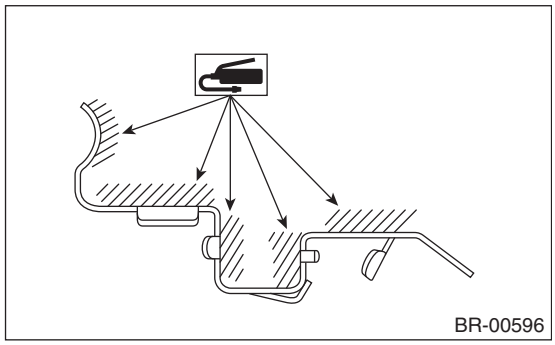
1) Apply a thin coat of Molykote M7439 (Part No. K0770YA000) or grease contained in the pad kit to the support.



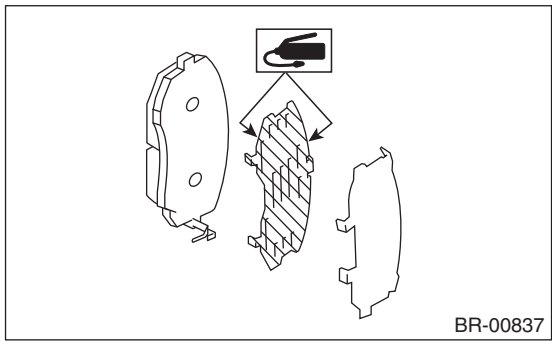
2) Install the support to the housing.

Tightening torque:
80 N·m (8.16 kgf-m, 59.0 ft-lb)

3) Apply a thin coat of Molykote M7439 (Part No. K0770YA000) or grease contained in the pad kit to the pad clip.

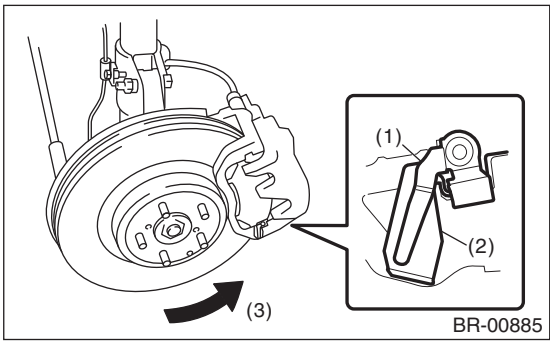


4) Apply a thin coat of Molykote AS880N (Part No. K0777YA010) or grease contained in the pad kit to both surfaces of the pad inner shim.



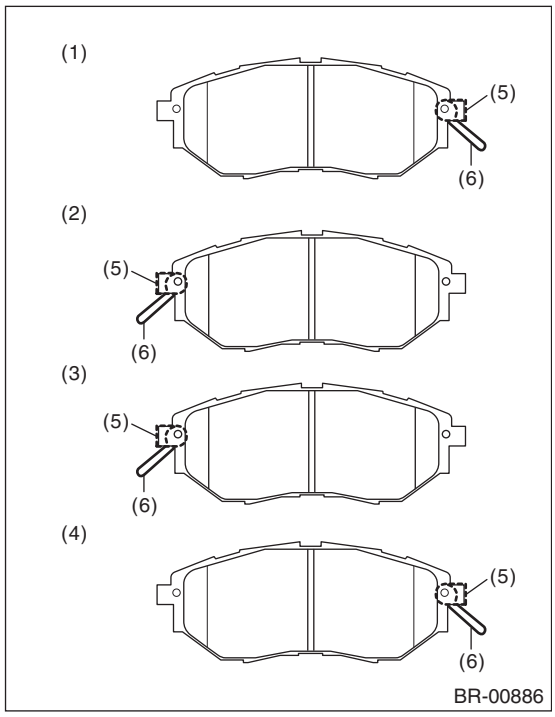
5) Install the pad to support.

CAUTION:
• Be sure to install so that the pad return spring faces the input side of the direction of brake rotor rotation, as shown in the figure.
• Correctly install the pad return spring to the supporting surface of the pad clip as shown in the figure.
• If the pad return spring is deformed or damaged, replace the brake pad.



(1) Pad return spring
(2) Supporting surface of pad clip
(3) Direction of brake rotor rotation

NOTE:
Install the pad indicator in proper direction.



(1) LH — IN
(2) LH — OUT
(3) RH — IN
(4) RH — OUT
(5) Pad indicator
(6) Pad return spring

6) Install the caliper body to the support.

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

7) Connect the brake hose using a new brake hose gasket.

Tightening torque:
18 N·m (1.84 kgf-m, 13.3 ft-lb)

8) Bleed air from the brake system. <Ref. to BR-33, PROCEDURE, Air Bleeding.>

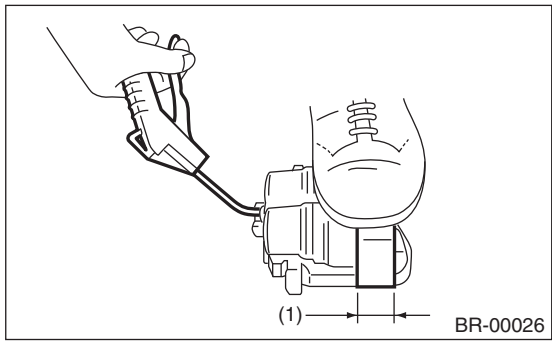
C: DISASSEMBLY

1) Remove mud and foreign matter from the caliper body and the support.

CAUTION:
Be careful not to allow foreign matter to enter the brake hose connector.

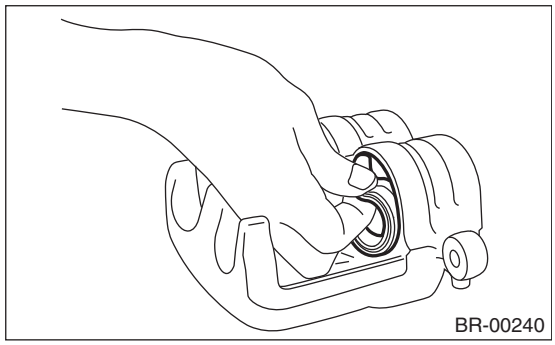
2) Place a wooden block in the caliper body as shown in the figure to prevent the piston from jumping out and being damaged.

3) Gradually apply compressed air via the brake hose installation hole to push the piston out.



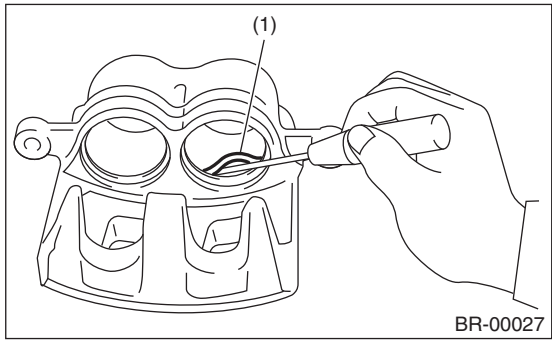
(1) Place a wooden block of 30 mm (1.18 in) width.

4) Remove the piston boot.



5) Remove the piston seal (1) from the caliper body cylinder.

CAUTION:
Do not damage the cylinder and piston seal groove.



6) Remove the guide pin and boot from caliper body.

D: ASSEMBLY

1) Clean the inside of the caliper body using brake fluid.

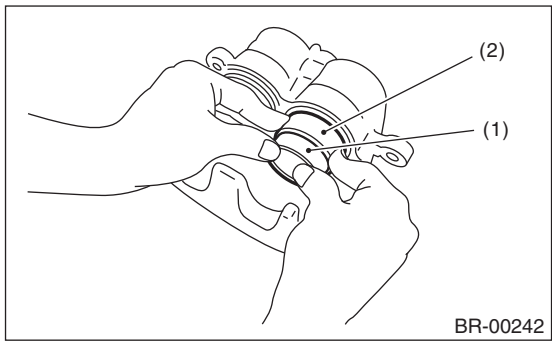
2) Apply a coat of brake fluid to piston seal and install the piston seal to the caliper body groove.

3) Apply a coat of brake fluid to the inner surface of cylinder and the entire outer surface of the piston.

4) Apply NIGLUBE RX-2 (Part No. 000041000) or grease contained in the piston seal kit to the boot, and install it to the groove at the end of the cylinder.

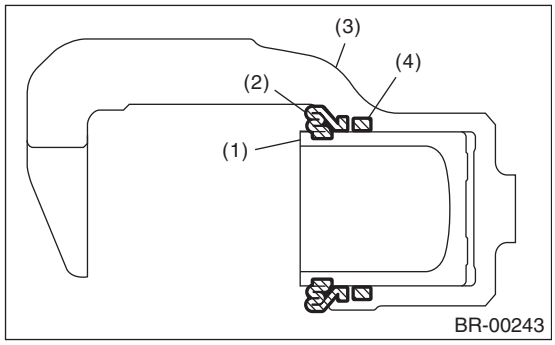
5) Insert the piston into cylinder.

CAUTION:
Do not force the piston into cylinder.



(1) Piston
(2) Piston boot

6) Position the boot in the grooves on cylinder and piston.

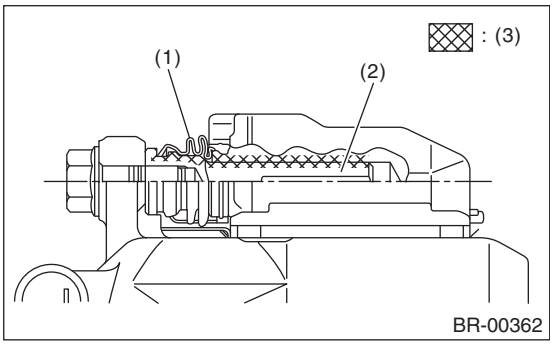


(1) Piston
(2) Piston boot
(3) Caliper body
(4) Piston seal

7) Apply NIGLUBE RX-2 (Part No. 000041000) or grease contained in the piston seal kit to the lock pin, guide pin outer surface, cylinder inner surface, and boot grooves.

8) Insert the lock pin and guide pin boot into the support.

CAUTION:
Insert the lock pin and guide pin into specified position, and make sure that they slide and seat properly.



(1) Pin boot
(2) Lock pin or guide pin
(3) Grease applied area

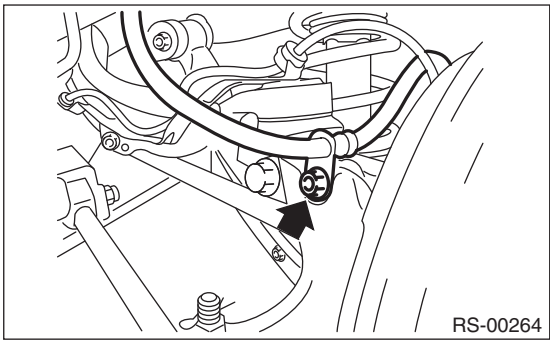
E: INSPECTION

1) Repair or replace the faulty parts.
2) Check the caliper body and piston for uneven wear, damage or rust.
3) Check the rubber parts for damage or deterioration.

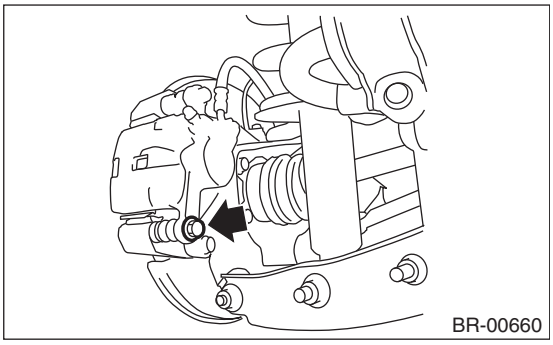
5. Rear Brake Pad

A: REMOVAL

1) Lift up the vehicle, and then remove the rear wheels.
2) Remove the brake hose bracket.



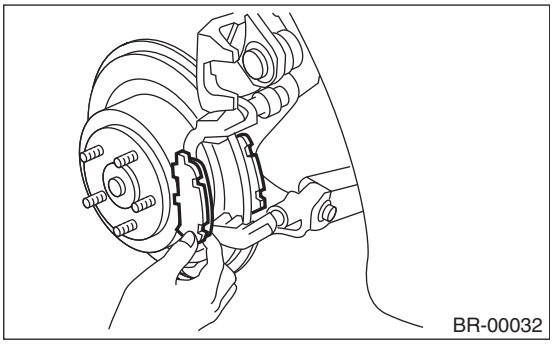
3) Remove the caliper bolt.



4) Raise the caliper body and support it.

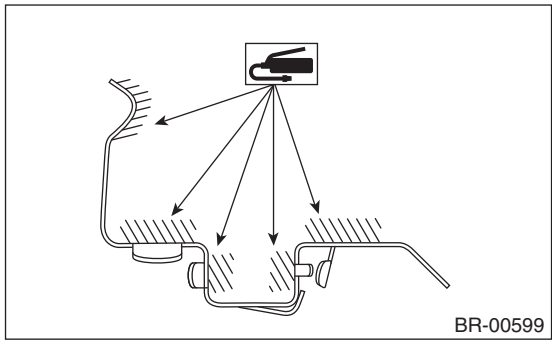
NOTE:
Do not disconnect the brake hose from the caliper body.

5) Remove the pads.

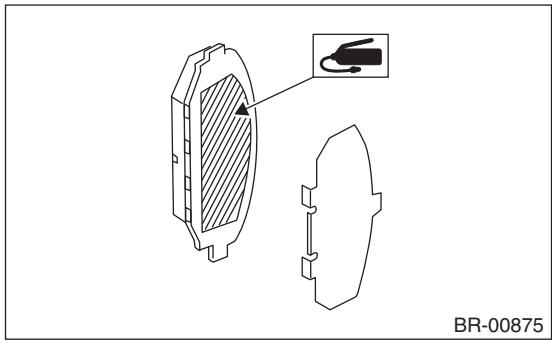


B: INSTALLATION

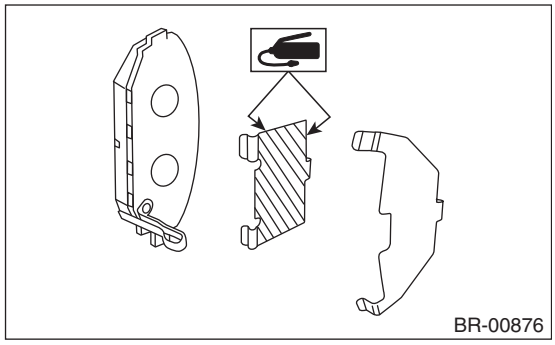
1) Apply a thin coat of Molykote M7439 (Part No. K0770YA000) or grease contained in the pad kit to the pad clip.



2) Apply a thin coat of Molykote AS880N (Part No. K0777YA010) or grease contained in the pad kit to the contact surface between the pad and shim.



3) Apply a thin coat of Molykote AS880N (Part No. K0777YA010) or grease contained in the pad kit to both surfaces of the pad inner shim.



4) Install the pad to support.
5) Install the caliper body to the support.

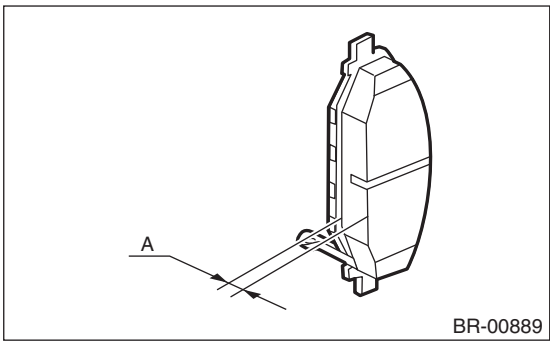
Tightening torque:
27 N·m (2.75 kgf-m, 19.9 ft-lb)

6) Install the brake hose bracket.

Tightening torque:
33 N·m (3.36 kgf-m, 24.3 ft-lb)

C: INSPECTION

Check the pad thickness A.



Pad thickness A mm (in)	Standard	9.0 (0.354)
	Wear limit	1.5 (0.059)

NOTE:

- Always replace the pads of both wheels and both sides as a set.
- Replace pad clips if they are twisted or worn.
- A wear indicator is installed on the inner disc brake pad.

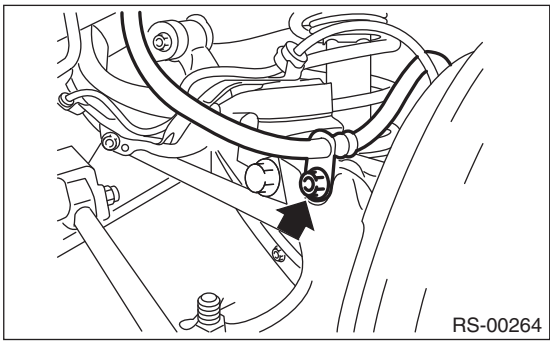
If the pad is worn to the limit, the end of wear indicator contacts disc rotor, and a squeaking sound is heard as the wheel rotates. If the sound is heard, replace the pad.

- Replace the pad if there is oil or grease on it.

6. Rear Disc Rotor

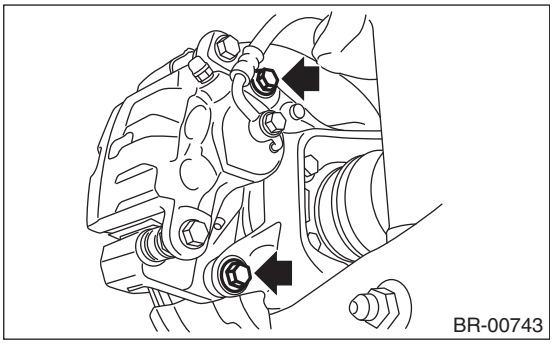
A: REMOVAL

1) Lift up the vehicle, and then remove the rear wheels.
2) Release the parking brake.
3) Remove the brake hose bracket.



4) Remove the caliper body assembly from housing, and suspend it from the strut using a wire.

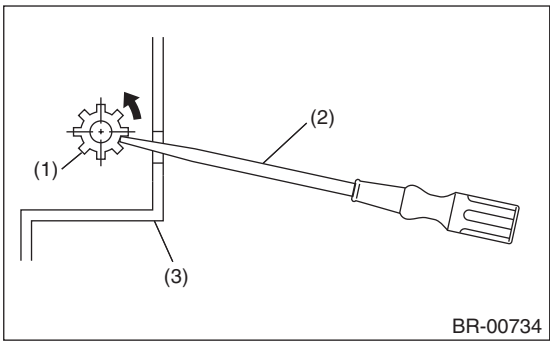
CAUTION:
Be careful not to stretch the brake hose.



5) Remove the disc rotor.

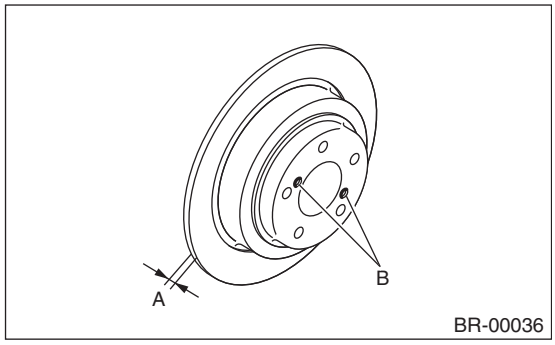
NOTE:
If it is difficult to remove the disc rotor, perform the following two methods in order.

(1) Turn the adjusting screw using a flat tip screwdriver until the brake shoe is far enough away to allow removal of the disc rotor.



(1) Adjusting screw
(2) Flat tip screwdriver
(3) Disc rotor

(2) If it is difficult to remove the disc rotor from the hub, drive an 8 mm bolt into the threads B of the rotor, then remove the rotor.



B: INSTALLATION

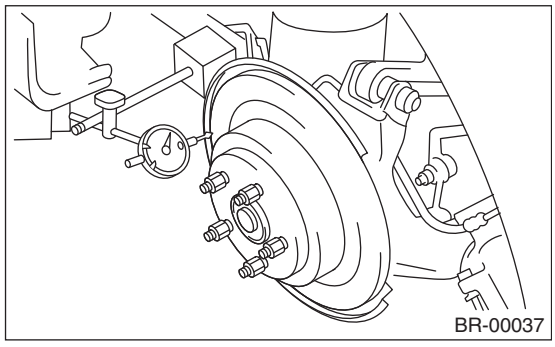
1) Install each part in the reverse order of removal.

Tightening torque:
Brake hose bracket
33 N·m (3.36 kgf-m, 24.3 ft-lb)
Caliper body assembly
66 N·m (6.73 kgf-m, 48.7 ft-lb)

2) Adjust the parking brake. <Ref. to PB-8, ADJUSTMENT, Parking Brake Assembly (Rear Disc Brake).>

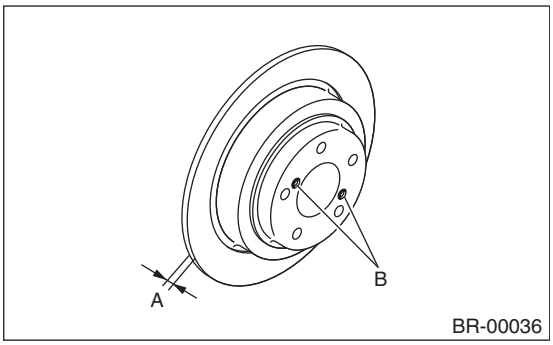
C: INSPECTION

1) Check the rear wheel bearing play and axle hub runout before inspecting the disc rotor runout. <Ref. to DS-26, INSPECTION, Rear Hub Unit Bearing.>
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 grinding, check the thickness of the disc rotor according to the procedure in step 4).



Disc rotor runout limit:
0.05 mm (0.0020 in)

4) Set a micrometer 10 mm (0.39 in) inward from the disc rotor outer perimeter, and then measure the disc rotor thickness. If the thickness A of the disc rotor exceeds the service limit, replace with a new disc rotor.



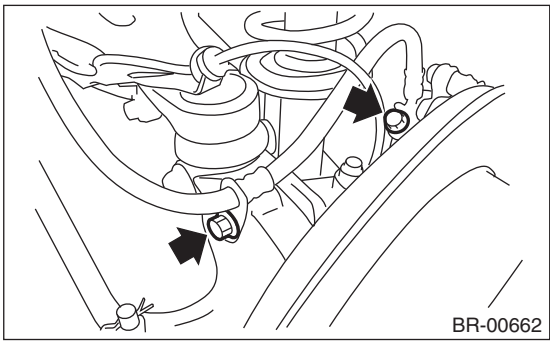
	Standard	Limit	Disc rotor diameter
Disc rotor thickness A mm (in)	10 (0.39)	8.5 (0.335)	286 (11.26)

7. Rear Disc Brake Assembly

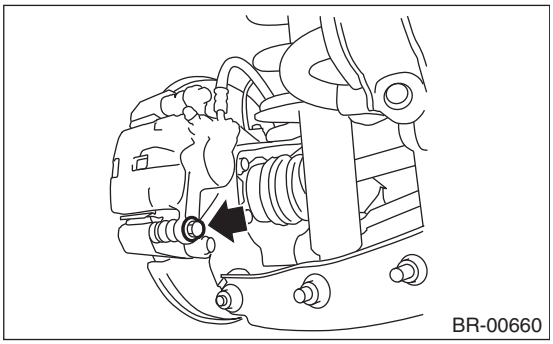
A: REMOVAL

CAUTION:
Do not allow brake fluid to come in contact with vehicle body. If it does, wash off with water and wipe away completely.

1) Lift up the vehicle, and then remove the rear wheels.
2) Remove the brake hose bracket.
3) Disconnect the brake hose.



4) Remove the caliper bolt.



5) Raise the caliper body, and then move it toward vehicle center to separate it from the support.
6) Remove the brake pad, and then remove the support from the housing.

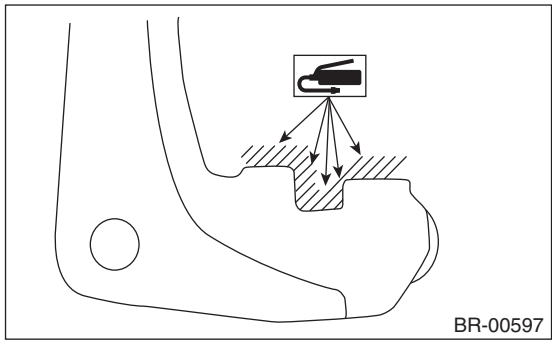
NOTE:
Remove the support only when replacing the rotor or support. It is not necessary to remove it when servicing the caliper body.

7) Remove mud and foreign matter from the caliper body and the support.

CAUTION:
Be careful not to allow foreign matter to enter the brake hose connector.

B: INSTALLATION

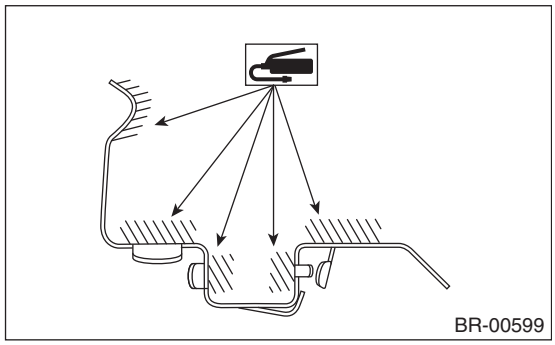
1) Apply a thin coat of Molykote M7439 (Part No. K0770YA000) or grease contained in the pad kit to the support.



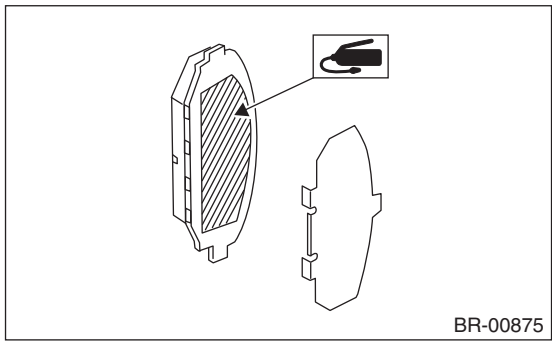
2) Install the support to the housing.

Tightening torque:
66 N·m (6.73 kgf-m, 48.7 ft-lb)

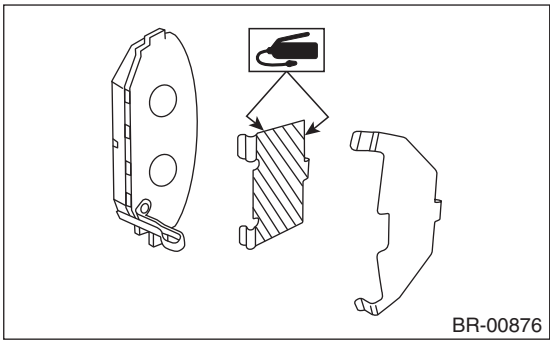
3) Apply a thin coat of Molykote M7439 (Part No. K0770YA000) or grease contained in the pad kit to the pad clip.



4) Apply a thin coat of Molykote AS880N (Part No. K0777YA010) or grease contained in the pad kit to the contact surface between the pad and shim.



5) Apply a thin coat of Molykote AS880N (Part No. K0777YA010) or grease contained in the pad kit to both surfaces of the pad inner shim.



6) Install the pad to support.
7) Install the caliper body to the support.

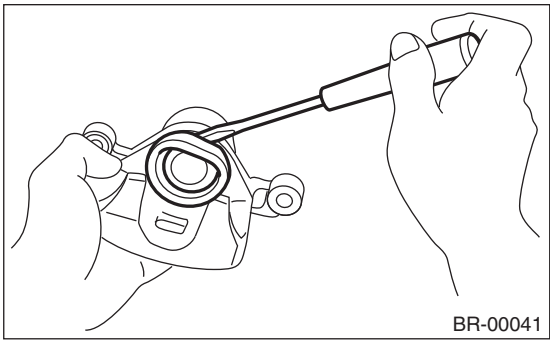
Tightening torque:
27 N·m (2.75 kgf-m, 19.9 ft-lb)
8) Install the brake hose bracket.

Tightening torque:
33 N·m (3.36 kgf-m, 24.3 ft-lb)
9) Connect the brake hose using a new brake hose gasket.

Tightening torque:
18 N·m (1.84 kgf-m, 13.3 ft-lb)
10) Bleed air from the brake system. <Ref. to BR-33, PROCEDURE, Air Bleeding.>

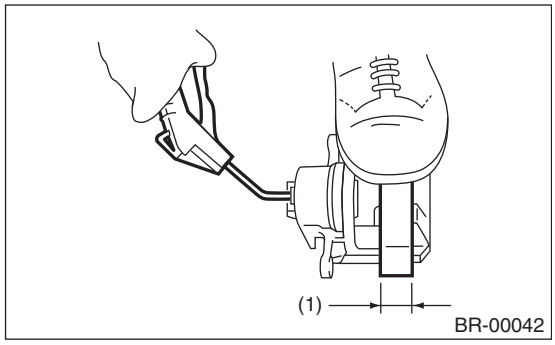
C: DISASSEMBLY

1) Remove the piston boot.



2) Place a wooden block in the caliper body as shown in the figure to prevent the piston from jumping out and being damaged.

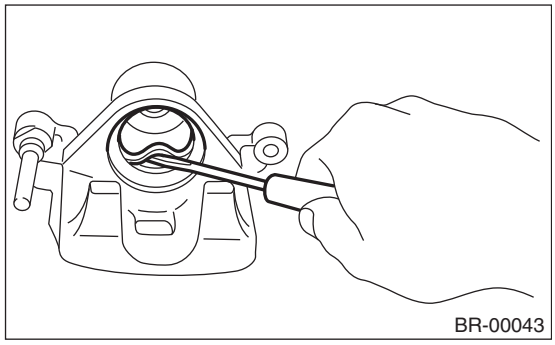
3) Gradually apply compressed air via the brake hose installation hole to push the piston out.



(1) Place a wooden block of 30 mm (1.18 in) width.

4) Remove the piston seal from caliper body cylinder.

CAUTION:
Do not damage the cylinder and piston seal groove.



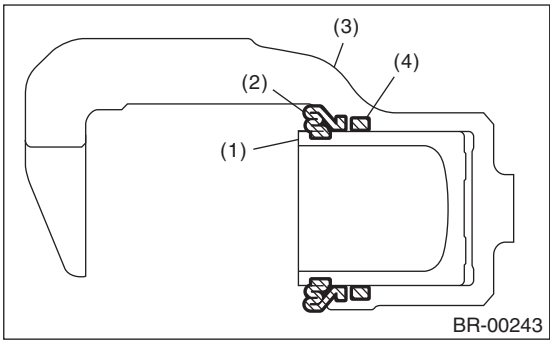
5) Remove the pin boot.

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 the piston seal to the caliper body groove.
3) Apply a coat of brake fluid to the inner surface of cylinder and the entire outer surface of the piston.
4) Apply NIGLUBE RX-2 (Part No. 000041000) or grease contained in the piston kit to the boot, and install it to the groove at the end of the cylinder.
5) Insert the piston into the cylinder.

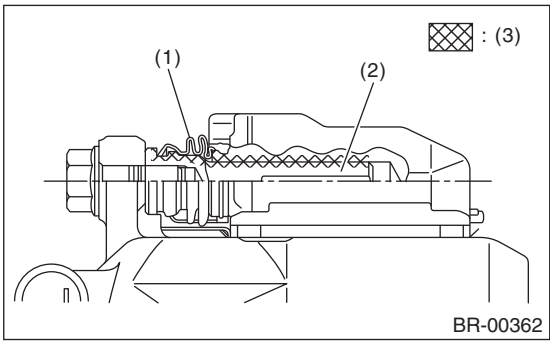
CAUTION:
Do not force the piston into cylinder.

6) Position the boot in the grooves on piston and cylinder.



(1) Piston
(2) Piston boot
(3) Caliper body
(4) Piston seal

7) Apply NIGLUBE RX-2 (Part No. 000041000) or grease contained in the piston kit to cylinder inner surface, pin, bushing outer surface, and boot grooves.



(1) Pin boot
(2) Lock pin or guide pin
(3) Grease applied area

8) Insert the pin boot into the support.
9) Install the pin boot to the support, and then insert the pin into the specified position.

CAUTION:
Insert pin into position, and make sure that it slides and seats properly.

E: INSPECTION

1) Repair or replace the faulty parts.
2) Check the caliper body and piston for uneven wear, damage or rust.
3) Check the rubber parts for damage or deterioration.

8. Master Cylinder

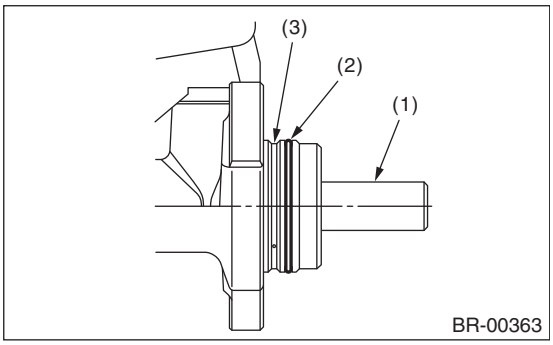
A: REMOVAL

CAUTION:
Do not allow brake fluid to come in contact with vehicle body. If it does, wash off with water and wipe away completely.
1) Drain brake fluid from the reservoir tank completely.
2) Disconnect the harness connector of the fluid level gauge.
3) Remove the brake pipe from the master cylinder.
4) Remove the master cylinder mounting nuts, and carefully remove the master cylinder from the brake booster.

B: INSTALLATION

1) Replace the O-ring for the master cylinder with a new part.

CAUTION:
Be careful not to install the O-ring in the wrong location.



(1) Primary piston
(2) O-ring
(3) Do not install the O-ring on this groove.

2) Install each part in the reverse order of removal.

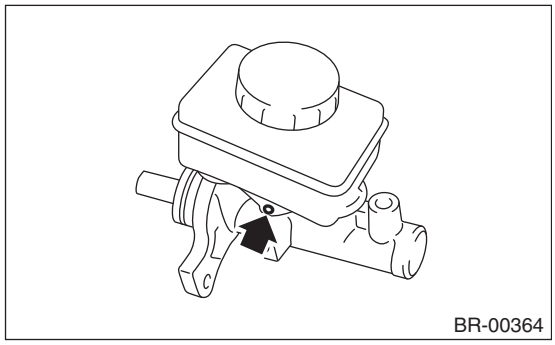
Tightening torque:
Master cylinder mounting nut
13 N·m (1.33 kgf-m, 9.6 ft-lb)
Piping flare nut
19 N·m (1.94 kgf-m, 14 ft-lb)

CAUTION:
Be sure to use recommended brake fluid.
3) Bleed air from the brake system. <Ref. to BR-33, PROCEDURE, Air Bleeding.>

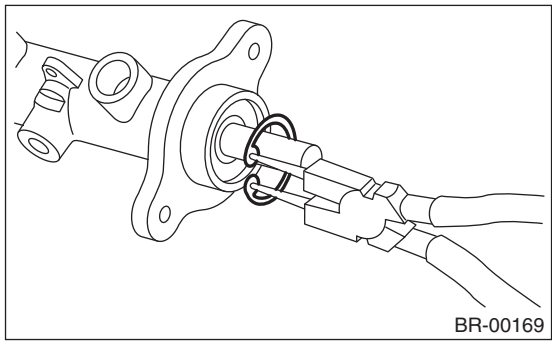
C: REPLACEMENT

1) Remove mud and dirt from the surface of brake master cylinder.
2) Secure the master cylinder in a vise.

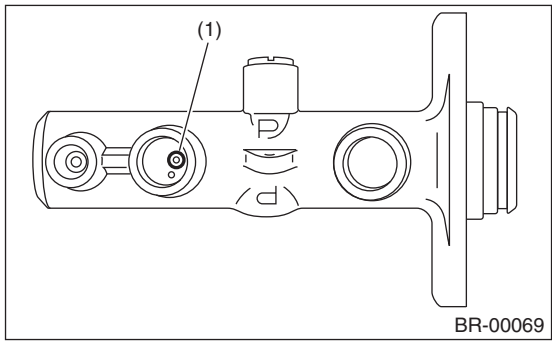
CAUTION:
To avoid damaging the master cylinder, place between aluminum plates or other material when holding with a vise.
3) Remove the pin which secures the master cylinder and reservoir tank, then remove the reservoir tank and seal.



4) While pushing in the primary piston, remove the C-ring using pliers.



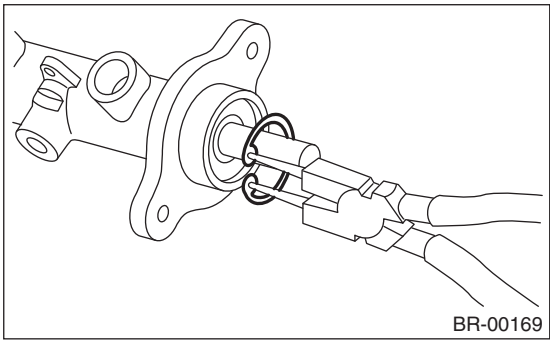
5) While pushing in the primary piston, remove the cylinder pin (1) from the port on the reservoir tank attachment location using a magnet pick-up tool.



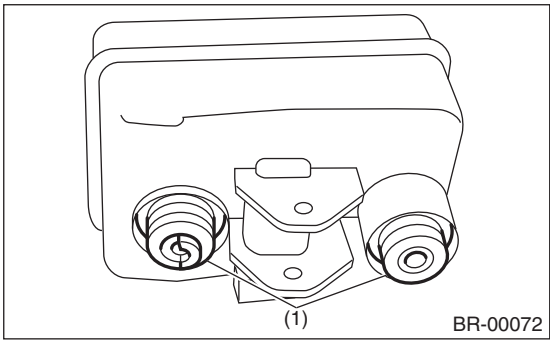
6) Extract the primary piston assembly and secondary piston assembly straight out while taking care not to scratch the inner surface of the cylinder.
7) Clean the inside of master cylinder with brake fluid. Check the inside of the cylinder for damage, deformation and wear. Replace the master cylinder as an assembly 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) While pushing-in the primary piston, install the cylinder pin.
11) While pushing-in the primary piston, install the C-ring to the groove using pliers.

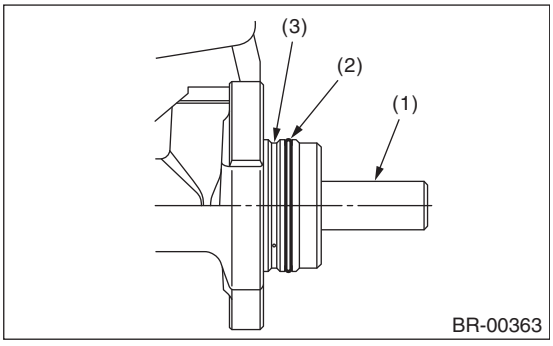
CAUTION:
Make sure the C-ring is installed to the groove securely.



12) Install the seal (1) to reservoir tank.



13) Install the reservoir tank to the master cylinder, and secure with pin.
14) Replace the O-ring for the master cylinder with a new part.



(1) Primary piston
(2) O-ring
(3) Do not install the O-ring on this groove.

D: INSPECTION

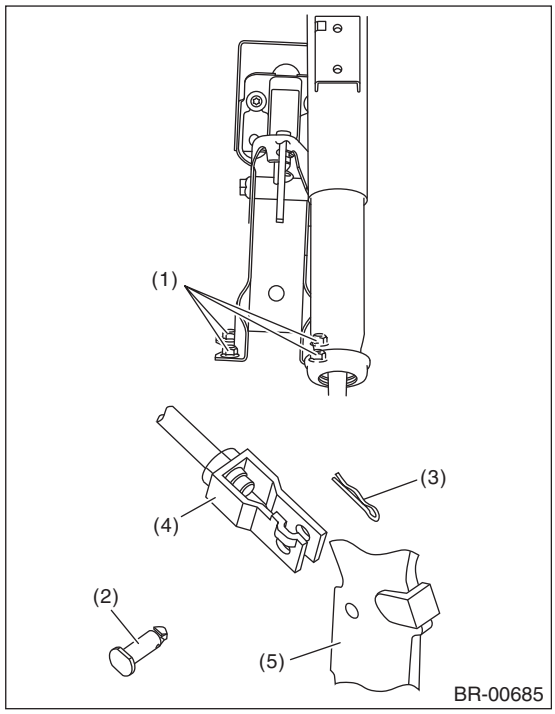
Inspect for brake fluid leakage from the master cylinder.

NOTE:
After replacing the piston kit, if an brake fluid 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.

9. Brake Booster

A: REMOVAL

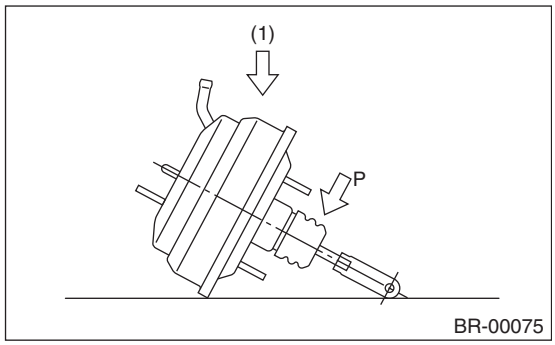
1) Remove or disconnect the following parts in the engine compartment.
   (1) Disconnect the connector of brake fluid level gauge.
   (2) Remove the brake pipe from the master cylinder.
   (3) Remove the master cylinder installation nut.
   (4) Disconnect the vacuum hose from brake booster.
2) Remove 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
(5) Brake pedal

3) Remove the brake booster while avoiding the brake pipe.

CAUTION:
• Do not disassemble the brake booster.
• If external force (1) is applied from above when brake booster is placed in this position, the resin portion as indicated by "P" may become damaged.

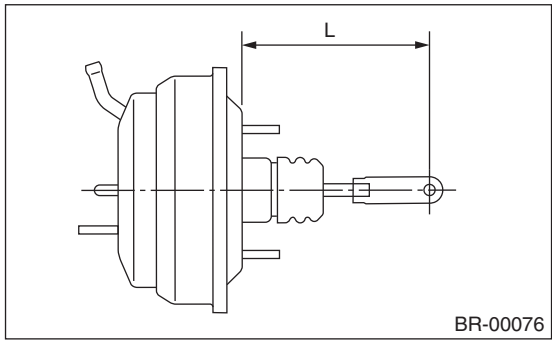


NOTE:
• Make sure that the booster shell and vacuum pipe are not subject to strong impacts.
• Be careful not to drop the brake booster. If the booster is dropped, replace it.
• Use special care when handling the operating rod. If excessive force is applied to the operating rod, the angle may change by ±3°, and it may result in damage to power piston cylinder.
• Be careful when placing the brake booster on floor.
• Do not change the push rod length.

B: INSTALLATION

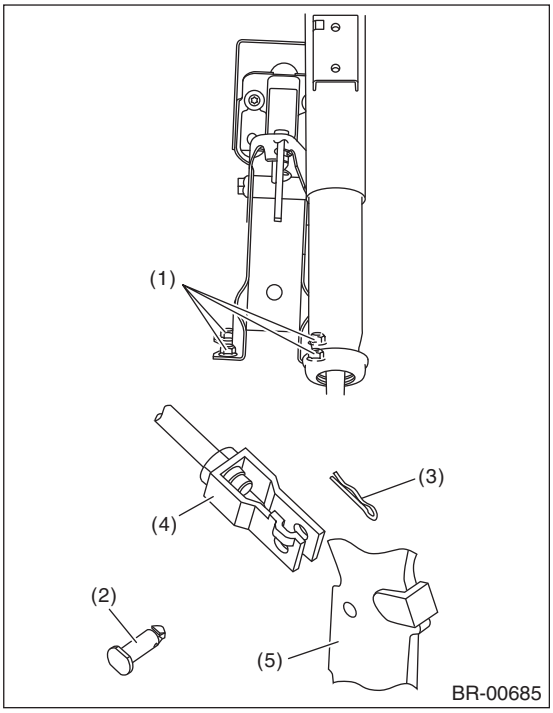
1) Check and adjust the operating rod of the brake booster.

Specification L:
136.3 mm (5.37 in)
If it is out of specification, adjust it with the brake booster operating rod.



2) Mount the brake booster in position.

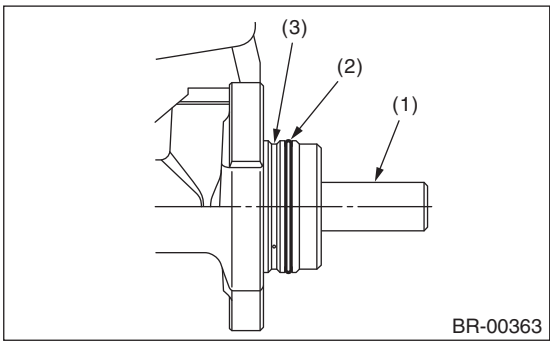
3) Install clevis pin and snap pin which secure the operating rod to the brake pedal.



(1) Nut
(2) Clevis pin
(3) Snap pin
(4) Operating rod
(5) Brake pedal

NOTE:
• Replace with a new clevis pin.
• Apply a thin coat of KOPR-KOTE (Part No. 003603001) to the clevis pin.

4) Connect the vacuum hose to the brake booster.
5) After replacing the O-ring, install the master cylinder to brake booster.



(1) Primary piston
(2) O-ring
(3) Do not install the O-ring on this groove.

6) Connect the brake pipes to the master cylinder.
7) Connect the connector of the brake fluid level gauge.
8) Apply grease to the operating rod connecting pin to prevent it from wear.
9) Bleed air from the brake system. <Ref. to BR-33, PROCEDURE, Air Bleeding.>
10) Perform a road test to make sure the brakes do not drag.

C: INSPECTION

NOTE:
On the model with brake assist mechanism, the following phenomena occur when the brake pedal is depressed. However, those are not malfunction but the phenomena that occur when the brake assist mechanism functions properly.
• Brake feel is soft when brake pedal is depressed hard or quicker than usual.
• ABS operating sound is heard when brake pedal is depressed hard or quicker than usual.

1. OPERATION CHECK (WITHOUT GAUGES)

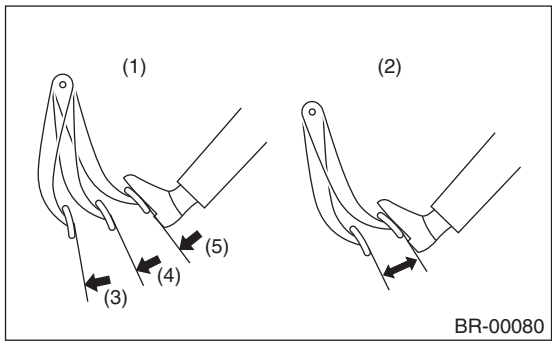
CAUTION:
When checking operation, be sure to apply the parking brake securely.

• Check without gauges

This method can not determine exactly what part is defective. 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 no change occurs in the pedal height when pressed, the brake booster is faulty.

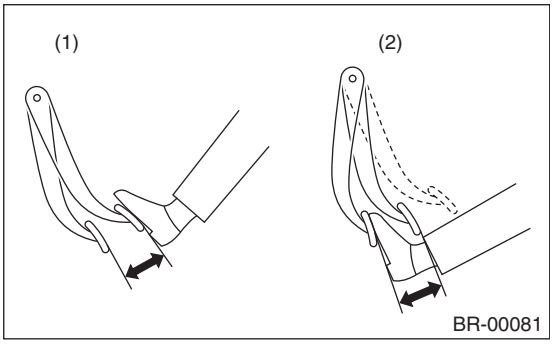


(1) Normal
(2) Not OK
(3) 1st
(4) 2nd
(5) 3rd

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 no improvement is observed, check precisely with gauges.

• CHECK OPERATION.

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 the brake pedal depressed, start the engine.
3) As the engine starts, the brake pedal should move slowly toward the floor. If the pedal height does not change, the brake booster is faulty.

NOTE:
If faulty, check precisely with gauges.

• Loaded air tightness check

Depress the brake pedal while the engine is running, and turn the engine to OFF while the pedal is 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.

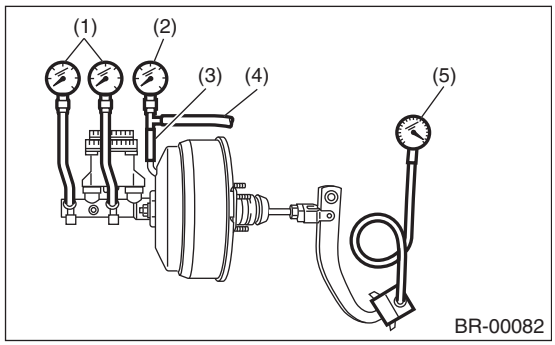
NOTE:
If faulty, check precisely with gauges.

2. OPERATION CHECK (WITH GAUGE)

CAUTION:
When checking operation, be sure to apply the parking brake securely.

• Check with gauge

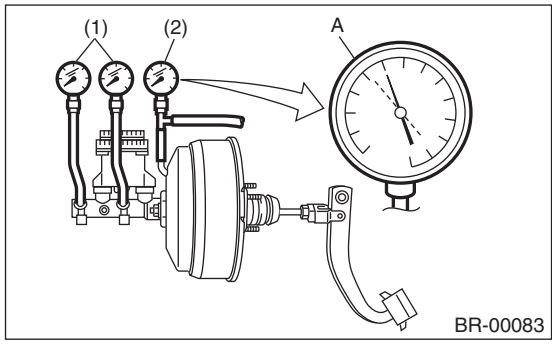
Connect the gauge as shown in the figure. After bleeding air from the pressure gauge, perform each check.



(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 point A of the vacuum gauge = 66.7 kPa (500 mmHg, 19.69 inHg). Do not depress the brake pedal at this time.

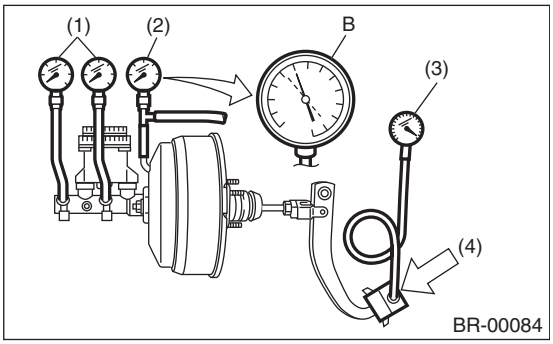


(1) Pressure gauge
(2) Vacuum gauge

2) Stop the engine and check the gauge. If the vacuum pressure drop within 15 seconds after stopping the engine is 3.3 kPa (25 mmHg, 0.98 inHg) or less, 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
• 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 lbf). Keep the engine running and keep the pedal pressed until a vacuum of point B = 66.7 kPa (500 mmHg, 19.69 inHg) is indicated on the vacuum gauge.



(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 3.3 kPa (25 mmHg, 0.98 inHg) or less, the function of brake booster is normal.
If defective, refer to “AIR TIGHTNESS CHECK”. <Ref. to BR-29, INSPECTION, Brake Booster.>
3) If the brake booster is faulty, replace it with a new part.

• Lack of boost 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 N (kgf, lbf)	147 (15, 33)	294 (30, 66)
Fluid pressure kPa (kgf/cm^2, psi)	545 (6, 79)	1,564 (16, 227)

• 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 N (kgf, lbf)	147 (15, 33)	294 (30, 66)
Fluid pressure kPa (kgf/cm^2, psi)	6,400 (65, 928)	11,273 (115, 1,635)

10.Brake Fluid

A: INSPECTION

1) Check that the brake fluid level is between “MIN” and “MAX”. If out of the specified range, refill or drain fluid. If the fluid level is close to “MIN”, check the brake pad for wear and refill the fluid.
2) Check the fluid for discoloration. If the fluid color has changed excessively, 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 the reservoir tank.

NOTE:
• During the operation, keep the reservoir tank filled with brake fluid to prevent entry of air.
• Operate the brake pedal slowly.
• For convenience and safety, perform the 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 the 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 brake fluid from the reservoir tank.
4) Refill the reservoir tank with recommended brake fluid.

Recommended brake fluid:
Refer to the “Specifications” in “General Description”. <Ref. to BR-2, SPECIFICATION, General Description.>

Perform the same procedure as for bleeding the brake line, until new brake fluid comes out from vinyl tube. <Ref. to BR-33, PROCEDURE, Air Bleeding.>

11.Air Bleeding

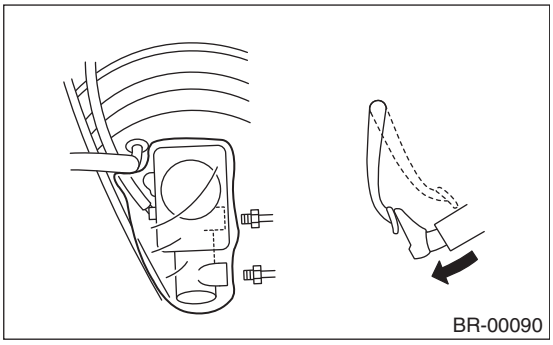
A: PROCEDURE

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 the reservoir tank.

1. MASTER CYLINDER

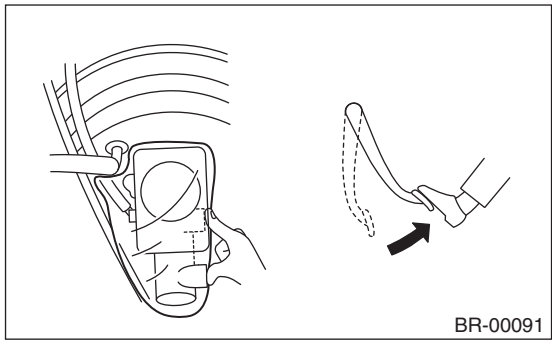
NOTE:
• When the master cylinder is disassembled or the reservoir tank is empty, bleed the master cylinder.
• If bleeding of the master cylinder is not necessary, omit the following procedures, and perform bleeding of the brake line. <Ref. to BR-33, BRAKE LINE, PROCEDURE, Air Bleeding.>
1) Fill the reservoir tank of the master cylinder with brake fluid.

NOTE:
While bleeding air, 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) Depress the brake pedal slowly and hold it.


BR-00090

NOTE:
On the model with brake assist mechanism, the following phenomena occur when the brake pedal is depressed. However, those are not malfunction but the phenomena that occur when the brake assist mechanism functions properly.
• Brake feel is soft when brake pedal is depressed hard or quicker than usual.
• ABS operating sound is heard when brake pedal is depressed hard or quicker than usual.

5) Plug the outlet plug with your finger, and then release the brake pedal.


BR-00091

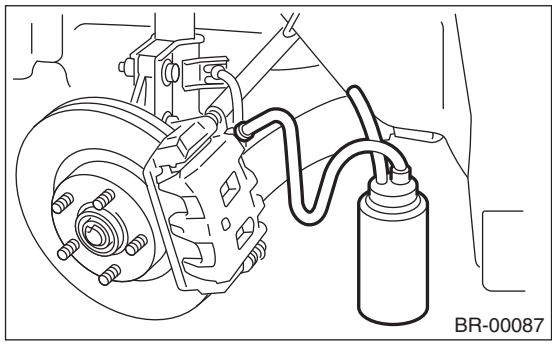
6) Repeat the step 4) and 5) several times.
7) Remove the plastic bag.
8) Install the brake pipe to the master cylinder.

Tightening torque:
19 N·m (1.94 kgf-m, 14.0 ft-lb)
9) Bleed air from the brake line. <Ref. to BR-33, BRAKE LINE, PROCEDURE, Air Bleeding.>

2. BRAKE LINE

1) When the master cylinder is disassembled or the reservoir tank is empty, bleed the master cylinder before bleeding the brake line. <Ref. to BR-33, MASTER CYLINDER, PROCEDURE, Air Bleeding.>
2) Fill the reservoir tank of the master cylinder 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.

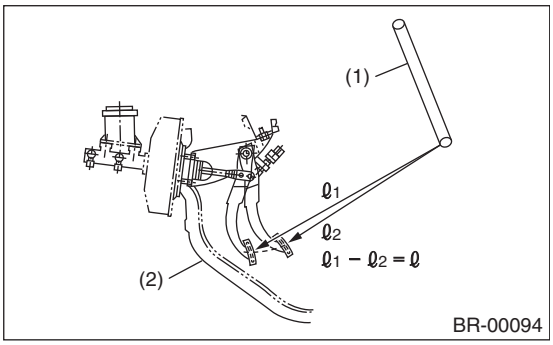

BR-00087

4) Depress the brake pedal several times, and hold it.
5) Loosen the air bleeder screw to drain brake fluid. Tighten the air bleeder quickly, and release the brake pedal.

NOTE:
Perform air bleed starting in the order from the farthest wheel cylinder from the master cylinder.
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.
8) Securely tighten the air bleeder screws.

Tightening torque:
8 N·m (0.82 kgf-m, 5.9 ft-lb)
9) Check that there are no brake fluid leaks in the entire system.
10) Check the pedal stroke.
Run the engine at idle after warming up the engine, and depress the brake pedal with a force of 500 N (51 kgf, 112 lbf). 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

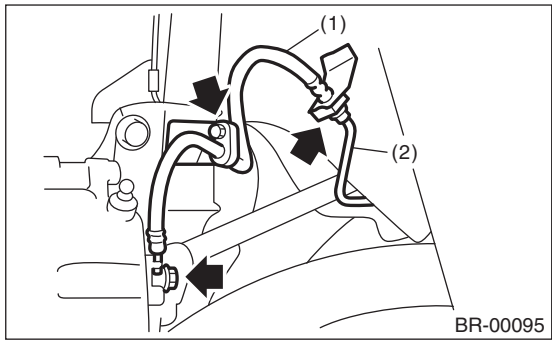
Specification of pedal stroke:
When depressing the pedal with a force of 500 N (51 kgf, 112 lbf).
95 mm (3.74 in) or less
11) If the distance is more than specification, there is a possibility of air being caught in the brake line. Bleed the brake line of all air until the pedal stroke meets the specification.
12) Operate the hydraulic control unit in the sequence control mode. <Ref. to VDC-13, ABS Sequence Control.>
13) Check the pedal stroke again.
14) If the distance is more than specification, there is a possibility of air being caught in the hydraulic unit. Repeat above steps 2) to 9) until the pedal stroke meets the specification.
15) Fill the reservoir tank with brake fluid up to the “MAX” level.
16) Test run the vehicle and ensure that the brakes operate normally.

12.Brake Hose

A: REMOVAL

1. FRONT BRAKE HOSE

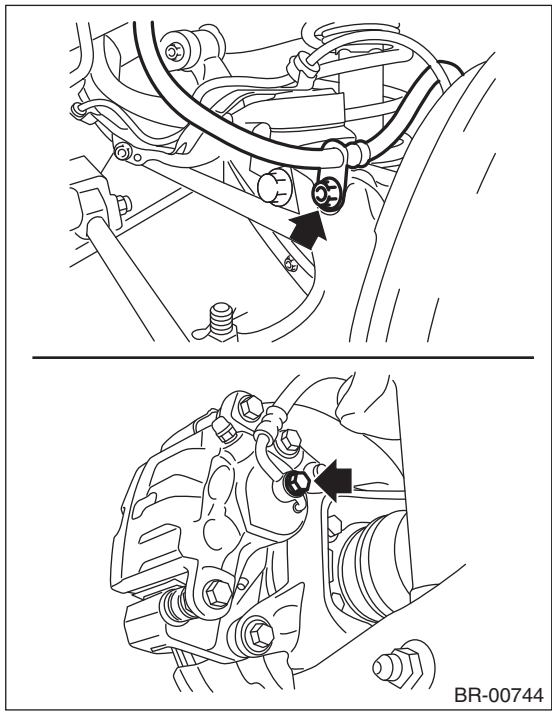
1) Separate the brake pipe from brake hose using a flare nut wrench.
2) Remove the clamp, the strut mount bolts, and union bolt.



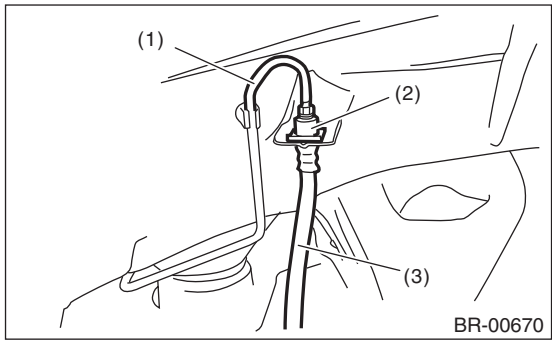
(1) Brake hose
(2) Brake pipe

2. REAR BRAKE HOSE

1) Remove union bolt and brake hose bracket bolt.



2) Separate the brake pipe from brake hose using a flare nut wrench.
3) Remove the clamp, and then remove the brake hose.



(1) Brake pipe
(2) Brake hose clamp
(3) Brake hose

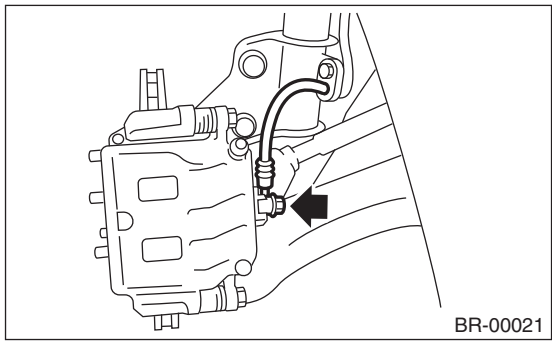
B: INSTALLATION

1. FRONT BRAKE HOSE

1) Secure the brake hose to strut mount.

Tightening torque:
33 N·m (3.36 kgf-m, 24.3 ft-lb)
2) Install the brake hose to the caliper body using a new gasket.

Tightening torque (union bolt):
18 N·m (1.84 kgf-m, 13.3 ft-lb)



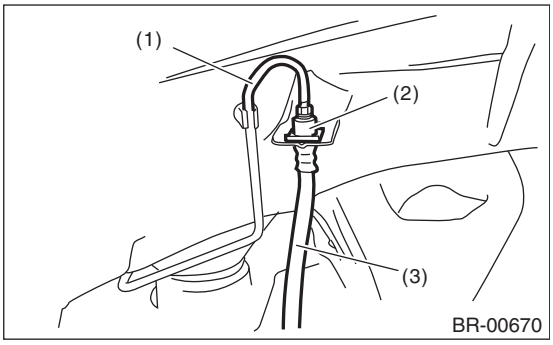
3) Position the disc in straight position and route the brake hose through the hole in the bracket on the wheel apron side.

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) Tighten the flare nut to the specified torque.

Tightening torque (brake pipe flare nut):
15 N·m (1.53 kgf-m, 11.1 ft-lb)
7) Bleed air from the brake system. <Ref. to BR-33, PROCEDURE, Air Bleeding.>

2. REAR BRAKE HOSE

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.



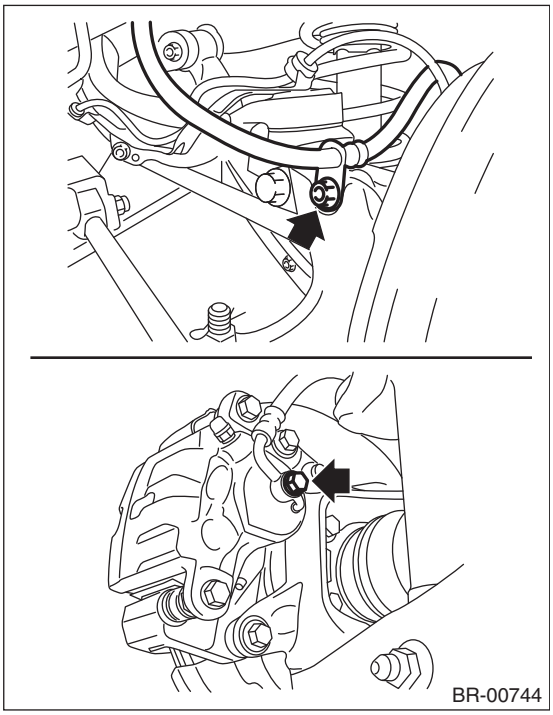
(1) Brake pipe
(2) Brake hose clamp
(3) Brake hose

3) Install the brake hose bracket.

Tightening torque:
33 N·m (3.36 kgf-m, 24.3 ft-lb)

4) Install the brake hose to the caliper body using a new gasket.

Tightening torque (union bolt):
18 N·m (1.84 kgf-m, 13.3 ft-lb)



5) Tighten the flare nut to the specified torque.

Tightening torque (brake pipe flare nut):
15 N·m (1.53 kgf-m, 11.1 ft-lb)

6) Bleed air from the brake system. <Ref. to BR-33, PROCEDURE, Air Bleeding.>

C: INSPECTION

Make sure there are no cracks, breakage or damage on hoses. Check the joint for fluid leakage. If any cracks, breakage, damage or fluid leakage is found, repair or replace the hose.

13.Brake Pipe

A: REMOVAL

CAUTION:
• Yellow connectors and harnesses with yellow tapes around them are the connectors and harnesses for the airbag system. Using a tester above such circuits may cause malfunction of airbag system. Follow the cautions for the airbag system in this case. <Ref. to AB-5, CAUTION, General Description.>
• Be careful not to damage the airbag system wiring harness when servicing the center brake pipe.
• When removing the brake pipe, do not bend.

NOTE:
The airbag system wiring harness is routed near the center brake pipe.

B: INSTALLATION

CAUTION:
• Yellow connectors and harnesses with yellow tapes around them are the connectors and harnesses for the airbag system. Using a tester above such circuits may cause malfunction of airbag system. Follow the cautions for the airbag system in this case. <Ref. to AB-5, CAUTION, General Description.>
• Be careful not to damage the airbag system wiring harness when servicing the center brake pipe.
• When installing the brake pipe, do not bend.
• After installing the brake pipe and hose, perform air bleed.
• After installing the brake hoses, make sure that they do not contact the tires or suspension assembly, etc.

NOTE:
The airbag system wiring harness is routed near the center brake pipe.

Brake pipe tightening torque:
Refer to "COMPONENT" of "General Description".
Front brake pipes & hoses: <Ref. to BR-7, FRONT BRAKE PIPES AND HOSES, COMPONENT, General Description.>
Center and rear brake pipes & hoses: <Ref. to BR-8, Center and rear brake pipes & hoses, COMPONENT, General Description.>

C: INSPECTION

Make sure there are no cracks, breakage or damage on hoses. Check the joint for fluid leakage. If any cracks, breakage, damage or fluid leakage is found, repair or replace the pipes.

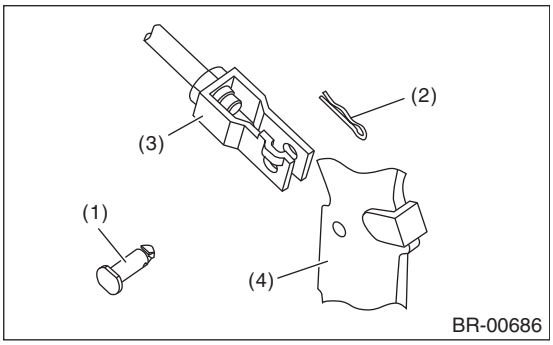
NOTE:
Use a mirror when inspecting back sides and other locations which are hard to see.

14.Brake Pedal

A: REMOVAL

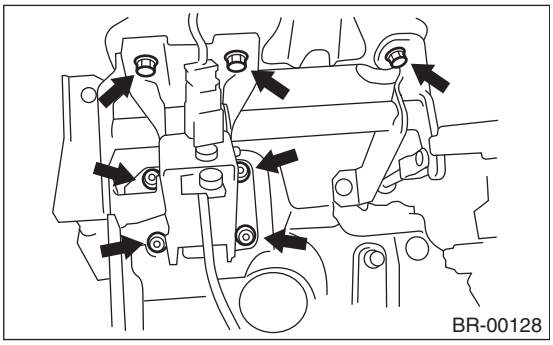
1. MT MODEL

1) Remove the steering column. <Ref. to PS-16, REMOVAL, Steering Column.>
2) Disconnect the connector from clutch switch.
3) Disconnect the connector from stop light switch.
4) Remove the clevis pin which secures the pedal and operating rod.



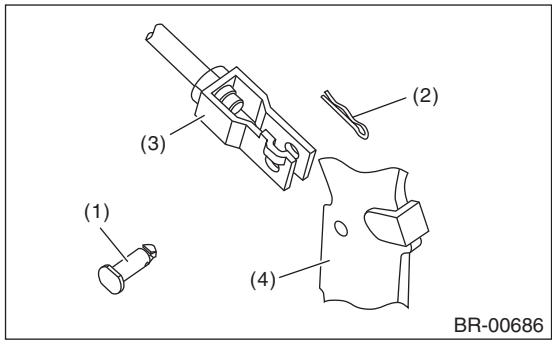
(1) Clevis pin
(2) Snap pin
(3) Operating rod
(4) Pedal

5) Remove the nut which secures the clutch master cylinder.
6) Remove the bolt and nut which secures the pedal bracket.



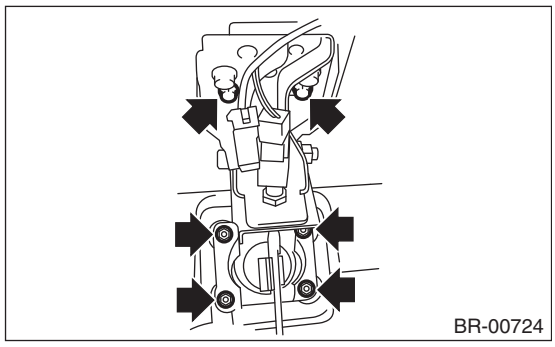
2. AT MODEL

1) Remove the steering column. <Ref. to PS-16, REMOVAL, Steering Column.>
2) Disconnect the connector from stop light switch.
3) Remove the clevis pin which secures the brake pedal and operating rod.



(1) Clevis pin
(2) Snap pin
(3) Operating rod
(4) Brake pedal

4) Remove the bolts and nuts which secure the brake pedal bracket.



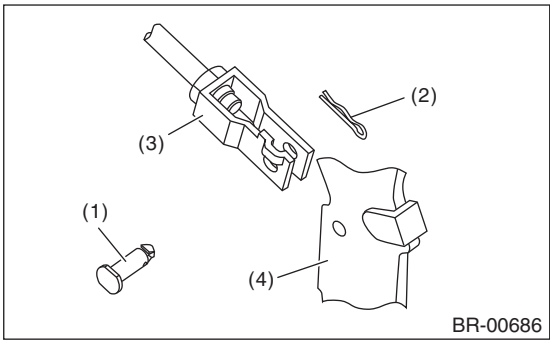
B: INSTALLATION

1) Install the bolt and nut which secure the brake pedal bracket.

Tightening torque:
18 N·m (1.84 kgf-m, 13.3 ft-lb)

2) Install clevis pin and snap pin which secure the operating rod to the brake pedal.

NOTE:
- Replace with a new clevis pin.
- Apply a thin coat of KOPR-KOTE (Part No. 003603001) to the clevis pin.



(1) Clevis pin
(2) Snap pin
(3) Operating rod
(4) Brake pedal

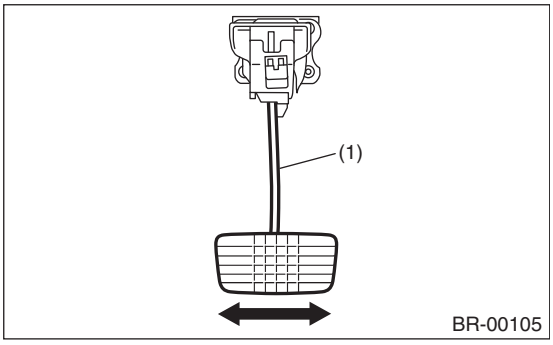
3) Connect the stop light switch connector.
4) Check that the brake light operate properly.
5) Check the brake pedal after installation. <Ref. to BR-39, INSPECTION, Brake Pedal.>

C: INSPECTION

1) Move the brake pedal pads in a horizontal direction with a force of approx. 10 N (1 kgf, 2 lbf), and check that the pedal deflection is in the range of specifications.

CAUTION:
If excessive deflection is noted, replace with a new bushing.

Deflection of brake pedal:
Limit
5.0 mm (0.197 in) or less

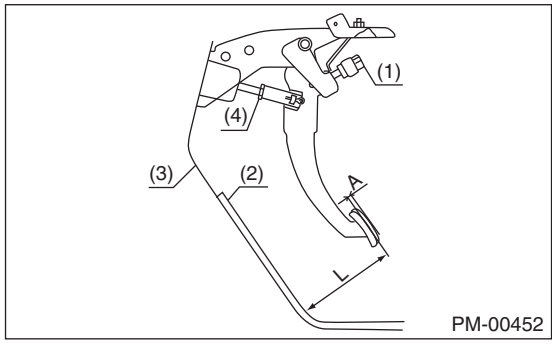


(1) Brake pedal

2) Check the position of the pedal pad.

Pedal height L:
150 — 160 mm (5.91 — 6.29 in)

Brake pedal free play A:
0.5 — 2 mm (0.020 — 0.079 in) [When pulling the brake pedal upward with a force of less than 10 N (1 kgf, 2 lbf).]



(1) Stop light switch
(2) Mat
(3) Toe board
(4) Brake booster operating rod

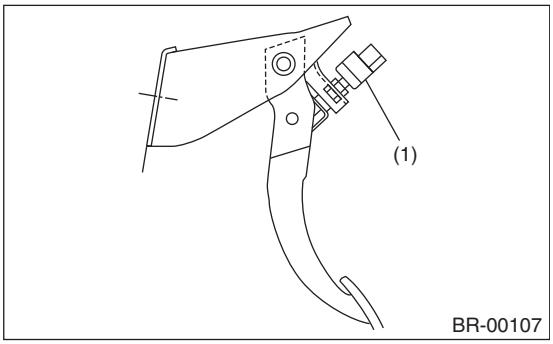
3) If the inspection result is not within the specification, loosen the lock nuts of brake booster operating rod, and rotate the rod to adjust the pedal height L within the specification.
4) Tighten the lock nut.

Tightening torque:
22 N·m (2.24 kgf-m, 16.2 ft-lb)

15.Stop Light Switch

A: REMOVAL

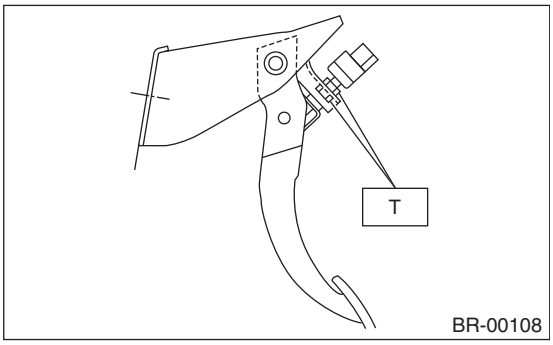
1) Disconnect the ground cable from battery.
2) Disconnect the stop light switch connector.
3) Loosen the nuts, remove the screw of the stop light switch (1), and remove stop light switch.



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-41, ADJUSTMENT, Stop Light Switch.>

Tightening torque:
8 N·m (0.82 kgf-m, 5.9 ft-lb)

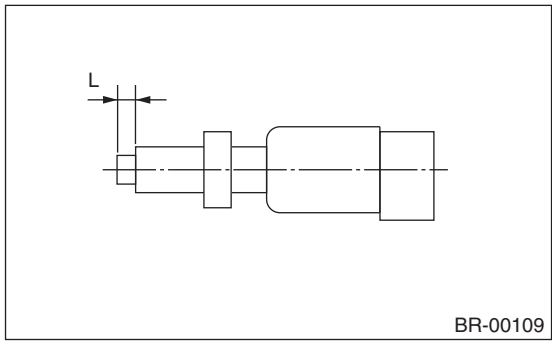


C: INSPECTION

1. INSPECT THE SPECIFIED POSITION

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.

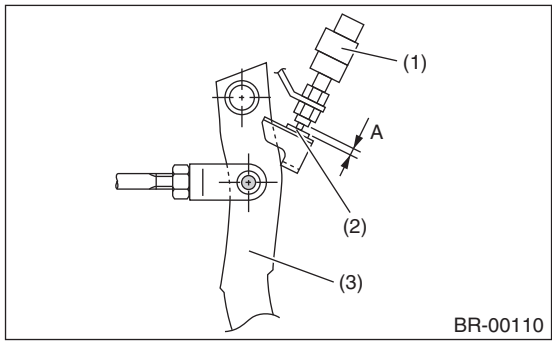
Specified position L:
2 mm (0.079 in)



2) Measure the clearance between the threaded end of the stop light switch and the stopper.

CAUTION:
Be careful not to rotate the stop light switch.

Stop light switch clearance A:
0.3 mm (0.012 in)



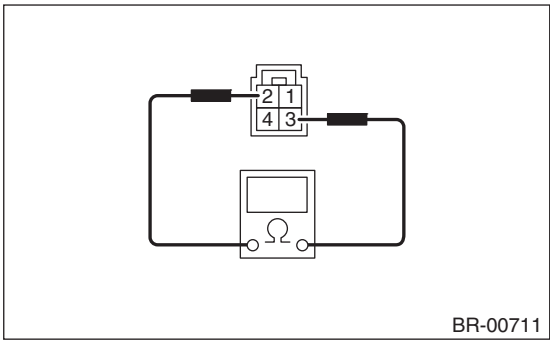
(1) Stop light switch
(2) Stopper
(3) Brake pedal

3) Adjust the position of the stop light switch if the inspection result is not within the standard value.

CAUTION:
Be careful not to rotate the stop light switch.

2. INSPECT THE RESISTANCE

1) If the stop light switch does not operate properly, replace with a new part.
2) Measure the resistance between stop light switch terminals.



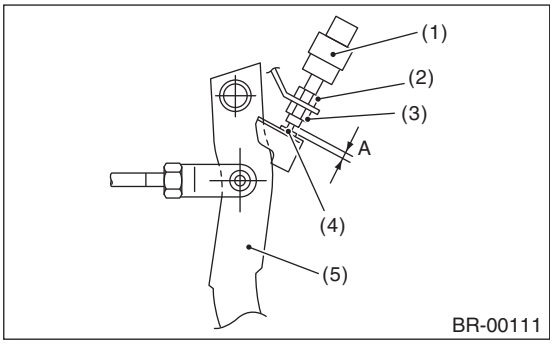
Pedal	Terminal No.	Standard
Released	2 and 3	1 MΩ or more
Depressed		Less than 1 Ω

3) Replace the stop light switch if the inspection result is not within the standard value.

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 (0.82 kgf-m, 5.9 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 (A) will become approximately 0.3 mm (0.012 in).

16.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) Wear, deteriorated surface material, water or fluid on lining	Replace, grind or clean.
	(4) Improper operation of master cylinder, disc caliper, brake booster or check valve	Correct or replace.
2. Unstable or uneven braking	(1) Fluid on lining or rotor	Correct the cause of fluid leakage, and clean or replace.
	(2) Rotor defective	Repair or replace the rotor.
	(3) Improper lining contact, deteriorated surface, deteriorated or worn lining material	Repair by grinding, or replace.
	(4) Deformed back plate	Correct or replace.
	(5) Overinflation of tires	Adjust the air pressure.
	(6) Defective wheel alignment	Adjust alignment.
	(7) Loose back plate or support installation bolt	Tighten to the specified torque.
	(8) Faulty wheel bearing	Replace.
	(9) Defective hydraulic system	Replace the cylinder, brake pipe or hose.
	(10) Unstable performance of the 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) 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 system	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) Improper disc caliper operation	Correct or replace.
	(7) Faulty wheel bearing	Replace.
5. Brake noise (1) (creaking sound)	(1) Hardened or deteriorated brake pad	Replace the pad.
	(2) Worn brake pad	Replace the pad.
	(3) Loose back plate or support installation bolt	Tighten to the specified torque.
	(4) Loose wheel bearing	Tighten to the specified torque.
	(5) Dirty rotor	Clean the rotor, or clean and replace brake assembly.
6. Brake noise (2) (hissing sound)	(1) Worn brake pad	Replace the pad.
	(2) Improperly installed pad	Correct or replace the pad.
	(3) Loose or bent rotor	Retighten or replace.
7. Brake noise (3) (click sound)	Excessively worn pad or support	Replace the pad or the support.

PARKING BRAKE

PB

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2. Parking Brake Lever 4
3. Parking Brake Cable 5
4. Parking Brake Assembly (Rear Disc Brake) 6
5. General Diagnostic Table 9

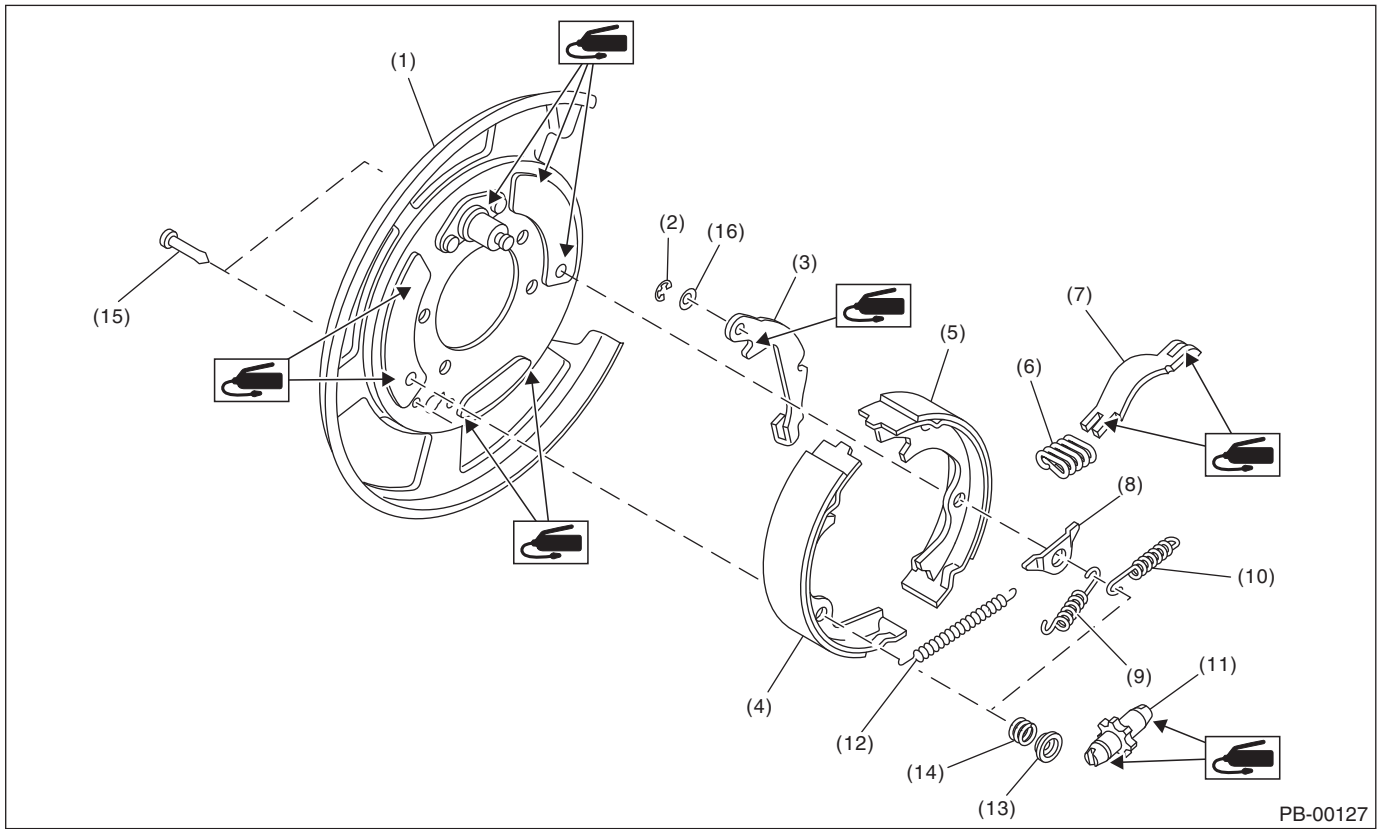
1. General Description

A: SPECIFICATION

Model	Rear disc brake
Type	Mechanical, drum in disc rear brakes
Effective drum diameter mm (in)	190 (7.48)
Lining dimensions (Length × Width × Thickness) mm (in)	165.8 × 30.0 × 2.8 (6.53 × 1.181 × 0.11)
Clearance adjustment	Manual adjustment
Lever stroke Notches/N (kgf, lbf)	7 — 8/200 (20.4, 45)

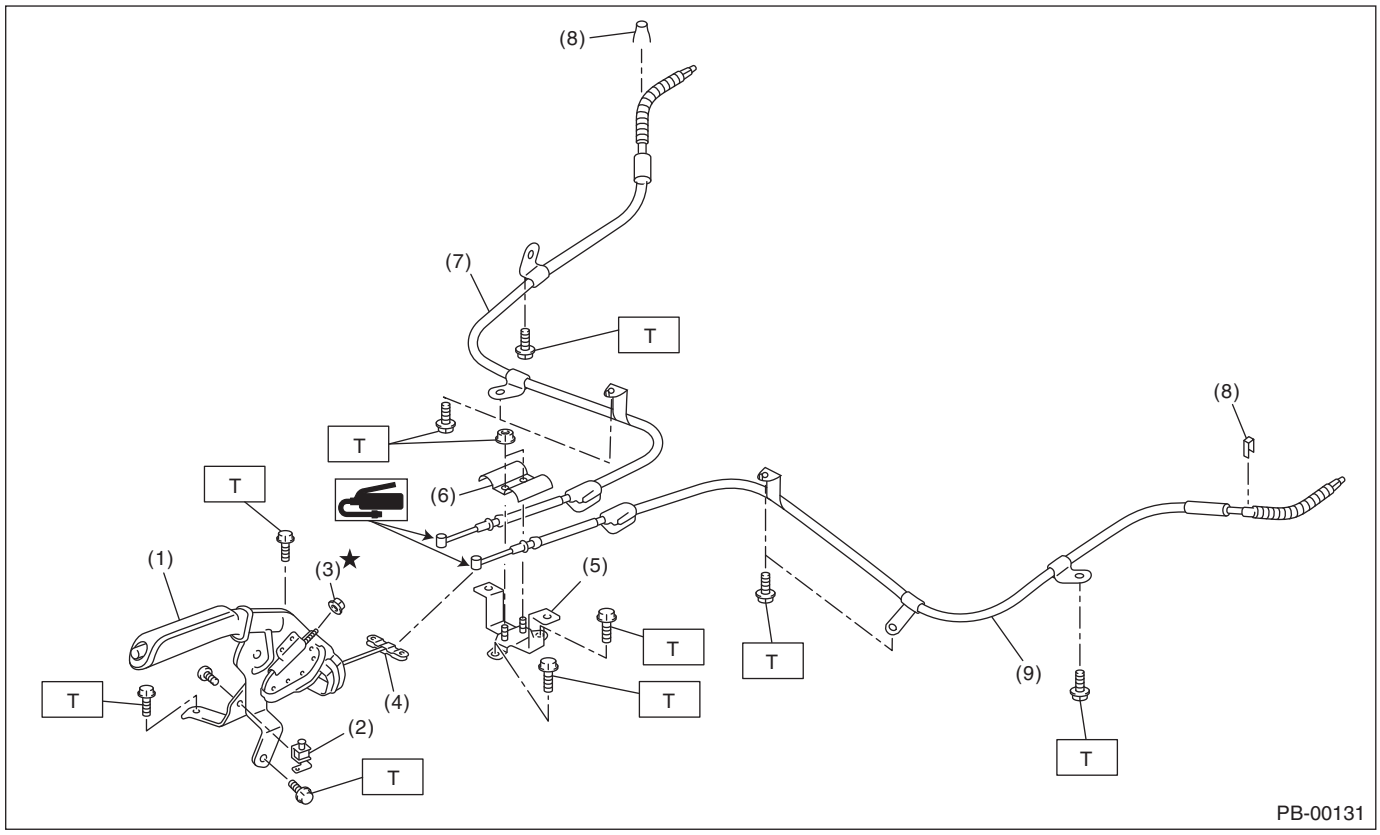
B: COMPONENT

1. PARKING BRAKE (REAR DISC BRAKE)



(1) Back plate
(2) Retainer
(3) Lever
(4) Parking brake shoe (Primary)
(5) Parking brake shoe (Secondary)
(6) Strut spring
(7) Strut
(8) Shoe guide plate
(9) Primary return spring
(10) Secondary return spring
(11) Adjusting screw
(12) Adjusting spring
(13) Shoe hold-down cup
(14) Shoe hold-down spring
(15) Shoe hold-down pin
(16) Wave washer

2. PARKING BRAKE LEVER AND CABLE



(1) Parking brake lever
(2) Parking brake switch
(3) Adjusting nut (self-locking nut)
(4) Equalizer
(5) Bracket
(6) Clamp
(7) Parking brake cable RH
(8) Clamp
(9) Parking brake cable LH

Tightening torque:N·m (kgf-m, ft-lb)
T: 18 (1.84, 13.3)

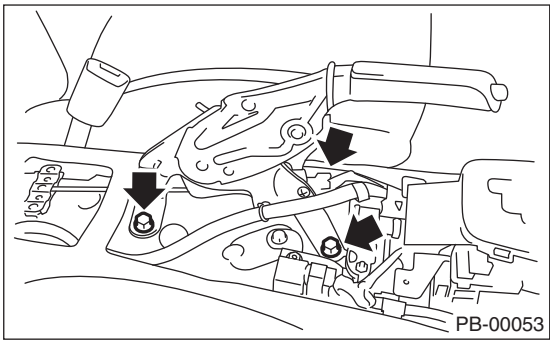
C: CAUTION

- 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.
- Make sure grease does not come into contact with the parking shoes.

2. Parking Brake Lever

A: REMOVAL

1) Set the wheel stoppers to tires.
2) Remove the console box. <Ref. to EI-49, REMOVAL, Console Box.>
3) Disconnect the parking brake switch connector.
4) Remove the parking cable adjusting nut (self-locking nut).
5) Remove the bolt, and then detach the parking brake lever.



B: INSTALLATION

1) Install each part in the reverse order of removal.

Tightening torque:
Parking brake lever
18 N·m (1.84 kgf-m, 13.3 ft-lb)

2) Install a new adjusting nut (self-locking nut).
3) Be sure to adjust the lever stroke. <Ref. to PB-4, ADJUSTMENT, Parking Brake Lever.>

C: INSPECTION

1) Operate the parking brake lever 3 to 4 times and fully return the lever.
2) While slowly pulling the parking brake lever upward, count the notches.

Lever stroke:
7 to 8 notches when pulled with a force of 200 N (20.4 kgf, 45 lbf)

3) Adjust the parking brake if the inspection result is not within the standard value. <Ref. to PB-8, ADJUSTMENT, Parking Brake Assembly (Rear Disc Brake).>

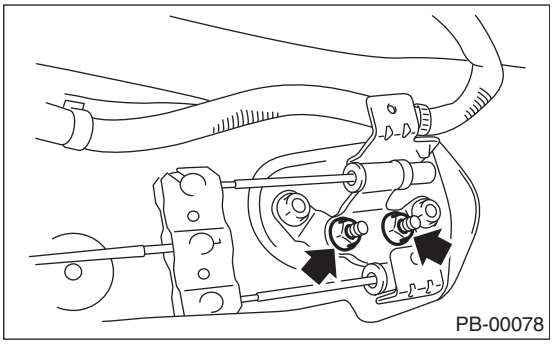
D: ADJUSTMENT

Adjust the parking lever stroke. <Ref. to PB-8, LEVER STROKE, ADJUSTMENT, Parking Brake Assembly (Rear Disc Brake).>

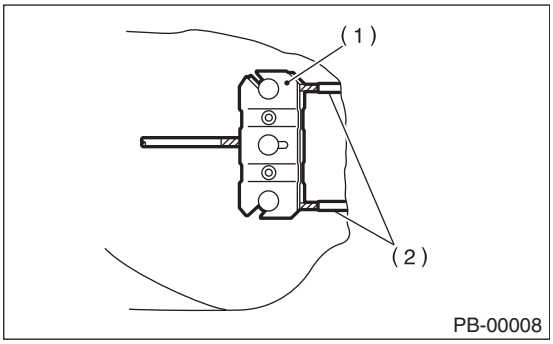
3. Parking Brake Cable

A: REMOVAL

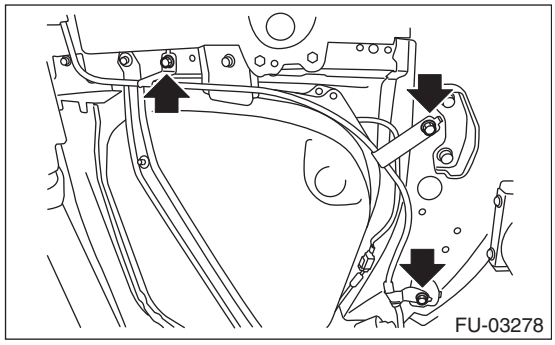
1) Remove the rear seat cushion. <Ref. to SE-16, REMOVAL, Rear Seat.>
2) Remove the console box. <Ref. to EI-49, REMOVAL, Console Box.>
3) Remove the parking cable adjusting nut (self-locking nut).
4) Remove the parking brake lever. <Ref. to PB-4, REMOVAL, Parking Brake Lever.>
5) Roll up the floor mat, remove the nuts, and then remove the clamps.



6) Remove the inner cable end (2) from the equalizer (1).



7) Lift up the vehicle, and then remove the rear wheels.
8) Remove the parking brake cable from rear brake. <Ref. to PB-6, REMOVAL, Parking Brake Assembly (Rear Disc Brake).>
9) Remove the clamp from the rear brake.
10) Remove the cable clamp from the rear arm bracket.
11) Remove the bolt and detach the cable clamp from the rear floor.



12) Remove the grommet from the rear floor, and remove the cable assembly.

B: INSTALLATION

1) Install each part in the reverse order of removal.

NOTE:
Be sure to pass the cable through the tunnel in the cable guide.

Tightening torque:
Cable clamp
18 N·m (1.84 kgf-m, 13.3 ft-lb)

2) Be sure to adjust the lever stroke. <Ref. to PB-4, ADJUSTMENT, Parking Brake Lever.>

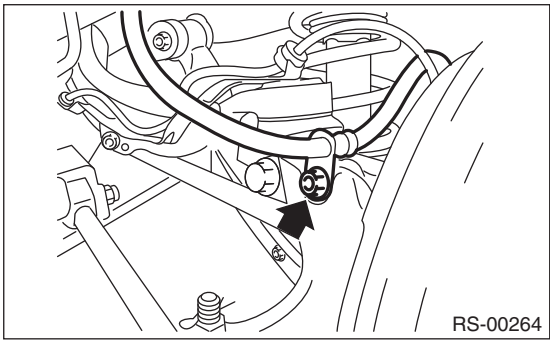
C: INSPECTION

Check and replace the removed cable if damaged, rusty or faulty.
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.

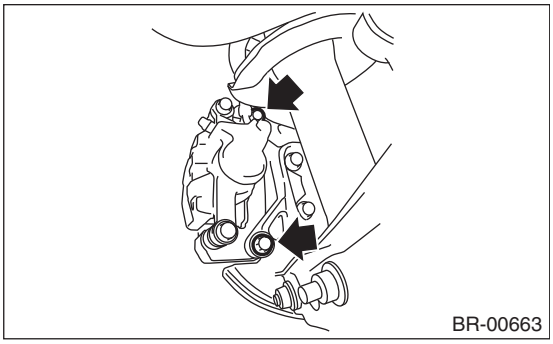
4. Parking Brake Assembly (Rear Disc Brake)

A: REMOVAL

1) Release the parking brake.
2) Lift up the vehicle, and then remove the rear wheels.
3) Remove the bolts and then remove the brake hose bracket.



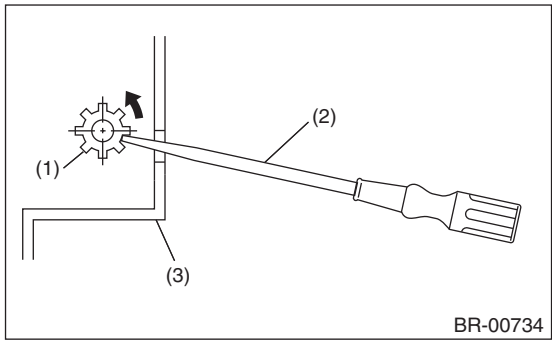
4) Remove the attachment bolts and remove the rear caliper body assembly.



5) Suspend the rear caliper body assembly so that the brake hose is not stretched.
6) Remove the rear disc rotor.

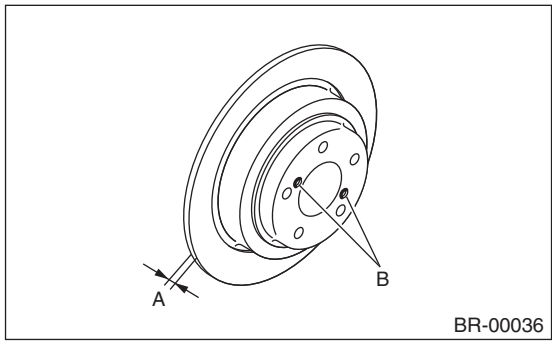
NOTE:
If the disc rotor is difficult to remove, try the following two methods in order.

(1) Turn the adjusting screw using a flat tip screwdriver until the brake shoe moves adequately away from the disc rotor.

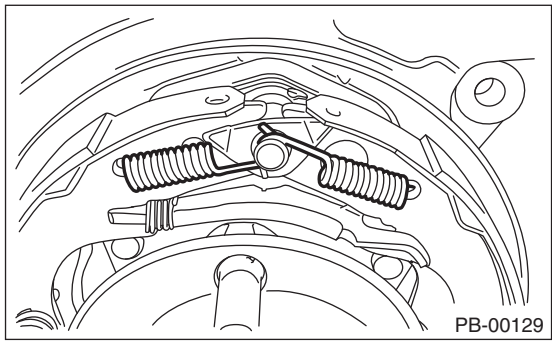


(1) Adjusting screw
(2) Flat tip screwdriver
(3) Disc rotor

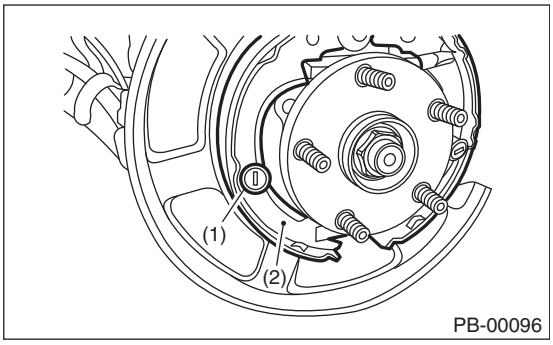
(2) If disc rotor is seized on the hub, drive the disc rotor out by pushing two 8 mm bolts in holes B on the rotor.



7) Remove the shoe return spring.

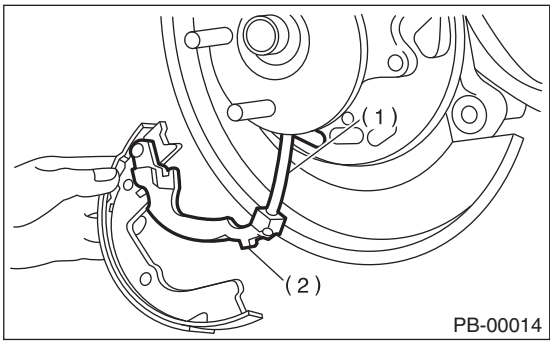


8) Remove the brake shoe cup and brake shoe spring, and remove the primary brake shoe.



(1) Brake shoe cup
(2) Primary brake shoe

9) Remove the strut and strut spring.
10) Remove the adjusting screw.
11) Remove brake shoe cup and brake shoe spring, and remove the secondary brake shoe.
12) Remove the parking brake cable from lever.



(1) Parking brake cable
(2) Lever

13) Remove a retainer from the secondary side brake shoe. Remove the lever from the brake shoe.

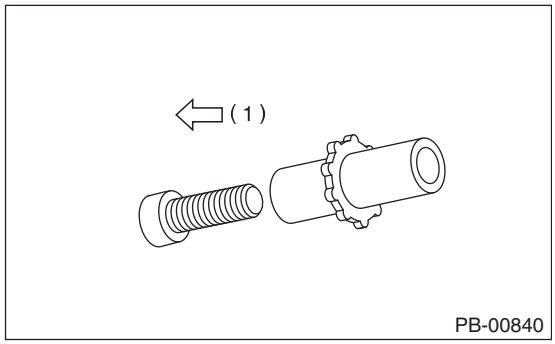
B: INSTALLATION

CAUTION:
Be sure the lining surface is free from brake fluid and grease.
1) Apply brake grease to the following locations.

Brake grease:
Brake Grease (Part No. 003602002)
- Six contact surfaces of the brake shoe rim and back plate gasket
- Contact surface of the brake shoe and the anchor pin
- Contact surface of the parking brake lever and strut
- Contact surface of the brake shoe and adjusting screw
- Contact surface of the brake shoe and strut
- Contact surface of the lever and brake shoe

2) Install the wave washer and lever to the secondary side brake shoe pin, and lock the retainer securely.
3) Install the parking brake cable to the lever.
4) Install the adjusting screw and adjusting spring to the brake shoe.

NOTE:
Install the adjusting screw with the screw section facing toward the direction shown in the figure below.



(1) Left wheel: front side of vehicle, right wheel: rear side of vehicle

5) Check that the parking brake cable does not fall from the cable guide.
6) Install the brake shoes to the back plate with shoe hold pins, brake shoe springs, and brake shoe cups.
7) Install the strut and strut spring to the brake shoes.

NOTE:
Install the strut springs on front side of the vehicle.
8) Install the return springs on the primary side first, and then the secondary side.
9) Install the rear disc rotors and rear caliper body assembly.

Tightening torque:
Caliper body assembly
66 N·m (6.73 kgf-m, 48.7 ft-lb)
10) Install the brake hose bracket.

Tightening torque:
33 N·m (3.36 kgf-m, 24.3 ft-lb)
11) Adjust the parking brake. <Ref. to PB-8, ADJUSTMENT, Parking Brake Assembly (Rear Disc Brake).>

12) If new brake shoes are replaced, drive the vehicle to break-in the parking brake lining.
(1) Drive the vehicle at approximately 35 km/h (22 MPH) or more.
(2) With the parking brake lever 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 steps (1) through (3) again.
(5) After breaking-in, re-adjust the parking brakes.

C: INSPECTION

1) Measure the inner diameter of the disc rotor. If scoring or worn is found on the disc, replace the disc rotor.

Disc rotor inner diameter:
Standard
190 mm (7.48 in)
Service limit
191 mm (7.52 in)

2) Measure the lining thickness. If it exceeds the limit, replace the brake shoe.

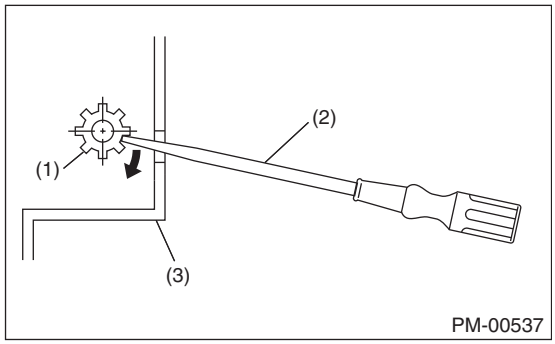
Lining thickness:
Standard
2.8 mm (0.11 in)
Service limit
1.5 mm (0.059 in)

NOTE:
Replace the right and left brake shoe as a set.

D: ADJUSTMENT

1. SHOE CLEARANCE

1) Return the parking brake lever fully.
2) Loosen the adjusting nut, and make the cable free.
3) Remove the adjusting hole cover from the disc rotor.
4) Using a flat tip screwdriver, turn the adjusting screw in the direction of the arrow as shown in the figure until the brake shoe is in close contact with the disc rotor.



(1) Adjusting screw
(2) Flat tip screwdriver
(3) Disc rotor

5) Loosen the adjusting screw by 5 notches to opposite direction of arrow.

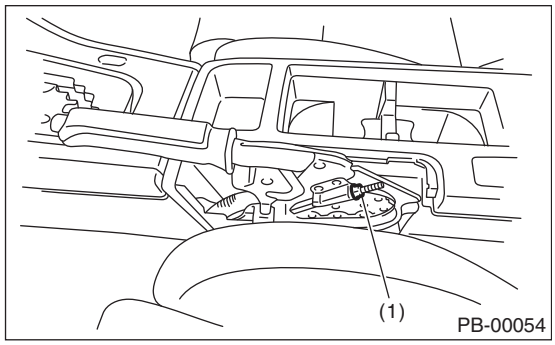
CAUTION:
• Check there is no brake drag.
• If the amount that the adjusting screw is turned back is little, securely loosen it by 5 notches to avoid dragging.

6) Install the adjusting hole cover to the disc rotor.
7) Adjust the parking lever stroke. <Ref. to PB-8, LEVER STROKE, ADJUSTMENT, Parking Brake Assembly (Rear Disc Brake).>

2. LEVER STROKE

1) Adjust the shoe clearance before adjusting lever stroke. <Ref. to PB-8, SHOE CLEARANCE, ADJUSTMENT, Parking Brake Assembly (Rear Disc Brake).>
2) Remove the parking lever cover.
3) Pull the parking brake lever hard 3 to 5 times.
4) Turn the adjusting nut until the lever stroke is at the specified value.

Lever stroke:
7 to 8 notches when pulled with a force of 200 N (20.4 kgf, 45 lbf)



(1) Adjusting nut (Self-locking nut)

5) Check there is no brake drag.
6) Install the parking lever cover.

5. General Diagnostic Table

A: INSPECTION

Symptom	Possible cause	Corrective action
Brake drag	Parking brake lever is not adjusted correctly.	Adjust.
	Parking brake cable does not move.	Correct or replace.
	Parking brake shoe clearance is maladjusted.	Adjust.
	Return spring is faulty.	Replace.
Noise from brake	Return spring is faulty.	Replace.
	Shoe hold-down spring faulty.	Replace.

POWER ASSISTED SYSTEM (POWER STEERING)

PS

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1.	General Description	2
2.	Steering Wheel	13
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6.	Pipe Assembly	36
7.	Oil Pump	42
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1. General Description

A: SPECIFICATION

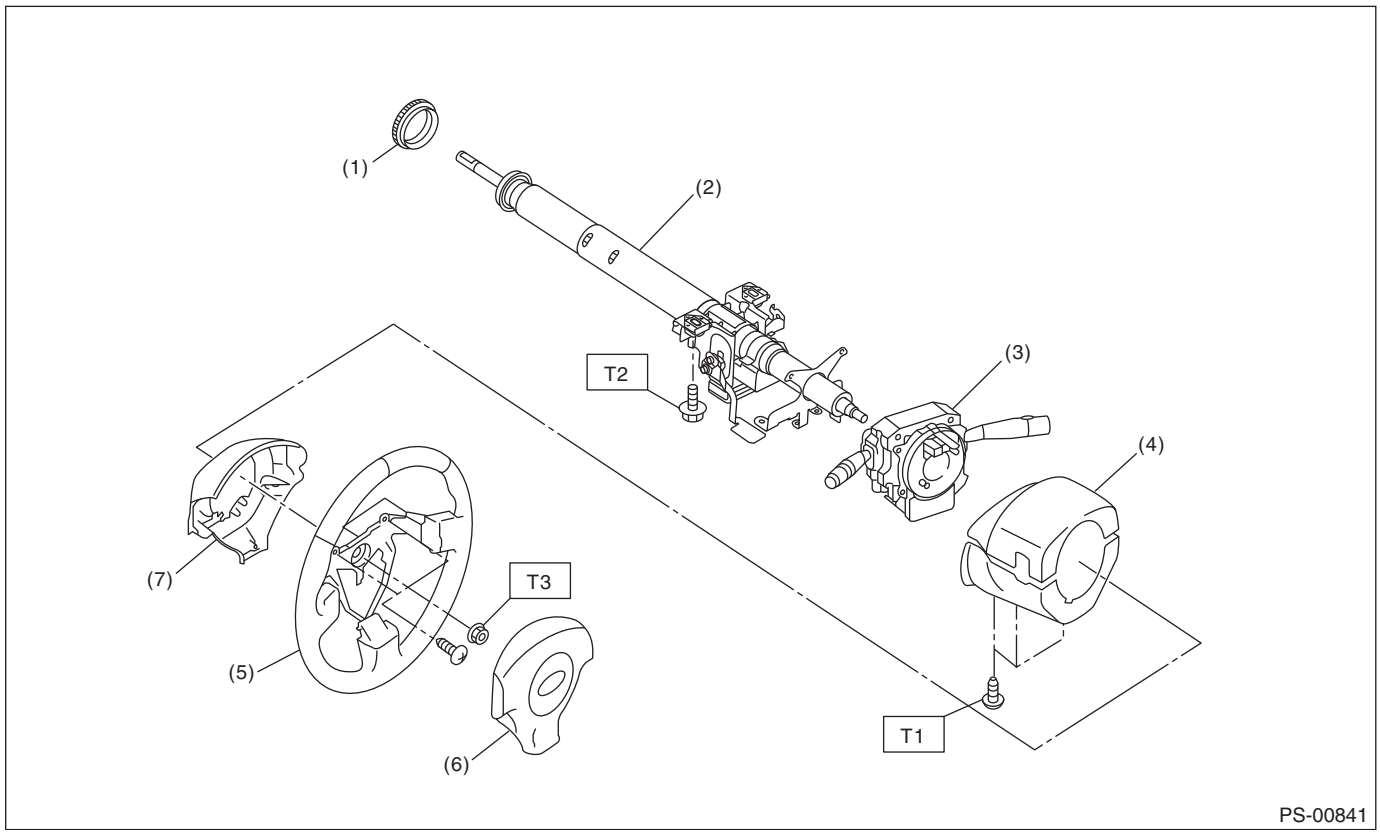
Model			Non-turbo model	Turbo model
Whole system	Minimum turning radius m (ft)		5.3 (17.4)	
	Steering angle	Inner wheel	38.3°±1.5°	
		Outer wheel	33.8°±1.5°	
	Steering wheel diameter mm (in)		375 (14.76)	
	Lock-to-lock revolution number		3.2	
Gearbox	Type		Rack and Pinion, Integral	
	Backlash		0 (Automatic adjusting)	
	Valve (Power steering system)		Rotary valve	
Pump (Power steering system)	Type		Vane pump	
	Oil tank		Installed on body	
	Specific output cm^3 (cu in)/rev.		7.2 (0.439)	8.5 (0.519)
	Relief pressure kPa (kgf/cm^2, psi)		7,350 — 8,050 (75 — 82, 1,066 — 1,167)	8,100 — 8,800 (83 — 90, 1,174 — 1,276)
	Hydraulic fluid control		Engine speed sensitive	
	Hydraulic fluid ℓ (US qt, Imp qt)		1,000 rpm: 6.5 (6.9, 5.7) 3,000 rpm: 5 (5.3, 4.4)	1,000 rpm: 6.3 (6.7, 5.5) 3,000 rpm: 5.9 (6.2, 5.2)
	RPM range rpm		680 — 9,800	680 — 9,600
	Direction of rotation		Clockwise	
Hydraulic oil (Power steering system)	Capacity ℓ (US qt, Imp qt)	Oil tank	0.2 (0.2, 0.2)	
		Whole system	0.7 (0.7, 0.6)	

Steering wheel	Free play		mm (in)	17 (0.67)
Steering shaft	Clearance between the steering wheel and column cover		mm (in)	2 — 4 (0.08 — 0.16)
Steering gearbox (Power steering system)	Sliding resistance		N (kgf, lbf)	314 (32, 71) or less Difference between right and left sliding resistance: 20% or less
	Rack shaft play in the radial direction	Right-turn steering	mm (in)	0.4 (0.016) or less
		Left-turn steering	mm (in)	Horizontal play: 0.6 (0.024) or less Vertical play: 0.4 (0.016) or less
	Input shaft play	In radial direction	mm (in)	0.18 (0.0071) or less
		In axial direction	mm (in)	0.27 (0.0106) or less
	Rotation resistance		N (kgf, lbf)	Maximum allowable value: 13 (1.33, 2.9) or less Difference between right and left sliding resistance: 20% or less
Oil pump (Power steering system)	Pulley shaft	Radial play	mm (in)	0.2 (0.008) or less
		Axial play	mm (in)	0.9 (0.035) or less
	Pulley	Ditch deflection	mm (in)	1.0 (0.039) or less
		Rotation resistance	N (kgf, lbf)	9.22 (0.94, 2.07) or less
	Regular pressure (Unloaded)		kPa (kgf/cm^2, psi)	981 (10, 142) or less
Steering wheel effort (Power steering system)	At standstill with engine idling on paved road		N (kgf, lbf)	29.4 (2.99, 6.6) or less
	At standstill with engine stalled on paved road		N (kgf, lbf)	294.2 (29.9, 66.2) or less

Recommended power steering fluid
SUBARU genuine ATF or DEXRON III

B: COMPONENT

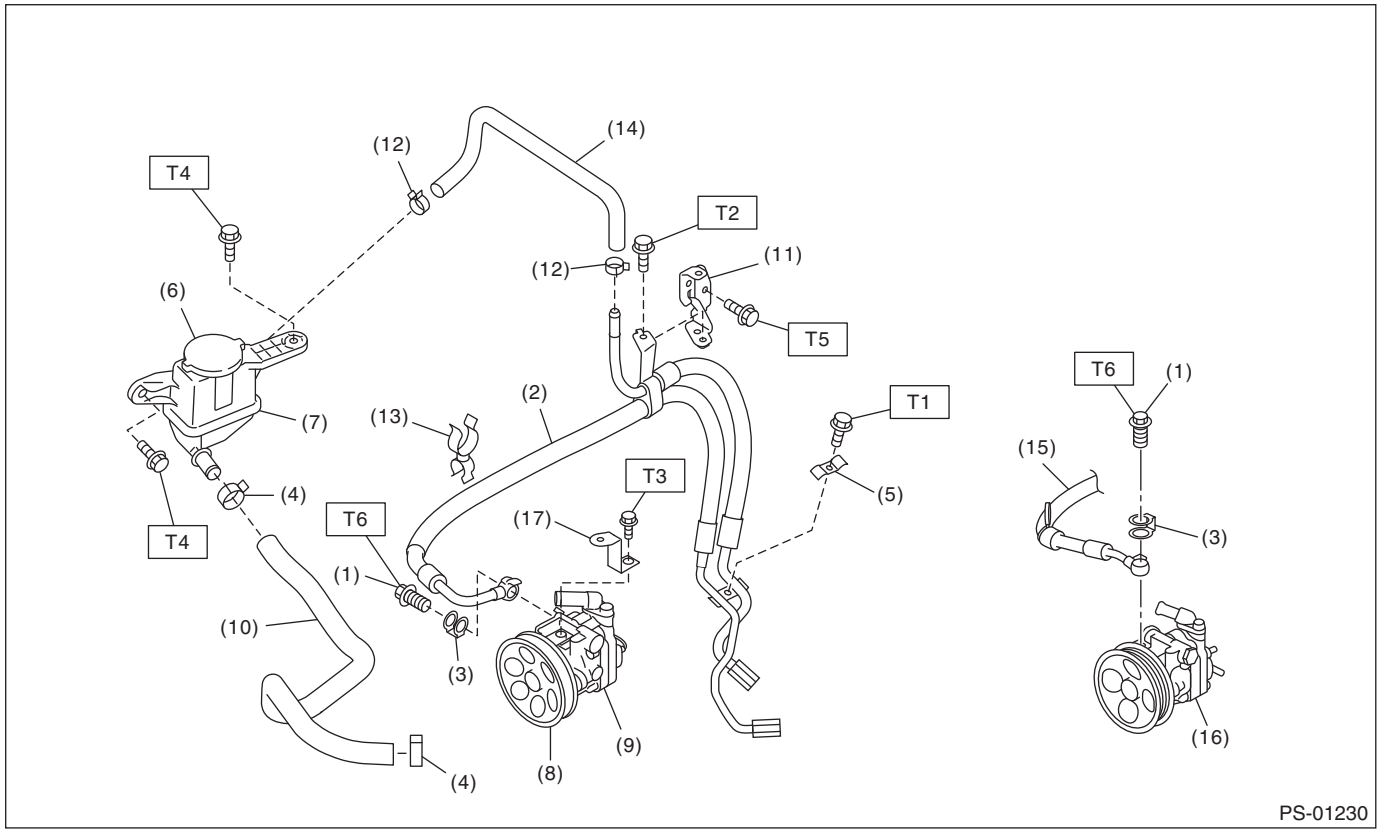
1. STEERING WHEEL AND COLUMN



(1)	Bushing	(5)	Steering wheel	***Tightening torque:N·m (kgf-m, ft-lb)***
(2)	Steering shaft	(6)	Airbag module	***T1: 1.2 (0.12, 0.9)***
(3)	Steering roll connector	(7)	Steering wheel lower cover	***T2: 20 (2.04, 14.8)***
(4)	Column cover			***T3: 39 (3.98, 28.8)***

2. POWER ASSISTED SYSTEM

- Hose and tank

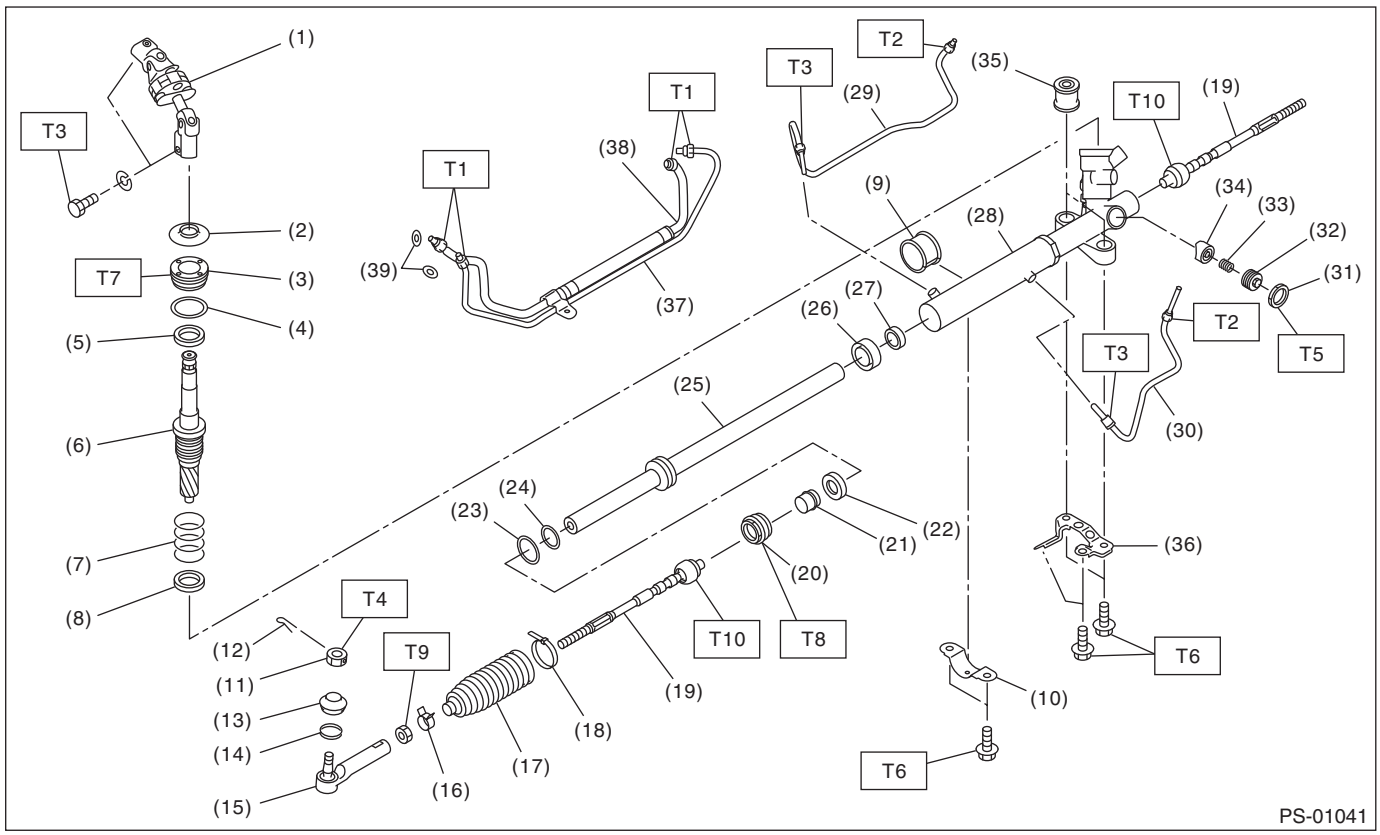


(1)	Eye bolt	(10)	Suction hose
(2)	Hose (turbo model)	(11)	Hose bracket
(3)	Eye bolt gasket	(12)	Clip
(4)	Clip	(13)	Clip
(5)	Clamp E	(14)	Return hose
(6)	Cap	(15)	Hose (non-turbo model)
(7)	Reservoir tank	(16)	Oil pump (non-turbo model)
(8)	Pulley	(17)	Belt cover bracket
(9)	Oil pump (turbo model)		

Tightening torque:N·m (kgf-m, ft-lb)

T1: 7.5 (0.76, 5.5)
T2: 10 (1.02, 7.4)
T3: 11 (1.12, 8.1)
T4: 13 (1.33, 9.6)
T5: 18 (1.84, 13.3)
T6: 40 (4.08, 29.5)

- Gearbox



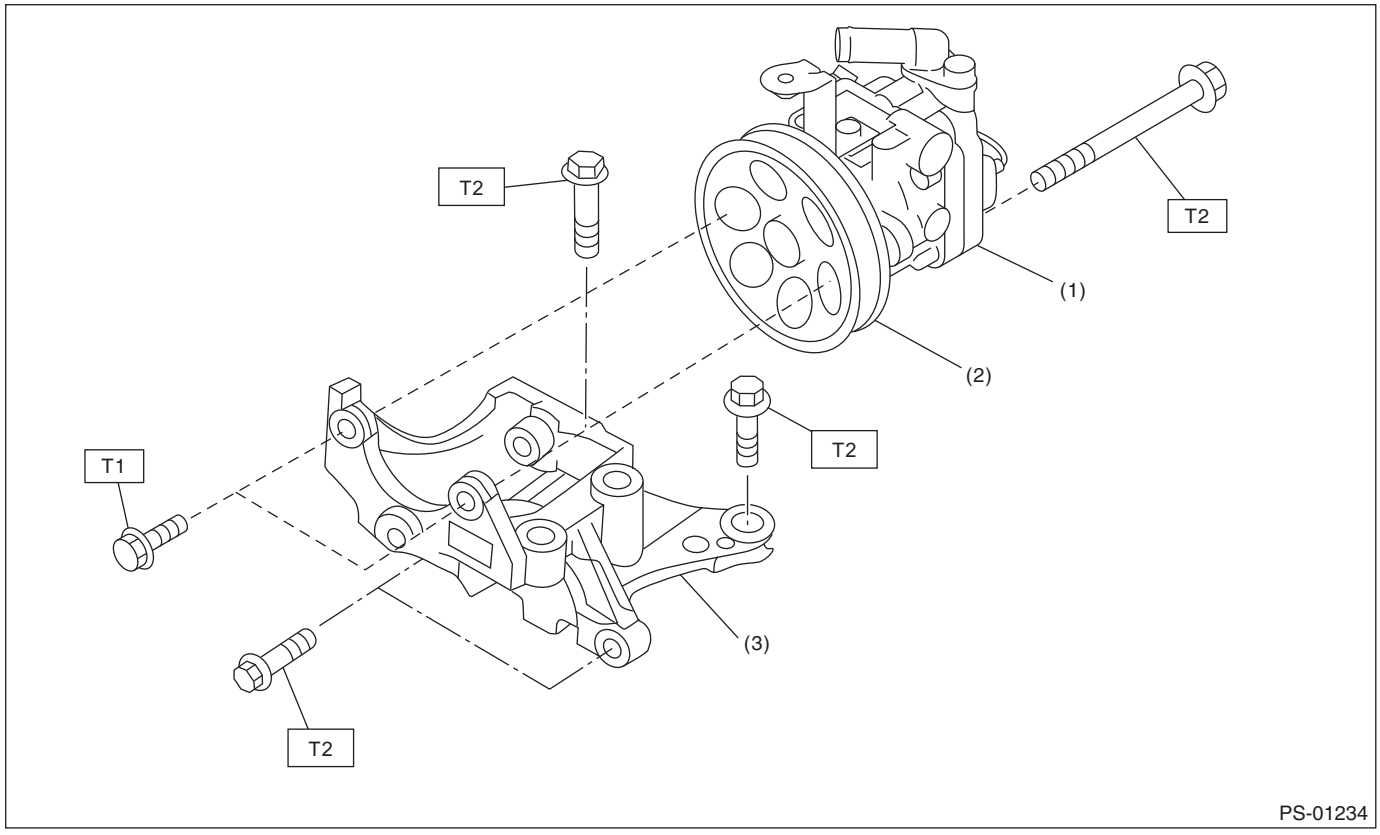
(1) Universal joint
(2) Dust cover
(3) Plug
(4) O-ring
(5) Oil seal
(6) Control valve
(7) Seal ring
(8) Oil seal
(9) Adapter
(10) Clamp
(11) Castle nut
(12) Cotter pin
(13) Dust seal
(14) Clip
(15) Tie-rod end
(16) Clip
(17) Boot
(18) Band
(19) Tie-rod
(20) Holder
(21) Bushing
(22) Oil seal
(23) Seal ring
(24) O-ring
(25) Rack
(26) Oil seal
(27) Back-up washer
(28) Steering body
(29) Pipe A
(30) Pipe B
(31) Lock nut
(32) Adjusting screw
(33) Spring
(34) Sleeve
(35) Bushing
(36) Stiffener
(37) Feed pipe
(38) Return pipe
(39) O-ring

Tightening torque:N·m (kgf-m, ft-lb)

T1: 15 (1.53, 11.1)
T2: 20 (2.04, 14.8)
T3: 24 (2.45, 17.7)
T4: 27 (2.75, 19.9)
T5: 39 (3.98, 28.8)
T6: 60 (6.12, 44.3)
T7: 64 (6.53, 47.2)
T8: 75 (7.65, 55.3)
T9: 85 (8.67, 62.7)
T10: 90 (9.18, 66.4)

3. OIL PUMP

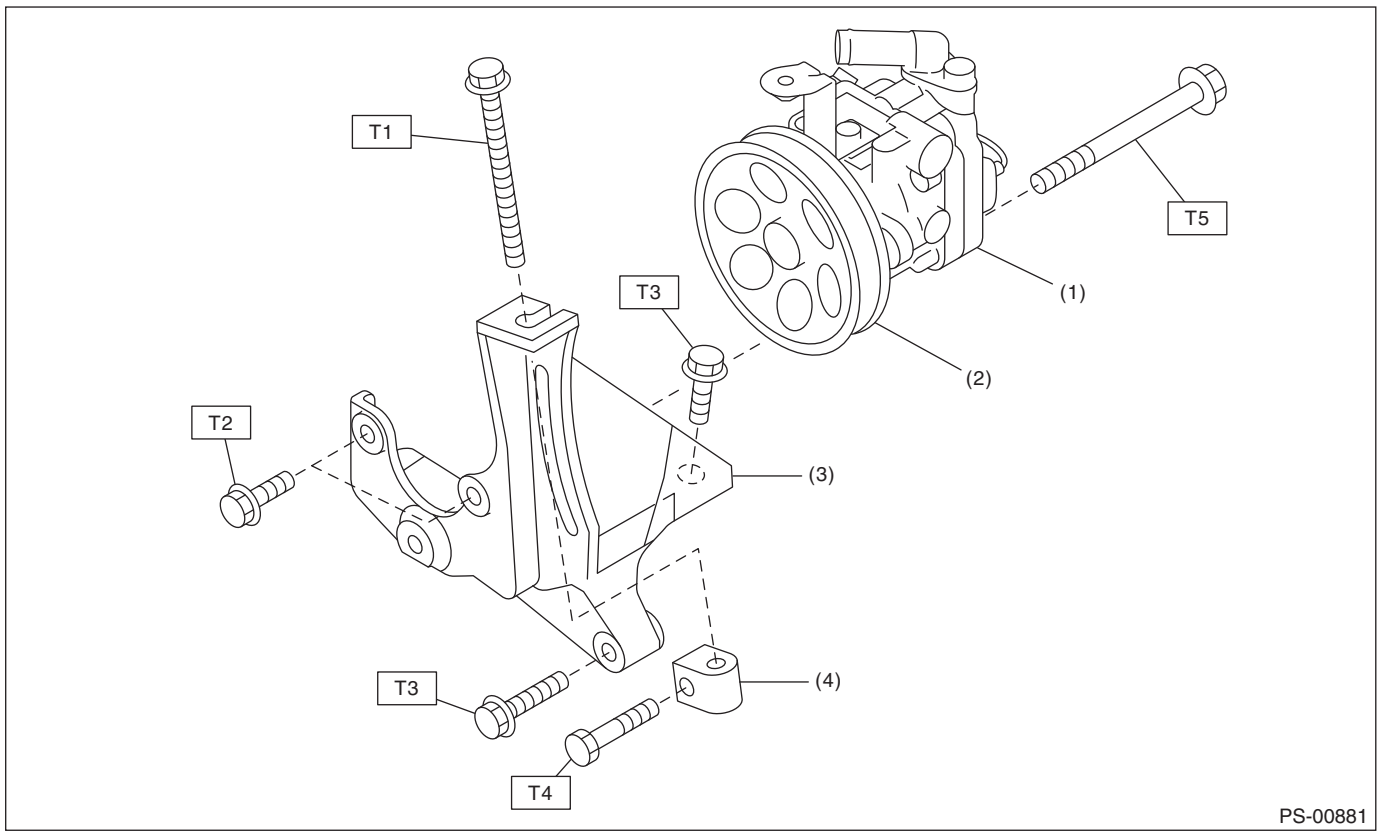
- Non-turbo model



(1) Oil pump
(2) Pulley
(3) Bracket

Tightening torque:N·m (kgf-m, ft-lb)
T1: 16 (1.63, 11.8)
T2: 36 (3.67, 26.6)

• Turbo model



(1) Oil pump
(2) Pulley
(3) Bracket
(4) Belt tension nut

Tightening torque:N·m (kgf-m, ft-lb)
T1: 8.0 (0.82, 5.8)
T2: 16 (1.63, 11.8)
T3: 22 (2.24, 16.2)
T4: 25 (2.55, 18.4)
T5: 48 (4.89, 35.4)

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 power steering 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.
• Before securing a part on a vise, place cushioning material such as wooden blocks, aluminum plate or cloth between the part and the vise.

D: PREPARATION TOOL

1. SPECIAL TOOL

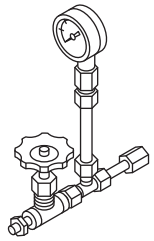
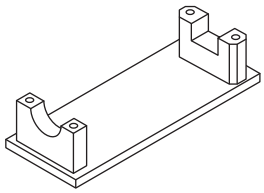
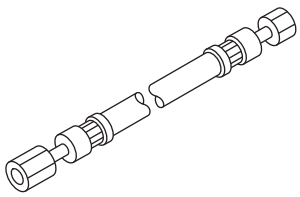
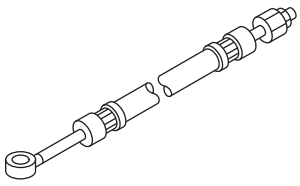
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-925711000	925711000	PRESSURE GAUGE	Used for measuring oil pressure.
 ST-926200000	926200000	STAND	• Used when inspecting characteristic of gear-box assembly and disassembling it. • Used together with BOSS D (34199AG000).
 ST34099AC010	34099AC010	ADAPTER HOSE A	Used together with PRESSURE GAUGE (925711000).
 ST34099AC020	34099AC020	ADAPTER HOSE B	Used together with PRESSURE GAUGE (925711000).

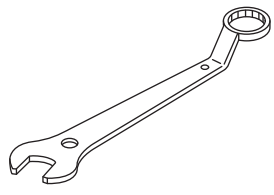
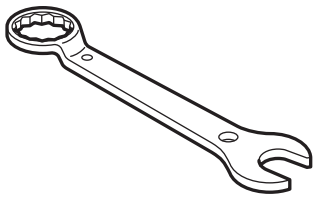
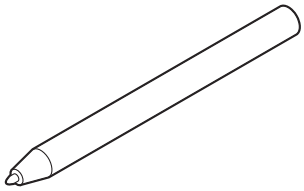
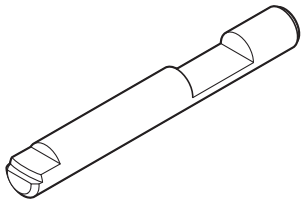
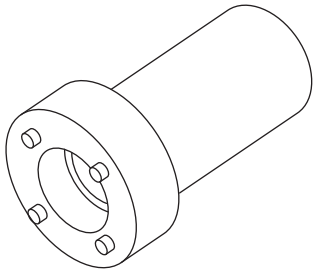
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-926230000	926230000	SPANNER	For the lock nut when adjusting backlash of gearbox.
 ST34099PA100	34099PA100	SPANNER	Used when measuring the rotating resistance of gearbox assembly.
 ST34099FA060	34099FA060	PUNCH HOLDER	Used for crimping.
 ST34099FA080	34099FA080	PUNCH	Used for removing crimps.
 ST34199AE090	34199AE090	PLUG WRENCH	Used for removing the plug.

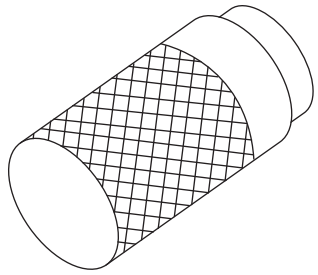
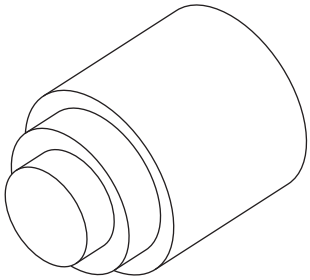
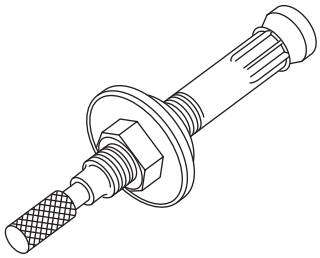
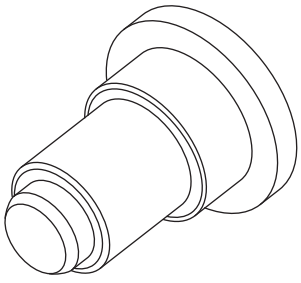
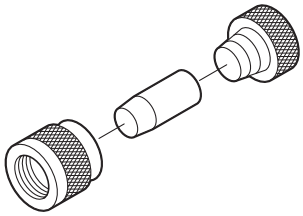
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST34199AE100	34199AE100	OIL SEAL PLUG REMOVER	Used for removing oil seal plug.
 ST34199AE110	34199AE110	OIL SEAL PLUG INSTALLER	Used for installing the oil seal plug.
 ST34199AE120	34199AE120	GEARBOX OIL SEAL REMOVER	Used to remove the oil seal of the gearbox.
 ST34199AE130	34199AE130	GEARBOX OIL SEAL INSTALLER	Used for attaching the gearbox oil seal.
 ST34199FE040	34199FE040	INSTALLER A, B, C	• Used for installing the oil seal to the rack assembly. • INSTALLER A: 34199FE070 • INSTALLER B: 34199FE080 • INSTALLER C: 34199FE090

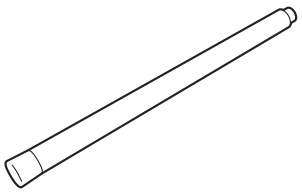
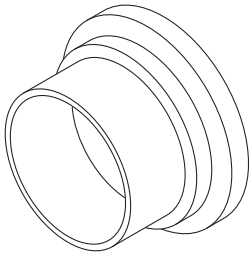
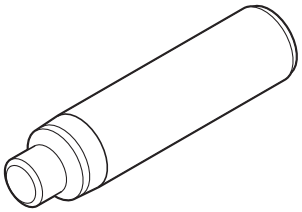
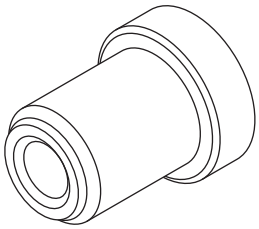
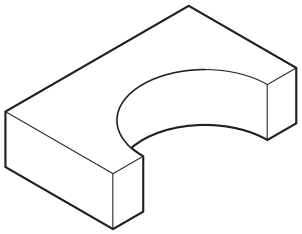
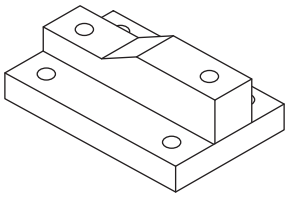
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST34199FE010	34199FE010	REMOVER	Used to remove the backup ring and oil seal.
 ST34199FE050	34199FE050	GUIDE	Used for installing the rack and seal to the housing assembly.
 ST34199FE000	34199FE000	INSTALLER & REMOVER	Used for removing and installing the rack oil seal (outer and inner).
 ST34199FE060	34199FE060	INSTALLER	Used for installing the rack oil seal (outer).
 ST34199FE020	34199FE020	BASE	Used for crimping.

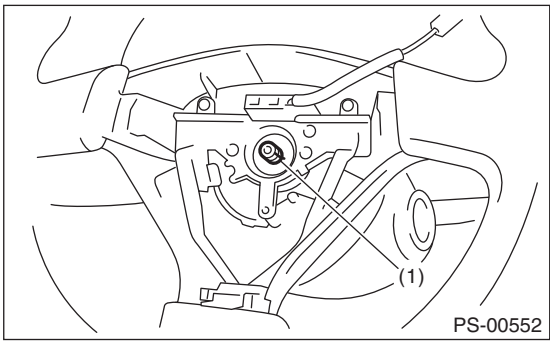
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST34199AG000	34199AG000	BOSS D	• Used when inspecting characteristic of gear-box assembly and disassembling it. • Used together with STAND (926200000).

2. Steering Wheel

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Set the tire to the straight-ahead position.
3) Remove the airbag module. <Ref. to AB-18, REMOVAL, Driver's Airbag Module.>

WARNING:
Always refer to "CAUTION" of "General Description" in "AIRBAG SYSTEM" before performing service on the airbag module. <Ref. to AB-5, 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 shaft using steering puller.

CAUTION:
When removing, always use the steering wheel puller to avoid deforming the steering wheel.

B: INSTALLATION

WARNING:
Always refer to "CAUTION" of "General Description" in "AIRBAG SYSTEM" before performing service on the airbag module. <Ref. to AB-5, CAUTION, General Description.>
1) Align the center position of the roll connector. <Ref. to AB-30, ADJUSTMENT, Roll Connector.>
2) Install each part in the reverse order of removal.

CAUTION:
Insert the roll connector guide pin into the guide hole on the lower end of the steering wheel surface. Avoid damaging the pin.

NOTE:
Align the alignment marks on the steering wheel and steering shaft.

Tightening torque:
39 N·m (3.98 kgf-m, 28.8 ft-lb)

Column cover-to-steering wheel clearance:
2 — 4 mm (0.08 — 0.16 in)

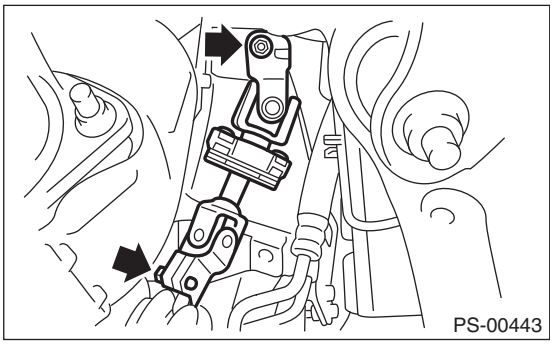
C: INSPECTION

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. Universal Joint

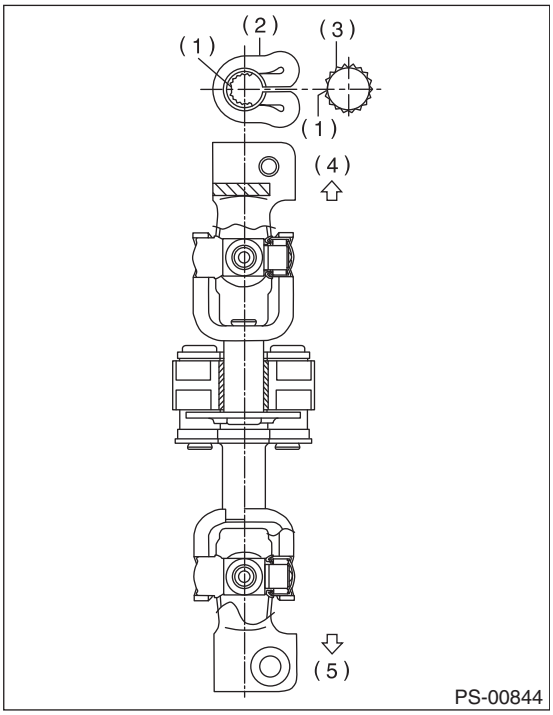
A: REMOVAL

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 remove the universal joint.



B: INSTALLATION

1) Align the cutout portion at serrated section of the column shaft and yoke, then install the universal joint into column shaft.



(1) Cutout portion
(2) Yoke
(3) Column shaft
(4) Column shaft side
(5) Gearbox side

2) Install the universal joint to the serrations of gearbox assembly by matching alignment marks.
3) Tighten the bolts on the gearbox side first, and then the column shaft side.

CAUTION:
Be sure to follow the tightening order and tightening torque of universal joint to avoid the steering effort from becoming heavy.

Tightening torque:
24 N·m (2.45 kgf-m, 17.7 ft-lb)

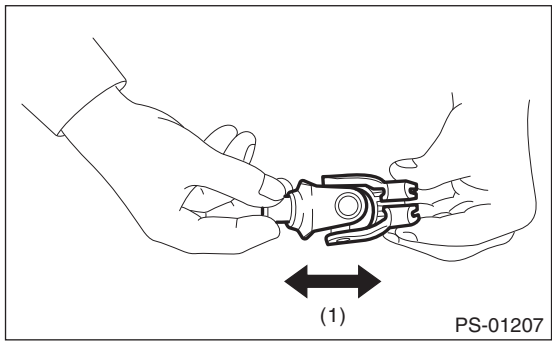
Clearance between coupling of universal joint and turbo cover:
15 mm (0.59 in) or more

4) Align the center position of the roll connector. <Ref. to AB-30, ADJUSTMENT, Roll Connector.>
5) Install the steering wheel. <Ref. to PS-13, INSTALLATION, Steering Wheel.>

C: INSPECTION

1) Check for wear, damage or any other faults. Replace as necessary

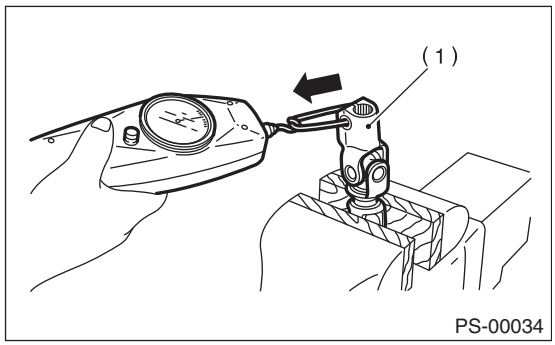
Service limit:
Universal joint play: 0 mm (0 in)



(1) Play

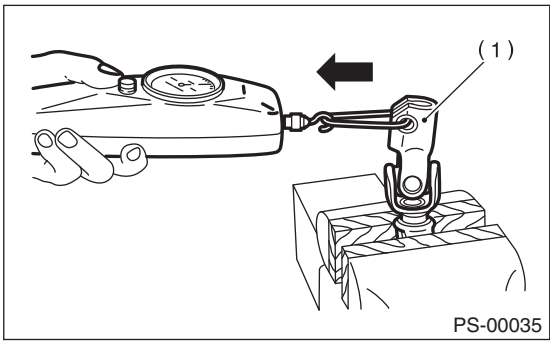
2) Measure the swing torque of universal joint.

Service limit:
Maximum load: 3.8 N (0.39 kgf, 0.86 lbf) or less



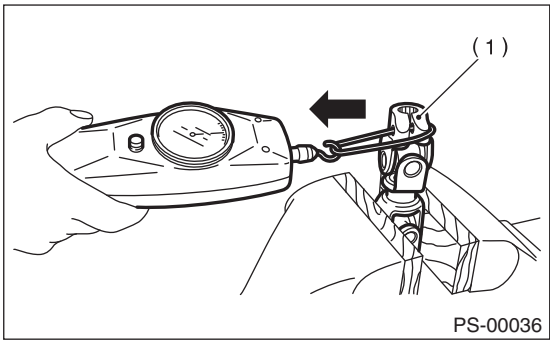
(1) Yoke (Gearbox side)

Service limit:
Maximum load: 3.8 N (0.39 kgf, 0.86 lbf) or less



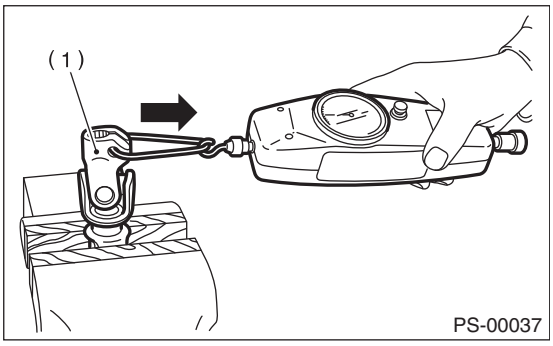
(1) Yoke (Gearbox side)

Service limit:
Maximum load: 7.3 N (0.74 kgf, 1.64 lbf) or less



(1) Yoke (Steering column side)

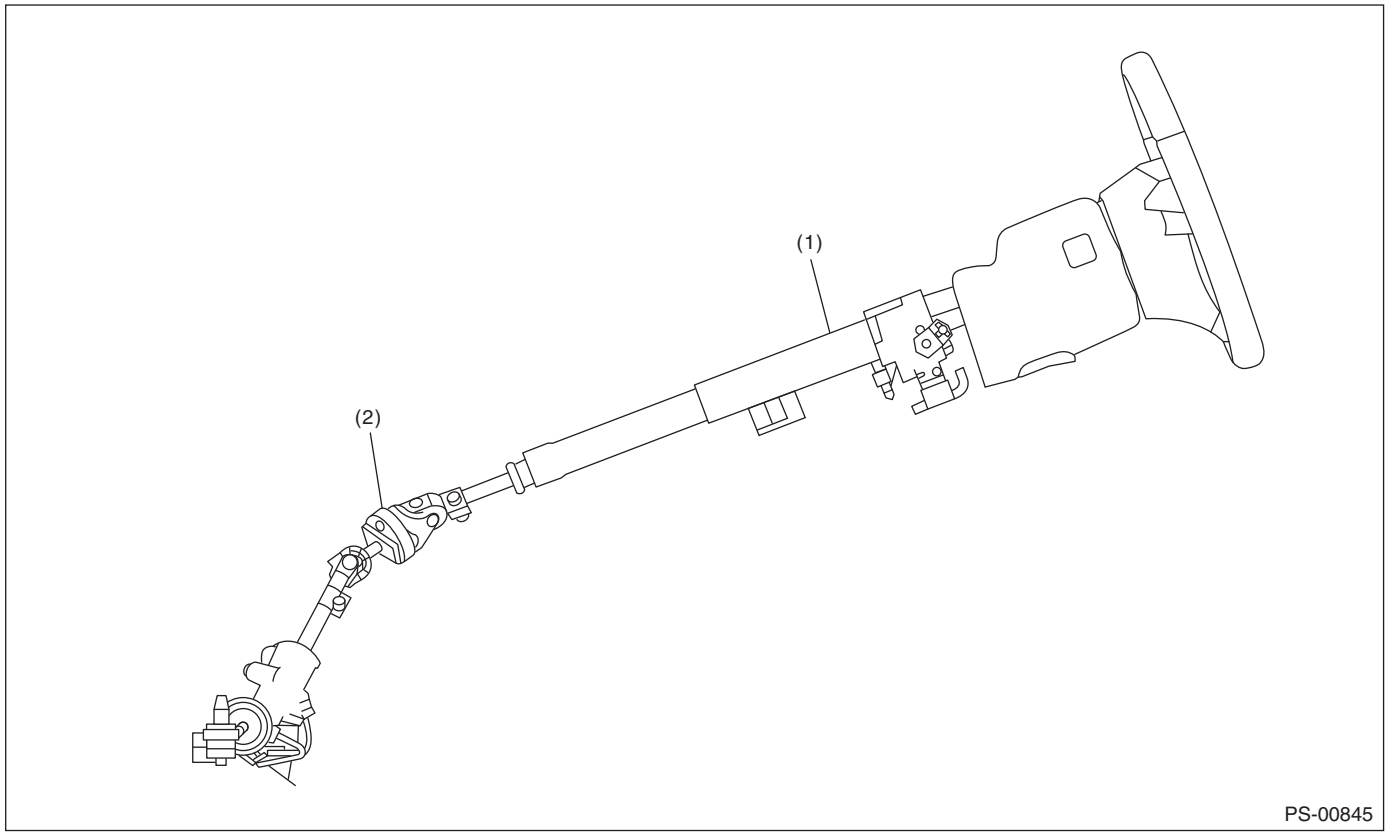
Service limit:
Maximum load: 7.3 N (0.74 kgf, 1.64 lbf) or less



(1) Yoke (Steering column side)

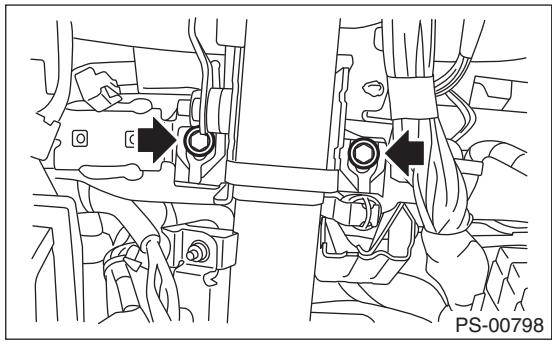
4. Steering Column

A: REMOVAL



(1) Tilt steering column (2) Universal joint

1) Adjust the tilt position of the steering column to the highest position and lock the tilt lever.
2) Remove the steering wheel. <Ref. to PS-13, REMOVAL, Steering Wheel.>
3) Remove the universal joint. <Ref. to PS-14, REMOVAL, Universal Joint.>
4) Remove the instrument panel lower cover under.
5) Remove the instrument panel lower cover upper.
6) Remove the screws which secure the column cover lower, then remove the column cover lower.
7) Remove all connectors from the steering column.
8) Remove the bolts under instrument panel securing the steering column.

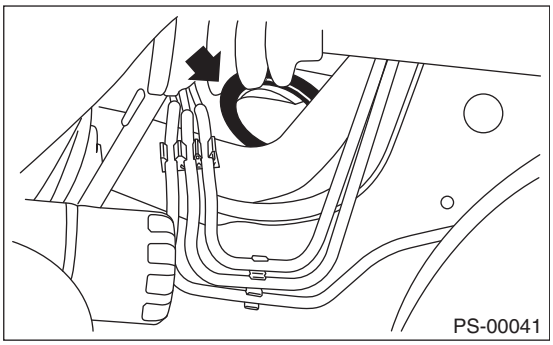


9) Pull out the steering shaft assembly from the hole on toe board.

CAUTION:
• Always remove the universal joint before removing the steering column installation bolt to avoid damage to the universal joint.
• Be sure to remove the universal joint before removing the parts, if the relative position between steering shaft and gearbox changes when removing steering shaft assembly or when lowering it and gearbox for servicing other parts.
• Do not loosen the tilt lever when the steering column is not secured to the vehicle.

B: INSTALLATION

1) Install the grommet to the toe board.



2) Insert the end of the steering shaft into the toe board grommet.
3) With the tilt lever secured, tighten the steering shaft mounting bolts under instrument panel.

Tightening torque:
20 N·m (2.04 kgf-m, 14.8 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 instrument panel lower 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-30, 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.

C: DISASSEMBLY

Remove the screw securing the upper steering column cover, and the screw 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.

CAUTION:
Do not overtorque the screw.

Tightening torque:
1.2 N·m (0.12 kgf-m, 0.9 ft-lb)

E: INSPECTION

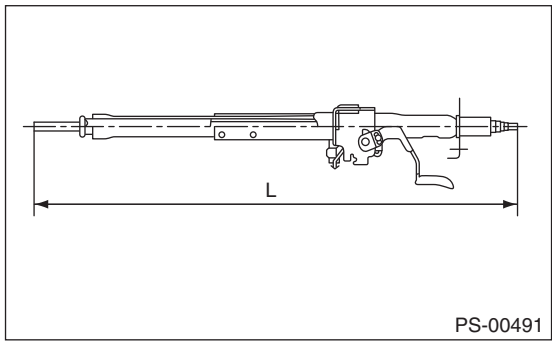
1. BASIC INSPECTION

Measure the overall length of steering column. If not within specification, replace it.

Standard: Overall length L

Tilt column
$833.6^{+1.3}_{-0.3}$ ***mm*** $(32.82^{+0.051}_{-0.012}$ ***in)***

Tilt & telescopic column (measure while minimized)
$823.6^{+1.5}_{-1.5}$ ***mm*** $(32.43^{+0.059}_{-0.059}$ ***in)***



2. INSPECTION OF AIRBAG SYSTEM

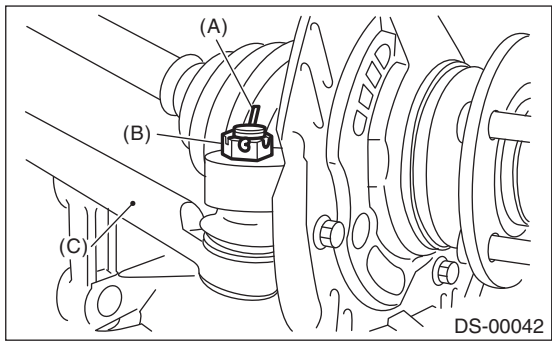
Refer to “Airbag System” for airbag inspection procedure. <Ref. to AB-18, INSPECTION, Driver’s Airbag Module.>

5. Steering Gearbox

A: REMOVAL

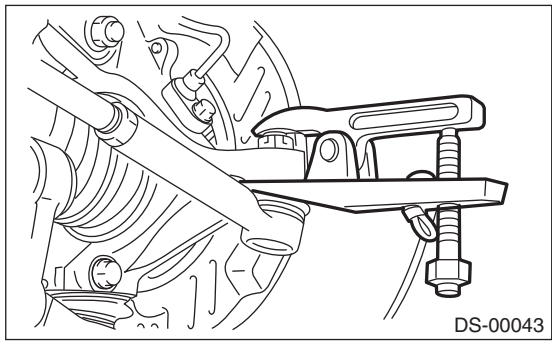
1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.
3) Loosen the front wheel nuts.
4) Lift up the vehicle, and then remove the front wheels.
5) Remove the under cover. <Ref. to EI-26, REMOVAL, Front Under Cover.>
6) Remove the front exhaust pipe assembly.
• Non-turbo model: <Ref. to EX(H4DO)-5, REMOVAL, Front Exhaust Pipe.>
• Turbo model: <Ref. to EX(H4DOTC)-5, REMOVAL, Front Exhaust Pipe.>

WARNING:
Be careful not to burn yourself because the exhaust pipe is hot.
7) Remove the cotter pin and castle nut securing the tie-rod end.

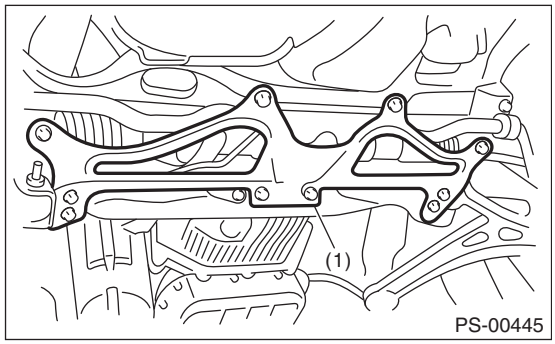


(A) Cotter pin
(B) Castle nut
(C) Tie-rod end

8) Using a puller, remove the tie-rod.

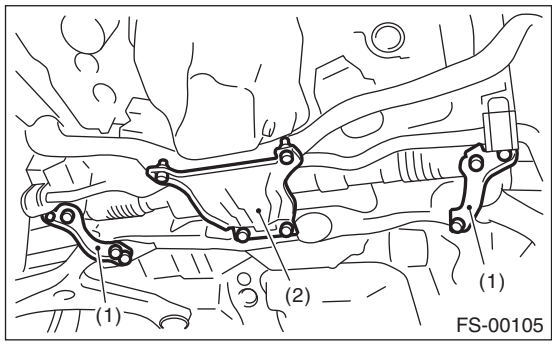


9) Remove the front crossmember support plate, jack-up plate and front stabilizer. <Ref. to FS-14, REMOVAL, Front Stabilizer.>
• Large type



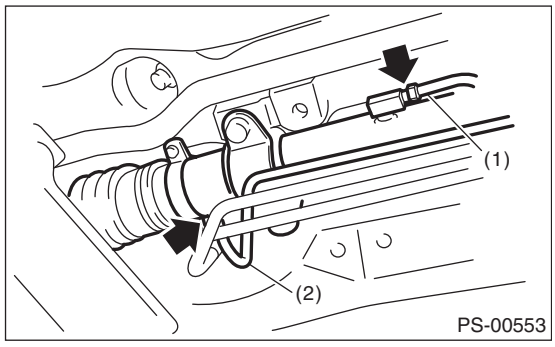
(1) Front crossmember support plate

• Small type



(1) Crossmember support plate
(2) Jack-up plate

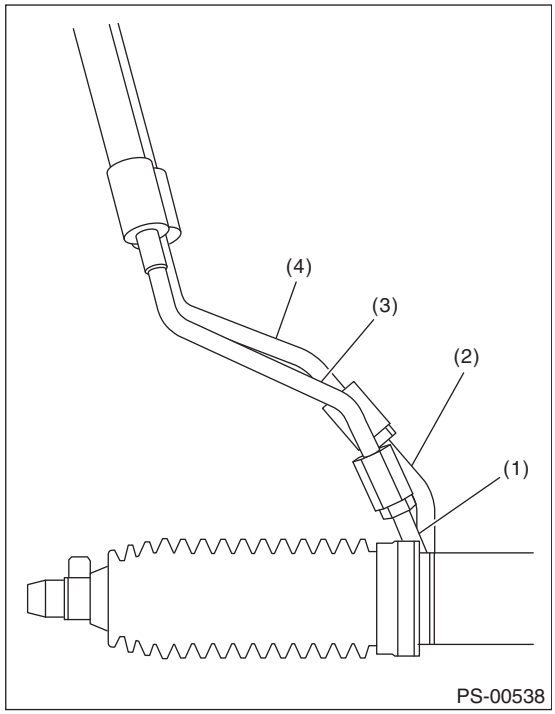
10) Remove the one pipe joint at the center of the gearbox, and connect the vinyl hose to the pipe and the joint. Discharge the fluid by turning the steering wheel fully clockwise and counterclockwise. Discharge the fluid similarly from other pipes.



(1) Pipe A
(2) Pipe B

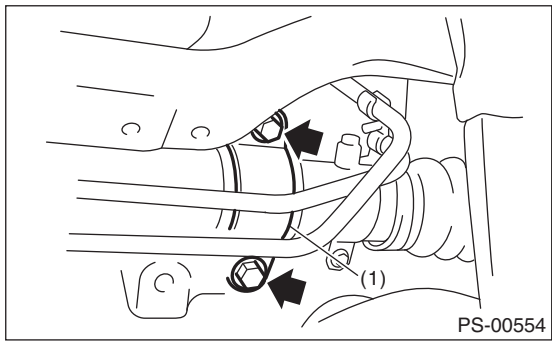
11) Remove the universal joint. <Ref. to PS-14, REMOVAL, Universal Joint.>

12) Disconnect the feed pipe from the pressure hose first, then disconnect the return pipe from the return hose.



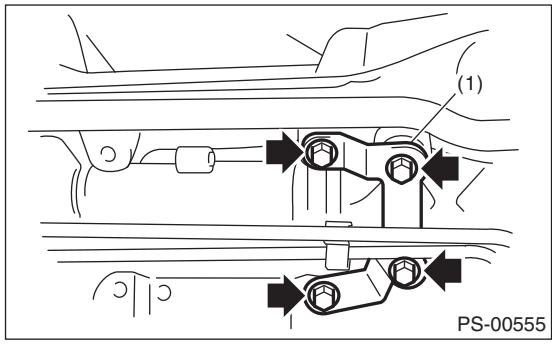
(1) Feed pipe
(2) Return pipe
(3) Pressure hose
(4) Return hose

13) Remove the clamp bolts securing the gearbox to the crossmember, and remove the clamp.



(1) Clamp

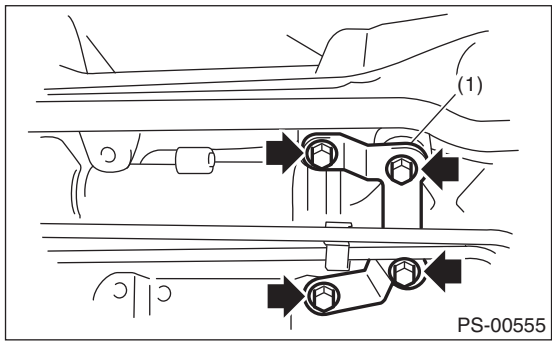
14) Remove the bolts which secure the gearbox bracket, and remove the stiffener and gearbox.



(1) Stiffener

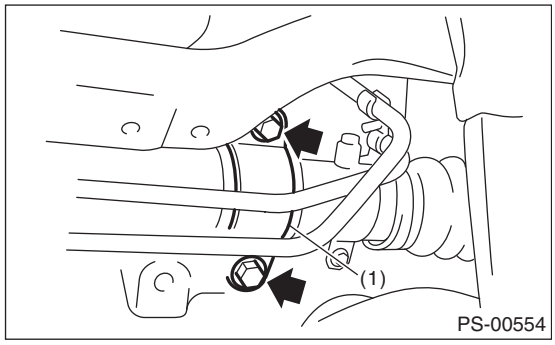
B: INSTALLATION

1) Insert the gearbox into crossmember, being careful not to damage gearbox boot.
2) Install the gearbox and stiffener. Temporarily tighten the bolts.



(1) Stiffener

3) Insert bolts through the clamp to temporarily tighten the gearbox to the crossmember bracket.



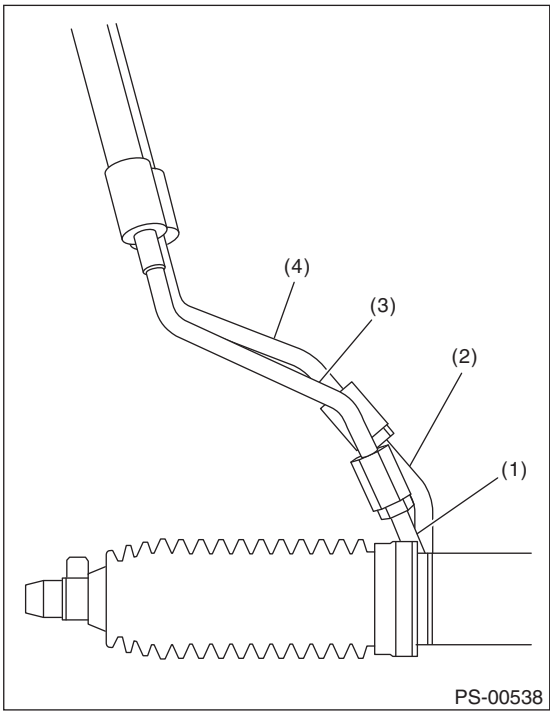
(1) Clamp

4) Tighten the bolts temporarily holding the gearbox clamp and bracket together to the specified torque.

Tightening torque:
60 N·m (6.12 kgf-m, 44.3 ft-lb)

5) Connect the return pipe to the return hose and then connect the feed pipe to the pressure hose.

Tightening torque:
15 N·m (1.53 kgf-m, 11.1 ft-lb)



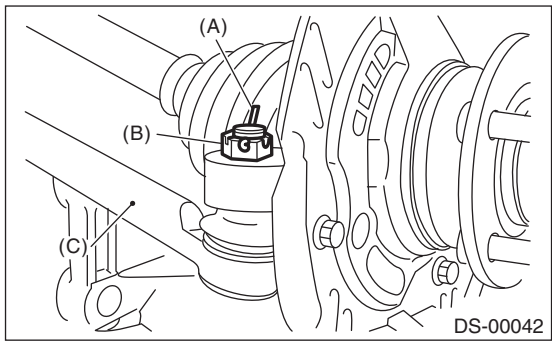
(1) Feed pipe
(2) Return pipe
(3) Pressure hose
(4) Return hose

6) Install the universal joint. <Ref. to PS-14, INSTALLATION, Universal Joint.>
7) Connect the tie-rod end and knuckle arm, and tighten with castle nut.

CAUTION:
When connecting, do not hit the cap at the bottom of tie-rod end with hammer.

Castle nut tightening torque:
27 N·m (2.75 kgf-m, 19.9 ft-lb)

8) 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 the nut, and then bend the pin to lock.



(A) Cotter pin
(B) Castle nut
(C) Tie-rod end

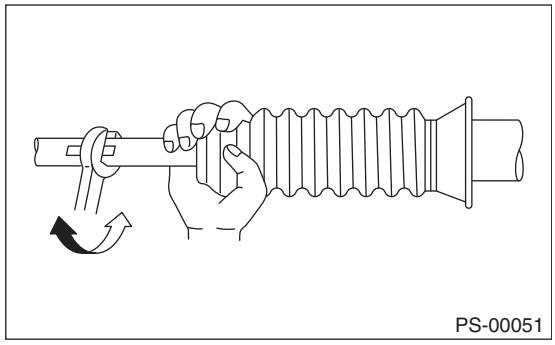
9) Install the front stabilizer. <Ref. to FS-14, INSTALLATION, Front Stabilizer.>
10) Install the front crossmember support plate and jack-up plate.
11) Install the front exhaust pipe assembly.
• Non-turbo model: <Ref. to EX(H4DO)-8, INSTALLATION, Front Exhaust Pipe.>
• Turbo model: <Ref. to EX(H4DOTC)-5, INSTALLATION, Front Exhaust Pipe.>
12) Install the under cover. <Ref. to EI-26, INSTALLATION, Front Under Cover.>
13) Install the front wheels.
14) Tighten the wheel nuts to the specified torque.

Tightening torque:
100 N·m (10.2 kgf-m, 73.8 ft-lb)
15) Lower the vehicle.
16) Remove the steering wheel. <Ref. to PS-13, REMOVAL, Steering Wheel.>
17) Align the center position of the roll connector. <Ref. to AB-30, ADJUSTMENT, Roll Connector.>
18) Install the steering wheel. <Ref. to PS-13, INSTALLATION, Steering Wheel.>
19) Connect the battery ground terminal.
20) Pour fluid into the oil tank, and bleed air. <Ref. to PS-49, Power Steering Fluid.>
21) Check for fluid leaks.
22) Check the fluid level in oil tank.

23) After adjusting toe-in and steering angle, tighten the lock nut on tie-rod end.

Tightening torque:
85 N·m (8.67 kgf-m, 62.7 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.

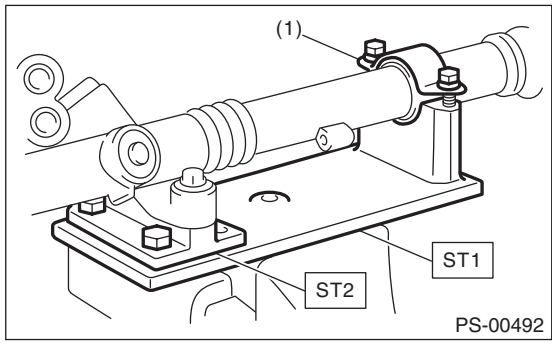

PS-00051

C: DISASSEMBLY

1) Disconnect the four pipes from gearbox.

NOTE:
Remove the pipes C and D, which are fixed to clamp plate, as a unit.
2) Secure the gearbox removed from vehicle in a vise using ST.

CAUTION:
Secure the gearbox assembly in a vise using ST as shown. Do not secure the gearbox to the vise without this ST.
ST1 926200000 STAND
ST2 34199AG000 BOSS D

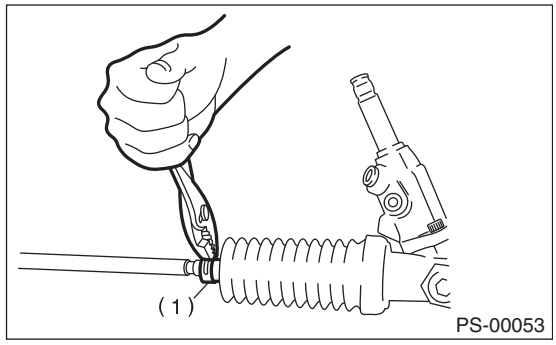


PS-00492

(1) Clamp

3) Remove the tie-rod end and lock nut from gearbox.

4) Remove the small clip from the boot using pliers, and then move the boot to tie-rod end side.

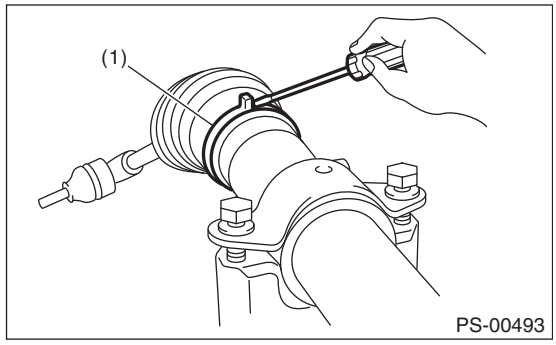


PS-00053

(1) Clip

5) Using a flat tip screwdriver, remove the band from boot.

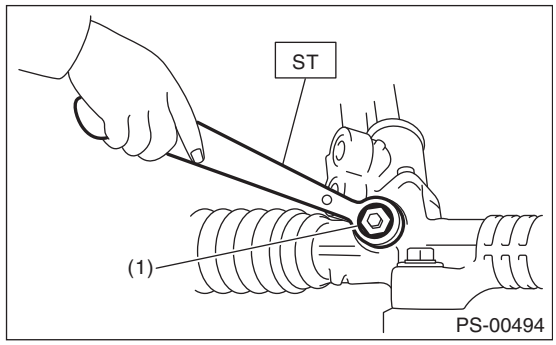
NOTE:
Replace the boot if there is damage, cracks or deterioration.



PS-00493

(1) Band

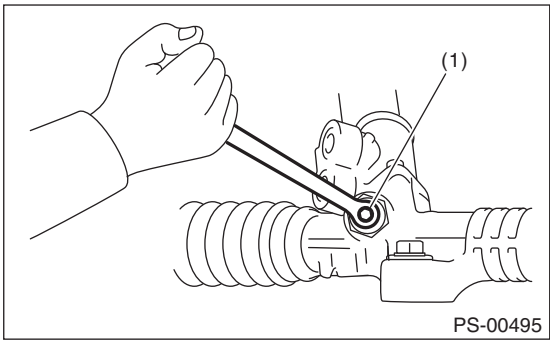
6) Using the ST, loosen the lock nut.
ST 926230000 SPANNER



PS-00494

(1) Lock nut

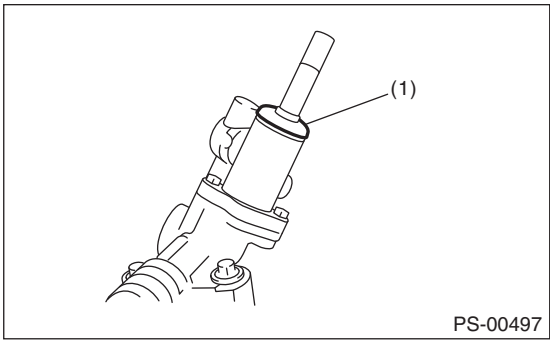
7) Tighten the adjusting screw until it can no longer be tightened.



(1) Adjusting screw

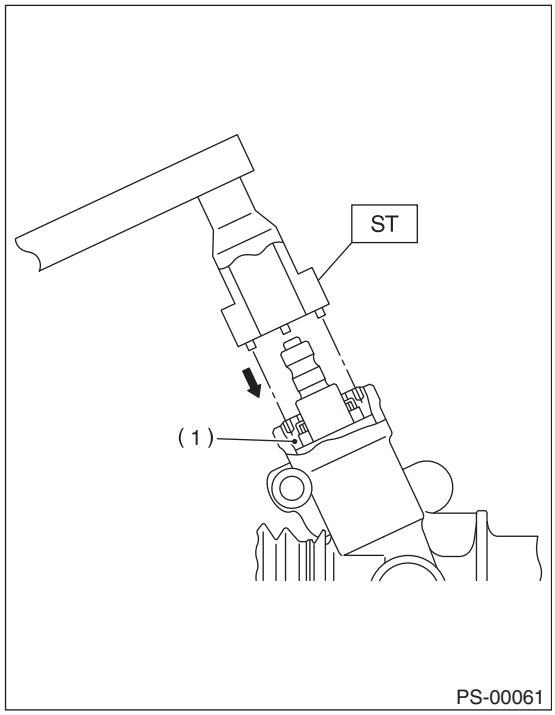
8) Remove the tie-rod.
9) Loosen the adjusting screw, and remove the spring and sleeve.
10) Clean any dirt adhered to the input shaft. Remove the dust cover, paying attention not to scratch the housing or input shaft and not to allow foreign matter to enter gearbox interior.

CAUTION:
Roll a vinyl tape around the input shaft spline to avoid scratching the dust cover.



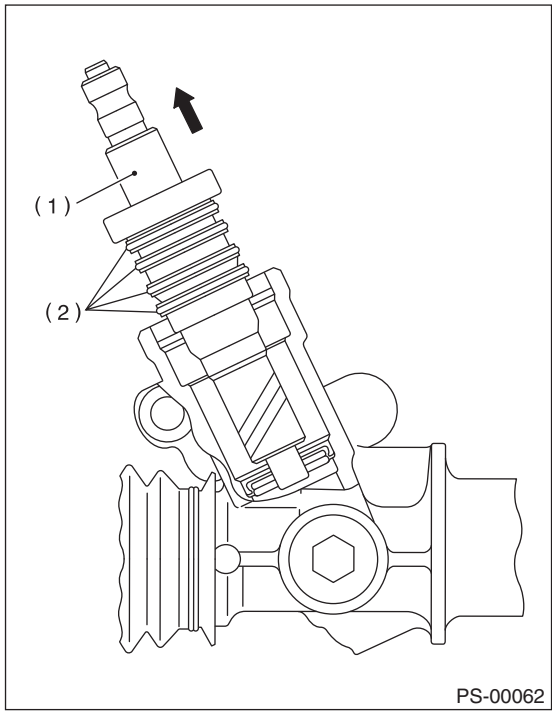
(1) Dust cover

11) Align the ST pin with plug hole to install. Rotate the ST counterclockwise to remove plug.
ST 34199AE090 PLUG WRENCH



(1) Plug

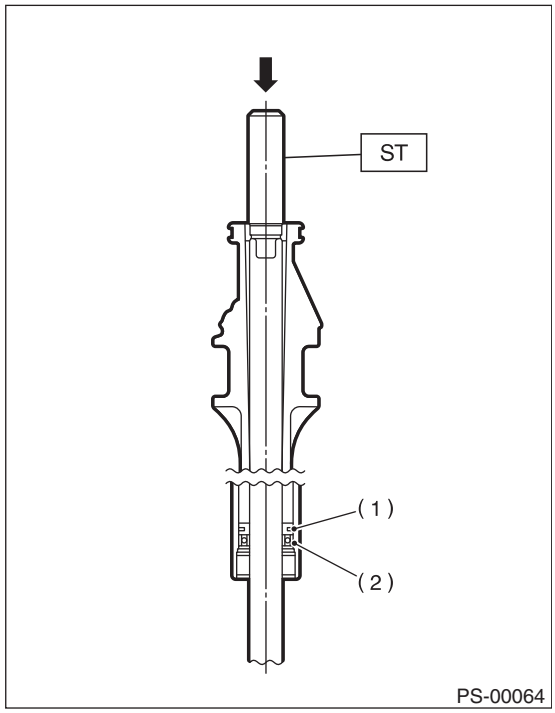
12) Remove the valve assembly paying attention not to scratch the seal ring or valve housing inner surfaces.



(1) Valve ASSY
(2) Seal ring

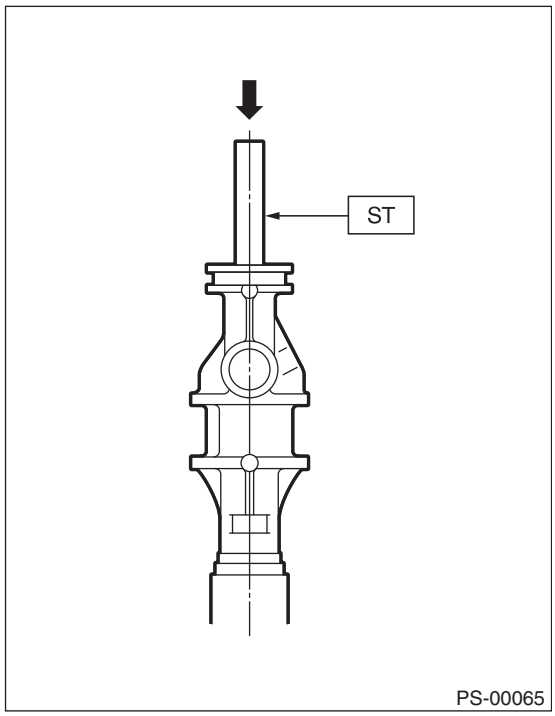
13) Remove the holder.
14) Attach the ST to the pinion housing side of the rack, and push out the rack together with the outer side oil seal.
ST 34199FE000 INSTALLER & REMOVER

NOTE:
Block the pipe connection of steering body to prevent fluid from flowing out.

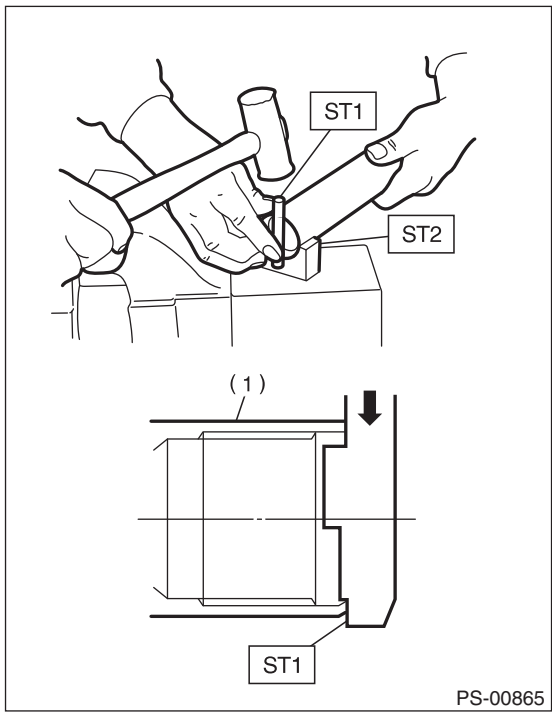


(1) Rack piston
(2) Outer side oil seal

15) Insert the ST from the valve side and press the back-up ring and oil seal out.
ST 34199FE010 REMOVER

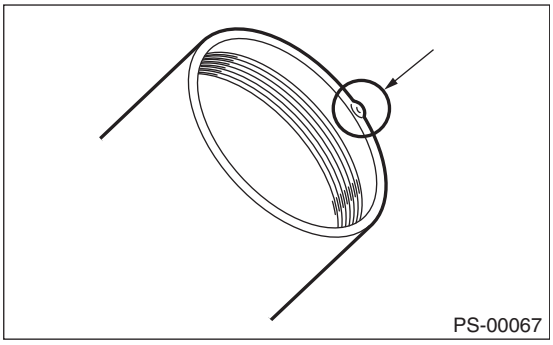


16) Using ST1 and ST2, repair the crimped portion of cylinder.
ST1 34099FA080 PUNCH
ST2 34199FE020 BASE



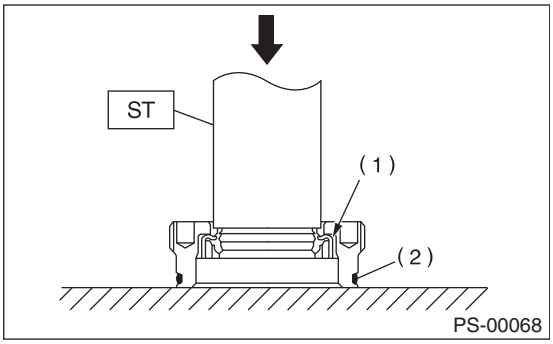
(1) Cylinder

17) If the cylinder edge is deformed in a convex shape, repair using an oil stone.



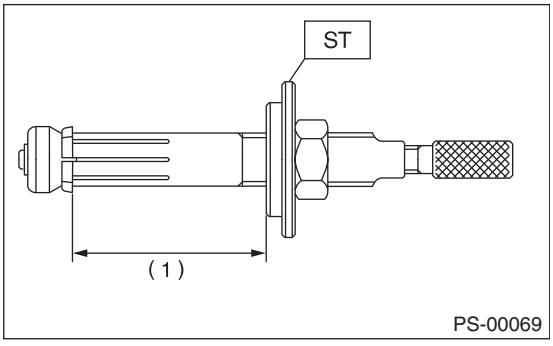
18) Remove the oil seal using ST and push out from the plug.
ST 34199AE100 OIL SEAL PLUG REMOVER

NOTE:
Do not apply force on the plug edge surface.



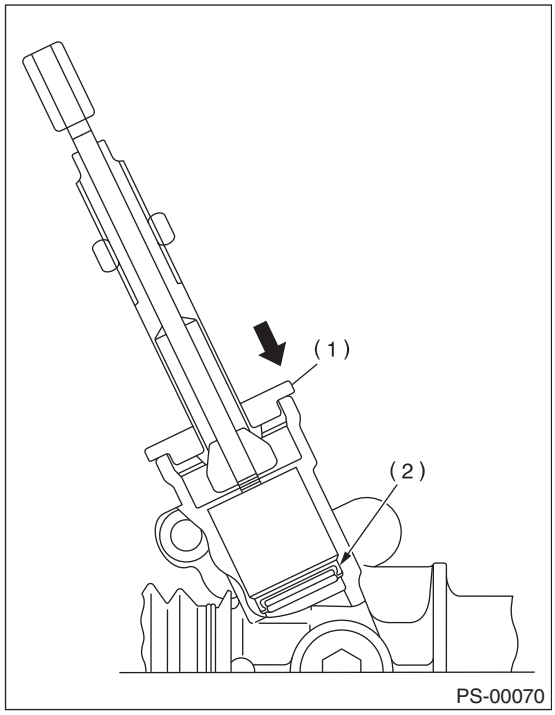
(1) Oil seal
(2) O-ring

19) Set the ST at a size shown in the figure.
ST 34199AE120 GEARBOX OIL SEAL REMOVER



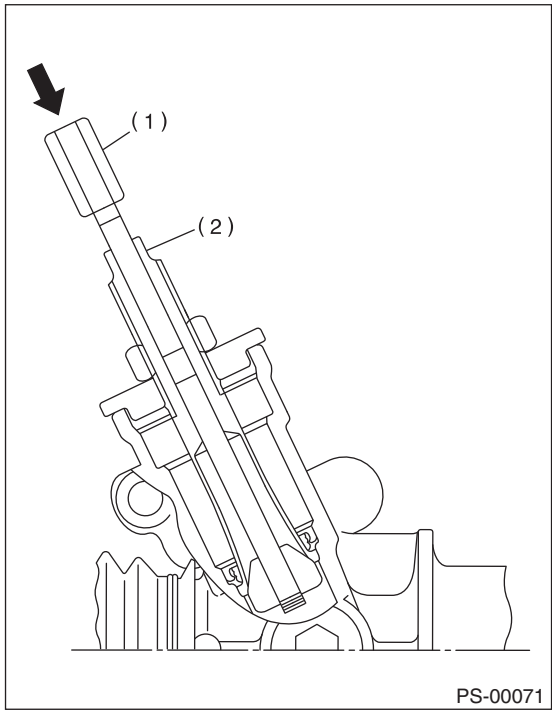
(1) 70 mm (2.76 in)

20) Set the stopper to gearbox, then insert the tip of the ST to the gearbox.



(1) Stopper
(2) Oil seal

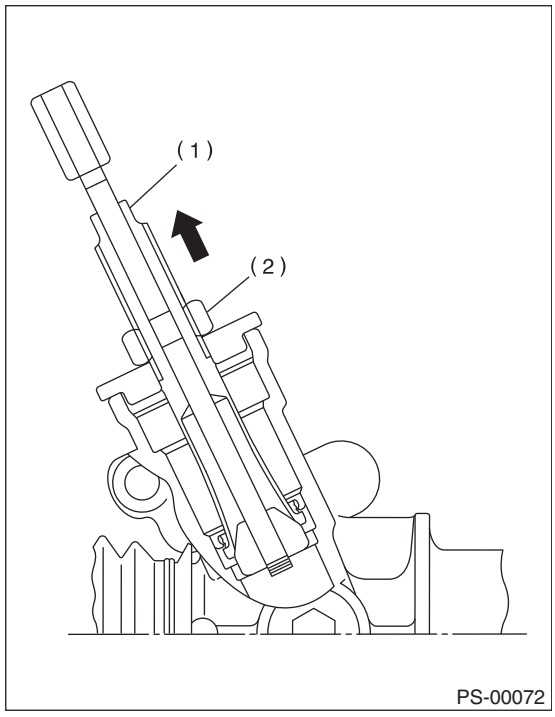
21) By fixing the 2-surface widths, press-in the rod while rotating it and catch the oil seal.



(1) Rod
(2) 2-surface widths

22) 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

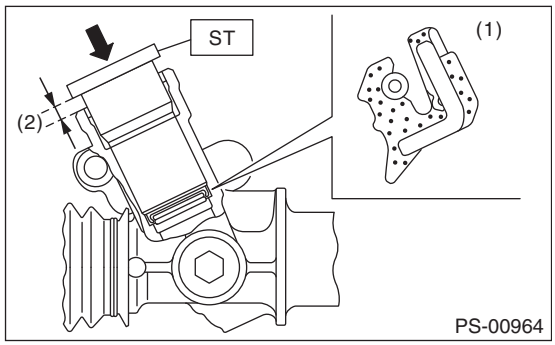
1) Apply a coat of grease to the inside and outside of the new oil seal.

Steering grease:
VALIANT GREASE M2 (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.

CAUTION:
• Make sure to press fit the oil seal in all the way.
• The gap between the gearbox end face and the ST is to be approximately 4 mm (0.157 in) after press fitting.

ST 34199AE130 GEARBOX OIL SEAL INSTALLER

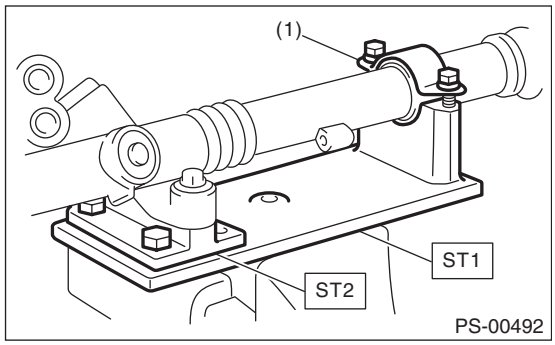


(1) Oil seal
(2) 4 mm (0.157 in)

3) Attach the steering body to ST as shown in the figure. Apply a coat of grease to needle bearing.

CAUTION:
Make sure the needle bearing is free from defects. If it is faulty, replace the steering body with a new part.

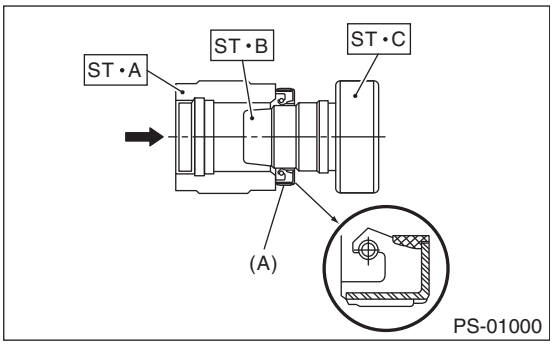
ST1 926200000 STAND
ST2 34199AG000 BOSS D



(1) Clamp

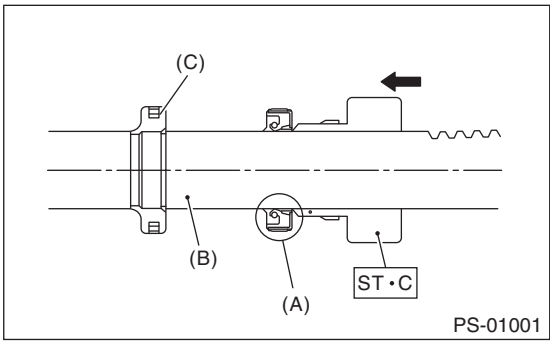
4) Using the ST A and ST B, attach the oil seal to ST C.
ST 34199FE040 INSTALLER A, B, C
- INSTALLER A: 34199FE070
- INSTALLER B: 34199FE080
- INSTALLER C: 34199FE090

NOTE:
Face the oil seal in the direction as shown in the figure.



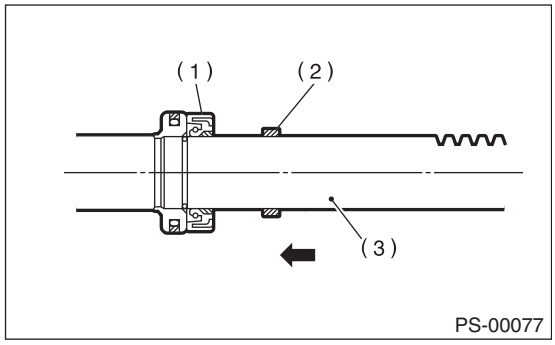
(A) Oil seal

5) Insert the ST C with oil seal assembled from the gear side of rack. Remove the oil seal from ST C near piston, and then remove the ST C from rack.



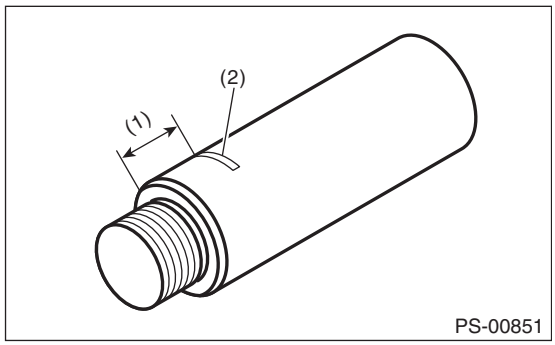
(A) Oil seal
(B) Rack
(C) Piston

6) Install the back-up washer from the gear side of rack.



(1) Oil seal
(2) Back-up washer
(3) Rack

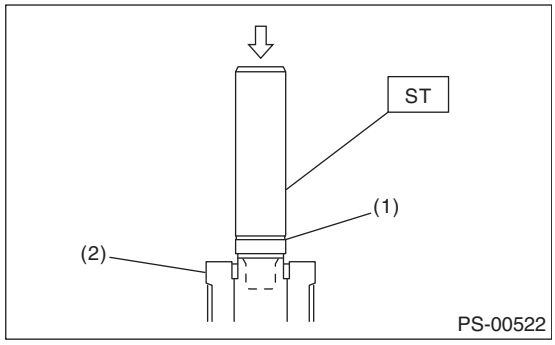
7) Apply a coat of grease to the grooves in rack, sliding surface of sleeve and sealing surface of piston. Then insert the rack into steering body from cylinder side.
8) Temporarily tighten the holder to gearbox cylinder.
9) Put a mark on a location of 9 mm (0.35 in) from the ST end surface as shown in the figure.
ST 34199FE000 INSTALLER & REMOVER



(1) 9 mm (0.35 in)
(2) Place a mark

10) Set the ST to the end of rack.
ST 34199FE000 INSTALLER & REMOVER

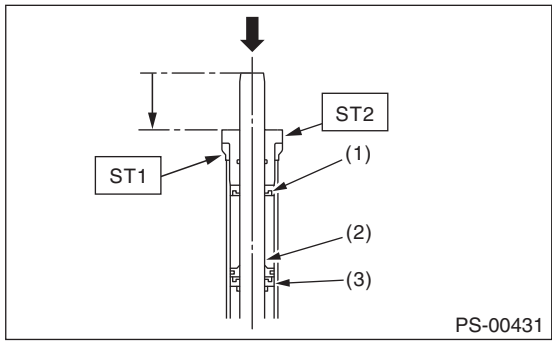
11) Using a press, press-fit until the mark on the ST is aligned with the end surface of the holder.



(1) Mark
(2) Holder

12) Remove the ST and holder.
13) Insert the outer side oil seal into the rack using the same procedure as steps 4) and 5).
ST 34199FE040 INSTALLER A, B, C
- INSTALLER A: 34199FE070
- INSTALLER B: 34199FE080
- INSTALLER C: 34199FE090

14) Make the ST2 pass through the rack, and then press in the rack and ST2 using a press.
Press in the outer side oil seal until the ST1 and ST2 comes into contact with each other and the rack end surface is aligned to the end surface of the ST2.
ST1 34199FE050 GUIDE
ST2 34199FE060 INSTALLER



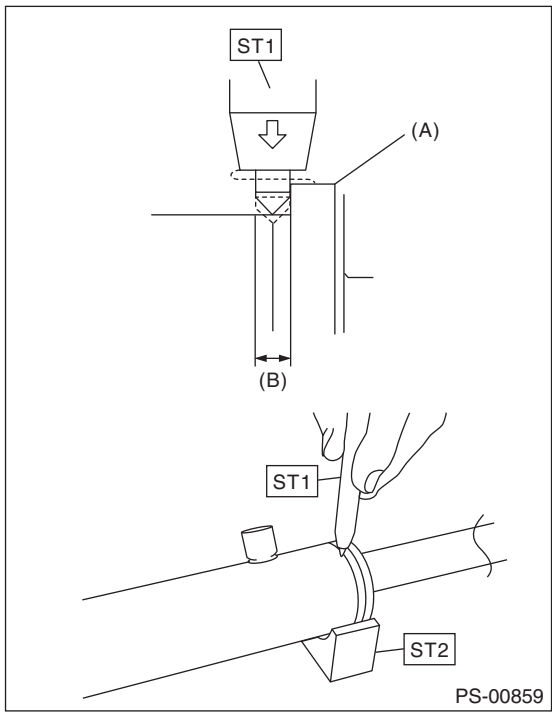
(1) Outer side oil seal
(2) Rack piston
(3) Inner side oil seal

15) Install a new holder to the cylinder side of steering body.

Tightening torque:
75 N·m (7.65 kgf-m, 55.3 ft-lb)

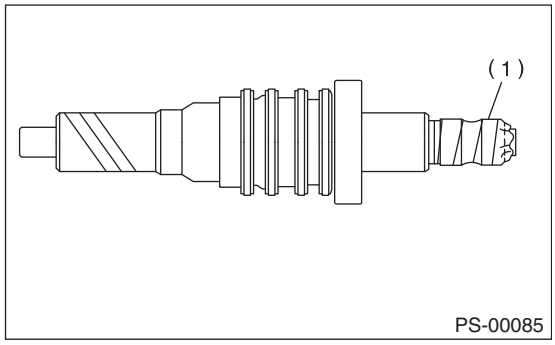
16) Using the ST, crimp one location less than 3 mm (0.12 in) from the holder.

CAUTION:
Be careful not to deform the holder.
ST1 34099FA060 PUNCH HOLDER
ST2 34199FE020 BASE



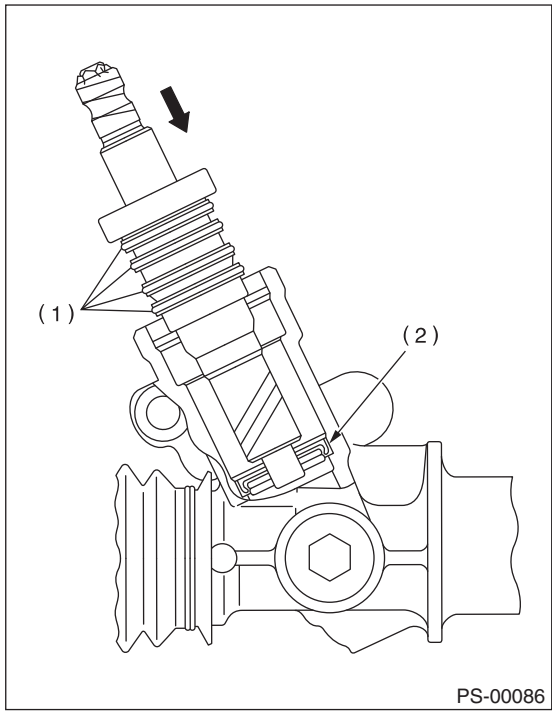
(A) Holder
(B) 3 mm (0.12 in)

17) Roll a vinyl tape on the serration portion of valve assembly, and then apply grease on the tape surface.



(1) Vinyl tape

18) 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.

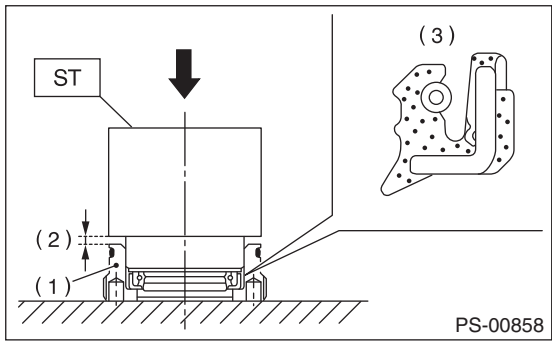


(1) Seal ring
(2) Oil seal

19) Replace the O-rings of plug circumference with new O-rings.
20) Apply grease on the oil seal circumference, and then press it into the plug using ST and a press.

CAUTION:
• Install the oil seal paying attention to correct direction.
• Make sure to press fit the oil seal in all the way.
• The gap between the plug and the ST is to be approximately 1 mm (0.039 in) after press fitting.

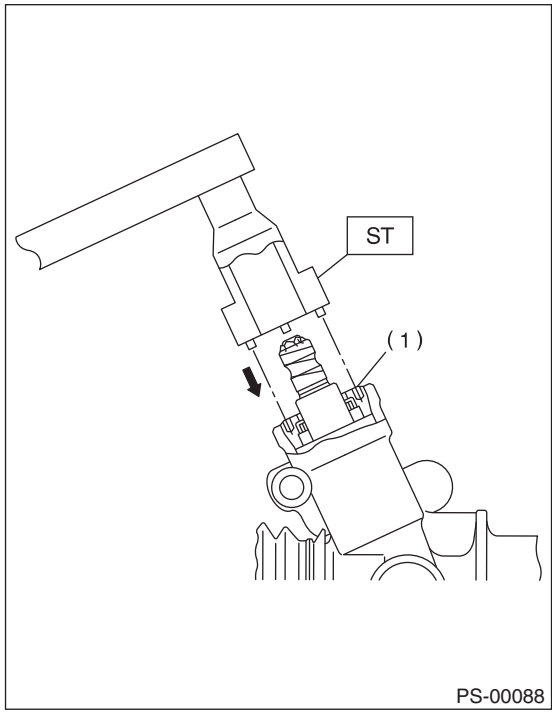
ST 34199AE110 OIL SEAL PLUG INSTALLER



(1) Plug
(2) 1 mm (0.039 in)
(3) Oil seal

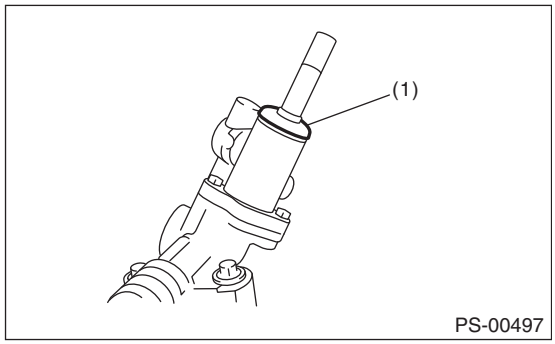
21) Attach the plug using ST.
ST 34199AE090 PLUG WRENCH

Tightening torque:
64 N·m (6.53 kgf-m, 47.2 ft-lb)



(1) Plug

22) Install the dust cover, and remove the vinyl tape.



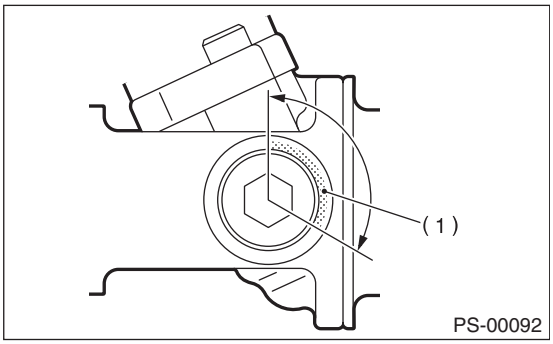
(1) Dust cover

23) 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.

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.

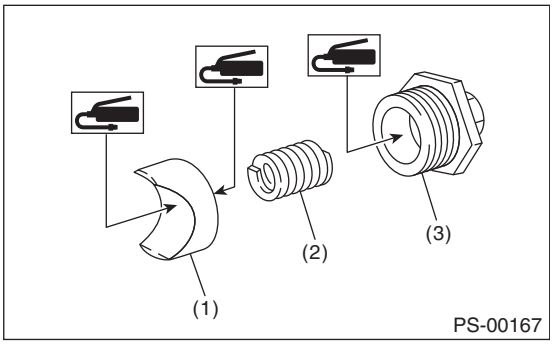
24) Apply liquid gasket to 1/3 or more of entire perimeter of adjusting screw thread.

Liquid gasket:
THREE BOND 1102 or THREE BOND 1215



(1) Apply liquid gasket to 1/3 or more of the entire perimeter.

25) Apply a coat of grease to the sliding surface of sleeve and seating surface of spring, and then insert the 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) Sleeve
(2) Spring
(3) Adjusting screw

26) Tighten the adjusting screw to the specified torque, then loosen it.

Tightening torque:
9.8 N·m (0.99 kgf-m, 7.2 ft-lb)
27) Tighten the adjusting screw to the specified torque, then loosen it.

Tightening torque:
4.9 N·m (0.49 kgf-m, 3.6 ft-lb)
28) Tighten the adjusting screw to the specified torque, then loosen it approx. 30°.

CAUTION:
Do not loosen 37° or more.

Tightening torque:
4.9 N·m (0.49 kgf-m, 3.6 ft-lb)
29) Remove the tie-rod.

30) Adjust the turning resistance of gearbox so that it is within specification using adjusting screw. <Ref. to PS-32, SERVICE LIMIT, INSPECTION, Steering Gearbox.>
31) Attach the lock nut into adjusting screw, and while holding the adjusting screw with wrench, tighten the lock nut using ST.
ST 926230000 SPANNER

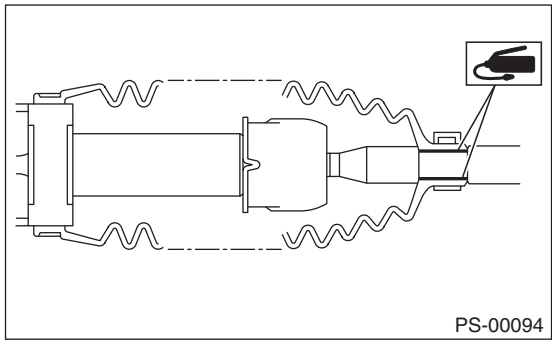
Tightening torque (lock nut):
39 N·m (3.98 kgf-m, 28.9 ft-lb)

NOTE:
Hold the adjusting screw with a wrench to prevent it from turning while tightening lock nut.
32) Install the tie-rod into rack.

Tightening torque:
90 N·m (9.18 kgf-m, 66.4 ft-lb)

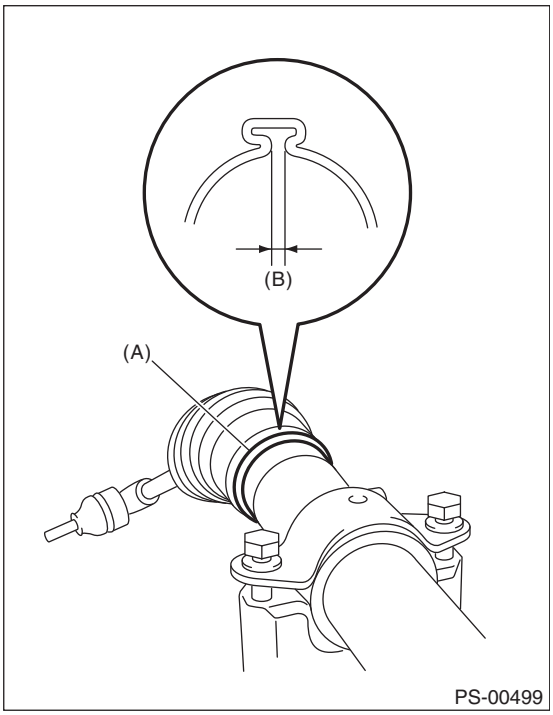
NOTE:
Check the mating face of rack and tie-rod for foreign matter such as dust etc.
33) Apply a coat of grease to the tie-rod groove, and then install the boot to the housing.

NOTE:
Make sure that the boot is installed without unusual inflation or deflation.



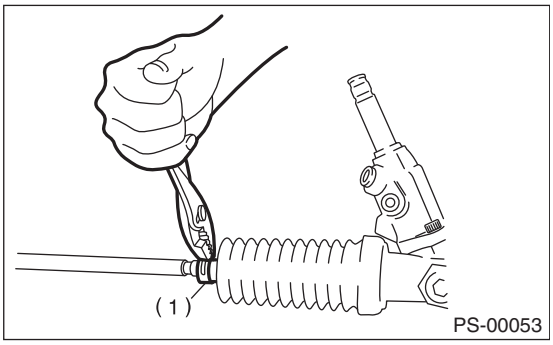
34) Using the boot clamp pliers, crimp the boot so that the clearance of the boot band crimp portion becomes 2 mm (0.08 in) or less.

NOTE:
Use a new boot band.



(A) Boot band
(B) 2 mm (0.08 in) or less

35) Fix the boot end with small clip.

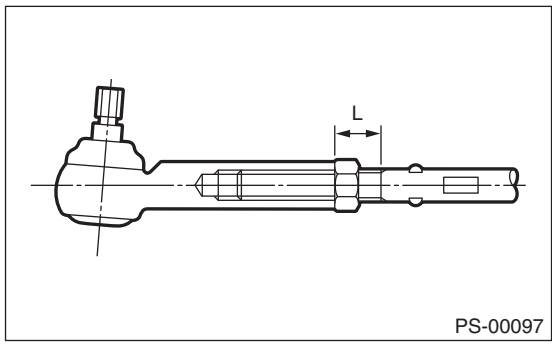


(1) Clip

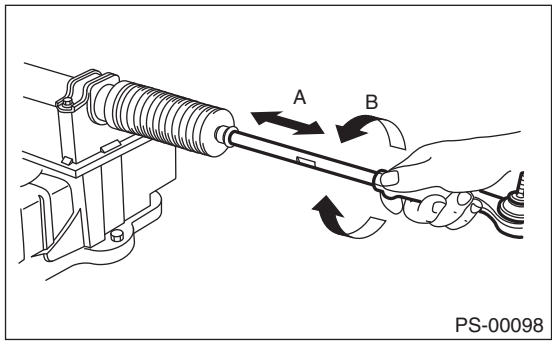
36) After installing, check that the boot end is installed to the groove of the tie-rod.

37) 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:
28 mm (1.1 in)



38) Inspect the gearbox as follows:
"A" Holding the tie-rod end, repeat lock to lock several times as quickly as possible.
"B" Holding the tie-rod end, turn it slowly at a radius several times as large as possible.
Finally, make sure that the boot is installed in the specified position without inflating.



39) Remove the gearbox from ST.
ST1 926200000 STAND
ST2 34199AG000 BOSS D

40) Attach the 4 pipes to the steering body and control valve housing.

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 for water. If any water is found, carefully check the boot for damage, 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 the bend or damage is excessive, replace the entire gearbox.
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 part.
3	Rack & pinion	Poor mating of rack with pinion	(1) Adjust the backlash properly. By measuring the turning torque of the gearbox and sliding resistance of rack, check if the rack & pinion engage 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. When the abnormality is found in either (1) or (2), replace the entire gearbox.
4	Gearbox unit	(1) Bending of the rack shaft (2) Bending of the cylinder portion (3) Crack or damage on the aluminum portion	Replace the gearbox with a new part.
		(4) Wear or damage on rack bushing	If the free play of rack shaft in radial direction is out of the specified range, replace the gearbox with new part. (Refer to “Service limit”.)
		(5) Wear on input shaft bearing	If the free play of input shaft in radial and axial direction is out of the specified range, replace the gearbox 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.

2. SERVICE LIMIT

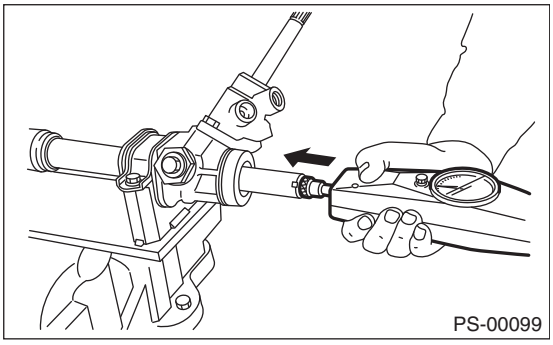
Make a measurements as follows. If it exceeds the specified service limits, adjust or replace.

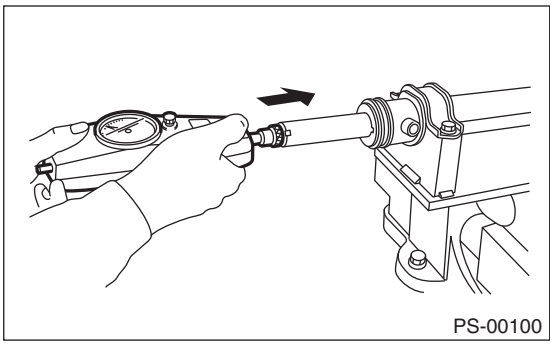
NOTE:
When making a measurement, vise the gearbox using ST. Never vise the gearbox by inserting aluminum plates etc. between vise and gearbox.
ST1 926200000 STAND
ST2 34199AG000 BOSS D

Rack shaft sliding resistance:

Limit
314 N (32 kgf, 71 lbf) or less

Left/right differential of sliding resistance:
20% or less


PS-00099

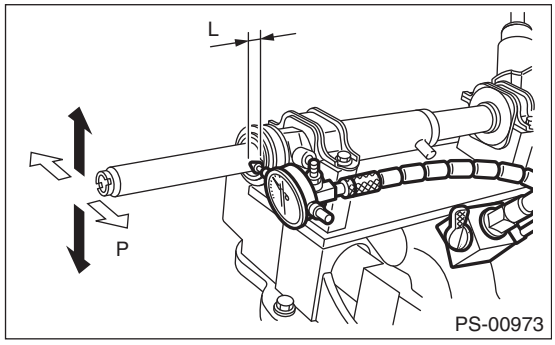

PS-00100

3. RACK SHAFT PLAY IN THE RADIAL DIRECTION

Right-turn steering:

Limit
Direction ⇦ ⇨ ⬅ ➡
0.4 mm (0.016 in) or less

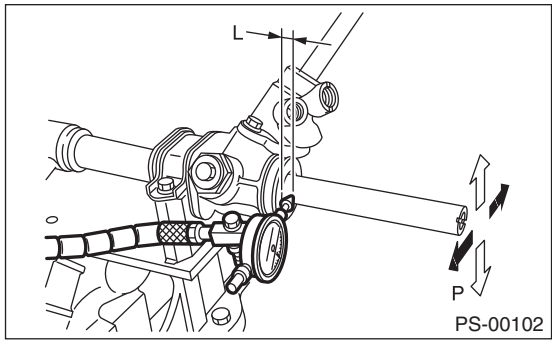
Condition
L: 5 mm (0.20 in)
P: 98 N (10 kgf, 22 lbf)



PS-00973

Left-turn steering:

Limit
Direction ⬅ ➡
0.6 mm (0.024 in) or less
Direction ⇦ ⇨
0.4 mm (0.016 in) or less



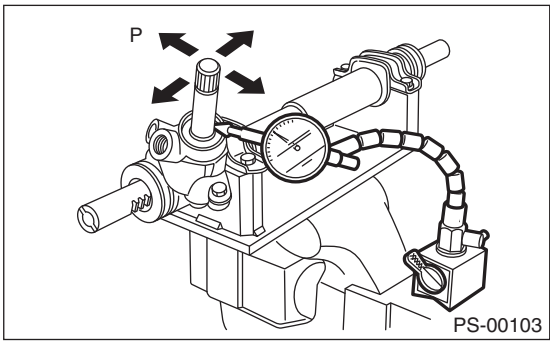
PS-00102

4. INPUT SHAFT PLAY

In radial direction:

Service limit
0.18 mm (0.0071 in) or less

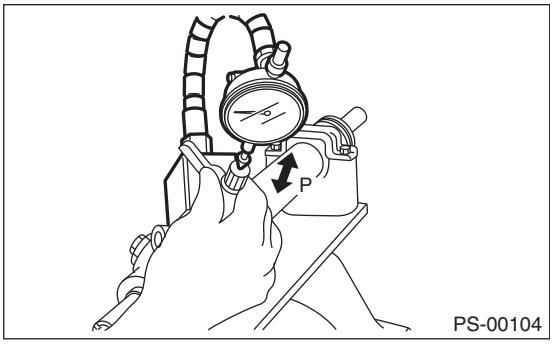
Condition
P: 98 N (10 kgf, 22 lbf)



In axial direction:

Service limit
0.27 mm (0.0106 in) or less

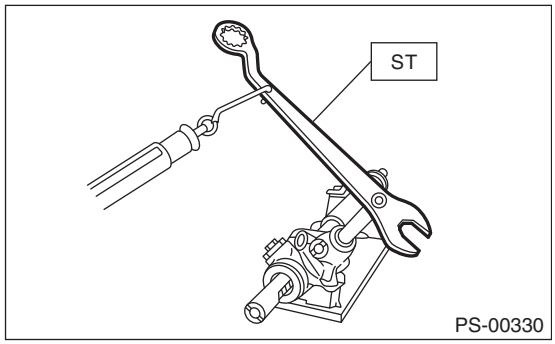
Condition
P: 20 — 49 N (2 — 5 kgf, 4 — 11 lbf)



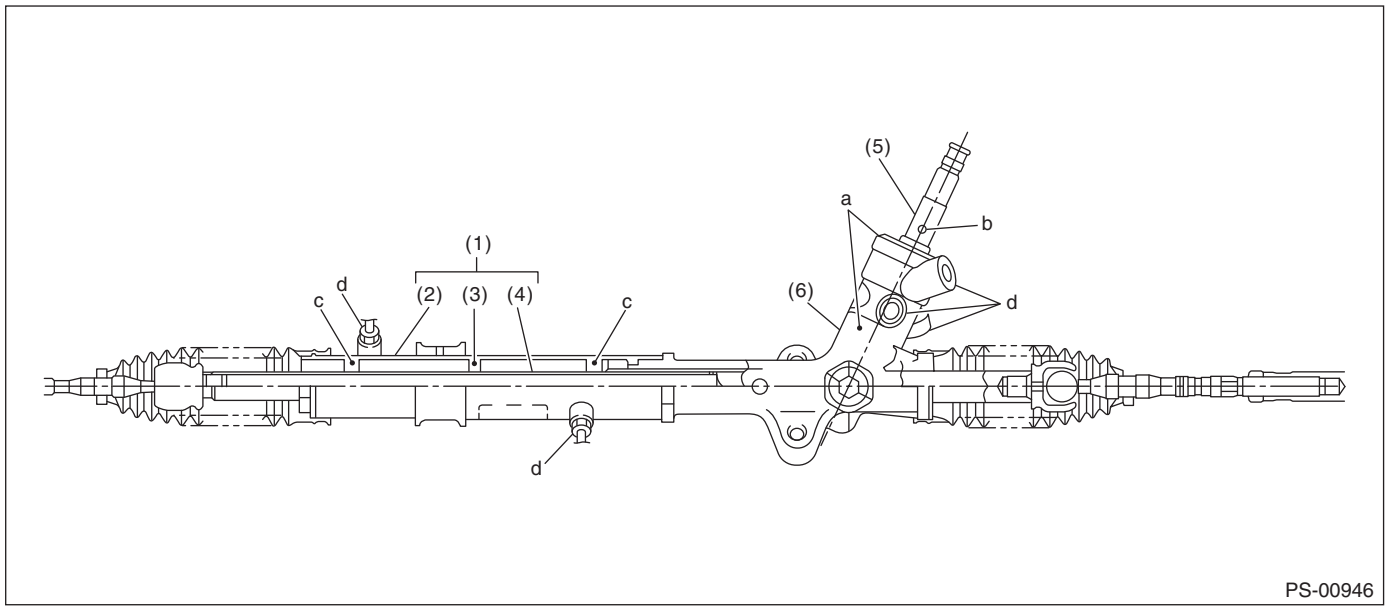
5. TURNING RESISTANCE OF GEARBOX

Using the ST, measure the gearbox turning resistance.
ST 34099PA100 SPANNER

Service limit:
Maximum allowable resistance:
13 N (1.3 kgf, 2.9 lbf) or less
Difference between right and left turning resistance:
20% or less



6. OIL LEAKAGE

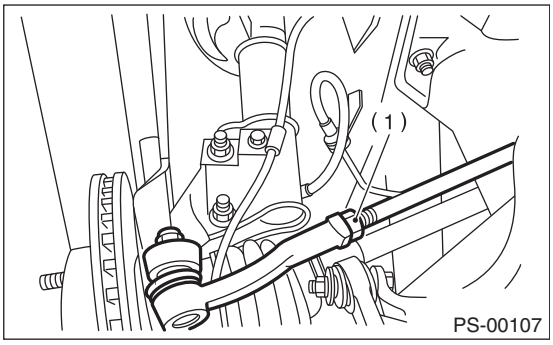


(1) Power cylinder
(2) Cylinder
(3) Rack piston
(4) Rack axle
(5) Input shaft
(6) Valve housing

1) Lift up the vehicle.
2) 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.
3) Cause and solution for oil leakage from “a”
The oil seal is damaged. Replace the valve assembly or oil seal with a new part.
4) Cause and measure for oil leakage from “b”.
The torsion bar O-ring is damaged. Replace the valve assembly with a new part.
5) Cause and measure for oil leakage from “c”.
The oil seal is damaged. Replace the oil seal with a new part.
6) Cause and solution for oil leakage from “d”.
The pipe is damaged. Replace the faulty pipe or O-ring.

F: ADJUSTMENT

1) Adjust the front toe. <Ref. to FS-10, FRONT WHEEL TOE-IN, INSPECTION, Wheel Alignment.>



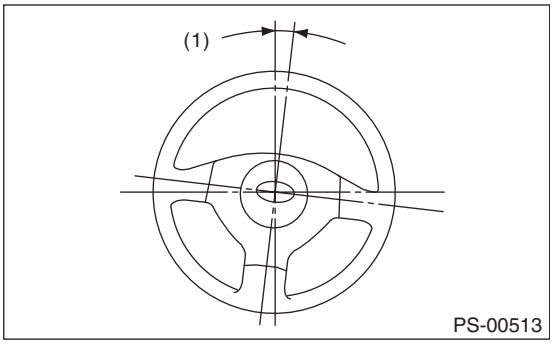
(1) Lock nut

2) Check the steering angle of the wheels.

Standard of steering angle:

Model	Inner wheel	Outer wheel
All models	38.3°±1.5°	33.8°±1.5°

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) 5° or less

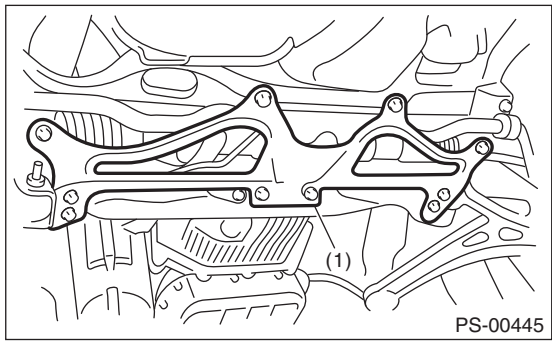
4) If the steering wheel spokes are not horizontal with vehicle set in the straight ahead position after this adjustment, correct it by turning the right and left tie-rods in the opposite direction from each other by the same angle.

6. Pipe Assembly

A: REMOVAL

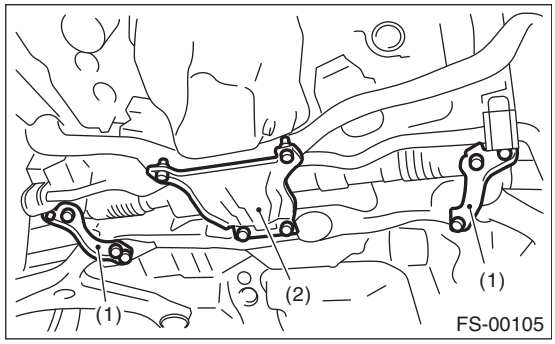
1) Disconnect the ground cable from battery.
2) Lift up the vehicle, and then remove the front crossmember support plate and jack-up plate.

- Large type



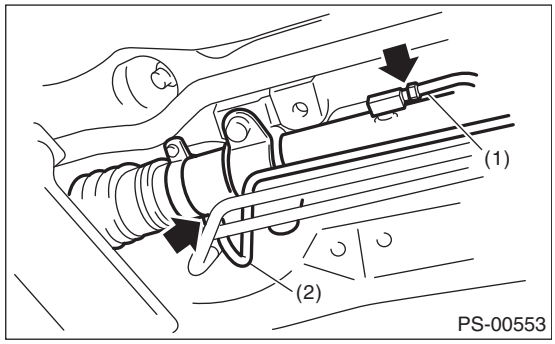
(1) Front crossmember support plate

- Small type



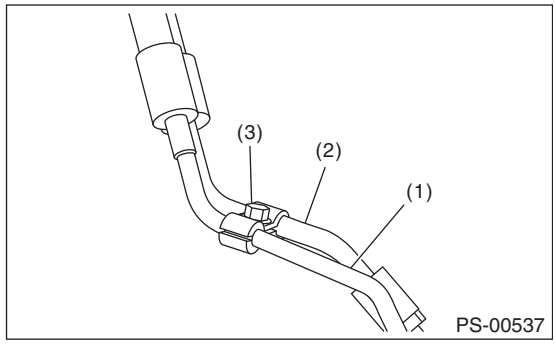
(1) Front crossmember support plate
(2) Jack-up plate

3) Remove the one pipe joint at the center of the gearbox, and connect the 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.



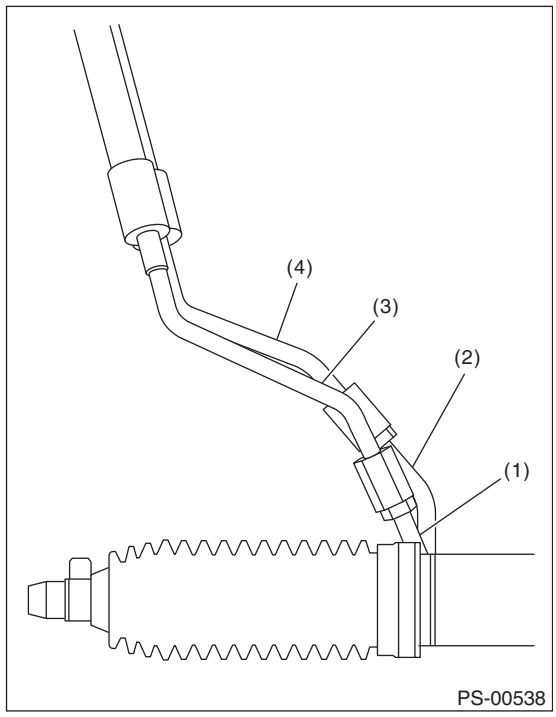
(1) Pipe A
(2) Pipe B

4) Remove the clamp E from return hose and pressure hose.



(1) Pressure hose
(2) Return hose
(3) Clamp E

5) Disconnect the return hose from return pipe and disconnect the pressure hose from feed pipe.



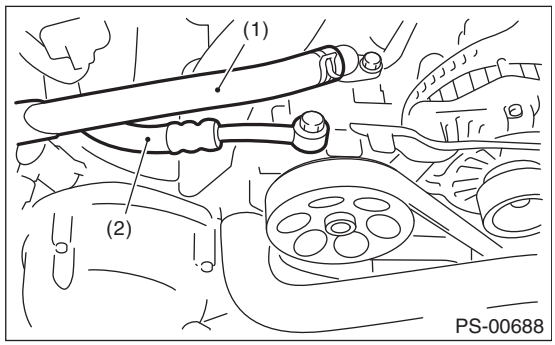
(1) Feed pipe
(2) Return pipe
(3) Pressure hose
(4) Return hose

6) Remove the air intake duct.

- Non-turbo model: <Ref. to IN(H4DO)-14, REMOVAL, Air Intake Duct.>
- Turbo model: <Ref. to IN(H4DOTC)-10, REMOVAL, Air Intake Duct.>

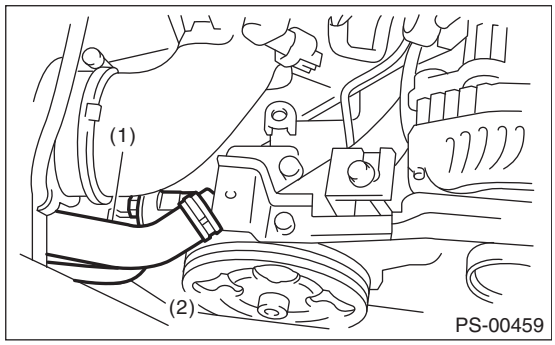
7) Disconnect the suction hose and pressure hose from oil pump.

• Non-turbo model



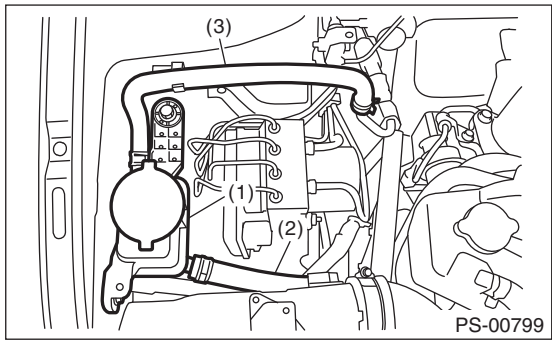
(1) Suction hose
(2) Pressure hose

• Turbo model



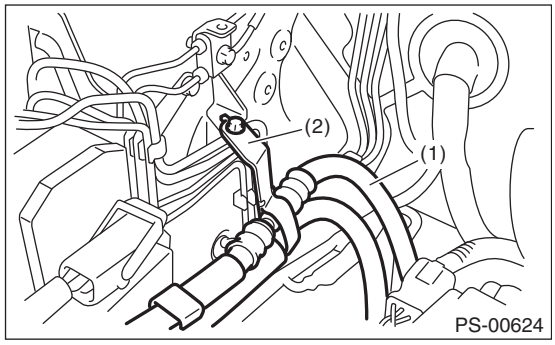
(1) Suction hose
(2) Pressure hose

8) Disconnect the suction hose and return hose from the reservoir tank.



(1) Reservoir tank
(2) Suction hose
(3) Return hose

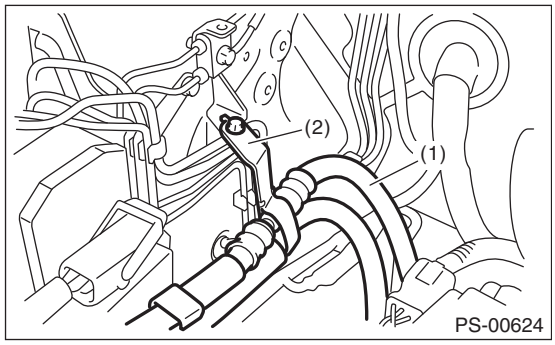
9) Remove the hose bracket and take out the hose assembly from vehicle.



(1) Hose ASSY
(2) Hose bracket

B: INSTALLATION

1) Temporarily tighten the hose bracket bolt.

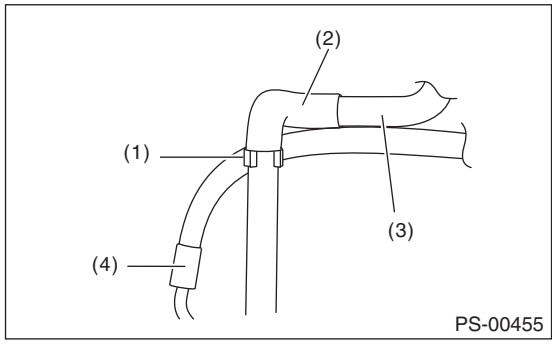


(1) Hose ASSY
(2) Hose bracket

2) Install the plastic clip to the pressure hose and suction hose.

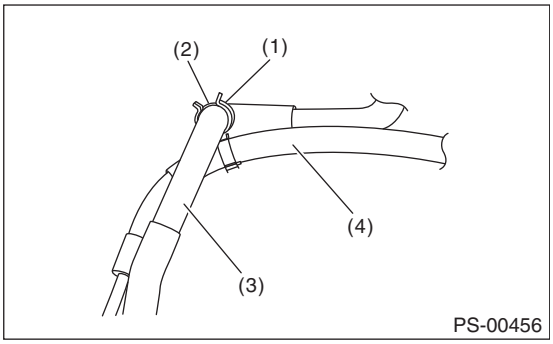
CAUTION:
Align the installation position of the plastic clip with the protector edge of the suction hose.

• Non-turbo model



(1) Plastic clip
(2) Protector
(3) Suction hose
(4) Pressure hose

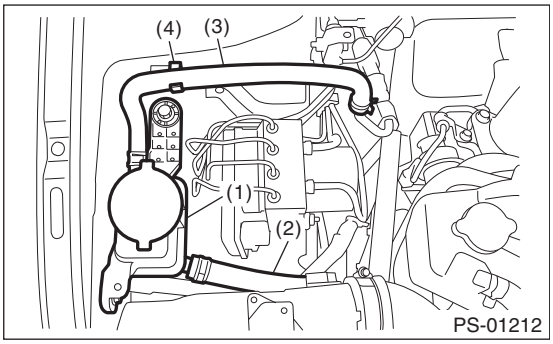
- Turbo model



(1) Plastic clip
(2) Protector
(3) Suction hose
(4) Pressure hose

3) Connect the suction hose and return hose to the reservoir tank.

CAUTION:
Firmly insert the plastic clip of return hose to the bracket.

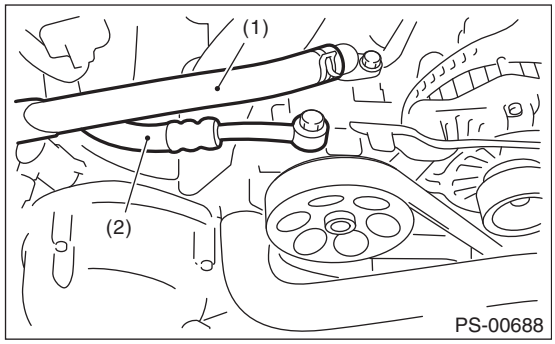


(1) Reservoir tank
(2) Suction hose
(3) Return hose
(4) Plastic clip

4) Connect the suction hose and pressure hose to the oil pump. Tighten the eye bolt of pressure hose.

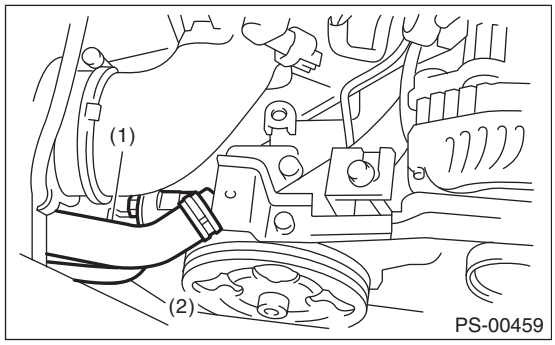
Tightening torque:
40 N·m (4.08 kgf-m, 29.5 ft-lb)

- Non-turbo model



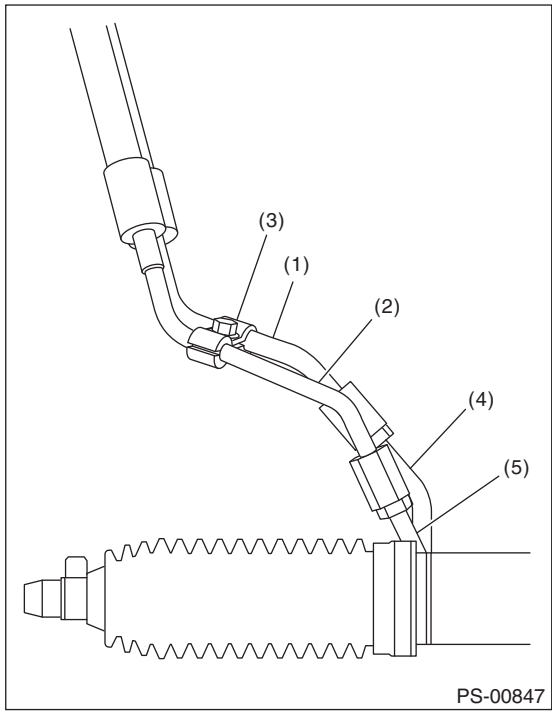
(1) Suction hose
(2) Pressure hose

- Turbo model



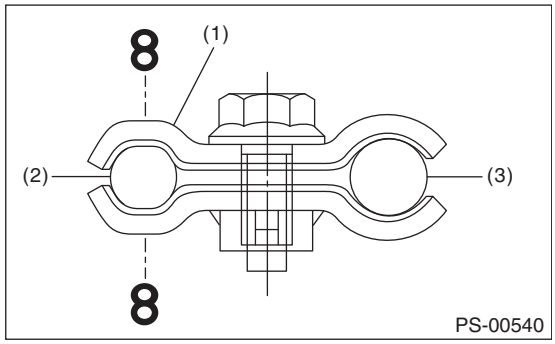
(1) Suction hose
(2) Pressure hose

5) Temporarily connect the pressure hose to feed pipe and return hose to return pipe. Temporarily tighten the bolt of clamp E.



(1) Return hose
(2) Pressure hose
(3) Clamp E
(4) Return pipe
(5) Feed pipe

NOTE:
Make sure that the character “8” on each clamp is positioned on the opposite side, as shown in the figure.



(1) Clamp E
(2) Pressure hose
(3) Return hose

6) Tighten clamp E.

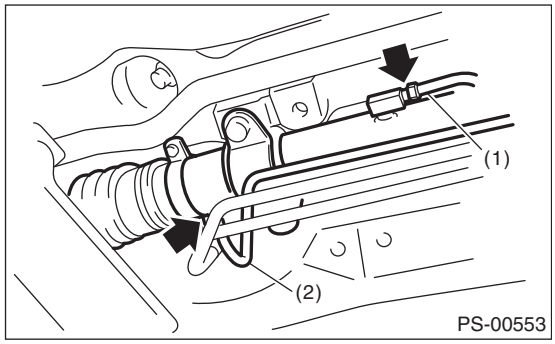
Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

7) Tighten the pressure hose to feed pipe and return hose to return pipe.

Tightening torque:
15 N·m (1.53 kgf-m, 11.1 ft-lb)

8) Connect pipes A and B to the four pipe joints of the gearbox.

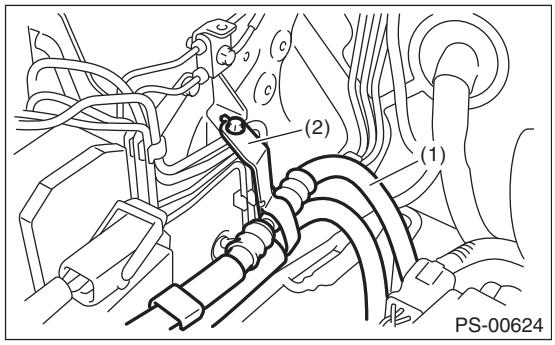
Tightening torque:
Refer to “COMPONENT” of “General Description”. <Ref. to PS-4, POWER ASSISTED SYSTEM, COMPONENT, General Description.>



(1) Pipe A
(2) Pipe B

9) Install the front crossmember support plate and jack-up plate.
10) Lower the vehicle.
11) Tighten the bolts which hold the hose bracket.

Tightening torque:
10 N·m (1.02 kgf-m, 7.4 ft-lb)



(1) Hose ASSY
(2) Hose bracket

12) Install the air intake duct.
• Non-turbo model: <Ref. to IN(H4DO)-14, INSTALLATION, Air Intake Duct.>
• Turbo model: <Ref. to IN(H4DOTC)-10, INSTALLATION, Air Intake Duct.>
13) Connect the battery ground terminal.

14) Fill with the specified fluid.

CAUTION:
Never start the engine before filling with fluid; otherwise the vane pump may become seized.
15) Finally, check the clearance between pipes or hoses as shown in the figure indicated in “General Diagnostic Table”. <Ref. to PS-55, INSPECTION OF CLEARANCE, INSPECTION, General Diagnostic Table.>

C: INSPECTION

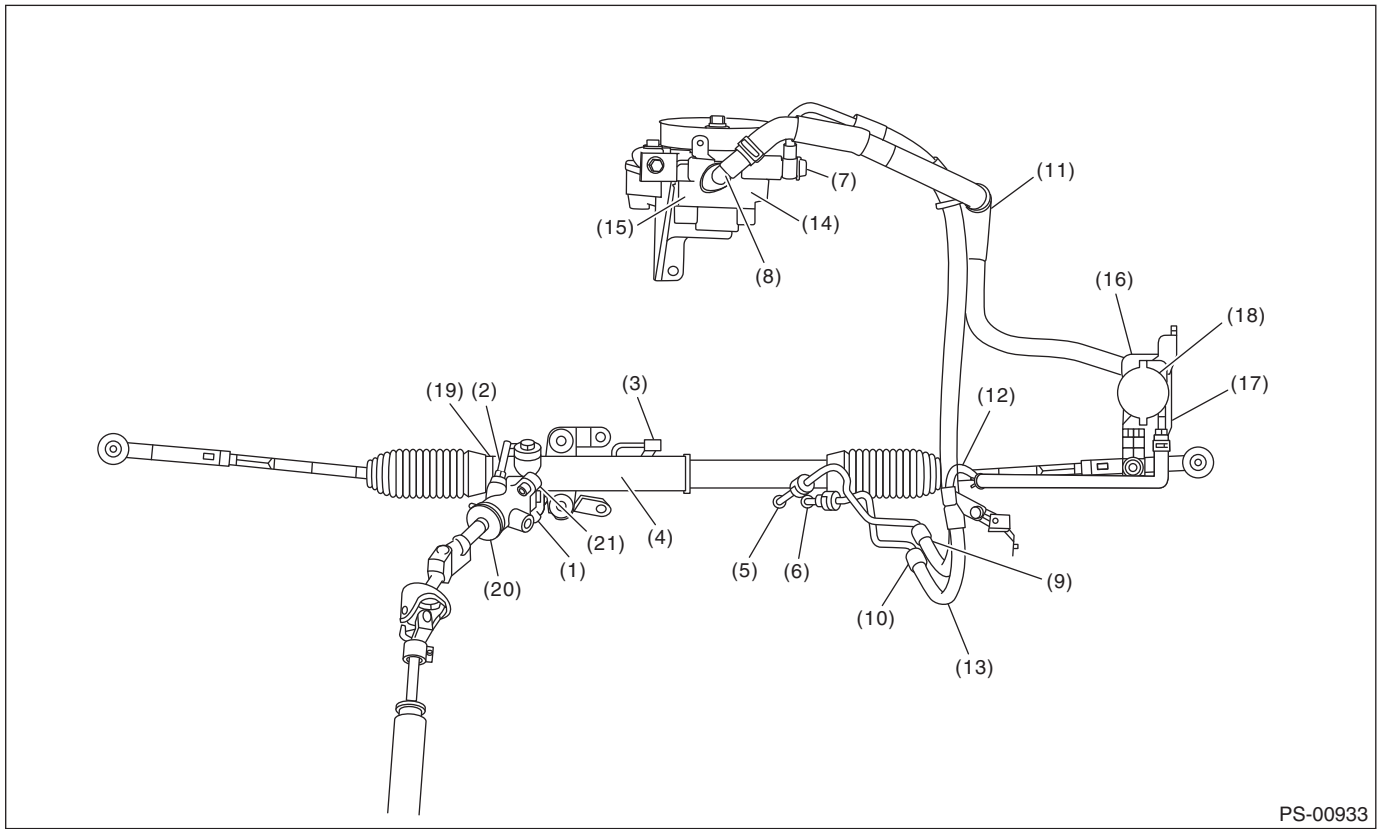
Check all disassembled parts for wear, damage or other problems. Repair or replace the defective parts as necessary.

Part	Maintenance parts	Corrective action
Pipe	• O-ring fitting surface damage • Nut damage • Pipe damage	Replace with a new part.
Hose	• 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 are likely to be damaged chemically by brake fluid, battery electrolyte, engine oil and automatic transmission fluid and their service lives are to be very shortened. Wipe off hoses immediately if any of these come into contact with the hoses.
Since resistances for heat or low temperature brittleness are gradually declining according to time accumulation of hot or cold conditions for the hoses 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 a driving condition in which many steering operations are required in short time.
Continuous discharge of the relief valve for 5 seconds or more will reduce the service lives of hoses, oil pump, fluid, etc., due to over heating.

Trouble	Possible cause	Corrective action
Pressure hose burst	Excessive holding time of relief status	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	Repair.
	Loosening of the clip	Replace the hose clip.
	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 customers.
	Power steering fluid, engine oil, electrolyte adhere on the hose surface	Replace. Be careful during service work.
	Too many uses in extremely cold weather	Replace. Instruct customers.

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.



Fluid leaking area	Possible cause	Corrective action
Leakage from the connections of pipes and hoses, numbered (1) through (8) in the figure	Insufficient tightening of flare nut, adhesion of dirt, damage to flare or flare nut or eye bolt	Loosen and retighten. Replace if ineffective.
	Improper installation of hose or clamp	Replace.
	Damaged O-ring or gasket	Replace the O-ring, gasket pipe or hose with new part, if still no improvement, replace the gearbox or oil pump as well.
Leakage from hose (9) through (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 aluminum 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 oil tank, (16) and (17) in the figure	Crack in oil tank	Replace the oil tank.
Leakage from filler neck of (18)	Damaged cap gasket	Replace the cap.
	Crack in root of filler neck	Replace the oil 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 gasket or oil seal	Replace the problem parts.
	Damage in control valve	Replace the control valve.

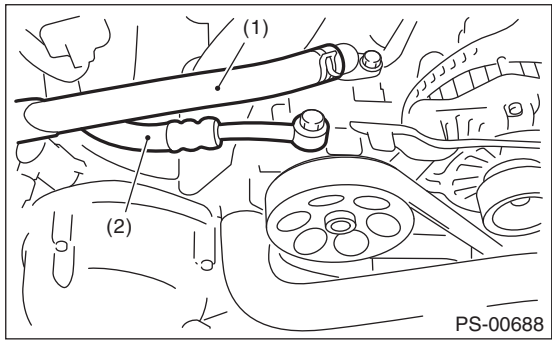
7. Oil Pump

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the V-belts (front side belt).
• Non-turbo model: <Ref. to ME(H4DO)-70, V-BELT, REMOVAL, V-belt.>
• Turbo model: <Ref. to ME(H4DOTC)-38, FRONT SIDE BELT, REMOVAL, V-belt.>
3) Disconnect the connector from power steering pump switch.
4) Disconnect the pressure hose and suction hose from the oil pump.

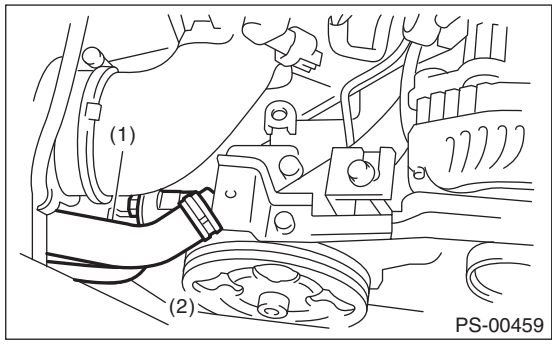
CAUTION:
• Do not allow fluid to come into contact with the pulley belt.
• To prevent foreign matter from entering the hose and pipe, cover the open ends with clean cloth.

• Non-turbo model



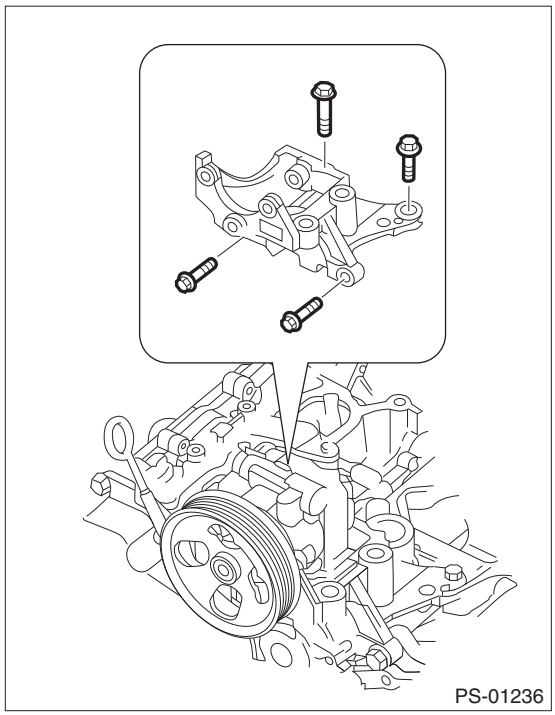
(1) Suction hose
(2) Pressure hose

• Turbo model

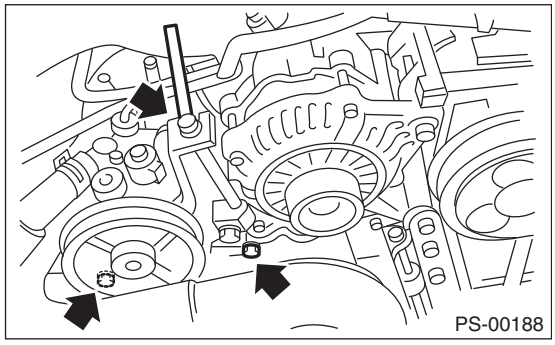


(1) Suction hose
(2) Pressure hose

5) Remove the installation bolt of the power steering pump bracket.
• Non-turbo model

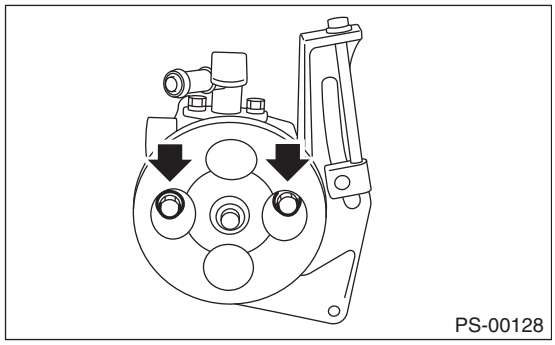


• Turbo model



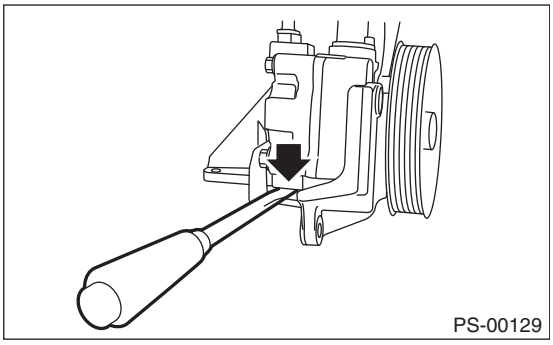
6) Secure the oil pump bracket in a vise, and remove the bolts from front of the oil pump.

CAUTION:
When securing the oil pump bracket in a vice, hold the oil pump bracket with the least possible force between two pieces of wood.



7) Remove the bolt from the rear side of oil pump.

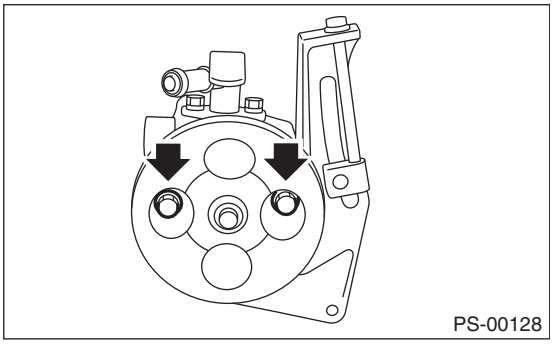
8) Disassemble the oil pump and bracket by inserting a flat tip screwdriver as shown in the figure.


PS-00129

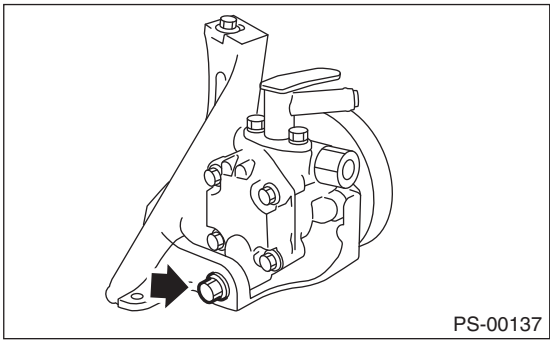
B: INSTALLATION

1) Install the oil pump to bracket.
2) Tighten the bolts which hold the oil pump to the bracket.

Tightening torque:
16 N·m (1.63 kgf-m, 11.8 ft-lb)


PS-00128

Tightening torque:
36 N·m (3.67 kgf-m, 26.6 ft-lb) (non-turbo model)
48 N·m (4.89 kgf-m, 35.4 ft-lb) (turbo model)

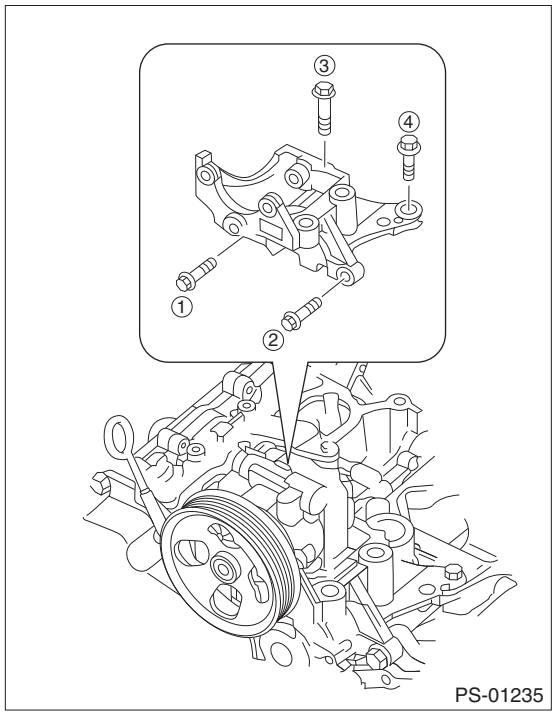

PS-00137

3) Attach the installation bolts of the power steering pump bracket.

4) Tighten the bolts to the specified torque in the order as shown in the figure.

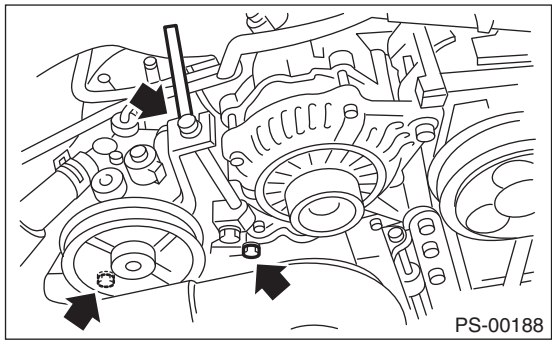
Tightening torque:
Refer to "COMPONENT" of "General Description". <Ref. to PS-6, OIL PUMP, COMPONENT, General Description.>

- Non-turbo model



PS-01235

- Turbo model

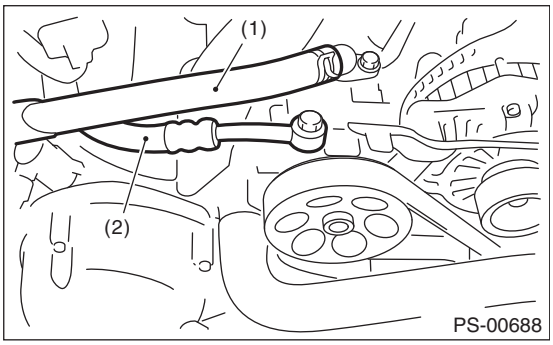

PS-00188

5) Connect the pressure hose and suction hose.

Tightening torque:
Eye bolt
40 N·m (4.08 kgf-m, 29.5 ft-lb)

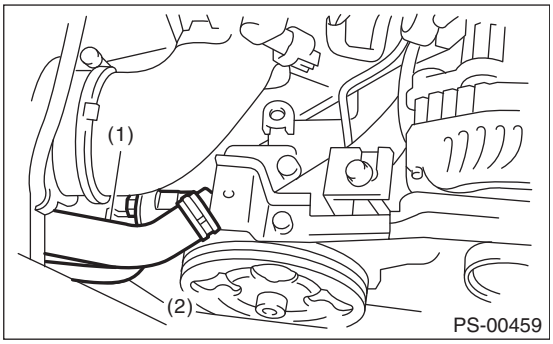
CAUTION:
Be careful when installing; If the hose is twisted it may come into contact with other parts.

- Non-turbo model



(1) Suction hose
(2) Pressure hose

- Turbo model



(1) Suction hose
(2) Pressure hose

6) Connect the power steering pump switch to the connector.
7) After installing the oil pump, fill the oil pump with fluid while rotating the pulley by hand and bleed the air from the oil pump.

CAUTION:
Always fill the oil pump with the fluid to prevent abnormal noise and seizure of the oil pump.
8) Install the V-belts (front side belt).
- Non-turbo model: <Ref. to ME(H4DO)-73, V-BELT, INSTALLATION, V-belt.>
- Turbo model: <Ref. to ME(H4DOTC)-38, FRONT SIDE BELT, INSTALLATION, V-belt.>

9) Connect the battery ground terminal.
10) Fill with the specified power steering fluid. <Ref. to PS-49, Power Steering Fluid.>

CAUTION:
Never start the engine before filling with fluid; otherwise the vane pump may become seized.

C: INSPECTION

1. BASIC INSPECTION

Perform the following inspection procedures and replace faulty parts.

No.	Parts	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 oil pump 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 a 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	Cracks	Replace with a new part.

2. SERVICE LIMIT

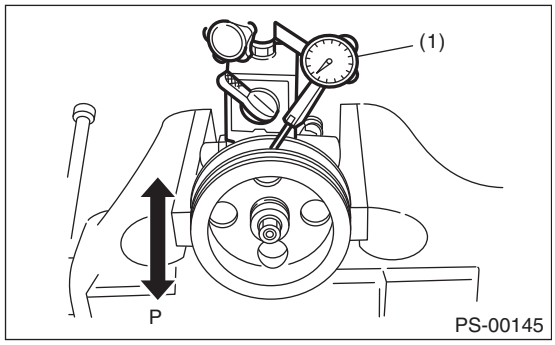
Make a measurements as follows. If it exceeds the service limit, replace with a new part.

CAUTION:
• When securing the oil pump in a vice, hold the oil pump with the least possible force between two pieces of wood.
• Do not set the outside of flow control valve or pulley on a vise; otherwise outside or pulley might be deformed. Select properly sized wood pieces.

1) Play of the pulley shaft

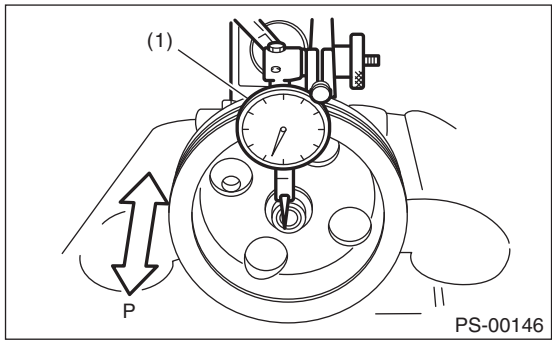
Condition:
P: When applying a force of 9.8 N (0.99 kgf, 2.2 lbf)

Service limit:
Play in the radial direction (Direction ⬅ ➡)
0.2 mm (0.008 in) or less



(1) Dial gauge

Axial play (Direction ⇦ ⇨)
0.9 mm (0.035 in) or less

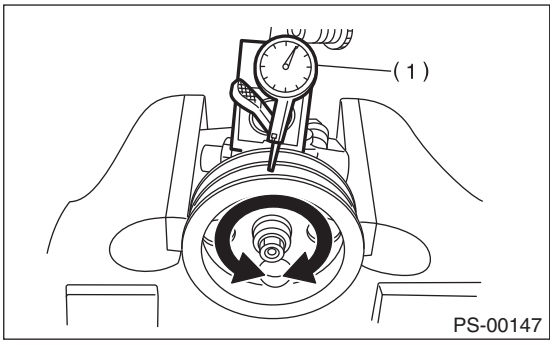


(1) Dial gauge

2) Deflection of the pulley groove

Service limit:
1.0 mm (0.039 in) or less

NOTE:
Read the value on one surface of V groove, set the dial gauge on the other surface, and read the value of the dial gauge.

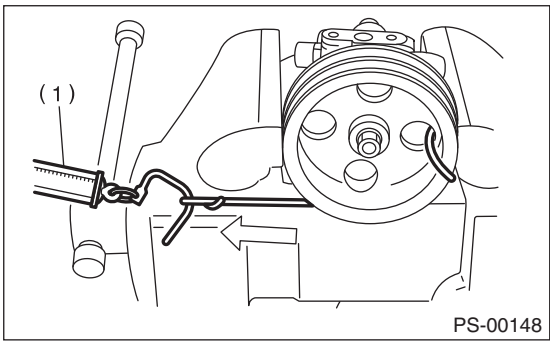


(1) Dial gauge

3) Rotating resistance of pulley

Service limit:
Maximum load: 9.22 N (0.94 kgf, 2.07 lbf) 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 scale

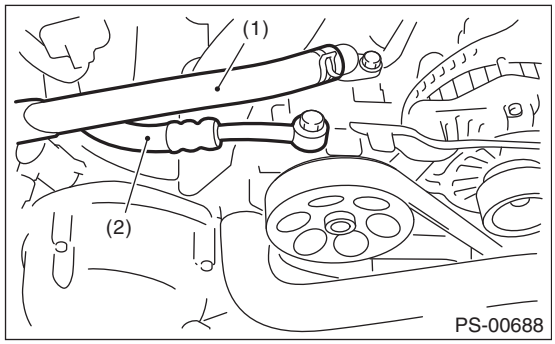
3. HYDRAULIC PRESSURE

NOTE:
• To measure hydraulic pressure correctly, be sure to complete all the items in “INSPECTION”, prior to performing the measurement. <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.

1) Regular pressure measurement
(1) Connect the ST1, ST2 and ST3.

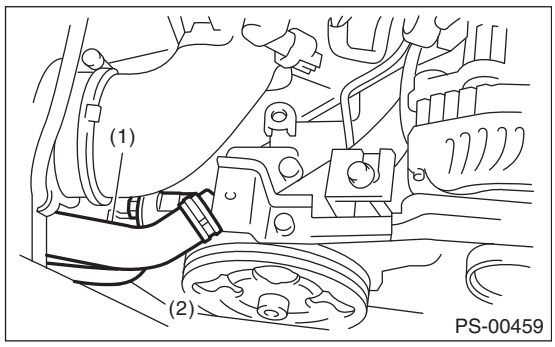
ST1 925711000 PRESSURE GAUGE
ST2 34099AC020 ADAPTER HOSE B
ST3 34099AC010 ADAPTER HOSE A

(2) Remove the air intake duct.
• Non-turbo model: <Ref. to IN(H4DO)-14, REMOVAL, Air Intake Duct.>
• Turbo model: <Ref. to IN(H4DOTC)-10, REMOVAL, Air Intake Duct.>
(3) Disconnect the pressure hose from the pump.
(4) Using the gasket (Part No. 34621AC021) and bolt (Part No. 34620AC010), install the ST2 to pump instead of pressure hose.
• Non-turbo model



(1) Suction hose
(2) Pressure hose

• Turbo model

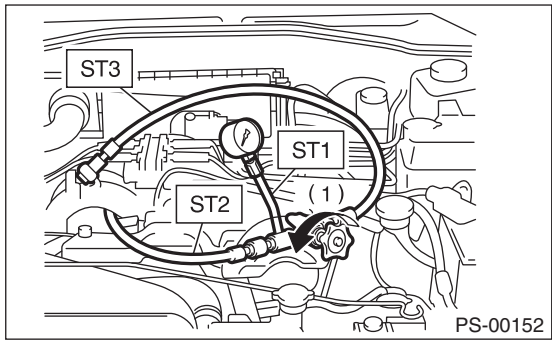


(1) Suction hose
(2) Pressure hose

(5) Attach the ST3 to the end of pressure hose 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



(1) Valve

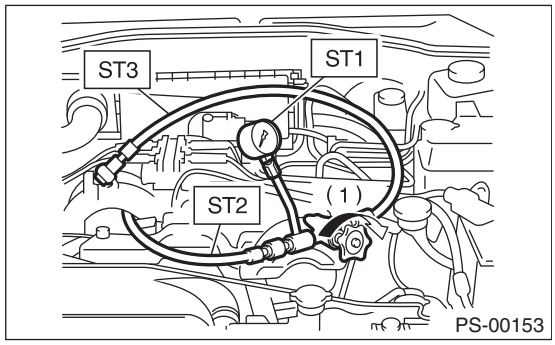
Service limit:
981 kPa (10 kgf/cm^2, 142 psi) or less

(9) If it is not within the specification, replace the faulty 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 ST, 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



(1) Valve

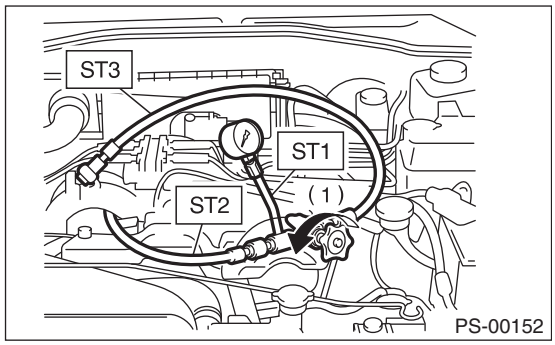
Service limit:
Non-turbo model:
7,350 — 8,050 kPa (75 — 82 kgf/cm^2, 1,066 — 1,167 psi)
Turbo model:
8,100 — 8,800 kPa (83 — 90 kgf/cm^2, 1,174 — 1,276 psi)

(4) If the torque is not within specified range, 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



(1) Valve

Service limit:
Non-turbo model:
7,350 — 8,050 kPa (75 — 82 kgf/cm^2, 1,066 — 1,167 psi)
Turbo model:
8,100 — 8,800 kPa (83 — 90 kgf/cm^2, 1,174 — 1,276 psi)

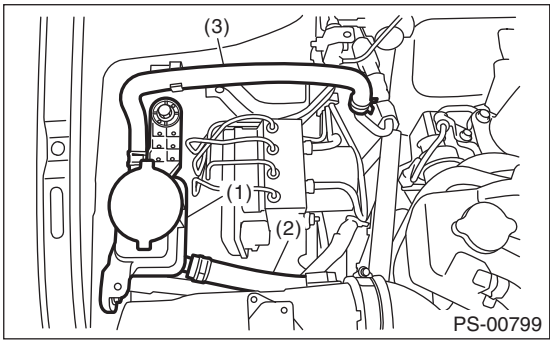
(4) If it is out of specification, measure the steering effort. <Ref. to PS-53, MEASUREMENT OF STEERING EFFORT, INSPECTION, General Diagnostic Table.> If it is not within specification, replace the control valve itself or control valve and pinion as a single unit, using new parts.
If it is not within specification, replace the control valve itself or control valve and pinion as a single unit, using new parts.

8. Reservoir Tank

A: REMOVAL

1) Drain fluid from the reservoir tank.
2) Disconnect the hose from reservoir tank.

CAUTION:
To prevent foreign matter from entering the hose and pipe, cover the open ends of them with clean cloth.



(1) Reservoir tank
(2) Suction hose
(3) Return hose

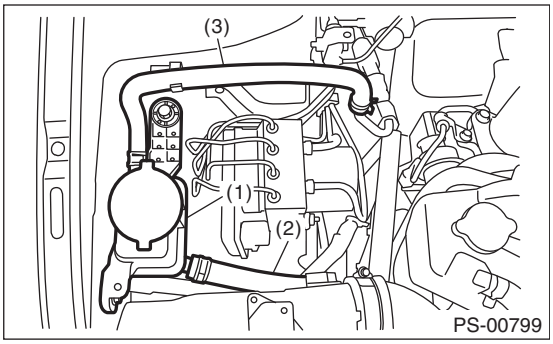
3) Remove the reservoir tank from the body.

B: INSTALLATION

1) Install the reservoir tank to the body.

Tightening torque:
13 N·m (1.33 kgf-m, 9.6 ft-lb)

2) Connect the hose to the reservoir tank.



(1) Reservoir tank
(2) Suction hose
(3) Return hose

3) Replenish power steering fluid up to the specified level. <Ref. to PS-49, INSPECTION, Power Steering Fluid.>

C: INSPECTION

Check the reservoir tank for cracks, breakage or damage. If a failure is found, replace the reservoir tank.

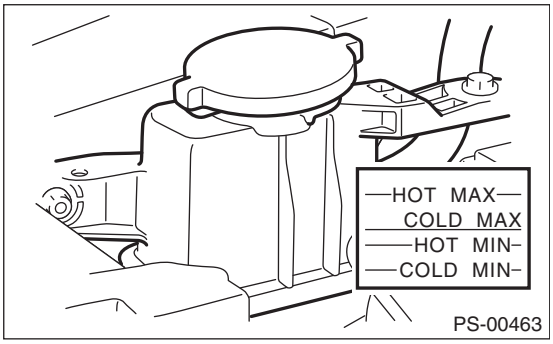
9. Power Steering Fluid

A: SPECIFICATION

Recommended power steering fluid
SUBARU genuine ATF or DEXRON III

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) Check at power steering fluid temperature 20°C (68°F); read the fluid level on the “COLD” side.
(2) Check at power steering fluid temperature 80°C (176°F); read the fluid level on the “HOT” side.



C: REPLACEMENT

1) Lift up the vehicle.
2) Remove the crossmember support.
3) Remove the pipe joint in the center of gearbox, and connect the vinyl hose to the pipe and joint. Wipe fluid off while turning the steering wheel.
4) Add the specified fluid to reservoir tank at “MAX” level.
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 3 mm (0.12 in) or more.
(2) Bubbles remain on the upper surface of the fluid.
(3) Grinding noise is generated from oil pump.
13) Check the fluid leakage after turning steering wheel from lock to lock with engine running.

10.General Diagnostic Table

A: INSPECTION

Trouble	Possible cause	Corrective action
• Steering effort is heavy in all ranges. • Steering effort is heavy at stand still. • Steering wheel vibrates when turning.	1. Pulley belt • 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 touches to pulley bottom • Poor revolution of pulleys (except oil pump pulley) • Poor revolution of oil pump pulley	Adjust or replace the faulty parts.
	2. Tire and wheel • Improper tire out of specifications*1 • Improper wheel out of specifications*1 • Tires not properly inflated	Replace or reinflate the tire and wheel. Instruct customers.
	3. Fluid • Low fluid level • Air entry in fluid • Dust entry in fluid • Fluid deterioration • Inadequate warm up of fluid*2	Refill the fluid, bleed air, replace or instruct customer.
	4. Idle speed • Lower idle speed • Excessive drop of idle speed at start or when turning the steering wheel*3	Adjust the idle speed or instruct customer.
	5. Measure the hydraulic pressure. <Ref. to PS-45, INSPECTION, Oil Pump.>	Replace the faulty parts.
	6. Measure the steering wheel effort. <Ref. to PS-53, MEASUREMENT OF STEERING EFFORT, INSPECTION, General Diagnostic Table.>	Adjust or replace.
	7. Fluid line • Fluid leakage from fluid line	Replace the faulty parts.
• Vehicle leads to one side or the other. • Returning force of steering wheel to center is poor. • Steering wheel vibrates when turning.	1. Tire and wheel • Flat tire • Mixed use of different tires • Mixed use of different wheels • Abnormal wear of tire • Unequal tread remaining • Unequal pressure of tire	Adjust, repair or replace the tire and wheel.
	2. Front alignment • Improper or unequal caster • Improper or unequal toe-in • Loose suspension connections	Adjust or retighten.
	3. Others • Damaged joint assembly • Unbalance of ground clearance • Unbalance of load	Replace or adjust the faulty parts, or instruct customer.
	4. Measure the steering wheel effort. <Ref. to PS-53, MEASUREMENT OF STEERING EFFORT, INSPECTION, General Diagnostic Table.>	Adjust or replace the faulty parts.

*1 If the tires or wheels are wider than standard, the load to power steering system is increased. Accordingly, in a condition, for example before fluid warms-up, relief valve may work before reaching maximum turning angle. In this case, steering effort may be heavy. When the measured hydraulic pressure is normal, there is no abnormal thing.
*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 fluid. If steering effort reduces normally, function is normal.
*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, start the vehicle with increasing engine speed than usual. If steering effort reduces normally, function is normal.

1. NOISE AND VIBRATION

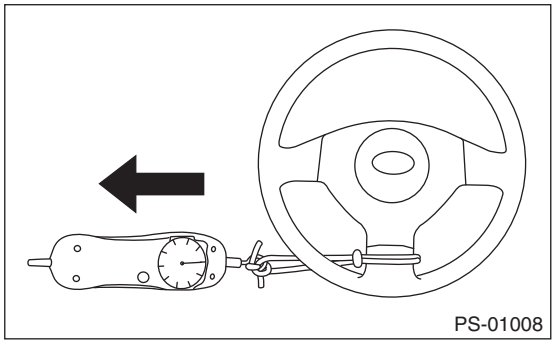
CAUTION:
Do not keep the relief valve operated for five seconds or more at any time or inner parts of the oil pump may be damaged due to rapid increase of fluid temperature.

NOTE:
• A screeching noise may be heard immediately after the engine start in extremely cold conditions. In this case, if the noise goes off during warm-up there is no abnormal function in the system. 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 steering wheel, fluid temperature and braking condition.
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 from slow to rapid, step by step.

Trouble	Possible cause	Corrective action
Hiss noise (continuous) While engine is running.	Relief valve emits operating sound when steering wheel is completely turned in either direction. (Do not keep this condition for 5 seconds or more.)	Normal operation
	Relief valve emits operating sound when steering wheel is not turned. This means that the relief valve is defective.	Replace the oil pump.
Rattling noise (intermittent) While engine is running.	Interference with adjacent parts	Check the clearance. Correct if necessary. <Ref. to PS-55, INSPECTION OF CLEARANCE, INSPECTION, General Diagnostic Table.>
	Loosened installation of oil pump, oil tank, pump bracket, gearbox or crossmember	Retighten.
	Loose oil pump pulley or other pulley(s)	Retighten.
	Looseness of linkage, play of steering, improper tightening (looseness) of suspension joint 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.

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	Correct or replace.
	Abnormal inside of oil tank	Replace.
	Removed oil 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 operation)	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 steering operation)	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 off when brake is released, it is normal.
Vibration While engine is running. (with/without steering operation)	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.

2. MEASUREMENT OF STEERING EFFORT

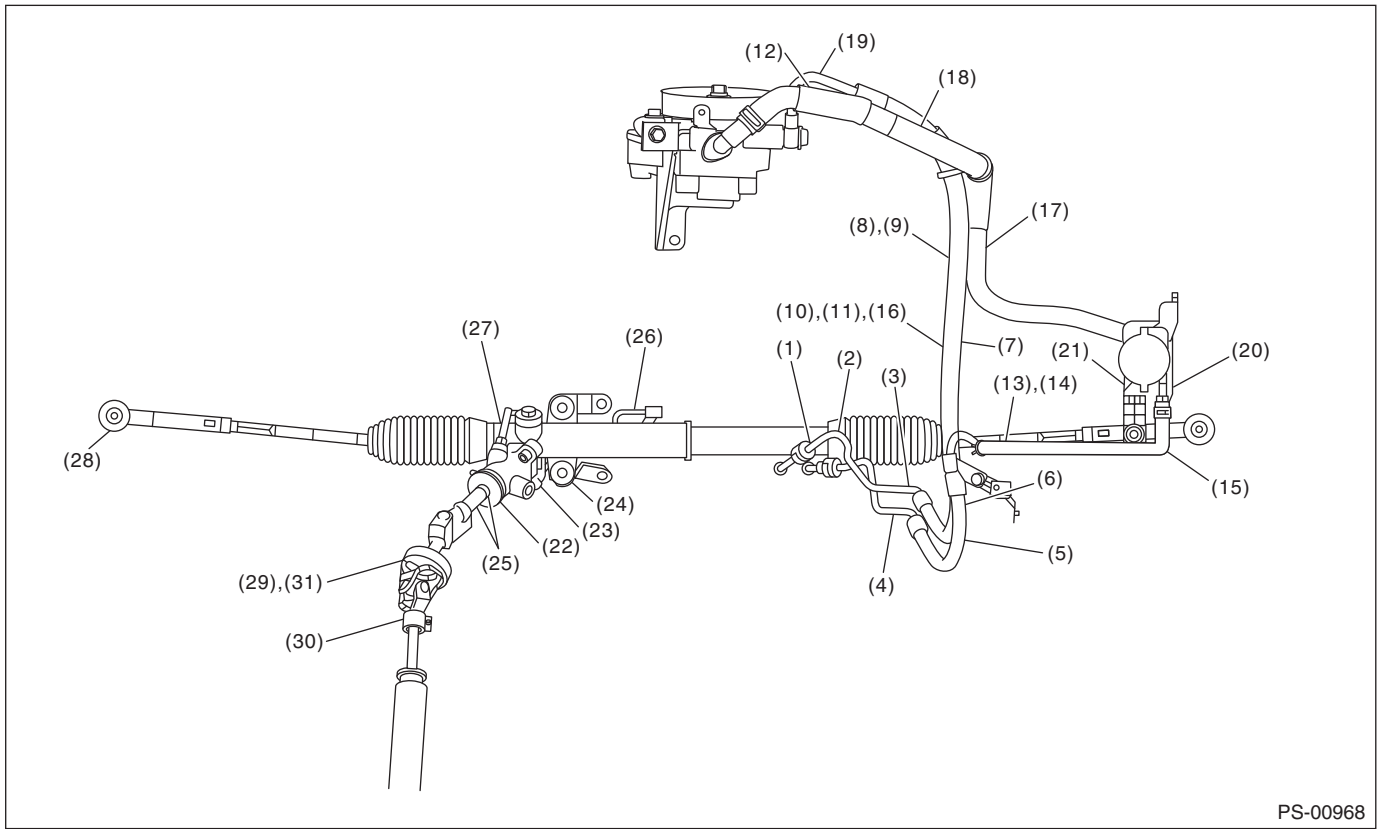
	Step	Check	Yes	No
1	**CHECK STEERING EFFORT.** 1) Stop the vehicle on paved road. 2) Start the engine. 3) Run the engine at idle. 4) Install a spring scale on the steering wheel. 5) Pull the spring scale at a right angle to the steering wheel, and measure both right and left steering wheel efforts.  PS-01008 NOTE: When turning the steering more quickly than necessary from a direction to the other direction at an engine speed of 2,000 rpm or higher, 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 (2.99 kgf, 6.6 lbf)?	Steering effort is normal.	Go to step **2**.
2	**CHECK STEERING EFFORT.** 1) Stop the engine and lift up the vehicle. 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 14 N (1.43 kgf, 3.1 lbf)?	Go to step **3**.	Perform the backlash adjustment.
3	**CHECK STEERING WHEEL EFFORT.** 1) Remove the universal joint. 2) Measure the steering wheel effort.	Is the steering effort less than 2.26 N (0.23 kgf, 0.51 lbf)?	Go to step **4**.	Replace the steering column.
4	**CHECK STEERING WHEEL EFFORT.** Measure the steering wheel effort.	Is the difference of steering effort between right and left less than 20%?	Go to step **5**.	Replace the steering column.
5	**CHECK UNIVERSAL JOINT.** Measure the swing torque of 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 lbf)?	Go to step **6**.	Replace the universal joint.
6	**CHECK UNIVERSAL JOINT.** Measure the swing torque of joint. (Yoke of gearbox side) <Ref. to PS-14, INSPECTION, Universal Joint.>	Is the swing torque of the universal joint less than 3.8 N (0.39 kgf, 0.86 lbf)?	Go to step **7**.	Replace the universal joint.
7	**CHECK FRONT WHEEL.** Check the front wheels.	Does the front wheels have unsteady revolution or rattling, or does the brake drag?	Inspect, readjust and replace if necessary.	Go to step **8**.
8	**CHECK TIE-ROD ENDS.** Remove the tie-rod ends from housing.	If the tie-rod ends have unsteady revolution or rattling?	Inspect and replace if necessary.	Go to step **9**.
9	**CHECK GEARBOX.** Measure the rotating of gearbox. <Ref. to PS-33, TURNING RESISTANCE OF GEARBOX, INSPECTION, Steering Gearbox.>	Is the turn resistance of the steering gearbox less than 13 N (1.33 kgf, 2.9 lbf)? Is the difference between right and left sides less than 24%?	Go to step **10**.	Readjust the backlash, and if ineffective, replace the faulty parts.

Step		Check	Yes	No
10	**CHECK GEARBOX.** Measure the sliding of gearbox. <Ref. to PS-32, SERVICE LIMIT, INSPECTION, Steering Gearbox.>	Is the sliding resistance of the steering gearbox less than 314 N (32 kgf, 71 lbf)? Is the difference between the right and left sliding resistances less than 20 %?	Steering effort is normal. Check the suspension.	Readjust the backlash, and if ineffective, replace the faulty parts.

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.

Location	Minimum allowance mm (in)
(1) Crossmember to Hose ASSY	3 (0.12)
(2) Front exhaust pipe to hose ASSY	15 (0.59)
(3) Front frame side to Hose ASSY	10 (0.39)
(4) Turbo cover to hose ASSY	10 (0.39)
(5) Master cylinder to return hose	10 (0.39)
(6) Master cylinder to hose clip	10 (0.39)
(7) VDC H/U to hose ASSY	5 (0.20)
(8) Air cleaner to hose ASSY	5 (0.20)
(9) Air boot to Hose ASSY	10 (0.39)
(10) Air cleaner hose to hose ASSY	10 (0.39)
(11) Blow-by hose to hose ASSY	8 (0.31)
(12) Over flow hose to hose ASSY	8 (0.31)
(13) Brake pipe to return hose	10 (0.39)
(14) Front suspension bracket to Return hose	5 (0.20)
(15) Front wheel apron to Return hose	5 (0.20)
(16) VDC H/U bracket to suction hose	5 (0.20)
(17) Air cleaner case to Suction hose	5 (0.20)
(18) Air intake duct to suction hose	10 (0.39)
(19) Air duct to suction hose	10 (0.39)
(20) Front wheel apron to Reservoir tank	5 (0.20)
(21) VDC H/U to reserve tank	5 (0.20)
(22) Valve housing to DOJ (5MT model)	12 (0.47)
(23) Valve housing to Crossmember (Hole)	1 (0.04)
(24) Cannon mount to crossmember	There must be no contact
(25) Pipe to crossmember	5 (0.20)
(26) Pipe to stabilizer	15 (0.59)
(27) Pipe to exhaust pipe	18 (0.71)
(28) Tie-rod end to brake dust cover	2.5 (0.10)
(29) Universal joint coupling to turbo cover	15 (0.59)
(30) Universal joint column side yoke to Master cylinder (Closest point of approach when the universal joint turns by 360°)	5 (0.20)
(31) Universal joint coupling to ATF level gauge	10 (0.39)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PS-00968

BODY SECTION

This service manual has been prepared to provide SUBARU service personnel with the necessary information and data for the correct maintenance and repair of SUBARU vehicles.
This manual includes the procedures for maintenance, disassembling, reassembling, inspection and adjustment of components and diagnostics for guidance of experienced mechanics.
Please peruse and utilize this manual fully to ensure complete repair work for satisfying our customers by keeping their vehicle in optimum condition. When replacement of parts during repair work is needed, be sure to use SUBARU genuine parts.

All information, illustration and specifications contained in this manual are based on the latest product information available at the time of publication approval.

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)	AC
HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)	AC(diag)
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AIRBAG SYSTEM (DIAGNOSTICS)	AB(diag)
OCCUPANT DETECTION SYSTEM (DIAGNOSTICS)	OD(diag)
SEAT BELT SYSTEM	SB
LIGHTING SYSTEM	LI
WIPER AND WASHER SYSTEMS	WW
ENTERTAINMENT	ET
COMMUNICATION SYSTEM	COM
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INSTRUMENTATION/DRIVER INFO	IDI
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SECURITY AND LOCKS	SL
SUNROOF/T-TOP/CONVERTIBLE TOP (SUNROOF)	SR
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BODY SECTION

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CRUISE CONTROL SYSTEM (DIAGNOSTICS)	CC(diag)
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LAN SYSTEM (DIAGNOSTICS)	LAN(diag)

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

AC

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1. General Description

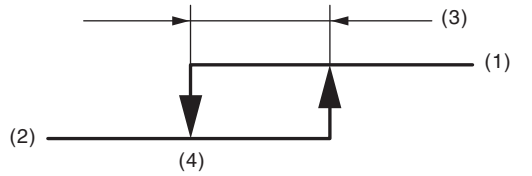
A: SPECIFICATION

1. HEATER SYSTEM

Item		Specifications	Condition
Heating capacity		5.0 kW (4,299 kcal/h, 17,059 BTU/h) or more	• Air flow control dial or switch: FOOT • Temperature adjustment dial: MAX 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		290 m^3 (10,243 cu ft)/h	FOOT mode (FRESH), MAX HOT at 12.5 V
Max air flow rate		480 m^3 (16,954 cu ft)/h	• Temperature adjustment dial: MAX COOL • FAN switch Dual auto A/C model: 7th position • Fan speed control dial Single auto A/C model: 7th position Manual A/C model: 4th position • FRESH/RECIRC switch: RECIRC
Heater core size (height × length × width)		257.5 × 118.5 × 27 mm (10.1 × 4.67 × 1.06 in)	—
Blower motor	Type	Magnet motor 260 W or less	12 V
	Fan type and size (diameter × width)	Sirocco fan type 150 × 75 mm (5.91 × 2.95 in)	—

2. A/C SYSTEM

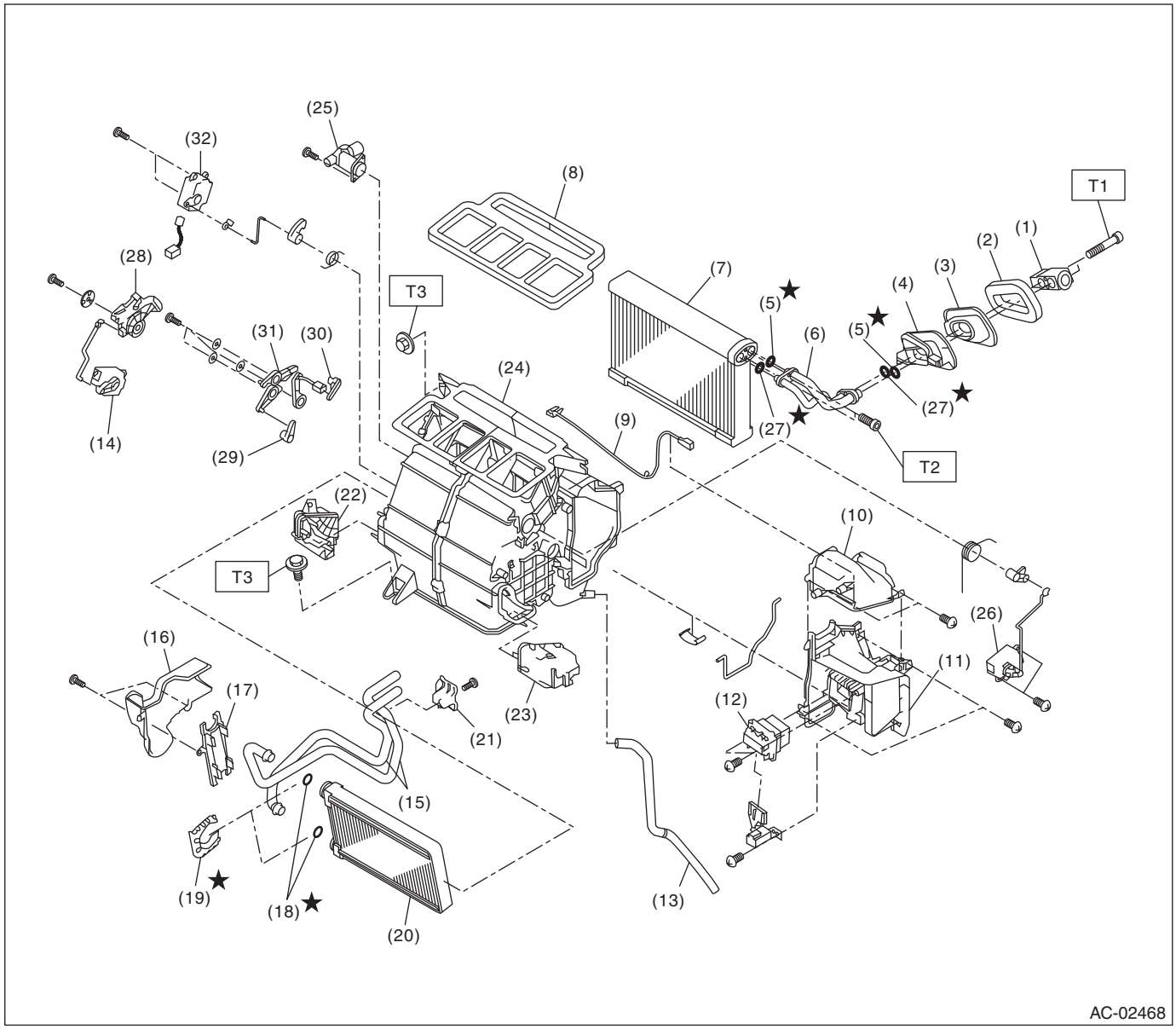
Item		Specifications
Type of air conditioner		Reheat air-mix type
Cooling capacity		5.0 kW [at 480 m^3 (16,954 cu ft) /h] (4,299 kcal/h, 17,059 BTU/h)
Refrigerant		HFC-134a (CH_2FCF_3) [0.5±0.05 kg (1.1±0.11 lb)]
Compressor	Type	Rotary, constant volume (DKV-10R)
	Discharge	105 cc (6.41 cu in)/rev
	Max. permissible speed	7,700 rpm
Magnet clutch	Type	Dry, single-disc type
	Power consumption	Non-turbo model: 41.2 W Turbo model: 38.8 W
	Type of belt	Non-turbo model: V-belt 6 PK Turbo model: V-belt 4 PK
	Pulley dia. (effective dia.)	Non-turbo model: 110 mm (4.33 in) Turbo model: 100 mm (3.94 in)
	Pulley ratio	Non-turbo model: 1.3 Turbo model: 1.33
Condenser	Type	Sub cool type
	Core face area	0.188 m^2 (2.002 sq ft)
	Core thickness	16 mm (0.63 in)
	Radiation area	4.5 m^2 (48.44 sq ft)
Expansion valve	Type	Block
Evaporator	Type	Dual-tank
	Dimensions (W × H × T)	290.1 × 172 × 39 mm (11.42 × 6.77 × 1.54 in)

Item			Specifications
Blower fan		Fan type	Sirocco fan
		Outer diameter × width	150 × 75 mm (5.91 × 2.95 in)
		Power consumption	260 W
Condenser fan (Sub fan)		Motor type	Magnet
		Power consumption	Non-turbo model: 90 W Turbo model: 120 W
		Fan outer diameter	Non-turbo model: 300 mm (11.8 in) Turbo model: 318.5 mm (12.5 in)
Radiator fan (Main fan)		Motor type	Magnet
		Power consumption	Non-turbo model: 90 W Turbo model: 120 W
		Fan outer diameter	Non-turbo model: 300 mm (11.8 in) Turbo model: 318.5 mm (12.5 in)
Idle speed	MPFI model	No load	Non-turbo MT model: 650±100 rpm Non-turbo AT model: 675±100 rpm Turbo model: 700±100 rpm
		A/C ON	Non-turbo model: 850±100 rpm Turbo model: 825±100 rpm
Triple switch (Pressure switch)	Low-pressure switch operating pressure	ON → OFF	177±25 kPa (1.80±0.25 kgf/cm^2, 25.7±3.6 psi)
		OFF → ON	206±30 kPa (2.10±0.31 kgf/cm^2, 29.9±4.3 psi)
	High-pressure switch operating pressure	ON → OFF	2,940±200 kPa (29.98±2.04 kgf/cm^2, 426.3±29 psi)
		OFF → ON	2,350±200 kPa (24.00±2.04 kgf/cm^2, 340.7±29.0 psi)
	Middle-pressure switch operating pressure	ON → OFF	1,470±120 kPa (14.99±1.22 kgf/cm^2, 213.15±17.4 psi)
		OFF → ON	1,770±100 kPa (18.05±1.02 kgf/cm^2, 256.65±14.5 psi)
Thermo-control amplifier working temperature			 AC-00601 (1) ON (2) OFF (3) 1.5±0.3°C (34.7±0.5°F) (4) 1.0±0.5°C (33.8±0.9°F)

B: COMPONENT

1. HEATER COOLING UNIT

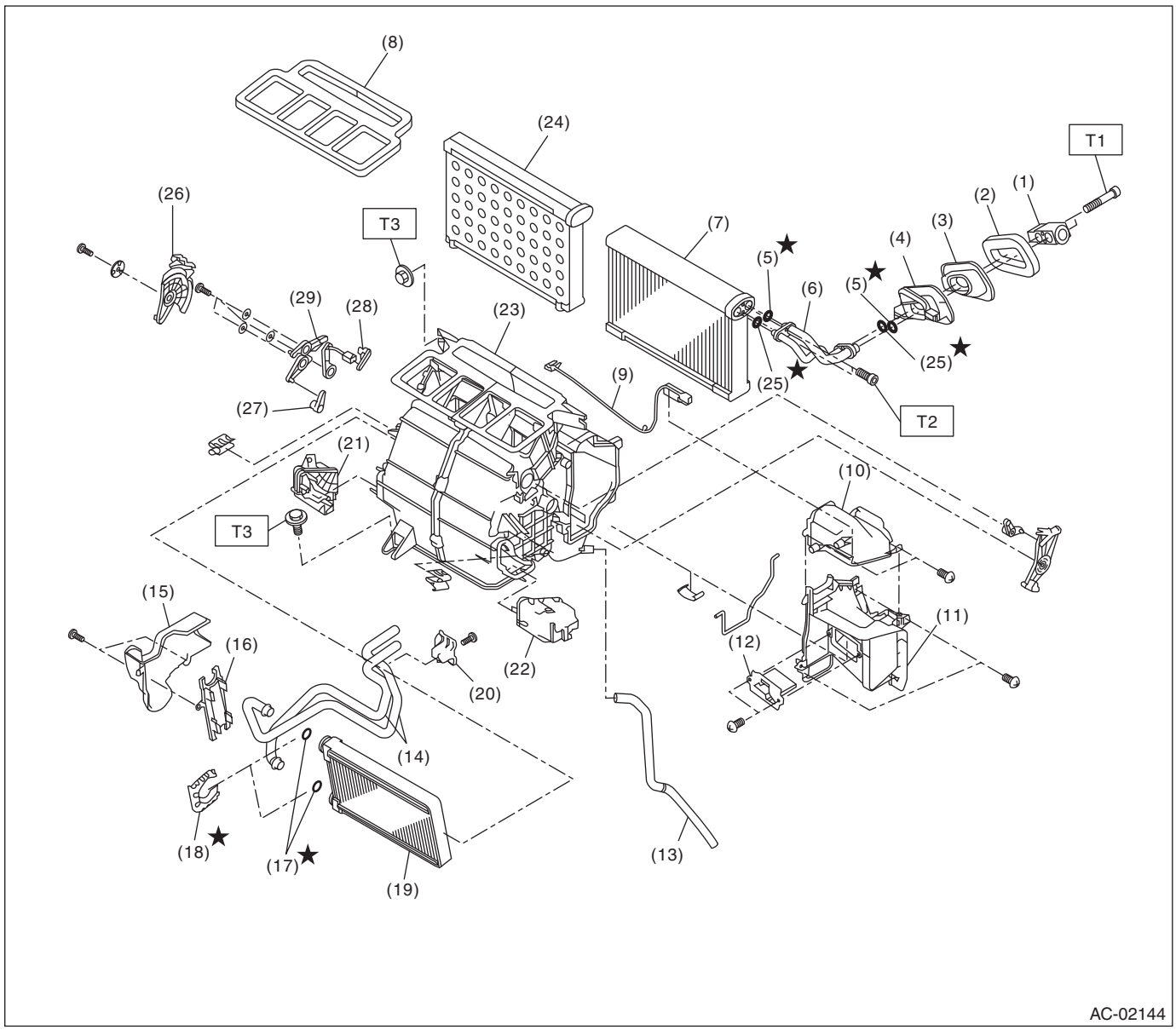
- Auto A/C model



(1) Expansion valve
(2) Gasket
(3) Grommet
(4) Case
(5) O-ring
(6) Evaporator pipe
(7) Evaporator
(8) Lining
(9) Evaporator sensor
(10) Evaporator pipe cover
(11) Evaporator cover
(12) Power transistor
(13) Drain hose
(14) Mode actuator
(15) Heater core pipe
(16) Heater pipe cover
(17) Heater core cover
(18) O-ring
(19) Clamp
(20) Heater core
(21) Pipe clamp
(22) Foot duct (LH)
(23) Foot duct (RH)
(24) Heater case
(25) Aspirator
(26) Air mix actuator
(27) O-ring
(28) Mode main lever
(29) Vent door link
(30) Defroster door link
(31) Mode link
(32) Air mix actuator (dual A/C model)

Tightening torque:N·m (kgf-m, ft-lb)
T1: 5.0 (0.51, 3.7)
T2: 6.7 (0.68, 4.9)
T3: 7.5 (0.76, 5.5)

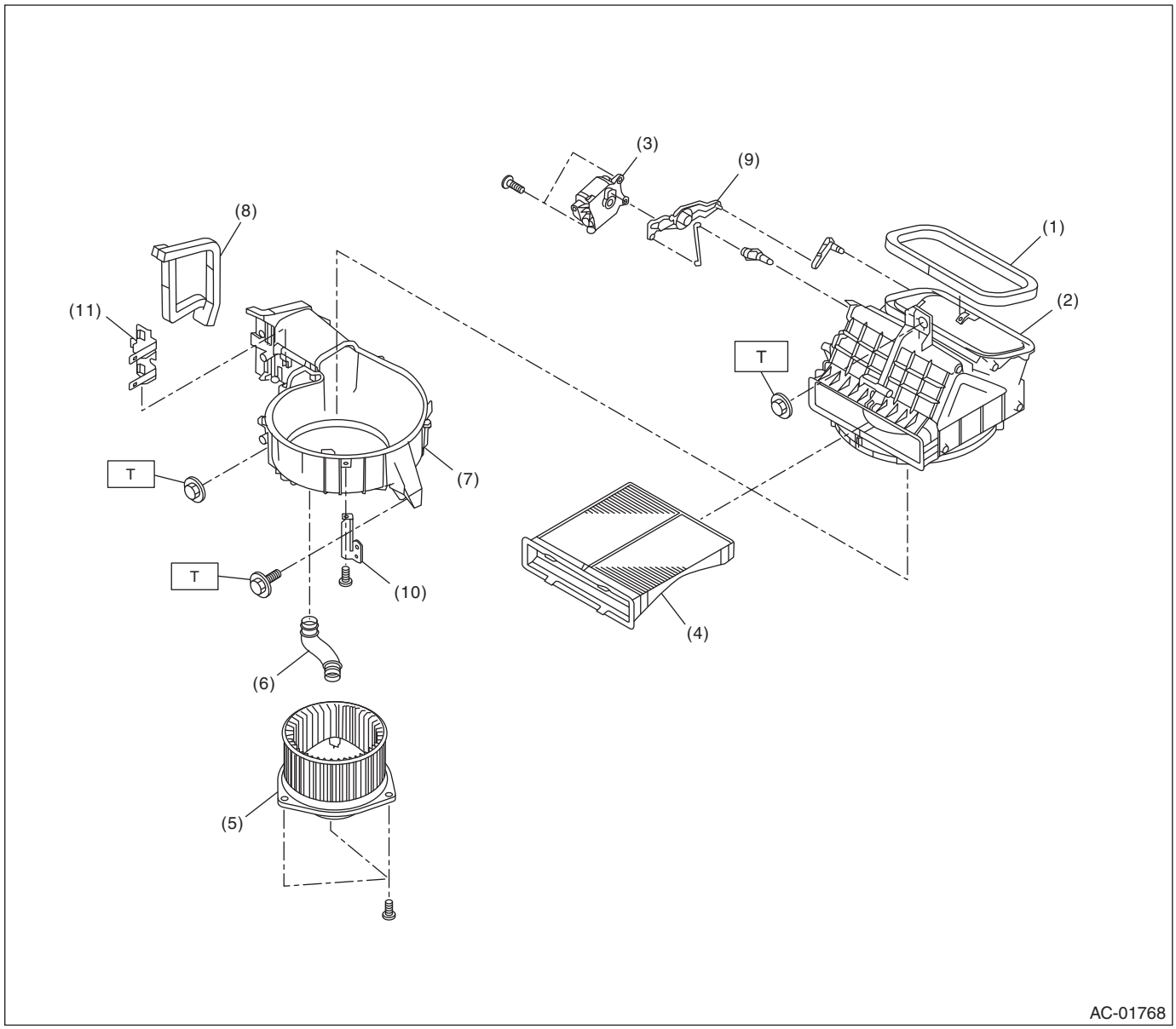
- Manual A/C model



(1) Expansion valve
(2) Gasket
(3) Grommet
(4) Case
(5) O-ring
(6) Evaporator pipe
(7) Evaporator
(8) Lining
(9) Thermostat
(10) Evaporator pipe cover
(11) Evaporator cover
(12) Resistor
(13) Drain hose
(14) Heater core pipe
(15) Heater pipe cover
(16) Heater core cover
(17) O-ring
(18) Clamp
(19) Heater core
(20) Pipe clamp
(21) Foot duct (LH)
(22) Foot duct (RH)
(23) Heater case
(24) Plate (Model without A/C)
(25) O-ring
(26) Mode main lever
(27) Vent door link
(28) Defroster door link
(29) Mode link

Tightening torque:N·m (kgf-m, ft-lb)
T1: 5.0 (0.51, 3.7)
T2: 6.7 (0.68, 4.9)
T3: 7.5 (0.76, 5.5)

2. BLOWER MOTOR UNIT

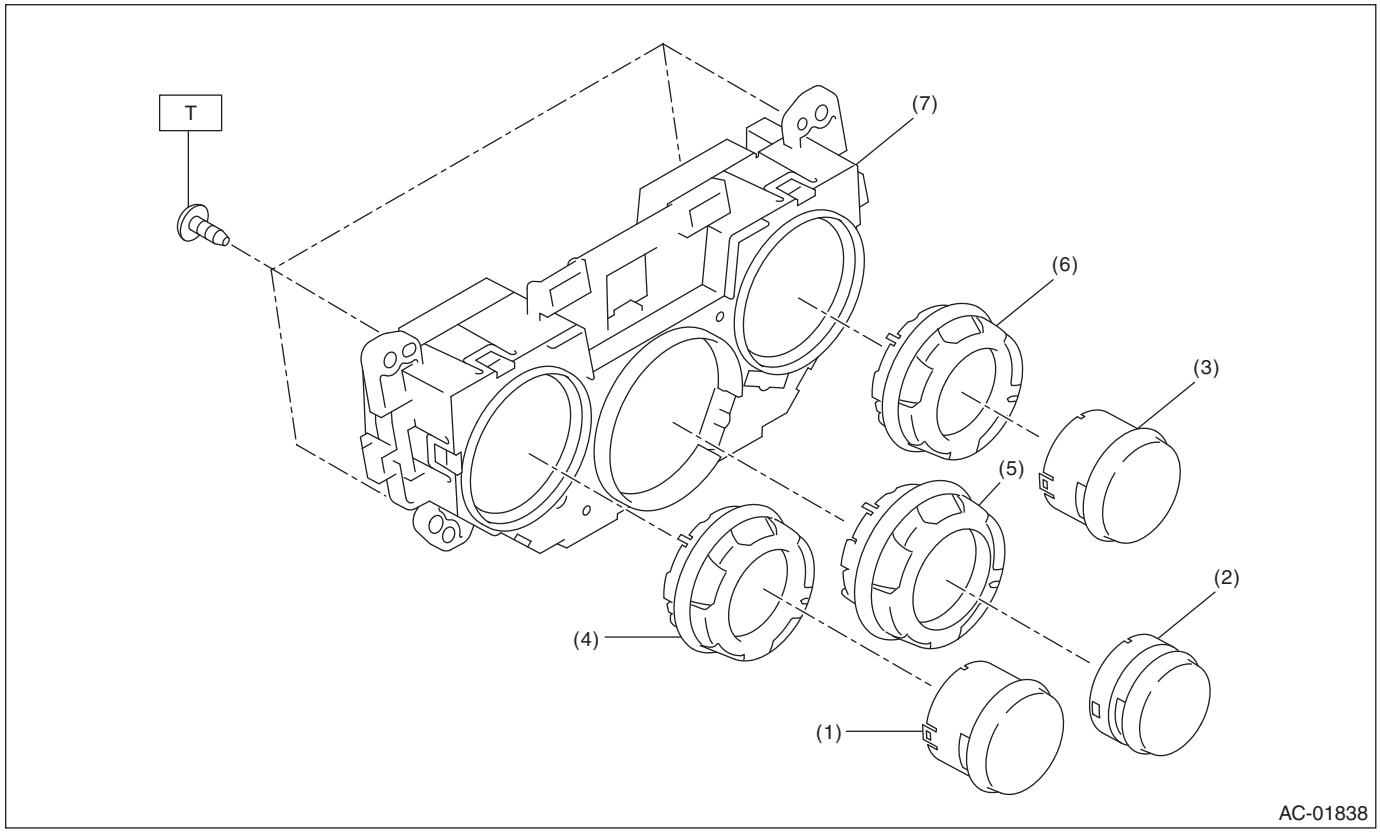


(1) Lining
(2) Upper case
(3) Intake door actuator
(4) Filter
(5) Blower motor ASSY
(6) Hose
(7) Lower case
(8) Lining
(9) Intake door link
(10) Relay bracket
(11) Relay holder bracket

Tightening torque:N·m (kgf-m, ft-lb)
T: 7.5 (0.76, 5.5)

3. CONTROL MODULE

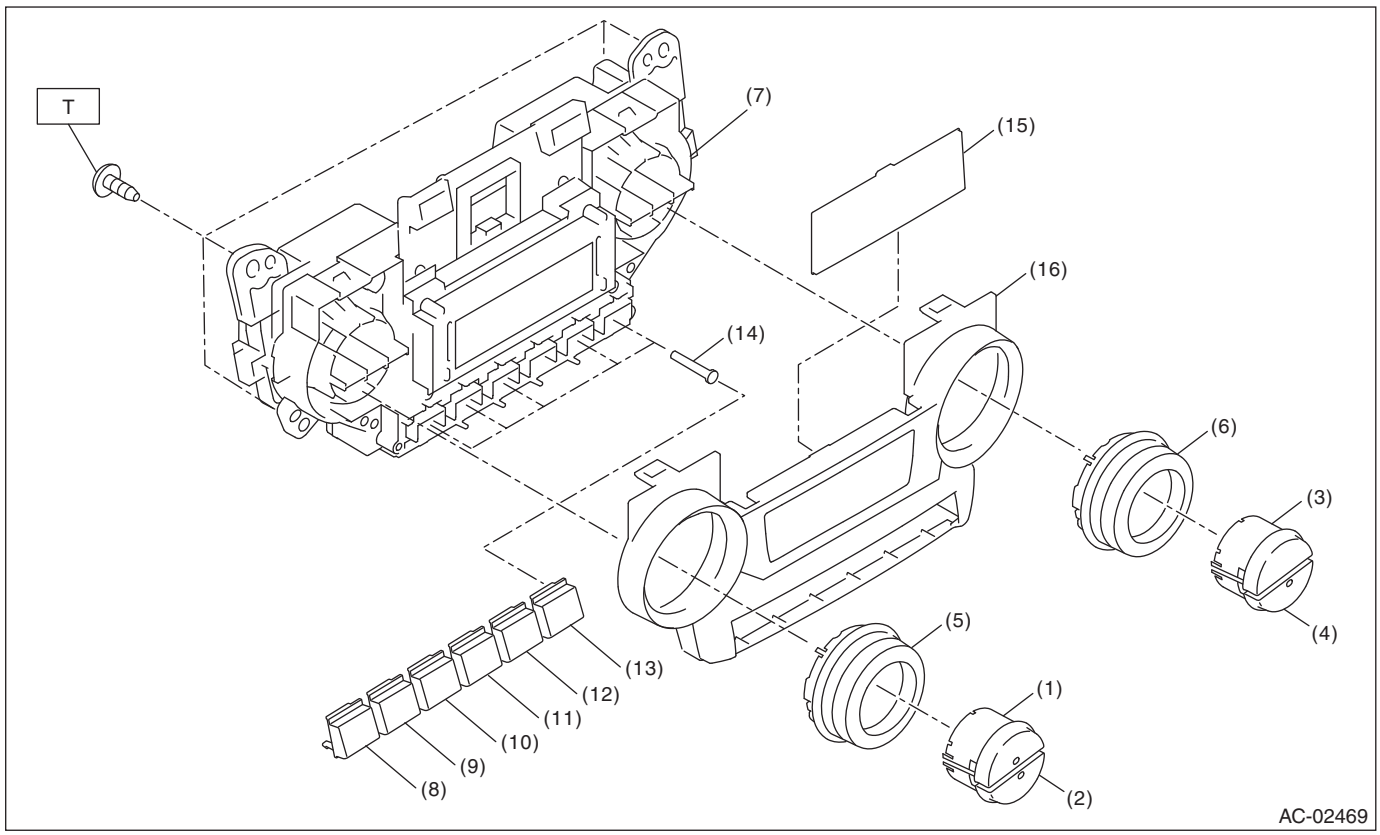
- Single auto A/C model



(1) FRESH/RECIRC switch
(2) Rear window defogger switch
(3) A/C switch
(4) Fan speed control dial
(5) Air flow control dial
(6) Temperature control dial
(7) Control case

Tightening torque:N·m (kgf-m, ft-lb)
T: 2 (0.20, 1.48)

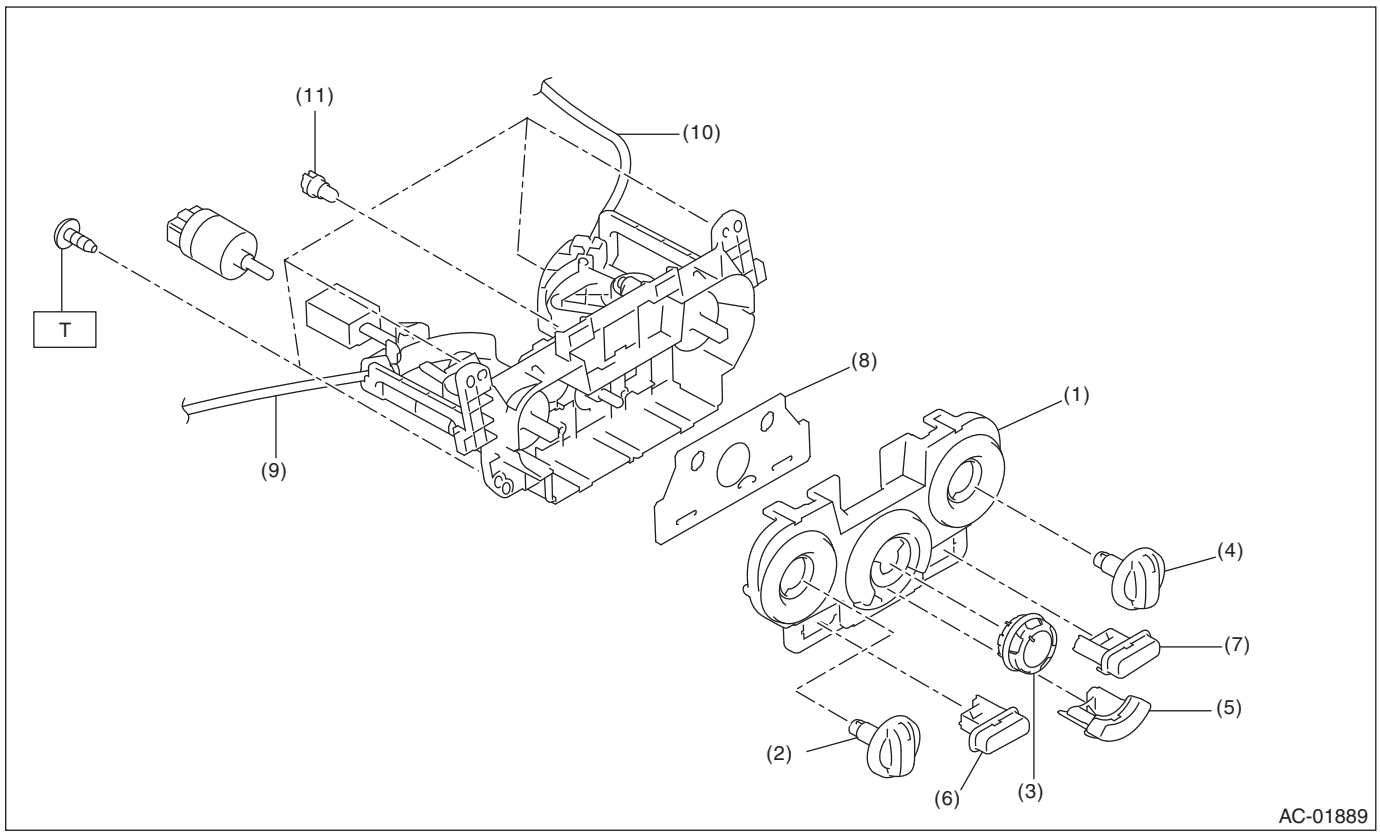
- Dual auto A/C model



(1) AUTO switch
(2) Dual switch
(3) Front defroster switch
(4) Rear window defogger switch
(5) Temperature adjustment dial (driver's seat)
(6) Temperature adjustment dial (passenger's seat)
(7) Control case
(8) OFF switch
(9) FRESH/RECIRC switch
(10) Fan switch (down)
(11) Fan switch (up)
(12) Air flow control switch
(13) A/C switch
(14) Shaft
(15) Lens
(16) Control panel

Tightening torque:N·m (kgf-m, ft-lb)
T: 2 (0.20, 1.48)

- Manual A/C model

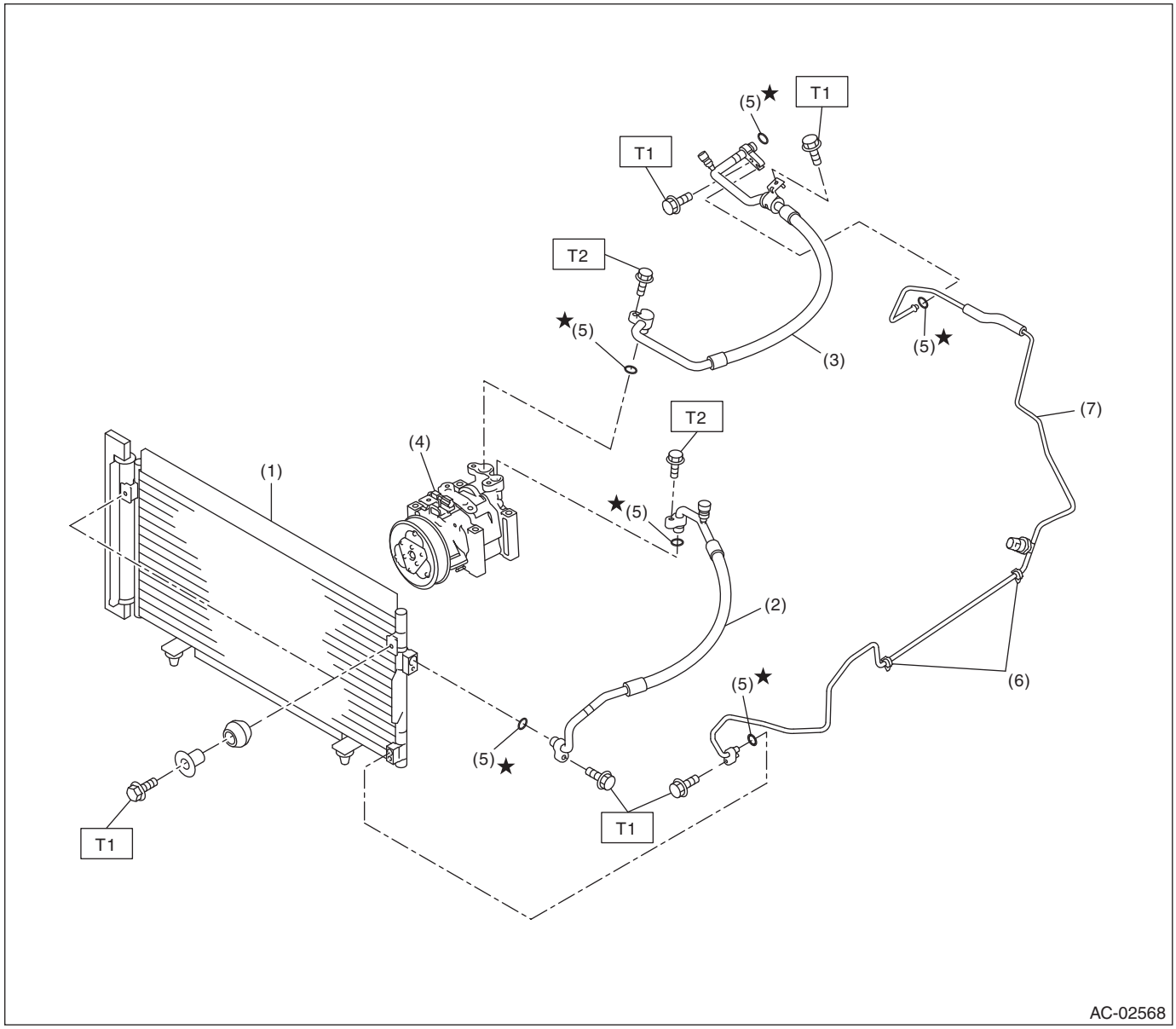


(1) Panel
(2) Air flow control dial
(3) Fan speed control dial
(4) Temperature control dial
(5) A/C switch
(6) Rear window defogger switch
(7) FRESH/RECIRC switch
(8) Switch board
(9) Air flow control cable
(10) Temperature control cable
(11) Valve

Tightening torque:N·m (kgf-m, ft-lb)
T: 2 (0.20, 1.5)

4. AIR CONDITIONING UNIT

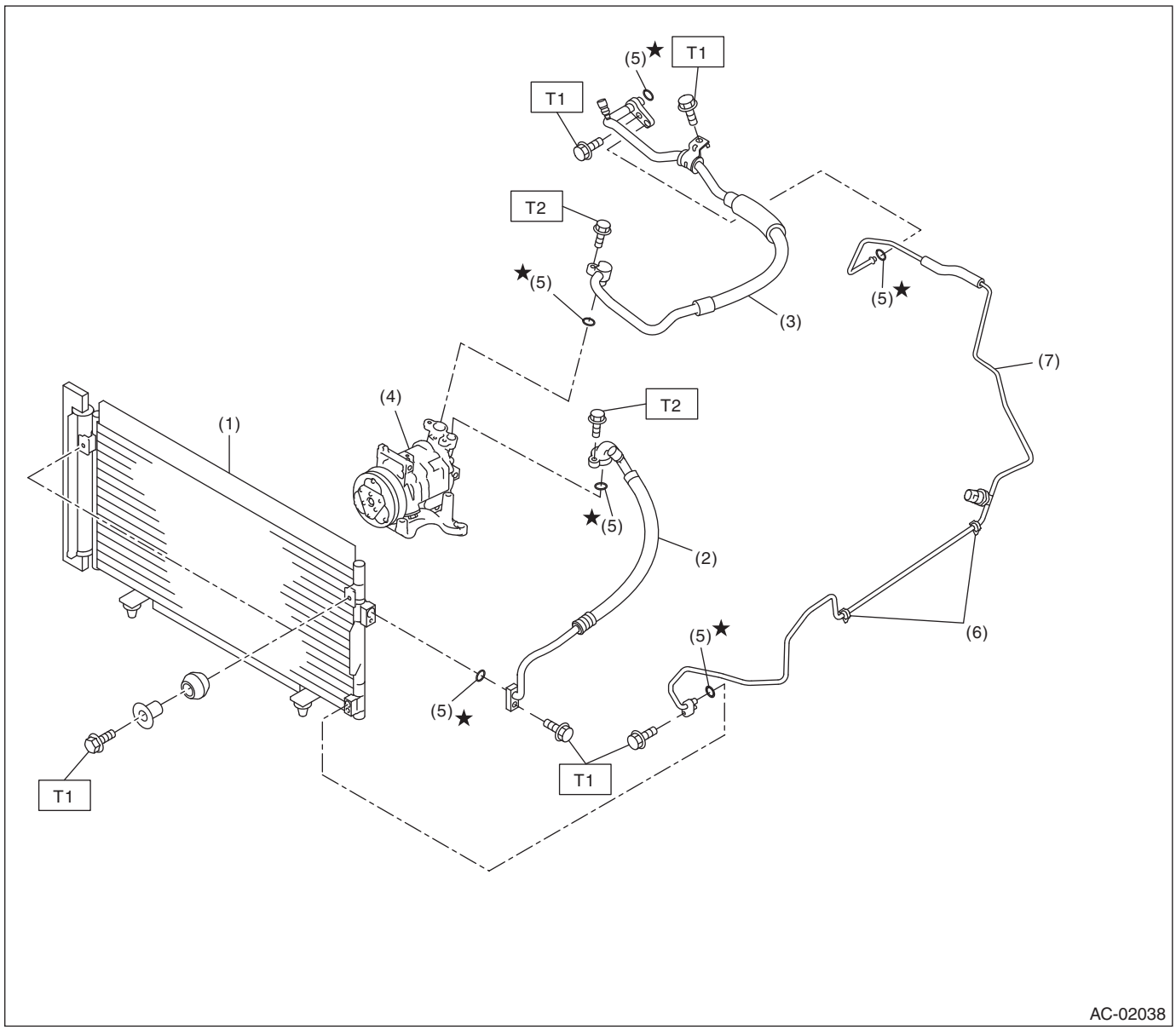
- Non-turbo model



(1) Condenser
(2) Hose (high-pressure)
(3) Hose (low-pressure)
(4) Compressor
(5) O-ring
(6) Clamp
(7) Pipe

Tightening torque:N·m (kgf-m, ft-lb)
T1: 7.5 (0.76, 5.5)
T2: 10 (1.02, 7.4)

- Turbo model

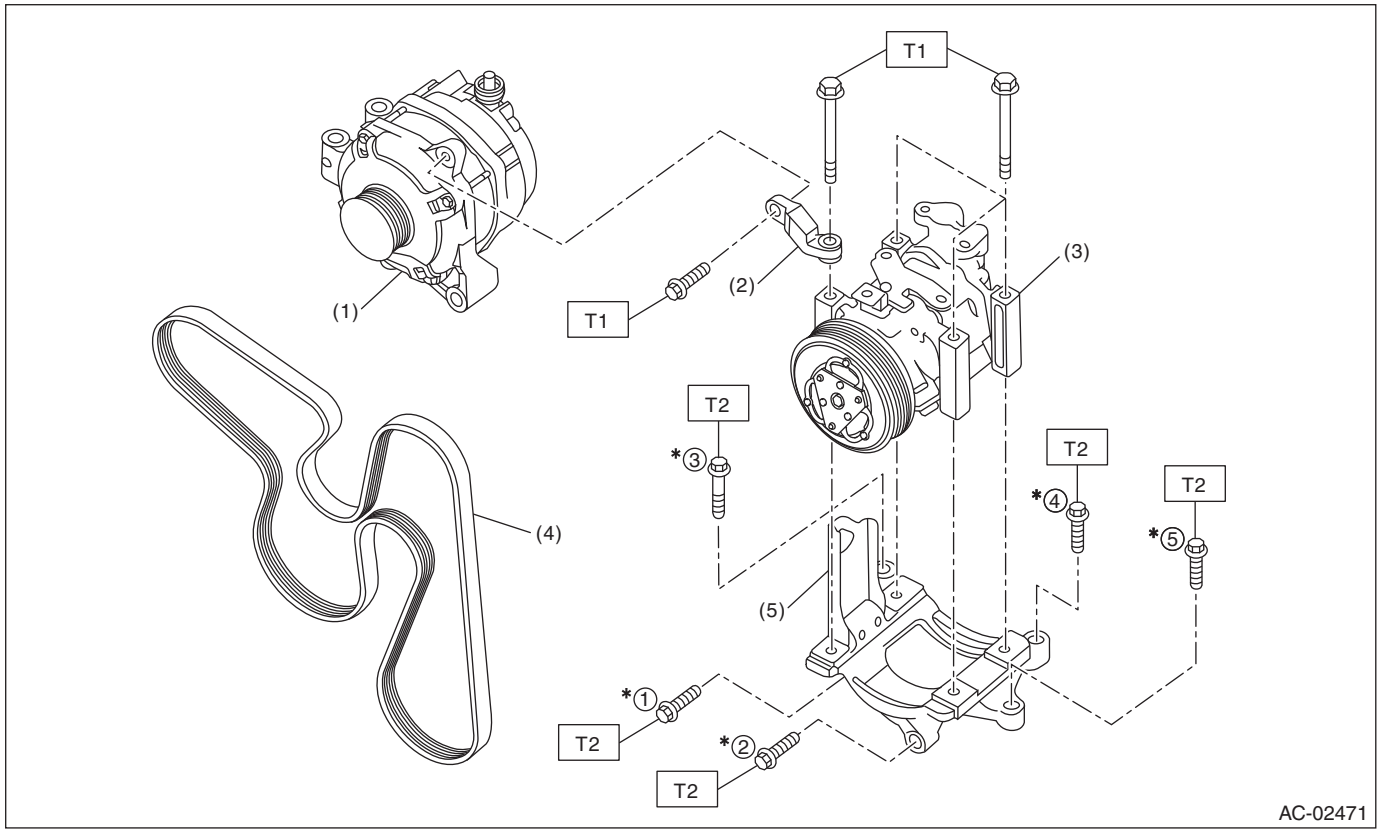


(1) Condenser
(2) Hose (high-pressure)
(3) Hose (low-pressure)
(4) Compressor
(5) O-ring
(6) Clamp
(7) Pipe

Tightening torque:N·m (kgf-m, ft-lb)
T1: 7.5 (0.76, 5.5)
T2: 10 (1.02, 7.4)

5. COMPRESSOR

- Non-turbo model

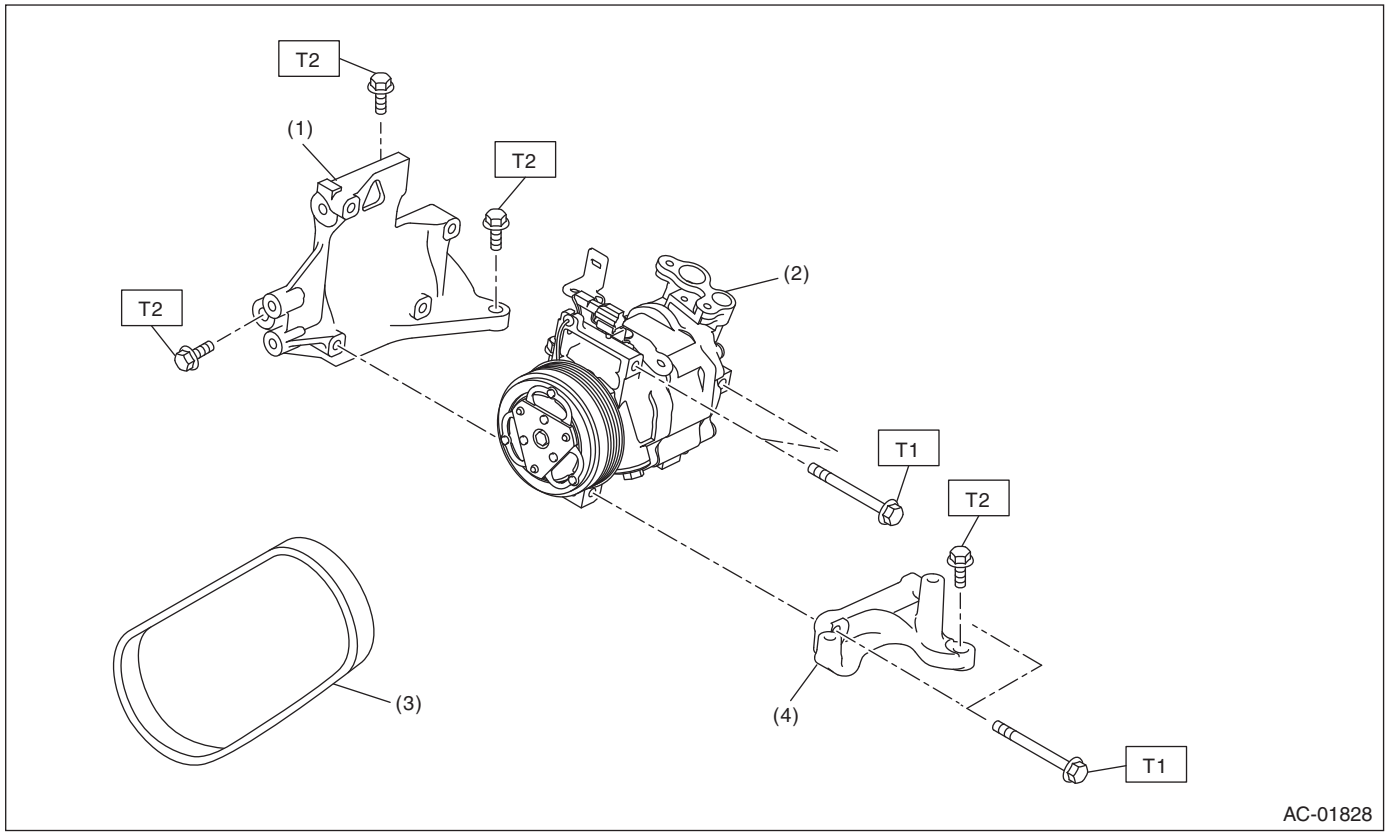


(1) Generator
(2) Generator bracket
(3) Compressor
(4) V-belt (6 PK)
(5) Compressor bracket

Tightening torque:N·m (kgf-m, ft-lb)
T1: 25 (2.55, 18.4)
T2: 36 (3.67, 26.6)

* Tighten the compressor bracket in the numerical order as shown in the figure.

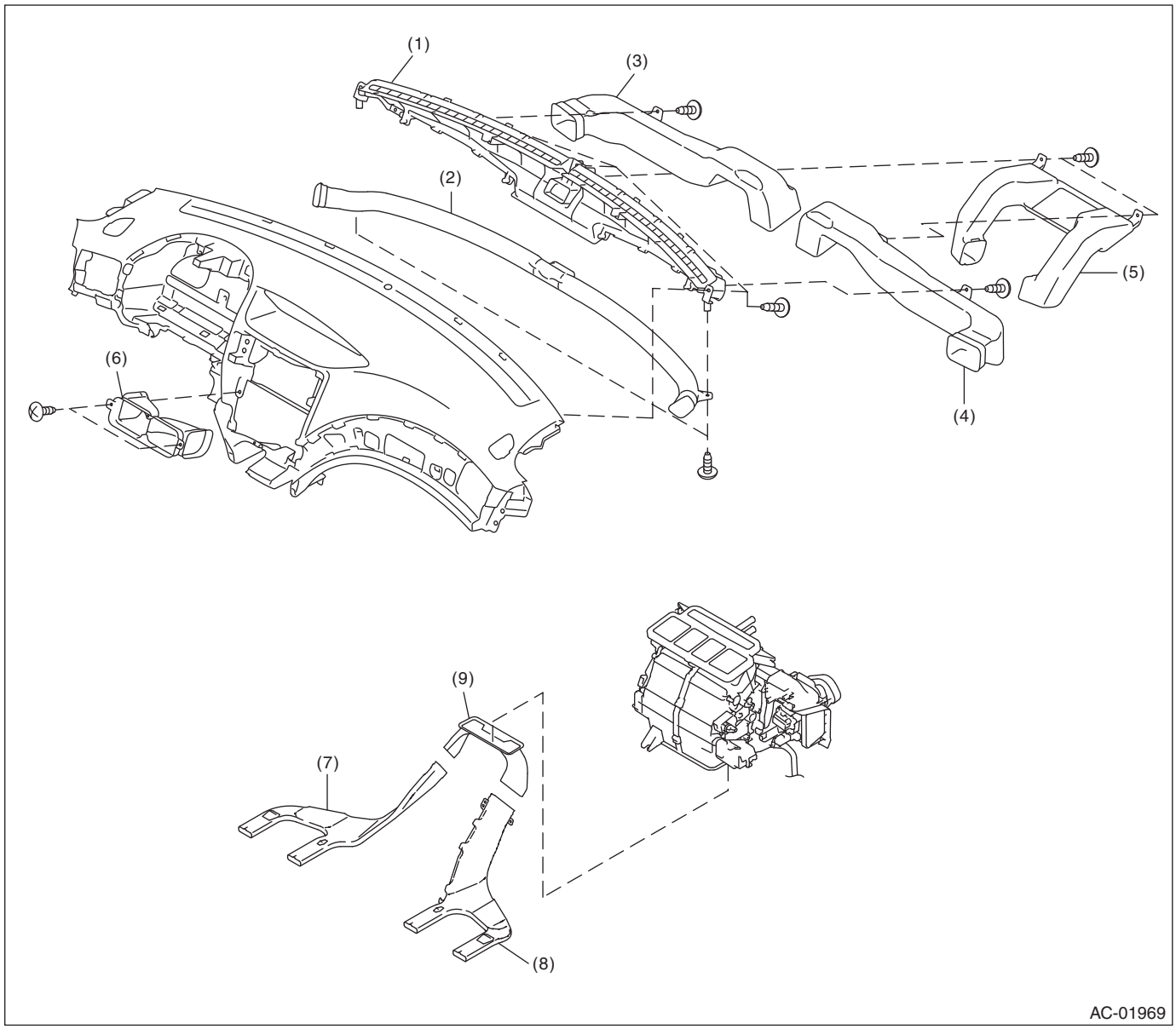
- Turbo model



(1)	Compressor bracket	(3)	V-belt (4 PK)
(2)	Compressor	(4)	Compressor bracket

Tightening torque:N·m (kgf-m, ft-lb)
T1: 26.5 (2.70, 19.5)
T2: 36 (3.67, 26.6)

6. HEATER DUCT



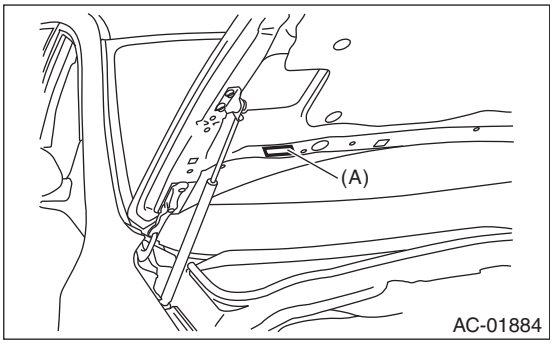
(1) Front defroster nozzle
(2) Side defroster duct
(3) Side vent duct (LH)
(4) Side vent duct (RH)
(5) Center vent duct
(6) Center vent duct front
(7) Rear heater duct (LH)
(8) Rear heater duct (RH)
(9) Rear heater duct center

C: CAUTION

• Before disassembling or reassembling parts, always disconnect the battery ground cable from battery. When replacing the audio, control module 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 securely during reassembly.
• After reassembly, make sure that the functional parts operate normally.

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.



2. COMPRESSOR OIL

• HFC-134a compressor oil has no compatibility with that of CFC-12 system.
• Use only the manufacturer-authorized compressor oil for the HFC-134a system; only use DH-PR (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.

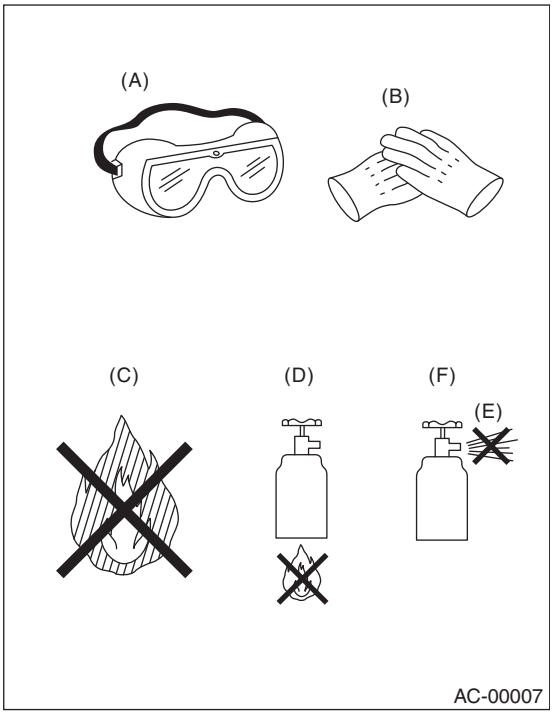
3. REFRIGERANT

• CFC-12 refrigerant cannot be used in a HFC-134a A/C system. HFC-134a refrigerant, also cannot be used in a 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 warm water of 40°C (104°F) or less.
• 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 the 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.

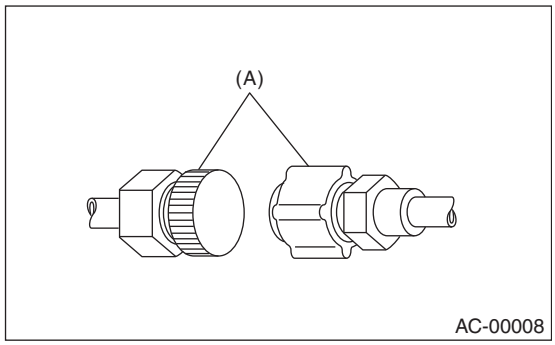
• In order to prevent global warming, avoid releasing HFC-134a into the atmosphere. Using a refrigerant recovery system, discharge and recycle the gas.



(A) Goggles
(B) Gloves
(C) Avoid open flame
(D) No direct heat on container
(E) Do not discharge
(F) Loosen

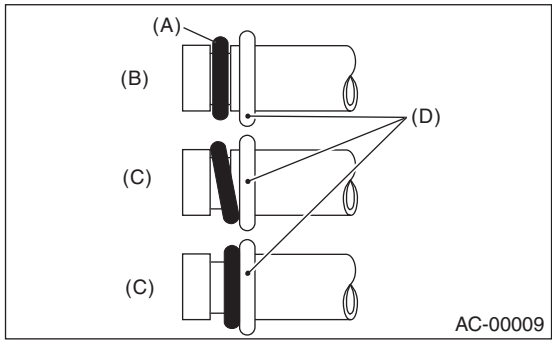
5. O-RING CONNECTIONS

• Always use a new O-ring.
• In order to keep the O-rings free of lint which will cause a refrigerant gas leak, perform work without using gloves or waste cloths.
• Before installation, apply compressor oil to O-rings to avoid sticking.
• Use a torque wrench to tighten the O-ring fittings. Over-tightening will result in damage of the O-ring and deformation of the pipe end.
• If the work is interrupted before completing pipe connections, recap the pipes, components and fittings with a plug or tape to prevent foreign matter from entering.



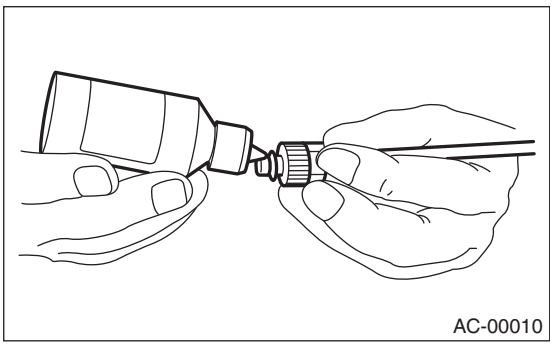
(A) Seal

• 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 pipe groove.



(A) O-ring
(B) OK
(C) NG
(D) Groove

• Use compressor oil specified in the service manual to lubricate the O-rings.
Apply oil to the top and sides of O-rings before installation.
Apply compressor oil to the pipe grooves.



• After tightening, use a clean cloth to remove excess compressor 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 tighten the connections further, 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 a HFC-134a system, only use HFC-134a specified tools and parts. Do not mix CFC-12 tools and parts. If HFC-134a and CFC-12 refrigerant or compressor oil is mixed, it will result in poor lubrication and the compressor itself may be damaged.
In order to prevent the mixture of HFC-134a and CFC-12 parts and liquid, the type of tool and screw, and the replacement 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

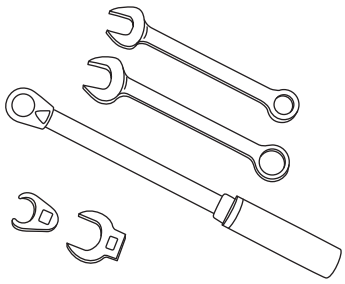
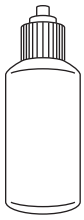
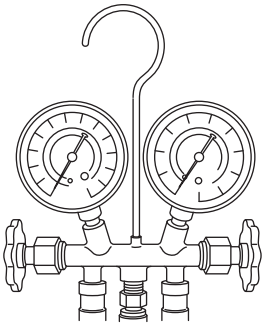
Illustration	Name and Function
 AC-00213	Wrench Various **WRENCHES** will be required to service an A/C system.7 — 40 N·m (0.7 to 4.1 kgf-m, 5 to 30 ft-lb) torque wrench and various crowfoot wrenches will be needed. Open end or flare nut wrenches will be needed to affix the pipe and hose fittings.
 AC-00012	Applicator bottle A small **APPLICATOR BOTTLE** is recommended to apply compressor oil to the various parts. It can be available at a hardware store.
 AC-00013	Manifold gauge set A **MANIFOLD GAUGE SET** (with hoses) is available either from a refrigerant supplier or an automotive equipment supplier.

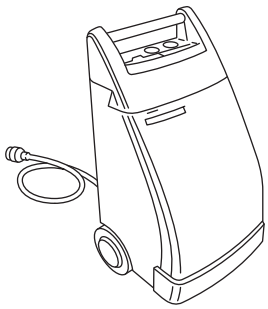
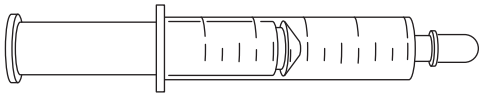
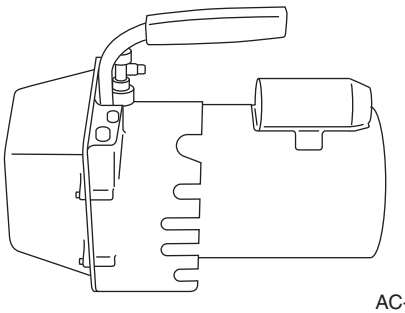
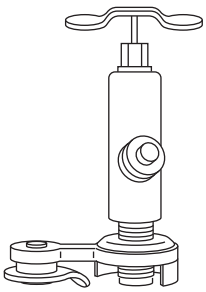
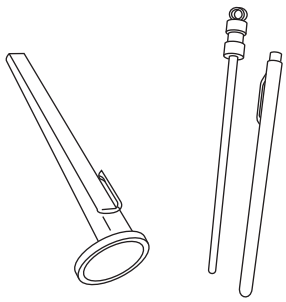
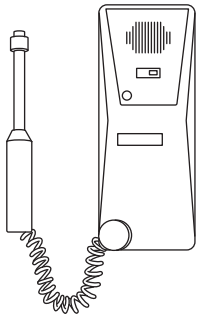
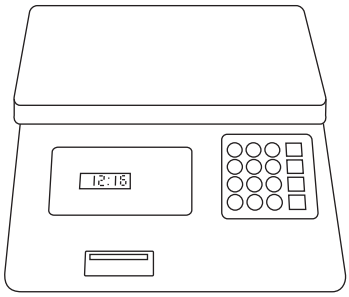
Illustration	Name and Function
 AC-00014	Refrigerant recovery system A **REFRIGERANT RECOVERY SYSTEM** is used for the recovery and recycling of an A/C system refrigerant after contaminants and moisture have been removed from the refrigerant.
 AC-00015	Syringe A graduated plastic **SYRINGE** will be needed to add oil into the system again. A syringe can be available at a pharmacy or drug store.
 AC-00016	Vacuum pump A **VACUUM PUMP** is necessary (for a good working condition), and is available either at a refrigerant supplier or an automotive equipment supplier.
 AC-00017	Can tap A **CAN TAP** for the 397 g (14 oz.) can is available at an automotive equipment supplier.
 AC-00018	Thermometer A Pocket **THERMOMETER** is available either at a industrial hardware store or a refrigerant supplier.

Illustration	Name and Function
 AC-00019	Electronic leak detector An **ELECTRONIC LEAK DETECTOR** is available at either a specialty tool supplier or an A/C equipment supplier.
 AC-00020	Weight scale 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.

2. Air Conditioning System

A: WIRING DIAGRAM

Refer to “Air Conditioning System” in the wiring diagram. <Ref. to WI-83, WIRING DIAGRAM, Air Conditioning System.>

B: INSPECTION

Refer to the “Basic Diagnostic Procedure” for “HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)”. <Ref. to AC(diag)-2, Basic Diagnostic Procedure.>

C: NOTE

For procedure of each component in the air conditioning system, refer to the respective section.

- Blower motor unit assembly: <Ref. to AC-29, Blower Motor Unit Assembly.>
- Blower motor: <Ref. to AC-30, Blower Motor.>
- Power transistor (auto A/C model): <Ref. to AC-31, Power Transistor (Auto A/C Model).>
- Blower resistor (manual A/C model): <Ref. to AC-32, Blower Resistor (Manual A/C Model).>
- Heater core: <Ref. to AC-33, Heater Core.>
- Control unit (manual A/C model): <Ref. to AC-34, Control Unit (Manual A/C Model).>
- Control unit (Auto A/C model): <Ref. to AC-35, Control Unit (Auto A/C Model).>
- Compressor: <Ref. to AC-36, Compressor.>
- Condenser: <Ref. to AC-38, Condenser.>
- Heater and cooling unit: <Ref. to AC-39, Heater and Cooling Unit.>
- Evaporator: <Ref. to AC-40, Evaporator.>
- Hose & pipe: <Ref. to AC-42, Hose and Pipe.>
- Ambient sensor (auto A/C model): <Ref. to AC-46, Ambient Sensor (Auto A/C Model).>
- Sunload sensor (auto A/C model): <Ref. to AC-47, Sunload Sensor (Auto A/C Model).>
- In-vehicle sensor (auto A/C model): <Ref. to AC-48, In-Vehicle Sensor (Auto A/C Model).>

3. 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 the front windows and close all doors.
5) Increase the engine to 1,500 rpm.
6) Turn the A/C switch to ON.
7) Turn the temperature control dial to MAX COOL position.
8) Turn the FRESH/RECIRC switch to RECIRC position.
9) Turn the fan speed control dial or switch to HI (MAX) position.
10) Read the gauge.

Specification:
Low pressure: 127 — 196 kPa (1.3 — 2.0 kgf/cm^2, 18 — 28 psi)
High pressure: 1,471 — 1,667 kPa (15 — 17 kgf/cm^2, 213 — 242 psi)
Ambient temperature: 30 — 35°C (86 — 95°F)

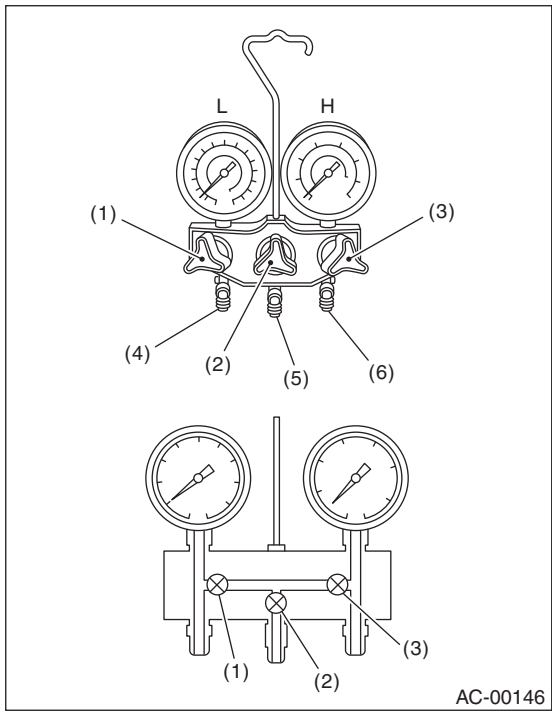
B: INSPECTION

Symptoms	Probable cause	Repair order
High-pressure side is unusually high.	• Defective condenser fan motor • Clogged condenser fin • Too much refrigerant • Air inside the system • Defective receiver dryer (condenser)	• Replace the fan motor. • Clean the condenser fin. • Discharge refrigerant. • Replace the condenser. • After evacuating again, charge an appropriate amount of refrigerant.
High-pressure side is unusually low.	• Defective compressor • Not enough refrigerant • Clogged expansion valve • Expansion valve frozen temporarily by moisture.	• Replace the compressor. • Check for leaks. • Replace the expansion valve. • Fully evacuate the expansion valve.
Low-pressure side is unusually high.	• Defective compressor • Defective expansion valve • Too much refrigerant	• Replace the compressor. • Replace the expansion valve. • Discharge refrigerant.
Low-pressure side is unusually low.	• Not enough refrigerant • Clogged expansion valve • Expansion valve frozen temporarily by moisture. • Saturated receiver dryer (condenser)	• Check for leaks. • Replace the expansion valve. • Replace the condenser.

4. Refrigerant Recovery Procedure

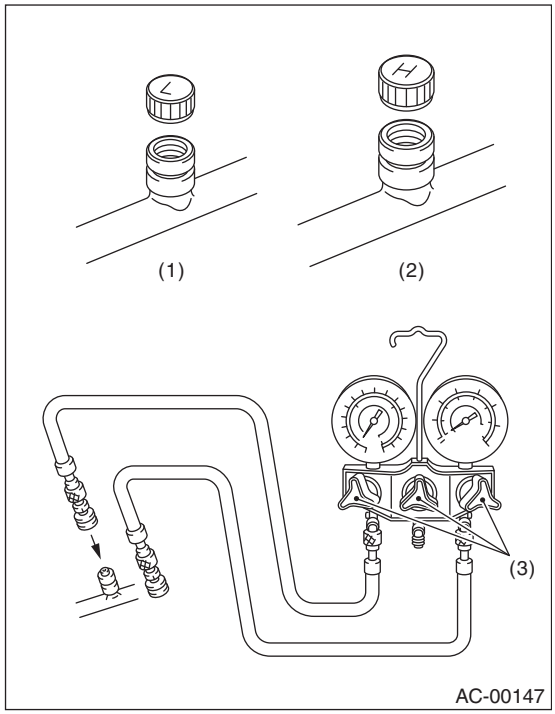
A: PROCEDURE

CAUTION:
• During operation, be sure to wear protective goggles and protective gloves.
• Connect the refrigerant recovery system with the manifold gauge set to discharge the refrigerant from the A/C system and recycle the gas.
• When recycling 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 compressor oil return operation. <Ref. to AC-28, 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

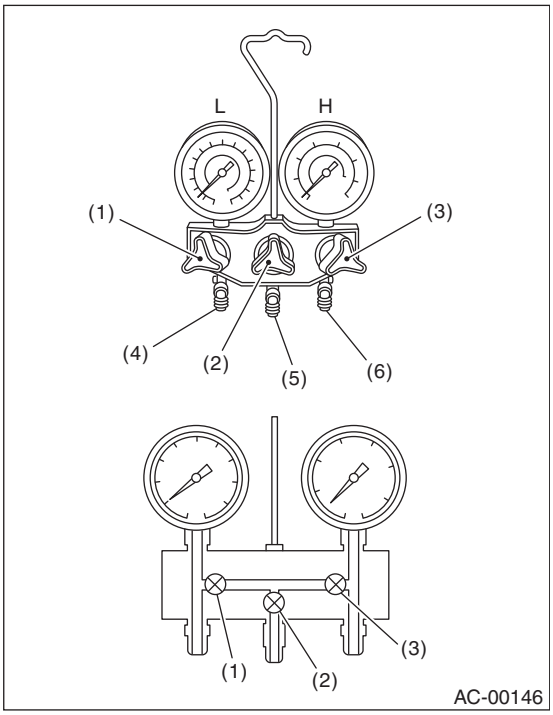
5) Connect the center hose to the refrigerant recovery system.
6) Follow the operation manual to activate the refrigerant recovery system.

5. Refrigerant Charging Procedure

A: PROCEDURE

CAUTION:
• While working, be sure to wear protective goggles and protective gloves.
• Air in the cycle can cause insufficient air conditioning, and water in the cycle can cause clogging in the cycle (icing) and rust. To remove this air and water content, use a vacuum pump to perform evacuation before filling with refrigerant. By making the inside of the cycle a vacuum, the water content will evaporate even at normal temperatures, and can be removed.

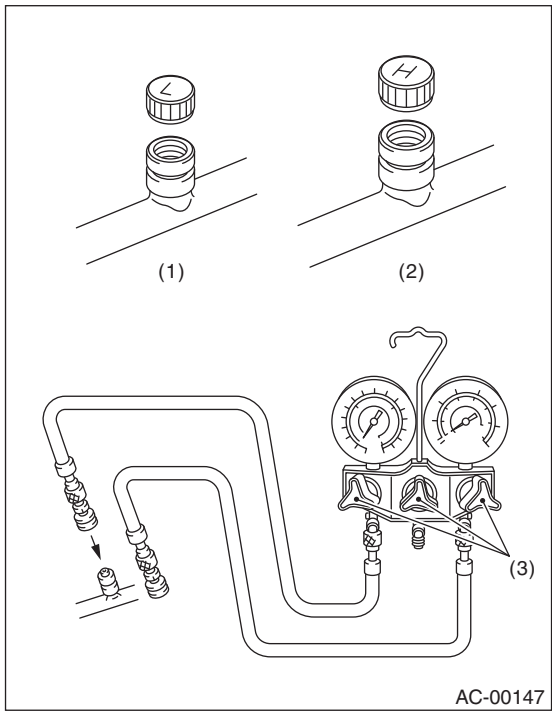
1) Close all valves of the manifold gauge.



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

2) Attach the low pressure side and high pressure side hoses to the vehicle service port.

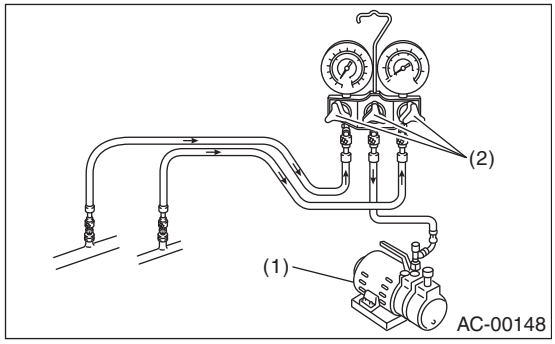
CAUTION:
Confirm that the connections are secure.



(1) Low-pressure side service port
(2) High-pressure side service port
(3) Close

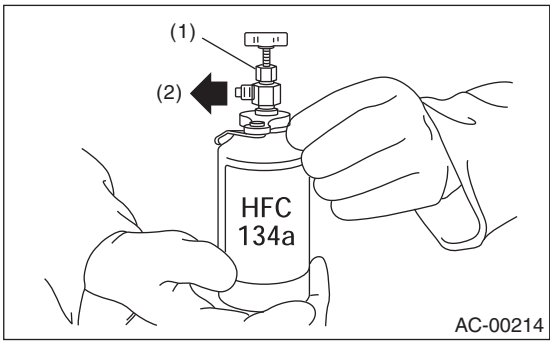
3) Connect the center manifold hose of the manifold gauge to the vacuum pump.
4) Operate the vacuum pump and open the low pressure and high pressure side valves. Next, open the center manifold hose valve, and begin evacuation.

CAUTION:
Make sure to perform evacuation using a vacuum pump.



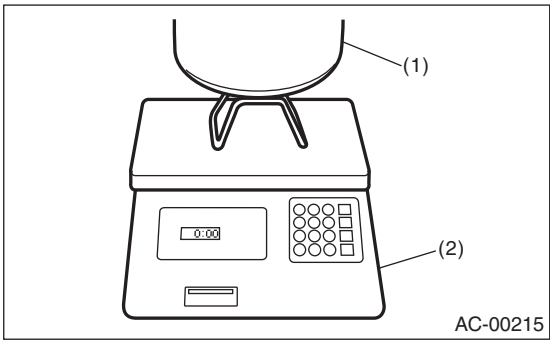
(1) Vacuum pump
(2) Open

5) Perform evacuation for 5 minutes or more, and when the low pressure gauge needle reaches –100.0 kPa (–750 mmHg, –29.5 inHg), close the center manifold hose valve, and stop the vacuum pump.
6) Leave alone for 5 to 10 minutes after closing the low pressure side and high pressure side valves, and check whether there is any change in the low pressure gauge needle indication. If the needle position changes, this indicates a leak. Check the pipe and hose connections, and repair the location with the problem. In this case, repeat again from step 1).
7) If there is no leakage, continue evacuation for additional 20 to 30 minutes.
8) Close all valves and stop the vacuum pump.
9) Follow the can tap operation manual, install to the refrigerant can.



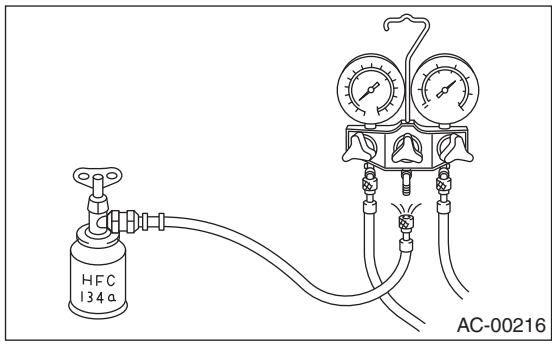
(1) Tap valve
(2) To the center manifold hose

10) Disconnect the center manifold hose from the vacuum pump, and connect the hose to the tap valve.
11) When a 13.6 kg (30 lb) refrigerant container is used, measure the amount of refrigerant with a refrigerant charging scale, and connect with the center manifold hose.



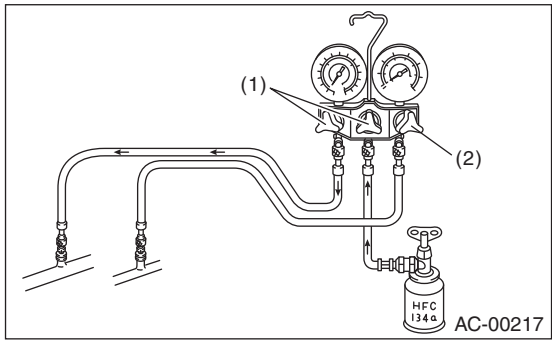
(1) Refrigerant container (HFC-134a)
(2) Weight scale

12) Open the valve on the HFC-134a source.
13) Loosen the center manifold hose connection on the manifold gauge for a few seconds (if there is a purge valve on the manifold gauge, push this instead) to allow the air in the center manifold hose to be bled by the refrigerant pressure.



14) Open the high pressure side and low pressure side valves of the manifold gauge to fill with refrigerant.

CAUTION:
When filling with the engine running, do not open the high pressure side valve. Always fill from the low pressure side.



(1) Open (low pressure)
(2) Open (high pressure)

15) When the gauge needle reaches approximately 200 kPa (1,500 mmHg, 59.1 inHg), close all valves.
16) Using a leak tester, check for refrigerant leaks in the system.
17) After checking that there are no refrigerant leaks, fill with refrigerant up to the specified amount.
18) If the HFC-134a supply container becomes empty, close all valves, and close the can tap valve to replace the empty container. After replacing with a new HFC-134a supply container, perform air purge, and resume the filling operation.
19) If the refrigerant filling efficiency drops, close all valves.
20) Check that both the low pressure and high pressure valves are closed. Start the engine with the A/C switch OFF.

21) To prevent damage to the compressor, push the A/C switch ON-OFF quickly a few times.
22) Set up the vehicle to the following status:

CAUTION:
When filling with the engine running, do not open the high pressure side valve.
Always fill from the low pressure side valve.

- A/C switch: ON
- Engine running at 1,500 rpm
- Fan speed control dial or switch: HI
- Temperature control dial: MAX COOL
- FRESH/RECIRC switch: RECIRC
- Window: open

23) Open the low pressure side valve and fill with refrigerant up to the specified amount.
24) After filling with refrigerant, close all valves and disconnect the hose from the service port.
25) Attach the cap to the service port.

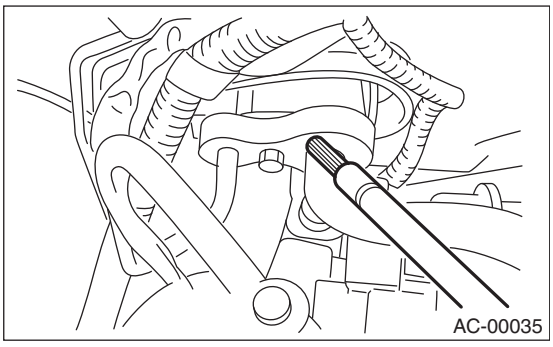
6. Refrigerant Leak Check

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 kgf/cm^2, 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.
• Check the joint and seam between pressure switch (triple pressure switch) and high-pressure pipe.
• Check the connections between condenser and pipes, and welded joints on the condenser.

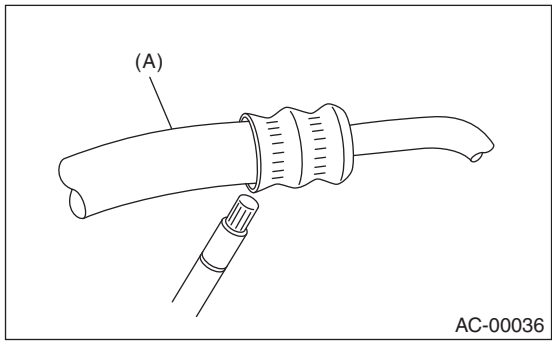
NOTE:
The leak tester may detect the oil on the condenser fins as a leak.
• Check the joint between compressor and hoses.
• Check the machined area of the compressor and other joints on the compressor.
• Check the compressor shaft seal at the area near the center of compressor clutch pulley.

NOTE:
Shaft seals may show a slight amount of leakage, about 3 g (0.1 oz) per year. This is not a problem.
3) 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


AC-00035

4) 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.

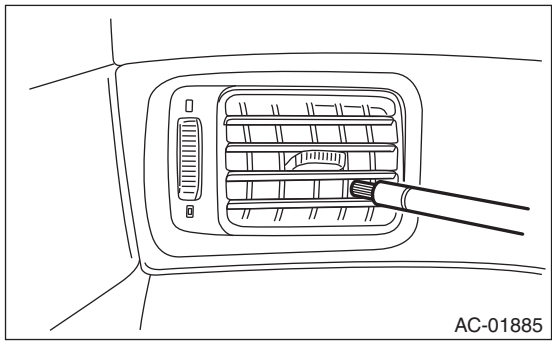
CAUTION:
Carefully check the external surface of hoses and pipes at approx. 25 mm (0.98 in) per second.



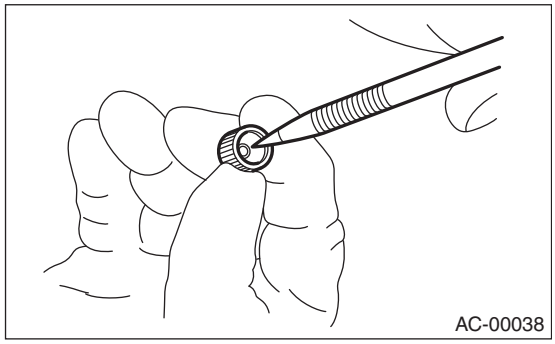
AC-00036

(A) Flexible hose

5) Disconnect the drain hose from the heater case, and check the hose end for at least 10 seconds. After the test is finished, reconnect the drain hose.
6) Turn the ignition key to the ON position, and run the blower at high speed for approx. 1 minute. Stop the blower and 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 position for at least 10 seconds.


AC-01885

7) Check the valve in the service port.
8) Visually check the rubber seal in the service port cap.


AC-00038

7. Compressor Oil

A: PROCEDURE

NOTE:
Before making repairs, perform the oil return operation to return the compressor oil in circulation with the refrigerant to the compressor.
1) Increase the engine to 1,500 rpm.
2) Turn the A/C switch to ON.
3) Turn the temperature control dial to MAX COOL position.
4) Turn the FRESH/RECIRC switch to RECIRC position.
5) Turn the fan speed control dial or switch to HI (MAX) position.
6) Leave in this condition for 10 minutes.

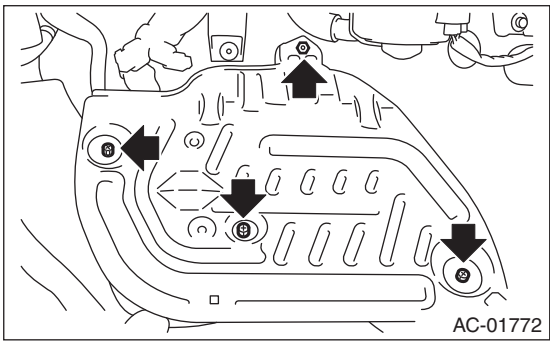
B: REPLACEMENT

NOTE:
• If a component has been replaced, add an appropriate amount of compressor oil (same as the amount of remaining oil in removed component).
• When replacing the compressor, the new compressor will already have the specified amount of oil in it. Adjust the oil amount (so that the amount remains the same as that of the removed compressor) and install the new compressor.
• Since the hygroscopicity of compressor oil is high, perform this series of works quickly.

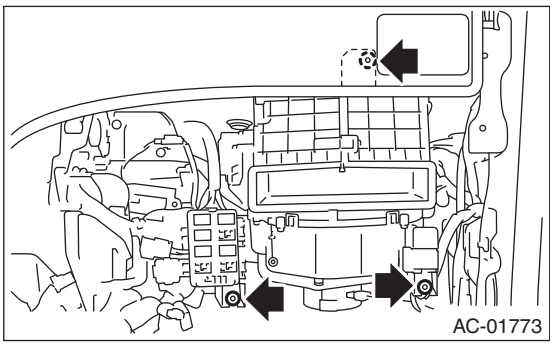
8. Blower Motor Unit Assembly

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the instrument panel lower. <Ref. to EI-52, INSTRUMENT PANEL LOWER, REMOVAL, Center Console.>
3) Turn over the floor mat near the engine ECM protect cover.
4) Remove the bolts and nut, and then remove the engine ECM protect cover.



5) Disconnect the blower motor relay and blower motor connector.
6) Remove the relay holder.
7) Remove the bolts and nuts to remove blower motor unit assembly.



B: INSTALLATION

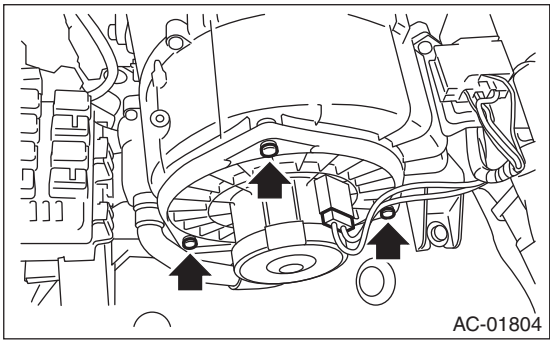
Install each part in the reverse order of removal.

Tightening torque:
Refer to "COMPONENT" of "General Description". <Ref. to AC-6, BLOWER MOTOR UNIT, COMPONENT, General Description.>

9. Blower Motor

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Disconnect the blower motor connector.
3) Turn over the floor mat near the blower motor.
4) Remove the screws and detach the blower motor.

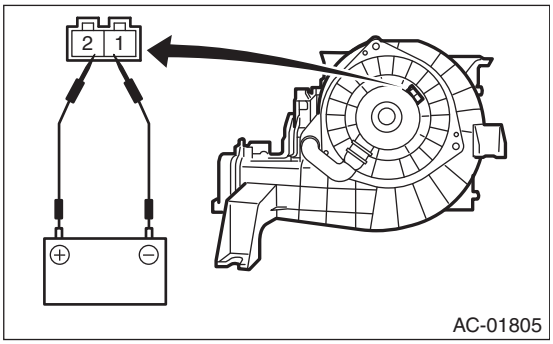


B: INSTALLATION

Install each part in the reverse order of removal.

C: INSPECTION

1) Disconnect the blower motor connector.
2) Connect the battery positive (+) terminal to terminal No. 2 of blower motor connector, and negative (–) terminal to terminal No. 1. Check that the blower motor rotates normally.

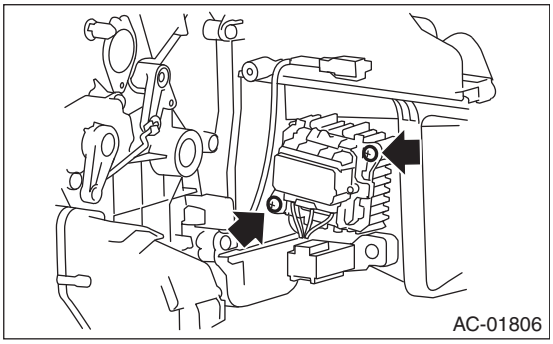


3) If the blower motor does not operate normally, replace the blower motor.

10. Power Transistor (Auto A/C Model)

A: REMOVAL

1) Remove the instrument panel lower. <Ref. to EI-52, INSTRUMENT PANEL LOWER, REMOVAL, Center Console.>
2) Disconnect the power transistor connector.
3) Remove the screws and remove the power transistor.



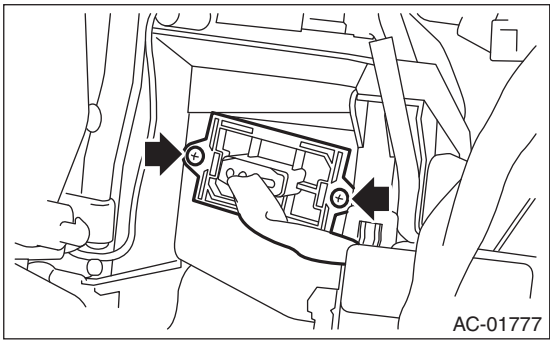
B: INSTALLATION

Install each part in the reverse order of removal.

11. Blower Resistor (Manual A/C Model)

A: REMOVAL

1) Remove the instrument panel lower. <Ref. to EI-52, INSTRUMENT PANEL LOWER, REMOVAL, Center Console.>
2) Disconnect the blower resistor connector.
3) Remove the screw and remove the blower resistor.

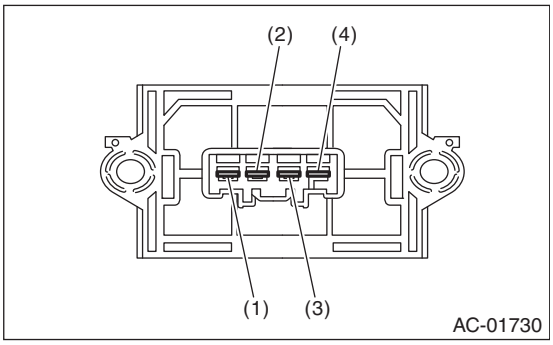


B: INSTALLATION

Install each part in the reverse order of removal.

C: INSPECTION

1) Disconnect the blower resistor connector.
2) Check the resistance between blower resistor terminals.



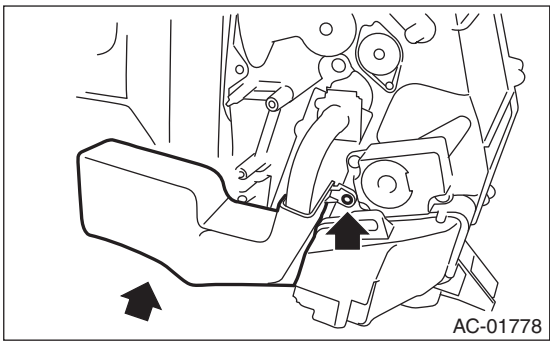
Terminal No.	Standard
4 and 3	Approx. 0.43 Ω
4 and 2	Approx. 1.03 Ω
4 and 1	Approx. 3.0 Ω

3) Replace the blower resistor if the inspection result is not within the standard value.

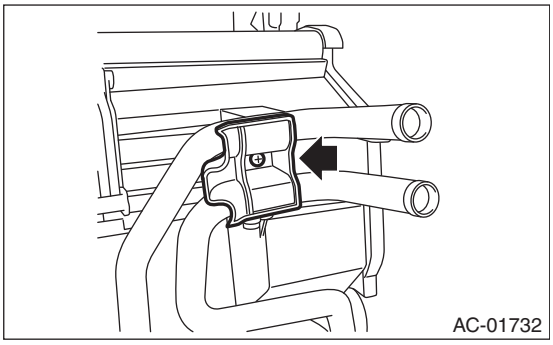
12.Heater Core

A: REMOVAL

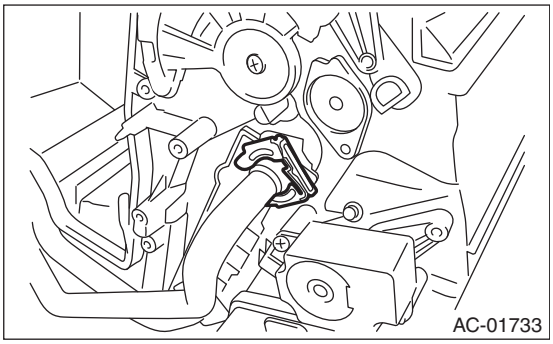
1) Remove the heater and cooling unit. <Ref. to AC-39, REMOVAL, Heater and Cooling Unit.>
2) Remove the screw and detach the heater pipe cover.


AC-01778

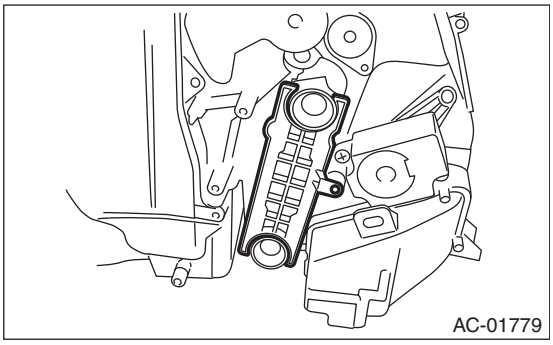
3) Remove the screw and detach the clamp.


AC-01732

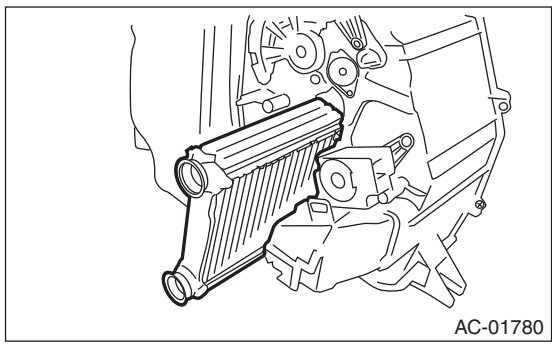
4) Remove the pipe clamp and pipe.


AC-01733

5) Remove the screw and detach the heater core cover.


AC-01779

6) Remove the heater core.


AC-01780

B: INSTALLATION

CAUTION:
Replace O-rings and pipe clamps with new parts and install securely.

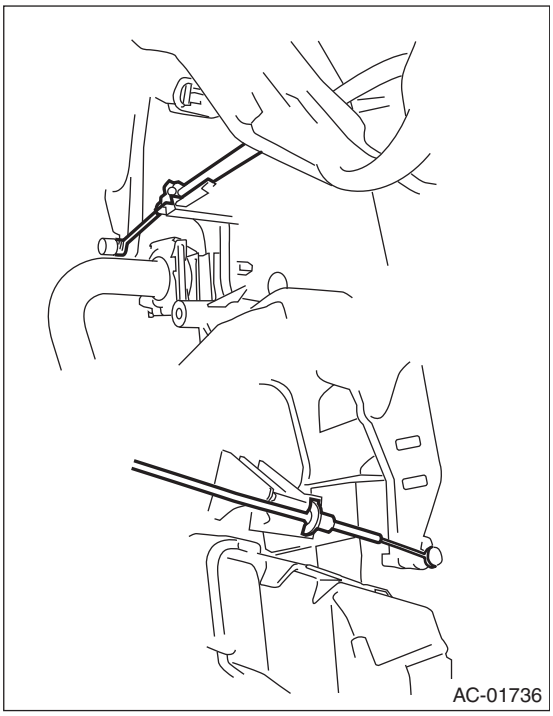
1) Install each part in the reverse order of removal.
2) Fill engine coolant.
- Non-turbo model: <Ref. to CO(H4DO)-13, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
- Turbo model: <Ref. to CO(H4DOTC)-13, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

3) Charge refrigerant. <Ref. to AC-24, PROCEDURE, Refrigerant Charging Procedure.>

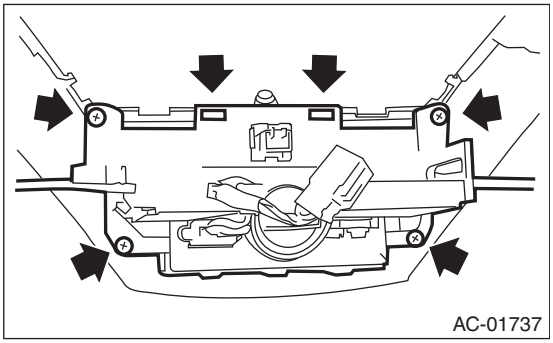
13.Control Unit (Manual A/C Model)

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the ornament panel. <Ref. to EI-50, ORNAMENT PANEL, REMOVAL, Center Console.>
3) Remove the knee guard panel.
4) Remove the control wires from both sides of the heater and cooling unit.


AC-01736

5) Remove the screws and claws, and remove the control module from the ornament panel RH.


AC-01737

B: INSTALLATION

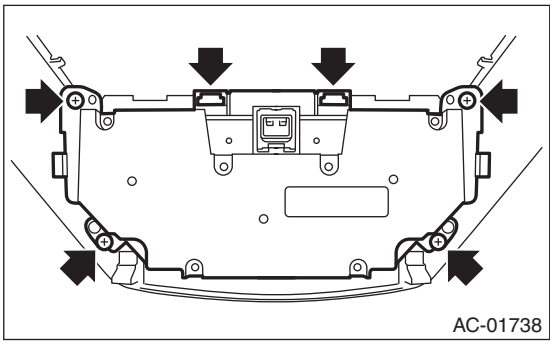
CAUTION:
Securely assemble the plate at the end of the control wire to the heater case.
Install each part in the reverse order of removal.

Tightening torque:
Refer to "COMPONENT" of "General Description". <Ref. to AC-7, CONTROL MODULE, COMPONENT, General Description.>

14.Control Unit (Auto A/C Model)

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the ornament panel. <Ref. to EI-50, ORNAMENT PANEL, REMOVAL, Center Console.>
3) Remove the screws and claws, and remove the control module from the ornament panel RH.



B: INSTALLATION

Install each part in the reverse order of removal.

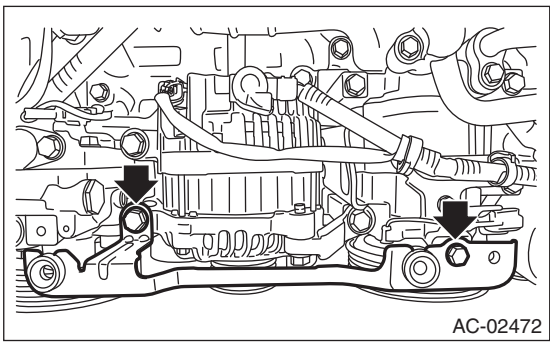
Tightening torque:
Refer to "COMPONENT" of "General Description". <Ref. to AC-7, CONTROL MODULE, COMPONENT, General Description.>

15.Compressor

A: REMOVAL

1. NON-TURBO MODEL

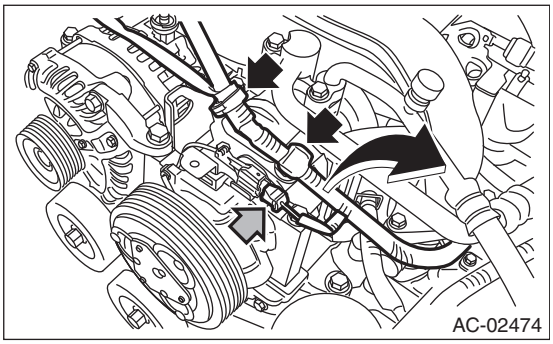
1) Perform compressor oil return operation. <Ref. to AC-28, PROCEDURE, Compressor Oil.>
2) Turn the A/C switch to OFF and stop the engine.
3) Using the refrigerant recovery system, discharge refrigerant. <Ref. to AC-23, PROCEDURE, Refrigerant Recovery Procedure.>
4) Disconnect the ground cable from battery.
5) Remove the V-belts. <Ref. to ME(H4DO)-70, REMOVAL, V-belt.>
6) Remove the bolts and remove the V-belt cover bracket.


AC-02472

7) Disconnect the connector and terminal from generator.

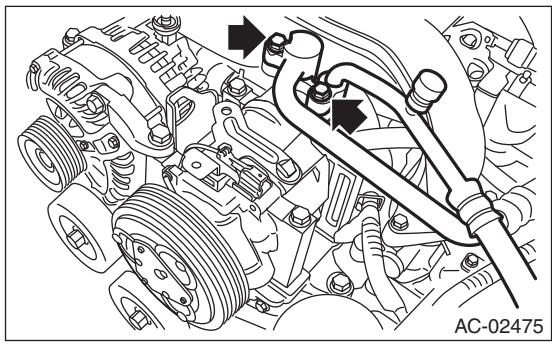
AC-02473

8) Disconnect the compressor connector and clip, and move the generator harness to the right.

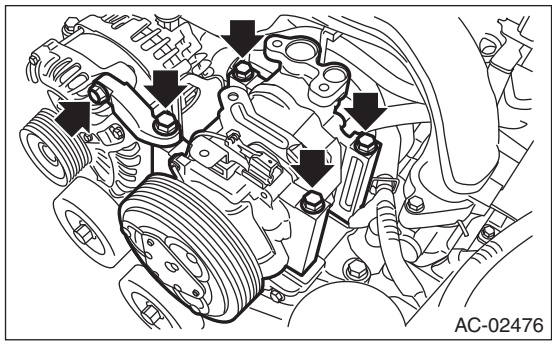

AC-02474

9) Remove the bolt and remove the low-pressure hose and high-pressure hose.

CAUTION:
Seal the disconnected hose with a plug or vinyl tape to prevent foreign matter from entering.

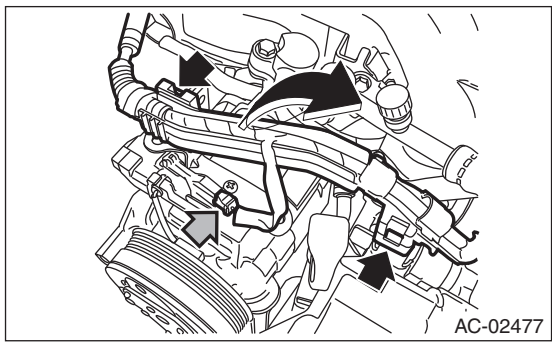

AC-02475

10) Loosen the generator bracket bolts.
11) Remove the bolts and remove the compressor.


AC-02476

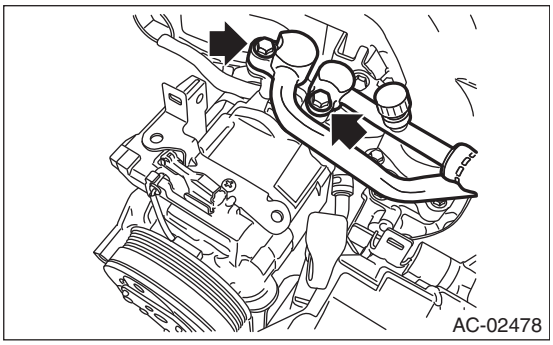
2. TURBO MODEL

1) Perform compressor oil return operation. <Ref. to AC-28, 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-23, PROCEDURE, Refrigerant Recovery Procedure.>
4) Disconnect the ground cable from battery.
5) Remove the V-belts. <Ref. to ME(H4DOTC)-38, REMOVAL, V-belt.>
6) Remove the generator. <Ref. to SC(H4DO)-36, TURBO MODEL, REMOVAL, Generator.>
7) Remove the secondary air pump. <Ref. to EC(H4DOTC)-29, REMOVAL, Secondary Air Pump.>
8) Disconnect the compressor connector and lock, and move the generator harness to the right.

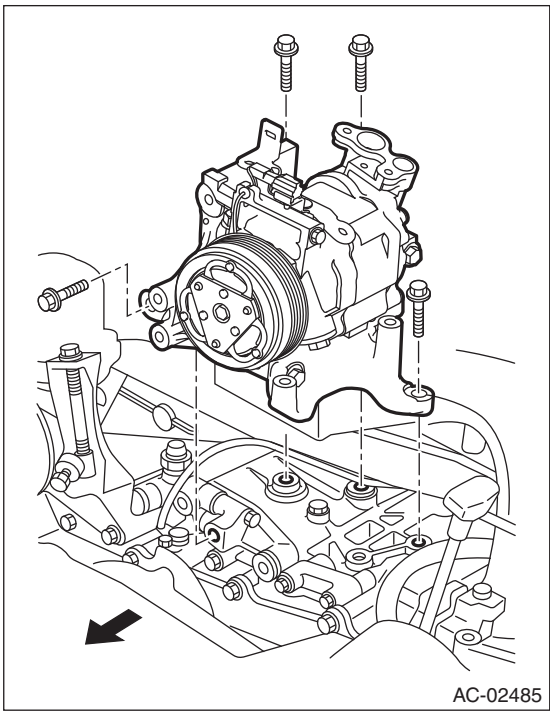

AC-02477

9) Remove the bolt and remove the low-pressure hose and high-pressure hose.

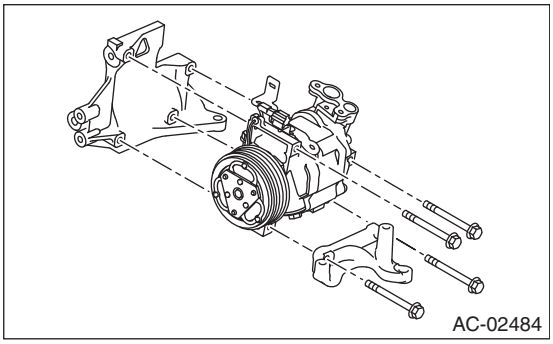
CAUTION:
Seal the disconnected hose with a plug or vinyl tape to prevent foreign matter from entering.


AC-02478

10) Remove the bolts and remove the compressor bracket.


AC-02485

NOTE:
Since the compressor cannot be removed by itself, remove with the compressor bracket as a unit.
11) Remove the bolts, then remove the bracket from the compressor.


AC-02484

B: INSTALLATION

CAUTION:
• Replace the O-rings with new parts, and then apply compressor oil.
• After replacing the compressor, adjust the amount of the compressor oil. <Ref. to AC-28, PROCEDURE, Compressor Oil.>

1) Install each part in the reverse order of removal.
2) Charge refrigerant. <Ref. to AC-24, PROCEDURE, Refrigerant Charging Procedure.>

Tightening torque:
Refer to "COMPONENT" of "General Description".
Air conditioning unit: <Ref. to AC-10, AIR CONDITIONING UNIT, COMPONENT, General Description.>
Compressor: <Ref. to AC-12, COMPRESSOR, COMPONENT, General Description.>

C: INSPECTION

1. MAGNETIC CLUTCH CLEARANCE

1) Check the clearance of entire circumference around the drive plate and pulley.

Specification:
0.3 — 0.6 mm (0.0118 — 0.0236 in)

2) Replace the compressor if the inspection result is not within the standard value.

2. MAGNETIC CLUTCH OPERATION

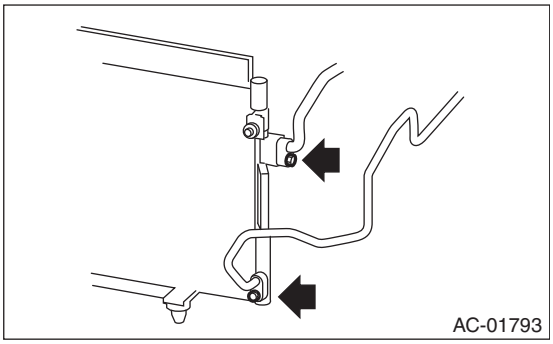
1) Disconnect the compressor connector.
2) Connect the battery positive (+) terminal to the terminal of the compressor connector.
3) Check the magnet clutch engagement.
4) If the magnet clutch does not operate normally, replace the compressor.

16.Condenser

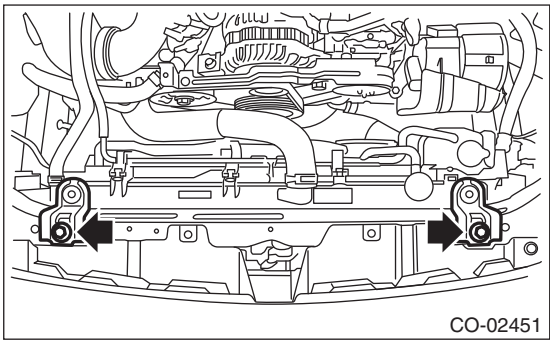
A: REMOVAL

1) Using the refrigerant recovery system, discharge refrigerant. <Ref. to AC-23, PROCEDURE, Refrigerant Recovery Procedure.>
2) Disconnect the ground cable from battery.
3) Disconnect the high pressure hose and pipe from the condenser.

CAUTION:
Seal the disconnected hose and pipe with a plug or vinyl tape to prevent foreign matter from entering.


AC-01793

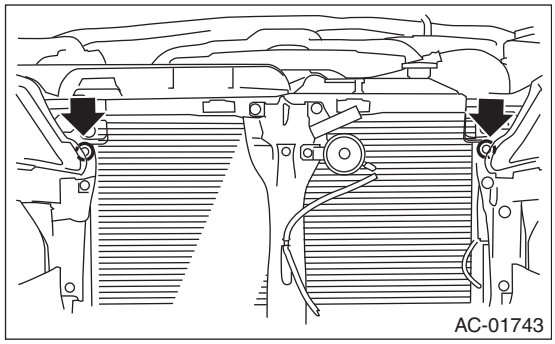
4) Remove the bolts and remove the radiator upper bracket.


CO-02451

5) Remove the front bumper face. <Ref. to EI-29, FRONT BUMPER FACE, REMOVAL, Front Bumper.>
6) Remove the bolts, and lift the condenser to pull it out through space between the radiator and the radiator panel.

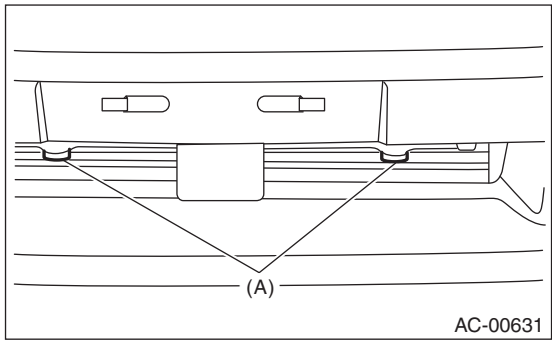
CAUTION:
• Be careful not to damage the condenser fins. If a damaged fin is found, repair it using a thin screwdriver.

• If the condenser is replaced, add an appropriate amount of compressor oil to the compressor. <Ref. to AC-28, REPLACEMENT, Compressor Oil.>


AC-01743

B: INSTALLATION

CAUTION:
• Replace the O-rings on hoses and pipes with new parts, and then apply compressor oil.
• Confirm that lower guide (A) of condenser fits into holes on radiator panel.



AC-00631

1) Install each part in the reverse order of removal.
2) Charge refrigerant. <Ref. to AC-24, PROCEDURE, Refrigerant Charging Procedure.>

Tightening torque:
Refer to "COMPONENT" of "General Description".
Air conditioning unit: <Ref. to AC-10, AIR CONDITIONING UNIT, COMPONENT, General Description.>
Radiator & radiator fan (non-turbo model): <Ref. to CO(H4DO)-4, RADIATOR & RADIATOR FAN, COMPONENT, General Description.>
Radiator & radiator fan (turbo model): <Ref. to CO(H4DOTC)-4, RADIATOR AND RADIATOR FAN, COMPONENT, General Description.>

C: INSPECTION

1) Check to see that the condenser fins are not clogged with debris or insects. Blow with compressed air or flush fins with water as needed.
2) If any oil leak is found from the condenser, replace the condenser with a new part.

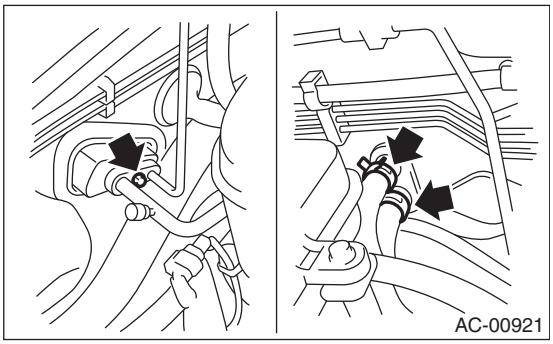
17.Heater and Cooling Unit

A: REMOVAL

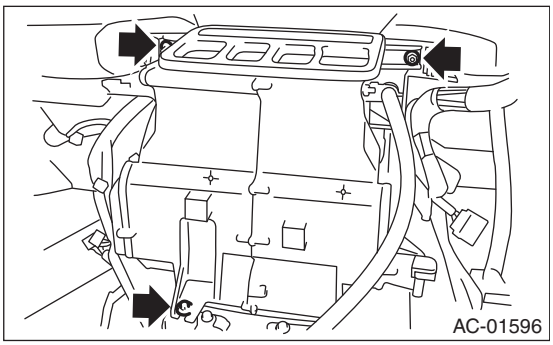
1) Disconnect the ground cable from battery.
2) Using the refrigerant recovery system, discharge refrigerant. <Ref. to AC-23, PROCEDURE, Refrigerant Recovery Procedure.>
3) Drain coolant from the radiator.
• Non-turbo model: <Ref. to CO(H4DO)-13, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
• Turbo model: <Ref. to CO(H4DOTC)-13, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
4) Remove the bolt and detach the hose and pipe from the expansion valve. Remove the bolts which hold the pipe from the engine compartment.

CAUTION:
Seal the disconnected hose and pipe with a plug or vinyl tape to prevent foreign matter from entering.

5) Release the heater hose clamps in engine compartment to remove the hoses.



6) Remove the instrument panel. <Ref. to EI-53, REMOVAL, Instrument Panel Assembly.>
7) Remove the blower motor unit assembly. <Ref. to AC-29, REMOVAL, Blower Motor Unit Assembly.>
8) Disconnect the connectors of the actuator, thermo sensor and blower resistor or power transistor.
9) Remove the bolt and nuts and remove the heater and cooling unit.



B: INSTALLATION

CAUTION:
Replace the O-rings on hoses and pipes with new parts, and then apply compressor oil.

1) Install each part in the reverse order of removal.
2) Fill engine coolant.
• Non-turbo model: <Ref. to CO(H4DO)-13, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
• Turbo model: <Ref. to CO(H4DOTC)-13, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
3) Charge refrigerant. <Ref. to AC-24, PROCEDURE, Refrigerant Charging Procedure.>

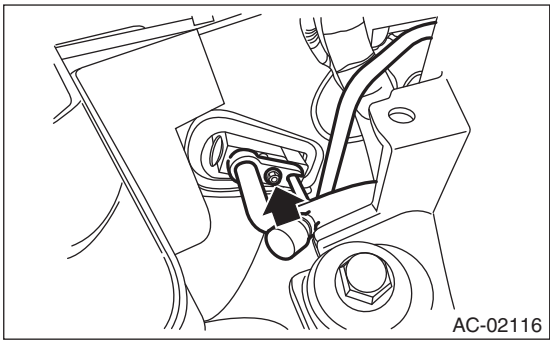
Tightening torque:
Refer to "COMPONENT" of "General Description".
Heater cooling unit: <Ref. to AC-4, HEATER COOLING UNIT, COMPONENT, General Description.>
Blower motor unit: <Ref. to AC-6, BLOWER MOTOR UNIT, COMPONENT, General Description.>

18.Evaporator

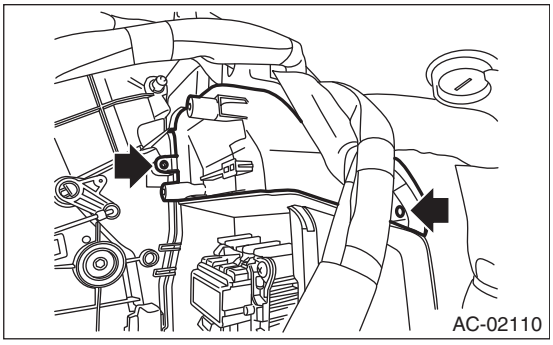
A: REMOVAL

1) Disconnect the ground cable from battery.
2) Using the refrigerant recovery system, discharge refrigerant. <Ref. to AC-23, PROCEDURE, Refrigerant Recovery Procedure.>
3) Remove the bolt and detach the hose and pipe from the expansion valve.

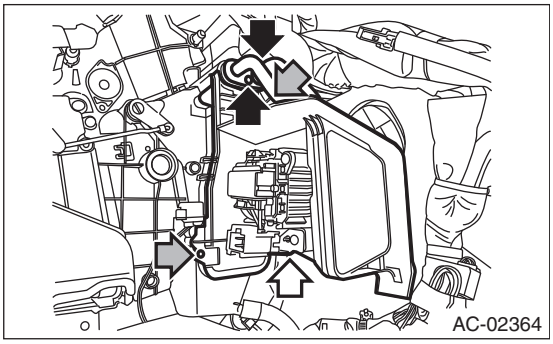
CAUTION:
Seal the disconnected hose and pipe with a plug or vinyl tape to prevent foreign matter from entering.


AC-02116

4) Remove the instrument panel lower. <Ref. to EI-52, INSTRUMENT PANEL LOWER, REMOVAL, Center Console.>
5) Remove the blower motor unit. <Ref. to AC-29, REMOVAL, Blower Motor Unit Assembly.>
6) Remove the screw and remove the evaporator pipe cover.

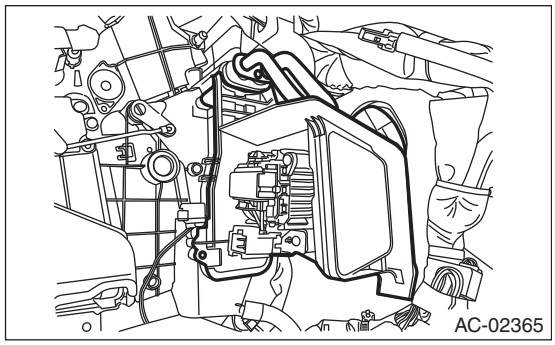

AC-02110

7) Remove the evaporator pipe mounting bolt, and evaporator cover mounting screw and clip.


AC-02364

8) Remove the evaporator cover and evaporator pipe.

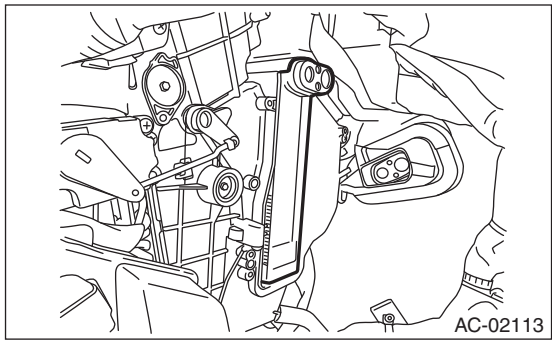
CAUTION:
Since the evaporator cover and the evaporator pipe cannot be removed by itself, remove them as a unit.


AC-02365

(1) Disengage the evaporator and the pipe.
(2) Remove the evaporator pipe with the evaporator cover.

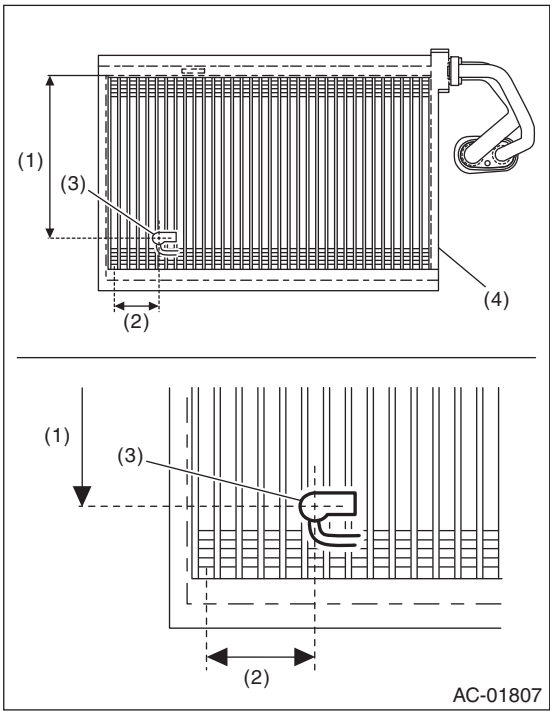
9) Remove the evaporator.

CAUTION:
If the evaporator is replaced, add an appropriate amount of compressor oil to evaporator. <Ref. to AC-28, REPLACEMENT, Compressor Oil.>


AC-02113

B: INSTALLATION

CAUTION:
• Replace the O-rings on hoses and pipes with new parts, and then apply compressor oil.
• Make sure that the water seal gasket on the cover attachment area is securely attached.
• Install the sensor in the location shown in the figures below.



(1) 148 mm (5.83 in) from the upper end of the fins
(2) Sixth row fin from the left end
(3) Sensor
(4) Evaporator

1) Install each part in the reverse order of removal.
2) Charge refrigerant. <Ref. to AC-24, PROCEDURE, Refrigerant Charging Procedure.>

Tightening torque:
Refer to "COMPONENT" of "General Description".
Heater cooling unit: <Ref. to AC-4, HEATER COOLING UNIT, COMPONENT, General Description.>
Blower motor unit: <Ref. to AC-6, BLOWER MOTOR UNIT, COMPONENT, General Description.>

19.Hose and Pipe

A: REMOVAL

CAUTION:
• When disconnecting hoses, do not apply excessive force.
• Seal the disconnected hose with a plug or vinyl tape to prevent foreign matter from entering.
1) Disconnect the ground cable from battery.
2) Using the refrigerant recovery system, drain the refrigerant. <Ref. to AC-23, PROCEDURE, Refrigerant Recovery Procedure.>
3) Remove the bolts and detach the hoses and pipes.

B: INSTALLATION

CAUTION:
• Replace the O-rings with new parts.
• When connecting hoses, do not apply an excessive force to them. After installing, check that no torsion or excessive tension applied to the hoses.
1) Install each part in the reverse order of removal.
2) Charge refrigerant. <Ref. to AC-24, PROCEDURE, Refrigerant Charging Procedure.>

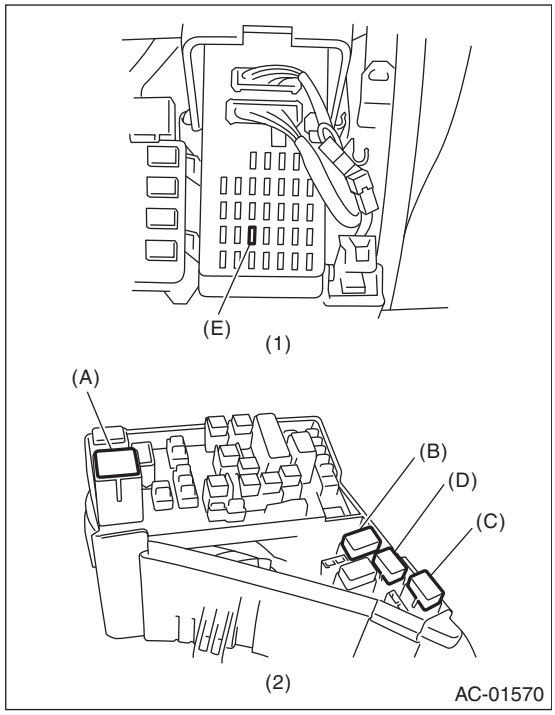
Tightening torque:
Refer to "COMPONENT" of "General Description". <Ref. to AC-10, AIR CONDITIONING UNIT, COMPONENT, General Description.>

C: INSPECTION

Check the hoses for cracks, damage and expansion, and then replace it with a new part if defective.

20.Relay and Fuse

A: LOCATION



(1) Joint box
(2) Main fuse box

Main fan relay 1	(A)
Main fan relay 2	(B)
Sub fan relay	(C)
A/C relay	(D)
A/C Fuse	(E)

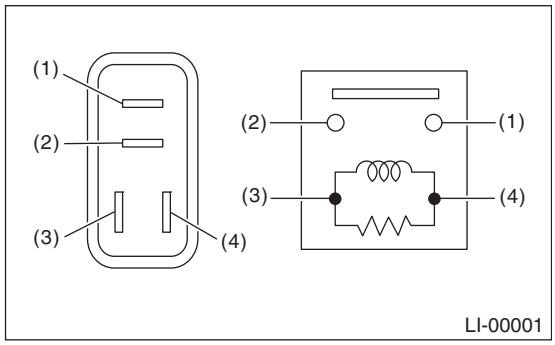
B: INSPECTION

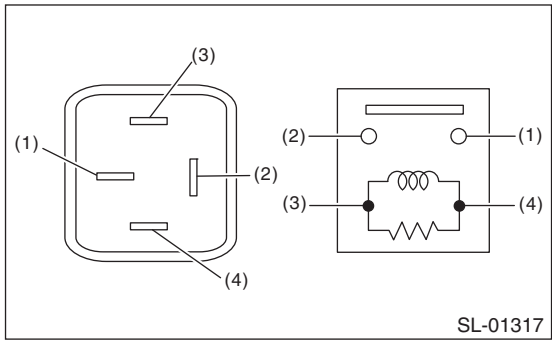
1. FUSE

1) Remove and visually inspect the fuses.
2) Replace any fuse if the fuse is blown out.

2. RELAY

1) Connect terminal No. 4 to the battery positive terminal and the terminal No. 3 to the battery negative terminal, and check the resistance value between the relay terminals.





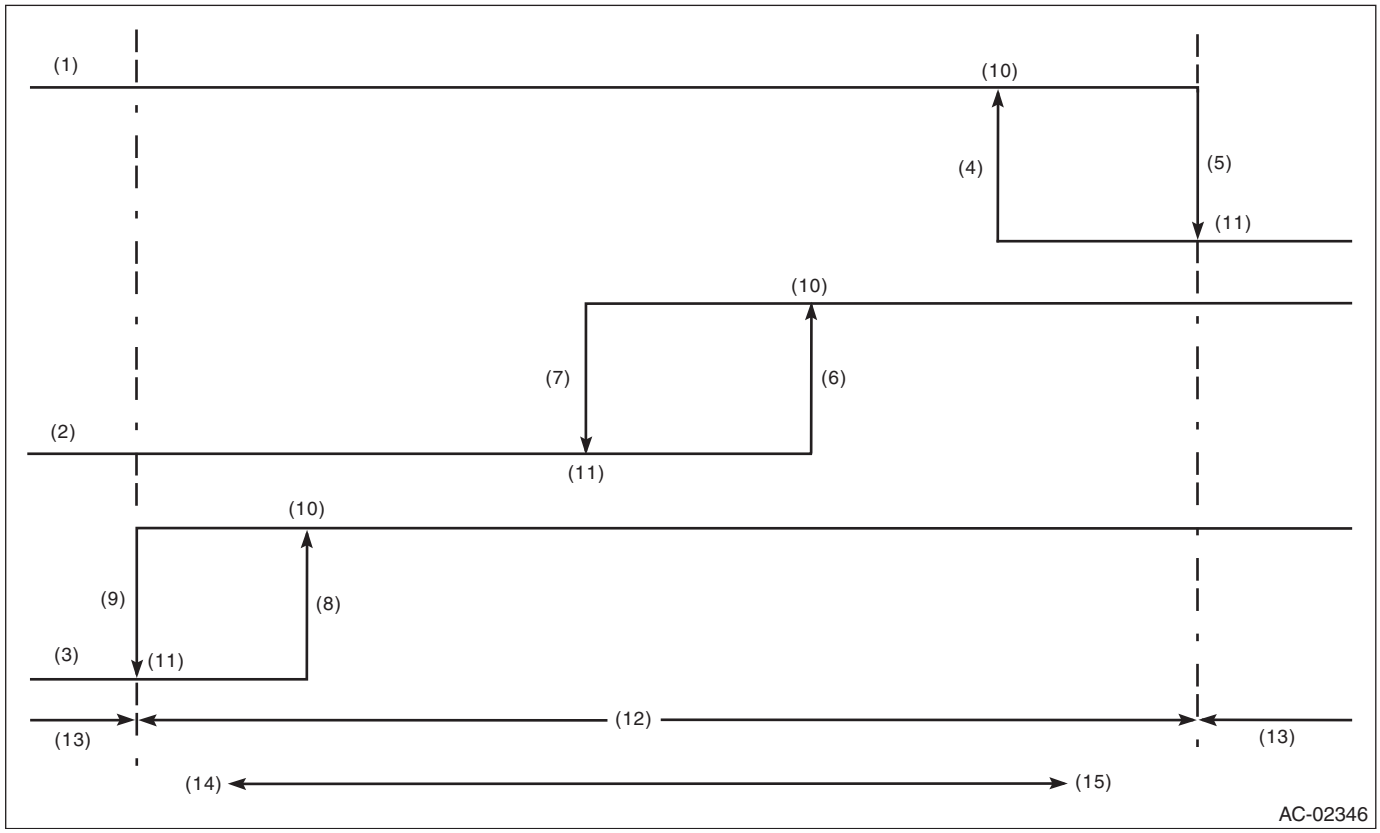
Continuity	Terminal No.	Standard
Yes	1 and 2	Less than 1 Ω
No		1 MΩ or more

2) Replace the relay if the inspection result is not within the standard value.

21.Pressure Switch (Triple Pressure Switch)

A: INSPECTION

1) Connect the manifold gauge to the service valve on the high-pressure side.
2) Disconnect the pressure switch connector.
3) 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	(6)	1,770±100 kPa (18.05±1.02 kg/cm^2, 256.65±14.5 psi)	(11)	OFF
(2)	Middle pressure switch	(7)	1,470±120 kPa (14.99±1.22 kg/cm^2, 213.15±17.4 psi)	(12)	Operative range of compressor
(3)	Low pressure switch	(8)	206±30 kPa (2.10±0.31 kg/cm^2, 29.9±4.3 psi)	(13)	Inoperative range of compressor
(4)	2,350±200 kPa (24.00±2.04 kg/cm^2, 340.7±29.0 psi)	(9)	177±25 kPa (1.80±0.25 kg/cm^2, 25.7±3.6 psi)	(14)	Low pressure
(5)	2,940±200 kPa (29.98±2.04 kg/cm^2, 426.3±29.0 psi)	(10)	ON	(15)	High pressure

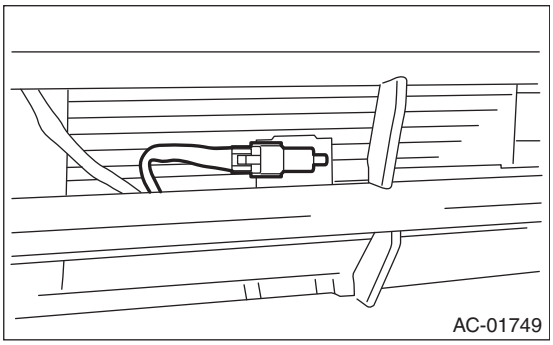
NOTE:

- High pressure switch turns the compressor (magnet clutch) to OFF when the refrigerant pressure becomes extremely high to prevent the evaporator, air conditioner piping and expansion valve from getting damaged or frozen, etc.
- Middle pressure switch effectively controls the radiator fan output by judging high load/low load in normal range.
- The low pressure switch detects a refrigerant shortage and deactivates the compressor (magnet clutch) if the refrigerant pressure is abnormally low. (Because any further compressor operation in such a state may lead to compressor seizure)

22. Ambient Sensor (Auto A/C Model)

A: REMOVAL

1) Disconnect the ground cable from the battery.
2) Disconnect the ambient sensor connector.
3) Remove the ambient sensor from the radiator lower panel.



B: INSTALLATION

Install each part in the reverse order of removal.

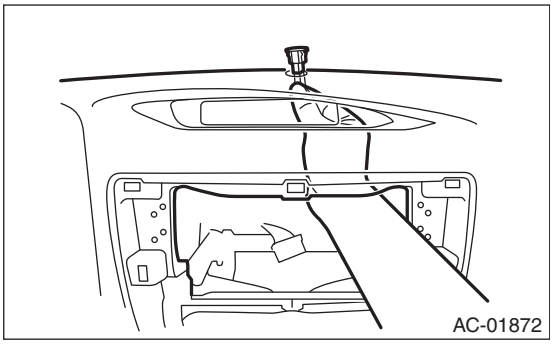
C: INSPECTION

Refer to “Ambient Sensor” of “HVAC SYSTEM (AUTO A/C)(DIAGNOSTICS)”. <Ref. to AC(diag)-32, AMBIENT SENSOR, Diagnostic Procedure for Sensors.>

23.Sunload Sensor (Auto A/C Model)

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the audio. (model with audio) <Ref. to ET-9, REMOVAL, Audio.>
3) Remove the navigation unit. (model with navigation) <Ref. to ET-17, PROCEDURE, Navigation Body.>
4) Push out the sunload sensor from the back side of the instrument panel.



5) Disconnect the harness connector and remove the sunload sensor.

CAUTION:
Be careful not to damage the interior trims when removing the sensor.

B: INSTALLATION

Install each part in the reverse order of removal.

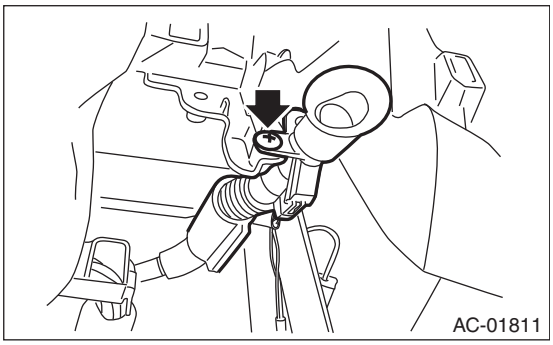
C: INSPECTION

Refer to “Sunload Sensor” of “HVAC SYSTEM (AUTO A/C)(DIAGNOSTICS)”. <Ref. to AC(diag)-38, SUNLOAD SENSOR, Diagnostic Procedure for Sensors.>

24.In-Vehicle Sensor (Auto A/C Model)

A: REMOVAL

CAUTION:
Be careful not to damage the sensors and interior trims when removing.
1) Disconnect the ground cable from battery.
2) Remove the instrument panel lower cover. <Ref. to EI-47, REMOVAL, Instrument Panel Lower Cover.>
3) Disconnect the in-vehicle sensor connector and aspirator hose, and remove the in-vehicle sensor from the instrument panel.



B: INSTALLATION

Install each part in the reverse order of removal.

C: INSPECTION

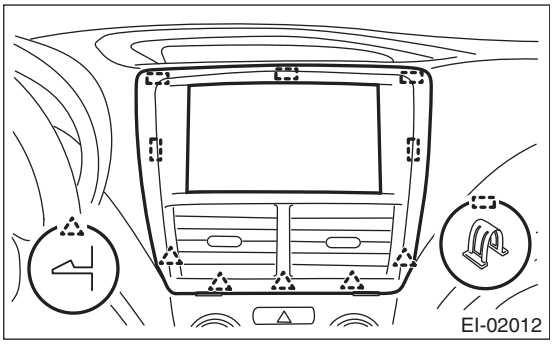
Refer to “In-vehicle Sensor” of “HVAC SYSTEM (AUTO A/C)(DIAGNOSTICS)”. <Ref. to AC(diag)-34, IN-VEHICLE SENSOR, Diagnostic Procedure for Sensors.>

25.Air Vent Grille

A: REMOVAL

1. CENTER GRILLE

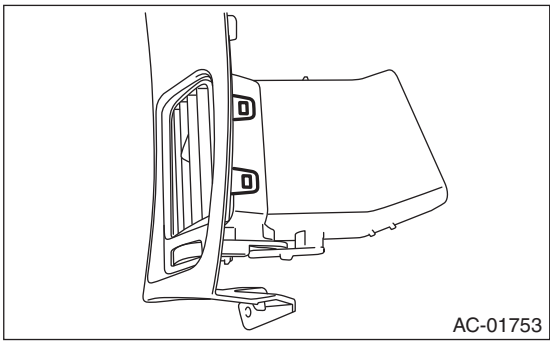
1) Insert a plastic remover into the slit at the bottom of the center panel, to lift the panel.
2) Remove the claws and resin hook and then remove the center panel.



3) Remove the claws, and remove the air vent center grille from the center panel.

2. SIDE GRILLE

1) Remove the ornament panel. <Ref. to EI-50, ORNAMENT PANEL, REMOVAL, Center Console.>
2) Remove the claws, and remove the air vent side grille.



B: INSTALLATION

Install each part in the reverse order of removal.

C: INSPECTION

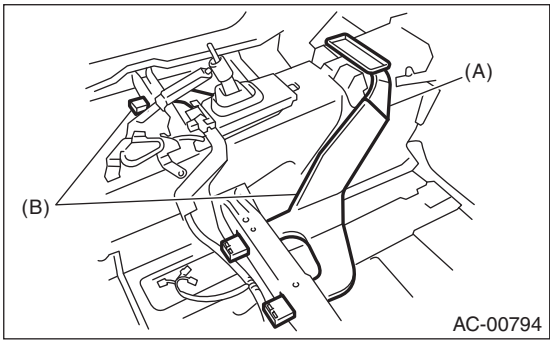
1) Check that the direction and amount of air can be adjusted smoothly, and if there is any faulty, replace the air vent grille.
2) Check that the adjustment can be maintained in each position, and if there is any faulty, replace the air vent grille.

26.Heater Duct

A: REMOVAL

1. REAR HEATER DUCT

1) Remove the heater and cooling unit. <Ref. to AC-39, REMOVAL, Heater and Cooling Unit.>
2) Remove the front seats. <Ref. to SE-8, REMOVAL, Front Seat.>
3) Remove the lower inner trim (front). <Ref. to EI-56, REMOVAL, Lower Inner Trim.>
4) Pull off the floor mat to remove the rear heater duct center (A) and rear heater duct LH, RH (B).



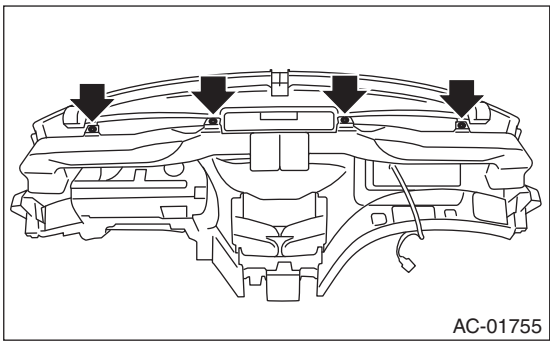
B: INSTALLATION

Install each part in the reverse order of removal.

27.Heater Vent Duct

A: REMOVAL

1) Remove the instrument panel. <Ref. to EI-53, REMOVAL, Instrument Panel Assembly.>
2) Remove the screws, and then remove the heater vent duct.



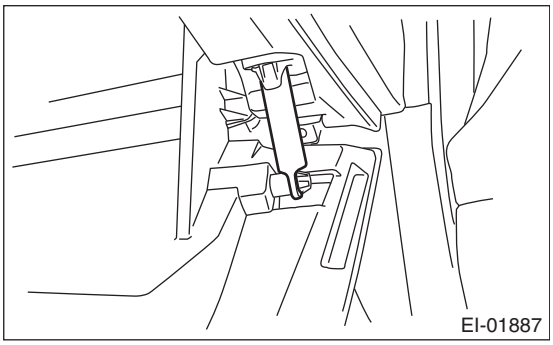
B: INSTALLATION

Install each part in the reverse order of removal.

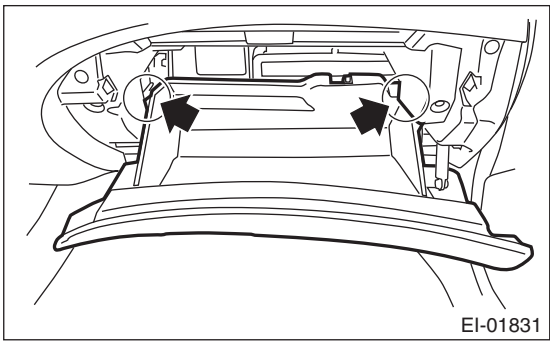
28.A/C Filter

A: REPLACEMENT

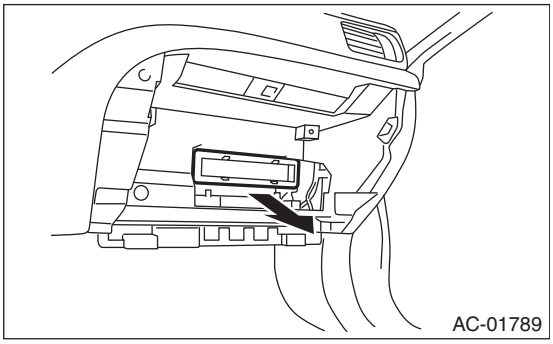
1) Remove the glove box damper.



2) Disengage the stopper section and pull the glove box lid to remove it.



3) Pinch the tabs to release the lock and remove the A/C filter.



4) Install each part in the reverse order of removal.

29.General Diagnostic Table

A: INSPECTION

Symptoms		Repair order
Blower motor	Does not operate.	Fuse
		Blower motor relay
		Blower motor
		Blower motor resistor (manual A/C model)
		Fan speed control dial or switch
		Wiring harness
	Noise	Blower motor
Compressor	Does not operate.	Refrigerant
		Fuse
		Air conditioning relay
		Magnet clutch
		Compressor
		Pressure switch
		A/C switch
		Fan speed control dial or switch
		Wiring harness
	Noise	V-belt
		Magnet clutch
		Compressor
Cold air not emitted.		Refrigerant
		V-belt
		Magnet clutch
		Compressor
		Pressure switch
		Aspirator hose
		Blower fan relay
		Blower motor
		A/C switch
		Fan speed control dial or switch
		Control module
		Expansion valve
		Evaporator
		Air mix actuator (auto A/C model)
		Temperature control dial
		Temperature control cable (manual A/C model)
		Wiring harness
		Heater duct
		Heater vent duct
Warm air not emitted.		Engine coolant
		Aspirator hose (auto A/C model)
		Air mix actuator (auto A/C model)
		Temperature control dial
		Temperature control cable (manual A/C model)
		Fan speed control dial or switch
		Heater core

Symptoms	Repair order
Temperature of air from vents does not change.	Engine coolant
	Air mix actuator (auto A/C model)
	Temperature control dial
	Temperature control cable (manual A/C model)
	Wiring harness (auto A/C model)
Unable to switch blow vents.	Mode actuator (auto A/C model)
	Mode switch cable (manual A/C model)
	Air flow control dial or switch (auto A/C model)
	Wiring harness (auto A/C model)
Unable to switch suction vents.	FRESH/RECIRC switch
	Intake door actuator
	Wiring harness

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

AC(diag)

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2. General Description 3
3. Electrical Component Location 6
4. Auto A/C Control Module I/O Signal 8
5. Diagnostic Chart for Self-Diagnosis 10
6. Diagnostics for A/C System Malfunction 17
7. Diagnostic Procedure for Actuators 26
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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)-10, OPERATION, Diagnostic Chart for Self-Diagnosis.>	Does the self-diagnosis operate?	Go to step **2**.	<Ref. to AC(diag)-17, 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 the A/C switch to ON. 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-22, PROCEDURE, Refrigerant Pressure with Manifold Gauge Set.>
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)-23, COMPARTMENT TEMPERATURE DOES NOT CHANGE, OR A/C SYSTEM DOES NOT RESPOND PROMPTLY, Diagnostics for A/C System Malfunction.>

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.
• Auto A/C control module may be damaged.
4) Every A/C-related part is a precision part. Do not drop them.
5) Airbag system wiring harness is routed near the auto A/C control module and junction box.

CAUTION:
• Do not use electrical test equipment on the airbag system wiring harness and connector.
• Be careful not to damage the airbag system wiring harness when servicing the 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 specific gravity of the electrolyte.

Standard voltage:
12 V

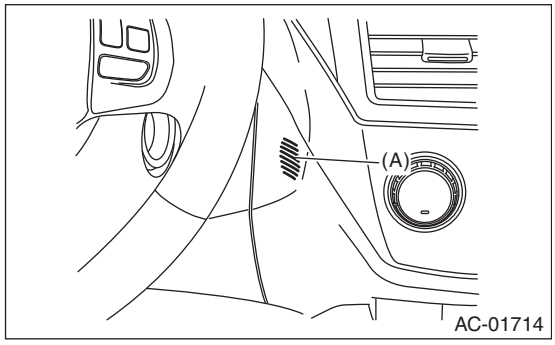
Specific gravity:
1.260 or more

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.

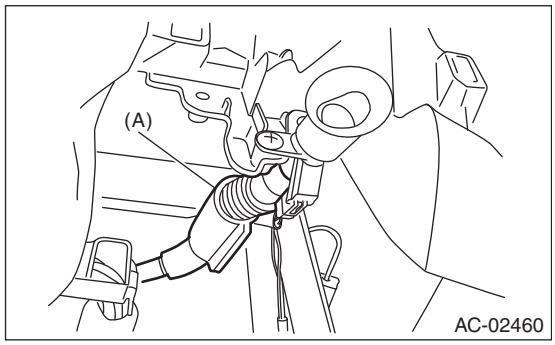
2. ASPIRATOR HOSE

1) Turn the ignition switch to ON, and press the A/C switch.
2) Turn the temperature control dial to maximum hot position.
3) Set the blow vents to the DEF position.
4) Turn the fan switch to “MAX” position.
5) Put a strip of paper close to the front side of in-vehicle sensor suction port (A) located in the instrument panel lower cover, 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.

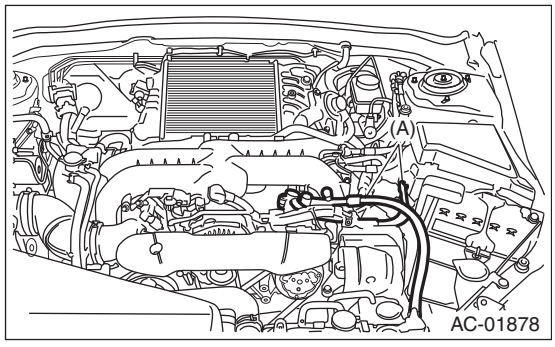


6) If the paper does not move at all, remove the instrument panel lower cover <Ref. to EI-47, REMOVAL, Instrument Panel Lower Cover.> and check for poor connection of the aspirator hose (A), in-vehicle sensor and heater unit, and repair them if necessary.



3. A/C LINE

Check the connection for A/C line (A) and lower side 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.

5. CONTROL SWITCHES

Start the engine and warm up completely.
1) Inspection using switches
• Without left/right independent air conditioner

No.	Point to check	Switch operation	Judgment standard
1	Air flow control dial	Turn the dial to the right.	Outlet opening (mode) switches AUTO → VENT → BILEVEL → HEAT → DEF/HEAT → DEF each time turning the dial.
2	Fan speed control dial	Turn the dial to the right.	Each time the dial is turned, the fan speed switches OFF → AUTO → 1st → 2nd → 3rd → 4th → 5th → 6th → 7th.
3	FRESH/RECIRC switch	Press the FRESH/RECIRC switch.	Inlet opening switches RECIRC → FRESH → RECIRC each time pressing the switch. (LED illuminates at RECIRC)
		Set the air flow control dial and fan speed control dial to the AUTO position.	The system switches to AUTO.
4	A/C switch	Turn the A/C switch to ON with the fan speed control dial set to other than OFF position.	The LED lights and the compressor operates.
		Set the air flow control dial and fan speed control dial to the AUTO position.	The system switches to AUTO.
5	Auto function Operate in order from 1).	1) Set the following dial to AUTO. • Air flow control dial • Fan speed control dial 2) Turn the temperature control dial completely to the left, and set to the maximum cool position.	• 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 hot position.	• 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.	• 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.	• Outlet air temperature: AUTO • Fan speed: AUTO • Outlet opening: DEF or DEF/HEAT • Inlet opening: FRESH • Compressor: ON
7	Rear defogger switch	Press the rear defogger switch.	LED illuminates.

• With left/right independent air conditioner

No.	Point to check	Switch operation	Judgment standard
1	MODE switch	Press the MODE switch.	Each time the switch is pressed, the outlet opening (mode) switches VENT → BILEVEL → HEAT → DEF/HEAT.
2	Fan switch	Press the fan switch (UP).	Each time the switch is pressed, the fan speed switches 1st → 2nd → 3rd → 4th → 5th → 6th → 7th.
3	FRESH/RECIRC switch	Press the FRESH/RECIRC switch.	Inlet opening switches RECIRC → FRESH → RECIRC each time pressing the switch.

No.	Point to check	Switch operation	Judgment standard
4	Auto function Operate in order from 1).	1) Press the AUTO switch. (“FULL AUTO” display) 2) Turn the driver’s side temperature control dial to the left fully, and set to 18°C (maximum cool position).	• Outlet air temperature: COOL • Fan speed: Max. • Outlet opening: VENT • Inlet opening: RECIRC • Compressor: AUTO
		3) Turn the driver’s side temperature control dial to the right slowly, and change the setting gradually from 18°C (maximum cool position) to 32°C.	• Outlet air temperature: COOL → HOT • Fan speed: AUTO • Outlet opening: AUTO • Inlet opening: AUTO • Compressor: AUTO
		4) Turn the driver’s side temperature control dial to the right fully, and set to 32°C (maximum hot position).	• Outlet air temperature: HOT • Fan speed: Max. • Outlet opening: HEAT • Inlet opening: FRESH • Compressor: AUTO
5	Temperature control dial (driver’s and passenger’s seats) and dual switch Operate in order from 1).	1) If the dual switch indicator illuminates, turn it off by pressing the switch. 2) Press the fan switch (UP). 3) Turn the driver’s side temperature control dial clockwise and counterclockwise.	Each setting temperature display becomes higher by turning clockwise and lower by turning counterclockwise.
		4) Turn the passenger’s side temperature control dial clockwise and counterclockwise.	The dual switch indicator illuminates. Only the passenger’s side setting temperature display becomes higher by turning clockwise and lower by turning counterclockwise.
		5) Turn the driver’s side temperature control dial clockwise and counterclockwise.	The dual switch indicator keeps illuminating. Only the driver’s side setting temperature reading becomes higher by turning the dial clockwise and lower by turning counterclockwise.
		6) Press the dual switch.	The dual switch indicator turns off. The passenger’s side setting temperature display is the same as the driver’s side setting temperature display.
6	Defroster switch	Press the defroster switch.	• Outlet air temperature: AUTO • Blower fan: AUTO • Outlet opening: DEF • Inlet opening: FRESH • Compressor: ON • LED illuminates.
7	Rear defogger switch	Press the rear defogger switch.	LED illuminates.
8	OFF switch	Press the OFF switch.	All displays are turned off. • Blower fan: OFF • Compressor: OFF

2) Inspection of compressor operation

No.	Point to check	Switch operation	Judgment standard
1	Compressor	1) Turn the A/C switch to ON. 2) Set the fan switch between LO and HI.	Compressor: ON

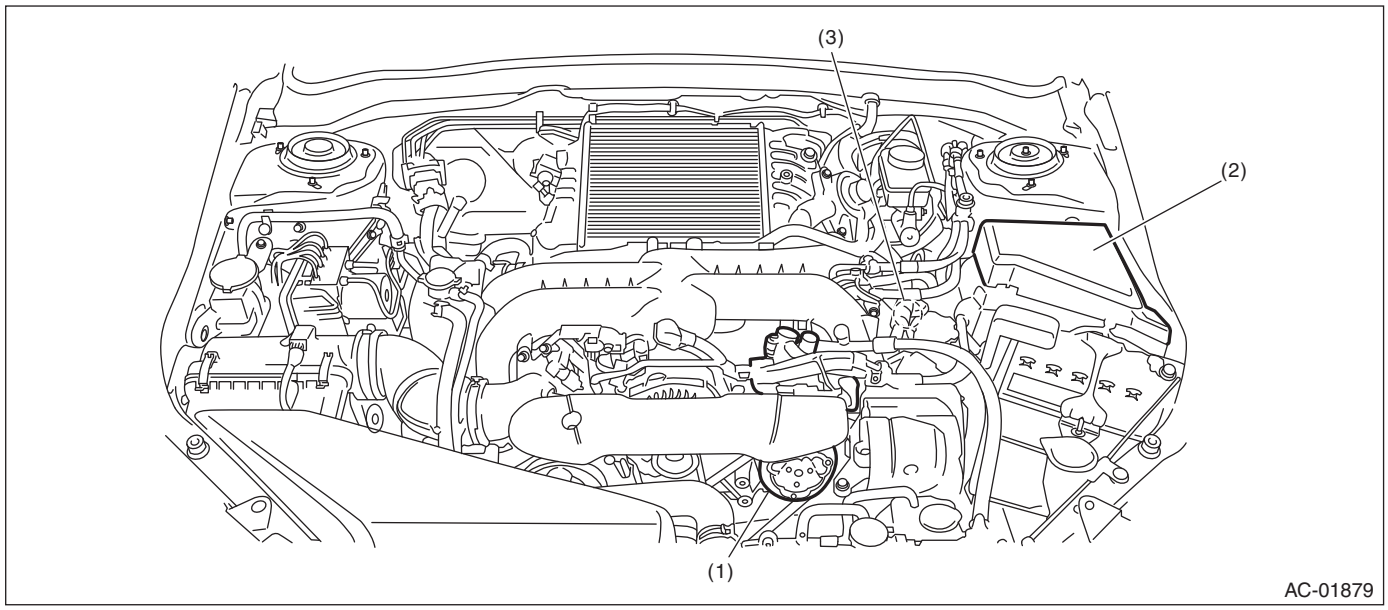
3) Inspection of illumination control

No.	Point to check	Switch operation	Judgment standard
1	Illumination	Turn the lighting switch to ON.	Illumination comes on. If the LED lights, the LED will dim.

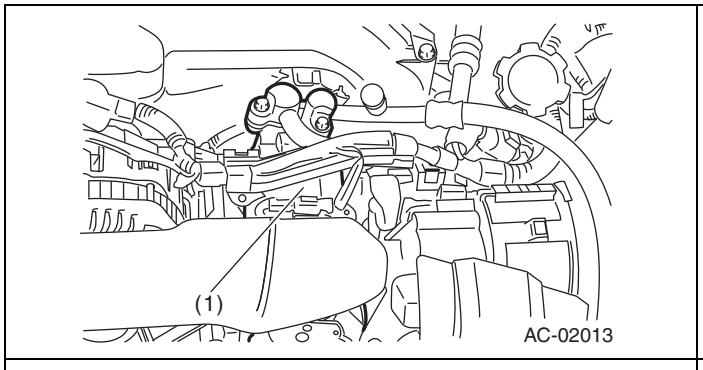
3. Electrical Component Location

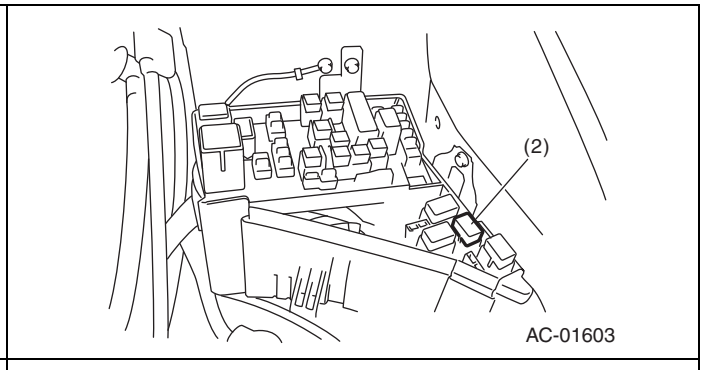
A: LOCATION

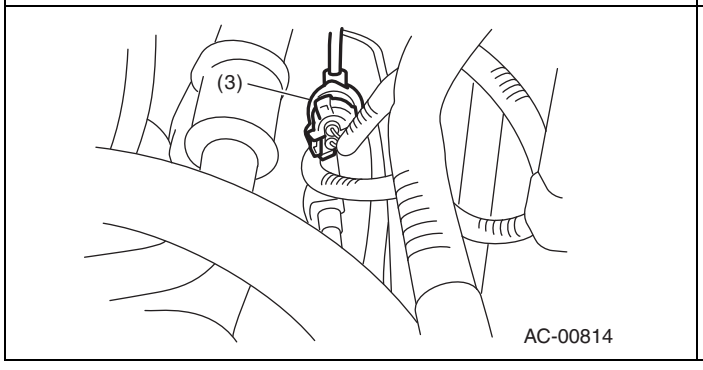
1. ENGINE COMPARTMENT

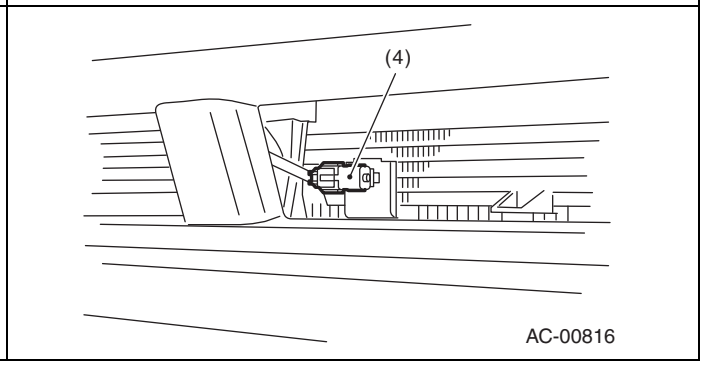


(1) A/C compressor
(2) A/C relay
(3) Pressure switch
(4) Ambient sensor

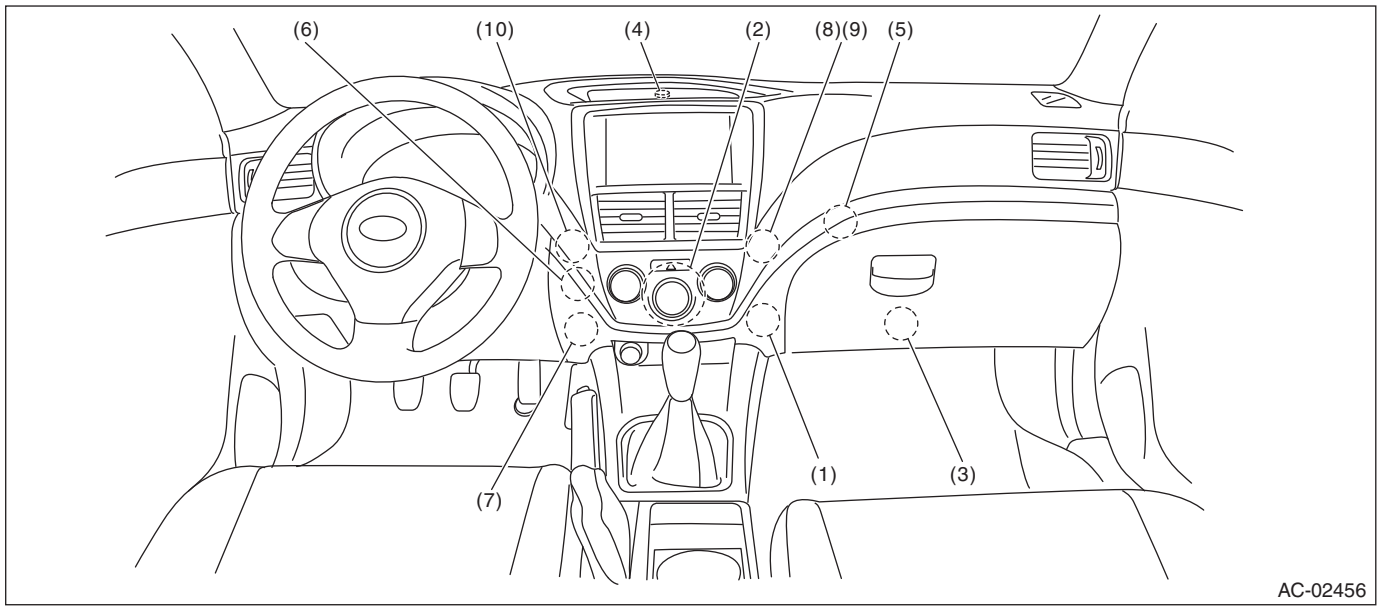








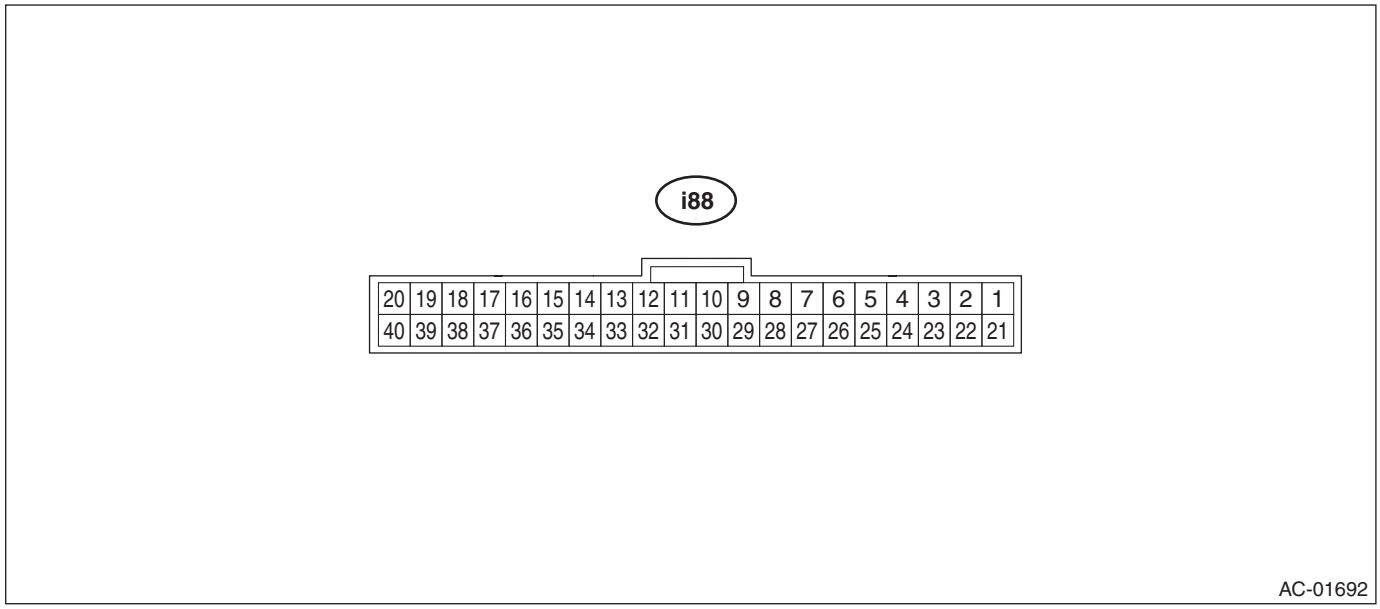
2. COMPARTMENT



(1) Evaporator sensor
(2) Auto A/C control module
(3) Blower motor
(4) Sunload sensor
(5) Intake door actuator
(6) Mode door actuator
(7) In-vehicle sensor
(8) Air mix door actuator (without left/right independent air conditioner)
(9) Air mix door actuator RH (with left/right independent air conditioner)
(10) Air mix door actuator LH (with left/right independent air conditioner)

4. Auto A/C Control Module I/O Signal

A: ELECTRICAL SPECIFICATION



Terminal No.	Content	Measuring condition	Standard
1	Mode door actuator #4	Actuator operating	8 V or more
2	Mode door actuator #3	Actuator operating	8 V or more
3	Mode door actuator #2	Actuator operating	8 V or more
4	Mode door actuator #1	Actuator operating	8 V or more
6	Intake door actuator (FRESH)	FRESH mode	1 V or less
7	Intake door actuator (MIX)	MIX mode	1 V or less
8	Intake door actuator (RECIRC)	RECIRC mode	1 V or less
9	Blower fan ON signal	Blower fan is ON	1 V or less
11	A/C cut-off signal	A/C is cut off	1 V or less
14	GND for sensors	Always	1 V or less
15	ACC power supply	ACC ON	Battery voltage
16	Sunload sensor	Sunlight is contacting sensor	1 — 4 V
17	RECIRC sensor	Ignition switch ON	25°C: 2.5 V
18	Post evaporator sensor	Depends on temperature after the evaporator.	1 — 4.5 V
19	CAN Lo	Digital signal; can not be measured	—
20	CAN Hi	Digital signal; can not be measured	—
21	Air mix door actuator LH #4 (with left/right independent air conditioner)	Actuator operating	8 V or more
22	Air mix door actuator LH #3 (with left/right independent air conditioner)	Actuator operating	8 V or more
23	Air mix door actuator LH #2 (with left/right independent air conditioner)	Actuator operating	8 V or more
24	Air mix door actuator LH #1 (with left/right independent air conditioner)	Actuator operating	8 V or more

Terminal No.	Content	Measuring condition	Standard
25	Air mix door actuator #4 (without left/right independent air conditioner) or air mix door actuator RH #4 (with left/right independent air conditioner)	Actuator operating	8 V or more
26	Air mix door actuator #3 (without left/right independent air conditioner) or air mix door actuator RH #3 (with left/right independent air conditioner)	Actuator operating	8 V or more
27	Air mix door actuator #2 (without left/right independent air conditioner) or air mix door actuator RH #2 (with left/right independent air conditioner)	Actuator operating	8 V or more
28	Air mix door actuator # 1 (without left/right independent air conditioner) or air mix door actuator RH # 1 (with left/right independent air conditioner)	Actuator operating	8 V or more
31	BATT	Always	Battery voltage
32	IGN	Ignition ON	Battery voltage
34	GND	Always	1 V or less
36	A/C ON signal	A/C is operating	8 V or more
35	ILL–	Illumination ON (measure between 37 — 35)	Battery voltage
37	ILL+		
39	Rr defogger switch output	When the rear defogger switch is ON	1 V or less
40	Fan control signal	Ignition switch: ON, Blower switch: ON	8 V or more

B: WIRING DIAGRAM

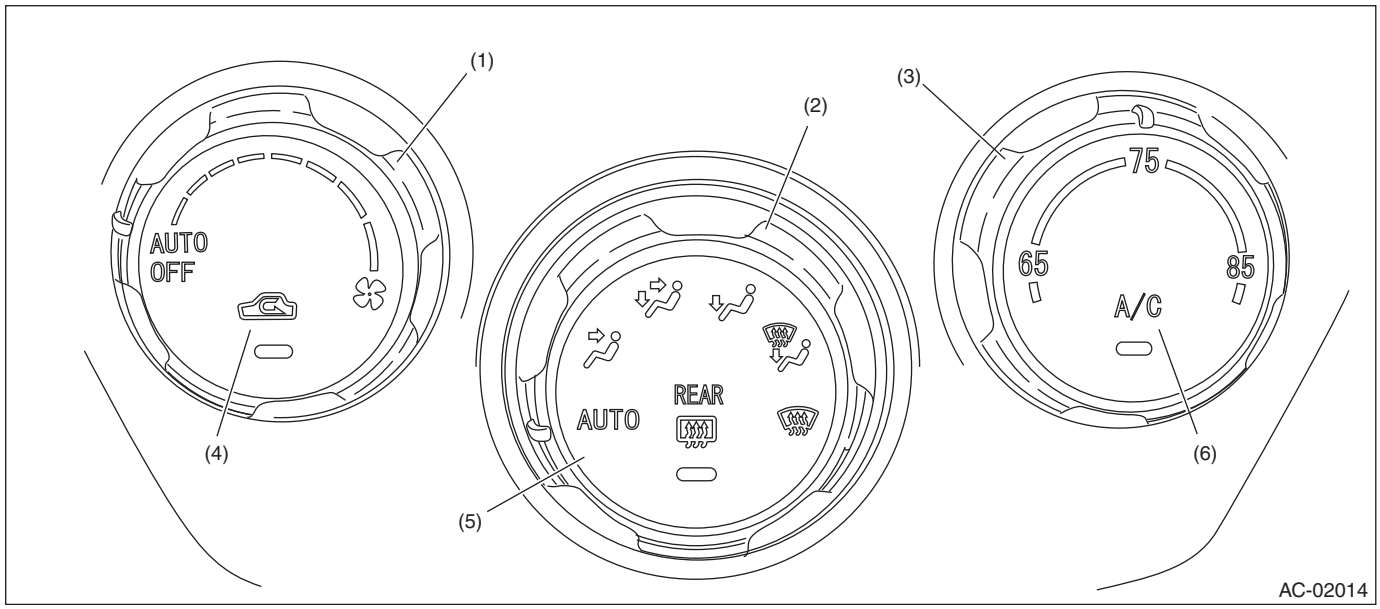
1. AIR CONDITIONER AUTO A/C MODEL

<Ref. to WI-83, WIRING DIAGRAM, Air Conditioning System.>

5. Diagnostic Chart for Self-Diagnosis

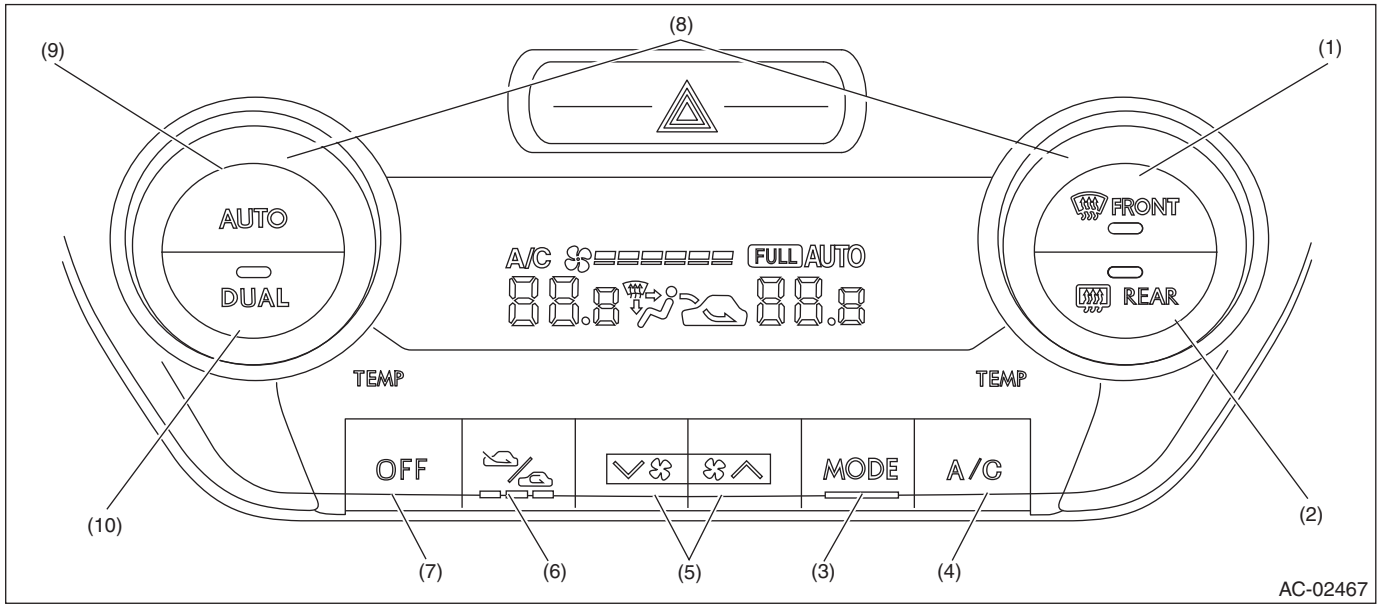
A: OPERATION

- Without left/right independent air conditioner



(1) Fan dial
(2) Air flow control dial
(3) Temperature adjustment dial
(4) FRESH/RECIRC switch
(5) Rear window defogger switch
(6) A/C switch

- With left/right independent air conditioner



(1) Defroster switch
(2) Rear window defogger switch
(3) Air flow control switch
(4) A/C switch
(5) Fan switch
(6) FRESH/RECIRC switch
(7) OFF switch
(8) Temperature adjustment dial
(9) AUTO switch
(10) Dual switch

1. A/C CONTROL MODULE SELF-DIAGNOSIS

- Without left/right independent air conditioner

	Step	Check	Yes	No
1	**SELECT SELF-DIAGNOSIS MODE IN THE CONTROL MODULE.** 1) Set the air flow control dial and fan dial to the AUTO position. 2) Start the engine with the A/C switch and the FRESH/RECIRC switch pressed.	Does the self-diagnosis mode operate?	Go to step **2**.	<Ref. to AC(diag)-17, A/C OR SELF-DIAGNOSIS SYSTEMS DO NOT OPERATE, Diagnostics for A/C System Malfunction.>
2	**CHECK THE LIGHTING OF THE LED.** Make sure that all switch LEDs on the control panel illuminate.	Do all LEDs blink eight times?	Go to step **3**.	Replace the control module.
3	**CHECK SENSOR MALFUNCTION.** 1) Set the air flow control dial and fan dial to the AUTO position. 2) If the system has trouble for each sensor, the FRESH/RECIRC switch LED blinks or is turned off. 3) If the system has no malfunctions, the FRESH/RECIRC switch LED is illuminated.	Does the FRESH/RECIRC switch LED illuminate?	Go to step **5**.	Go to step **4**.
4	**CONFIRM MALFUNCTIONING SENSOR.** 1) Set the air flow control dial to AUTO. 2) Turn the fan dial to each mode position, and check each switch LED illumination according to sensor check table. <Ref. to AC(diag)-14, SENSOR CHECK TABLE, OPERATION, Diagnostic Chart for Self-Diagnosis.>	When turning the fan dial to each mode position, does the FRESH/RECIRC switch LED go off?	Go to step **5**.	Repair the defective sensor. <Ref. to AC(diag)-32, Diagnostic Procedure for Sensors.>
5	**CHECK AIR MIX DOOR AND MODE DOOR POSITION OPERATION SIGNALS.** 1) Set the air flow control dial to FACE. 2) Turn the fan dial to AUTO. 3) If there is a system malfunction in the air mix door signal or the mode door position signal, the FRESH/RECIRC switch LED goes off or blinks. 4) If the system has no malfunctions, the FRESH/RECIRC switch LED is illuminated.	Does the FRESH/RECIRC switch LED illuminate?	Go to step **8**.	Go to step **6**.
6	**CHECK AIR MIX DOOR POSITION DRIVE SIGNALS.** 1) Set the air flow control dial to FACE. 2) Place the fan dial in each position and then check each LED illumination conditions. <Ref. to AC(diag)-16, DRIVE SIGNAL CHECK TABLE, OPERATION, Diagnostic Chart for Self-Diagnosis.>	Do the LEDs illuminate in accordance with operation signal table?	Go to step **7**.	Check the air mix door actuator circuit. <Ref. to AC(diag)-30, AIR MIX DOOR ACTUATOR, Diagnostic Procedure for Actuators.>
7	**CHECK MODE DOOR POSITION DRIVE SIGNAL.** 1) Press the A/C switch. 2) Place the fan dial in each position and then check each LED illumination conditions. <Ref. to AC(diag)-16, DRIVE SIGNAL CHECK TABLE, OPERATION, Diagnostic Chart for Self-Diagnosis.>	Do the LEDs illuminate in accordance with operation signal table?	Go to step **8**.	Check the mode door actuator circuit. <Ref. to AC(diag)-28, MODE DOOR ACTUATOR, Diagnostic Procedure for Actuators.>

	Step	Check	Yes	No
8	**CHECK OPERATION OF EACH ACTUATOR, BLOWER FAN AND COMPRESSOR CLUTCH.** 1) Set the air flow control dial to B/L. 2) Turn the fan dial from AUTO to 7th, and select operating modes. 3) Check the operation of each mode according to operating mode table. <Ref. to AC(diag)-15, OPERATING MODE TABLE, OPERATION, Diagnostic Chart for Self-Diagnosis.> • FRESH/RECIRC door • Air flow control door • Air mix door • Blower fan • A/C compressor	Does the operation of each mode match to operating mode table?	Turn the fan dial to OFF or the ignition switch to OFF in order to complete self-diagnosis.	Repair the malfunctioning part in accordance with each diagnostic chart.

• With left/right independent air conditioner

	Step	Check	Yes	No
1	**SELECT SELF-DIAGNOSIS MODE IN THE CONTROL MODULE.** Start the engine with the A/C switch and the FRESH/RECIRC switch pressed.	Does the self-diagnosis mode operate?	Go to step **2**.	<Ref. to AC(diag)-17, A/C OR SELF-DIAGNOSIS SYSTEMS DO NOT OPERATE, Diagnostics for A/C System Malfunction.>
2	**CHECK DISPLAY AND INDICATOR.** Check if the screen display and all indicators illuminate.	Do the screen display and all indicators illuminate?	Go to step **3**.	Replace the control module.
3	**CHECK SENSOR MALFUNCTION.** 1) After illumination of the display and indicator, the Inspection Mode for the sensor is initiated by pressing the fan switch (UP). (“2” illuminates at tenths place of driver’s side setting temperature display) 2) When malfunction occurs in each sensor, codes are displayed on the screen. When malfunction does not occur in each sensor, code “20” is displayed on the screen. 3) Identify defective sensors according to the sensor check table. <Ref. to AC(diag)-14, SENSOR CHECK TABLE, OPERATION, Diagnostic Chart for Self-Diagnosis.>	Is “20” displayed on the screen?	Go to step **4**.	Repair the defective sensor. <Ref. to AC(diag)-32, Diagnostic Procedure for Sensors.>

	Step	Check	Yes	No
4	**CHECK AIR MIX DOOR AND MODE DOOR POSITION OPERATION SIGNALS.** 1) After checking of the sensor, the Inspection Mode for the air mix door and mode door position drive signal is initiated by pressing the fan switch (UP). ("3" flashes at tenths place of driver's side setting temperature display for five seconds) 2) When malfunction occurs in each actuator circuit, codes are displayed on the screen. When malfunction does not occur, code "30" is displayed on the screen. 3) Identify defective actuator circuit according to the drive signal check table. <Ref. to AC(diag)-16, DRIVE SIGNAL CHECK TABLE, OPERATION, Diagnostic Chart for Self-Diagnosis.>	Is "30" displayed on the screen?	Go to step **5**.	Repair the defective actuator circuit. <Ref. to AC(diag)-26, Diagnostic Procedure for Actuators.>
5	**CHECK OPERATION OF EACH ACTUATOR, BLOWER FAN AND COMPRESSOR CLUTCH.** 1) After checking of the air mix door and mode door position drive signal, the Operation Inspection Mode for the actuator, blower fan and compressor clutch is initiated by pressing the fan switch (UP). ("4" illuminates at tenths place of driver's side setting temperature display) 2) The setting temperature display changes and the operation mode changes each time the mode switch is pressed. 3) Check each operation according to the operating mode table. <Ref. to AC(diag)-15, OPERATING MODE TABLE, OPERATION, Diagnostic Chart for Self-Diagnosis.> • FRESH/RECIRC door • Air flow control door • Air mix door LH • Air mix door RH • Blower fan • A/C compressor	Does each operation match to operating mode table?	System is normal. Turn the ignition switch to OFF to end the self-diagnosis.	Repair the defective part in accordance with each diagnostic chart.

2. SENSOR CHECK TABLE

- Without left/right independent air conditioner

NOTE:

- When the sunload sensor check is performed indoors or in the shade, it could be diagnosed as having an open circuit. Always check the sunload sensor at a location exposed to direct sunlight.
- LED illuminates to warn the past malfunction if it was detected four times or more in the past.
- To clear the past malfunction, disconnect the ground cable from the battery, or press and hold the FRESH/RECIRC switch for five seconds or more when performing the self-diagnosis Step 3 to Step 7.

Air flow control dial position	Fan dial position	Sensor	No trouble	Short circuit	Open circuit	When currently malfunctioning	When having malfunctioned in the past
AUTO	AUTO	In-vehicle sensor	FRESH/ RECIRC switch LED is turned off	FRESH/ RECIRC switch LED blinks (Illuminates for 0.2 sec. ⇔ turns off for 0.2 sec.)	FRESH/ RECIRC switch LED blinks (Illuminates for 1 sec. ⇔ turns off for 1 sec.)	Rear window defogger switch LED is turned off	Rear window defogger switch LED illuminates
	1st	Ambient sensor		FRESH/ RECIRC switch LED blinks (Illuminates for 0.2 sec. ⇔ turns off for 0.2 sec.)			
	2nd	Evaporator sensor		FRESH/ RECIRC switch LED blinks (Illuminates for 0.2 sec. ⇔ turns off for 0.2 sec.)			
	3rd	Engine coolant temperature sensor		—			
	4th	Sunload sensor		FRESH/ RECIRC switch LED blinks (Illuminates for 0.2 sec. ⇔ turns off for 0.2 sec.)			
	5th — 7th	CAN communication		—			

- With left/right independent air conditioner

NOTE:
- When the sunload sensor check is performed indoors or in the shade, it could be diagnosed as having an open circuit. Always check the sunload sensor at a location exposed to direct sunlight.
- If there are multiple defective sensors, display occurs two times.
- LED illuminates to warn the past malfunction if it was detected four times or more in the past.
- To clear the past malfunction, disconnect the ground cable from the battery, or press and hold the FRESH/RECIRC switch for five seconds or more when performing the self-diagnosis Step 3 to Step 4.

Sensor	No trouble	Open circuit	Short circuit	When currently malfunctioning	When having malfunctioned in the past
In-vehicle sensor	20	210	215	AUTO is turned off	AUTO illuminates
Ambient sensor		220	225		
Evaporator sensor		230	235		
Engine coolant temperature sensor		240	—		
Sunload sensor		250	255		
CAN communication		260	—		

3. OPERATING MODE TABLE

- Without left/right independent air conditioner

Operation	Fan dial position							
	AUTO	1st	2nd	3rd	4th	5th	6th	7th
Blower fan	4 V	4 V	4.9 V	5.9 V	7.0 V	8.3 V	9.8 V	14 V
FRESH/RECIRC door	RECIRC	RECIRC	MIX	FRESH	FRESH	FRESH	FRESH	FRESH
Air flow control door	FACE	FACE	FACE	B/L	HEAT	HEAT	D/H	DEF
Air mix door	0%	0%	0%	50%	50%	100%	100%	100%
A/C compressor	OFF	ON	ON	ON	ON	ON	ON	ON

- With left/right independent air conditioner

Operation	Setting temperature display							
	41	42	43	44	45	46	47	48
Blower fan	4 V	4 V	4.9 V	5.9 V	7.0 V	8.3 V	9.8 V	14 V
FRESH/RECIRC door	RECIRC	RECIRC	MIX	FRESH	FRESH	FRESH	FRESH	FRESH
Air flow control door	FACE	FACE	FACE	B/L	HEAT	HEAT	D/H	DEF
Air mix door RH	0%	0%	0%	50%	50%	100%	100%	100%
Air mix door LH	0%	0%	0%	50%	50%	100%	100%	100%
A/C compressor	OFF	ON	ON	ON	ON	ON	ON	ON

4. DRIVE SIGNAL CHECK TABLE

- Without left/right independent air conditioner

NOTE:
- LED illuminates to warn the past malfunction if it was detected four times or more in the past.
- To clear the past malfunction, disconnect the ground cable from the battery, or press and hold the FRESH/RECIRC switch for five seconds or more when performing the self-diagnosis Step 3 to Step 7.

Air flow control dial position	Fan dial position	Drive signal to check	A/C switch LED	No trouble	Short circuit	Open circuit	When currently malfunctioning	When having malfunctioned in the past
FACE	AUTO	MIX #1	Blinking (Illuminates for 0.2 sec. ⇔ turns off for 0.2 sec.)	FRESH/ RECIRC switch LED is turned off	FRESH/ RECIRC switch LED blinks (Illuminates for 0.2 sec. ⇔ turns off for 0.2 sec.)	FRESH/ RECIRC switch LED blinks (Illuminates for 1 sec. ⇔ turns off for 1 sec.)	Rear window defogger switch LED is turned off	Rear window defogger switch LED illuminates
	1st	MIX #2						
	2nd	MIX #3						
	3rd — 7th	MIX #4						
	AUTO	MODE #1	Blinking (Illuminates for 1 sec. ⇔ turns off for 1 sec.)					
	1st	MODE #2						
	2nd	MODE #3						
	3rd — 7th	MODE #4						

- With left/right independent air conditioner

NOTE:
- If there are multiple defective sensors, display occurs two times.
- LED illuminates to warn the past malfunction if it was detected four times or more in the past.
- To clear the past malfunction, disconnect the ground cable from the battery, or press and hold the FRESH/RECIRC switch for five seconds or more when performing the self-diagnosis Step 3 to Step 4.

Drive signal to check		No trouble	Short circuit	Open circuit	When currently malfunctioning	When having malfunctioned in the past
Air mix door RH	#1	30	310	315	AUTO is turned off	AUTO illuminates
	#2		320	325		
	#3		330	335		
	#4		340	345		
Air mix door LH	#1		350	355		
	#2		360	365		
	#3		370	375		
	#4		380	385		
Air flow control door	#1		390	395		
	#2		3A0	3A5		
	#3		3b0	3b5		
	#4		3C0	3C5		

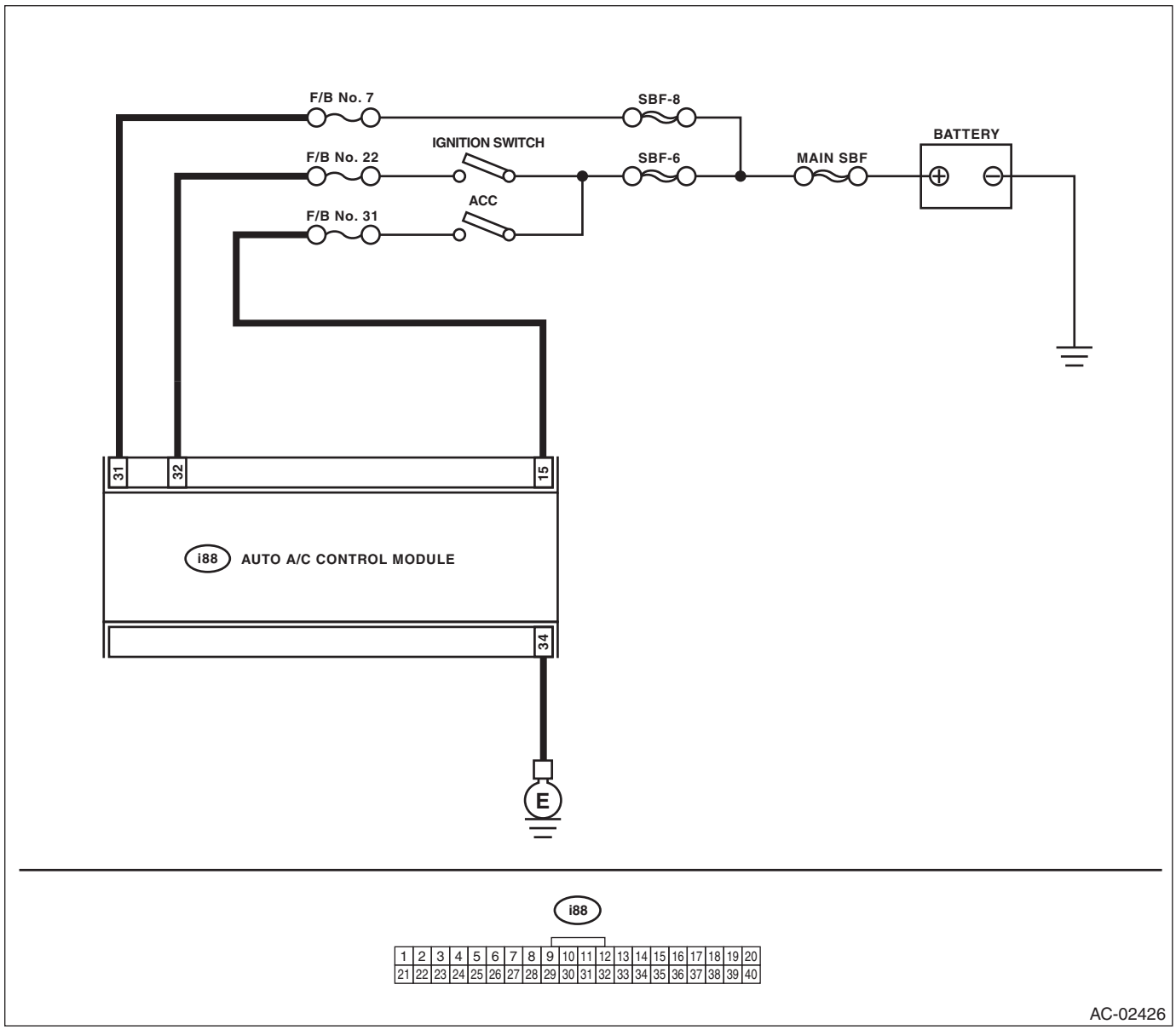
6. Diagnostics for A/C System Malfunction

A: A/C OR SELF-DIAGNOSIS SYSTEMS DO NOT OPERATE

TROUBLE SYMPTOM:

- Set temperature is not indicated on the display, switch LEDs are faulty and switches do not operate.
- Self-diagnosis system does not operate.

WIRING DIAGRAM:



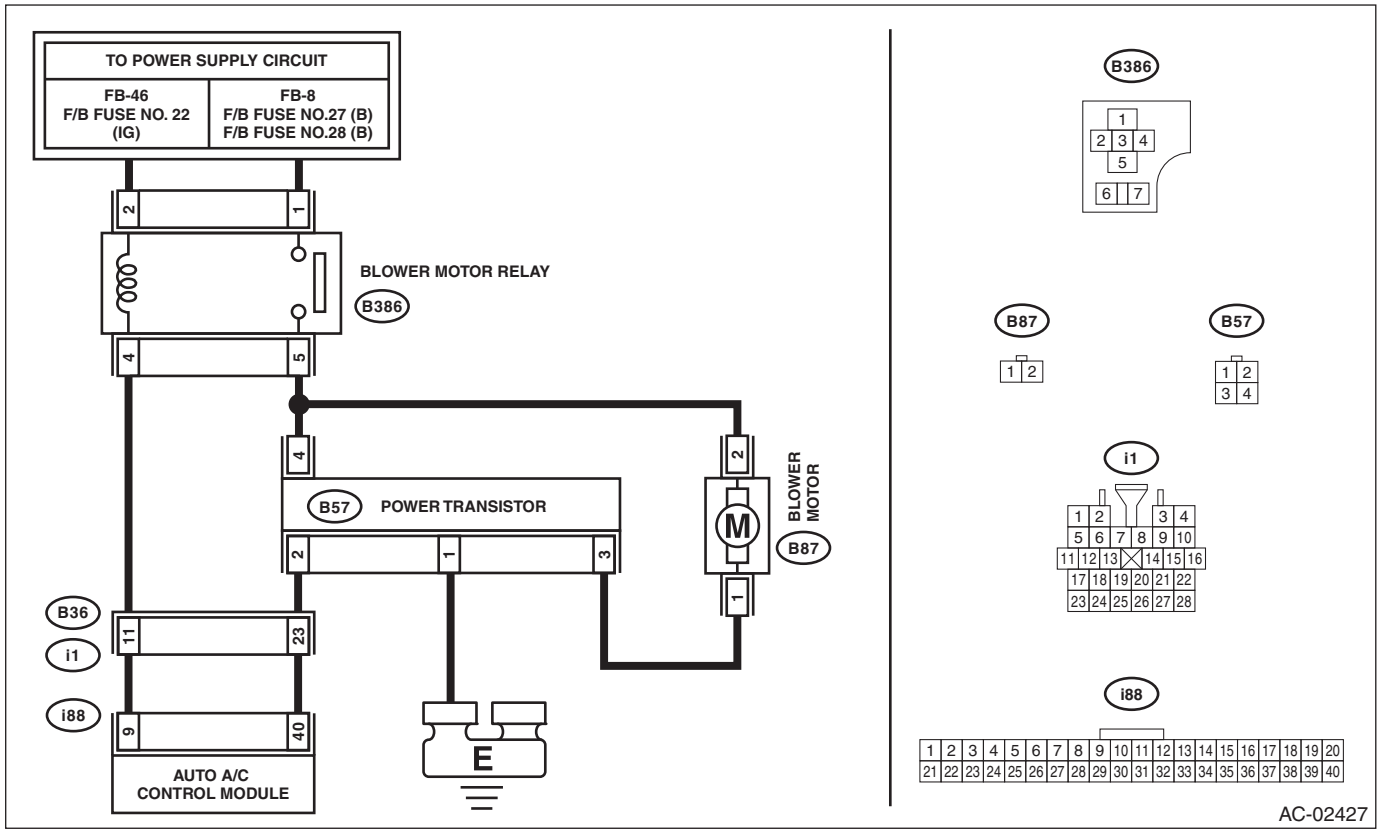
	Step	Check	Yes	No
1	**CHECK FUSE.** 1) Turn the ignition switch to OFF. 2) Remove the fuse No. 7, No. 22 and No. 31 from fuse & relay box. 3) Check the condition of fuse.	Is the fuse blown out?	Replace the fuse.	Go to step **2**.
2	**CHECK A/C CONTROL MODULE POWER CIRCUIT.** 1) Remove the A/C control module. 2) Disconnect the A/C control module harness connector. 3) Turn the ignition switch to ACC, and measure the voltage between A/C control module harness connector terminal and chassis ground. ***Connector & terminal*** ***(i88) No. 15 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **3**.	Check for open or short circuit in the harness between A/C control module and fuse.
3	**CHECK A/C CONTROL MODULE POWER CIRCUIT.** Measure the voltage between A/C control module harness connector terminal and chassis ground after turning the ignition switch to ON. ***Connector & terminal*** ***(i88) No. 32 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **4**.	Check for open or short circuit in the harness between A/C control module and fuse.
4	**CHECK A/C CONTROL MODULE GROUND CIRCUIT.** Measure the resistance of harness between A/C control module and chassis ground after turning the ignition switch to OFF. ***Connector & terminal*** ***(i88) No. 34 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **5**.	Repair the harness for ground line.
5	**CHECK FOR POOR CONTACT.** Check poor contact of auto A/C control module connector.	Is there poor contact of connector?	Repair the connector.	Replace the auto A/C control module. <Ref. to AC-35, REMOVAL, Control Unit (Auto A/C Model).>

B: BLOWER MOTOR DOES NOT ROTATE

TROUBLE SYMPTOM:

- Blower motor does not rotate.
- Blower motor does not change speeds.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK FUSE.** 1) Remove fuse No. 22, 27 and 28 from fuse & relay box. 2) Check the condition of fuse.	Is any fuse blown out?	Replace the fuse.	Go to step **2**.
2	**CHECK POWER SUPPLY OF BLOWER MOTOR RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the blower motor relay. 3) Turn the ignition switch to ON. 4) Use a tester to measure the voltage between the blower motor relay connector and chassis ground. ***Connector & terminal*** ***(B386) No. 2 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	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) Connect the battery positive terminal to the blower motor relay terminal No. 2, and the negative terminal to No. 4. 3) Using the tester, measure the resistance between terminals. ***Connector & terminal*** ***(Relay) No. 1 — No. 5:***	Is the resistance less than 1 Ω?	Go to step **4**.	Replace the blower motor relay.

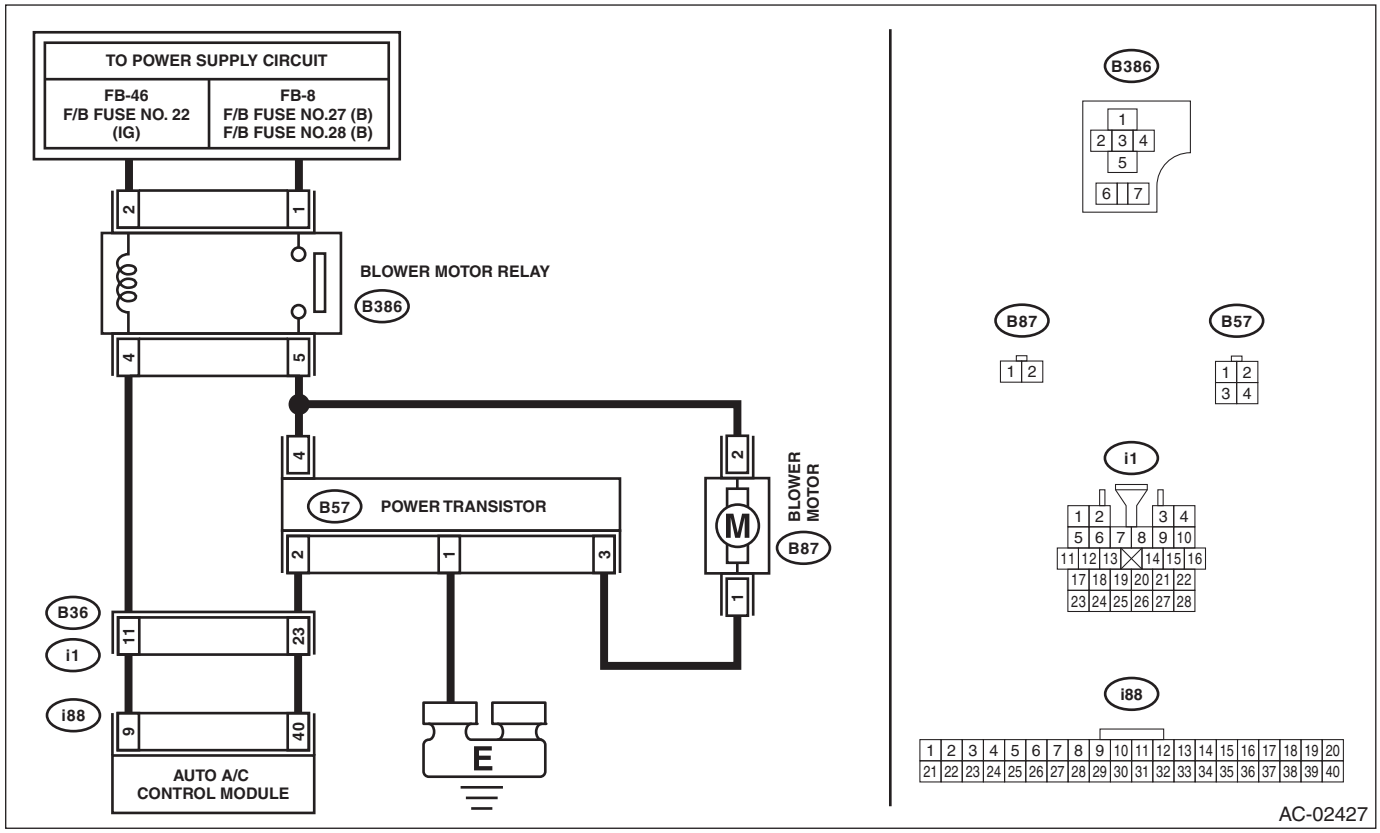
	Step	Check	Yes	No
4	**CHECK HARNESS.** 1) Remove the auto A/C control module. 2) Measure the resistance between auto A/C control module and relay using a tester. ***Connector & terminal*** ***(B386) No. 4 — (i88) No. 9:***	Is the resistance less than 1 Ω?	Go to step **5**.	Repair or replace the harness.
5	**CHECK BLOWER MOTOR POWER SUPPLY.** 1) Install the blower motor relay and auto A/C control module. 2) Turn the ignition switch to ON. 3) Turn the blower fan switch to ON. 4) Use a tester to measure the voltage between the blower motor and chassis ground. ***Connector & terminal*** ***(B87) No. 2 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **6**.	Repair or replace the harness between relay and the blower motor.
6	**CHECK BLOWER MOTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from blower motor. 3) Connect the battery positive terminal to the blower motor connector terminal No. 2, and the negative terminal to No. 1. 4) Make sure the blower motor runs.	Does the blower motor run?	Go to step **7**.	Replace the blower motor. <Ref. to AC-30, REMOVAL, Blower Motor.>
7	**CHECK HARNESS.** 1) Disconnect the power transistor connector. 2) Disconnect the auto A/C control module connector. 3) Using the tester, measure the resistance between terminals of harness. ***Connector & terminal*** ***(B57) No. 1 — Chassis ground:*** ***(B57) No. 2 — (i88) No. 40:*** ***(B57) No. 3 — (B87) No. 1:*** ***(B57) No. 4 — (B87) No. 2:*** ***(B57) No. 4 — (B386) No. 5:***	Is the resistance less than 1 Ω?	Go to step **8**.	Repair or replace the harness.
8	**CHECK FAN CONTROL SIGNAL.** 1) Connect the disconnected connectors. 2) Turn the ignition switch to ON. 3) Set the fan dial or fan switch to 1st — 7th. 4) Measure the voltage between the power transistor and chassis ground using a tester. ***Connector & terminal*** ***(B57) No. 2 (+) — Chassis ground (–):***	Is the voltage approx. 10 V at 1st and approx. 1 V at 7th?	Replace the power transistor. <Ref. to AC-31, REMOVAL, Power Transistor (Auto A/C Model).>	Go to step **9**.
9	**CHECK FOR POOR CONTACT.** Check poor contact of auto A/C control module connector.	Is there poor contact of connector?	Repair the connector.	Replace the auto A/C control module. <Ref. to AC-35, REMOVAL, Control Unit (Auto A/C Model).>

C: BLOWER MOTOR TURNS AROUND EARLY

TROUBLE SYMPTOM:

- The blower rotates even though the blower switch is not turned on.
- The blower motor continues to rotate at high speed. (Not adjustable.)

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK BLOWER MOTOR CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the power transistor connector. 3) Use a tester to measure the resistance between the power transistor connector and chassis ground. ***Connector & terminal*** ***(B57) No. 3 — Chassis ground:***	Is there continuity?	Repair or replace the short circuit of the harness.	Go to step **2**.
2	**CHECK HARNESS.** 1) Remove the auto A/C control module. 2) Use a tester to measure the resistance between the power transistor connector and chassis ground. ***Connector & terminal*** ***(B57) No. 2 — Chassis ground:***	Is there continuity?	Repair or replace the short circuit of the harness.	Go to step **3**.
3	**CHECK POWER TRANSISTOR.** 1) Connect the disconnected connectors. 2) Turn the ignition switch to ON. 3) Use a tester to measure the voltage between the power transistor connector and chassis ground. ***Connector & terminal*** ***(B57) No. 2 (+) — Chassis ground (–):***	Is the voltage approx. 10 V when fan dial or fan switch is in 1st position, and approx. 1 V in 7th position?	Replace the power transistor. <Ref. to AC-31, REMOVAL, Power Transistor (Auto A/C Model).>	Go to step **4**.

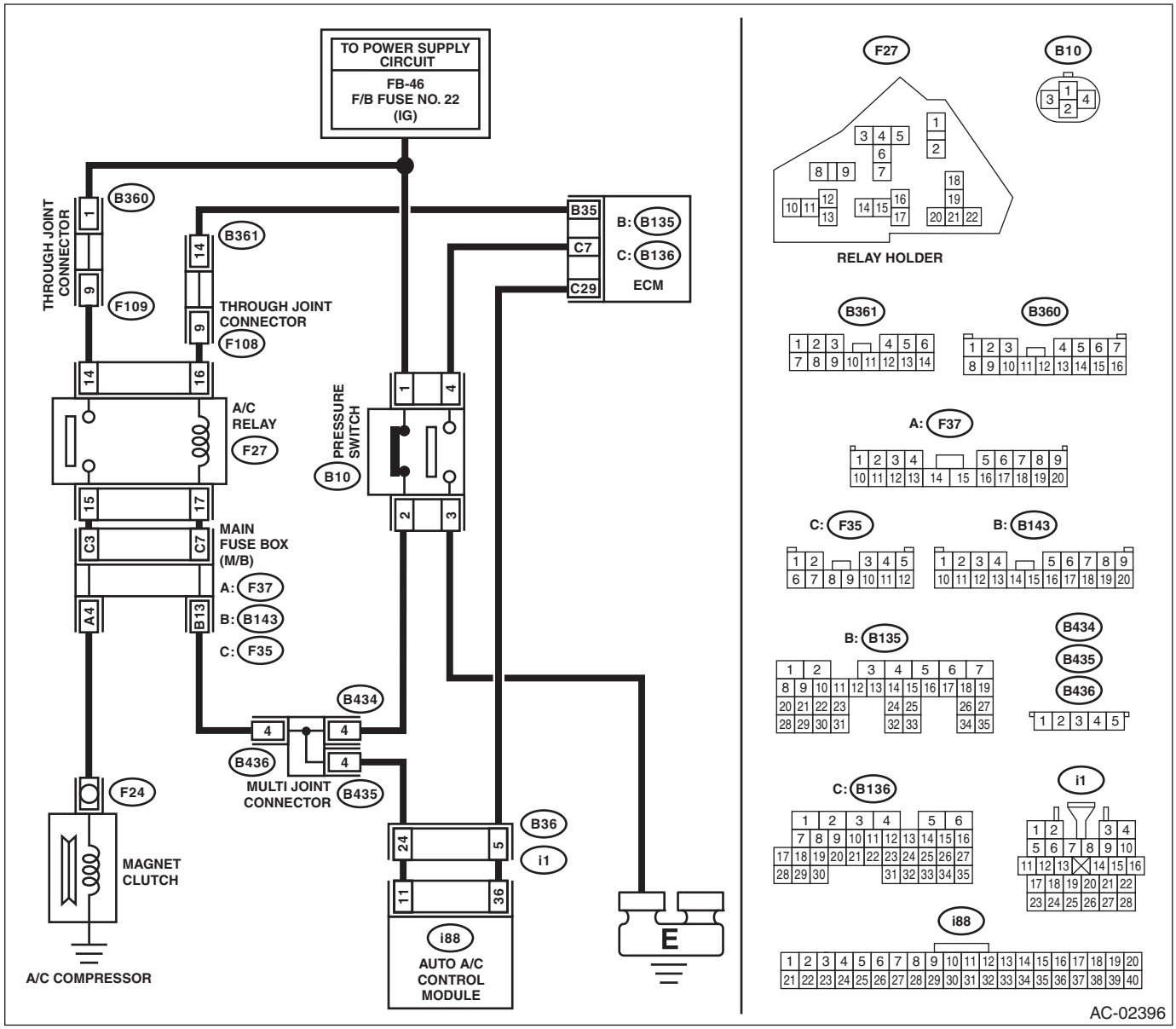
Step		Check	Yes	No
4	**CHECK AUTO A/C CONTROL MODULE.** 1) Turn the fan dial or fan switch OFF. 2) Disconnect the power transistor connector. 3) Use a tester to measure the resistance between the power transistor connector and chassis ground. ***Connector & terminal*** ***(B57) No. 2 — Chassis ground:***	When turning the fan dial or fan switch from OFF to another position, does the resistance change?	Replace the power transistor. <Ref. to AC-31, REMOVAL, Power Transistor (Auto A/C Model).>	Replace the auto A/C control module. <Ref. to AC-35, REMOVAL, Control Unit (Auto A/C Model).>

D: COMPARTMENT TEMPERATURE DOES NOT CHANGE, OR A/C SYSTEM DOES NOT RESPOND PROMPTLY

TROUBLE SYMPTOM:

- Compartment temperature does not change. (Cold air does not come out.)
- A/C system does not respond. (Response is extremely slow)

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK FUSE.** 1) Turn the ignition switch to OFF. 2) Remove the fuse No. 22 from fuse & relay box. 3) Check the condition of fuse.	Is the fuse blown out?	Replace the fuse.	Go to step **2**.

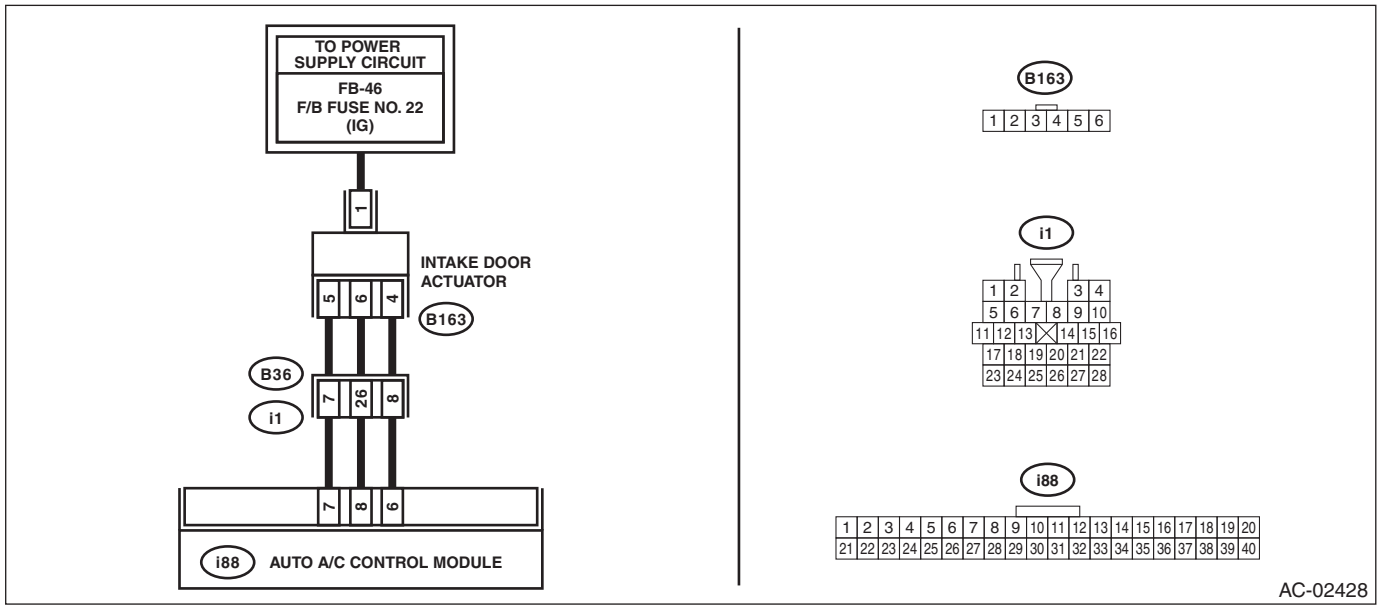
Step		Check	Yes	No
2	**CHECK SIGNAL TO A/C RELAY AND AUTO A/C CONTROL MODULE.** 1) Disconnect the A/C relay and auto A/C control module harness connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between A/C relay connector terminal and chassis ground. 4) Measure the voltage between auto A/C control module harness connector terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 17 (+) — Chassis ground (–):*** ***(i88) No. 11 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **5**.	Go to step **3**.
3	**CHECK POWER SUPPLY FOR PRESSURE SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the pressure switch harness connector. 3) Turn the ignition switch to ON. 4) Measure the voltage between pressure switch harness connector terminal and chassis ground. ***Connector & terminal*** ***(B10) No. 2 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **4**.	Check for open or short circuit in the harness between fuse and pressure switch.
4	**CHECK HARNESS BETWEEN PRESSURE SWITCH AND A/C RELAY, AUTO A/C CONTROL MODULE.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between pressure switch connector and A/C relay connector. 3) Measure the resistance of harness between pressure switch connector and auto A/C control module connector. ***Connector & terminal*** ***(B10) No. 2 — (F27) No. 17:*** ***(B10) No. 2 — (i88) No. 11:***	Is the resistance less than 1 Ω?	Check the pressure switch. <Ref. to AC-44, INSPECTION, Pressure Switch (Triple Pressure Switch).>	Repair the harness.
5	**CHECK POWER SUPPLY FOR A/C RELAY.** Measure the voltage between A/C relay connector terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 14 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **6**.	Check open or short circuit of harness between fuse and A/C relay.
6	**CHECK A/C RELAY.** Check the A/C relay. <Ref. to AC-43, INSPECTION, Relay and Fuse.>	Is the A/C relay normal?	Go to step **7**.	Replace the A/C relay.
7	**CHECK A/C ON SIGNAL.** 1) Turn the ignition switch to OFF. 2) Connect the A/C relay and all disconnected connectors. 3) Start the engine and turn the A/C switch to ON. 4) Turn the temperature control dial at maximum cool position. 5) Measure the voltage between auto A/C control module harness connector terminal and chassis ground. ***Connector & terminal*** ***(i88) No. 36 (+) — Chassis ground (–):***	Is the voltage 5.5 V or more?	Go to step **8**.	Replace the auto A/C control module. <Ref. to AC-35, REMOVAL, Control Unit (Auto A/C Model).>

	Step	Check	Yes	No
8	**CHECK HARNESS BETWEEN AUTO A/C CONTROL MODULE AND ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the harness connector of auto A/C control module and ECM. 3) Measure the resistance of harness between auto A/C control module connector and ECM connector. ***Connector & terminal*** ***(i88) No. 36 — (B136) No. 29:***	Is the resistance less than 1 Ω?	Go to step **9**.	Repair the harness.
9	**CHECK MAGNET CLUTCH ON SIGNAL.** 1) Stop the engine and turn the A/C switch to OFF. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM connector terminal and chassis ground. ***Connector & terminal*** ***(B136) No. 35 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **10**.	Check for open or short circuit in the harness between A/C relay and ECM.
10	**CHECK MAGNET CLUTCH ON SIGNAL.** 1) Start the engine and turn the A/C switch to ON. 2) Turn the temperature control dial at maximum cool position. 3) Measure the voltage between ECM connector terminal and chassis ground. ***Connector & terminal*** ***(B136) No. 35 (+) — Chassis ground (–):***	Is the voltage 0 V?	Go to step **11**.	Replace the ECM. <Ref. to FU(H4DO)-101, REMOVAL, Engine Control Module (ECM).> <Ref. to FU(H4DOTC)-57, REMOVAL, Engine Control Module (ECM).>
11	**CHECK POWER SUPPLY FOR MAGNET CLUTCH.** 1) Stop the engine and turn the A/C switch to OFF. 2) Disconnect the harness connector of magnet clutch. 3) Start the engine and turn the A/C switch to ON. 4) Turn the temperature control dial at maximum cool position. 5) Measure the voltage between magnet clutch harness connector terminal and chassis ground. ***Connector & terminal*** ***(F24) No. 1 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Inspect the compressor. <Ref. to AC-37, INSPECTION, Compressor.>	Check for open or short circuit in the harness between A/C relay and magnet clutch.

7. Diagnostic Procedure for Actuators

A: INTAKE DOOR ACTUATOR

TROUBLE SYMPTOM:
FRESH/RECIRC mode is not changed.
WIRING DIAGRAM:

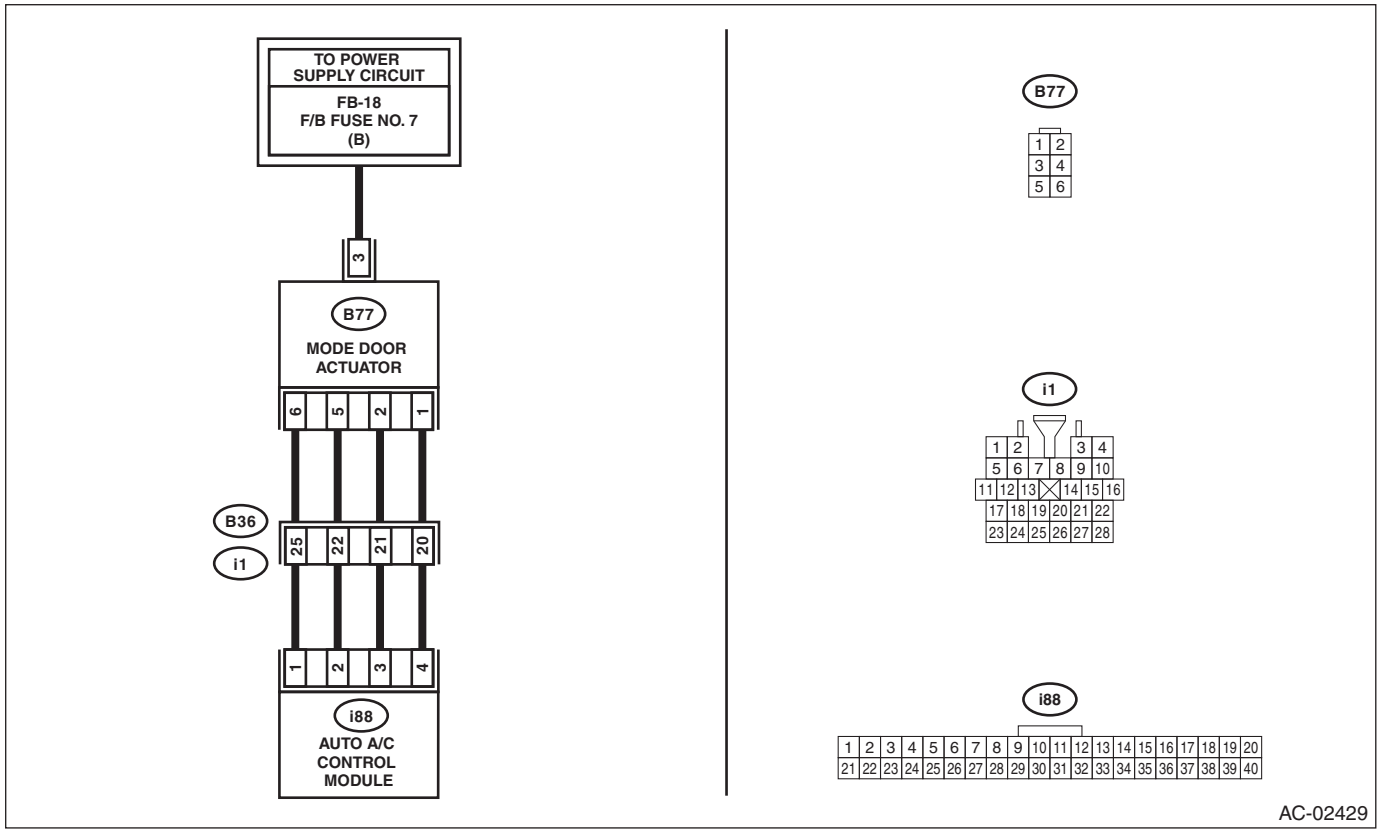


Step		Check	Yes	No
1	**CHECK POWER SUPPLY FOR INTAKE DOOR ACTUATOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the intake door actuator connector. 3) Turn the ignition switch to ON. 4) Measure the voltage between intake door actuator connector and chassis ground. ***Connector & terminal*** ***(B163) No. 1 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	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*** ***(i88) No. 8 — (B163) No. 6:*** ***(i88) No. 7 — (B163) No. 5:*** ***(i88) No. 6 — (B163) No. 4:***	Is the resistance less than 1 Ω?	Go to step **3**.	Repair the 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*** ***(i88) No. 6 — Chassis ground:***	Does the actuator move to the FRESH side?	Go to step **4**.	Replace the intake door actuator.

	Step	Check	Yes	No
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:*** ***(i88) No. 8 — Chassis ground:***	Does the actuator move to the RECIRC side?	Replace the auto A/C control module. <Ref. to AC-35, REMOVAL, Control Unit (Auto A/C Model).>	Replace the intake door actuator.

B: MODE DOOR ACTUATOR

TROUBLE SYMPTOM:
Air flow outlet is not changed.
WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK POWER SUPPLY FOR MODE DOOR ACTUATOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the mode door actuator connector. 3) Turn the ignition switch to ON. 4) Measure the voltage between the mode door actuator connector terminal and chassis ground. ***Connector & terminal*** ***(B77) No. 3 (+) — Chassis ground (–):***	Is the voltage approx. 10 V or more?	Go to step **2**.	Check the DC power supply circuit.
2	**CHECK MODE DOOR ACTUATOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between mode door actuator terminals using a tester. ***Connector & terminal*** ***(B77) No. 3 — No. 1:*** ***(B77) No. 3 — No. 2:*** ***(B77) No. 3 — No. 5:*** ***(B77) No. 3 — No. 6:***	Is the resistance 80 — 100 Ω?	Go to step **3**.	Replace the mode door actuator.

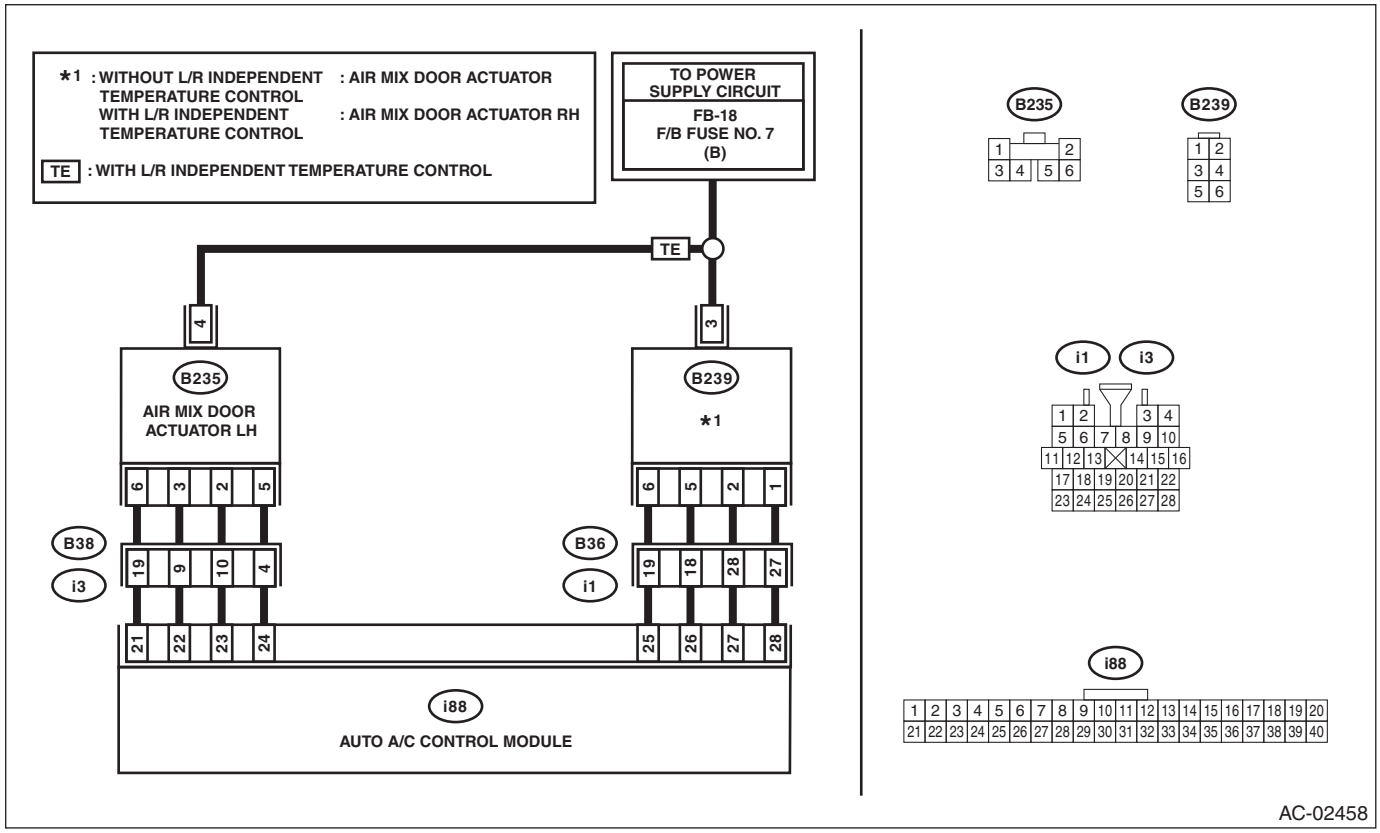
	Step	Check	Yes	No
3	**CHECK HARNESS BETWEEN AUTO A/C CONTROL MODULE AND MODE DOOR ACTUATOR.** 1) Disconnect the auto A/C control module connector. 2) Measure the resistance between auto A/C control module and mode door actuator connector. ***Connector & terminal*** ***(B77) No. 1 — (i88) No. 4:*** ***(B77) No. 2 — (i88) No. 3:*** ***(B77) No. 5 — (i88) No. 2:*** ***(B77) No. 6 — (i88) No. 1:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the harness between auto A/C control module and mode door actuator.
4	**CHECK FOR POOR CONTACT.** Check poor contact of auto A/C control module and connector.	Is there poor contact of connector?	Repair the connector.	Replace the auto A/C control module. <Ref. to AC-35, REMOVAL, Control Unit (Auto A/C Model).>

C: AIR MIX DOOR ACTUATOR

TROUBLE SYMPTOM:

Outlet air temperature does not change.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK POWER SUPPLY OF AIR MIX DOOR ACTUATOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the air mix door actuator connector. 3) Turn the ignition switch to ON. 4) Measure the voltage between the air mix door actuator connector terminal and chassis ground. ***Connector & terminal*** ***Without left/right independent air conditioner*** ***(B239) No. 3 (+) — Chassis ground (–):*** ***With left/right independent air conditioner*** ***(B235) No. 4 (+) — Chassis ground (–):*** ***(B239) No. 3 (+) — Chassis ground (–):***	Is the voltage approx. 10 V or more?	Go to step **2**.	Check the DC power supply circuit.

	Step	Check	Yes	No
2	**CHECK AIR MIX DOOR ACTUATOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between air mix actuator terminals using a tester. ***Connector & terminal*** ***Without left/right independent air conditioner*** ***(B239) No. 3 — No. 1:*** ***(B239) No. 3 — No. 2:*** ***(B239) No. 3 — No. 5:*** ***(B239) No. 3 — No. 6:*** ***With left/right independent air conditioner*** ***(B235) No. 4 — No. 2:*** ***(B235) No. 4 — No. 3:*** ***(B235) No. 4 — No. 5:*** ***(B235) No. 4 — No. 6:*** ***(B239) No. 3 — No. 1:*** ***(B239) No. 3 — No. 2:*** ***(B239) No. 3 — No. 5:*** ***(B239) No. 3 — No. 6:***	Is the resistance 80 — 100 Ω?	Go to step **3**.	Replace the air mix door actuator.
3	**CHECK HARNESS BETWEEN AUTO A/C CONTROL MODULE AND AIR MIX DOOR ACTUATOR.** 1) Disconnect the auto A/C control module connector. 2) Measure the resistance between auto A/C control module and air mix door actuator connector. ***Connector & terminal*** ***Without left/right independent air conditioner*** ***(B239) No. 1 — (i88) No. 28:*** ***(B239) No. 2 — (i88) No. 27:*** ***(B239) No. 5 — (i88) No. 26:*** ***(B239) No. 6 — (i88) No. 25:*** ***With left/right independent air conditioner*** ***(B235) No. 2 — (i88) No. 23:*** ***(B235) No. 3 — (i88) No. 22:*** ***(B235) No. 5 — (i88) No. 24:*** ***(B235) No. 6 — (i88) No. 21:*** ***(B239) No. 1 — (i88) No. 28:*** ***(B239) No. 2 — (i88) No. 27:*** ***(B239) No. 5 — (i88) No. 26:*** ***(B239) No. 6 — (i88) No. 25:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the harness between auto A/C control module and air mix door actuator.
4	**CHECK FOR POOR CONTACT.** Check poor contact of auto A/C control module and connector.	Is there poor contact of connector?	Repair the connector.	Replace the auto A/C control module. <Ref. to AC-35, REMOVAL, Control Unit (Auto A/C Model).>

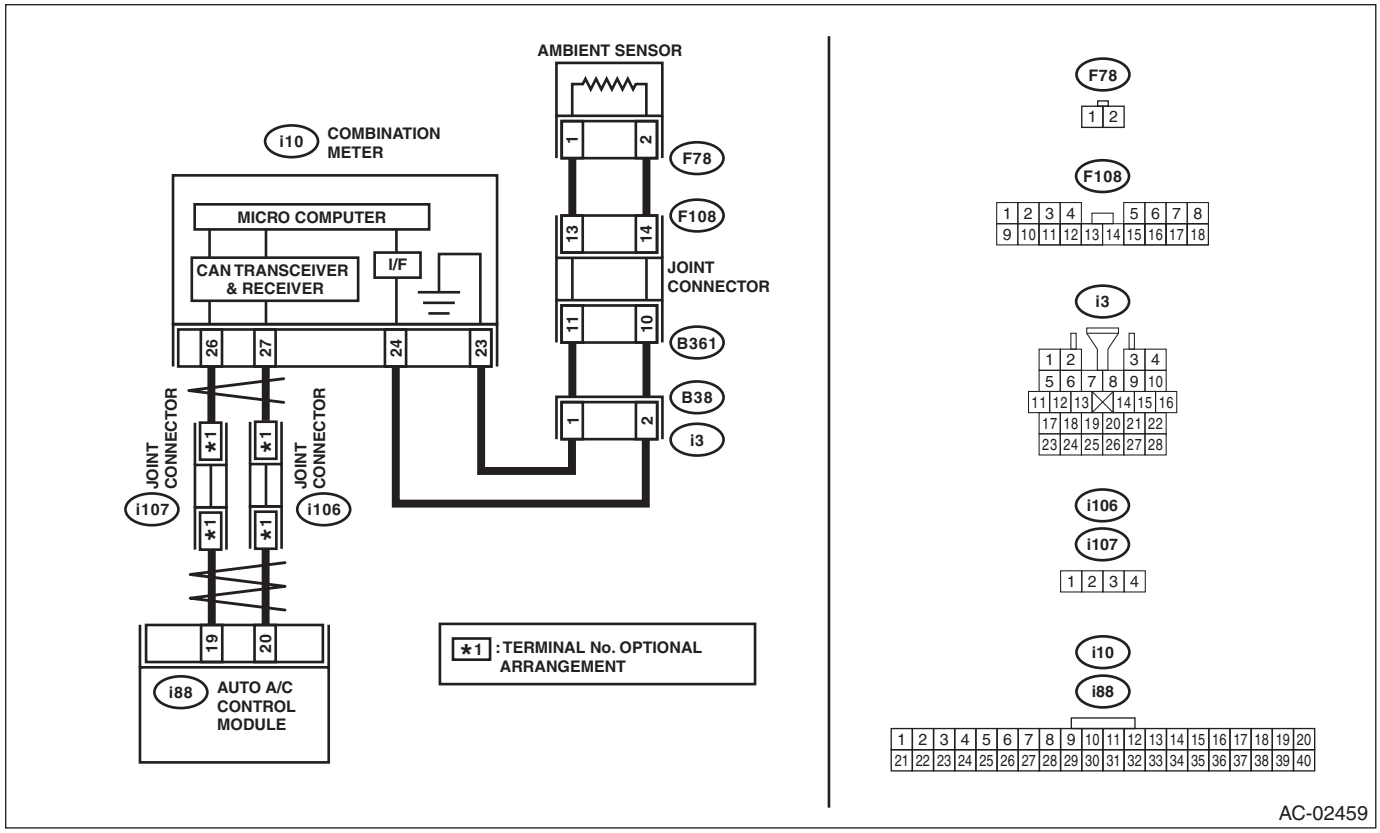
8. Diagnostic Procedure for Sensors

A: AMBIENT SENSOR

TROUBLE SYMPTOM:

- Fan speed is not switched when the fan dial is in AUTO position.
- Failure related to the ambient sensor is indicated in self-diagnosis.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK AMBIENT SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ambient sensor. 3) Measure the resistance between terminals of ambient sensor. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance approximately 3 kΩ at 25°C (77°F)?	Go to step **2**.	Replace the ambient sensor. <Ref. to AC-46, REMOVAL, Ambient Sensor (Auto A/C Model).>
2	**CHECK INPUT SIGNAL FOR AMBIENT SENSOR.** 1) Turn the ignition to ON. 2) Measure the voltage between connector (F78) terminals. ***Connector & terminal*** ***(F78) No. 2 (+) — No. 1 (–):***	Is the voltage approx. 5 V?	Go to step **6**.	Go to step **3**.

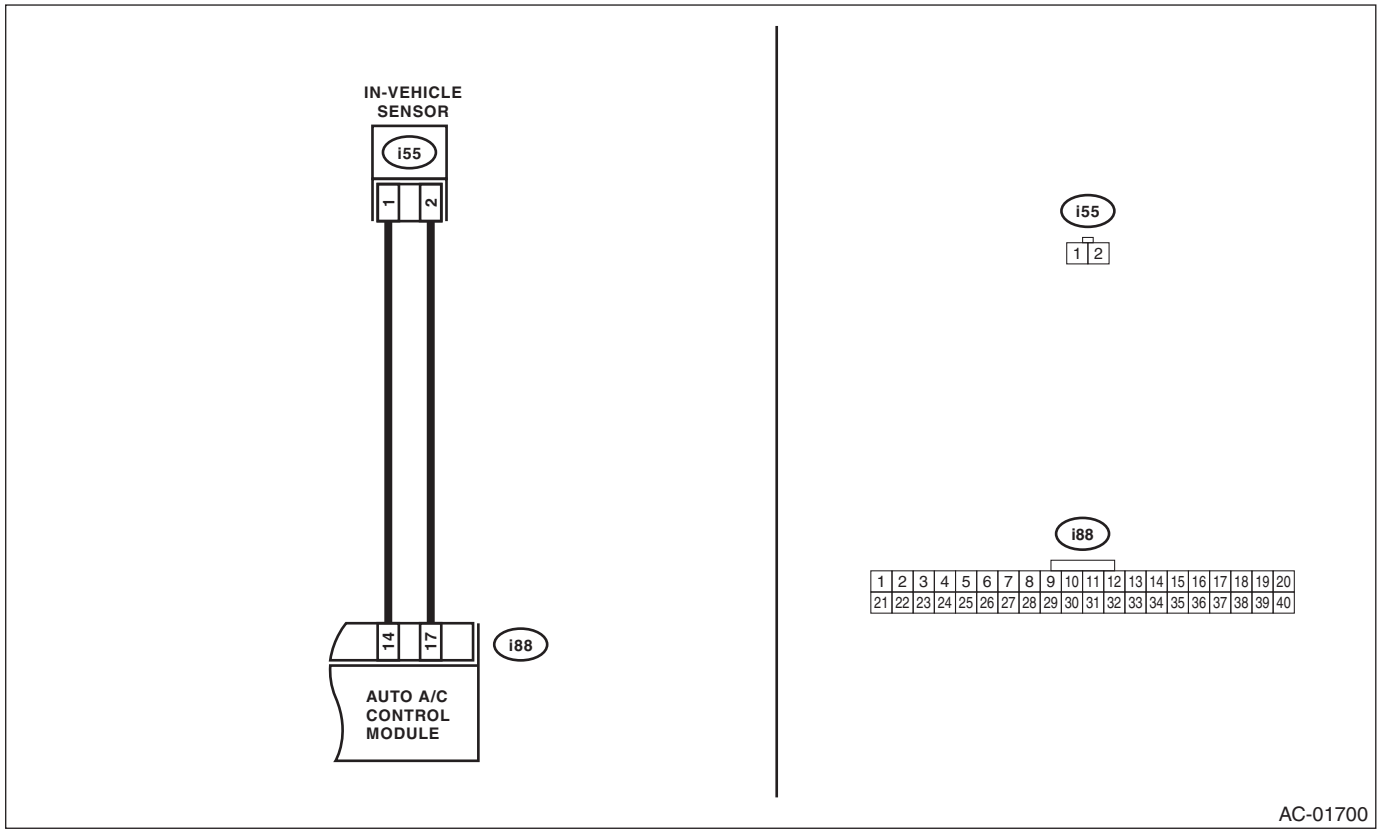
	Step	Check	Yes	No
3	**CHECK COMBINATION METER OUTPUT SIGNAL.** 1) Turn the ignition switch to OFF. 2) Pull out the combination meter. 3) Disconnect the connector from ambient sensor. 4) Turn the ignition switch to ON. 5) Measure the voltage between the combination meter connector terminals. ***Connector & terminal*** ***(i10) No. 24 (+) — No. 23 (–):***	Is the voltage approx. 5 V?	Go to step **4**.	Replace the combination meter. <Ref. to IDI-21, REMOVAL, Combination Meter.>
4	**CHECK HARNESS CONNECTOR BETWEEN COMBINATION METER AND AMBIENT SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the combination meter. 3) Measure the resistance of harness between combination meter and ambient sensor. ***Connector & terminal*** ***(F78) No. 1 — (i10) No. 23:***	Is the resistance less than 1 Ω?	Go to step **5**.	Repair the open circuit of the harness between the combination meter and ambient sensor.
5	**CHECK HARNESS CONNECTOR BETWEEN COMBINATION METER AND AMBIENT SENSOR.** Measure the resistance of harness between combination meter and ambient sensor. ***Connector & terminal*** ***(F78) No. 2 — (i10) No. 24:***	Is the resistance less than 1 Ω?	Replace the combination meter. <Ref. to IDI-21, REMOVAL, Combination Meter.>	Repair the open circuit of the harness between the combination meter and ambient sensor.
6	**CHECK HARNESS CONNECTOR BETWEEN COMBINATION METER AND AUTO A/C CONTROL MODULE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the combination meter. 3) Disconnect the auto A/C control module connector. 4) Measure the resistance of harness between the combination meter and auto A/C control module. ***Connector & terminal*** ***(i88) No. 19 — (i10) No. 26:***	Is the resistance less than 1 Ω?	Go to step **7**.	Repair the open circuit in the harness between the combination meter and auto A/C control module. <Ref. to LAN(diag)-6, LAN SYSTEM, CAUTION, General Description.>
7	**CHECK HARNESS CONNECTOR BETWEEN COMBINATION METER AND AUTO A/C CONTROL MODULE.** Measure the resistance of harness between the combination meter and auto A/C control module. ***Connector & terminal*** ***(i88) No. 20 — (i10) No. 27:***	Is the resistance less than 1 Ω?	Go to step **8**.	Repair the open circuit in the harness between the combination meter and auto A/C control module. <Ref. to LAN(diag)-6, LAN SYSTEM, CAUTION, General Description.>
8	**CHECK FOR POOR CONTACT.** Check poor contact of auto A/C control module connector.	Is there poor contact of connector?	Repair the connector.	Replace the auto A/C control module. <Ref. to AC-35, REMOVAL, Control Unit (Auto A/C Model).>

B: IN-VEHICLE SENSOR

TROUBLE SYMPTOM:

- Blower fan speed, air flow outlet and FRESH/RECIRC do not change after turning the AUTO switch to ON.
- Failure related to the in-vehicle sensor is indicated in self-diagnosis.

WIRING DIAGRAM:

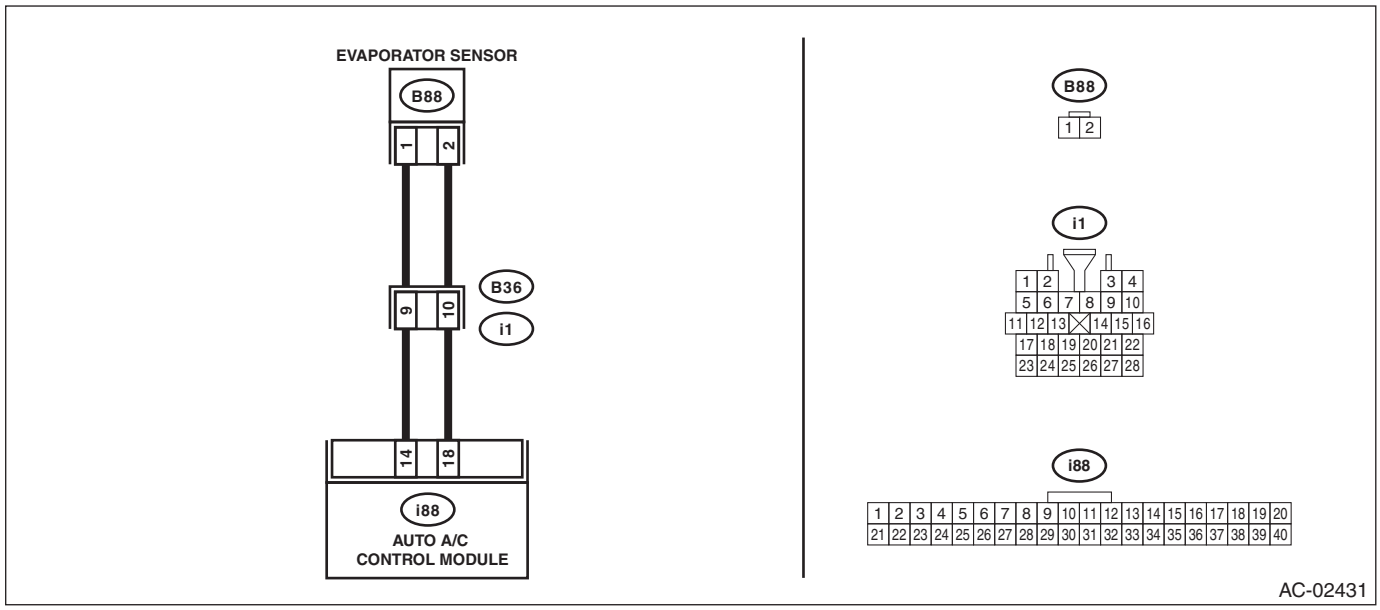


Step		Check	Yes	No
1	**CHECK IN-VEHICLE SENSOR.** 1) Turn the ignition switch to OFF. 2) Remove the driver's side lower cover. 3) Disconnect the connector from in-vehicle sensor. 4) Measure the resistance between terminals of in-vehicle sensor. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance approximately 2.2 kΩ at 25°C (77°F)?	Go to step **2**.	Replace the in-vehicle sensor. <Ref. to AC-48, REMOVAL, In-Vehicle Sensor (Auto A/C Model).>
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 terminals. ***Connector & terminal*** ***(i55) No. 2 (+) — No. 1 (–):***	Is the voltage approx. 5 V?	Go to step **6**.	Go to step **3**.
3	**CHECK AUTO A/C CONTROL MODULE OUTPUT SIGNAL.** 1) Turn the ignition switch to OFF. 2) Remove 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*** ***(i88) No. 17 (+) — (i88) No. 14 (–):***	Is the voltage approx. 5 V?	Go to step **4**.	Go to step **6**.

	Step	Check	Yes	No
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 — (i88) No. 17:***	Is the resistance less than 1 Ω?	Go to step **5**.	Repair 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 — (i88) No. 14:***	Is the resistance less than 1 Ω?	Go to step **6**.	Repair the harness between auto A/C control module and in-vehicle sensor.
6	**CHECK FOR POOR CONTACT.** Check poor contact of auto A/C control module connector.	Is there poor contact of connector?	Repair the connector.	Replace the auto A/C control module. <Ref. to AC-35, REMOVAL, Control Unit (Auto A/C Model).>

C: EVAPORATOR SENSOR

WIRING DIAGRAM:



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 terminals of the evaporator sensor. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance approx. 6.2 kΩ at 0°C (32°F) and approx. 3.3 kΩ at 15°C (59°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 connector (B88) terminals. ***Connector & terminal*** ***(B88) No. 2 (+) — No. 1 (–):***	Is the voltage approx. 5 V?	Go to step **6**.	Go to step **3**.
3	**CHECK AUTO A/C CONTROL MODULE OUTPUT SIGNAL.** 1) Turn the ignition switch to OFF. 2) Remove 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*** ***(i88) No. 18 (+) — (i88) No. 14 (–):***	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. ***Connector & terminal*** ***(B88) No. 2 — (i88) No. 18:***	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.

	Step	Check	Yes	No
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. ***Connector & terminal*** ***(B88) No. 1 — (i88) No. 14:***	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 FOR POOR CONTACT.** Check poor contact of auto A/C control module connector.	Is there poor contact of connector?	Repair the connector.	Replace the auto A/C control module. <Ref. to AC-35, REMOVAL, Control Unit (Auto A/C Model).>

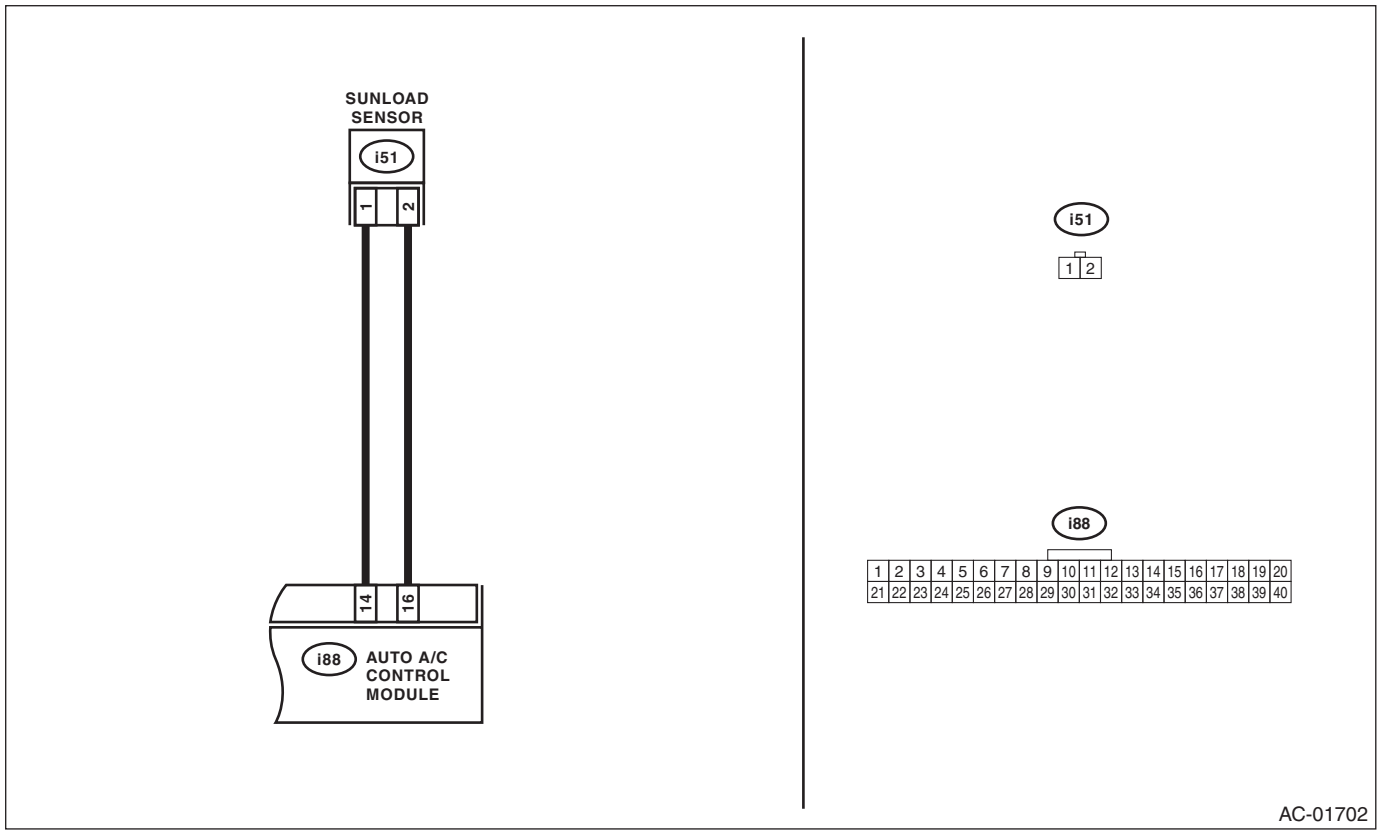
D: SUNLOAD SENSOR

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 check is performed indoors or in the shade, it could be diagnosed as having an open circuit. Always check the sunload sensor with the sun shining on it.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK POWER SUPPLY VOLTAGE FOR SUNLOAD SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from sunload sensor. 3) Turn the ignition switch to ON. 4) Measure the power supply voltage for sunload sensor. ***Connector & terminal*** ***(i51) No. 2 (+) — No. 1 (–):***	Is the voltage approx. 5 V?	Go to step **4**.	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. ***Connector & terminal*** ***(i51) No. 2 — (i88) No. 16:***	Is the resistance less than 1 Ω?	Go to step **3**.	Repair the harness between auto A/C control module and sunload sensor.

	Step	Check	Yes	No
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. ***Connector & terminal*** ***(i51) No. 1 — (i88) No. 14:***	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 connectors of sunload sensor and auto A/C control module. 2) Turn the ignition switch to ON. 3) Measure the voltage between connector terminals of auto A/C control module. ***Connector & terminal*** ***(i88) No. 16 (+) — (i88) No. 14 (–):***	Is the voltage within approximately 1.0 — 4.0 V?	Go to step **5**.	Replace the sunload sensor. <Ref. to AC-47, REMOVAL, Sunload Sensor (Auto A/C Model).>
5	**CHECK FOR POOR CONTACT.** Check poor contact of auto A/C control module connector.	Is there poor contact of connector?	Repair the connector.	Replace the auto A/C control module. <Ref. to AC-35, REMOVAL, Control Unit (Auto A/C Model).>

9. Diagnostics with Phenomenon

A: INSPECTION

Symptoms	Faulty parts
A/C system fails to operate.	• Fuse (F/B No. 7, 22, 31) • Connector (Poor contact) • Ground • Auto A/C control module • Blower fan motor • Blower fan relay • A/C relay • Compressor (Magnet clutch) • Evaporator sensor • ECM
Fuse is blown out.	• Fuse (F/B No. 7, 22, 31) • Connector (Poor contact)
Illumination cannot dim.	• Fuse (F/B No. 7, 22, 31) • Connector (Poor contact) • Auto A/C control module
Blower fan does not rotate or fan speed cannot be controlled.	• Fuse (F/B No. 7, 22, 31) • Connector (Poor contact) • Ground • Auto A/C control module • Blower fan motor • Blower fan relay • Power transistor
Unable to switch suction vents.	• Connector (Poor contact) • Auto A/C control module • Intake door actuator
Unable to switch vents.	• Connector (Poor contact) • Auto A/C control module • Mode door actuator
Compartment temperature does not rise. (Warm air does not come out.)	• 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
Compartment temperature does not lower. (Cold air does not come out.)	• 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.	• 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.	• 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.	• Radiator fan motor • Radiator fan relay • ECM

AIRBAG SYSTEM

AB

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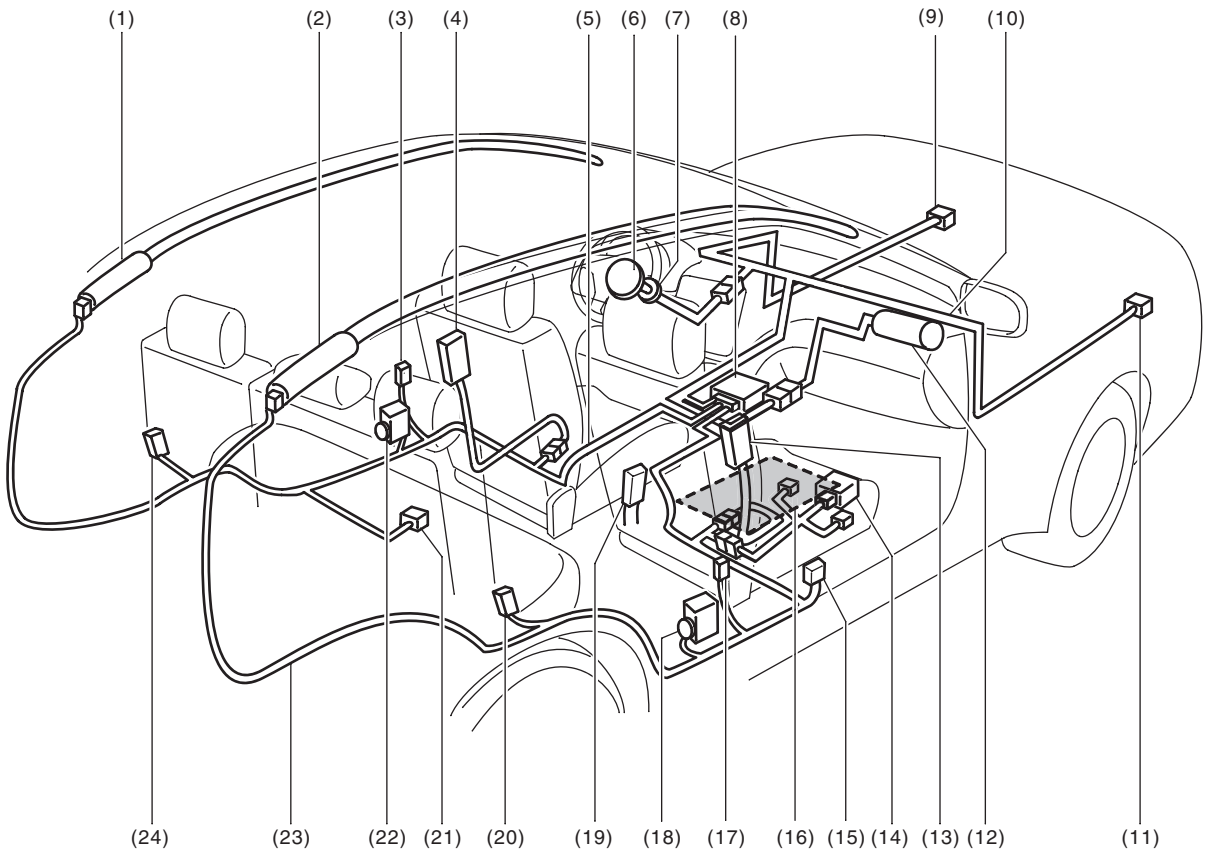
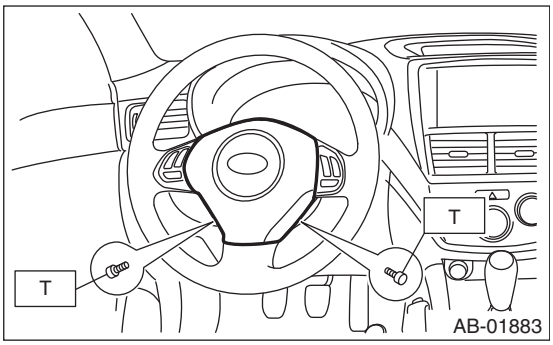
1. General Description

A: COMPONENT



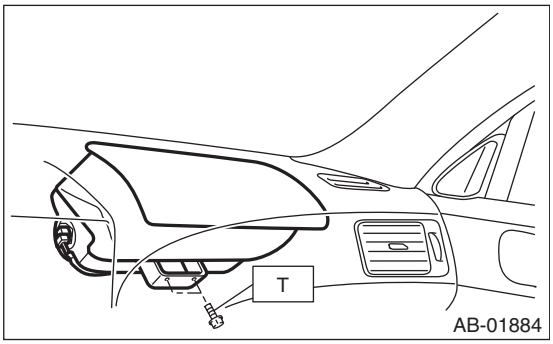
(1)	Curtain airbag module LH	(9)	Front sub sensor LH	(17)	Side airbag sensor RH
(2)	Curtain airbag module RH	(10)	Front airbag harness (integrated with bulkhead wiring harness)	(18)	Seat belt pretensioner RH
(3)	Side airbag sensor LH	(11)	Front sub sensor RH	(19)	Buckle switch RH
(4)	Side airbag module LH	(12)	Airbag module ASSY (Passenger)	(20)	Curtain airbag sensor RH
(5)	Airbag rear harness LH (integrated with rear wiring harness)	(13)	Side airbag module RH	(21)	Satellite safing sensor
(6)	Airbag module ASSY (Driver)	(14)	Occupant detection control module	(22)	Seat belt pretensioner LH
(7)	Combination switch ASSY with roll connector	(15)	Belt tension sensor	(23)	Airbag rear harness RH (integrated with rear wiring harness)
(8)	Airbag control module	(16)	Occupant detection sensor	(24)	Curtain airbag sensor LH

1. DRIVER'S AIRBAG MODULE



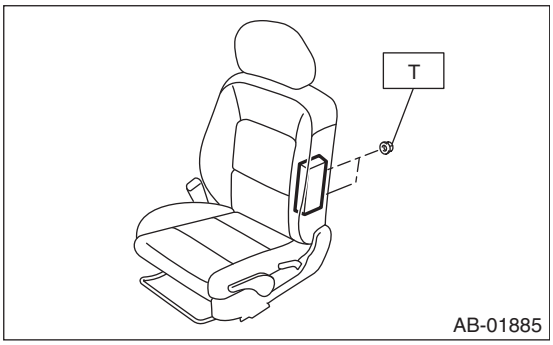
Tightening torque:
10 N·m (1.02 kgf-m, 7.4 ft-lb)

2. PASSENGER'S AIRBAG MODULE



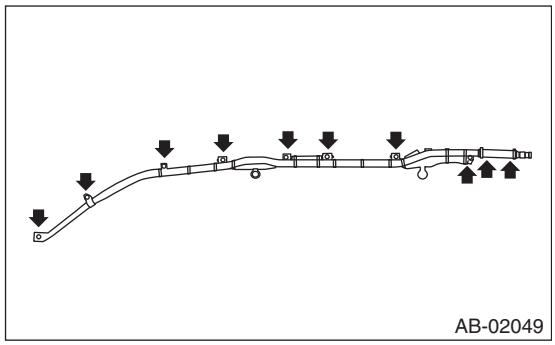
Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

3. SIDE AIRBAG MODULE



Tightening torque:
6 N·m (0.61 kgf-m, 4.4 ft-lb)

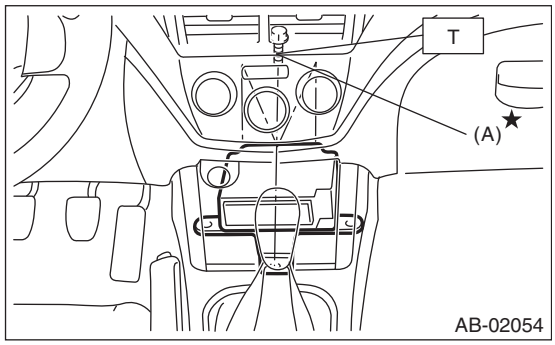
4. CURTAIN AIRBAG MODULE



Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

5. AIRBAG CONTROL MODULE

CAUTION:
Do not reuse mounting bolts and nuts.

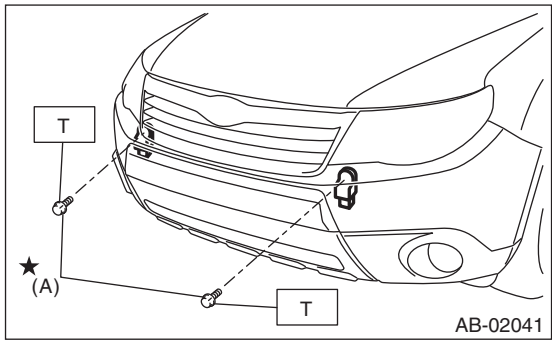


(A) Bolt

Tightening torque:
25 N·m (2.55 kgf-m, 18.1 ft-lb)

6. FRONT SUB SENSOR

CAUTION:
Do not reuse mounting bolts and nuts.

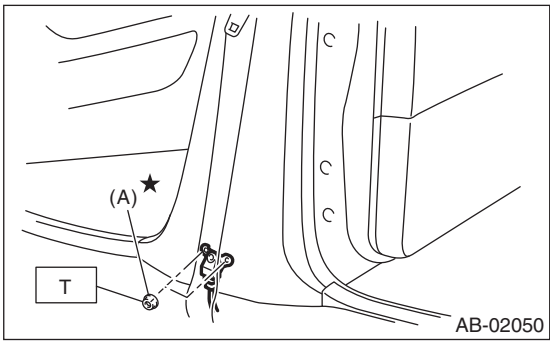


(A) Bolt

Tightening torque:
13 N·m (1.32 kgf-m, 9.6 ft-lb)

7. SIDE AIRBAG SENSOR

CAUTION:
Do not reuse mounting bolts and nuts.

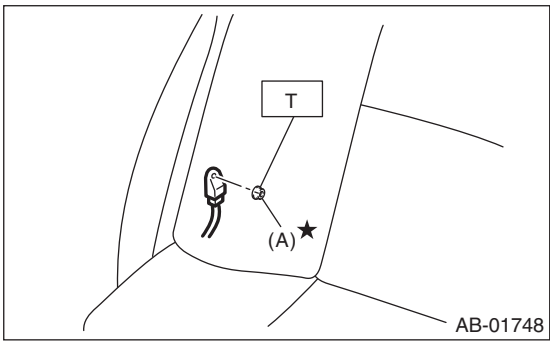


(A) Nut

Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

8. CURTAIN AIRBAG SENSOR

CAUTION:
Do not reuse mounting bolts and nuts.

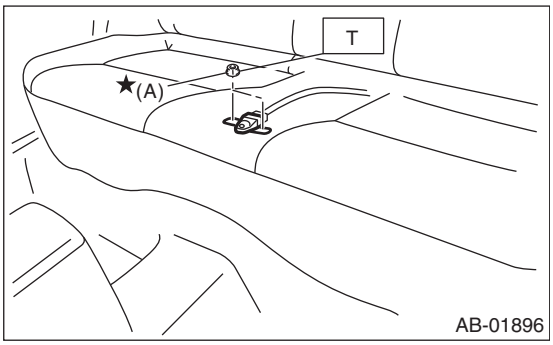


(A) Nut

Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

9. SATELLITE SAFING SENSOR

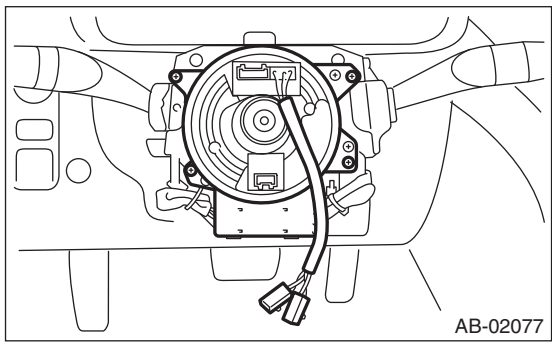
CAUTION:
Do not reuse mounting bolts and nuts.



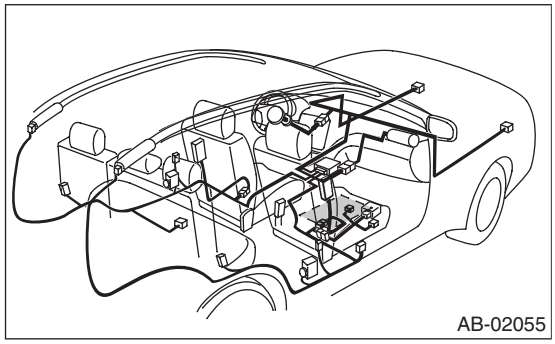
(A) Nut

Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

10.STEERING ROLL CONNECTOR



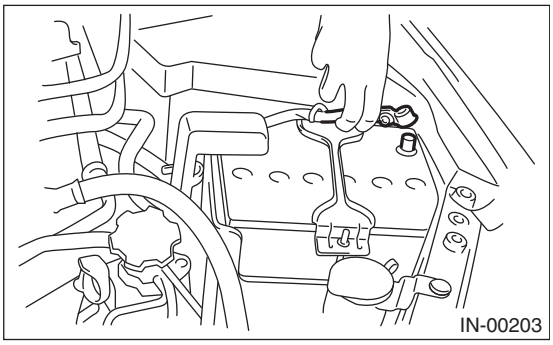
11.AIRBAG HARNESS



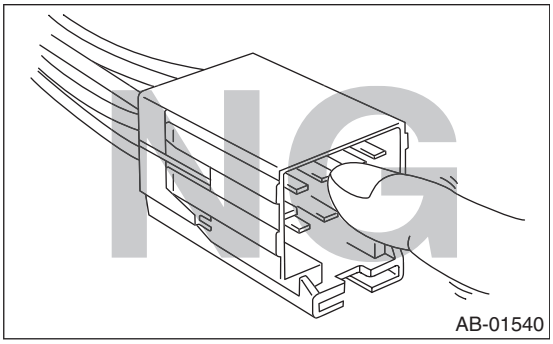
B: CAUTION

1. BEFORE STARTING ALL WORKS

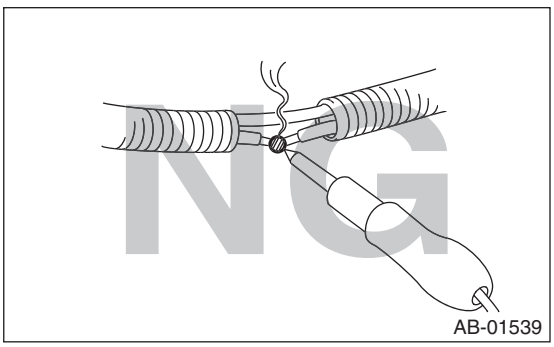
• When servicing a vehicle, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait for 60 seconds or more before starting work.
• The airbag system is fitted with a backup power supply. After disconnecting the battery ground cable, the airbag may operate if you do not wait for 60 seconds or more before starting the service of airbag system.



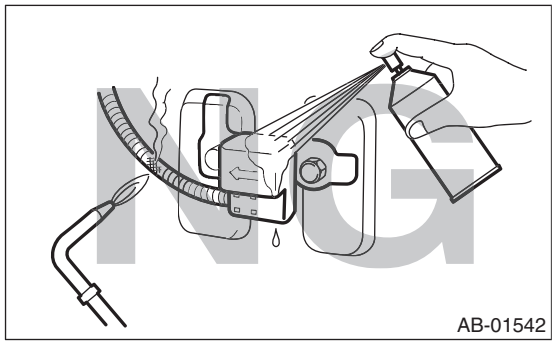
• If the airbag warning light illuminates, check or repair the vehicle immediately to prevent it from airbag system malfunction.
• Do not allow water or oil to come in contact with the connector terminals. Also, do not touch the connector terminals directly.



• 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.



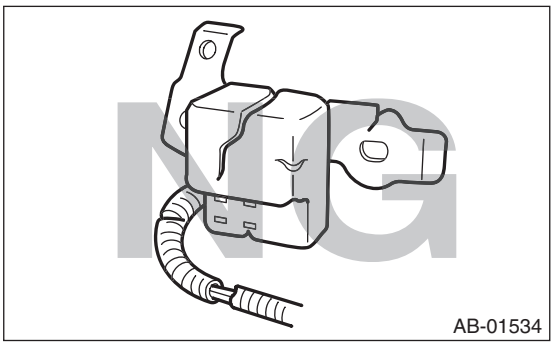
• When painting or performing sheet metal work on the front part of the vehicle, including the front wheel apron, front fender and front side frame, remove the front sub sensors and wiring harness of airbag system.
• When painting or performing sheet metal work on the side of the vehicle including the side sill, center pillar and front and rear doors, or on the rear floor pan or around the rear crossmember, remove the side airbag sensors, curtain airbag sensor, satellite safing sensor and wiring harness of the airbag system.



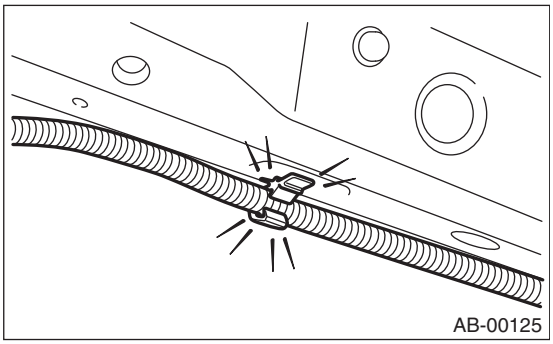
• When attaching the steering wheel and steering roll connector, be sure to adjust the steering roll connector.

2. BEFORE STARTING PARTS REPLACEMENT

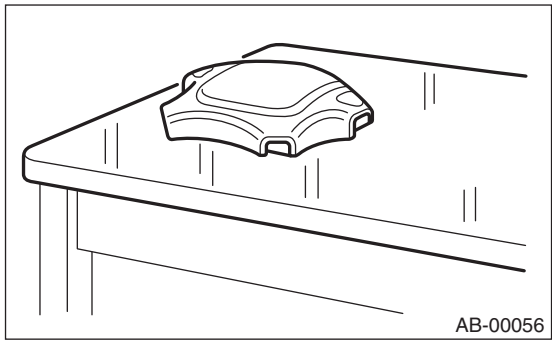
• If any of the airbag sensors, airbag module, airbag control module, pretensioner, harness or satellite safing sensor cover is deformed or damaged, replace with new parts.



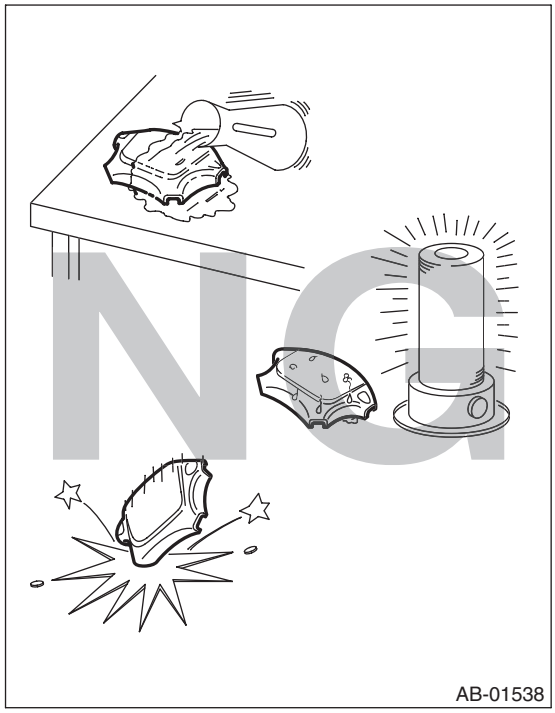
• Install the wiring harness securely with the specified clips to avoid interference or tangled with other parts.



• Do not use the airbag or pretensioner parts from other vehicles. Always replace the defective parts with new parts.
• Never reuse any activated airbag module and pretensioner.
• Do not discard undeployed airbag or pretensioner.
• When airbag control module, front sub sensor, side airbag sensor, curtain airbag sensor and satellite safing sensor are removed, do not reuse the bolts and nuts of them. Always replace with the specified new bolts and nuts.
• When attaching the steering wheel and steering roll connector, be sure to adjust the steering roll connector.
• After removing each parts of the airbag system, keep them with the pad side facing upward on a dry, clean and flat surface away from heat, light sources, moisture and dust.

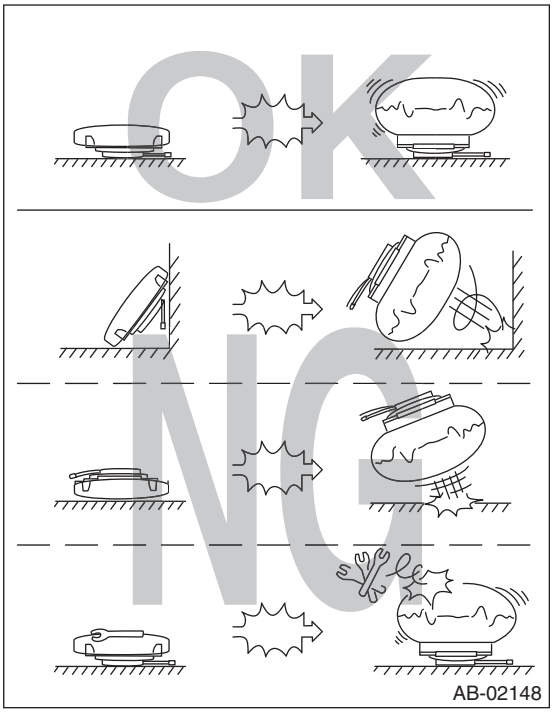


• Do not drop each airbag module, airbag control module and each sensor, or store these parts under high temperature of 85°C (185°F) or more, or let water, oil or grease get on them; the internal parts may be damaged or the reliability may be decreased.

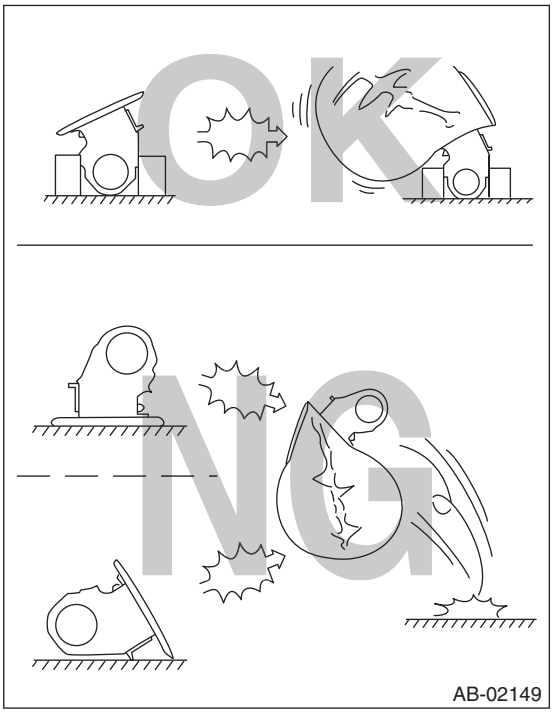


• When storing a removed airbag module, do not place it with the pad side facing downward. Do not place any objects on the airbag module. Do not pile up the airbag module. If the pad of the airbag module is in contact with other objects, it may cause a serious accident if the airbag accidentally operates.

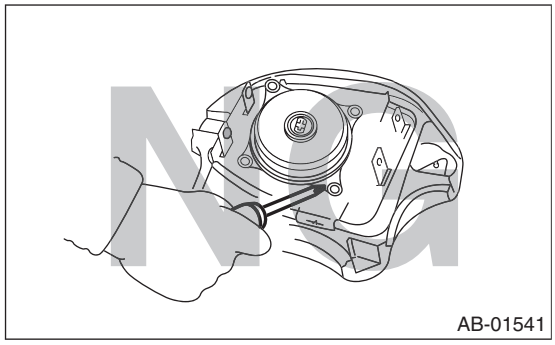
- Driver's airbag module



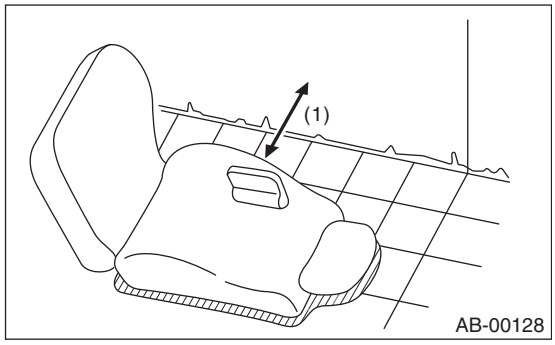
- Passenger's airbag module and side airbag module



- Do not disassemble driver's airbag module, passenger's airbag module, side or curtain airbag modules, or pretensioner.



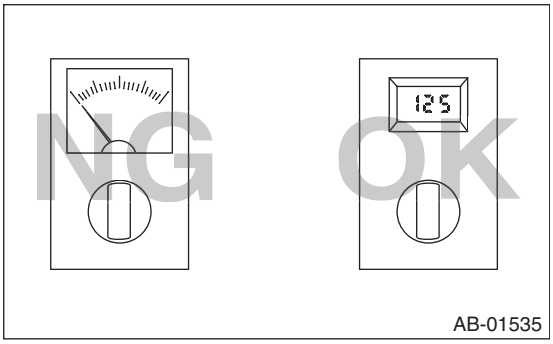
- The removed front seat with airbag module must be kept at least 200 mm (8 in) away from walls and other objects.



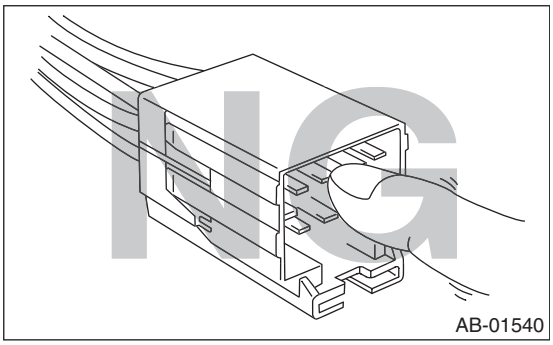
(1) 200 mm (8 in) or more

3. BEFORE STARTING TROUBLESHOOTING

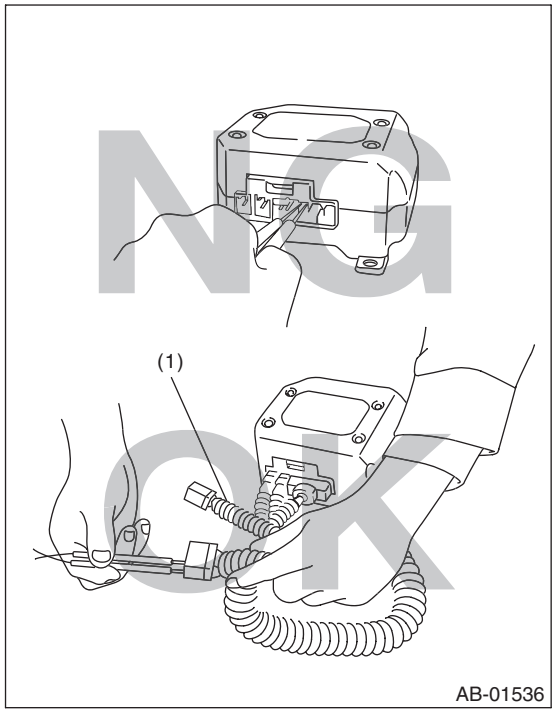
• Even if any part must be replaced as the result of troubleshooting, do not use an airbag part or pretensioner part from other vehicles. Always replace the defective parts with new parts.
• When checking the airbag system, be sure to use a digital circuit tester. Use of an analog circuit tester may cause the airbag to activate erroneously due to a minimal current inside tester.



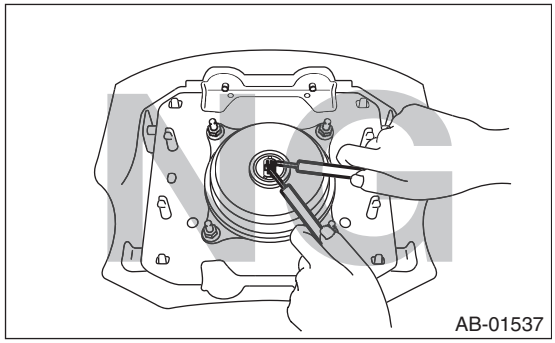
• Do not allow water or oil to come in contact with the connector terminals. Also, do not touch the connector terminals directly.



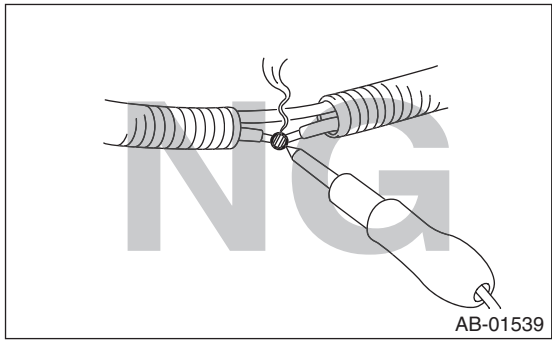
• When checking, use a test harness (1). Damage to connector terminal causes malfunction. Do not directly put the tester probe on airbag connector terminal.



• Do not check continuity of the airbag modules for driver's side, passenger's side and curtain, or the pretensioner.

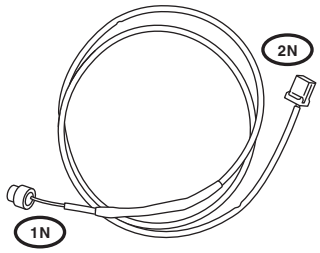
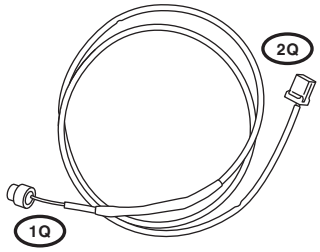


• If damage, open circuit or rust is found on airbag system wiring harness, do not use a soldering equipment to repair. Replace the faulty harness with a new genuine part.



C: PREPARATION TOOL

1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST98299SA000	98299SA000	TEST HARNESS N	Used for inspecting the steering roll connector.
 ST98299SA040	98299SA040	TEST HARNESS Q	Used for inspecting the steering roll connector.

2. GENERAL TOOL

TOOL NAME	REMARKS
TORX® T30	Used for removal/installation of driver's airbag module

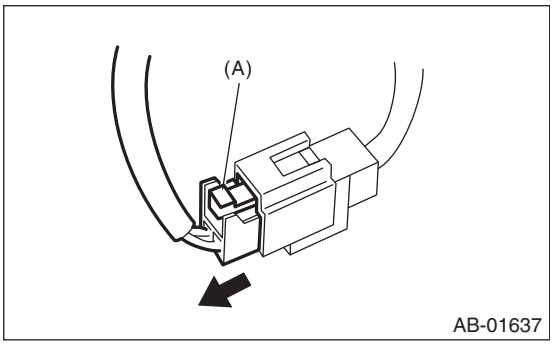
2. Airbag Connector

A: PROCEDURE

1. POWER SUPPLY

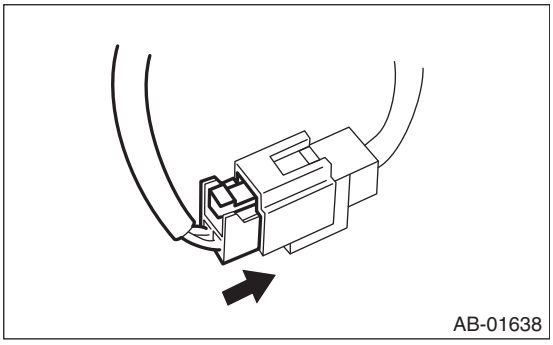
1) How to disconnect:

CAUTION:
When pulling the slide lock or disconnecting connector, be sure to hold the connector, not the harness.
Press the lock (A), and then disconnect the connector.



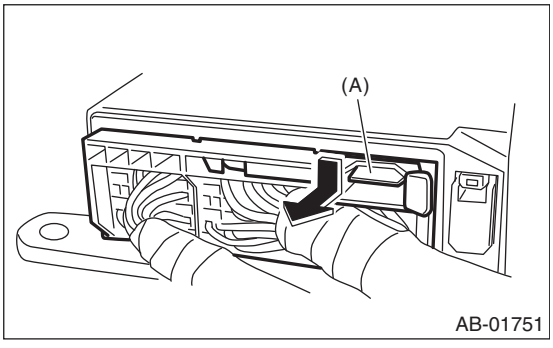
2) How to connect:

CAUTION:
Be sure to insert the connector in until it is locked. Then pull it gently to make sure that it is locked.
Holding the connector, push it in securely until a clicking sound is heard.



2. AIRBAG CONTROL MODULE

1) How to disconnect:
Press the lock lever plate (A) and pull out the lock lever.



2) How to connect:

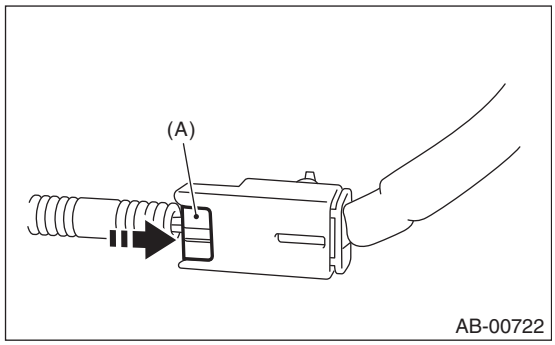
CAUTION:
Be sure to insert the connector in until it is locked. Then pull it gently to make sure that it is locked.
Insert the connector and push the lock lever in securely.

3. DRIVER'S AIRBAG MODULE (BETWEEN AIRBAG MAIN HARNESS AND ROLL CONNECTOR) AND PASSENGER'S AIRBAG MODULE

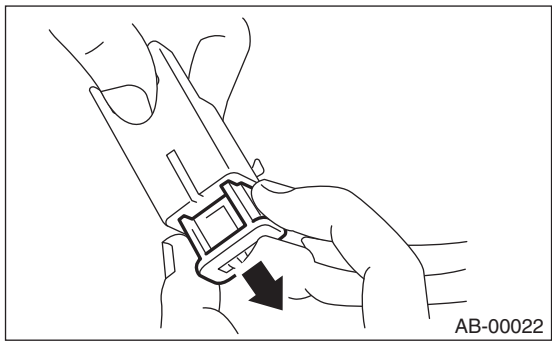
1) How to disconnect:

CAUTION:
When pulling the slide lock or disconnecting connector, be sure to hold the connector, not the harness.

(1) Push the slide lock (A) in the direction of arrow.

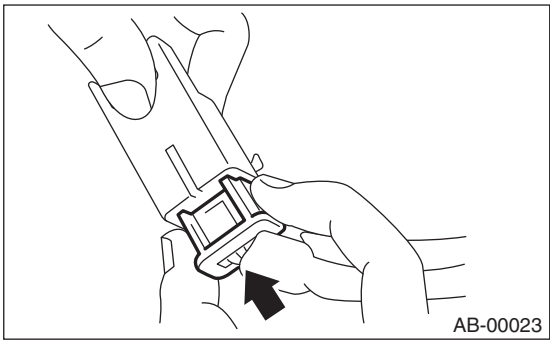


(2) With the slide lock pushed, disconnect the connector.



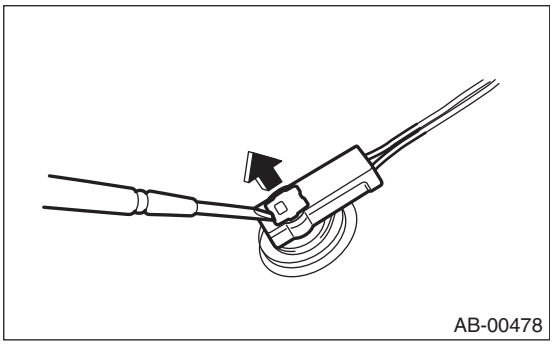
2) How to connect:

CAUTION:
Be sure to insert the connector in until it is locked. Then pull it gently to make sure that it is locked.
Holding the connector, push it in securely until a clicking sound is heard.

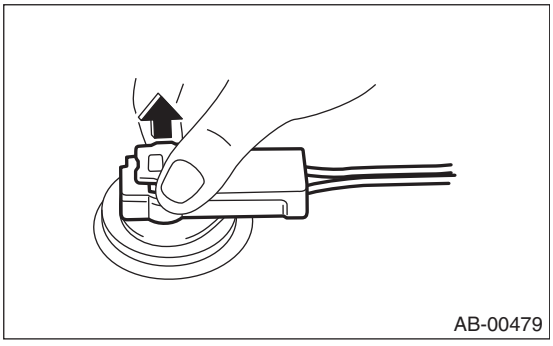


4. DRIVER'S AIRBAG MODULE, CURTAIN AIRBAG MODULE AND PRETENSIONER

1) How to disconnect:
(1) Using a flat tip screwdriver, pry the push lock upward to unlock.

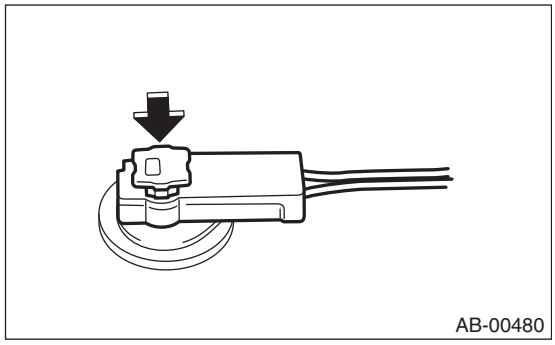


(2) Pull the connector to disconnect from the driver's airbag module assembly or the retractor assembly.



2) How to connect:

CAUTION:
• Be sure to insert the connector in until it is locked.
• Be sure to push the push lock in securely. Then pull it gently to make sure that it is locked.

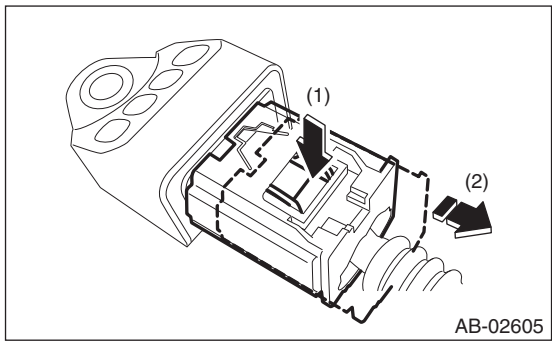


Connect the connector in the reverse order of disconnecting. At this time, be sure to insert until a clicking sound is heard.

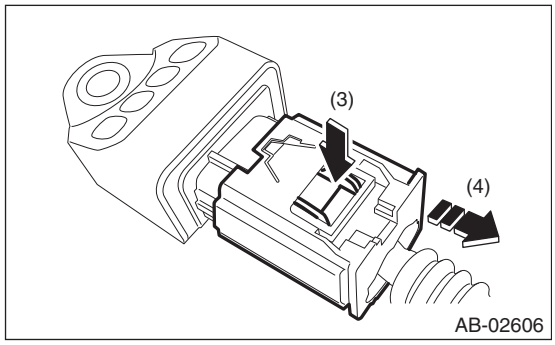
5. SIDE AIRBAG SENSOR AND CURTAIN AIRBAG SENSOR

1) How to disconnect:

CAUTION:
When pulling the slide lock or disconnecting connector, be sure to hold the connector, not the harness.
(1) Push the lock arm.
(2) Holding outer part, pull it one step in the direction of arrow.

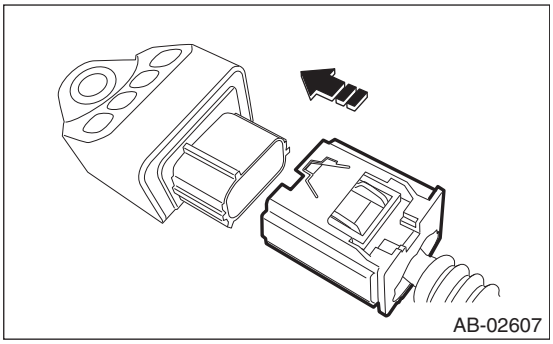


(3) Push the lock arm again.
(4) Holding outer part, pull it in the direction of arrow to disconnect the connector.



2) How to connect:

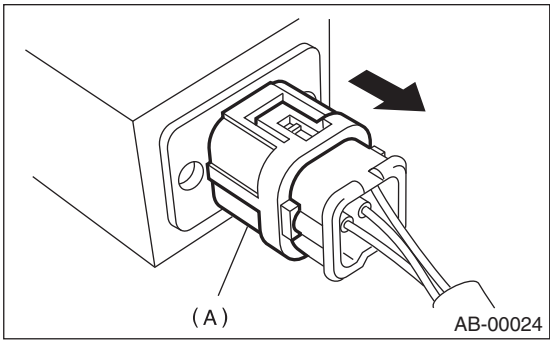
CAUTION:
Be sure to insert the connector in until it is locked. Then pull it gently to make sure that it is locked.
Holding the connector, push it in securely until a clicking sound is heard.



6. SATELLITE SAFING SENSOR

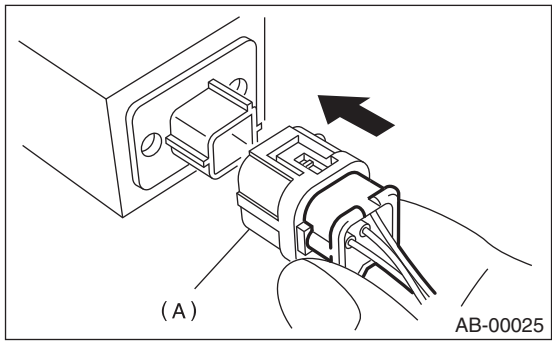
1) How to disconnect:

CAUTION:
When pulling the slide lock or disconnecting connector, be sure to hold the connector, not the harness.
Holding outer part (A), pull it in the direction of arrow.



2) How to connect:

CAUTION:
• Do not touch the outer side section or else the 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.
Holding the connector, push it in securely until a clicking sound is heard.

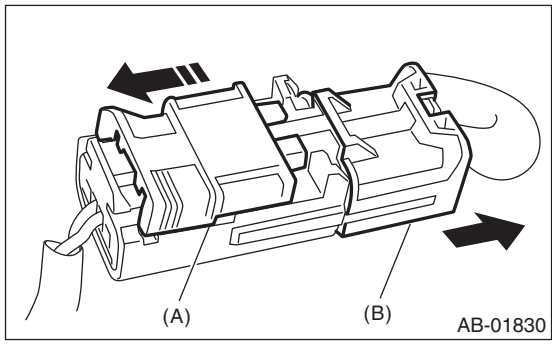


7. SIDE AIRBAG MODULE

1) How to disconnect:

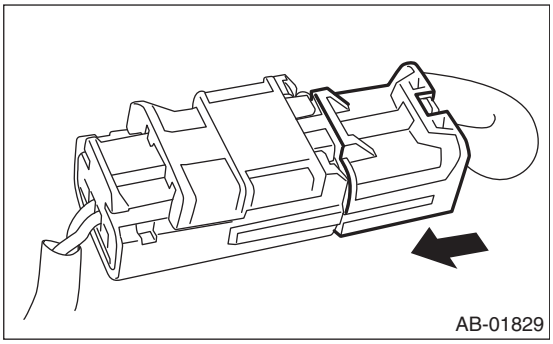
CAUTION:
When pulling the slide lock or disconnecting connector, be sure to hold the connector, not the harness.

(1) Move the slide lock (A) in the direction of arrow and hold it.
(2) With the slide lock (A) moved, pull the connector (B) in the direction of arrow.



2) How to connect:

CAUTION:
Be sure to insert the connector in until it is locked. Then pull it gently to make sure that it is locked.
Holding the connector, push it in securely until a clicking sound is heard.

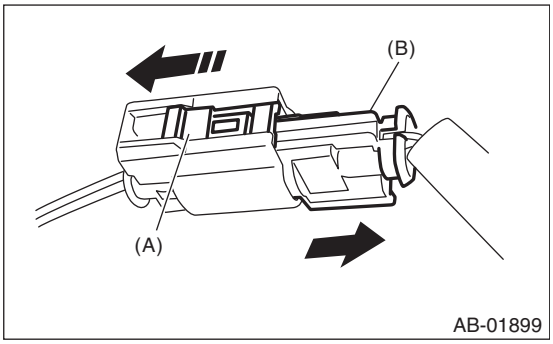


8. BUCKLE SWITCH RH

1) How to disconnect:

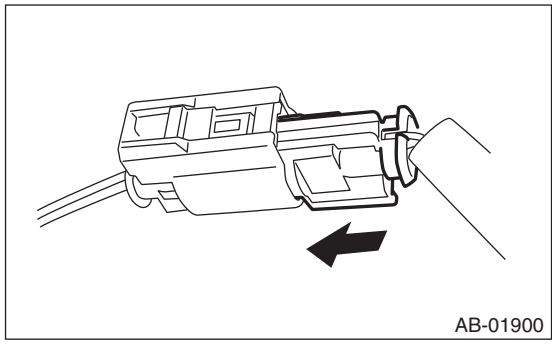
CAUTION:
When pulling the slide lock or disconnecting connector, be sure to hold the connector, not the harness.

(1) Move the slide lock (A) in the direction of arrow and hold it.
(2) With the slide lock (A) moved, pull the connector (B) in the direction of arrow.



2) How to connect:

CAUTION:
Be sure to insert the connector in until it is locked. Then pull it gently to make sure that it is locked.
Holding the connector, push it in securely until a clicking sound is heard.

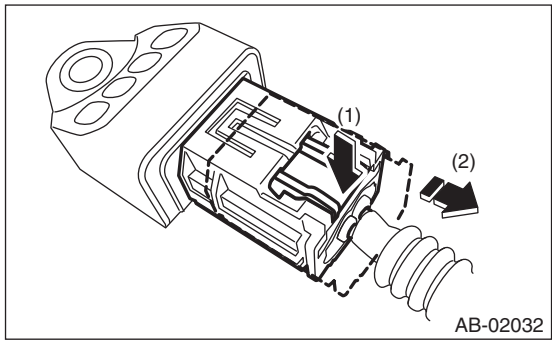


9. FRONT SUB SENSOR

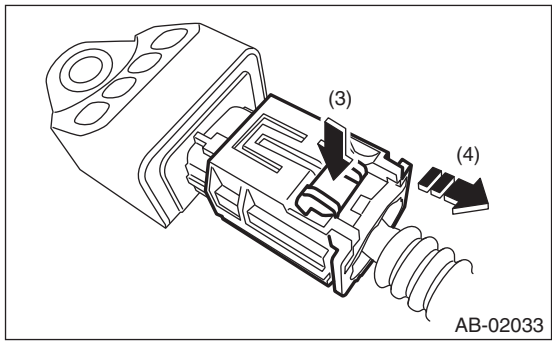
1) How to disconnect:

CAUTION:
When pulling the slide lock or disconnecting connector, be sure to hold the connector, not the harness.

(1) Push the lock arm.
(2) Holding outer part, pull it for one level in the direction of arrow.

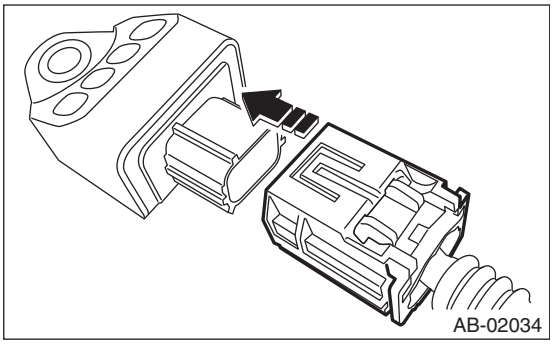


(3) Push the lock arm again.
(4) Holding outer part, pull it in the direction of arrow to separate the connector.



2) How to connect:

CAUTION:
Be sure to insert the connector in until it is locked. Then pull it gently to make sure that it is locked.
Holding the connector, push it in securely until a clicking sound is heard.



3. Inspection Locations After a Collision

A: REPLACEMENT

Replace the following parts if the airbag has been activated.

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 (right and left)
7) Roll connector
8) Passenger's side seat cushion pad and frame assembly
9) Instrument panel (for integrating with passenger's airbag module)

2. SIDE COLLISION

1) Airbag control module
2) Satellite safing sensor
3) Satellite safing sensor cover (model without rear seat center table)
4) Driver's seat belt pretensioner
5) Passenger's seat belt pretensioner
6) Side airbag module (operating side seat backrest)
7) Side airbag sensor (operating side)
8) Curtain airbag module (operating side)
9) Curtain 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 direct type connector of driver's airbag module, curtain airbag module, pretensioner, etc. for damage, and also check each harness for pinch and connector damage. Replace the main harness as a unit if damage is found.
3) Check the seat cushion, backrest, slide rail and headrest for installation condition and looseness.
4) For the passenger's seat, replace the seat cushion pad frame assembly with a new part if the seat cushion frame assembly is deformed or cracked.
5) If there are tears or loosening in the passenger side seat cushion cover, it may interfere with the proper operation of the occupant detection system. Replace with a new cushion cover.
6) Be sure to perform the system calibration for the occupant detection system after removing or replacing the passenger seat cushion cover. If system adjustment is not performed, the occupant detection system may not function properly. <Ref. to OD(diag)-18, OPERATION, System Calibration (Rezeroing).>
7) Use the Subaru Select Monitor to check the front right seat belt buckle switch is operating normally.

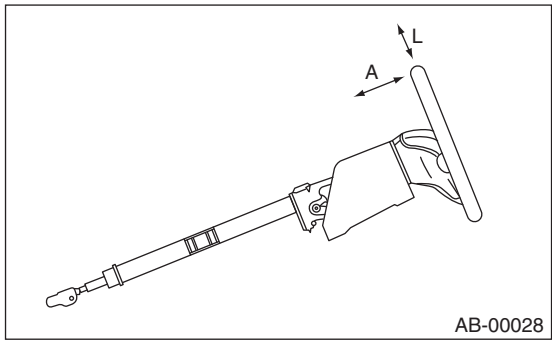
B: INSPECTION

If the vehicle is involved in a collision, 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 for the following, and replace the damaged parts with new parts.
• 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.

Standard:
Axial deflection A
Less than 6 mm (0.24 in)
Vertical deflection L
Less than 17 mm (0.68 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.

3. SIDE AIRBAG MODULE

Check for the following, and replace the damaged parts with new parts.
- Front seat, airbag module and mounting bracket are damaged or deformed.
- Harness and/or connector is cracked, deformed or open.
- Harness wire is exposed.

4. CURTAIN AIRBAG MODULE

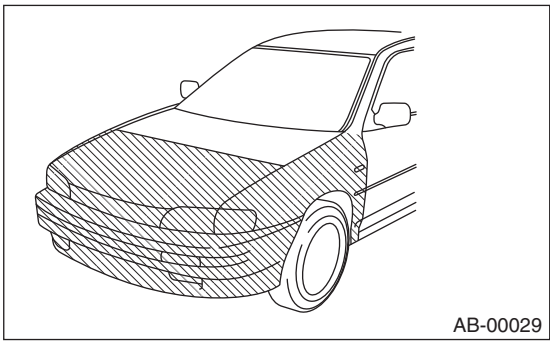
Check for the following, and replace the damaged parts with new parts.
- Airbag cover is scratched or torn.
- Harness and/or connector is cracked, deformed or open.
- Harness wire is exposed.
- Mounting bracket and securing clip are cracked or deformed.

5. AIRBAG CONTROL MODULE

Check for the following, and replace the damaged parts with new parts.
- Control module is cracked or deformed.
- Mounting bracket is cracked or deformed.
- Connector is scratched, cracked or deformed.
- Airbag has been activated.
- Side airbag has been activated.
- Curtain airbag has been activated.

6. FRONT SUB SENSOR

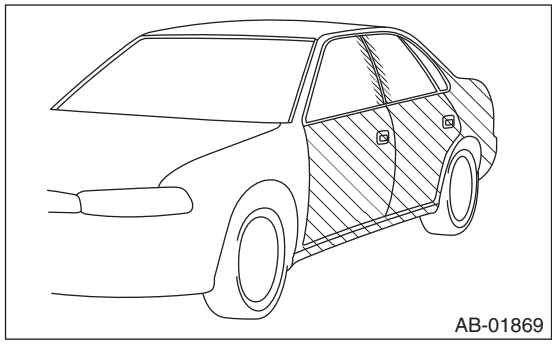
If the section of vehicle as shown in the figure is damaged, check the following items and replace the damaged parts with new parts.


AB-00029

- Front sub sensor is cracked or deformed.
- Connector is scratched, cracked or deformed.
- Airbag has been activated.

7. SATELLITE SAFING SENSOR, SIDE AIRBAG SENSOR AND CURTAIN 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.


AB-01869

- Satellite safing sensor, side airbag sensor and curtain airbag sensor are cracked or deformed.
- Mounting bracket is cracked or deformed.
- Satellite safing sensor cover is cracked or deformed. (model without rear seat center table)
- Connector is scratched, cracked or deformed.
- Side airbag or curtain airbag has been activated. (operating side)

8. ROLL CONNECTOR

Check for the following, and replace the damaged parts such as cracks, deformation, etc. with new parts.
- Combination switch
- Steering roll connector

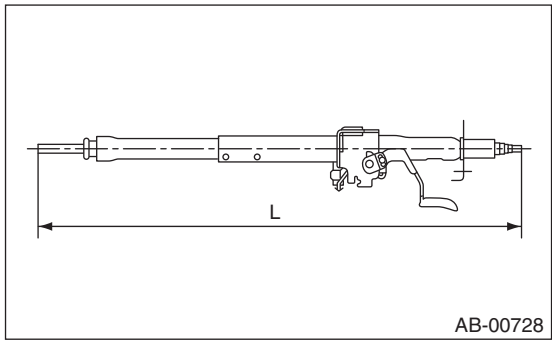
9. STEERING SHAFT

Measure the overall length of steering column.
If the length is not within the specification, the steering column may be damaged. Replace it with a new part.

Standard: Overall length L

Tilt column
$833.6^{+1.3}_{-0.3}$ mm ($32.82^{+0.051}_{-0.012}$ in)

Tilt and telescopic column (measure while minimized)
$823.6^{+1.5}_{-1.5}$ mm ($32.43^{+0.059}_{-0.059}$ in)



AB-00728

10.PASSENGER'S SEAT

1) Check for the following, and replace the damaged parts with new parts.
• Seat belt buckle body or bracket is scratched, cracked or deformed.
• Backrest frame for crack or deformation
• Headrest for deformation or play
• If the seat cushion cover and seat backrest cover is scratched or coming loose, replace with a new cover and readjust the system. <Ref. to OD(diag)-18, OPERATION, System Calibration (Rezeroing).>

CAUTION:
If any of the following applies, replace the seat cushion pad and frame assembly. Do not disassemble.
• Cracks or deformation found in the seat cushion frame or seat cushion pad.
• Scratches, cracks, or deformation found on the passenger detection system pressure sensor hoses or passenger 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)-18, OPERATION, System Calibration (Rezeroing).>

11.BELT TENSION SENSOR

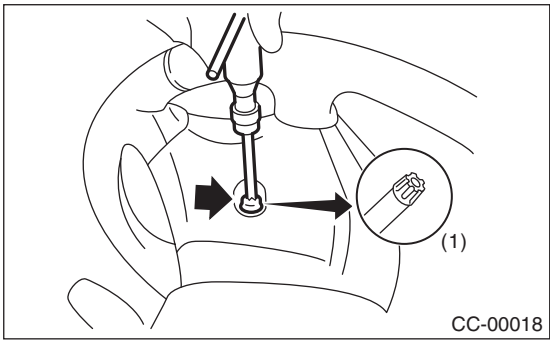
Check for the following, and replace the damaged parts with new parts.
• Belt tension sensor is scratched, cracked, or deformed.
• Harness and/or connector is cracked, deformed or open. Harness wire is exposed.

4. Driver's Airbag Module

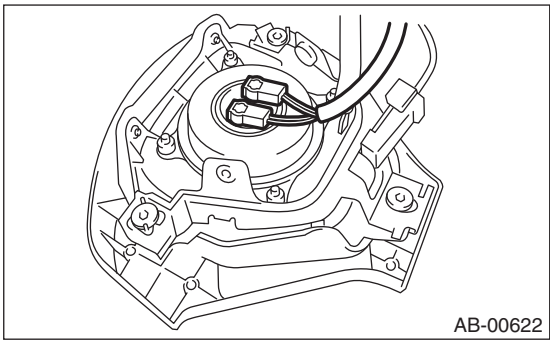
A: REMOVAL

CAUTION:
Refer to "CAUTION" of "General Description" before handling the airbag module. <Ref. to AB-5, CAUTION, General Description.>

1) Position the front wheels straight ahead. (After moving a vehicle 5 m (16 ft) or more 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 60 seconds before starting work.
4) Using TORX® bit T30 (1), remove the two TORX® bolts on the side of the 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-10, PROCEDURE, Airbag Connector.>



7) For handling of the removed airbag module, refer to "CAUTION". <Ref. to AB-5, CAUTION, General Description.>

B: INSTALLATION

CAUTION:
• Refer to "CAUTION" of "General Description" before handling the airbag module. <Ref. to AB-5, CAUTION, General Description.>
• Do not allow harness and connectors to interfere or get tangled up with other parts.

Install each part in the reverse order of removal.

Tightening torque:
10 N·m (1.02 kgf-m, 7.4 ft-lb)

C: INSPECTION

CAUTION:
• Refer to "CAUTION" of "General Description" before handling the airbag module. <Ref. to AB-5, CAUTION, General Description.>
• Do not allow harness and connectors to interfere or get tangled up with other parts.

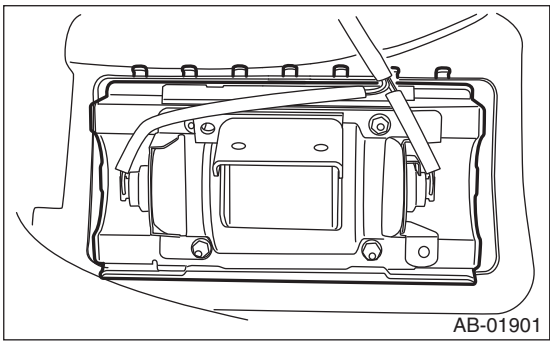
Check for the following, and replace the damaged parts with new parts. <Ref. to AB-15, DRIVER'S AIRBAG MODULE, INSPECTION, Inspection Locations After a Collision.>

- Airbag module
- Harness
- Connector
- Mounting bracket

5. Passenger's Airbag Module

A: REMOVAL

CAUTION:
Refer to "CAUTION" of "General Description" before handling the airbag module. <Ref. to AB-5, CAUTION, General Description.>
1) Turn the ignition switch to OFF.
2) Disconnect the ground cable from battery and wait for at least 60 seconds before starting work.
3) Remove the instrument panel. <Ref. to EI-53, REMOVAL, Instrument Panel Assembly.>
4) Remove the claw, and remove the passenger's airbag module.



5) For handling of the removed airbag module, refer to "CAUTION". <Ref. to AB-5, CAUTION, General Description.>

B: INSTALLATION

CAUTION:
Do not allow harness and connectors to interfere or get tangled up with other parts.
Install each part in the reverse order of removal.

Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

C: INSPECTION

CAUTION:
Refer to "CAUTION" of "General Description" before handling the airbag module. <Ref. to AB-5, CAUTION, General Description.>
Check for the following, and replace the damaged parts with new parts. <Ref. to AB-16, PASSENGER'S AIRBAG MODULE, INSPECTION, Inspection Locations After a Collision.>
- Airbag module
- Harness
- Connector
- Mounting bracket

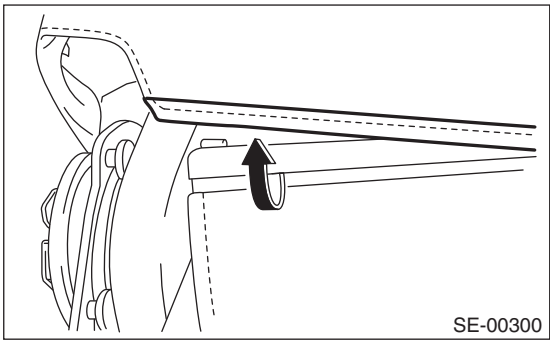
6. Side Airbag Module

A: REMOVAL

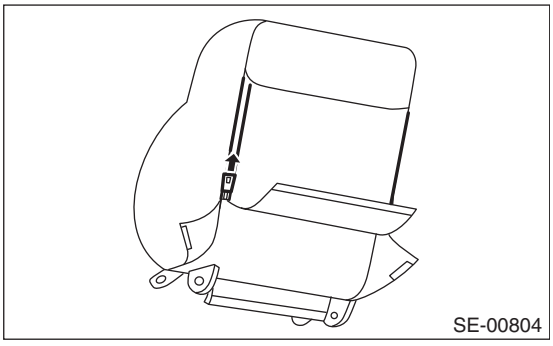
CAUTION:
Refer to "CAUTION" of "General Description" before handling the airbag module. <Ref. to AB-5, CAUTION, General Description.>

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 60 seconds before starting work.
3) Remove the front seat from vehicle. <Ref. to SE-8, REMOVAL, Front Seat.>
4) Remove the clip from reverse side of seat cushion assembly and slide rail, and then remove the side airbag harness.
5) Remove the side airbag harness from backrest frame assembly.
6) Remove the plastic fastener at the back side (bottom) of backrest.

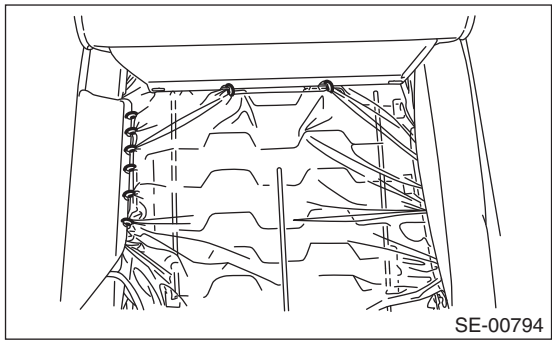

SE-00300

7) Open the fastener at the rear side of backrest.

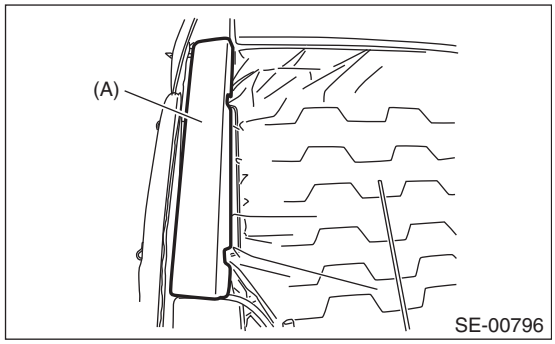

SE-00804

8) Remove the hog rings of backrest cover.

CAUTION:
Be careful not to tear the vinyl inside the seat when removing the hog rings.
If torn, replace with a new part.


SE-00794

9) Remove the pad (A), and remove the mounting nut from the side airbag module.



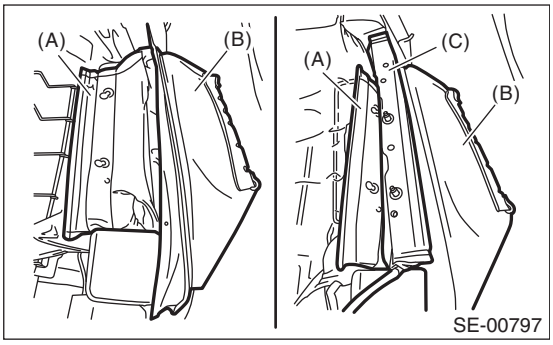
SE-00796

10) Remove the side airbag harness from backrest frame assembly.

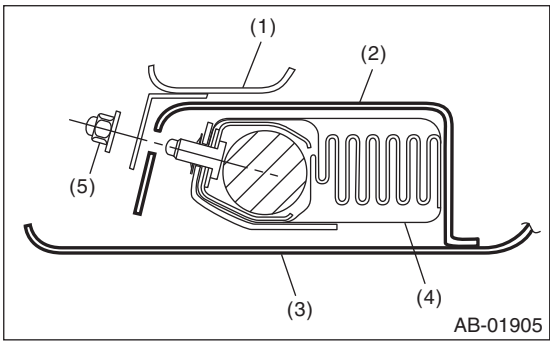
B: INSTALLATION

CAUTION:
- **Refer to "CAUTION" of "General Description" before handling the airbag module. <Ref. to AB-5, CAUTION, General Description.>**
- **Be sure to perform the system calibration for occupant detection system after passenger's seat installation. <Ref. to OD(diag)-18, OPERATION, System Calibration (Rezeroing).>**

• When installing the side airbag module assembly, be sure to put the side airbag module between backrest cover and airbag guide cloth.



(A) Airbag guide cloth
(B) Backrest cover
(C) Side airbag module ASSY



(1) Backrest frame ASSY
(2) Airbag guide cloth
(3) Backrest cover
(4) Side airbag module ASSY
(5) Hexagon cap nut

Besides, when the backrest cover is not installed securely, the side airbag module may not be activated 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) 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:
6 N·m (0.61 kgf-m, 4.4 ft-lb)

3) Install the side airbag harness to backrest frame assembly.
4) Install the backrest cover.
5) Install the side airbag harness to the clips on the back of the seat cushion assembly and on the slide rail.
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.
7) Install the front seat to the vehicle body.

Tightening torque:
Front seat assembly: <Ref. to SE-2, FRONT SEAT LH, COMPONENT, General Description.>

C: INSPECTION

CAUTION:
Refer to "CAUTION" of "General Description" before handling the airbag module. <Ref. to AB-5, CAUTION, General Description.>

Check for the following, and replace damaged parts with new parts. <Ref. to AB-16, SIDE AIRBAG MODULE, INSPECTION, Inspection Locations After a Collision.>

1) With side collision (when side airbag is activated)
• Side airbag module assembly
• Satellite safing sensor
• Side airbag sensor
• Curtain airbag sensor
• Backrest pad assembly
• Backrest frame assembly
• Backrest cover assembly

2) When damage is found by visual check
• Headrest assembly
• Headrest lock bushing
• Outer slide rail
• Inner slide rail
• Seat hinge cover
• Seat lifter lever
• Reclining lever
• Side airbag harness and connector on body side
• Satellite safing sensor cover (model without rear seat center table)

3) With side collision (when side airbag is not activated)
Check the seat, airbag module, sensor 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.

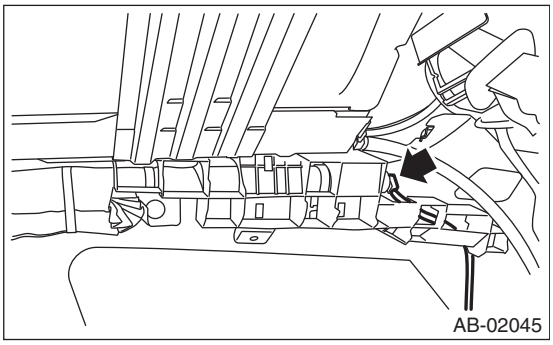
4) Without side collision (dirt and damage of cover)
Replace the corresponding part with a new part.

7. Curtain Airbag Module

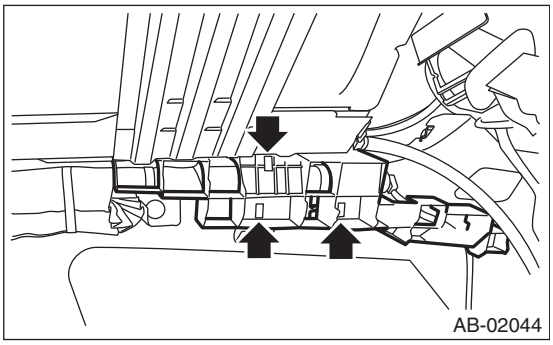
A: REMOVAL

CAUTION:
Refer to "CAUTION" of "General Description" before handling the airbag module. <Ref. to AB-5, CAUTION, General Description.>

1) Turn the ignition switch to OFF.
2) Disconnect the ground cable from battery and wait for at least 60 seconds before starting work.
3) Remove the upper inner trim. <Ref. to EI-58, REMOVAL, Upper Inner Trim.>
4) Remove the rear quarter trim. <Ref. to EI-60, REMOVAL, Rear Quarter Trim.>
5) Remove the roof trim. <Ref. to EI-64, REMOVAL, Roof Trim.>
6) Disconnect the curtain airbag module connector.

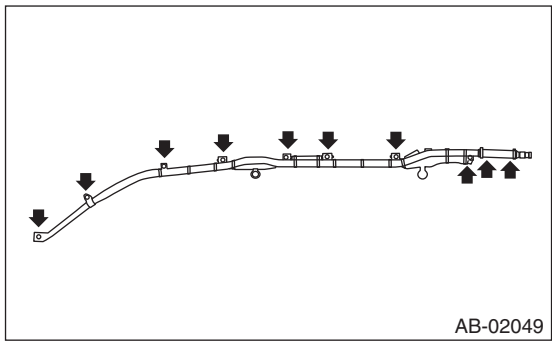

AB-02045

7) Remove the inflator pad.


AB-02044

8) Remove the bolt, and remove the curtain airbag module.

CAUTION:
• Be careful not to damage the curtain airbag module during removal.
• Never open the curtain airbag module before activation. Never reuse the deployed curtain airbag module.


AB-02049

B: INSTALLATION

CAUTION:
• Refer to "CAUTION" of "General Description" before handling the airbag module. <Ref. to AB-5, CAUTION, General Description.>
• When installing the curtain airbag module, install a specified part at specified place.
• Be careful not to damage the curtain airbag module during installation.
• Never open the curtain airbag module before activation. Never reuse the deployed curtain airbag module.
• Make sure that there are no foreign matter on airbag module.

Install each part in the reverse order of removal.

Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

C: INSPECTION

CAUTION:
Refer to "CAUTION" of "General Description" before handling the airbag module. <Ref. to AB-5, CAUTION, General Description.>

Check for the following, and replace the damaged parts with new parts. <Ref. to AB-16, CURTAIN AIRBAG MODULE, INSPECTION, Inspection Locations After a Collision.>

1) With side collision (when curtain airbag is activated)
- Curtain airbag module assembly
- Satellite safing sensor
- Curtain airbag sensor
- Roof trim
- Front pillar upper trim
- Center pillar upper trim
- Rear quarter pillar trim
- Airbag guide

2) When damage is found by visual check
- Assist grip
- Assist grip bracket
- Curtain airbag harness and connector on body side.
- Satellite safing sensor cover (model without rear seat center table)

3) With side collision (when curtain airbag is not activated)

Check the roof trim, pillar trim, airbag module and sensor 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)

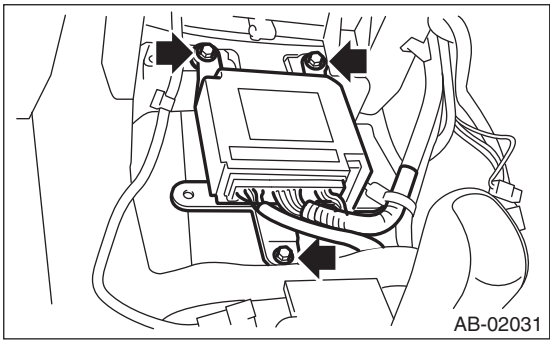
Replace the corresponding part with a new part.

8. 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 60 seconds before starting work.
3) Remove the console box. <Ref. to EI-49, REMOVAL, Console Box.>
4) Remove the console front panel. <Ref. to EI-50, CONSOLE FRONT PANEL, REMOVAL, Center Console.>
5) Remove the audio.
6) Disconnect the connector from airbag control module.
7) Remove the three bolts and remove airbag control module.



B: INSTALLATION

CAUTION:
• Do not reuse the bolt and nut.
Always replace with the specified new bolts and nuts.
• Before installing the audio, make sure that the heater duct is securely connected.

Install each part in the reverse order of removal.

Tightening torque:
25 N·m (2.55 kgf-m, 18.1 ft-lb)

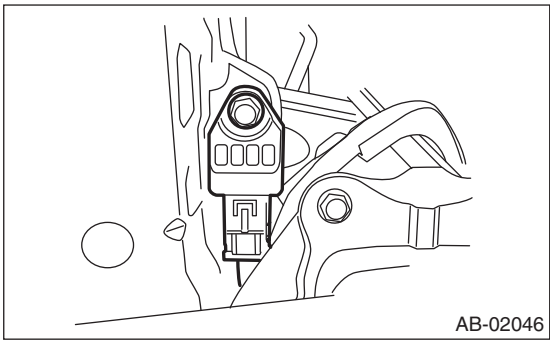
C: INSPECTION

Check for the following, and replace the damaged parts with new parts.
• Control module, connector, and mounting bracket are damaged.
• Airbag has been activated.
• Side airbag has been activated.
• Curtain airbag has been activated.

9. Front Sub Sensor

A: REMOVAL

1) Turn the ignition switch to OFF.
2) Disconnect the ground cable from battery and wait for at least 60 seconds before starting work.
3) Remove the front bumper face. <Ref. to EI-29, REMOVAL, Front Bumper.>
4) Remove the headlight assembly. <Ref. to LI-18, REMOVAL, Headlight Assembly.>
5) Remove the bolt, and then detach the front sub sensor.



6) Disconnect the connector from front sub sensor.

B: INSTALLATION

Install each part in the reverse order of removal.

CAUTION:
• Do not reuse the bolt and nut.
Always replace with the specified new bolts and nuts.
• When installing the sensor, insert the set pin on the backside of the sensor into the hole on the body side securely.
• After the installation of headlight assembly, be sure to perform headlight beam adjustment.

Tightening torque:
13 N·m (1.32 kgf-m, 9.6 ft-lb)

C: INSPECTION

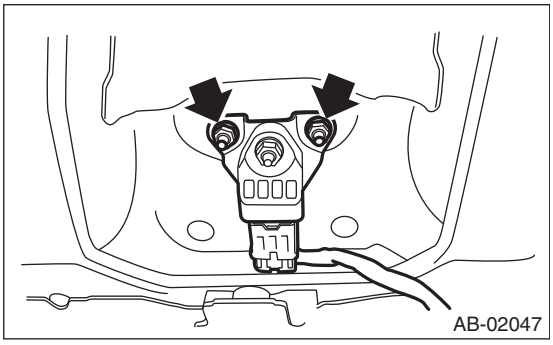
Check for the following, and replace the damaged parts with new parts.
- Front sub sensor or connector is damaged.
- Airbag has been activated.

10.Side Airbag Sensor

A: REMOVAL

1) Turn the ignition switch to OFF.
2) Disconnect the ground cable from battery and wait for at least 60 seconds before starting work.
3) Remove the front outer seat belt. <Ref. to SB-17, OUTER SEAT BELT ASSEMBLY, REMOVAL, Front Seat Belt.>
4) Remove the nuts and then remove the side airbag sensor.

CAUTION:
• Do not separate the side airbag sensor and bracket. It cause the airbag system malfunction.
• If the sensor is removed from the bracket, be sure to replace with a new part.



5) Disconnect the airbag connector.

B: INSTALLATION

CAUTION:
Do not reuse the bolt and nut.
Always replace with the specified new bolts and nuts.
Install each part in the reverse order of removal.

Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

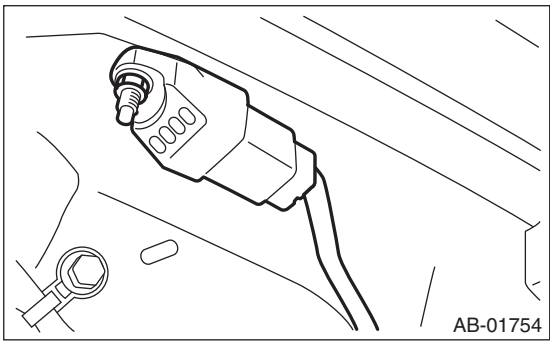
C: INSPECTION

Check for the following, and replace the damaged parts with new parts.
• The bracket or connector of side airbag sensor is damaged.
• Side airbag has been activated.

11.Curtain Airbag Sensor

A: REMOVAL

1) Turn the ignition switch to OFF.
2) Disconnect the ground cable from battery and wait for at least 60 seconds before starting work.
3) Remove the rear seat cushion assembly and seatback shoulder. <Ref. to SE-16, REMOVAL, Rear Seat.>
4) Remove the nuts and then remove the curtain airbag sensor.



5) Disconnect the airbag connector.

B: INSTALLATION

CAUTION:
• Do not reuse the bolt and nut.
Always replace with the specified new bolts and nuts.
• When installing the sensor, insert the set pin on the backside of the sensor into the hole on the body side securely.
Install each part in the reverse order of removal.

Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

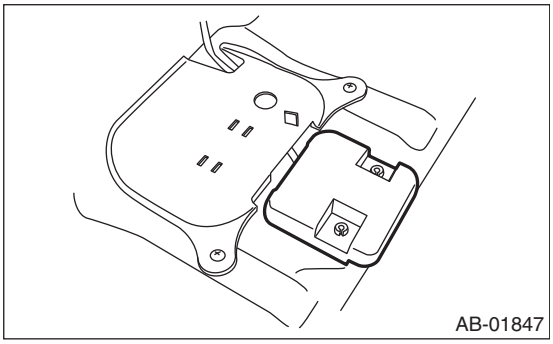
C: INSPECTION

Check for the following, and replace the damaged parts with new parts.
- Curtain airbag sensor or connector is damaged.
- Curtain airbag has been activated.

12.Satellite Safing Sensor

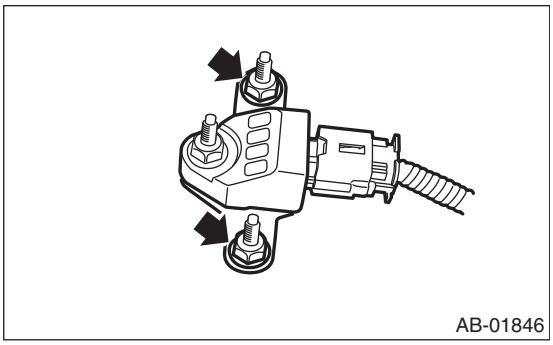
A: REMOVAL

1) Turn the ignition switch to OFF.
2) Disconnect the ground cable from battery and wait for at least 60 seconds before starting work.
3) Remove the rear seat cushion. <Ref. to SE-16, REMOVAL, Rear Seat.>
4) Remove the satellite safing sensor cover. (model without rear seat center table)


AB-01847

5) Remove the nut, and remove the satellite safing sensor.

CAUTION:
• Do not separate the satellite safing sensor and bracket. It cause the airbag system malfunction.
• If the sensor is removed from the bracket, be sure to replace with a new part.


AB-01846

6) Disconnect the airbag connector.

B: INSTALLATION

CAUTION:
• Do not reuse the bolt and nut.
Always replace with the specified new bolts and nuts.
• When installing the satellite safing sensor cover, push the cover securely until it contacts the floor panel.
• When the installation of the satellite safing sensor cover becomes loose and it can be removed easily, replace the cover with a new part.
• After installing the satellite safing sensor cover, make sure that the sensor harness does not get caught.
Install each part in the reverse order of removal.

Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

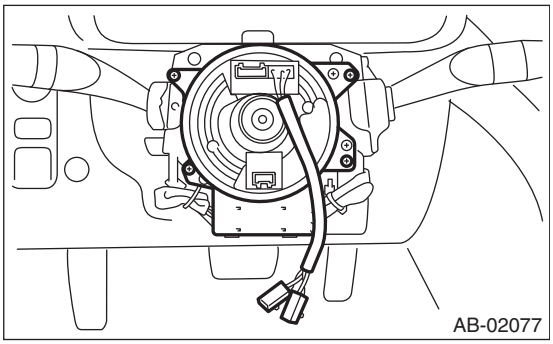
C: INSPECTION

Check for the following, and replace the damaged parts with new parts.
• Mounting bracket or connector of satellite safing sensor is damaged.
• The satellite safing sensor cover is damaged
• Side airbag or curtain airbag has been activated.

13.Roll Connector

A: REMOVAL

1) Turn the ignition switch to OFF.
2) Disconnect the ground cable from battery and wait for at least 60 seconds before starting work.
3) Remove the driver's airbag module. <Ref. to AB-18, 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 each part 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-30, ADJUSTMENT, Roll Connector.>

C: INSPECTION

1. VISUAL INSPECTION

Check for the following, and replace the damaged parts with new parts.
- Combination switch is cracked or deformed.
- Roll connector is cracked or deformed.

2. UNIT INSPECTION OF ROLL CONNECTOR

CAUTION:
• Do not rotate the roll connector to more than the specified number of turns. Otherwise, the roll connector internal wire may be broken.
• When determining the end stop, rotate the connector slowly without applying excessive force. Applying excessive force at the end stop may break the internal wire.
1) Adjust the roll connector. <Ref. to AB-30, ADJUSTMENT, Roll Connector.>
2) Set the roll connector to the central position.
3) Connect the test harness to the airbag module connectors (black) and (orange).

PREPARATION TOOL:
Test harness N (98299SA000)
Test harness Q (98299SA040)
Airbag module connector (black) — Test harness (1N)
Airbag module connector (orange) — Test harness (1Q)
4) With the following conditions, check the resistance between the test harness connector terminals.
• Perform the check with the roll connector centered (front wheels direct straightforward).
• Rotate the roll connector counterclockwise from the center (front wheels direct straightforward) to an end stop. Then, perform the check while rotating it clockwise to approximately 3.25 turns.

Preparation tool: Circuit tester

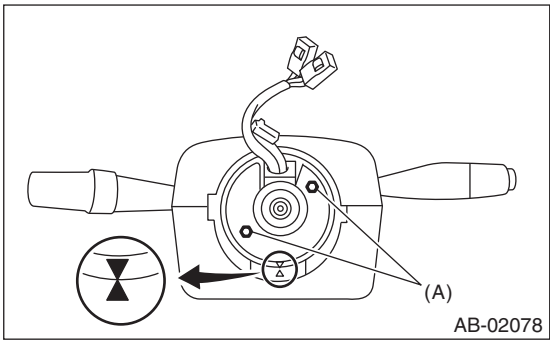
Terminal No.	Inspection conditions	Standard
(2N) No. 1 and (2N) No. 2	Always	Less than 1 Ω
(2Q) No. 1 and (2Q) No. 2	Always	Less than 1 Ω

NOTE:
Terminals are designed to be shorted as the connection between airbag main harness and roll connector is disconnected.
5) Replace the roll connector with a new part if the inspection result is not within the standard value.

D: ADJUSTMENT

CAUTION:
• Do not rotate the roll connector to more than the specified number of turns. Otherwise, the roll connector internal wire may be broken.
• When determining the end stop, rotate the connector slowly without applying excessive force. Applying excessive force at the end stop may break the internal wire.

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.



AIRBAG SYSTEM (DIAGNOSTICS)

AB(diag)

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1. Basic Diagnostic Procedure

A: PROCEDURE

	Step	Check	Yes	No
1	**CHECK WARNING LIGHT.** Check whether the airbag warning light in the combination meter is lit.	Does the airbag warning light illuminate?	Go to step **2**.	Perform the diagnosis according to phenomenon of the problem.
2	**READ 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 AB(diag)-28, 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 AB(diag)-25, COMMUNICATION FOR INITIALIZING IMPOSSIBLE, INSPECTION, Subaru Select Monitor.> 5) Record all DTCs and freeze frame data.	Is DTC displayed?	Go to step **3**.	Move to “Airbag Warning Light Failure”. <Ref. to AB(diag)-33, Airbag Warning Light Failure.>
3	**PERFORM DIAGNOSIS.** 1) Judge the possible cause from “List of Diagnostic Trouble Code (DTC)”. <Ref. to AB(diag)-37, 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)-30, Clear Memory Mode.> 5) Perform the Inspection Mode. <Ref. to AB(diag)-29, Inspection Mode.> 6) Read any other DTCs displayed.	Is DTC displayed?	Perform the procedure 1) to 5) in step 3.	Finish the diagnosis.

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	❑ Fine ❑ Cloudy ❑ Rainy ❑ Snowy ❑ Others:		
Temperature	°C (°F)		
Road condition	❑ Flat road ❑ Uphill ❑ Downhill ❑ Gravel road ❑ Others:		

Vehicle operation	❑ Starting
	❑ Idling
	❑ Driving
	  ❑ Constant speed
	  ❑ Accelerating
	  ❑ Decelerating
	  ❑ Turning
	  ❑ Others:		

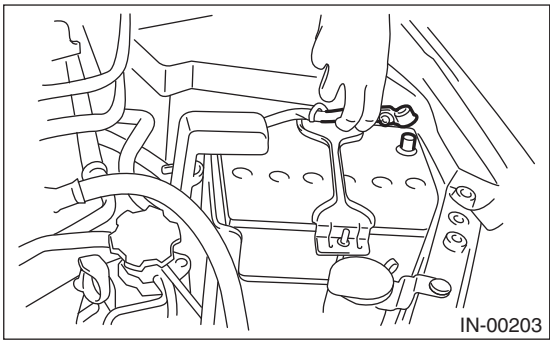
Details of problem			
Airbag warning light operation	❑ Normal (After turning the ignition switch to ON, lit for approximately 6 seconds and goes off.) ❑ Remains ON ❑ Remains OFF		
DTC output	❑ OK code ❑ DTC: (Code:)		

3. General Description

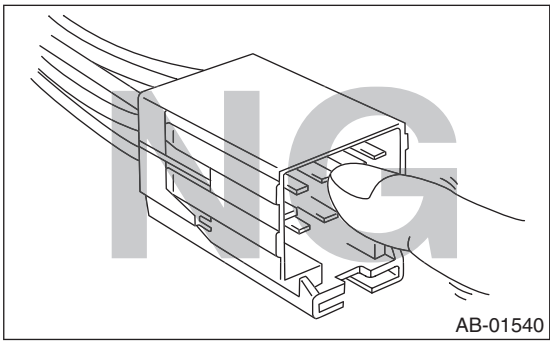
A: CAUTION

1. BEFORE STARTING ALL WORKS

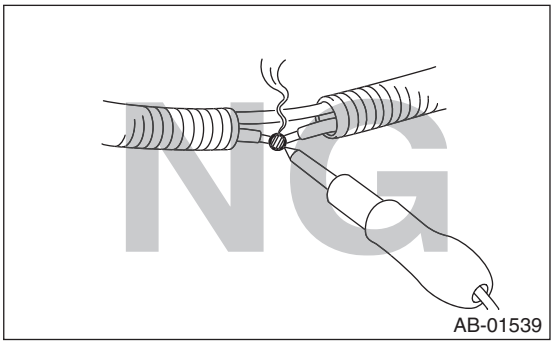
• When servicing a vehicle, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait for 60 seconds or more before starting work.
• The airbag system is fitted with a backup power supply. After disconnecting the battery ground cable, the airbag may operate if you do not wait for 60 seconds or more before starting the service of airbag system.


IN-00203

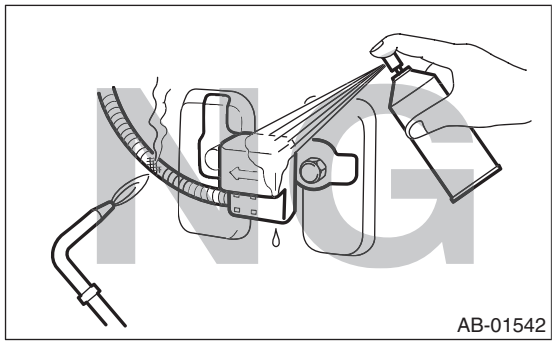
• If the airbag warning light illuminates, check or repair the vehicle immediately to prevent it from airbag system malfunction.
• Do not allow water or oil to come in contact with the connector terminals. Also, do not touch the connector terminals directly.


AB-01540

• 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.


AB-01539

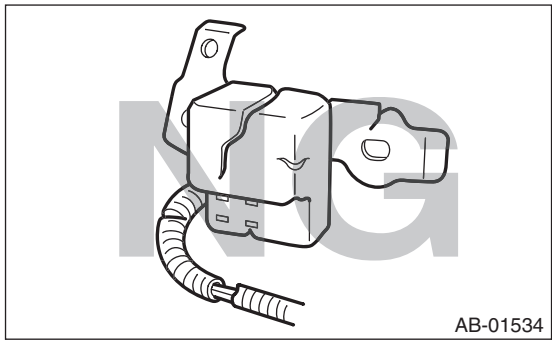
• When painting or performing sheet metal work on the front part of the vehicle, including the front wheel apron, front fender and front side frame, remove the front sub sensors and wiring harness of airbag system.
• When painting or performing sheet metal work on the side of the vehicle including the side sill, center pillar and front and rear doors, or on the rear floor pan or around the rear crossmember, remove the side airbag sensors, curtain airbag sensor, satellite safing sensor and wiring harness of the airbag system.


AB-01542

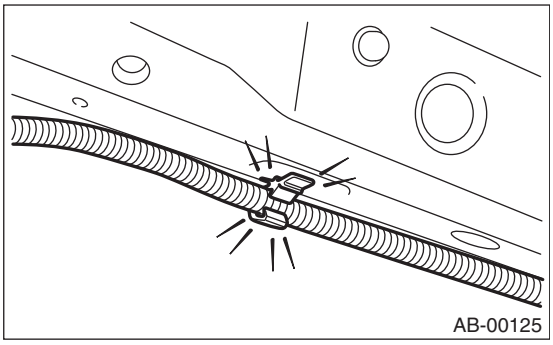
• When attaching the steering wheel and steering roll connector, be sure to adjust the steering roll connector.

2. BEFORE STARTING PARTS REPLACEMENT

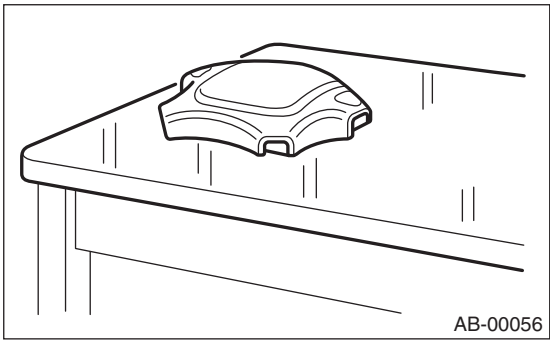
• If any of the airbag sensors, airbag module, airbag control module, pretensioner, harness or satellite safing sensor cover is deformed or damaged, replace with new parts.


AB-01534

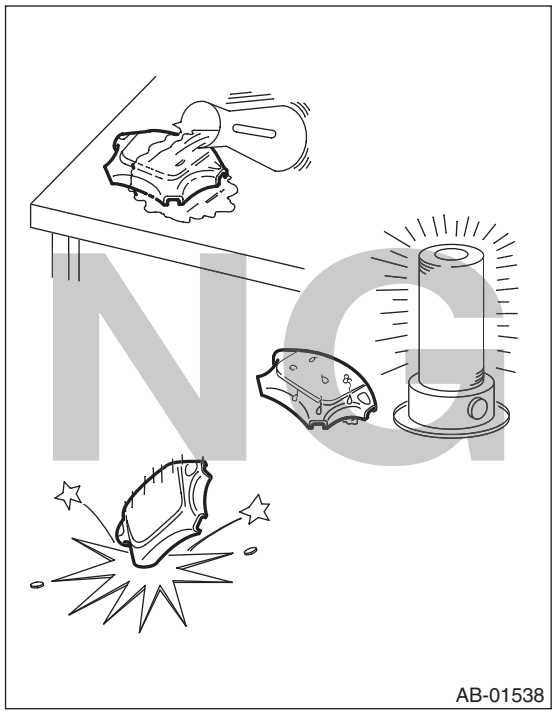
• Install the wiring harness securely with the specified clips to avoid interference or tangled with other parts.



• Do not use the airbag or pretensioner parts from other vehicles. Always replace the defective parts with new parts.
• Never reuse any activated airbag module and pretensioner.
• Do not discard undeployed airbag or pretensioner.
• When airbag control module, front sub sensor, side airbag sensor, curtain airbag sensor and satellite safing sensor are removed, do not reuse the bolts and nuts of them. Always replace with the specified new bolts and nuts.
• When attaching the steering wheel and steering roll connector, be sure to adjust the steering roll connector.
• After removing each parts of the airbag system, keep them with the pad side facing upward on a dry, clean and flat surface away from heat, light sources, moisture and dust.

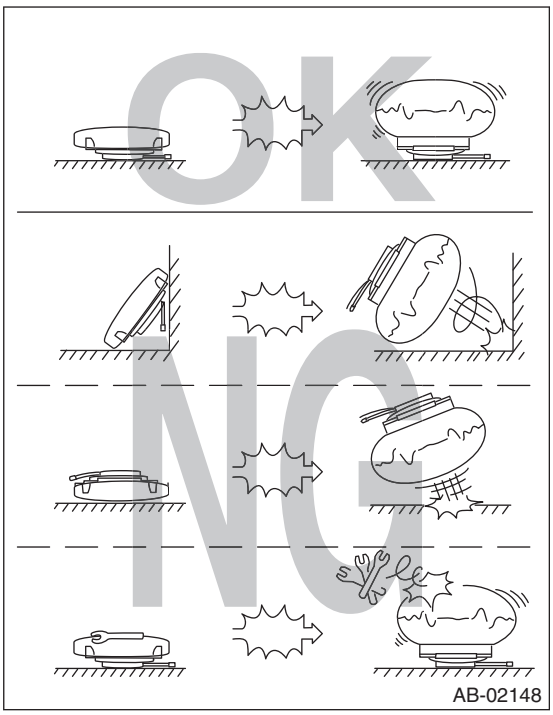


• Do not drop each airbag module, airbag control module and each sensor, or store these parts under high temperature of 85°C (185°F) or more, or let water, oil or grease get on them; the internal parts may be damaged or the reliability may be decreased.

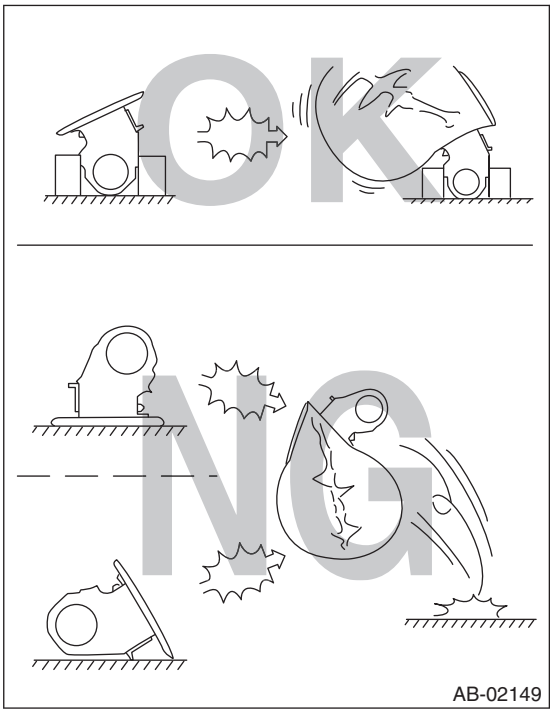


• When storing a removed airbag module, do not place it with the pad side facing downward. Do not place any objects on the airbag module. Do not pile up the airbag module. If the pad of the airbag module is in contact with other objects, it may cause a serious accident if the airbag accidentally operates.

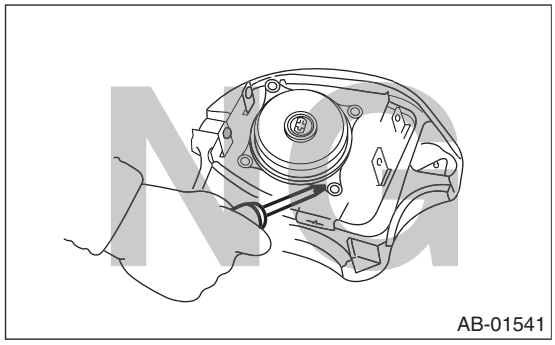
• Driver's airbag module



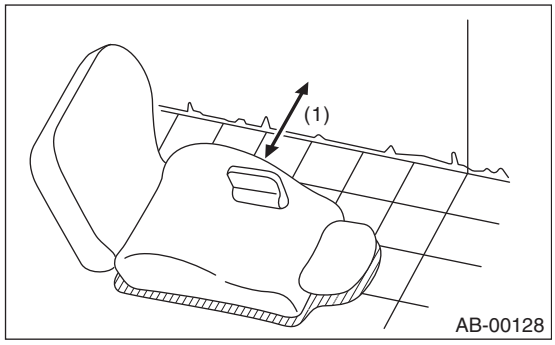
• Passenger's airbag module and side airbag module



• Do not disassemble driver's airbag module, passenger's airbag module, side or curtain airbag modules, or pretensioner.



• The removed front seat with airbag module must be kept at least 200 mm (8 in) away from walls and other objects.

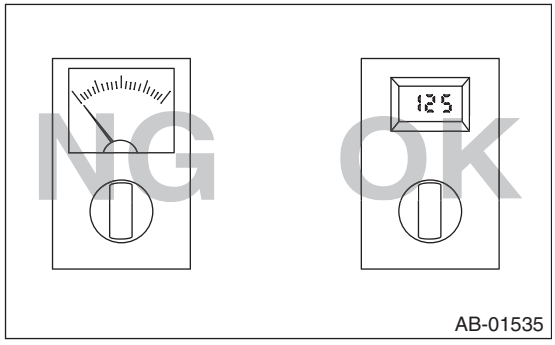


(1) 200 mm (8 in) or more

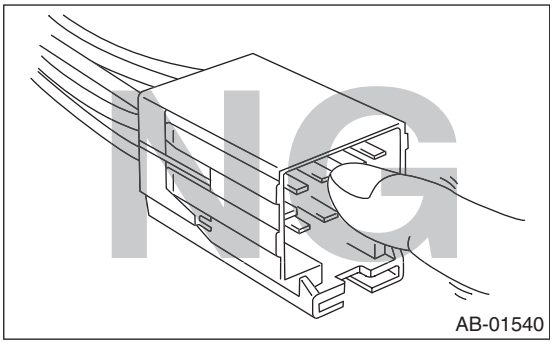
3. BEFORE STARTING TROUBLESHOOTING

• Even if any part must be replaced as the result of troubleshooting, do not use an airbag part or pretensioner part from other vehicles. Always replace the defective parts with new parts.

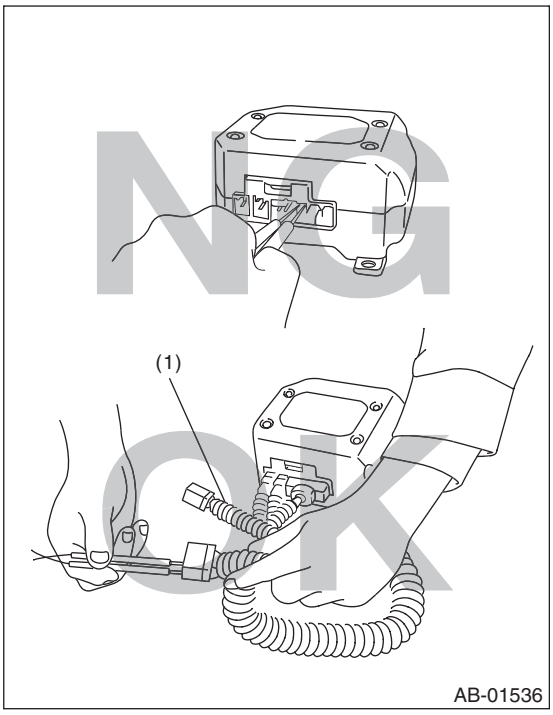
• When checking the airbag system, be sure to use a digital circuit tester. Use of an analog circuit tester may cause the airbag to activate erroneously due to a minimal current inside tester.



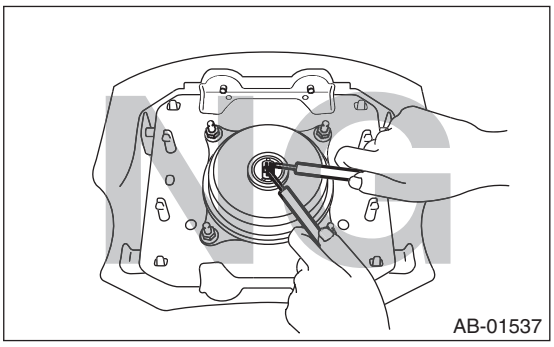
• Do not allow water or oil to come in contact with the connector terminals. Also, do not touch the connector terminals directly.



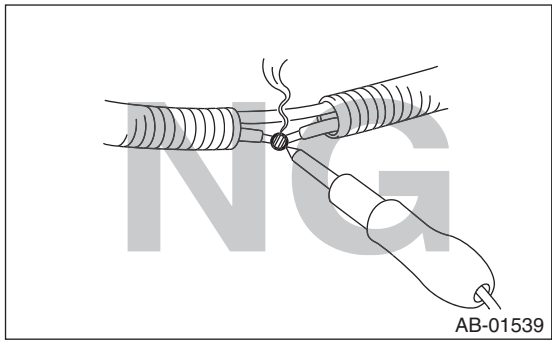
• When checking, use a test harness (1). Damage to connector terminal causes malfunction. Do not directly put the tester probe on airbag connector terminal.



• Do not check continuity of the airbag modules for driver's side, passenger's side and curtain, or the pretensioner.



• 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.



B: INSPECTION

Measure the battery voltage and check electrolyte.

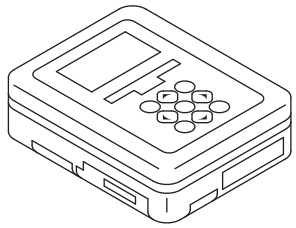
Standard voltage: 12 V

Specific gravity: 1.260 or more

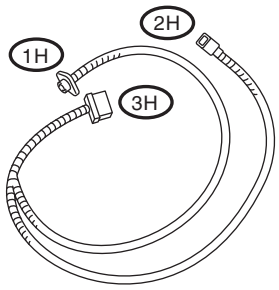
C: PREPARATION TOOL

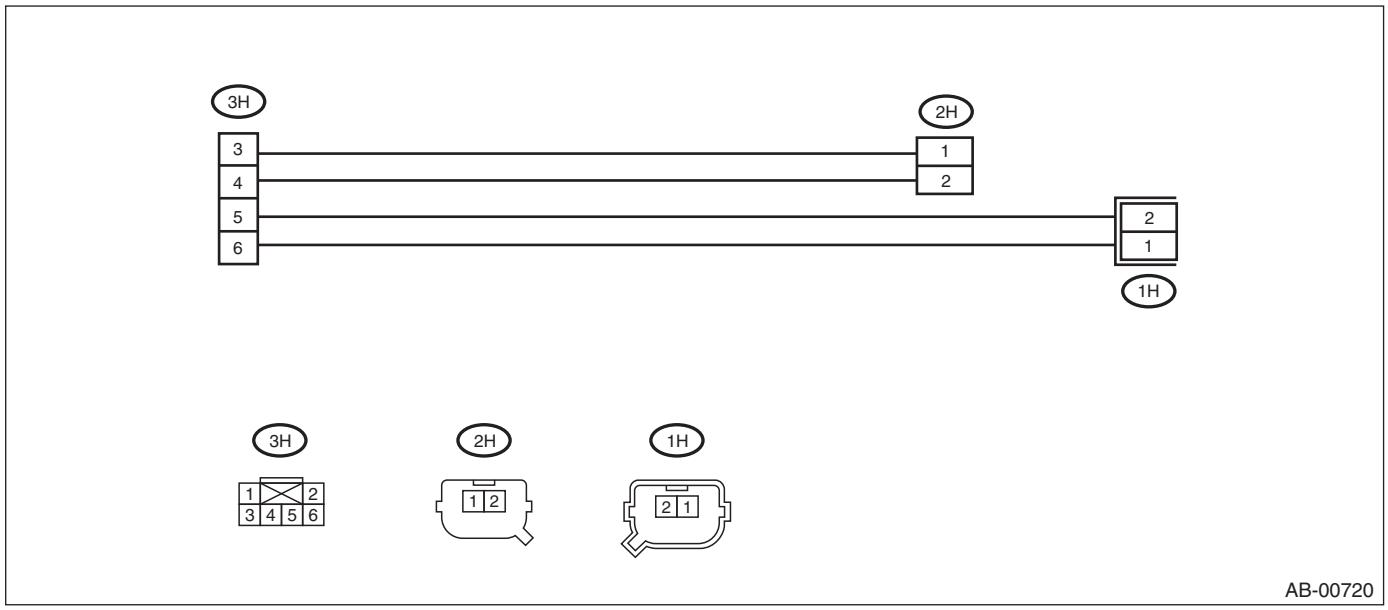
CAUTION:
To measure the voltage and resistance of airbag system component, be sure to use the specified test harness.

1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST1B022XU0	1B022XU0	SUBARU SELECT MONITOR III KIT	Used for troubleshooting the electrical system.

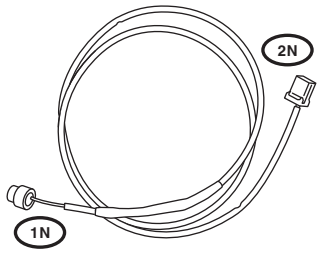
- TEST HARNESS H

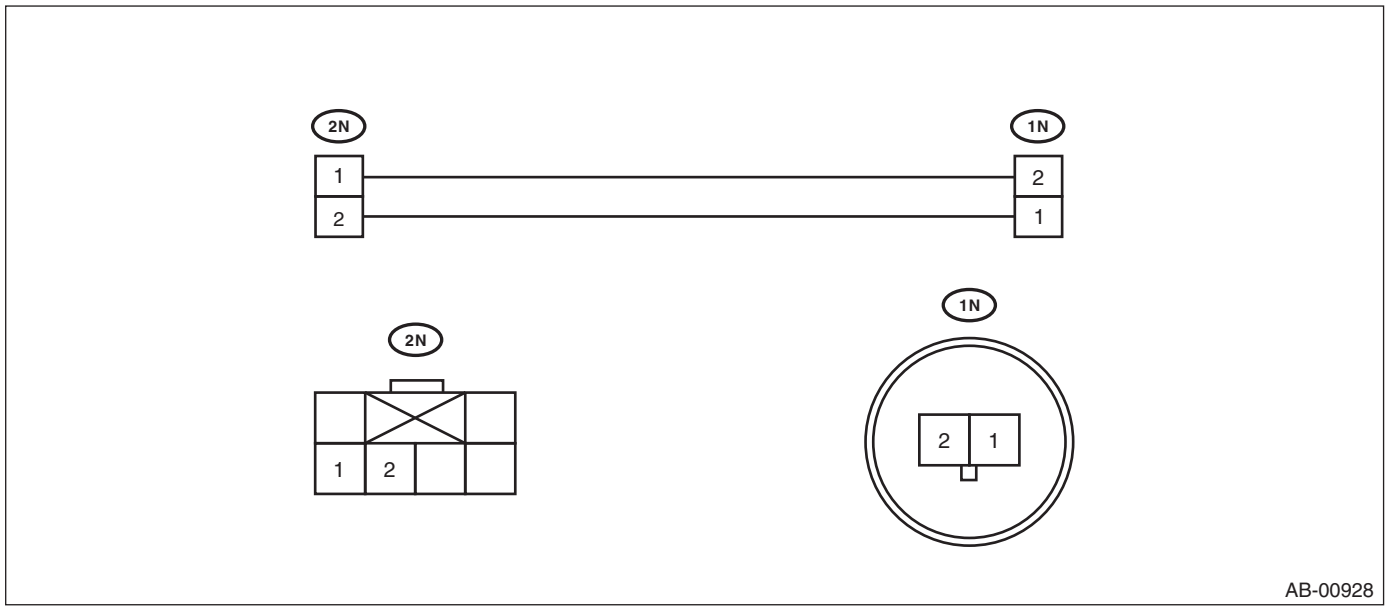
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST98299FA030	98299FA030	TEST HARNESS H	Used when measuring voltage and resistance of front sub sensor and satellite safing sensor.



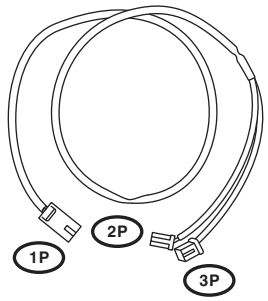
AB-00720

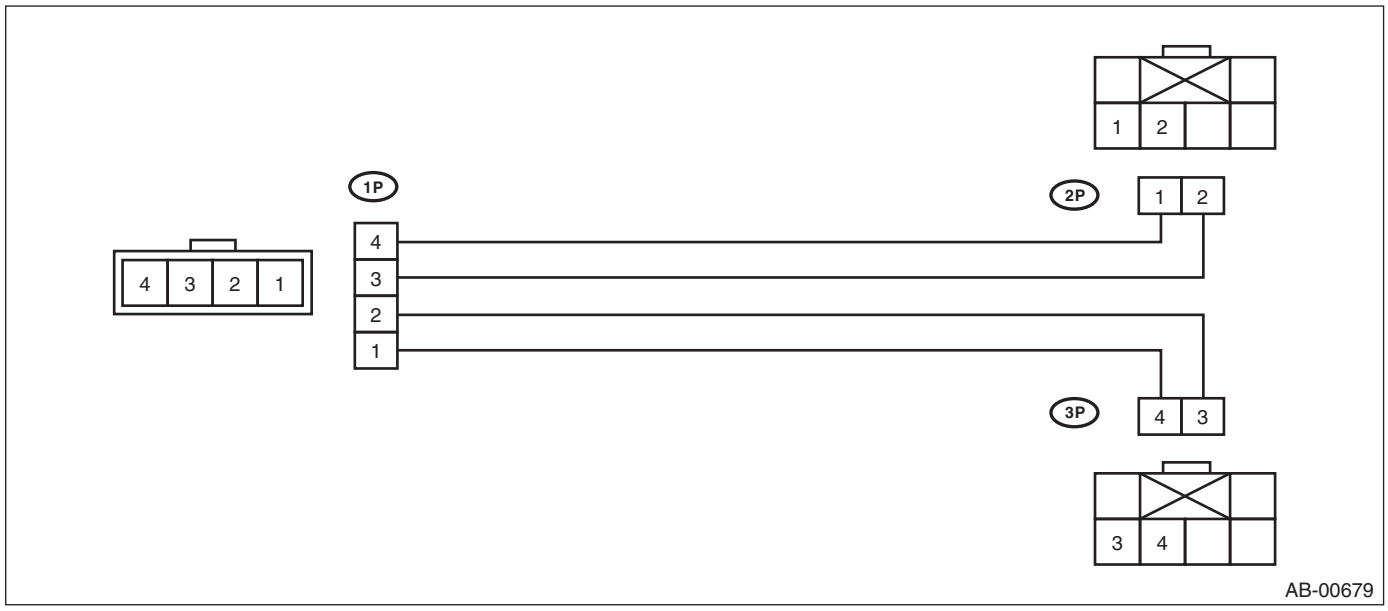
- TEST HARNESS N

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST98299SA000	98299SA000	TEST HARNESS N	Used when measuring voltage and resistance of driver's airbag module, curtain airbag module, and seat belt pretensioner.

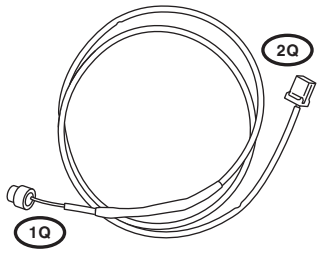


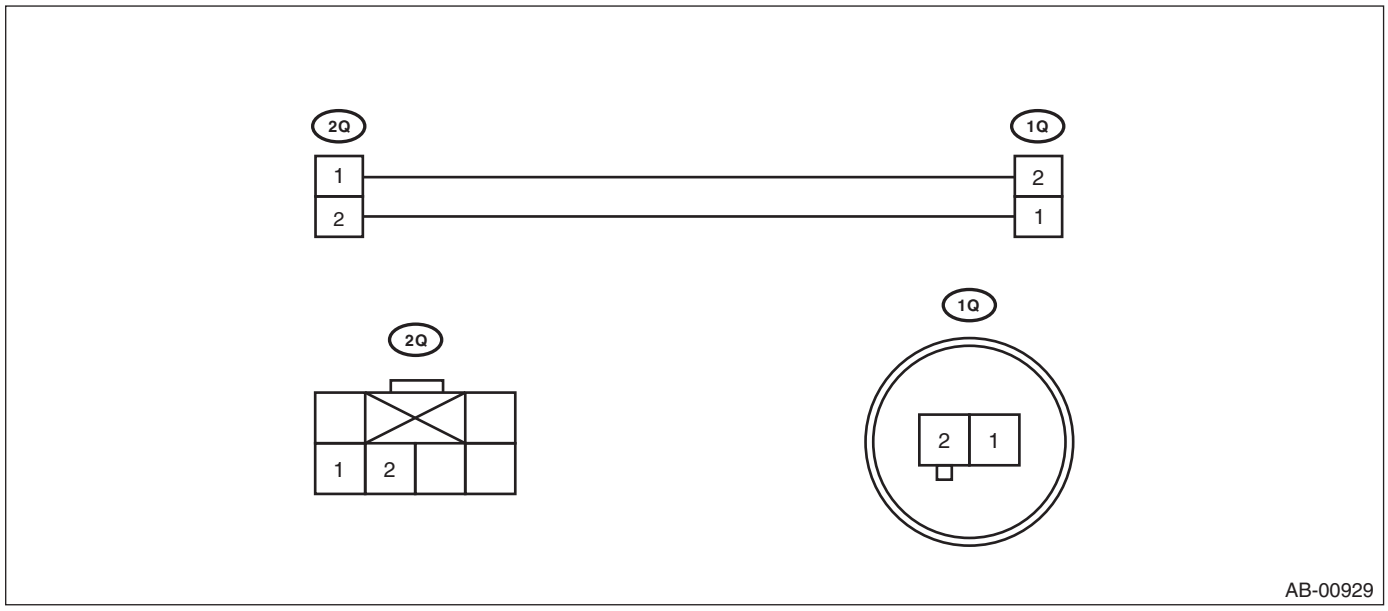
- TEST HARNESS P

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST98299SA020	98299SA020	TEST HARNESS P	Used when measuring voltage and resistance of driver's airbag module and passenger's airbag module.



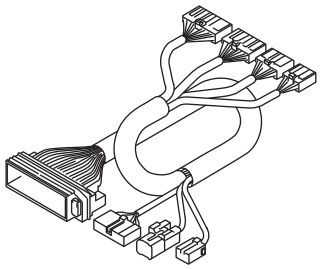
- TEST HARNESS Q

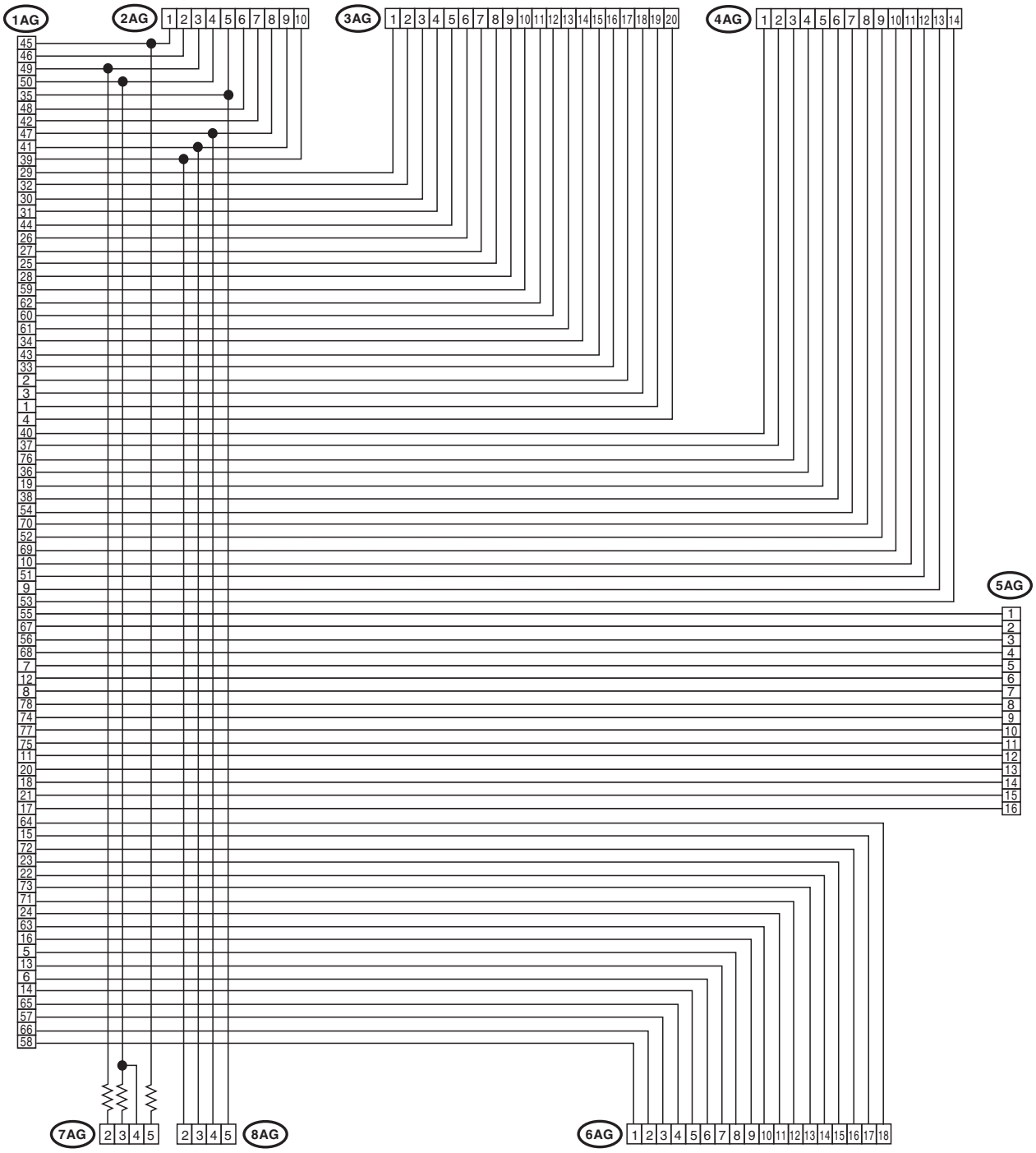
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST98299SA040	98299SA040	TEST HARNESS Q	Used when measuring voltage and resistance of driver's airbag module.



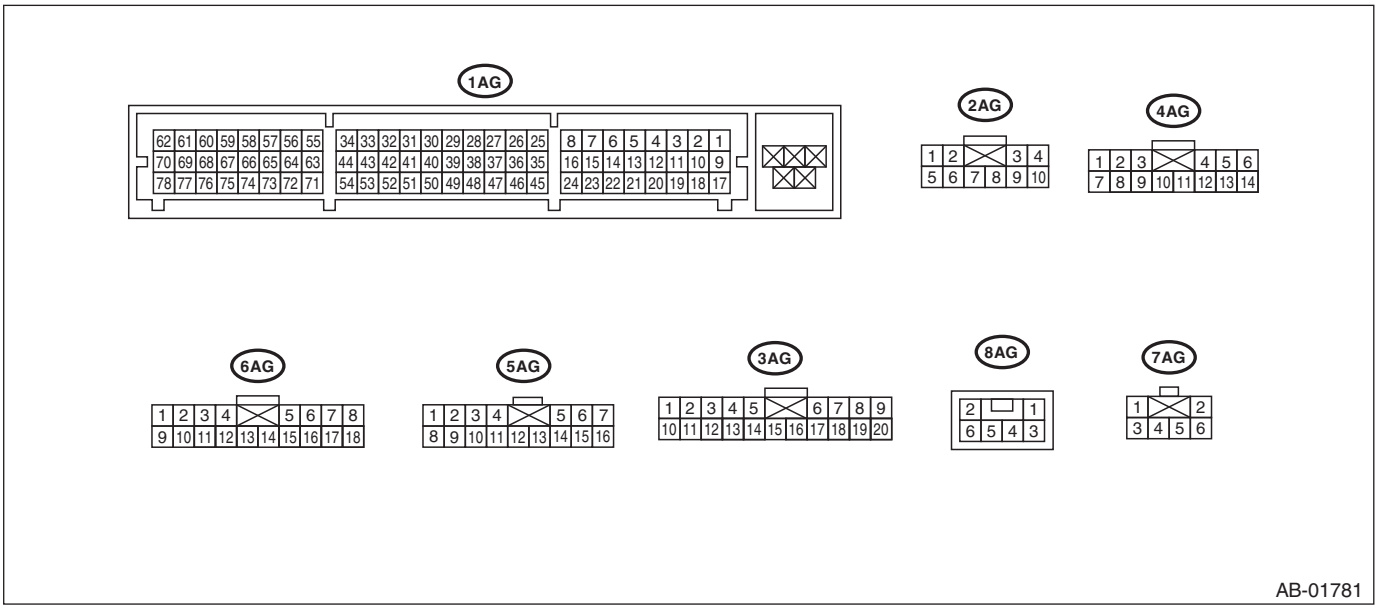
AB-00929

- TEST HARNESS AG

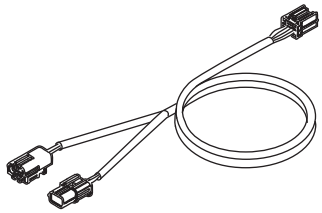
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST98299AG070	98299AG070	TEST HARNESS AG	Used when measuring voltage and resistance of airbag control module.

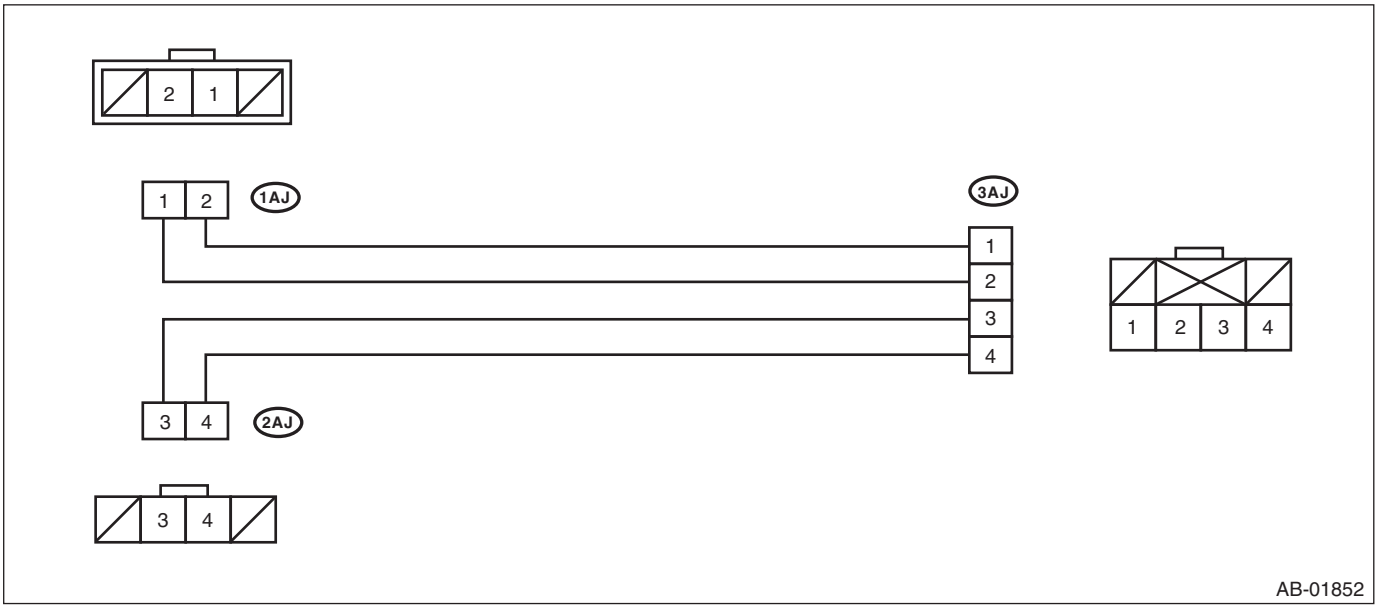


AB-01902

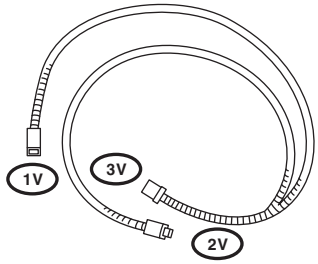


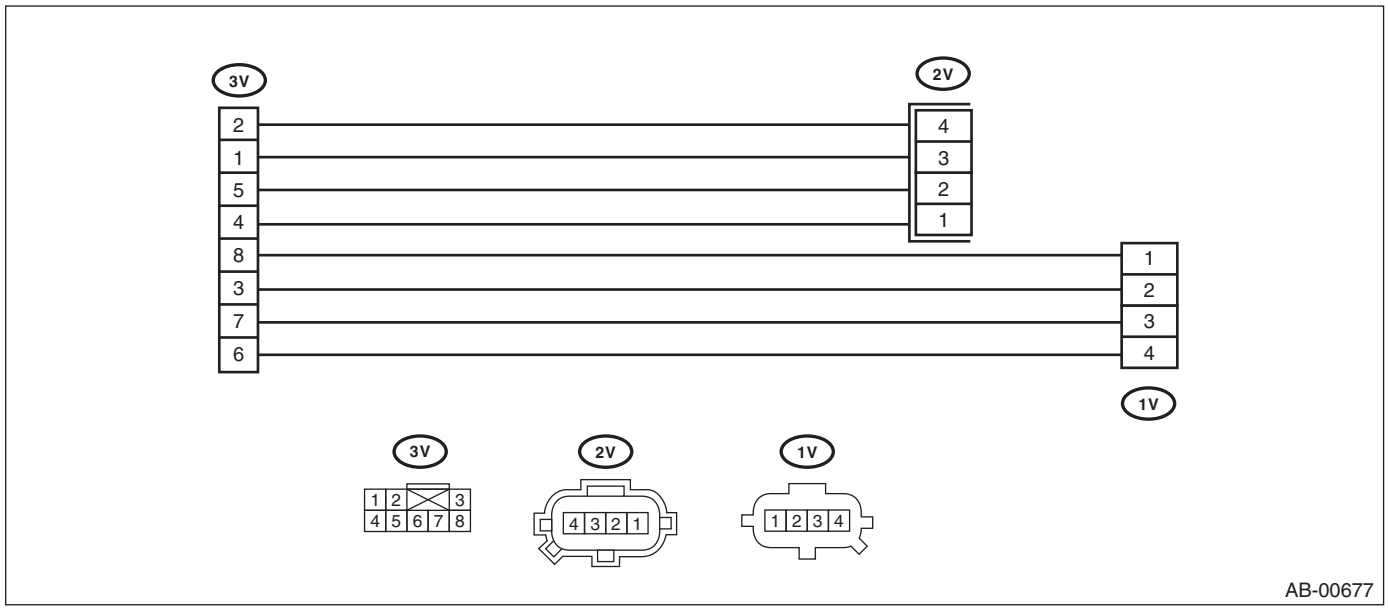
- TEST HARNESS AJ

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST98299FG000	98299FG000	TEST HARNESS AJ	Used when measuring power supply and resistance of side airbag harness.

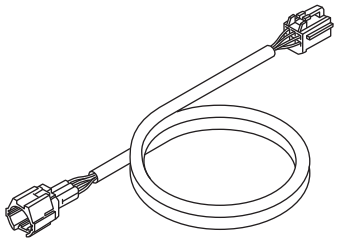


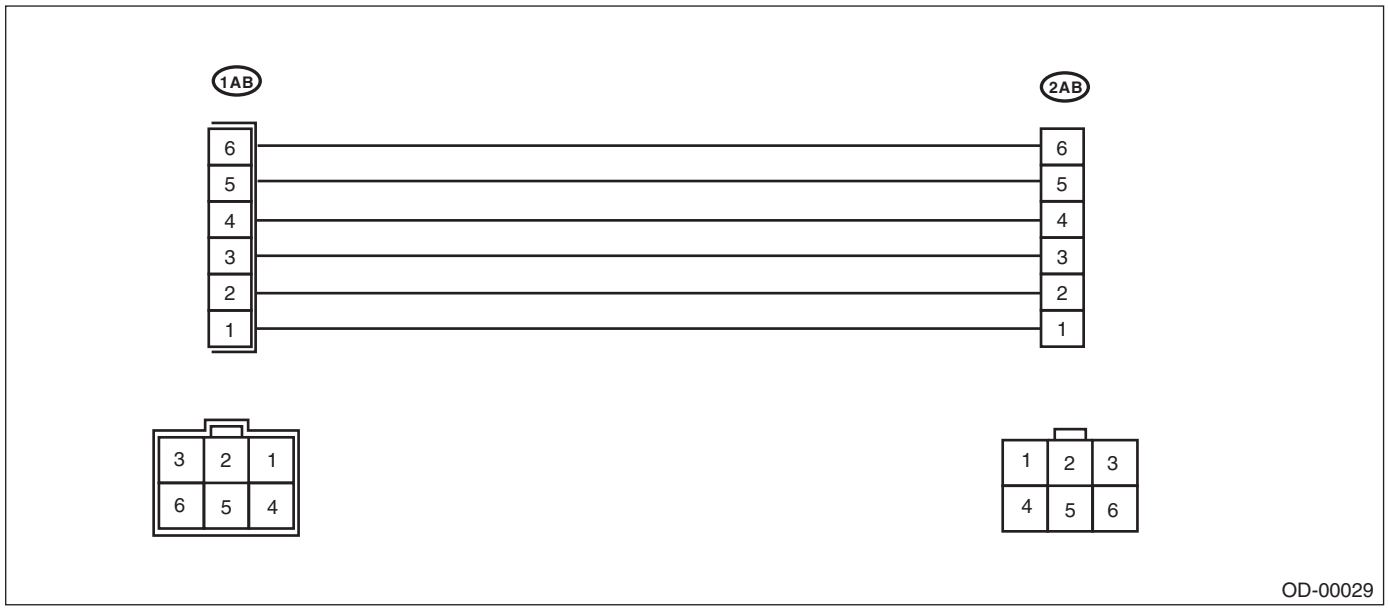
- TEST HARNESS V

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST98299AG010	98299AG010	TEST HARNESS V	Used when measuring voltage and resistance of side airbag sensor and curtain airbag sensor.

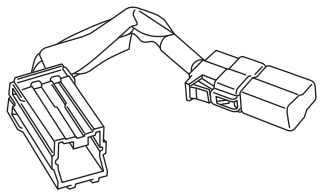


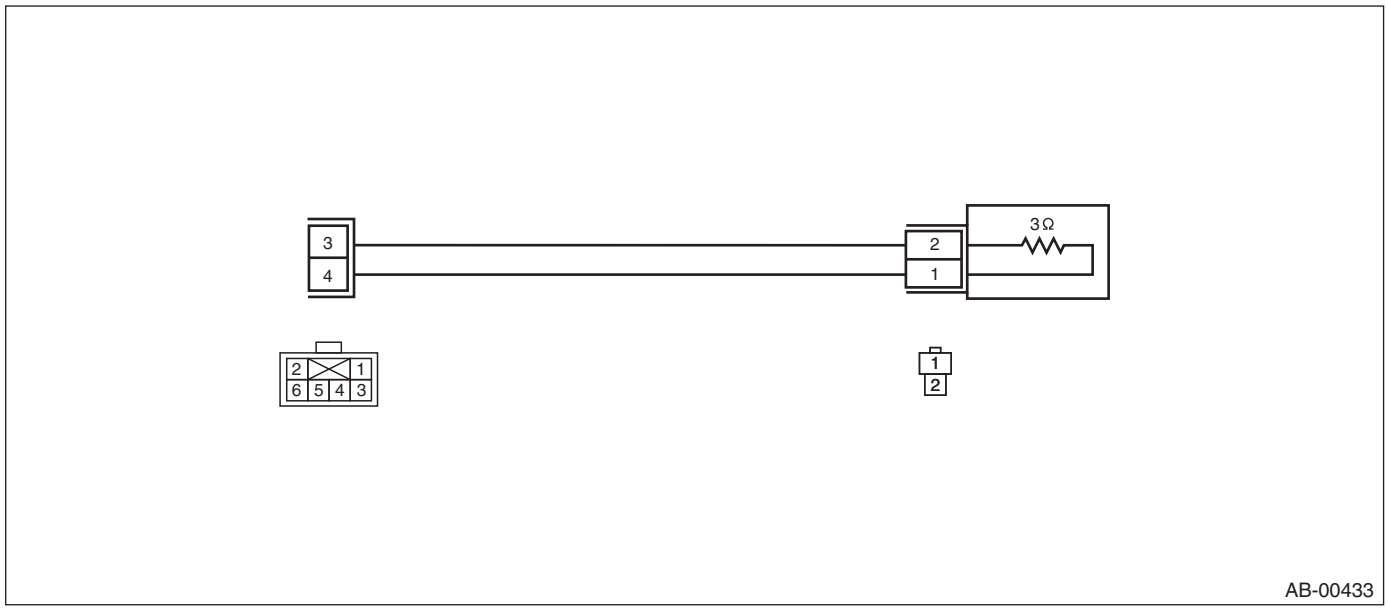
- TEST HARNESS AB

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST98299XA000	98299XA000	TEST HARNESS AB	Used when measuring voltage and resistance of occupant detection system.

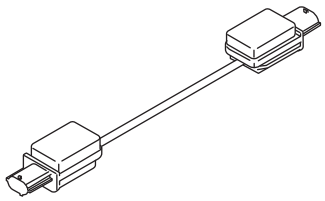


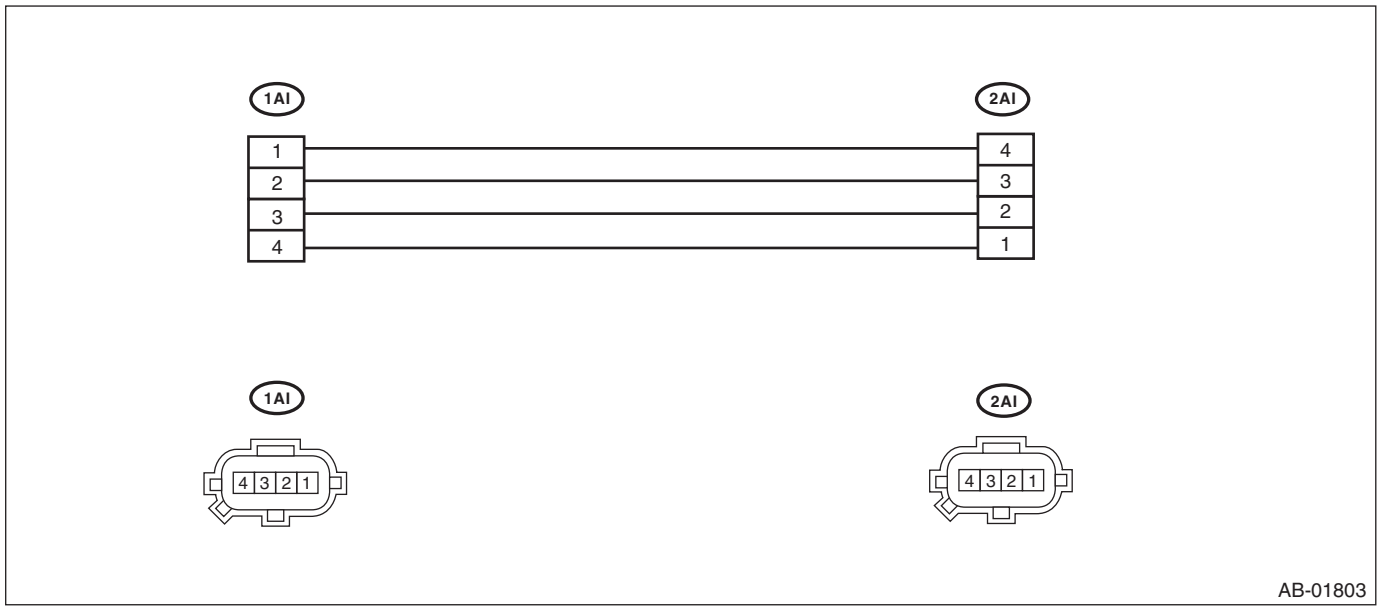
- AIRBAG RESISTOR

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST98299PA040	98299PA040	AIRBAG RESISTOR	Used in replacement of airbag module for which resistance value is same as airbag module. Two ST are required for diagnosis of two-stage inflator type airbag module.



- TEST HARNESS AI

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST98299AG090	98299AG090	TEST HARNESS AI	• Used for diagnoses of side airbag sensor and curtain airbag sensor. • Used together with test harness V.

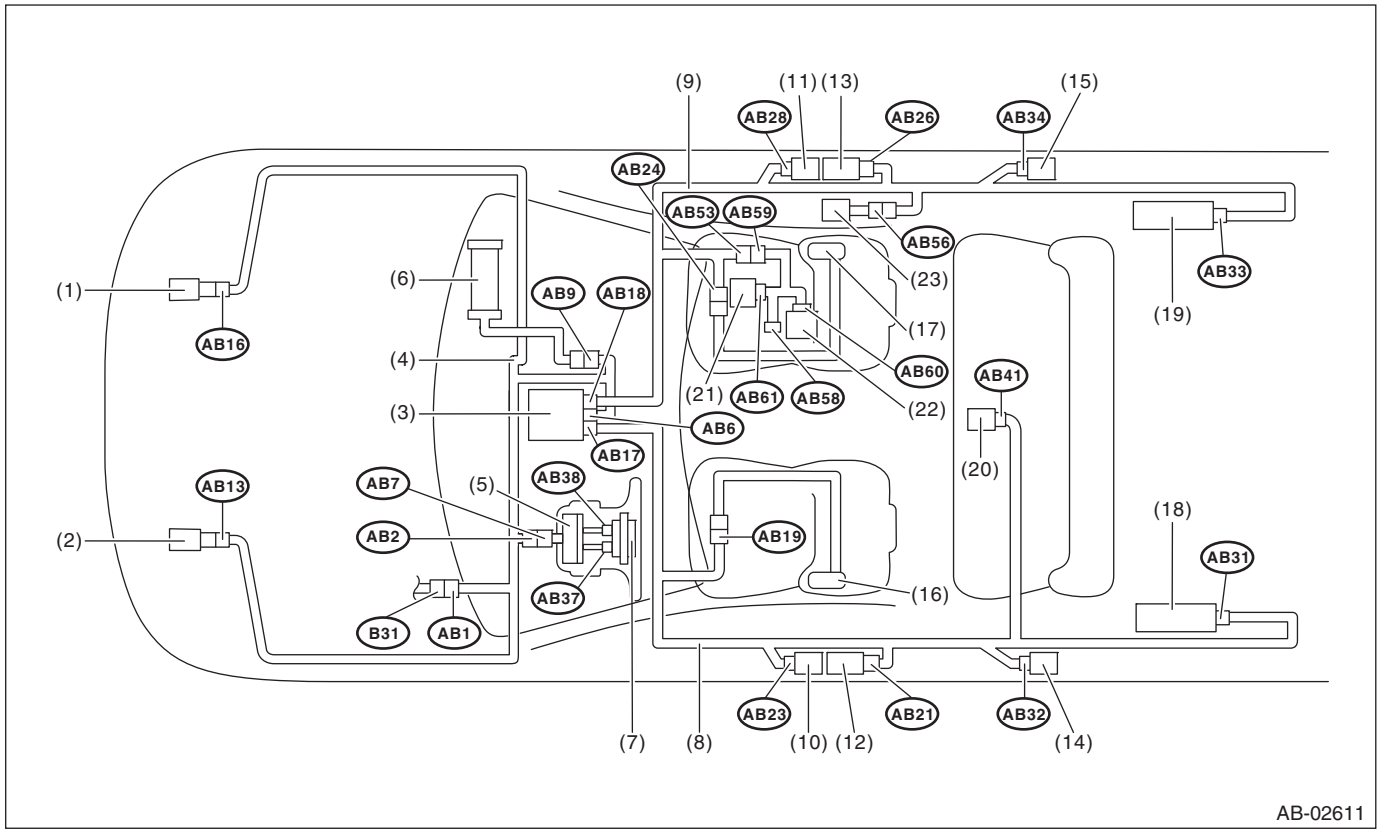


2. GENERAL TOOL

TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance, voltage and current.
Oscilloscope	Used for measuring the sensor.

4. Electrical Component Location

A: LOCATION



(1)	Front sub sensor (RH)	(9)	Airbag rear harness (RH)	(17)	Side airbag inflator (RH)
(2)	Front sub sensor (LH)	(10)	Side airbag sensor (LH)	(18)	Curtain airbag inflator (LH)
(3)	Airbag control module	(11)	Side airbag sensor (RH)	(19)	Curtain airbag inflator (RH)
(4)	Airbag main harness (bulkhead harness)	(12)	Seat belt pretensioner (LH)	(20)	Satellite safing sensor
(5)	Roll connector	(13)	Seat belt pretensioner (RH)	(21)	Occupant detection control module
(6)	Passenger's airbag inflator	(14)	Curtain airbag sensor (LH)	(22)	Buckle switch (RH)
(7)	Driver's airbag inflator	(15)	Curtain airbag sensor (RH)	(23)	Belt tension sensor
(8)	Airbag rear harness (LH)	(16)	Side airbag inflator (LH)		

Connector No.	(AB1)	(AB2)	(AB6)	(AB7)	(AB9)	(AB13)	(AB16)	(AB17)	(AB18)	(AB19)	(AB21)	(AB23)
Pin	6	4	30	4	4	2	2	24	24	4	2	4
Color	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Black	Yellow
Male/Female	Male	Female	Female	Male	Female	Female	Female	Female	Female	Female	Female	Female
Connector No.	(AB24)	(AB26)	(AB28)	(AB31)	(AB32)	(AB33)	(AB34)	(AB37)	(AB38)	(AB41)	(AB53)	(AB56)
Pin	4	2	4	2	4	2	4	2	2	2	6	3
Color	Yellow	Black	Yellow	Black	Yellow	Black	Yellow	Orange	Black	Yellow	Gray	Brown
Male/Female	Female	Female	Female	Female	Female	Female	Female	Female	Female	Female	Female	Female
Connector No.	(AB58)	(AB59)	(AB60)	(AB61)	(AB62)							
Pin	3	6	2	18	3							
Color	Gray	Gray	Yellow	Black	Brown							
Male/Female	Female	Female	Female	Female	Female							

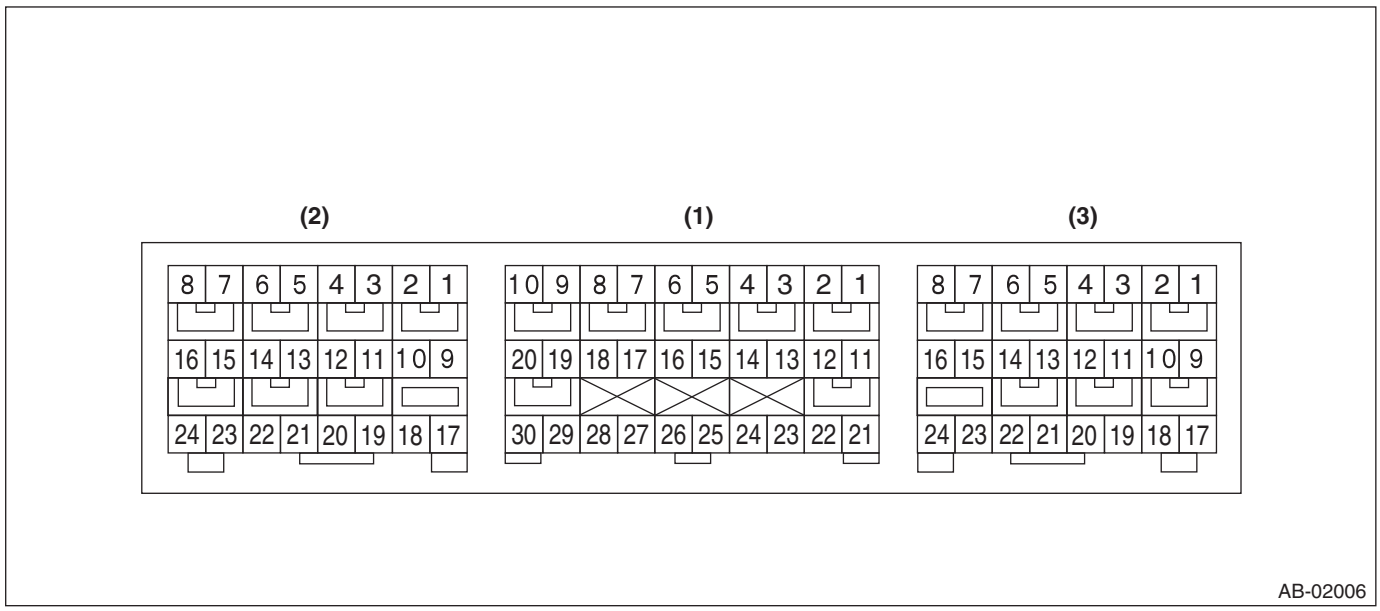
5. Airbag Connector

A: PROCEDURE

For detailed operation procedures, refer to “Airbag Connector” in the airbag system section. <Ref. to AB-10, PROCEDURE, Airbag Connector.>

6. Airbag Control Module I/O Signal

A: ELECTRICAL SPECIFICATION



- Terminal numbers in airbag control module connector are shown in the figure.
- The airbag warning light illuminates when the connector is removed from the airbag control module.

Item		Control module terminal No.
Data link connector		(1) — 16
Combination meter		(1) — 11
Battery power supply	Dedicated fuse	(1) — 21
Passenger's airbag module level one	+	(1) — 4
	–	(1) — 3
Passenger's airbag module level two	+	(1) — 1
	–	(1) — 2
Driver's airbag module level one	+	(1) — 5
	–	(1) — 6
Driver's airbag module level two	+	(1) — 8
	–	(1) — 7
Front sub sensor LH	+	(1) — 30
	–	(1) — 28
Front sub sensor RH	+	(1) — 29
	–	(1) — 27
Ground line (GND)		(1) — 25
		(1) — 26
Passenger's airbag OFF indicator		(1) — 17
Passenger's airbag ON indicator		(1) — 23
Passenger's seat belt warning light (integrated module)		(1) — 15
Seat belt pretensioner LH	+	(2) — 5
	–	(2) — 6
Side airbag sensor LH Curtain airbag sensor LH	+	(2) — 24
	–	(2) — 23
Side airbag module LH	+	(2) — 1
	–	(2) — 2
Curtain airbag module LH	+	(2) — 4
	–	(2) — 3

Item		Control module terminal No.
Satellite safing sensor	+	(2) — 20
	–	(2) — 19
Seat belt pretensioner RH	+	(3) — 4
	–	(3) — 3
Side airbag sensor RH Curtain airbag sensor RH	+	(3) — 17
	–	(3) — 18
Side airbag module RH	+	(3) — 8
	–	(3) — 7
Curtain airbag module RH	+	(3) — 5
	–	(3) — 6
Occupant detection control module	+	(3) — 16
	–	(3) — 24

B: WIRING DIAGRAM

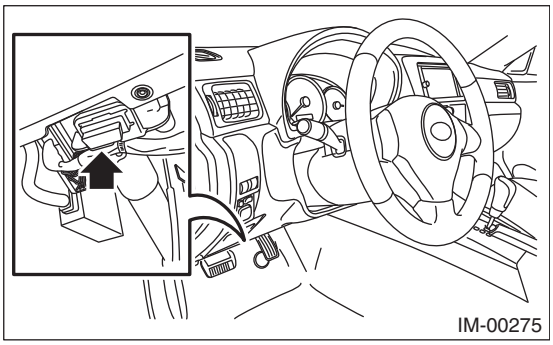
Refer to the WI section wiring diagram. <Ref. to WI-92, WIRING DIAGRAM, Airbag System.>

7. Subaru Select Monitor

A: OPERATION

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) 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.

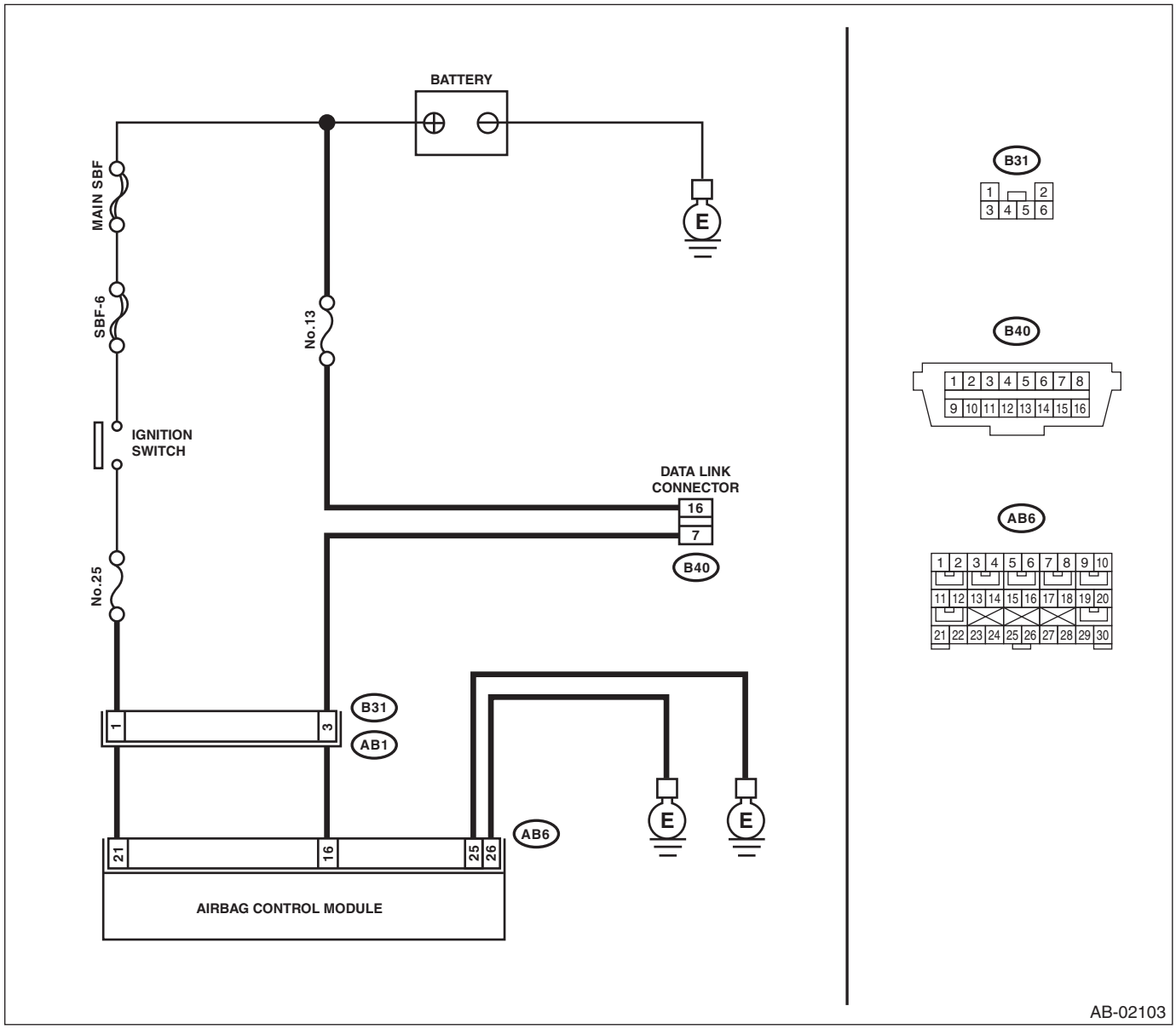
CAUTION:
Do not connect scan tools other than the Subaru Select Monitor.

4) Turn the ignition switch to ON (engine OFF) and run the Subaru Select Monitor.

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:



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.

	Step	Check	Yes	No
3	**CHECK BATTERY TERMINAL.**	Is there poor contact at 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.	Is the system name displayed on Subaru Select Monitor?	Go to step **11**.	Go to step **5**.
5	**CHECK SUBARU SELECT MONITOR.**	Is Subaru Select Monitor powered on?	Go to step **7**.	Go to step **6**.
6	**CHECK FUSE.** Remove fuse No. 13 from the fuse & relay box, and perform visual inspection.	Is the fuse OK?	Repair the harness between the battery and the data link connector.	Replace the fuse. If the fuse is blown out again, check the power supply circuit.
7	**CHECK AIRBAG CONTROL MODULE CONNECTOR.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Confirm that the connectors of airbag control module (AB6, AB17, AB18) are securely connected.	Is the connector of the airbag control module securely connected?	Go to step **8**.	Connect the connector of the airbag control module.
8	**CHECK SUBARU SELECT MONITOR COMMUNICATION.** 1) Disconnect the airbag control module connector. 2) Connect the battery ground terminal. 3) Turn the ignition switch to ON. 4) Check whether communication to other systems can be executed normally.	Is the system name displayed on Subaru Select Monitor?	Replace the airbag control module. <Ref. to AB-24, Airbag Control Module.>	Go to step **9**.
9	**CHECK HARNESS CONNECTOR BETWEEN EACH CONTROL MODULE AND DATA LINK CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the airbag control module, VDCCM&H/U, body integrated unit, 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 MΩ or more?	Go to step **10**.	Repair the harness and connector between each control module and data link connector. (Replace the entire harness if repair is necessary for airbag harness.)
10	**CHECK OUTPUT SIGNAL TO THE AIRBAG CONTROL MODULE.** 1) Turn the ignition switch to ON in the condition of step 9. 2) Measure the voltage between data link connector and chassis ground. ***Connector & terminal*** ***(B40) No. 7 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Repair each control module.	Repair the harness and connector between each control module and data link connector. (Replace the entire harness if repair is necessary for airbag harness.)
11	**CHECK FUSE.** Remove fuse No. 25 from the fuse & relay box, and perform visual inspection.	Is the fuse OK?	Go to step **12**.	Replace the fuse. If the fuse is blown out again, check the power supply circuit.

	Step	Check	Yes	No
12	**CHECK AIRBAG CONTROL MODULE CONNECTOR.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Confirm that the connectors of airbag control module (AB6, AB17, AB18) are securely connected.	Is the connector of the airbag control module securely connected?	Go to step **13**.	Connect the connector of the airbag control module.
13	**CHECK THE HARNESS BETWEEN THE AIRBAG CONTROL MODULE AND DATA LINK CONNECTOR.** 1) Disconnect the connectors (AB6, AB17, AB18) from airbag control module. 2) Connect the connector (1AG) in the test harness AG to the connectors (AB6, AB17, AB18). 3) Measure the resistance between connector (4AG) in the test harness AG and the data link connector. ***Connector & terminal*** ***(4AG) No. 1 — (B40) No. 7:***	Is the resistance less than 10 Ω?	Go to step **14**.	Repair the harness between the airbag control module and the data link connector. Or replace the airbag main harness along with the bulkhead harness.
14	**CHECK POWER SUPPLY CIRCUIT.** 1) Turn the ignition switch to ON. 2) Measure the voltage between connector (2AG) in the test harness AG and chassis ground. ***Connector & terminal*** ***(2AG) No. 1 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **15**.	Repair the harness between the airbag control module and the battery. Or replace the airbag main harness along with the bulkhead harness.
15	**CHECK BETWEEN AIRBAG CONTROL MODULE AND CHASSIS GROUND.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between connector (2AG) in the test harness AG and chassis ground. ***Connector & terminal*** ***(2AG) No. 4 — Chassis ground:*** ***(2AG) No. 3 — Chassis ground:***	Is the resistance less than 10 Ω?	Go to step **16**.	Repair the harness between the airbag control module and the chassis ground. Or replace the airbag main harness along with the bulkhead harness.
16	**CHECK POOR CONTACT OF CONNECTOR.**	Is there poor contact of the control module power supply, ground circuit and data link connector?	Repair the connector. (Replace the harness instead of repairing the airbag system connector.)	Replace the airbag control module. <Ref. to AB-24, REMOVAL, Airbag Control Module.>

8. Read Diagnostic Trouble Code (DTC)

A: OPERATION

When malfunction of airbag system occurs, the DTC stored in airbag control module will be read out.

1) On the «Main Menu», select {Each System Check}.
2) On the «System Selection Menu», select {Airbag System}.
3) After {Airbag System} is displayed, select [OK].
4) Select the {Diagnostic Code(s) Display} in «Airbag System».
5) Record the DTC displayed.

NOTE:

- For details concerning the operation procedure, refer to the “PC application help for Subaru Select Monitor”.
- For details concerning DTCs, refer to “List of Diagnostic Trouble Code (DTC)”. <Ref. to AB(diag)-37, List of Diagnostic Trouble Code (DTC).>
- If “No diagnostic Code Present” is displayed, the combination meter fault or the open circuit of harness is possible. For the diagnostic procedure, refer to <Ref. to AB(diag)-33, Airbag Warning Light Failure.>.
- When the airbag warning light is OFF and “No diagnostic Code Present” is displayed on Subaru Select Monitor, the airbag system is operating properly.

9. Inspection Mode

A: PROCEDURE

Recreate the circumstance by referring to the conditions described in the checklist.

10.Clear Memory Mode

A: OPERATION

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 «Main Menu» display, select {Each System Check}.
2) On «System Selection Menu» display, select {Airbag System}.
3) Select the {Clear Memory} in «Airbag System».
4) When the “Clear Memory?” is shown on the screen, select the [OK] button.
5) When “Done” is displayed, end the Subaru Select Monitor.
6) When “Done” and “Turn Ignition Switch OFF.” are shown on the display, turn the ignition switch to OFF.

NOTE:

- For detailed operation procedures, refer to “PC application help for Subaru Select Monitor”.
- Initial diagnosis of electronic throttle control is performed after memory clearance. Wait for 10 seconds or more after turning the ignition switch to ON, and then start the engine.

11.Display of Status Information

A: OPERATION

Check the operating condition of each sensor in the event of malfunction in the seat belt buckle switch, or when the seat belt buckle switch has been replaced.
1) On «Main Menu» display, select {Each System Check}.
2) On «System Selection Menu» display, select {Airbag System}.
3) On «Airbag System» display, select {Status Data}.
The following table is for support data.

Item	Display
Seat position sensor LH	—*2
Seat position sensor RH	—*2
Seat belt buckle switch LH	—*6
Seat belt buckle switch RH	Equipped*3/Unequipped*4/Other*5/Initial setting*1/—*6
Passenger's airbag control status	ON*7/OFF*8 /Initial setting*1

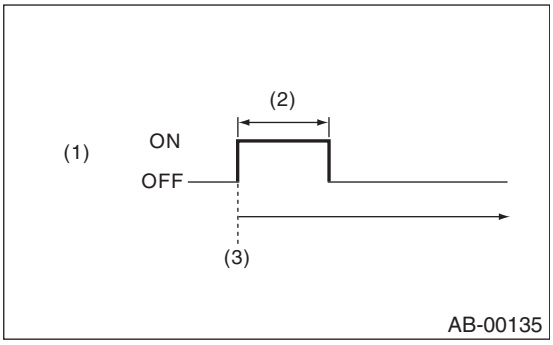
*1: Displayed when it is initial.
*2: Seat position sensor not supported
*3: Seat belt fastened
*4: Seat belt not fastened
*5: Displayed when data other than belt fastened or not fastened, such as breakdowns is input.
*6: Seat belt buckle switch not supported
*7: Passenger's airbag operating state
*8: Passenger's airbag non-operating state

NOTE:
For detailed operation procedures, refer to "PC application help for Subaru Select Monitor".

12. 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 and then goes off afterwards.



(1) Airbag warning light
(2) Approx. 6 sec.
(3) Ignition switch ON

13.Airbag Warning Light Failure

A: AIRBAG WARNING LIGHT REMAINS ON

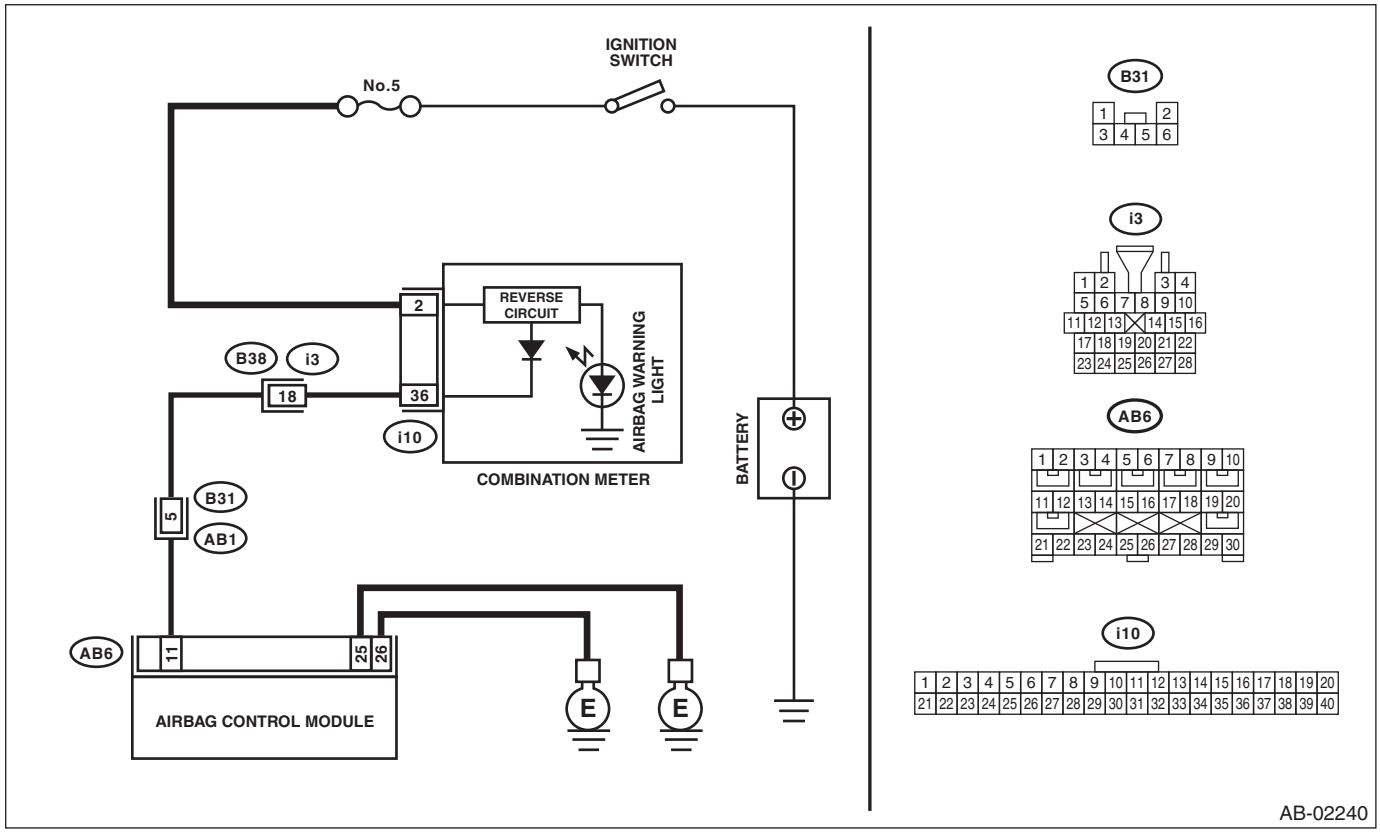
DETECTING CONDITION:

- Airbag warning light is faulty.
- Airbag control module to airbag warning light circuit is shorted or open.
- Grounding circuit is faulty.
- Airbag control module is faulty.
- Connector connection is improper.
- Connections of (AB6, AB17, AB18) to airbag control module are improper.

CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait 60 seconds or more 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 of the driver's and passenger's seats for safety.
• When inspecting the airbag rear harness, disconnect the side airbag module connector, curtain airbag module connector and seat belt pretensioner connector for safety reasons.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**READ DTC.** Read the DTC. <Ref. to AB(diag)-28, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is DTC displayed?	Go to step **2**.	Go to step **3**.
2	**CHECK DTC.**	Is the displayed DTC 2D?	Go to step **3**.	Perform the diagnosis according to DTC.

	Step	Check	Yes	No
3	**CHECK FOR POOR CONTACT.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Check that the airbag control module and the connectors (AB6, AB17, AB18) are securely connected.	Are there poor contact of connectors (AB6, AB17, AB18)?	If the faulty connector contact remains, replace the airbag main harness along with body harness or replace the airbag control module. <Ref. to AB-24, Airbag Control Module.>	Go to step **4**.
4	**CHECK AIRBAG MAIN HARNESS.** 1) Remove the instrument panel lower cover and disconnect the connectors (AB7) and (AB2). 2) Remove the console front panel and disconnect the connector (AB9). 3) Disconnect the connectors (AB6, AB17, AB18) from the airbag control module, and connect the connector (1AG) in the test harness AG. 4) Connect the battery ground terminal and turn the ignition switch to ON. 5) Connect the connectors (7AG) and (8AG) in the test harness AG. NOTE: After the fault has been cleared, disconnect the connectors (7AG) and (8AG).	Does the airbag warning light go off?	Go to step **5**.	Go to step **6**.
5	**CHECK GROUND CIRCUIT.** Measure the resistance between connector (2AG) in the test harness AG and chassis ground. ***Connector & terminal*** ***(2AG) No. 4 — Chassis ground:*** ***(2AG) No. 3 — Chassis ground:***	Is the resistance less than 10 Ω?	Replace the airbag control module. <Ref. to AB-24, Airbag Control Module.>	Repair the chassis ground circuit.
6	**CHECK AIRBAG MAIN HARNESS AND BULKHEAD HARNESS.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Disconnect the connectors (7AG) and (8AG). 3) Remove the combination meter. 4) Measure the resistance between the combination meter connector and test harness AG connector (2AG). ***Connector & terminal*** ***(2AG) No. 5 — (i10) No. 36:***	Is the resistance less than 10 Ω?	Check the combination meter.	Go to step **7**.
7	**CHECK POOR CONTACT OF CONNECTOR.** 1) Turn the ignition switch to OFF, disconnect the battery ground terminal, and wait 60 seconds or more. 2) Confirm that the connectors between the airbag control module and the combination meter are securely connected.	Is there poor contact of connector?	Repair the bulkhead harness or replace the airbag main harness along with body harness.	Go to step **8**.
8	**CHECK AIRBAG MAIN HARNESS.** Check the airbag main harness for defect.	Is there any defect in the airbag main harness?	Replace the airbag main harness along with bulkhead harness.	Repair the bulkhead harness.

B: AIRBAG WARNING LIGHT REMAINS OFF

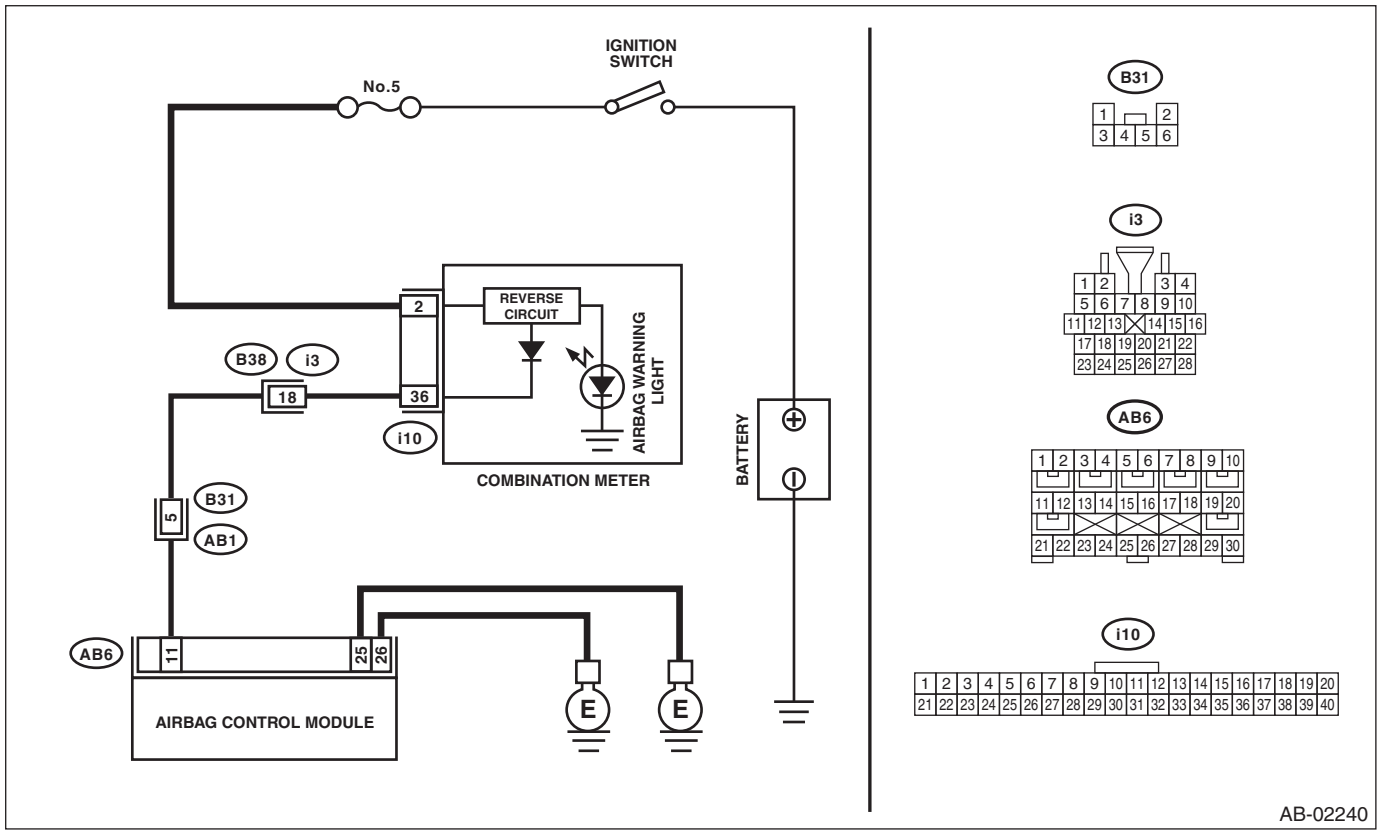
DETECTING CONDITION:

- Fuse No. 5 (in fuse & relay box) is blown out.
- Body harness circuit is open.
- Airbag warning light is faulty.
- 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 cable from battery, and wait 60 seconds or more 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 of the driver's and passenger's seats for safety.
• When inspecting the airbag rear harness, disconnect the side airbag module connector, curtain airbag module connector and seat belt pretensioner connector for safety reasons.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK COMBINATION METER.** Turn the ignition switch to ON, and confirm that warning lights of combination meter illuminate.	Do warning lights except for airbag illuminate?	Go to step **2**.	Check the combination meter.
2	**CHECK DTC.** Read the DTC. <Ref. to AB(diag)-28, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is DTC displayed?	Perform the diagnosis according to DTC.	Go to step **3**.
3	**CHECK FUSE.** Remove fuse No. 5 from the fuse & relay box, and perform visual inspection.	Is the fuse OK?	Go to step **4**.	Replace the fuse. If the fuse is blown out again, go to step 4.

	Step	Check	Yes	No
4	**CHECK AIRBAG WARNING LIGHT CIRCUIT (IN COMBINATION METER).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Disconnect the connectors (AB1) and (B31). 3) Connect the battery ground terminal and turn the ignition switch to ON.	Does airbag warning light illuminate?	Go to step **5**.	Check the combination meter.
5	**CHECK AIRBAG MAIN HARNESS.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Connect the connector (AB1) and (B31). 3) Disconnect the connectors (AB6, AB17, AB18) from airbag control module. 4) Connect the battery ground terminal and turn the ignition switch to ON.	Does airbag warning light illuminate?	Replace the airbag control module. <Ref. to AB-24, Airbag Control Module.>	Replace the airbag main harness along with bulkhead harness.

14.List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Display	Content of diagnosis	Reference
11	Driver's Airbag failure	• Airbag main harness circuit is shorted to ground. • Airbag module harness (driver's side) circuit is shorted to ground. • Roll connector circuit is shorted to ground. • Driver's airbag module is faulty. • Airbag control module is faulty.	<Ref. to AB(diag)-46, DTC 11 DRIVER'S AIRBAG FAILURE, Diagnostic Chart with Trouble Code.>
12	Passenger's Airbag failure	• Airbag main harness circuit is shorted to ground. • Airbag module harness (passenger's side) circuit is shorted to ground. • Passenger's airbag module is faulty. • Airbag control module is faulty.	<Ref. to AB(diag)-49, DTC 12 PASSENGER'S AIRBAG FAILURE, Diagnostic Chart with Trouble Code.>
15	Driver's Airbag failure	• Airbag main harness circuit is shorted to power supply. • Airbag module harness circuit (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.	<Ref. to AB(diag)-51, DTC 15 DRIVER'S AIRBAG FAILURE, Diagnostic Chart with Trouble Code.>
16	Passenger's Airbag failure	• Airbag main harness circuit is shorted to power supply. • Airbag module harness (passenger's side) circuit is shorted to power supply. • Passenger's airbag module is faulty. • Airbag control module is faulty.	<Ref. to AB(diag)-54, DTC 16 PASSENGER'S AIRBAG FAILURE, Diagnostic Chart with Trouble Code.>
1A	Driver's Airbag failure	• Airbag main harness circuit is shorted. • Airbag module harness (driver's side) circuit is shorted. • Roll connector circuit is shorted. • Driver's airbag module is faulty. • Airbag control module is faulty.	<Ref. to AB(diag)-56, DTC 1A DRIVER'S AIRBAG FAILURE, Diagnostic Chart with Trouble Code.>
1B	Passenger's Airbag failure	• Airbag main harness circuit is shorted. • Airbag module harness circuit (passenger's side) is shorted. • Passenger's airbag module is faulty. • Airbag control module is faulty.	<Ref. to AB(diag)-59, DTC 1B PASSENGER'S AIRBAG FAILURE, Diagnostic Chart with Trouble Code.>
1D	Driver's Airbag failure	• Airbag main harness circuit is open. • Airbag module harness circuit (driver's side) is open. • Roll connector circuit is open. • Driver's airbag module is faulty. • Airbag control module is faulty.	<Ref. to AB(diag)-61, DTC 1D DRIVER'S AIRBAG FAILURE, Diagnostic Chart with Trouble Code.>
1E	Passenger's Airbag failure	• Airbag main harness circuit is open. • Airbag module harness circuit (passenger's side) is open. • Passenger's airbag module is faulty. • Airbag control module is faulty.	<Ref. to AB(diag)-64, DTC 1E PASSENGER'S AIRBAG FAILURE, Diagnostic Chart with Trouble Code.>
21	Airbag ECU failure	Airbag control module is faulty.	<Ref. to AB(diag)-66, DTC 21 AIRBAG ECM FAILURE, Diagnostic Chart with Trouble Code.>

List of Diagnostic Trouble Code (DTC)

DTC	Display	Content of diagnosis	Reference
22	Front Airbag: Firing output	Front airbag module and seat belt pretensioner (LH/RH) are inflated.	<Ref. to AB(diag)-66, DTC 22 FRONT AIRBAG FIRING OUTPUT, Diagnostic Chart with Trouble Code.>
26	Passenger's Airbag Indicator Failure	• Passenger's airbag indicator is faulty. • Airbag control module is faulty. • Airbag main harness circuit is open, shorted or shorted to ground. • Body harness circuit is open.	<Ref. to AB(diag)-67, DTC 26 PASSENGER'S AIRBAG INDICATOR FAILURE, Diagnostic Chart with Trouble Code.>
27	ODS Communication Error	• Occupant detection control module communication is faulty. • Airbag rear harness circuit is open, shorted, 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)-69, DTC 27 ODS COMMUNICATION ERROR, Diagnostic Chart with Trouble Code.>
29	ODS Failure	• Occupant detection sensor is faulty. • Occupant detection control module is faulty. • Occupant detection harness is faulty. • Fuse is blown.	<Ref. to OD(diag)-26, DTC 29 ODS FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
2A	ODS Calibration Error	• Occupant detection control module is faulty. • Calibration of occupant detection control module is initial setting or faulty.	<Ref. to OD(diag)-23, DTC 2A ODS CALIBRATION ERROR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
2B	ODS System Wrong Parts	• Specification of occupant detection control module is improper. • Occupant detection control module is faulty.	<Ref. to OD(diag)-23, DTC 2B ODS SYSTEM WRONG PARTS, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
2C	Belt Tension Sensor Failure	• 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)-24, DTC 2C BELT TENSION SENSOR FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
2D	Airbag Warning Indicator Failure	• Airbag warning light is faulty. • Open or short circuit in harness between airbag control module and airbag warning light. • Poor contact of airbag main harness and instrument panel harness. • Ground circuit is faulty. • Airbag control module is faulty.	<Ref. to AB(diag)-71, DTC 2D AIRBAG WARNING INDICATOR 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.>
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.>

DTC	Display	Content of diagnosis	Reference
37	Buckle Switch RH Failure	• 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)-27, DTC 37 BUCKLE SWITCH RH FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
39	Seat Belt Warning Failure	• Airbag control module is faulty. • Body integrated unit is faulty. • Harness circuits between body integrated unit and airbag control module are open, shorted or shorted to ground.	<Ref. to AB(diag)-72, DTC 39 SEAT BELT WARNING FAILURE, Diagnostic Chart with Trouble Code.>
3A	Front Sub Sensor RH false installation	• Front sensor (RH) is misinstalled. • Airbag control module is faulty.	<Ref. to AB(diag)-74, DTC 3A FRONT SUB SENSOR RH FALSE INSTALLATION, Diagnostic Chart with Trouble Code.>
3B	Front Sub Sensor LH false installation	• Front sensor (LH) is misinstalled. • Airbag control module is faulty.	<Ref. to AB(diag)-74, DTC 3B FRONT SUB SENSOR LH FALSE INSTALLATION, Diagnostic Chart with Trouble Code.>
3C	Satellite Sensor Bus failure	Satellite safing sensor is faulty.	<Ref. to AB(diag)-74, DTC 3C SATELLITE SENSOR BUS FAILURE, Diagnostic Chart with Trouble Code.>
3D	Satellite Sensor false installation	• Satellite safing sensor is misinstalled. • Airbag control module is faulty.	<Ref. to AB(diag)-74, DTC 3D SATELLITE SENSOR FALSE INSTALLATION, Diagnostic Chart with Trouble Code.>
41	Side Airbag RH failure	• Side airbag harness (RH) circuit is shorted to ground. • Side airbag module (RH) is faulty. • Airbag control module is faulty.	<Ref. to AB(diag)-75, DTC 41 SIDE AIRBAG RH FAILURE, Diagnostic Chart with Trouble Code.>
42	Side Airbag LH failure	• Side airbag harness (LH) circuit is shorted to ground. • Side airbag module (LH) is faulty. • Airbag control module is faulty.	<Ref. to AB(diag)-77, DTC 42 SIDE AIRBAG LH FAILURE, Diagnostic Chart with Trouble Code.>
45	Side Airbag RH failure	• Side airbag harness (RH) circuit is shorted to power supply. • Side airbag module (RH) is faulty. • Airbag control module is faulty.	<Ref. to AB(diag)-79, DTC 45 SIDE AIRBAG RH FAILURE, Diagnostic Chart with Trouble Code.>
46	Side Airbag LH failure	• Side airbag harness (LH) circuit is shorted to power supply. • Side airbag module (LH) is faulty. • Airbag control module is faulty.	<Ref. to AB(diag)-81, DTC 46 SIDE AIRBAG LH FAILURE, Diagnostic Chart with Trouble Code.>
4A	Side Airbag RH failure	• Side airbag harness (RH) circuit is shorted. • Side airbag module (RH) is faulty. • Airbag control module is faulty.	<Ref. to AB(diag)-83, DTC 4A SIDE AIRBAG RH FAILURE, Diagnostic Chart with Trouble Code.>

DTC	Display	Content of diagnosis	Reference
4B	Side Airbag LH failure	• Side airbag harness (LH) circuit is shorted. • Side airbag module (LH) is faulty. • Airbag control module is faulty.	<Ref. to AB(diag)-85, DTC 4B SIDE AIRBAG LH FAILURE, Diagnostic Chart with Trouble Code.>
4D	Side Airbag RH failure	• Side airbag harness (RH) circuit is open. • Side airbag module (RH) is faulty. • Airbag control module is faulty.	<Ref. to AB(diag)-87, DTC 4D SIDE AIRBAG RH FAILURE, Diagnostic Chart with Trouble Code.>
4E	Side Airbag LH failure	• Side airbag harness (LH) circuit is open. • Side airbag module (LH) is faulty. • Airbag control module is faulty.	<Ref. to AB(diag)-89, DTC 4E SIDE AIRBAG LH FAILURE, Diagnostic Chart with Trouble Code.>
53	Side Airbag Sensor RH failure	Side airbag sensor (RH) is faulty.	<Ref. to AB(diag)-91, DTC 53 SIDE AIRBAG SENSOR RH FAILURE, Diagnostic Chart with Trouble Code.>
54	Side Airbag Sensor LH failure	Side airbag sensor (LH) is faulty.	<Ref. to AB(diag)-91, DTC 54 SIDE AIRBAG SENSOR LH FAILURE, Diagnostic Chart with Trouble Code.>
55	Side/Curtain Airbag: Firing output	• Side airbag module and curtain airbag module are deployed. • Curtain airbag module is deployed.	<Ref. to AB(diag)-91, DTC 55 SIDE CURTAIN AIRBAG FIRING OUTPUT, Diagnostic Chart with Trouble Code.>
58	Curtain Airbag Sensor RH failure	Curtain airbag sensor (RH) is faulty.	<Ref. to AB(diag)-91, DTC 58 CURTAIN AIRBAG SENSOR RH FAILURE, Diagnostic Chart with Trouble Code.>
59	Curtain Airbag Sensor LH failure	Curtain airbag sensor (LH) is faulty.	<Ref. to AB(diag)-91, DTC 59 CURTAIN AIRBAG SENSOR LH FAILURE, Diagnostic Chart with Trouble Code.>
5A	Side Airbag Sensor RH false installation	• Side airbag sensor (RH) is misinstalled. • Airbag control module is faulty.	<Ref. to AB(diag)-92, DTC 5A SIDE AIRBAG SENSOR RH FALSE INSTALLATION, Diagnostic Chart with Trouble Code.>
5B	Side Airbag Sensor LH false installation	• Side airbag sensor (LH) is misinstalled. • Airbag control module is faulty.	<Ref. to AB(diag)-92, DTC 5B SIDE AIRBAG SENSOR LH FALSE INSTALLATION, Diagnostic Chart with Trouble Code.>
5C	Curtain Airbag Sensor RH false installation	• Curtain airbag sensor (RH) is misinstalled. • Airbag control module is faulty.	<Ref. to AB(diag)-92, DTC 5C CURTAIN AIRBAG SENSOR RH FALSE INSTALLATION, Diagnostic Chart with Trouble Code.>

DTC	Display	Content of diagnosis	Reference
5D	Curtain Airbag Sensor LH false installation	• Curtain airbag sensor (LH) is misinstalled. • Airbag control module is faulty.	<Ref. to AB(diag)-92, DTC 5D CURTAIN AIR-BAG SENSOR LH FALSE INSTALLATION, Diagnostic Chart with Trouble Code.>
61	Belt Pretensioner RH failure	• Seat belt pretensioner (RH) circuit is shorted to ground. • Pretensioner (RH) is faulty. • Pretensioner harness (RH) is shorted to ground. • Airbag control module is faulty.	<Ref. to AB(diag)-93, DTC 61 BELT PRETEN-SIONER RH FAILURE, Diagnostic Chart with Trouble Code.>
62	Belt Pretensioner LH failure	• Seat belt pretensioner (LH) circuit is shorted to ground. • Pretensioner (LH) is faulty. • Pretensioner harness (LH) is shorted to ground. • Airbag control module is faulty.	<Ref. to AB(diag)-95, DTC 62 BELT PRETEN-SIONER LH FAILURE, Diagnostic Chart with Trouble Code.>
65	Belt Pretensioner RH failure	• Seat belt pretensioner (RH) circuit is shorted to power supply. • Pretensioner (RH) is faulty. • Pretensioner harness (RH) is shorted to power sup-ply. • Airbag control module is faulty.	<Ref. to AB(diag)-97, DTC 65 BELT PRETEN-SIONER RH FAILURE, Diagnostic Chart with Trouble Code.>
66	Belt Pretensioner LH failure	• Seat belt pretensioner (LH) circuit is shorted to power supply. • Pretensioner (LH) is faulty. • Pretensioner harness (LH) is shorted to power sup-ply. • Airbag control module is faulty.	<Ref. to AB(diag)-99, DTC 66 BELT PRETEN-SIONER LH FAILURE, Diagnostic Chart with Trouble Code.>
6A	Belt Pretensioner RH failure	• Seat belt pretensioner (RH) circuit is shorted. • Pretensioner (RH) is faulty. • Pretensioner harness (RH) is shorted. • Airbag control module is faulty.	<Ref. to AB(diag)-101, DTC 6A BELT PRETEN-SIONER RH FAILURE, Diagnostic Chart with Trouble Code.>
6B	Belt Pretensioner LH failure	• Seat belt pretensioner (LH) circuit is shorted. • Pretensioner (LH) is faulty. • Pretensioner harness (LH) is shorted. • Airbag control module is faulty.	<Ref. to AB(diag)-103, DTC 6B BELT PRETEN-SIONER LH FAILURE, Diagnostic Chart with Trouble Code.>
6D	Belt Pretensioner RH failure	• Seat belt pretensioner (RH) circuit is open. • Pretensioner (RH) is faulty. • Pretensioner harness (RH) is open. • Airbag control module is faulty.	<Ref. to AB(diag)-105, DTC 6D BELT PRETEN-SIONER RH FAILURE, Diagnostic Chart with Trouble Code.>
6E	Belt Pretensioner LH failure	• Seat belt pretensioner (LH) circuit is open. • Pretensioner harness (LH) is open. • Airbag control module is faulty.	<Ref. to AB(diag)-107, DTC 6E BELT PRETEN-SIONER LH FAILURE, Diagnostic Chart with Trouble Code.>
71	Driver's Airbag failure	• Airbag main harness circuit is shorted to ground. • Airbag module harness (driver's side) circuit is shorted to ground. • Roll connector circuit is shorted to ground. • Driver's airbag module is faulty. • Airbag control module is faulty.	<Ref. to AB(diag)-109, DTC 71 DRIVER'S AIR-BAG FAILURE, Diag-nostic Chart with Trouble Code.>
72	Passenger's Airbag failure	• Airbag main harness circuit is shorted to ground. • Airbag module harness (passenger's side) circuit is shorted to ground. • Passenger's airbag module is faulty. • Airbag control module is faulty.	<Ref. to AB(diag)-112, DTC 72 PASSENGER'S AIRBAG FAILURE, Diagnostic Chart with Trouble Code.>

DTC	Display	Content of diagnosis	Reference
75	Driver's Airbag failure	• Airbag main harness circuit is shorted to power supply. • Airbag module harness circuit (driver's side) is shorted to power supply. • Roll connector circuit is shorted to power supply. • Driver's airbag module is faulty. • Airbag control module is faulty.	<Ref. to AB(diag)-114, DTC 75 DRIVER'S AIRBAG FAILURE, Diagnostic Chart with Trouble Code.>
76	Passenger's Airbag failure	• Airbag main harness circuit is shorted to power supply. • Airbag module harness (passenger's side) circuit is shorted to power supply. • Passenger's airbag module is faulty. • Airbag control module is faulty.	<Ref. to AB(diag)-117, DTC 76 PASSENGER'S AIRBAG FAILURE, Diagnostic Chart with Trouble Code.>
7A	Driver's Airbag failure	• Airbag main harness circuit is shorted. • Airbag module harness (driver's side) circuit is shorted. • Roll connector circuit is shorted to power supply. • Driver's airbag module is faulty. • Airbag control module is faulty.	<Ref. to AB(diag)-119, DTC 7A DRIVER'S AIRBAG FAILURE, Diagnostic Chart with Trouble Code.>
7B	Passenger's Airbag failure	• Airbag main harness circuit is shorted. • Airbag module harness circuit (passenger's side) is shorted. • Passenger's airbag module is faulty. • Airbag control module is faulty.	<Ref. to AB(diag)-122, DTC 7B PASSENGER'S AIRBAG FAILURE, Diagnostic Chart with Trouble Code.>
7D	Driver's Airbag failure	• Airbag main harness circuit is open. • Airbag module harness circuit (driver's side) is open. • Roll connector circuit is open. • Driver's airbag module is faulty. • Airbag control module is faulty.	<Ref. to AB(diag)-124, DTC 7D DRIVER'S AIRBAG FAILURE, Diagnostic Chart with Trouble Code.>
7E	Passenger's Airbag failure	• Airbag main harness circuit is open. • Airbag module harness circuit (passenger's side) is open. • Passenger's airbag module is faulty. • Airbag control module is faulty.	<Ref. to AB(diag)-127, DTC 7E PASSENGER'S AIRBAG FAILURE, Diagnostic Chart with Trouble Code.>
91	Curtain Airbag Module RH Failure	• Curtain airbag harness (RH) circuit is shorted to ground. • Curtain airbag module (RH) is faulty. • Airbag control module is faulty.	<Ref. to AB(diag)-129, DTC 91 CURTAIN AIRBAG MODULE RH FAILURE, Diagnostic Chart with Trouble Code.>
92	Curtain Airbag Module LH Failure	• Curtain airbag harness (LH) circuit is shorted to ground. • Curtain airbag module (LH) is faulty. • Airbag control module is faulty.	<Ref. to AB(diag)-131, DTC 92 CURTAIN AIRBAG MODULE LH FAILURE, Diagnostic Chart with Trouble Code.>
95	Curtain Airbag Module RH Failure	• Curtain airbag harness (RH) is shorted to power supply. • Curtain airbag module (RH) is faulty. • Airbag control module is faulty.	<Ref. to AB(diag)-133, DTC 95 CURTAIN AIRBAG MODULE RH FAILURE, Diagnostic Chart with Trouble Code.>
96	Curtain Airbag Module LH Failure	• Curtain airbag harness (LH) is shorted to power supply. • Curtain airbag module (LH) is faulty. • Airbag control module is faulty.	<Ref. to AB(diag)-135, DTC 96 CURTAIN AIRBAG MODULE LH FAILURE, Diagnostic Chart with Trouble Code.>

DTC	Display	Content of diagnosis	Reference
9A	Curtain Airbag Module RH Failure	• Curtain airbag harness (RH) circuit is shorted. • Curtain airbag module (RH) is faulty. • Airbag control module is faulty.	<Ref. to AB(diag)-137, DTC 9A CURTAIN AIRBAG MODULE RH FAILURE, Diagnostic Chart with Trouble Code.>
9B	Curtain Airbag Module LH Failure	• Curtain airbag harness (LH) circuit is shorted. • Curtain airbag module (LH) is faulty. • Airbag control module is faulty.	<Ref. to AB(diag)-139, DTC 9B CURTAIN AIRBAG MODULE LH FAILURE, Diagnostic Chart with Trouble Code.>
9D	Curtain Airbag Module RH Failure	• Curtain airbag harness (RH) circuit is open. • Curtain airbag module (RH) is faulty. • Airbag control module is faulty.	<Ref. to AB(diag)-141, DTC 9D CURTAIN AIRBAG MODULE RH FAILURE, Diagnostic Chart with Trouble Code.>
9E	Curtain Airbag Module LH Failure	• Curtain airbag harness (LH) circuit is open. • Curtain airbag module (LH) is faulty. • Airbag control module is faulty.	<Ref. to AB(diag)-143, DTC 9E CURTAIN AIRBAG MODULE LH FAILURE, Diagnostic Chart with Trouble Code.>
A1	Front Sensor Bus Communication Error	• Open or short circuit in harness between airbag control module and front sub sensor. • Front sub sensor is faulty. • Airbag control module is faulty.	<Ref. to AB(diag)-145, DTC A1 FRONT SENSOR BUS COMMUNICATION ERROR, Diagnostic Chart with Trouble Code.>
BB	Roll Over: Firing Output	Curtain airbag module (LH/RH) and seat belt pretensioner (LH/RH) are deployed.	<Ref. to AB(diag)-147, DTC BB ROLL OVER:FIRING OUTPUT, Diagnostic Chart with Trouble Code.>
E3 E4	Front Sensor Bus RH Communication error	• Open or short circuit in harness (RH) between airbag control module and front sub sensor. • Front sub sensor (RH) is faulty. • Airbag control module is faulty.	<Ref. to AB(diag)-147, DTC E3 FRONT SENSOR BUS RH COMMUNICATION ERROR, Diagnostic Chart with Trouble Code.> <Ref. to AB(diag)-147, DTC E4 FRONT SENSOR BUS RH COMMUNICATION ERROR, Diagnostic Chart with Trouble Code.>
E7 E8	Front Sensor Bus LH Communication error	• Open or short circuit in harness (LH) between airbag control module and front sub sensor. • Front sub sensor (LH) is faulty. • Airbag control module is faulty.	<Ref. to AB(diag)-148, DTC E7 FRONT SENSOR BUS LH COMMUNICATION ERROR, Diagnostic Chart with Trouble Code.> <Ref. to AB(diag)-150, DTC E8 FRONT SENSOR BUS LH COMMUNICATION ERROR, Diagnostic Chart with Trouble Code.>

DTC	Display	Content of diagnosis	Reference
E9	Side Sensor Bus RH Communication error	• Open or short circuit in harness (RH) between airbag control module and curtain airbag sensor. • Side airbag sensor (RH) is faulty. • Curtain airbag sensor (RH) is faulty. • Airbag control module is faulty.	<Ref. to AB(diag)-150, DTC E9 SIDE SENSOR BUS RH COMMUNICATION ERROR, Diagnostic Chart with Trouble Code.>
EB EC	Side Sensor Bus RH Communication error	• Open or short circuit in harness (RH) between airbag control module and side airbag sensor. • Side airbag sensor (RH) is faulty. • Airbag control module is faulty.	<Ref. to AB(diag)-150, DTC EB SIDE SENSOR BUS RH COMMUNICATION ERROR, Diagnostic Chart with Trouble Code.> <Ref. to AB(diag)-151, DTC EC SIDE SENSOR BUS RH COMMUNICATION ERROR, Diagnostic Chart with Trouble Code.>
ED EE	Side Sensor Bus RH Communication error	• Open or short circuit in harness (RH) between airbag control module and curtain airbag sensor. • Side airbag sensor (RH) is faulty. • Curtain airbag sensor (RH) is faulty. • Airbag control module is faulty.	<Ref. to AB(diag)-153, DTC ED SIDE SENSOR BUS RH COMMUNICATION ERROR, Diagnostic Chart with Trouble Code.> <Ref. to AB(diag)-154, DTC EE SIDE SENSOR BUS RH COMMUNICATION ERROR, Diagnostic Chart with Trouble Code.>
F1	Side Sensor Bus LH Communication error	• Open or short circuit in harness (LH) between airbag control module and curtain airbag sensor. • Side airbag sensor (LH) is faulty. • Curtain airbag sensor (LH) is faulty. • Airbag control module is faulty.	<Ref. to AB(diag)-157, DTC F1 SIDE SENSOR BUS LH COMMUNICATION ERROR, Diagnostic Chart with Trouble Code.>
F3 F4	Side Sensor Bus LH Communication error	• Open or short circuit in harness (LH) between airbag control module and side airbag sensor. • Side airbag sensor (LH) is faulty. • Airbag control module is faulty.	<Ref. to AB(diag)-157, DTC F3 SIDE SENSOR BUS LH COMMUNICATION ERROR, Diagnostic Chart with Trouble Code.> <Ref. to AB(diag)-158, DTC F4 SIDE SENSOR BUS LH COMMUNICATION ERROR, Diagnostic Chart with Trouble Code.>
F5 F6	Side Sensor Bus LH Communication error	• Open or short circuit in harness (LH) between airbag control module and curtain airbag sensor. • Side airbag sensor (LH) is faulty. • Curtain airbag sensor (LH) is faulty. • Airbag control module is faulty.	<Ref. to AB(diag)-160, DTC F5 SIDE SENSOR BUS LH COMMUNICATION ERROR, Diagnostic Chart with Trouble Code.> <Ref. to AB(diag)-161, DTC F6 SIDE SENSOR BUS LH COMMUNICATION ERROR, Diagnostic Chart with Trouble Code.>

DTC	Display	Content of diagnosis	Reference
F9 FA	Satellite Sensor Bus Communication error	• Open or short circuit in harness between airbag control module and satellite safing sensor. • Satellite safing sensor is faulty. • Airbag control module is faulty.	<Ref. to AB(diag)-163, DTC F9 SATELLITE SENSOR BUS COMMUNICATION ERROR, Diagnostic Chart with Trouble Code.> <Ref. to AB(diag)-164, DTC FA SATELLITE SENSOR BUS COMMUNICATION ERROR, Diagnostic Chart with Trouble Code.>

15.Diagnostic Chart with Trouble Code

A: DTC 11 DRIVER'S AIRBAG FAILURE

DTC DETECTING CONDITION:

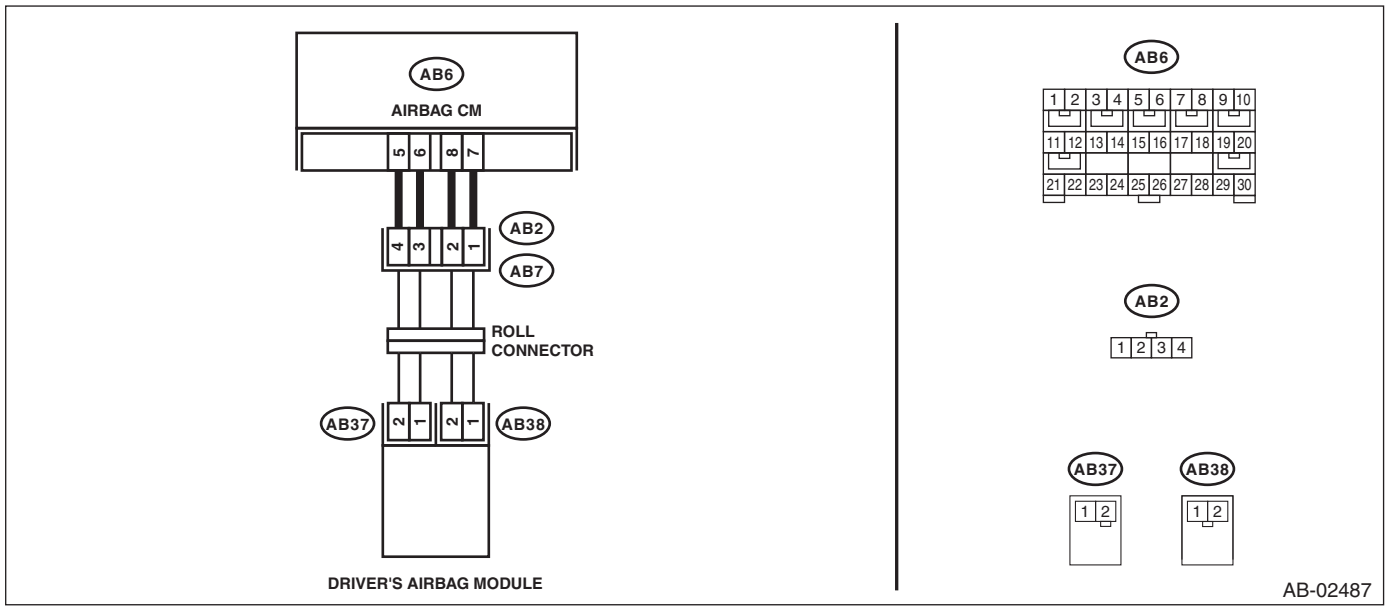
- Airbag main harness circuit is shorted to ground.
- Airbag module harness (driver's side) circuit is shorted to ground.
- Roll connector circuit is shorted to ground.
- Driver's airbag module is faulty.
- Airbag control module is faulty.

CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait 60 seconds or more 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 of the driver's and passenger's seats for safety.
• When inspecting the airbag rear harness, disconnect the side airbag module connector, curtain airbag module connector and seat belt pretensioner connector for safety reasons.

NOTE:
Prior to starting work, prepare two airbag resistors (98299PA040).

WIRING DIAGRAM:



	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 the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Remove the driver's airbag module. 3) Connect the connector (1N) in the test harness N to the connector (AB38). 4) Connect the airbag resistor to the connector (2N) of 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 six seconds and go off?	Replace the driver's airbag module. <Ref. to AB-18, Driver's Airbag Module.>	Go to step **3**.
3	**CHECK ROLL CONNECTOR.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 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 and disconnect the connector (AB7) 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) of test harness P. 7) Connect the battery ground terminal and turn the ignition switch to ON.	Does the airbag warning light illuminate for six seconds and go off?	Replace the roll connector. <Ref. to AB-29, Roll Connector.>	Go to step **4**.
4	**CHECK AIRBAG MAIN HARNESS (DRIVER'S AIRBAG HARNESS).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Disconnect the airbag resistor from the connectors (2P) and (3P) of test harness P. 3) Remove the console front panel and disconnect the connector (AB9). 4) Disconnect the connectors (AB6, AB17, AB18) from the airbag control module, and connect the connector (1AG) in the test harness AG. 5) Measure the resistance between connector (3AG) in the test harness AG and chassis ground. ***Connector & terminal*** ***(3AG) No. 1 — Chassis ground:*** ***(3AG) No. 3 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **5**.	Replace the airbag main harness along with body harness.

	Step	Check	Yes	No
5	**CHECK AIRBAG CONTROL MODULE.** 1) Connect all connectors. 2) Clear the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-24, Airbag Control Module.>	Go to step **6**.
6	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to AB(diag)-37, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

B: DTC 12 PASSENGER'S AIRBAG FAILURE

DTC DETECTING CONDITION:

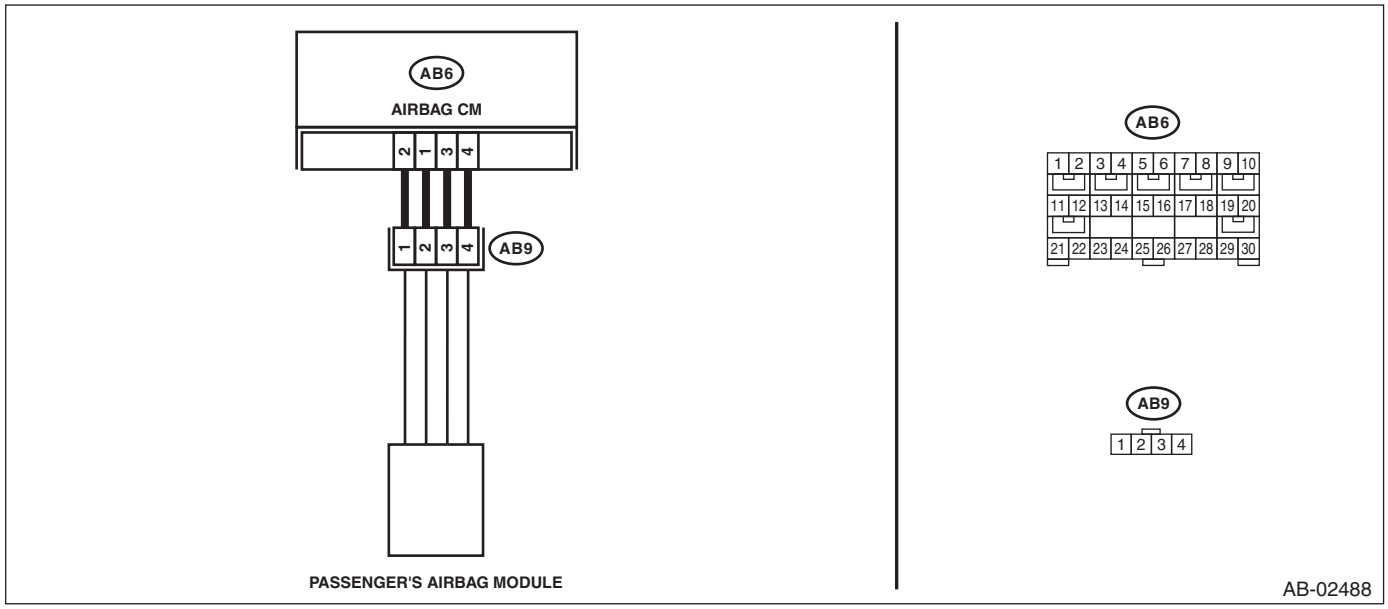
- Airbag main harness circuit is shorted to ground.
- Airbag module harness (passenger's side) circuit is shorted to ground.
- Passenger's airbag module is faulty.
- Airbag control module is faulty.

CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait 60 seconds or more 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 of the driver's and passenger's seats for safety.
• When inspecting the airbag rear harness, disconnect the side airbag module connector, curtain airbag module connector and seat belt pretensioner connector for safety reasons.

NOTE:
Prior to starting work, prepare two airbag resistors (98299PA040).

WIRING DIAGRAM:



	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 the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Remove the console front panel and disconnect the connector (AB9). 3) Connect the connector (1P) in the test harness P to connector (AB9). 4) Connect the airbag resistor to the connectors (2P) and (3P) of test harness P. 5) Connect the battery ground terminal and turn the ignition switch to ON.	Does the airbag warning light illuminate for six seconds and go off?	Replace the passenger's airbag module. <Ref. to AB-19, Passenger's Airbag Module.>	Go to step **3**.

	Step	Check	Yes	No
3	**CHECK AIRBAG MAIN HARNESS (PASSENGER'S AIRBAG HARNESS).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Disconnect the airbag resistor from the connectors (2P) and (3P) of test harness P. 3) Remove the instrument panel lower cover and disconnect the connector (AB7) from (AB2). 4) Disconnect the connectors (AB6, AB17, AB18) from the airbag control module, and connect the connector (1AG) in the test harness AG. 5) Measure the resistance between connector (3AG) in the test harness AG and chassis ground. ***Connector & terminal*** ***(3AG) No. 9 — Chassis ground:*** ***(3AG) No. 7 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **4**.	Replace the airbag main harness along with body harness.
4	**CHECK AIRBAG CONTROL MODULE.** 1) Connect all connectors. 2) Clear the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-24, Airbag Control Module.>	Go to step **5**.
5	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to AB(diag)-37, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

C: DTC 15 DRIVER'S AIRBAG FAILURE

DTC DETECTING CONDITION:

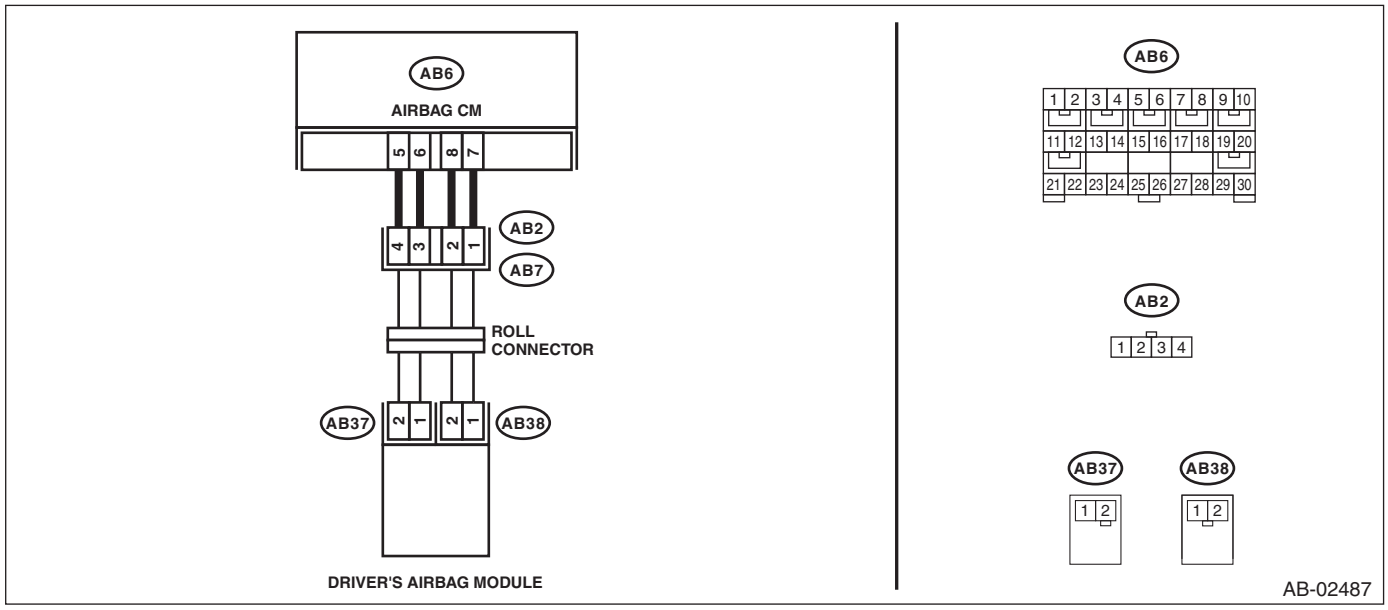
- Airbag main harness circuit (Driver's side) is shorted to power supply.
- Airbag module harness circuit (Driver's side) is shorted to power supply.
- Roll connector is shorted to power supply.
- Driver's airbag module is faulty.
- Airbag control module is faulty.

CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait 60 seconds or more 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 of the driver's and passenger's seats for safety.
• When inspecting the airbag rear harness, disconnect the side airbag module connector, curtain airbag module connector and seat belt pretensioner connector for safety reasons.

NOTE:
Prior to starting work, prepare two airbag resistors (98299PA040).

WIRING DIAGRAM:



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**.

	Step	Check	Yes	No
2	**CHECK DRIVER'S AIRBAG MODULE.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 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) of 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 six seconds and go off?	Replace the driver's airbag module. <Ref. to AB-18, Driver's Airbag Module.>	Go to step **3**.
3	**CHECK ROLL CONNECTOR.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 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 and disconnect the connector (AB7) 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) of test harness P. 7) Connect the battery ground terminal and turn the ignition switch to ON.	Does the airbag warning light illuminate for six seconds and go off?	Replace the roll connector. <Ref. to AB-29, Roll Connector.>	Go to step **4**.
4	**CHECK AIRBAG MAIN HARNESS (DRIVER'S AIRBAG HARNESS).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Disconnect the airbag resistor from the connectors (2P) and (3P) of test harness P. 3) Remove the console front panel and disconnect the connector (AB9). 4) Disconnect the connectors (AB6, AB17, AB18) from the airbag control module, and connect the connector (1AG) in the test harness AG. 5) Connect the battery ground terminal and turn the ignition switch to ON. (engine OFF) 6) Measure the voltage between connector (3AG) in the test harness AG and chassis ground. ***Connector & terminal*** ***(3AG) No. 3 (+) — Chassis ground (–):*** ***(3AG) No. 1 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **5**.	Replace the airbag main harness along with body harness.
5	**CHECK AIRBAG CONTROL MODULE.** 1) Connect all connectors. 2) Clear the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-24, Airbag Control Module.>	Go to step **6**.

Step		Check	Yes	No
6	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to AB(diag)-37, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

D: DTC 16 PASSENGER'S AIRBAG FAILURE

DTC DETECTING CONDITION:

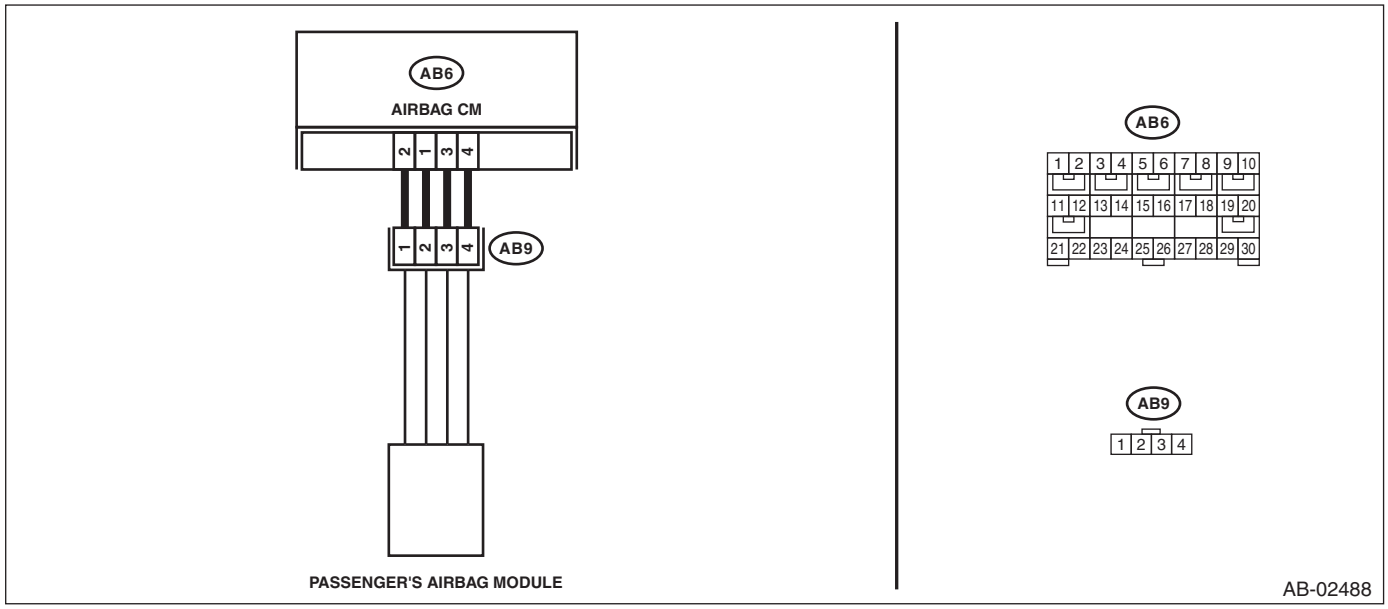
- Airbag main harness circuit (Passenger's side) is shorted to power supply.
- Airbag module harness circuit (Passenger's side) is shorted to power supply.
- Passenger's airbag module is faulty.
- Airbag control module is faulty.

CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait 60 seconds or more 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 of the driver's and passenger's seats for safety.
• When inspecting the airbag rear harness, disconnect the side airbag module connector, curtain airbag module connector and seat belt pretensioner connector for safety reasons.

NOTE:
Prior to starting work, prepare two airbag resistors (98299PA040).

WIRING DIAGRAM:



	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 chassis harness.	Go to step **2**.
2	**CHECK PASSENGER'S AIRBAG MODULE.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Remove the console front panel and disconnect the connector (AB9). 3) Connect the connector (1P) in the test harness P to connector (AB9). 4) Connect the airbag resistor to the connectors (2P) and (3P) of test harness P. 5) Connect the battery ground terminal and turn the ignition switch to ON.	Does the airbag warning light illuminate for six seconds and go off?	Replace the passenger's airbag module. <Ref. to AB-19, Passenger's Airbag Module.>	Go to step **3**.
3	**CHECK AIRBAG MAIN HARNESS (PASSENGER'S AIRBAG HARNESS).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Disconnect the airbag resistor from the connectors (2P) and (3P) of test harness P. 3) Remove the instrument panel lower cover and disconnect the connector (AB7) from (AB2). 4) Disconnect the connectors (AB6, AB17, AB18) from the airbag control module, and connect the connector (1AG) in the test harness AG. 5) Connect the battery ground terminal and turn the ignition switch to ON. (engine OFF) 6) Measure the voltage between connector (3AG) in the test harness AG and chassis ground. ***Connector & terminal*** ***(3AG) No. 9 (+) — Chassis ground (–):*** ***(3AG) No. 7 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **4**.	Replace the airbag main harness along with body harness.
4	**CHECK AIRBAG CONTROL MODULE.** 1) Connect all connectors. 2) Clear the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-24, Airbag Control Module.>	Go to step **5**.
5	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to AB(diag)-37, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

E: DTC 1A DRIVER'S AIRBAG FAILURE

DTC DETECTING CONDITION:

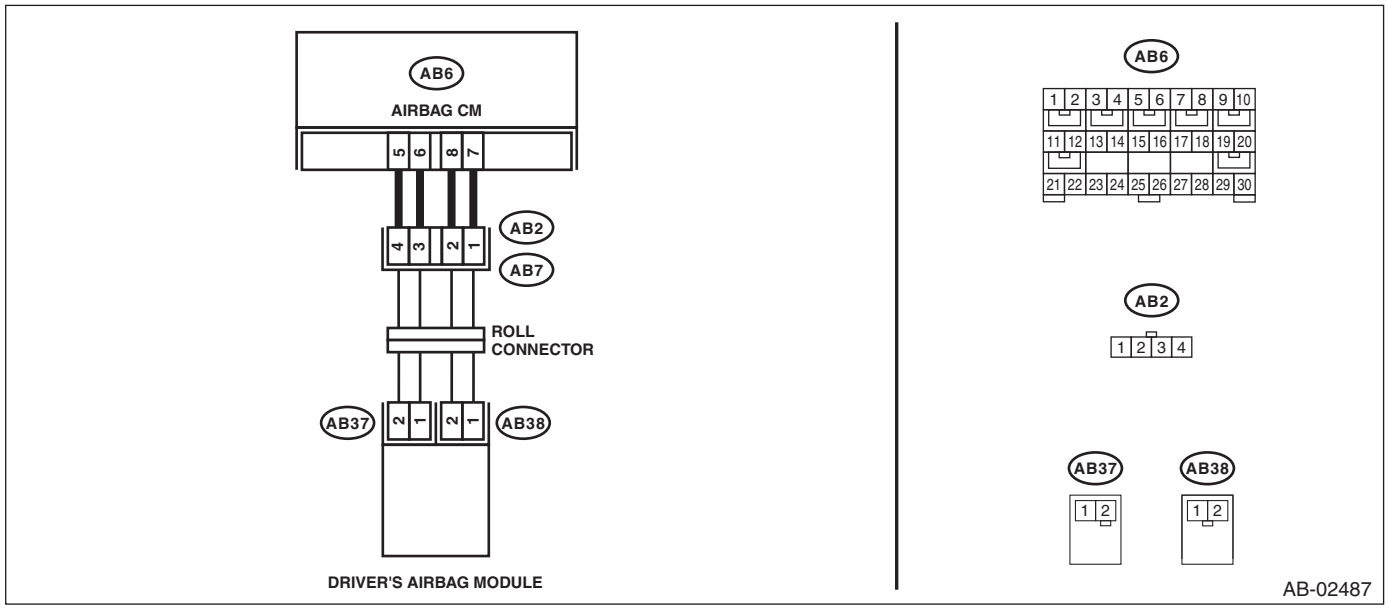
- Airbag main harness circuit is shorted.
- Airbag module harness (driver's side) circuit is shorted.
- Roll connector circuit is shorted.
- Driver's airbag module is faulty.
- Airbag control module is faulty.

CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait 60 seconds or more 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 of the driver's and passenger's seats for safety.
• When inspecting the airbag rear harness, disconnect the side airbag module connector, curtain airbag module connector and seat belt pretensioner connector for safety reasons.

NOTE:
Prior to starting work, prepare two airbag resistors (98299PA040).

WIRING DIAGRAM:



	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 the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Remove the driver's airbag module. 3) Connect the connector (1N) in the test harness N to the connector (AB38). 4) Connect the airbag resistor to the connector (2N) of 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 and go off?	Replace the driver's airbag module. <Ref. to AB-18, Driver's Airbag Module.>	Go to step **3**.
3	**CHECK ROLL CONNECTOR.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 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 and disconnect the connector (AB7) 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) of test harness P. 7) Connect the battery ground terminal and turn the ignition switch to ON.	Does the airbag warning light illuminate for six seconds and go off?	Replace the roll connector. <Ref. to AB-29, Roll Connector.>	Go to step **4**.
4	**CHECK AIRBAG MAIN HARNESS (DRIVER'S AIRBAG HARNESS).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Disconnect the airbag resistor from the connectors (2P) and (3P) of test harness P. 3) Remove the console front panel and disconnect the connector (AB9). 4) Disconnect the connectors (AB6, AB17, AB18) from the airbag control module, and connect the connector (1AG) in the test harness AG. 5) Measure the resistance between connector (3AG) terminals in test harness AG. ***Connector & terminal*** ***(3AG) No. 1 — (3AG) No. 3:***	Is the resistance 1 MΩ or more?	Go to step **5**.	Replace the airbag main harness along with body harness.
5	**CHECK AIRBAG CONTROL MODULE.** 1) Connect all connectors. 2) Clear the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-24, Airbag Control Module.>	Go to step **6**.

Step		Check	Yes	No
6	CHECK FOR ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to AB(diag)-37, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

F: DTC 1B PASSENGER'S AIRBAG FAILURE

DTC DETECTING CONDITION:

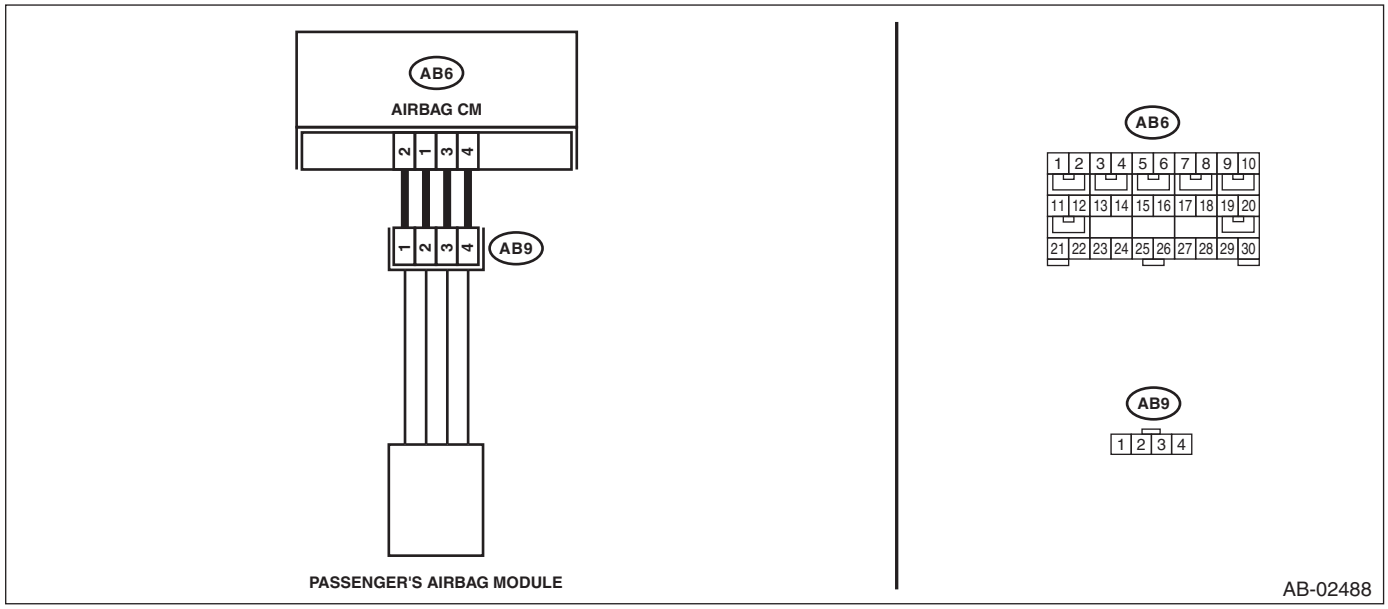
- Airbag main harness circuit is shorted.
- Airbag module harness (passenger's side) circuit is shorted.
- Passenger's airbag module is faulty.
- Airbag control module is faulty.

CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait 60 seconds or more 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 of the driver's and passenger's seats for safety.
• When inspecting the airbag rear harness, disconnect the side airbag module connector, curtain airbag module connector and seat belt pretensioner connector for safety reasons.

NOTE:
Prior to starting work, prepare two airbag resistors (98299PA040).

WIRING DIAGRAM:



	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 the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Remove the console front panel and disconnect the connector (AB9). 3) Connect the connector (1P) in the test harness P to connector (AB9). 4) Connect the airbag resistor to the connectors (2P) and (3P) of 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 and go off?	Replace the passenger's airbag module. <Ref. to AB-19, Passenger's Airbag Module.>	Go to step **3**.
3	**CHECK AIRBAG MAIN HARNESS (PASSENGER'S AIRBAG HARNESS).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Disconnect the airbag resistor from the connectors (2P) and (3P) of test harness P. 3) Remove the instrument panel lower cover and column cover, and disconnect the connector (AB7) from (AB2). 4) Disconnect the connectors (AB6, AB17, AB18) from the airbag control module, and connect the connector (1AG) in the test harness AG. 5) Measure the resistance between connector (3AG) terminals in test harness AG. ***Connector & terminal*** ***(3AG) No. 7 — (3AG) No. 9:***	Is the resistance 1 MΩ or more?	Go to step **4**.	Replace the airbag main harness along with body harness.
4	**CHECK AIRBAG CONTROL MODULE.** 1) Connect all connectors. 2) Clear the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-24, Airbag Control Module.>	Go to step **5**.
5	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to AB(diag)-37, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

G: DTC 1D DRIVER'S AIRBAG FAILURE

DTC DETECTING CONDITION:

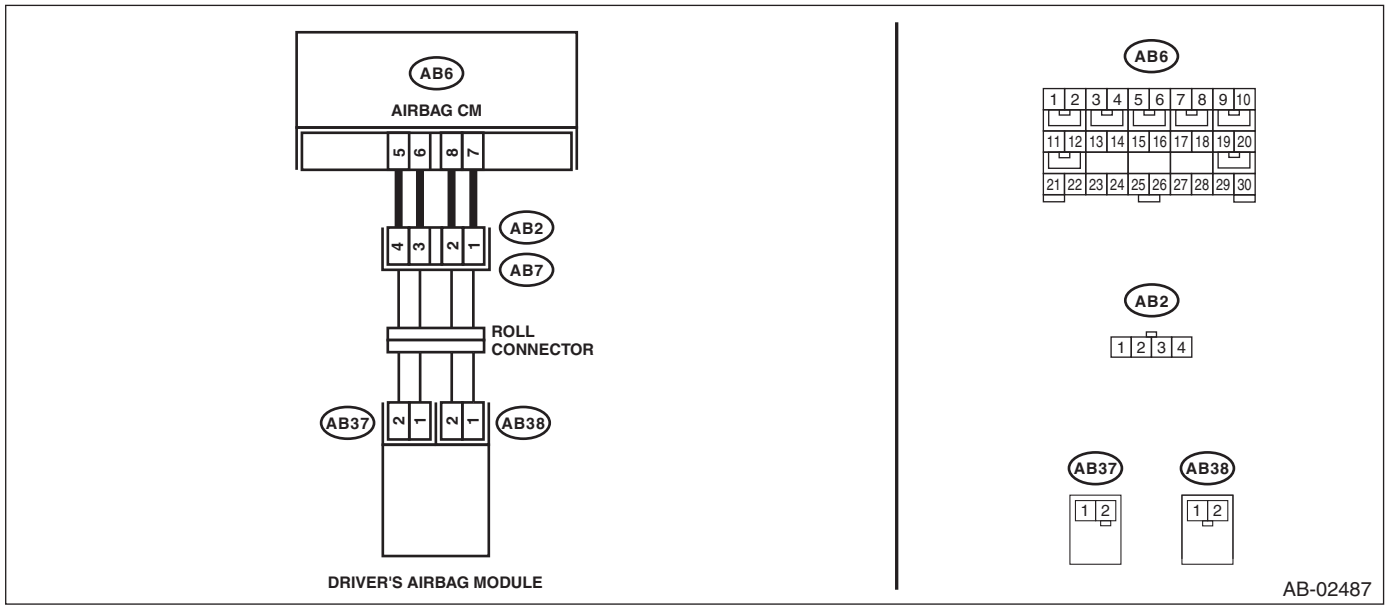
- Airbag main harness circuit is open.
- Airbag module harness (driver's side) circuit is open.
- Roll connector circuit is open.
- Driver's airbag module is faulty.
- Airbag control module is faulty.

CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait 60 seconds or more 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 of the driver's and passenger's seats for safety.
• When inspecting the airbag rear harness, disconnect the side airbag module connector, curtain airbag module connector and seat belt pretensioner connector for safety reasons.

NOTE:
Prior to starting work, prepare two airbag resistors (98299PA040).

WIRING DIAGRAM:



	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 the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Remove the driver's airbag module. 3) Connect the connector (1N) in the test harness N to the connector (AB38). 4) Connect the airbag resistor to the connector (2N) of 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 and go off?	Replace the driver's airbag module. <Ref. to AB-18, Driver's Airbag Module.>	Go to step **3**.
3	**CHECK ROLL CONNECTOR.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Disconnect the connector (1N) in the test harness N from the connector (AB38). 3) Disconnect the test harness Q from connector (AB37). 4) Remove the instrument panel lower cover and disconnect the connector (AB7) 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) of 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 and go off?	Replace the roll connector. <Ref. to AB-29, Roll Connector.>	Go to step **4**.
4	**CHECK AIRBAG MAIN HARNESS (DRIVER'S AIRBAG HARNESS).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Disconnect the airbag resistor from the connectors (2P) and (3P) of test harness P. 3) Remove the console front panel and disconnect the connector (AB9). 4) Disconnect the connectors (AB6, AB17, AB18) from the airbag control module, and connect the connector (1AG) in the test harness AG. 5) Measure the resistance between connector (3AG) of test harness AG and connector (2P) of test harness P. ***Connector & terminal*** ***(3AG) No. 1 — (2P) No. 1:*** ***(3AG) No. 3 — (2P) No. 2:***	Is the resistance less than 10 Ω?	Go to step **5**.	Replace the airbag main harness along with body harness.

	Step	Check	Yes	No
5	**CHECK AIRBAG CONTROL MODULE.** 1) Connect all connectors. 2) Clear the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-24, Airbag Control Module.>	Go to step **6**.
6	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to AB(diag)-37, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

H: DTC 1E PASSENGER'S AIRBAG FAILURE

DTC DETECTING CONDITION:

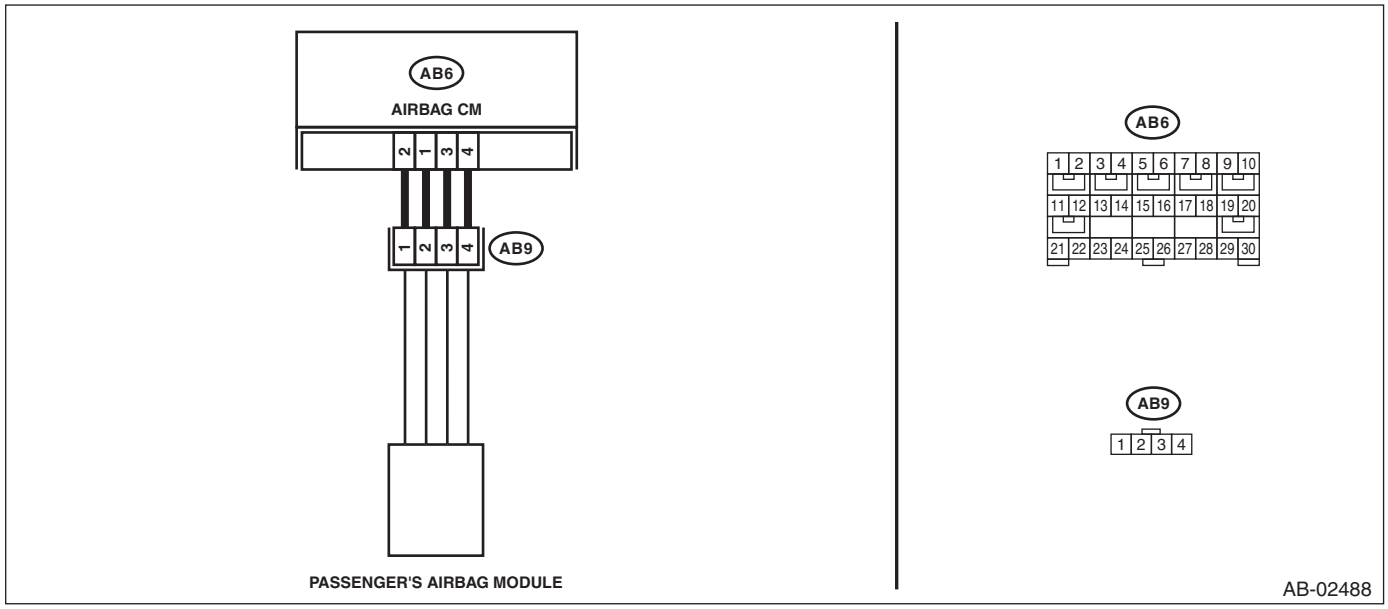
- Airbag main harness circuit is open.
- Airbag module harness (passenger's side) circuit is open.
- Passenger's airbag module is faulty.
- Airbag control module is faulty.

CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait 60 seconds or more 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 of the driver's and passenger's seats for safety.
• When inspecting the airbag rear harness, disconnect the side airbag module connector, curtain airbag module connector and seat belt pretensioner connector for safety reasons.

NOTE:
Prior to starting work, prepare two airbag resistors (98299PA040).

WIRING DIAGRAM:



	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 the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Remove the console front panel and disconnect the connector (AB9). 3) Connect the connector (1P) in the test harness P to connector (AB9). 4) Connect the airbag resistor to the connectors (2P) and (3P) of 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 and go off?	Replace the passenger's airbag module. <Ref. to AB-19, Passenger's Airbag Module.>	Go to step **3**.
3	**CHECK AIRBAG MAIN HARNESS (PASSENGER'S AIRBAG HARNESS).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Disconnect the airbag resistor from the connectors (2P) and (3P) of test harness P. 3) Remove the instrument panel lower cover and column cover, and disconnect the connector (AB7) from (AB2). 4) Disconnect the connectors (AB6, AB17, AB18) from the airbag control module, and connect the connector (1AG) in the test harness AG. 5) Measure the resistance between connector (3AG) of test harness AG and connector (2P) of test harness P. ***Connector & terminal*** ***(3AG) No. 9 — (2P) No. 1:*** ***(3AG) No. 7 — (2P) No. 2:***	Is the resistance less than 10 Ω?	Go to step **4**.	Replace the airbag main harness along with body harness.
4	**CHECK AIRBAG CONTROL MODULE.** 1) Connect all connectors. 2) Clear the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-24, Airbag Control Module.>	Go to step **5**.
5	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to AB(diag)-37, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

I: 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 cable from battery, and wait 60 seconds or more 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 IF DTC 21 IS INDICATED.** Read the DTC. <Ref. to AB(diag)-28, OPERATION, Read Diagnostic Trouble Code (DTC).>	Does the Subaru Select Monitor display DTC21?	Replace the airbag control module. <Ref. to AB-24, Airbag Control Module.>	Perform the Clear Memory Mode. <Ref. to AB(diag)-30, OPERATION, Clear Memory Mode.>

J: DTC 22 FRONT AIRBAG FIRING OUTPUT

This DTC is indicated when the front airbag module and the pretensioner are deployed.
Once this DTC is displayed, the memory cannot be cleared. Therefore replace the following parts.
- Airbag control module <Ref. to AB-24, Airbag Control Module.>
- Driver's airbag module <Ref. to AB-18, Driver's Airbag Module.>
- Passenger's airbag module <Ref. to AB-19, Passenger's Airbag Module.>
- Front sub sensor of both sides. <Ref. to AB-25, Front Sub Sensor.>
- Front outer seat belt with pretensioner of both sides. <Ref. to SB-17, Front Seat Belt.>
- Steering roll connector <Ref. to AB-29, Roll Connector.>
- Occupant detection system (passenger's seat cushion & frame assembly) <Ref. to SE-8, Front Seat.>

K: DTC 26 PASSENGER'S AIRBAG INDICATOR FAILURE

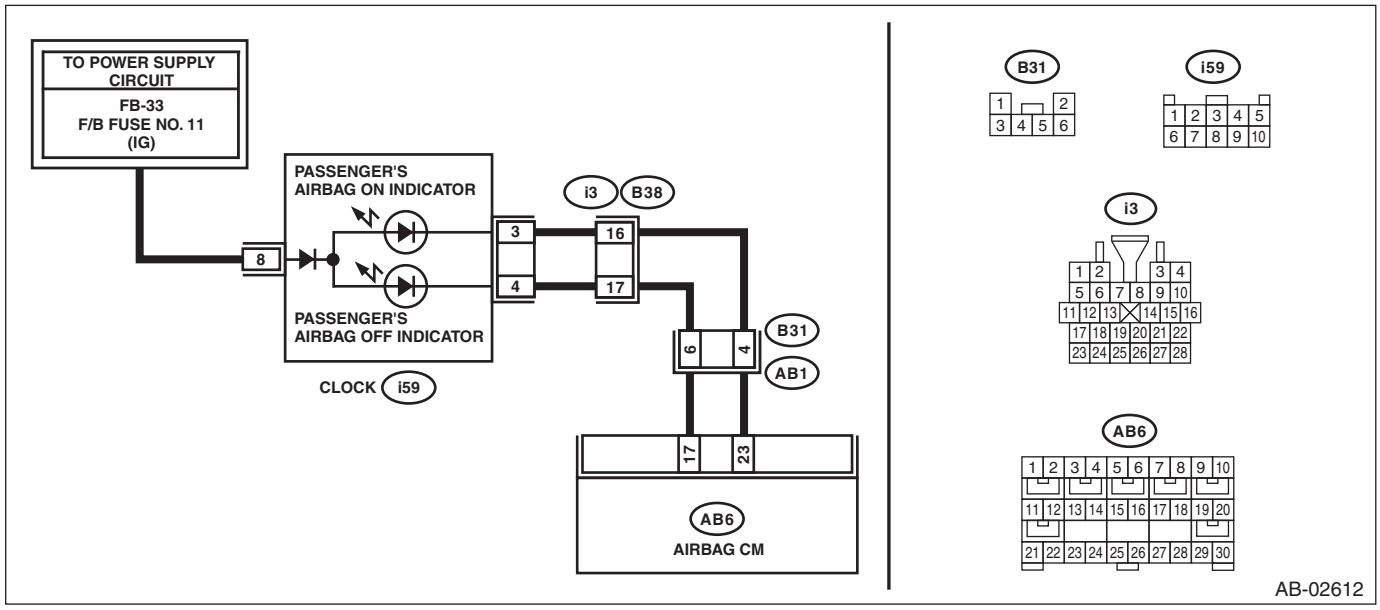
DTC DETECTING CONDITION:

- Passenger's airbag indicator is faulty.
- Airbag control module is faulty.
- Airbag main harness circuit is open.
- Body harness circuit is open.

CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait 60 seconds or more 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 of the driver's and passenger's seats for safety.
• When inspecting the airbag rear harness, disconnect the side airbag module connector, curtain airbag module connector and seat belt pretensioner connector for safety reasons.

WIRING DIAGRAM:



Diagnostic Chart with Trouble Code

	Step	Check	Yes	No
1	**CHECK FOR POOR CONTACT.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Confirm that firm contact is secured for the connector between the airbag control module and the clock.	Is there poor contact of any connector?	Repair the bulkhead harness. Or replace the airbag main harness along with body harness.	Go to step **2**.
2	**CHECK AIRBAG MAIN HARNESS.** 1) Disconnect the connectors (AB6, AB17, AB18) from airbag control module. 2) Connect the battery ground terminal and turn the ignition switch to ON. NOTE: Neither of ON/OFF illuminates when it is normal.	Does the passenger's airbag indicator illuminate?	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 disconnect the connector (i59). 3) Connect the connector (1AG) in the test harness AG to the connectors (AB6, AB17, AB18). 4) Measure the resistance between connector (2AG) in the test harness AG and chassis ground. ***Connector & terminal*** ***(2AG) No. 9 — (2AG) No. 8:*** ***(2AG) No. 9 — Chassis ground:*** ***(2AG) No. 8 — Chassis ground:***	Is the resistance 1 MΩ or more?	Replace the clock. <Ref. to IDI-27, REMOVAL, Clock.>	Repair the bulkhead harness. Or replace the airbag main harness along with body harness.
4	**CHECK AIRBAG HARNESS.** 1) Turn the ignition switch to OFF. 2) Connect the connector (1AG) in the test harness AG to the connectors (AB6, AB17, AB18). 3) Connect the connectors (7AG) and (8AG) in the test harness AG. 4) Connect the battery ground terminal and turn the ignition switch to ON.	Does the passenger's airbag indicator illuminate?	Replace the airbag control module. <Ref. to AB-24, Airbag Control Module.>	Go to step **5**.
5	**CHECK AIRBAG HARNESS.** 1) Turn the ignition switch to OFF. 2) Remove the clock and disconnect the connector (i59). 3) Measure the resistance between connector (2AG) in the test harness AG and connector (i59). ***Connector & terminal*** ***(2AG) No. 9 — (i59) No. 4:*** ***(2AG) No. 8 — (i59) No. 3:***	Is the resistance less than 10 Ω?	Go to step **6**.	Repair the bulkhead harness. Or replace the airbag main harness along with body harness.
6	**CHECK BODY HARNESS.** 1) Turn the ignition switch to ON. 2) Measure the voltage between connector (i59) and chassis ground. ***Connector & terminal*** ***(i59) No. 8 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Replace the clock. <Ref. to IDI-27, REMOVAL, Clock.>	Repair the clock power supply line.

L: DTC 27 ODS COMMUNICATION ERROR

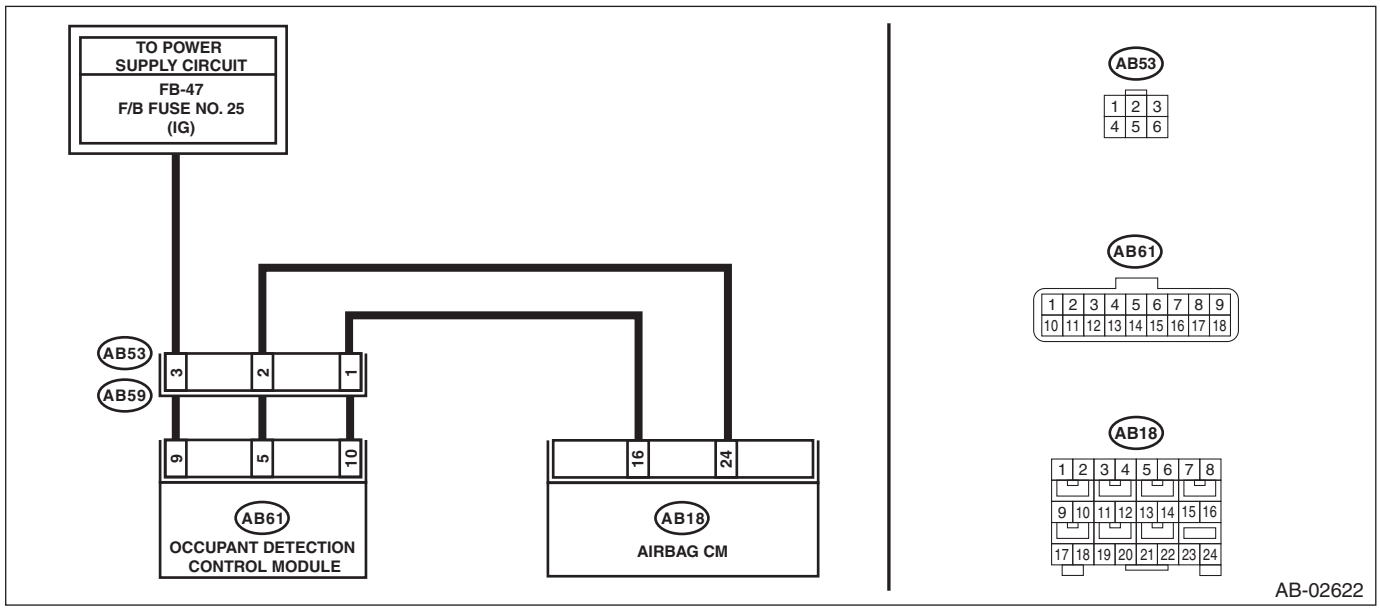
DTC DETECTING CONDITION:

- Communication to the occupant detection control module is faulty.
- Airbag rear harness circuit is open, shorted, shorted to ground or shorted to power supply.
- Occupant detection harness (seat harness) is faulty.
- Occupant detection system 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 cable from battery, and wait 60 seconds or more 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 rear harness, disconnect the side airbag module connector, curtain airbag module connector and seat belt pretensioner connector for safety reasons.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK POOR CONTACT OF CONNECTORS.** Check for poor contact of the connectors between the airbag control module and the occupant detection control module.	Is there poor contact?	Reconnect the connector. If defective is not improved, replace the airbag rear harness along with the body harness or the occupant detection harness (seat harness).	Go to step **2**.
2	**CHECK AIRBAG HARNESS.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Disconnect the connectors (AB6, AB17, AB18) from airbag control module. 3) Disconnect the connectors (AB59) and (AB53) under the passenger's seat. 4) Connect the connector (1AG) in the test harness AG to the connectors (AB6, AB17, AB18). 5) Connect the connector (1AB) in the test harness AB to the connector (AB53). 6) Measure the resistance between connector (6AG) in the test harness AG and connector (2AB) in the test harness AB. ***Connector & terminal*** ***(6AG) No. 9 — (2AB) No. 1:*** ***(6AG) No. 11 — (2AB) No. 2:***	Is the resistance less than 10 Ω?	Go to step **3**.	Replace the airbag rear harness along with body harness.
3	**CHECK AIRBAG HARNESS.** Measure the resistance between connector (6AG) in the test harness AG and chassis ground. ***Connector & terminal*** ***(6AG) No. 9 — Chassis ground:*** ***(6AG) No. 9 — (6AG) No. 11:*** ***(6AG) No. 11 — Chassis ground:***	Is the resistance less than 1 MΩ?	Go to step **4**.	Replace the airbag rear harness along with body harness.
4	**CHECK AIRBAG HARNESS.** 1) Turn the ignition switch to ON. 2) Measure the voltage between connector (2AB) in the test harness AB and chassis ground. ***Connector & terminal*** ***(2AB) No. 3 (+) — Chassis ground (–):***	Is the voltage 9 V or more?	Replace the occupant detection harness (seat harness). If defective is not improved, replace the occupant detection system (seat cushion & frame assembly), and then the airbag control module in this order.	Check the battery voltage and fuse. If there is no fault, replace the airbag rear harness along with body harness or replace the body harness.

M: DTC 29 ODS FAILURE

NOTE:
Refer to “Occupant Detection System” for details on DTC 29. <Ref. to OD(diag)-26, DTC 29 ODS FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

N: DTC 2A ODS CALIBRATION ERROR

NOTE:
Refer to “Occupant Detection System” for details on DTC 2A. <Ref. to OD(diag)-23, DTC 2A ODS CALIBRATION ERROR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

O: DTC 2B ODS SYSTEM WRONG PARTS

NOTE:
Refer to “Occupant Detection System” for details on DTC 2B. <Ref. to OD(diag)-23, DTC 2B ODS SYSTEM WRONG PARTS, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

P: DTC 2C BELT TENSION SENSOR FAILURE

NOTE:
Refer to “Occupant Detection System” for details on DTC 2C. <Ref. to OD(diag)-24, DTC 2C BELT TENSION SENSOR FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Q: DTC 2D AIRBAG WARNING INDICATOR FAILURE

DTC DETECTING CONDITION:

- Airbag warning light is faulty.
- Harness between airbag control module and airbag warning light is shorted or open.
- Connection of airbag main harness and instrument panel harness is improper.
- Grounding circuit is faulty.
- Airbag control module is faulty.

NOTE:
For the diagnostic procedure, refer to “Airbag Warning Light Failure”. <Ref. to AB(diag)-33, Airbag Warning Light Failure.>

R: DTC 33 FRONT SUB SENSOR RH FAILURE

DTC DETECTING CONDITION:

Front sub sensor (RH) is faulty.
When DTC 33 is displayed, the circuit within the front sub sensor (RH) is faulty.
Replace the front sub sensor (RH). <Ref. to AB-25, Front Sub Sensor.>

S: DTC 34 FRONT SUB SENSOR LH FAILURE

DTC DETECTING CONDITION:

Front sub sensor (LH) is faulty.
If DTC 34 is displayed, the circuit within the front sub sensor (LH) is faulty.
Replace the front sub sensor (LH). <Ref. to AB-25, Front Sub Sensor.>

T: DTC 37 BUCKLE SWITCH RH FAILURE

NOTE:
Refer to “Occupant Detection System” for details on DTC 37. <Ref. to OD(diag)-27, DTC 37 BUCKLE SWITCH RH FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

U: DTC 39 SEAT BELT WARNING FAILURE

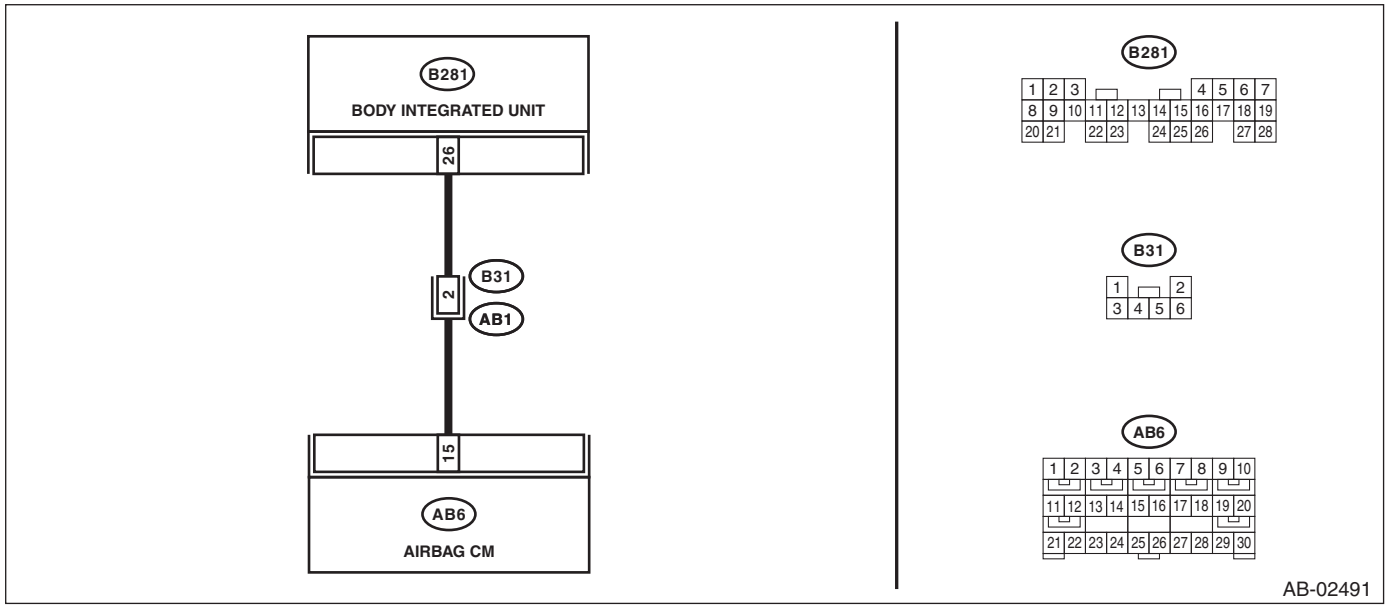
DTC DETECTING CONDITION:

- Airbag control module is faulty.
- Body integrated unit is faulty.
- Harness circuits between body integrated unit and airbag control module are open, shorted or shorted to ground.

CAUTION:

- **Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait 60 seconds or more 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 of the driver's and passenger's seats for safety.**

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK AIRBAG HARNESS.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Disconnect the connectors (AB6, AB17, AB18) from airbag control module. 3) Connect the battery ground terminal and turn the ignition switch to ON.	Does the passenger's seat belt warning light blink for 6 seconds and go off?	Go to step **3**.	Go to step **2**.
2	**CHECK AIRBAG HARNESS.** 1) Turn the ignition switch to OFF. 2) Connect the connector (1AG) in the test harness AG to the connectors (AB6, AB17, AB18). 3) Measure the resistance between connector (2AG) in the test harness AG and chassis ground. ***Connector & terminal*** ***(2AG) No. 10 — Chassis ground:***	Is the resistance 1 MΩ or more?	Replace the body integrated unit.	Repair the bulkhead harness. Or replace the airbag main harness along with body harness.
3	**CHECK AIRBAG HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors (AB6, AB17, AB18) from the airbag control module, and connect the connector (1AG) in the test harness AG. 3) Connect the connectors (7AG) and (8AG) in the test harness AG. 4) Turn the ignition switch to ON.	Does the passenger's seat belt warning light blink for 6 seconds, then repeatedly light and go off?	Replace the airbag control module. <Ref. to AB-24, Airbag Control Module.>	Go to step **4**.
4	**CHECK AIRBAG HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors (7AG) and (8AG) in the test harness AG. 3) Disconnect the connector (B281) from body integrated unit. 4) Measure the resistance between connector (2AG) in the test harness AG and connector (B281). ***Connector & terminal*** ***(2AG) No. 10 — (B281) No. 26:***	Is the resistance less than 10 Ω?	Replace the body integrated unit.	Repair the bulkhead harness. Or replace the airbag main harness along with body harness.

V: DTC 3A FRONT SUB SENSOR RH FALSE INSTALLATION

DTC DETECTING CONDITION:

Front sub sensor (RH) is misinstalled.

	Step	Check	Yes	No
1	**REPLACE FRONT SUB SENSOR.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Replace the front sub sensor (RH) with a genuine sensor. <Ref. to AB-25, REMOVAL, Front Sub Sensor.>	Does the warning light go off?	Finish the diagnosis.	Replace the airbag control module. <Ref. to AB-24, REMOVAL, Airbag Control Module.>

W: DTC 3B FRONT SUB SENSOR LH FALSE INSTALLATION

DTC DETECTING CONDITION:

Front sub sensor (LH) is misinstalled.

	Step	Check	Yes	No
1	**REPLACE FRONT SUB SENSOR.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Replace the front sub sensor (LH) with a genuine sensor. <Ref. to AB-25, REMOVAL, Front Sub Sensor.>	Does the warning light go off?	Finish the diagnosis.	Replace the airbag control module. <Ref. to AB-24, REMOVAL, Airbag Control Module.>

X: DTC 3C SATELLITE SENSOR BUS FAILURE

DTC DETECTING CONDITION:

Satellite safing sensor is faulty.

	Step	Check	Yes	No
1	**REPLACE SATELLITE SAFING SENSOR.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Replace the satellite safing sensor with a genuine sensor. <Ref. to AB-28, REMOVAL, Satellite Safing Sensor.>	Does the warning light go off?	Finish the diagnosis.	Replace the airbag control module. <Ref. to AB-24, REMOVAL, Airbag Control Module.>

Y: DTC 3D SATELLITE SENSOR FALSE INSTALLATION

DTC DETECTING CONDITION:

Satellite safing sensor is misinstalled.

	Step	Check	Yes	No
1	**REPLACE SATELLITE SAFING SENSOR.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Replace the satellite safing sensor with a genuine sensor. <Ref. to AB-28, REMOVAL, Satellite Safing Sensor.>	Does the warning light go off?	Finish the diagnosis.	Replace the airbag control module. <Ref. to AB-24, REMOVAL, Airbag Control Module.>

Z: DTC 41 SIDE AIRBAG RH FAILURE

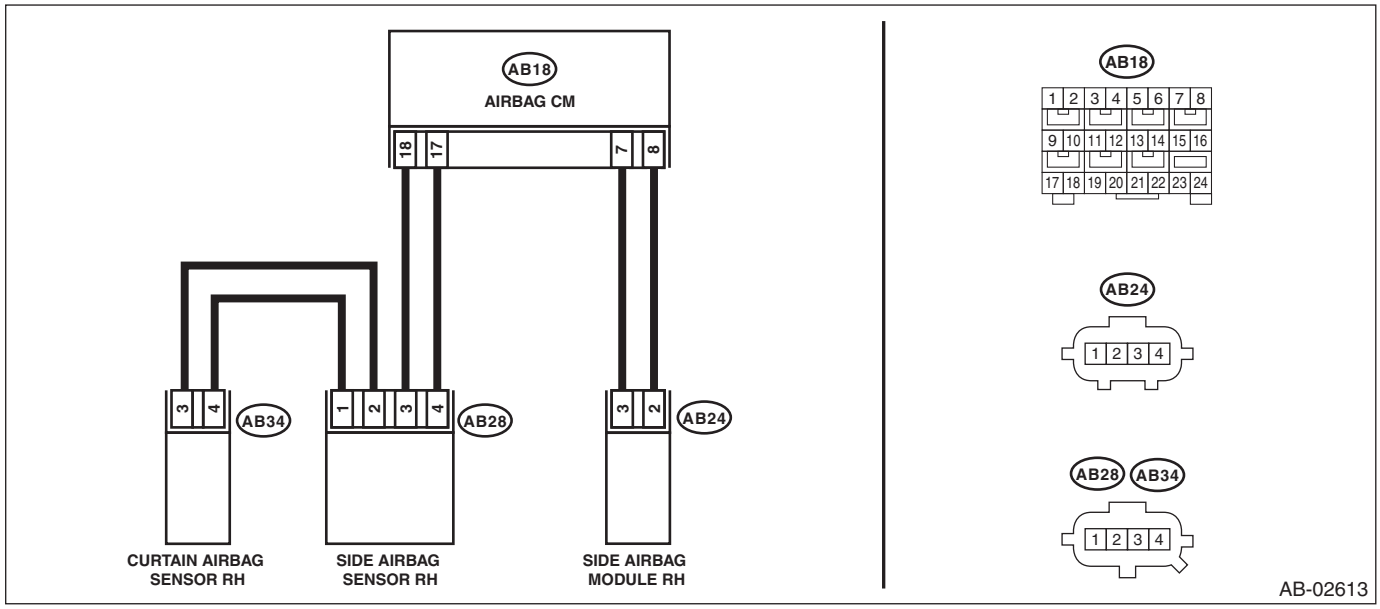
DTC DETECTING CONDITION:

- Side airbag harness (RH) circuit is shorted to ground.
- 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 cable from battery, and wait 60 seconds or more 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 of the driver's and passenger's seats for safety.
• When inspecting the airbag rear harness, disconnect the side airbag module connector, curtain airbag module connector and seat belt pretensioner connector for safety reasons.

WIRING DIAGRAM:



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 along with body harness.	Go to step **2**.
2	**CHECK SIDE AIRBAG MODULE.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Disconnect the connector (AB24), and connect the connector (1AJ) in test harness AJ to connector (AB24). 3) Connect the airbag resistor to the test harness AJ connector (3AJ). 4) Connect the battery ground terminal and turn the ignition switch to ON.	Does the airbag warning light illuminate for six seconds and go off?	Replace the side airbag module (RH). <Ref. to AB-20, REMOVAL, Side Airbag Module.>	Go to step **3**.

	Step	Check	Yes	No
3	**CHECK AIRBAG REAR HARNESS (SIDE AIRBAG MODULE HARNESS RH).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Disconnect the connector (AB26) from seat belt pretensioner (RH). 3) Disconnect the connector (AB33) from curtain airbag module (RH). 4) Disconnect the airbag resistor from test harness AJ. 5) Disconnect the connectors (AB6, AB17, AB18) from airbag control module. 6) Connect the connector (1AG) in the test harness AG to the connectors (AB6, AB17, AB18). 7) Measure the resistance between connector (5AG) in the test harness AG and chassis ground. ***Connector & terminal*** ***(5AG) No. 5 — Chassis ground:*** ***(5AG) No. 7 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **4**.	Replace the airbag rear harness along with body harness.
4	**CHECK AIRBAG CONTROL MODULE.** 1) Connect all connectors. 2) Clear the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-24, Airbag Control Module.>	Go to step **5**.
5	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to AB(diag)-37, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

AA:DTC 42 SIDE AIRBAG LH FAILURE

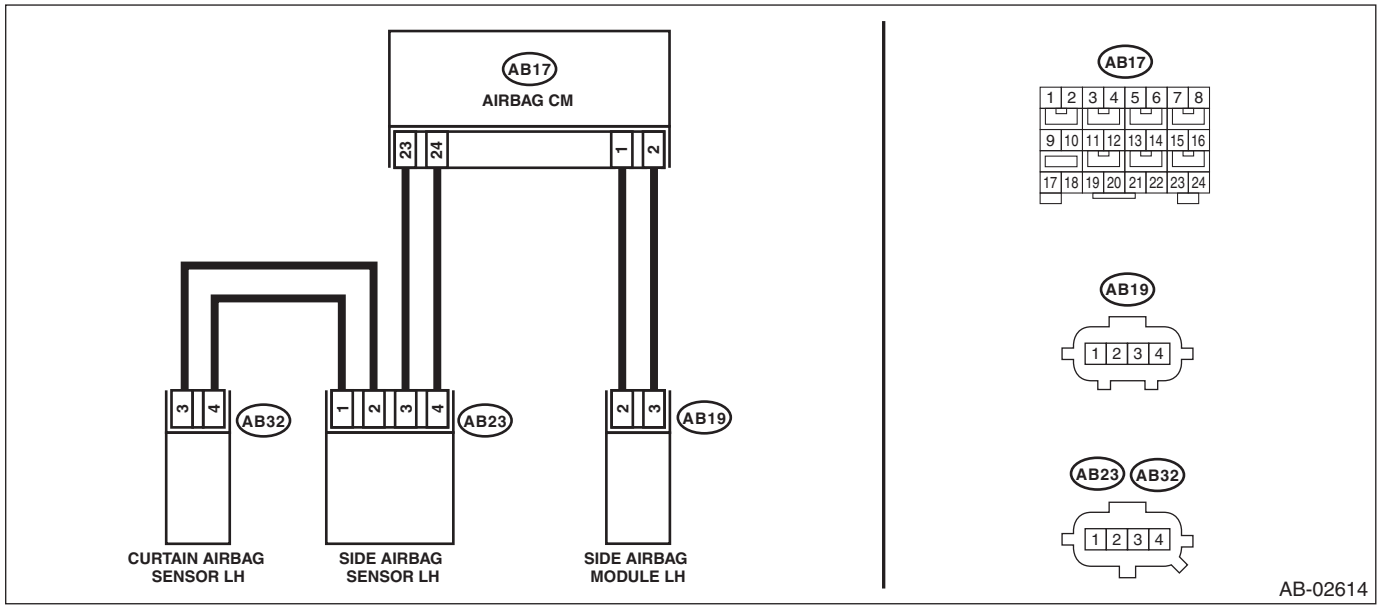
DTC DETECTING CONDITION:

- Side airbag harness (LH) circuit is shorted to ground.
- 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 cable from battery, and wait 60 seconds or more 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 of the driver's and passenger's seats for safety.
• When inspecting the airbag rear harness, disconnect the side airbag module connector, curtain airbag module connector and seat belt pretensioner connector for safety reasons.

WIRING DIAGRAM:



	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 along with body harness.	Go to step **2**.
2	**CHECK SIDE AIRBAG MODULE.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Disconnect the connector (AB19), and connect the connector (1AJ) in test harness AJ to connector (AB19). 3) Connect the airbag resistor to the test harness AJ connector (3AJ). 4) Connect the battery ground terminal and turn the ignition switch to ON.	Does the airbag warning light illuminate for six seconds and go off?	Replace the side airbag module (LH). <Ref. to AB-20, REMOVAL, Side Airbag Module.>	Go to step **3**.

	Step	Check	Yes	No
3	**CHECK AIRBAG REAR HARNESS (SIDE AIRBAG MODULE HARNESS LH).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Disconnect the connector (AB21) from seat belt pretensioner (LH). 3) Disconnect the connector (AB31) from curtain airbag module (LH). 4) Disconnect the airbag resistor from test harness. 5) Disconnect the connectors (AB6, AB17, AB18) from airbag control module. 6) Connect the connector (1AG) in the test harness AG to the connectors (AB6, AB17, AB18). 7) Measure the resistance between connector (5AG) in the test harness AG and chassis ground. ***Connector & terminal*** ***(5AG) No. 1 — Chassis ground:*** ***(5AG) No. 3 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **4**.	Replace the airbag rear harness along with body harness.
4	**CHECK AIRBAG CONTROL MODULE.** 1) Connect all connectors. 2) Clear the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-24, Airbag Control Module.>	Go to step **5**.
5	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to AB(diag)-37, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

AB:DTC 45 SIDE AIRBAG RH FAILURE

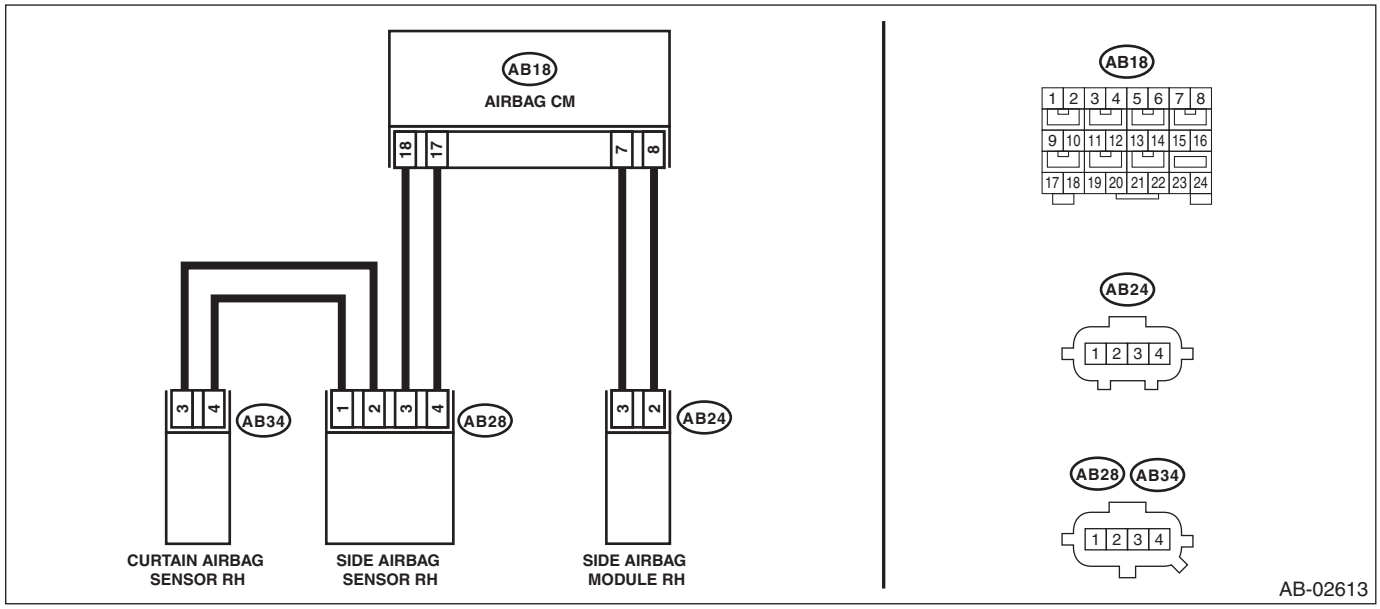
DTC DETECTING CONDITION:

- Side airbag harness (RH) 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 cable from battery, and wait 60 seconds or more 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 of the driver's and passenger's seats for safety.
• When inspecting the airbag rear harness, disconnect the side airbag module connector, curtain airbag module connector and seat belt pretensioner connector for safety reasons.

WIRING DIAGRAM:



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 along with body harness.	Go to step **2**.
2	**CHECK SIDE AIRBAG MODULE.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Disconnect the connector (AB24), and connect the connector (1AJ) in test harness AJ to connector (AB24). 3) Connect the airbag resistor to the test harness AJ connector (3AJ). 4) Connect the battery ground terminal and turn the ignition switch to ON.	Does the airbag warning light illuminate for six seconds and go off?	Replace the side airbag module (RH). <Ref. to AB-20, REMOVAL, Side Airbag Module.>	Go to step **3**.

	Step	Check	Yes	No
3	**CHECK AIRBAG REAR HARNESS (SIDE AIRBAG MODULE HARNESS RH).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Disconnect the connector (AB26) from seat belt pretensioner (RH). 3) Disconnect the connector (AB33) from curtain airbag module (RH). 4) Disconnect the airbag resistor from test harness. 5) Disconnect the connectors (AB6, AB17, AB18) from airbag control module. 6) Connect the connector (1AG) in the test harness AG to the connectors (AB6, AB17, AB18). 7) Connect the battery ground terminal and turn the ignition switch to ON. 8) Measure the voltage between connector (5AG) in the test harness AG and chassis ground. ***Connector & terminal*** ***(5AG) No. 5 (+) — Chassis ground (–):*** ***(5AG) No. 7 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **4**.	Replace the airbag rear harness along with body harness.
4	**CHECK AIRBAG CONTROL MODULE.** 1) Connect all connectors. 2) Clear the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-24, Airbag Control Module.>	Go to step **5**.
5	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to AB(diag)-37, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

AC:DTC 46 SIDE AIRBAG LH FAILURE

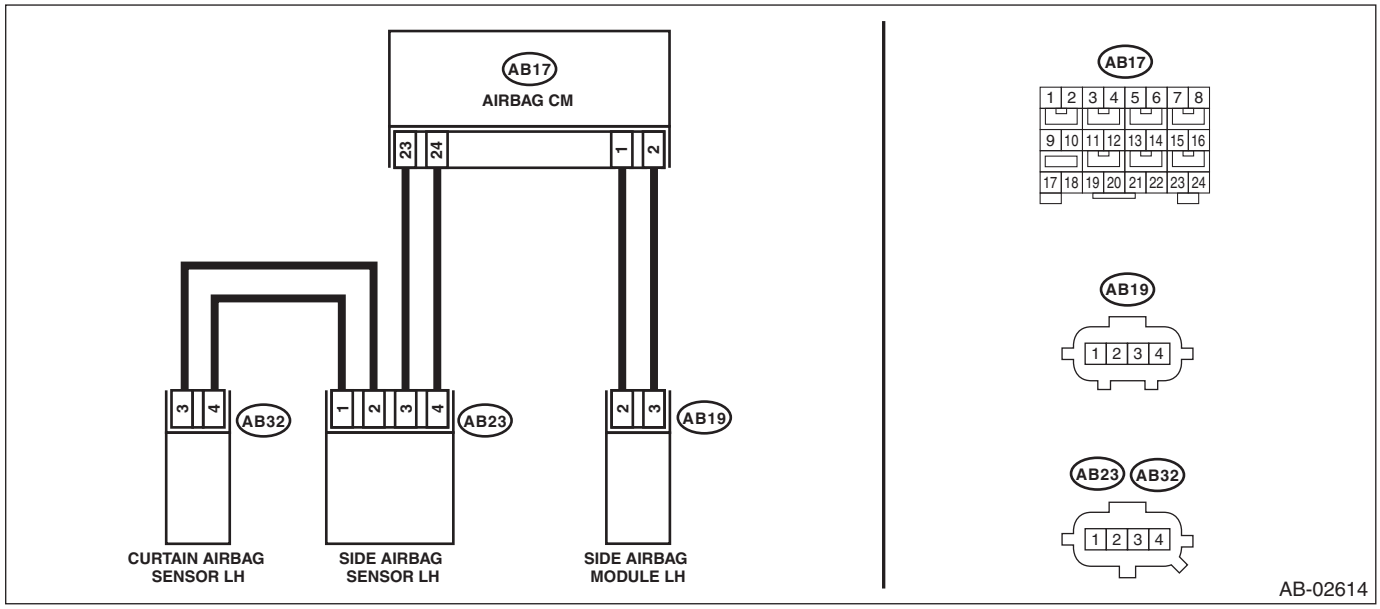
DTC DETECTING CONDITION:

- Side airbag harness (LH) 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 cable from battery, and wait 60 seconds or more 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 of the driver's and passenger's seats for safety.
• When inspecting the airbag rear harness, disconnect the side airbag module connector, curtain airbag module connector and seat belt pretensioner connector for safety reasons.

WIRING DIAGRAM:



	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 along with body harness.	Go to step **2**.
2	**CHECK SIDE AIRBAG MODULE.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Disconnect the connector (AB19), and connect the connector (1AJ) in test harness AJ to connector (AB19). 3) Connect the airbag resistor to the test harness AJ connector (3AJ). 4) Connect the battery ground terminal and turn the ignition switch to ON.	Does the airbag warning light illuminate for six seconds and go off?	Replace the side airbag module (LH). <Ref. to AB-20, REMOVAL, Side Airbag Module.>	Go to step **3**.

	Step	Check	Yes	No
3	**CHECK AIRBAG REAR HARNESS (SIDE AIRBAG MODULE HARNESS LH).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Disconnect the connector (AB21) from seat belt pretensioner (LH). 3) Disconnect the connector (AB31) from curtain airbag module (LH). 4) Disconnect the airbag resistor from test harness. 5) Disconnect the connectors (AB6, AB17, AB18) from airbag control module. 6) Connect the connector (1AG) in the test harness AG to the connectors (AB6, AB17, AB18). 7) Connect the battery ground terminal and turn the ignition switch to ON. 8) Measure the voltage between connector (5AG) in the test harness AG and chassis ground. ***Connector & terminal*** ***(5AG) No. 3 (+) — Chassis ground (–):*** ***(5AG) No. 1 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **4**.	Replace the airbag rear harness along with body harness.
4	**CHECK AIRBAG CONTROL MODULE.** 1) Connect all connectors. 2) Clear the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-24, Airbag Control Module.>	Go to step **5**.
5	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to AB(diag)-37, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

AD:DTC 4A SIDE AIRBAG RH FAILURE

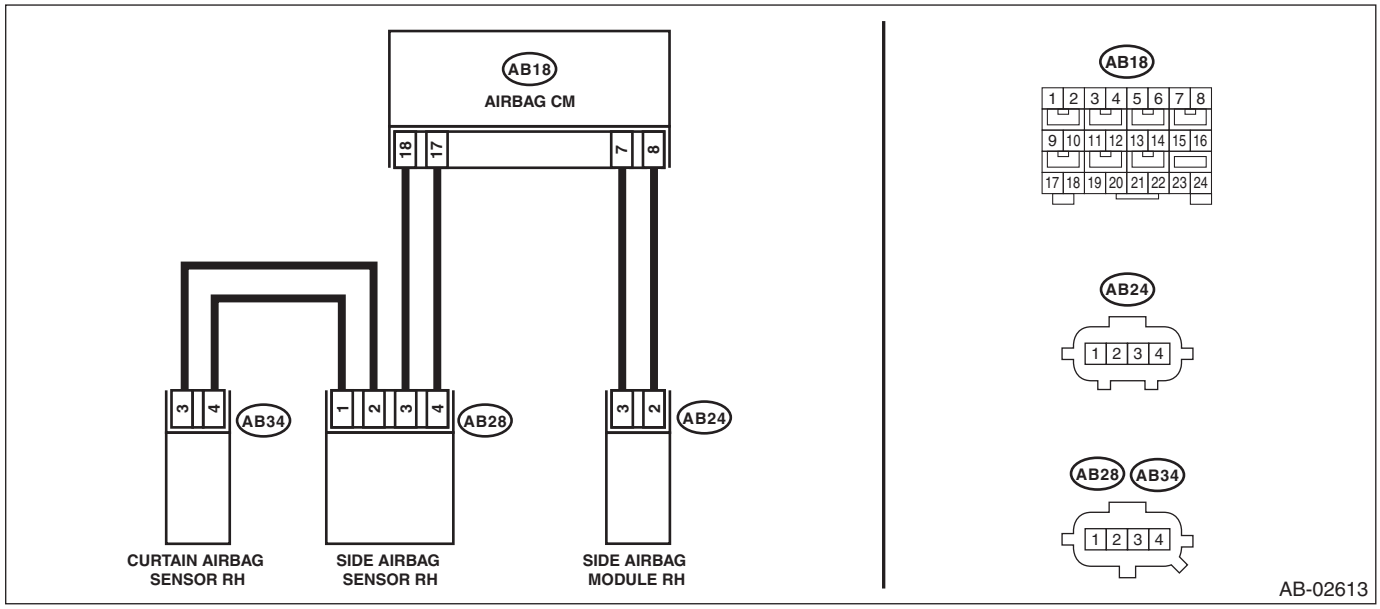
DTC DETECTING CONDITION:

- Side airbag harness (RH) circuit is shorted.
- 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 cable from battery, and wait 60 seconds or more 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 of the driver's and passenger's seats for safety.
• When inspecting the airbag rear harness, disconnect the side airbag module connector, curtain airbag module connector and seat belt pretensioner connector for safety reasons.

WIRING DIAGRAM:



	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 along with body harness.	Go to step **2**.
2	**CHECK SIDE AIRBAG MODULE.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Disconnect the connector (AB24) from the side airbag module (RH), and connect the connector (1AJ) in the test harness AJ to connector (AB24). 3) Connect the airbag resistor to the test harness AJ connector (3AJ). 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 side airbag module (RH). <Ref. to AB-20, REMOVAL, Side Airbag Module.>	Go to step **3**.

	Step	Check	Yes	No
3	**CHECK AIRBAG REAR HARNESS (SIDE AIRBAG MODULE HARNESS RH).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Disconnect the connector (AB26) from seat belt pretensioner (RH). 3) Disconnect the connector (AB33) from curtain airbag module (RH). 4) Disconnect the airbag resistor from test harness AJ. 5) Disconnect the connectors (AB6, AB17, AB18) from airbag control module. 6) Connect the connector (1AG) in the test harness AG to the connectors (AB6, AB17, AB18). 7) Measure the resistance between connector (5AG) terminals in test harness AG. ***Connector & terminal (5AG) No. 5 — (5AG) No. 7:***	Is the resistance 1 MΩ or more?	Go to step **4**.	Replace the airbag rear harness along with body harness.
4	**CHECK AIRBAG CONTROL MODULE.** 1) Connect all connectors. 2) Clear the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-24, Airbag Control Module.>	Go to step **5**.
5	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to AB(diag)-37, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

AE:DTC 4B SIDE AIRBAG LH FAILURE

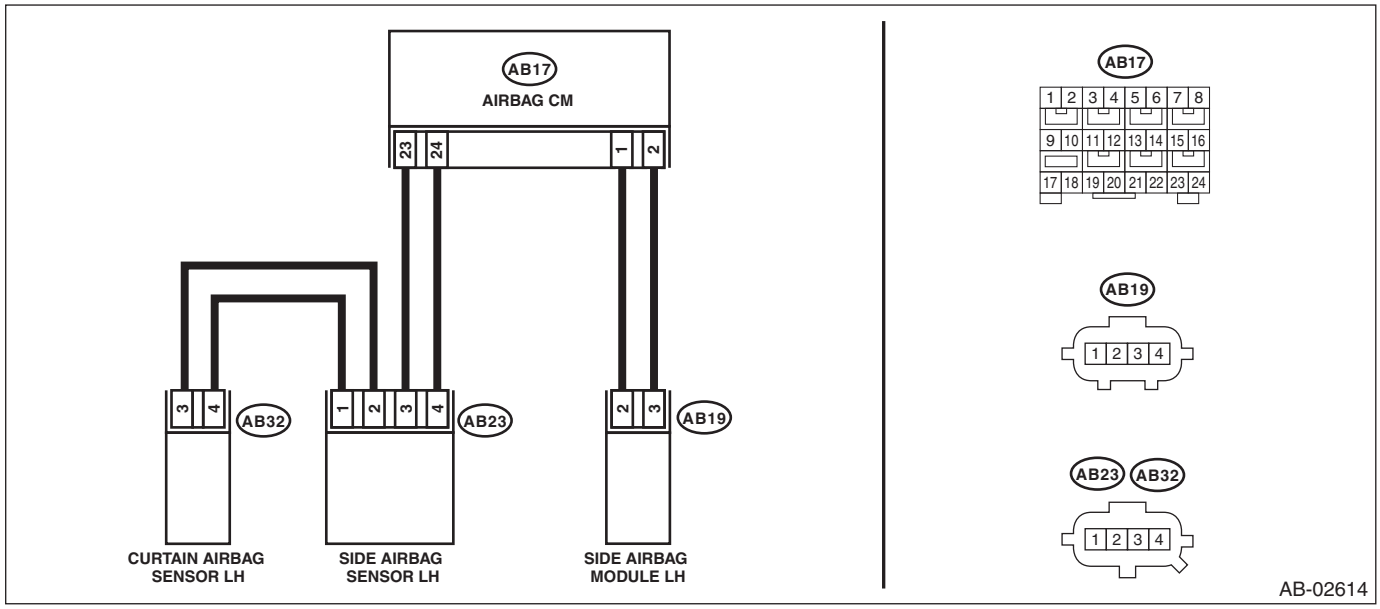
DTC DETECTING CONDITION:

- Side airbag harness (LH) circuit is shorted.
- 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 cable from battery, and wait 60 seconds or more 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 of the driver's and passenger's seats for safety.
• When inspecting the airbag rear harness, disconnect the side airbag module connector, curtain airbag module connector and seat belt pretensioner connector for safety reasons.

WIRING DIAGRAM:



	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 along with body harness.	Go to step **2**.
2	**CHECK SIDE AIRBAG MODULE.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Disconnect the connector (AB19) from the side airbag module (LH), and connect the connector (1AJ) in test harness AJ to the connector (AB19). 3) Connect the airbag resistor to the test harness AJ connector (3AJ). 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 side airbag module (LH). <Ref. to AB-20, REMOVAL, Side Airbag Module.>	Go to step **3**.

	Step	Check	Yes	No
3	**CHECK AIRBAG REAR HARNESS (SIDE AIRBAG MODULE HARNESS LH).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Disconnect the connector (AB21) from seat belt pretensioner (LH). 3) Disconnect the connector (AB31) from curtain airbag module (LH). 4) Disconnect the airbag resistor from test harness AJ. 5) Disconnect the connectors (AB6, AB17, AB18) from airbag control module. 6) Connect the connector (1AG) in the test harness AG to the connectors (AB6, AB17, AB18). 7) Measure the resistance between connector (5AG) terminals in test harness AG. ***Connector & terminal (5AG) No. 1 — (5AG) No. 3:***	Is the resistance 1 MΩ or more?	Go to step **4**.	Replace the airbag rear harness along with body harness.
4	**CHECK AIRBAG CONTROL MODULE.** 1) Connect all connectors. 2) Clear the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-24, Airbag Control Module.>	Go to step **5**.
5	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to AB(diag)-37, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

AF:DTC 4D SIDE AIRBAG RH FAILURE

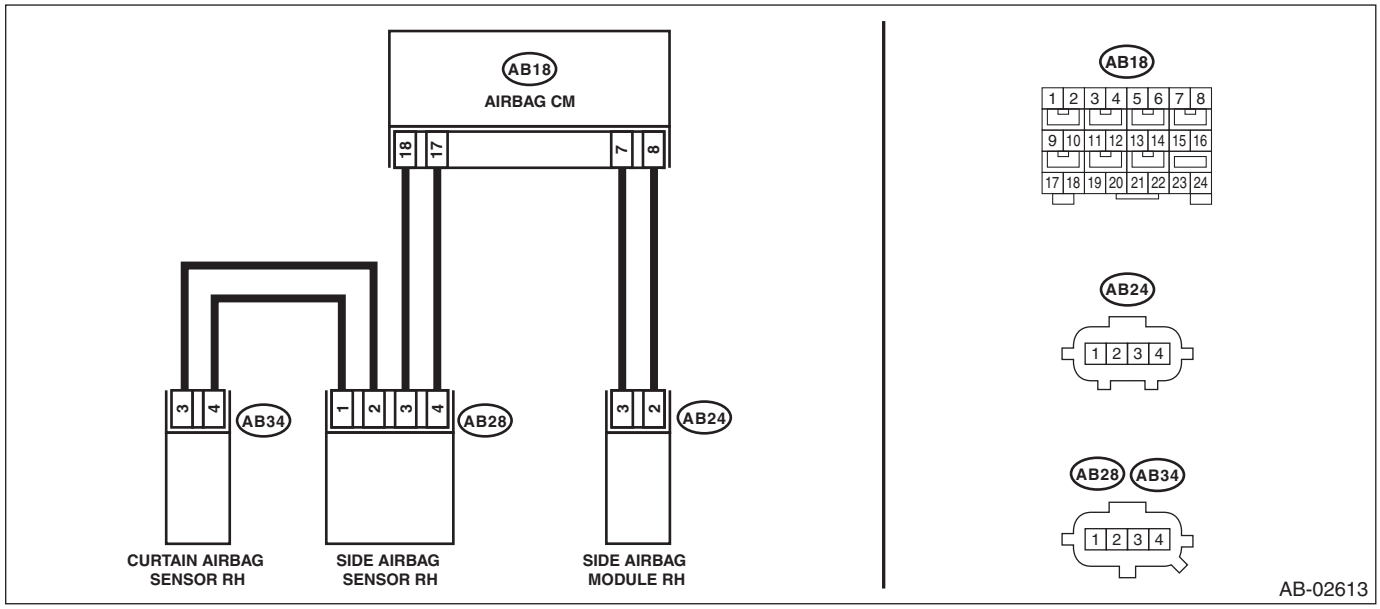
DTC DETECTING CONDITION:

- Side airbag harness (RH) circuit is open.
- 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 cable from battery, and wait 60 seconds or more 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 of the driver's and passenger's seats for safety.
• When inspecting the airbag rear harness, disconnect the side airbag module connector, curtain airbag module connector and seat belt pretensioner connector for safety reasons.

WIRING DIAGRAM:



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 along with body harness.	Go to step **2**.
2	**CHECK SIDE AIRBAG MODULE.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Disconnect the connector (AB24) from the side airbag module (RH), and connect the connector (1AJ) in the test harness AJ to connector (AB24). 3) Connect the airbag resistor to the test harness AJ connector (3AJ). 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 side airbag module (RH). <Ref. to AB-20, REMOVAL, Side Airbag Module.>	Go to step **3**.

	Step	Check	Yes	No
3	**CHECK AIRBAG REAR HARNESS (SIDE AIRBAG MODULE HARNESS RH).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Disconnect the connector (AB26) from seat belt pretensioner (RH). 3) Disconnect the connector (AB33) from curtain airbag module (RH). 4) Disconnect the airbag resistor from test harness AJ. 5) Disconnect the connectors (AB6, AB17, AB18) from airbag control module. 6) Connect the connector (1AG) in the test harness AG to the connectors (AB6, AB17, AB18). 7) Measure the resistance between the test harness AG connector (5AG) and the test harness AJ connector (3AJ). ***Connector & terminal*** ***(5AG) No. 5 — (3AJ) No. 1:*** ***(5AG) No. 7 — (3AJ) No. 2:***	Is the resistance less than 10 Ω?	Go to step **4**.	Replace the airbag rear harness along with body harness.
4	**CHECK AIRBAG CONTROL MODULE.** 1) Connect all connectors. 2) Clear the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-24, Airbag Control Module.>	Go to step **5**.
5	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to AB(diag)-37, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

AG:DTC 4E SIDE AIRBAG LH FAILURE

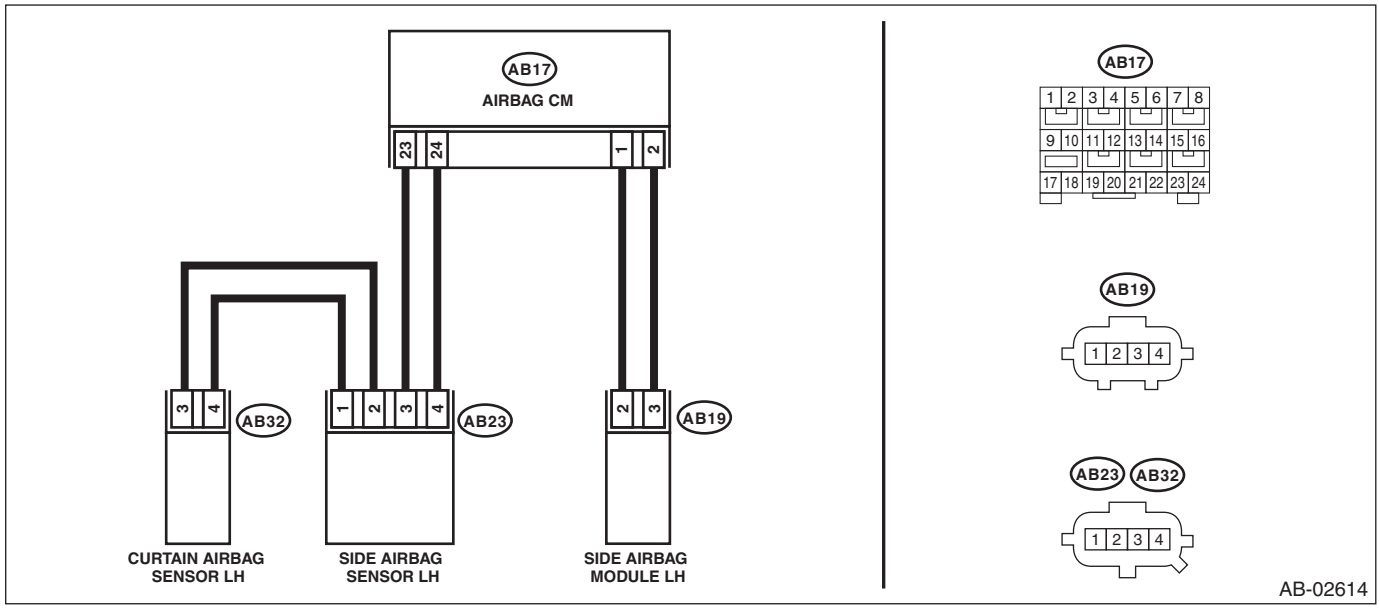
DTC DETECTING CONDITION:

- Side airbag harness (LH) circuit is open.
- 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 cable from battery, and wait 60 seconds or more 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 of the driver's and passenger's seats for safety.
• When inspecting the airbag rear harness, disconnect the side airbag module connector, curtain airbag module connector and seat belt pretensioner connector for safety reasons.

WIRING DIAGRAM:



	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 along with body harness.	Go to step **2**.
2	**CHECK SIDE AIRBAG MODULE.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Disconnect the connector (AB19) from the side airbag module (LH), and connect the connector (1AJ) in test harness AJ to the connector (AB19). 3) Connect the airbag resistor to the test harness AJ connector (3AJ). 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 side airbag module (LH). <Ref. to AB-20, REMOVAL, Side Airbag Module.>	Go to step **3**.

	Step	Check	Yes	No
3	**CHECK AIRBAG REAR HARNESS (SIDE AIRBAG MODULE HARNESS LH).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Disconnect the connector (AB21) from seat belt pretensioner (LH). 3) Disconnect the connector (AB31) from curtain airbag module (LH). 4) Disconnect the airbag resistor from test harness AJ. 5) Disconnect the connectors (AB6, AB17, AB18) from airbag control module. 6) Connect the connector (1AG) in the test harness AG to the connectors (AB6, AB17, AB18). 7) Measure the resistance between the test harness AG connector (5AG) and the test harness AJ connector (3AJ). ***Connector & terminal*** ***(5AG) No. 1 — (3AJ) No. 2:*** ***(5AG) No. 3 — (3AJ) No. 1:***	Is the resistance less than 10 Ω?	Go to step **4**.	Replace the airbag rear harness along with body harness.
4	**CHECK AIRBAG CONTROL MODULE.** 1) Connect all connectors. 2) Clear the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-24, Airbag Control Module.>	Go to step **5**.
5	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to AB(diag)-37, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

AH:DTC 53 SIDE AIRBAG SENSOR RH FAILURE

DTC DETECTING CONDITION:

Side airbag sensor (RH) is faulty.
When DTC 53 is displayed, the circuit within the side airbag sensor (RH) is faulty.
Replace the side airbag sensor (RH). <Ref. to AB-26, Side Airbag Sensor.>

AI: DTC 54 SIDE AIRBAG SENSOR LH FAILURE

DTC DETECTING CONDITION:

Side airbag sensor (LH) is faulty.
When DTC 54 is displayed, the circuit within the side airbag sensor (LH) is faulty.
Replace the side airbag sensor (LH). <Ref. to AB-26, Side Airbag Sensor.>

AJ:DTC 55 SIDE CURTAIN AIRBAG FIRING OUTPUT

This DTC is displayed when the side airbag module and curtain airbag module are deployed.
Once this DTC is displayed, the memory cannot be cleared. Replace the following parts.

- Airbag control module <Ref. to AB-24, Airbag Control Module.>
- Front seat with side airbag module (Operating side) <Ref. to SE-8, Front Seat.>
- Side airbag sensor (Operating side) <Ref. to AB-26, Side Airbag Sensor.>
- Curtain airbag module (Operating side) <Ref. to AB-22, Curtain Airbag Module.>
- Curtain airbag sensor (Operating side) <Ref. to AB-27, Curtain Airbag Sensor.>
- Satellite safing sensor <Ref. to AB-28, Satellite Safing Sensor.>

AK:DTC 58 CURTAIN AIRBAG SENSOR RH FAILURE

DTC DETECTING CONDITION:

Curtain airbag sensor (RH) is faulty.
If DTC 58 is displayed, the circuit within the curtain airbag sensor (RH) is faulty.
Replace the curtain airbag sensor (RH). <Ref. to AB-27, Curtain Airbag Sensor.>

AL:DTC 59 CURTAIN AIRBAG SENSOR LH FAILURE

DTC DETECTING CONDITION:

Curtain airbag sensor (LH) is faulty.
If DTC 59 is displayed, the circuit within the curtain airbag sensor (LH) is faulty.
Replace the curtain airbag sensor (LH). <Ref. to AB-27, Curtain Airbag Sensor.>

AM:DTC 5A SIDE AIRBAG SENSOR RH FALSE INSTALLATION

DTC DETECTING CONDITION:

Side airbag sensor RH is misinstalled.

	Step	Check	Yes	No
1	**REPLACE SIDE AIRBAG SENSOR (RH).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Replace the side A/B sensor (RH) with a genuine sensor. <Ref. to AB-26, REMOVAL, Side Airbag Sensor.>	Does the warning light go off?	Finish the diagnosis.	Replace the airbag control module. <Ref. to AB-24, REMOVAL, Airbag Control Module.>

AN:DTC 5B SIDE AIRBAG SENSOR LH FALSE INSTALLATION

DTC DETECTING CONDITION:

Side airbag sensor LH is misinstalled.

	Step	Check	Yes	No
1	**REPLACE SIDE AIRBAG SENSOR (LH).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Replace the side A/B sensor (LH) with a genuine sensor. <Ref. to AB-26, REMOVAL, Side Airbag Sensor.>	Does the warning light go off?	Finish the diagnosis.	Replace the airbag control module. <Ref. to AB-24, REMOVAL, Airbag Control Module.>

AO:DTC 5C CURTAIN AIRBAG SENSOR RH FALSE INSTALLATION

DTC DETECTING CONDITION:

Curtain airbag sensor RH is misinstalled.

	Step	Check	Yes	No
1	**REPLACE CURTAIN AIRBAG SENSOR (RH).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Replace the curtain A/B sensor (RH) with a genuine sensor. <Ref. to AB-27, REMOVAL, Curtain Airbag Sensor.>	Does the warning light go off?	Finish the diagnosis.	Replace the airbag control module. <Ref. to AB-24, REMOVAL, Airbag Control Module.>

AP:DTC 5D CURTAIN AIRBAG SENSOR LH FALSE INSTALLATION

DTC DETECTING CONDITION:

Curtain airbag sensor LH is misinstalled.

	Step	Check	Yes	No
1	**REPLACE CURTAIN AIRBAG SENSOR (LH).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Replace the curtain A/B sensor (LH) with a genuine sensor. <Ref. to AB-27, REMOVAL, Curtain Airbag Sensor.>	Does the warning light go off?	Finish the diagnosis.	Replace the airbag control module. <Ref. to AB-24, REMOVAL, Airbag Control Module.>

AQ:DTC 61 BELT PRETENSIONER RH FAILURE

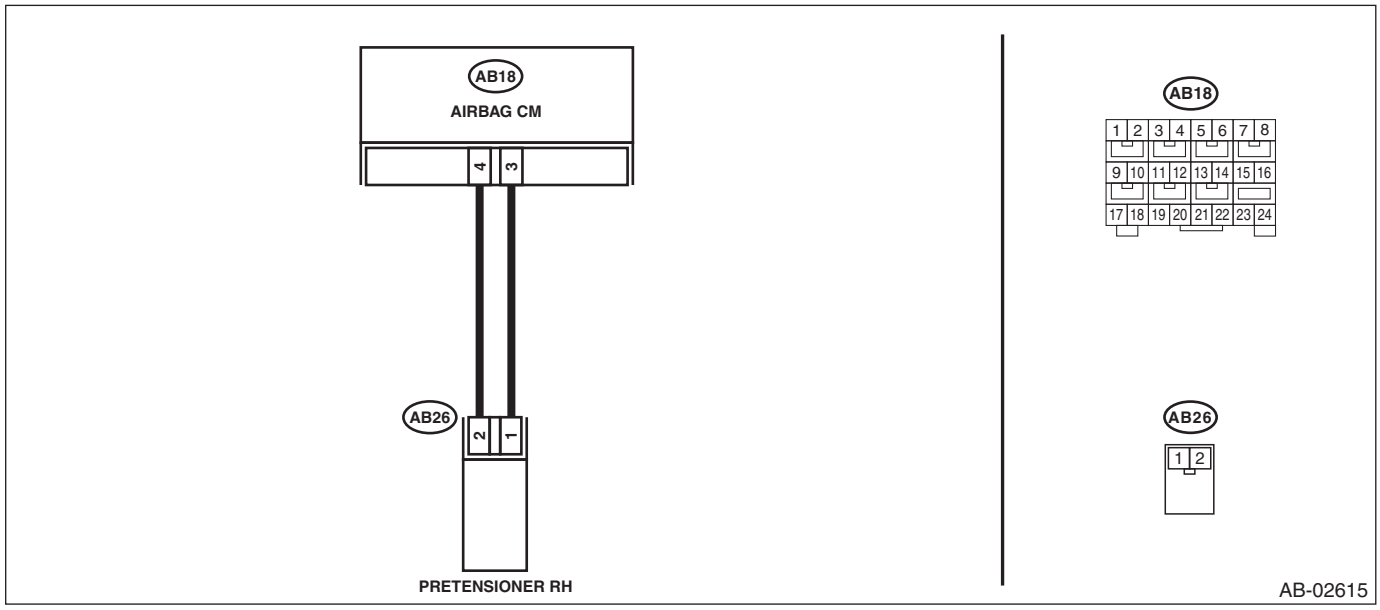
DTC DETECTING CONDITION:

- Seat belt pretensioner (RH) circuit is shorted to ground.
- Pretensioner (RH) is faulty.
- Pretensioner 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 cable from battery, and wait 60 seconds or more 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 of the driver's and passenger's seats for safety.
• When inspecting the airbag rear harness, disconnect the side airbag module connector, curtain airbag module connector and seat belt pretensioner connector for safety reasons.

WIRING DIAGRAM:



	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 along with body harness.	Go to step **2**.
2	**CHECK SEAT BELT PRETENSIONER.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Disconnect the connector (AB26) from seat belt pretensioner (RH). 3) Connect the connector (1N) in the test harness N to the connector (AB26). 4) Connect the airbag resistor to the connector (2N) of test harness N. 5) Connect the battery ground terminal and turn the ignition switch to ON.	Does the airbag warning light illuminate for six seconds and go off?	Replace the seat belt pretensioner (RH). <Ref. to SB-17, Front Seat Belt.>	Go to step **3**.

	Step	Check	Yes	No
3	**CHECK AIRBAG REAR HARNESS (PRETENSIONER HARNESS RH).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Disconnect the airbag resistor from test harness. 3) Disconnect connector (AB24) from side airbag module (RH). 4) Disconnect the connector (AB33) from curtain airbag module (RH). 5) Disconnect the connectors (AB6, AB17, AB18) from airbag control module. 6) Connect the connector (1AG) in the test harness AG to the connectors (AB6, AB17, AB18). 7) Measure the resistance between connector (3AG) in the test harness AG and chassis ground. ***Connector & terminal*** ***(3AG) No. 18 — Chassis ground:*** ***(3AG) No. 20 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **4**.	Replace the airbag rear harness along with body harness.
4	**CHECK AIRBAG CONTROL MODULE.** 1) Connect all connectors. 2) Clear the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-24, Airbag Control Module.>	Go to step **5**.
5	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to AB(diag)-37, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

AR:DTC 62 BELT PRETENSIONER LH FAILURE

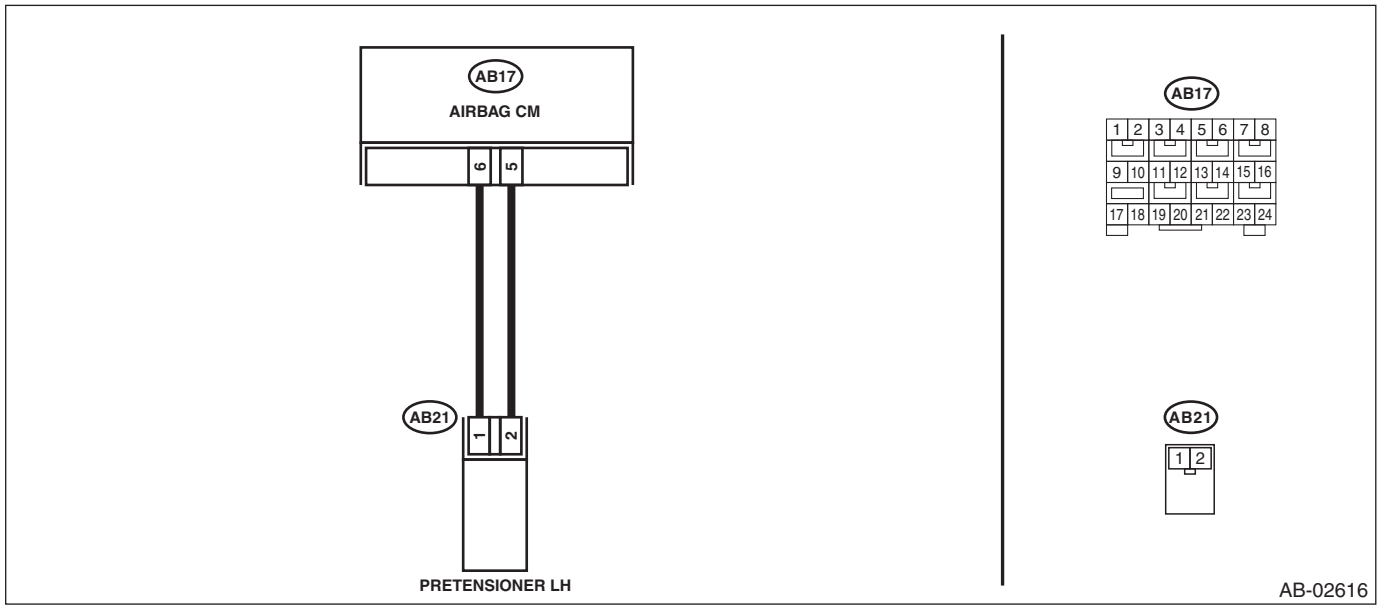
DTC DETECTING CONDITION:

- Seat belt pretensioner (LH) circuit is shorted to ground.
- Pretensioner (LH) is faulty.
- Pretensioner 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 cable from battery, and wait 60 seconds or more 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 of the driver's and passenger's seats for safety.
• When inspecting the airbag rear harness, disconnect the side airbag module connector, curtain airbag module connector and seat belt pretensioner connector for safety reasons.

WIRING DIAGRAM:



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 along with body harness.	Go to step **2**.
2	**CHECK SEAT BELT PRETENSIONER.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Disconnect the connector (AB21) from seat belt pretensioner (LH). 3) Connect the connector (1N) in the test harness N to the connector (AB21). 4) Connect the airbag resistor to the connector (2N) of test harness N. 5) Connect the battery ground terminal and turn the ignition switch to ON.	Does the airbag warning light illuminate for six seconds and go off?	Replace the seat belt pretensioner (LH). <Ref. to SB-17, Front Seat Belt.>	Go to step **3**.

	Step	Check	Yes	No
3	**CHECK AIRBAG REAR HARNESS (PRETENSIONER HARNESS LH).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Disconnect the airbag resistor from test harness. 3) Disconnect connector (AB19) from side airbag module (LH). 4) Disconnect the connector (AB31) from curtain airbag module (LH). 5) Disconnect the connectors (AB6, AB17, AB18) from airbag control module. 6) Connect the connector (1AG) in the test harness AG to the connectors (AB6, AB17, AB18). 7) Measure the resistance between connector (3AG) in the test harness AG and chassis ground. ***Connector & terminal*** ***(3AG) No. 12 — Chassis ground:*** ***(3AG) No. 10 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **4**.	Replace the airbag rear harness along with body harness.
4	**CHECK AIRBAG CONTROL MODULE.** 1) Connect all connectors. 2) Clear the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-24, Airbag Control Module.>	Go to step **5**.
5	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to AB(diag)-37, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

AS:DTC 65 BELT PRETENSIONER RH FAILURE

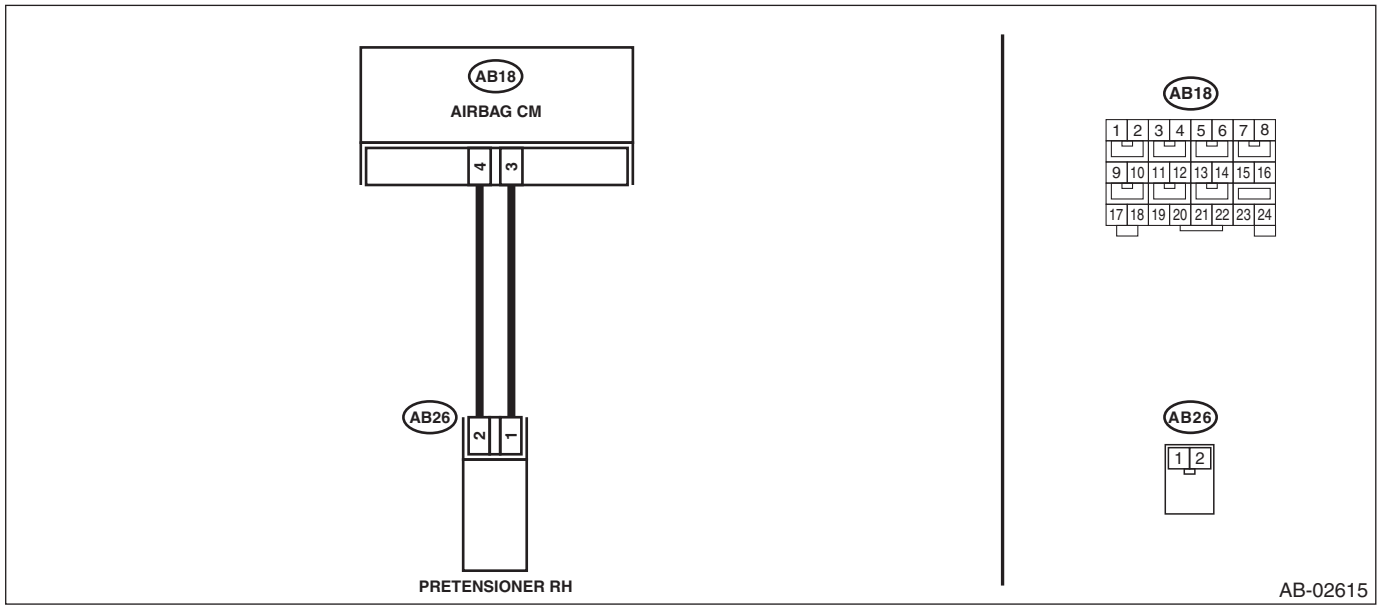
DTC DETECTING CONDITION:

- Seat belt pretensioner (RH) circuit is shorted to power supply.
- Pretensioner (RH) is faulty.
- Pretensioner 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 cable from battery, and wait 60 seconds or more 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 of the driver's and passenger's seats for safety.
• When inspecting the airbag rear harness, disconnect the side airbag module connector, curtain airbag module connector and seat belt pretensioner connector for safety reasons.

WIRING DIAGRAM:



	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 along with body harness.	Go to step **2**.
2	**CHECK SEAT BELT PRETENSIONER.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Disconnect the connector (AB26) from seat belt pretensioner (RH). 3) Connect the connector (1N) in the test harness N to the connector (AB26). 4) Connect the airbag resistor to the connector (2N) of test harness N. 5) Connect the battery ground terminal and turn the ignition switch to ON.	Does the airbag warning light illuminate for six seconds and go off?	Replace the seat belt pretensioner (RH). <Ref. to SB-17, Front Seat Belt.>	Go to step **3**.

	Step	Check	Yes	No
3	**CHECK AIRBAG REAR HARNESS (PRETENSIONER HARNESS RH).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Disconnect the airbag resistor from test harness. 3) Disconnect connector (AB24) from side airbag module (RH). 4) Disconnect the connector (AB33) from curtain airbag module (RH). 5) Disconnect the connectors (AB6, AB17, AB18) from airbag control module. 6) Connect the connector (1AG) in the test harness AG to the connectors (AB6, AB17, AB18). 7) Connect the battery ground terminal and turn the ignition switch to ON. 8) Measure the voltage between connector (3AG) in the test harness AG and chassis ground. ***Connector & terminal*** ***(3AG) No. 20 (+) — Chassis ground (–):*** ***(3AG) No. 18 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **4**.	Replace the airbag rear harness along with body harness.
4	**CHECK AIRBAG CONTROL MODULE.** 1) Connect all connectors. 2) Clear the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-24, Airbag Control Module.>	Go to step **5**.
5	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to AB(diag)-37, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

AT:DTC 66 BELT PRETENSIONER LH FAILURE

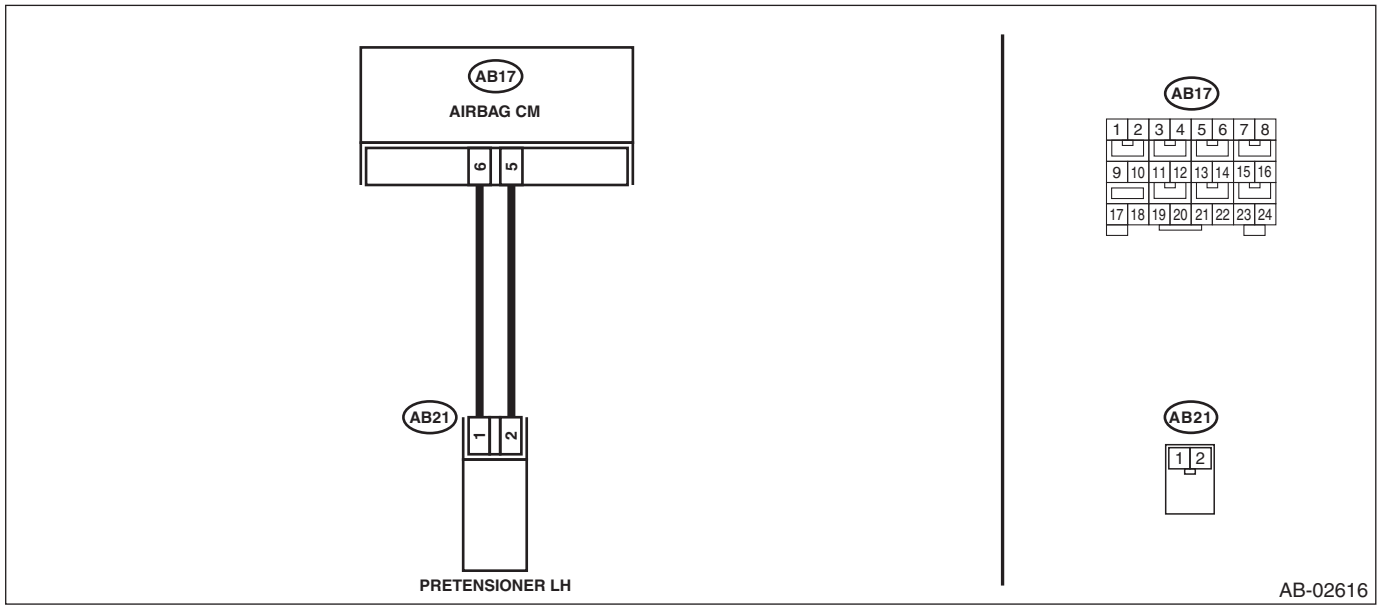
DTC DETECTING CONDITION:

- Seat belt pretensioner (LH) circuit is shorted to power supply.
- Pretensioner (LH) is faulty.
- Pretensioner 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 cable from battery, and wait 60 seconds or more 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 of the driver's and passenger's seats for safety.
• When inspecting the airbag rear harness, disconnect the side airbag module connector, curtain airbag module connector and seat belt pretensioner connector for safety reasons.

WIRING DIAGRAM:



	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 along with body harness.	Go to step **2**.
2	**CHECK SEAT BELT PRETENSIONER.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Disconnect the connector (AB21) from seat belt pretensioner (LH). 3) Connect the connector (1N) in the test harness N to the connector (AB21). 4) Connect the airbag resistor to the connector (2N) of test harness N. 5) Connect the battery ground terminal and turn the ignition switch to ON.	Does the airbag warning light illuminate for six seconds and go off?	Replace the seat belt pretensioner (LH). <Ref. to SB-17, Front Seat Belt.>	Go to step **3**.

	Step	Check	Yes	No
3	**CHECK AIRBAG REAR HARNESS (PRETENSIONER HARNESS LH).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Disconnect the airbag resistor from test harness. 3) Disconnect connector (AB19) from side airbag module (LH). 4) Disconnect the connector (AB31) from curtain airbag module (LH). 5) Disconnect the connectors (AB6, AB17, AB18) from airbag control module. 6) Connect the connector (1AG) in the test harness AG to the connectors (AB6, AB17, AB18). 7) Connect the battery ground terminal and turn the ignition switch to ON. 8) Measure the voltage between connector (3AG) in the test harness AG and chassis ground. ***Connector & terminal*** ***(3AG) No. 10 (+) — Chassis ground (–):*** ***(3AG) No. 12 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **4**.	Replace the airbag rear harness along with body harness.
4	**CHECK AIRBAG CONTROL MODULE.** 1) Connect all connectors. 2) Clear the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-24, Airbag Control Module.>	Go to step **5**.
5	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to AB(diag)-37, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

AU:DTC 6A BELT PRETENSIONER RH FAILURE

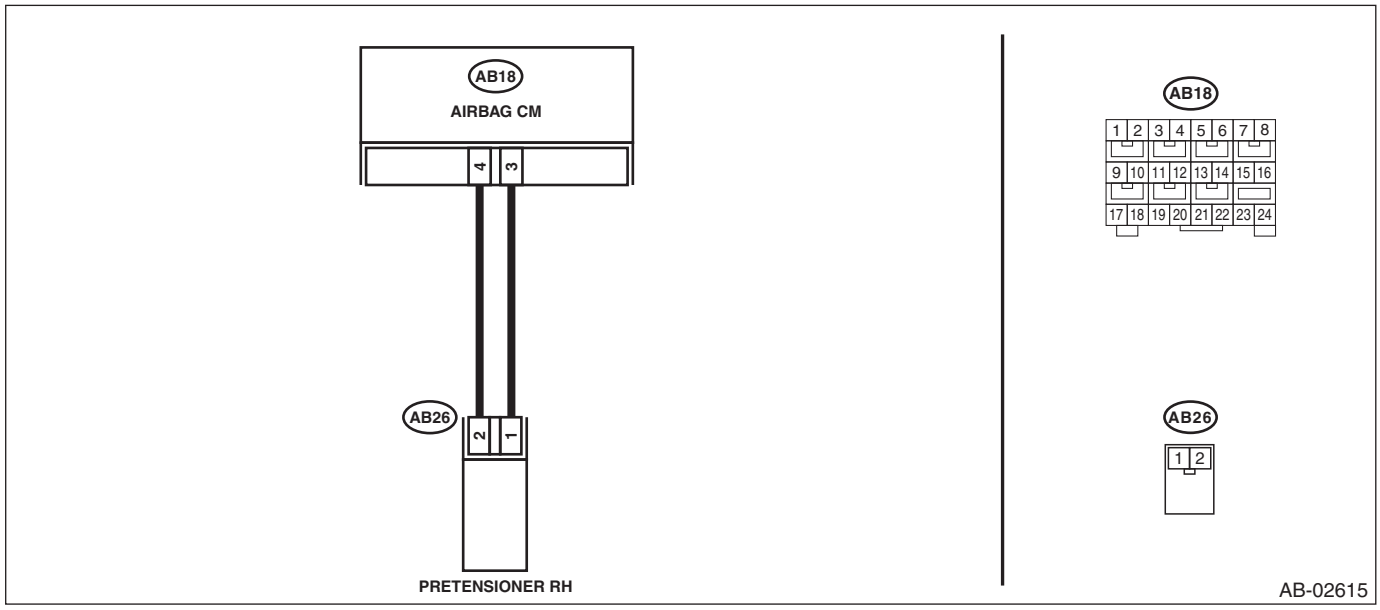
DTC DETECTING CONDITION:

- Seat belt pretensioner (RH) circuit is shorted.
- Pretensioner (RH) is faulty.
- Pretensioner 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 cable from battery, and wait 60 seconds or more 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 airbag warning light operates properly.
• When inspecting the airbag main harness, disconnect the airbag module connectors of the driver's and passenger's seats for safety.
• When inspecting the airbag rear harness, disconnect the side airbag module connector, curtain airbag module connector and seat belt pretensioner connector for safety reasons.

WIRING DIAGRAM:



	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 along with body harness.	Go to step **2**.
2	**CHECK SEAT BELT PRETENSIONER.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Disconnect the connector (AB26) from seat belt pretensioner (RH). 3) Connect the connector (1N) in the test harness N to the connector (AB26). 4) Connect the airbag resistor to the connector (2N) of 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 and go off?	Replace the seat belt pretensioner (RH). <Ref. to SB-17, Front Seat Belt.>	Go to step **3**.

	Step	Check	Yes	No
3	**CHECK AIRBAG REAR HARNESS (PRETENSIONER HARNESS RH).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Disconnect the airbag resistor from test harness N. 3) Disconnect connector (AB24) from side airbag module (RH). 4) Disconnect the connector (AB33) from curtain airbag module (RH). 5) Disconnect the connectors (AB6, AB17, AB18) from airbag control module. 6) Connect the connector (1AG) in the test harness AG to the connectors (AB6, AB17, AB18). 7) Measure the resistance between connector (3AG) terminals in test harness AG. ***Connector & terminal (3AG) No. 18 — (3AG) No. 20:***	Is the resistance 1 MΩ or more?	Go to step **4**.	Replace the airbag rear harness along with body harness.
4	**CHECK AIRBAG CONTROL MODULE.** 1) Connect all connectors. 2) Clear the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-24, Airbag Control Module.>	Go to step **5**.
5	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to AB(diag)-37, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

AV:DTC 6B BELT PRETENSIONER LH FAILURE

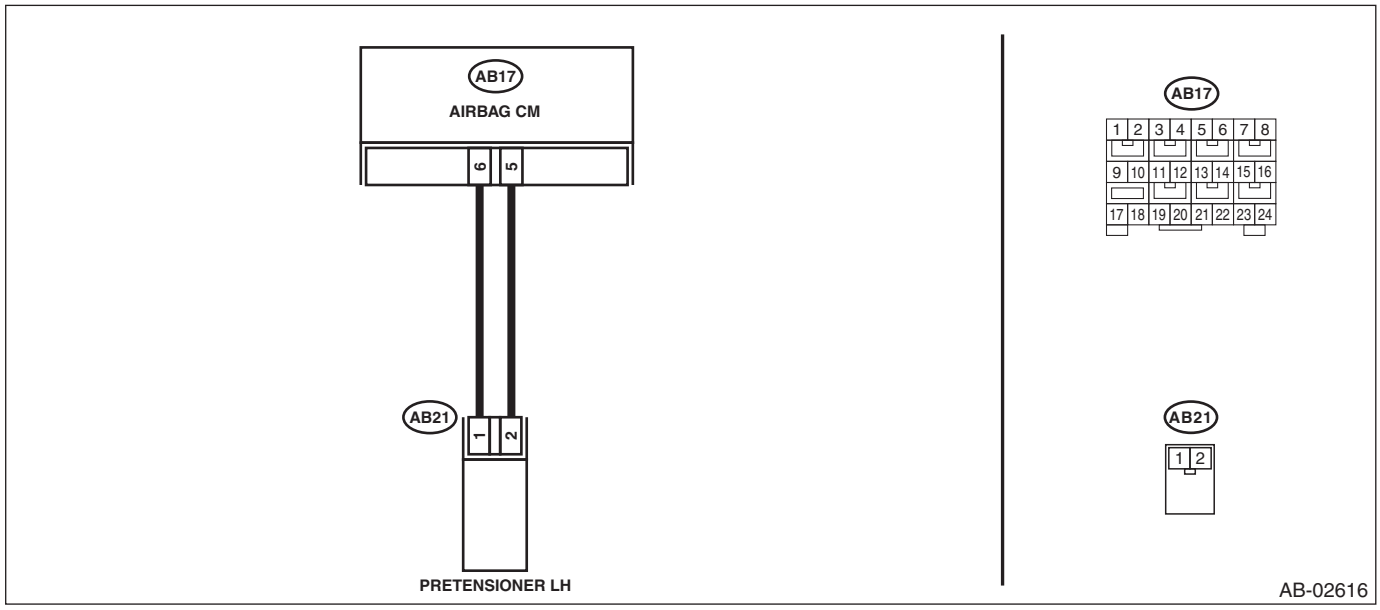
DTC DETECTING CONDITION:

- Seat belt pretensioner (LH) circuit is shorted.
- Pretensioner (LH) is faulty.
- Pretensioner 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 cable from battery, and wait 60 seconds or more 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 airbag warning light operates properly.
• When inspecting the airbag main harness, disconnect the airbag module connectors of the driver's and passenger's seats for safety.
• When inspecting the airbag rear harness, disconnect the side airbag module connector, curtain airbag module connector and seat belt pretensioner connector for safety reasons.

WIRING DIAGRAM:



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 along with body harness.	Go to step **2**.
2	**CHECK SEAT BELT PRETENSIONER.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Disconnect the connector (AB21) from seat belt pretensioner (LH). 3) Connect the connector (1N) in the test harness N to the connector (AB21). 4) Connect the airbag resistor to the connector (2N) of 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 and go off?	Replace the seat belt pretensioner (LH). <Ref. to SB-17, Front Seat Belt.>	Go to step **3**.

	Step	Check	Yes	No
3	**CHECK AIRBAG REAR HARNESS (PRETENSIONER HARNESS LH).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Disconnect the airbag resistor from the connector (2N) of test harness N. 3) Disconnect connector (AB19) from side airbag module (LH). 4) Disconnect the connector (AB31) from curtain airbag module (LH). 5) Disconnect the connectors (AB6, AB17, AB18) from airbag control module. 6) Connect the connector (1AG) in the test harness AG to the connectors (AB6, AB17, AB18). 7) Measure the resistance between connector (3AG) terminals in test harness AG. ***Connector & terminal (3AG) No. 10 — (3AG) No. 12:***	Is the resistance 1 MΩ or more?	Go to step **4**.	Replace the airbag rear harness along with body harness.
4	**CHECK AIRBAG CONTROL MODULE.** 1) Connect all connectors. 2) Clear the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-24, Airbag Control Module.>	Go to step **5**.
5	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to AB(diag)-37, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

AW:DTC 6D BELT PRETENSIONER RH FAILURE

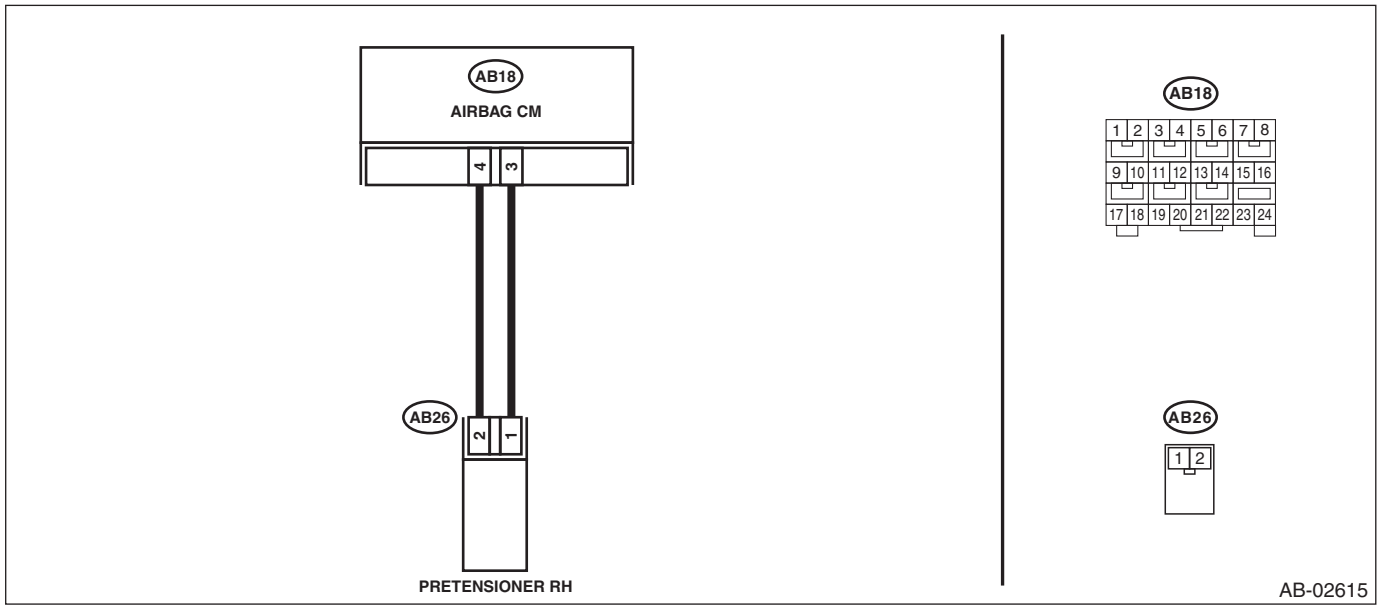
DTC DETECTING CONDITION:

- Seat belt pretensioner (RH) circuit is open.
- Pretensioner (RH) is faulty.
- Pretensioner 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 cable from battery, and wait 60 seconds or more 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 airbag warning light operates properly.
• When inspecting the airbag main harness, disconnect the airbag module connectors of the driver's and passenger's seats for safety.
• When inspecting the airbag rear harness, disconnect the side airbag module connector, curtain airbag module connector and seat belt pretensioner connector for safety reasons.

WIRING DIAGRAM:



	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 along with body harness.	Go to step **2**.
2	**CHECK SEAT BELT PRETENSIONER.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Disconnect the connector (AB26) from seat belt pretensioner (RH). 3) Connect the connector (1N) in the test harness N to the connector (AB26). 4) Connect the airbag resistor to the connector (2N) of 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 and go off?	Replace the seat belt pretensioner (RH). <Ref. to SB-17, Front Seat Belt.>	Go to step **3**.

	Step	Check	Yes	No
3	**CHECK AIRBAG REAR HARNESS (PRETENSIONER HARNESS RH).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Disconnect the airbag resistor from the connector (2N) of test harness N. 3) Disconnect connector (AB24) from side airbag module (RH). 4) Disconnect the connector (AB33) from curtain airbag module (RH). 5) Disconnect the connectors (AB6, AB17, AB18) from airbag control module. 6) Connect the connector (1AG) in the test harness AG to the connectors (AB6, AB17, AB18). 7) Measure the resistance between connector (3AG) in the test harness AG and connector (2N) in the test harness N. ***Connector & terminal*** ***(3AG) No. 18 — (2N) No. 2:*** ***(3AG) No. 20 — (2N) No. 1:***	Is the resistance less than 10 Ω?	Go to step **4**.	Replace the airbag rear harness along with body harness.
4	**CHECK AIRBAG CONTROL MODULE.** 1) Connect all connectors. 2) Clear the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-24, Airbag Control Module.>	Go to step **5**.
5	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to AB(diag)-37, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

AX:DTC 6E BELT PRETENSIONER LH FAILURE

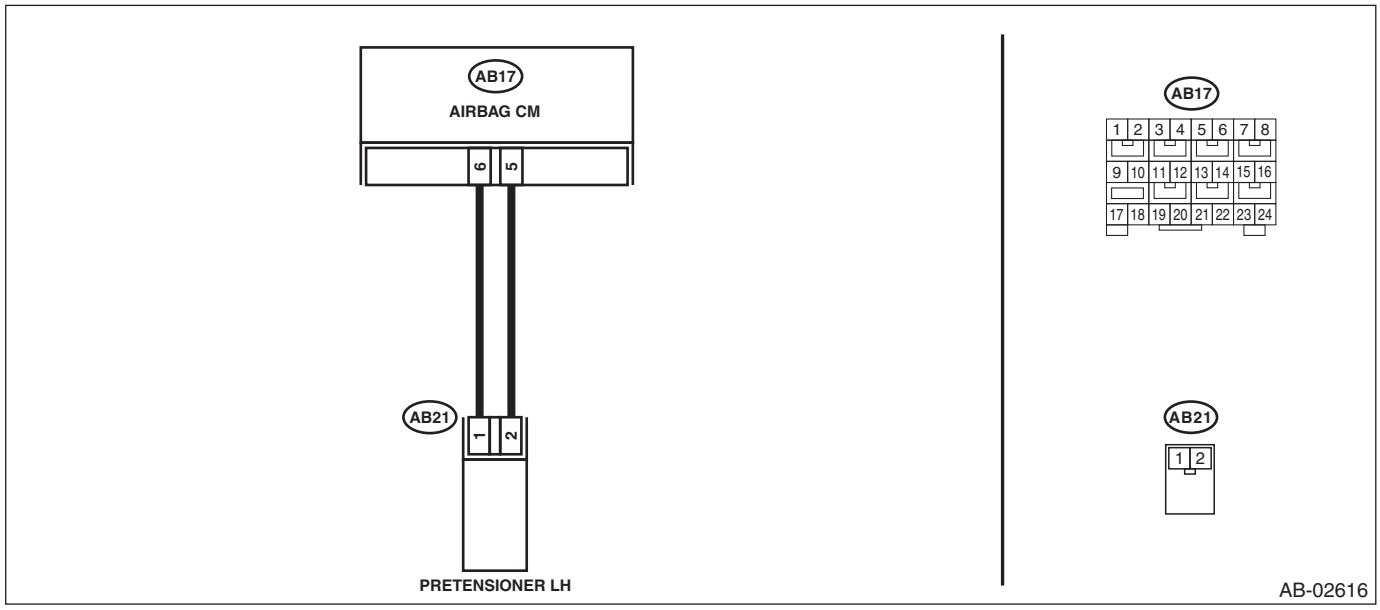
DTC DETECTING CONDITION:

- Seat belt pretensioner (LH) circuit is open.
- Pretensioner (LH) is faulty.
- Pretensioner 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 cable from battery, and wait 60 seconds or more 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 airbag warning light operates properly.
• When inspecting the airbag main harness, disconnect the airbag module connectors of the driver's and passenger's seats for safety.
• When inspecting the airbag rear harness, disconnect the side airbag module connector, curtain airbag module connector and seat belt pretensioner connector for safety reasons.

WIRING DIAGRAM:



	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 along with body harness.	Go to step **2**.
2	**CHECK SEAT BELT PRETENSIONER.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Disconnect the connector (AB21) from seat belt pretensioner (LH). 3) Connect the connector (1N) in the test harness N to the connector (AB21). 4) Connect the airbag resistor to the connector (2N) of 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 and go off?	Replace the seat belt pretensioner (LH). <Ref. to SB-17, Front Seat Belt.>	Go to step **3**.

	Step	Check	Yes	No
3	**CHECK AIRBAG REAR HARNESS (PRETENSIONER HARNESS LH).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Disconnect the airbag resistor from the connector (2N) of test harness N. 3) Disconnect connector (AB19) from side airbag module (LH). 4) Disconnect the connector (AB31) from curtain airbag module (LH). 5) Disconnect the connectors (AB6, AB17, AB18) from airbag control module. 6) Connect the connector (1AG) in the test harness AG to the connectors (AB6, AB17, AB18). 7) Measure the resistance between connector (3AG) in the test harness AG and connector (2N) in the test harness N. ***Connector & terminal*** ***(3AG) No. 10 — (2N) No. 1:*** ***(3AG) No. 12 — (2N) No. 2:***	Is the resistance less than 10 Ω?	Go to step **4**.	Replace the airbag rear harness along with body harness.
4	**CHECK AIRBAG CONTROL MODULE.** 1) Connect all connectors. 2) Clear the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-24, Airbag Control Module.>	Go to step **5**.
5	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to AB(diag)-37, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

AY:DTC 71 DRIVER'S AIRBAG FAILURE

DTC DETECTING CONDITION:

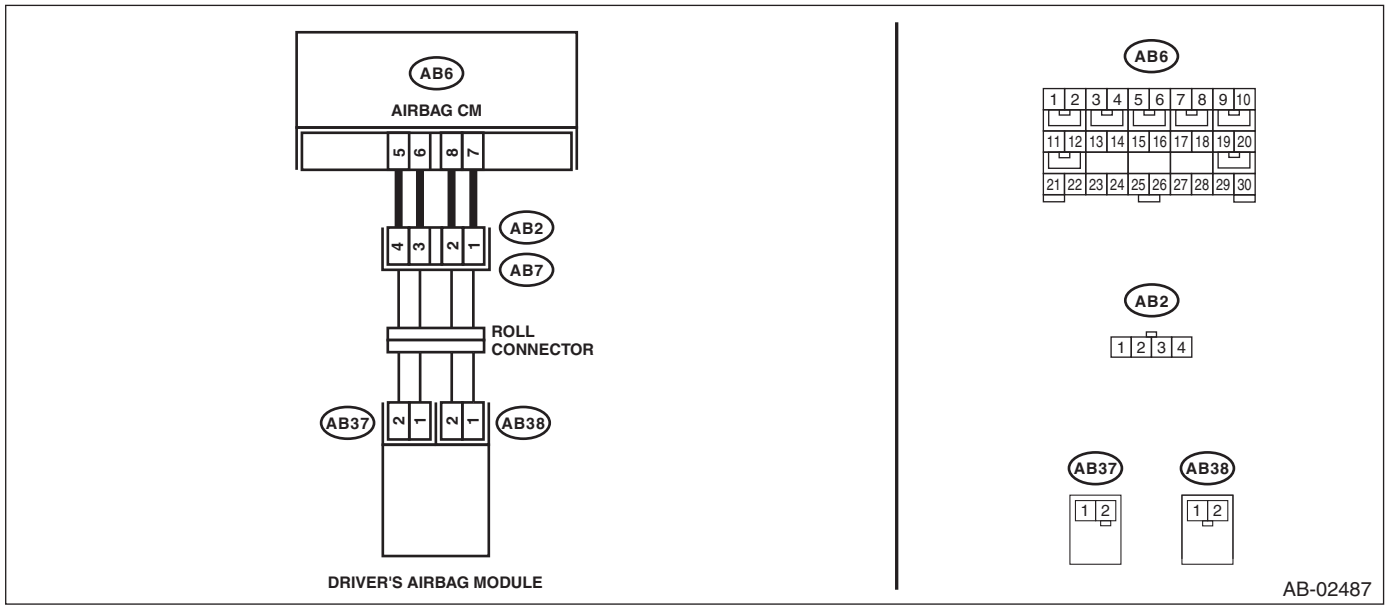
- Airbag main harness circuit is shorted to ground.
- Airbag module harness (driver's side) circuit is shorted to ground.
- Roll connector circuit is shorted to ground.
- Driver's airbag module is faulty.
- Airbag control module is faulty.

CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait 60 seconds or more 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 of the driver's and passenger's seats for safety.
• When inspecting the airbag rear harness, disconnect the side airbag module connector, curtain airbag module connector and seat belt pretensioner connector for safety reasons.

NOTE:
Prior to starting work, prepare two airbag resistors (98299PA040).

WIRING DIAGRAM:



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 body harness.	Go to step **2**.

	Step	Check	Yes	No
2	**CHECK DRIVER'S AIRBAG MODULE.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Remove the driver's airbag module. 3) Connect the connector (1N) in the test harness N to the connector (AB38). 4) Connect the airbag resistor to the connector (2N) of 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 six seconds and go off?	Replace the driver's airbag module. <Ref. to AB-18, Driver's Airbag Module.>	Go to step **3**.
3	**CHECK ROLL CONNECTOR.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 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 and disconnect the connector (AB7) 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) of test harness P. 7) Connect the battery ground terminal and turn the ignition switch to ON.	Does the airbag warning light illuminate for six seconds and go off?	Replace the roll connector. <Ref. to AB-29, Roll Connector.>	Go to step **4**.
4	**CHECK AIRBAG MAIN HARNESS (DRIVER'S AIRBAG HARNESS).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Disconnect the airbag resistor from the connectors (2P) and (3P) of test harness P. 3) Remove the console front panel and disconnect the connector (AB9). 4) Disconnect the connectors (AB6, AB17, AB18) from the airbag control module, and connect the connector (1AG) in the test harness AG. 5) Measure the resistance between connector (3AG) in the test harness AG and chassis ground. ***Connector & terminal*** ***(3AG) No. 2 — Chassis ground:*** ***(3AG) No. 4 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **5**.	Replace the airbag main harness along with body harness.
5	**CHECK AIRBAG CONTROL MODULE.** 1) Connect all connectors. 2) Clear the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-24, Airbag Control Module.>	Go to step **6**.

Step		Check	Yes	No
6	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to AB(diag)-37, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

AZ:DTC 72 PASSENGER'S AIRBAG FAILURE

DTC DETECTING CONDITION:

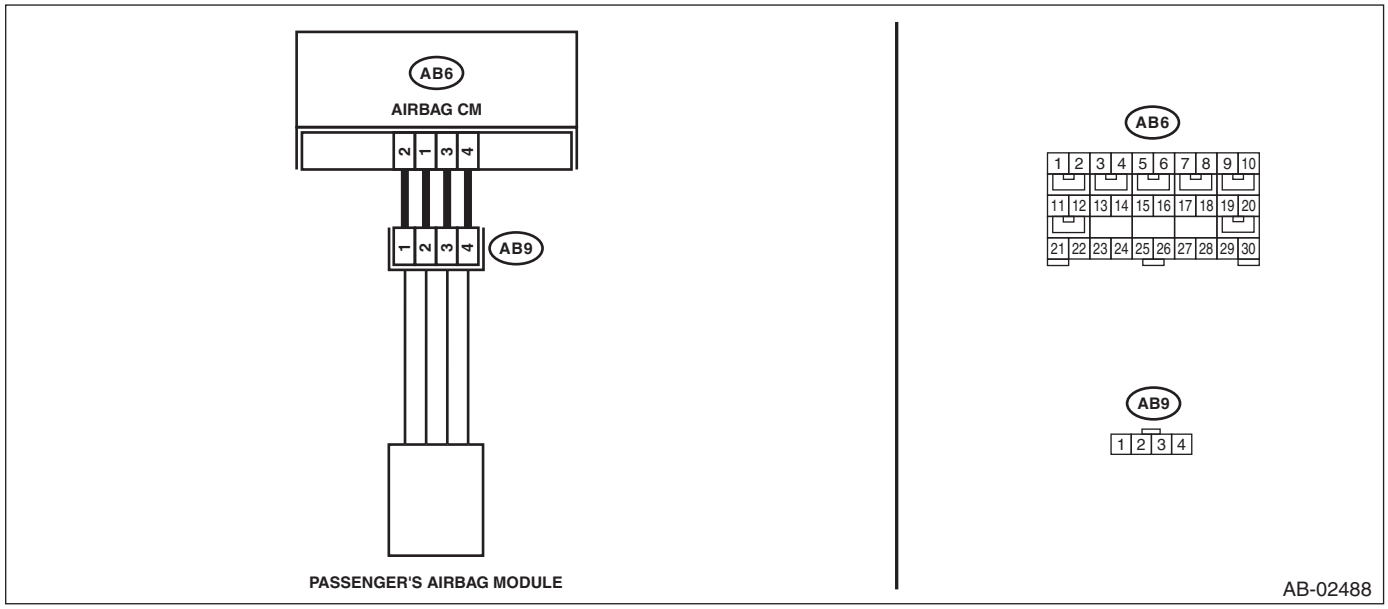
- Airbag main harness circuit is shorted to ground.
- Airbag module harness (passenger's side) circuit is shorted to ground.
- Passenger's airbag module is faulty.
- Airbag control module is faulty.

CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait 60 seconds or more 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 of the driver's and passenger's seats for safety.
• When inspecting the airbag rear harness, disconnect the side airbag module connector, curtain airbag module connector and seat belt pretensioner connector for safety reasons.

NOTE:
Prior to starting work, prepare two airbag resistors (98299PA040).

WIRING DIAGRAM:



	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 main harness along with body harness.	Go to step **2**.
2	**CHECK PASSENGER'S AIRBAG MODULE.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Remove the console front panel and disconnect the connector (AB9). 3) Connect the connector (1P) in the test harness P to connector (AB9). 4) Connect the airbag resistor to the connectors (2P) and (3P) of test harness P. 5) Connect the battery ground terminal and turn the ignition switch to ON.	Does the airbag warning light illuminate for six seconds and go off?	Replace the passenger's airbag module. <Ref. to AB-19, Passenger's Airbag Module.>	Go to step **3**.

	Step	Check	Yes	No
3	**CHECK AIRBAG MAIN HARNESS (PASSENGER'S AIRBAG HARNESS).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Disconnect the airbag resistor from the connectors (2P) and (3P) of test harness P. 3) Remove the instrument panel lower cover and disconnect the connector (AB7) from (AB2). 4) Disconnect the connectors (AB6, AB17, AB18) from the airbag control module, and connect the connector (1AG) in the test harness AG. 5) Measure the resistance between connector (3AG) in the test harness AG and chassis ground. ***Connector & terminal*** ***(3AG) No. 8 — Chassis ground:*** ***(3AG) No. 6 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **4**.	Replace the airbag main harness along with body harness.
4	**CHECK AIRBAG CONTROL MODULE.** 1) Connect all connectors. 2) Clear the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-24, Airbag Control Module.>	Go to step **5**.
5	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to AB(diag)-37, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

BA:DTC 75 DRIVER'S AIRBAG FAILURE

DTC DETECTING CONDITION:

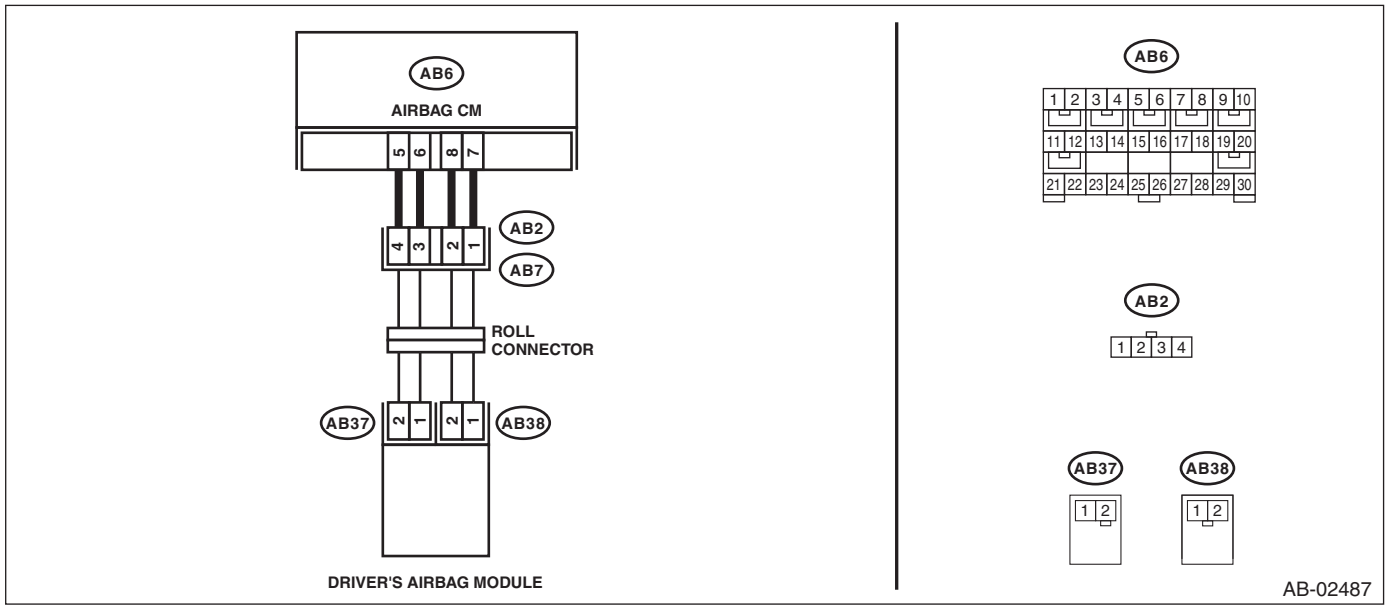
- Airbag main harness circuit (Driver's side) is shorted to power supply.
- Airbag module harness circuit (Driver's side) is shorted to power supply.
- Roll connector is shorted to power supply.
- Driver's airbag module is faulty.
- Airbag control module is faulty.

CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait 60 seconds or more 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 of the driver's and passenger's seats for safety.
• When inspecting the airbag rear harness, disconnect the side airbag module connector, curtain airbag module connector and seat belt pretensioner connector for safety reasons.

NOTE:
Prior to starting work, prepare two airbag resistors (98299PA040).

WIRING DIAGRAM:



	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 body harness.	Go to step **2**.
2	**CHECK DRIVER'S AIRBAG MODULE.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 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) of 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 six seconds and go off?	Replace the driver's airbag module. <Ref. to AB-18, Driver's Airbag Module.>	Go to step **3**.
3	**CHECK ROLL CONNECTOR.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 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 and disconnect the connector (AB7) 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) of test harness P. 7) Connect the battery ground terminal and turn the ignition switch to ON.	Does the airbag warning light illuminate for six seconds and go off?	Replace the roll connector. <Ref. to AB-29, Roll Connector.>	Go to step **4**.
4	**CHECK AIRBAG MAIN HARNESS (DRIVER'S AIRBAG HARNESS).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Disconnect the airbag resistor from the connectors (2P) and (3P) of test harness P. 3) Remove the console front panel and disconnect the connector (AB9). 4) Disconnect the connectors (AB6, AB17, AB18) from the airbag control module, and connect the connector (1AG) in the test harness AG. 5) Connect the battery ground terminal and turn the ignition switch to ON. (engine OFF) 6) Measure the voltage between connector (3AG) in the test harness AG and chassis ground. ***Connector & terminal*** ***(3AG) No. 2 (+) — Chassis ground (–):*** ***(3AG) No. 4 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **5**.	Replace the airbag main harness along with body harness.

Step		Check	Yes	No
5	**CHECK AIRBAG CONTROL MODULE.** 1) Connect all connectors. 2) Clear the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-24, Airbag Control Module.>	Go to step **6**.
6	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to AB(diag)-37, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

BB:DTC 76 PASSENGER'S AIRBAG FAILURE

DTC DETECTING CONDITION:

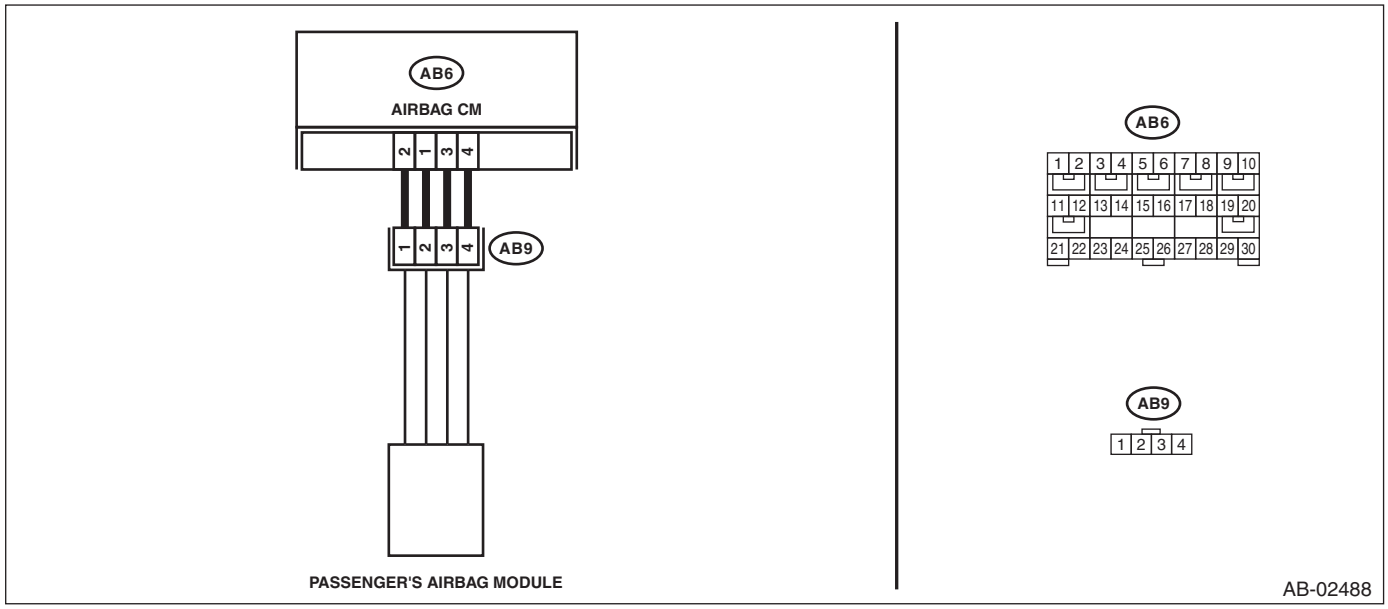
- Airbag main harness circuit (Passenger's side) is shorted to power supply.
- Airbag module harness circuit (Passenger's side) is shorted to power supply.
- Passenger's airbag module is faulty.
- Airbag control module is faulty.

CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait 60 seconds or more 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 of the driver's and passenger's seats for safety.
• When inspecting the airbag rear harness, disconnect the side airbag module connector, curtain airbag module connector and seat belt pretensioner connector for safety reasons.

NOTE:
Prior to starting work, prepare two airbag resistors (98299PA040).

WIRING DIAGRAM:



	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 main harness along with body harness.	Go to step **2**.
2	**CHECK PASSENGER'S AIRBAG MODULE.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Remove the console front panel and disconnect the connector (AB9). 3) Connect the connector (1P) in the test harness P to connector (AB9). 4) Connect the airbag resistor to the connectors (2P) and (3P) of test harness P. 5) Connect the battery ground terminal and turn the ignition switch to ON.	Does the airbag warning light illuminate for six seconds and go off?	Replace the passenger's airbag module. <Ref. to AB-19, Passenger's Airbag Module.>	Go to step **3**.

	Step	Check	Yes	No
3	**CHECK AIRBAG MAIN HARNESS (PASSENGER'S AIRBAG HARNESS).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Disconnect the airbag resistor from the connectors (2P) and (3P) of test harness P. 3) Remove the instrument panel lower cover and disconnect the connector (AB7) from (AB2). 4) Disconnect the connectors (AB6, AB17, AB18) from the airbag control module, and connect the connector (1AG) in the test harness AG. 5) Measure the voltage between connector (3AG) in the test harness AG and chassis ground. ***Connector & terminal*** ***(3AG) No. 8 (+) — Chassis ground (–):*** ***(3AG) No. 6 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **4**.	Replace the airbag main harness along with body harness.
4	**CHECK AIRBAG CONTROL MODULE.** 1) Connect all connectors. 2) Clear the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-24, Airbag Control Module.>	Go to step **5**.
5	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to AB(diag)-37, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

BC:DTC 7A DRIVER'S AIRBAG FAILURE

DTC DETECTING CONDITION:

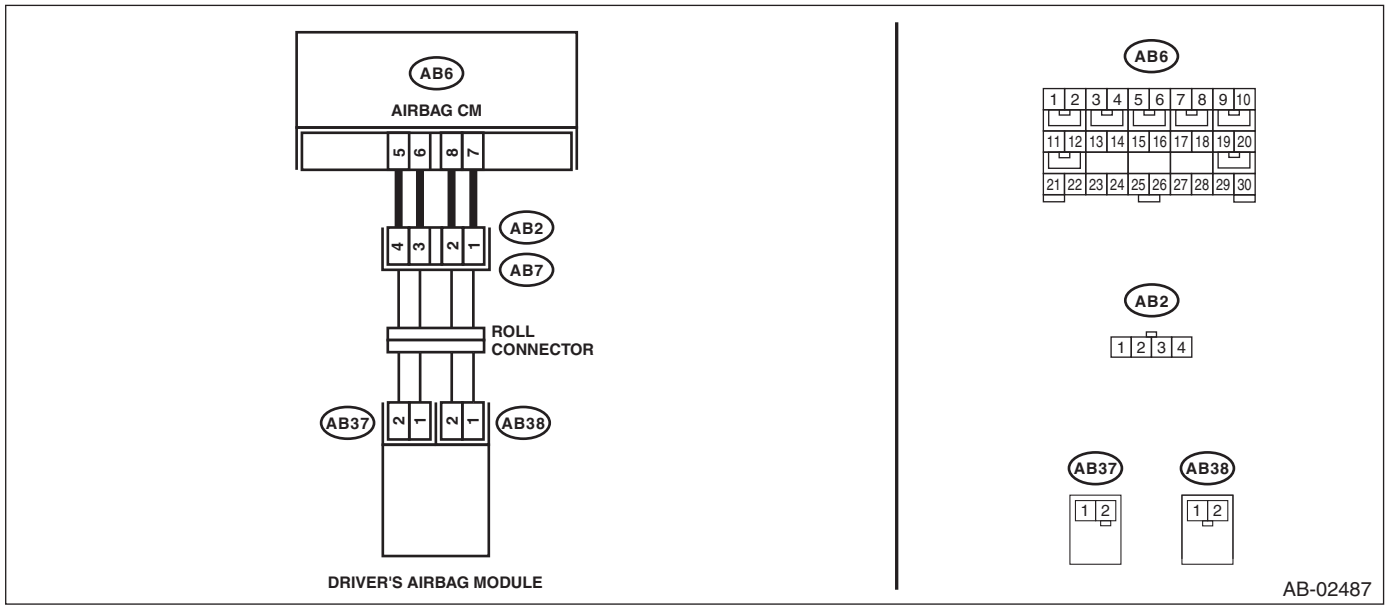
- Airbag main harness circuit is shorted.
- Airbag module harness (driver's side) circuit is shorted.
- Roll connector circuit is shorted.
- Driver's airbag module is faulty.
- Airbag control module is faulty.

CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait 60 seconds or more 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 of the driver's and passenger's seats for safety.
• When inspecting the airbag rear harness, disconnect the side airbag module connector, curtain airbag module connector and seat belt pretensioner connector for safety reasons.

NOTE:
Prior to starting work, prepare two airbag resistors (98299PA040).

WIRING DIAGRAM:



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**.

	Step	Check	Yes	No
2	**CHECK DRIVER'S AIRBAG MODULE.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Remove the driver's airbag module. 3) Connect the connector (1N) in the test harness N to the connector (AB38). 4) Connect the airbag resistor to the connector (2N) of 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 six seconds and go off?	Replace the driver's airbag module. <Ref. to AB-18, Driver's Airbag Module.>	Go to step **3**.
3	**CHECK ROLL CONNECTOR.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 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 and disconnect the connector (AB7) 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) of test harness P. 7) Connect the battery ground terminal and turn the ignition switch to ON.	Does the airbag warning light illuminate for six seconds and go off?	Replace the roll connector. <Ref. to AB-29, Roll Connector.>	Go to step **4**.
4	**CHECK AIRBAG MAIN HARNESS (DRIVER'S AIRBAG HARNESS).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Disconnect the airbag resistor from the connectors (2P) and (3P) of test harness P. 3) Remove the console front panel and disconnect the connector (AB9). 4) Disconnect the connectors (AB6, AB17, AB18) from the airbag control module, and connect the connector (1AG) in the test harness AG. 5) Measure the resistance between connector (3AG) terminals in test harness AG. ***Connector & terminal*** ***(3AG) No. 2 — (3AG) No. 4:***	Is the resistance 1 MΩ or more?	Go to step **5**.	Replace the airbag main harness along with body harness.
5	**CHECK AIRBAG CONTROL MODULE.** 1) Connect all connectors. 2) Clear the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-24, Airbag Control Module.>	Go to step **6**.

Step		Check	Yes	No
6	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to AB(diag)-37, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

BD:DTC 7B PASSENGER'S AIRBAG FAILURE

DTC DETECTING CONDITION:

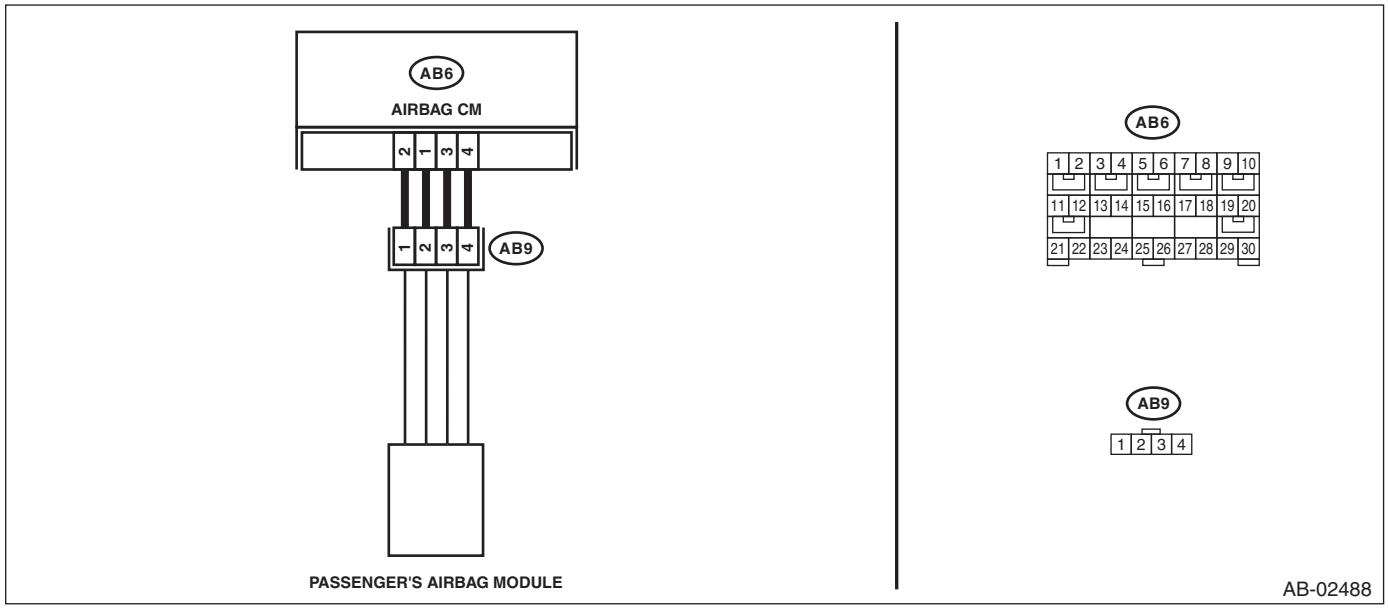
- Airbag main harness circuit is shorted.
- Airbag module harness (passenger's side) circuit is shorted.
- Passenger's airbag module is faulty.
- Airbag control module is faulty.

CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait 60 seconds or more 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 of the driver's and passenger's seats for safety.
• When inspecting the airbag rear harness, disconnect the side airbag module connector, curtain airbag module connector and seat belt pretensioner connector for safety reasons.

NOTE:
Prior to starting work, prepare two airbag resistors (98299PA040).

WIRING DIAGRAM:



	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 the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Remove the console front panel and disconnect the connector (AB9). 3) Connect the connector (1P) in the test harness P to connector (AB9). 4) Connect the airbag resistor to the connectors (2P) and (3P) of test harness P. 5) Connect the battery ground terminal and turn the ignition switch to ON.	Does the airbag warning light illuminate for six seconds and go off?	Replace the passenger's airbag module. <Ref. to AB-19, Passenger's Airbag Module.>	Go to step **3**.

	Step	Check	Yes	No
3	**CHECK AIRBAG MAIN HARNESS (PASSENGER'S AIRBAG HARNESS).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Disconnect the airbag resistor from the connectors (2P) and (3P) of test harness P. 3) Remove the instrument panel lower cover and column cover, and disconnect the connector (AB7) from (AB2). 4) Disconnect the connectors (AB6, AB17, AB18) from the airbag control module, and connect the connector (1AG) in the test harness AG. 5) Measure the resistance between connector (3AG) terminals in test harness AG. ***Connector & terminal*** ***(3AG) No. 6 — (3AG) No. 8:***	Is the resistance 1 MΩ or more?	Go to step **4**.	Replace the airbag main harness along with body harness.
4	**CHECK AIRBAG CONTROL MODULE.** 1) Connect all connectors. 2) Clear the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-24, Airbag Control Module.>	Go to step **5**.
5	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to AB(diag)-37, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

BE:DTC 7D DRIVER'S AIRBAG FAILURE

DTC DETECTING CONDITION:

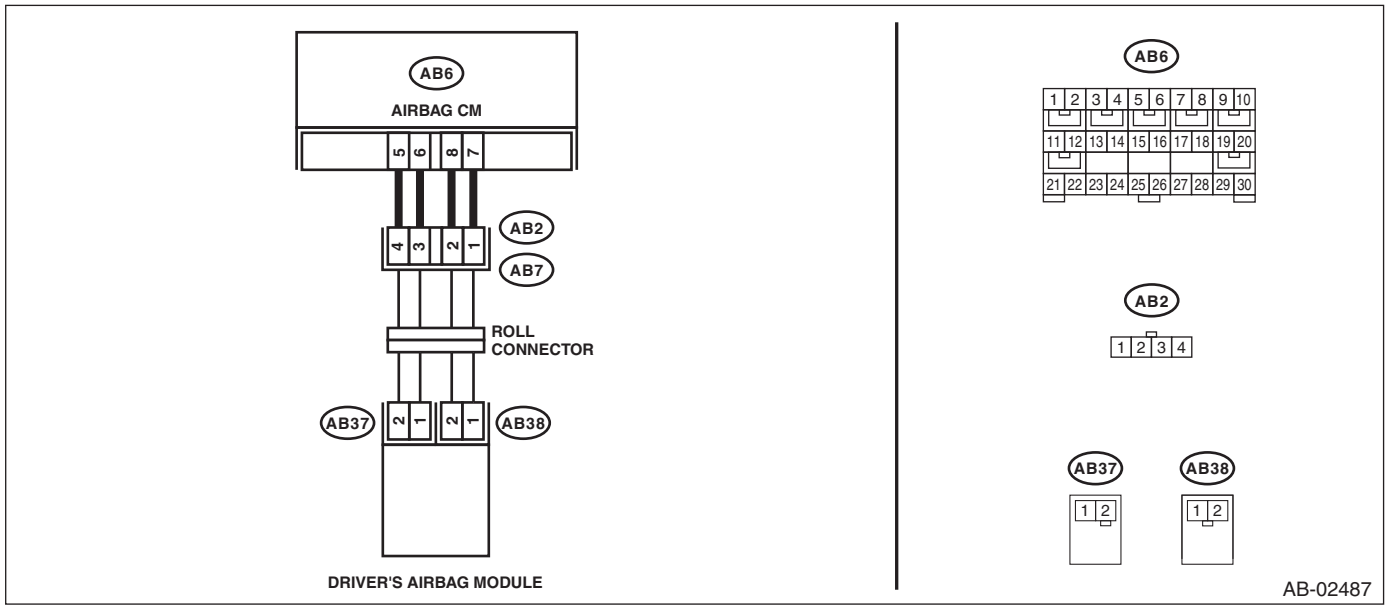
- Airbag main harness circuit is open.
- Airbag module harness (driver's side) circuit is open.
- Roll connector circuit is open.
- Driver's airbag module is faulty.
- Airbag control module is faulty.

CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait 60 seconds or more 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 of the driver's and passenger's seats for safety.
• When inspecting the airbag rear harness, disconnect the side airbag module connector, curtain airbag module connector and seat belt pretensioner connector for safety reasons.

NOTE:
Prior to starting work, prepare two airbag resistors (98299PA040).

WIRING DIAGRAM:



	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 the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Remove the driver's airbag module. 3) Connect the connector (1N) in the test harness N to the connector (AB38). 4) Connect the airbag resistor to the connector (2N) of 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 six seconds and go off?	Replace the driver's airbag module. <Ref. to AB-18, Driver's Airbag Module.>	Go to step **3**.
3	**CHECK ROLL CONNECTOR.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 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 and disconnect the connector (AB7) 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) of test harness P. 7) Connect the battery ground terminal and turn the ignition switch to ON.	Does the airbag warning light illuminate for six seconds and go off?	Replace the roll connector. <Ref. to AB-29, Roll Connector.>	Go to step **4**.
4	**CHECK AIRBAG MAIN HARNESS (DRIVER'S AIRBAG HARNESS).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Disconnect the airbag resistor from the connectors (2P) and (3P) of test harness P. 3) Remove the console front panel and disconnect the connector (AB9). 4) Disconnect the connectors (AB6, AB17, AB18) from the airbag control module, and connect the connector (1AG) in the test harness AG. 5) Measure the resistance between connector (3AG) of test harness AG and connector (3P) of test harness P. ***Connector & terminal*** ***(3AG) No. 2 — (3P) No. 3:*** ***(3AG) No. 4 — (3P) No. 4:***	Is the resistance less than 10 Ω?	Go to step **5**.	Replace the airbag main harness along with body harness.

	Step	Check	Yes	No
5	**CHECK AIRBAG CONTROL MODULE.** 1) Connect all connectors. 2) Clear the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-24, Airbag Control Module.>	Go to step **6**.
6	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to AB(diag)-37, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

BF:DTC 7E PASSENGER'S AIRBAG FAILURE

DTC DETECTING CONDITION:

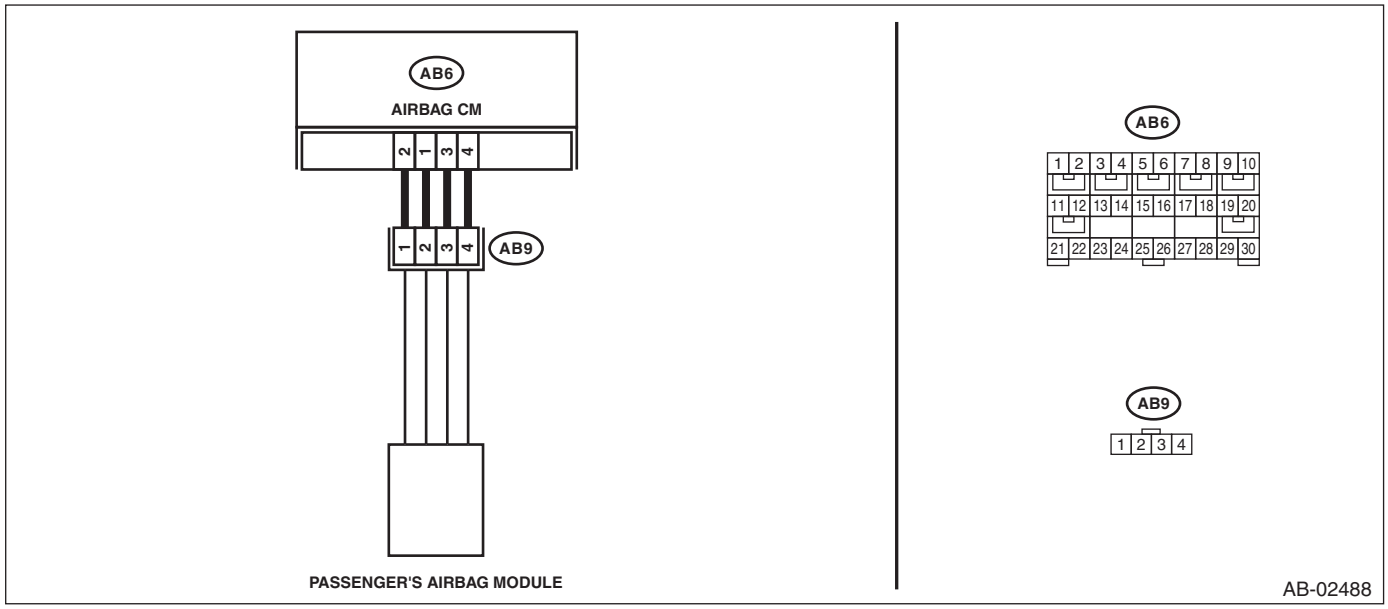
- Airbag main harness circuit is open.
- Airbag module harness (passenger's side) circuit is open.
- Passenger's airbag module is faulty.
- Airbag control module is faulty.

CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait 60 seconds or more 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 of the driver's and passenger's seats for safety.
• When inspecting the airbag rear harness, disconnect the side airbag module connector, curtain airbag module connector and seat belt pretensioner connector for safety reasons.

NOTE:
Prior to starting work, prepare two airbag resistors (98299PA040).

WIRING DIAGRAM:



	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 the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Remove the console front panel and disconnect the connector (AB9). 3) Connect the connector (1P) in the test harness P to connector (AB9). 4) Connect the airbag resistor to the connectors (2P) and (3P) of test harness P. 5) Connect the battery ground terminal and turn the ignition switch to ON.	Does the airbag warning light illuminate for six seconds and go off?	Replace the passenger's airbag module. <Ref. to AB-19, Passenger's Airbag Module.>	Go to step **3**.

	Step	Check	Yes	No
3	**CHECK AIRBAG MAIN HARNESS (PASSENGER'S AIRBAG HARNESS).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Disconnect the airbag resistor from the connectors (2P) and (3P) of test harness P. 3) Remove the instrument panel lower cover and column cover, and disconnect the connector (AB7) from (AB2). 4) Disconnect the connectors (AB6, AB17, AB18) from the airbag control module, and connect the connector (1AG) in the test harness AG. 5) Measure the resistance between connector (3AG) of test harness AG and connector (3P) of test harness P. ***Connector & terminal*** ***(3AG) No. 6 — (3P) No. 4:*** ***(3AG) No. 8 — (3P) No. 3:***	Is the resistance less than 10 Ω?	Go to step **4**.	Replace the airbag main harness along with body harness.
4	**CHECK AIRBAG CONTROL MODULE.** 1) Connect all connectors. 2) Clear the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-24, Airbag Control Module.>	Go to step **5**.
5	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to AB(diag)-37, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

BG:DTC 91 CURTAIN AIRBAG MODULE RH FAILURE

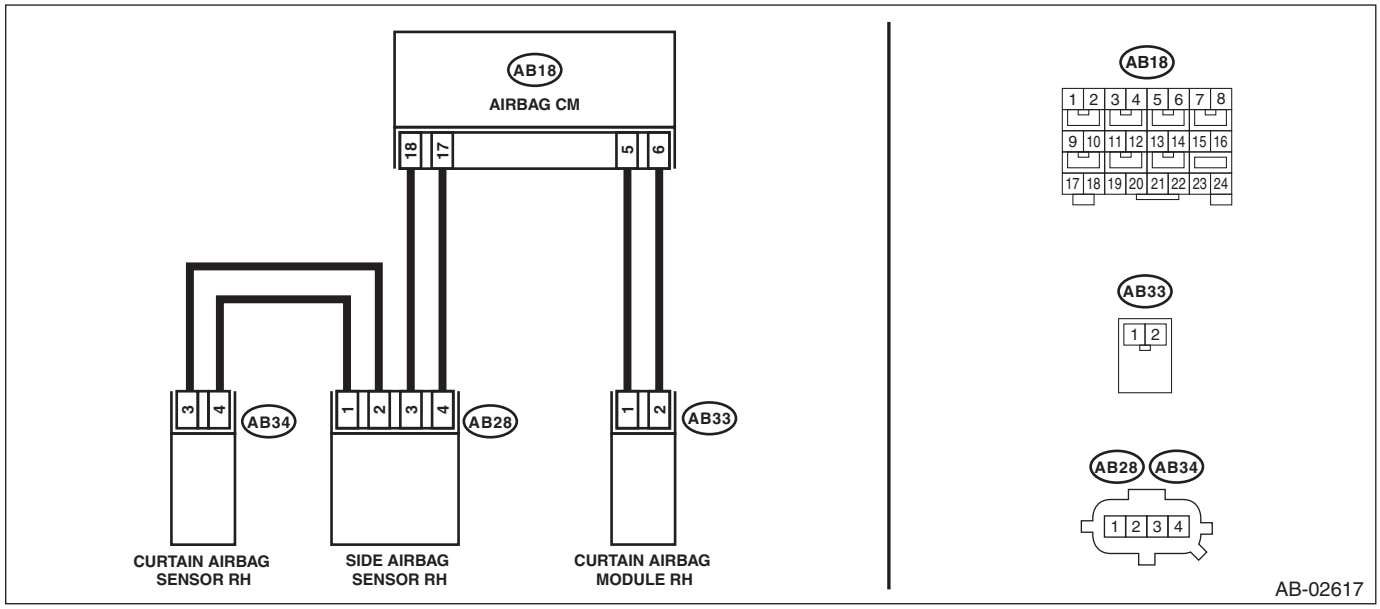
DTC DETECTING CONDITION:

- Curtain airbag harness (RH) circuit is shorted to ground.
- Curtain 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 cable from battery, and wait 60 seconds or more 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 of the driver's and passenger's seats for safety.
• When inspecting the airbag rear harness, disconnect the side airbag module connector, curtain airbag module connector and seat belt pretensioner connector for safety reasons.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK POOR CONTACT OF CONNECTORS.** Check for poor contact of the connectors between the airbag control module, curtain airbag module RH and the curtain airbag sensor RH.	Is there poor contact?	Replace the airbag rear harness along with body harness.	Go to step **2**.
2	**CHECK CURTAIN AIRBAG MODULE.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Disconnect the connector (AB33), and connect the connector (1N) in test harness N to connector (AB33). 3) Connect the airbag resistor to the connector (2N) of test harness N. 4) Connect the battery ground terminal and turn the ignition switch to ON.	Does the airbag warning light illuminate for six seconds and go off?	Replace the curtain airbag module (RH). <Ref. to AB-22, Curtain Airbag Module.>	Go to step **3**.

	Step	Check	Yes	No
3	**CHECK AIRBAG REAR HARNESS (CURTAIN AIRBAG MODULE HARNESS RH).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Disconnect the connector (AB26) from seat belt pretensioner (RH). 3) Disconnect connector (AB24) from side airbag module (RH). 4) Disconnect the airbag resistor from test harness N. 5) Disconnect the connectors (AB6, AB17, AB18) from airbag control module. 6) Connect the connector (1AG) in the test harness AG to the connectors (AB6, AB17, AB18). 7) Measure the resistance between connector (6AG) in the test harness AG and chassis ground. ***Connector & terminal*** ***(6AG) No. 6 — Chassis ground:*** ***(6AG) No. 8 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **4**.	Replace the airbag rear harness along with body harness.
4	**CHECK AIRBAG CONTROL MODULE.** 1) Connect all connectors. 2) Clear the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-24, Airbag Control Module.>	Go to step **5**.
5	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to AB(diag)-37, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

BH:DTC 92 CURTAIN AIRBAG MODULE LH FAILURE

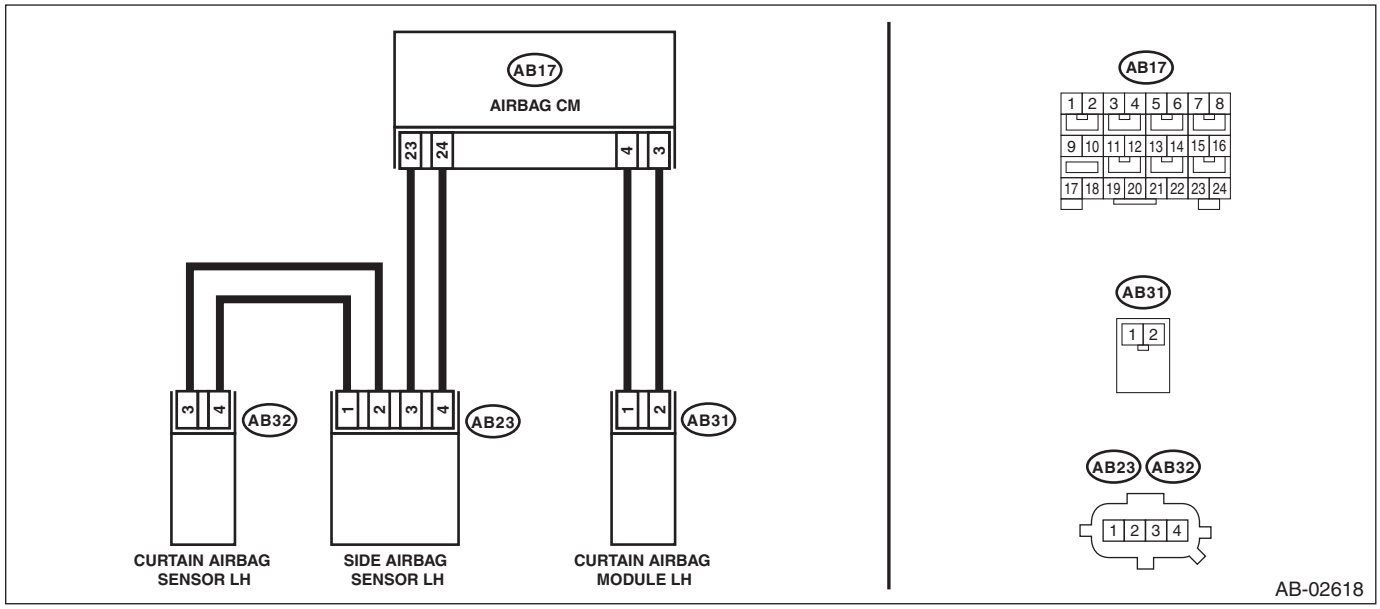
DTC DETECTING CONDITION:

- Curtain airbag harness (LH) circuit is shorted to ground.
- Curtain 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 cable from battery, and wait 60 seconds or more 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 of the driver's and passenger's seats for safety.
• When inspecting the airbag rear harness, disconnect the side airbag module connector, curtain airbag module connector and seat belt pretensioner connector for safety reasons.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK POOR CONTACT OF CONNECTORS.** Check for poor contact of the connectors between the airbag control module, curtain airbag module LH and the curtain airbag sensor LH.	Is there poor contact?	Replace the airbag rear harness along with body harness.	Go to step **2**.
2	**CHECK CURTAIN AIRBAG MODULE.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Disconnect the connector (AB31), and connect the connector (1N) in test harness N to connector (AB31). 3) Connect the airbag resistor to the connector (2N) of test harness N. 4) Connect the battery ground terminal and turn the ignition switch to ON.	Does the airbag warning light illuminate for six seconds and go off?	Replace the curtain airbag module (LH). <Ref. to AB-22, Curtain Airbag Module.>	Go to step **3**.

	Step	Check	Yes	No
3	**CHECK AIRBAG REAR HARNESS (CURTAIN AIRBAG MODULE HARNESS LH).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Disconnect the connector (AB21) from seat belt pretensioner (LH). 3) Disconnect connector (AB19) from side airbag module (LH). 4) Disconnect the airbag resistor from test harness N. 5) Disconnect the connectors (AB6, AB17, AB18) from airbag control module. 6) Connect the connector (1AG) in the test harness AG to the connectors (AB6, AB17, AB18). 7) Measure the resistance between connector (6AG) in the test harness AG and chassis ground. ***Connector & terminal*** ***(6AG) No. 1 — Chassis ground:*** ***(6AG) No. 3 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **4**.	Replace the airbag rear harness along with body harness.
4	**CHECK AIRBAG CONTROL MODULE.** 1) Connect all connectors. 2) Clear the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-24, Airbag Control Module.>	Go to step **5**.
5	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to AB(diag)-37, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

BI: DTC 95 CURTAIN AIRBAG MODULE RH FAILURE

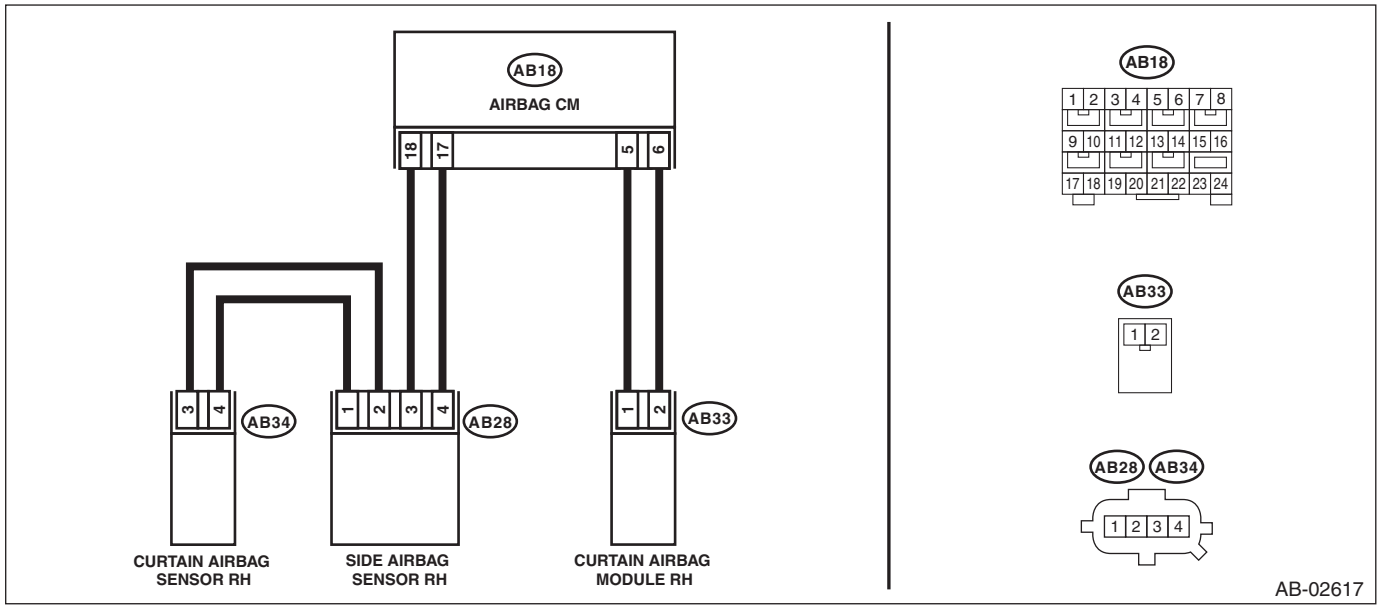
DTC DETECTING CONDITION:

- Curtain airbag harness (RH) is shorted to power supply.
- Curtain 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 cable from battery, and wait 60 seconds or more 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 of the driver's and passenger's seats for safety.
• When inspecting the airbag rear harness, disconnect the side airbag module connector, curtain airbag module connector and seat belt pretensioner connector for safety reasons.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK POOR CONTACT OF CONNECTORS.** Check for poor contact of the connectors between the airbag control module, curtain airbag module RH and the curtain airbag sensor RH.	Is there poor contact?	Replace the airbag rear harness along with body harness.	Go to step **2**.
2	**CHECK CURTAIN AIRBAG MODULE.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Disconnect the connector (AB33), and connect the connector (1N) in test harness N to connector (AB33). 3) Connect the airbag resistor to the connector (2N) of test harness N. 4) Connect the battery ground terminal and turn the ignition switch to ON.	Does the airbag warning light illuminate for six seconds and go off?	Replace the curtain airbag module (RH). <Ref. to AB-22, Curtain Airbag Module.>	Go to step **3**.

	Step	Check	Yes	No
3	**CHECK AIRBAG REAR HARNESS (CURTAIN AIRBAG MODULE HARNESS RH).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Disconnect the connector (AB26) from seat belt pretensioner (RH). 3) Disconnect connector (AB24) from side airbag module (RH). 4) Disconnect the airbag resistor from test harness N. 5) Disconnect the connectors (AB6, AB17, AB18) from airbag control module. 6) Connect the connector (1AG) in the test harness AG to the connectors (AB6, AB17, AB18). 7) Connect the battery ground terminal and turn the ignition switch to ON. 8) Measure the voltage between connector (6AG) in the test harness AG and chassis ground. ***Connector & terminal*** ***(6AG) No. 6 (+) — Chassis ground (–):*** ***(6AG) No. 8 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **4**.	Replace the airbag rear harness along with body harness.
4	**CHECK AIRBAG CONTROL MODULE.** 1) Connect all connectors. 2) Clear the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-24, Airbag Control Module.>	Go to step **5**.
5	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to AB(diag)-37, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

BJ:DTC 96 CURTAIN AIRBAG MODULE LH FAILURE

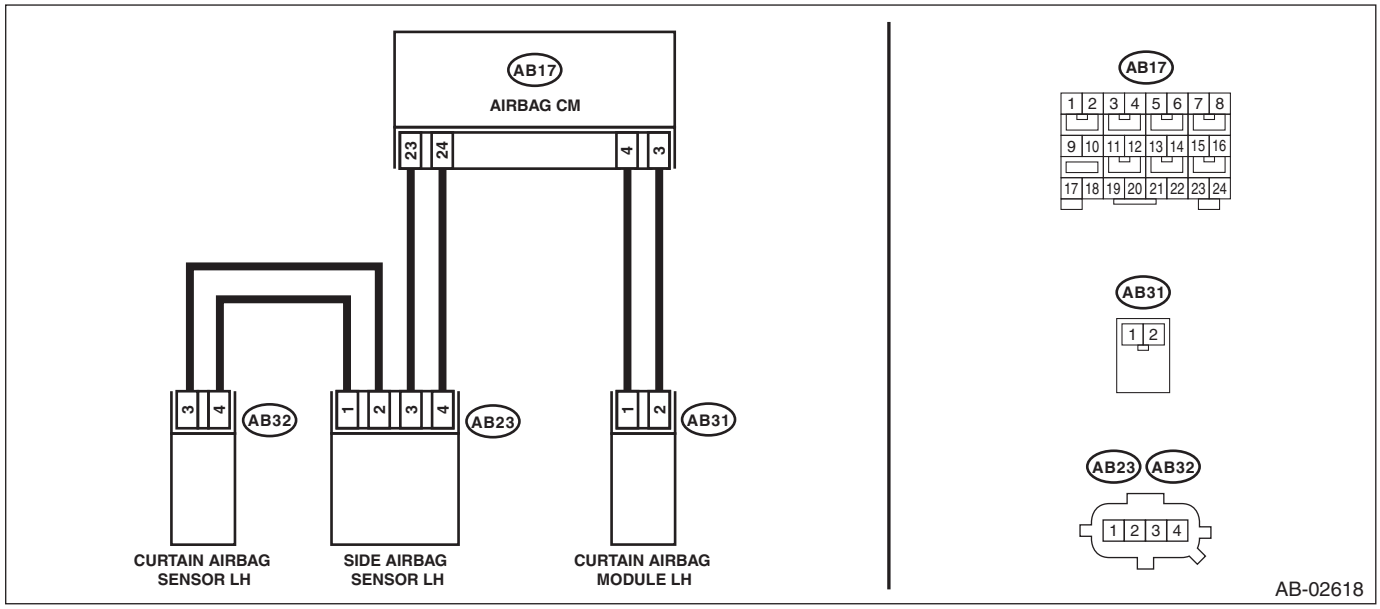
DTC DETECTING CONDITION:

- Curtain airbag harness (LH) is shorted to power supply.
- Curtain 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 cable from battery, and wait 60 seconds or more 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 of the driver's and passenger's seats for safety.
• When inspecting the airbag rear harness, disconnect the side airbag module connector, curtain airbag module connector and seat belt pretensioner connector for safety reasons.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK POOR CONTACT OF CONNECTORS.** Check for poor contact of the connectors between the airbag control module, curtain airbag module LH and the curtain airbag sensor LH.	Is there poor contact?	Replace the airbag rear harness along with body harness.	Go to step **2**.
2	**CHECK CURTAIN AIRBAG MODULE.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Disconnect the connector (AB31), and connect the connector (1N) in test harness N to connector (AB31). 3) Connect the airbag resistor to the connector (2N) of test harness N. 4) Connect the battery ground terminal and turn the ignition switch to ON.	Does the airbag warning light illuminate for six seconds and go off?	Replace the curtain airbag module (LH). <Ref. to AB-22, Curtain Airbag Module.>	Go to step **3**.

	Step	Check	Yes	No
3	**CHECK AIRBAG REAR HARNESS (CURTAIN AIRBAG MODULE HARNESS LH).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Disconnect the connector (AB21) from seat belt pretensioner (LH). 3) Disconnect connector (AB19) from side airbag module (LH). 4) Disconnect the airbag resistor from test harness N. 5) Disconnect the connectors (AB6, AB17, AB18) from airbag control module. 6) Connect the connector (1AG) in the test harness AG to the connectors (AB6, AB17, AB18). 7) Connect the battery ground terminal and turn the ignition switch to ON. 8) Measure the voltage between connector (6AG) in the test harness AG and chassis ground. ***Connector & terminal*** ***(6AG) No. 1 (+) — Chassis ground (–):*** ***(6AG) No. 3 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **4**.	Replace the airbag rear harness along with body harness.
4	**CHECK AIRBAG CONTROL MODULE.** 1) Connect all connectors. 2) Clear the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-24, Airbag Control Module.>	Go to step **5**.
5	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to AB(diag)-37, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

BK:DTC 9A CURTAIN AIRBAG MODULE RH FAILURE

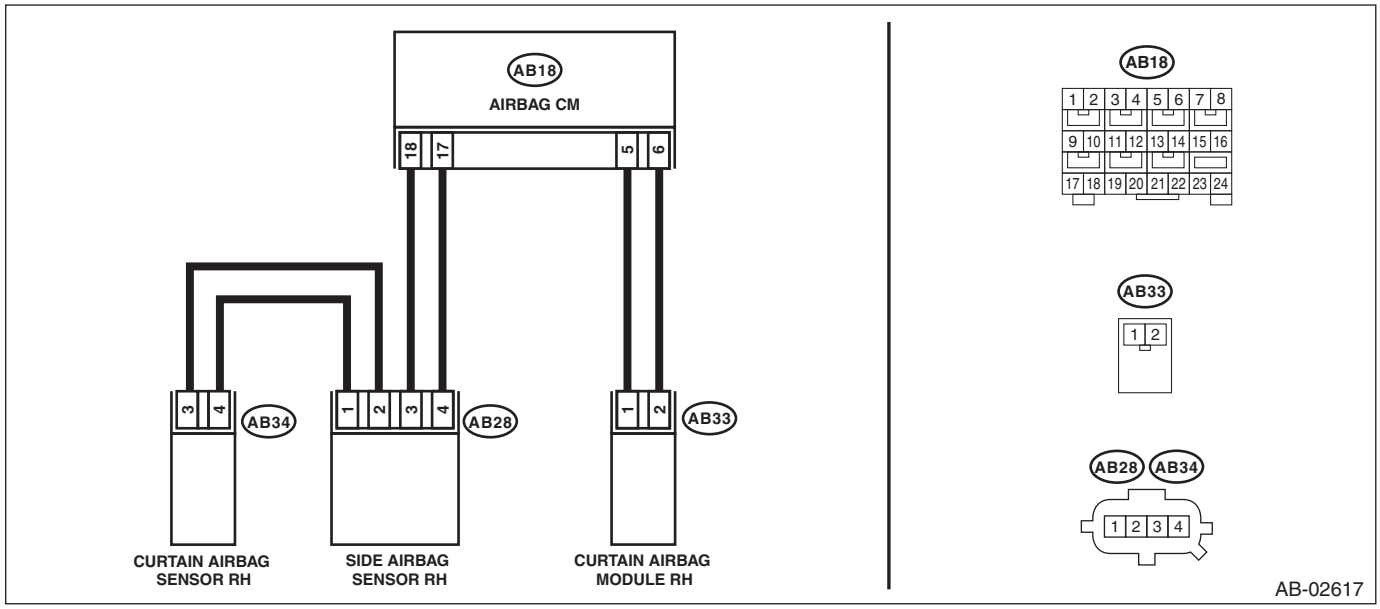
DTC DETECTING CONDITION:

- Curtain airbag harness (RH) circuit is shorted.
- Curtain 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 cable from battery, and wait 60 seconds or more 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 of the driver's and passenger's seats for safety.
• When inspecting the airbag rear harness, disconnect the side airbag module connector, curtain airbag module connector and seat belt pretensioner connector for safety reasons.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK POOR CONTACT OF CONNECTORS.** Check for poor contact of the connectors between the airbag control module, curtain airbag module RH and the curtain airbag sensor RH.	Is there poor contact?	Replace the airbag rear harness along with body harness.	Go to step **2**.
2	**CHECK CURTAIN AIRBAG MODULE.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Disconnect the connector (AB33) from curtain airbag module (RH). 3) Connect the connector (1N) in the test harness N to the connector (AB33). 4) Connect the airbag resistor to the connector (2N) of 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 and go off?	Replace the curtain airbag module (RH). <Ref. to AB-22, Curtain Airbag Module.>	Go to step **3**.

	Step	Check	Yes	No
3	**CHECK AIRBAG REAR HARNESS (CURTAIN AIRBAG MODULE HARNESS RH).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Disconnect the connector (AB26) from seat belt pretensioner (RH). 3) Disconnect connector (AB24) from side airbag module (RH). 4) Disconnect the airbag resistor from test harness N. 5) Disconnect the connectors (AB6, AB17, AB18) from airbag control module. 6) Connect the connector (1AG) in the test harness AG to the connectors (AB6, AB17, AB18). 7) Measure the resistance between connector (6AG) terminals in test harness AG. ***Connector & terminal (6AG) No. 6 — (6AG) No. 8:***	Is the resistance 1 MΩ or more?	Go to step **4**.	Replace the airbag rear harness along with body harness.
4	**CHECK AIRBAG CONTROL MODULE.** 1) Connect all connectors. 2) Clear the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-24, Airbag Control Module.>	Go to step **5**.
5	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to AB(diag)-37, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

BL:DTC 9B CURTAIN AIRBAG MODULE LH FAILURE

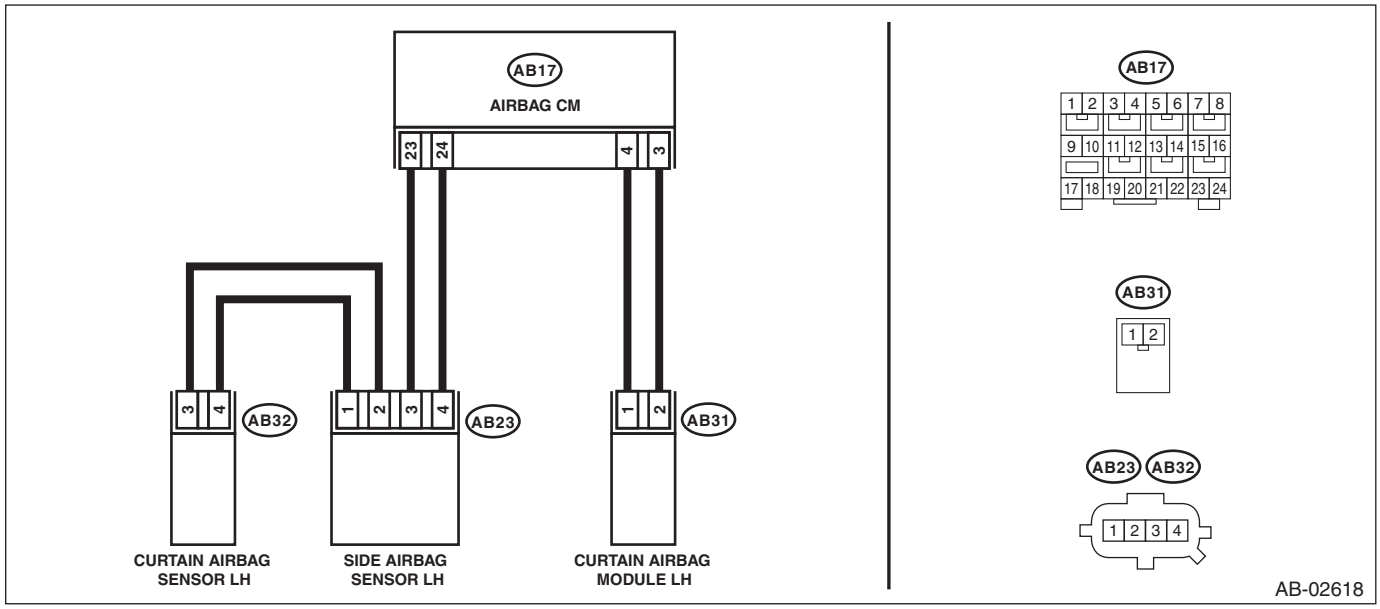
DTC DETECTING CONDITION:

- Curtain airbag harness (LH) circuit is shorted.
- Curtain 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 cable from battery, and wait 60 seconds or more 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 of the driver's and passenger's seats for safety.
• When inspecting the airbag rear harness, disconnect the side airbag module connector, curtain airbag module connector and seat belt pretensioner connector for safety reasons.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK POOR CONTACT OF CONNECTORS.** Check for poor contact of the connectors between the airbag control module, curtain airbag module LH and the curtain airbag sensor LH.	Is there poor contact?	Replace the airbag rear harness along with body harness.	Go to step **2**.
2	**CHECK CURTAIN AIRBAG MODULE.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Disconnect the connector (AB31) from curtain airbag module (LH). 3) Connect the connector (1N) in the test harness N to the connector (AB31). 4) Connect the airbag resistor to the connector (2N) of 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 and go off?	Replace the curtain airbag module (LH). <Ref. to AB-22, Curtain Airbag Module.>	Go to step **3**.

	Step	Check	Yes	No
3	**CHECK AIRBAG REAR HARNESS (CURTAIN AIRBAG MODULE HARNESS LH).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Disconnect the connector (AB21) from seat belt pretensioner (LH). 3) Disconnect connector (AB19) from side airbag module (LH). 4) Disconnect the airbag resistor from test harness N. 5) Disconnect the connectors (AB6, AB17, AB18) from airbag control module. 6) Connect the connector (1AG) in the test harness AG to the connectors (AB6, AB17, AB18). 7) Measure the resistance between connector (5AG) terminals in test harness AG. ***Connector & terminal (6AG) No. 1 — (6AG) No. 3:***	Is the resistance 1 MΩ or more?	Go to step **4**.	Replace the airbag rear harness along with body harness.
4	**CHECK AIRBAG CONTROL MODULE.** 1) Connect all connectors. 2) Clear the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-24, Airbag Control Module.>	Go to step **5**.
5	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to AB(diag)-37, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

BM:DTC 9D CURTAIN AIRBAG MODULE RH FAILURE

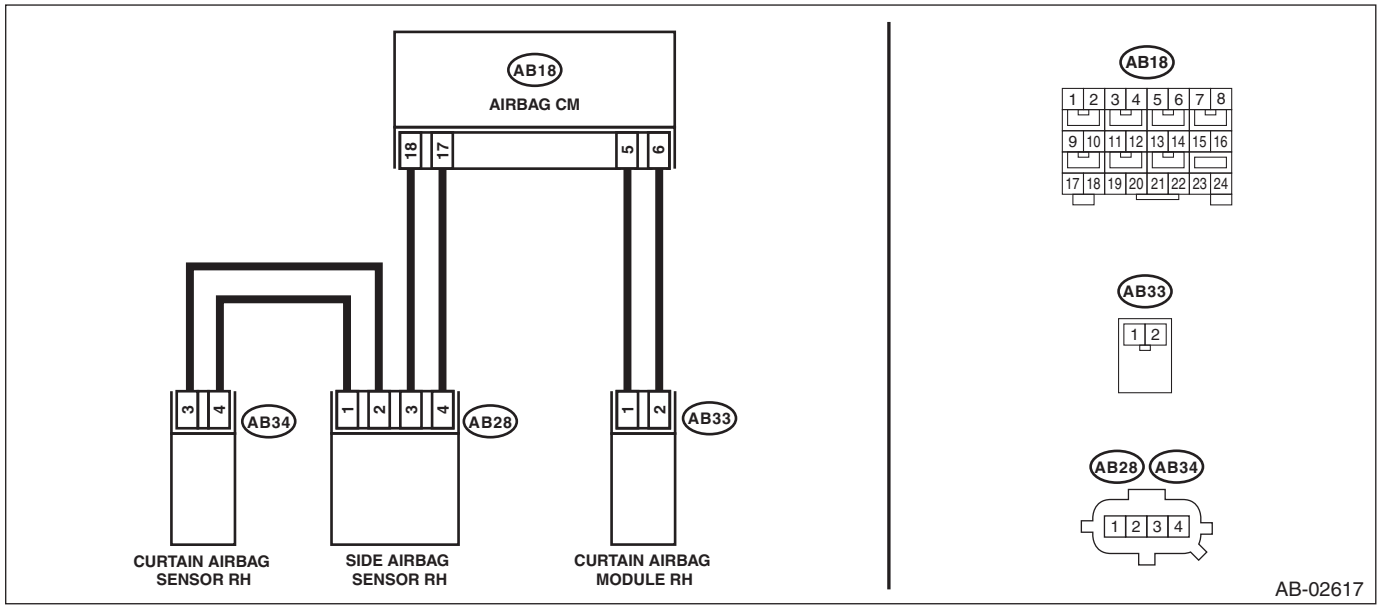
DTC DETECTING CONDITION:

- Curtain airbag harness (RH) circuit is open.
- Curtain 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 cable from battery, and wait 60 seconds or more 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 of the driver's and passenger's seats for safety.
• When inspecting the airbag rear harness, disconnect the side airbag module connector, curtain airbag module connector and seat belt pretensioner connector for safety reasons.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK POOR CONTACT OF CONNECTORS.** Check for poor contact of the connectors between the airbag control module, curtain airbag module RH and the curtain airbag sensor RH.	Is there poor contact?	Replace the airbag rear harness along with body harness.	Go to step **2**.
2	**CHECK CURTAIN AIRBAG MODULE.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Disconnect the connector (AB33) from curtain airbag module (RH). 3) Connect the connector (1N) in the test harness N to the connector (AB33). 4) Connect the airbag resistor to the connector (2N) of 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 and go off?	Replace the curtain airbag module (RH). <Ref. to AB-22, Curtain Airbag Module.>	Go to step **3**.

	Step	Check	Yes	No
3	**CHECK AIRBAG REAR HARNESS (CURTAIN AIRBAG MODULE HARNESS RH).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Disconnect the connector (AB26) from seat belt pretensioner (RH). 3) Disconnect connector (AB24) from side airbag module (RH). 4) Disconnect the airbag resistor from test harness N. 5) Disconnect the connectors (AB6, AB17, AB18) from airbag control module. 6) Connect the connector (1AG) in the test harness AG to the connectors (AB6, AB17, AB18). 7) Measure the resistance between connector (6AG) in the test harness AG and connector (2N) in the test harness N. ***Connector & terminal*** ***(6AG) No. 6 — (2N) No. 1:*** ***(6AG) No. 8 — (2N) No. 2:***	Is the resistance less than 10 Ω?	Go to step **4**.	Replace the airbag rear harness along with body harness.
4	**CHECK AIRBAG CONTROL MODULE.** 1) Connect all connectors. 2) Clear the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-24, Airbag Control Module.>	Go to step **5**.
5	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to AB(diag)-37, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

BN:DTC 9E CURTAIN AIRBAG MODULE LH FAILURE

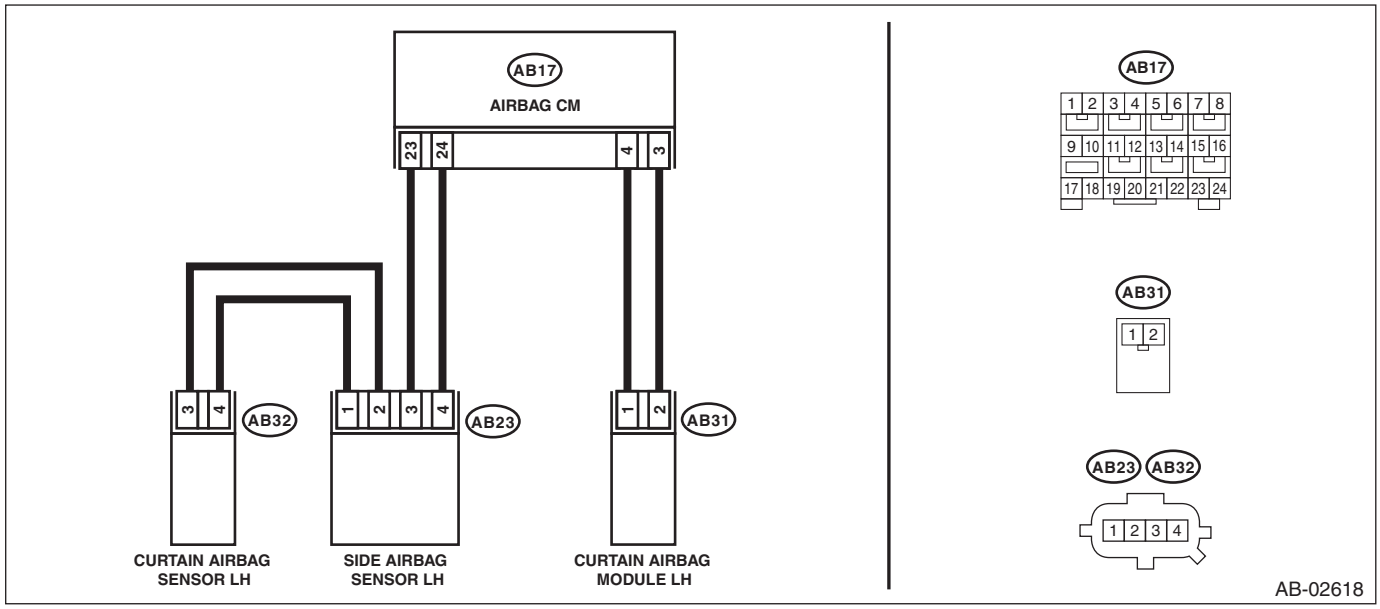
DTC DETECTING CONDITION:

- Curtain airbag harness (LH) circuit is open.
- Curtain 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 cable from battery, and wait 60 seconds or more 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 of the driver's and passenger's seats for safety.
• When inspecting the airbag rear harness, disconnect the side airbag module connector, curtain airbag module connector and seat belt pretensioner connector for safety reasons.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK POOR CONTACT OF CONNECTORS.** Check for poor contact of the connectors between the airbag control module, curtain airbag module LH and the curtain airbag sensor LH.	Is there poor contact?	Replace the airbag rear harness along with body harness.	Go to step **2**.
2	**CHECK CURTAIN AIRBAG MODULE.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Disconnect the connector (AB31) from curtain airbag module (LH). 3) Connect the connector (1N) in the test harness N to the connector (AB31). 4) Connect the airbag resistor to the connector (2N) of 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 and go off?	Replace the curtain airbag module (LH). <Ref. to AB-22, Curtain Airbag Module.>	Go to step **3**.

	Step	Check	Yes	No
3	**CHECK AIRBAG REAR HARNESS (CURTAIN AIRBAG MODULE HARNESS LH).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Disconnect the connector (AB21) from seat belt pretensioner (LH). 3) Disconnect connector (AB19) from side airbag module (LH). 4) Disconnect the airbag resistor from test harness N. 5) Disconnect the connectors (AB6, AB17, AB18) from airbag control module. 6) Connect the connector (1AG) in the test harness AG to the connectors (AB6, AB17, AB18). 7) Measure the resistance between connector (6AG) in the test harness AG and connector (2N) in the test harness N. ***Connector & terminal*** ***(6AG) No. 1 — (2N) No. 2:*** ***(6AG) No. 3 — (2N) No. 1:***	Is the resistance less than 10 Ω?	Go to step **4**.	Replace the airbag rear harness along with body harness.
4	**CHECK AIRBAG CONTROL MODULE.** 1) Connect all connectors. 2) Clear the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-24, Airbag Control Module.>	Go to step **5**.
5	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to AB(diag)-37, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

BO:DTC A1 FRONT SENSOR BUS COMMUNICATION ERROR

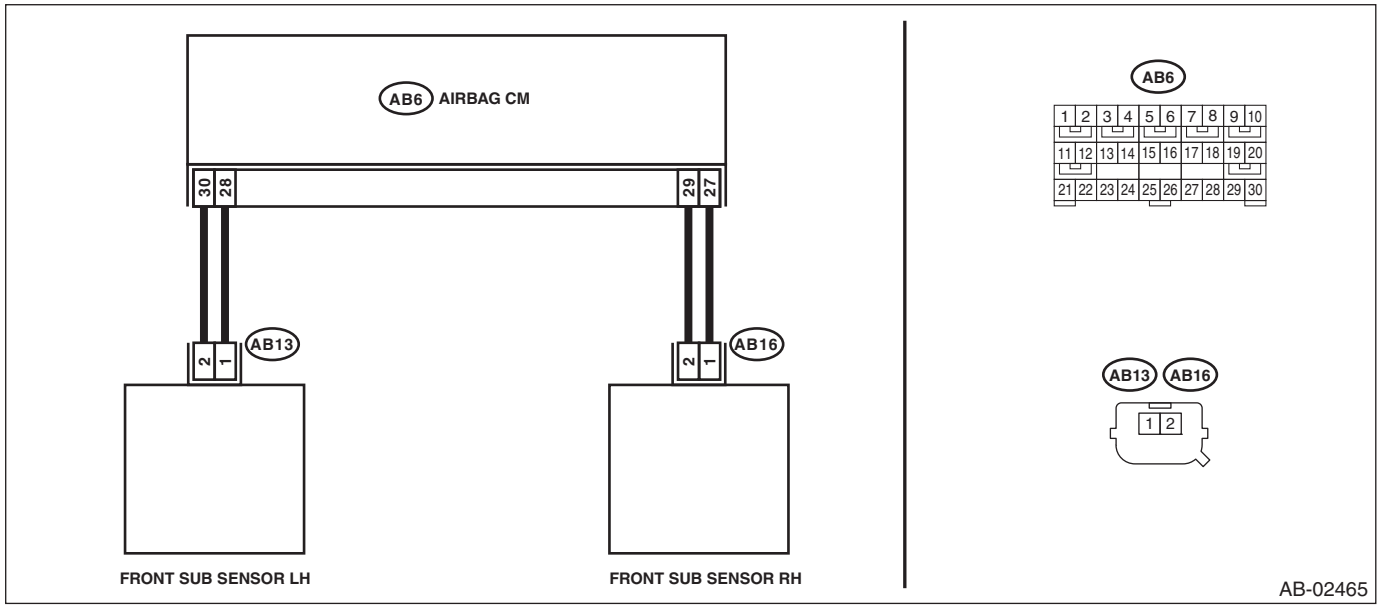
DTC DETECTING CONDITION:

- Harness between airbag control module and front sub sensor is open or shorted.
- Front sub sensor 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 cable from battery, and wait 60 seconds or more 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 connectors of the driver's and passenger's seats for safety reasons.

WIRING DIAGRAM:



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.	Is there poor contact?	Replace the airbag main harness along with body harness.	Go to step **2**.

	Step	Check	Yes	No
2	**CHECK AIRBAG MAIN HARNESS (FRONT SENSOR BUS LH).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Remove the instrument panel lower cover and column cover, and disconnect the connectors (AB7) and (AB2). 3) Remove the console front panel and disconnect the connector (AB9). 4) Disconnect the connectors (AB6, AB17, AB18) from airbag control module. 5) Connect the connector (1AG) in the test harness AG to the connectors (AB6, AB17, AB18). 6) Disconnect the connector (AB13) from the front sub sensor (LH), and then connect the connector (1H) in the test harness H to connector (AB13). 7) Measure the resistance between connector (4AG) in the test harness AG and connector (3H) in the test harness H. ***Connector & terminal*** ***(4AG) No. 7 — (3H) No. 5:*** ***(4AG) No. 9 — (3H) No. 6:***	Is the resistance less than 10 Ω?	Go to step **3**.	Replace the airbag main harness along with body harness.
3	**CHECK AIRBAG MAIN HARNESS (FRONT SENSOR BUS LH).** Measure the resistance between connector (4AG) in the test harness AG and chassis ground, and the resistance between connector (4AG) terminals in the test harness AG. ***Connector & terminal*** ***(4AG) No. 7 — Chassis ground:*** ***(4AG) No. 9 — Chassis ground:*** ***(4AG) No. 7 — (4AG) No. 9:***	Is the resistance 1 MΩ or more?	Go to step **4**.	Replace the airbag main harness along with body harness.
4	**CHECK AIRBAG MAIN HARNESS (FRONT SENSOR BUS RH).** 1) Disconnect the connector (1H) in the test harness H from connector (AB13). 2) Disconnect the connector (AB16) from the front sub sensor (RH), and then connect the connector (1H) in the test harness H to connector (AB16). 3) Measure the resistance between connector (4AG) in the test harness AG and connector (3H) in the test harness H. ***Connector & terminal*** ***(4AG) No. 14 — (3H) No. 5:*** ***(4AG) No. 12 — (3H) No. 6:***	Is the resistance less than 10 Ω?	Go to step **5**.	Replace the airbag main harness along with body harness.
5	**CHECK AIRBAG MAIN HARNESS (FRONT SENSOR BUS RH).** Measure the resistance between connector (4AG) in the test harness AG and chassis ground, and the resistance between connector (4AG) terminals in the test harness AG. ***Connector & terminal*** ***(4AG) No. 12 — Chassis ground:*** ***(4AG) No. 14 — Chassis ground:*** ***(4AG) No. 12 — (4AG) No. 14:***	Is the resistance 1 MΩ or more?	Go to step **6**.	Replace the airbag main harness along with body harness.

	Step	Check	Yes	No
6	**CHECK AIRBAG CONTROL MODULE.** 1) Connect all connectors. 2) Clear the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the front sub sensor (LH) and front sub sensor (RH). <Ref. to AB-25, REMOVAL, Front Sub Sensor.> Replace the airbag control module if not operating normally even after replacing the sensor. <Ref. to AB-24, REMOVAL, Airbag Control Module.>	Go to step **7**.
7	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code". <Ref. to AB(diag)-37, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

BP:DTC BB ROLL OVER:FIRING OUTPUT

This DTC is indicated when the curtain airbag module and the seat belt pretensioner are deployed.
Once this DTC is displayed, the memory cannot be cleared. Replace the following parts.

- Airbag control module <Ref. to AB-24, Airbag Control Module.>
- Curtain airbag module (operating side) <Ref. to AB-22, Curtain Airbag Module.>
- Curtain airbag sensor (operating side) <Ref. to AB-27, Curtain Airbag Sensor.>
- Front outer seat belt with pretensioner (operating side) <Ref. to SB-17, Front Seat Belt.>

BQ:DTC E3 FRONT SENSOR BUS RH COMMUNICATION ERROR

NOTE:
Refer to DTC A1 for DTC E3. <Ref. to AB(diag)-145, DTC A1 FRONT SENSOR BUS COMMUNICATION ERROR, Diagnostic Chart with Trouble Code.>

BR:DTC E4 FRONT SENSOR BUS RH COMMUNICATION ERROR

NOTE:
Refer to DTC A1 for DTC E4. <Ref. to AB(diag)-145, DTC A1 FRONT SENSOR BUS COMMUNICATION ERROR, Diagnostic Chart with Trouble Code.>

BS:DTC E7 FRONT SENSOR BUS LH COMMUNICATION ERROR

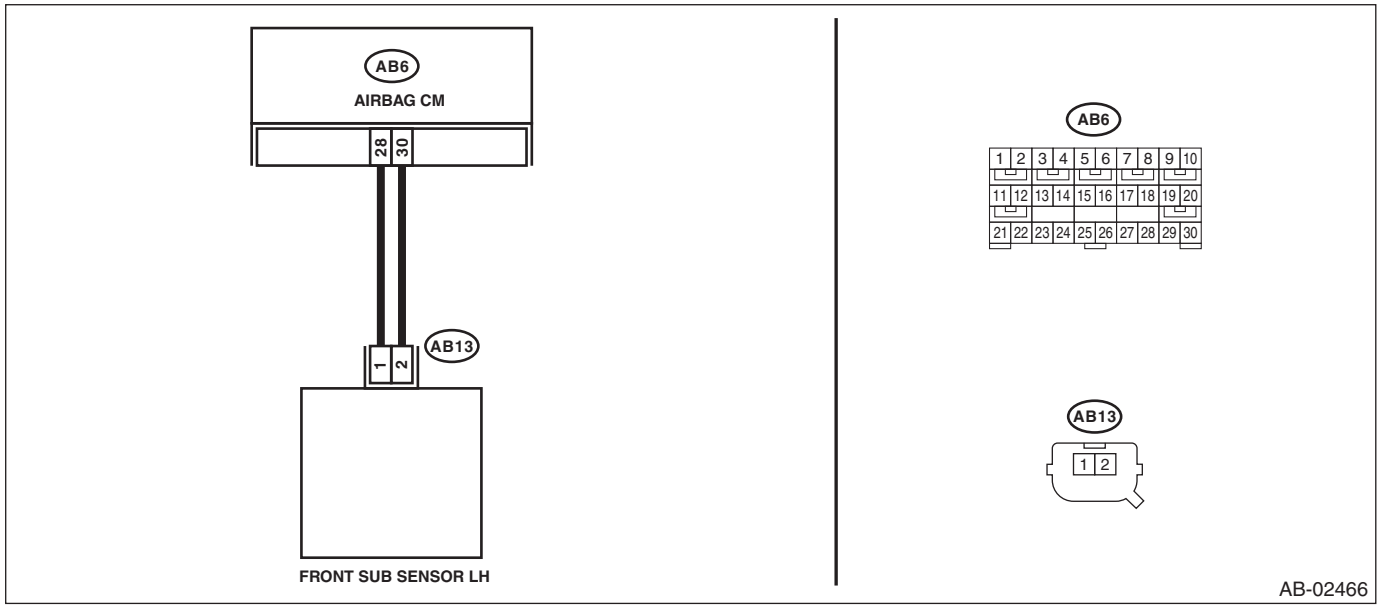
DTC DETECTING CONDITION:

- Open or short circuit in harness of front sensor bus (LH).
- 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 cable from battery, and wait 60 seconds or more 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 connectors of the driver's and passenger's seats for safety reasons.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK POOR CONTACT OF CONNECTORS.** Check for poor contact of the connectors (AB6, AB13) between the airbag control module and the front sub sensor (LH).	Is there poor contact?	Replace the airbag main harness along with body harness.	Go to step **2**.

	Step	Check	Yes	No
2	**CHECK AIRBAG MAIN HARNESS (FRONT SENSOR BUS LH).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Remove the instrument panel lower cover and column cover, and disconnect the connectors (AB7) and (AB2). 3) Remove the console front panel and disconnect the connector (AB9). 4) Disconnect the connectors (AB6, AB17, AB18) from airbag control module. 5) Connect the connector (1AG) in the test harness AG to the connectors (AB6, AB17, AB18). 6) Disconnect the connector (AB13) from the front sub sensor (LH), and then connect the connector (1H) in the test harness H to connector (AB13). 7) Measure the resistance between connector (4AG) in the test harness AG and connector (3H) in the test harness H. ***Connector & terminal*** ***(4AG) No. 7 — (3H) No. 5:*** ***(4AG) No. 9 — (3H) No. 6:***	Is the resistance less than 10 Ω?	Go to step **3**.	Replace the airbag main harness along with body harness.
3	**CHECK AIRBAG MAIN HARNESS (FRONT SENSOR BUS LH).** Measure the resistance between connector (4AG) in the test harness AG and chassis ground, and the resistance between connector (4AG) terminals in the test harness AG. ***Connector & terminal*** ***(4AG) No. 7 — Chassis ground:*** ***(4AG) No. 9 — Chassis ground:*** ***(4AG) No. 7 — (4AG) No. 9:***	Is the resistance 1 MΩ or more?	Go to step **4**.	Replace the airbag main harness along with body harness.
4	**CHECK AIRBAG CONTROL MODULE.** 1) Connect all connectors. 2) Clear the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the front sub sensor (LH). <Ref. to AB-25, REMOVAL, Front Sub Sensor.> Replace the airbag control module if not operating normally even after replacing the sensor. <Ref. to AB-24, REMOVAL, Airbag Control Module.>	Go to step **5**.
5	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code". <Ref. to AB(diag)-37, LIST, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

BT:DTC E8 FRONT SENSOR BUS LH COMMUNICATION ERROR

NOTE:
Refer to DTC E7 for DTC E8. <Ref. to AB(diag)-148, DTC E7 FRONT SENSOR BUS LH COMMUNICATION ERROR, Diagnostic Chart with Trouble Code.>

BU:DTC E9 SIDE SENSOR BUS RH COMMUNICATION ERROR

NOTE:
Refer to DTC EC for details on DTC E9. <Ref. to AB(diag)-151, DTC EC SIDE SENSOR BUS RH COMMUNICATION ERROR, Diagnostic Chart with Trouble Code.>

BV:DTC EB SIDE SENSOR BUS RH COMMUNICATION ERROR

NOTE:
Refer to DTC EC for details on DTC EB. <Ref. to AB(diag)-151, DTC EC SIDE SENSOR BUS RH COMMUNICATION ERROR, Diagnostic Chart with Trouble Code.>

BW:DTC EC SIDE SENSOR BUS RH COMMUNICATION ERROR

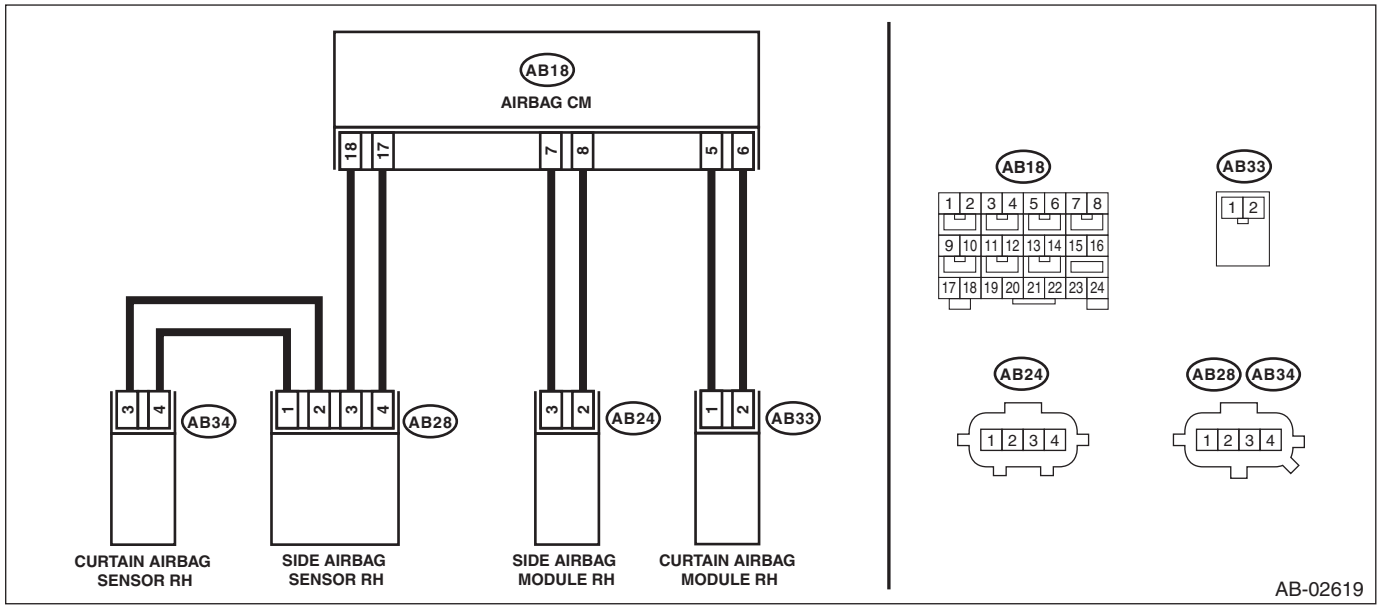
DTC DETECTING CONDITION:

- Open or short circuit in harness of side sensor bus (RH).
- Side airbag sensor (RH) and curtain airbag sensor (RH) are faulty.
- Airbag control module is faulty.

CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait 60 seconds or more 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 pretensioners of the driver's and passenger's seats for safety reasons.
• When inspecting the airbag rear harness, disconnect the side airbag module connector, curtain airbag module connector and seat belt pretensioner connector for safety reasons.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK POOR CONTACT OF CONNECTORS.** Check for poor contact of the connectors (AB18, AB28, AB34) between the airbag control module and the curtain airbag sensor (RH).	Is there poor contact?	Replace the airbag rear harness along with body harness.	Go to step **2**.

	Step	Check	Yes	No
2	**CHECK AIRBAG REAR HARNESS (BETWEEN AIRBAG CONTROL MODULE AND SIDE AIRBAG SENSOR RH).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Disconnect the connector (AB26) from seat belt pretensioner (RH). 3) Disconnect the connector (AB33) from curtain airbag module (RH). 4) Disconnect connector (AB24) of the side airbag module (RH). 5) Disconnect the connectors (AB6, AB17, AB18) from airbag control module. 6) Connect the connector (1AG) in the test harness AG to the connectors (AB6, AB17, AB18). 7) Disconnect the connector (AB28) from side airbag sensor (RH), and connect the connector (2V) in test harness V to connector (AB28). 8) Measure the resistance between connector (5AG) in the test harness AG and connector (3V) in the test harness V. ***Connector & terminal*** ***(5AG) No. 16 — (3V) No. 2:*** ***(5AG) No. 14 — (3V) No. 1:***	Is the resistance less than 10 Ω?	Go to step **3**.	Replace the airbag rear harness along with body harness.
3	**CHECK AIRBAG REAR HARNESS (BETWEEN AIRBAG CONTROL MODULE AND SIDE AIRBAG SENSOR RH).** Measure the resistance between test harness AG connectors (5AG) and chassis ground, and the resistance between connectors (5AG) of the test harness AG. ***Connector & terminal*** ***(5AG) No. 16 — Chassis ground:*** ***(5AG) No. 14 — Chassis ground:*** ***(5AG) No. 16 — (5AG) No. 14:***	Is the resistance 1 MΩ or more?	Go to step **4**.	Replace the airbag rear harness along with body harness.
4	**CHECK AIRBAG REAR HARNESS (BETWEEN SIDE AIRBAG SENSOR AND CURTAIN AIRBAG SENSOR RH).** 1) Disconnect the connector (2V) in the test harness V from the connector (AB28) of side airbag sensor (RH). 2) Connect the connector (AB28) of side airbag sensor (RH) and the connector (1AI) in the test harness AI. 3) Connect the connector (2AI) in the test harness AI and the connector (1V) in the test harness V. 4) Disconnect the connector (AB34) from curtain airbag sensor (RH), and connect the connector (2V) in test harness V to connector (AB34). 5) Measure the resistance between connector (3V) terminals in the test harness V. ***Connector & terminal*** ***(3V) No. 2 — (3V) No. 6:*** ***(3V) No. 1 — (3V) No. 7:***	Is the resistance less than 10 Ω?	Go to step **5**.	Replace the airbag rear harness along with body harness.

	Step	Check	Yes	No
5	**CHECK AIRBAG REAR HARNESS (BETWEEN SIDE AIRBAG SENSOR AND CURTAIN AIRBAG SENSOR RH).** Measure the resistance between connector (3V) in test harness V and chassis ground, and the resistance between connector (3V) in test harness V. ***Connector & terminal*** ***(3V) No. 2 — Chassis ground:*** ***(3V) No. 1 — Chassis ground:*** ***(3V) No. 2 — (3V) No. 1:***	Is the resistance 1 MΩ or more?	Go to step **6**.	Replace the airbag rear harness along with body harness.
6	**CHECK AIRBAG CONTROL MODULE.** 1) Connect all connectors. 2) Clear the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Go to step **7**.	Go to step **8**.
7	**REPLACE SIDE AIRBAG SENSOR (RH) AND CHECK AIRBAG CONTROL MODULE AFTER REPLACEMENT.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Replace the side airbag sensor (RH). <Ref. to AB-26, REMOVAL, Side Airbag Sensor.> 3) Connect all connectors. 4) Clear the memory. 5) Perform the Inspection Mode. 6) Read the DTC.	Is the system normal?	Go to step **8**.	Replace the curtain airbag sensor (RH). <Ref. to AB-27, REMOVAL, Curtain Airbag Sensor.> Replace the airbag control module if not operating normally even after replacing the sensor. <Ref. to AB-24, REMOVAL, Airbag Control Module.>
8	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to AB(diag)-37, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

BX:DTC ED SIDE SENSOR BUS RH COMMUNICATION ERROR

NOTE:
Refer to DTC EE for details on DTC ED. <Ref. to AB(diag)-154, DTC EE SIDE SENSOR BUS RH COMMUNICATION ERROR, Diagnostic Chart with Trouble Code.>

BY:DTC EE SIDE SENSOR BUS RH COMMUNICATION ERROR

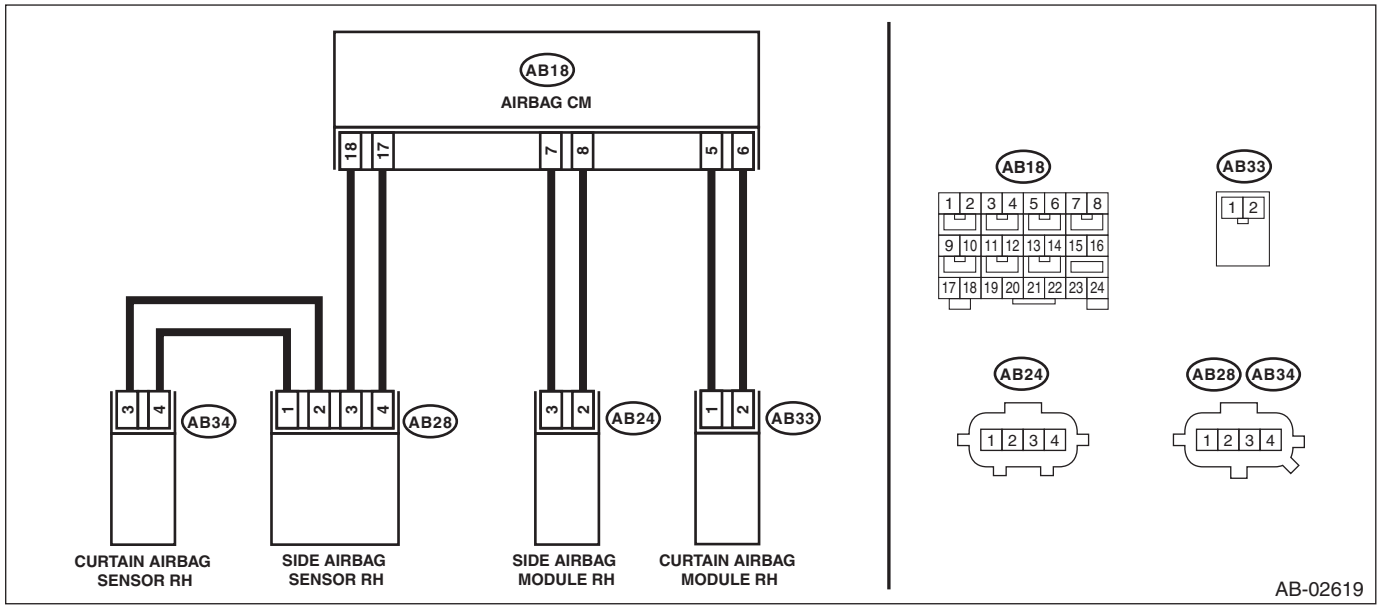
DTC DETECTING CONDITION:

- Open or short circuit in harness of side sensor bus (RH).
- Side airbag sensor (RH) or curtain airbag sensor (RH) are faulty.
- Airbag control module is faulty.

CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait 60 seconds or more 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 pretensioners of the driver's and passenger's seats for safety reasons.
• When inspecting the airbag rear harness, disconnect the side airbag module connector, curtain airbag module connector and seat belt pretensioner connector for safety reasons.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK POOR CONTACT OF CONNECTORS.** Check for poor contact of the connectors (AB18, AB28, AB34) between the airbag control module and the curtain airbag sensor (RH).	Is there poor contact?	Replace the airbag rear harness along with body harness.	Go to step **2**.

	Step	Check	Yes	No
2	**CHECK AIRBAG REAR HARNESS (BETWEEN SIDE AIRBAG SENSOR (RH) AND CURTAIN AIRBAG SENSOR (RH)).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Disconnect the connector (AB26) from seat belt pretensioner (RH). 3) Disconnect the connector (AB33) from curtain airbag module (RH). 4) Disconnect connector (AB24) of the side airbag module (RH). 5) Disconnect connector (AB28) from side airbag sensor (RH). 6) Connect the connector (AB28) of side airbag sensor (RH) and the connector (1AI) in the test harness AI. 7) Connect the connector (2AI) in the test harness AI and the connector (1V) in the test harness V. 8) Disconnect the connector (AB34) from curtain airbag sensor (RH), and connect the connector (2V) in test harness V to connector (AB34). 9) Measure the resistance between connector (3V) terminals in the test harness V. ***Connector & terminal*** ***(3V) No. 2 — (3V) No. 6:*** ***(3V) No. 1 — (3V) No. 7:***	Is the resistance less than 10 Ω?	Go to step **3**.	Replace the airbag rear harness along with body harness.
3	**CHECK AIRBAG REAR HARNESS (BETWEEN SIDE AIRBAG SENSOR AND CURTAIN AIRBAG SENSOR RH).** Measure the resistance between connector (3V) in test harness V and chassis ground, and the resistance between connector (3V) in test harness V. ***Connector & terminal*** ***(3V) No. 2 — Chassis ground:*** ***(3V) No. 1 — Chassis ground:*** ***(3V) No. 2 — (3V) No. 1:***	Is the resistance 1 MΩ or more?	Go to step **4**.	Replace the airbag rear harness along with body harness.

	Step	Check	Yes	No
4	**CHECK AIRBAG REAR HARNESS (BETWEEN AIRBAG CONTROL MODULE AND SIDE AIRBAG SENSOR (RH)).** 1) Disconnect the connectors (AB6, AB17, AB18) from airbag control module. 2) Connect the connector (1AG) in the test harness AG to the connectors (AB17, AB6, AB18). 3) Disconnect the connector (AB28) in the side airbag sensor (RH) from the connector (1AI) in the test harness AI. 4) Disconnect the connector (2AI) in the test harness AI from the connector (1V) in the test harness V. 5) Connect the connector (AB28) of side airbag sensor (RH) and the connector (2V) in the test harness V. 6) Measure the resistance between connector (5AG) in the test harness AG and connector (3V) in the test harness V. ***Connector & terminal*** ***(5AG) No. 16 — (3V) No. 2:*** ***(5AG) No. 14 — (3V) No. 1:***	Is the resistance less than 10 Ω?	Go to step **5**.	Replace the airbag rear harness along with body harness.
5	**CHECK AIRBAG REAR HARNESS (BETWEEN AIRBAG CONTROL MODULE AND SIDE AIRBAG SENSOR RH).** Measure the resistance between connector (5AG) in the test harness AG and chassis ground, and the resistance between connector (5AG) terminals in the test harness AG. ***Connector & terminal*** ***(5AG) No. 16 — Chassis ground:*** ***(5AG) No. 14 — Chassis ground:*** ***(5AG) No. 16 — (5AG) No. 14:***	Is the resistance 1 MΩ or more?	Go to step **6**.	Replace the airbag rear harness along with body harness.
6	**CHECK AIRBAG CONTROL MODULE.** 1) Connect all connectors. 2) Clear the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Go to step **7**.	Go to step **8**.
7	**REPLACE SIDE AIRBAG SENSOR (RH) AND CHECK AIRBAG CONTROL MODULE AFTER REPLACEMENT.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Replace the side airbag sensor (RH). <Ref. to AB-26, REMOVAL, Side Airbag Sensor.> 3) Connect all connectors. 4) Clear the memory. 5) Perform the Inspection Mode. 6) Read the DTC.	Is the system normal?	Go to step **8**.	Replace the curtain airbag sensor (RH). <Ref. to AB-27, REMOVAL, Curtain Airbag Sensor.> Replace the airbag control module if not operating normally even after replacing the sensor. <Ref. to AB-24, REMOVAL, Airbag Control Module.>
8	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to AB(diag)-37, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

BZ:DTC F1 SIDE SENSOR BUS LH COMMUNICATION ERROR

NOTE:
Refer to DTC F4 for details on DTC F1. <Ref. to AB(diag)-158, DTC F4 SIDE SENSOR BUS LH COMMUNICATION ERROR, Diagnostic Chart with Trouble Code.>

CA:DTC F3 SIDE SENSOR BUS LH COMMUNICATION ERROR

NOTE:
Refer to DTC F4 for details on DTC F3. <Ref. to AB(diag)-158, DTC F4 SIDE SENSOR BUS LH COMMUNICATION ERROR, Diagnostic Chart with Trouble Code.>

CB:DTC F4 SIDE SENSOR BUS LH COMMUNICATION ERROR

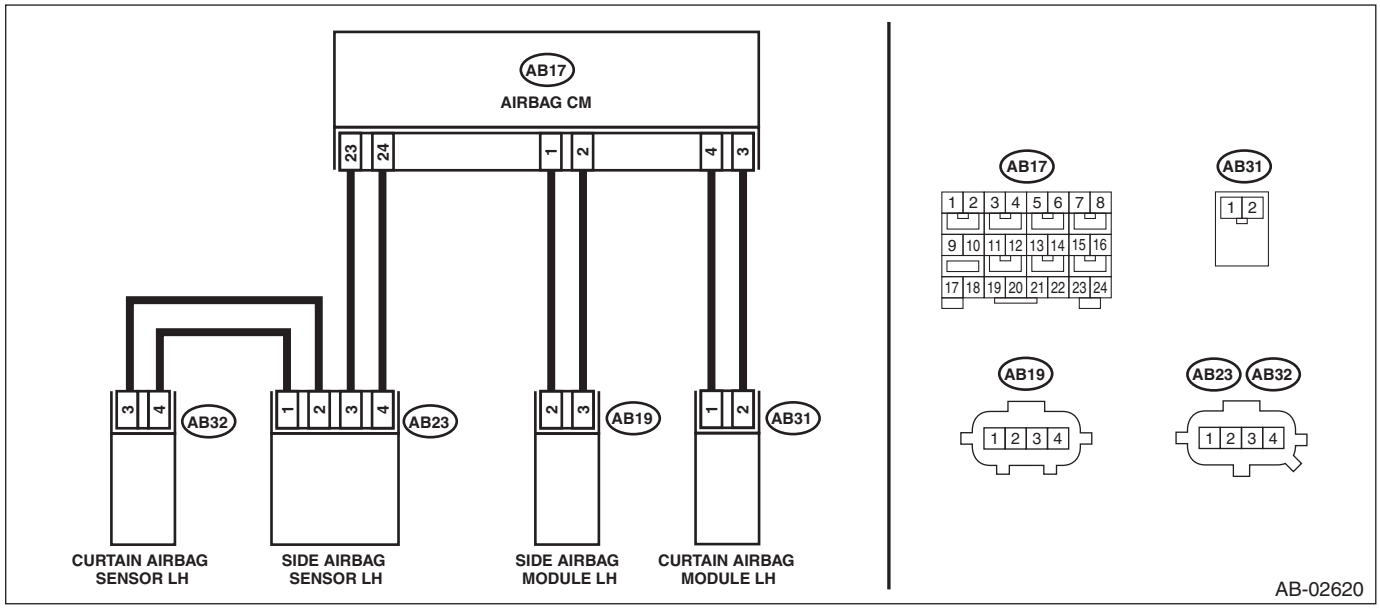
DTC DETECTING CONDITION:

- Open or short circuit in harness of side sensor bus (LH).
- Side airbag sensor (LH) and curtain airbag sensor (LH) are faulty.
- Airbag control module is faulty.

CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait 60 seconds or more 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 pretensioners of the driver's and passenger's seats for safety reasons.
• When inspecting the airbag rear harness, disconnect the side airbag module connector, curtain airbag module connector and seat belt pretensioner connector for safety reasons.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK POOR CONTACT OF CONNECTORS.** Check for poor contact of the connectors (AB17, AB23, AB32) between the airbag control module and the curtain airbag sensor (LH).	Is there poor contact?	Replace the airbag rear harness along with body harness.	Go to step **2**.

	Step	Check	Yes	No
2	**CHECK AIRBAG REAR HARNESS (BETWEEN AIRBAG CONTROL MODULE AND SIDE AIRBAG SENSOR LH).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Disconnect the connector (AB21) from seat belt pretensioner (LH). 3) Disconnect the connector (AB31) from curtain airbag module (LH). 4) Disconnect connector (AB19) of the side airbag module (LH). 5) Disconnect the connectors (AB17, AB6, AB18) from airbag control module. 6) Connect the connector (1AG) in the test harness AG to the connectors (AB17, AB6, AB18). 7) Disconnect the connector (AB23) from side airbag sensor (LH), and connect the connector (2V) in test harness V to connector (AB23). 8) Measure the resistance between connector (5AG) in the test harness AG and connector (3V) in the test harness V. ***Connector & terminal*** ***(5AG) No. 10 — (3V) No. 1:*** ***(5AG) No. 8 — (3V) No. 2:***	Is the resistance less than 10 Ω?	Go to step **3**.	Replace the airbag rear harness along with body harness.
3	**CHECK AIRBAG REAR HARNESS (BETWEEN AIRBAG CONTROL MODULE AND SIDE AIRBAG SENSOR LH).** Measure the resistance between connector (5AG) in the test harness AG and chassis ground, and the resistance between connector (5AG) terminals in the test harness AG. ***Connector & terminal*** ***(5AG) No. 10 — Chassis ground:*** ***(5AG) No. 8 — Chassis ground:*** ***(5AG) No. 10 — (5AG) No. 8:***	Is the resistance 1 MΩ or more?	Go to step **4**.	Replace the airbag rear harness along with body harness.
4	**CHECK AIRBAG REAR HARNESS (BETWEEN SIDE AIRBAG SENSOR LH AND CURTAIN AIRBAG SENSOR LH).** 1) Disconnect the connector (2V) in the test harness V from the connector (AB23) of side airbag sensor (LH). 2) Connect the connector (AB23) of side airbag sensor (LH) and the connector (1AI) in the test harness AI. 3) Connect the connector (2AI) in the test harness AI and the connector (1V) in the test harness V. 4) Disconnect the connector (AB32) from curtain airbag sensor (LH), and connect the connector (2V) in test harness V to connector (AB32). 5) Measure the resistance between connector (3V) terminals in the test harness V. ***Connector & terminal*** ***(3V) No. 2 — (3V) No. 6:*** ***(3V) No. 1 — (3V) No. 7:***	Is the resistance less than 10 Ω?	Go to step **5**.	Replace the airbag rear harness along with body harness.

	Step	Check	Yes	No
5	**CHECK AIRBAG REAR HARNESS (BETWEEN SIDE AIRBAG SENSOR LH AND CURTAIN AIRBAG SENSOR LH).** Measure the resistance between connector (3V) in test harness V and chassis ground, and the resistance between connector (3V) in test harness V. ***Connector & terminal*** ***(3V) No. 2 — Chassis ground:*** ***(3V) No. 1 — Chassis ground:*** ***(3V) No. 2 — (3V) No. 1:***	Is the resistance 1 MΩ or more?	Go to step **6**.	Replace the airbag rear harness along with body harness.
6	**CHECK AIRBAG CONTROL MODULE.** 1) Connect all connectors. 2) Clear the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Go to step **7**.	Go to step **8**.
7	**REPLACE SIDE AIRBAG SENSOR (LH) AND CHECK AIRBAG CONTROL MODULE AFTER REPLACEMENT.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Replace the side airbag sensor (LH). <Ref. to AB-26, REMOVAL, Side Airbag Sensor.> 3) Connect all connectors. 4) Clear the memory. 5) Perform the Inspection Mode. 6) Read the DTC.	Is the system normal?	Go to step **8**.	Replace the curtain airbag sensor (LH). <Ref. to AB-27, REMOVAL, Curtain Airbag Sensor.> Replace the airbag control module if not operating normally even after replacing the sensor. <Ref. to AB-24, REMOVAL, Airbag Control Module.>
8	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to AB(diag)-37, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

CC:DTC F5 SIDE SENSOR BUS LH COMMUNICATION ERROR

NOTE:
Refer to DTC F6 for details on DTC F5. <Ref. to AB(diag)-161, DTC F6 SIDE SENSOR BUS LH COMMUNICATION ERROR, Diagnostic Chart with Trouble Code.>

CD:DTC F6 SIDE SENSOR BUS LH COMMUNICATION ERROR

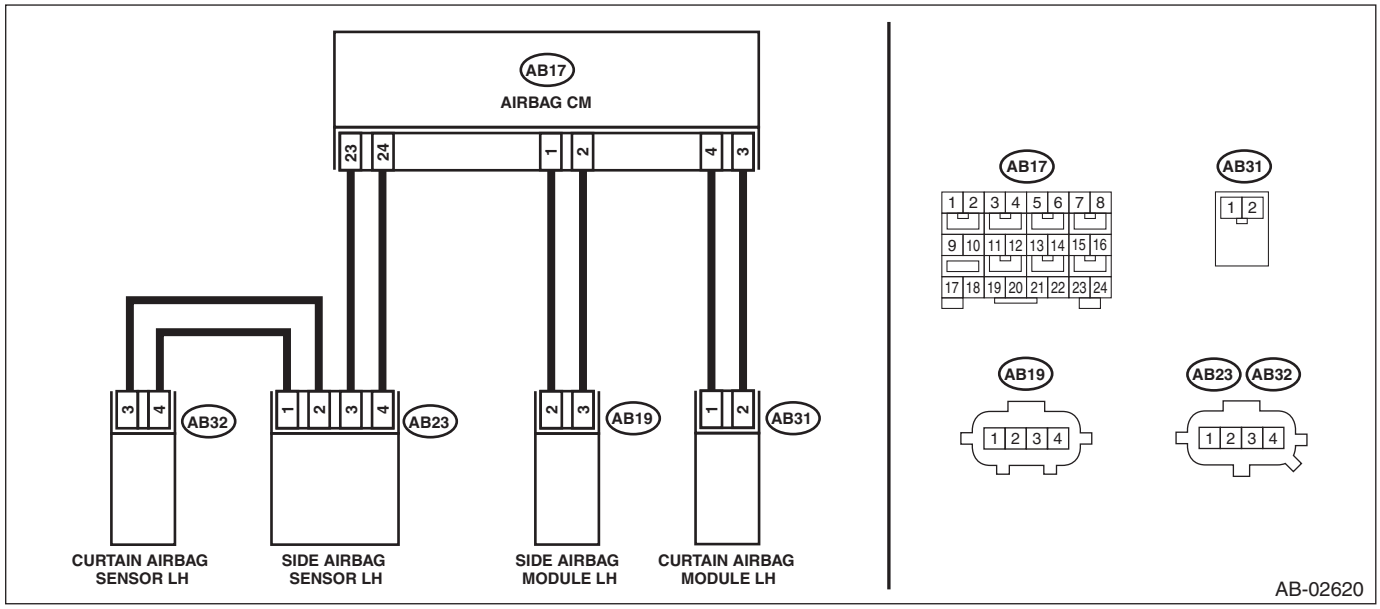
DTC DETECTING CONDITION:

- Open or short circuit in harness of side sensor bus (LH).
- Side airbag sensor (LH) or curtain airbag sensor (LH) are faulty.
- Airbag control module is faulty.

CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait 60 seconds or more 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 pretensioners of the driver's and passenger's seats for safety reasons.
• When inspecting the airbag rear harness, disconnect the side airbag module connector, curtain airbag module connector and seat belt pretensioner connector for safety reasons.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK POOR CONTACT OF CONNECTORS.** Check for poor contact of the connectors (AB17, AB23, AB32) between the airbag control module and the curtain airbag sensor (LH).	Is there poor contact?	Replace the airbag rear harness along with body harness.	Go to step **2**.

	Step	Check	Yes	No
2	**CHECK AIRBAG REAR HARNESS (BETWEEN SIDE AIRBAG SENSOR LH AND CURTAIN AIRBAG SENSOR LH).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Disconnect the connector (AB21) from seat belt pretensioner (LH). 3) Disconnect the connector (AB31) from curtain airbag module (LH). 4) Disconnect connector (AB19) of the side airbag module (LH). 5) Disconnect the connector (AB23) in the side airbag sensor (LH). 6) Connect the connector (AB23) of side airbag sensor (LH) and the connector (1AI) in the test harness AI. 7) Connect the connector (2AI) in the test harness AI and the connector (1V) in the test harness V. 8) Disconnect the connector (AB32) from curtain airbag sensor (LH), and connect to the connector (2V) in test harness V. 9) Measure the resistance between connector (3V) terminals in the test harness V. ***Connector & terminal*** ***(3V) No. 2 — (3V) No. 6:*** ***(3V) No. 1 — (3V) No. 7:***	Is the resistance less than 10 Ω?	Go to step **3**.	Replace the airbag rear harness along with body harness.
3	**CHECK AIRBAG REAR HARNESS (BETWEEN SIDE AIRBAG SENSOR AND CURTAIN AIRBAG SENSOR LH).** Measure the resistance between connector (3V) in test harness V and chassis ground, and the resistance between connector (3V) in test harness V. ***Connector & terminal*** ***(3V) No. 1 — Chassis ground:*** ***(3V) No. 2 — Chassis ground:*** ***(3V) No. 1 — (3V) No. 2:***	Is the resistance 1 MΩ or more?	Go to step **4**.	Replace the airbag rear harness along with body harness.
4	**CHECK AIRBAG REAR HARNESS (BETWEEN AIRBAG CONTROL MODULE AND SIDE AIRBAG SENSOR LH).** 1) Disconnect the connectors (AB6, AB17, AB18) from airbag control module. 2) Connect the connector (1AG) in the test harness AG to the connectors (AB17, AB6, AB18). 3) Disconnect the connector (AB23) in the side airbag sensor (LH) from the connector (1AI) in the test harness AI. 4) Disconnect the connector (2AI) in the test harness AI from the connector (1V) in the test harness V. 5) Connect the connector (2V) in the test harness V to the connector (AB23). 6) Measure the resistance between connector (5AG) in the test harness AG and connector (3V) in the test harness V. ***Connector & terminal*** ***(5AG) No. 10 — (3V) No. 1:*** ***(5AG) No. 8 — (3V) No. 2:***	Is the resistance less than 10 Ω?	Go to step **5**.	Replace the airbag rear harness along with body harness.

	Step	Check	Yes	No
5	**CHECK AIRBAG REAR HARNESS (BETWEEN SIDE AIRBAG SENSOR LH AND CURTAIN AIRBAG SENSOR LH).** Measure the resistance between connector (3V) in test harness V and chassis ground, and the resistance between connector (5AG) terminals in test harness AG. ***Connector & terminal*** ***(3V) No. 2 — Chassis ground:*** ***(3V) No. 1 — Chassis ground:*** ***(5AG) No. 10 — (5AG) No. 8:***	Is the resistance 1 MΩ or more?	Go to step **6**.	Replace the airbag rear harness along with body harness.
6	**CHECK AIRBAG CONTROL MODULE.** 1) Connect all connectors. 2) Clear the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Go to step **7**.	Go to step **8**.
7	**REPLACE SIDE AIRBAG SENSOR (LH) AND CHECK AIRBAG CONTROL MODULE AFTER REPLACEMENT.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Replace the side airbag sensor (LH). <Ref. to AB-26, REMOVAL, Side Airbag Sensor.> 3) Connect all connectors. 4) Clear the memory. 5) Perform the Inspection Mode. 6) Read the DTC.	Is the system normal?	Go to step **8**.	Replace the curtain airbag sensor (LH). <Ref. to AB-27, REMOVAL, Curtain Airbag Sensor.> Replace the airbag control module if not operating normally even after replacing the sensor. <Ref. to AB-24, REMOVAL, Airbag Control Module.>
8	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to AB(diag)-37, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

CE:DTC F9 SATELLITE SENSOR BUS COMMUNICATION ERROR

NOTE:
Refer to DTC FA for details on DTC F9. <Ref. to AB(diag)-164, DTC FA SATELLITE SENSOR BUS COMMUNICATION ERROR, Diagnostic Chart with Trouble Code.>

CF:DTC FA SATELLITE SENSOR BUS COMMUNICATION ERROR

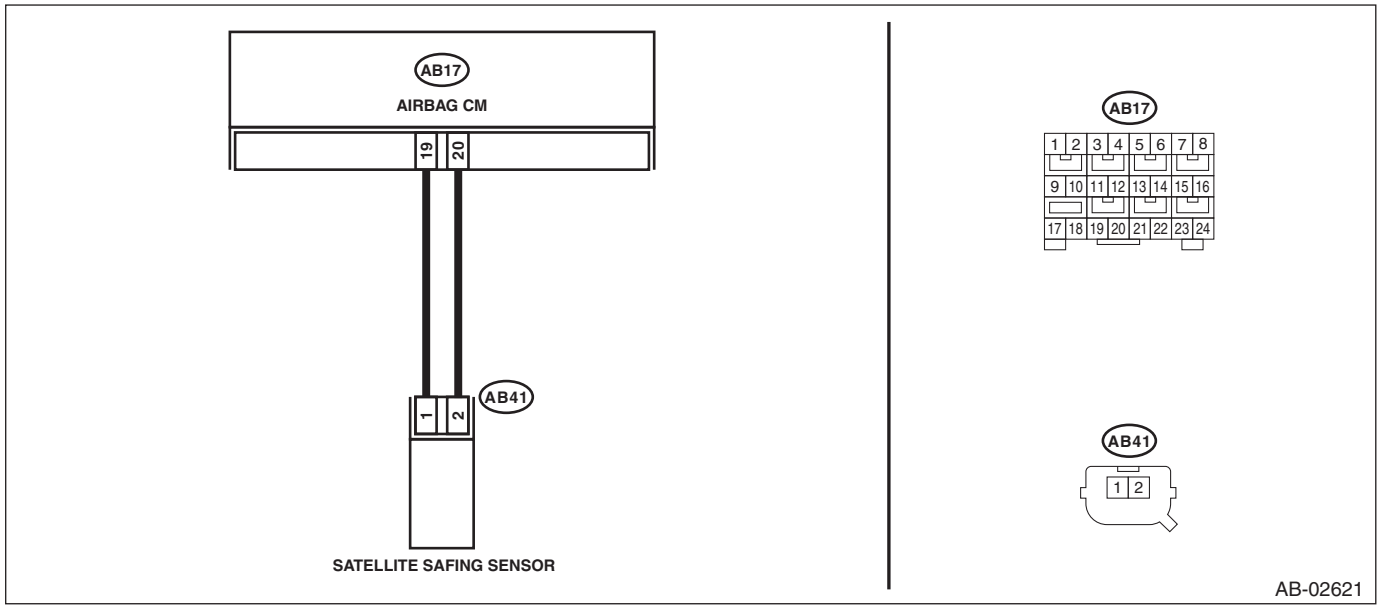
DTC DETECTING CONDITION:

- Open or short circuit in harness of satellite safing sensor.
- Satellite safing sensor 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 cable from battery, and wait 60 seconds or more 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 pretensioners of the driver's and passenger's seats for safety reasons.
• When inspecting the airbag rear harness, disconnect the side airbag module connector, curtain airbag module connector and seat belt pretensioner connector for safety reasons.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK POOR CONTACT OF CONNECTORS.** Check for poor contact of the connectors (AB17, AB41) between the airbag control module and the satellite safing sensor.	Is there poor contact?	Replace the airbag rear harness along with body harness.	Go to step **2**.

	Step	Check	Yes	No
2	**CHECK AIRBAG REAR HARNESS (BETWEEN AIRBAG CONTROL MODULE AND SATELLITE SAFING SENSOR).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Disconnect the connectors (AB21, AB26) from seat belt pretensioner. 3) Disconnect the connectors (AB31, AB33) from curtain airbag module. 4) Disconnect connectors (AB19) and (AB24) from the side airbag module. 5) Disconnect the connectors (AB17, AB6, AB18) from airbag control module. 6) Connect the connector (1AG) in the test harness AG to the connectors (AB17, AB6, AB18). 7) Disconnect the connector (AB41) from the satellite safing sensor and connect to the test harness H connector (1H). 8) Measure the resistance between connectors (5AG) and (4AG) in the test harness AG and connector (3H) in the test harness H. ***Connector & terminal*** ***(5AG) No. 9 — (3H) No. 5:*** ***(6AG) No. 13 — (3H) No. 6:***	Is the resistance less than 10 Ω?	Go to step **3**.	Replace the airbag rear harness along with body harness.
3	**CHECK AIRBAG REAR HARNESS (BETWEEN AIRBAG CONTROL MODULE AND SATELLITE SAFING SENSOR).** Measure the resistance between connector (5AG) in the test harness AG and chassis ground, and the resistance between connector (5AG) terminals in the test harness AG. ***Connector & terminal*** ***(5AG) No. 9 — Chassis ground:*** ***(6AG) No. 13 — Chassis ground:*** ***(5AG) No. 9 — (6AG) No. 13:***	Is the resistance 1 MΩ or more?	Go to step **4**.	Replace the airbag rear harness along with body harness.
4	**CHECK AIRBAG CONTROL MODULE.** 1) Connect all connectors. 2) Clear the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the satellite safing sensor. <Ref. to AB-28, REMOVAL, Satellite Safing Sensor.> Replace the airbag control module if not operating normally even after replacing the sensor. <Ref. to AB-24, REMOVAL, Airbag Control Module.>	Go to step **5**.
5	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to AB(diag)-37, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

OCCUPANT DETECTION SYSTEM (DIAGNOSTICS)

OD(diag)

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1. Basic Diagnostic Procedure

A: PROCEDURE

	Step	Check	Yes	No
1	**CHECK WARNING LIGHT.** Check whether the airbag warning light in the combination meter is lit.	Does the airbag warning light illuminate?	Go to step **2**.	Perform the diagnosis according to phenomenon of the problem.
2	**READ 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)-14, 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 AB(diag)-25, COMMUNICATION FOR INITIALIZING IMPOSSIBLE, INSPECTION, Subaru Select Monitor.> 5) Record all DTCs and freeze frame data.	Is DTC displayed?	Go to step **3**.	Go to “Airbag Warning Light Failure”. <Ref. to AB(diag)-33, Airbag Warning Light Failure.>
3	**PERFORM DIAGNOSIS.** 1) Determine the possible cause from “List of Diagnostic Trouble Code (DTC)”. <Ref. to OD(diag)-22, 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 OD(diag)-16, Clear Memory Mode.> 5) Perform the Inspection Mode. <Ref. to OD(diag)-15, Inspection Mode.> 6) Read any other DTCs displayed.	Is DTC displayed?	Perform the procedure 1) to 5) in step 3.	Finish the diagnosis.

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	❑ Fine ❑ Cloudy ❑ Rainy ❑ Snowy ❑ Others:		
Temperature	°C (°F)		
Road condition	❑ Flat road ❑ Uphill ❑ Downhill ❑ Gravel road ❑ Others:		
Vehicle operation	❑ Starting ❑ Idling ❑ Driving ❑ Constant speed ❑ Accelerating ❑ Decelerating ❑ Turning ❑ Others:		
Details of problem			
Airbag warning light operation	❑ Normal (After turning the ignition switch to ON, illuminates for 6 seconds then goes off.) ❑ Remains ON ❑ Remains OFF		
Passengers airbag ON/OFF indicator operation	❑ Normal (After turning the ignition switch to ON, illuminates for 6 seconds then goes off for 2 seconds; Lights ON (adult) or OFF (children/unoccupied).) ❑ Both remain ON ❑ Both remain OFF		
DTC output	❑ OK code ❑ DTC: (Code:)		

3. General Description

A: CAUTION

1) If the seat cushion cover is removed or replaced, make sure to perform passenger detection system adjustment after installing the seat to the vehicle. <Ref. to OD(diag)-18, System Calibration (Rezeroing).>
Failure to do so may cause improper operation of the occupant detection system.
2) The passenger detection system (passenger seat only) control unit and the passenger detection sensor are fixed to the seat cushion frame. Never remove the passenger detection control unit or the pressure sensor from the seat cushion frame.
3) Do not replace the seat cushion pad by itself. Always replace the seat cushion pad and frame assembly as a set. The seat cushion pad and cushion frame are adjusted as a set at the time of manufacture. If cushion pads and cushion frames are combined from those of other vehicles or other sets, the passenger detection system may not operate properly.
4) If the seat cushion cover is removed, make sure to replace the hang wire on the seat cushion side with a new wire.
5) Never connect the battery in reverse polarity.
Occupant detection system may be destroyed instantly.
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.
7) Before disconnecting the connectors of each sensor and control module, be sure to turn the ignition switch to OFF and wait for 60 seconds or more.
Occupant detection control module may be damaged.
8) Every occupant detection system-related part is a precision part. Do not drop them.

CAUTION:
• Do not use electrical test equipment on wiring harness and connector circuits of the airbag system.
• Be careful not to damage the airbag system wiring harness when servicing the occupant detection system.
• Refer to CAUTION in Airbag System when repairing the occupant detection system. <Ref. to AB(diag)-4, CAUTION, General Description.>

B: INSPECTION

Measure the battery voltage and check electrolyte.

Standard voltage:
12 V

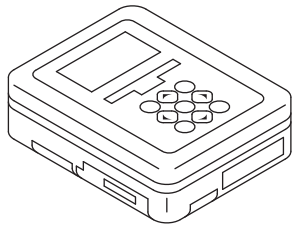
Specific gravity:
1.260 or more

Fluid level:
Between the upper level and lower level

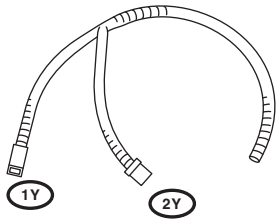
C: PREPARATION TOOL

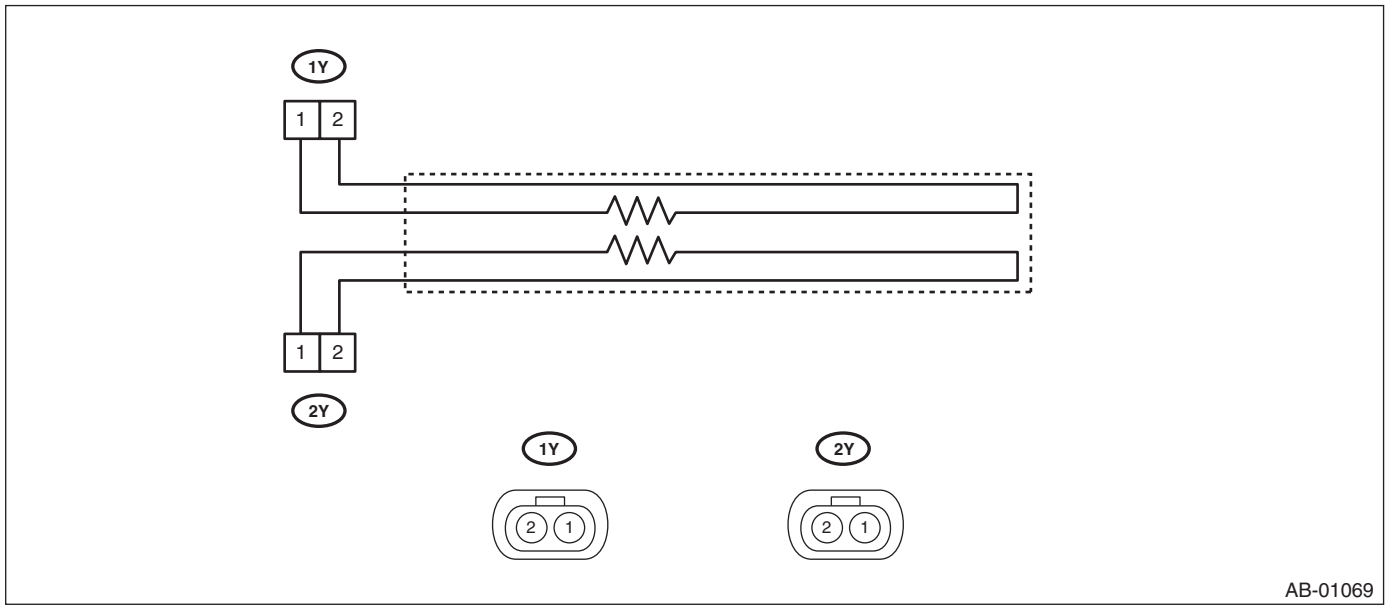
CAUTION:
To measure the voltage and resistance of airbag system and occupant detection system components, be sure to use the specified test harness.

1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST1B022XU0	1B022XU0	SUBARU SELECT MONITOR III KIT	Used for troubleshooting the electrical system.

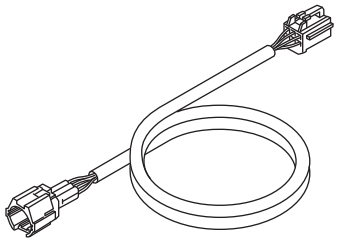
- TEST HARNESS Y

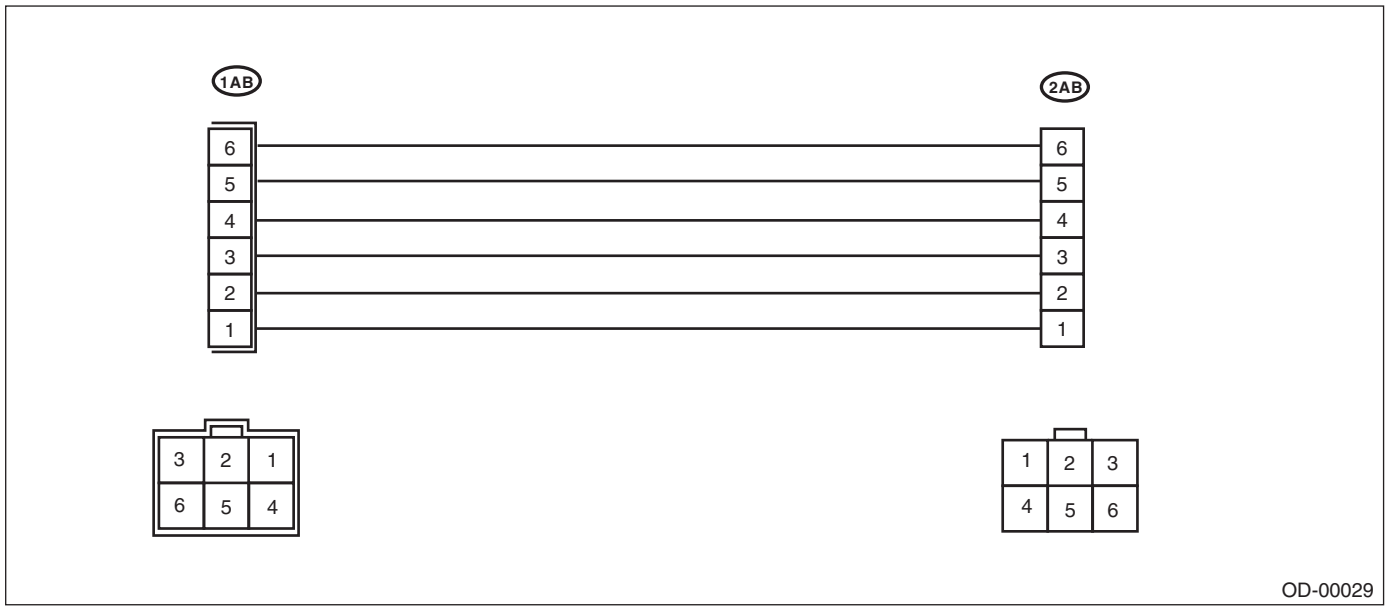
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST98299AG040	98299AG040	TEST HARNESS Y	Used for troubleshooting seat belt buckle switch.



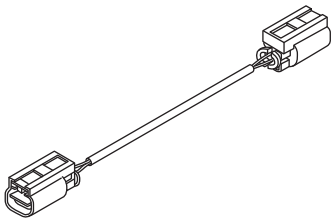
AB-01069

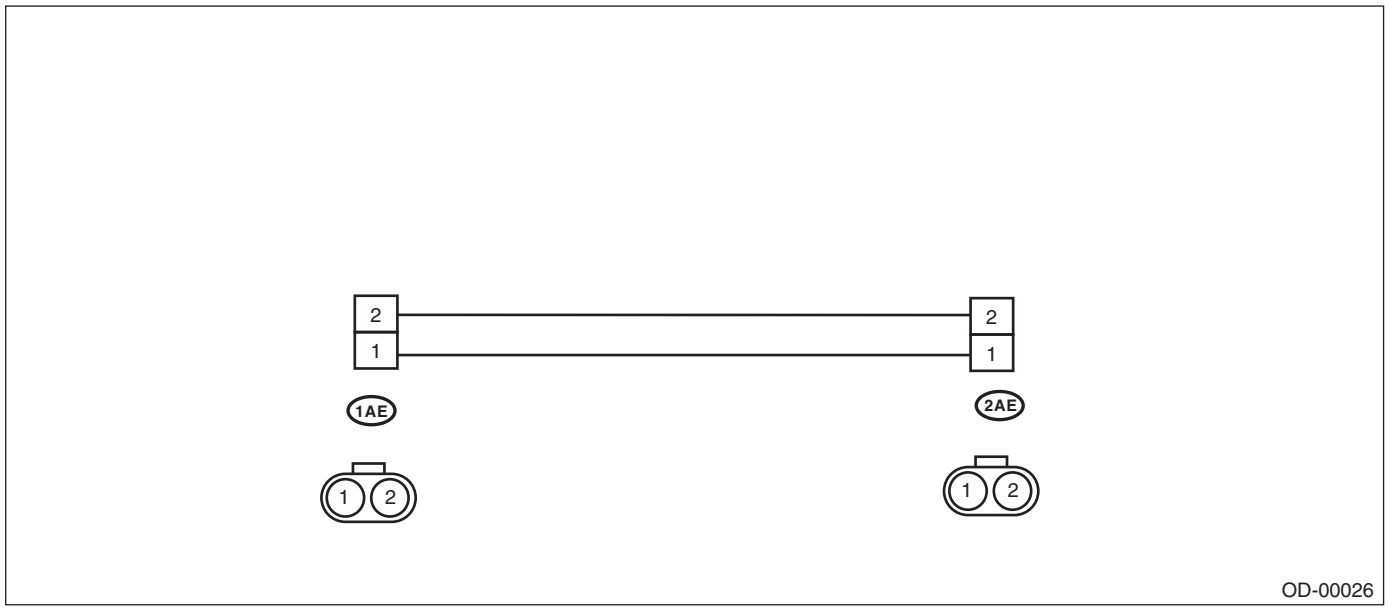
- TEST HARNESS AB

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST98299XA000	98299XA000	TEST HARNESS AB	Used when measuring voltage and resistance of occupant detection system.

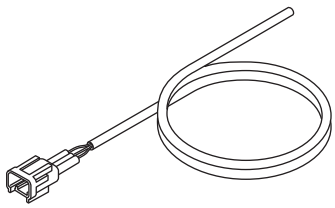


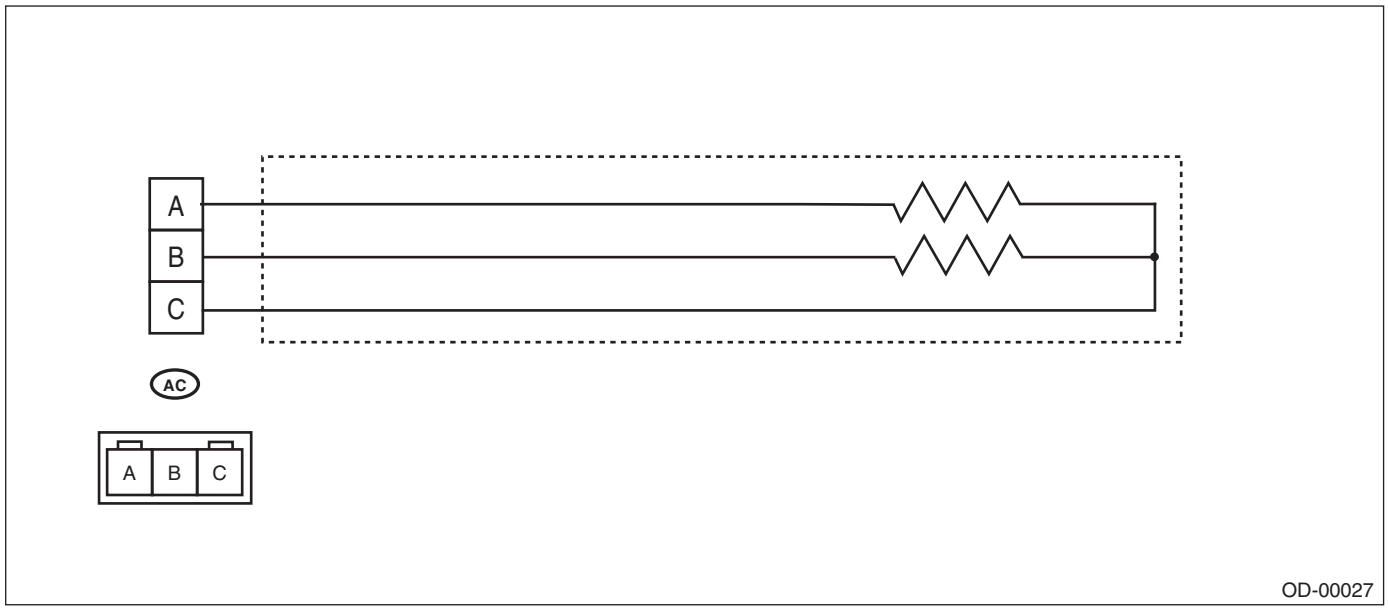
- TEST HARNESS AE

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST98299XA030	98299XA030	TEST HARNESS AE	TEST HARNESS Y adapter harness Used for troubleshooting seat belt buckle switch.

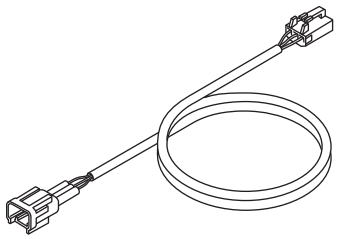


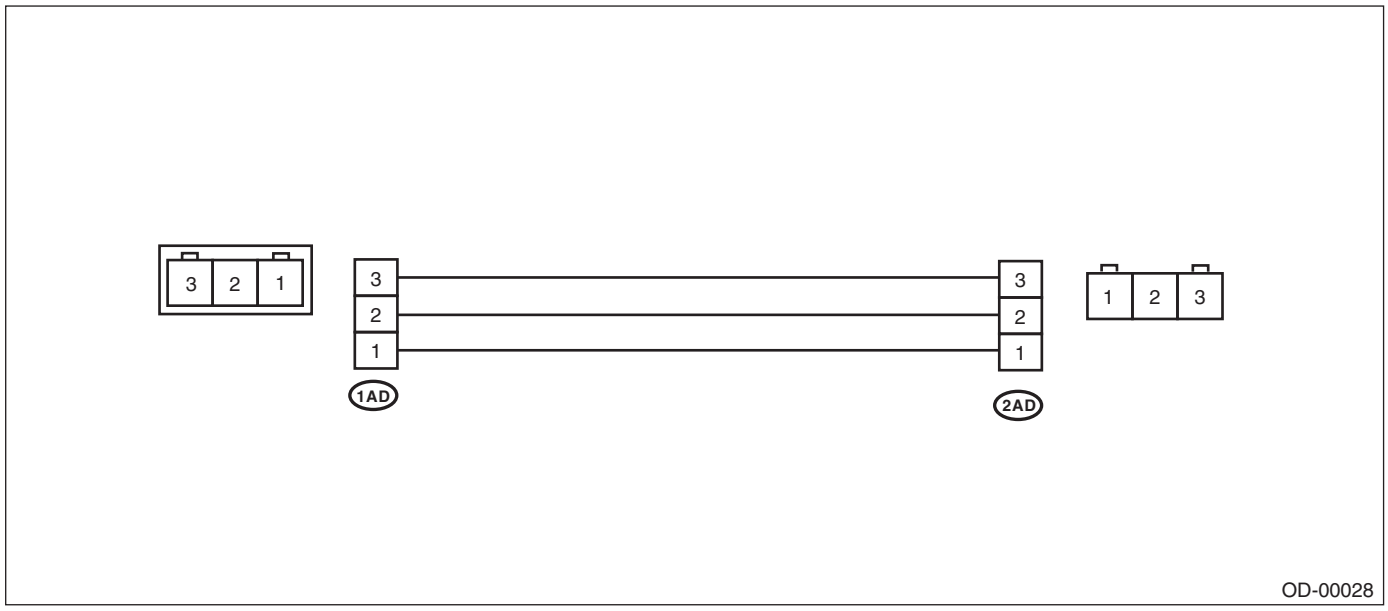
- TEST HARNESS AC

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST98299XA010	98299XA010	TEST HARNESS AC	Used for troubleshooting seat belt tension sensor.



- TEST HARNESS AD

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST98299XA020	98299XA020	TEST HARNESS AD	Used when measuring voltage and resistance of the seat belt tension sensor.

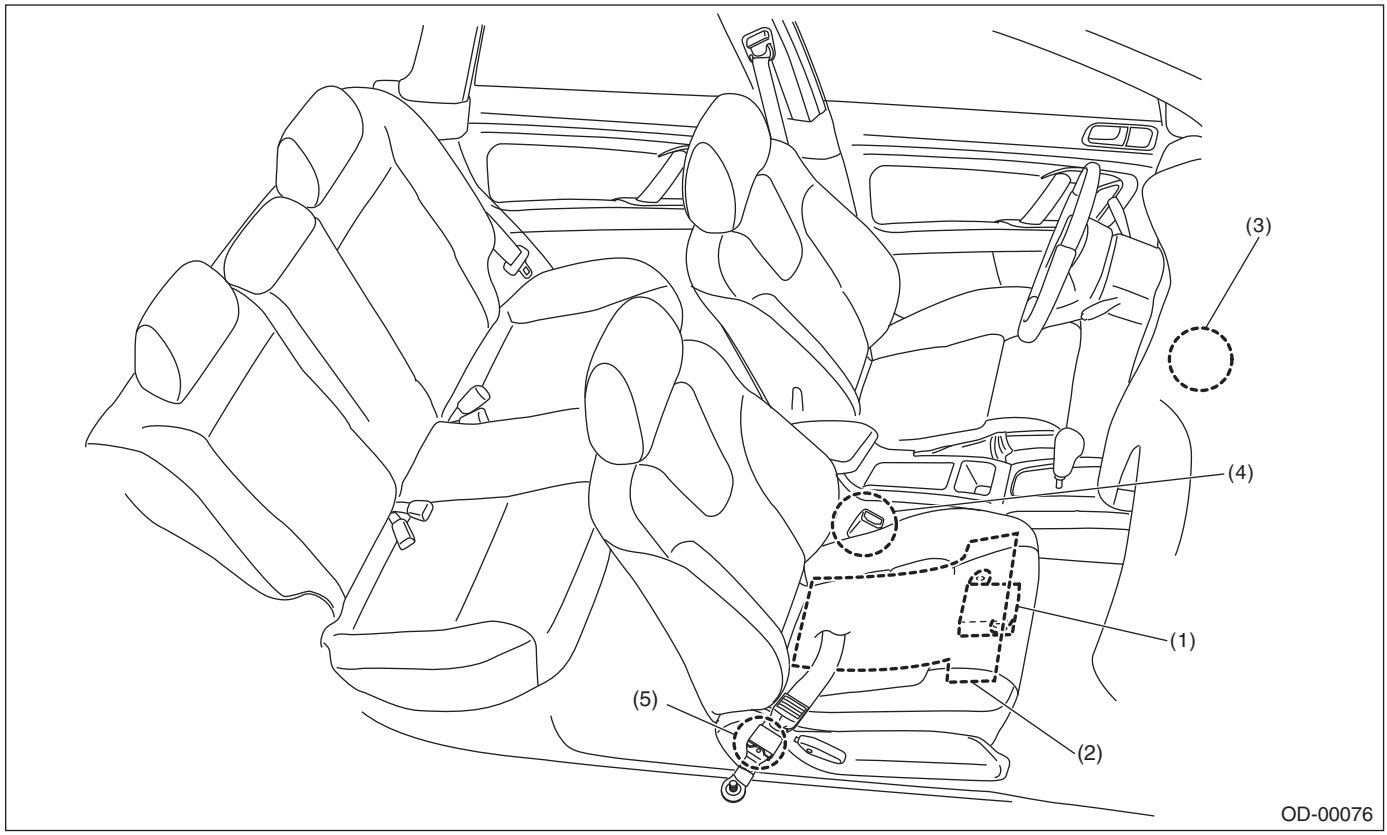


2. GENERAL TOOL

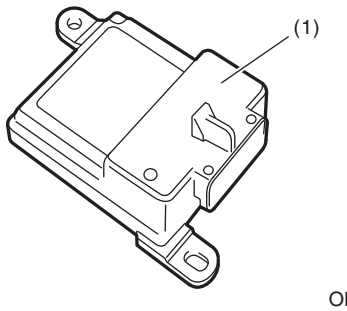
TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance, voltage and current.

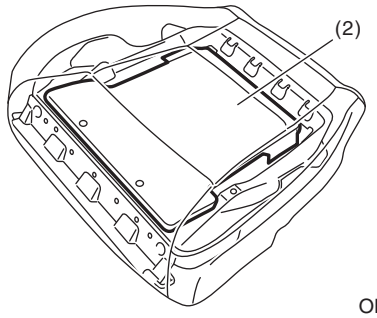
4. Electrical Component Location

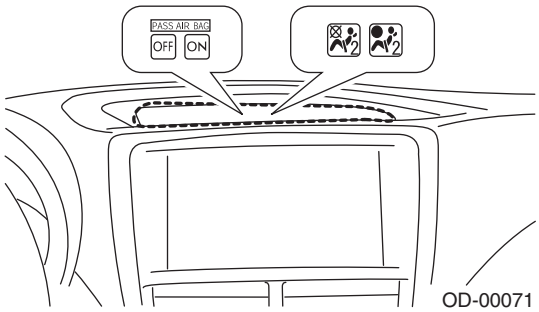
A: LOCATION

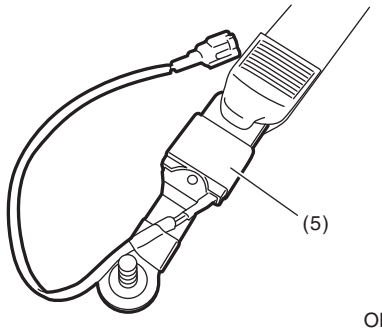


(1) Occupant detection control module
(2) Occupant detection sensor
(3) Airbag ON/OFF indicator light
(4) Buckle switch (Passenger's seat)
(5) Seat belt tension sensor









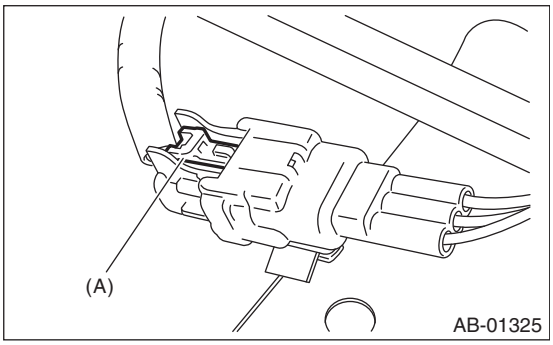
5. Airbag Connector

A: PROCEDURE

1. OCCUPANT DETECTION SYSTEM (BETWEEN AIRBAG REAR HARNESS AND SEAT HARNESS & BELT TENSION SENSOR)

1) How to disconnect:
Press the lock arm (A) to disconnect the connector.

CAUTION:
When pulling the slide lock or disconnecting the connector, make sure to hold the connector rather than the harness.



2) How to connect:
Hold the connector and push in firmly until it clicks.

CAUTION:
Make sure to insert the connector until the connector is locked. Pull lightly to confirm that it is fixed securely.

2. AIRBAG CONTROL MODULE

Refer to the airbag system section. <Ref. to AB-10, AIRBAG CONTROL MODULE, PROCEDURE, Airbag Connector.>

3. BUCKLE SWITCH RH

Refer to the airbag system section. <Ref. to AB-13, BUCKLE SWITCH RH, PROCEDURE, Airbag Connector.>

6. Control Module I/O Signal

A: ELECTRICAL SPECIFICATION

CAUTION:
Never remove the occupant detection control module, occupant detection sensor or seat frame because they are integrated into one unit.

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	Ignition voltage when switch ON
Buckle switch	(GND)	2	0 V	Switch ground

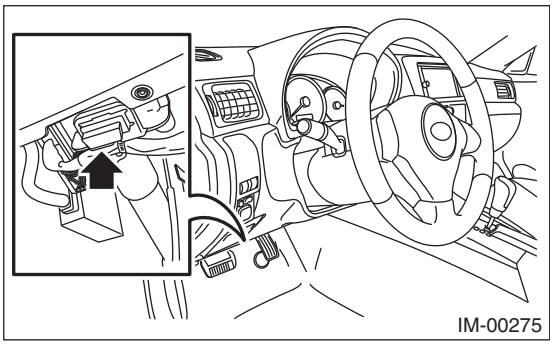
B: WIRING DIAGRAM

Refer to the electrical wiring diagram. <Ref. to WI-97, WIRING DIAGRAM, Occupant Detection System.>

7. Subaru Select Monitor

A: OPERATION

1) Prepare the Subaru Select Monitor kit. <Ref. to AB(diag)-8, SPECIAL TOOL, PREPARATION TOOL, General Description.>
2) Connect the diagnosis cable to Subaru Select Monitor.
3) Connect the Subaru Select Monitor to 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 data link connector.

CAUTION:
Do not connect scan tools other than the Subaru Select Monitor.
4) Turn the ignition switch to ON and run the Subaru Select Monitor.

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 "COMMUNICATION FOR INITIALIZING IMPOSSIBLE" in the DTC of the airbag system (diag). <Ref. to AB(diag)-25, COMMUNICATION FOR INITIALIZING IMPOSSIBLE, INSPECTION, Subaru Select Monitor.>

2. WITHOUT DTC

DETECTING CONDITION:
- Defective combination meter
- Open circuit of harness

TROUBLE SYMPTOM:
- Airbag warning light remains on.
- "No diagnostic Code Present" will be displayed on the Subaru Select Monitor.

NOTE:
- For detailed operation procedures, refer to "Airbag Warning Light Failure". <Ref. to AB(diag)-33, Airbag Warning Light Failure.>
- When the airbag warning light is OFF and "No diagnostic Code Present" is displayed on Subaru Select Monitor, the system is operating properly.

8. Read Diagnostic Trouble Code (DTC)

A: OPERATION

1) Using the Subaru Select Monitor, on the «Main Menu», select {Each System Check}.
2) On the «System Selection Menu», select {Airbag System}.
3) After {Airbag System} is displayed, select [OK].
4) Select the {Diagnostic Code(s) Display} in «Airbag System».
5) Record the displayed DTC.

NOTE:
• For details concerning the operation procedure, refer to the “PC Application Help for Subaru Select Monitor”.
• For details concerning DTCs, refer to the List of Diagnostic Trouble Code (Airbag system, Occupant detection system). <Ref. to AB(diag)-37, List of Diagnostic Trouble Code (DTC).> <Ref. to OD(diag)-22, List of Diagnostic Trouble Code (DTC).>

9. Inspection Mode

A: PROCEDURE

Recreate the circumstance by referring to the conditions described in the checklist.

10.Clear Memory Mode

A: OPERATION

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) Select {Each System Check} in «Main Menu».
2) On the «System Selection Menu» display screen, select the {Airbag System}.
3) On the «Airbag System» display screen, select the {Clear Memory}.
4) When the «Clear Memory?» is shown on the screen, select the [OK].
5) When «Done» is displayed, terminate the Subaru Select Monitor and turn the ignition switch to OFF.

NOTE:
For details concerning the operation procedure, refer to the “PC Application Help for Subaru Select Monitor”.

11.Display of Status Information

A: OPERATION

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 «Main Menu» display, select {Each System Check}.
2) On «System Selection Menu» display, select {Airbag System}.
3) On «Airbag System» display, select {Status Data}.
The following table is for support data.

Contents	Display Contents
Seat position sensor LH	—*2
Seat position sensor RH	—*2
Seat belt buckle switch LH	—*6
Seat belt buckle switch RH	Equipped*3/Unequipped*4 /Other*5/Initial setting*1 /—*6
Passenger's airbag control 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 input.
*6: Seat belt buckle switch not supported
*7: Passenger's airbag operating state
*8: Passenger's airbag non-operating state

NOTE:
For detailed operation procedures, refer to "PC application help for Subaru Select Monitor".

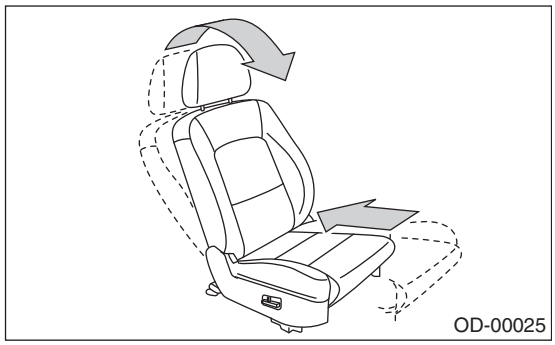
12.System Calibration (Rezeroing)

A: OPERATION

NOTE:
When replacing the occupant detection system, or removing and disassembling the passenger's seat, always perform the system calibration after installing a seat in the vehicle.

CAUTION:
When the trouble occurs in the system during calibration process, "Occupant detection calibration failure" is detected in the DTC 2A of the airbag system 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 «Main Menu» display, select {Each System Check}.
3) On «System Selection Menu» display, select {Occupant Detection System}.
4) On «Occupant Detection System» display, select {Re-zeroing }.
5) «See service manual. And check vehicle condition for successfully completing the rezeroing.» is displayed. Check the following to adjust the condition of the vehicle.
• Adjust the seat backrest to be fully upright. (For models with power seats, press the power seat button until the backrest comes to a stop.)
• Adjust the seat slide position all the way back. (For models with power seats, press the power seat button until the seat slide does not move any further.)
• 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 to 40°C.
6) When the «Re-zeroing Adjust the passenger seat to the condition shown in service manual» is displayed, slide the passenger seat all the way to the back, check that the backrest is adjusted to all the way up, 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 and 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 select the [OK].

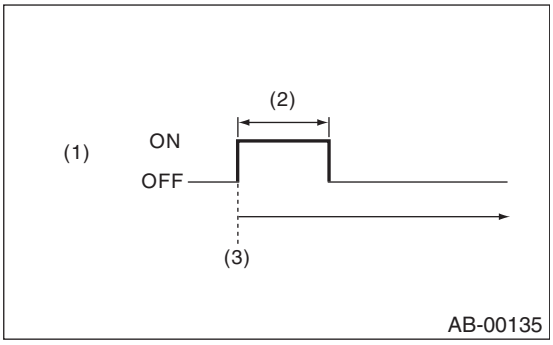
NOTE:
• After selecting the [OK], «In process...Please wait for a while without touching vehicle» is displayed. Do not touch or rock the vehicle while the message is displayed.
• During the system calibration process, if the «Re-zeroing is unsuccessful See service manual Press OK to END» is displayed, go to step 10).
9) When the re-zeroing is ended normally, the «Rezeroing is successfully completed Press "OK" to END» is displayed. Then turn the ignition switch to OFF to finish the diagnosis.
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 to ON again, then read the DTC of the airbag system. <Ref. to OD(diag)-14, Read Diagnostic Trouble Code (DTC).>
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)-18, System Calibration (Rezeroing).>

NOTE:
When the re-zeroing is unsuccessful, there could be occupant detection system failure or improper seat and vehicle status. 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 OD(diag)-14, Read Diagnostic Trouble Code (DTC).> <Ref. to AB(diag)-37, LIST, List of Diagnostic Trouble Code (DTC).>

13. Airbag Warning Light Illumination Pattern

A: INSPECTION

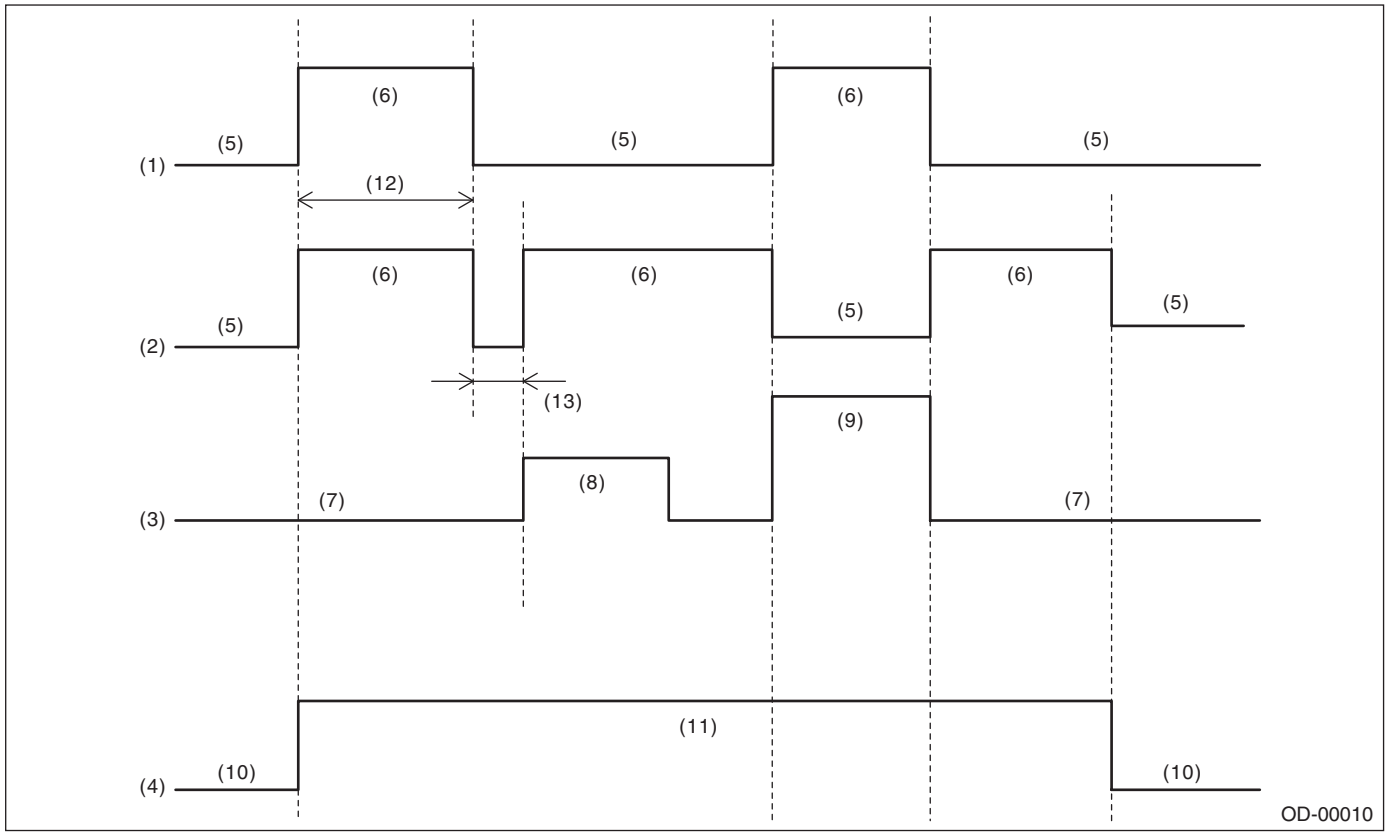
Turn the ignition switch to ON, and confirm that the airbag warning light remains on for approx. 6 seconds and then goes off afterwards.



(1) Airbag warning light
(2) Approx. 6 sec.
(3) Ignition switch ON

14.Passenger's Airbag ON/OFF Indicator Light Illumination Pattern

A: INSPECTION



(1)	Passenger's airbag ON indicator light	(6)	Light ON	(10)	OFF
(2)	Passenger's airbag OFF indicator light	(7)	Empty	(11)	ON
(3)	Occupant seating	(8)	Child	(12)	Approx. 6 sec.
(4)	Ignition switch	(9)	Adult	(13)	Approx. 2 sec.
(5)	Light OFF				

15.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)-23, DTC 2A ODS CALIBRATION ERROR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
2B	ODS System Wrong Parts	• Wrong airbag control module is installed. • Wrong occupant detection system is installed. • Occupant detection system is faulty.	<Ref. to OD(diag)-23, DTC 2B ODS SYSTEM WRONG PARTS, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
2C	Belt Tension Sensor Failure	• 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)-24, DTC 2C BELT TENSION SENSOR FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
27	ODS Communication Error	• Occupant detection control module and airbag control module communication is faulty. • Airbag rear harness circuit is open, shorted, shorted to ground or shorted to power supply. • Occupant detection harness is faulty. • Occupant detection system is faulty. • Airbag control module is faulty.	<Ref. to OD(diag)-25, DTC 27 ODS COMMUNICATION ERROR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
29	ODS Failure	• Occupant detection sensor is faulty. • Occupant detection control module is faulty. • Occupant detection harness is faulty. • Fuse No. 25 (in joint box) is blown.	<Ref. to OD(diag)-26, DTC 29 ODS FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
37	Buckle Switch RH Failure	• 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)-27, DTC 37 BUCKLE SWITCH RH FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

16.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 system calibration using the Subaru Select Monitor. <Ref. to OD(diag)-18, System Calibration (Rezeroing).>	Did the system calibration complete properly?	Finish the diagnosis.	Follow the system calibration procedures. <Ref. to OD(diag)-18, System Calibration (Rezeroing).>

B: DTC 2B ODS SYSTEM WRONG PARTS

DTC DETECTING CONDITION:

- Wrong airbag control module is installed.
- Wrong occupant detection system is installed.

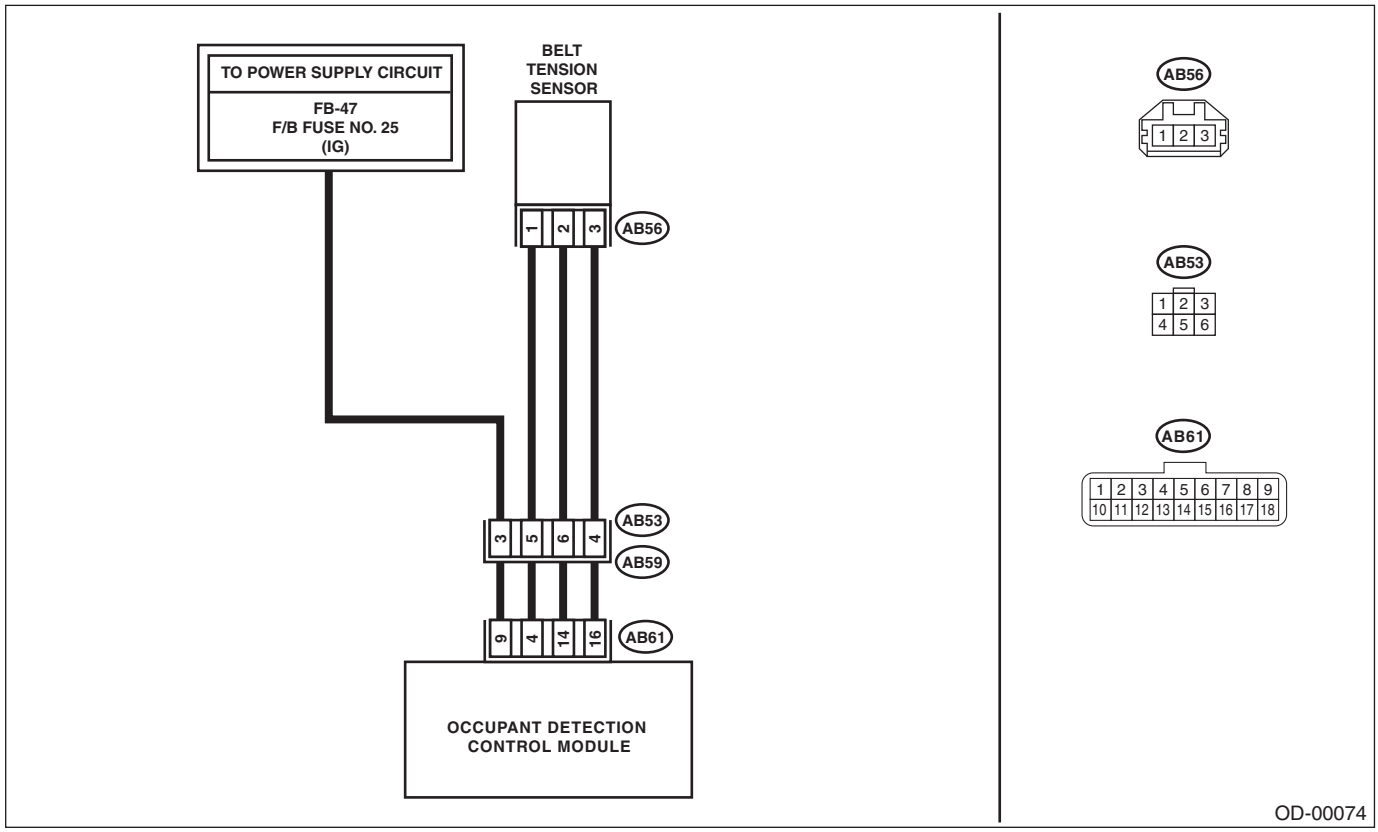
	Step	Check	Yes	No
1	**CHECK OCCUPANT DETECTION SYSTEM.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Replace the passenger's seat cushion pad frame assembly. <Ref. to SE-8, REMOVAL, Front Seat.> <Ref. to SE-10, DRIVER'S SEAT (POWER SEAT), DISASSEMBLY, Front Seat.> 3) Connect the ground cable to battery. 4) Connect Subaru Select Monitor to the vehicle and perform the system calibration. <Ref. to OD(diag)-18, System Calibration (Rezeroing).>	Did the system calibration complete properly?	Finish the diagnosis.	Go to step **2**.
2	**CHECK AIRBAG CONTROL SYSTEM.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Replace the airbag control module. <Ref. to AB-24, REMOVAL, Airbag Control Module.> 3) Connect the ground cable to battery. 4) Connect Subaru Select Monitor to the vehicle and perform the system calibration. <Ref. to OD(diag)-18, System Calibration (Rezeroing).>	Did the system calibration complete properly?	Finish the diagnosis.	Check between the occupant detection control module and airbag control module.

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:



Step		Check	Yes	No
1	**CHECK POOR CONTACT OF CONNECTORS.** Check for poor contact of the connectors between the occupant detection control module and belt tension sensor.	Is there poor contact?	Reconnect the connector. If the fault is not fixed, replace the airbag harness.	Go to step **2**.
2	**CHECK BELT TENSION SENSOR.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Disconnect the belt tension sensor connector (AB56) from the airbag harness. 3) Connect the test harness AC to the connector (AB56). 4) Connect the battery ground terminal and turn the ignition switch to ON.	Does the airbag warning light illuminate for approximately 6 seconds and go off?	Replace the seat belt outer. <Ref. to SB-17, OUTER SEAT BELT ASSEMBLY, REMOVAL, Front Seat Belt.>	Go to step **3**.

	Step	Check	Yes	No
3	**CHECK AIRBAG HARNESS.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more. 2) Disconnect the test harness AC from the belt tension sensor connector (AB56). 3) Connect the test harness AD (1AD) to the connector (AB56). 4) Disconnect the airbag harness connector (AB53), 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:***	Is the resistance less than 10 Ω?	Go to step **4**.	Replace the airbag harness along with chassis harness.
4	**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:***	Is the resistance 1 MΩ or more?	Go to step **5**.	Replace the airbag harness along with chassis harness.
5	**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 (–):***	Is the voltage 1 V or less?	Replace the airbag harness along with chassis harness.	Check the seat harness, and if any fault is found, replace the seat harness. If no fault is found in the seat harness, replace the seat cushion frame assembly. <Ref. to SE-13, PASSENGER'S SEAT, DISASSEMBLY, Front Seat.>

D: DTC 27 ODS COMMUNICATION ERROR

Perform the diagnosis following diagnostic procedures for the airbag system. <Ref. to AB(diag)-69, 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.
- Rear airbag harness is faulty.
- Fuse No. 25 (in joint box) is blown.

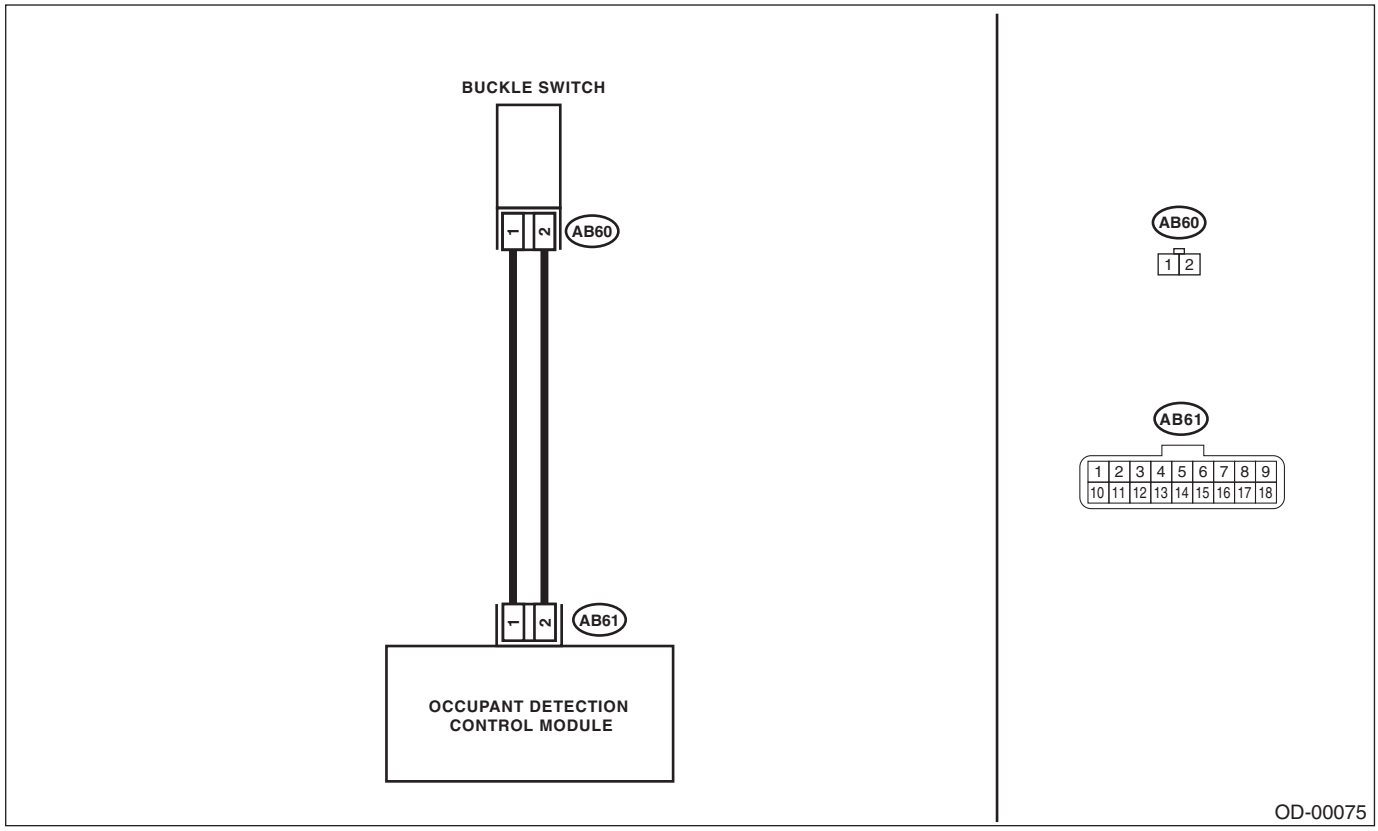
	Step	Check	Yes	No
1	**CHECK POOR CONTACT OF CONNECTORS.** Check for poor contact of the connectors between the occupant detection control module and airbag control module.	Is there poor contact?	Reconnect the connector. If the fault is not fixed, replace the airbag harness.	Go to step **2**.
2	**CHECK 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 in the diagnostics code?	Perform the diagnosis according to each DTC.	Check the seat harness, and if any fault is found, replace the seat harness. If the fault is not fixed, replace the occupant detection system. <Ref. to SE-13, PASSENGER'S SEAT, DISASSEMBLY, Front Seat.>

F: DTC 37 BUCKLE SWITCH RH FAILURE

DTC DETECTING CONDITION:

- Passenger's 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:



	Step	Check	Yes	No
1	**CHECK POOR CONTACT OF CONNECTORS.** 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 terminal, and wait for 60 seconds. 2) Disconnect the buckle switch connector (AB60). 3) Connect the test harness AE and test harness connector Y to buckle switch connector (AB60). 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-17, INNER SEAT BELT ASSEMBLY, REMOVAL, Front Seat Belt.>	Check the seat harness, and if any fault is found, replace the seat harness. If the fault is not fixed, replace the occupant detection system.

SEAT BELT SYSTEM

SB

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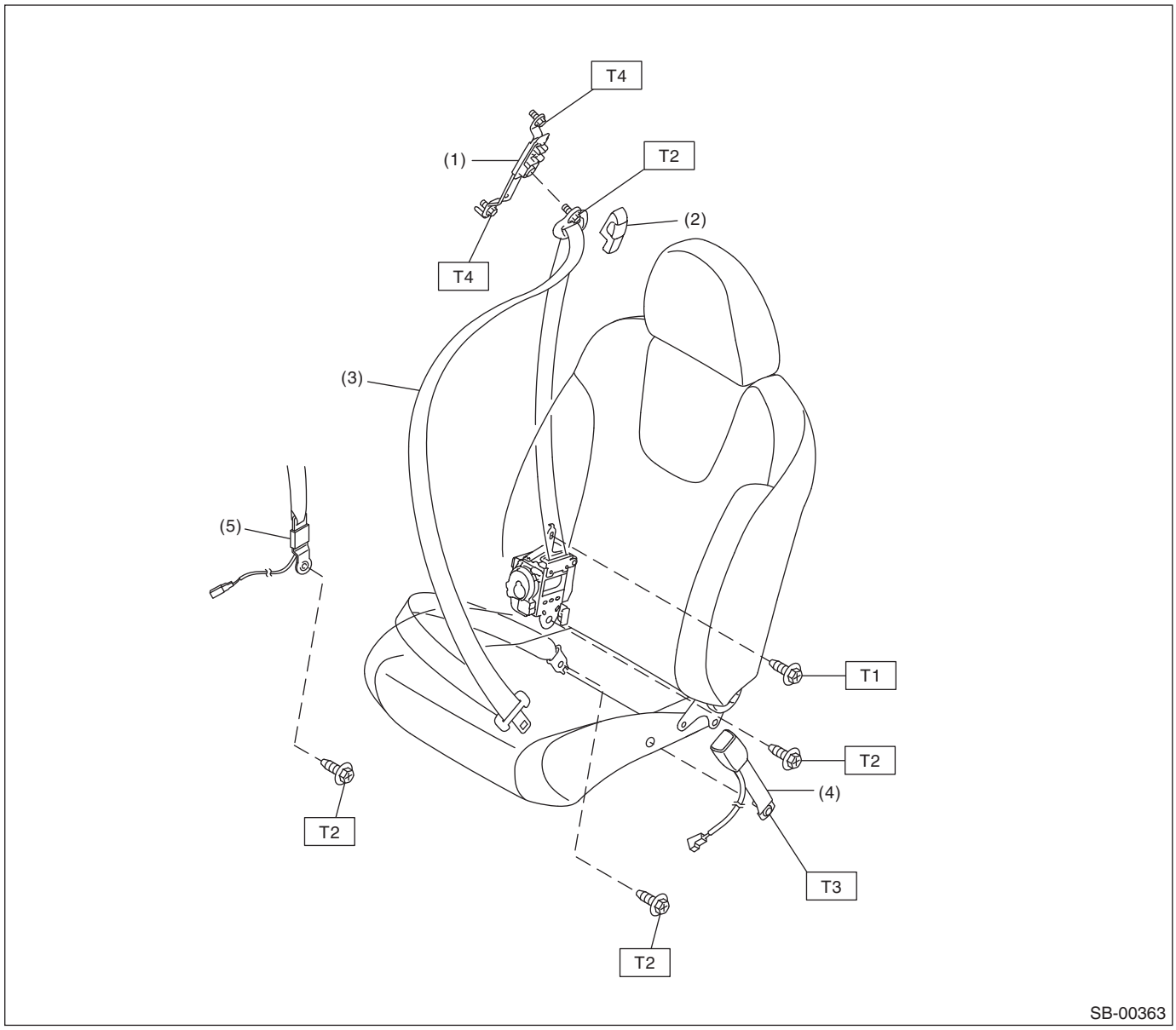
1. General Description 2
2. Pretensioner Connector 11
3. Inspection Locations After a Collision 12
4. Seat Belt Warning System 13
5. Front Seat Belt 17
6. Rear Seat Belt 19

1. General Description

A: COMPONENT

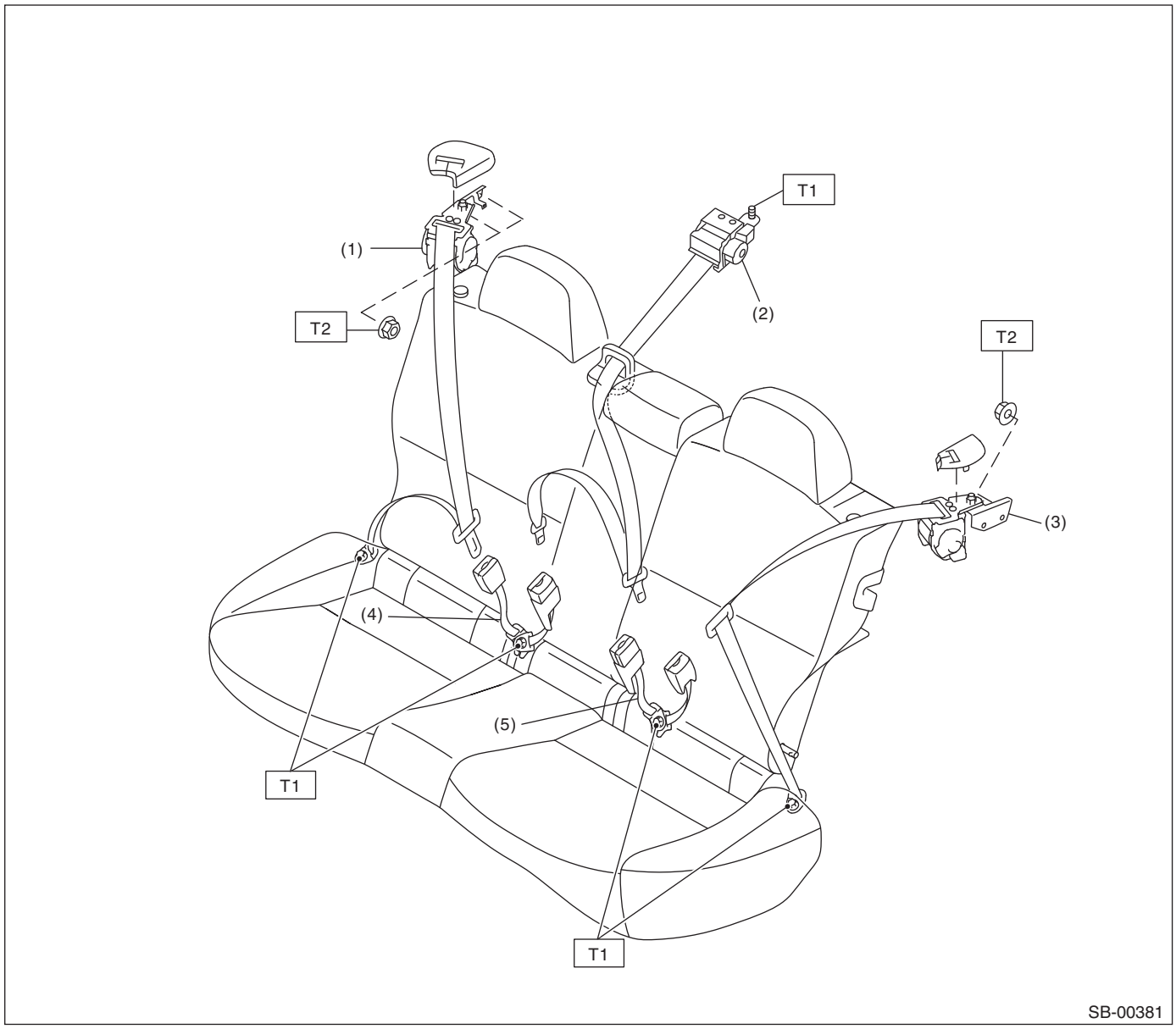
1. FRONT SEAT BELT



(1) Adjustable anchor ASSY
(2) Anchor cover
(3) Outer belt ASSY
(4) Inner seat belt ASSY
(5) Belt tension sensor (passenger seat only)

Tightening torque:N·m (kgf-m, ft-lb)
T1: 7.5 (0.76, 5.5)
T2: 30 (3.06, 22.1)
T3: 38 (3.87, 28.0)
T4: 53 (5.40, 39.1)

2. REAR SEAT BELT



(1) Outer seat belt ASSY RH
(2) Outer seat belt center ASSY
(3) Outer seat belt ASSY LH
(4) Center seat belt ASSY RH
(5) Center seat belt ASSY LH

Tightening torque:N·m (kgf-m, ft-lb)
T1: 30 (3.06, 22.1)
T2: 53 (5.40, 39.1)

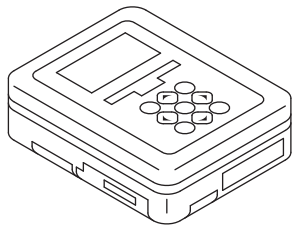
B: CAUTION

• Before starting the work, turn the ignition switch to OFF, disconnect the battery ground cable and wait for 60 seconds or more.
• The pretensioner system has a back-up power supply. Be aware that the pretensioner might deploy if you do not wait for 60 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 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.

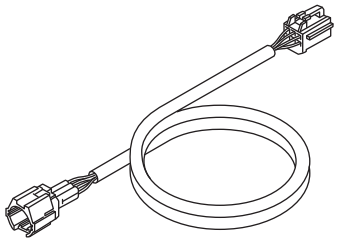
C: PREPARATION TOOL

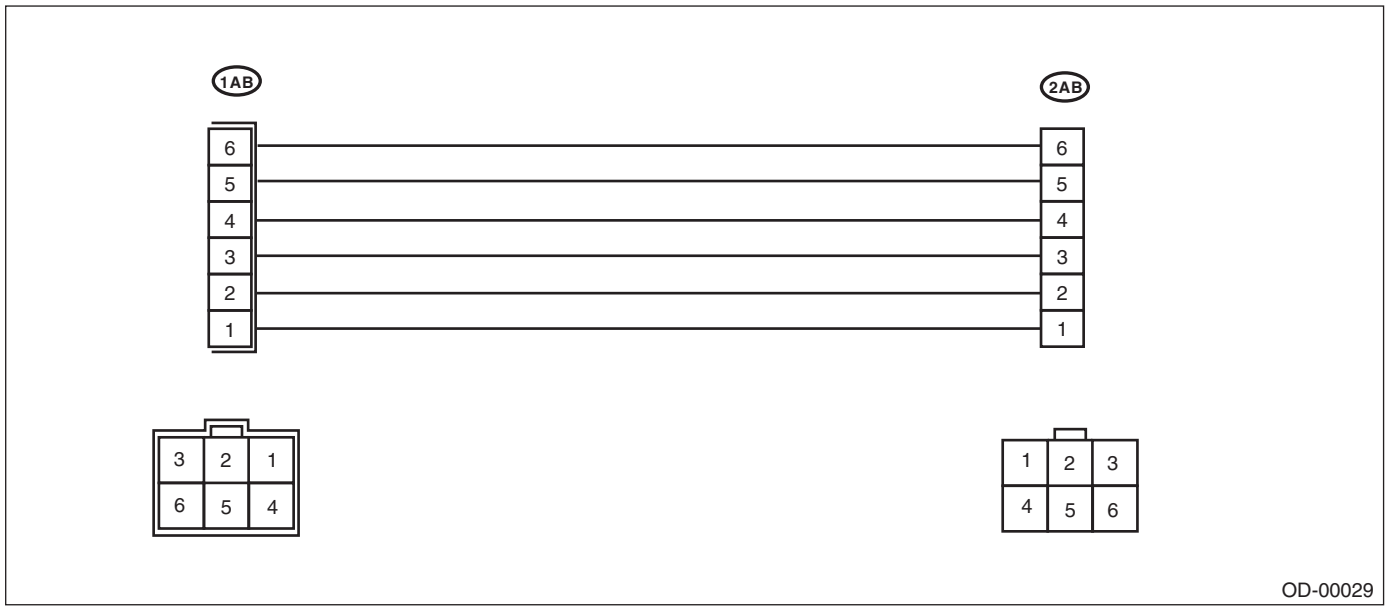
1. SPECIAL TOOL

• SUBARU SELECT MONITOR

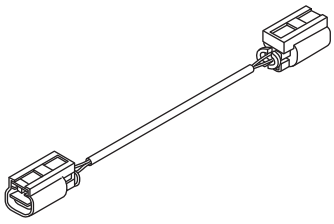
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST1B022XU0	1B022XU0	SUBARU SELECT MONITOR III KIT	Used for setting of each function and trouble-shooting for electrical system.

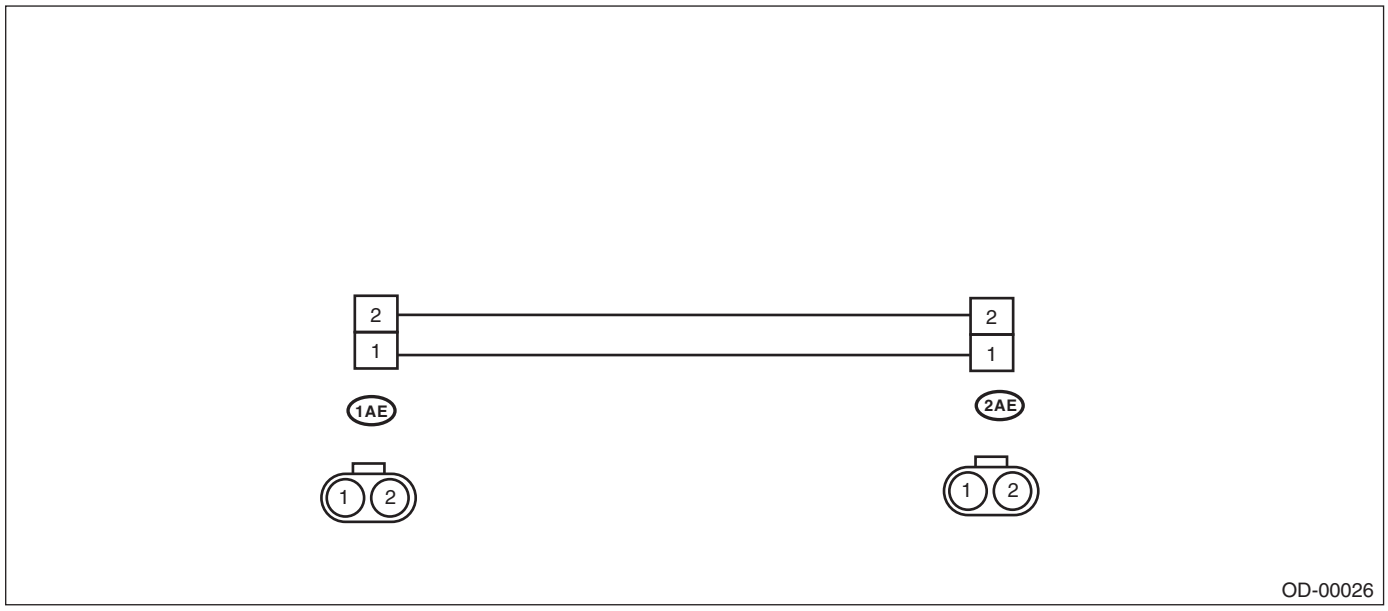
- TEST HARNESS AB

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST98299XA000	98299XA000	TEST HARNESS AB	Used when measuring voltage and resistance of occupant detection system.

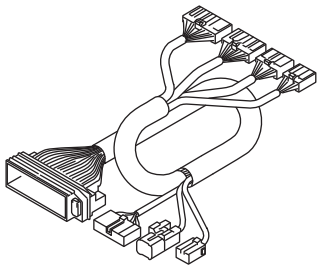


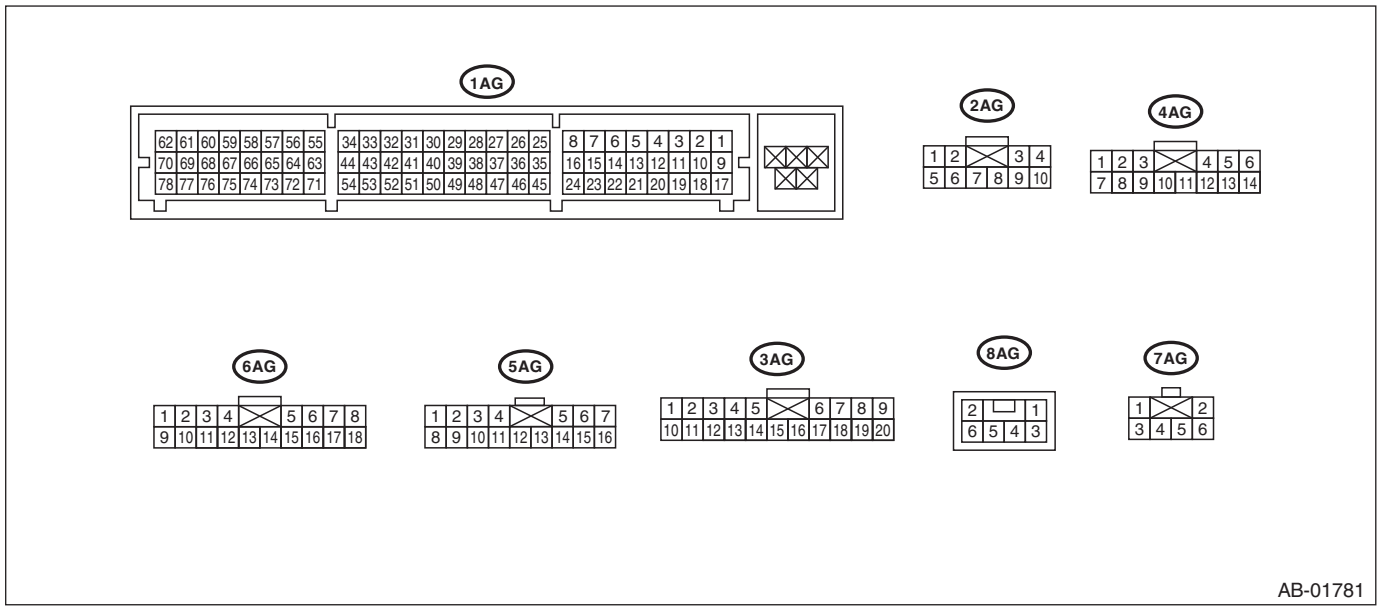
- TEST HARNESS AE

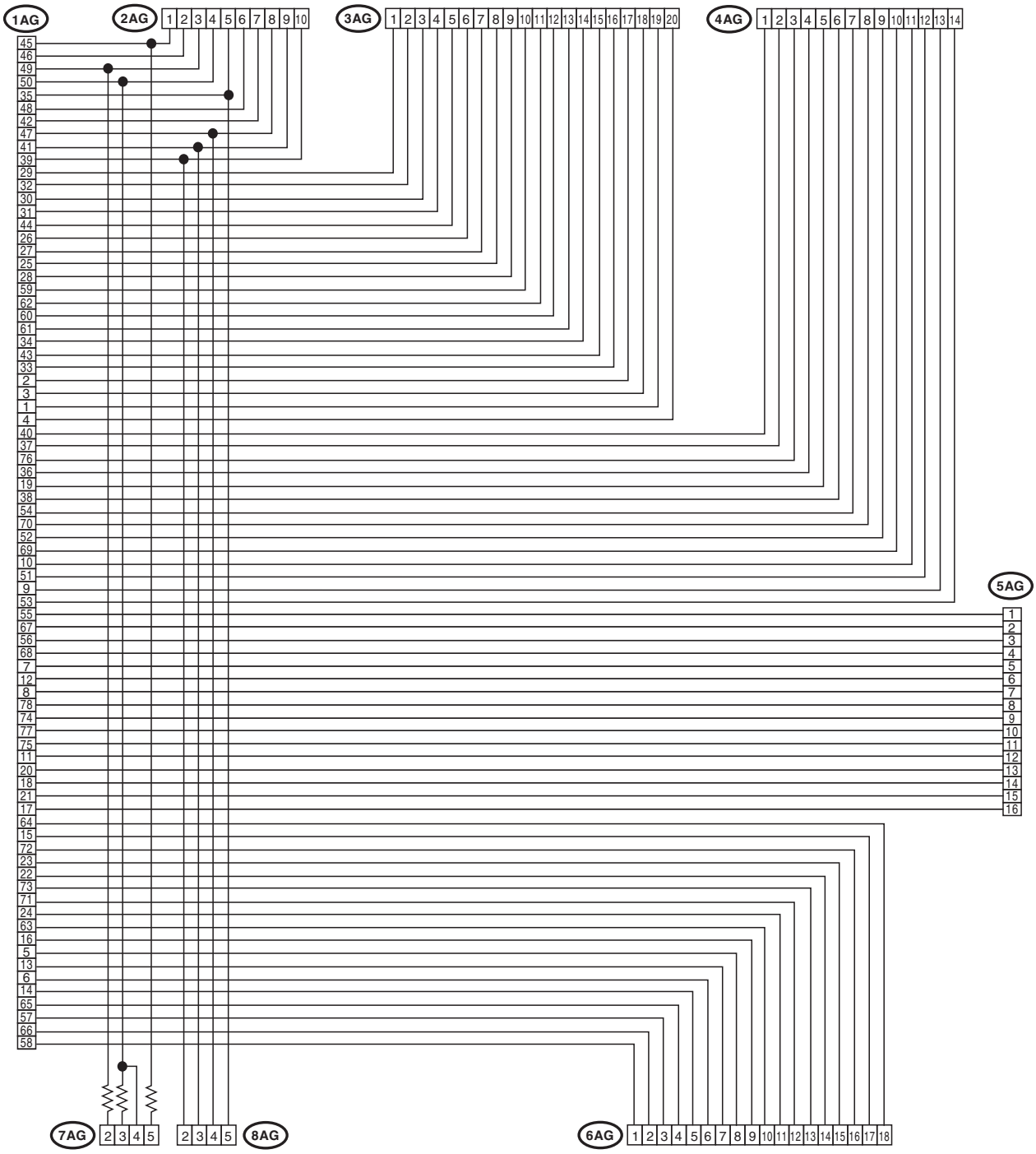
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST98299XA030	98299XA030	TEST HARNESS AE	• Used for diagnosing seat belt tension sensor. • Used together with test harness Y.



- TEST HARNESS AG

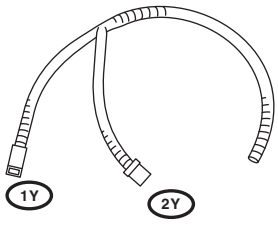
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST98299AG070	98299AG070	TEST HARNESS AG	Used when measuring voltage and resistance of airbag control module.

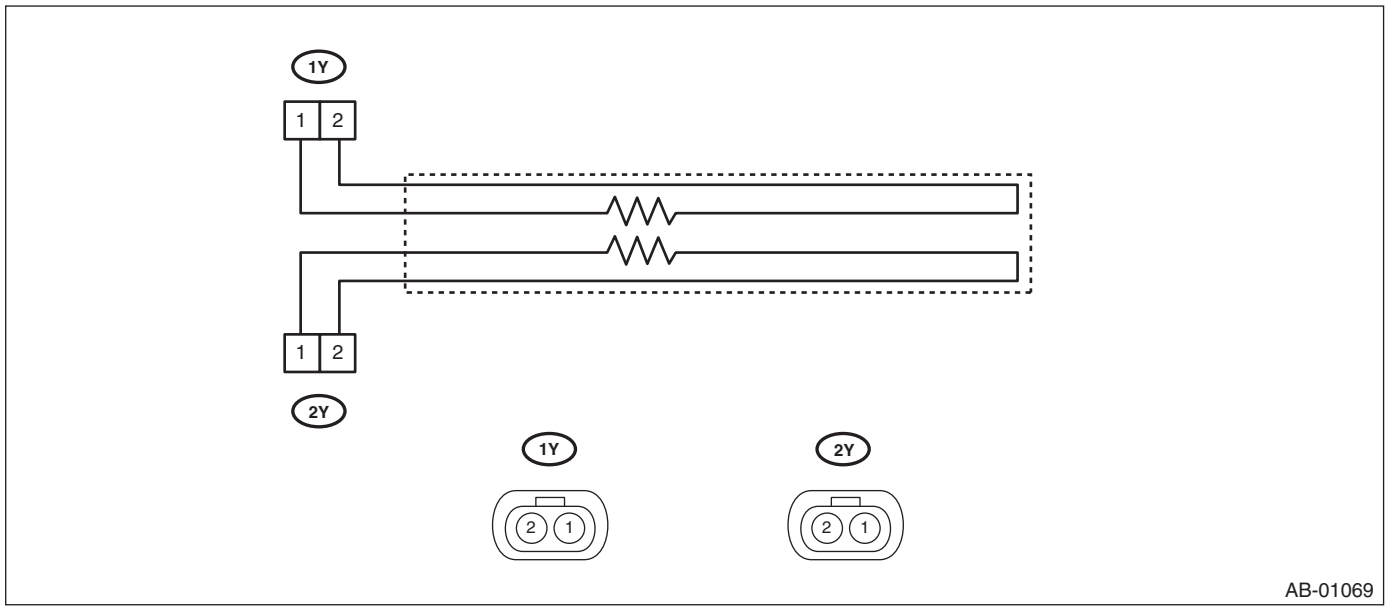




AB-01902

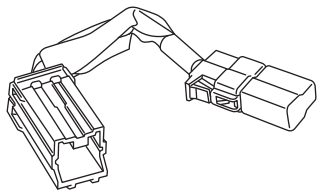
- TEST HARNESS Y

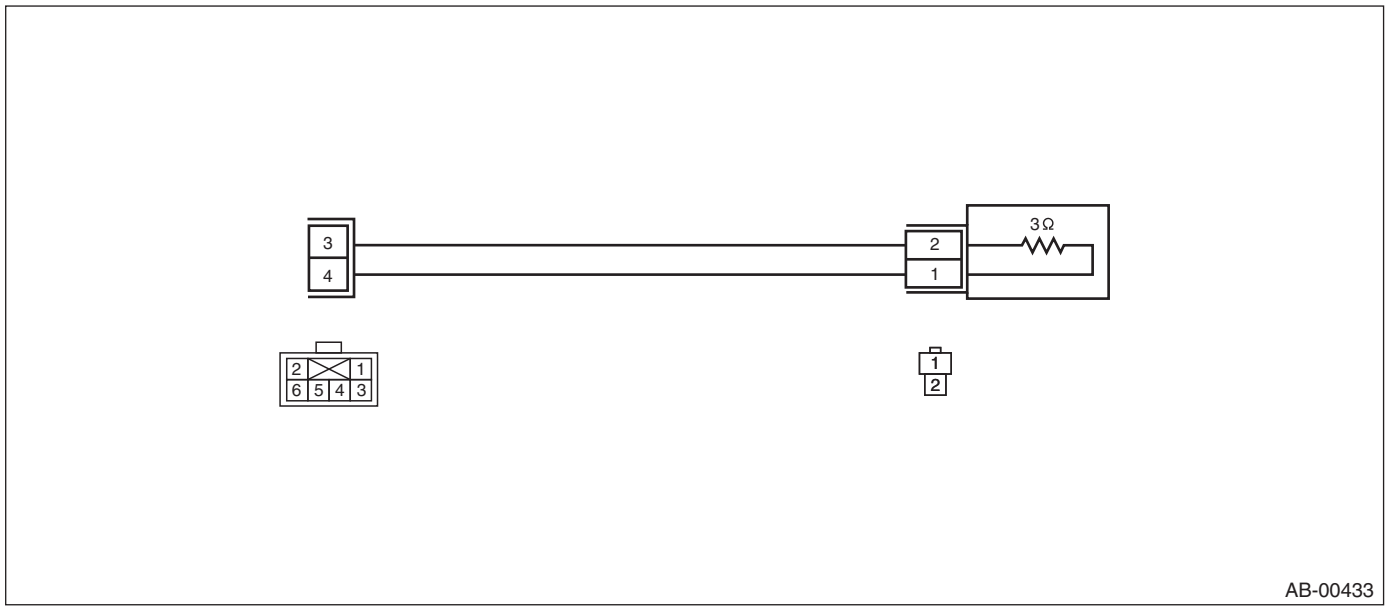
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST98299AG040	98299AG040	TEST HARNESS Y	Used for troubleshooting seat belt buckle switch.



AB-01069

- AIRBAG RESISTOR

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST98299PA040	98299PA040	AIRBAG RESISTOR	Used in replacement of airbag module for which resistance value is same as airbag module. Two ST are required for diagnosis of two-stage inflator type airbag module.



2. GENERAL TOOL

TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance and voltage.

2. Pretensioner Connector

A: PROCEDURE

Refer to “Airbag Connector” of Airbag section for the connectors of the seat belt pretensioners and buckle switch RH. <Ref. to AB-10, PROCEDURE, Airbag Connector.>

3. Inspection Locations After a Collision

A: INSPECTION

Refer to “Inspection Locations After a Collision” of Airbag section. <Ref. to AB-15, Inspection Locations After a Collision.>

4. Seat Belt Warning System

A: WIRING DIAGRAM

Refer to “Seat Belt Warning Light System” in the wiring diagram. <Ref. to WI-96, WIRING DIAGRAM, Seat Belt Warning System.>

B: INSPECTION

CAUTION:
• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait 60 seconds or more 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 of the driver’s and passenger’s seats for safety.
• When inspecting the airbag rear harness, disconnect the side airbag module connector, curtain airbag module connector and seat belt pretensioner connector for safety reasons.
TROUBLE SYMPTOM:
- Driver’s side seat belt warning light does not illuminate or it remains illuminating.
- Warning buzzer does not beep.

	Step	Check	Yes	No
1	**CHECK CURRENT SETTINGS.** 1) Prepare the Subaru Select Monitor. 2) Turn the ignition switch to ON (engine OFF) and run the “PC application for Subaru Select Monitor”. 3) Select the “current data display” and read the data of the “belt warning switch”.	Is the belt warning display ON?	Go to step **2**.	Turn the belt warning ON with unit customization.
2	**CHECK CURRENT DATA.** 1) Select the “current data display” and read the data of the “IG power supply voltage”. 2) Turn the ignition switch ON ←→ OFF.	Does the voltage change between 10 V or higher ←→ less than 1.5 V, according to the ignition switch ON ←→ OFF operation?	Go to step **3**.	Check the ignition switch circuit.
3	**CHECK FUNCTION.** 1) Sit on the driver’s seat and passenger’s seat and disconnect the seat belts of the both. 2) Turn the ignition switch to ON (engine OFF). 3) Check if the driver’s seat belt warning light in the combination meter and the passenger’s seat belt warning light in the clock unit illuminate, and if the warning buzzer sounds.	Do the driver’s warning light and passenger’s warning light blink and the buzzer sound while blinking?	Go to step **4**.	• Malfunction of the driver’s seat belt warning light → Go to step **10**. • Malfunction of the passenger’s seat belt warning light → Go to step **16**. • The buzzer does not sound → Go to step **6**.
4	**CHECK FUNCTION.** 1) Wait until the buzzer stops sounding in step 3. (for approximately six seconds after starting sounding) 2) Connect and disconnect the seat belts of the driver’s and passenger’s. 3) Check the illumination of the driver’s seat belt warning light in the combination meter and the passenger’s seat belt warning light in the clock unit.	Do the seat belts warning light illuminate ←→ go off according to the operation?	Go to step **5**.	• Malfunction of the driver’s seat belt warning light → Go to step **6**. • Malfunction of the passenger’s seat belt warning light → Go to step **12**.

	Step	Check	Yes	No
5	**CHECK FUNCTION.** 1) Wait until the buzzer stops sounding in step 3. (for approximately six seconds after starting sounding) 2) Start the engine, and set the vehicle speed at 15 km/h (9 MPH) or more. 3) Check the seat belt warning lights of the driver's and the passenger's, and if the warning buzzer sounds.	Do the driver's warning light and passenger's warning light blink and the buzzer sound while blinking?	Seat belt warning system is normal.	Go to step **19**.
6	**CHECK CURRENT DATA.** 1) Select the "current data display" and read the data of the seat belt switch of the driver's. 2) Connect and disconnect the seat belt buckle.	Does the seat belt SW display turn ON ←→ OFF according to the operation?	Go to step **10**.	Go to step **7**.
7	**CHECK HARNESS.** 1) Disconnect the negative terminal from the battery, and wait for 60 seconds or more. 2) Disconnect the connector of body integrated unit and the seat belt buckle switch. 3) Check for short circuit to battery, open circuit and short circuit to ground between the body integrated unit and the seat belt buckle switch LH. ***Connector & terminal*** ***(B281) No. 16 — (R108) No. 3:***	Is the harness normal?	Go to step **8**.	Repair or replace the harness.
8	**CHECK HARNESS.** Measure the resistance between the seat belt buckle switch LH and chassis ground. ***Connector & terminal*** ***(R108) No. 1 — Chassis ground:***	Is the resistance less than 10 Ω?	Go to step **9**.	Repair or replace the harness.
9	**CHECK SEAT BELT BUCKLE SWITCH LH.** Measure the resistance between the connector terminals of the driver's seat belt switch when the driver's seat belt is fastened and detached. ***Connector & terminal*** ***(R108) No. 1 — (R108) No. 3:***	Is the resistance when the belt is fastened 1 MΩ or more, and less than 10 Ω when the belt is detached?	Replace the body integrated unit. <Ref. to SL-46, REMOVAL, Body Integrated Unit.>	Replace the inner belt assembly LH. <Ref. to SB-17, INNER SEAT BELT ASSEMBLY, REMOVAL, Front Seat Belt.>
10	**CHECK DTC.** Read the DTC using Subaru Select Monitor.	Is any CAN-related body system DTC detected?	Check the CAN system according to the DTC.	Go to step **11**.
11	**CHECK COMBINATION METER.** Perform the self-diagnosis of combination meter. <Ref. to IDI-5, SELF-DIAGNOSIS, INSPECTION, Combination Meter System.>	At the start of combination meter self diagnosis, did the buzzer sound and the seat belt warning light illuminate?	Replace the body integrated unit or the combination meter. Or replace both. It may be due to the transmission failure of the body integrated unit or the reception failure of the combination meter.	Replace the combination meter. <Ref. to IDI-21, REMOVAL, Combination Meter.>
12	**CHECK CURRENT DATA.** 1) Sit in the passenger's seat. 2) Select "Current Data Display" and display the data of "P seat belt SW input ". 3) Fasten and detach the passenger's side seat belt buckle, and read the data of the seat belt switch. <Ref. to LAN(diag)-20, OPERATION, Read Current Data.>	Does the seat belt switch display turn ON ←→ OFF according to the operation of the seat belt buckle?	Go to step **16**.	Go to step **13**.

	Step	Check	Yes	No
13	**CHECK AIRBAG SYSTEM AND OCCUPANT DETECTION SYSTEM.** Perform the check in accordance with the diagnostic procedure DTC 27 of the airbag system. <Ref. to AB(diag)-69, DTC 27 ODS COMMUNICATION ERROR, Diagnostic Chart with Trouble Code.>	Is there any problem on the inspection result?	Go to step **14**.	Repair or replace the harness.
14	**CHECK BUCKLE SWITCH RH.** Perform the check in accordance with the diagnostic procedure DTC 37 of the occupant detection system. <Ref. to OD(diag)-27, DTC 37 BUCKLE SWITCH RH FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any problem on the inspection result?	Go to step **15**.	Repair or replace the harness.
15	**CHECK AIRBAG CONTROL MODULE AND BODY INTEGRATED UNIT.** Check the airbag control module, occupant detection sensor and seat belt buckle switch RH. Perform the check in accordance with the diagnostic procedure DTC 39 of the airbag system. <Ref. to AB(diag)-72, DTC 39 SEAT BELT WARNING FAILURE, Diagnostic Chart with Trouble Code.>	Is there any problem on the inspection result?	Replace the body integrated unit. <Ref. to SL-46, REMOVAL, Body Integrated Unit.>	Repair or replace the harness.
16	**CHECK HARNESS.** 1) Disconnect the clock connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between the ignition power supply and the clock. ***Connector & terminal*** ***(i59) No. 8 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **17**.	Repair or replace the harness.
17	**CHECK HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector of body integrated unit. 3) Check for battery short and open circuits, and short to ground between the body integrated unit and clock. ***Connector & terminal*** ***(i84) No. 25 — (i59) No. 2:***	Is the harness normal?	Go to step **18**.	Repair or replace the harness.
18	**CHECK CLOCK.** 1) Connect the clock connector. 2) Turn the ignition switch to ON. 3) Use an appropriate wiring harness to create a short between the body integrated unit and clock. ***Connector & terminal*** ***(i84) No. 25 — Chassis ground:*** ***(i59) No. 2 — Chassis ground:***	Does passenger's seat belt warning light in the clock illuminate?	Replace the body integrated unit. <Ref. to SL-46, REMOVAL, Body Integrated Unit.>	Replace the clock. <Ref. to IDI-27, REMOVAL, Clock.>
19	**CHECK DTC.** Read the DTCs for all systems using the Subaru Select Monitor.	Is a DTC detected?	Perform a check according to the DTC.	Go to step **20**.

Step		Check	Yes	No
20	**CHECK CURRENT DATA.** Select “Current Data Display” and read the data of the “Front Wheel Speed”. <Ref. to LAN(diag)-20, OPERATION, Read Current Data.>	Does the data display the wheel speed data correctly?	Go to step **11**.	Check the following items. • LAN system <Ref. to LAN(diag)-63, DTC U1223 CAN-HS VDC/ABS NO-RECEIVE DATA, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> • VDC <Ref. to VDC(diag)-2, Basic Diagnostic Procedure.>

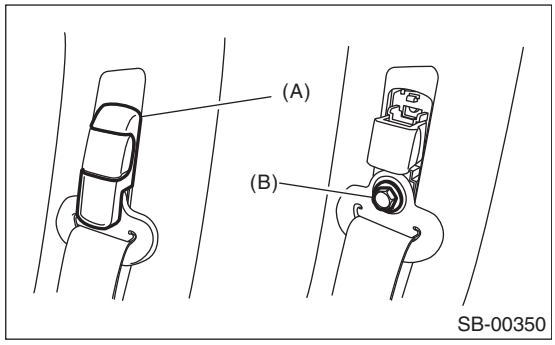
5. Front Seat Belt

A: REMOVAL

1. OUTER SEAT BELT ASSEMBLY

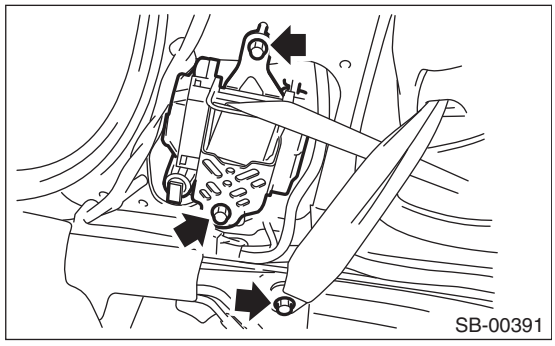
CAUTION:
• Do not drop or subject the pretensioner to any impact.
• Since the pretensioner and bracket are integrated as a unit, do not disassemble them.

1) Before starting the work, turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more.
2) Tilt the backrest forward and move the seat to the front most position.
3) Remove the center pillar lower trim. <Ref. to EI-56, REMOVAL, Lower Inner Trim.>
4) Remove the shoulder anchor.

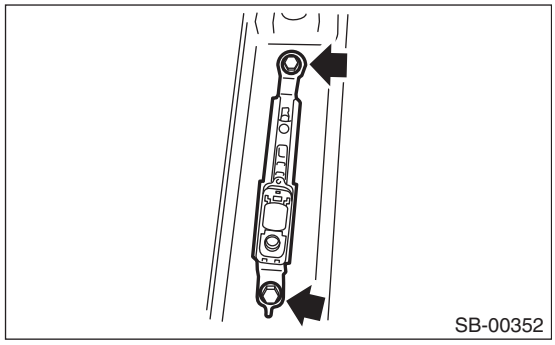


(1) Remove the anchor cover (A).
(2) Loosen the shoulder anchor bolt (B), and then detach the shoulder anchor from center pillar.

5) Disconnect the connector of the belt tension sensor on passenger's seat.
6) Turn over the floor mat to disconnect the belt tension sensor connector.
7) Remove the three bolts to remove the seat belt retractor.



8) Remove the center pillar upper trim. <Ref. to EI-58, REMOVAL, Upper Inner Trim.>
9) Remove the two bolts to remove the adjustable anchor assembly.

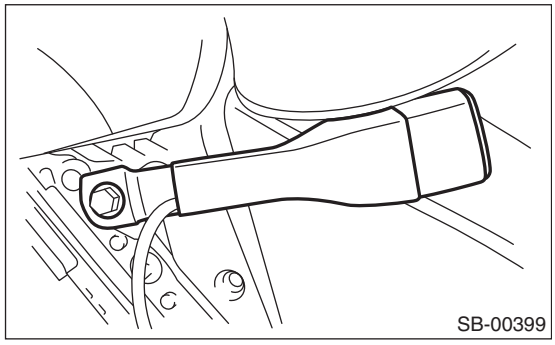


2. INNER SEAT BELT ASSEMBLY

1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for 60 seconds or more.

NOTE:
For the power seat, remove the slide rail installing bolt before removing the battery ground.

2) Remove the slide rail installing bolt.
(1) Tilt the backrest forward and move the seat to the front most position.
(2) Remove the rear bolt cover at the rear side of the slide rail and remove the bolt.
(3) Move the seat to the rearmost position, and remove the bolt on the front side of the slide rail.
3) Disconnect the seat belt warning light connector under the seat.
4) Remove the harness clips from seat cushion frame.
5) Remove the bolts, then remove the inner seat belt assembly.



B: INSTALLATION

CAUTION:
• Before installation, make sure that the correct part is used.
• Be careful not to twist the seat belts during installation.
Install each part in the reverse order of removal.

Tightening torque:
Front seat belt: <Ref. to SB-2, FRONT SEAT BELT, COMPONENT, General Description.>
Front seat assembly: 53 N·m (5.40 kgf-m, 39.1 ft-lb)

C: INSPECTION

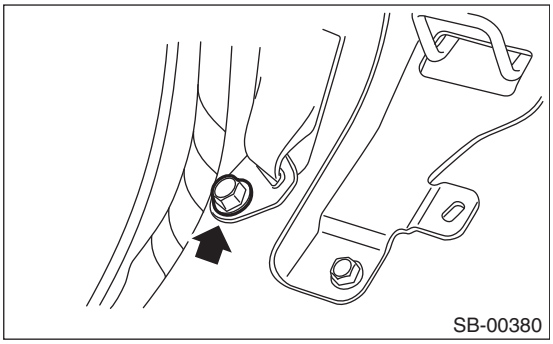
Check for the following, and replace with new parts if necessary.
• Pretensioner is cracked or deformed.
• Seat belt is slackened, bent or worn.
• Seat belt is abnormally wound or extended.
• Inner seat belt assembly is deformed or damaged.
• Seat belt buckle cannot be engaged properly.

6. Rear Seat Belt

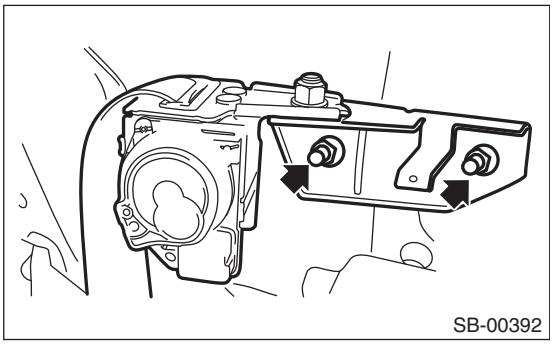
A: REMOVAL

1. OUTER SEAT BELT ASSEMBLY RH & LH

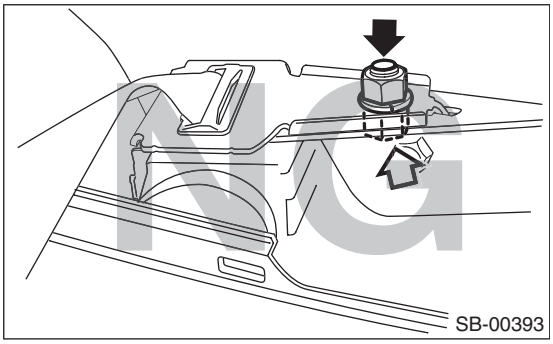
1) Remove the luggage floor mat.
2) Remove the rear seat cushion assembly and seatback shoulder. <Ref. to SE-16, REMOVAL, Rear Seat.>
3) Remove the seat belt lower anchor bolt.



4) Remove the rear quarter trim. <Ref. to EI-60, REMOVAL, Rear Quarter Trim.>
5) Remove the nuts, and remove the outer belt assembly.

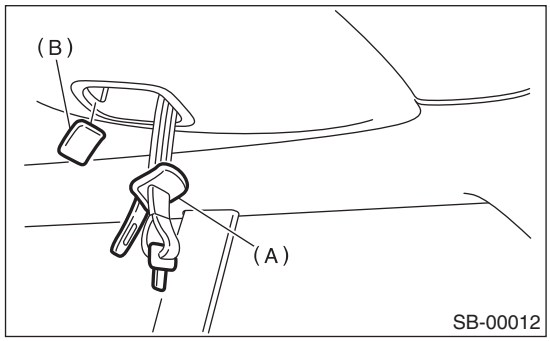


CAUTION:
Do not remove the bolt and nut securing the retractor and bracket.

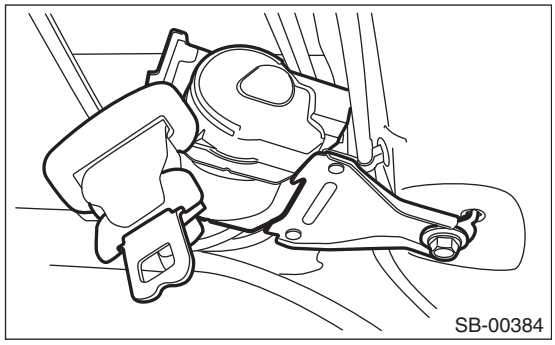


2. OUTER SEAT BELT CENTER ASSY

1) Carefully remove the snap lock, and remove cover (B). Pull the outer seat belt center tongue (A) from the hole towards the trim.

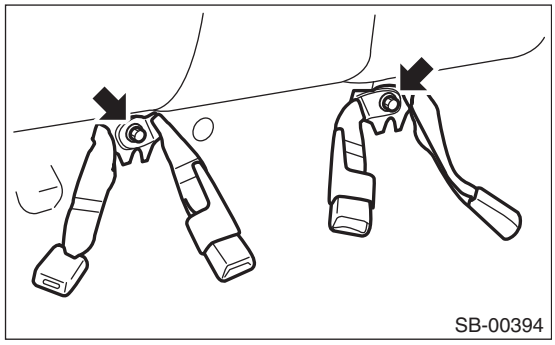


2) Remove the clip and drop the rear end of the roof trim from the roof.
3) Remove the bolts, then remove the outer seat belt center assembly.



3. CENTER SEAT BELT ASSEMBLY

1) Remove the rear seat cushion. <Ref. to SE-16, REMOVAL, Rear Seat.>
2) Remove the bolts, then remove the center seat belt assembly.



B: INSTALLATION

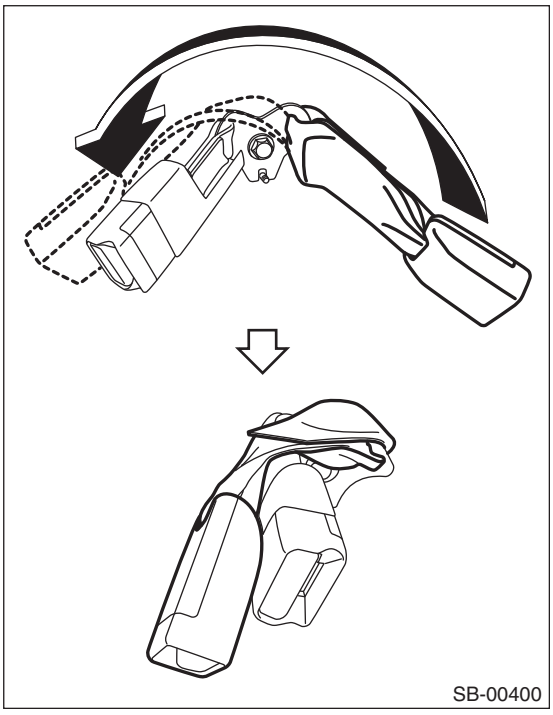
CAUTION:
• During installation, make sure that the seat belts are not twisted.
• After installation, make sure that the seat belts are smoothly extended and wound.
• Check that the center seat belt is not assembled wrongly.

1) Install each part in the reverse order of removal.

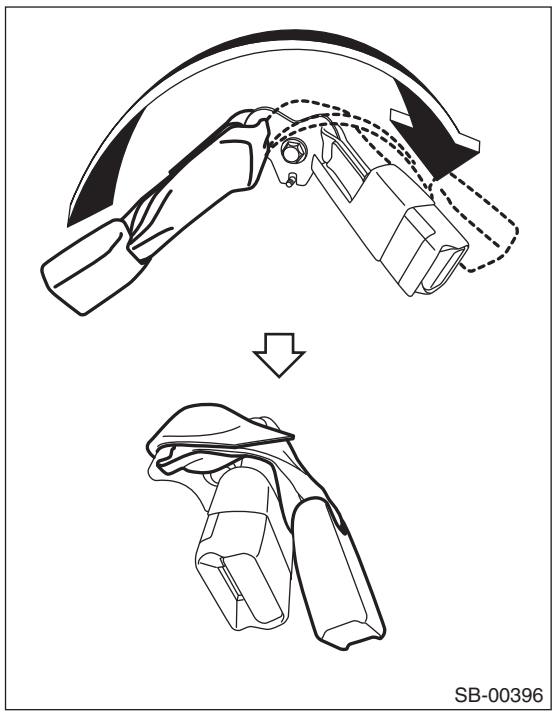
Tightening torque:
Refer to "COMPONENT" of "General Description". <Ref. to SB-3, REAR SEAT BELT, COMPONENT, General Description.>

2) Route the seat belt as shown in the figure below, and affix with Velcro tape.

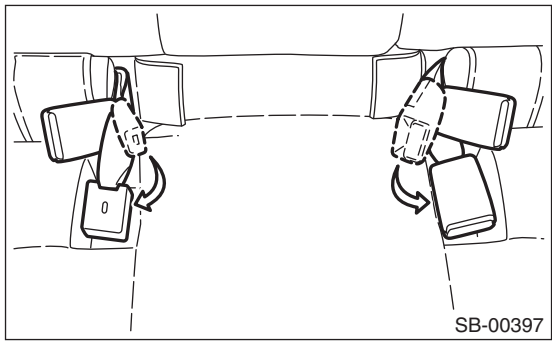
• LH side



• RH side



3) Install the seat cushion and pull out the center seat belt assembly.



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 seat belt is deformed or damaged.
• Seat belt buckle cannot be engaged properly.

LIGHTING SYSTEM

LI

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1. General Description

A: SPECIFICATION

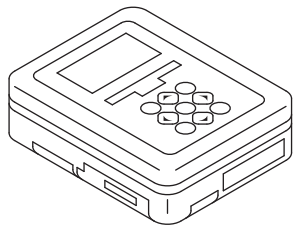
Headlight	Low beam (Halogen type)	12 V — 55 W
	Low beam (HID type)	12 V — 35 W
	High beam	12 V — 60 W
Front turn signal light		12 V — 21 W
Clearance/parking light		12 V — 5 W
Front fog light		12 V — 51 W
Side turn signal light		12 V — 1.4 W (LED)
Front side marker light		12 V — 5 W
Rear combination light	Tail/stop light	12 V — 5 / 21 W
	Turn signal light	12 V — 21 W
	Back-up light	12 V — 21 W
License plate light		12 V — 5 W
High-mounted stop light	9 light bulb type	12 V — 3.3 W (LED)
	12 light bulb type	12 V — 3.8 W (LED)
Room light		12 V — 8 W
Spot map light		12 V — 8 W
Luggage room light		12 V — 13 W
Door step light		12 V — 5 W

B: CAUTION

- Before removing or installing parts, always disconnect the battery ground cable from battery. When replacing the audio, control module 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.
- Connect the connectors securely during reassembly.
- After reassembly, make sure that the functional parts operate normally.
- Yellow connectors and harnesses with yellow tapes around them are the connectors and harnesses for the airbag system. Using a tester above such circuits may cause malfunction of airbag system. Follow the cautions for the airbag system in this case. <Ref. to AB-5, CAUTION, General Description.>
- Be careful not to damage the airbag system wiring harness when servicing electrical parts and switches.

C: PREPARATION TOOL

1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST1B022XU0	1B022XU0	SUBARU SELECT MONITOR III KIT	Used for troubleshooting the electrical system.

2. GENERAL TOOL

TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance and voltage.

2. Headlight and Tail Light System

A: WIRING DIAGRAM

1. HALOGEN TYPE HEADLIGHT

Refer to “Headlight System” in the wiring diagram. <Ref. to WI-100, WIRING DIAGRAM, Headlight System.>

2. HID TYPE HEADLIGHT

Refer to “Headlight System” in the wiring diagram. <Ref. to WI-100, WIRING DIAGRAM, Headlight System.>

3. CLEARANCE LIGHT AND ILLUMINATION LIGHT

Refer to “Clearance Light and Illumination Light System” in the wiring diagram. <Ref. to WI-109, WIRING DIAGRAM, Clearance Light and Illumination Light System.>

B: INSPECTION

1. LIGHTING SWITCH

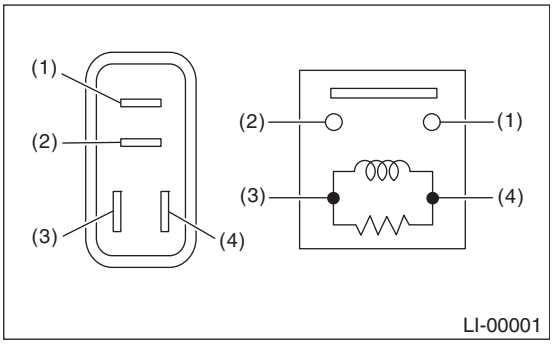
Measure the resistance between lighting switch terminals. <Ref. to LI-10, INSPECTION, Combination Switch (Light).>

2. DIMMER & PASSING SWITCH

Measure the resistance between dimmer & passing switch terminals. <Ref. to LI-10, INSPECTION, Combination Switch (Light).>

3. HEADLIGHT RELAY

1) Connect terminal No. 4 to the battery positive terminal and the terminal No. 3 to the battery negative terminal, and check the resistance value between the headlight relay terminals.

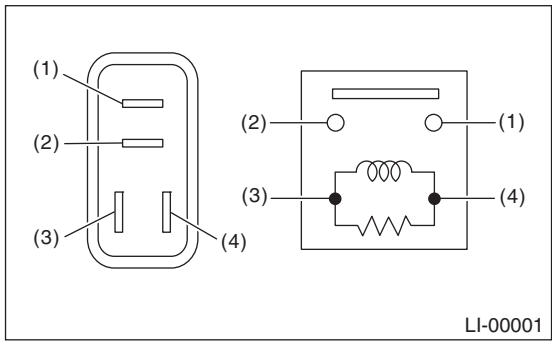


Continuity	Terminal No.	Standard
Yes	1 and 2	Less than 1 Ω
No		1 MΩ or more

2) Replace the headlight relay if the inspection result is not within the standard value.

4. TAIL AND ILLUMINATION RELAY

1) Connect terminal No. 4 to the battery positive terminal and terminal No. 3 to the battery ground terminal, and check the resistance between tail and illumination relay terminals.



Continuity	Terminal No.	Standard
Yes	1 and 2	Less than 1 Ω
No		1 MΩ or more

2) If the result of the inspection is not at the standard value, replace the tail & illumination relay.

C: NOTE

For operation procedures of each component of the headlight and tail light system, refer to the respective section.

- Headlight Assembly: <Ref. to LI-18, Headlight Assembly.>
- Headlight bulb: <Ref. to LI-21, Headlight Bulb.>
- Combination switch (light): <Ref. to LI-10, Combination Switch (Light).>
- Combination base switch: <Ref. to LI-17, Combination Base Switch Assembly.>
- License plate light: <Ref. to LI-34, License Plate Light.>
- Clearance light/parking light bulb: <Ref. to LI-24, Clearance/Parking Light Bulb.>
- Rear combination light assembly: <Ref. to LI-30, Rear Combination Light Assembly.>
- Tail light/stop light bulb: <Ref. to LI-31, Tail/Stop Light Bulb.>
- Front side marker light bulb: <Ref. to LI-25, Front Side Marker Light Bulb.>

3. Day Time Running Light System

A: WIRING DIAGRAM

Refer to “Headlight System” in the wiring diagram. <Ref. to WI-100, WIRING DIAGRAM, Headlight System.>

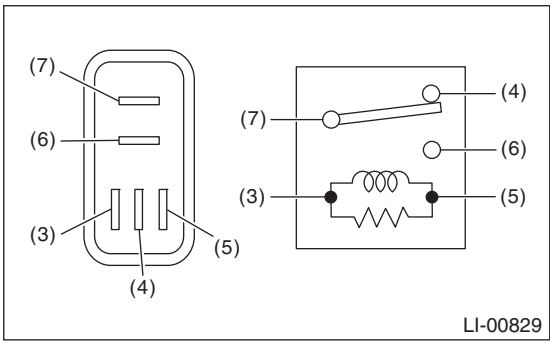
B: INSPECTION

1. DAYTIME RUNNING LIGHT MODULE CHECK

	Step	Check	Yes	No
1	**CHECK DTC.** 1) Prepare the Subaru Select Monitor kit. 2) Turn the ignition switch to ON (engine OFF) and run the “PC application for Subaru Select Monitor”. 3) On «System Selection Menu» display, select {Integ. unit mode}. 4) Select the {Diagnostic Code(s) Display}.	Is DTC displayed?	Perform the diagnosis according to DTC.	Go to step **2**.
2	**CHECK INPUT SIGNAL.** 1) From the state in step 1), select {Integ. unit mode}. 2) Select the following input signals. (1) Parking Brake Switch Input (2) Shift position (3) Lighting II Switch Input	Is the input signal normal?	Go to step **3**.	Check the defective part.
3	**CHECK RELAY.** Check the daytime running light relay.	Is the relay OK?	Go to step **4**.	Replace the relay.
4	**CHECK HARNESS.**	Is harness normal?	Replace the body integrated unit. <Ref. to SL-46, Body Integrated Unit.>	Repair or replace the harness.

2. DAYTIME RUNNING LIGHT RELAY

1) Check the resistance between the daytime running relay terminals when connecting terminal No. 3 to the battery positive terminal and terminal No. 5 to the battery ground terminal.



Continuity	Terminal No.	Standard
Yes	7 and 6	Less than 1 Ω
No		1 MΩ or more
Yes	7 and 4	1 MΩ or more
No		Less than 1 Ω

2) Replace the daytime running light relay if the inspection result is not within the standard value.

4. Front Fog Light System

A: WIRING DIAGRAM

Refer to “Front Fog Light System” in the wiring diagram. <Ref. to WI-105, WIRING DIAGRAM, Front Fog Light System.>

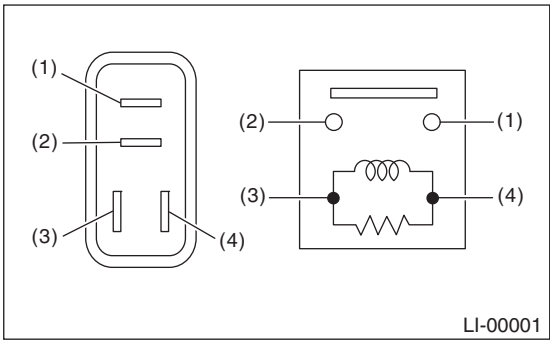
B: INSPECTION

1. FRONT FOG LIGHT SWITCH

Measure the resistance between front fog light switch terminals. <Ref. to LI-10, INSPECTION, Combination Switch (Light).>

2. FRONT FOG LIGHT RELAY

1) Connect terminal No. 4 to the battery positive terminal and the terminal No. 3 to the battery negative terminal, and check the resistance value between the front fog light relay terminals.



Continuity	Terminal No.	Standard
Yes	1 and 2	Less than 1 Ω
No		1 MΩ or more

2) If the result of the inspection is not at the standard value, replace the front fog light relay.

C: NOTE

For operation procedures of each component of the front fog light system, refer to the respective section.

- Front fog light assembly: <Ref. to LI-26, Front Fog Light Assembly.>
- Front fog light bulb: <Ref. to LI-28, Front Fog Light Bulb.>
- Combination switch (light): <Ref. to LI-10, Combination Switch (Light).>
- Combination base switch: <Ref. to LI-17, Combination Base Switch Assembly.>

5. Turn Signal Light and Hazard Light System

A: WIRING DIAGRAM

Refer to “Turn Signal Light and Hazard Light System” in the wiring diagram. <Ref. to WI-114, WIRING DIAGRAM, Turn Signal Light and Hazard Light System.>

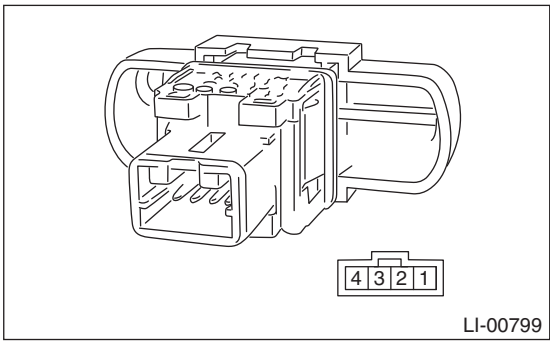
B: INSPECTION

1. TURN SIGNAL SWITCH

Measure the resistance between turn signal switch terminals. <Ref. to LI-10, INSPECTION, Combination Switch (Light).>

2. HAZARD SWITCH

1) Measure the resistance between hazard switch terminals.

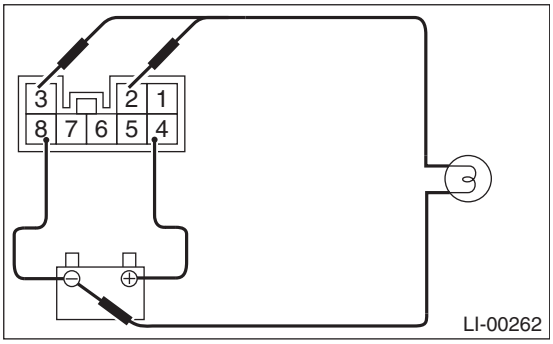


Switch position	Terminal No.	Standard
OFF	2 and 3	1 MΩ or more
ON		Less than 1 Ω

2) If the result of the inspection is not at the standard value, replace the hazard switch.

3. TURN SIGNAL AND HAZARD MODULE

1) Connect the battery and turn signal light bulb to the module. The module is properly functioning if it blinks when power is supplied to the circuit.



2) Replace the turn signal & hazard module if it is found defective.

C: NOTE

For operation procedures of each component of the turn signal and hazard light system, refer to the respective sections.

- Rear combination light assembly: <Ref. to LI-30, Rear Combination Light Assembly.>
- Front turn signal light bulb: <Ref. to LI-23, Front Turn Signal Light Bulb.>
- Rear turn signal light bulb: <Ref. to LI-32, Rear Turn Signal Light Bulb.>
- Combination switch (light): <Ref. to LI-10, Combination Switch (Light).>
- Combination base switch: <Ref. to LI-17, Combination Base Switch Assembly.>
- Side turn signal light assembly: <Ref. to LI-29, Side Turn Signal Light Assembly.>

6. Back-up Light System

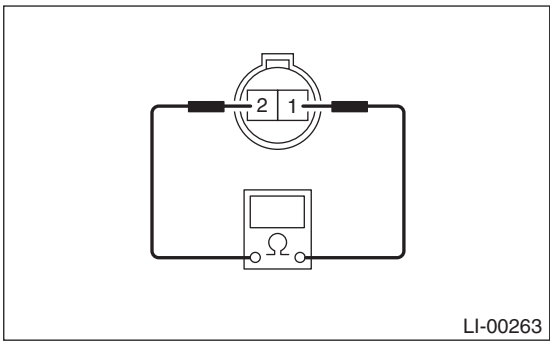
A: WIRING DIAGRAM

Refer to “Back-up Light System” in the wiring diagram. <Ref. to WI-107, WIRING DIAGRAM, Back-up Light System.>

B: INSPECTION

1. BACK-UP LIGHT SWITCH (MT MODEL)

1) Measure the resistance between back-up light switch terminals.

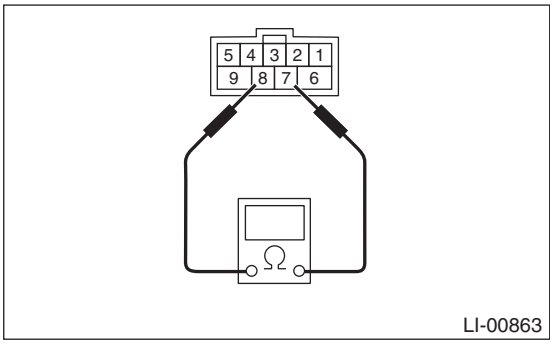


Switch position	Terminal No.	Standard
When shift lever is set in reverse position	1 and 2	Less than 1 Ω
Other positions		1 MΩ or more

2) Replace the back-up light switch if the inspection result is not within the standard value.

2. INHIBITOR SWITCH (AT MODEL)

1) Measure the resistance between inhibitor switch terminals.



Switch position	Terminal No.	Standard
When the selector lever is in the “R” range	7 and 8	Less than 1 Ω
Other positions		1 MΩ or more

2) Replace the inhibitor switch if the inspection result is not within the standard value.

3. REFERENCE

For operation procedures of each component of the back-up light system, refer to the respective section.

- Rear combination light assembly: <Ref. to LI-30, Rear Combination Light Assembly.>
- Back-up light bulb: <Ref. to LI-33, Back-up Light Bulb.>

7. Stop Light System

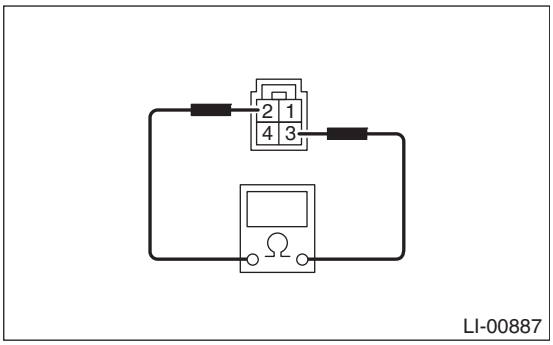
A: WIRING DIAGRAM

Refer to “Stop Light System” in the wiring diagram. <Ref. to WI-108, WIRING DIAGRAM, Stop Light System.>

B: INSPECTION

1. STOP LIGHT SWITCH

1) Measure the resistance between stop light switch terminals.



Switch position	Terminal No.	Standard
When brake pedal is depressed	2 and 3	Less than 1 Ω
When brake pedal is released		1 MΩ or more

2) Replace the stop light switch if the inspection result is not within the standard value.

2. REFERENCE

For operation procedures of each component of the stop light system, refer to the respective section.

- Rear combination light assembly: <Ref. to LI-30, Rear Combination Light Assembly.>
- Tail light/stop light bulb: <Ref. to LI-31, Tail/Stop Light Bulb.>
- High-mounted stop light: <Ref. to LI-35, High-mounted Stop Light.>

8. Room Light System

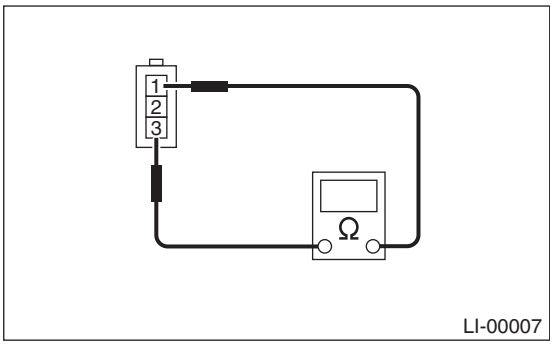
A: WIRING DIAGRAM

Refer to “Interior Light System” in the wiring diagram. <Ref. to WI-117, WIRING DIAGRAM, Interior Light System.>

B: INSPECTION

1. DOOR SWITCH

1) Measure the resistance between door switch terminals.

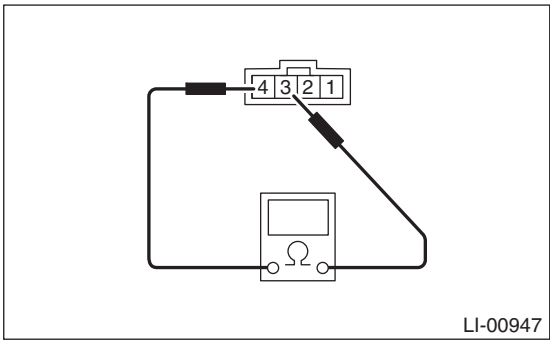


Switch position	Terminal No.	Standard
When door is opened	1 and 3	Less than 1 Ω
When door is closed		1 MΩ or more

2) Replace the door switch if the inspection result is not within the standard value.

2. REAR GATE LATCH SWITCH

1) Measure the resistance between rear gate latch switch terminals.



Switch position	Terminal No.	Standard
When rear gate is opened	3 and 4	Less than 1 Ω
When rear gate is closed		1 MΩ or more

2) If the inspection result is not within the standard value, replace the rear gate latch and actuator assembly.

3. REFERENCE

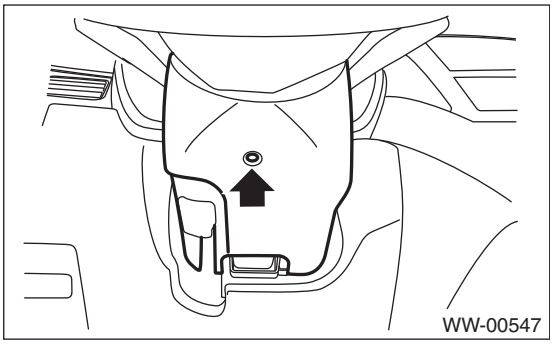
For operation procedures of each component of the room light system, refer to the respective section.

- Spot map light: <Ref. to LI-36, Spot Map Light.>
- Room light: <Ref. to LI-37, Room Light.>
- Luggage room light: <Ref. to LI-38, Luggage Room Light.>
- Door step light: <Ref. to LI-39, Door Step Light.>
- Door switch: <Ref. to LI-46, Door Switch.>
- Ignition switch illumination: <Ref. to LI-40, Ignition Switch Illumination.>

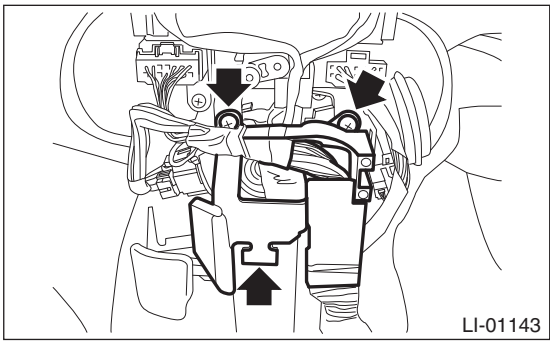
9. Combination Switch (Light)

A: REMOVAL

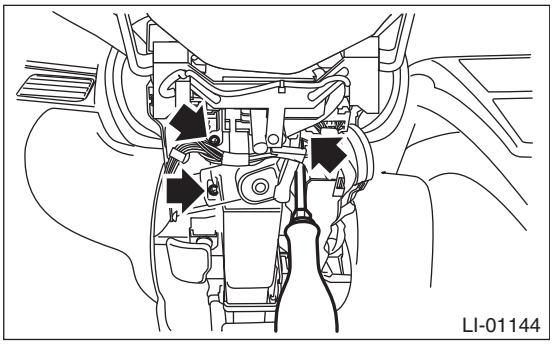
1) Disconnect the ground cable from battery.
2) Remove the screws and remove the steering column cover lower.



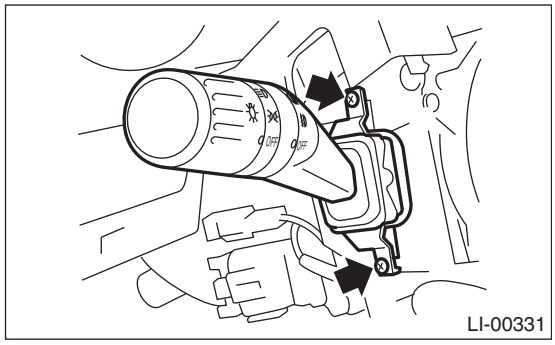
3) Remove the harness cover lock.
4) Remove the screws and detach the knee protector.



5) Remove the mounting screws of steering column cover upper.



6) Disconnect the connector from combination switch.
7) Remove the screws which secure the switch, then remove the combination switch.

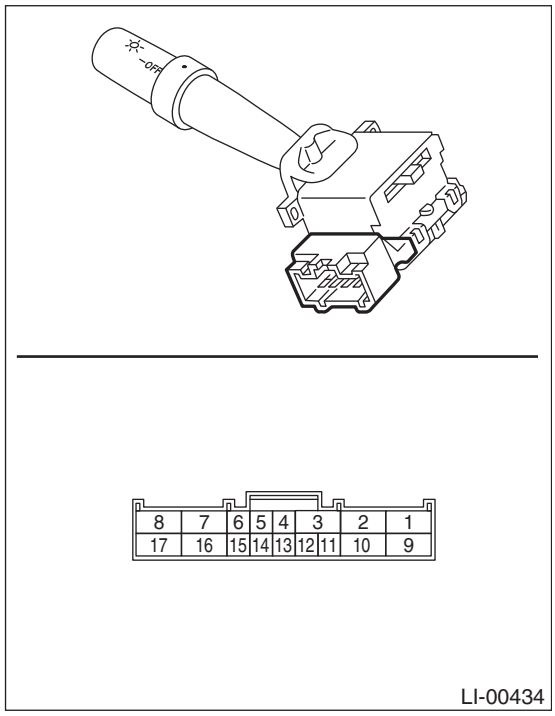


B: INSTALLATION

Install each part in the reverse order of removal.

C: INSPECTION

1) Disconnect the combination switch connector.
2) Check the resistance between combination switch terminals.



3) Replace the combination switch (light) if the inspection result of each switch is not within the standard value.

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 & PASSING SWITCH

Switch position	Terminal No.	Standard
Passing	7, 8 and 16	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	3 and 2	Less than 1 Ω

4. FRONT FOG LIGHT SWITCH

Switch position	Terminal No.	Standard
OFF	11 and 10	1 MΩ or more
ON		Less than 1 Ω

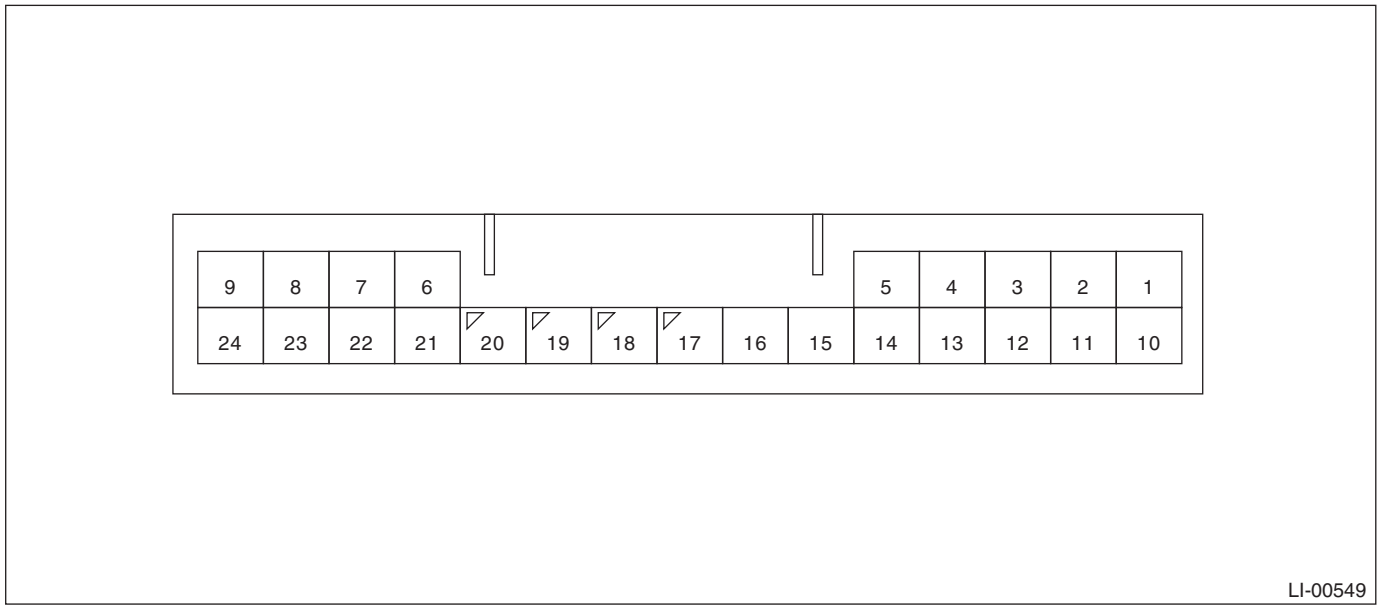
10.Auto Headlight Beam Leveler System

A: WIRING DIAGRAM

Refer to “Headlight Beam Leveler System” in the wiring diagram. <Ref. to WI-103, WIRING DIAGRAM, Headlight Beam Leveler System.>

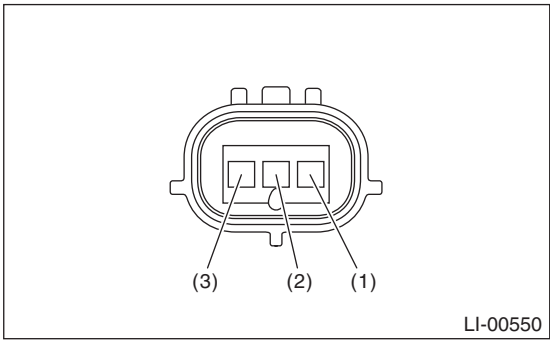
B: SPECIFICATION

1. CONNECTOR TERMINAL ARRANGEMENT



(1) IG power supply
(2) Not used
(3) Headlights ON signal
(4) Not used
(5) Not used
(6) Indicator output
(7) Not used
(8) Not used
(9) GND
(10) Actuator power supply
(11) Not used
(12) Rear sensor power supply
(13) Not used
(14) Not used
(15) Not used
(16) Vehicle speed pulse input
(17) Actuator control signal output
(18) Not used
(19) Rear sensor input
(20) Not used
(21) Rear sensor GND
(22) Not used
(23) Actuator GND
(24) Not used

2. VEHICLE HEIGHT SENSOR UNIT TERMINAL LAYOUT



(1) GND
(2) Output
(3) Power supply

C: INSPECTION

1. SYMPTOM CHART

- Beam level control does not function

Step		Check	Yes	No
1	**CHECK INDICATOR OUTPUT.** Turn the ignition switch to ON.	Does the warning indicator turn on for three seconds?	Go to step **2**.	Go to step **5**.
2	**CHECK INDICATOR OUTPUT.** Leave the ignition switch to ON for 10 seconds.	Does the warning indicator light go off?	Go to step **10**.	Go to step **3**.
3	**CHECK OUTPUT VOLTAGE BETWEEN AUTO HEADLIGHT BEAM LEVELER CONTROL MODULE AND VEHICLE HEIGHT SENSOR.** 1) Disconnect the vehicle height sensor connector. (rear) 2) Turn the ignition switch to ON. 3) Measure the voltage between the vehicle height sensor connector and chassis ground. ***Connector & terminal*** ***Rear vehicle height sensor*** ***(R29) No. 3 (+) — Chassis ground (–):***	Is the voltage 5 V ±0.25 V?	Go to step **8**.	Go to step **4**.
4	**CHECK HARNESS BETWEEN AUTO HEADLIGHT BEAM LEVELER CONTROL MODULE AND VEHICLE HEIGHT SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the auto headlight beam leveler control module connector. 3) Measure the continuity between the auto headlight beam leveler control module connector and the vehicle height sensor connector. ***Connector & terminal*** ***Rear vehicle height sensor*** ***(B150) No. 21 — (R29) No. 1:*** ***(B150) No. 19 — (R29) No. 2:*** ***(B150) No. 12 — (R29) No. 3:***	Is there continuity?	Replace the auto headlight beam leveler control module.	Repair the open circuit and poor contact of the connector in the harness between the auto headlight beam leveler control module and vehicle height sensor.
5	**CHECK HARNESS BETWEEN BATTERY — INDICATOR BULB — AUTO HEADLIGHT BEAM LEVELER CONTROL MODULE.** 1) Disconnect the auto headlight beam leveler control module connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between auto headlight beam leveler control module and chassis ground. ***Connector & terminal*** ***(B150) No. 6 (+) — Chassis ground (–):***	Is the voltage 12 V?	Replace the auto headlight beam leveler control module.	Go to step **6**.
6	**CHECK INDICATOR BULB.** 1) Turn the ignition switch to OFF. 2) Disconnect the combination meter connector. 3) Measure the continuity between combination meter body terminals. ***Connector & terminal*** ***(i10) No. 2 — (i10) No. 7:***	Is there continuity?	Go to step **7**.	Replace the meter case assembly.

	Step	Check	Yes	No
7	**CHECK HARNESS BETWEEN AUTO HEADLIGHT BEAM LEVELER CONTROL MODULE AND INDICATOR BULB.** 1) Turn the ignition switch to OFF. 2) Disconnect the auto headlight beam leveler control module connector. 3) Disconnect the combination meter connector. 4) Measure the continuity between the auto headlight beam leveler control module connector and the combination meter connector. ***Connector & terminal*** ***(B150) No. 6 — (i10) No. 7:***	Is there continuity?	Replace the auto headlight beam leveler control module.	Repair the open circuit and poor contact of the connector in the harness between the auto headlight beam leveler control module and indicator.
8	**CHECK VEHICLE HEIGHT SENSOR OUTPUT SIGNAL.** 1) Connect three dry cell batteries (1.5 V) in series. 2) Connect the (+) side of the battery to the No. 3 terminal of the sensor body, and the (–) side of the battery to terminal No. 1, and apply a voltage of 4.5 V between terminals No. 3 — No. 1. 3) With voltage applied, use a tester to measure the voltage between the No. 2 — No. 1 terminals when the sensor body link is moved slowly up and down. ***Connector & terminal*** ***Sensor body No. 2 (+) — No. 1 (–):***	Is the voltage 0.5 — 4.1 V?	Go to step **9**.	Replace the vehicle height sensor.
9	**CHECK HARNESS BETWEEN AUTO HEADLIGHT BEAM LEVELER CONTROL MODULE AND VEHICLE HEIGHT SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the auto headlight beam leveler control module connector. 3) Measure the continuity between the auto headlight beam leveler control module connector and the vehicle height sensor connector. ***Connector & terminal*** ***Rear vehicle height sensor*** ***(B150) No. 21 — (R29) No. 1:*** ***(B150) No. 19 — (R29) No. 2:*** ***(B150) No. 12 — (R29) No. 3:***	Is there continuity?	Replace the auto headlight beam leveler control module.	Repair the open circuit and poor contact of the connector in the harness between the auto headlight beam leveler control module and vehicle height sensor.
10	**CHECK HEADLIGHT ON SIGNAL.** 1) Disconnect the auto headlight beam leveler control module connector. 2) Turn the ignition switch to ON. 3) Turn the headlight switch to ON. 4) Measure the voltage between auto headlight beam leveler control module connector and chassis ground. ***Connector & terminal*** ***(B150) No. 3 (+) — Chassis ground (–):***	Is the voltage 12 V?	Go to step **11**.	Repair the open circuit and poor contact of the connector in the harness between the auto headlight relay and headlight leveler control module.

	Step	Check	Yes	No
11	**CHECK HEADLIGHT ASSEMBLY (LEVELER ACTUATOR) DRIVE.** 1) Set the vehicle in a parked state. 2) Turn the ignition switch to ON, and within 10 seconds, repeat OFF ⇒ ON of headlight switch 5 times. 3) Check that the headlight beam drops once, then returns to normal. 4) Then, after waiting for 30 seconds or more with the ignition ON, turn the ignition switch to OFF.	Does the headlight beam drop down once, and then return?	Replace the auto headlight beam leveler control module.	Go to step **12**.
12	**CHECK OUTPUT VOLTAGE BETWEEN AUTO HEADLIGHT BEAM LEVELER CONTROL MODULE AND HEADLIGHT ASSEMBLY (LEVELER ACTUATOR).** 1) Disconnect the headlight assembly (leveler actuator) connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between auto headlight beam leveler control module connector and chassis ground. ***Connector & terminal*** ***(B150) No. 10 (+) — Chassis ground (–):***	Is the voltage 12 V?	Replace the headlight assembly.	Go to step **13**.
13	**CHECK HARNESS BETWEEN AUTO HEADLIGHT BEAM LEVELER CONTROL MODULE AND HEADLIGHT ASSEMBLY (LEVELER ACTUATOR).** Measure the continuity between the auto headlight beam leveler control module connector and headlight assembly (leveler actuator) connector. ***Connector & terminal*** ***• Headlight beam leveler RH*** ***(B150) No. 10 — (F59) No. 3:*** ***(B150) No. 17 — (F59) No. 2:*** ***(B150) No. 23 — (F59) No. 1:*** ***• Headlight beam leveler LH*** ***(B150) No. 10 — (F58) No. 3:*** ***(B150) No. 17 — (F58) No. 2:*** ***(B150) No. 23 — (F58) No. 1:***	Is there continuity?	Replace the auto headlight beam leveler control module.	Repair the open circuit and poor contact of the connector in the harness between the auto headlight assembly and headlight leveler control module.

D: PROCEDURE

When parts related to the auto headlight beam leveler system are removed or replaced, perform the following procedures to initialize or reinitialize.

NOTE:
Before performing initialization or reinitialization, check the following:
- Vehicle is parked on a level surface.
- The inflation pressure of tires is correct.
- Unload any cargo from the vehicle.
- Vehicle's fuel tank is fully filled.
- Refer to the following chart to determine whether to initialize or reinitialize.

Initialization	• When the auto headlight beam leveler control module has been replaced with a new module.
Reinitialization	• When the auto headlight beam leveler control module has been replaced with a part from a different vehicle. • When suspension parts have been removed or replaced. (Crossmember, front arm, housing, lateral link, strut) • When the vehicle height sensor has been replaced or removed.

1. INITIALIZATION

1) Confirm that the indicator in the meter is repeatedly flashing twice.
2) Bounce the vehicle several times to normalize the suspension.
3) Make certain that someone is seated in the driver's seat.
4) Turn the ignition ON, and within a period over 1.5 seconds and under 20 seconds, repeat headlight switch OFF ⇒ ON 3 times or more.
5) Confirm that the indicator in the meter flashes 3 times and turns OFF, completing the initialization. (At this time, the headlight beam adjustment is lowered, and then returns to the original position.)
6) Perform beam adjustment for the headlight. <Ref. to LI-19, ADJUSTMENT, Headlight Assembly.>

2. REINITIALIZATION

1) Bounce the vehicle several times to normalize the suspension.
2) Make certain that someone is seated in the driver's seat.
3) Turn the ignition switch to ON, and, within 1.5 — 10 seconds, turn the headlight switch OFF ⇒ ON five or more successive times.
4) Check that the headlight beam drops once, then returns to normal.
5) After confirming 4), turn the ignition switch to OFF within 30 seconds.
6) Turn the ignition switch to ON again, and, within 1.5 — 10 seconds, turn the headlight switch OFF ⇒ ON five or more successive times.
7) Make sure that the indicator in the meter flashes three times and then turns OFF, indicating that reinitialization has been successfully completed. (At this time, the headlight beam drops once, and then returns to the original position.)
8) Perform beam adjustment for the headlight. <Ref. to LI-19, ADJUSTMENT, Headlight Assembly.>

CAUTION:
If the indicator does not flash three times or the headlight beam does not operate, it can be assumed that there is an open circuit or faulty wiring in the harness of the auto headlight beam leveler control module, rear vehicle height sensors or headlight assembly. Perform inspection and repair according to the inspection results, then perform initialization/reinitialization again.
- **Inspection: <Ref. to LI-13, INSPECTION, Auto Headlight Beam Leveler System.>**
- **Initialization: <Ref. to LI-16, INITIALIZATION, PROCEDURE, Auto Headlight Beam Leveler System.>**
- **Reinitialization: <Ref. to LI-16, REINITIALIZATION, PROCEDURE, Auto Headlight Beam Leveler System.>**

3. REFERENCE

For operation procedures of each component of the auto headlight beam leveler system, refer to the respective section.
- Auto headlight beam leveler control module: <Ref. to LI-42, Auto Headlight Beam Leveler Control Module.>
- Rear vehicle height sensor: <Ref. to LI-43, Rear Height Sensor.>

11.Combination Base Switch Assembly

A: REMOVAL

1) Remove the driver's airbag module. <Ref. to AB-18, REMOVAL, Driver's Airbag Module.>

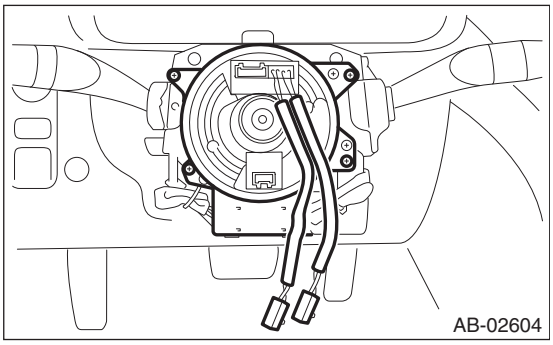
WARNING:
Before handling the airbag module, refer to "CAUTION" of "General Description" in "AIRBAG SYSTEM". <Ref. to AB-5, CAUTION, General Description.>

2) Remove the steering wheel. <Ref. to PS-13, REMOVAL, Steering Wheel.>

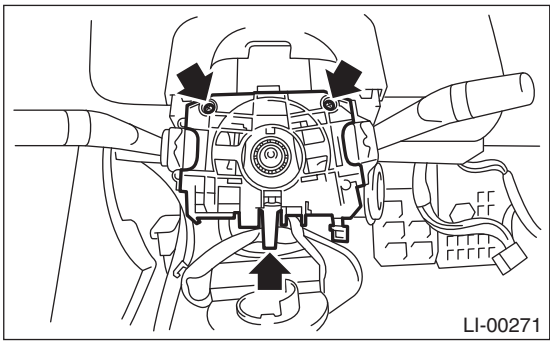
3) Remove the combination switch.

- Combination switch (light): <Ref. to LI-10, REMOVAL, Combination Switch (Light).>
- Combination switch (Wiper): <Ref. to WW-8, REMOVAL, Combination Switch (Wiper).>

4) Remove the screws, and then remove the roll connector.



5) Remove the screws, disconnect the harness connector and remove the combination base switch assembly.



B: INSTALLATION

1) Before installing steering wheel, be sure to adjust the direction of roll connector with steering. <Ref. to AB-30, ADJUSTMENT, Roll Connector.>

2) Install each part in the reverse order of removal.

C: INSPECTION

1. COMBINATION BASE SWITCH ASSEMBLY

Inspect the combination base switch assembly and roll connector for cracks or deformation. If any damage is found, replace with a new part.

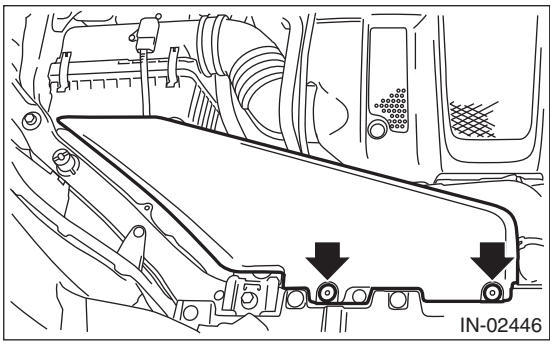
12.Headlight Assembly

A: REMOVAL

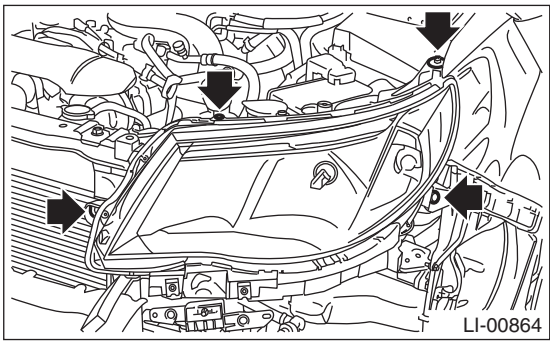
WARNING:
Because the headlight system uses high voltage, be careful not to perform work with wet hands. There is a possibility of electrical shock.

CAUTION:
The HID headlight uses very high voltages for the lighting circuit. Make sure that the power is turned OFF before working.

1) Disconnect the ground cable from battery.
2) Remove the clips and remove the air intake duct (rear). (When removing the headlight RH)



3) Remove the front bumper face. <Ref. to EI-29, FRONT BUMPER FACE, REMOVAL, Front Bumper.>
4) Disconnect harness connectors.
5) Remove the bolts and clips, and remove the headlight assembly.



B: INSTALLATION

Install each part in the reverse order of removal.

Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

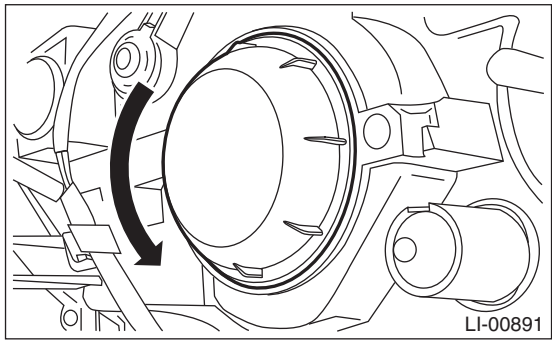
C: DISASSEMBLY

1. HID HEADLIGHT BALLAST

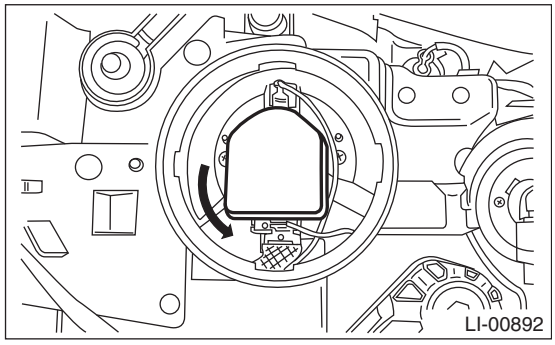
WARNING:
Because the headlight system uses high voltage, be careful not to perform work with wet hands. There is a possibility of electrical shock.

CAUTION:
• The HID headlight uses very high voltages for the lighting circuit. Make sure that the power is turned OFF before working.
• Do not leave the headlight without a ballast and back cover for a long time. Dust, moisture, etc. entering the headlight may affect its performance.

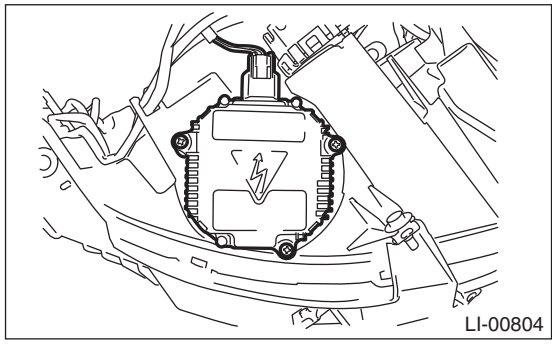
1) Disconnect the ground cable from battery.
2) Remove the headlight assembly. <Ref. to LI-18, REMOVAL, Headlight Assembly.>
3) Remove the back cover.



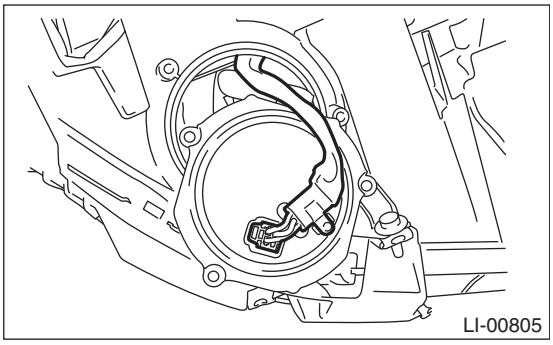
4) Disconnect the bulb connector.



5) Remove the harness connector and screws to pull out the ballast.



6) Remove the harness connector and screws on the back to remove the headlight ballast.



D: ASSEMBLY

1. HID HEADLIGHT BALLAST

CAUTION:
• When installing the ballast cover, be sure to install the gasket.
• After installing the ballast to the vehicle, be sure to perform beam adjustment.
Assemble each part in the reverse order of removal.

Tightening torque:
1.3 N·m (0.13 kgf-m, 0.96 ft-lb)

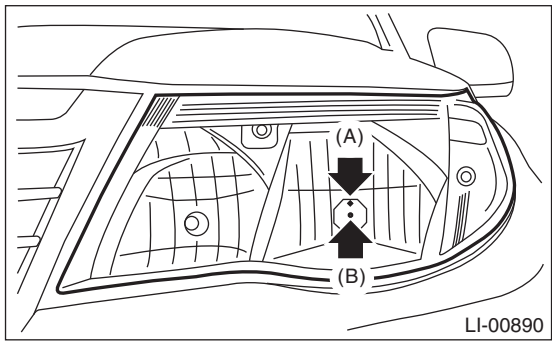
NOTE:
Adjust the projector lens to near the center of the extension opening before installing the ballast. This makes the beam adjustment work easier.

E: ADJUSTMENT

1. HEADLIGHT BEAM ADJUSTMENT

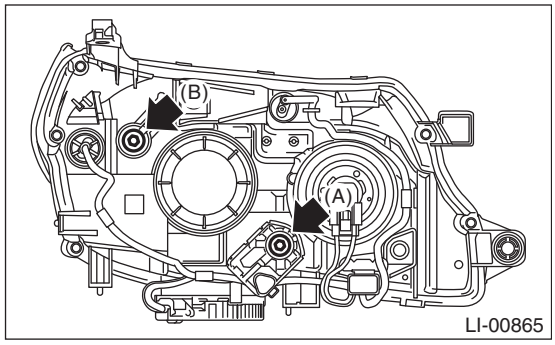
CAUTION:
Turn off the light before adjusting the headlight beam level. If it is necessary to inspect the beam level, do not keep the light on for two minutes or more.
1) Before checking the headlight beam level, be sure of the following:
• the area around the headlight has not sustained any scratches, 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 fully filled.
2) Bounce the vehicle several times to normalize the suspension.
3) Make certain that someone is seated in the driver's seat.
4) Measure the distance between the low beam bulb centers and the height of the bulb center.

CAUTION:
Check the bulb center mark on the inner side of the lens since the low beam bulb center will differ according to bulb shape.



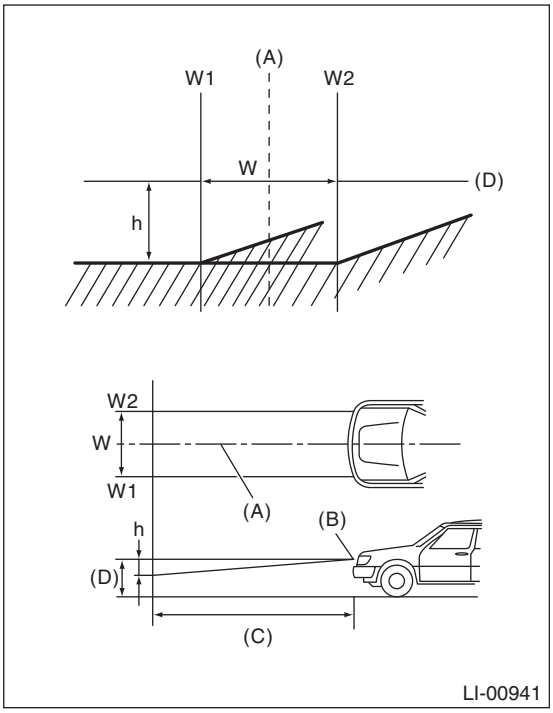
(A) HID type
(B) Halogen type

5) Turn the headlights on and then adjust the low beam pattern.



(1) Adjust the vertical beam level (A).

(2) Adjust the horizontal beam level (B).



(A) Vehicle center
(B) Bulb center marking
(C) 3 m (10 ft)
(D) Height of headlight center

W mm (in)	h mm (in) at 3 m (10 ft)
1,210 (47.64)	30 (1.18)

13.Headlight Bulb

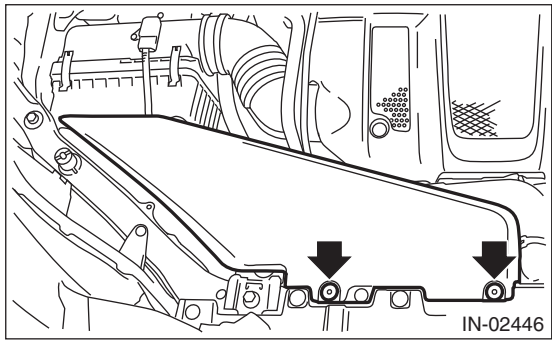
A: REMOVAL

1. HIGH BEAM & HALOGEN TYPE LOW BEAM

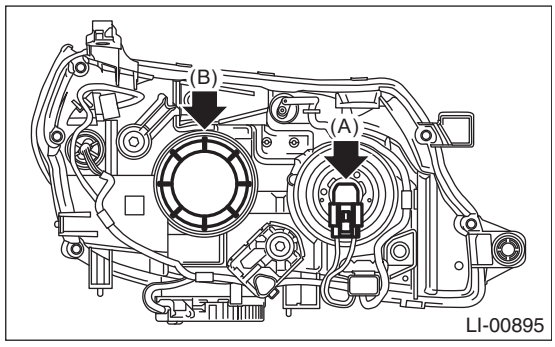
WARNING:
Because the headlight system uses high voltage, be careful not to perform work with wet hands. There is a possibility of electrical shock.

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. Never touch the glass portion.
• Do not leave the headlight without a bulb and back cover for a long time. Dust, moisture, etc. entering the headlight may affect its performance.

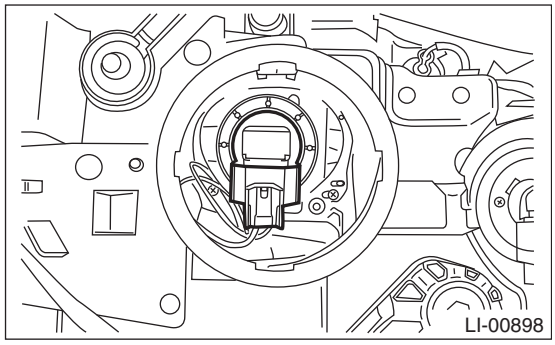
1) Disconnect the ground cable from battery.
2) Remove the clips and remove the air intake duct (rear). (When removing the headlight bulb RH)



3) Disconnect the harness connector.
4) Remove the bulb assembly (A) then remove the high beam. To remove the low beam, remove the back cover (B), and then go to step 5.



5) Disconnect the bulb connector, and remove the bulb.

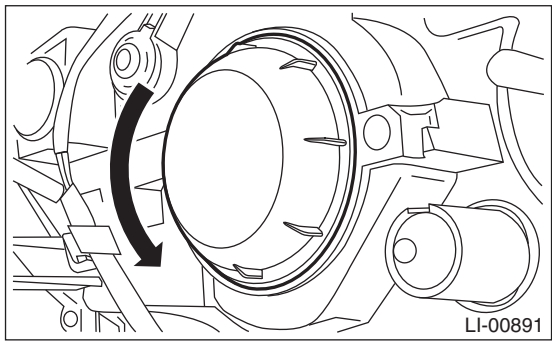


2. HID TYPE LOW BEAM

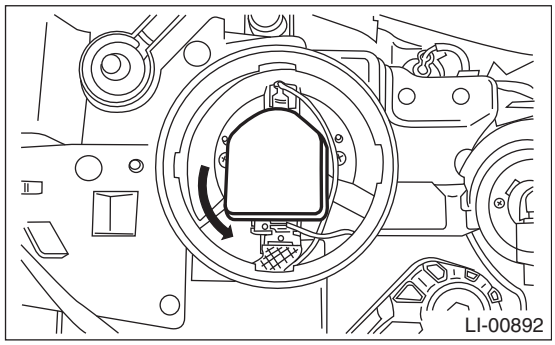
WARNING:
Because the headlight system uses high voltage, be careful not to perform work with wet hands. There is a possibility of electrical shock.

CAUTION:
• Because the HID lighting circuit uses high voltage, be sure to confirm that the power supply is turned off before operation.
• When replacing bulb, hold the flange area. Be careful not to touch the glass area.
• Do not leave the headlight without a bulb and back cover for a long time. Dust, moisture, etc. entering the headlight may affect its performance.

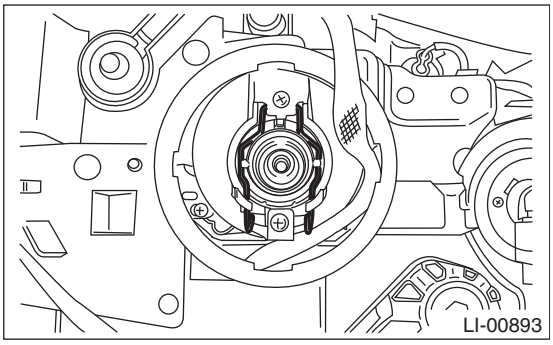
1) Disconnect the ground cable from battery.
2) Remove the headlight assembly. <Ref. to LI-18, REMOVAL, Headlight Assembly.>
3) Remove the back cover.



4) Disconnect the bulb connector.



5) Remove the retaining spring of bulb, and remove the bulb.



B: INSTALLATION

Install each part in the reverse order of removal.

C: INSPECTION

1. HALOGEN TYPE

WARNING:
Because the headlight system uses high voltage, be careful not to perform work with wet hands. There is a possibility of electrical shock.

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. 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) Visually check the bulb for blow out.
2) Check the bulb specification. <Ref. to LI-2, SPECIFICATION, General Description.>
3) Replace the bulb if it is found defective.

2. HID TYPE

WARNING:
Because the headlight system uses high voltage, be careful not to perform work with wet hands. There is a possibility of electrical shock.

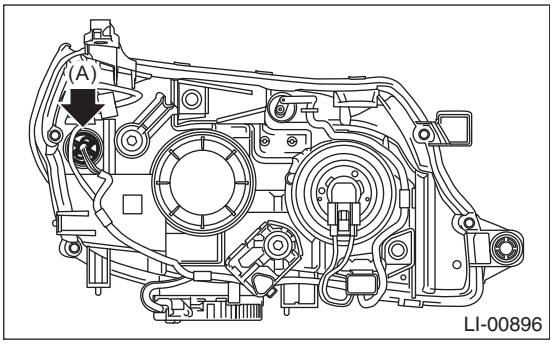
CAUTION:
• When lit (lighting switch is ON), do not touch the harness, light internals, or metal parts of the light.
• When performing a lighting test, make sure that the headlight is mounted on the vehicle, and the power supply is connected to the connector on the vehicle's side.

1) Check the bulb specification. <Ref. to LI-2, SPECIFICATION, General Description.>
2) Install the factory HID bulb to check whether it lights properly.
3) If it fails to illuminate normally, replace the bulb with a new part.
4) Inspect the HID ballast.
Inspect the ballast in the following manner, and determine whether or not to reuse.
   (1) Perform cold starts (light the headlight after turning off for 10 minutes or more), and hot starts (light the headlight for 15 minutes or more, then turn off for 1 minute and relight) several times, to make sure that the headlight lights properly.
   (2) Monitor the lighting condition right after a cold start up to a stable state (approx. 5 min.), to see if there are any unstable conditions such as flickering.
   (3) Install bulbs with the same number of operating hours on both headlights, and light for approximately 30 minutes. Check for whether there is a difference in brightness on the right and left sides.
5) Replace the ballast if it is found defective.

14.Front Turn Signal Light Bulb

A: REMOVAL

1) Disconnect the ground cable from the battery.
2) Turn socket (A) and remove the bulb.



B: INSTALLATION

Install each part in the reverse order of removal.

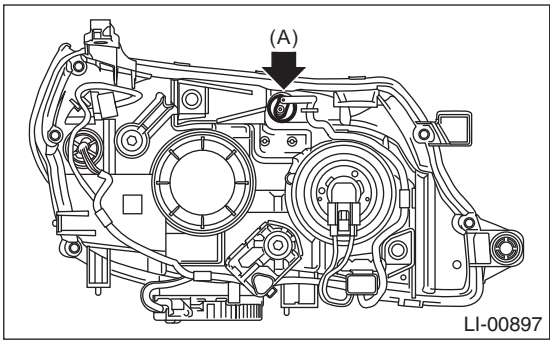
C: INSPECTION

1) Visually check the bulb for blow out.
2) Check the bulb specification. <Ref. to LI-2, SPECIFICATION, General Description.>
3) Replace the bulb if it is found defective.

15.Clearance/Parking Light Bulb

A: REMOVAL

1) Disconnect the ground cable from the battery.
2) Turn socket (A) and remove the bulb.



B: INSTALLATION

Install each part in the reverse order of removal.

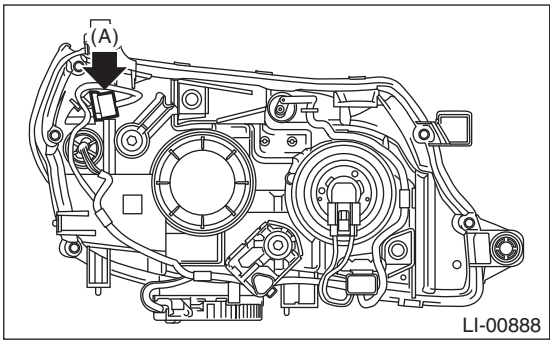
C: INSPECTION

1) Visually check the bulb for blow out.
2) Check the bulb specification. <Ref. to LI-2, SPECIFICATION, General Description.>
3) Replace the bulb if it is found defective.

16.Front Side Marker Light Bulb

A: REMOVAL

1) Disconnect the ground cable from the battery.
2) Turn socket (A) and remove the bulb.



B: INSTALLATION

Install each part in the reverse order of removal.

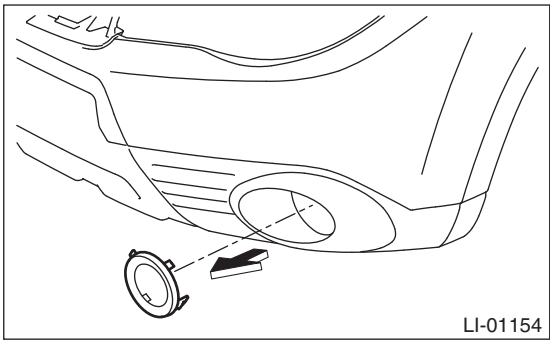
C: INSPECTION

1) Visually check the bulb for blow out.
2) Check the bulb specification. <Ref. to LI-2, SPECIFICATION, General Description.>
3) Replace the bulb if it is found defective.

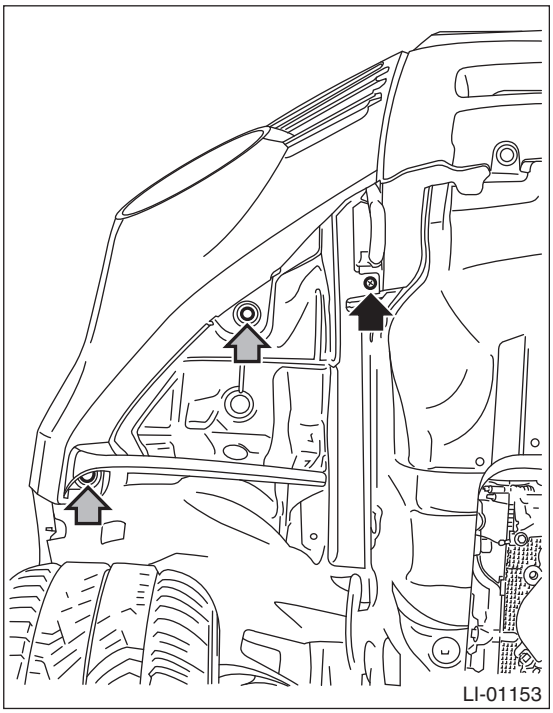
17.Front Fog Light Assembly

A: REMOVAL

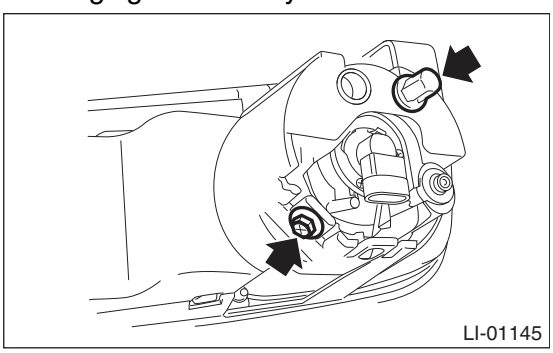
1) Disconnect the ground cable from battery.
2) Remove the fog light cover.


LI-01154

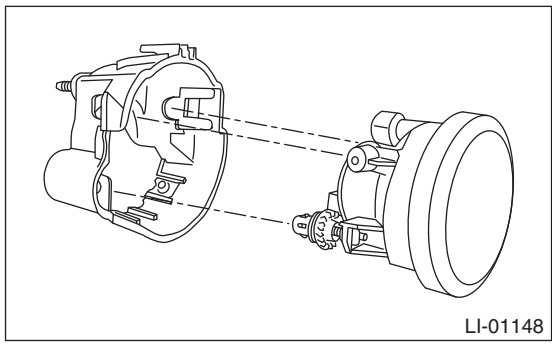
3) Remove the screw and clips, and turn over the mud guard.


LI-01153

4) Disconnect the bulb connector.
5) Remove the plastic nut and bolt, and then detach the fog light assembly.


LI-01145

NOTE:
Remove the bracket as required.


LI-01148

B: INSTALLATION

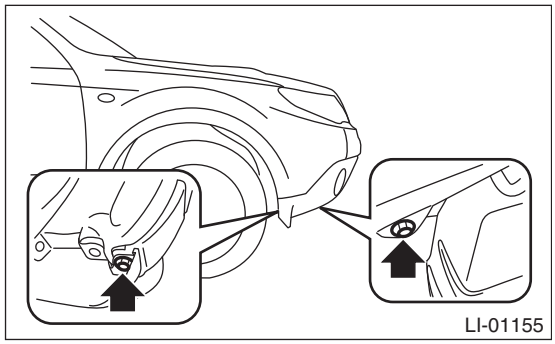
CAUTION:
After connecting the connector, make sure that the bulb is locked securely.
Install each part in the reverse order of removal.

Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

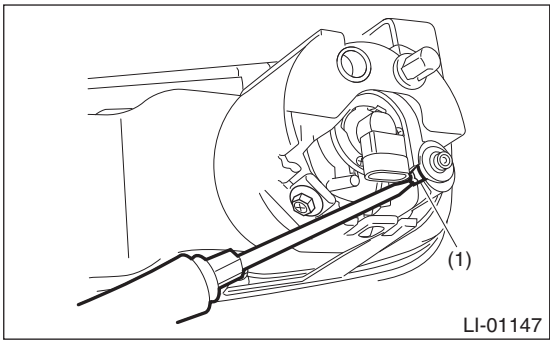
C: ADJUSTMENT

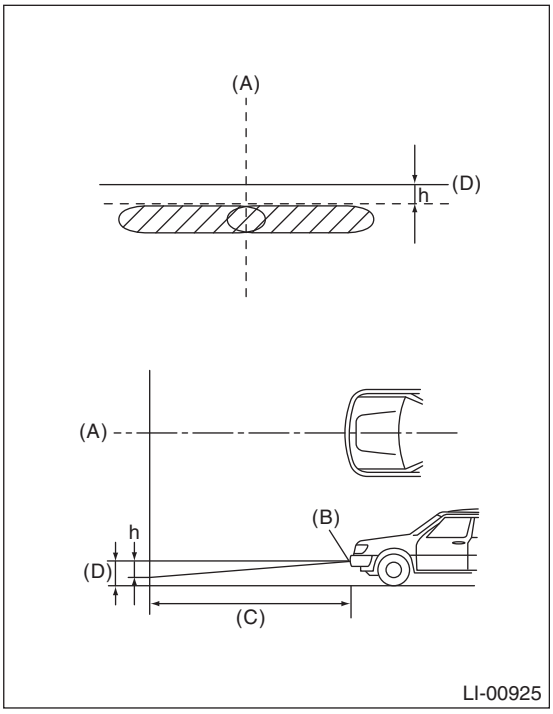
1. FOG LIGHT AIMING

1) Before checking the fog light beam level, be sure of the following:
• The area around the fog light has not sustained any accident, 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 fully filled.
2) Bounce the vehicle several times to normalize the suspension.
3) Make certain that someone is seated in the driver's seat.
4) Remove the clips and turn over the mud guard.


LI-01155

5) Adjust the front fog light pattern by inserting a Philips screwdriver to the adjusting hole (1).





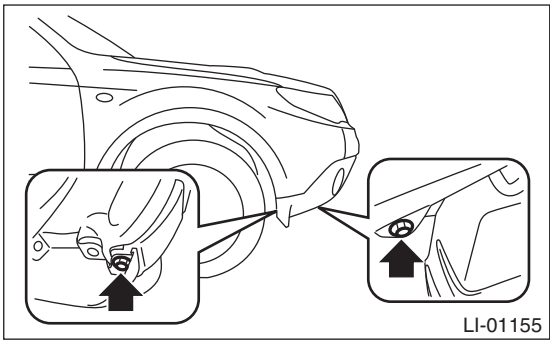
(A) Vehicle center
(B) Bulb center marking
(C) 3 m (10 ft)
(D) Height of fog light center

h mm (in) at 3 m (10 ft)
60 (2.38)

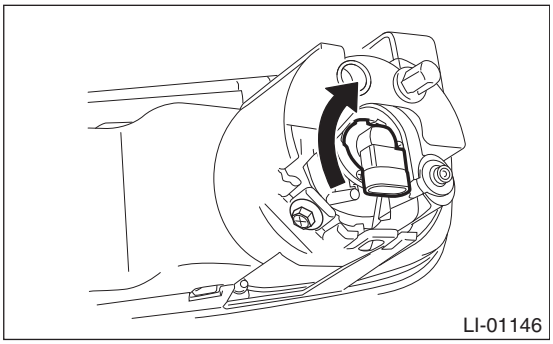
18.Front Fog Light Bulb

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the clips and turn over the mud guard.



3) Disconnect the bulb connector.
4) Rotate the bulb then detach the fog light bulb.



B: INSTALLATION

CAUTION:
• Align the bulb tabs with the fog light securely, push the bulb fully, and then rotate it.
• After connecting the connector, make sure that the bulb is locked securely.
Install each part in the reverse order of removal.

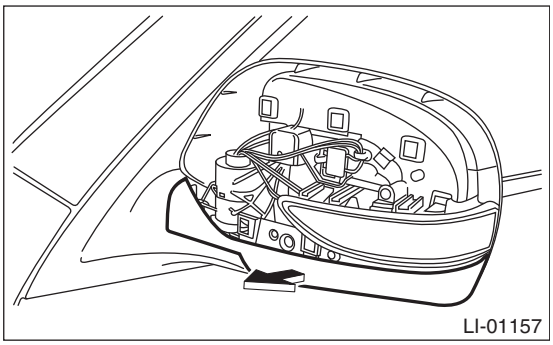
C: INSPECTION

1) Visually check the bulb for blow out.
2) Check the bulb specification. <Ref. to LI-2, SPECIFICATION, General Description.>
3) Replace the bulb if it is found defective.

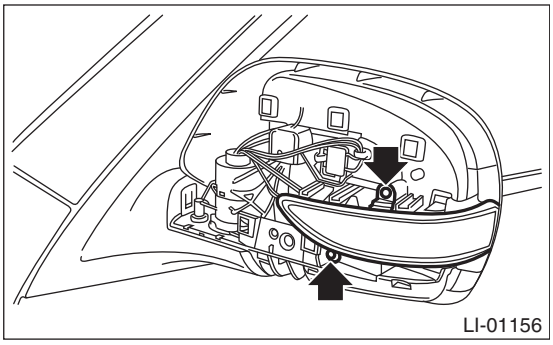
19.Side Turn Signal Light Assembly

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the mirror. <Ref. to GW-17, REPLACEMENT, Outer Mirror.>
3) Remove the scalp cap. <Ref. to GW-15, REPLACEMENT, Scalp Cap.>
4) Remove the outer mirror lower cover.


LI-01157

5) Remove the side turn signal light assembly.


LI-01156

(1) Remove the screws.
(2) Disconnect the harness connector.

B: INSTALLATION

Install each part in the reverse order of removal.

C: INSPECTION

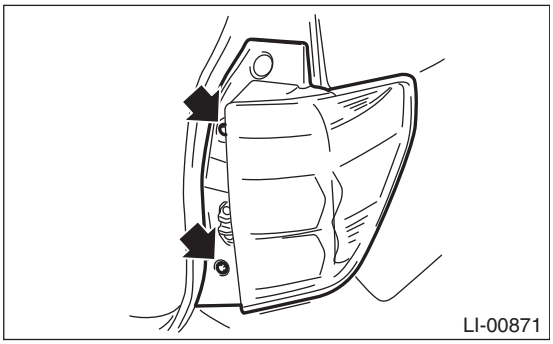
1) Install the side turn signal light assembly and check that it blinks normally.
2) If it fails to blink normally, replace the side turn signal light assembly with a new part.

NOTE:
Since LED (Light Emitting Diode) is used for the side turn signal light, replace the side turn signal light assembly if the LED burns out.

20. Rear Combination Light Assembly

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the bolts, and then detach the rear combination light by pulling it to the rear side of vehicle.



3) Disconnect the harness connector and remove the rear combination light.

B: INSTALLATION

Install each part in the reverse order of removal.

Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

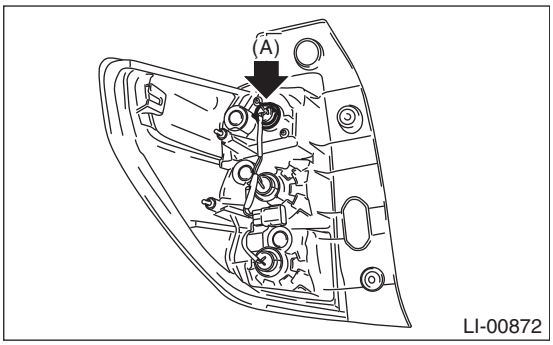
C: INSPECTION

1) Visually check the bulb for blow out.
2) Check the bulb specification. <Ref. to LI-2, SPECIFICATION, General Description.>
3) Replace the bulb if it is found defective.

21.Tail/Stop Light Bulb

A: REMOVAL

1) Remove the rear combination light assembly. <Ref. to LI-30, REMOVAL, Rear Combination Light Assembly.>
2) Turn socket (A) and remove the bulb.



B: INSTALLATION

Install each part in the reverse order of removal.

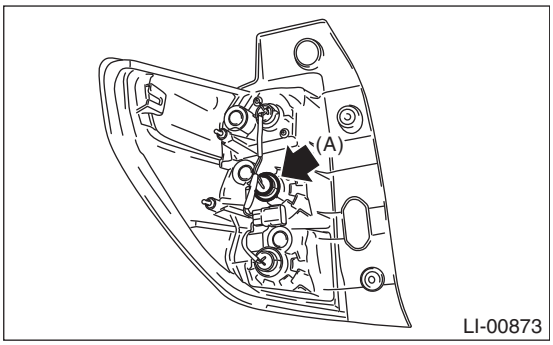
C: INSPECTION

1) Visually check the bulb for blow out.
2) Check the bulb specification. <Ref. to LI-2, SPECIFICATION, General Description.>
3) Replace the bulb if it is found defective.

22.Rear Turn Signal Light Bulb

A: REMOVAL

1) Remove the rear combination light assembly. <Ref. to LI-30, REMOVAL, Rear Combination Light Assembly.>
2) Turn socket (A) and remove the bulb.



B: INSTALLATION

Install each part in the reverse order of removal.

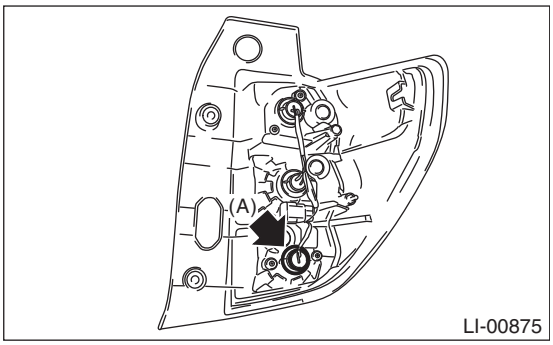
C: INSPECTION

1) Visually check the bulb for blow out.
2) Check the bulb specification. <Ref. to LI-2, SPECIFICATION, General Description.>
3) Replace the bulb if it is found defective.

23.Back-up Light Bulb

A: REMOVAL

1) Remove the rear combination light assembly. <Ref. to LI-30, REMOVAL, Rear Combination Light Assembly.>
2) Turn socket (A) and remove the bulb.



B: INSTALLATION

Install each part in the reverse order of removal.

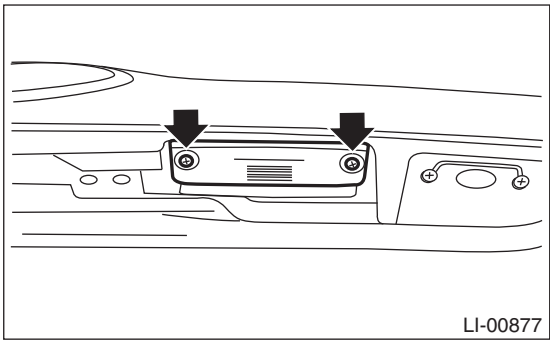
C: INSPECTION

1) Visually check the bulb for blow out.
2) Check the bulb specification. <Ref. to LI-2, SPECIFICATION, General Description.>
3) Replace the bulb if it is found defective.

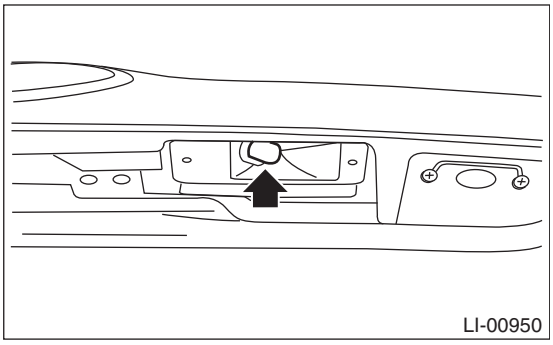
24.License Plate Light

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the screw and remove the license light cover.



3) Remove the bulb.



4) Remove the rear gate trim. <Ref. to EI-67, REMOVAL, Rear Gate Trim.>
5) Remove the license plate light assembly harness.

B: INSTALLATION

Install each part in the reverse order of removal.

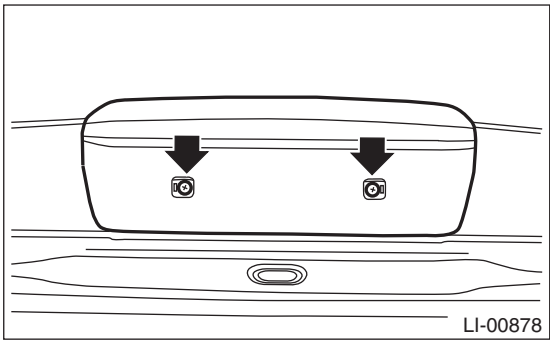
C: INSPECTION

1) Visually check the bulb for blow out.
2) Check the bulb specification. <Ref. to LI-2, SPECIFICATION, General Description.>
3) Replace the bulb if it is found defective.

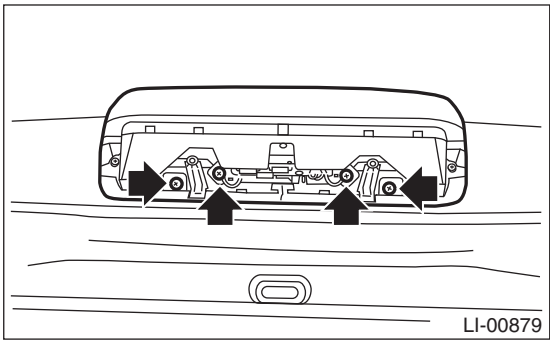
25.High-mounted Stop Light

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the caps and screws, then detach the high-mounted stop light cover.



3) Remove the high-mounted stop light.



(1) Remove the screws.
(2) Disconnect the harness connector.

B: INSTALLATION

Install each part in the reverse order of removal.

C: INSPECTION

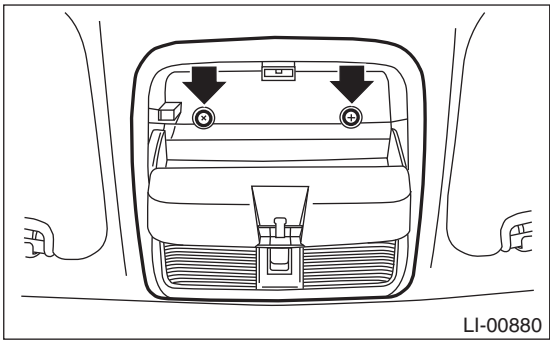
1) Install the high-mounted stop light to test if it illuminates normally.
2) If it fails to illuminate normally, replace the high-mounted stop light with a new part.

NOTE:
Since LED (Light Emitting Diode) is used for the high-mounted stop light, replace the high-mounted stop light assembly if the LED burns out.

26.Spot Map Light

A: REMOVAL

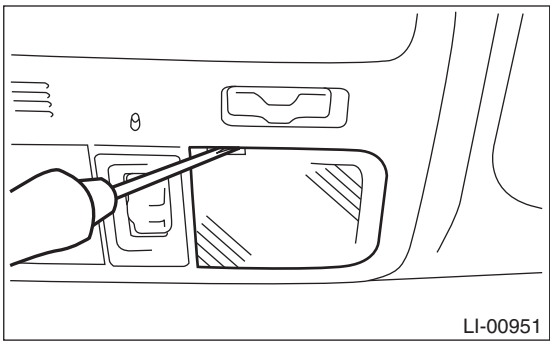
1) Disconnect the ground cable from battery.
2) Push and open the rear end of the overhead console lid, and remove the screws.



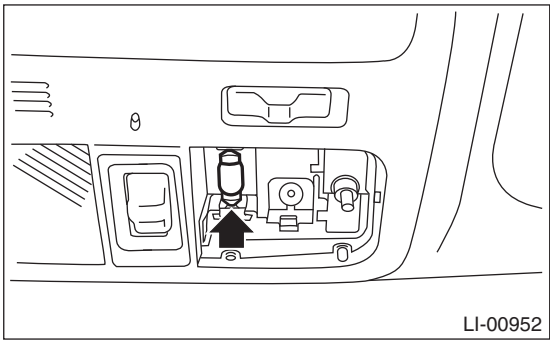
3) Disconnect the harness connector and remove the overhead console assembly.

NOTE:
The spot map light is a single unit with the overhead console.

4) Remove the spot map light lens.



5) Remove the bulb.



B: INSTALLATION

Install each part in the reverse order of removal.

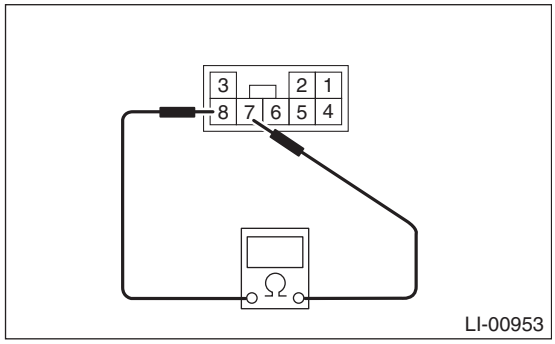
C: INSPECTION

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) Replace the bulb if it is found defective.

2. SPOT MAP LIGHT SWITCH

1) Measure the resistance between spot map light terminals.

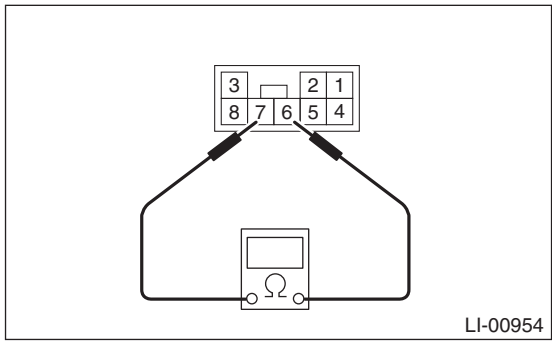


Switch position	Terminal No.	Standard
OFF	—	1 MΩ or more
ON	7 and 8	1.5±0.5 Ω

2) Replace the overhead console assembly if the inspection result is not within the standard value.

3. SPOT MAP LIGHT SLIDE SWITCH

1) Turn the spot map light switch to OFF.
2) Measure the resistance between spot map light slide switch terminals.



Switch position	Terminal No.	Standard
OFF	—	1 MΩ or more
DOOR	6 and 7	1.5±0.5 Ω

Replace the overhead console assembly if the inspection result is not within the standard value.

4. OVERHEAD CONSOLE ILLUMINATION LIGHT BULB

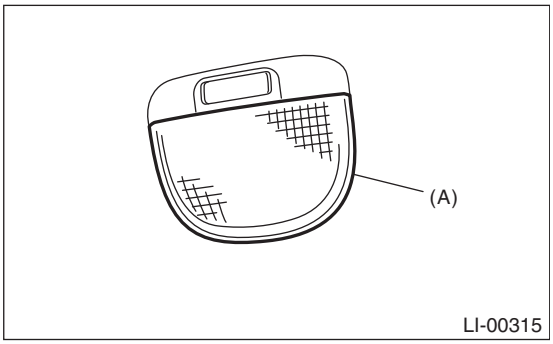
1) Install the overhead console assembly to test if it illuminates normally.
2) If it does not illuminate normally, replace the overhead console assembly.

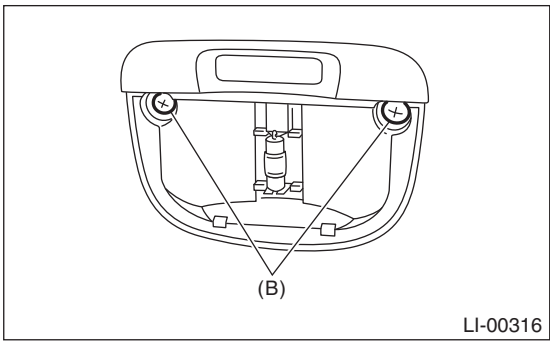
NOTE:
Since LEDs (Light Emitting Diode) are used for the overhead console illumination light bulb, replace the overhead console assembly if an LED burns out.

27.Room Light

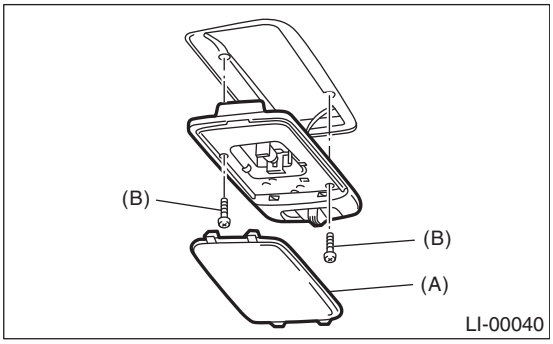
A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the lens (A) and room light mounting screws (B).
• Model without sunroof





• Model with sunroof



3) Disconnect the harness connector and remove the room light.
4) Remove the bulb.

B: INSTALLATION

Install each part in the reverse order of removal.

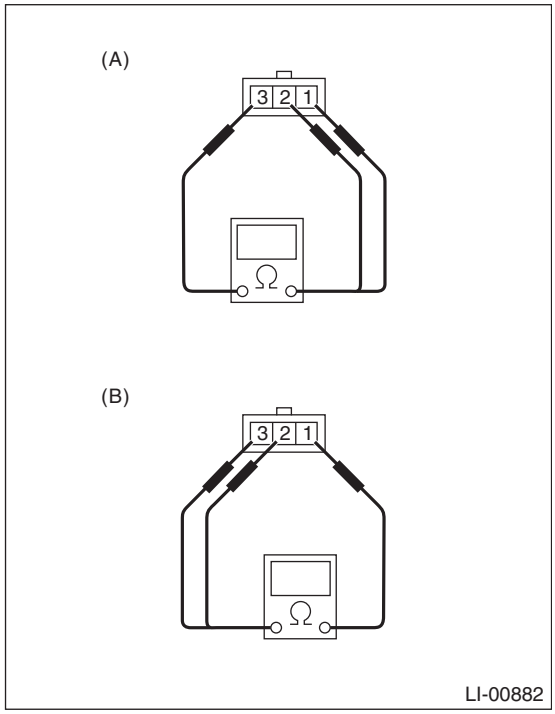
C: INSPECTION

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) Replace the bulb if it is found defective.

2. ROOM LIGHT SWITCH

1) Measure the resistance between room light switch terminals.



(A) Model without sunroof
(B) Model with sunroof

Switch position	Terminal No.	Standard
OFF	—	1 MΩ or more
ON	1 and 3	1.5±0.5 Ω
DOOR	2 and 3: Models without sunroof 1 and 2: Model with sunroof	1.5±0.5 Ω

2) Check the room light illumination condition.
• Model without sunroof
Connect terminal No. 3 to the battery positive terminal and terminal No. 1 and No. 2 to the battery ground terminal.
• Model with sunroof
Connect terminal No. 1 to the battery positive terminal and terminal No. 2 and No. 3 to the battery ground terminal.

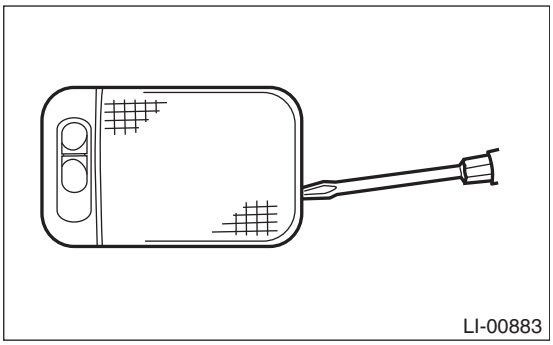
Switch position	Light status
OFF	Light OFF
ON	Light ON
DOOR	Light ON

3) Replace the room light if it is found defective.

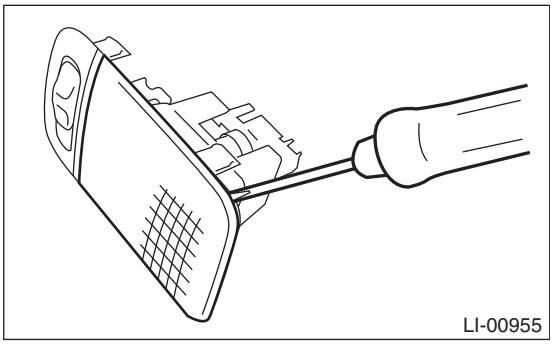
28.Luggage Room Light

A: REMOVAL

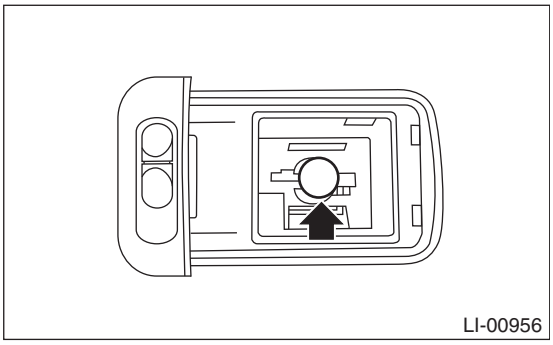
1) Disconnect the ground cable from battery.
2) Insert a flat tip screwdriver into the edge of the luggage room light body to remove the luggage room light.



3) Disconnect the harness connector and remove the luggage room light.
4) Insert a flat tip screwdriver to remove the luggage room light.



5) Remove the bulb.



B: INSTALLATION

Install each part in the reverse order of removal.

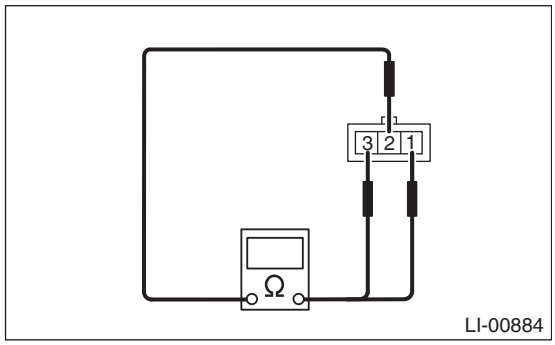
C: INSPECTION

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) Replace the bulb if it is found defective.

2. LUGGAGE ROOM LIGHT SWITCH

1) Measure the resistance between luggage room light switch terminals.



Switch position	Terminal No.	Standard
OFF	—	1 MΩ or more
ON	1 and 2	Less than 1 Ω
DOOR	2 and 3	Less than 1 Ω

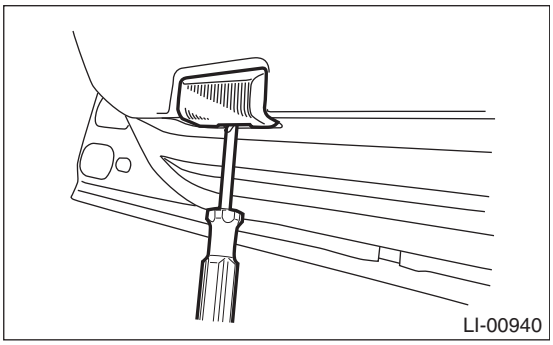
2) Replace the luggage room light if the inspection result is not within the standard value.

29.Door Step Light

A: REMOVAL

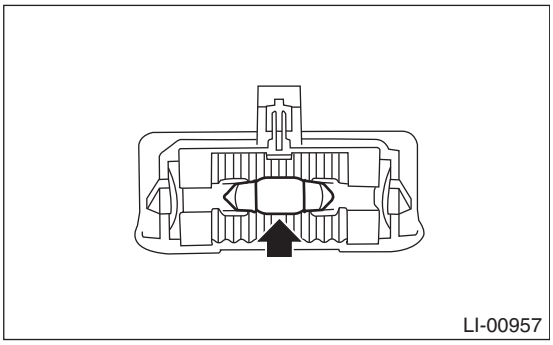
1) Disconnect the ground cable from battery.
2) Remove the door step light.

CAUTION:
Be careful not to damage light and door trim.



(1) Insert a flat tip screwdriver into the slit of the door step light body to remove the door step light.
(2) Disconnect the harness connector.

3) Remove the bulb.



B: INSTALLATION

Install each part in the reverse order of removal.

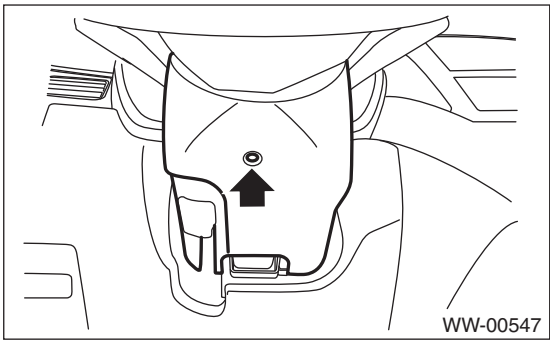
C: INSPECTION

1) Visually check the bulb for blow out.
2) Check the bulb specification. <Ref. to LI-2, SPECIFICATION, General Description.>
3) Replace the bulb if it is found defective.

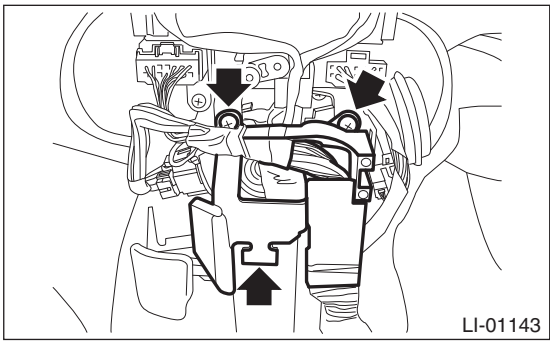
30.Ignition Switch Illumination

A: REMOVAL

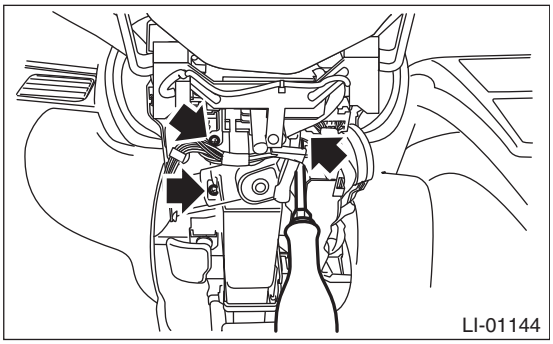
1) Disconnect the ground cable from battery.
2) Remove the screws and steering cover lower.



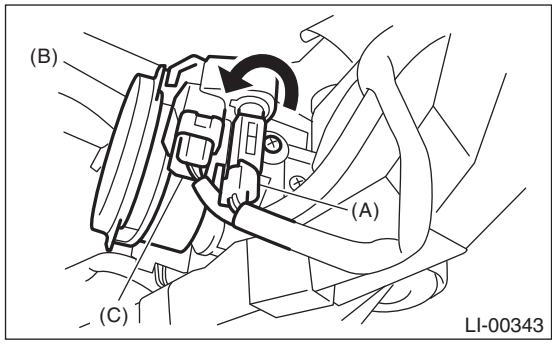
3) Remove the harness cover lock.
4) Remove the screws and detach the knee protector.



5) Remove the screws and remove the steering column cover upper.



6) Remove the instrument panel lower cover. <Ref. to EI-47, REMOVAL, Instrument Panel Lower Cover.>
7) Disconnect the ignition switch illumination connector (A).
8) Turn the ignition switch illumination connector to the left and remove it.



(A) Ignition switch illumination connector
(B) Ignition switch illumination
(C) Immobilizer antenna connector

B: INSTALLATION

Install each part in the reverse order of removal.

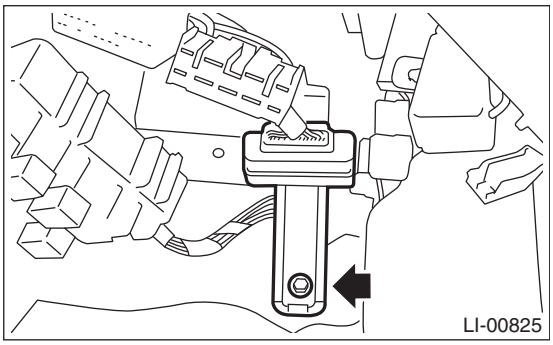
C: INSPECTION

Step		Check	Yes	No
1	**CHECK THE IGNITION SWITCH ILLUMINATION.** Make sure the ignition switch illumination illuminates when driver's side door is open.	Does the ignition switch illumination illuminate?	Ignition switch illumination is normal.	Go to step **2**.
2	**CHECK THE IGNITION SWITCH ILLUMINATION.** Make sure the ignition switch illumination blinks when the ignition switch is turned to ON.	Does the ignition switch illumination blink?	Check the function setting of body integrated unit. <Ref. to LAN(diag)-28, REGISTRATION BODY INTEGRATED UNIT (FUNCTION SETTING), OPERATION, Registration Body Integrated Unit.>	Check the ignition switch illumination circuit. <Ref. to SL-25, CHECK IGNITION SWITCH ILLUMINATION, INSPECTION, Keyless Entry System.>

31. Auto Headlight Beam Leveler Control Module

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Disconnect the harness connector.
3) Remove the bolts and the auto headlight beam leveler control module.



B: INSTALLATION

Install each part in the reverse order of removal.

Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

NOTE:
When the auto headlight beam leveler control module is removed, perform initialization or reinitialization. <Ref. to LI-16, PROCEDURE, Auto Headlight Beam Leveler System.>

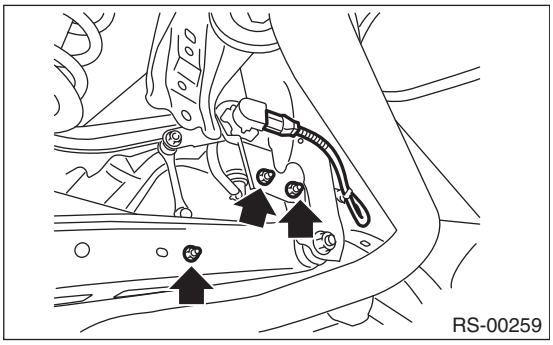
32.Rear Height Sensor

A: REMOVAL

CAUTION:
Always remove the vehicle height sensor before removing any parts related to the suspension.

1) Disconnect the ground cable from battery.
2) Lift up the vehicle body, and remove the left rear wheel.
3) Disconnect the rear vehicle height sensor connector.
4) Remove the nut and remove the rear vehicle height sensor.

CAUTION:
Remove the bracket as a unit, and do not disassemble the sensor and lever.



B: INSTALLATION

Install each part in the reverse order of removal.

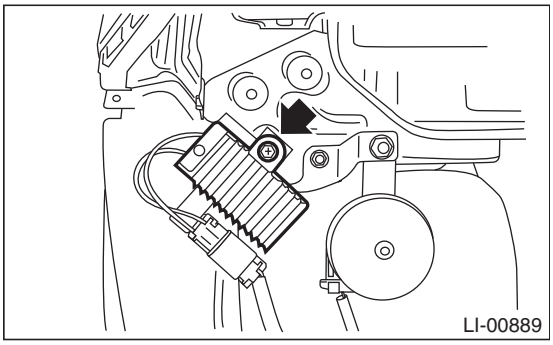
Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

NOTE:
If the rear vehicle height sensor is removed, perform reinitialization. <Ref. to LI-16, PROCEDURE, Auto Headlight Beam Leveler System.>

33.Day Time Running Resistor

A: REMOVAL

1) Remove the front bumper face. <Ref. to EI-29, FRONT BUMPER FACE, REMOVAL, Front Bumper.>
2) Disconnect the harness connector.
3) Remove the bolt, and remove the daytime running resistor.



B: INSTALLATION

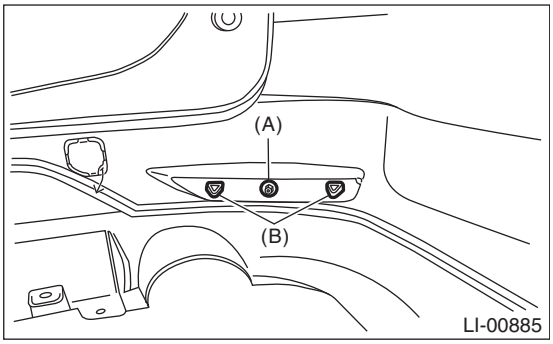
Install each part in the reverse order of removal.

Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

34.Reflex Reflector

A: REMOVAL

1) Remove the plastic nut (A) of the reflex reflector from the backside of the bumper.
2) Press the tabs (B) to remove the reflex reflector.



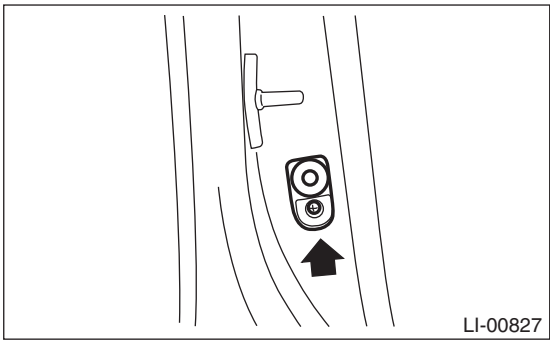
B: INSTALLATION

Install each part in the reverse order of removal.

35.Door Switch

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the screw, and pull out the door switch.



3) Disconnect the harness connector and remove the door switch.

B: INSTALLATION

Install each part in the reverse order of removal.

C: INSPECTION

Refer to “Inspection” of “Room Light System”. <Ref. to LI-9, DOOR SWITCH, INSPECTION, Room Light System.>

WIPER AND WASHER SYSTEMS

WW

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3.	Combination Switch (Wiper)	8
4.	Wiper Blade	12
5.	Washer Tank and Motor	14
6.	Front Wiper Arm	15
7.	Front Wiper Motor and Link	16
8.	Front Washer Nozzle	18
9.	Rear Wiper Arm	19
10.	Rear Wiper Motor	20
11.	Rear Washer	21

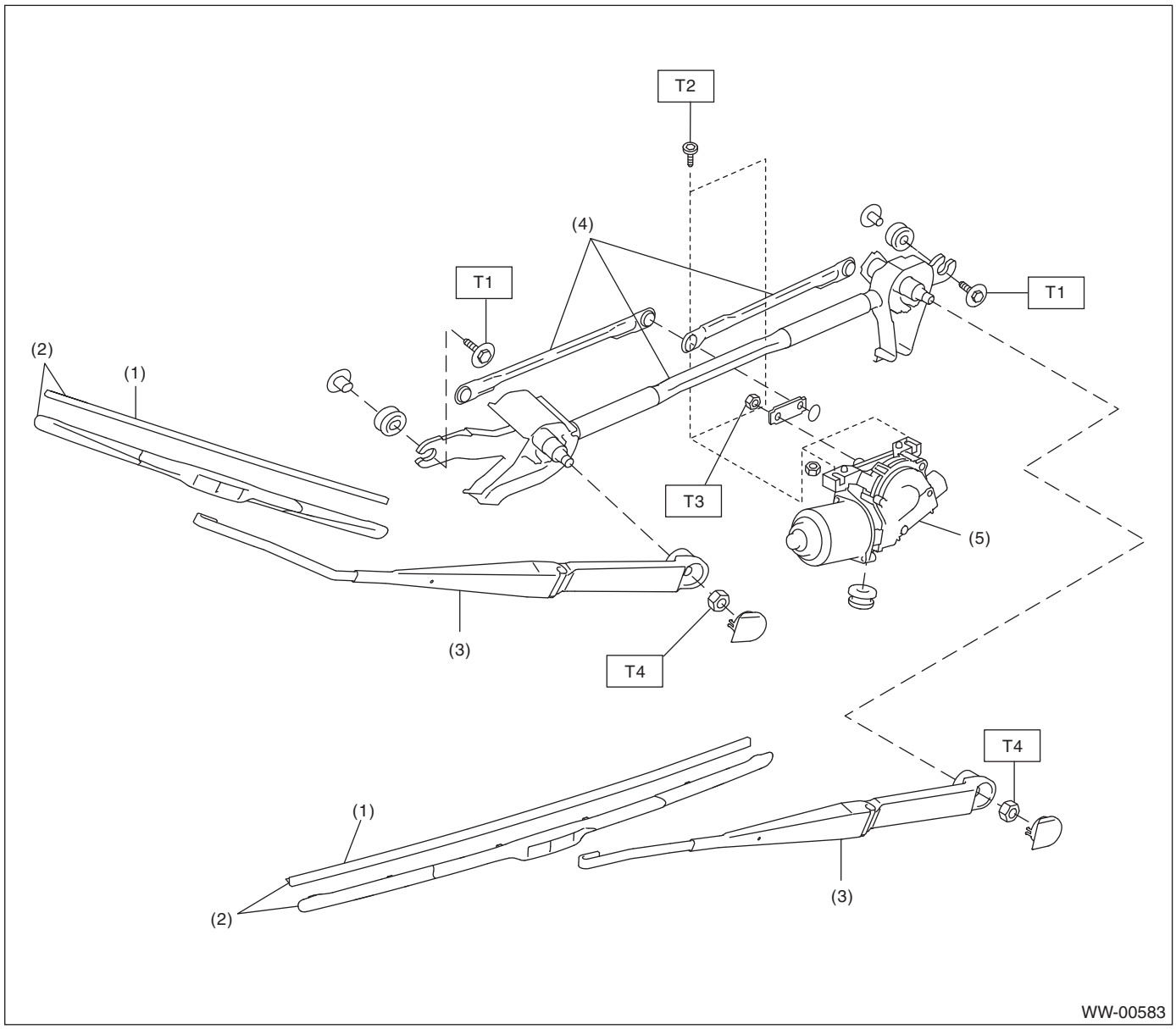
1. General Description

A: SPECIFICATION

Front wiper motor	Input	12 V — 72 W or less
Rear wiper motor	Input	12 V — 42 W or less
Front washer motor	Pump type	Centrifugal
	Input	12 V — 36 W or less
Rear washer motor	Pump type	Centrifugal
	Input	12 V — 36 W or less

B: COMPONENT

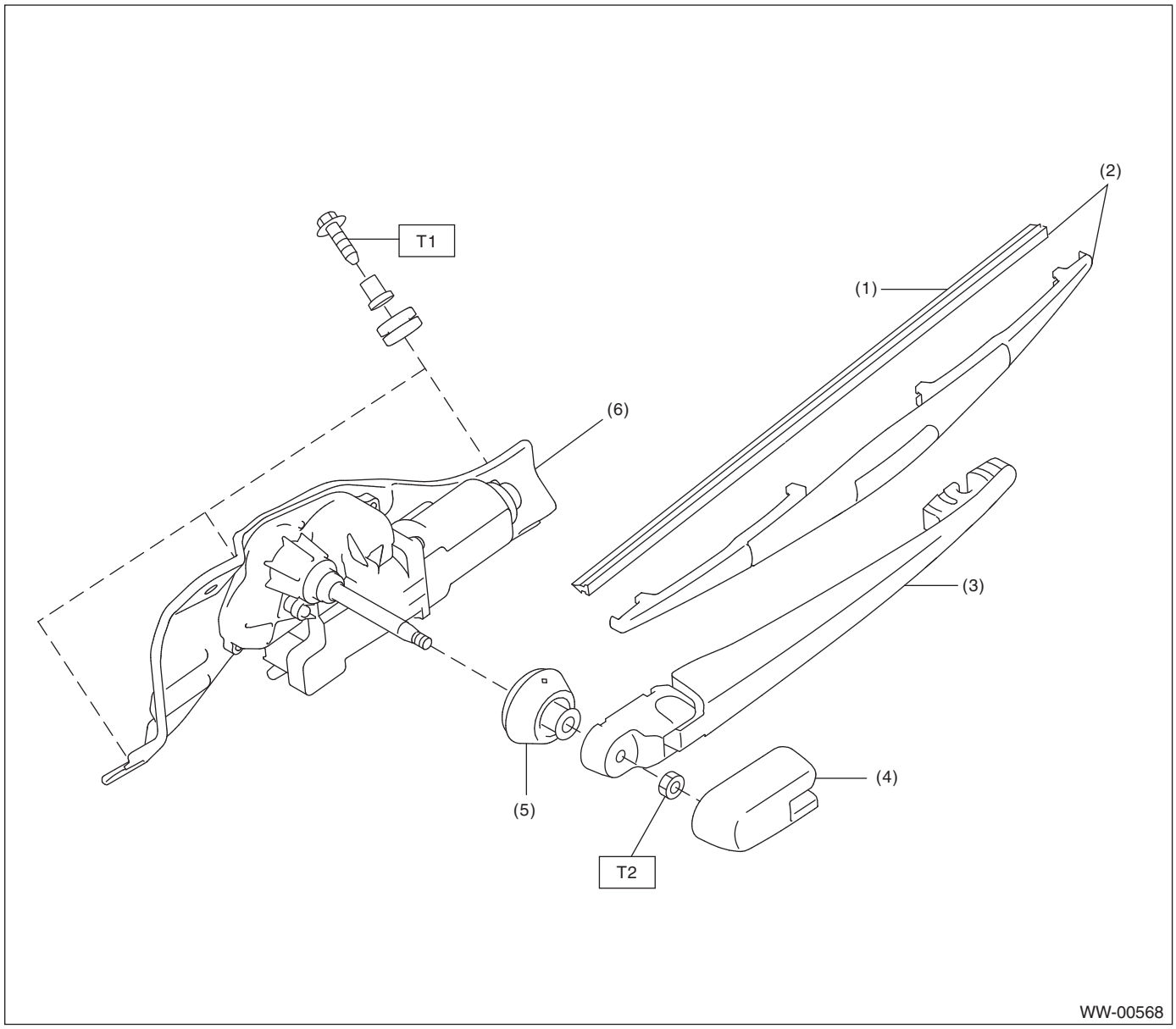
1. FRONT WIPER



(1) Wiper rubber
(2) Wiper blade ASSY
(3) Wiper arm
(4) Wiper link
(5) Wiper motor

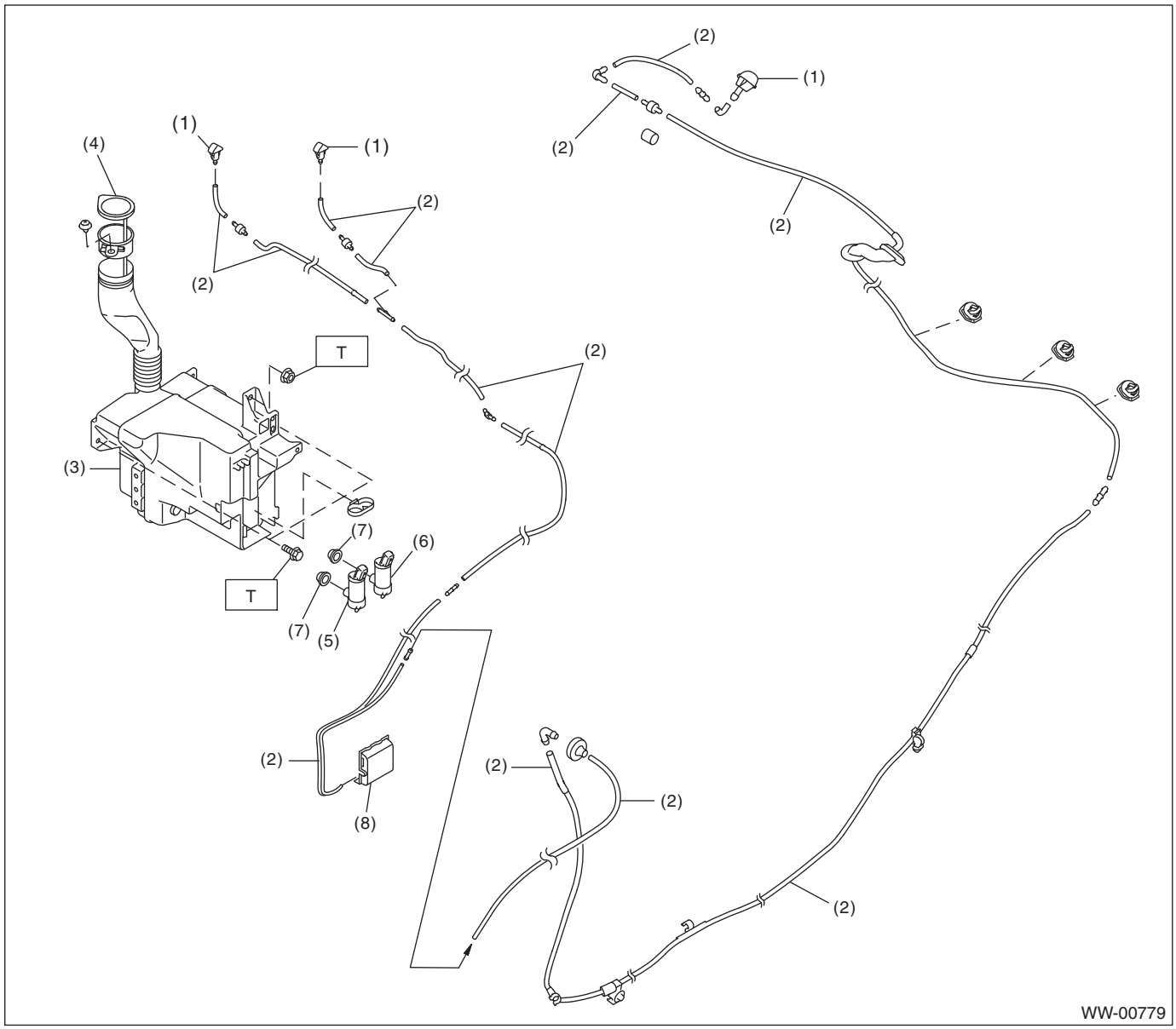
Tightening torque:N·m (kgf-m, ft-lb)
T1: 6.0 (0.61, 4.4)
T2: 7.5 (0.76, 5.5)
T3: <Ref. to WW-16, INSTALLATION, Front Wiper Motor and Link.>
T4: 22 (2.24, 16.2)

2. REAR WIPER



(1)	Wiper rubber	(4)	Wiper arm cover	***Tightening torque:N·m (kgf-m, ft-lb)***
(2)	Wiper blade ASSY	(5)	Pivot cap	***T1: 6.0 (0.61, 4.4)***
(3)	Wiper arm	(6)	Wiper motor	***T2: 8.0 (0.82, 5.9)***

3. WASHER TANK



(1)	Washer nozzle	(5)	Front washer motor
(2)	Washer hose	(6)	Rear washer motor
(3)	Washer tank	(7)	Grommet
(4)	Washer tank cap & level gauge	(8)	Washer motor cover

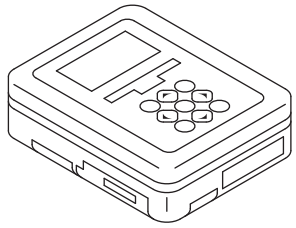
Tightening torque:N·m (kgf-m, ft-lb)
T: 6.0 (0.61, 4.4)

C: CAUTION

- Connect the connectors and hoses securely during reassembly.
- After reassembly, make sure that the each function operates normally.
- Be careful with the airbag system wiring harness which passes near electrical parts and switches.
- Yellow connectors and harnesses with yellow tapes around them are the connectors and harnesses for the airbag system. Using a tester above such circuits may cause malfunction of airbag system. Follow the cautions for the airbag system in this case. <Ref. to AB-5, CAUTION, General Description.>
- Care must be taken when connecting the hose to the pipe 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. Make sure that no oil comes into contact with the system.

D: PREPARATION TOOL

1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST1B022XU0	1B022XU0	SUBARU SELECT MONITOR III KIT	Used for setting of each function and trouble-shooting for electrical system.

2. GENERAL TOOL

TOOL NAME	REMARKS
TORX® T50	Used for removing and installing the wiper motor assembly.
Circuit tester	Used for checking voltage and continuity.

2. Wiper and Washer System

A: WIRING DIAGRAM

1. WIPER AND WASHER (FRONT)

Refer to “Front Wiper and Washer System” in the wiring diagram. <Ref. to WI-121, WIRING DIAGRAM, Front Wiper and Washer System.>

2. WIPER AND WASHER (REAR)

Refer to “Rear Wiper and Washer System” in the wiring diagram. <Ref. to WI-122, WIRING DIAGRAM, Rear Wiper and Washer System.>

B: INSPECTION

Symptoms	Repair order
Wiper and washers do not operate.	1. Wiper fuse 2. Combination switch 3. Wiper motor assembly 4. Wiring harness
Wipers do not operate in LO or HI.	1. Combination switch 2. Wiper motor assembly 3. Wiring harness
Wipers do not operate in INT.	1. Combination switch 2. Wiper motor assembly 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 ON.	1. Wiper motor assembly 2. Wiring harness
Washer fluid spray does not operate properly.	1. Washer motor 2. Washer hose and nozzle

C: NOTE

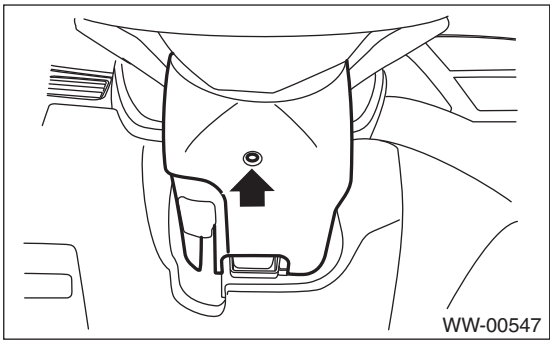
For procedure of each component of the wiper and washer system, refer to the respective sections.

- Combination switch (Wiper): <Ref. to WW-8, Combination Switch (Wiper).>
- Wiper blade: <Ref. to WW-12, Wiper Blade.>
- Front wiper arm: <Ref. to WW-15, Front Wiper Arm.>
- Front wiper motor and link: <Ref. to WW-16, Front Wiper Motor and Link.>
- Rear wiper arm: <Ref. to WW-19, Rear Wiper Arm.>
- Rear wiper motor: <Ref. to WW-20, Rear Wiper Motor.>
- Washer tank and motor: <Ref. to WW-14, Washer Tank and Motor.>
- Front washer nozzle: <Ref. to WW-18, Front Washer Nozzle.>
- Rear washer nozzle: <Ref. to WW-21, Rear Washer.>

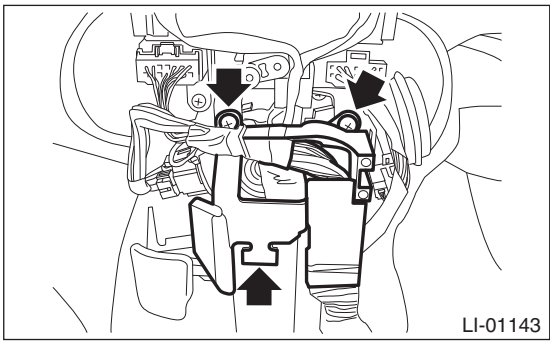
3. Combination Switch (Wiper)

A: REMOVAL

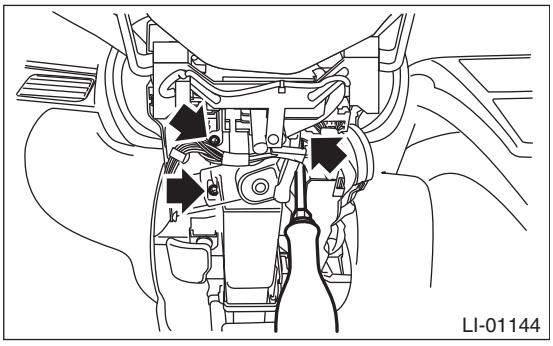
1) Disconnect the ground cable from battery.
2) Remove the screws and remove the steering column cover lower.



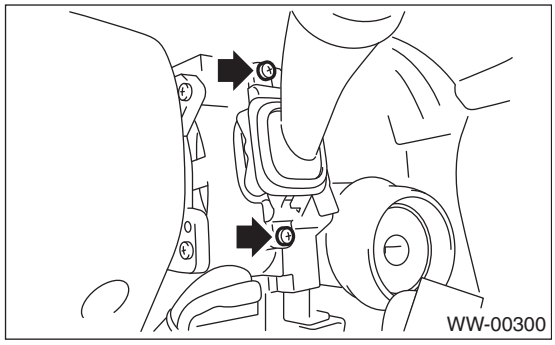
3) Remove the harness cover lock.
4) Remove the screws and detach the knee protector.



5) Remove the mounting screws of steering column cover upper.



6) Disconnect the connector from wiper switch.
7) Remove the screws and then remove the wiper switch.

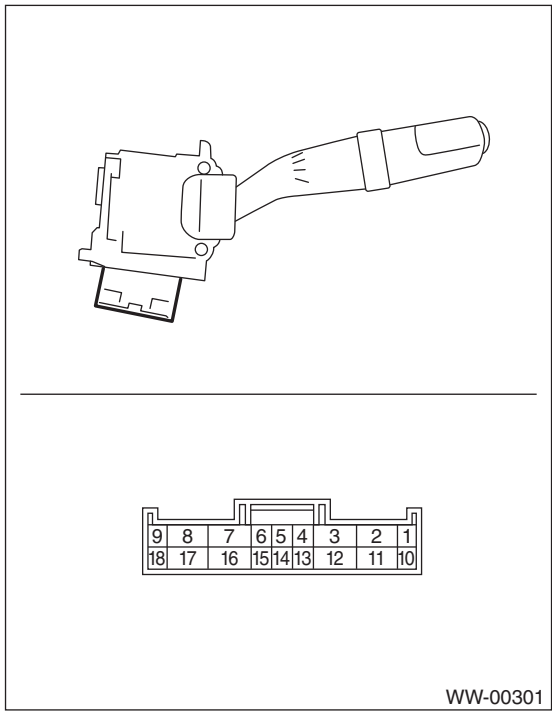


B: INSTALLATION

Install each part in the reverse order of removal.

C: INSPECTION

1) Operate the switches to check the continuity between terminals.



	Switch position	Terminal No.	Standard
Front	OFF	7 and 16	Less than 1 Ω
	INT	7 and 16	Less than 1 Ω
	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	OFF	2 and 10 10 and 12 2 and 12	1 MΩ or more
	INT	2 and 13	Less than 1 Ω
	ON	2 and 10	Less than 1 Ω
	Washer ON	2 and 12	Less than 1 Ω

2) Replace the switch if the inspection result is not within the standard value.

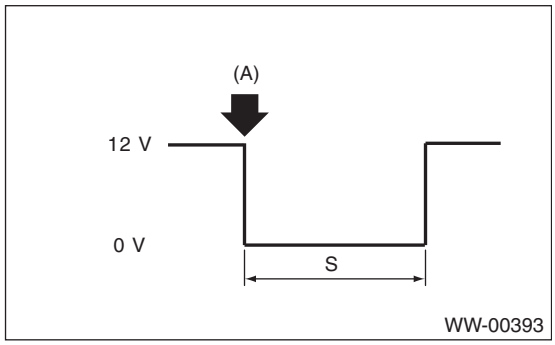
1. FRONT WIPER

1) Check with Subaru Select Monitor
When the front wiper switch is operated, check the input signal using the Subaru Select Monitor.
(1) Prepare the Subaru Select Monitor kit.
(2) Turn the ignition switch to ON.
(3) On «System Selection Menu» display, select {Integ. unit mode}.
(4) Select the {Current Data Display & Save}.
(5) Check the input signal when the front wiper switch is set to LO or HI.
Is the input signal normal?
- **Yes** → Finish the diagnosis.
- **No** →
  1. Check the harness.
  2. Check ACC input voltage of body integrated unit.

Connector & terminal
(B281) No. 5 (+) — Chassis ground (–):
3. Replace the body integrated unit. <Ref. to SL-46, Body Integrated Unit.>

2) Check the intermittent operation (inspection of the wiper switch alone)
(1) Set the voltage meter between terminal No. 7 (+) and No. 2 (–).
(2) Connect the battery to connector. (Terminal No. 17 (+), terminal No. 2 & 16 (–))
(3) Turn the front wiper switch to INT.
(4) Connect the battery (+) to the terminal No. 16 for 5 seconds.
(5) Connect the battery (–) to the terminal No. 16, and check the voltage between terminal No. 7 — No. 2 when performing the intermittent operation.
(6) Perform step (1) to (5) above when intermittent control switch is in MIN or MAX, and replace the switch if the operation is not as specified.

Intermittent stationary time
MIN: Approx. 4 seconds
MAX: Approx. 19 seconds



(A): Connect the battery (–) to the terminal No. 16.
S: Intermittent downtime (sec.)

2. REAR WIPER

1) Check with Subaru Select Monitor

	Step	Check	Yes	No
1	**CHECK INPUT OF REAR WIPER SWITCH.** Check the input from body integrated unit using the Subaru Select Monitor. 1) Prepare the Subaru Select Monitor kit. 2) Turn the ignition switch to ON. 3) On «System Selection Menu» display, select {Integ. unit mode}. 4) Select the {Current Data Display & Save}. 5) Check the input of the rear wiper switch.	Is the input normal?	Go to step **4**.	Go to step **2**.
2	**CHECK HARNESS.** 1) Disconnect the ground cable from battery. 2) Disconnect the connector of body integrated unit. 3) Disconnect the connector from wiper switch. 4) Measure the resistance between body integrated unit and wiper switch. ***Connector & terminal*** ***(B281) No. 18 — (B70) No. 10:*** ***(B281) No. 27 — (B70) No. 13:*** ***(B281) No. 28 — (B70) No. 12:***	Is the resistance less than 10 Ω?	Go to step **3**.	Repair the harness between the body integrated unit and wiper switch.
3	**CHECK INPUT VOLTAGE OF BODY INTEGRATED UNIT.** 1) Connect the ground cable to battery. 2) Turn the ignition switch to ACC. 3) Check the input voltage of body integrated unit. ***Connector & terminal*** ***(B280) No. 7 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **4**.	Check the harness and fuse.
4	**CHECK OUTPUT OF BODY INTEGRATED UNIT.** When the rear wiper switch is operated, check the output using the Subaru Select Monitor. 1) Turn the ignition switch to ON. 2) Operate the rear wiper switch and set to each position of ON and INT. 3) At this time, check the body integrated unit output.	When set to ON, is ON output continuous? When set to INT, is ON/OFF output repeated? (INT OFF time (when vehicle parked): 12 seconds)	Check the rear wiper motor circuit.	Replace the body integrated unit. <Ref. to SL-46, Body Integrated Unit.>

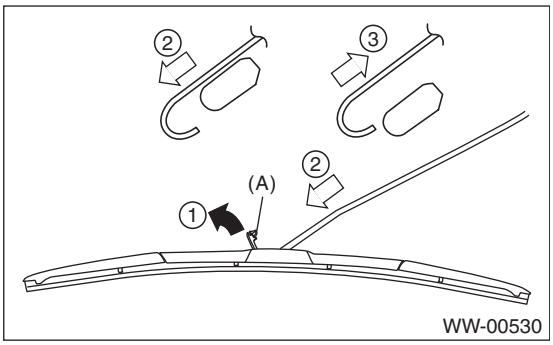
2) Check rear wiper motor circuit

	Step	Check	Yes	No
1	**CHECK POWER SUPPLY CIRCUIT OF THE REAR WIPER MOTOR.** 1) Disconnect the harness connector of the rear wiper motor. 2) Turn the ignition switch to ACC. 3) Measure the voltage between the rear wiper motor harness connector terminal and chassis ground. ***Connector & terminal*** ***(D43) No. 3 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **2**.	• Check the fuse (No. 23 in fuse & relay box). • Check the fusible link (No. 7 in main fuse box).
2	**CHECK GROUND CIRCUIT OF REAR WIPER MOTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between the rear wiper motor harness connector terminal and chassis ground. ***Connector & terminal*** ***(D43) No. 4 — Chassis ground:***	Is the resistance less than 10 Ω?	Go to step **3**.	Repair the open circuit of the rear wiper motor ground circuit.
3	**CHECK HARNESS BETWEEN BODY INTEGRATED UNIT AND REAR WIPER MOTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the harness connector of body integrated unit. 3) Disconnect the harness connector of the rear wiper motor. 4) Measure the resistance between the harness connector terminals of the body integrated unit and rear wiper motor. ***Connector & terminal*** ***(B279) No. 8 — (D43) No. 1:*** ***(B279) No. 9 — (D43) No. 2:***	Is the resistance less than 10 Ω?	Go to step **4**.	Repair the open circuit of the harness between body integrated unit and rear wiper motor.
4	**CHECK INPUT VOLTAGE OF BODY INTEGRATED UNIT.** 1) Turn the ignition switch to ACC. 2) Check the input voltage of body integrated unit. ***Connector & terminal*** ***(B279) No. 21 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **5**.	Check the harness and fuse.
5	**CHECK OUTPUT OF BODY INTEGRATED UNIT.** 1) Connect the harness connector of body integrated unit. 2) Disconnect the connector of the rear wiper motor. 3) Turn the ignition switch to ACC. 4) Measure the voltage between rear wiper motor connector and chassis ground. ***Connector & terminal*** ***(D43) No. 2 (+) — Chassis ground (–):***	Is the voltage less than 1.5 V when the rear wiper switch is OFF, and is the voltage 10 V or more when the rear wiper switch is ON?	Go to step **6**.	Replace the body integrated unit. <Ref. to SL-46, Body Integrated Unit.>
6	**CHECK OPERATION OF REAR WIPER MOTOR.** 1) Remove the rear wiper motor. 2) Check the rear wiper motor. <Ref. to WW-20, INSPECTION, Rear Wiper Motor.>	Does the rear wiper motor rotate normally?	End.	Replace the rear wiper motor.

4. Wiper Blade

A: REMOVAL

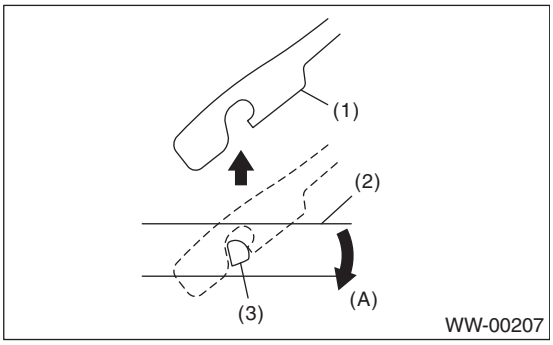
1. FRONT



1) Pull up locking clip (A), and push the arm into the blade assembly side. (Arrow 2)
2) While lifting the arm, pull out (Arrow 3), and remove the blade assembly from the 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

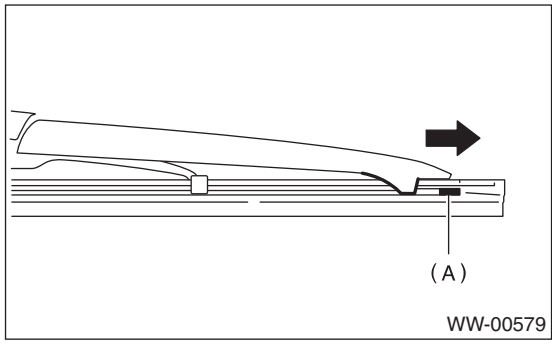
B: INSTALLATION

1) Install each part in the reverse order of removal.
2) Confirm that the clip is locked securely.

C: DISASSEMBLY

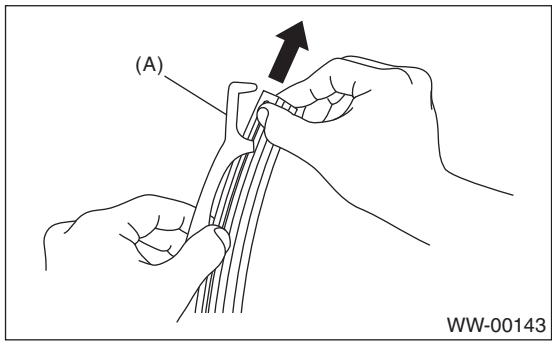
1. FRONT

Pull side (A) of the wiper rubber stopper and remove the rubber from the blade assembly.



2. REAR

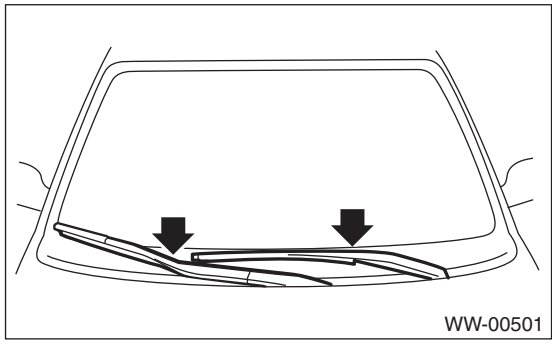
Pull the wiper rubber top slightly from stopper (A) and pull out completely.



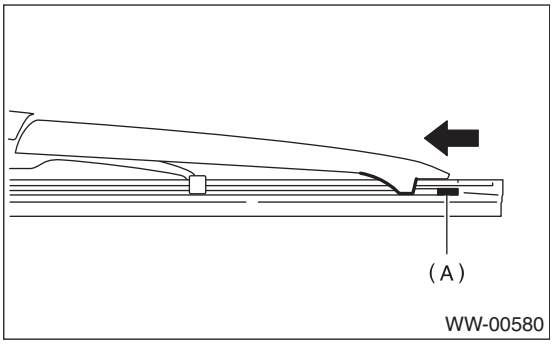
D: ASSEMBLY

1. FRONT

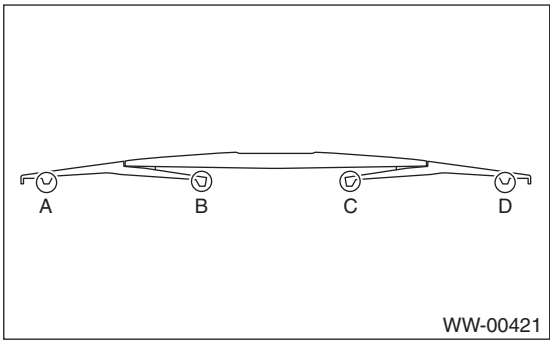
1) Insert the wiper rubber onto the blade so that the stopper is in the position shown in the figure.



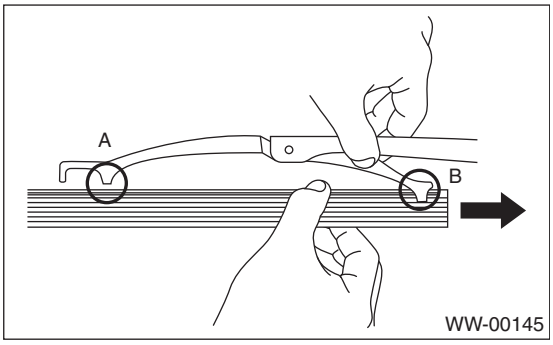
2) Make sure the wiper rubber is securely fastened to the pull stopper (A).



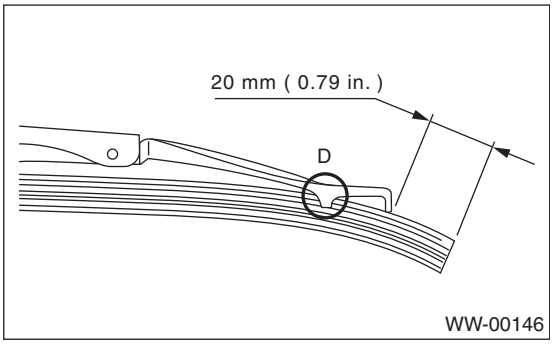
2. REAR



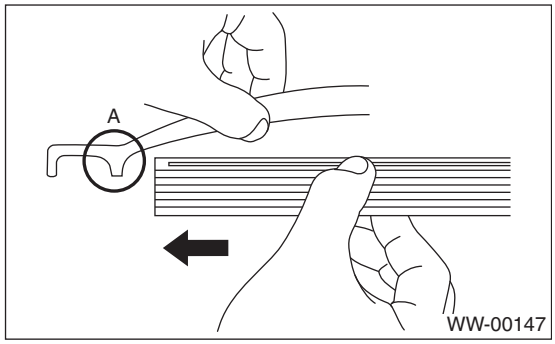
1) Insert the wiper rubber through claw (B).



2) Insert the wiper rubber until its top end protrudes approx. 20 mm (0.79 in) from stopper (D).



3) Insert the wiper rubber into claw (A).



E: INSPECTION

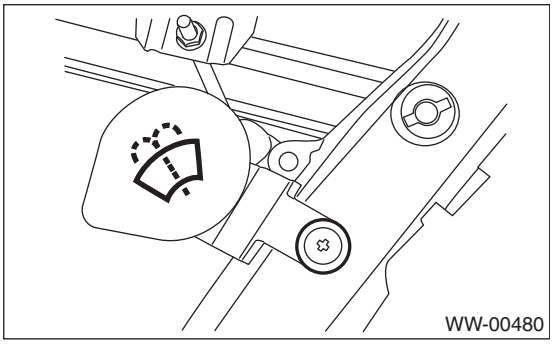
1) When the wiper does not operate properly, inspect the following item.
- Make sure the movable part of blade assembly moves smoothly.
- Make sure the wiper rubber is not deformed or damaged.

2) Replace with a new part if damage is found.

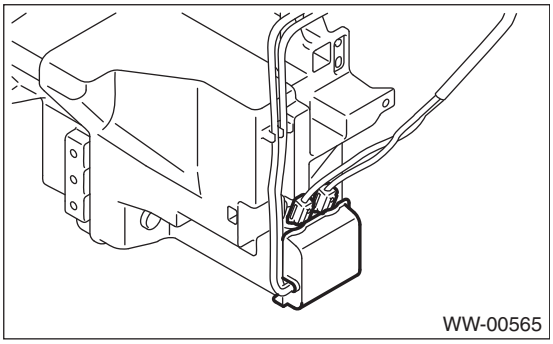
5. Washer Tank and Motor

A: REMOVAL

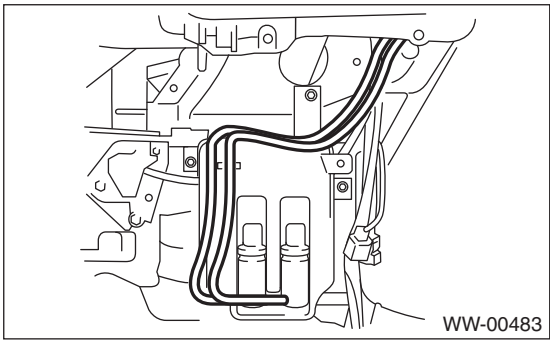
1) Open the front hood.
2) Disconnect the ground cable from battery.
3) Remove the front bumper. <Ref. to EI-29, REMOVAL, Front Bumper.>
4) Remove the clip of the washer tank duct.



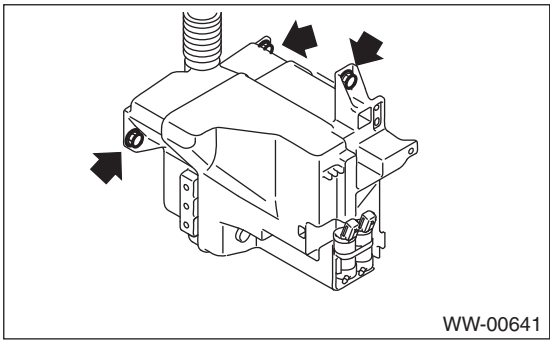
5) Remove the washer motor cover, and disconnect the connector.



6) Disconnect the hose.



7) Remove the bolt and nuts and remove the washer tank.



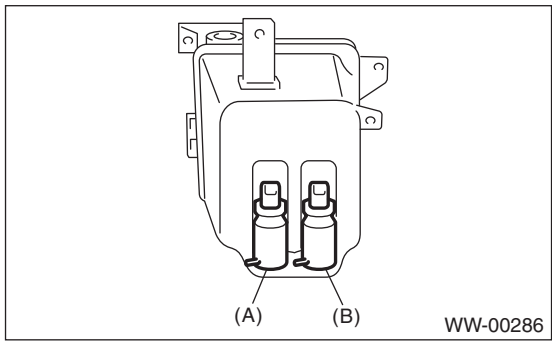
B: INSTALLATION

Install each part 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 the tank.



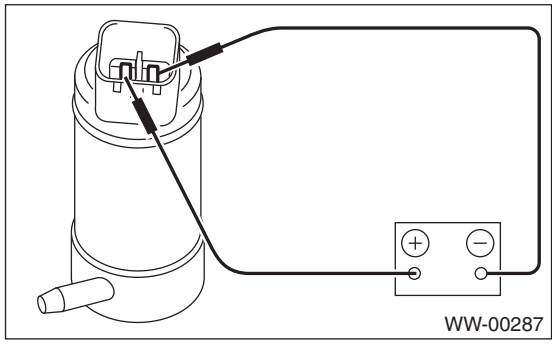
(A) Front
(B) Rear

D: ASSEMBLY

1) Assemble each part in the reverse order of disassembly.
2) Confirm that water does not leak from installation area of motor.

E: INSPECTION

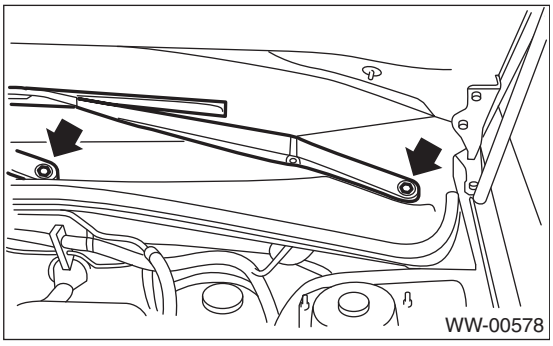
Apply battery voltage to the connector terminal of the washer motor and make sure that the motor operates.



6. Front Wiper Arm

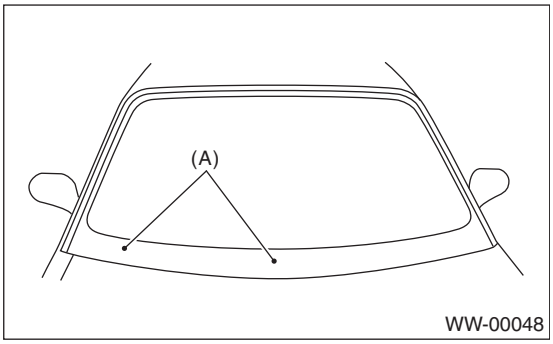
A: REMOVAL

1) Open the front hood.
2) Remove the cap.
3) Remove the nut, and remove the arm.



B: INSTALLATION

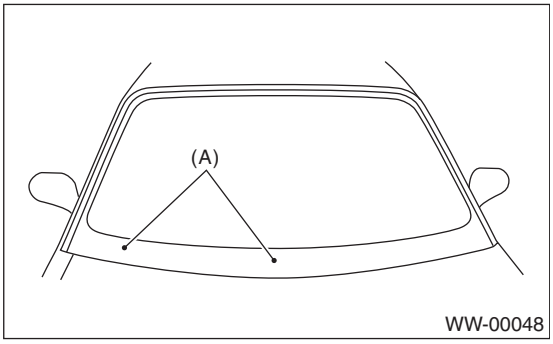
1) Install each part in the reverse order of removal.
2) Operate the wiper once.
3) Align the wiper blade to ceramic print point mark (A) of front window panel.



Tightening torque:
Refer to "COMPONENT" of "General Description". <Ref. to WW-3, FRONT WIPER, COMPONENT, General Description.>

C: ADJUSTMENT

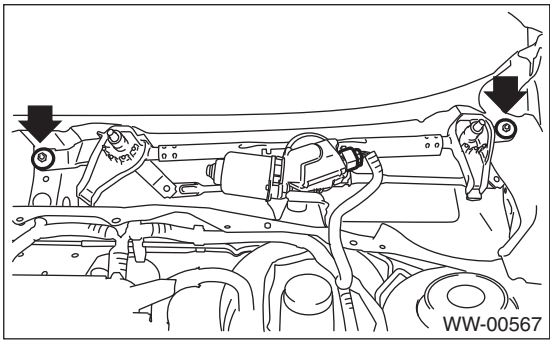
Operate the wiper once. Align the wiper blade to ceramic print point mark (A) of front window panel.



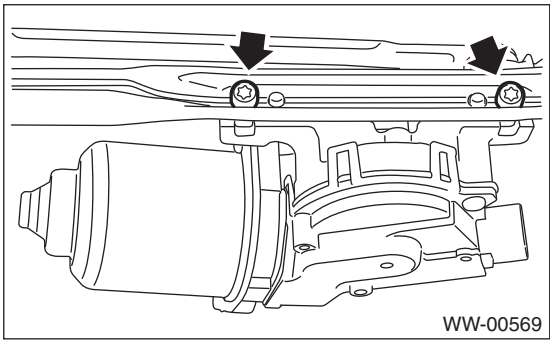
7. Front Wiper Motor and Link

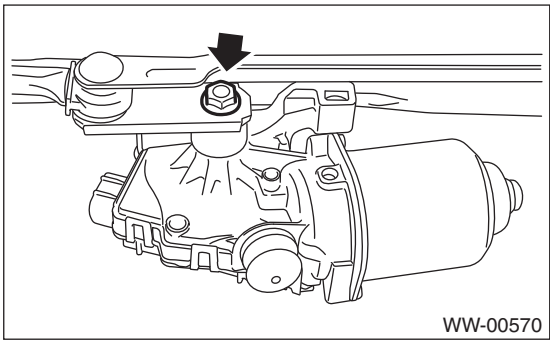
A: REMOVAL

1) Disconnect the ground cable from the battery.
2) Remove the cowl panel. <Ref. to EI-38, REMOVAL, Cowl Panel.>
3) Disconnect the connector of motor.
4) Remove the bolt, and remove the wiper link.



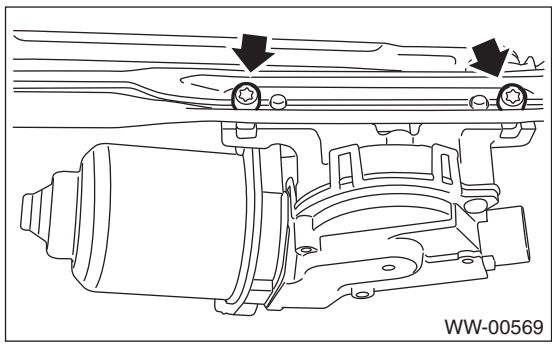
5) Remove the TORX® bolt and nuts, and remove the wiper motor assembly.





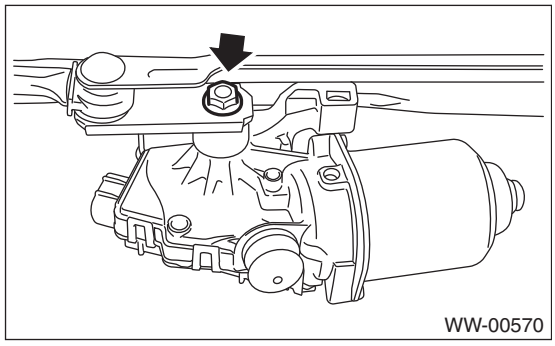
B: INSTALLATION

1) Connect the battery ground terminal.
2) To confirm that the motor is at the auto stop position, connect the harness to the motor and turn the wiper switch to ON/OFF once.
3) Disconnect the ground cable from battery.
4) Install the wiper motor assembly.

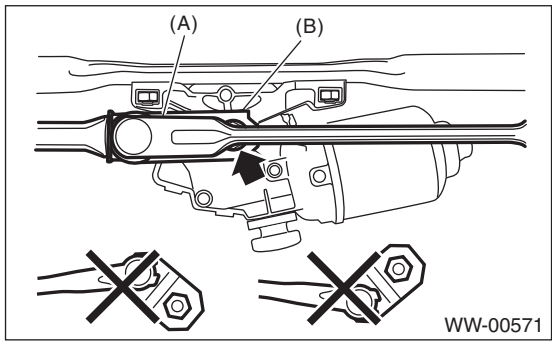


Tightening torque:
Refer to "COMPONENT" of "General Description". <Ref. to WW-3, FRONT WIPER, COMPONENT, General Description.>

5) Tighten the nut of the link plate and motor assembly.



CAUTION:
Tighten the nut where rod (A) and link plate (B) is aligned in a straight line.



Tightening torque:
Tighten to 8.5 N·m (0.87 kgf-m, 6.3 ft-lb) by 115°.

6) Install each part in the reverse order of removal.

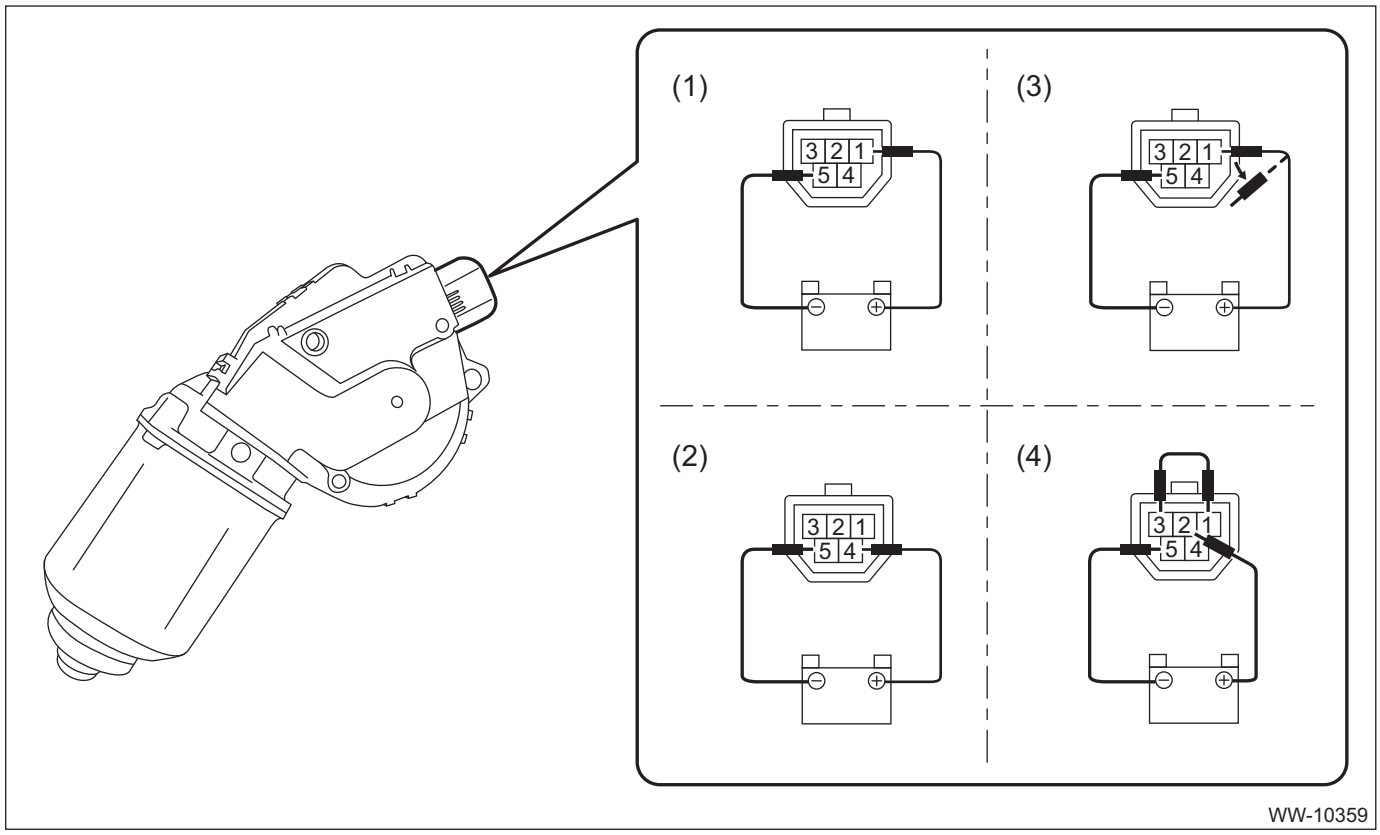
Tightening torque:
Refer to "COMPONENT" of "General Description". <Ref. to WW-3, FRONT WIPER, COMPONENT, General Description.>

C: INSPECTION

1) Check that the following operations perform normally.

CAUTION:
Fix the motor to prevent the motor from being shorted by moving during operation.

(1) When the battery is connected to the terminal of connectors, confirm that the motor operates at low speed.
(2) When the battery is connected to the terminal of connectors, confirm that the 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 motor assembly - windshield wiper in mid-operation.
(4) Connect the battery and check that the motor stops at the automatic stop position after the motor operates at low speed again.

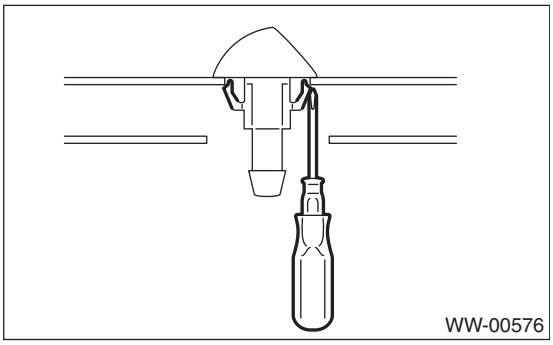


2) Replace the motor assembly - windshield wiper if it is found defective.

8. Front Washer Nozzle

A: REMOVAL

1) Remove the cowl panel. <Ref. to EI-38, REMOVAL, Cowl Panel.>
2) Remove the washer hose from the washer nozzle.
3) Using a driver with a narrow tip, etc., remove the washer nozzle from the cowl panel.



B: INSTALLATION

1) Install each part in the reverse order of removal.
2) Adjust the washer nozzle position. <Ref. to WW-18, ADJUSTMENT, Front Washer Nozzle.>

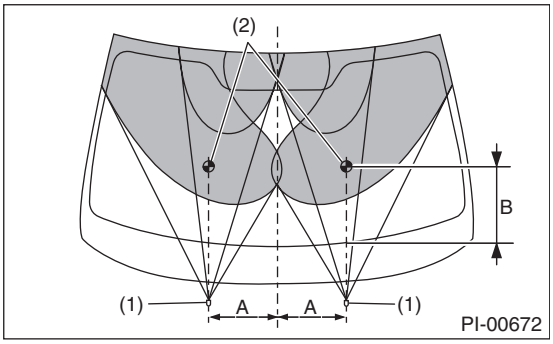
C: INSPECTION

- 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) While the vehicle is at a standstill, adjust the washer injection position as shown in the figure.

Injection position:
A: 250 mm (9.84 in)
B: 279 mm (10.99 in)

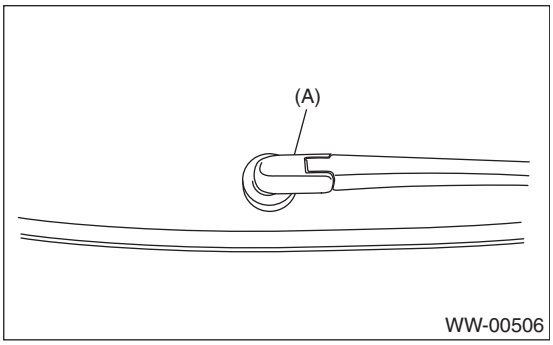


(1) Washer nozzle
(2) Center of lower nozzle

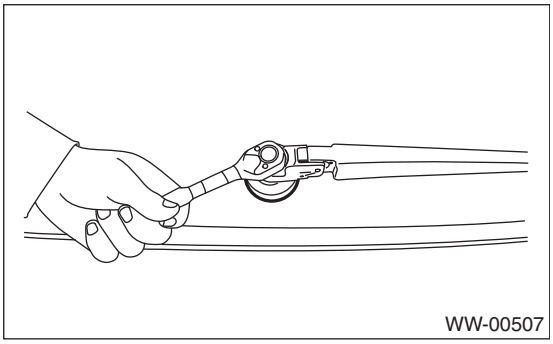
9. Rear Wiper Arm

A: REMOVAL

1) Detach the wiper arm cover (A).

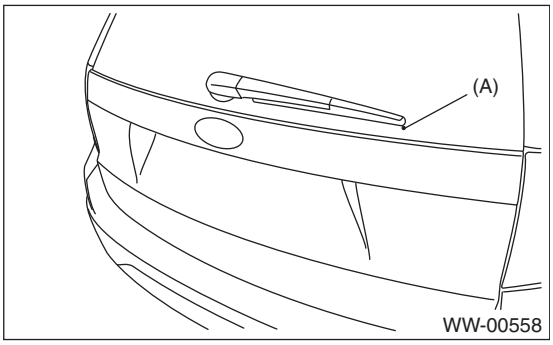


2) Remove the nut and remove the wiper arm.



B: INSTALLATION

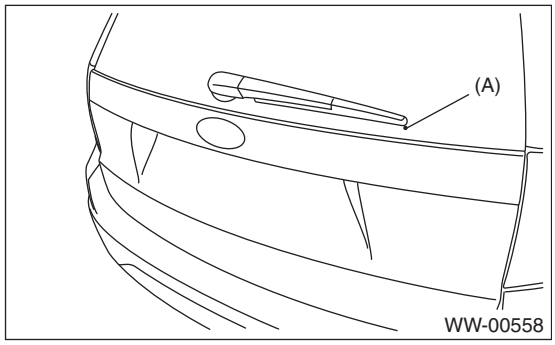
1) Install each part in the reverse order of removal.
2) Operate the rear wiper once.
3) Align the blade with the marking (A) of the glass.



Tightening torque:
Refer to "COMPONENT" of "General Description". <Ref. to WW-4, REAR WIPER, COMPONENT, General Description.>

C: ADJUSTMENT

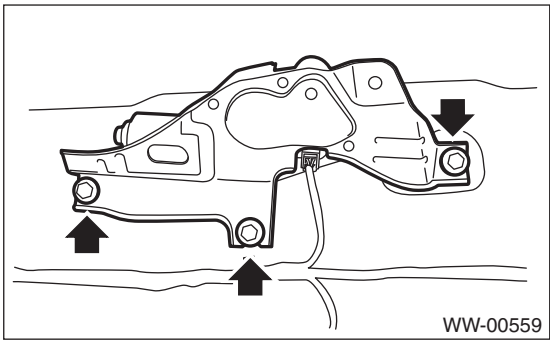
1) Operate the rear wiper once.
2) Align the blade with the marking (A) of the glass.



10.Rear Wiper Motor

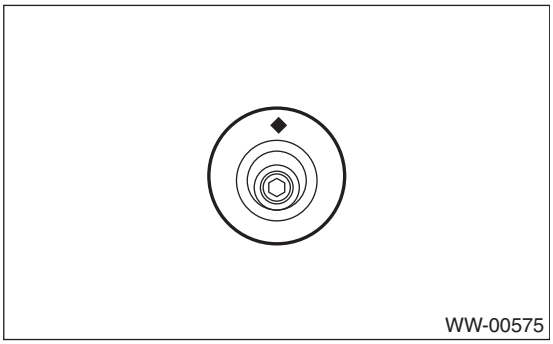
A: REMOVAL

1) Disconnect the ground cable from the battery.
2) Remove the rear wiper arm. <Ref. to WW-19, REMOVAL, Rear Wiper Arm.>
3) Remove the rear gate lower trim. <Ref. to EI-67, REMOVAL, Rear Gate Trim.>
4) Disconnect the harness connector of wiper motor assembly.
5) Remove the bolt, and then remove the wiper assembly.



B: INSTALLATION

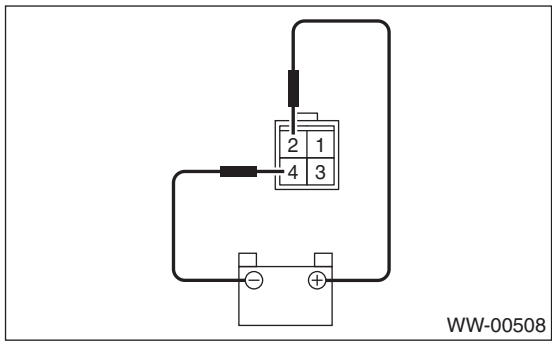
1) Install each part in the reverse order of removal.
2) As shown in the figure, make sure that the diamond mark of the pivot cap is facing upward.



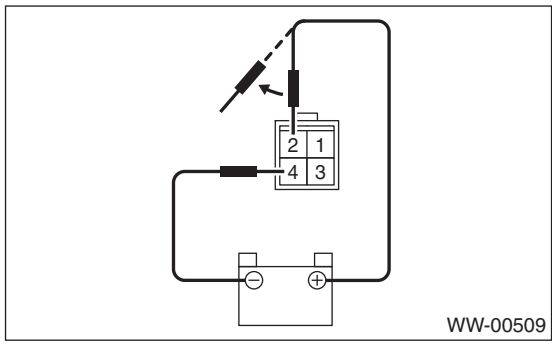
Tightening torque:
Refer to "COMPONENT" of "General Description". <Ref. to WW-4, REAR WIPER, COMPONENT, General Description.>

C: INSPECTION

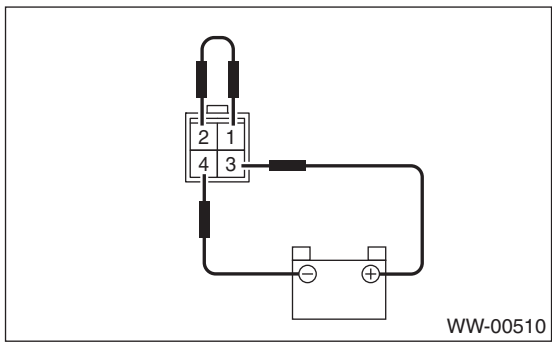
1) Connect the battery to the wiper motor connector and confirm that wiper motor operates.



2) Connect the battery to the connector terminal, run the motor and disconnect the terminal connection, and stop the wiper motor in mid motion.



3) Connect the battery and confirm that the motor stops at the automatic stop position after the motor operates at low speed.



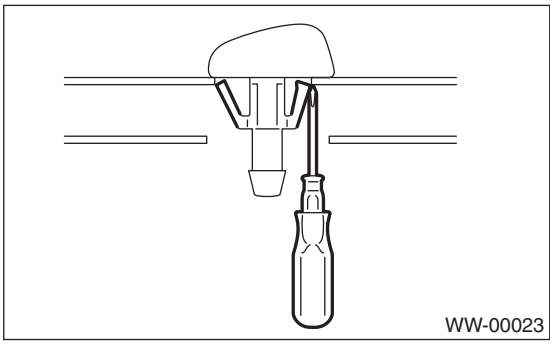
11.Rear Washer

A: REMOVAL

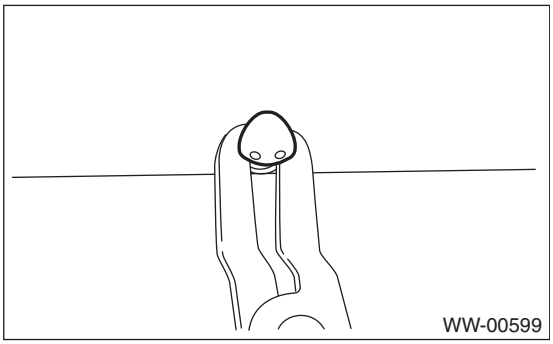
1) Remove the roof spoiler. (Model with roof spoiler) <Ref. to EI-39, REMOVAL, Roof Spoiler.>
2) Remove the high-mounted stop light. <Ref. to LI-35, REMOVAL, High-mounted Stop Light.>
3) Remove the washer nozzle.

CAUTION:
Be careful not to scratch the rear gate panel during removal.

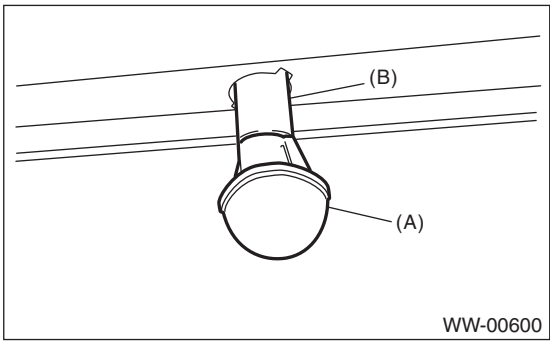
(1) Using a driver with a narrow tip, etc., push out the nozzle craw from the rear side of rear gate panel.



(2) Hold the washer nozzle from the outer side of the rear gate, and pull the washer nozzle.



(3) Remove the washer hose (B) from washer nozzle (A).



B: INSTALLATION

Install each part in the reverse order of removal.

C: INSPECTION

1. VISUAL INSPECTION

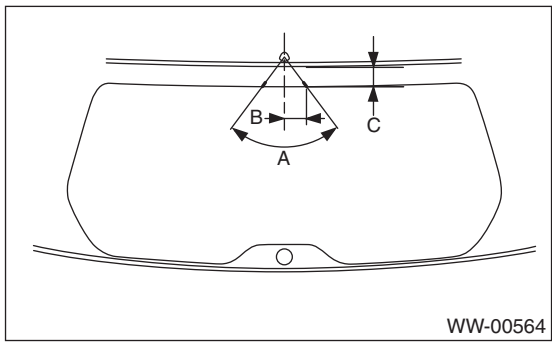
Check for the following items, and if any malfunction is found, replace the corresponding part.

- Make sure the nozzle and hose are not clogged.
- Make sure the hose is not bent.

2. INSPECTING THE SPRAY POSITION

1) Turn the wiper switch to OFF position.
2) While the vehicle is stopped, check that the washer spray position is as shown in the figure.
3) After inspection, if the spray position is really out of the specified range, replace with the new washer nozzle.

Spray position:
A: 72°
B: 45 mm (1.8 in)
C: 36 mm (1.4 in)



ENTERTAINMENT

ET

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1. General Description

A: CAUTION

• Before disassembling or reassembling parts, always disconnect the battery ground cable from battery. When replacing the audio, control module 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 securely during reassembly.
• After reassembly, make sure that the functional parts operate normally.

B: PREPARATION TOOL

1. GENERAL TOOL

TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance and voltage.

2. Audio System

A: WIRING DIAGRAM

1. AUDIO

Refer to “Audio System” in the wiring diagram. <Ref. to WI-125, WIRING DIAGRAM, Audio System.>

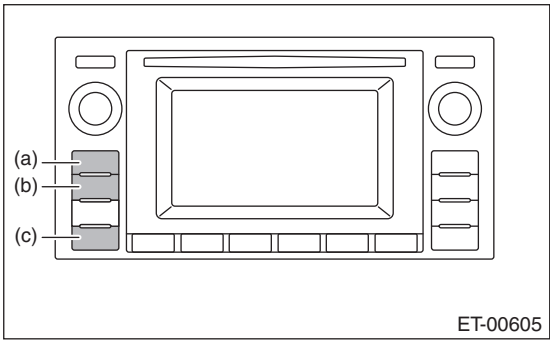
B: INSPECTION

Symptoms	Repair order
No power coming in. (No display and no sound from speakers)	1. Check the fuse and power supply for audio. 2. Check the audio ground. 3. Remove the audio for repair.
A specific speaker does not operate.	1. Check the speaker. 2. Check the output circuit between audio and speaker.
Audio generates noise with engine running.	1. Check the audio ground. 2. Check the generator. 3. Check the ignition coil. 4. Remove the audio for repair.
Volume is low in AM and FM modes or interference noise occurs.	1. Check the antenna. 2. Check the audio ground. 3. Remove the audio for repair.

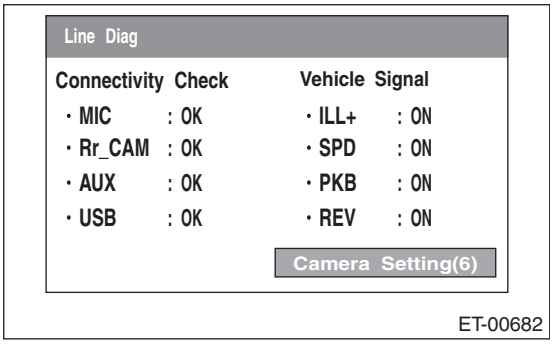
NOTE:
For HD radio, the following symptoms may occur in the nature of radio waves.
- Hybrid mode providing both digital broadcasting and analog broadcasting
- When the vehicle moves outside the digital broadcasting area (smaller than analog broadcasting area regulated by FCC output specification), the digital voice is automatically switched to the analog voice.
- Main channel and sub channel are available in the same frequency. (FM broadcasting only)
- Digital voice failure (delay echo skip) may occur due to reasons of broadcasting station. This is not a malfunction of audio unit.
- Depending on the broadcasting area, digital spectrum cannot be received even in the area where analog broadcasting can be normally received. Or switching between digital broadcasting and analog broadcasting may frequently occur. These are not malfunction of audio unit.

1. CHECK EACH CONNECTION (DISPLAY AUDIO)

1) Turn the ignition switch to ON, and then while pressing the buttons (a) and (b), press and hold the button (c) for 3 seconds or more.



2) The display will switch to the Line Diag screen.



• CHECK MICROPHONE

Check that “OK” is displayed in MIC.
OK: Normal.
NG: Abnormal. Check the signal line connection. If there are no problems, the unit could be faulty.

• CHECK REARVIEW CAMERA

Check that “OK” is displayed in Rr_CAM.
OK: Normal.
NG: Abnormal. Check the signal line connection. If there are no problems, the unit could be faulty.

• CHECK AUX

Check that “OK” is displayed in AUX.
OK: Normal.
NG: Abnormal. Check the signal line connection. If there are no problems, the unit could be faulty.

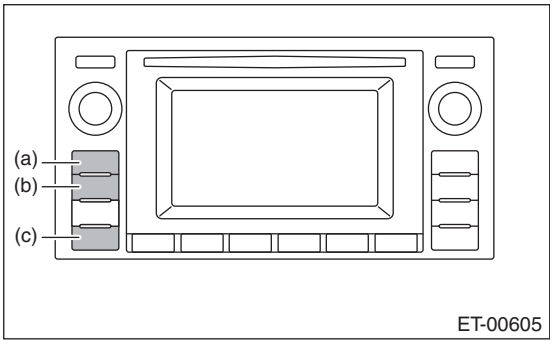
• CHECK USB

Check that “OK” is displayed in USB when USB memory is connected.

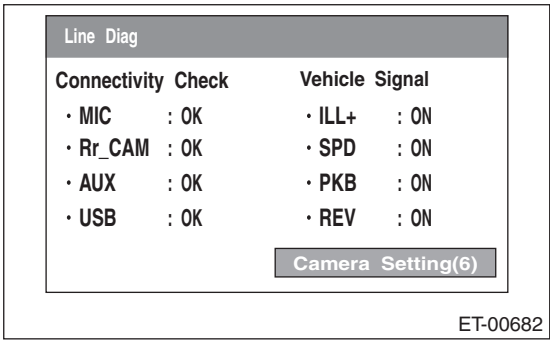
NOTE:
When USB memory is connected, it takes approximately 2 seconds for audio unit to recognize the USB memory.
OK: Normal.
NG: Abnormal. Check the signal line connection. If there are no problems, the unit could be faulty.

2. CHECK EACH VEHICLE SIGNAL (DISPLAY AUDIO)

1) Turn the ignition switch to ON, and then while pressing the buttons (a) and (b), press and hold the button (c) for 3 seconds or more.



2) The display will switch to the Line Diag screen.



• CHECK ILLUMINATION

NOTE:
Before starting inspections, turn the ignition switch to ON.
1) Turn the lighting switch to level 1.
Make sure that the bright switch is not turned ON at this time.
2) Make sure that “ON” lights in ILL+ and then the screen becomes dim.
ON: Normal.
OFF: Abnormal. Check the signal line connector. If there are no problems, the unit could be faulty.

• CHECK SPEED SENSOR

NOTE:
- Before starting inspections, check the safety around the vehicle.
- Lift up the vehicle as necessary.
- When the diagnostic trouble code is input in the VDCCM, perform the Clear Memory operation.

1) Move the vehicle 2 to 3 meters (6.6 to 9.8 ft).
2) Check that “ON” is displayed in SPD.
ON: Normal.
OFF: Abnormal. Check the signal line connection. If there are no problems, the unit could be faulty.

• CHECK PARKING BRAKE SIGNAL

1) Pull parking brake lever.
2) Check that “ON” is displayed in PKB.
ON: Normal.
OFF: Abnormal. Check the signal line connector. If there are no problems, the unit could be faulty.

• **CHECK BACK SENSOR**

NOTE:
Before starting inspections, check the safety around the rear end of the vehicle and then turn the ignition switch to ON.
1) Pull the parking brake and depress the brake, then put the gear in reverse.
2) Make sure that “ON” is displayed in REV.
ON: Normal.
OFF: Abnormal. Check the signal line connection. If there are no problems, the unit could be faulty.

C: NOTE

For procedure of each component in the audio system, refer to the respective sections.
- Audio unit: <Ref. to ET-9, Audio.>
- Front speaker: <Ref. to ET-10, Front Speaker.>
- Tweeter: <Ref. to ET-11, Tweeter.>
- Rear speaker: <Ref. to ET-12, Rear Speaker.>
- Antenna: <Ref. to ET-13, Antenna.>
- Steering satellite switch: <Ref. to ET-14, Steering Satellite Switch.>
- Steering switch: <Ref. to ET-16, Steering Switch.>
- AUX input terminal: <Ref. to ET-26, AUX Input Terminal.>
- Microphone: <Ref. to ET-27, Microphone.>
- Rearview camera: <Ref. to ET-19, Rearview Camera System.>

3. Navigation System

A: WIRING DIAGRAM

Refer to “Navigation System” in the wiring diagram. <Ref. to WI-132, WIRING DIAGRAM, Navigation System.>

B: INSPECTION

NOTE:
If there are no problems in the following “CHECK NAVIGATION OPERATION”, “CHECK DVD-ROM”, “CHECK CONNECTION” and “CHECK EACH VEHICLE SIGNAL”, check the navigation system circuit. <Ref. to WI-132, WIRING DIAGRAM, Navigation System.>

1. CHECK THE OPERATION OF THE NAVIGATION

Start the engine, and then inspect that the opening screen is displayed.
Standard value: The opening screen should be displayed.
OK: Normal
NG: When not displayed, check the connecting lines for the power supply connector at the back side of the audio unit. If there are no problems in the connecting lines or the lines were repaired, check that the opening screen is displayed.
At this point, if the display is not viewable, the unit is defective.

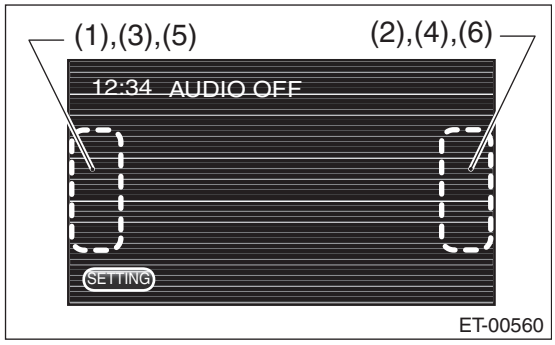
2. CHECK THE DVD-ROM

After the opening screen is displayed, press the «Agree» key to switch to the map screen.
When a screen other than the opening screen is displayed, press the «MAP» key.
Standard: The map screen should be displayed.
OK: Normal.
NG: If map screen is not displayed, any of the followings may be the cause.
- DVD-ROM is not set in the navigation system unit.
- DVD-ROM is inserted upside down.
- Wrong DVD-ROM is in.
- DVD-ROM has scratches or something.

If there are no problems on the DVD-ROM, the unit is faulty.

3. CHECK EACH CONNECTION

1) Press «Audio» key to display the Audio OFF screen.
2) Touch the screen in the order of (1) to (6) shown in the figure.



3) The display will switch to the Dealer Diag Menu screen.

• CHECK AUX

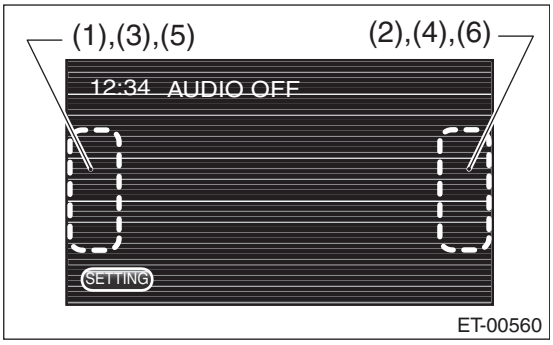
1) Touch {Connection Info.} on the «Dealer Diag Menu» screen.
2) Check that “Connect” is displayed in AUX.
Connect: Normal.
NC: Abnormal. Check the signal line connection. If there are no problems, the unit could be faulty.

• CHECK MICROPHONE

1) Touch {Connection Info.} on the «Dealer Diag Menu» screen.
2) Check that “Connect” is displayed in MIC.
Connect: Normal.
NC: Abnormal. Check the signal line connection. If there are no problems, the unit could be faulty.

4. CHECK EACH VEHICLE SIGNAL

1) Press «Audio» key to display the Audio OFF screen.
2) Touch the screen in the order of (1) to (6) shown in the figure.



3) The display will switch to the Dealer Diag Menu screen.

• CHECK GPS ANTENNA

NOTE:
When checking the GPS antenna, perform the check operation outdoors to improve the receiver sensitivity.
1) Touch {Vehicle Signal Info.} on the «Dealer Diag Menu» screen.
2) Check that “Connect” is displayed in the GPS Antenna item.
Connect: Normal.
NC: Abnormal. Check the GPS antenna connection.

• CHECK BACK SENSOR

NOTE:
Before starting inspections, check the safety around the rear end of the vehicle and then turn the ignition switch to ON.
1) Touch {Vehicle Signal Info.} on the «Dealer Diag Menu» screen.
2) Pull the parking brake and depress the brake, then put the gear in reverse.
3) Make sure that “ON” is displayed in the Reverse item.
ON: Normal.
OFF: Abnormal. Check the signal line connection. If there are no problems, the unit could be faulty.

• CHECK ILLUMINATION

NOTE:
Before starting inspections, turn the ignition switch to ON.
1) Touch {Vehicle Signal Info.} on the «Dealer Diag Menu» screen.
2) Turn the lighting switch to level 1.
Make sure that the bright switch is not turned ON at this time.
3) Make sure that “ON” lights in the Illumination item and then the screen becomes dim.
ON: Normal.
OFF: Abnormal. Check the signal line connector. If there are no problems, the unit could be faulty.

• CHECK SPEED SENSOR

NOTE:
• Before starting inspections, check the safety around the vehicle.
• Lift up the vehicle as necessary.
• When the diagnostic trouble code is input in the VDCCM, perform the Clear Memory operation.
1) Touch {Vehicle Signal Info.} on the «Dealer Diag Menu» screen.
2) Move the vehicle 2 to 3 meters (6.6 to 9.8 ft).
3) Check that “ON” is displayed in the Speed item.
ON: Normal.
OFF: Abnormal. Check the signal line connection. If there are no problems, the unit could be faulty.

• CHECK IGNITION SIGNAL

1) Touch {Vehicle Signal Info.} on the «Dealer Diag Menu» screen.
2) Turn the ignition switch to ON.
3) Check that “ON” is displayed in the IGN item.
ON: Normal.
OFF: Abnormal. Check the signal line connector. If there are no problems, the unit could be faulty.

• CHECK PARKING BRAKE SIGNAL

1) Touch {Vehicle Signal Info.} on the «Dealer Diag Menu» screen.
2) Pull parking brake lever.
3) Check that “ON” is displayed in the Parking item.
ON: Normal.
OFF: Abnormal. Check the signal line connector. If there are no problems, the unit could be faulty.

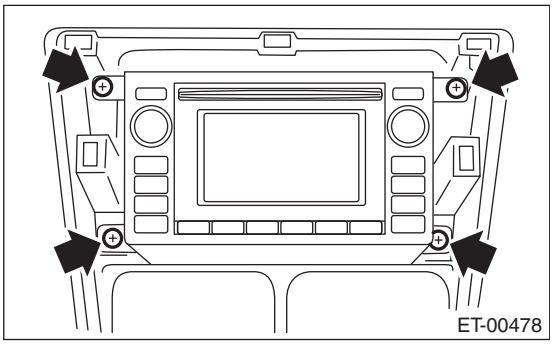
C: NOTE

For procedure of each component in the navigation system, refer to the respective section.
• Navigation unit: <Ref. to ET-17, Navigation Body.>
• GPS antenna: <Ref. to ET-18, GPS Antenna.>
• Rearview camera: <Ref. to ET-19, Rearview Camera System.>

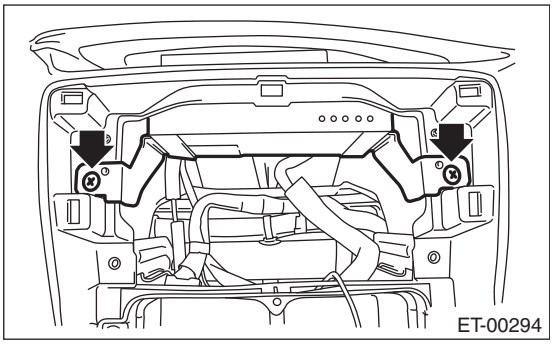
4. Audio

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the center panel. <Ref. to EI-50, CENTER PANEL, REMOVAL, Center Console.>
3) Remove the fitting screws, and slightly pull the audio out from the center console.



4) Disconnect the harness connectors and antenna feeder cord.
5) Remove the audio.
6) Remove the mounting screws and detach the satellite radio unit.



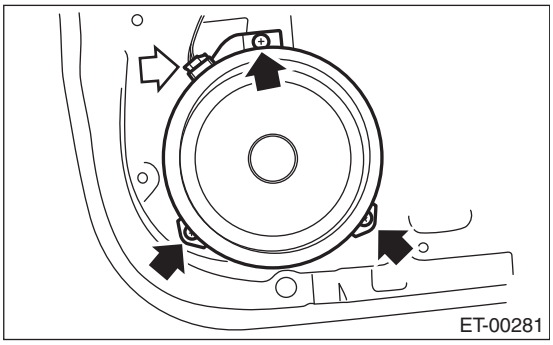
B: INSTALLATION

Install each part in the reverse order of removal.

5. Front Speaker

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the front door trim. <Ref. to EI-43, FRONT DOOR, REMOVAL, Door Trim.>
3) Remove the mounting screw of the front speaker.



4) Disconnect the harness connector and remove the front speaker.

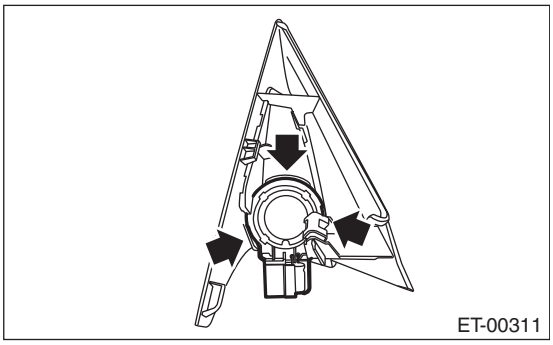
B: INSTALLATION

Install each part in the reverse order of removal.

6. Tweeter

A: REMOVAL

1) Disconnect the ground cable from the battery.
2) Disconnect the harness connector and remove the front door gusset cover.
3) Remove the claws and detach the tweeter.



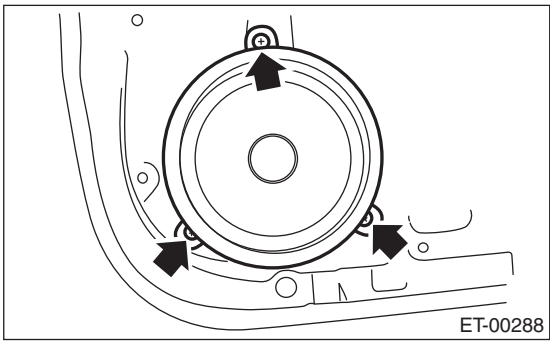
B: INSTALLATION

Install each part in the reverse order of removal.

7. Rear Speaker

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the rear door trim. <Ref. to EI-44, REAR DOOR, REMOVAL, Door Trim.>
3) Remove the mounting screw of the rear speaker.



4) Disconnect the harness connector and remove the rear speaker.

B: INSTALLATION

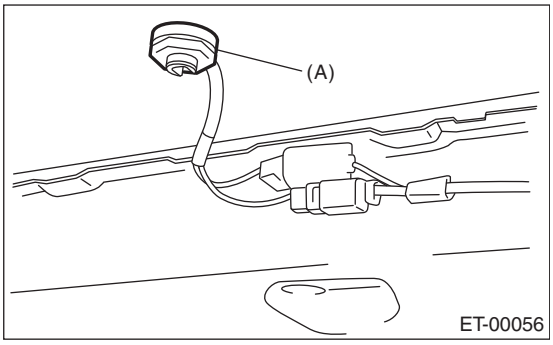
Install each part in the reverse order of removal.

8. Antenna

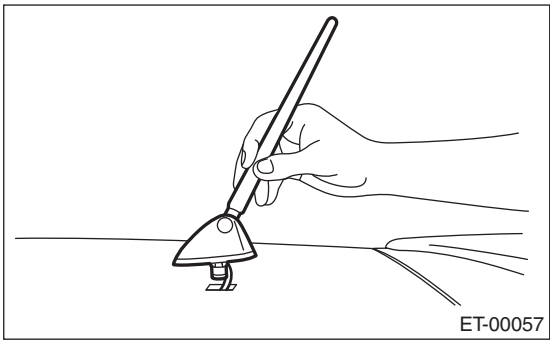
A: REMOVAL

1. ROOF ANTENNA

1) Remove the roof trim. <Ref. to EI-64, REMOVAL, Roof Trim.>
2) Disconnect the harness connector and terminal, and remove the mounting nut (A).



3) Pull out the antenna from the roof top.



2. FEEDER CORD

1) Remove the roof trim. <Ref. to EI-64, REMOVAL, Roof Trim.>
2) Remove the feeder cord from the roof trim.

B: INSTALLATION

Install each part in the reverse order of removal.

NOTE:
For how to attach the feeder cord, refer to the “Roof Trim” section. <Ref. to EI-65, INSTALLATION, Roof Trim.>

C: INSPECTION

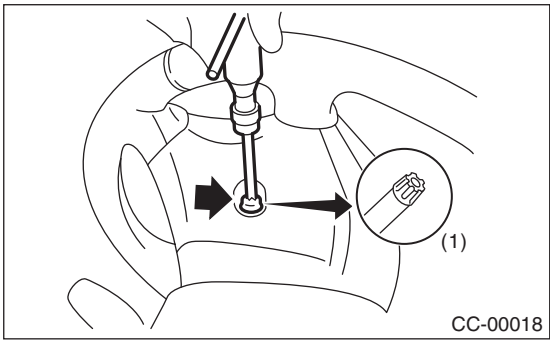
Check for cracks or damages.
Replace the antenna if defective.

9. Steering Satellite Switch

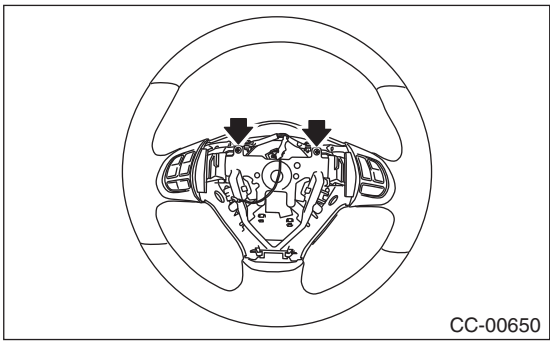
A: REMOVAL

CAUTION:
Before handling the airbag module, refer to "CAUTION" of "General Description" in "AIR-BAG SYSTEM". <Ref. to AB-5, CAUTION, General Description.>

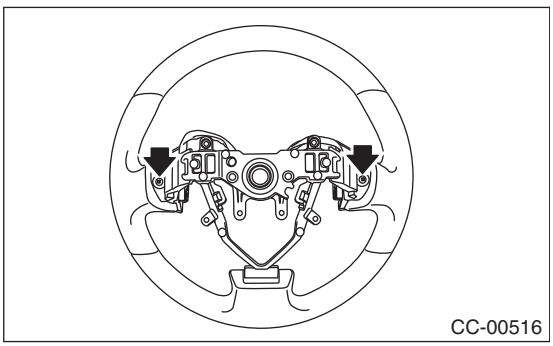
1) Set the front wheels in straight ahead position.
2) Turn the ignition switch to OFF.
3) Disconnect the ground cable from battery and wait for at least 60 seconds before starting work.
4) Using TORX® bit T30 (1), loosen two TORX® bolts which secure the driver's airbag module.



5) Disconnect the airbag module connector on back of the airbag module. <Ref. to AB-10, PROCEDURE, Airbag Connector.>
6) Remove the steering wheel. <Ref. to PS-13, REMOVAL, Steering Wheel.>
7) Remove the screws to remove the lower cover from steering wheel.



8) Loosen the screws on the backside of the steering wheel and remove the satellite switch.



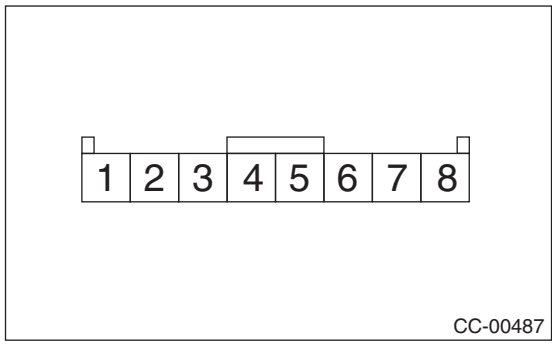
B: INSTALLATION

Install each part in the reverse order of removal.

C: INSPECTION

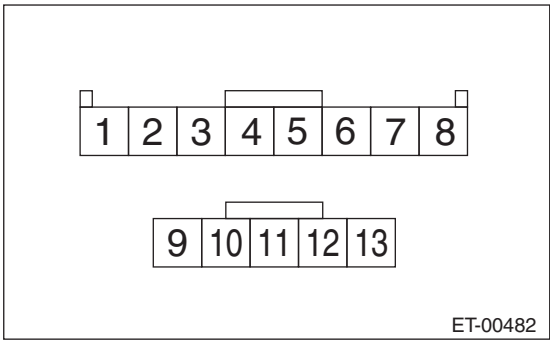
1) Remove the airbag module from the steering wheel. <Ref. to AB-18, REMOVAL, Driver's Airbag Module.>
2) Check the resistance between satellite switch connector terminals.

- Model with normal audio and navigation



Switch	Position	Terminal No.	Standard
Mute Volume (+) Volume (–) Mode SEEK (╱╲) SEEK (╲╱)	All OFF	4 and 5	Approx. 4.7 kΩ
Mute	ON	4 and 5	Approx. 22 Ω
Volume (+)	ON	4 and 5	Approx. 90 Ω
Volume (–)	ON	4 and 5	Approx. 200 Ω
Mode	ON	4 and 5	Approx. 360 Ω
Preset CH UP/ SEEK (╱╲)	ON	4 and 5	Approx. 690 Ω
Preset CH DOWN/SEEK (╲╱)	ON	4 and 5	Approx. 1.5 kΩ

- Model with premium audio (Bluetooth applicable)



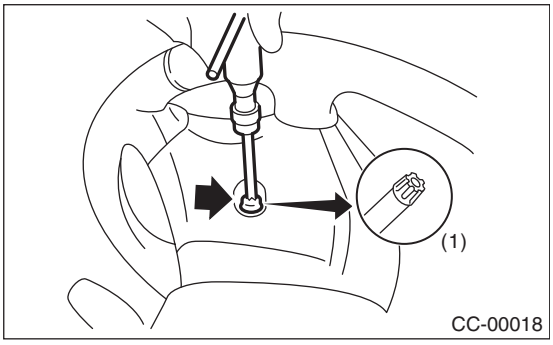
Switch	Position	Terminal No.	Standard
Volume (+) Volume (–) Mode SEEK (△) SEEK (▽)	All OFF	4 and 5 5 and 11	Approx. 100 kΩ
Volume (+)	ON	4 and 5	Approx. 1010 Ω
Volume (–)	ON	4 and 5	Approx. 3.21 kΩ
Mode	ON	5 and 11	Less than 1 Ω
SEEK (△)	ON	4 and 5	Less than 1 Ω
SEEK (▽)	ON	4 and 5	Approx. 330 Ω

3) Replace the satellite switch if the inspection result is not within the standard value.

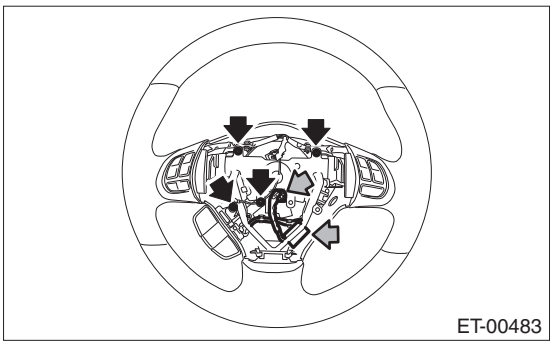
10.Steering Switch

A: REMOVAL

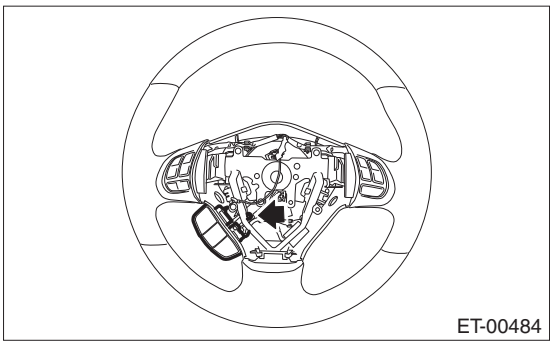
1) Set the front wheels in straight ahead position.
2) Turn the ignition switch to OFF.
3) Disconnect the ground cable from battery and wait for at least 60 seconds before starting work.
4) Using TORX® bit T30 (1), loosen two TORX® bolts which secure the driver's airbag module.



5) Disconnect the airbag module connector on back of the airbag module. <Ref. to AB-10, PROCEDURE, Airbag Connector.>
6) Remove the steering wheel.
7) Remove the screws, disconnect the steering switch connector, and remove the lower cover from steering wheel.



8) Remove the screws and remove the steering switch.

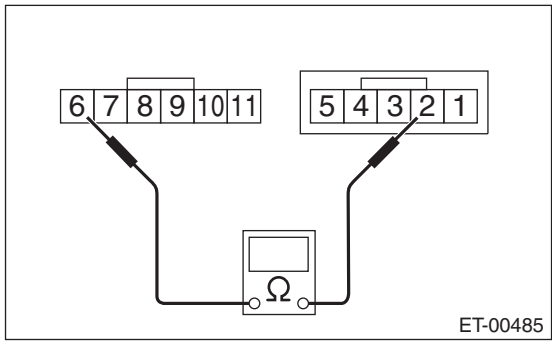


B: INSTALLATION

Install each part in the reverse order of removal.

C: INSPECTION

1) Remove the airbag module from the steering wheel. <Ref. to AB-18, REMOVAL, Driver's Airbag Module.>
2) Connect the tester as shown in the figure, then check resistance between terminals when each switch is pressed.



Switch	Resistance
No switch pressed	1 MΩ or more
HOOK ON	Approx. 330 Ω
HOOK OFF	Approx. 1010 Ω
TALK	Approx. 3.21 kΩ

3) If internal resistance is out of specification shown in the above table, replace the steering switch.

11.Navigation Body

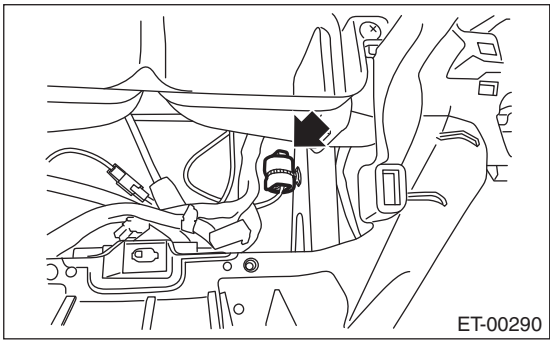
A: PROCEDURE

For the removal and installation operation procedures of navigation unit, refer to the removal and installation procedures of the audio unit. <Ref. to ET-9, Audio.>

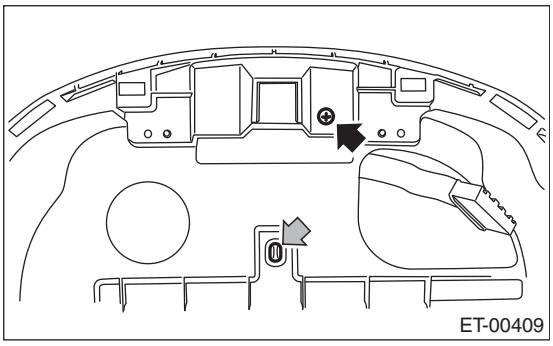
12.GPS Antenna

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the center panel. <Ref. to EI-50, CENTER PANEL, REMOVAL, Center Console.>
3) Remove the navigation body. <Ref. to ET-17, PROCEDURE, Navigation Body.>
4) Disconnect the connector (green) of GPS antenna.



NOTE:
Attach a string of about 50 cm in length, etc. to the GPS antenna connector for easy installation work.
5) Remove the combination meter assembly. <Ref. to IDI-21, REMOVAL, Combination Meter.>
6) Remove the screw and harness clamp to remove the GPS antenna.



NOTE:
When the GPS antenna harness connector is pulled out, remove the string attached to the connector in step 4).

B: INSTALLATION

Install each part in the reverse order of removal.

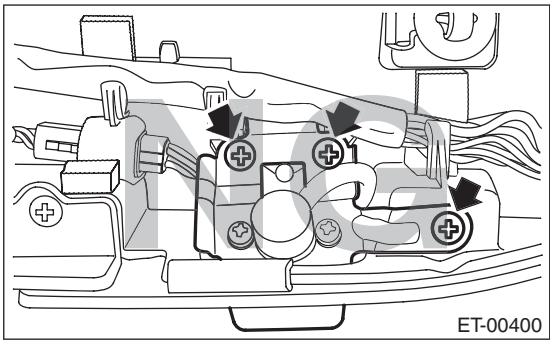
13.Rearview Camera System

A: WIRING DIAGRAM

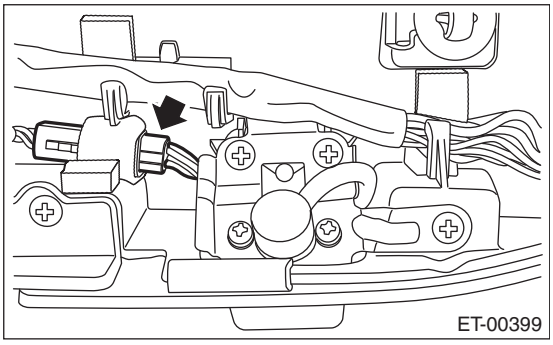
Refer to “Rearview Camera System” in the wiring diagram. <Ref. to WI-136, WIRING DIAGRAM, Rearview Camera System.>

B: REMOVAL

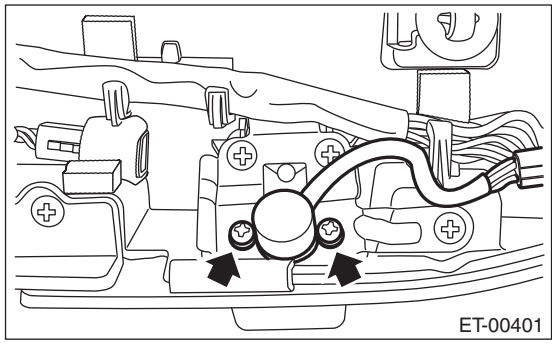
CAUTION:
• Do not drop or apply any impact to the rearview camera because it is a precision equipment.
• When removing the rearview camera, remove the screws located at the specified position only. Do not remove the screws attaching the bracket. Removing them will decrease the rearview camera attaching force.



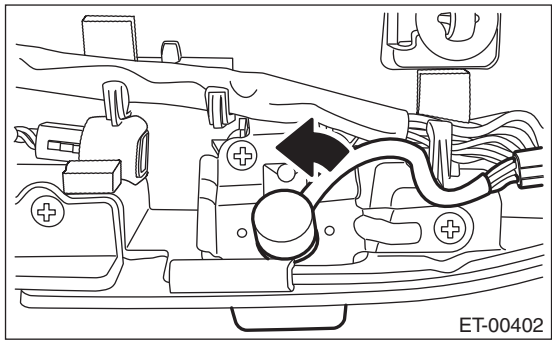
1) Disconnect the ground cable from battery.
2) Remove the rear gate trim. <Ref. to EI-67, REMOVAL, Rear Gate Trim.>
3) Remove the rear wiper motor. <Ref. to WW-20, REMOVAL, Rear Wiper Motor.>
4) Remove the rear gate garnish. <Ref. to EI-69, REMOVAL, Rear Gate Garnish.>
5) Remove the rearview camera assembly.
(1) Disconnect the connector.



(2) Pull out the harness, and then remove the screws.



(3) Rotate the camera harness to remove the rearview camera.



C: INSTALLATION

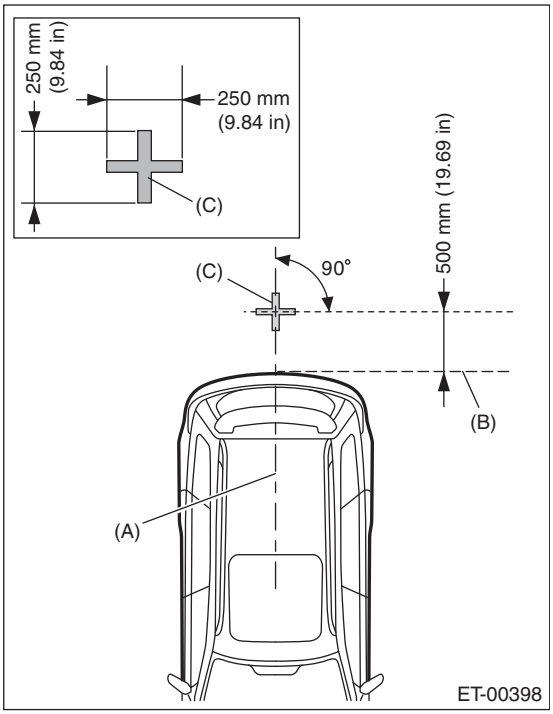
CAUTION:
• If the urethane foam of connector is removed during removal, be sure to apply new urethane foam.
• Be sure to confirm the marker position, whenever the rearview camera is removed/installed/replaced.
Install each part in the reverse order of removal.

Tightening torque:
Rear gate garnish: 4.5 N·m (0.46 kgf-m, 3.3 ft-lb)
Rear wiper motor & wiper arm: <Ref. to WW-4, REAR WIPER, COMPONENT, General Description.>

D: INSPECTION

1) Park the vehicle at the level place where there are enough area at the rear of the vehicle.
2) Attache the tape as the target point for standard at the floor rearward of the vehicle as shown in the figure below.

NOTE:
Standard tape width is about 30 — 50 mm (1.18 — 1.97 in) and brilliant color shall be used.



(A) Vehicle body center line
(B) Rear edge of bumper
(C) Target point

3) Confirm the following before checking the corresponding items.
- If the display is blank.

Rearview camera image is not displayed. (Navigation screen or display audio screen is displayed normally.)

1. Check the condition of back sensor connection. <Ref. to ET-8, CHECK EACH VEHICLE SIGNAL, INSPECTION, Navigation System.>
2. Check the condition of rearview camera connection. <Ref. to ET-7, CHECK EACH CONNECTION, INSPECTION, Navigation System.>

- If the marker is not displayed.

Check the condition of vehicle selection. <Ref. to ET-20, VEHICLE SELECTION MODE, ADJUSTMENT, Rearview Camera System.>

- If the marker position is not aligned.

Adjust the marker position according to the MARKER ADJUSTMENT MODE. <Ref. to ET-21, MARKER ADJUSTMENT MODE, ADJUSTMENT, Rearview Camera System.>

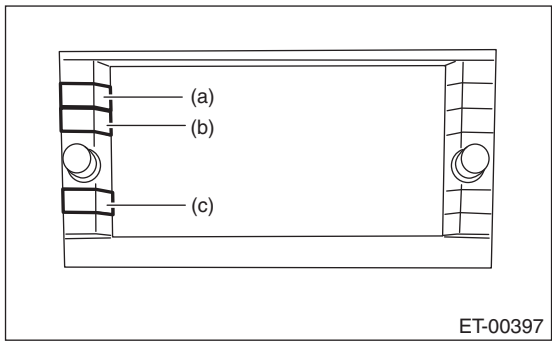
E: ADJUSTMENT

1. VEHICLE SELECTION MODE

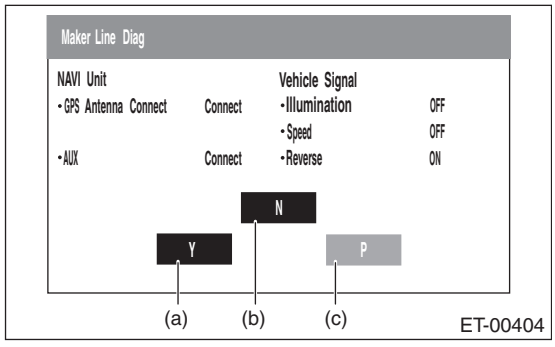
• Navigation system

CAUTION:
When replacing the navigation unit, be sure to replace with specified navigation unit. The marker adjustment can not be performed correctly if replacing with unspecified navigation unit.

1) When the map screen is displayed, press the (b) key for one second while pressing the (a) key + (c) key.



2) When the Maker Line Diag menu screen is displayed, confirm the «P» key is selected.
If the «P» key is not selected, select the «P» key. (Press)



(a) Y key
(b) No marker line (not used)
(c) P key

3) Turn the ignition switch to OFF and wait for 60 seconds or more before finishing the procedures.

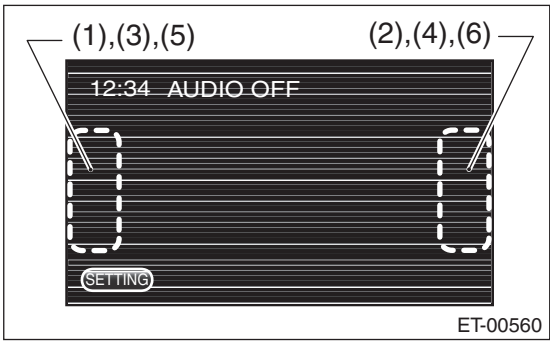
CAUTION:
Do not turn the ignition switch to ON or disconnect the ground cable from battery within 60 seconds after turning the ignition switch to OFF. The navigation unit data updating can not be performed correctly.

2. MARKER ADJUSTMENT MODE

• Navigation system

CAUTION:
When replacing the navigation unit, be sure to replace with specified navigation unit. The marker adjustment can not be performed correctly if replacing with unspecified navigation unit.

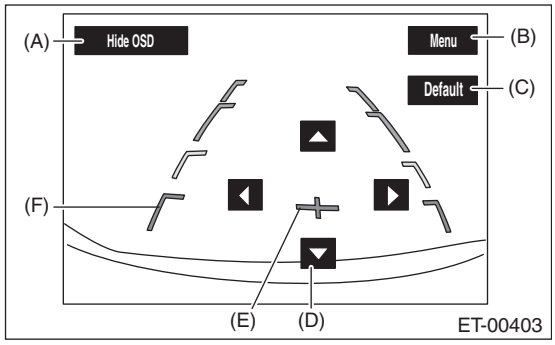
1) Prepare the target point. <Ref. to ET-20, INSPECTION, Rearview Camera System.>
2) Display the audio OFF screen by turning the ignition switch to ON, then touch the screen in the order of (1) — (6).



3) When the Dealer Diag menu screen is displayed, touch the “RearCamera Setup” from the items.

CAUTION:
Do not select the item other than “RearCamera Setup”. The navigation system can not operate normally.

4) Shift the select lever to the “R” position to display the image of the rearview camera.
5) Touch the adjustment keys on the display screen to adjust the marker line.



(A) Hide OSD key
(B) Menu key
(C) Default key
(D) Adjustment keys
(E) Cross line
(F) Vehicle width and distance reference line

(1) Confirm that the target point position in the display screen is identified.
(2) Adjust by touching the adjustment keys so that the cross line (E) and target point join together.

NOTE:
• Hide OSD key: Touching the Hide OSD key hides the operation keys. When the operation keys are not displayed, touching the display screen displays the operation keys again.
• Menu key: Touching this key shifts to the Dealer Diag Menu screen.
• Default key: Touching this key resets the adjustment values to the default condition.

6) Turn the ignition switch to OFF and wait for 60 seconds or more before turning the ignition switch to ON again.

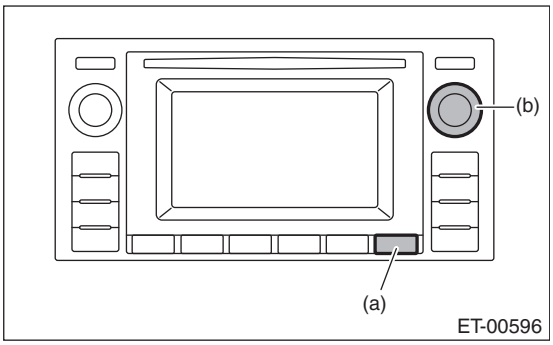
CAUTION:
If the ignition switch is turned to OFF, be sure to wait for 60 seconds or more before turning the ignition switch to ON again.
If turning the ignition switch to ON again or disconnecting the ground cable from battery within 60 seconds after turning the ignition switch to OFF, the navigation unit data updating can not be performed correctly.

7) Shift the select lever to the “R” position to display the image of the rearview camera.
8) Confirm that the marker line position is correctly adjusted before turning the ignition switch to OFF, then finish the procedures.

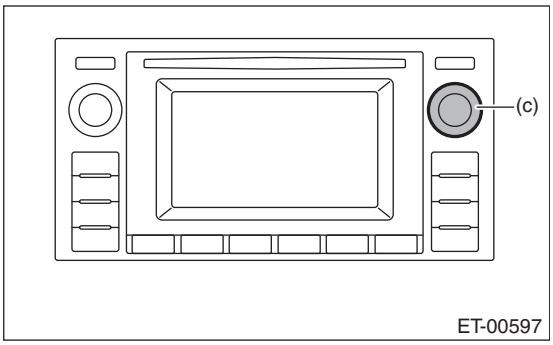
• **Display audio**

CAUTION:
When replacing the audio unit, be sure to replace with specified audio unit. The marker adjustment can not be performed correctly if replacing with unspecified audio unit.

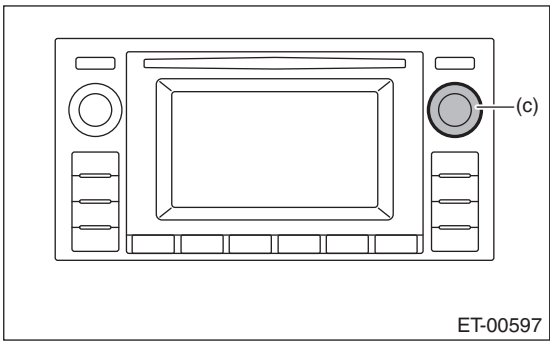
1) With the main power OFF, turn the TUNE/TRACK/CH dial (b) by 30 clicks while pressing the preset 6 key (a).



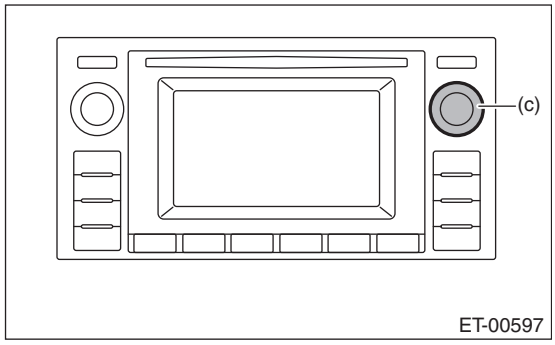
2) When the version information screen is displayed, press the MENU/ENTER key (c).



3) When the uploader screen is displayed, press the MENU/ENTER key (c).



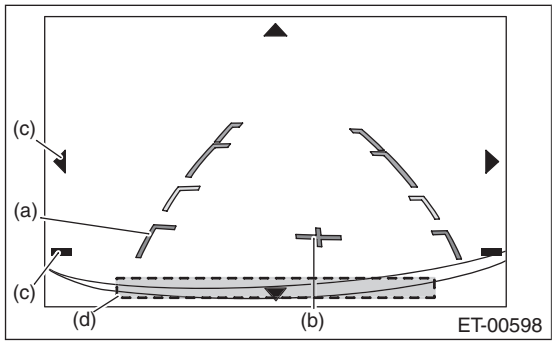
4) When the rearview camera marker adjust screen is displayed, press and hold the MENU/ENTER key (c).



NOTE:
When the ENTER key (c) is tapped, the version information screen is displayed again.

5) With the image of the rearview camera displayed, adjust the rearview camera marker.

CAUTION:
Operate the keys shown in the table only.



(a) Line marker line
(b) Center marker
(c) Bumper marker
(d) Warning message display position

Key operation	Contents
TUNE/TRACK/CH dial CCW	Line marker moves upward.
TUNE/TRACK/CH dial CW	Line marker moves downward.
» key	Line marker moves to the right.
« key	Line marker moves to the left.
MENU/ENTER key	Modified line marker position is determined, and then rearview camera marker screen is displayed.

6) Turn the ignition switch to OFF and wait for 60 seconds or more before finishing the procedures.

CAUTION:
Do not turn the ignition switch to ON or disconnect the ground cable from battery within 60 seconds after turning the ignition switch to OFF. The audio unit data updating can not be performed correctly.

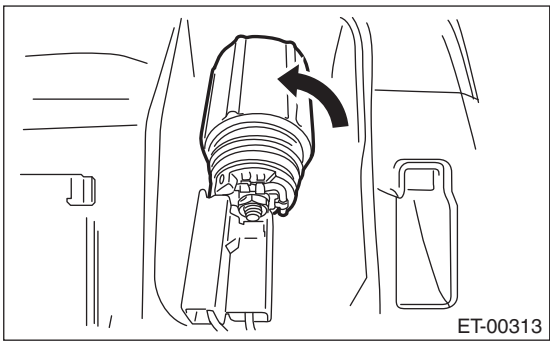
14.Front Accessory Power Supply Socket

A: WIRING DIAGRAM

Refer to “Front Accessory Power Supply Socket System” in the wiring diagram. <Ref. to WI-130, WIRING DIAGRAM, Front Accessory Power Supply Socket System.>

B: REMOVAL

1) Disconnect the ground cable from the battery.
2) Remove the instrument panel lower cover. <Ref. to EI-52, INSTRUMENT PANEL LOWER, REMOVAL, Center Console.>
3) Disconnect the harness connectors and remove the front accessory power supply socket.



C: INSTALLATION

Install each part in the reverse order of removal.

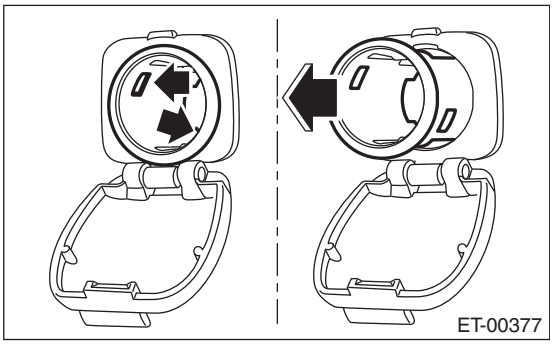
15.Rear Accessory Power Supply Socket

A: WIRING DIAGRAM

Refer to “Rear Accessory Power Supply Socket System” in the wiring diagram. <Ref. to WI-131, WIRING DIAGRAM, Rear Accessory Power Supply Socket System.>

B: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the console box. <Ref. to EI-49, REMOVAL, Console Box.>
3) Disconnect the harness connector, and remove the claws (two) in accessory power supply socket.
4) Pull the accessory power supply socket out to remove.



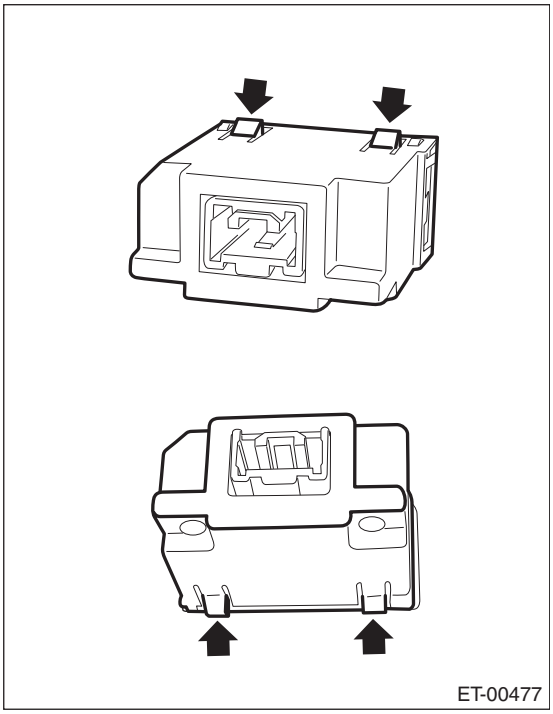
C: INSTALLATION

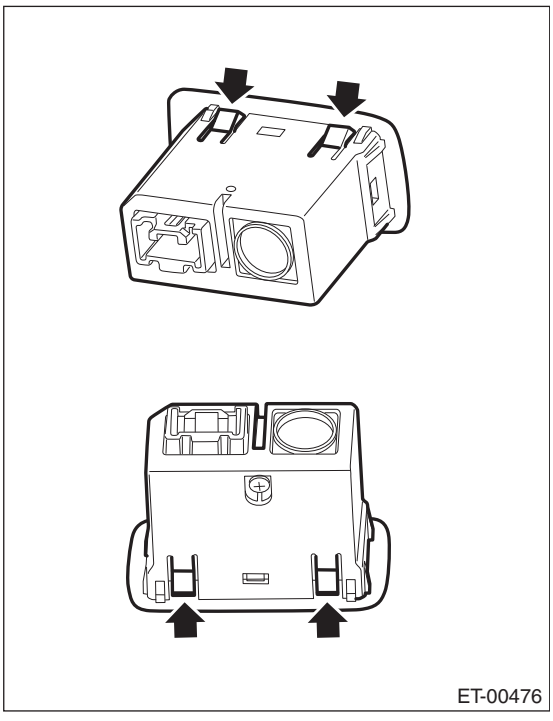
Install each part in the reverse order of removal.

16.AUX Input Terminal

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the console box. <Ref. to EI-49, REMOVAL, Console Box.>
3) Disconnect the harness connector.
4) Remove the four claws to remove the AUX input terminal by pushing it into the console box.





B: INSTALLATION

Install each part in the reverse order of removal.

17.Microphone

A: PROCEDURE

Refer to “Spot Map Light” for removal and installation procedures of microphone. <Ref. to LI-36, Spot Map Light.>

B: INSPECTION

1) Check the connection status of the microphone.
2) Replace the spot map light assembly if the microphone is found defective. <Ref. to LI-36, REMOVAL, Spot Map Light.>

COMMUNICATION SYSTEM

COM

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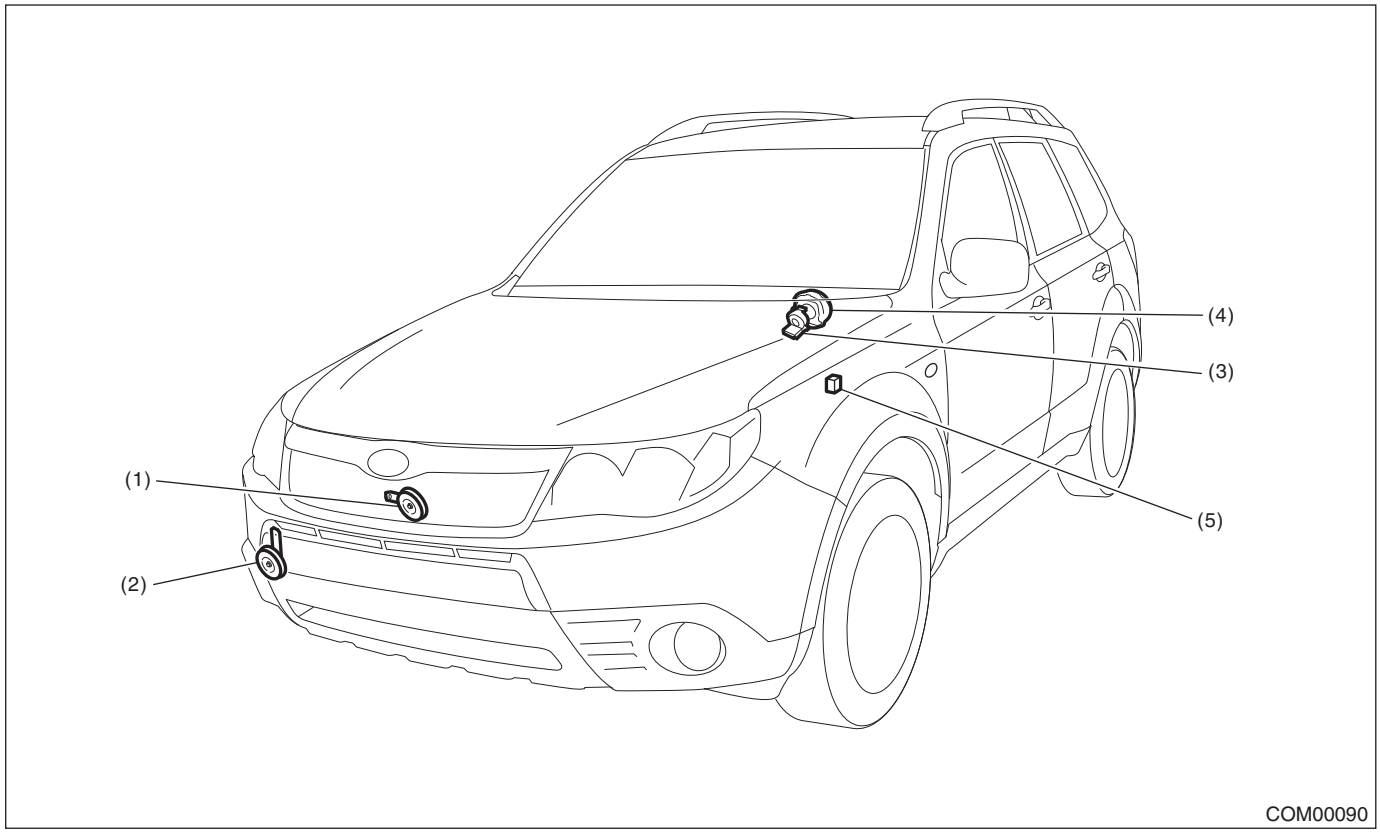
2. Horn System 3
3. Horn 4
4. Horn Switch 5

1. General Description

A: COMPONENT



(1) Lo side horn
(2) Hi side horn
(3) Roll connector
(4) Horn switch (Driver's airbag module ASSY)
(5) Horn relay

B: CAUTION

• Before disassembling or reassembling parts, always disconnect the battery ground cable from battery. When replacing the audio, control module 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.
• Connect the connectors securely during reassembly.
• After reassembly, make sure that the functional parts operate normally.

C: PREPARATION TOOL

1. GENERAL TOOL

TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance and voltage.
TORX® T30	Used for removal/installation of drivers airbag module

2. Horn System

A: WIRING DIAGRAM

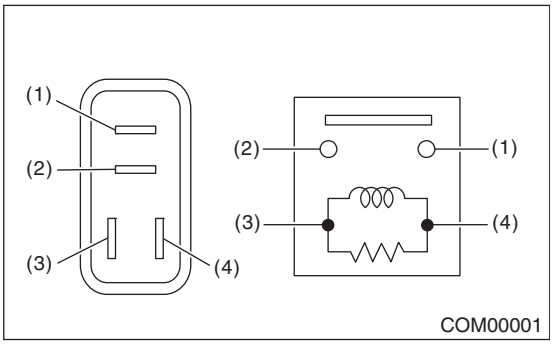
Refer to “Horn System” in the wiring diagram. <Ref. to WI-138, WIRING DIAGRAM, Horn System.>

B: INSPECTION

Symptoms	Inspection steps
Horn does not sound	1. Check the fuse.
	2. Check the horn relay.
	3. Check the role connector.
	4. Check the horn switch.
	5. Check the horn assembly.
	6. Check the harness.

1. HORN RELAY

1) Connect terminal No. 4 to the battery positive terminal and the terminal No. 3 to the battery negative terminal, and check the resistance value between the horn relay terminals.



Continuity	Terminal No.	Standard
Yes	1 and 2	Less than 1 Ω
No		1 MΩ or more

2) Replace the horn relay if the inspection result is not within the standard value.

C: NOTE

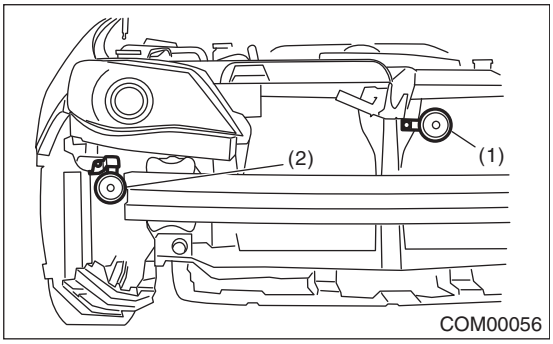
For procedure of each component in the horn system, refer to the respective section.

- Horn assembly: <Ref. to COM-4, Horn.>
- Horn switch: <Ref. to COM-5, Horn Switch.>

3. Horn

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the front bumper face. <Ref. to EI-29, FRONT BUMPER FACE, REMOVAL, Front Bumper.>
3) Disconnect the harness connector.
4) Remove the horn bracket mounting bolt to remove the horn assembly.



(1) Low side horn
(2) High side horn

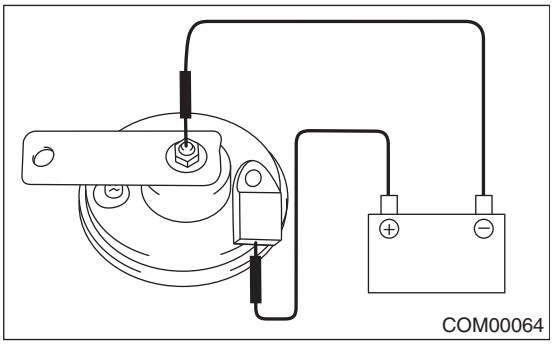
B: INSTALLATION

Install each part in the reverse order of removal.

Tightening torque:
Lo side: 18 N·m (1.84 kgf-m, 13.3 ft-lb)
Hi side: 13 N·m (1.33 kgf-m, 9.6 ft-lb)

C: INSPECTION

1) Remove the horn. <Ref. to COM-4, REMOVAL, Horn.>
2) Check the horn sounds when applying the battery voltage to the horn assembly.



3) If it does not operate normally, replace the horn assembly.

4. Horn Switch

A: REMOVAL

WARNING:
Always refer to "CAUTION" of "General Description" in "AIRBAG SYSTEM" before handling the airbag module. <Ref. to AB-5, CAUTION, General Description.>

NOTE:
Horn switch is a unit with the driver's airbag module.
1) Disconnect the ground cable from battery and wait for at least 60 seconds before starting work.
2) Remove the driver's airbag module. <Ref. to AB-18, REMOVAL, Driver's Airbag Module.>

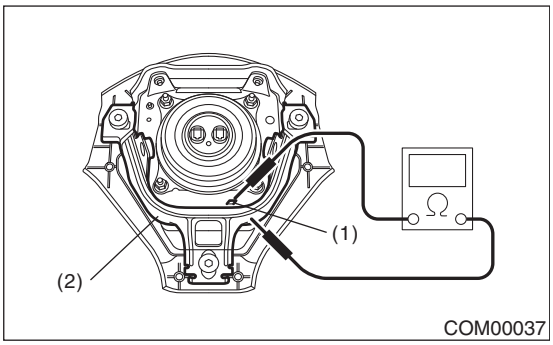
B: INSTALLATION

Install each part in the reverse order of removal.

Tightening torque:
Driver's airbag module: 10 N·m (1.02 kgf-m, 7.4 ft-lb)

C: INSPECTION

1) Remove the horn switch. <Ref. to COM-5, REMOVAL, Horn Switch.>
2) Check the resistance between horn switch terminal and airbag module bracket.



(1) Horn switch terminal
(2) Airbag module bracket

Switch position	Terminal No.	Standard
The airbag module bracket being pushed	Horn switch terminal and airbag module bracket	Less than 1 Ω
The airbag module bracket being separated		1 MΩ or more

3) Replace the driver's airbag module if the inspection result is not within the standard value.

GLASS/WINDOWS/MIRRORS

GW

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17.	Rearview Mirror	33
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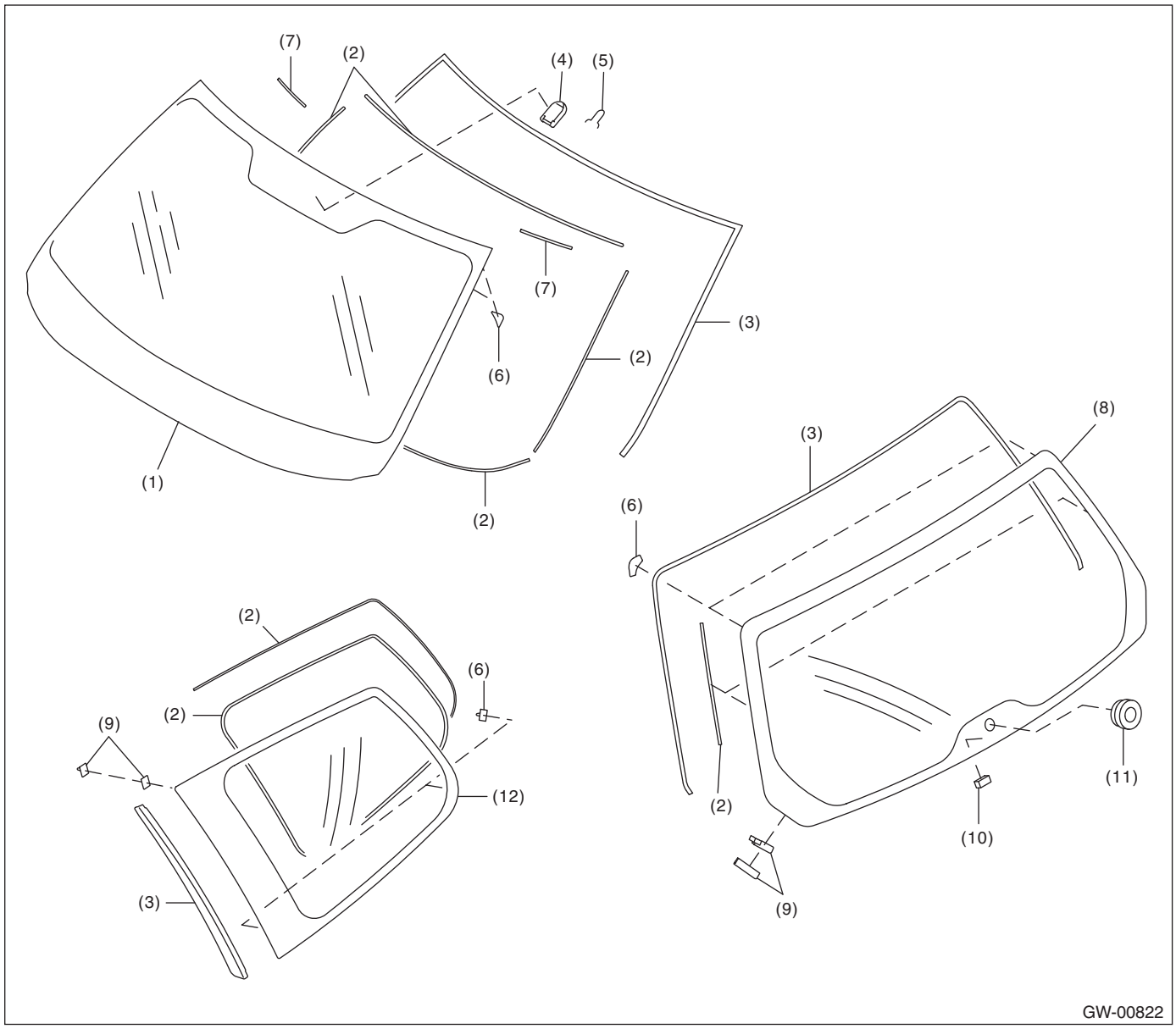
1. General Description

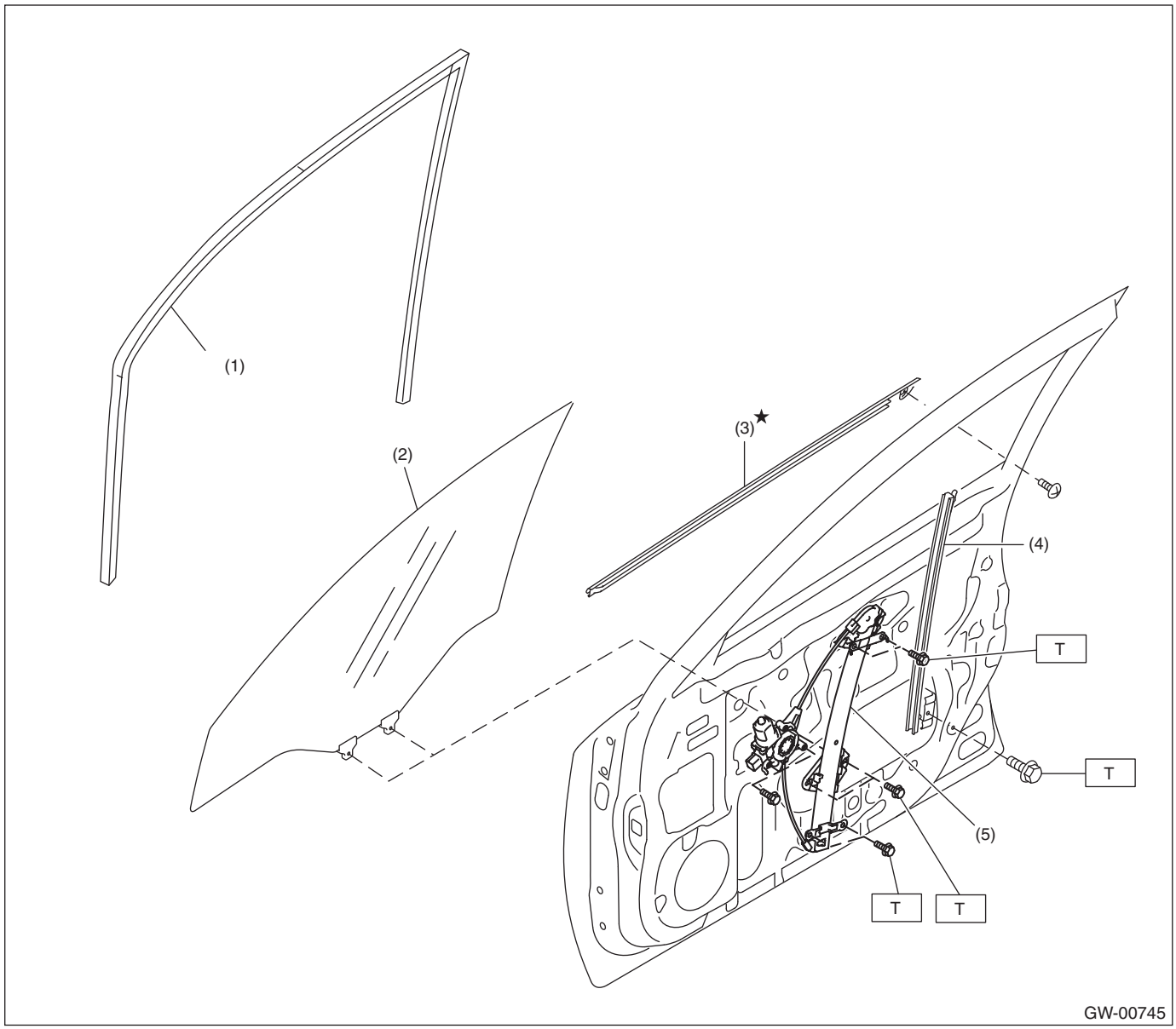
A: COMPONENT

1. FIXED GLASS



(1) Windshield glass
(2) Dam rubber
(3) Molding
(4) Rearview mirror mount
(5) Spring
(6) Locating pin
(7) Seal
(8) Rear gate glass
(9) Fastener
(10) Rubber spacer
(11) Pivot
(12) Rear quarter glass

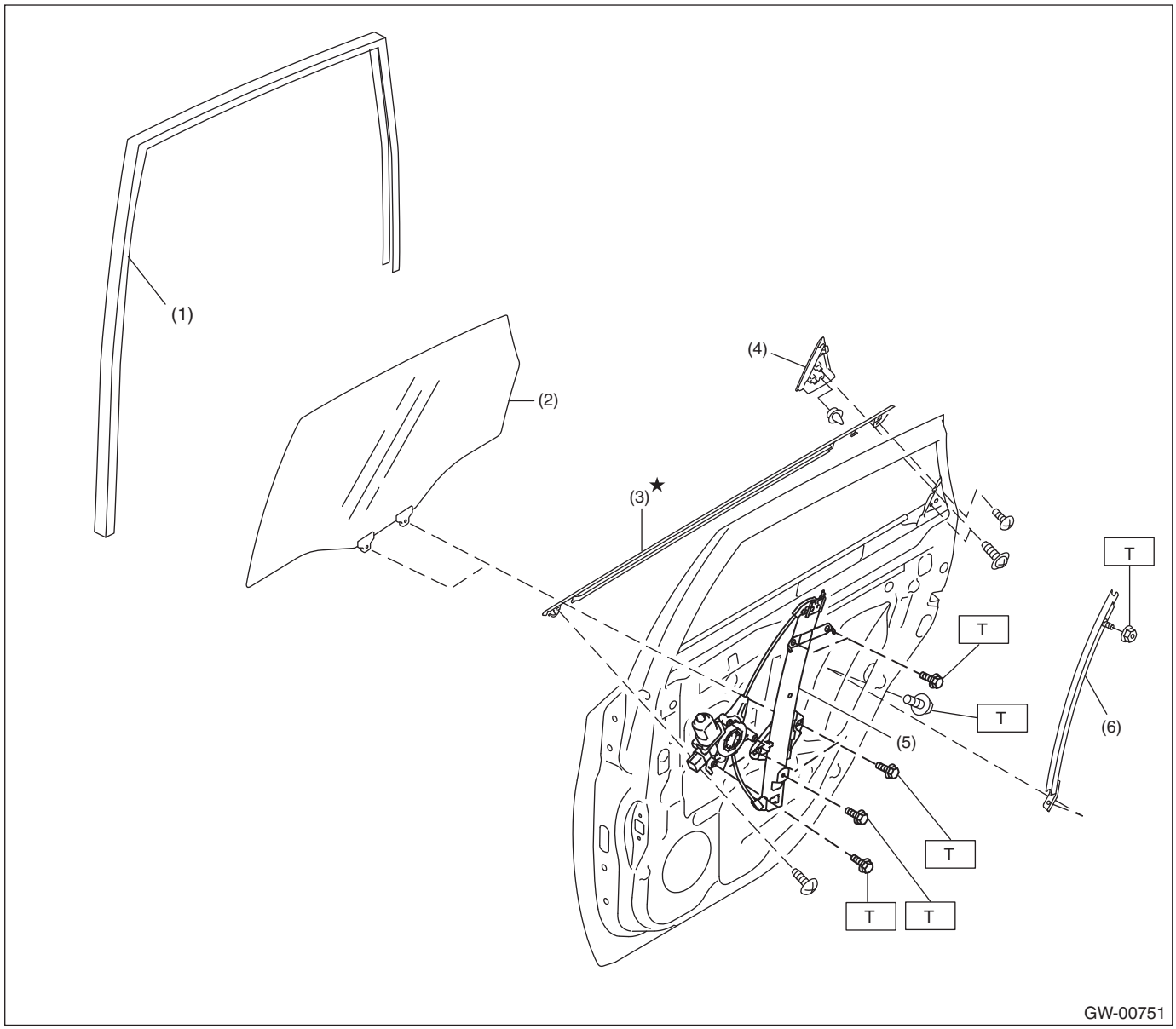
2. FRONT DOOR GLASS



(1) Glass run rubber
(2) Glass
(3) Weather strip outer
(4) Door sash
(5) Regulator and motor ASSY

Tightening torque:N·m (kgf-m, ft-lb)
T: 7.5 (0.76, 5.5)

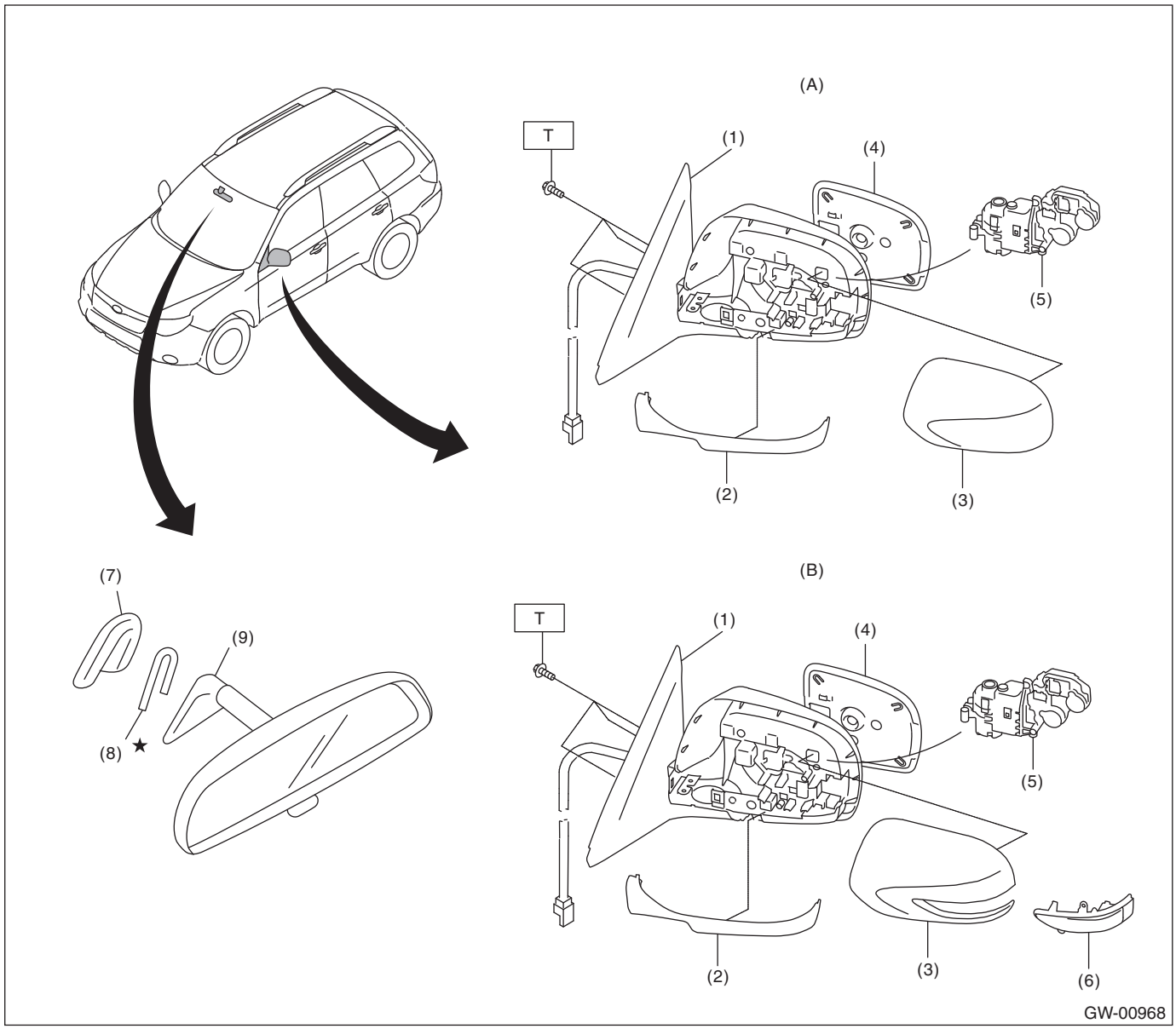
3. REAR DOOR GLASS



(1) Glass run rubber
(2) Glass
(3) Weather strip outer
(4) Rear outer gusset cover
(5) Regulator and motor ASSY
(6) Door sash

Tightening torque:N·m (kgf-m, ft-lb)
T: 7.5 (0.76, 5.5)

4. MIRROR



(A)	Model without turn signal light	(B)	Model with turn signal light		
(1)	Outer mirror case ASSY	(5)	Mirror motor ASSY	(9)	Rearview mirror ASSY
(2)	Outer mirror lower cover	(6)	Side turn signal light ASSY		
(3)	Scalp cap	(7)	Mount		
(4)	Outer mirror	(8)	Spring		

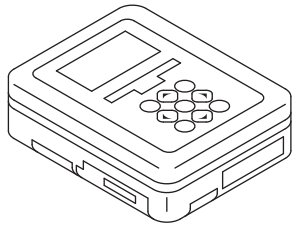
Tightening torque:N·m (kgf-m, ft-lb)
T: 4.5 (0.46, 3.3)

B: CAUTION

- Before disassembling or reassembling parts, always disconnect the battery ground cable from battery. When replacing the audio, control module and other parts provided with memory functions, record the memory contents before disconnecting the battery ground cable. Otherwise, the memory is cleared.
- Avoid impact and damage to the glass.
- Reassemble the parts in the reverse order of disassembly procedure unless otherwise indicated.
- Connect the connectors securely during reassembly.
- After reassembly, make sure that the functional parts operate normally.

C: PREPARATION TOOL

1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST1B022XU0	1B022XU0	SUBARU SELECT MONITOR III KIT	Used for setting of each function and trouble-shooting for electrical system.

2. GENERAL TOOL

TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance and voltage.
Piano wire	Used for removing the window glass.
Cutter knife	Used for removing the window glass.
Windshield glass knife	Used for removing the window glass.

2. Power Window System

A: WIRING DIAGRAM

Refer to “Power Window System” in the wiring diagram. <Ref. to WI-139, WIRING DIAGRAM, Power Window System.>

B: INSPECTION

Symptoms	Repair order
All power windows do not operate.	1. Check the fuse (SBF-4). 2. Check the power window circuit breaker. 3. Check the power window relay. 4. Check the wiring harness.
Particular window does not operate.	1. Check the power window main switch. 2. Check the power window sub-switch. 3. Check the power window motor. 4. Check the wiring harness.
“Window Lock” does not operate.	Check the power window main switch.
Driver’s side window moves slightly (approx. 20 mm (0.79 in)). (model with driver’s side AUTO UP function)	1. Check the power window motor. 2. Check the power window main switch. 3. Check the wiring harness.
Driver’s side window moves slightly (approx. 50 mm (1.97 in)). (model with driver’s side AUTO UP function) (This status is not a failure.)	Perform reset operation A. <Ref. to GW-7, RESET OPERATION A, INSPECTION, Power Window System.>
Driver’s side window does not close completely. (model with driver’s side AUTO UP function) (Using AUTO UP allows the window to fully close first and then move in reverse resulting in slightly opening.)	Perform reset operation B. <Ref. to GW-7, RESET OPERATION B, INSPECTION, Power Window System.>

1. RESET OPERATION A

1) Sit in the driver’s seat and close the door.
2) Turn the ignition switch to ON.
3) Operate the power window main switch to open the window glass halfway.
4) Operate the power window main switch to “UP” direction to fully close the driver’s side window glass.
5) While the window glass is fully closed, hold down the power window switch to “UP” direction for one second.
6) Operate the power window main switch to “AUTO DOWN” direction to check whether the window fully opens properly. If the window does not fully open properly, repeat steps 1) to 6).

2. RESET OPERATION B

1) Sit in the driver’s seat and close the door.
2) Turn the ignition switch to ON.
3) Perform “AUTO UP” operation for the driver’s side window glass, by fully pulling up the power window main switch to cause the reverse operation (in reverse operation, the window is repeatedly fully closed and then reversed to open it slightly.) 10 times in row.
4) Check that the “AUTO UP” does not operate.
5) Perform reset operation A.
6) Check that the window operates properly by operating the “AUTO UP” and “AUTO DOWN” switch. If the window does not fully open/close properly, repeat steps 1) to 6).

C: NOTE

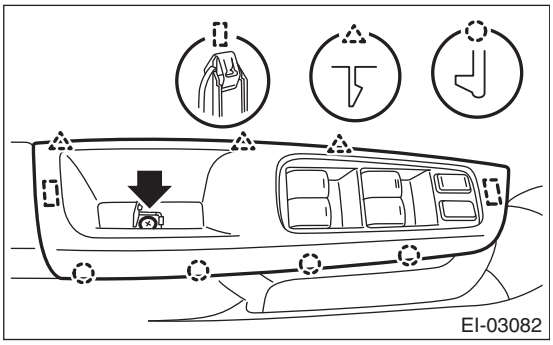
For procedure of each component in the power window system, refer to the respective section.
- Power window control switch: <Ref. to GW-9, Power Window Control Switch.>
- Front door glass: <Ref. to GW-12, Front Door Glass.>
- Front regulator and motor assembly: <Ref. to GW-13, Front Regulator and Motor Assembly.>
- Rear door glass: <Ref. to GW-19, Rear Door Glass.>
- Rear regulator and motor assembly: <Ref. to GW-20, Rear Regulator and Motor Assembly.>

3. Power Window Control Switch

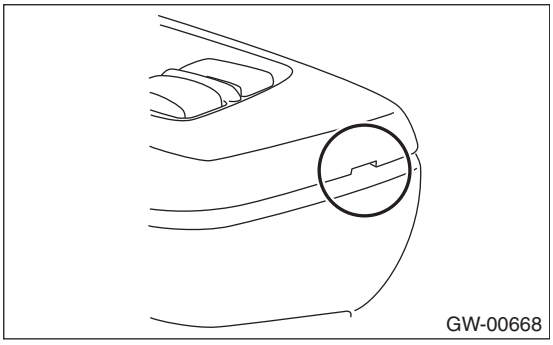
A: REMOVAL

1. MAIN SWITCH

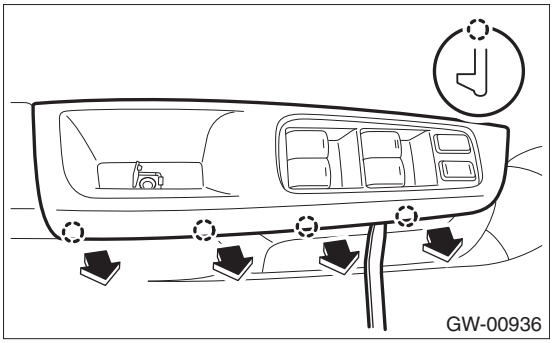
1) Disconnect the ground cable from battery.
2) Remove the power window switch panel.



(1) Open the cover and remove the screws.
(2) Lift up the tip of switch panel by using a plastic remover.



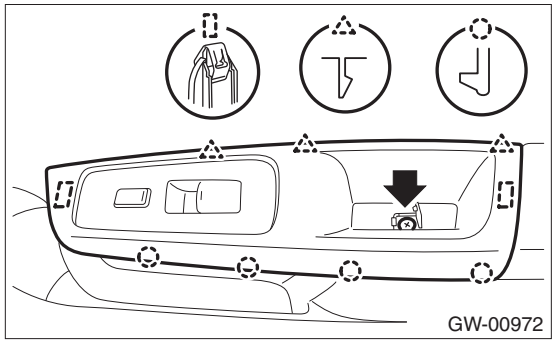
(3) Disengage the end face tabs by using a plastic remover.



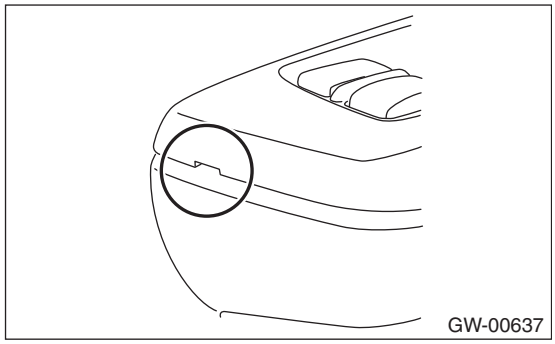
(4) Remove the power window switch panel.
3) Disconnect the main switch connector.
4) Remove the screws to remove the power window main switch assembly.

2. SUB-SWITCH

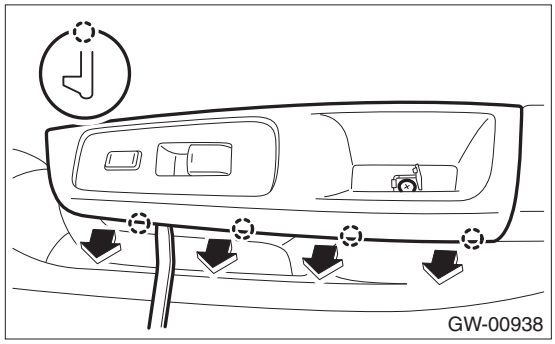
1) Remove the power window switch panel.



(1) Open the cover and remove the screws.
(2) Lift up the tip of switch panel by using a plastic remover.



(3) Disengage the end face tabs by using a plastic remover.



(4) Remove the power window switch panel.
2) Disconnect the sub-switch connector.
3) Remove the screws to remove the power window sub-switch assembly.

B: INSTALLATION

CAUTION:
After installation of main switch, always perform the reset operation A (initial setting). (model with driver's side AUTO UP function)
Failure to do so may cause the improper activation of auto-reverse operation for pinching hazard prevention. <Ref. to GW-7, RESET OPERATION A, INSPECTION, Power Window System.>
Install each part in the reverse order of removal.

C: INSPECTION

1. MAIN SWITCH

• Driver's seat

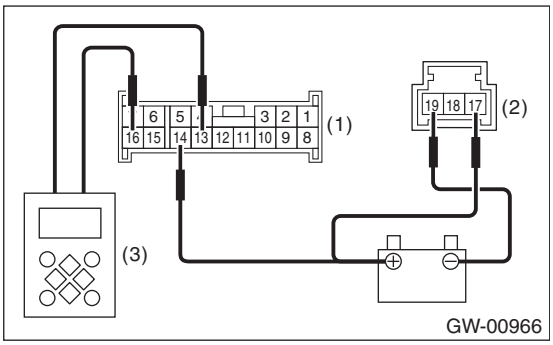
Check output from the power window main switch to driver's side motor using the oscilloscope function in the Subaru Select Monitor.

CAUTION:
Since the driver's side power window switch is controlled by CPU, do not check continuity for switch alone with the circuit tester. Performing continuity check with circuit tester may damage the driver's side power window switch circuit.

1) Disconnect the ground cable from battery.
2) Remove the power window main switch. <Ref. to GW-9, REMOVAL, Power Window Control Switch.>
3) Connect the battery and the Subaru Select Monitor to the power window main switch connector.

CAUTION:
Never mix up the terminals when connecting the power window main switch connector and battery. If connected to a wrong terminal, the power window main switch may be damaged.

NOTE:
• When the battery is connected to the power window main switch, the letters "AUTO" on the driver's side knob illuminates.
• For detailed procedures, refer to "Subaru Select Monitor Operation Manual".



(1) Power window main switch connector (16 poles)
(2) Power window main switch connector (3 poles)
(3) Subaru Select Monitor

4) Operate the driver's side power window switch knob and check the output.

NOTE:
Since output time during window UP operation is extremely short, it cannot be checked without using a measuring instrument such as oscilloscope. Output is constantly produced while the knob is operated for window DOWN operation.
• Model without auto-reverse function

Switch knob position	Output time	Standard
AUTO UP	Approx. 600 ms	Battery voltage
UP	During switch knob operation	
OFF	—	0 V
DOWN	During switch knob operation	Battery voltage
AUTO DOWN	Approx. 600 ms	

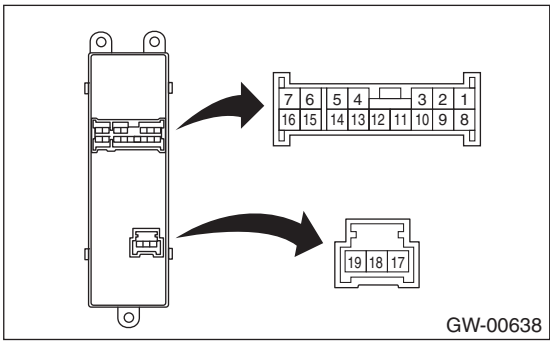
• Model with auto-reverse function

Switch knob position	Output time	Standard
AUTO UP	Approx. 200 ms	Battery voltage
UP		
OFF	—	0 V
DOWN	During switch knob operation	Battery voltage
AUTO DOWN	Approx. 300 ms	

5) Replace the power window main switch if the inspection result is not within the standard value.

• **Except for driver's seat**

1) Check the resistance between switch terminals.



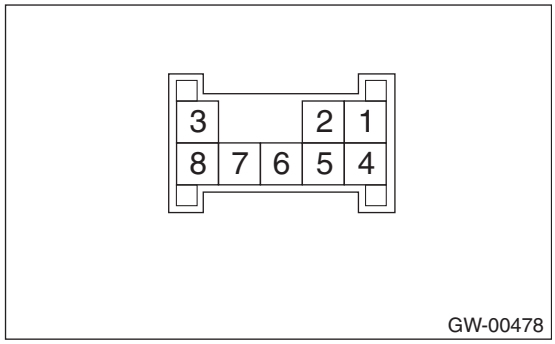
	Switch position	Terminal No.	Standard
Passenger's seat	UP	14 and 8 12 and 19	Less than 1 Ω
	OFF	14 and 12 14 and 8	1 MΩ or more
		8 and 12 8 and 19 12 and 19	Less than 1 Ω
	DOWN	14 and 12 8 and 19	Less than 1 Ω
Rear LH	UP	14 and 7 5 and 19	Less than 1 Ω
	OFF	14 and 7 14 and 5	1 MΩ or more
		19 and 7 19 and 5 7 and 5	Less than 1 Ω
	DOWN	14 and 5 7 and 19	Less than 1 Ω
Rear RH	UP	14 and 1 3 and 19	Less than 1 Ω
	OFF	14 and 1 14 and 3	1 MΩ or more
		19 and 3 19 and 1 3 and 1	Less than 1 Ω
	DOWN	14 and 3 1 and 19	Less than 1 Ω

2) Replace the power window main switch if the inspection result is not within the standard value.

2. SUB-SWITCH

1) Remove the sub-switch. <Ref. to GW-9, SUB-SWITCH, REMOVAL, Power Window Control Switch.>

2) Check the resistance between sub-switch terminals.



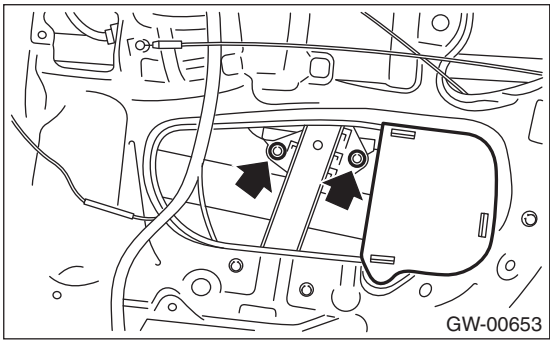
	Switch position	Terminal No.	Standard
Passenger seat, rear	UP	4 and 5 6 and 7	Less than 1 Ω
	OFF	7 and 4 8 and 4	1 MΩ or more
		5 and 8 6 and 7	Less than 1 Ω
	DOWN	4 and 6 5 and 8	Less than 1 Ω

3) Replace the power window sub-switch if the inspection result is not within the standard value.

4. Front Door Glass

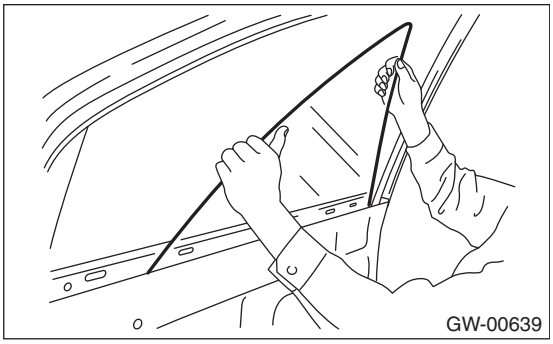
A: REMOVAL

1) Remove the front door trim. <Ref. to EI-43, FRONT DOOR, REMOVAL, Door Trim.>
2) Remove the sealing cover. <Ref. to EB-18, REMOVAL, Front Sealing Cover.>
3) Remove the pads.
4) Operate the power window switch to move the glass, and remove the bolts.



5) Tilt the door glass forward and remove the door glass from the glass run rubber.
6) Remove the door glass while tilting.

CAUTION:
Avoid impact and damage to the glass.



B: INSTALLATION

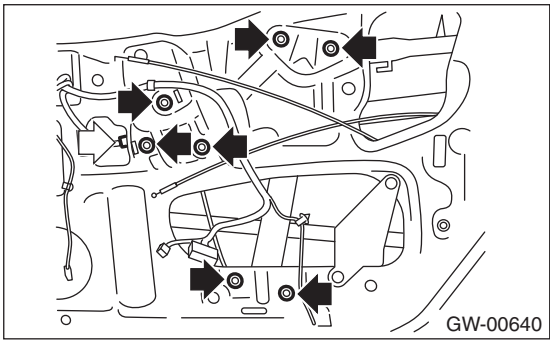
CAUTION:
Make sure that the glass run rubber is placed securely in door frame and sash.
Install each part in the reverse order of removal.

Tightening torque:
Refer to "COMPONENT" of "General Description". <Ref. to GW-3, FRONT DOOR GLASS, COMPONENT, General Description.>

5. Front Regulator and Motor Assembly

A: REMOVAL

1) Remove the front door glass. <Ref. to GW-12, REMOVAL, Front Door Glass.>
2) Disconnect the motor connector.
3) Remove the bolts, and then remove the front regulator and motor assembly.



B: INSTALLATION

Install each part in the reverse order of removal.

Tightening torque:
Refer to "COMPONENT" of "General Description". <Ref. to GW-3, FRONT DOOR GLASS, COMPONENT, General Description.>

C: INSPECTION

1) Disconnect the motor connector.
2) Apply battery voltage between the motor connector terminals and check the motor operation. Check to ensure that the motor rotates in reverse direction when the terminal to which battery voltage is applied is changed.
3) If the inspection results in improper operation, replace the front regulator and motor assembly.

6. Remote Control Mirror System

A: WIRING DIAGRAM

Refer to “Remote Control Mirror System” in the wiring diagram. <Ref. to WI-147, WIRING DIAGRAM, Remote Control Mirror System.>

B: INSPECTION

Symptoms	Repair order
All function does not operate.	1. Check the fuse (F/B No. 6). 2. Check the remote control mirror switch. 3. Check the wiring harness.
One side of the mirror motor does not operate.	1. Check the remote control mirror switch. 2. Check the mirror motor. 3. Check the wiring harness.
Mirror heater does not operate.	1. Check the defogger switch. 2. Check the mirror heater. 3. Check the wiring harness.

NOTE:
The mirror heater operates with the rear window defogger at the same time. Refer to “INSPECTION” of “Rear Window Defogger System” for details. <Ref. to GW-29, INSPECTION, Rear Window Defogger System.>

C: NOTE

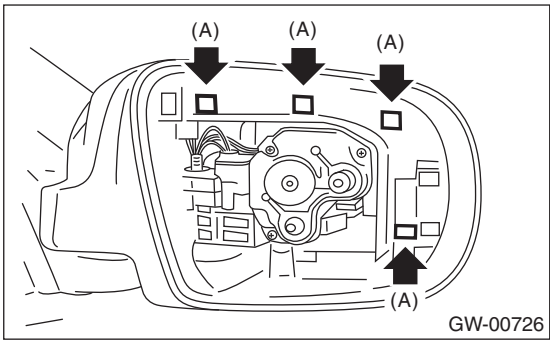
For procedure of each component in the remote control mirror system, refer to the respective section.

- Scalp cap: <Ref. to GW-15, Scalp Cap.>
- Outer mirror assembly: <Ref. to GW-16, Outer Mirror Assembly.>
- Outer mirror: <Ref. to GW-17, Outer Mirror.>
- Remote control mirror switch: <Ref. to GW-18, Remote Control Mirror Switch.>

7. Scalp Cap

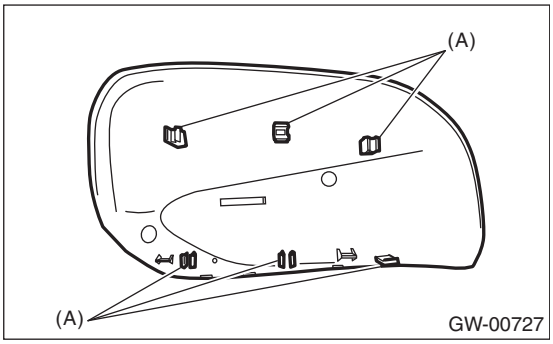
A: REPLACEMENT

1) Remove the mirror. <Ref. to GW-17, REPLACEMENT, Outer Mirror.>
2) Press-in the clips (A) from inside of outer mirror.



3) Pull the scalp cap towards the front of the outer mirror, then remove the scalp cap.

CAUTION:
Be careful not to apply excessive force when removing the scalp cap, as the lower hooks may become damaged.
4) Align clip (A) on the reverse side of the scalp cap and the clip attachment hole of the outer mirror, and push the scalp cap in.

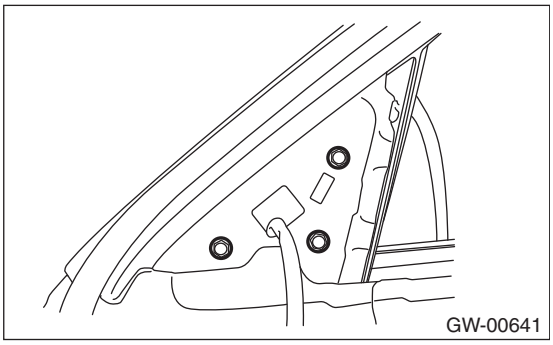


5) Install the scalp cap securely.

8. Outer Mirror Assembly

A: REMOVAL

1) Remove the front door trim. <Ref. to EI-43, FRONT DOOR, REMOVAL, Door Trim.>
2) Disconnect the outer mirror connector.
3) Remove the bolts to remove outer mirror assembly.


GW-00641

B: INSTALLATION

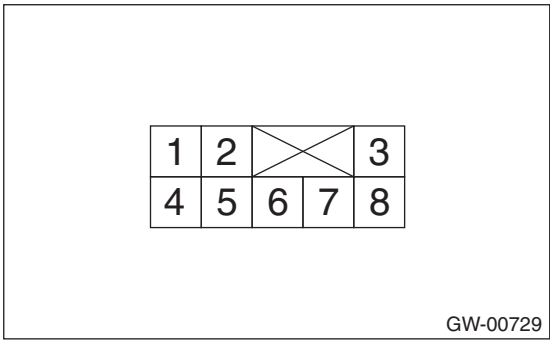
Install each part in the reverse order of removal.

Tightening torque:
4.5 N·m (0.46 kgf-m, 3.3 ft-lb)

C: INSPECTION

1) Disconnect the outer mirror connector.
2) Apply battery voltage between the outer mirror connector terminals and check the mirror operation.

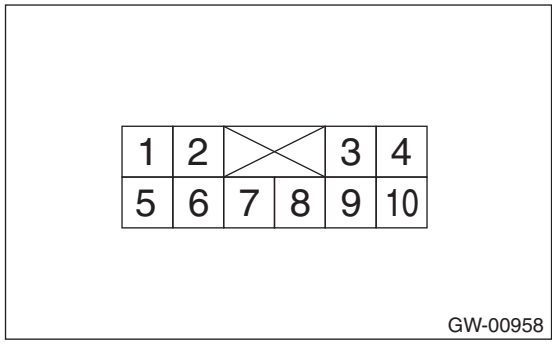
- Model without mirror heater



GW-00729

Switch position	Terminal No.
OFF	—
UP	6 (+) and 3 (–)
DOWN	3 (+) and 6 (–)
LEFT	7 (+) and 3 (–)
RIGHT	3 (+) and 7 (–)

- Model with mirror heater



GW-00958

Switch position	Terminal No.
OFF	—
UP	7 (+) and 3 (–)
DOWN	3 (+) and 7 (–)
LEFT	8 (+) and 3 (–)
RIGHT	3 (+) and 8 (–)
Folding	6 (+) and 3 (–)
Unfolding	3 (+) and 6 (–)

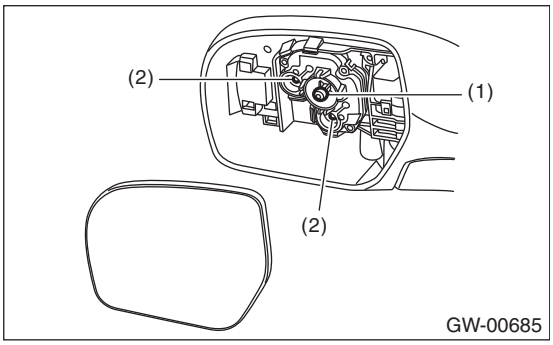
3) If it does not operate normally, replace the outer mirror assembly.

9. Outer Mirror

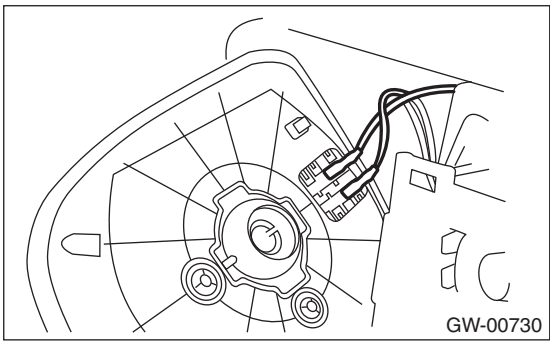
A: REPLACEMENT

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 fitting area securely.

1) Face the mirror upward.
2) Disconnect the ground cable from battery. (Model with mirror heater)
3) Lift the lower part of the mirror and the outer side, and remove fitting (1) and (2).



4) Disconnect the mirror heater connector. (Model with mirror heater)



5) Attach a mirror to the fitting area (1), and attach the worm to the fitting area (2).

CAUTION:
When installing the mirror, insert the worm securely.

10. Remote Control Mirror Switch

A: REMOVAL

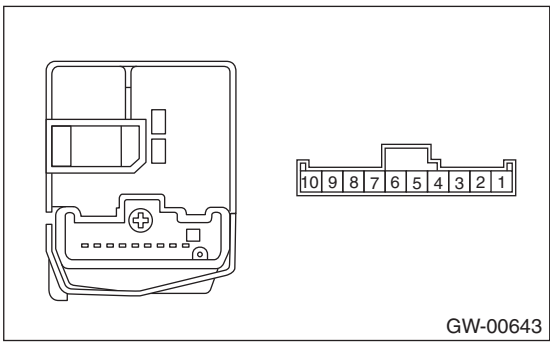
1) Remove the instrument panel lower cover. <Ref. to EI-47, REMOVAL, Instrument Panel Lower Cover.>
2) Remove the remote control mirror switch from instrument panel lower cover.

B: INSTALLATION

Install each part in the reverse order of removal.

C: INSPECTION

1) Disconnect the remote control mirror switch connector.
2) Check the resistance between remote control mirror switch terminals.



- Switch the change over switch to the right side.

Switch position	Terminal No.	Standard
OFF	—	1 MΩ or more
UP	8 and 3, 6 and 7	Less than 1 Ω
DOWN	8 and 6, 3 and 7	Less than 1 Ω
LEFT	8 and 2, 6 and 7	Less than 1 Ω
RIGHT	8 and 6, 2 and 7	Less than 1 Ω

- Switch the change over switch to the left side.

Switch position	Terminal No.	Standard
OFF	—	1 MΩ or more
UP	8 and 4, 6 and 7	Less than 1 Ω
DOWN	8 and 6, 4 and 7	Less than 1 Ω
LEFT	8 and 5, 6 and 7	Less than 1 Ω
RIGHT	8 and 6, 5 and 7	Less than 1 Ω

- Folding switch

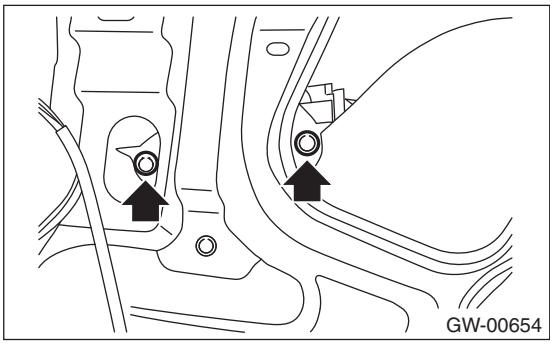
Switch position	Terminal No.	Standard
Folding	8 and 9, 7 and 10	Less than 1 Ω
Unfolding	8 and 10, 7 and 9	Less than 1 Ω

3) Replace the remote control mirror switch if the inspection result is not within the standard value.

11.Rear Door Glass

A: REMOVAL

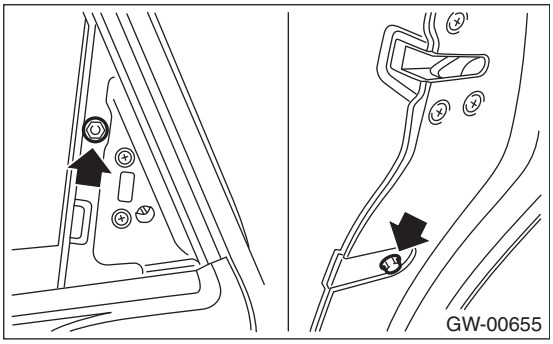
1) Remove the rear door trim. <Ref. to EI-44, REAR DOOR, REMOVAL, Door Trim.>
2) Remove the sealing cover. <Ref. to EB-21, REMOVAL, Rear Sealing Cover.>
3) Operate the power window switch to move the glass, and remove the bolts.



4) Remove the glass from the carrier plate, and while holding the glass, lower the carrier plate alone to the lowest position.

CAUTION:
Without the carrier plate lowered to the bottom most position, do not lower the glass by itself to the lowest position within the door panel. Otherwise the glass may come off of the sash and become damaged.

5) Lower the glass slowly to the bottom most position in the door panel.
6) Remove the bolts and nuts, and then remove the sash. (Remove the upper attachment point first.)



7) Remove the glass run rubber.
8) Remove the glass while tilting.

CAUTION:
Avoid impact and damage to the glass.

B: INSTALLATION

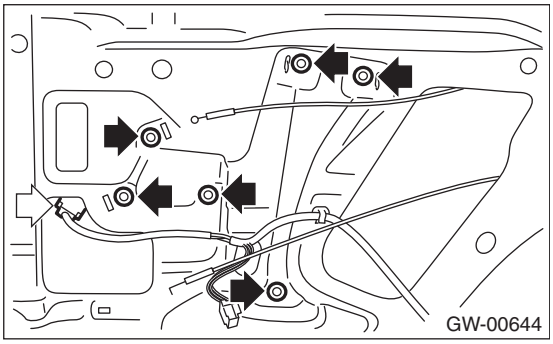
CAUTION:
Make sure that the glass run rubber is placed securely in door frame and sash.
Install each part in the reverse order of removal.

Tightening torque:
Refer to "COMPONENT" of "General Description". <Ref. to GW-4, REAR DOOR GLASS, COMPONENT, General Description.>

12. Rear Regulator and Motor Assembly

A: REMOVAL

1) Remove the rear door glass. <Ref. to GW-19, REMOVAL, Rear Door Glass.>
2) Disconnect the motor connector.
3) Remove the bolts, and then remove the rear regulator and regulator assembly.



B: INSTALLATION

Install each part in the reverse order of removal.

Tightening torque:
Refer to "COMPONENT" of "General Description". <Ref. to GW-4, REAR DOOR GLASS, COMPONENT, General Description.>

C: INSPECTION

1) Disconnect the motor connector.
2) Apply battery voltage between the motor connector terminals and check the motor operation. Check to ensure that the motor rotates in reverse direction when the terminal to which battery voltage is applied is changed.
3) If the inspection results in improper operation, replace the rear regulator and motor assembly.

13.Windshield Glass

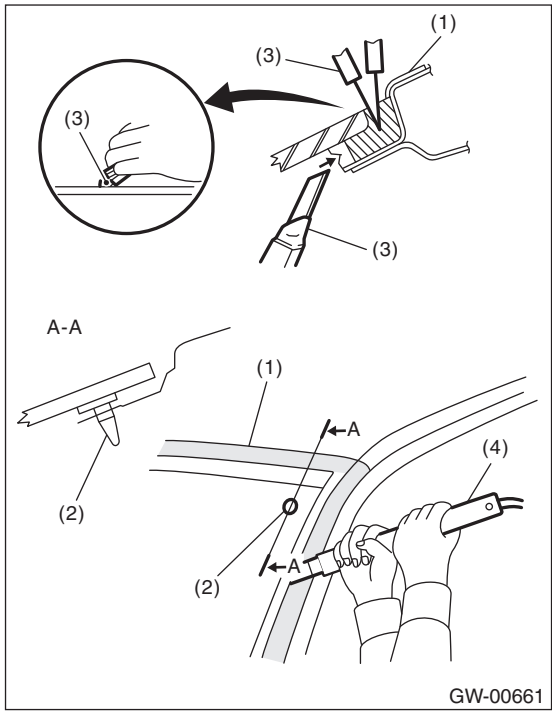
A: REMOVAL

1. WHEN USING WINDSHIELD GLASS KNIFE

CAUTION:
Apply protective tape, etc, and be careful that the inner and outer components of the vehicle are not damaged.

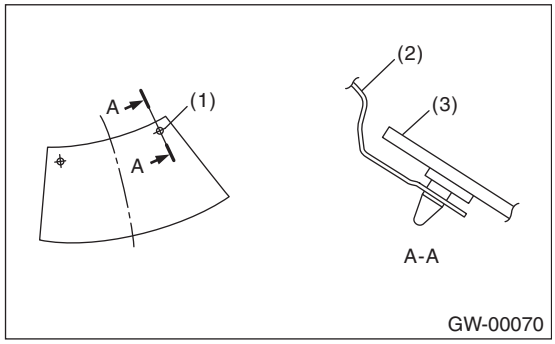
1) Disconnect the ground cable from battery. (Models with wiper deicer)
2) Remove the front pillar upper trim. <Ref. to EI-58, REMOVAL, Upper Inner Trim.>
3) Disconnect the wiper deicer connector. (Models with wiper deicer)
4) Remove the cowl panel. <Ref. to EI-38, REMOVAL, Cowl Panel.>
5) Remove the glass molding.
6) Tape the body side of the circumference of windshield glass for protection.
7) Apply sufficient amount of soapy water to the adhesive part.
8) Make a slit using a cutter knife to make it easier to insert the windshield glass knife.
9) Insert the windshield glass knife into adhesive part.
10) 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.



(1) Tape for protection
(2) Locating pin
(3) Cutter knife
(4) Windshield glass knife

• The locating pins are bonded to the corners of glass. Use piano wire to disconnect the pins.

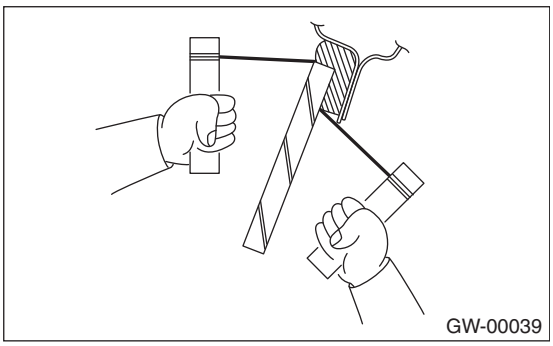


(1) Locating pin
(2) Body panel
(3) Windshield glass

2. WHEN USING PIANO WIRE

CAUTION:
• Do not tightly pull the piano wire against the windshield glass edge.
• Apply protective tape, etc., and be careful not to damage interior and exterior parts.
• Do not cross piano wires. Otherwise they may be cut.

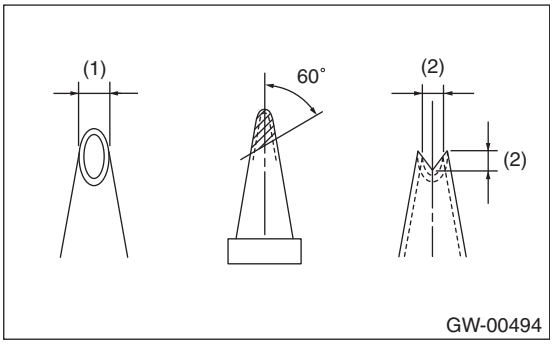
1) Disconnect the ground cable from battery. (Models with wiper deicer)
2) Remove the front pillar upper trim. <Ref. to EI-58, REMOVAL, Upper Inner Trim.>
3) Disconnect the wiper deicer connector. (Models with wiper deicer)
4) Remove the cowl panel. <Ref. to EI-38, REMOVAL, Cowl Panel.>
5) Remove the glass molding.
6) Tape the body side of the circumference of windshield glass for protection.
7) Using a drill or razor blade, make a hole in the adhesive part.
8) Pass the piano wire through the hole, and attach both the wire ends securely to pieces of wood.



9) Pull the wire ends alternately to cut off the adhesive part.

B: INSTALLATION

1) Cut the cartridge nozzle tip as shown in the figure, and set the adhesive in the sealant gun.

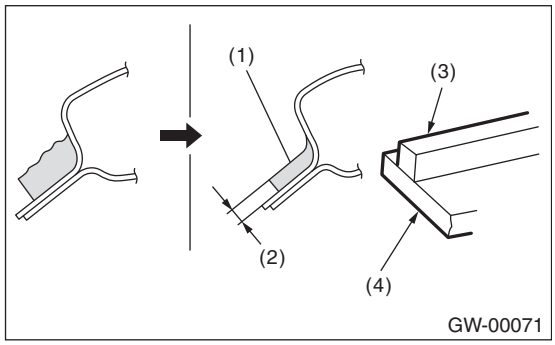


(1) 10 mm (0.39 in)
(2) 8 mm (0.31 in)

2) Clean the external circumference of windshield glass with alcohol or white gasoline.

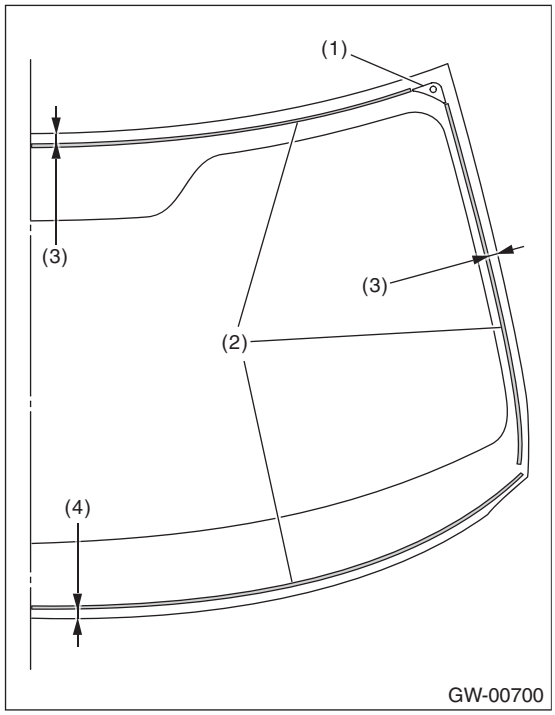
3) Remove the adhesive layer on the body using cutter knife to obtain smooth face of 2 mm (0.08 in) thick.

CAUTION:
Be careful not to damage the body and paint surface.



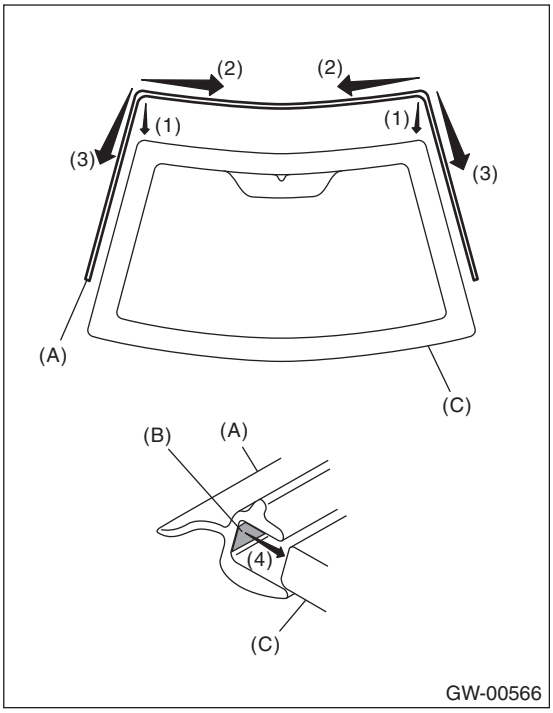
(1) Adhesive
(2) 2 mm (0.08 in)
(3) Dam rubber
(4) Glass

4) Clean the body with alcohol or white gasoline to eliminate cutting powder, dust and dirt completely from body.
5) Install the dam rubber.



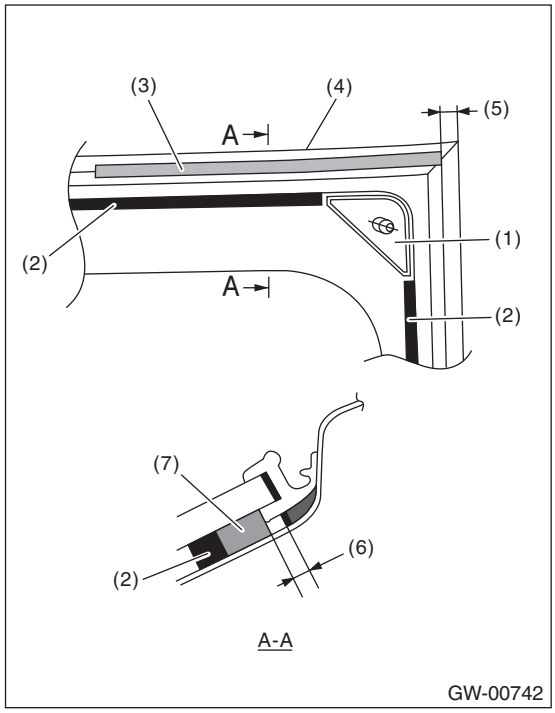
(1) Locating pin
(2) Dam rubber
(3) 11 mm (0.43 in)
(4) 13.5 mm (0.53 in)

6) Attach the molding to the glass.



(1) Align the molding (A) to the upper ends of the windshield glass (C).
(2) Attach the molding from the upper corners towards the center.
(3) Attach the molding from the upper corners downward.
(4) Firmly apply the double sided tape (B) of the molding evenly to the end face of the glass.

7) Apply the seal to the molding.



(1) Locating pin
(2) Dam rubber
(3) Seal
(4) Molding
(5) 10 mm (0.39 in)
(6) 1.5 mm (0.06 in)
(7) Adhesive

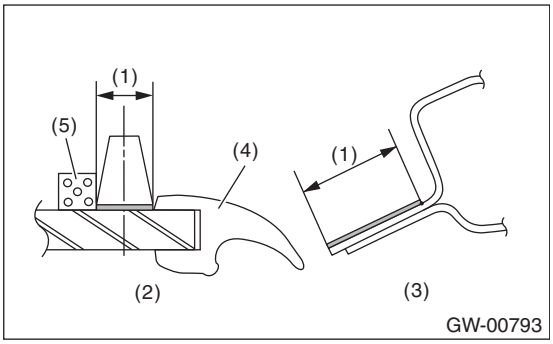
NOTE:
Apply so that the sticker does not overlap out to the adhesive side (6).
8) Using a sponge, apply primer to the glass side and body side adhesive surfaces.

Glass primer:
Dow Automotive
• ESSEX U-401, U-402 or equivalent

Painted surface primer:
Dow Automotive
• ESSEX U-413 or equivalent

NOTE:
• Primer once attached to the painted surface of the body and internal trim is hard to wipe off. Mask the circumference of such area.
• Let primer dry for about ten minutes before installing the glass.

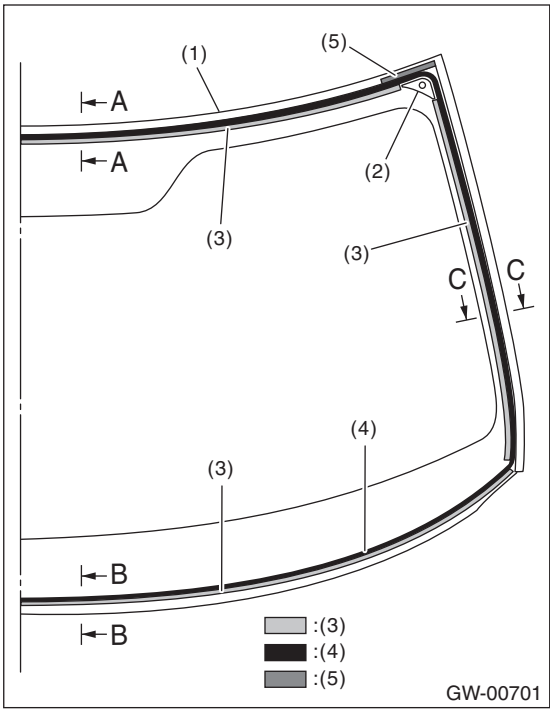
- Do not touch the surface coated with primer.



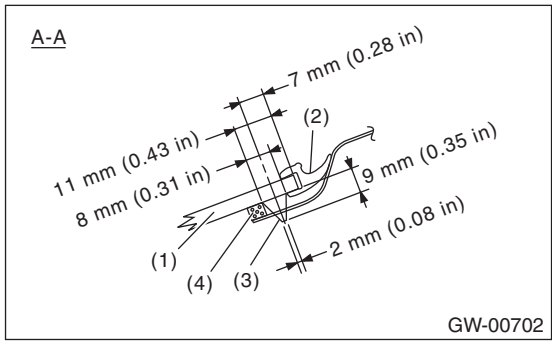
(1) Application of primer
(2) Glass side
(3) Body side
(4) Molding
(5) Dam rubber

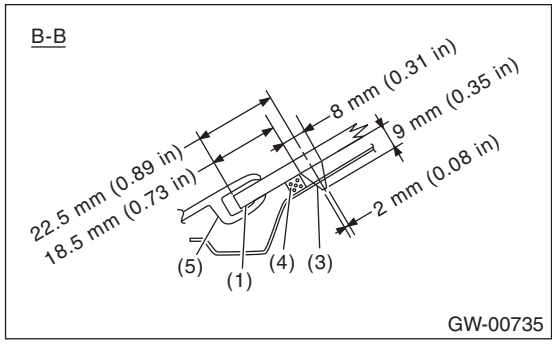
9) Apply adhesive to the glass end surface as shown in the figure.

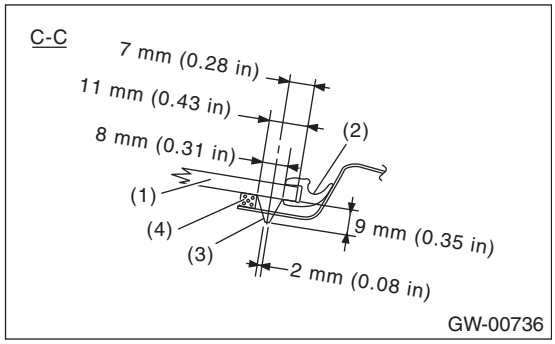
Adhesive:
Dow Automotive
• ESSEX U-400HV or equivalent



(1) Molding
(2) Locating pin
(3) Dam rubber
(4) Adhesive
(5) Seal



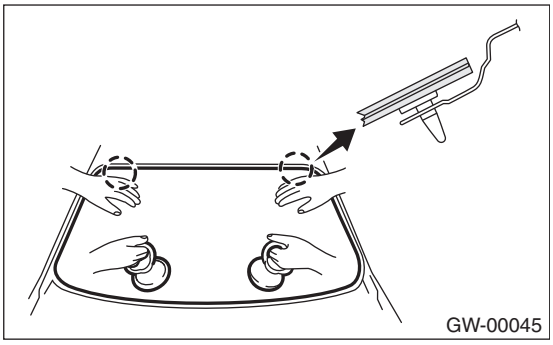




A-A Upper end area
B-B Lower end area
C-C Side area

(1) Glass
(2) Molding
(3) Adhesive
(4) Dam rubber
(5) Cowl panel

10) Using suction rubber cups, fit the locator pins into the body side, and attach the windshield glass.



11) Lightly press the windshield glass for tight fit.
12) Make flush the adhesive surface jutted out using spatula.
13) 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.

14) 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.

15) Install the cowl panel. <Ref. to EI-38, INSTALLATION, Cowl Panel.>
16) Connect the wiper deicer connector. (Models with wiper deicer)
17) Install the front pillar upper trim. <Ref. to EI-59, INSTALLATION, Upper Inner Trim.>

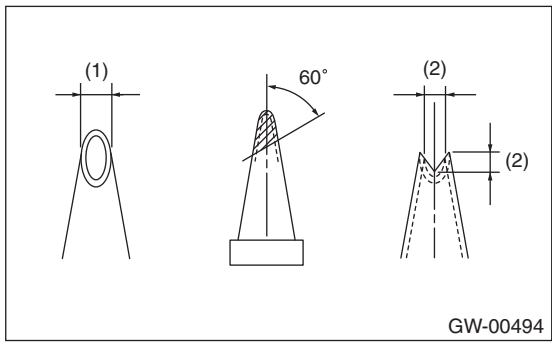
14.Rear Gate Glass

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the roof spoiler. <Ref. to EI-39, REMOVAL, Roof Spoiler.>
3) Remove the rear wiper motor. <Ref. to WW-20, REMOVAL, Rear Wiper Motor.>
4) Disconnect the connectors from rear defogger terminal.
5) Remove the glass in the same procedure as for windshield glass. <Ref. to GW-21, REMOVAL, Windshield Glass.>

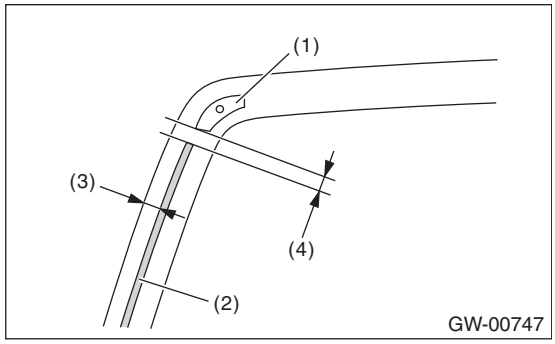
B: INSTALLATION

1) Fabricate the cartridge nozzle tip as shown and set the sealant gun with the adhesive.



(1) 10 mm (0.39 in)
(2) 8 mm (0.31 in)

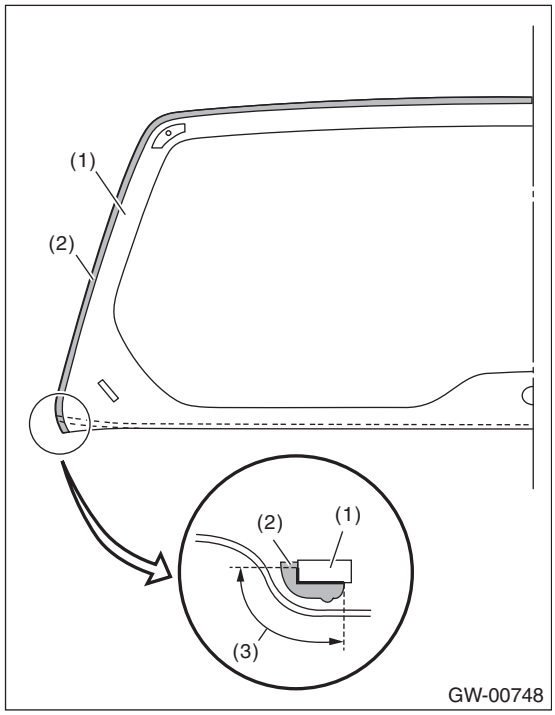
2) Install the dam rubber.



(1) Locating pin
(2) Dam rubber
(3) 16 mm (0.63 in)
(4) 45 mm (1.77 in)

3) Install the molding.
(1) Align the molding and glass corners, and adhere together.
(2) Because the lower end of the molding can become removed easily, affix the contact surfaces of the glass and molding with an adhesive agent.

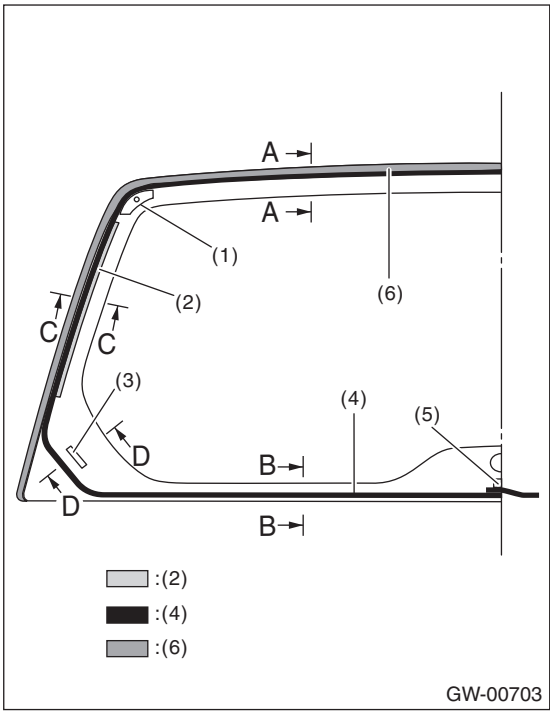
Adhesive:
Cemedine
• Cemedine 3000 (jelly type) or equivalent



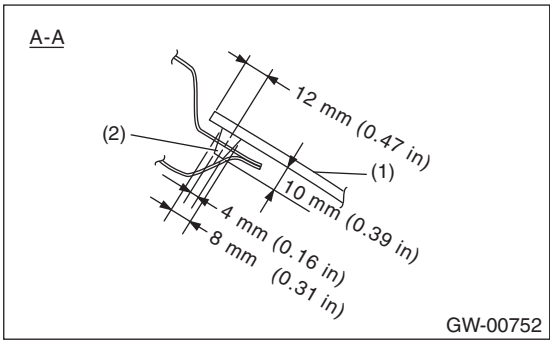
(1) Rear gate glass
(2) Molding
(3) Adhesive application area

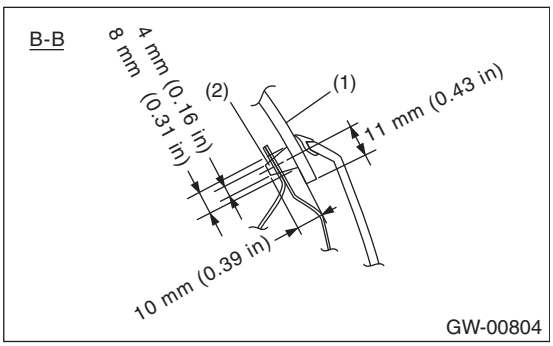
4) Apply the primer to the glass and body sides in the same procedure as for windshield glass. <Ref. to GW-22, INSTALLATION, Windshield Glass.>

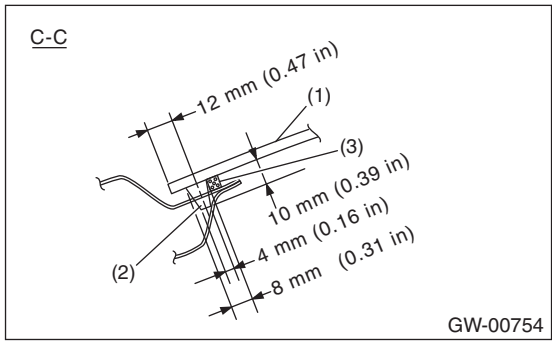
5) Apply adhesive in the same procedure as for windshield glass. <Ref. to GW-22, INSTALLATION, Windshield Glass.>

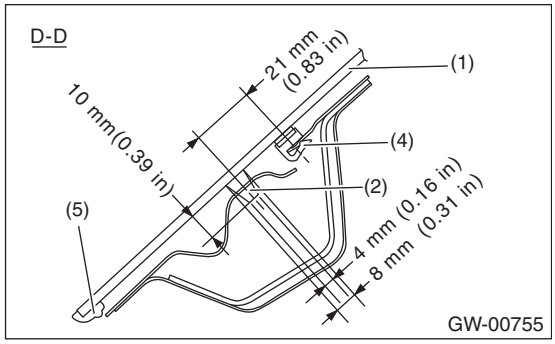


(1) Locating pin
(2) Dam rubber
(3) Fastener
(4) Adhesive
(5) Rubber spacer
(6) Molding









A-A Upper end
B-B Lower end
C-C Side end
D-D Lower end area

(1) Glass
(2) Adhesive
(3) Dam rubber
(4) Fastener
(5) Molding

6) Attach the fastener to the rear gate panel.
7) Insert the glass locating pin into the hole on rear gate panel and push on the area around the locating pin to secure it.
8) Push lightly on the area around the fastener and spacer to seal.
9) 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.

10) 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.

11) Connect the rear defogger terminals.
12) Install the rear wiper. <Ref. to WW-20, INSTALLATION, Rear Wiper Motor.>
13) Install the roof spoiler. <Ref. to EI-39, INSTALLATION, Roof Spoiler.>
14) Connect the battery ground terminal.

15. Rear Window Defogger System

A: WIRING DIAGRAM

Refer to “Rear Defogger System” in the wiring diagram. <Ref. to WI-149, WIRING DIAGRAM, Rear Defogger System.>

B: INSPECTION

1. SYSTEM INSPECTION

Symptoms	Repair order
Rear window defogger does not operate.	1. Check the fuse. 2. Check the rear defogger relay. 3. Check the rear defogger switch. 4. Check the heat wire. 5. Check the wiring harness. 6. Check body integrated unit.

NOTE:
Rear window defogger system can be customized on the Subaru Select Monitor, when the body integrated unit customize setting {A/C ECM setting} is “support”. (Auto A/C model)

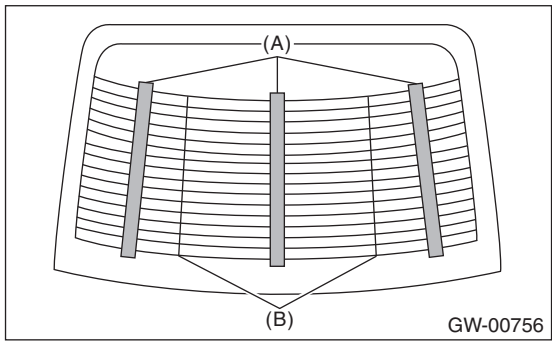
System name	Initial setting	Customize setting
Rr defogger op. mode	OFF after 15 min.	Repeat 15 min. operation and 2 min. stop.

2. CHECK WITH SUBARU SELECT MONITOR

CAUTION:
Check whether the “Rr defogger op. mode” setting is in initial setting or customize setting before performing inspection.
1) Check the input signal when the rear window defogger switch is operated using Subaru Select Monitor.
(1) Prepare the Subaru Select Monitor. <Ref. to GW-6, PREPARATION TOOL, General Description.>
(2) Turn the ignition switch to ON (engine OFF) and run the “PC application for Subaru Select Monitor”.
(3) On «System Selection Menu» display, select {Integ. unit mode}.
(4) Select the {Rr defogger output} on {Current Data Display & Save}.
(5) Check the displayed data (ON/OFF) by operating the rear window defogger switch.
2) Check the operation with rear window defogger switch ON.
• When customize setting is set as “Continuous”, it is normal if the 15-minute operation and 2-minute stop repeats.
• When customize setting is “Normal”, it is normal if the operation lasts for 15 minutes and then turns OFF.
3) When the operation in 2) above fails, replace the body integrated unit.

3. HEAT WIRE 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) Prepare the following checking items.
• Liquid crystal thermograph sheet (Approximate Size: 300 × 300 mm (11.8 × 11.8 in) and thermal temperature: 35 — 40°C (95 — 104°F))
• Aluminum foil
2) Turn the ignition switch to ON.
3) Turn the defogger switch to ON.
4) Push the liquid crystal thermograph sheet from the outside of the rear glass.



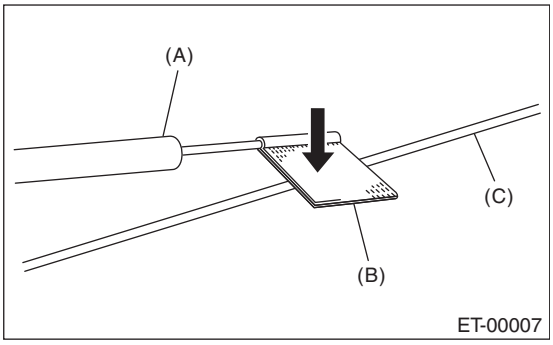
(A) Liquid crystal thermograph sheet
(B) Separate line

NOTE:
Use the liquid crystal thermograph sheet every range it is separated with the separate line.
5) Determine the faulty heat wire by checking the color of the liquid crystal thermograph sheet.

Liquid crystal thermograph sheet	Criteria
Change occurred (red → blue)	Normal
No change (black)	Open

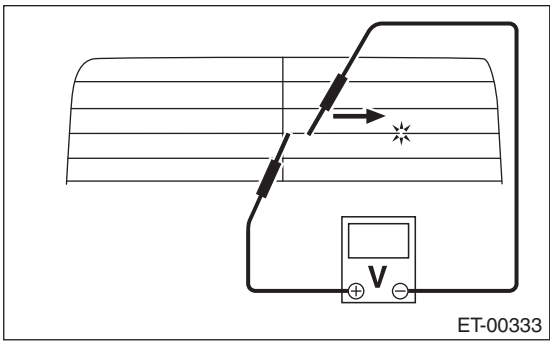
NOTE:
• Check from the inside of the glass if the liquid crystal thermograph sheet does not change.
• The time for the color change may differ depends on the surface temperature of the glass.

6) Wrap a piece of aluminum foil around the tip of tester probe and press it against the heat wire with your finger.



(A) Tester probe
(B) Aluminum foil
(C) Heat wire

7) To both ends of the section that has been found to include an open in the step 5), apply the tester positive (+) probe and the negative (–) probe.
8) Move the tester probe on the negative (–) side slowly along the heat wire. If voltage changes from zero while moving the tester probe, heat wire is open at the voltage change point.

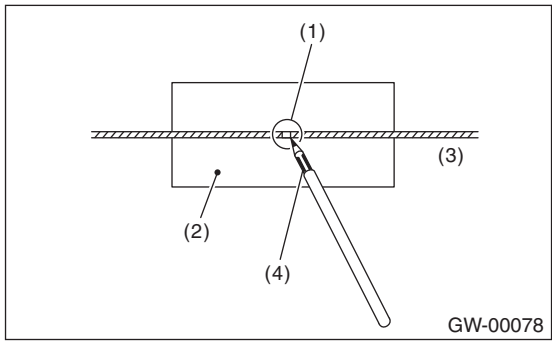


9) Repair the heat wire that determines the place of the open circuit. <Ref. to GW-30, REPAIR, Rear Window Defogger System.>

C: REPAIR

1) Clean the broken portion with alcohol or white gasoline.
2) Cover both sides of the heat wire with masking tapes.
3) Apply conductive silver composition to the damaged point.

Conductive silver composition:
Permatex
• QUICK GRID



(1) Broken portion
(2) Masking tape
(3) Broken wire
(4) Conductive silver composition

4) After applying conductive silver composition, dry it using a drier.
5) After repair, check the wire.

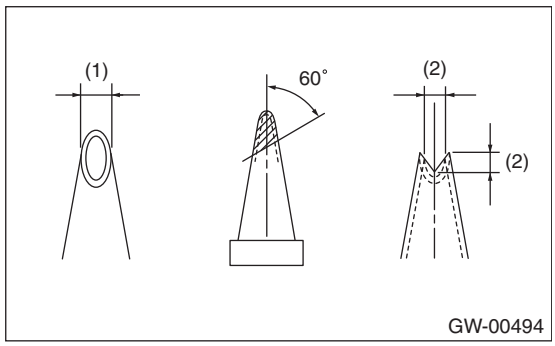
16.Rear Quarter Glass

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the rear quarter trim. <Ref. to EI-60, REMOVAL, Rear Quarter Trim.>
3) Remove the rear quarter glass in the same procedure as for windshield glass. <Ref. to GW-21, REMOVAL, Windshield Glass.>

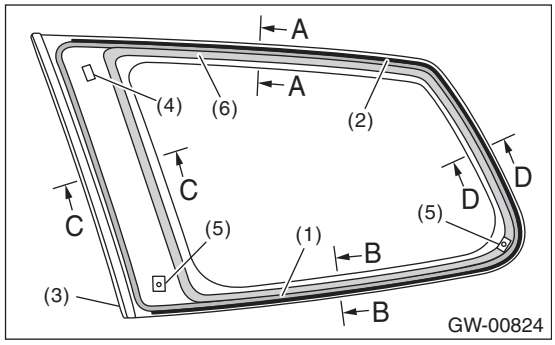
B: INSTALLATION

1) Cut the cartridge nozzle tip as shown in the figure, and set the adhesive in the sealant gun.

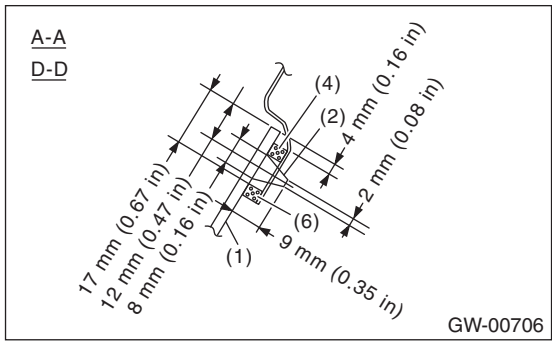


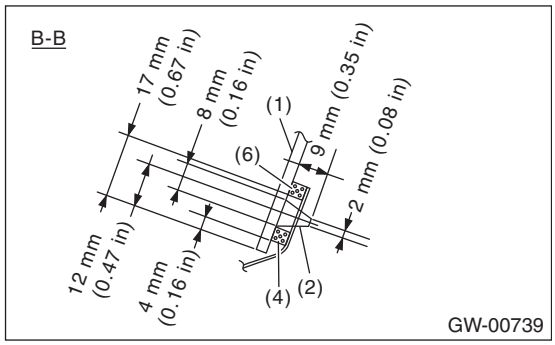
(1) 10 mm (0.39 in)
(2) 8 mm (0.31 in)

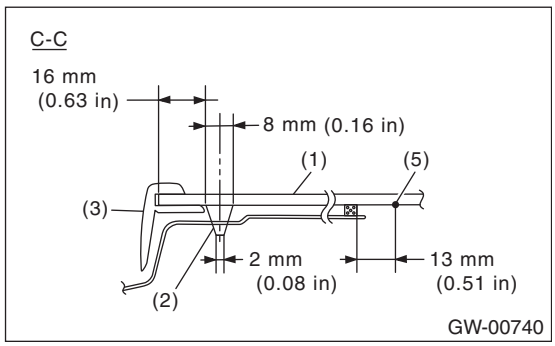
2) Prepare and clean the adhesion surfaces of the glass and body using the same procedures as for the windshield glass. <Ref. to GW-22, INSTALLATION, Windshield Glass.>
3) Attach the fastener to the body.
4) Attach the outer dam rubber at a position 4 mm (0.16 in) from the glass end.
5) On the front end, attach the inner periphery dam rubber at a position 13 mm (0.51 in) from the border of the glass ceramic gradation, and for other locations 17 mm (0.61 in) from the end of the glass.
6) Using the same procedures as for the windshield glass, apply primer to the glass and body. <Ref. to GW-22, INSTALLATION, Windshield Glass.>
7) Apply adhesive in the same procedure as for the windshield glass. <Ref. to GW-22, INSTALLATION, Windshield Glass.>



(1) Adhesive
(2) Outer periphery dam rubber
(3) Molding
(4) Fastener
(5) Locating pin
(6) Inner periphery dam rubber







A-A Upper end area
B-B Lower end area
C-C Front end area
D-D Rear end area

(1) Glass
(2) Adhesive
(3) Molding
(4) Outer periphery dam rubber
(5) Glass ceramic gradation border
(6) Inner periphery dam rubber

8) Insert the glass locating pin into the hole on side panel and push on the area around the locating pin to secure it.
9) Push lightly on the area around the fastener and spacer to seal.
10) 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.
11) After curing of adhesive, pour the water on external surface of vehicle to check that there are no water leaks.

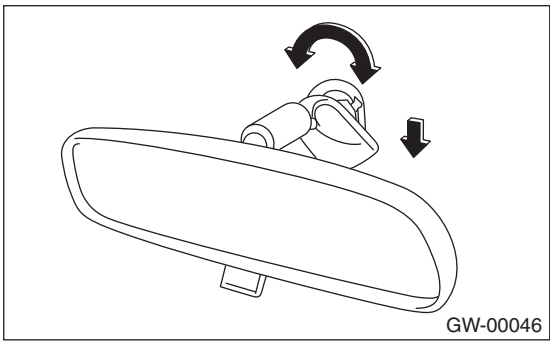
NOTE:
When a vehicle is returned to the user, tell him or her that the vehicle should not be subjected to heavy impact for at least three days.
12) Install the rear quarter trim. <Ref. to EI-61, INSTALLATION, Rear Quarter Trim.>

17.Rearview Mirror

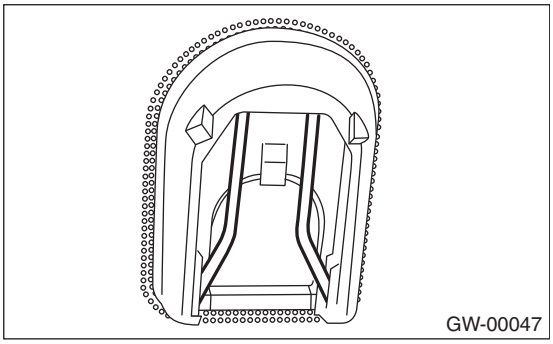
A: REMOVAL

CAUTION:
• Never reuse the spring. When the rearview mirror assembly is removed from the mirror base, fixed force will decline and the rearview mirror assembly may come off.
• Be careful not to damage the mirror surface and windshield glass.

NOTE:
Never reuse the spring. Prepare a new spring before removal.
1) Turn the mirror base 90° clockwise or counterclockwise to remove it.


GW-00046

2) Remove the spring from the mirror base.


GW-00047

3) When the mirror base is damaged, use a piano wire, spatula, etc. to remove.

B: INSTALLATION

Install each part in the reverse order of removal.

NOTE:
If the mirror base is removed, install it in the following procedure.
1. Clean the old adhesive completely.
2. Align the mirror base with the mark on the windshield glass to install it.
3. Make sure the mirror base is securely attached and then install the spring to it.

Adhesive:
• REPAIR KIT IN MR (Part No. 65029FC000) or equivalent

C: INSPECTION

Check the mirror, mirror base and spring for damage, and replace if defective.

18.Wiper Deicer System

A: WIRING DIAGRAM

Refer to “Wiper Deicer System” in the wiring diagram. <Ref. to WI-124, WIRING DIAGRAM, Wiper Deicer System.>

B: INSPECTION

1. SYSTEM INSPECTION

NOTE:
• The wiper deicer does not operate when the ambient temperature becomes 5°C (41°F) or more.
• The wiper deicer operates with the rear window defogger at the same time.
• It is possible to perform a forced operation if you keep holding the rear window defogger switch for 3 seconds or more.

Symptoms	Inspection order
Wiper deicer does not operate.	1. Check the fuse. 2. Check the wiper deicer relay. 3. Check the rear defogger switch. 4. Check the heat wire. 5. Check the wiring harness. 6. Check body integrated unit.

NOTE:
• Wiper deicer system can be customized using the Subaru Select Monitor, when the customize setting {A/C ECM setting} of the body integrated unit is set to With. (auto A/C model)
• Set the system using the Rr Defogger op. mode, and setting will be the same as rear defogger system setting.

System name	Initial setting	Customize setting
Rear defogger operation mode	OFF after 15 min.	Continuous operation*

*: When one of the following conditions occurs, continuous operation is suspended and turned off after 15 minutes.
• Ambient temperature at 5°C (41°F) or more continues for 10 seconds.
• Malfunction occurs on ambient sensor.
• Vehicle speed of 15 km/h (9 MPH) or less continues 15 minutes (OFF when conditions are met)
• Malfunction occurs in CAN communication.
• Battery voltage remains at 10 V or less for 30 seconds.

2. CHECK WITH SUBARU SELECT MONITOR

CAUTION:
Before performing the inspection, check the following settings.
• Wiper deicer setting → “support”. If “no support”, set to “support” using customize setting.
• Rr Defogger op. mode setting → Initial setting or customize setting.
1) Check the input signal when the rear window defogger switch is operated using Subaru Select Monitor.
(1) Prepare the Subaru Select Monitor. <Ref. to GW-6, PREPARATION TOOL, General Description.>
(2) Turn the ignition switch to ON (engine OFF) and run the “PC application for Subaru Select Monitor”.
(3) On «System Selection Menu» display, select {Integ. unit mode}.
(4) Select the {wiper deicer output} on {Current Data Display & Save}.
(5) Check the displayed data (ON/OFF) by operating the rear window defogger switch.
2) Check the operation with rear window defogger switch ON.
• When customize setting is “Continuous”, it is normal if the operation lasts without any termination conditions.
• When customize setting is “Normal”, it is normal if the operation lasts for 15 minutes and then turns OFF.
3) When the operation in 2) above fails, replace the body integrated unit.

3. HEAT WIRE INSPECTION

For operation procedures, refer to “HEAT WIRE INSPECTION” of “Rear Window Defogger System”. <Ref. to GW-29, HEAT WIRE INSPECTION, INSPECTION, Rear Window Defogger System.>

NOTE:
Heat wire inspection needs removing/installing procedure of instrument panel assembly.

C: REPAIR

For operation procedures, refer to “REPAIR” of “Rear Window Defogger System”. <Ref. to GW-30, REPAIR, Rear Window Defogger System.>

NOTE:
Heat wire repair needs removing/installing procedure of instrument panel assembly.

BODY STRUCTURE

BS

Page
1. General Description 2

1. General Description

A: SPECIFICATION

Refer to “Body Repair Manual” for general description of body structure, reference points and reference dimensions.

INSTRUMENTATION/DRIVER INFO

IDI

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3.	Clock System	18
4.	Combination Meter	21
5.	Speedometer	22
6.	Tachometer	23
7.	Fuel Gauge	24
8.	Engine Coolant Temperature Gauge	25
9.	ECO Gauge	26
10.	Clock	27

1. General Description

A: SPECIFICATION

Model with normal meter

- Combination meter

Meter, display	Operation method, display method	Drive control	When checking the indicator needle operation/needle reading operation
Speedometer	Stepping motor type	Combination meter	—
Tachometer			
Fuel gauge			
ABS warning light	LED	Combination meter	On/Off
AT oil temperature warning light (AT model)			
Seat belt warning light			
Door open warning light			
Tire pressure warning light (U.S. model)			
AWD warning light (AT model)			
Hill start assist warning light (MT model)			
Engine coolant temperature indicator light			
VDC warning light / VDC OFF indicator light			
VDC indicator light			
HI-beam indicator light			
CRUISE indicator light			
CRUISE SET indicator light			
Front fog light indicator light			
SPORT indicator light (AT model)			
Light illumination indicator light			
Meter illumination back light			Light ON
LCD back light			Light ON
Engine coolant temperature warning light (red)			On (red)/Off
Engine coolant temperature indicator light (blue)			Off/On (blue)
Fuel level warning light			On/Off (Turns on near E.)
Malfunction indicator light		ECM	Turns on or off according to module control
Oil pressure warning light		Oil pressure switch	
Airbag warning light		Airbag CM	
Charge warning light		Generator	
Turn signal indicator light		Turn signal and hazard unit	
Security/immobilizer indicator light		Body integrated unit	
Parking brake/brake fluid level warning light		Combination meter/ brake fluid level switch	On/Turns on or off according to module control
Odo/Trip indicator	LCD	Combination meter	—
SPORT shift indicator (AT model)			
AT select lever position indicator (AT model)			

- Clock

Display	Display method
Average fuel economy, Ambient air temperature, Current time, Malfunction warning display	VFD
Passenger's airbag indicator light (U.S. model)	LED
Passenger's airbag ON indicator	
Passenger's airbag OFF indicator	
Passenger' seat belt warning light	

Model with luminescent meter

- Combination meter

Meter, display	Operation method, display method	Drive control	When checking the indicator needle operation/needle reading operation
Speedometer	Stepping motor type	Combination meter	—
Tachometer			
Engine coolant temperature gauge			
ECO gauge			
ABS warning light	LED	Combination meter	On/Off
ATF temperature warning light			
Seat belt warning light			
Door open warning light			
Tire pressure warning light (U.S. model)			
AWD warning light			
VDC warning light / VDC OFF indicator light			
VDC indicator light			
HI-beam indicator light			
Front fog light indicator light			
Light illumination indicator light			
Fuel level warning light			
Meter illumination back light			Light ON
LCD back light			Light ON
Malfunction indicator light		ECM	Turns on or off according to module control
Oil pressure warning light		Oil pressure switch	
Airbag warning light		Airbag CM	
Charge warning light		Generator	
Turn signal indicator light		Turn signal and hazard unit	
Security/immobilizer indicator light		Body integrated unit	
Parking brake/brake fluid level warning light		Combination meter/ brake fluid level switch	On/Turns on or off according to module control
Odo indicator	LCD	Combination meter	—
Trip indicator			
SPORT shift indicator			
AT select lever position indicator			
Fuel gauge			
CRUISE indicator			
CRUISE SET indicator			
SPORT indicator			

- Clock

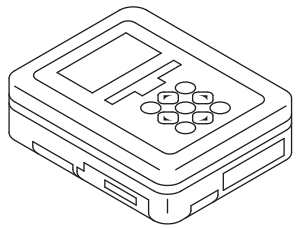
Display	Display method
Average fuel economy, Ambient air temperature, Current time, Malfunction warning display	VFD
Passenger's airbag indicator light (U.S. model)	LED
Passenger's airbag ON indicator	
Passenger's airbag OFF indicator	
Passenger' seat belt warning light	

B: CAUTION

- Before disassembling or reassembling parts, always disconnect the battery ground cable from battery. When replacing the audio, control module 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.
- Use gloves to avoid damage and getting fingerprints on the glass surface and meter surfaces.
- Do not apply an excessive force on the printed circuit.
- Do not drop or otherwise apply impact.
- Connect the connectors securely during reassembly.
- After reassembly, make sure that the functional parts operate normally.
- When the combination meter has been replaced, be sure to perform the registration of immobilizer.

C: PREPARATION TOOL

1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST1B022XU0	1B022XU0	SUBARU SELECT MONITOR III KIT	Used for troubleshooting the electrical system.

2. GENERAL TOOL

TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance and voltage.

2. Combination Meter System

A: WIRING DIAGRAM

Refer to “Combination Meter System” in the wiring diagram. <Ref. to WI-150, WIRING DIAGRAM, Combination Meter System.>

B: INSPECTION

1. SELF-DIAGNOSIS

The self-diagnosis (checking of each meter, warning light, indicator light, illumination, LCD) of combination meter can be performed in the following procedure.

CAUTION:
Perform the steps described in 2) through 4) within 10 seconds.
1) Within 3 seconds after turning the ignition switch to ON, set the lighting switch to tail light or headlight position.
2) Press the odo/trip meter knob three times.
3) Turn the lighting switch to OFF, and press the odo/trip meter knob three times.
4) Set the lighting switch to tail light or headlight position again, and press the odo/trip meter knob three times.

NOTE:
• When pressing the odo/trip meter knob four times, the display changes to DTC display mode. <Ref. to IDI-15, DTC DISPLAY MODE, INSPECTION, Combination Meter System.>
• Warning light, indicator light, and LCD display checks are performed when self-diagnosis is performed. After this, every time the odo/trip meter knob is pressed, the buzzer will sound for 0.5 seconds, and operation checks for meter operation, meter readings, and the LCD are performed in this order. Turn the ignition switch to OFF to cancel the self-diagnosis function.
• The self-diagnosis function is not cancelled if the engine is started during diagnosis. However, the self-diagnosis function is cancelled automatically for safety when you start to drive the vehicle.
5) Go to “Check meter indicator operation”.
Check meter operation, warning light, indicator light, and LCD.

NOTE:
• “dIAGS.1” (model with normal meter) or “_S_1” (model with luminescent meter) is displayed on the LCD. After that, the meter indicator operation check mode is initiated.
• Each of the meter indicator operation display and LCD display switches every 6 seconds.

Meter indicator	LCD display, illumination	Warning light, indicator light
MIN indication ↓ MAX indication	ILL1 (Min. brightness) ↓(Display for one second for each level) ILL6 (Max. brightness)	*1, *2, *3
MAX indication ↓ MIN indication	ILL6 (Max. brightness) ↓(Display for one second for each level) ILL1 (Min. brightness)	

*1: Warning lights and indicator lights controlled by the meter drive circuit are illuminated. <Ref. to IDI-2, SPECIFICATION, General Description.>
*2: Warning lights and indicator lights controlled by other module are turned on/off according to the module control. <Ref. to IDI-2, SPECIFICATION, General Description.>
*3: Engine coolant temperature warning light illuminates in red. (models with normal meters)
6) Press the odo/trip meter knob once.
7) Go to “Check meter indication”.
Check meter operation, warning light, indicator light, and LCD.

NOTE:
• Meter indicator switches every 1.5 seconds for each indication.
• ILL indication illuminates at the same brightness as when entering “Meter Indicator Needle Indication Check”.

• During operation, “dIAGS.2” (model with normal meter) or “_S_2” (model with luminescent meter) is displayed on the LCD.
Model with normal meter

Speedometer (km/h)	Tachometer (rpm)	Fuel gauge	Fuel level warning light	Warning light, indicator light
0	0	Lowest point	Light ON	*1, *2, *3
0	0	E	Light ON	
40	1000	1/2	Light OFF	
100	4000	F	Light OFF	
40	1000	1/2	Light OFF	
0	0	E	Light ON	

Model with luminescent meter

Speedometer (km/h)	Tachometer (rpm)	Engine coolant temperature gauge	ECO gauge	Warning light, indicator light
0	0	Lowest point	Lowest point	*1, *2
0	0	C	–Max	
40	1000	Starting point of the red line	0	
100	4000	H	+Max	
40	1000	Starting point of the red line	0	
0	0	C	–Max	

*1: Warning lights and indicator lights controlled by the meter drive circuit turn off. <Ref. to IDI-2, SPECIFICATION, General Description.>
*2: Warning lights and indicator lights controlled by other module are turned on/off according to the module control. <Ref. to IDI-2, SPECIFICATION, General Description.>
*3: Engine coolant temperature indicator light illuminates in blue.
8) Press the odo/trip meter knob once.
9) Go to “Check LCD display”.
Check the LCD.

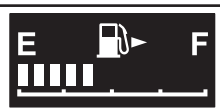
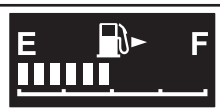
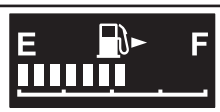
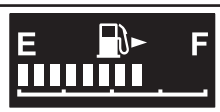
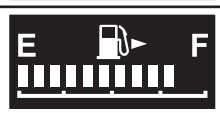
NOTE:
• “dIAGS.3” (model with normal meter) or “_S_3” (model with luminescent meter) is displayed on the LCD. After that, the LCD display check mode is initiated.
• LCD display switches every 1 second.
• Warning lights and indicator lights controlled by the meter drive circuit turn off. <Ref. to IDI-2, SPECIFICATION, General Description.>
• Warning lights and indicator lights controlled by other module are turned on/off according to the module control. <Ref. to IDI-2, SPECIFICATION, General Description.>
• The meter indication remains at the same level as “Meter Indicator Needle Indication Check”.
• ILL indication illuminates at ILL6 level (max. brightness).
• After No. 13 is displayed in the illumination order, display is repeated from No. 1 again. (models with normal meters)
• After No. 14 is displayed in the illumination order, display is repeated from No. 1 again. (luminescent meter model)

Model with normal meter

ORDER	AT/SS	TRIP/ODO
1	▲ ▼	ODO TRIP AB 88888.8
2		111111
3	▲	ODO 22222.2
4		333333
5	▼	TRIP A 44444.4
6		555555
7	▲	TRIP B 66666.6
8		777777
9	▼	88888.8
10		999999
11	▲	TRIP A 00000.0
12		888888
13	▼	TRIP B 88888.8

IDI00373

Model with luminescent meter

ORDER	AT/SS	SPORT/SHIFT UP CRUISE/SET	TRIP/ODO S/I/S#	FUEL METER	LFW
1	▲ ▼	SPORT CRUISE △ SET	A B 8 8 8 . 8 8 8 8 8 8 [S] [I] S#		OFF
2		OFF	1 1 1 . 1 1 1 1 1 1		ON
3	▲	SPORT	A 2 2 2 . 2 2 2 2 2 2 [S]		ON
4		OFF	3 3 3 . 3 3 3 3 3 3		OFF
5	▼	△	B 4 4 4 . 4 4 4 4 4 4 [I]		OFF
6		OFF	5 5 5 . 5 5 5 5 5 5		OFF
7	▲	CRUISE	A 6 6 6 . 6 6 6 6 6 6 S#		OFF
8		OFF	7 7 7 . 7 7 7 7 7 7		OFF
9	▼	SET	B 8 8 8 . 8 8 8 8 8 8 [S]		OFF
10		OFF	9 9 9 . 9 9 9 9 9 9		OFF
11	▲	SPORT △	A 0 0 0 . 0 0 0 0 0 0 [I]		OFF
12		OFF	8 8 8 . 8 8 8 8 8 8		OFF
13	▼	CRUISE SET	B 8 8 8 . 8 8 8 8 8 8 S#		ON
14		OFF	8 8 8 . 8 8 8 8 8 8		OFF

IDI00374

2. SYMPTOM CHART

CAUTION:
When measuring the voltage and resistance of each control module or 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).

Symptoms	Repair order	Note
Combination meter assembly does not operate.	1. Power supply 2. Ground circuit 3. Combination meter	<Ref. to IDI-10, CHECK POWER SUPPLY AND GROUND CIRCUIT, INSPECTION, Combination Meter System.>
Speedometer does not operate.	1. VDC C/M 2. Harness 3. Combination meter	<Ref. to IDI-10, CHECK VDC CONTROL MODULE, INSPECTION, Combination Meter System.>
Tachometer does not operate.	1. ECM 2. Harness 3. Combination meter	<Ref. to IDI-11, CHECK ENGINE CONTROL MODULE (ECM), INSPECTION, Combination Meter System.>
Fuel gauge does not operate.	1. Communication circuit 2. Harness 3. Body integrated unit 4. Fuel level sensor 5. Combination meter	<Ref. to IDI-11, CHECK FUEL LEVEL SENSOR, INSPECTION, Combination Meter System.>
Engine coolant temperature gauge or engine coolant temperature indicator light/engine coolant temperature warning light does not operate.	1. Communication circuit 2. Engine coolant temperature sensor 3. Harness 4. Combination meter	<Ref. to IDI-13, CHECK ENGINE COOLANT TEMPERATURE SENSOR, INSPECTION, Combination Meter System.>
ECO gauge does not operate. (luminescent meter model)	1. Communication circuit 2. Combination meter	<Ref. to IDI-13, CHECK ECO GAUGE (MODEL WITH LUMINESCENT METER), INSPECTION, Combination Meter System.> NOTE: The ECO gauge does not operate unless the vehicle is driven at least 1 km after the trip meter is reset.
Warning buzzer for key left in ignition does not sound.	1. Communication circuit 2. Combination meter	<Ref. to IDI-14, CHECK WARNING BUZZER FOR KEY LEFT IN IGNITION, INSPECTION, Combination Meter System.>

3. CHECK POWER SUPPLY AND GROUND CIRCUIT

	Step	Check	Yes	No
1	**CHECK POWER SUPPLY FOR COMBINATION METER.** 1) Remove the combination meter. <Ref. to IDI-21, REMOVAL, Combination Meter.> 2) Measure the voltage between combination meter connector and chassis ground. ***Connector & terminal*** ***(i10) No. 1 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **2**.	Check the harness for open or short between the fuse and combination meter.
2	**CHECK POWER SUPPLY FOR COMBINATION METER.** 1) Turn the ignition switch to ON. 2) Measure the voltage between combination meter connector and chassis ground. ***Connector & terminal*** ***(i10) No. 2 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **3**.	Check the harness for open or short between the ignition switch and combination meter.
3	**CHECK GROUND CIRCUIT OF COMBINATION METER.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between combination meter connector and chassis ground. ***Connector & terminal*** ***(i10) No. 21 — Chassis ground:*** ***(i10) No. 22 — Chassis ground:***	Is the resistance less than 10 Ω?	Replace the meter case assembly.	Repair or replace the harness.

4. CHECK VDC CONTROL MODULE

	Step	Check	Yes	No
1	**CHECK VEHICLE SPEED SIGNAL.** 1) Remove the combination meter mounting screws. 2) Lift up the vehicle and support it with rigid racks. 3) Drive the vehicle faster than 10 km/h (6 MPH). **WARNING:** **Be careful not to get caught in the running wheels.** 4) Measure the voltage between combination meter connector and chassis ground. ***Connector & terminal*** ***(i10) No. 31 (+) — Chassis ground (–):***	Is the voltage less than 1 V ←→ 5 V or more?	Replace the meter case assembly.	Go to step **2**.
2	**CHECK HARNESS BETWEEN VDC CONTROL MODULE AND COMBINATION METER.** 1) Turn the ignition switch to OFF. 2) Disconnect the VDC control unit connector and the combination meter connector. 3) Measure the resistance between the VDC control module connector and the combination meter connector. ***Connector & terminal*** ***(B310) No. 33 — (i10) No. 31:***	Is the resistance less than 10 Ω?	Check VDC control module. <Ref. to VDC(diag)-2, Basic Diagnostic Procedure.>	Repair or replace the harness.

5. CHECK ENGINE CONTROL MODULE (ECM)

	Step	Check	Yes	No
1	**CHECK ECM SIGNAL.** 1) Start the engine. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 15 (+) — Chassis ground (–):***	Is the voltage 0 ←→ 14 V or more?	Go to step **2**.	Inspect the ECM. • Non-turbo model: <Ref. to EN(H4DO)(diag)-2, Basic Diagnostic Procedure.> • Turbo model: <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.>
2	**CHECK HARNESS BETWEEN COMBINATION METER AND ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the ECM connector and combination meter connector. 3) Measure the resistance between the ECM connector and the combination meter connector. ***Connector & terminal*** ***(B135) No. 15 — (i10) No. 32:***	Is the resistance less than 10 Ω?	Replace the meter case assembly.	Repair or replace the harness.

6. CHECK FUEL LEVEL SENSOR

	Step	Check	Yes	No
1	**CHECK COMBINATION METER.** 1) Drain fuel. 2) Check the indication status of the fuel gauge in the combination meter.	Does the fuel gauge needle or segment display indicate EMPTY and is the low fuel warning light blinking?	Go to step **4**.	Go to step **2**.
2	**CHECK COMBINATION METER.** Perform the self-diagnosis of combination meter. <Ref. to IDI-5, SELF-DIAGNOSIS, INSPECTION, Combination Meter System.>	Is it operating normally?	Go to step **3**.	Replace the meter case assembly.
3	**CHECK DIAGNOSTIC TROUBLE CODE (DTC).** 1) Prepare the Subaru Select Monitor kit. 2) Turn the ignition switch to ON (engine OFF) and run the “PC application for Subaru Select Monitor”. 3) On «System Selection Menu» display, select {Integ. unit mode}. 4) Select the {Diagnostic Code(s) Display}.	Is DTC being displayed?	Perform the diagnosis according to DTC. <Ref. to LAN(diag)-31, LIST, List of Diagnostic Trouble Code (DTC).>	Go to step **4**.
4	**CHECK HARNESS.** 1) Disconnect the body integrated unit connector. 2) Measure the resistance between body integrated unit connector and chassis ground. ***Connector & terminal*** ***(B281) No. 7 — Chassis ground:***	Is the resistance 2 — 96 Ω?	Go to step **5**. If the step 1 is “Yes”, Go to step **9**.	Repair or replace the harness.

Step		Check	Yes	No
5	**CHECK COMMUNICATION BETWEEN BODY INTEGRATED UNIT AND METERS.** 1) Remove the fuel sub level sensor. • Non-turbo model: <Ref. to FU(H4DO)-147, REMOVAL, Fuel Sub Level Sensor.> • Turbo model: <Ref. to FU(H4DOTC)-80, REMOVAL, Fuel Sub Level Sensor.> 2) Short the fuel sub level sensor connector terminal to the chassis ground with approx. 100 Ω resistance. 3) Turn the ignition switch to ON. ***Terminals*** ***(R59) No. 1 — Chassis ground:***	Does the meter needle or segment display indicate EMPTY?	Go to step **7**.	Go to step **6**.
6	**CHECK BODY INTEGRATED UNIT.** 1) Retain the condition in step 5. 2) On {Integ. unit mode}, select {Fuel level resistance} using the Subaru Select Monitor.	Is the resistance displayed as approx. 100 Ω?	Go to step **11**.	Replace the body integrated unit. <Ref. to SL-46, Body Integrated Unit.>
7	**CHECK COMMUNICATION BETWEEN BODY INTEGRATED UNIT AND COMBINATION METERS.** 1) Remove the fuel sub level sensor. • Non-turbo model: <Ref. to FU(H4DO)-147, REMOVAL, Fuel Sub Level Sensor.> • Turbo model: <Ref. to FU(H4DOTC)-80, REMOVAL, Fuel Sub Level Sensor.> 2) Short the fuel sub level sensor connector terminal to the chassis ground with approx. 2 Ω to 6 Ω resistance. 3) Turn the ignition switch to ON. ***Terminals*** ***(R59) No. 1 — Chassis ground:***	Does the meter needle or segment display indicate FULL?	Go to step **9**.	Go to step **8**.
8	**CHECK BODY INTEGRATED UNIT.** 1) Retain the condition in step 7. 2) On {Integ. unit mode}, select {Fuel level resistance} using the Subaru Select Monitor.	Is the resistance 2 — 6 Ω?	Go to step **11**.	Replace the body integrated unit. <Ref. to SL-46, Body Integrated Unit.>
9	**CHECK FUEL SUB LEVEL SENSOR.** 1) Remove the fuel sub level sensor. • Non-turbo model: <Ref. to FU(H4DO)-147, REMOVAL, Fuel Sub Level Sensor.> • Turbo model: <Ref. to FU(H4DOTC)-80, REMOVAL, Fuel Sub Level Sensor.> 2) Measure the resistance between the fuel sub level sensor connector terminals when the float is in FULL and EMPTY position. ***Connector & terminal*** ***(R59) No. 1 — No. 2:***	Is the resistance 1.0 to 2.5 Ω (FULL) and 61 to 63 Ω (EMPTY)?	Go to step **10**.	Replace the fuel sub level sensor.
10	**CHECK FUEL LEVEL SENSOR.** 1) Remove the fuel level sensor. • Non-turbo model: <Ref. to FU(H4DO)-143, REMOVAL, Fuel Level Sensor.> • Turbo model: <Ref. to FU(H4DOTC)-79, REMOVAL, Fuel Level Sensor.> 2) Measure the resistance between the fuel level sensor connector terminals when the float is in FULL and EMPTY position. ***Connector & terminal*** ***(R58) No. 1 — No. 4:***	Is the resistance 1.0 to 2.5 Ω (FULL, non-turbo model), 1.0 to 3.0 Ω (FULL, turbo model), and 31 to 33 Ω (EMPTY)?	Check the connection status of the harness and connector that may have a temporary poor contact.	Replace the fuel level sensor.

	Step	Check	Yes	No
11	**CHECK COMBINATION METER OPERATION.** 1) Remove the combination meter. 2) Attach the combination meter to another vehicle on which the fuel gauge operates normally to check its operation.	Is the fuel gauge normal?	Replace the body integrated unit. <Ref. to SL-46, Body Integrated Unit.>	Replace the meter case assembly.

7. CHECK ENGINE COOLANT TEMPERATURE SENSOR

	Step	Check	Yes	No
1	**CHECK COMMUNICATION STATUS.** 1) Prepare the Subaru Select Monitor kit. 2) Turn the ignition switch to ON (engine OFF) and run the “PC application for Subaru Select Monitor”. 3) On «System Selection Menu» display, select {Integ. unit mode}. 4) Select the {Diagnostic Code(s) Display}.	Is DTC being displayed?	Perform the diagnosis according to DTC. <Ref. to LAN(diag)-31, LIST, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK ENGINE COOLANT TEMPERATURE SENSOR.** Check the engine coolant temperature sensor. • Non-turbo model: <Ref. to EN(H4DO)(diag)-2, Basic Diagnostic Procedure.> • Turbo model: <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.>	Is the engine coolant temperature sensor OK?	Replace the meter case assembly.	Replace the engine coolant temperature sensor. • Non-turbo model: <Ref. to FU(H4DO)-42, REMOVAL, Engine Coolant Temperature Sensor.> • Turbo model: <Ref. to FU(H4DOTC)-34, REMOVAL, Engine Coolant Temperature Sensor.>

8. CHECK ECO GAUGE (MODEL WITH LUMINESCENT METER)

	Step	Check	Yes	No
1	**CHECK DIAGNOSTIC TROUBLE CODE (DTC).** 1) Prepare the Subaru Select Monitor kit. 2) Turn the ignition switch to ON (engine OFF) and run the “PC application for Subaru Select Monitor”. 3) On «System Selection Menu» display, select {Integ. unit mode}. 4) Select the {Diagnostic Code(s) Display}.	Is a DTC of high-speed CAN detected?	Perform the diagnosis according to DTC. <Ref. to LAN(diag)-31, LIST, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK ECO GAUGE** Perform the self-diagnosis of combination meter. <Ref. to IDI-5, SELF-DIAGNOSIS, INSPECTION, Combination Meter System.>	Does ECO gauge operate properly?	Check the connection status of the harness and connector that may have a temporary poor contact.	Replace the meter case assembly.

9. CHECK WARNING BUZZER FOR KEY LEFT IN IGNITION

	Step	Check	Yes	No
1	**CHECK KEY WARNING SWITCH ALARM.** 1) Insert the key into ignition key lock. 2) Open the driver's side door.	Does the buzzer sound from the meter?	Normal	Go to step **2**.
2	**CHECK COMMUNICATION STATUS.** 1) Prepare the Subaru Select Monitor. 2) On «System Selection Menu» display, select {Integ. unit mode}. 3) On {Current Data Display & Save}, select {Key-lock warning SW}. 4) Insert and remove the key.	Does the display change between ON ⇔ OFF?	Go to step **3**.	Check the ignition circuit. <Ref. to SL-40, INSPECTION, Ignition Key Lock.>
3	**CHECK COMMUNICATION STATUS.** 1) On {Current Data Display & Save}, select {Driver's door SW input}. 2) Open and close the door.	Does the display change between ON ⇔ OFF?	Go to step **4**.	Check the door switch circuit. <Ref. to SL-9, CHECK DOOR LOCK SWITCH, INSPECTION, Door Lock Control System.>
4	**CHECK COMMUNICATION STATUS.** 1) Turn the ignition switch to ON (engine OFF) and run the "PC application for Subaru Select Monitor". 2) On «System Selection Menu» display, select {Integ. unit mode}. 3) Select the {Diagnostic Code(s) Display}.	Is DTC being displayed?	Perform the diagnosis according to DTC. <Ref. to LAN(diag)-31, LIST, List of Diagnostic Trouble Code (DTC).>	Go to step **5**.
5	**CHECK COMBINATION METER.** Perform the self-diagnosis of combination meter. <Ref. to IDI-5, SELF-DIAGNOSIS, INSPECTION, Combination Meter System.>	Did the buzzer sound?	Go to step **6**.	Replace the meter case assembly.
6	**CHECK COMBINATION METER.** 1) Remove the combination meter. 2) Attach the buzzer to another vehicle on which the buzzer operates normally to check its operation.	Did the buzzer sound?	Replace the body integrated unit. <Ref. to SL-46, Body Integrated Unit.>	Replace the meter case assembly.

10.DTC DISPLAY MODE

Model with normal meter

The combination meter DTCs can be displayed according to the following procedure.

CAUTION:
Perform the steps described in 2) through 4) within 10 seconds.

1) Within 3 seconds after turning the ignition switch to ON, set the lighting switch to tail light or headlight position.
2) Press the odo/trip meter knob four times.
3) Turn the lighting switch to OFF, and press the odo/trip meter knob four times.
4) Set the lighting switch to tail light or headlight position again, and press the odo/trip meter knob four times.
5) Go to “DTC display mode”.

When the DTC display mode operates, the display is changed every 3 seconds or {ECM}, {TCM}, {ABS/VDC} is displayed cyclically in this order for every press of the trip knob. DTC is displayed in the following table according to type of control module, receiving DTC, DTC detected or No DTC.

Control module	Condition	Display
ECM	Receiving DTC	Trip “A” + “P (Blink)”
	DTC detected	Trip “A” + “P xxxx”
	No DTC	Trip “A” + “P ----”
TCM	Receiving DTC	Trip “B” + “P (Blink)”
	DTC detected	Trip “B” + “P xxxx”
	No DTC	Trip “B” + “P ----”
VDC CM	Receiving DTC	Trip “A” + “C (Blink)”
	DTC detected	Trip “A” + “C xxxx”
	No DTC	Trip “A” + “C ----”
When CAN communication error is occurred	—	“-----”

NOTE:
• When the engine starts during diagnosis, the self-diagnosis function is not cancelled, however, once ignition switch is turned OFF or the vehicle is driven, the DTC display mode is cancelled automatically for safety.
• When the DTC of individual control modules changes in status from current trouble to past trouble, and the trouble is fixed, the DTC will no longer appear in the combination meter if the engine is started three times or more. In this case, read the DTC using the Subaru Select Monitor.
• Because the MT model is not equipped with a TCM, only “Receiving DTC” is displayed.

Model with luminescent meter

The combination meter DTCs can be displayed according to the following procedure.

CAUTION:
Perform the steps described in 1) through 4) within 10 seconds.

1) Within 3 seconds after turning the ignition switch to ON, set the lighting switch to tail light or headlight position.
2) Press the trip meter knob four times.
3) Turn the lighting switch to OFF, and press the trip meter knob four times.
4) Set the lighting switch to tail light or headlight position again, and press the trip meter knob four times.
5) Go to “DTC display mode”.

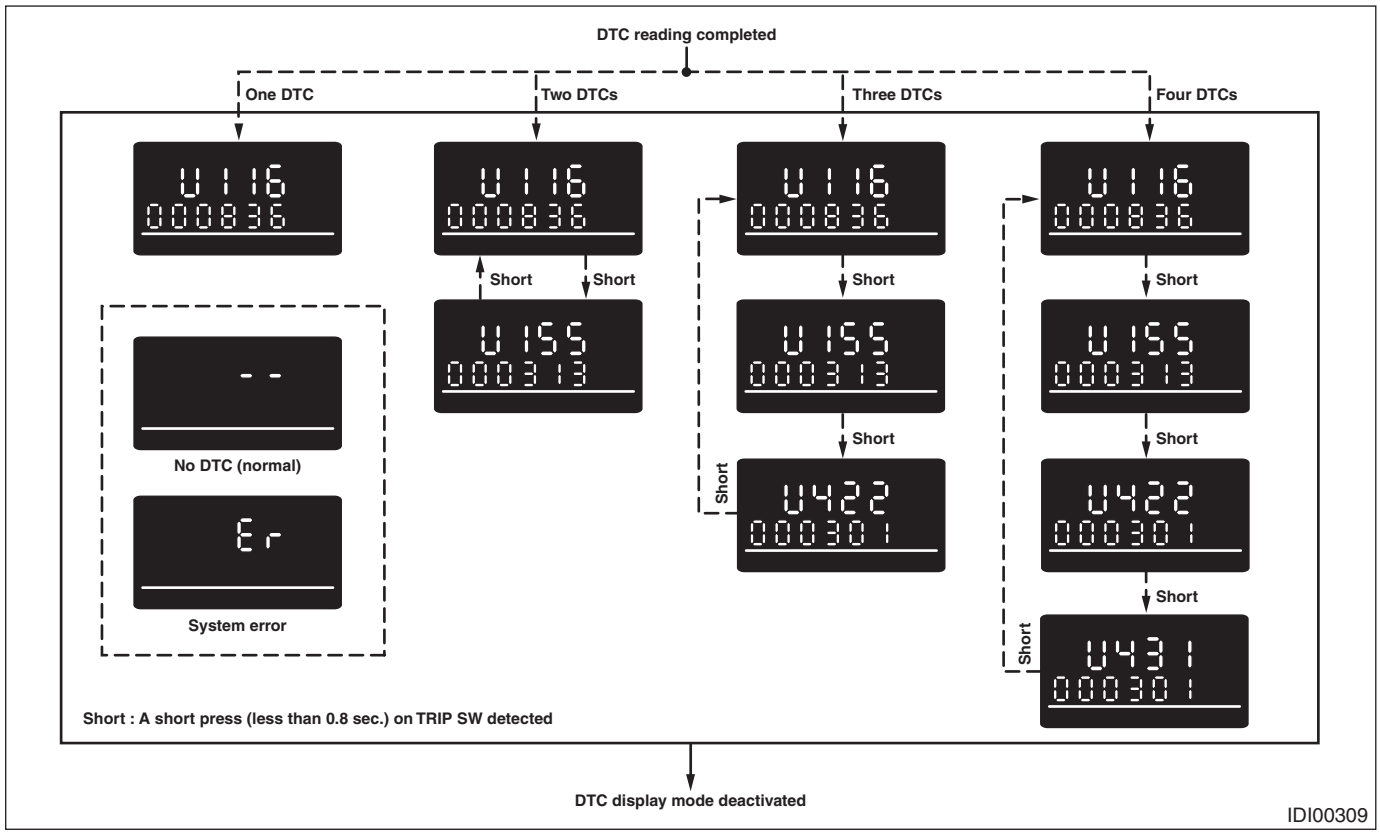
NOTE:
• If a diagnostic trouble code (DTC) is detected, an input error to meters exists. Check the harness on the body side and related parts.
• Detected diagnostic trouble code (DTC) cannot be cleared.
• When the engine starts during diagnosis, the self-diagnosis function is not cancelled, however, once ignition switch is turned OFF or the vehicle is driven, the DTC display mode is cancelled automatically.

(1) When the DTC display mode operates, the LCD displays whether diagnostic trouble code (DTC) exists.

DTC display	Item	Condition
"--"	-	Normal
"Er"	-	System error (meter error)
B900	Power supply system	When IG OFF is detected while driving
B901	Speedometer	Abnormal speed pulse value and CAN data value with engine ON
B902	Speedometer	Inconsistency between speed pulse value and CAN data value with engine ON
U116	Engine coolant temperature gauge	Abnormal input data with engine ON
U140	Fuel gauge	Abnormal input data with engine ON
U155	CAN communication	CAN communication error
U167	Immobilizer collation	Collation with body integrated unit failed
U422	Fuel gauge	Abnormal input data with IG ON
U431	Fuel gauge	When input data out of range is detected with engine ON

(2) If the diagnostic trouble code (DTC) is stored, ODO value at occurrence of trouble is displayed.

NOTE:
• Diagnostic trouble code (DTC) is stored for up to four cases. If diagnostic trouble code (DTC) is input exceeding four cases, the code is deleted in order starting with the oldest one.
• When there are more than one diagnostic trouble code (DTC), the code is displayed according to the following conditions and switches every time when the trip meter knob is pressed.
1. Displayed in the descending order of ODO value.
2. If the ODO value is the same, displayed in the ascending order of diagnostic trouble code (DTC) value.



C: NOTE

For procedure of each component in the combination meter system, refer to the respective section.
- Combination meter: <Ref. to IDI-21, Combination Meter.>
- Speedometer: <Ref. to IDI-22, Speedometer.>
- Tachometer: <Ref. to IDI-23, Tachometer.>
- Fuel gauge: <Ref. to IDI-24, Fuel Gauge.>
- Engine coolant temperature gauge (model with luminescent meter): <Ref. to IDI-25, Engine Coolant Temperature Gauge.>
- ECO gauge (model with luminescent meter): <Ref. to IDI-26, ECO Gauge.>

3. Clock System

A: WIRING DIAGRAM

Refer to “Clock System” in the wiring diagram. <Ref. to WI-161, WIRING DIAGRAM, Clock System.>

B: INSPECTION

1. SYMPTOM CHART

Symptoms	Repair order	Note
No display is shown.	1. Power supply 2. Ground circuit 3. Communication circuit harness 4. Clock body	<Ref. to IDI-18, CHECK POWER SUPPLY AND GROUND CIRCUIT, INSPECTION, Clock System.>
Ambient air temperature/fuel economy display does not appear.	1. Power supply 2. Ground circuit 3. Communication circuit harness 4. Clock body	<Ref. to IDI-19, CHECK CLOCK SYSTEM COMMUNICATION CIRCUIT, INSPECTION, Clock System.>
Only ambient air temperature display is not displayed.	1. Power supply 2. Harness 3. Ambient sensor 4. Communication circuit 5. Clock body	<Ref. to IDI-19, CHECK AMBIENT TEMPERATURE METER SYSTEM COMMUNICATION CIRCUIT, INSPECTION, Clock System.>
Only fuel economy display is not displayed.	1. Setting 2. Communication circuit 3. Clock body	<Ref. to IDI-20, CHECK FUEL ECONOMY SYSTEM COMMUNICATION CIRCUIT, INSPECTION, Clock System.>

2. CHECK POWER SUPPLY AND GROUND CIRCUIT

	Step	Check	Yes	No
1	**CHECK POWER SUPPLY.** 1) Disconnect the clock connector. 2) Measure the voltage between clock connector and chassis ground. ***Connector & terminal*** ***(i59) No. 10 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **2**.	Check the harness for a open or short between the fuse and clock.
2	**CHECK GROUND CIRCUIT.** Measure the resistance between the clock connector and chassis ground. ***Connector & terminal*** ***(i59) No. 6 — Chassis ground:***	Is the resistance less than 10 Ω?	Go to step **3**.	Repair or replace the harness.
3	**CHECK HARNESS BETWEEN CLOCK AND COMBINATION METER.** 1) Disconnect the combination meter connector. 2) Measure the resistance between the clock connector and combination meter connector. ***Connector & terminal*** ***(i59) No. 5 — (i10) No. 29:***	Is the resistance less than 10 Ω?	Go to step **4**.	Repair or replace the harness.
4	**CHECK CLOCK.** 1) Remove the clock. 2) Attach the clock to another vehicle on which the clock operates normally to check its operation.	Is clock normal?	Replace the meter case assembly.	Replace the clock body.

3. CHECK CLOCK SYSTEM COMMUNICATION CIRCUIT

	Step	Check	Yes	No
1	**CHECK POWER SUPPLY.** 1) Disconnect the clock connector. 2) Measure the voltage between clock connector and chassis ground. ***Connector & terminal*** ***(i59) No. 8 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **2**.	Repair or replace the harness.
2	**CHECK GROUND CIRCUIT.** Measure the resistance between the clock connector and chassis ground. ***Connector & terminal*** ***(i59) No. 6 — Chassis ground:***	Is the resistance less than 10 Ω?	Go to step **3**.	Repair or replace the harness.
3	**CHECK HARNESS BETWEEN CLOCK AND COMBINATION METER.** 1) Disconnect the combination meter connector. 2) Measure the resistance between the clock connector and combination meter connector. ***Connector & terminal*** ***(i59) No. 5 — (i10) No. 29:***	Is the resistance less than 10 Ω?	Go to step **4**.	Repair or replace the harness.
4	**CHECK CLOCK.** 1) Remove the clock. 2) Attach the clock to another vehicle on which the clock operates normally to check its operation.	Is clock normal?	Replace the meter case assembly.	Replace the clock body.

4. CHECK AMBIENT TEMPERATURE METER SYSTEM COMMUNICATION CIRCUIT

	Step	Check	Yes	No
1	**CHECK AMBIENT SENSOR POWER SUPPLY.** 1) Disconnect the ambient sensor connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between the ambient sensor connector and chassis ground. ***Connector & terminal*** ***(F78) No. 2 (+) — Chassis ground (–):***	Is the voltage 4 V or more?	Go to step **2**.	Check the harness for a open or short between the fuse and clock.
2	**CHECK HARNESS BETWEEN AMBIENT SENSOR AND COMBINATION METER.** 1) Disconnect the combination meter connector. 2) Measure the resistance between the ambient sensor connector and the combination meter connector. ***Connector & terminal*** ***(F78) No. 1 — (i10) No. 23:*** ***(F78) No. 2 — (i10) No. 24:***	Is the resistance less than 10 Ω?	Go to step **3**.	Repair or replace the harness.
3	**CHECK AMBIENT SENSOR.** 1) Remove the ambient sensor. <Ref. to AC-46, REMOVAL, Ambient Sensor (Auto A/C Model).> 2) Check the ambient sensor. <Ref. to AC(diag)-32, AMBIENT SENSOR, Diagnostic Procedure for Sensors.>	Is the ambient sensor operating properly?	Go to step **4**.	Replace the ambient sensor.

	Step	Check	Yes	No
4	**CHECK AMBIENT TEMPERATURE DISPLAY.** 1) Connect the combination meter connector. 2) Install the 3 Ω resistance to ambient sensor connector terminal. 3) Turn the ignition switch to ON. ***Connector & terminal (F78) No. 1 — No. 2:***	Does the ambient temperature display 25°C (77°F)?	Repair the poor contact between the ambient sensor and harness connector.	Go to step **5**.
5	**CHECK AMBIENT TEMPERATURE OUTPUT DATA.** 1) Prepare the Subaru Select Monitor kit. 2) Turn the ignition switch to ON (engine OFF) and run the "PC application for Subaru Select Monitor". 3) On «System Selection Menu» display, select {Integ. unit mode}. 4) Select {Ambient Temperature}.	Does the ambient temperature display 25°C (77°F)?	Go to step **6**.	Replace the meter case assembly. <Ref. to IDI-21, Combination Meter.>
6	**CHECK CLOCK.** 1) Remove the clock. 2) Attach the ambient temperature display to another vehicle on which the ambient temperature display operates normally to check its operation.	Does the ambient temperature display 25°C (77°F)?	Replace the clock body.	Replace the meter case assembly.

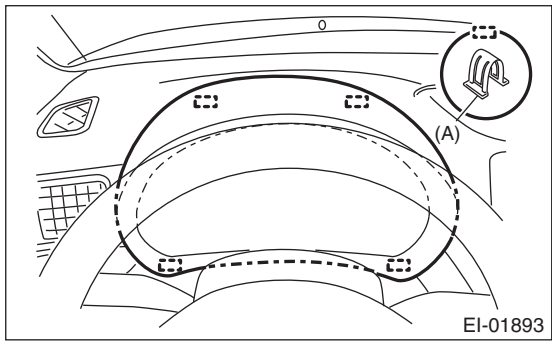
5. CHECK FUEL ECONOMY SYSTEM COMMUNICATION CIRCUIT

	Step	Check	Yes	No
1	**CHECK FUEL ECONOMY DISPLAY OFF MODE.** Hold down the button "+" on the clock for 5 seconds or more.	Does the fuel economy display part blink?	Go to step **2**.	Go to step **3**.
2	**CHECK FUEL ECONOMY DISPLAY OFF MODE.** Turn the ignition switch to ON.	Is fuel economy displayed?	Clock is normal.	Go to step **3**.
3	**CHECK DIAGNOSTIC TROUBLE CODE (DTC).** 1) Prepare the Subaru Select Monitor kit. 2) Turn the ignition switch to ON (engine OFF) and run the "PC application for Subaru Select Monitor". 3) On «System Selection Menu» display, select {Integ. unit mode}. 4) Select the {Diagnostic Code(s) Display}.	Is DTC displayed?	Go to step **4**.	Replace the meter case assembly.
4	**CHECK CLOCK.** 1) Remove the clock. 2) Attach the fuel economy display to another vehicle on which the fuel economy display operates normally to check its operation.	Is the fuel economy display correct?	Replace the clock body.	Replace the meter case assembly.

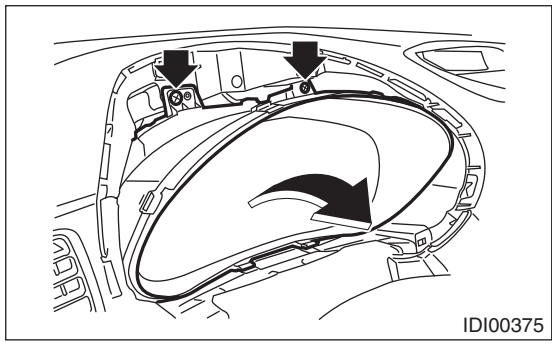
4. Combination Meter

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Set the tilt steering at the lowest position. For steering wheel with telescopic system, pull the steering.
3) Remove the instrument panel lower cover. <Ref. to EI-47, REMOVAL, Instrument Panel Lower Cover.>
4) Remove the plastic hook (A), and detach the meter visor.



5) Remove the screws of the combination meter, and pull on the meter while tipping it towards yourself.



6) Disconnect the connector in the rear side of combination meter to remove meter.

CAUTION:
• Be careful not to damage the meter or instrument panel.
• Pay particular attention to avoid damaging the meter glass.

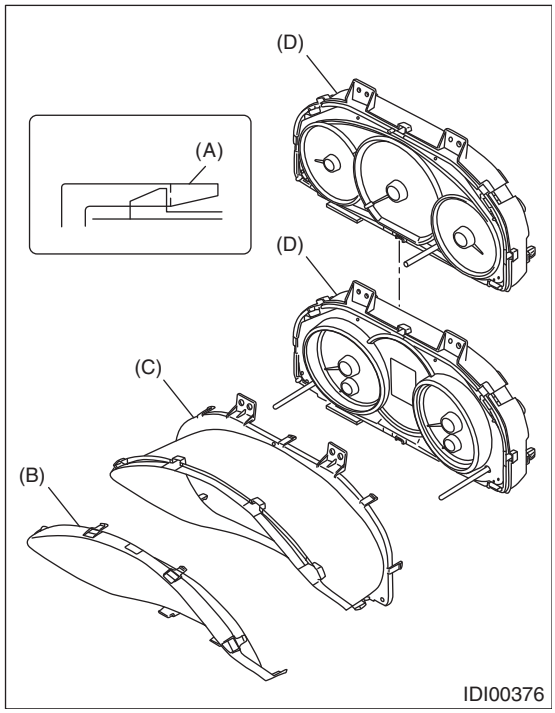
B: INSTALLATION

CAUTION:
• Make sure the electrical connector is connected securely.
• Make sure that each meter operates normally.
• When the combination meter has been replaced, be sure to perform the registration of immobilizer.
Install each part in the reverse order of removal.

C: DISASSEMBLY

1. DISASSEMBLY OF COMBINATION METER

CAUTION:
• Use gloves to avoid damage and getting fingerprints on the glass surface and meter surfaces.
• Be careful not to apply excessive force to the trip knob.
• Be sure not to touch the meter indicator needle.
Disengage the tabs (A), and remove the meter glass assembly (B) and meter visor (C) from the meter case assembly (D).



2. BULB REPLACEMENT

LEDs are used for all of warning lights and indicator lights of combination meters, replace the meter case assembly if faulty.

D: ASSEMBLY

Assemble each part in the reverse order of disassembly.

5. Speedometer

A: SPECIFICATION

Since the meter case assembly cannot be disassembled, do not remove or inspect the speedometer alone. (Do not remove the cover on the back surface.)

6. Tachometer

A: SPECIFICATION

Since the meter case assembly cannot be disassembled, do not remove or inspect the tachometer alone. (Do not remove the cover on the back surface.)

7. Fuel Gauge

A: SPECIFICATION

Since the meter case assembly cannot be disassembled, do not remove or inspect the fuel gauge alone. (Do not remove the cover on the back surface.)

8. Engine Coolant Temperature Gauge

A: SPECIFICATION

Since the meter case assembly cannot be disassembled, do not remove or inspect the engine coolant temperature gauge alone. (Do not remove the cover on the back surface.)

9. ECO Gauge

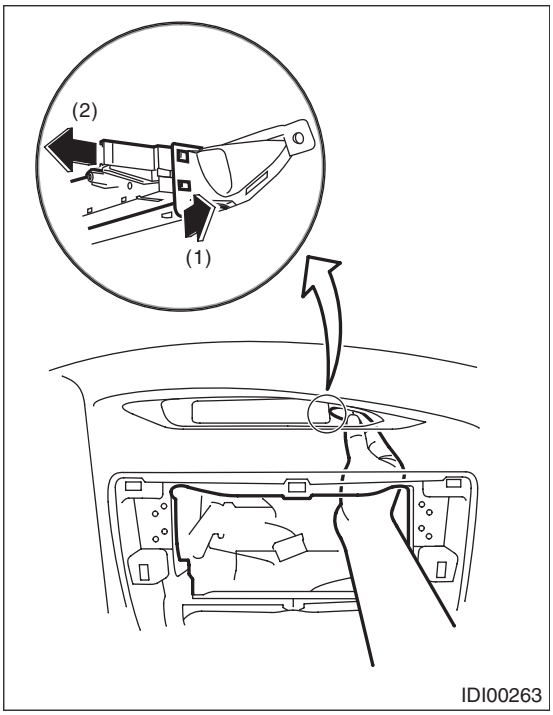
A: SPECIFICATION

Since the meter case assembly cannot be disassembled, do not remove or inspect the ECO gauge alone. (Do not remove the cover on the back surface.)

10.Clock

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the audio. (model with audio) <Ref. to ET-9, REMOVAL, Audio.>
3) Remove the navigation unit. (model with navigation) <Ref. to ET-17, PROCEDURE, Navigation Body.>
4) Insert hands from the audio space, disengage the tabs of the bracket on the back side of the instrument panel, and push the clock.



5) Disconnect the harness connector and remove the clock.

B: INSTALLATION

Install each part in the reverse order of removal.

SEATS

SE

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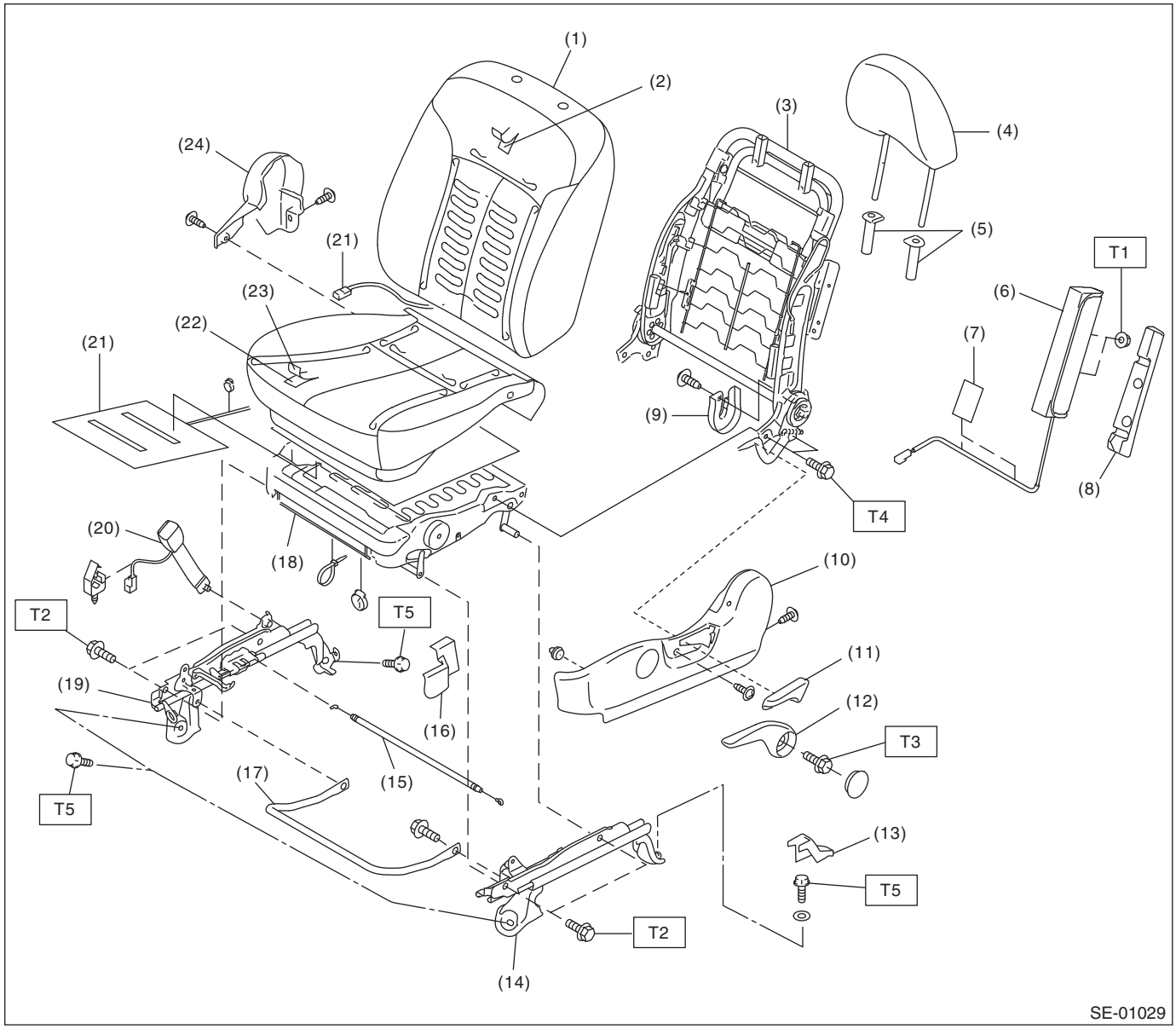
7. Remote Control Back Rest System 28

1. General Description

A: COMPONENT

1. FRONT SEAT LH

- Normal seat

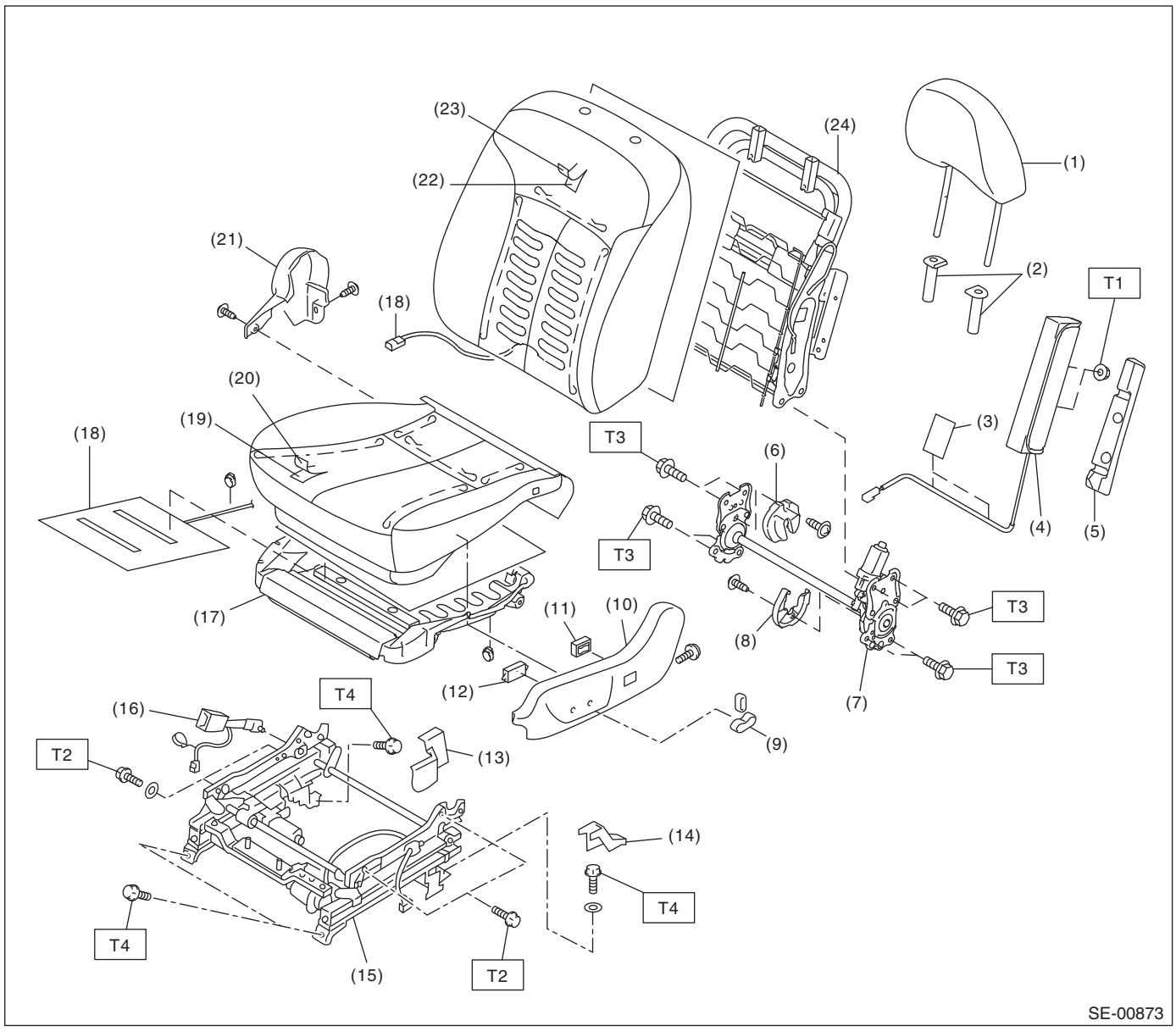


(1) Backrest cover
(2) Backrest pad
(3) Backrest frame ASSY
(4) Headrest ASSY
(5) Headrest lock bushing
(6) Side airbag module ASSY
(7) Tape
(8) Pad
(9) Seat hinge inner cover
(10) Seat side cover outside
(11) Reclining lever
(12) Lifter lever
(13) Rear bolt cover outside
(14) Outer slide rail
(15) Connecting cable
(16) Rear bolt cover inside
(17) Seat slide bar
(18) Seat cushion frame ASSY
(19) Inner slide rail
(20) Inner seat belt ASSY
(21) Seat heater module ASSY
(22) Seat cushion pad
(23) Seat cushion cover
(24) Seat side cover inside

Tightening torque:N·m (kgf-m, ft-lb)

T1: 6.0 (0.61, 4.43)
T2: With lifter: 9.8 (0.99, 7.23) Without lifter: 17.6 (1.79, 13.0)
T3: 17.6 (1.79, 13.0)
T4: 52 (5.30, 38.4)
T5: 53 (5.40, 39.1)

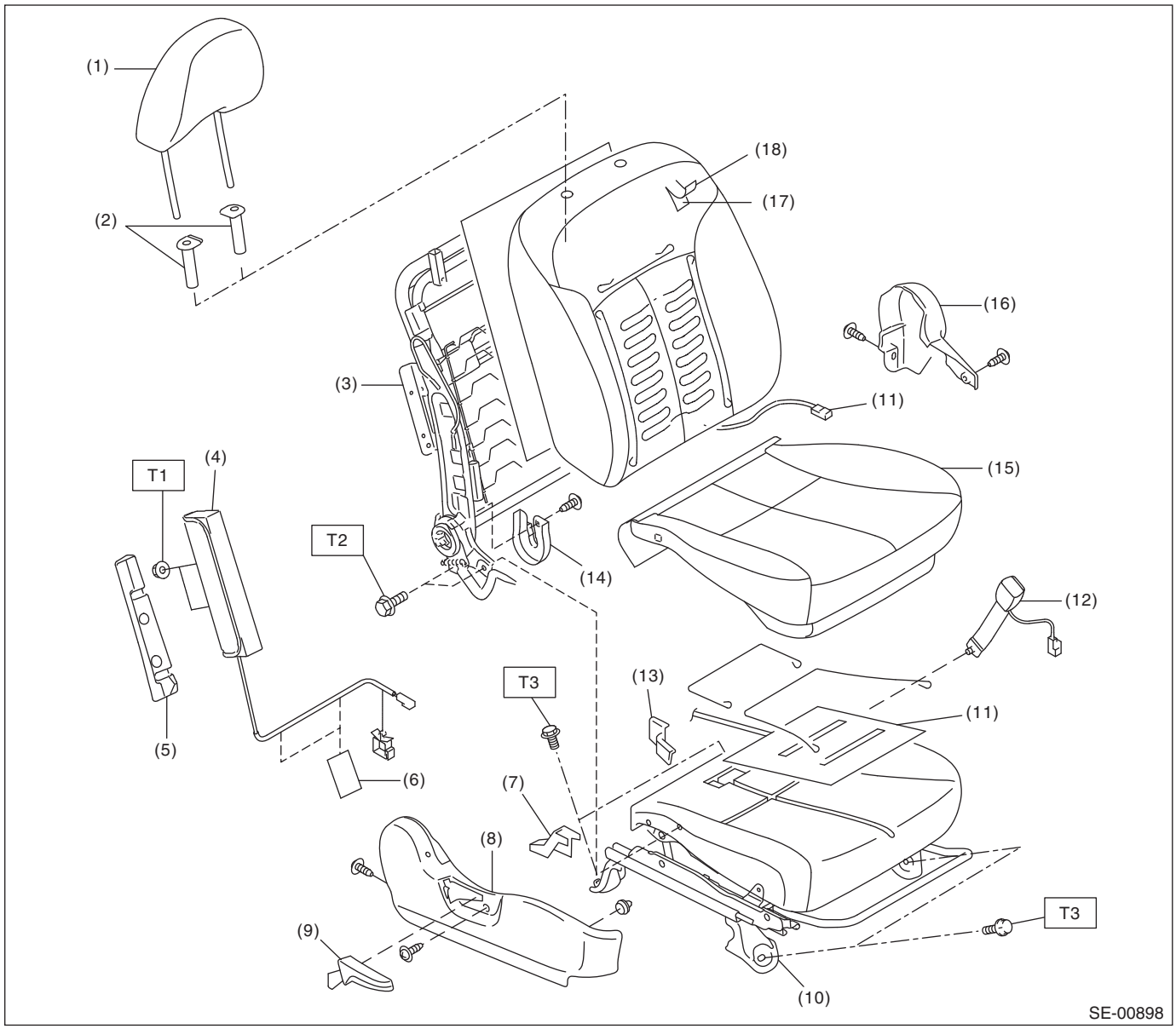
- Power seat



(1) Headrest ASSY
(2) Headrest lock bushing
(3) Tape
(4) Side airbag module ASSY
(5) Pad
(6) Hinge inner cover RH
(7) Reclining hinge ASSY
(8) Hinge inner cover LH
(9) Power seat switch knob
(10) Seat side cover outside
(11) Lumbar switch unit
(12) Power seat switch unit
(13) Rear bolt cover inside
(14) Rear bolt cover outside
(15) Slide rail ASSY
(16) Inner seat belt ASSY
(17) Seat cushion frame ASSY
(18) Seat heater module ASSY
(19) Seat cushion pad
(20) Seat cushion cover
(21) Seat side cover inside
(22) Backrest pad
(23) Backrest cover
(24) Backrest frame ASSY

Tightening torque:N·m (kgf-m, ft-lb)
T1: 6.0 (0.61, 4.43)
T2: 17.6 (1.79, 13.0)
T3: 52 (5.30, 38.4)
T4: 53 (5.40, 39.1)

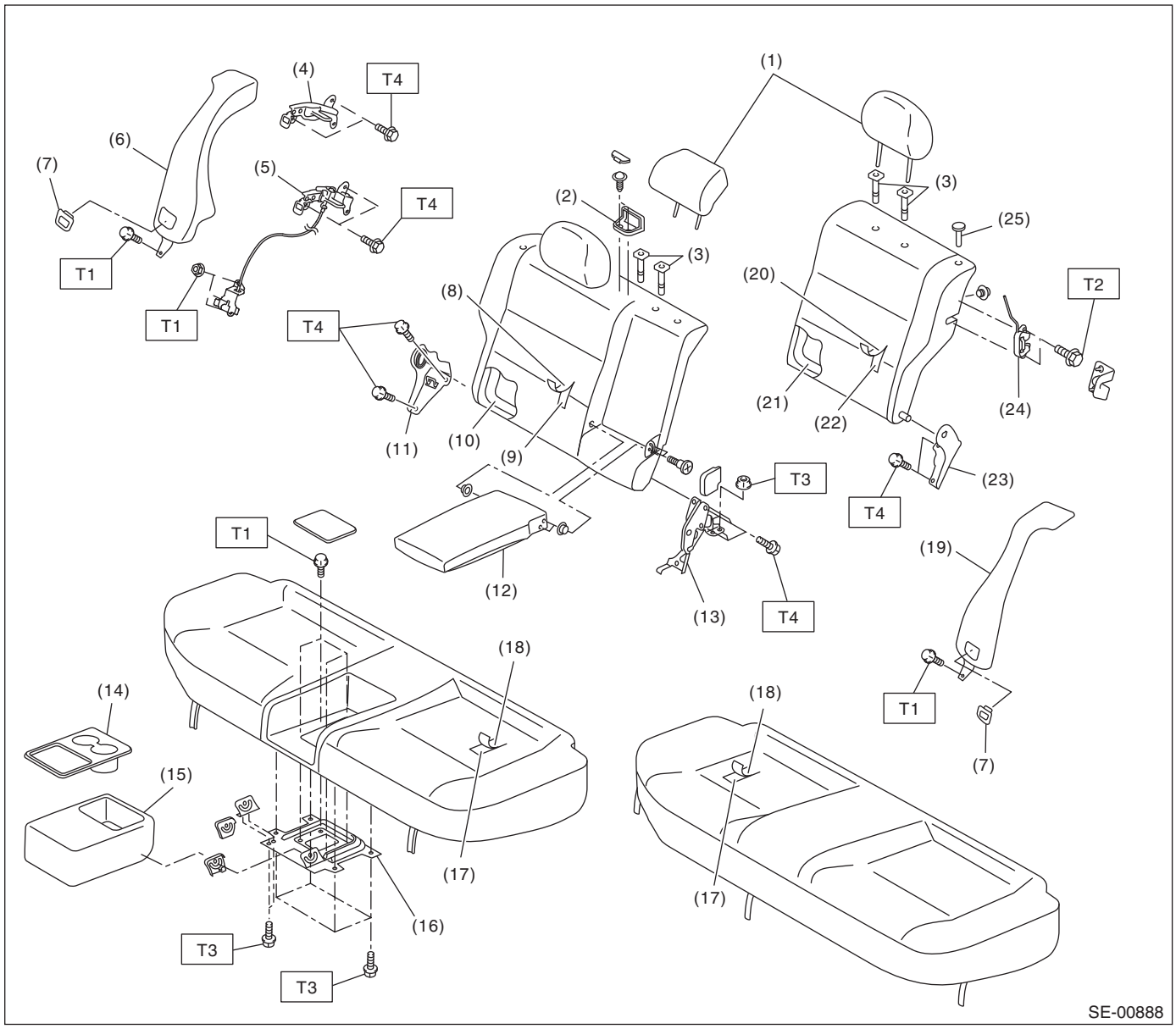
2. FRONT SEAT RH



(1) Headrest ASSY
(2) Headrest lock bushing
(3) Backrest frame ASSY
(4) Side airbag module ASSY
(5) Pad
(6) Tape
(7) Rear bolt cover outside
(8) Seat side cover outside
(9) Reclining lever
(10) Seat cushion pad and frame ASSY
(11) Seat heater unit
(12) Inner seat belt ASSY
(13) Rear bolt cover inside
(14) Hinge inner cover RH
(15) Seat cushion cover
(16) Seat side cover inside
(17) Backrest pad
(18) Backrest cover

Tightening torque:N·m (kgf-m, ft-lb)
T1: 6.0 (0.61, 4.43)
T2: 52 (5.30, 38.4)
T3: 53 (5.40, 39.1)

3. REAR SEAT



(1)	Headrest ASSY	(11)	Hinge ASSY RH	(21)	Backrest frame LH
(2)	Seat belt guide	(12)	Armrest ASSY	(22)	Backrest pad LH
(3)	Headrest bushing	(13)	Hinge ASSY center	(23)	Hinge ASSY LH
(4)	Striker	(14)	Seat table plate (model with seat table)	(24)	Seat back latch
(5)	Striker (reclining type)	(15)	Seat table (model with seat table)	(25)	Backrest knob
(6)	Seat back shoulder RH	(16)	Seat table frame (model with seat table)	***Tightening torque:N·m (kgf-m, ft-lb)***	
(7)	Reclining button	(17)	Seat cushion pad	***T1:***	***7.5 (0.76, 5.5)***
(8)	Backrest cover RH	(18)	Seat cushion cover	***T2:***	***17.6 (1.79, 13.0)***
(9)	Backrest pad RH	(19)	Seat back shoulder LH	***T3:***	***24.5 (2.49, 18.1)***
(10)	Backrest frame RH	(20)	Backrest cover LH	***T4:***	***33 (3.36, 24.3)***

B: CAUTION

• If the seat cushion cover is removed or replaced, make sure to perform passenger detection system adjustment after installing the seat to the vehicle. <Ref. to OD(diag)-18, OPERATION, System Calibration (Rezeroing).>
If system adjustment is not performed, the occupant detection system may not function properly.
• The passenger detection system (passenger seat only) control unit and the passenger detection sensor are fixed to the seat cushion frame. Never remove the passenger detection control unit or the pressure sensor from the seat cushion frame.
• Do not replace the seat cushion pad by itself. Always replace the seat cushion pad and frame assembly as a set. The seat cushion pad and cushion frame are adjusted as a set at the time of manufacture. If cushion pads and cushion frames are combined from those of other vehicles or other sets, the passenger detection system may not operate properly.
• If the seat cushion cover is removed, make sure to replace the hang wire on the seat cushion side with a new wire.
• When removing the front seat from a vehicle loaded a side airbag, follow cautions given in the airbag section. <Ref. to AB-5, CAUTION, General Description.>

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.
Circuit tester	Used for measuring resistance and voltage.

2. Front Seat

A: REMOVAL

CAUTION:
The airbag system is fitted with a backup power supply. After disconnecting the battery ground cable, the airbag may operate if you do not wait for 60 seconds before starting the service of airbag system.

1. DRIVER'S SEAT

1) Disconnect the ground cable from battery, and wait for 60 seconds or more before starting work.

NOTE:
Remove the front and rear bolts from the slide rail of the power seat before removing the battery ground.

2) Remove the headrest.
3) Remove the slide rail installing bolt.
   (1) Tilt the backrest forward and move the seat to the front most position.
   (2) Remove the rear bolt cover at the rear side of the slide rail and remove the bolt.
   (3) Move the seat to the rearmost position, and remove the bolt on the front side of the slide rail.
4) Disconnect the connector under the seat.
- Seat belt warning light connector (driver's seat)
- Side airbag connector
- Seat heater connector (model with seat heater)
- Power seat connector (model with power seats)

5) Remove the front seat from vehicle.

2. PASSENGER'S SEAT

CAUTION:
Always refer to "CAUTION" of "General Description" before starting the work. <Ref. to SE-7, CAUTION, General Description.>

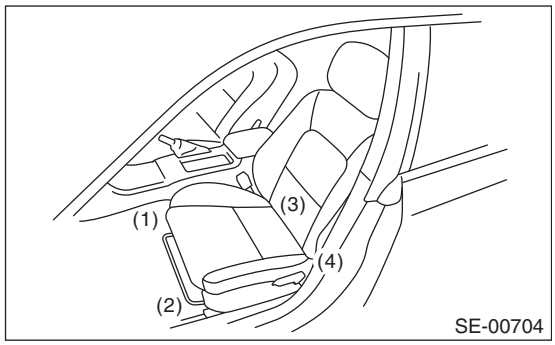
1) Disconnect the ground cable from battery, and wait for 60 seconds or more before starting work.
2) Remove the headrest.
3) Remove the slide rail installing bolt.
   (1) Tilt the backrest forward and move the seat to the front most position.
   (2) Remove the rear bolt cover at the rear side of the slide rail and remove the bolt.
   (3) Move the seat to the rearmost position, and remove the bolt on the front side of the slide rail.
4) 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)

5) Remove the seat from vehicle.

B: INSTALLATION

Install each part in the reverse order of removal.

CAUTION:
• The seat mounting bolts differ between the front mounting points and the rear mounting points. Make sure that you are using correct bolts at correct positions.
• Tighten the slide rail installing bolt gradually in several steps to the specified torque in the order as shown in the figure.



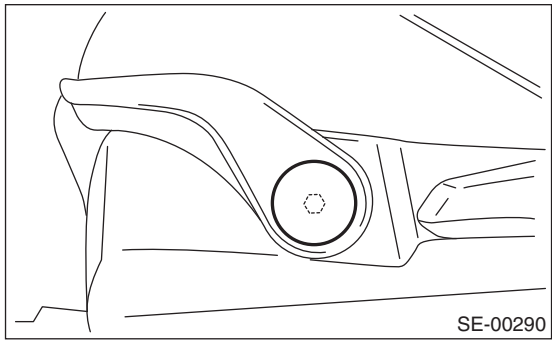
Tightening torque:
53 N·m (5.40 kgf-m, 39.1 ft-lb)

C: DISASSEMBLY

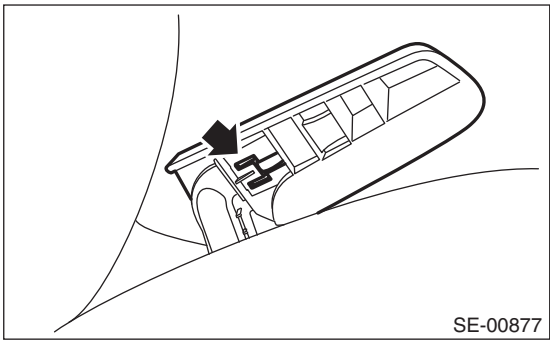
1. DRIVER'S SEAT (NORMAL)

CAUTION:
Make sure how the harnesses of the side airbag and inner seat belt are routed before assembling to avoid misarranging. Incorrect harness routing during assembly can result in pinched harnesses or short circuits.

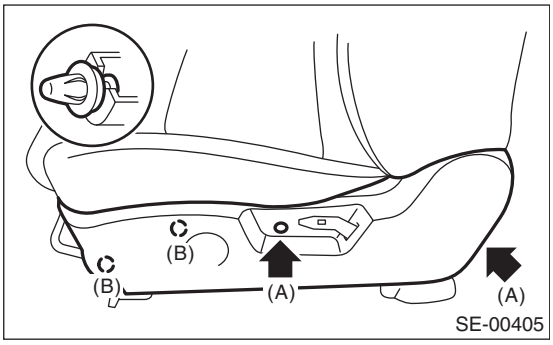
1) Remove the seat from vehicle. <Ref. to SE-8, REMOVAL, Front Seat.>
2) Remove the seat lifter cover using a flat tip screwdriver and loosen the inner bolt to remove the seat lifter lever.



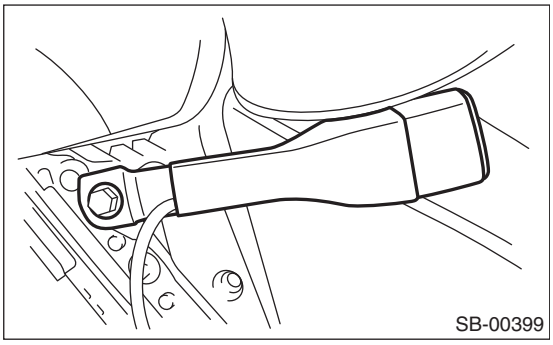
3) Disengage the tab on the backside while pulling the reclining lever, and remove the reclining lever cover.



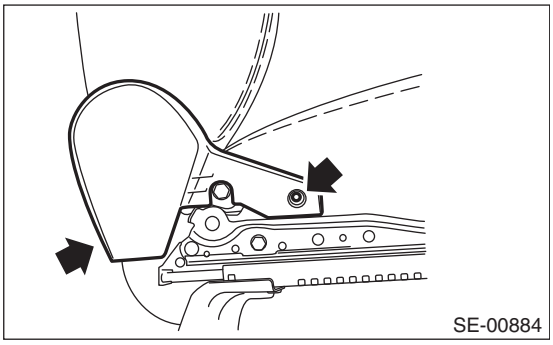
4) Remove screws (A) and clips (B), and then detach the seat side cover outside.



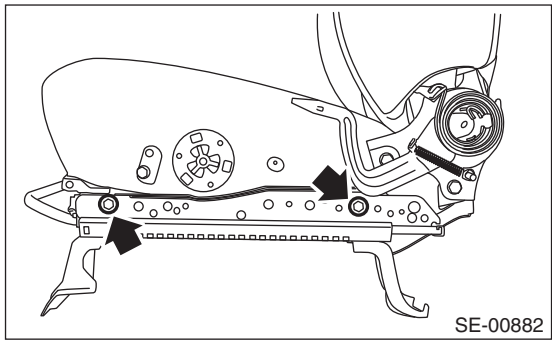
5) Remove the bolts and remove the inner seat belt assembly.



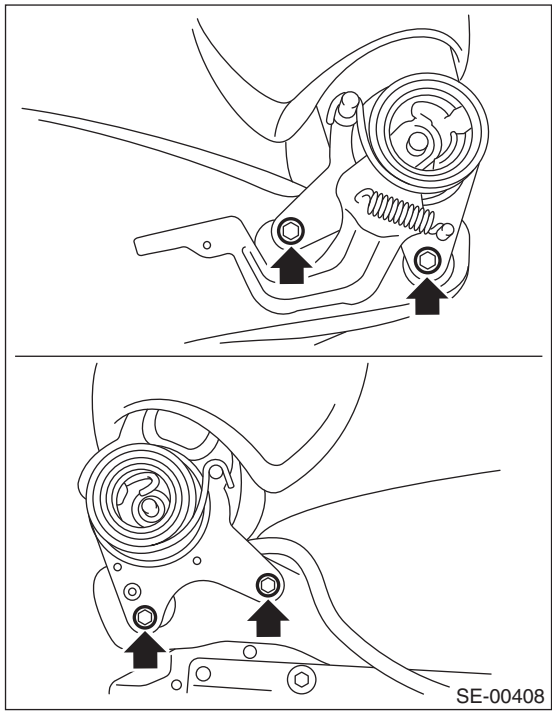
6) Remove the screws to detach the seat side cover inside.



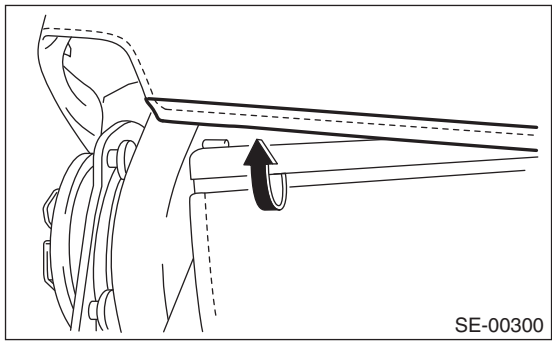
7) Remove the bolts on the seat cushion assembly side, and remove the slide rail.



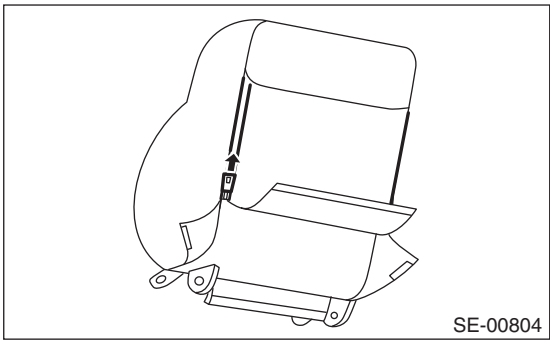
8) Remove the bolts from the right and left reclining hinges.



9) Remove the plastic fastener at the back side (bottom) of backrest.

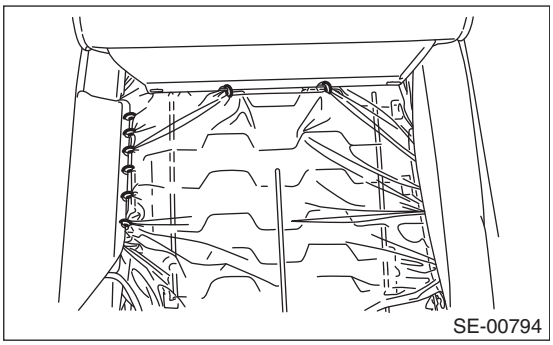


10) Open the fastener at the rear side of backrest.

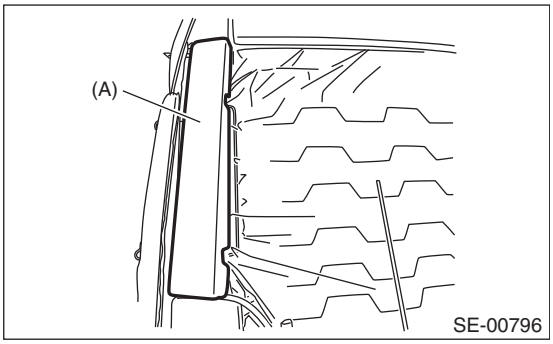

SE-00804

11) Remove the hog rings of backrest cover.

CAUTION:
When removing the hog rings, be careful not to tear the vinyl sheet within the seat.
If the sheet has torn, replace it with a new sheet.


SE-00794

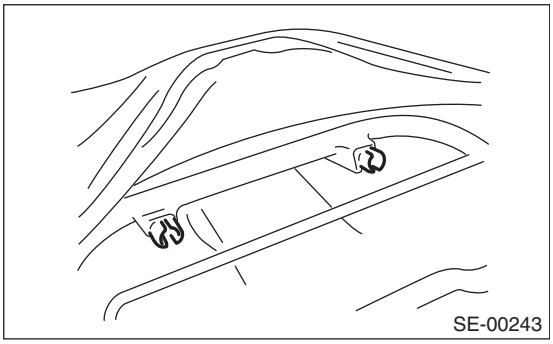
12) Remove the pad (A) and then remove the mounting nuts for side airbag module.



SE-00796

13) Remove the headrest bushing.

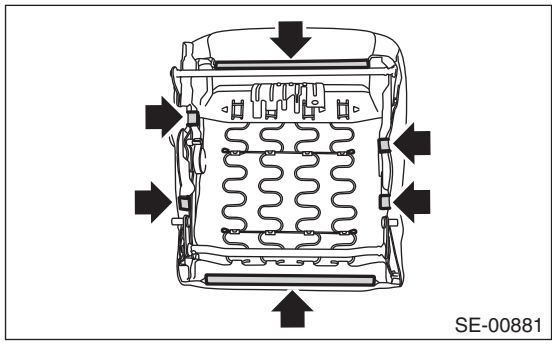
NOTE:
Push outside to remove it from the inside of seat.


SE-00243

14) Pull out the backrest frame.

15) Remove all of the hog rings on the front side of the backrest, and then remove the backrest cover from backrest.

16) Remove the plastic hooks of the seat cushion cover, and then remove the seat cushion assembly.


SE-00881

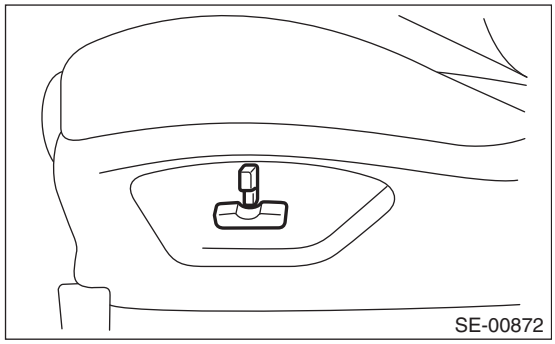
17) Remove all the hog rings, and then remove the seat cushion cover from the seat cushion pad.

2. DRIVER'S SEAT (POWER SEAT)

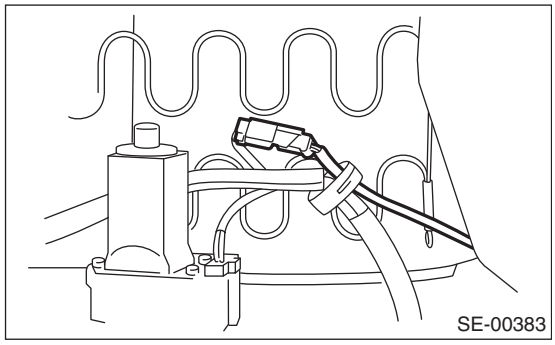
CAUTION:
• Make sure how the harnesses of the side airbag and inner seat belt are routed before assembling to avoid misarranging. Assembling with harnesses improperly routed may cause the harness to get caught and short out.
• Do not disassemble the backrest assembly and seat cushion frame and slide rail assembly.

1) Remove the seat from vehicle. <Ref. to SE-8, REMOVAL, Front Seat.>

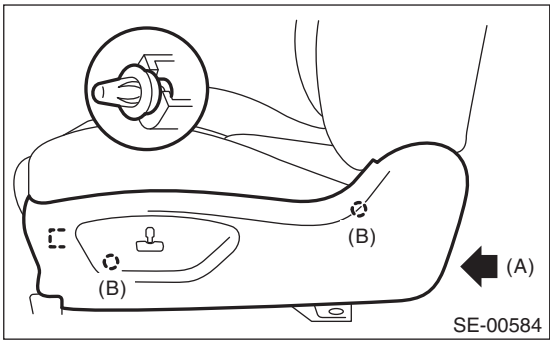
2) Remove the power seat switch knob.


SE-00872

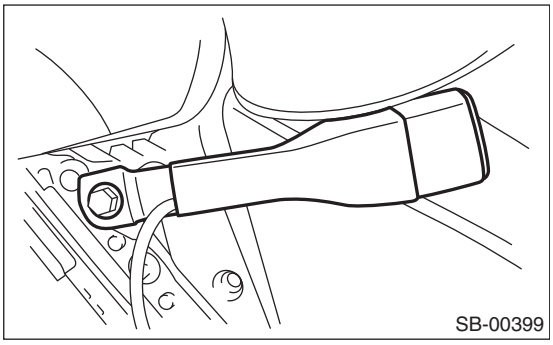
3) Disconnect the connector for reclining motor from the backside of seat cushion.


SE-00383

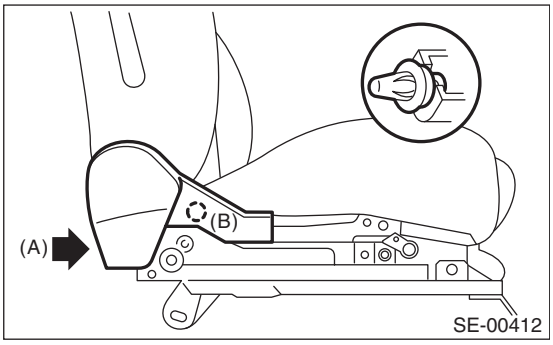
4) Remove the screw (A) and clips (B), and then disconnect the seat switch connector to remove seat side cover outside.



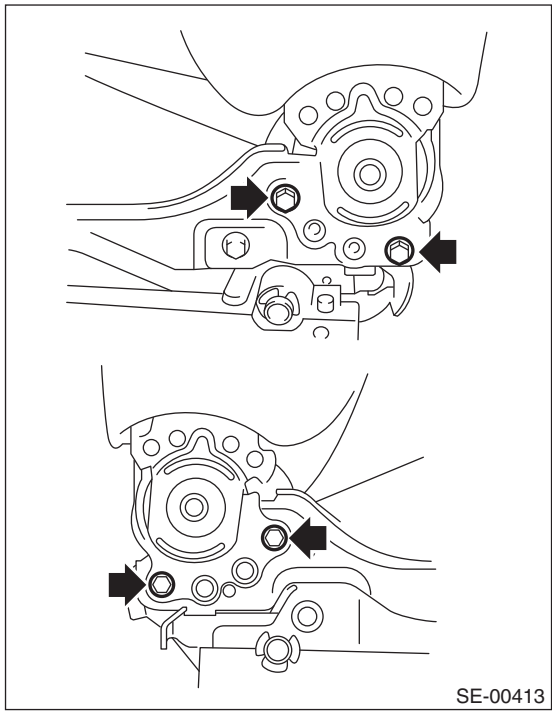
5) Remove the bolts, then remove the inner seat belt assembly.



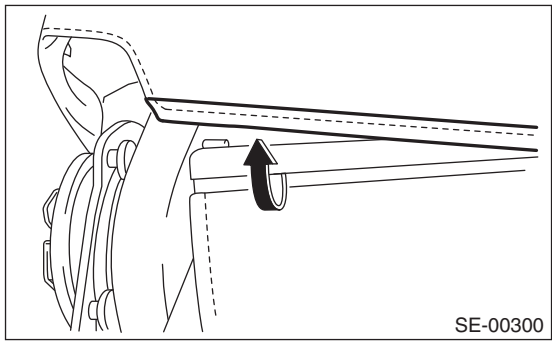
6) Remove the screw (A) and clip (B), and then remove the seat side cover inside.



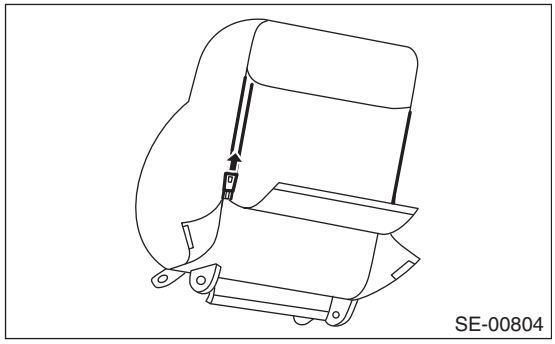
7) Remove the bolts from reclining hinge of both sides.



8) Remove the plastic fastener at the back side (bottom) of backrest.

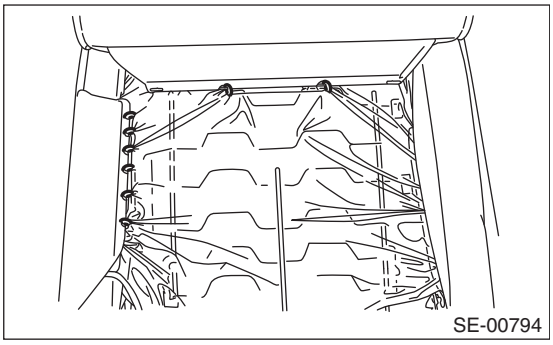


9) Open the fastener at the rear side of backrest.

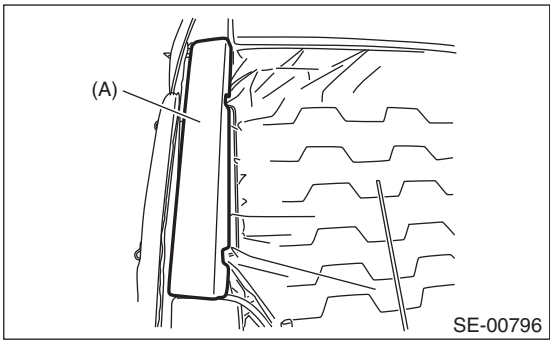


10) Remove the hog rings of backrest cover.

CAUTION:
Be careful not to tear the vinyl inside the seat when removing the hog rings.
If torn, replace with a new part.


SE-00794

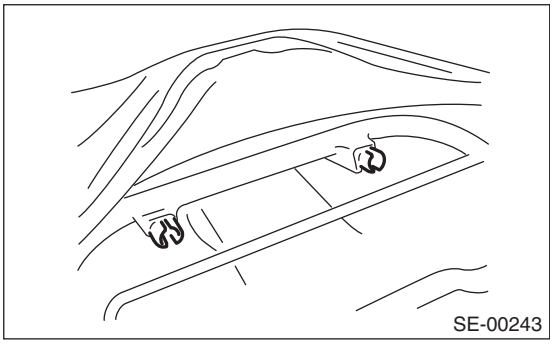
11) Remove the pad (A), and remove the mounting nut from the side airbag module.



SE-00796

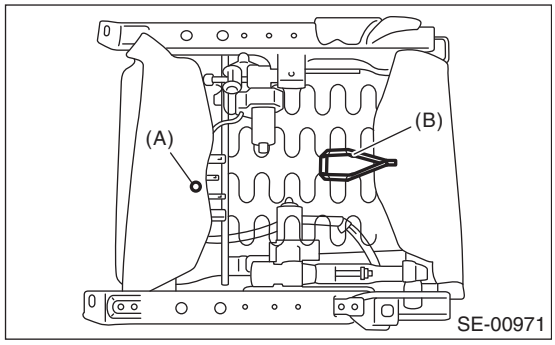
12) Remove the headrest bushing.

NOTE:
Push outside to remove it from the inside of seat.


SE-00243

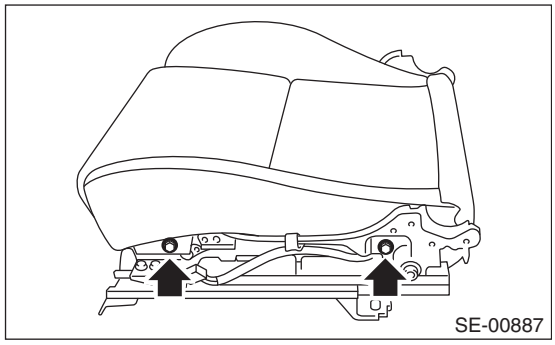
13) Pull out the backrest frame.
14) Remove all the hog rings at front side of seat back, and then remove the seat back cover from seat back.

15) Remove the clip (A) and straps (B) on the back of seat cushion.

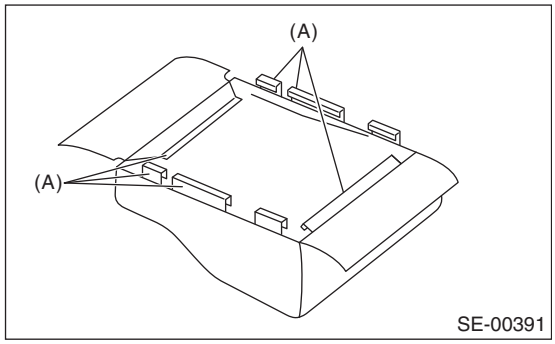


SE-00971

16) Remove the bolts on left and right side, and remove the seat cushion frame from the slide rail assembly.


SE-00887

17) Remove the hooks (A), and then remove the seat cushion from seat cushion frame.



SE-00391

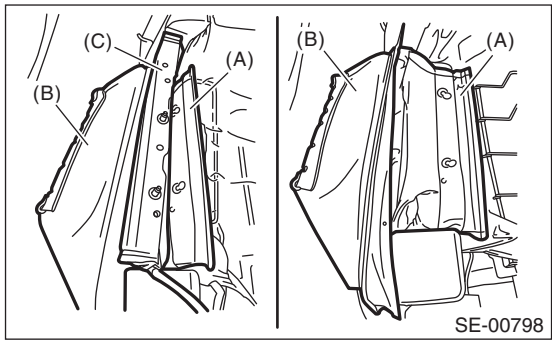
18) Remove the hog rings, and then remove the seat cushion cover from the seat cushion pad.

3. PASSENGER'S SEAT

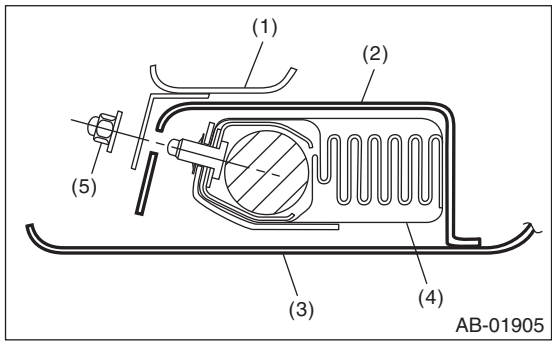
CAUTION:
• If the seat cushion cover is removed or replaced, make sure to perform passenger detection system adjustment after installing the seat to the vehicle. <Ref. to OD(diag)-18, OPERATION, System Calibration (Rezeroing).>
Failure to do so may prevent the passenger's airbag from operating properly.
• The passenger detection system (passenger seat only) control unit, passenger detection sensor, seat cushion pad and seat cushion frame are considered as a single seat cushion pad and frame assembly. Never remove the passenger detection control unit or the pressure sensor from the seat cushion frame.
• If the seat cushion cover is removed, make sure to replace the hang wire on the seat cushion side with a new wire.
1) Remove the seat from the vehicle. <Ref. to SE-8, PASSENGER'S SEAT, REMOVAL, Front Seat.>
2) Refer to the disassembly procedures for the driver's seat. <Ref. to SE-8, DRIVER'S SEAT (NORMAL), DISASSEMBLY, Front Seat.>

D: ASSEMBLY

CAUTION:
• Do not confuse the harness routing of the side airbag and inner seat belt etc. Assembling with harnesses improperly routed may cause the harness to get caught and short out.
• When installing the side airbag module assembly, be sure to put the side airbag module between backrest cover and airbag guide cloth.



(A) Airbag guide cloth
(B) Backrest cover
(C) Side airbag module ASSY



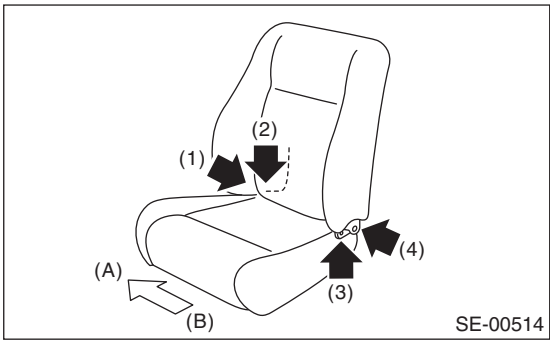
(1) Backrest frame ASSY
(2) Airbag guide cloth
(3) Backrest cover
(4) Side airbag module ASSY
(5) Hexagon cap nut

Besides, when the backrest cover is not installed securely, the side airbag module may not be activated 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.

Tightening torque:
Refer to "COMPONENT" of "General Description". <Ref. to SE-2, FRONT SEAT LH, COMPONENT, General Description.> <Ref. to SB-2, FRONT SEAT BELT, COMPONENT, General Description.>

1. DRIVER'S SEAT

NOTE:
• When installing the inner seat belt assembly, follow the procedures described in the seat belt section. <Ref. to SB-18, INSTALLATION, Front Seat Belt.>
• Install the backrest assembly and seat cushion assembly in the following procedure.
1) Make sure that there is no foreign matter on side airbag module.
2) Temporarily tighten the reclining hinge bolts.
3) Place the backrest in the most upright position.
4) Tighten the reclining hinge bolts (1) through (4) in order, in two or three steps by gradually increasing the torque until they reach the specified torque.

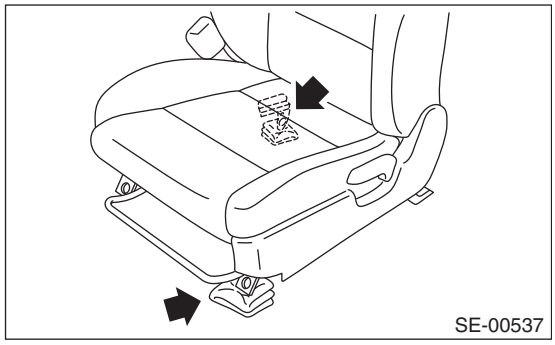


(A) Vehicle inside
(B) Vehicle outside

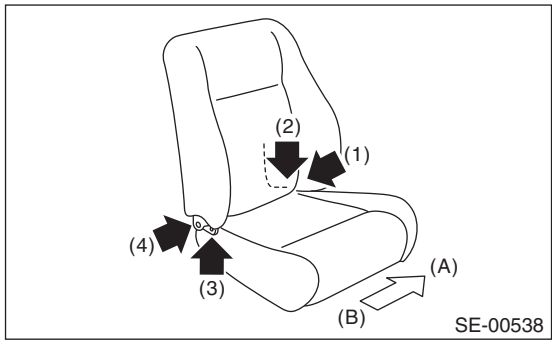
5) Assemble each part in the reverse order of disassembly.

2. PASSENGER'S SEAT

CAUTION:
Make sure to adhere to the following rules when assembling the passenger seat. Improper work procedures can cause the passenger detection system to not operate properly.
• 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)-18, OPERATION, System Calibration (Rezeroing).>
Failure to do so may prevent the passenger's airbag from operating properly.
• The passenger detection system (passenger seat only) control unit, passenger detection sensor, seat cushion pad and seat cushion frame are considered as a single seat cushion pad and frame assembly. Never remove the passenger detection control unit or the pressure sensor from the seat cushion frame.
• If the seat cushion cover is removed, make sure to replace the hang wire on the seat cushion side with a new wire.
• Make sure to install the hog rings/clips to the specified locations. Do not reuse hog rings.
1) Assemble the seat cushion in the reverse order of disassembly.
2) Assemble the backrest in the reverse order of disassembly.
3) When assembling the backrest assembly to the seat cushion assembly, fill up the gap in the front side of slide rail LH and in the rear side of slide rail RH using cloth etc.



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) Vehicle inside
(B) Vehicle outside

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 belt assembly and each cover in the reverse order of removal.

8) Install the seat assembly.

CAUTION:
Tighten the slide rail installing bolt gradually in several steps to the specified torque in the order as shown in the figure.

Tightening torque:
53 N·m (5.40 kgf-m, 39.1 ft-lb)

E: INSPECTION

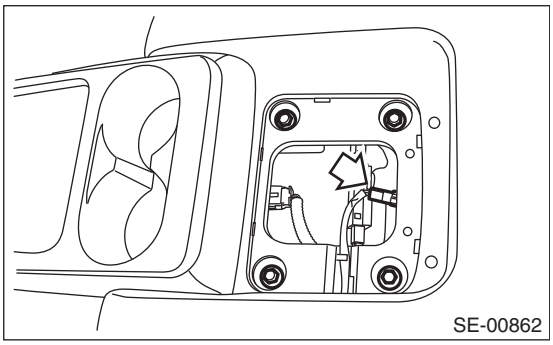
Check that no tear or fray on the backrest cover and seat cushion cover.

NOTE:
For model with side airbag, if the door side of the backrest cover is torn or frayed, the side airbag may not be deployed properly. In this case, replace the backrest cover.

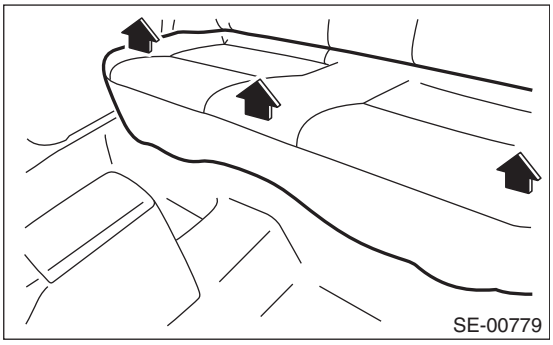
3. Rear Seat

A: REMOVAL

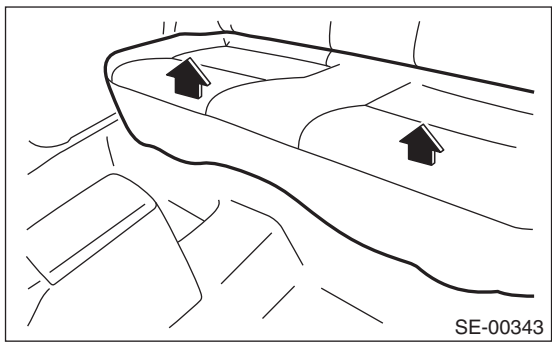
CAUTION:
• Airbag system satellite safing sensor is located in the lower of the rear seat cushion center. Always refer to "CAUTION" of "General Description" in "AIRBAG SYSTEM" before removing the rear seat. <Ref. to AB-5, CAUTION, General Description.>
• The airbag system is fitted with a backup power supply. After disconnecting the battery ground cable, the airbag may operate if you do not wait for 60 seconds before starting the service of airbag system.
1) Disconnect the ground cable from battery, and wait for 60 seconds or more before starting work.
2) Remove the cap behind the seat table and disconnect the connector. (Models with seat table)
3) Remove the bolt. (Models with seat table)


SE-00862

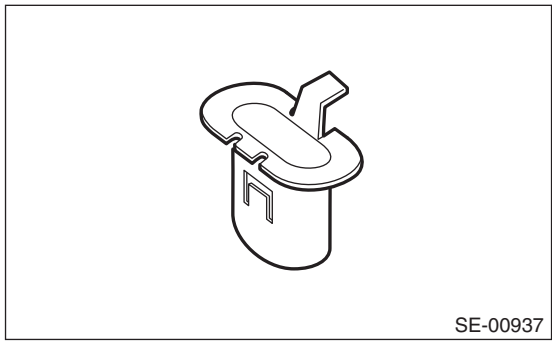
4) Remove the hooks while lifting up the rear seat cushion.
• Without seat table


SE-00779

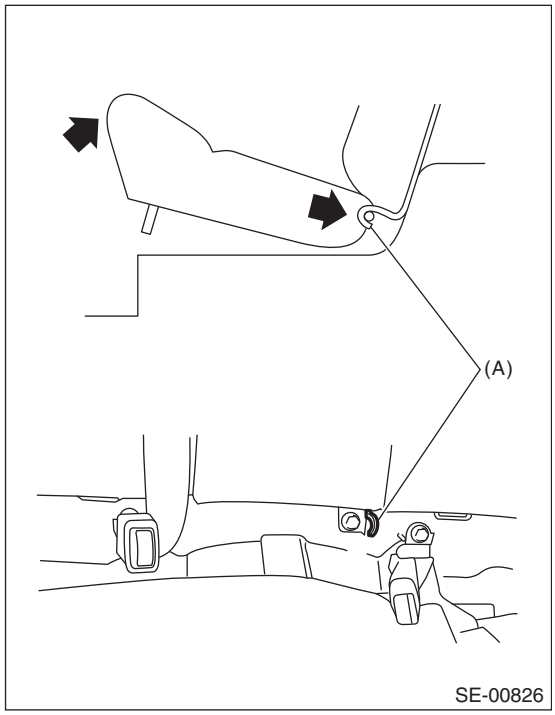
• With seat table


SE-00343

CAUTION:
If the hooks on the vehicle body side is disengaged (remained on the seat cushion side) when removing the rear seat cushion, always replace with new hooks to prevent the decline of the fixed force of the seat.


SE-00937

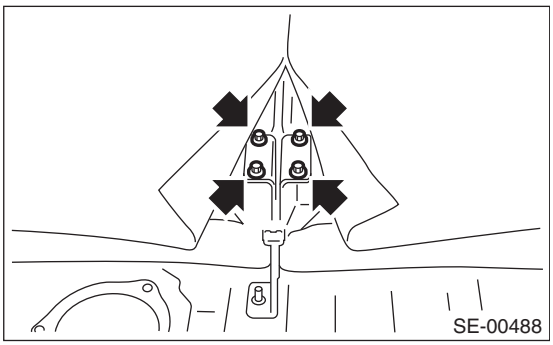
5) Remove the hook (A) by pushing it back while lifting the front side of the seat cushion, and remove the seat cushion.



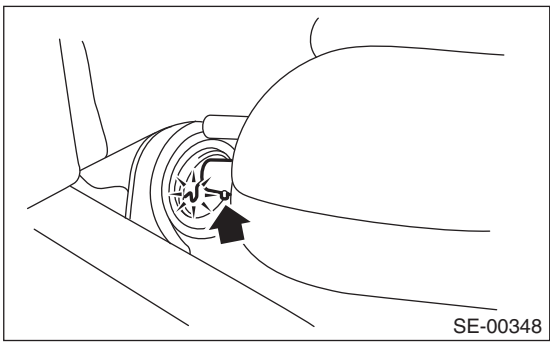
SE-00826

6) Remove the headrest, and then tilt the backrest forward.

7) Remove the luggage floor mat.
8) Turn over the mat to remove the bolt.



9) Remove the backrest from the hinge assembly LH (hinge assembly RH).

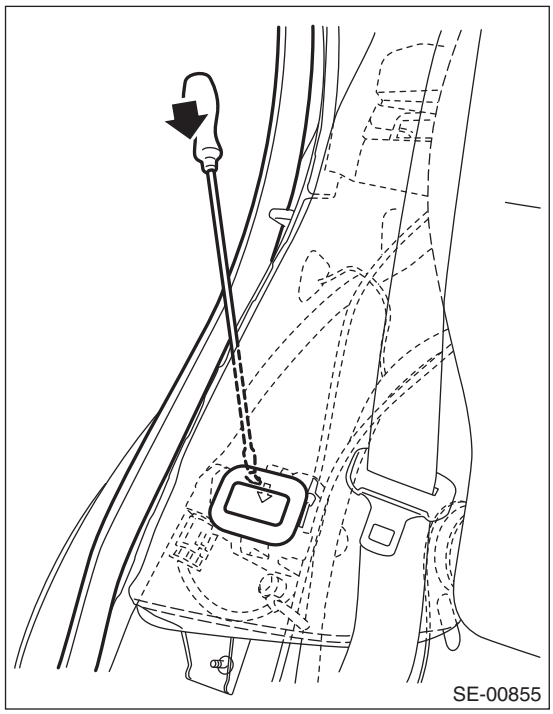


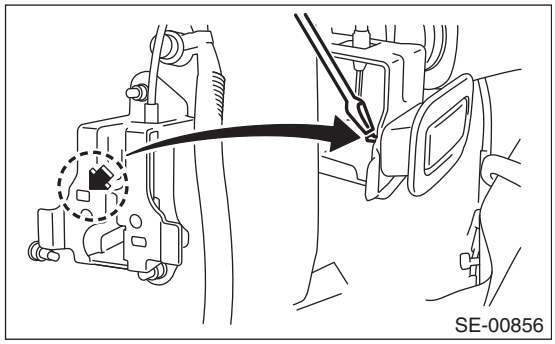
NOTE:
The armrests cannot be detached while pin positions of the hinge assembly and armrest are not aligned.
10) Remove the reclining button.

CAUTION:
Use the following procedures to remove the reclining button. Damage to the reclining button may result if the procedures are not followed correctly.

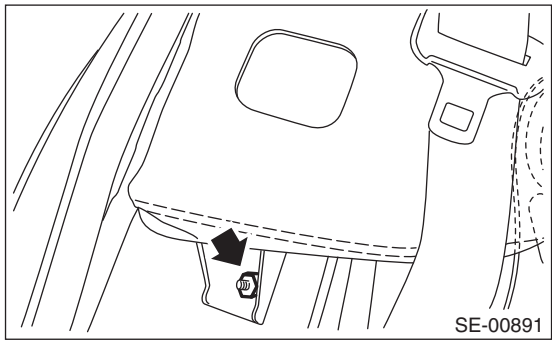
(1) Remove the weather strip, and insert a flat tip screwdriver into the rear of the rear seat backrest shoulder.
(2) Press the tab on the rear side of the reclining button downwards and remove the reclining button.

CAUTION:
Do not press strongly on the button tab. Pressing with excessive force may break the tab.



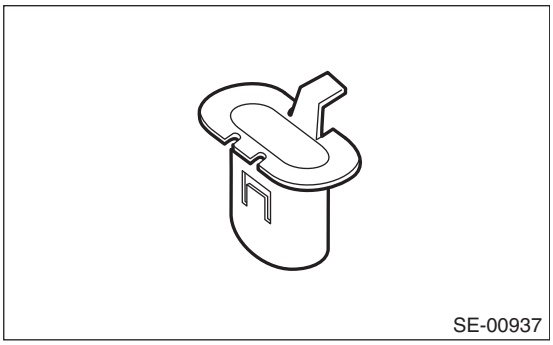


NOTE:
• Direct a light from under the rear seat backrest shoulder to easily identify the tab position.
• The LH side is left and right symmetrical.
11) Remove the nut, and remove the seat backrest shoulder.



B: INSTALLATION

CAUTION:
If the hooks on the vehicle body side is disengaged (remained on the seat cushion side) when removing the rear seat cushion, always replace with new hooks to prevent the decline of the fixed force of the seat.


SE-00937

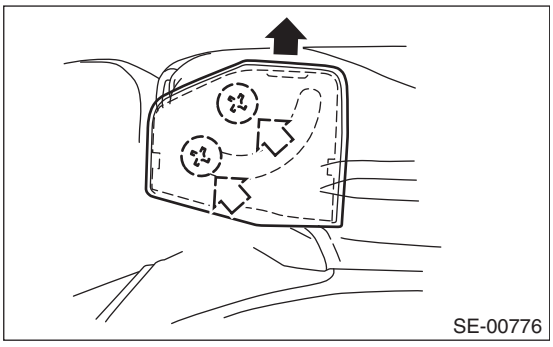
1) Install each part in the reverse order of removal.

Tightening torque:
Refer to "COMPONENT" of "General Description". <Ref. to SE-6, REAR SEAT, COMPONENT, General Description.>

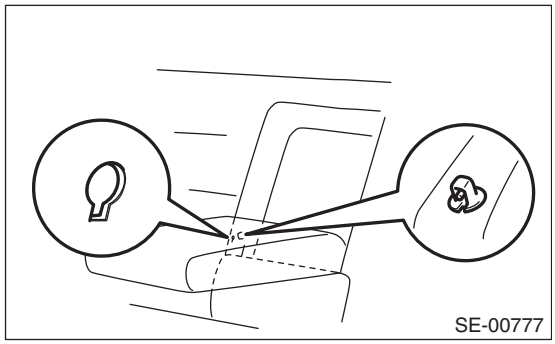
2) Route the seat belt securely. <Ref. to SB-20, INSTALLATION, Rear Seat Belt.>

C: DISASSEMBLY

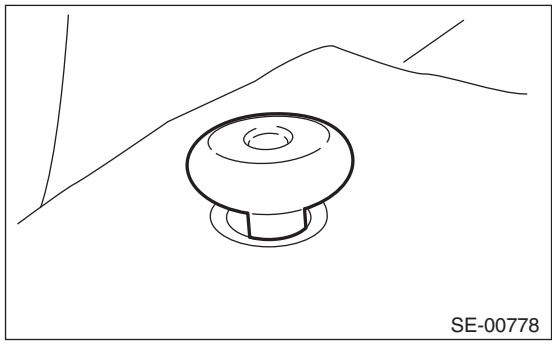
1) Remove the rear seat. <Ref. to SE-16, REMOVAL, Rear Seat.>
2) Remove the armrest hinge cover in the direction of the black arrow, and remove the screws to remove the armrest.


SE-00776

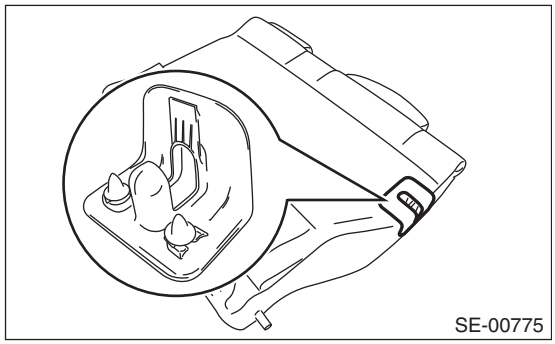
NOTE:
The armrests cannot be detached while the backrest assembly RH and armrest side pin positions are not aligned.


SE-00777

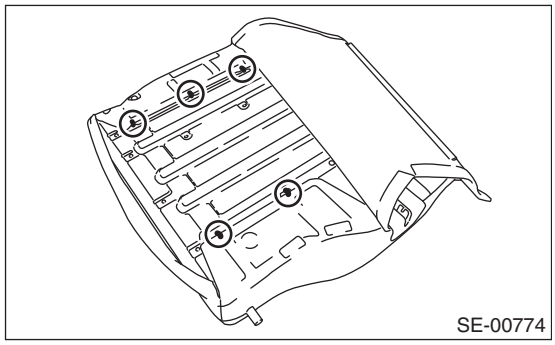
3) Remove the backrest knob. (Screw-in type)


SE-00778

4) Remove the seat backrest latch cover.

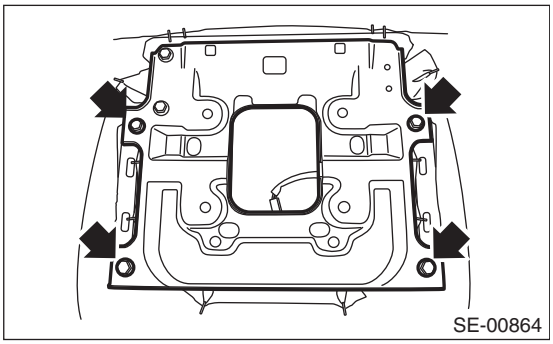

SE-00775

5) Peel back the backrest cover and remove the hog rings.

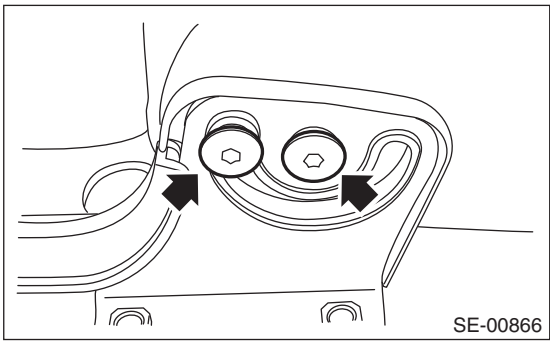

SE-00774

6) Remove all the hog rings securing the backrest frame and backrest pad.
7) Remove the headrest bushing.
8) Remove the backrest pad and backrest cover from the backrest frame.

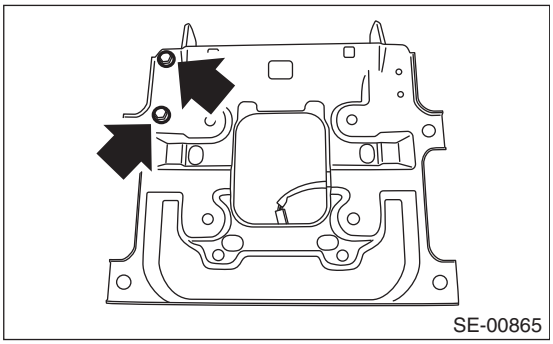
9) Disassemble the backrest assembly LH by referring to above procedures.
10) Remove the bolts on the backside of the seat cushion, and remove the seat table assembly.


SE-00864

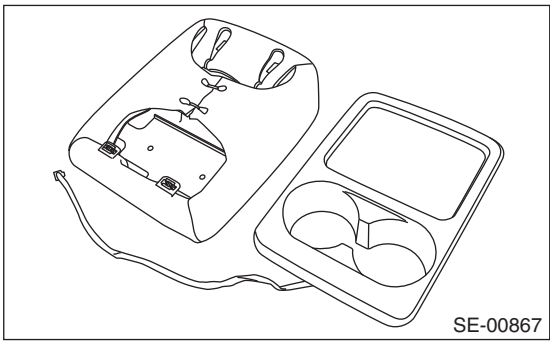
11) Remove the bolts on the right and left sides, and remove the seat table assembly.


SE-00866

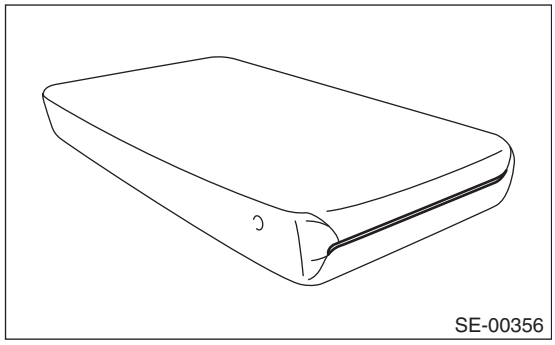
12) Remove the bolts and the seat table hinge.


SE-00865

13) Remove the hooks and the seat table plate.


SE-00867

14) Remove all the hog rings on the backside of the seat cushion, and disassemble the seat cushion cover and seat cushion pad.
15) Detach the plastic zipper and hog ring, and then remove the armrest cover.


SE-00356

D: ASSEMBLY

CAUTION:
- **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.**

Assemble each part 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.

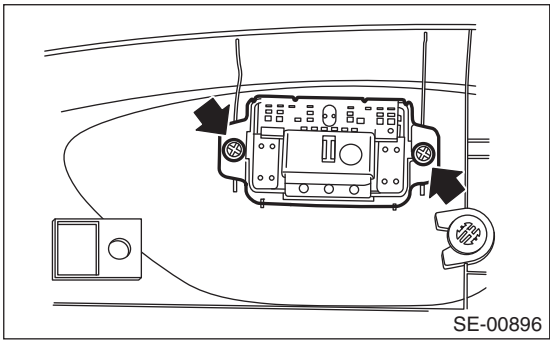
4. Power Seat System

A: REMOVAL

CAUTION:
When removing the front seat, disconnect the ground cable from the battery before disconnecting the side airbag module harness connector, and wait for 60 seconds before starting the operation.

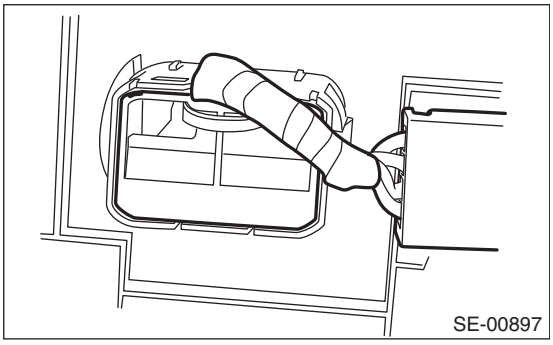
1. POWER SEAT SWITCH

1) Detach the connectors and remove the seat side cover outside. <Ref. to SE-8, DISASSEMBLY, Front Seat.>
2) Remove the screws to remove the power seat switch assembly.


SE-00896

2. LUMBAR SWITCH

1) Detach the connectors and remove the seat side cover outside. <Ref. to SE-8, DISASSEMBLY, Front Seat.>
2) Disconnect the lumbar switch connector and remove the lumbar switch assembly.


SE-00897

B: INSTALLATION

Install each part in the reverse order of removal.

C: INSPECTION

1. WIRING DIAGRAM

Refer to “Power Seat System” in the wiring diagram. <Ref. to WI-91, WIRING DIAGRAM, Power Seat System.>

2. TROUBLE SYMPTOM

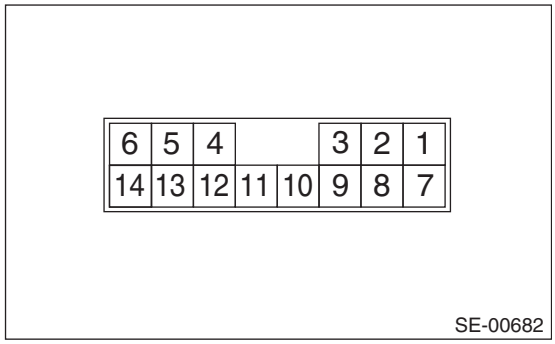
- Driver’s side

Symptom	Criteria
All function fails to operate. <Ref. to SE-21, ALL FUNCTION FAILS TO OPERATE, INSPECTION, Power Seat System.>	• Power seat switch • Lumbar switch • Power seat harness • Body harness
A part of function does not operate. <Ref. to SE-22, SOME OF THE MOTORS DO NOT OPERATE (DRIVER’S SEAT), INSPECTION, Power Seat System.>	• Power seat switch • Lumbar switch • Power seat harness • Relevant motor

3. CHECK SWITCH

Check resistance between terminals while operating each switch.

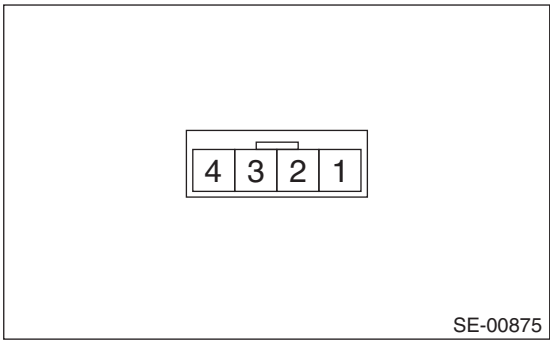
- Power seat switch



SE-00682

Switch position	Terminal No.	Standard
Slide forward	7 and 14 8 and 13	Less than 10 Ω
Slide rearward	7 and 13 8 and 14	Less than 10 Ω
Tilt up	7 and 2 8 and 1	Less than 10 Ω
Tilt down	7 and 1 8 and 2	Less than 10 Ω
Lifter up	7 and 5 8 and 6	Less than 10 Ω
Lifter down	7 and 6 8 and 5	Less than 10 Ω
Reclining forward	7 and 3 8 and 4	Less than 10 Ω
Reclining rearward	7 and 4 8 and 3	Less than 10 Ω

- Lumbar switch



Switch position	Terminal No.	Standard
Lumbar forward	1 and 3 2 and 4	Less than 10 Ω
Lumbar backward	1 and 4 2 and 3	Less than 10 Ω

4. ALL FUNCTION FAILS TO OPERATE

	Step	Check	Yes	No
1	**CHECK SEAT FUNCTIONS.** Operate each power seat switch and check that each power seat function operates normally.	Does all function fails to operate?	Go to step **2**.	Check the motor which does not operate. <Ref. to SE-22, SOME OF THE MOTORS DO NOT OPERATE (DRIVER'S SEAT), INSPECTION, Power Seat System.>
2	**CHECK FUSE.** Check the power seat fuse inside the fuse box.	Is the fuse blown out?	Replace the appropriate fuse.	Go to step **3**.
3	**CHECK POWER SUPPLY CIRCUIT.** 1) Disconnect the connectors for power seat switch and lumbar switch. 2) Measure the voltage between harness connector and chassis ground. ***Connector & terminal*** ***(R200) No. 7 (+) — Chassis ground (–):*** ***(R195) No. 1 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **4**.	Check body harness.
4	**CHECK POWER SUPPLY CIRCUIT.** Measure the resistance between the harness connectors for power seat switch and lumbar switch and the chassis ground. ***Connector & terminal*** ***(R200) No. 8 — Chassis ground:*** ***(R195) No. 2 — Chassis ground:***	Is the resistance less than 10 Ω?	Replace the faulty switch assembly.	Check body harness.

5. SOME OF THE MOTORS DO NOT OPERATE (DRIVER'S SEAT)

- Slide operation failure

	Step	Check	Yes	No
1	**CHECK SWITCH.** 1) Disconnect the connector of power seat switch assembly. 2) Measure the resistance between connector terminals when moving the switch to slide forward and slide backward. <Ref. to SE-20, CHECK SWITCH, INSPECTION, Power Seat System.>	Is there any problem on the inspection result?	Go to step **2**.	Replace the power seat switch assembly.
2	**CHECK HARNESS.** 1) Disconnect the power seat switch connector and slide motor connector. 2) Measure the resistance between power seat switch connector and slide motor connector. ***Connector & terminal*** ***(R202) No. 1 — (R200) No. 14:*** ***(R202) No. 2 — (R200) No. 13:***	Is the resistance less than 10 Ω?	Go to step **3**.	Check power seat harness.
3	**CHECK SLIDE MOTOR.** 1) Connect the power seat switch connector and slide motor connector. 2) Apply 12 V to the slide motor and check the motor rotation. ***Connector & terminal*** ***(R200) No. 14 (+) — (R200) No. 13 (–):*** ***(R200) No. 13 (+) — (R200) No. 14 (–):***	Does the motor rotate normally?	Check for temporary poor contact or mechanical trouble in slide rail.	Slide motor problem. Replace the slide rail assembly.

- Malfunction of tilt operation

	Step	Check	Yes	No
1	**CHECK SWITCH.** 1) Disconnect the connector of power seat switch assembly. 2) Measure the resistance between connector terminals when moving the switch to tilt up and tilt down. <Ref. to SE-20, CHECK SWITCH, INSPECTION, Power Seat System.>	Is there any problem on the inspection result?	Go to step **2**.	Replace the power seat switch assembly.
2	**CHECK HARNESS.** 1) Disconnect the power seat switch connector and tilt motor connector. 2) Measure the resistance between power seat switch connector and tilt motor connector. ***Connector & terminal*** ***(R203) No. 2 — (R200) No. 2:*** ***(R203) No. 3 — (R200) No. 1:***	Is the resistance less than 10 Ω?	Go to step **3**.	Check power seat harness.
3	**CHECK TILT MOTOR.** 1) Connect the power seat switch connector and tilt motor connector. 2) Apply 12 V to the tilt motor and check the motor rotation. ***Connector & terminal*** ***(R200) No. 2 (+) — (R200) No. 1 (–):*** ***(R200) No. 1 (+) — (R200) No. 2 (–):***	Does the motor rotate normally?	Check for temporary poor contact or mechanical trouble in tilt mechanism.	Tilt motor problem. Replace the slide rail assembly.

• Malfunction of lifter operation

	Step	Check	Yes	No
1	**CHECK SWITCH.** 1) Disconnect the connector of power seat switch assembly. 2) Measure the resistance between connector terminals when moving the switch to lifter up and lifter down. <Ref. to SE-20, CHECK SWITCH, INSPECTION, Power Seat System.>	Is there any problem on the inspection result?	Go to step **2**.	Replace the power seat switch assembly.
2	**CHECK HARNESS.** 1) Disconnect the power seat switch connector and lifter motor connector. 2) Measure the resistance between power seat switch connector and lifter motor connector. ***Connector & terminal*** ***(R204) No. 4 — (R200) No. 5:*** ***(R204) No. 3 — (R200) No. 6:***	Is the resistance less than 10 Ω?	Go to step **3**.	Check power seat harness.
3	**CHECK LIFTER MOTOR.** 1) Connect the power seat switch connector and lifter motor connector. 2) Apply 12 V to the lifter motor and check the motor rotation. ***Connector & terminal*** ***(R200) No. 5 (+) — (R200) No. 6 (–):*** ***(R200) No. 6 (+) — (R200) No. 5 (–):***	Does the motor rotate normally?	Check for temporary poor contact or mechanical trouble in lifter mechanism.	Lifter motor problem. Replace the slide rail assembly.

• Malfunction of reclining operation

	Step	Check	Yes	No
1	**CHECK SWITCH.** 1) Disconnect the connector of power seat switch assembly. 2) Measure the resistance between connector terminals when moving the switch to reclining forward and reclining backward. <Ref. to SE-20, CHECK SWITCH, INSPECTION, Power Seat System.>	Is there any problem on the inspection result?	Go to step **2**.	Replace the power seat switch assembly.
2	**CHECK HARNESS.** 1) Disconnect the power seat switch connector and reclining motor connector. 2) Measure the resistance between power seat switch connector and reclining motor connector. ***Connector & terminal*** ***(R201) No. 2 — (R200) No. 3:*** ***(R201) No. 1 — (R200) No. 4:***	Is the resistance less than 10 Ω?	Go to step **3**.	Check power seat harness.
3	**CHECK RECLINING MOTOR.** 1) Connect the power seat switch connector and reclining motor connector. 2) Apply 12 V to the reclining motor and check the motor rotation. ***Connector & terminal*** ***(R200) No. 3 (+) — (R200) No. 4 (–):*** ***(R200) No. 4 (+) — (R200) No. 3 (–):***	Does the motor rotate normally?	Check for temporary poor contact or mechanical trouble in reclining hinge.	Reclining motor problem. Replace the backrest hinge and motor assembly.

- Malfunction of lumbar operation

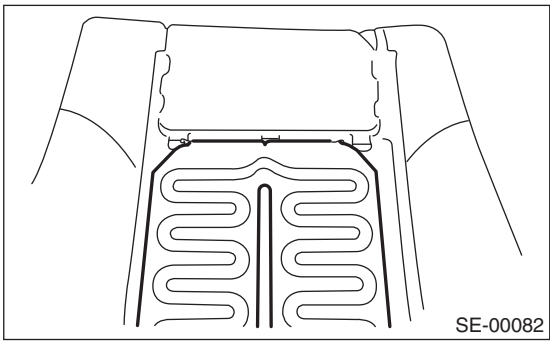
	Step	Check	Yes	No
1	**CHECK SWITCH.** 1) Disconnect the connector of lumbar switch assembly. 2) Measure the resistance between connector terminals when moving the switch to lumbar forward and lumbar backward. <Ref. to SE-20, CHECK SWITCH, INSPECTION, Power Seat System.>	Is there any problem on the inspection result?	Go to step **2**.	Replace the lumbar switch assembly.
2	**CHECK HARNESS.** 1) Disconnect the lumbar switch connector and lumbar motor connector. 2) Measure the resistance between lumbar switch connector and lumbar motor connector. ***Connector & terminal*** ***(R198) No. 1 — (R195) No. 3:*** ***(R198) No. 2 — (R195) No. 4:***	Is the resistance less than 10 Ω?	Go to step **3**.	Check power seat harness.
3	**CHECK LUMBAR MOTOR** 1) Connect the lumbar switch connector and lumbar motor connector. 2) Apply 12 V to the lumbar motor and check the motor rotation. ***Connector & terminal*** ***(R195) No. 3 (+) — (R195) No. 4 (–):*** ***(R195) No. 4 (+) — (R195) No. 3 (–):***	Does the motor rotate normally?	Check for temporary poor contact or mechanical trouble in lumbar mechanism.	Lumbar motor problem. Replace the lumbar motor assembly.

5. Seat Heater System

A: REMOVAL

1. SEAT HEATER UNIT

1) Remove the front seats. <Ref. to SE-8, REMOVAL, Front Seat.>
2) Remove the backrest cover of front seat and seat cushion cover. <Ref. to SE-8, DISASSEMBLY, Front Seat.>
3) Remove the seat heater unit.



2. SEAT HEATER SWITCH

1) Remove the console box. <Ref. to EI-49, REMOVAL, Console Box.>
2) Remove the seat heater switch from the console box.

B: INSTALLATION

Install each part in the reverse order of removal.

C: INSPECTION

1. WIRING DIAGRAM

Refer to “Seat Heater System” in the wiring diagram. <Ref. to WI-98, WIRING DIAGRAM, Seat Heater System.>

2. DIAGNOSIS CHART

Symptoms	Repair order
Seat heater does not operate.	1. Check the fuse. <Ref. to SE-25, CHECK SEAT HEATER FUSE, INSPECTION, Seat Heater System.>
	2. Check the seat heater system power supply and ground circuit. <Ref. to SE-25, CHECK POWER SUPPLY AND GROUND CIRCUIT, INSPECTION, Seat Heater System.>
	3. Check the seat heater module. <Ref. to SE-26, SEAT HEATER UNIT, INSPECTION, Seat Heater System.>
	4. Check the seat heater switch circuit. <Ref. to SE-26, Seat heater switch, INSPECTION, Seat Heater System.>

3. CHECK SEAT HEATER FUSE

Remove the seat heater fuse, and then visually check.
Is the fuse blown out?
- **Yes** → Replace the fuse.
- **No** → Check the power supply and ground circuits.

4. CHECK POWER SUPPLY AND GROUND CIRCUIT

1) Check power supply circuit.
   (1) Disconnect the seat heater switch.
   (2) Turn the ignition switch to ON.
   (3) Measure the voltage between harness connector terminal and chassis ground.

Connector & terminal
(R43) No. 7 (+) — Chassis ground (–):
Is the voltage 12 V or more?
- **Yes** → Go to step 2.
- **No** → Check the harness between the seat heater switch and fuse.

2) Check ground circuit.
Measure the resistance between harness connector terminal and chassis ground.

Connector & terminal
(R43) No. 2 — Chassis ground:
Is the resistance less than 10 Ω?
- **Yes** → Go to step 3.
- **No** → Repair the harness.

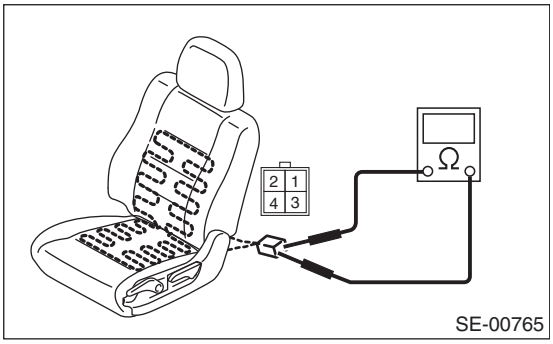
3) Check ground circuit.
Measure the resistance between seat heater switch terminals.

Connector & terminal
(R43) No. 7 — (R43) No. 2:
Is the resistance less than 10 Ω?
- **Yes** → The power supply and ground circuits are normal.
- **No** → Replace the seat heater switch.

5. SEAT HEATER UNIT

1) Disconnect the seat heater unit connector, and check the continuity between terminals of connector.

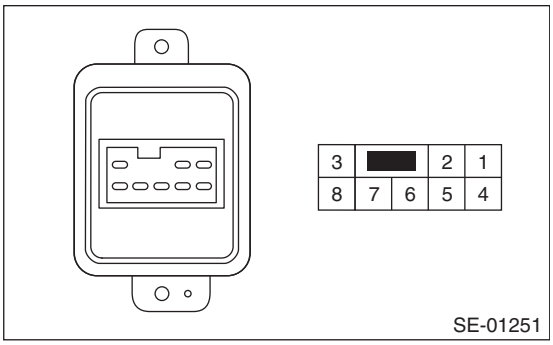
Connector & terminal
No. 1 — No. 3:
No. 1 — No. 4:
No. 3 — No. 4:



2) If no continuity exists, replace the seat heater module with a new part.

6. SEAT HEATER SWITCH

1) Inspect the continuity between the seat heater switch terminals.



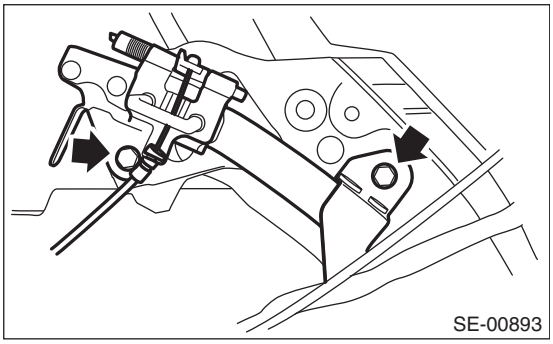
Connector & terminal
HI
No. 7 — No. 2:
No. 7 — No. 4:
No. 7 — No. 8:
LOW
No. 7 — No. 1:
No. 7 — No. 2:
No. 7 — No. 3:

2) If no continuity exists, replace the seat heater switch with a new part.

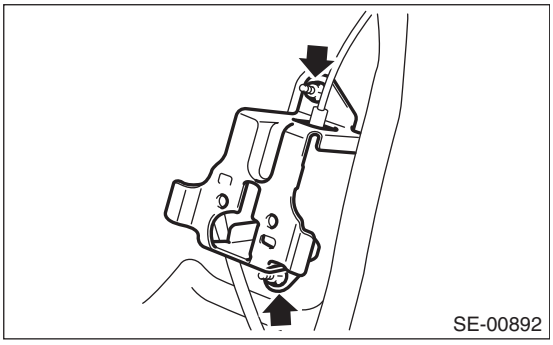
6. Rear Seat Reclining System

A: REMOVAL

1) Disconnect the ground cable from the battery.
2) Remove the backrest shoulder. <Ref. to SE-16, REMOVAL, Rear Seat.>
3) Remove the rear quarter lower trim. <Ref. to EI-60, REMOVAL, Rear Quarter Trim.>
4) Remove the bolts and the wire, and remove the rear seat backrest striker assembly.


SE-00893

5) Remove the nuts and remove the reclining button bracket.


SE-00892

B: INSTALLATION

Install each part in the reverse order of removal.

7. Remote Control Back Rest System

A: REMOVAL

1. REMOTE CONTROL BACK REST SWITCH

1) Disconnect the ground cable from battery.
2) Remove the rear quarter lower trim. <Ref. to EI-60, REMOVAL, Rear Quarter Trim.>
3) Remove the remote control back rest switch from the rear quarter lower trim.

2. REMOTE CONTROL BACK REST ACTUATOR

1) Remove the rear seat backrest. <Ref. to SE-16, REMOVAL, Rear Seat.>
2) Remove the remote control back rest actuator from the rear seat backrest. <Ref. to SE-18, DISASSEMBLY, Rear Seat.>

B: INSTALLATION

Install each part in the reverse order of removal.

C: INSPECTION

1. WIRING DIAGRAM

Refer to “Remote Control Back Rest System” in the wiring diagram. <Ref. to WI-99, WIRING DIAGRAM, Remote Control Back Rest System.>

2. DIAGNOSTIC CHART

Symptoms	Repair order
Remote control back rest system does not operate.	1. Check the fuse. <Ref. to SE-28, CHECK REMOTE CONTROL BACK REST SYSTEM FUSE, INSPECTION, Remote Control Back Rest System.>
	2. Check the power supply and ground circuit for the remote control back rest system. <Ref. to SE-28, CHECK POWER SUPPLY AND GROUND CIRCUIT, INSPECTION, Remote Control Back Rest System.>
	3. Perform the inspection of switch unit. <Ref. to SE-29, INSPECTION OF SWITCH UNIT, INSPECTION, Remote Control Back Rest System.>
	4. Perform the inspection of actuator unit. <Ref. to SE-29, INSPECTION OF ACTUATOR UNIT, INSPECTION, Remote Control Back Rest System.>

3. CHECK REMOTE CONTROL BACK REST SYSTEM FUSE

Remove the fuse (FB-6) of remote control back rest system, and visually check.
Is the fuse blown out?
- **Yes** → Replace the fuse.
- **No** → Check the power supply and ground circuits.

4. CHECK POWER SUPPLY AND GROUND CIRCUIT

1) Check power supply circuit.
   (1) Disconnect the remote control back rest switch.
   (2) Turn the ignition switch to ON.
   (3) Measure the voltage between harness connector terminal and chassis ground.

Connector & terminal
RH side:
(R172) No. 5 (+) — Chassis ground (–):
LH side:
(R173) No. 5 (+) — Chassis ground (–):
Is the voltage 12 V or more?
- **Yes** → Go to step 2.
- **No** → Check the harness between the remote control back rest switch and fuse.

2) Check ground circuit.
Measure the resistance between harness connector terminal and chassis ground.

Connector & terminal
RH side:
(R172) No. 1 — Chassis ground:
LH side:
(R173) No. 1 — Chassis ground:
Is the resistance less than 10 Ω when the switch is ON?
- **Yes** → Go to step 3.
- **No** → Check the switch.

3) Check power supply circuit.
(1) Connect the remote control back rest switch.
(2) Disconnect the remote control back rest actuator.
(3) Turn the ignition switch to ON.
(4) Measure the voltage between harness connector terminal and chassis ground.

Connector & terminal
RH side:
(R170) No. 1 (+) — Chassis ground (–):
LH side:
(R171) No. 1 (+) — Chassis ground (–):
Is the voltage 12 V or more when the switch is ON?
- **Yes** → Go to step 4.
- **No** → Check the harness between the remote control back rest switch and actuator.

4) Check ground circuit.
Measure the resistance between harness connector terminal and chassis ground.

Connector & terminal
RH side:
(R170) No. 2 — Chassis ground:
LH side:
(R171) No. 2 — Chassis ground:
Is the resistance 1 MΩ or more when the switch is ON?
- **Yes** → Perform the inspection of actuator unit.
- **No** → Repair the harness of ground circuit.

5. INSPECTION OF SWITCH UNIT

1) Disconnect the remote control back rest switch connector.
2) Measure the resistance between terminals of remote control back rest switch connector.

Connector & terminal
RH side:
(R172) No. 5 — (R172) No. 1:
LH side:
(R173) No. 5 — (R173) No. 1:
Is the resistance less than 10 Ω when the switch is ON?
- **Yes** → Normal operation.
- **No** → Replace the switch.

6. INSPECTION OF ACTUATOR UNIT

1) Disconnect the connector of actuator.
2) Connect the battery to the actuator connector.

Connector & terminal
RH side:
(R170) No. 1 (+) — (R170) No. 2 (–):
LH side:
(R171) No. 1 (+) — (R171) No. 2 (–):
Does the actuator operate?
- **Yes** → Normal operation.
- **No** → Replace the actuator.

SECURITY AND LOCKS

SL

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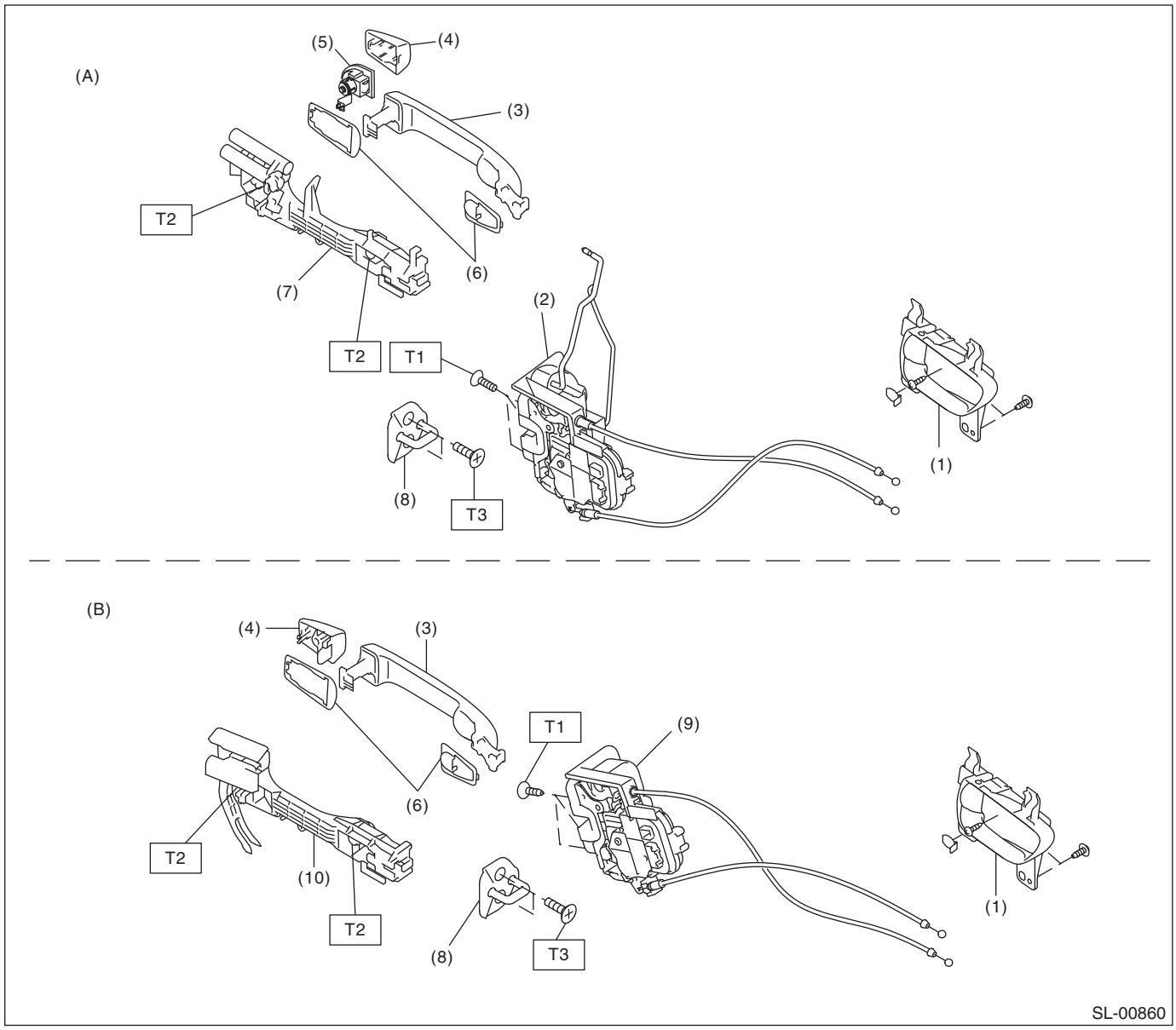
1. General Description

A: COMPONENT

1. DOOR LOCK ASSEMBLY

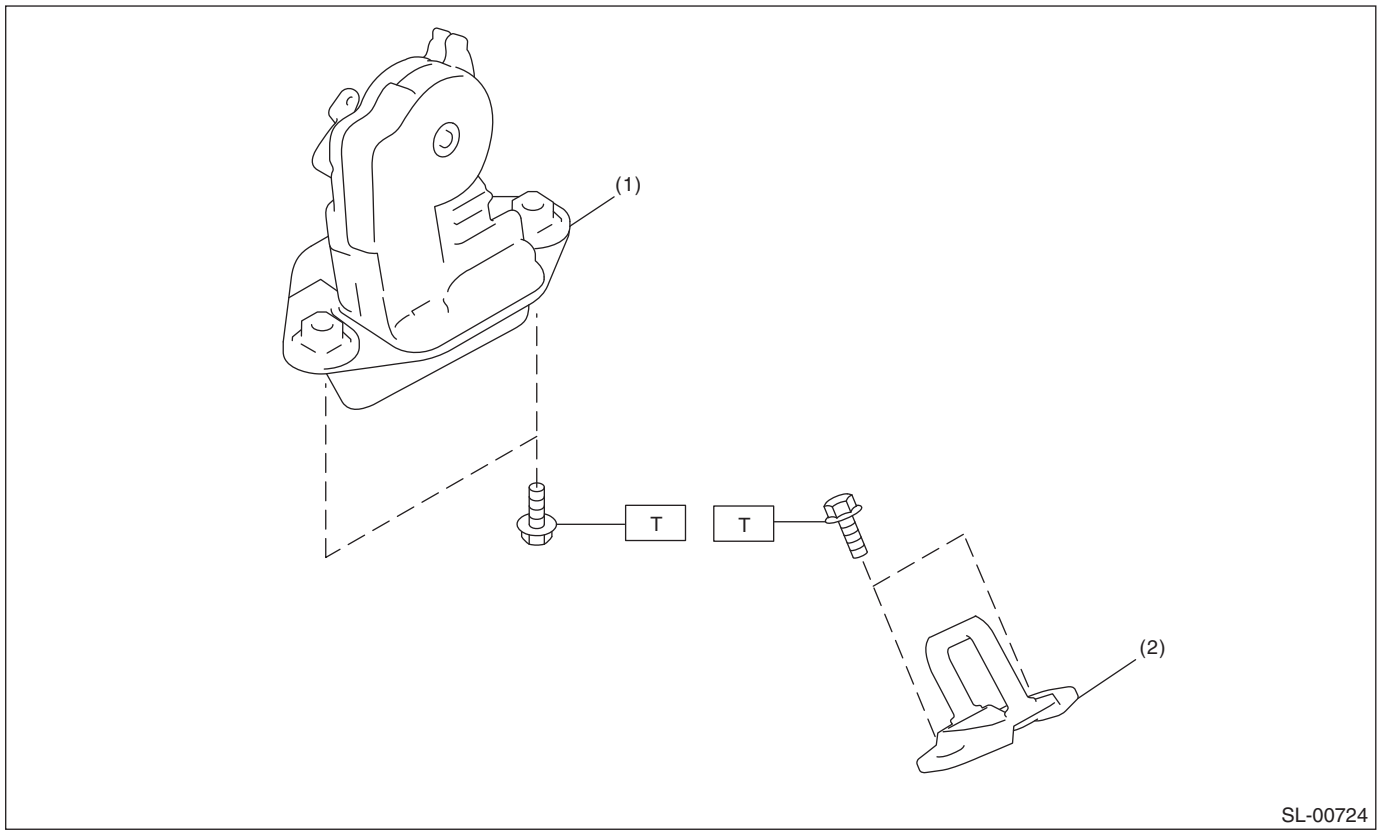


(A) Front
(B) Rear

(1) Inner remote ASSY
(2) Front door latch and door lock actuator ASSY
(3) Door outer handle
(4) Door outer handle cover
(5) Key cylinder (driver's side only)
(6) Door outer handle spacer
(7) Front door outer handle frame ASSY
(8) Striker
(9) Rear door latch and door lock actuator ASSY
(10) Rear door outer handle frame ASSY

Tightening torque:N·m (kgf-m, ft-lb)
T1: 6.5 (0.66, 4.8)
T2: 7.5 (0.76, 5.5)
T3: 18 (1.84, 13.3)

2. REAR GATE LOCK

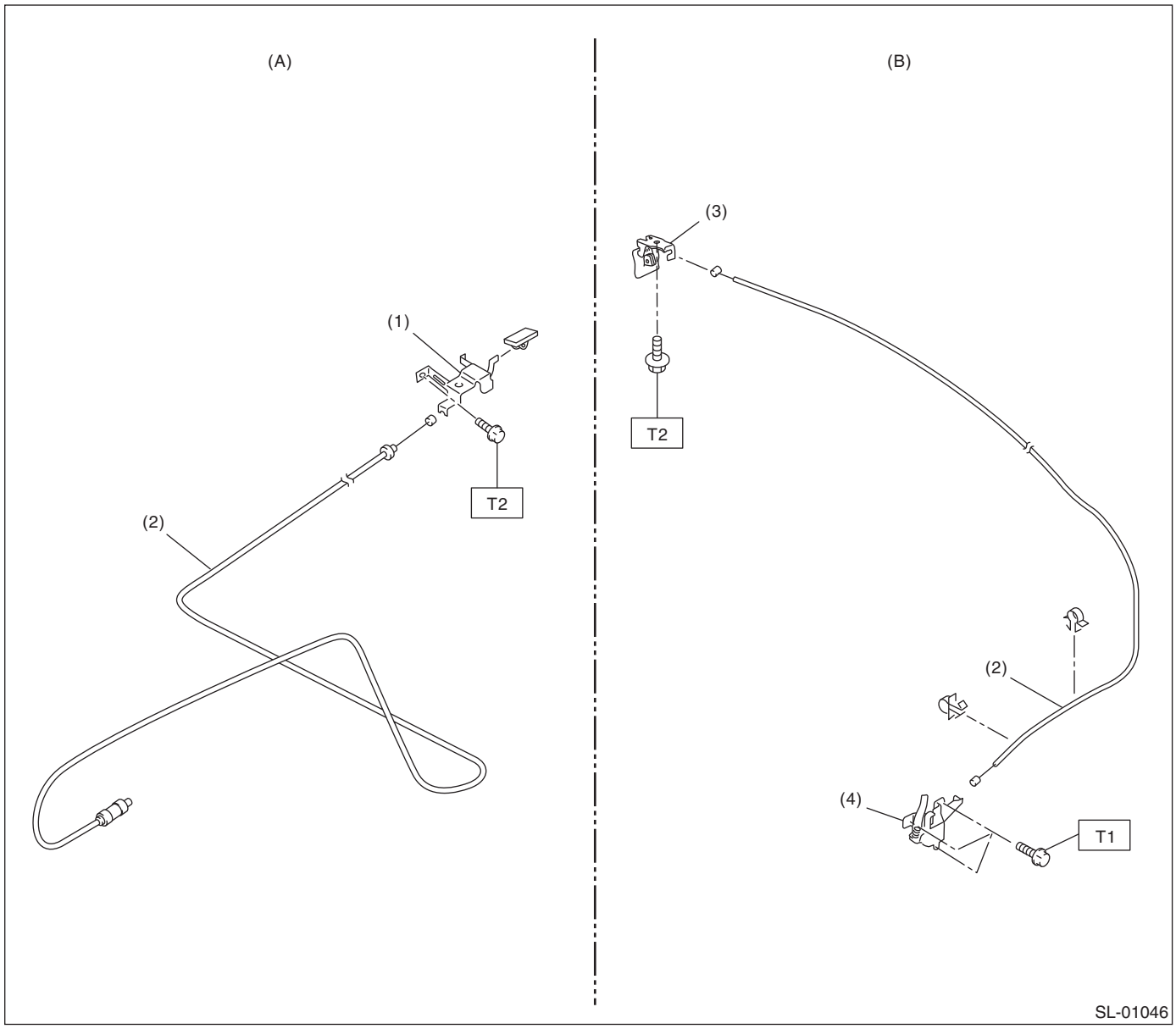


(1) Rear gate latch and actuator ASSY
(2) Striker

Tightening torque:N·m (kgf-m, ft-lb)

T: 25 (2.55, 18.4)

3. FRONT HOOD LOCK AND REMOTE OPENERS

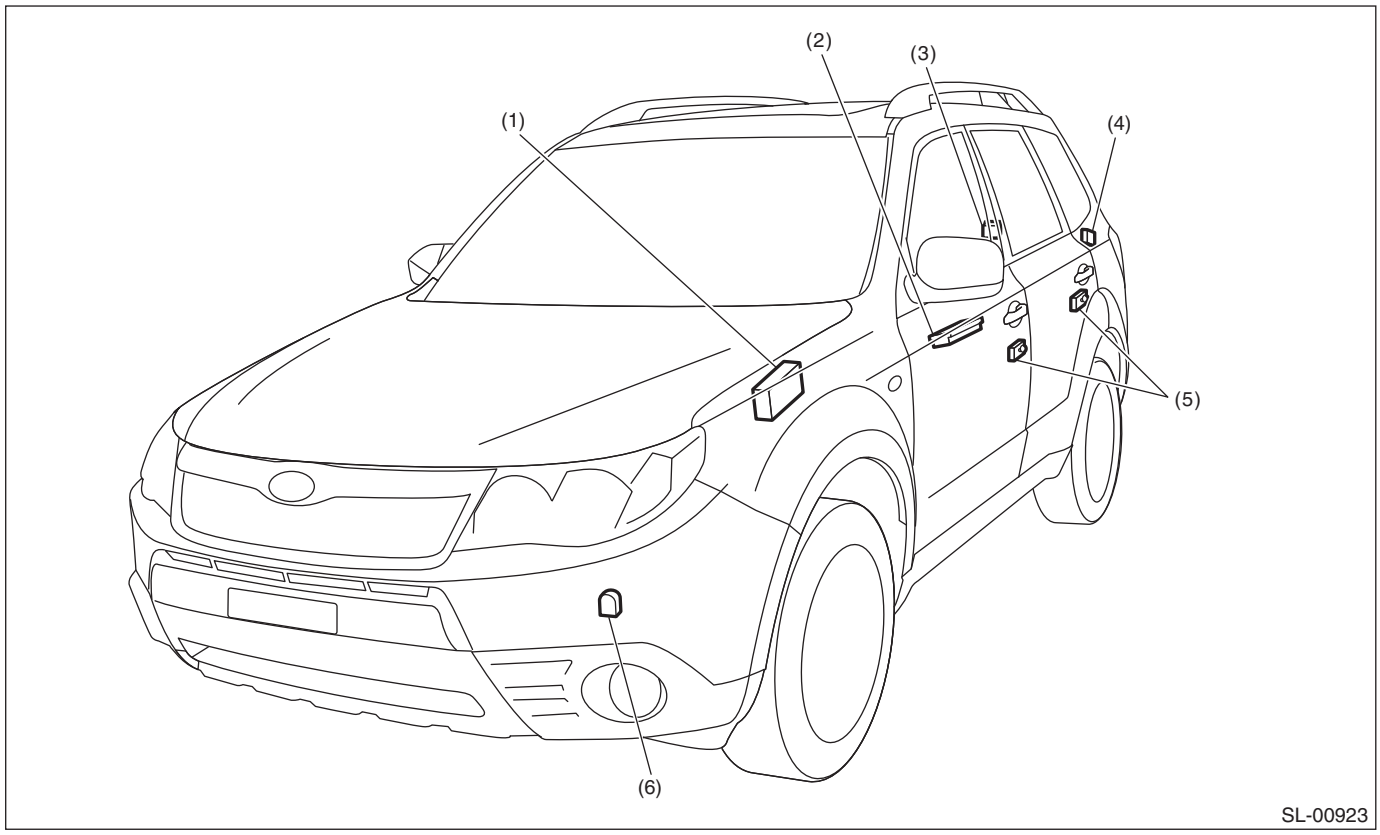


(A) Fuel lock release
(B) Hood lock release

(1) Pull handle ASSY
(2) Cable
(3) Lever ASSY
(4) Front hood lock ASSY

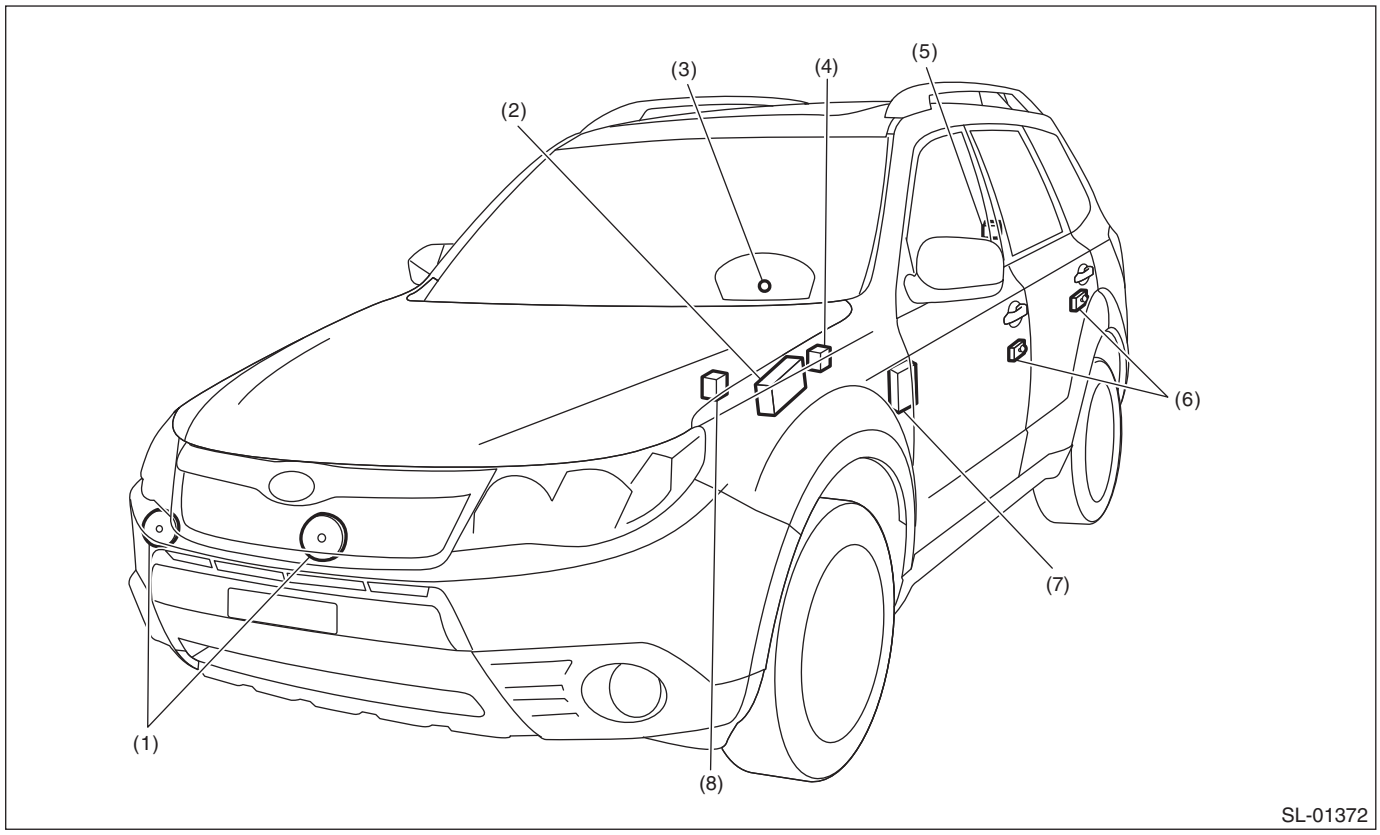
Tightening torque:N·m (kgf-m, ft-lb)
T1: 33 (3.36, 24.2)
T2: 7.5 (0.76, 5.5)

4. KEYLESS ENTRY SYSTEM



(1) Body integrated unit
(2) Power window main switch
(3) Rear gate latch switch
(4) Keyless entry control module
(5) Door switch
(6) Keyless buzzer

5. SECURITY SYSTEM



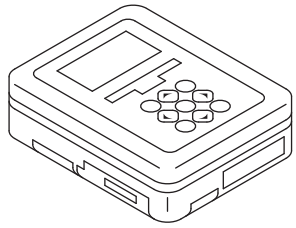
(1)	Horn	(4)	Turn signal and hazard module	(7)	Impact sensor (driver's seat instrument panel side) (dealer option)
(2)	Body integrated unit	(5)	Rear gate latch switch	(8)	Horn relay (in main fuse box)
(3)	Security indicator light (in combination meter)	(6)	Door switch		

B: CAUTION

- Before disassembling or reassembling parts, always disconnect the battery ground cable from battery. When replacing the audio, control module and other parts provided with memory functions, record the memory contents before disconnecting the battery ground cable. Otherwise, the memory is cleared.
- When performing a check after disconnecting the battery or restoring from a dead battery condition, perform the check after turning the ignition to ON and OFF, then opening and closing the driver's side door a few times.
- 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 securely during reassembly.
- After reassembly, make sure that the functional parts operate normally.
- If any immobilizer related part has been replaced, make sure to register the immobilizer.
- Yellow connectors and harnesses with yellow tapes around them are the connectors and harnesses for the airbag system. Using a tester above such circuits may cause malfunction of airbag system. Follow the cautions for the airbag system in this case. <Ref. to AB-5, CAUTION, General Description.>
- 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
 ST1B022XU0	1B022XU0	SUBARU SELECT MONITOR III KIT	Used for troubleshooting the electrical system.

2. GENERAL TOOL

TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance and voltage.
Drill	Used for replacing the ignition key lock.
TORX® T30	Used for removing and installing door outer handles.
Clip remover	Used for removing trim clip

2. Door Lock Control System

A: WIRING DIAGRAM

Refer to “Keyless Entry System” in the wiring diagram. <Ref. to WI-172, WIRING DIAGRAM, Keyless Entry System.>

B: ELECTRICAL SPECIFICATION

1. BODY INTEGRATED UNIT

Refer to the “Control Module I/O Signal” of “LAN SYSTEM (DIAGNOSTICS)”. <Ref. to LAN(diag)-10, ELECTRICAL SPECIFICATION, Control Module I/O Signal.>

C: INSPECTION

1. SYMPTOM CHART

Symptom	Repair order	Reference
The door lock control system does not operate.	1. Remove the following fuses and inspect visually. • No. 3 (In fuse & relay box) • No. 7 (In fuse & relay box) • No. 8 (in main fuse box)	If the fuse is blown out, replace the fuse with a new part. Check the power supply and ground circuit, if the fuse has no abnormality. <Ref. to SL-9, CHECK POWER SUPPLY & GROUND CIRCUIT, INSPECTION, Door Lock Control System.>
	2. Check the power supply and ground circuit for body integrated unit.	<Ref. to SL-9, CHECK POWER SUPPLY & GROUND CIRCUIT, INSPECTION, Door Lock Control System.>
	3. Check the door lock switch and the circuit.	<Ref. to SL-9, CHECK DOOR LOCK SWITCH, INSPECTION, Door Lock Control System.>
	4. Check the rear gate opener button and circuit.	<Ref. to SL-10, CHECK REAR GATE OPENER BUTTON CIRCUIT, INSPECTION, Door Lock Control System.>
	5. Check the door lock actuator and the circuit.	<Ref. to SL-11, CHECK DOOR LOCK ACTUATOR & CIRCUIT, INSPECTION, Door Lock Control System.>
A specific door lock actuator does not operate.	Check the door lock actuator and circuit.	<Ref. to SL-11, CHECK DOOR LOCK ACTUATOR & CIRCUIT, INSPECTION, Door Lock Control System.>

2. CHECK POWER SUPPLY & GROUND CIRCUIT

	Step	Check	Yes	No
1	**CHECK POWER SUPPLY.** 1) Disconnect the harness connector of body integrated unit. 2) Measure the voltage between body integrated unit connector and chassis ground. ***Connector & terminal*** ***(i84) No. 34 (+) — Chassis ground (–):*** ***(B280) No. 6 (+) — Chassis ground (–):*** ***(B281) No. 2 (+) — Chassis ground (–):***	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.
2	**CHECK GROUND CIRCUIT.** Measure the resistance between body integrated unit connector and chassis ground. ***Connector & terminal*** ***(i84) No. 28 — Chassis ground:*** ***(B280) No. 17 — Chassis ground:*** ***(B281) No. 20 — Chassis ground:*** ***(B279) No. 27 — Chassis ground:***	Is the resistance less than 10 Ω?	The power supply and ground circuit are OK.	Repair or replace the harness.

3. CHECK DOOR LOCK SWITCH

	Step	Check	Yes	No
1	**CHECK DOOR LOCK SWITCH.** 1) Prepare the Subaru Select Monitor kit. 2) Turn the ignition switch to ON (engine OFF) and run the “PC application for Subaru Select Monitor”. 3) On «System Selection Menu» display, select {Integ. unit mode}. 4) Select the {Current Data Display & Save}. 5) Select the {Manual lock SW input}.	Does the display switch between OFF ⇔ ON when each door lock switch is moved to LOCK?	Go to step **2**.	Go to step **3**.
2	**CHECK DOOR LOCK SWITCH.** From the condition in step 1), operate each door lock switch (driver’s and passenger’s) in the UNLOCK direction.	Does the display switch between OFF ⇔ ON?	The door lock switch is OK.	Go to step **4**.
3	**CHECK DOOR LOCK SWITCH.** 1) Disconnect the door lock switch harness connector. 2) Check the continuity when the door lock switch is operated to the LOCK direction. ***Connector & terminal*** ***Driver’s side:*** ***Without auto-reverse function:*** ***(D102) No. 2 — (D102) No. 3:*** ***With auto-reverse function:*** ***(D7) No. 10 — (D102) No. 3:*** ***Passenger’s side:*** ***(D125) No. 4 — (D125) No. 5:***	Did the indicator change from “No continuity” (1 MΩ or more) to “Continuity exists” (less than 10 Ω)?	Go to step **4**.	Replace the power window main switch or door lock switch. <Ref. to GW-9, Power Window Control Switch.>
4	**CHECK DOOR LOCK SWITCH.** Check the continuity when the door lock switch is operated to the UNLOCK direction. ***Connector & terminal*** ***Driver’s side:*** ***Without auto-reverse function:*** ***(D102) No. 1 — (D102) No. 3:*** ***With auto-reverse function:*** ***(D7) No. 2 — (D102) No. 3:*** ***Passenger’s side:*** ***(D125) No. 2 — (D125) No. 5:***	Did the indicator change from “No continuity” (1 MΩ or more) to “Continuity exists” (less than 10 Ω)?	Go to step **5**.	Replace the power window main switch or door lock switch. <Ref. to GW-9, Power Window Control Switch.>

	Step	Check	Yes	No
5	**CHECK HARNESS.** Measure the resistance between the door lock switch connector and chassis ground. ***Connector & terminal*** ***Driver's side:*** ***(D102) No. 3 — Chassis ground:*** ***Passenger's side:*** ***(D125) No. 5 — Chassis ground:***	Is the resistance less than 10 Ω?	Go to step **6**.	Repair or replace the harness.
6	**CHECK HARNESS.** 1) Disconnect the harness connector of body integrated unit. 2) Check the harness between body integrated unit connector and door lock switch. ***Connector & terminal*** ***Driver's side:*** ***Without auto-reverse function:*** ***(D102) No. 2 — (i84) No. 15:*** ***(D102) No. 1 — (i84) No. 29:*** ***With auto-reverse function:*** ***(D7) No. 10 — (i84) No. 15:*** ***(D7) No. 2 — (i84) No. 29:*** ***Passenger's side:*** ***(D125) No. 4 — (i84) No. 15:*** ***(D125) No. 2 — (i84) No. 29:***	Is harness normal?	Replace the body integrated unit. <Ref. to SL-46, Body Integrated Unit.>	Repair or replace the harness.

4. CHECK REAR GATE OPENER BUTTON CIRCUIT

	Step	Check	Yes	No
1	**CHECK REAR GATE OPENER BUTTON.** 1) Prepare the Subaru Select Monitor kit. 2) Turn the ignition switch to ON (engine OFF) and run the "PC application for Subaru Select Monitor". 3) On «System Selection Menu» display, select {Integ. unit mode}. 4) Select the {Current Data Display & Save}. 5) Select the {R Gate SW input}.	Is the display change to OFF ⇔ ON, when the rear gate opener button is operated?	Rear gate opener button is normal.	Go to step **2**.
2	**CHECK HARNESS.** Check the harness between the body integrated unit and rear gate opener button. ***Connector & terminal*** ***(B281) No. 24 — (D99) No. 5:***	Is harness normal?	Go to step **3**.	Repair or replace the harness.
3	**CHECK HARNESS.** Measure the resistance between the rear gate opener button and chassis ground. ***Connector & terminal*** ***(D99) No. 6 — Chassis ground:***	Is the resistance less than 10 Ω?	Go to step **4**.	Repair or replace the harness.
4	**CHECK REAR GATE OPENER BUTTON.** Measure the resistance between connector terminals when the rear gate opener button is pressed, and when it is released. ***Connector & terminal*** ***(D99) No. 5 — (D99) No. 6:***	Is the resistance less than 10 Ω when the switch is pressed and 1 MΩ or more when not pressed?	Replace the body integrated unit. <Ref. to SL-46, Body Integrated Unit.>	Replace the rear gate opener button. <Ref. to SL-36, Rear Gate Opener Button.>

5. CHECK DOOR LOCK ACTUATOR & CIRCUIT

	Step	Check	Yes	No
1	**CHECK HARNESS (DOOR LOCK).** 1) Disconnect the body integrated unit connector and each door lock actuator. 2) Check the harness between body integrated unit and each door lock actuator. ***Connector & terminal*** ***Front door RH*** ***(i84) No. 7 — (D72) No. 1:*** ***Front door LH*** ***(i84) No. 7 — (D18) No. 1:*** ***Rear door RH*** ***(i84) No. 7 — (D32) No. 1:*** ***Rear door LH*** ***(i84) No. 7 — (D26) No. 1:***	Is harness normal?	Go to step **2**.	Repair or replace the harness.
2	**CHECK HARNESS (DOOR UNLOCK).** Check the harness between body integrated unit and each door lock actuator. ***Connector & terminal*** ***Front door RH*** ***(i84) No. 8 — (D72) No. 2:*** ***Front door LH*** ***(i84) No. 23 — (D18) No. 2:*** ***Rear door RH*** ***(i84) No. 8 — (D32) No. 2:*** ***Rear door LH*** ***(i84) No. 8 — (D26) No. 2:***	Is harness normal?	Go to step **3**.	Repair or replace the harness.
3	**CHECK HARNESS (REAR GATE UNLOCK).** Check the harness between the body integrated unit and rear gate lock actuator. ***Connector & terminal*** ***(i84) No. 22 — (D46) No. 1:***	Is harness normal?	Go to step **4**.	Repair or replace the harness.
4	**CHECK HARNESS (REAR GATE UNLOCK).** Measure the resistance between the rear gate lock actuator and chassis ground. ***Connector & terminal*** ***(D46) No. 2 — Chassis ground:***	Is the resistance less than 10 Ω?	Go to step **5**.	Repair or replace the harness.
5	**CHECK BODY INTEGRATED UNIT OUTPUT SIGNAL.** Measure the voltage between terminals of the body integrated unit connector when operating the door lock switch to LOCK direction. ***Connector & terminal*** ***Except for front door LH*** ***(i84) No. 7 (+) — (i84) No. 8 (–):*** ***Front door LH*** ***(i84) No. 7 (+) — (i84) No. 23 (–):***	Does the voltage change from less than 1 V → 9 V or more? (During lock output)	Go to step **6**.	Replace the body integrated unit. <Ref. to SL-46, Body Integrated Unit.>
6	**CHECK OUTPUT SIGNAL OF BODY INTEGRATED UNIT.** Measure the voltage between terminals of the body integrated unit connector when operating the door lock switch to UNLOCK direction. ***Connector & terminal*** ***Except for front door LH*** ***(i84) No. 8 (+) — (i84) No. 7 (–):*** ***Front door LH*** ***(i84) No. 23 (+) — (i84) No. 7 (–):***	Does the voltage change from less than 1 V → 9 V or more? (During unlock output)	Go to step **7**.	Replace the body integrated unit. <Ref. to SL-46, Body Integrated Unit.>

	Step	Check	Yes	No
7	**CHECK OUTPUT SIGNAL OF BODY INTEGRATED UNIT.** Measure the voltage between body integrated unit and chassis ground when operating the rear gate opener button. ***Connector & terminal*** ***(i84) No. 22 (+) — Chassis ground (–):***	Does the voltage change from less than 1 V → 9 V or more? (During unlock output)	Go to step **8**.	Replace the body integrated unit. <Ref. to SL-46, Body Integrated Unit.>
8	**CHECK DOOR LOCK ACTUATOR.** Check the door lock actuator. • Front door lock actuator: <Ref. to SL-32, INSPECTION, Front Door Latch and Door Lock Actuator Assembly.> • Rear door lock actuator: <Ref. to SL-35, INSPECTION, Rear Door Latch and Door Lock Actuator Assembly.>	Is the door lock actuator OK?	Go to step **9**.	Replace the door latch and door lock actuator assembly.
9	**CHECK REAR GATE LOCK ACTUATOR.** Check the rear gate lock actuator. <Ref. to SL-37, Rear Gate Latch and Actuator Assembly.>	Is the rear gate lock actuator normal?	Check the connection status of the harness and connector that may have a temporary poor contact.	Replace the rear gate latch and actuator assembly.

3. Keyless Entry System

A: WIRING DIAGRAM

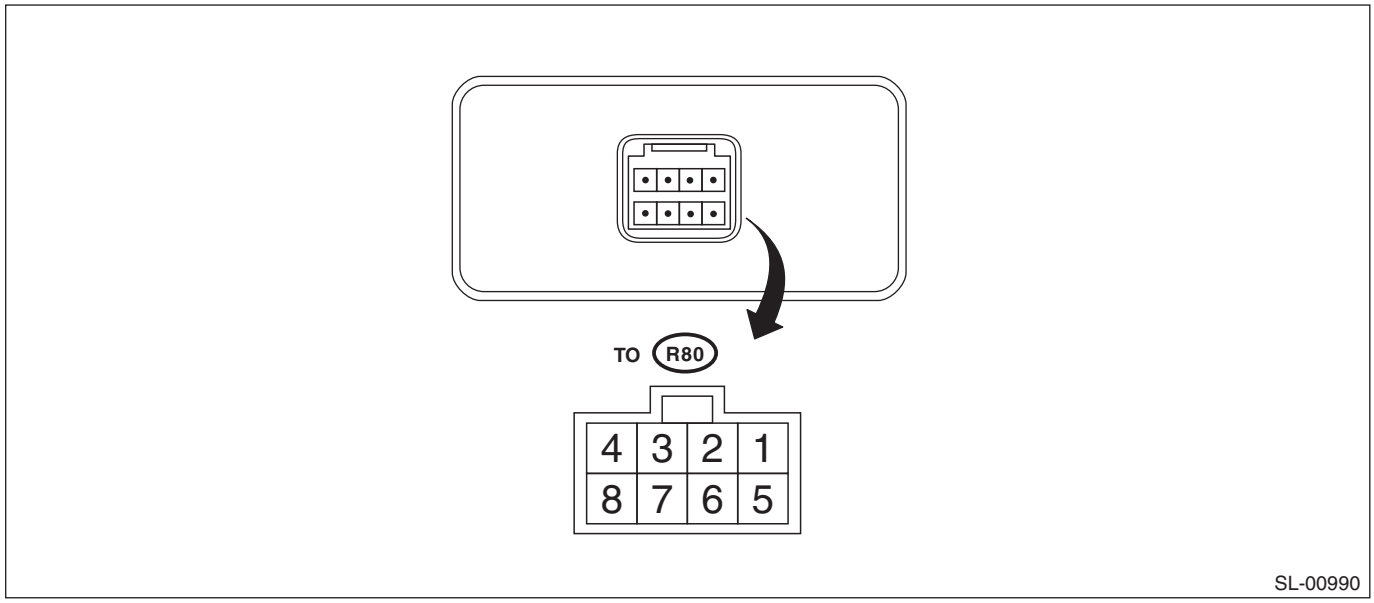
1. KEYLESS ENTRY

Refer to “Keyless Entry System” in the wiring diagram. <Ref. to WI-172, WIRING DIAGRAM, Keyless Entry System.>

B: ELECTRICAL SPECIFICATION

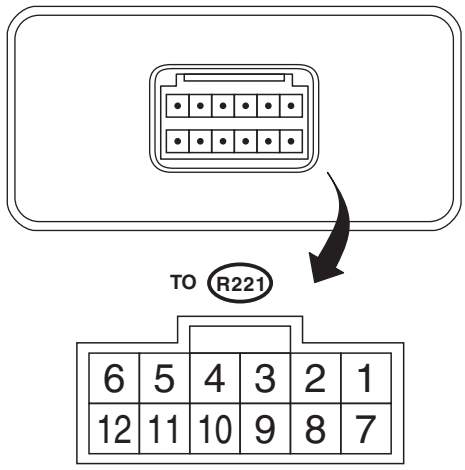
1. KEYLESS ENTRY CONTROL MODULE

- Model without tire pressure monitoring system



Remarks	Terminal No.	Measuring condition
—	1	—
—	2	—
Body integrated unit	3 (OUTPUT)	Battery voltage cannot be measured because of digital signal.
Power supply (Backup)	4	Battery voltage is constantly present.
—	5	—
—	6	—
Ground	7	0 V is constantly present.
—	8	—

- Model with tire pressure monitoring system



SL-01308

Remarks	Terminal No.	Measuring condition
—	1	—
Tire pressure warning light	2	Illuminate when malfunction occurs, or tire pressure decreases
Vehicle speed signal	3 (OUTPUT)	While driving (0 ←→ 12 V pulse)
Power supply (IGN SW)	4	Battery voltage is detected when the ignition switch is turned ON.
Ground	5	0 V is constantly present.
Power supply (Backup)	6	Battery voltage is constantly present.
—	7	—
—	8	—
—	9	—
—	10	—
Body integrated unit	11 (OUTPUT)	Battery voltage cannot be measured because of digital signal.
Select monitor communication	12	Serial communication

2. BODY INTEGRATED UNIT

Refer to the “Control Module I/O Signal” of “LAN SYSTEM (DIAGNOSTICS)”. <Ref. to LAN(diag)-10, ELECTRICAL SPECIFICATION, Control Module I/O Signal.>

C: INSPECTION

1. SYMPTOM CHART

Symptoms	Repair order	Reference
None of the functions of the keyless entry system operate.	1. Check the keyless transmitter battery.	<Ref. to SL-17, CHECK KEYLESS TRANSMITTER BATTERY AND FUNCTIONS, INSPECTION, Keyless Entry System.>
	2. Remove the following fuses and inspect visually. • No. 31 (in fuse & relay box) • No. 7 (in fuse & relay box)	If the fuse is blown out, replace the fuse with a new part. When there is no defective with the fuse, check the power supply and ground circuit. <Ref. to SL-9, CHECK POWER SUPPLY & GROUND CIRCUIT, INSPECTION, Door Lock Control System.>
	3. Check the keyless entry control module.	<Ref. to SL-18, CHECK KEYLESS ENTRY CONTROL MODULE, INSPECTION, Keyless Entry System.>
	4. Check the power supply and ground circuit for body integrated unit.	<Ref. to SL-18, CHECK BODY INTEGRATED UNIT POWER SUPPLY AND GROUND CIRCUIT, INSPECTION, Keyless Entry System.>
	5. Check the key warning switch.	<Ref. to SL-21, CHECK KEY WARNING SWITCH, INSPECTION, Keyless Entry System.>
	6. Check the door switch.	<Ref. to SL-19, CHECK DOOR SWITCH, INSPECTION, Keyless Entry System.>
	7. Check the body integrated unit.	<Ref. to LAN(diag)-2, Basic Diagnostic Procedure.>
The keyless transmitter cannot be registered.	1. Check the keyless transmitter battery.	<Ref. to SL-17, CHECK KEYLESS TRANSMITTER BATTERY AND FUNCTIONS, INSPECTION, Keyless Entry System.>
	2. Check the key warning switch.	<Ref. to SL-21, CHECK KEY WARNING SWITCH, INSPECTION, Keyless Entry System.>
	3. Check the door lock switch signal.	<Ref. to SL-24, CHECK DOOR LOCK SWITCH, INSPECTION, Keyless Entry System.>
	4. Check the body integrated unit.	<Ref. to LAN(diag)-2, Basic Diagnostic Procedure.>

Symptoms	Repair order	Reference
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.	<Ref. to SL-17, CHECK KEYLESS TRANSMITTER BATTERY AND FUNCTIONS, INSPECTION, Keyless Entry System.>
	2. Check the keyless entry control module.	<Ref. to SL-18, CHECK KEYLESS ENTRY CONTROL MODULE, INSPECTION, Keyless Entry System.>
	3. Check the key warning switch.	<Ref. to SL-21, CHECK KEY WARNING SWITCH, INSPECTION, Keyless Entry System.>
	4. Check the door switch.	<Ref. to SL-19, CHECK DOOR SWITCH, INSPECTION, Keyless Entry System.>
	5. Check the body integrated unit.	<Ref. to LAN(diag)-2, Basic Diagnostic Procedure.>
Buzzer and hazard light do not operate.	1. Check the buzzer operation.	<Ref. to SL-24, CHECK KEYLESS BUZZER, INSPECTION, Keyless Entry System.>
	2. Check the hazard light operation.	<Ref. to SL-23, CHECK HAZARD LIGHT OPERATION, INSPECTION, Keyless Entry System.>
	3. Check the body integrated unit.	<Ref. to LAN(diag)-2, Basic Diagnostic Procedure.>
Room light does not operate.	1. Check the room light operation.	<Ref. to SL-22, CHECK ROOM LIGHT OPERATION, INSPECTION, Keyless Entry System.>
	2. Check the body integrated unit.	<Ref. to LAN(diag)-2, Basic Diagnostic Procedure.>
Ignition switch illumination does not operate.	1. Check the ignition switch illumination.	<Ref. to SL-25, CHECK IGNITION SWITCH ILLUMINATION, INSPECTION, Keyless Entry System.>
	2. Check the body integrated unit.	<Ref. to LAN(diag)-2, Basic Diagnostic Procedure.>

2. CHECK KEYLESS TRANSMITTER BATTERY AND FUNCTIONS

CAUTION:
Be sure to reset keyless transmitter of other vehicles registered to the inspection target vehicle, and vehicles to which keyless transmitters were registered for inspection, to the condition before performing the inspection. (Re-register the keyless transmitters.)

	Step	Check	Yes	No
1	**CHECK KEYLESS TRANSMITTER BATTERY.** 1) Remove the battery from the keyless transmitter. <Ref. to SL-47, REMOVAL, Transmitter.> 2) Check the battery voltage. <Ref. to SL-47, INSPECTION, Transmitter.>	Is the voltage 2.5 V or more?	Go to step **2**.	Replace the keyless transmitter battery. <Ref. to SL-47, Transmitter.>
2	**CHECK KEYLESS TRANSMITTER.** Register the keyless transmitter which operates normally on other vehicles to the inspection target vehicle. <Ref. to SL-47, 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.	Can the check vehicle be locked and unlocked properly?	Go to step **3**.	Due to vehicle malfunction, continue the keyless entry system diagnosis.
3	**CHECK KEYLESS TRANSMITTER.** Register the keyless transmitter of inspection target vehicle to the another vehicle on which the keyless system operates normally. <Ref. to SL-47, 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-47, REGISTRATION OF KEYLESS TRANSMITTER WITH SUBARU SELECT MONITOR, REPLACEMENT, Transmitter.>
4	**CHECK KEYLESS TRANSMITTER.** Check the registered keyless transmitter. 1) Close all the doors and rear gate of the vehicle which keyless system operates normally. 2) Using the keyless transmitter, lock and unlock the doors and rear gate of vehicle.	Does the vehicle operate lock and unlock normally?	The keyless transmitter is working properly.	Replace the keyless transmitter. <Ref. to SL-47, REGISTRATION OF KEYLESS TRANSMITTER WITH SUBARU SELECT MONITOR, REPLACEMENT, Transmitter.>

3. CHECK KEYLESS ENTRY CONTROL MODULE

	Step	Check	Yes	No
1	**CHECK DIAGNOSTIC TROUBLE CODE (DTC).** 1) Prepare the Subaru Select Monitor kit. 2) Turn the ignition switch to ON (engine OFF) and run the “PC application for Subaru Select Monitor”. 3) On «System Selection Menu» display, select {Integ. unit mode}. 4) Select the {Diagnostic Code(s) Display}.	Is DTC B1500 “Keyless UART com. Malfunction” displayed?	Go to step **2**.	Keyless entry control module is normal.
2	**CHECK POWER SUPPLY.** 1) Disconnect the keyless entry control module harness connector. 2) Measure the voltage between keyless entry control module and chassis ground. ***Connector & terminal*** ***Model without tire pressure monitoring system:*** ***(R80) No. 4 (+) — Chassis ground (–):*** ***Model with tire pressure monitoring system:*** ***(R221) No. 6 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **3**.	Check the harness for open circuits and shorts between the keyless entry control module and fuse.
3	**CHECK GROUND CIRCUIT.** Measure the resistance between keyless entry control module and chassis ground. ***Connector & terminal*** ***Model without tire pressure monitoring system*** ***(R80) No. 7 — Chassis ground:*** ***Model with tire pressure monitoring system*** ***(R221) No. 5 — Chassis ground:***	Is the resistance less than 10 Ω?	Go to step **4**.	Repair or replace the harness.
4	**CHECK KEYLESS ENTRY CONTROL MODULE CIRCUIT.** 1) Disconnect the harness connector of body integrated unit. 2) Measure the resistance between body integrated unit and keyless entry control module. ***Connector & terminal*** ***Model without tire pressure monitoring system*** ***(i84) No. 24 — (R80) No. 3:*** ***Model with tire pressure monitoring system*** ***(i84) No. 24 — (R221) No. 11:***	Is the resistance less than 10 Ω?	Replace the keyless entry control module. <Ref. to SL-44, Keyless Entry Control Module.>	Repair or replace the harness.

4. CHECK BODY INTEGRATED UNIT POWER SUPPLY AND GROUND CIRCUIT

Refer to the “INSPECTION of POWER SUPPLY AND GROUND CIRCUIT” of “Door Lock Control System” for detailed procedures. <Ref. to SL-9, CHECK POWER SUPPLY & GROUND CIRCUIT, INSPECTION, Door Lock Control System.>

5. CHECK DOOR SWITCH

	Step	Check	Yes	No
1	**CHECK INPUT CIRCUIT.** 1) Prepare the Subaru Select Monitor kit. 2) Turn the ignition switch to ON (engine OFF) and run the "PC application for Subaru Select Monitor". 3) On «System Selection Menu» display, select {Integ. unit mode}. 4) Select the {Current Data Display & Save}. 5) Select the {Driver's door SW input}, {P-door SW input}, {Rear right door SW input}, {Rear left door SW input}, and {R Gate SW input}.	Does the display switch between OFF ⇔ ON when each door or rear gate is opened?	The door and rear gate latch switch circuits are normal.	Go to step **2**.
2	**CHECK HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the harness connector of body integrated unit. 3) Disconnect the door switch harness connector that the display does not change. 4) Check the harness between body integrated unit and defective door switch. ***Connector & terminal*** ***Front door RH*** ***(i84) No. 32 — (R12) No. 1:*** ***Front door LH*** ***(i84) No. 19 — (R9) No. 1:*** ***Rear door RH*** ***(i84) No. 6 — (R16) No. 1:*** ***Rear door LH*** ***(i84) No. 20 — (R22) No. 1:*** ***Rear gate*** ***(i84) No. 33 — (D46) No. 3:***	Is harness normal?	Go to step **3**.	Repair or replace the harness.
3	**CHECK HARNESS CIRCUIT.** Measure the resistance between defective door switch harness connector terminal and chassis ground. ***Connector & terminal*** ***Front door RH*** ***(R12) No. 3 — Chassis ground:*** ***Front door LH*** ***(R9) No. 3 — Chassis ground:*** ***Rear door RH*** ***(R16) No. 3 — Chassis ground:*** ***Rear door LH*** ***(R22) No. 3 — Chassis ground:*** ***Rear gate*** ***(D46) No. 4 — Chassis ground:***	Is the resistance less than 10 Ω?	Go to step **4**.	Repair or replace the harness.
4	**CHECK DOOR SWITCH.** Measure the resistance between faulty door switch or rear gate latch switch terminals. ***Connector & terminal*** ***Front RH door switch*** ***(R12) No. 1 — No. 3:*** ***Front LH door switch*** ***(R9) No. 1 — No. 3:*** ***Rear RH door switch*** ***(R16) No. 1 — No. 3:*** ***Rear LH door switch*** ***(R22) No. 1 — No. 3:*** ***Rear gate latch switch*** ***(D46) No. 3 — No. 4:***	Is the resistance 1 MΩ or more when the door switch is pushed or the rear gate is closed?	Go to step **5**.	Replace the faulty parts. • Door switch • Rear gate latch and actuator ASSY

Step		Check	Yes	No
5	**CHECK DOOR SWITCH.** Measure the resistance between faulty door switch or rear gate latch switch terminals. ***Connector & terminal*** ***Front RH door switch*** ***(R12) No. 1 — No. 3:*** ***Front LH door switch*** ***(R9) No. 1 — No. 3:*** ***Rear RH door switch*** ***(R16) No. 1 — No. 3:*** ***Rear LH door switch*** ***(R22) No. 1 — No. 3:*** ***Rear gate latch switch*** ***(D46) No. 3 — No. 4:***	Is the resistance less than 10 Ω when door switch is released or the rear gate is opened?	Replace the body integrated unit. <Ref. to SL-46, Body Integrated Unit.>	Replace the door switch, or rear gate latch and actuator assembly.

6. CHECK KEY WARNING SWITCH

	Step	Check	Yes	No
1	**CHECK KEY WARNING SWITCH.** 1) Prepare the Subaru Select Monitor kit. 2) On «System Selection Menu» display, select {Integ. unit mode}. 3) Select the {Current Data Display & Save}. 4) Select the {key-lock warning SW}.	Is the normal input signal displayed when the key is inserted in/removed from the ignition switch?	The key warning switch is OK.	Go to step **2**.
2	**CHECK FUSE.** Remove and visually check fuse No. 14 (in the main fuse box).	Is the fuse blown out?	Replace the fuse with a new part.	Go to step **3**.
3	**CHECK KEY WARNING SWITCH CIRCUIT.** 1) Disconnect the harness connector of body integrated unit. 2) Insert the key into ignition switch. (LOCK position) 3) Measure the voltage between body integrated unit and chassis ground. ***Connector & terminal*** ***(B279) No. 2 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **4**.	Go to step **5**.
4	**CHECK KEY WARNING SWITCH CIRCUIT.** 1) Remove the key from ignition switch. 2) Measure the voltage between body integrated unit and chassis ground. ***Connector & terminal*** ***(B279) No. 2 (+) — Chassis ground (–):***	Is the voltage 1.5 V?	The key warning switch is OK.	Go to step **5**.
5	**CHECK KEY WARNING SWITCH.** 1) Disconnect the key warning switch connector. 2) Insert the key into ignition switch. (LOCK position) 3) Measure the resistance between key warning switch terminals. ***Connector & terminal*** ***(B350) No. 3 — No. 4:***	Is the resistance less than 1 Ω?	Go to step **6**.	Replace the key warning switch.
6	**CHECK KEY WARNING SWITCH.** 1) Remove the key from ignition switch. 2) Measure the resistance between key warning switch terminals. ***Connector & terminal*** ***(B350) No. 3 — No. 4:***	Is the resistance 1 MΩ or more?	Check the following: • Harness for open circuits and shorts between the key warning switch and fuse • Harness for open or short between the body integrated unit and key warning switch	Replace the key warning switch.

7. 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 ON, and goes off when the switch is OFF.	Does the room light illuminate or go off?	Go to step **2**.	Check the room light circuit. <Ref. to LI-37, INSPECTION, Room Light.>
2	**CHECK ROOM LIGHT OPERATION.** 1) Turn the room light switch to the “DOOR” position. 2) Open and close any door.	Does the room light illuminate ⇔ go off (including off delay) when the door is opened and closed?	Go to step **3**.	Go to step **4**.
3	**CHECK KEYLESS ENTRY OPERATION.** Press the LOCK/UNLOCK button of the keyless transmitter.	Does it operate properly?	Room light is normal.	Check keyless entry system. <Ref. to SL-15, SYMPTOM CHART, INSPECTION, Keyless Entry System.>
4	**CHECK ROOM LIGHT.** 1) Disconnect the harness connector of the room light. 2) Check the room light. <Ref. to LI-37, INSPECTION, Room Light.>	Is room light normal?	Go to step **5**.	Replace the bulb or room light assembly.
5	**CHECK HARNESS.** 1) Disconnect the harness connector of body integrated unit. 2) Check the harness between body integrated unit and room light. ***Connector & terminal*** ***(B279) No. 5 — (R52) No. 2:***	Is harness normal?	Go to step **6**.	Repair or replace the harness.
6	**CHECK HARNESS.** Measure the voltage between room light and chassis ground. ***Connector & terminal*** ***Model without sunroof*** ***(R52) No. 1 (+) — Chassis ground (–):*** ***Model with sunroof*** ***(R52) No. 3 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Replace the body integrated unit. <Ref. to SL-46, Body Integrated Unit.>	Repair or replace the harness.

8. 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 TO HAZARD LIGHT.** 1) Turn the ignition switch to OFF. 2) Disconnect the key warning switch harness connector. 3) Prepare the Subaru Select Monitor kit. 4) Turn the ignition switch to ON (engine OFF) and run the “PC application for Subaru Select Monitor”. 5) On «System Selection Menu» display, select {Integ. unit mode}. 6) Select {Integ. Unit customizing}. 7) Check {Emergency light setup}, and then switch to ON setting if necessary. 8) Select the {Current Data Display & Save}. 9) Remove the key from ignition switch. 10) Select the {Hazard Output}.	Is output signal present when operating the transmitter LOCK/UNLOCK button?	The hazard light operation circuit is OK.	Go to step **3**.
3	**CHECK HARNESS BETWEEN HAZARD LIGHT AND BODY INTEGRATED UNIT.** 1) Disconnect the harness connector of body integrated unit. 2) Disconnect the turn signal and hazard unit harness connector. 3) Measure the resistance between body integrated unit and turn signal & hazard unit. ***Connector & terminal*** ***(B281) No. 22 — (B32) No. 8:***	Is the resistance less than 10 Ω?	Check body integrated unit. <Ref. to LAN(diag)-2, Basic Diagnostic Procedure.>	Repair or replace the harness.

9. CHECK KEYLESS BUZZER

	Step	Check	Yes	No
1	**CHECK FUNCTION.** Using the Subaru Select Monitor, check {Buzzer beeping setup}. <Ref. to LAN(diag)-20, OPERATION, Read Current Data.>	Is it ON?	Go to step **2**.	Change the setting to ON. <Ref. to LAN(diag)-25, OPERATION, User Customizing.>
2	**CHECK OUTPUT TO KEYLESS BUZZER.** 1) Remove the key from ignition switch. 2) Display the {Keyless Buzzer Output} of the body integrated unit using the Subaru Select Monitor. <Ref. to LAN(diag)-18, OPERATION, Read Diagnostic Trouble Code (DTC).> 3) Press the LOCK/UNLOCK button of the keyless transmitter. NOTE: Due to the screen refresh timing of the Subaru Select Monitor, repeat the operation a few times to confirm, as there may be no change of OFF → ON at first.	Does display change from OFF → ON?	Go to step **3**.	Replace the body integrated unit. <Ref. to SL-46, Body Integrated Unit.>
3	**CHECK KEYLESS BUZZER.** 1) Remove the keyless buzzer. 2) Install the keyless buzzer to another vehicle which operates keyless buzzer normally, check the buzzer sounds.	Does the keyless buzzer sound?	Go to step **4**.	Replace the keyless buzzer.
4	**CHECK HARNESS.** 1) Disconnect the harness connector of body integrated unit. 2) Disconnect the keyless buzzer harness connector. 3) Measure the resistance between body integrated unit and keyless buzzer. ***Connector & terminal*** ***(B279) No. 24 — (B164) No. 1:***	Is the resistance less than 10 Ω?	Go to step **5**.	Repair or replace the harness.
5	**CHECK HARNESS.** Measure the resistance between keyless buzzer and chassis ground. ***Connector & terminal*** ***(B164) No. 2 — Chassis ground:***	Is the resistance less than 10 Ω?	Replace the body integrated unit. <Ref. to SL-46, Body Integrated Unit.>	Repair or replace the harness.

10.CHECK DOOR LOCK SWITCH

For diagnostic procedures, refer to the “INSPECTION OF DOOR LOCK SWITCH” of the “Door Lock Control System”. <Ref. to SL-9, CHECK DOOR LOCK SWITCH, INSPECTION, Door Lock Control System.>

11.CHECK IGNITION SWITCH ILLUMINATION

	Step	Check	Yes	No
1	**CHECK IGNITION CIRCUIT.** Check the ignition circuit.	Is the circuit normal?	Go to step **2**.	Repair or replace.
2	**CHECK DOOR SWITCH CIRCUIT.** Inspect door switch circuit.	Is the circuit normal?	Go to step **3**.	Repair or replace.
3	**CHECK FUSE.** Remove and visually check fuse No. 14 (in the main fuse box).	Is the fuse blown out?	Replace the fuse with a new part.	Go to step **4**.
4	**CHECK HARNESS.** 1) Disconnect the ignition switch illumination harness connector. 2) Measure the voltage between ignition switch illumination and chassis ground. ***Connector & terminal*** ***(B224) No. 2 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **5**.	Check the harness for open or short circuits between the ignition switch illumination and fuse.
5	**CHECK IGNITION SWITCH ILLUMINATION CIRCUIT.** 1) Disconnect the harness connector of body integrated unit and ignition switch illumination harness connector. 2) Check the harness between body integrated unit connector terminal and ignition switch illumination connector terminal. ***Connector & terminal*** ***(B281) No. 23 — (B224) No. 1:***	Is harness normal?	Go to step **6**.	Check the harness for open circuits and shorts between the body integrated unit and ignition switch illumination.
6	**CHECK IGNITION SWITCH ILLUMINATION BULB.** Apply battery voltage to the bulb.	Does the bulb illuminate?	Replace the body integrated unit. <Ref. to SL-46, Body Integrated Unit.>	Replace the ignition switch illumination bulb. <Ref. to LI-40, REMOVAL, Ignition Switch Illumination.>

4. Security System

A: WIRING DIAGRAM

Refer to “Security System” in the wiring diagram. <Ref. to WI-168, WIRING DIAGRAM, Security System.>

B: ELECTRICAL SPECIFICATION

1. BODY INTEGRATED UNIT

Refer to the “Control Module I/O Signal” of “LAN SYSTEM (DIAGNOSTICS)”. <Ref. to LAN(diag)-10, ELECTRICAL SPECIFICATION, Control Module I/O Signal.>

C: INSPECTION

1. BASIC DIAGNOSTIC PROCEDURE

	Step	Check	Yes	No
1	**INITIAL CHECK.** Check keyless entry system.	Does the keyless entry system operate normally?	Go to step **2**.	Check keyless entry system. <Ref. to SL-15, INSPECTION, Keyless Entry System.>
2	**CHECK SECURITY ON/OFF SETTING.** 1) Press the LOCK button of the keyless transmitter. 2) Check the security indicator light blinking patterns.	Is the security indicator light blinking patterns as follows? / When monitoring lag is set to 0 seconds: flashes twice within 0.5 seconds, in 2 second intervals / When monitoring lag is set to 30 seconds: flashes 3 times within 1 second, in 0.4 second intervals.	Go to step **5**.	Go to step **3**.
3	**CHANGE SETTING OF SECURITY SYSTEM** Change the setting of security system to ON. <Ref. to SL-28, SECURITY SYSTEM ON/OFF SETTING, INSPECTION, Security System.>	Is setting change completed correctly?	Go to step **4**.	• Check the ignition switch circuit. <Ref. to SL-29, CHECK IGNITION SWITCH CIRCUIT, INSPECTION, Security System.> • Check the door lock switch circuit. <Ref. to SL-24, CHECK DOOR LOCK SWITCH, INSPECTION, Keyless Entry System.>
4	**CHECK SETTING CHANGE OF SECURITY SYSTEM.** 1) Remove the key from ignition switch, and then close all doors. 2) Press the LOCK button of the keyless transmitter. 3) Check the security indicator light blinking patterns.	Is the security indicator light blinking patterns as follows? / When monitoring lag is set to 0 seconds: flashes twice within 0.5 seconds, in 2 second intervals / When monitoring lag is set to 30 seconds: flashes 3 times within 1 second, in 0.4 second intervals.	Go to step **5**.	Check the security indicator light circuit. <Ref. to SL-28, CHECK SECURITY INDICATOR LIGHT CIRCUIT, INSPECTION, Security System.>
5	**CHECK SECURITY SYSTEM OPERATION.** Press the LOCK button of keyless transmitter, and wait for 30 seconds.	Does the security indicator light blink twice within 0.5 seconds in 2 second intervals?	Go to step **6**.	Replace the body integrated unit. <Ref. to SL-46, Body Integrated Unit.>

	Step	Check	Yes	No
6	**CHECK SECURITY ALARM OPERATION.** 1) Unlock all doors using the door lock switch on driver's door. 2) Open any door or rear gate.	Does the security alarm operate when opening any door or rear gate?	Go to step **7**.	Check the door switch or rear gate latch switch. <Ref. to SL-28, CHECK DOOR SWITCH, INSPECTION, Security System.>
7	**CHECK SECURITY ALARM OPERATION.** Check the security alarm operation.	Do all security alarms operate? / Horn sound / Hazard lights flash / Security indicator light illuminates	Go to step **8**.	• Check the horn. <Ref. to SL-29, CHECK HORN, INSPECTION, Security System.> • Check the hazard light. <Ref. to SL-29, CHECK HAZARD LIGHT OPERATION, INSPECTION, Security System.>
8	**CHECK SECURITY ALARM CANCEL OPERATION.** Press any button of transmitter while the security alarm is operating. Or turn the ignition switch to ON.	Do all security alarms stop? / Horn / Hazard lights	Go to step **9**.	Check the ignition switch circuit. <Ref. to SL-29, CHECK IGNITION SWITCH CIRCUIT, INSPECTION, Security System.>
9	**CHECK SECURITY SYSTEM CONDITION MEMORY.** Check that the system functions properly even when the battery is not connected temporarily. <Ref. to SL-28, CHECK SECURITY SYSTEM CONDITION MEMORY, INSPECTION, Security System.>	Does the system function properly when the battery is not connected temporarily?	Go to step **10**.	Replace the body integrated unit. <Ref. to SL-46, Body Integrated Unit.>
10	**CHECK IMPACT SENSOR (DEALER OPTION).** Check the sensibility of impact sensor. <Ref. to SL-43, CHECK IMPACT SENSOR, ADJUSTMENT, Impact Sensor.>	Is the sensibility set properly?	Press the UNLOCK button of keyless transmitter, and finish the diagnosis.	Adjust the sensitivity. <Ref. to SL-43, IMPACT SENSITIVITY ADJUSTMENT, ADJUSTMENT, Impact Sensor.>

NOTE:
Check the function settings of the body integrated unit if any of the following symptoms appear. <Ref. to LAN(diag)-2, Basic Diagnostic Procedure.>
• The horn does not sound even when the security alarm is triggered and operating. As a cause, it is possible that the siren ON/OFF setting is set to ON in the customization function.
• The horn sounds when setting the security to ON (Monitoring condition) using the keyless transmitter. As a cause, it is possible that the impact sensor present (ON) / not present (OFF) setting is set to ON in the customization function though there is no impact sensor.

2. CHECK SECURITY SYSTEM CONDITION MEMORY

1) Pull out the key from the ignition switch, or turn the ignition to OFF.
2) Close all the doors and the rear gate.
3) Open the front hood.
4) Press the LOCK button of the keyless transmitter.

NOTE:
Wait until the security indicator light blinks twice within 0.5 second at 2 seconds intervals.
If the 30 seconds monitoring lag has been set, wait 30 seconds.
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 0.5 second at 2 seconds intervals. When it does not blink, replace the body integrated unit.

3. SECURITY SYSTEM ON/OFF SETTING

1) Close all doors and rear gate, and sit in the driver's seat. Press the UNLOCK button of the keyless transmitter.
2) Turn the ignition switch to ON.
3) Push the centralized door lock switch down and open the driver's side door at the same time, and hold in this condition for 10 seconds. (Keep the central door unlock switch pressed down.)
4) If the security system is ON, it will turn OFF. If OFF, it will turn ON.

Setting	Horn activation	Meter display
ON → OFF	Twice	[AL_OF]
OFF → ON	Once	[AL_ON]

4. CHECK DOOR SWITCH

For operation procedure, refer to "CHECK DOOR SWITCH" of "Keyless Entry System". <Ref. to SL-19, CHECK DOOR SWITCH, INSPECTION, Keyless Entry System.>

5. CHECK SECURITY INDICATOR LIGHT CIRCUIT

For operation procedures, refer to "CHECK SECURITY INDICATOR LIGHT CIRCUIT" of "IMMOBILIZER (DIAGNOSTICS)". <Ref. to IM(diag)-11, CHECK SECURITY INDICATOR LIGHT CIRCUIT, INSPECTION, Diagnostics Chart for Security Indicator Light.>

6. CHECK HORN

	Step	Check	Yes	No
1	**CHECK HORN OPERATION.** Check the horn sounds when the horn switch is pushed.	Does the horn sound?	Go to step **2**.	Check the horn circuit.
2	**CHECK OUTPUT TO HORN RELAY.** 1) Connect the Subaru Select Monitor Kit. 2) Turn the ignition switch to ON (engine OFF) and run the “PC application for Subaru Select Monitor”. 3) On «System Selection Menu» display, select {Integ. unit mode}. 4) Select {Function check}. 5) Select {Horn Output} and execute.	Does the horn sound?	Horn circuit is OK.	Go to step **3**.
3	**CHECK HORN RELAY CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the harness connector of body integrated unit. 3) Disconnect the harness connector of main fuse box. 4) Measure the resistance between harness connector terminals. ***Connector & terminal*** ***(B279) No. 29 — (B186) No. 1:***	Is the resistance less than 10 Ω?	Check body integrated unit. <Ref. to LAN(diag)-2, Basic Diagnostic Procedure.>	Repair or replace the harness.

7. CHECK HAZARD LIGHT OPERATION

For operation procedure, refer to “CHECK HAZARD LIGHT OPERATION” of “Keyless Entry System”. <Ref. to SL-23, CHECK HAZARD LIGHT OPERATION, INSPECTION, Keyless Entry System.>

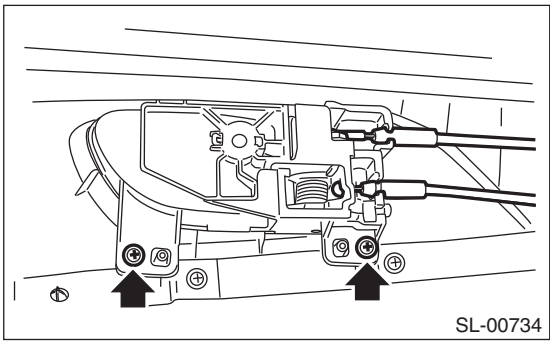
8. CHECK IGNITION SWITCH CIRCUIT

	Step	Check	Yes	No
1	**CHECK IGNITION SWITCH VOLTAGE.** 1) Prepare the Subaru Select Monitor kit. 2) Turn the ignition switch to ON (engine OFF) and run the “PC application for Subaru Select Monitor”. 3) On «System Selection Menu» display, select {Integ. unit mode}. 4) Select the {Current Data Display & Save}. 5) Check the {BATT voltage} and {IG power supply}.	Is the {IG power supply voltage} within ±1 V against {BATT voltage}?	The ignition switch input circuit is OK.	Go to step **2**.
2	**CHECK IGNITION SWITCH CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the harness connector of body integrated unit. 3) Turn the ignition switch to ON. 4) Measure the voltage between body integrated unit and chassis ground. ***Connector & terminal*** ***(B280) No. 1 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Check body integrated unit. <Ref. to LAN(diag)-2, Basic Diagnostic Procedure.>	Check the harness for open or short circuit between body integrated unit and fuse.

5. Front Inner Remote

A: REMOVAL

1) Remove the front door trim. <Ref. to EI-43, FRONT DOOR, REMOVAL, Door Trim.>
2) Remove the cable from the cable holder.
3) Remove the screws, and remove the inner remote handle.



B: INSTALLATION

Install each part in the reverse order of removal.

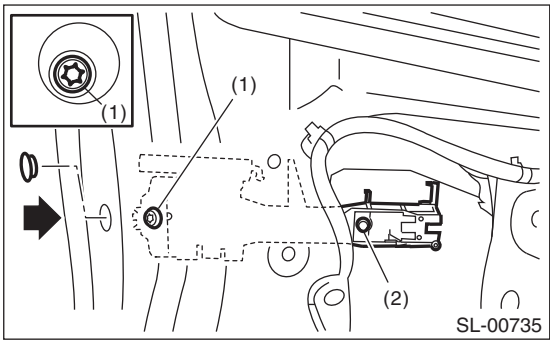
C: INSPECTION

Check if the front remote handle operates normally.
• If the lever is faulty, replace the front inner remote handle.
• If the cable is deformed, replace the front door latch & door lock actuator assembly.

6. Front Outer Handle

A: REMOVAL

1) Raise the front door glass to the top position.
2) Remove the front door trim. <Ref. to EI-43, FRONT DOOR, REMOVAL, Door Trim.>
3) Remove the sealing cover. <Ref. to EB-18, REMOVAL, Front Sealing Cover.>
4) Remove the rod clamp.
5) Remove the plug at the rear of the door panel, and loosen the TORX® bolt (1).



6) Remove the door outer handle cover.
7) Move the front outer handle towards the rear, and remove the front outer handle.

CAUTION:
Do not apply excessive force to remove the handle from the door panel. The door panel may become deformed.
8) Remove the outer side spacer.
9) Loosen TORX® bolt (2).
10) Remove the frame assembly from inside the door panel.

B: INSTALLATION

Install each part in the reverse order of removal.

Tightening torque:
Refer to "COMPONENT" of "General Description". <Ref. to SL-2, DOOR LOCK ASSEMBLY, COMPONENT, General Description.>

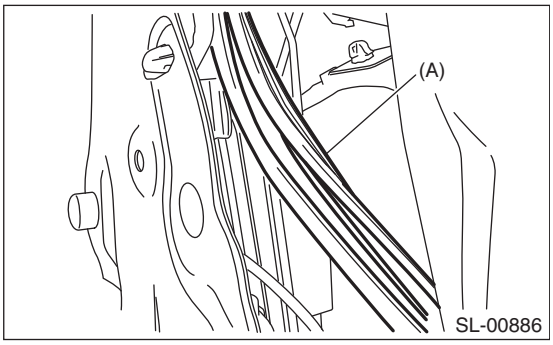
C: INSPECTION

Check if the front outer handle operates normally.
• If the lever is faulty, replace the front outer handle.
• If the rod is deformed, replace the front door latch & door lock actuator assembly.

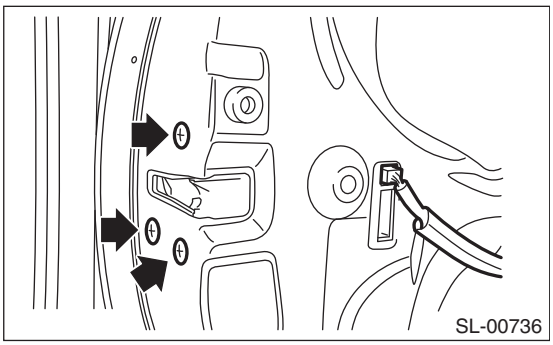
7. Front Door Latch and Door Lock Actuator Assembly

A: REMOVAL

1) Raise the front door glass to the top position.
2) Disconnect the ground cable from battery.
3) Remove the front door trim. <Ref. to EI-43, FRONT DOOR, REMOVAL, Door Trim.>
4) Remove the sealing cover. <Ref. to EB-18, REMOVAL, Front Sealing Cover.>
5) Remove the glass run rubber (A) partially.



6) Remove the rear sash.
7) Remove the rod from the outer handle rod clamp.
8) Disconnect the harness connector of front door latch and door lock actuator assembly.
9) Remove the screws, and remove the front door latch & door lock actuator assembly.



B: INSTALLATION

Install each part in the reverse order of removal.

Tightening torque:
Refer to "COMPONENT" of "General Description". <Ref. to SL-2, DOOR LOCK ASSEMBLY, COMPONENT, General Description.>

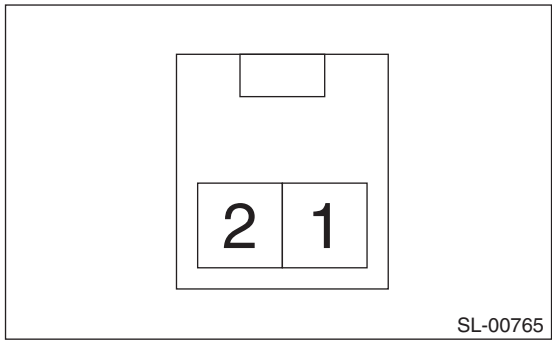
C: INSPECTION

1. DOOR LATCH

Check if the front door latch operates normally.
• If the cable or rod is faulty, replace the front door latch & door lock actuator assembly.

2. LOCK ACTUATOR

1) Disconnect the door lock actuator harness connector.
2) Connect the battery to door lock actuator terminals.



Actuator operation	Terminals	
	No. 1	No. 2
Lock → Unlock	–	+
Unlock → Lock	+	–

3) Replace the front door latch & door lock actuator assembly if it is found defective.

8. Rear Inner Remote

A: REMOVAL

Refer to “Front Inner Remote” for the removal procedure. <Ref. to SL-30, REMOVAL, Front Inner Remote.>

B: INSTALLATION

Install each part in the reverse order of removal.

C: INSPECTION

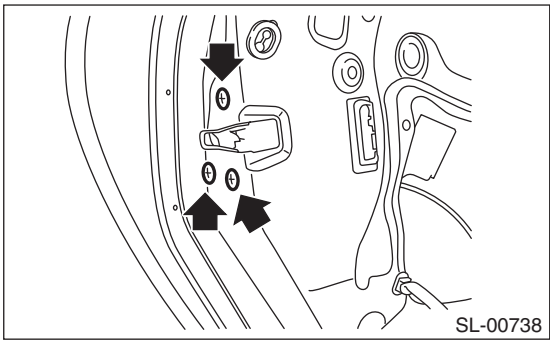
Check if the rear remote handle operates normally.

- If the lever is faulty, replace the rear inner remote handle.
- If the cable is deformed, replace the rear door latch & door lock actuator assembly.

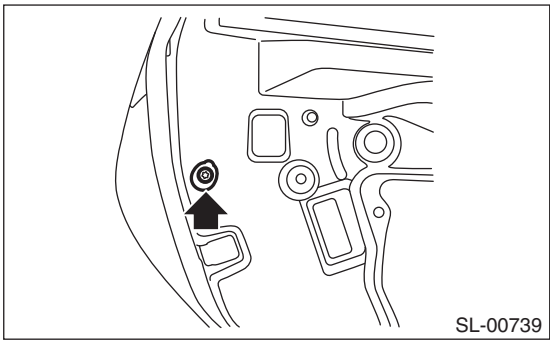
9. Rear Outer Handle

A: REMOVAL

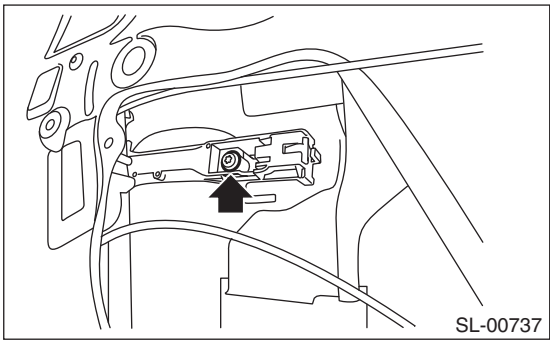
1) Raise the rear door glass to the top position.
2) Remove the rear door trim. <Ref. to EI-44, REAR DOOR, REMOVAL, Door Trim.>
3) Remove the sealing cover. <Ref. to EB-21, REMOVAL, Rear Sealing Cover.>
4) Disconnect the harness connector of rear door latch and door lock actuator assembly.
5) Remove the screws, and move aside the rear door latch and door lock actuator assembly.


SL-00738

6) Remove the child protector cover, and loosen the TORX® bolt.


SL-00739

7) Detach the outer handle cover.
8) Move the rear outer handle towards the rear, and remove the rear outer handle.
9) Remove the outer side spacer.
10) Remove the TORX® bolt.


SL-00737

11) Remove the frame assembly from inside the door panel.

CAUTION:
Do not apply excessive force to remove the handle from the door panel. The door panel may become deformed.

B: INSTALLATION

Install each part in the reverse order of removal.

Tightening torque:
Refer to "COMPONENT" of "General Description". <Ref. to SL-2, DOOR LOCK ASSEMBLY, COMPONENT, General Description.>

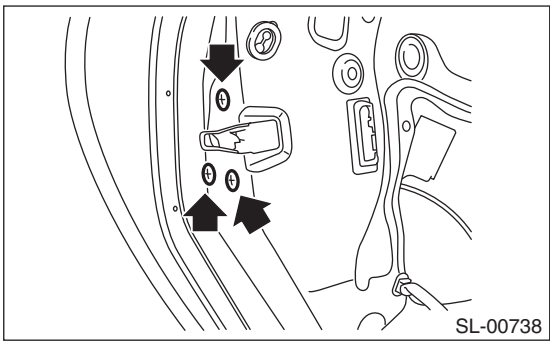
C: INSPECTION

Check if the rear outer handle operates normally.
- If the lever is faulty, replace the rear outer handle.
- If the rod is deformed, replace the rear door latch & door lock actuator assembly.

10. Rear Door Latch and Door Lock Actuator Assembly

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the rear door trim. <Ref. to EI-44, REAR DOOR, REMOVAL, Door Trim.>
3) Remove the wire from the rear inner remote. <Ref. to SL-33, REMOVAL, Rear Inner Remote.>
4) Remove the sealing cover. <Ref. to EB-21, REMOVAL, Rear Sealing Cover.>
5) Remove the rear door glass. <Ref. to GW-19, REMOVAL, Rear Door Glass.>
6) Disconnect the harness connector of rear door latch and door lock actuator assembly.
7) Remove the screws, and remove the rear door latch & door lock actuator assembly.



B: INSTALLATION

Install each part in the reverse order of removal.

Tightening torque:
Refer to "COMPONENT" of "General Description". <Ref. to SL-2, DOOR LOCK ASSEMBLY, COMPONENT, General Description.>

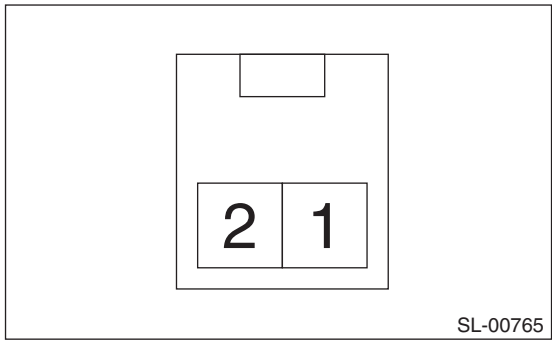
C: INSPECTION

1. DOOR LATCH

Check if the rear door latch operates normally.
• If the cable or rod is faulty, replace the rear door latch & door lock actuator assembly.

2. LOCK ACTUATOR

1) Disconnect the door lock actuator harness connector.
2) Connect the battery to door lock actuator terminals.



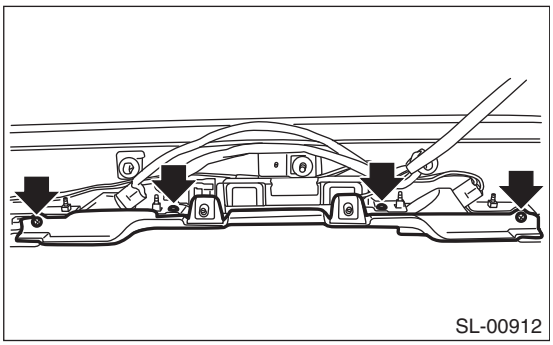
Actuator operation	Terminals	
	No. 1	No. 2
Lock → Unlock	–	+
Unlock → Lock	+	–

3) Replace the rear door latch & door lock actuator assembly if it is found defective.

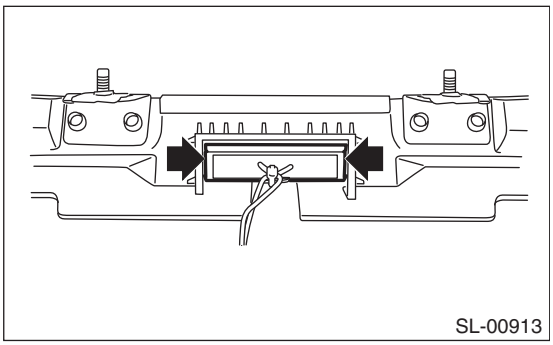
11.Rear Gate Opener Button

A: REMOVAL

NOTE:
The rear gate opener button is integrated into the license plate light assembly harness.
1) Remove the rear gate trim. <Ref. to EI-67, REMOVAL, Rear Gate Trim.>
2) Remove the rear gate garnish. <Ref. to EI-69, REMOVAL, Rear Gate Garnish.>
3) Remove the screws, and then remove the rear gate garnish lower cover.


SL-00912

4) Hold down the rear gate opener button hook, and remove the rear gate opener button.


SL-00913

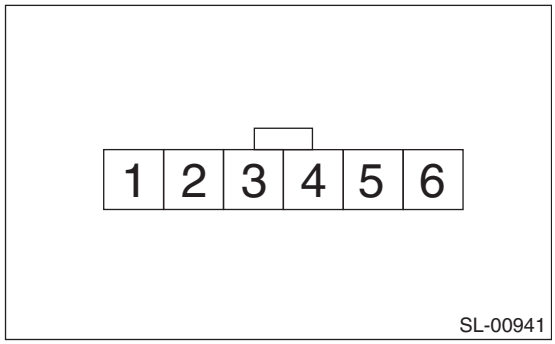
5) Remove the license plate light. <Ref. to LI-34, REMOVAL, License Plate Light.>
6) Remove the license plate light assembly harness.

B: INSTALLATION

CAUTION:
• Install with the band tightened point of switch harness facing towards the vehicle.
• Make sure that the harness grommet is securely installed.
If not properly installed, this may cause leaks.
Install each part in the reverse order of removal.

C: INSPECTION

1) Disconnect the rear gate opener button harness connector.
2) Check the resistance between rear gate opener button connector terminals.



SL-00941

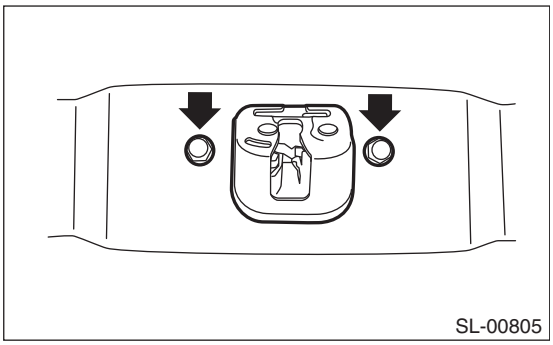
Switch	Terminal No.	Standard
Open	5 and 6	Less than 1 Ω
Close		1 MΩ or more

3) Replace the rear gate opener button if the inspection result is not within the standard value.

12. Rear Gate Latch and Actuator Assembly

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the rear gate trim. <Ref. to EI-67, REMOVAL, Rear Gate Trim.>
3) Disconnect the harness connector of rear gate latch and actuator assembly.
4) Remove the bolts, and remove the rear gate latch & actuator assembly.



B: INSTALLATION

Install each part in the reverse order of removal.

Tightening torque:
Refer to "COMPONENT" of "General Description". <Ref. to SL-3, REAR GATE LOCK, COMPONENT, General Description.>

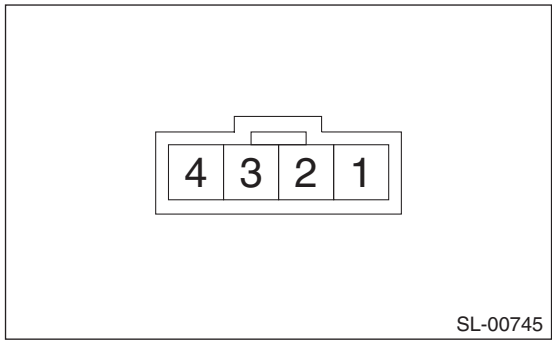
C: INSPECTION

1. REAR GATE LATCH

Check if the rear gate latch operates normally.
• If latch deformation, abnormal wear, or unsmooth lock operation is observed, replace the rear gate latch & actuator assembly.

2. CHECK LOCK ACTUATOR

1) Disconnect the harness connector of rear gate latch and actuator assembly.
2) Connect the battery to the rear gate latch and actuator assembly terminals.



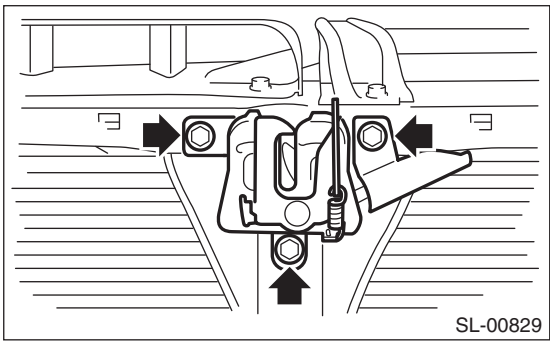
Actuator operation	Terminals	
	No. 1	No. 2
Lock → Unlock	+	–

3) Replace the rear gate latch and actuator assembly if it is found defective.

13.Front Hood Lock Assembly

A: REMOVAL

1) Open the front hood.
2) Remove the front bumper face. <Ref. to EI-29, FRONT BUMPER FACE, REMOVAL, Front Bumper.>
3) Remove the bolts, and then detach the front hood lock assembly.
4) Remove the release cable from the lock assembly.



B: INSTALLATION

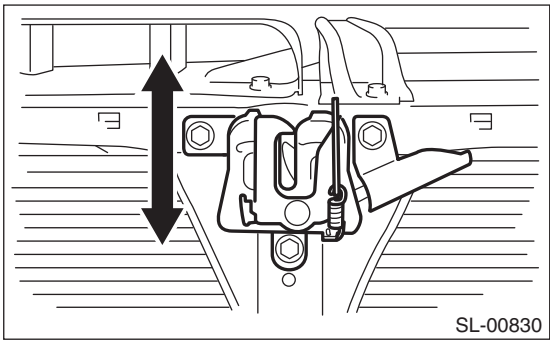
Install each part in the reverse order of removal.

Tightening torque:
Refer to "COMPONENT" of "General Description". <Ref. to SL-4, FRONT HOOD LOCK AND REMOTE OPENERS, COMPONENT, General Description.>

NOTE:
Apply grease to the movable part.

C: ADJUSTMENT

1) Loosen the bolt, and adjust the lock assembly while moving it up and down.



2) After adjustment, tighten the bolts securely.

D: INSPECTION

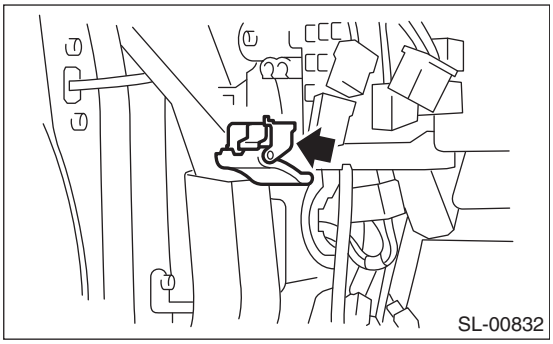
Check if the front hood lock assembly operates normally.
• If latch deformation, abnormal wear, or unsmooth lock operation is observed, replace the front hood lock assembly.

14.Remote Openers

A: REMOVAL

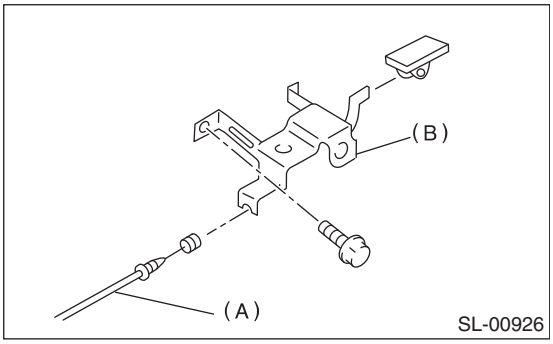
1. FRONT HOOD OPENER

1) Remove the cable from the front hood lock.
2) Remove the bolt, and then detach the opener lever.

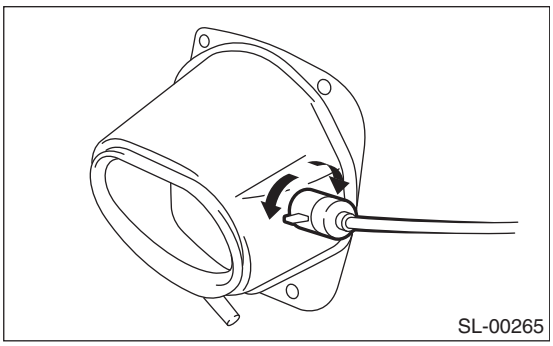


2. FUEL FILLER LID OPENER

1) Remove the rear seat. <Ref. to SE-16, REMOVAL, Rear Seat.>
2) Remove the lower inner trim, rear quarter trim and floor mat on the driver's side. Remove the clip holding the cable.
3) Remove the bolt and nut, and remove the opener pull handle (B).
4) Remove cable (A) from the opener pull handle (B).



5) Rotate the fuel lock inside the quarter panel to 90° and remove. (Either right or left turn)



B: INSTALLATION

Install each part in the reverse order of removal.

Tightening torque:
Refer to "COMPONENT" of "General Description". <Ref. to SL-4, FRONT HOOD LOCK AND REMOTE OPENERS, COMPONENT, General Description.>

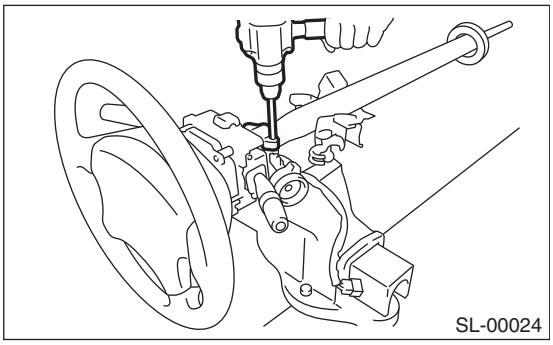
C: INSPECTION

Check if the front hood and fuel flap operate normally.

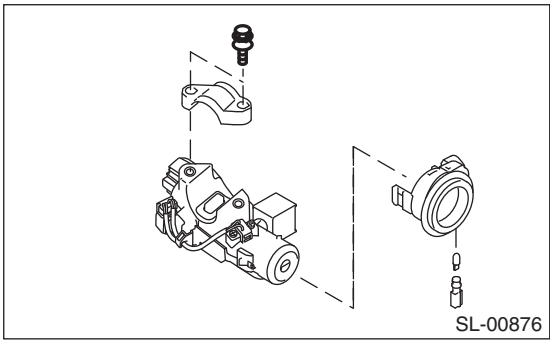
15.Ignition Key Lock

A: REPLACEMENT

1) Disconnect the ground cable from battery.
2) Remove the steering column. <Ref. to PS-16, REMOVAL, Steering Column.>
3) Secure the steering column in a vise. Remove the bolt with a drill.

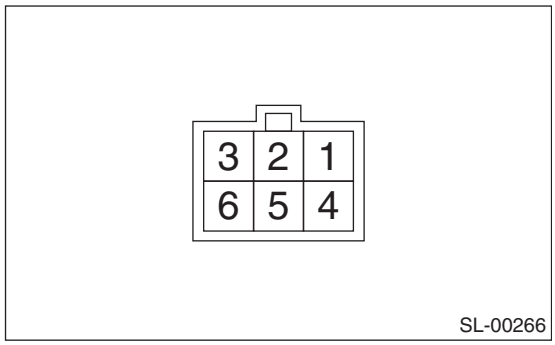


4) Remove the ignition key lock.
5) Use new bolts. Tighten the bolt until the bolt head is broken (bolt head wrenched off).



B: INSPECTION

1) Remove the instrument panel lower cover.
2) Remove the lower column cover.
3) Unfasten the fixing clip which secures harness, and then disconnect the harness connector of the ignition switch from body harness.
4) Turn the ignition key plate to each position and check the resistance between ignition connector terminals.



Switch position	Terminal No.	Standard
LOCK	—	—
ACC	3 and 5	Less than 1 Ω
ON	3 and 1 and 4 3 and 5	Less than 1 Ω
ST	3 and 2 3 and 1 and 6	Less than 1 Ω

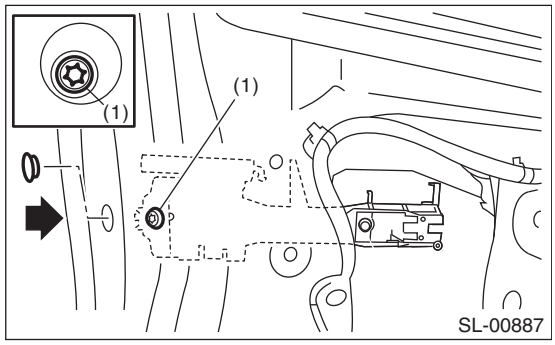
5) Replace the ignition switch if the inspection result is not within the standard value.

16.Key Lock Cylinders

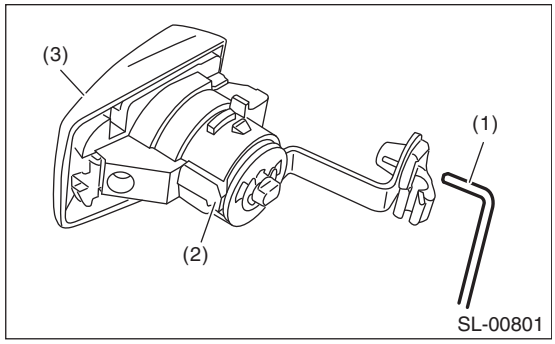
A: REPLACEMENT

1. FRONT DOOR

1) Raise the front door glass to the top position.
2) Remove the front door trim. <Ref. to EI-43, FRONT DOOR, REMOVAL, Door Trim.>
3) Remove the sealing cover. <Ref. to EB-18, REMOVAL, Front Sealing Cover.>
4) Remove the rod clamp.
5) Remove the plug to the rear of the door panel.
6) Loosen TORX® bolt (1).



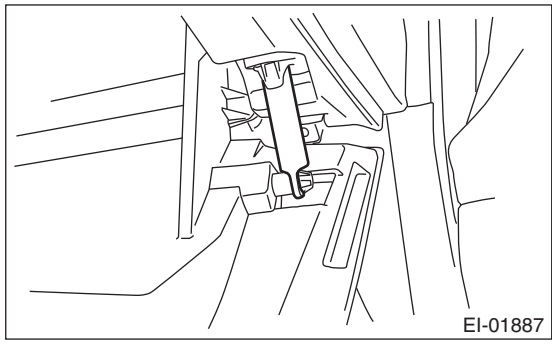
7) Remove the key cylinder along with the handle cover.
8) Remove the key cylinder from the cover, and replace the key cylinder.



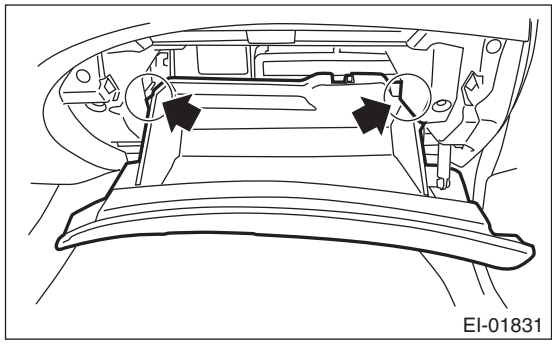
(1) Latch connection rod
(2) Key cylinder
(3) Door outer handle cover

2. GLOVE BOX LID

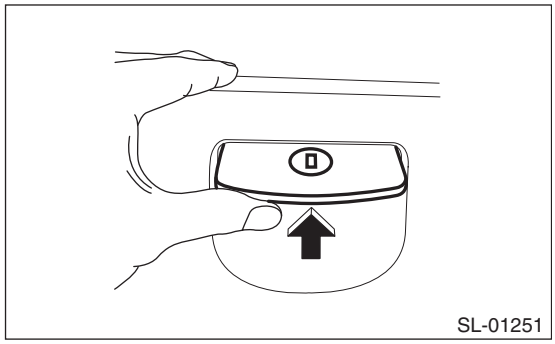
1) Remove the glove box damper.



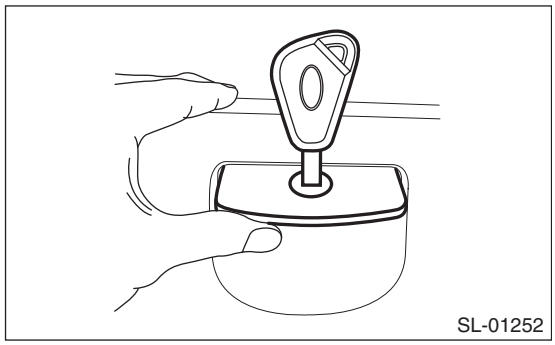
2) Remove the stoppers and pull the glove box lid assembly forward to remove.



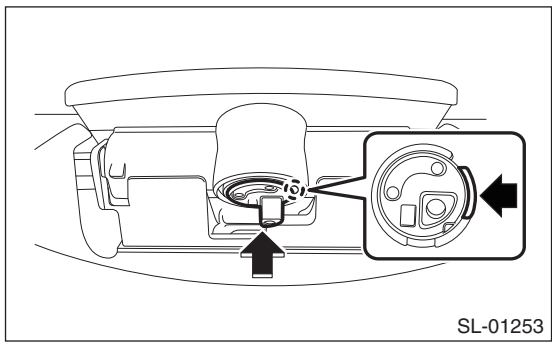
3) Pull up the lock knob with the key cylinder in UNLOCK.



4) Insert the key while holding the condition of step 3), and pull out the key in LOCK status.



5) Remove the key cylinder from lock knob while pushing in the metal plate, and replace the key cylinder.



17.Security Control Module

A: NOTE

The control of security system is carried out in body integrated unit. For operation procedures, refer to “Body Integrated Unit”.

- Removal: <Ref. to SL-46, REMOVAL, Body Integrated Unit.>
- Installation: <Ref. to SL-46, INSTALLATION, Body Integrated Unit.>

18.Impact Sensor

A: REMOVAL

1) Remove the key from ignition switch.
2) Close all the doors and the rear gate.
3) Press the UNLOCK button of the keyless transmitter.
4) Disconnect the ground cable from the battery.
5) Remove the impact sensor.
6) Change the setting of impact sensor using Subaru Select Monitor.

B: INSTALLATION

1) Remove the key from ignition switch.
2) Close all the doors and the 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) 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 data link connector.
2) Turn the ignition switch to ON (engine OFF) and run the “PC application for Subaru Select Monitor”.
3) On «System Selection Menu» display, select {Integ. unit mode}.
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 ignition switch.
2) Close all the 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 the security indicator light blinks twice within 0.5 second in 2 seconds cycles after 30 seconds.
6) Hit all windows with the palm with force repeatedly, to check for whether 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 data link connector.
2) Turn the ignition switch to ON (engine OFF) and run the “PC application for Subaru Select Monitor”.
3) On the «System Selection Menu», select the {Impact Sensor}.
4) Make a {Sensitivity Adjustment Mode}.
- Sensitivity can be adjusted in 11 levels (0 to 10).
- Initial setting is 5.
- Smaller number means more sensitive.
- Larger number means less sensitive.

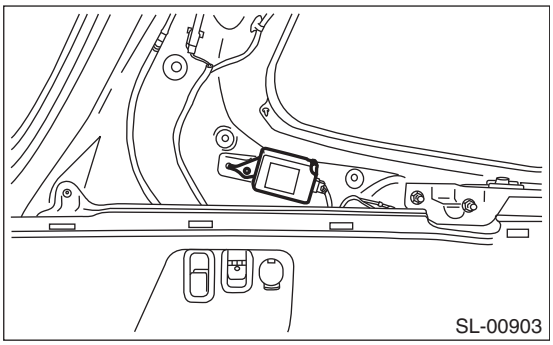
5) Turn the ignition switch to OFF, and then remove the Subaru Select Monitor.

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 burglary attempt, if there is vibration (road construction, elevated parking lots, passage of trains or boarding of ferries), the alarm can be triggered. Because of this, ask the customer about their parking conditions, and set an appropriate sensitivity level after discussion.
- The impact sensitivity can also be adjusted on the manufacturer’s optional display, and it can be set in 11 levels from 0 to 10. The sensitivity is set to 5 by default. (Unlike the specification of the Subaru Select Monitor, the setting becomes duller as the setting value becomes smaller, and more sensitive as the number becomes larger.)
- If the sensitivity setting was not performed properly, a buzzer will sound four times. In this case, check the following:
  - Is there an error in CAN communication?
  - Is there an open circuit in the harness between the body integrated unit and the impact sensor?
  - Is there a malfunction in the display, body integrated unit or impact sensor?

19. Keyless Entry Control Module

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the left rear quarter trim. <Ref. to EI-60, REMOVAL, Rear Quarter Trim.>
3) Disconnect the keyless entry control module harness connector.
4) Remove the bolt and then remove the keyless entry control module.



B: INSTALLATION

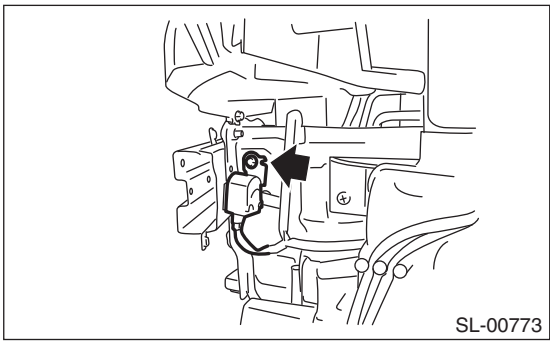
Install each part in the reverse order of removal.

Tightening torque:
13 N·m (1.33 kgf-m, 9.6 ft-lb)

20.Keyless Buzzer

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the front bumper face. <Ref. to EI-29, FRONT BUMPER FACE, REMOVAL, Front Bumper.>
3) Remove the bolt, and then remove the keyless buzzer.



B: INSTALLATION

Install each part in the reverse order of removal.

Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

C: INSPECTION

Using the Subaru Select Monitor, perform forced operation of the keyless buzzer. <Ref. to LAN(diag)-30, Function Check.>

NOTE:
If it does not sound, replace the buzzer.

21.Body Integrated Unit

A: NOTE

1. WHEN REPLACING THE BODY INTEGRATED UNIT

1) Check and record the current setting. <Ref. to LAN(diag)-27, CONFIRMATION OF CURRENT SETTING, OPERATION, Registration Body Integrated Unit.>
2) Prepare the following.
- Security ID plate
- Required number of registered immobilizer keys or new immobilizer keys.

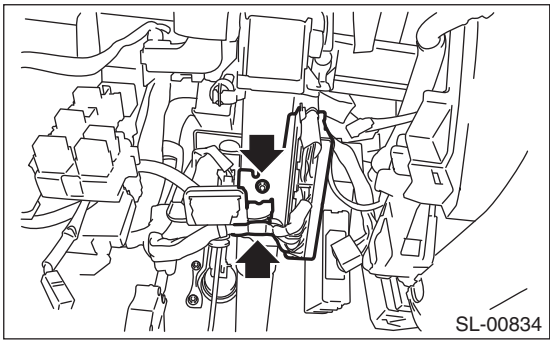
2. AFTER REPLACING THE BODY INTEGRATED UNIT

1) Register the immobilizer. For detailed operation procedures, refer to “PC application help for Subaru Select Monitor”.
2) Set the current settings as recorded.

B: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the driver’s side instrument panel lower cover. <Ref. to EI-47, REMOVAL, Instrument Panel Lower Cover.>
3) Remove the knee guard panel.
4) Disconnect the harness connector of body integrated unit.

CAUTION:
Be careful to keep water and other foreign materials away from body integrated unit.
5) Remove the mounting bolt for the body integrated unit bracket, and remove the body integrated unit.



C: INSTALLATION

Install each part in the reverse order of removal.

Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

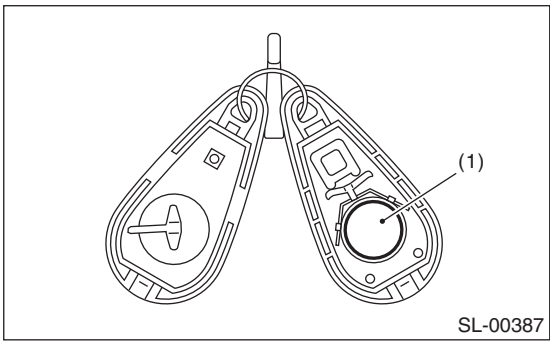
NOTE:
Make sure that there are no differences from the contents of the current settings after installation. <Ref. to LAN(diag)-20, Read Current Data.>

22.Transmitter

A: REMOVAL

1. TRANSMITTER BATTERY

CAUTION:
To prevent static electricity damage to the transmitter printed circuit board, touch the steel area of building with hand to discharge static electricity carried on body or clothes before disassembling the transmitter.
Remove the battery (1) from the transmitter.



B: INSTALLATION

1. TRANSMITTER BATTERY

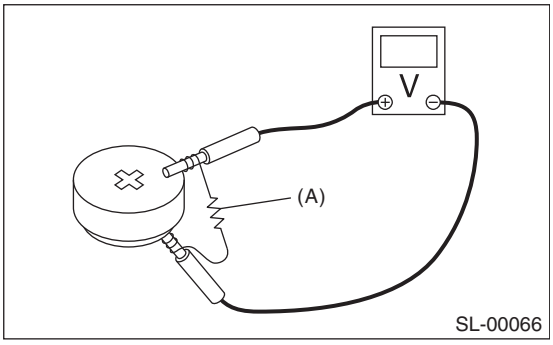
Install each part in the reverse order of removal.

C: INSPECTION

1. TRANSMITTER BATTERY

1) Check the voltage between the transmitter battery (+) terminal and (–) terminal.

NOTE:
Battery discharge occurs during the inspection. Complete the measurement within 5 seconds.



(A) Resistance 47 Ω

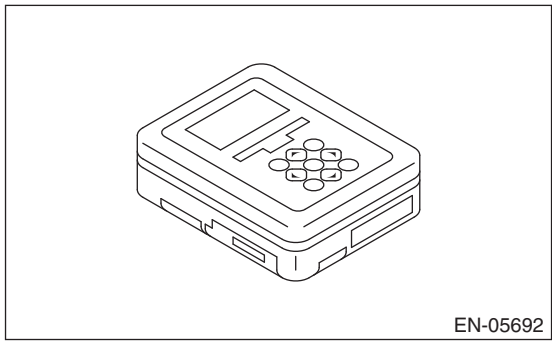
Tester connection		Standard
(+)	(–)	
Battery Positive terminal	Battery Ground terminal	2.5 — 3.0 V

2) Replace the battery if the inspection result is not within the standard value. (Use CR2025 or equivalent.)

D: REPLACEMENT

1. REGISTRATION OF KEYLESS TRANSMITTER WITH SUBARU SELECT MONITOR

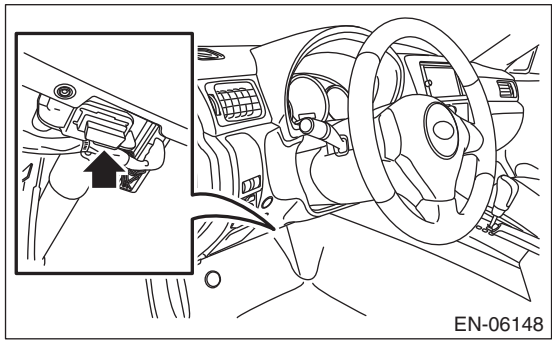
NOTE:
• A maximum of four keyless transmitter can be registered for each individual vehicle.
• When replacing or adding the keyless transmitter, new registration of transmitter is necessary.
1) Prepare the Subaru Select Monitor kit. <Ref. to SL-7, SPECIAL TOOL, PREPARATION TOOL, General Description.>



2) Prepare PC with Subaru Select Monitor installed.
3) Connect the USB cable to SDI (Subaru Diagnosis Interface) and USB port on the personal computer (dedicated port for the Subaru Select Monitor).

NOTE:
The dedicated port for the Subaru Select Monitor means the USB port which was used to install the Subaru Select Monitor.
4) Connect the diagnosis cable to SDI.
5) Connect SDI to data link connector located in the lower portion of the instrument panel (on the driver's side).

CAUTION:
Do not connect scan tools other than the Subaru Select Monitor.



6) Start the PC.

7) Turn the ignition switch to ON (engine OFF) and run the “PC application for Subaru Select Monitor”.
8) On the «Main Menu» of the Subaru Select Monitor, select the {Each System Check} → {Integ. unit mode} → {Keyless ID registration}.
9) Input the 8-digit ID number attached to the tag plate of the transmitter or inside the transmitter, from left to right. Press the [OK] key.
10) The ID number you have entered will be shown. Make sure that the ID number shown is the same as that of plastic bag or inside of transmitter.
11) Press the [OK] key if the ID number is correct. Press the [EXIT] key if incorrect, to return to the step 3) and enter the ID number again.
12) «ID is being registered···» is displayed and registration starts.
13) «ID registration completed » will be displayed when the registration process is done.
14) To exit, select «Quit: NO» to return to {Keyless ID registration}. If there are additional keyless transmitters to be registered, select «The following are registered: OK» to return to the step 4).

NOTE:
• If the registration fails, «ID cannot register. Try again.» will be shown. Select the [OK] key to return to the {Keyless ID registration}. Retry starting from the step 3).
• «Quit: NO» is shown on the Subaru Select Monitor when fourth keyless transmitter has been registered. Select the [NO] key to return to {Keyless ID registration}.

23.Immobilizer Control Module

A: NOTE

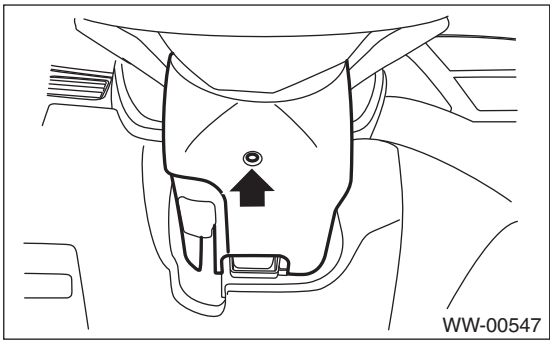
The control of immobilizer system is carried out in body integrated unit. For operation procedures, refer to “Body Integrated Unit”.

- Removal: <Ref. to SL-46, REMOVAL, Body Integrated Unit.>
- Installation: <Ref. to SL-46, INSTALLATION, Body Integrated Unit.>

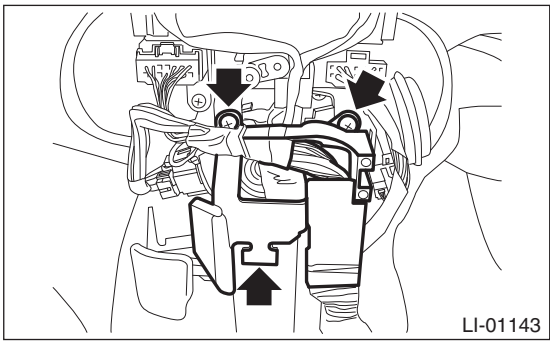
24.Immobilizer Antenna

A: REMOVAL

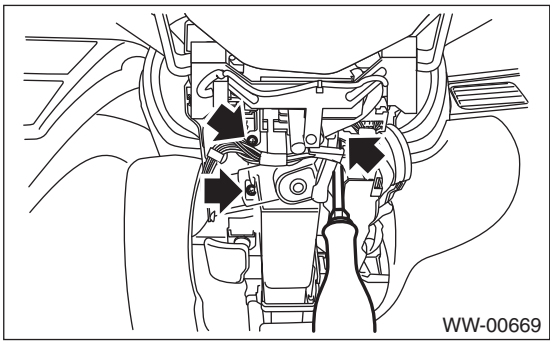
1) Disconnect the ground cable from battery.
2) Remove the screws and remove the steering column cover lower.



3) Remove the harness cover lock.
4) Remove the screws and detach the knee protector.

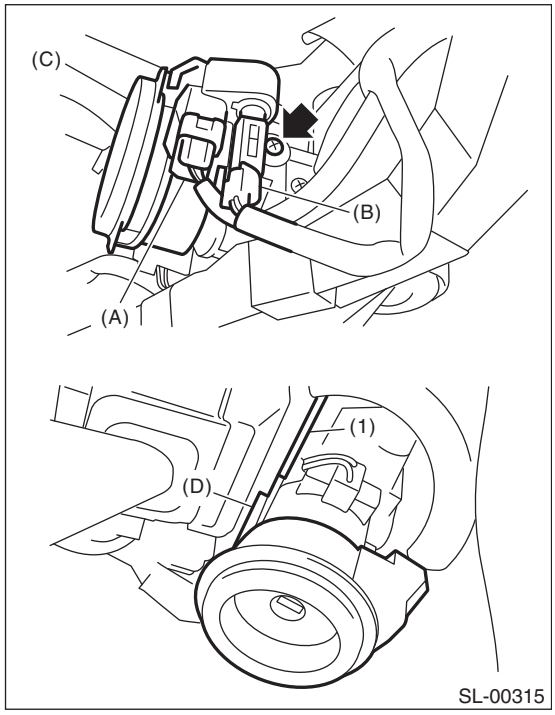


5) Remove the screws and remove the steering column cover upper.



6) Remove the instrument panel lower cover. <Ref. to EI-47, REMOVAL, Instrument Panel Lower Cover.>
7) Disconnect the immobilizer antenna harness connector (A) and ignition switch lighting harness connector (B).
8) Loosen the screw and release the lock (D) at opposite side using flat tip screwdriver (1), and then detach the immobilizer antenna (C).

CAUTION:
Do not apply excessive force to remove the immobilizer antenna and lock. Otherwise they may be broken because those parts are the products made of a plastic.



B: INSTALLATION

Install each part in the reverse order of removal.

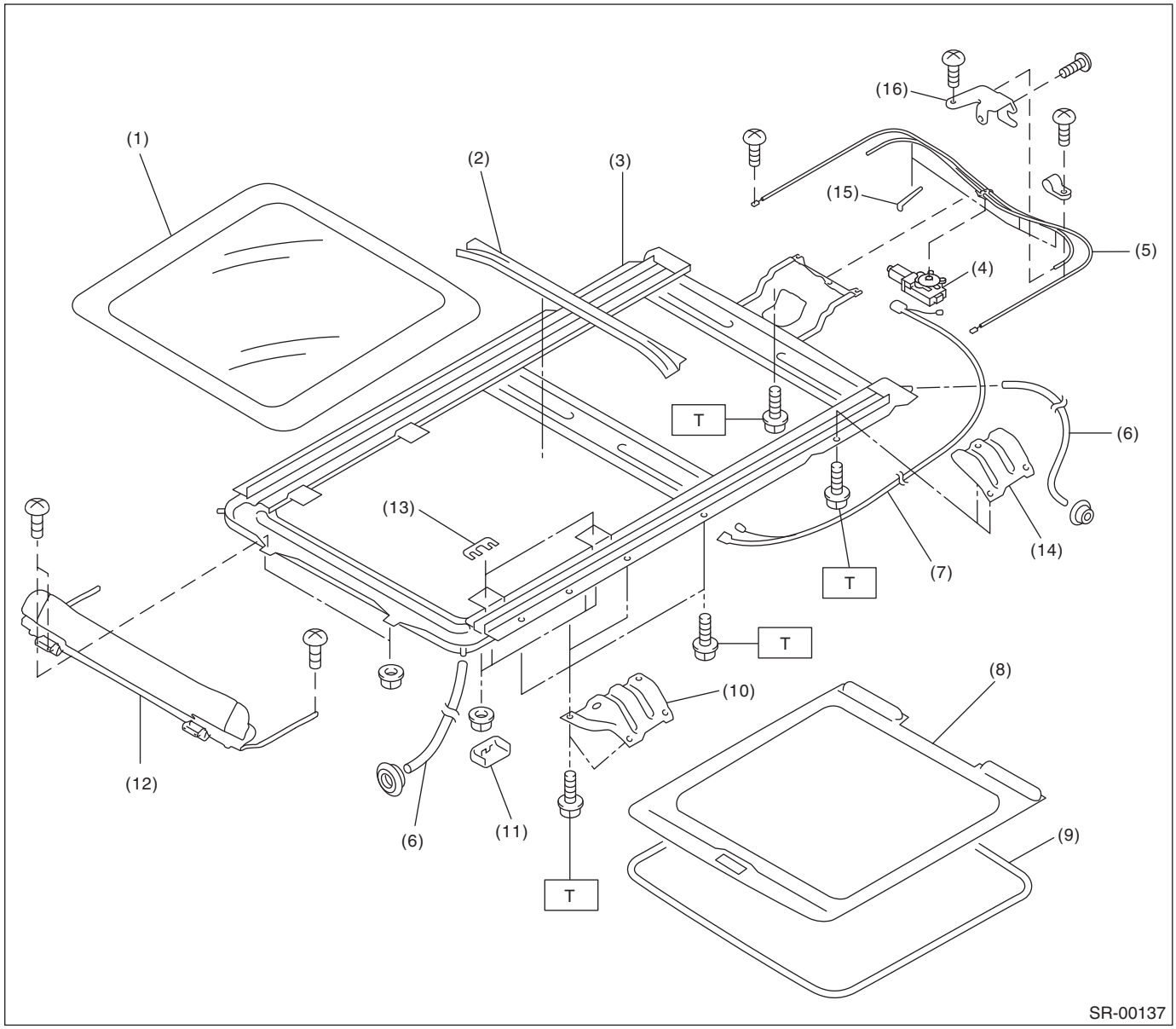
SUNROOF/T-TOP/CONVERTIBLE TOP (SUNROOF)

SR

		Page
1.	General Description	2
2.	Sunroof Control System	4
3.	Sunroof Lid	5
4.	Sunroof Assembly	6
5.	Sunroof Motor	8
6.	Sunroof Switch	9

1. General Description

A: COMPONENT



(1) Sunroof lid
(2) Rear drain ASSY
(3) Frame ASSY
(4) Motor ASSY
(5) Drive unit
(6) Drain tube
(7) Harness
(8) Sunshade
(9) Garnish
(10) Frame bracket
(11) Cover
(12) Deflector
(13) Shim
(14) Sunroof bracket
(15) Band
(16) Shade stopper

Tightening torque:N·m (kgf-m, ft-lb)
T: 7.5 (0.76, 5.5)

B: CAUTION

• Before disassembling or reassembling parts, always disconnect the battery ground cable from battery. When replacing the audio, control module 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 unless otherwise indicated.
• Adjust parts to the given specifications.
• Connect the connectors and hoses securely during reassembly.
• After reassembly, make sure that the functional parts operate normally.

C: PREPARATION TOOL

1. GENERAL TOOL

TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance and voltage.

2. Sunroof Control System

A: WIRING DIAGRAM

Refer to “Sunroof Control System” in the wiring diagram. <Ref. to WI-167, WIRING DIAGRAM, Sunroof Control System.>

B: INSPECTION

Symptoms	Inspection order
Water leakage	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.
Booming noise, wind noise and other noise	1. Check the deflector upright position without binding. 2. Check sunroof lid and roof panel for improper clearance. 3. Check sunshade and roof trim for improper clearance.
Abnormal motor noise	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.)	1. Check guide rail for foreign particles. 2. Check guide rail for improper installation. 3. Check parts for mutual interference. 4. Check cable slider for improper clinching. 5. Check cable for improper installation.
Motor does not rotate or it rotates improperly.	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.

C: NOTE

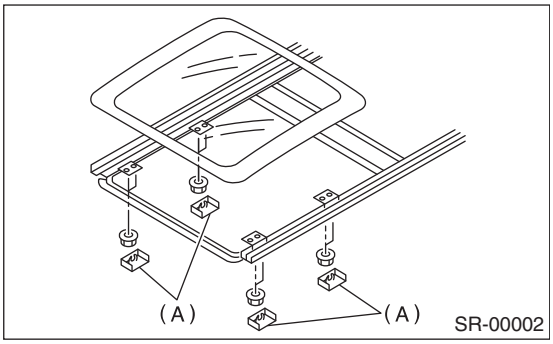
For procedure of each component in the sunroof control system, refer to the respective section.

- Sunroof lid: <Ref. to SR-5, Sunroof Lid.>
- Sunroof assembly: <Ref. to SR-6, Sunroof Assembly.>
- Sunroof motor: <Ref. to SR-8, Sunroof Motor.>
- Sunroof switch: <Ref. to SR-9, Sunroof Switch.>

3. Sunroof Lid

A: REMOVAL

1) Completely close the sunroof lid, and open the sunshade.
2) Remove the cover (A), then remove the nuts.



3) Remove the sunroof lid carefully.

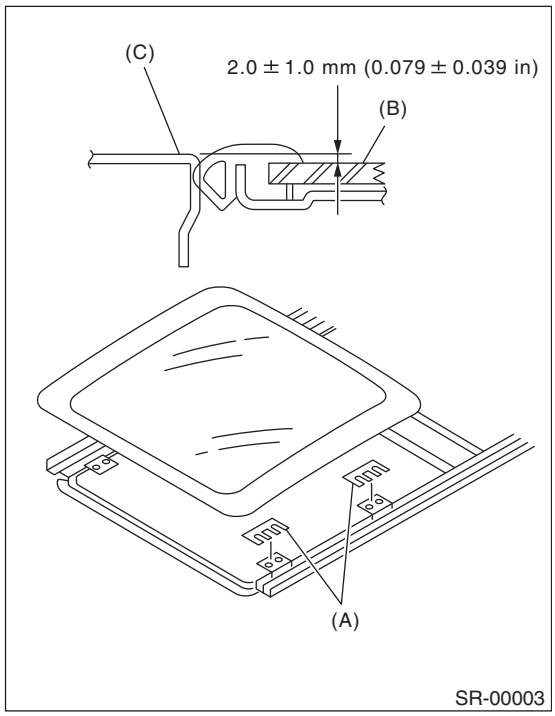
B: INSTALLATION

Install each part in the reverse order of removal.

C: ADJUSTMENT

Adjust the 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 in height between sunroof and roof panel
2.0±1.0 mm (0.079±0.039 in)

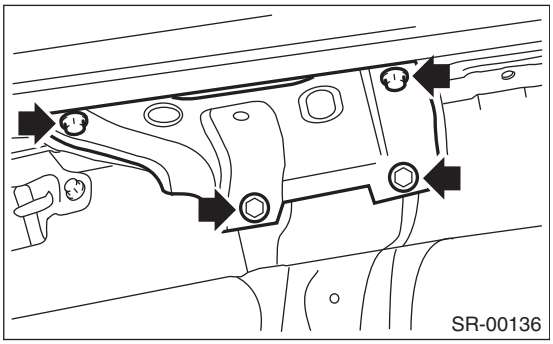


(A) Shim
(B) Sunroof lid
(C) Roof panel

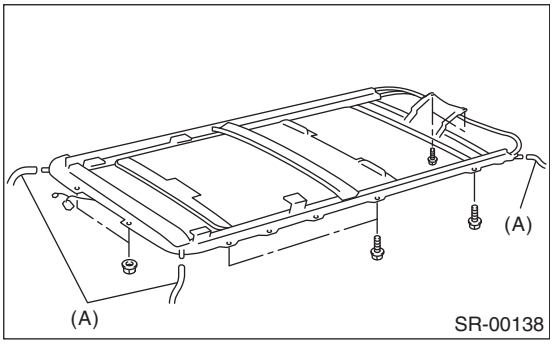
4. Sunroof Assembly

A: REMOVAL

CAUTION:
Use great care not to damage the roof trim.
1) Disconnect the ground cable from battery.
2) Remove the roof trim. <Ref. to EI-64, REMOVAL, Roof Trim.>
3) Remove the sunroof lid. <Ref. to SR-5, REMOVAL, Sunroof Lid.>
4) Disconnect the sunroof motor connector.
5) Remove the bolts and then move the curtain airbag module.
6) Remove the bolts and then remove the frame bracket.



7) Remove the drain tube (A) from the sunroof frame.
8) Remove the nuts and bolts to remove the sunroof frame.



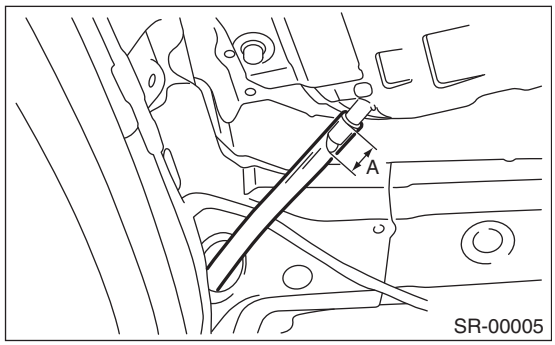
B: INSTALLATION

CAUTION:
Be careful not to snag the harness.
Install each part in the reverse order of removal.

Tightening torque:
Refer to "COMPONENT" of "General Description". <Ref. to SR-2, COMPONENT, General Description.>

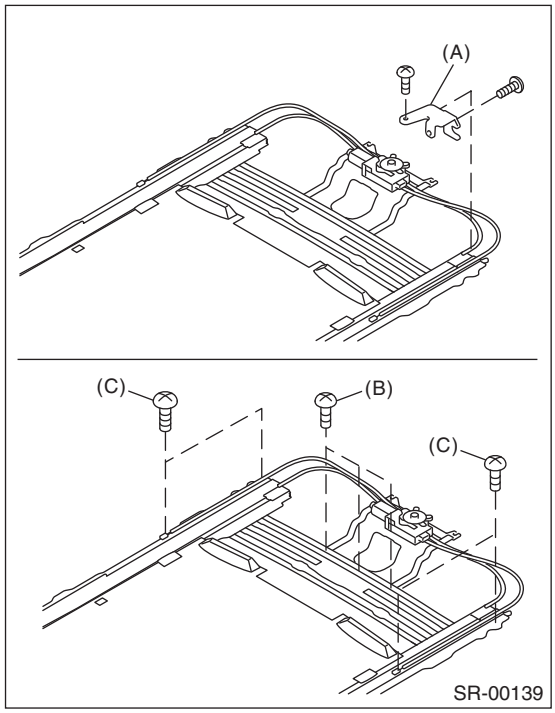
NOTE:
- Be sure to connect the harness connector.
- When installing the drain tube, insert it securely into drain pipe.

Length A:
15 mm (0.59 in) or more

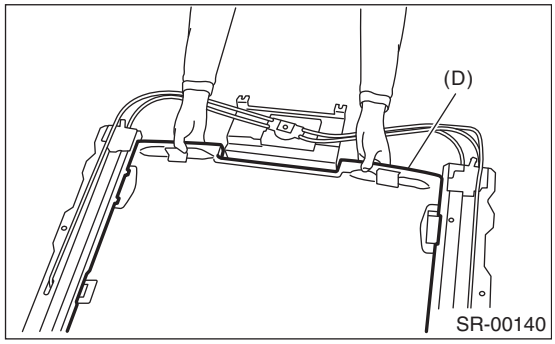


C: DISASSEMBLY

1) Remove the sunroof frame. <Ref. to SR-6, REMOVAL, Sunroof Assembly.>
2) Remove the shade stopper (A).
3) Remove the motor bracket screw (B).
4) Remove the guide pipe screw (C), slightly pull out the guide pipe from the guide rail and then lower the motor bracket.



5) Pull out the sunshade (D) from sunroof frame.

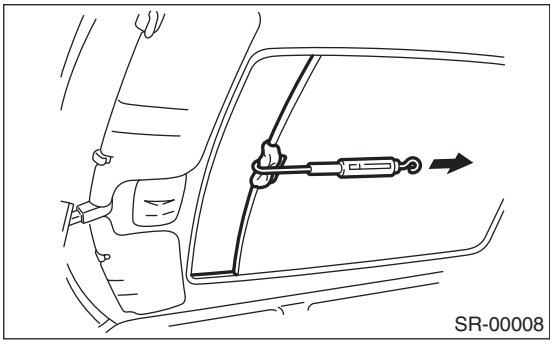


D: ASSEMBLY

Assemble each part in the reverse order of disassembly.

E: INSPECTION

Check the moving load of the sunshade.
1) Attach a spring scale to sunshade edge using a cloth.



2) Pull the spring scale to measure moving load of the sunshade.

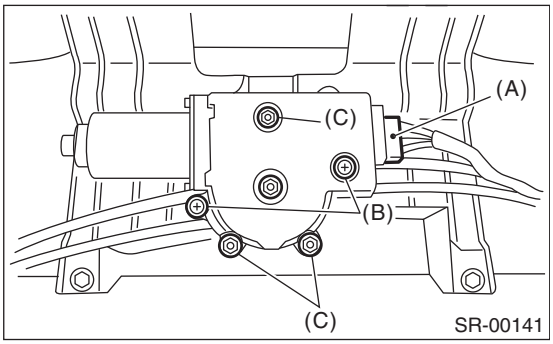
Moving load of sunshade:
20 N (2.04 kgf, 4.5 lb) or less

NOTE:
Moving load is larger at the beginning of pulling a spring scale, so take a spring scale reading while sunshade sliding smoothly.
3) If it exceeds the specification, check the sunroof lid, sunshade, deflector and guide rail assembly for improper installation.

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.
2) Disconnect the ground cable from battery.
3) Remove the roof trim. <Ref. to EI-64, REMOVAL, Roof Trim.>
4) Disconnect sunroof motor connector (A).
5) Remove the screws (B) and nuts (C), and remove the sunroof motor.



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 connector, and connect the 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-65, INSTALLATION, Roof Trim.>

C: ADJUSTMENT

Reset the sunroof motor.
1) Completely close the sunroof lid.
2) After completely closing the sunroof lid, press and hold the switch to CLOSE side again for one second or more.

D: INSPECTION

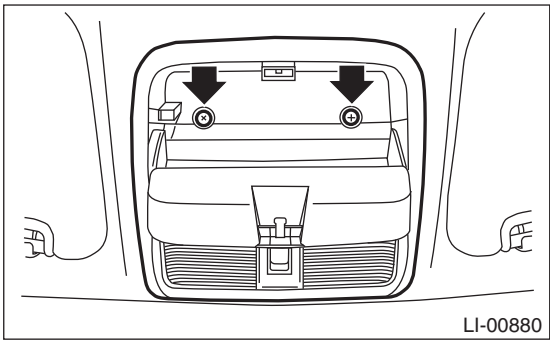
CAUTION:
Do not place objects in the way to check the auto-reverse mechanism.
Inspect the sunroof lid auto-reverse mechanism.
1) Open the sunroof lid.
2) Forcefully push the sunroof lid in the opening direction while auto-closing, to check whether the window auto-reverse mechanism functions.
3) Check whether the window auto-reverse mechanism operates and the roof moves back 150 mm (5.91 in) in the opening direction.

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

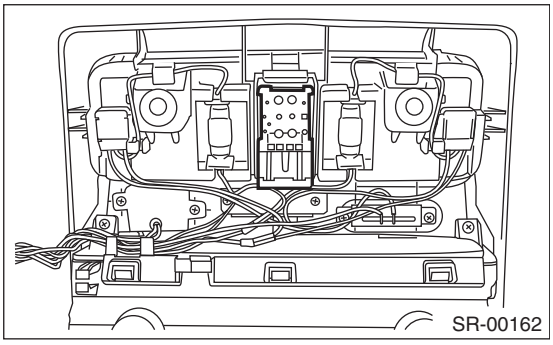
A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the overhead console.



(1) Push and open the rear end of the overhead console lid, and remove the screws.
(2) Remove the overhead console and disconnect the harness connector.

3) Remove the sunroof switch from the overhead console.

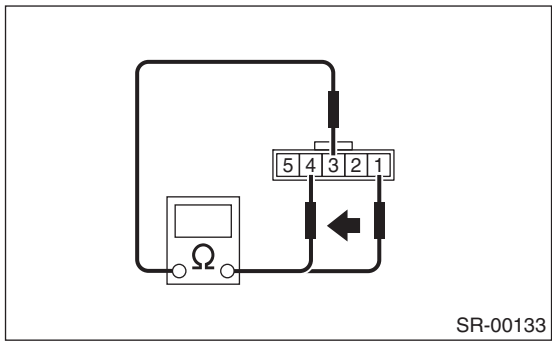


B: INSTALLATION

Install each part in the reverse order of removal.

C: INSPECTION

1) Check the resistance between sunroof switch terminals.



Switch position	Terminal No.	Standard
Open	1 and 3	Less than 1 Ω
Close	3 and 4	Less than 1 Ω

2) Replace the sunroof switch if the inspection result is not within the standard value.

EXTERIOR/INTERIOR TRIM

EI

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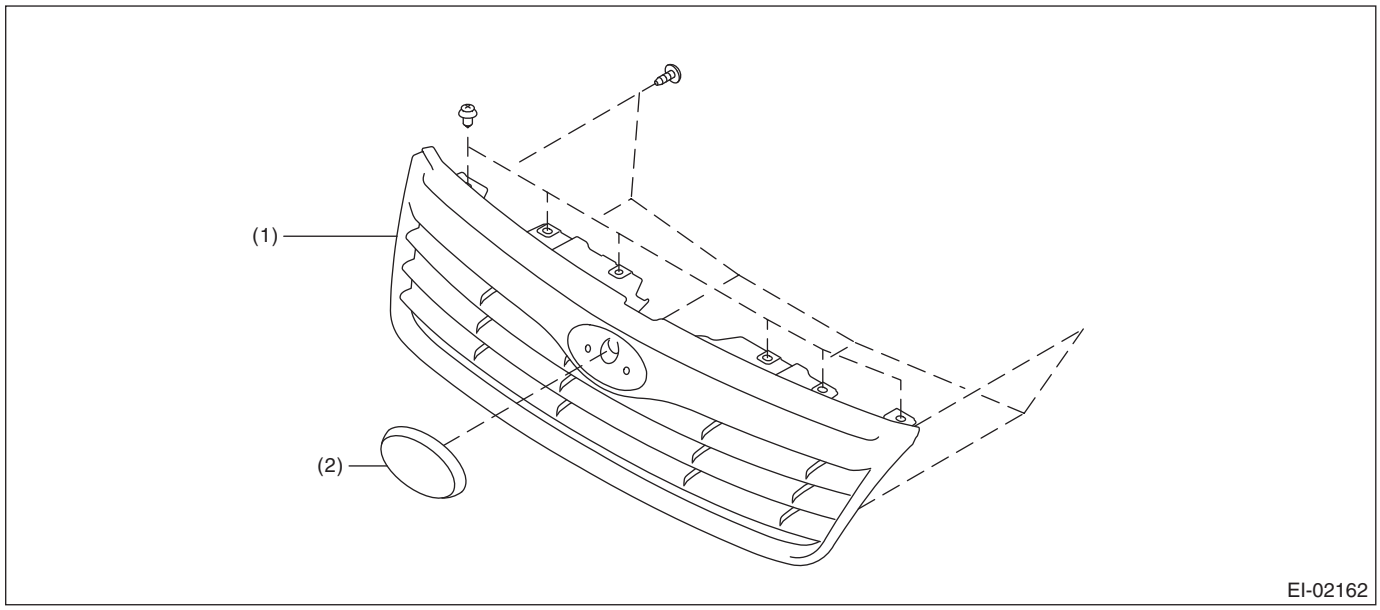
1. General Description

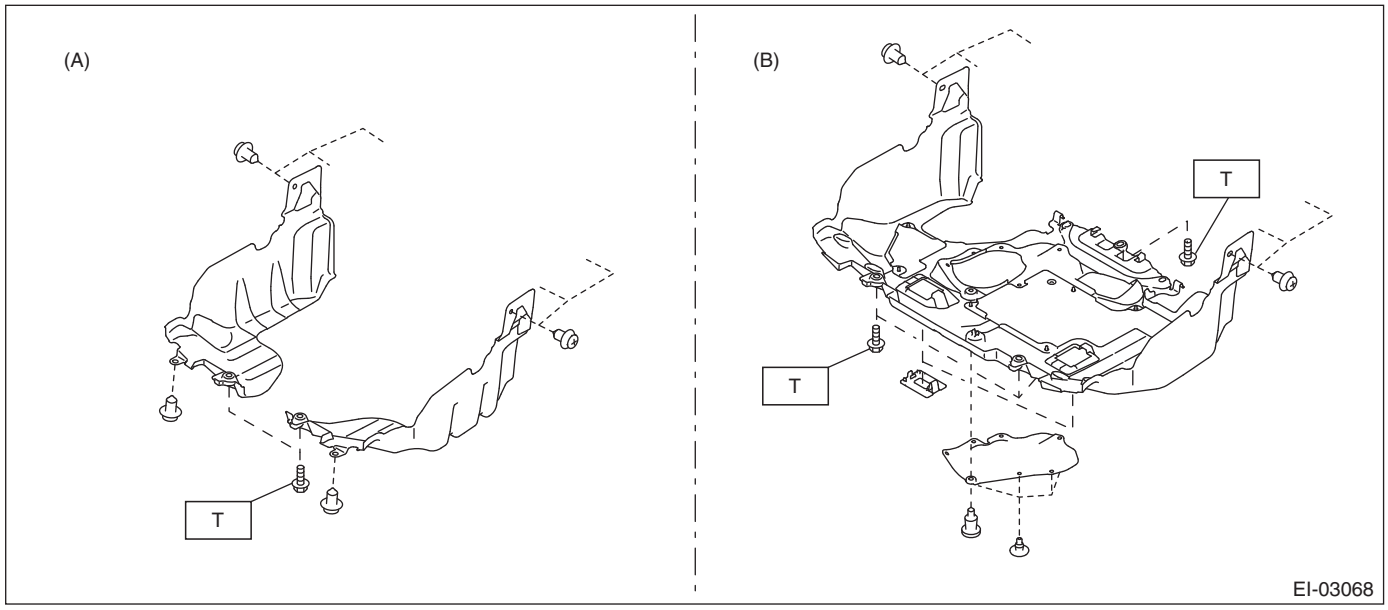
A: COMPONENT

1. FRONT GRILLE



(1) Front grille ASSY
(2) Front grille emblem

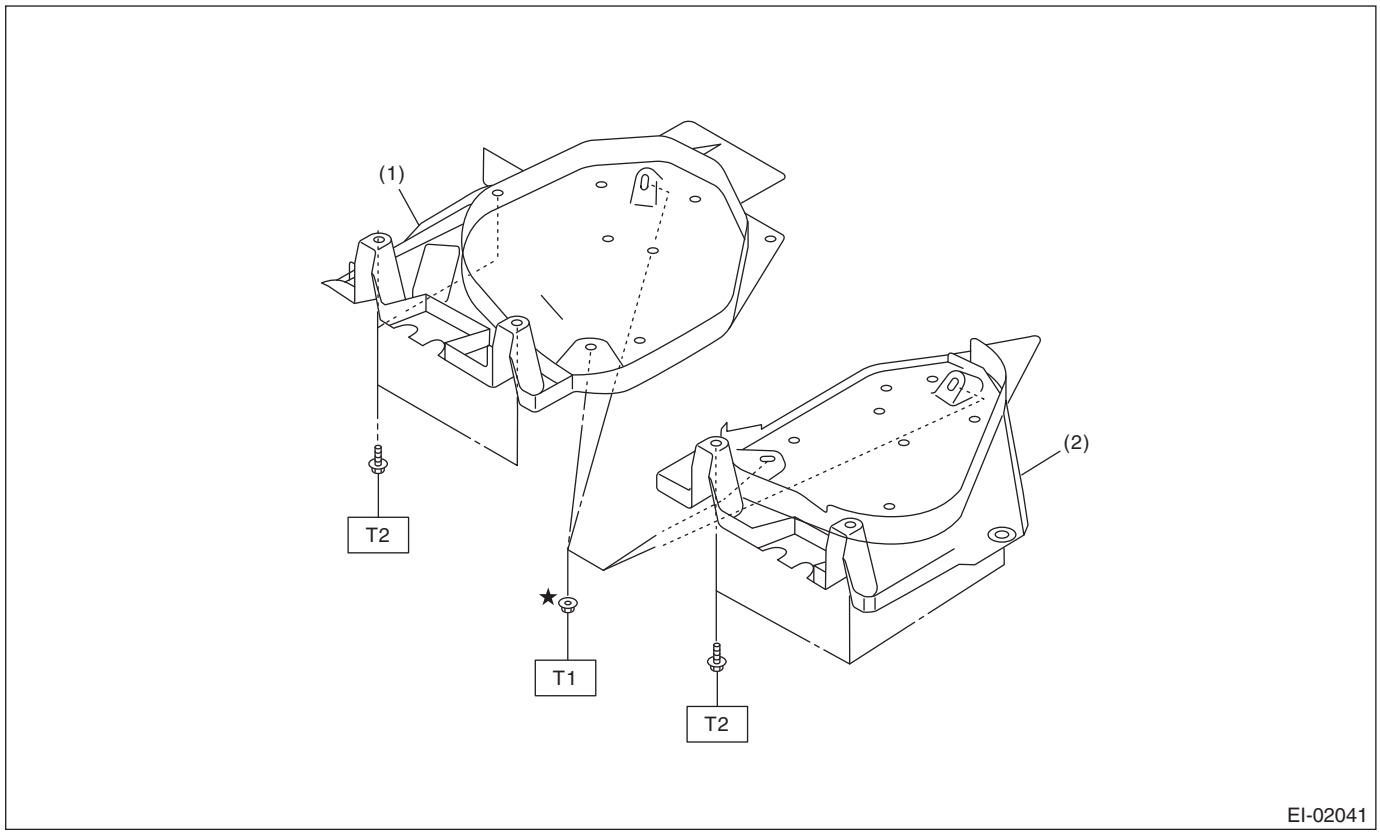
2. UNDER COVER



(A) Small type
(B) Large type

Tightening torque:N·m (kgf-m, ft-lb)
T: 18 (1.84, 13.3)

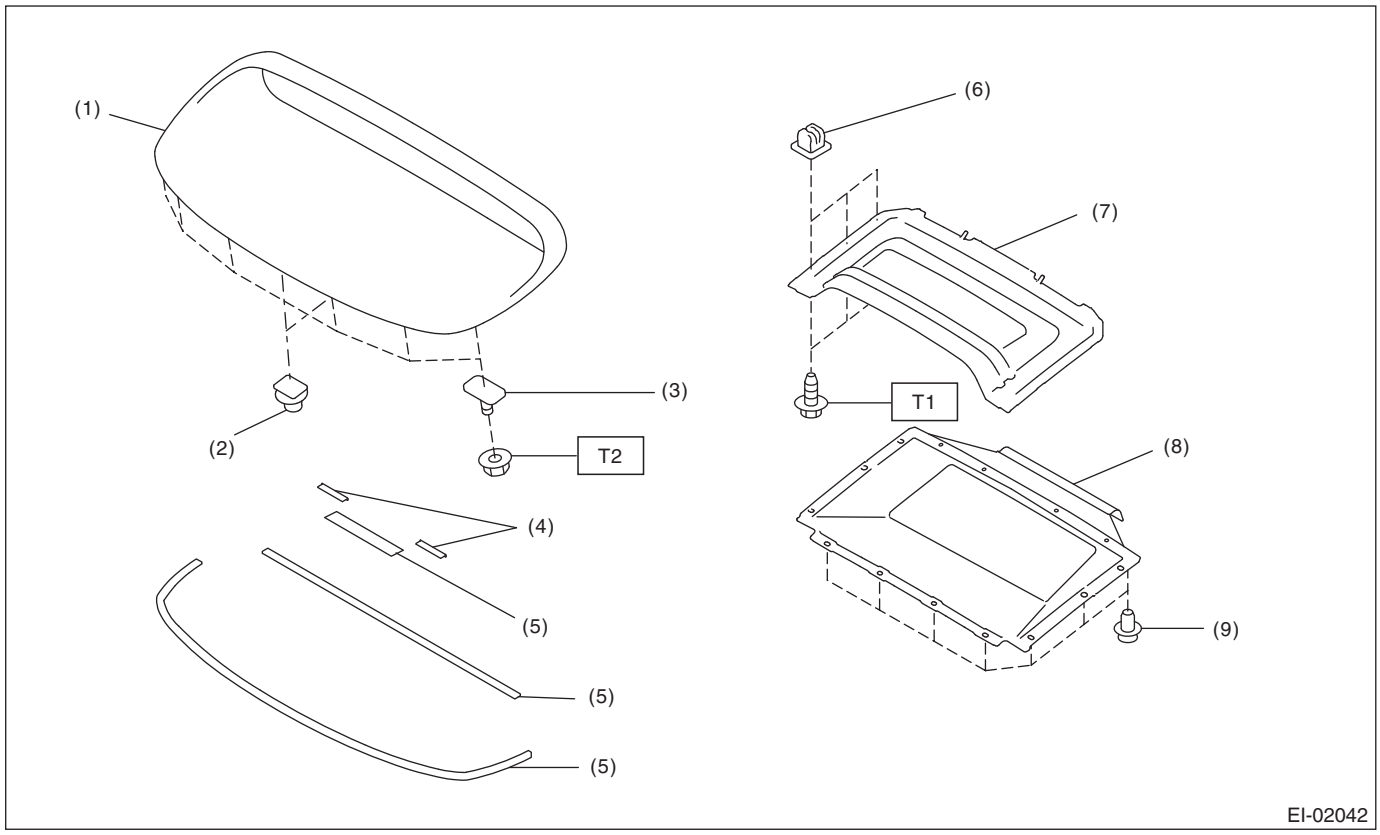
3. UNDER PROTECTOR



(1) Fuel tank protector RH
(2) Fuel tank protector LH

Tightening torque:N·m (kgf-m, ft-lb)
T1: 9 (0.92, 6.5)
T2: 18 (1.84, 13.3)

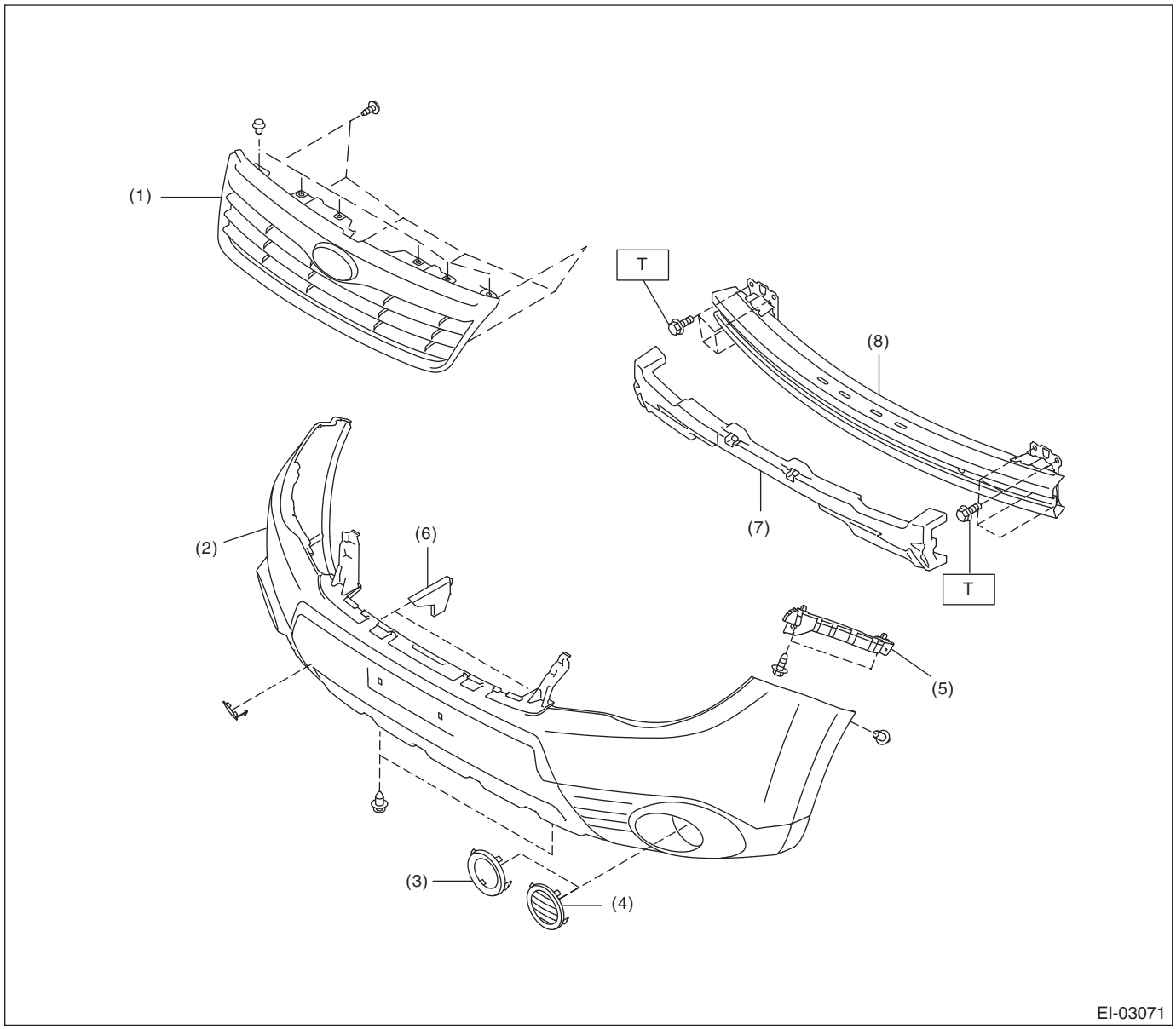
4. FRONT HOOD GRILLE



(1) Front hood grille
(2) Clip anchor
(3) Bolt
(4) Protector
(5) Gasket
(6) Grommet
(7) Hood duct
(8) Hood duct inner
(9) Clip

Tightening torque:N·m (kgf-m, ft-lb)
T1: 1.0 (0.10, 0.74)
T2: 4.5 (0.46, 3.3)

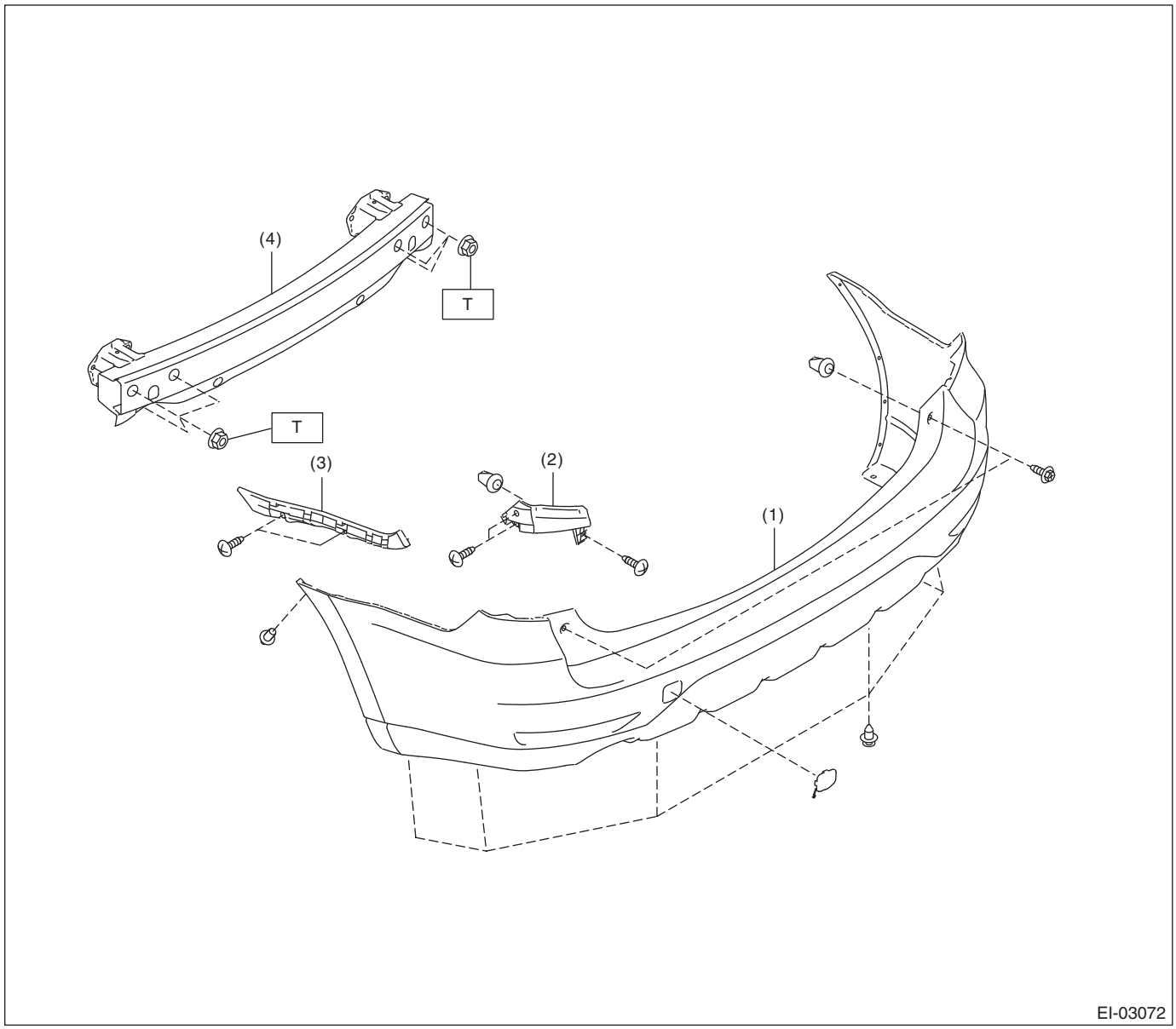
5. FRONT BUMPER



(1) Front grille ASSY
(2) Bumper face
(3) Fog light cover
(4) Front cover (models without fog lights)
(5) Front side bracket
(6) Radiator gasket
(7) Energy absorber foam
(8) Bumper beam reinforcement

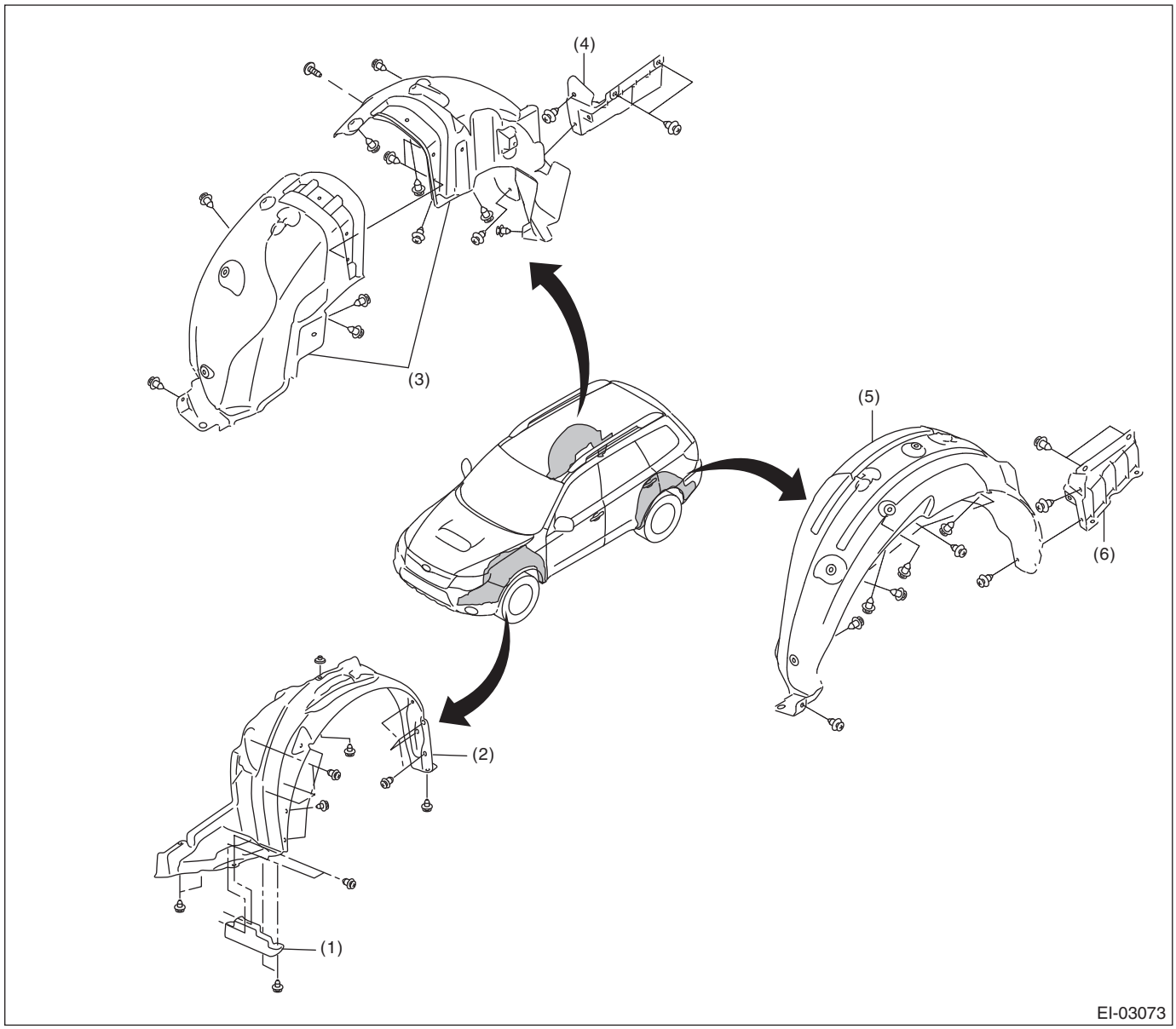
Tightening torque:N·m (kgf-m, ft-lb)
T: 32 (3.26, 23.6)

6. REAR BUMPER



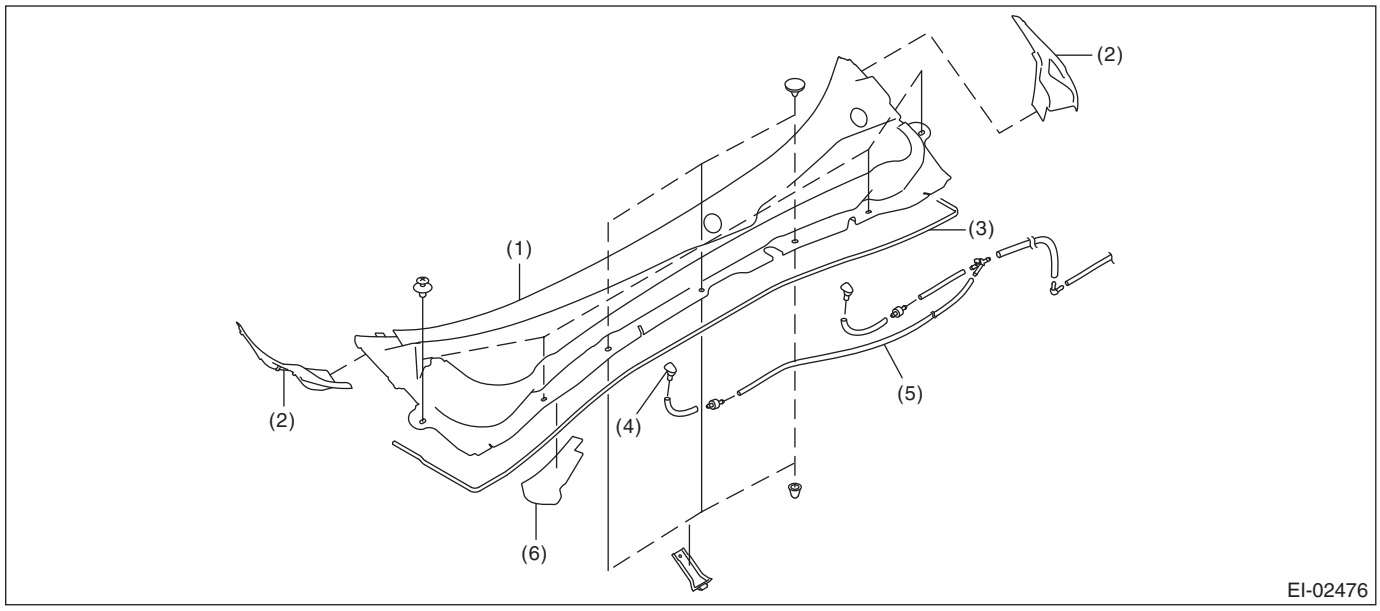
(1)	Bumper face	(3)	Rear bracket side	***Tightening torque:N·m (kgf-m, ft-lb)***
(2)	Rear bracket corner	(4)	Bumper beam reinforcement	***T: 45 (4.59, 33.2)***

7. MUD GUARD



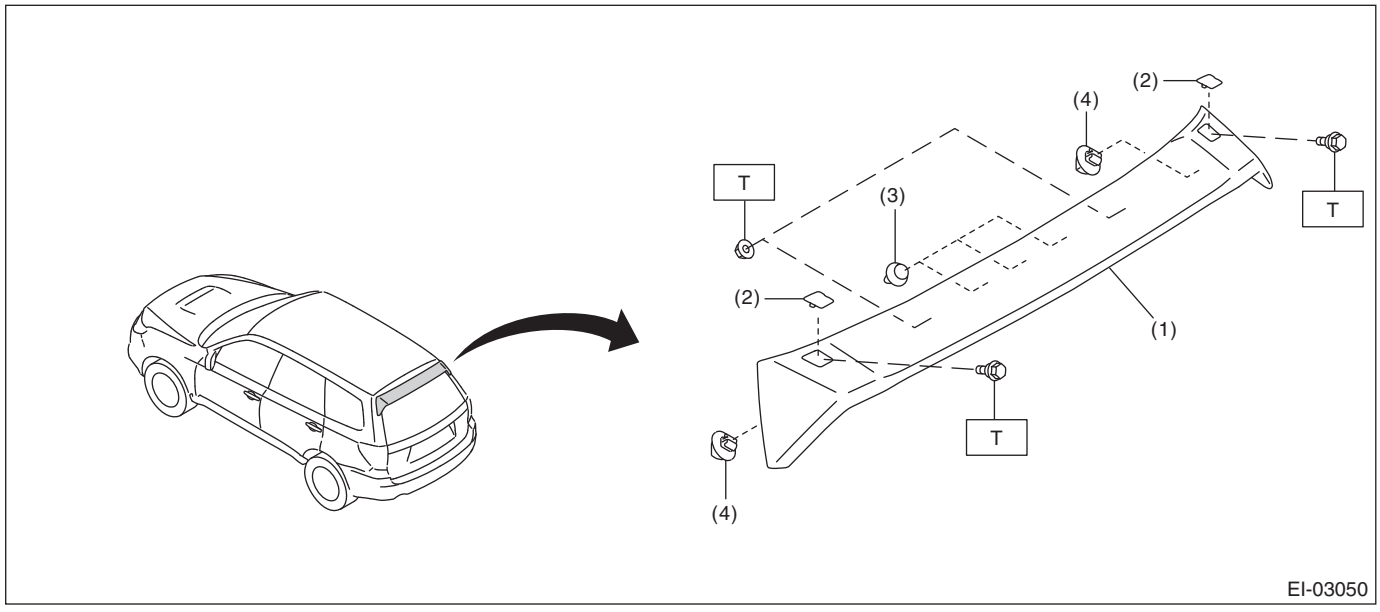
(1) Air flap
(2) Front mud guard
(3) Rear mud guard RH
(4) Mud guard rear RH
(5) Rear mud guard LH
(6) Mud guard rear LH

8. COWL PANEL



(1) Cowl panel
(2) Cowl panel side
(3) Gasket
(4) Washer nozzle
(5) Hose
(6) Insulator

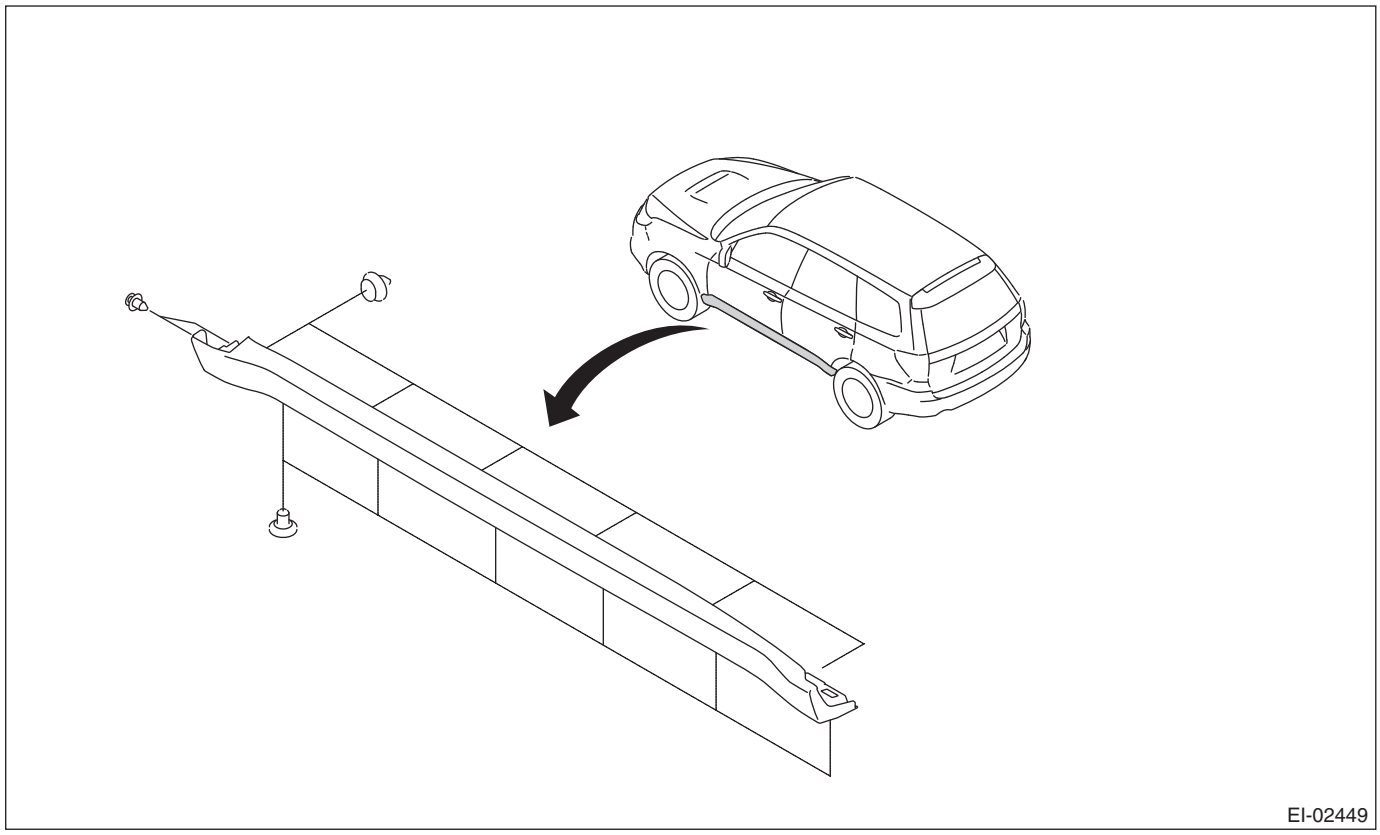
9. ROOF SPOILER



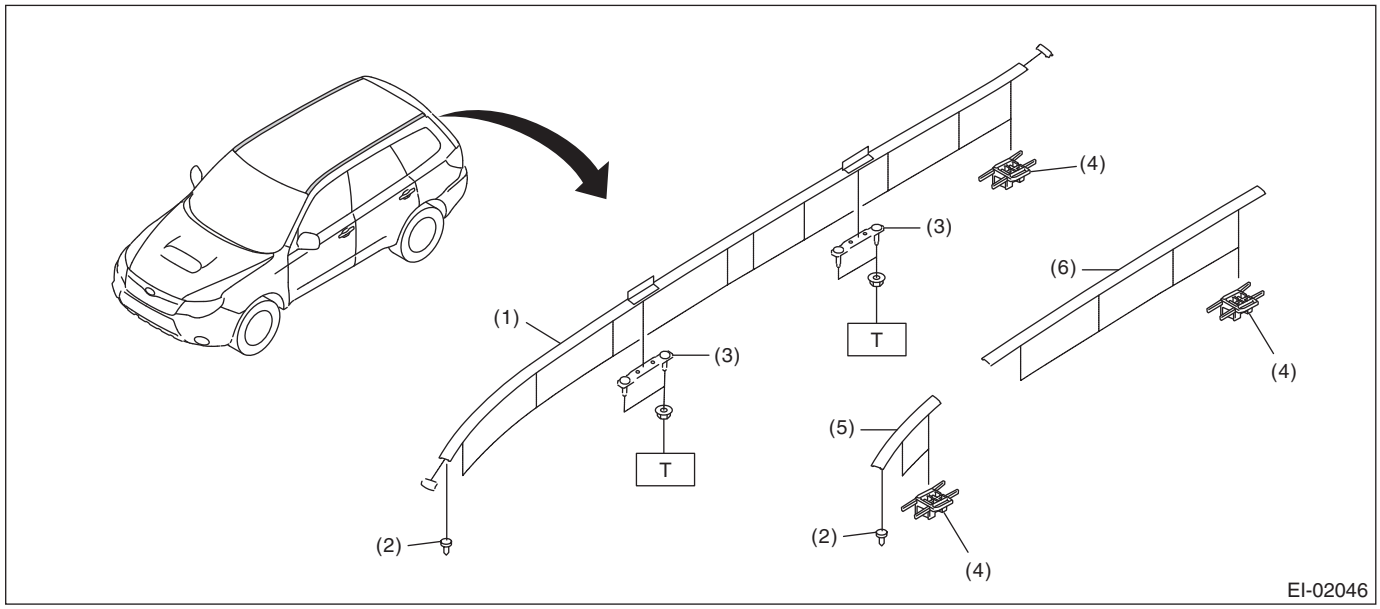
(1) Roof spoiler
(2) Cap
(3) Clip A
(4) Clip B

Tightening torque:N·m (kgf-m, ft-lb)
T: 7.5 (0.76, 5.5)

10.SIDE SILL SPOILER



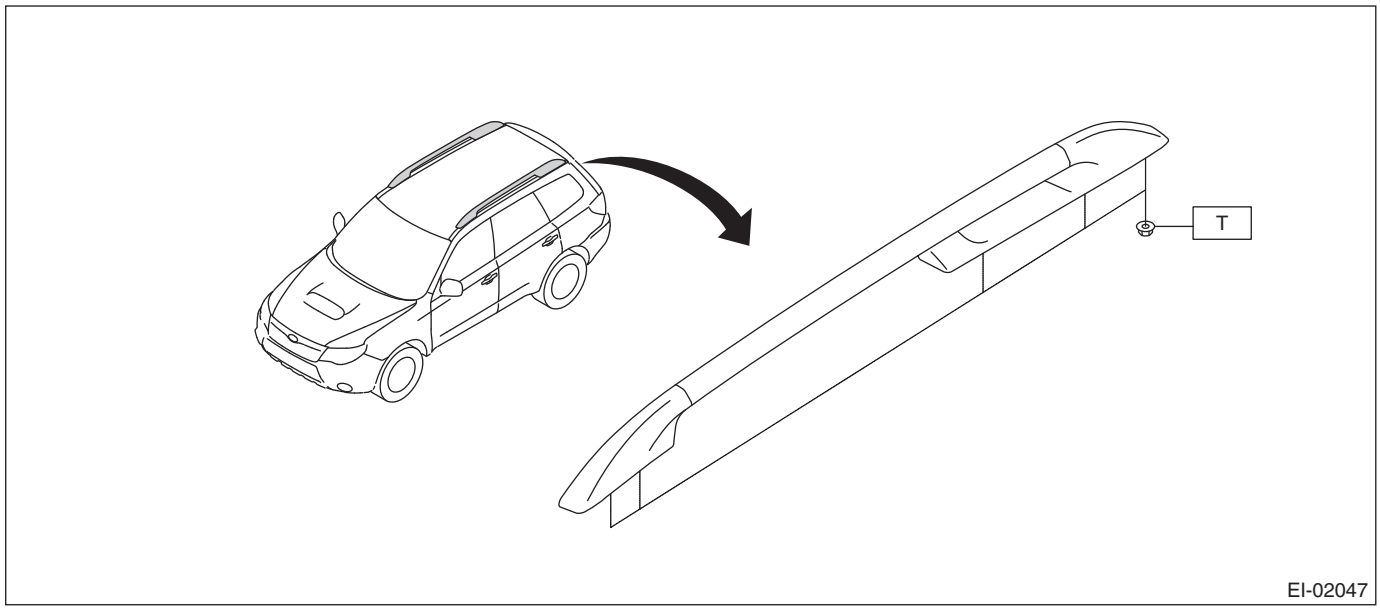
11.ROOF MOLDING



(1)	Roof molding	(4)	Clip
(2)	Rivet	(5)	Roof molding, front (Models with roof molding)
(3)	Roof carrier attachment bracket	(6)	Roof molding, rear (Models with roof molding)

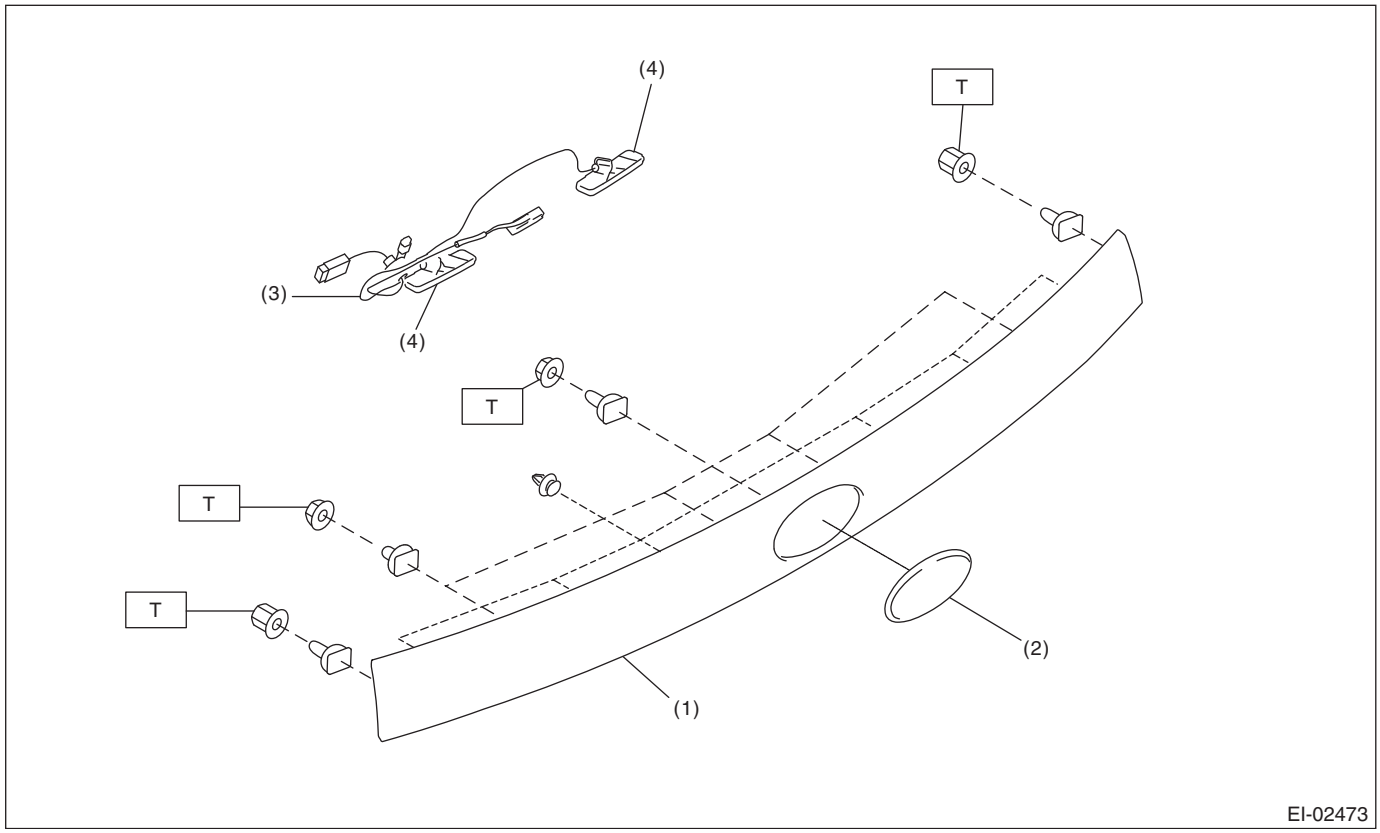
Tightening torque:N·m (kgf-m, ft-lb)
T: 7.5 (0.76, 5.5)

12.ROOF RAIL



Tightening torque:N·m (kgf-m, ft-lb)
T: 7.5 (0.76, 5.5)

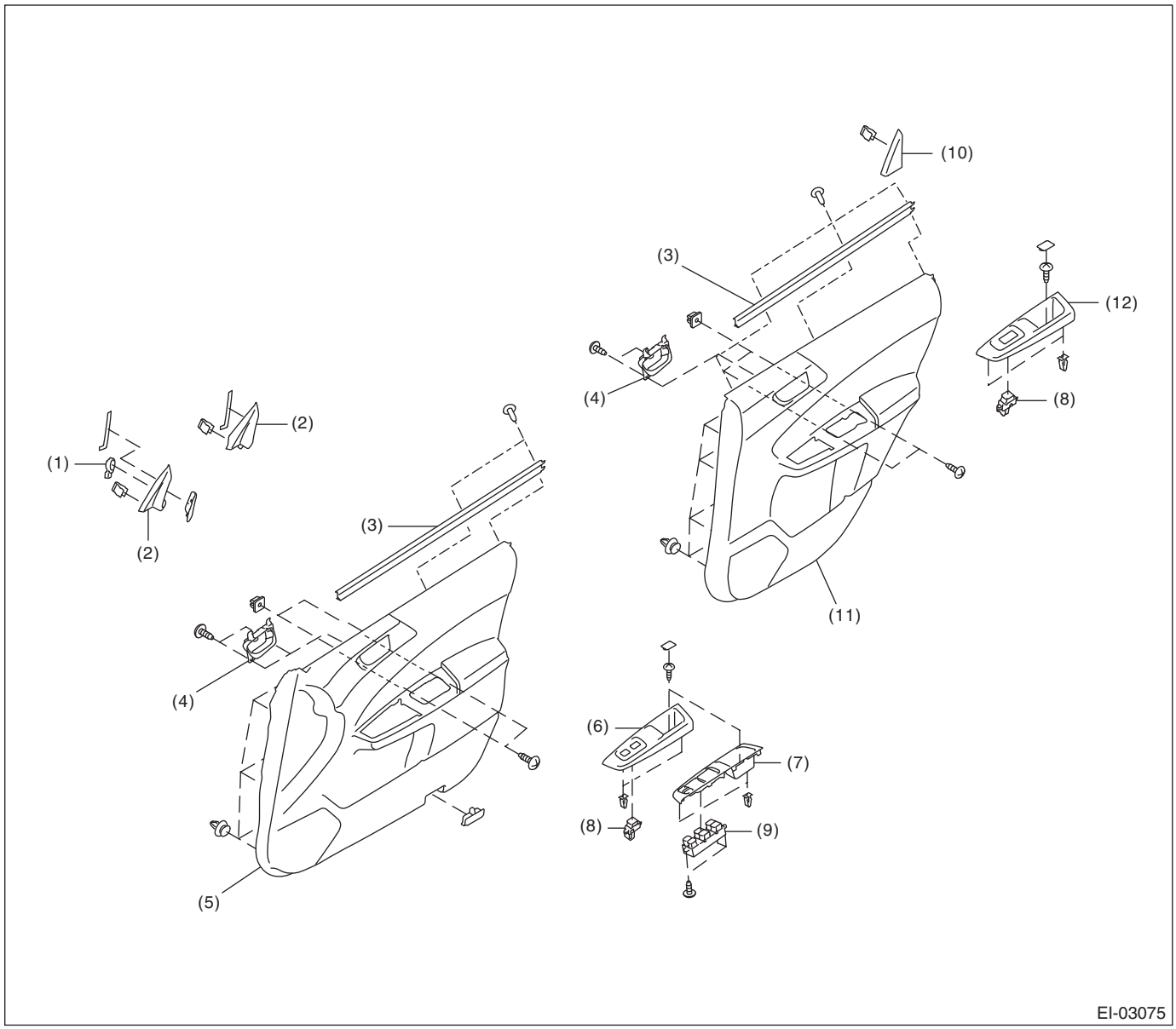
13.REAR GATE GARNISH



(1) Rear gate garnish
(2) Ornament
(3) License plate light ASSY harness
(4) License plate light

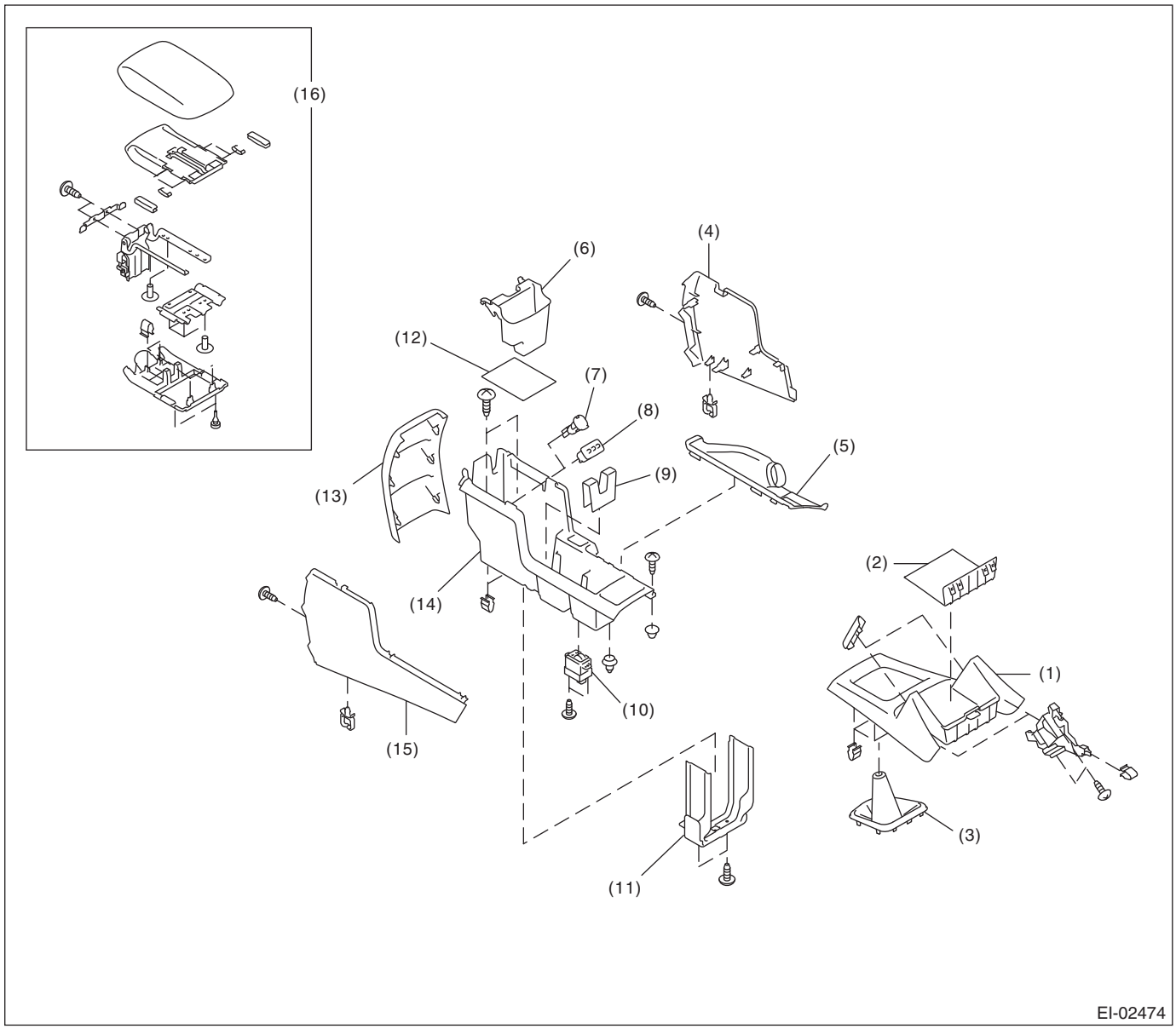
Tightening torque:N·m (kgf-m, ft-lb)
T: 4.5 (0.46, 3.3)

14.DOOR TRIM



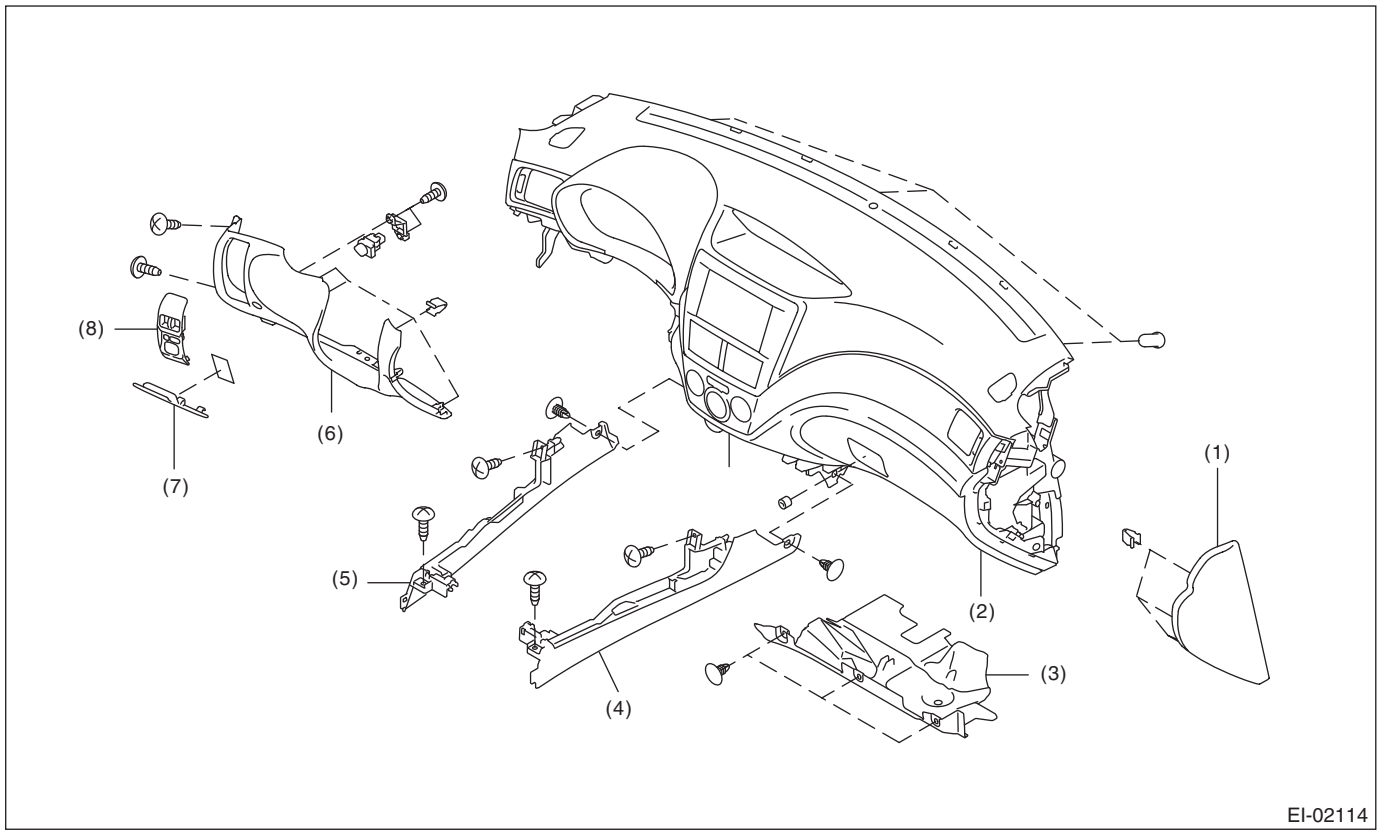
(1)	Tweeter	(5)	Front door trim	(9)	Power window main switch ASSY
(2)	Gusset cover front	(6)	Power window switch panel front RH	(10)	Gusset cover rear
(3)	Upper weather strip inner	(7)	Power window switch panel front LH	(11)	Rear door trim
(4)	Inner remote	(8)	Power window sub-switch	(12)	Power window switch panel rear

15.CONSOLE BOX

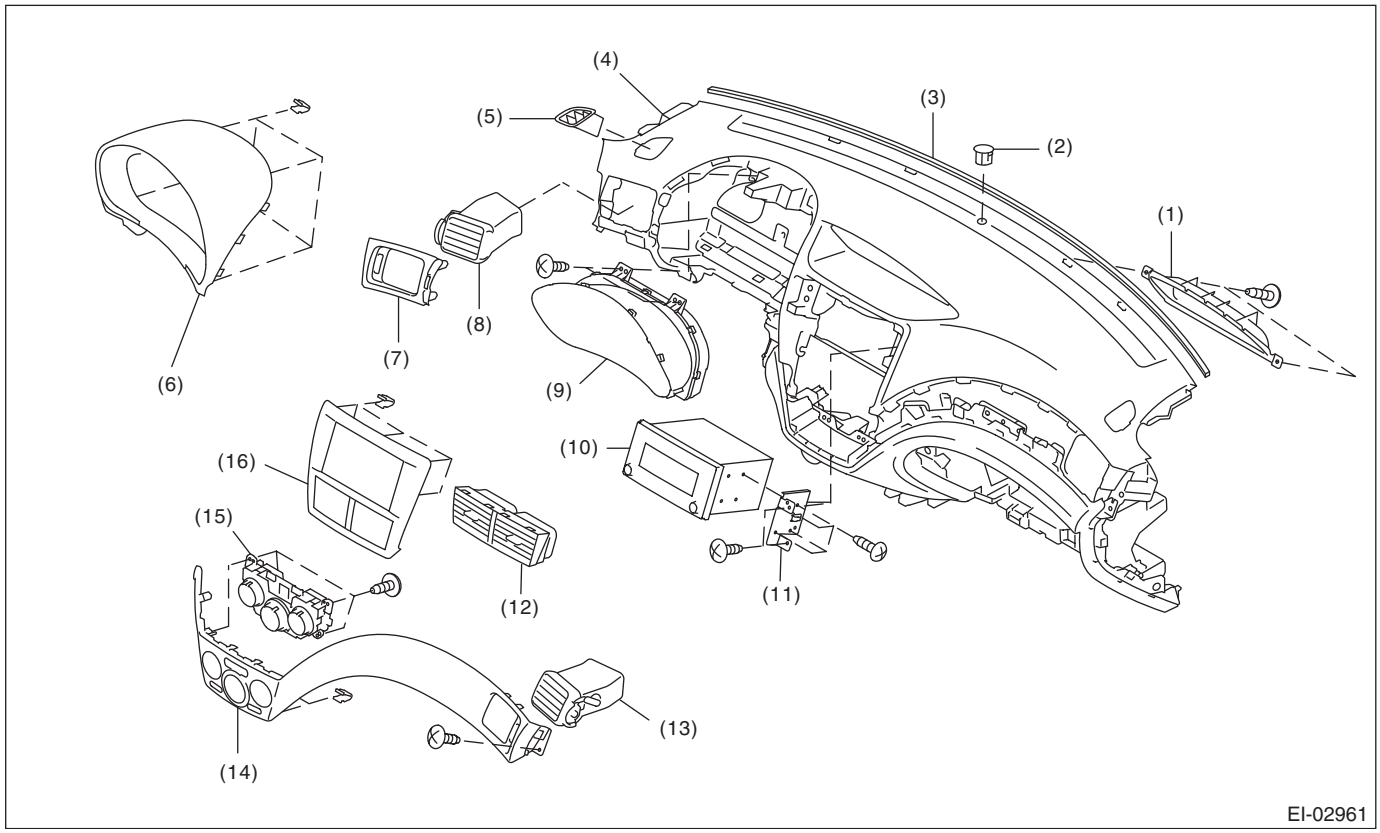


(1) Console front panel
(2) Console front mat
(3) Shift boot (MT model)
(4) Console box side cover LH
(5) Parking brake lever boot
(6) Console pocket
(7) Accessory power supply socket
(8) AUX input terminal
(9) Cup holder partition
(10) Seat heater switch
(11) Console box reinforcement
(12) Console mat
(13) Console box, rear
(14) Console cover
(15) Console box side cover RH
(16) Console lid ASSY

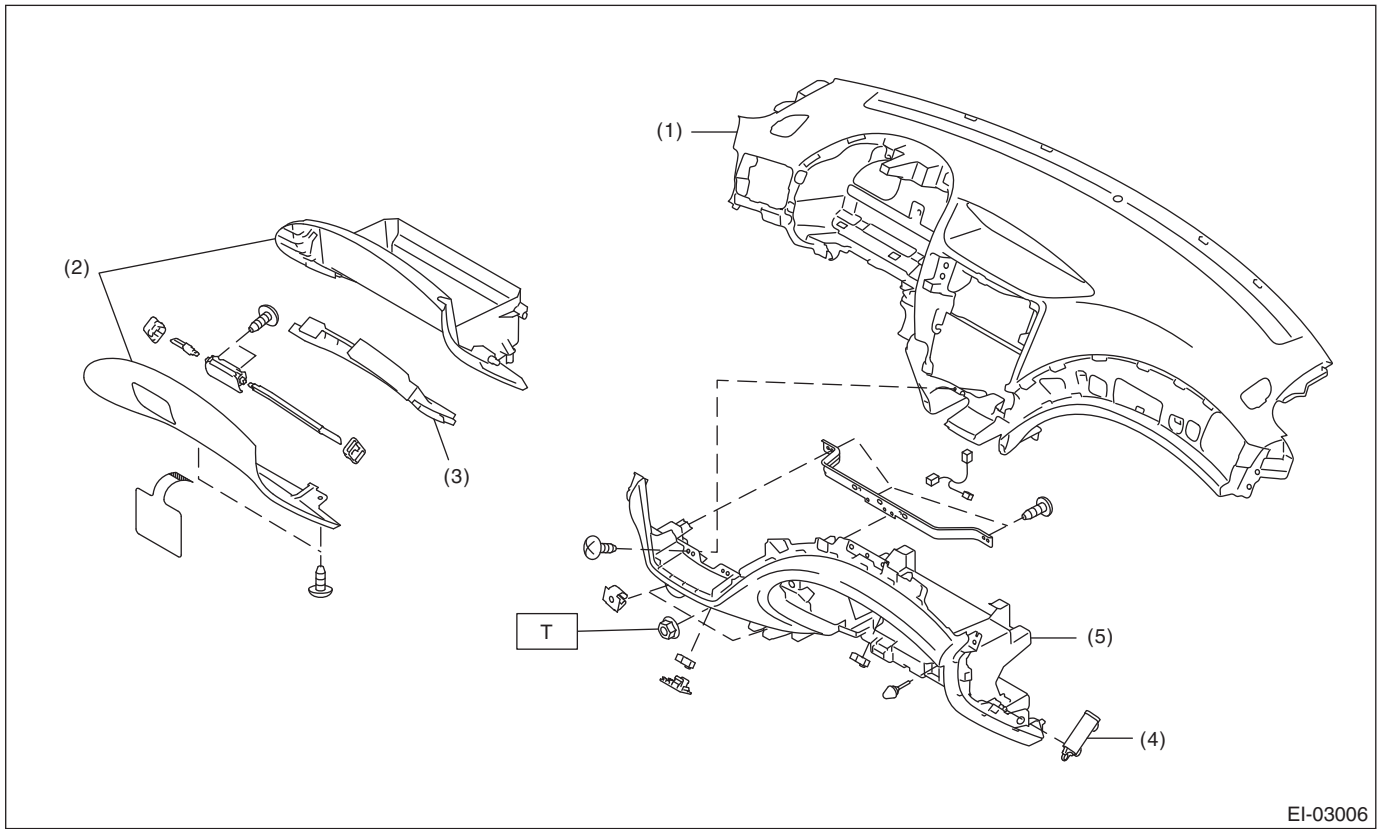
16.INSTRUMENT PANEL



(1) Instrument panel side cover
(2) Instrument panel ASSY
(3) Glove box lower cover
(4) Console side panel RH
(5) Console side panel LH
(6) Instrument panel lower cover
(7) Fuse box lid
(8) Switch panel ASSY



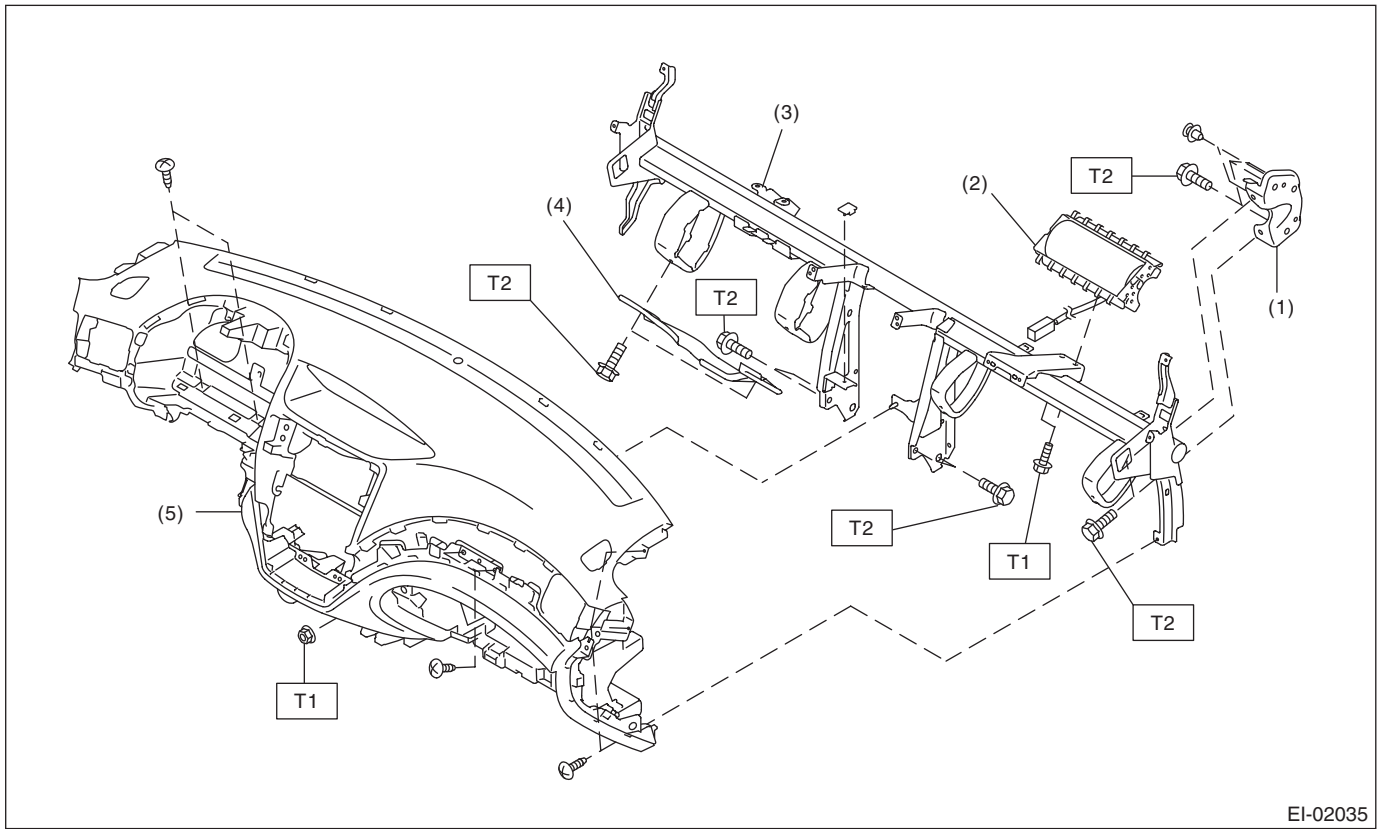
(1) Clock panel
(2) Sunload sensor
(3) Cushion
(4) Instrument panel ASSY
(5) Defroster side grille
(6) Meter visor ASSY
(7) Ornament panel LH
(8) Air vent side grille LH
(9) Combination meter ASSY
(10) Audio
(11) Audio bracket
(12) Air vent side grille CTR
(13) Air vent grille RH
(14) Ornament panel RH
(15) Control module
(16) Center panel



(1) Instrument panel pad and frame ASSY
(2) Glove box lid ASSY
(3) Glove box pad
(4) Glove box damper
(5) Instrument panel lower

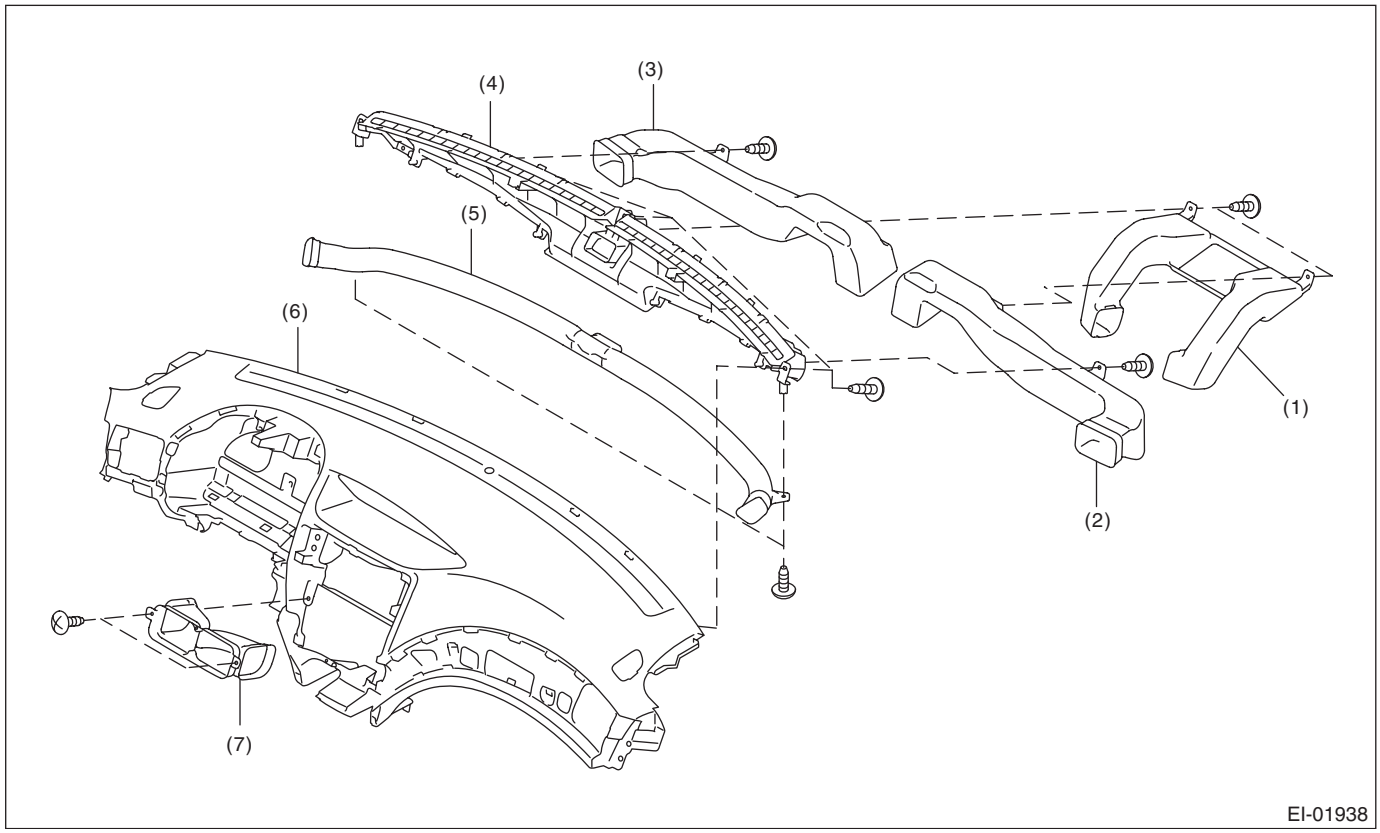
Tightening torque:N·m (kgf-m, ft-lb)

T: 7.5 (0.76, 5.5)



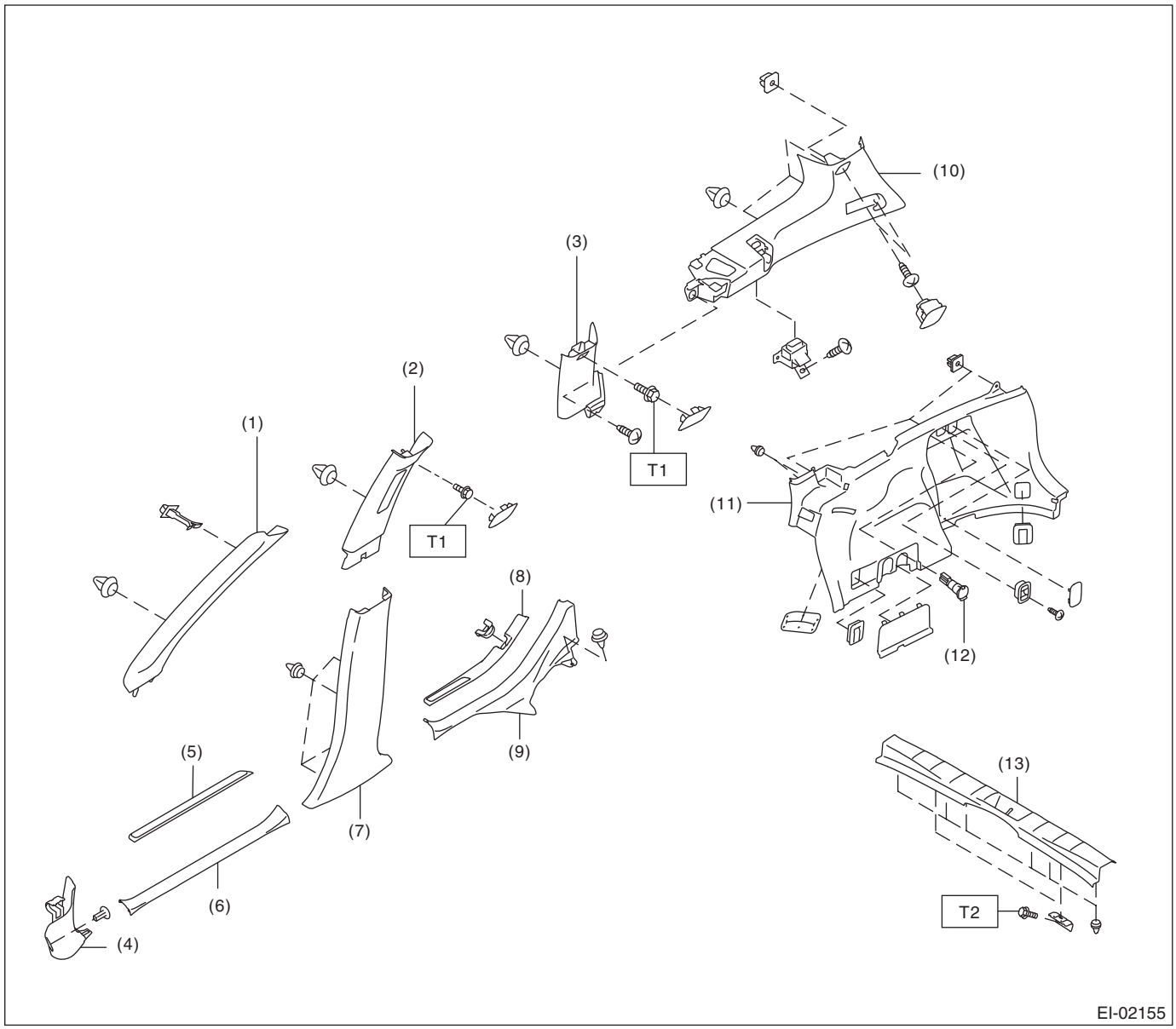
(1) Steering support beam bracket
(2) Passenger's airbag module ASSY
(3) Steering support beam ASSY
(4) Knee guard panel
(5) Instrument panel ASSY

Tightening torque:N·m (kgf-m, ft-lb)
T1: 7.5 (0.76, 5.5)
T2: 25 (2.55, 18.4)



(1) Center vent duct
(2) Side vent duct RH
(3) Side vent duct LH
(4) Defroster nozzle ASSY
(5) Side defroster
(6) Instrument panel pad and frame ASSY
(7) Center vent duct front

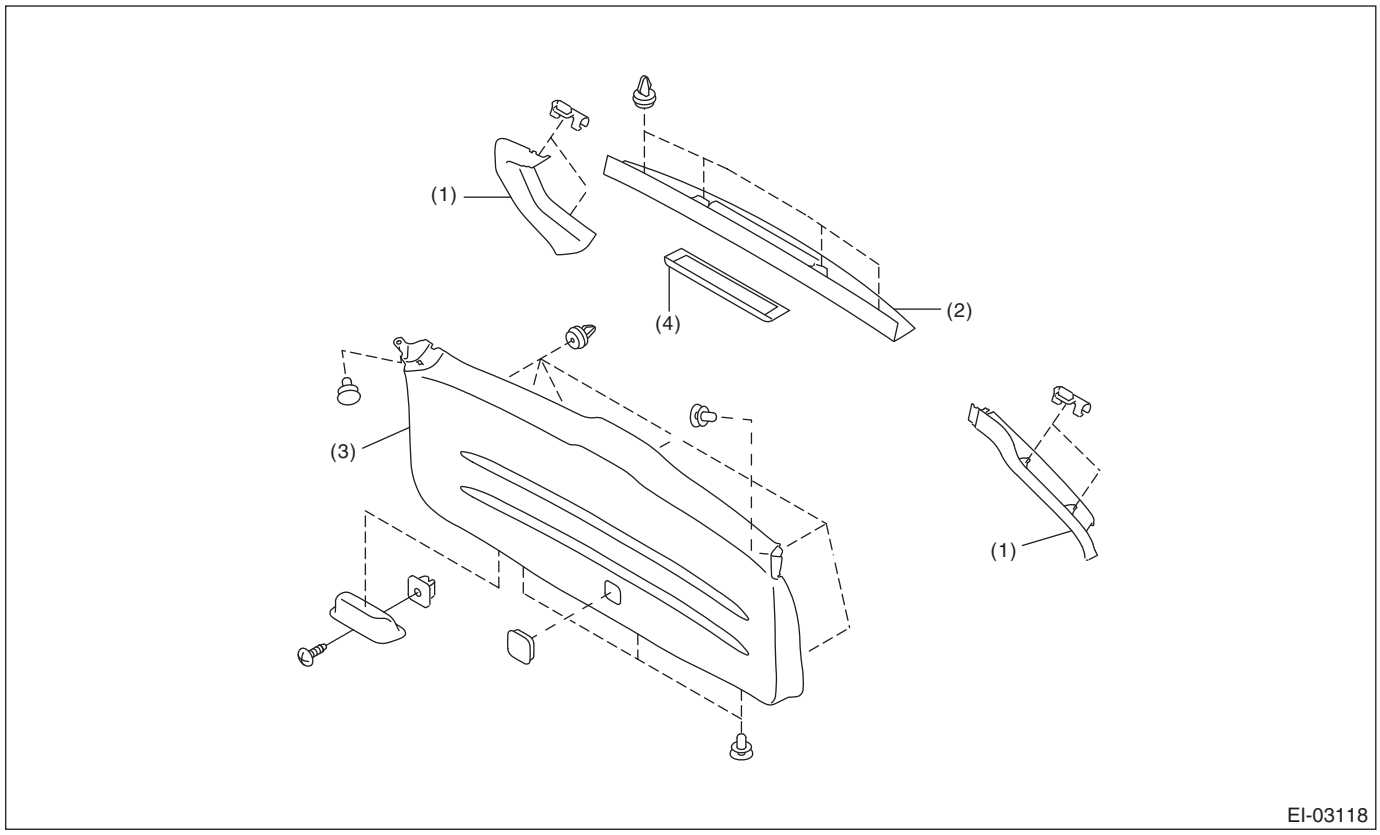
17.INNER TRIM



(1) Front pillar upper trim
(2) Center pillar upper trim
(3) Rear quarter pillar front trim
(4) Front pillar lower trim
(5) Front outside scuff plate
(6) Front inside scuff plate
(7) Center pillar lower trim
(8) Rear outside scuff plate
(9) Rear inside scuff plate
(10) Rear quarter upper trim
(11) Rear quarter lower trim
(12) Accessory power supply socket
(13) Luggage room end cover

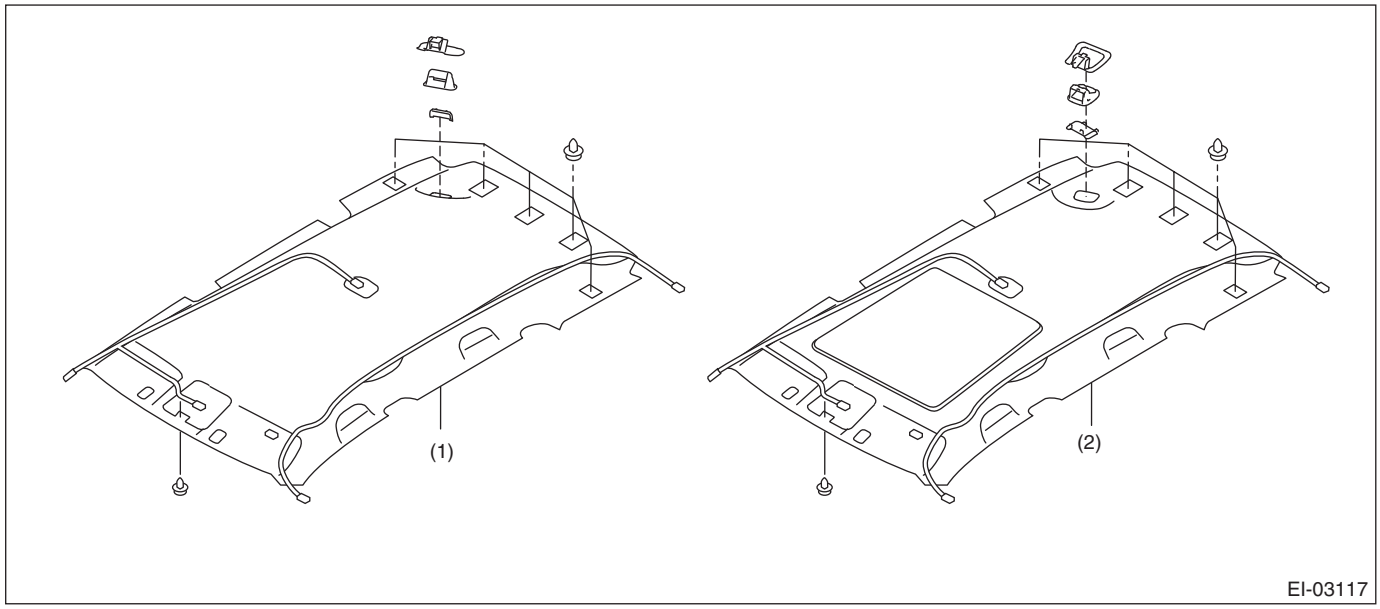
Tightening torque:N·m (kgf-m, ft-lb)
T1: 7.5 (0.76, 5.5)
T2: 25 (2.55, 18.4)

18.REAR GATE TRIM



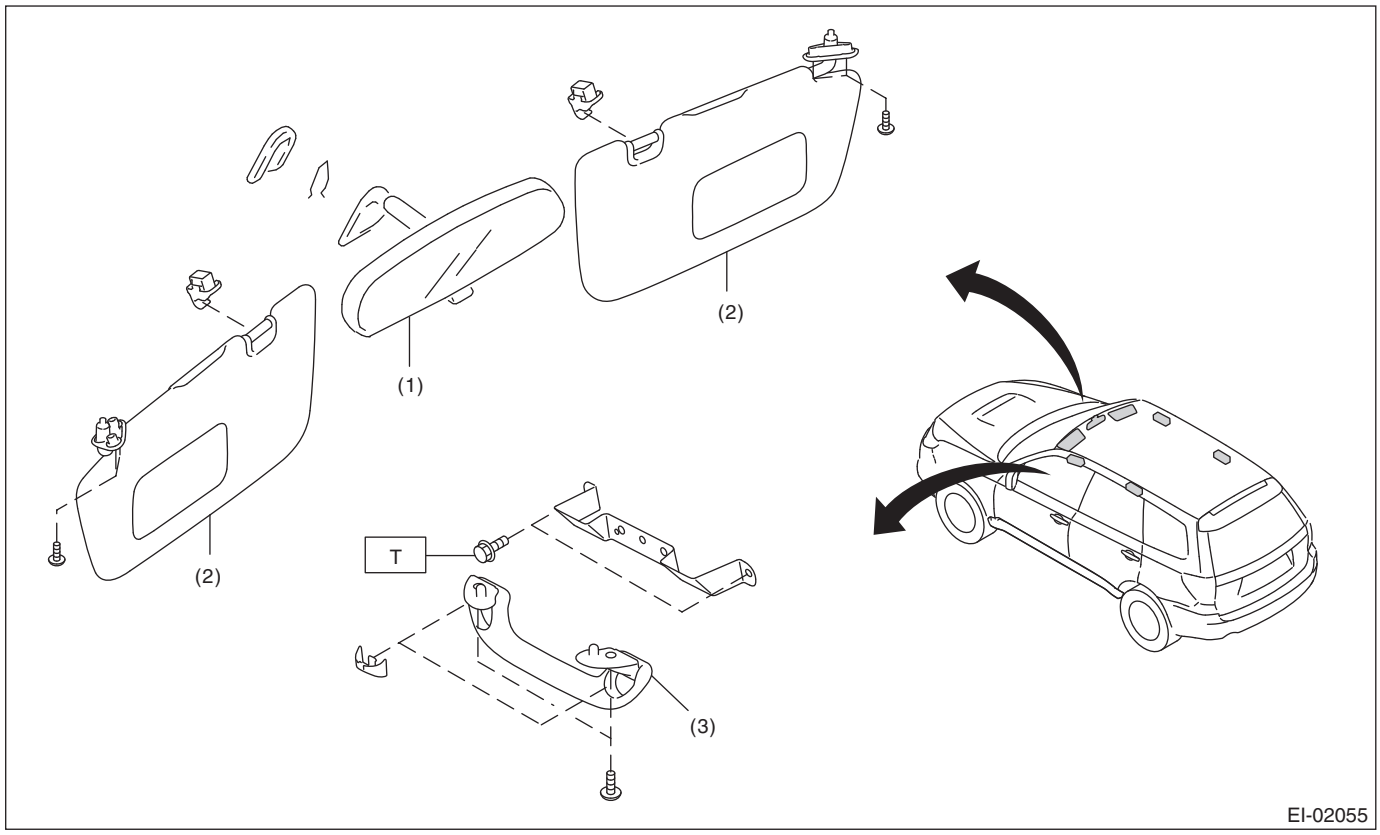
(1) Rear gate pillar trim
(2) Rear gate upper trim
(3) Rear gate lower trim
(4) High-mounted stop light

19.ROOF TRIM



(1) Models without sunroof
(2) Models with sunroof

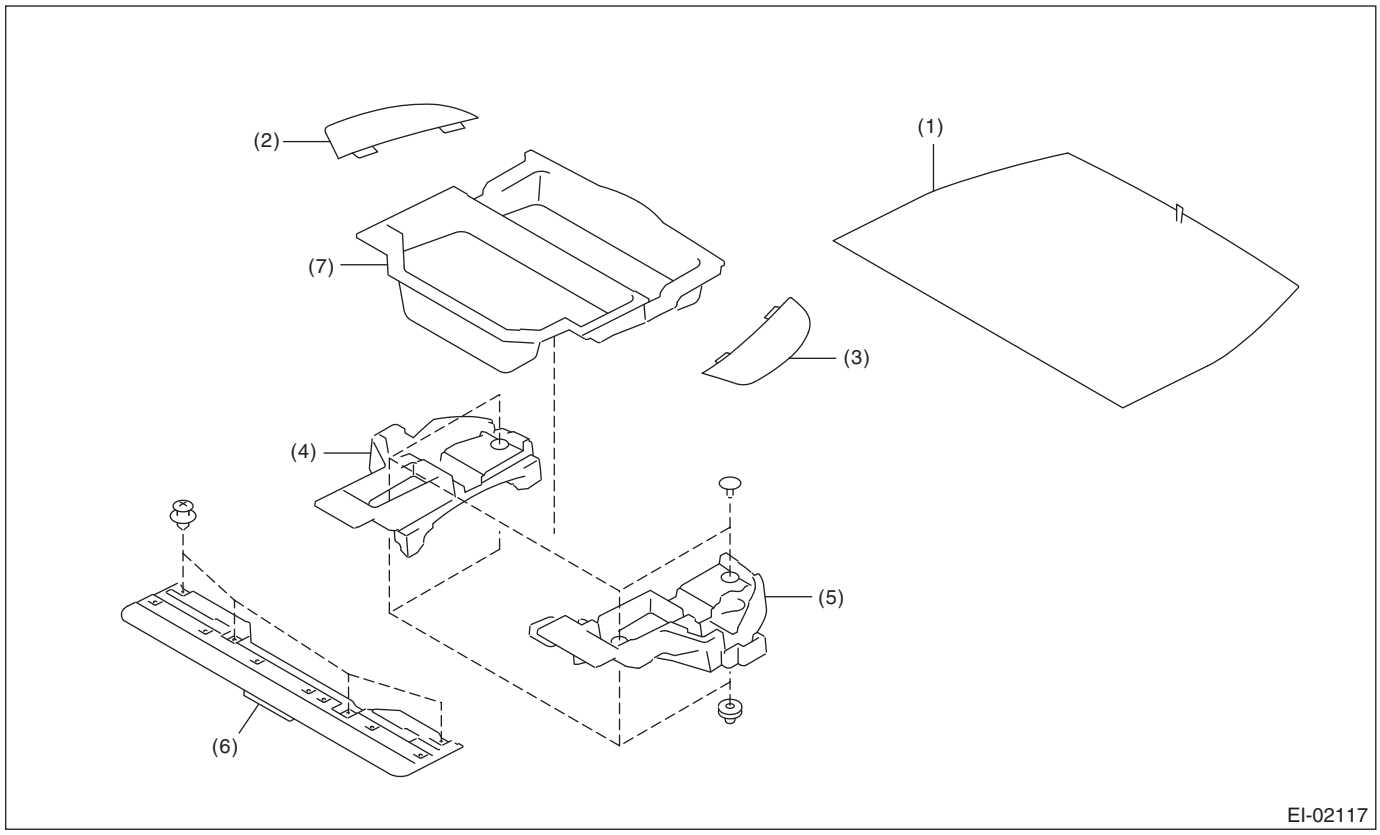
20.ROOM INNER PARTS



(1) Room mirror
(2) Sun visor
(3) Assist grip

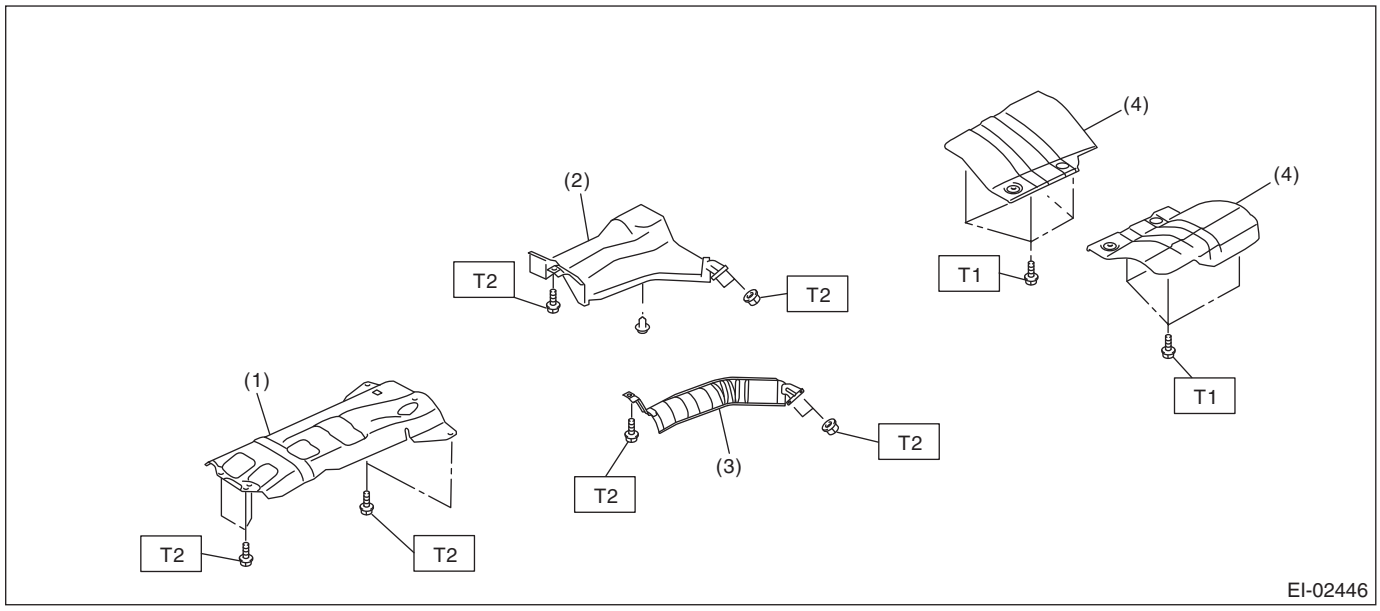
Tightening torque:N·m (kgf-m, ft-lb)
T: 7.5 (0.76, 5.5)

21.LUGGAGE ROOM PARTS



(1) Luggage floor mat CTR
(2) Luggage floor mat RH
(3) Luggage floor mat LH
(4) Rear floor spacer side RH
(5) Rear floor spacer side LH
(6) Rear floor spacer front
(7) Trunk cover

22.HEAT SHIELD COVER



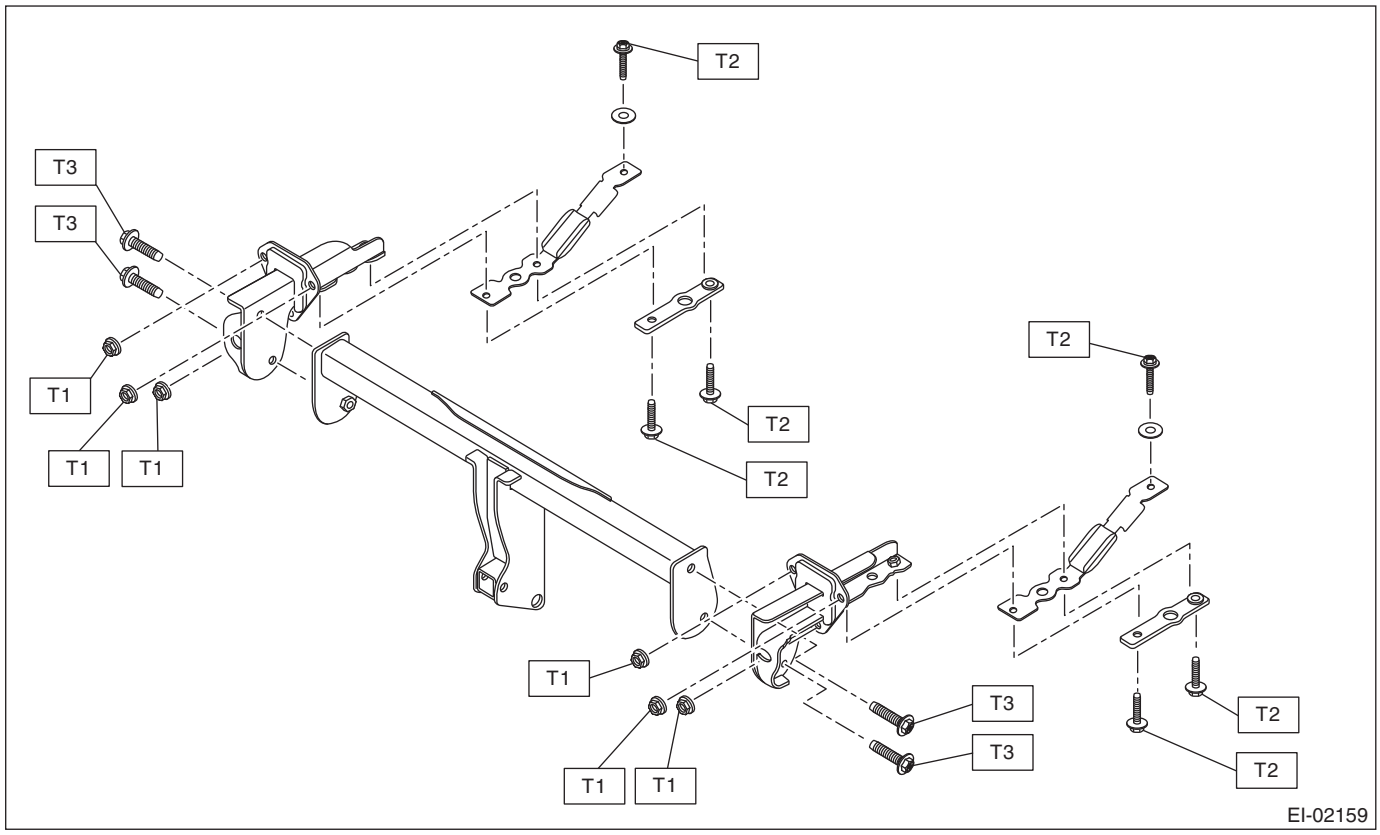
(1)	Front heat shield cover	(3)	Center heat shield cover (non-turbo model)
(2)	Center heat shield cover (turbo model)	(4)	Rear heat shield cover

Tightening torque:N·m (kgf-m, ft-lb)

T1: 7.5 (0.76, 5.5)

T2: 18 (1.84, 13.3)

23.TRAILER HITCH



Tightening torque:N·m (kgf-m, ft-lb)
T1: 75 (7.65, 55.3)
T2: 90 (9.18, 66.4)
T3: 180 (18.35, 132.8)

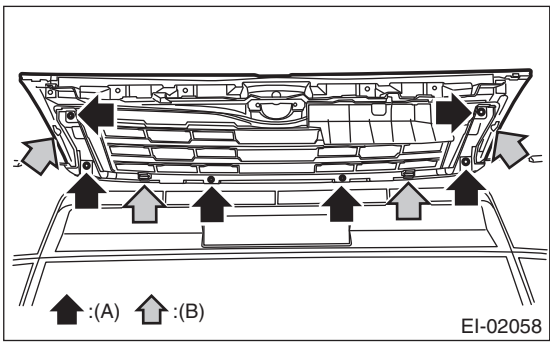
B: PREPARATION TOOL

TOOL NAME	REMARKS
Clip remover	Used for removing trim. • KTC AP201-10A • KTC AP201-N • KTC AP203-10A • KTC AP20L-10B Or equivalent.
Clip clamp pliers	Used for removal of various clips and clamps. • KTC CCP-190 Or equivalent.

2. Front Grille

A: REMOVAL

1) Remove the front bumper face. <Ref. to EI-29, FRONT BUMPER FACE, REMOVAL, Front Bumper.>
2) Remove the screws (A) from the backside of the bumper face.
3) Detach the tabs (B) and remove the front grille assembly.



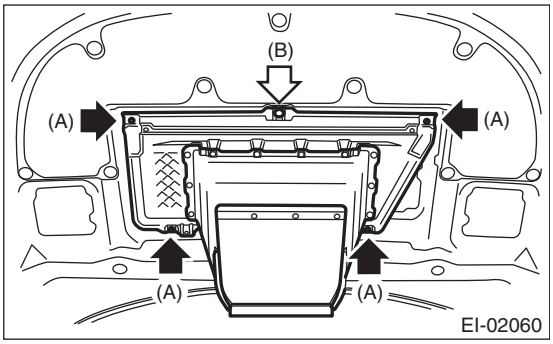
B: INSTALLATION

Install each part in the reverse order of removal.

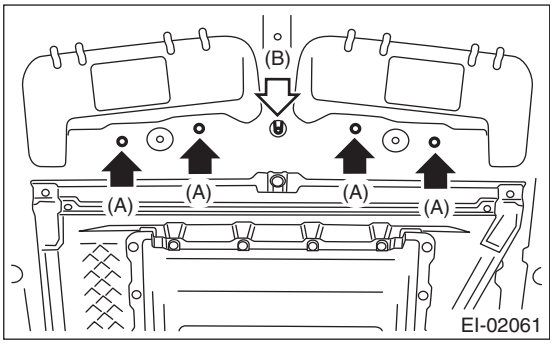
3. Front Hood Grille

A: REMOVAL

1) Open the front hood.
2) Remove screws (A) and clips (B), and remove the hood duct assembly.



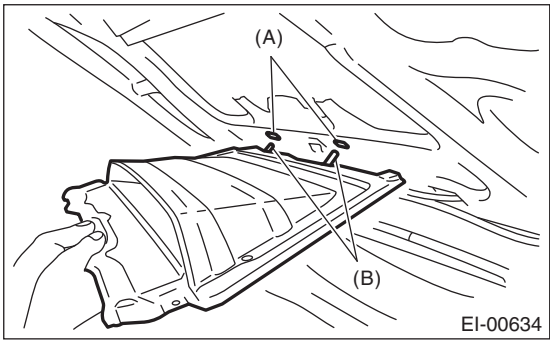
3) Remove the nuts (A) and clips (B), and remove the front hood grille.



B: INSTALLATION

Install each part in the reverse order of removal.

NOTE:
Insert the hooks (B) of the front hood duct into holes (A) of the front hood.

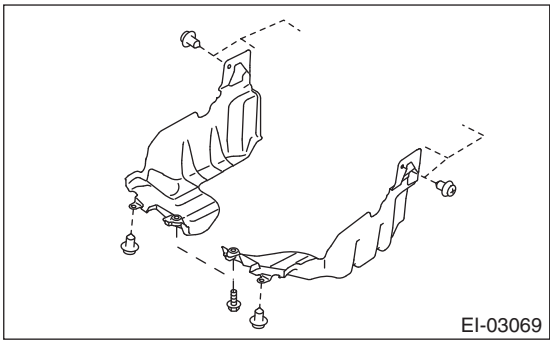


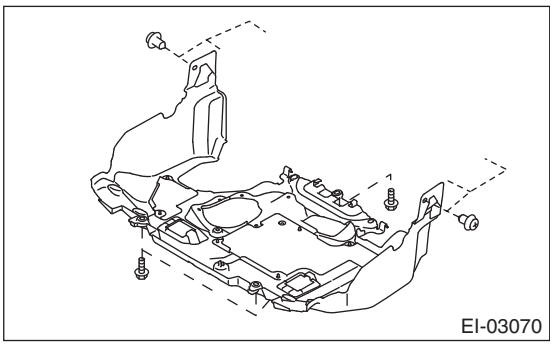
Tightening torque:
Refer to "COMPONENT" of "General Description". <Ref. to EI-4, FRONT HOOD GRILLE, COMPONENT, General Description.>

4. Front Under Cover

A: REMOVAL

1) Lift up the vehicle.
2) Remove clips and bolts in front fender, then remove the front under cover.





B: INSTALLATION

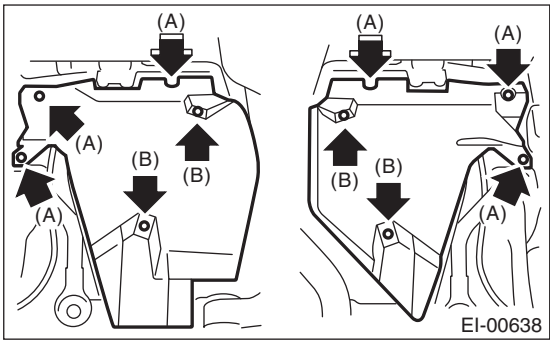
Install each part in the reverse order of removal.

Tightening torque:
18 N·m (1.84 kgf-m, 13.3 ft-lb)

5. Fuel Tank Protector

A: REMOVAL

1) Lift up the vehicle.
2) Remove the bolts (A) and nuts (B), and then remove the fuel tank protector.



B: INSTALLATION

CAUTION:
Do not reuse the nut (self locking nut). Always replace with a new part.
Install each part in the reverse order of removal.

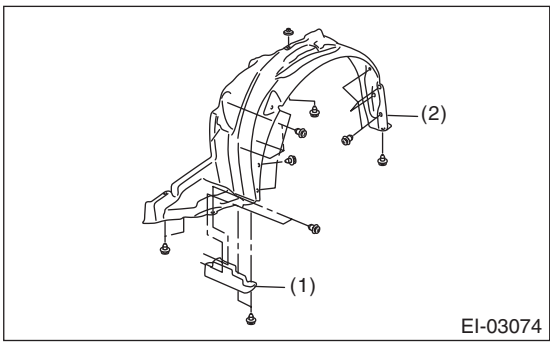
Tightening torque:
Refer to "COMPONENT" of "General Description". <Ref. to EI-3, UNDER PROTECTOR, COMPONENT, General Description.>

6. Mud Guard

A: REMOVAL

1. FRONT MUD GUARD

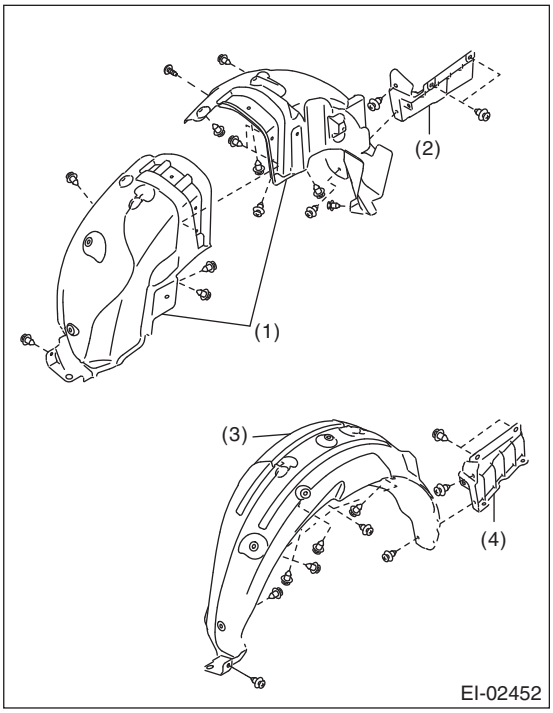
1) Lift up the vehicle.
2) Remove the front wheels.
3) Remove the clips, then remove the mud guard.



(1) Air flap
(2) Front mud guard

2. REAR MUD GUARD

1) Lift up the vehicle.
2) Remove the rear wheels.
3) Loosen the clips and screws (RH side one location) to remove the mud guard.



(1) Rear mud guard RH
(2) Mud guard rear RH
(3) Rear mud guard LH
(4) Mud guard rear LH

B: INSTALLATION

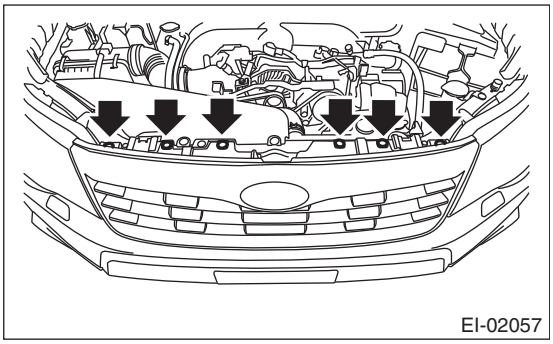
Install each part in the reverse order of removal.

7. Front Bumper

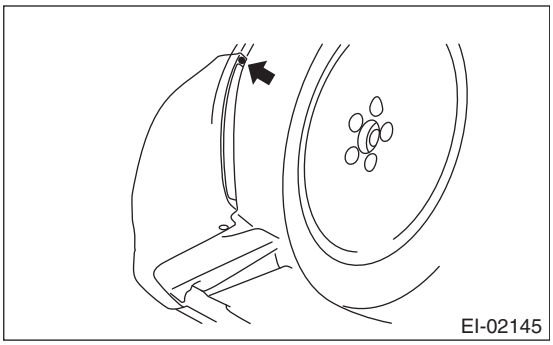
A: REMOVAL

1. FRONT BUMPER FACE

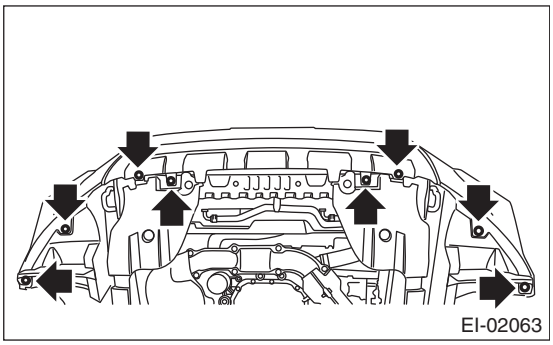
1) Disconnect the ground cable from battery.
2) Remove the clips at the upper side of the bumper.


EI-02057

3) Remove the clips from the fender.


EI-02145

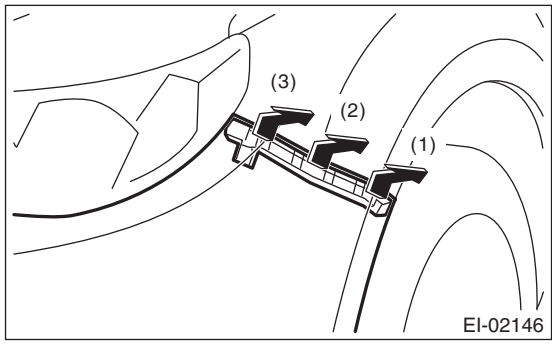
4) Remove the clips at the lower side of bumper.


EI-02063

5) Disconnect the fog light connector. (Model with fog light)
6) Detach the flange section on the bumper face side from the front side bracket.

CAUTION:
Do not pull forcibly. It may damage the flange sections of the bumper face.

NOTE:
It is easier to detach them from the fender side in the order from (1) to (3), while pulling up the bumper face to the direction of arrow (upward).

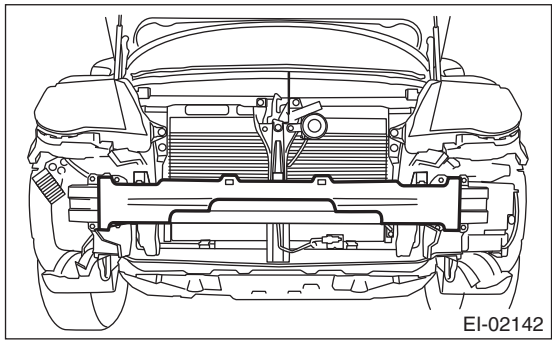


EI-02146

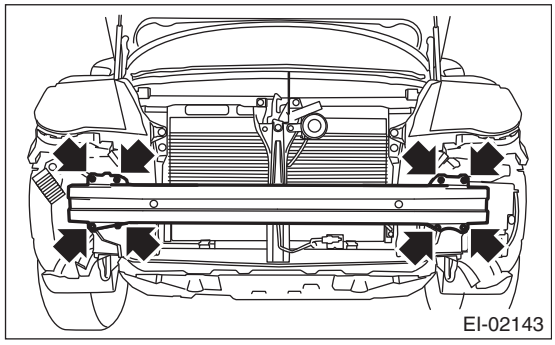
7) Remove the bumper face from vehicle body.
8) Remove the front grille from bumper face. <Ref. to EI-24, REMOVAL, Front Grille.>
9) Remove the fog light from bumper face. <Ref. to LI-26, REMOVAL, Front Fog Light Assembly.>

2. FRONT BUMPER BEAM ASSEMBLY

1) Disconnect the ground cable from the battery.
2) Remove the front bumper face. <Ref. to EI-29, FRONT BUMPER FACE, REMOVAL, Front Bumper.>
3) Remove the energy absorber foam from the bumper beam assembly.


EI-02142

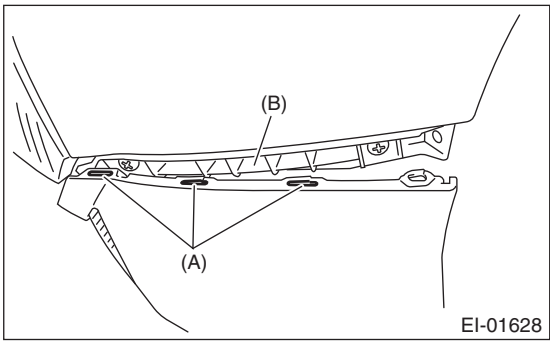
4) Remove the bolts, and remove the bumper beam assembly from vehicle body.


EI-02143

NOTE:
After all bolts are removed, raise the whole bumper beam a little to remove it from vehicle body.

B: INSTALLATION

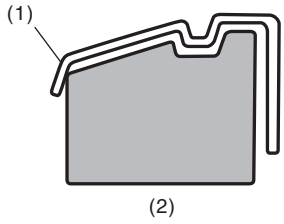
1) Install each part in the reverse order of removal.
2) Securely attach the bumper tabs (A) to the plastic bracket (B).



Tightening torque:
Refer to "COMPONENT" of "General Description". <Ref. to EI-5, 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.	 (1) Bumper (2) Set bumper section
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 to all parts to be painted, using spray 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)	Non-colored	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 — 13 sec./20°C (68°F) • Film thickness: 35 — 45 μ • Spraying pressure: 245 — 343 kPa (2.5 — 3.5 kgf/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 — 13 sec./20°C (68°F) • Film thickness: 15 — 20 μ • Spraying pressure: 245 — 343 kPa (2.5 — 3.5 kgf/cm^2, 36 — 50 psi)

Process No.	Process name	Job contents	
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.	After top coating (I) three times at 5 — 7 minutes intervals, apply an additional clear coat to the part. • Paint to be used: Metallic paint Hardener PB Thinner T-301 • Mixture ratio: Clear coat : Hardener = 6 : 1 • Viscosity: 14 — 16 sec./20°C (68°F) • Film thickness: 25 — 30 μ • Spraying pressure: 245 — 343 kPa (2.5 — 3.5 kgf/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 become be deformed. Keep maximum temperature 80°C (176°F) or less.	
10	Inspection	Check paint.	
11	Removal of masking	Remove the masking tape applied in procedure 2.	

2. REPAIR INSTRUCTIONS FOR COLORED PP BUMPER

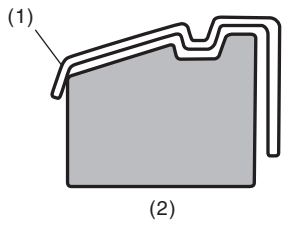
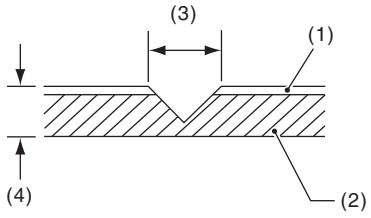
NOTE:
All PP bumpers are provided with a grained surface, and if the surface is damaged, it cannot normally be restored to its former condition. Damages limited to the shallow scratches that cause only a change in the luster of the base material or coating, can be almost fully restored. Before repairing 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.

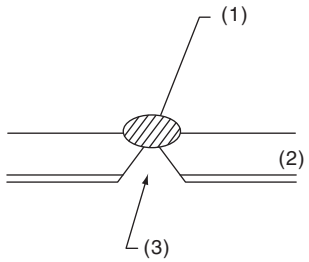
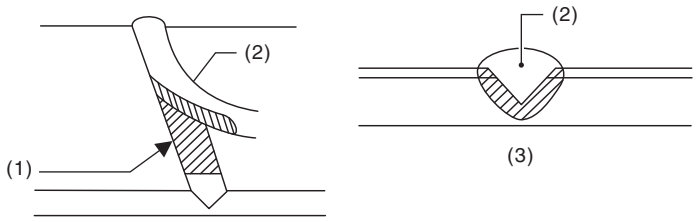
Process No.	Process name	Job contents	
1	Cleaning	Clean the area to be repaired using water.	
2	Sanding	Grind the repairing area with #500 sand paper in a “feathering” motion.	
3	Finish	Resin section	Coated section
		Repeatedly apply wax to the affected area using soft cloth (such as flannel). Recommended wax: NITTO KASEI Soft 99 TIRE WAX BLACK, or equivalent.	Perform either the same procedures as for the resin section or Process No. 18 and subsequent in section 3), 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 section “1)”.	Perform process No. 12 and subsequent operations in section “3)”.

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.	 EI-00234 (1) Bumper (2) Set bumper section
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.).	
5	Cutting	If the damage is a crack or a hole, 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 base surface. Next, use a knife or grinder to carve a V-shaped groove in the area for repair.	 EI-00235 (1) Paint surface (2) PP base surface (3) 20 — 30 mm (0.79 — 1.18 in) (4) 3 mm (0.12 in)
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 process No. 4.	

Process No.	Process name	Job contents
8	Temporary welding	Grind the side just opposite the beveled area with sand paper (#40 — #60) and clean using a solvent. Temporarily spot-weld the side, using PP welding rod and heater gun.
		 EI-00236 (1) Welded point (Use heater gun and PP welding rod) (2) PP base surface (3) Beveled section NOTE: • 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	Using a heater gun and PP welding rod, weld the beveled spot while melting both the rod and damaged area.
		 EI-00237 (1) Welding rod (2) Melt hatched area (3) Section NOTE: • 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.
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 process No. 4.

Process No.	Process name	Job contents	
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: Be sure to apply a coat of primer using a spray gun at a pressure of 245 — 343 kPa (2.5 — 3.5 kgf/cm^2, 36 — 50 psi).	
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: • 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 — 14 sec./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)	Non-colored	Metallic paint
		Use a “block” coating method. • Recommended paint: Suncryl (SC) No. 307 Flex Hardener SC Reducer (thinner) • Mixture ratio: Suncryl (SC): No. 307 Flex Hardener = 3 : 1 • Viscosity: 11 — 13 sec./20°C (68°F) • Coating film thickness: 40 — 50 µ • Spraying pressure: 245 — 343 kPa (2.5 — 3.5 kgf/cm^2, 36 — 50 psi)	Use a “block” coating method. • Recommended paint: Suncryl (SC) No. 307 Flex Hardener SC Reducer (thinner) • Mixture ratio: Suncryl (SC): No. 307 Flex Hardener = 3 : 1 • Viscosity: 11 — 13 sec./20°C (68°F) • Coating film thickness: 20 — 30 µ • Spraying pressure: 245 — 343 kPa (2.5 — 3.5 kgf/cm^2, 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.
21	Top coat (II)	Not required.	Apply a clear coat three times at an interval of 3 to 5 minutes. • Recommended paint: SC710 Overlay Clear No. 307 Flex Hardener SC Reducer (thinner) • Mixture ratio: Suncryl (SC): No. 307 Flex Hardener = 3 : 1 • Viscosity: 10 — 13 sec./20°C (68°F) • Coating film thickness: 20 — 30 µ • Spraying pressure: 245 — 343 kPa (2.5 — 3.5 kgf/cm^2, 36 — 50 psi)
22	Drying	Allow the coated surface to dry for two hours at 20°C (68°F) or 30 minutes at 60°C (140°F). NOTE: Do not allow the temperature to exceed 80°C (176°F) since this will deform the PP substrate.	
23	Inspection	Carefully check the condition of the repaired area.	

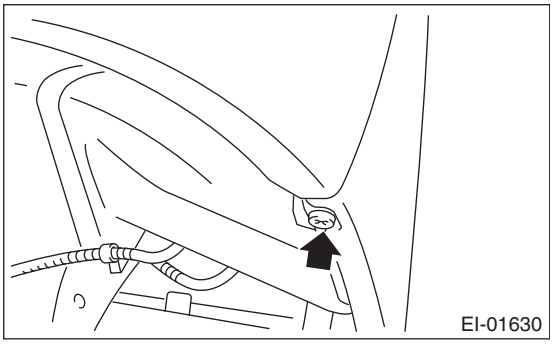
Process No.	Process name	Job contents
24	Removal of masking	Remove the masking tape applied in process No. 11 and 13.
25	Parts installation	Install parts on the bumper in reverse order of removal.
26	Bumper installation	Install the bumper.

8. Rear Bumper

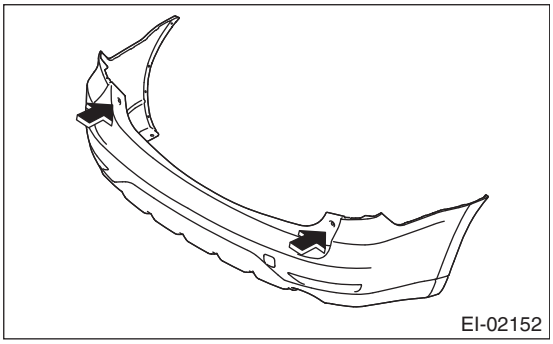
A: REMOVAL

1. REAR BUMPER FACE

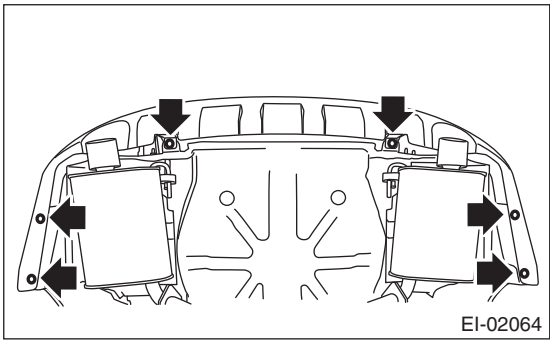
1) Remove the clips inside the wheel housing.



2) Remove the bolt.

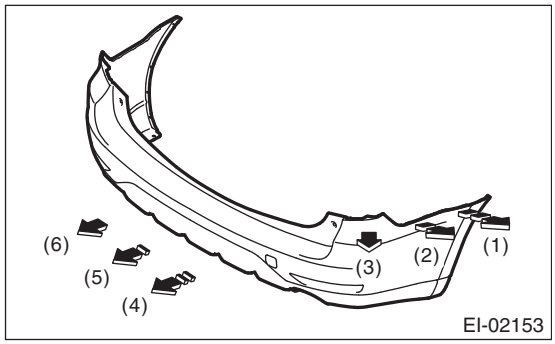


3) Remove the clips on the lower side of rear bumper.



4) Remove the rear bumper from vehicle body.
(1) Detach from the fender side in order from (1) to (3) while pulling up on the bumper face and twisting it towards you. (Both sides)
(2) Detach in order from (4) to (6) while pulling up on the center part of the bumper face.

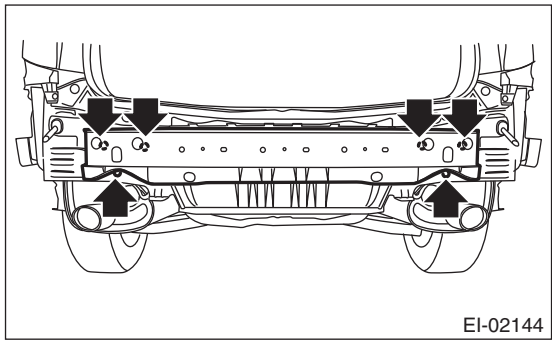
CAUTION:
Do not pull with a excessive force. Otherwise the bracket installation area may be damaged.



5) Remove the reflector.

2. REAR BUMPER BEAM ASSEMBLY

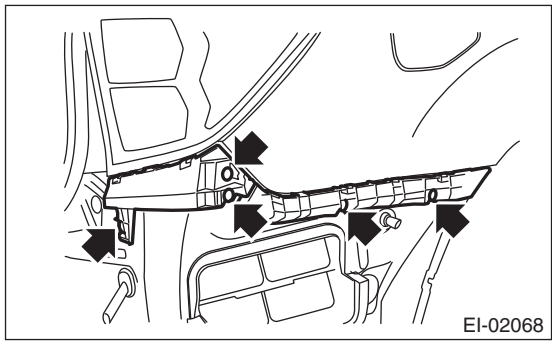
1) Disconnect the ground cable from the battery.
2) Remove the rear bumper face. <Ref. to EI-36, REAR BUMPER FACE, REMOVAL, Rear Bumper.>
3) Remove the nuts, and remove the bumper beam assembly from the vehicle body.



NOTE:
After all nuts are removed, raise the whole bumper beam a little to remove it from the vehicle body.

3. REAR BUMPER BRACKET

Remove the rear bumper face from vehicle body, and remove each bumper bracket.



B: INSTALLATION

Install each part in the reverse order of removal.

NOTE:
If the bumper face comes off easily from the beam upper rear, adjust the hook of the bracket side.

Tightening torque:
Refer to "COMPONENT" of "General Description". <Ref. to EI-6, REAR BUMPER, COMPONENT, General Description.>

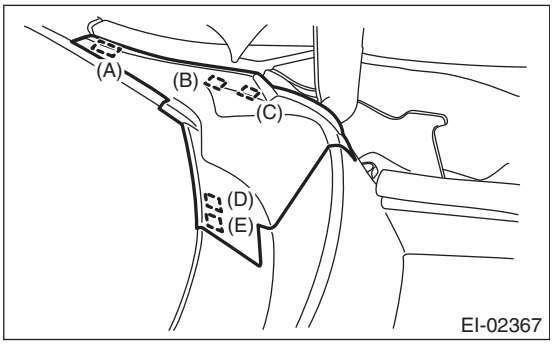
C: REPAIR

Refer to front bumper repair. <Ref. to EI-30, REPAIR, Front Bumper.>

9. Cowl Panel

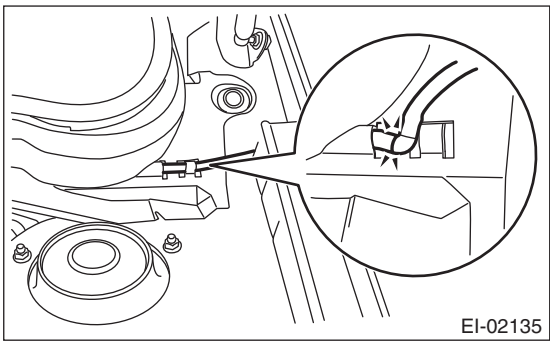
A: REMOVAL

1) Open the front hood.
2) Remove the wiper arm. <Ref. to WW-15, REMOVAL, Front Wiper Arm.>
3) Detach the tabs and remove the cowl panel, side.

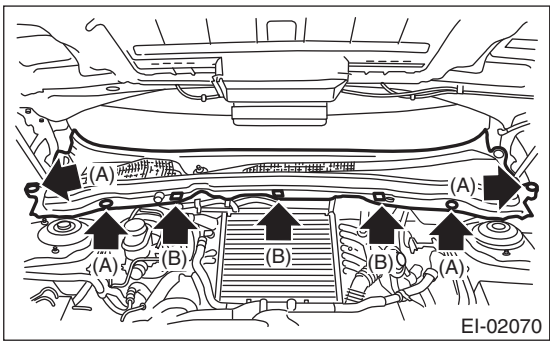


(1) Detach tabs (A), (B), and (C) from the vehicle exterior.
(2) Detach tabs (D) and (E).

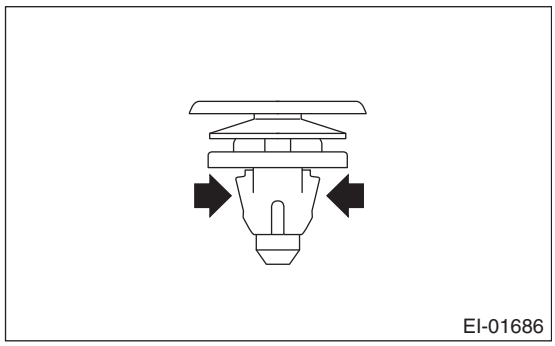
4) Pull out and disconnect the washer hose.



5) Remove clips (A) and (B), and remove the cowl panel.



CAUTION:
Press on the clip tabs from the left and right when removing clips (B).
Do not pull forcibly on the clips to prevent damaging them.

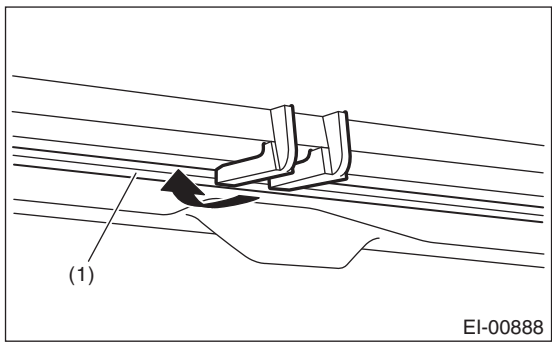


6) Disconnect the washer hose.
7) Remove the washer nozzle. <Ref. to WW-18, REMOVAL, Front Washer Nozzle.>

B: INSTALLATION

Install each part in the reverse order of removal.

NOTE:
Hook the claw of the cowl panel on the lower end of the windshield.

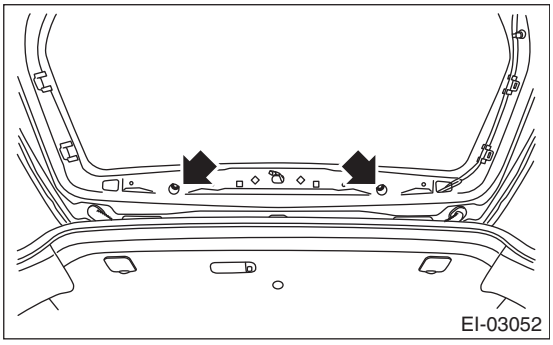


(1) Windshield cross section

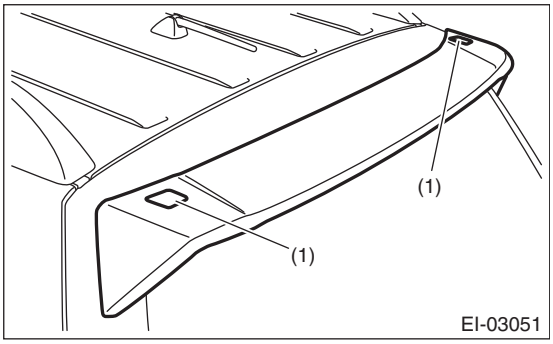
10.Roof Spoiler

A: REMOVAL

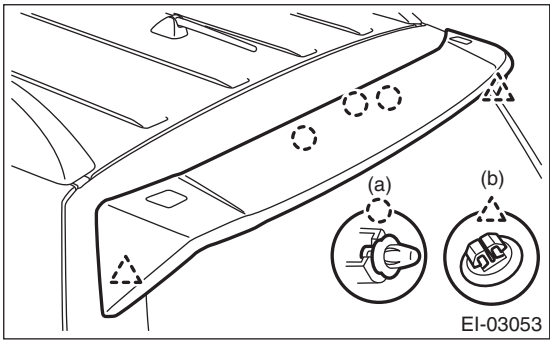
1) Disconnect the ground cable from battery.
2) Remove the high-mounted stop light. <Ref. to LI-35, REMOVAL, High-mounted Stop Light.>
3) Remove the rear gate trim. <Ref. to EI-67, REMOVAL, Rear Gate Trim.>
4) Remove the nuts.



5) Open the caps (1), and remove the bolt inside.

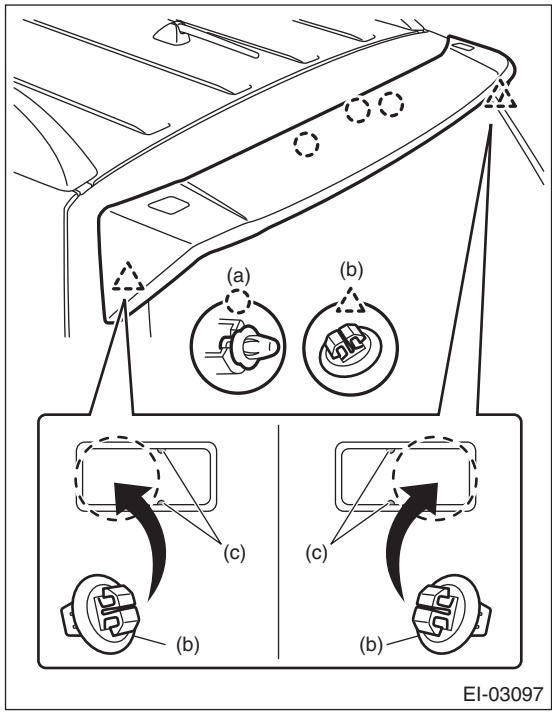


6) Remove the clips (a) and (b), and remove the roof spoiler.



B: INSTALLATION

CAUTION:
• Make sure the bolt is tightened securely because improper installation may cause the water leakage.
• If the clip (b) is deformed or broken, replace it with a new part.
• Install the clip (b) to the spoiler side first.
• Right side: Install clip (b) to the right of protrusions (c).
• Left side: Install clip (b) to the left of protrusions (c).



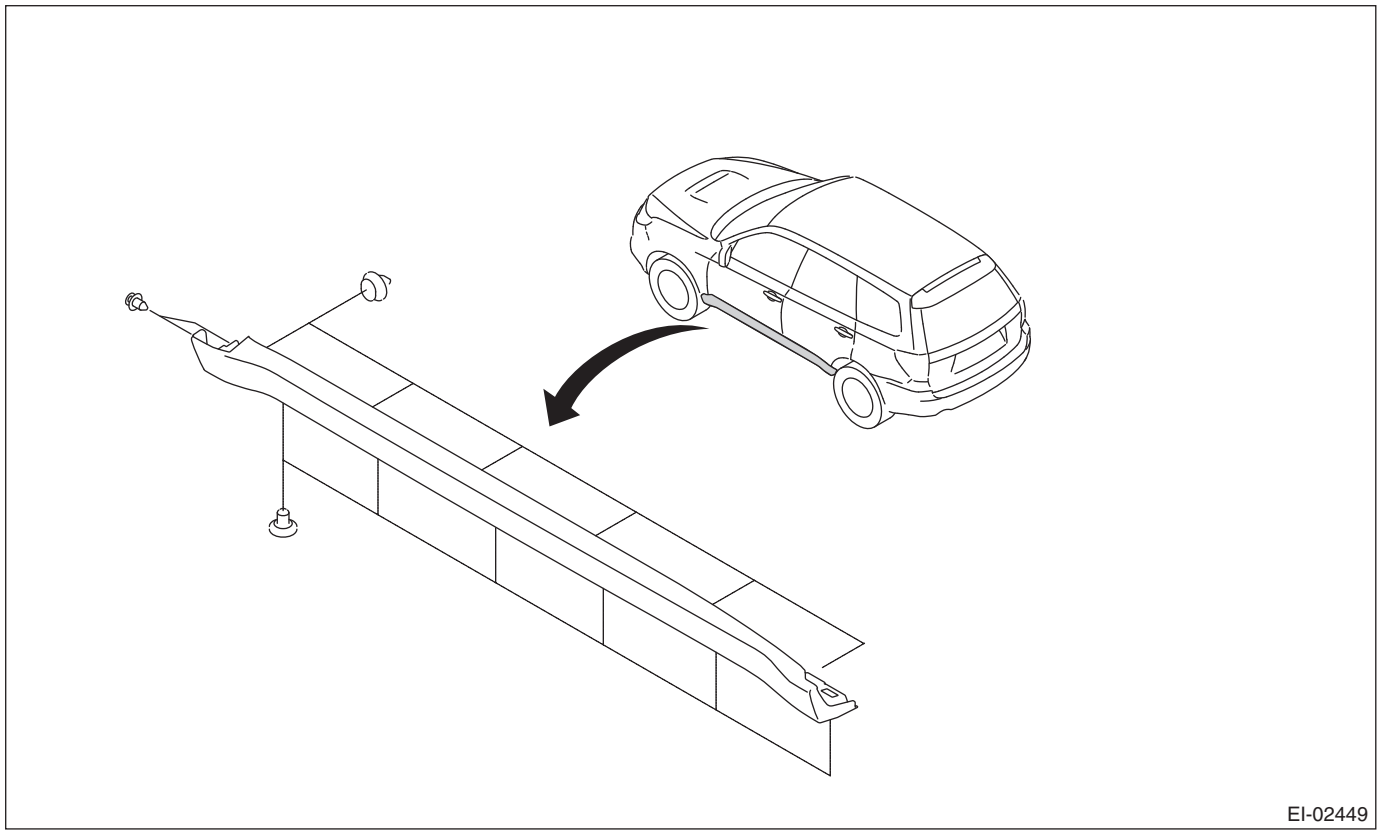
Install each part in the reverse order of removal.

Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

11.Side Sill Spoiler

A: REMOVAL

Remove the clips, and remove the side spoiler.



B: INSTALLATION

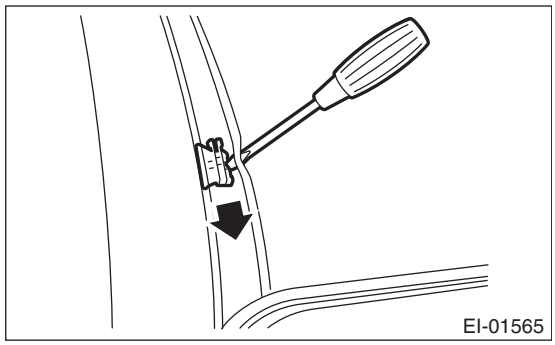
Install each part in the reverse order of removal.

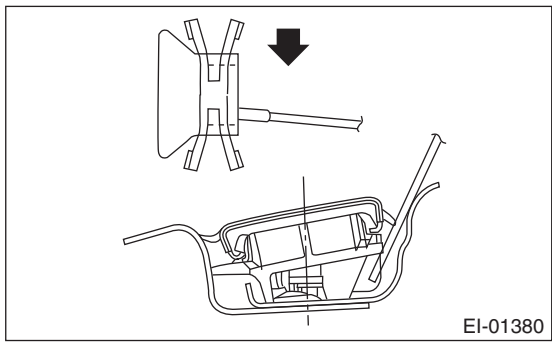
12.Roof Molding

A: REMOVAL

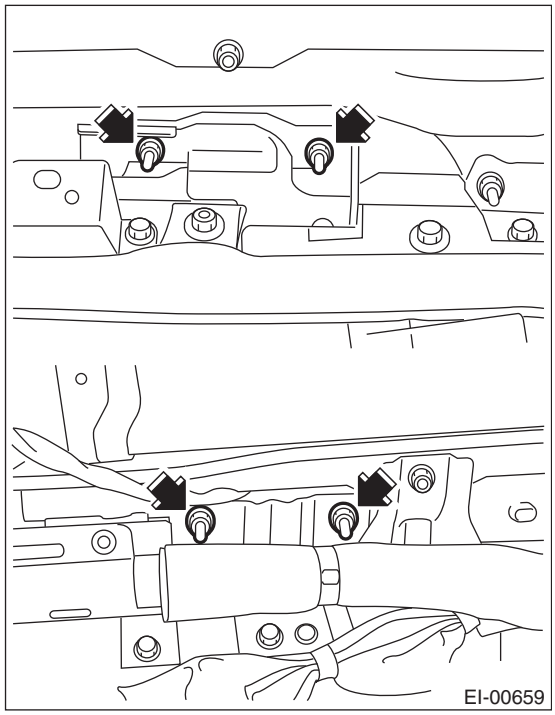
1) Peel the end of the roof molding, and slide the inner clip in the direction of the arrow using a flat tip screwdriver, to remove the clip from the stud on the vehicle side.

CAUTION:
Be careful not to damage the body.
Right side: Slide towards the front of the vehicle.
Left side: Slide towards the rear of the vehicle.


EI-01565


EI-01380

2) Pull up the roof molding upward, and remove from the vehicle.
3) Remove the roof trim. <Ref. to EI-64, REMOVAL, Roof Trim.>
4) Remove the nuts, and remove the roof carrier bracket.


EI-00659

B: INSTALLATION

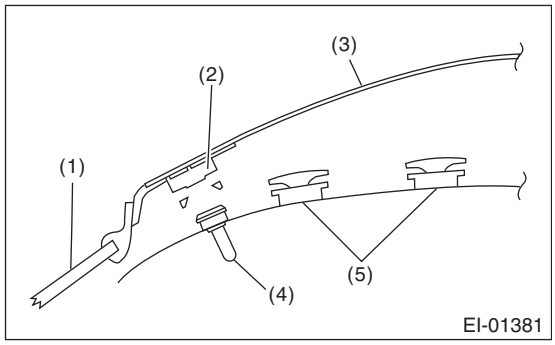
1) Install the roof carrier bracket.

Tightening torque:
7.5 N·m (7.6 kgf-m, 5.5 ft-lb)

2) Remove the clips from the roof molding, and attach to the studs on the vehicle.

CAUTION:
Always replace clips that were damaged during removal of the roof molding.

3) Push the front end of the roof molding against the front window, and attach the forward positioning clip onto the rivet on the body.



EI-01381

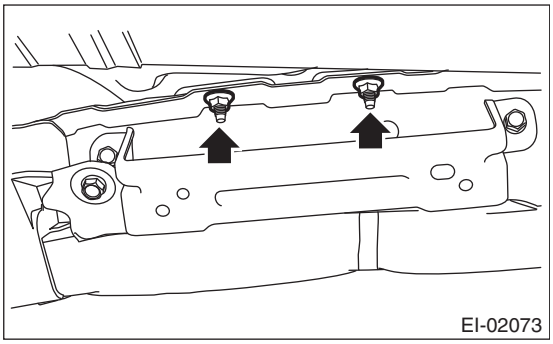
(1) Windshield
(2) Positioning clip
(3) Roof molding
(4) Rivet
(5) Clip

4) While pushing down on the roof molding from above, join the roof molding and clips.

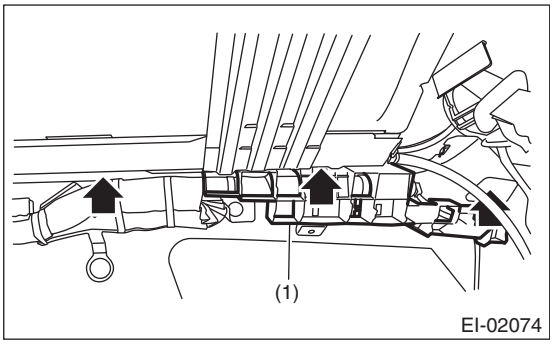
13.Roof Rail

A: REMOVAL

1) Remove the roof trim. <Ref. to EI-64, REMOVAL, Roof Trim.>
2) Remove the front installation nuts.



3) Remove the inflator pad (1) and then remove the rear mounting nuts.



B: INSTALLATION

Install each part in the reverse order of removal.

CAUTION:
When removing or installing the roof rail, be careful not to scratch the body panel with the stud bolt of roof rail.

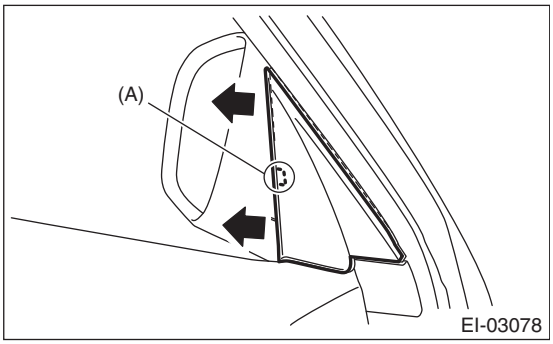
Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

14.Door Trim

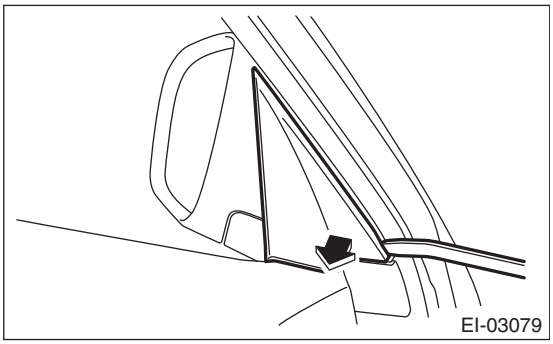
A: REMOVAL

1. FRONT DOOR

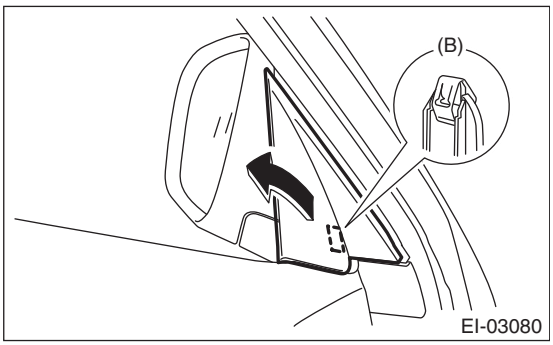
1) Disconnect the ground cable from battery.
2) Remove the gusset cover.
   (1) Pull the gusset cover backward to detach the claws (A) on the backside of the gusset cover.



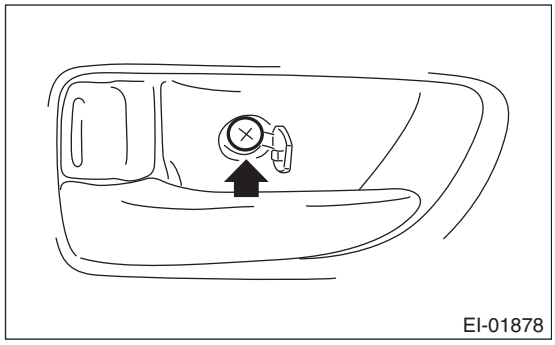
   (2) Insert a plastic remover into the position shown in the figure while retaining the condition in step (1), and lift up the gusset cover.



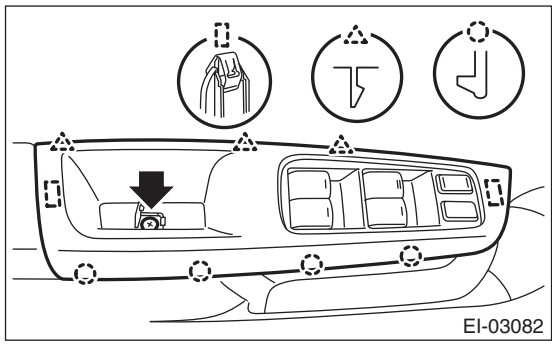
   (3) Remove the gusset cover in the direction of the arrow to detach the clip section (B), and disconnect the connector.



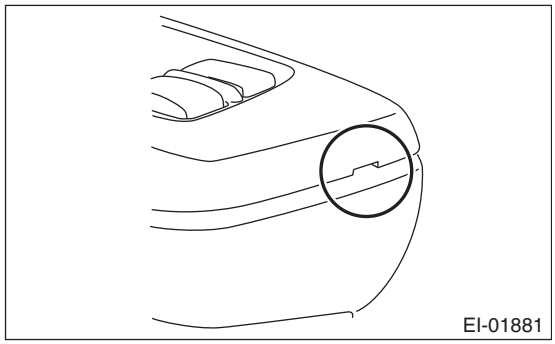
3) Open the cover of the inner remote section, and remove the screws.



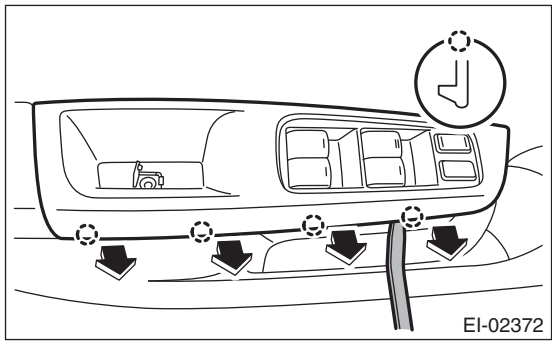
4) Remove the power window switch panel.



   (1) Open the cover and remove the screws.
   (2) Lift up the tip of switch panel by using a plastic remover.

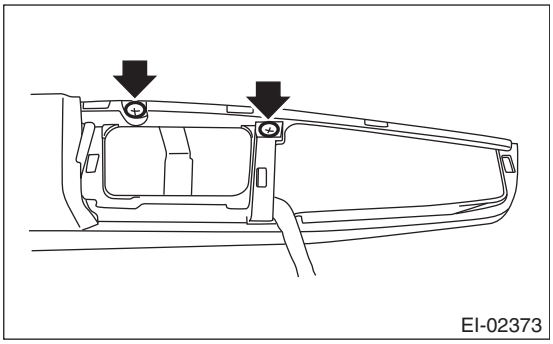


   (3) Disengage the end face tabs by using a plastic remover.

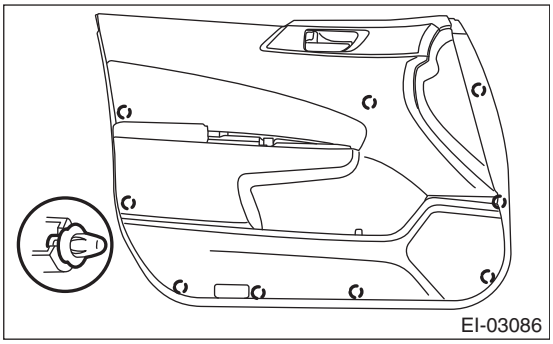


   (4) Disconnect the harness connector, and remove the power window switch panel.

5) Remove the door trim screws.

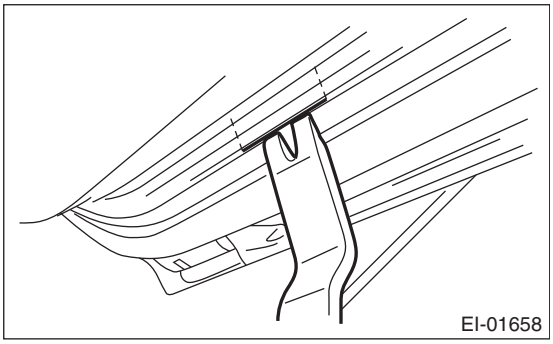


6) Remove the door trim.

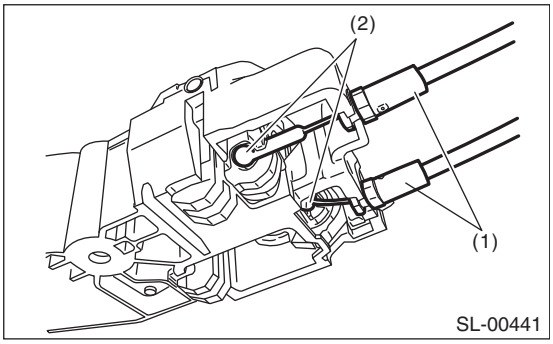


(1) Remove the clips, then lift the door trim.

NOTE:
Insert a plastic clip remover into the slit at the bottom of the door trim, to lift the door trim.



(2) Remove the cable (1) and (2) from the cable holder of inner remote.

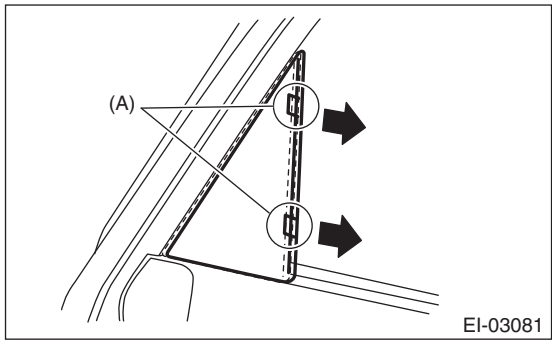


(3) Disconnect the harness connector and remove the door trim.

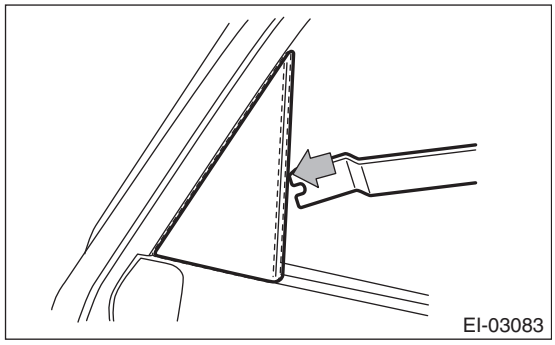
2. REAR DOOR

1) Disconnect the ground cable from battery.
2) Remove the gusset cover.
   (1) Push gusset cover in direction of vehicle front to detach the claws (A) on the backside of the gusset cover.

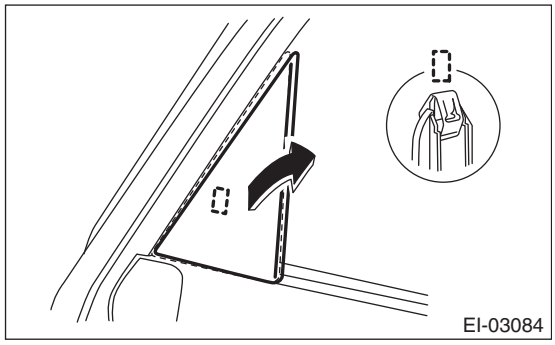
CAUTION:
Be careful not to damage the claws (A).



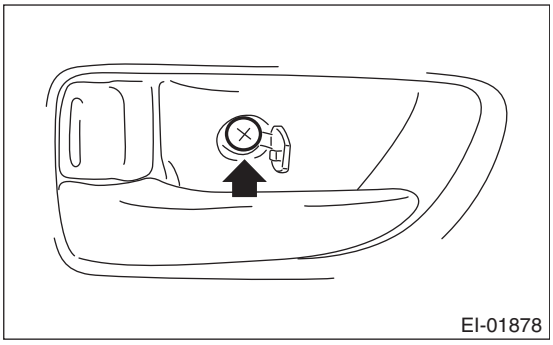
(2) Insert a plastic remover into the position shown in the figure while retaining the condition in step (1), and lift up the gusset cover.



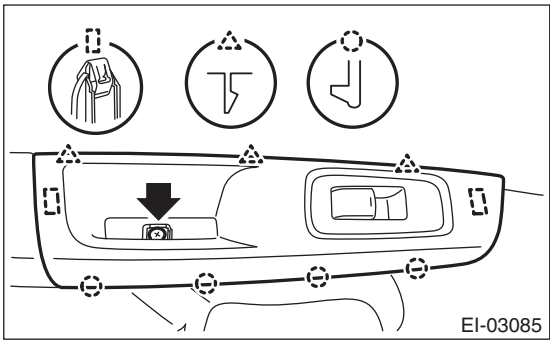
(3) Remove the gusset cover in the direction of the arrow to detach the clip section.



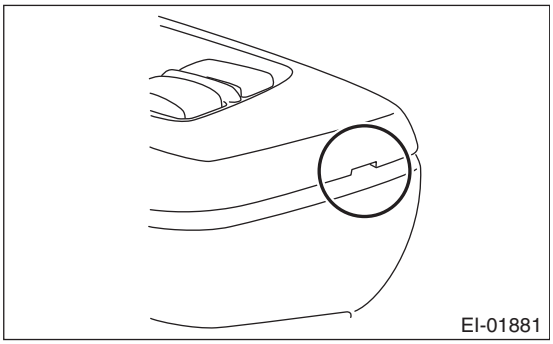
3) Open the cover of the inner remote section, and remove the screws.



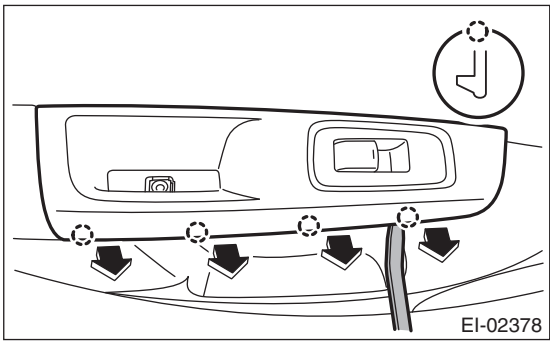
4) Remove the power window switch panel.



(1) Open the cover and remove the screws.
(2) Lift up the tip of switch panel by using a plastic remover.

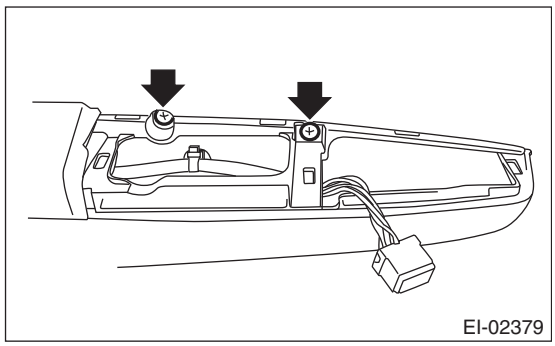


(3) Disengage the end face tabs by using a plastic remover.

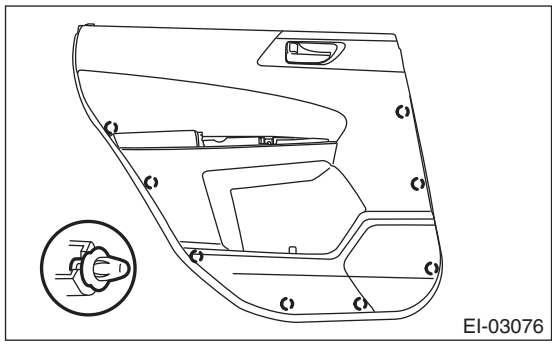


(4) Disconnect the harness connector, and remove the power window switch panel.

5) Remove the door trim screws.

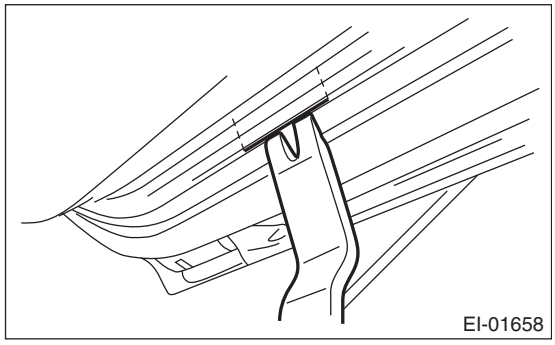


6) Remove the door trim.

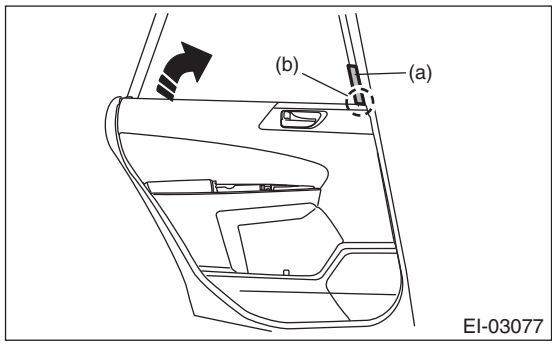


(1) Remove the clips, then lift the door trim.

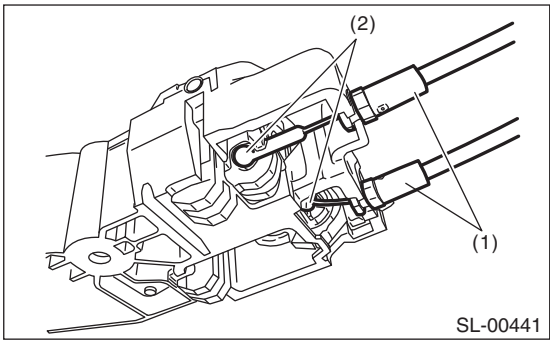
NOTE:
Insert a plastic clip remover into the slit at the bottom of the door trim, to lift the door trim.



(2) Attach the protective tape (a) to the front door sash.
(3) Remove the door trim by rotating it around the trim tip part (b).



(4) Remove the cable (1) and (2) from the cable holder of inner remote.



(5) Disconnect the harness connector and remove the door trim.

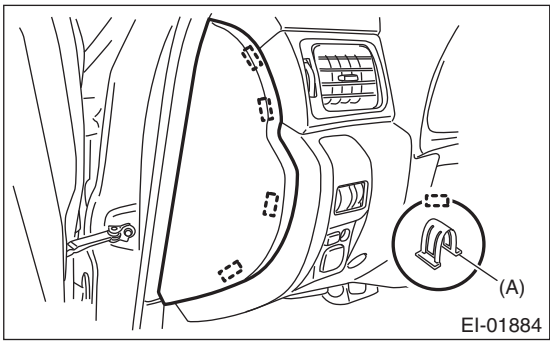
B: INSTALLATION

Install each part in the reverse order of removal.

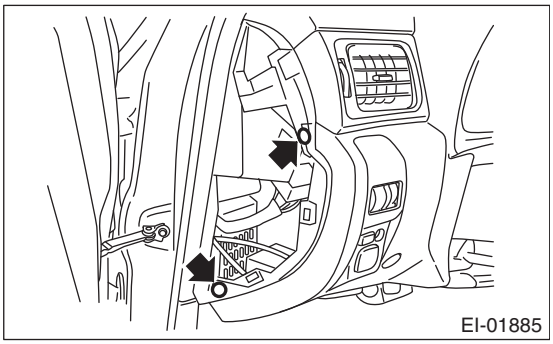
15.Instrument Panel Lower Cover

A: REMOVAL

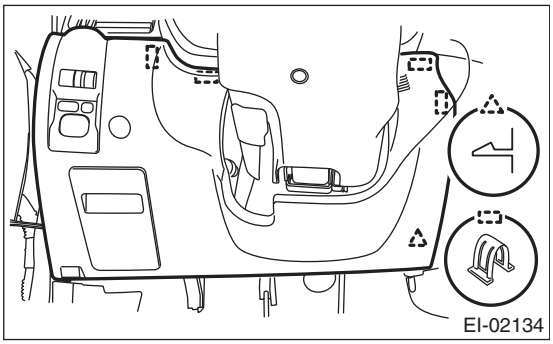
1) Disconnect the ground cable from the battery.
2) Detach the plastic hooks (A) and remove the instrument panel side cover LH.



3) Remove the screws.



4) Disconnect the connectors and remove the instrument panel lower cover.



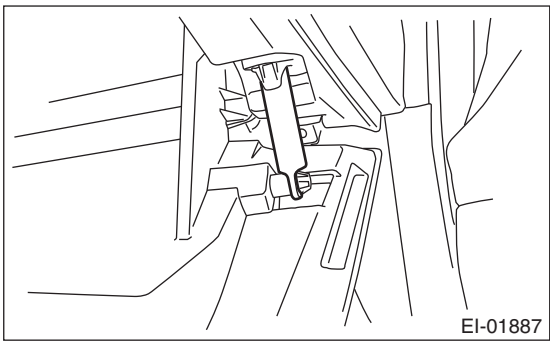
B: INSTALLATION

Install each part in the reverse order of removal.

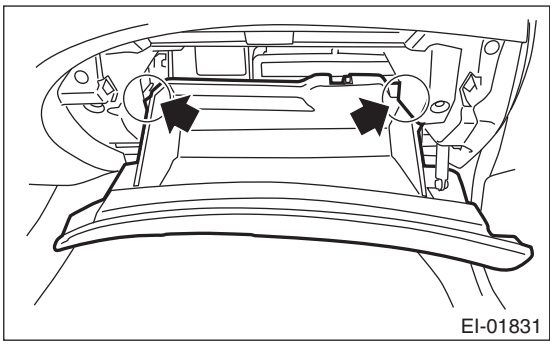
16.Glove Box

A: REMOVAL

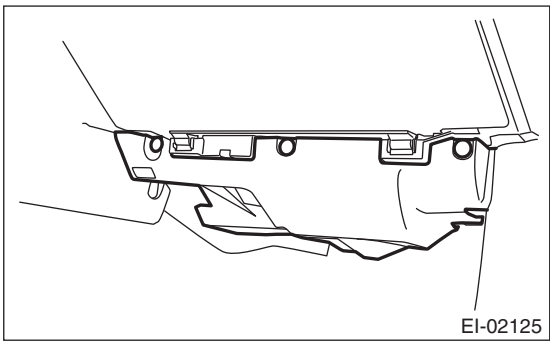
NOTE:
Refer to “Security and Locks” section for key cylinder replacement. <Ref. to SL-41, GLOVE BOX LID, REPLACEMENT, Key Lock Cylinders.>
1) Disconnect the ground cable from battery.
2) Remove the glove box damper.



3) Remove the stoppers and pull the glove box lid assembly forward to remove.



4) Remove the clips, and remove the glove box lower cover.



5) Remove the instrument panel lower. <Ref. to EI-52, INSTRUMENT PANEL LOWER, REMOVAL, Center Console.>

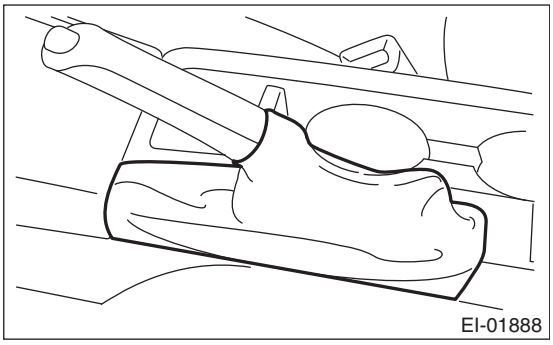
B: INSTALLATION

Install each part in the reverse order of removal.

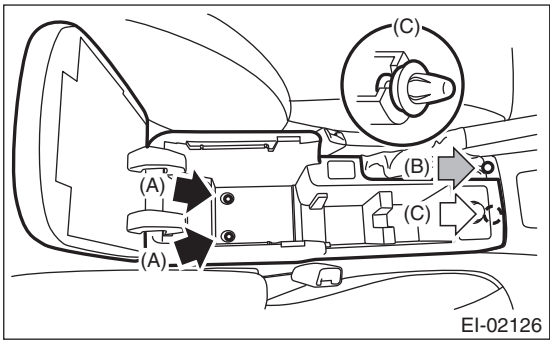
17.Console Box

A: REMOVAL

1) Disconnect the ground cable from the battery.
2) Remove the parking brake lever boot.



3) Remove bolts (A), screw (B), and clips (C).



4) Disconnect the connectors and remove the console box.

B: INSTALLATION

Install each part in the reverse order of removal.

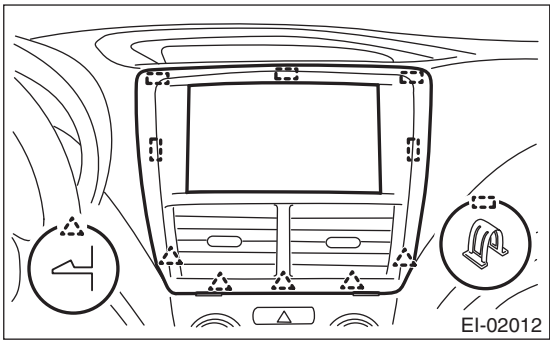
Tightening torque:
2 N·m (0.20 kgf-m, 1.5 ft-lb)

18.Center Console

A: REMOVAL

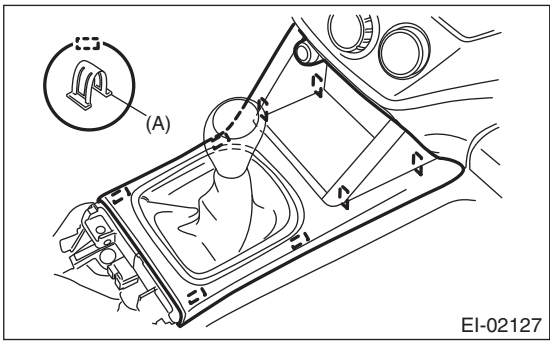
1. CENTER PANEL

1) Insert a plastic clip remover into the slit at the bottom edge of the center panel, and lift the panel.
2) Disengage the tabs and plastic hooks, and remove the center panel.


EI-02012

2. CONSOLE FRONT PANEL

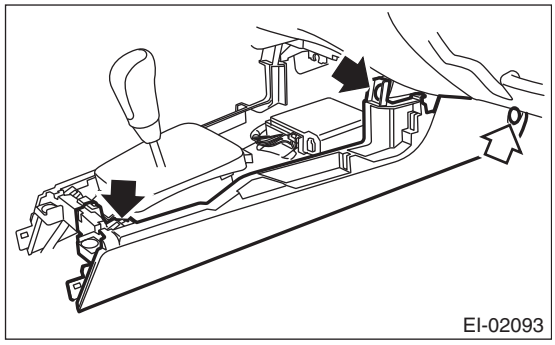
1) Remove the console box. <Ref. to EI-49, REMOVAL, Console Box.>
2) Remove the shift knob. (MT model)
3) Detach the plastic hooks (A) and pull up on the console front panel.

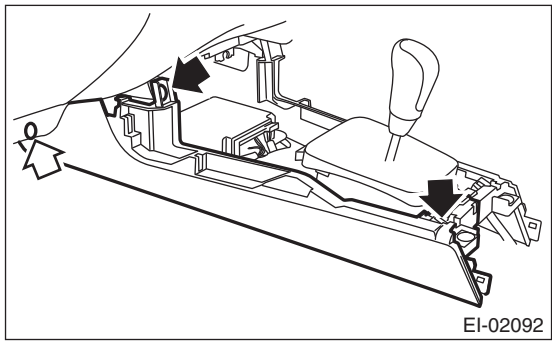


EI-02127

NOTE:
Pull up towards the rear of the vehicle to remove.

4) Remove the clips and screws, and remove the console side panel.


EI-02093

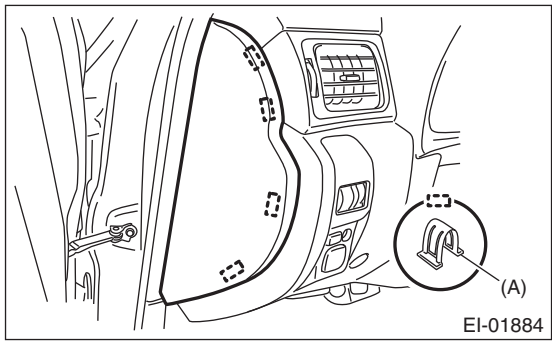

EI-02092

NOTE:
Pull towards the rear of the vehicle to remove.

3. ORNAMENT PANEL

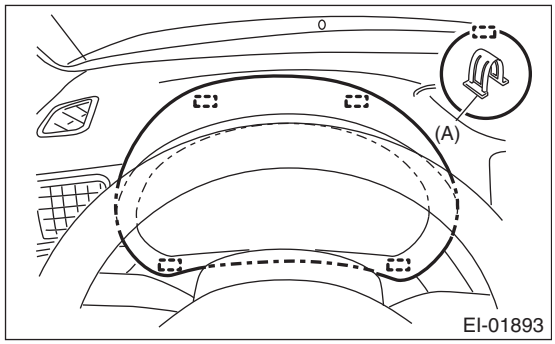
- **Driver's side**

1) Detach the plastic hooks (A) and remove the instrument panel side cover LH.



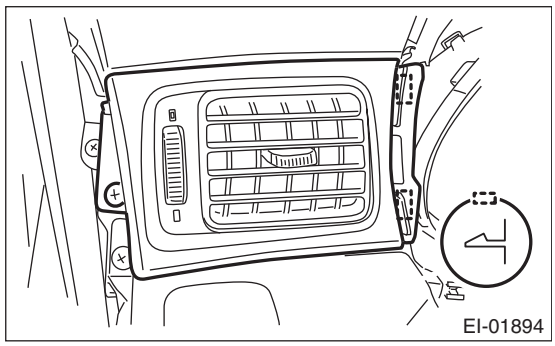
EI-01884

2) Remove the plastic hook (A), and detach the meter visor.



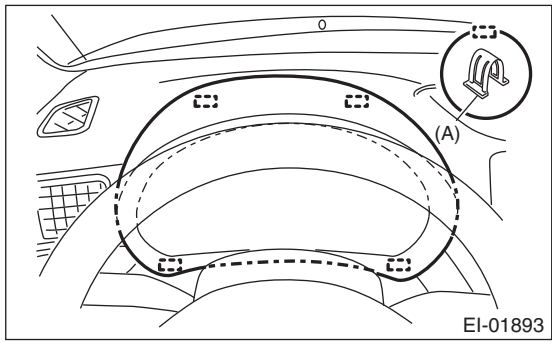
EI-01893

NOTE:
Pull the plastic hooks at the bottom of the meter visor towards you to remove.
3) Detach the screws and the tabs to remove the ornament panel LH.

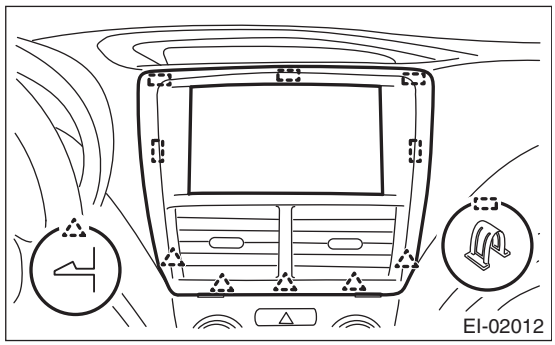


- **Passenger's side**

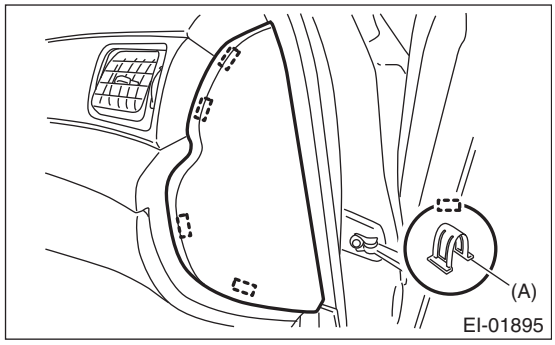
1) Remove the instrument panel lower cover. <Ref. to EI-47, REMOVAL, Instrument Panel Lower Cover.>
2) Remove the plastic hook (A), and detach the meter visor.



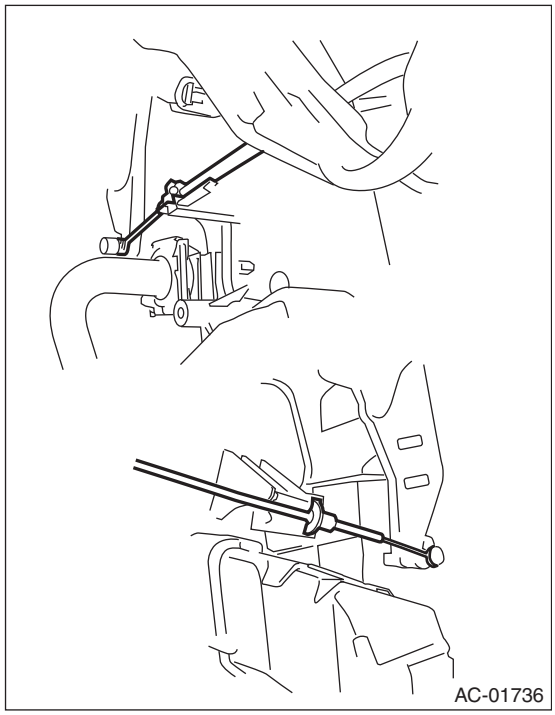
NOTE:
Pull the plastic hooks at the bottom of the meter visor towards you to remove.
3) Insert a plastic clip remover into the slit at the bottom edge of the center panel, and lift the panel.
4) Remove the claws and resin hook and then remove the center panel.



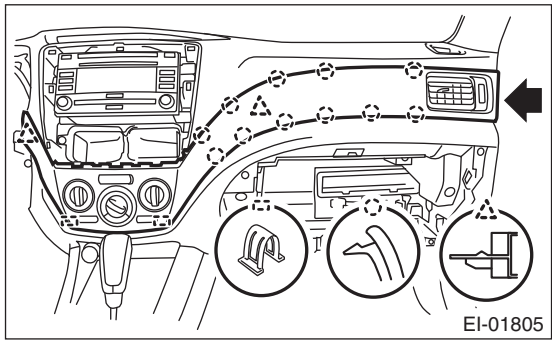
5) Detach the plastic hooks (A) and remove the instrument panel side cover RH.



6) Remove the glove box lid. (Manual air conditioning model) <Ref. to EI-48, REMOVAL, Glove Box.>
7) On manual air conditioning models, remove the control cable.



8) Detach the screws and the plastic hooks to remove the ornament panel RH.

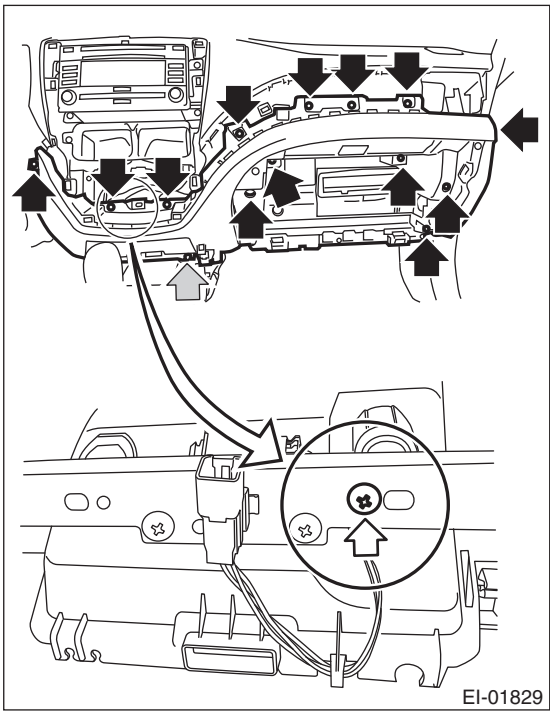


9) Disconnect the connectors.

4. INSTRUMENT PANEL LOWER

1) Remove the console box. <Ref. to EI-49, REMOVAL, Console Box.>
2) Remove the center panel. <Ref. to EI-50, CENTER PANEL, REMOVAL, Center Console.>
3) Remove the console front panel. <Ref. to EI-50, CONSOLE FRONT PANEL, REMOVAL, Center Console.>
4) Remove the ornament panel RH. <Ref. to EI-50, ORNAMENT PANEL, REMOVAL, Center Console.>
5) Remove the instrument panel lower cover. <Ref. to EI-47, REMOVAL, Instrument Panel Lower Cover.>
6) Remove the glove box lid and glove box lower cover. <Ref. to EI-48, REMOVAL, Glove Box.>
7) Remove the screws and nuts to remove the instrument panel lower.

NOTE:
The screw indicated by the white arrow is installed on the reverse face.



B: INSTALLATION

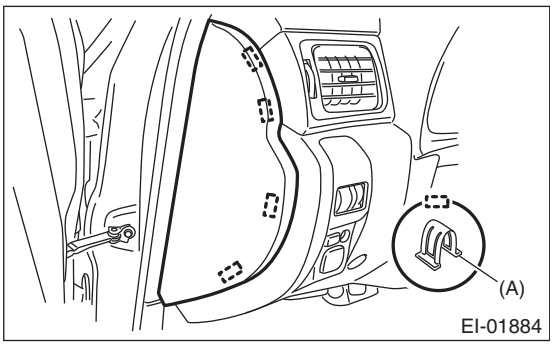
Install each part in the reverse order of removal.

19.Instrument Panel Assembly

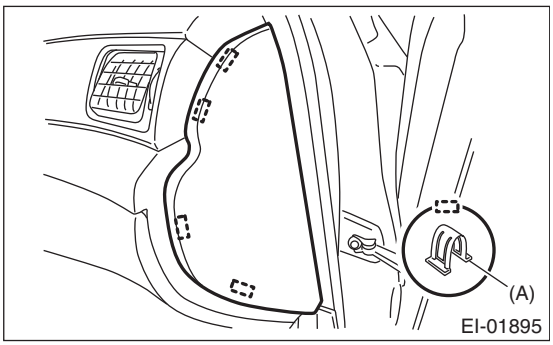
A: REMOVAL

CAUTION:
Be careful not to damage the airbag system harness when servicing the instrument panel. Damage may cause the system to malfunction.

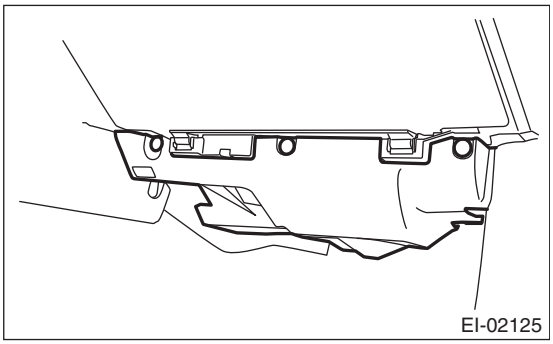
1) Disconnect the ground cable from battery.
2) Remove the front pillar upper trim. <Ref. to EI-58, REMOVAL, Upper Inner Trim.>
3) Detach the plastic hooks (A) and remove the instrument panel side cover LH.



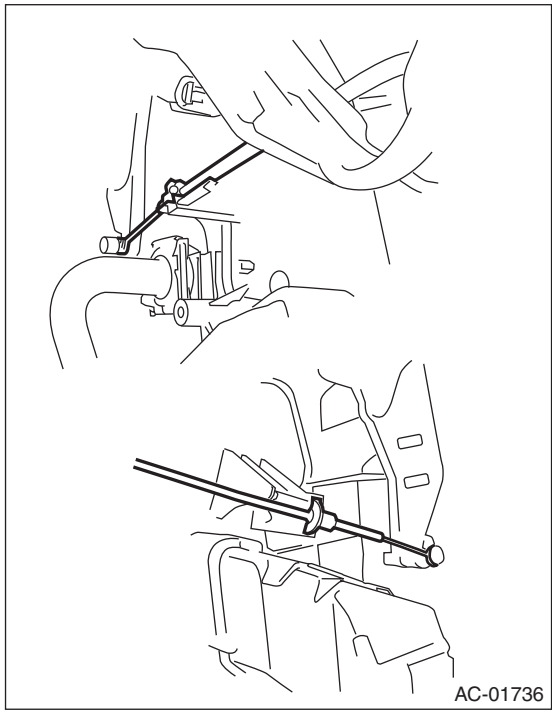
4) Detach the plastic hooks (A) and remove the instrument panel side cover RH.



5) Remove the clips, and remove the glove box lower cover.



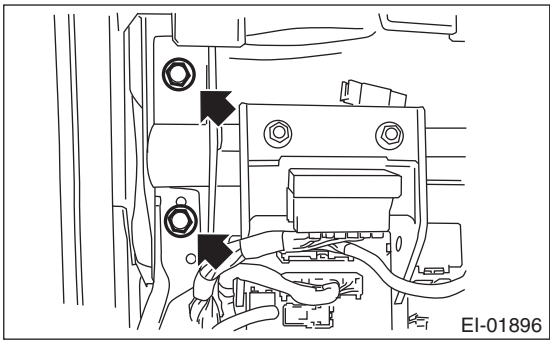
6) Remove the console box. <Ref. to EI-49, REMOVAL, Console Box.>
7) Remove the console front panel. <Ref. to EI-50, CONSOLE FRONT PANEL, REMOVAL, Center Console.>
8) Remove the instrument panel lower cover. <Ref. to EI-47, REMOVAL, Instrument Panel Lower Cover.>
9) Remove the glove box lid. (Manual air conditioning model) <Ref. to EI-48, REMOVAL, Glove Box.>
10) On manual air conditioning models, remove the control cable.

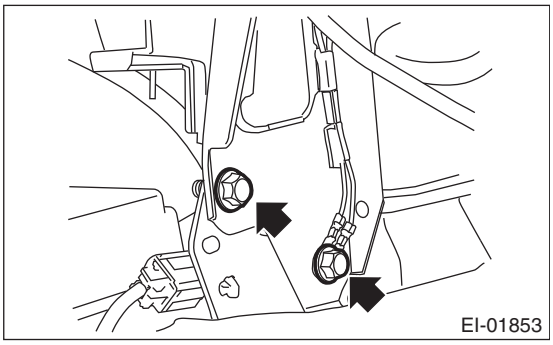


11) Remove the steering shaft assembly. <Ref. to PS-16, REMOVAL, Steering Column.>
12) Disconnect the connectors.

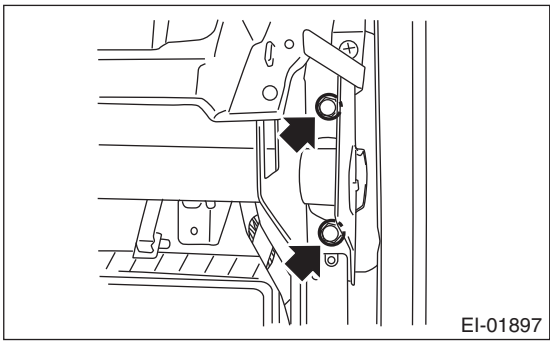
NOTE:
To make reassembly easier, place matching markings on connectors as necessary.

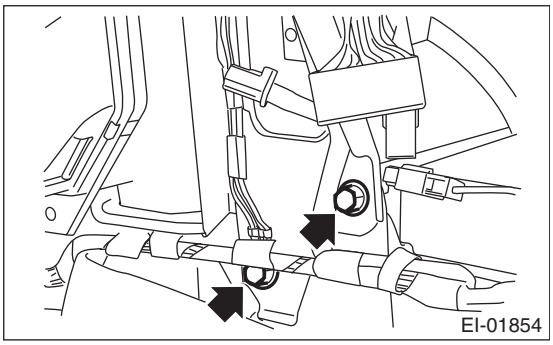
13) Remove the bolts on the driver's side and fuse box.


EI-01896


EI-01853

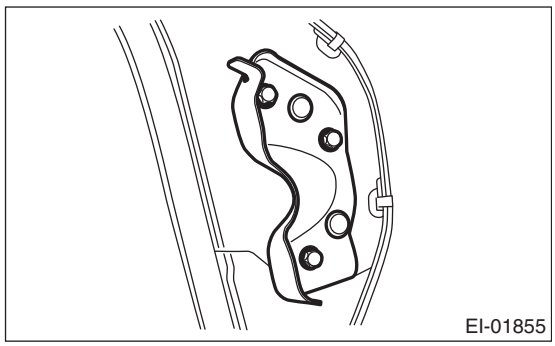
14) Remove the bolts on the passenger's side.


EI-01897


EI-01854

15) Check that the connectors are disconnected, and remove the instrument panel from the vehicle.

16) Remove the steering support beam bracket.


EI-01855

B: INSTALLATION

1) Install the parts in the reverse order of removal until the instrument panel assembly is formed.

NOTE:
Insulator installation procedures
- Adhesive

Use polyurethane adhesive. When assembling the instrument panel assembly, wait until the adhesive has evaporated to prevent filling of the smell in the compartment.
- Double-sided tape

Use commercial double-sided tape. (Use strong double-sided adhesive tape.)

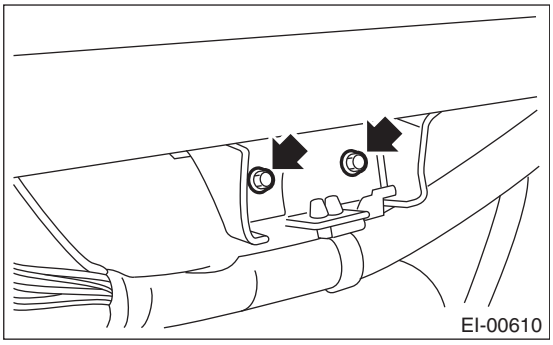
2) Insert the matching pins (three locations) on the body side into the instrument panel assembly.
3) Check that the matching pins are inserted securely, and then route the harness.
4) Install in the reverse order of removal.

Tightening torque:
Steering support beam & steering support beam bracket: 25 N·m (2.55 kgf-m, 18.4 ft-lb)
Steering shaft: <Ref. to PS-3, STEERING WHEEL AND COLUMN, COMPONENT, General Description.>
Instrument panel lower: 7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

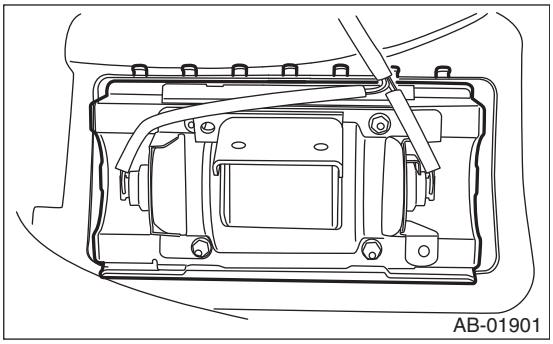
C: DISASSEMBLY

1) Remove the combination meter assembly. <Ref. to IDI-21, REMOVAL, Combination Meter.>
2) Remove the audio. <Ref. to ET-9, REMOVAL, Audio.>
3) Remove the GPS antenna. <Ref. to ET-18, REMOVAL, GPS Antenna.>
4) Remove the heater vent duct. <Ref. to AC-51, REMOVAL, Heater Vent Duct.>

5) Remove the bolts securing the passenger's side airbag module to the steering support beam.



6) Remove the claw, and remove the passenger's airbag module.

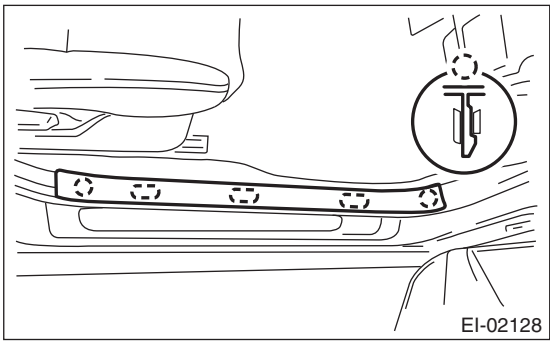


20.Lower Inner Trim

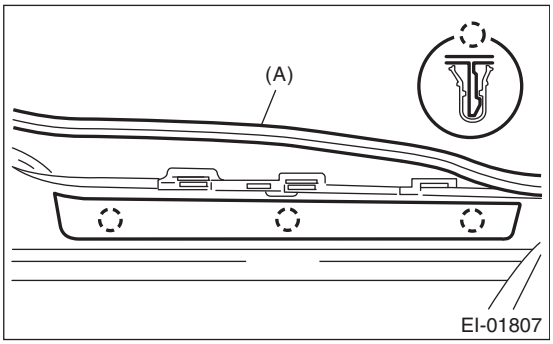
A: REMOVAL

1) Remove the hook, and remove the inside scuff plate.

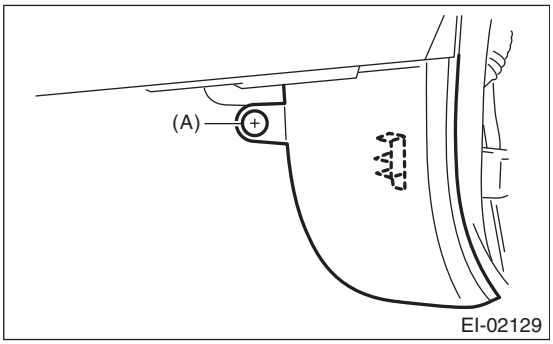
CAUTION:
Do not pull with excessive force. There is the possibility of the scuff plate being damaged.



2) Remove the door molding (A), and remove the outside scuff plate.

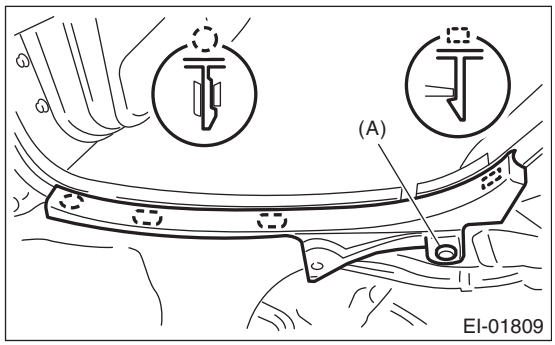


3) Remove clip (A), and remove the front pillar lower trim.

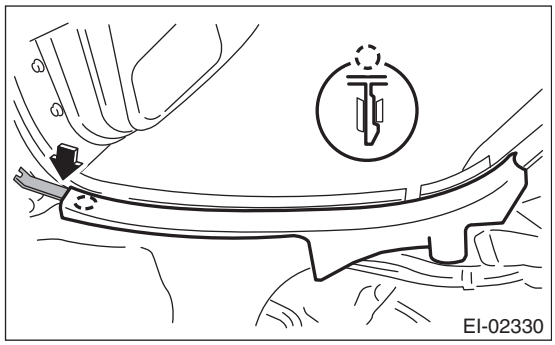


4) Remove the rear seat cushion. <Ref. to SE-16, REMOVAL, Rear Seat.>
5) Remove clip (A), and remove the inside scuff plate.

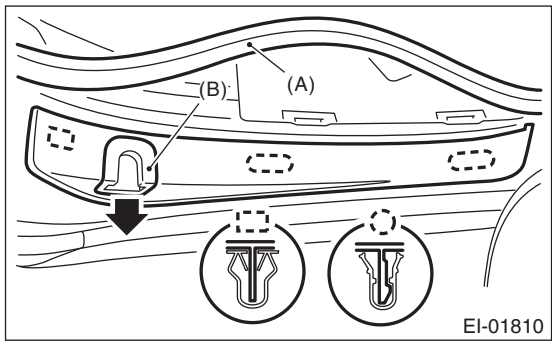
CAUTION:
Do not pull with excessive force. There is the possibility of the scuff plate being damaged.



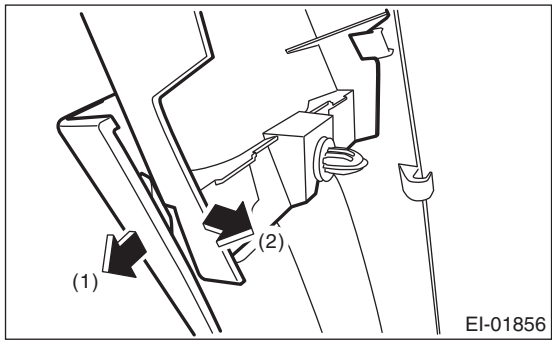
NOTE:
• To facilitate the work, remove the weather strip and access the scuff plate tabs from behind the floor mat.
• To release the tabs on the front edge of the scuff plate easily, use a clip remover.



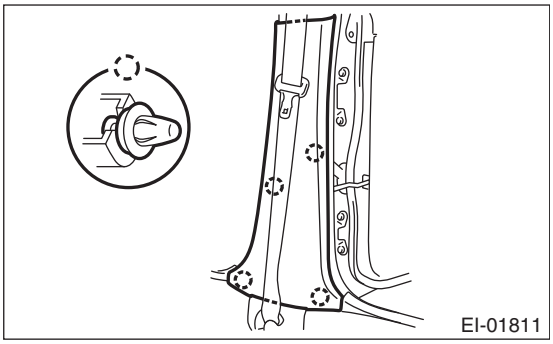
6) Remove door molding (A) and door catcher cover (B), then remove the outside scuff plate.



7) Spread the lower trim tab outward to disengage and pull the upper trim to remove.



8) Remove the clips of the center pillar lower trim.



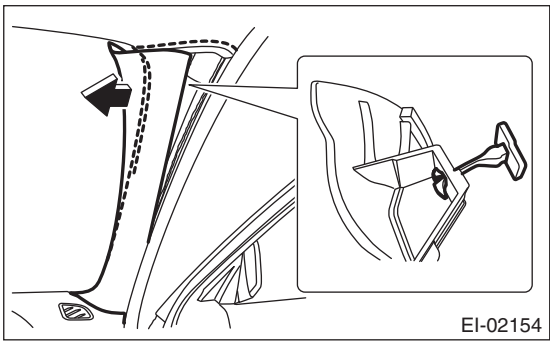
B: INSTALLATION

Install each part in the reverse order of removal.

21.Upper Inner Trim

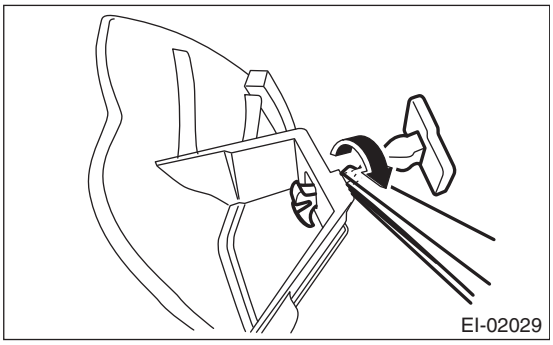
A: REMOVAL

1) Pull the upper part of the front pillar upper trim towards the center of the vehicle.

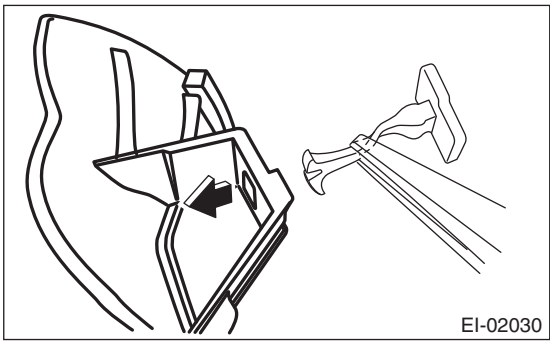

EI-02154

2) Insert long-nose pliers into the top part of the trim, grip the clip with the pliers and twist 90° in that position.

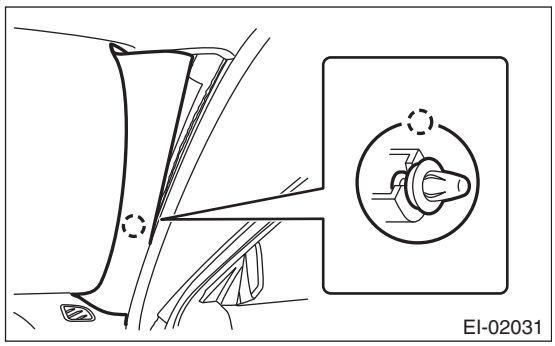
CAUTION:
Be careful not to damage the pillar trim surface and curtain airbag module when inserting the pliers.


EI-02029

3) Holding the clip twisted as in the previous step, remove the front pillar upper trim from the clip.

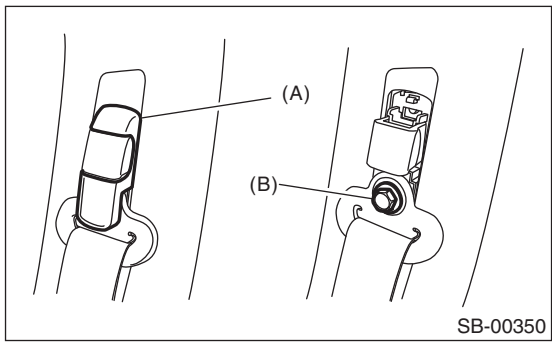

EI-02030

4) Remove the clip and the front pillar upper trim.


EI-02031

5) Remove the front inside scuff plate, rear inside scuff plate and center pillar lower trim. <Ref. to EI-56, REMOVAL, Lower Inner Trim.>

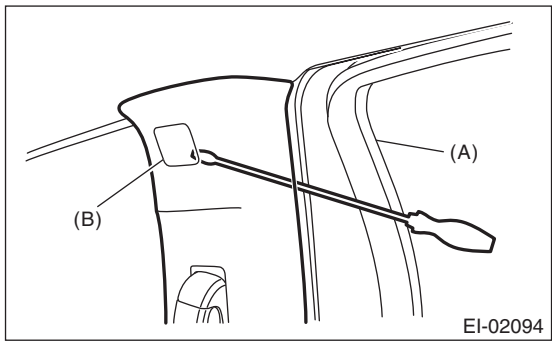
6) Remove the shoulder anchor.



SB-00350

(1) Remove anchor bolt cover (A).
(2) Loosen the shoulder anchor bolt (B), and then detach the shoulder anchor from center pillar.

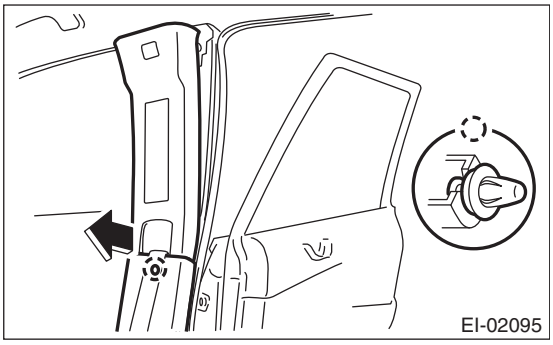
7) Remove the cap (B) on the upper side of the pillar trim, and remove the bolt.



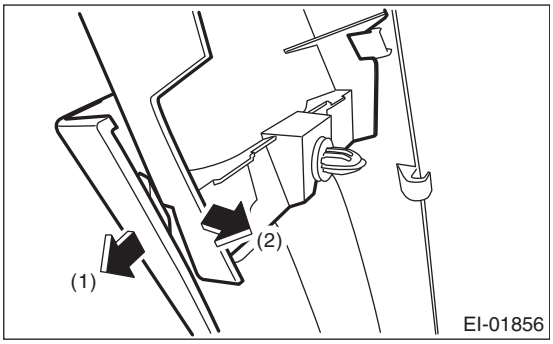
EI-02094

NOTE:
Remove molding (A), and remove the cap from the backside of the pillar trim being careful not to damage the trim.

8) Pull the upper trim clip part of the center pillar towards yourself along with the entire lower trim.



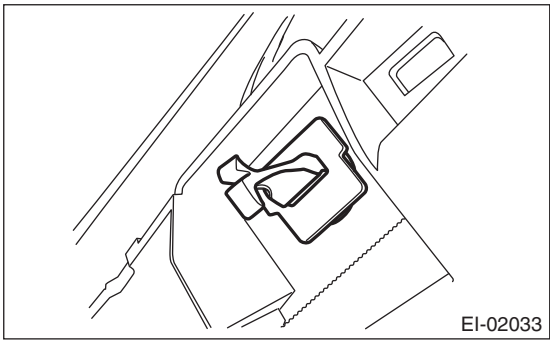
9) Spread the lower trim tab outward to disengage and pull the upper trim to remove.



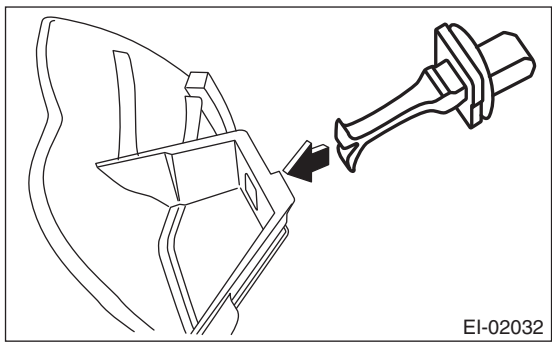
B: INSTALLATION

CAUTION:
• Do not reuse the pillar trim upper clips. The securing strength of the clips is reduced once they are removed from the pillar trim. Reuse might result in the pillar trim falling off.
Always use new clips when installing the pillar trim.
• Before installing the pillar trim, check the condition of the protective fabric (white) of the curtain airbags. Replace the curtain airbag module assembly with a new module if the protective fabric is damaged (if the pink fabric of the airbag module can be seen).

1) Remove the remaining clips from the vehicle body.



2) Prepare new clips and install the front pillar trim.



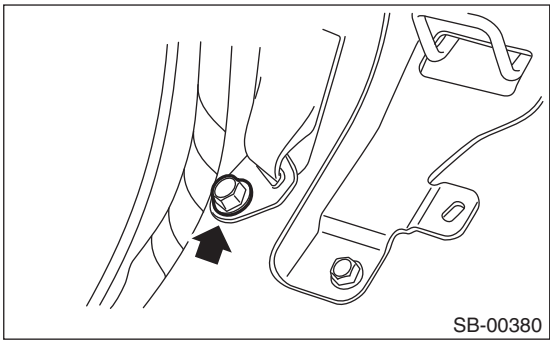
3) Install the front pillar trim.
4) Install each part in the reverse order of removal.

Tightening torque
Refer to "COMPONENT" of "General Description".
Upper inner trim: <Ref. to EI-18, INNER TRIM, COMPONENT, General Description.>
Seat belt anchor: <Ref. to SB-2, FRONT SEAT BELT, COMPONENT, General Description.>

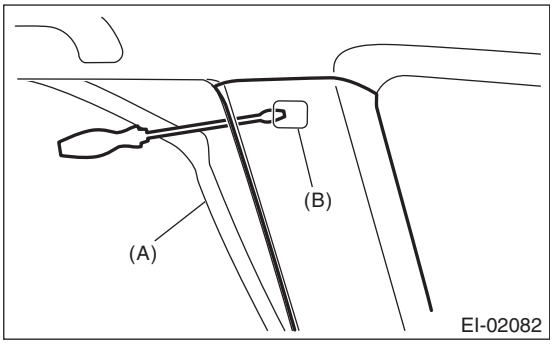
22.Rear Quarter Trim

A: REMOVAL

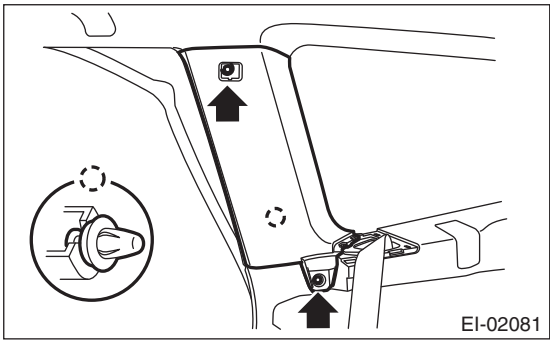
1) Remove the rear seat. <Ref. to SE-16, REMOVAL, Rear Seat.>
2) Remove the seat belt lower anchor bolt.



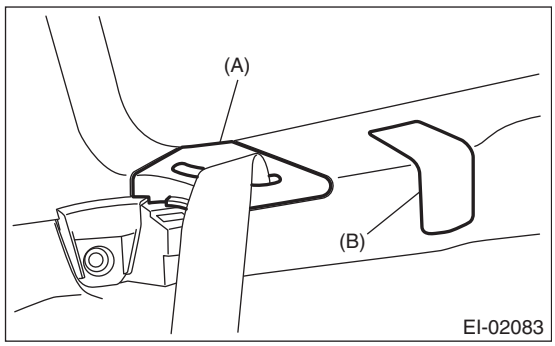
3) Remove cap (B) on the upper side of the rear quarter pillar front trim.



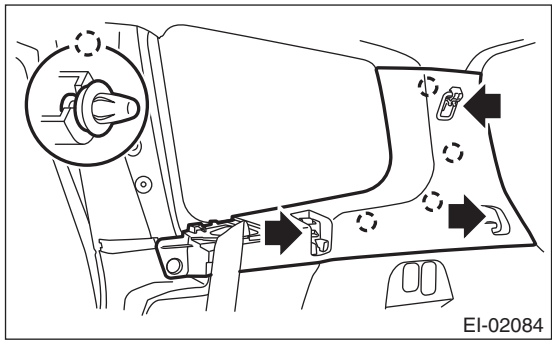
NOTE:
Remove molding (A), and remove the cap from the backside of the pillar trim being careful not to damage the trim.
4) Remove the bolt and screw, and remove the rear quarter pillar front trim.



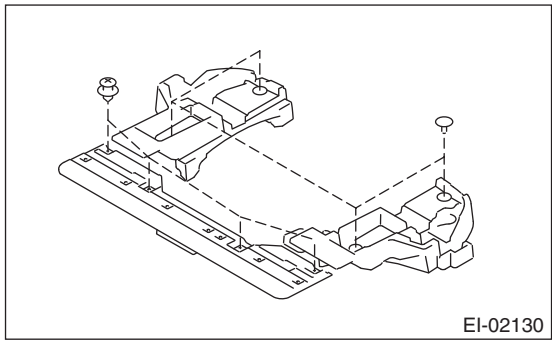
5) Remove covers (A) and (B).



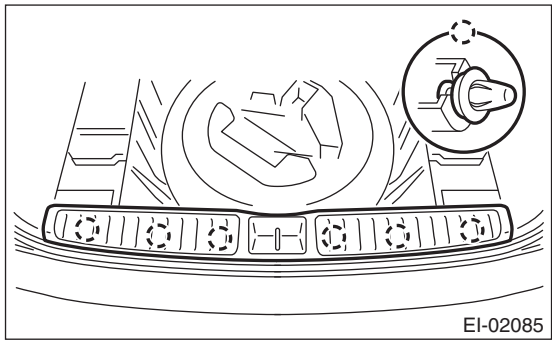
6) Remove the clips and screws, and remove the rear quarter upper trim.



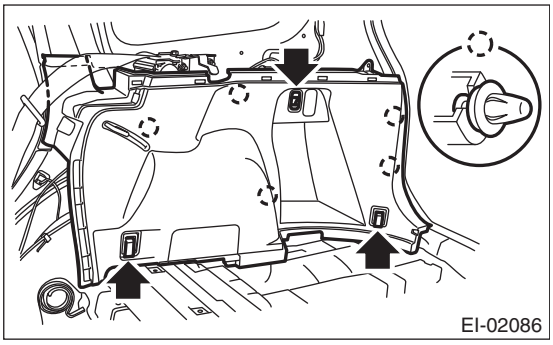
7) Remove the rear floor spacer.



8) Remove the luggage room end covers.



9) Remove the bolt and screws, and remove the rear quarter lower trim.



B: INSTALLATION

Install each part in the reverse order of removal.

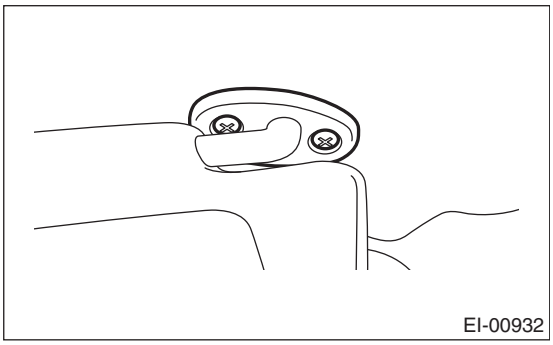
Tightening torque

Refer to "COMPONENT" of "General Description".
Rear quarter upper trim: <Ref. to EI-18, INNER TRIM, COMPONENT, General Description.>
Seat belt anchor: <Ref. to SB-3, REAR SEAT BELT, COMPONENT, General Description.>

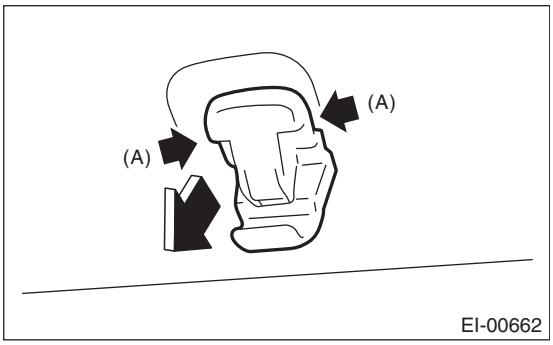
23.Sun Visor

A: REMOVAL

1) Remove the mounting screws and detach the sun visor.



2) While pressing the (A) on the both side using flat tip screwdriver, pull the sun visor hook to remove it.



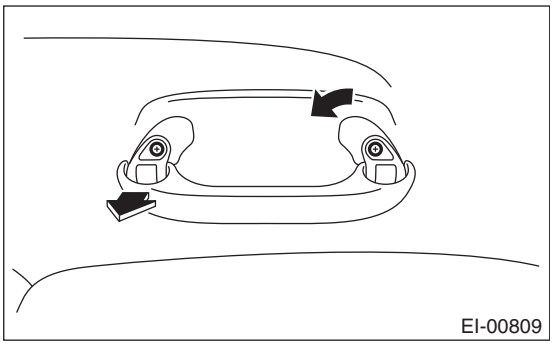
B: INSTALLATION

Install each part in the reverse order of removal.

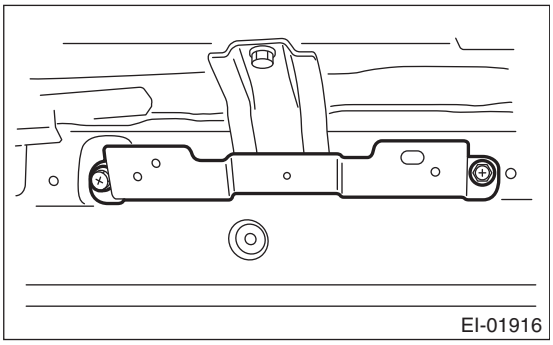
24.Assist Grip

A: REMOVAL

1) Remove the screw cover, and remove the screw inside.
2) Pull the left side of assist grip, and rotate the right side of it counterclockwise to remove.



3) Remove the roof trim. <Ref. to EI-64, REMOVAL, Roof Trim.>
4) Remove the bolts, and remove the assist grip bracket.



B: INSTALLATION

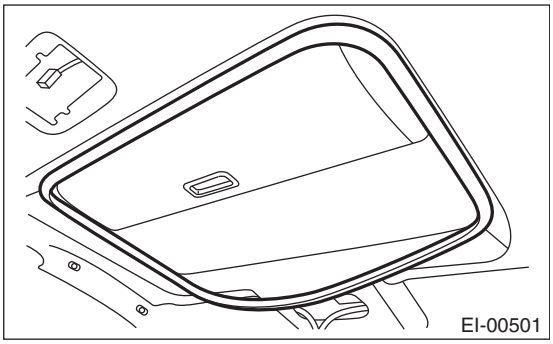
Install each part in the reverse order of removal.

Tightening torque
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

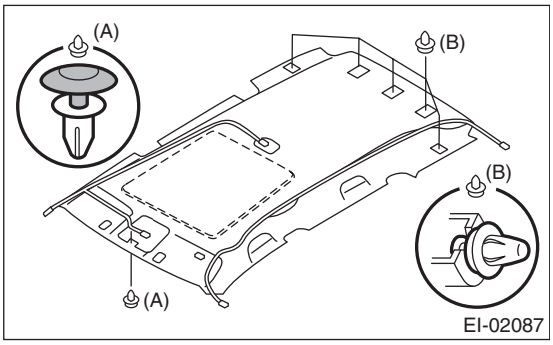
25.Roof Trim

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the spot map light. <Ref. to LI-36, REMOVAL, Spot Map Light.>
3) Remove the room light. <Ref. to LI-37, REMOVAL, Room Light.>
4) Remove the sun visor. <Ref. to EI-62, REMOVAL, Sun Visor.>
5) Remove the assist grip. <Ref. to EI-63, REMOVAL, Assist Grip.>
6) Remove the upper inner trim. <Ref. to EI-58, REMOVAL, Upper Inner Trim.>
7) Remove the rear quarter trim. <Ref. to EI-60, REMOVAL, Rear Quarter Trim.>
8) Remove the sunroof opening trim. (Model with sunroof)


EI-00501

9) Disconnect the harness connectors of the right and left front pillars, and the rear quarter (LH).
10) Remove the clips, and then remove the roof trim.



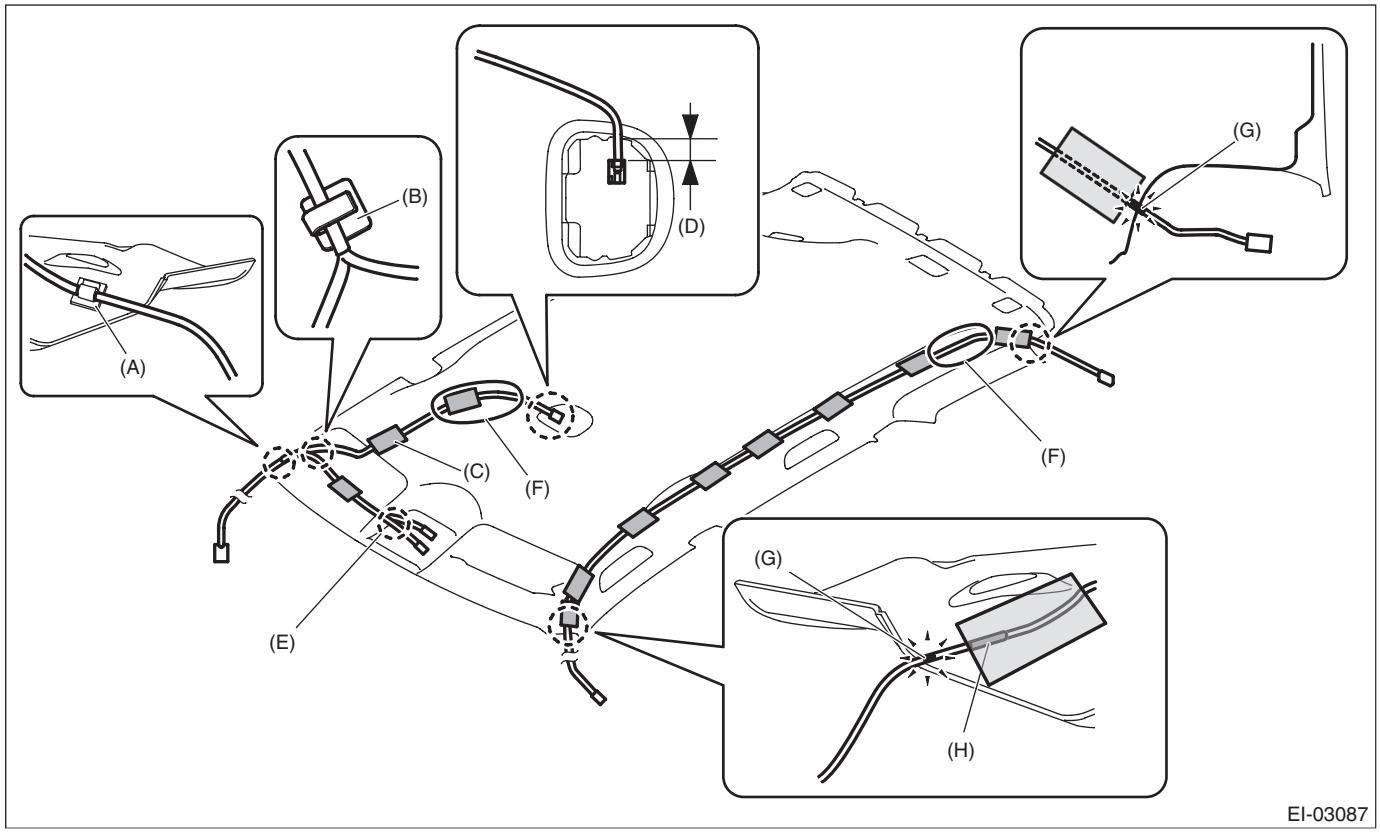
EI-02087

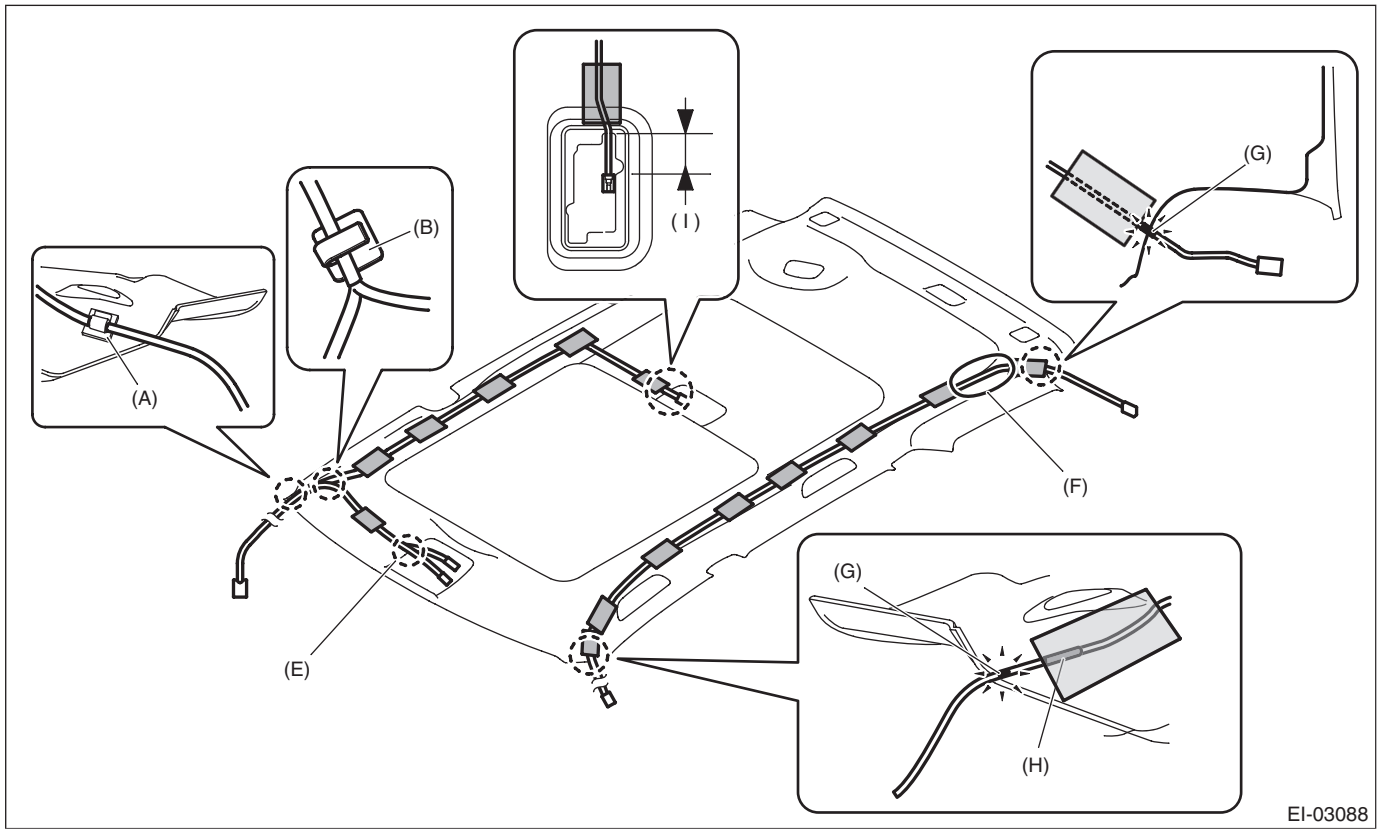
B: INSTALLATION

1) Apply the roof cord and feeder cord along the mark-off line of the roof trim.

Tape:
Item number: 86359SC000/TAPE

NOTE:
Use the tape (service parts) by cutting into 80 mm × 50 mm (3.2 in × 2.0 in).





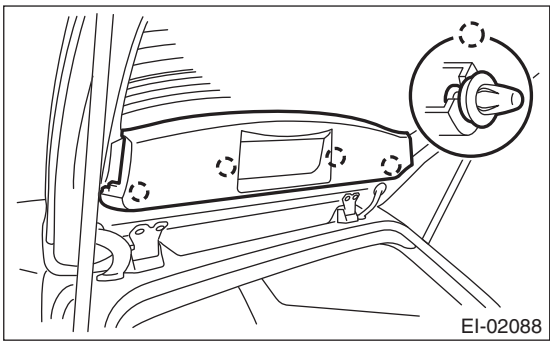
(A)	Place the roof cord along the roof trim clamp to secure.	(D)	Adjust the excess roof cord to 55±15 mm (2.2±0.6 in).	(G)	Align the red tape of the feeder cord to the roof trim end.
(B)	Fix the roof cord branching point with the clip.	(E)	Fix the roof cord branching point to the patch area of overhead console.	(H)	Affix with tape while aligning with the white tape of the feeder cord.
(C)	Attach the tape along the back side line of the sun visor.	(F)	Fix with the tape by adjusting the excess portion of cord at the (F) position.	(I)	Adjust the excess roof cord to 55±15 mm (2.2±0.6 in).

2) Install each part in the reverse order of removal.

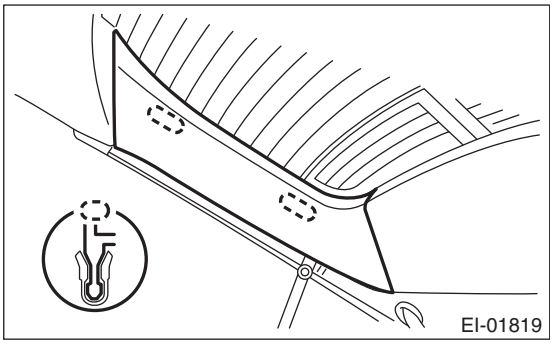
26.Rear Gate Trim

A: REMOVAL

1) Remove the high-mounted stop light. <Ref. to LI-35, REMOVAL, High-mounted Stop Light.>
2) Remove the clips, and remove the rear gate upper trim.

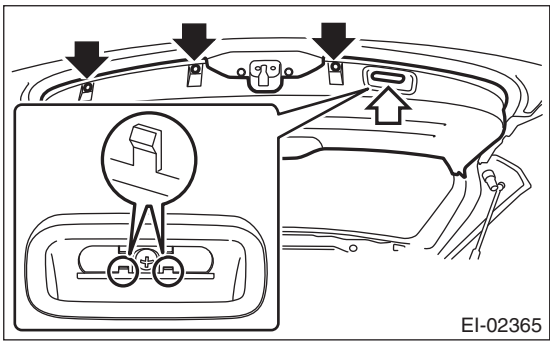

EI-02088

3) Using a plastic clip remover, disengage the trim tabs and remove the rear gate pillar trim.


EI-01819

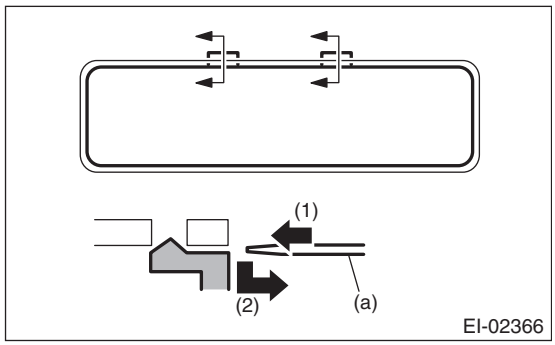
4) Remove the hand grip and clip of rear gate.

CAUTION:
Be careful not to scratch the trim.


EI-02365

(1) Open the cover by using a plastic remover, etc.
(2) Remove the screws and detach the hand grip.

NOTE:
If the screw cover cannot be opened, perform the procedures indicated in the figure.

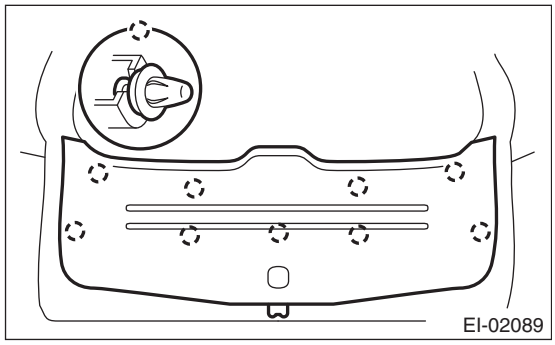


EI-02366

(a) Precise screwdriver, etc

(1) Insert the precise screwdriver, etc.
(2) With the precise screwdriver, etc inserted, push down the tab to disengage and pull it towards yourself.

5) Remove the clips and rear gate lower trim.


EI-02089

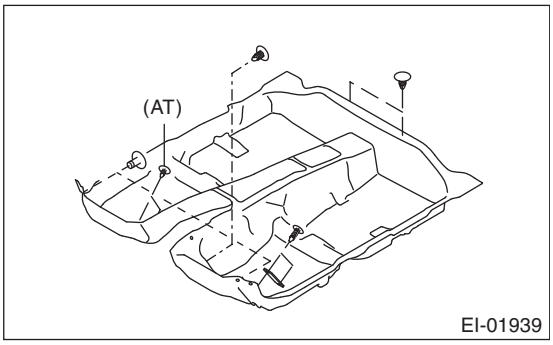
B: INSTALLATION

Install each part in the reverse order of removal.

27.Floor Mat

A: REMOVAL

1) Remove the front seats. <Ref. to SE-8, REMOVAL, Front Seat.>
2) Remove the rear seat cushion. <Ref. to SE-16, REMOVAL, Rear Seat.>
3) Remove the console box. <Ref. to EI-49, Console Box.>
4) Remove the console side panel. <Ref. to EI-50, CONSOLE FRONT PANEL, REMOVAL, Center Console.>
5) Remove the lower inner trim. <Ref. to EI-56, REMOVAL, Lower Inner Trim.>
6) Remove the fuel filler lid opener. <Ref. to SL-39, FUEL FILLER LID OPENER, REMOVAL, Remote Openers.>
7) Remove the footrest.
8) Remove the clips from the floor mat.
9) Remove the mat hook on both sides.
10) Remove the mat from toe board area.
11) Remove the mat from rear heater duct.
12) Roll the mat, and then take it out of opened rear door.



(AT) Automatic transmission model

B: INSTALLATION

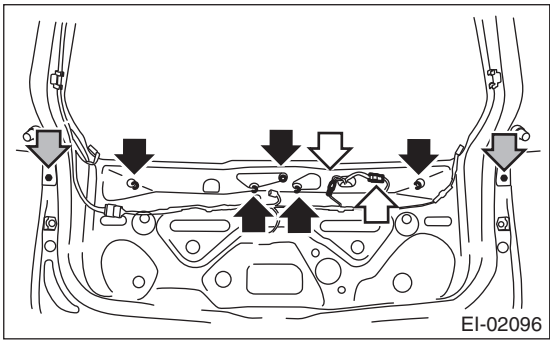
Install each part in the reverse order of removal.

NOTE:
- Secure the mat firmly with hook and clip.
- Insert the mat edge firmly into the groove of side sill cover.

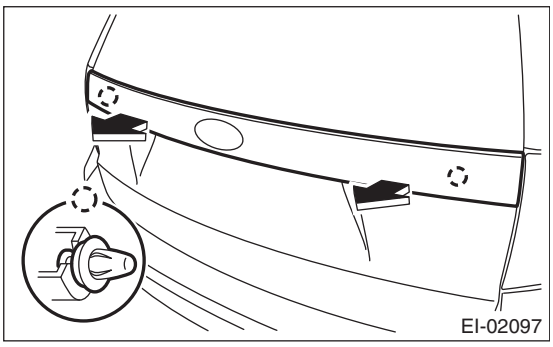
28.Rear Gate Garnish

A: REMOVAL

1) Remove the rear gate trim. <Ref. to EI-67, REMOVAL, Rear Gate Trim.>
2) Remove the rear wiper motor. <Ref. to WW-20, Rear Wiper Motor.>
3) Disconnect the connectors (white arrows).
4) Remove the nuts (black and gray arrows).



5) Remove the clips and rear gate garnish.



B: INSTALLATION

CAUTION:
Make sure that the harness grommet is securely installed.
If not properly installed, this may cause leaks.
Install each part in the reverse order of removal.

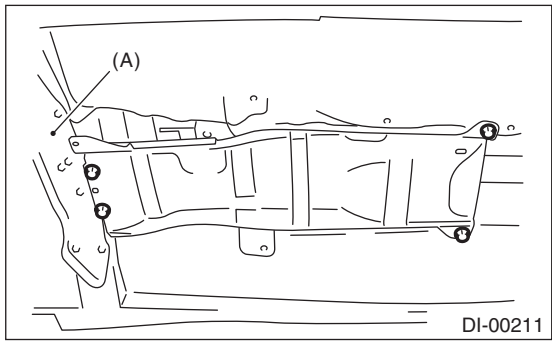
Tightening torque
4.5 N·m (0.46 kgf-m, 3.3 ft-lb)

29.Heat Shield Cover

A: REMOVAL

1. FRONT HEAT SHIELD COVER

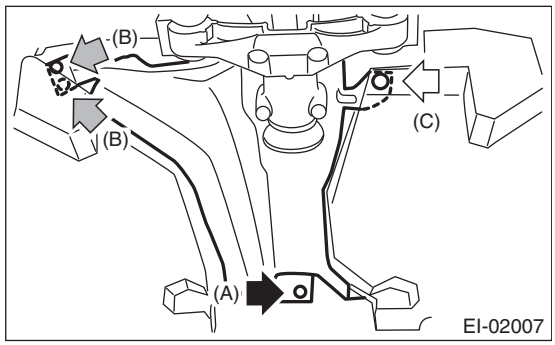
1) Disconnect the ground cable from battery.
2) Disconnect the connector from oxygen (A/F) sensor.
• Turbo model: <Ref. to EX(H4DOTC)-7, REMOVAL, Center Exhaust Pipe.>
• Non-turbo model: <Ref. to EX(H4DO)-5, REMOVAL, Front Exhaust Pipe.>
3) Remove the exhaust pipe and muffler.
4) Remove the four bolts to remove the front heat shield cover.

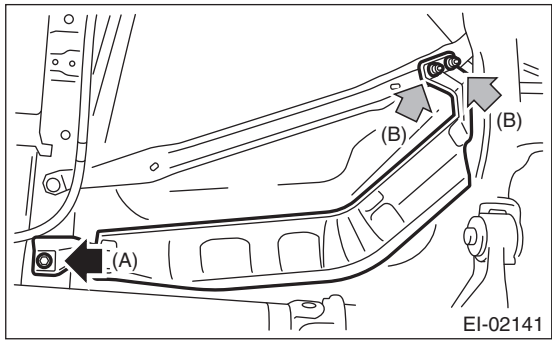


(A) Transmission mount

2. CENTER HEAT SHIELD COVER

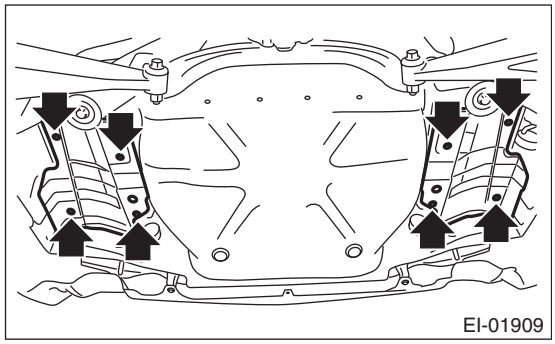
1) Remove the rear exhaust pipe and muffler.
2) Remove the propeller shaft. (Turbo model only) <Ref. to DS-10, REMOVAL, Propeller Shaft.>
3) Remove the bolt (A), nut (B) and clip (C) to remove center heat shield cover.





3. REAR HEAT SHIELD COVER

1) Remove the rear exhaust pipe and muffler.
2) Remove the bolts, and remove the rear heat shield cover.



B: INSTALLATION

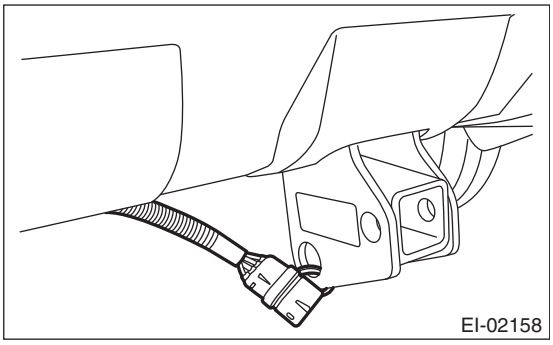
Install each part in the reverse order of removal.

Tightening torque:
Refer to "COMPONENT" of "General Description". <Ref. to EI-22, HEAT SHIELD COVER, COMPONENT, General Description.>

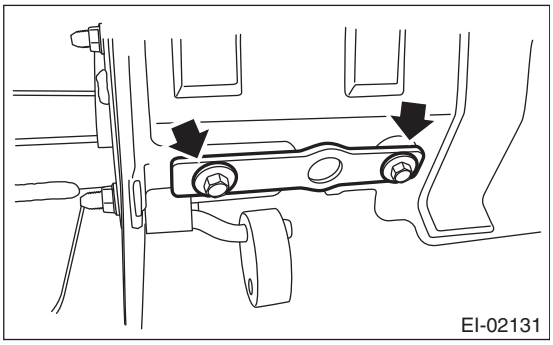
30.Trailer Hitch

A: REMOVAL

1) Remove the muffler.
2) Remove the trailer hitch harness.

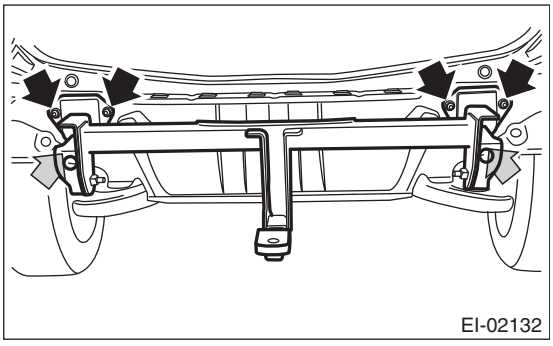


3) Remove the rear bumper face. <Ref. to EI-36, REAR BUMPER FACE, REMOVAL, Rear Bumper.>
4) Remove the bolts, then remove the side plate lower.



5) Remove the nuts, and then remove the trailer hitch main frame assembly.

CAUTION:
The trailer hitch main frame assembly is heavy. Be careful when removing.



6) Remove the side plate upper from the vehicle.

B: INSTALLATION

Install each part in the reverse order of removal.

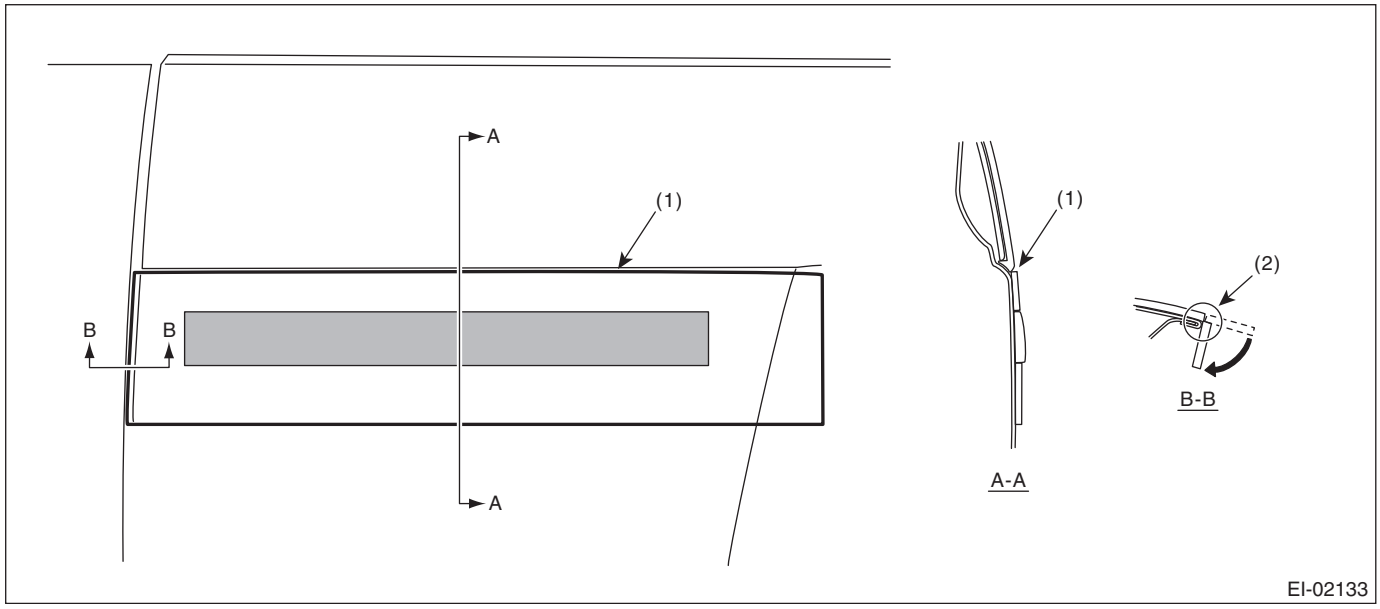
Tightening torque:
Refer to "COMPONENT" of "General Description". <Ref. to EI-23, TRAILER HITCH, COMPONENT, General Description.>

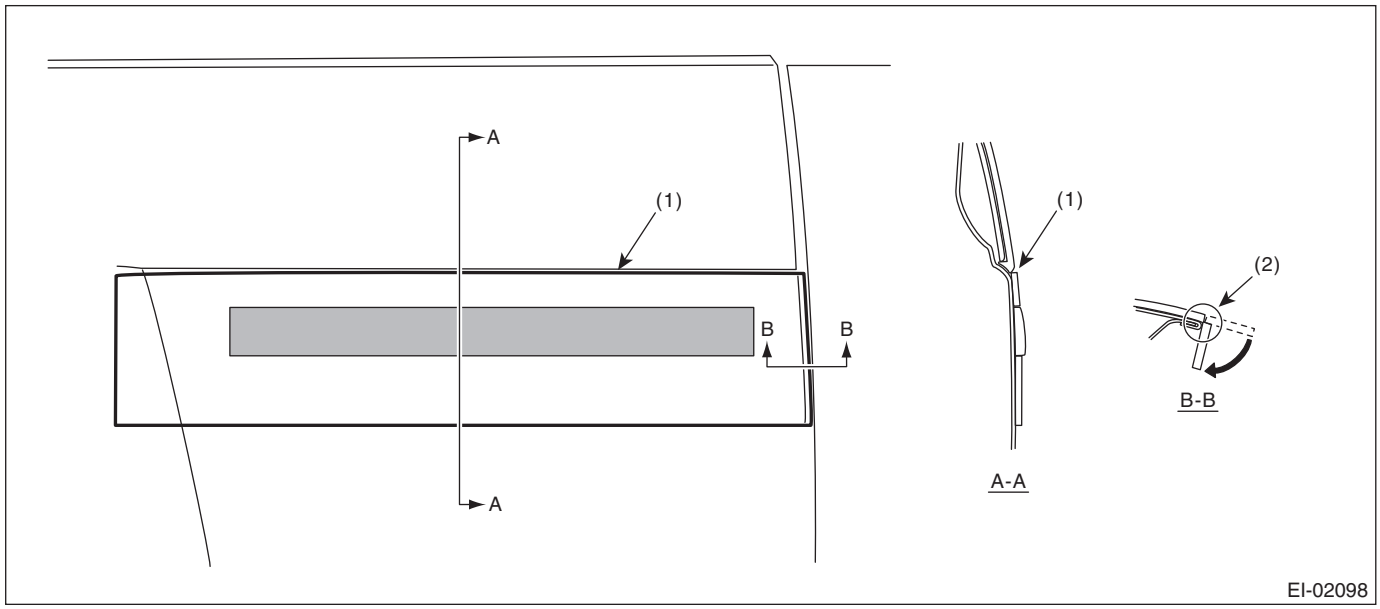
31.Ornament

A: INSTALLATION

1. LETTER MARK

Adhere the letter mark according to the following measurements.





(1) Align the upper edge of the application tape with the rear gate garnish.

(2) Align the slit of the application tape with the edge of the rear gate panel, and break off the application tape.

EXTERIOR BODY PANELS

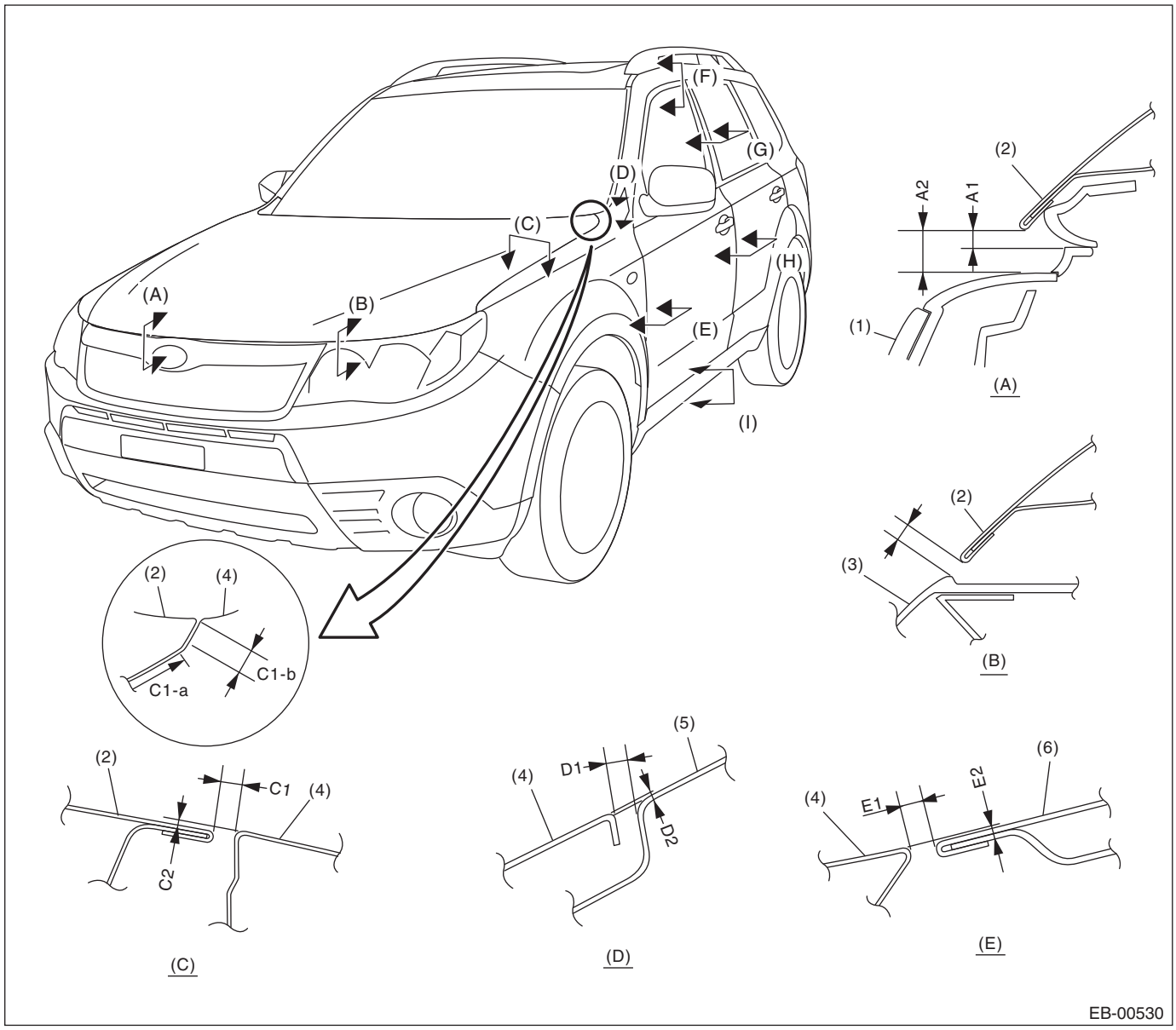
EB

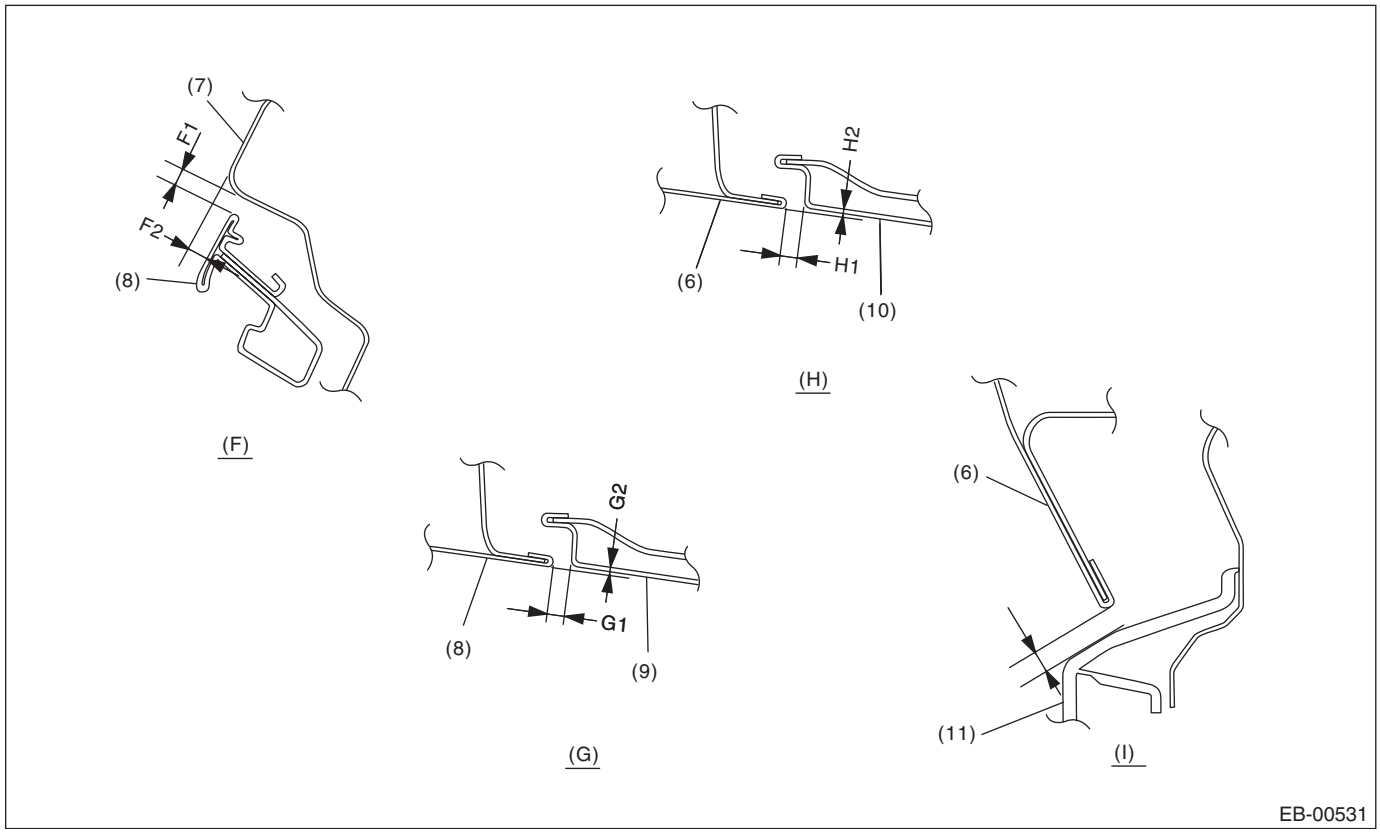
		Page
1.	General Description	2
2.	Front Hood	12
3.	Front Fender	14
4.	Front Performance Stay	15
5.	Front Door	16
6.	Front Sealing Cover	18
7.	Rear Door	19
8.	Rear Sealing Cover	21
9.	Door Sash Tape	22
10.	Rear Gate	27
11.	Protector Tape	31

1. General Description

A: SPECIFICATION

1. FRONT



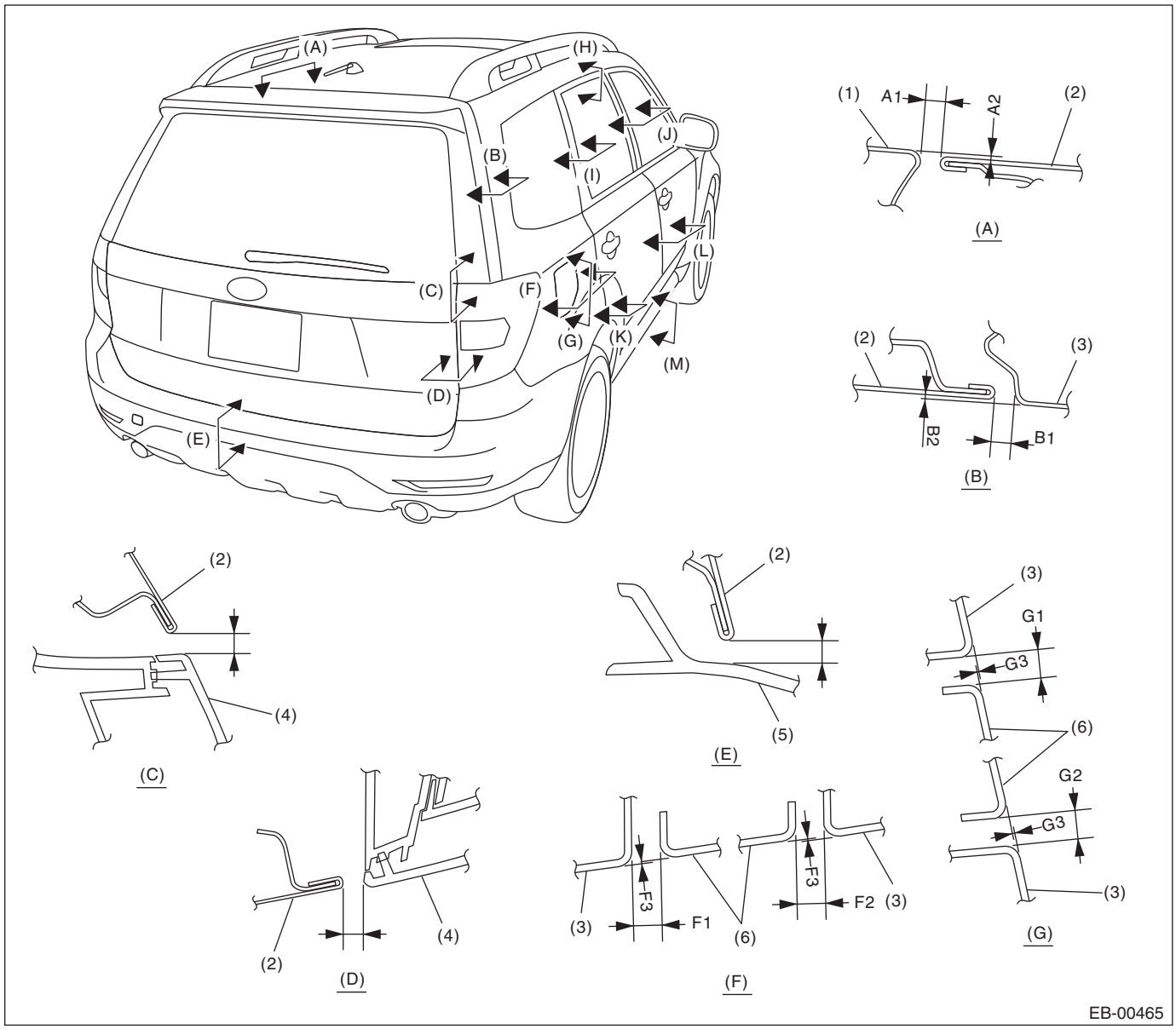


(1) Front grille
(2) Front hood panel
(3) Headlight
(4) Front fender panel
(5) Front pillar panel
(6) Front door panel
(7) Roof panel
(8) Front door sash
(9) Rear door sash
(10) Rear door panel
(11) Side sill spoiler

Section	Part	Standard
(A)	Front hood panel to Front grille	A1: 2.2±1.0 mm (0.09±0.04 in) A2: 7.7±1.0 mm (0.30±0.04 in)
(B)	Front hood panel to Headlight	5.6±1.0 mm (0.22±0.04 in)
(C)	Front hood panel to Front fender panel	C1-a: 3.5±1.0 mm (0.14±0.04 in) C1-b: 4.5±1.0 mm (0.18±0.04 in) C2: –0.5, +0.5 — –1.0 mm (–0.02 +0.02 — –0.04 in)
(D)	Front fender panel to Front pillar panel	D1: 3.0±1.0 mm (0.12±0.04 in) D2: 0±1.0 mm (0±0.04 in)
(E)	Front fender panel to Front door panel	E1: 4.0±1.0 mm (0.16±0.04 in) E2: 0+1.0, –0.5 mm (0+0.04, –0.02 in)
(F)	Roof panel to Front door sash	F1: 5.0±1.0 mm (0.20±0.04 in) F2: 3.8±1.0 mm (0.15±0.04 in)
(G)	Front door sash to Rear door sash	G1: 5.5±1.0 mm (0.22±0.04 in) G2: 0+1.0, –0.5 mm (0+0.04, –0.02 in)
(H)	Front door panel to Rear door panel	H1: 4.5±1.0 mm (0.18±0.04 in) H2: 0+1.0, –0.5 mm (0+0.04, –0.02 in)
(I)	Front door panel to Side sill spoiler	6.0±1.0 mm (0.24±0.04 in)

NOTE:
For surface level gap between sunroof lid and roof panel, refer to “Adjustment” of “SUNROOF”. <Ref. to SR-5, ADJUSTMENT, Sunroof Lid.>

2. REAR


(A)
(H)
(J)
(B)
(I)
(L)
(C)
(F)
(G)
(K)
(M)
(D)
(E)
(1)
A1
A2
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(A)
(2)
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B2
B1
(B)
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G1
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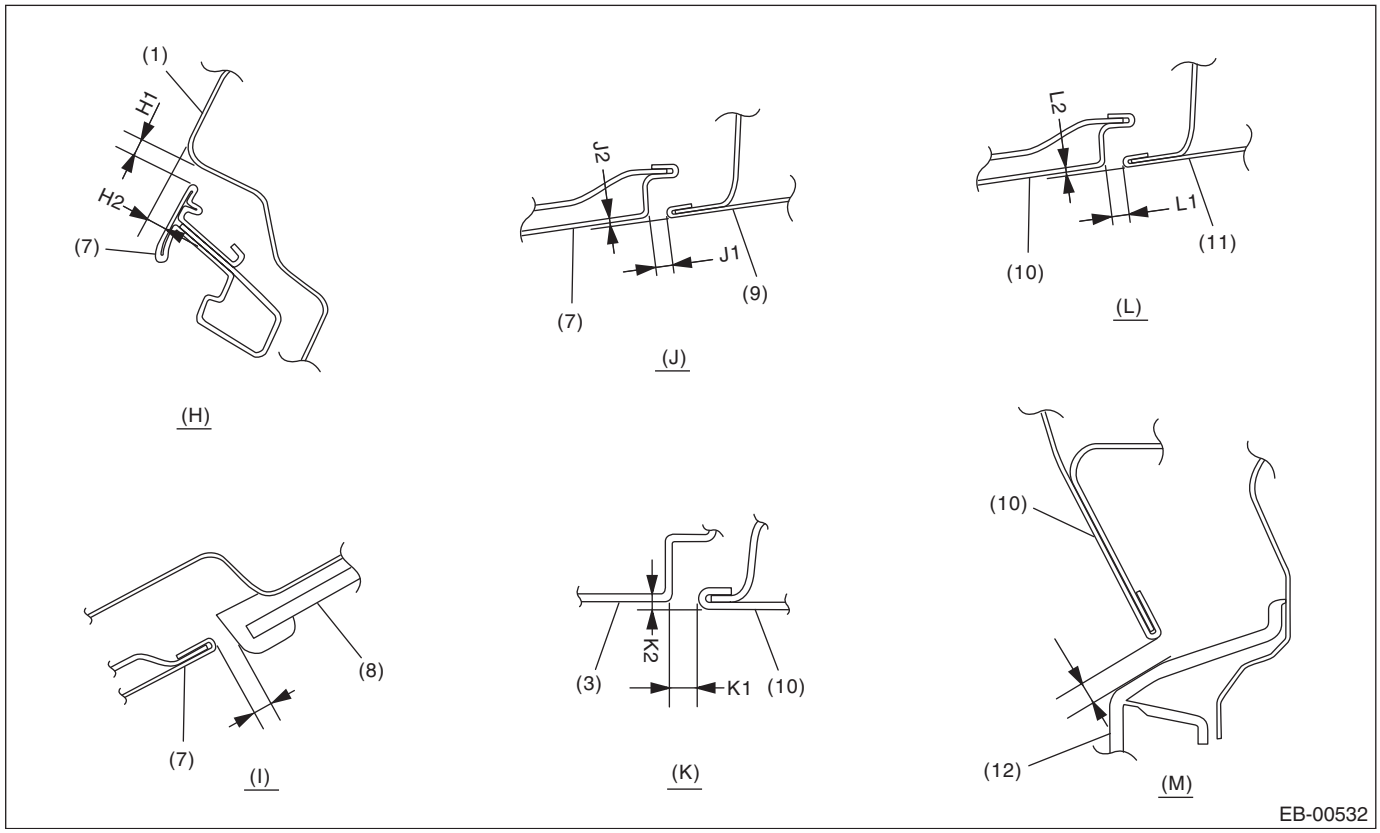
(F)
EB-00465

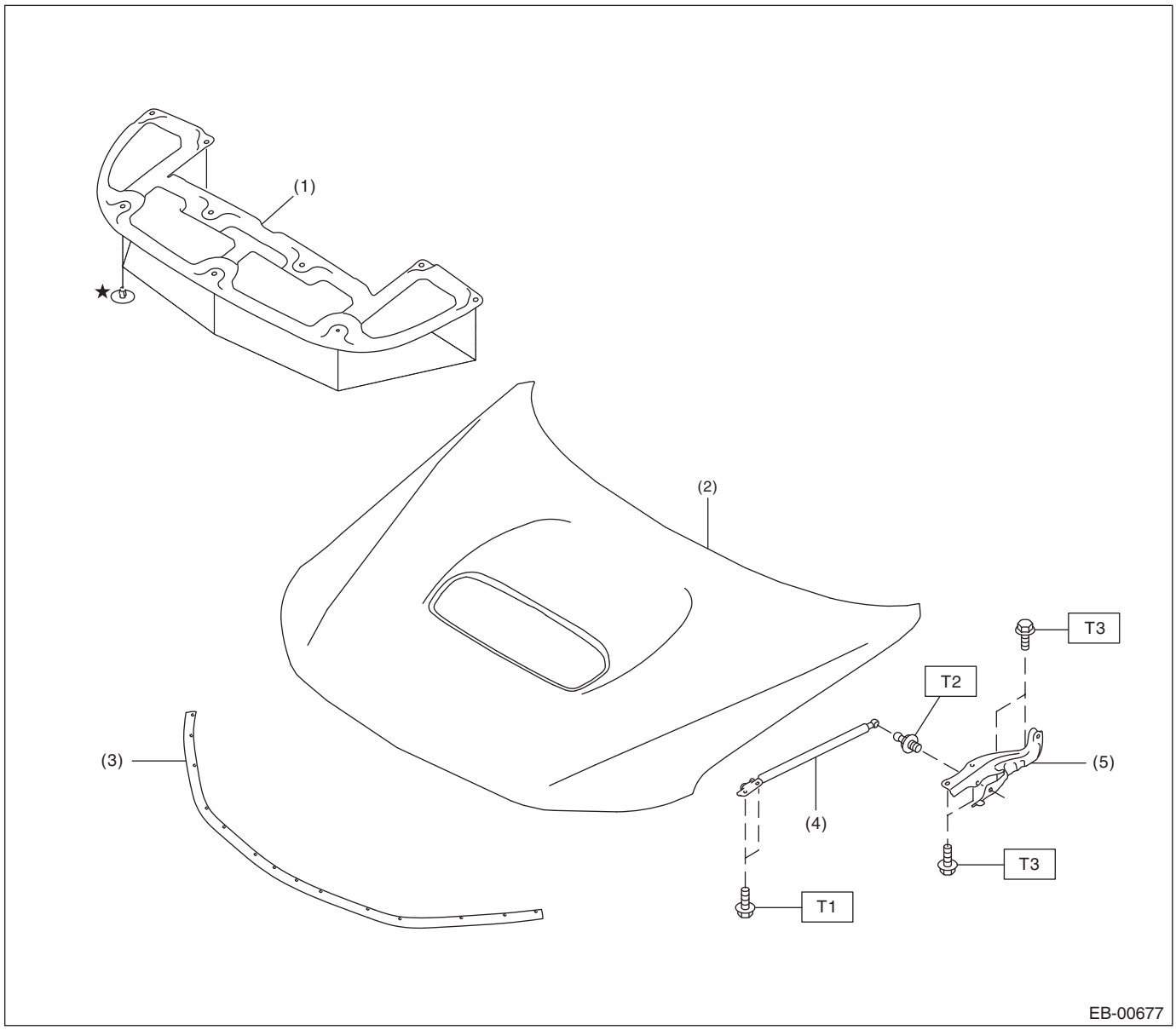


(1) Roof panel
(2) Rear gate panel
(3) Rear quarter panel
(4) Rear combination light
(5) Rear bumper
(6) Fuel filler lid
(7) Rear door sash
(8) Rear quarter glass
(9) Front door sash
(10) Rear door panel
(11) Front door panel
(12) Side sill spoiler

Section	Part	Standard
(A)	Roof panel to Rear gate panel	A1: 6.5+1.0, –0.5 mm (0.26+0.04, –0.02 in) A2: 1.5±1.0 mm (0.06±0.04 in)
(B)	Rear gate panel to Rear quarter panel	B1: 6.8±1.0 mm (0.27±0.04 in) B2: 0–1.5 mm (0–0.06 in)
(C)	Rear combination light to Rear gate panel	5.4±1.0 mm (0.21±0.04 in)
(D)	Rear combination light to Rear gate panel	5.1±1.0 mm (0.20±0.04 in)
(E)	Rear gate panel to Rear bumper	7.1±1.0 mm (0.28±0.04 in)
(F)	Rear quarter panel to Fuel filler lid	F1: 3.5±0.5 mm (0.14±0.02 in) F2: 3.5±0.5 mm (0.14±0.02 in) F3: –0.2±0.4 mm (0.01±0.02 in)
(G)	Rear quarter panel to Fuel filler lid	G1: 3.5±0.5 mm (0.14±0.02 in) G2: 3.5±0.5 mm (0.14±0.02 in) G3: –0.2±0.4 mm (0.01±0.02 in)
(H)	Roof panel to Rear door sash	H1: 5.0±1.0 mm (0.20±0.04 in) H2: 3.8±1.0 mm (0.15±0.04 in)
(I)	Rear door sash to Rear quarter glass	5.5±1.0 mm (0.22±0.04 in)
(J)	Rear door sash to Front door sash	J1: 5.5±1.0 mm (0.22±0.04 in) J2: 0+1.0, –0.5 mm (0+0.04, –0.02 in)
(K)	Rear door panel to Rear quarter panel	K1: 4.0±1.0 mm (0.16±0.04 in) K2: 0±1.0 mm (0±0.04 in) (Vehicle body standard)
(L)	Front door panel to Rear door panel	L1: 4.5±1.0 mm (0.18±0.04 in) L2: 0+1.0, –0.5 mm (0+0.04, –0.02 in)
(M)	Rear door panel to Side sill spoiler	6.0±1.0 mm (0.24±0.04 in)

B: COMPONENT

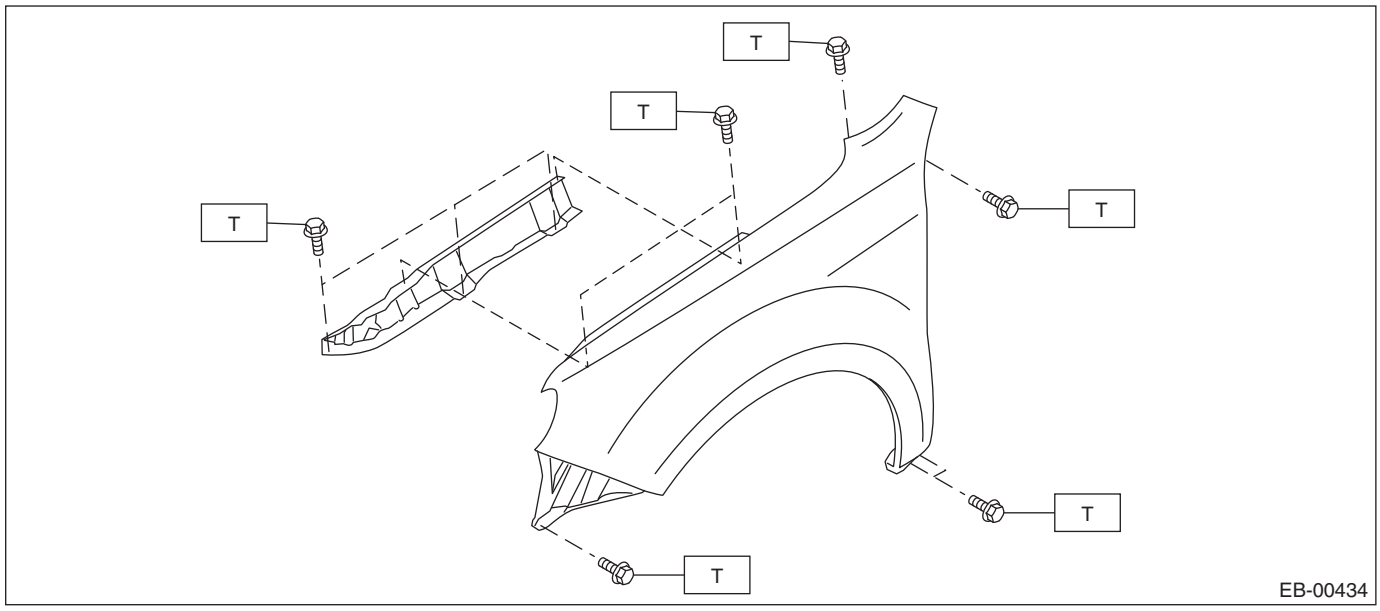
1. FRONT HOOD



(1) Insulator
(2) Front hood panel ASSY
(3) Seal
(4) Damper stay
(5) Hinge

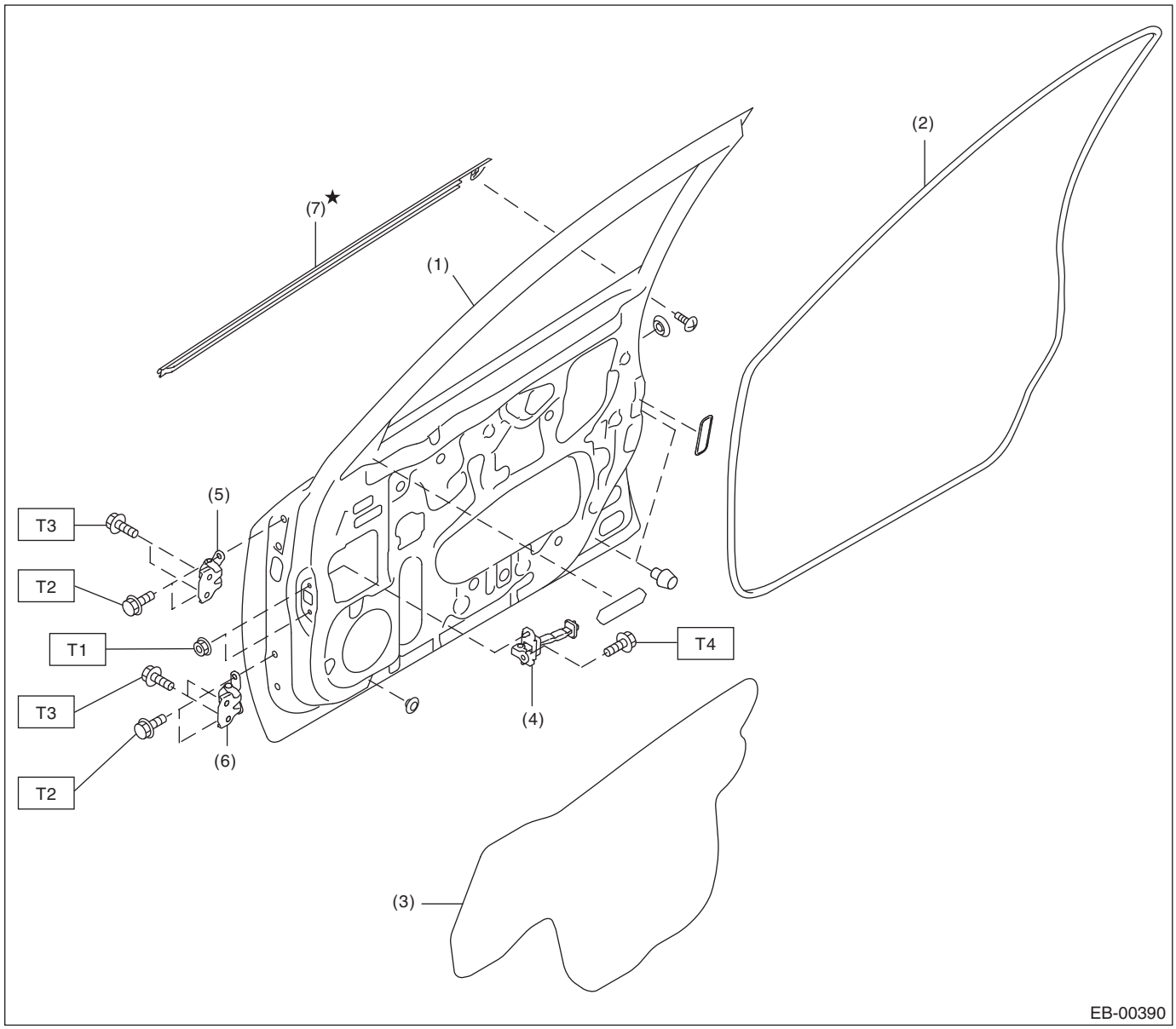
Tightening torque:N·m (kgf-m, ft-lb)
T1: 7.5 (0.76, 5.5)
T2: 20 (2.04, 14.5)
T3: 25 (2.55, 18.4)

2. FRONT FENDER



Tightening torque:N·m (kgf-m, ft-lb)
T: 7.5 (0.76, 5.5)

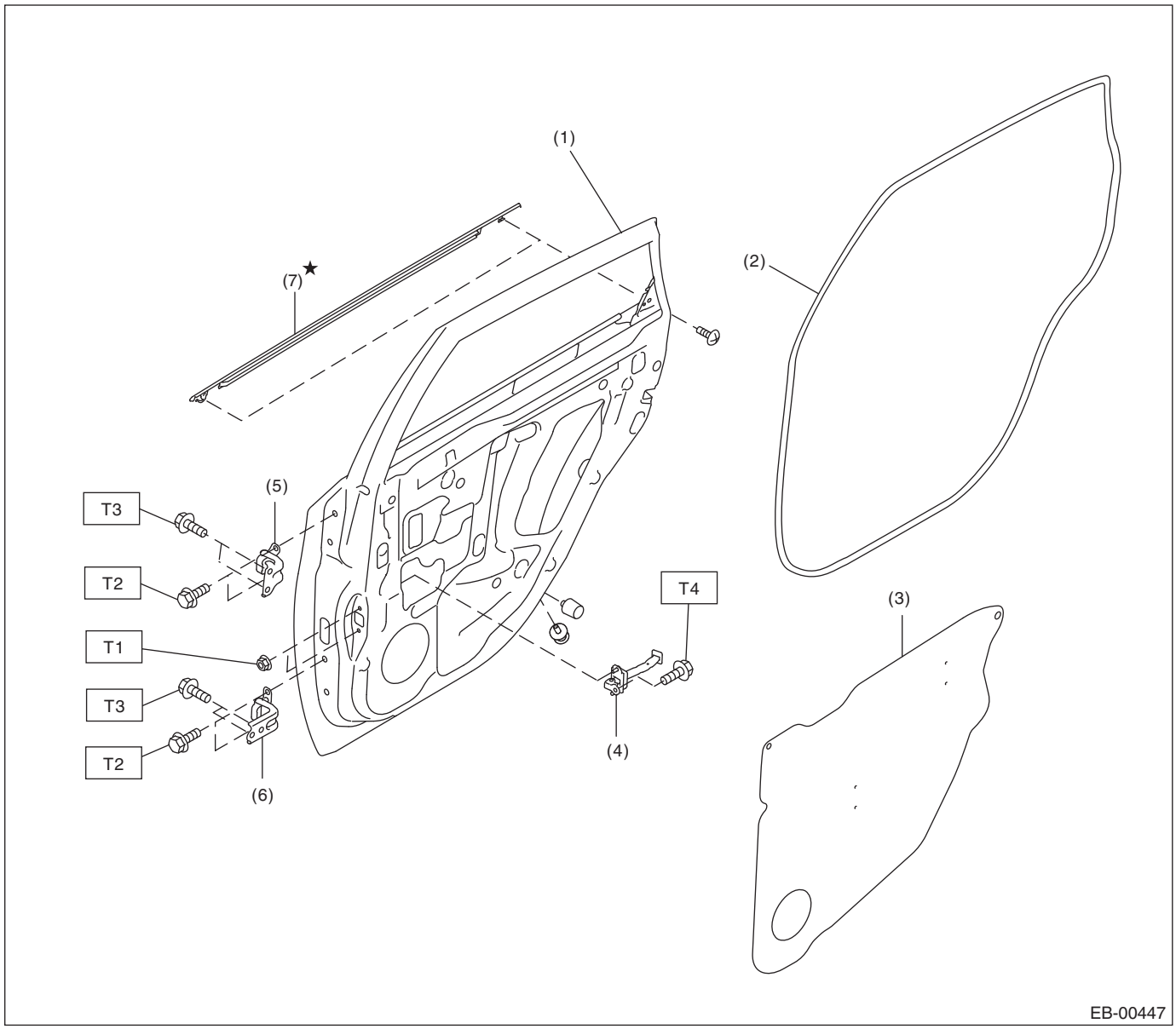
3. FRONT DOOR



(1) Front door panel
(2) Front door weather strip
(3) Sealing cover
(4) Checker
(5) Upper hinge
(6) Lower hinge
(7) Front door weather strip outer

Tightening torque:N·m (kgf-m, ft-lb)
T1: 7.5 (0.76, 5.5)
T2: 25 (2.55, 18.4)
T3: 30 (3.06, 22.1)
T4: 33 (3.36, 24.3)

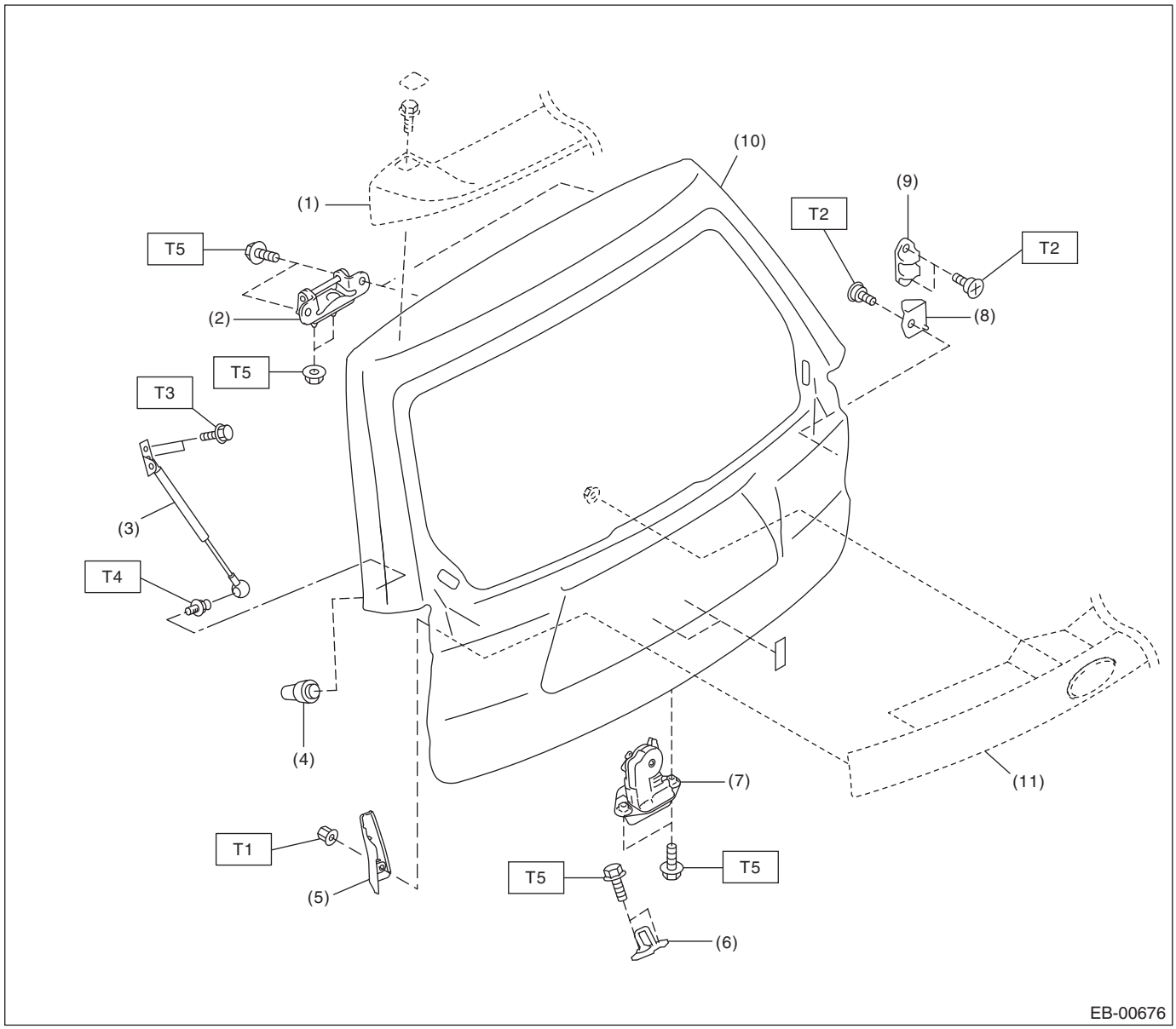
4. REAR DOOR



(1)	Rear door panel	(6)	Lower hinge
(2)	Rear door weather strip	(7)	Rear door weather strip outer
(3)	Sealing cover		
(4)	Checker		
(5)	Upper hinge		

Tightening torque:N·m (kgf-m, ft-lb)
T1: 7.5 (0.76, 5.5)
T2: 25 (2.55, 18.4)
T3: 30 (3.06, 22.1)
T4: 33 (3.36, 24.3)

5. REAR GATE



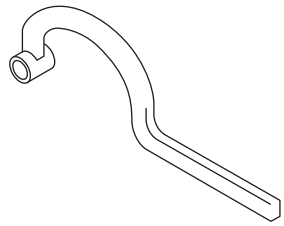
(1)	Rear spoiler	(7)	Rear gate latch and actuator ASSY	***Tightening torque:N·m (kgf-m, ft-lb)***
(2)	Hinge	(8)	Buffer (Rear gate side)	***T1: 4.5 (0.46, 3.32)***
(3)	Rear gate damper stay	(9)	Buffer (Body side)	***T2: 7.5 (0.76, 5.5)***
(4)	Stopper rubber	(10)	Rear gate panel	***T3: 10 (1.02, 7.4)***
(5)	Rear gate cover	(11)	Rear gate garnish	***T4: 20 (2.04, 14.5)***
(6)	Striker			***T5: 25 (2.55, 18.4)***

C: CAUTION

- Exterior body panels are heavy. Do not drop and damage the panels. During removal and installation, do not damage the panel painting surface.
- While removing mounting bolts, using assistance devices such as a support jack will help support the panel.

D: PREPARATION TOOL

1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-925610000	925610000	WRENCH	Used for removing and installing door hinge.

2. GENERAL TOOL

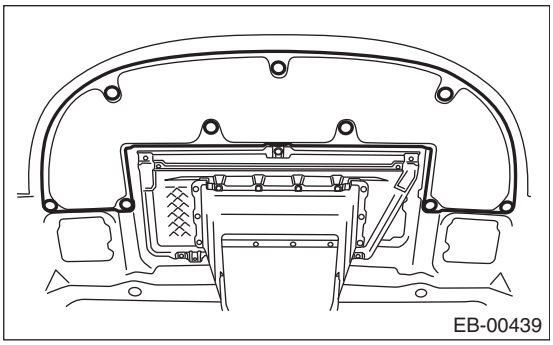
TOOL NAME	REMARKS
Support jack	Used for supporting door panel.
Clip remover	Used for removing various types of clips

2. Front Hood

A: REMOVAL

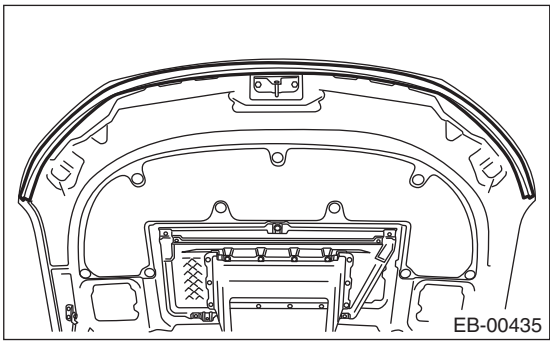
1. FRONT HOOD INSULATOR

CAUTION:
Do not reuse any clips damaged during removal. Always replace with new clips.
Release the clips to remove the front hood insulator.



2. FRONT HOOD SEAL

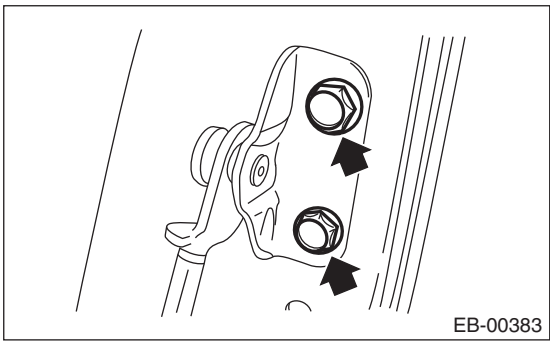
Remove the seal.



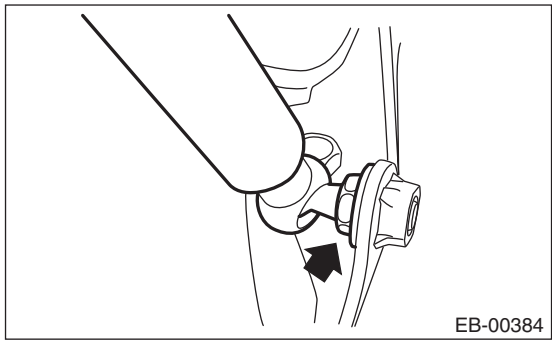
3. FRONT HOOD DAMPER

CAUTION:
- **Do not damage piston rods and oil seals.**
- **Never disassemble cylinders: They contain gas.**
- **The front hood panel is heavy. When removing or installing the damper stay and hood hinge, be sure to work in a group of two or more.**

1) Remove mounting bolt, and remove the damper stay.

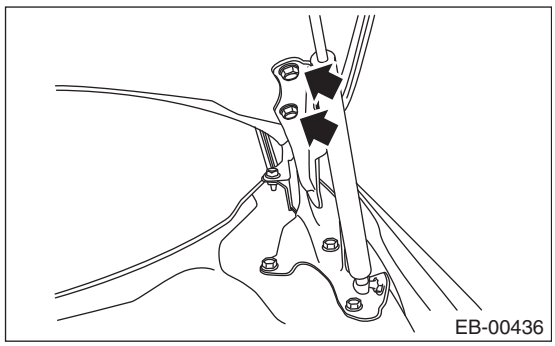


2) Remove the mounting bolt of front hood damper stay.

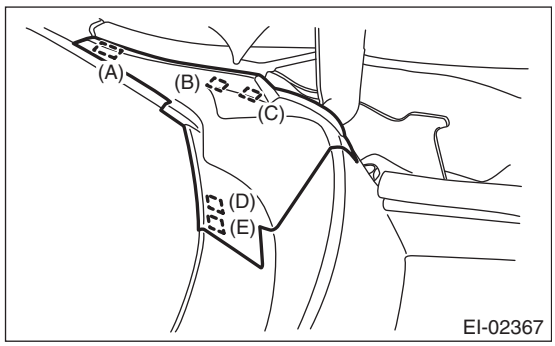


4. FRONT HOOD HINGE

CAUTION:
The front hood panel is very heavy. Always work with two persons when removing/installing the damper stay and hood hinges.
1) Remove the front hood damper.
2) Remove the bolts and front hood panel.

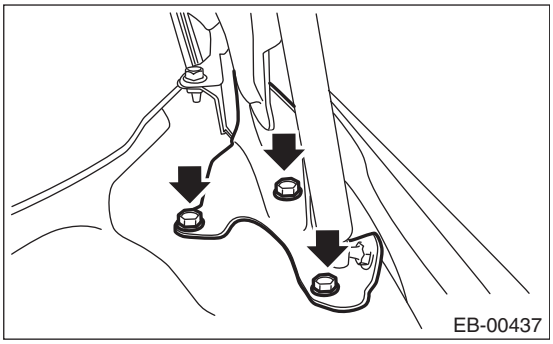


3) Detach the tabs and remove the cowl side panel front.



(1) Detach tabs (A), (B), and (C) from the vehicle exterior.
(2) Detach tabs (D) and (E).

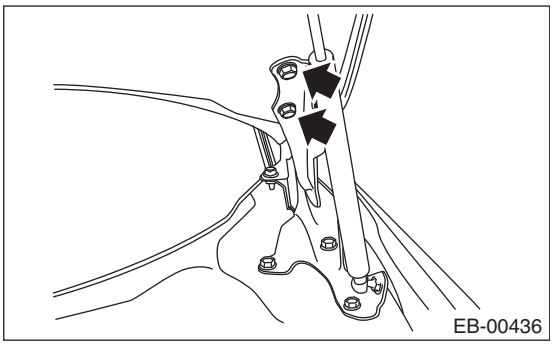
4) Remove the front hood hinge bolts.



5. FRONT HOOD PANEL

CAUTION:
The front hood panel is heavy. Always work with two persons when removing/installing the damper stay and hood hinges.

1) Remove the front hood insulator.
2) Remove the front hood seal.
3) Remove the window washer hose and nozzle. <Ref. to WW-18, REMOVAL, Front Washer Nozzle.>
4) Remove the front hood damper.
5) Remove the bolt, and remove the front hood panel from the front hood hinge.



B: INSTALLATION

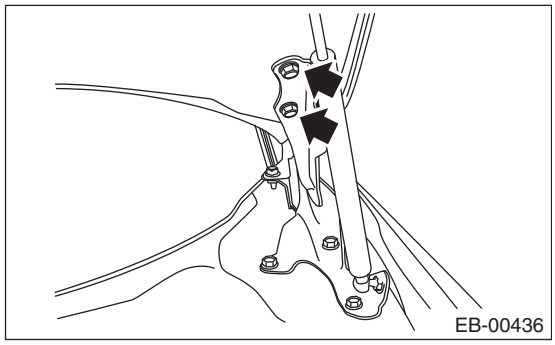
Install each part in the reverse order of removal.

NOTE:
• Be careful not to catch the window washer hose between insulators etc.
• Install while paying attention to make a uniform clearance around the front hood panel. For the dimension of clearance, refer to “SPECIFICATION” in “General Description”. <Ref. to EB-2, SPECIFICATION, General Description.>

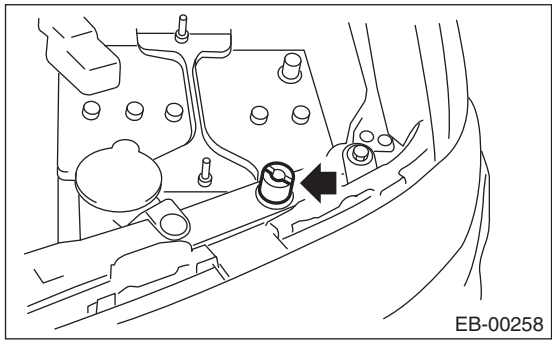
Tightening torque:
Refer to “COMPONENT” of “General Description”. <Ref. to EB-6, FRONT HOOD, COMPONENT, General Description.>

C: ADJUSTMENT

1) Adjust the clearance between front hood panel and front fender panel. Clearance must be equal at both sides. For the dimension of clearance, refer to “SPECIFICATION” in “General Description”. <Ref. to EB-2, SPECIFICATION, General Description.>
2) Use the hinge mounting bolts to align the front hood longitudinal and lateral position.



3) Adjust the height at the front end of hood. <Ref. to SL-38, ADJUSTMENT, Front Hood Lock Assembly.>
4) Rotate the hood buffer to adjust lateral height.



D: DISPOSAL

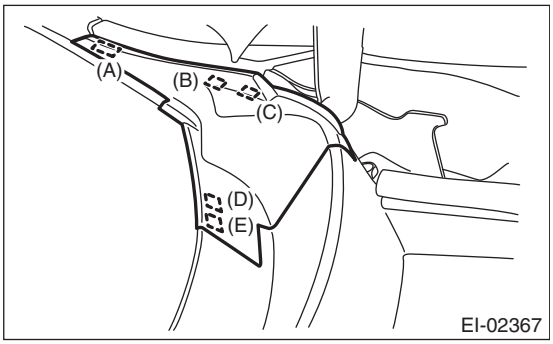
For the disposal procedures of front hood damper stay, refer to “Disposal Procedures of Rear Gate Damper Stay”. <Ref. to EB-30, REAR GATE DAMPER STAY, DISPOSAL, Rear Gate.>

3. Front Fender

A: REMOVAL

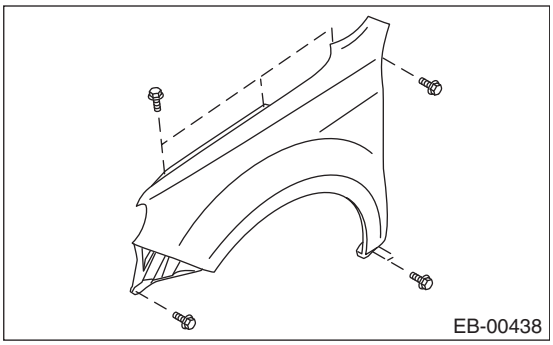
1. FRONT FENDER PANEL

1) Disconnect the ground cable from battery.
2) Remove the side sill spoilers. <Ref. to EI-40, REMOVAL, Side Sill Spoiler.>
3) Remove the front bumper face. <Ref. to EI-29, FRONT BUMPER FACE, REMOVAL, Front Bumper.>
4) Remove the headlight assembly. <Ref. to LI-18, REMOVAL, Headlight Assembly.>
5) Remove the mud guard. <Ref. to EI-28, REMOVAL, Mud Guard.>
6) Detach the tabs and remove the cowl panel, side.



(1) Detach tabs (A), (B), and (C) from the vehicle exterior.
(2) Detach tabs (D) and (E).

7) Remove the bolt, and remove the front fender panel.



2. COWL SIDE STAY

For operation procedures of cowl side stay, refer to “Front Performance Stay” items. <Ref. to EB-15, REMOVAL, Front Performance Stay.>

B: INSTALLATION

CAUTION:
- **Always use new double sided tape.**
- **After the installation of front fender panel, be sure to perform headlight beam adjustment.**

Install each part in the reverse order of removal.

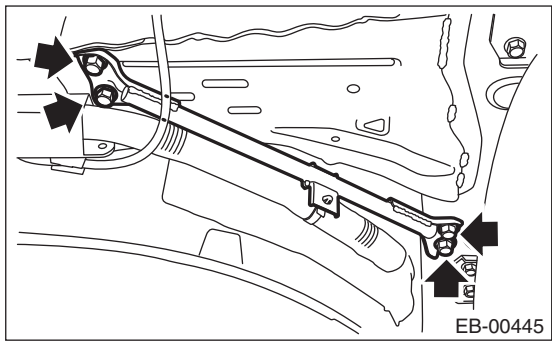
Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

NOTE:
Install while paying attention to make a uniform clearance around the front fender panel. For the dimension of clearance, refer to “SPECIFICATION” in “General Description”. <Ref. to EB-2, SPECIFICATION, General Description.>

4. Front Performance Stay

A: REMOVAL

1) Remove the front fender. <Ref. to EB-14, REMOVAL, Front Fender.>
2) Remove the bolts and harness clip, and remove the front performance stay.



B: INSTALLATION

Install each part in the reverse order of removal.

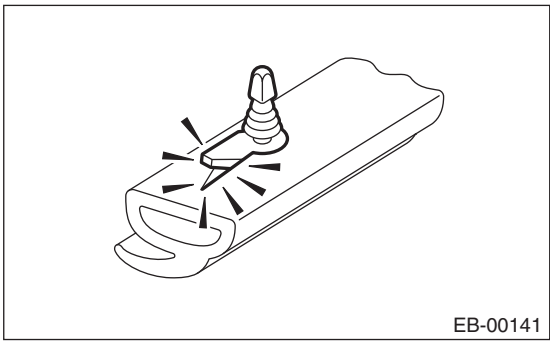
Tightening torque:
70 N·m (7.14 kgf-m, 51.6 ft-lb)

5. Front Door

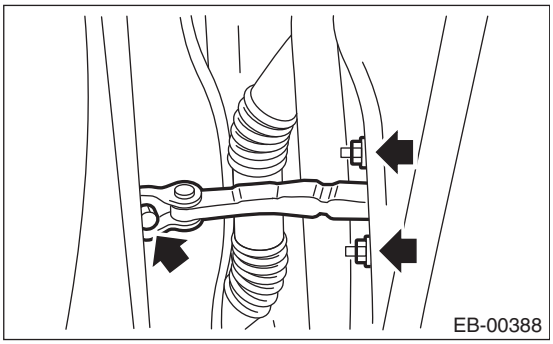
A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the front door trim. <Ref. to EI-43, FRONT DOOR, REMOVAL, Door Trim.>
3) Remove the outer mirror assembly. <Ref. to GW-16, REMOVAL, Outer Mirror Assembly.>
4) Remove the front door speaker. <Ref. to ET-10, REMOVAL, Front Speaker.>
5) Remove the sealing cover. <Ref. to EB-18, REMOVAL, Front Sealing Cover.>
6) Remove the front door glass. <Ref. to GW-12, REMOVAL, Front Door Glass.>
7) Remove the front door regulator and motor. <Ref. to GW-13, REMOVAL, Front Regulator and Motor Assembly.>
8) Remove the front door latch assembly. <Ref. to SL-32, REMOVAL, Front Door Latch and Door Lock Actuator Assembly.>
9) Remove the front outer handle. <Ref. to SL-31, REMOVAL, Front Outer Handle.>
10) Remove the front door weather strip.

NOTE:
If the weather strip clip is removed with excessive force, the weather strip may be damaged. Be sure to use clip remover to remove.

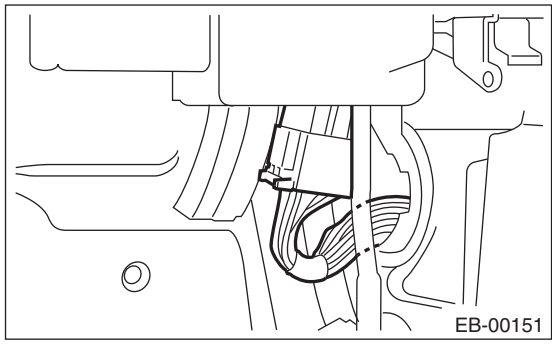

EB-00141

11) Remove the bolts and nuts to remove the door checker.

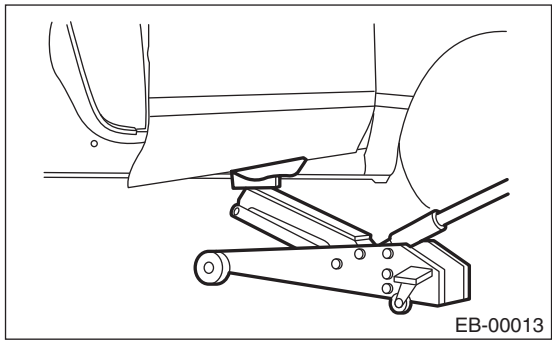

EB-00388

12) Remove the front pillar lower trim. <Ref. to EI-56, REMOVAL, Lower Inner Trim.>

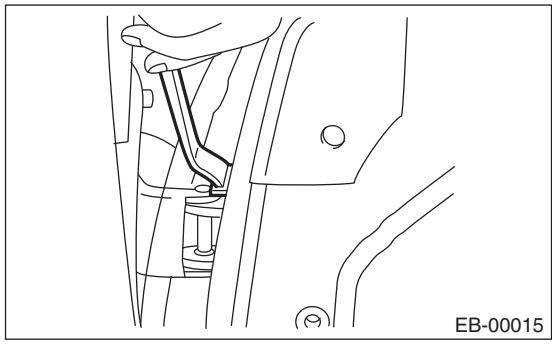
13) Disconnect the connector of door harness from body harness.


EB-00151

14) Put a wooden block on jack and place jack under the front door. Support the door with a jack to protect it from damage.


EB-00013

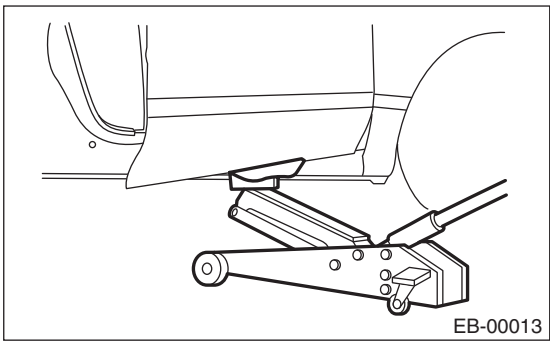
15) Remove the door-side bolts for upper and lower hinges to remove front door panel.


EB-00015

16) Remove the door hinge from vehicle.

B: INSTALLATION

1) Put a wooden block on jack and place the front door on that.



2) Apply grease to the sliding area of door hinges, and install the door hinge to vehicle.
3) Install the front door to upper hinge and lower hinge adjusting by jack.
4) Tighten bolt of door checker.
5) Connect door harness connector, and install the instrument panel lower cover.
6) Install the front pillar lower trim.

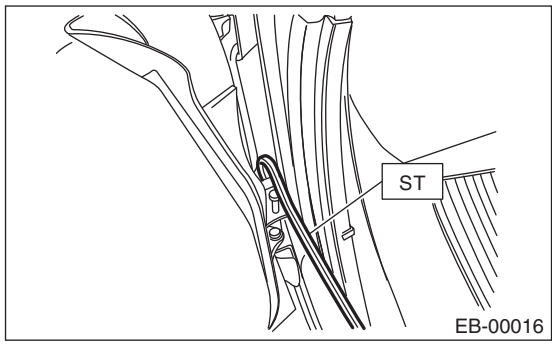
Tightening torque:
Refer to "COMPONENT" of "General Description". <Ref. to EB-9, REAR DOOR, COMPONENT, General Description.>

7) Install while paying attention to make a uniform clearance around the front door panel. For the dimension of clearance, refer to "SPECIFICATION" in "General Description". <Ref. to EB-2, SPECIFICATION, General Description.>

C: ADJUSTMENT

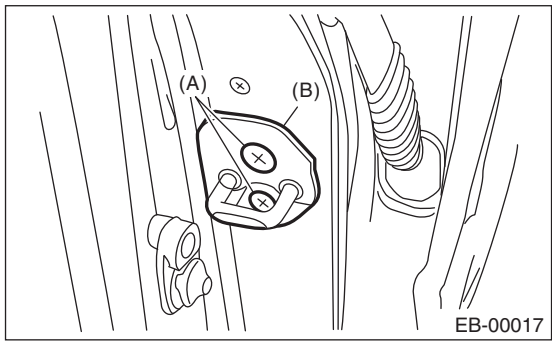
1) Using the ST, loosen the body-side bolts of the upper and lower hinges to align the position for vertical and horizontal direction of the front door panel.

Preparation tool: WRENCH (925610000)



2) Loosen the screw (A), and tap the striker (B) using a plastic hammer to adjust the gap between rear end surface of front door panel and front end surface of rear door.

CAUTION:
Do not use an impact wrench. Welding area on the striker nut plate is easily broken.

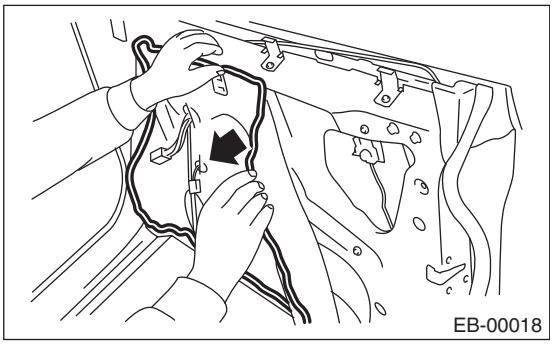


6. Front Sealing Cover

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the front door trim. <Ref. to EI-43, FRONT DOOR, REMOVAL, Door Trim.>
3) 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 each part 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 the 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

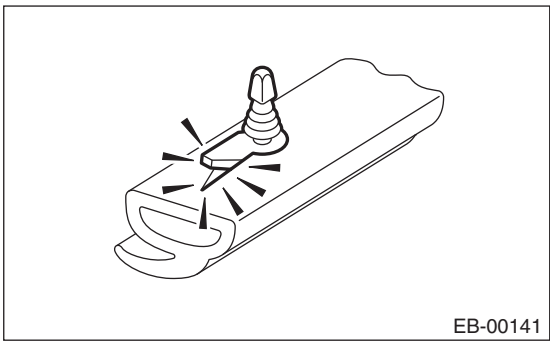
If the sealing cover gets damaged, replace it with a new part.

7. Rear Door

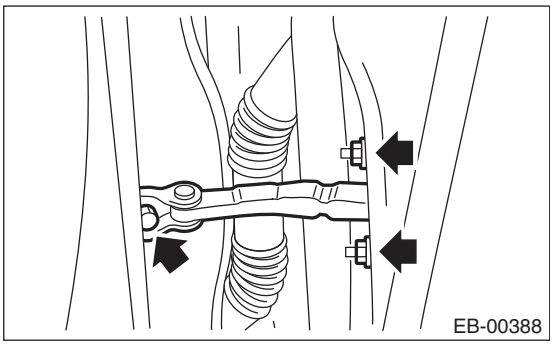
A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the rear door trim. <Ref. to EI-44, REAR DOOR, REMOVAL, Door Trim.>
3) Remove the rear speaker. <Ref. to ET-12, REMOVAL, Rear Speaker.>
4) Remove the sealing cover. <Ref. to EB-21, REMOVAL, Rear Sealing Cover.>
5) Remove the door sash and rear door glass. <Ref. to GW-19, REMOVAL, Rear Door Glass.>
6) Remove the rear door regulator and motor assembly. <Ref. to GW-20, REMOVAL, Rear Regulator and Motor Assembly.>
7) Remove the rear door latch. <Ref. to SL-35, REMOVAL, Rear Door Latch and Door Lock Actuator Assembly.>
8) Remove the rear outer handle. <Ref. to SL-34, REMOVAL, Rear Outer Handle.>
9) Remove the rear door weather strip.

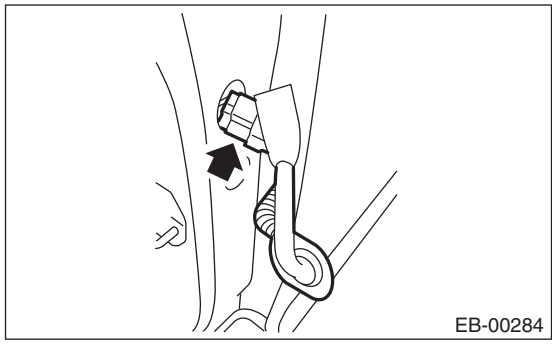
NOTE:
If the weather strip clip is removed with excessive force, the weather strip may be damaged. Be sure to use clip remover to remove.


EB-00141

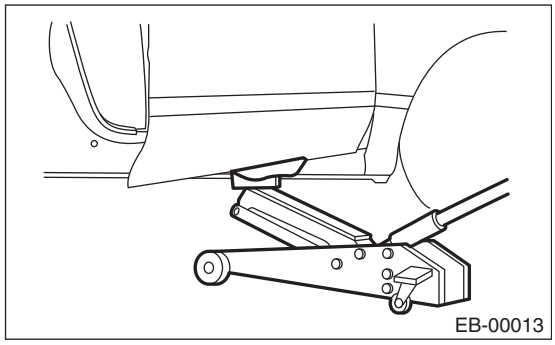
10) Remove the bolts and nuts to remove the door checker.


EB-00388

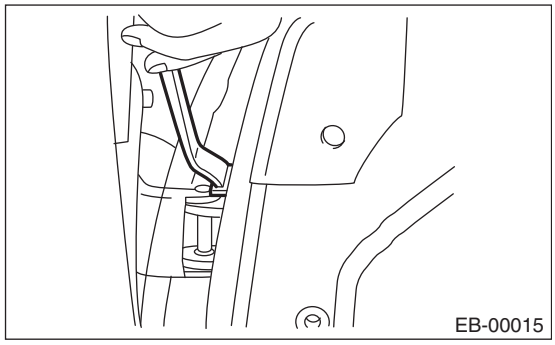
11) Pull the door harness connector inside the center pillar, then disconnect the connector.


EB-00284

12) Put a wooden block on jack and place jack under the rear door. Support the rear door with a jack to protect it from damage.


EB-00013

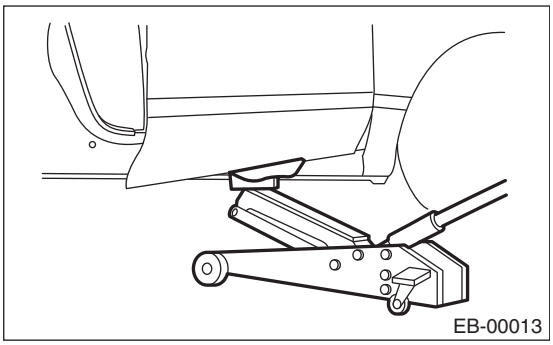
13) Remove the door-side bolts for upper and lower hinges to remove the rear door panel.


EB-00015

14) Remove the door hinge from vehicle.

B: INSTALLATION

1) Put a wooden block on jack and place the rear door on that.



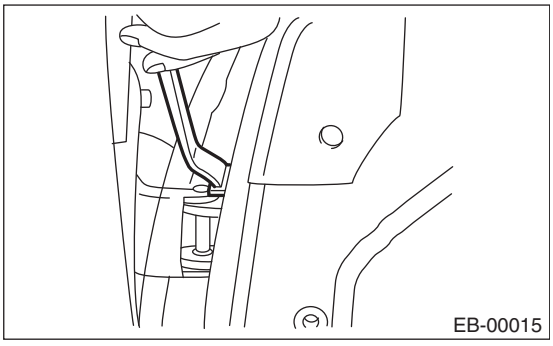
2) Apply grease to the moving part of door hinges.
3) Install the rear door to upper hinge and lower hinge adjusting by jack.
4) Tighten bolt of door checker.
5) Connect door harness connector.

Tightening torque:
Refer to "COMPONENT" of "General Description". <Ref. to EB-9, REAR DOOR, COMPONENT, General Description.>

6) Install while paying attention to make a uniform clearance around the rear door panel. For the dimension of clearance, refer to "SPECIFICATION" in "General Description". <Ref. to EB-2, SPECIFICATION, General Description.>

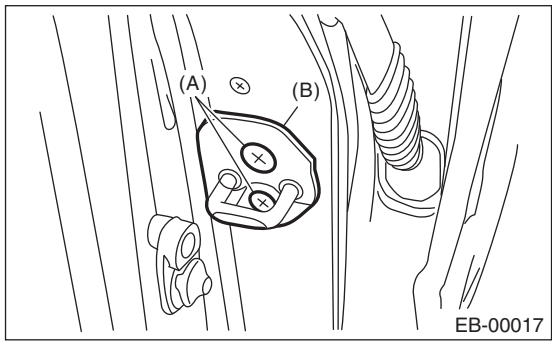
C: ADJUSTMENT

1) Open the rear door, loosen the door-side bolts of upper and lower hinges to align the position for vertical and horizontal direction of rear door panel.



2) Loosen the screw (A) and tap striker (B) using plastic hammer to adjust the gap between rear end surface of rear door panel and body surface.

CAUTION:
Do not use an impact wrench. Welding area on the striker nut plate is easily broken.

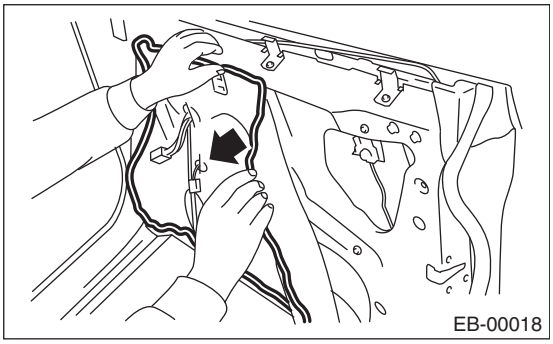


8. Rear Sealing Cover

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the rear door trim. <Ref. to EI-44, REAR DOOR, REMOVAL, Door Trim.>
3) Remove the rear speaker. <Ref. to ET-12, REMOVAL, Rear Speaker.>
4) 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 each part 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 the equivalent

NOTE:
• Apply a uniform bead of butyl tape.
• Attach the sealing cover, keeping it from becoming wrinkled.
• If the butyl tape is applied unevenly, it will cause water leakage and soiling.

C: INSPECTION

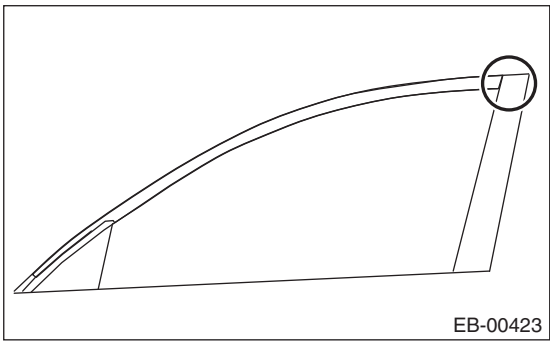
If the sealing cover gets damaged, replace it with a new part.

9. Door Sash Tape

A: REMOVAL

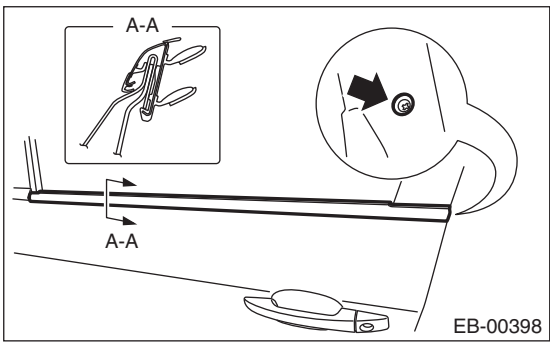
1. FRONT DOOR

1) Disconnect the ground cable from battery.
2) Remove the front door trim. <Ref. to EI-43, FRONT DOOR, REMOVAL, Door Trim.>
3) Remove the outer mirror assembly. <Ref. to GW-16, REMOVAL, Outer Mirror Assembly.>
4) Remove the sealing cover. <Ref. to EB-18, REMOVAL, Front Sealing Cover.>
5) Remove the front door glass. <Ref. to GW-12, REMOVAL, Front Door Glass.>
6) Remove the glass run rubber.
7) Remove the B pillar upper clip, and remove the front door weather strip.



8) Remove the screws, and remove the front door weather strip outer.

CAUTION:
• When removing the weather strip outer, be careful not to damage the vehicle.
• If the weather strip outer is deformed, always replace with a new part.

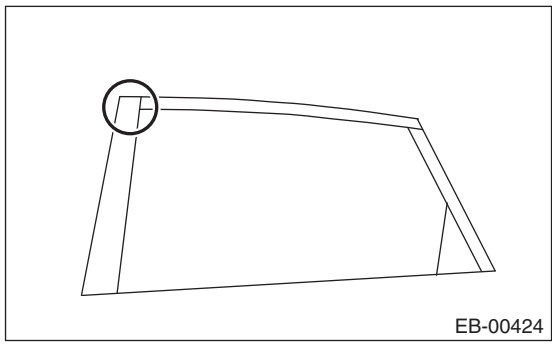


9) Peel the door sash tape from the door sash.

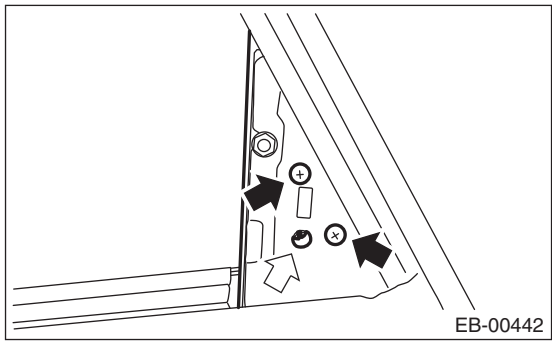
NOTE:
• If the tape is difficult to remove, warm the tape with a hairdryer, etc. to make the removal easier. Use a household hairdryer. Do not use industrial dryers.
• If tape residue is remaining on the door sash, wipe clean.

2. REAR DOOR

1) Disconnect the ground cable from battery.
2) Remove the rear door trim. <Ref. to EI-44, REAR DOOR, REMOVAL, Door Trim.>
3) Remove the sealing cover. <Ref. to EB-21, REMOVAL, Rear Sealing Cover.>
4) Remove the rear door glass. <Ref. to GW-19, REMOVAL, Rear Door Glass.>
5) Remove the glass run rubber.
6) Remove the B pillar upper clip, and remove the rear door weather strip.

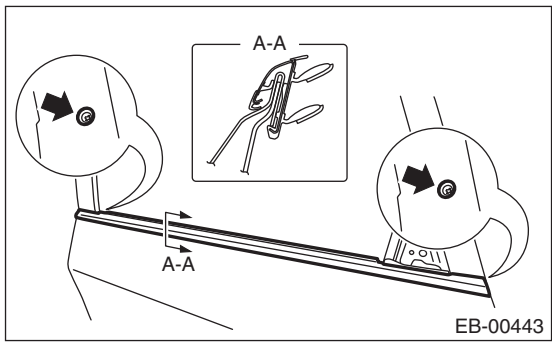


7) Loosen the screws and clips to remove the gusset cover outer.



8) Remove the rear door weather strip outer.

CAUTION:
• When removing the weather strip outer, be careful not to damage the vehicle.
• If the weather strip outer is deformed, always replace with a new part.



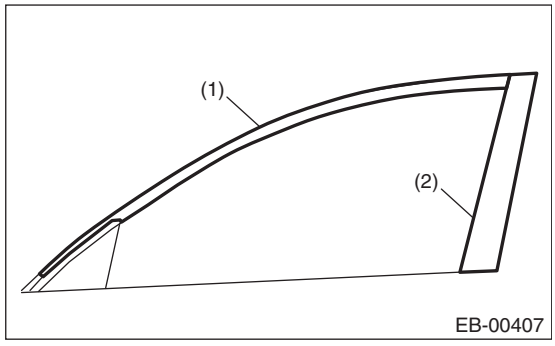
9) Peel the door sash tape from the door sash.

NOTE:
• If the tape is difficult to remove, warm the tape with a hairdryer, etc. to make the removal easier. Use a household hairdryer. Do not use industrial dryers.
• If tape residue is remaining on the door sash, wipe clean.

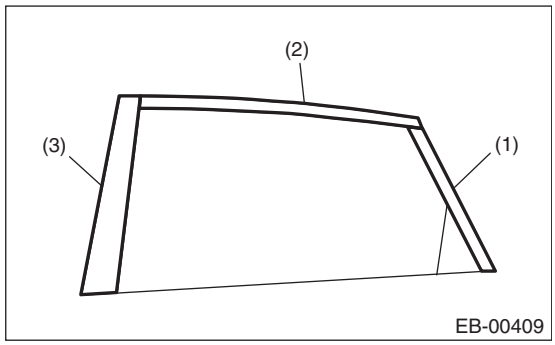
B: INSTALLATION

CAUTION:
• Press evenly along the sash when applying the tape using a spatula or similar object to make sure no bubbles are formed.
If air bubbles are formed, reapply the tape.
• If the tape is wrinkled, etc. during application, replace the tape.
• Be sure to press the ends of the tape firmly to adhere securely. If the tape comes off at the ends or where folded, the adhesive strength is weakened and the tape may peel off.
• There are locations where the tape ends will overlap each other. When applying the tape, be careful of the order of their application.

- **Front**

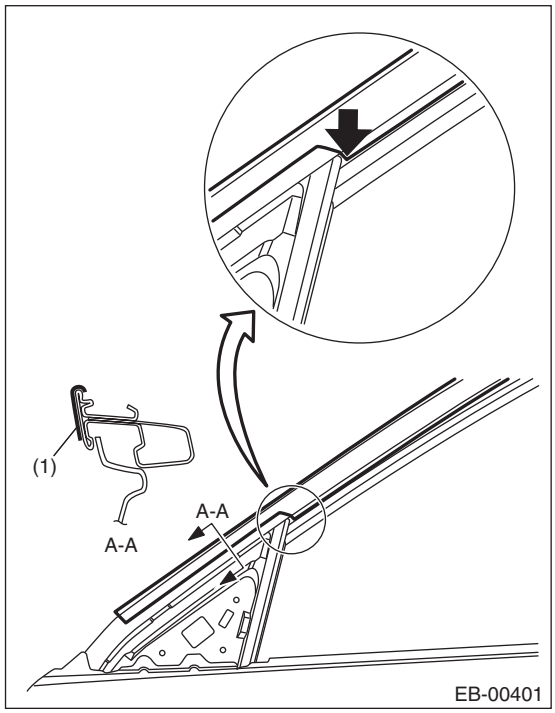


- **Rear**



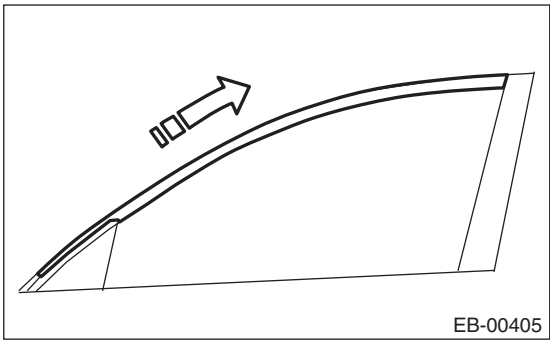
1. FRONT DOOR

1) Align the cutout of the tape with the top of the gusset as shown in the figure. (Position indicated by the arrow)

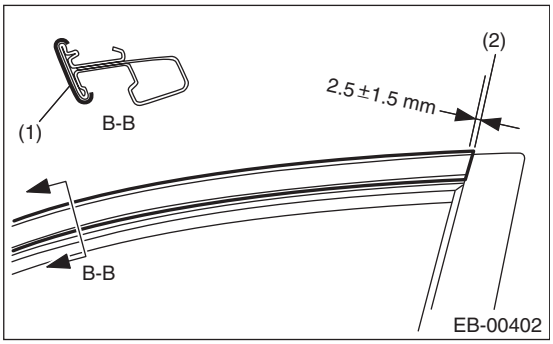


(1) Front door sash tape - front

2) Apply the tape from the front of the vehicle towards the rear.

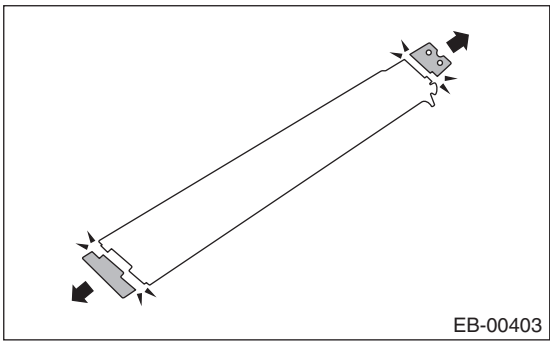


NOTE:
Apply the tape so that the end of the tape is within 2.5±1.5 mm (0.1±0.06 in) from a line extending from the front door rear sash.



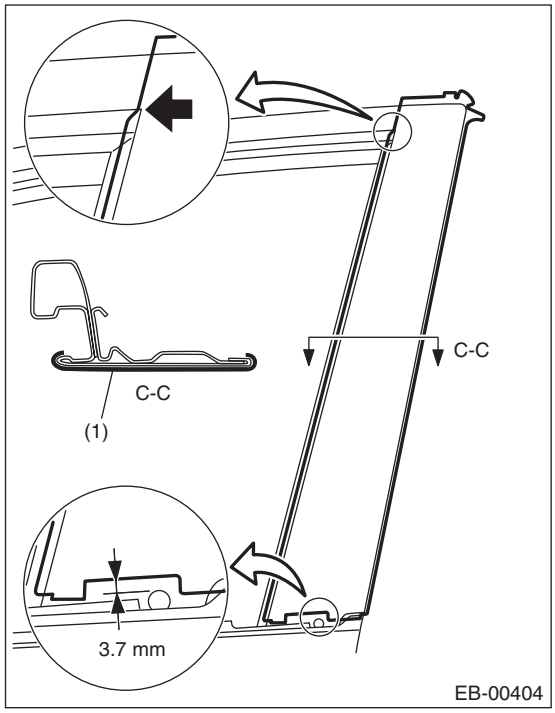
(1) Front door sash tape - front
(2) Line extending from the front door rear sash

3) Cut away both ends of the front door sash tape - rear.



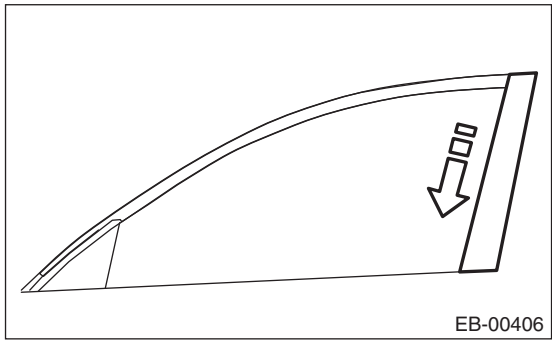
4) Align the cutaway portion of the tape with the corner of the sash as shown in the figure. (Position indicated by the arrow)

5) Position the tape so that there is a clearance of 3.7 mm (0.15 in) at the bottom end of the tape and it is not blocking the outer weather strip installation hole. (Position indicated by the arrow)

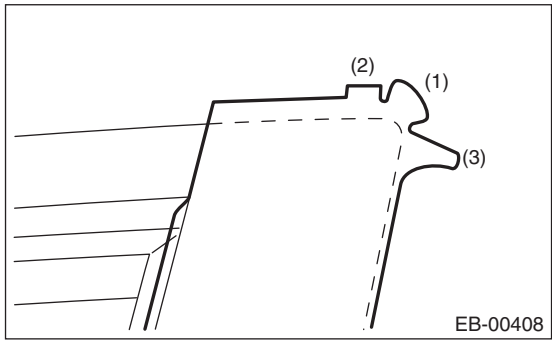


(1) Front door sash tape - rear

6) Apply the tape from the top of the vehicle towards the bottom.



7) Fold the door upper end in order of (1) to (3).

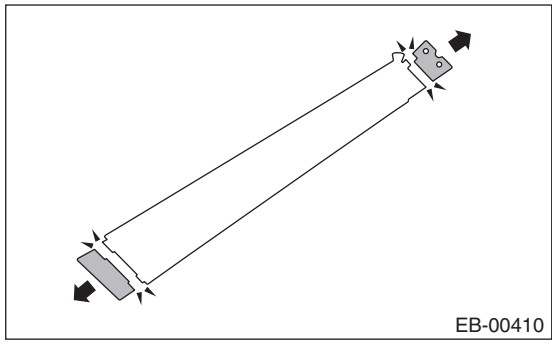


8) Install the door parts in the reverse order of removal.

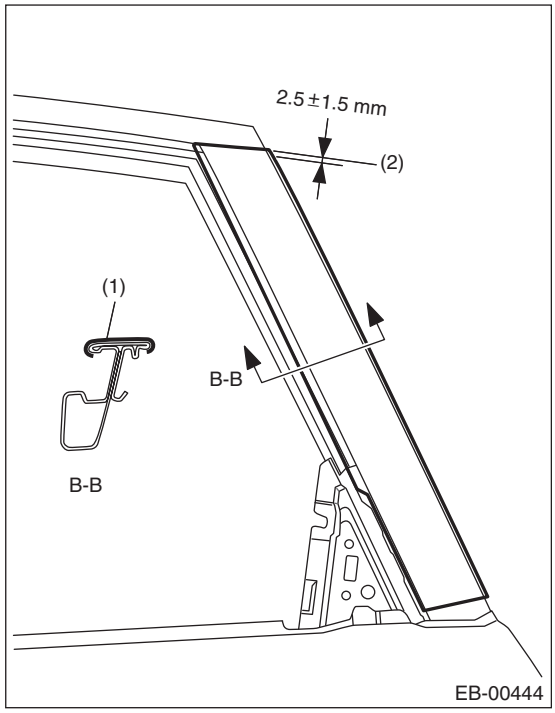
9) Install while paying attention to maintaining a uniform clearance around the front door panel. For the dimension of clearances, refer to “SPECIFICATION” in “General Description”. <Ref. to EB-2, SPECIFICATION, General Description.>

2. REAR DOOR

1) Cut away both ends of the rear door sash tape-rear.

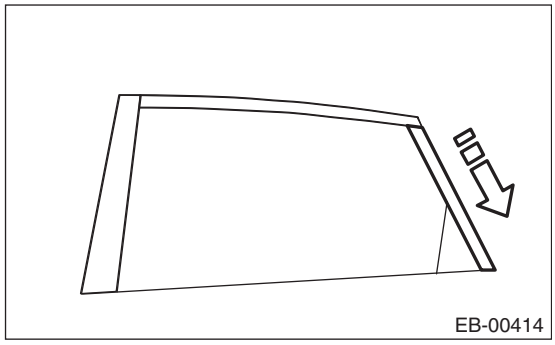


2) Apply the tape so that the end of the tape is within 2.5±1.5 mm (0.1±0.06 in) of a line extending from the rear door upper sash.



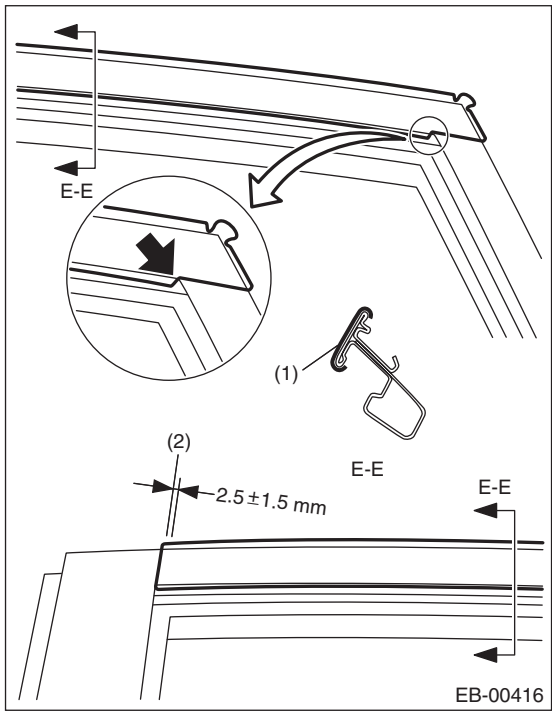
(1) Rear door sash tape - rear
(2) Line extending from the rear door upper sash

3) Apply the tape from the top of the vehicle towards the bottom.



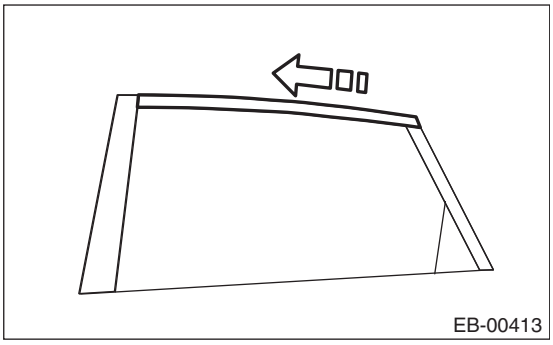
4) Align the cutout of the tape with the corner of the rear door upper sash as shown in the figure. (Position indicated by the arrow)

NOTE:
Apply the tape so that the end of the tape is within 2.5±1.5 mm (0.1±0.06 in) of a line extending from the rear door front sash.

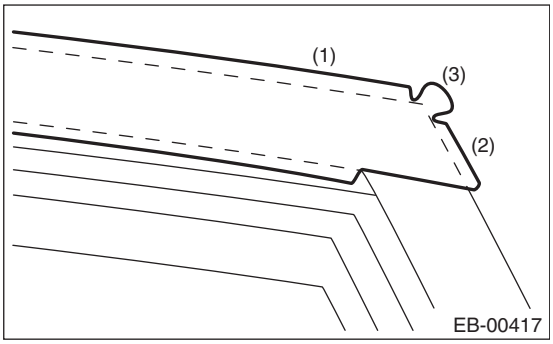


(1) Rear door sash tape - medium
(2) Line extending from the front sash of the rear door

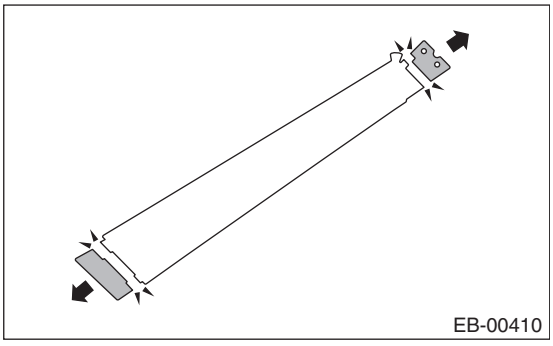
5) Apply the tape from the rear of the vehicle towards the front.



6) Fold the door upper end in order from (1) to (3).

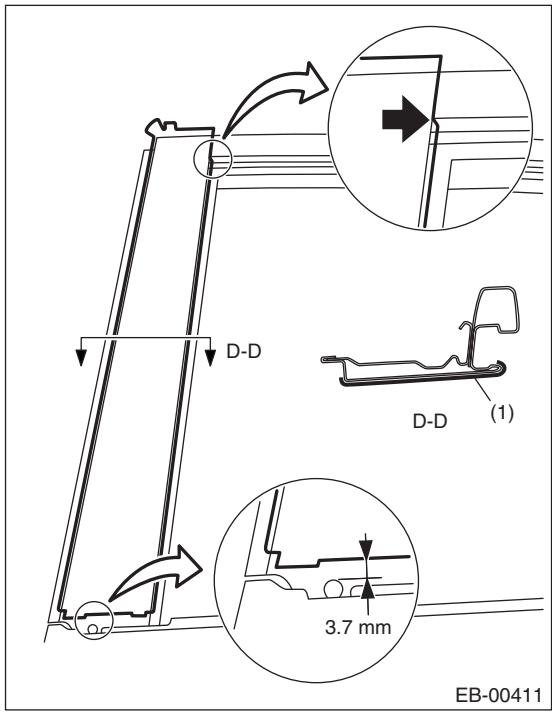


7) Cut away both ends of the rear door sash tape - front.



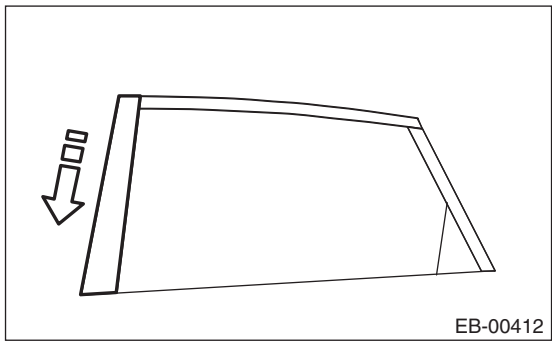
8) Align the cutaway portion of the tape with the corner of the sash as shown in the figure. (Position indicated by the arrow)

9) Position the tape so that there is a clearance of 3.7 mm (0.15 in) at the bottom end of the tape and it is not blocking the outer weather strip installation hole. (Position indicated by the arrow)

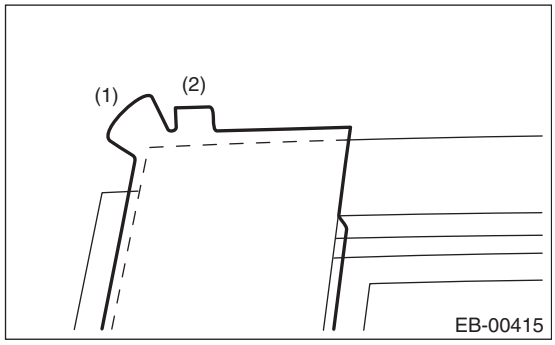


(1) Rear door sash tape - front

10) Apply the tape from the top of the vehicle towards the bottom.



11) Fold the door upper end in order from (1) to (2).



12) Install the door parts in the reverse order of removal.

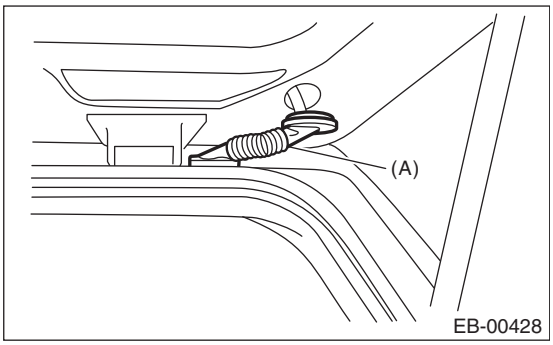
13) Install while paying attention to make a uniform clearance around the rear door panel. For the dimension of clearance, refer to “SPECIFICATION” in “General Description”. <Ref. to EB-2, SPECIFICATION, General Description.>

10.Rear Gate

A: REMOVAL

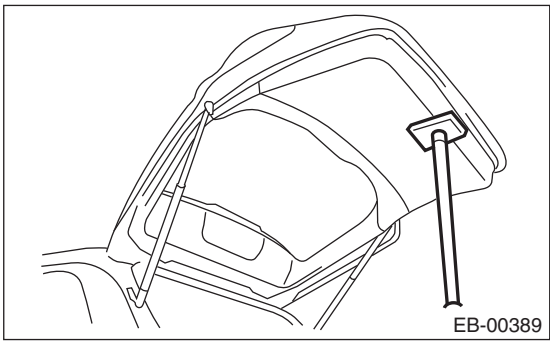
1. REAR GATE PANEL

1) Disconnect the ground cable from the battery.
2) Remove the rear gate trim. <Ref. to EI-67, REMOVAL, Rear Gate Trim.>
3) Remove the rear gate garnish. <Ref. to EI-69, REMOVAL, Rear Gate Garnish.>
4) Remove the rear wiper arm. <Ref. to WW-19, REMOVAL, Rear Wiper Arm.>
5) Remove the rear wiper motor. <Ref. to WW-20, REMOVAL, Rear Wiper Motor.>
6) Remove the rear gate latch and actuator assembly. <Ref. to SL-37, REMOVAL, Rear Gate Latch and Actuator Assembly.>
7) Remove the roof spoiler. <Ref. to EI-39, REMOVAL, Roof Spoiler.>
8) Remove the connecting part of rubber duct (A).

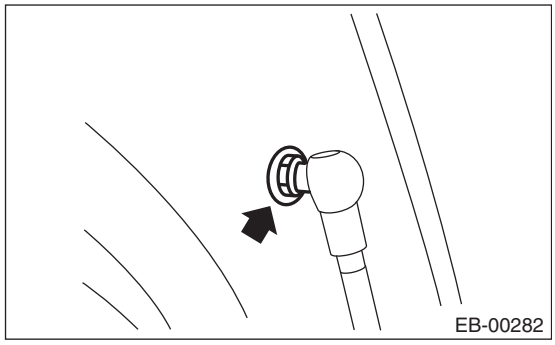


9) Pull off the harness and washer hose from the rear gate.
10) Remove harness clip of each connector from the rear gate panel.
11) Before removing the rear gate damper stay, prevent the rear gate from closing using prop or the like.

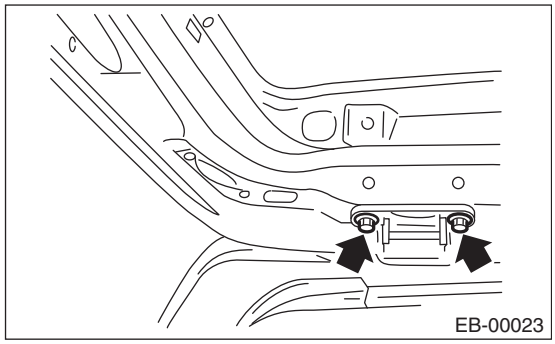
CAUTION:
If the prop comes off, operators may get injured and vehicle may get damaged. Make sure to support the rear gate with secure material to prevent injury or damage.



12) Remove the mounting bolt of rear gate damper stay.



13) Remove the rear gate hinge bolt, and remove the rear gate panel.



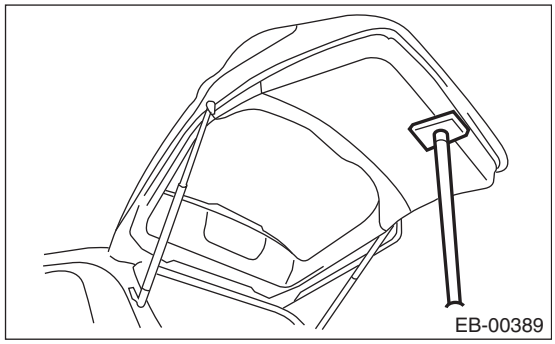
14) Remove the rear gate hinge from the vehicle.

2. REAR GATE DAMPER STAY

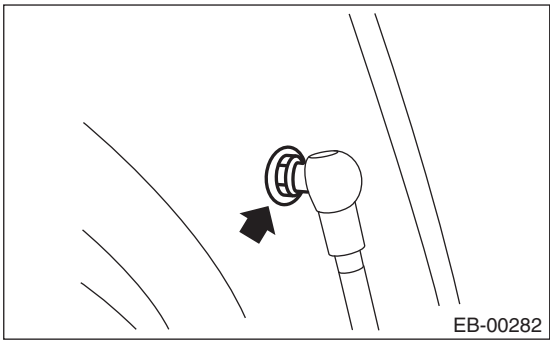
CAUTION:
- **Do not damage piston rods and oil seals.**
- **Never disassemble cylinders: They contain gas.**

1) Before removing the rear gate damper stay, prevent the rear gate from closing using prop or the like.

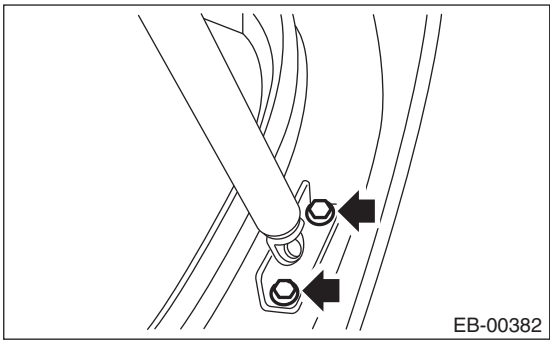
CAUTION:
If the prop comes off, operators may get injured and vehicle may get damaged. Make sure to support the rear gate with secure material to prevent injury or damage.



2) Remove the mounting bolt of rear gate damper stay.

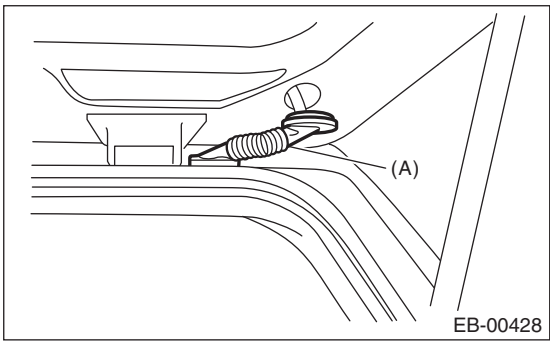


3) Remove the mounting bolts and the damper stay.

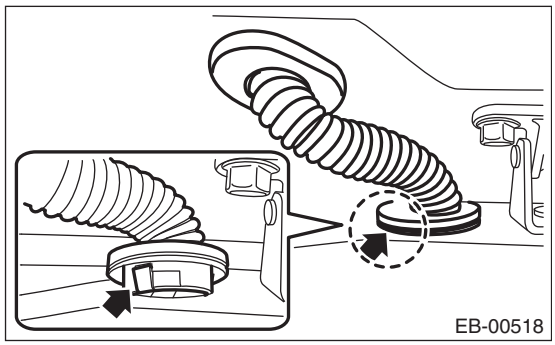


3. REAR GATE HINGE

1) Disconnect the ground cable from battery.
2) Remove the roof trim. <Ref. to EI-64, REMOVAL, Roof Trim.>
3) Disconnect the rear gate harness connector and rear washer hose behind the rear quarter.
4) Remove the connecting part of rubber duct (A).

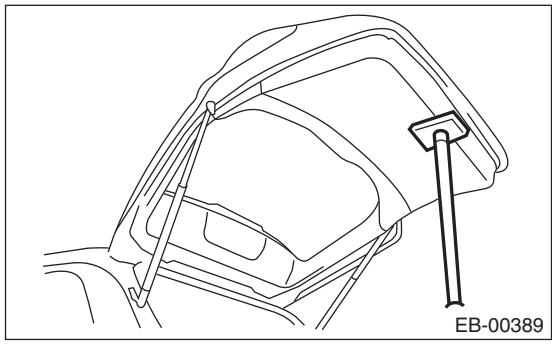


NOTE:
To remove the rubber duct from the vehicle side, press the tab.

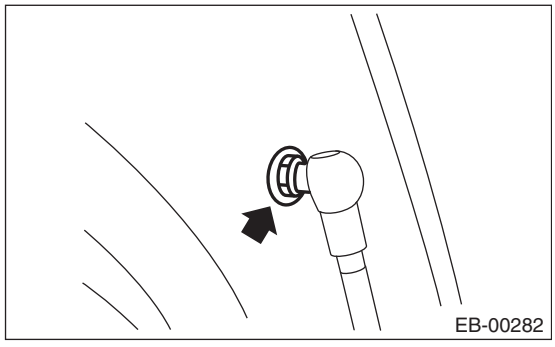


5) Pull out the rear gate harness and rear washer hose.
6) Before removing the rear gate damper stay, prevent the rear gate from closing using prop or the like.

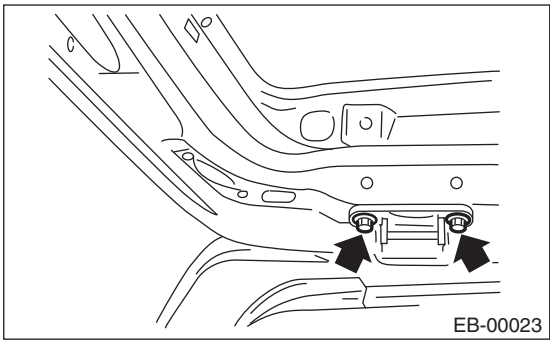
CAUTION:
If the prop comes off, operators may get injured and vehicle may get damaged. Make sure to support the rear gate with secure material to prevent injury or damage.



7) Remove the mounting bolt of rear gate damper stay.



8) Remove the rear gate hinge bolt, and remove the rear gate panel.



9) Remove the nuts and remove the rear gate hinge from the vehicle.

B: INSTALLATION

1. REAR GATE PANEL

1) Install each part in the reverse order of removal.

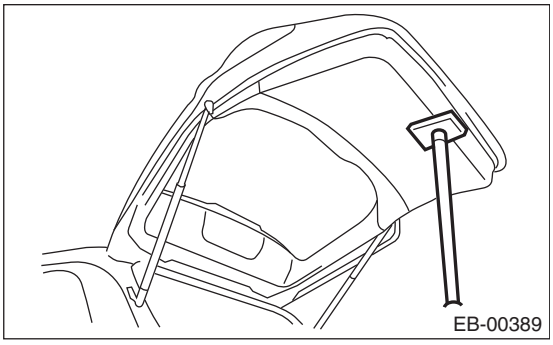
Tightening torque:
25 N·m (2.55 kgf-m, 18.4 ft-lb)

2) Install while paying attention to make a uniform clearance around the rear gate panel. For the dimension of clearance, refer to “SPECIFICATION” in “General Description”. <Ref. to EB-2, SPECIFICATION, General Description.>

2. REAR GATE DAMPER STAY

1) Prevent the rear gate from closing using prop or the like.

CAUTION:
If the prop comes off, operators may get injured and vehicle may get damaged. Make sure to support the rear gate with secure material to prevent injury or damage.



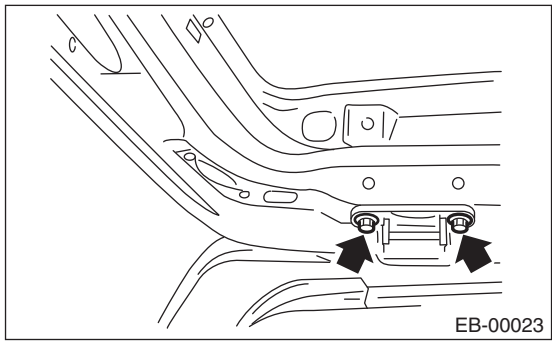
2) Install each part in the reverse order of removal.

Tightening torque:
Refer to “COMPONENT” of “General Description”. <Ref. to EB-10, REAR GATE, COMPONENT, General Description.>

C: ADJUSTMENT

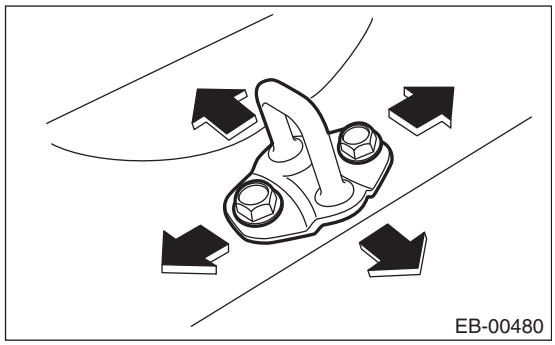
For the panel clearance around the rear gate panel, refer to “SPECIFICATION” in “General Description”. <Ref. to EB-2, SPECIFICATION, General Description.>

1) Adjust the rear gate panel position in the vertical and horizontal directions.



(1) Loosen the hinge mounting bolts.
(2) Adjust the panel clearance for the rear gate panel in the vertical and horizontal directions.

2) Adjust the height difference between the rear gate panel and the body.

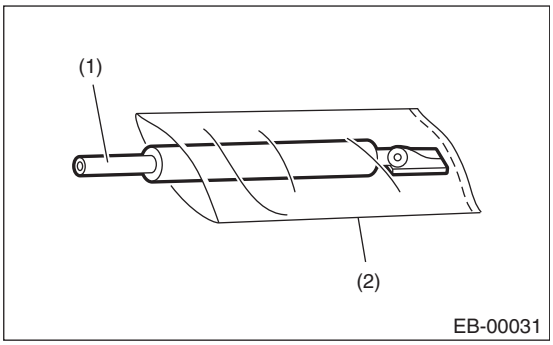


(1) Loosen the bolts.
(2) By tapping on the striker with a plastic hammer, adjust the height difference between the rear gate panel and the body.

D: DISPOSAL

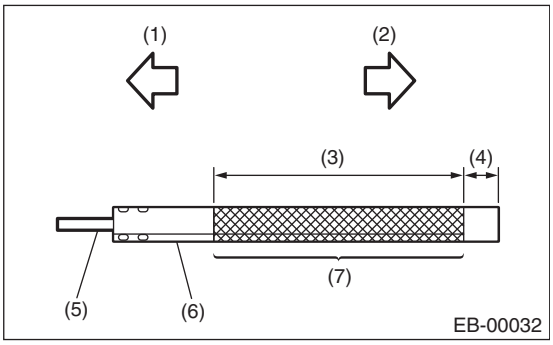
1. REAR GATE DAMPER STAY

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

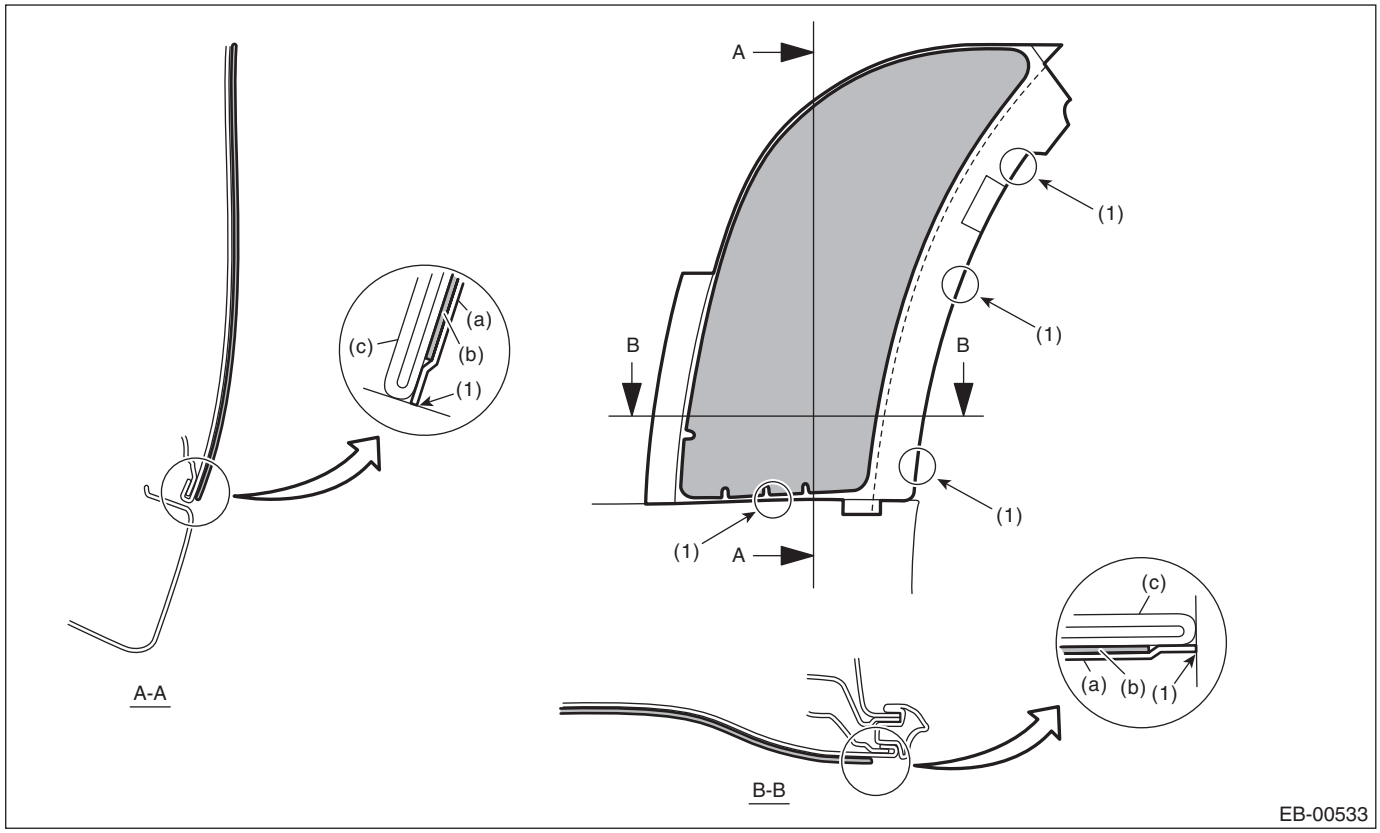
NOTE:
Prevent the vinyl sack from being caught by drill cutting edge.
2) Lift the body side slightly with piston rods fully extended, and secure the body side with vise.
Drill a hole of 2 to 3 mm (0.08 to 0.12 in) diameter at a point 10 to 200 mm (0.39 to 7.87 in) from the body side, and bleed the gas in the rear gate damper stay completely.



(1) Door side
(2) Body side
(3) 190 mm (7.48 in)
(4) 10 mm (0.39 in)
(5) Piston rod
(6) Cylinder
(7) Portion to be drilled

11.Protector Tape

A: INSTALLATION



(a) Application tape
(b) Protector tape
(c) Door panel

(1) Align the application paper to the rounded edge of door panel.

1) Clean the area around applying position to remove any foreign objects on body.
2) Detach the backing paper and apply the protector tape after positioning it correctly.
3) Detach the backing papers, and moisten the applying area and the backside of protector tape by spraying liquid (mild detergent solution at 3% concentration).
4) Apply the protector tape to the vehicle body.

CAUTION:
Remove the water or air bubbles out of the protector tape by using the plastic or rubber spatula.
5) Remove the application tape.

CRUISE CONTROL SYSTEM

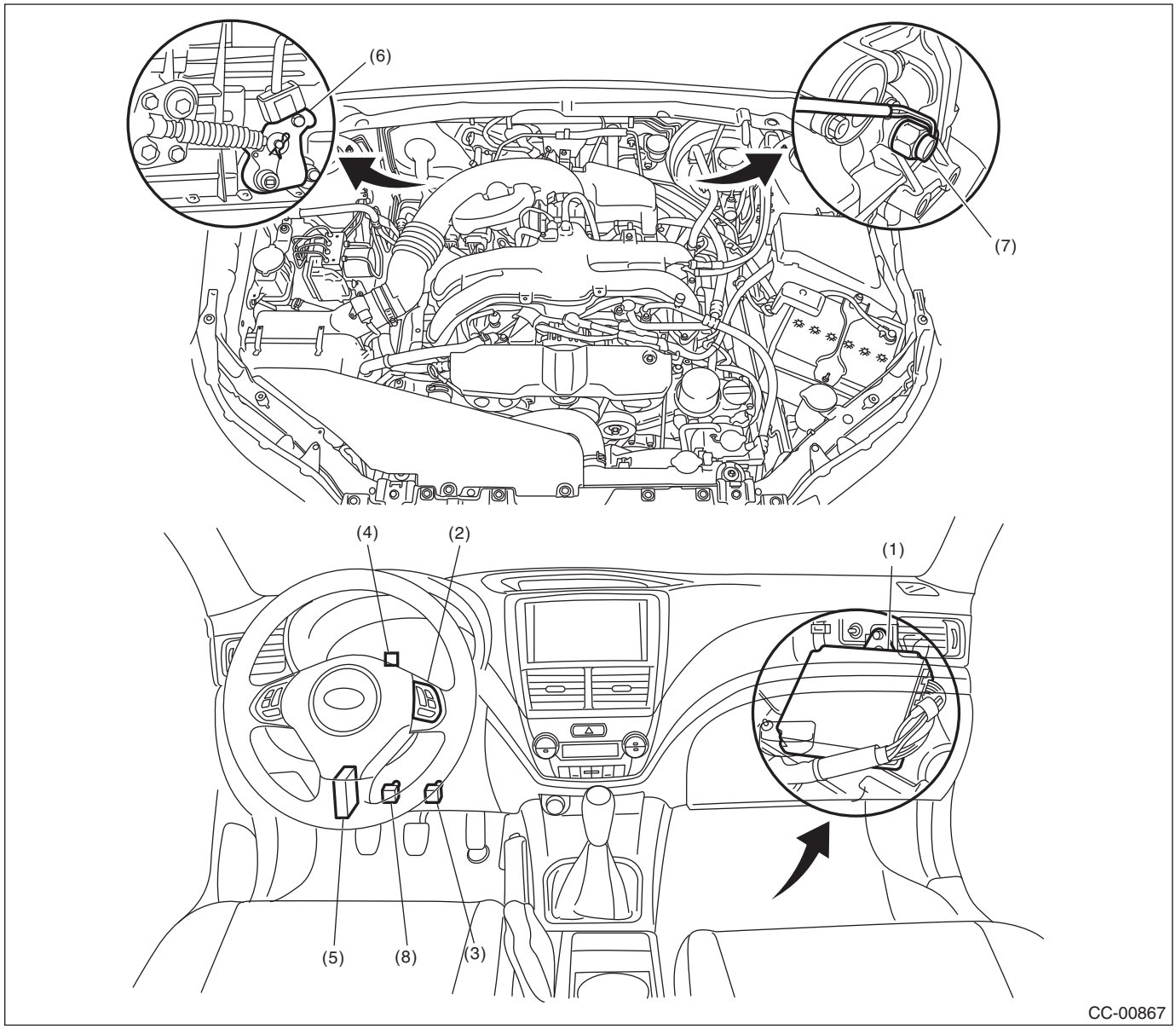
CC

Page

1. General Description 2
2. Cruise Control System 4
3. Cruise Control Module 5
4. Cruise Control Command Switch 6
5. Combination Meter 8
6. Stop Light & Brake Switch 9
7. Clutch Switch 10
8. Transmission Control Module (TCM) 11
9. Inhibitor Switch 12
10. Neutral Position Switch 13

1. General Description

A: COMPONENT



(1)	Engine control module (ECM)	(4)	Cruise indicator light and cruise set indicator light	(7)	Neutral position switch (MT model)
(2)	Cruise control command switch	(5)	Transmission control module (TCM) (AT model)	(8)	Clutch switch (MT model)
(3)	Stop light and brake switch	(6)	Inhibitor switch (AT model)		

B: CAUTION

- Before disassembling or reassembling parts, always disconnect the battery ground cable from battery. When replacing the audio, control module 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 securely during reassembly.
- After reassembly, make sure that the functional parts operate normally.

C: PREPARATION TOOL

TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance and voltage.
TORX® bit T30	Used for removing/installing driver's airbag module.

2. Cruise Control System

A: WIRING DIAGRAM

Refer to “Cruise Control System” in the wiring diagram. <Ref. to WI-176, WIRING DIAGRAM, Cruise Control System.>

B: INSPECTION

Refer to “Basic Diagnostic Procedure” of “CRUISE CONTROL SYSTEM (DIAGNOSTICS)”. <Ref. to CC(diag)-2, Basic Diagnostic Procedure.>

C: NOTE

For operation procedures of each component of the cruise control system, refer to the respective section.

- Cruise control unit: <Ref. to CC-5, Cruise Control Module.>
- Cruise control command switch: <Ref. to CC-6, Cruise Control Command Switch.>
- Combination meter: <Ref. to CC-8, Combination Meter.>
- Stop light and brake switch: <Ref. to CC-9, Stop Light & Brake Switch.>
- Clutch switch: <Ref. to CC-10, Clutch Switch.>
- Inhibitor switch: <Ref. to CC-12, Inhibitor Switch.>
- Transmission control module (TCM): <Ref. to CC-11, Transmission Control Module (TCM).>
- Neutral position switch: <Ref. to CC-13, Neutral Position Switch.>

3. Cruise Control Module

A: NOTE

The control of cruise control system is carried out in engine control module (ECM).

B: REMOVAL

For removal procedures of the control module, refer to “FUEL INJECTION (FUEL SYSTEM)”.

- Non-turbo model: <Ref. to FU(H4DO)-101, REMOVAL, Engine Control Module (ECM).>
- Turbo model: <Ref. to FU(H4DOTC)-57, REMOVAL, Engine Control Module (ECM).>

C: INSTALLATION

For installation procedures of the control module, refer to “FUEL INJECTION (FUEL SYSTEM)”.

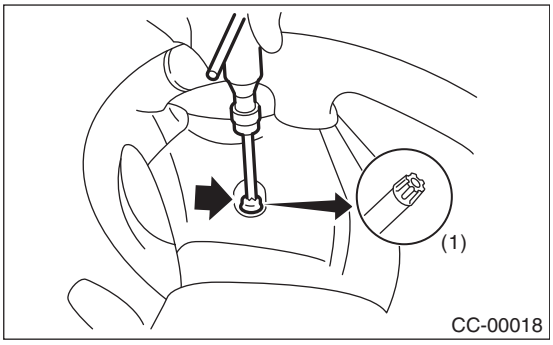
- Non-turbo model: <Ref. to FU(H4DO)-102, INSTALLATION, Engine Control Module (ECM).>
- Turbo model: <Ref. to FU(H4DOTC)-57, INSTALLATION, Engine Control Module (ECM).>

4. Cruise Control Command Switch

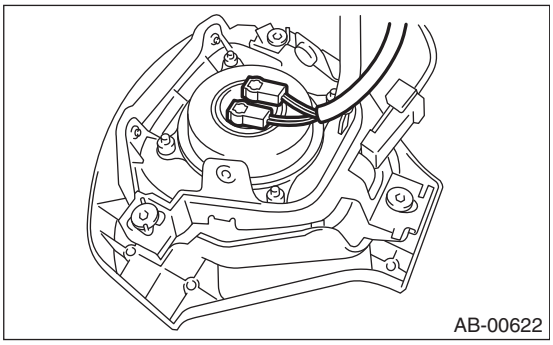
A: REMOVAL

CAUTION:
Before handling the airbag module, refer to "CAUTION" of "General Description" in "AIR-BAG SYSTEM". <Ref. to AB-5, CAUTION, General Description.>

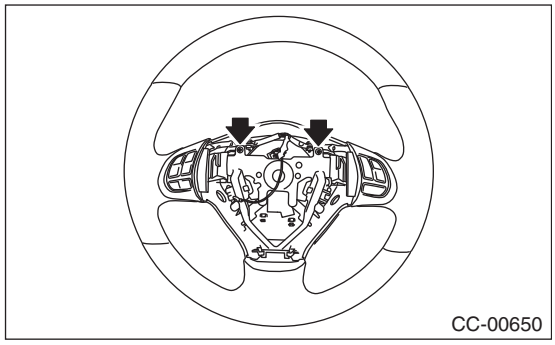
1) Set the front wheels in straight ahead position.
2) Turn the ignition switch to OFF.
3) Disconnect the ground cable from battery and wait for at least 60 seconds before starting work.
4) Using TORX® bit T30 (1), loosen two TORX® bolts on the side of the steering wheel.



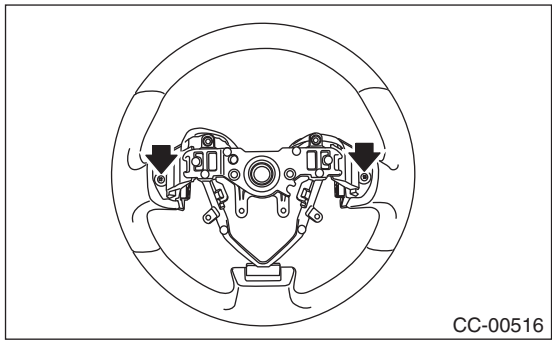
5) Disconnect the horn harness.
6) Disconnect the airbag module connector on the back of airbag module, and then remove the airbag module. <Ref. to AB-10, PROCEDURE, Airbag Connector.>



7) Remove the steering wheel. <Ref. to PS-13, REMOVAL, Steering Wheel.>
8) Remove the screws to remove the lower cover from steering wheel.



9) Remove the screws on the backside of the steering wheel to remove the cruise control command switch.



B: INSTALLATION

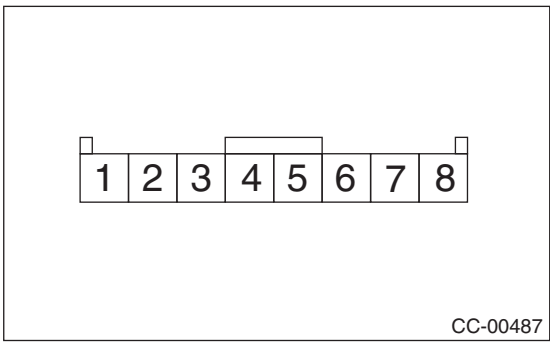
CAUTION:
• Before handling the airbag module, refer to "CAUTION" of "General Description" in "AIR-BAG SYSTEM". <Ref. to AB-5, CAUTION, General Description.>
• Do not allow harness and connectors to interfere or get tangled up with other parts.

Install each part in the reverse order of removal.

Tightening torque:
Airbag module: 10 N·m (1.02 kgf-m, 7.4 ft-lb)

C: INSPECTION

1) Disconnect the cruise control command switch connector.
2) Check the resistance between cruise control command switch terminals.



Switch	Position	Terminal No.	Standard
CANCEL SET/COAST RESUME/ ACCEL	All OFF	7 and 6	Approx. 4 kΩ
CANCEL	ON	7 and 6	Less than 1 Ω
SET/COAST	ON	7 and 6	Approx. 250 Ω
RESUME/ ACCEL	ON	7 and 6	Approx. 1500 Ω
MAIN (CRUISE)	OFF	8 and 6	1 MΩ or more
	ON	8 and 6	Less than 1 Ω

3) Replace the cruise control command switch if the inspection result is not within the standard value.

5. Combination Meter

A: NOTE

For the combination meter, refer to “INSTRUMENTATION/DRIVER INFO” section. <Ref. to IDI-21, Combination Meter.>

6. Stop Light & Brake Switch

A: NOTE

For stop light and brake switch, refer to “BRAKE” section. <Ref. to BR-40, Stop Light Switch.>

7. Clutch Switch

A: NOTE

For clutch switch, refer to “CLUTCH SYSTEM” section. <Ref. to CL-26, Clutch Switch.>

8. Transmission Control Module (TCM)

A: NOTE

For transmission control module (TCM), refer to “AUTOMATIC TRANSMISSION” section. <Ref. to 4AT-66, Transmission Control Module (TCM).>

9. Inhibitor Switch

A: NOTE

For inhibitor switch, refer to “AUTOMATIC TRANSMISSION” section. <Ref. to 4AT-52, Inhibitor Switch.>

10.Neutral Position Switch

A: NOTE

For neutral position switch, refer to “MANUAL TRANSMISSION AND DIFFERENTIAL” section. <Ref. to 5MT-34, Switches and Harness.>

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

CC(diag)

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1. Basic Diagnostic Procedure

A: PROCEDURE

	Step	Check	Yes	No
1	**CHECK MALFUNCTION INDICATOR LIGHT.** Make sure the 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 **7**.	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 phenomenon 1. <Ref. to CC(diag)-9, DIAGNOSTIC PROCEDURE WITH PHENOMENON, Diagnostics with Phenomenon.>
4	**CHECK CRUISE CONTROL SET OPERATION.** Check the cruise control setting operation.	Can the cruise control be set while driving at 40 km/h (25 MPH) or more?	Go to step **8**.	Go to step **7**.
5	**CHECK DTC.** Read all DTCs using the Subaru Select Monitor.	Is an engine or ABS/VDC related DTC displayed?	Record the DTC. Go to step **6**.	Go to phenomenon 2. <Ref. to CC(diag)-9, DIAGNOSTIC PROCEDURE WITH PHENOMENON, Diagnostics with Phenomenon.>
6	**CHECK FREEZE FRAME DATA.** Using the Subaru Select Monitor, check the Freeze Frame Data or Information in Trouble State.	Was the Freeze Frame Data or Information in Trouble State recorded?	Record the data. Perform the diagnosis according to DTC related to engine or ABS/VDC.	Perform the diagnosis according to DTC related to engine or ABS/VDC.
7	**CHECK CANCEL CODE.** Using the Subaru Select Monitor, read the cancel codes. NOTE: • Do not turn the ignition switch to OFF after the cruise control is deactivated. • Do not operate the cruise control command switch after the cruise control is deactivated. If the above is performed, the cancel code will be cleared.	Is it possible to read the cancel codes?	Perform the diagnosis according to the cancel code. <Ref. to CC(diag)-11, LIST, List of Cancel Code.>	Go to step **8**.
8	**CHECK CRUISE SET INDICATOR LIGHT.** Make sure the cruise set indicator light illuminates.	Does the cruise set indicator light illuminate?	Go to step **9**.	Go to phenomenon 3. <Ref. to CC(diag)-9, DIAGNOSTIC PROCEDURE WITH PHENOMENON, Diagnostics with Phenomenon.>

	Step	Check	Yes	No
9	**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 **10**.	Go to phenomenon 4. <Ref. to CC(diag)-9, DIAGNOSTIC PROCEDURE WITH PHENOMENON, Diagnostics with Phenomenon.>
10	**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 **11**.	Go to phenomenon 5. <Ref. to CC(diag)-9, DIAGNOSTIC PROCEDURE WITH PHENOMENON, Diagnostics with Phenomenon.>
11	**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 **12**.	Go to phenomenon 6. <Ref. to CC(diag)-9, DIAGNOSTIC PROCEDURE WITH PHENOMENON, Diagnostics with Phenomenon.>
12	**CANCEL OPERATION CHECK.** Check the CANCEL switch operation.	Is the cruise control released after CANCEL switch has been pressed?	Go to step **13**.	Go to phenomenon 7. <Ref. to CC(diag)-9, DIAGNOSTIC PROCEDURE WITH PHENOMENON, Diagnostics with Phenomenon.>
13	**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 **14**.	Go to phenomenon 8. <Ref. to CC(diag)-9, DIAGNOSTIC PROCEDURE WITH PHENOMENON, Diagnostics with Phenomenon.>
14	**CHECK CRUISE CONTROL RELEASE OPERATION.** Check the cruise control release operation.	Is the cruise control released after shifting to the neutral position?	Go to step **15**.	Go to phenomenon 9. <Ref. to CC(diag)-9, DIAGNOSTIC PROCEDURE WITH PHENOMENON, Diagnostics with Phenomenon.>
15	**CHECK CRUISE CONTROL RELEASE OPERATION.** Check the cruise control release operation.	Is the cruise control released after depressing the clutch pedal?	Finish the diagnosis.	Go to phenomenon 10. <Ref. to CC(diag)-9, DIAGNOSTIC PROCEDURE WITH PHENOMENON, Diagnostics with Phenomenon.>

2. General Description

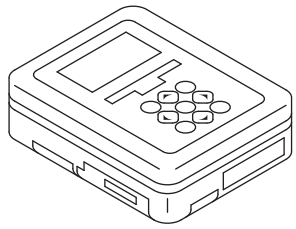
A: CAUTION

Airbag system wiring harness is routed near the cruise control command switch.

CAUTION:
• Do not use the electrical test equipment on the airbag system wiring harnesses and connector 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
 ST1B022XU0	1B022XU0	SUBARU SELECT MONITOR III KIT	Used for troubleshooting the electrical system.

2. GENERAL TOOL

TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance, voltage and current.

C: INSPECTION

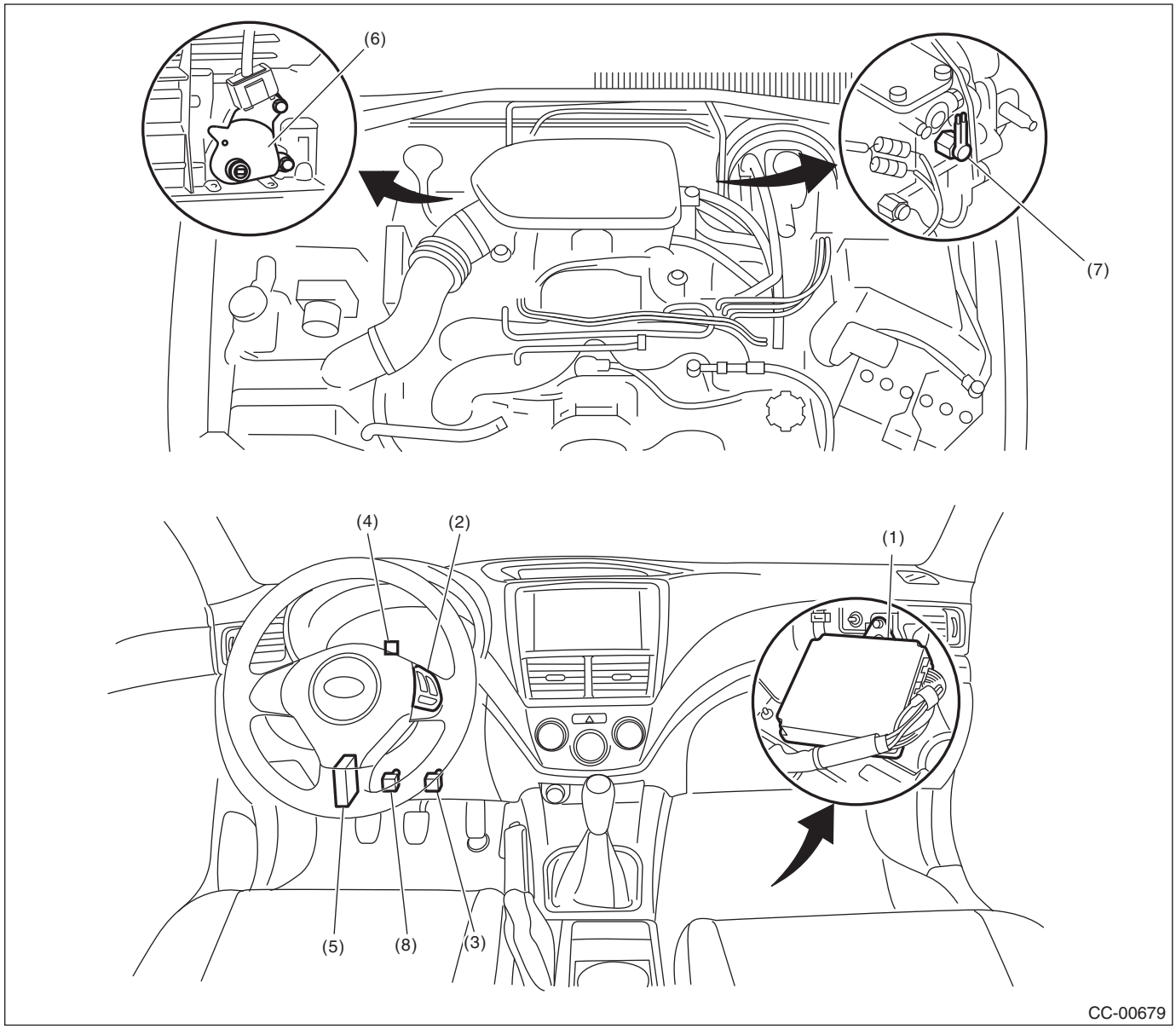
Measure the battery voltage and specific gravity of electrolyte.

Standard voltage:
12 V or more

Specific gravity:
1.260 or more

3. Electrical Component Location

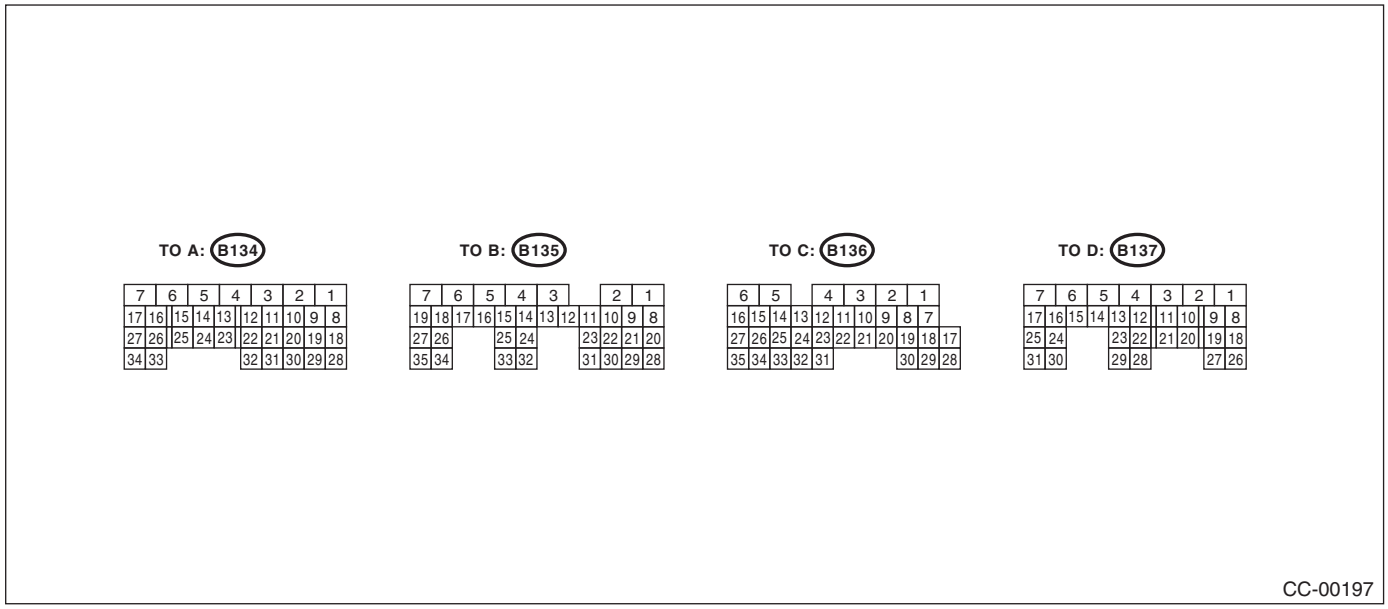
A: LOCATION



(1) Engine control module (ECM)
(2) Cruise control command switch
(3) Stop light & brake switch
(4) Cruise indicator light and cruise set indicator light
(5) Transmission control module (TCM) (AT model)
(6) Inhibitor switch (AT model)
(7) Neutral position switch (MT model)
(8) Clutch switch (MT model)

4. Engine Control Module (ECM) I/O Signal

A: ELECTRICAL SPECIFICATION



Content		Terminal No.	Measurement condition and I/O signal (Idling with ignition ON: except for cruise set light)
Main power supply	VB (CONTROL 1) VB (CONTROL 2)	C1 D7	• Battery voltage is detected when the main power is turned ON. • “0 V” is detected when the main power is turned OFF.
Command switch		C12	• “0 V” is detected when the command switch is in CANCEL position. • “Approx. 1 V” is detected when the command switch is in SET/ COAST position. • “Approx. 3 V” is detected when the command switch is in RESUME/ ACCEL position. • “Approx. 4 V” is detected when the command switch is released.
Brake switch 1 (brake switch)		C15	• Battery voltage is detected when the brake pedal is released. • “0 V” is detected when brake pedal is depressed.
Brake switch 2 (stop light switch)		C3	• Battery voltage is detected when brake pedal is depressed. • “0 V” is detected when the brake pedal is released.
Main switch		C13	• “0 V” is detected while the main switch is pressed or turned ON. • Approx. “5 V” is detected when the main switch is OFF.
Ground	GND (CONTROL)	A6	—
Ignition switch		C30	• Battery voltage is detected when the ignition switch is turned ON. • “0 V” is detected when the ignition switch is turned OFF.
Clutch switch (MT model)		B9	• “0 V” is detected when clutch pedal is depressed. • Battery voltage is detected when the clutch pedal is released.
Neutral position switch (MT model)		C35	• Battery voltage is detected when the shift lever is in any position except for neutral. • “Approx. 0 V” is detected when the shift lever is in neutral position.
Neutral signal (AT model)		C35	• Battery voltage is detected when the shift lever is in any position except for “P” or “N”. • “0 V” is detected when the shift lever is in “P” or “N” position.

B: WIRING DIAGRAM

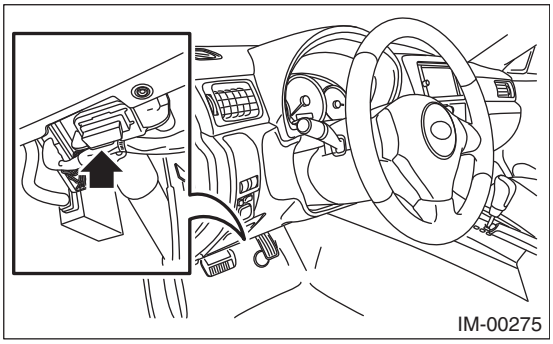
<Ref. to WI-176, WIRING DIAGRAM, Cruise Control System.>

5. Subaru Select Monitor

A: OPERATION

1) Prepare the Subaru Select Monitor kit.
2) Prepare PC with Subaru Select Monitor installed.
3) Connect the SDI (Subaru Diagnostic Interface) to the PC USB port (exclusively for Subaru Selector Monitor) using a USB cable.

NOTE:
Port exclusively for Subaru Select Monitor refers to the USB port used when installing Subaru Select Monitor.
4) Connect the diagnosis cable to the SDI.
5) Connect the SDI to data link connector located in the lower portion of the instrument panel (on the driver's side).



CAUTION:
Do not connect scan tools other than the Subaru Select Monitor.
6) Turn the ignition switch to ON.
7) Start the PC.
8) Run the "PC application for Subaru Select Monitor".

6. Read Cancel Code

A: OPERATION

1. GENERAL DESCRIPTION

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 code which occurred during driving. When there are multiple cancel code, 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 memory content (latest code) is cleared when ignition switch is turned to OFF. However, the memory content by the diagnosis of faulty switches relating to the system and cruise control is retained as the fault history (memory code) after the ignition switch is turned 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) Run the Subaru Select Monitor.
2) On «Main Menu» display, select {Each System Check}.
On «System Selection Menu» display, select {Engine Control System} and select the [OK]. Select [OK] after the engine type information is displayed.
3) 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.
• The cancel code will be also appear when cruise control is cancelled by the driver's operation. Do not confuse them.
• Be sure to get an assistant to support the diagnosis while driving, and have him/her operate the select monitor.

4) When the set speed is cancelled by itself (without any cancel operations such as applying brake) or when the cruise control could not be set by performing the setting operation, selecting the {Cancel Code(s) Display} on the engine malfunction diagnosis screen will display the cancel code on the select monitor display.

NOTE:
The {Latest Diagnostic Code(s)} and {Memorized Diagnostic Code(s)} are contained in the cancel code. The latest code recognized during current test drive is displayed in {Latest Diagnostic Code(s)}. Cancel codes resulting from fault diagnosis of switches relating to the system and cruise control are also displayed in {Memorized Diagnostic Code(s)}.

5) Perform Engine DTC Clear Memory operation. <Ref. to EN(H4DO)(diag)-56, OPERATION, Clear Memory Mode.> <Ref. to EN(H4DOTC)(diag)-56, OPERATION, Clear Memory Mode.>
Cancel codes for switches relating to the system and cruise control are deleted by clearing memory on the engine side.

NOTE:
The latest code will be cleared by turning ignition switch to OFF.

3. REAL-TIME DIAGNOSIS

1) Select {Current Data Display & Save} in «Engine Diagnosis» display screen.
2) Make sure that normal display is shown when operated as follows:
• Depress and release the brake pedal. (Stop light switch and brake switch are turned ON.)
• Turn the main switch to ON.
• Turn the "CANCEL" switch to ON.
• Turn the "SET/COAST" switch to ON.
• Turn the "RESUME/ACCEL" switch to ON.
• 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 "PC application help for Subaru Select Monitor".
• For detailed concerning cancel code, refer to the "List of Cancel Codes". <Ref. to CC(diag)-11, List of Cancel Code.>

7. Diagnostics with Phenomenon

A: DIAGNOSTIC PROCEDURE WITH PHENOMENON

Phenomenon		Check item	Reference
1	Cruise control main switch is not turned to ON. (Cruise indicator light does not illuminate.) Or, the cruise control was released without operating the cruise control main switch.	(1) Perform cruise cancel conditions diagnosis.	Perform the diagnosis according to displayed cancel code.
		(2) Perform the real-time diagnosis.	Check the input signal of cruise control system.
		(3) Check the cruise control command switch.	<Ref. to CC(diag)-14, 11, Diagnostic Procedure with Cancel Code.>
		(4) Check the cruise indicator light.	<Ref. to CC(diag)-10, CHECK CRUISE INDICATOR LIGHT AND CRUISE SET INDICATOR LIGHT, Diagnostics with Phenomenon.>
2	Cruise control cannot be set. Or, the cruise control was released without a releasing operation.	(1) Perform cruise cancel conditions diagnosis.	Perform the diagnosis according to displayed cancel code.
		(2) Perform the real-time diagnosis.	Check the input signal of cruise control system.
		(3) Check the cruise control command switch.	<Ref. to CC(diag)-14, 11, Diagnostic Procedure with Cancel Code.>
		(4) Check stop light switch and brake switch.	<Ref. to BR-38, Brake Pedal.> <Ref. to CC(diag)-16, 12, Diagnostic Procedure with Cancel Code.>
		(5) Check clutch switch.	<Ref. to CL-26, Clutch Switch.> <Ref. to CC(diag)-18, 13, Diagnostic Procedure with Cancel Code.>
		(6) Check the neutral position switch.	<Ref. to CC(diag)-20, 14, Diagnostic Procedure with Cancel Code.> <Ref. to CC(diag)-24, 62, Diagnostic Procedure with Cancel Code.>
		(7) Check vehicle speed sensor.	<Ref. to CC(diag)-23, 22, Diagnostic Procedure with Cancel Code.>
3	Cruise set indicator light does not illuminate.	Check the cruise set indicator light.	<Ref. to CC(diag)-10, CHECK CRUISE INDICATOR LIGHT AND CRUISE SET INDICATOR LIGHT, Diagnostics with Phenomenon.>
4	Vehicle speed is not held within set speed ±3 km/h (±2 MPH).	Check the vehicle speed sensor.	<Ref. to CC(diag)-23, 22, Diagnostic Procedure with Cancel Code.>
5	Vehicle speed does not increase or does not return to set speed after RESUME/ACCEL switch has been pressed.	(1) Perform the real-time diagnosis.	Check the input signal of cruise control system.
		(2) Check the RESUME/ACCEL switch.	<Ref. to CC(diag)-14, 11, Diagnostic Procedure with Cancel Code.>
6	Vehicle speed does not decrease after SET/COAST switch has been pressed.	(1) Perform the real-time diagnosis.	Check the input signal of cruise control system.
		(2) Check the SET/COAST switch.	<Ref. to CC(diag)-14, 11, Diagnostic Procedure with Cancel Code.>
7	Cruise control is not released after CANCEL switch has been pressed.	(1) Perform the real-time diagnosis.	Check the input signal of cruise control system.
		(2) Check the CANCEL switch.	<Ref. to CC(diag)-14, 11, Diagnostic Procedure with Cancel Code.>
8	Cruise control is not released after brake pedal has been depressed.	(1) Perform the real-time diagnosis.	Check the input signal of cruise control system.
		(2) Check stop light switch and brake switch.	<Ref. to CC(diag)-16, 12, Diagnostic Procedure with Cancel Code.> <Ref. to BR-40, INSTALLATION, Stop Light Switch.>
9	Cruise control is not released after shifting to the neutral position.	(1) Perform the real-time diagnosis.	Check the input signal of cruise control system.
		(2) Check the neutral position switch.	<Ref. to CC(diag)-20, 14, Diagnostic Procedure with Cancel Code.> <Ref. to 4AT-52, INSPECTION, Inhibitor Switch.>
10	Cruise control is not released after clutch pedal has been depressed.	(1) Perform the real-time diagnosis.	Check the input signal of cruise control system.
		(2) Check clutch switch.	<Ref. to CC(diag)-18, 13, Diagnostic Procedure with Cancel Code.> <Ref. to CL-26, Clutch switch, INSTALLATION, Clutch Switch.>

B: CHECK CRUISE INDICATOR LIGHT AND CRUISE SET INDICATOR LIGHT

TROUBLE SYMPTOM:

Cruise control can be set, but the cruise indicator light and cruise set indicator light do not illuminate.

	Step	Check	Yes	No
1	**CHECK CRUISE INDICATOR LIGHT AND CRUISE SET INDICATOR LIGHT.** 1) Perform the self-diagnosis of combination meter. <Ref. to IDI-5, SELF-DIAGNOSIS, INSPECTION, Combination Meter System.> 2) Check the cruise indicator light and cruise set indicator light if they illuminate.	Do the cruise indicator light and cruise set indicator light illuminate?	Go to step **2**.	Replace the meter case assembly. <Ref. to IDI-21, Combination Meter.>
2	**CHECK DTC OF LAN COMMUNICATION CIRCUIT.** 1) Complete self-diagnosis, and turn the ignition switch to ON again. 2) Read the DTC of body integrated unit using Subaru Select Monitor.	Is DTC of low-speed CAN displayed?	Check the LAN communication circuit. <Ref. to LAN(diag)-2, Basic Diagnostic Procedure.>	Replace the ECM. <Ref. to FU(H4DOTC)-57, Engine Control Module (ECM).>

8. List of Cancel Code

A: LIST

NOTE:
- The cancel code is registered even when cancel is performed intentionally by the driver.
- Cancel codes are cleared if the ignition switch is turned to OFF.
- If a different cancel code is input after a cancel code (latest code) has been input, the latest code is overwritten.
- If the cruise indicator light is flashing, a malfunction is occurring in the system or cruise control related switch. The cancel code at this time is saved even after ignition switch is OFF as a memory code of a past malfunction.
- To display a cancel code, use the Subaru Select Monitor to read the code after the cruise control is deactivated during a driving test.

Cancel code	Item	Contents of diagnosis	Note
11	Main Switch	Main switch of cruise control command switch is turned to OFF, and then the cruise control is released.	This code is displayed without operating the main switch. <Ref. to CC(diag)-14, 11, Diagnostic Procedure with Cancel Code.>
12	Stop Light & Brake Switch	Stop light switch or brake switch is turned to ON, and then the cruise control is released.	This code is displayed without depressing the brake pedal. <Ref. to CC(diag)-16, 12, Diagnostic Procedure with Cancel Code.>
13	Clutch Switch	Clutch switch is turned to ON, and then the cruise control is released.	This code is displayed without depressing the clutch pedal. <Ref. to CC(diag)-18, 13, Diagnostic Procedure with Cancel Code.>
14	Neutral Position Switch	Neutral position switch is turned to ON, and then the cruise control is released.	This code is displayed without shifting to neutral position. <Ref. to CC(diag)-20, 14, Diagnostic Procedure with Cancel Code.>
15	Cancel Switch	Cancel switch is turned to ON, and then the cruise control is released.	This code is displayed without operating the cancel switch. <Ref. to CC(diag)-21, 15, Diagnostic Procedure with Cancel Code.>
16	Ignition switch	Ignition switch is turned to OFF, and then the cruise control is released.	This code is displayed without operating the ignition switch. <Ref. to CC(diag)-22, 16, Diagnostic Procedure with Cancel Code.>
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 code is displayed when the ignition switch is turned to ON without operating the cruise control command switch. <Ref. to CC(diag)-22, 21, Diagnostic Procedure with Cancel Code.>

List of Cancel Code

Cancel code	Item	Contents of diagnosis	Note
22	Abnormality of change in vehicle speed	Malfunction of vehicle speed signal variation is detected.	<Ref. to CC(diag)-23, 22, Diagnostic Procedure with Cancel Code.>
24	Abnormality of switches related to cruise control	Open circuit of the cruise control switch is detected during cruise driving. (The system is judged as model without cruise control.)	This code is displayed with normal operation. <Ref. to CC(diag)-23, 24, Diagnostic Procedure with Cancel Code.>
25	Abnormality of input circuit for Brake switch	Malfunction of brake switch input circuit in ECM is detected.	<Ref. to CC(diag)-23, 25, Diagnostic Procedure with Cancel Code.>
31	Abnormal engine speed Signal	• Abnormal increase of engine speed is detected. • Gear is placed in Neutral, 1st or Reverse position.	Cruise in 2nd shift position or more. <Ref. to CC(diag)-23, 31, Diagnostic Procedure with Cancel Code.>
32	Cruse Control out of Range	• Controlled vehicle speed decreased under the limit during cruising. • Set operation was performed at vehicle speed unavailable for setting. • RESUME operation was performed without memorized vehicle speed.	This code is displayed, though the vehicle speed is increased to the speed available for cruise set and set operation was performed again. <Ref. to CC(diag)-23, 32, Diagnostic Procedure with Cancel Code.>
34	Prohibition of cruise control at continuing big Accel. angle	The vehicle has been driven at higher speed than set vehicle speed for an abnormally long time (approximately 10 minutes) during cruise driving.	This code is displayed when driving for a long period of time at higher speed than appropriate cruise set vehicle speed by operating accelerator pedal. In this case, the cruise setting is deactivated. <Ref. to CC(diag)-24, 34, Diagnostic Procedure with Cancel Code.>
35	Prohibition of cruise control at vehicle speed F/B malfunction	Set vehicle speed cannot be kept because of some reasons (steep uphill, parking brake, abnormal decrease of engine output, etc.) during cruise driving.	This code is displayed when driving condition is not suitable for cruise control. Perform cruise set operation again after clearing the possible cause. <Ref. to CC(diag)-24, 35, Diagnostic Procedure with Cancel Code.>
41	VDC/TCS Operating	Vehicle dynamics control (VDC) or TCS is operated during cruise driving or cruise setting.	This code is displayed when driving condition is not suitable for cruise control. Perform cruise set operation again after clearing the possible cause. <Ref. to CC(diag)-24, 41, Diagnostic Procedure with Cancel Code.>
43	ABS/VDC Failure	ABS or Vehicle dynamics control (VDC) system malfunction is detected during cruise driving or cruise setting.	<Ref. to CC(diag)-24, 43, Diagnostic Procedure with Cancel Code.>

Cancel code	Item	Contents of diagnosis	Note
44	Body Integrated unit Failure	Body integrated unit system malfunction is detected during cruise driving or cruise setting.	<Ref. to CC(diag)-24, 44, Diagnostic Procedure with Cancel Code.>
45	Meter Failure	Combination meter malfunction is detected during cruise driving or cruise setting.	<Ref. to CC(diag)-24, 45, Diagnostic Procedure with Cancel Code.>
61	Brake switch abnormal	Malfunction in the stop light & brake switch is detected.	<Ref. to CC(diag)-24, 61, Diagnostic Procedure with Cancel Code.>
62	Neutral Switch Failure	Neutral position switch malfunction is detected.	<Ref. to CC(diag)-24, 62, Diagnostic Procedure with Cancel Code.>
63	Abnormality of change in vehicle speed	Malfunction of vehicle speed signal variation is detected.	<Ref. to CC(diag)-24, 63, Diagnostic Procedure with Cancel Code.>
64	Engine Sensor Failure 1	Malfunction related to engine is detected.	<Ref. to CC(diag)-25, 64, Diagnostic Procedure with Cancel Code.>
65	Abnormality 1 of switches related to cruise control	Cruise control command switch malfunction is detected. (When the switch is pressed ON for a long time (approximately two minutes), stuck ON condition is detected.)	<Ref. to CC(diag)-25, 65, Diagnostic Procedure with Cancel Code.>
66	Cruise Control Calculation Error	Cruise control calculation (microcomputer) malfunction is detected.	<Ref. to CC(diag)-25, 66, Diagnostic Procedure with Cancel Code.>

9. Diagnostic Procedure with Cancel Code

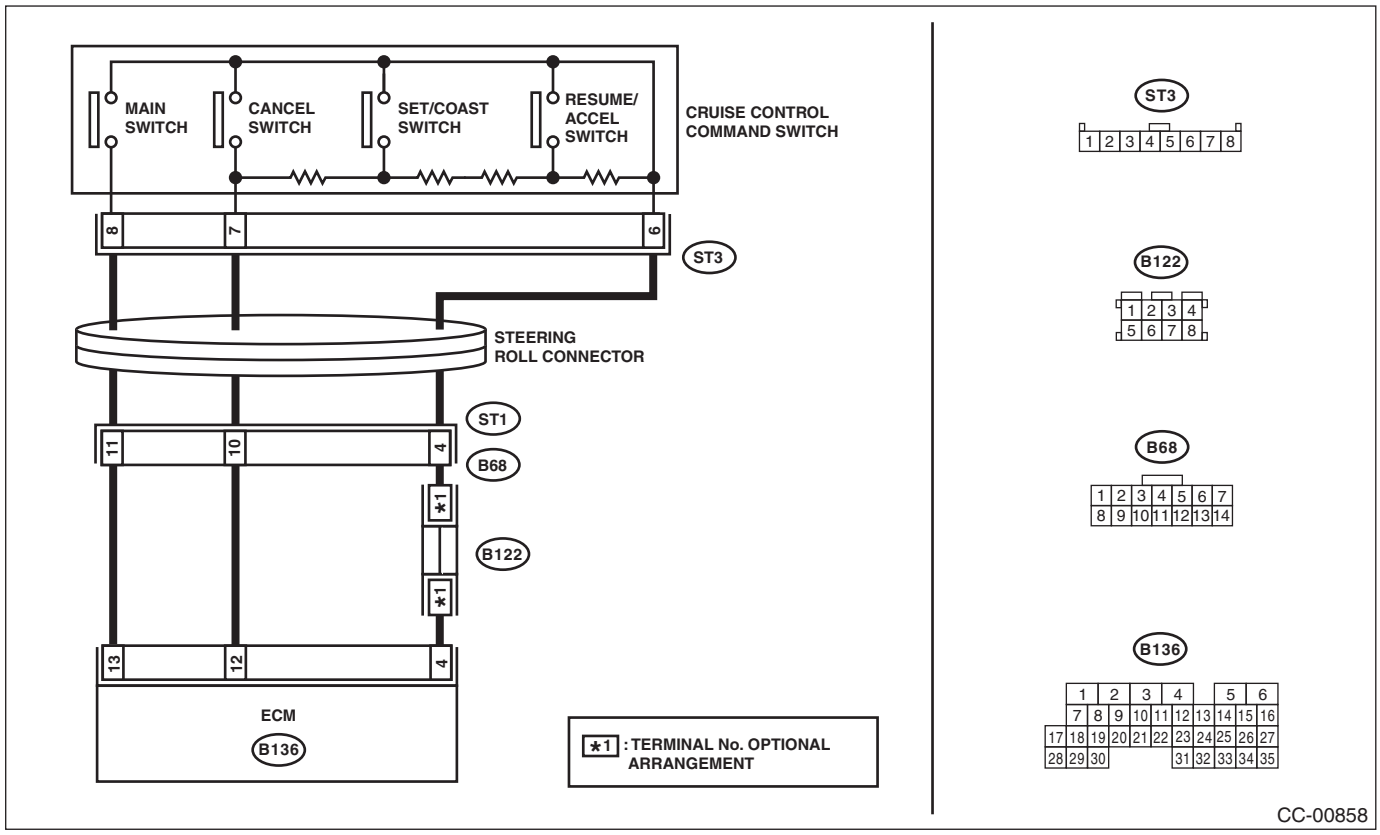
A: 11

Detected when main switch is pressed or when main switch related malfunction occurs.

TROUBLE SYMPTOM:

- Cruise control cannot be set. (Cancelled immediately.)
- Cruise control cannot be released.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK CRUISE CONTROL COMMAND SWITCH CIRCUIT.** 1) Remove the driver's airbag module. <Ref. to AB-18, 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. 8 (+) — Chassis ground (–):*** ***(ST3) No. 7 (+) — Chassis ground (–):***	Is the voltage 5 V or more?	Go to step **2**.	Check the harness between cruise control command switch and ECM, and the steering roll connector for open or short circuit, or for poor contact.
2	**CHECK CRUISE CONTROL COMMAND SWITCH CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Remove the cruise control command switch. <Ref. to CC-6, REMOVAL, Cruise Control Command Switch.> 3) Measure the resistance between harness connector terminal and chassis ground. ***Connector & terminal*** ***(ST3) No. 6 — Chassis ground:***	Is the resistance less than 10 Ω?	Go to step **3**.	Check for open circuit between cruise control command switch, ECM, and chassis ground and check the ECM.

	Step	Check	Yes	No
3	**CHECK CRUISE CONTROL COMMAND SWITCH.** Measure the resistance between switch terminals when the cruise control command switch is not depressed. ***Terminals*** ***No. 6 — No. 7:***	Is the resistance approx. 4 kΩ?	Go to step **4**.	Replace the cruise control command switch. <Ref. to CC-6, Cruise Control Command Switch.>
4	**CHECK CANCEL SWITCH.** 1) Turn the ignition switch to OFF. 2) Remove the cruise control command switch. <Ref. to CC-6, REMOVAL, Cruise Control Command Switch.> 3) Measure the resistance between switch terminals with the CANCEL switch pressed. ***Terminals*** ***No. 6 — No. 7:***	Is the resistance approx. less than 1 Ω when the CANCEL switch is pressed?	Go to step **5**.	Replace the cruise control command switch. <Ref. to CC-6, Cruise Control Command Switch.>
5	**CHECK SET/COAST SWITCH.** Measure the resistance between switch terminals with the SET/COAST switch pressed. ***Terminals*** ***No. 6 — No. 7:***	Is the resistance approx. 250 Ω when SET/COAST switch is pressed?	Go to step **6**.	Replace the cruise control command switch. <Ref. to CC-6, Cruise Control Command Switch.>
6	**CHECK RESUME/ACCEL SWITCH CIRCUIT.** Measure the resistance between switch terminals with the RESUME/ACCEL switch pressed. ***Terminals*** ***No. 6 — No. 7:***	Is the resistance approx. 1,500 Ω when RESUME/ACCEL switch is pressed?	Replace the ECM. <Ref. to FU(H4DOTC)-57, Engine Control Module (ECM).>	Replace the cruise control command switch. <Ref. to CC-6, Cruise Control Command Switch.>

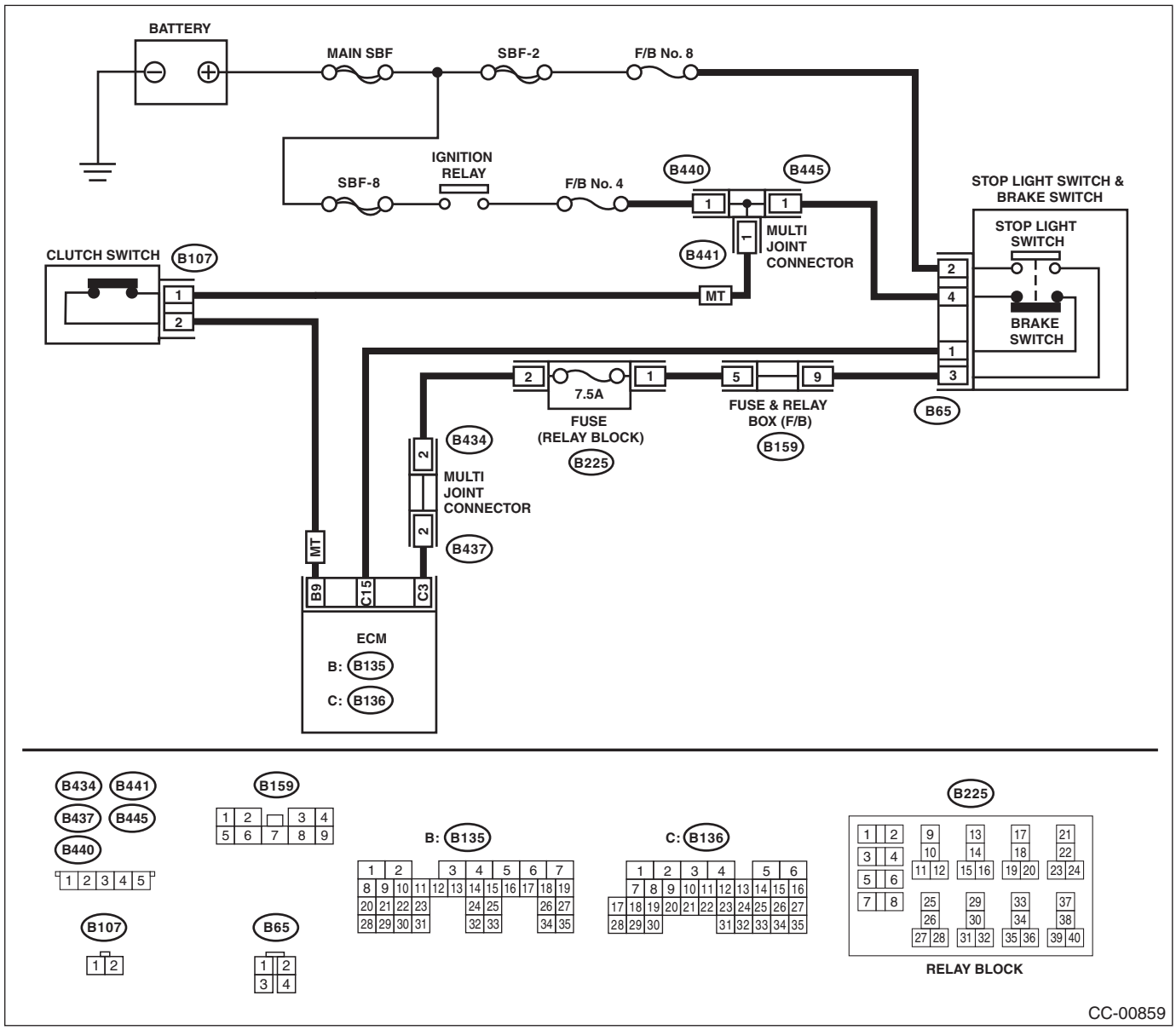
B: 12

Detected when brake pedal is depressed or malfunction related to stop light & brake switch occurs.

TROUBLE SYMPTOM:

- Cruise control cannot be set.
- Cruise control cannot be released.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK STOP LIGHT & BRAKE SWITCH.** Check the stop light & brake switch. <Ref. to CC-9, Stop Light & Brake Switch.>	Is the stop light & brake switch and installation position OK?	Go to step **2**.	Replace the stop light & brake switch. Or adjust the installation position.
2	**CHECK STOP LIGHT & BRAKE SWITCH CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the stop light & brake switch harness connector. 3) Turn the ignition switch to ON. 4) Measure the voltage between harness connector terminal and chassis ground. ***Connector & terminal*** ***(B65) No. 2 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **3**.	• Check fuse No. 8 (in fuse & relay box). • Check for open or short in the harness between stop light & brake switch and fuse & relay box.
3	**CHECK STOP LIGHT & BRAKE SWITCH CIRCUIT.** Measure the voltage between harness connector terminal and chassis ground. ***Connector & terminal*** ***(B65) No. 4 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **4**.	• Check fuse No. 4 (in fuse & relay box). • Check for open or short in the harness between stop light & brake switch and fuse & relay box.
4	**CHECK STOP LIGHT & BRAKE SWITCH CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the harness connector of ECM. 3) Measure the resistance between ECM harness connector terminal and stop light & brake switch harness connector terminal. ***Connector & terminal*** ***(B136) No. 15 — (B65) No. 1:*** ***(B136) No. 3 — (B65) No. 3:***	Is the resistance less than 10 Ω?	Replace the ECM. <Ref. to FU(H4DOTC)-57, Engine Control Module (ECM).>	Repair the harness.

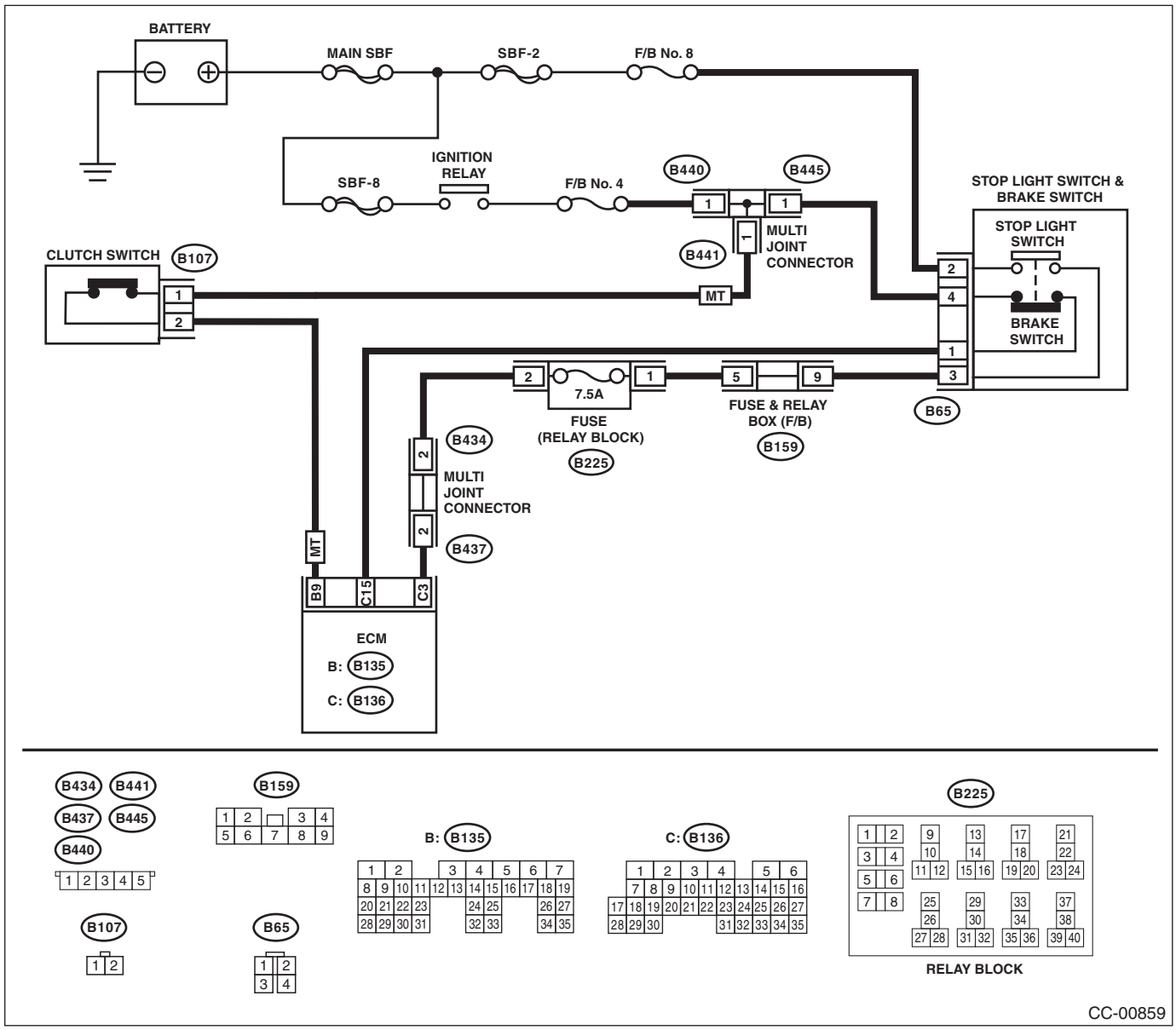
C: 13

Detected when clutch pedal is depressed or malfunction related to clutch switch occurs.

TROUBLE SYMPTOM:

- Cruise control cannot be set.
- Cruise control cannot be released.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CLUTCH SWITCH.** Check the clutch switch. <Ref. to CL-26, INSPECTION, Clutch Switch.>	Is the clutch switch and installation position OK?	Go to step **2**.	Replace the clutch switch. Or adjust the installation position.
2	**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. ***Connector & terminal*** ***(B107) No. 1 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **3**.	• Check fuse No. 4 (in fuse & relay box). • Check open or shorted circuit of harness between clutch switch and fuse & relay box.
3	**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. ***Connector & terminal*** ***(B107) No. 2 — (B135) No. 9:***	Is the resistance less than 10 Ω?	Replace the ECM. <Ref. to FU(H4DOTC)-57, Engine Control Module (ECM).>	Repair the harness.

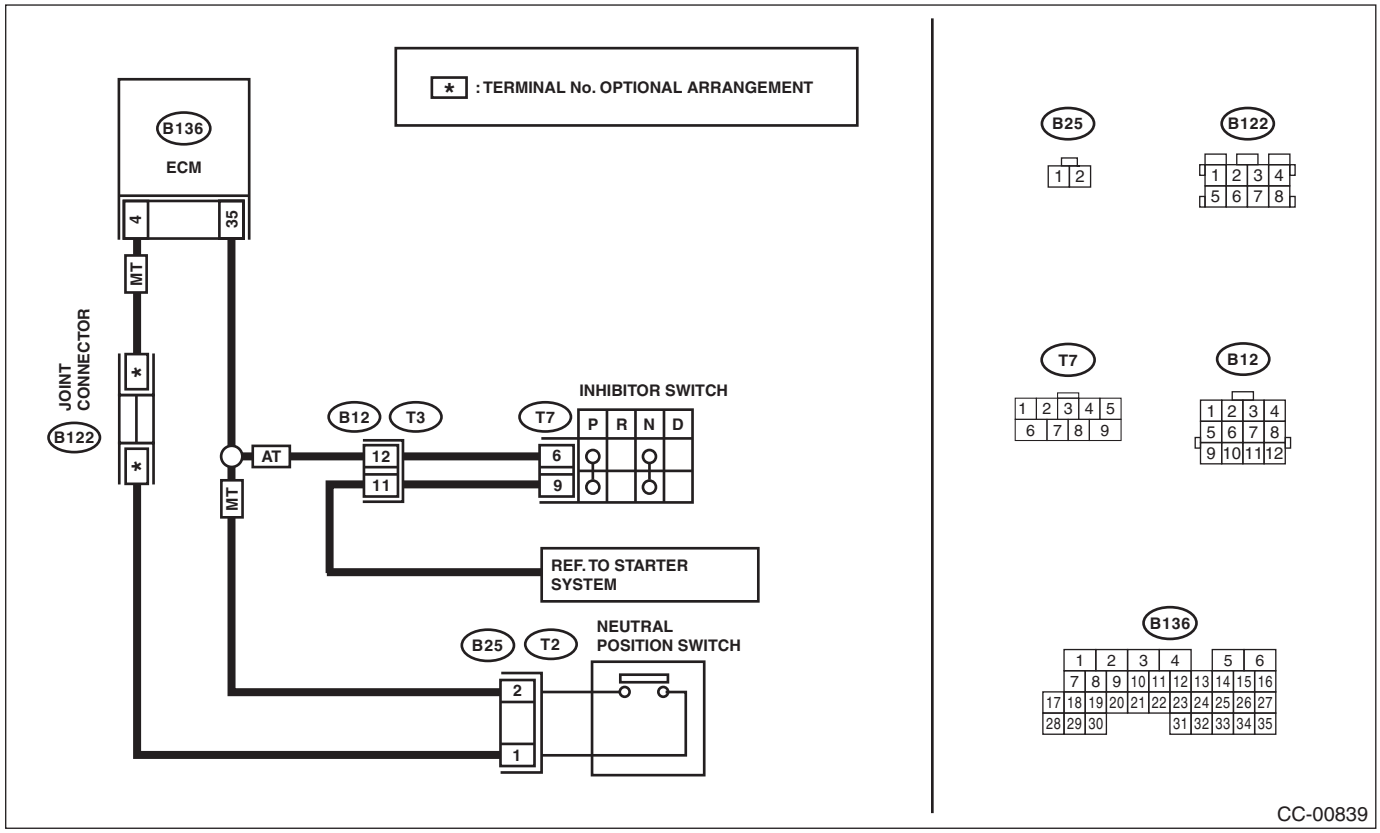
D: 14

Detected when select lever is set in the neutral position, or when malfunction related to neutral position switch occurs.

TROUBLE SYMPTOM:

Cruise control cannot be set.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK TRANSMISSION TYPE.**	Is the transmission type MT?	Go to step **5**.	Go to step **2**.
2	**CHECK INHIBITOR SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the inhibitor switch harness connector. 3) Turn the ignition switch to ON. 4) Measure the voltage between harness connector terminal and chassis ground. ***Connector & terminal*** ***(T7) No. 6 (+) — Chassis ground (–):***	Is the voltage approx. 10 V or more?	Go to step **3**.	Check for open or short circuit in the harness between inhibitor switch and ECM.
3	**CHECK INHIBITOR SWITCH CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the starter motor connector. 3) Turn the ignition switch to ON. 4) Measure the resistance between inhibitor switch harness connector terminal and starter motor. ***Connector & terminal*** ***(T7) No. 9 — Starter motor:***	Is the resistance less than 10 Ω?	Repair the harness.	Go to step **4**.
4	**CHECK INHIBITOR SWITCH.** Remove and check the inhibitor switch. <Ref. to 4AT-52, INSPECTION, Inhibitor Switch.>	Is the inhibitor switch working normal?	Replace the ECM. <Ref. to FU(H4DOTC)-57, Engine Control Module (ECM).>	Replace the inhibitor switch.

	Step	Check	Yes	No
5	**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*** ***(B25) No. 2 (+) — Chassis ground (–):***	Is the voltage approx. 10 V or more?	Go to step **6**.	Check for open or short in the harness between neutral position switch and ECM.
6	**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*** ***(B25) No. 1 — Chassis ground:***	Is the resistance less than 10 Ω?	Go to step **7**.	Repair the harness.
7	**CHECK NEUTRAL POSITION SWITCH.** Remove and check the neutral position switch. <Ref. to 5MT-35, INSPECTION, Switches and Harness.>	Is the neutral position switch OK?	Replace the ECM. <Ref. to FU(H4DO)-101, Engine Control Module (ECM).>	Replace the neutral position switch.

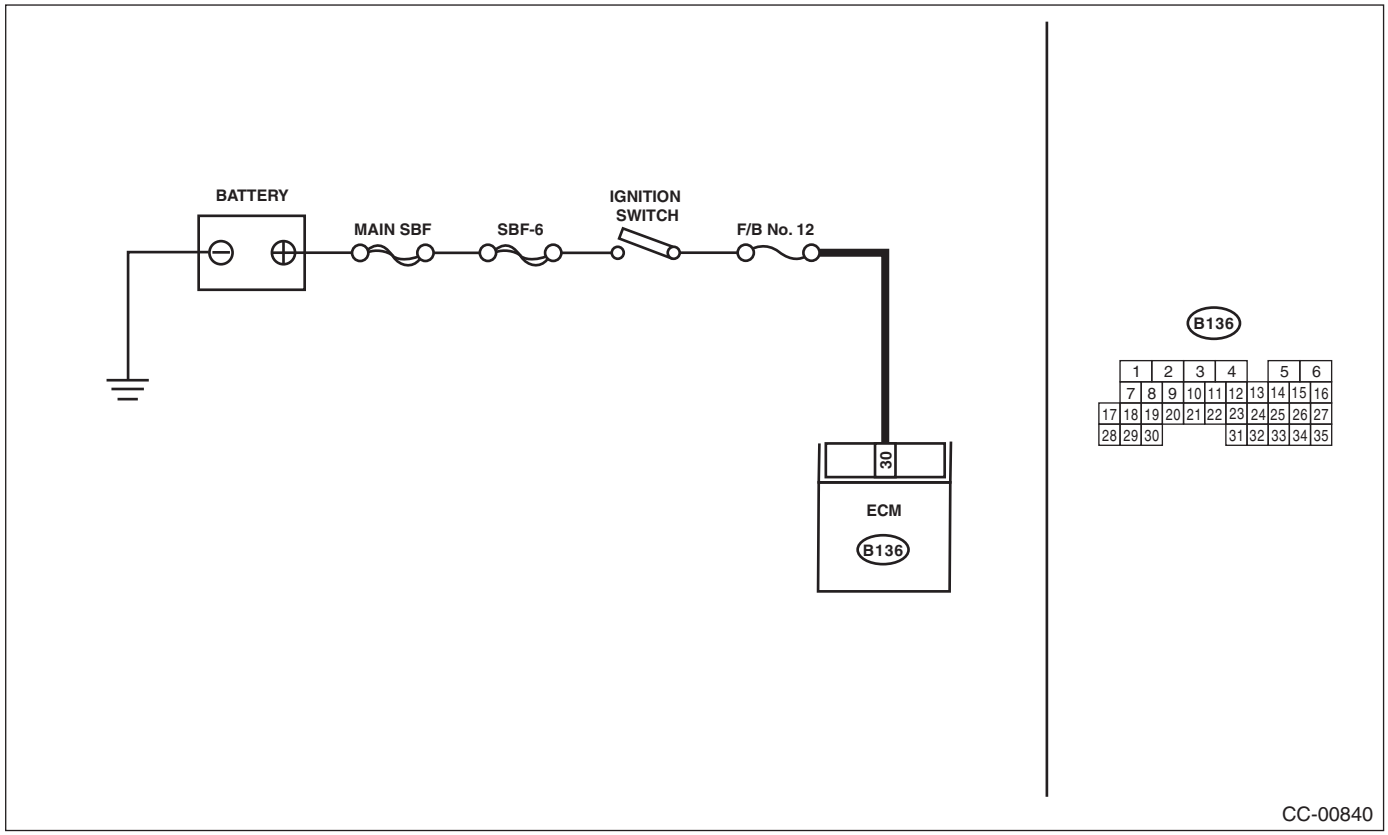
E: 15

Detected when CANCEL switch is pressed or malfunction related to main switch occurs.
TROUBLE SYMPTOM:
- Cruise control cannot be set. (Cancelled immediately.)
- Cruise control cannot be released.

Refer to 11 for diagnostic procedure.
<Ref. to CC(diag)-14, 11, Diagnostic Procedure with Cancel Code.>

F: 16

Detected when ignition switch is turned to OFF or malfunction related to the ignition switch occurs.
TROUBLE SYMPTOM:
Cruise control cannot be set.
WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK IGNITION SWITCH CIRCUIT** 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. ***Connector & terminal*** ***(B136) No. 30 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Check for poor contact of ECM connector.	• Check fuse No. 12 (in fuse & relay box). • Check the harness for open or short circuit between ignition switch and ECM.

G: 21

Cruise control command switch malfunction is detected.
TROUBLE SYMPTOM:
- Cruise control cannot be set. (Cancelled immediately.)
- Cruise control cannot be released.

Refer to 11 for diagnostic procedure. <Ref. to CC(diag)-14, 11, Diagnostic Procedure with Cancel Code.>

H: 22

Malfunction related to vehicle speed sensor is detected.
DIAGNOSIS:
Open or shorted circuit in vehicle speed sensor system.
TROUBLE SYMPTOM:
Cruise control cannot be set. (Cancelled immediately.)

	Step	Check	Yes	No
1	**CHECK ABS OR VDC WARNING LIGHT.** 1) Turn the ignition switch to ON. 2) After the initial operation of the combination meter is completed, check whether the VDC warning light continues to illuminate.	Does the warning light continue to illuminate?	Check the VDCCM. <Ref. to VDC(diag)-2, Basic Diagnostic Procedure.>	Go to step **2**.
2	**CHECK DTC OF LAN COMMUNICATION CIRCUIT.** Read the DTC of body integrated unit using Subaru Select Monitor.	Is DTC of low-speed CAN displayed?	Check the LAN communication circuit.	Replace the ECM. <Ref. to FU(H4DO)-101, Engine Control Module (ECM).> <Ref. to FU(H4DOTC)-57, Engine Control Module (ECM).>

I: 24

Malfunction in cruise control-related switch is detected.
TROUBLE SYMPTOM:
- Cruise control cannot be set. (Cancelled immediately.)
- Cruise control cannot be released.

Refer to 11 for diagnostic procedure.
<Ref. to CC(diag)-14, 11, Diagnostic Procedure with Cancel Code.>

J: 25

Malfunction of brake input circuit in ECM is detected.
Refer to the Engine Diagnostic Procedure for diagnostic procedure. <Ref. to EN(H4DO)(diag)-2, PROCEDURE, Basic Diagnostic Procedure.> <Ref. to EN(H4DOTC)(diag)-2, PROCEDURE, Basic Diagnostic Procedure.>

K: 31

Engine speed signal malfunction is detected.
Abnormal increase of engine speed is detected.
Gear is placed in 1st or Reverse position.
After driving at the 2nd gear position or higher, perform the cruise setting again. If a cancel code is not detected, it is normal.

L: 32

Detected when the vehicle speed is out of the system controllable range.
Increase vehicle speed high enough to allow the cruise control to function, and then perform setting operation again.
If the cancel code is detected after performing the setting operation again, perform diagnosis of 22.
Refer to 22 for diagnostic procedure.
<Ref. to CC(diag)-23, 22, Diagnostic Procedure with Cancel Code.>

M: 34

The vehicle has been driven at a speed higher than set speed for a long time (approximately 10 minutes) during cruise driving.
This cancel code is detected when driving for a long period of time at a speed higher than appropriate for cruise control setting by operating the accelerator pedal.
Perform the cruise control setting operation again. If the cancel code is not detected, it is normal.

N: 35

Detected when it is impossible to perform the vehicle speed feedback.
Set vehicle speed cannot be kept for some reasons (steep uphill, unreleased parking brake, etc.) during cruise driving.
Cancel code is detected when driving condition is not suitable for cruise control.
Perform cruise set operation again after clearing the possible cause.

O: 41

VDC/TCS has operated.
Vehicle dynamics control (VDC) or TCS is operated during cruise driving or cruise setting.
<Ref. to VDC(diag)-2, PROCEDURE, Basic Diagnostic Procedure.>

P: 43

ABS/VDC malfunction is detected.
VDC malfunction is detected during cruise driving or cruise setting.
<Ref. to VDC(diag)-2, PROCEDURE, Basic Diagnostic Procedure.>

Q: 44

Body integrated unit malfunction is detected.
Body integrated unit system malfunction is detected during cruise driving or cruise setting. <Ref. to LAN(diag)-2, PROCEDURE, Basic Diagnostic Procedure.>

R: 45

Combination meter malfunction is detected.
Combination meter malfunction is detected during cruise driving or cruise setting. <Ref. to LAN(diag)-2, PROCEDURE, Basic Diagnostic Procedure.>

S: 61

Malfunction in the stop light & brake switch is detected.
TROUBLE SYMPTOM:
- Cruise control cannot be set.
- Cruise control cannot be released.

Refer to 12 for diagnostic procedure. <Ref. to CC(diag)-16, 12, Diagnostic Procedure with Cancel Code.>

T: 62

Neutral position switch malfunction is detected.
TROUBLE SYMPTOM:
Cruise control cannot be set.
Refer to 14 for diagnostic procedure. <Ref. to CC(diag)-20, 14, Diagnostic Procedure with Cancel Code.>

U: 63

Malfunction of vehicle speed signal variation is detected.
TROUBLE SYMPTOM:
Cruise control cannot be set. (Cancelled immediately.)
Refer to 22 for diagnostic procedure. <Ref. to CC(diag)-23, 22, Diagnostic Procedure with Cancel Code.>

V: 64

Malfunction related to engine is detected.
Refer to the Engine Diagnostic Procedure for diagnostic procedure. <Ref. to EN(H4DO)(diag)-2, PROCEDURE, Basic Diagnostic Procedure.> <Ref. to EN(H4DOTC)(diag)-2, PROCEDURE, Basic Diagnostic Procedure.>

W: 65

Cruise control command switch malfunction is detected.
While the command switch is pressed ON for a long time (approximately two minutes), stuck ON condition is detected.
TROUBLE SYMPTOM:
- Cruise control cannot be set. (Cancelled immediately.)
- Cruise control cannot be released.

Refer to 11 for diagnostic procedure. <Ref. to CC(diag)-14, 11, Diagnostic Procedure with Cancel Code.>

X: 66

Cruise control calculation malfunction is detected.
Refer to the Engine Diagnostic Procedure for diagnostic procedure. <Ref. to EN(H4DO)(diag)-2, PROCEDURE, Basic Diagnostic Procedure.> <Ref. to EN(H4DOTC)(diag)-2, PROCEDURE, Basic Diagnostic Procedure.>

IMMOBILIZER (DIAGNOSTICS)

IM(diag)

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1. Basic Diagnostic Procedure

A: PROCEDURE

	Step	Check	Yes	No
1	**CHECK SECURITY INDICATOR LIGHT.** 1) Turn the ignition switch to “OFF” or “ACC”. 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)-11, CHECK SECURITY INDICATOR LIGHT CIRCUIT, INSPECTION, Diagnostics Chart for Security Indicator Light.>
2	**CHECK KEY SWITCH.** 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 key switch circuit. <Ref. to IM(diag)-13, CHECK KEY SWITCH CIRCUIT, INSPECTION, Diagnostics Chart for Security Indicator Light.>
3	**CHECK SECURITY INDICATOR LIGHT.** Turn the ignition switch to ON.	Does the security indicator light go off?	Go to step **5**.	Go to step **4**.
4	**CHECK ENGINE START.** Turn the ignition switch to START.	Does the starter operate?	Check the LAN communication system. <Ref. to LAN(diag)-2, Basic Diagnostic Procedure.>	Go to step **7**.
5	**CHECK ENGINE START.** Turn the ignition switch to START.	Does the starter operate?	Go to step **6**.	Check the LAN communication system. <Ref. to LAN(diag)-2, Basic Diagnostic Procedure.>
6	**CHECK ENGINE START.** Turn the ignition switch to START.	Does the engine start?	Immobilizer system is normal.	Go to step **8**.
7	**CHECK DTC.** 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor to data link connector. <Ref. to IM(diag)-8, Subaru Select Monitor.> 3) Turn the ignition switch and Subaru Select Monitor switch to ON. 4) Read the DTC of the body integrated unit.	Is the DTC displayed on screen?	Go to step **10**.	Replace the body integrated unit <Ref. to SL-46, Body Integrated Unit.> Register all ignition keys (transponders). Refer to the “PC application help for Subaru Select Monitor”.

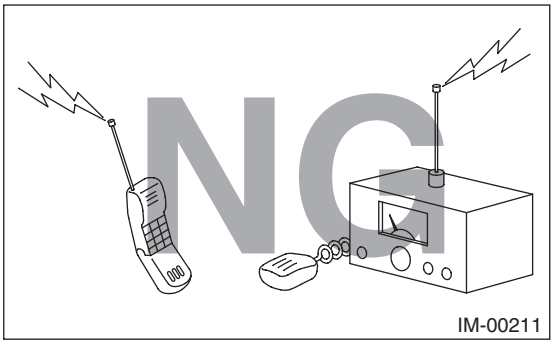
Step		Check	Yes	No
8	**CHECK DTC.** 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor to data link connector. <Ref. to IM(diag)-8, Subaru Select Monitor.> 3) Turn the ignition switch and Subaru Select Monitor switch to ON. 4) Read the DTC of the ECM.	Is the DTC displayed on screen?	Go to step **9**.	Perform the diagnosis for engine system. <Ref. to EN(H4DO)(diag)-70, PROCEDURE, Diagnostics for Engine Starting Failure.> <Ref. to EN(H4DOTC)(diag)-69, PROCEDURE, Diagnostics for Engine Starting Failure.>
9	**CHECK FREEZE FRAME DATA.** Using the Subaru Select Monitor, check the Freeze Frame Data.	Was the Freeze Frame Data recorded?	Record the data. Go to step **10**.	Go to step **10**.
10	**PERFORM DIAGNOSIS.** 1) Inspect using the “Diagnostic Procedure with Diagnostic Trouble Code (DTC)”. <Ref. to IM(diag)-15, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> 2) Repair the trouble cause. 3) Perform the Clear Memory Mode. 4) Read DTCs again.	Is the DTC displayed on screen?	Inspect using the “Diagnostic Procedure with Diagnostic Trouble Code (DTC)”. <Ref. to IM(diag)-15, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

2. General Description

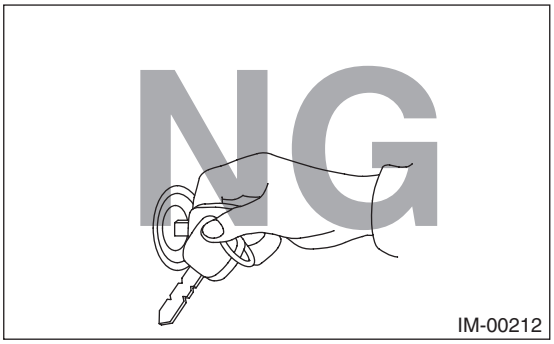
A: CAUTION

CAUTION:

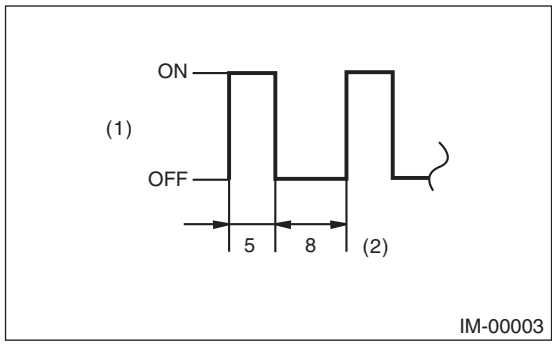
- **Do not use the electrical test equipment on the airbag system wiring harnesses and connector circuits.**
- **Be careful not to damage the airbag system wiring harness.**
- **While diagnostic items are being checked, do not operate radios, portable telephones, etc. which emit electromagnetic waves near or inside the vehicle.**



- **When turning the ignition switch to ON or OFF while diagnostic items are being checked, do not allow keys with different ID codes close to the ignition switch. If the ignition key is on a key holder, remove it from the key holder before performing 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.**

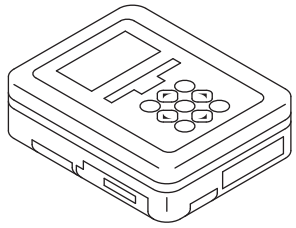


(1) Ignition switch position
(2) Sec.

- **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 performing the diagnostics, obtain all keys for the vehicle from the owner.**
- **Do not install or register a body integrated unit already registered to another vehicle to diagnose failures or inspect functions.**

B: PREPARATION TOOL

1. SPECIAL TOOL

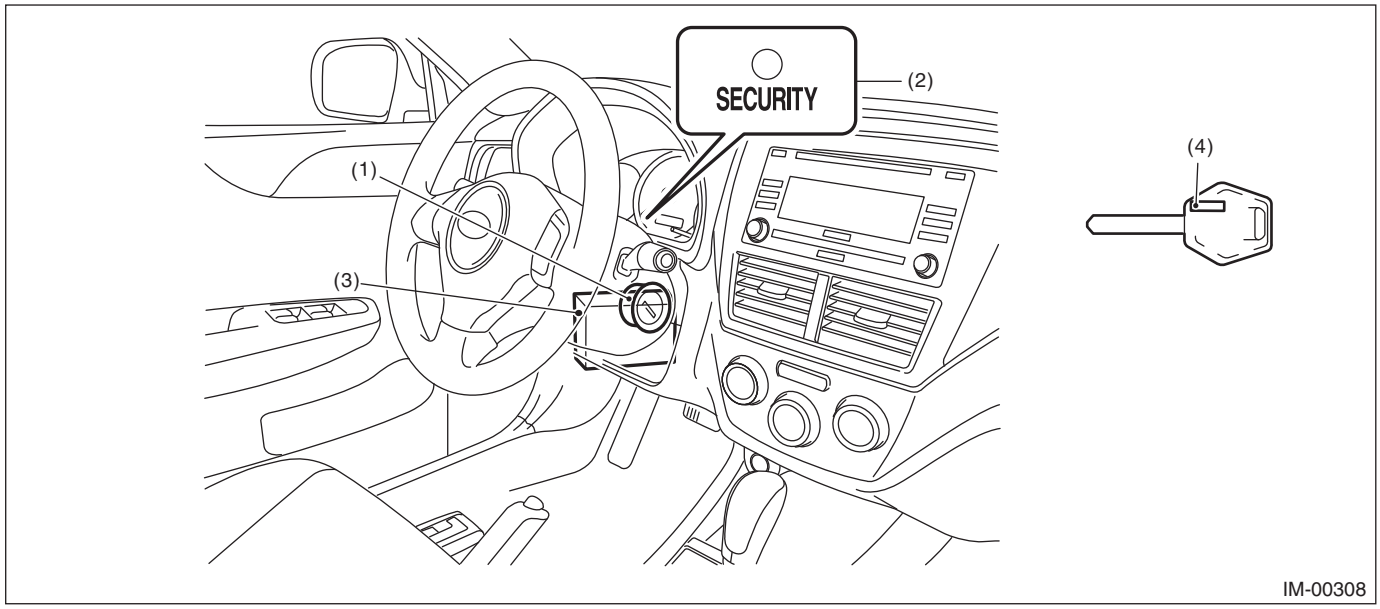
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST1B022XU0	1B022XU0	SUBARU SELECT MONITOR III KIT	Used for troubleshooting the electrical system.

2. GENERAL TOOL

TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance, voltage and current.

3. Electrical Component Location

A: LOCATION



(1) Antenna
(2) Security indicator light (LED bulb)
(3) Body integrated unit
(4) Transponder

4. Immobilizer Control Module I/O Signal

A: WIRING DIAGRAM

1. IMMOBILIZER

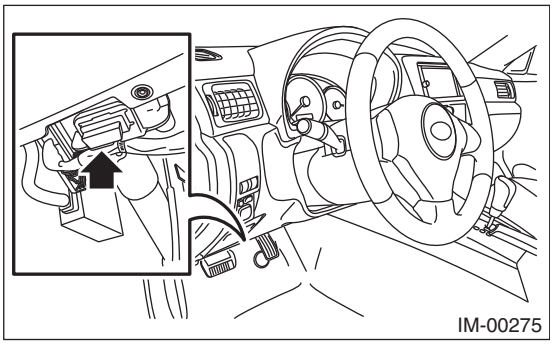
<Ref. to WI-171, WIRING DIAGRAM, Immobilizer System.>

5. Subaru Select Monitor

A: OPERATION

1. HOW TO USE 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 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 data link connector.

CAUTION:
Do not connect scan tools other than the Subaru Select Monitor.
4) Turn the ignition switch to ON and start the Subaru Select Monitor.
5) Using the Subaru Select Monitor, call up DTCs and various data, then record them.

2. COMMUNICATION LINE CHECK

NOTE:
Use "System Operation Check Mode" to check the communication line between ECM and the body integrated unit. This is called "communication line check".
1) Connect the Subaru Select Monitor.
2) On «Main Menu» display, select {Each System Check}.
3) On «System Selection Menu» display, select {Engine Control System}.
4) After engine type information is displayed, select [OK].
5) On «Engine Diagnosis» display, select {System Operation Check Mode}.
6) On «System Operation Check Mode» display, select {Immobilizer System}.
7) Start the communication line check.
8) Is «OK» displayed on screen?
If displayed, go to step 9).
If not, go to step 10).
9) After diagnostic results, it is determined that the circuit is not shorted. Finish the communication line check.
10) If a problem is detected, repair the trouble cause. <Ref. to IM(diag)-19, DTC P1572 IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

6. Read Diagnostic Trouble Code (DTC)

A: OPERATION

1. ECM

1) On «Main Menu» display, select {Each System Check}.
2) On «System Selection Menu» display, select {Engine Control System}.
3) Select [OK] after the information of engine type is displayed.
4) On «Engine Diagnosis» display, select {Diagnostic Code(s) Display}.
5) On «Diagnostic Code(s) Display» display, select {Current DTC} or {Past DTC}.

NOTE:
• For detailed operation procedures, refer to “PC application help for Subaru Select Monitor”.
• For detailed concerning DTC, refer to the List of Diagnostic Trouble Codes (DTC). <Ref. to IM(diag)-14, LIST, List of Diagnostic Trouble Code (DTC).>

2. BODY INTEGRATED UNIT

1) On «Main Menu» display, select {Each System Check}.
2) On «System Selection Menu» display, select {Integ. Unit}.
3) After {Integ. unit} is displayed, select [OK].
4) On «Integ. unit mode failure diag.» display, select {Diagnostic Code(s) Display}.

NOTE:
• For detailed operation procedures, refer to “PC application help for Subaru Select Monitor”.
• For detailed concerning DTC, refer to the List of Diagnostic Trouble Codes (DTC). <Ref. to IM(diag)-14, LIST, List of Diagnostic Trouble Code (DTC).>

7. Clear Memory Mode

A: OPERATION

1. ECM

1) On «Main Menu» display, select {Each System Check}.
2) On «System Selection Menu» display, select {Engine Control System}.
3) After engine type information is displayed, select [OK].
4) On «Engine Diagnosis» display, select {Clear Memory}.
5) When “Done” is displayed on the display, end the Subaru Select Monitor and turn the ignition switch to OFF.

NOTE:
• Initial diagnosis of electronic throttle control is performed after memory clearance. Wait for 10 seconds or more after turning the ignition switch to ON, and then start the engine.
• For detailed operation procedures, refer to “PC application help for Subaru Select Monitor”.

2. BODY INTEGRATED UNIT

1) On the «Main Menu», select {Each System Check}.
2) On the «System Selection Menu», select {Integ. Unit}.
3) After {Integ. Unit} is displayed, select [OK].
4) On the «Integ. unit mode», select {Clear Memory}.
5) When “Done” is displayed on the display screen, end the Subaru Select Monitor and turn the ignition switch to OFF.

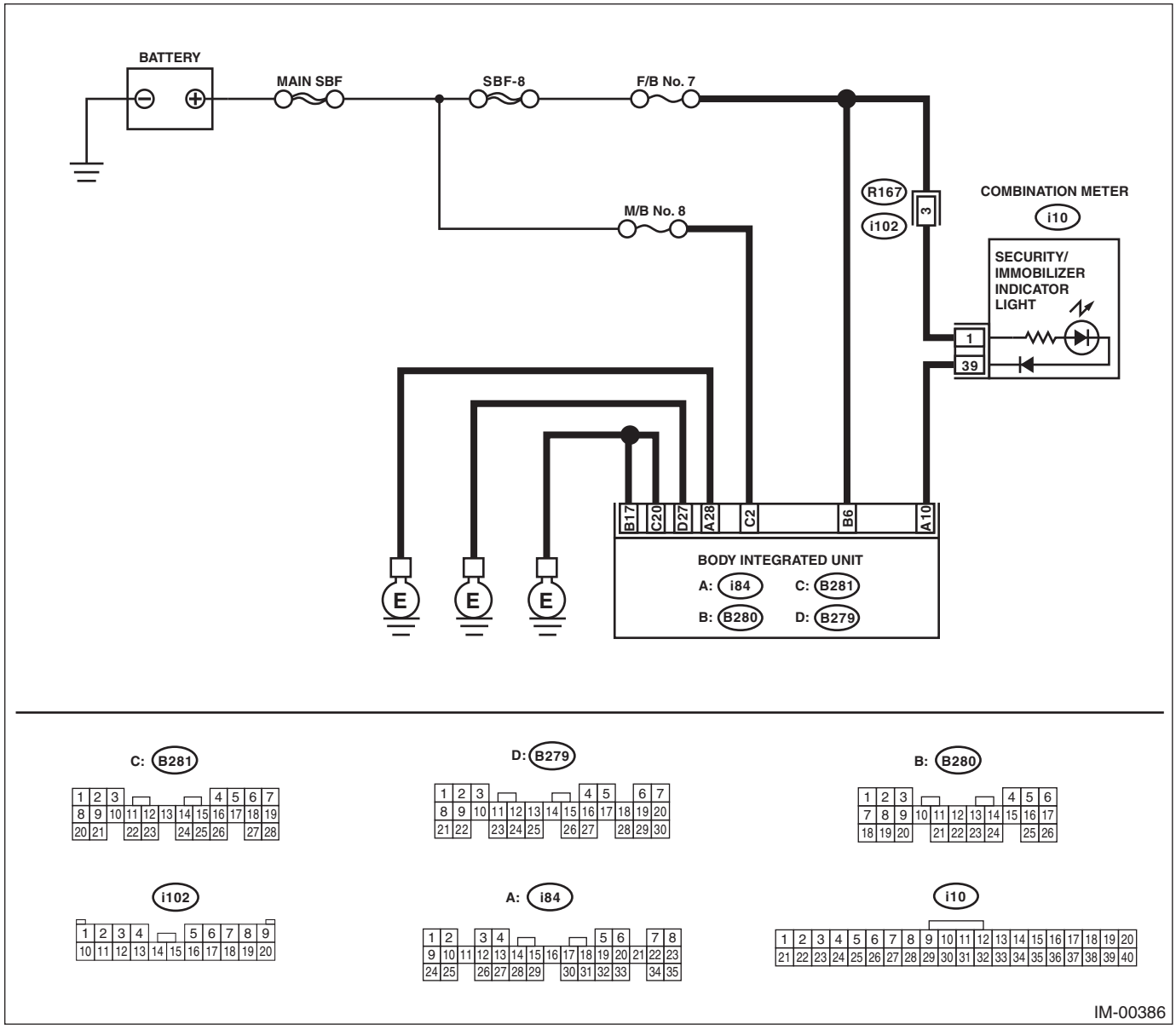
NOTE:
For detailed operation procedure, refer to the “PC application help for Subaru Select Monitor”.

8. Diagnostics Chart for Security Indicator Light

A: INSPECTION

1. CHECK SECURITY INDICATOR LIGHT CIRCUIT

WIRING DIAGRAM:



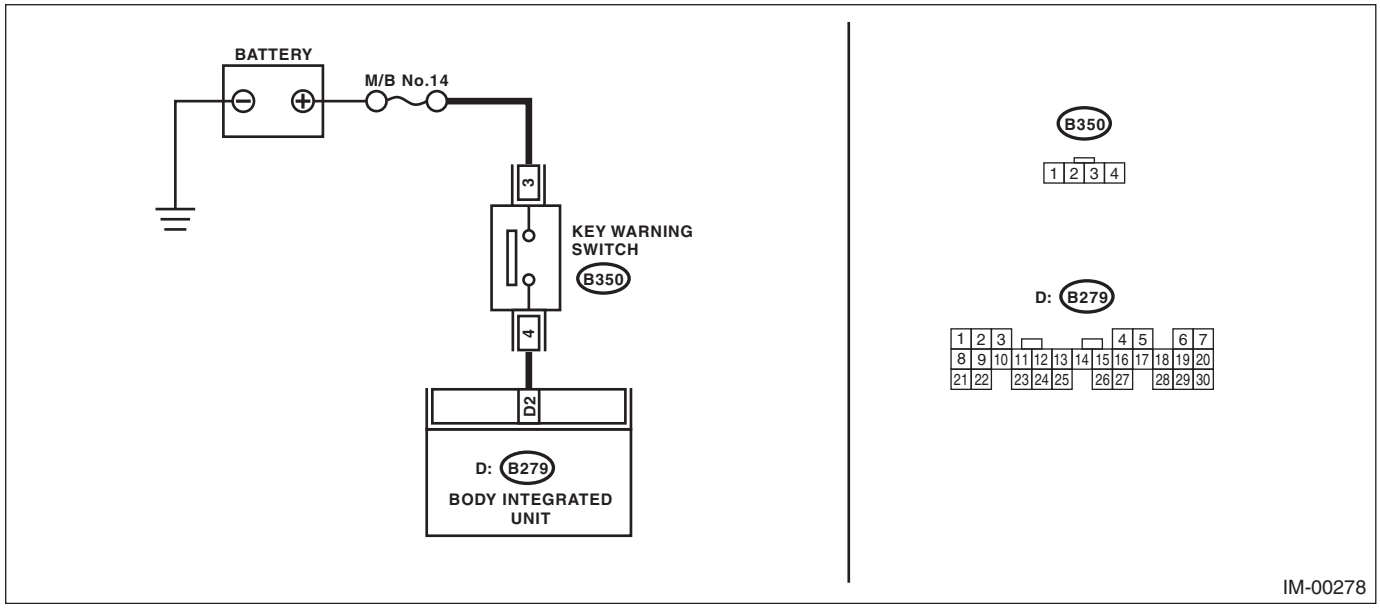
Step		Check	Yes	No
1	**CHECK FUSE.** 1) Remove the ignition key from ignition switch. 2) Check the fuse (M/B No. 8).	Is the fuse OK?	Go to step **2**.	Replace the fuse. If the replaced fuse blows out easily, repair the short circuit in the harness between the fuse and body integrated unit.

Diagnostics Chart for Security Indicator Light

	Step	Check	Yes	No
2	**CHECK SECURITY INDICATOR LIGHT.** 1) Disconnect the connector from body integrated unit. 2) Connect the resistor (100 Ω) between the body integrated unit connector terminal (i84) No. 10 and chassis ground.	Does the security indicator light illuminate?	Go to step **3**.	Go to step **5**.
3	**CHECK BODY INTEGRATED UNIT GROUND CIRCUIT.** Measure the resistance between the body integrated unit connector terminal and chassis ground. ***Connector & terminal*** ***(i84) No. 28 — Chassis ground:*** ***(B280) No. 17 — Chassis ground:*** ***(B281) No. 20 — Chassis ground:*** ***(B279) No. 27 — Chassis ground:***	Is the resistance less than 10 Ω?	Go to step **4**.	Repair the open circuit of the body integrated unit ground circuit.
4	**CHECK BODY INTEGRATED UNIT POWER SUPPLY CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Measure the voltage between the body integrated unit connector terminal and chassis ground. ***Connector & terminal*** ***(B280) No. 6 (+) — Chassis ground (–):*** ***(B281) No. 2 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Replace the body integrated unit <Ref. to SL-46, Body Integrated Unit.> Register all ignition keys (transponders). Refer to the "PC application help for Subaru Select Monitor".	Check the harness for open or short circuit between body integrated unit and fuse.
5	**CHECK COMBINATION METER CIRCUIT.** 1) Remove the combination meter. <Ref. to IDI-21, Combination Meter.> 2) Measure the voltage between combination meter connector terminal and chassis ground. ***Connector & terminal*** ***(i10) No. 1 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **6**.	Check for an open or short circuit in the harness between the combination meter and fuse.
6	**CHECK COMBINATION METER CIRCUIT.** Measure the resistance between the body integrated unit connector terminal and combination meter connector terminal. ***Connector & terminal*** ***(i84) No. 10 — (i10) No. 39:***	Is the resistance less than 10 Ω?	LED bulb is defective. Replace the combination meter case assembly. <Ref. to IDI-21, DISASSEMBLY, Combination Meter.>	Repair the harness or connector.

2. CHECK KEY SWITCH CIRCUIT

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK POWER SUPPLY CIRCUIT.** 1) Disconnect the connector from key warning switch. 2) Measure the voltage between key warning switch connector terminal and chassis ground. ***Connector & terminal*** ***(B350) No. 3 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **2**.	Check the harness for an open or short between the key warning switch and fuse.
2	**CHECK KEY WARNING SWITCH.** 1) Insert the ignition key in the ignition switch. (OFF or ACC) 2) Measure the resistance between key warning switch connector terminals. ***Connector & terminal*** ***No. 3 — No. 4:***	Is the resistance less than 1 Ω?	Go to step **3**.	Replace the key warning switch.
3	**CHECK KEY WARNING SWITCH.** 1) Remove the ignition key from ignition switch. 2) Measure the resistance between key warning switch connector terminals. ***Connector & terminal*** ***No. 3 — No. 4:***	Is the resistance 1 MΩ or more?	Go to step **4**.	Replace the key warning switch.
4	**CHECK HARNESS BETWEEN KEY WARNING SWITCH AND BODY INTEGRATED UNIT.** 1) Disconnect the connector from body integrated unit. 2) Measure the resistance between key warning switch connector terminal and body integrated unit connector terminal. ***Connector & terminal*** ***(B350) No. 4 — (B279) No. 2:***	Is the resistance less than 10 Ω?	Replace the body integrated unit <Ref. to SL-46, Body Integrated Unit.> Register all ignition keys (transponders). Refer to the “PC application help for Subaru Select Monitor”.	Repair the harness between key warning switch and body integrated unit.

9. List of Diagnostic Trouble Code (DTC)

A: LIST

1. ECM

DTC	Item	Contents of diagnosis	Index No.
P0513	Incorrect Immobilizer Key	Incorrect immobilizer key (Use of unregistered key in body integrated unit)	<Ref. to IM(diag)-15, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1570	Antenna	Faulty antenna	<Ref. to IM(diag)-16, DTC P1570 ANTENNA, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1571	Reference Code Incompatibility	Reference code incompatibility between body integrated unit and ECM	<Ref. to IM(diag)-18, DTC P1571 REFERENCE CODE INCOMPATIBILITY, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1572	IMM Circuit Failure (Except Antenna Circuit)	Communication failure between body integrated unit and ECM	<Ref. to IM(diag)-19, DTC P1572 IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1574	Key Communication Failure	Communication failure between key and body integrated unit	<Ref. to IM(diag)-22, DTC P1574 KEY COMMUNICATION FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1576	EGI Control Module EEPROM	ECM malfunctioning	<Ref. to IM(diag)-23, DTC P1576 EGI CONTROL MODULE EEPROM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1577	IMM Control Module EEPROM	Body integrated unit malfunctioning	<Ref. to IM(diag)-24, DTC P1577 IMM CONTROL MODULE EEPROM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1578	Meter Failure	• Reference code incompatibility between combination meter and body integrated unit • Communication failure between body integrated unit and ECM	<Ref. to IM(diag)-25, DTC P1578 METER FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

NOTE:
Perform diagnosis of engine DTC when a DTC other than an immobilizer DTC is detected. <Ref. to EN(H4DOTC)(diag)-82, List of Diagnostic Trouble Code (DTC).>

2. BODY INTEGRATED UNIT

DTC	Item	Contents of diagnosis	Index No.	Relation between ECM and DTC
B1401	M Collation NG	Reference code incompatibility between combination meter and body integrated unit	<Ref. to IM(diag)-25, DTC B1401 M COLLATION NG, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	P1578
B1402	Immobilizer Key Collation NG	• Incorrect immobilizer key (Use of unregistered key in body integrated unit) • Faulty antenna	<Ref. to IM(diag)-25, DTC B1402 IMMOBILIZER KEY COLLATION NG, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	• P0513 • P1570 • P1574
B1403	E/G request NG	Communication failure between body integrated unit and ECM	<Ref. to IM(diag)-25, DTC B1403 E/G REQUEST NG, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	P1572

NOTE:
The starter relay control is performed in immobilizer system. When the body integrated unit detects a nonconformity of reference code, it immediately outputs a starter relay cut signal to ECM, and then ECM stops the starter relay operation. In this case, engine does not start, and DTC is not recorded in ECM. Check that the engine does not start on the DTC of body integrated unit.

10.Diagnostic Procedure with Diagnostic Trouble Code (DTC)

A: DTC P0513 INCORRECT IMMOBILIZER KEY

DTC DETECTING CONDITION:

Incorrect immobilizer key (Use of unregistered key in body integrated unit)

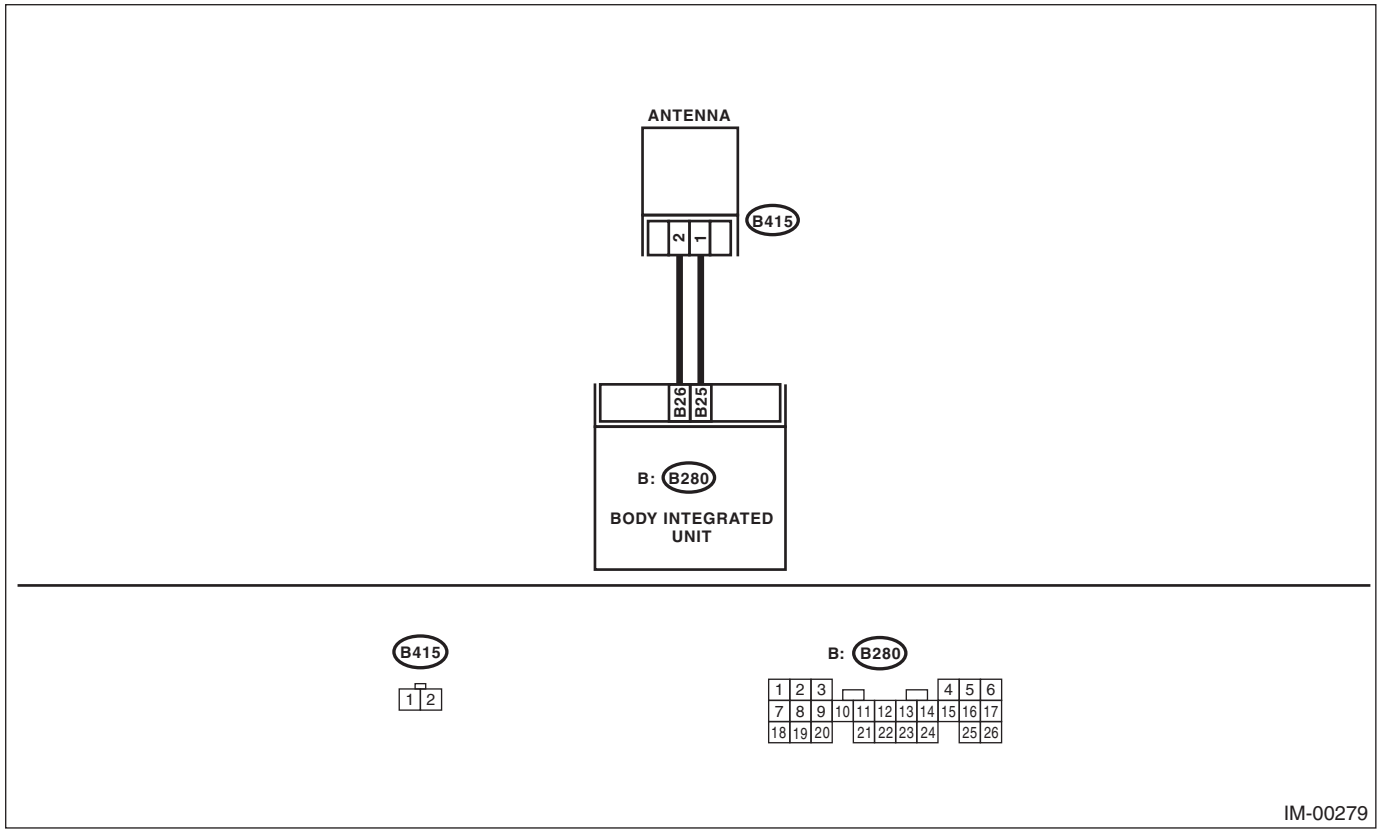
	Step	Check	Yes	No
1	**PERFORM IGNITION KEY REGISTRATION.** Perform registration to all keys used for the vehicle. Refer to the “PC application help for Subaru Select Monitor”.	Is registration of all keys complete?	End.	Replace ignition keys (including transponder) which cannot be registered. Go to step **2**.
2	**PERFORM IGNITION KEY REGISTRATION.** Perform registration to all keys used for the vehicle. Refer to the “PC application help for Subaru Select Monitor”.	Is registration of all keys complete?	End.	Replace the body integrated unit <Ref. to SL-46, Body Integrated Unit.> Register all ignition keys (transponders). Refer to the “PC application help for Subaru Select Monitor”.

B: 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 connector from the antenna. <Ref. to SL-50, Immobilizer Antenna.> 3) Measure the resistance of antenna circuit. ***Connector & terminal*** ***(B415) No. 1 — No. 2:***	Is the resistance 6 — 10 Ω?	Go to step **2**.	Replace the antenna. <Ref. to SL-50, Immobilizer Antenna.>
2	**CHECK ANTENNA CIRCUIT.** 1) Disconnect the connector from body integrated unit. 2) Measure the resistance between body integrated unit connector and antenna connector. ***Connector & terminal*** ***(B280) No. 25 — (B415) No. 1:*** ***(B280) No. 26 — (B415) No. 2:***	Is the resistance less than 10 Ω?	Go to step **3**.	Repair the harness.
3	**CHECK ANTENNA CIRCUIT.** Measure the resistance between body integrated unit connector and chassis ground. ***Connector & terminal*** ***(B280) No. 25 — Chassis ground:*** ***(B280) No. 26 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **4**.	Repair the harness.

	Step	Check	Yes	No
4	**CHECK BODY INTEGRATED UNIT FUNCTION.** 1) Connect the connector to antenna. 2) Connect the connector to body integrated unit. 3) Insert the key into the ignition switch, then use an oscilloscope to measure changes in voltage between the antenna connector and the chassis ground. ***Connector & terminal*** ***(B280) No. 25 (+) — Chassis ground (–):***	Is the maximum voltage more than 40 V? (Approx. 0.1 second after inserting the key) Is the voltage 0 V? (Approx. 1 second after inserting the key)	Go to step **5**.	Replace the body integrated unit. <Ref. to SL-46, Body Integrated Unit.> Register all ignition keys (transponders). Refer to the "PC application help for Subaru Select Monitor".
5	**CHECK IGNITION KEY (TRANSPONDER).** 1) Remove the key from ignition switch. 2) Start the engine using other key which is already registered.	Does the engine start?	Replace the ignition key (transponder). Execute the registration procedure next. Refer to the "PC application help for Subaru Select Monitor".	Replace the body integrated unit. <Ref. to SL-46, Body Integrated Unit.> Register all ignition keys (transponders). Refer to the "PC application help for Subaru Select Monitor".

C: DTC P1571 REFERENCE CODE INCOMPATIBILITY

DTC DETECTING CONDITION:

Reference code incompatibility between body integrated unit and ECM

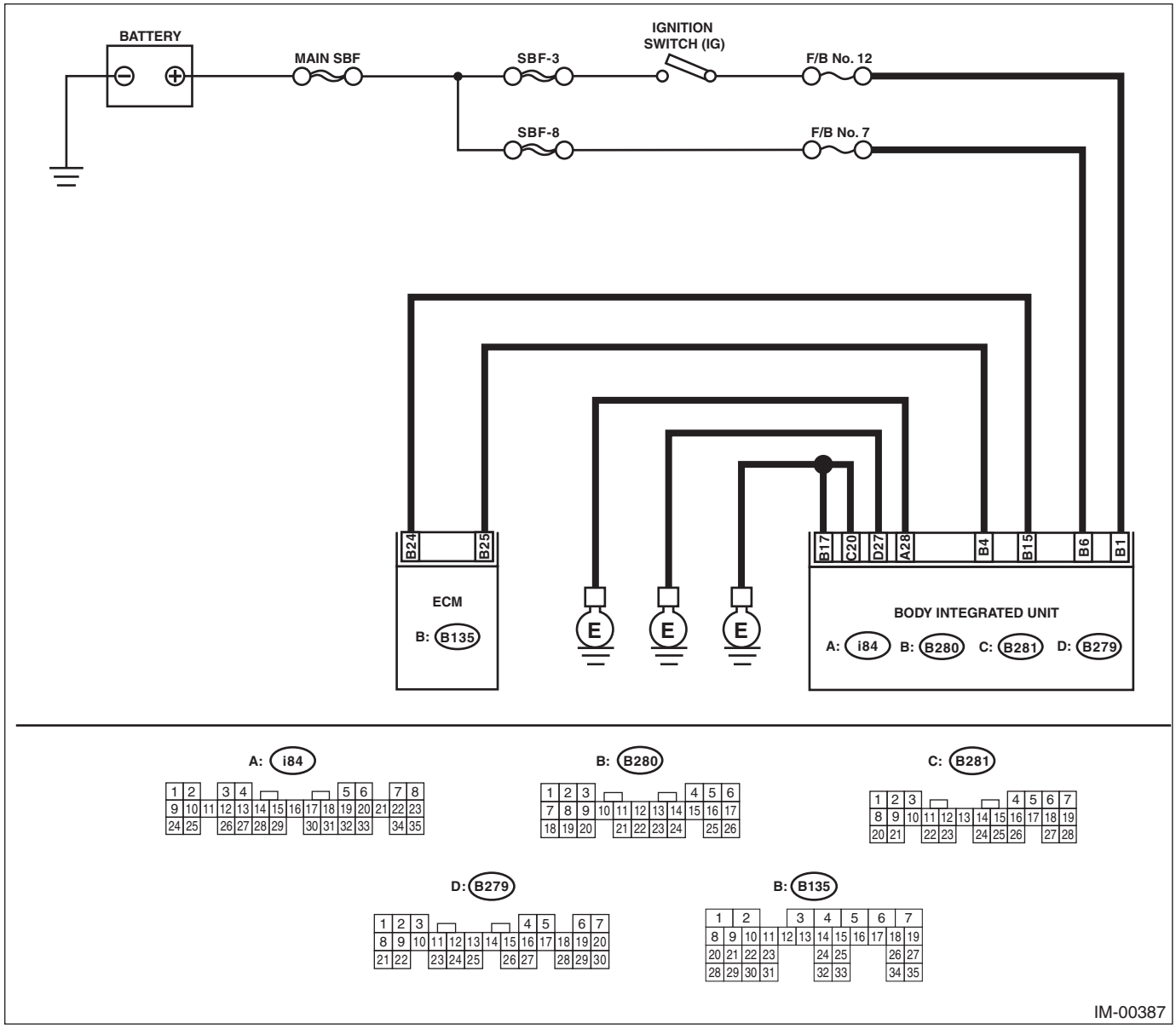
	Step	Check	Yes	No
1	**PERFORM IGNITION KEY REGISTRATION.** Perform registration to all keys used for the vehicle. Refer to the “PC application help for Subaru Select Monitor”.	Is registration of all keys complete?	End.	Go to step **2**.
2	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other immobilizer DTC displayed?	Check the appropriate DTC using the “List of Diagnostic Trouble Code (DTC)”. <Ref. to IM(diag)-14, List of Diagnostic Trouble Code (DTC).> Execute the registration procedure next. Refer to the “PC application help for Subaru Select Monitor”.	Replace the ECM. <Ref. to FU(H4DOTC)-57, Engine Control Module (ECM).> Replace the body integrated unit <Ref. to SL-46, Body Integrated Unit.> and register all ignition keys (transponders). Refer to the “PC application help for Subaru Select Monitor”.

D: DTC P1572 IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT)

DTC DETECTING CONDITION:

Communication failure between body integrated unit and ECM

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK BODY INTEGRATED UNIT POWER SUPPLY CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from body integrated unit. 3) Measure the voltage between the body integrated unit connector terminal and chassis ground. ***Connector & terminal*** ***(B280) No. 6 (+) — Chassis ground (–):***	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.
2	**CHECK BODY INTEGRATED UNIT POWER SUPPLY CIRCUIT.** 1) Turn the ignition switch to ON. (engine OFF) 2) Measure the voltage between the body integrated unit connector terminal and chassis ground. ***Connector & terminal*** ***(B280) No. 1 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **3**.	Check the harness for open or short circuit between the body integrated unit and ignition switch.
3	**CHECK BODY INTEGRATED UNIT GROUND CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between the body integrated unit connector terminal and chassis ground. ***Connector & terminal*** ***(i84) No. 28 — Chassis ground:*** ***(B280) No. 17 — Chassis ground:*** ***(B281) No. 20 — Chassis ground:*** ***(B279) No. 27 — Chassis ground:***	Is the resistance less than 10 Ω?	Go to step **4**.	Repair the open circuit of the body integrated unit ground circuit.
4	**CHECK GROUND CIRCUIT FOR ECM.** Measure the resistance between the ECM ground terminal and engine ground.	Is the resistance less than 10 Ω?	Go to step **5**.	Repair the ECM ground circuit.
5	**CHECK HARNESS BETWEEN BODY INTEGRATED UNIT AND ECM.** 1) Disconnect the connector from the ECM and body integrated unit. 2) Measure the resistance between body integrated unit connector terminal and ECM connector terminal. ***Connector & terminal*** ***(B280) No. 4 — (B135) No. 25:*** ***(B280) No. 15 — (B135) No. 24:***	Is the resistance less than 10 Ω?	Go to step **6**.	Repair the open circuit of the harness between the body integrated unit and ECM.
6	**CHECK COMMUNICATION CIRCUIT HARNESS.** 1) Turn the ignition switch to ON. 2) Measure the voltage between the body integrated unit connector terminal and chassis ground. ***Connector & terminal*** ***(B280) No. 4 (+) — Chassis ground (–):*** ***(B280) No. 15 (+) — Chassis ground (–):***	Is the voltage 0 V?	Go to step **7**.	Repair the harness between body integrated unit and ECM.
7	**CHECK COMMUNICATION CIRCUIT HARNESS.** Measure the voltage between ECM connector terminal and engine ground. ***Connector & terminal*** ***(B135) No. 24 (+) — Chassis ground (–):*** ***(B135) No. 25 (+) — Chassis ground (–):***	Is the voltage 0 V?	Go to step **8**.	Repair the harness between body integrated unit and ECM.

	Step	Check	Yes	No
8	**CHECK ECM BY COMMUNICATION SHORT CHECK.** 1) Connect the connector to ECM. 2) Disconnect the connector from body integrated unit. 3) Start the communication short check. <Ref. to IM(diag)-8, COMMUNICATION LINE CHECK, OPERATION, Subaru Select Monitor.>	Is the communication short check OK?	Replace the body integrated unit <Ref. to SL-46, Body Integrated Unit.> Register all ignition keys (transponders). Refer to the "PC application help for Subaru Select Monitor".	Replace the ECM. <Ref. to FU(H4DOTC)-57, Engine Control Module (ECM).> Perform the registration procedure next. Refer to the "PC application help for Subaru Select Monitor".

NOTE:
Refer to the following inspection when DTC is detected after inspection above. <Ref. to IM(diag)-25, DTC P1578 METER FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

E: DTC P1574 KEY COMMUNICATION FAILURE

DTC DETECTING CONDITION:

Communication failure between key and body integrated unit

	Step	Check	Yes	No
1	**CHECK BODY INTEGRATED UNIT FUNCTION.** Insert the key into the ignition switch (LOCK position), then measure changes in voltage between the antenna connector and the chassis ground. ***Connector & terminal*** ***(B415) No. 1 (+) — Chassis ground (–):***	Is the maximum voltage more than 40 V? (Approx. 0.1 second after inserting the key) Is the voltage 0 V? (Approx. 1 second after inserting the key)	Go to step **2**.	Replace the body integrated unit <Ref. to SL-46, Body Integrated Unit.> Register all ignition keys (transponders). Refer to the “PC application help for Subaru Select Monitor”.
2	**CHECK IGNITION KEY (TRANSPONDER).** 1) Remove the key from ignition switch. 2) Start the engine using other key which is already registered.	Does the engine start?	Register ignition keys (transponders). Refer to the “PC application help for Subaru Select Monitor”.	Replace the body integrated unit <Ref. to SL-46, Body Integrated Unit.> Register all ignition keys (transponders). Refer to the “PC application help for Subaru Select Monitor”.

F: 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 “PC application help for Subaru Select Monitor”.	Is registration for all keys complete?	Make sure it is possible to start the engine with all keys that have been taught. This completes the work.	Go to step **2**.
2	**PERFORM REGISTRATION ON IGNITION KEY.** Perform registration on all keys of the vehicle. Refer to the “PC application help for Subaru Select Monitor”.	Is registration for all keys complete?	Make sure it is possible to start the engine with all keys that have been taught. This completes the work.	Go to step **3**.
3	**PERFORM REGISTRATION ON IGNITION KEY.** Perform registration on all keys of the vehicle. Refer to the “PC application help for Subaru Select Monitor”.	Is registration for all keys complete?	Make sure it is possible to start the engine with all keys that have been taught. This completes the work.	Replace the ECM. <Ref. to FU(H4DOTC)-57, Engine Control Module (ECM).> Perform the registration procedure next. Refer to the “PC application help for Subaru Select Monitor”.

G: DTC P1577 IMM CONTROL MODULE EEPROM

DTC DETECTING CONDITION:

- Body integrated unit malfunctioning
- Failed to access the ROM inside the body integrated unit.

	Step	Check	Yes	No
1	**PERFORM IGNITION KEY REGISTRATION.** Perform registration to all keys used for the vehicle. Refer to the “PC application help for Subaru Select Monitor”.	Is registration of all keys complete?	Using the all registered keys, make sure that the engine can start. This completes the work.	Go to step **2**.
2	**PERFORM IGNITION KEY REGISTRATION.** Perform registration to all keys used for the vehicle. Refer to the “PC application help for Subaru Select Monitor”.	Is registration of all keys complete?	Using the all registered keys, make sure that the engine can start. This completes the work.	Go to step **3**.
3	**PERFORM IGNITION KEY REGISTRATION.** Perform registration to all keys used for the vehicle. Refer to the “PC application help for Subaru Select Monitor”.	Is registration of all keys complete?	Using the all registered keys, make sure that the engine can start. This completes the work.	Replace the body integrated unit <Ref. to SL-46, Body Integrated Unit.> Register all ignition keys (transponders). Refer to the “PC application help for Subaru Select Monitor”.

H: DTC P1578 METER FAILURE

DTC DETECTING CONDITION:

- Reference code incompatibility between combination meter and body integrated unit
- Communication failure between body integrated unit and ECM

	Step	Check	Yes	No
1	**CHECK DTC.** Read the DTC of body integrated unit using Subaru Select Monitor.	Is DTC B1401 detected?	Go to step **2**.	<Ref. to IM(diag)-19, DTC P1572 IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
2	**CHECK LAN COMMUNICATION SYSTEM.** Inspect LAN communication system. <Ref. to LAN(diag)-2, Basic Diagnostic Procedure.>	Is DTC U1300, U1301, U1302, B1100 or B1101 of the body integrated unit displayed?	Perform the diagnosis according to the DTC. <Ref. to LAN(diag)-31, List of Diagnostic Trouble Code (DTC).>	Go to step **3**.
3	**CHECK COMBINATION METER.** 1) Perform the registration of immobilizer. Refer to the “PC application help for Subaru Select Monitor”. 2) Start the engine.	Does the engine start?	System is normal.	Replace the combination meter. <Ref. to IDI-21, REMOVAL, Combination Meter.>

NOTE:

- When the combination meter has been replaced, be sure to perform the registration procedure of immobilizer.
- When the combination meter and body integrated unit are replaced at a time, the registration can not be completed. In this case, it is necessary to rewrite the ID into the body integrated unit.

I: DTC B1401 M COLLATION NG

NOTE:

For the diagnostic procedure, refer to DTC P1578 “METER FAILURE”. <Ref. to IM(diag)-25, DTC P1578 METER FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

J: DTC B1402 IMMOBILIZER KEY COLLATION NG

NOTE:

Refer to the following inspection for diagnostic procedure.

- DTC P0513 “INCORRECT IMMOBILIZER KEY”. <Ref. to IM(diag)-15, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
- DTC P1570 “ANTENNA”. <Ref. to IM(diag)-16, DTC P1570 ANTENNA, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
- DTC P1574 “KEY COMMUNICATION FAILURE”. <Ref. to IM(diag)-22, DTC P1574 KEY COMMUNICATION FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

K: DTC B1403 E/G REQUEST NG

NOTE:

For the diagnostic procedure, refer to DTC P1572 “IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT)”. <Ref. to IM(diag)-19, DTC P1572 IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

LAN SYSTEM (DIAGNOSTICS)

LAN(diag)

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1. Basic Diagnostic Procedure

A: PROCEDURE

CAUTION:
• Subaru Select Monitor is required for reading DTC, performing diagnosis and reading current data.
• Remove foreign matter (dust, water, oil, etc.) from the body integrated unit connector during removal and installation.
• For model with immobilizer, registration of immobilizer may be needed after the replacement of controller etc. For details, refer to the "PC application help for Subaru Select Monitor".

NOTE:
• To check harness for open or short circuits, shake the suspected trouble spot or connector.
• Check List for Interview <Ref. to LAN(diag)-3, Check List for Interview.>

	Step	Check	Yes	No
1	**CHECK PRE-INSPECTION.** Ask the customer when and how the trouble occurred using the interview check list. <Ref. to LAN(diag)-3, Check List for Interview.>	Did you interview the customer?	Go to step **2**.	Interview the customer.
2	**BASIC INSPECTION.** Check components which might affect body control. <Ref. to LAN(diag)-6, INSPECTION, General Description.>	Is the component that might influence the body control problem normal?	Go to step **3**.	Repair or replace each component.
3	**CHECK DTC.** 1) Read the DTC. <Ref. to LAN(diag)-18, Read Diagnostic Trouble Code (DTC).> NOTE: If the communication function of the Subaru Select Monitor cannot be executed properly, check the communication circuit. <Ref. to LAN(diag)-15, COMMUNICATION FOR INITIALIZING IMPOSSIBLE, INSPECTION, Subaru Select Monitor.> 2) Record all DTCs and freeze frame data.	Is DTC displayed on Subaru Select Monitor?	Go to step **5**.	Go to step **4**.
4	**PERFORM GENERAL DIAGNOSTICS.** Inspect using "General Diagnostics Table". <Ref. to LAN(diag)-79, General Diagnostic Table.>	Is result of inspection OK?	LAN system is normal.	Go to step **5**.
5	**PERFORM DIAGNOSIS.** 1) Correct the cause of trouble. 2) Perform the Clear Memory Mode. <Ref. to LAN(diag)-19, Clear Memory Mode.> 3) Read the DTC. <Ref. to LAN(diag)-18, Read Diagnostic Trouble Code (DTC).>	Is DTC displayed on Subaru Select Monitor?	Repeat step 5 until DTC is not shown.	Finish the diagnosis.

2. Check List for Interview

A: CHECK

Inspect the following item about the vehicle's state.

1. DISPLAY STATUS IN THE COMBINATION METER

Display status in the combination meter	Engine coolant temperature gauge display	❑ OK / ❑ NG
	Fuel gauge display	❑ OK / ❑ NG
Display of other indicators	Malfunction indicator light	❑ ON / ❑ OFF
	SPORT indicator light (AT warning light)	❑ ON / ❑ Blink / ❑ OFF
	Engine coolant temperature warning light	❑ ON / ❑ Blink / ❑ OFF
	Fuel level warning light	❑ ON / ❑ Blink / ❑ OFF
	ATF temperature warning light	❑ ON / ❑ Blink / ❑ OFF
	EBD warning light	❑ ON / ❑ Blink / ❑ OFF
	ABS warning light	❑ ON / ❑ Blink / ❑ OFF
	VDC warning light	❑ ON / ❑ Blink / ❑ OFF
	Hill start assist warning light	❑ ON / ❑ Blink / ❑ OFF
	Security/immobilizer indicator	❑ ON / ❑ Blink / ❑ OFF

2. SYMPTOM

Vehicle condition	Clearance light does not illuminate.	❑ Yes / ❑ No
	Clearance light indicator does not illuminate.	❑ Yes / ❑ No
	Low beam does not illuminate.	❑ Yes / ❑ No
	High beam does not illuminate.	❑ Yes / ❑ No
	High beam indicator does not illuminate.	❑ Yes / ❑ No
	Front fog light does not illuminate.	❑ Yes / ❑ No
	Front fog light indicator does not illuminate.	❑ Yes / ❑ No
	DRL does not illuminate.	❑ Yes / ❑ No
	Key cannot be removed from key cylinder.	❑ Yes / ❑ No
	Key can be removed from any other than parking range.	❑ Yes / ❑ No
	Shift lever can not be operated.	❑ Yes / ❑ No
	Shift lock does not operate.	❑ Yes / ❑ No
	Warning buzzer for key left in ignition does not beep.	❑ Yes / ❑ No
	Driver's seat belt warning light does not illuminate.	❑ Yes / ❑ No
	Passenger's seat belt warning light does not illuminate.	❑ Yes / ❑ No
	Seat belt warning alarm does not sound.	❑ Yes / ❑ No
	Wiper deicer does not operate.	❑ Yes / ❑ No
	Rear defogger does not operate.	❑ Yes / ❑ No
	Illumination volume control is not available.	❑ Yes / ❑ No
	Combination meter does not dim when headlights are ON.	❑ Yes / ❑ No
	Rear wiper does not operate.	❑ Yes / ❑ No
	Doors can not be locked/unlocked with central door lock switch.	❑ Yes / ❑ No
	Doors can not be locked/unlocked with keyless entry system.	❑ Yes / ❑ No
	Rear gate can not be opened when rear gate opener button is pressed.	❑ Yes / ❑ No
	Hazard answer-back does not operate.	❑ Yes / ❑ No
	Answer-back buzzer does not sound	❑ Yes / ❑ No
	Ignition key illumination does not light.	❑ Yes / ❑ No
	Ignition key illumination blinks.	❑ Yes / ❑ No
	Room light does not operate in accordance with door open/close operations.	❑ Yes / ❑ No
	Room light blinks.	❑ Yes / ❑ No
	Map light does not operate in accordance with door open/close operations.	❑ Yes / ❑ No
	Map light blinks.	❑ Yes / ❑ No
	Indicator does not illuminate when parking brake is operated.	❑ Yes / ❑ No
	Security monitoring does not start	❑ Yes / ❑ No
	Security cannot be cancelled	❑ Yes / ❑ No
	Hazard answer-back does not blink during security monitoring	❑ Yes / ❑ No
	Horn does not sound during security monitoring	❑ Yes / ❑ No
	Alarm operates as soon as security monitor condition occurs.	❑ Yes / ❑ No
	Security alarm does not operate even when impact is applied (model with impact sensor).	❑ Yes / ❑ No
	Engine does not start.	❑ Yes / ❑ No

3. CONDITIONS UNDER WHICH TROUBLE OCCURS

Driving condition	❑ At standstill (While idling)			
	❑ When the vehicle is running	Vehicle speed	km/h (MPH)	
	❑ While accelerating	Acceleration	km/h (MPH) to	km/h (MPH)
	❑ Decelerating (With braking)	Deceleration	km/h (MPH) to	km/h (MPH)
	❑ Decelerating (Without braking)	Deceleration	km/h (MPH) to	km/h (MPH)
	❑ Flat road ❑ Uphill ❑ Downhill ❑ Gravel road ❑ Bumpy road ❑ Snowy road			
	Does it occur when operating any part? Operated part: **TROUBLE SYMPTOM:**			
	Are there any other troubles occurred? From where: **TROUBLE SYMPTOM:**			

3. General Description

A: CAUTION

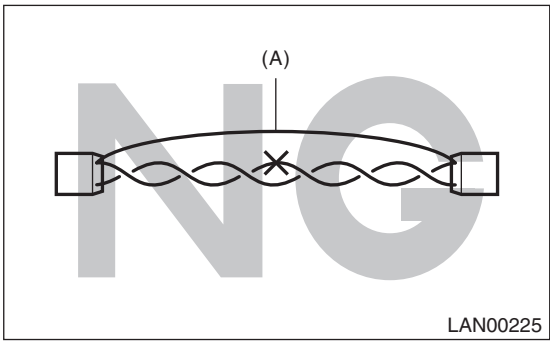
1. SUPPLEMENTAL RESTRAINT SYSTEM "AIRBAG"

Airbag system wiring harness is routed near the body integrated unit and twisted pair line.

CAUTION:
• Do not use electric test equipment on any wiring harnesses and connectors in the airbag system.
• Be careful not to damage the airbag system wiring harness when servicing the body integrated unit and LAN system.

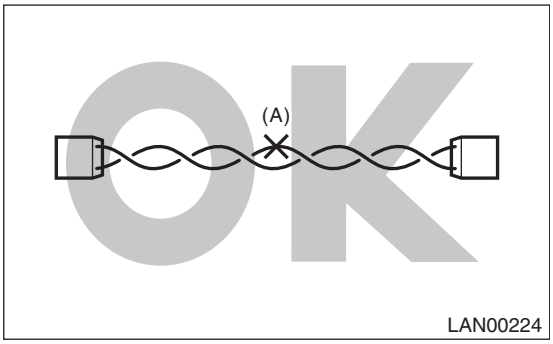
2. LAN SYSTEM

• Bus line of LAN system is twisted pair line. Be careful not to bypass or partly unbind the twisted pair line.
• Do not make clearance between bus lines (CAN High, CAN Low).
• Difference of bus line length should be within 10 cm (3.94 in).
• Fray near the connector should be within 8 cm (3.14 in).



(A) Bypass wire connection

• If the characteristics of the twisted pair line are changed, it may extremely weaken against noise.
• When repairing the harness, connect the wires using soldering and protect it with insulating tape etc.



(A) Soldering and protection with insulating tape

B: INSPECTION

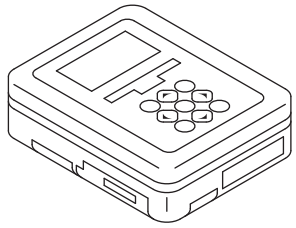
Before performing diagnostics, check the following item which might affect body integrated unit malfunctions.
1) Measure the battery voltage and check electrolyte.

Standard voltage: 12 V or more

Specific gravity: 1.260 or more
2) Check the fuse condition.
Make sure that ampere of the fuse is setting value, and it is not blown out.
(Be sure to check the back-up fuse also.)
3) Check the connecting condition of harness and harness connector.
4) Confirm settings of body integrated unit are corresponded to vehicle equipment. <Ref. to LAN(diag)-27, Registration Body Integrated Unit.>
5) Make sure that a setting that does not match the vehicle equipment, is not set in the User Customizing of the body integrated unit. <Ref. to LAN(diag)-25, User Customizing.>
6) Confirm "Factory or Market setting" of body integrated unit registrations is "Market".
7) Confirm key illumination does not blink with ignition switch turned to ON.

C: PREPARATION TOOL

1. SPECIAL TOOL

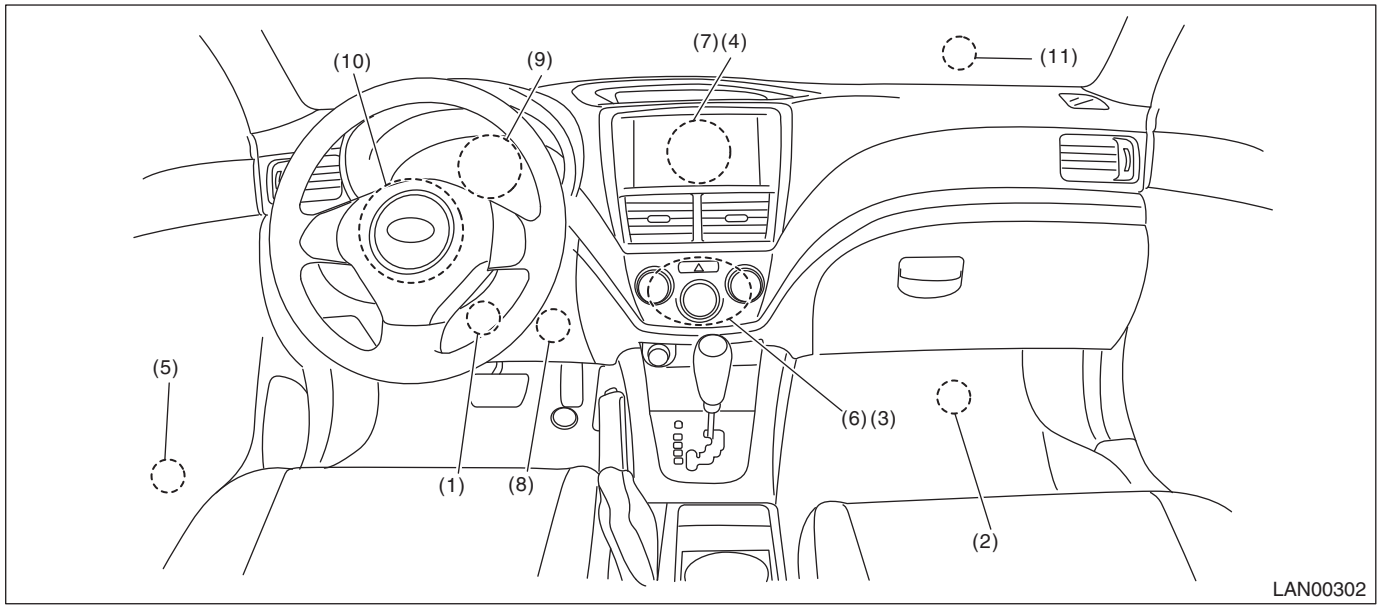
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST1B022XU0	1B022XU0	SUBARU SELECT MONITOR III KIT	Used for troubleshooting the electrical system.

2. GENERAL TOOL

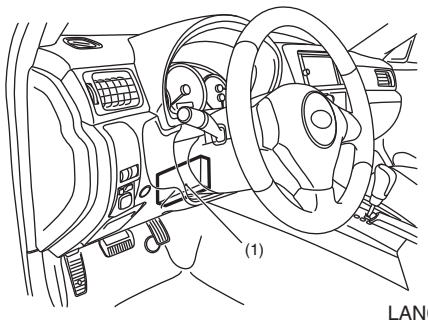
TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance, voltage and current.

4. Electrical Component Location

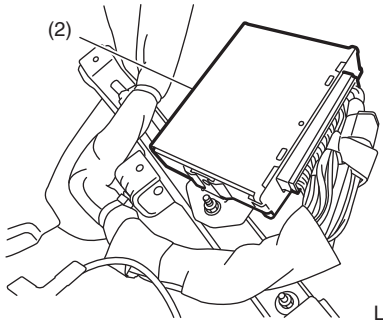
A: LOCATION



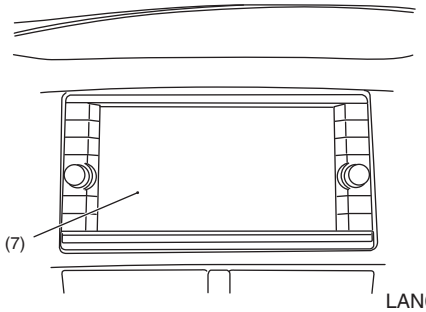
(1)	Body integrated unit	(5)	Keyless entry control module (inside rear quarter trim)	(9)	Combination meter
(2)	Engine control module (ECM)	(6)	A/C control panel	(10)	Steering angle sensor
(3)	Auto A/C control module	(7)	Center display	(11)	VDCCM&H/U (in engine compartment)
(4)	Navigation unit	(8)	Transmission control module (TCM)		



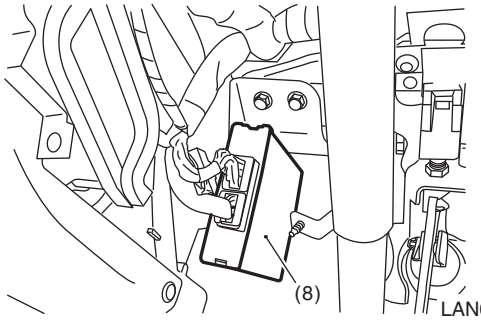
LAN00303



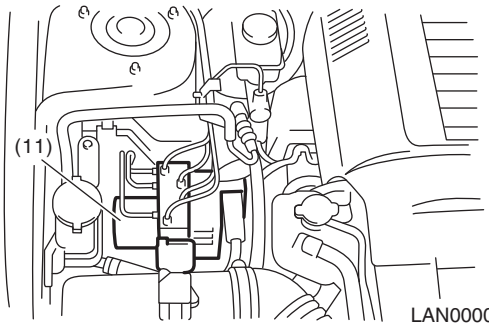
LAN00425



LAN00299



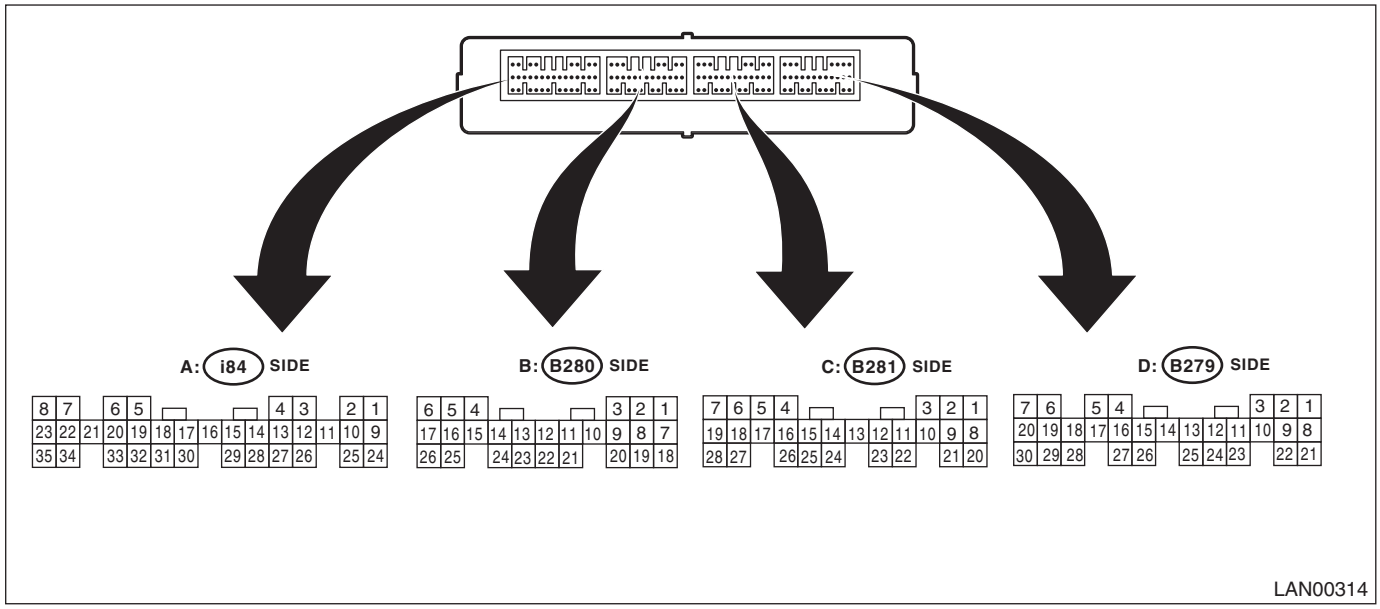
LAN00297



LAN00008

5. Control Module I/O Signal

A: ELECTRICAL SPECIFICATION



Contents	Terminal No.	Standard	Measuring condition
BAT (control)	B6 ←→ chassis ground	9 — 16 V	Always
BAT (backup)	C2 ←→ chassis ground	9 — 16 V	Always
BAT (door lock)	A34 ←→ chassis ground	9 — 16 V	Always
BAT (shift lock/key lock)	D22 ←→ chassis ground	9 — 16 V	Always
ACC (rear wiper)	D21 ←→ chassis ground	Less than 1.5 V → 9 — 16 V	ACC OFF → ACC ON
Ground	A28 ←→ chassis ground	Less than 1.5 V	Always
Ground	B17 ←→ chassis ground	Less than 1.5 V	Always
Ground	C20 ←→ chassis ground	Less than 1.5 V	Always
Ground	D27 ←→ chassis ground	Less than 1.5 V	Always
Key warning switch	D2 ←→ chassis ground	Less than 1.5 V → 9 — 16 V	With key removed → inserted
ACC	B7 ←→ chassis ground	Less than 1.5 V → 9 — 16 V	ACC OFF → ACC ON
IGN	B1 ←→ chassis ground	Less than 1.5 V → 9 — 16 V	IGN OFF → IGN ON
P range switch	C4 ←→ chassis ground	Less than 1.5 V → 8 V or more	P range → other than P range
Stop light switch	B2 ←→ chassis ground	Less than 1.5 V → 8 V or more	With brake pedal released → depressed
Door switch, driver's seat	A19 ←→ chassis ground	8 V or more → less than 1.5 V	With driver's door closed → opened
Door switch, passenger's seat	A32 ←→ chassis ground	8 V or more → less than 1.5 V	With passenger's door closed → opened

Contents	Terminal No.	Standard	Measuring condition
Door switch, rear RH seat	A6 ←→ chassis ground	8 V or more → less than 1.5 V	With rear RH seat door closed → opened
Door switch, rear LH seat	A20 ←→ chassis ground	8 V or more → less than 1.5 V	With rear LH seat door closed → opened
Door switch, trunk/rear gate	A33 ←→ chassis ground	8 V or more → less than 1.5 V	With rear gate closed → opened
Rear gate opener button	C24 ←→ chassis ground	8 V or more → less than 1.5 V	Switch OFF → ON
Manual switch (LOCK)	A15 ←→ chassis ground	8 V or more → less than 1.5 V	Switch OFF → ON
Manual switch (UNLOCK)	A29 ←→ chassis ground	8 V or more → less than 1.5 V	Switch OFF → ON
Delivery (test) mode connector	A17 ←→ chassis ground	8 V or more → less than 1.5 V	When delivery (test) mode connector is connected
Front wiper input RTN	C5 ←→ chassis ground	8 V or more → less than 1.5 V	When front wiper is reversed
Rear wiper switch ON	C18 ←→ chassis ground	8 V or more → less than 1.5 V	Switch OFF → ON
Rear wiper switch (INT)	C27 ←→ chassis ground	8 V or more → less than 1.5 V	Switch OFF → ON
Rear wiper switch, washer	C28 ←→ chassis ground	8 V or more → less than 1.5 V	Switch OFF → ON
Lighting I switch	B11 ←→ chassis ground	8 V or more → less than 1.5 V	Switch OFF → ON
Lighting II switch	C8 ←→ chassis ground	8 V or more → less than 1.5 V	Switch OFF → ON
	D6 ←→ chassis ground	8 V or more → less than 1.5 V	Key warning switch ON and lighting switch OFF → ON
Dimmer switch, Hi beam	B12 ←→ chassis ground	8 V or more → less than 1.5 V	Switch OFF → ON
Dimmer switch, passing	B22 ←→ chassis ground	8 V or more → less than 1.5 V	Switch OFF → ON
Front fog light switch	B24 ←→ chassis ground	8 V or more → less than 1.5 V	Switch OFF → ON
MT reverse switch	B18 ←→ chassis ground	Less than 1.5 V → 8 V or more	Other than reverse → reverse
Parking brake switch	C15 ←→ chassis ground	8 V or more → less than 1.5 V	With parking brake not operated → operated
Bright switch	A14 ←→ chassis ground	Less than 1.5 V → 8 V or more	Switch OFF → ON
Illumination (Vi1)	A12 ←→ chassis ground	Approx. 5 V	Always
Illumination (Vi2)	A3 ←→ chassis ground	0.5 V — approx. 5 V	Always
Illumination (Vi3)	A26 ←→ chassis ground	Less than 1.5 V	Always
Fuel level sensor	C7 ←→ chassis ground	Approx. 2 — 96 Ω	Ignition ON
Wiper deicer & rear defogger switch	A16 ←→ chassis ground	8 V or more → less than 1.5 V	Switch OFF → ON
Seat belt switch (driver's seat)	C16 ←→ chassis ground	Less than 1.5 V → 8 V or more	With seat belt unbuckled → buckled
Seat belt switch (Passenger's seat)	C26 ←→ chassis ground	Less than 1.5 V → 8 V or more	With seat belt unbuckled → buckled

Contents	Terminal No.	Standard	Measuring condition
Impact sensor	B8 ←→ chassis ground	Less than 1.5 V → 8 V or more	When a shock is applied
Key lock solenoid output	D11 ←→ chassis ground	Less than 1.5 V → 6 V or more	While key is inserted in other than P range
Shift lock solenoid output	D12 ←→ chassis ground	Less than 1 V → 9 V or more	When vehicle stopped, IGN ON, other than P range, brake pedal depressed
Rear wiper output ON	D9 ←→ chassis ground	Less than 1 V → 9 V or more	When rear wiper operates
Rear wiper output RTN	D8 ←→ chassis ground	Less than 1 V → 9 V or more	When rear wiper reversed
Door lock output	A7 ←→ A8	Less than 1 V → 9 V or more	During lock output
Door unlock output	A8 ←→ A7	Less than 1 V → 9 V or more	While unlock output
Driver's side door unlock output	A23 ←→ A7	Less than 1 V → 9 V or more	While unlock output
Trunk/rear gate UNLOCK output	A22 ←→ chassis ground	Less than 1 V → 9 V or more	While rear gate UNLOCK output
Lighting power supply	C1 ←→ chassis ground	Less than 1 V → 9 V or more	"With back-up fuse inserted, ACC ON or IGN ON" or "When key warning switch is ON"
	D1 ←→ chassis ground		
Clearance light relay output	D19 ←→ chassis ground	9 V or more → less than 1 V	Small light ON
Lo beam relay output	C3 ←→ chassis ground	9 V or more → less than 1 V	Headlight switch ON
	D7 ←→ chassis ground	9 V or more → less than 1 V	Headlight switch ON
Hi beam relay output	D20 ←→ chassis ground	9 V or more → less than 1 V	Headlight switch ON and Hi beam ON or Passing switch ON
Front fog light relay output	D17 ←→ chassis ground	9 V or more → less than 1 V	Headlight switch ON, and front fog light switch ON
DRL cancel output	D18 ←→ chassis ground	9 V or more → less than 1 V	When Hi beam 100 % illuminates
Room light output	D5	Pulse control	Illumination is adjusted through PWM control
Key ring illumination output	C23	Pulse control	Illumination is adjusted through PWM control
Illumination output	A2	Pulse control	Illumination is adjusted through PWM control
Map light output (model with sunroof)	D4	Pulse control	Illumination is adjusted through PWM control
Rear defogger relay output	D16 ←→ chassis ground	9 V or more → less than 1 V	While rear defogger output
Wiper deicer relay output	D15 ←→ chassis ground	9 V or more → less than 1 V	While wiper deicer output
Seat belt warning light passenger's seat	A25 ←→ chassis ground	9 V or more → less than 1 V	Indicator go off → illuminate
Buzzer sound output	D24 ←→ chassis ground	Less than 1 V → 9 V or more	Door lock → unlock with keyless entry system
Turn & hazard output	C22 ←→ chassis ground	9 V or more → less than 1 V	Door lock or unlock with keyless entry system
Horn relay output	D29 ←→ chassis ground	9 V or more → less than 1 V	During security alarm operation

Contents	Terminal No.	Standard	Measuring condition
Security indicator output	A10 ←→ chassis ground	9 V or more → less than 1 V	While indicator in combination meter blinks
Immobilizer antenna 1	B26 ←→ B25	-30 — +30 V	While key secret code is verified
Immobilizer antenna 2	B25 ←→ B26		
Immobilizer communication_1	B4	Can not be measured because of digital communication	Serial communication line
Immobilizer communication_2	B15	Can not be measured because of digital communication	Serial communication line
Keyless entry module communication	A24	Can not be measured because of digital communication	Serial communication line
SSM communication (K line)	B20	Can not be measured because of digital communication	Serial communication line
Body system CAN_Hi	A1 ←→ chassis ground	Can not be measured because of digital communication	Serial communication line
Body system CAN_Lo	A9 ←→ chassis ground	Can not be measured because of digital communication	Serial communication line
Driving system CAN_Hi	B3 ←→ chassis ground	Can not be measured because of digital communication	Serial communication line
Driving system CAN_Lo	B9 ←→ chassis ground	Can not be measured because of digital communication	Serial communication line

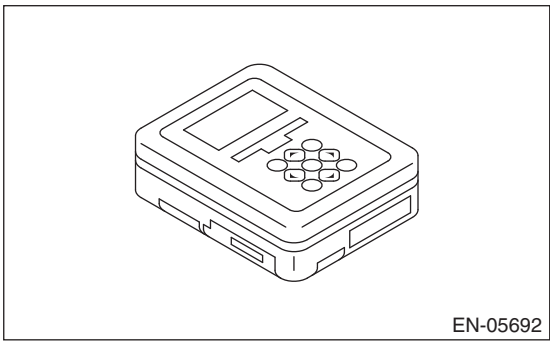
B: WIRING DIAGRAM

<Ref. to WI-184, WIRING DIAGRAM, CAN Communication System.>

6. Subaru Select Monitor

A: OPERATION

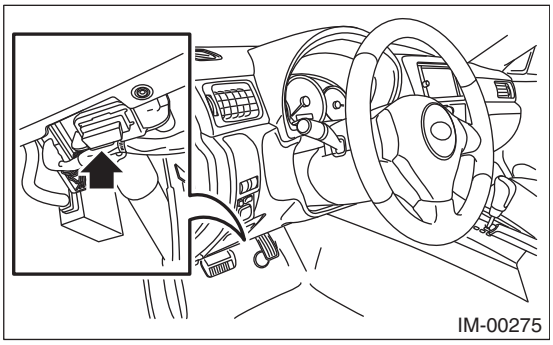
1) Prepare the Subaru Select Monitor kit. <Ref. to LAN(diag)-7, PREPARATION TOOL, General Description.>


EN-05692

2) Prepare PC with Subaru Select Monitor installed.
3) Connect the USB cable to SDI (Subaru Diagnosis Interface) and USB port on the personal computer (dedicated port for the Subaru Select Monitor).

NOTE:
The dedicated port for the Subaru Select Monitor means the USB port which was used to install the Subaru Select Monitor.

4) Connect the diagnosis cable to SDI.
5) Connect SDI to data link connector located in the lower portion of the instrument panel (on the driver's side).

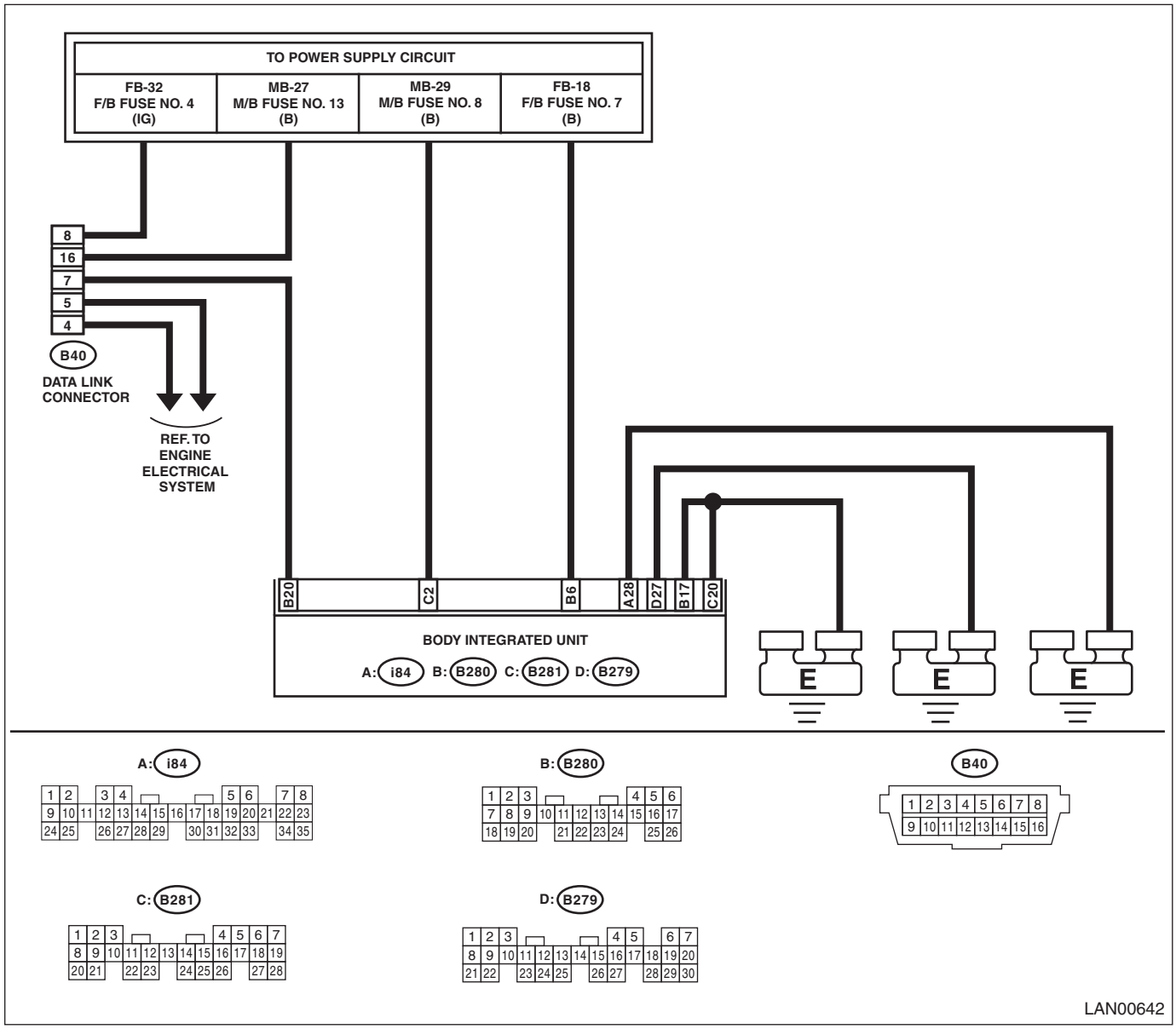

IM-00275

6) Start the PC.
7) Turn the ignition switch to ON and run the "PC application for Subaru Select Monitor".

B: INSPECTION

1. COMMUNICATION FOR INITIALIZING IMPOSSIBLE

DETECTING CONDITION:
Defective harness connector
TROUBLE SYMPTOM:
Not communicable with Subaru Select Monitor.
WIRING DIAGRAM:



	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 Integ. unit 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 battery terminal?	Repair or tighten the battery terminal.	Go to step **4**.
4	**CHECK COMMUNICATION OF SUBARU SELECT MONITOR.** 1) Turn the ignition switch to ON. 2) Using the Subaru Select Monitor, check whether communication to other systems can be executed normally.	Is the system name displayed?	Go to step **7**.	Go to step **5**.
5	**CHECK COMMUNICATION OF SUBARU SELECT MONITOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the body integrated unit connector. 3) Turn the ignition switch to ON. 4) Check whether communication to other systems can be executed normally.	Is the system name displayed?	Go to step **7**.	Go to step **6**.
6	**CHECK HARNESS CONNECTOR BETWEEN EACH CONTROL MODULE AND SUBARU SELECT MONITOR.** 1) Turn the ignition switch to OFF. 2) 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 Subaru Select Monitor.
7	**CHECK OUTPUT SIGNAL TO BODY INTEGRATED UNIT.** 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 less than 1 V?	Go to step **8**.	Repair the harness and connector between each control module and Subaru Select Monitor.
8	**CHECK HARNESS CONNECTOR BETWEEN BODY INTEGRATED UNIT AND DATA LINK CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between body integrated unit and data link connector. ***Connector & terminal*** ***(B40) No. 7 — (B280) No. 20:***	Is the resistance less than 1 Ω?	Go to step **9**.	Repair the harness and connector between body integrated unit and Subaru Select Monitor.
9	**CHECK BACK-UP FUSE.** Check that back-up fuse is not blown out, or check that it is inserted.	Is back-up fuse OK?	Go to step **10**.	Replace the back-up fuse, or insert it into the fuse holder.
10	**CHECK POWER SUPPLY CIRCUIT.** 1) Connect the body integrated unit. 2) Measure the voltage between body integrated unit connector and chassis ground. ***Connector & terminal*** ***(B280) No. 6 (+) — Chassis ground (–):*** ***(B281) No. 2 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **11**.	Repair the open circuit of harness between body integrated unit and battery.

	Step	Check	Yes	No
11	**CHECK HARNESS CONNECTOR 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 of harness between the body integrated unit and chassis ground. ***Connector & terminal*** ***(i84) No. 28 — Chassis ground:*** ***(B279) No. 27 — Chassis ground:*** ***(B280) No. 17 — Chassis ground:*** ***(B280) No. 20 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **12**.	Repair the poor contact of harness between body integrated unit and ground.
12	**CHECK POOR CONTACT OF CONNECTOR.**	Is there poor contact of the control unit ground and the Subaru Select Monitor?	Repair the poor contact of connector.	Replace the body integrated unit. <Ref. to SL-46, REMOVAL, Body Integrated Unit.>

CAUTION:
For model with immobilizer, immobilizer registration work is necessary when the body integrated unit replaced. For details, refer to the "PC application help for Subaru Select Monitor".

7. Read Diagnostic Trouble Code (DTC)

A: OPERATION

1) On the «Main Menu» display screen, select {Each System Check}.
2) On the «Each System Check» menu display screen, select the {Integ. unit mode}.
3) Select the [OK] after the information of body integrated unit type is displayed.
4) On the «Integ. unit mode» display screen, select the {Diagnostic Code(s) Display}.
5) Record the DTC displayed.

NOTE:
• For details concerning the operation procedure, refer to the “PC application help for Subaru Select Monitor”.
• For details concerning DTC, refer to “List of Diagnostic Trouble Code (DTC)”. <Ref. to LAN(diag)-31, List of Diagnostic Trouble Code (DTC).>

8. Clear Memory Mode

A: OPERATION

1) On «Main Menu» display, select {Each System Check}.
2) On «System Selection Menu» display, select {Integ. unit mode}.
3) Press the [OK] key after the information of body integrated unit type is displayed.
4) On «Integ. unit mode failure diag» display, select {Clear Memory} and press the [OK] key.

Display	Contents to be displayed
Clear Memory ?	Clear function of DTC and freeze frame data

5) When “Done” is shown on the display screen, turn the ignition switch to OFF.

NOTE:
For detailed operation procedures, refer to “PC application help for Subaru Select Monitor”.

9. Read Current Data

A: OPERATION

1) On the «Main Menu» display screen, select {Each System Check}.
2) On the «System Selection Menu» display screen, select the {Integ. unit mode}.
3) On the «Integ. unit mode failure diag» display screen, select the {Current Data Display & Save}.
4) Using the scroll key, scroll the display screen up or down until the desired data is shown.

B: LIST

Items to be displayed	Unit of measure	Remarks	Note
BATT voltage (control)	9 — 16 V	Body integrated unit input value	Always
BATT voltage (BACKUP)	9 — 16 V	Body integrated unit input value	Always
IG power supply voltage	9 — 16 V	Body integrated unit input value	Ignition switch ON
ACC voltage	9 — 16 V	Body integrated unit input value	Ignition switch ACC
Illumination VR Voltage	0 — 5 V	Body integrated unit input value	Input value from illumination volume
Illumi. output d-ratio	0 — 100%	Body integrated unit output value	Small light ON Illumination volume is other than bright.
Ambient Temperature	–40 — 87.5°C	CAN data input value	Ignition switch ON
Fuel level voltage	0 — 10 V	Body integrated unit input value	Ignition switch ON
Fuel level resistance	0 — 102.3 Ω	Body integrated unit input value	Ignition switch ON
key-lock solenoid V	6 — 15 V	Body integrated unit output value	Key warning switch ON, other than parking range Ignition ON
number of regist.	0 — 4	Number of keyless key registered	Number of transmitter registered is displayed
Front Wheel Speed	km/h	CAN data input value	Reception from VDC module
VDC/ABS latest f-code	DTC display (Temporarily)	CAN data input value	It is normal when DTC is not been input even if this code is displayed. Received from VDC (displayed by hexadecimal number system)
Blower Fan Steps	0 — 2 levels	CAN data input value	0: OFF, 1: Low, 2: 2 levels or more Reception from air conditioner ECM
Fuel level resistance 2	0 — 102.3 Ω	CAN data output value	Reception from body integrated unit
Fuel consumption	cc/s	CAN data input value	Reception from ECM and transmission to center monitor
Coolant Temp.	–40 — 130°C	CAN data input value	Reception from ECM
Vehicle longitudinal G	m/s^2	CAN data input value	Reception from VDC module
SPORT Shift Stages	0 — 7 levels	CAN data input value	(0: Light OFF; 1 — 5: Gear display; 6: Fail; 7: ATF temperature High/Low) Reception from TCM
Shift Position	0 — 7 levels	CAN data input value	0: 1, 1: 2, 2: 3, 3: 4, 4: D, 5: N, 6: R, 7: P shift position (8 indicates no input) 8 is displayed in manual mode Reception from TCM
VDC/ABS condition	0 — 4	CAN data input value	Reception from VDC module
Destination Code	0 — 16	CAN data input value	Reception from combination meter
Touch SW	0 — 64	CAN data input value	Reception from navigation module
key-lock warning SW	ON/OFF	Body integrated unit input value	ON when ignition key inserted
Stop Light Switch	ON/OFF	Body integrated unit input value	ON when brake pedal is depressed
Front fog lamp SW input	ON/OFF	Body integrated unit input value	When front fog light switch is ON
Driver's door SW input	ON/OFF	Body integrated unit input value	ON when driver's door is open
P-door SW input	ON/OFF	Body integrated unit input value	ON when passenger's door is open
Rear right door SW input	ON/OFF	Body integrated unit input value	ON when rear right door is open
Rear left door SW input	ON/OFF	Body integrated unit input value	ON when rear left door is open

Items to be displayed	Unit of measure	Remarks	Note
R Gate SW input	ON/OFF	Body integrated unit input value	ON when rear gate/trunk open
Manual lock SW input	ON/OFF	Body integrated unit input value	Manual lock switch ON
Manual unlock SW input	ON/OFF	Body integrated unit input value	Manual unlock switch ON
Bright SW input	ON/OFF	Body integrated unit input value	ON when bright switch is ON
P SW	ON/OFF	Body integrated unit input value	ON when shift range is in parking Shift lever P switch signal
MT Reverse Switch	ON/OFF	Body integrated unit input value	Shift lever is at reverse position
R wiper ON SW input	ON/OFF	Body integrated unit input value	Rear wiper switch ON
R wiper INT SW input	ON/OFF	Body integrated unit input value	Rear wiper switch (INT ON)
R washer SW input	ON/OFF	Body integrated unit input value	Rear washer switch ON
wiper deicer SW input	ON/OFF	Body integrated unit input value	Rear defogger switch ON
Rear Defogger SW	ON/OFF	Body integrated unit input value	
Driver's Seat SW input	ON/OFF	Body integrated unit input value	Driver's seat buckle switch ON
P seatbelt SW input	ON/OFF	Body integrated unit input value	Passenger's seat occupied and buckle switch ON
Fr wiper input	ON/OFF	Body integrated unit input value	ON when front wiper is operating
Parking Brake Switch Input	ON/OFF	Body integrated unit input value	ON when parking brake locked
R gate lock status SW input	ON/OFF	Body integrated unit inner memory value	Displays door lock/unlock state, ON when locked
R Gate Release SW input	ON/OFF	Body integrated unit input value	When rear gate opener button is ON
Rr Defogger output	ON/OFF	Body integrated unit output value	ON when rear defogger relay is operating
lock actuat. LOCK output	ON/OFF	Body integrated unit output value	ON when LOCK signal is output
All seat UNLOCK output	ON/OFF	Body integrated unit output value	ON when unlock signal is output
D-seat UNLOCK output	ON/OFF	Body integrated unit output value	ON when unlock signal is output
R gate/trunk UNLK output	ON/OFF	Body integrated unit output value	ON when rear gate/trunk unlock signal is output
R wiper output	ON/OFF	Body integrated unit output value	ON when rear wiper motor is operating
Shift Lock Solenoid	ON/OFF	Body integrated unit output value	ON when shift lock solenoid is operating (only AT)
Key locking output	ON/OFF	Body integrated unit output value	With ignition switch ON and in other than the shift P range, with key in switch ON
wiper deicer output	ON/OFF	Body integrated unit output value	ON when wiper deicer relay is operating
Hazard Output	ON/OFF	Body integrated unit output value	ON when answer-back signal is received or when emergency light (answer-back) is operating
Keyless Buzzer Output	ON/OFF	Body integrated unit output value	ON when lock/unlock signal is received
Horn Output	ON/OFF	Body integrated unit output value	ON when security warning is operating
D-belt warning light O/P	ON/OFF	CAN data output value	ON when ignition switch is turned to ON, and buckle switch is turned off
P-belt warning light O/P	ON/OFF	Body integrated unit output value	ON when ignition switch is turned to ON, occupant is seated, and buckle switch is turned off
Illumination lamp O/P	ON/OFF	Body integrated unit output value	ON when illumination is illuminated
Room lamp output	ON/OFF	Body integrated unit output value	When one of the doors is open
key illumi. lamp o/p	ON/OFF	Body integrated unit output value	ON when key illumination light is illuminated
Immobilizer lamp output	ON/OFF	Body integrated unit output value	ON when immobilizer pilot light blinks
Keyless operation 1	Regist./Normal	Body integrated unit input value	When keyless is registered
Keyless operation 2	Deletion/Normal	Body integrated unit input value	When keyless registration is deleted
CC Main Lamp	ON/OFF	CAN data input value	Cruise control switch ON Reception from ECM and transmission to combination meter

Items to be displayed	Unit of measure	Remarks	Note
CC Set Lamp	ON/OFF	CAN data input value	ON when cruise control vehicle speed is set Reception from ECM and transmission to combination meter
SPORT Lamp	ON/OFF	CAN data input value	SPORT mode switch ON Reception from TCM and transmission to combination meter (only AT)
SPORT Blink	Blink/OFF	CAN data input value	Blinks when there is an AT failure Reception from TCM and transmission to combination meter (only AT)
ATF Temperature Lamp	ON/OFF	CAN data input value	When ATF temperature rise (only AT)
ATF Blink	Blink/OFF	CAN data input value	Blinks when there is an AT failure Reception from TCM and transmission to combination meter (only AT)
ECO Lamp (AT)	ON/OFF	CAN data input value	Not applicable
ECO Lamp (MT)	ON/OFF	CAN data input value	Not applicable
Tire diameter abnormal 1	ON/OFF	CAN data input value	Lit when FWD fuse is connected (4AT only)
Tire diameter abnormal 2	Blink/OFF	CAN data input value	Blinks when the difference in rotation between front and rear wheels is 4% or more Reception from TCM and transmission to combination meter (only AT)
Shift Up Indication	UP/OFF	CAN data input value	ON when shift lever up-operation is possible (only AT)
Shift Down Indication	DOWN/OFF	CAN data input value	ON when shift lever down-operation is possible (only AT)
SPORT Shift (buzzer 1)	ON/OFF	CAN data input value	ON while the shift change prohibited warning buzzer is operating Reception from TCM and transmission to combination meter (only AT)
SPORT Shift (buzzer 2)	ON/OFF	CAN data input value	ON when the ATF high temperature warning buzzer is operating Reception from TCM and transmission to combination meter (only AT)
ABS/VDC Judging	ABS/VDC	CAN data input value	Transmission from vehicle dynamic control (VDC) to high speed control module
Small Light SW	ON/OFF	CAN data output value	ON when small light is illuminated
Headlamp	ON/OFF	CAN data output value	When headlight LO is ON
High Beam	ON/OFF	CAN data output value	When headlight HI is ON
km/mile display	mile/km	CAN data input value	Unit of distance received from meter
large diameter tire	large Tire/Others	CAN data output value	Large tire when the standard tire is 18 in Reception from combination meter
Number of cylinders	4 Cylinder/6 Cylinder	CAN data input value	Display engine equipped
Cam shaft specification	SOHC/DOHC	CAN data input value	Display engine equipped
Turbo	Turbo/Non-turbo	CAN data input value	Display engine equipped

Items to be displayed	Unit of measure	Remarks	Note
E/G displacement (2.5L)	2.5 L/ OFF	CAN data input value	Display engine equipped
E/G displacement (3.0L)	3.0 L/ OFF	CAN data input value	Display engine equipped
AT Vehicle ID Signal	ON/OFF	CAN data input value	Display transmission equipped
Blower fan information	ON/OFF	CAN data input value	ON when blower fan is operating (always OFF for auto A/C equipped models)
Smart judging flag	Smart/other than Smart	CAN data output value	Smart when integrated unit judges as a model with Smart
Diesel judging flag	Diesel/other than diesel	CAN data output value	Display diesel/other than diesel
Turbo judging flag	Non-turbo/Turbo	CAN data output value	Display engine equipped
AT type judging flag	4AT/5AT	CAN data output value	Display transmission equipped
CVT judging flag	CVT/other than CVT	CAN data output value	Display CVT judging
Center display failure	OK/NG	CAN data input value	NG when there is a center display failure Reception from center display (NAVI monitor)
NAVI Failure	OK/NG	CAN data input value	NG when there is a navigation system failure Reception from Center Display
IE Bus failure	Can not use	CAN data input value	Reception from Center Display
Auto A/C failure	OK/NG	CAN data input value	NG when there is a failure in auto air conditioning system Reception from auto A/C module
EBD Warning Light	ON/OFF	CAN data input value	OK when EBD warning light is illuminated Reception from VDC/ABS and transmission to combination meter
ABS Warning Light	ON/OFF	CAN data input value	OK when ABS warning light is illuminated Reception from VDC/ABS and transmission to combination meter
VDC OFF flag	ON/OFF	CAN data input value	Vehicle dynamics control OFF SW is ON Reception from VDC/ABS and transmission to combination meter
VDC/ABS OK B	OK/NG	CAN data input value	NG when there is an error in VDC/ABS system Reception from VDC/ABS
Lighting I Switch Input	ON/OFF	Body integrated unit input value	ON when lighting switch illumination is ON
Lighting II Switch Input	ON/OFF	Body integrated unit input value	ON when lighting switch, headlight is ON
Dimmer Hi Switch Input	ON/OFF	Body integrated unit input value	ON when dimmer switch is Hi beam position
Dimmer Pass Switch Input	ON/OFF	Body integrated unit input value	ON when dimmer switch is passing position
Lighting I Lamp Output	ON/OFF	Body integrated unit output value	ON when small light is illuminated
Lighting II Lamp Output	ON/OFF	Body integrated unit output value	ON when headlight is illuminated
Lighting Hi Lamp Output	ON/OFF	Body integrated unit output value	ON when Hi beam is illuminated
Front Fog Lamp Output	ON/OFF	Body integrated unit output value	ON when front fog light is ON.
DRL Cancel Output	ON/OFF	Body integrated unit output value	ON when lighting switch is “Headlight ON” and dimmer switch is “Hi beam” or “Passing” position
Power Supply Tr	ON/OFF	Body integrated unit output value	ON when lighting switch is “Head” position without inserting key in key cylinder
Spot map lamp output	ON/OFF	Body integrated unit output value	ON when one of the doors is open (except for tail gate)
Echo switch information	ON/OFF	CAN data output value	Not applicable

Items to be displayed	Unit of measure	Remarks	Note
Off delay time	OFF, Short, Normal, Long	Body integrated unit setting items	Customize setting
Rr Defogger op. mode	Continuous/Normal	Body integrated unit setting items	Customize setting
Security Alarm Setup	ON/OFF	Body integrated unit setting items	Customize setting
Impact Sensor Setup	ON/OFF	Body integrated unit setting items	Customize setting
Alarm delay setup	ON/OFF	Body integrated unit setting items	Customize setting
Lockout prevention	ON/OFF	Body integrated unit setting items	Customize setting
Impact sensor	ON/OFF	Body integrated unit setting items	Customize setting
Buzzer beeping setup	ON/OFF	Body integrated unit setting items	Customize setting
Emergency light setup	ON/OFF	Body integrated unit setting items	Customize setting
Buzzer setting	ON/OFF	Body integrated unit setting items	Customize setting
Auto locking	ON/OFF	Body integrated unit setting items	Customize setting
Passive Alarm	ON/OFF	Body integrated unit setting items	Customize setting
Door open warning	ON/OFF	Body integrated unit setting items	Customize setting
Dome Light Alarm Setting	ON/OFF	Body integrated unit setting items	Customize setting
Map Light Setting	ON/OFF	Body integrated unit setting items	Customize setting
Belt Warning Switch	ON/OFF	Body integrated unit setting items	Customize setting
Map lamp 30 sec off record	ON/OFF	Body integrated unit setting items	Customize setting
A/C ECM setting	ON/OFF	Body integrated unit setting items	Customize setting
wiperdeicer	ON/OFF	Body integrated unit setting items	Customize setting
Sedan/Wagon Setting	Sedan/wagon	Body integrated unit setting items	Customize setting
MT/AT Setting	MT/AT	Body integrated unit setting items	Customize setting
6MT Setting	6MT/Other than 6MT	Body integrated unit setting items	Customize setting
Destination Setting	0 — 16	Body integrated unit setting items	—
Factory initial setting	Factory/Market	Body integrated unit setting items	Customize setting

NOTE:
For detailed operation procedures, refer to “PC application help for Subaru Select Monitor”.

10.User Customizing

A: OPERATION

1) On «Main Menu» display, select {Each System Check}.
2) On «System Selection Menu» display, select {Integ. unit mode}.
3) On «Integ. unit mode failure diag.» display, select {Integ. Unit customizing}.
4) Change the setting with UP/DOWN key and set with the [OK] key.

• List of User Customizing item

Data	Initial setting value	Customize setting	Remarks
Off delay time	Long		Delay time below can be selected by setting.
		OFF	0 second
		Short	10 seconds
		Normal	20 seconds
		Long	30 seconds
Rr Defogger op. mode	15 minutes	15 minutes	Automatically stops in 15 minutes after switch is turned to ON.
		Continuous	Repeats active condition for 15 minutes and inactive condition for 2 minutes until switch is turned to OFF.
Security Alarm Setup	ON	ON	Security alarm (hazard, horn or siren) in active condition
		OFF	Security alarm in inactive condition
Impact Sensor Setup	OFF	ON	Workable when Impact Sensor Setup is set to “ON”. Impact sensor function becomes activated.
		OFF	Impact sensor in inactive condition (Set to “OFF” in models without sensors.)
Alarm delay setup	ON		After the keyless lock operation, the alarm monitor starts after the following delay time has passed.
		ON	Delay time is 30 seconds.
		OFF	Delay time is 0 seconds.
Lockout prevention	ON	ON	Lockout prevention in active condition. (The function does not operate if safety knob is locked by hand.)
		OFF	Lockout prevention in inactive condition
Impact sensor (OP)	OFF	ON	Vehicle is controlled in impact sensor equipped mode. (Make sure to set to “OFF” for models without the impact sensor. When “ON”, hazard, horn or siren become activated by keyless lock (alarm monitor start).
		OFF	Vehicle is controlled in no impact sensor mode.
Buzzer beeping setup	ON	ON	When lock/unlock is selected by keyless entry system operation, buzzer operates.
		OFF	When lock/unlock is selected by keyless entry system operation, buzzer does not operate.
Emergency light setup	ON	ON	When lock/unlock is selected by keyless entry system operation, buzzer operates.
		OFF	When lock/unlock is selected by keyless entry system operation, buzzer does not operate.
Buzzer setting	ON	ON	Vehicle is controlled in answer-back buzzer equipped mode.
		OFF	Vehicle is controlled in answer-back buzzer non-equipped mode. (Make sure to set to “OFF” in models without answer back buzzers.)
Initial keyless setting	—	—	—
		Execution	Settings of keyless entry system are initialized.
Initial button setting	—	—	—
		Execution	Settings of each function are initialized.
Passive Alarm	OFF	ON	Setting only for North American models
		OFF	

Data	Initial setting value	Customize setting	Remarks
Door open warning	ON	ON	If detecting door open for 20 minutes, room light, map light, and key ring illumination that are related to doors are turned off to prevent battery run-out.
		OFF	Room light, map light, key illumination and door warning light are not turned off.
Dome Light Alarm Setting	OFF	ON	The room light lights by being interlocked with the activation of the alarm.
		OFF	
Map Light Setting	ON	ON	Illuminates in accordance with the door interlocked room light.
		OFF	
Belt Warning Switch	ON	ON	When using normally
		OFF	Stop the belt warning buzzer beep and warning light illumination.

5) After setting, make sure that the setting changed in the {Current Data Display & Save} is same as vehicle equipment.

CAUTION:
- **The above settings must match the actual vehicle equipment.**
- **Do not change settings except for setting above while setting the functions.**
- **Be sure not to change Factory initial setting except when installing a new body integrated unit.**

NOTE:
For detailed operation procedures, refer to “PC application help for Subaru Select Monitor”.

11.Registration Body Integrated Unit

A: OPERATION

1. CONFIRMATION OF CURRENT SETTING

1) On «Main Menu» display, select {Each System Check}.
2) On «System Selection Menu» display, select {Integ. unit mode}.
3) On «Integ. unit mode failure diag.» display, select {Current Data Display & Save}.
4) Using the scroll key, scroll the display screen up or down until the desired data is shown.
5) Display the following item and record the settings.

Required items for new registration (Except for system not equipped)

Item	Item to confirm				Remarks
number of regist.	1	2	3	4	Registered ID type
Off delay time	OFF	Long	Normal	Short	Setting for lighting off time
Rr Defogger op. mode	Normal		Continuous		
Security Alarm Setup	ON		OFF		
Impact Sensor Setup	ON		OFF		Option setting
Alarm delay setup	ON		OFF		
Lockout prevention	ON		OFF		
Impact sensor	support		no support		Option setting
Buzzer beeping setup	ON		OFF		
Emergency light setup	ON		OFF		
Buzzer setting	support		no support		
Passive Alarm	ON		OFF		
Door open warning	support		no support		
Dome Light Alarm Setting	ON		OFF		
Map Light Setting	ON		OFF		
Belt Warning Switch	ON		OFF		Switch the belt warning lighting and the buzzer sound.
Map lamp 30 sec off record	support		no support		
A/C ECM setting	support		no support		Model with auto A/C
wiperdeicer	support		no support		Option setting
Sedan/Wagon Setting	Sedan		Wagon		
MT/AT Setting	AT		MT		
6MT Setting	6MT		Other than 6MT		
Factory initial setting	Factory		Market		Do not change to factory mode.

2. REGISTRATION BODY INTEGRATED UNIT (FUNCTION SETTING)

CAUTION:
Body integrated unit is core of LAN system, and also can select the function of all vehicle system control. It is possible to control the original functions of vehicle when registrations of body integrated unit and function setting are corresponded to vehicle equipment.
If registrations and function setting are different from vehicle equipment, vehicle system does not operate normally and diagnosis cannot be performed correctly. Pay attention to following item.
- **Be sure to correspond registrations and function settings to vehicle equipment.**
- **Do not change the settings of vehicle improperly.**
- **Confirm key illumination does not blink when ignition key is turned ON, or "Factory initial setting" of body integrated unit registrations is set to "Market". If "Factory initial setting" is set to "Factory", key illumination blinks when ignition key is turned ON, to notify that the settings are unconfirmed.**
- **Key illumination does not blink with ignition switch turned to ON and go off with door closed.**
- **Be sure to register immobilizer if body integrated unit is replaced with a new part. (model with immobilizer)**
- **Make a registration of immobilizer when the parts related to immobilizer have been replaced. Refer to the "PC application help for Subaru Select Monitor".**

1) On «Main Menu» display, select {Each System Check}.
2) On «System Selection Menu» display, select {Integ. unit mode}.
3) Click the [OK] button after the control module name {Integ. Unit} is displayed.
4) On «Integ. unit mode failure diag.» display, select {Integ. Unit customizing}.
5) Change the setting with UP/DOWN key.
- List of body integrated unit registration item

NOTE:
Setting is different depending on the grade of vehicle.

Data	Initial setting	Registration	Remarks
Map lamp 30 sec off record	OFF	ON	Set to "OFF" for models with door interlock switch in map light, "ON" for models without door interlock switch.
		OFF	
A/C ECM setting	OFF	ON	Set to "ON" in case of model with auto A/C. Set to "OFF" in case of model without auto A/C.
		OFF	
wiperdeicer (Manufacturer option)	OFF	ON	ON signal does not output with operation of wiper deicer switch if wiper deicer is set to "OFF" in models with a wiper deicer.
		OFF	
Sedan/Wagon Setting	Wagon	Wagon	Door lock/unlock control by Wagon
		Sedan	Door lock/unlock control by Sedan
MT/AT Setting	AT	MT	No control of shift lock solenoid, key-lock solenoid
		AT	Control of shift lock solenoid, key-lock solenoid
6MT Setting	Other than 6MT	6MT	Set to "6MT" for 6MT model, and set to "Other than 6MT" for AT/5AT model.
		Other than 6MT	
Factory initial setting	Factory	Factory	Be sure to set to "Market". After setting change, turn the ignition switch to OFF and settle the changed settings.
		Market (Confirmed)	

CAUTION:
- **To perform normal operation of vehicle and diagnosis, the above settings must match the actual vehicle equipment.**
- **When body integrated unit is a new part or "Factory" mode, key illumination blinks to show equipment settings have not been completed. Check the detailed procedures of function setting.**
- **Be sure not to change Factory initial setting except when installing a new body integrated unit.**

NOTE:
“Factory” mode:
- Body integrated unit has not been set yet. It can be recognized by key illumination blinking with ignition switch turned to ON.
- All replacement body integrated units are set to “Factory” mode. When replacing a body integrated unit, be sure to perform the registration operation.

“Market” mode:
- Each settings have been set. It can be recognized by key ring illumination coming on in concocting with room light and going off with ignition switch turned to ON.

6) Perform the Factory initial setting. On the «Integ. Unit customizing» display screen of Subaru Select Monitor, select the {Factory initial setting}.
7) Change the mode from Factory to Market.
8) Turn the ignition switch to OFF to settle the setting.
9) Change the Subaru Select Monitor system selection to «Immobilizer» to register the immobilizer key.
10) Perform the operation according to the “PC application help for Subaru Select Monitor”.
11) When key registration is completed, “Do you want to register remote engine start?” is displayed. Perform registration only for equipped models.
12) Perform the User Customizing. <Ref. to LAN(diag)-25, OPERATION, User Customizing.>

NOTE:
For detailed operation procedures, refer to “PC application help for Subaru Select Monitor”.

12.Function Check

A: OPERATION

NOTE:
In order to check the body integrated unit function, inspect the body integrated unit and actuator using Subaru Select Monitor without operating switches.
1) On «Main Menu» display, select {Each System Check}.
2) On «System Selection Menu» display, select {Integ. unit mode}.
3) On «Integ. unit mode failure diag.» display, select {Function check}.
4) Select the item to be operated on the «Function check» display screen with “UP/Down key” and press the [Next] button.
5) Pressing [Next] starts, [End] cancels the operation and [OK] returns to the System Operation Check Mode display screen.

NOTE:
• If not equipped (based on area or condition), process will not go on.
• For detailed operation procedures, refer to “PC application help for Subaru Select Monitor”.

13.List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Item	Content of diagnosis	Note
B1100	Integ. Unit System Error	Memory read out error in body integrated unit	<Ref. to LAN(diag)-34, DTC B1100 INTEG. UNIT SYSTEM ERROR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
B1101	BATT p/supply malfunction cont.	• Open or short in battery power supply control circuit • Voltage malfunction caused by poor contact	<Ref. to LAN(diag)-35, DTC B1101 BATT P/SUPPLY MALFUNCTION CONT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
B1102	BATT p/supply malfunction backup	• Battery power supply backup circuit is open or shorted. • Voltage malfunction caused by poor contact	<Ref. to LAN(diag)-37, DTC B1102 BATT P/SUPPLY MALFUNCTION BACKUP, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
B1103	Ignition power failure	• IGN power supply circuit is open or shorted. • Voltage malfunction caused by poor contact	<Ref. to LAN(diag)-39, DTC B1103 IGNITION POWER FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
B1104	ACC power failure	• ACC power supply circuit is open or shorted. • Voltage malfunction caused by poor contact	<Ref. to LAN(diag)-40, DTC B1104 ACC POWER FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
B1105	Key interlock circuit abnormal	GND-output short of key interlock circuit	<Ref. to LAN(diag)-41, DTC B1105 KEY INTERLOCK CIRCUIT ABNORMAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
B1106	shift lock circuit Failure	Open or power supply-output short, GND-output short in shift lock circuit	<Ref. to LAN(diag)-43, DTC B1106 SHIFT LOCK CIRCUIT FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
U1201	CAN-HS counter abnormal	Communication is unstable because of high speed CAN communication error.	<Ref. to LAN(diag)-45, DTC U1201 CAN-HS COUNTER ABNORMAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
U1202	CAN-HS bus off	Integrated unit communication is shut down because of high speed CAN communication error.	<Ref. to LAN(diag)-49, DTC U1202 CAN-HS BUS OFF, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
U1211	CAN-HS ECM data abnormal	Received error data from ECM.	<Ref. to LAN(diag)-52, DTC U1211 CAN-HS ECM DATA ABNORMAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
U1212	CAN-HS TCM data abnormal	Received error data from TCM.	<Ref. to LAN(diag)-54, DTC U1212 CAN-HS TCM DATA ABNORMAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
U1213	CAN-HS VDC/ABS data abnormal	Received error data from VDC/ABS module.	<Ref. to LAN(diag)-56, DTC U1213 CAN-HS VDC/ABS DATA ABNORMAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
U1221	CAN-HS ECM no-receive data	Not received data from ECM.	<Ref. to LAN(diag)-58, DTC U1221 CAN-HS ECM NO-RECEIVE DATA, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
U1222	CAN-HS TCM no-receive Data	Not received data from TCM.	<Ref. to LAN(diag)-61, DTC U1222 CAN-HS TCM NO-RECEIVE DATA, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
U1223	CAN-HS VDC/ABS no-receive data	Not received data from VDC/ABS CM.	<Ref. to LAN(diag)-63, DTC U1223 CAN-HS VDC/ABS NO-RECEIVE DATA, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Content of diagnosis	Note
U1300	CAN-LS malfunction	CAN-LS circuit is open or shorted.	<Ref. to LAN(diag)-65, DTC U1300 CAN-LS MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
U1301	CAN-LS counter abnormal	Communication is unstable because of low speed CAN communication error.	<Ref. to LAN(diag)-68, DTC U1301 CAN-LS COUNTER ABNORMAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
U1302	CAN-LS bus off	Integrated unit communication is shut down because of low speed CAN communication error.	<Ref. to LAN(diag)-71, DTC U1302 CAN-LS BUS OFF, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
U1311	CAN-LS meter unit data abnormal	Received error data from meter.	<Ref. to LAN(diag)-74, DTC U1311 CAN-LS METER UNIT DATA ABNORMAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
U1321	CAN-LS meter no-receive data	Not received data from meter.	<Ref. to LAN(diag)-75, DTC U1321 CAN-LS METER NO-RECEIVE DATA, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
B1401	M Collation NG	Malfunction related immobilizer	<Ref. to IM(diag)-25, DTC B1401 M COLLATION NG, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
B1402	Immobilizer Key Collation NG	Malfunction related immobilizer	<Ref. to IM(diag)-25, DTC B1402 IMMOBILIZER KEY COLLATION NG, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
B1403	E/G request NG	Malfunction related immobilizer	<Ref. to IM(diag)-25, DTC B1403 E/G REQUEST NG, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
B1500	Keyless UART com. Malfunction	Open or short circuit in keyless UART circuit	<Ref. to LAN(diag)-77, DTC B1500 KEYLESS UART COM. MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

1. DTC TABLE

NOTE:
When more than two DTC codes are recorded, referring to their combination will make it easy to identify the possible cause. Refer to the list for typical examples.

DTC to Check	Diagnostic Code that was displayed.				Probable cause
	Body integrated unit	ECM	TCM	VDC/ABS CM	
B1100 <Ref. to LAN(diag)-34, DTC B1100 INTEG. UNIT SYSTEM ERROR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	B1100	—	—	—	There could be a problem in the body integrated unit.
U1221 <Ref. to LAN(diag)-58, DTC U1221 CAN-HS ECM NO-RECEIVE DATA, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	U1221	—	P1718	C0047	It is possible that the ECM is faulty.
U1222 <Ref. to LAN(diag)-61, DTC U1222 CAN-HS TCM NO-RECEIVE DATA, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	U1222	U0101	—	C0047	It is possible that the TCM is faulty.
U1223 <Ref. to LAN(diag)-63, DTC U1223 CAN-HS VDC/ABS NO-RECEIVE DATA, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	U1223	U0122	P1718	—	It is possible that the VDC/ABS CM is faulty.
U1321 <Ref. to LAN(diag)-75, DTC U1321 CAN-LS METER NO-RECEIVE DATA, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	U1321	—	—	—	It is possible that the combination meter is faulty.
B1500 <Ref. to LAN(diag)-77, DTC B1500 KEYLESS UART COM. MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	B1500	—	—	—	It's possible that there is an internal problem in the keyless entry control module, or a problem in the communication line.

14.Diagnostic Procedure with Diagnostic Trouble Code (DTC)

A: DTC B1100 INTEG. UNIT SYSTEM ERROR

DTC DETECTING CONDITION:
Memory read out error in body integrated unit
TROUBLE SYMPTOM:
LAN communication immobilizer function may not be executed normally.

	Step	Check	Yes	No
1	**CHECK DTC.** Check DTC indicated by body integrated unit. <Ref. to LAN(diag)-14, OPERATION, Subaru Select Monitor.>	Is B1100 current malfunction?	Go to step **2**.	Temporary EEPROM access error occurred.
2	**CHECK CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the body integrated unit connector. 3) Connect the disconnected connectors. 4) Turn the ignition switch to ON. 5) Read the DTC of body integrated unit using Subaru Select Monitor.	Is B1100 current malfunction?	Replace the body integrated unit. <Ref. to SL-46, REMOVAL, Body Integrated Unit.>	Temporary EEPROM access error occurred.

B: DTC B1101 BATT P/SUPPLY MALFUNCTION CONT

DTC DETECTING CONDITION:

- Open or short in battery power supply control circuit
- Voltage malfunction caused by poor contact

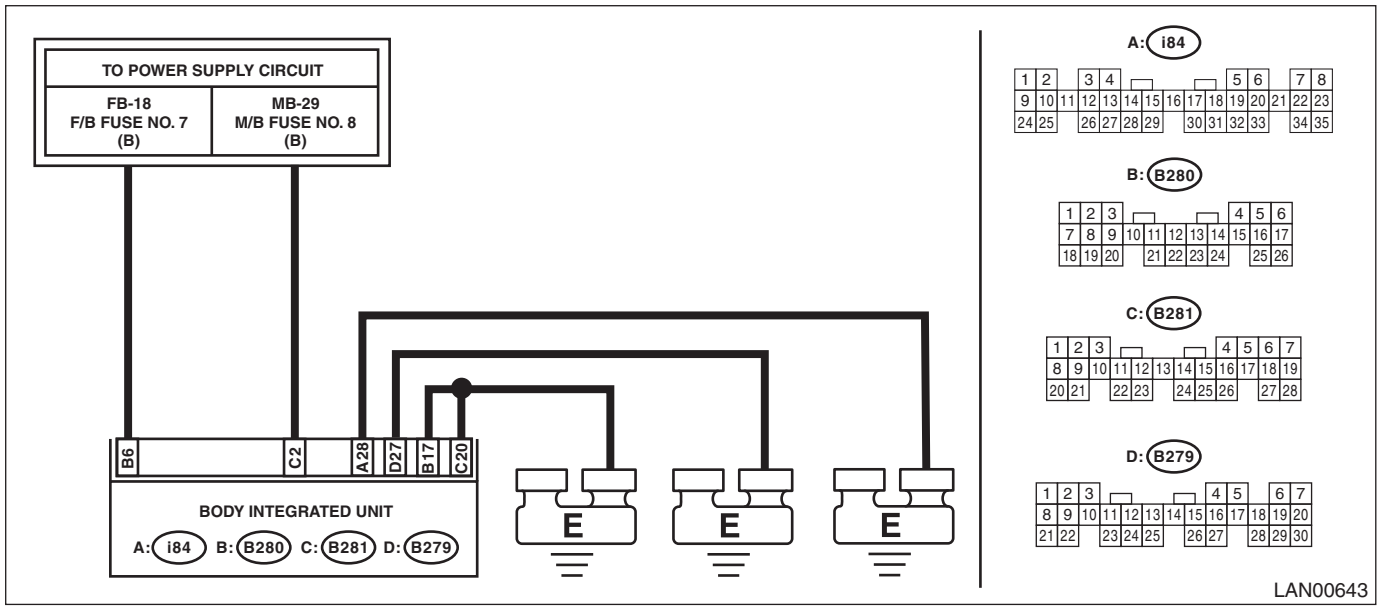
TROUBLE SYMPTOM:

Each function stops operation.

NOTE:

- When B1102 BATT p/supply (backup) malfunction is output at the same time, all the function of body integrated unit may not operate.
- B1101 may input when the battery run-out occurs.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK DTC.** Read the DTC of body integrated unit using Subaru Select Monitor. <Ref. to LAN(diag)-14, OPERATION, Subaru Select Monitor.>	Is B1101 current malfunction?	Go to step **2**.	Go to step **5**.
2	**CHECK DTC.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from body integrated unit and reconnect. 3) Wait approx. 2 minutes. 4) Turn the ignition switch to ON. 5) Read the DTC of body integrated unit using Subaru Select Monitor.	Is B1101 current malfunction?	Go to step **3**.	Go to step **5**.
3	**CHECK FUSE.** 1) Turn the ignition switch to OFF. 2) Check the fuse.	Is the fuse OK?	Go to step **4**.	Replace the defective fuse.
4	**CHECK HARNESS.** 1) Disconnect the body integrated unit connector (B280). 2) Measure the voltage between body integrated unit connector and chassis ground using tester. ***Connector & terminal*** ***(B280) No. 6 (+) — Chassis ground (–):***	Is the voltage 8.5 — 16.5 V?	Replace the body integrated unit. <Ref. to SL-46, REMOVAL, Body Integrated Unit.>	Repair or replace the open or shorted circuit between body integrated unit and fuse.
5	**CHECK CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the body integrated unit connector (B280).	Is there poor contact of connector?	Repair or replace the poor contact of connector.	A temporary change of voltage occurred.

C: DTC B1102 BATT P/SUPPLY MALFUNCTION BACKUP

DTC DETECTING CONDITION:

- Open or short of battery power supply backup circuit
- Voltage malfunction caused by poor contact

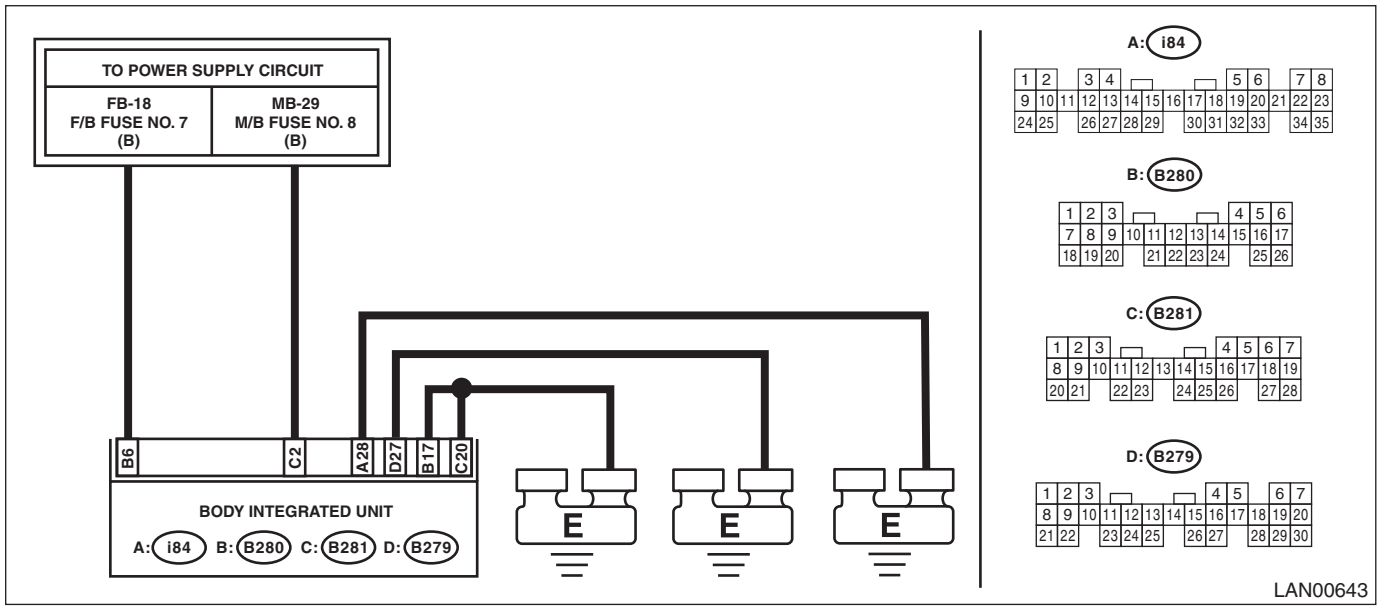
TROUBLE SYMPTOM:

No influence.

NOTE:

- When B1101 BATT p/supply (cont.) malfunction are output at the same time, all function of body integrated unit may not operate.
- B1101 may input when the battery run-out occurs.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK DTC.** Read the DTC of body integrated unit using Subaru Select Monitor. <Ref. to LAN(diag)-14, OPERATION, Subaru Select Monitor.>	Is B1102 current malfunction?	Go to step **2**.	Go to step **5**.
2	**CHECK DTC.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from body integrated unit and reconnect. 3) Wait approx. 2 minutes. 4) Turn the ignition switch to ON. 5) Read the DTC of body integrated unit using Subaru Select Monitor.	Is B1102 current malfunction?	Go to step **3**.	Go to step **5**.
3	**CHECK FUSE.** 1) Turn the ignition switch to OFF. 2) Check the fuse.	Is the fuse OK?	Go to step **4**.	Replace the defective fuse.
4	**CHECK HARNESS.** 1) Disconnect the body integrated unit connector (B281). 2) Measure the voltage between body integrated unit connector and chassis ground using tester. ***Connector & terminal*** ***(B281) No. 2 (+) — Chassis ground (–):***	Is the voltage 8.5 — 16.5 V?	Replace the body integrated unit. <Ref. to SL-46, REMOVAL, Body Integrated Unit.>	Repair or replace the open or shorted circuit between body integrated unit and fuse.
5	**CHECK CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the body integrated unit connector (B281).	Is there poor contact of connector?	Repair or replace the poor contact of connector.	A temporary change of voltage occurred.

D: DTC B1103 IGNITION POWER FAILURE

DTC DETECTING CONDITION:

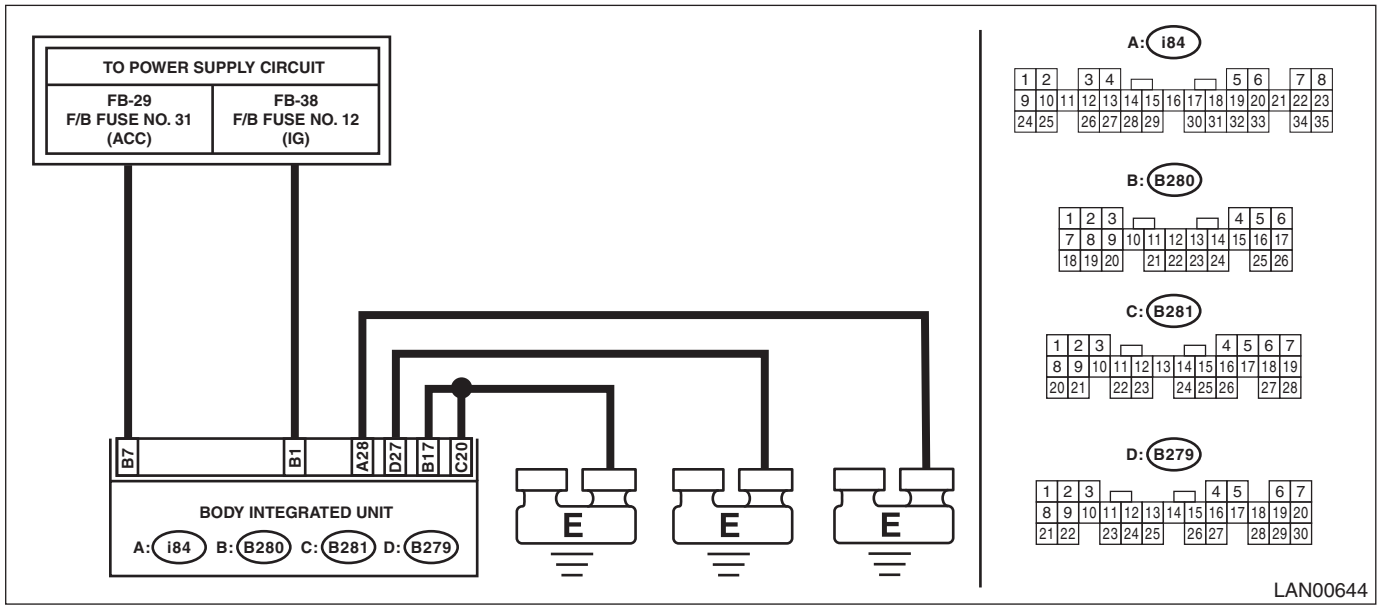
- Open or short in IGN power supply circuit
- Voltage malfunction caused by poor contact

TROUBLE SYMPTOM:

Error related to LAN system will not be detected.

NOTE:
B1103 may output when the ignition switch turns to ON with the weak battery condition.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK DTC.** Read the DTC of body integrated unit using Subaru Select Monitor. <Ref. to LAN(diag)-14, OPERATION, Subaru Select Monitor.>	Is B1103 current malfunction?	Go to step **2**.	Go to step **5**.
2	**CHECK DTC.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from body integrated unit and reconnect. 3) Turn the ignition switch to ON. 4) Wait approx. 2 minutes. 5) Read the DTC of body integrated unit using Subaru Select Monitor.	Is B1103 current malfunction?	Go to step **3**.	Go to step **5**.
3	**CHECK FUSE.** 1) Turn the ignition switch to OFF. 2) Check the fuse.	Is the fuse OK?	Go to step **4**.	Replace the defective fuse.
4	**CHECK HARNESS.** 1) Disconnect the body integrated unit connector (B280). 2) Turn the ignition switch to ON. 3) Measure the voltage between body integrated unit connector and chassis ground using tester. ***Connector & terminal*** ***(B280) No. 1 (+) — Chassis ground (–):***	Is the voltage 8.5 — 16.5 V?	Replace the body integrated unit. <Ref. to SL-46, REMOVAL, Body Integrated Unit.>	Repair or replace the open or shorted circuit between body integrated unit and fuse.
5	**CHECK CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the body integrated unit connector (B280).	Is there poor contact of connector?	Repair or replace the poor contact of connector.	A temporary change of voltage occurred.

E: DTC B1104 ACC POWER FAILURE

DTC DETECTING CONDITION:

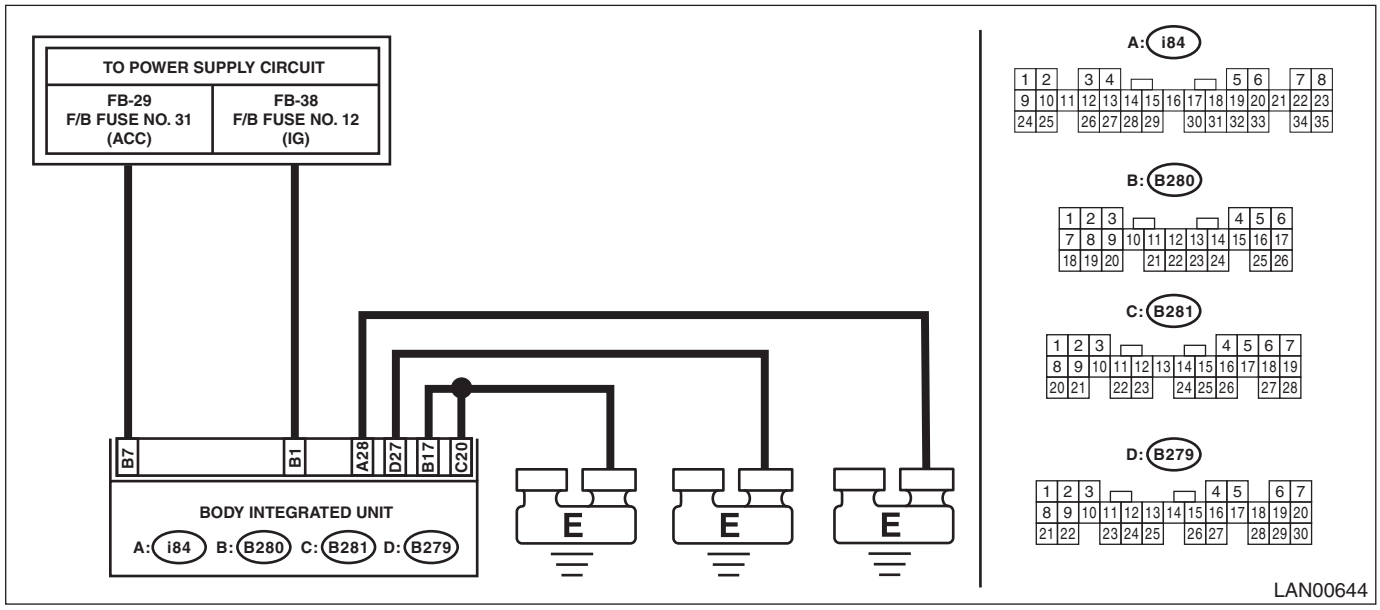
- Open or short in ACC power supply circuit
- Voltage malfunction caused by poor contact

TROUBLE SYMPTOM:

Does not exist.

NOTE:
B1104 may output when the ignition switch turns to ACC with the weak battery condition.

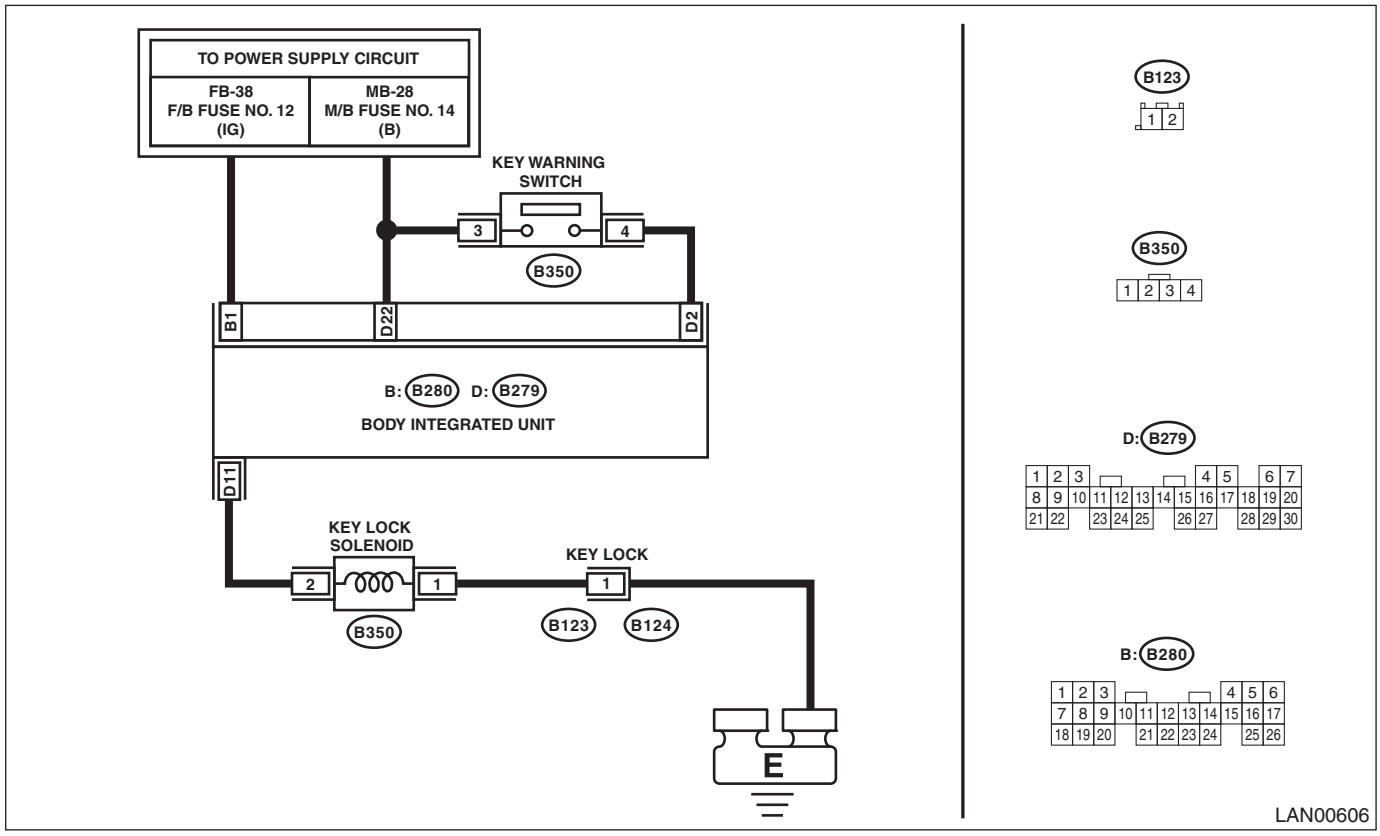
WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK DTC.** Read the DTC of body integrated unit using Subaru Select Monitor. <Ref. to LAN(diag)-14, OPERATION, Subaru Select Monitor.>	Is B1104 current malfunction?	Go to step **2**.	Go to step **5**.
2	**CHECK DTC.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from body integrated unit and reconnect. 3) Turn the ignition switch to ON. 4) Wait approx. 2 minutes. 5) Read the DTC of body integrated unit using Subaru Select Monitor.	Is B1104 current malfunction?	Go to step **3**.	Go to step **5**.
3	**CHECK FUSE.** 1) Turn the ignition switch to OFF. 2) Check the fuse.	Is the fuse OK?	Go to step **4**.	Replace the defective fuse.
4	**CHECK HARNESS.** 1) Disconnect the body integrated unit connector (B280). 2) Turn the ignition switch to ON. 3) Measure the voltage between body integrated unit connector and chassis ground using tester. ***Connector & terminal*** ***(B280) No. 7 (+) — Chassis ground (–):***	Is the voltage 8.5 — 16.5 V?	Replace the body integrated unit. <Ref. to SL-46, REMOVAL, Body Integrated Unit.>	Repair or replace the open or shorted circuit between body integrated unit and fuse.
5	**CHECK CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the body integrated unit connector (B280).	Is there poor contact of connector?	Repair or replace the poor contact of connector.	A temporary change of voltage occurred.

F: DTC B1105 KEY INTERLOCK CIRCUIT ABNORMAL

DTC DETECTING CONDITION:
Ground short of key interlock circuit
TROUBLE SYMPTOM:
Key interlock does not keep lock condition.
WIRING DIAGRAM:



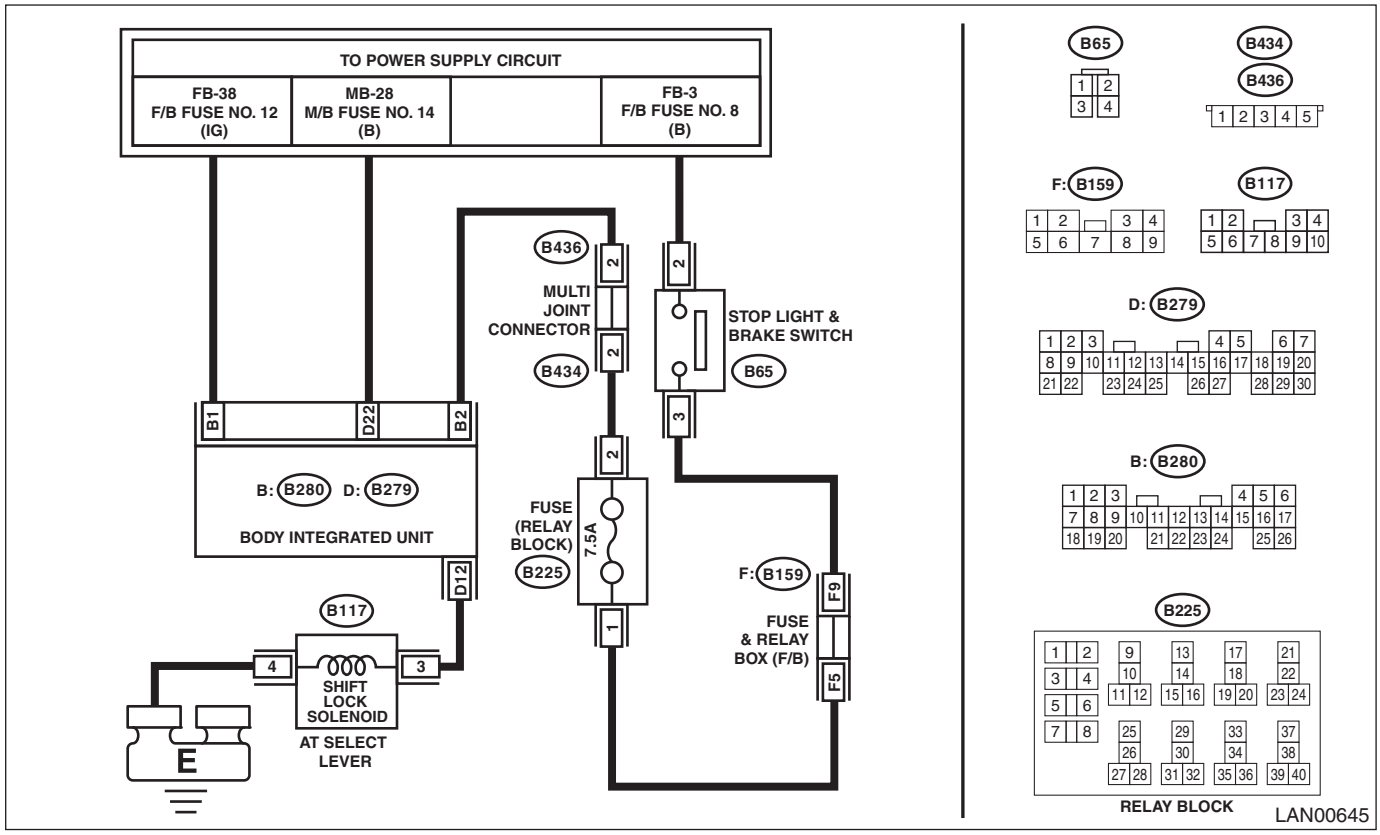
Step		Check	Yes	No
1	**CHECK DTC.** 1) Insert the ignition key. 2) Shift to the Neutral range. 3) Read the DTC of body integrated unit using Subaru Select Monitor. <Ref. to LAN(diag)-14, OPERATION, Subaru Select Monitor.>	Is B1105 current malfunction?	Go to step **2**.	Go to step **8**.
2	**CHECK DTC.** 1) Shift the select lever to P range. 2) Remove the ignition key. 3) Disconnect the key lock solenoid connector (B350) and body integrated unit connector (B279). 4) Connect the disconnected connectors. 5) Insert the ignition key. 6) Turn the ignition switch to ON and shift into Neutral. 7) Read the DTC of body integrated unit using Subaru Select Monitor.	Is B1105 current malfunction?	Go to step **3**.	Go to step **8**.

	Step	Check	Yes	No
3	**CHECK KEY LOCK SOLENOID.** 1) Turn the ignition switch to OFF. 2) Disconnect the key lock solenoid connector (B350). 3) Measure the resistance between the key lock solenoid connector. ***Connector & terminal*** ***(B350) No. 1 — No. 2:***	Is the resistance 12 — 14.5 Ω?	Go to step **4**.	Replace the key lock solenoid.
4	**CHECK KEY LOCK SOLENOID.** Connect the battery terminal to key lock solenoid. ***Terminals*** ***(B350) No. 2 — positive terminal:*** ***(B350) No. 1 — ground terminal:***	Is the solenoid activated and then key locked?	Go to step **5**.	Replace the key lock solenoid.
5	**CHECK HARNESS.** 1) Disconnect the body integrated unit connector (B279). 2) Measure the resistance between body integrated unit and key lock solenoid using tester. ***Connector & terminal*** ***(B350) No. 2 — (B279) No. 11:***	Is the resistance less than 10 Ω?	Go to step **6**.	Repair or replace the open circuit of harness.
6	**CHECK HARNESS.** Measure the resistance between body integrated unit and chassis ground using tester. ***Connector & terminal*** ***(B279) No. 11 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **7**.	Repair or replace the short circuit of the harness.
7	**CHECK HARNESS.** 1) Connect the body integrated unit. 2) Turn the ignition switch to ON. 3) Measure the voltage between body integrated unit and chassis ground using tester. ***Connector & terminal*** ***(B279) No. 11 — Chassis ground:***	Is the voltage 6 V or more?	Repair or replace the short circuit of the harness.	Replace the body integrated unit. <Ref. to SL-46, REMOVAL, Body Integrated Unit.>
8	**CHECK CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the body integrated unit connector (B279) and key lock solenoid connector (B350).	Is there poor contact at disconnected connector terminal?	Repair the terminal where poor contact exists, or replace harness.	It is possible that temporary poor contact occurs.

G: DTC B1106 SHIFT LOCK CIRCUIT FAILURE

DTC DETECTING CONDITION:
Shift lock circuit is open or shorted.
TROUBLE SYMPTOM:
Shift lock does not be released or remain locked.

NOTE:
P0801 may input simultaneously.
WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK DTC.** 1) Turn the ignition switch to ON. 2) Keep the Parking range for approx. 5 seconds. 3) Read the DTC of body integrated unit using Subaru Select Monitor.	Is B1106 current malfunction?	Go to step **2**.	Go to step **8**.
2	**CHECK DTC.** 1) Turn the ignition switch to OFF. 2) Disconnect the body integrated unit connector (B279) and shift lock solenoid connector (B117). 3) Connect the disconnected connectors. 4) Turn the ignition switch to ON, then keep the Parking range for approx. 5 seconds. 5) Read the DTC of body integrated unit using Subaru Select Monitor.	Is B1106 current malfunction?	Go to step **3**.	Go to step **8**.

	Step	Check	Yes	No
3	**CHECK HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the shift lock solenoid connector (B117). 3) Measure the resistance between shift lock solenoid and chassis ground using tester. ***Connector & terminal*** ***(B117) No. 4 — Chassis ground:***	Is the resistance less than 10 Ω?	Go to step **4**.	Repair the open circuit of harness or replace harness.
4	**CHECK SHIFT LOCK SOLENOID.** Measure the resistance between the shift lock solenoid connector. ***Connector & terminal*** ***(B117) No. 4 — No. 3:***	Is the resistance 19 — 25 Ω?	Go to step **5**.	Replace the shift lock solenoid.
5	**CHECK SHIFT LOCK SOLENOID.** Connect the battery terminal to shift lock solenoid. ***Terminals*** ***(B117) No. 3 — positive terminal:*** ***(B117) No. 4 — ground terminal:***	Is the solenoid activated, and then the shift lock released?	Go to step **6**.	Replace the shift lock solenoid.
6	**CHECK HARNESS.** 1) Disconnect the body integrated unit connector (B279). 2) Measure the resistance between body integrated unit connector (B279) and chassis ground. ***Connector & terminal*** ***(B279) No. 12 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **7**.	Repair the short circuit of harness or replace harness.
7	**CHECK HARNESS.** Measure the resistance between body integrated unit connector (B279) and shift lock solenoid (B117). ***Connector & terminal*** ***(B117) No. 3 — (B279) No. 12:***	Is the resistance less than 10 Ω?	Replace the body integrated unit. <Ref. to SL-46, REMOVAL, Body Integrated Unit.>	Repair the open circuit of harness or replace harness.
8	**CHECK DTC.** 1) With Parking range, depress the brake pedal and keep it at depressed condition. 2) Read the DTC of body integrated unit using Subaru Select Monitor.	Is B1106 current malfunction?	Go to step **9**.	Go to step **10**.
9	**CHECK DTC.** 1) Turn the ignition switch to OFF. 2) Disconnect the body integrated unit connector (B279) and shift lock solenoid connector (B117). 3) Connect the disconnected connectors. 4) Turn the ignition switch to ON. 5) Shift into Parking range, then depress the brake pedal. 6) Read the DTC of body integrated unit using Subaru Select Monitor.	Is B1106 current malfunction?	Go to step **4**.	Go to step **10**.
10	**CHECK CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the body integrated unit connector (B279) and shift lock solenoid connector (B117).	Is there poor contact of connector terminal?	Repair the poor contact of the terminal or replace the harness.	It is possible that temporary poor contact occurs.

H: DTC U1201 CAN-HS COUNTER ABNORMAL

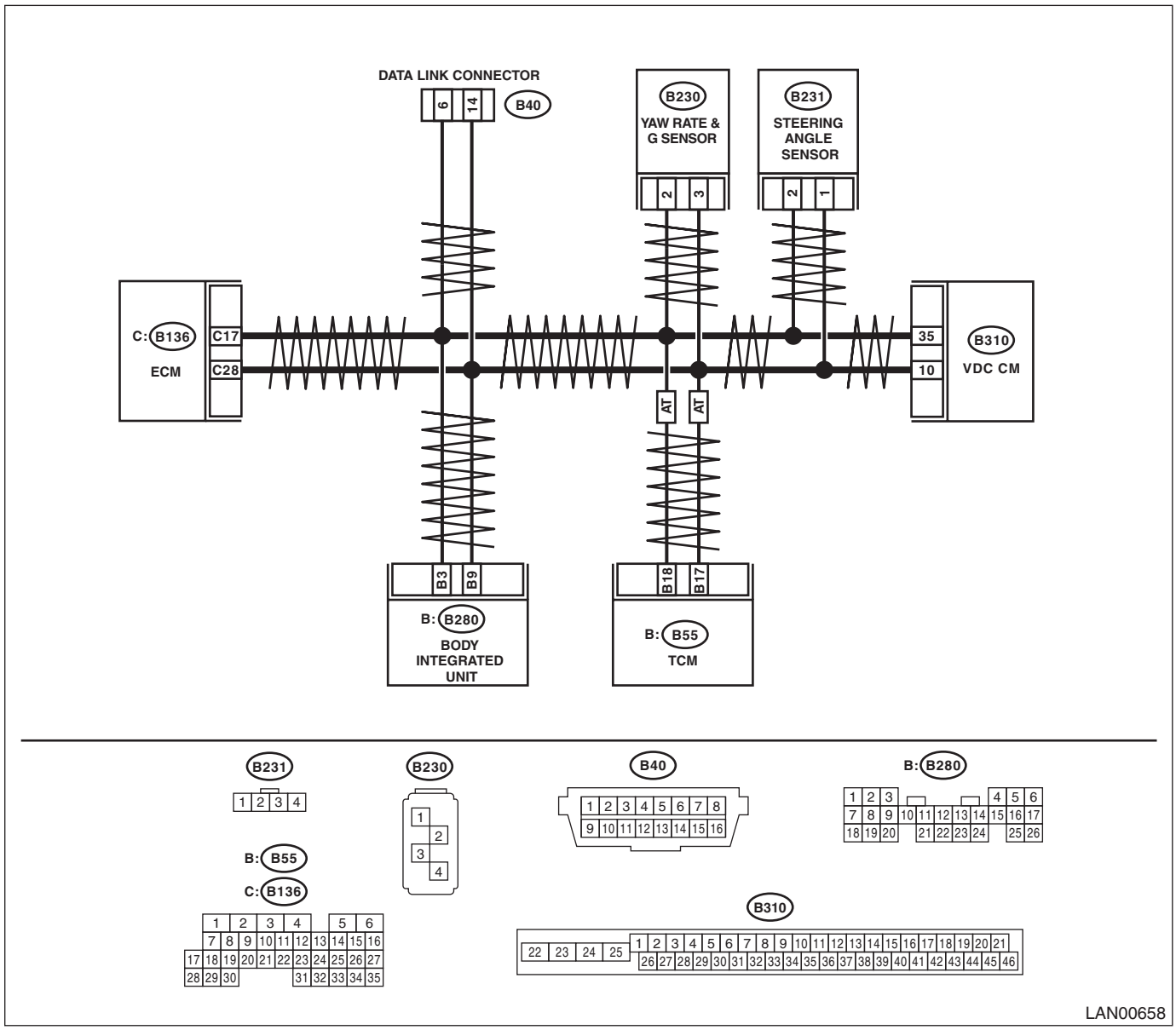
DTC DETECTING CONDITION:

Communication is unstable because of high speed CAN communication error.

TROUBLE SYMPTOM:

Malfunction indicator light illuminates.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK DTC.** Read all DTCs using the Subaru Select Monitor. <Ref. to LAN(diag)-14, OPERATION, Subaru Select Monitor.>	Are there U1202 or DTCs other than for the body integrated unit?	Perform the diagnosis according to DTC.	Go to step **2**.
2	**CHECK DTC.** Check DTC indicated by body integrated unit.	Is U1201 a current malfunction?	Go to step **3**.	Go to step **14**.

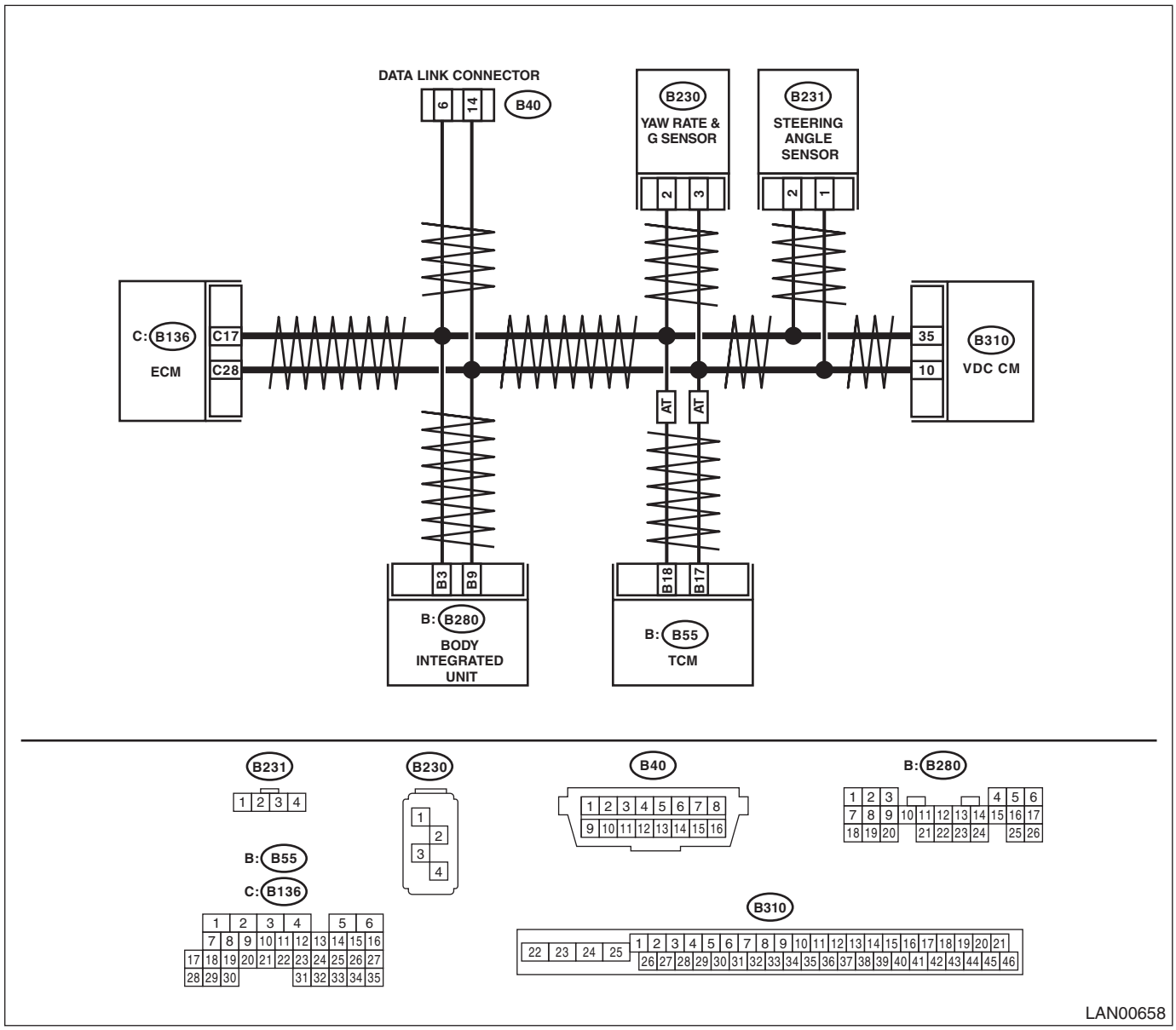
	Step	Check	Yes	No
3	**CHECK DTC.** 1) Turn the ignition switch to OFF. 2) Disconnect all control module connectors (B280, B310, B55, B136, B230, B231) that are connected to high speed CAN communication line. 3) Connect all the disconnected connectors. 4) Turn the ignition switch to ON. 5) Read the DTC of body integrated unit using Subaru Select Monitor.	Is U1201 a current malfunction?	Go to step **4**.	Go to step **14**.
4	**CHECK TCM.** NOTE: If the vehicle is MT model, go to the next step. 1) Turn the ignition switch to OFF. 2) Disconnect the TCM connector (B55). 3) Turn the ignition switch to ON. 4) Read the DTC of body integrated unit using Subaru Select Monitor.	Is U1201 a current malfunction?	Go to step **5**.	Go to step **16**.
5	**CHECK STEERING ANGLE SENSOR.** 1) Turn the ignition switch to OFF. 2) Connect the TCM connector. 3) Disconnect the steering angle sensor connector (B231). 4) Turn the ignition switch to ON. 5) Read the DTC of body integrated unit using Subaru Select Monitor.	Is U1201 a current malfunction?	Go to step **6**.	Go to step **17**.
6	**CHECK YAW RATE SENSOR.** 1) Turn the ignition switch to OFF. 2) Connect the steering angle sensor connector. 3) Disconnect the yaw rate sensor connector (B230). 4) Turn the ignition switch to ON. 5) Read the DTC of body integrated unit using Subaru Select Monitor.	Is U1201 a current malfunction?	Go to step **7**.	Go to step **18**.
7	**CHECK VDC/ABS CM.** 1) Turn the ignition switch to OFF. 2) Connect the yaw rate sensor connector. 3) Disconnect the VDC/ABS CM connector (B310). 4) Install the 120 Ω resistance to VDC/ABS CM connector terminals. ***Terminals*** ***(B310) No. 10 — No. 35:*** 5) Using the tester, measure the resistance between terminals of data link connector. ***Terminals*** ***(B40) No. 6 — No. 14:***	Is the resistance 60 Ω?	Go to step **8**.	Go to step **10**.
8	**CHECK DTC.** Read the DTC of body integrated unit using Subaru Select Monitor.	Is U1201 a current malfunction?	Go to step **9**.	Go to step **10**.
9	**CHECK DTC.** Read the DTC of body integrated unit using Subaru Select Monitor.	Is U1202 a current malfunction?	Replace the VDC/ABS CM. <Ref. to VDC-7, REMOVAL, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **10**.

	Step	Check	Yes	No
10	**CHECK ECM.** 1) Turn the ignition switch to OFF. 2) Connect the VDC/ABS CM. 3) Disconnect the ECM connector (B136). 4) Install the 120 Ω resistance to ECM connector. ***Terminals*** ***(B136) No. 17 — No. 28:*** 5) Using the tester, measure the resistance between terminals of data link connector. ***Connector & terminal*** ***(B40) No. 6 — No. 14:***	Is the resistance 60 Ω?	Go to step **11**.	Repair or replace the open circuit of harness.
11	**CHECK DTC.** Read the DTC of body integrated unit using Subaru Select Monitor.	Is U1201 a current malfunction?	Go to step **12**.	Go to step **13**.
12	**CHECK DTC.** Read the DTC of body integrated unit using Subaru Select Monitor.	Is U1202 a current malfunction?	Replace the ECM. <Ref. to FU(H4DOTC)-57, REMOVAL, Engine Control Module (ECM).>	Go to step **13**.
13	**CHECK DTC.** 1) Turn the ignition switch to OFF. 2) Reconnect all the disconnected connectors. 3) Turn the ignition switch to ON. 4) Read the DTC of body integrated unit using Subaru Select Monitor.	Is U1201 a current malfunction?	Replace the body integrated unit. <Ref. to SL-46, REMOVAL, Body Integrated Unit.>	Go to step **14**.
14	**CHECK HARNESS.** 1) Shake the instrument harness and bulkhead harness, rear harness. 2) Read the DTC of body integrated unit using Subaru Select Monitor.	Is U1201 a current malfunction?	Repair or replace the harness.	Go to step **15**.
15	**CHECK CONNECTOR.** 1) Disconnect the connector used for CAN circuit. 2) Check the connector terminal.	Is there poor contact of connector terminal?	Repair the connector terminal where poor contact exists, or replace harness.	It is possible that temporary poor communication occurs.
16	**CHECK HARNESS.** Using the tester, check for open or short (power supply-output short, GND-output short) in the harness between terminals of data link connector and TCM. ***Connector & terminal*** ***(B40) No. 14 — (B55) No. 17:*** ***(B40) No. 6 — (B55) No. 18:***	Is harness normal?	Replace the TCM. <Ref. to 4AT-66, REMOVAL, Transmission Control Module (TCM).>	Repair or replace the harness.
17	**CHECK HARNESS.** Using the tester, check for open or short (power supply-output short, GND-output short) in the harness between terminals of data link connector and steering angle sensor. ***Connector & terminal*** ***(B40) No. 14 — (B231) No. 1:*** ***(B40) No. 6 — (B231) No. 2:***	Is harness normal?	Replace the steering angle sensor. <Ref. to VDC-21, REPLACEMENT, Steering Angle Sensor.>	Repair or replace the harness.

	Step	Check	Yes	No
18	**CHECK HARNESS.** Using the tester, check for open or short (power supply-output short, GND-output short) in the harness between terminals of data link connector and yaw rate sensor. ***Connector & terminal*** ***(B40) No. 14 — (B230) No. 3:*** ***(B40) No. 6 — (B230) No. 2:***	Is harness normal?	Replace the yaw rate sensor. <Ref. to VDC-19, REMOVAL, Yaw Rate and G Sensor.>	Repair or replace the harness.

I: DTC U1202 CAN-HS BUS OFF

DTC DETECTING CONDITION:
Integrated unit communication is shut down because of high speed CAN error.
TROUBLE SYMPTOM:
Each warning light illuminates because the CAN communication (sending and receiving) is not normal.
WIRING DIAGRAM:



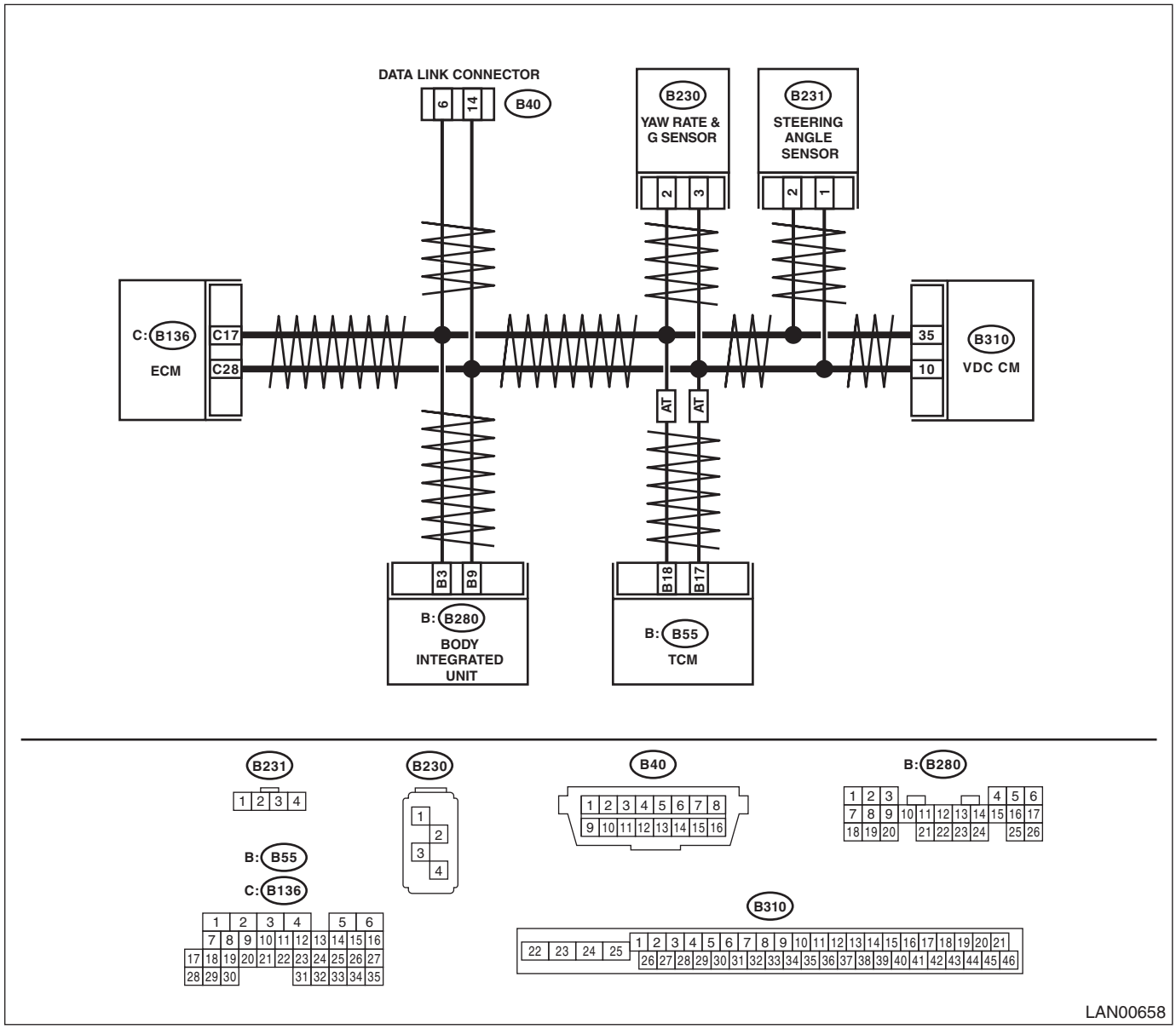
Step		Check	Yes	No
1	**CHECK DTC.** Using the Subaru Select Monitor, confirm all DTCs. <Ref. to LAN(diag)-14, OPERATION, Subaru Select Monitor.>	Is any DTC other than for the body integrated unit displayed?	Perform the diagnosis according to displayed DTC.	Go to step **2**.
2	**CHECK DTC.** 1) Turn the ignition switch to OFF → ON. 2) Read the DTC of body integrated unit using Subaru Select Monitor.	Is U1202 a current malfunction?	Go to step **3**.	Go to step **10**.

	Step	Check	Yes	No
3	**CHECK DTC.** 1) Turn the ignition switch to OFF. 2) Disconnect all control module connectors (B280, B310, B55, B136, B230, B231) that are connected to high speed CAN communication line. 3) Connect the disconnected connectors. 4) Turn the ignition switch to ON. 5) Read the DTC of body integrated unit using Subaru Select Monitor.	Is U1202 a current malfunction?	Go to step **4**.	Go to step **10**.
4	**CHECK HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect all control module connectors (B280, B310, B55, B136, B230, B231) that are connected to high speed CAN communication line. 3) Using the tester, check for open, short (power supply-output short, GND-output short) in the harness. ***Connector & terminal*** ***(B40) No. 6 — (B136) No. 17:*** ***(B40) No. 6 — (B310) No. 35:*** ***(B40) No. 6 — (B230) No. 2:*** ***(B40) No. 6 — (B231) No. 2:*** ***(B40) No. 6 — (B55) No. 18 (AT model):*** ***(B40) No. 6 — (B280) No. 3:***	Is harness normal?	Go to step **5**.	Repair or replace the harness.
5	**CHECK HARNESS.** Using the tester, check for open, short (power supply-output short, GND-output short) in the harness. ***Connector & terminal*** ***(B40) No. 14 — (B136) No. 28:*** ***(B40) No. 14 — (B310) No. 10:*** ***(B40) No. 14 — (B230) No. 3:*** ***(B40) No. 14 — (B231) No. 1:*** ***(B40) No. 14 — (B55) No. 17 (AT model):*** ***(B40) No. 14 — (B280) No. 9:***	Is harness normal?	Go to step **6**.	Repair or replace the harness.
6	**CHECK ECM.** 1) Connect the ECM. 2) Using the tester, measure the resistance between terminals of data link connector. ***Connector & terminal*** ***(B40) No. 6 — No. 14:***	Is the resistance 120±5 Ω?	Go to step **7**.	Replace the ECM. <Ref. to FU(H4DOTC)-57, REMOVAL, Engine Control Module (ECM).>
7	**CHECK VDC/ABS CM.** 1) Disconnect the ECM connector (B136). 2) Connect the VDC/ABS CM. 3) Using the tester, measure the resistance between terminals of data link connector. ***Connector & terminal*** ***(B40) No. 6 — No. 14:***	Is the resistance 120±5 Ω?	Go to step **8**.	Replace the VDC/ABS CM. <Ref. to VDC-7, REMOVAL, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>
8	**CHECK HARNESS.** 1) Connect the disconnected connectors. 2) Using the tester, measure the resistance between terminals of data link connector and chassis ground. ***Connector & terminal*** ***(B40) No. 6 — Chassis ground:*** ***(B40) No. 14 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **9**.	Go to step **12**.

	Step	Check	Yes	No
9	**CHECK HARNESS.** 1) Turn the ignition switch to ON. 2) Using the tester, measure the voltage between terminals of data link connector and chassis ground. ***Connector & terminal*** ***(B40) No. 6 — Chassis ground:*** ***(B40) No. 14 — Chassis ground:***	Is the voltage less than 6 V?	Replace the body integrated unit. <Ref. to SL-46, REMOVAL, Body Integrated Unit.>	Go to step **13**.
10	**CHECK HARNESS.** 1) Shake the harness. 2) Read the DTC of body integrated unit using Subaru Select Monitor.	Is U1202 a current malfunction?	Repair or replace the harness.	Go to step **11**.
11	**CHECK CONNECTOR.** Disconnect the connector used for high speed CAN circuit.	Is there poor contact of connector terminal?	Repair the connector terminal, or replace harness.	It is possible that temporary poor communication occurs.
12	**CHECK CONTROL MODULE.** With the tester connected, disconnect each control module connector.	Is there any control module whose resistance has changed?	Replace the control module whose resistance has changed.	Repair or replace the open or short circuit of the harness.
13	**CHECK ECM.** With the tester connected, disconnect each control module connector.	Is there any control module whose voltage has changed?	Replace the control module whose voltage has changed.	Repair or replace the short circuit of the harness.

J: DTC U1211 CAN-HS ECM DATA ABNORMAL

DTC DETECTING CONDITION:
Received error data from ECM.
TROUBLE SYMPTOM:
It is possible that engine control error may occur.
WIRING DIAGRAM:

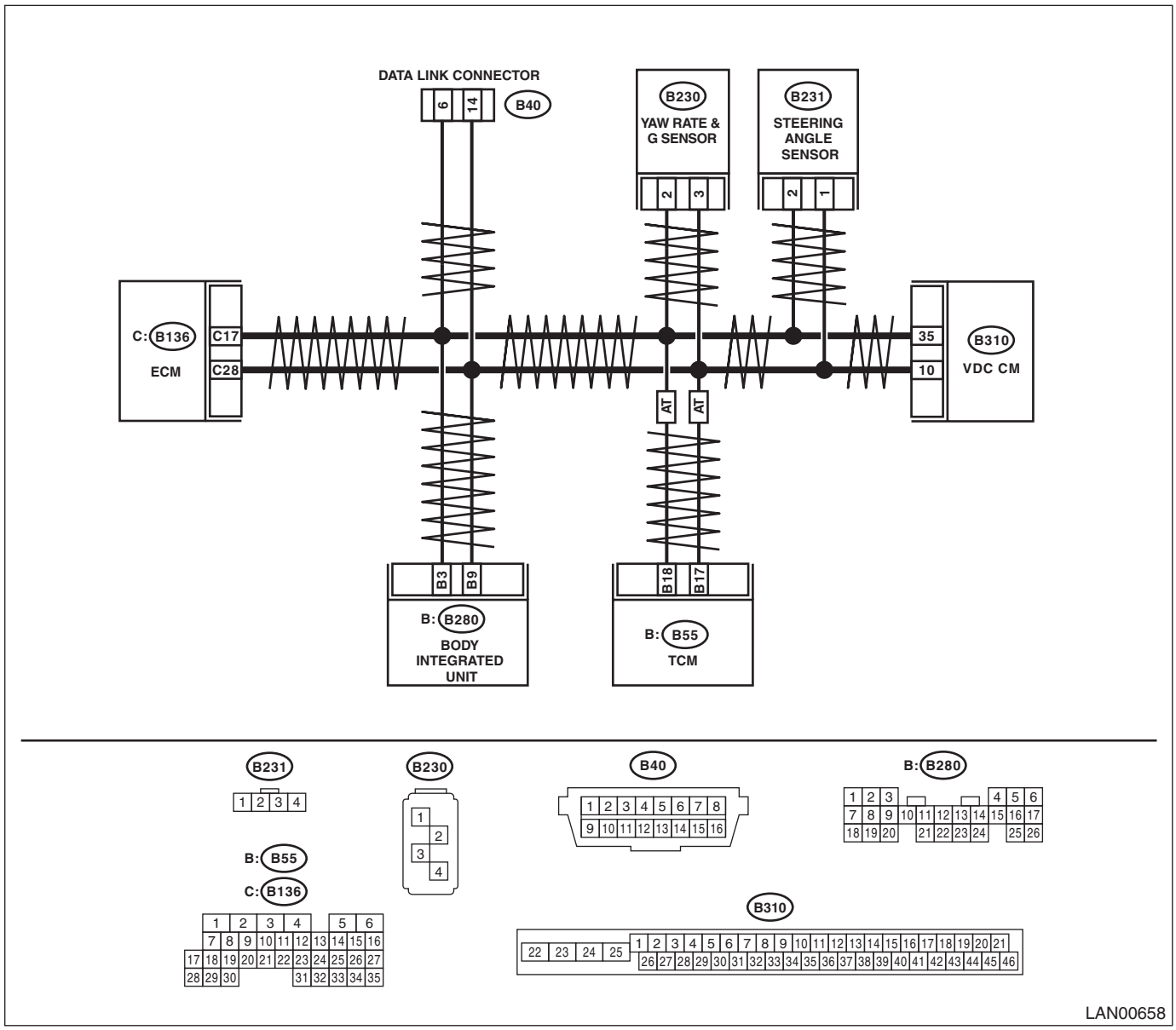


Step		Check	Yes	No
1	**CHECK DTC.** Read all DTCs using the Subaru Select Monitor. <Ref. to LAN(diag)-14, OPERATION, Subaru Select Monitor.>	Is there DTC U1202?	Perform the diagnosis according to DTC.	Go to step **2**.
2	**CHECK DTC.** Read the DTC of body integrated unit using Subaru Select Monitor.	Is U1211 a current malfunction?	Go to step **3**.	Go to step **4**.

	Step	Check	Yes	No
3	**CHECK ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Connect the disconnected connectors. 4) Turn the ignition switch to ON. 5) Read the DTC of body integrated unit using Subaru Select Monitor.	Is U1211 a current malfunction?	Replace the ECM. <Ref. to FU(H4DOTC)-57, REMOVAL, Engine Control Module (ECM).>	Go to step **4**.
4	**CHECK HARNESS.** 1) Turn the ignition switch to OFF. 2) Shake the harness used for CAN communication circuit. 3) Turn the ignition switch to ON. 4) Read the DTC of body integrated unit using Subaru Select Monitor.	Is U1211 a current malfunction?	Repair the poor contact or temporary open circuit of harness.	Go to step **5**.
5	**CHECK CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector that is connected to high speed CAN circuit.	Is there poor contact of connector?	Repair the connector terminal where poor contact exists, or replace harness.	It is possible that temporary poor communication occurs.

K: DTC U1212 CAN-HS TCM DATA ABNORMAL

DTC DETECTING CONDITION:
Received error data from TCM.
TROUBLE SYMPTOM:
It is possible that transmission control error may occur.
WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK DTC.** Read all DTCs using the Subaru Select Monitor. <Ref. to LAN(diag)-14, OPERATION, Subaru Select Monitor.>	Is there DTC U1202?	Perform the diagnosis according to DTC.	Go to step **2**.
2	**CHECK DTC.** Read the DTC of body integrated unit using Subaru Select Monitor.	Is U1212 a current malfunction?	Go to step **3**.	Go to step **4**.

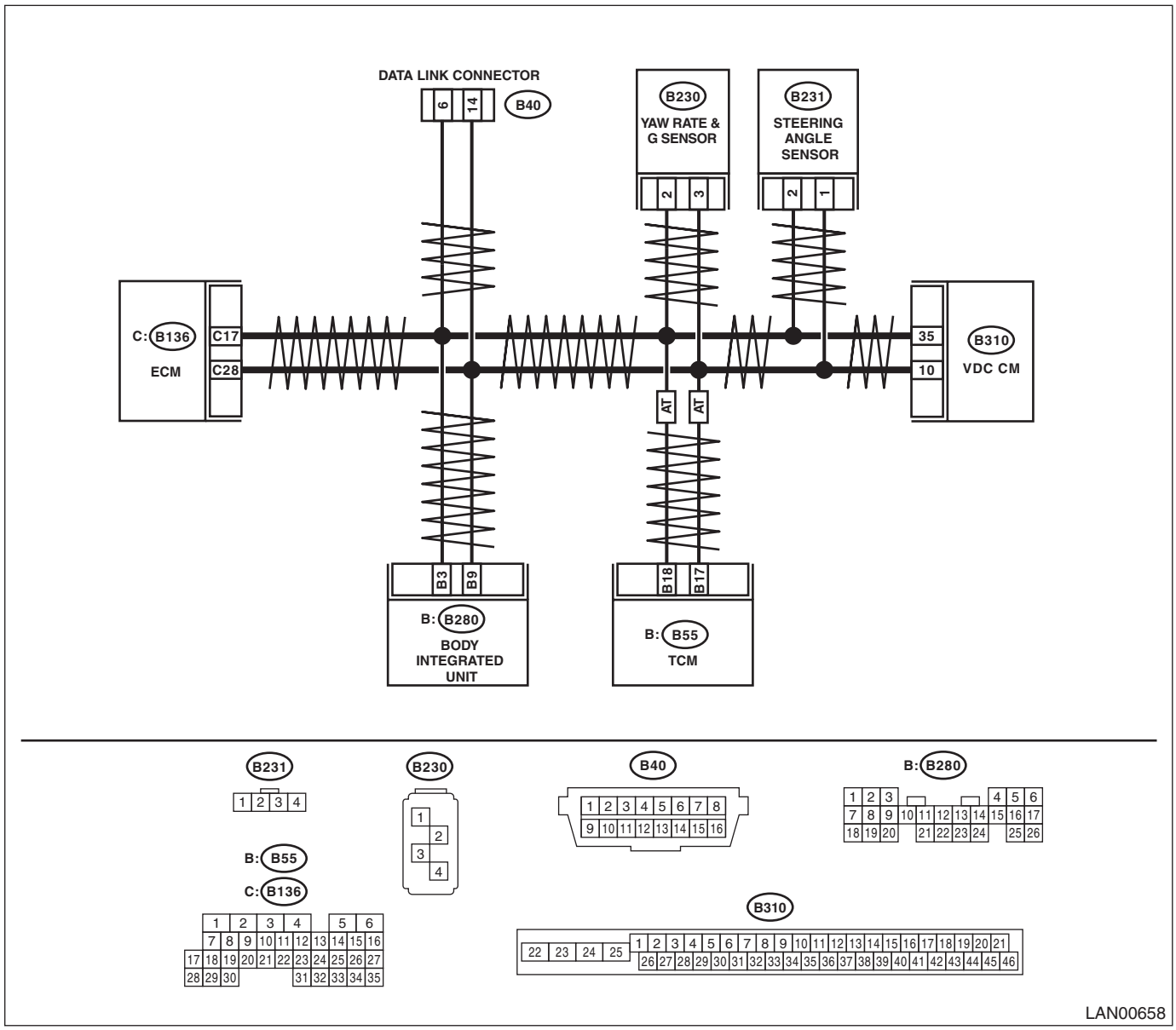
	Step	Check	Yes	No
3	**CHECK DTC.** 1) Turn the ignition switch to OFF. 2) Disconnect the TCM connector. 3) Connect the disconnected connectors. 4) Turn the ignition switch to ON. 5) Read the DTC of body integrated unit using Subaru Select Monitor.	Is U1212 a current malfunction?	Replace the TCM. <Ref. to 4AT-66, REMOVAL, Transmission Control Module (TCM).>	Go to step **4**.
4	**CHECK HARNESS.** 1) Turn the ignition switch to OFF. 2) Shake the harness used for CAN communication circuit. 3) Turn the ignition switch to ON. 4) Read the DTC of body integrated unit using Subaru Select Monitor.	Is U1212 a current malfunction?	Repair or replace the harness.	Go to step **5**.
5	**CHECK CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector that is connected to high speed CAN circuit.	Is there poor contact of connector terminal?	Repair the connector terminal, or replace harness.	Temporary poor contact occurs.

L: DTC U1213 CAN-HS VDC/ABS DATA ABNORMAL

DTC DETECTING CONDITION:
Received error data from VDC/ABS module.

TROUBLE SYMPTOM:
It is possible that brake control error may occur.

WIRING DIAGRAM:

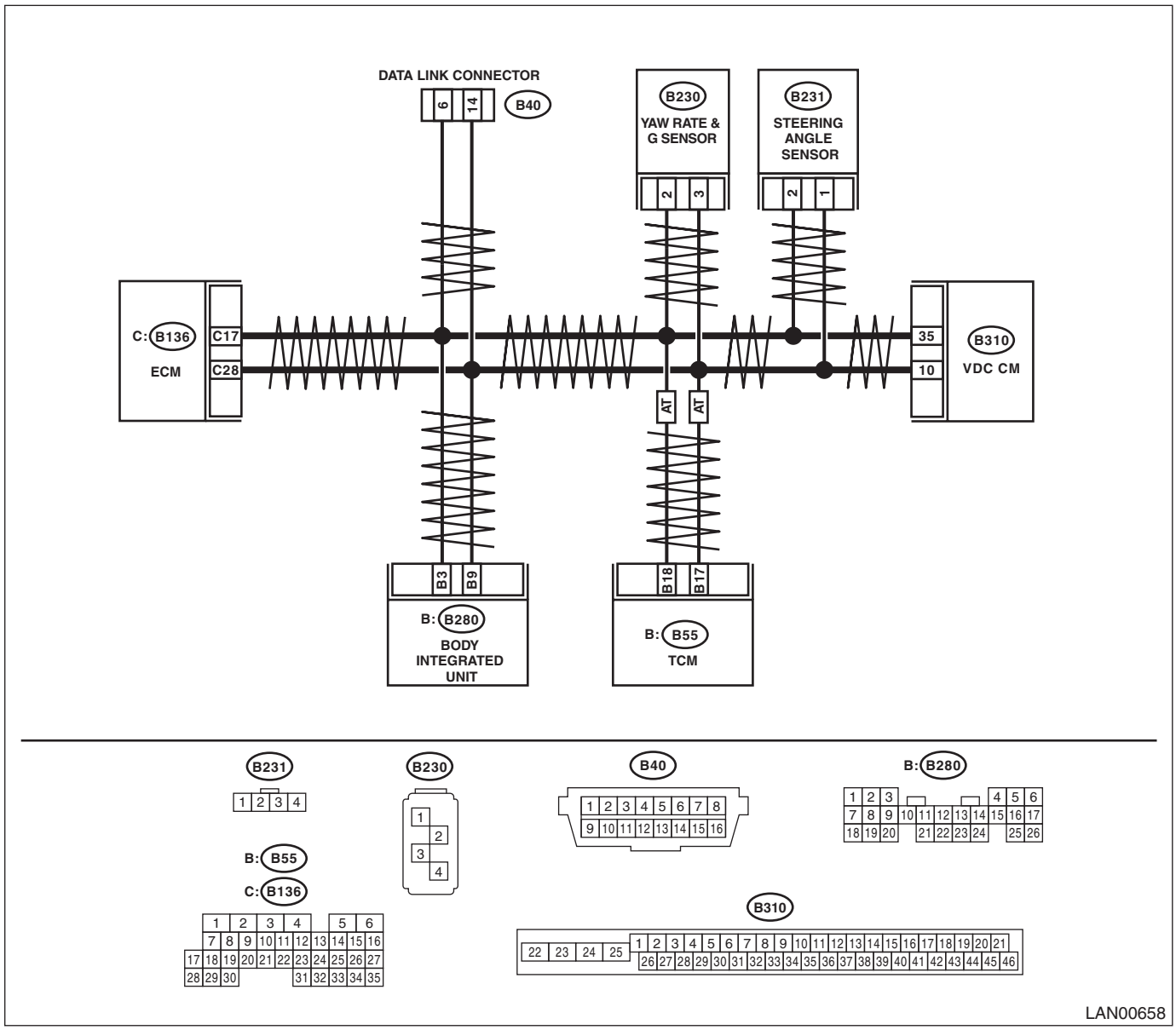


Step		Check	Yes	No
1	**CHECK DTC.** Read all DTCs using the Subaru Select Monitor. <Ref. to LAN(diag)-14, OPERATION, Subaru Select Monitor.>	Is there DTC U1202?	Perform the diagnosis according to DTC.	Go to step **2**.
2	**CHECK DTC.** Read the DTC of body integrated unit using Subaru Select Monitor.	Is U1213 a current malfunction?	Go to step **3**.	Go to step **4**.

	Step	Check	Yes	No
3	**CHECK DTC.** 1) Turn the ignition switch to OFF. 2) Disconnect the VDC/ABS CM connector. 3) Connect the disconnected connectors. 4) Turn the ignition switch to ON. 5) Read the DTC of body integrated unit using Subaru Select Monitor.	Is U1213 a current malfunction?	Replace the VDC/ABS CM. <Ref. to VDC-7, REMOVAL, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Go to step **4**.
4	**CHECK HARNESS.** 1) Turn the ignition switch to OFF. 2) Shake the harness used for CAN communication circuit. 3) Turn the ignition switch to ON. 4) Read the DTC of body integrated unit using Subaru Select Monitor.	Is U1213 a current malfunction?	Repair or replace the harness.	Go to step **5**.
5	**CHECK CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector that is connected to high speed CAN circuit.	Is there poor contact of connector terminal?	Repair the connector terminal, or replace harness.	It is possible that temporary poor communication occurs.

M: DTC U1221 CAN-HS ECM NO-RECEIVE DATA

DTC DETECTING CONDITION:
Not received data from ECM.
TROUBLE SYMPTOM:
Malfunction indicator light illuminates.
WIRING DIAGRAM:

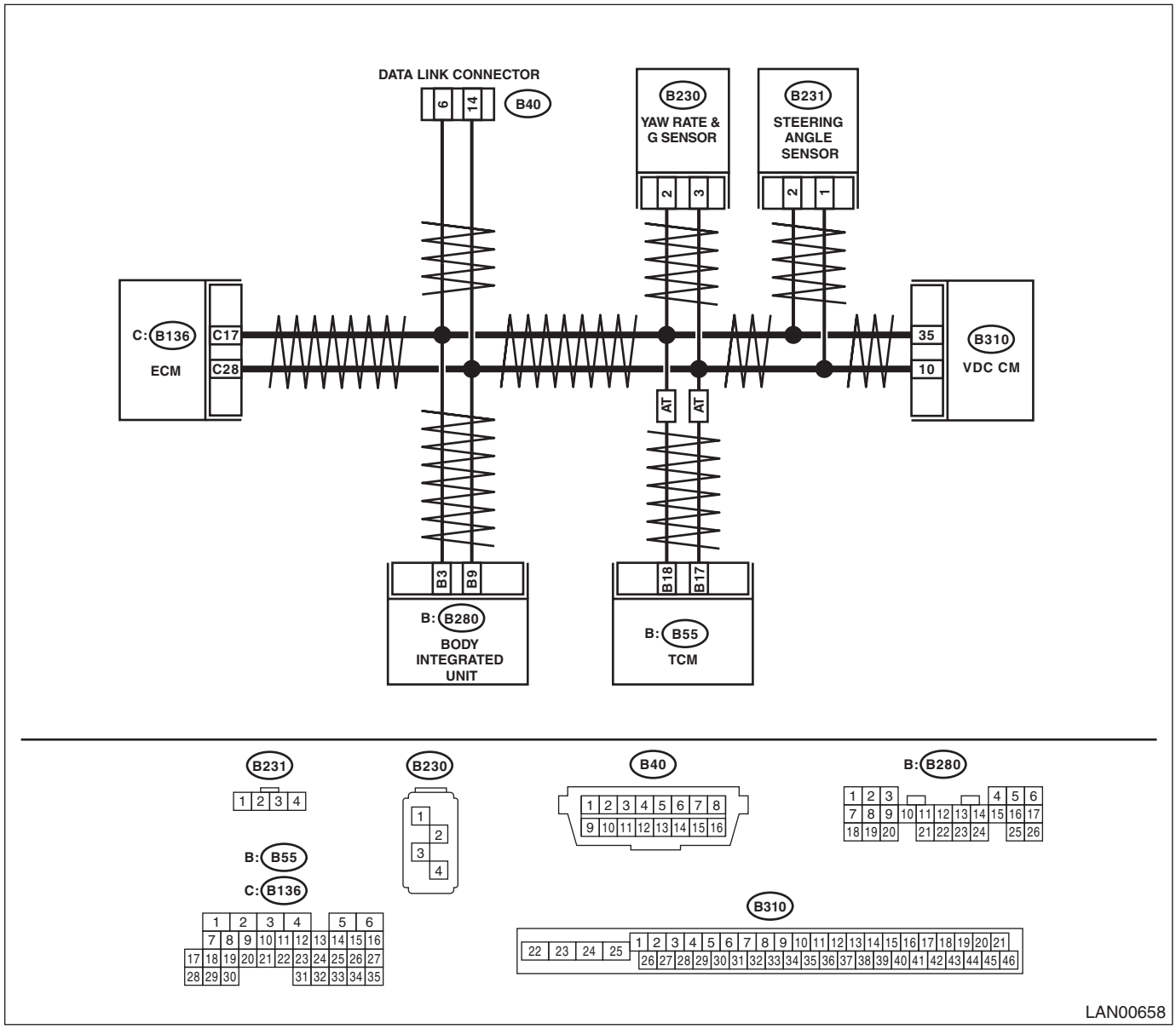


	Step	Check	Yes	No
1	**CHECK DTC.** Read all DTCs using the Subaru Select Monitor. <Ref. to LAN(diag)-14, OPERATION, Subaru Select Monitor.>	Is there DTC U1202?	Perform the diagnosis according to DTC.	Go to step **2**.
2	**CHECK DTC.** Read the DTC of body integrated unit using Subaru Select Monitor.	Is U1221 a current malfunction?	Go to step **3**.	Go to step **8**.
3	**CHECK DTC.** 1) Turn the ignition switch to OFF. 2) Disconnect all control module connectors (B280, B310, B55, B136, B230, B231) that are connected to high speed CAN communication line. 3) Connect the disconnected connectors. 4) Turn the ignition switch to ON. 5) Read the DTC of body integrated unit using Subaru Select Monitor.	Is U1221 a current malfunction?	Go to step **4**.	Go to step **8**.
4	**CHECK CURRENT DATA.** 1) Turn the ignition switch to OFF. 2) Disconnect all control module connectors (B280, B310, B55, B136, B230, B231) that are connected to high speed CAN communication line. 3) Using the tester, check for open, short (power supply-output short, GND-output short) in the harness. ***Connector & terminal*** ***(B40) No. 6 — (B136) No. 17:*** ***(B40) No. 6 — (B310) No. 35:*** ***(B40) No. 6 — (B230) No. 2:*** ***(B40) No. 6 — (B231) No. 2:*** ***(B40) No. 6 — (B55) No. 18 (AT model):*** ***(B40) No. 6 — (B280) No. 3:***	Is harness normal?	Go to step **5**.	Repair or replace the harness.
5	**CHECK HARNESS.** Using the tester, check for open, short (power supply-output short, GND-output short) in the harness. ***Connector & terminal*** ***(B40) No. 14 — (B136) No. 28:*** ***(B40) No. 14 — (B310) No. 10:*** ***(B40) No. 14 — (B230) No. 3:*** ***(B40) No. 14 — (B231) No. 1:*** ***(B40) No. 14 — (B55) No. 17 (AT model):*** ***(B40) No. 14 — (B280) No. 9:***	Is harness normal?	Go to step **6**.	Repair or replace the harness.
6	**CHECK DTC.** 1) Turn the ignition switch to OFF. 2) Connect the disconnected connectors. 3) Start the engine and stop. 4) Turn the ignition switch to ON. 5) Read the DTC of body integrated unit using Subaru Select Monitor.	Is U1221 a current malfunction?	Go to step **7**.	Go to step **8**.
7	**CHECK DTC.** Read all DTCs using the Subaru Select Monitor.	Are DTCs P1718 or C0047 detected?	Replace the ECM. <Ref. to FU(H4DOTC)-57, REMOVAL, Engine Control Module (ECM).>	Replace the body integrated unit. <Ref. to SL-46, REMOVAL, Body Integrated Unit.>

	Step	Check	Yes	No
8	**CHECK HARNESS.** 1) Turn the ignition switch to OFF. 2) Shake the harness used for CAN communication circuit. 3) Turn the ignition switch to ON. 4) Read the DTC of body integrated unit using Subaru Select Monitor.	Is U1221 a current malfunction?	Repair or replace the harness.	Go to step **9**.
9	**CHECK CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect all the connector that is connected to high speed CAN circuit.	Is there poor contact of connector terminal?	Repair the connector terminal where poor contact exists, or replace harness.	Temporary poor contact occurs.

N: DTC U1222 CAN-HS TCM NO-RECEIVE DATA

DTC DETECTING CONDITION:
Not received data from TCM.
TROUBLE SYMPTOM:
Malfunction indicator light illuminates.
WIRING DIAGRAM:

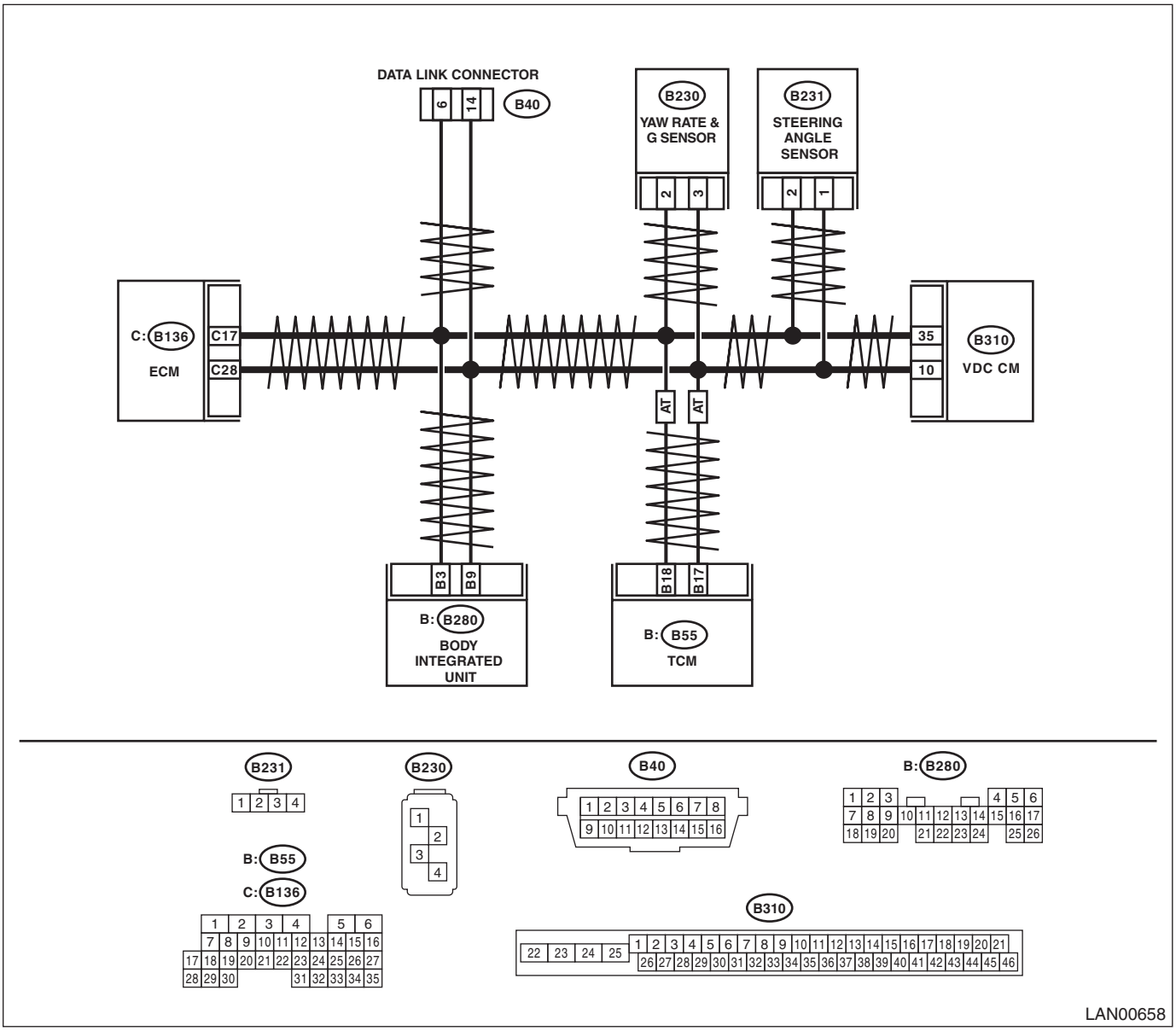


Step		Check	Yes	No
1	**CHECK DTC.** Read all DTCs using the Subaru Select Monitor. <Ref. to LAN(diag)-14, OPERATION, Subaru Select Monitor.>	Is there DTC U1202?	Perform the diagnosis according to DTC.	Go to step **2**.
2	**CHECK DTC.** Read the DTC of body integrated unit using Subaru Select Monitor.	Is U1222 a current malfunction?	Go to step **3**.	Go to step **7**.

	Step	Check	Yes	No
3	**CHECK DTC.** 1) Turn the ignition switch to OFF. 2) Disconnect all control module connectors (B280, B310, B55, B136, B230, B231) that are connected to high speed CAN communication line. 3) Connect the disconnected connectors. 4) Turn the ignition switch to ON. 5) Read the DTC of body integrated unit using Subaru Select Monitor.	Is U1222 a current malfunction?	Go to step **4**.	Go to step **7**.
4	**CHECK HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect all control module connectors (B280, B310, B55, B136, B230, B231) that are connected to high speed CAN communication line. 3) Using the tester, check for open, short (power supply-output short, GND-output short) in the harness. ***Connector & terminal*** ***(B55) No. 17 — (B40) No. 14:*** ***(B55) No. 18 — (B40) No. 6:***	Is harness normal?	Go to step **5**.	Repair or replace the harness.
5	**CHECK DTC.** 1) Connect the disconnected connectors. 2) Start the engine and stop. 3) Turn the ignition switch to ON. 4) Read the DTC of body integrated unit using Subaru Select Monitor.	Is U1222 a current malfunction?	Go to step **6**.	Go to step **7**.
6	**CHECK DTC.** Using the Subaru Select Monitor, read all DTCs.	Is U0101 or C0047 displayed?	Replace the TCM. <Ref. to 4AT-66, REMOVAL, Transmission Control Module (TCM).>	Replace the body integrated unit. <Ref. to SL-46, REMOVAL, Body Integrated Unit.>
7	**CHECK HARNESS.** 1) Turn the ignition switch to OFF. 2) Shake the harness used for CAN communication circuit. 3) Turn the ignition switch to ON. 4) Read the DTC of body integrated unit using Subaru Select Monitor.	Is U1222 a current malfunction?	Repair or replace the harness.	Go to step **8**.
8	**CHECK CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect all the connector that is connected to high speed CAN circuit.	Is there poor contact of connector terminal?	Repair the connector terminal where poor contact exists, or replace harness.	Temporary poor contact occurs.

O: DTC U1223 CAN-HS VDC/ABS NO-RECEIVE DATA

DTC DETECTING CONDITION:
Not received data from VDC/ABS CM.
TROUBLE SYMPTOM:
ABS warning light and VDC warning light illuminate.
WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK DTC.** Read all DTCs using the Subaru Select Monitor. <Ref. to LAN(diag)-14, OPERATION, Subaru Select Monitor.>	Is there DTC U1202?	Perform the diagnosis according to DTC.	Go to step **2**.
2	**CHECK DTC.** Read the DTC of body integrated unit using Subaru Select Monitor.	Is U1223 a current malfunction?	Go to step **3**.	Go to step **7**.

	Step	Check	Yes	No
3	**CHECK DTC.** 1) Turn the ignition switch to OFF. 2) Disconnect all control module connectors (B280, B310, B55, B136, B230, B231) that are connected to high speed CAN communication line. 3) Connect the disconnected connectors. 4) Turn the ignition switch to ON. 5) Read the DTC of body integrated unit using Subaru Select Monitor.	Is U1223 a current malfunction?	Go to step **4**.	Go to step **7**.
4	**CHECK HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect all control module connectors (B280, B310, B55, B136, B230, B231) that are connected to high speed CAN communication line. 3) Using the tester, check for open, short (power supply-output short, GND-output short) in the harness. ***Connector & terminal*** ***(B40) No. 6 — (B310) No. 35:*** ***(B40) No. 14 — (B310) No. 10:***	Is harness normal?	Go to step **5**.	Repair or replace the harness.
5	**CHECK DTC.** 1) Connect the disconnected connectors. 2) Start the engine and stop. 3) Turn the ignition switch to ON. 4) Read the DTC of body integrated unit using Subaru Select Monitor.	Is U1223 a current malfunction?	Go to step **6**.	Go to step **7**.
6	**CHECK DTC.** Read all DTCs using the Subaru Select Monitor.	Is P1718 or U0122 displayed?	Replace the VDC/ABS CM. <Ref. to VDC-7, REMOVAL, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>	Replace the body integrated unit. <Ref. to SL-46, REMOVAL, Body Integrated Unit.>
7	**CHECK HARNESS.** 1) Turn the ignition switch to OFF. 2) Shake the harness used for CAN communication circuit. 3) Turn the ignition switch to ON. 4) Read the DTC of body integrated unit using Subaru Select Monitor.	Is U1223 a current malfunction?	Repair or replace the harness.	Go to step **8**.
8	**CHECK CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect all control module connectors (B280, B310, B55, B136, B230, B231) that are connected to high speed CAN communication line.	Is there connector terminal where poor contact exists?	Repair the connector terminal where poor contact exists, or replace harness.	Temporary poor contact occurs.

P: DTC U1300 CAN-LS MALFUNCTION

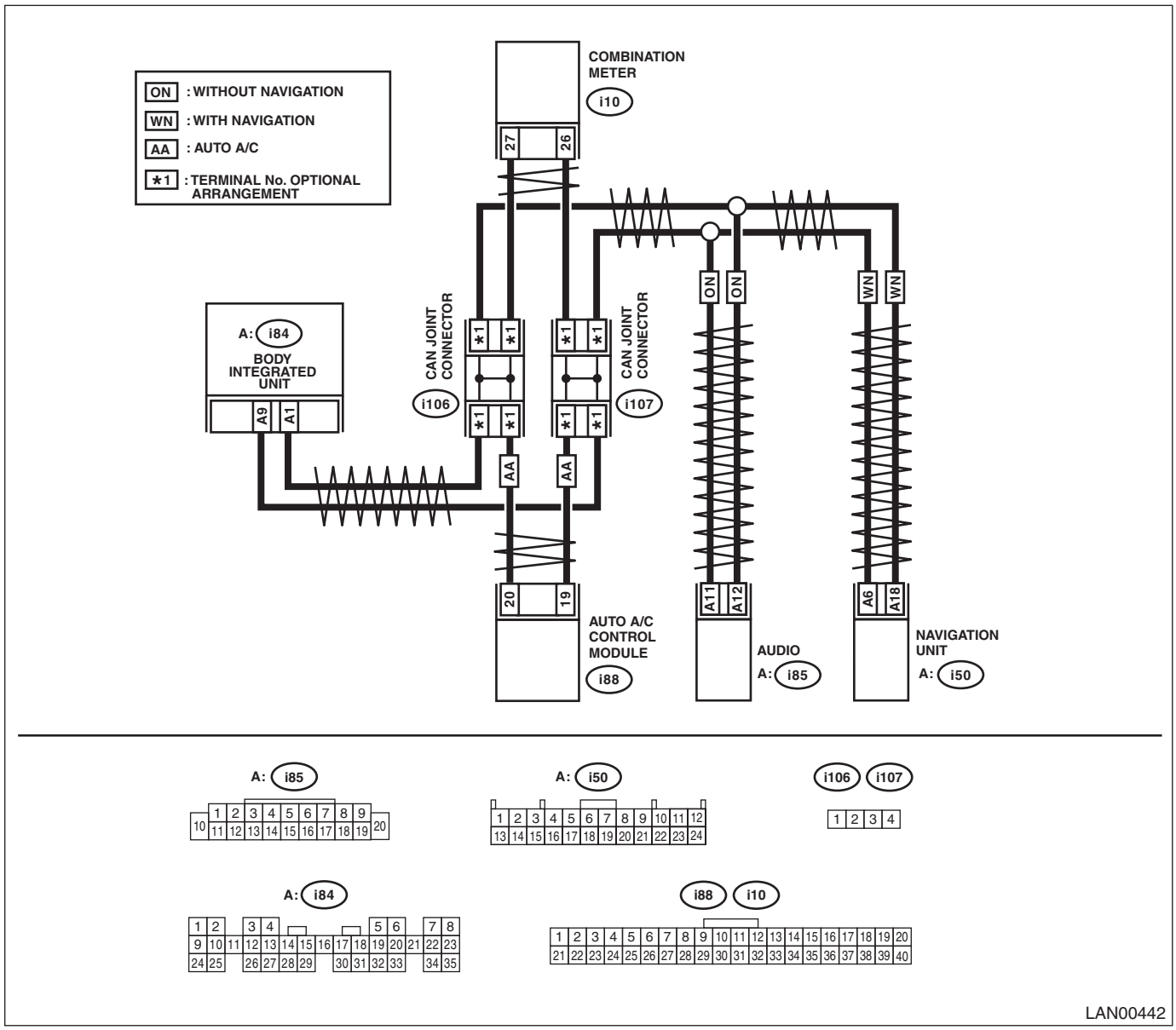
DTC DETECTING CONDITION:

Open or short in low speed CAN circuit

TROUBLE SYMPTOM:

Low speed CAN communication is not normal.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK DTC.** Read the DTC of body integrated unit using Subaru Select Monitor. <Ref. to LAN(diag)-14, OPERATION, Subaru Select Monitor.>	Is U1300 a current malfunction?	Go to step **2**.	Go to step **7**.
2	**CHECK DTC.** 1) Disconnect all connectors (i84, i10, i88, i85 or i50) that are connected to low speed CAN communication line. 2) Connect the disconnected connectors. 3) Turn the ignition switch to ON. 4) Read the DTC of body integrated unit using Subaru Select Monitor.	Is U1300 a current malfunction?	Go to step **3**.	Go to step **7**.
3	**CHECK HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect all connectors (i84, i10, i88, i85 or i50) that are connected to low speed CAN communication line. 3) Using the tester, check for open, short (power supply-output short, GND-output short) in the harness. ***Connector & terminal*** ***(i84) No. 1 — (i10) No. 27 (combination meter):*** ***(i84) No. 9 — (i10) No. 26 (combination meter):*** ***(i84) No. 1 — (i88) No. 20 (A/C):*** ***(i84) No. 9 — (i88) No. 19 (A/C):*** ***(i84) No. 1 — (i85) No. 12 (audio):*** ***(i84) No. 9 — (i85) No. 11 (audio):*** ***(i84) No. 1 — (i50) No. 18 (navigation):*** ***(i84) No. 9 — (i50) No. 6 (navigation):***	Is harness normal?	Go to step **4**.	Repair or replace the harness.
4	**CHECK AUDIO OR NAVIGATION.** 1) Connect the disconnected connectors. 2) Disconnect the connector of navigation (i50) or audio (i85). 3) Turn the ignition switch to ON. 4) Read the DTC of body integrated unit using Subaru Select Monitor.	Is U1300 a current malfunction?	Go to step **5**.	Replace the navigation or audio. <Ref. to ET-9, REMOVAL, Audio.>
5	**CHECK AUTO A/C CONTROL MODULE.** 1) Turn the ignition switch to OFF. 2) Connect the audio or navigation connectors. 3) Disconnect the auto A/C control module connector (i88). 4) Turn the ignition switch to ON. 5) Read the DTC of body integrated unit using Subaru Select Monitor.	Is U1300 a current malfunction?	Go to step **6**.	Replace the auto A/C control module. <Ref. to AC-35, REMOVAL, Control Unit (Auto A/C Model).>
6	**CHECK BODY INTEGRATED UNIT.** 1) Turn the ignition switch to OFF. 2) Connect the auto A/C control module. 3) Replace the body integrated unit of your vehicle with the body integrated unit from other vehicle, which is working normally. 4) Turn the ignition switch to ON. 5) Read the DTC of body integrated unit using Subaru Select Monitor.	Is U1300 a current malfunction?	Replace the combination meter. <Ref. to IDI-21, REMOVAL, Combination Meter.>	Replace the body integrated unit. <Ref. to SL-46, REMOVAL, Body Integrated Unit.>

	Step	Check	Yes	No
7	**CHECK HARNESS.** 1) Turn the ignition switch to OFF. 2) Shake the harness used for CAN communication circuit. 3) Turn the ignition switch to ON. 4) Read the DTC of body integrated unit using Subaru Select Monitor.	Is U1300 a current malfunction?	Repair or replace the harness.	Go to step **8**.
8	**CHECK CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector that is connected to low speed CAN circuit.	Is there poor contact at disconnected connector?	Repair the connector terminal, or replace harness.	Temporary poor contact occurs.

Q: DTC U1301 CAN-LS COUNTER ABNORMAL

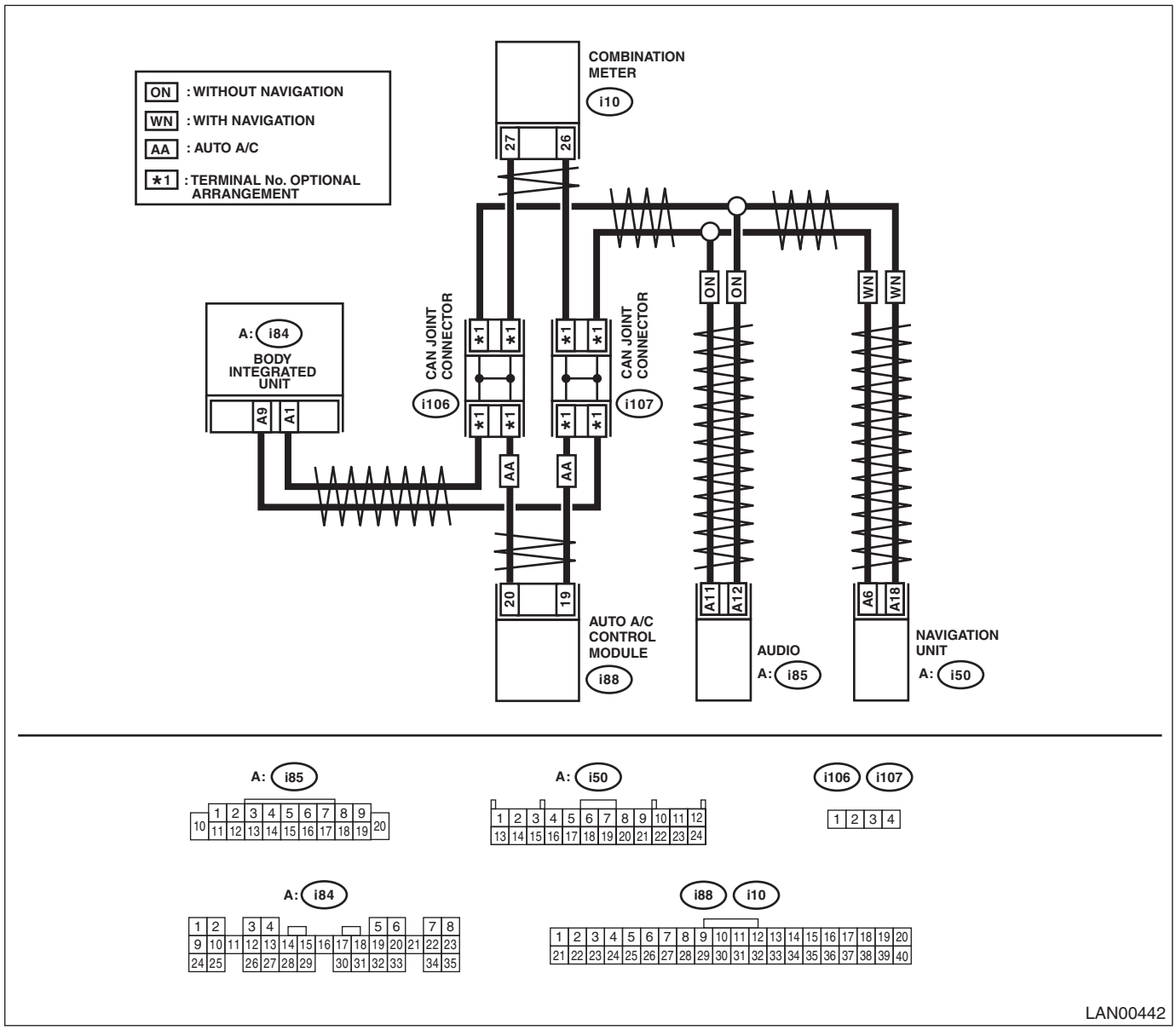
DTC DETECTING CONDITION:

Communication is unstable because of low speed CAN communication error.

TROUBLE SYMPTOM:

Display error may occur in fuel gauge because the CAN communication is not transmitted (sending/receiving) normally.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK DTC.** Read the DTC of body integrated unit using Subaru Select Monitor. <Ref. to LAN(diag)-14, OPERATION, Subaru Select Monitor.>	Are there DTC U1300 or U1302?	Perform the diagnosis according to DTC.	Go to step **2**.
2	**CHECK DTC.** Read the DTC of body integrated unit using Subaru Select Monitor.	Is U1301 a current malfunction?	Go to step **3**.	Go to step **9**.

	Step	Check	Yes	No
3	**CHECK DTC.** 1) Turn the ignition switch to OFF. 2) Disconnect all connectors (i84, i10, i88, i85 or i50) that are connected to low speed CAN communication line. 3) Connect the disconnected connectors. 4) Turn the ignition switch to ON. 5) Read the DTC of body integrated unit using Subaru Select Monitor.	Is U1301 a current malfunction?	Go to step **4**.	Go to step **9**.
4	**CHECK HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect all connectors (i84, i10, i88, i85 or i50) that are connected to low speed CAN communication line. 3) Using the tester, check for open, short (power supply-output short, GND-output short) in the harness. ***Connector & terminal*** ***(i84) No. 1 — (i10) No. 27 (combination meter):*** ***(i84) No. 9 — (i10) No. 26 (combination meter):*** ***(i84) No. 1 — (i88) No. 20 (A/C):*** ***(i84) No. 9 — (i88) No. 19 (A/C):*** ***(i84) No. 1 — (i85) No. 12 (audio):*** ***(i84) No. 9 — (i85) No. 11 (audio):*** ***(i84) No. 1 — (i50) No. 18 (navigation):*** ***(i84) No. 9 — (i50) No. 6 (navigation):***	Is harness normal?	Go to step **5**.	Repair or replace the harness.
5	**CHECK AUDIO OR NAVIGATION.** 1) Connect the disconnected connectors. 2) Disconnect the connector of navigation (i50) or audio (i85). 3) Turn the ignition switch to ON. 4) Read the DTC of body integrated unit using Subaru Select Monitor.	Is U1301 a current malfunction?	Go to step **6**.	Replace the audio or navigation. <Ref. to ET-9, REMOVAL, Audio.>
6	**CHECK AUTO A/C CONTROL MODULE.** 1) Turn the ignition switch to OFF. 2) Connect the audio or navigation module. 3) Disconnect the auto A/C control module connector (i88). 4) Turn the ignition switch to ON. 5) Read the DTC of body integrated unit using Subaru Select Monitor.	Is U1301 a current malfunction?	Go to step **7**.	Replace the auto A/C control module. <Ref. to AC-35, REMOVAL, Control Unit (Auto A/C Model).>
7	**CHECK COMBINATION METER.** 1) Turn the ignition switch to OFF. 2) Connect the disconnected connectors. 3) Perform the self-diagnosis of combination meter. <Ref. to IDI-5, SELF-DIAGNOSIS, INSPECTION, Combination Meter System.>	Is the self-diagnosis of combination meter OK?	Go to step **8**.	Replace the combination meter. <Ref. to IDI-21, REMOVAL, Combination Meter.>
8	**CHECK BODY INTEGRATED UNIT.** 1) Turn the ignition switch to OFF. 2) Disconnect all connectors (i84, i10, i88, i85 or i50) that are connected to low speed CAN communication line. 3) Connect the disconnected connectors. 4) Turn the ignition switch to ON. 5) Read the DTC of body integrated unit using Subaru Select Monitor.	Is U1301 a current malfunction?	Replace the body integrated unit. <Ref. to SL-46, REMOVAL, Body Integrated Unit.>	Go to step **9**.

	Step	Check	Yes	No
9	**CHECK HARNESS.** 1) Turn the ignition switch to OFF. 2) Shake the harness used for low speed CAN communication circuit. 3) Turn the ignition switch to ON. 4) Read the DTC of body integrated unit using Subaru Select Monitor.	Is U1301 a current malfunction?	Repair or replace the harness.	Go to step **10**.
10	**CHECK CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect all connectors (i84, i10, i88, i85 or i50) that are connected to low speed CAN communication line.	Is there poor contact of connector terminal?	Repair the connector terminal, or replace harness.	Temporary poor contact occurs.

R: DTC U1302 CAN-LS BUS OFF

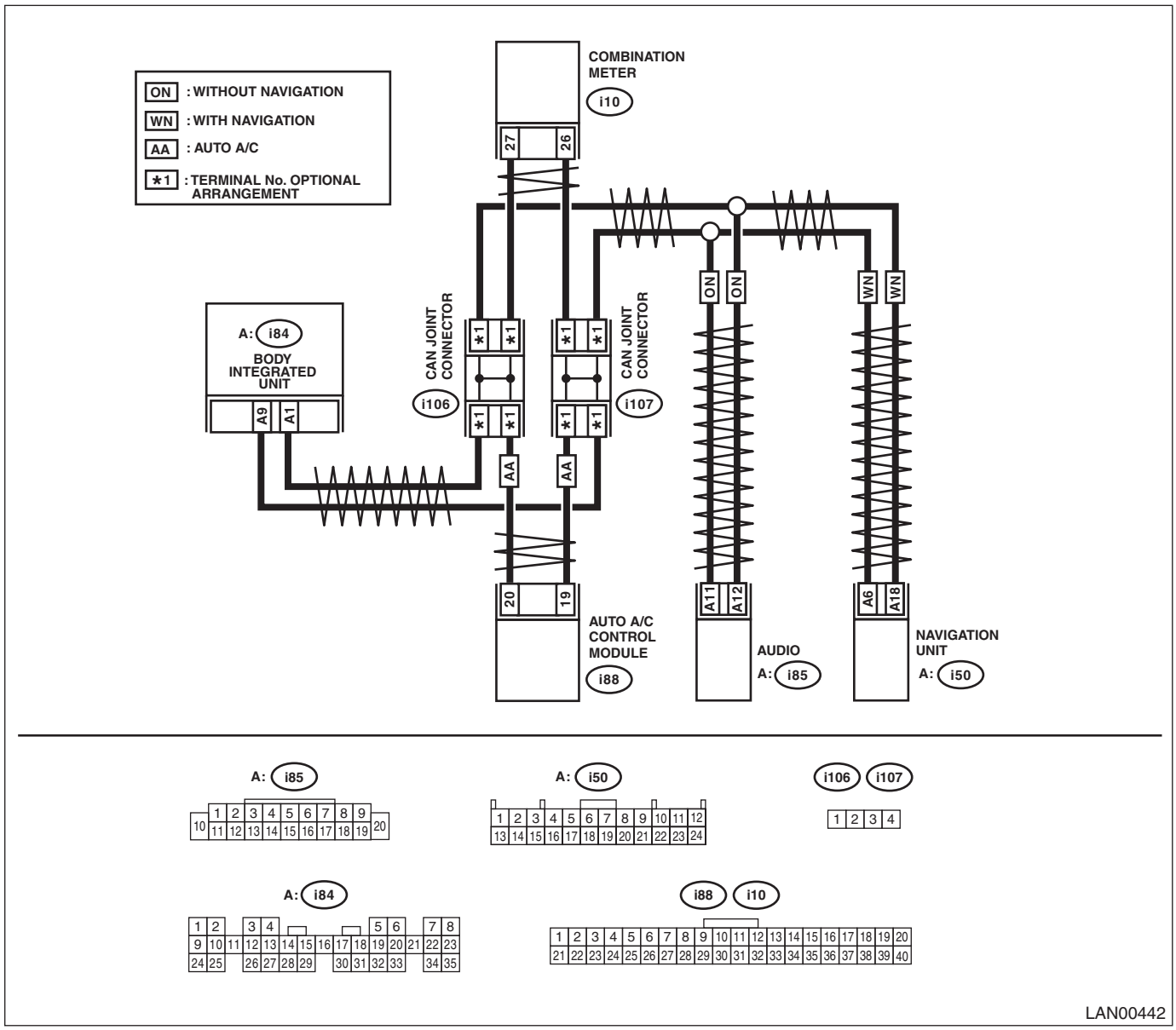
DTC DETECTING CONDITION:

Integrated unit communication is shut down because of low speed CAN communication error.

TROUBLE SYMPTOM:

Display error may occur in fuel gauge because the CAN communication is not transmitted (sending/receiving) normally.

WIRING DIAGRAM:

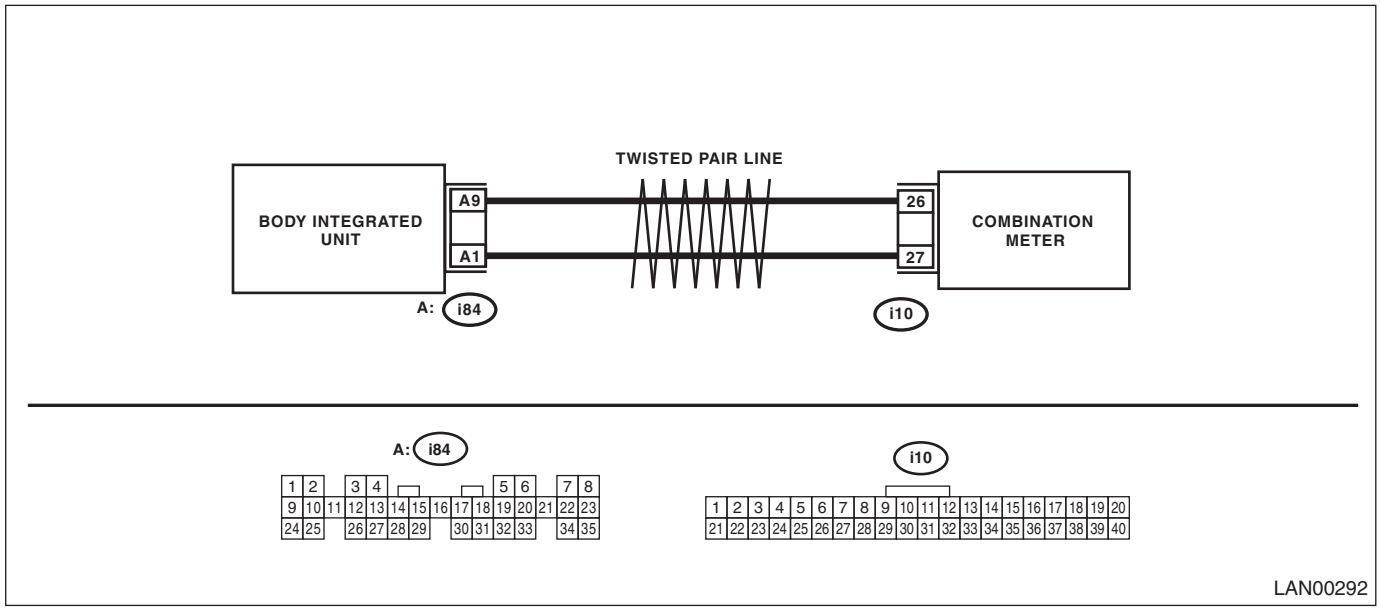


	Step	Check	Yes	No
1	**CHECK DTC.** Read the DTC of body integrated unit using Subaru Select Monitor. <Ref. to LAN(diag)-14, OPERATION, Subaru Select Monitor.>	Is U1302 a current malfunction?	Go to step **2**.	Go to step **8**.
2	**CHECK DTC.** 1) Turn the ignition switch to OFF. 2) Disconnect all connectors (i84, i10, i88, i85 or i50) that are connected to low speed CAN communication line. 3) Connect the disconnected connectors. 4) Turn the ignition switch to ON. 5) Read the DTC of body integrated unit using Subaru Select Monitor.	Is U1302 a current malfunction?	Go to step **3**.	Go to step **8**.
3	**CHECK HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect all connectors (i84, i10, i88, i85 or i50) that are connected to low speed CAN communication line. 3) Using the tester, check for open, short (power supply-output short, GND-output short) in the harness. ***Connector & terminal*** ***(i84) No. 1 — (i10) No. 27 (combination meter):*** ***(i84) No. 9 — (i10) No. 26 (combination meter):*** ***(i84) No. 1 — (i88) No. 20 (A/C):*** ***(i84) No. 9 — (i88) No. 19 (A/C):*** ***(i84) No. 1 — (i85) No. 12 (audio):*** ***(i84) No. 9 — (i85) No. 11 (audio):*** ***(i84) No. 1 — (i50) No. 18 (navigation):*** ***(i84) No. 9 — (i50) No. 6 (navigation):***	Is harness normal?	Go to step **4**.	Repair or replace the harness.
4	**CHECK HARNESS.** 1) Connect the disconnected connectors. 2) Using the tester, measure the resistance between harness connector and chassis ground. ***Connector & terminal*** ***(i84) No. 1 — Chassis ground:*** ***(i84) No. 9 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **5**.	Go to step **7**.
5	**CHECK HARNESS.** 1) Turn the ignition switch to ON. 2) Using the tester, measure the voltage between harness connector and chassis ground. ***Connector & terminal*** ***(i84) No. 1 (+) — Chassis ground (–):*** ***(i84) No. 9 (+) — Chassis ground (–):***	Is the voltage less than 6 V?	Replace the body integrated unit. <Ref. to SL-46, REMOVAL, Body Integrated Unit.>	Go to step **6**.
6	**CHECK HARNESS.** With the tester connected, disconnect control module.	Is there any control module whose voltage has changed?	Replace the control module whose voltage has changed.	Repair or replace the short circuit of the harness.
7	**CHECK HARNESS.** With the tester connected, disconnect control module.	Is there any control module whose resistance has changed?	Replace the control module whose resistance has changed.	Repair or replace the short circuit of the harness.

	Step	Check	Yes	No
8	**CHECK HARNESS.** 1) Turn the ignition switch to OFF. 2) Shake the harness used for low speed CAN communication circuit. 3) Turn the ignition switch to ON. 4) Read the DTC of body integrated unit using Subaru Select Monitor.	Is U1302 a current malfunction?	Repair or replace the open, short circuit of the harness.	Go to step **9**.
9	**CHECK CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect all connectors (i84, i10, i88, i85 or i50) that are connected to low speed CAN communication line.	Is there poor contact of connector terminal?	Repair the connector terminal, or replace harness.	Temporary poor contact occurs.

S: DTC U1311 CAN-LS METER UNIT DATA ABNORMAL

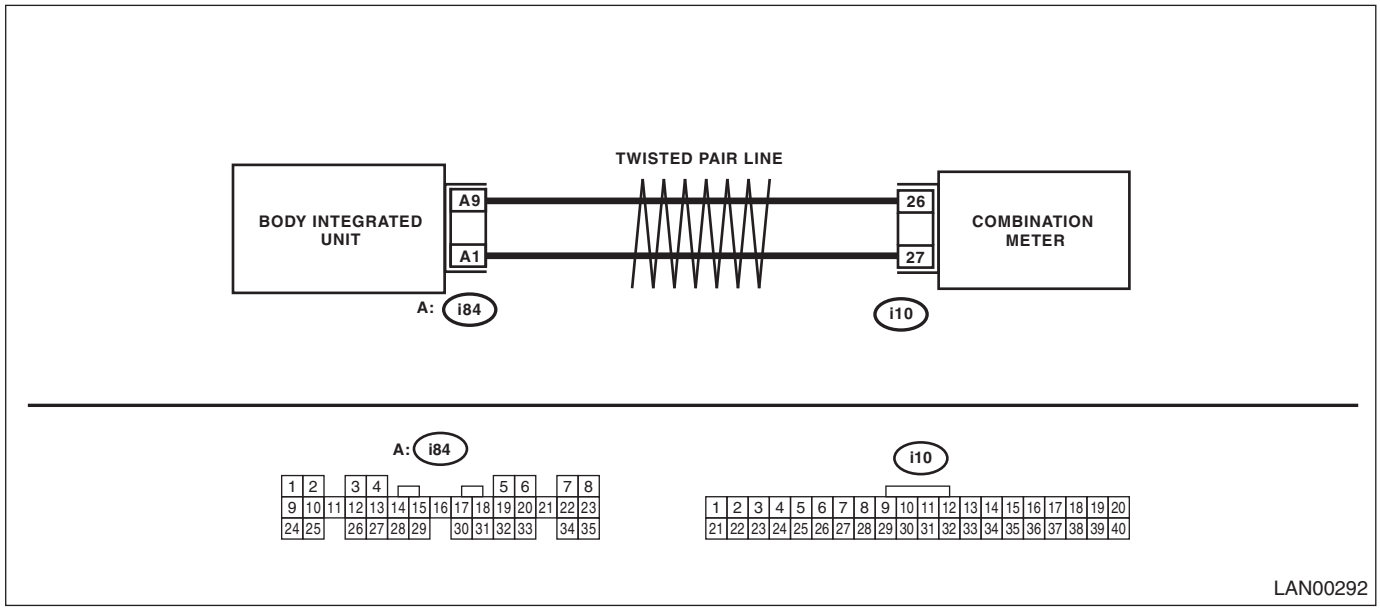
DTC DETECTING CONDITION:
Received error data from meter.
TROUBLE SYMPTOM:
Defective data from combination meter occurs.
WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK DTC.** Read the DTC of body integrated unit using Subaru Select Monitor. <Ref. to LAN(diag)-14, OPERATION, Subaru Select Monitor.>	Is DTC U1300 or U1302 displayed?	Perform the diagnosis according to DTC.	Go to step **2**.
2	**CHECK DTC.** Read the DTC of body integrated unit using Subaru Select Monitor.	Is U1311 a current malfunction?	Go to step **3**.	Go to step **4**.
3	**CHECK DTC.** 1) Turn the ignition switch to OFF. 2) Disconnect the combination meter connector (i10). 3) Connect the disconnected connectors. 4) Turn the ignition switch to ON. 5) Read the DTC of body integrated unit using Subaru Select Monitor.	Is U1311 a current malfunction?	Replace the combination meter. <Ref. to IDI-21, REMOVAL, Combination Meter.>	Go to step **4**.
4	**CHECK HARNESS.** 1) Turn the ignition switch to OFF. 2) Shake the harness used for low speed CAN communication circuit. 3) Turn the ignition switch to ON. 4) Read the DTC of body integrated unit using Subaru Select Monitor.	Is U1311 a current malfunction?	Repair or replace the harness.	Go to step **5**.
5	**CHECK CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect all connectors (i84, i10, i88, i85 or i50) that are connected to low speed CAN communication line.	Is there poor contact of connector terminal?	Repair the connector terminal, or replace harness.	Temporary poor contact occurs.

T: DTC U1321 CAN-LS METER NO-RECEIVE DATA

DTC DETECTING CONDITION:
Not received data from meter.
TROUBLE SYMPTOM:
Engine may not be started.
WIRING DIAGRAM:

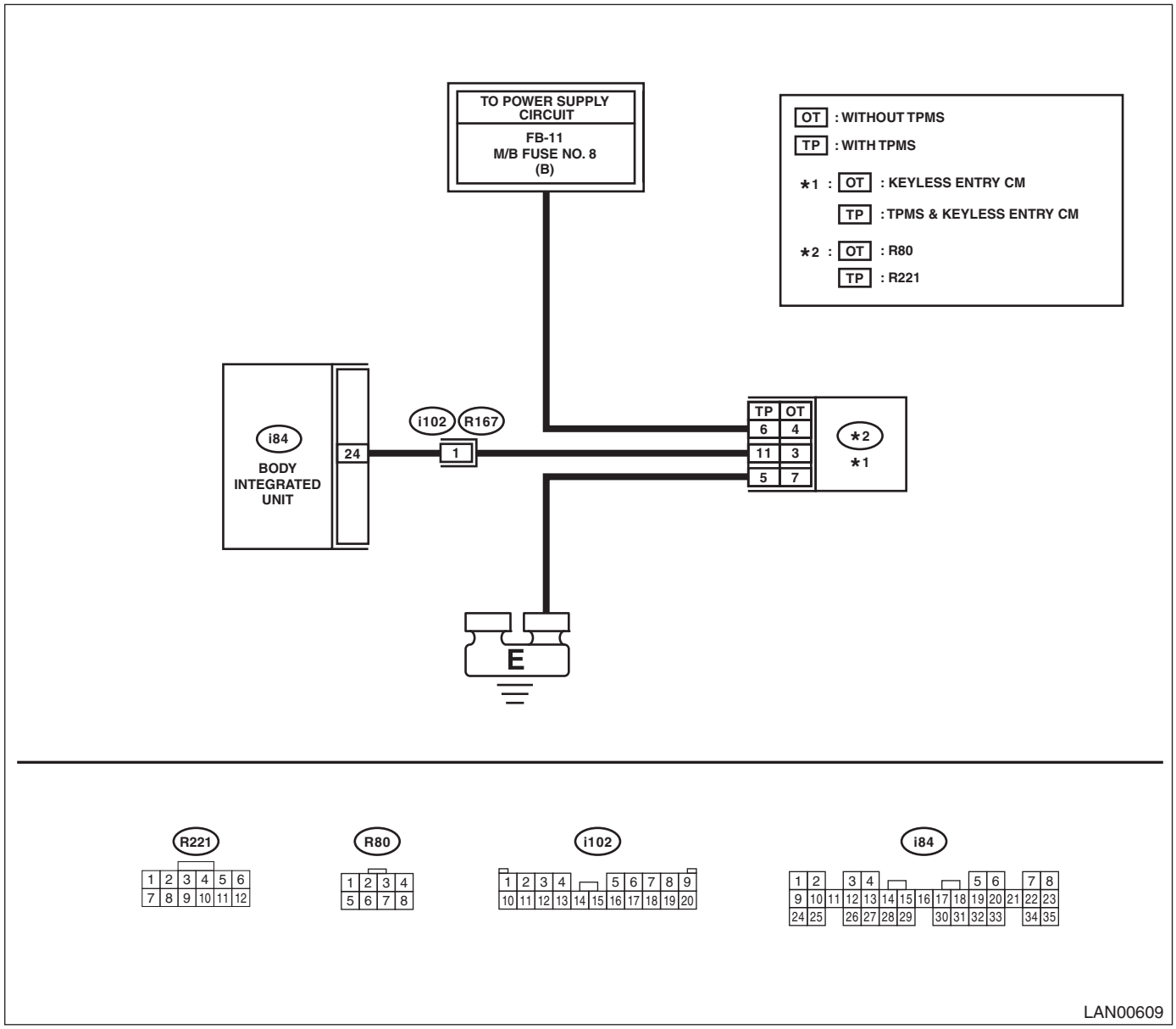


Step		Check	Yes	No
1	**CHECK ALL DTCS.** Read all DTCs using the Subaru Select Monitor. <Ref. to LAN(diag)-14, OPERATION, Subaru Select Monitor.>	Is U1300 or U1302 displayed?	Perform the diagnosis according to DTC.	Go to step **2**.
2	**CHECK DTC.** Read the DTC of body integrated unit using Subaru Select Monitor.	Is U1321 a current malfunction?	Go to step **3**.	Go to step **7**.
3	**CHECK DTC.** 1) Turn the ignition switch to OFF. 2) Disconnect all connectors (i84, i10, i88, i85 or i50) that are connected to low speed CAN communication line. 3) Connect the disconnected connectors. 4) Turn the ignition switch to ON. 5) Read the DTC of body integrated unit using Subaru Select Monitor.	Is U1321 a current malfunction?	Go to step **4**.	Go to step **7**.

	Step	Check	Yes	No
4	**CHECK HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect all connectors (i84, i10, i88, i85 or i50) that are connected to low speed CAN communication line. 3) Using the tester, check for open, short (power supply-output short, GND-output short) in the harness. ***Connector & terminal*** ***(i84) No. 1 — (i10) No. 27 (combination meter):*** ***(i84) No. 9 — (i10) No. 26 (combination meter):*** ***(i84) No. 1 — (i88) No. 20 (A/C):*** ***(i84) No. 9 — (i88) No. 19 (A/C):*** ***(i84) No. 1 — (i85) No. 12 (audio):*** ***(i84) No. 9 — (i85) No. 11 (audio):*** ***(i84) No. 1 — (i50) No. 18 (navigation):*** ***(i84) No. 9 — (i50) No. 6 (navigation):***	Is harness normal?	Go to step **5**.	Repair or replace the harness.
5	**CHECK COMBINATION METER.** 1) Connect the disconnected connectors. 2) Perform the self-diagnosis of combination meter. <Ref. to IDI-5, SELF-DIAGNOSIS, INSPECTION, Combination Meter System.>	Is the self diagnosis normal?	Go to step **6**.	Replace the combination meter. <Ref. to IDI-21, REMOVAL, Combination Meter.>
6	**CHECK DTC.** 1) Turn the ignition switch to OFF. 2) Disconnect all connectors (i84, i10, i88, i85 or i50) that are connected to low speed CAN communication line. 3) Connect the disconnected connectors. 4) Turn the ignition switch to ON. 5) Read the DTC of body integrated unit using Subaru Select Monitor.	Is U1321 a current malfunction?	Replace the body integrated unit. <Ref. to SL-46, REMOVAL, Body Integrated Unit.>	Go to step **7**.
7	**CHECK DTC.** 1) Turn the ignition switch to OFF. 2) Shake the harness used for low speed CAN communication circuit. 3) Turn the ignition switch to ON. 4) Read the DTC of body integrated unit using Subaru Select Monitor.	Is U1321 a current malfunction?	Repair the poor contact, open circuit of harness or replace harness.	Go to step **8**.
8	**CHECK CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect all connectors (i84, i10, i88, i85 or i50) that are connected to low speed CAN communication line.	Is there poor contact of connector terminal?	Repair the connector terminal, or replace harness.	It is possible that temporary poor communication occurs.

U: DTC B1500 KEYLESS UART COM. MALFUNCTION

DTC DETECTING CONDITION:
Open or short circuit in keyless UART circuit
TROUBLE SYMPTOM:
Door lock does not operate with keyless.
WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK DTC.** Read the DTC of body integrated unit using Subaru Select Monitor. <Ref. to LAN(diag)-18, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is B1500 current malfunction?	Go to step **2**.	Go to step **7**.

	Step	Check	Yes	No
2	**CHECK DTC.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from body integrated unit and keyless entry control module. 3) Connect the disconnected connectors. 4) Turn the ignition switch to ON. 5) Read the DTC of body integrated unit using Subaru Select Monitor.	Is B1500 current malfunction?	Go to step **3**.	Go to step **7**.
3	**CHECK HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from body integrated unit and keyless entry control module. 3) Using the tester, inspect the open circuit of harness and short (power supply-output short, GND-output short). ***Connector & terminal*** ***Keyless entry CM*** ***(i84) No. 24 — (R80) No. 3:*** ***TPMS & keyless entry CM*** ***(i84) No. 24 — (R221) No. 11:***	Is harness normal?	Go to step **4**.	Repair or replace the harness.
4	**CHECK HARNESS.** Using the tester, measure the voltage between keyless entry control module and chassis ground. ***Connector & terminal*** ***Keyless entry CM*** ***(R80) No. 4 (+) — Chassis ground (–):*** ***TPMS & keyless entry CM*** ***(R221) No. 6 (+) — Chassis ground (–):***	Is the voltage battery voltage?	Go to step **5**.	Check the power supply circuit for keyless entry control module.
5	**CHECK HARNESS.** Using the tester, measure the resistance between keyless entry control module and chassis ground. ***Connector & terminal*** ***Keyless entry CM*** ***(R80) No. 7 — Chassis ground:*** ***TPMS & keyless entry CM*** ***(R221) No. 5 — Chassis ground:***	Is the resistance less than 10 Ω?	Go to step **6**.	Repair the open circuit of harness or replace harness.
6	**CHECK OPERATION.** 1) Install the keyless entry control module from other vehicle, which is working normally. 2) Register the keyless key which is working normally. 3) Operate the keyless key.	Is the door locking operate?	Replace the keyless entry control module. <Ref. to SL-44, REMOVAL, Keyless Entry Control Module.>	Replace the body integrated unit. <Ref. to SL-46, REMOVAL, Body Integrated Unit.>
7	**CHECK CONNECTOR.** Disconnect the connectors from body integrated unit and keyless entry control module.	Is there poor contact of connector?	Repair the connector, or replace harness.	Temporary poor contact occurs.

15.General Diagnostic Table

A: INSPECTION

Item	Operation	Specifications		Note
		YES	NO	
Diagnostic code	DTC is not displayed when inspecting all DTCs.	System is normal.	Perform the diagnosis according to DTC.	—
Engine coolant temperature	Engine coolant temperature gauge displays correctly without engine coolant temperature warning light illuminating/blinking.	System is normal.	Refer to the following to check. • Engine cooling system • LAN system	If three data values are different when display the current data of ECM, TCM and body integrated unit, it is possible that driving system CAN is malfunction.
Remaining fuel level	Fuel gauge displays correctly without low fuel warning light remaining illuminated.	System is normal.	Refer to the following to check. • Combination meter system • LAN system	If the values of “Fuel level resistance” and “Fuel level resistance 2” are different when display the current data of body integrated unit, it is possible that body integrated unit is malfunction.
ATF temperature warning light	ATF temperature warning light is free from illuminating/blinking.	System is normal.	Refer to the following to check. • Automatic transmission • Shift lock control system • LAN system	Warning light also blinks when DTC: B1106 occurs.
EBD warning light ABS warning light VDC warning light Hill start assist warning light	EBD warning light/ABS warning light/VDC warning light/Hill start assist warning light are free from ON/OFF all the time.	System is normal.	Refer to the following to check. • ABS (diagnostics) • VDC (diagnostics) • Parking brake • Combination meter system • LAN system	—
Shift position	Meter display of shift position is correct. Shift position changes when switch the shift (up/down) on manual mode.	System is normal.	Refer to the following to check. • Automatic transmission • Combination meter system • LAN system	—
Clearance light Low beam High beam	Clearance light/low beam/high beam illuminate correctly by switch operation. Indicator in the meter illuminates when clearance light/high beam are illuminating.	System is normal.	Refer to the following to check. • Lighting system • Combination meter system • LAN system	—
Fog light	Fog light illuminates correctly by switch operation. Indicator in the meter illuminates when each fog light is illuminating.	System is normal.	Refer to the following to check. • Lighting system • Combination meter system • LAN system	—

General Diagnostic Table

Item	Operation	Specifications		Note
		YES	NO	
DRL	DRL operates correctly.	System is normal.	Refer to the following to check. • Lighting system • LAN system	—
Key interlock	Key cannot be removed in other than P range. Key can be removed in P range.	System is normal.	Refer to the following to check. • Shift lock control system • LAN system	—
Shift lock	Shift operation is normal.	System is normal.	Refer to the following to check. • Shift lock control system • Combination meter system • LAN system	—
Key warning switch alarm	Alarm sounds when driver's door is open with the key removed.	System is normal.	Refer to the following to check. • Combination meter system • LAN system	—
Seat belt warning alarm	Indicator in the meter illuminate and alarm sounds when driver's seat belt is not worn. Indicator in the clock illuminates. When passenger's seat is occupied without passenger's seat belt worn. Alarm sounds when vehicle speed is approx. 15 km/h without seat belt fastened.	System is normal.	Refer to the following to check. • Seat belt warning system • Combination meter system • LAN system	—
Rear window defogger	Rear window defogger operates by operating the switch. Indicator in the switch illuminates when rear window defogger is operating.	System is normal.	Refer to the following to check. • Rear window defogger • A/C control module	—
Wiper deicer	Wiper deicer operates by operating the switch. (When the outside temperature is 5°C or higher, press the switch for three seconds or more to operate forcibly, otherwise the wiper deicer operation will be cancelled.)	System is normal.	Refer to the following to check. • Wiper deicer system • A/C control module	—
Rear wiper	Rear wiper operates by operating the switch.	System is normal.	Refer to the following to check. • Wiper and washer system	Vehicle speed response time varies depending on the condition of customization of the body integrated unit "Sedan/Wagon Setting".
Door lock	Lock/unlock operates by operating the central door lock switch. Rear gate opens by operating the rear gate opener button.	System is normal.	Refer to the following to check. • Security and locks • LAN system	Rear gate cannot open by operating the rear gate opener button when customization of the body integrated unit "Sedan/Wagon Setting" is set to "Sedan".

Item	Operation	Specifications		Note
		YES	NO	
Keyless entry	Lock/unlock operates by operating the keyless transmitter. Trunk/rear gate unlocks by operating the trunk opener button and rear gate lock/unlock button.	System is normal.	Refer to the following to check. • Security and locks • LAN system	Rear gate swung to open by operating the trunk/rear gate unlock button when customization of the body integrated unit “Sedan/Wagon Setting” is set to “Sedan”.
Hazard lights	Answer back operates by operating lock/unlock with the keyless entry.	System is normal.	Refer to the following to check. • Security and locks • LAN system	—
Room light	ON/OFF according to the door open/close operation, the lock/unlock operation with the keyless entry, and the ignition operation.	System is normal.	Refer to the following to check. • Room light system • Security and locks • LAN system	—
Map light	ON/OFF according to the door open/close operation except rear gate, the lock/unlock operation with the keyless entry, and the ignition operation.	System is normal.	Refer to the following to check. • Spot map light • Security and locks • LAN system	—
Key illumination	ON/OFF according to the driver’s door open/close operation, the lock/unlock operation with the keyless entry, and the ignition operation.	System is normal.	Refer to the following to check. • Ignition switch illumination • Security and locks • LAN system	Key illumination blinks when customization of the body integrated unit “Factory initial setting” is set to “Factory” for models with keyless entry.
Illumination control	Illumination volume control is available.	System is normal.	Refer to the following to check. • Combination meter system • LAN system	Lighting adjustment is not possible when customization of the body integrated unit “Illumination Control On/Off” is set to “Off”.
Engine start	Engine starts normally.	System is normal.	Refer to the following to check. • Engine (diagnostics) • Immobilizer • LAN system	—
Vehicle security	When locked by the keyless entry, security monitor condition starts. When unlocked by the keyless entry, security is released.	System is normal.	Refer to the following to check. • Security and locks • LAN system	When the “Impact sensor” setup is set to “ON” without connecting the impact sensor (dealer option), the alarm operates as soon as security monitor condition occurs.

WIRING SYSTEM SECTION

WIRING SYSTEM WI

This service manual has been prepared to provide SUBARU service personnel with the necessary information and data for the correct maintenance and repair of SUBARU vehicles.
This manual includes the procedures for maintenance, disassembling, reassembling, inspection and adjustment of components and diagnostics for guidance of experienced mechanics.
Please peruse and utilize this manual fully to ensure complete repair work for satisfying our customers by keeping their vehicle in optimum condition. When replacement of parts during repair work is needed, be sure to use SUBARU genuine parts.

All information, illustration and specifications contained in this manual are based on the latest product information available at the time of publication approval.

FUJI HEAVY INDUSTRIES LTD. G8160BE7

WIRING SYSTEM

WI

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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.

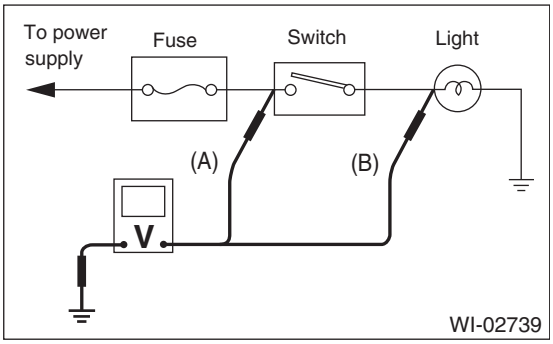
5. SYSTEM OPERATION CHECK

After repairing, ensure that the system operates properly.

B: BASIC INSPECTION

1. VOLTAGE MEASUREMENT

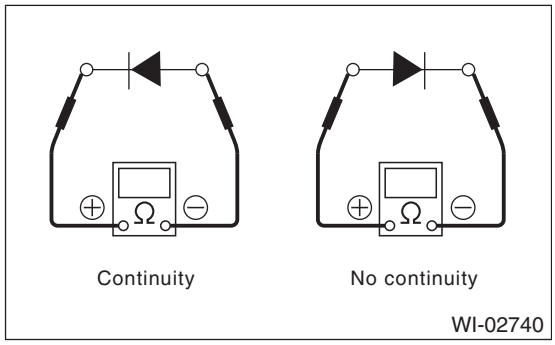
1) Using a voltmeter, connect the negative lead to a good ground point or negative battery terminal and the positive lead to the connector or component terminal.
2) Touch connector (A) with the positive probe of the volt meter. The voltmeter will indicate a voltage.
3) Touch connector (B) with the positive probe. The voltmeter will indicate no voltage.



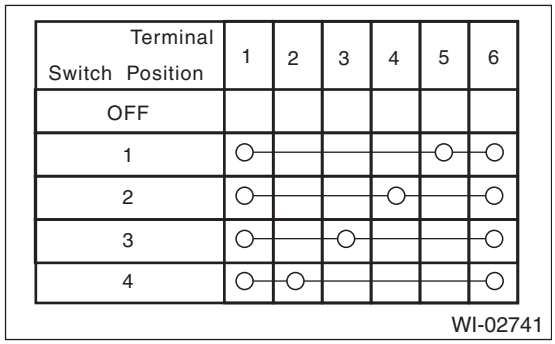
4) With the test set-up held as it is, turn the switch to ON. The voltmeter will indicate a voltage and, at the same time, the light will illuminate.
5) The circuit is in good order. If a problem such as a light failing to illuminate occurs, use the procedures outlined above to track down the malfunction.

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.

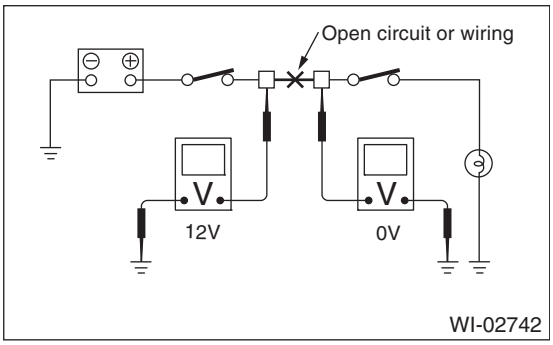


Terminal / Switch Position	1	2	3	4	5	6
OFF						
1	○				○	○
2	○			○		○
3	○		○			○
4	○	○				○

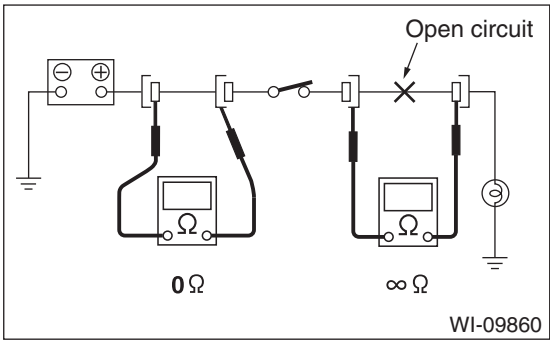
WI-02741

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.

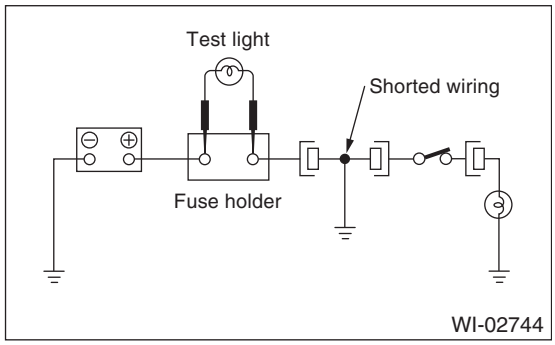


2) WITH OHMMETER:
Disconnect all connectors affected, and check continuity in the wiring between adjacent connectors. When the ohmmeter indicates “infinite”, the wiring is open.

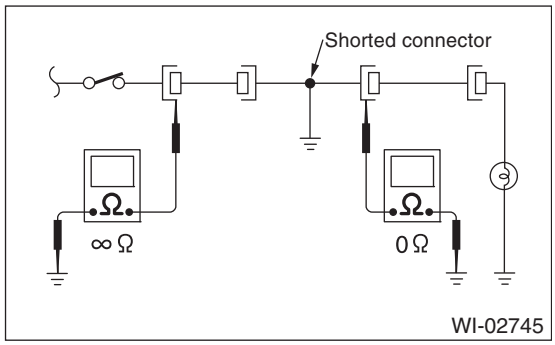


4. HOW TO DETERMINE A SHORT CIRCUIT

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.

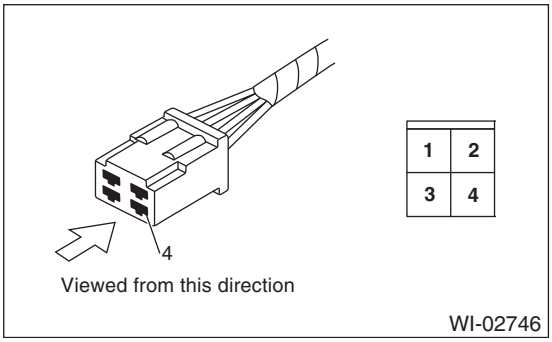


C: HOW TO READ WIRING DIAGRAMS

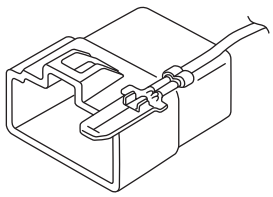
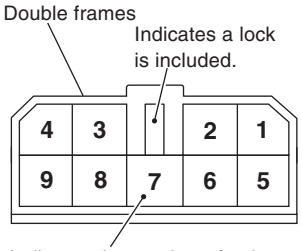
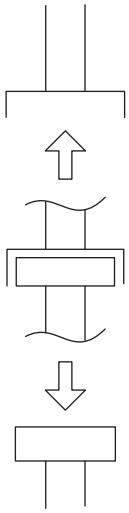
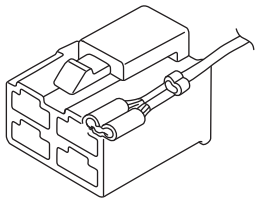
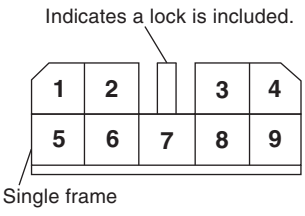
1. WIRING DIAGRAM:

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
			Numbered in order from upper right to lower left.
			Numbered in order from upper left to lower right.

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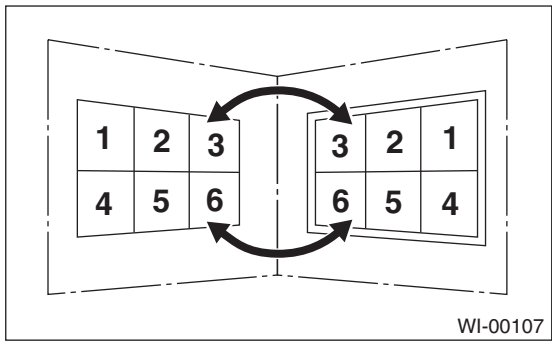
• When one set of connectors is viewed from the front side, the pole numbers of one connector are symmetrical to those of the other. When these two connectors are connected as a unit, the poles which have the same number are joined.



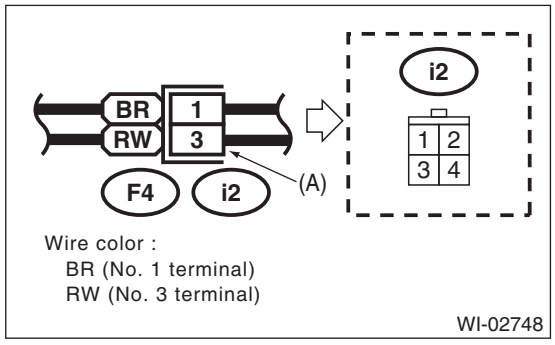
• WIRING DIAGRAM:

The connectors are numbered along with the number of poles, external colors, and mating connections in the accompanying list.

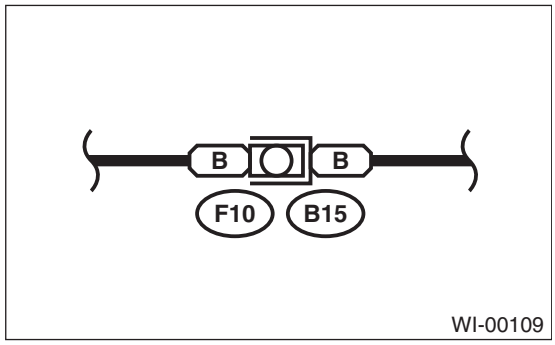
• The sketch of each connector in the wiring diagram usually shows the (A) side of the connector. The relationship between the wire color, terminal number and connector is described in the figure.

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.

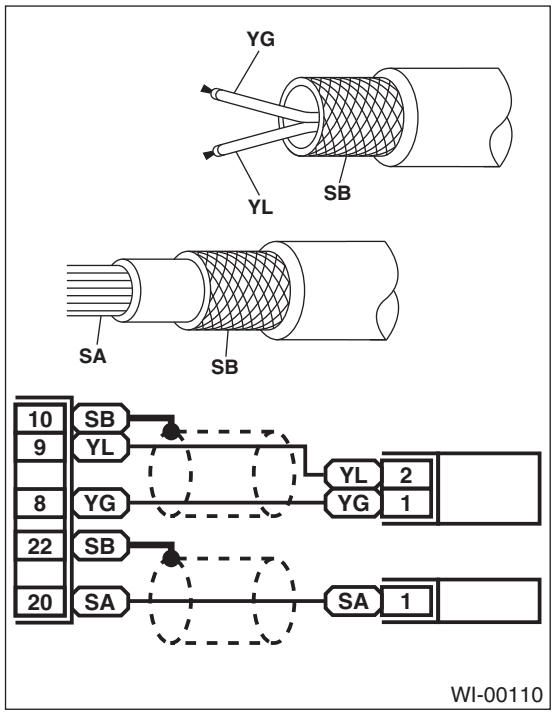


• In the wiring diagram, connectors which have no terminal number refer to one-pole types. Sketches of these connectors are omitted intentionally.

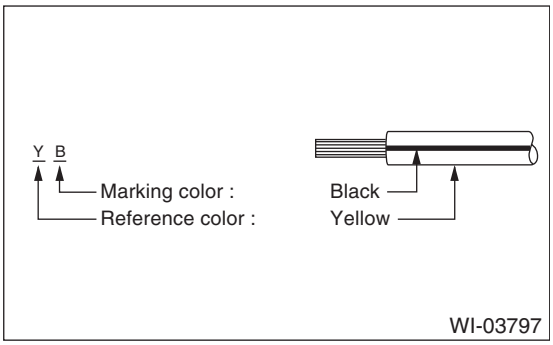


• The following color codes are used to indicate the colors of the wires.

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	Light blue
V	Violet
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.



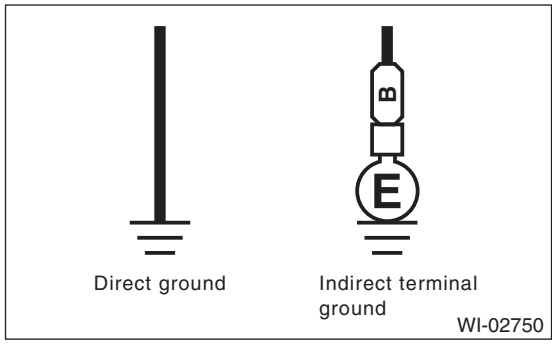
• The table lists the nominal sectional areas and allowable currents of the wires.

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.

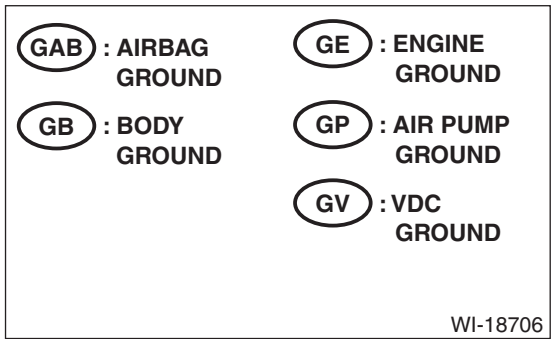
Nominal sectional area mm^2	No. of strands/ strand diameter	Outside diameter of wiring mm	Allowable current Amps/ 40°C (104°F)
0.3	7/0.26	1.8	7
0.5	7/0.32	2.2 (or 2.0)	12
0.75	30/0.18	2.6 (or 2.4)	16
0.85	11/0.32	2.4 (or 2.2)	16
1.25	16/0.32	2.7 (or 2.5)	21
2	26/0.32	3.1 (or 2.9)	28
3	41/0.32	3.8 (or 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.



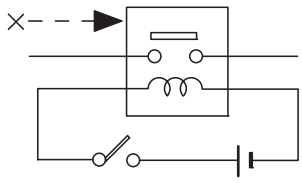
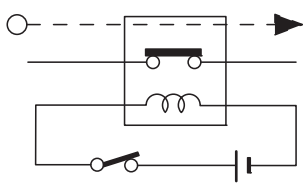
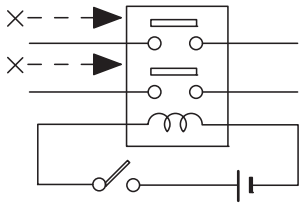
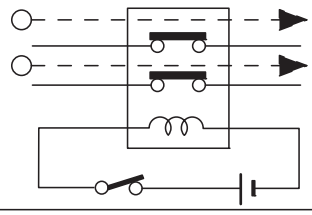
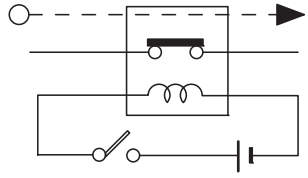
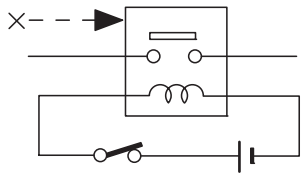
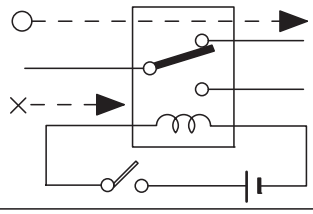
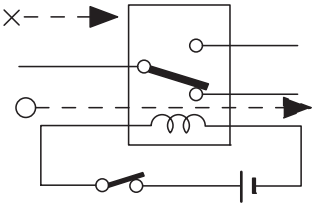
• The ground points shown in the wiring diagram refer to the following:

NOTE:
All wiring harnesses are provided with a ground point which must be securely connected.



- 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.

Relay type		Energizing circuit OFF	Energizing circuit ON
Normally-open type	4-pole		
	6-pole		
Normally-closed type	4-pole		
Mixed type	6-pole		

Key to symbols:

○ ⟶ : Current flows.

× ⟶ : Current does not flow.

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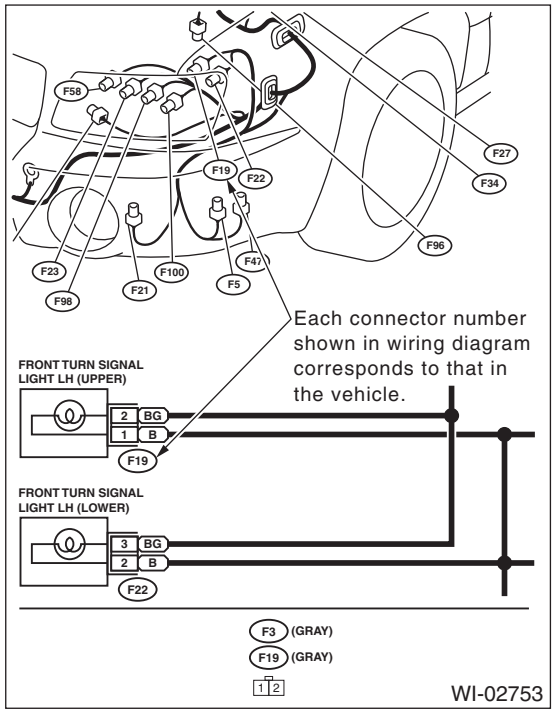
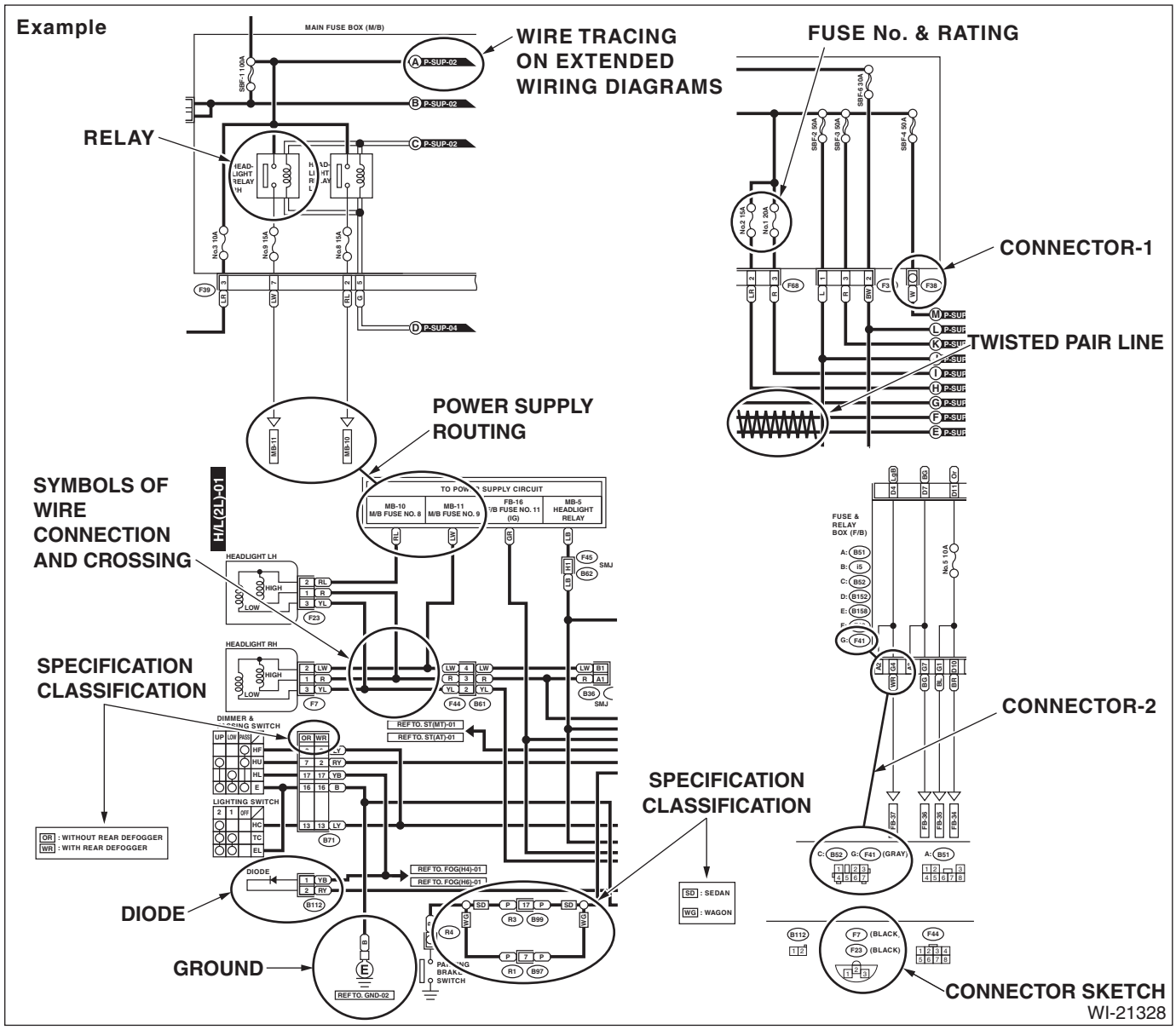
• Each connector number shown in the wiring diagram corresponds to that in the wiring harness. The location of each connector in the actual vehicle is determined by reading the first character of the connector (for example, a “F” for F8, “i” for i16, etc.) and the type of wiring harness. The first character of each connector number corresponds to the area or system of the vehicle.

Symbol	Wiring harness and cord
F	Front wiring harness, Generator cord
B	Bulkhead wiring harness
E	Engine wiring harness
T	Transmission cord, Rear oxygen sensor cord
D	Front door cord LH & RH, Rear gate cord Rear door cord LH & RH, Rear defogger cord
i	Instrument panel wiring harness
R	Rear wiring harness LH&RH, Fuel tank cord, Roof cord, Rear gate cord
AB	Airbag wiring harness



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

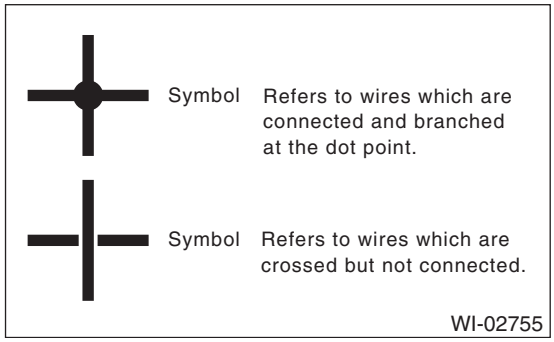
A symbol is used to indicate a diode.

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 next.

A ←→ A, B ←→ B

10.SYMBOLS OF WIRE CONNECTION AND CROSSING



11.POWER SUPPLY CIRCUIT

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 the “DC POWER SUPPLY CIRCUIT” in the wiring diagram.

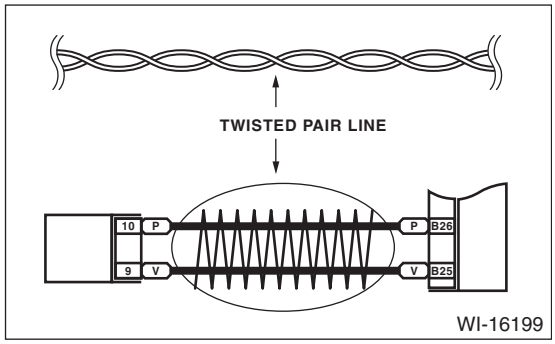
Accordingly, using the “DC POWER SUPPLY CIRCUIT” and wiring diagrams permits service personnel to understand the entire electrical arrangement of a system.

12.CLASSIFICATION BY SPECIFICATION

When the wiring diagram differ according to vehicle specifications, the specification difference is described by using abbreviations.

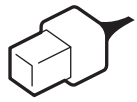
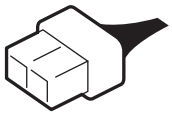
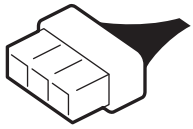
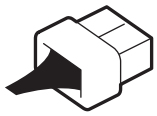
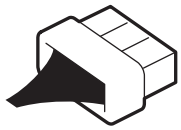
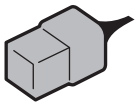
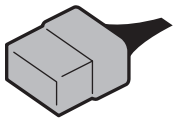
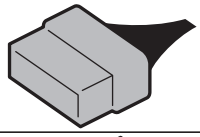
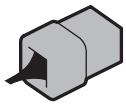
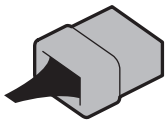
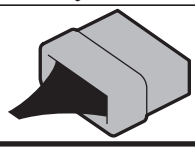
13.TWISTED PAIR LINE

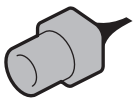
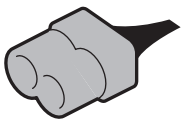
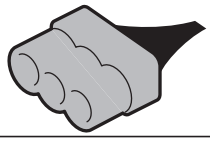
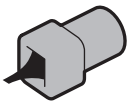
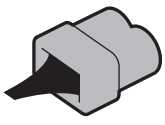
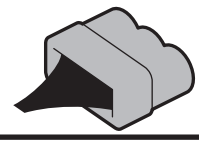
The twisted pair line is indicated by a symbol in the wiring diagrams.



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
ABS	Anti-lock Brake System
ACC	Accessory
A/C	Air Conditioner
ASSY	Assembly
AT	Automatic Transmission
A/F	Air/Fuel (Air fuel ratio sensor)
ATF	Automatic Transmission Fluid
AUX	Auxiliary Audio Input Terminal
AWD	All Wheel Drive
B	Battery
CAN	Controller Area Network
CM	Control Module
D	Drive Range
DN	Down
E	Ground
ECM	Engine Control Module
EEPROM	Electrically Erasable Programmable Read-Only Memory
EGR	Exhaust Gas Recirculation
ELCM	Evaporative Leak Check Module
F/B	Fuse & Relay Box
FL	Front Left
FR	Front Right
FWD	Front Wheel Drive
G	Gravity (G sensor)
H/L	Headlight
HI	High
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
OP	Open
P	Parking Range
PASS	Passing
PCV	Positive Crankcase Ventilation Valve
R	Reverse Range or Rear
RH	Right Hand
RL	Rear Left
RR	Rear Right
SBF	Slow Blow Fuse
ST	Starter

Abbr.	Full name
SW	Switch
TCM	Transmission Control Module
TPMS	Tire Pressure Monitor System
U	Up
VDC	Vehicle Dynamics Control
VFD	Vacuum Fluorescent Display
WASH	Washer

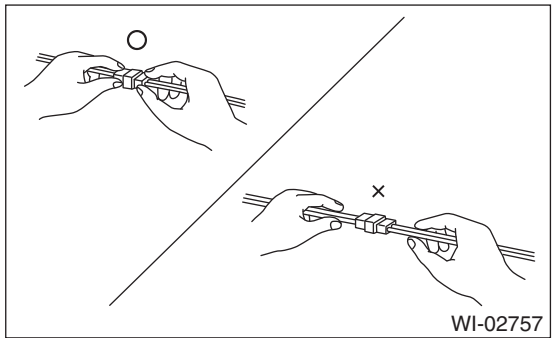
2. Working Precautions

A: PRECAUTIONS WHEN WORKING WITH THE PARTS MOUNTED ON THE VEHICLE

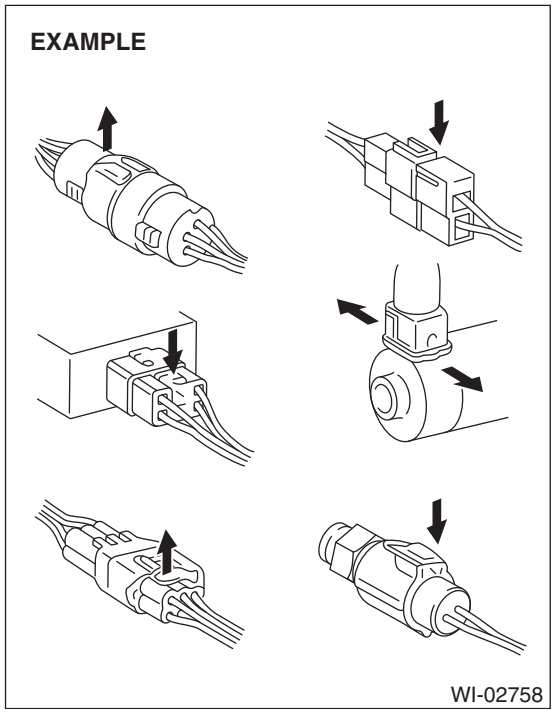
1) When working under a vehicle which is jacked-up, always be sure to use rigid rack.
2) The parking brake must always be applied during working. Also, in automatic transmission vehicles, keep the select lever set to the P (Parking) range.
3) Be sure the workshop is properly ventilated when running the 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 the radiator and exhaust system immediately after the engine has been turned off.

B: PRECAUTIONS IN TROUBLE DIAGNOSIS AND REPAIR OF ELECTRIC PARTS

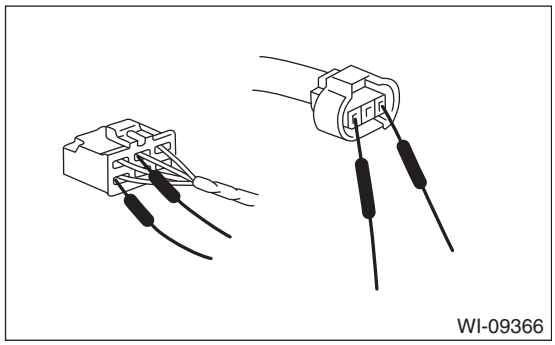
1) The battery cable must be disconnected from the battery's (–) terminal, and the ignition switch must be set to the OFF position, unless otherwise required by the diagnostics.
2) Securely fasten the wiring harness with clamps and clips so that the harness does not interfere with the body end parts, edges, 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 touch tester probe(s) to 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 measurable from the wiring side), touch test probes on the terminal side and be careful not to bend or damage the terminals.

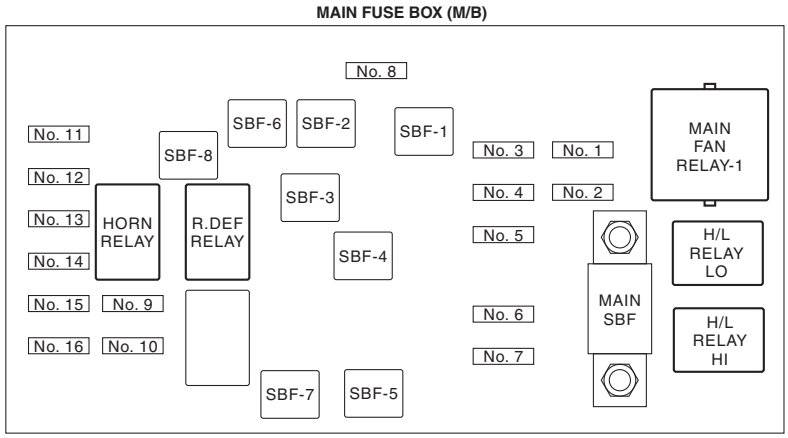


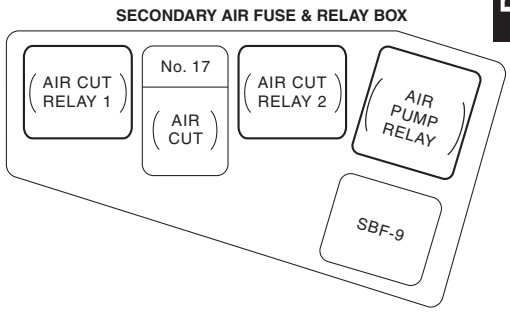
7) Sensors, relays, electrical unit, etc., are sensitive to strong impacts.
Handle them with care so that they are not dropped or mishandled.

3. Power Supply Circuit

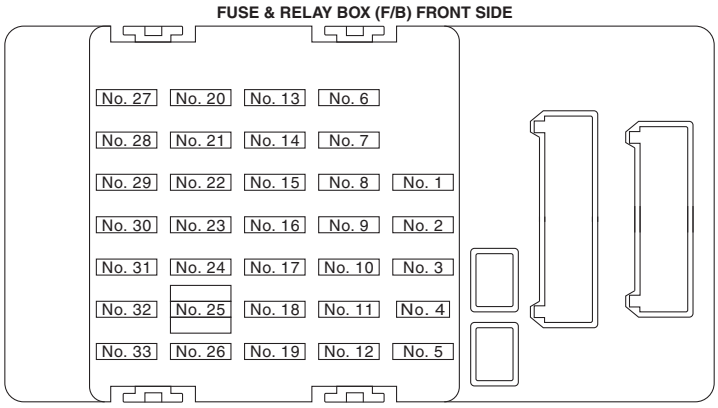
A: WIRING DIAGRAM

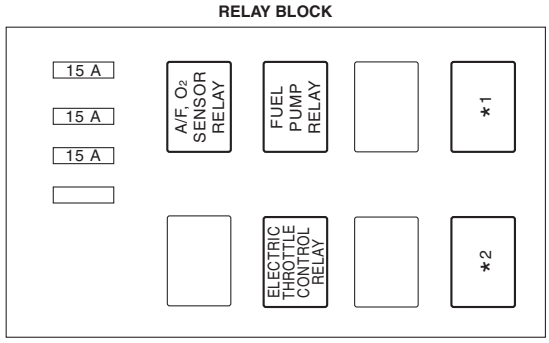
P-SUP-01

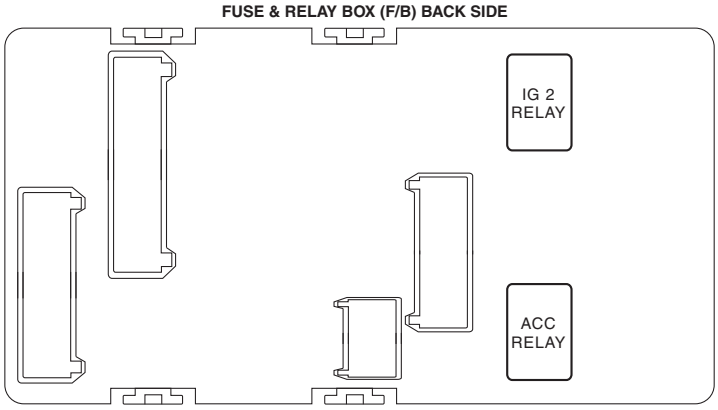


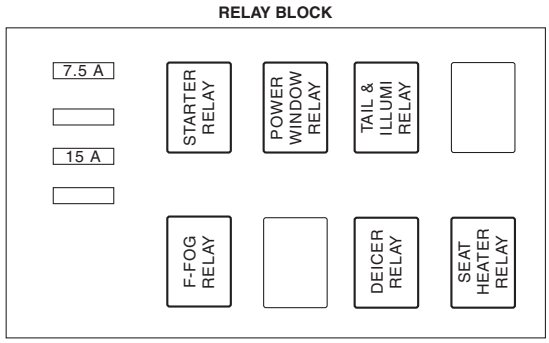


P-SUP-01





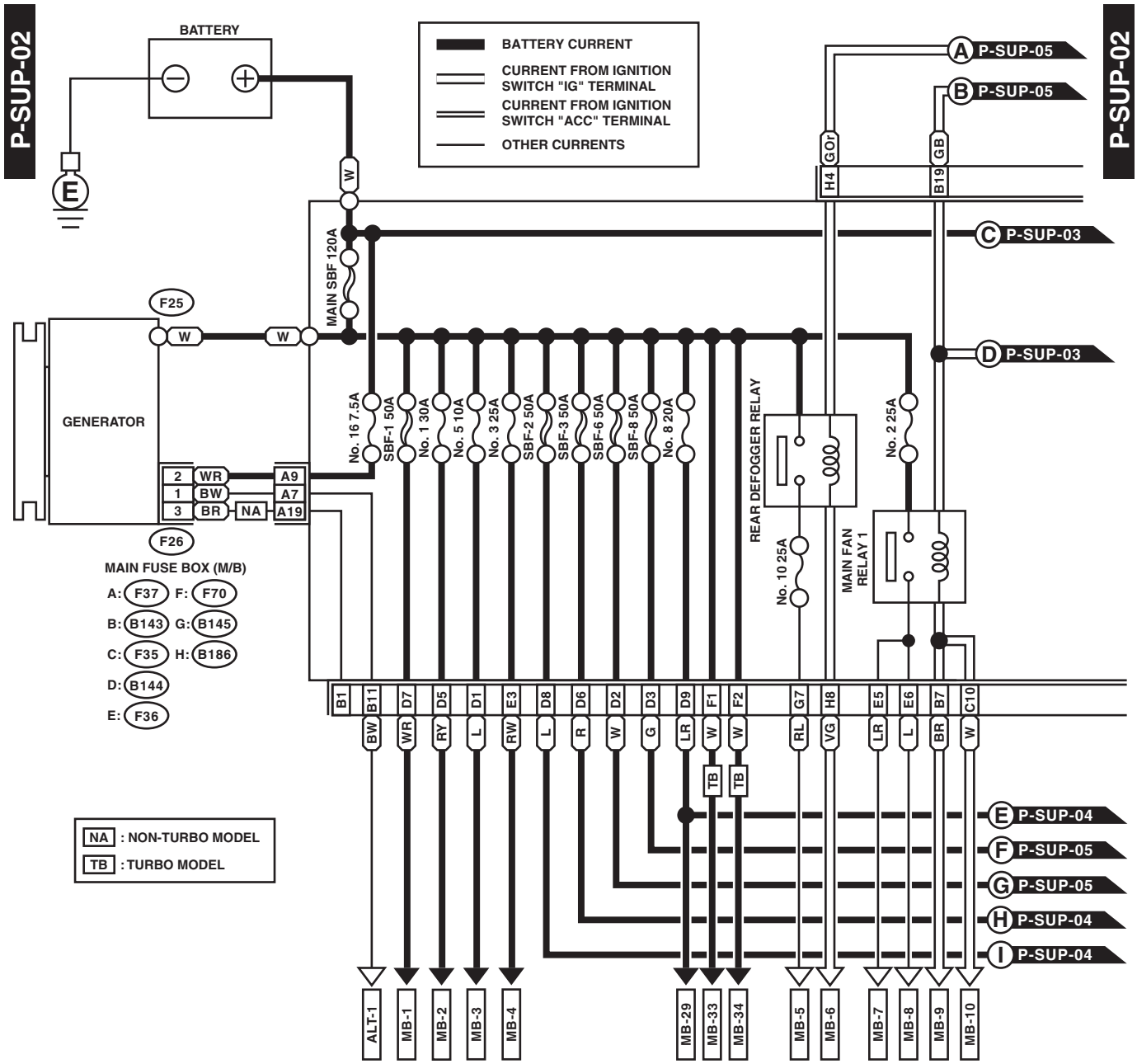


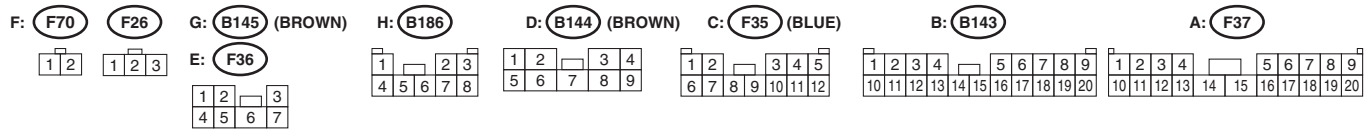


*1 : NON-TURBO MODEL : IG RELAY
TURBO MODEL : MAIN RELAY
*2 : NON-TURBO MODEL : MAIN RELAY

WI-25101

Power Supply Circuit

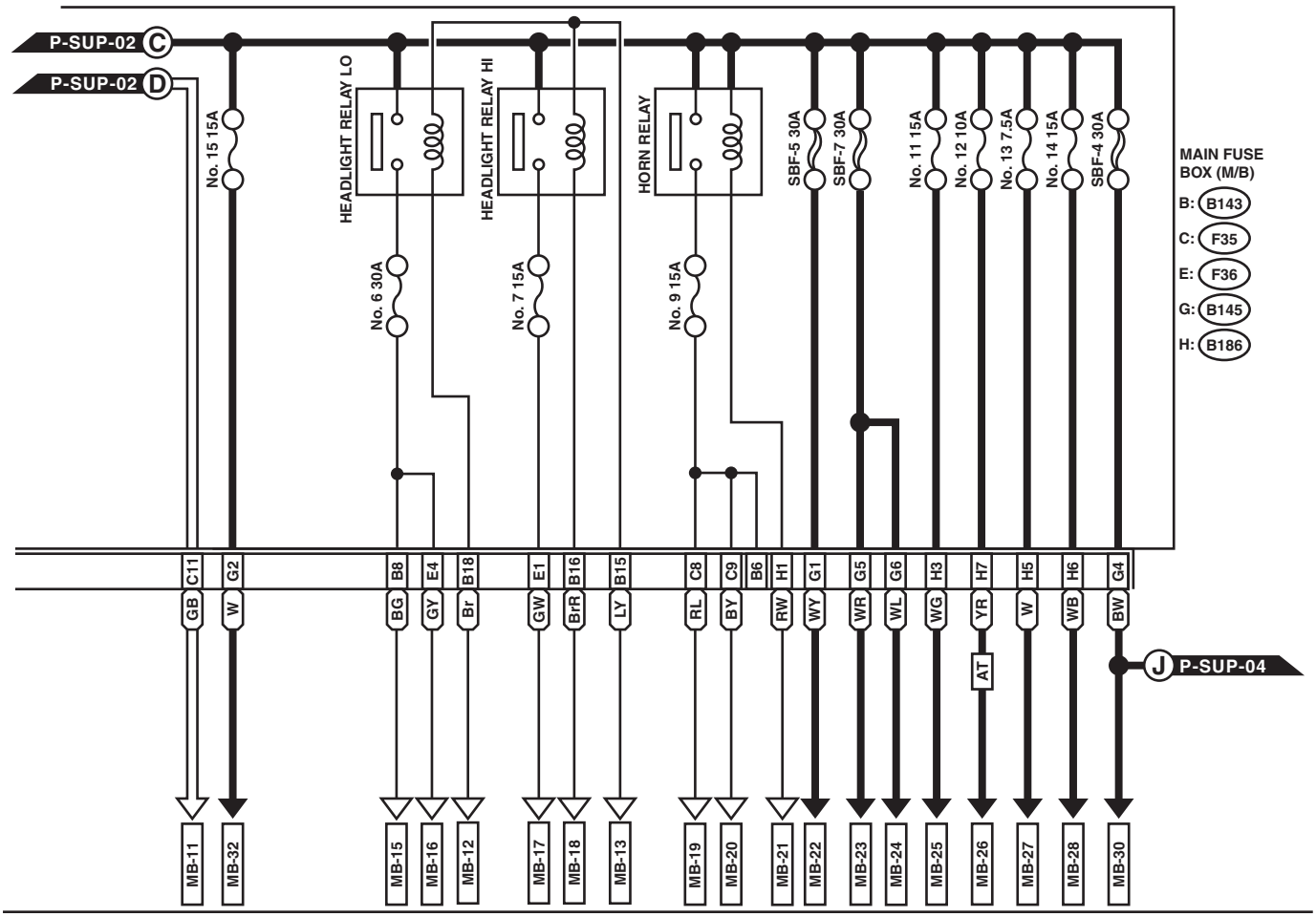


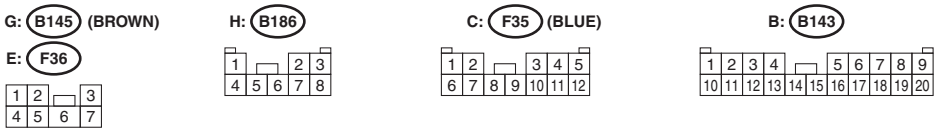


WI-31016

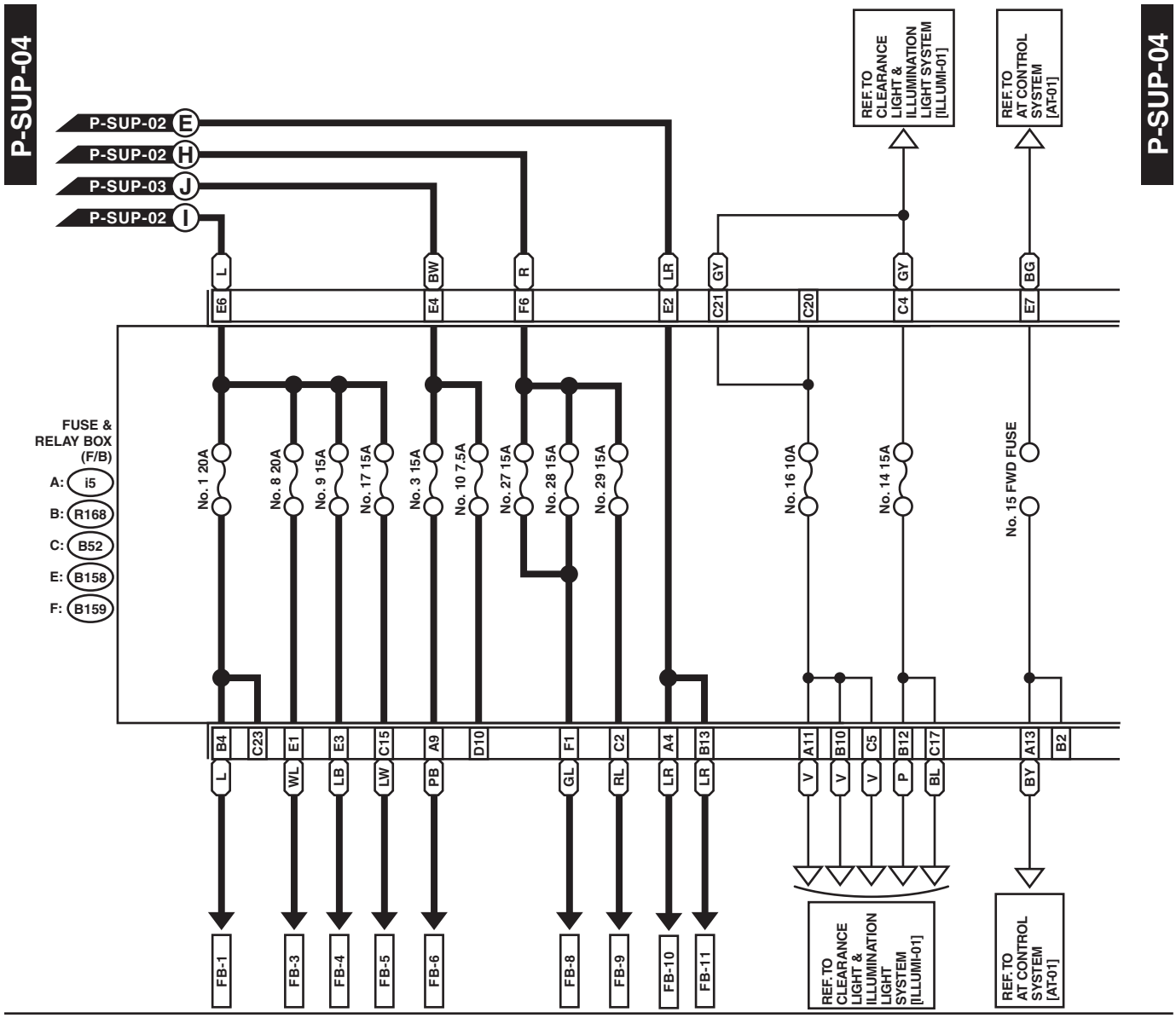
P-SUP-03

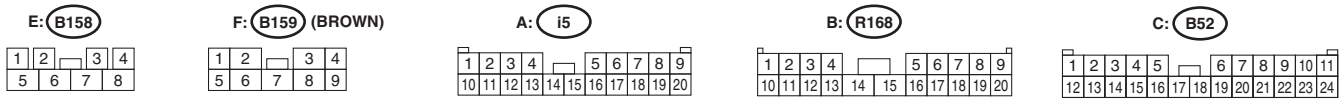
P-SUP-03



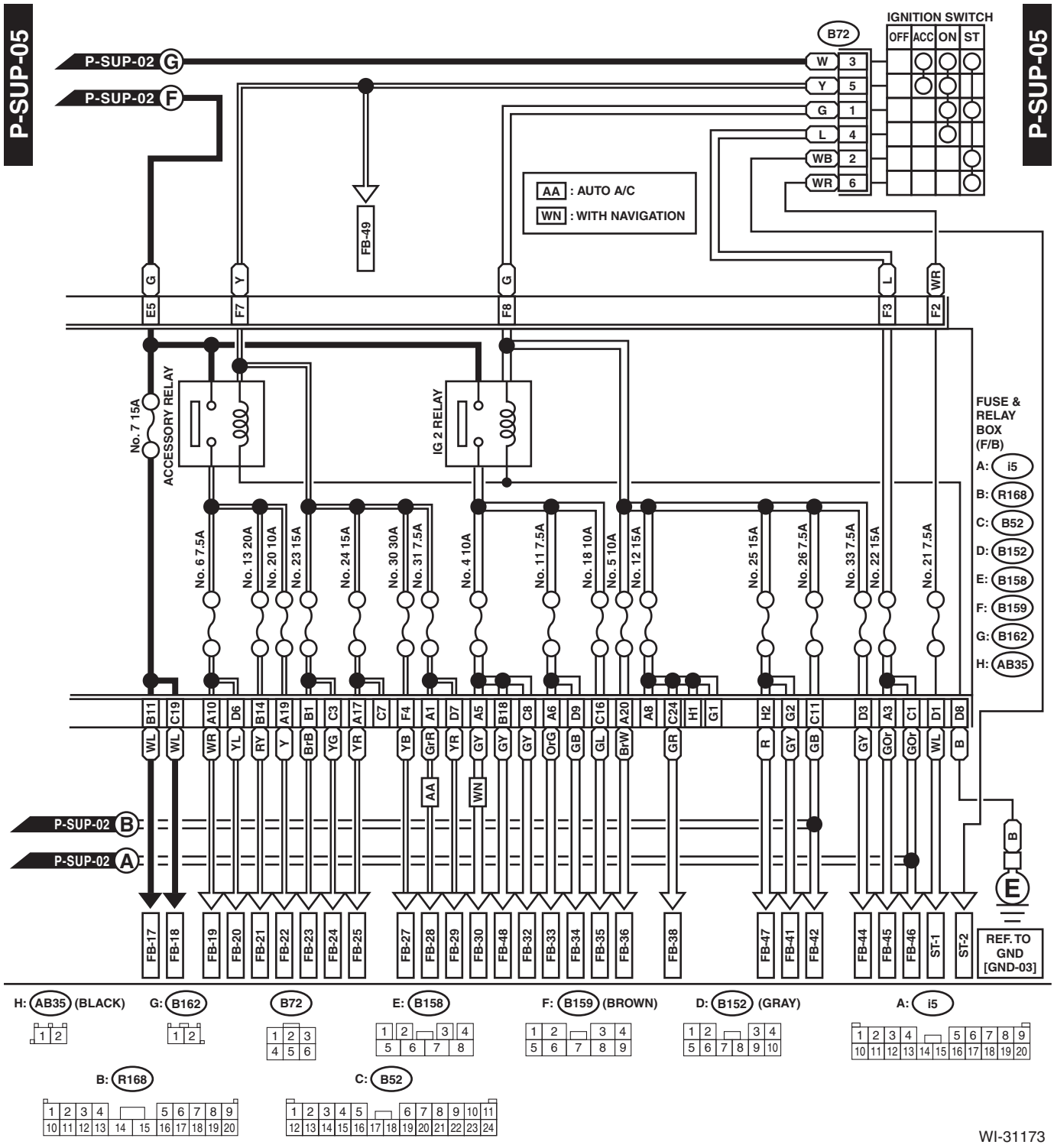


WI-25103


P-SUP-04
P-SUP-04
P-SUP-02 E
P-SUP-02 H
P-SUP-03 J
P-SUP-02 I
REF.TO CLEARANCE LIGHT & ILLUMINATION LIGHT SYSTEM [ILLUMI-01]
REF.TO AT CONTROL SYSTEM [AT-01]
FUSE & RELAY BOX (F/B)
A: i5
B: R168
C: B52
E: B158
F: B159
No. 1 20A
No. 8 20A
No. 9 15A
No. 17 15A
No. 3 15A
No. 10 7.5A
No. 27 15A
No. 28 15A
No. 29 15A
No. 16 10A
No. 14 15A
No. 15 FWD FUSE
FB-1
FB-3
FB-4
FB-5
FB-6
FB-8
FB-9
FB-10
FB-11
REF.TO CLEARANCE LIGHT & ILLUMINATION LIGHT SYSTEM [ILLUMI-01]
REF.TO AT CONTROL SYSTEM [AT-01]


E: B158
F: B159 (BROWN)
A: i5
B: R168
C: B52

WI-31017


P-SUP-05
P-SUP-05
P-SUP-02 G
P-SUP-02 F
P-SUP-02 B
P-SUP-02 A
IGNITION SWITCH
OFF ACC ON ST
B72
W 3
Y 5
G 1
L 4
WB 2
WR 6
AA : AUTO A/C
WN : WITH NAVIGATION
FB-49
G E5
Y F7
G F8
L F3
WR F2
No. 7 15A
ACCESSORY RELAY
IG 2 RELAY
No. 6 7.5A
No. 13 20A
No. 20 10A
No. 23 15A
No. 24 15A
No. 30 30A
No. 31 7.5A
No. 4 10A
No. 11 7.5A
No. 18 10A
No. 5 10A
No. 12 15A
No. 25 15A
No. 26 7.5A
No. 33 7.5A
No. 22 15A
No. 21 7.5A
FUSE & RELAY BOX (F/B)
A: i5
B: R168
C: B52
D: B152
E: B158
F: B159
G: B162
H: AB35
B11 WL
C19 WL
A10 WR
D6 YL
B14 RY
A19 Y
B1 BrB
C3 YG
A17 YR
C7
F4 YB
A1 GrR
D7 YR
A5 GY
B18 GY
C8 GY
A6 OrG
D9 GB
C16 GL
A20 BrW
A8
C24 GR
H1
G1
H2 R
G2 GY
C11 GB
D3 GY
A3 GOr
C1 GOr
D1 WL
D8 B
AA
WN
B
E
FB-17
FB-18
FB-19
FB-20
FB-21
FB-22
FB-23
FB-24
FB-25
FB-27
FB-28
FB-29
FB-30
FB-48
FB-32
FB-33
FB-34
FB-35
FB-36
FB-38
FB-47
FB-41
FB-42
FB-44
FB-45
FB-46
ST-1
ST-2
REF. TO GND [GND-03]
H: AB35 (BLACK)
G: B162
B72
E: B158
F: B159 (BROWN)
D: B152 (GRAY)
A: i5
B: R168
C: B52

WI-31173

No.	Load
MB-1	VDC CM
MB-2	VDC CM
MB-3	Sub woofer
MB-4	Sub fan relay
MB-5	Mirror heater LH
	Mirror heater RH
	Rear defogger
	A/C control panel
MB-6	Body integrated unit
MB-7	Main fan relay 2
MB-8	Main fan motor
MB-9	ECM
MB-10	Main fan relay 2
MB-11	Main fan relay 2
MB-12	Body integrated unit
MB-13	Body integrated unit
MB-15	Front fog light relay
MB-16	Headlight LH
	Headlight RH
MB-17	Daytime running light relay (except for C6 model)
	Headlight LH (C6 model)
	Headlight RH (C6 model)
MB-18	Body integrated unit
MB-19	Horn
MB-20	Horn
MB-21	Horn switch
	Body integrated unit
	Remote engine start CM
MB-22	A/F, oxygen sensor relay
MB-23	Main relay
	IG relay
	A/F, oxygen sensor relay
MB-24	Electronic throttle control relay
MB-25	Fuel pump relay
MB-26	TCM
MB-27	ECM
	Data link connector
MB-28	Key illumination
	Key warning switch
	Turn signal and hazard unit
	Body integrated unit
MB-29	Spot map light
	Room light
	Door step light LH
	Puddle light LH
	Puddle light RH
	Body integrated unit
MB-30	Power window circuit breaker

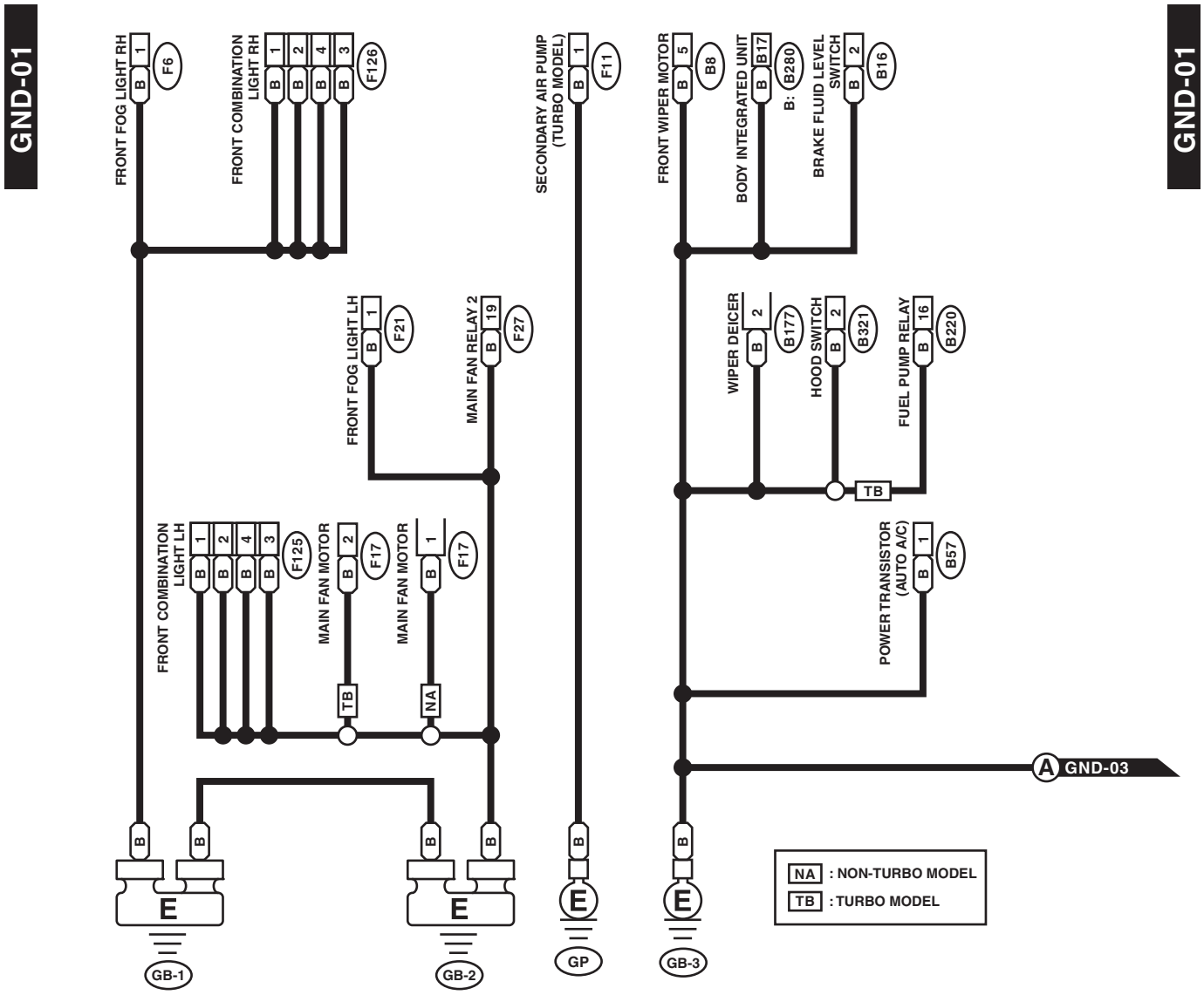
No.	Load
MB-32	Tail & Illumination relay
	Daytime running light relay
MB-33	Secondary air pump relay
MB-34	Secondary air combination valve relay 1
	Secondary air combination valve relay 2
ALT-1	Combination meter
ST-1	Starter relay
ST-2	Clutch start switch
	ECM
	Starter relay
FB-1	Trailer connector
FB-3	Stop light and brake switch
FB-4	Wiper deicer relay
FB-5	Seat heater relay
FB-6	Body integrated unit
	Remote control back rest switch LH
	Remote control back rest switch RH
FB-8	Blower motor relay
FB-9	Front fog light relay
FB-10	Audio
	Navigation unit
	Door step light RH
	Clock
FB-11	Keyless entry CM
	TPMS & keyless entry CM
	Luggage room light
FB-17	A/C control panel (Auto A/C)
	Combination meter
FB-18	Body integrated unit
	Impact sensor
	Mode door actuator (Auto A/C)
	Air mix door actuator (without left/right independent air conditioner) (auto A/C)
	Air mix door actuator LH (with left/right independent air conditioner) (auto A/C)
	Air mix door actuator RH (with left/right independent air conditioner) (auto A/C)
FB-19	Remote control mirror switch
FB-20	Seat heater relay
	Rear view mirror
FB-21	Rear accessory power supply socket (luggage room)
	Rear accessory power supply socket (console)
FB-22	Front accessory power supply socket
FB-23	Rear wiper motor
FB-24	Body integrated unit
	Rear washer motor
FB-25	Audio
	Navigation unit

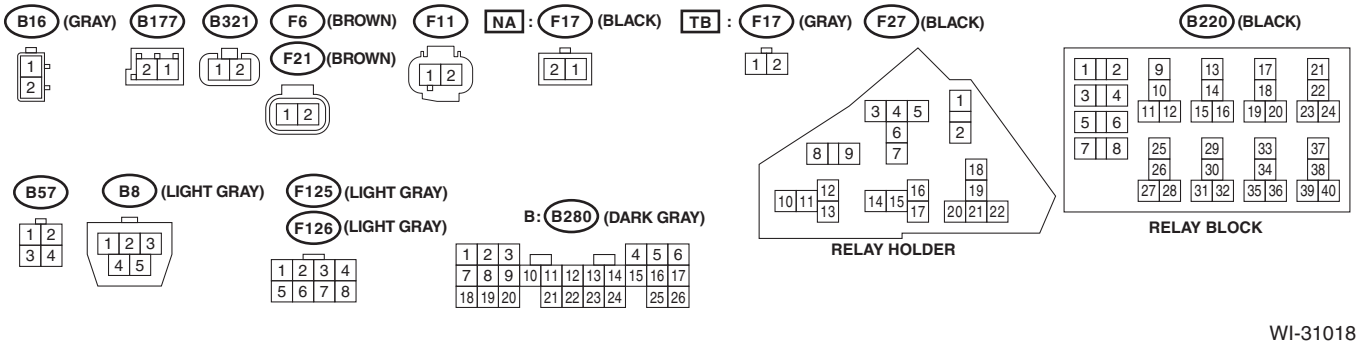
No.	Load
FB-27	Combination switch
	Front wiper motor
FB-28	A/C control panel (Auto A/C)
FB-29	Body integrated unit
FB-30	Navigation unit
FB-32	ECM
	Clutch switch (model with cruise control)
	Impact sensor
	Data link connector
	Stop light and brake switch
	Wiper deicer relay
FB-33	Clock
FB-34	Turn signal and hazard unit
FB-35	Inhibitor switch
	Auto headlight beam leveler CM
	Back-up light switch
FB-36	Combination meter
FB-38	ECM
	TCM
	Body integrated unit
	Fuel pump relay
	Rear vehicle speed sensor
	Ignition coil No. 1 (turbo model)
	Ignition coil No. 2 (turbo model)
	Ignition coil No. 3 (turbo model)
	Ignition coil No. 4 (turbo model)
FB-41	Airbag CM
FB-42	Power window relay
FB-44	VDC CM
	Steering angle sensor
	Yaw rate & G sensor
FB-45	A/C control panel
FB-46	A/C relay
	Intake door actuator
	Sub fan relay
	Pressure switch
	Blower motor relay
FB-47	Occupant detection control module
FB-48	TPMS & keyless entry CM
FB-49	Front washer motor

4. Ground Circuit

A: WIRING DIAGRAM

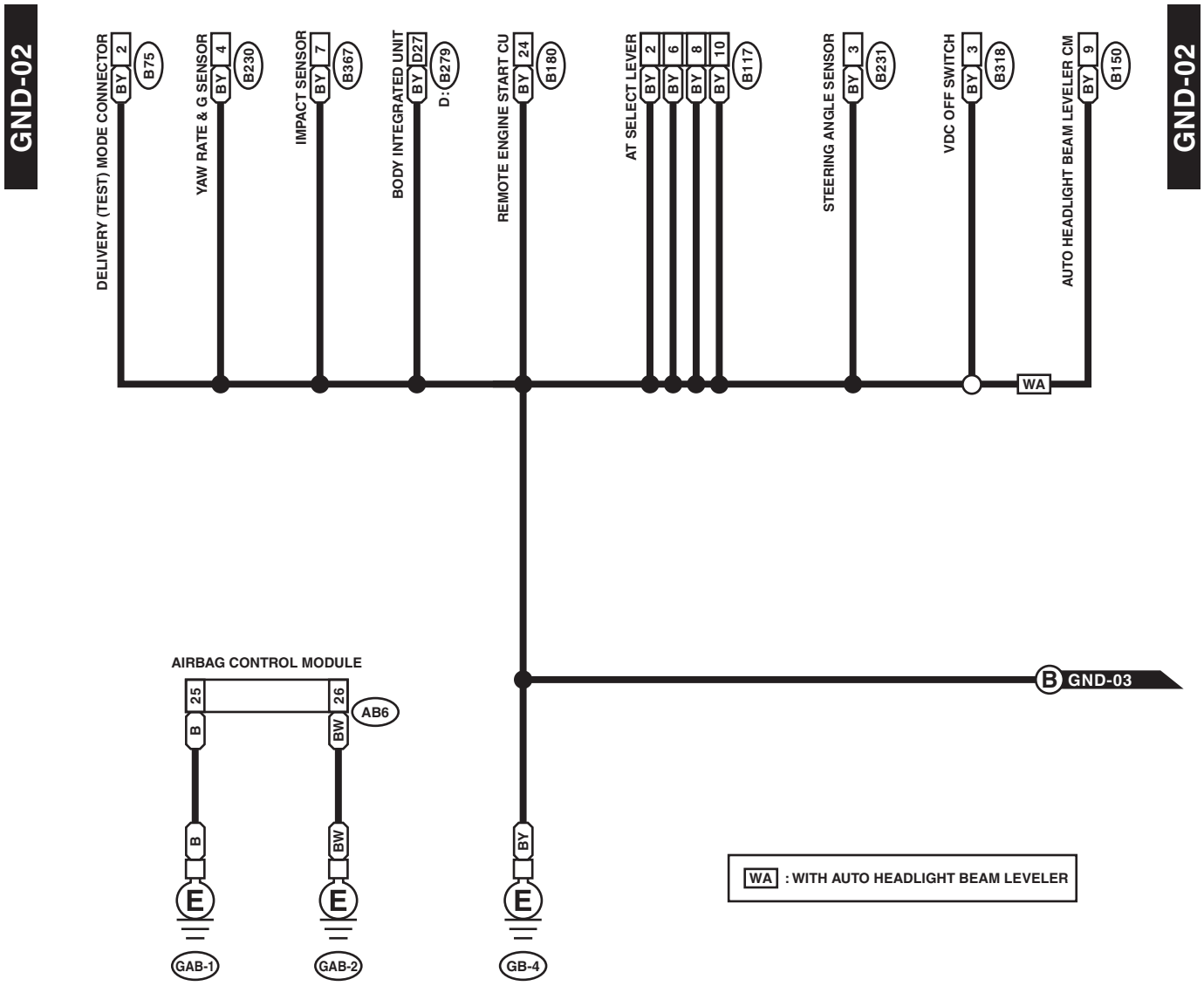
1. BODY GROUND

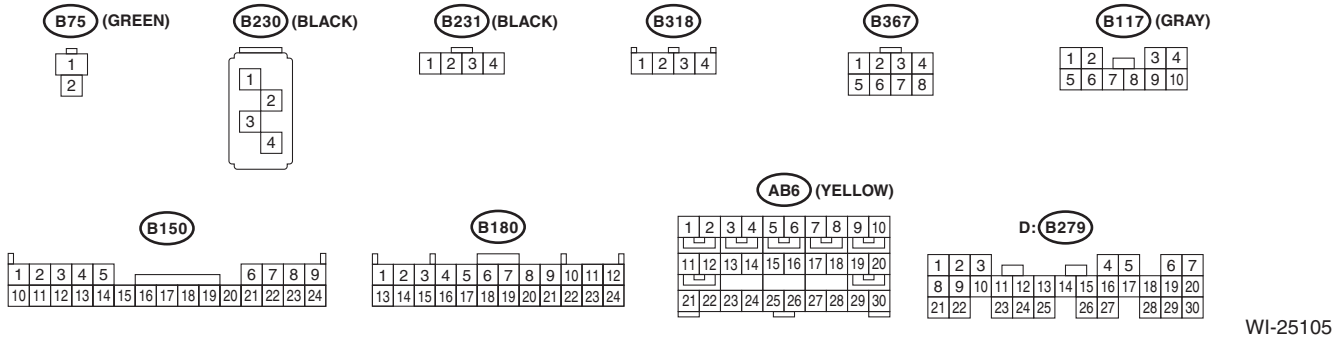




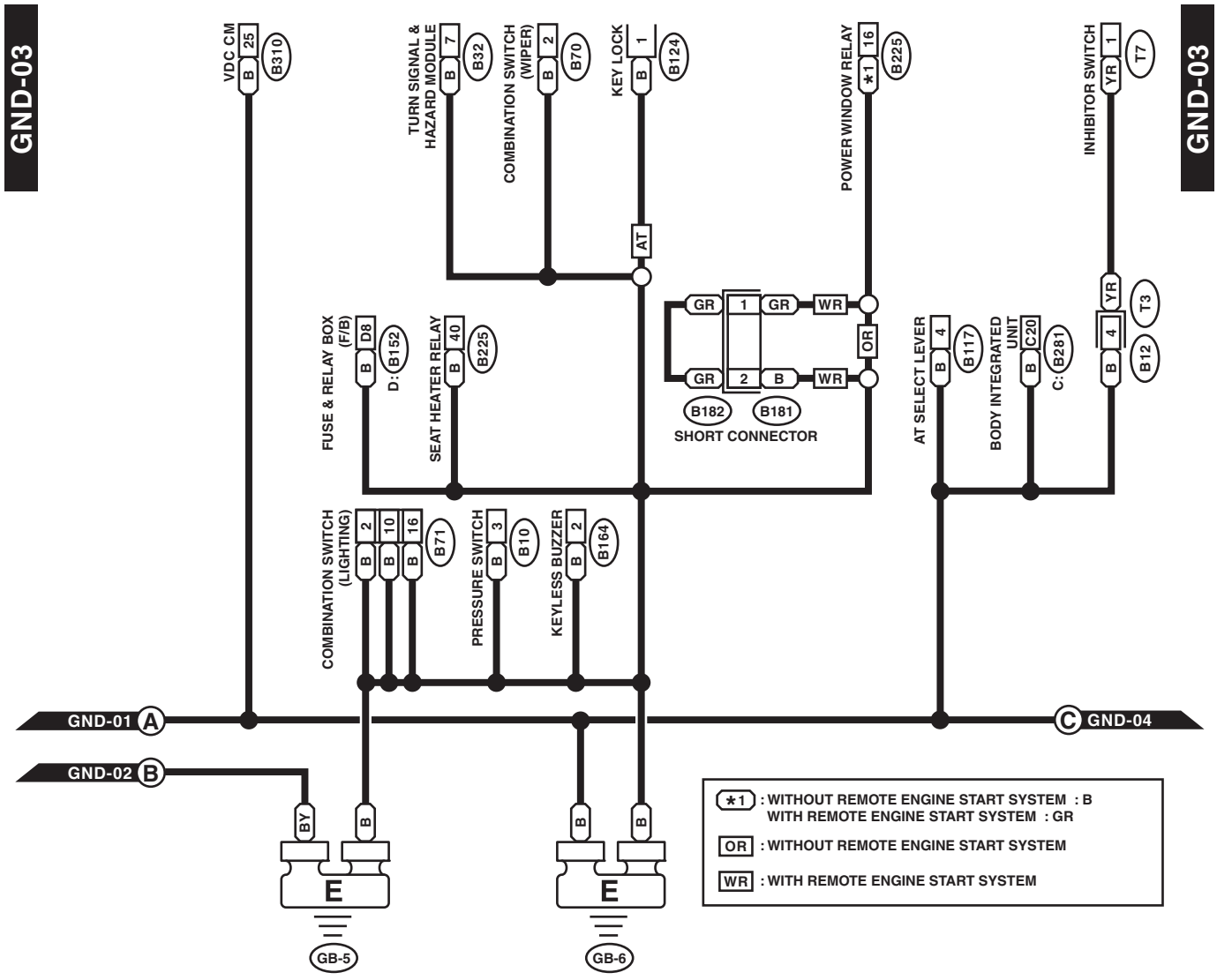
WI-31018

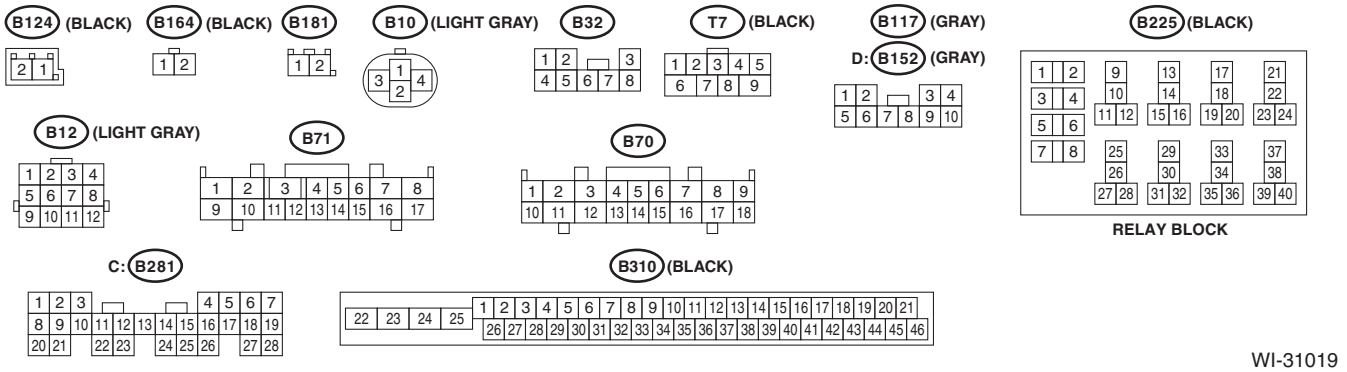
Ground Circuit



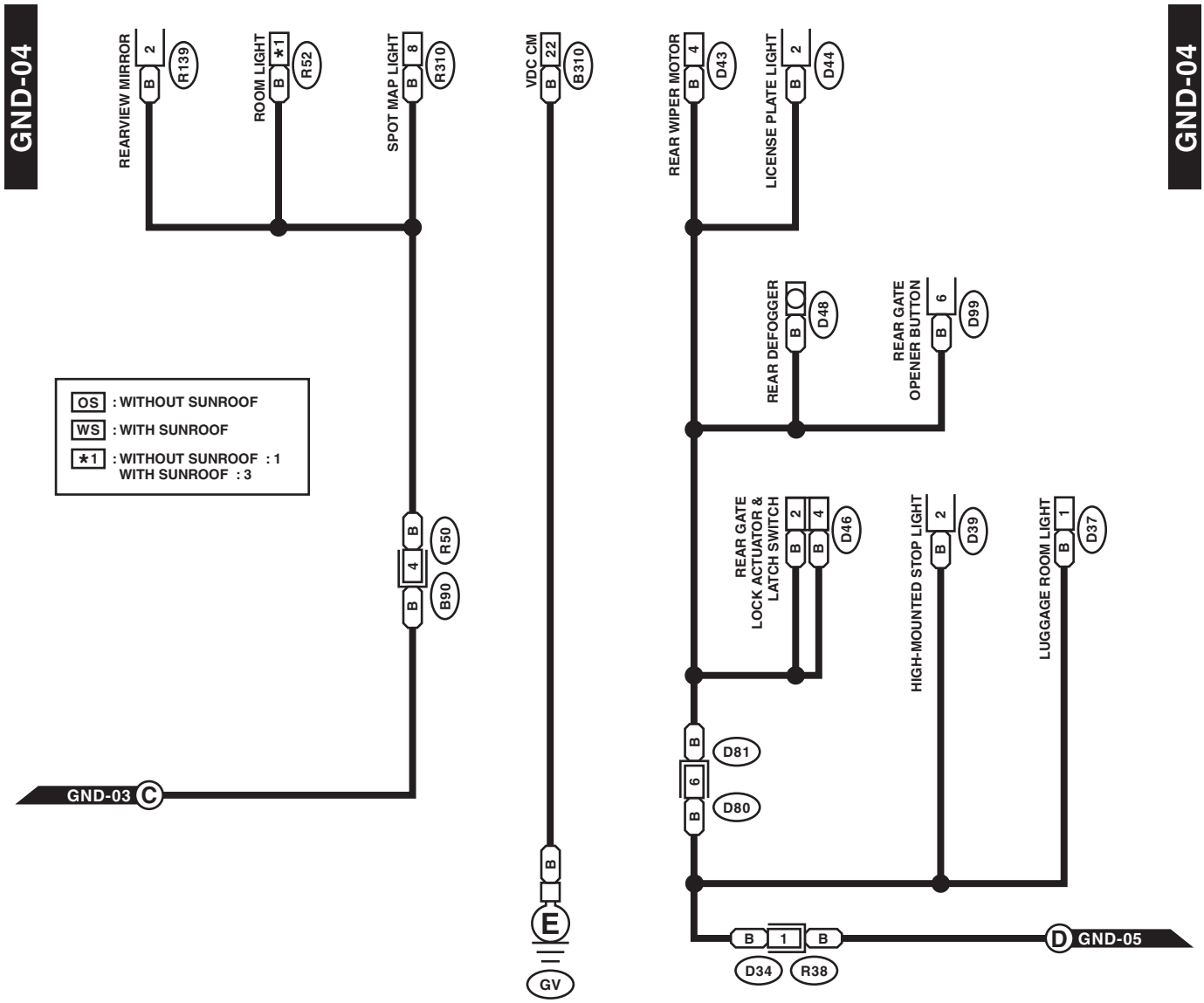


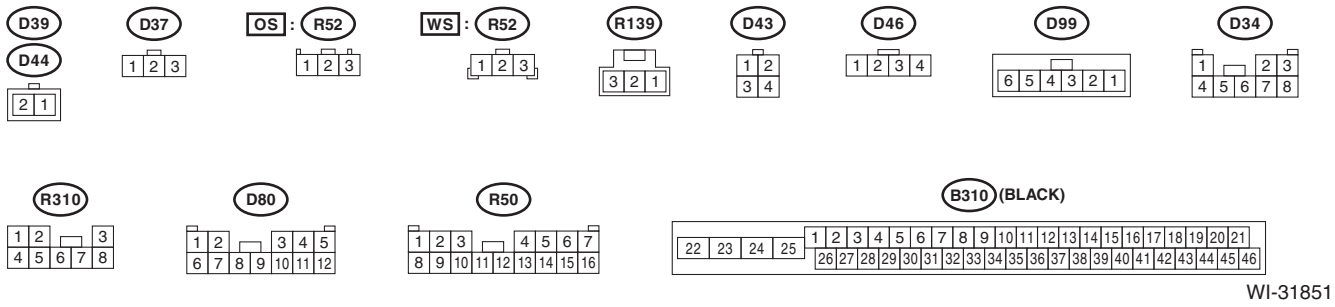
WI-25105


GND-03
GND-03
VDC C/M
B 25
B310
TURN SIGNAL & HAZARD MODULE
B 7
B32
COMBINATION SWITCH (WIPER)
B 2
B70
KEY LOCK
B 1
B124
AT
POWER WINDOW RELAY
*1 16
B225
INHIBITOR SWITCH
YR 1
T7
YR
4
T3
B12
FUSE & RELAY BOX (F/B)
B D8
D: B152
SEAT HEATER RELAY
B 40
B225
GR 1 GR WR
GR 2 B WR
OR
B182
B181
SHORT CONNECTOR
AT SELECT LEVER
B 4
B117
BODY INTEGRATED UNIT
B C20
C: B281
COMBINATION SWITCH (LIGHTING)
B 2
B 10
B 16
B71
PRESSURE SWITCH
B 3
B10
KEYLESS BUZZER
B 2
B164
GND-01 A
GND-02 B
C GND-04
BY
B
B
B
E
E
GB-5
GB-6
*1 : WITHOUT REMOTE ENGINE START SYSTEM : B
WITH REMOTE ENGINE START SYSTEM : GR
OR : WITHOUT REMOTE ENGINE START SYSTEM
WR : WITH REMOTE ENGINE START SYSTEM

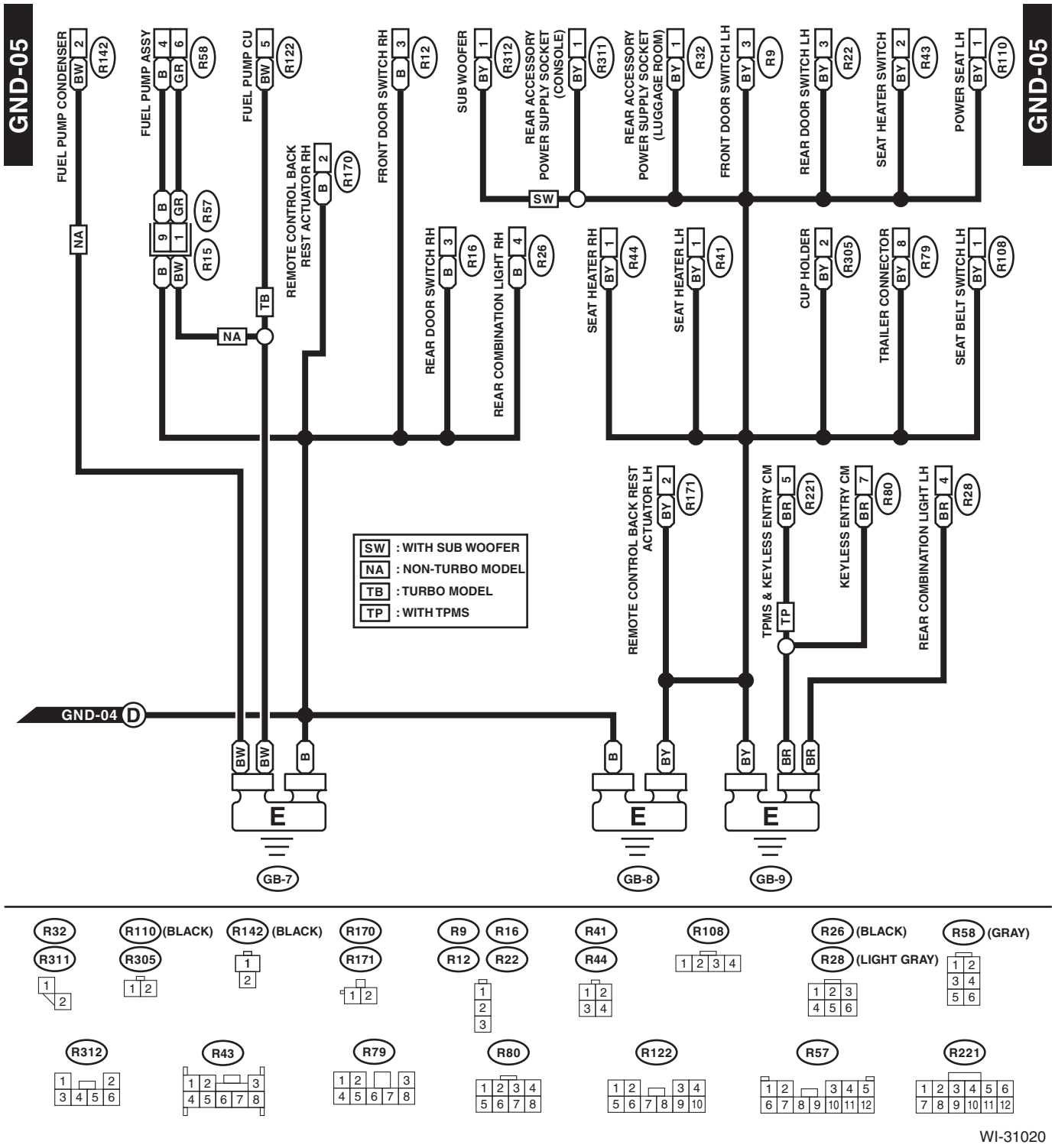

B124 (BLACK)
B164 (BLACK)
B181
B10 (LIGHT GRAY)
B32
T7 (BLACK)
B117 (GRAY)
D: B152 (GRAY)
B225 (BLACK)
B12 (LIGHT GRAY)
B71
B70
RELAY BLOCK
C: B281
B310 (BLACK)

WI-31019

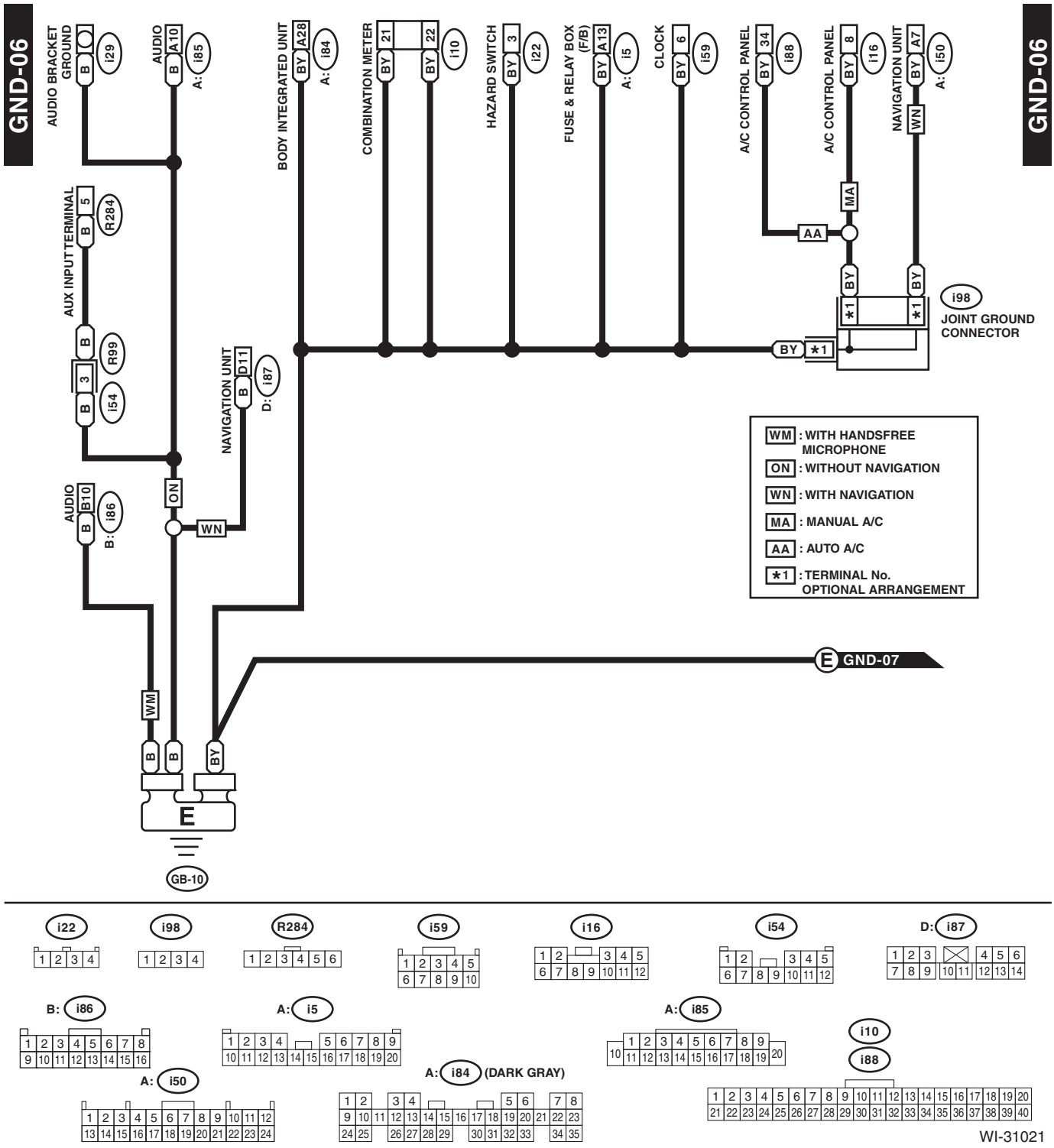

GND-04
GND-04
REARVIEW MIRROR
ROOM LIGHT
SPOT MAP LIGHT
VDC CM
REAR WIPER MOTOR
LICENSE PLATE LIGHT
REAR DEFOGGER
REAR GATE OPENER BUTTON
REAR GATE LOCK ACTUATOR & LATCH SWITCH
HIGH-MOUNTED STOP LIGHT
LUGGAGE ROOM LIGHT
OS : WITHOUT SUNROOF
WS : WITH SUNROOF
*1 : WITHOUT SUNROOF : 1
WITH SUNROOF : 3
GND-03
GND-05
GV


D39
D44
D37
OS : R52
WS : R52
R139
D43
D46
D99
D34
R310
D80
R50
B310 (BLACK)

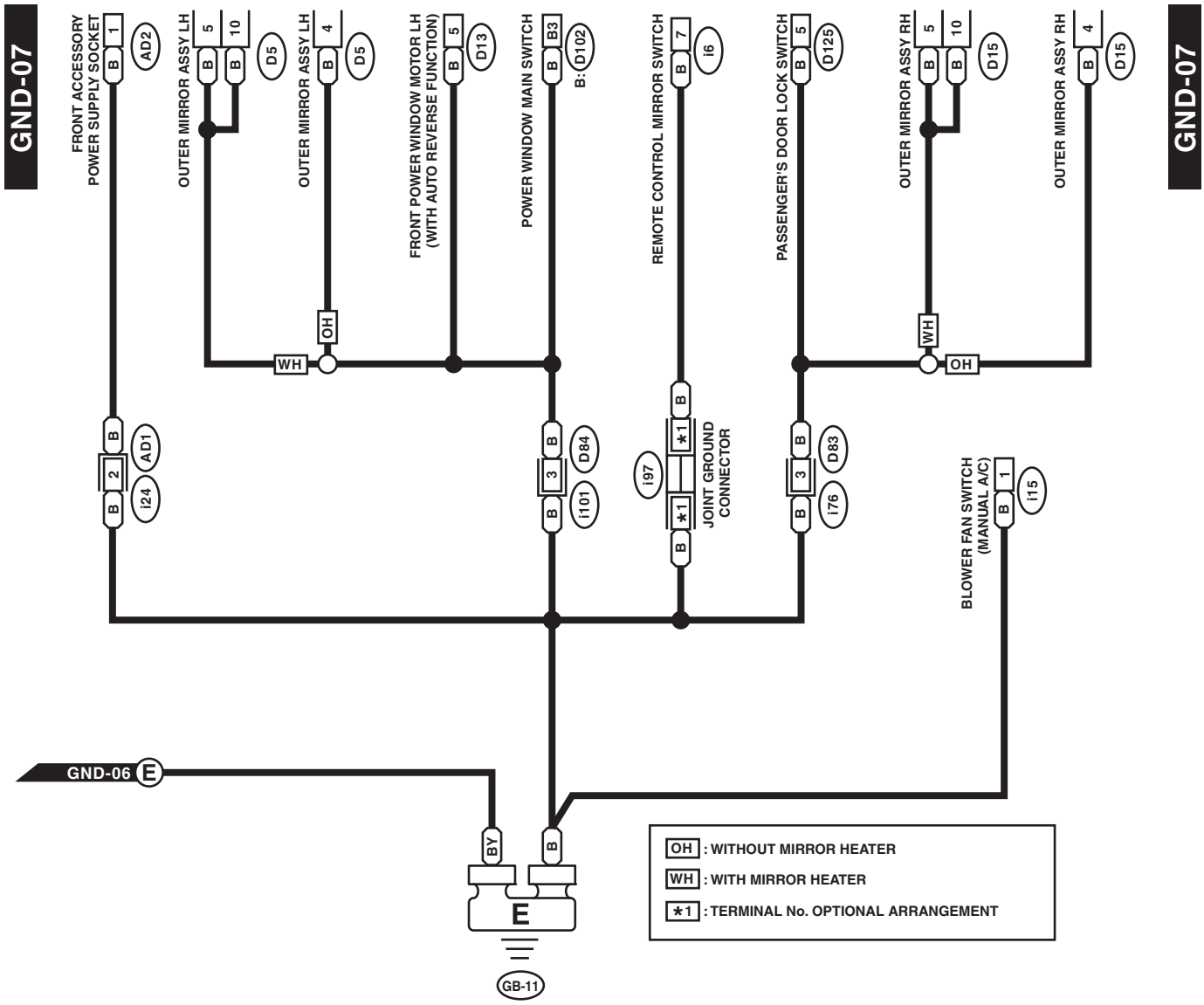
WI-31851

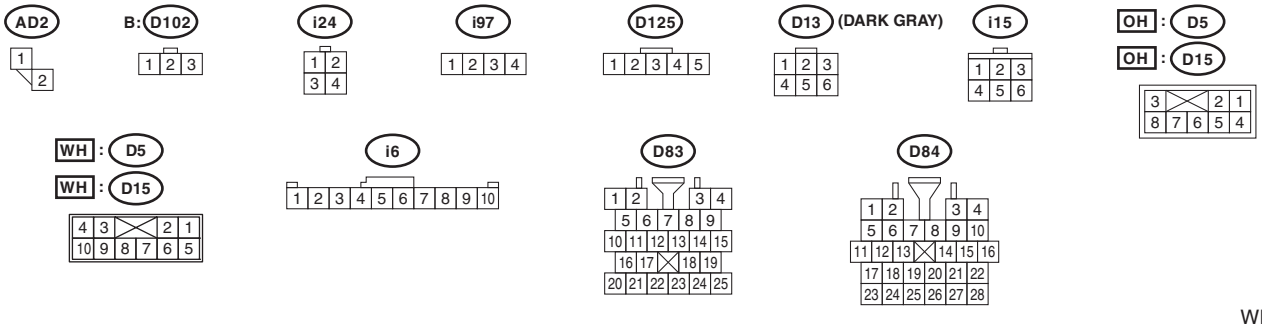

GND-05
GND-05
FUEL PUMP CONDENSER
FUEL PUMP ASSY
FUEL PUMP CU
REMOTE CONTROL BACK REST ACTUATOR RH
FRONT DOOR SWITCH RH
SUB WOOFER
REAR ACCESSORY POWER SUPPLY SOCKET (CONSOLE)
REAR ACCESSORY POWER SUPPLY SOCKET (LUGGAGE ROOM)
FRONT DOOR SWITCH LH
REAR DOOR SWITCH LH
SEAT HEATER SWITCH
POWER SEAT LH
REAR DOOR SWITCH RH
REAR COMBINATION LIGHT RH
SEAT HEATER RH
SEAT HEATER LH
CUP HOLDER
TRAILER CONNECTOR
SEAT BELT SWITCH LH
REMOTE CONTROL BACK REST ACTUATOR LH
TPMS & KEYLESS ENTRY CM
KEYLESS ENTRY CM
REAR COMBINATION LIGHT LH
SW : WITH SUB WOOFER
NA : NON-TURBO MODEL
TB : TURBO MODEL
TP : WITH TPMS
GND-04 D
GB-7
GB-8
GB-9
R32
R311
R110 (BLACK)
R305
R142 (BLACK)
R170
R171
R9
R12
R16
R22
R41
R44
R108
R26 (BLACK)
R28 (LIGHT GRAY)
R58 (GRAY)
R312
R43
R79
R80
R122
R57
R221

WI-31020


GND-06
GND-06
AUDIO BRACKET GROUND
B
i29
AUDIO
A10
B
i85
A:
BODY INTEGRATED UNIT
BY
A28
i84
A:
COMBINATION METER
21
22
BY
BY
i10
HAZARD SWITCH
BY
3
i22
FUSE & RELAY BOX (F/B)
BY
A13
i5
A:
CLOCK
BY
6
i59
A/C CONTROL PANEL
BY
34
i88
A/C CONTROL PANEL
BY
8
i16
NAVIGATION UNIT
BY
A7
i50
A:
WN
MA
AA
BY
*1
BY
*1
i98
JOINT GROUND CONNECTOR
BY
*1
AUX INPUT TERMINAL
B
5
R284
B
R99
3
B
i54
NAVIGATION UNIT
B
D11
i87
D:
AUDIO
B
B10
i86
B:
ON
WN
WM
B
B
BY
E
GB-10
E
GND-07
WM : WITH HANDSFREE MICROPHONE
ON : WITHOUT NAVIGATION
WN : WITH NAVIGATION
MA : MANUAL A/C
AA : AUTO A/C
*1 : TERMINAL No. OPTIONAL ARRANGEMENT
i22
i98
R284
i59
i16
i54
D: i87
B: i86
A: i5
A: i85
i10
i88
A: i50
A: i84 (DARK GRAY)

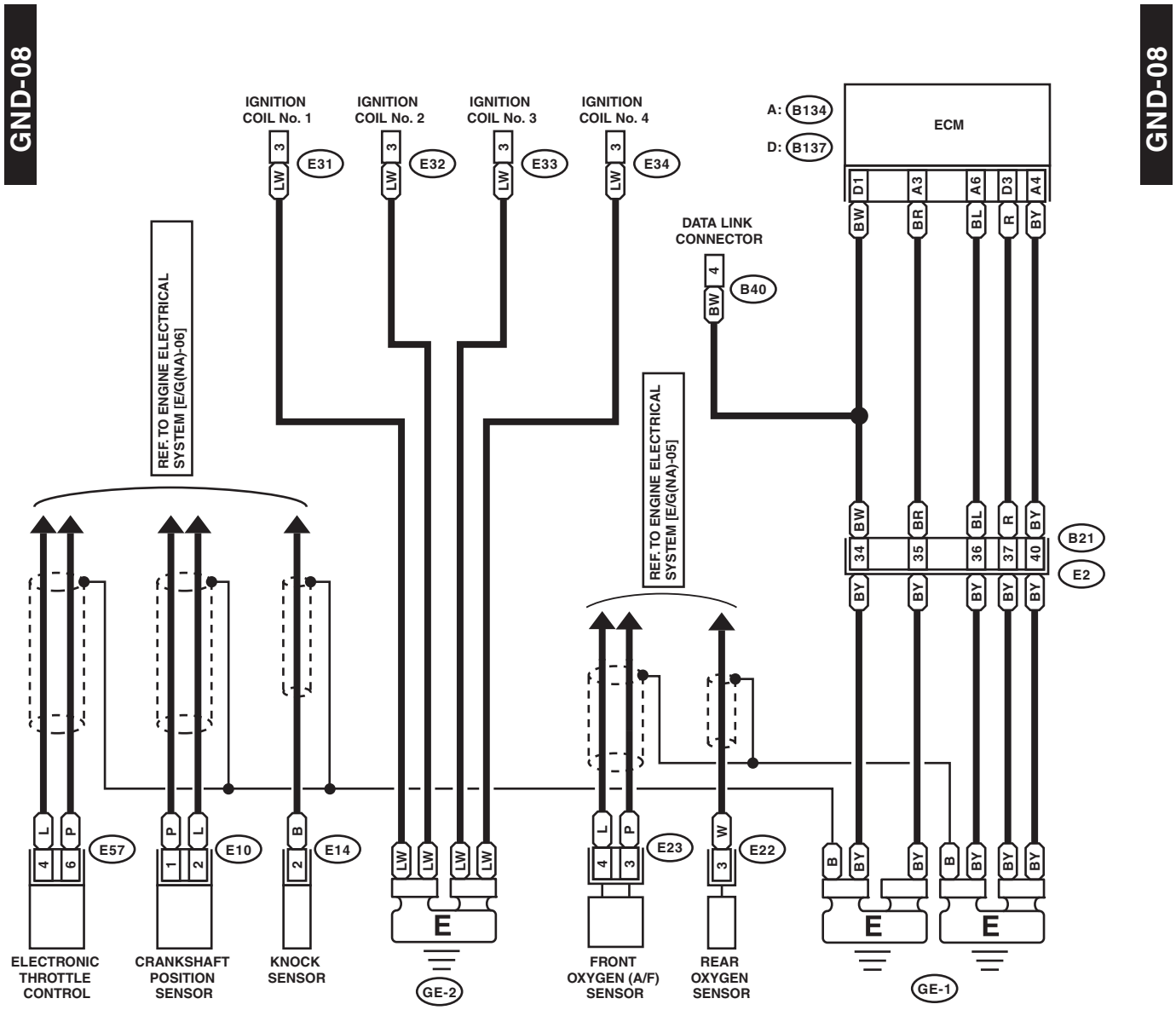
WI-31021

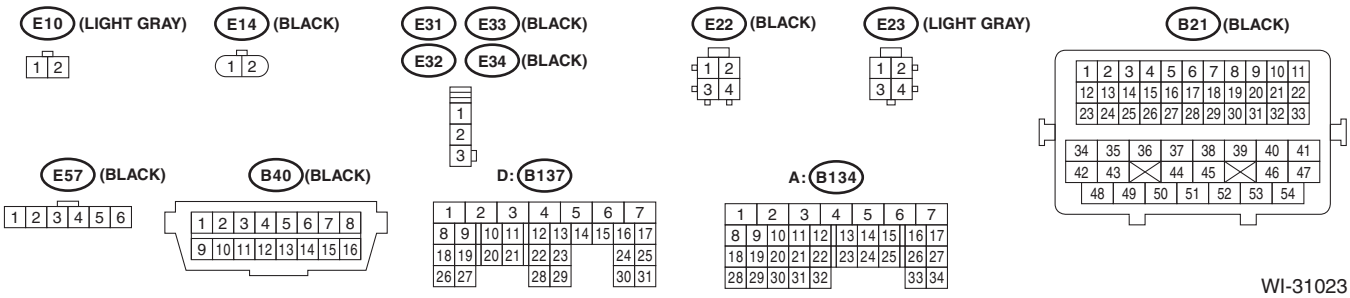

GND-07
GND-07
FRONT ACCESSORY POWER SUPPLY SOCKET
OUTER MIRROR ASSY LH
OUTER MIRROR ASSY LH
FRONT POWER WINDOW MOTOR LH (WITH AUTO REVERSE FUNCTION)
POWER WINDOW MAIN SWITCH
B: D102
REMOTE CONTROL MIRROR SWITCH
PASSENGER'S DOOR LOCK SWITCH
OUTER MIRROR ASSY RH
OUTER MIRROR ASSY RH
JOINT GROUND CONNECTOR
BLOWER FAN SWITCH (MANUAL A/C)
GND-06 E
GB-11
OH : WITHOUT MIRROR HEATER
WH : WITH MIRROR HEATER
*1 : TERMINAL No. OPTIONAL ARRANGEMENT


AD2
B: D102
i24
i97
D125
D13 (DARK GRAY)
i15
OH : D5
OH : D15
WH : D5
WH : D15
i6
D83
D84

WI-31022

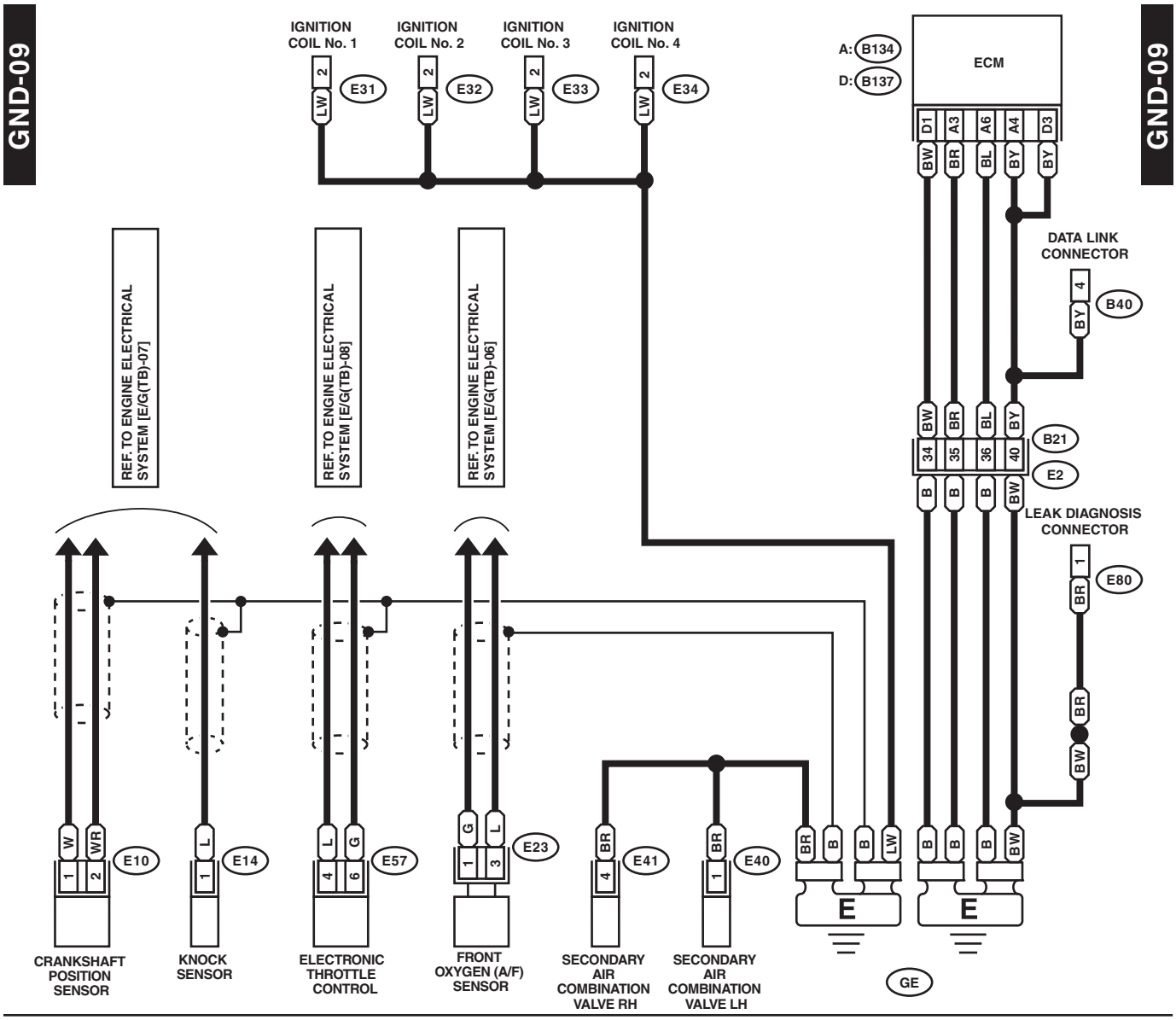
2. ENGINE GROUND (NON-TURBO MODEL)

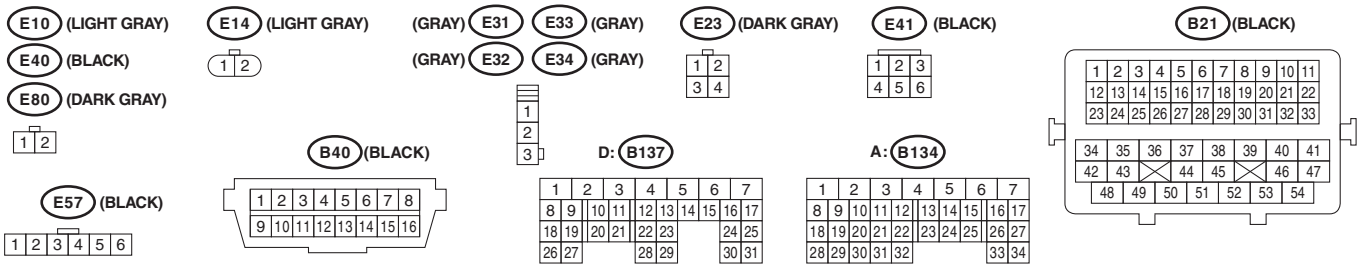




WI-31023

3. ENGINE GROUND (TURBO MODEL)



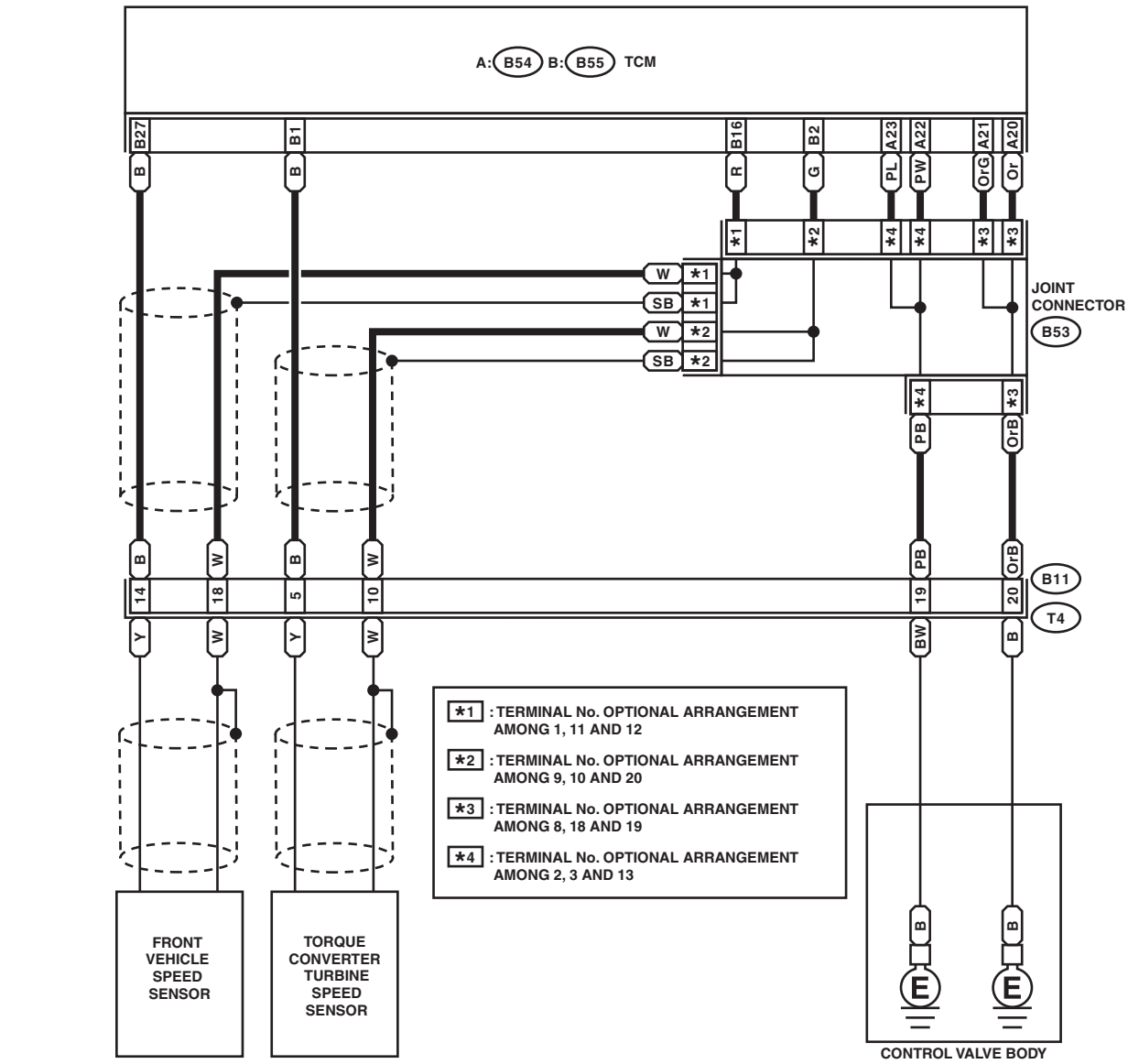


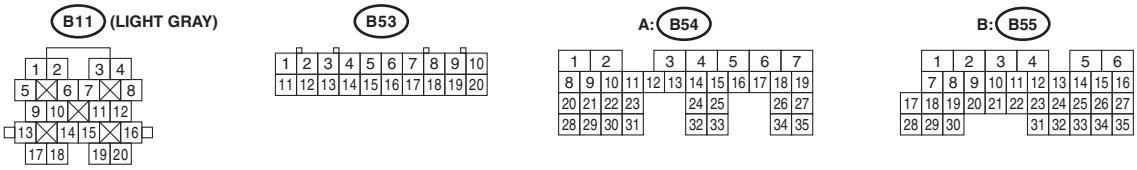
WI-31024

4. TRANSMISSION GROUND (AT MODEL)

GND-10

GND-10



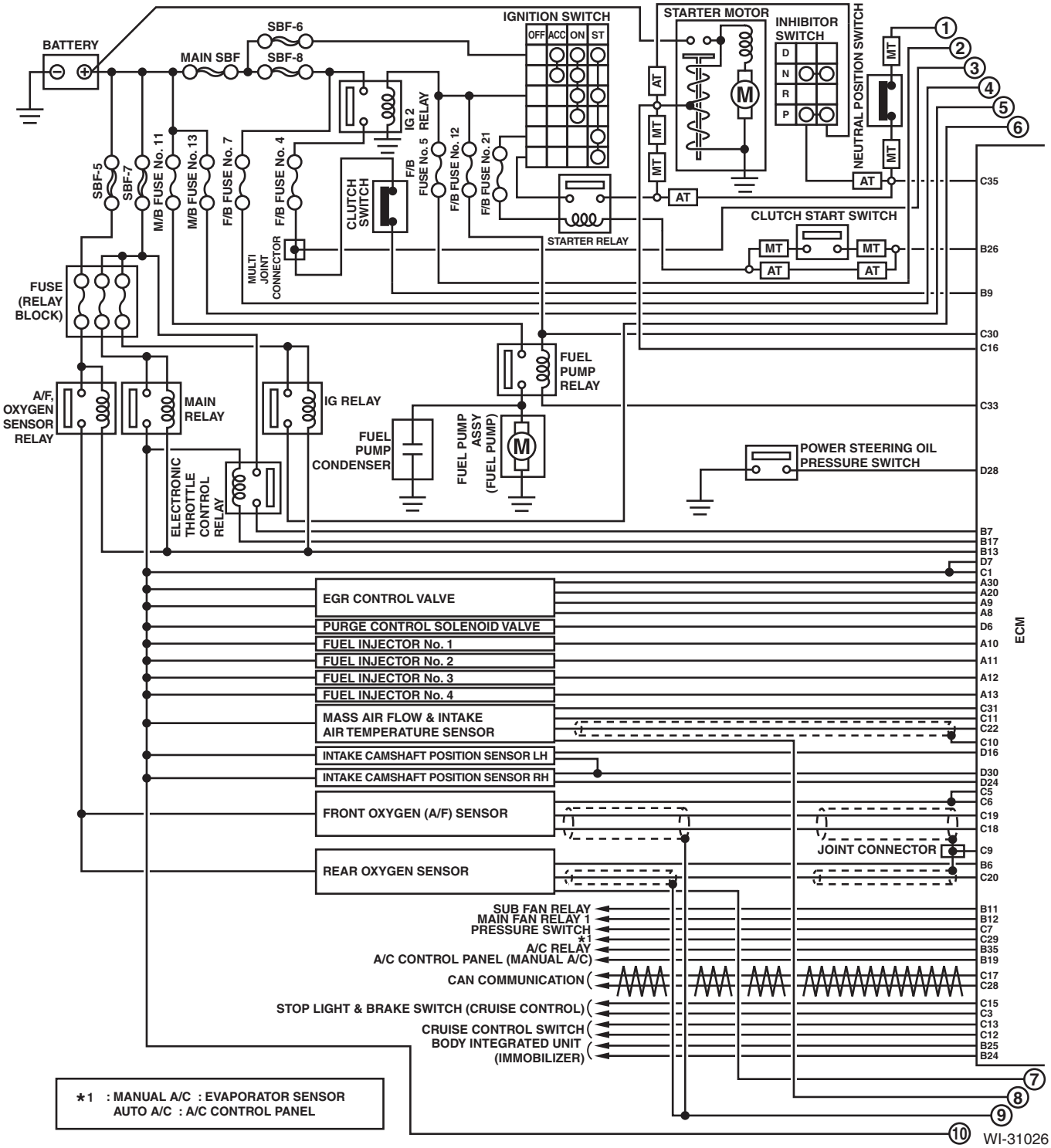


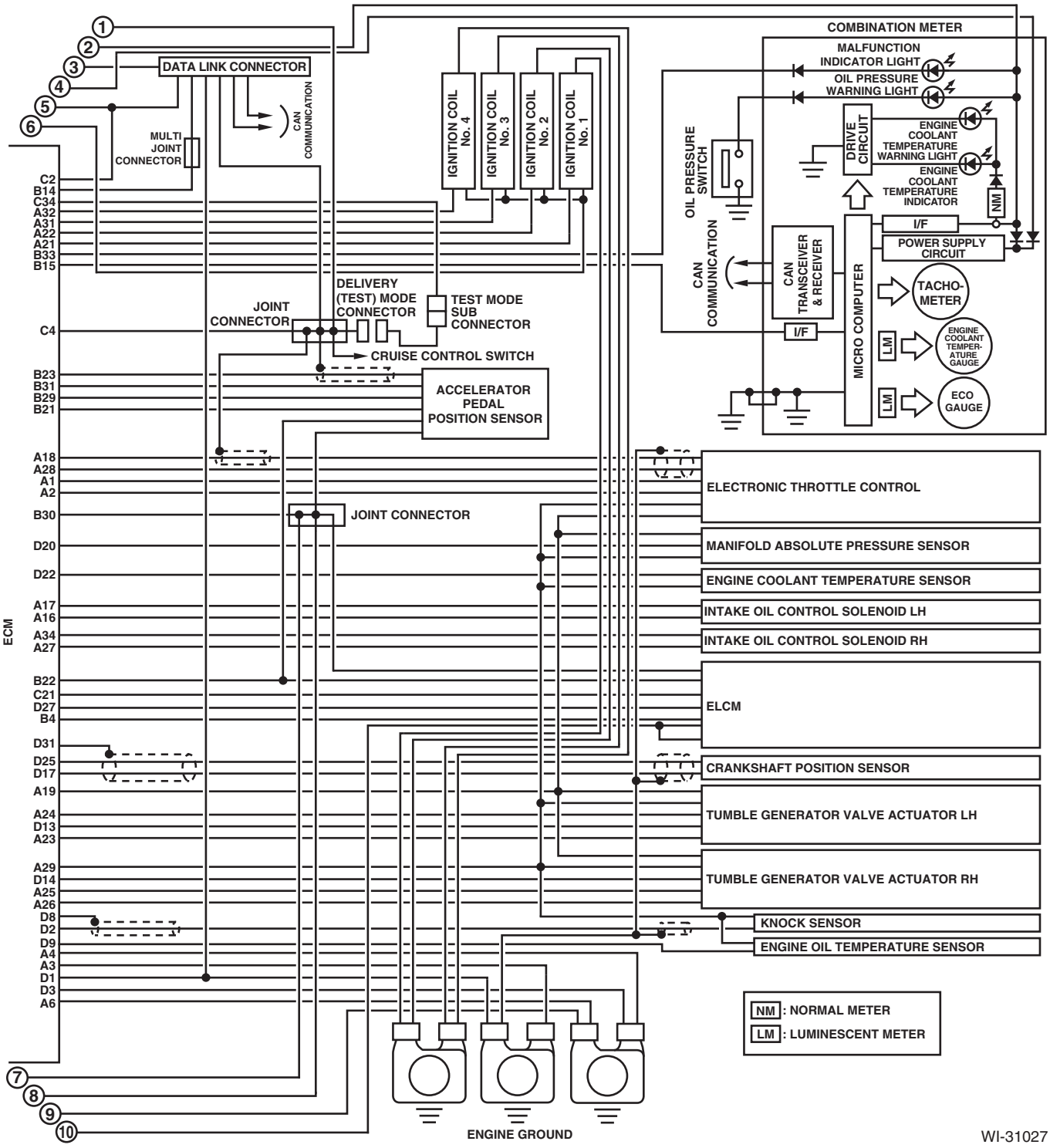
WI-31025

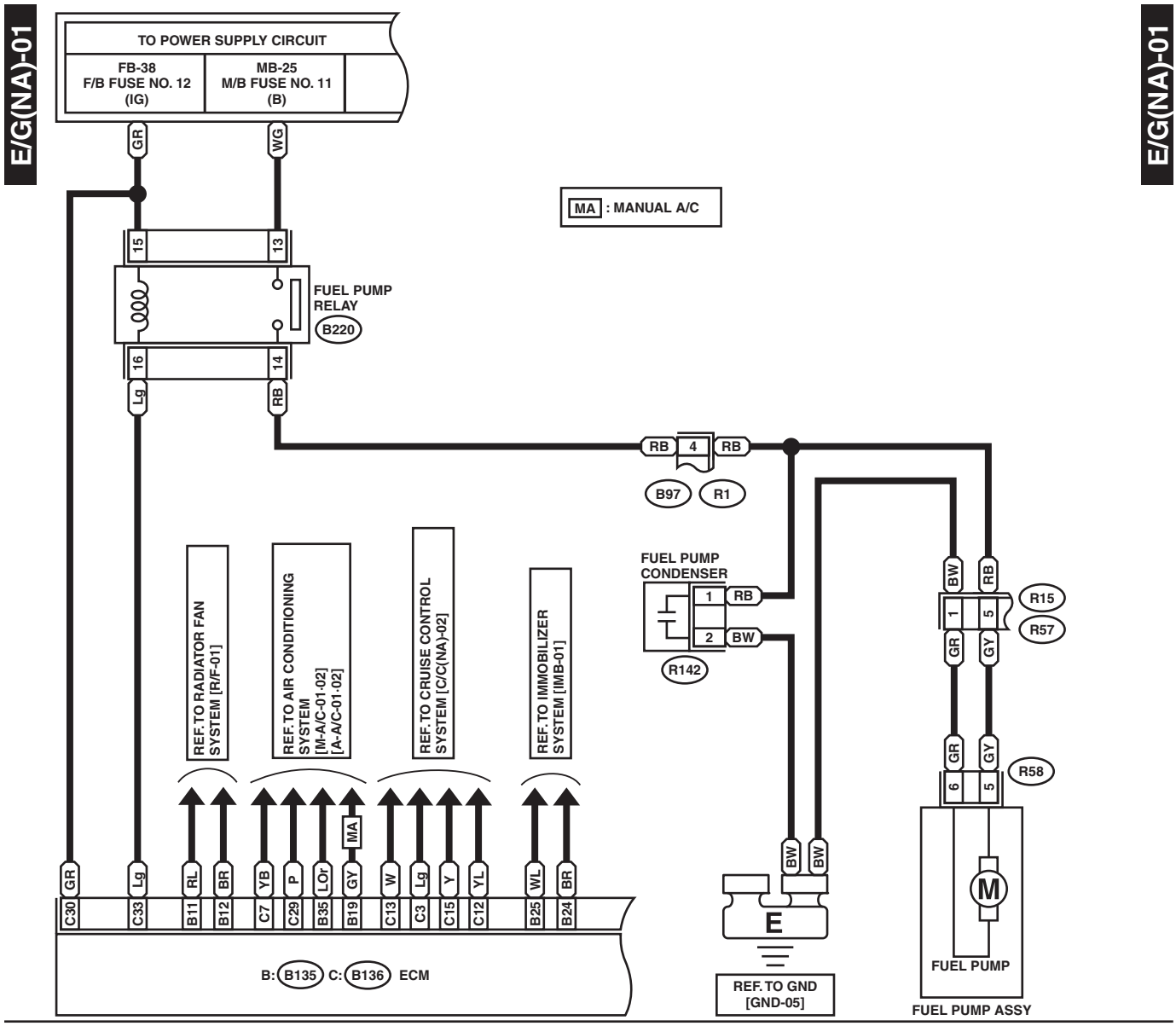
5. Engine Electrical System

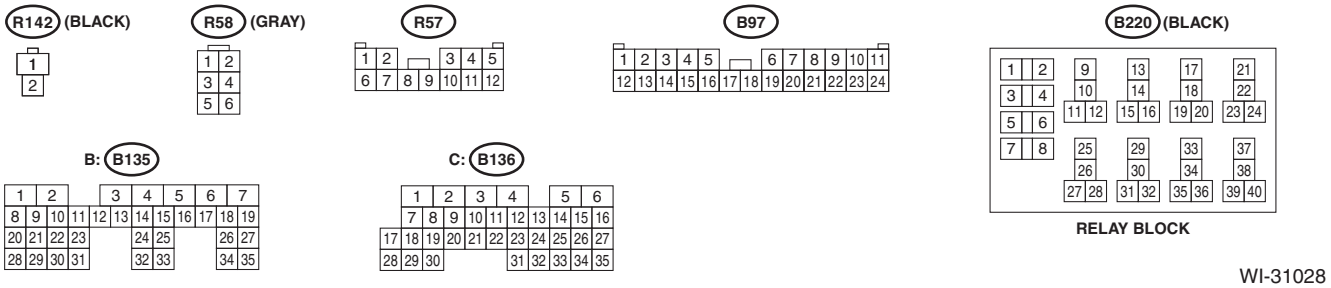
A: WIRING DIAGRAM

1. NON-TURBO MODEL

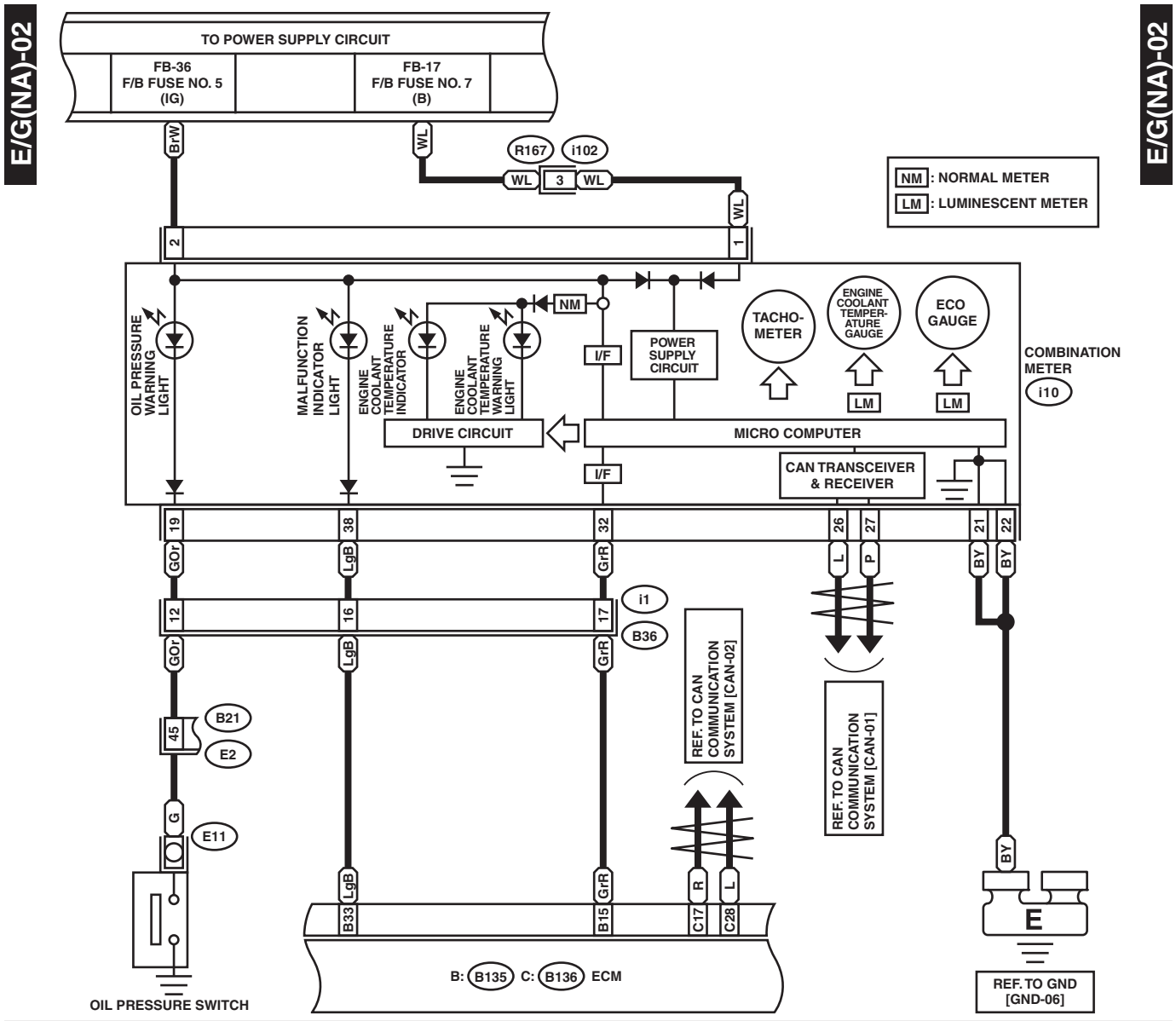


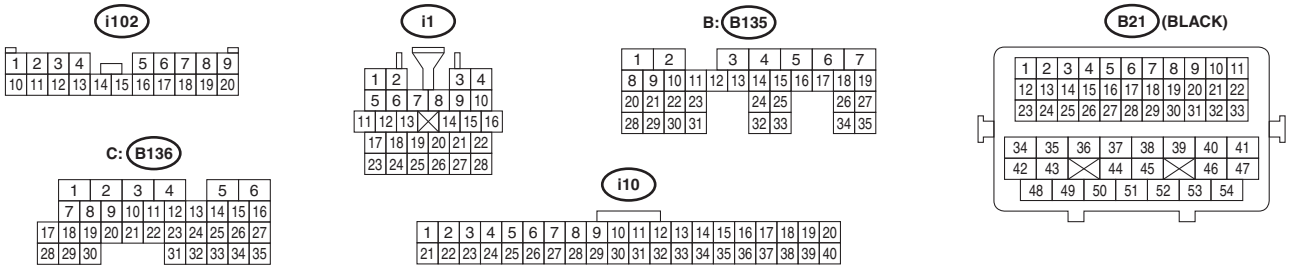

COMBINATION METER
MALFUNCTION INDICATOR LIGHT
OIL PRESSURE WARNING LIGHT
ENGINE COOLANT TEMPERATURE WARNING LIGHT
ENGINE COOLANT TEMPERATURE INDICATOR
DRIVE CIRCUIT
NM
I/F
POWER SUPPLY CIRCUIT
TACHO-METER
ENGINE COOLANT TEMPER-ATURE GAUGE
ECO GAUGE
LM
MICRO COMPUTER
CAN TRANSCEIVER & RECEIVER
CAN COMMUNICATION
OIL PRESSURE SWITCH
DATA LINK CONNECTOR
MULTI JOINT CONNECTOR
IGNITION COIL No. 4
IGNITION COIL No. 3
IGNITION COIL No. 2
IGNITION COIL No. 1
JOINT CONNECTOR
DELIVERY (TEST) MODE CONNECTOR
TEST MODE SUB CONNECTOR
CRUISE CONTROL SWITCH
ACCELERATOR PEDAL POSITION SENSOR
ECM
C2
B14
C34
A32
A31
A22
A21
B33
B15
C4
B23
B31
B29
B21
A18
A28
A1
A2
B30
D20
D22
A17
A16
A34
A27
B22
C21
D27
B4
D31
D25
D17
A19
A24
D13
A23
A29
D14
A25
A26
D8
D2
D9
A4
A3
D1
D3
A6
ELECTRONIC THROTTLE CONTROL
MANIFOLD ABSOLUTE PRESSURE SENSOR
ENGINE COOLANT TEMPERATURE SENSOR
INTAKE OIL CONTROL SOLENOID LH
INTAKE OIL CONTROL SOLENOID RH
ELCM
CRANKSHAFT POSITION SENSOR
TUMBLE GENERATOR VALVE ACTUATOR LH
TUMBLE GENERATOR VALVE ACTUATOR RH
KNOCK SENSOR
ENGINE OIL TEMPERATURE SENSOR
NM : NORMAL METER
LM : LUMINESCENT METER
ENGINE GROUND
WI-31027


E/G(NA)-01
E/G(NA)-01
TO POWER SUPPLY CIRCUIT
FB-38
F/B FUSE NO. 12
(IG)
MB-25
M/B FUSE NO. 11
(B)
GR
WG
MA : MANUAL A/C
15
13
FUEL PUMP
RELAY
B220
16
14
Lg
RB
RB
4
RB
B97
R1
FUEL PUMP
CONDENSER
1
RB
2
BW
R142
BW
RB
R15
R57
GR
GY
GR
GY
R58
6
5
REF. TO RADIATOR FAN
SYSTEM [R/F-01]
REF. TO AIR CONDITIONING
SYSTEM
[M-A/C-01-02]
[A-A/C-01-02]
REF. TO CRUISE CONTROL
SYSTEM [C/C(NA)-02]
REF. TO IMMOBILIZER
SYSTEM [IMB-01]
MA
GR
Lg
RL
BR
YB
P
LOr
GY
W
Lg
Y
YL
WL
BR
C30
C33
B11
B12
C7
C29
B35
B19
C13
C3
C15
C12
B25
B24
BW
BW
E
M
B: B135 C: B136 ECM
REF. TO GND
[GND-05]
FUEL PUMP
FUEL PUMP ASSY

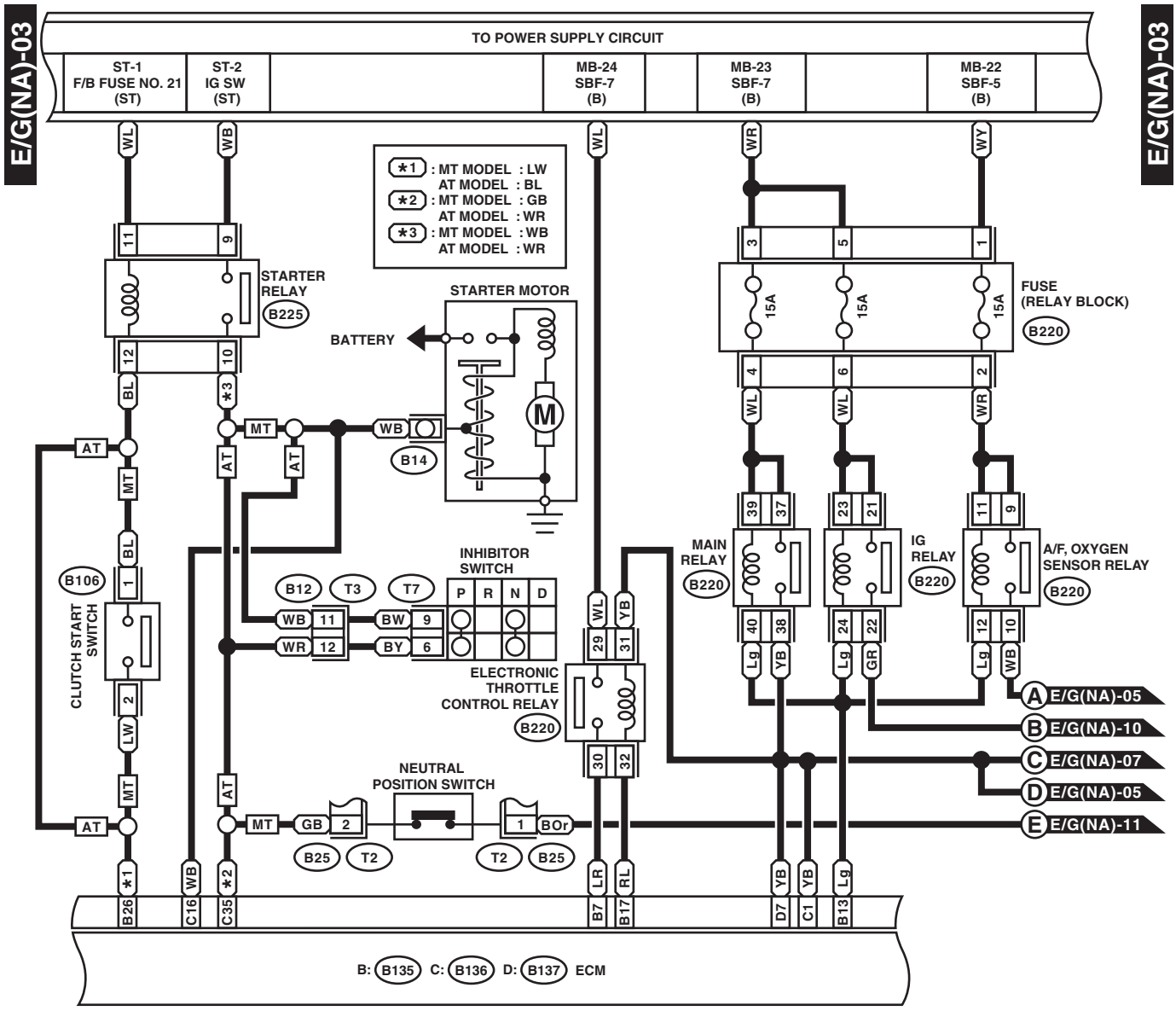

R142 (BLACK)
R58 (GRAY)
R57
B97
B220 (BLACK)
B: B135
C: B136
RELAY BLOCK

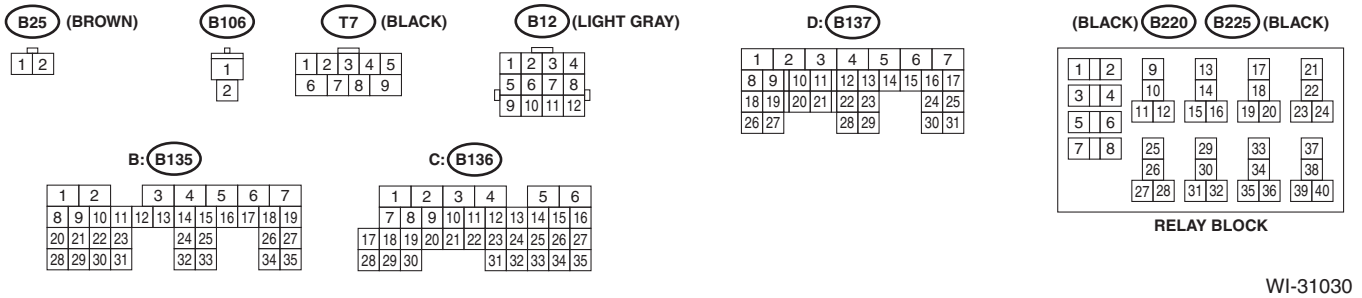
WI-31028


E/G(NA)-02
E/G(NA)-02
TO POWER SUPPLY CIRCUIT
FB-36
F/B FUSE NO. 5
(IG)
FB-17
F/B FUSE NO. 7
(B)
BrW
WL
R167
i102
WL
3
WL
WL
NM : NORMAL METER
LM : LUMINESCENT METER
2
1
OIL PRESSURE WARNING LIGHT
MALFUNCTION INDICATOR LIGHT
ENGINE COOLANT TEMPERATURE INDICATOR
ENGINE COOLANT TEMPERATURE WARNING LIGHT
NM
I/F
POWER SUPPLY CIRCUIT
TACHO-METER
ENGINE COOLANT TEMPER-ATURE GAUGE
ECO GAUGE
COMBINATION METER
i10
LM
LM
DRIVE CIRCUIT
MICRO COMPUTER
I/F
CAN TRANSCEIVER & RECEIVER
19
38
32
26
27
21
22
GOr
LgB
GrR
L
P
BY
BY
12
16
17
i1
B36
GOr
LgB
GrR
45
B21
E2
G
E11
REF. TO CAN COMMUNICATION SYSTEM [CAN-02]
REF. TO CAN COMMUNICATION SYSTEM [CAN-01]
LgB
GrR
R
L
BY
B33
B15
C17
C28
E
B: B135 C: B136 ECM
OIL PRESSURE SWITCH
REF. TO GND [GND-06]


i102
1 2 3 4 5 6 7 8 9
10 11 12 13 14 15 16 17 18 19 20
i1
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
B: B135
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
B21 (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
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
i10
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

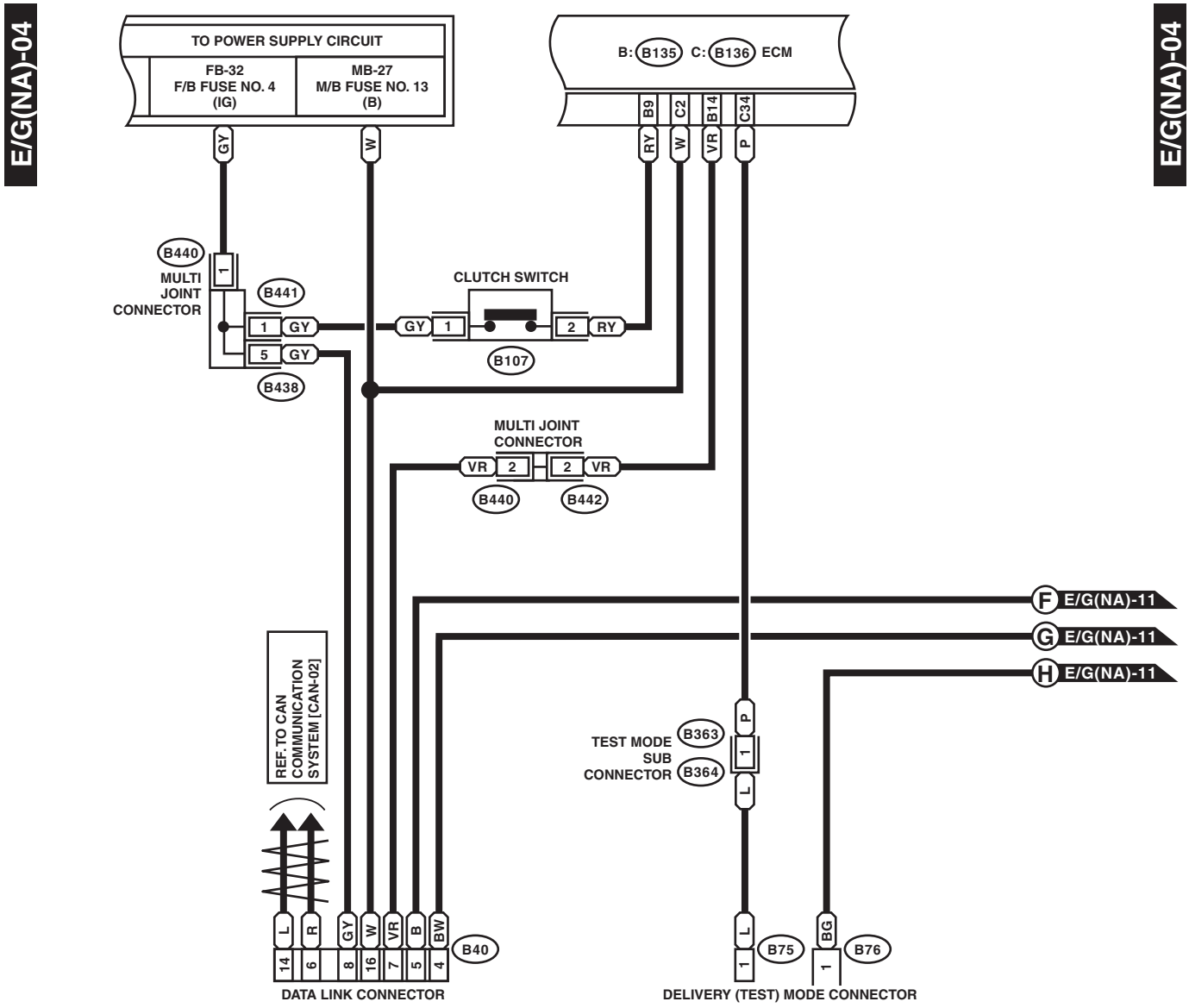
WI-31029

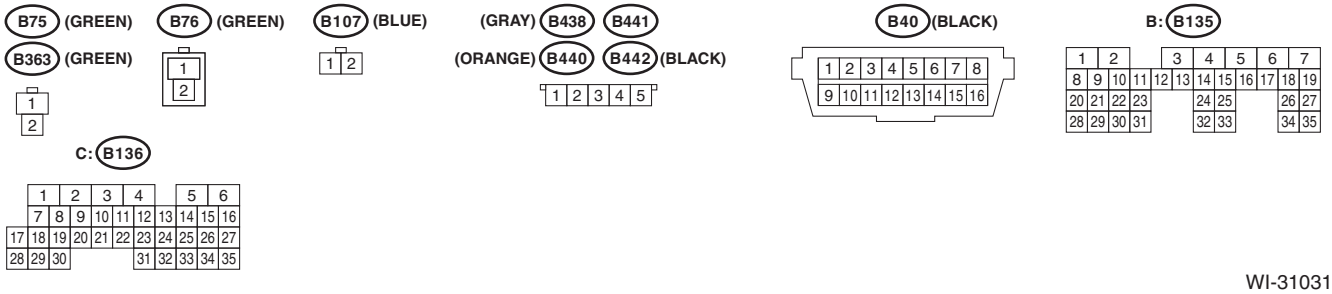

E/G(NA)-03
TO POWER SUPPLY CIRCUIT
ST-1 F/B FUSE NO. 21 (ST)
ST-2 IG SW (ST)
MB-24 SBF-7 (B)
MB-23 SBF-7 (B)
MB-22 SBF-5 (B)
*1 : MT MODEL : LW
AT MODEL : BL
*2 : MT MODEL : GB
AT MODEL : WR
*3 : MT MODEL : WB
AT MODEL : WR
STARTER RELAY B225
STARTER MOTOR
BATTERY
FUSE (RELAY BLOCK) B220
15A
B14
MAIN RELAY B220
IG RELAY B220
A/F, OXYGEN SENSOR RELAY B220
INHIBITOR SWITCH
P R N D
B106
CLUTCH START SWITCH
ELECTRONIC THROTTLE CONTROL RELAY B220
NEUTRAL POSITION SWITCH
B25 T2 T2 B25
A E/G(NA)-05
B E/G(NA)-10
C E/G(NA)-07
D E/G(NA)-05
E E/G(NA)-11
B: B135 C: B136 D: B137 ECM


B25 (BROWN)
B106
T7 (BLACK)
B12 (LIGHT GRAY)
D: B137
(BLACK) B220 B225 (BLACK)
RELAY BLOCK
B: B135
C: B136

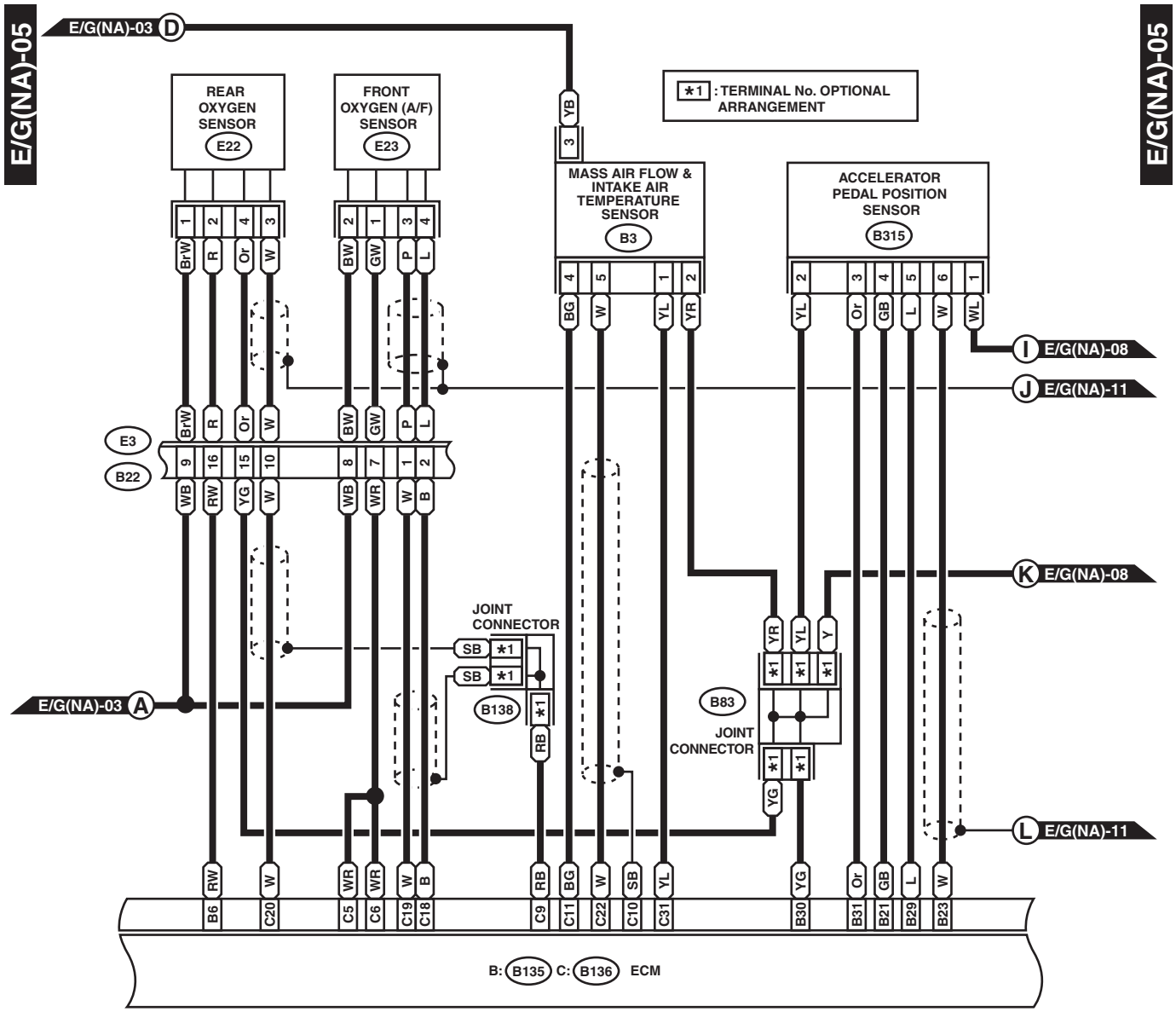
WI-31030

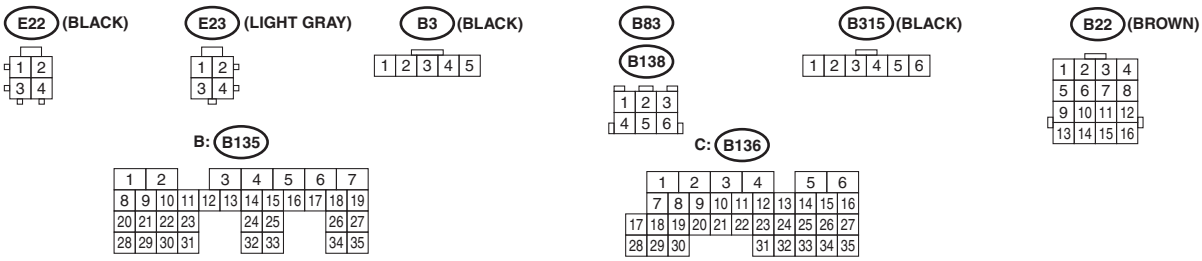
E/G(NA)-04



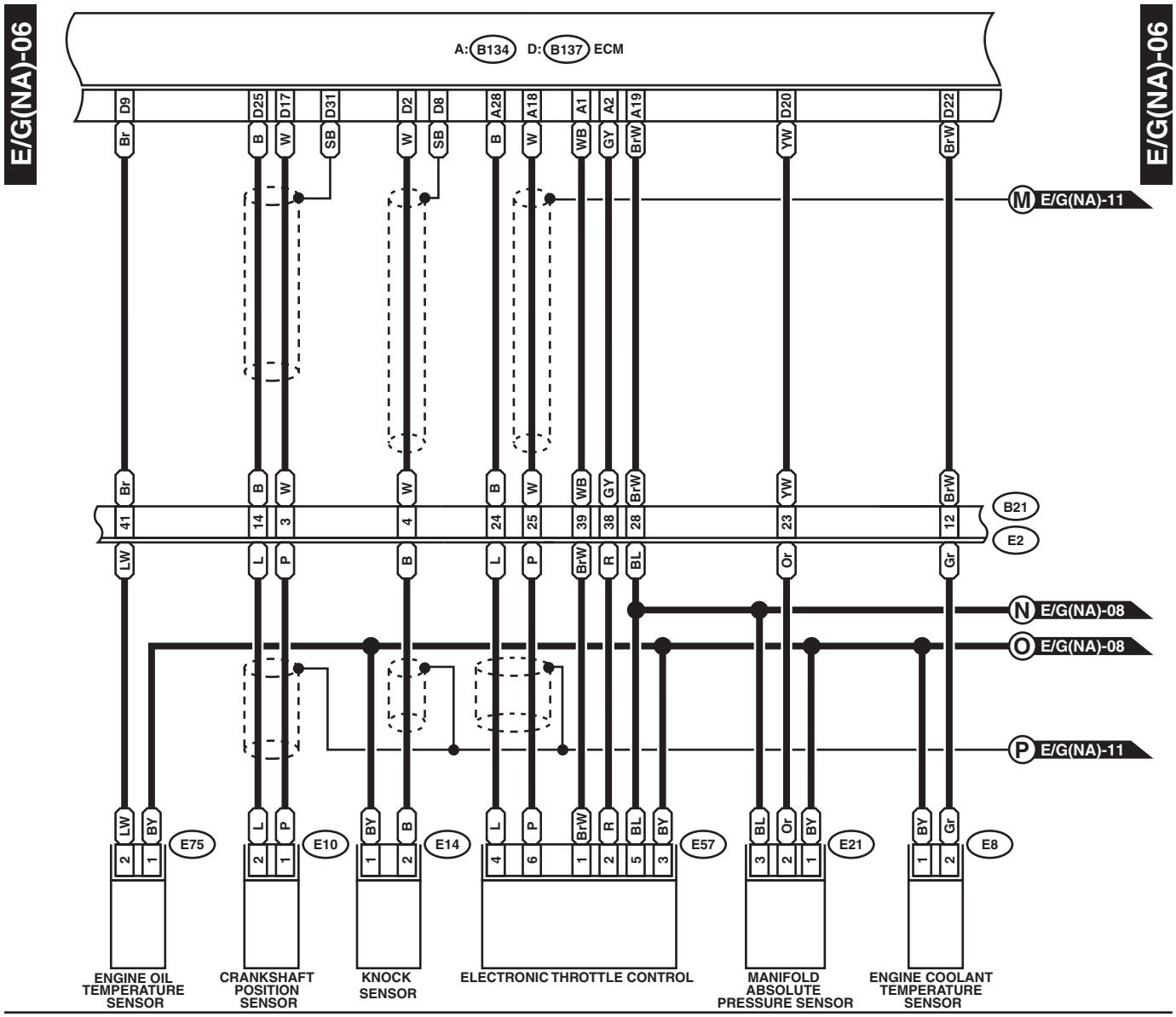


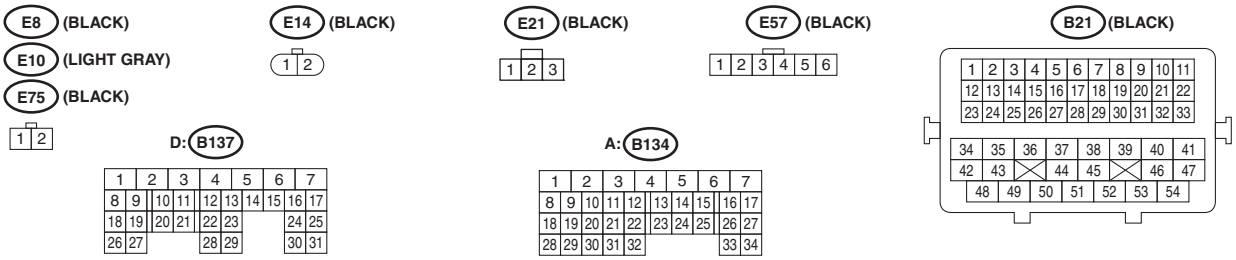
WI-31031


E/G(NA)-05
E/G(NA)-03 D
REAR OXYGEN SENSOR E22
FRONT OXYGEN (A/F) SENSOR E23
*1 : TERMINAL No. OPTIONAL ARRANGEMENT
MASS AIR FLOW & INTAKE AIR TEMPERATURE SENSOR B3
ACCELERATOR PEDAL POSITION SENSOR B315
E/G(NA)-08 I
E/G(NA)-11 J
E3
B22
E/G(NA)-08 K
JOINT CONNECTOR
B138
B83
JOINT CONNECTOR
E/G(NA)-03 A
E/G(NA)-11 L
B: B135 C: B136 ECM

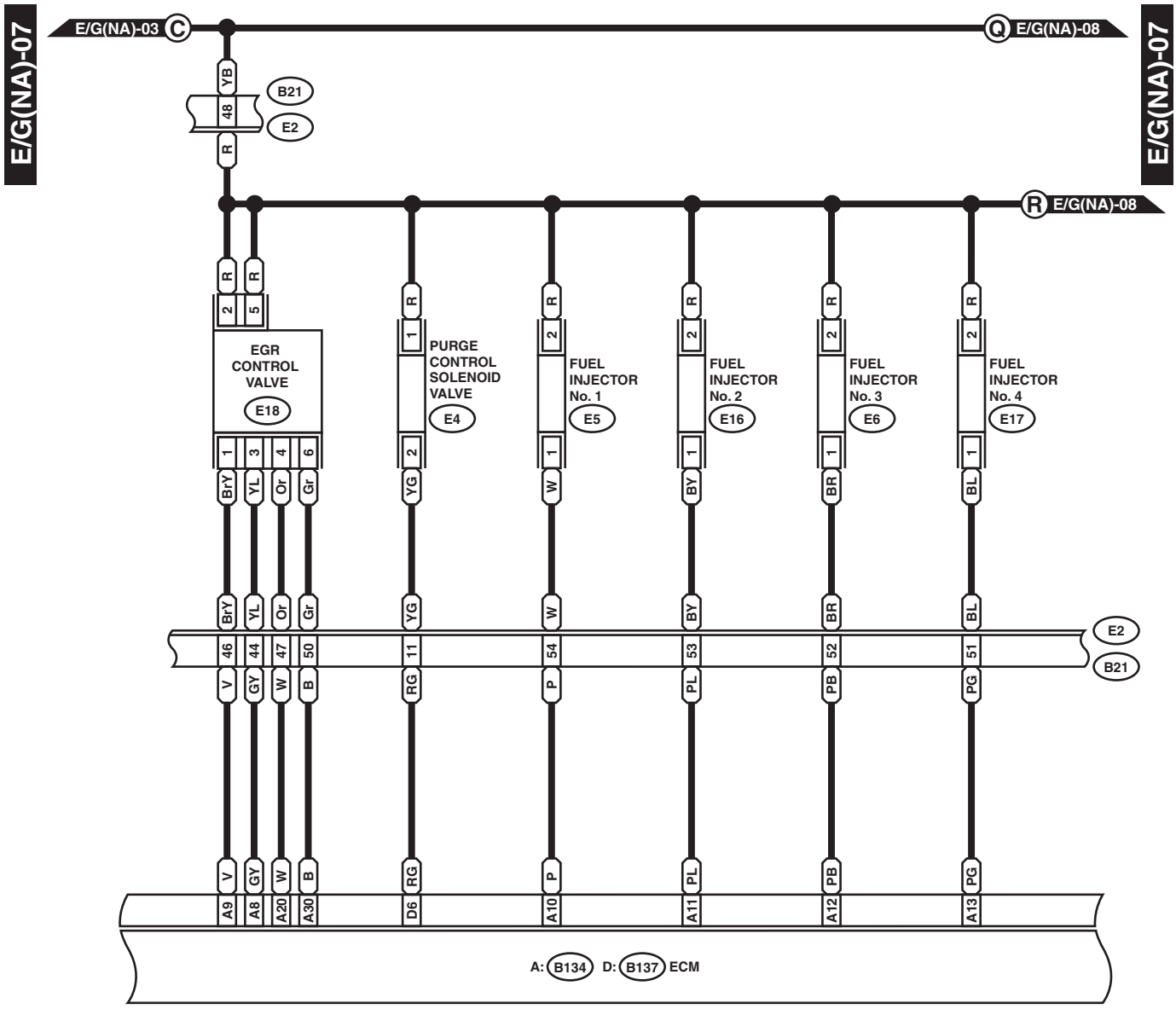

E22 (BLACK)
E23 (LIGHT GRAY)
B3 (BLACK)
B83
B138
B315 (BLACK)
B22 (BROWN)
B: B135
C: B136

WI-31032


E/G(NA)-06
E/G(NA)-06
A: B134 D: B137 ECM
D9 D25 D17 D31 D2 D8 A28 A18 A1 A2 A19 D20 D22
Br B W SB W SB B W WB GY BrW YW BrW
M E/G(NA)-11
41 14 3 4 24 25 39 38 28 23 12
B21
E2
LW L P B L P BrW R BL Or Gr
N E/G(NA)-08
O E/G(NA)-08
P E/G(NA)-11
LW BY L P BY B L P BrW R BL BY BL Or BY BY Gr
E75 E10 E14 E57 E21 E8
ENGINE OIL TEMPERATURE SENSOR
CRANKSHAFT POSITION SENSOR
KNOCK SENSOR
ELECTRONIC THROTTLE CONTROL
MANIFOLD ABSOLUTE PRESSURE SENSOR
ENGINE COOLANT TEMPERATURE SENSOR


E8 (BLACK)
E10 (LIGHT GRAY)
E75 (BLACK)
E14 (BLACK)
E21 (BLACK)
E57 (BLACK)
B21 (BLACK)
D: B137
A: B134

WI-31033



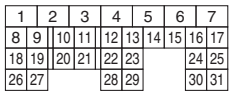
E4 (BLUE)

(DARK GRAY) E5 E16 (DARK GRAY)

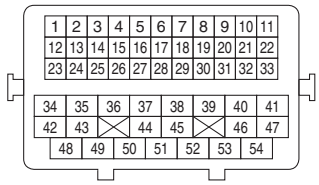
(DARK GRAY) E6 E17 (DARK GRAY)

E18 (DARK GRAY)

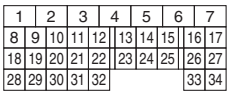
D: B137



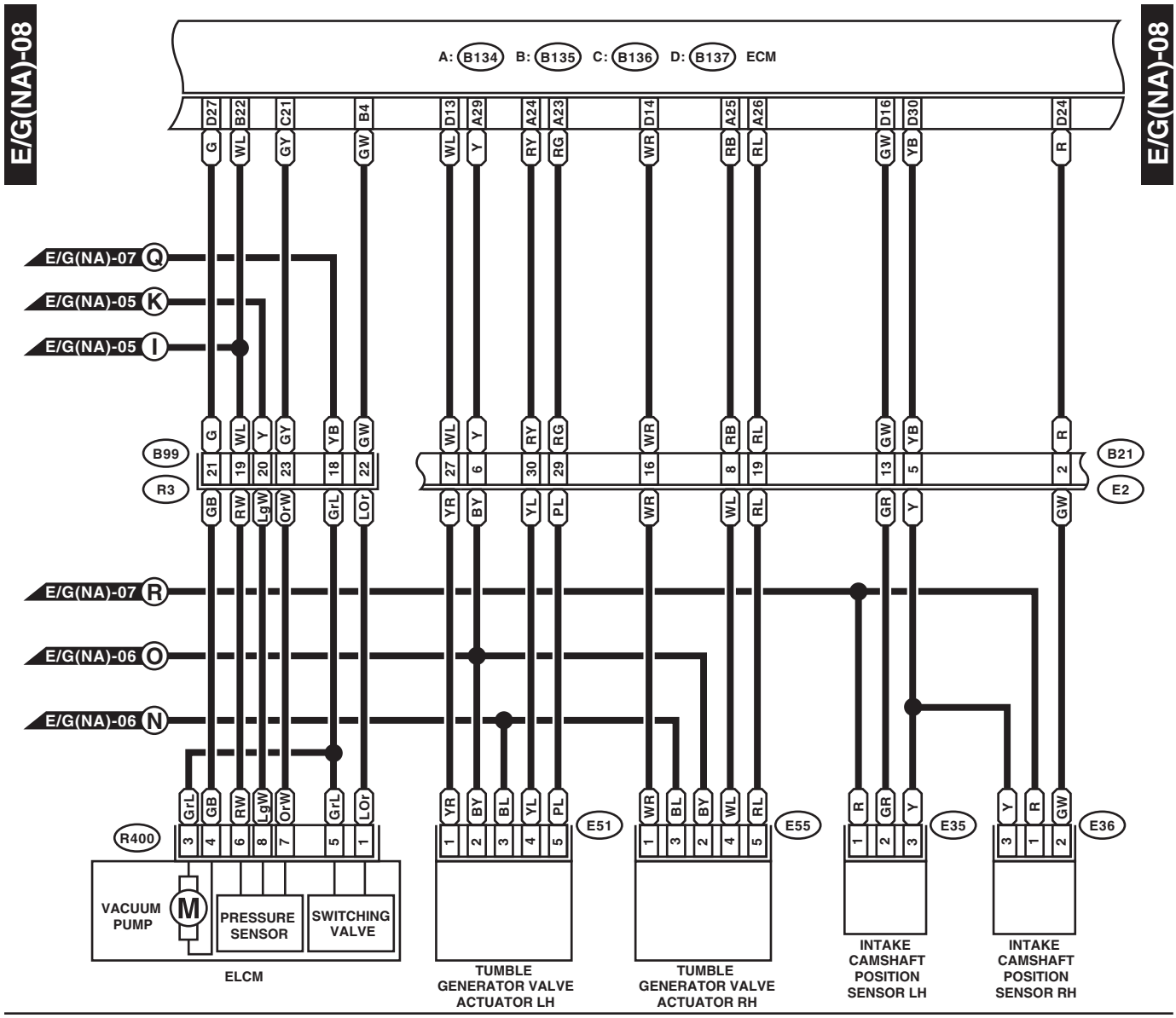
B21 (BLACK)



A: B134



WI-31034



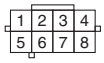
E35 (LIGHT GRAY)

E36 (LIGHT GRAY)

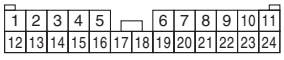
E51 (LIGHT GRAY)

E55 (LIGHT GRAY)

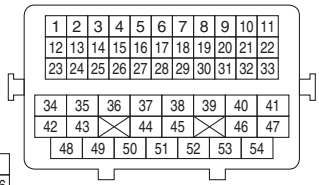
R400 (GRAY)



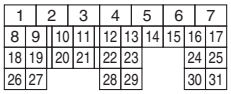
B99



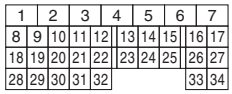
B21 (BLACK)



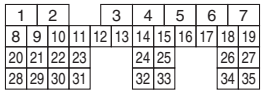
D: B137



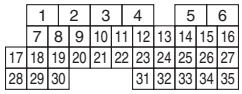
A: B134



B: B135

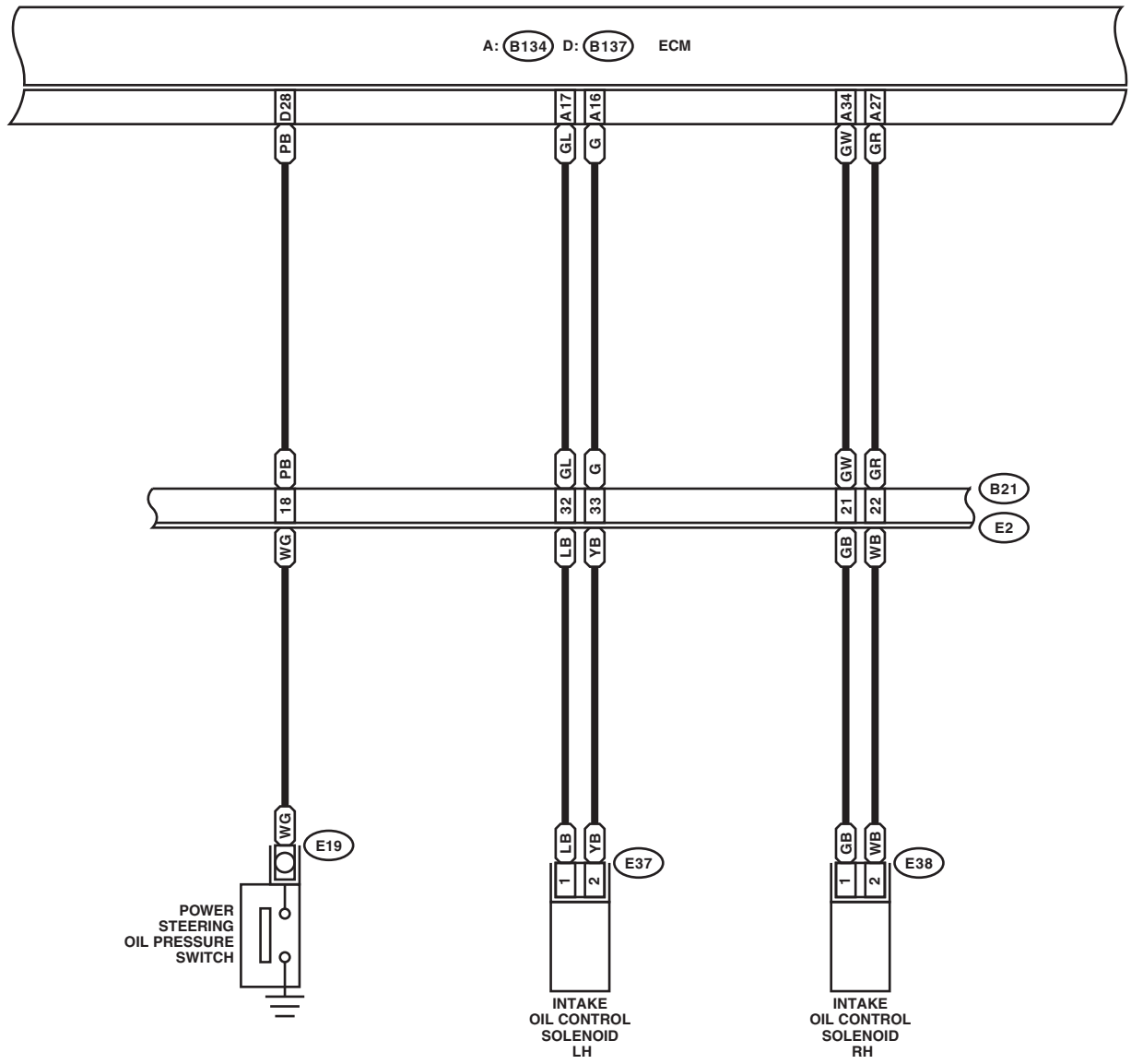


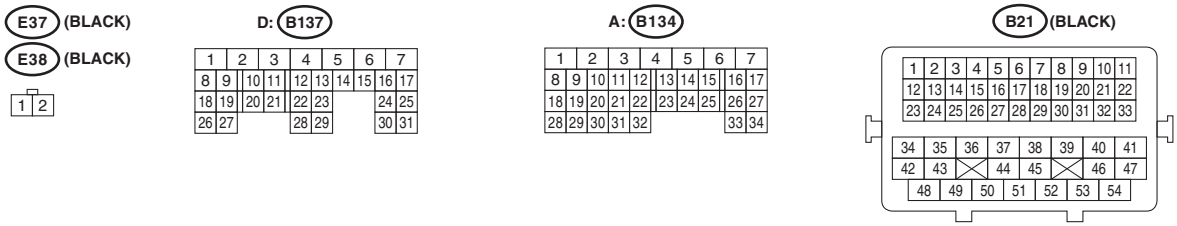
C: B136



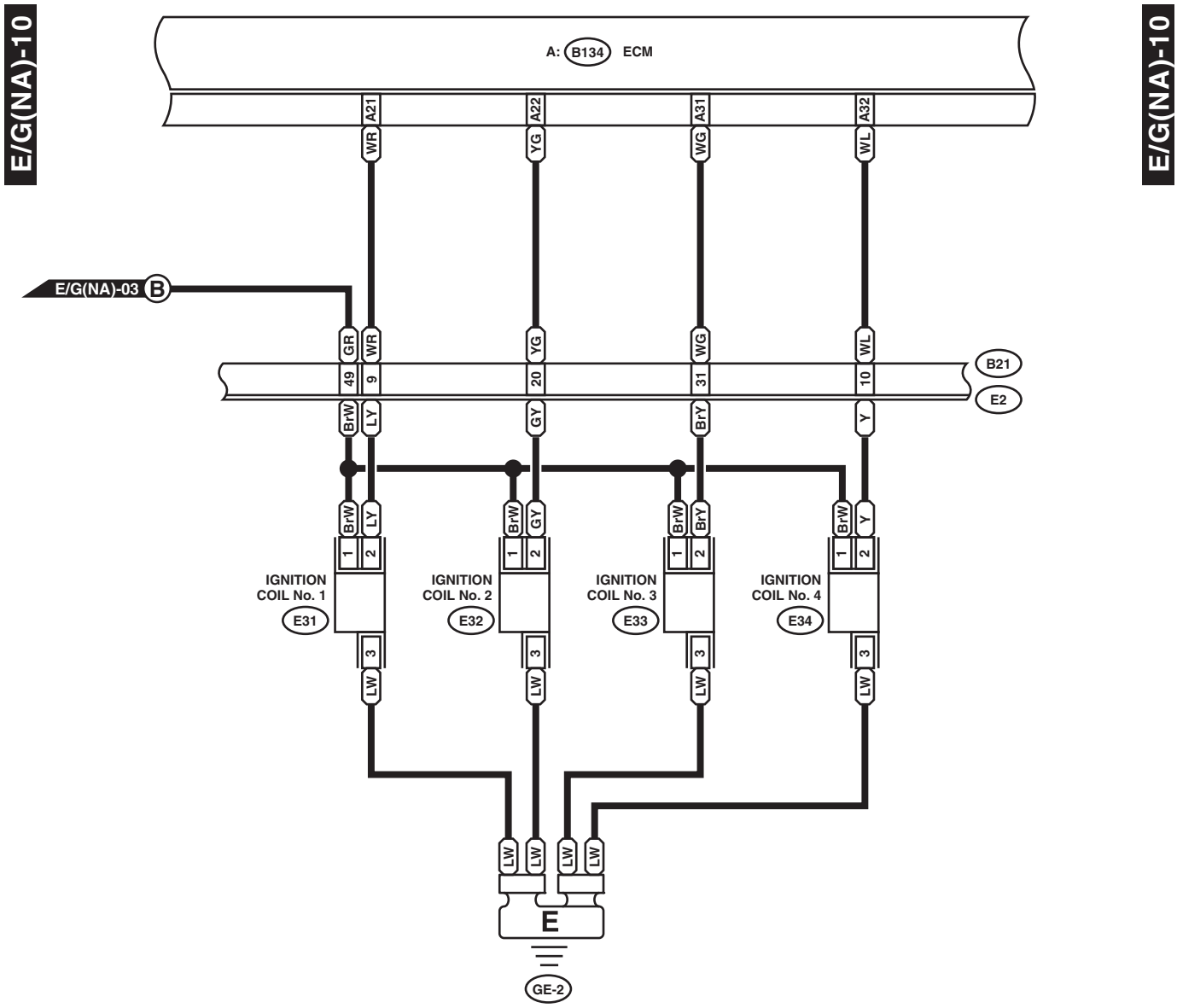
WI-31035

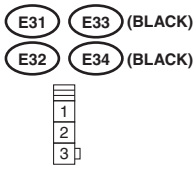
E/G(NA)-09

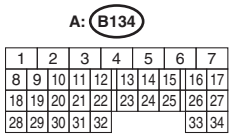


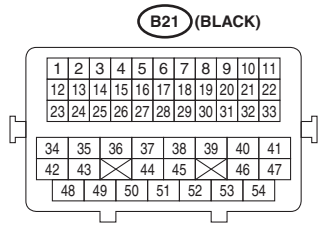


WI-31036

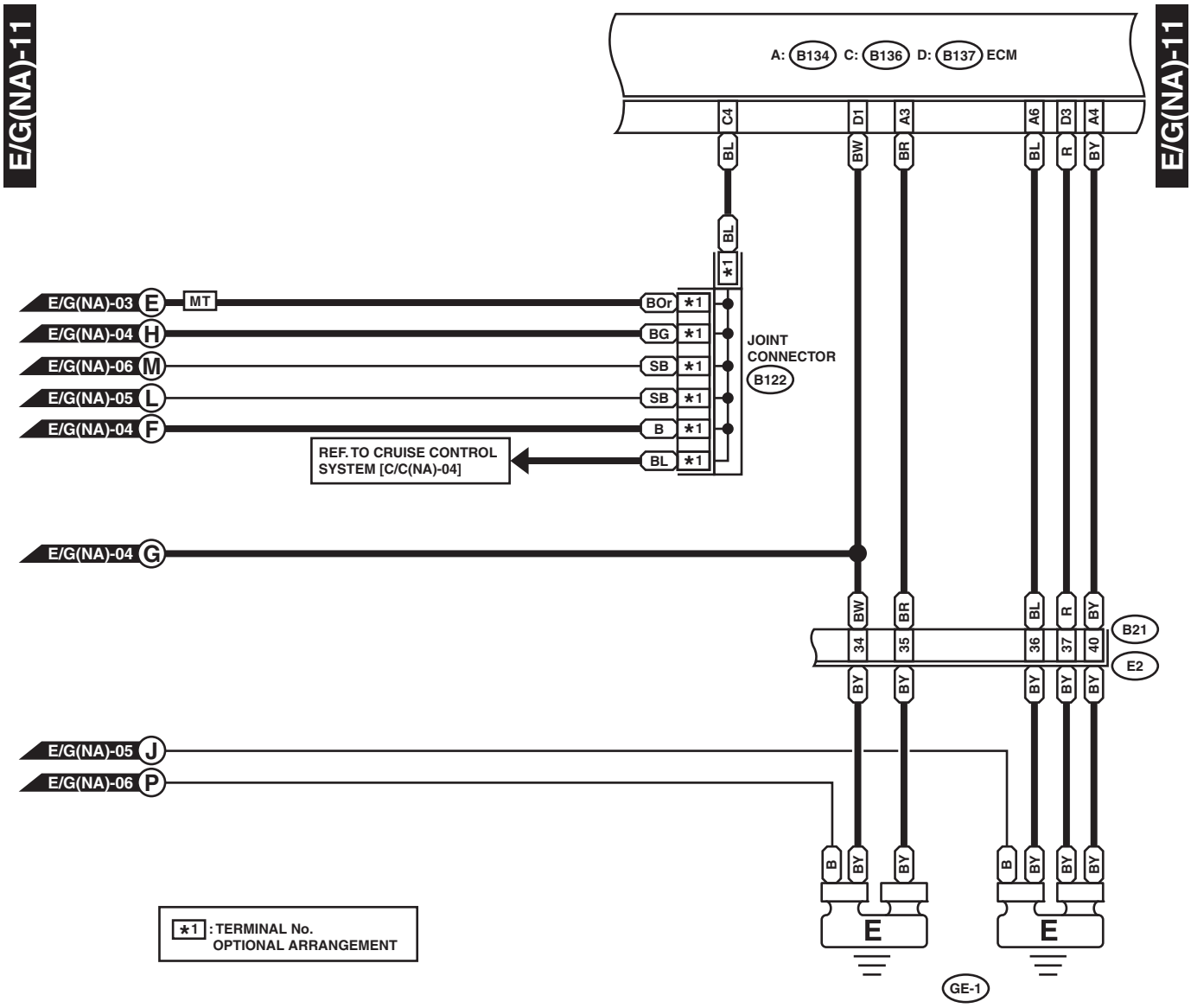

E/G(NA)-10
E/G(NA)-10
A: B134 ECM
A21
A22
A31
A32
WR
YG
WG
WL
E/G(NA)-03 B
GR
WR
YG
WG
WL
B21
E2
49
9
20
31
10
BrW
LY
GY
BrY
Y
1
2
IGNITION COIL No. 1
E31
IGNITION COIL No. 2
E32
IGNITION COIL No. 3
E33
IGNITION COIL No. 4
E34
3
LW
E
GE-2

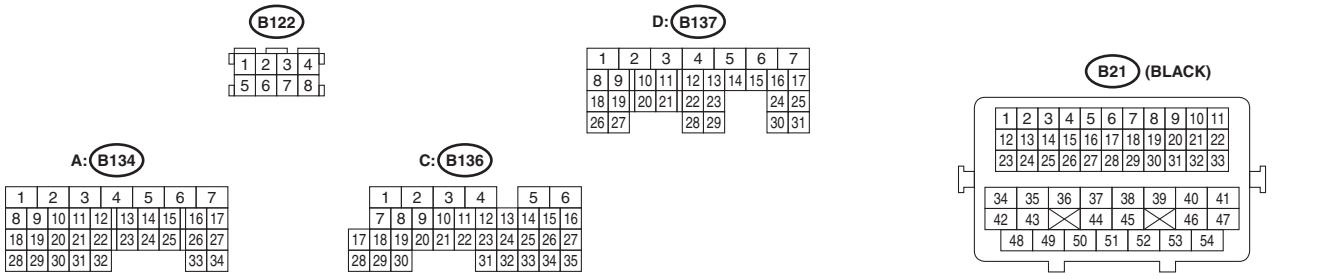

E31
E33
(BLACK)
E32
E34
(BLACK)
1
2
3


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


B21
(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

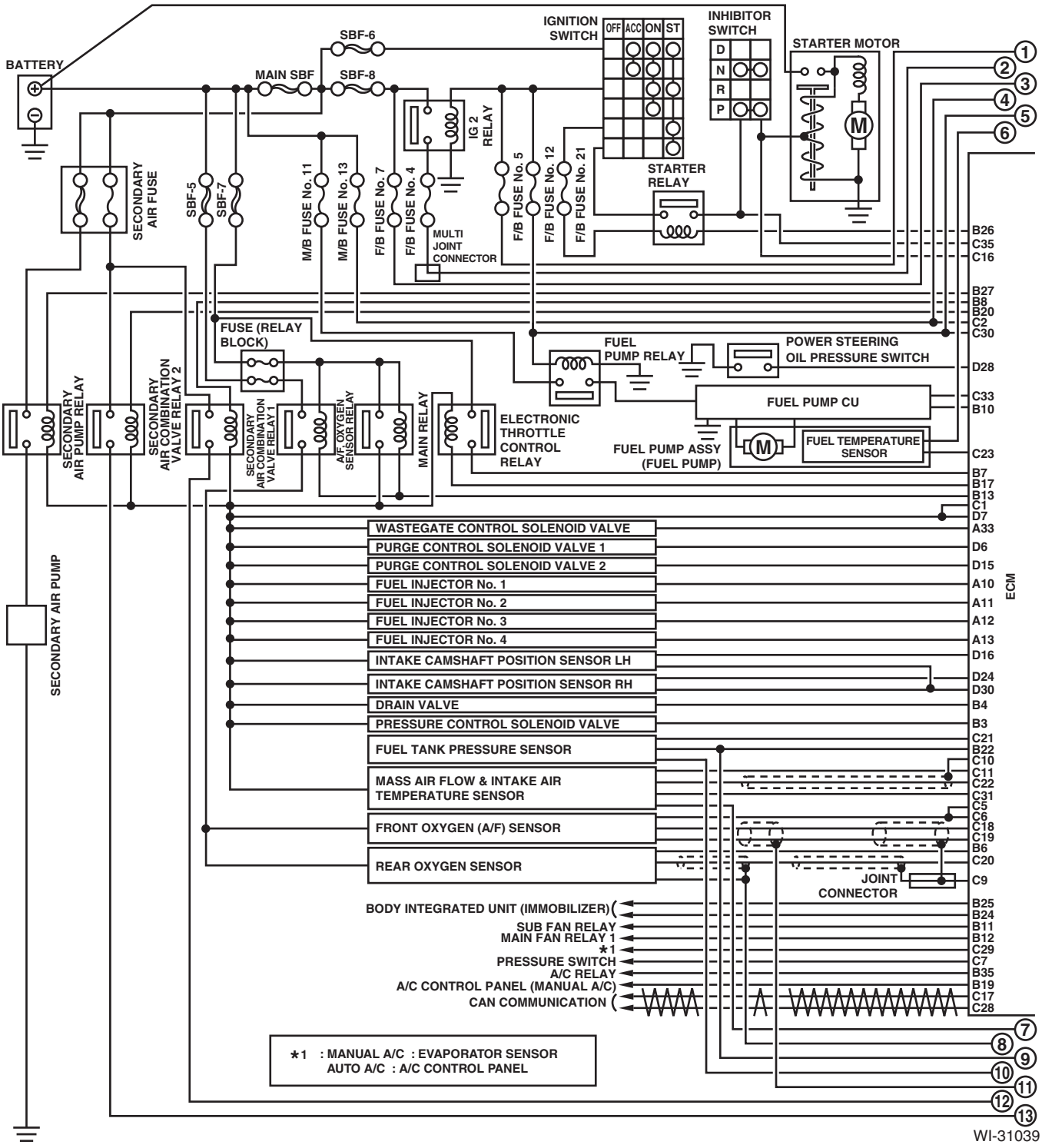
WI-31037

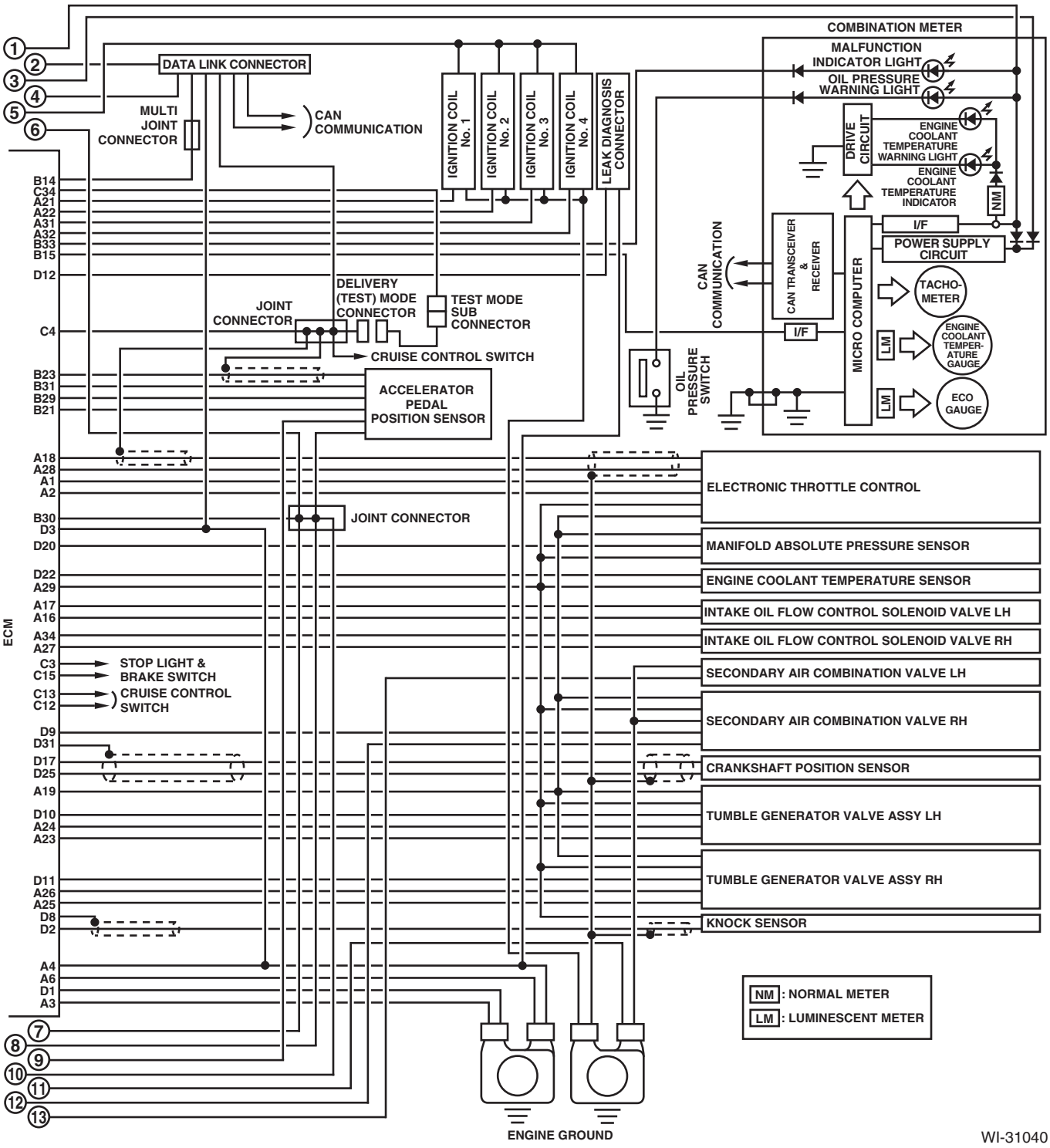

E/G(NA)-11
E/G(NA)-11
A: B134 C: B136 D: B137 ECM
C4
D1
A3
A6
D3
A4
BL
BW
BR
BL
R
BY
*1
E/G(NA)-03 E MT
E/G(NA)-04 H
E/G(NA)-06 M
E/G(NA)-05 L
E/G(NA)-04 F
BOr
BG
SB
SB
B
BL
JOINT CONNECTOR B122
REF. TO CRUISE CONTROL SYSTEM [C/C(NA)-04]
E/G(NA)-04 G
34
35
36
37
40
B21
E2
E/G(NA)-05 J
E/G(NA)-06 P
B
E
GE-1
*1 : TERMINAL No. OPTIONAL ARRANGEMENT

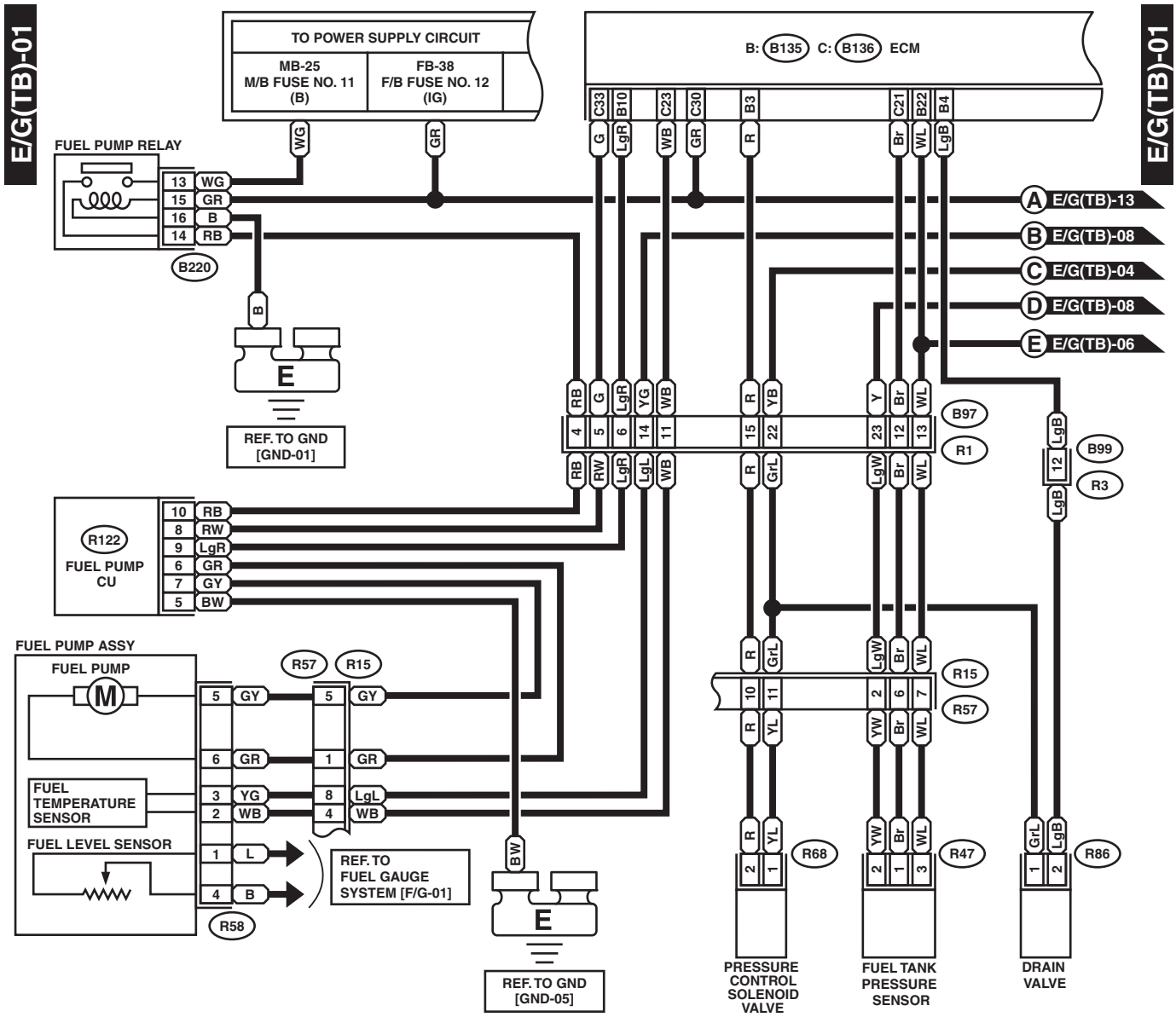

B122
1 2 3 4
5 6 7 8
D: B137
1 2 3 4 5 6 7
8 9 10 11 12 13 14 15 16 17
18 19 20 21 22 23 24 25
26 27 28 29 30 31
B21 (BLACK)
1 2 3 4 5 6 7 8 9 10 11
12 13 14 15 16 17 18 19 20 21 22
23 24 25 26 27 28 29 30 31 32 33
34 35 36 37 38 39 40 41
42 43 44 45 46 47
48 49 50 51 52 53 54
A: B134
1 2 3 4 5 6 7
8 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
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

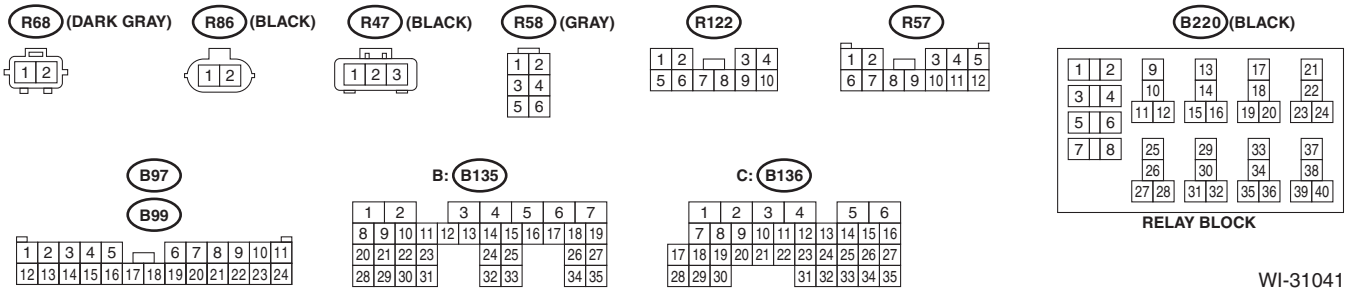
WI-31038

2. TURBO MODEL




COMBINATION METER
MALFUNCTION INDICATOR LIGHT
OIL PRESSURE WARNING LIGHT
ENGINE COOLANT TEMPERATURE WARNING LIGHT
ENGINE COOLANT TEMPERATURE INDICATOR
DRIVE CIRCUIT
NM
I/F
POWER SUPPLY CIRCUIT
TACHO-METER
ENGINE COOLANT TEMPER-ATURE GAUGE
ECO GAUGE
LM
MICRO COMPUTER
CAN TRANSCEIVER & RECEIVER
CAN COMMUNICATION
DATA LINK CONNECTOR
MULTI JOINT CONNECTOR
CAN COMMUNICATION
IGNITION COIL No. 1
IGNITION COIL No. 2
IGNITION COIL No. 3
IGNITION COIL No. 4
LEAK DIAGNOSIS CONNECTOR
JOINT CONNECTOR
DELIVERY (TEST) MODE CONNECTOR
TEST MODE SUB CONNECTOR
CRUISE CONTROL SWITCH
ACCELERATOR PEDAL POSITION SENSOR
OIL PRESSURE SWITCH
JOINT CONNECTOR
ECM
STOP LIGHT & BRAKE SWITCH
CRUISE CONTROL SWITCH
ELECTRONIC THROTTLE CONTROL
MANIFOLD ABSOLUTE PRESSURE SENSOR
ENGINE COOLANT TEMPERATURE SENSOR
INTAKE OIL FLOW CONTROL SOLENOID VALVE LH
INTAKE OIL FLOW CONTROL SOLENOID VALVE RH
SECONDARY AIR COMBINATION VALVE LH
SECONDARY AIR COMBINATION VALVE RH
CRANKSHAFT POSITION SENSOR
TUMBLE GENERATOR VALVE ASSY LH
TUMBLE GENERATOR VALVE ASSY RH
KNOCK SENSOR
NM : NORMAL METER
LM : LUMINESCENT METER
ENGINE GROUND
WI-31040

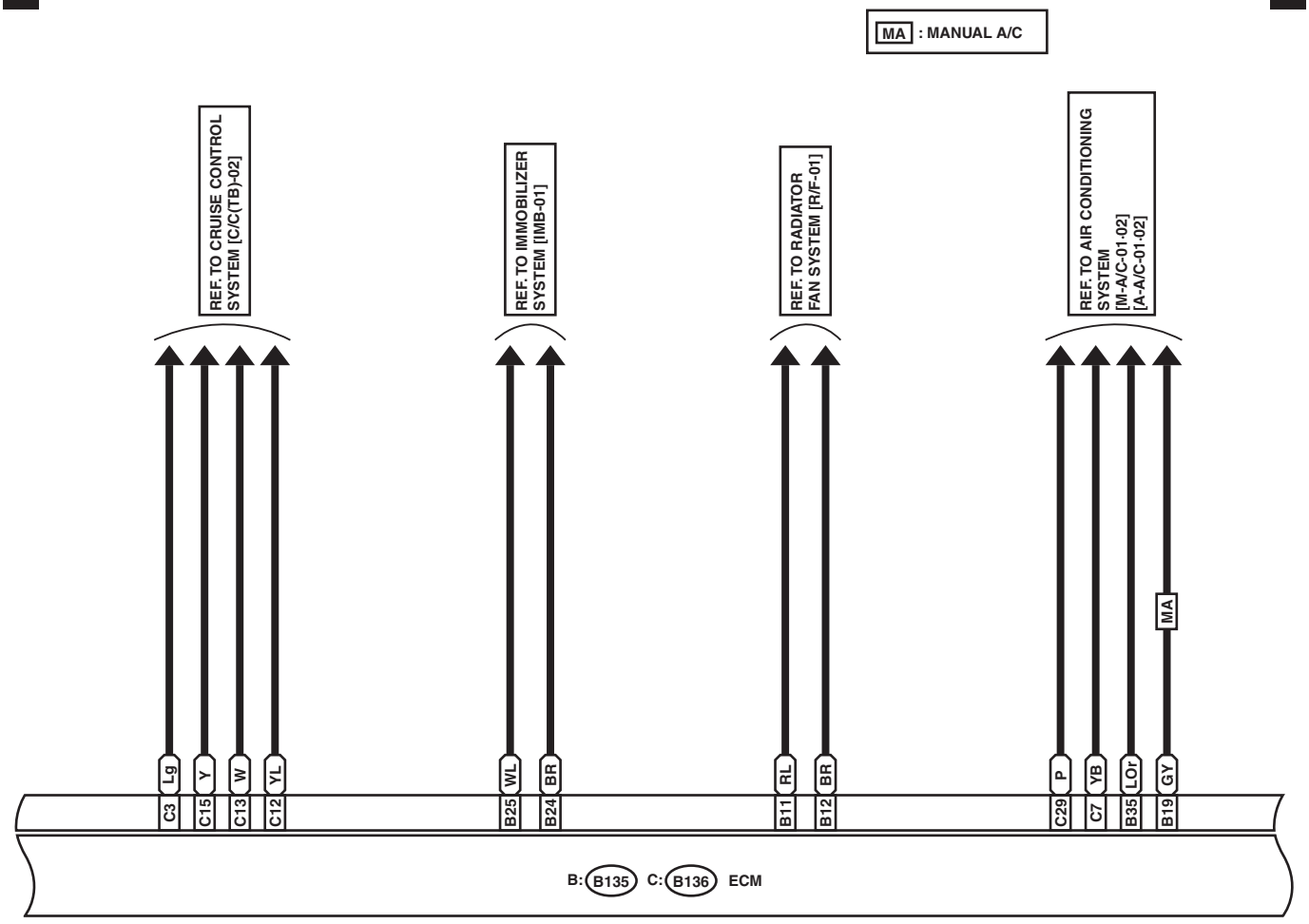

E/G(TB)-01
TO POWER SUPPLY CIRCUIT
MB-25 M/B FUSE NO. 11 (B)
FB-38 F/B FUSE NO. 12 (IG)
B: B135 C: B136 ECM
FUEL PUMP RELAY
B220
REF. TO GND [GND-01]
A E/G(TB)-13
B E/G(TB)-08
C E/G(TB)-04
D E/G(TB)-08
E E/G(TB)-06
B97
R1
B99
R3
R122 FUEL PUMP CU
FUEL PUMP ASSY
FUEL PUMP
FUEL TEMPERATURE SENSOR
FUEL LEVEL SENSOR
R57
R15
R58
REF. TO FUEL GAUGE SYSTEM [F/G-01]
REF. TO GND [GND-05]
R68
R47
R86
PRESSURE CONTROL SOLENOID VALVE
FUEL TANK PRESSURE SENSOR
DRAIN VALVE


R68 (DARK GRAY)
R86 (BLACK)
R47 (BLACK)
R58 (GRAY)
R122
R57
B220 (BLACK)
RELAY BLOCK
B97
B99
B: B135
C: B136

WI-31041

E/G(TB)-02

E/G(TB)-02



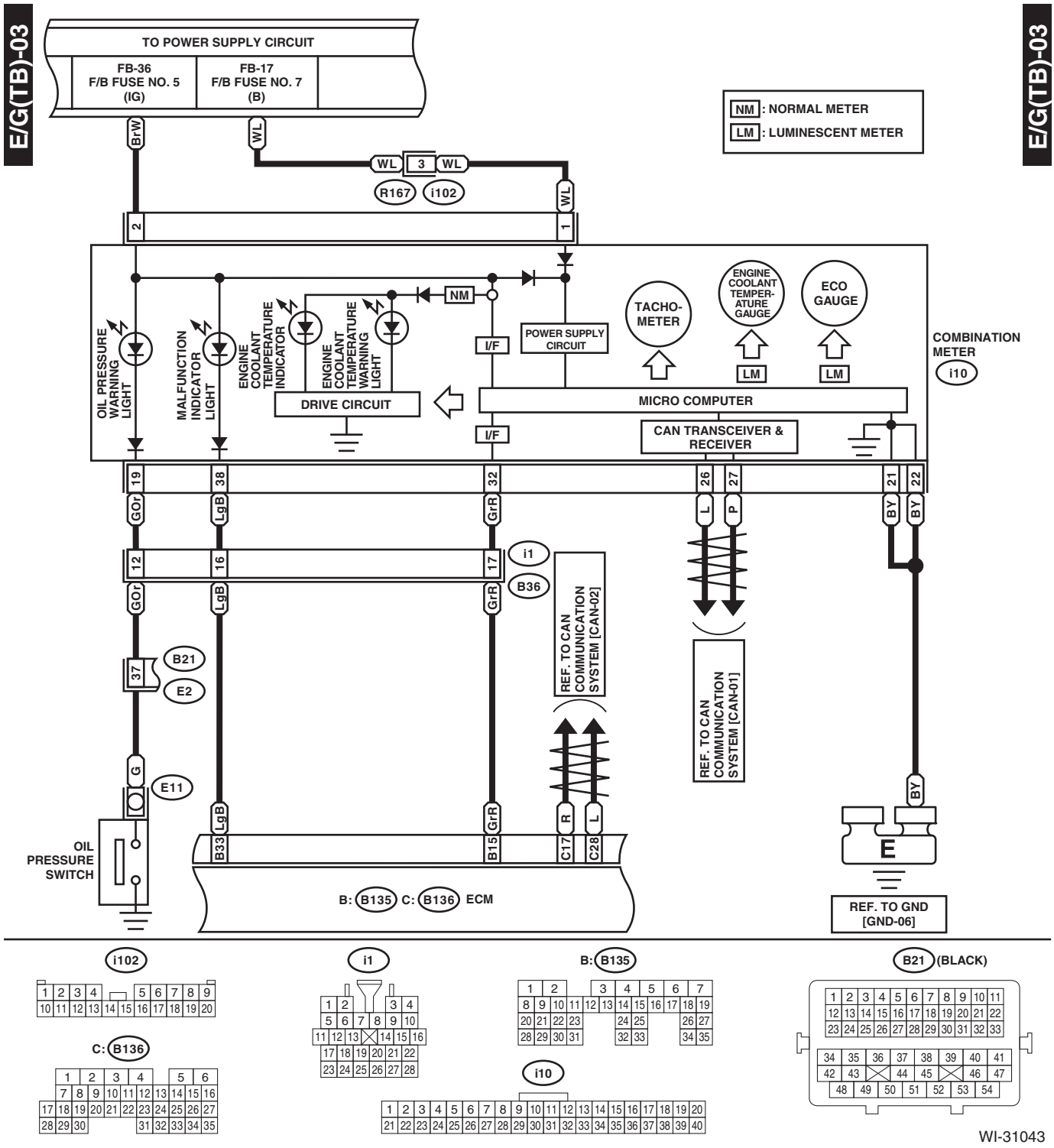
B: B135

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

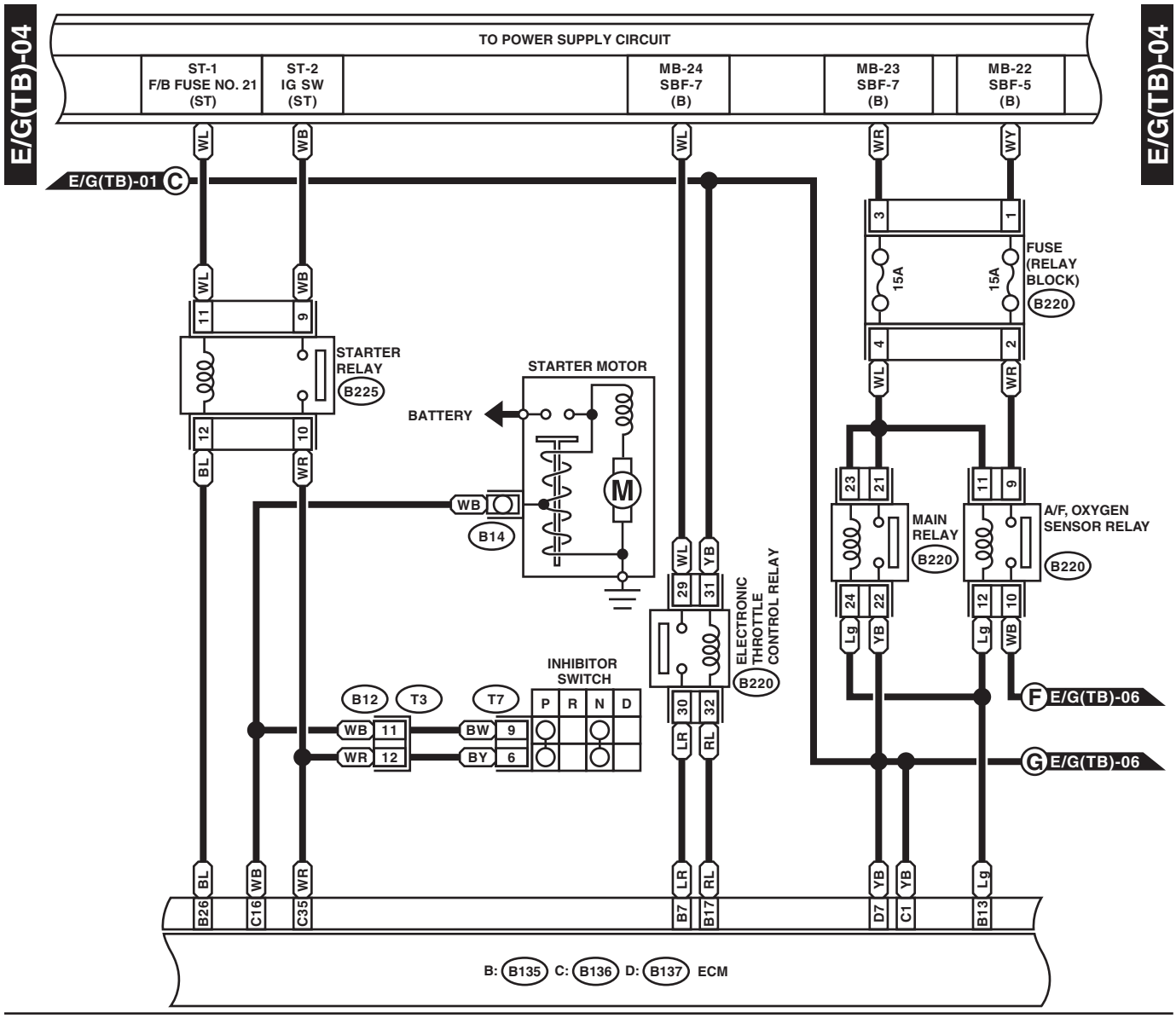
	1	2	3	4					5	6								
7	8	9	10	11	12	13	14	15	16									
17	18	19	20	21	22	23	24	25	26	27								
28	29	30			31	32	33	34	35									

WI-31042

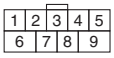

E/G(TB)-03
E/G(TB)-03
TO POWER SUPPLY CIRCUIT
FB-36
F/B FUSE NO. 5
(IG)
FB-17
F/B FUSE NO. 7
(B)
NM : NORMAL METER
LM : LUMINESCENT METER
BrW
WL
WL
3
WL
R167
i102
WL
2
1
NM
I/F
POWER SUPPLY CIRCUIT
TACHO-METER
ENGINE COOLANT TEMPER-ATURE GAUGE
ECO GAUGE
COMBINATION METER
i10
LM
LM
OIL PRESSURE WARNING LIGHT
MALFUNCTION INDICATOR LIGHT
ENGINE COOLANT TEMPERATURE INDICATOR
ENGINE COOLANT TEMPERATURE WARNING LIGHT
DRIVE CIRCUIT
MICRO COMPUTER
I/F
CAN TRANSCEIVER & RECEIVER
19
38
32
26
27
21
22
GOr
LgB
GrR
L
P
BY
BY
12
16
17
i1
B36
GOr
LgB
GrR
37
B21
E2
G
E11
REF. TO CAN COMMUNICATION SYSTEM [CAN-02]
REF. TO CAN COMMUNICATION SYSTEM [CAN-01]
BY
LgB
GrR
R
L
B33
B15
C17
C28
E
OIL PRESSURE SWITCH
B: B135 C: B136 ECM
REF. TO GND [GND-06]

i102
C: B136
i1
B: B135
i10
B21 (BLACK)

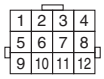
WI-31043



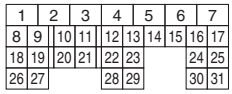
T7 (BLACK)



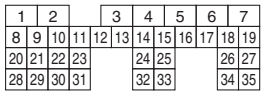
B12 (LIGHT GRAY)



D: B137

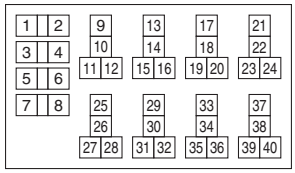


B: B135



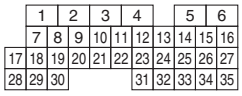
B220 (BLACK)

B225 (BLACK)

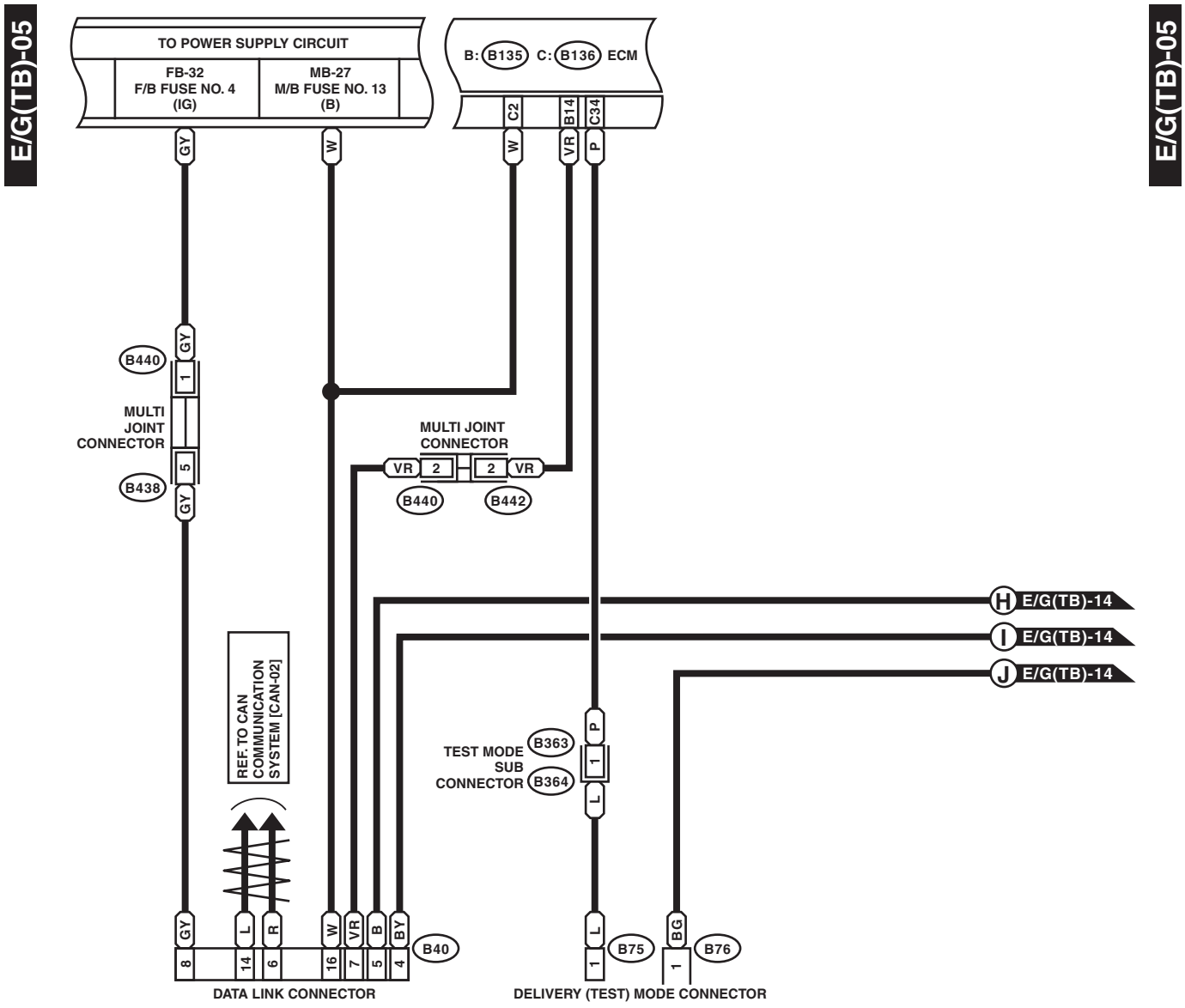


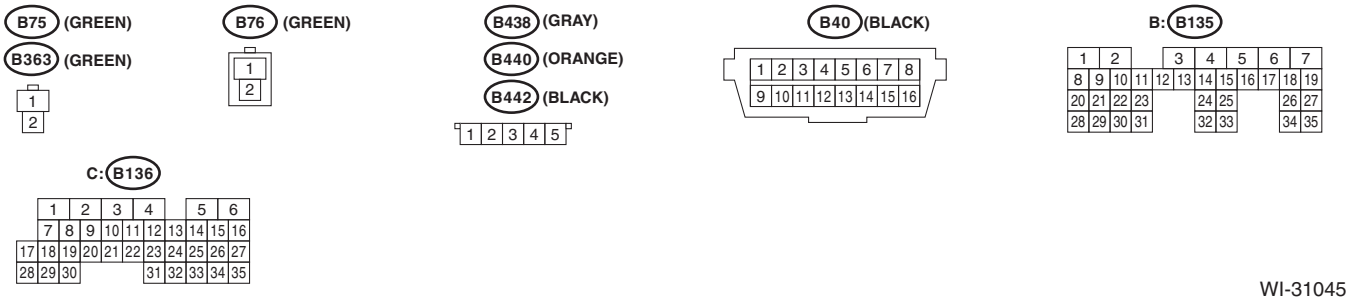
RELAY BLOCK

C: B136

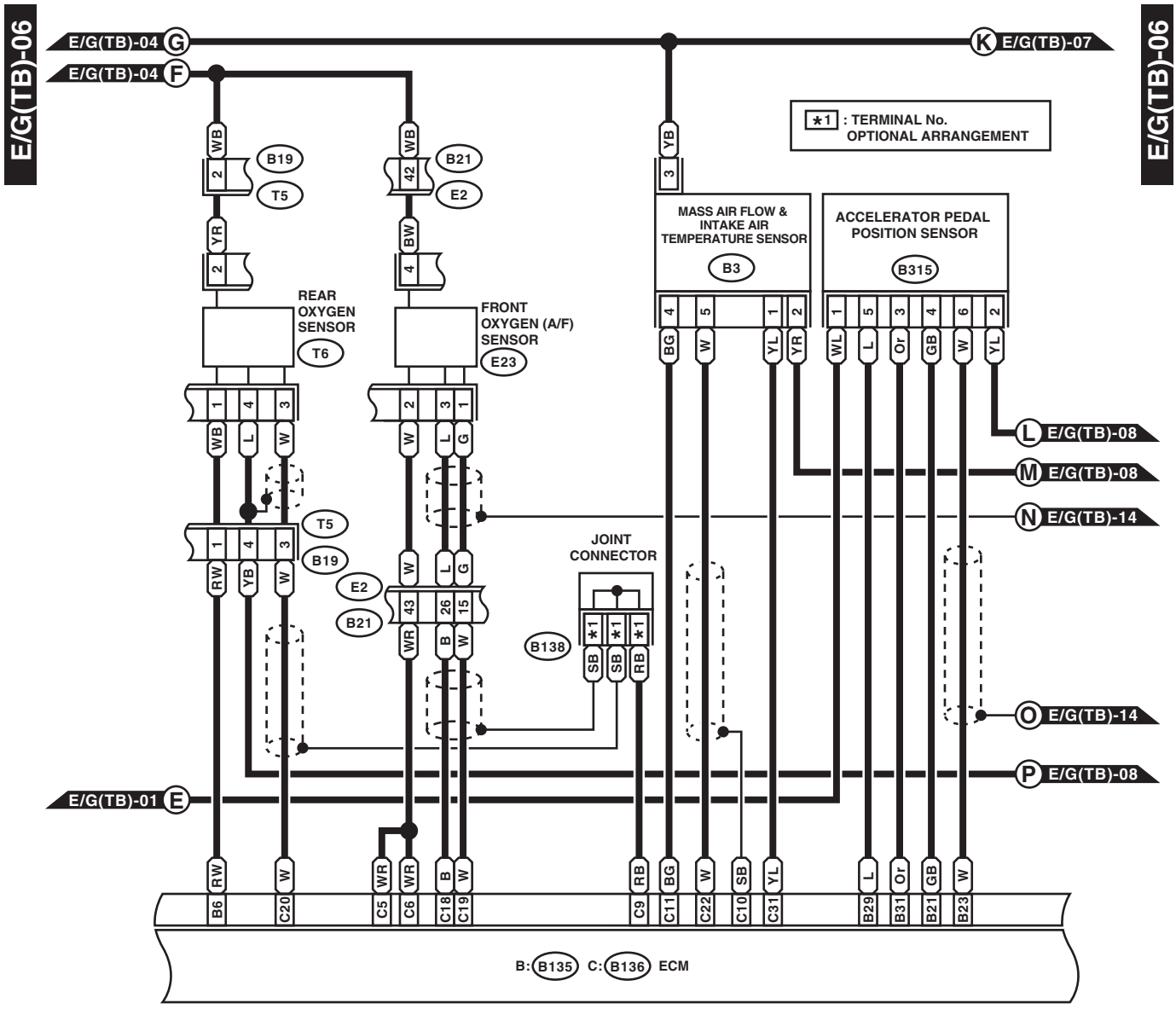


WI-31044


E/G(TB)-05
E/G(TB)-05
TO POWER SUPPLY CIRCUIT
FB-32
F/B FUSE NO. 4
(IG)
MB-27
M/B FUSE NO. 13
(B)
B: B135 C: B136 ECM
C2
B14
C34
GY
W
W
VR
P
B440
GY
1
MULTI
JOINT
CONNECTOR
5
B438
GY
MULTI JOINT
CONNECTOR
VR
2
2
VR
B440
B442
H E/G(TB)-14
I E/G(TB)-14
J E/G(TB)-14
REF. TO CAN
COMMUNICATION
SYSTEM [CAN-02]
TEST MODE
SUB
CONNECTOR
B363
B364
P
1
L
GY
L
R
W
VR
B
BY
B40
8
14
6
16
7
5
4
L
BG
B75
B76
1
1
DATA LINK CONNECTOR
DELIVERY (TEST) MODE CONNECTOR

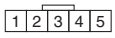

B75 (GREEN)
B363 (GREEN)
B76 (GREEN)
B438 (GRAY)
B440 (ORANGE)
B442 (BLACK)
B40 (BLACK)
B: B135
C: B136

WI-31045

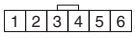


B19 (LIGHT GRAY)
E23 (DARK GRAY)
T6 (DARK GRAY)

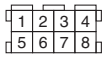
B3 (BLACK)



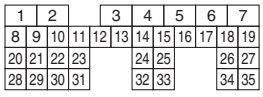
B315 (BLACK)



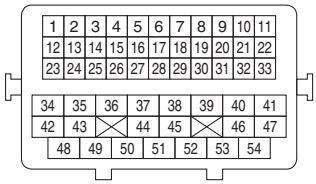
B138



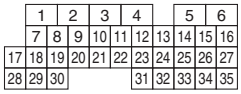
B: B135



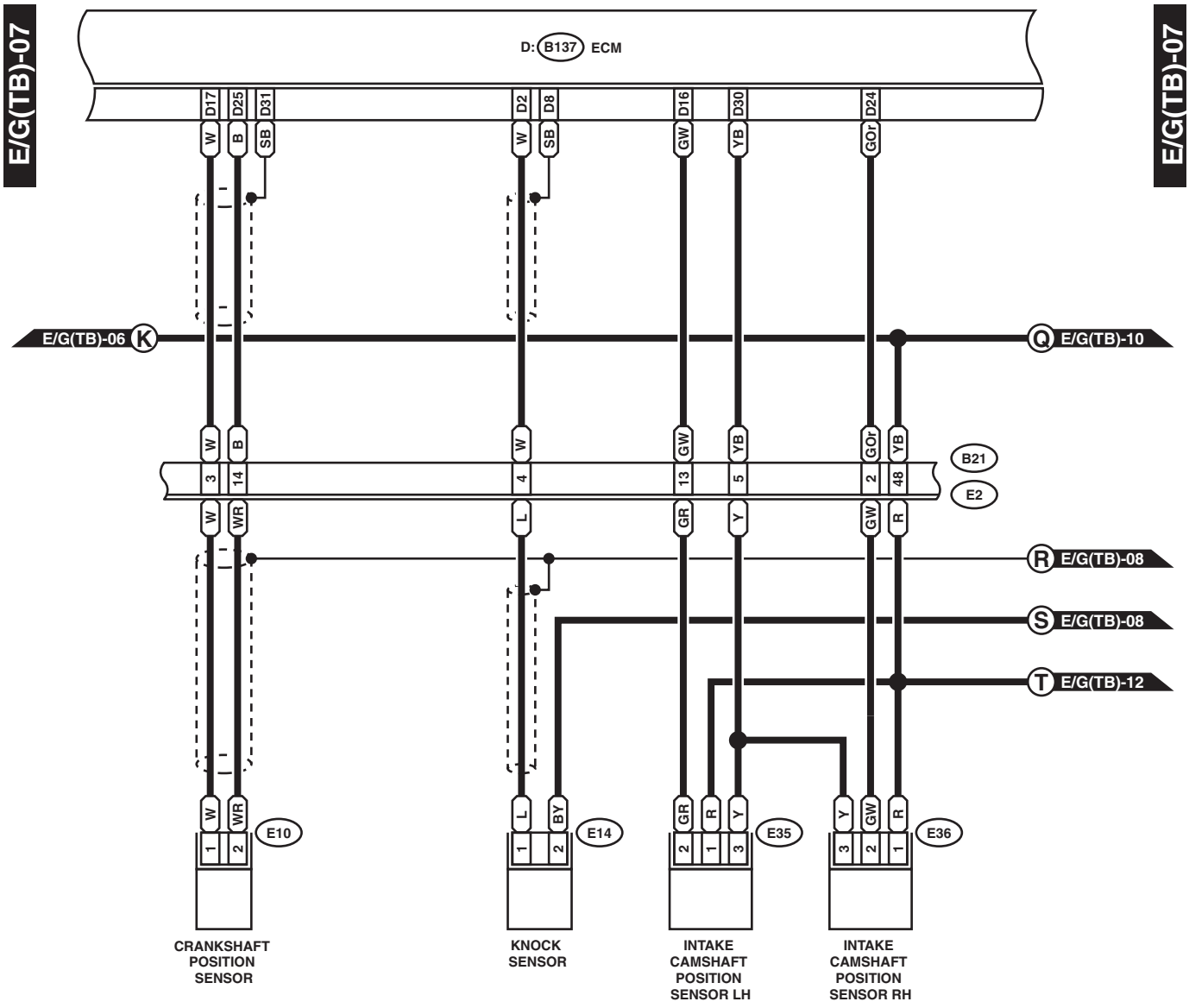
B21 (BLACK)



C: B136



WI-31046



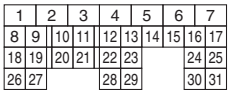
E10 (LIGHT GRAY)

E14 (LIGHT GRAY)

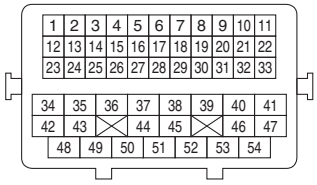
E35 (LIGHT GRAY)

E36 (LIGHT GRAY)

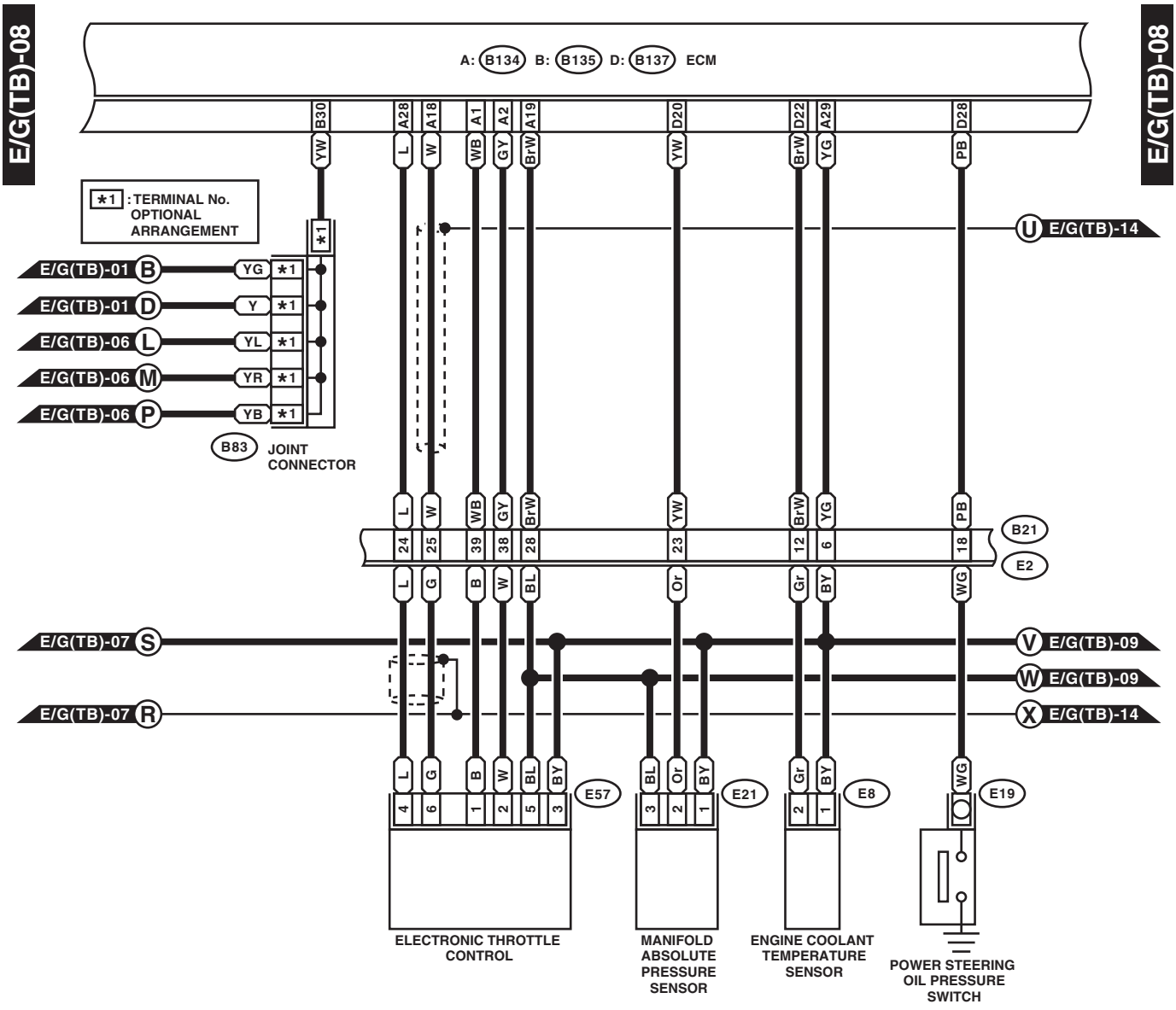
D: B137

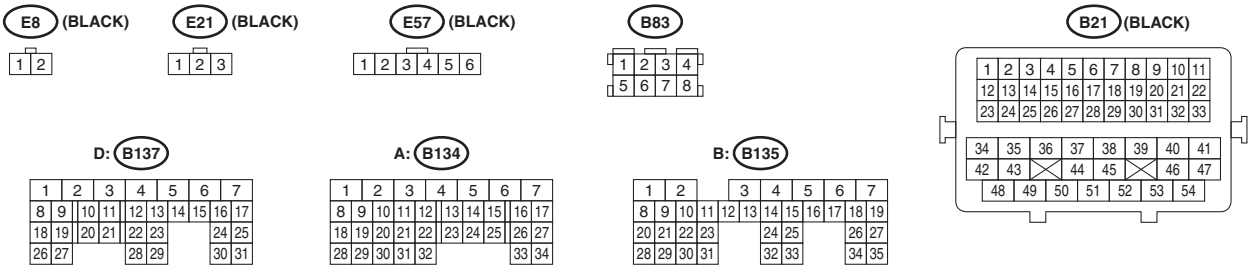


B21 (BLACK)

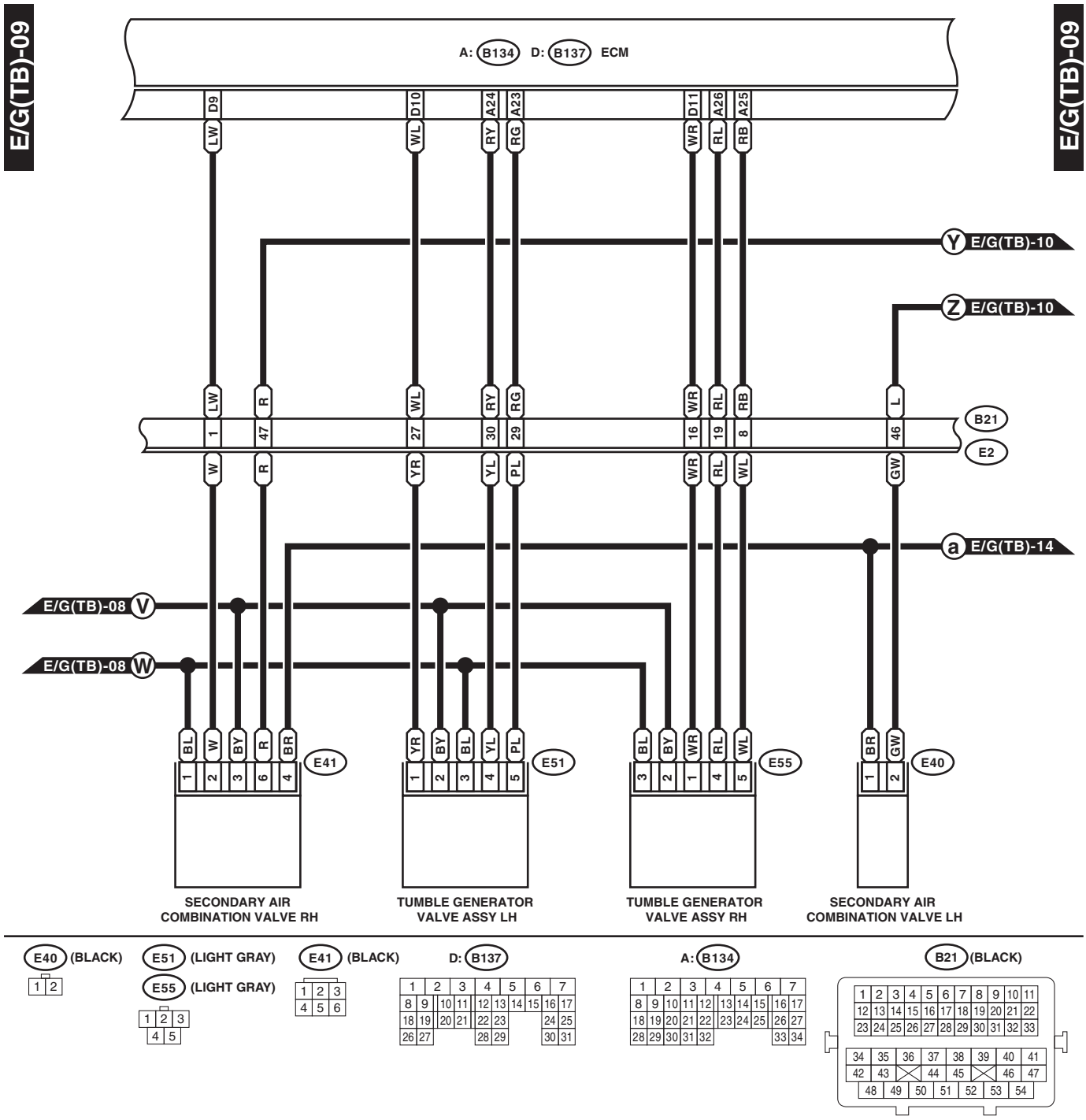


WI-31047

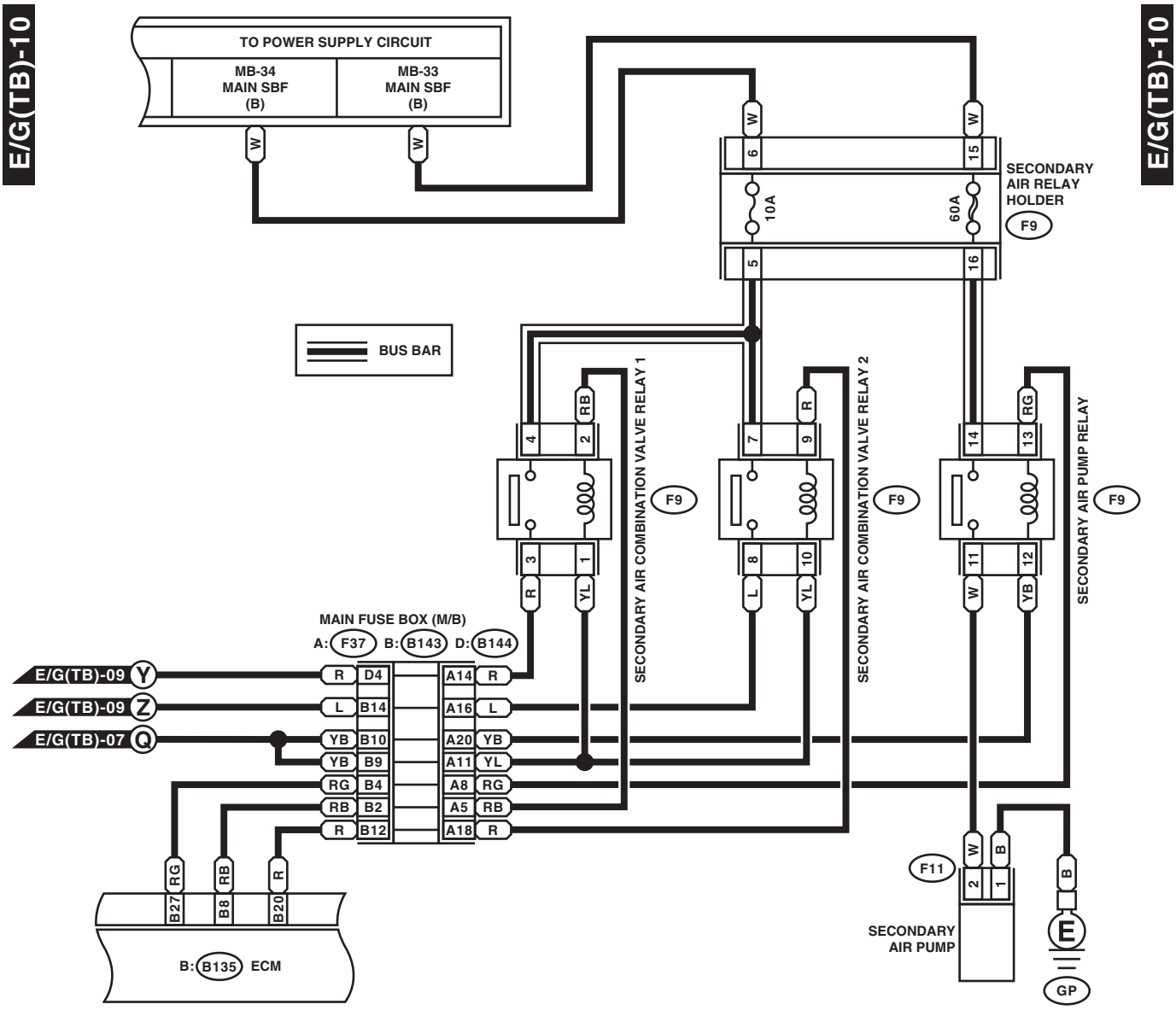

E/G(TB)-08
E/G(TB)-08
A: B134 B: B135 D: B137 ECM
B30 A28 A18 A1 A2 A19 D20 D22 A29 D28
YW L W WB GY BrW YW BrW YG PB
*1 : TERMINAL No. OPTIONAL ARRANGEMENT
*1
E/G(TB)-01 B YG *1
E/G(TB)-01 D Y *1
E/G(TB)-06 L YL *1
E/G(TB)-06 M YR *1
E/G(TB)-06 P YB *1
B83 JOINT CONNECTOR
U E/G(TB)-14
L W WB GY BrW YW BrW YG PB
24 25 39 38 28 23 12 6 18
B21
E2
L G B W BL Or Gr BY WG
E/G(TB)-07 S
E/G(TB)-07 R
V E/G(TB)-09
W E/G(TB)-09
X E/G(TB)-14
L G B W BL BY BL Or BY Gr BY WG
4 6 1 2 5 3 3 2 1 2 1
E57
E21
E8
E19
ELECTRONIC THROTTLE CONTROL
MANIFOLD ABSOLUTE PRESSURE SENSOR
ENGINE COOLANT TEMPERATURE SENSOR
POWER STEERING OIL PRESSURE SWITCH

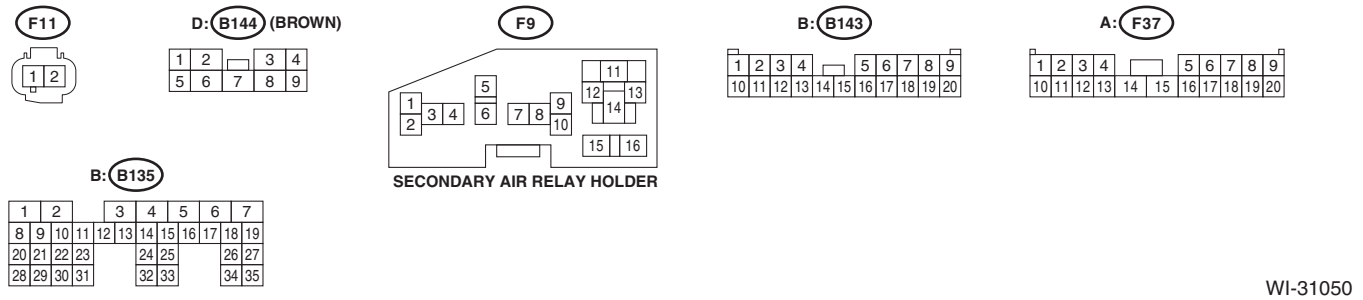

E8 (BLACK)
1 2
E21 (BLACK)
1 2 3
E57 (BLACK)
1 2 3 4 5 6
B83
1 2 3 4
5 6 7 8
B21 (BLACK)
1 2 3 4 5 6 7 8 9 10 11
12 13 14 15 16 17 18 19 20 21 22
23 24 25 26 27 28 29 30 31 32 33
34 35 36 37 38 39 40 41
42 43 44 45 46 47
48 49 50 51 52 53 54
D: B137
1 2 3 4 5 6 7
8 9 10 11 12 13 14 15 16 17
18 19 20 21 22 23 24 25
26 27 28 29 30 31
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
B: B135
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-31048


E/G(TB)-09
E/G(TB)-09
A: B134 D: B137 ECM
D9 D10 A24 A23 D11 A26 A25
LW WL RY RG WR RL RB
Y E/G(TB)-10
Z E/G(TB)-10
LW R WL RY RG WR RL RB L
1 47 27 30 29 16 19 8 46
B21
E2
W R YR YL PL WR RL WL GW
a E/G(TB)-14
E/G(TB)-08 V
E/G(TB)-08 W
BL W BY R BR E41
1 2 3 6 4
YR BY BL YL PL E51
1 2 3 4 5
BL BY WR RL WL E55
3 2 1 4 5
BR GW E40
1 2
SECONDARY AIR COMBINATION VALVE RH
TUMBLE GENERATOR VALVE ASSY LH
TUMBLE GENERATOR VALVE ASSY RH
SECONDARY AIR COMBINATION VALVE LH
E40 (BLACK)
1 2
E51 (LIGHT GRAY)
E55 (LIGHT GRAY)
1 2 3
4 5
E41 (BLACK)
1 2 3
4 5 6
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
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
B21 (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

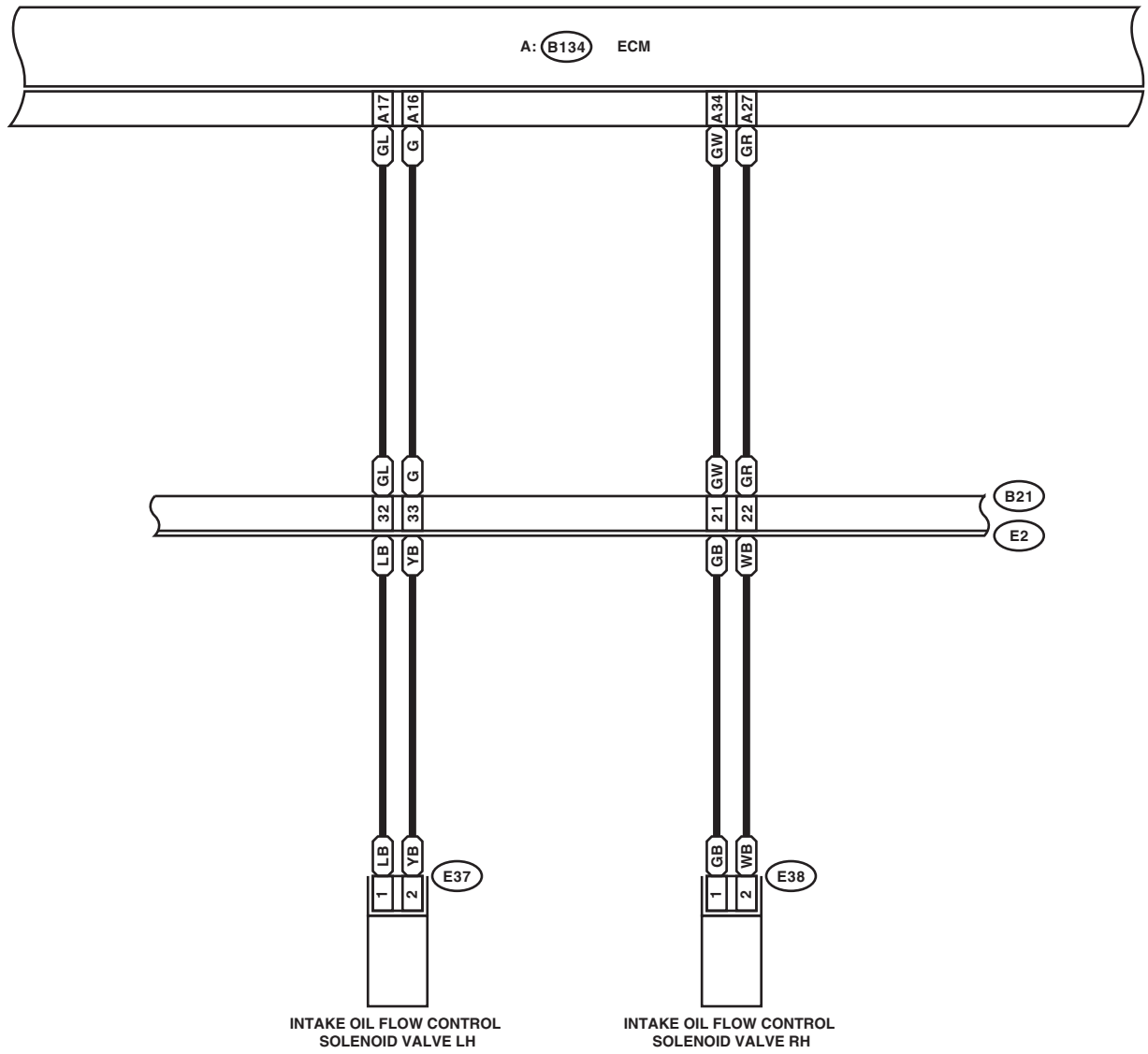
WI-31049


E/G(TB)-10
E/G(TB)-10
TO POWER SUPPLY CIRCUIT
MB-34 MAIN SBF (B)
MB-33 MAIN SBF (B)
W
W
W
W
6
15
SECONDARY AIR RELAY HOLDER
F9
10A
60A
5
16
BUS BAR
SECONDARY AIR COMBINATION VALVE RELAY 1
SECONDARY AIR COMBINATION VALVE RELAY 2
SECONDARY AIR PUMP RELAY
RB
R
RG
4
2
7
9
14
13
F9
F9
F9
3
1
8
10
11
12
R
YL
L
YL
W
YB
MAIN FUSE BOX (M/B)
A: F37 B: B143 D: B144
E/G(TB)-09 Y
E/G(TB)-09 Z
E/G(TB)-07 Q
R D4
L B14
YB B10
YB B9
RG B4
RB B2
R B12
A14 R
A16 L
A20 YB
A11 YL
A8 RG
A5 RB
A18 R
RG
RB
R
B27
B8
B20
B: B135 ECM
F11
W
B
2
1
B
SECONDARY AIR PUMP
E
GP


F11
D: B144 (BROWN)
F9
B: B143
A: F37
B: B135
SECONDARY AIR RELAY HOLDER

WI-31050

E/G(TB)-11

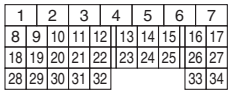


E/G(TB)-11

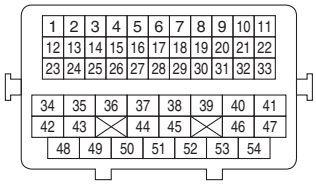
E37 (BLUE)

E38 (BLUE)

A: B134



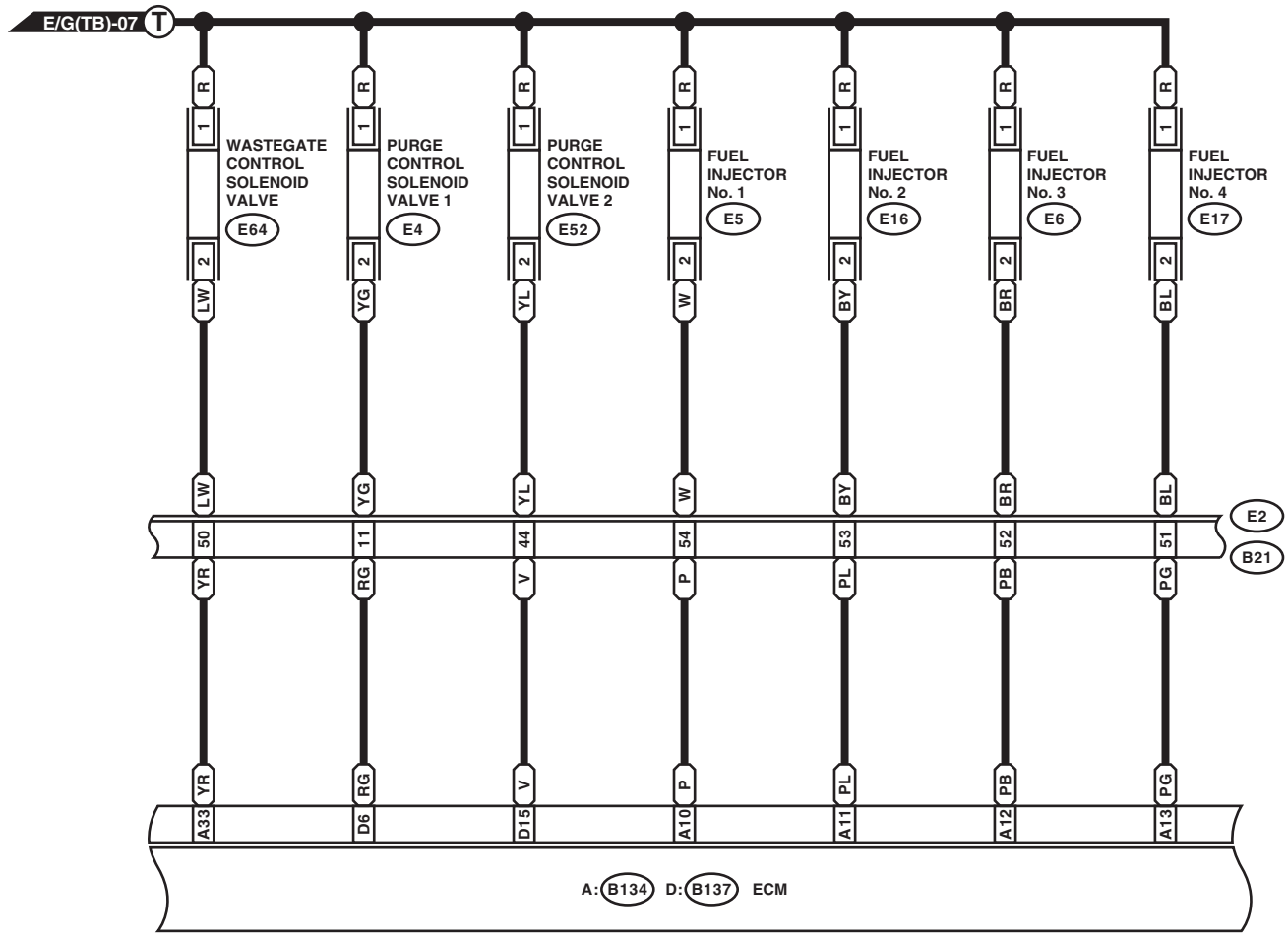
B21 (BLACK)



WI-31051

E/G(TB)-12

E/G(TB)-12



E4 (BLACK)

E52 (BLACK)

E64 (BLUE)

E5 (DARK GRAY)

E6 (DARK GRAY)

E16 (DARK GRAY)

E17 (DARK GRAY)

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				

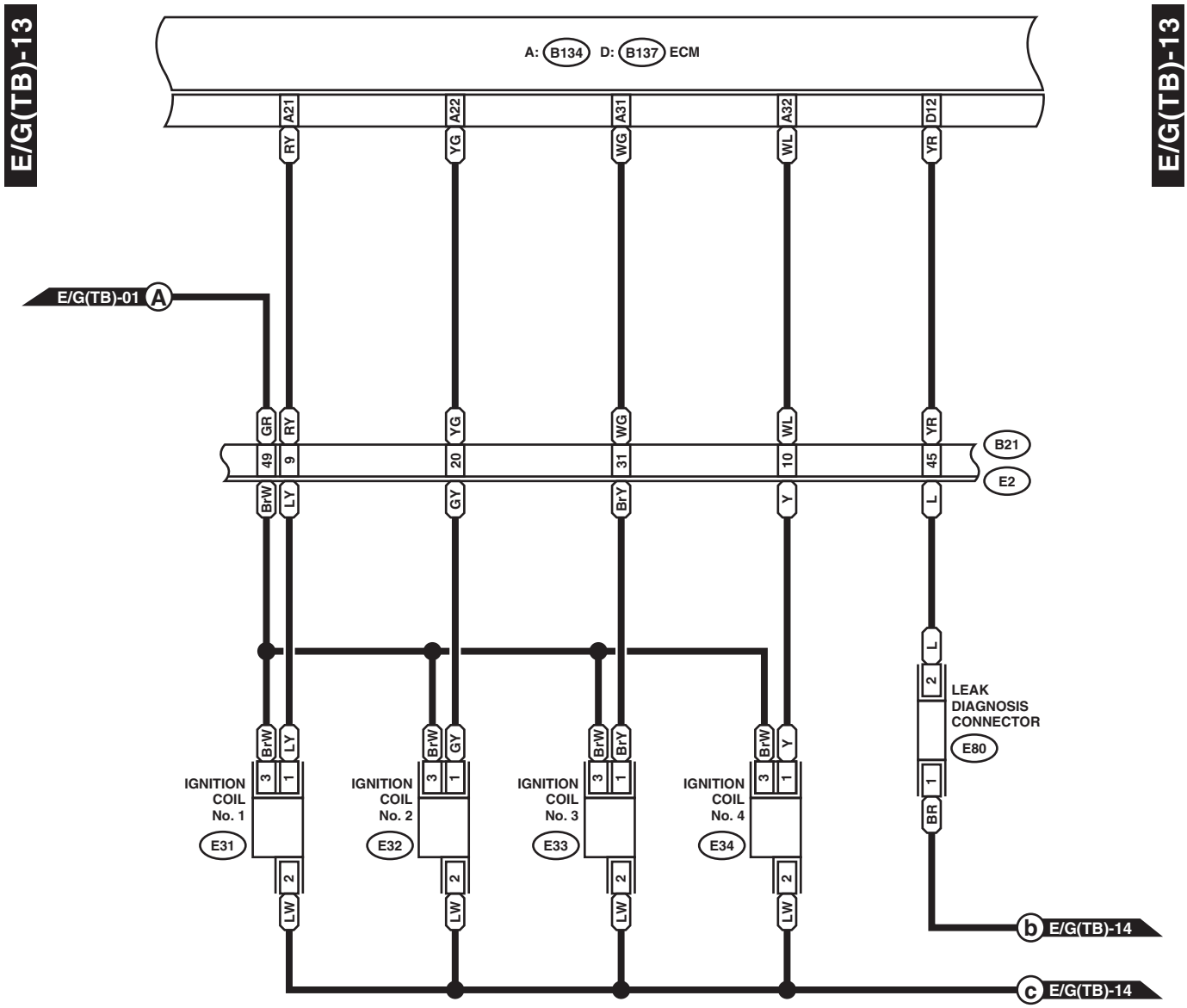
A: B134

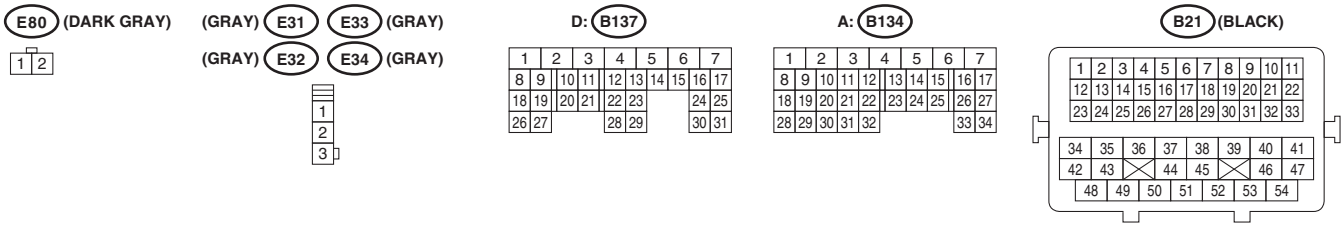
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31	32	33	34	

B21 (BLACK)

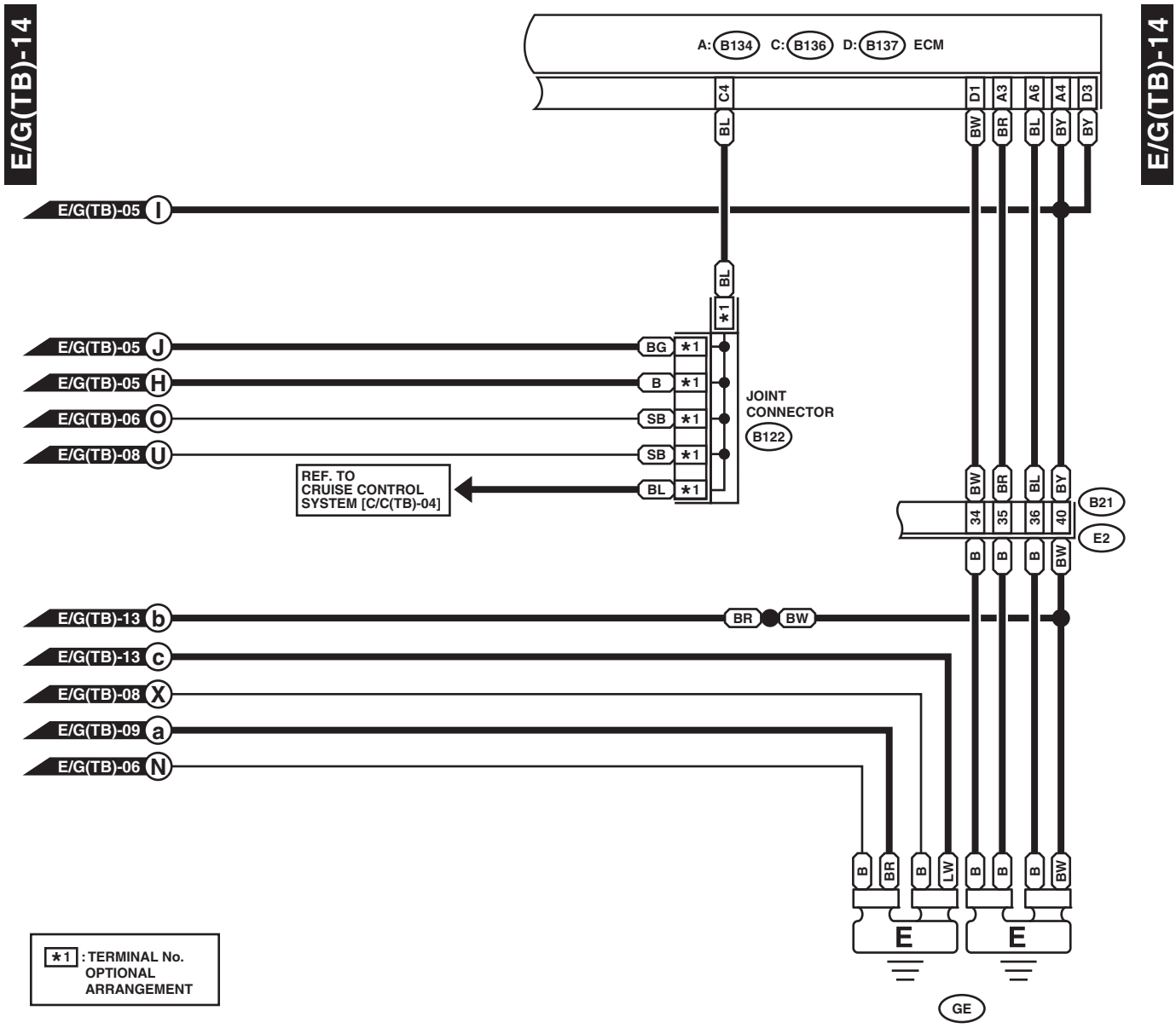
1	2	3	4	5	6	7	8	9	10	11
12	13	14	15	16	17	18	19	20	21	22
23	24	25	26	27	28	29	30	31	32	33
34	35	36	37	38	39	40	41			
42	43		44	45		46	47			
48	49	50	51	52	53	54				

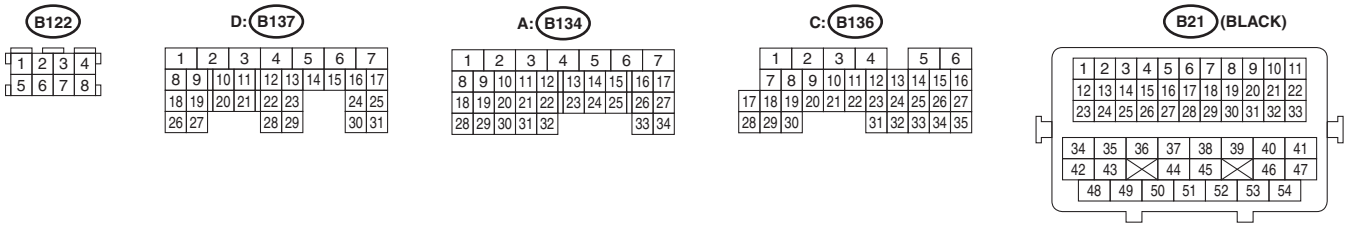
WI-31052


E/G(TB)-13
E/G(TB)-13
A: B134 D: B137 ECM
A21
A22
A31
A32
D12
RY
YG
WG
WL
YR
E/G(TB)-01 A
GR
RY
YG
WG
WL
YR
49
9
20
31
10
45
B21
E2
BrW
LY
GY
BrY
Y
L
L
2
LEAK
DIAGNOSIS
CONNECTOR
E80
BrW
LY
BrW
GY
BrW
BrY
BrW
Y
3
1
IGNITION
COIL
No. 1
E31
IGNITION
COIL
No. 2
E32
IGNITION
COIL
No. 3
E33
IGNITION
COIL
No. 4
E34
2
LW
BR
b E/G(TB)-14
c E/G(TB)-14


E80 (DARK GRAY)
1 2
(GRAY) E31 E33 (GRAY)
(GRAY) E32 E34 (GRAY)
1
2
3
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
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
B21 (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-31053

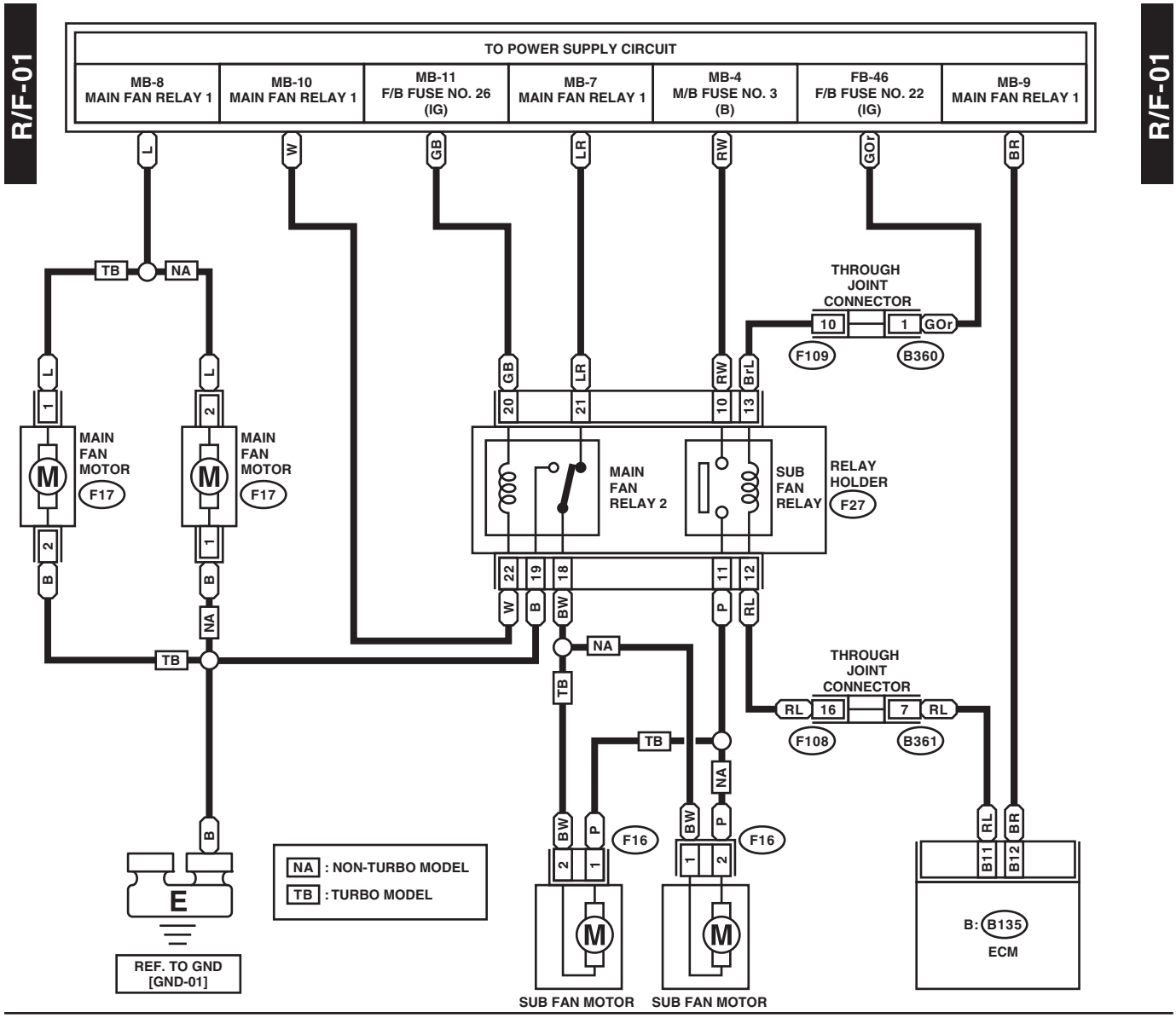

E/G(TB)-14
E/G(TB)-14
A: B134 C: B136 D: B137 ECM
C4
D1
A3
A6
A4
D3
BL
BW
BR
BL
BY
BY
E/G(TB)-05 I
E/G(TB)-05 J
E/G(TB)-05 H
E/G(TB)-06 O
E/G(TB)-08 U
BG
B
SB
SB
BL
*1
JOINT CONNECTOR B122
REF. TO CRUISE CONTROL SYSTEM [C/C(TB)-04]
B21
E2
34
35
36
40
E/G(TB)-13 b
E/G(TB)-13 c
E/G(TB)-08 X
E/G(TB)-09 a
E/G(TB)-06 N
BR
BW
B
BR
B
LW
B
B
B
BW
E
E
GE
*1 : TERMINAL No. OPTIONAL ARRANGEMENT

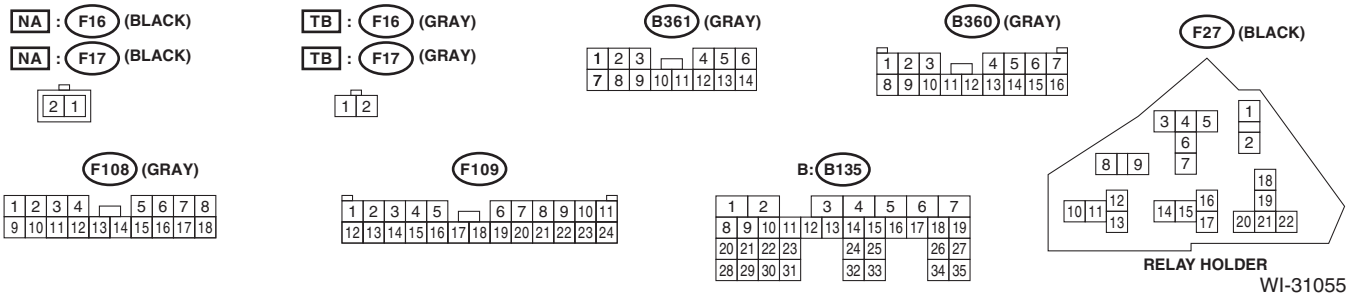

B122
D: B137
A: B134
C: B136
B21 (BLACK)

WI-31054

6. Radiator Fan System

A: WIRING DIAGRAM



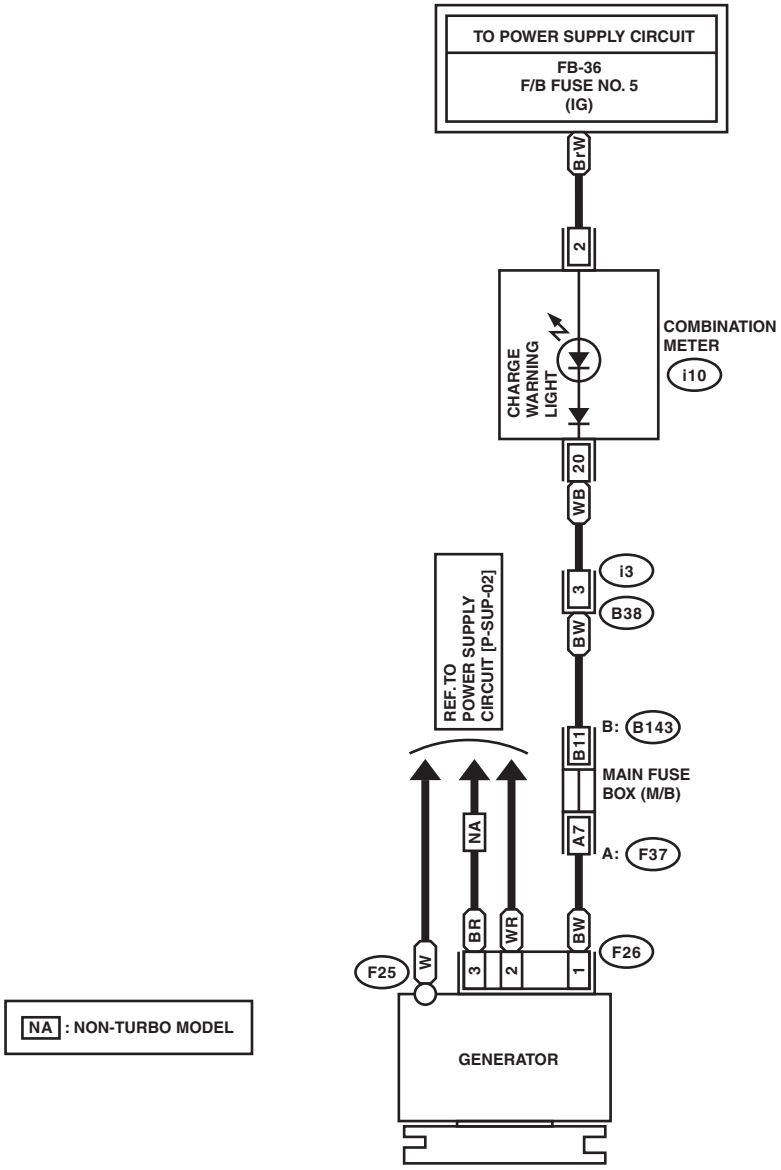


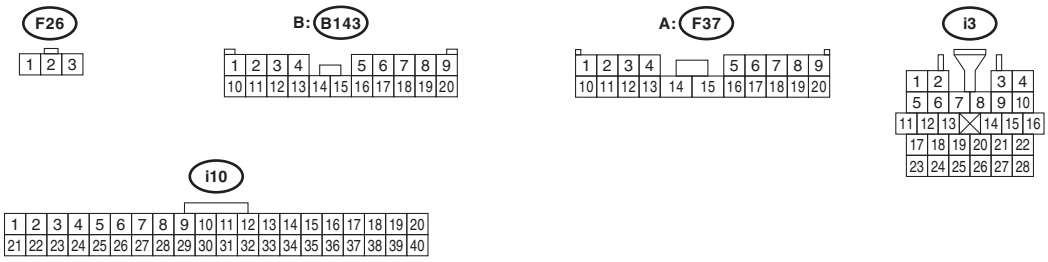
WI-31055

7. Charging System

A: WIRING DIAGRAM

CHG-01



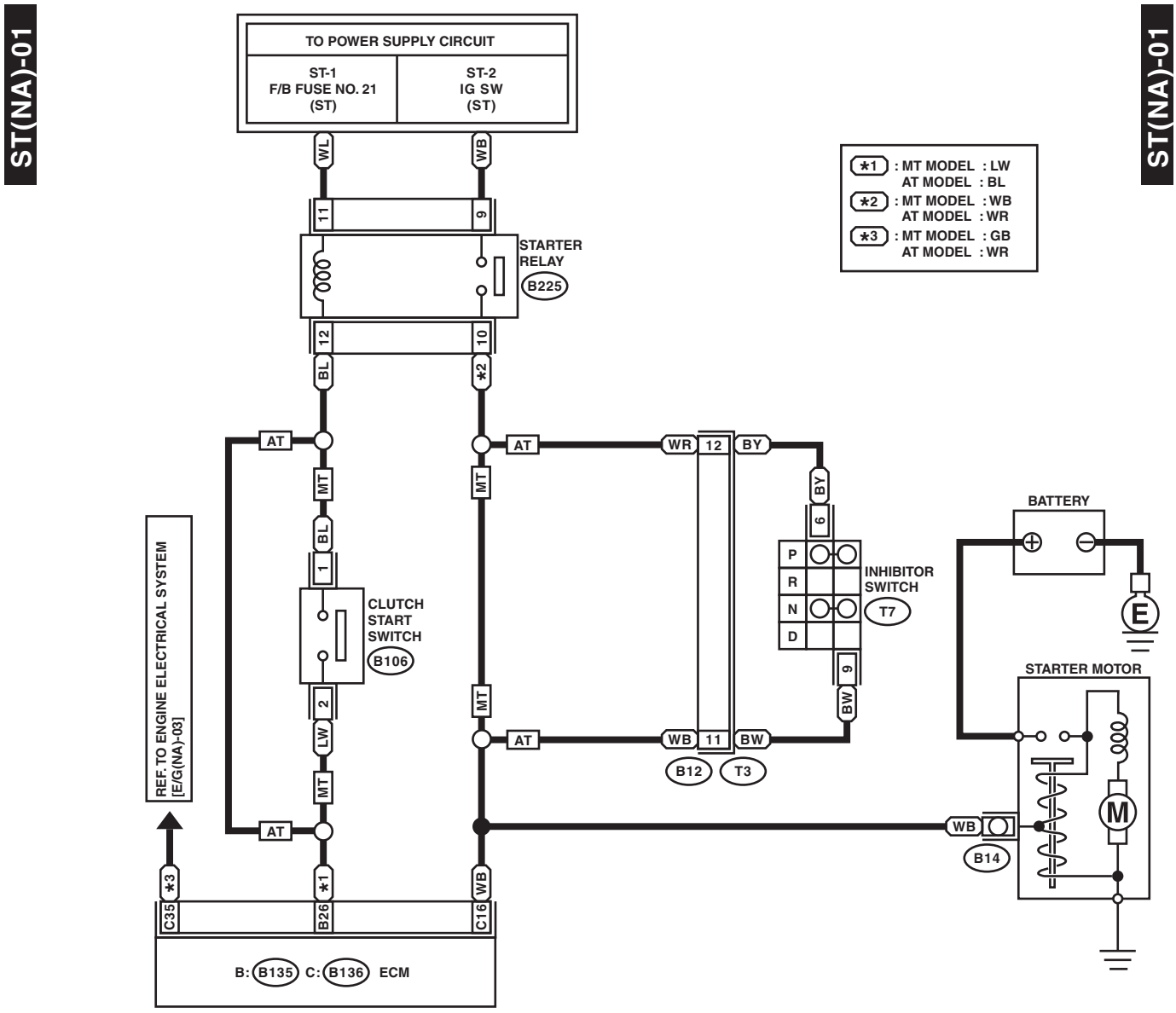


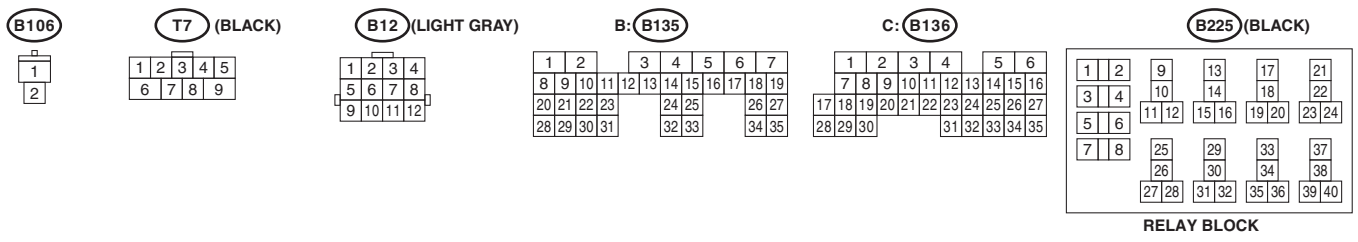
WI-31056

8. Starter System

A: WIRING DIAGRAM

1. NON-TURBO MODEL

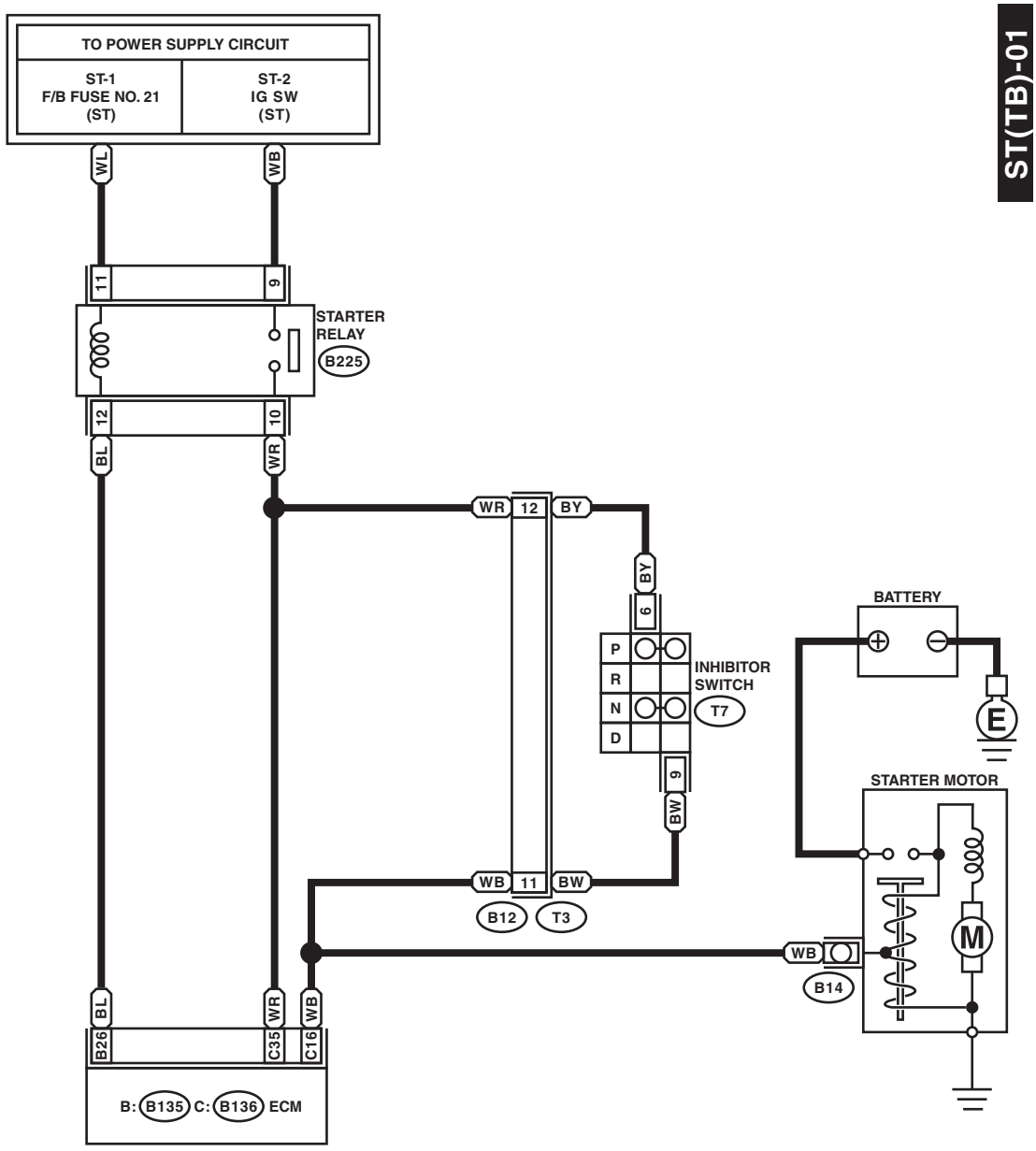


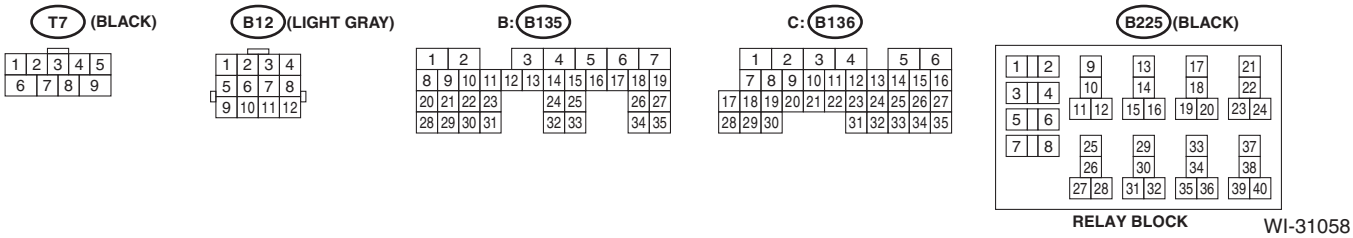


WI-31057

2. TURBO MODEL

ST(TB)-01

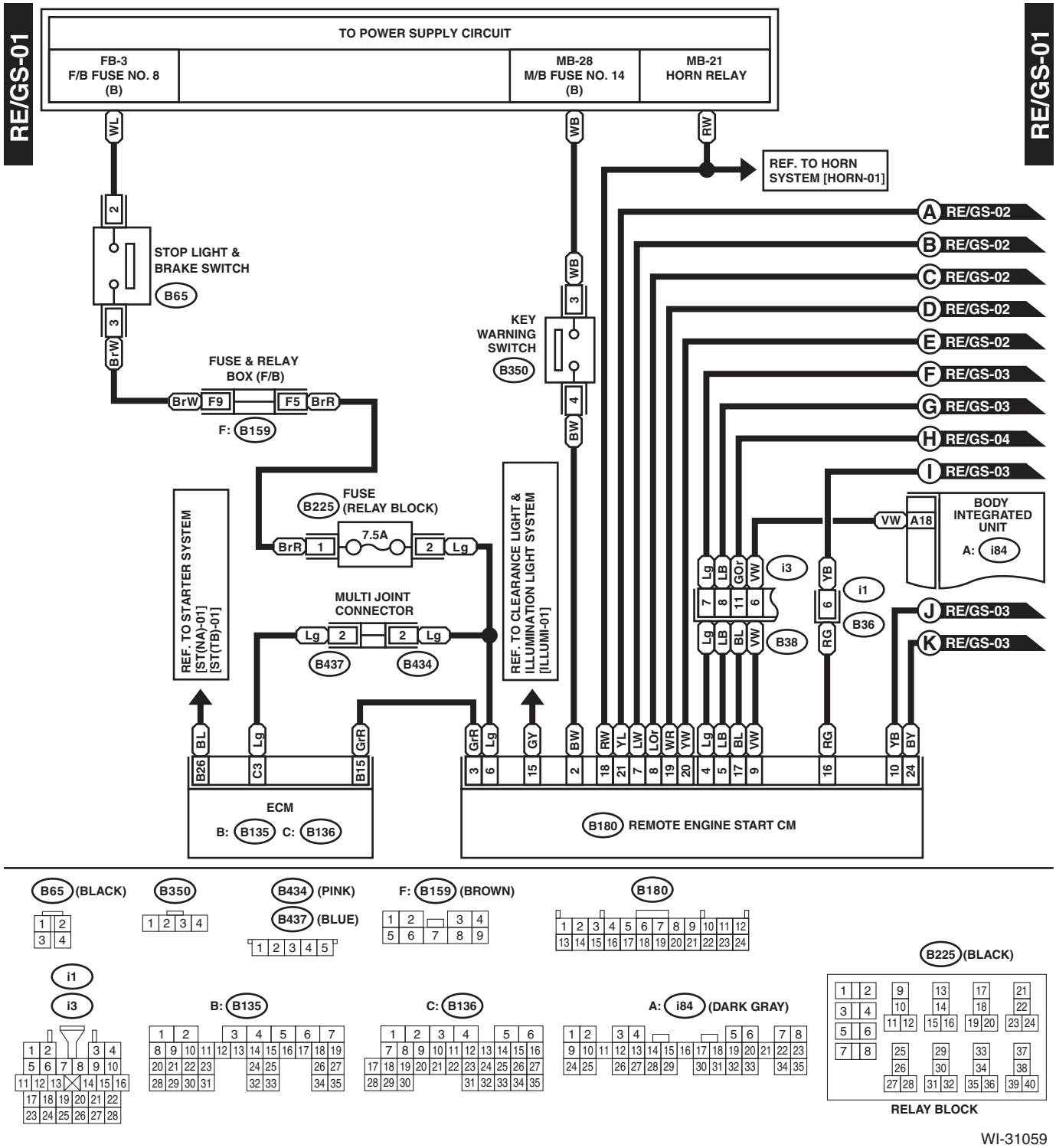




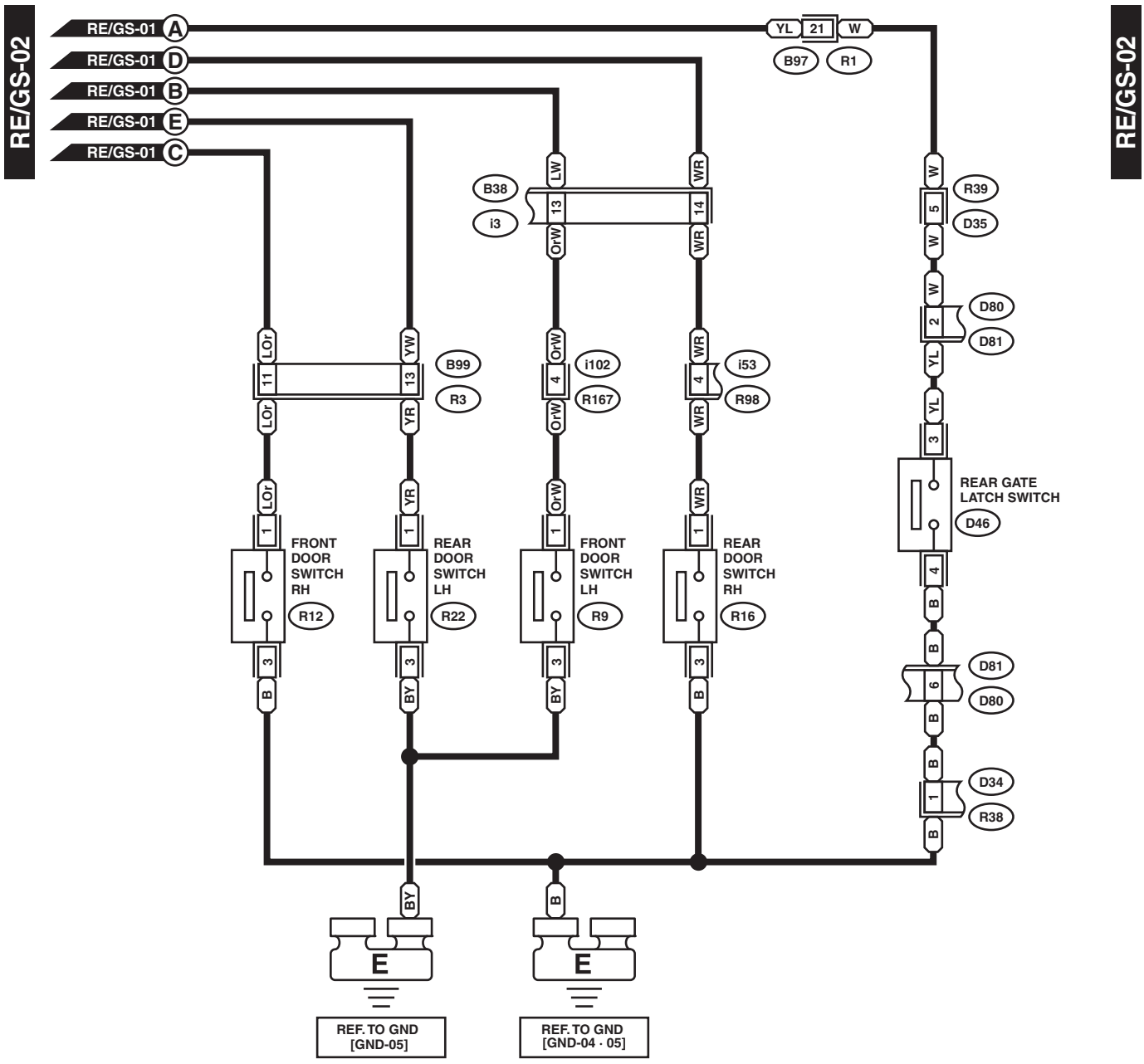
WI-31058

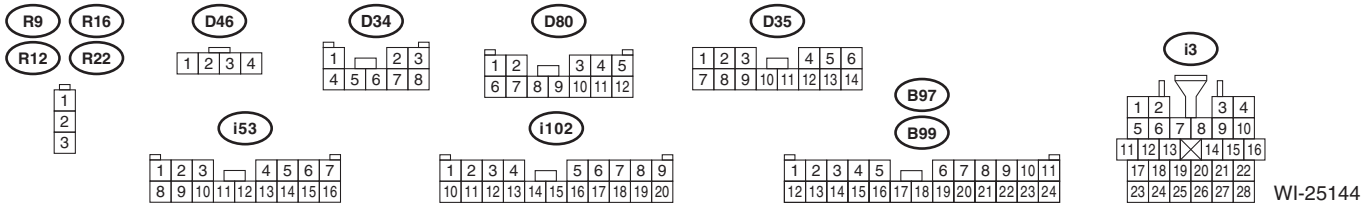
9. Remote Engine Start System

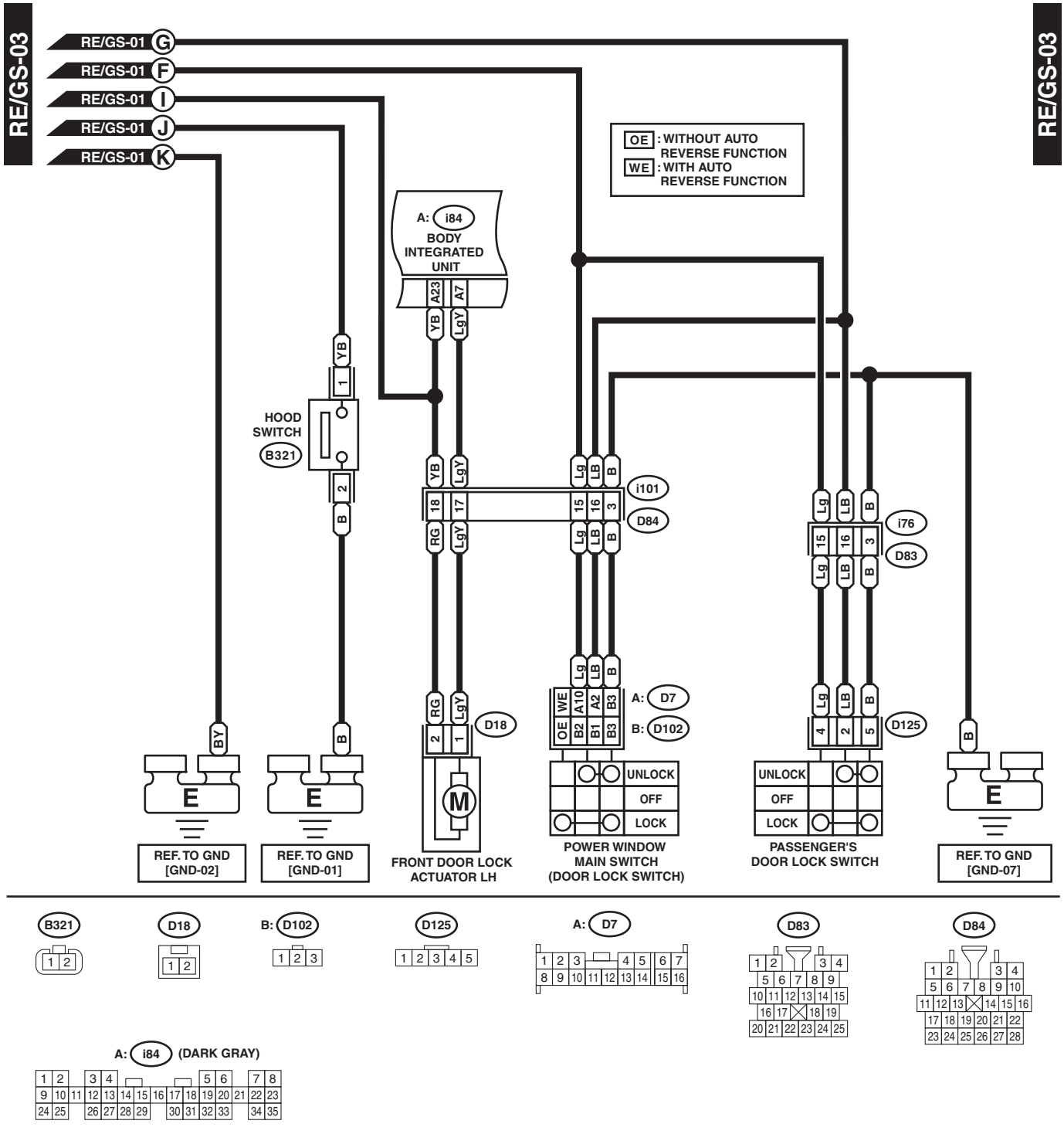
A: WIRING DIAGRAM



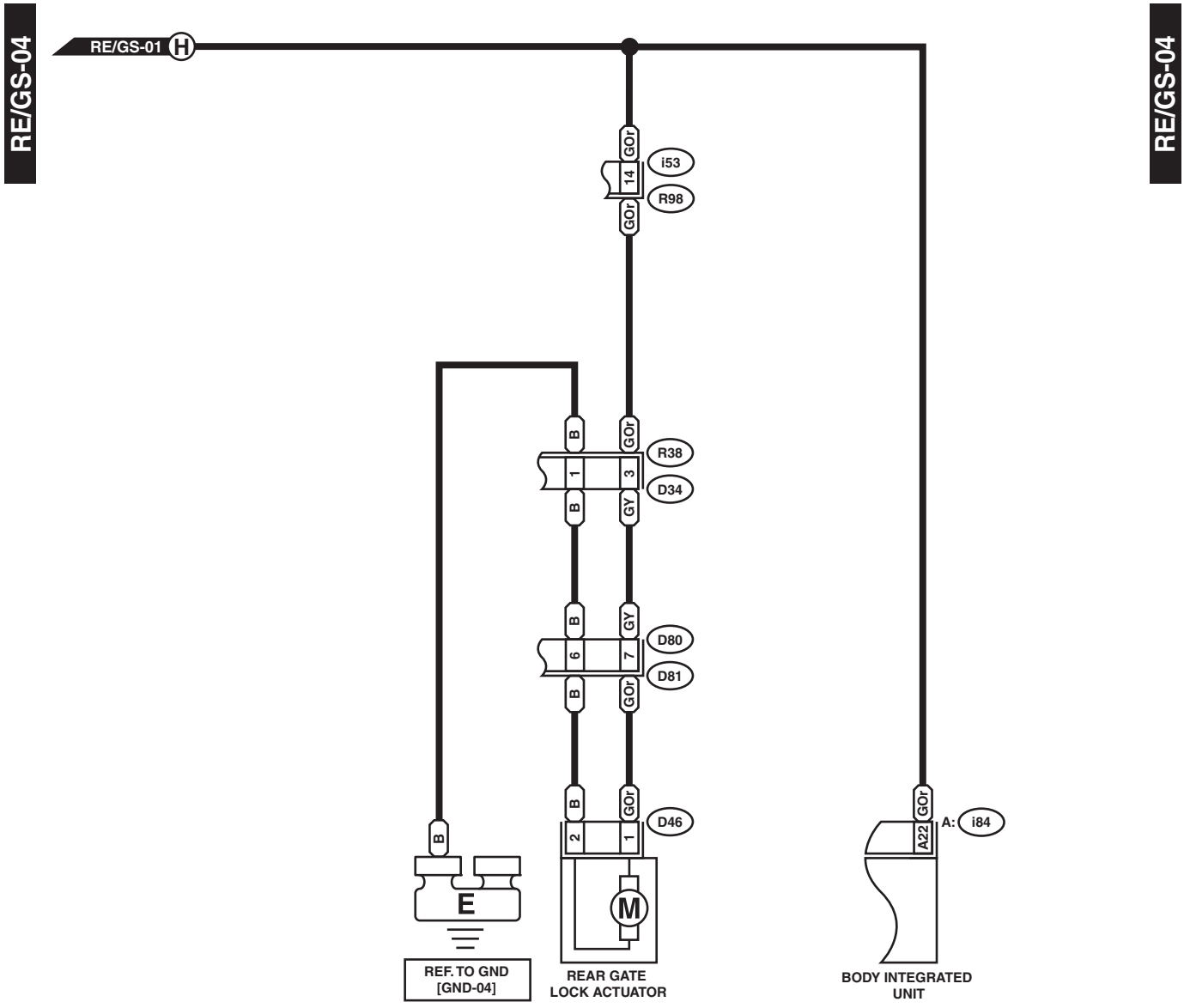
WI-31059

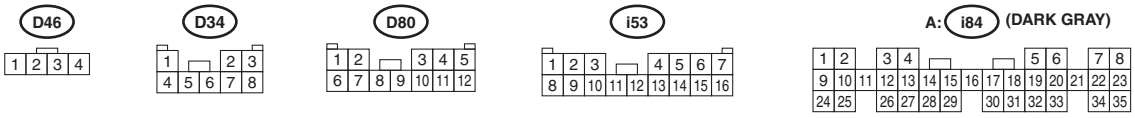

RE/GS-02
RE/GS-01 A
RE/GS-01 D
RE/GS-01 B
RE/GS-01 E
RE/GS-01 C
YL 21 W
B97 R1
B38
i3
LW
WR
13
14
OrW
WR
W
R39
5
D35
W
W
2
D80
D81
YL
YL
3
REAR GATE LATCH SWITCH
D46
4
B
B
D81
6
D80
B
B
D34
1
R38
B
LOr
YW
11
13
B99
R3
LOr
YR
OrW
4
i102
R167
OrW
WR
4
i53
R98
WR
LOr
YR
OrW
WR
1
FRONT DOOR SWITCH RH
R12
1
REAR DOOR SWITCH LH
R22
1
FRONT DOOR SWITCH LH
R9
1
REAR DOOR SWITCH RH
R16
3
B
3
BY
3
BY
3
B
BY
B
E
E
REF. TO GND [GND-05]
REF. TO GND [GND-04 · 05]


R9
R16
R12
R22
1
2
3
D46
1 2 3 4
D34
1 2 3
4 5 6 7 8
D80
1 2 3 4 5
6 7 8 9 10 11 12
D35
1 2 3 4 5 6
7 8 9 10 11 12 13 14
i53
1 2 3 4 5 6 7
8 9 10 11 12 13 14 15 16
i102
1 2 3 4 5 6 7 8 9
10 11 12 13 14 15 16 17 18 19 20
B97
B99
1 2 3 4 5 6 7 8 9 10 11
12 13 14 15 16 17 18 19 20 21 22 23 24
i3
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
WI-25144


RE/GS-03
RE/GS-01 G
RE/GS-01 F
RE/GS-01 I
RE/GS-01 J
RE/GS-01 K
RE/GS-03
OE : WITHOUT AUTO REVERSE FUNCTION
WE : WITH AUTO REVERSE FUNCTION
A: i84
BODY INTEGRATED UNIT
A23
A7
YB
LgY
HOOD SWITCH
B321
i101
D84
i76
D83
D18
A: D7
B: D102
D125
BY
B
RG
Lg
LB
OE
WE
A10
A2
B1
B2
B3
UNLOCK
OFF
LOCK
REF. TO GND [GND-02]
REF. TO GND [GND-01]
FRONT DOOR LOCK ACTUATOR LH
POWER WINDOW MAIN SWITCH (DOOR LOCK SWITCH)
PASSENGER'S DOOR LOCK SWITCH
REF. TO GND [GND-07]
B321
D18
B: D102
D125
A: D7
D83
D84
A: i84 (DARK GRAY)

WI-31060

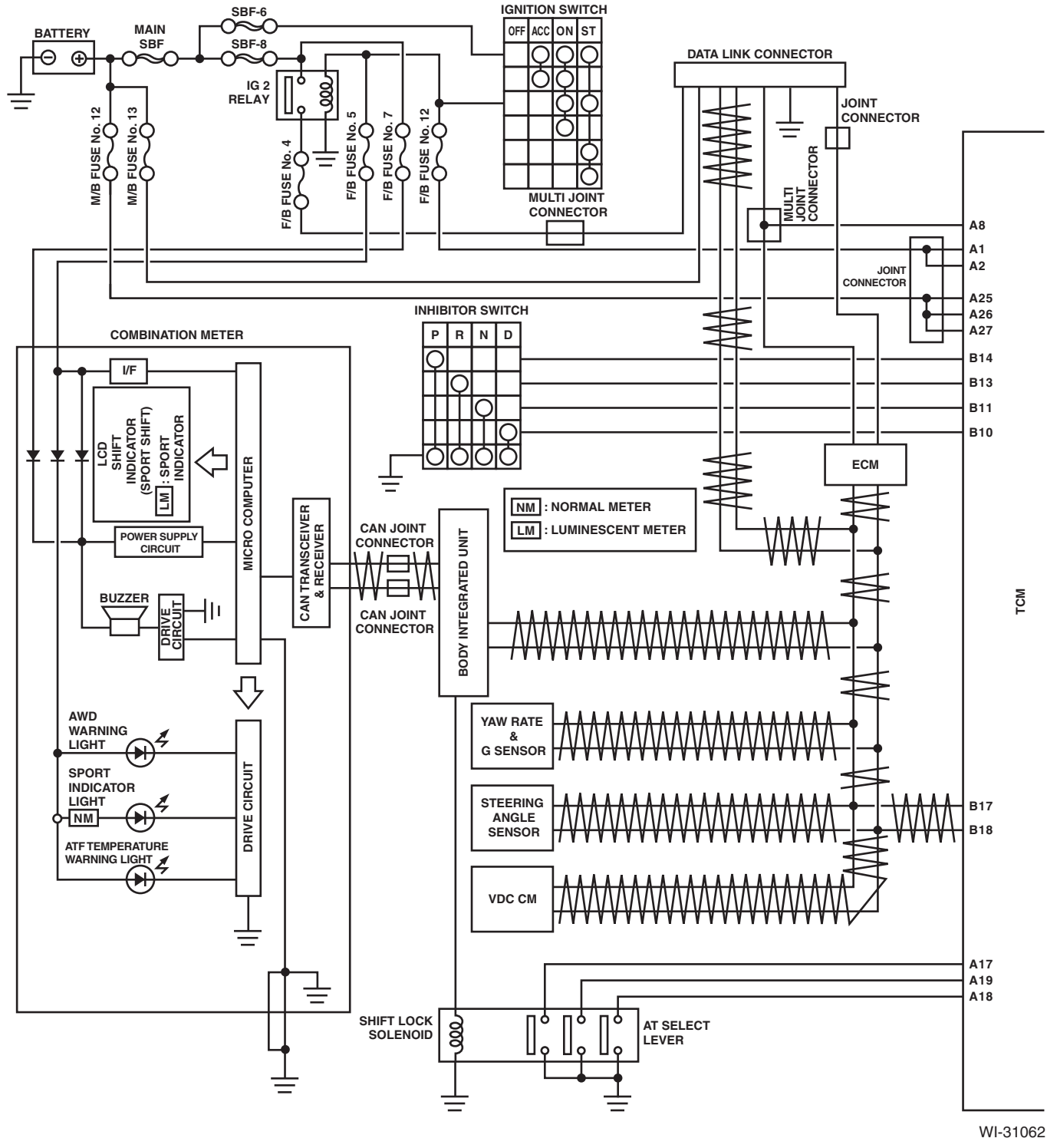

RE/GS-04
RE/GS-01
H
RE/GS-04
GOr
i53
14
R98
GOr
B
GOr
R38
1
3
D34
B
GY
B
GY
D80
6
7
D81
B
GOr
B
GOr
D46
2
1
B
A: i84
GOr
A22
E
M
REF. TO GND
[GND-04]
REAR GATE
LOCK ACTUATOR
BODY INTEGRATED
UNIT

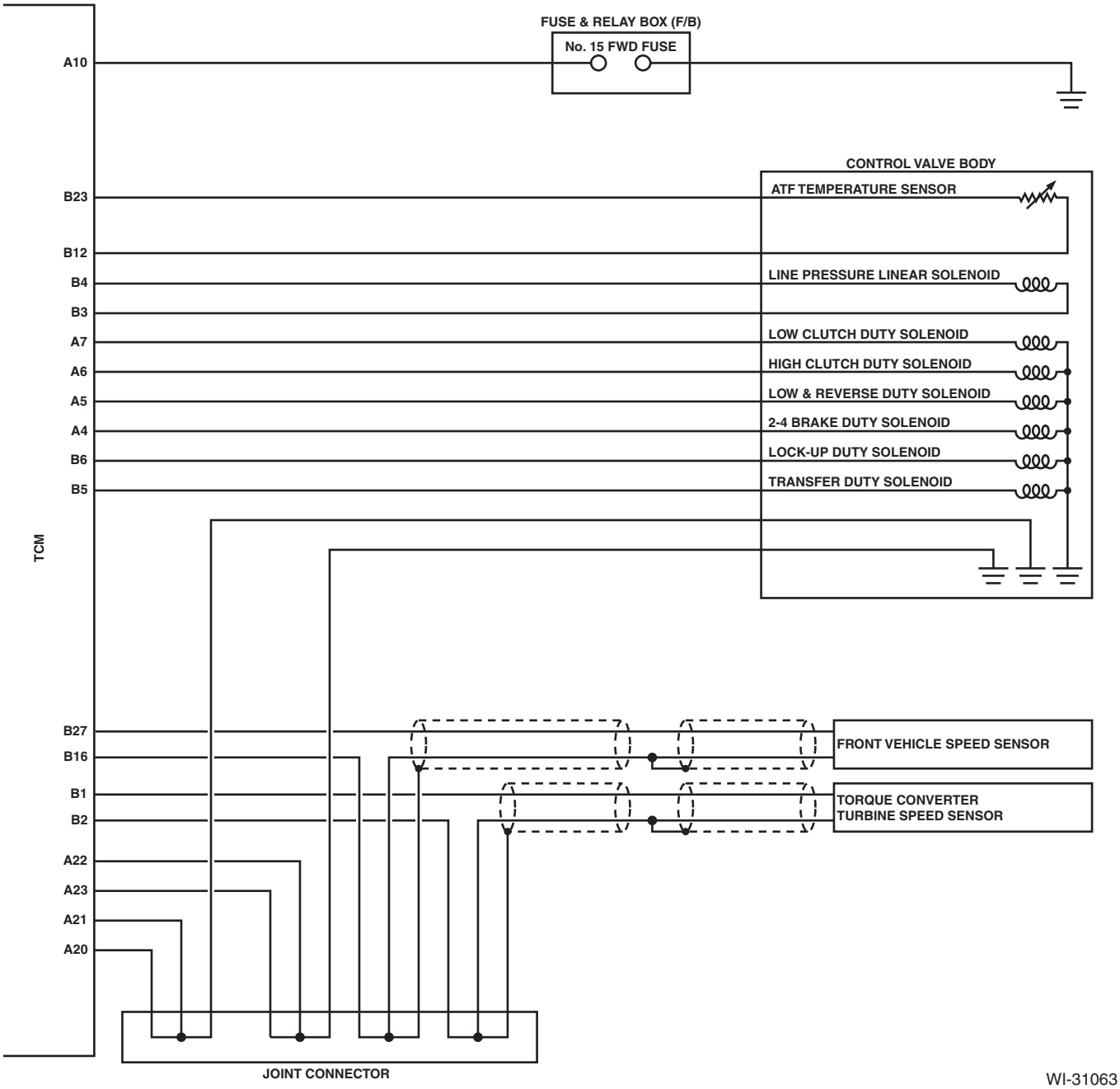

D46
1 2 3 4
D34
1 2 3
4 5 6 7 8
D80
1 2 3 4 5
6 7 8 9 10 11 12
i53
1 2 3 4 5 6 7
8 9 10 11 12 13 14 15 16
A: i84 (DARK GRAY)
1 2 3 4 5 6 7 8
9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
24 25 26 27 28 29 30 31 32 33 34 35

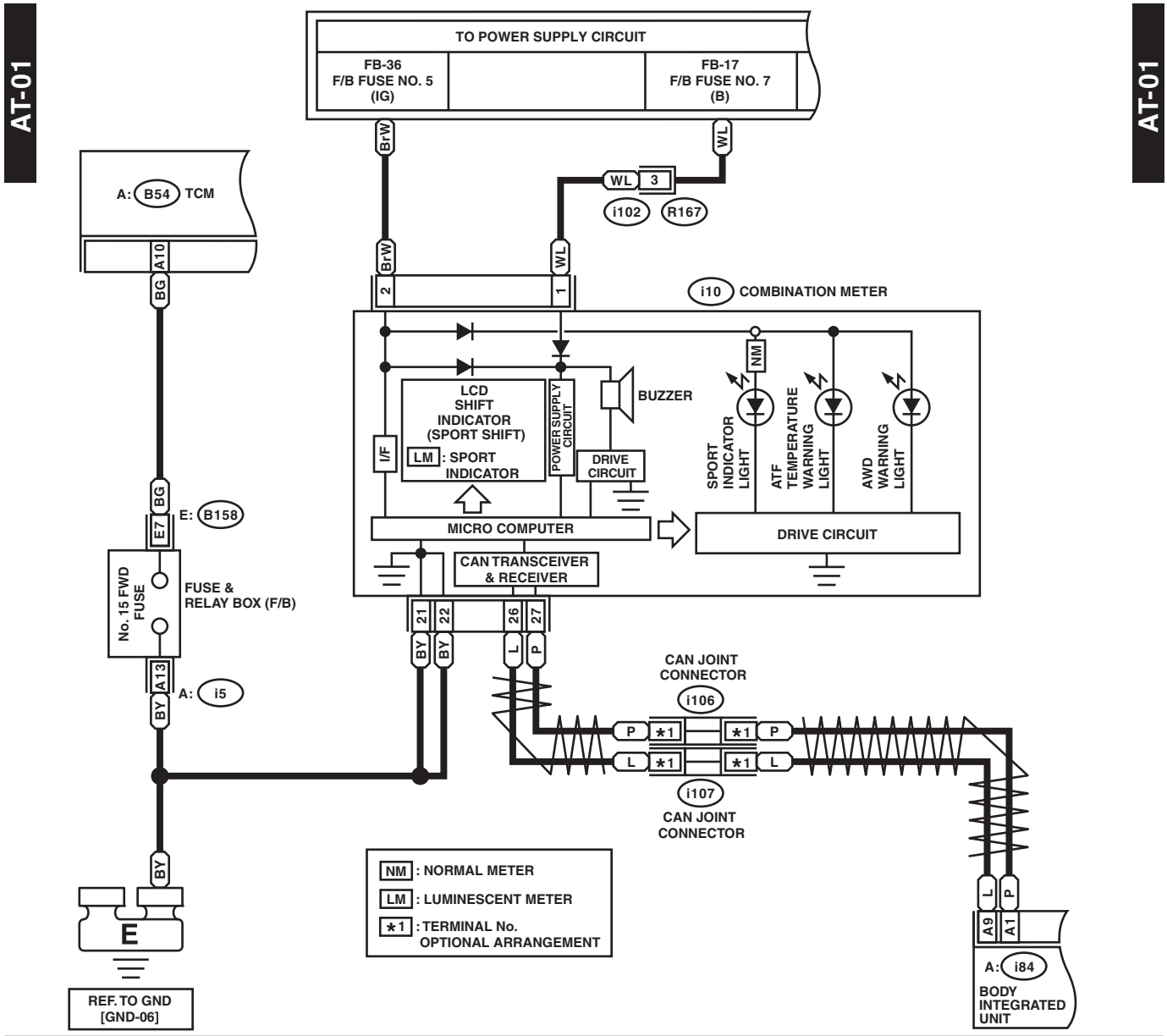
WI-31061

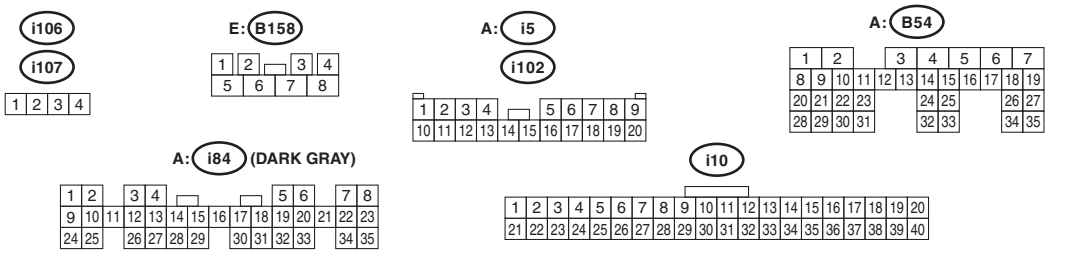
10.AT Control System

A: WIRING DIAGRAM



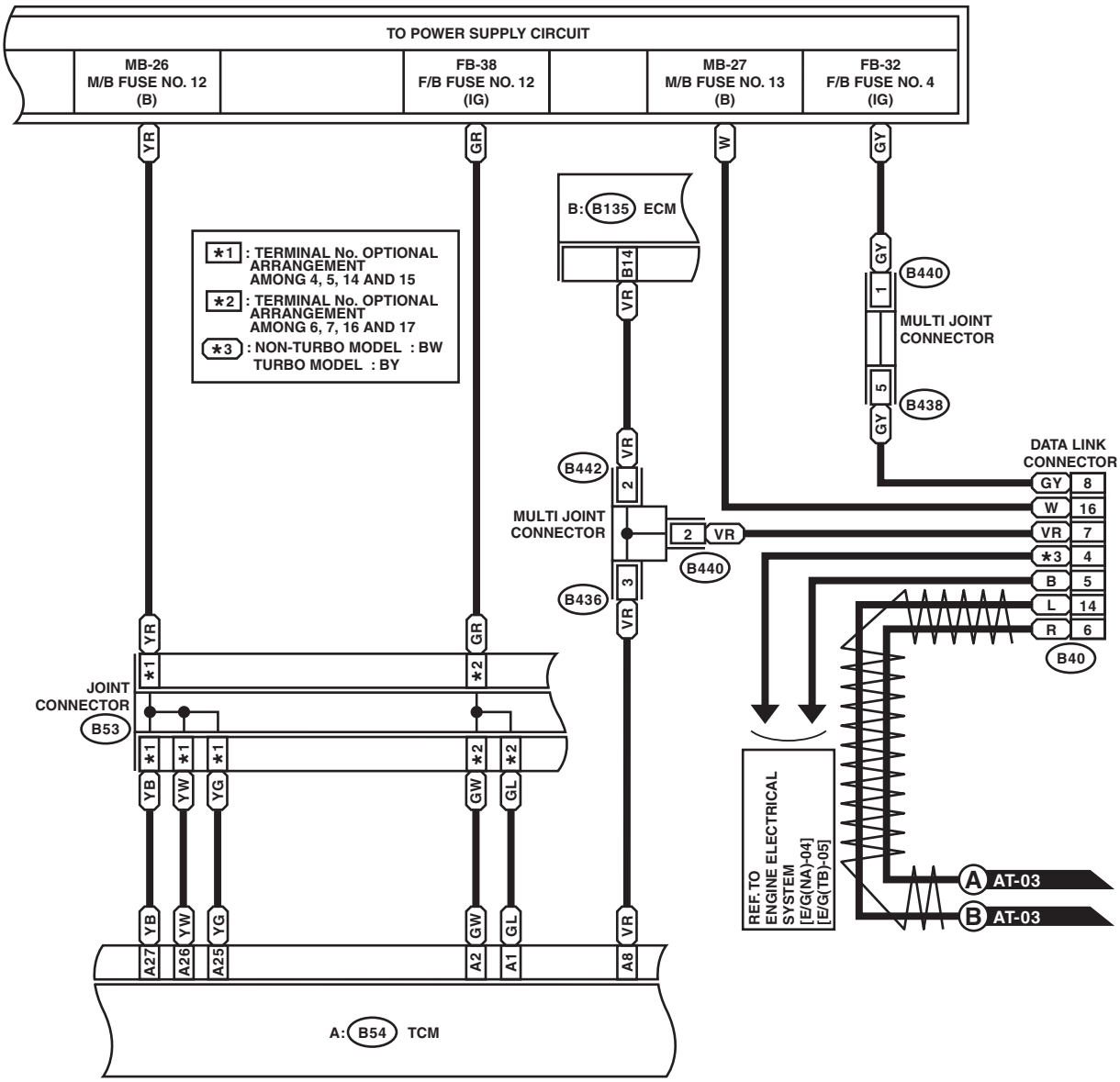

FUSE & RELAY BOX (F/B)
No. 15 FWD FUSE
A10
CONTROL VALVE BODY
ATF TEMPERATURE SENSOR
B23
B12
LINE PRESSURE LINEAR SOLENOID
B4
B3
LOW CLUTCH DUTY SOLENOID
A7
HIGH CLUTCH DUTY SOLENOID
A6
LOW & REVERSE DUTY SOLENOID
A5
2-4 BRAKE DUTY SOLENOID
A4
LOCK-UP DUTY SOLENOID
B6
TRANSFER DUTY SOLENOID
B5
TCM
B27
FRONT VEHICLE SPEED SENSOR
B16
B1
TORQUE CONVERTER
TURBINE SPEED SENSOR
B2
A22
A23
A21
A20
JOINT CONNECTOR
WI-31063

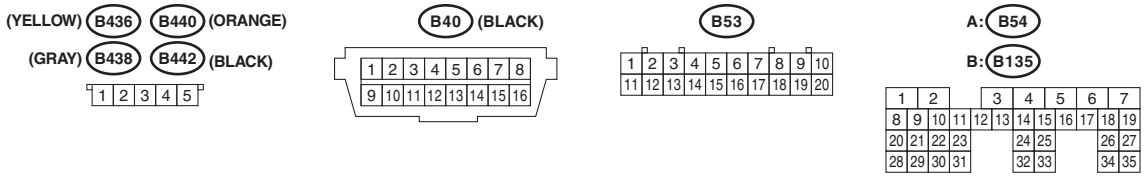

TO POWER SUPPLY CIRCUIT
FB-36
F/B FUSE NO. 5
(IG)
FB-17
F/B FUSE NO. 7
(B)
Br-W
WL
A: B54 TCM
A10
BG
WL 3
i102
R167
2
1
i10 COMBINATION METER
LCD
SHIFT
INDICATOR
(SPORT SHIFT)
LM : SPORT
INDICATOR
I/F
POWER SUPPLY CIRCUIT
BUZZER
DRIVE CIRCUIT
NM
SPORT INDICATOR LIGHT
ATF TEMPERATURE WARNING LIGHT
AWD WARNING LIGHT
MICRO COMPUTER
DRIVE CIRCUIT
CAN TRANSCEIVER & RECEIVER
E7
E: B158
No. 15 FWD FUSE
FUSE & RELAY BOX (F/B)
A13
A: i5
21
22
26
27
BY
L
P
CAN JOINT CONNECTOR
i106
*1
i107
CAN JOINT CONNECTOR
NM : NORMAL METER
LM : LUMINESCENT METER
*1 : TERMINAL No. OPTIONAL ARRANGEMENT
E
REF. TO GND [GND-06]
A9
A1
A: i84
BODY INTEGRATED UNIT


i106
i107
E: B158
A: i5
i102
A: B54
A: i84 (DARK GRAY)
i10

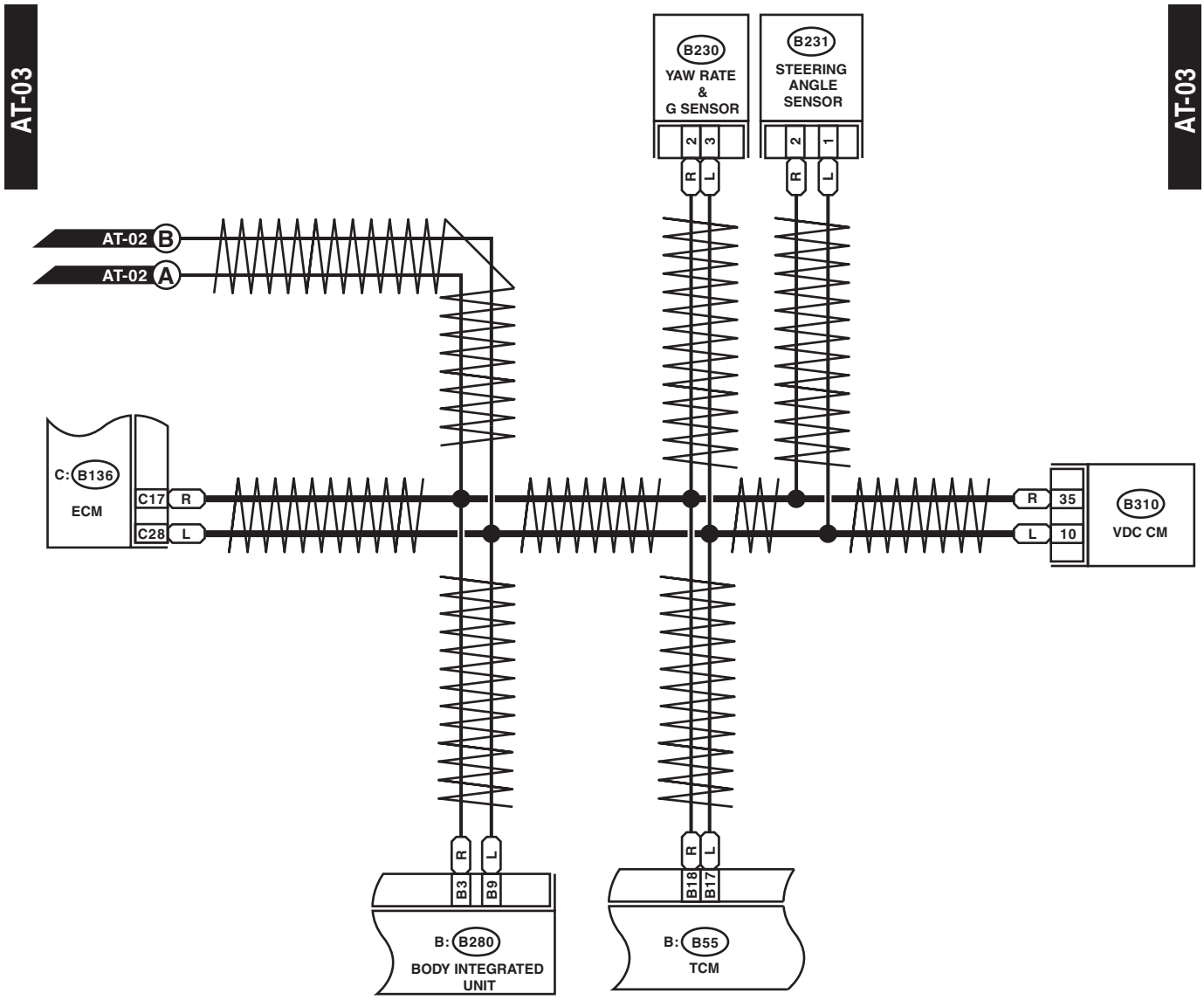
WI-31064

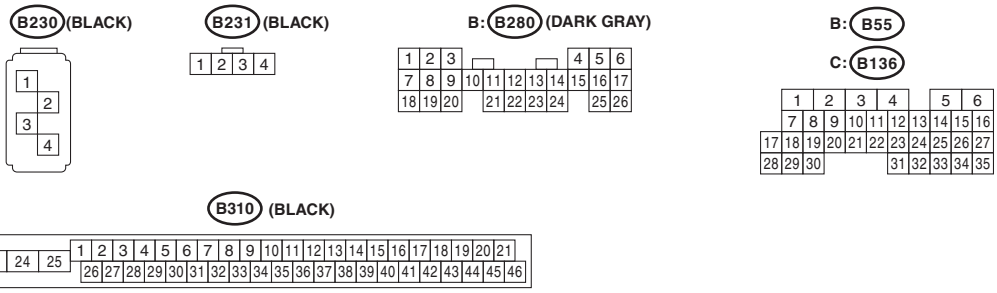
AT-02



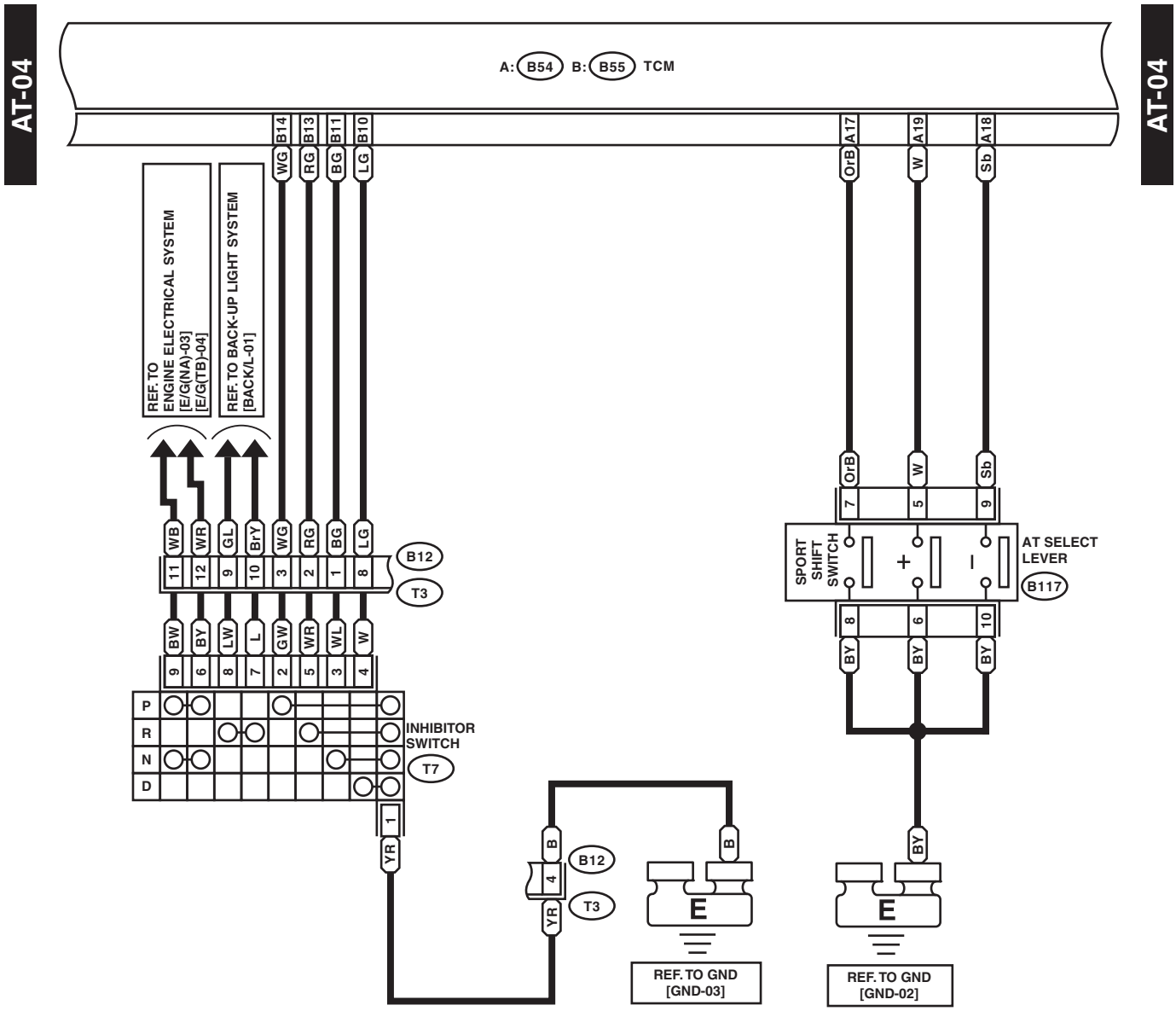


WI-31065


AT-03
AT-03
B230
YAW RATE & G SENSOR
B231
STEERING ANGLE SENSOR
AT-02 B
AT-02 A
C: B136
ECM
C17
C28
R
L
B310
VDC CM
35
10
B3
B9
B18
B17
B: B280
BODY INTEGRATED UNIT
B: B55
TCM


B230 (BLACK)
B231 (BLACK)
B: B280 (DARK GRAY)
B: B55
C: B136
B310 (BLACK)

WI-31066



T7 (BLACK)

1	2	3	4	5
6	7	8	9	

B117 (GRAY)

1	2		3	4
5	6	7	8	9	10

B12 (LIGHT GRAY)

1	2	3	4
5	6	7	8
9	10	11	12

A: B54 (LIGHT GRAY)

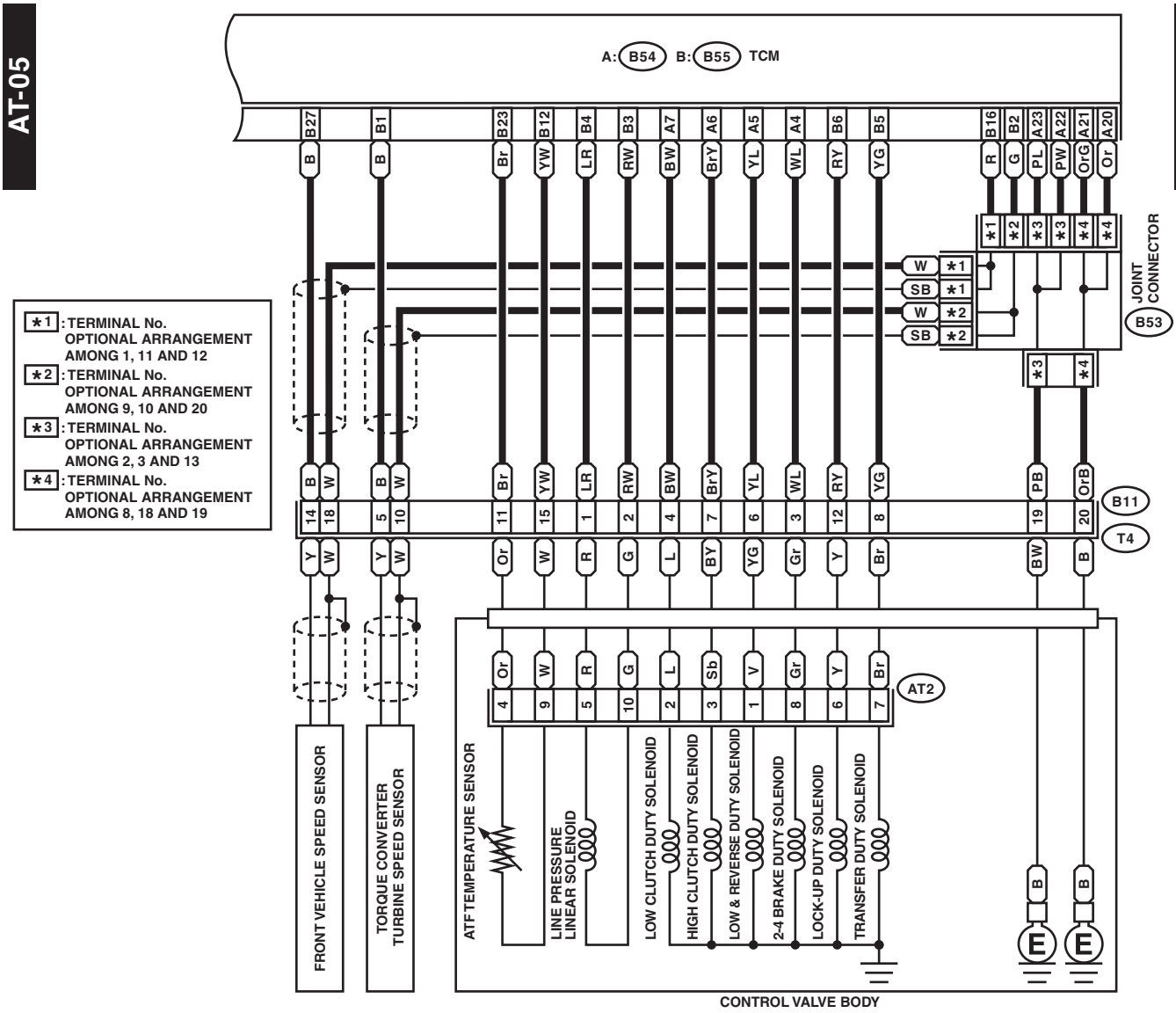
1	2					3	4	5	6	7								
8	9	10	11	12	13	14	15	16	17	18	19							
20	21	22	23			24	25			26	27							
28	29	30	31			32	33			34	35							

B: B55

	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-31067

AT-05



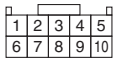
*1 : TERMINAL No. OPTIONAL ARRANGEMENT AMONG 1, 11 AND 12

*2 : TERMINAL No. OPTIONAL ARRANGEMENT AMONG 9, 10 AND 20

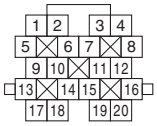
*3 : TERMINAL No. OPTIONAL ARRANGEMENT AMONG 2, 3 AND 13

*4 : TERMINAL No. OPTIONAL ARRANGEMENT AMONG 8, 18 AND 19

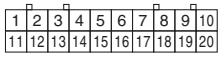
AT2



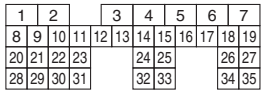
B11 (LIGHT GRAY)



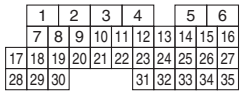
B53



A: B54



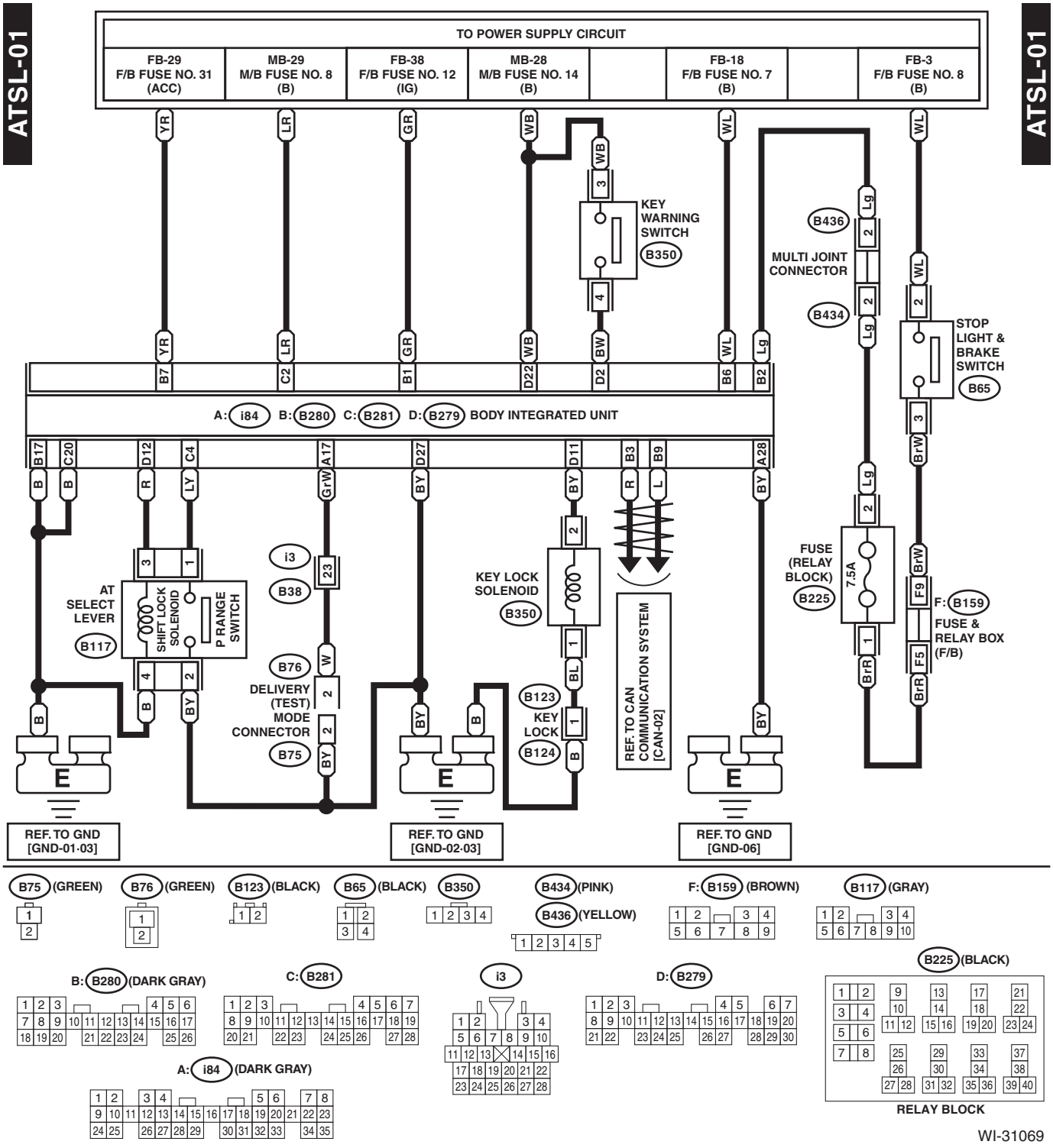
B: B55



WI-31068

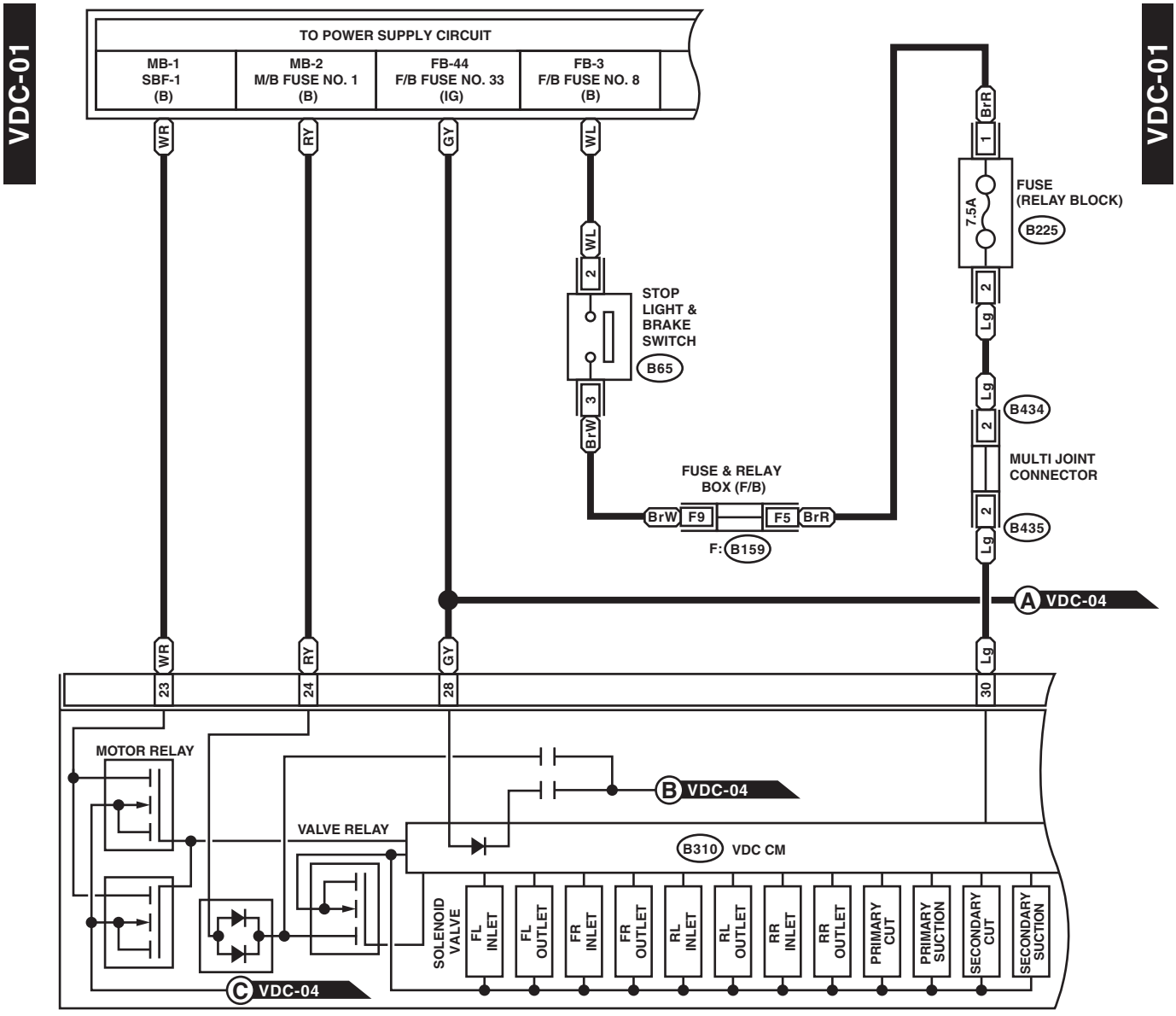
11.AT Shift Lock Control System

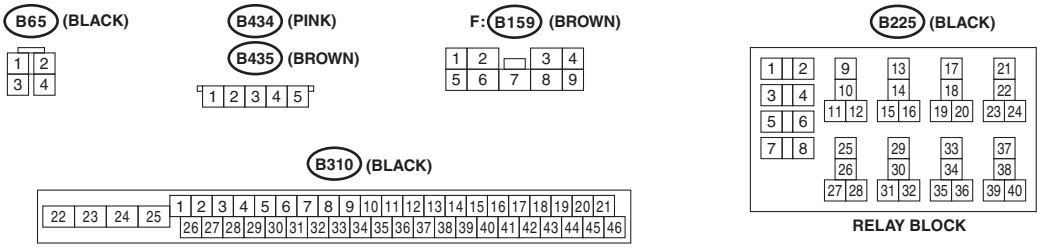
A: WIRING DIAGRAM



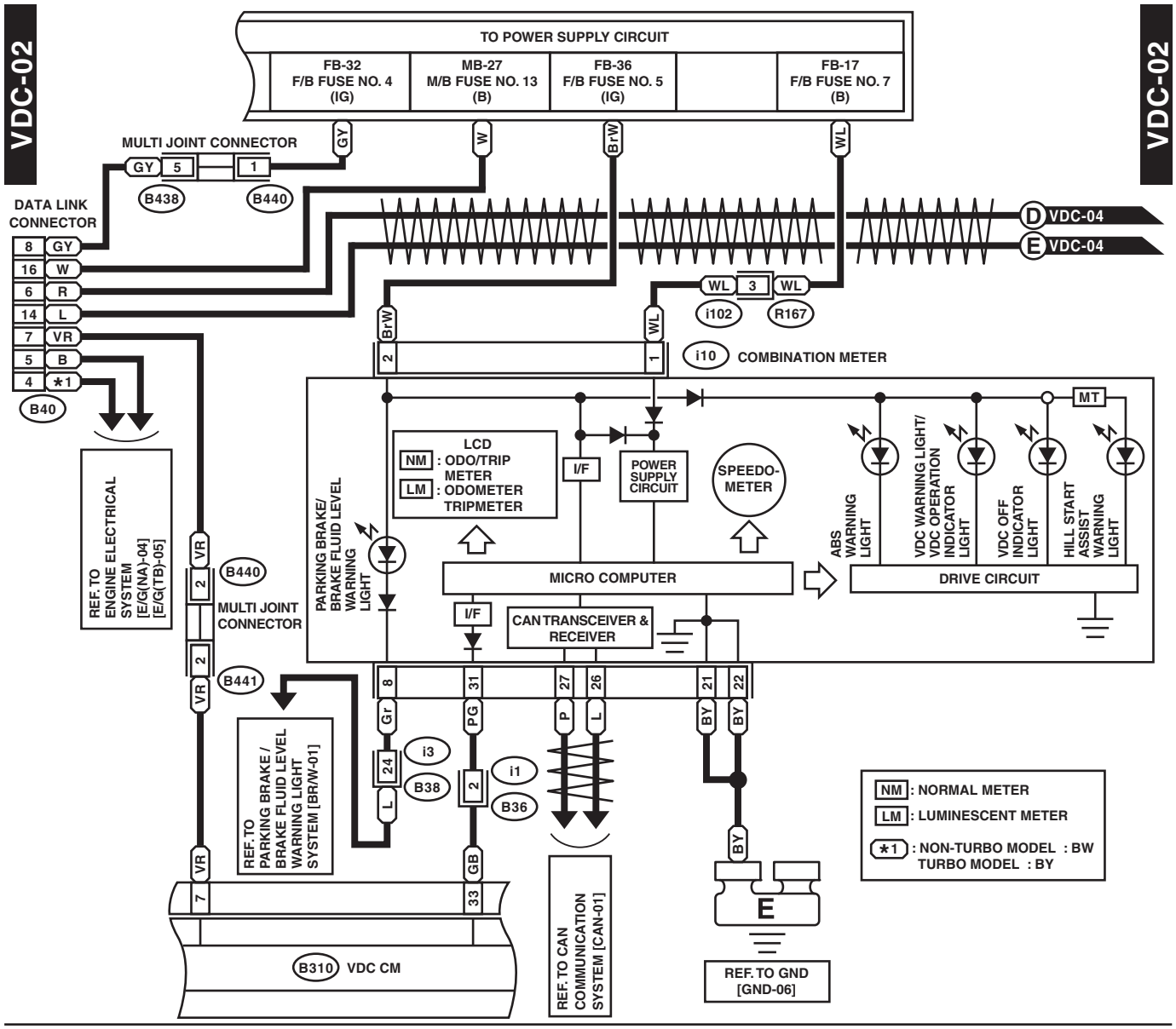
12.Vehicle Dynamics Control System

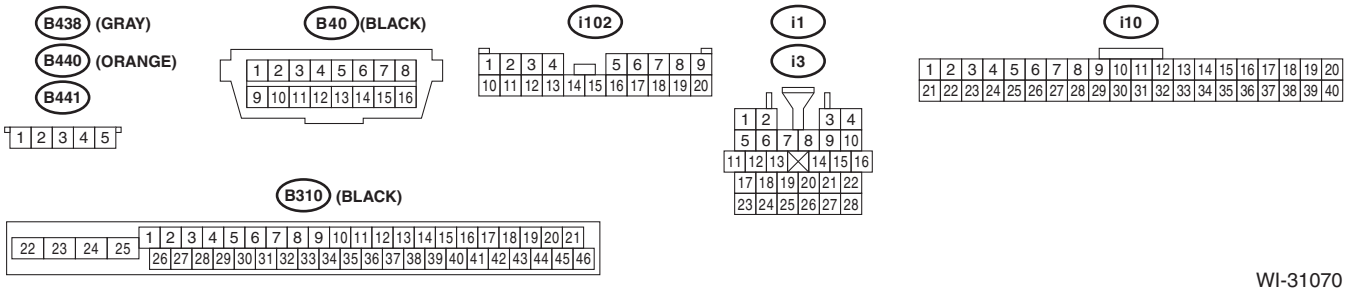
A: WIRING DIAGRAM





WI-25153

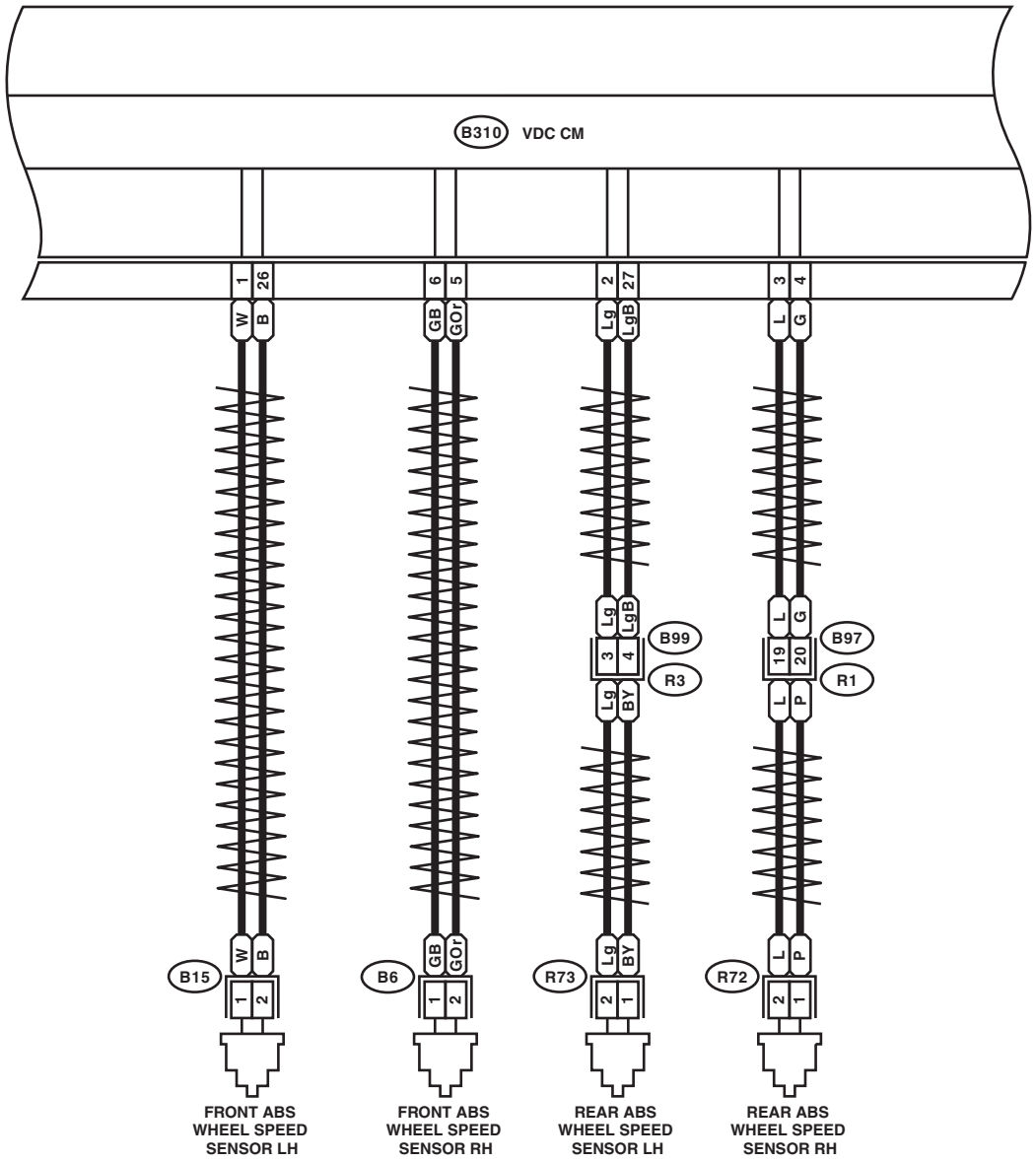

VDC-02
VDC-02
TO POWER SUPPLY CIRCUIT
FB-32 F/B FUSE NO. 4 (IG)
MB-27 M/B FUSE NO. 13 (B)
FB-36 F/B FUSE NO. 5 (IG)
FB-17 F/B FUSE NO. 7 (B)
MULTI JOINT CONNECTOR
B438
B440
DATA LINK CONNECTOR
D VDC-04
E VDC-04
i102
R167
i10 COMBINATION METER
B40
REF. TO ENGINE ELECTRICAL SYSTEM [E/G(NA)-04] [E/G(TB)-05]
MULTI JOINT CONNECTOR
B441
REF. TO PARKING BRAKE / BRAKE FLUID LEVEL WARNING LIGHT SYSTEM [BR/W-01]
PARKING BRAKE/ BRAKE FLUID LEVEL WARNING LIGHT
LCD
NM : ODO/TRIP METER
LM : ODOMETER TRIPMETER
I/F
POWER SUPPLY CIRCUIT
SPEEDO-METER
MT
ABS WARNING LIGHT
VDC WARNING LIGHT/ VDC OPERATION INDICATOR LIGHT
VDC OFF INDICATOR LIGHT
HILL START ASSIST WARNING LIGHT
MICRO COMPUTER
DRIVE CIRCUIT
CAN TRANSCEIVER & RECEIVER
i3
B38
i1
B36
B310 VDC CM
REF. TO CAN COMMUNICATION SYSTEM [CAN-01]
E
REF. TO GND [GND-06]
NM : NORMAL METER
LM : LUMINESCENT METER
*1 : NON-TURBO MODEL : BW
TURBO MODEL : BY


B438 (GRAY)
B440 (ORANGE)
B441
B40 (BLACK)
i102
i1
i3
i10
B310 (BLACK)

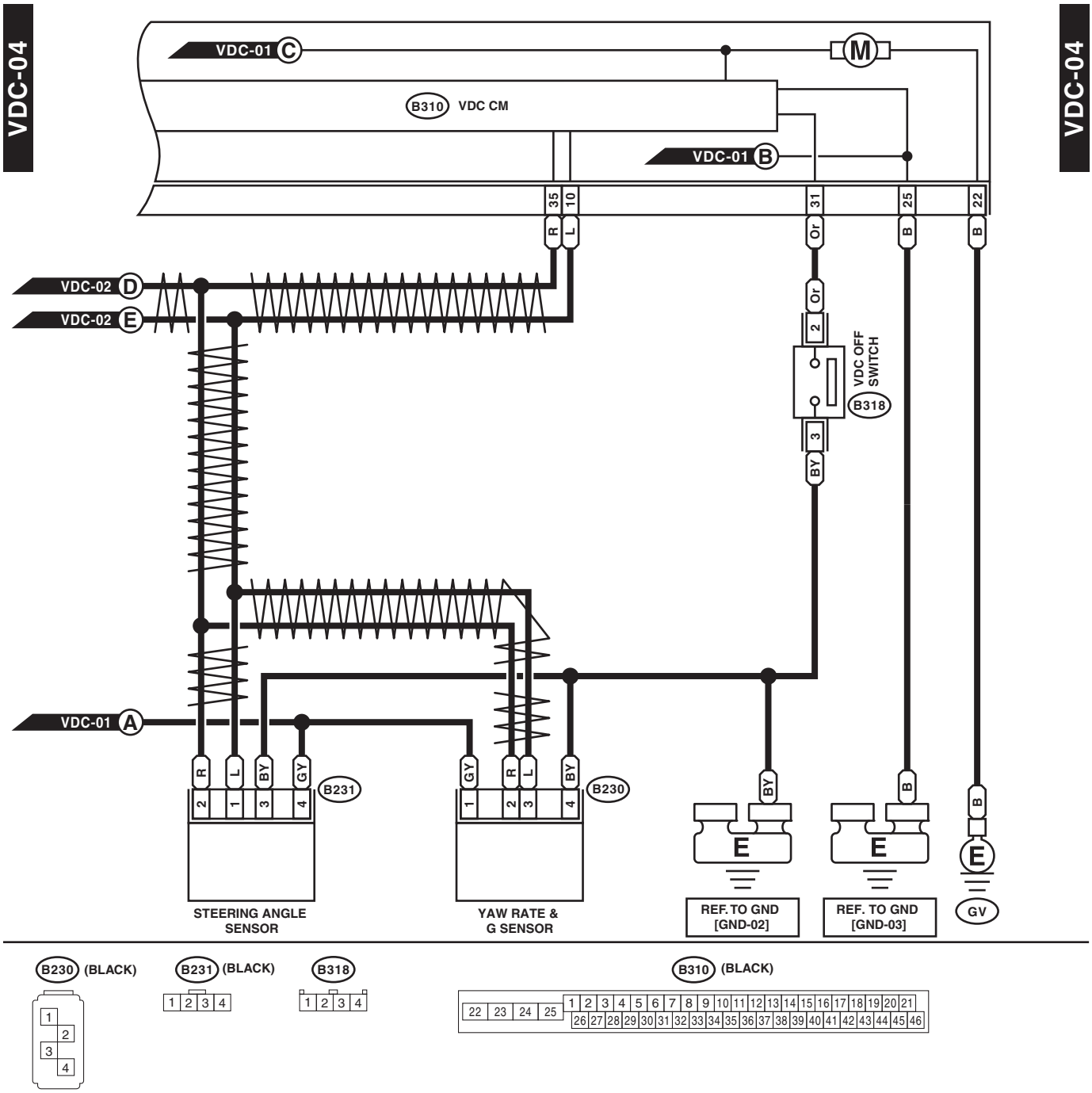
WI-31070

VDC-03

VDC-03



WI-25387

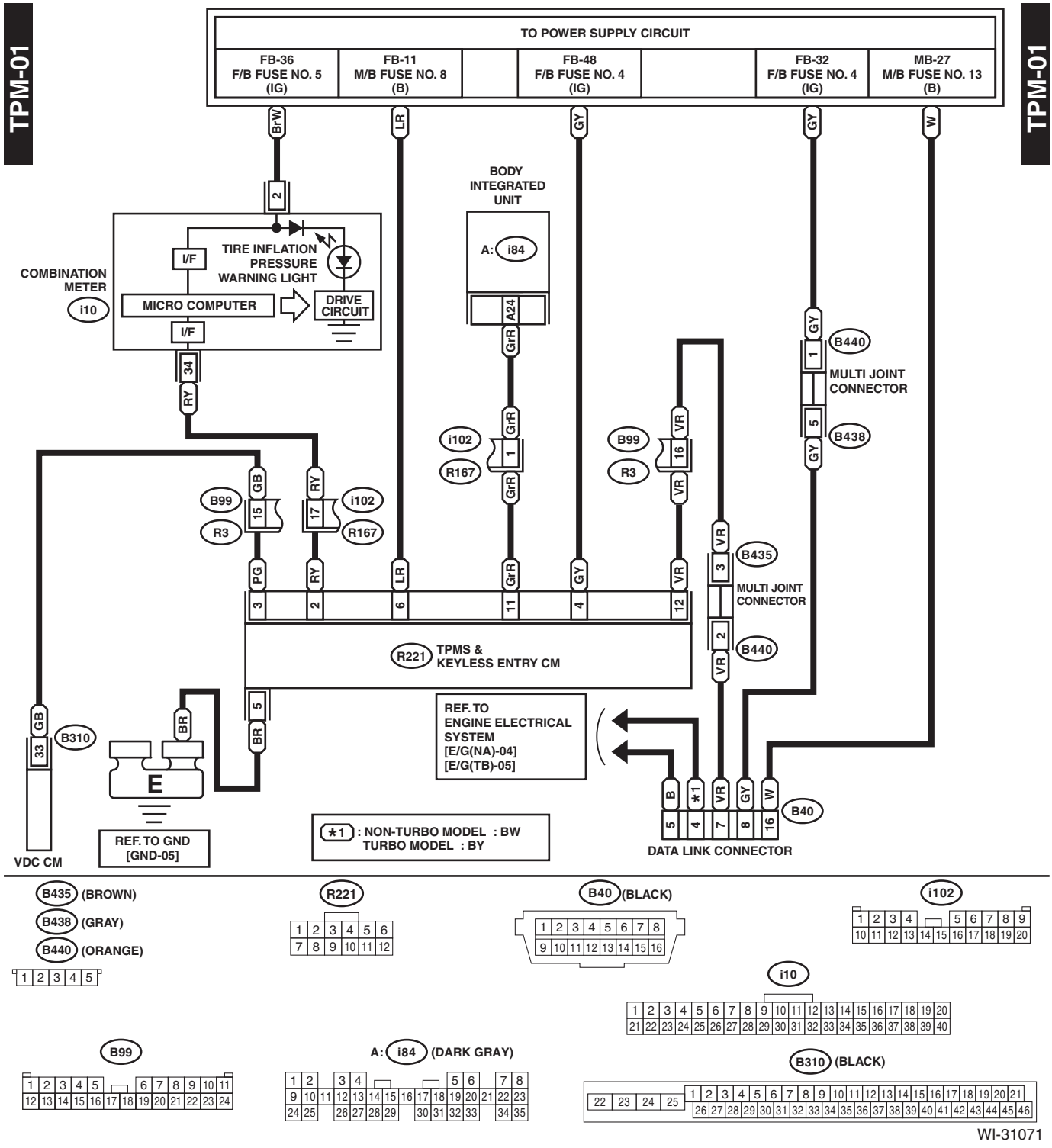

VDC-04
VDC-04
VDC-01 C
M
B310 VDC CM
VDC-01 B
35
10
31
25
22
R
L
Or
B
B
VDC-02 D
VDC-02 E
Or
2
VDC OFF SWITCH
B318
3
BY
VDC-01 A
R
L
BY
GY
B231
GY
R
L
BY
B230
BY
B
B
E
E
E
STEERING ANGLE SENSOR
YAW RATE & G SENSOR
REF. TO GND [GND-02]
REF. TO GND [GND-03]
GV

B230 (BLACK)
B231 (BLACK)
B318
B310 (BLACK)
1 2 3 4
1 2 3 4
1 2 3 4
22 23 24 25
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46

WI-25155

13.Tire Pressure Monitoring System

A: WIRING DIAGRAM

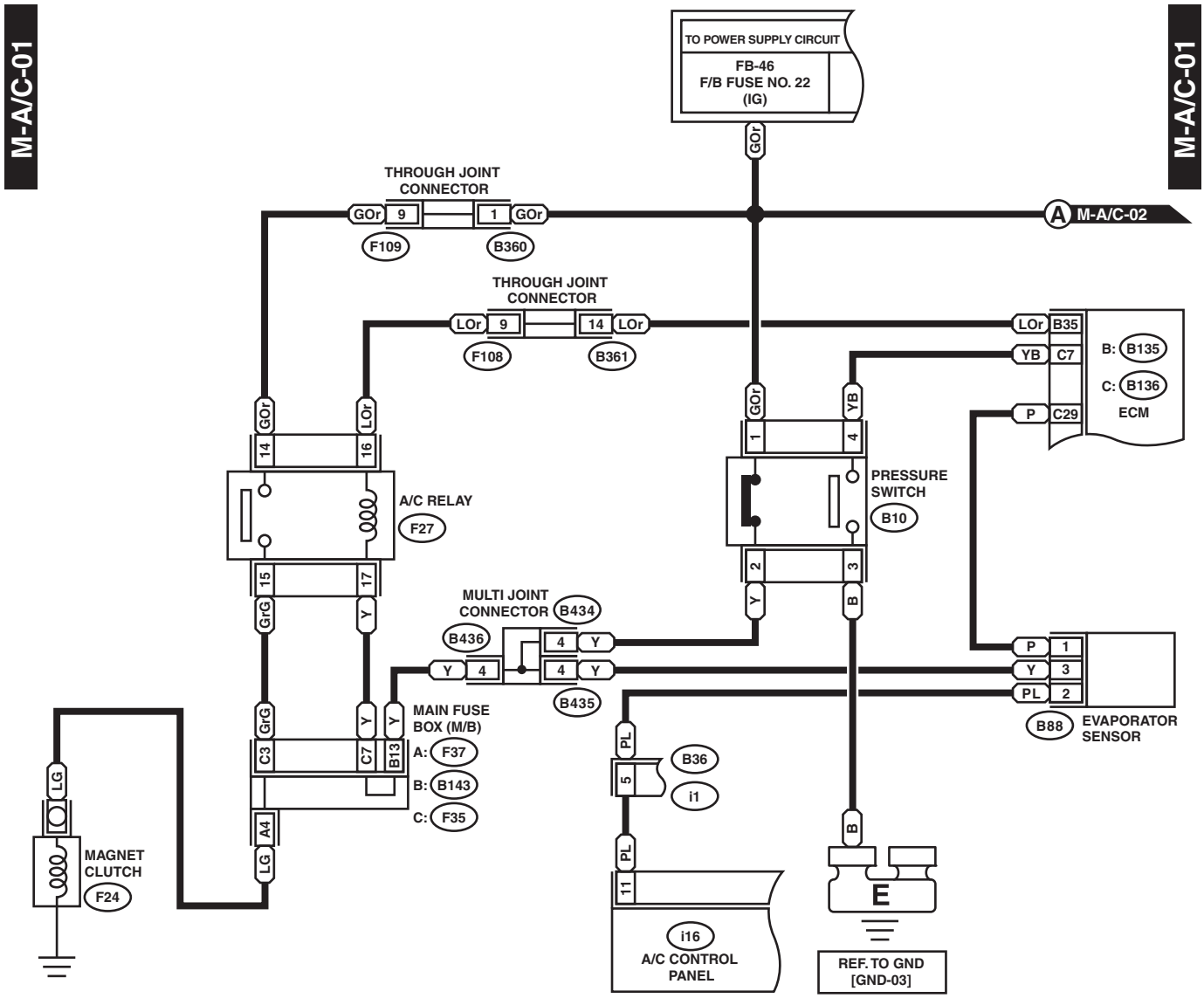


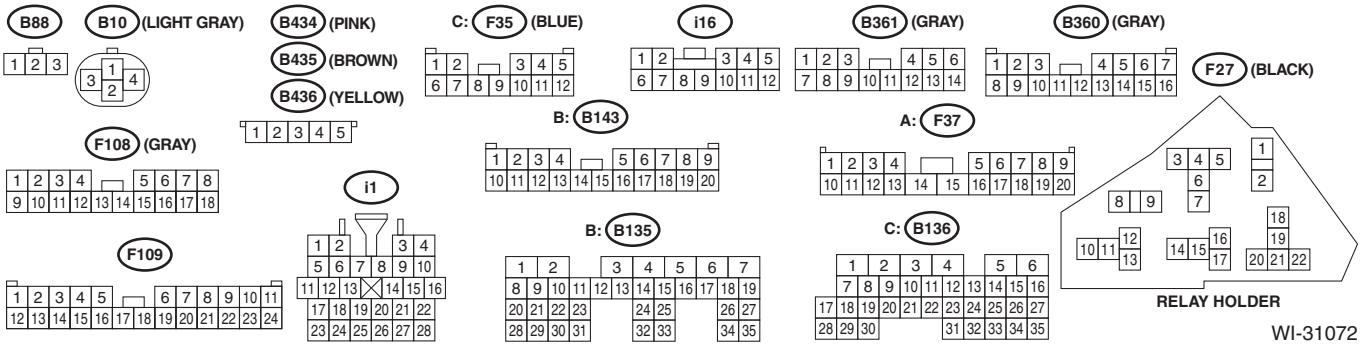
WI-31071

14.Air Conditioning System

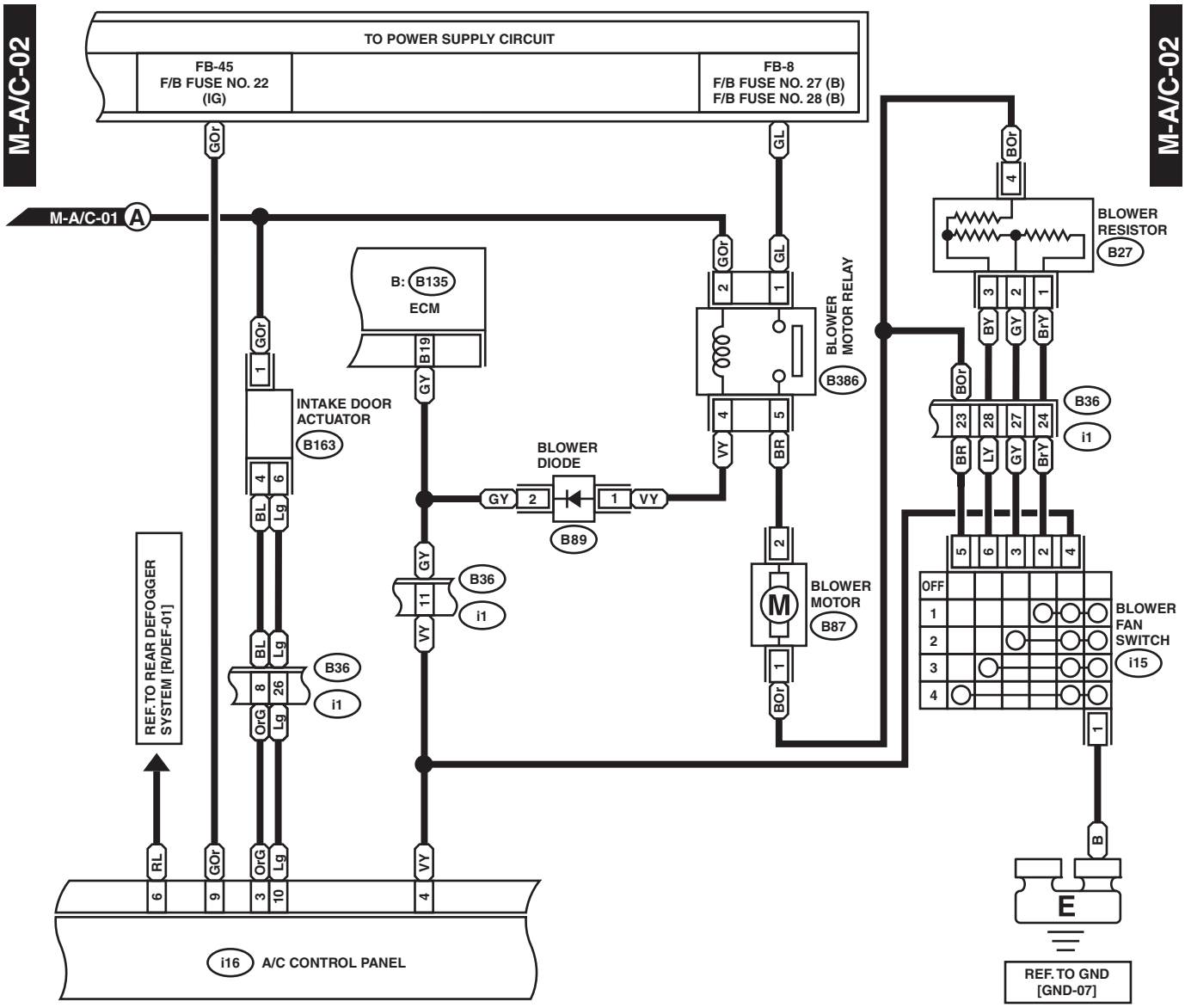
A: WIRING DIAGRAM

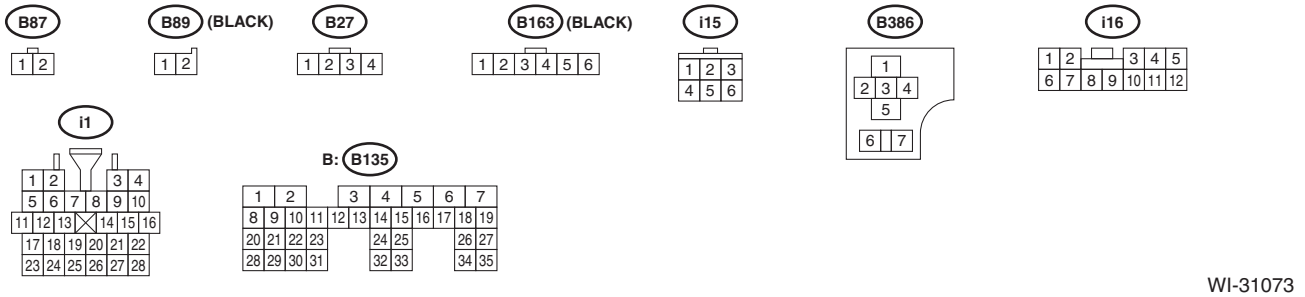
1. MANUAL A/C MODEL





WIRING SYSTEM

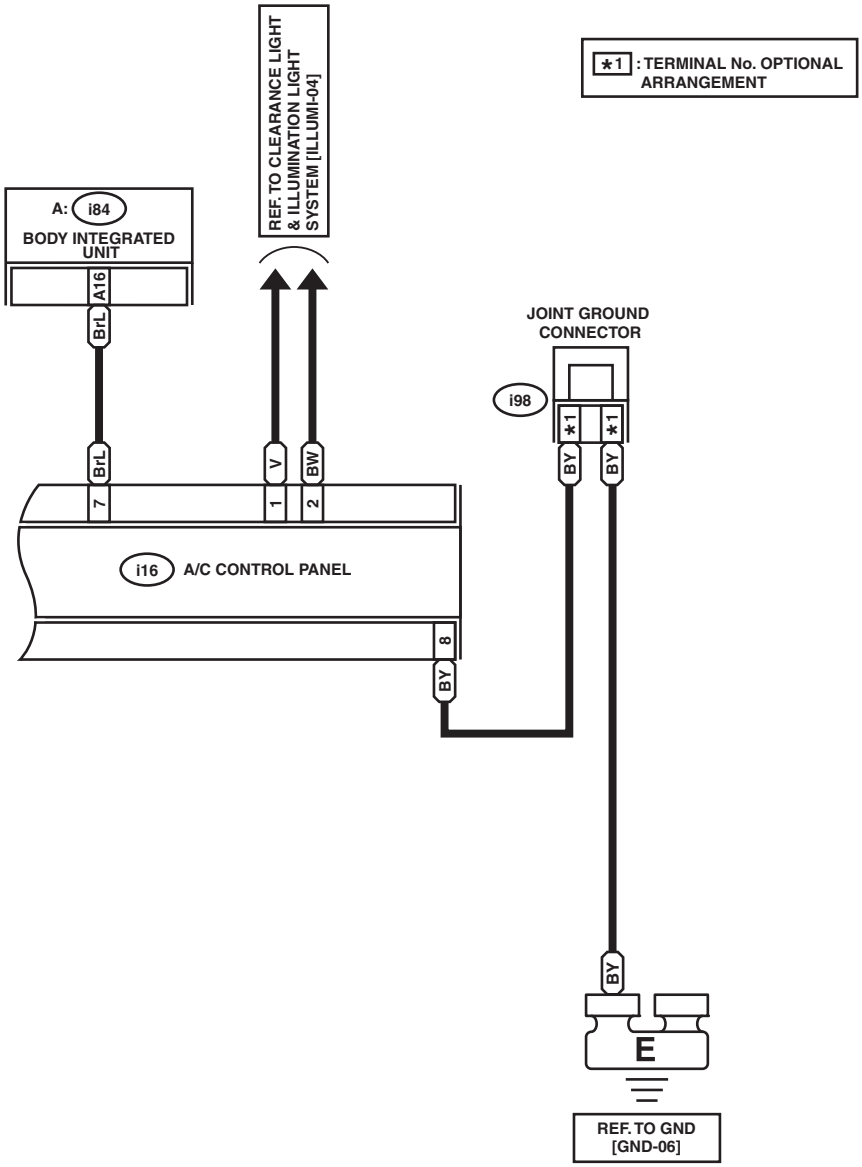


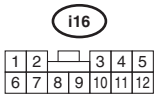


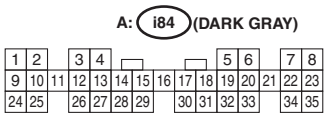
WI-31073

M-A/C-03

M-A/C-03

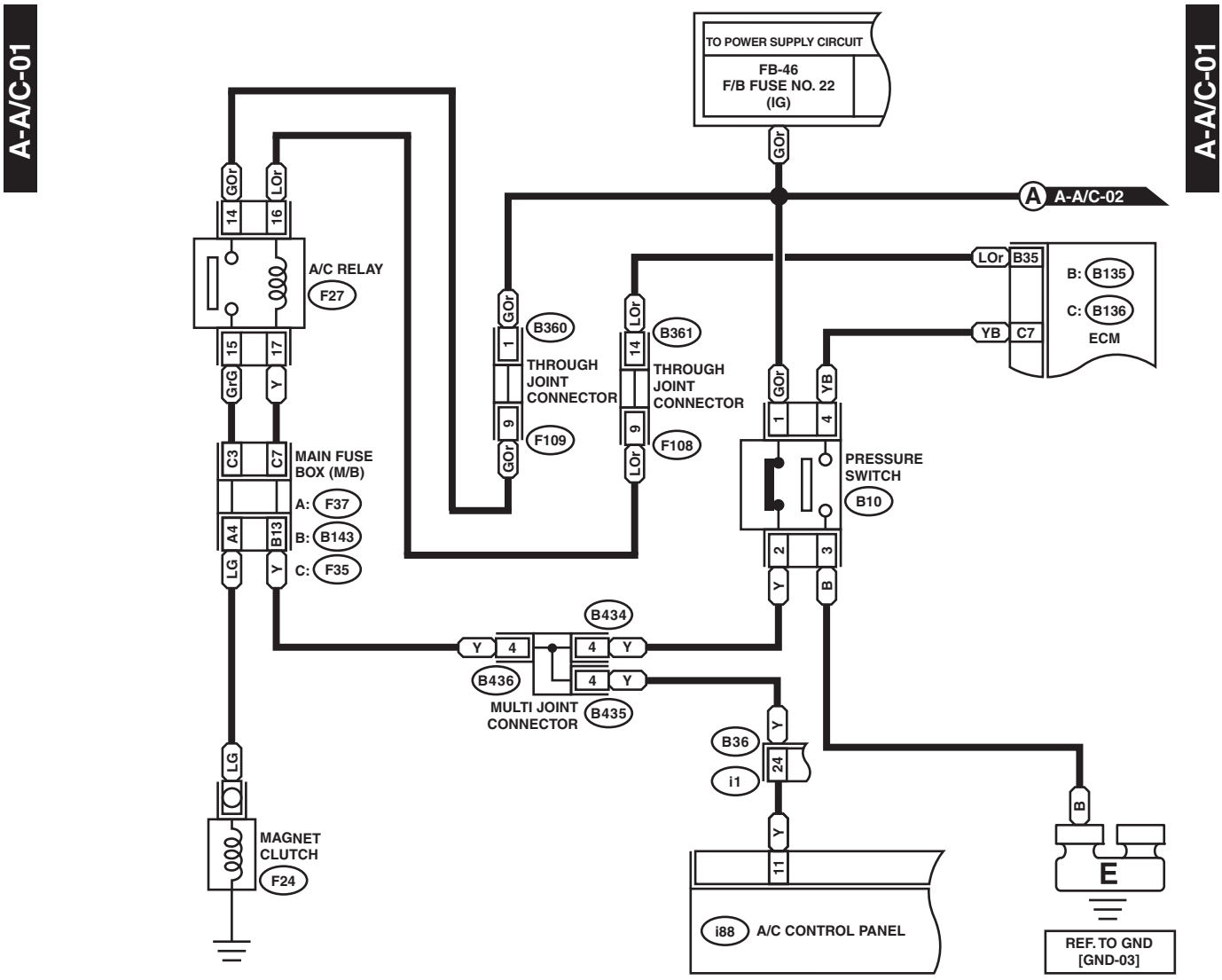


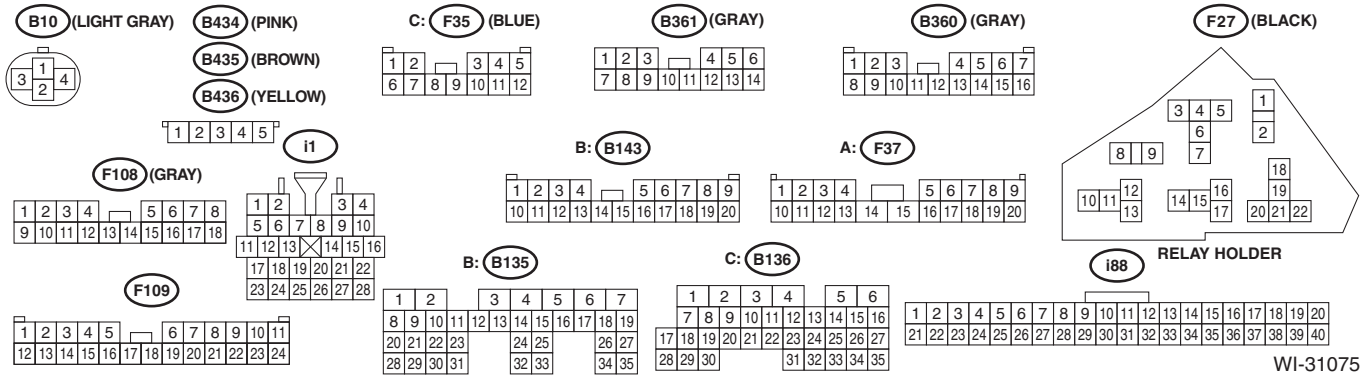


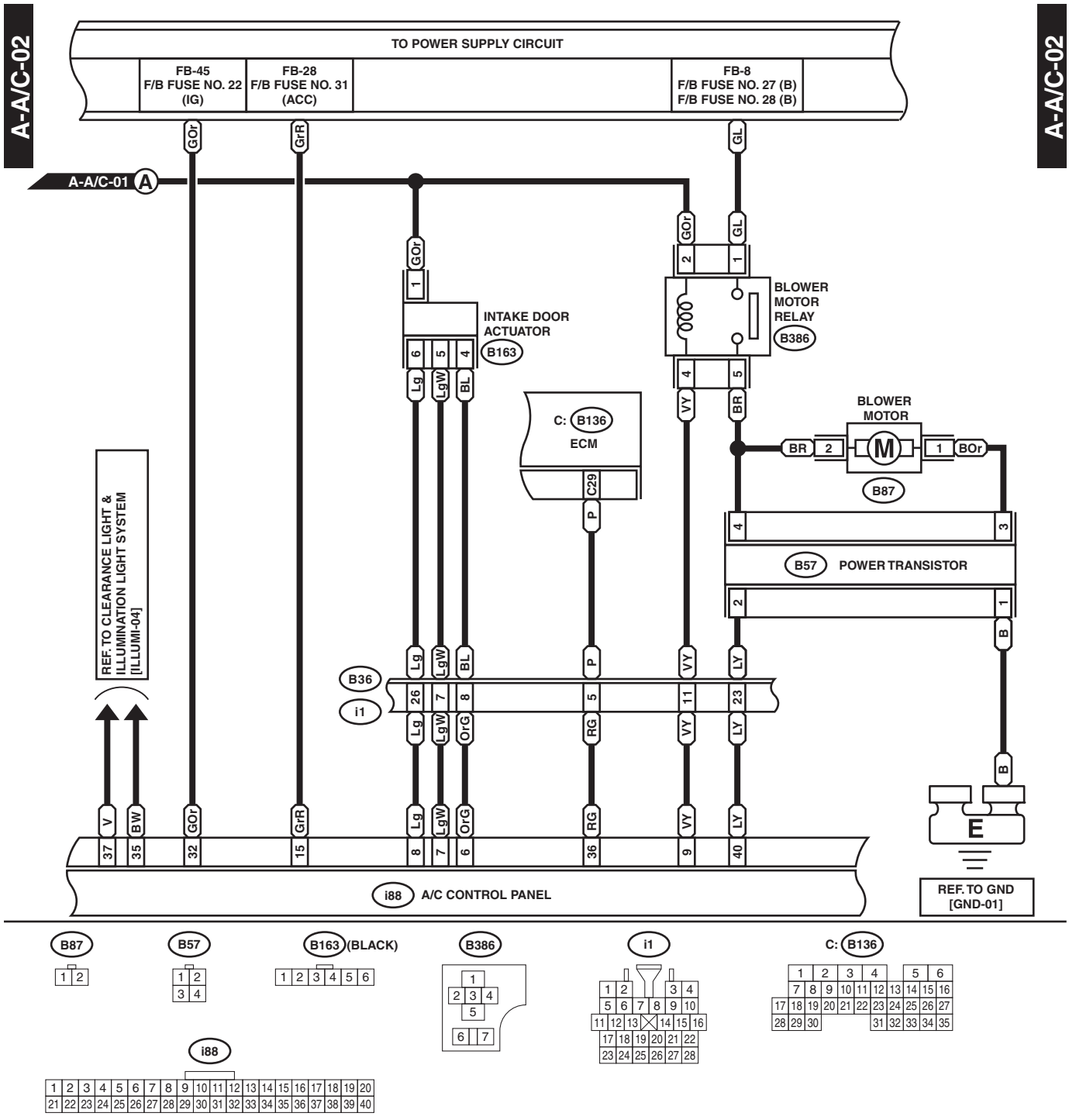


WI-31074

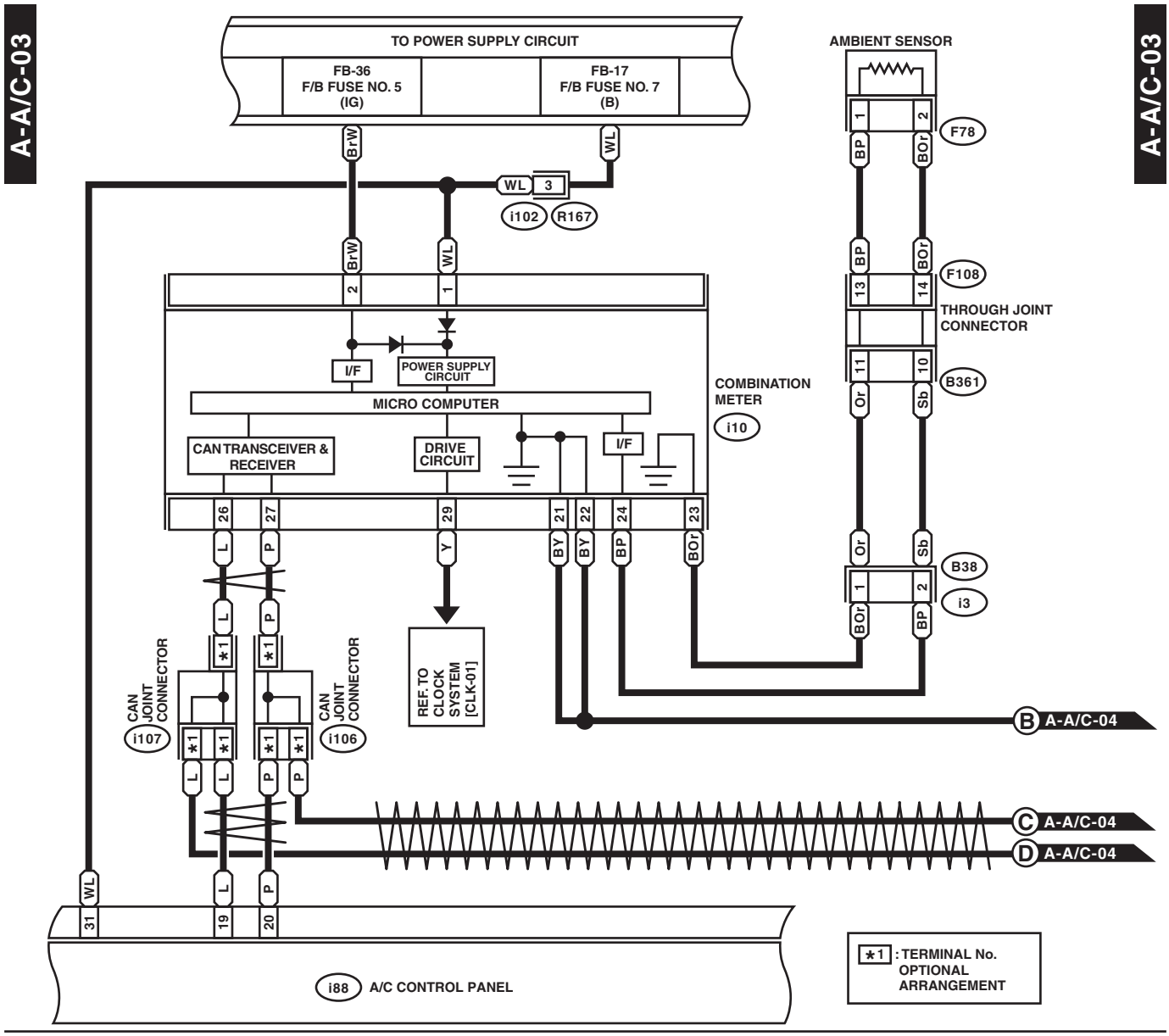
2. AUTO A/C MODEL

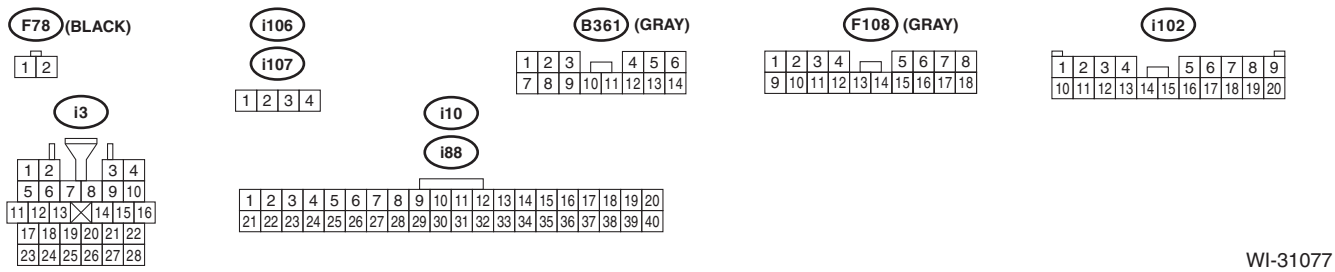




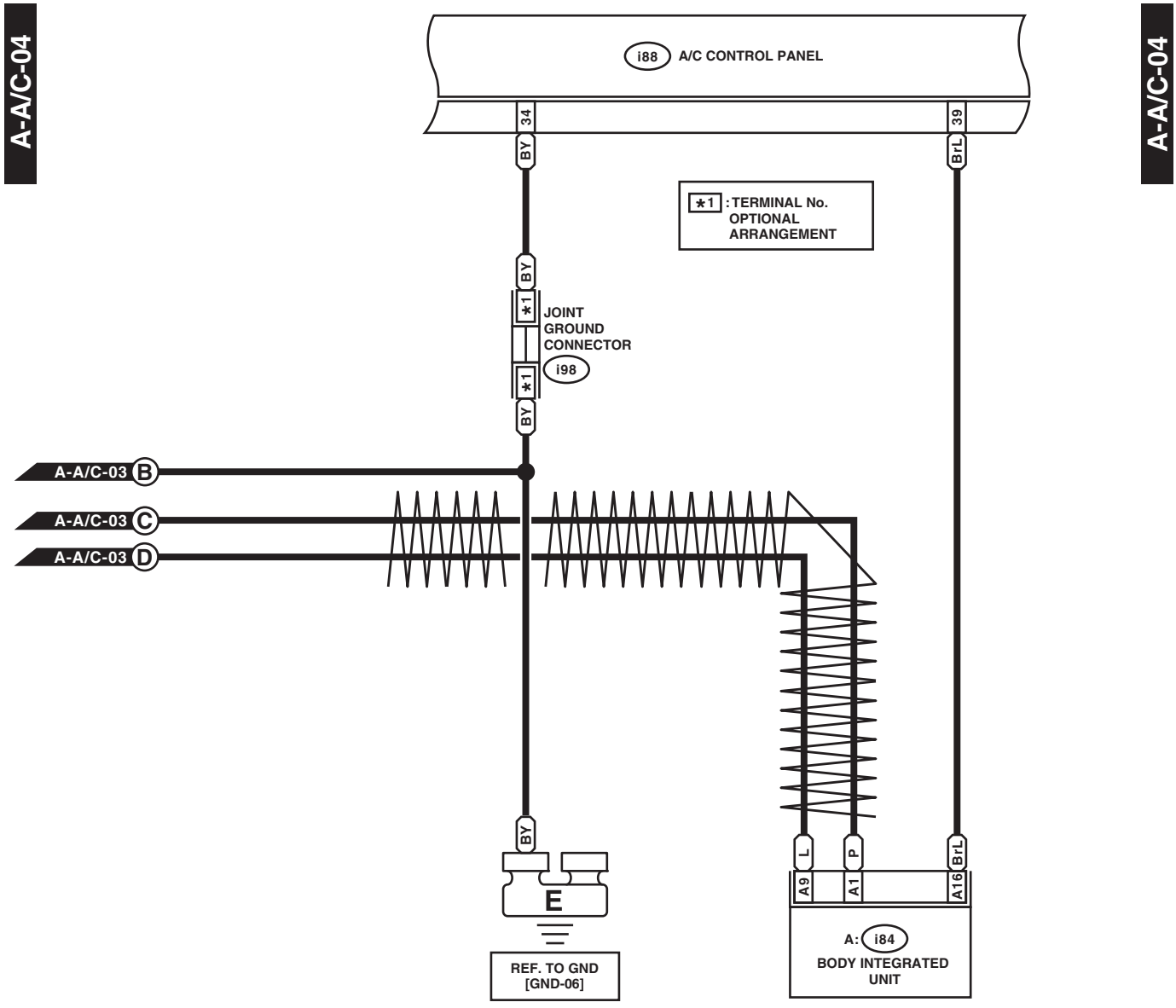

A-A/C-02
A-A/C-02
TO POWER SUPPLY CIRCUIT
FB-45
F/B FUSE NO. 22
(IG)
FB-28
F/B FUSE NO. 31
(ACC)
FB-8
F/B FUSE NO. 27 (B)
F/B FUSE NO. 28 (B)
A-A/C-01 A
INTAKE DOOR
ACTUATOR
B163
BLOWER
MOTOR
RELAY
B386
C: B136
ECM
BLOWER
MOTOR
B87
B57 POWER TRANSISTOR
REF. TO CLEARANCE LIGHT &
ILLUMINATION LIGHT SYSTEM
[ILLUMI-04]
B36
i1
i88 A/C CONTROL PANEL
REF. TO GND
[GND-01]
B87
B57
B163 (BLACK)
B386
i1
C: B136
i88

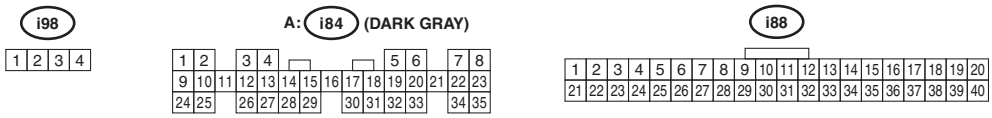
WI-31076


A-A/C-03
A-A/C-03
TO POWER SUPPLY CIRCUIT
FB-36
F/B FUSE NO. 5
(IG)
FB-17
F/B FUSE NO. 7
(B)
AMBIENT SENSOR
F78
F108
THROUGH JOINT CONNECTOR
B361
B38
i3
i102
R167
WL 3
COMBINATION METER
i10
I/F
POWER SUPPLY CIRCUIT
MICRO COMPUTER
CAN TRANSCEIVER & RECEIVER
DRIVE CIRCUIT
I/F
CAN JOINT CONNECTOR
i107
CAN JOINT CONNECTOR
i106
REF. TO CLOCK SYSTEM [CLK-01]
B A-A/C-04
C A-A/C-04
D A-A/C-04
i88 A/C CONTROL PANEL
*1 : TERMINAL No. OPTIONAL ARRANGEMENT


F78 (BLACK)
i3
i106
i107
i10
i88
B361 (GRAY)
F108 (GRAY)
i102

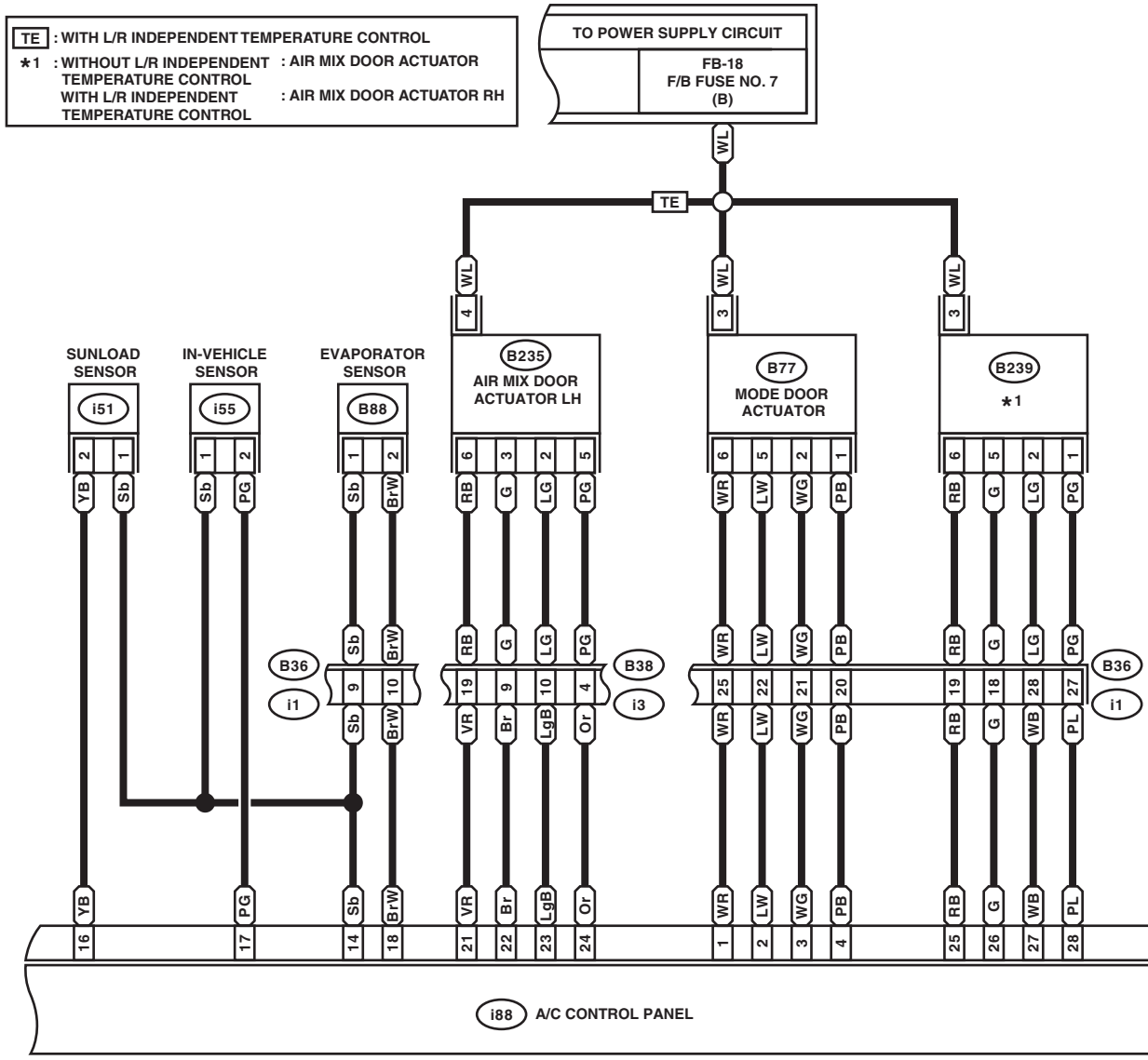
WI-31077

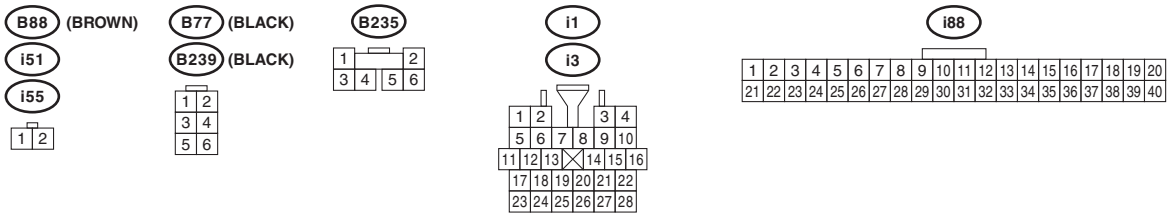

A-A/C-04
A-A/C-04
i88 A/C CONTROL PANEL
34
39
BY
BrL
*1 : TERMINAL No. OPTIONAL ARRANGEMENT
JOINT GROUND CONNECTOR
i98
A-A/C-03 B
A-A/C-03 C
A-A/C-03 D
E
REF. TO GND [GND-06]
L
P
A9
A1
A16
A: i84
BODY INTEGRATED UNIT


i98
1 2 3 4
A: i84 (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
i88
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

WI-31078

A-A/C-05

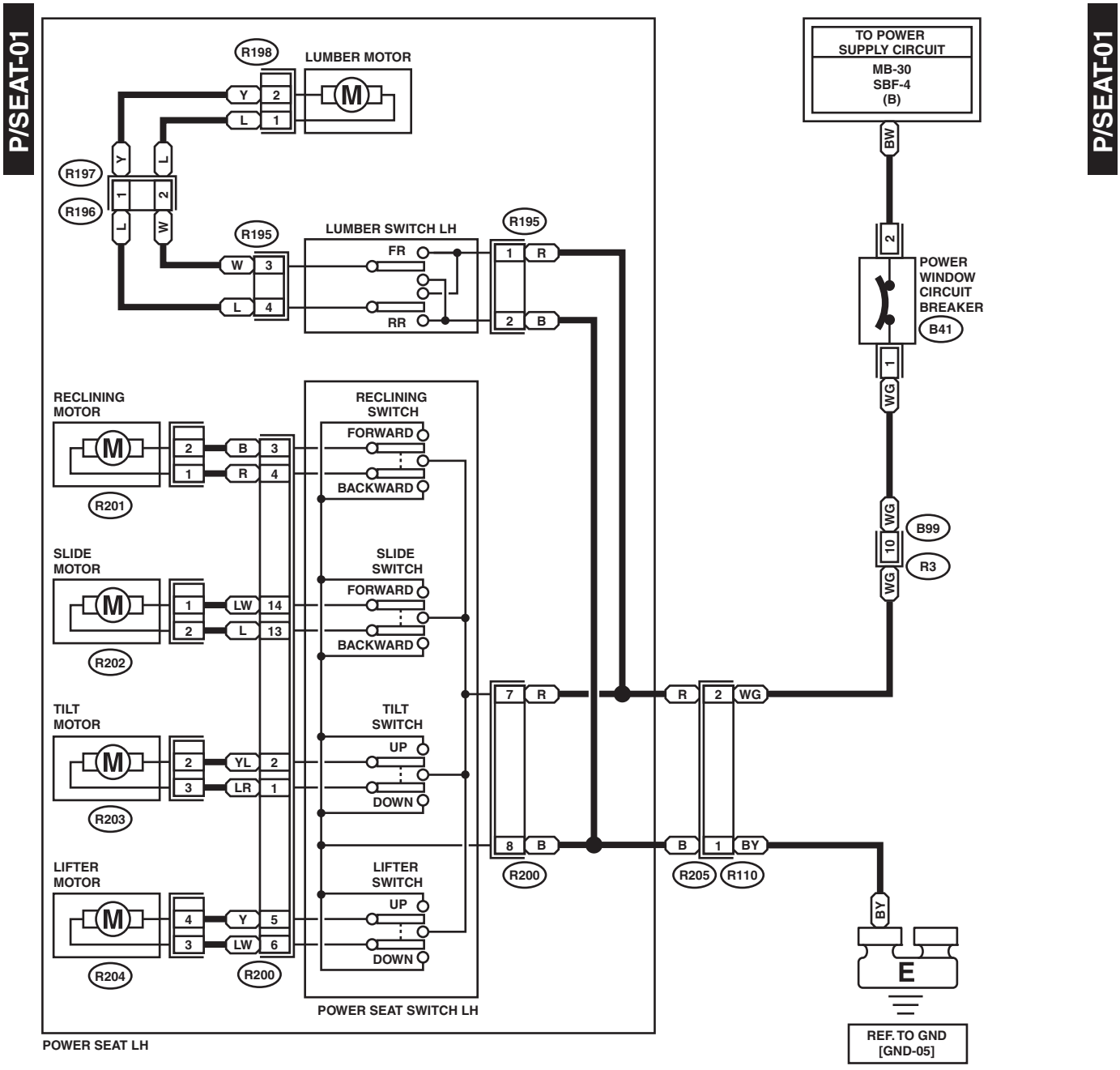


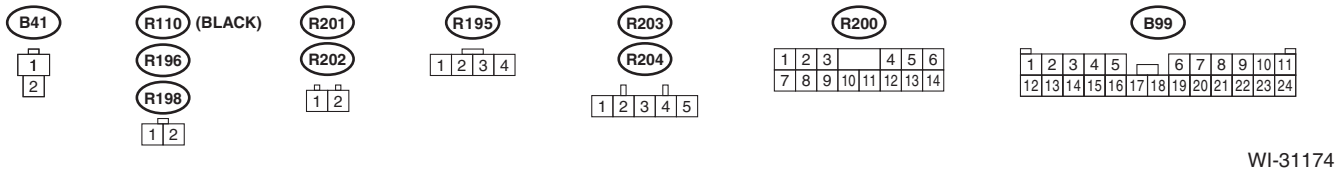


WI-31079

15.Power Seat System

A: WIRING DIAGRAM

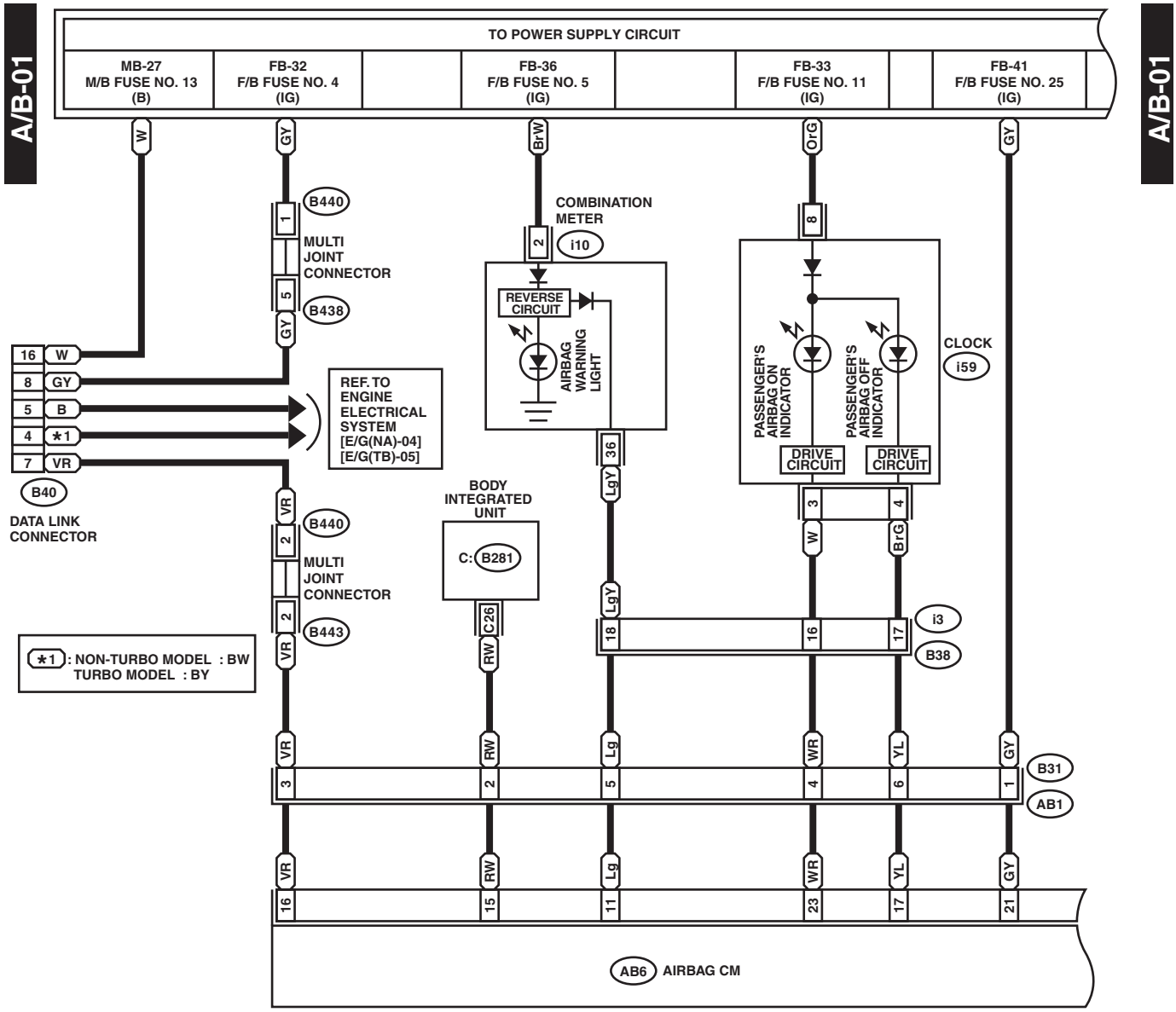


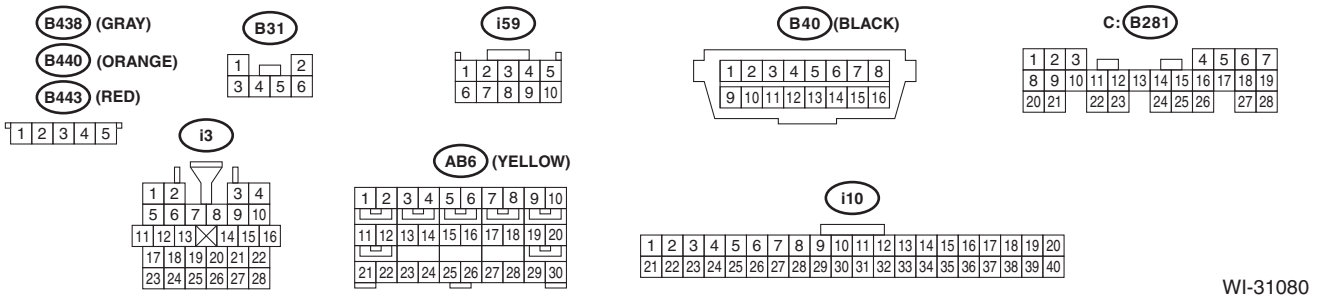


WI-31174

16.Airbag System

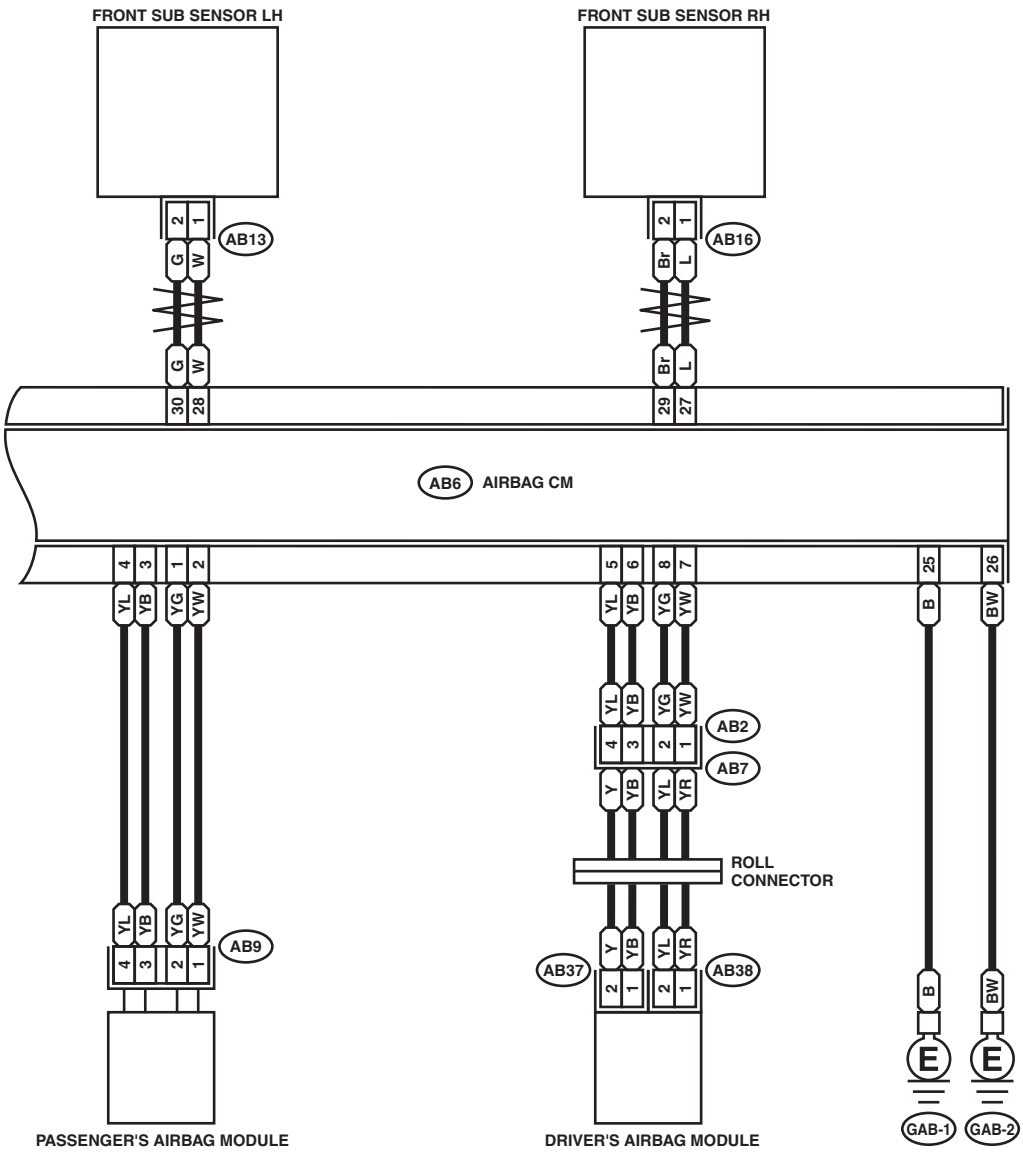
A: WIRING DIAGRAM

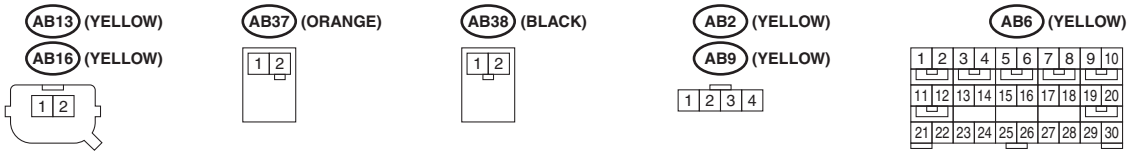




WI-31080

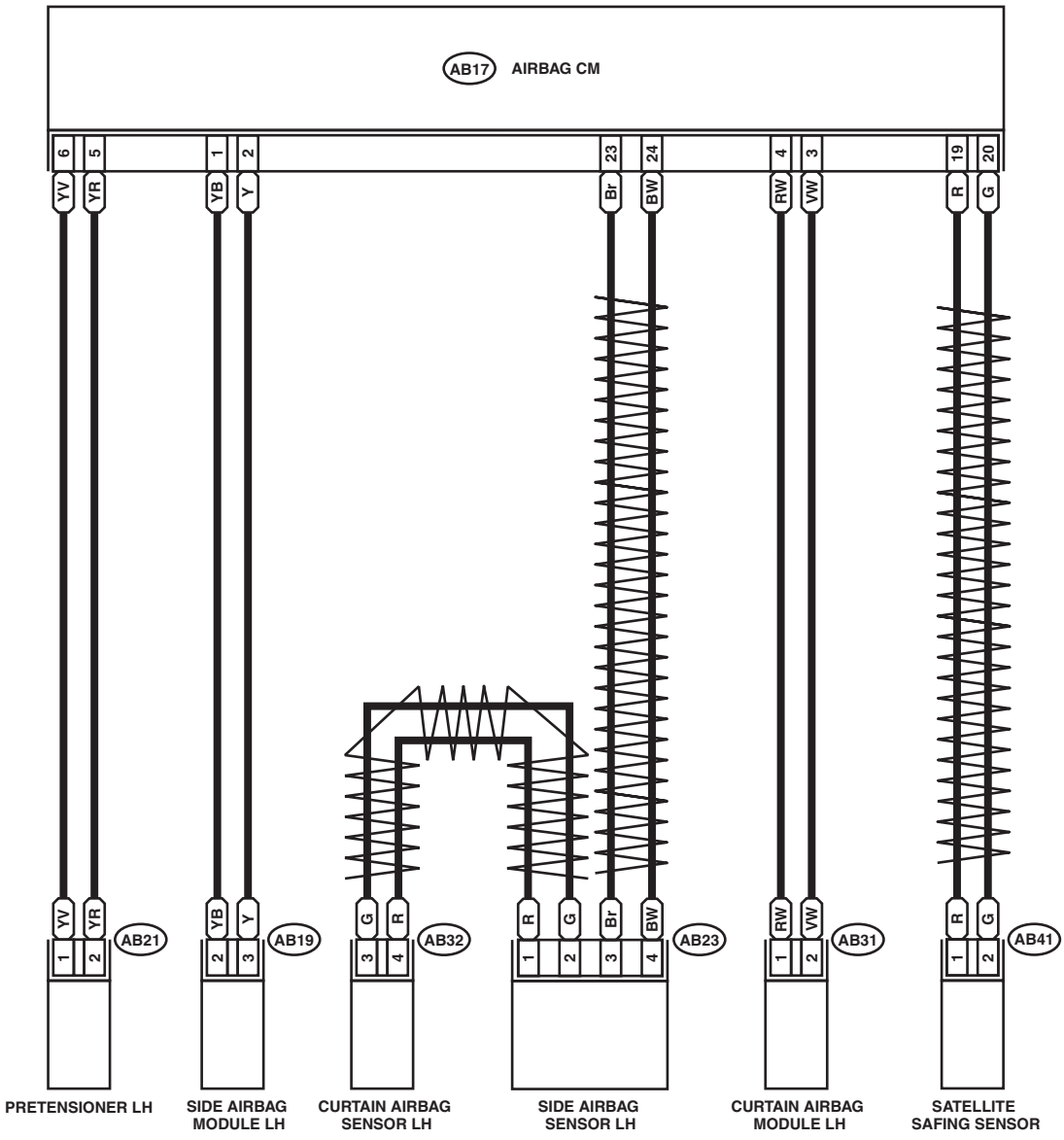
A/B-02

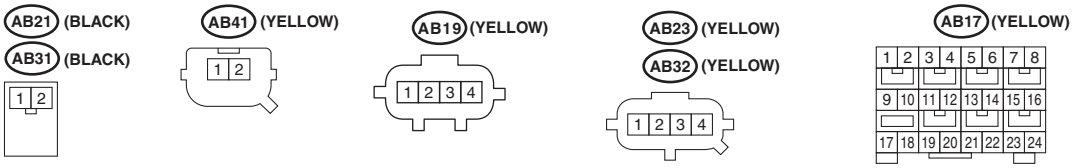




WI-19555

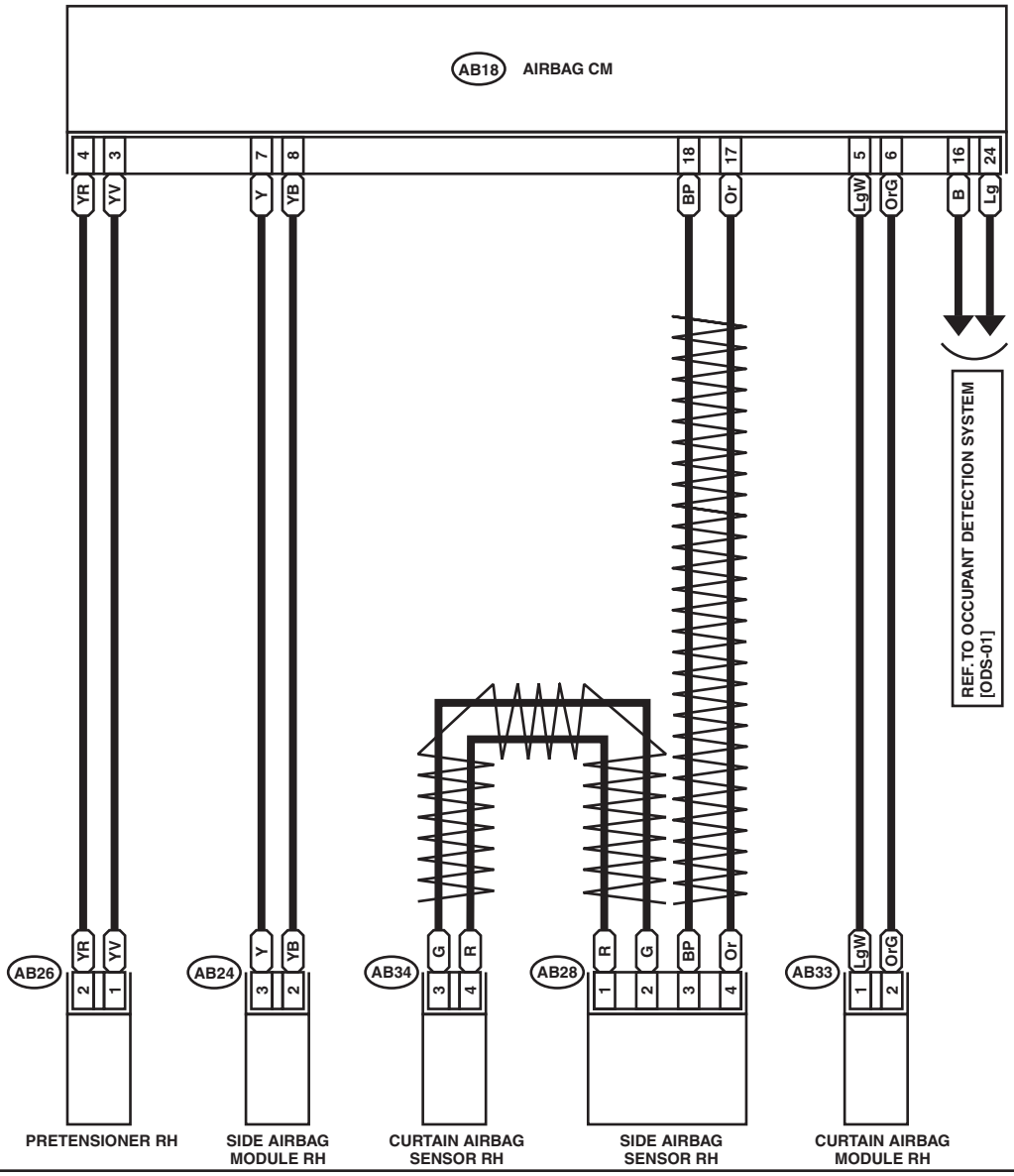
A/B-03

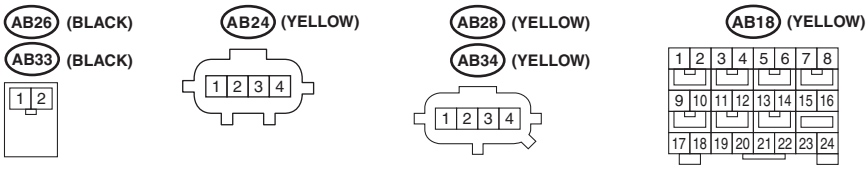




WI-31081

A/B-04

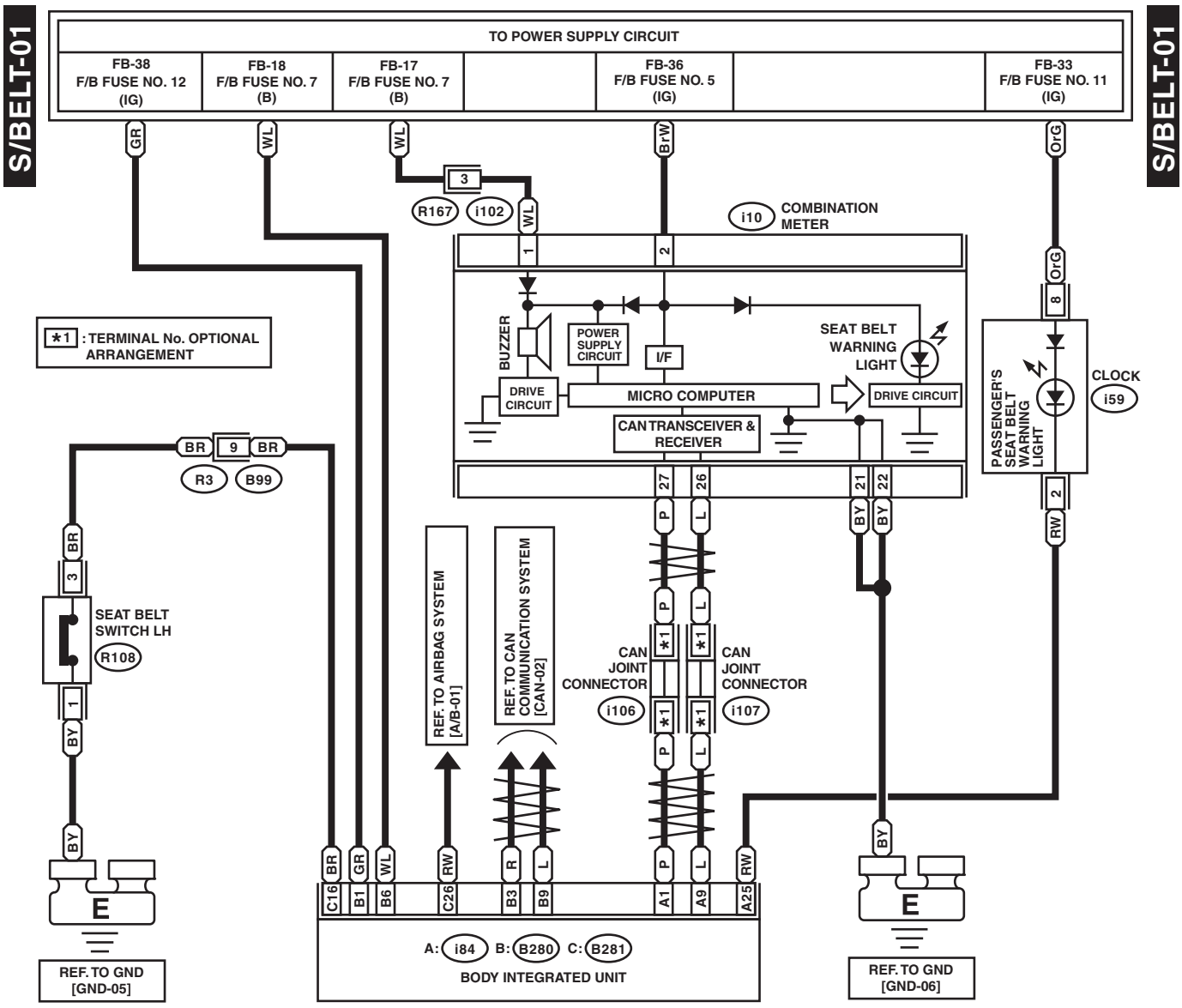


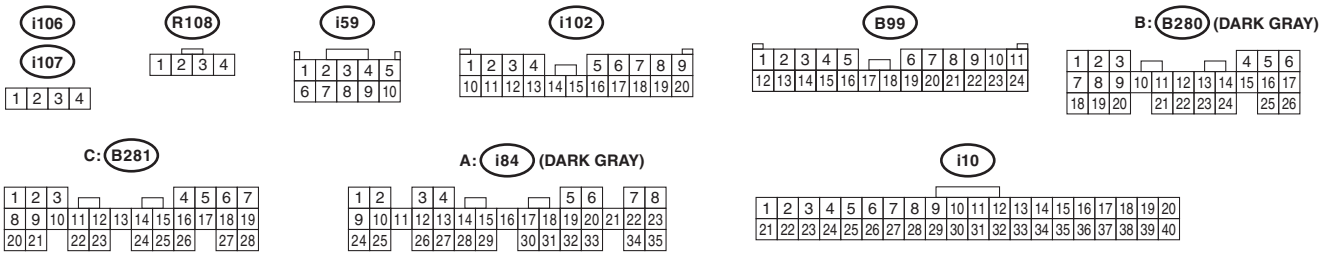


WI-19557

17.Seat Belt Warning System

A: WIRING DIAGRAM

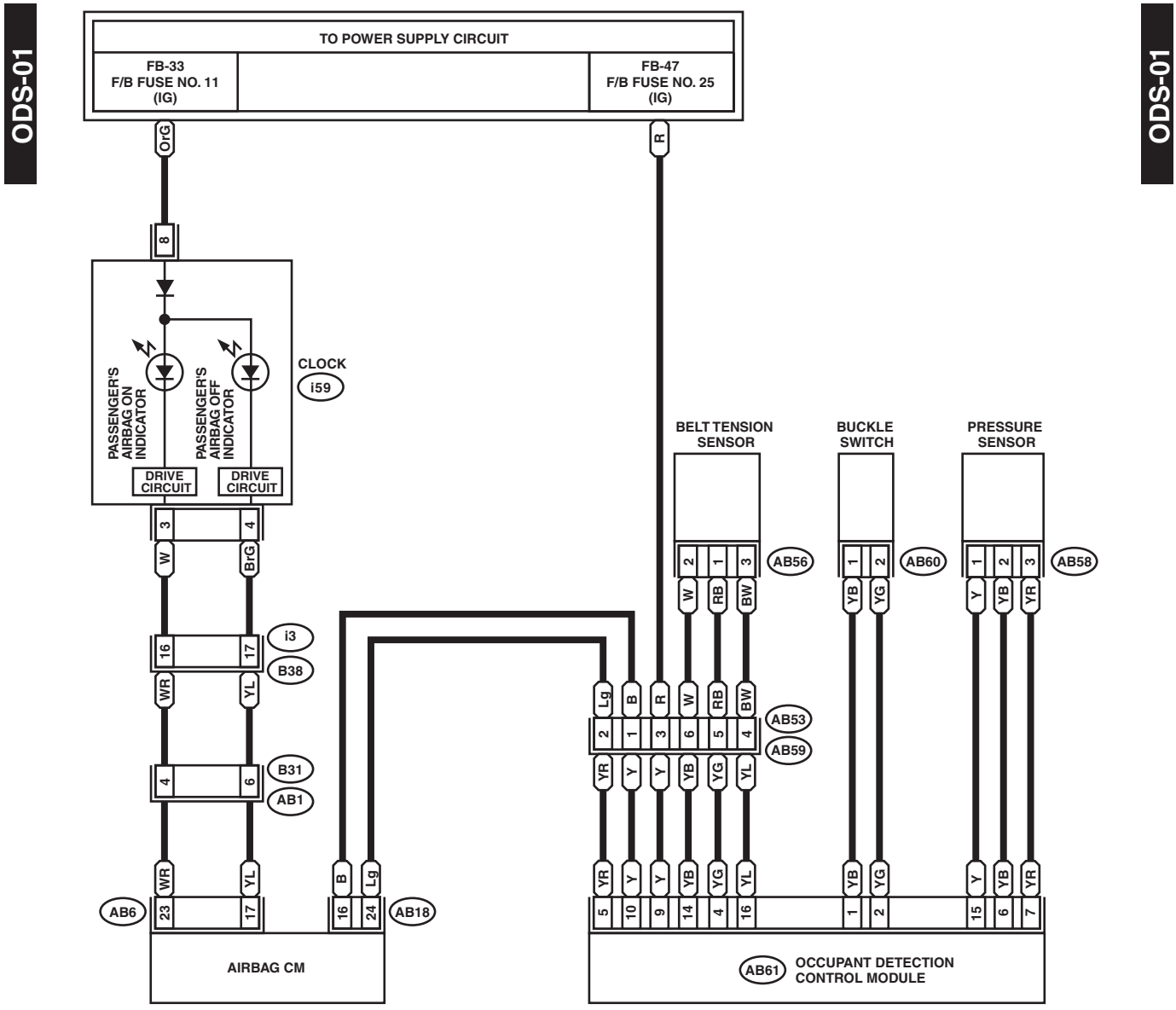


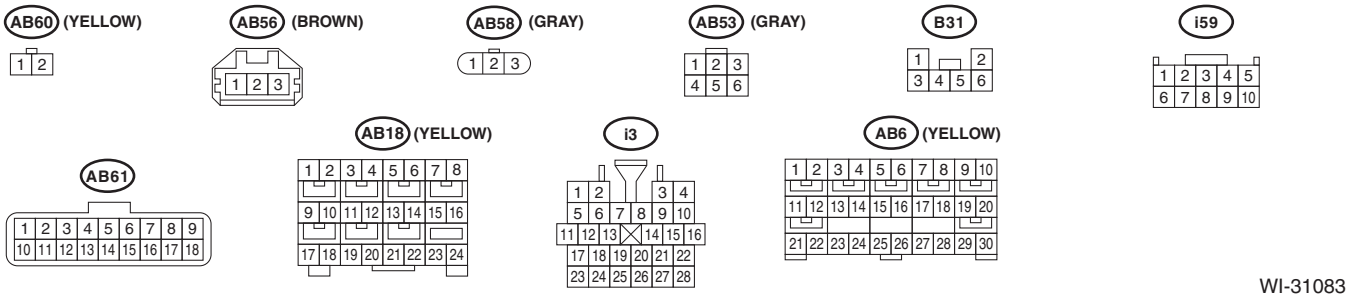


WI-31082

18.Occupant Detection System

A: WIRING DIAGRAM



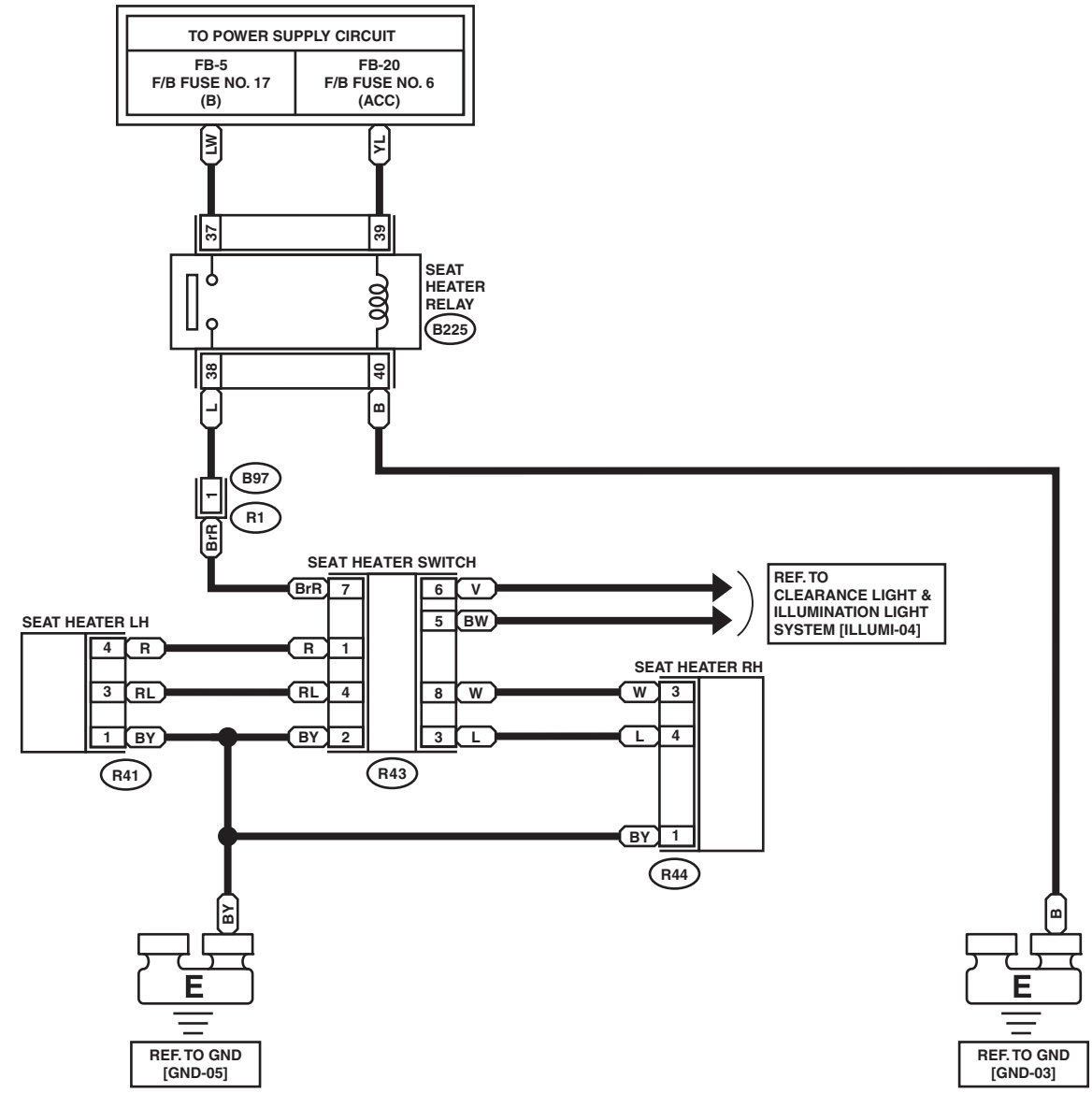


WI-31083

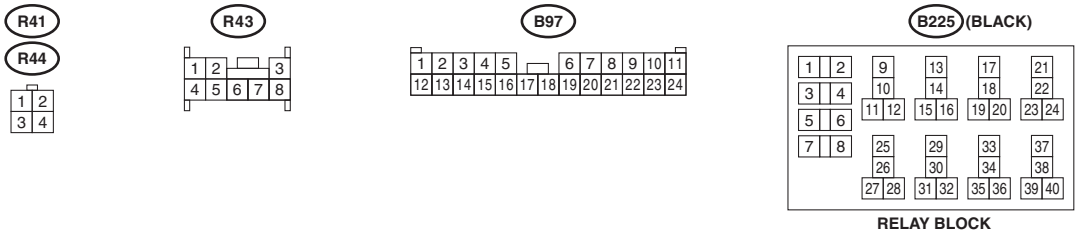
19.Seat Heater System

A: WIRING DIAGRAM

S/H-01



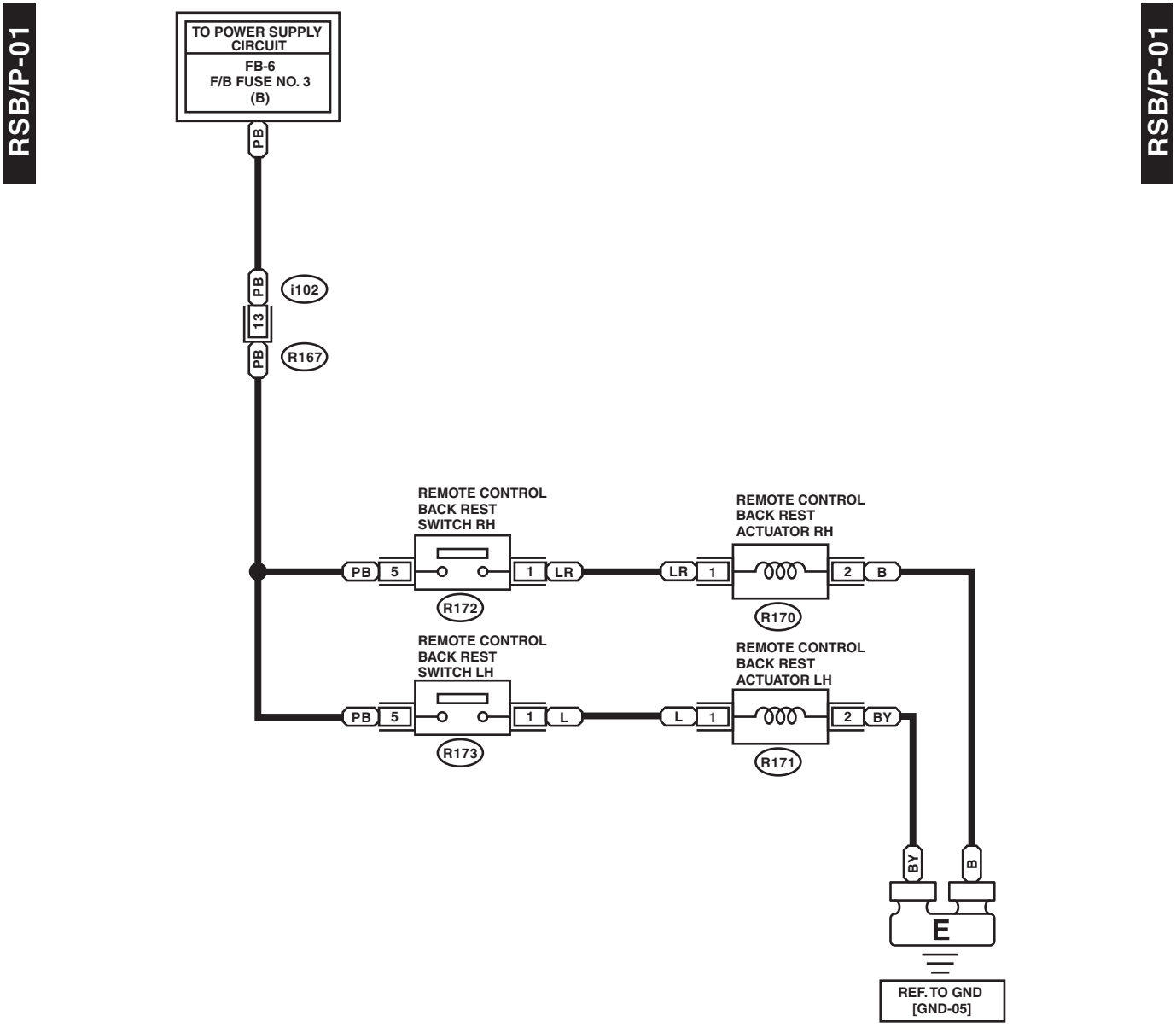
S/H-01

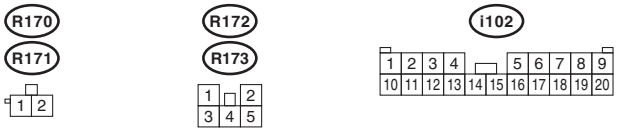


WI-31084

20.Remote Control Back Rest System

A: WIRING DIAGRAM

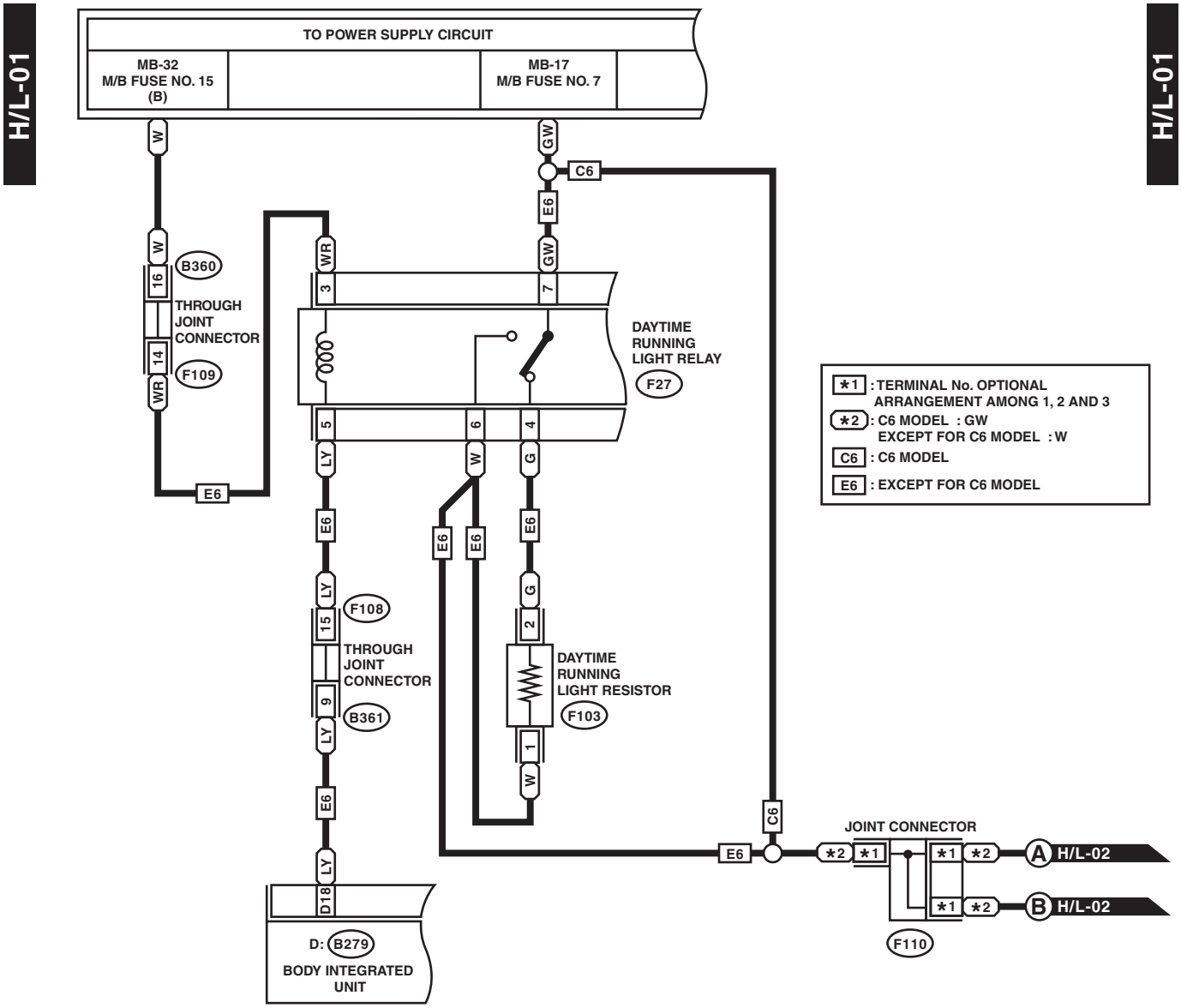


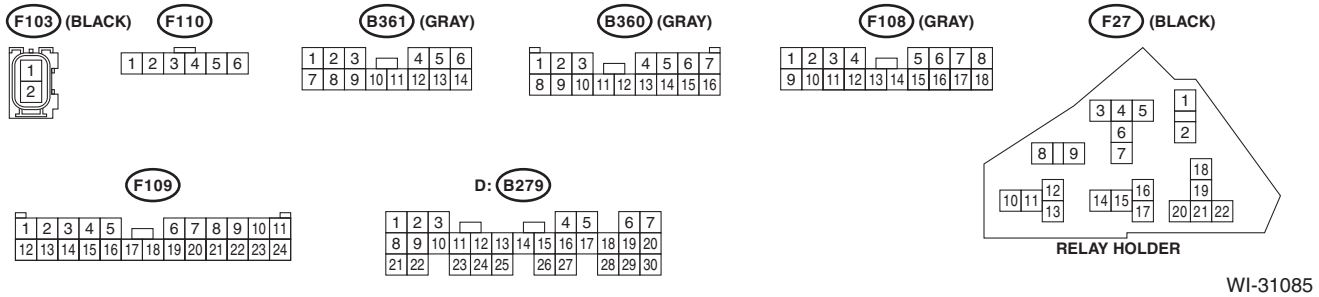


WI-29302

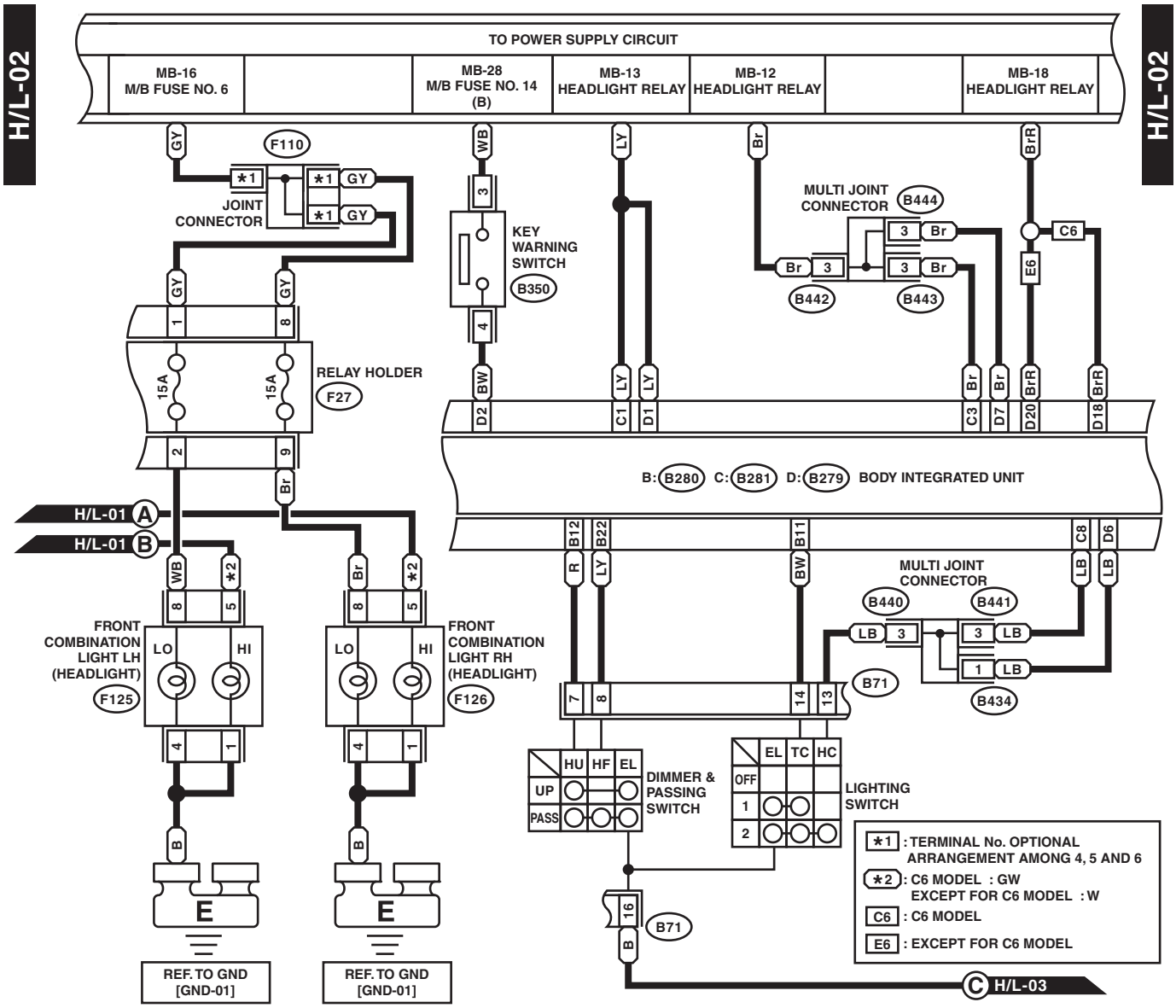
21.Headlight System

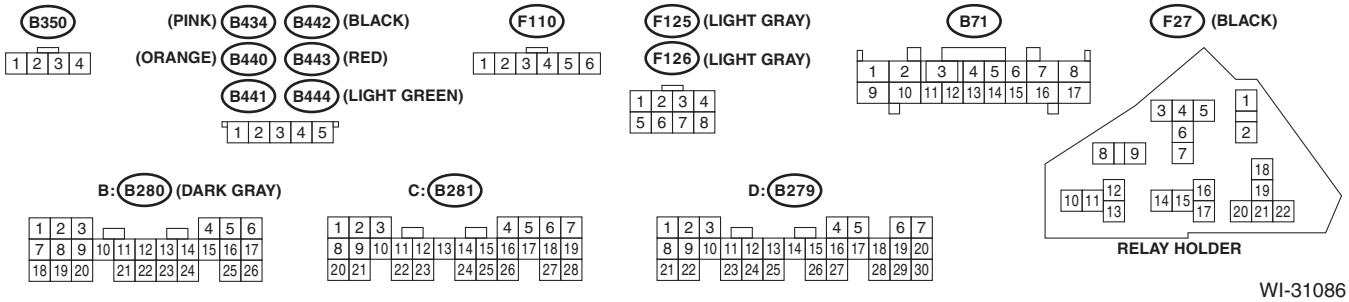
A: WIRING DIAGRAM



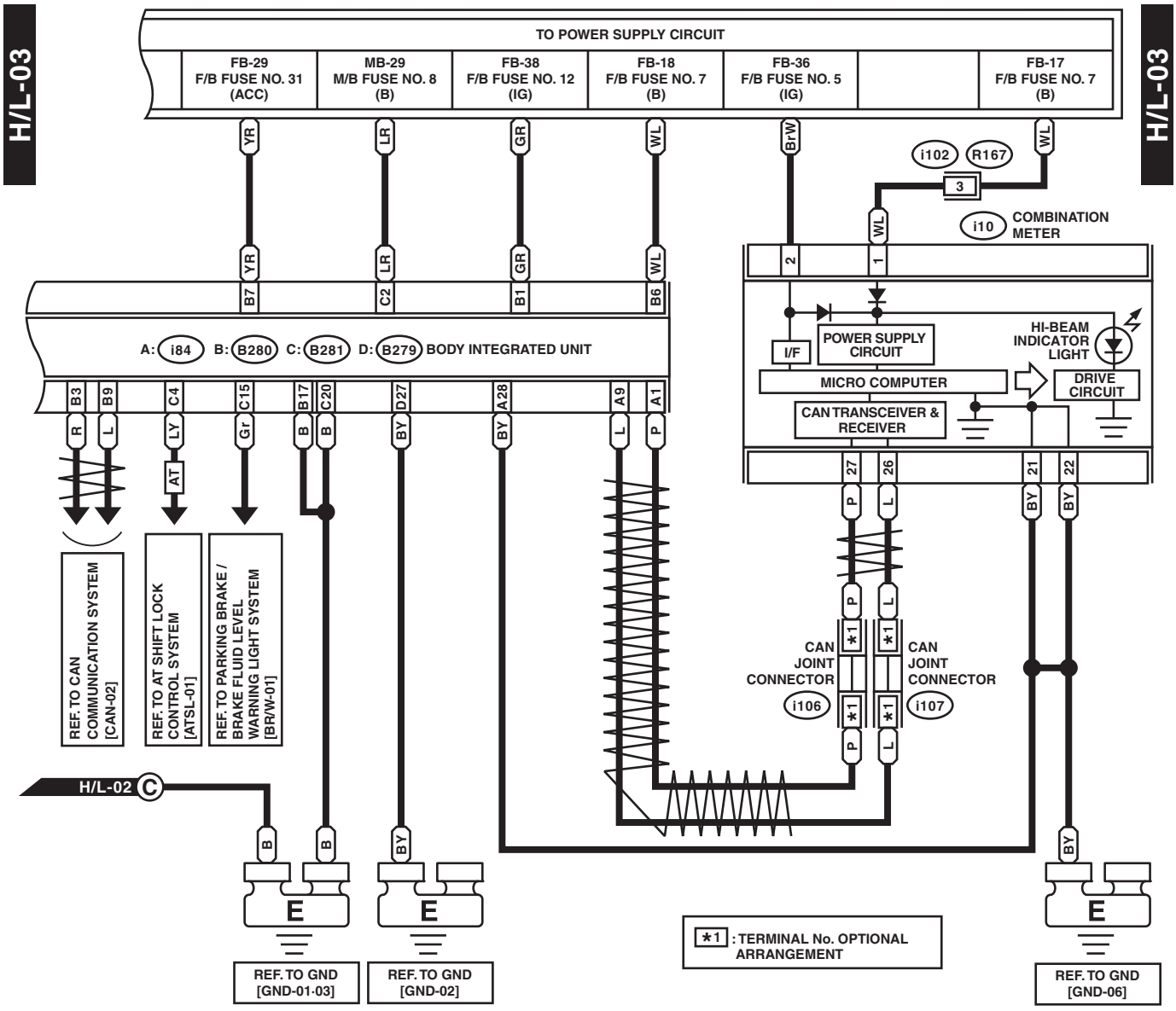


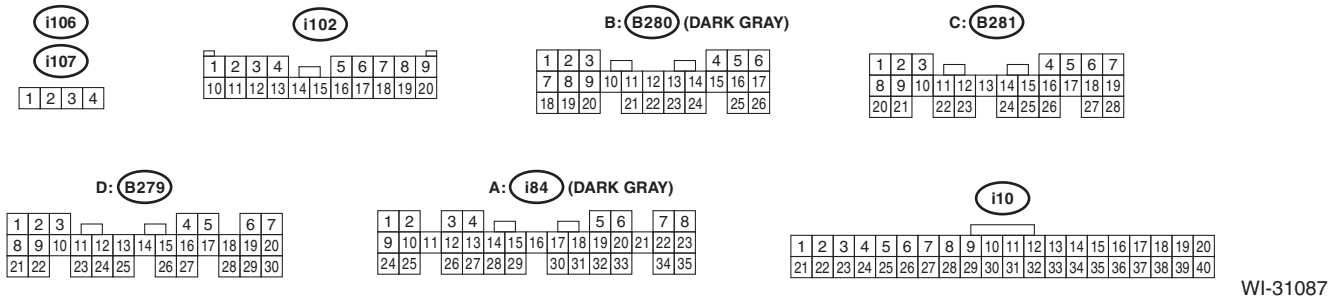
WI-31085


H/L-02
H/L-02
TO POWER SUPPLY CIRCUIT
MB-16
M/B FUSE NO. 6
MB-28
M/B FUSE NO. 14
(B)
MB-13
HEADLIGHT RELAY
MB-12
HEADLIGHT RELAY
MB-18
HEADLIGHT RELAY
F110
JOINT
CONNECTOR
KEY
WARNING
SWITCH
B350
MULTI JOINT
CONNECTOR
B444
B442
B443
RELAY HOLDER
F27
15A
15A
B: B280 C: B281 D: B279 BODY INTEGRATED UNIT
H/L-01 A
H/L-01 B
MULTI JOINT
CONNECTOR
B440
B441
B434
FRONT
COMBINATION
LIGHT LH
(HEADLIGHT)
F125
FRONT
COMBINATION
LIGHT RH
(HEADLIGHT)
F126
LO
HI
B71
DIMMER &
PASSING
SWITCH
HU
HF
EL
UP
PASS
LIGHTING
SWITCH
OFF
TC
HC
REF. TO GND
[GND-01]
REF. TO GND
[GND-01]
*1 : TERMINAL No. OPTIONAL
ARRANGEMENT AMONG 4, 5 AND 6
*2 : C6 MODEL : GW
EXCEPT FOR C6 MODEL : W
C6 : C6 MODEL
E6 : EXCEPT FOR C6 MODEL
C H/L-03


B350
(PINK) B434 B442 (BLACK)
(ORANGE) B440 B443 (RED)
B441 B444 (LIGHT GREEN)
F110
F125 (LIGHT GRAY)
F126 (LIGHT GRAY)
B71
F27 (BLACK)
B: B280 (DARK GRAY)
C: B281
D: B279
RELAY HOLDER

WI-31086

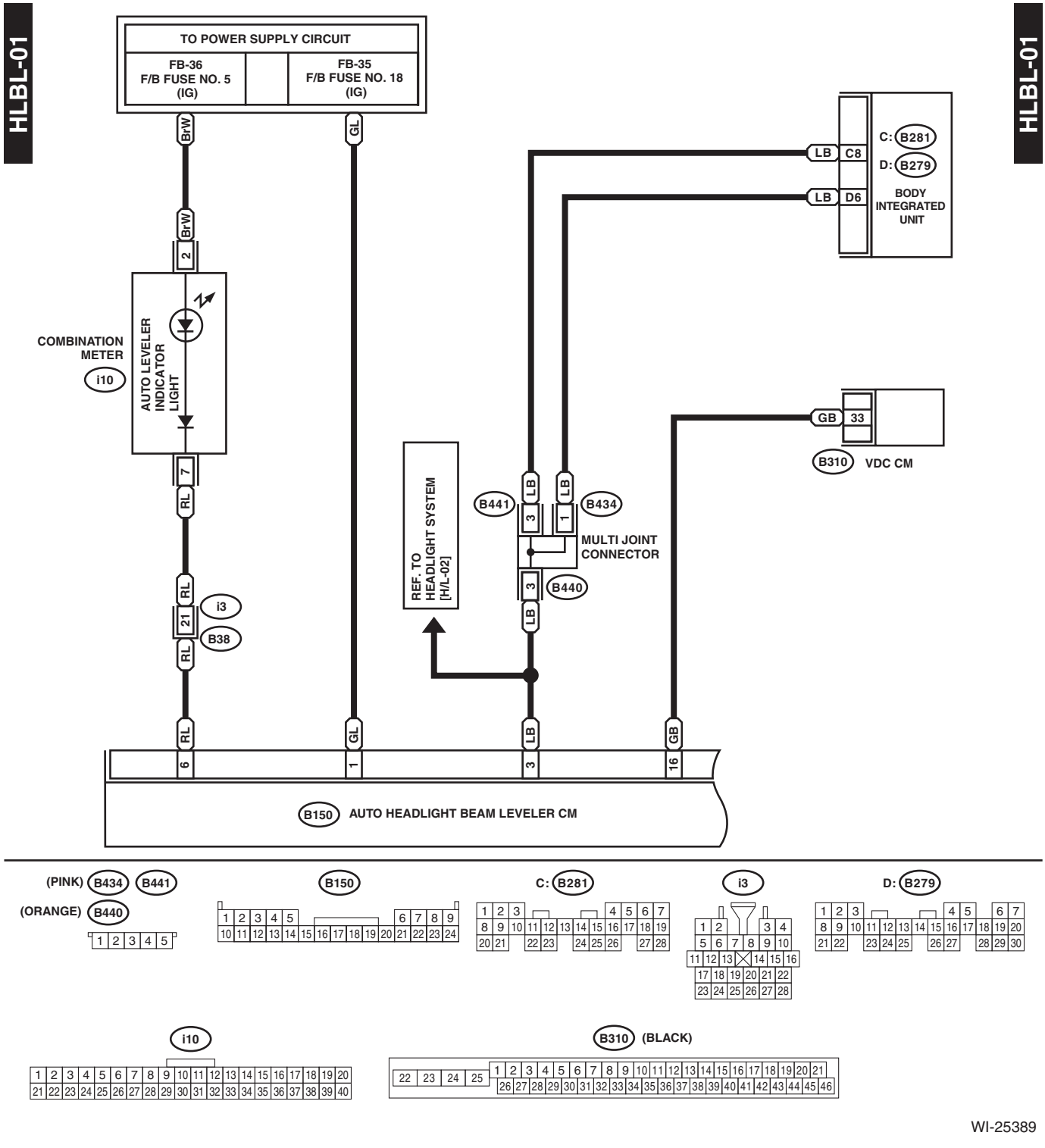

H/L-03
H/L-03
TO POWER SUPPLY CIRCUIT
FB-29 F/B FUSE NO. 31 (ACC)
MB-29 M/B FUSE NO. 8 (B)
FB-38 F/B FUSE NO. 12 (IG)
FB-18 F/B FUSE NO. 7 (B)
FB-36 F/B FUSE NO. 5 (IG)
FB-17 F/B FUSE NO. 7 (B)
i102
R167
3
i10 COMBINATION METER
A: i84 B: B280 C: B281 D: B279 BODY INTEGRATED UNIT
I/F
POWER SUPPLY CIRCUIT
HI-BEAM INDICATOR LIGHT
MICRO COMPUTER
DRIVE CIRCUIT
CAN TRANSCEIVER & RECEIVER
REF. TO CAN COMMUNICATION SYSTEM [CAN-02]
REF. TO AT SHIFT LOCK CONTROL SYSTEM [ATSL-01]
REF. TO PARKING BRAKE / BRAKE FLUID LEVEL WARNING LIGHT SYSTEM [BR/W-01]
CAN JOINT CONNECTOR i106
CAN JOINT CONNECTOR i107
H/L-02 C
*1 : TERMINAL No. OPTIONAL ARRANGEMENT
REF. TO GND [GND-01·03]
REF. TO GND [GND-02]
REF. TO GND [GND-06]


i106
i107
i102
B: B280 (DARK GRAY)
C: B281
D: B279
A: i84 (DARK GRAY)
i10

WI-31087

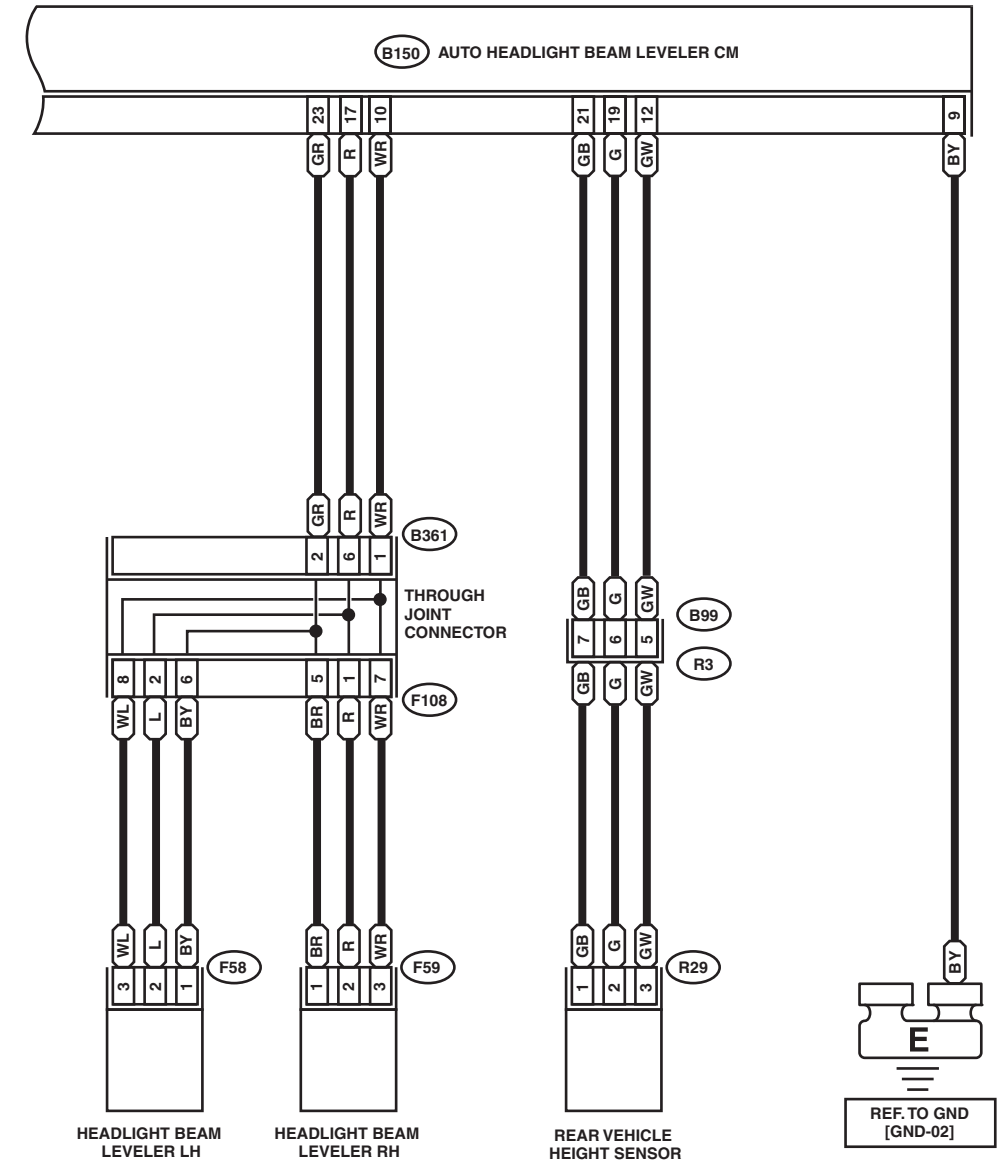
22.Headlight Beam Leveler System

A: WIRING DIAGRAM

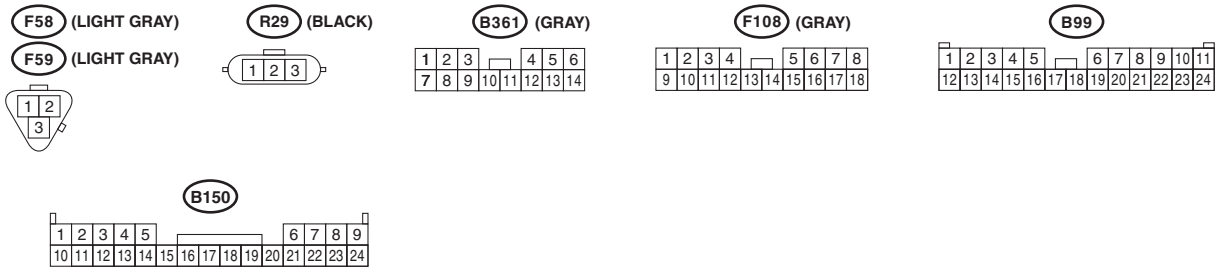


WI-25389

HLBL-02



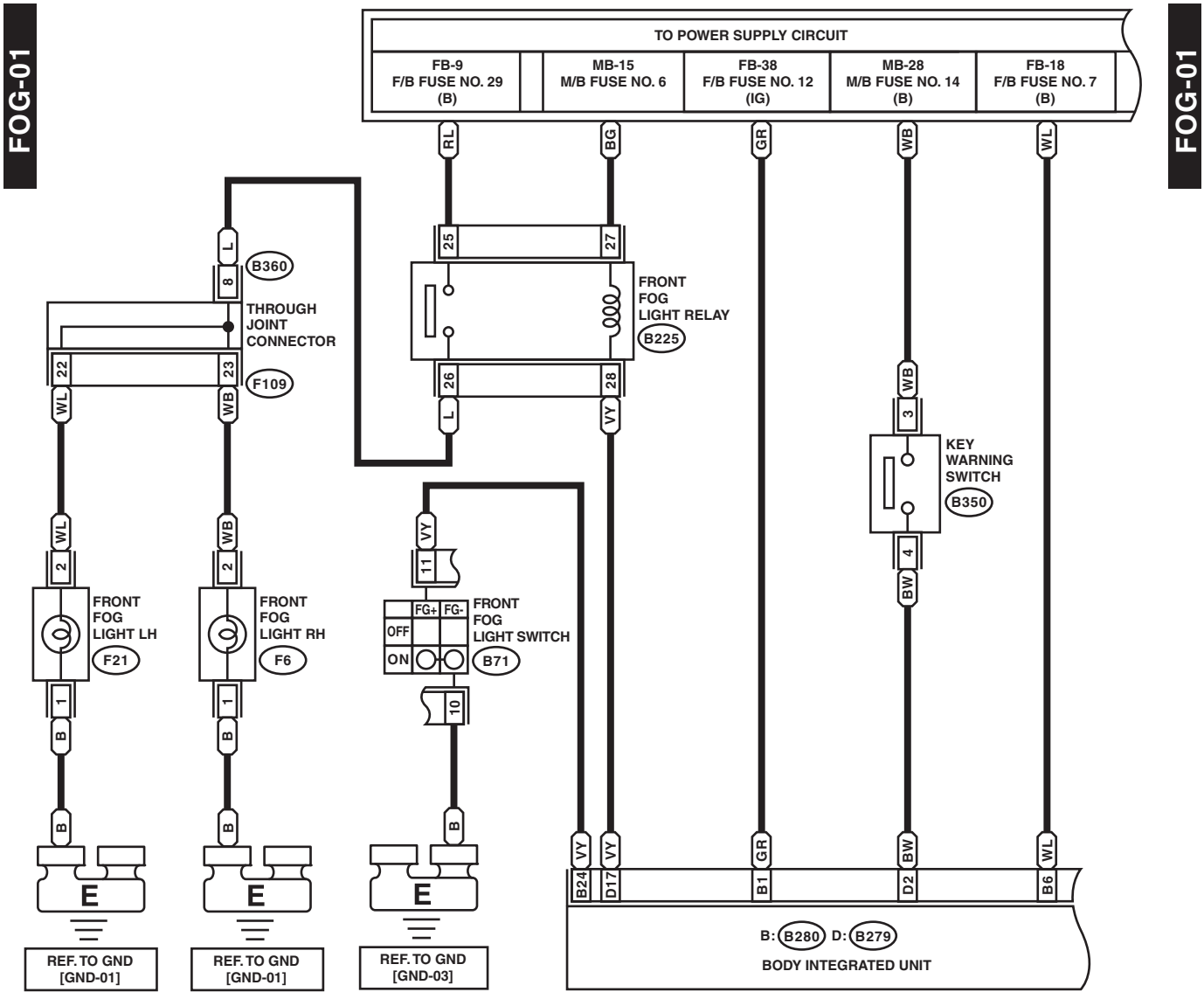
HLBL-02

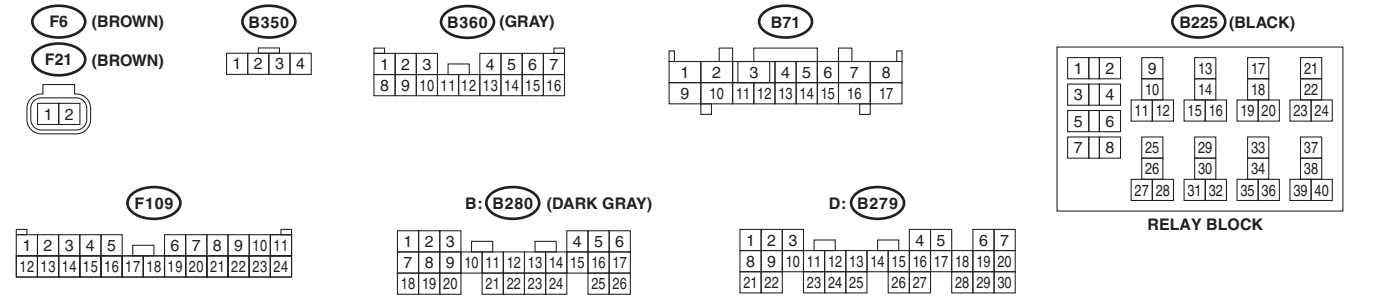


WI-31088

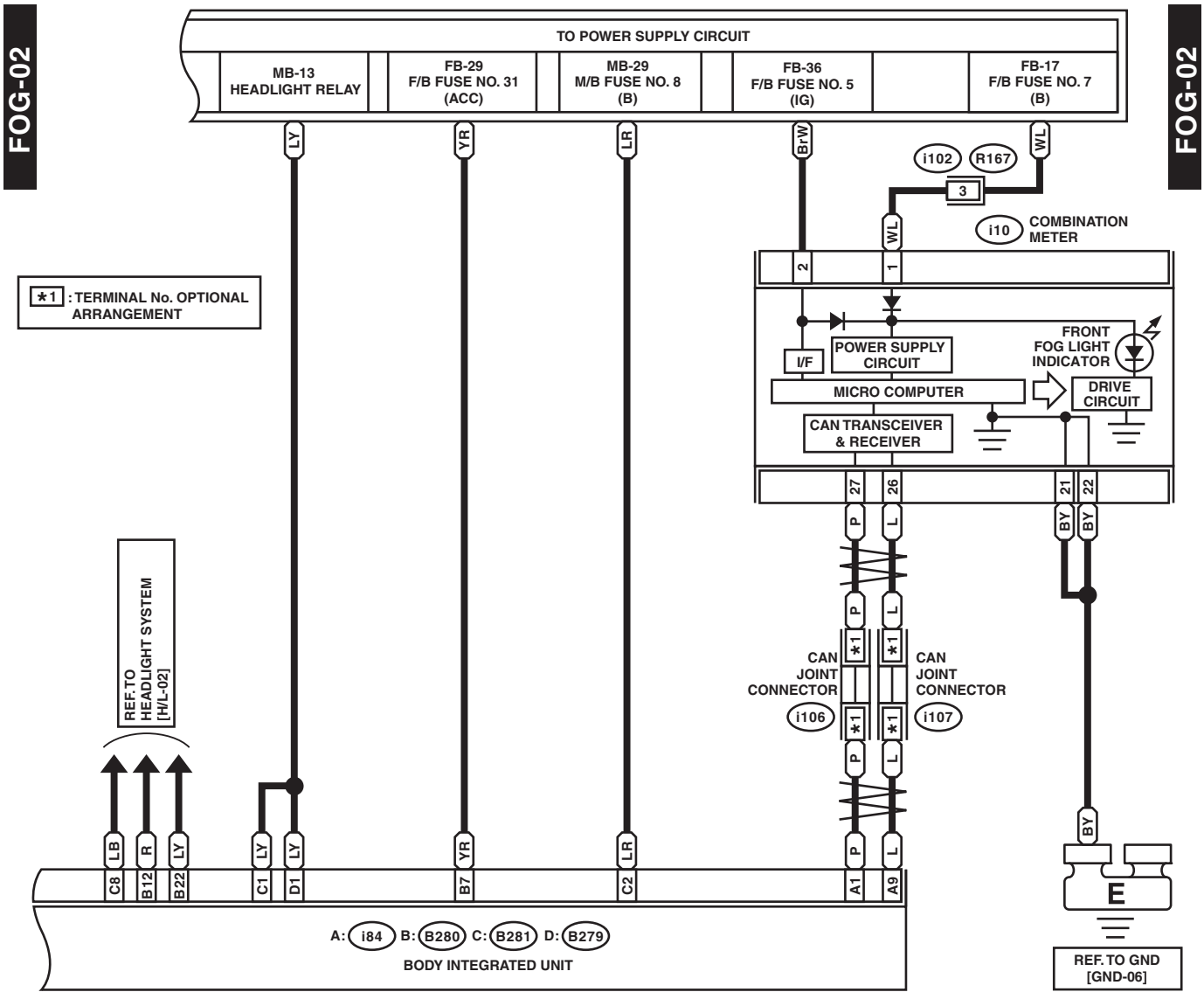
23.Front Fog Light System

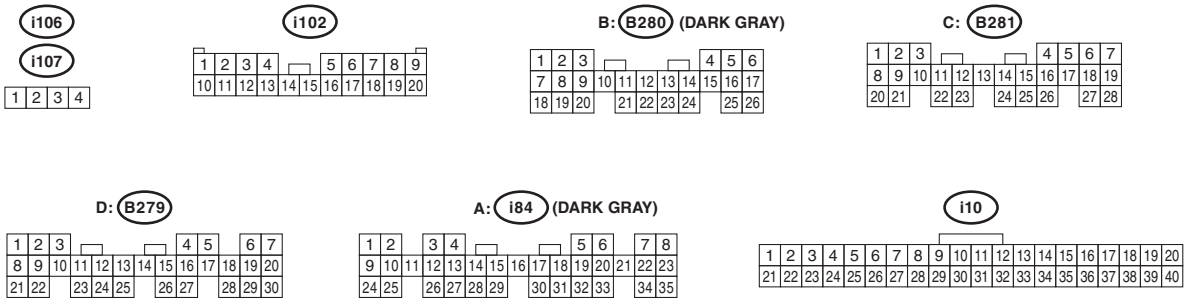
A: WIRING DIAGRAM





WI-31089

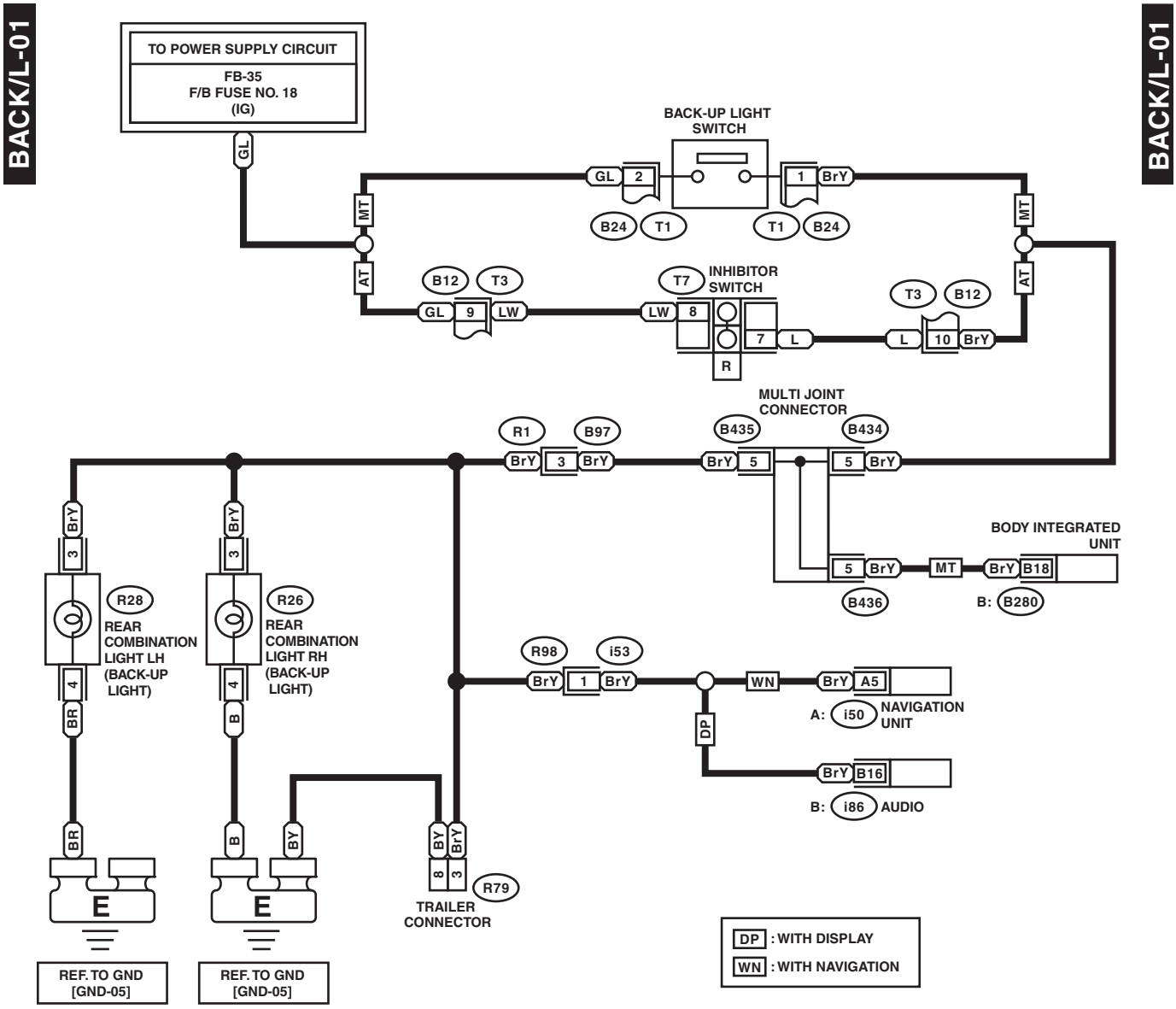

FOG-02
FOG-02
TO POWER SUPPLY CIRCUIT
MB-13 HEADLIGHT RELAY
FB-29 F/B FUSE NO. 31 (ACC)
MB-29 M/B FUSE NO. 8 (B)
FB-36 F/B FUSE NO. 5 (IG)
FB-17 F/B FUSE NO. 7 (B)
*1 : TERMINAL No. OPTIONAL ARRANGEMENT
i102
R167
3
i10 COMBINATION METER
I/F
POWER SUPPLY CIRCUIT
FRONT FOG LIGHT INDICATOR
MICRO COMPUTER
DRIVE CIRCUIT
CAN TRANSCEIVER & RECEIVER
REF. TO HEADLIGHT SYSTEM [H/L-02]
CAN JOINT CONNECTOR i106
CAN JOINT CONNECTOR i107
A: i84 B: B280 C: B281 D: B279
BODY INTEGRATED UNIT
REF. TO GND [GND-06]

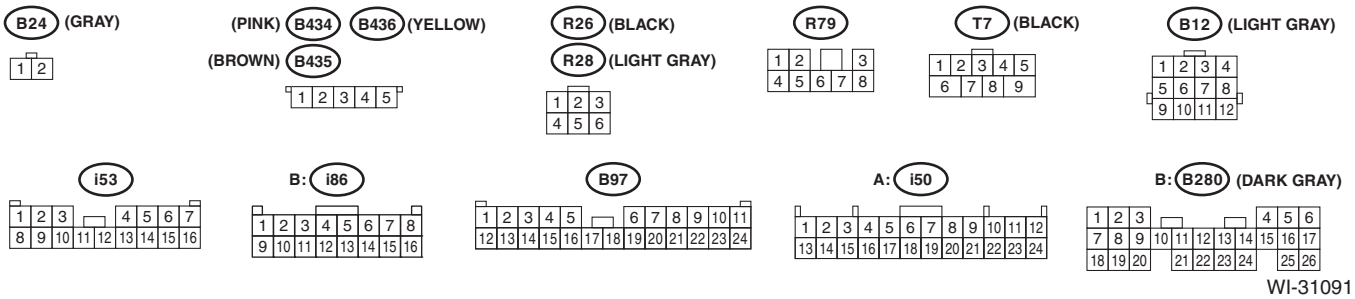

i106
i107
i102
B: B280 (DARK GRAY)
C: B281
D: B279
A: i84 (DARK GRAY)
i10

WI-31090

24.Back-up Light System

A: WIRING DIAGRAM

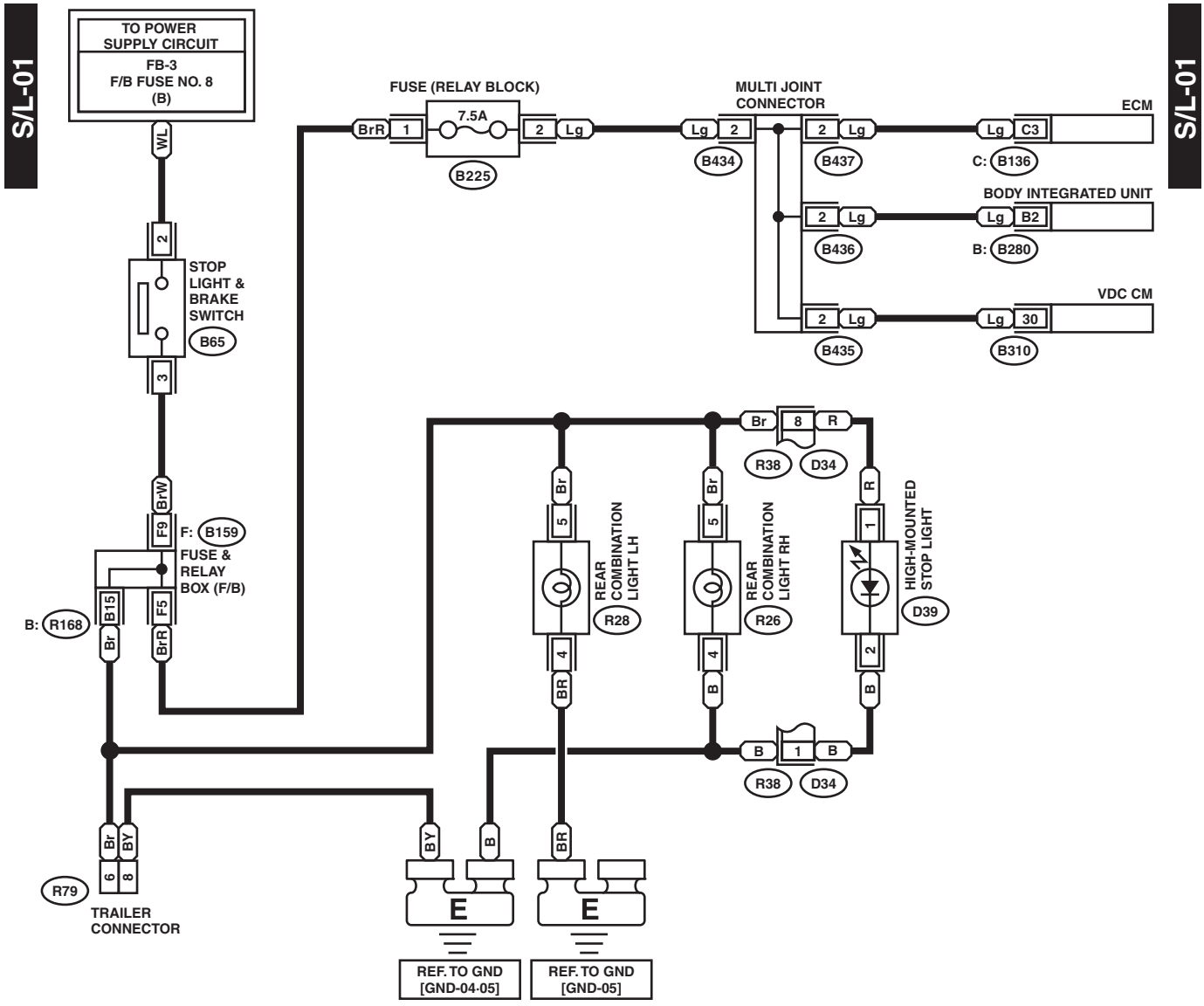


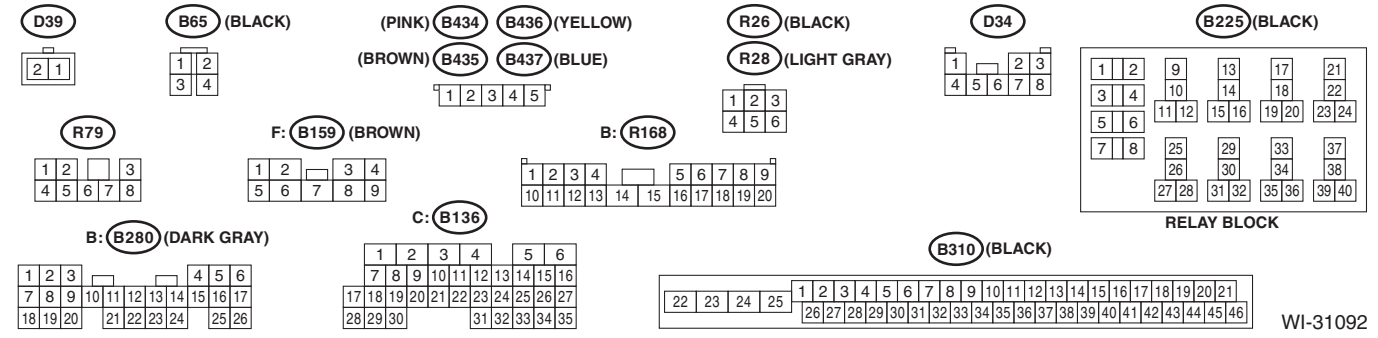


WI-31091

25.Stop Light System

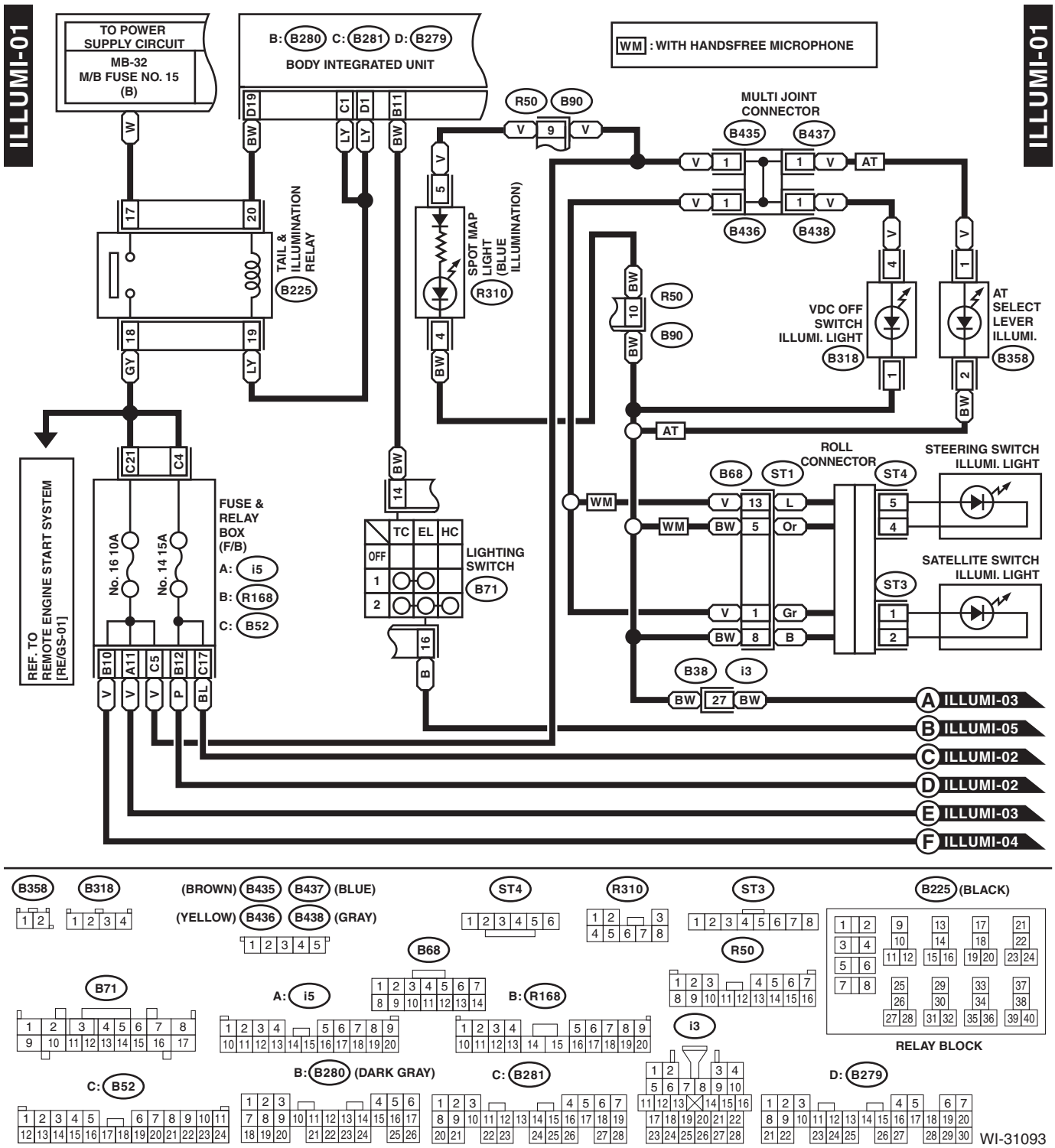
A: WIRING DIAGRAM

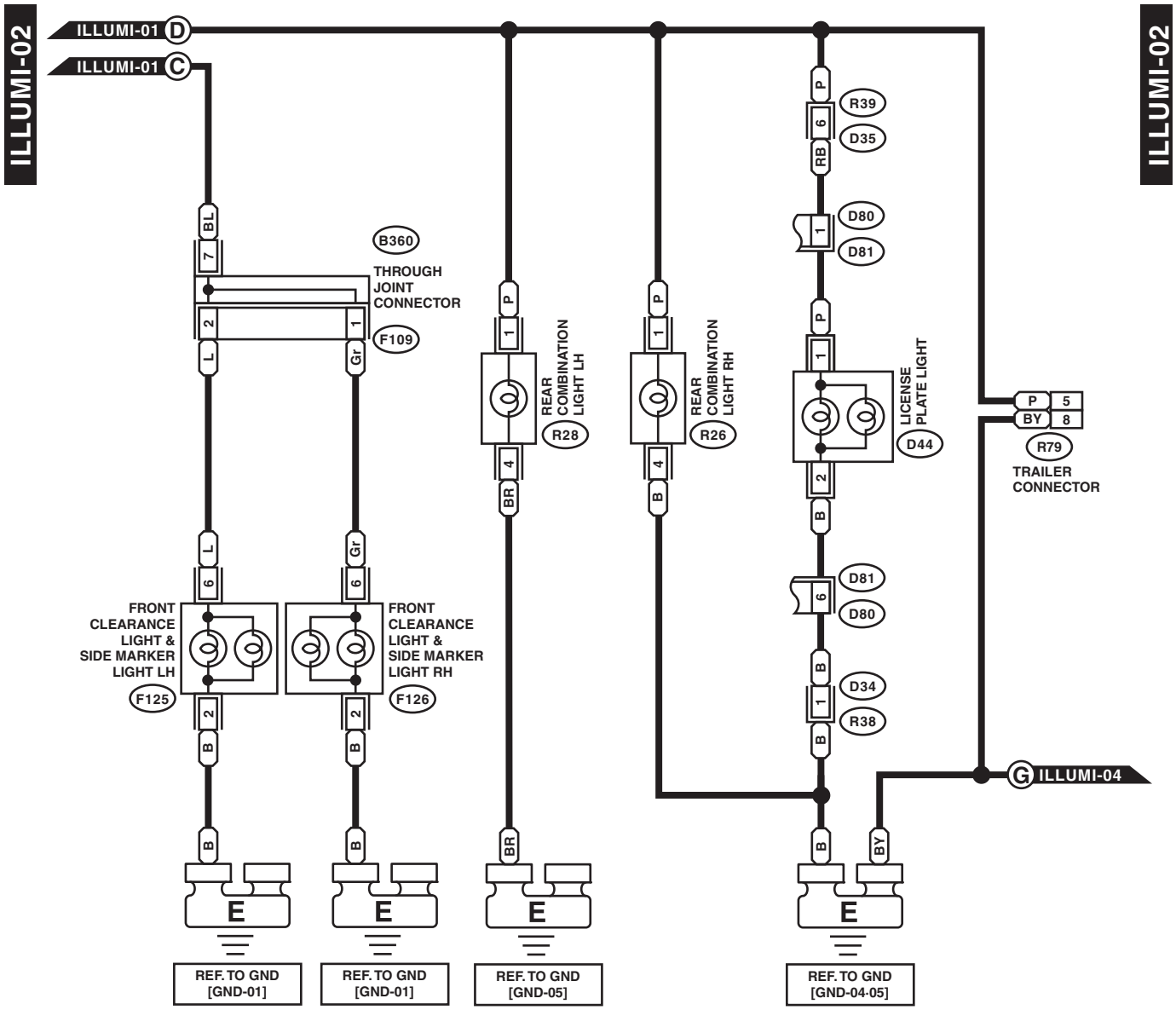


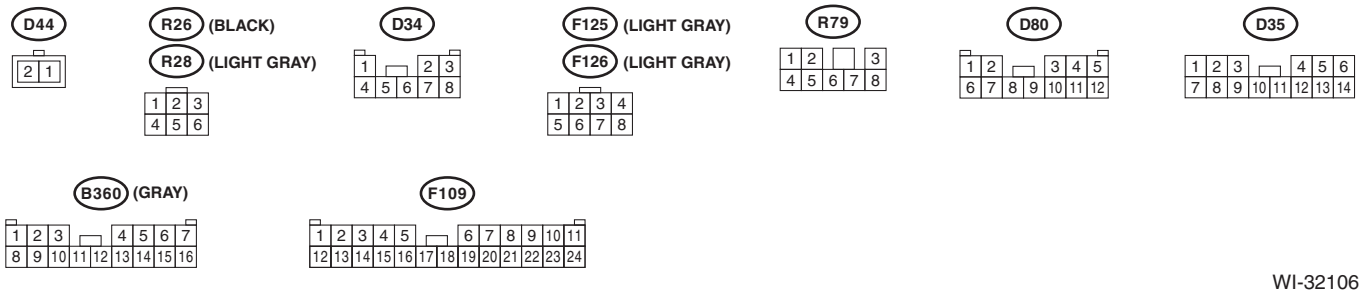


26.Clearance Light and Illumination Light System

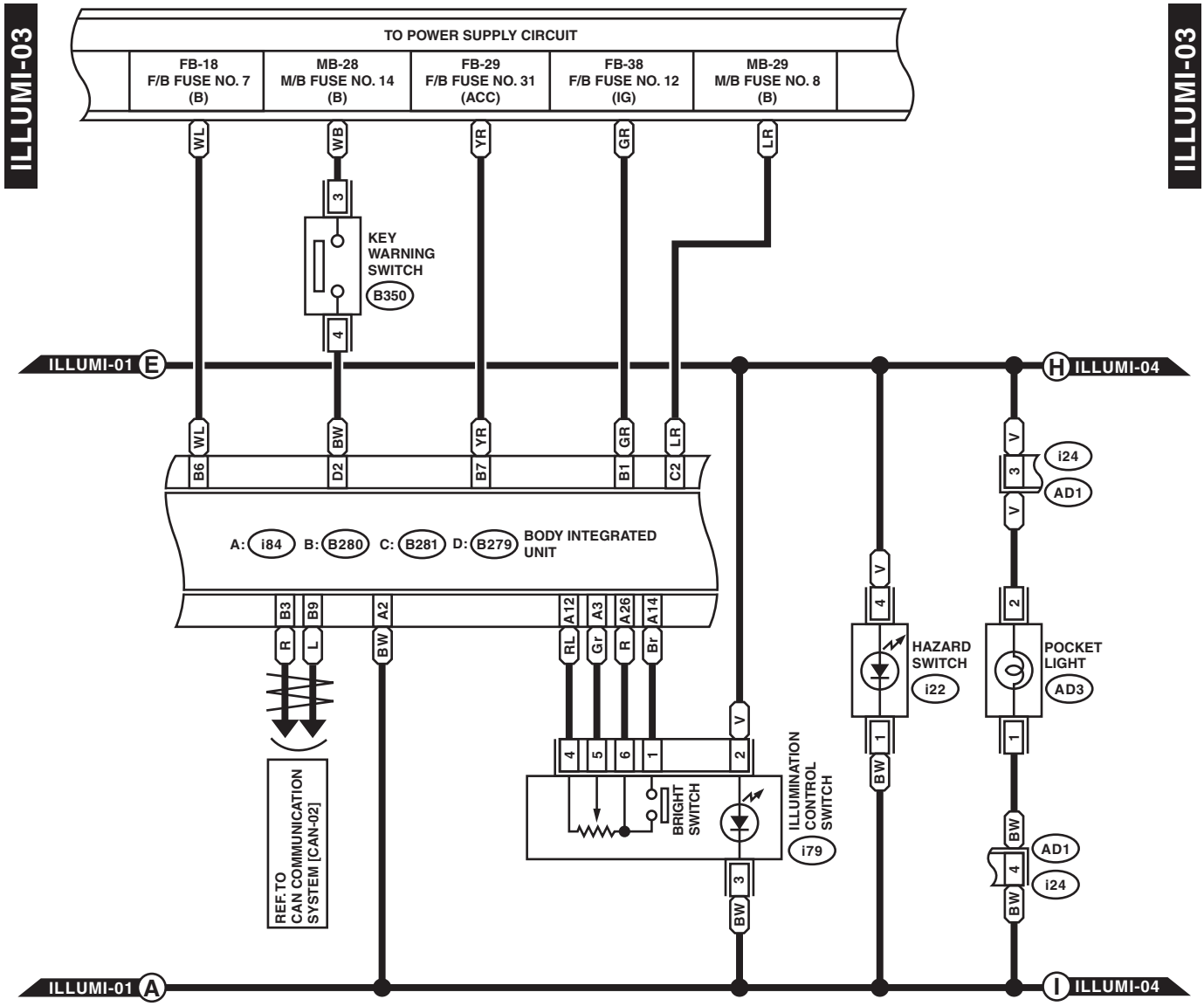
A: WIRING DIAGRAM

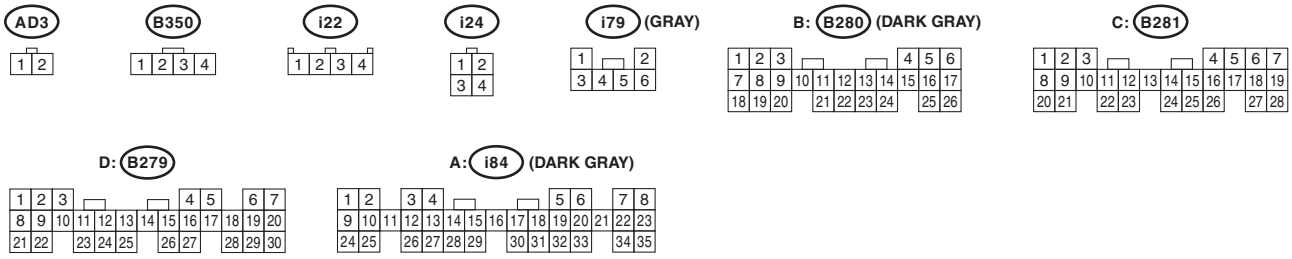



ILLUMI-02
ILLUMI-01 D
ILLUMI-01 C
ILLUMI-02
B360
THROUGH JOINT CONNECTOR
F109
REAR COMBINATION LIGHT LH
R28
REAR COMBINATION LIGHT RH
R26
LICENSE PLATE LIGHT
D44
R39
D35
D80
D81
R79
TRAILER CONNECTOR
FRONT CLEARANCE LIGHT & SIDE MARKER LIGHT LH
F125
FRONT CLEARANCE LIGHT & SIDE MARKER LIGHT RH
F126
D34
R38
G ILLUMI-04
REF. TO GND [GND-01]
REF. TO GND [GND-01]
REF. TO GND [GND-05]
REF. TO GND [GND-04-05]


D44
R26 (BLACK)
R28 (LIGHT GRAY)
D34
F125 (LIGHT GRAY)
F126 (LIGHT GRAY)
R79
D80
D35
B360 (GRAY)
F109

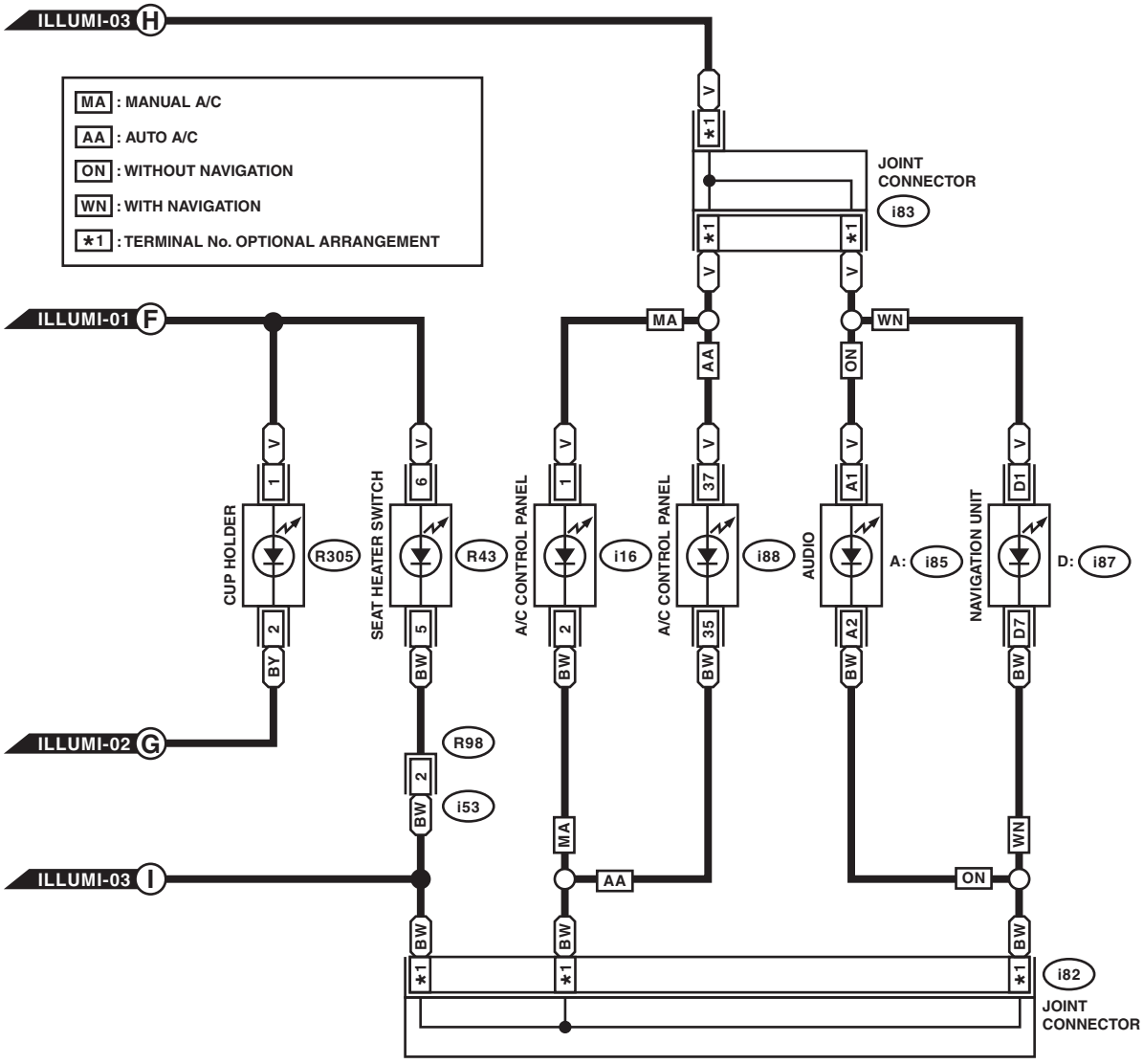
WI-32106

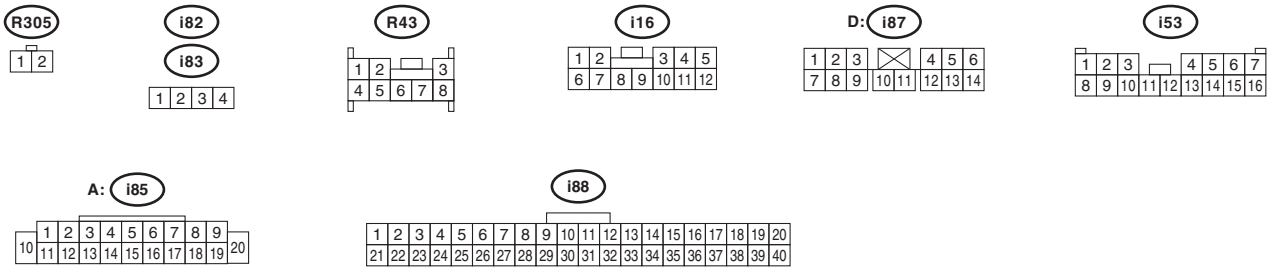

ILLUMI-03
ILLUMI-03
TO POWER SUPPLY CIRCUIT
FB-18 F/B FUSE NO. 7 (B)
MB-28 M/B FUSE NO. 14 (B)
FB-29 F/B FUSE NO. 31 (ACC)
FB-38 F/B FUSE NO. 12 (IG)
MB-29 M/B FUSE NO. 8 (B)
WL
WB
YR
GR
LR
KEY WARNING SWITCH
B350
ILLUMI-01 E
H ILLUMI-04
B6
D2
B7
B1
C2
A: i84 B: B280 C: B281 D: B279 BODY INTEGRATED UNIT
B3
B9
A2
A12
A3
A26
A14
REF.TO CAN COMMUNICATION SYSTEM [CAN-02]
HAZARD SWITCH
i22
POCKET LIGHT
AD3
i24
AD1
BRIGHT SWITCH
ILLUMINATION CONTROL SWITCH
i79
ILLUMI-01 A
I ILLUMI-04


AD3
B350
i22
i24
i79 (GRAY)
B: B280 (DARK GRAY)
C: B281
D: B279
A: i84 (DARK GRAY)

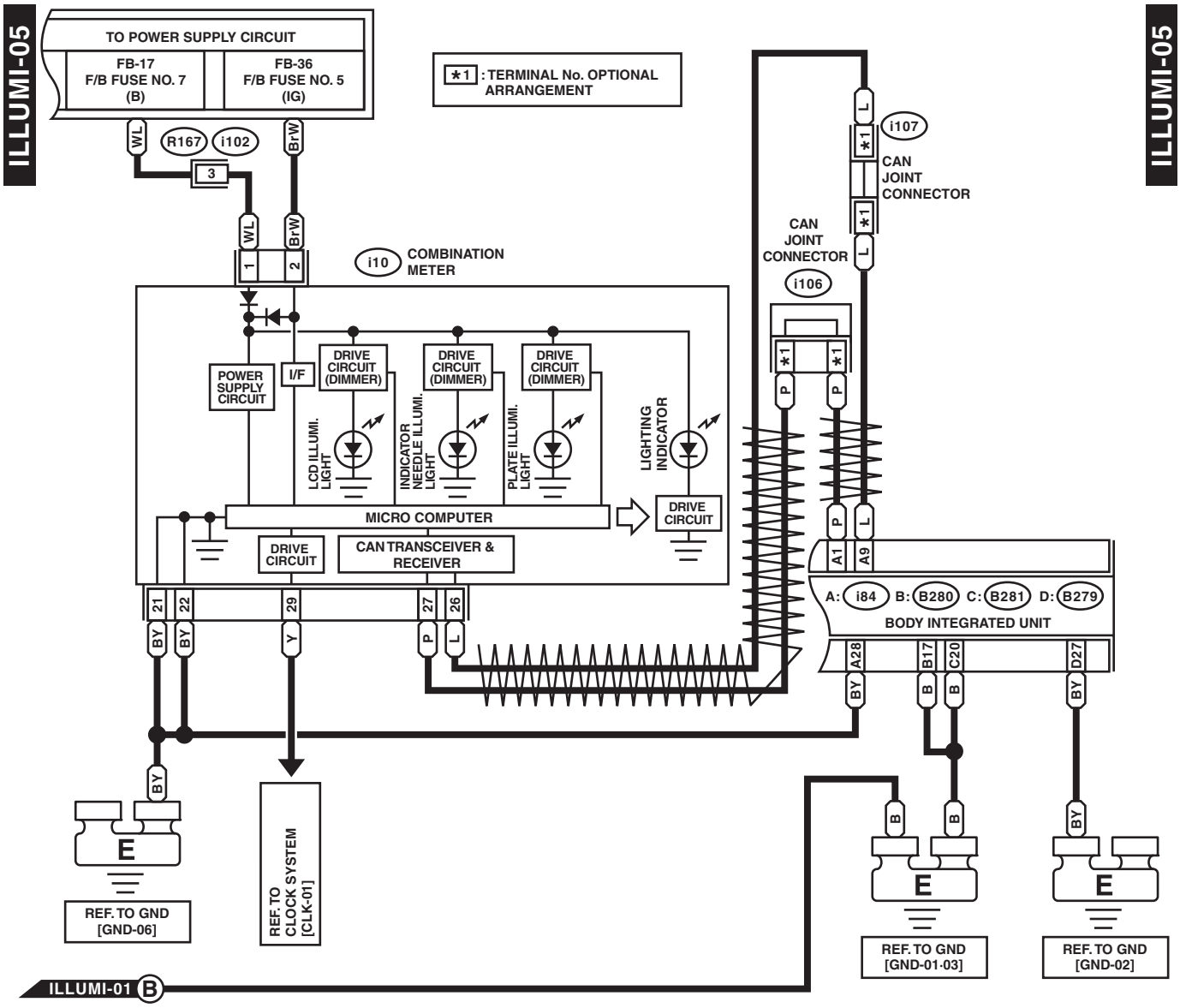
WI-31094

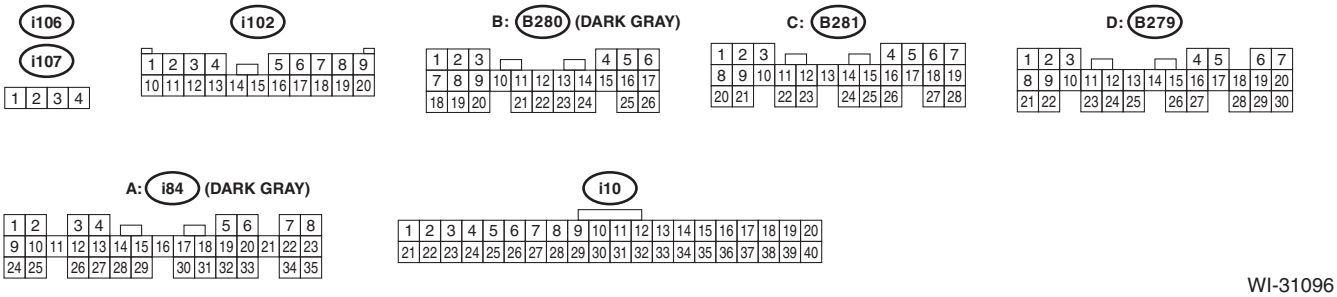
ILLUMI-04





WI-31095

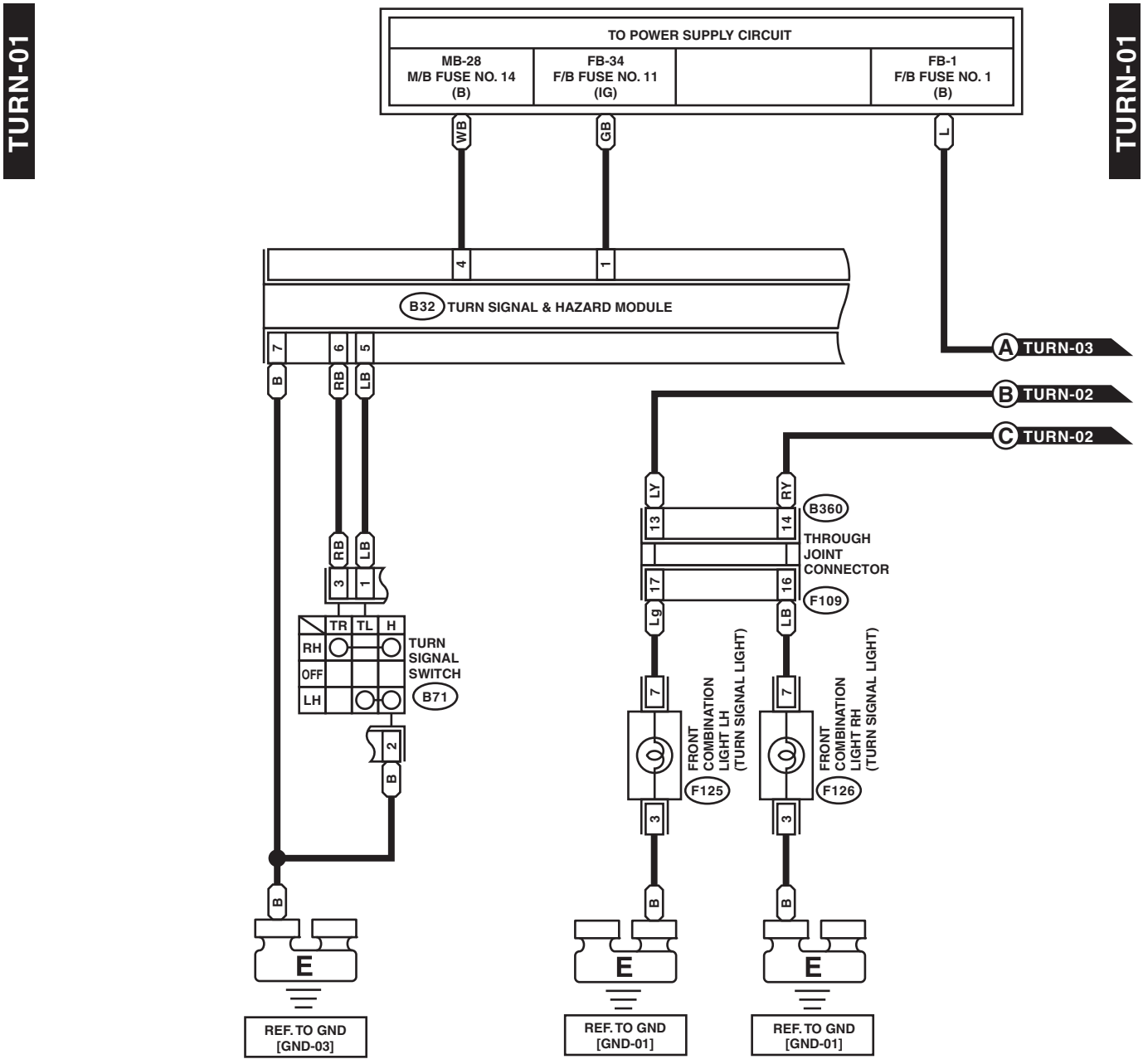

ILLUMI-05
TO POWER SUPPLY CIRCUIT
FB-17
F/B FUSE NO. 7
(B)
FB-36
F/B FUSE NO. 5
(IG)
*1 : TERMINAL No. OPTIONAL ARRANGEMENT
WL
R167
i102
BrW
3
i10 COMBINATION METER
POWER SUPPLY CIRCUIT
I/F
DRIVE CIRCUIT (DIMMER)
LCD ILLUMI. LIGHT
INDICATOR NEEDLE ILLUMI. LIGHT
PLATE ILLUMI. LIGHT
LIGHTING INDICATOR
MICRO COMPUTER
DRIVE CIRCUIT
CAN TRANSCEIVER & RECEIVER
CAN JOINT CONNECTOR
i107
i106
A: i84 B: B280 C: B281 D: B279
BODY INTEGRATED UNIT
REF. TO GND [GND-06]
REF. TO CLOCK SYSTEM [CLK-01]
REF. TO GND [GND-01-03]
REF. TO GND [GND-02]
ILLUMI-01 B

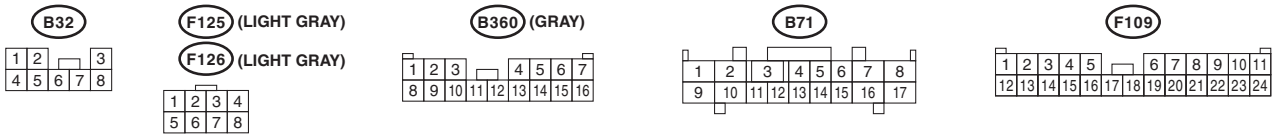

i106
i107
i102
B: B280 (DARK GRAY)
C: B281
D: B279
A: i84 (DARK GRAY)
i10

WI-31096

27.Turn Signal Light and Hazard Light System

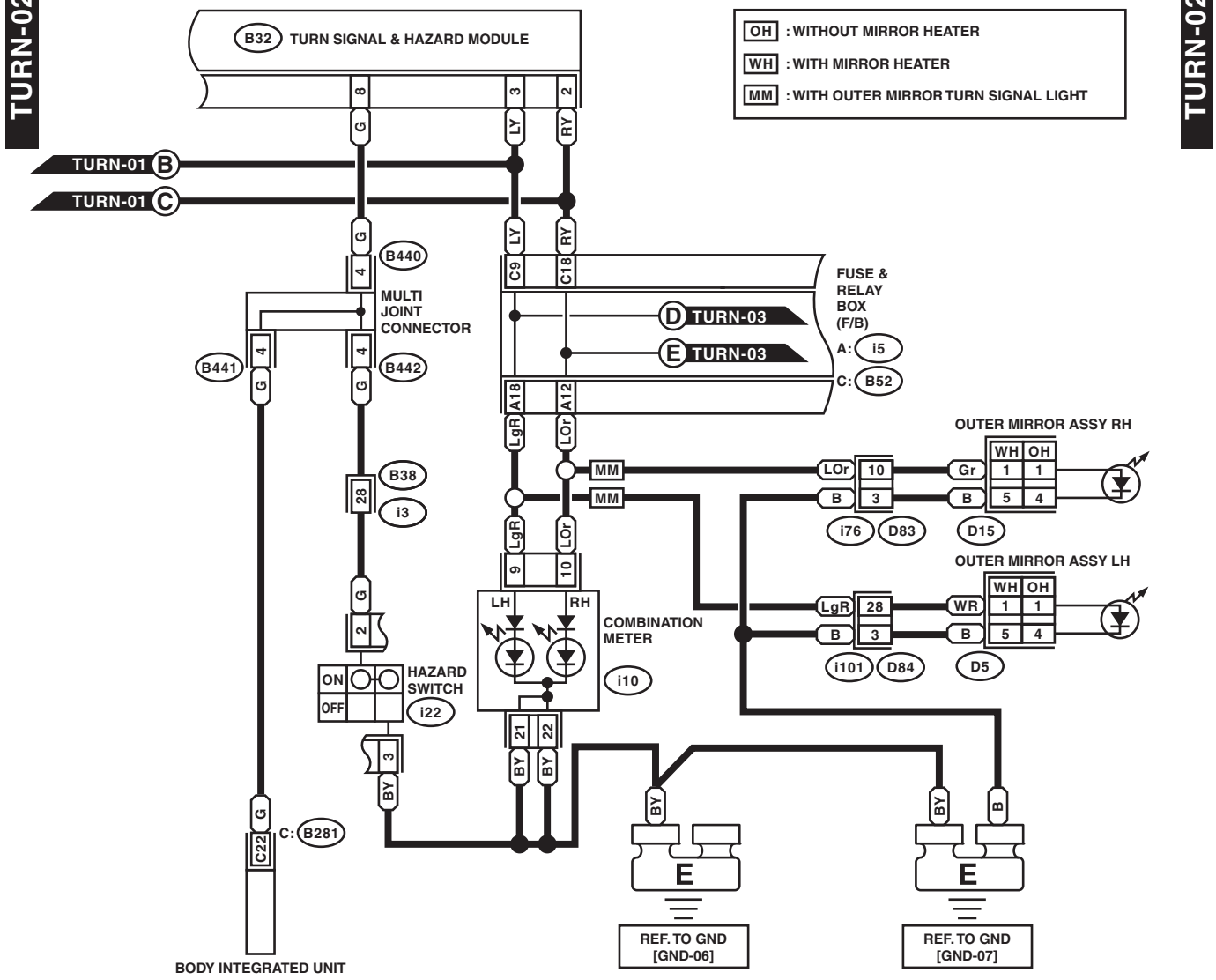
A: WIRING DIAGRAM

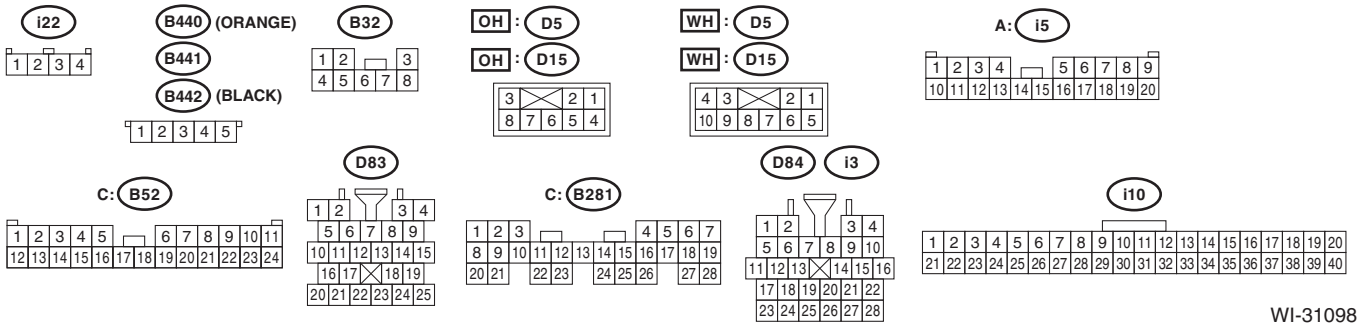




WI-31097

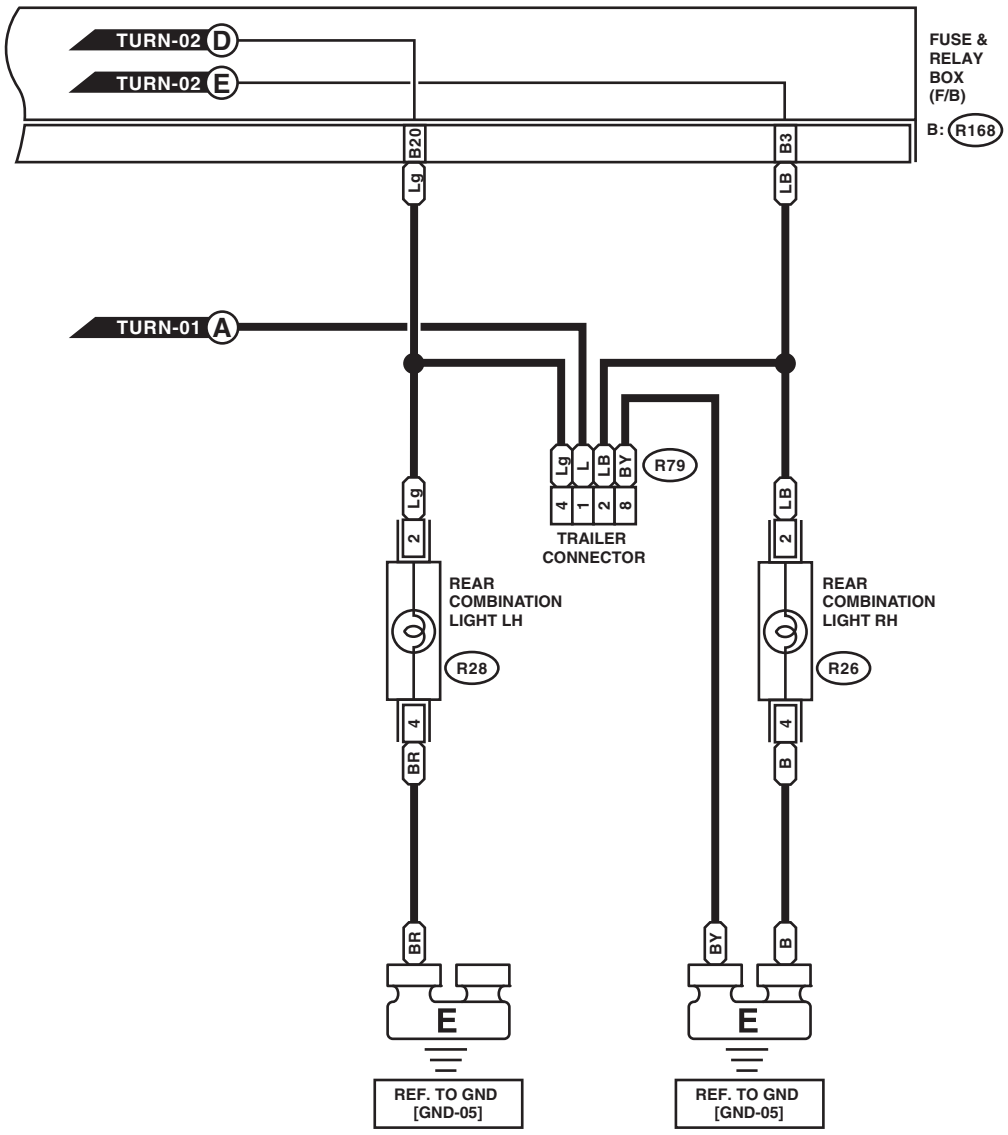
TURN-02





WI-31098

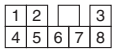
TURN-03



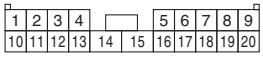
TURN-03

R26 (BLACK)
R28 (LIGHT GRAY)

R79



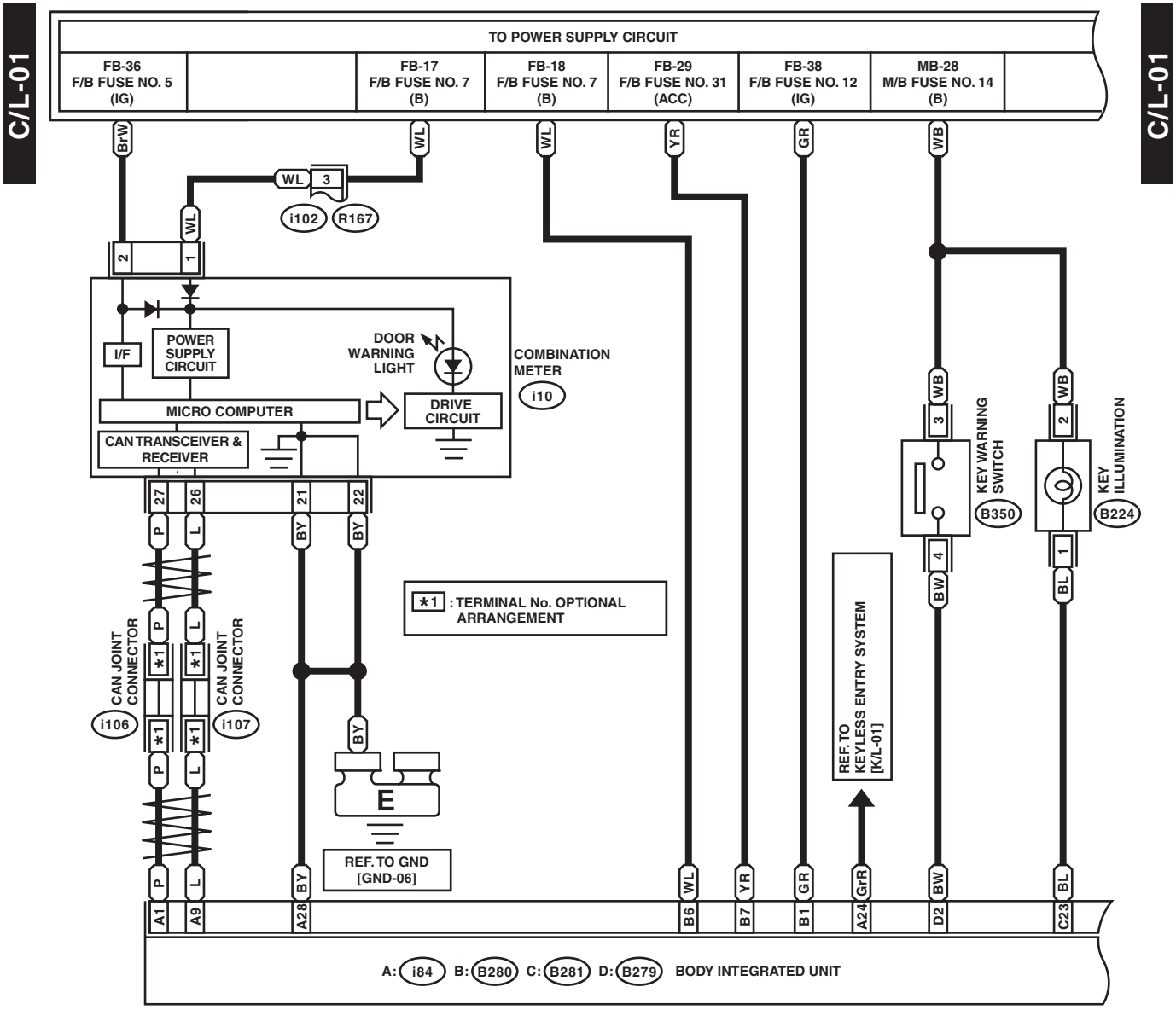
B: R168

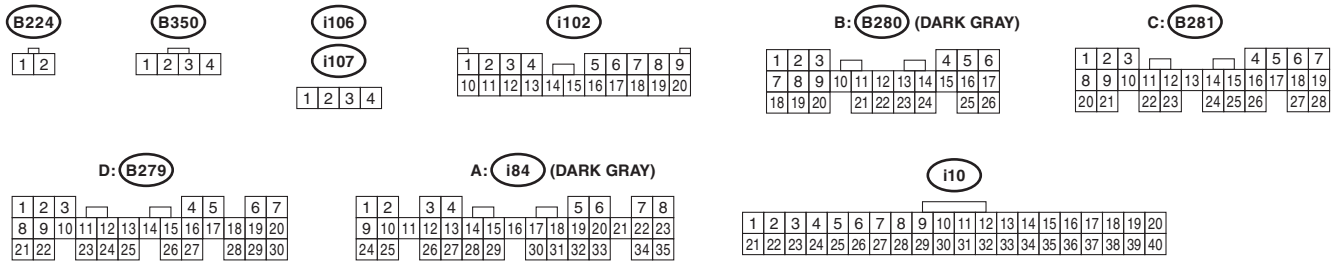


WI-25184

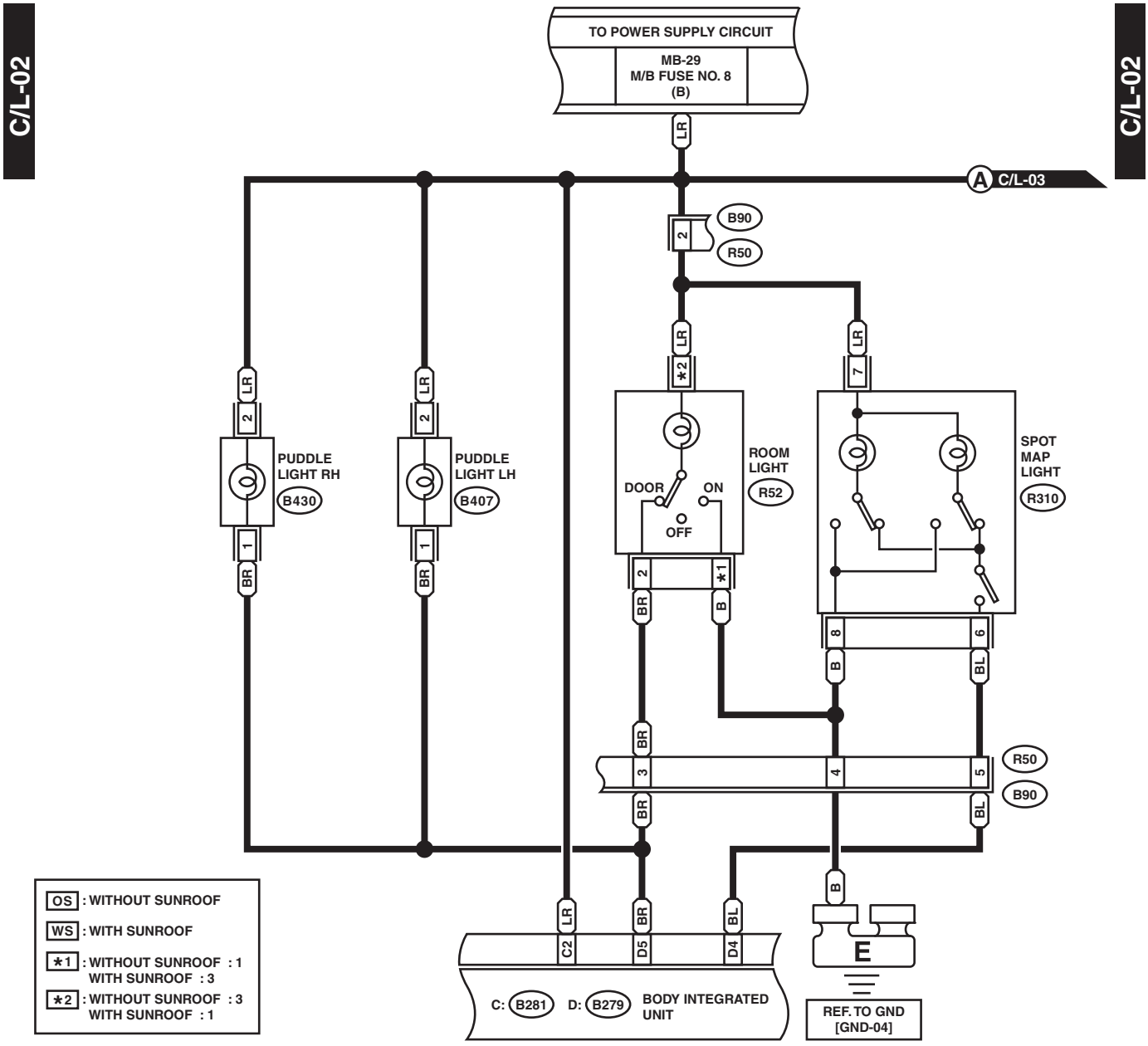
28.Interior Light System

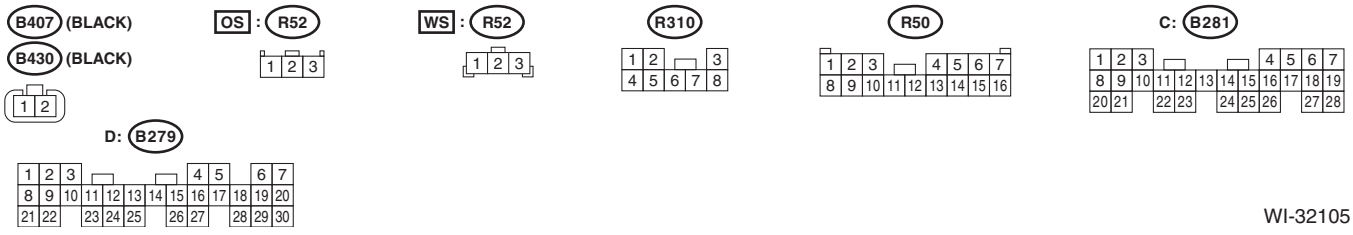
A: WIRING DIAGRAM



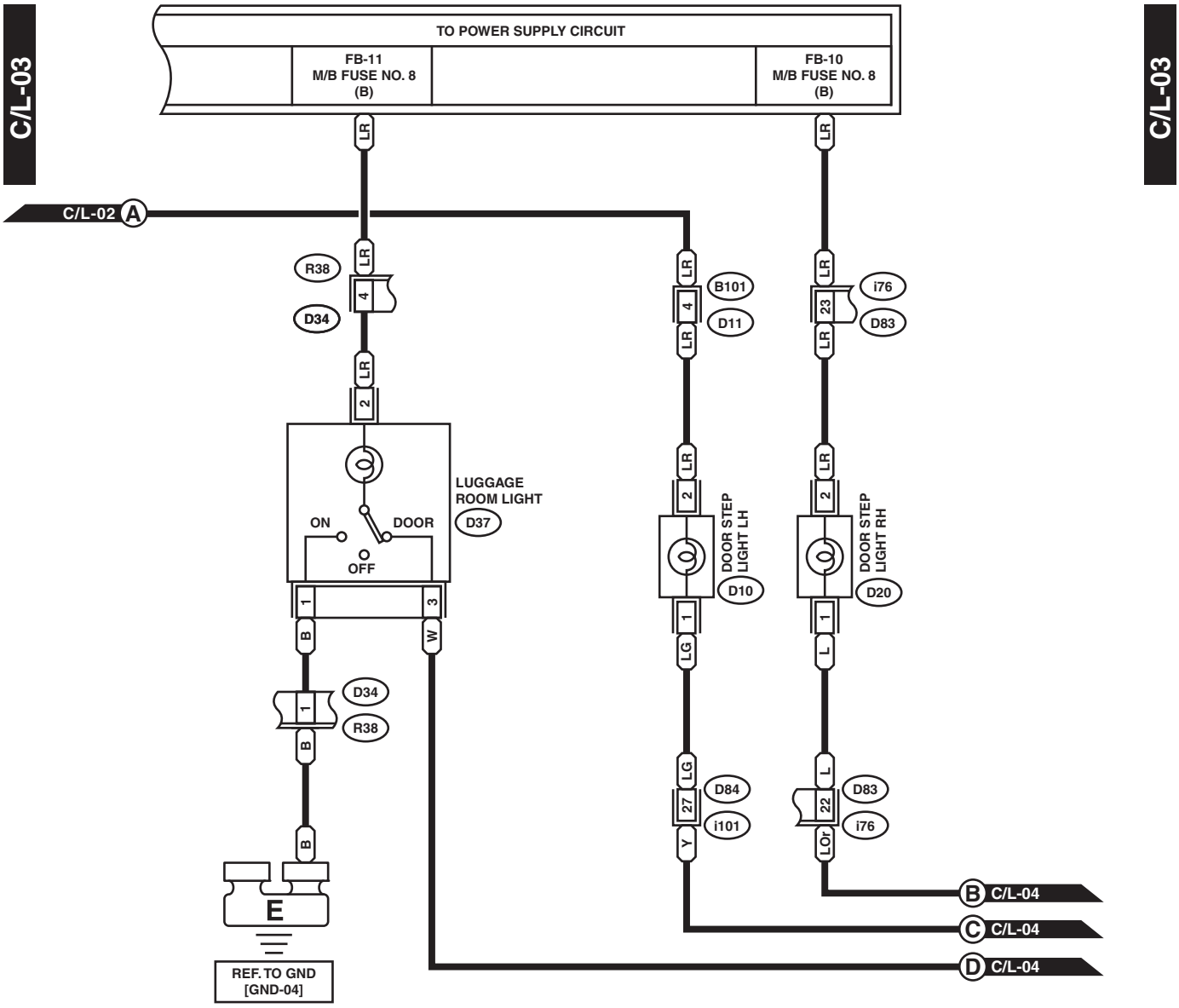


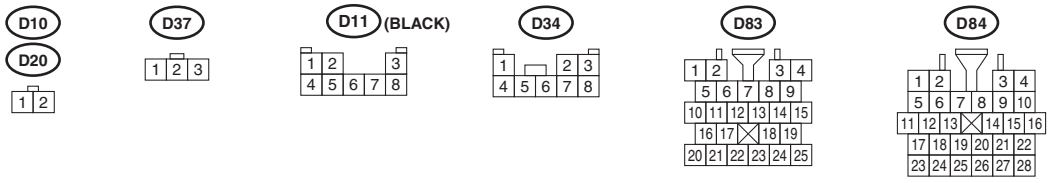
WI-31099


C/L-02
C/L-02
TO POWER SUPPLY CIRCUIT
MB-29
M/B FUSE NO. 8
(B)
LR
A C/L-03
B90
R50
2
LR
*2
LR
7
LR
2
LR
2
PUDDLE
LIGHT RH
B430
1
BR
PUDDLE
LIGHT LH
B407
ROOM
LIGHT
R52
DOOR
ON
OFF
SPOT
MAP
LIGHT
R310
2
*1
BR
B
8
6
B
BL
BR
3
4
5
R50
B90
BR
BL
B
LR
BR
BL
C2
D5
D4
E
C: B281
D: B279
BODY INTEGRATED
UNIT
REF. TO GND
[GND-04]
OS : WITHOUT SUNROOF
WS : WITH SUNROOF
*1 : WITHOUT SUNROOF : 1
WITH SUNROOF : 3
*2 : WITHOUT SUNROOF : 3
WITH SUNROOF : 1

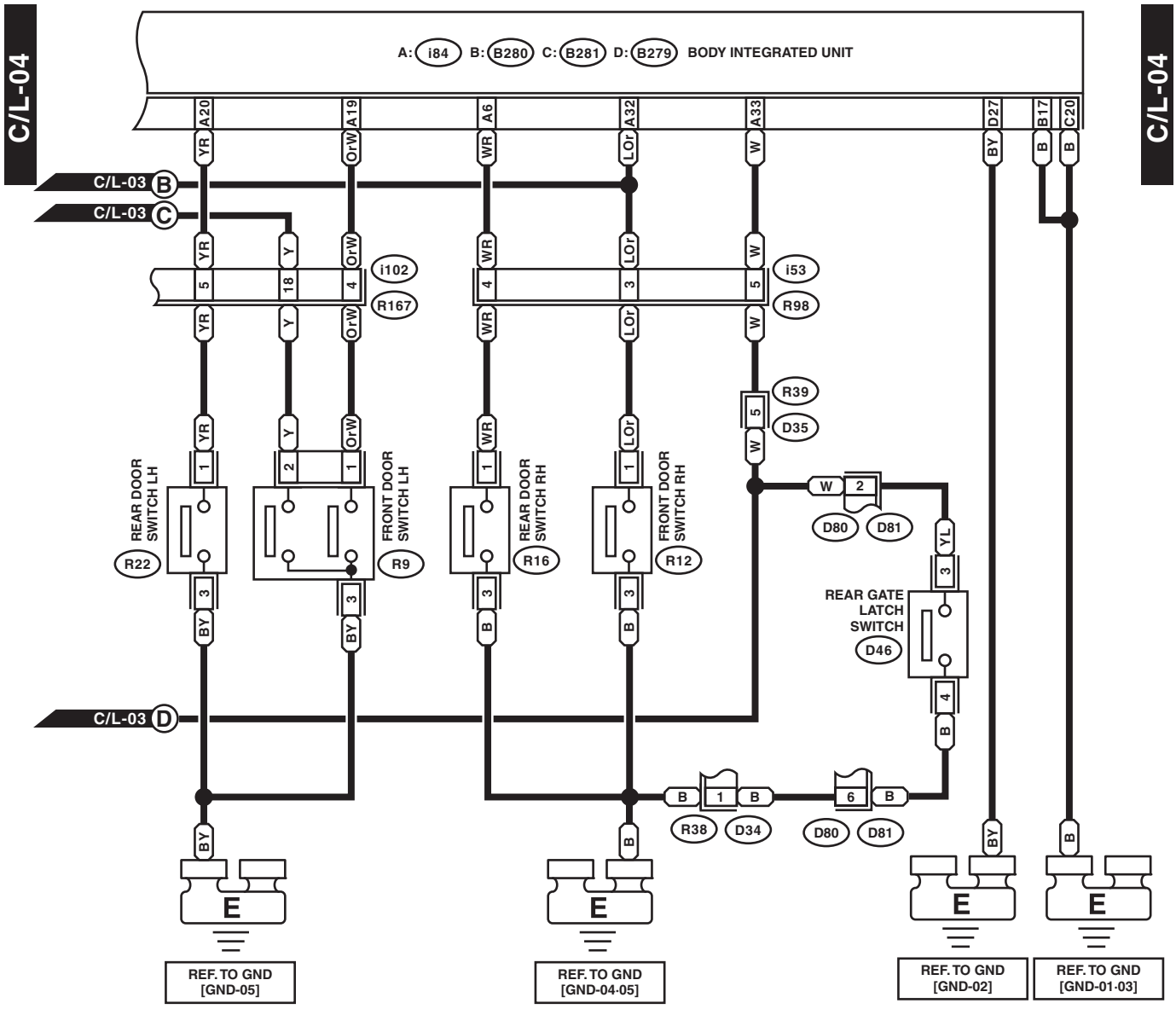

B407 (BLACK)
B430 (BLACK)
1 2
OS : R52
1 2 3
WS : R52
1 2 3
R310
1 2 3
4 5 6 7 8
R50
1 2 3 4 5 6 7
8 9 10 11 12 13 14 15 16
C: B281
1 2 3 4 5 6 7
8 9 10 11 12 13 14 15 16 17 18 19
20 21 22 23 24 25 26 27 28
D: B279
1 2 3 4 5 6 7
8 9 10 11 12 13 14 15 16 17 18 19 20
21 22 23 24 25 26 27 28 29 30

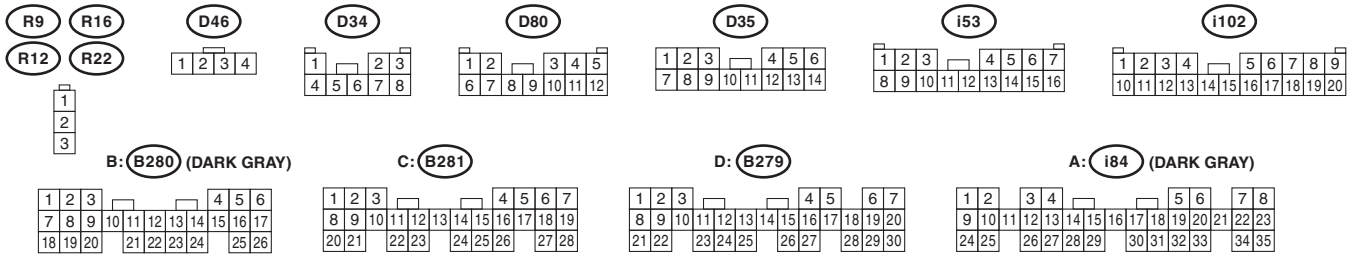
WI-32105


C/L-03
C/L-03
TO POWER SUPPLY CIRCUIT
FB-11
M/B FUSE NO. 8
(B)
FB-10
M/B FUSE NO. 8
(B)
C/L-02 A
R38
D34
B101
D11
i76
D83
LUGGAGE
ROOM LIGHT
D37
ON
DOOR
OFF
DOOR STEP
LIGHT LH
D10
DOOR STEP
LIGHT RH
D20
D34
R38
D84
i101
D83
i76
B C/L-04
C C/L-04
D C/L-04
E
REF. TO GND
[GND-04]


D10
D20
D37
D11 (BLACK)
D34
D83
D84

WI-31100

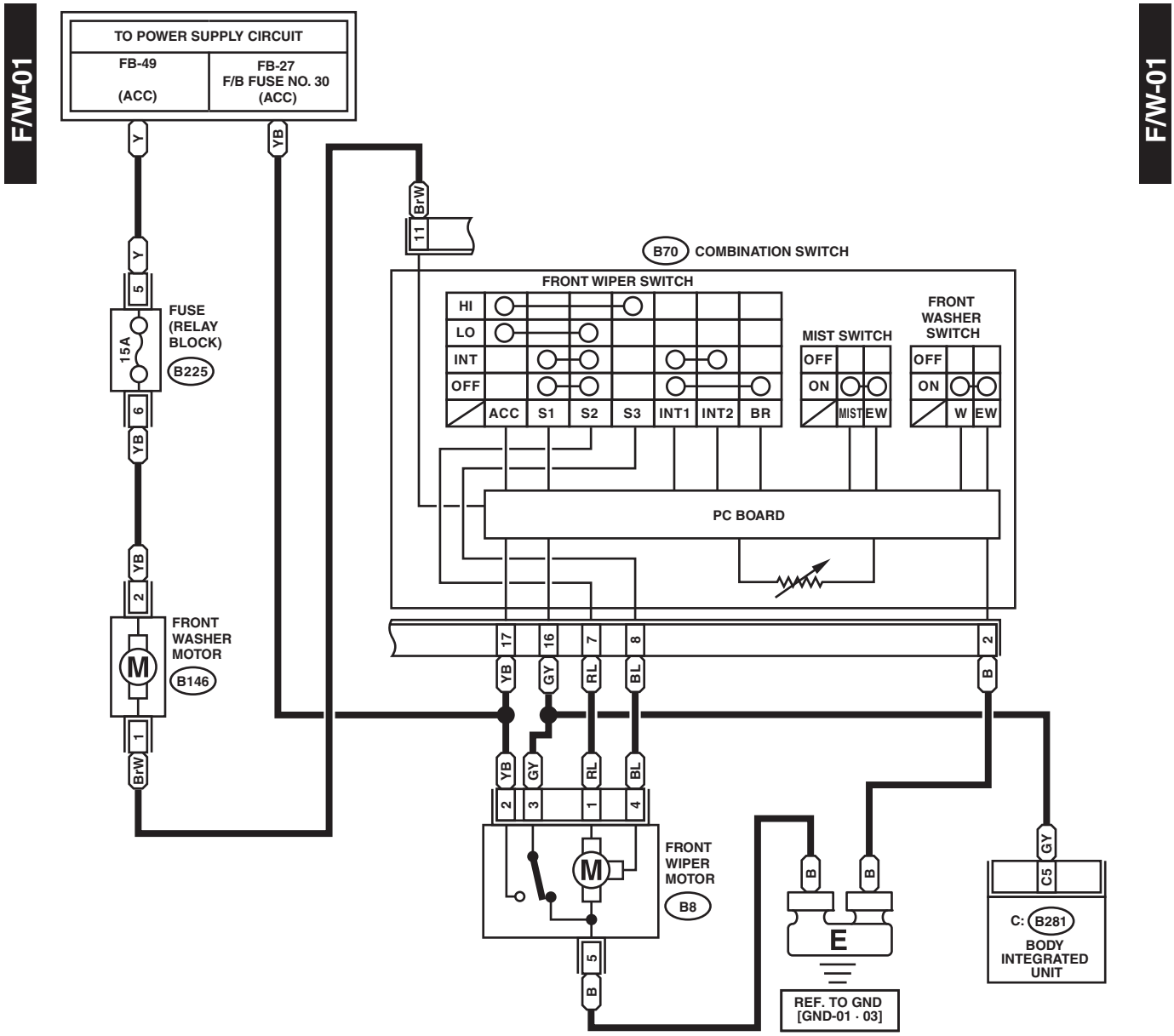

C/L-04
C/L-04
A: i84 B: B280 C: B281 D: B279 BODY INTEGRATED UNIT
A20
A19
A6
A32
A33
D27
B17
C20
C/L-03 B
C/L-03 C
C/L-03 D
i102
R167
i53
R98
R39
D35
REAR DOOR SWITCH LH
R22
FRONT DOOR SWITCH LH
R9
REAR DOOR SWITCH RH
R16
FRONT DOOR SWITCH RH
R12
D80
D81
REAR GATE LATCH SWITCH
D46
R38
D34
E
REF. TO GND [GND-05]
REF. TO GND [GND-04-05]
REF. TO GND [GND-02]
REF. TO GND [GND-01-03]

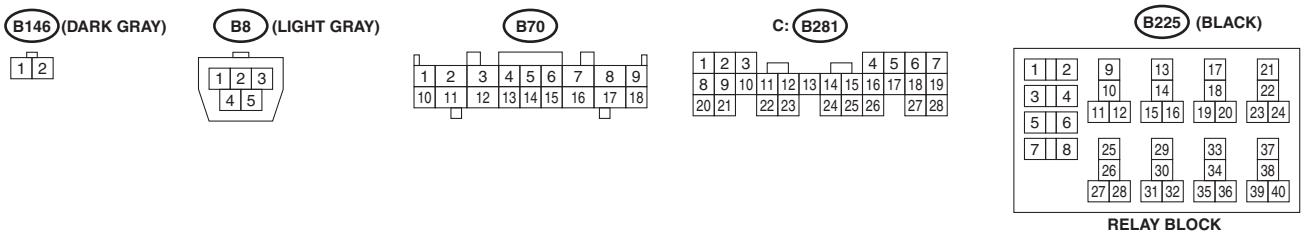

R9
R16
R12
R22
D46
D34
D80
D35
i53
i102
B: B280 (DARK GRAY)
C: B281
D: B279
A: i84 (DARK GRAY)

WI-31101

29.Front Wiper and Washer System

A: WIRING DIAGRAM

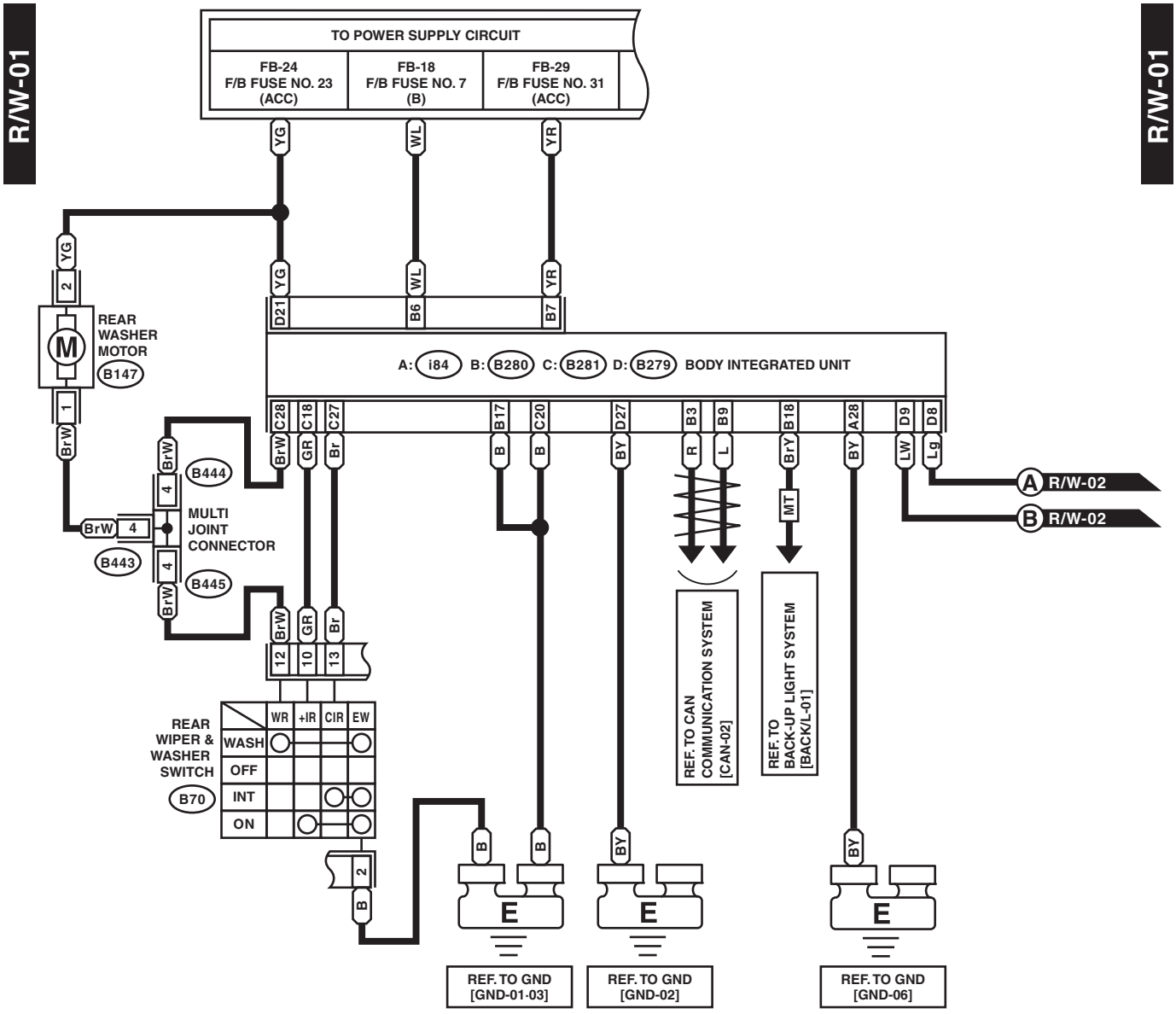


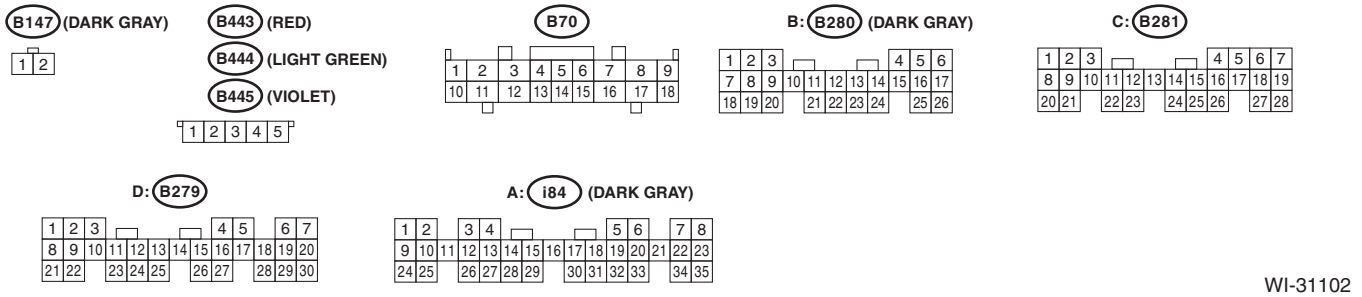


WI-25188

30.Rear Wiper and Washer System

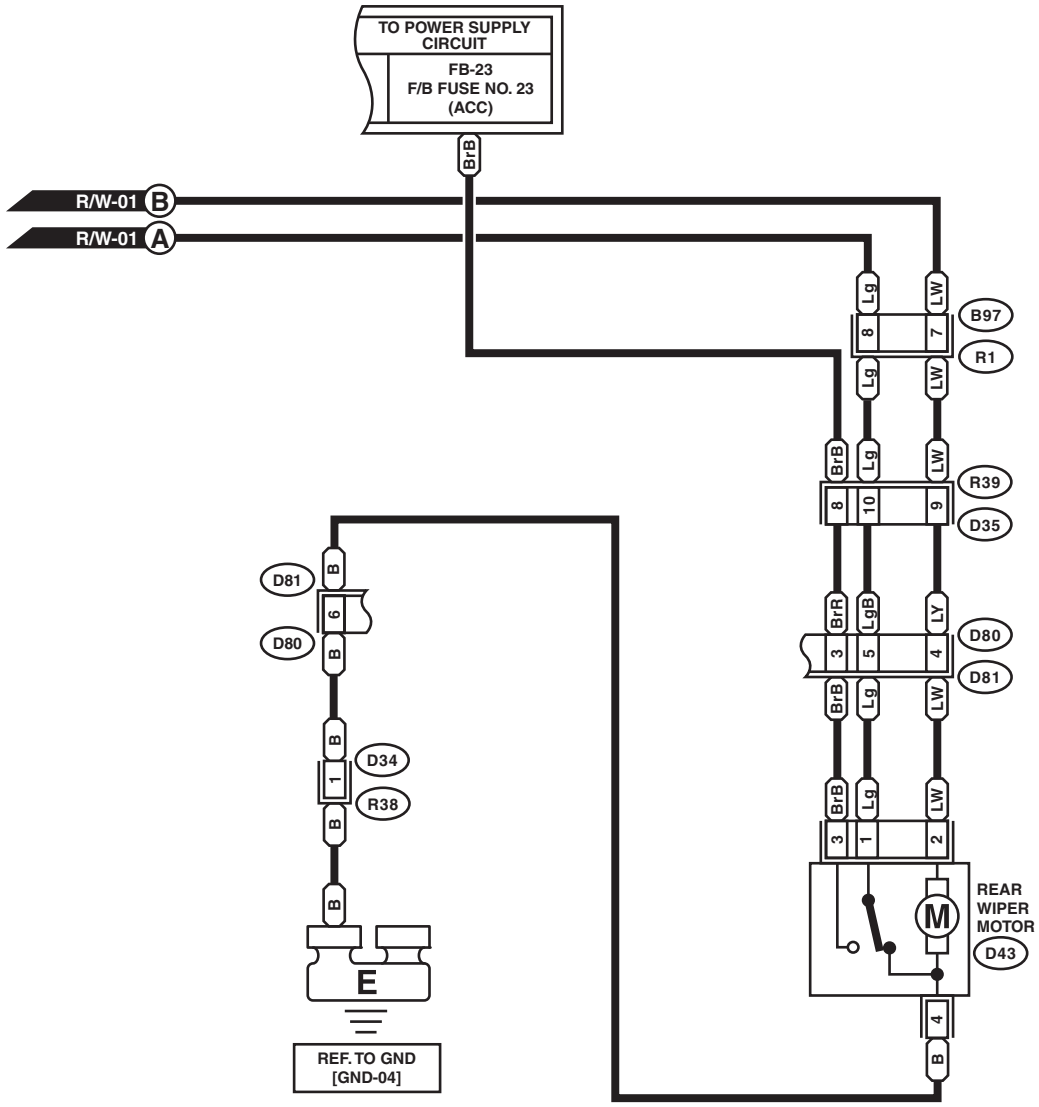
A: WIRING DIAGRAM





WI-31102

R/W-02

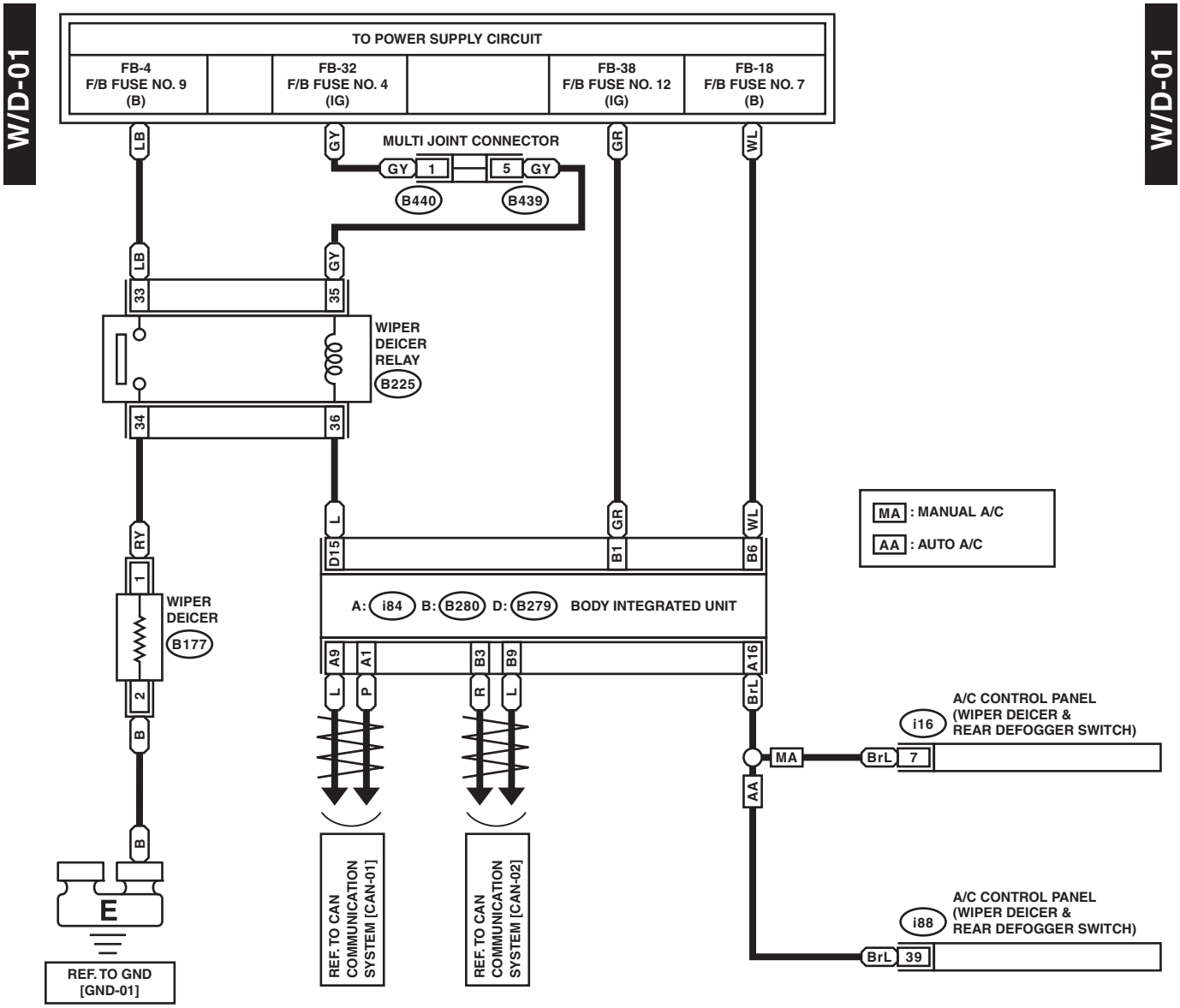


R/W-02

WI-19584

31.Wiper Deicer System

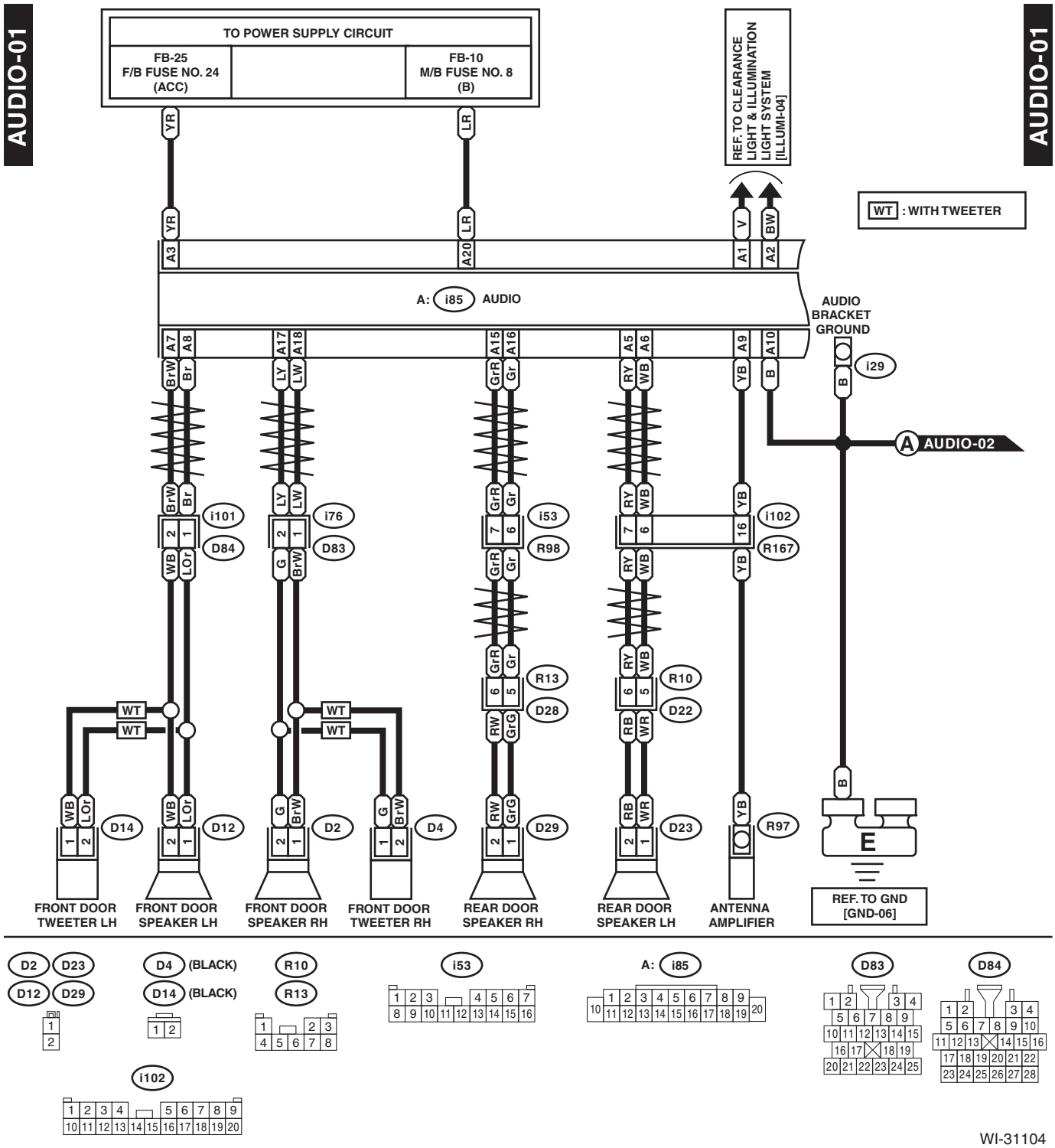
A: WIRING DIAGRAM



32.Audio System

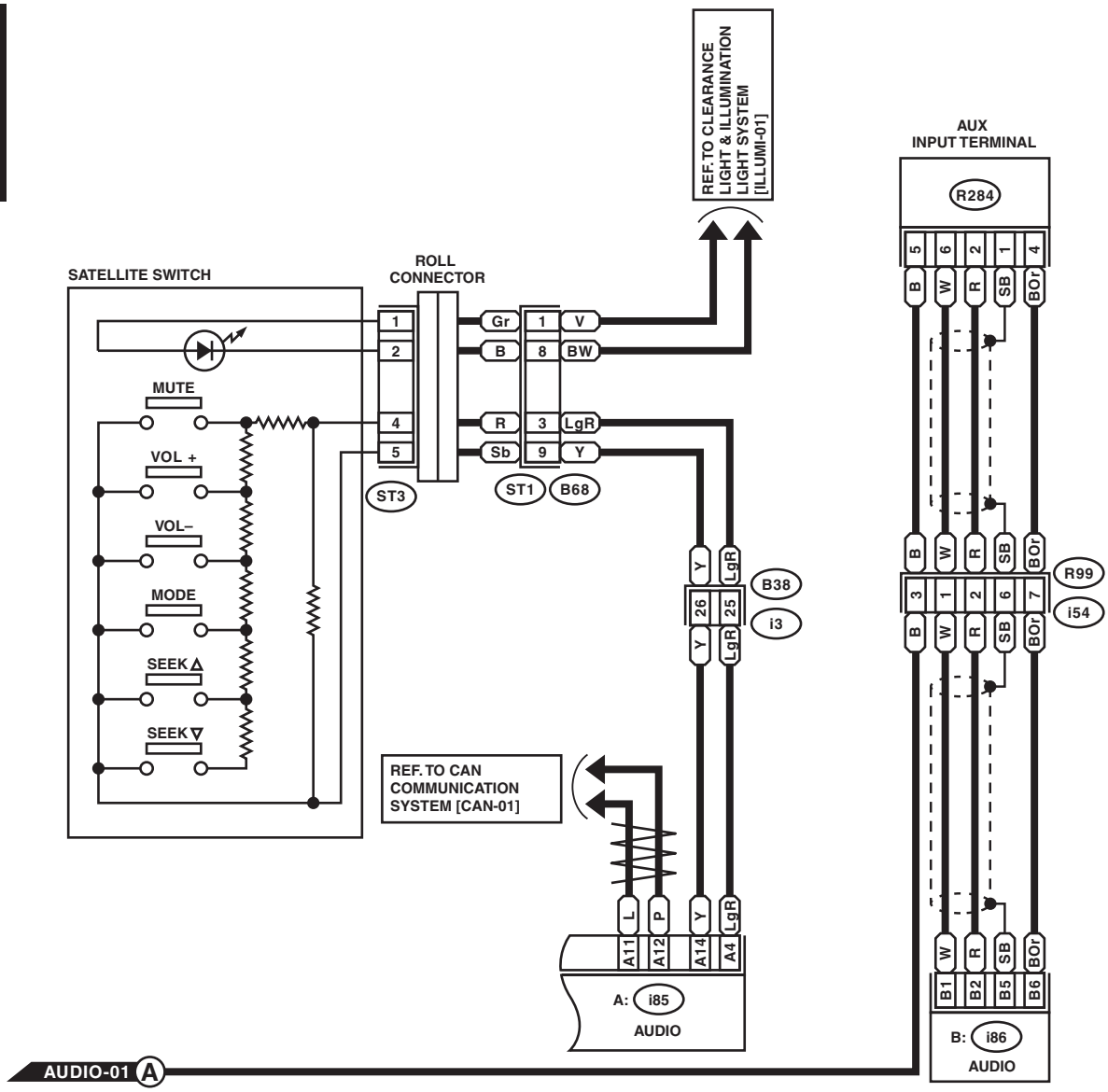
A: WIRING DIAGRAM

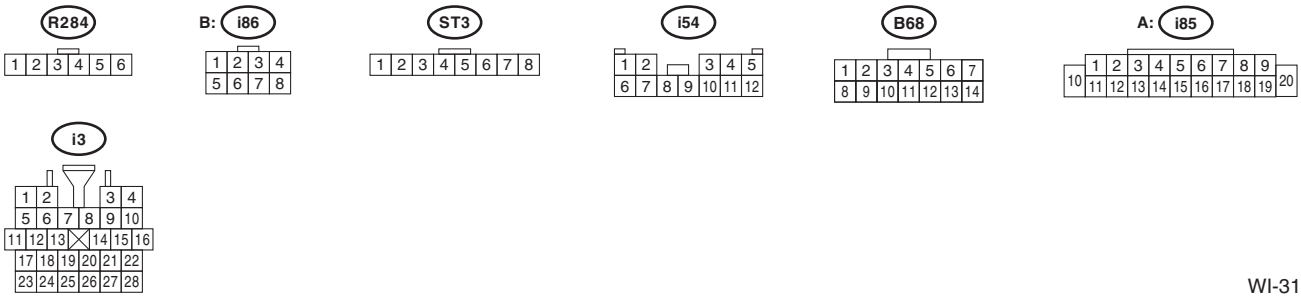
1. WITHOUT HANDSFREE MICROPHONE



WI-31104

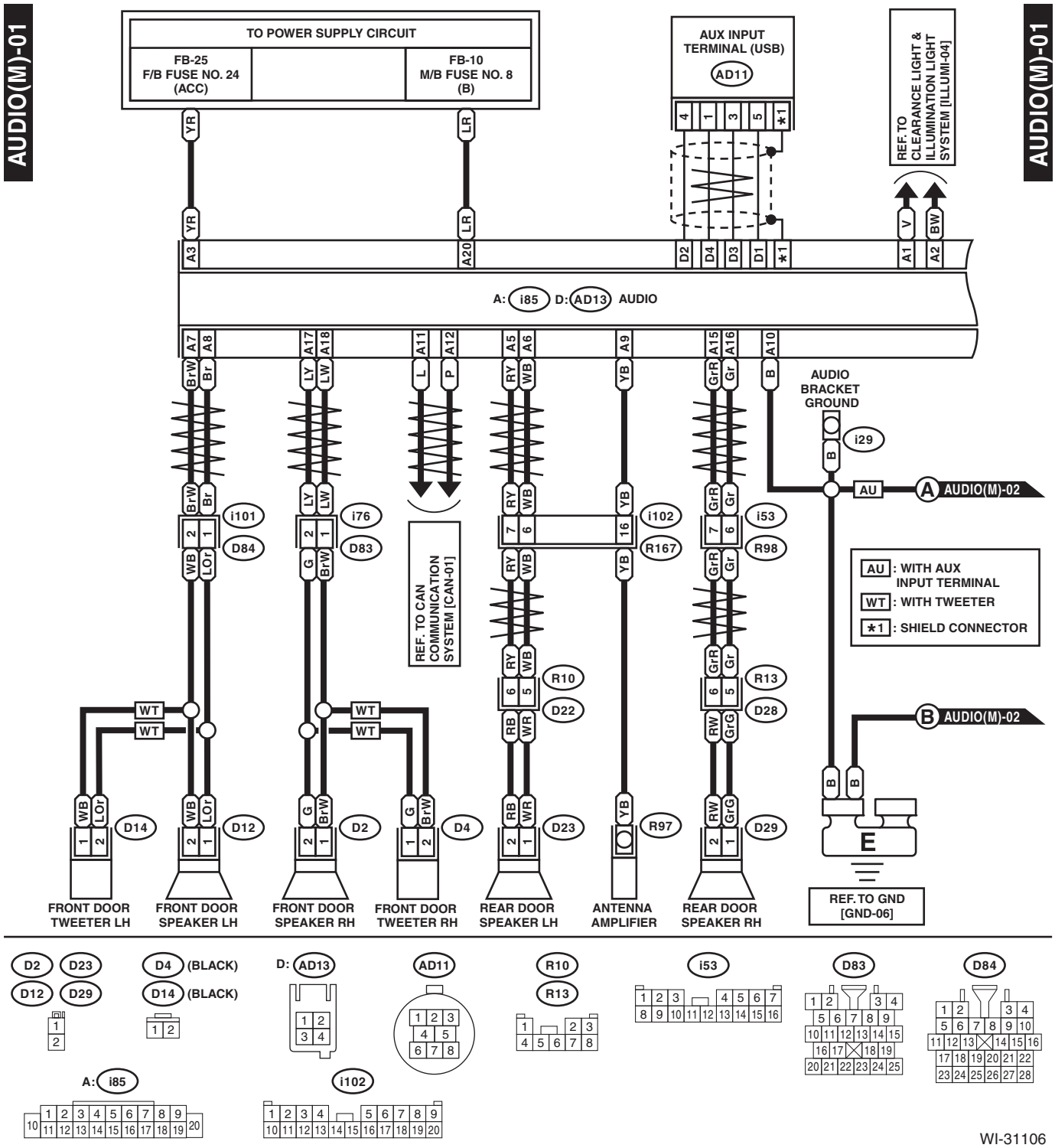
AUDIO-02



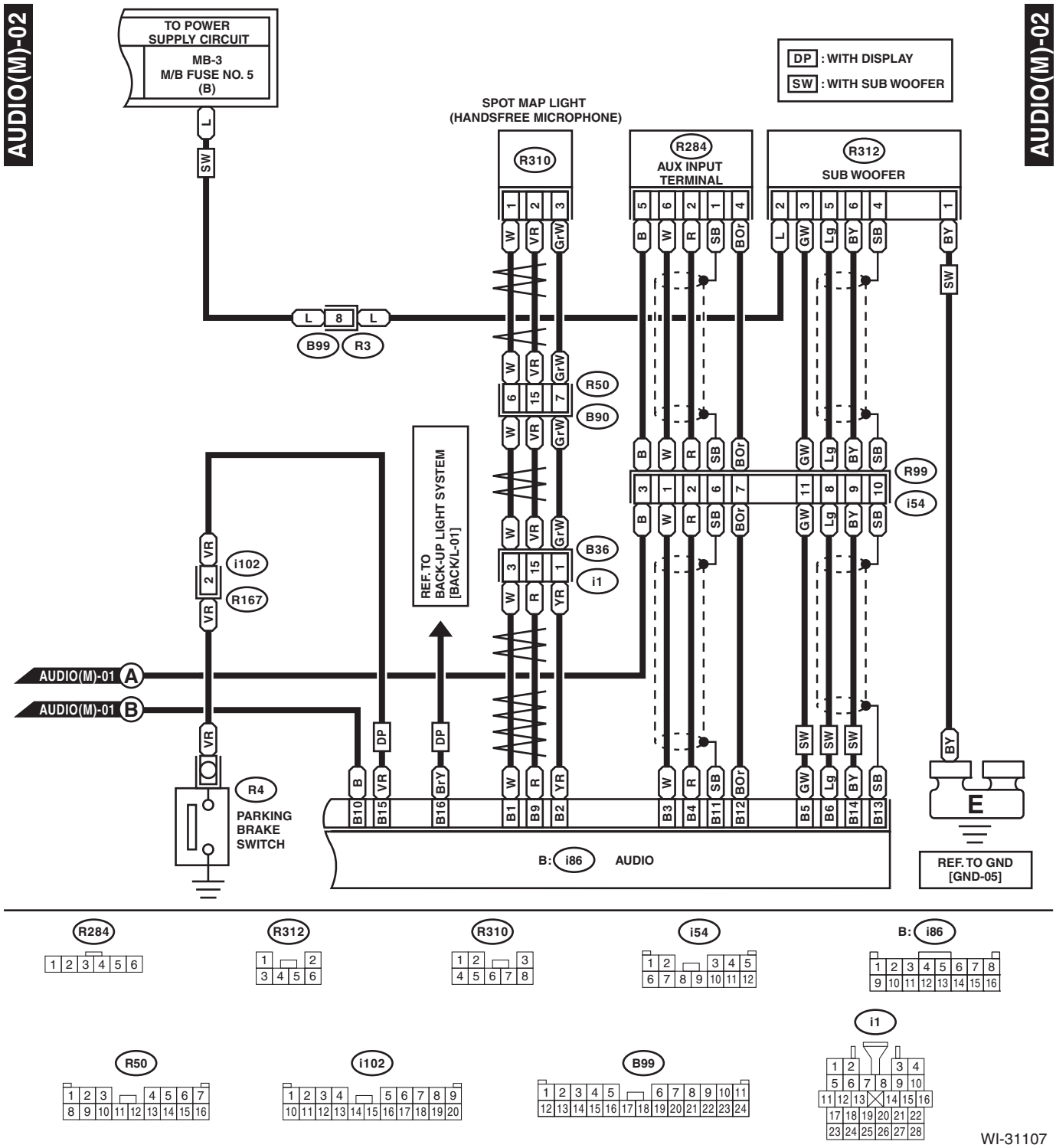


WI-31105

2. WITH HANDSFREE MICROPHONE

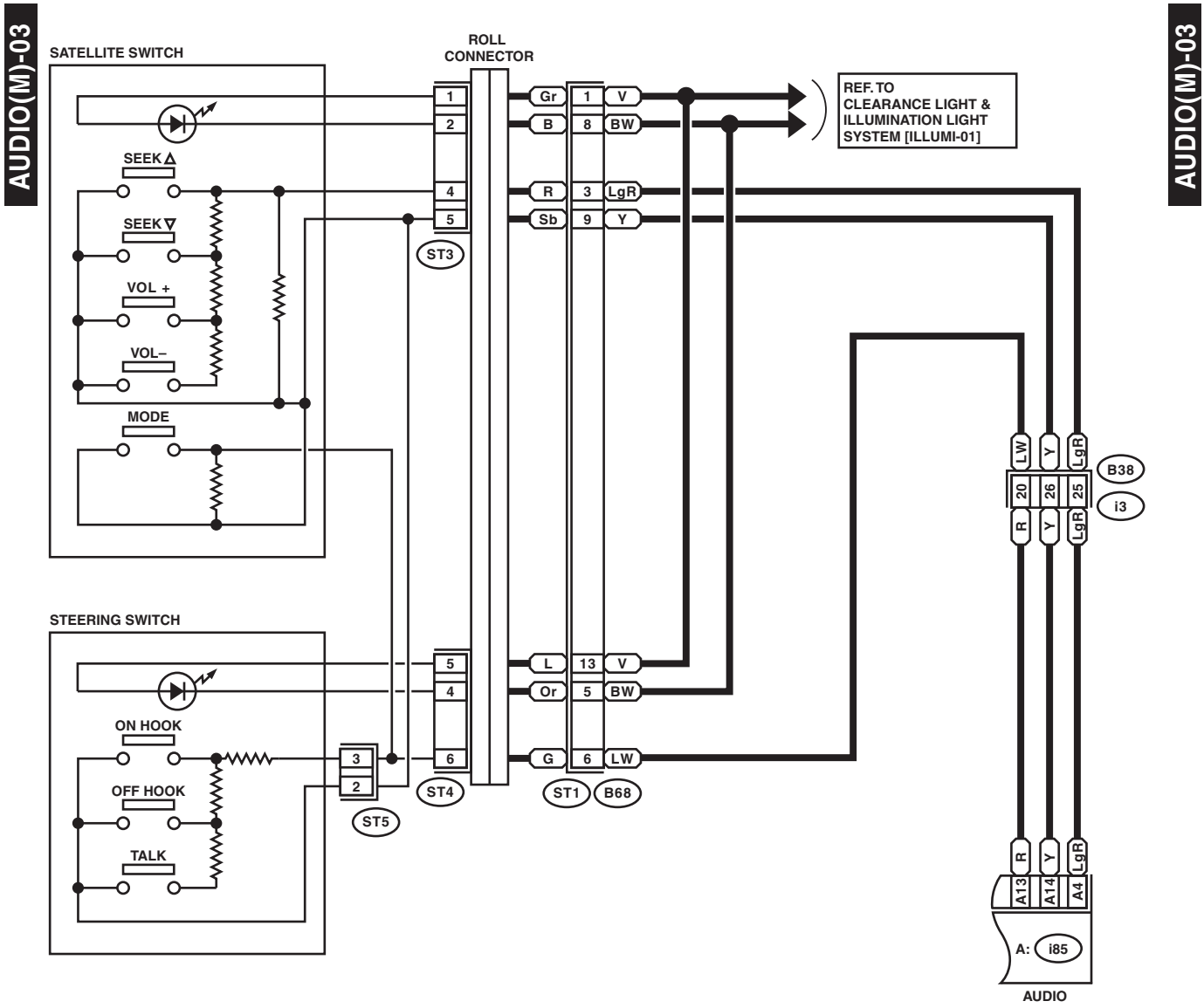


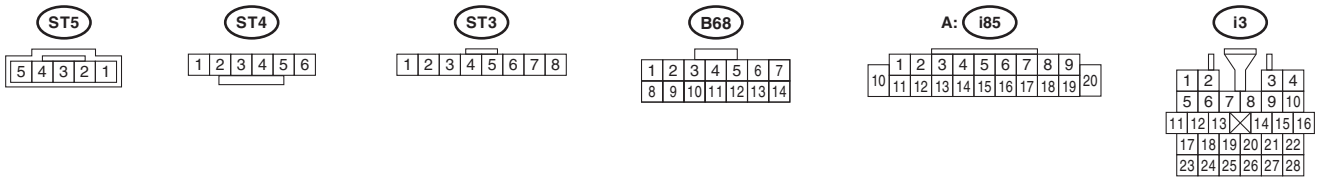
WI-31106


AUDIO(M)-02
AUDIO(M)-02
TO POWER SUPPLY CIRCUIT
MB-3
M/B FUSE NO. 5
(B)
DP : WITH DISPLAY
SW : WITH SUB WOOFER
SPOT MAP LIGHT
(HANDSFREE MICROPHONE)
R310
R284
AUX INPUT TERMINAL
R312
SUB WOOFER
B99
R3
R50
B90
B36
i1
R99
i54
i102
R167
REF. TO BACK-UP LIGHT SYSTEM [BACK/L-01]
AUDIO(M)-01 A
AUDIO(M)-01 B
R4
PARKING BRAKE SWITCH
B: i86 AUDIO
E
REF. TO GND [GND-05]

R284
R312
R310
i54
B: i86
R50
i102
B99
i1

WI-31107


AUDIO(M)-03
AUDIO(M)-03
SATELLITE SWITCH
SEEK △
SEEK ▽
VOL +
VOL–
MODE
ROLL CONNECTOR
1
2
4
5
ST3
Gr
B
R
Sb
1
8
3
9
V
BW
LgR
Y
REF. TO CLEARANCE LIGHT & ILLUMINATION LIGHT SYSTEM [ILLUMI-01]
LW
Y
LgR
20
26
25
B38
i3
R
Y
LgR
STEERING SWITCH
ON HOOK
OFF HOOK
TALK
5
4
6
3
2
ST4
ST5
L
Or
G
13
5
6
V
BW
LW
ST1
B68
R
Y
LgR
A13
A14
A4
A:
i85
AUDIO

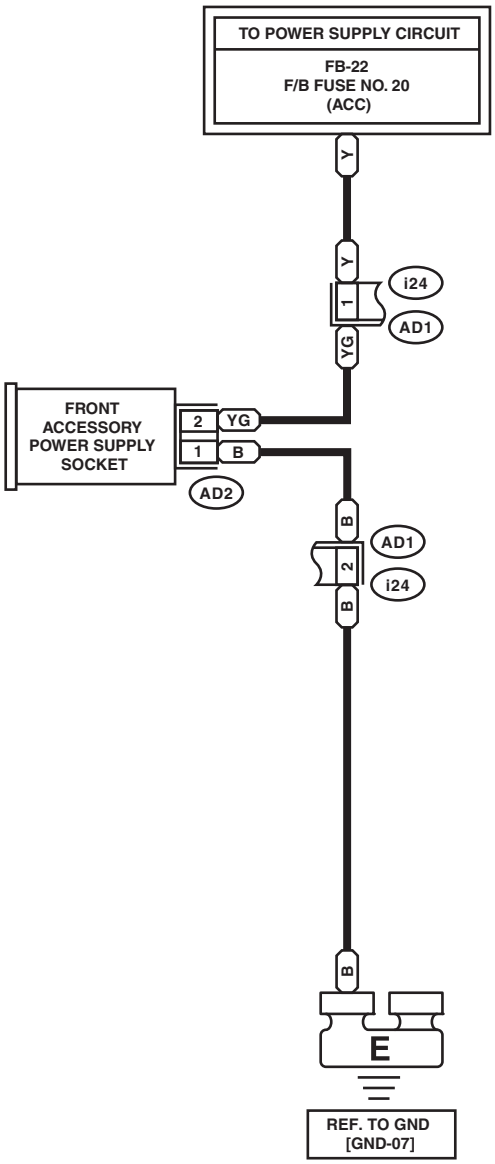

ST5
5 4 3 2 1
ST4
1 2 3 4 5 6
ST3
1 2 3 4 5 6 7 8
B68
1 2 3 4 5 6 7
8 9 10 11 12 13 14
A: i85
1 2 3 4 5 6 7 8 9
10 11 12 13 14 15 16 17 18 19 20
i3
1 2 3 4
5 6 7 8 9 10
11 12 13 14 15 16
17 18 19 20 21 22
23 24 25 26 27 28

WI-31108

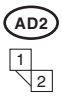
33.Front Accessory Power Supply Socket System

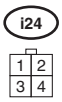
A: WIRING DIAGRAM

FAPS-01



FAPS-01



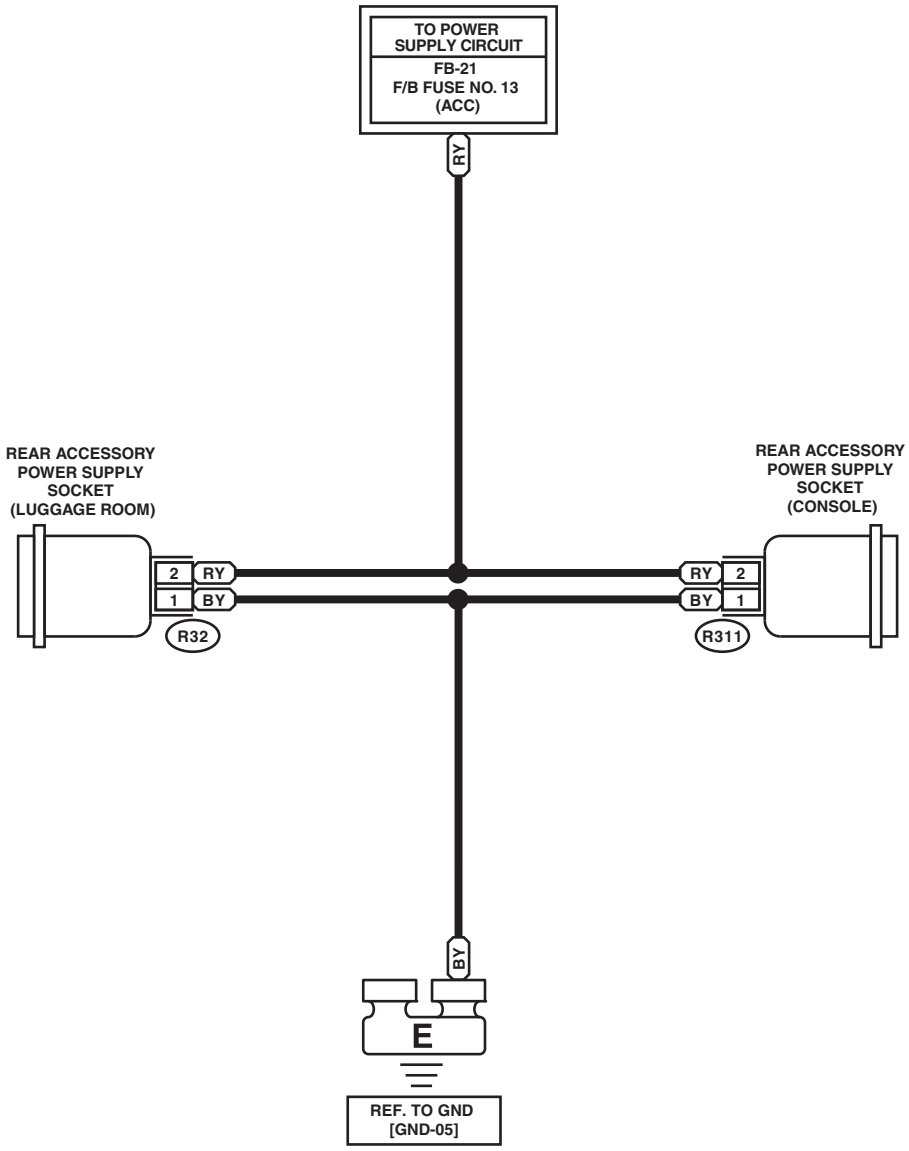


WI-25194

34.Rear Accessory Power Supply Socket System

A: WIRING DIAGRAM

RAPS-01



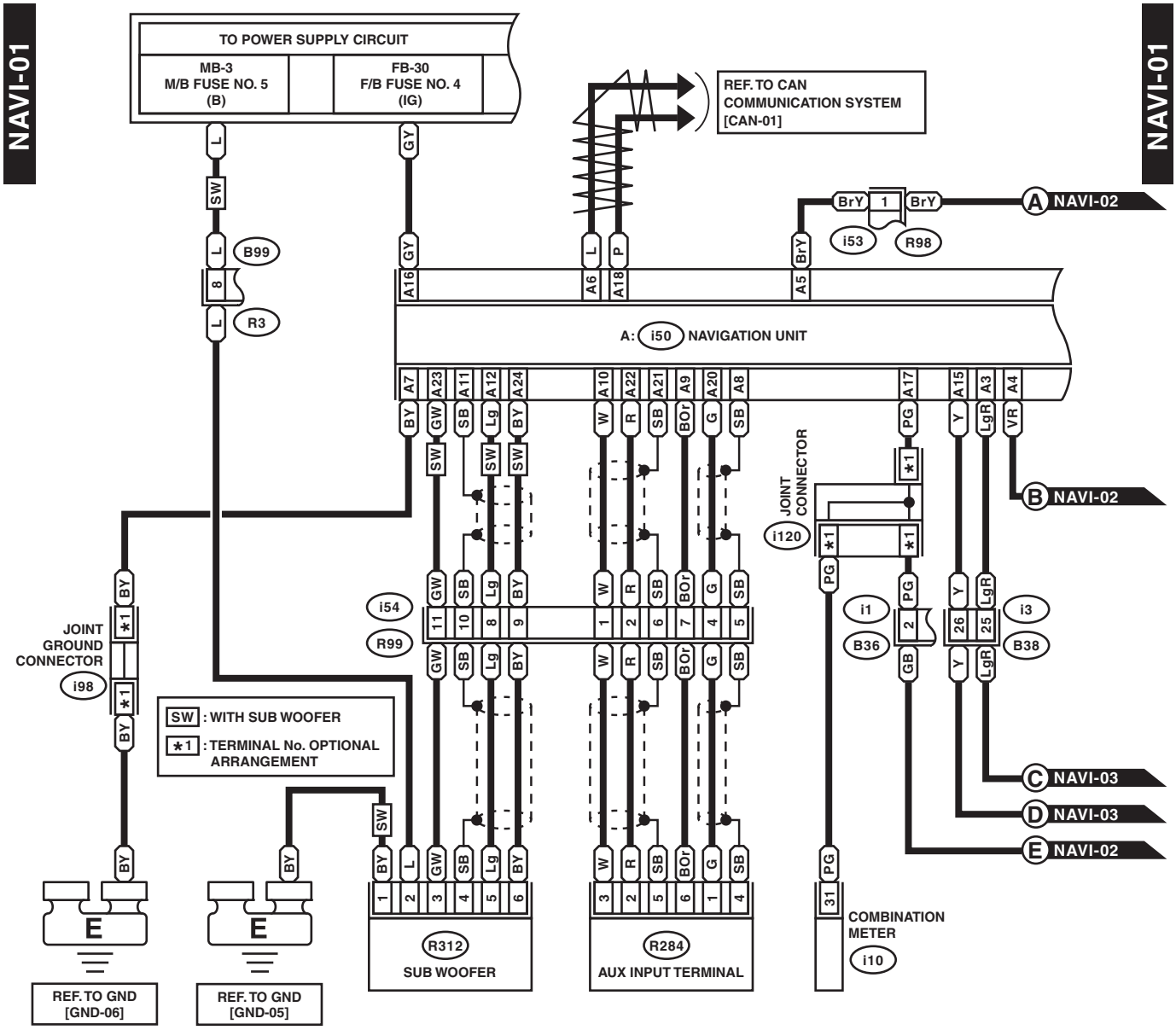
RAPS-01

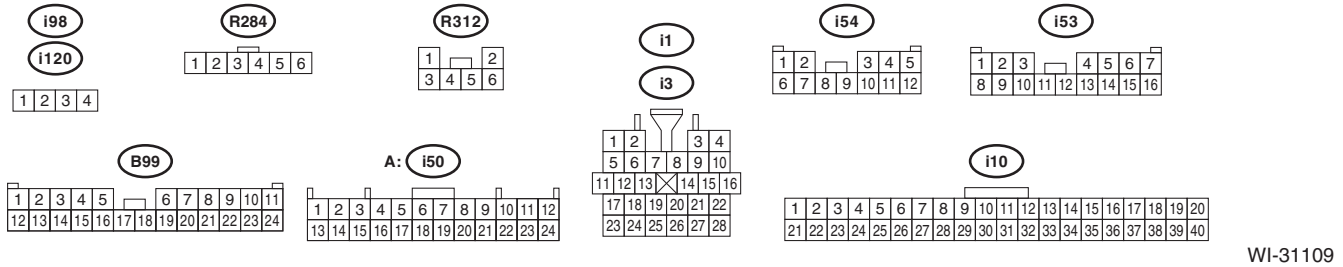
R32
R311
1
2

WI-25195

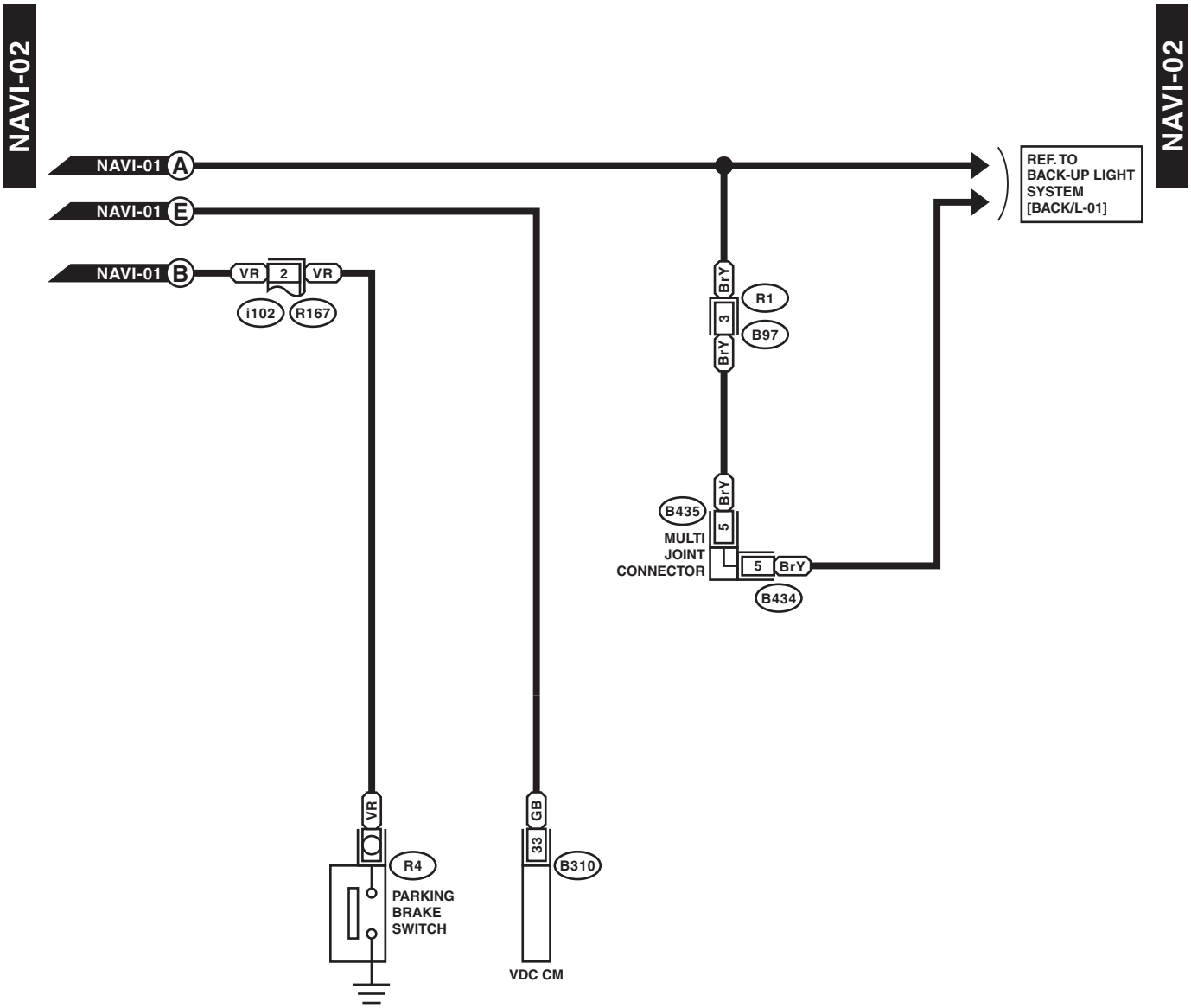
35.Navigation System

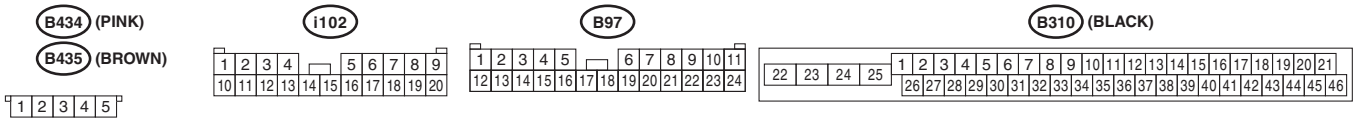
A: WIRING DIAGRAM





WI-31109

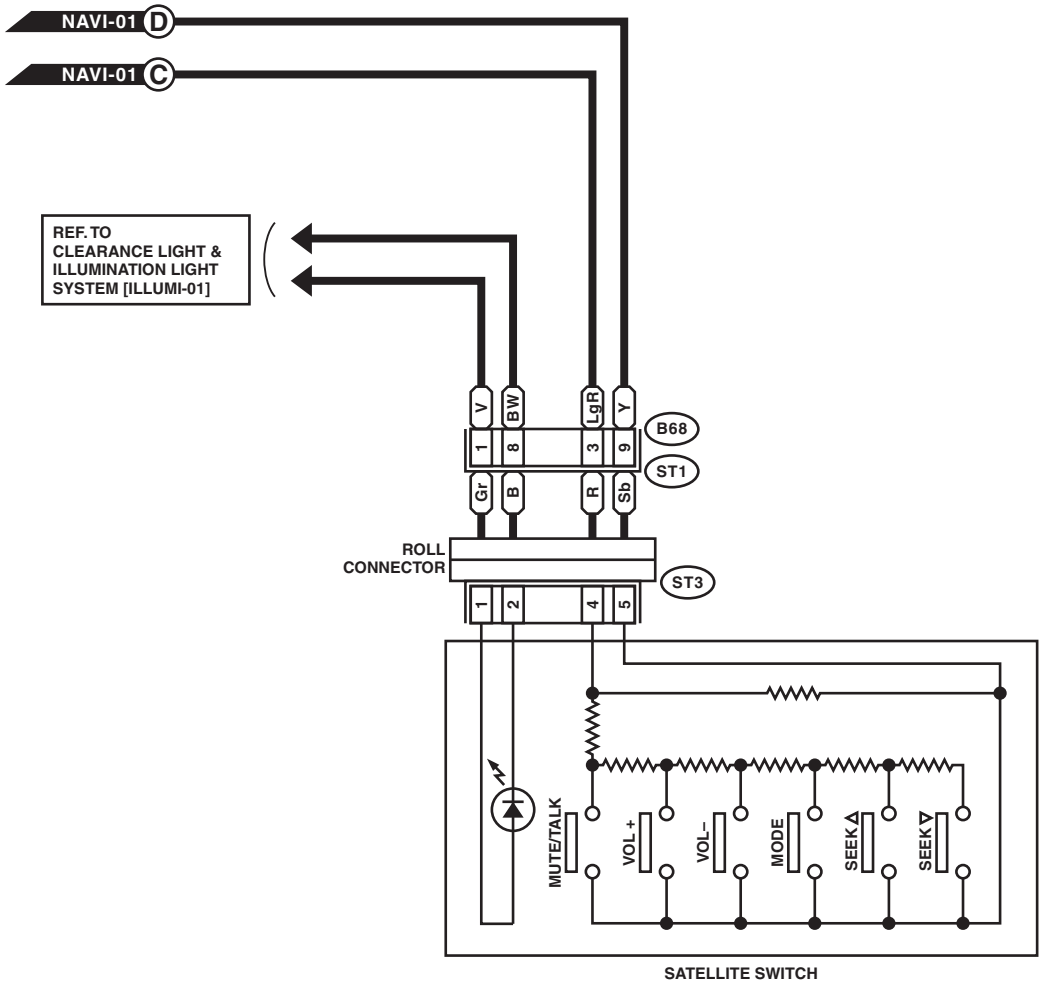

NAVI-02
NAVI-02
NAVI-01 A
NAVI-01 E
NAVI-01 B
VR
2
VR
i102
R167
REF. TO
BACK-UP LIGHT
SYSTEM
[BACK/L-01]
BrY
R1
3
B97
BrY
B435
BrY
5
MULTI
JOINT
CONNECTOR
5
BrY
B434
VR
R4
PARKING
BRAKE
SWITCH
GB
33
B310
VDC CM

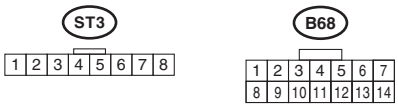

B434 (PINK)
B435 (BROWN)
1 2 3 4 5
i102
1 2 3 4 5 6 7 8 9
10 11 12 13 14 15 16 17 18 19 20
B97
1 2 3 4 5 6 7 8 9 10 11
12 13 14 15 16 17 18 19 20 21 22 23 24
B310 (BLACK)
22 23 24 25
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46

WI-31110

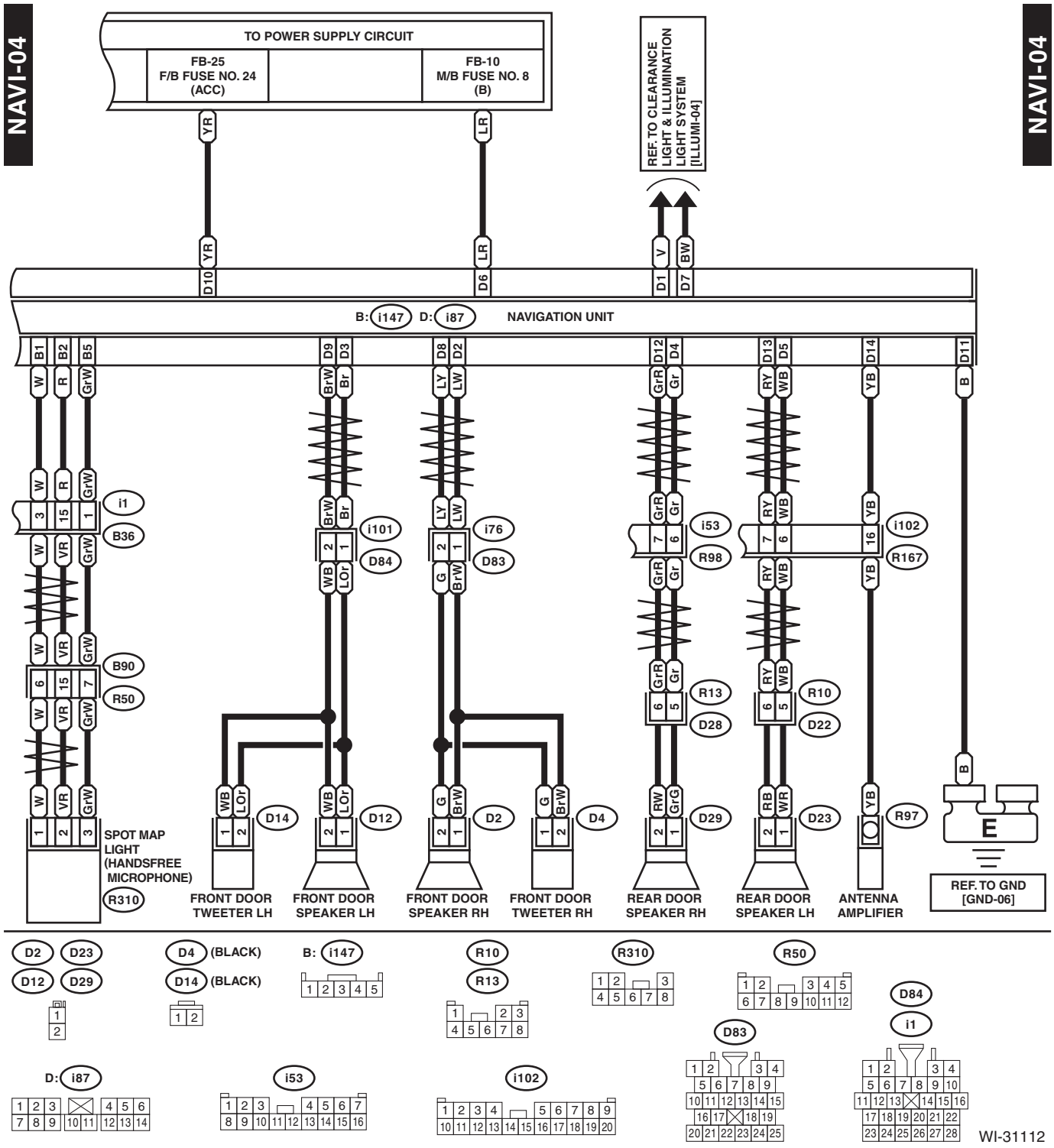
NAVI-03

NAVI-03





WI-31111

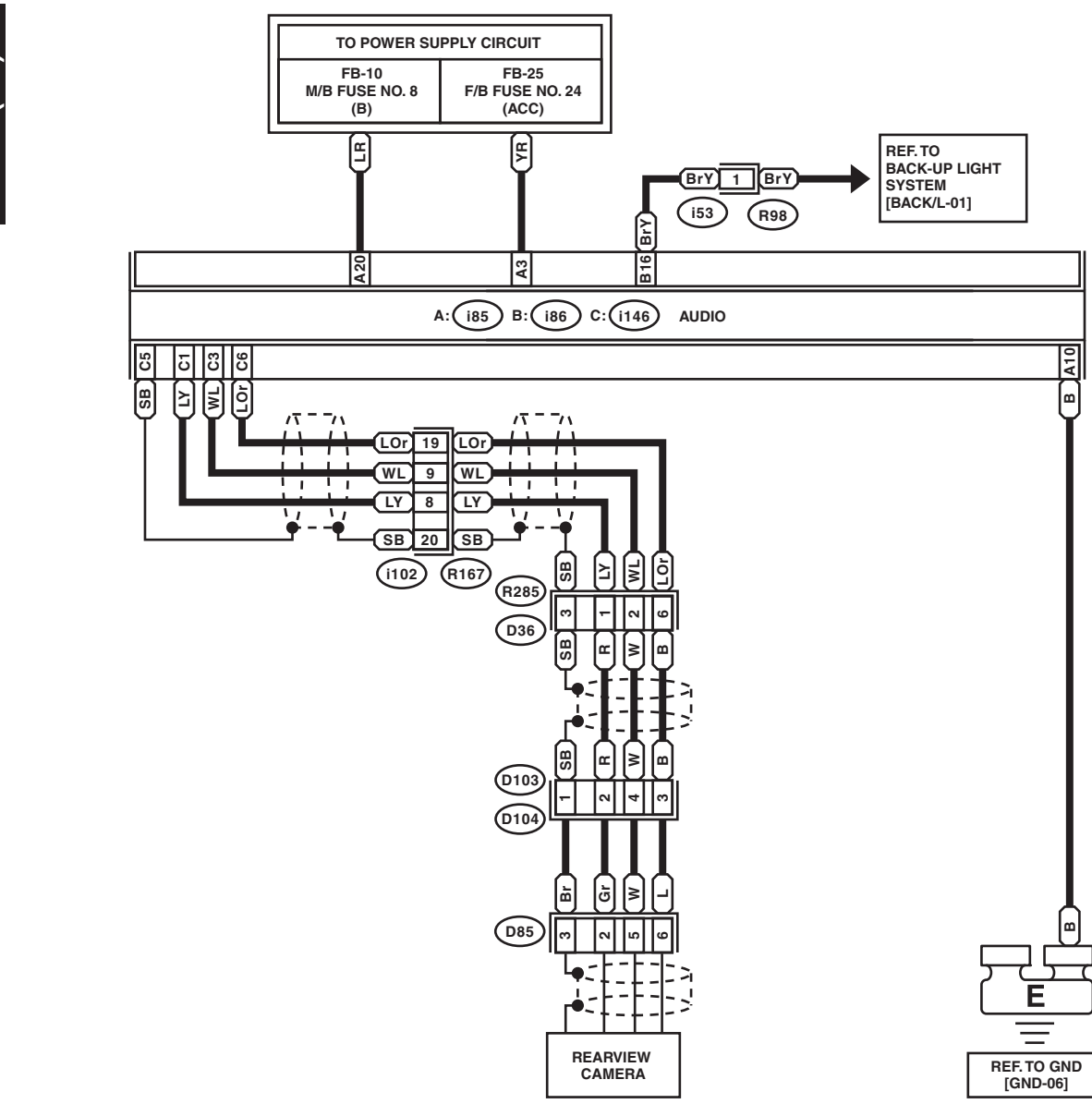

NAVI-04
NAVI-04
TO POWER SUPPLY CIRCUIT
FB-25
F/B FUSE NO. 24
(ACC)
FB-10
M/B FUSE NO. 8
(B)
REF. TO CLEARANCE LIGHT & ILLUMINATION LIGHT SYSTEM [ILLUMI-04]
B: i147 D: i87
NAVIGATION UNIT
i1
B36
B90
R50
R310
SPOT MAP LIGHT (HANDSFREE MICROPHONE)
i101
D84
i76
D83
i53
R98
i102
R167
R13
D28
R10
D22
D14
D12
D2
D4
D29
D23
R97
FRONT DOOR TWEETER LH
FRONT DOOR SPEAKER LH
FRONT DOOR SPEAKER RH
FRONT DOOR TWEETER RH
REAR DOOR SPEAKER RH
REAR DOOR SPEAKER LH
ANTENNA AMPLIFIER
REF. TO GND [GND-06]
D2
D23
D12
D29
D4 (BLACK)
D14 (BLACK)
B: i147
R10
R13
R310
R50
D84
i1
D: i87
i53
i102
D83
WI-31112

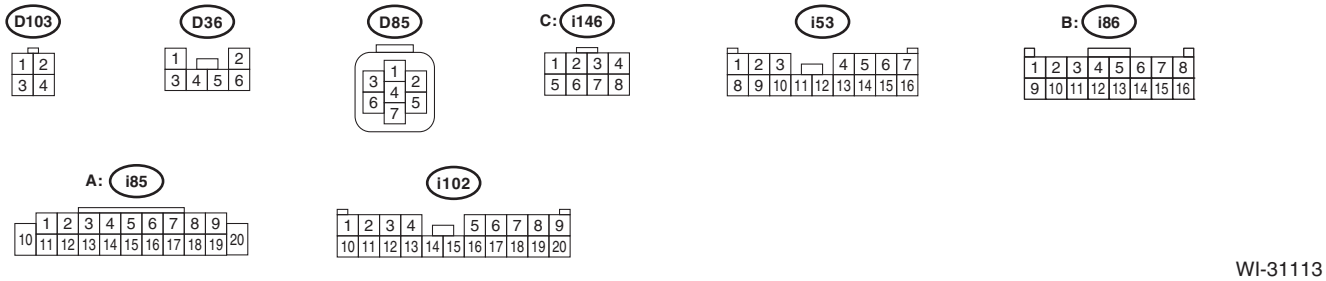
36.Rearview Camera System

A: WIRING DIAGRAM

1. MODELS WITHOUT NAVIGATION SYSTEM

RVCAM(ON)-01

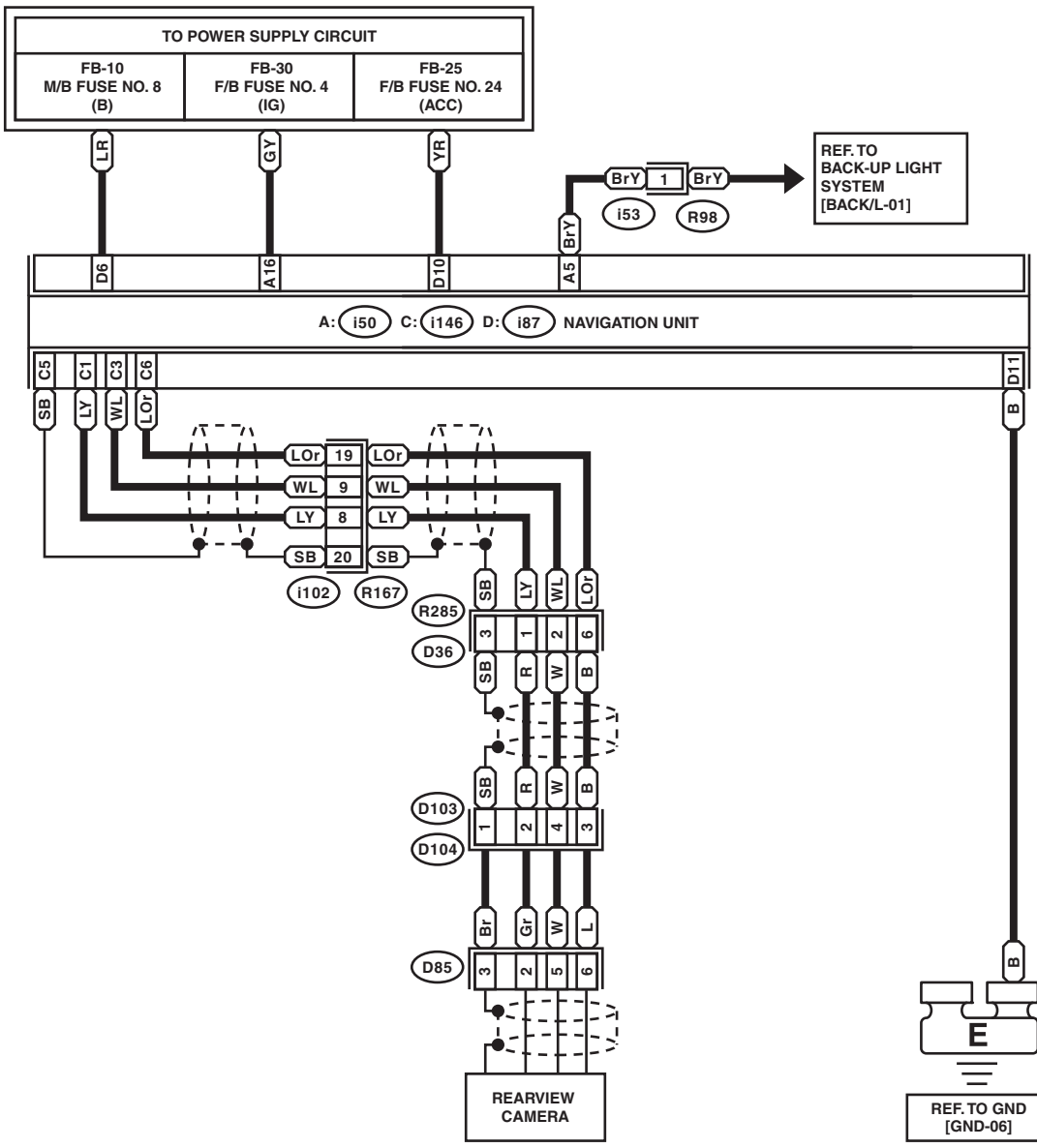


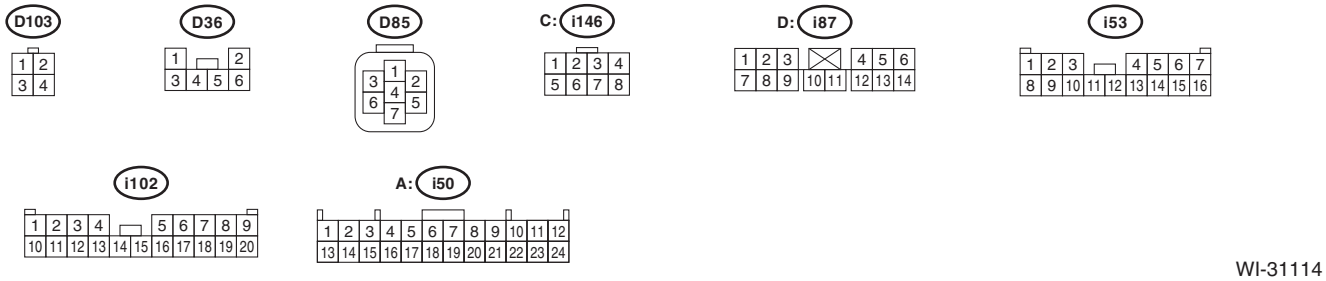


WI-31113

2. MODELS WITH NAVIGATION SYSTEM

RVCAM(WN)-01

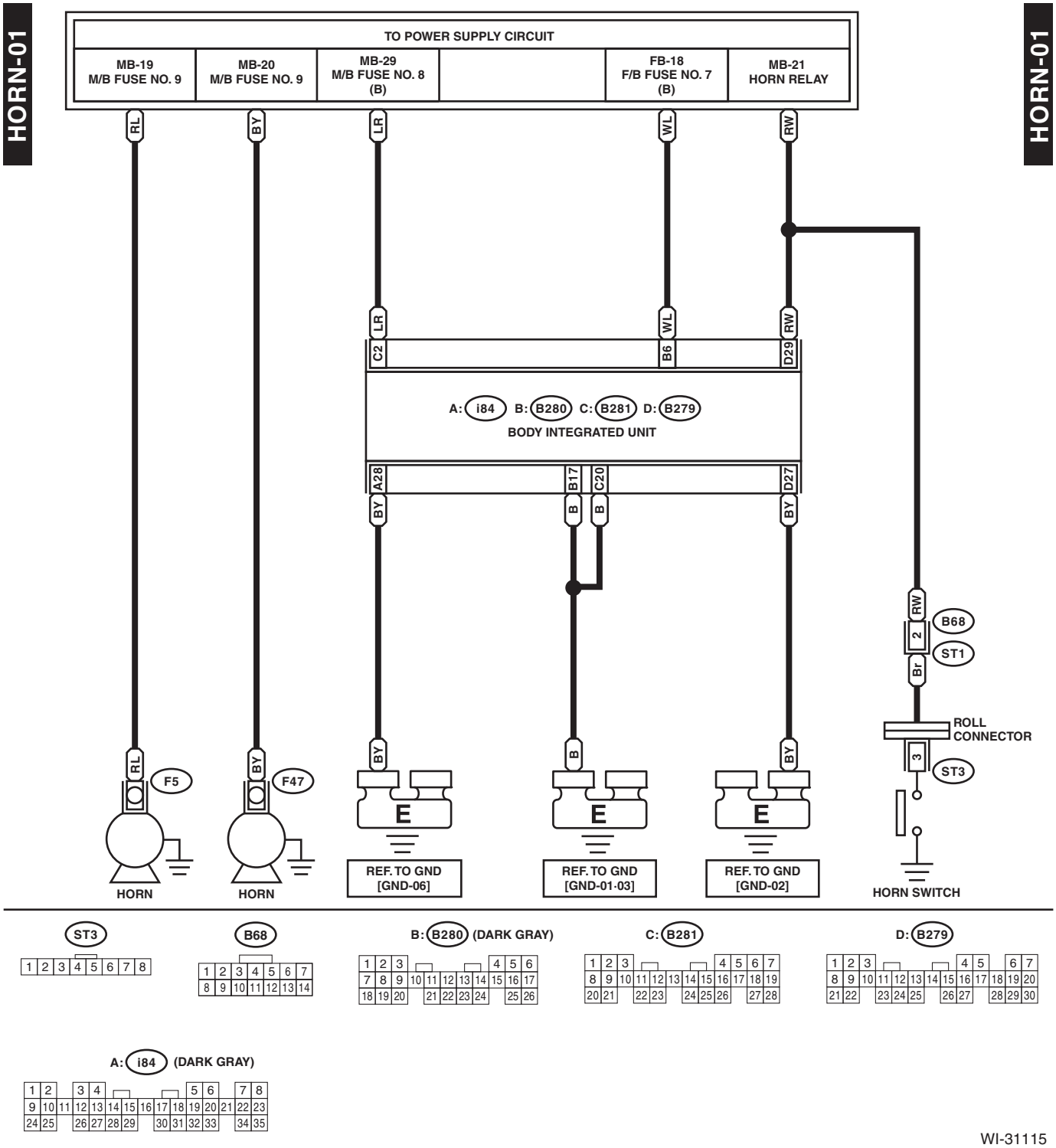




WI-31114

37.Horn System

A: WIRING DIAGRAM

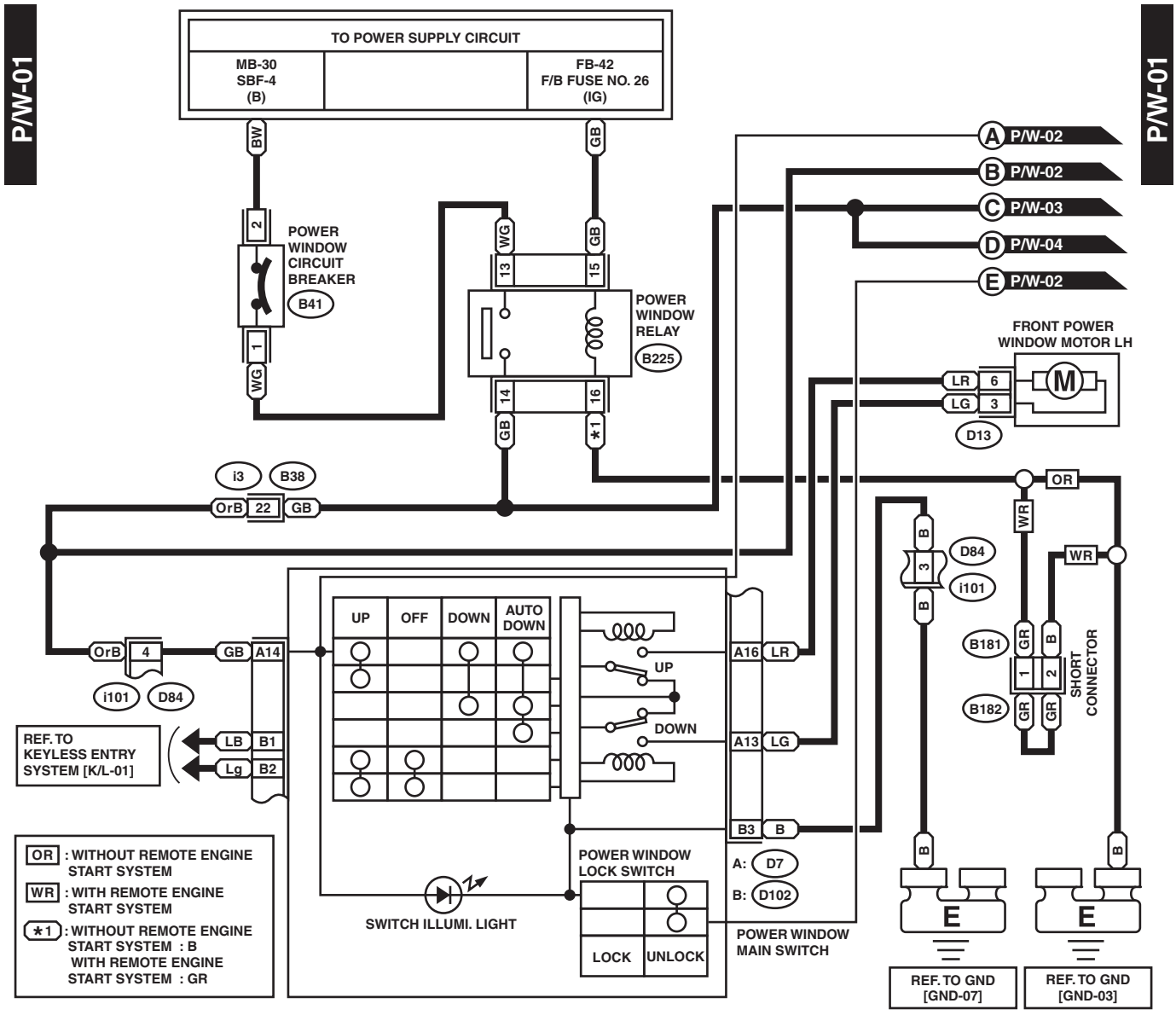


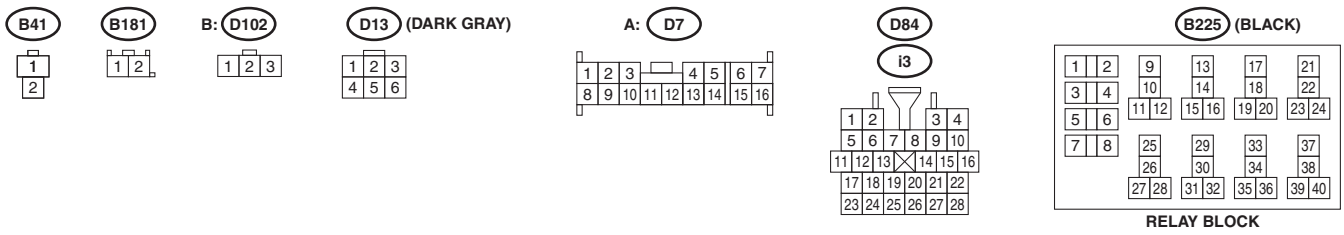
WI-31115

38.Power Window System

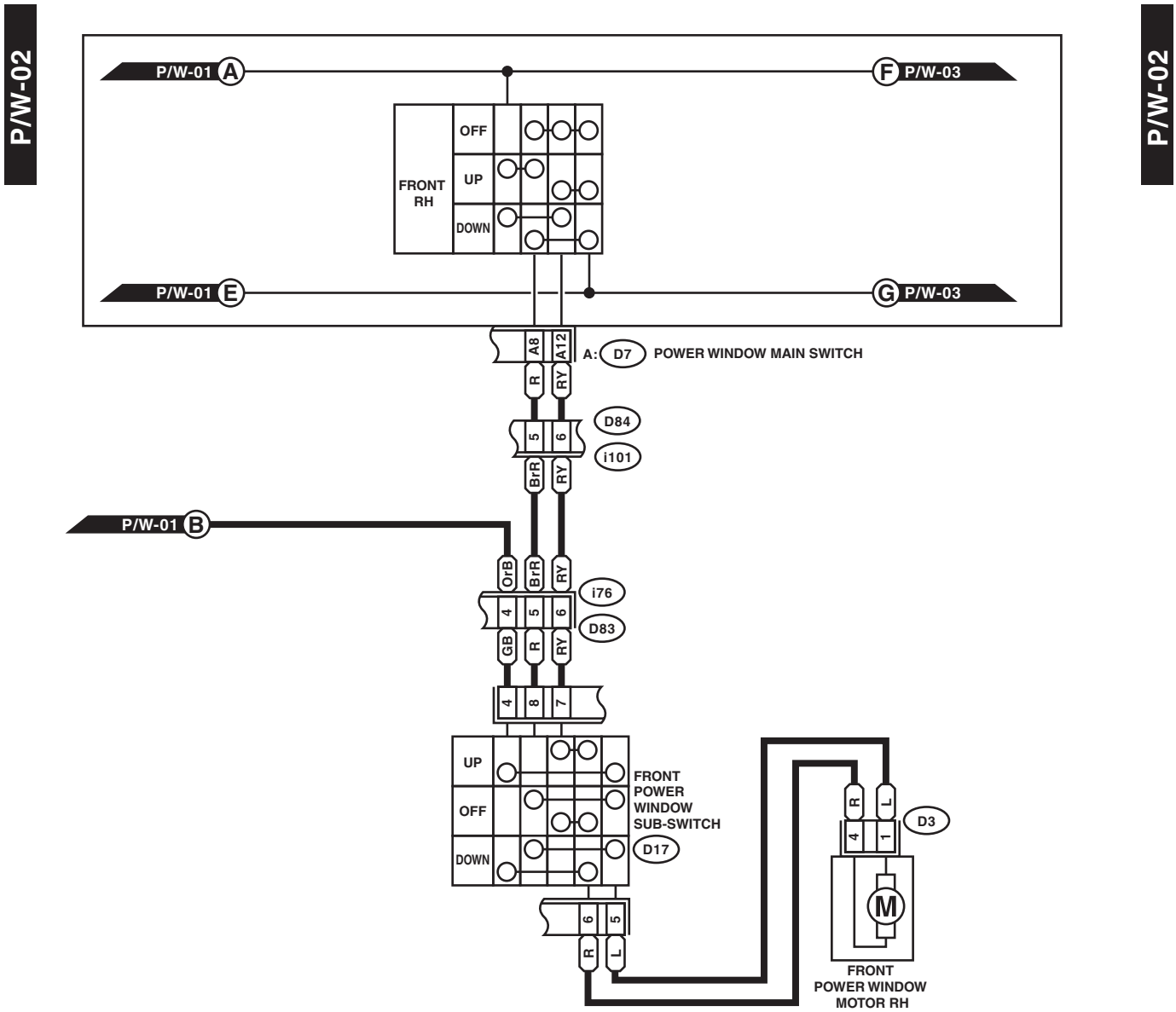
A: WIRING DIAGRAM

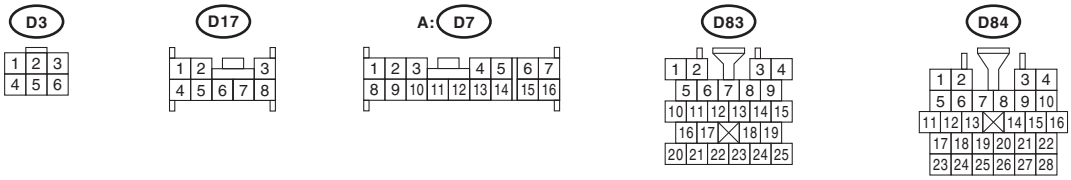
1. WITHOUT AUTO-REVERSE FUNCTION



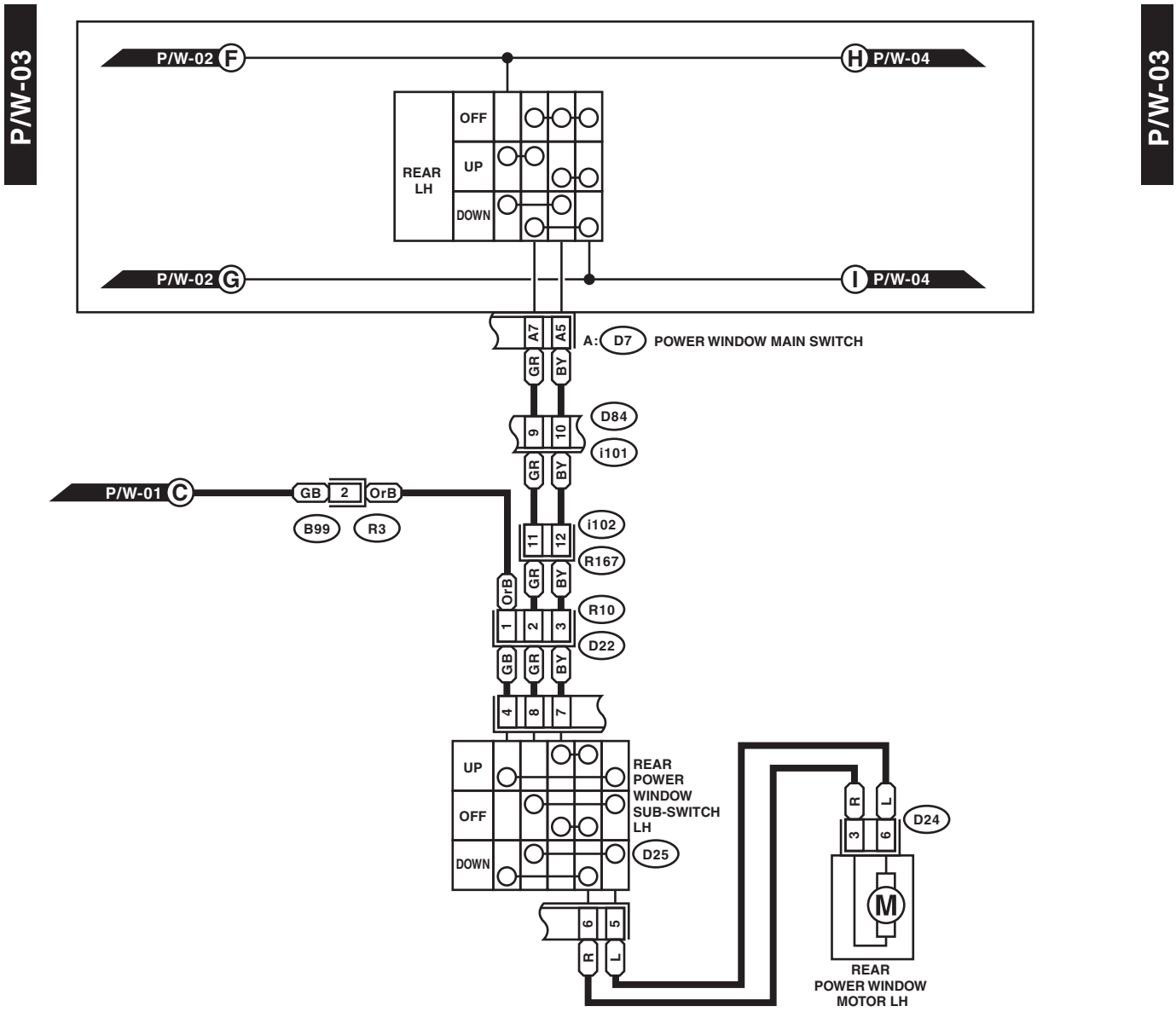


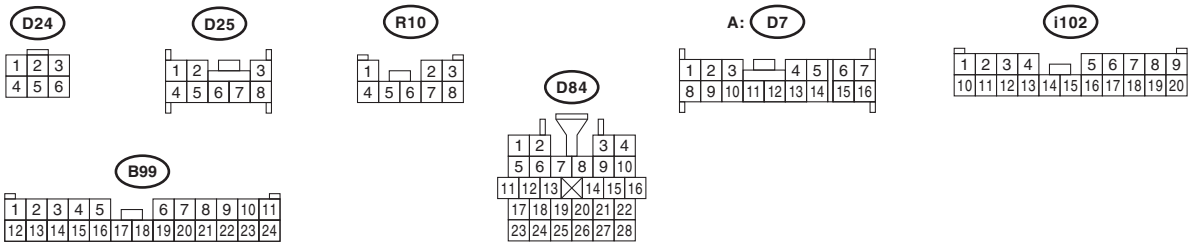
WI-31116


P/W-02
P/W-02
P/W-01 A
F P/W-03
FRONT RH
OFF
UP
DOWN
P/W-01 E
G P/W-03
A8
A12
A: D7 POWER WINDOW MAIN SWITCH
R
RY
D84
5
6
i101
BrR
RY
P/W-01 B
OrB
BrR
RY
i76
4
5
6
D83
GB
R
RY
4
8
7
UP
OFF
DOWN
FRONT POWER WINDOW SUB-SWITCH
D17
R
L
D3
4
1
M
FRONT POWER WINDOW MOTOR RH
6
5
R
L

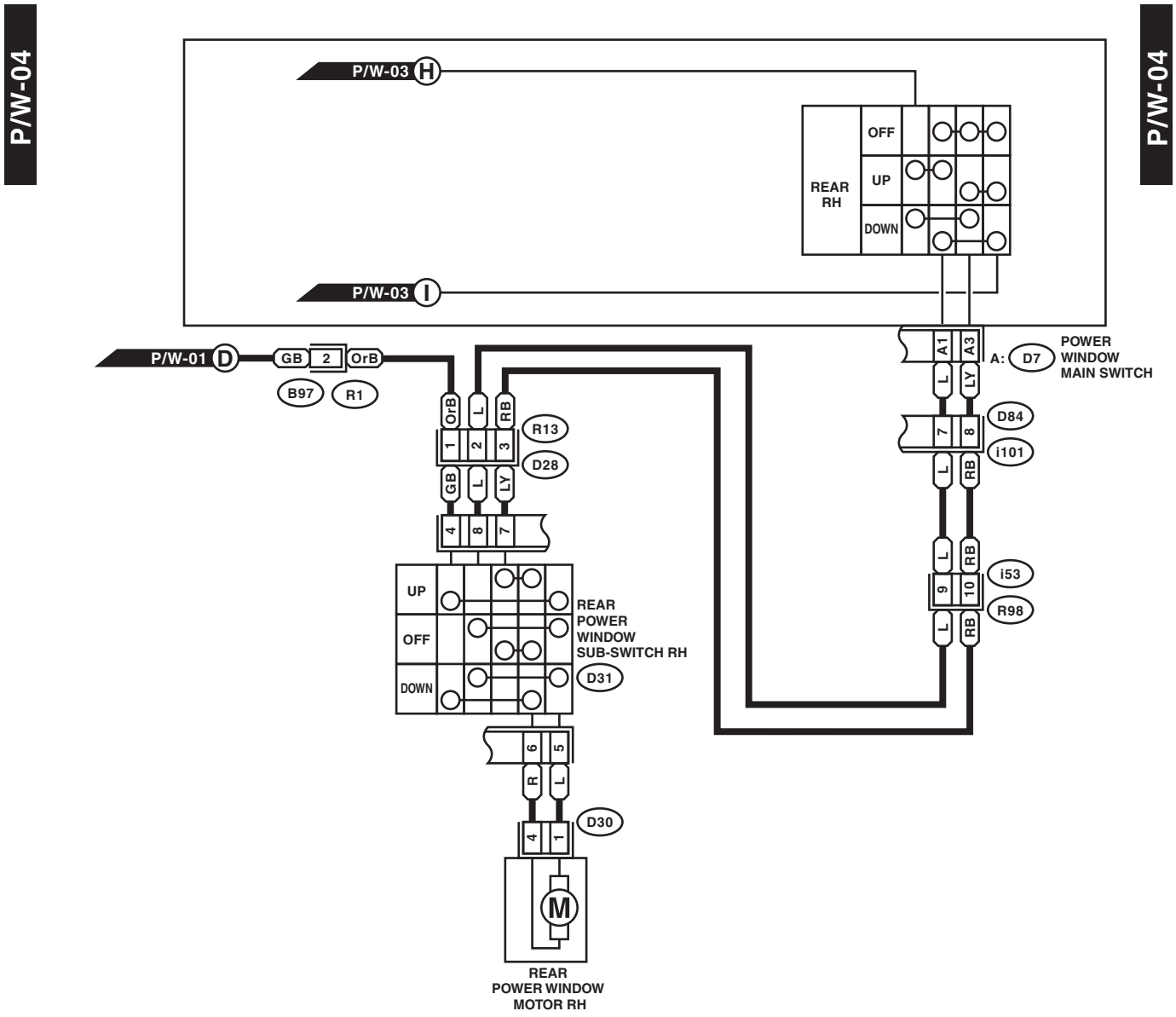

D3
1 2 3
4 5 6
D17
1 2 3
4 5 6 7 8
A: D7
1 2 3 4 5 6 7
8 9 10 11 12 13 14 15 16
D83
1 2 3 4
5 6 7 8 9
10 11 12 13 14 15
16 17 18 19
20 21 22 23 24 25
D84
1 2 3 4
5 6 7 8 9 10
11 12 13 14 15 16
17 18 19 20 21 22
23 24 25 26 27 28

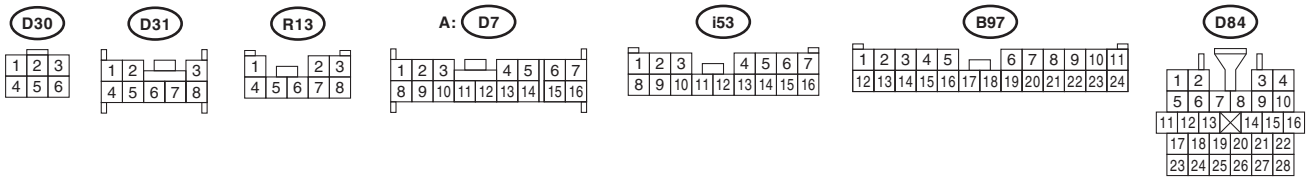
WI-31175


P/W-03
P/W-03
P/W-02 F
H P/W-04
REAR LH
OFF
UP
DOWN
P/W-02 G
I P/W-04
A7
A5
A: D7 POWER WINDOW MAIN SWITCH
GR
BY
D84
9
10
i101
P/W-01 C
GB
2
OrB
B99
R3
11
12
i102
R167
OrB
GR
BY
R10
1
2
3
D22
GB
GR
BY
4
8
7
UP
OFF
DOWN
REAR POWER WINDOW SUB-SWITCH LH
D25
6
5
R
L
R
L
D24
3
6
M
REAR POWER WINDOW MOTOR LH


D24
D25
R10
D84
A: D7
i102
B99

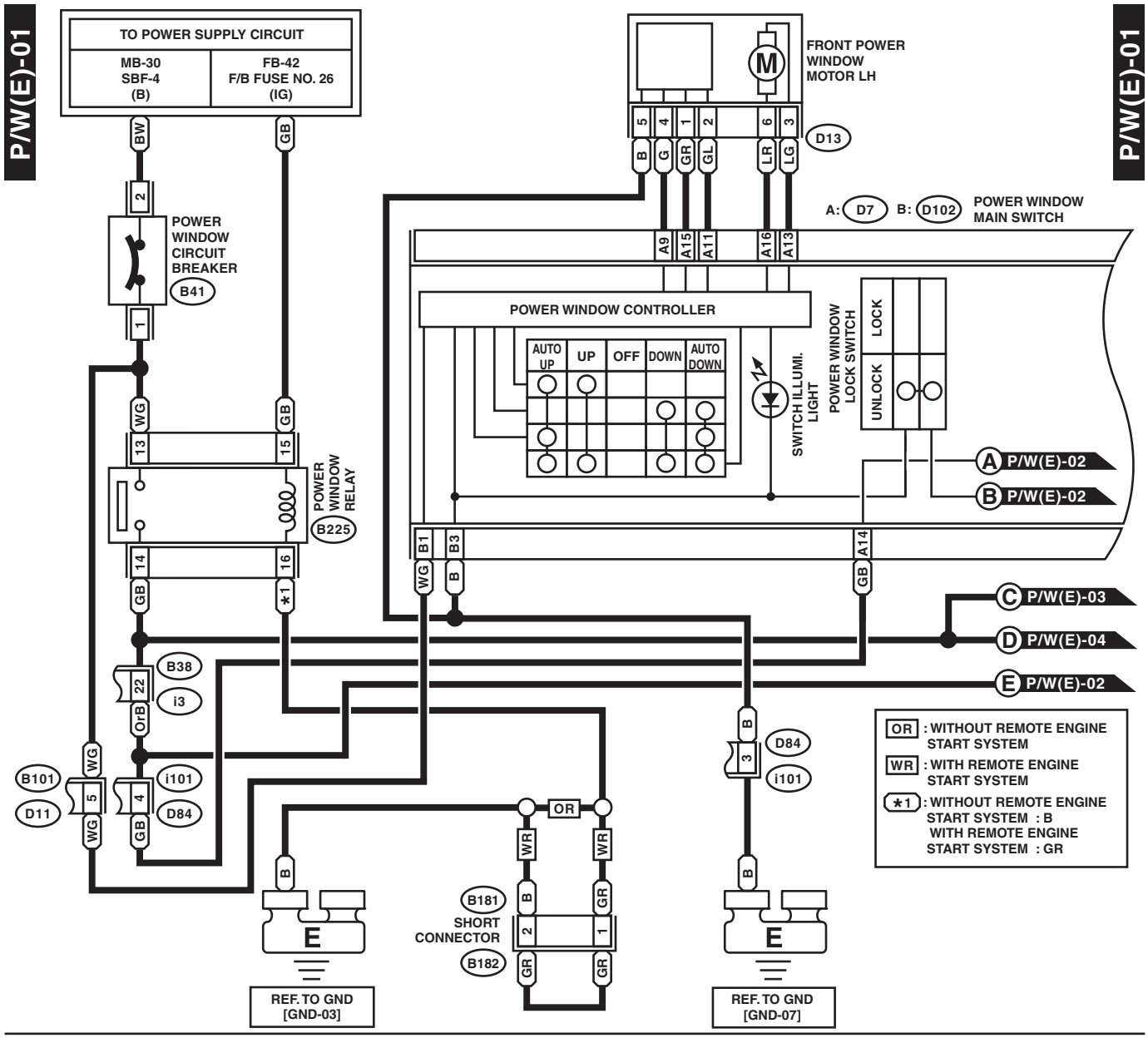
WI-31176

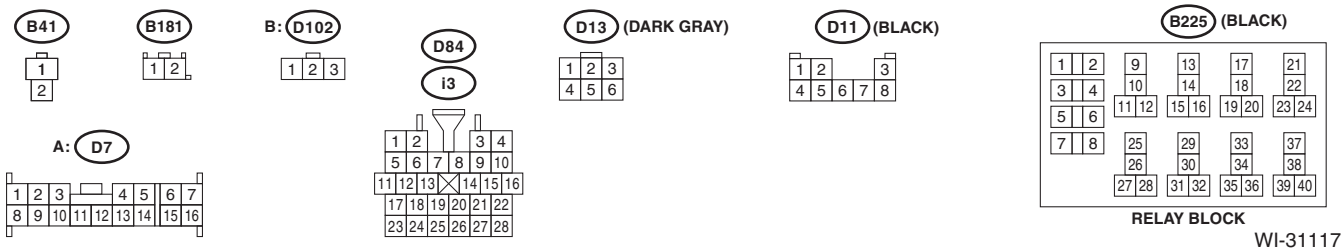

P/W-04
P/W-04
P/W-03 H
P/W-03 I
REAR RH
OFF
UP
DOWN
P/W-01 D
GB
2
OrB
B97
R1
R13
D28
D84
i101
i53
R98
D31
D30
A: D7
POWER WINDOW MAIN SWITCH
REAR POWER WINDOW SUB-SWITCH RH
REAR POWER WINDOW MOTOR RH
M


D30
D31
R13
A: D7
i53
B97
D84

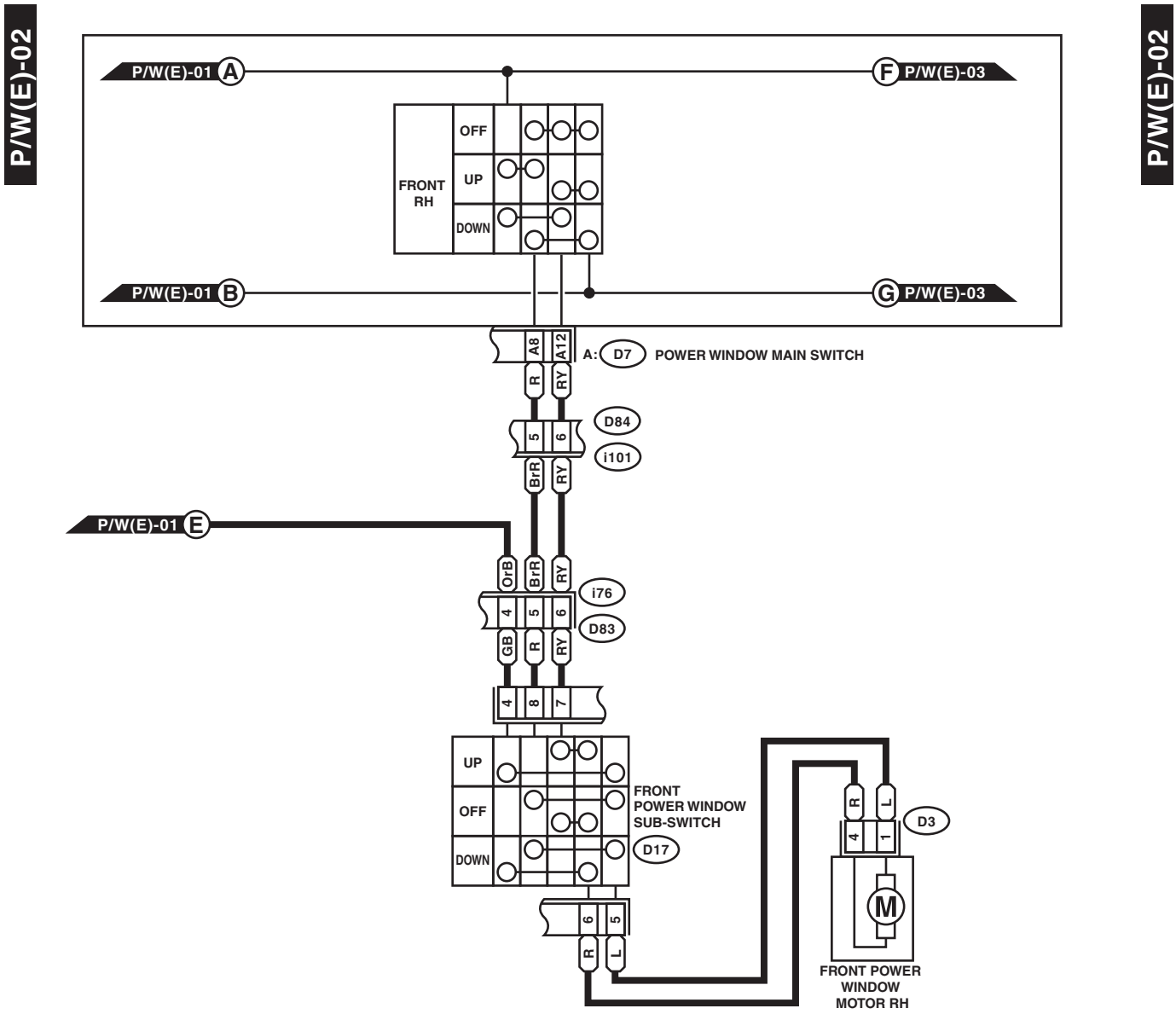
WI-31177

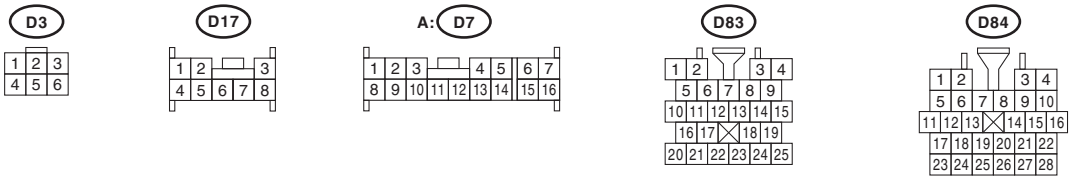
2. WITH AUTO-REVERSE FUNCTION



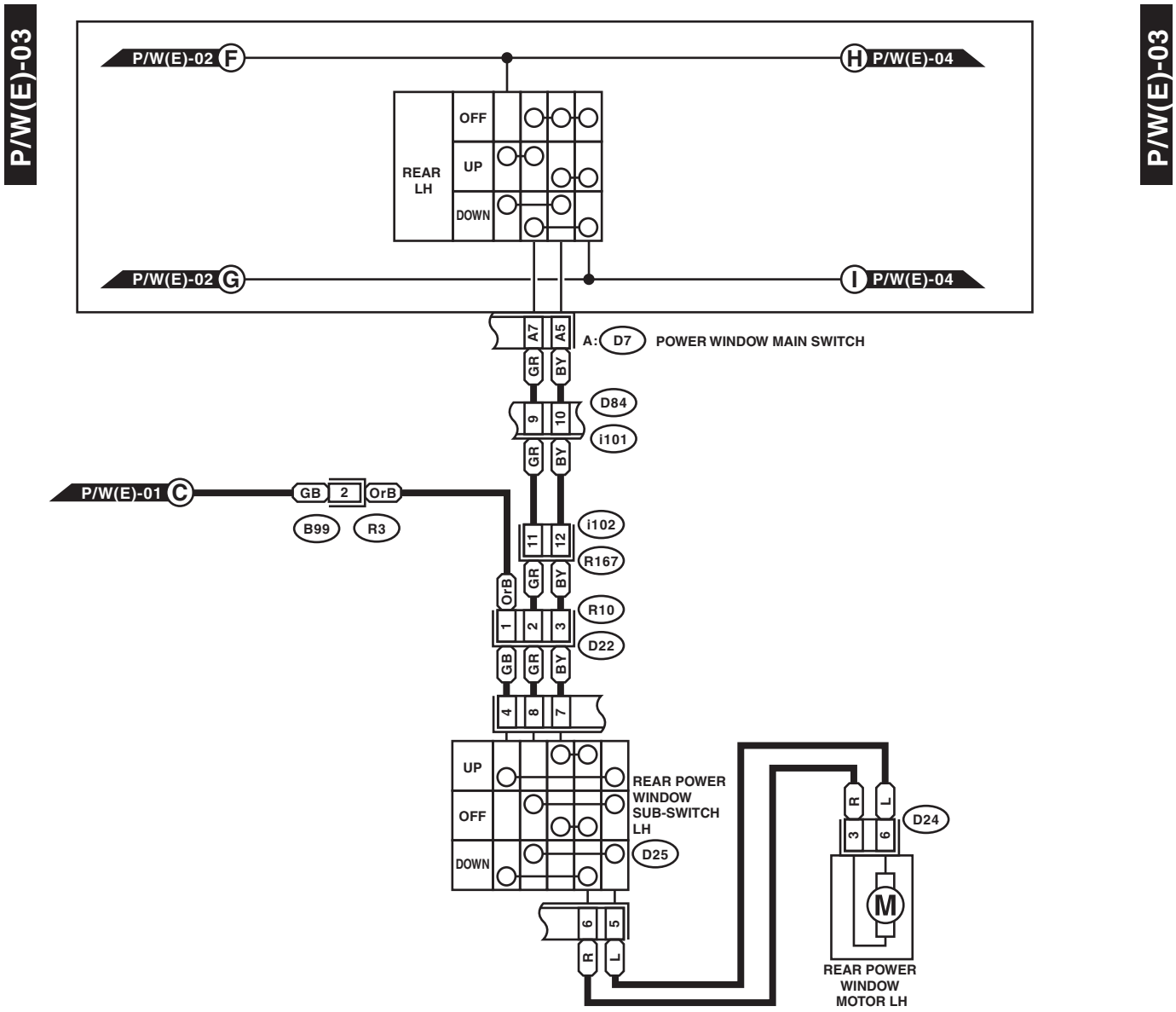


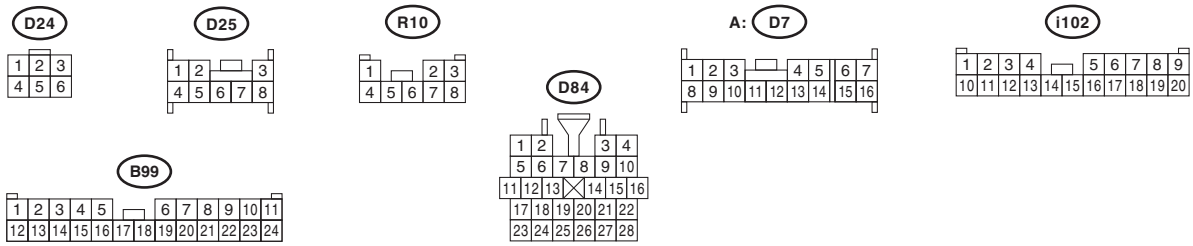
WI-31117


P/W(E)-02
P/W(E)-02
P/W(E)-01 A
F P/W(E)-03
FRONT RH
OFF
UP
DOWN
P/W(E)-01 B
G P/W(E)-03
A8
A12
A: D7 POWER WINDOW MAIN SWITCH
R
RY
D84
5
6
i101
BrR
RY
P/W(E)-01 E
OrB
BrR
RY
i76
4
5
6
D83
GB
R
RY
4
8
7
UP
OFF
DOWN
FRONT POWER WINDOW SUB-SWITCH
D17
R
L
D3
4
1
M
FRONT POWER WINDOW MOTOR RH
6
5
R
L

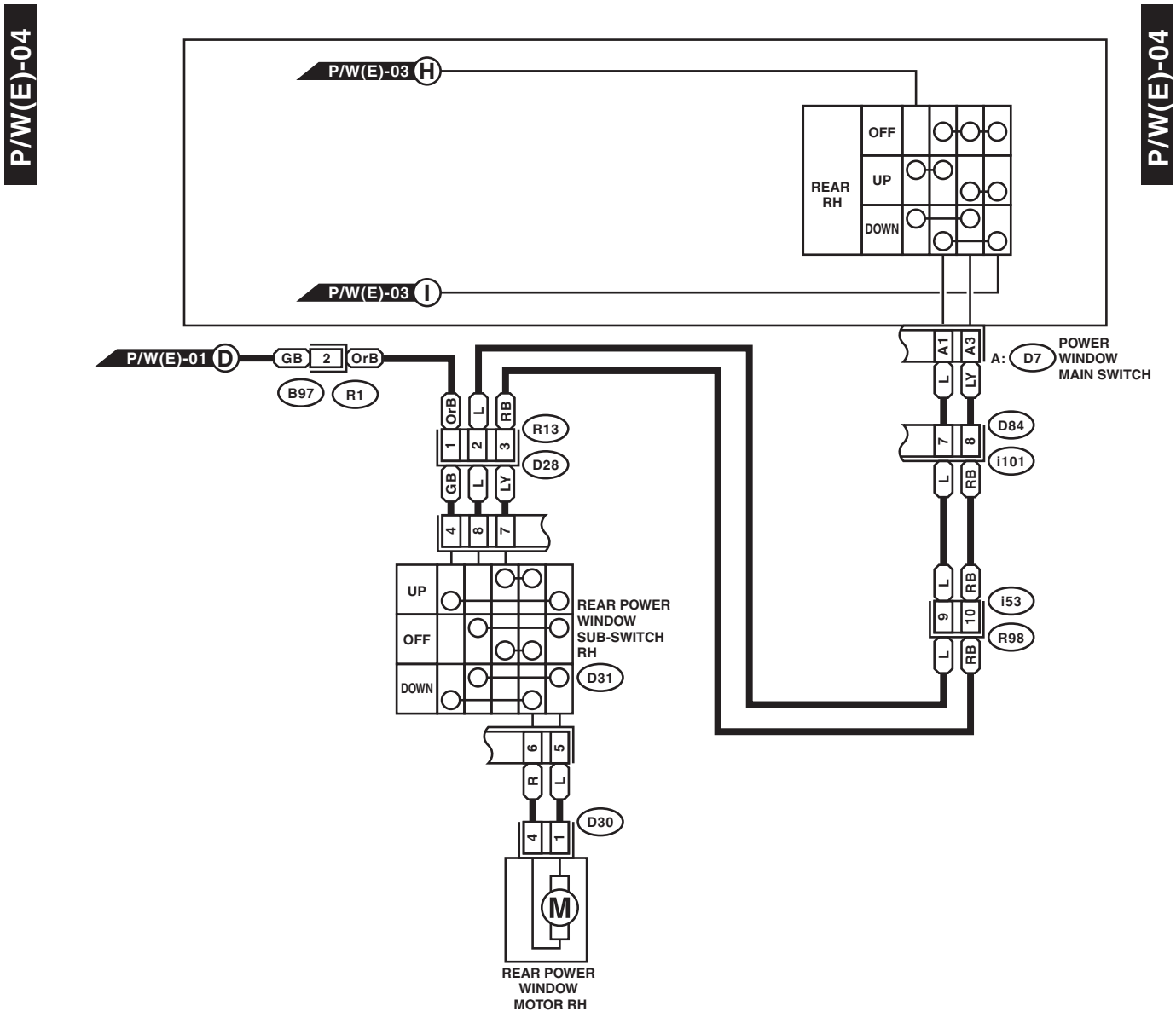

D3
1 2 3
4 5 6
D17
1 2 3
4 5 6 7 8
A: D7
1 2 3 4 5 6 7
8 9 10 11 12 13 14 15 16
D83
1 2 3 4
5 6 7 8 9
10 11 12 13 14 15
16 17 18 19
20 21 22 23 24 25
D84
1 2 3 4
5 6 7 8 9 10
11 12 13 14 15 16
17 18 19 20 21 22
23 24 25 26 27 28

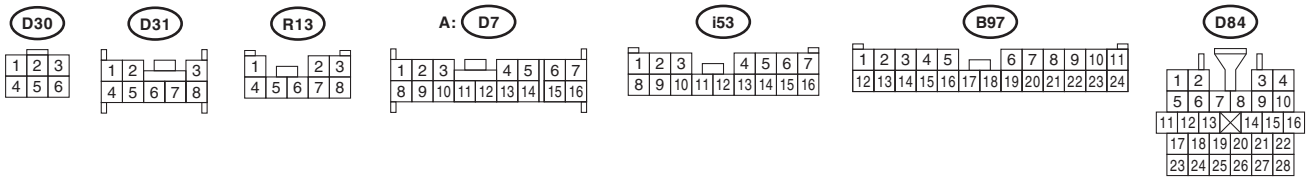
WI-31118


P/W(E)-03
P/W(E)-03
P/W(E)-02 F
H P/W(E)-04
REAR LH
OFF
UP
DOWN
P/W(E)-02 G
I P/W(E)-04
A7
A5
A: D7 POWER WINDOW MAIN SWITCH
GR
BY
D84
9
10
i101
P/W(E)-01 C
GB
2
OrB
B99
R3
11
12
i102
R167
OrB
GR
BY
R10
1
2
3
D22
GB
GR
BY
4
8
7
UP
OFF
DOWN
REAR POWER WINDOW SUB-SWITCH LH
D25
6
5
R
L
R
L
3
6
D24
M
REAR POWER WINDOW MOTOR LH


D24
1 2 3
4 5 6
D25
1 2 3
4 5 6 7 8
R10
1 2 3
4 5 6 7 8
A: D7
1 2 3 4 5 6 7
8 9 10 11 12 13 14 15 16
i102
1 2 3 4 5 6 7 8 9
10 11 12 13 14 15 16 17 18 19 20
B99
1 2 3 4 5 6 7 8 9 10 11
12 13 14 15 16 17 18 19 20 21 22 23 24
D84
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

WI-31119


P/W(E)-04
P/W(E)-04
P/W(E)-03 H
P/W(E)-03 I
REAR RH
OFF
UP
DOWN
P/W(E)-01 D
GB
2
OrB
B97
R1
R13
D28
D84
i101
i53
R98
D31
D30
A: D7
POWER WINDOW MAIN SWITCH
REAR POWER WINDOW SUB-SWITCH RH
REAR POWER WINDOW MOTOR RH

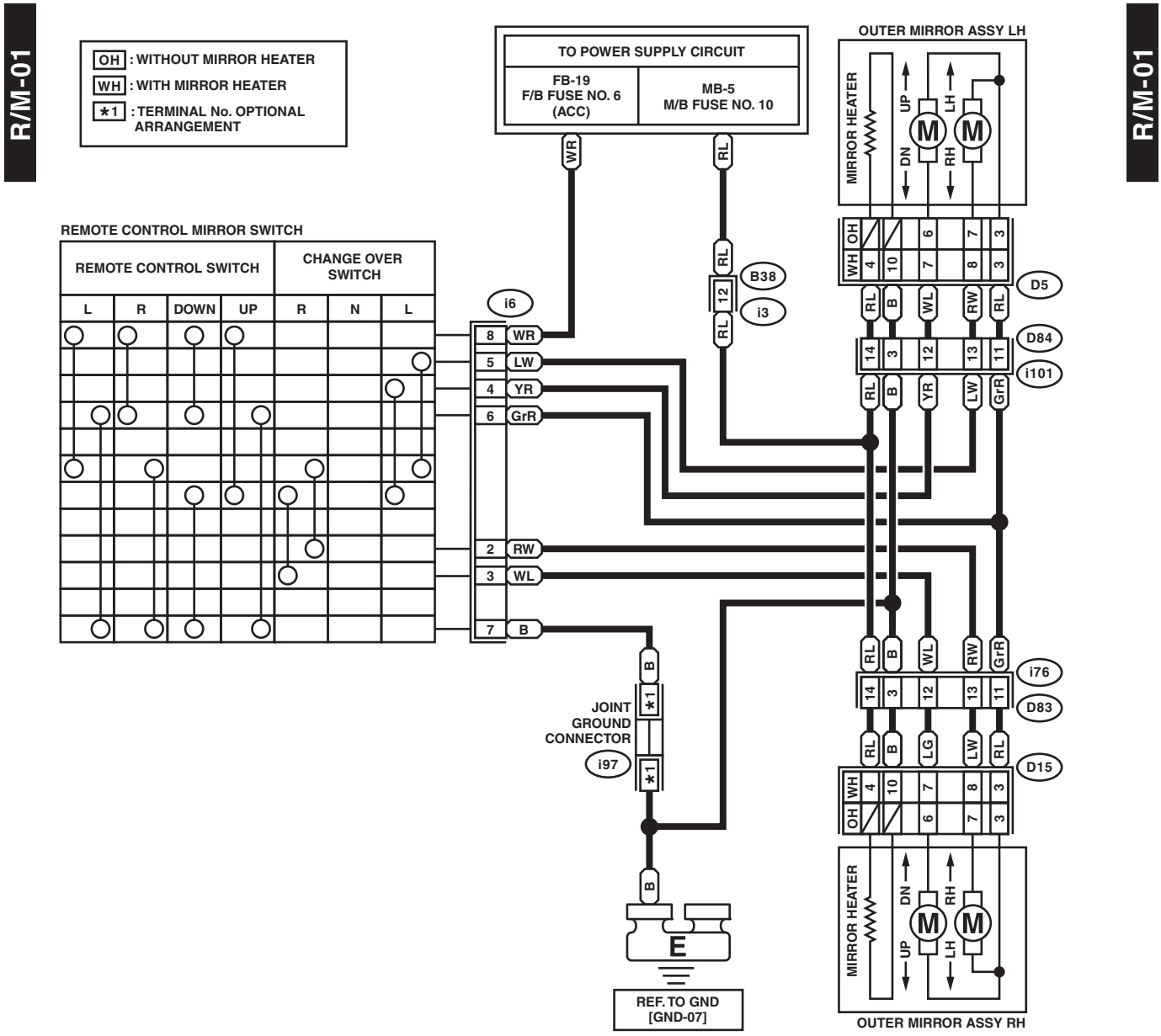

D30
D31
R13
A: D7
i53
B97
D84

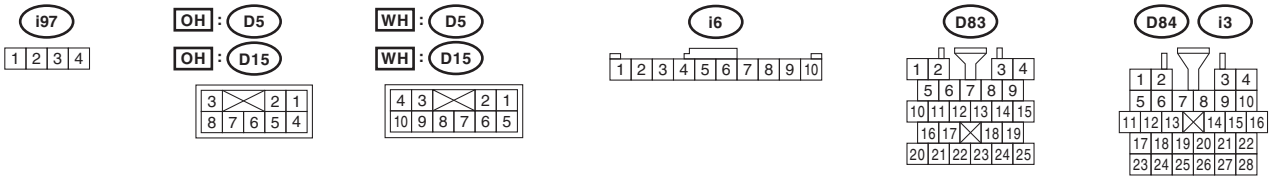
WI-31120

39.Remote Control Mirror System

A: WIRING DIAGRAM

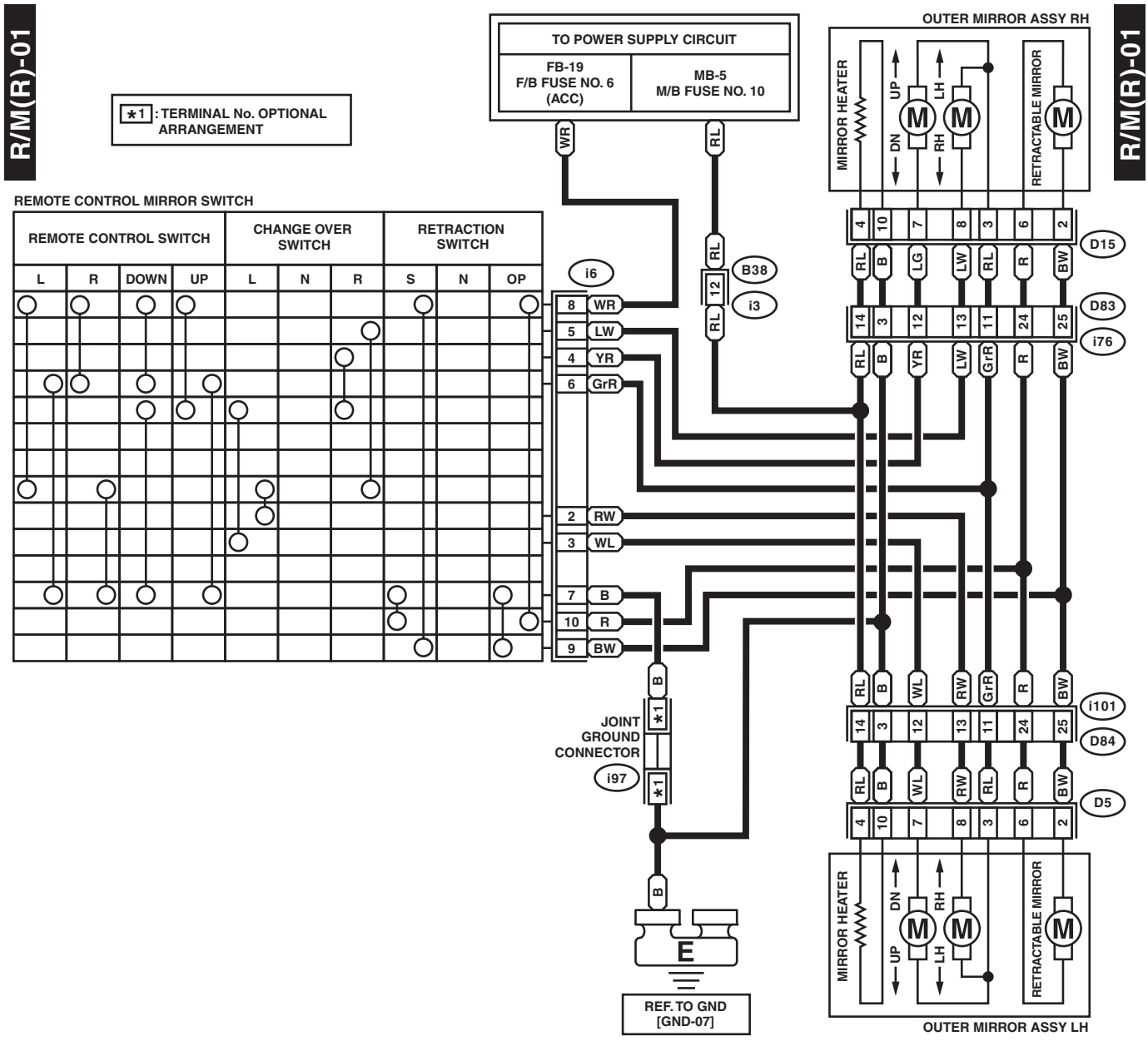
1. WITHOUT ELECTRIC RETRACTION SYSTEM

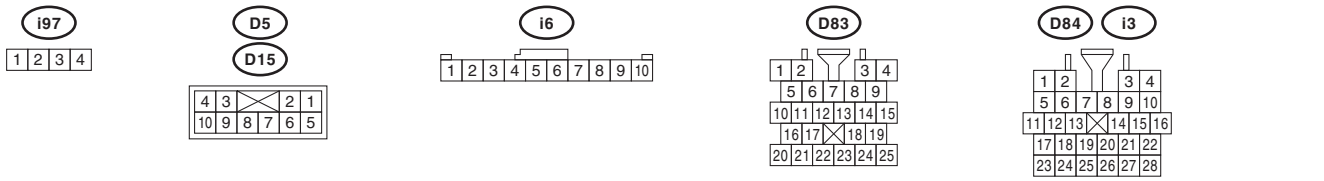




WI-31121

2. WITH ELECTRIC RETRACTION SYSTEM

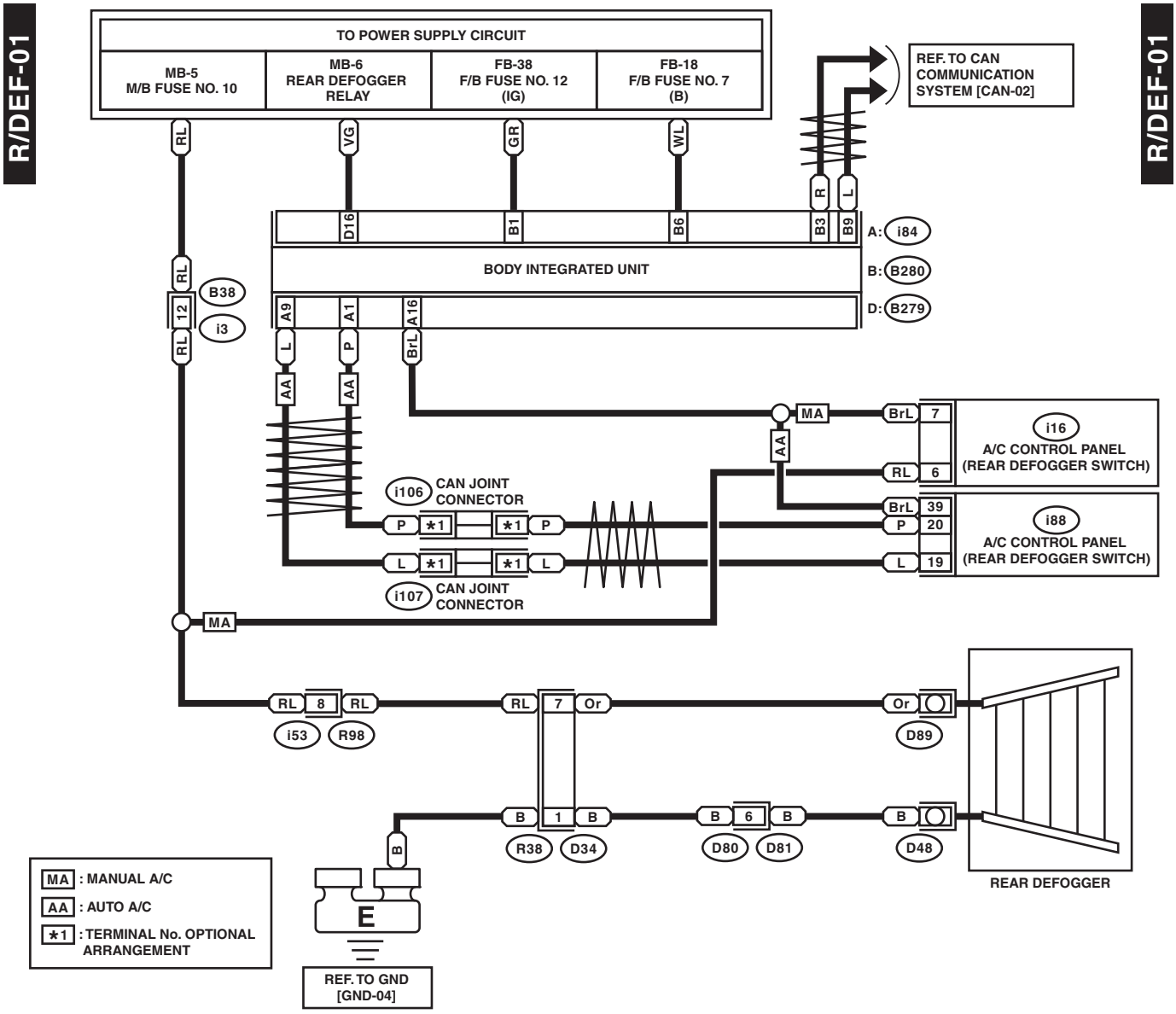


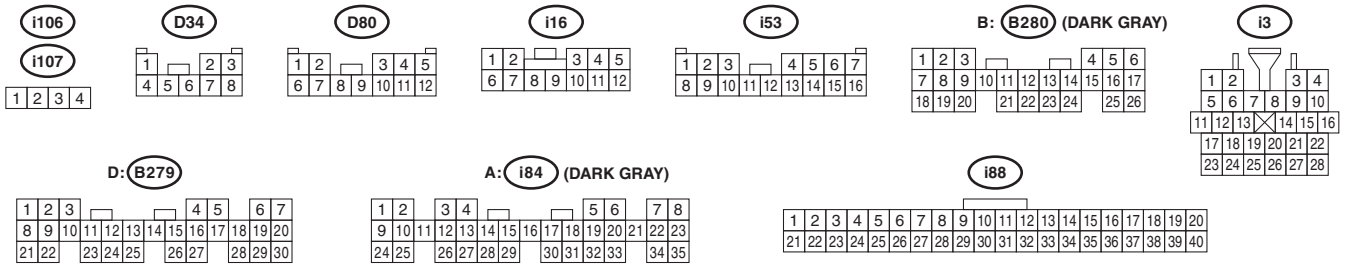


WI-31122

40.Rear Defogger System

A: WIRING DIAGRAM





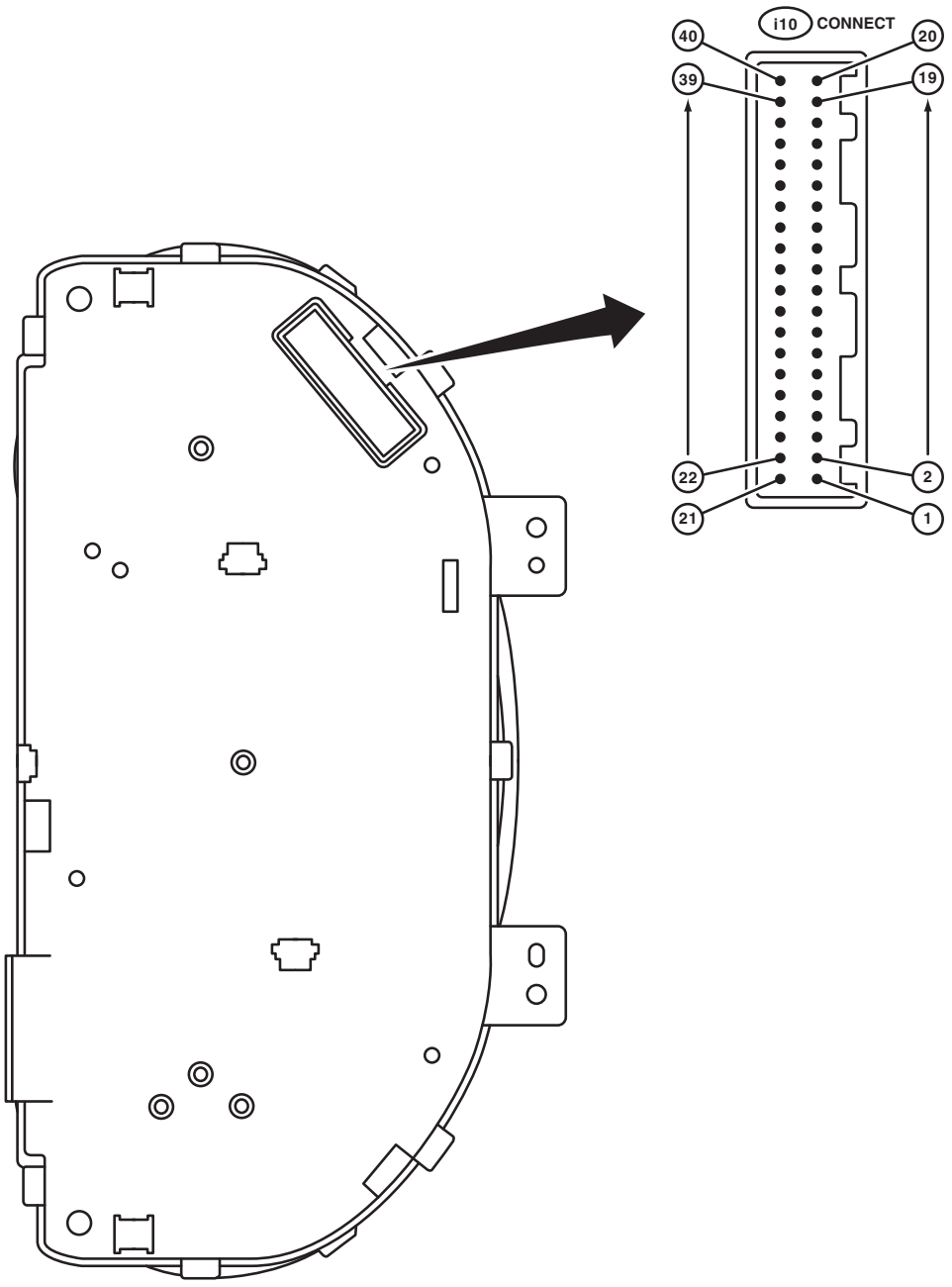
WI-31123

41.Combination Meter System

A: WIRING DIAGRAM

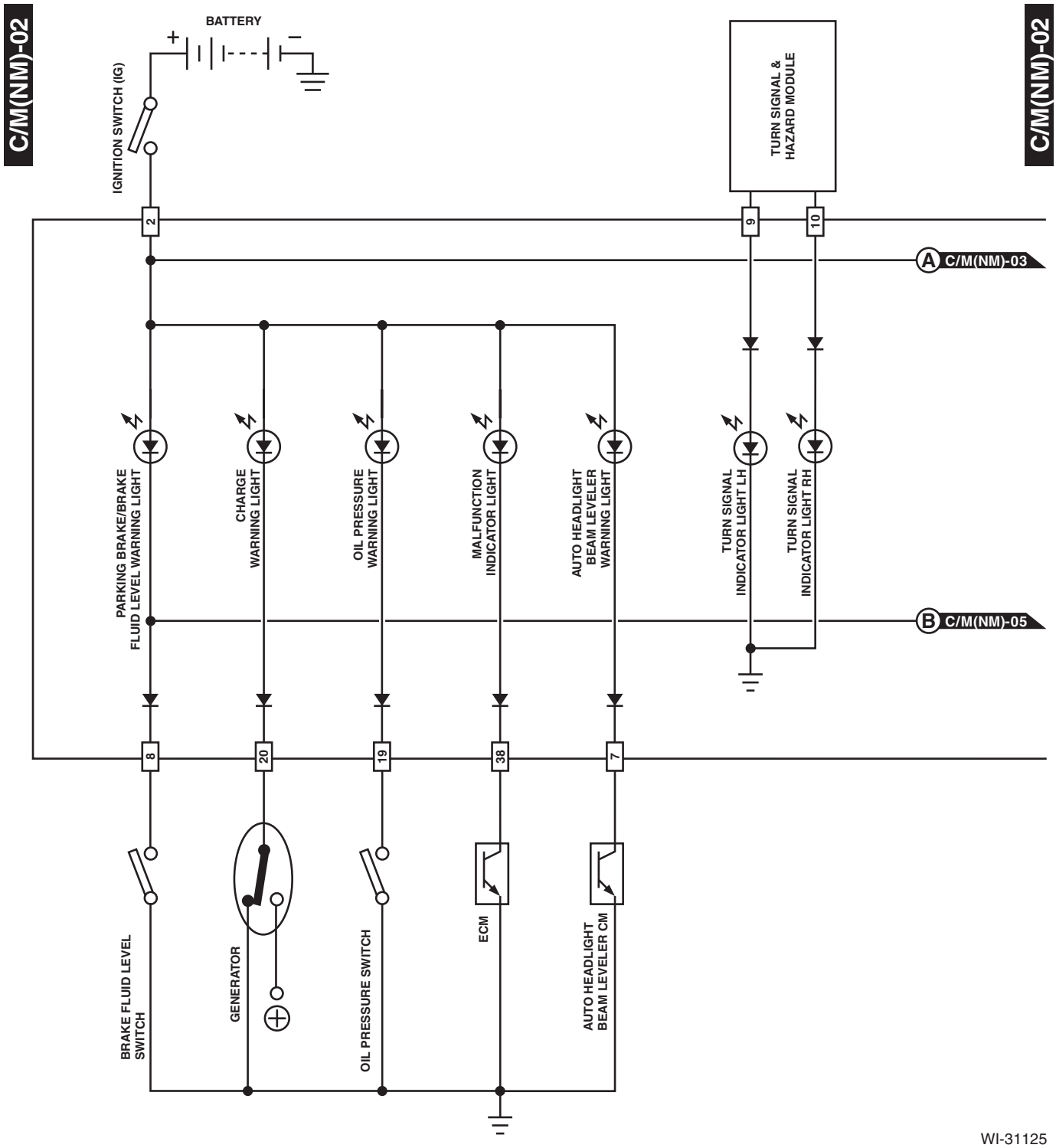
1. MODEL WITH NORMAL METER

C/M(NM)-01

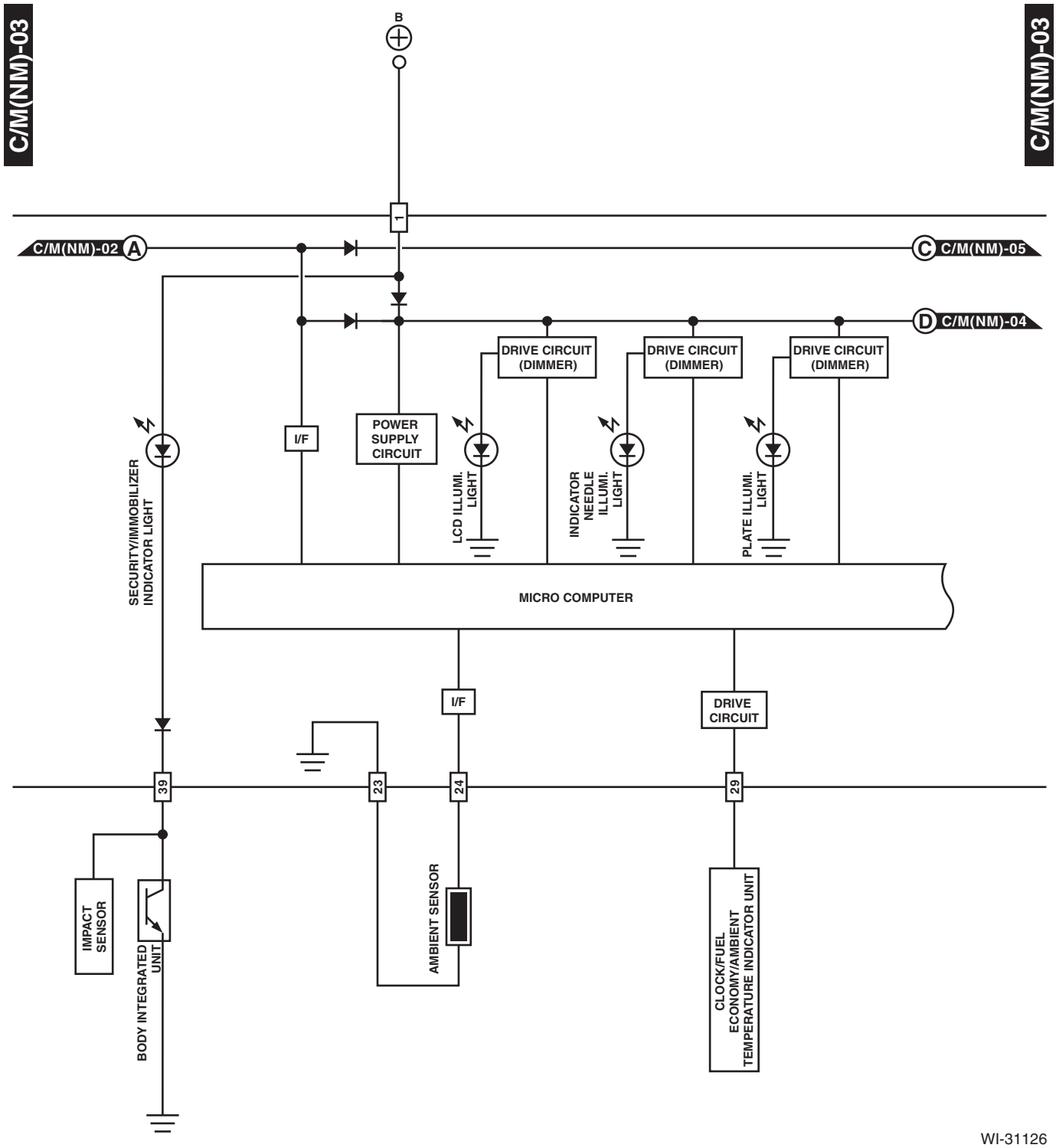


C/M(NM)-01

WI-31124


C/M(NM)-02
C/M(NM)-02
BATTERY
+
−
IGNITION SWITCH (IG)
TURN SIGNAL & HAZARD MODULE
2
9
10
A C/M(NM)-03
PARKING BRAKE/BRAKE FLUID LEVEL WARNING LIGHT
CHARGE WARNING LIGHT
OIL PRESSURE WARNING LIGHT
MALFUNCTION INDICATOR LIGHT
AUTO HEADLIGHT BEAM LEVELER WARNING LIGHT
TURN SIGNAL INDICATOR LIGHT LH
TURN SIGNAL INDICATOR LIGHT RH
B C/M(NM)-05
8
20
19
38
7
BRAKE FLUID LEVEL SWITCH
GENERATOR
OIL PRESSURE SWITCH
ECM
AUTO HEADLIGHT BEAM LEVELER CM

WI-31125

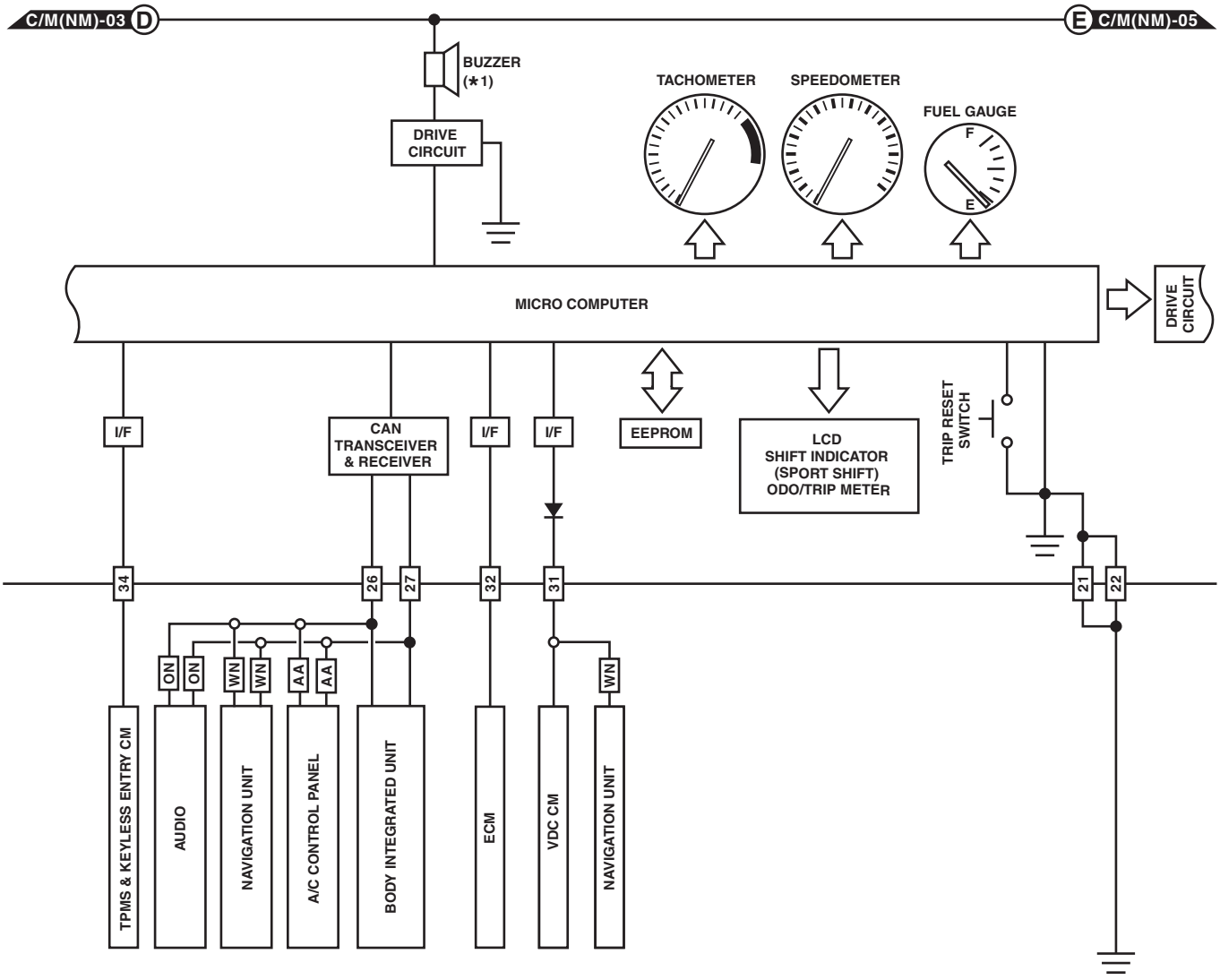

C/M(NM)-03
C/M(NM)-03
B
1
C/M(NM)-02 A
C C/M(NM)-05
D C/M(NM)-04
DRIVE CIRCUIT (DIMMER)
DRIVE CIRCUIT (DIMMER)
DRIVE CIRCUIT (DIMMER)
I/F
POWER SUPPLY CIRCUIT
SECURITY/IMMOBILIZER INDICATOR LIGHT
LCD ILLUMI. LIGHT
INDICATOR NEEDLE ILLUMI. LIGHT
PLATE ILLUMI. LIGHT
MICRO COMPUTER
I/F
DRIVE CIRCUIT
39
23
24
29
IMPACT SENSOR
BODY INTEGRATED UNIT
AMBIENT SENSOR
CLOCK/FUEL ECONOMY/AMBIENT TEMPERATURE INDICATOR UNIT

WI-31126

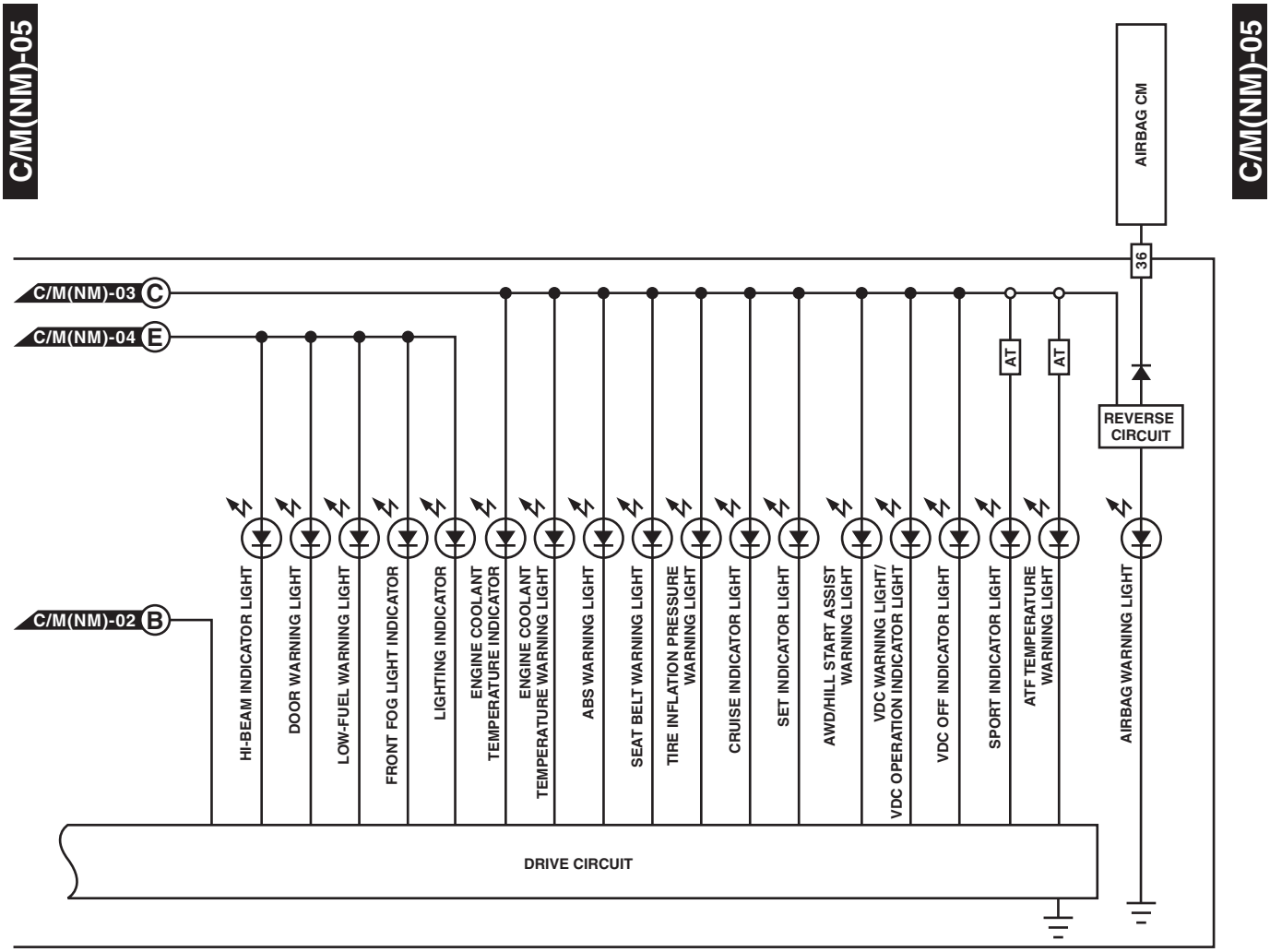
C/M(NM)-04

C/M(NM)-04

ON : WITHOUT NAVIGATION
WN : WITH NAVIGATION
AA : AUTO A/C
*1 : CUSTOMIZED,
SPORT SHIFT,
HEADLIGHT ON WARNING,
KEY WARNING,
SEAT BELT



WI-31127

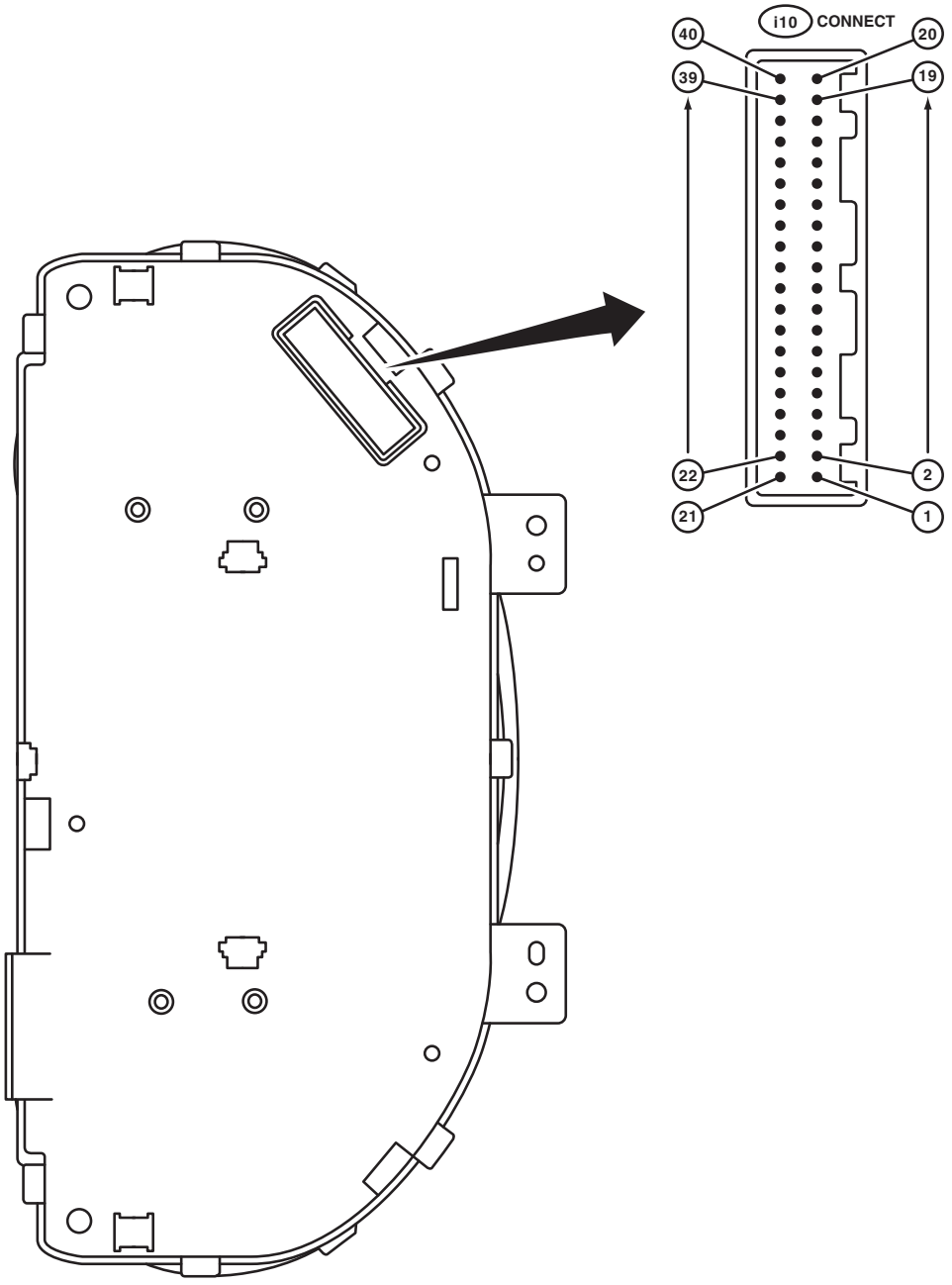

C/M(NM)-05
C/M(NM)-05
AIRBAG CM
36
C/M(NM)-03 C
C/M(NM)-04 E
C/M(NM)-02 B
AT
AT
REVERSE CIRCUIT
HI-BEAM INDICATOR LIGHT
DOOR WARNING LIGHT
LOW-FUEL WARNING LIGHT
FRONT FOG LIGHT INDICATOR
LIGHTING INDICATOR
ENGINE COOLANT TEMPERATURE INDICATOR
ENGINE COOLANT TEMPERATURE WARNING LIGHT
ABS WARNING LIGHT
SEAT BELT WARNING LIGHT
TIRE INFLATION PRESSURE WARNING LIGHT
CRUISE INDICATOR LIGHT
SET INDICATOR LIGHT
AWD/HILL START ASSIST WARNING LIGHT
VDC WARNING LIGHT/ VDC OPERATION INDICATOR LIGHT
VDC OFF INDICATOR LIGHT
SPORT INDICATOR LIGHT
ATF TEMPERATURE WARNING LIGHT
AIRBAG WARNING LIGHT
DRIVE CIRCUIT

WI-31128

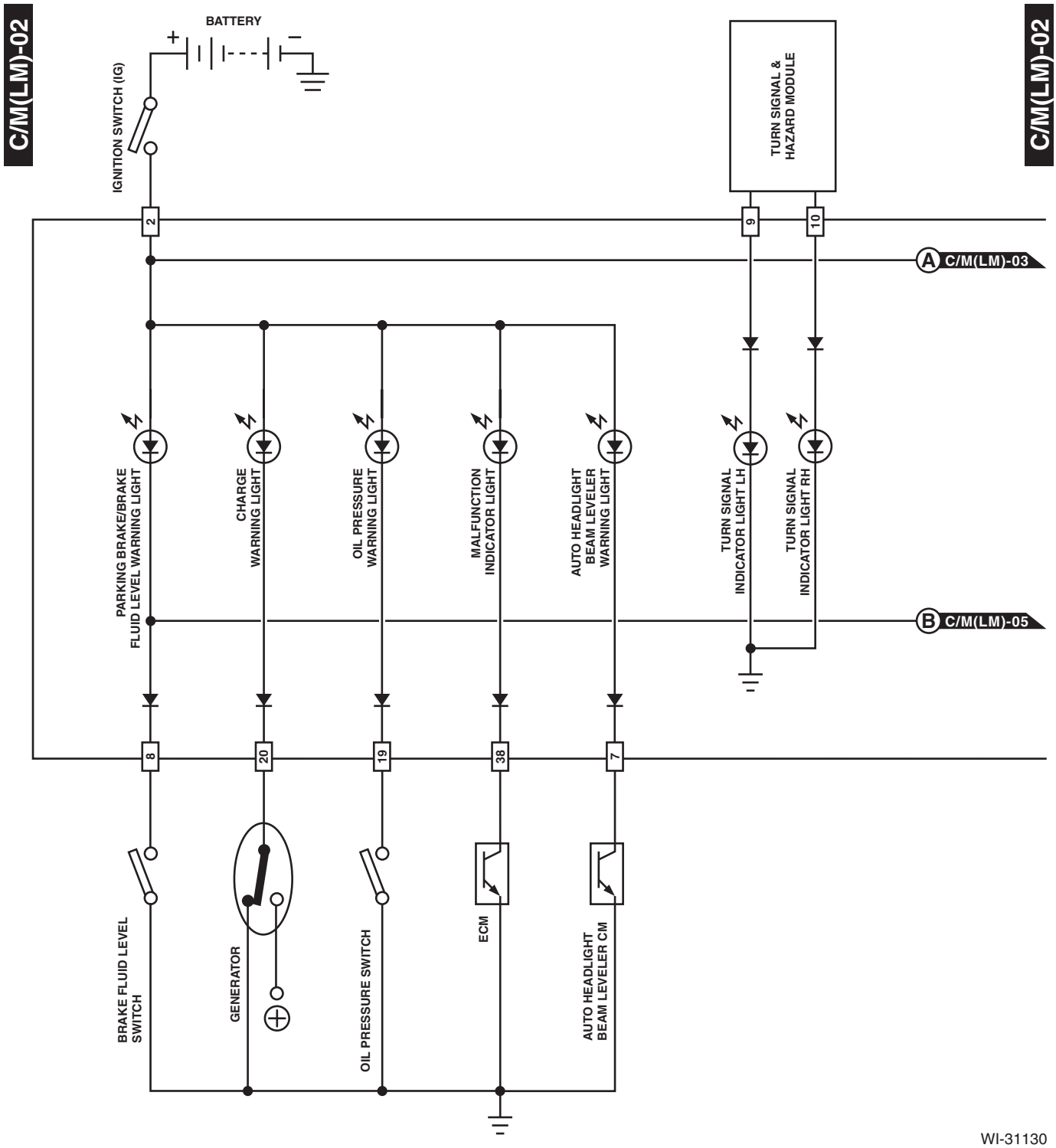
2. MODEL WITH LUMINESCENT METER

C/M(LM)-01

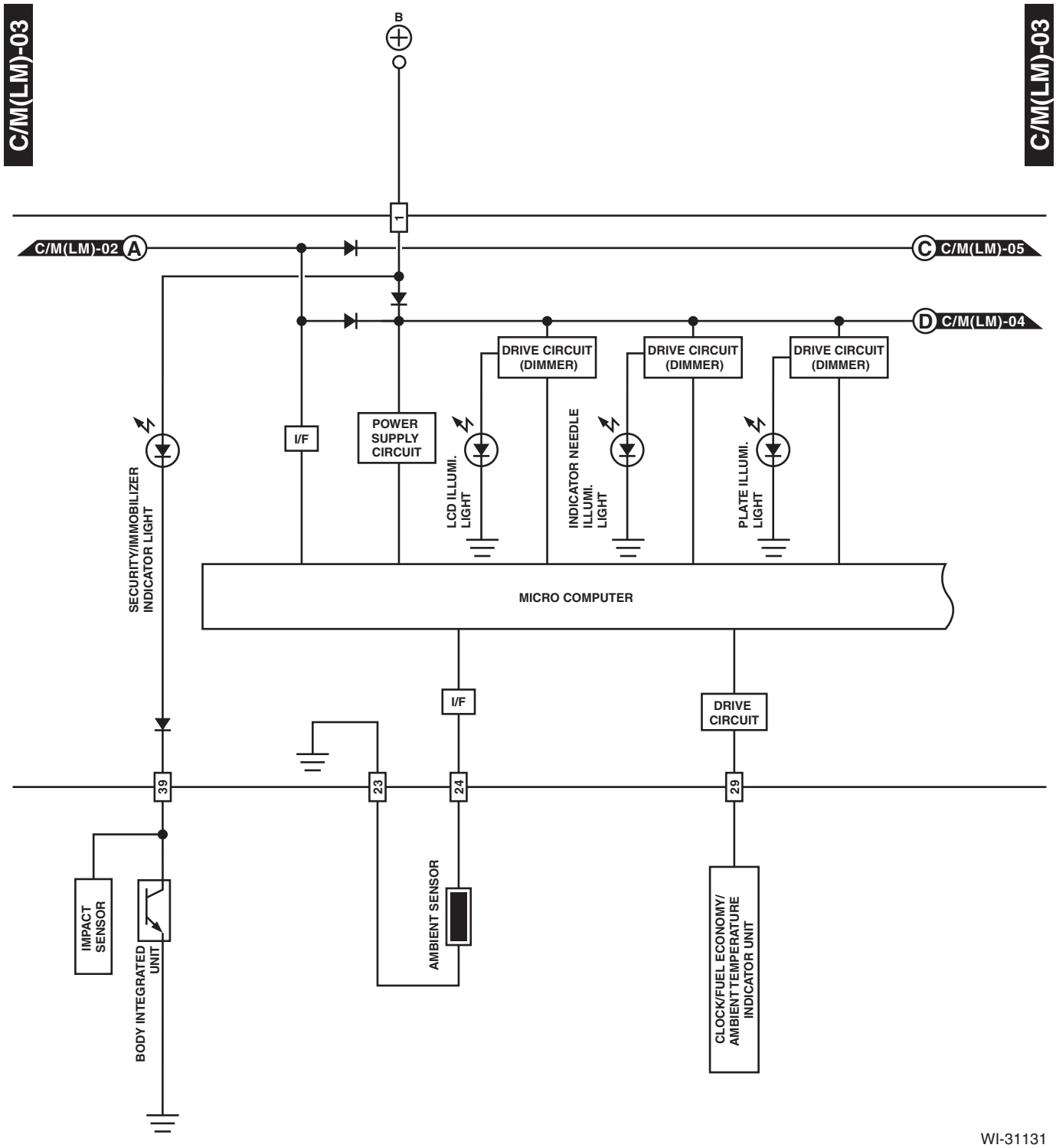
C/M(LM)-01



WI-31129


C/M(LM)-02
C/M(LM)-02
BATTERY
+
−
IGNITION SWITCH (IG)
TURN SIGNAL & HAZARD MODULE
2
9
10
A C/M(LM)-03
PARKING BRAKE/BRAKE FLUID LEVEL WARNING LIGHT
CHARGE WARNING LIGHT
OIL PRESSURE WARNING LIGHT
MALFUNCTION INDICATOR LIGHT
AUTO HEADLIGHT BEAM LEVELER WARNING LIGHT
TURN SIGNAL INDICATOR LIGHT LH
TURN SIGNAL INDICATOR LIGHT RH
B C/M(LM)-05
8
20
19
38
7
BRAKE FLUID LEVEL SWITCH
GENERATOR
OIL PRESSURE SWITCH
ECM
AUTO HEADLIGHT BEAM LEVELER CM

WI-31130


C/M(LM)-03
C/M(LM)-03
B
1
C/M(LM)-02 A
C C/M(LM)-05
D C/M(LM)-04
DRIVE CIRCUIT (DIMMER)
DRIVE CIRCUIT (DIMMER)
DRIVE CIRCUIT (DIMMER)
I/F
POWER SUPPLY CIRCUIT
SECURITY/IMMOBILIZER INDICATOR LIGHT
LCD ILLUMI. LIGHT
INDICATOR NEEDLE ILLUMI. LIGHT
PLATE ILLUMI. LIGHT
MICRO COMPUTER
I/F
DRIVE CIRCUIT
39
23
24
29
IMPACT SENSOR
BODY INTEGRATED UNIT
AMBIENT SENSOR
CLOCK/FUEL ECONOMY/ AMBIENT TEMPERATURE INDICATOR UNIT

WI-31131

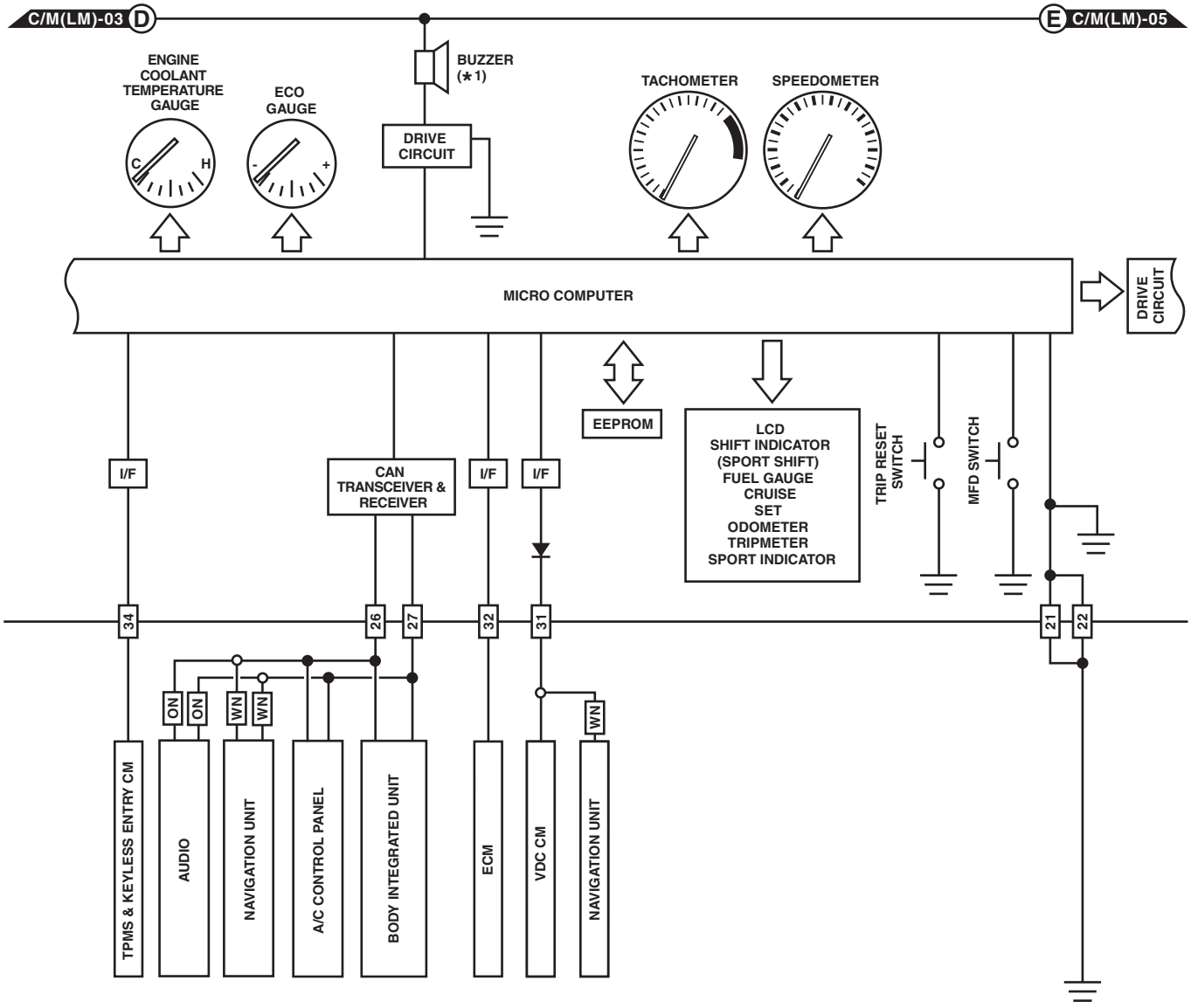
C/M(LM)-04

C/M(LM)-04

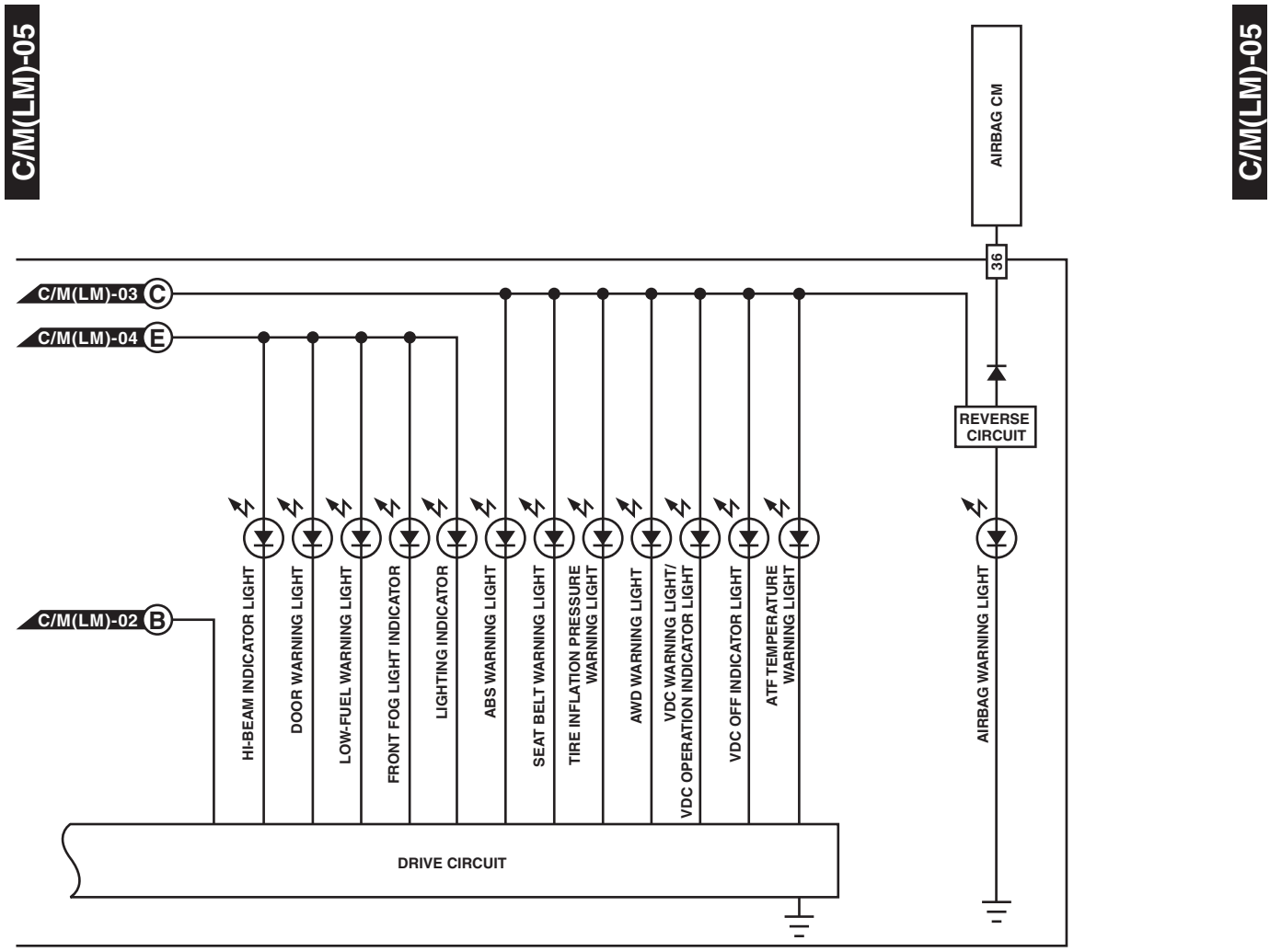
ON : WITHOUT NAVIGATION

WN : WITH NAVIGATION

*1 : CUSTOMIZED,
SPORT SHIFT,
HEADLIGHT ON WARNING,
KEY WARNING,
SEAT BELT



WI-31132

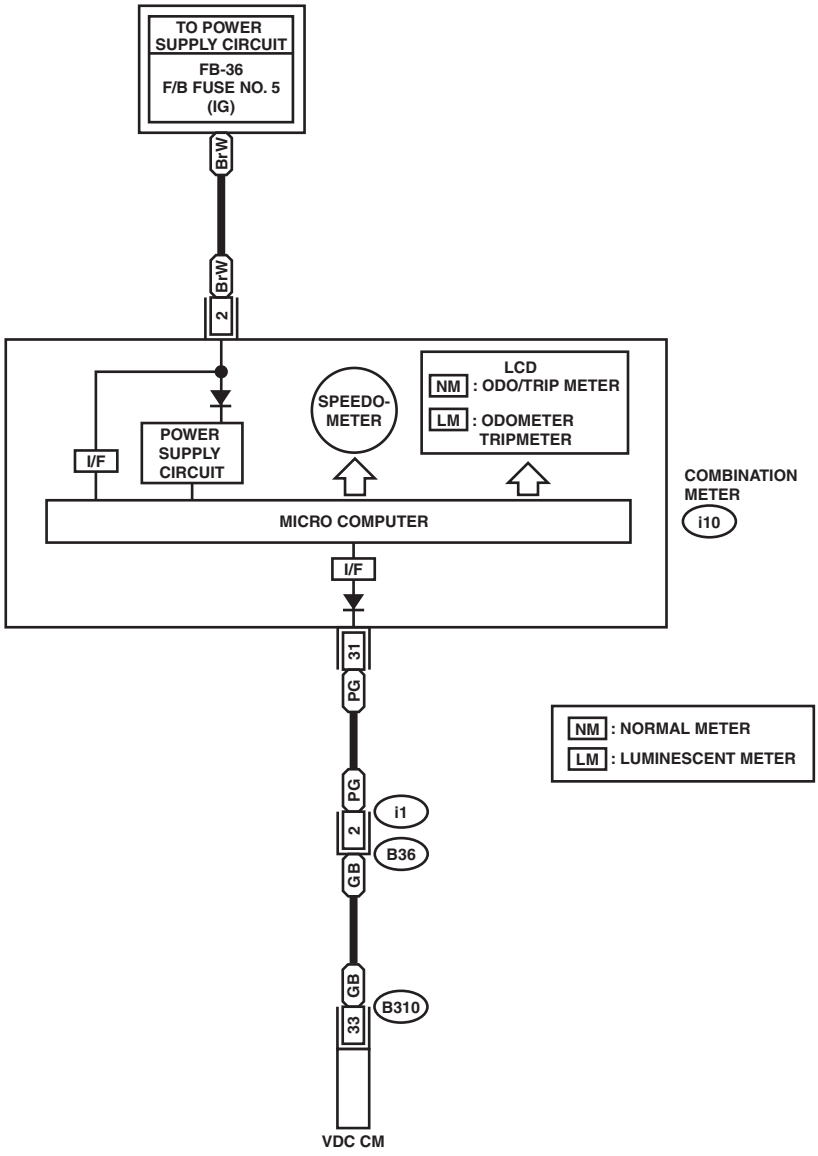

C/M(LM)-05
C/M(LM)-05
AIRBAG CM
36
C/M(LM)-03 C
C/M(LM)-04 E
C/M(LM)-02 B
REVERSE CIRCUIT
HI-BEAM INDICATOR LIGHT
DOOR WARNING LIGHT
LOW-FUEL WARNING LIGHT
FRONT FOG LIGHT INDICATOR
LIGHTING INDICATOR
ABS WARNING LIGHT
SEAT BELT WARNING LIGHT
TIRE INFLATION PRESSURE WARNING LIGHT
AWD WARNING LIGHT
VDC WARNING LIGHT/ VDC OPERATION INDICATOR LIGHT
VDC OFF INDICATOR LIGHT
ATF TEMPERATURE WARNING LIGHT
AIRBAG WARNING LIGHT
DRIVE CIRCUIT

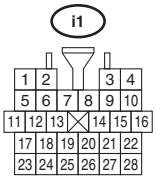
WI-31133

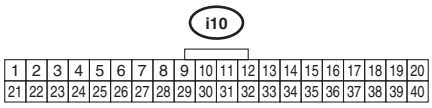
42.Speedometer System

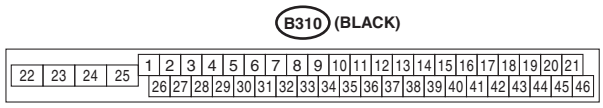
A: WIRING DIAGRAM

SP-01





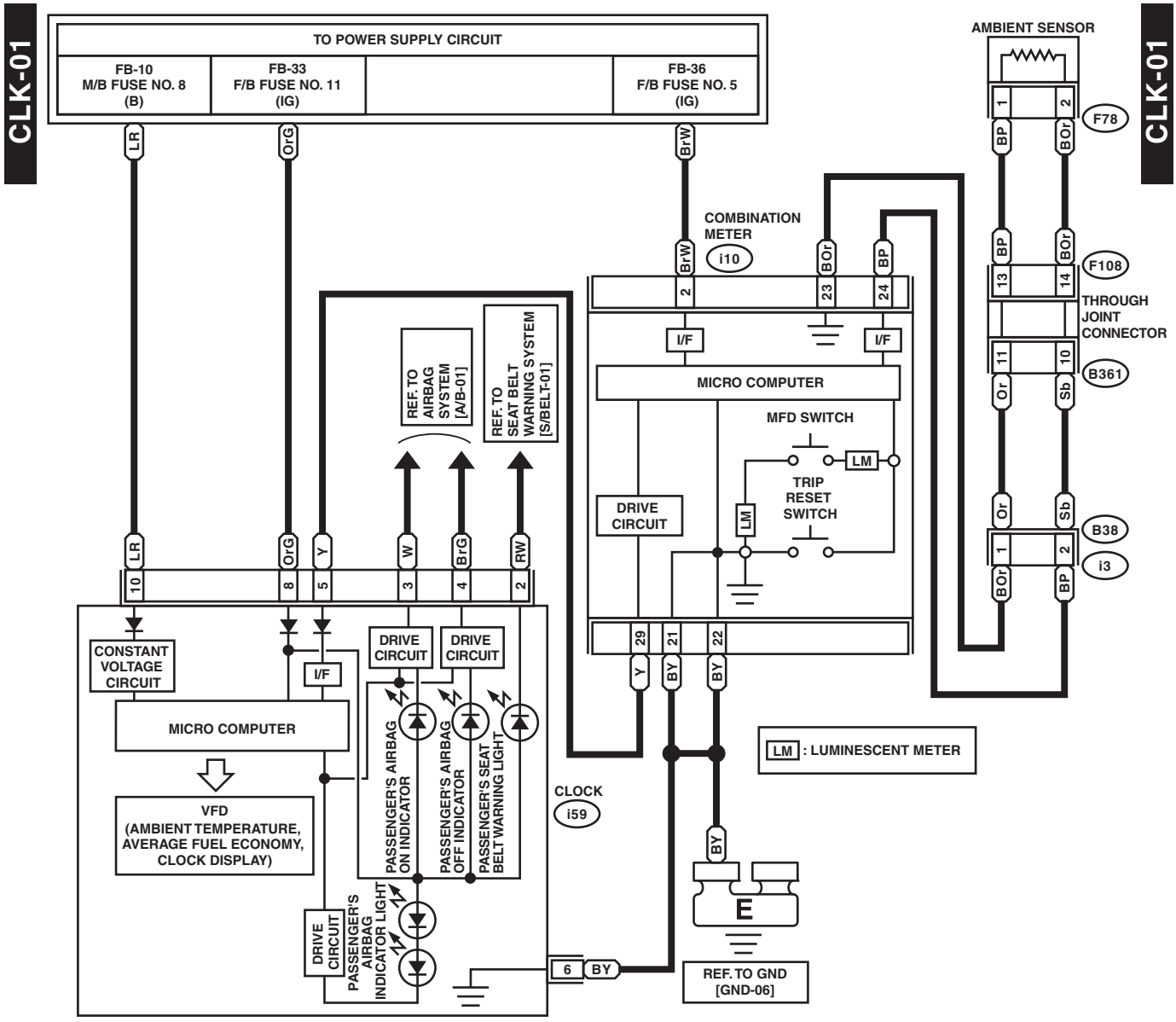


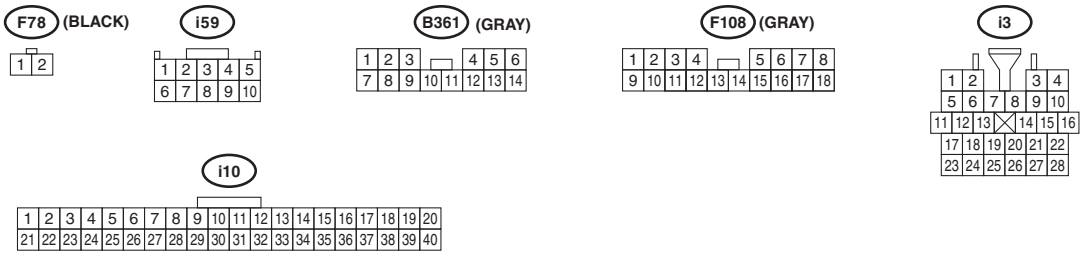


WI-31853

43.Clock System

A: WIRING DIAGRAM

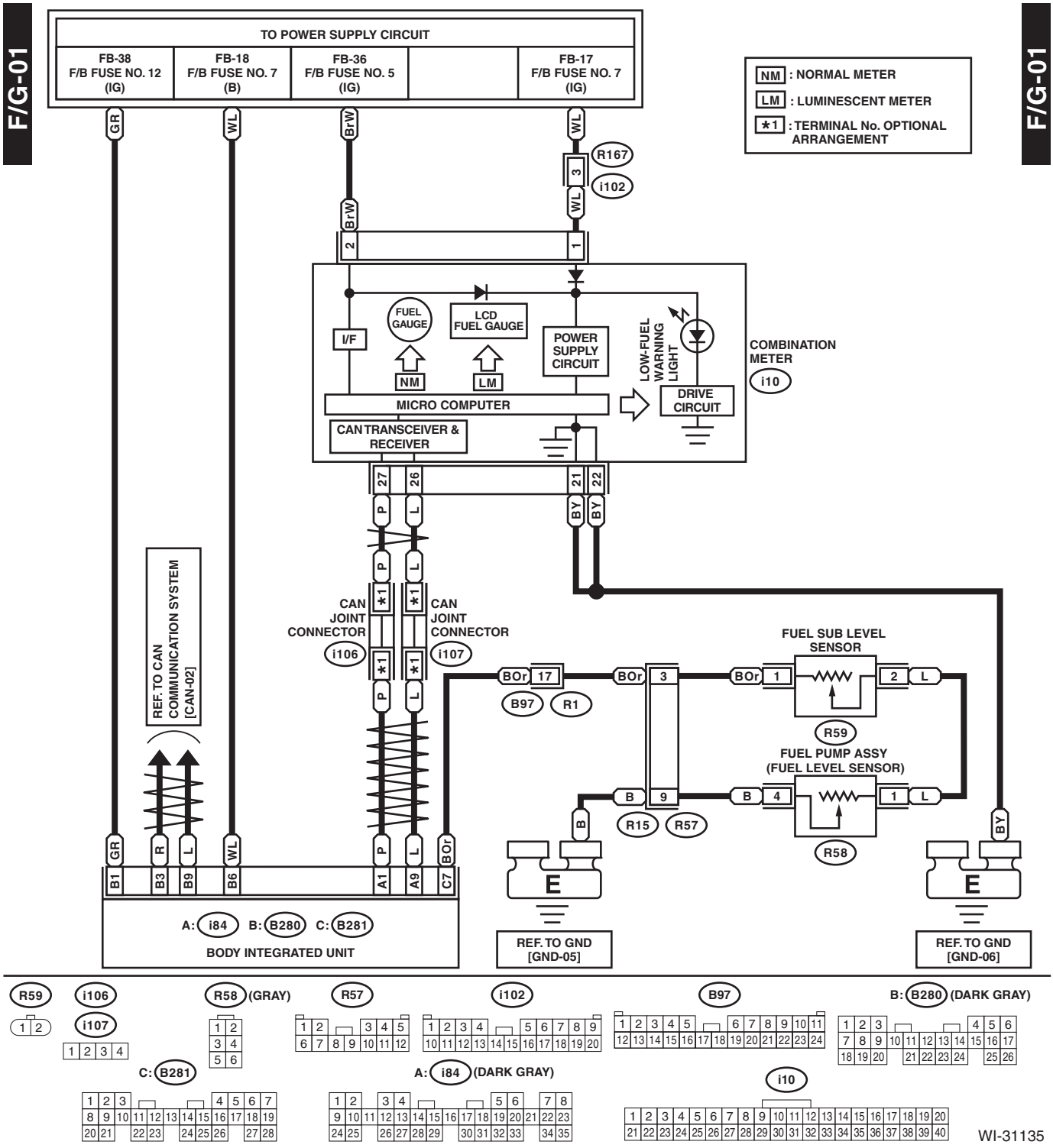




WI-31134

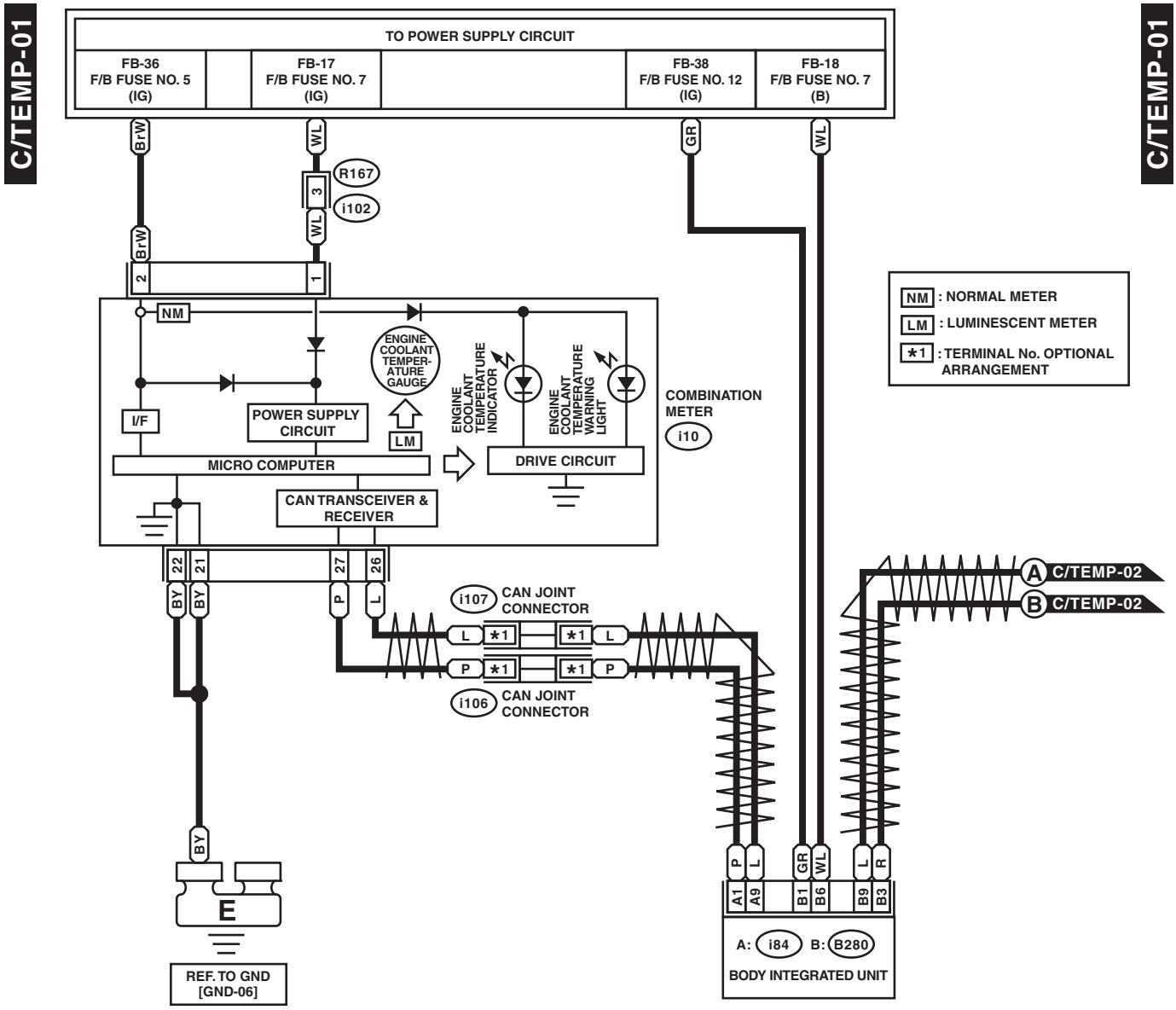
44.Fuel Gauge System

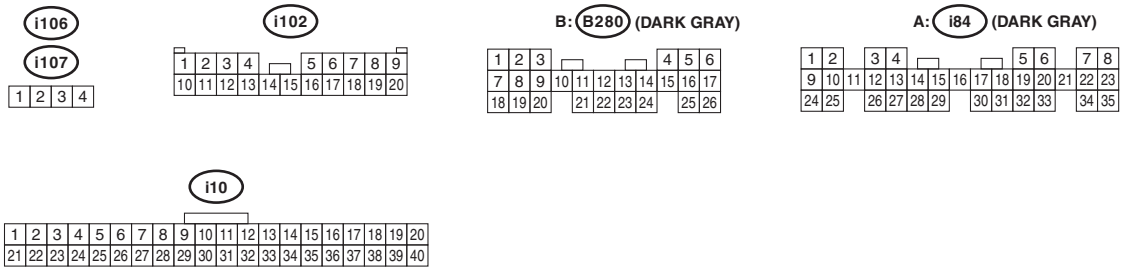
A: WIRING DIAGRAM



45.Coolant Temperature System

A: WIRING DIAGRAM

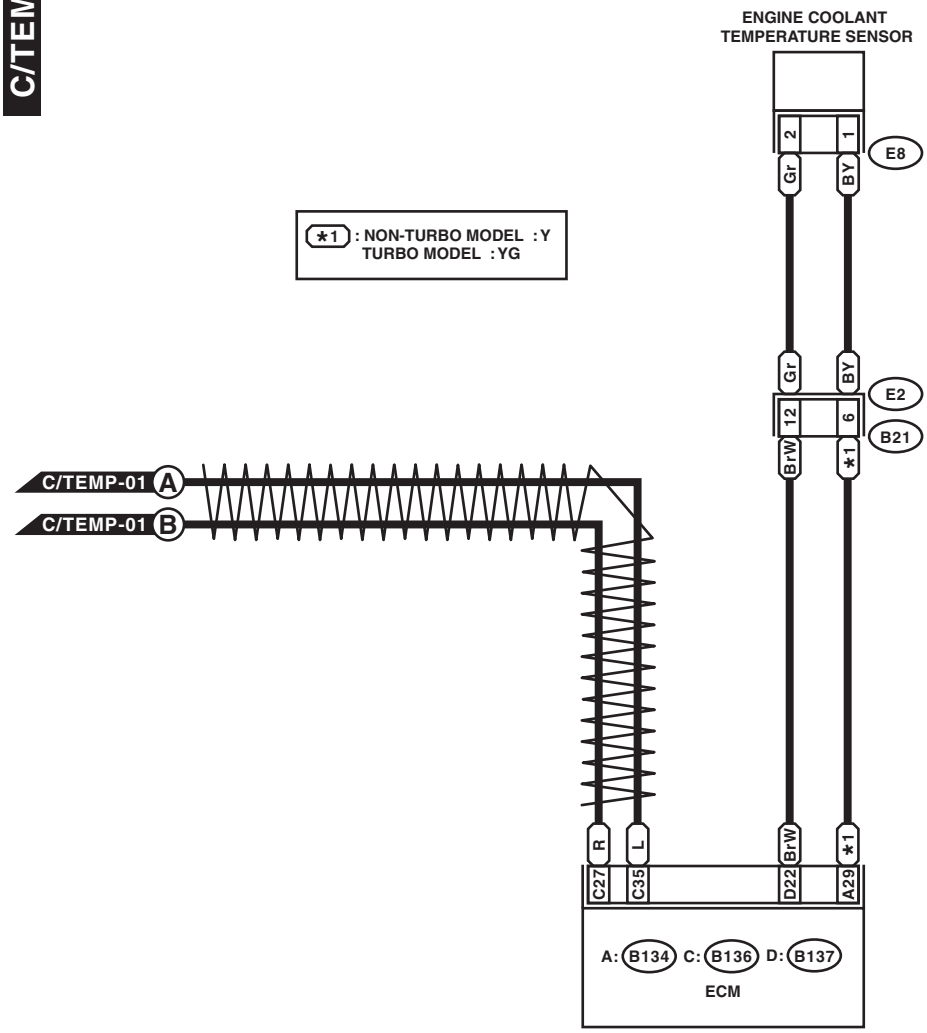


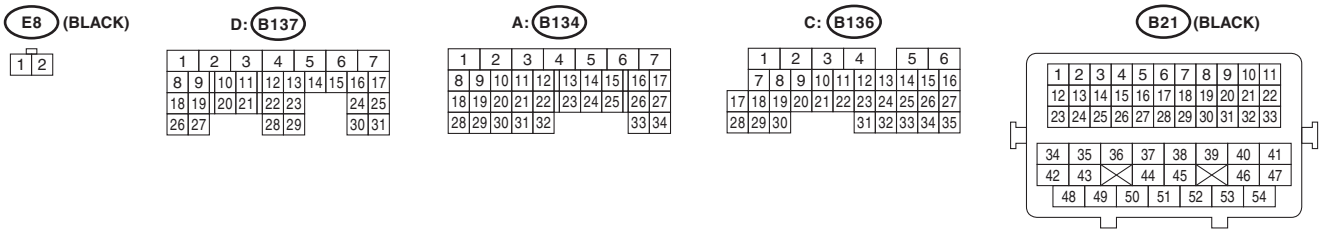


WI-31136

C/TEMP-02

C/TEMP-02



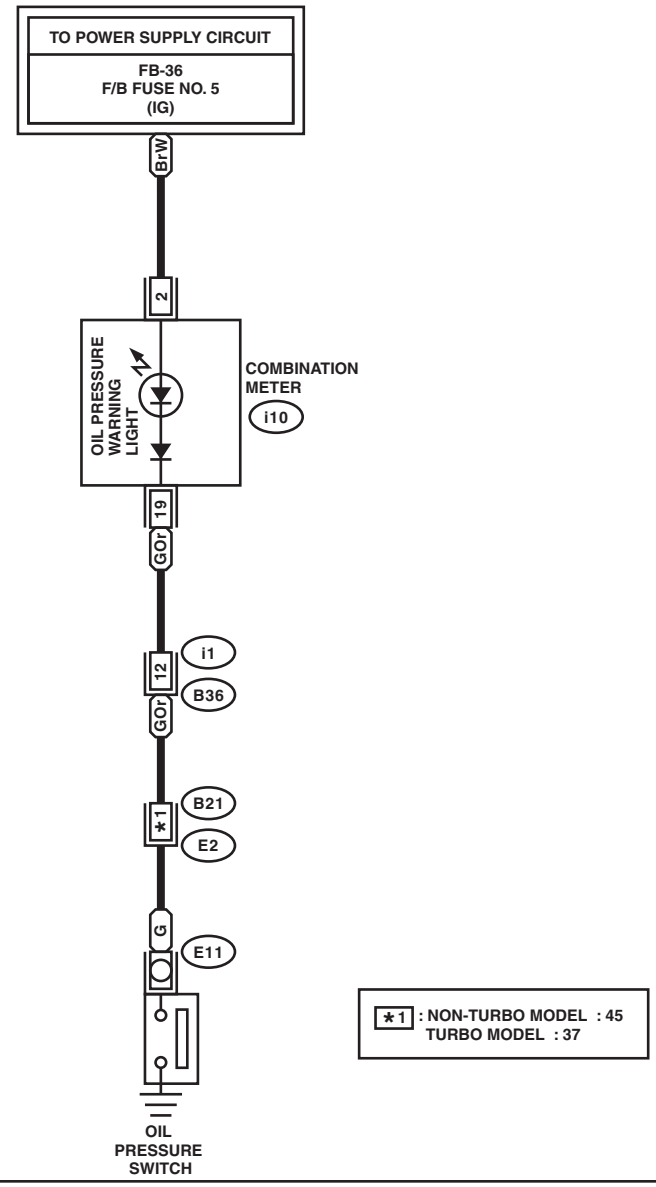


WI-31137

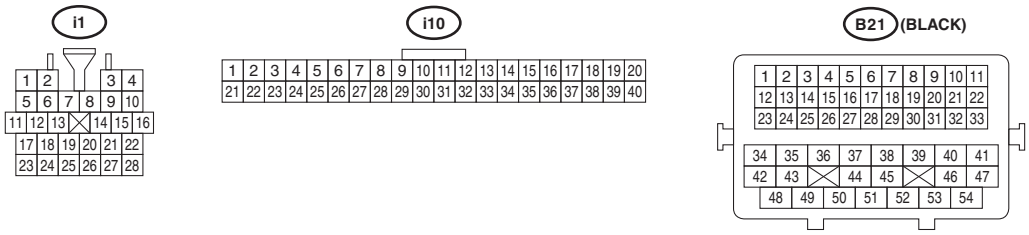
46.Oil Pressure Warning Light System

A: WIRING DIAGRAM

OIL/P-01



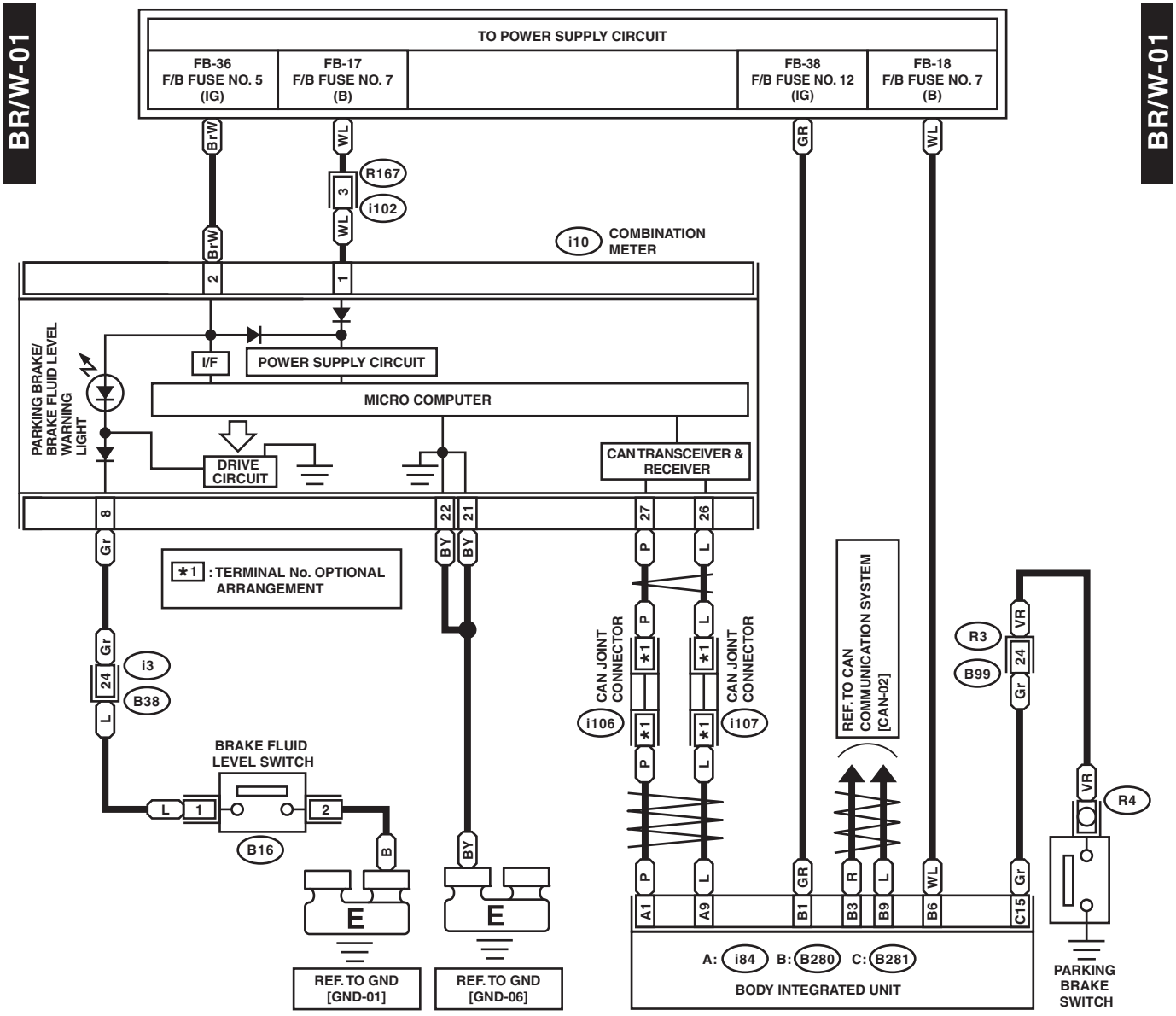
OIL/P-01

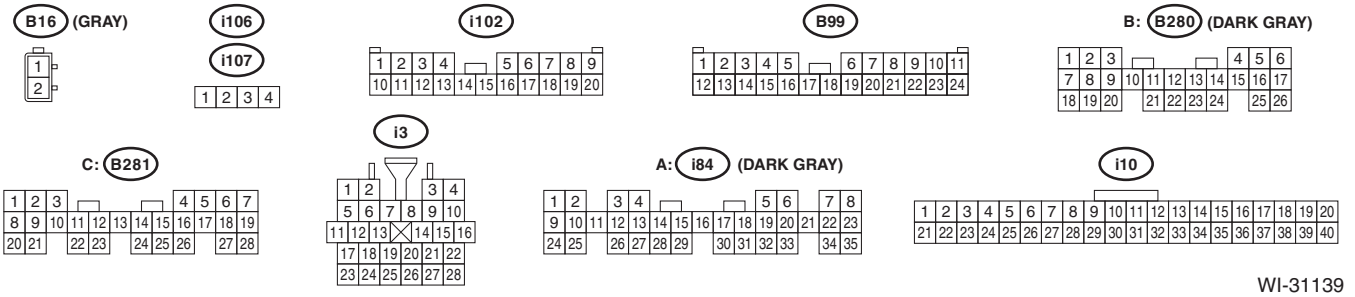


WI-31138

47.Parking Brake / Brake Fluid Level Warning Light System

A: WIRING DIAGRAM





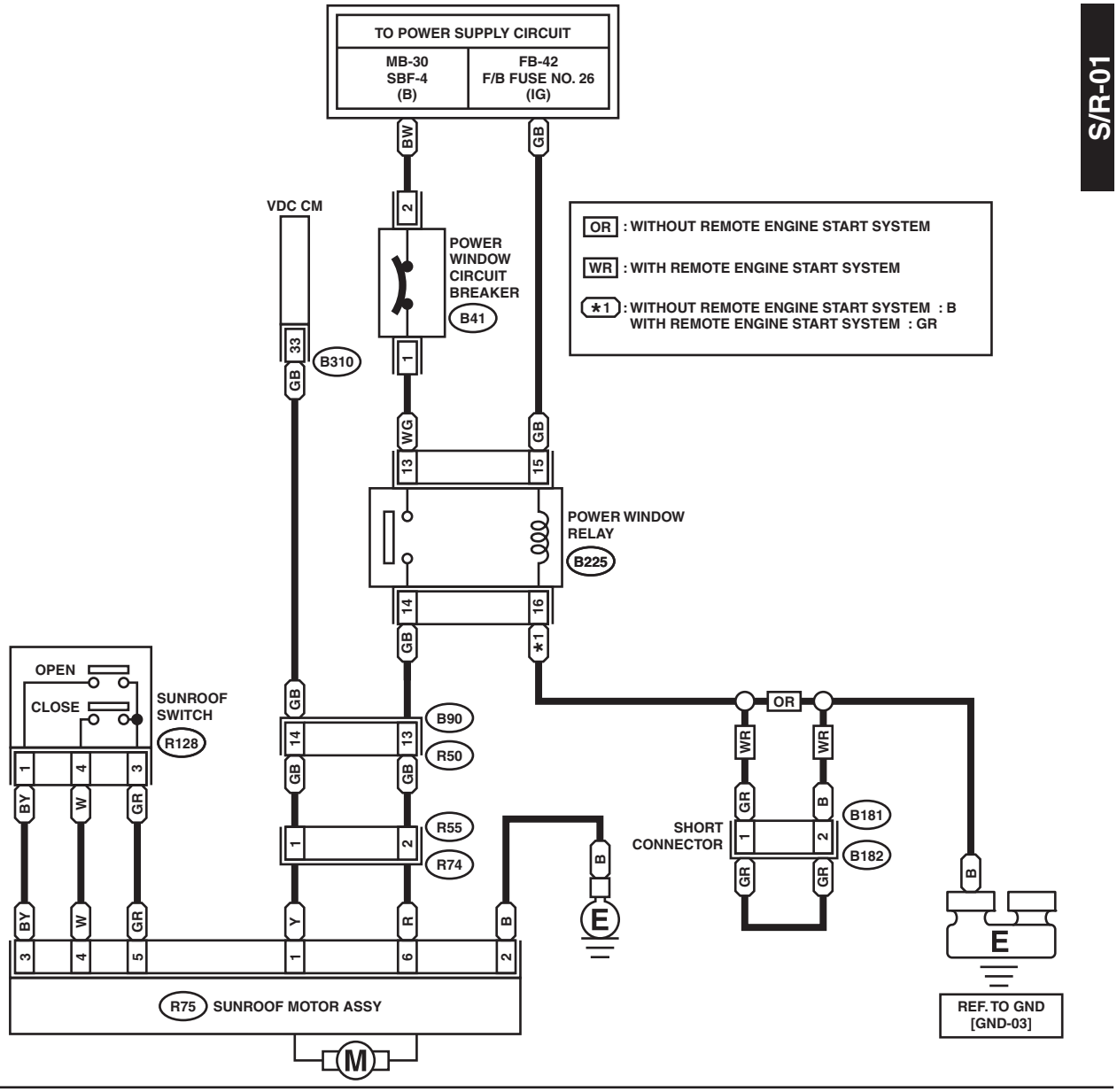
WI-31139

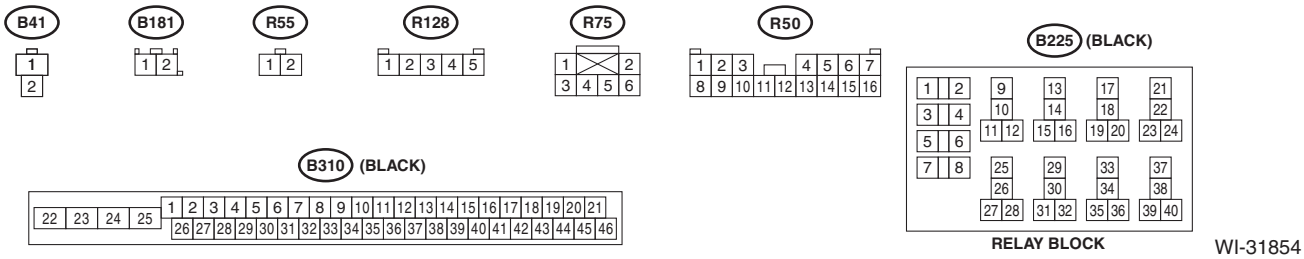
48.Sunroof Control System

A: WIRING DIAGRAM

S/R-01

S/R-01

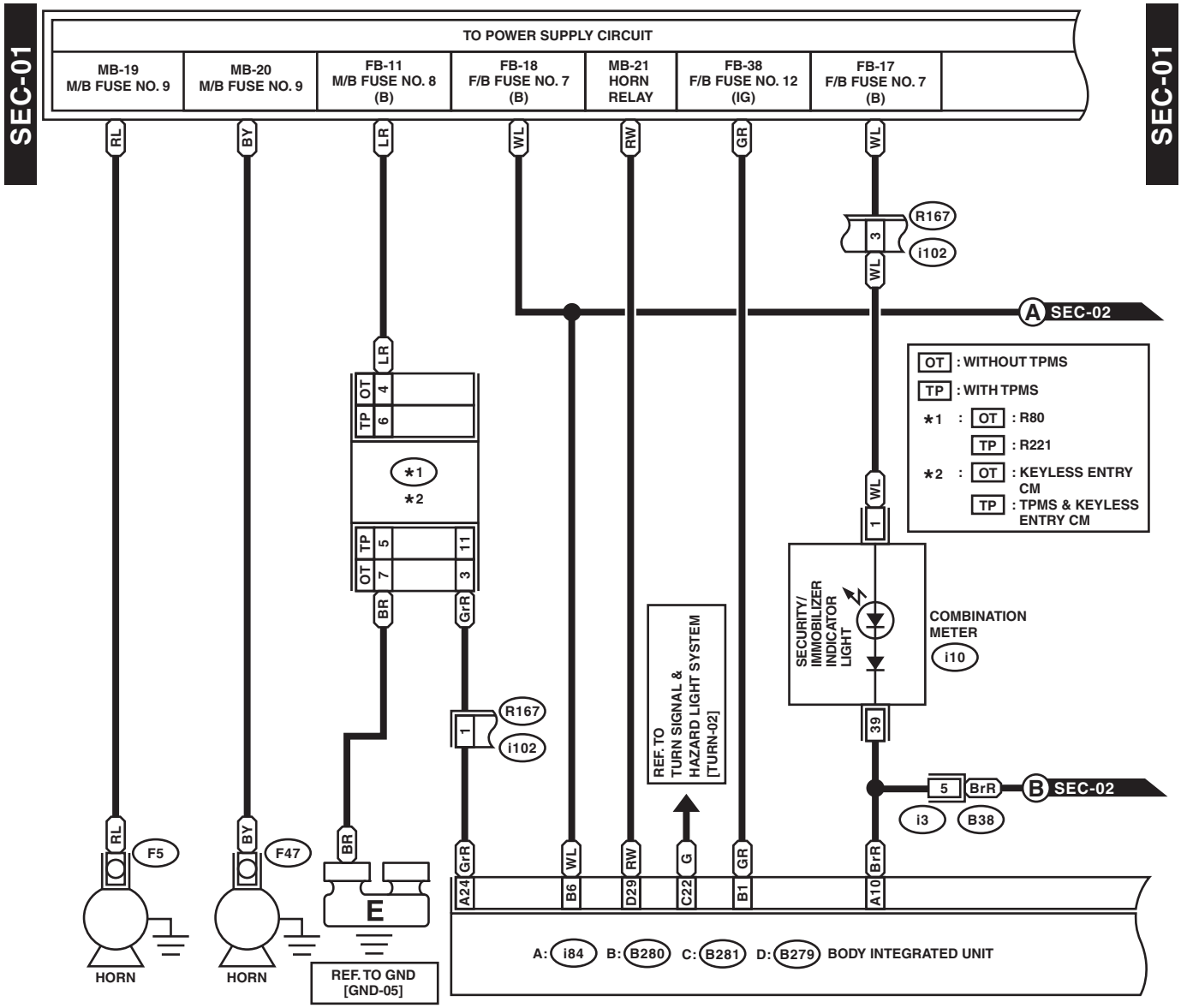


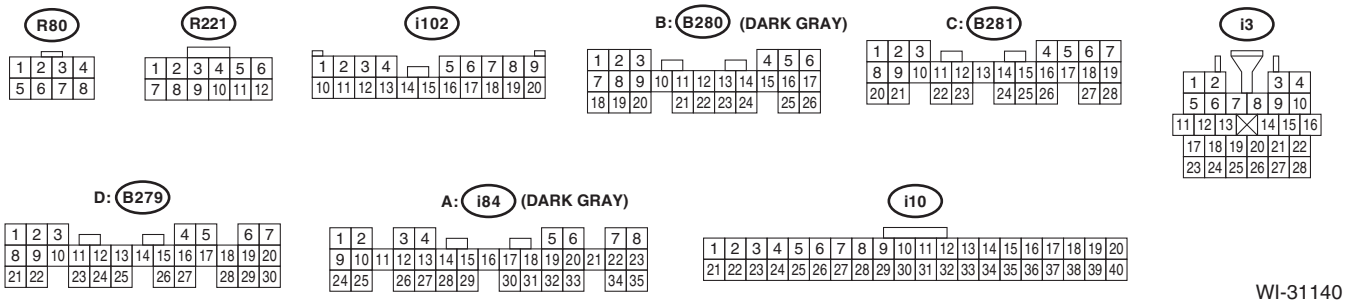


WI-31854

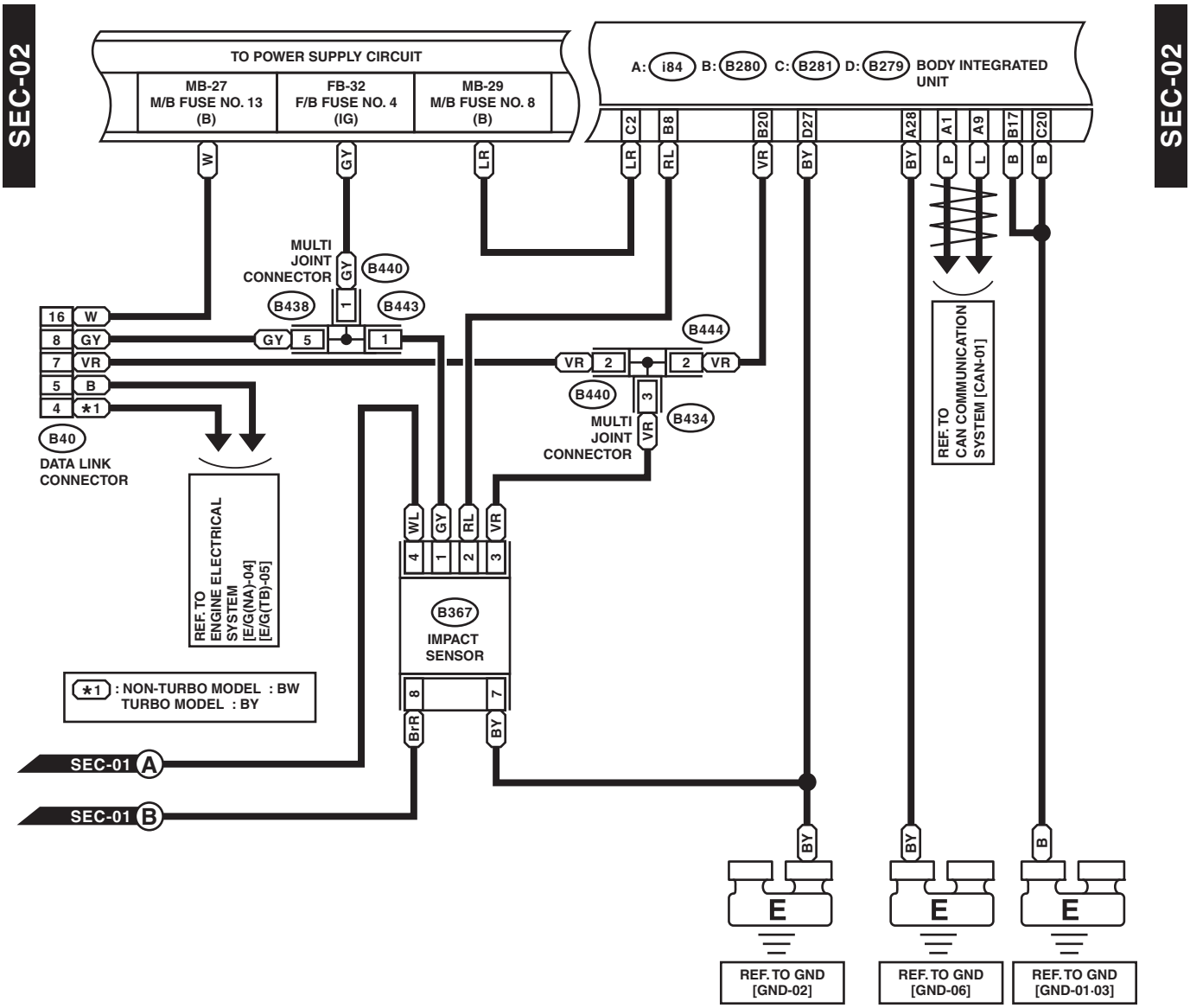
49.Security System

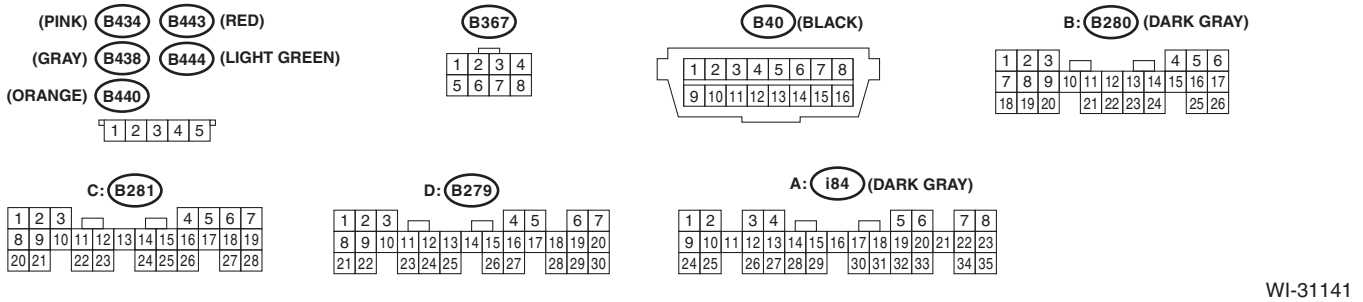
A: WIRING DIAGRAM



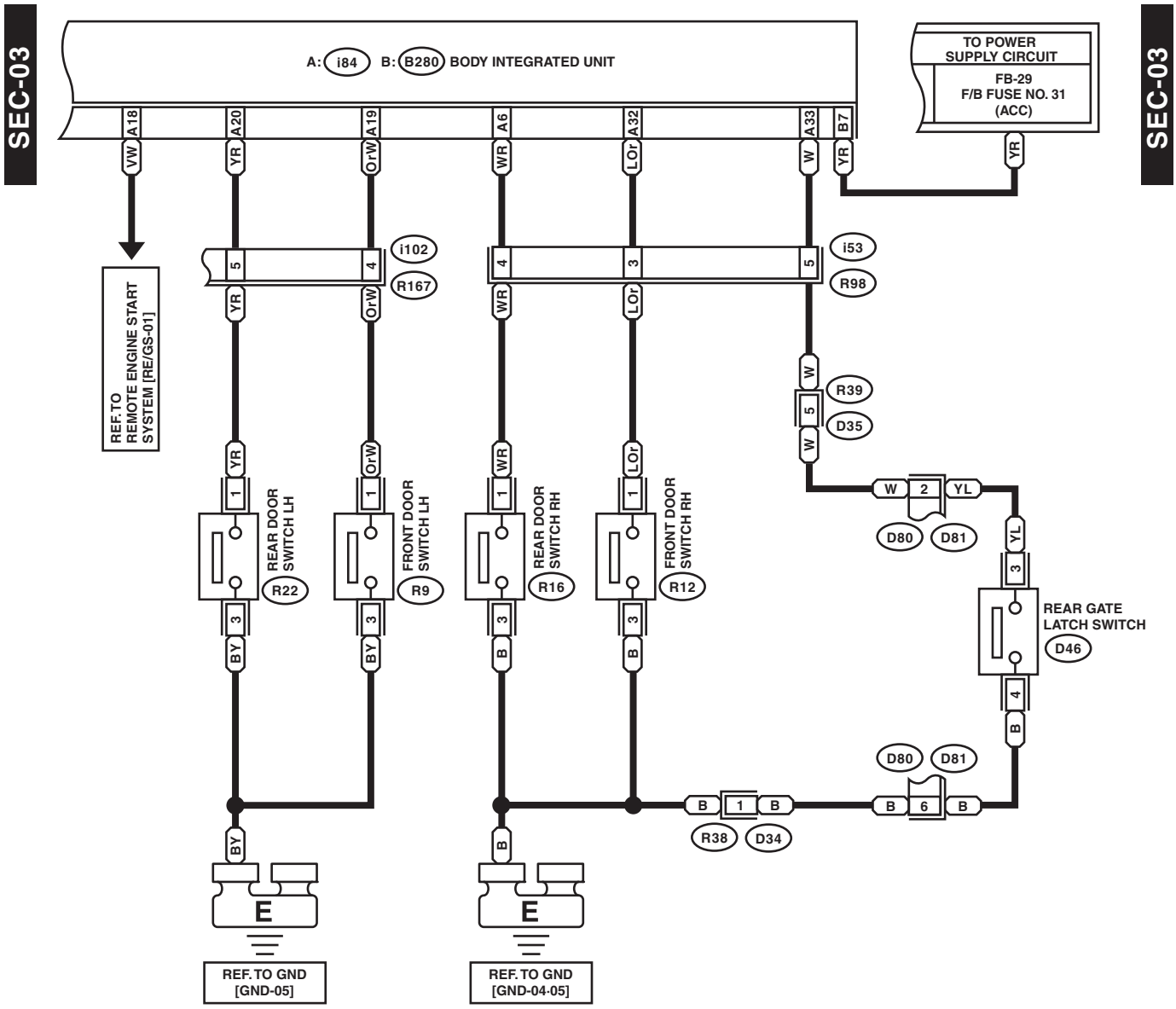


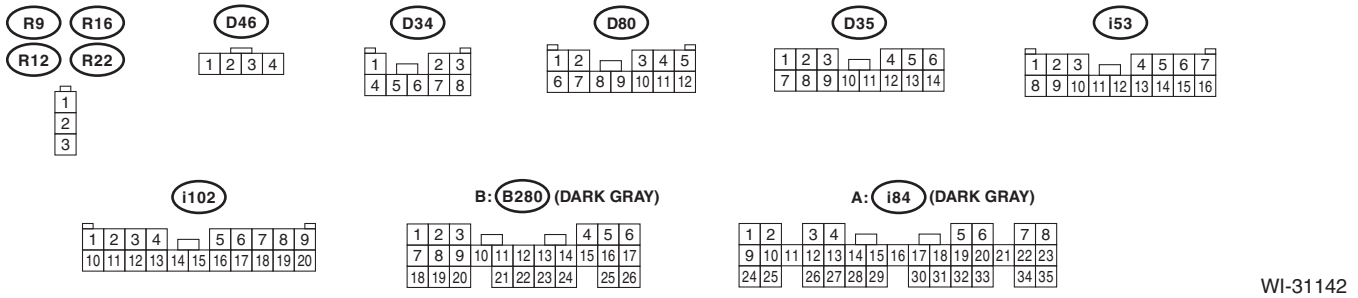
WI-31140


SEC-02
SEC-02
TO POWER SUPPLY CIRCUIT
MB-27
M/B FUSE NO. 13
(B)
FB-32
F/B FUSE NO. 4
(IG)
MB-29
M/B FUSE NO. 8
(B)
A: i84 B: B280 C: B281 D: B279 BODY INTEGRATED UNIT
C2
B8
B20
D27
A28
A1
A9
B17
C20
W
GY
LR
LR
RL
VR
BY
BY
P
L
B
B
MULTI JOINT CONNECTOR
B440
B438
B443
B444
B434
B40
DATA LINK CONNECTOR
REF. TO ENGINE ELECTRICAL SYSTEM [E/G(NA)-04] [E/G(TB)-05]
REF. TO CAN COMMUNICATION SYSTEM [CAN-01]
B367
IMPACT SENSOR
WL
GY
RL
VR
BrR
BY
*1 : NON-TURBO MODEL : BW
TURBO MODEL : BY
SEC-01 A
SEC-01 B
E
REF. TO GND [GND-02]
REF. TO GND [GND-06]
REF. TO GND [GND-01·03]


(PINK) B434 B443 (RED)
(GRAY) B438 B444 (LIGHT GREEN)
(ORANGE) B440
B367
B40 (BLACK)
B: B280 (DARK GRAY)
C: B281
D: B279
A: i84 (DARK GRAY)

WI-31141

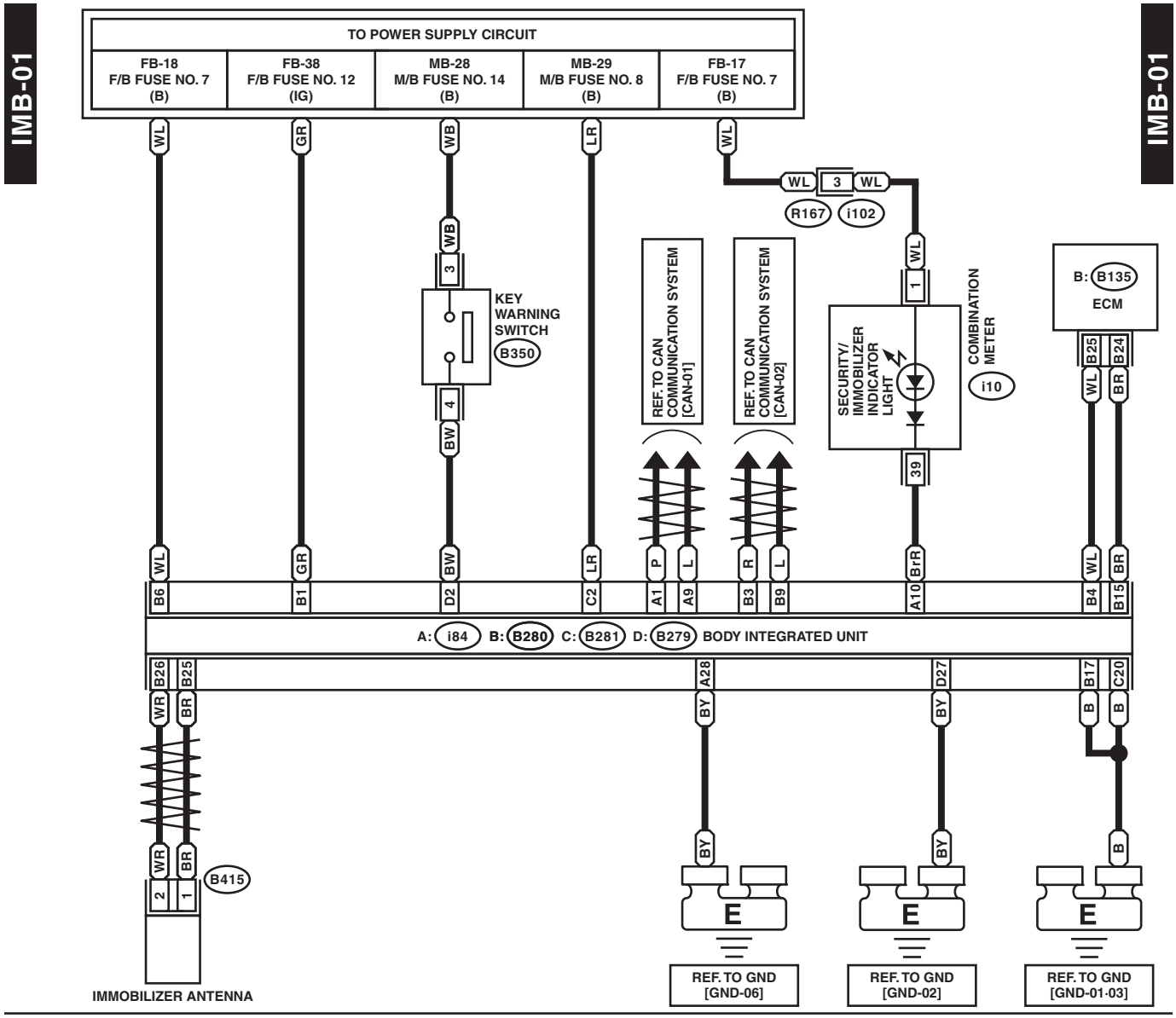

SEC-03
SEC-03
A: i84 B: B280 BODY INTEGRATED UNIT
TO POWER SUPPLY CIRCUIT
FB-29
F/B FUSE NO. 31
(ACC)
A18
A20
A19
A6
A32
A33
B7
VW
YR
OrW
WR
LOr
W
YR
YR
i102
R167
i53
R98
REF. TO REMOTE ENGINE START SYSTEM [RE/GS-01]
W
R39
D35
REAR DOOR SWITCH LH
R22
FRONT DOOR SWITCH LH
R9
REAR DOOR SWITCH RH
R16
FRONT DOOR SWITCH RH
R12
W
YL
D80
D81
REAR GATE LATCH SWITCH
D46
BY
B
R38
D34
E
E
REF. TO GND [GND-05]
REF. TO GND [GND-04·05]


R9
R16
R12
R22
D46
D34
D80
D35
i53
i102
B: B280 (DARK GRAY)
A: i84 (DARK GRAY)

WI-31142

50.Immobilizer System

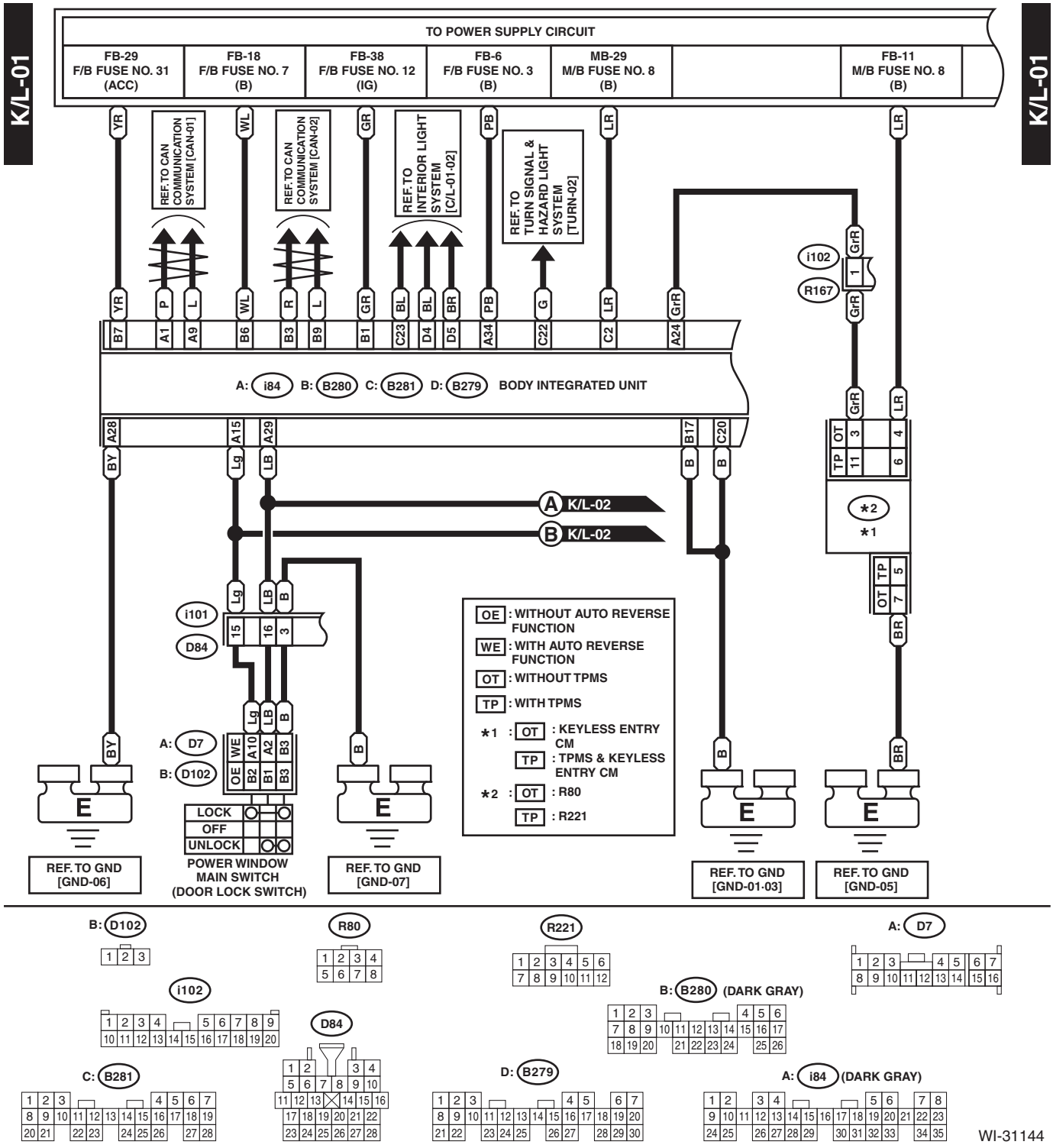
A: WIRING DIAGRAM

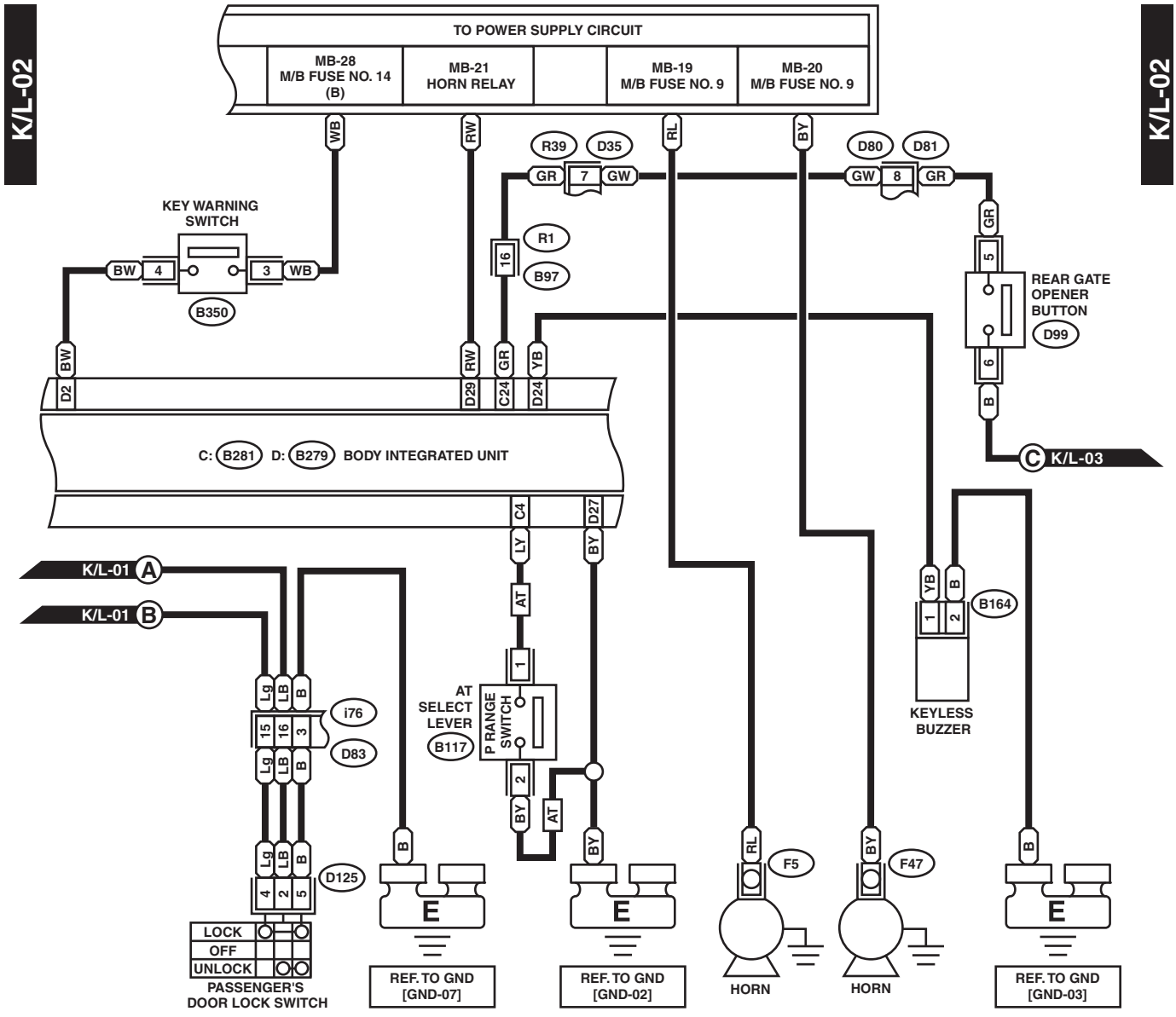


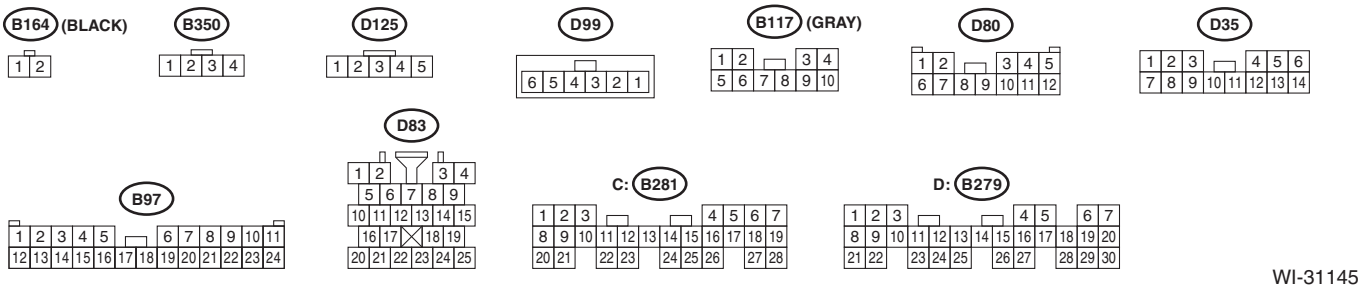
WI-31143

51.Keyless Entry System

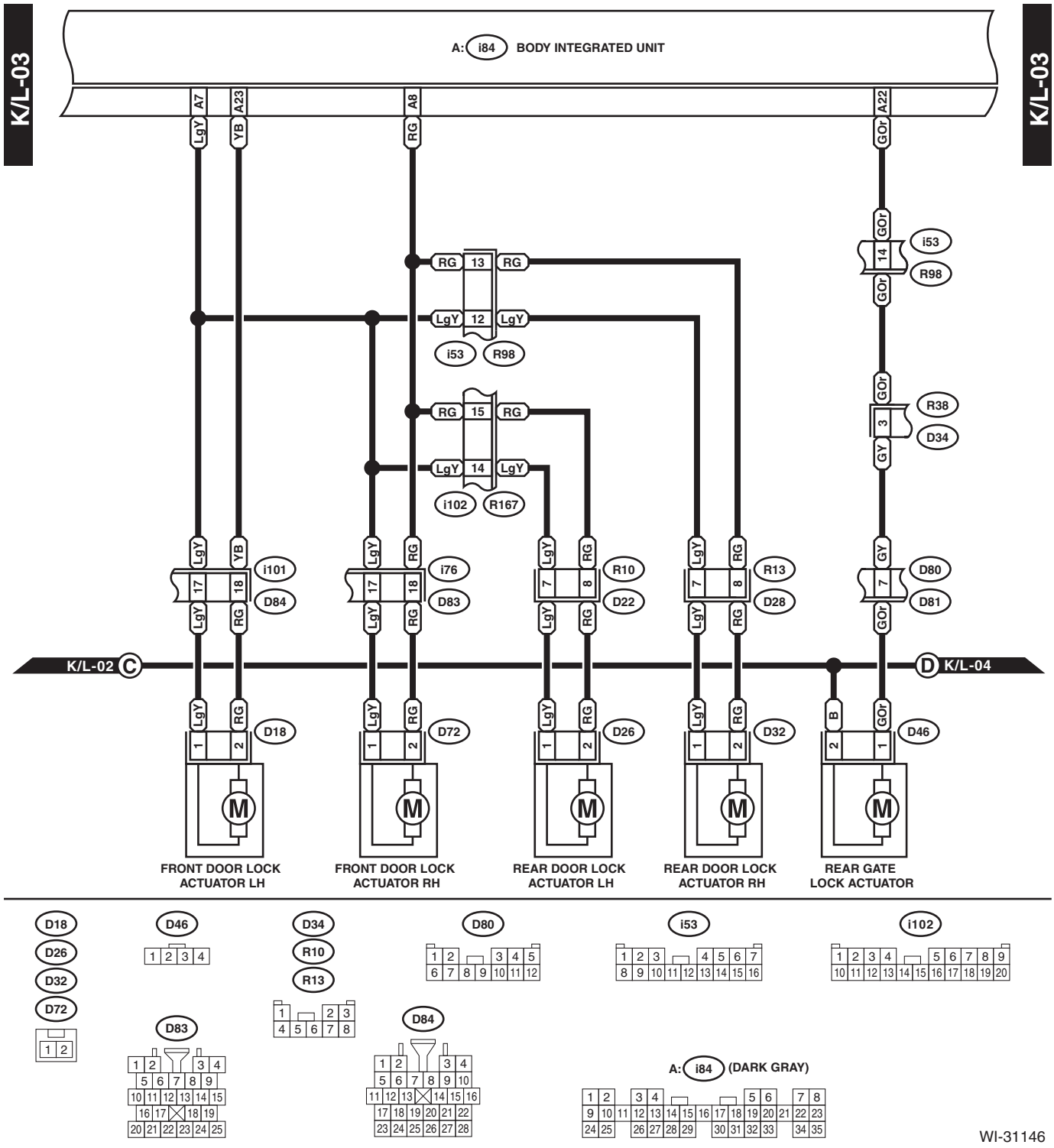
A: WIRING DIAGRAM

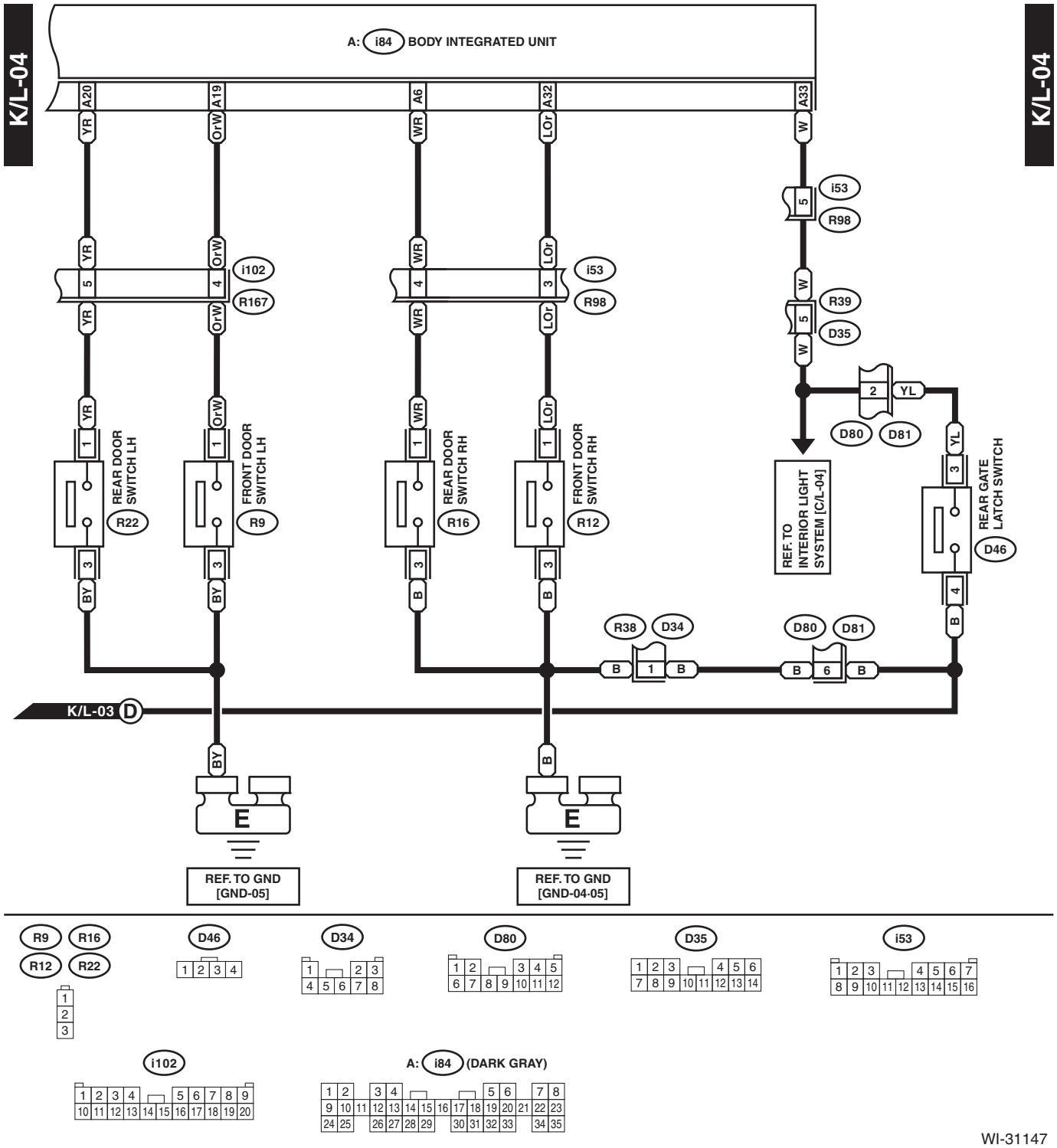



K/L-02
K/L-02
TO POWER SUPPLY CIRCUIT
MB-28
M/B FUSE NO. 14
(B)
MB-21
HORN RELAY
MB-19
M/B FUSE NO. 9
MB-20
M/B FUSE NO. 9
KEY WARNING
SWITCH
B350
R39
D35
D80
D81
R1
B97
REAR GATE
OPENER
BUTTON
D99
C: B281 D: B279 BODY INTEGRATED UNIT
C K/L-03
K/L-01 A
K/L-01 B
AT
SELECT
LEVER
B117
P RANGE
SWITCH
B164
KEYLESS
BUZZER
i76
D83
D125
LOCK
OFF
UNLOCK
PASSENGER'S
DOOR LOCK SWITCH
REF. TO GND
[GND-07]
REF. TO GND
[GND-02]
F5
F47
HORN
HORN
REF. TO GND
[GND-03]


B164 (BLACK)
B350
D125
D99
B117 (GRAY)
D80
D35
D83
B97
C: B281
D: B279

WI-31145


K/L-03
K/L-03
A: i84 BODY INTEGRATED UNIT
A7
A23
A8
A22
LgY
YB
RG
GOr
i53
R98
R38
D34
GY
i101
D84
i76
D83
R10
D22
R13
D28
D80
D81
K/L-02 C
D K/L-04
D18
D72
D26
D32
D46
B
FRONT DOOR LOCK ACTUATOR LH
FRONT DOOR LOCK ACTUATOR RH
REAR DOOR LOCK ACTUATOR LH
REAR DOOR LOCK ACTUATOR RH
REAR GATE LOCK ACTUATOR
i102
R167
A: i84 (DARK GRAY)
WI-31146


K/L-04
K/L-04
A: i84 BODY INTEGRATED UNIT
A20
A19
A6
A32
A33
YR
OrW
WR
LOr
W
i53
R98
i102
R167
i53
R98
R39
D35
REAR DOOR SWITCH LH
R22
FRONT DOOR SWITCH LH
R9
REAR DOOR SWITCH RH
R16
FRONT DOOR SWITCH RH
R12
REF. TO INTERIOR LIGHT SYSTEM [C/L-04]
D80
D81
YL
REAR GATE LATCH SWITCH
D46
R38
D34
D80
D81
BY
B
K/L-03 D
REF. TO GND [GND-05]
REF. TO GND [GND-04·05]

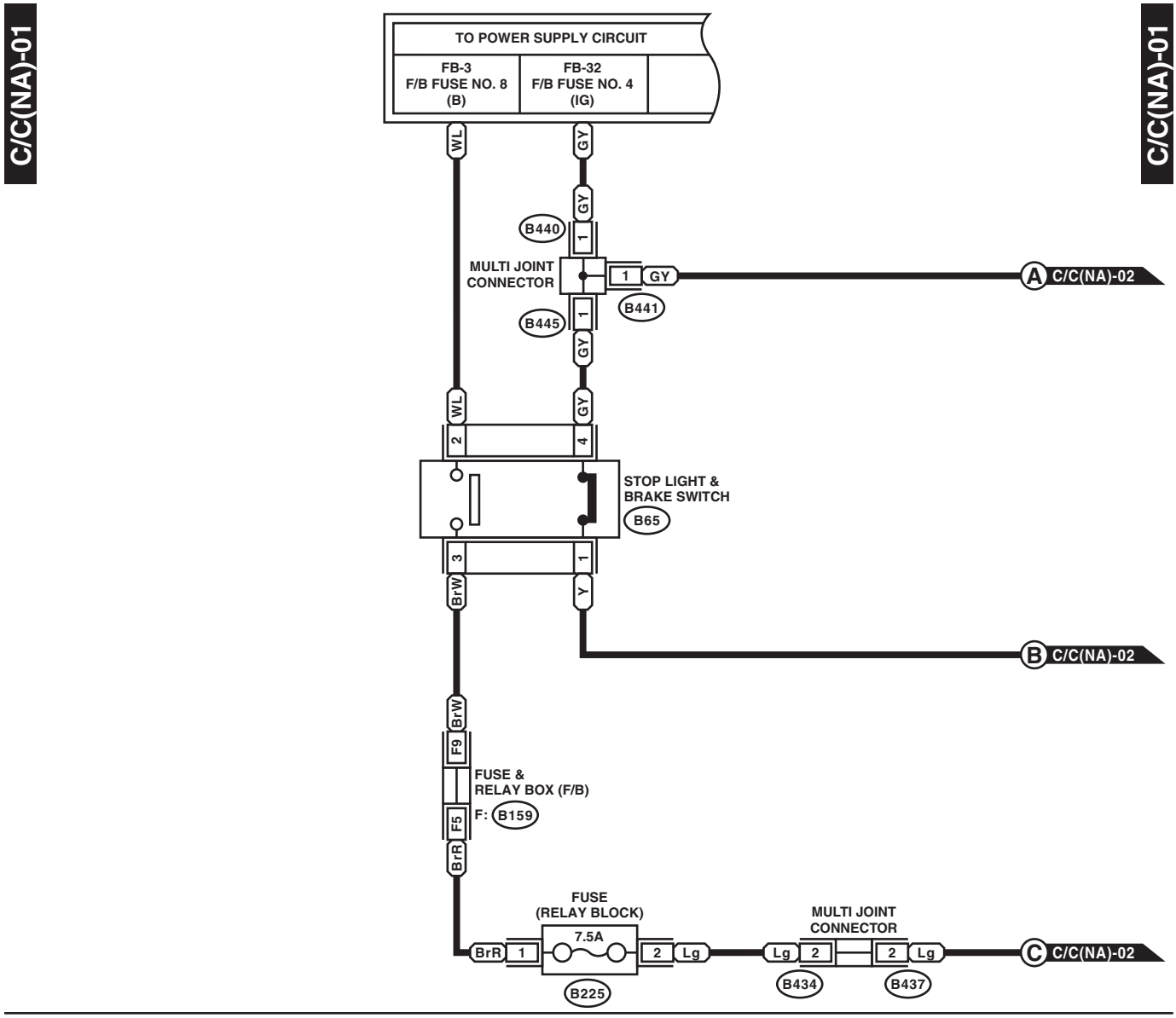
R9
R16
R12
R22
D46
D34
D80
D35
i53
i102
A: i84 (DARK GRAY)

WI-31147

52.Cruise Control System

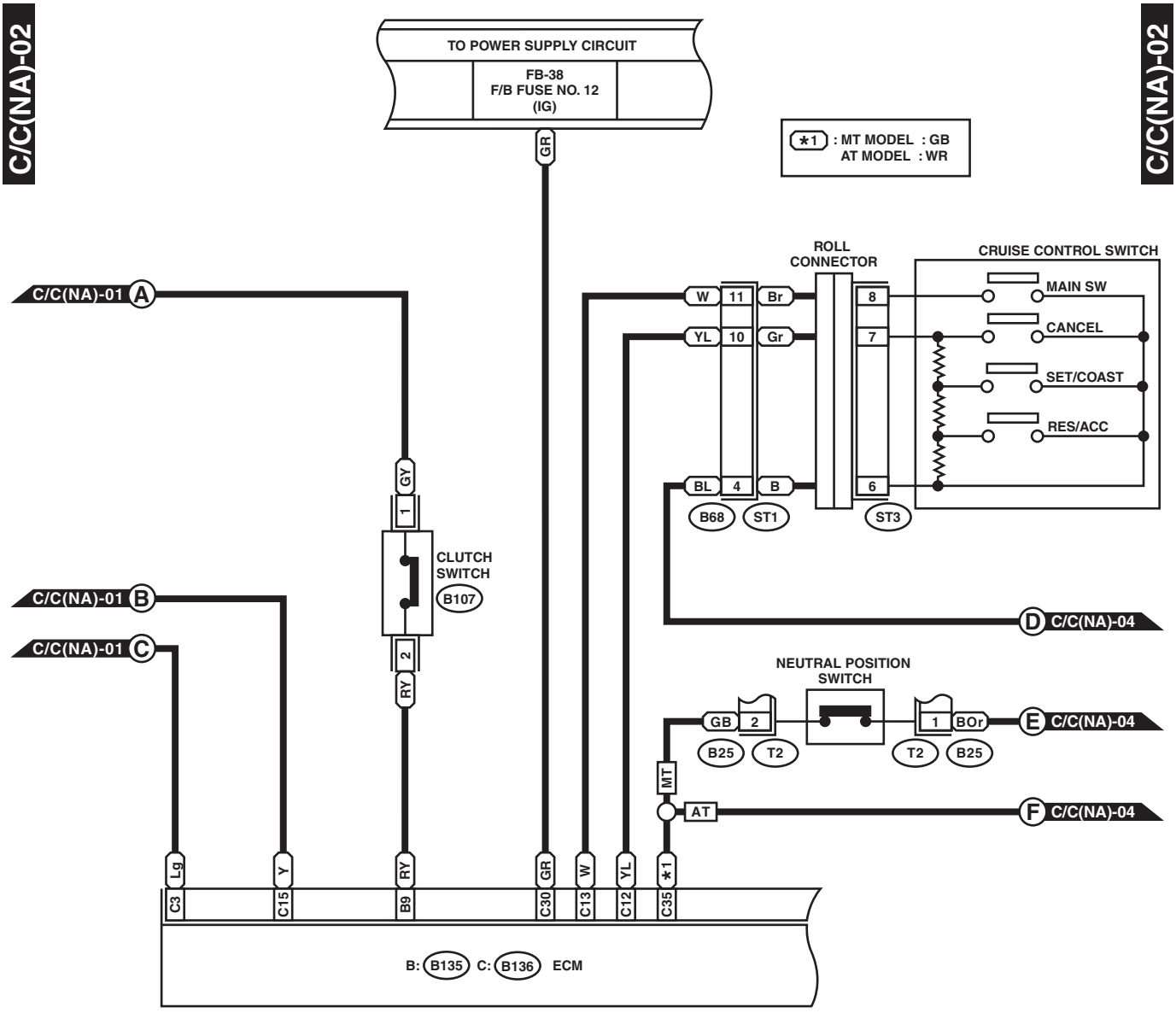
A: WIRING DIAGRAM

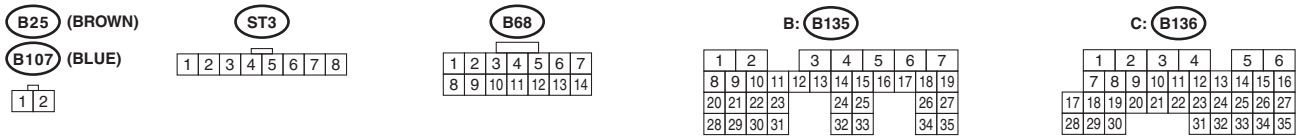
1. NON-TURBO MODEL



WI-25224

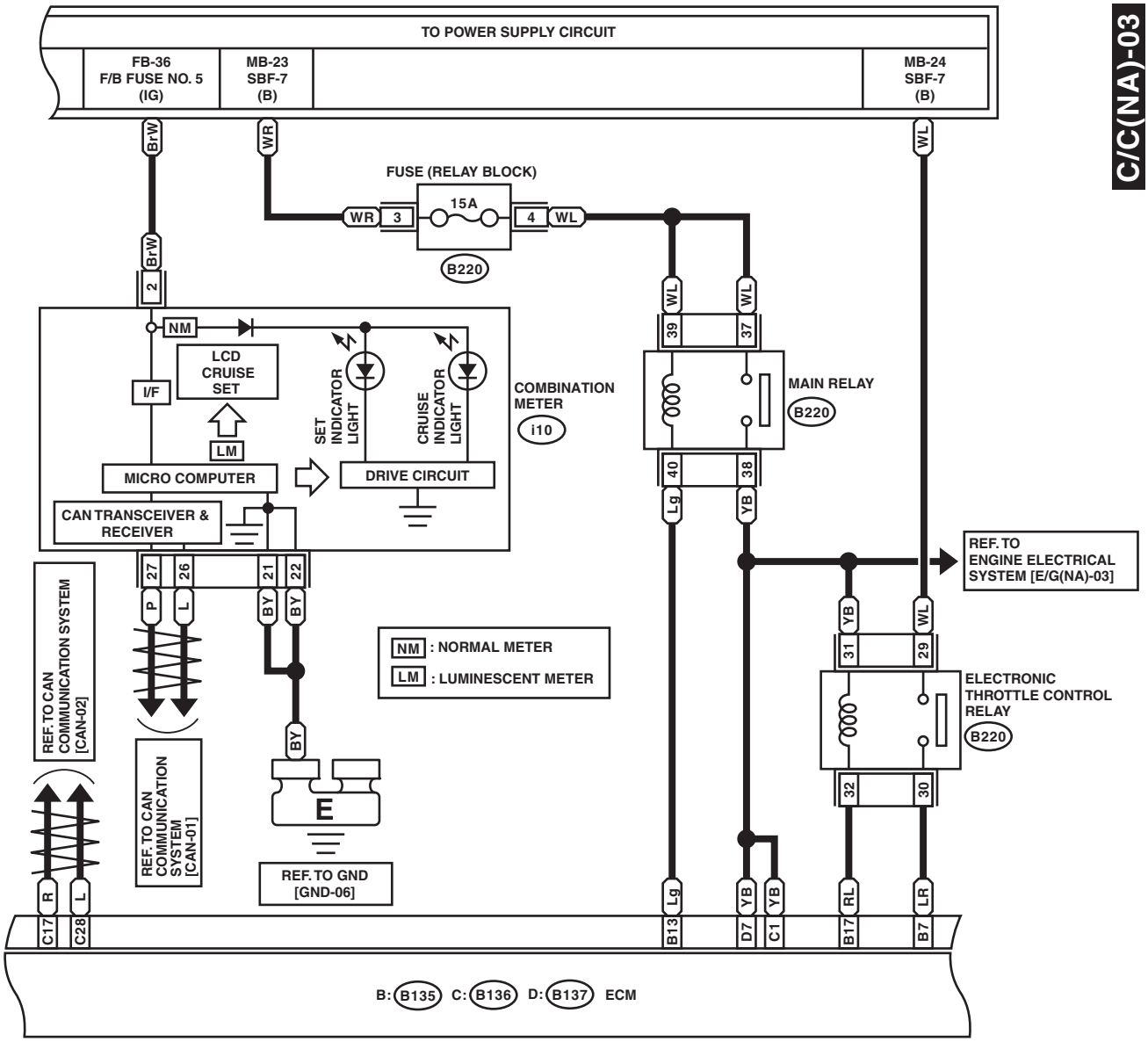
C/C(NA)-02

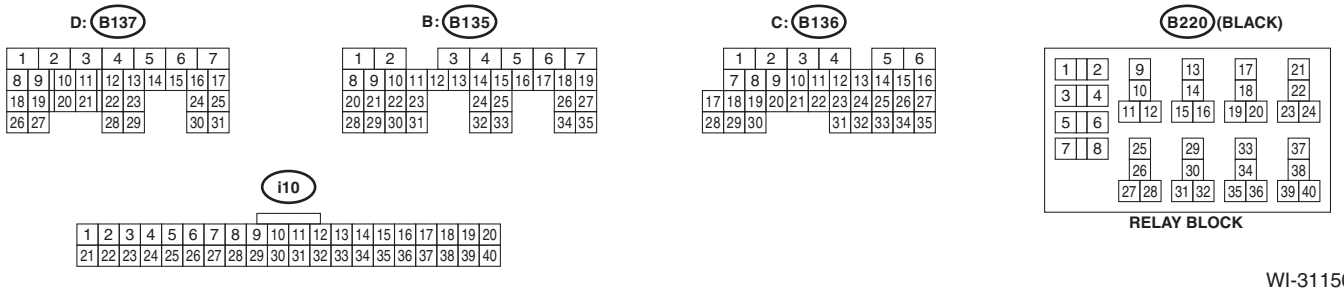




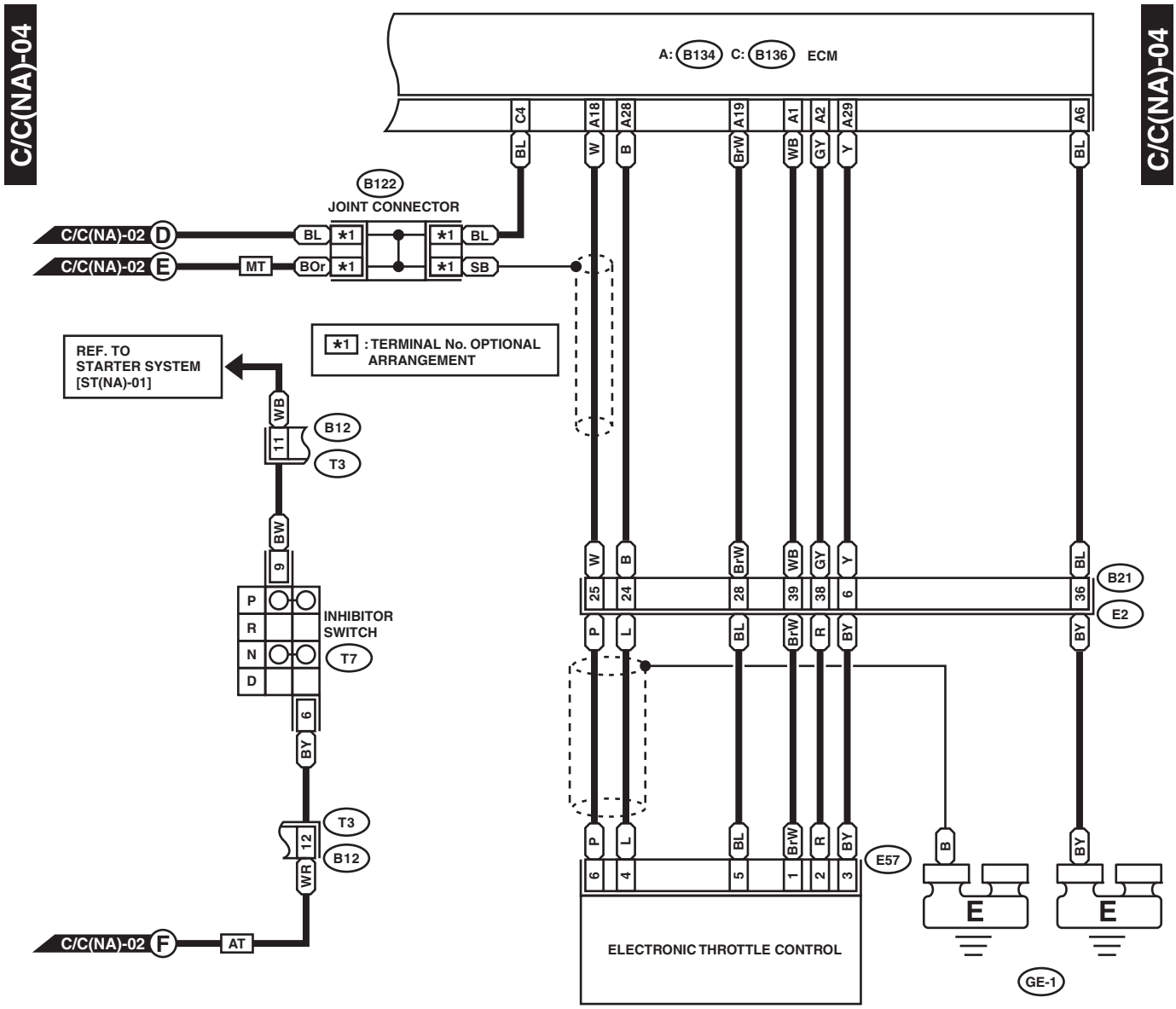
WI-31149

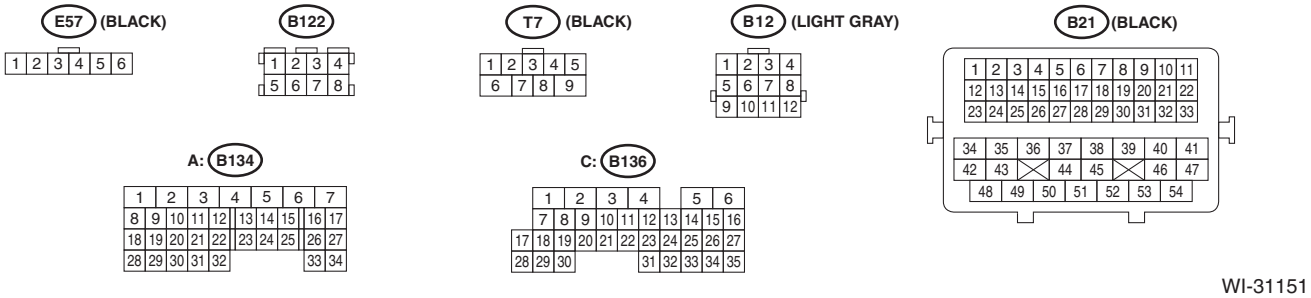
C/C(NA)-03





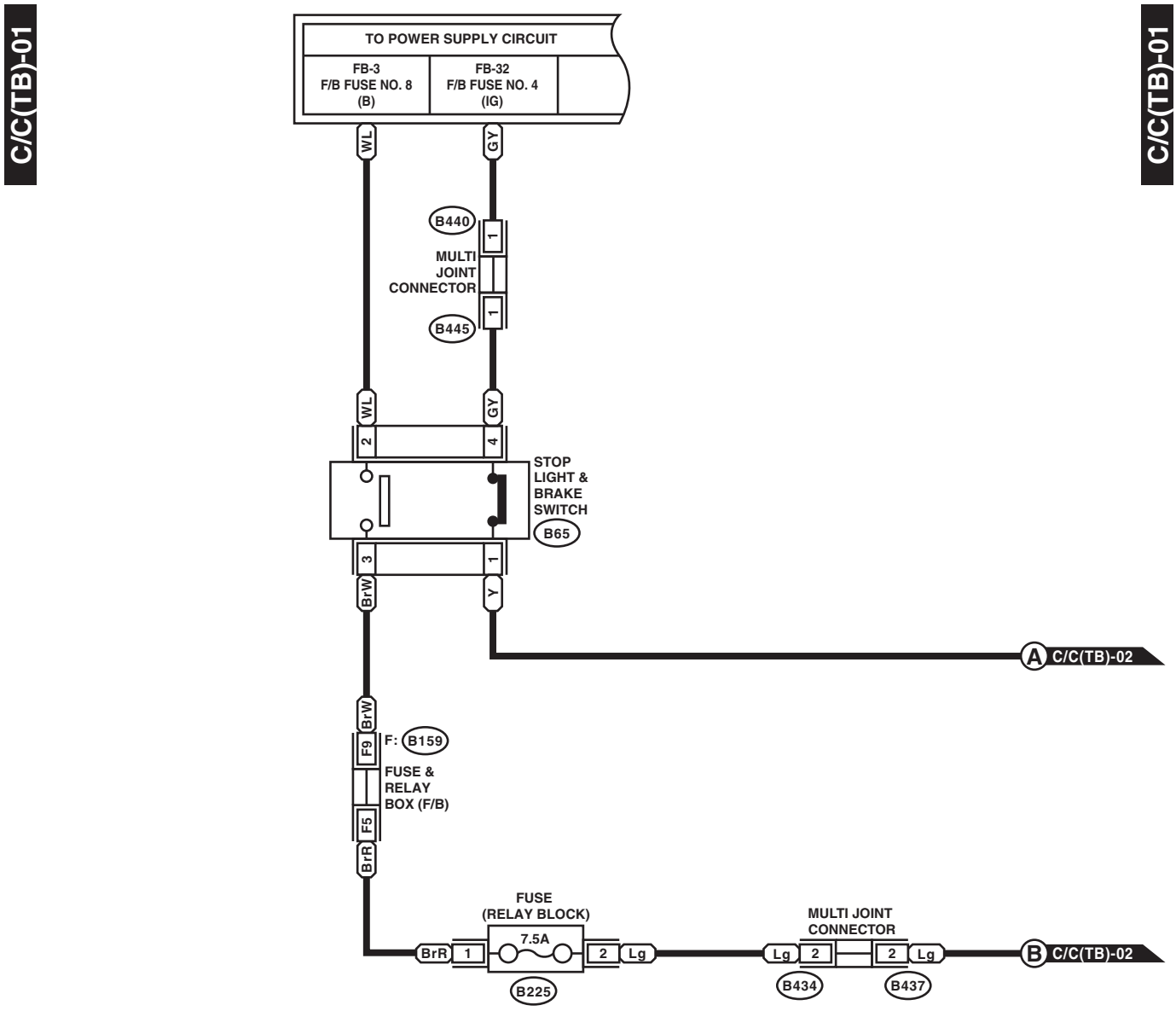
WI-31150


C/C(NA)-04
C/C(NA)-04
A: B134 C: B136 ECM
C4
A18
A28
A19
A1
A2
A29
A6
BL
W
B
BrW
WB
GY
Y
BL
B122
JOINT CONNECTOR
C/C(NA)-02 D
C/C(NA)-02 E
BL
MT
BOr
*1
*1
BL
*1
SB
*1 : TERMINAL No. OPTIONAL ARRANGEMENT
REF. TO STARTER SYSTEM [ST(NA)-01]
WB
11
B12
T3
BW
9
P
R
N
D
INHIBITOR SWITCH
T7
6
BY
T3
12
B12
WR
C/C(NA)-02 F
AT
W
B
BrW
WB
GY
Y
BL
B21
25
24
28
39
38
6
36
E2
P
L
BL
BrW
R
BY
BY
P
L
BL
BrW
R
BY
E57
B
BY
6
4
5
1
2
3
E
E
ELECTRONIC THROTTLE CONTROL
GE-1

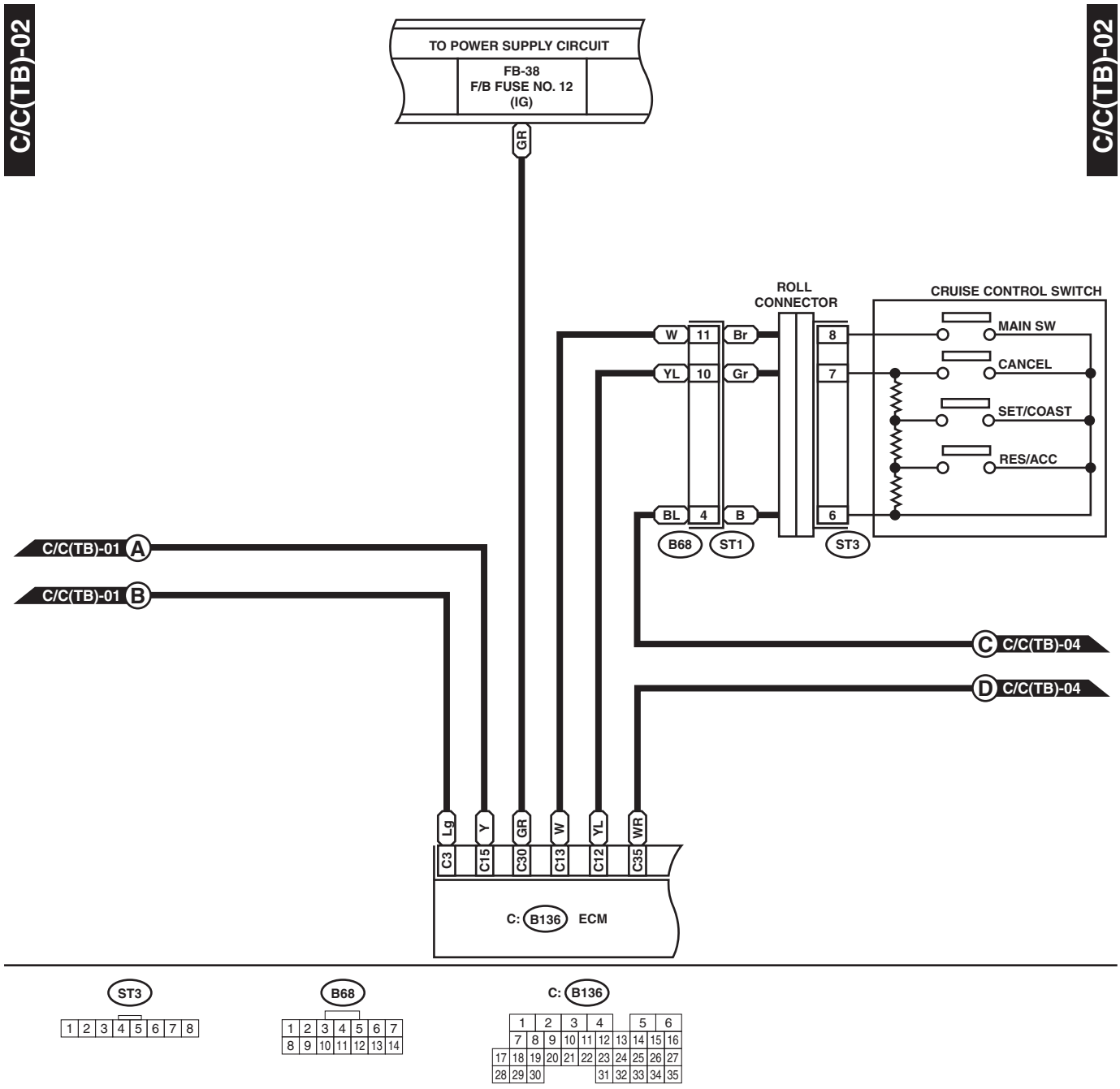

E57 (BLACK)
1 2 3 4 5 6
B122
1 2 3 4
5 6 7 8
T7 (BLACK)
1 2 3 4 5
6 7 8 9
B12 (LIGHT GRAY)
1 2 3 4
5 6 7 8
9 10 11 12
B21 (BLACK)
1 2 3 4 5 6 7 8 9 10 11
12 13 14 15 16 17 18 19 20 21 22
23 24 25 26 27 28 29 30 31 32 33
34 35 36 37 38 39 40 41
42 43 44 45 46 47
48 49 50 51 52 53 54
A: B134
1 2 3 4 5 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
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

WI-31151

2. TURBO MODEL

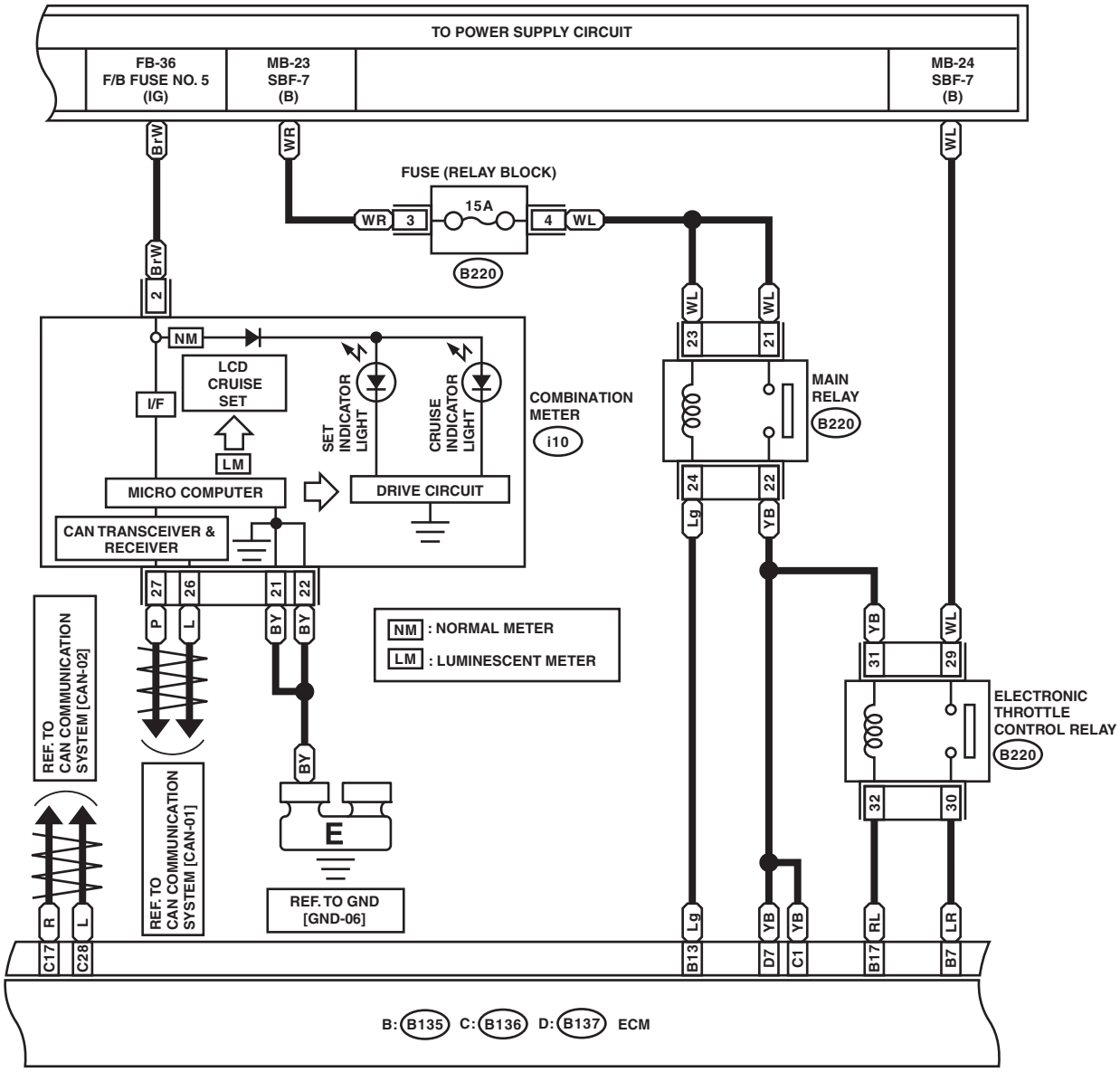


WI-31152

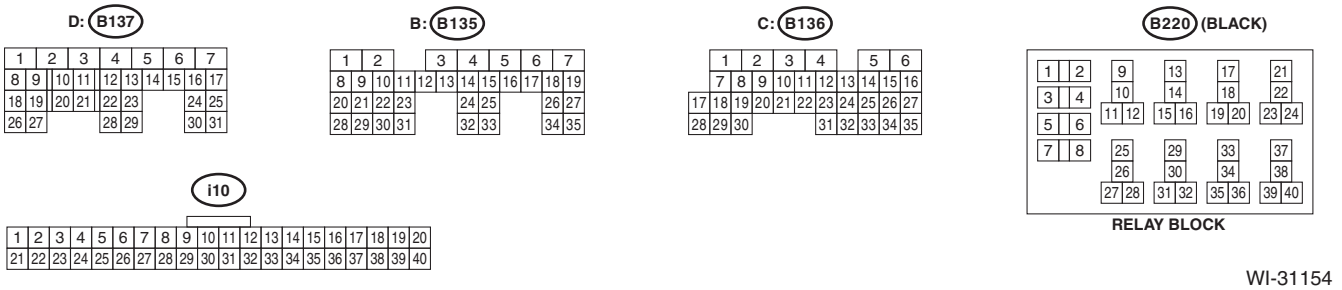

C/C(TB)-02
C/C(TB)-02
TO POWER SUPPLY CIRCUIT
FB-38
F/B FUSE NO. 12
(IG)
GR
ROLL
CONNECTOR
CRUISE CONTROL SWITCH
W
11
Br
8
MAIN SW
YL
10
Gr
7
CANCEL
SET/COAST
RES/ACC
BL
4
B
6
B68
ST1
ST3
C/C(TB)-01 A
C/C(TB)-01 B
C C/C(TB)-04
D C/C(TB)-04
Lg
Y
GR
W
YL
WR
C3
C15
C30
C13
C12
C35
C: B136 ECM
ST3
1 2 3 4 5 6 7 8
B68
1 2 3 4 5 6 7
8 9 10 11 12 13 14
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

WI-31153

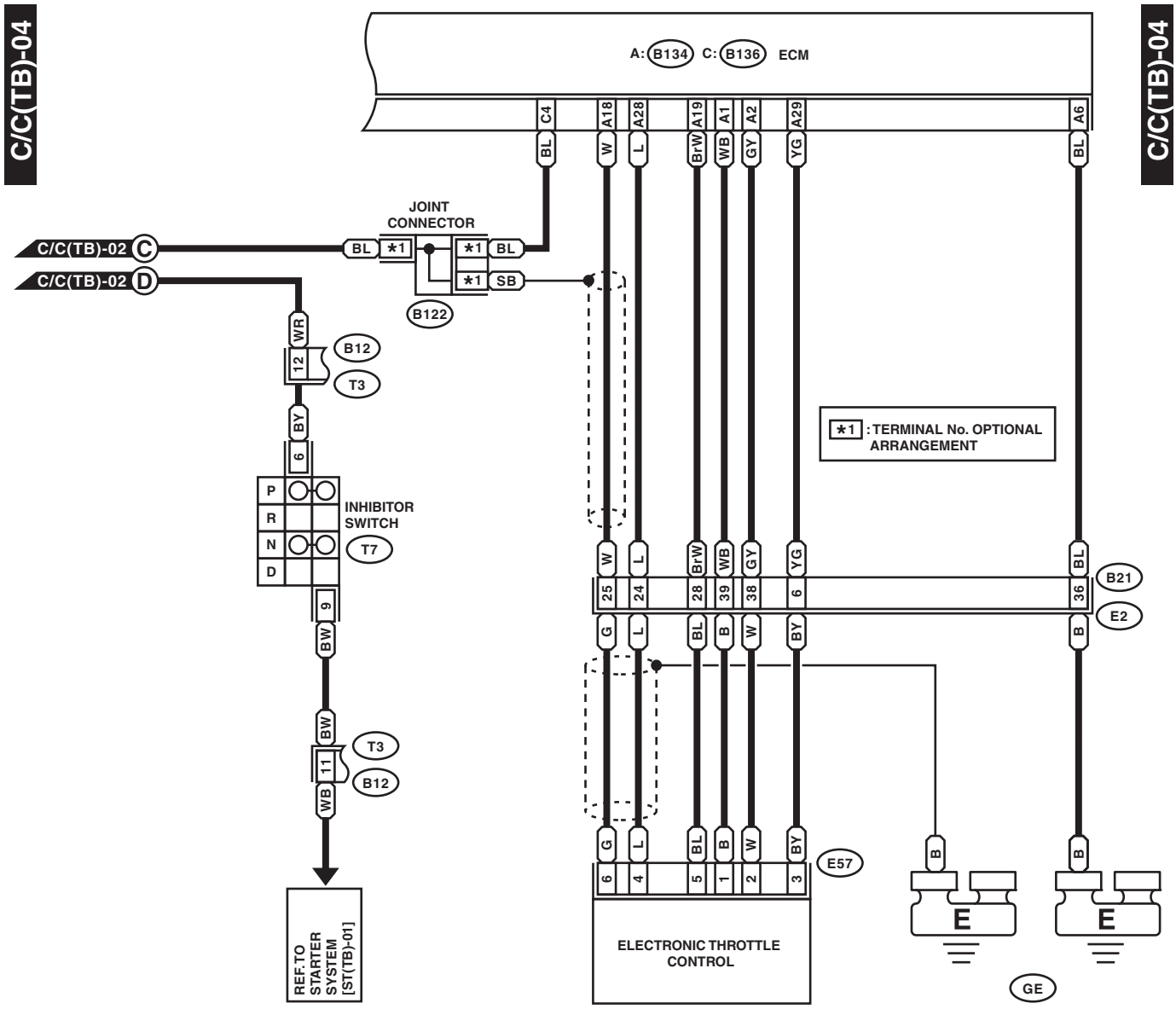
C/C(TB)-03



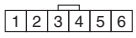
C/C(TB)-03



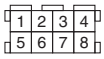
WI-31154



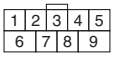
E57 (BLACK)



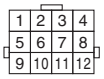
B122



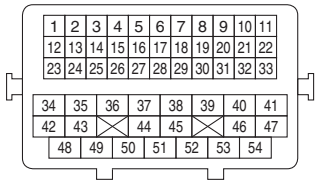
T7 (BLACK)



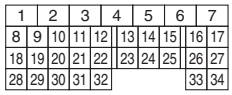
B12 (LIGHT GRAY)



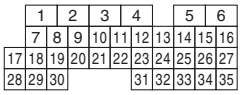
B21 (BLACK)



A: B134



C: B136

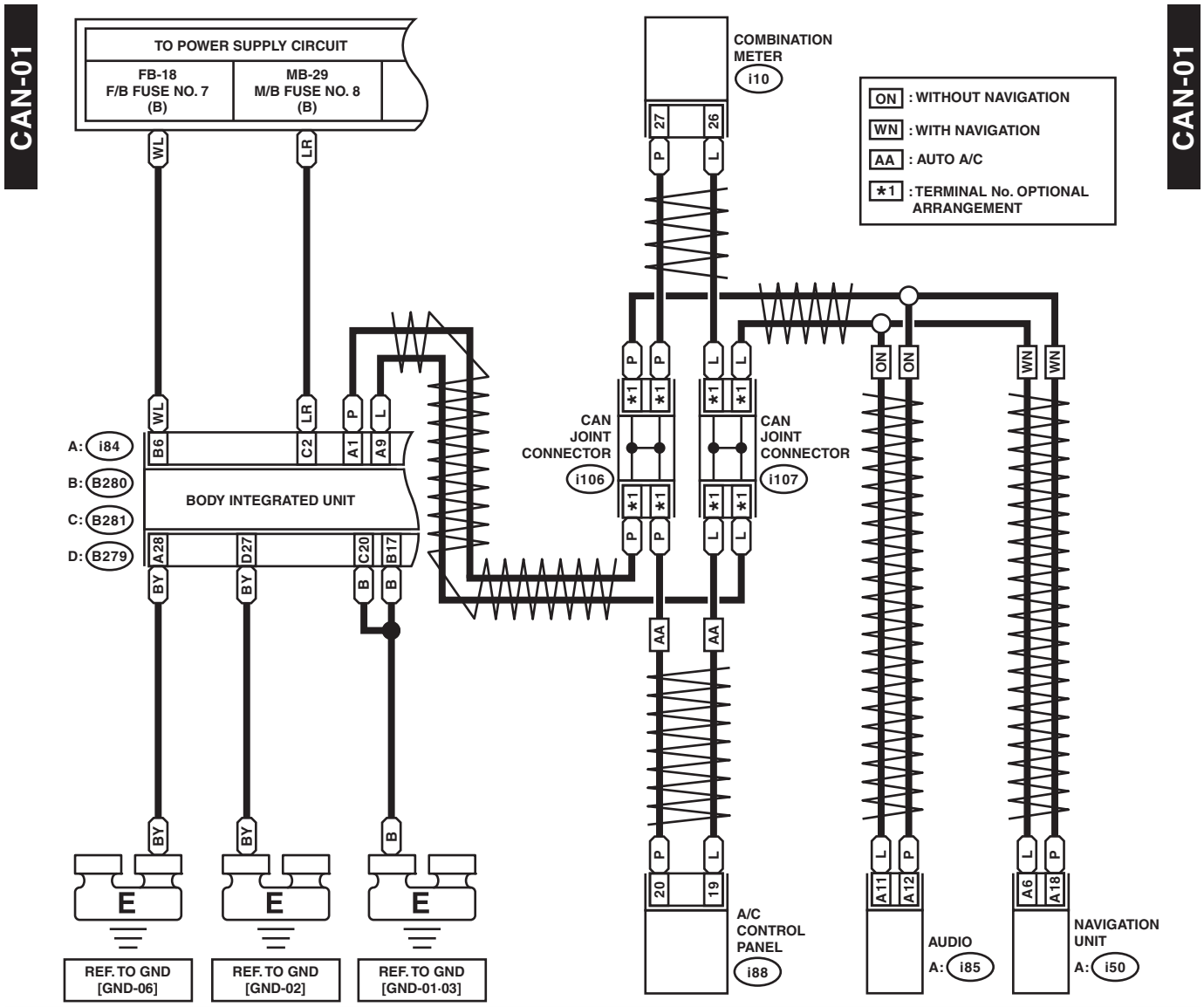


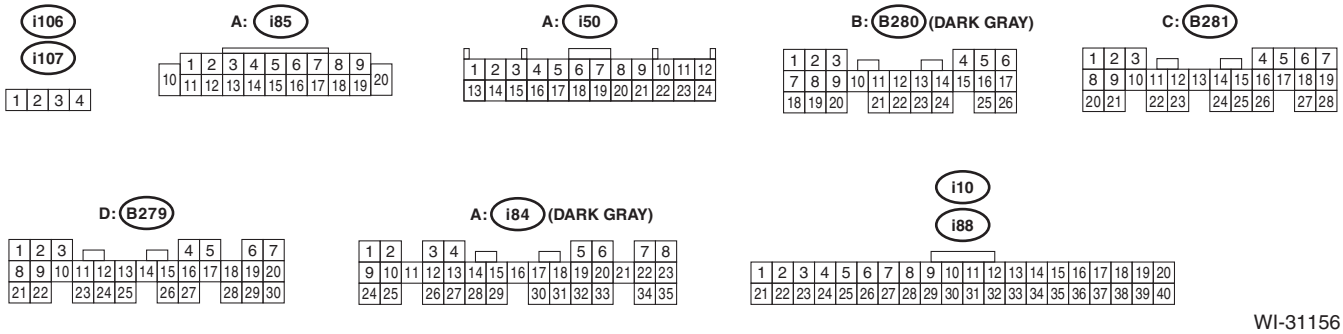
WI-31155

53.CAN Communication System

A: WIRING DIAGRAM

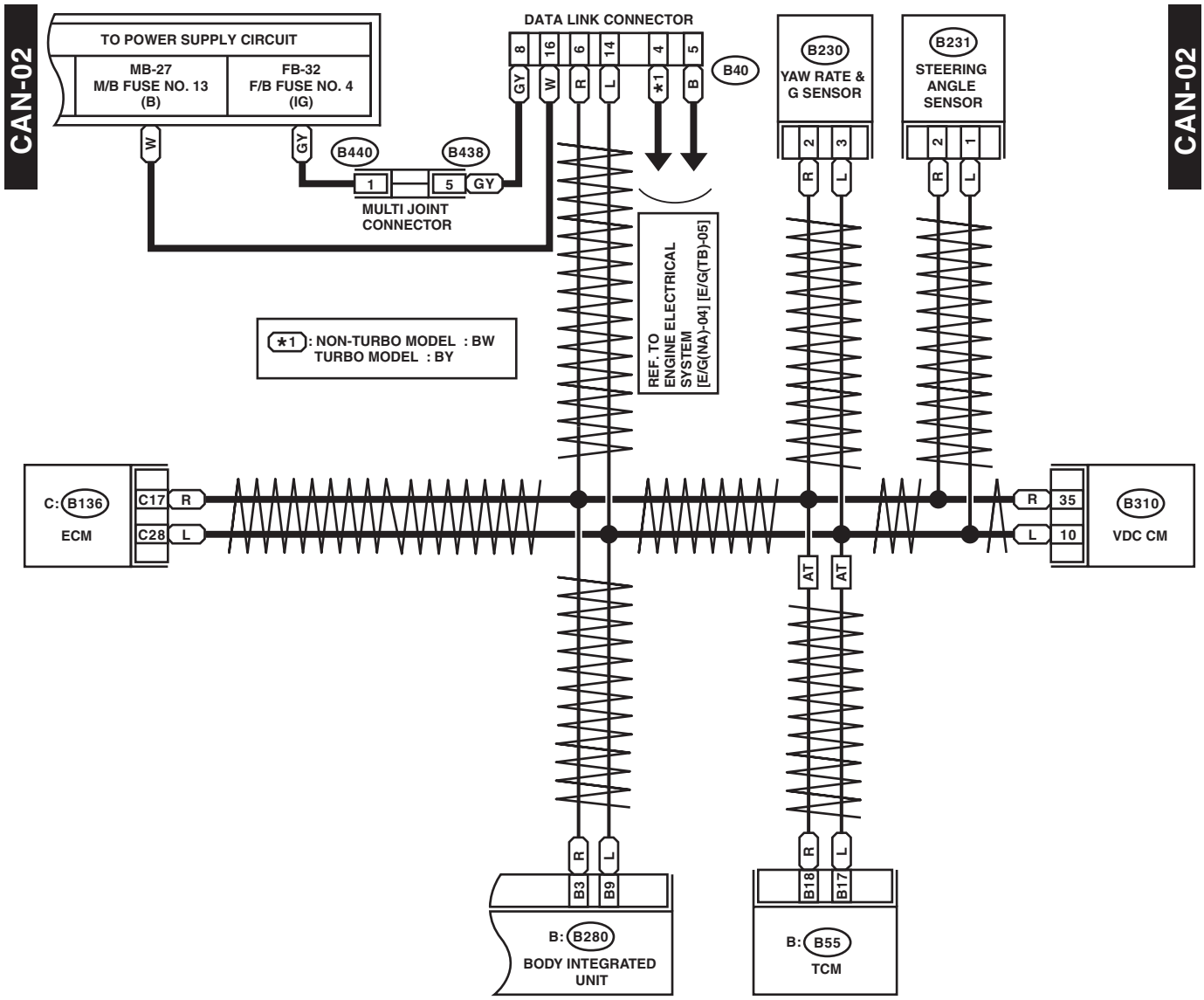
1. LOW-SPEED CAN

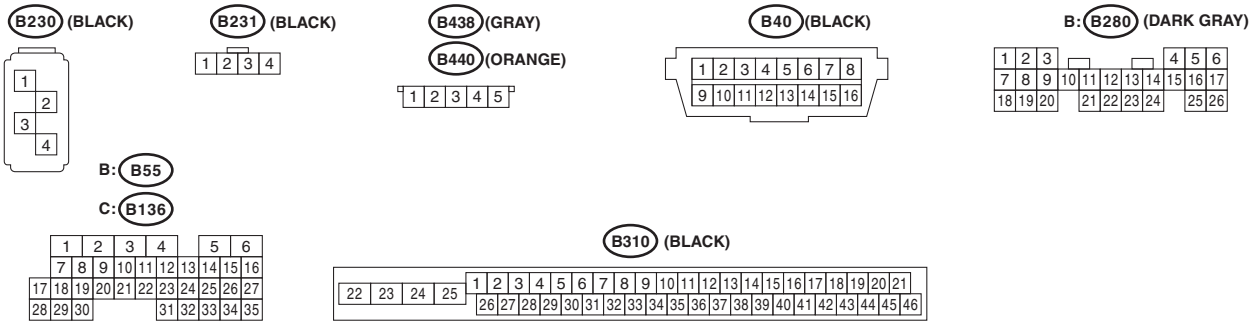




WI-31156

2. HIGH-SPEED CAN

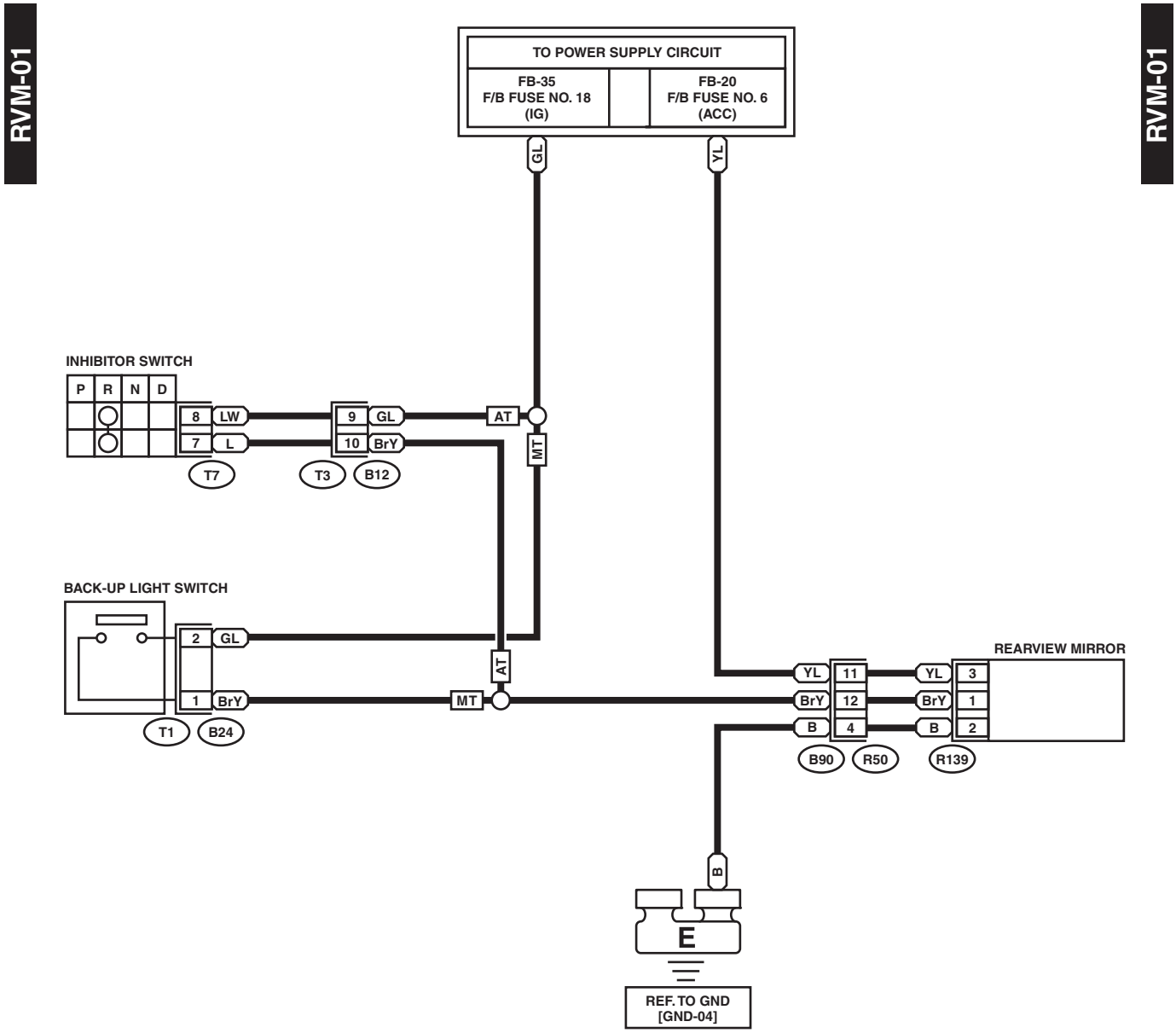


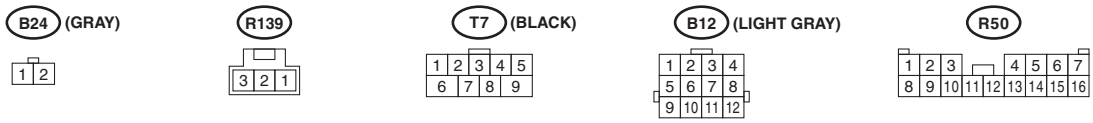


WI-31157

54.Rearview Mirror System

A: WIRING DIAGRAM

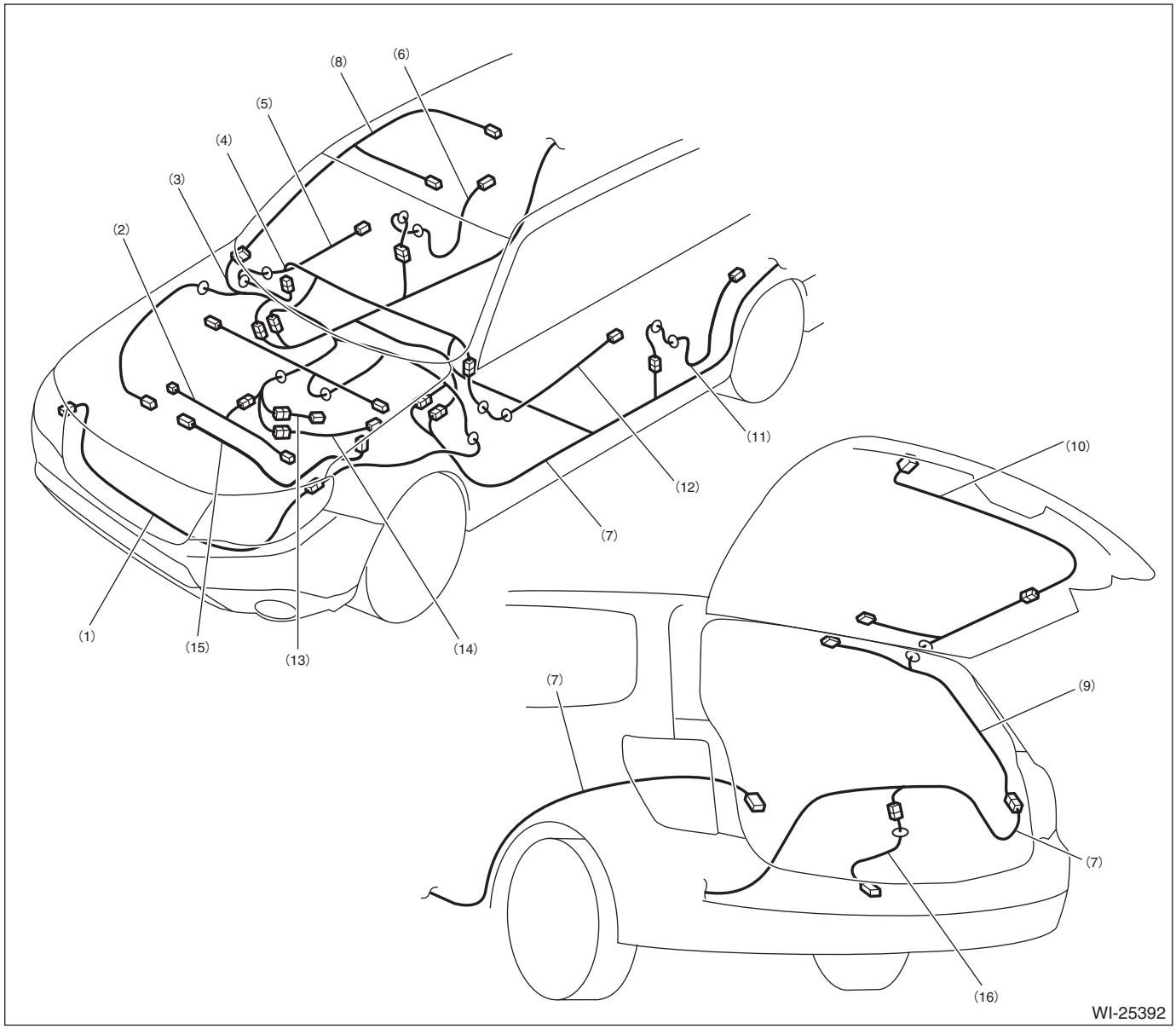




WI-31158

55.Harness Components Location

A: LOCATION



(1) Front wiring harness
(2) Engine wiring harness
(3) Bulkhead wiring harness
(4) Instrument panel wiring harness
(5) Front door cord RH
(6) Rear door cord RH
(7) Rear wiring harness
(8) Roof cord
(9) Rear gate cord No. 1
(10) Rear gate cord No. 2
(11) Rear door cord LH
(12) Front door cord LH
(13) Transmission cord
(14) Rear oxygen sensor cord
(15) Generator cord
(16) Fuel cord

56.Front Wiring Harness

A: LOCATION

Connector				Connecting to	
No.	Pole	Color	Area	No.	Description
F5	1	Black	C-2		Horn
F6	2	Brown	C-1		Front fog light RH
F9	16	★	B-5		Secondary air relay holder (turbo model)
F11	2	★	C-3		Secondary air pump (turbo model)
F16	2	Black	C-1		Sub fan motor (non-turbo model)
		Gray			Sub fan motor (turbo model)
F17	2	Black	C-2		Main fan motor (non-turbo model)
		Gray			Main fan motor (turbo model)
F21	2	Brown	D-3		Front fog light LH
F24	1	★	C-2		Magnet clutch
F25	1	★	C-2		Generator terminal B
F26	3	★	C-2		Generator
F27	22	Black	B-4		Relay holder
F35	12	Blue	B-4		Main fuse box (M/B)
F36	7	★	B-4		
F37	20	★	C-4		
F47	1	Black	C-2		Horn
F58	3	Light gray	C-3		Headlight beam leveler LH
F59	3	Light gray	C-1		Headlight beam leveler RH
F70	2	★	B-4		Main fuse box (M/B)
F78	2	Black	C-2		Ambient sensor
F103	2	Black	B-1		Daytime running light resistor
F108	18	Gray	B-4	B361	Through joint connector
F109	24	★	B-3	B360	
F110	6	★	C-4		Joint connector
F125	8	Light gray	C-3		Front combination light LH
F126	8	Light gray	C-1		Front combination light RH

★: White or natural color

Front Wiring Harness

57.Bulkhead Wiring Harness (In Engine Compartment)

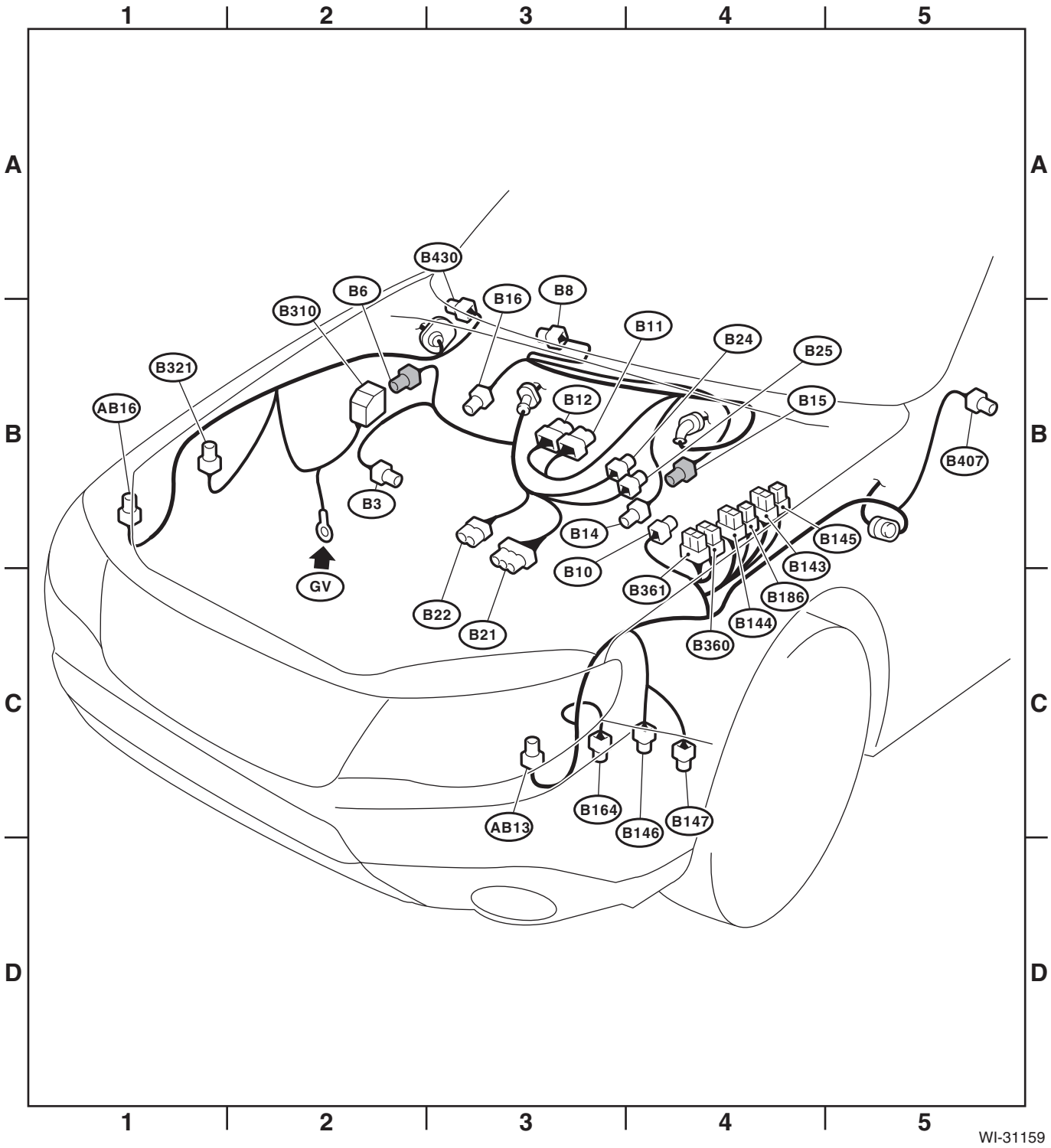
A: LOCATION

1. NON-TURBO MODEL

Connector				Connecting to	
No.	Pole	Color	Area	No.	Description
B3	5	Black	B-2		Mass air flow and intake air temperature sensor
B6	2	Gray	B-2		Front ABS wheel speed sensor RH
B8	5	Light gray	B-3		Front wiper motor
B10	4	Light gray	B-4		Pressure switch
B11	20	Light gray	B-3	T4	Transmission cord
B12	12	Light gray	B-3	T3	
B14	1	Black	B-4		Starter motor
B15	2	Gray	B-4		Front ABS wheel speed sensor LH
B16	2	Gray	B-3		Brake fluid level switch
B21	54	Black	B-3	E2	Engine wiring harness
B22	16	Brown	B-3	E3	Engine wiring harness
B24	2	Gray	B-3	T1	Back-up light switch (MT model)
B25	2	Brown	B-4	T2	Neutral position switch
B143	20	★	B-4		Main fuse box (M/B)
B144	9	Brown	B-4		
B145	7	Brown	B-4		
B146	2	Dark gray	C-4		Front washer motor
B147	2	Dark gray	C-4		Rear washer motor
B164	2	Black	C-3		Keyless buzzer
B186	8	★	B-4		Main fuse box (M/B)
B310	46	Black	B-2		VDC CM
B321	2	★	B-1		Hood switch
B360	16	Gray	B-4	F109	Through joint connector
B361	14	Gray	B-4	F108	
B407	2	Black	B-5		Puddle light LH
B430	2	Black	B-3		Puddle light RH
★: White or natural color					

Connector				Connecting to	
No.	Pole	Color	Area	No.	Description
AB13	2	Yellow	C-3		Front sub sensor LH
AB16	2	Yellow	B-1		Front sub sensor RH

Bulkhead Wiring Harness (In Engine Compartment)

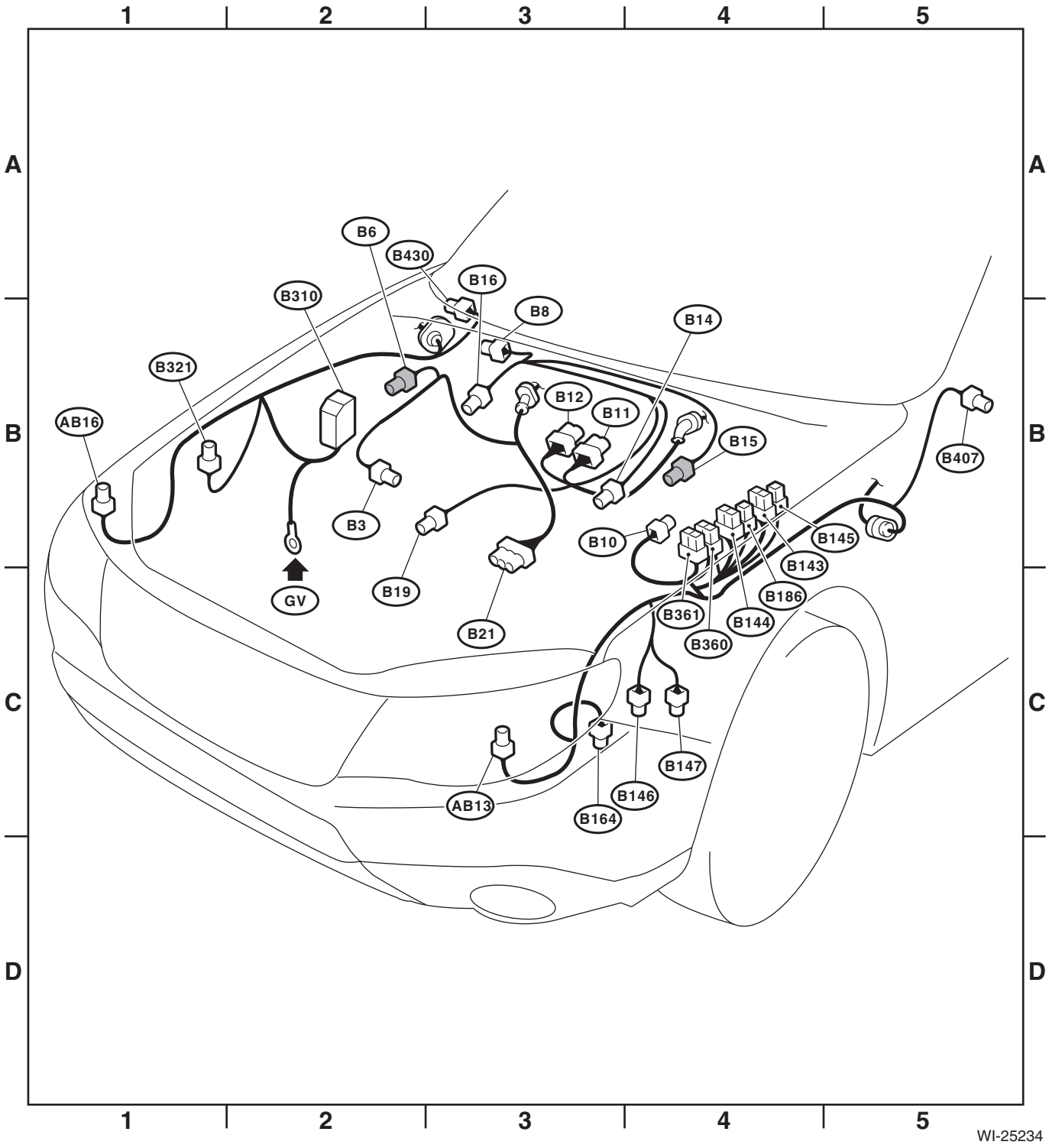


2. TURBO MODEL

Connector				Connecting to	
No.	Pole	Color	Area	No.	Description
B3	5	Black	B-2		Mass air flow and intake air temperature sensor
B6	2	Gray	B-2		Front ABS wheel speed sensor RH
B8	5	Light gray	B-3		Front wiper motor
B10	4	Light gray	B-4		Pressure switch
B11	20	Light gray	B-3	T4	Transmission cord
B12	12	Light gray	B-3	T3	
B14	1	Black	B-3		Starter motor
B15	2	Gray	B-4		Front ABS wheel speed sensor LH
B16	2	Gray	B-3		Brake fluid level switch
B19	4	Light gray	B-3	T5	Rear oxygen sensor cord
B21	54	Black	B-3	E2	Engine wiring harness
B143	20	★	B-4		Main fuse box (M/B)
B144	9	Brown	B-4		
B145	7	Brown	B-4		
B146	2	Dark gray	C-4		Front washer motor
B147	2	Dark gray	C-4		Rear washer motor
B164	2	Black	C-3		Keyless buzzer
B186	8	★	B-4		Main fuse box (M/B)
B310	46	Black	B-2		VDC CM
B321	2	★	B-1		Hood switch
B360	16	Gray	B-4	F109	Through joint connector
B361	14	Gray	B-4	F108	
B407	2	Black	B-5		Puddle light LH
B430	2	Black	B-3		Puddle light RH
★: White or natural color					

Connector				Connecting to	
No.	Pole	Color	Area	No.	Description
AB13	2	Yellow	C-3		Front sub sensor LH
AB16	2	Yellow	B-1		Front sub sensor RH

Bulkhead Wiring Harness (In Engine Compartment)



58.Bulkhead Wiring Harness (In Compartment)

A: LOCATION

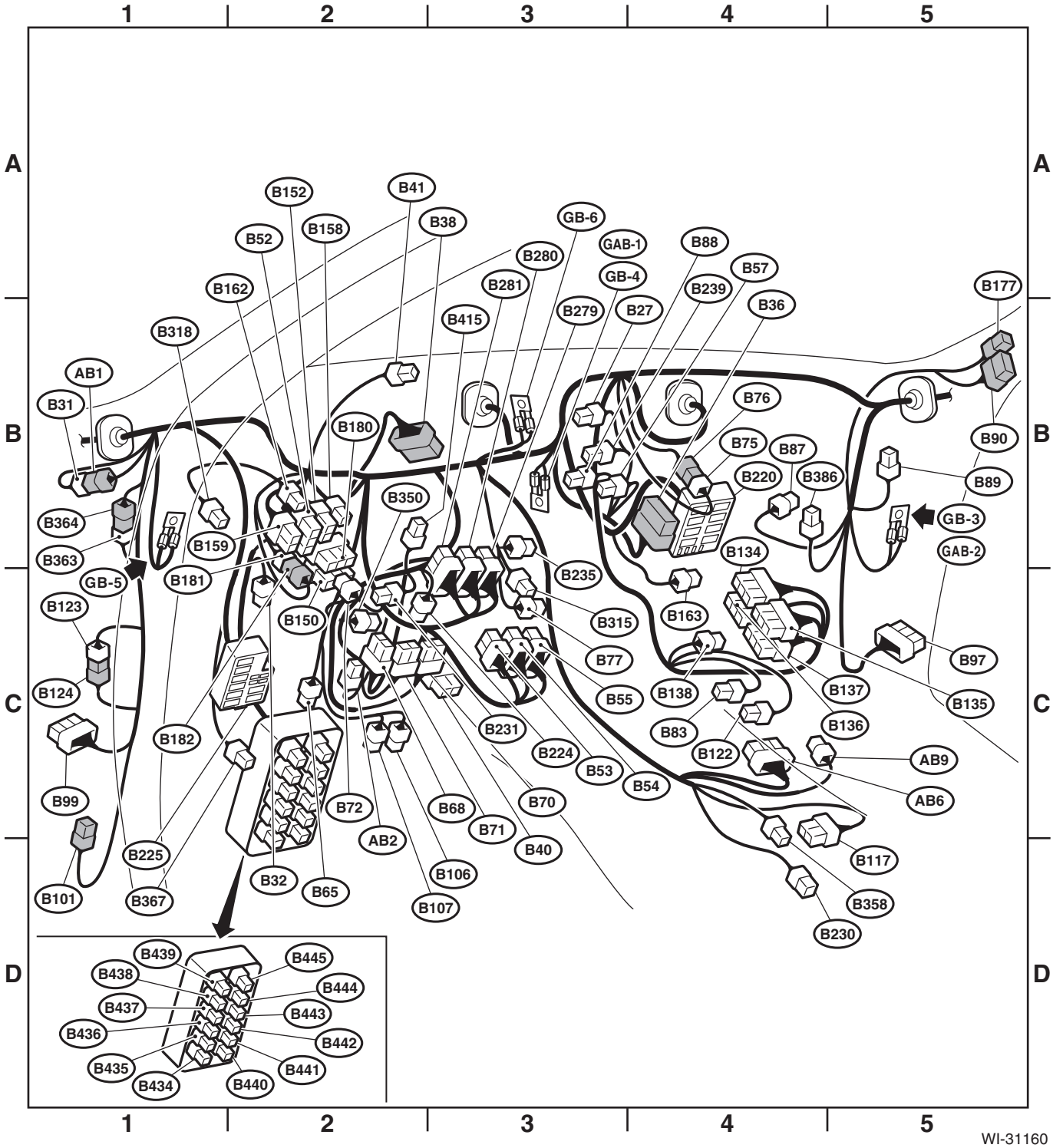
Connector				Connecting to	
No.	Pole	Color	Area	No.	Description
B27	4	★	B-3		Blower Resistor (Manual A/C)
B31	6	★	B-1	AB1	Airbag wiring harness
B32	8	★	C-2		Turn signal and hazard unit
B36	28	★	B-4	i1	Instrument panel wiring harness
B38	28	★	B-2	i3	
B40	16	Black	C-3		Data link connector
B41	2	★	B-2		Power window circuit breaker
B52	24	★	B-2		Fuse & relay box (F/B)
B53	20	★	C-3		Joint connector
B54	35	★	C-3		TCM
B55	35	★	C-3		
B57	4	★	B-3		Power transistor (Auto A/C)
B65	4	Black	C-2		Stop light and brake switch
B68	14	★	C-2		Roll connector
B70	18	★	C-2		Combination switch
B71	17	★	C-2		
B72	6	★	C-2		Ignition switch
B75	2	Green	B-4	B76	Delivery (test) mode connector
B76	2	Green	B-4	B75	
B77	6	Black	C-3		Mode door actuator (Auto A/C)
B83	6	★	C-4		Joint connector (non-turbo model)
	8	★	C-4		Joint connector (turbo model)
B87	2	★	B-4		Blower motor
B88	2	Brown	B-3		Evaporator sensor (Auto A/C)
	3	★	B-3		Evaporator sensor (Manual A/C)
B89	2	Black	B-5		Blower diode
B90	16	★	B-5	R50	Roof cord
B97	24	★	C-5	R1	Rear wiring harness
B99	24	★	C-1	R3	
B101	8	Black	C-1	D11	Front door cord LH
B106	2	★	C-2		Clutch start switch
B107	2	Blue	C-2		Clutch switch
B117	10	Gray	C-4		AT select lever
B122	8	★	C-4		Joint connector
B123	2	Black	C-1	B124	Key lock
B124	2	Black	C-1	B123	
B134	34	★	C-4		ECM
B135	35	★	C-4		
B136	35	★	C-4		
B137	31	★	C-4		
B138	6	★	C-4		Joint connector (non-turbo model)
	8	★	C-4		Joint connector (turbo model)
B150	24	★	C-2		Auto headlight beam leveler CM

Connector				Connecting to	
No.	Pole	Color	Area	No.	Description
B152	10	Gray	B-2		Fuse & relay box (F/B)
B158	8	★	B-2		
B159	9	Brown	B-2		
B162	2	★	B-2		
B163	6	Black	C-4		Intake door actuator
B177	2	★	B-5		Wiper deicer
B180	24	★	B-2		Remote engine start CM
B181	2	★	B-2	B182	Short connector
B182	2	★	C-2	B181	
B220	40	Black	B-4		Fuse (relay block)
					A/F, oxygen sensor relay
					Fuel pump relay
					IG relay (non-turbo model)
					Main relay
					Electronic throttle control relay
B224	2	★	C-2		Key illumination
B225	40	Black	C-2		Fuse (relay block)
					Starter relay
					Front fog light relay
					Power window relay
					Wiper deicer relay
					Tail & Illumination relay
					Seat heater relay
B230	4	Black	D-4		Yaw rate & G sensor
B231	4	Black	C-2		Steering angle sensor
B235	6	★	B-3		Air mix door actuator LH (with left/right independent air conditioner) (auto A/C)
B239	6	Black	B-3		Air mix door actuator (without left/right independent air conditioner) (auto A/C)
					Air mix door actuator RH (with left/right independent air conditioner) (auto A/C)
B279	30	★	B-3		Body integrated unit
B280	26	Dark gray	B-3		
B281	28	★	B-3		
B315	6	Black	C-3		Accelerator pedal position sensor
B318	4	★	B-1		VDC OFF switch
B350	4	★	C-2		Key warning switch & key lock solenoid
B358	2	★	C-4		AT select lever illumination
B363	2	Green	B-1	B364	Test mode sub connector
B364	2	Green	B-1	B363	
B367	8	★	C-2		Impact sensor
B386	7	★	B-4		Blower motor relay
B415	2	Black	B-2		Immobilizer antenna

Connector				Connecting to	
No.	Pole	Color	Area	No.	Description
B434	5	Pink	D-1		Multi joint connector
B435	5	Brown	D-1		
B436	5	Yellow	D-1		
B437	5	Blue	D-1		
B438	5	Gray	D-1		
B439	5	Green	D-1		
B440	5	Orange	D-1		
B441	5	★	D-1		
B442	5	Black	D-2		
B443	5	Red	D-2		
B444	5	Light green	D-2		
B445	5	Violet	D-2		
★: White or natural color					

Connector				Connecting to	
No.	Pole	Color	Area	No.	Description
AB1	6	Yellow	B-1	B31	Bulkhead wiring harness
AB2	4	Yellow	C-2	AB7	Driver's airbag module
AB6	30	Yellow	C-4		Airbag CM
AB9	4	Yellow	C-4		Passenger's airbag module

Bulkhead Wiring Harness (In Compartment)



59.Engine Wiring Harness and Transmission Cord

A: LOCATION

1. NON-TURBO MODEL

Connector				Connecting to	
No.	Pole	Color	Area	No.	Description
E2	54	Black	A-3	B21	Bulkhead wiring harness
E3	16	Brown	A-3	B22	
E4	2	Blue	B-4		Purge control solenoid valve
E5	2	Dark gray	B-2		Fuel injector No. 1
E6	2	Dark gray	A-2		Fuel injector No. 3
E8	2	Black	B-2		Engine coolant temperature sensor
E10	2	Light gray	B-3		Crankshaft position sensor
E11	1	—	B-3		Oil pressure switch
E14	2	Black	B-3		Knock sensor
E16	2	Dark gray	C-4		Fuel injector No. 2
E17	2	Dark gray	B-4		Fuel injector No. 4
E18	6	Dark gray	A-3		EGR control valve
E19	1	★	B-2		Power steering oil pressure switch
E21	3	Black	A-3		Manifold absolute pressure sensor
E22	4	Black	B-1		Rear oxygen sensor
E23	4	Light gray	B-1		Front oxygen (A/F) sensor
E31	3	★	B-2		Ignition coil No. 1
E32	3	★	B-4		Ignition coil No. 2
E33	3	Black	A-2		Ignition coil No. 3
E34	3	Black	B-4		Ignition coil No. 4
E35	3	Light gray	C-3		Intake camshaft position sensor LH
E36	3	Light gray	B-1		Intake camshaft position sensor RH
E37	2	Black	C-3		Intake oil control solenoid LH
E38	2	Black	B-1		Intake oil control solenoid RH
E51	5	Light gray	B-4		Tumble generator valve actuator LH
E55	5	Light gray	A-2		Tumble generator valve actuator RH
E57	6	Black	A-3		Electronic throttle control
E75	2	Black	B-3		Engine oil temperature sensor
★: White or natural color					

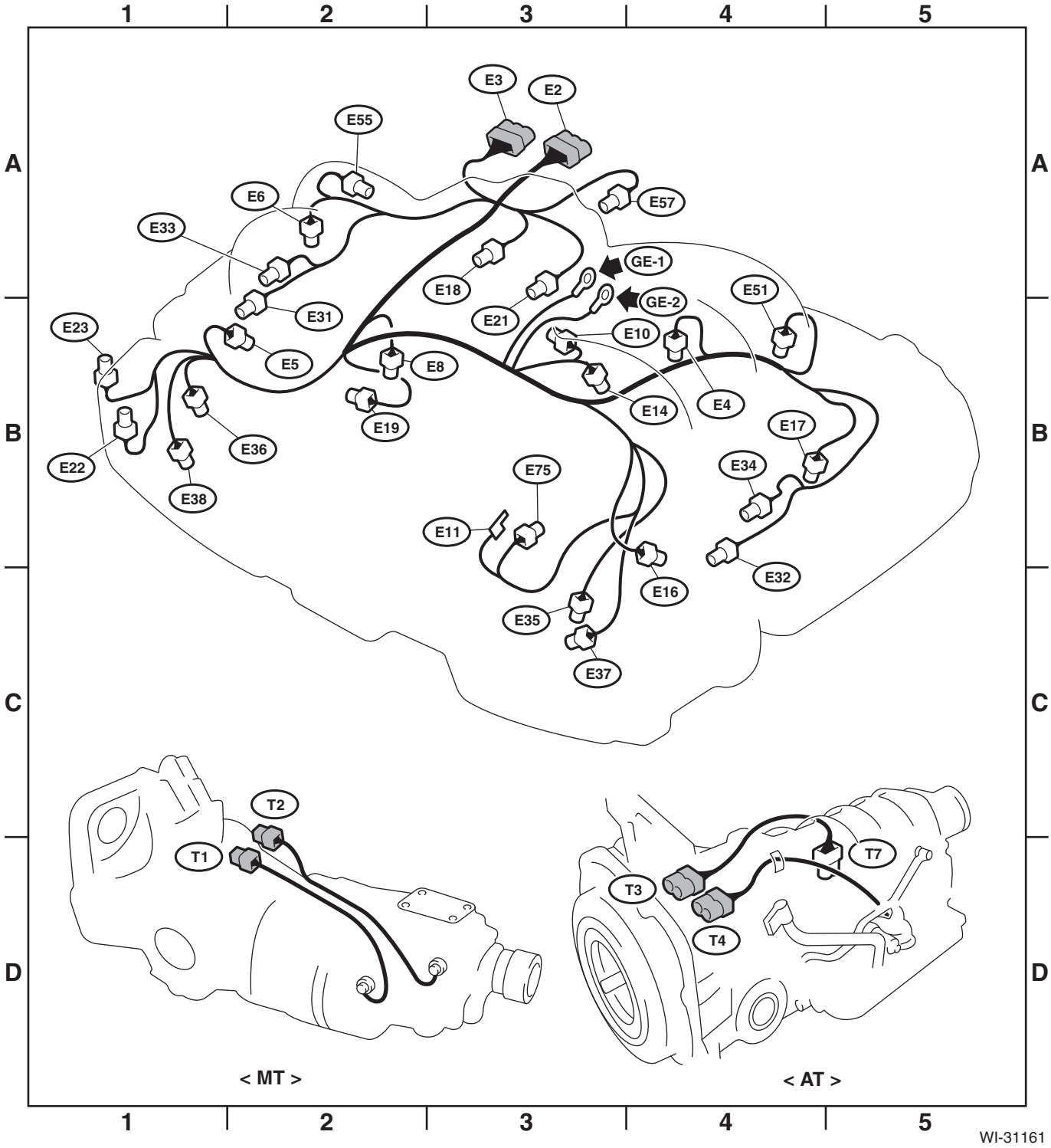
- **MT MODEL**

Connector				Connecting to	
No.	Pole	Color	Area	No.	Description
T1	2	Gray	D-2	B24	Bulkhead wiring harness
T2	2	Brown	D-2	B25	

- **AT MODEL**

Connector				Connecting to	
No.	Pole	Color	Area	No.	Description
T3	12	Black	D-4	B12	Bulkhead wiring harness
T4	20	Light gray	D-4	B11	
T7	9	Black	D-5		Inhibitor switch

Engine Wiring Harness and Transmission Cord



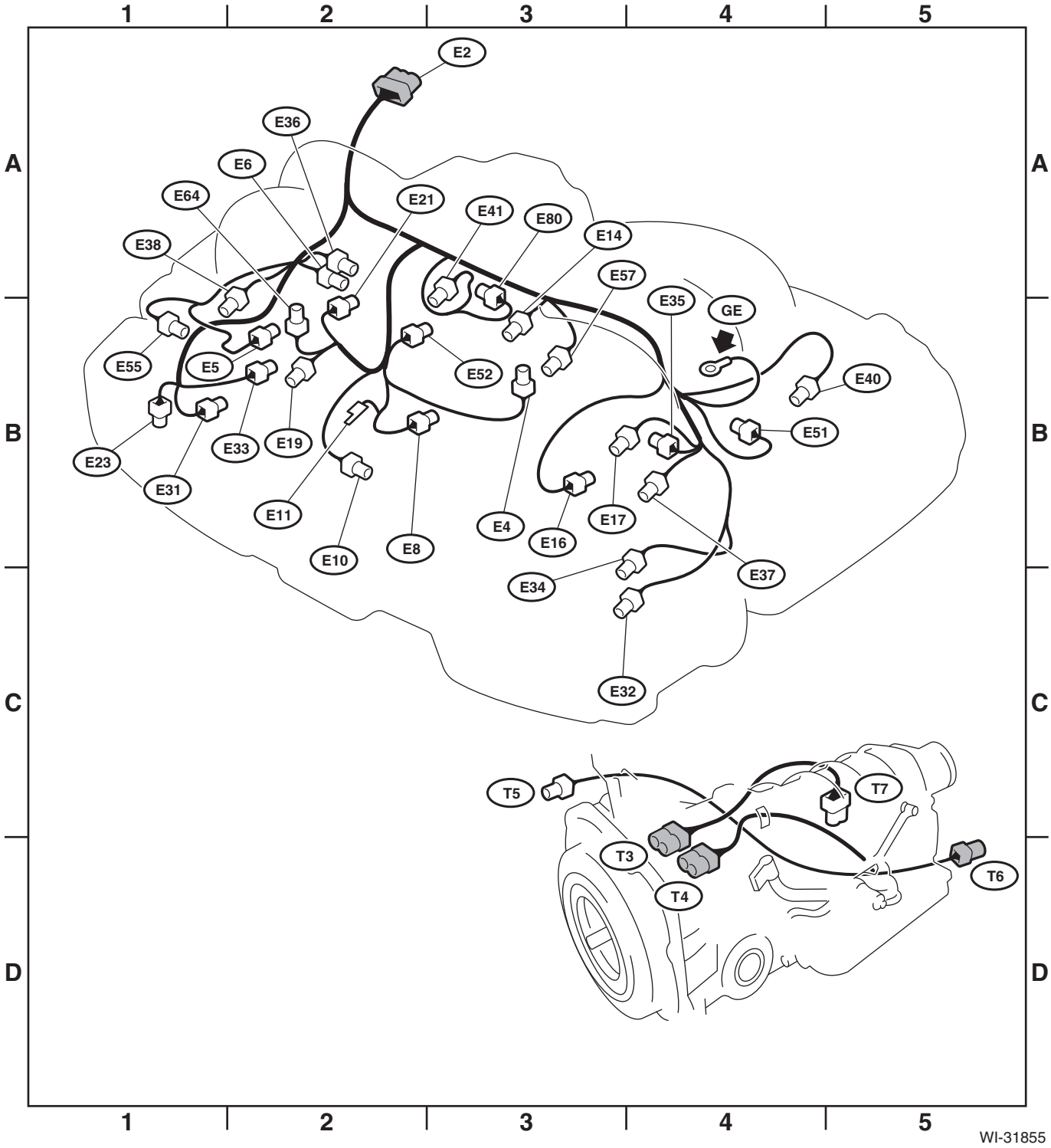
2. TURBO MODEL

Connector				Connecting to	
No.	Pole	Color	Area	No.	Description
E2	54	Black	A-2	B21	Bulkhead wiring harness
E4	2	Black	B-3		Purge control solenoid valve 1
E5	2	Dark gray	B-2		Fuel injector No. 1
E6	2	Dark gray	A-2		Fuel injector No. 3
E8	2	Black	B-2		Engine coolant temperature sensor
E10	2	Light gray	B-2		Crankshaft position sensor
E11	1	—	B-2		Oil pressure switch
E14	2	Light gray	B-3		Knock sensor
E16	2	Dark gray	B-3		Fuel injector No. 2
E17	2	Dark gray	B-3		Fuel injector No. 4
E19	1	★	B-2		Power steering oil pressure switch
E21	3	Black	B-2		Manifold absolute pressure sensor
E23	4	Dark gray	B-1		Front oxygen (A/F) sensor
E31	3	Gray	B-1		Ignition coil No. 1
E32	3	Gray	C-4		Ignition coil No. 2
E33	3	Gray	B-2		Ignition coil No. 3
E34	3	Gray	B-4		Ignition coil No. 4
E35	3	Light gray	B-4		Intake camshaft position sensor LH
E36	3	Light gray	A-2		Intake camshaft position sensor RH
E37	2	Blue	B-4		Intake oil flow control solenoid valve LH
E38	2	Blue	B-2		Intake oil flow control solenoid valve RH
E40	2	Black	B-4		Secondary air combination valve LH
E41	6	Black	A-3		Secondary air combination valve RH
E51	5	Light gray	B-4		Tumble generator valve assembly LH
E52	2	Black	B-2		Purge control solenoid valve 2
E55	5	Light gray	B-1		Tumble generator valve assembly RH
E57	6	Black	B-3		Electronic throttle control
E64	2	Blue	B-2		Wastegate control solenoid valve
E80	2	Dark gray	A-3		Leak diagnosis connector
★: White or natural color					

• AT MODEL

Connector				Connecting to	
No.	Pole	Color	Area	No.	Description
T3	12	Black	D-4	B12	Bulkhead wiring harness
T4	20	Light gray	D-4	B11	
T5	4	Dark gray	C-3	B19	
T6	4	Dark gray	D-5		Rear oxygen sensor
T7	9	Black	C-5		Inhibitor switch

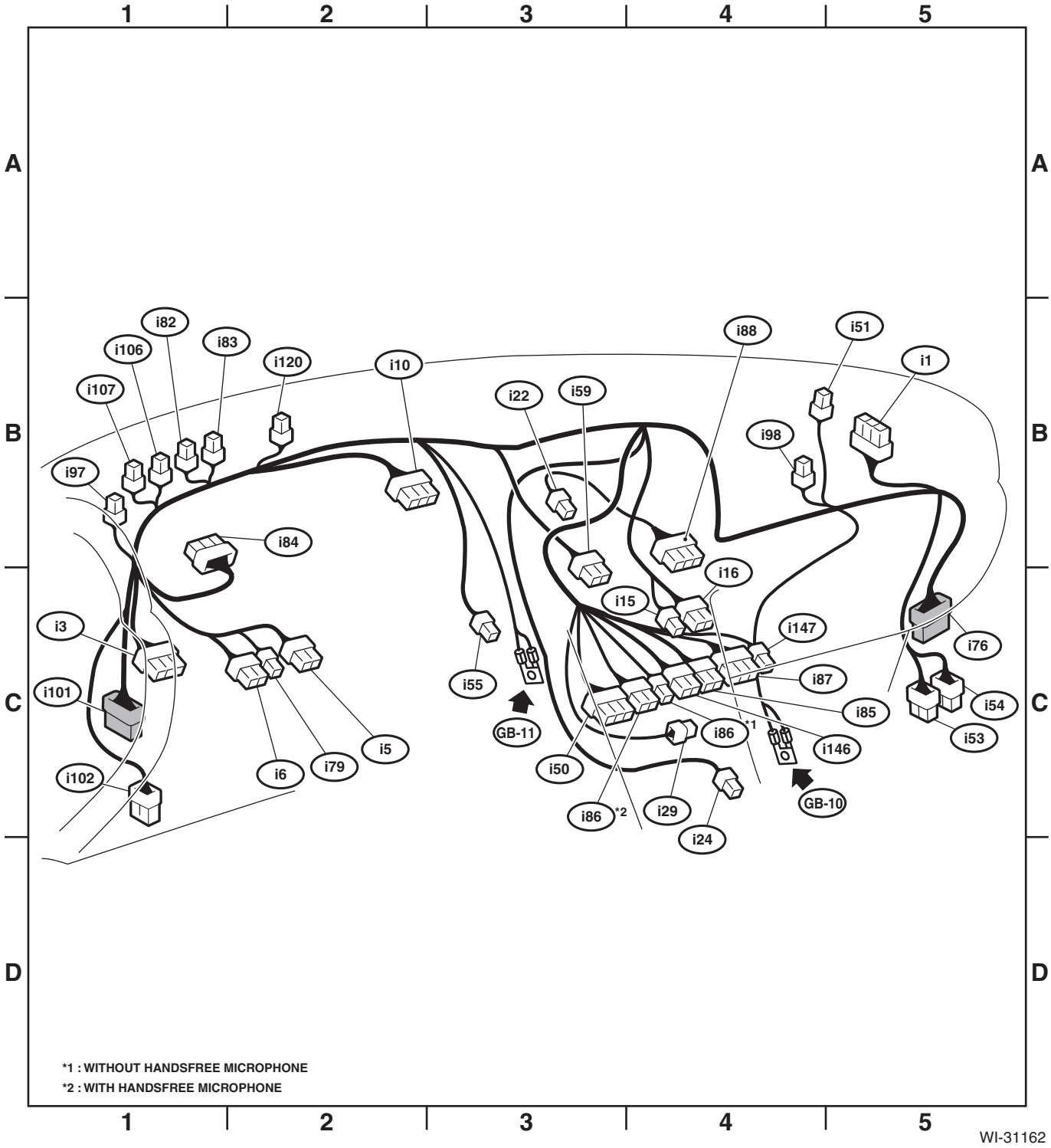
Engine Wiring Harness and Transmission Cord



60.Instrument Panel Wiring Harness

A: LOCATION

Connector				Connecting to	
No.	Pole	Color	Area	No.	Description
i1	28	★	B-5	B36	Bulkhead wiring harness
i3	28	★	C-1	B38	
i5	20	★	C-2		Fuse & relay box (F/B)
i6	10	★	C-2		Remote control mirror switch
i10	40	★	B-2		Combination meter
i15	6	★	C-4		Blower fan switch (Manual A/C)
i16	12	★	C-4		A/C control panel (Manual A/C)
i22	4	★	B-3		Hazard switch
i24	4	★	C-4	AD1	Front accessory power supply socket & pocket light
i29	1	★	C-4		Audio bracket ground (without navigation system)
i50	24	★	C-4		Navigation unit
i51	2	★	B-4		Sunload sensor
i53	16	★	C-5	R98	Rear wiring harness RH
i54	12	★	C-5	R99	Rear wiring harness RH
i55	2	★	C-3		In-vehicle sensor
i59	10	★	C-3		Clock
i76	25	★	C-5	D83	Front door cord RH
i79	6	Gray	C-2		Illumination control switch
i82	4	★	B-1		Joint connector
i83	4	★	B-1		
i84	35	Dark gray	B-1		Body integrated unit
i85	20	★	C-4		Audio
i86	8	★	C-4		Audio (without handsfree microphone)
	16	★	C-4		Audio (with handsfree microphone)
i87	14	★	C-4		Navigation unit
i88	40	★	B-4		A/C control panel (Auto A/C)
i97	4	★	B-1		Joint ground connector
i98	4	★	B-4		
i101	28	★	C-1	D84	Front door cord LH
i102	20	★	C-1	R167	Rear wiring harness LH
i106	4	★	B-1		CAN joint connector
i107	4	★	B-1		
i120	4	★	B-2		Joint connector (with navigation system)
i146	8	★	C-4		Audio (without navigation system)
					Navigation unit (with navigation)
i147	5	★	C-4		Navigation unit
★ White or natural color					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i82
i106
i83
i120
i10
i107
i22
i59
i88
i51
i1
i98
i97
i84
i16
i15
i147
i3
i55
i76
i87
i101
GB-11
i85
i54
i86
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i146
i53
i5
i50
i6
i79
i102
i86
*2
i29
GB-10
i24
*1 : WITHOUT HANDSFREE MICROPHONE
*2 : WITH HANDSFREE MICROPHONE
WI-31162

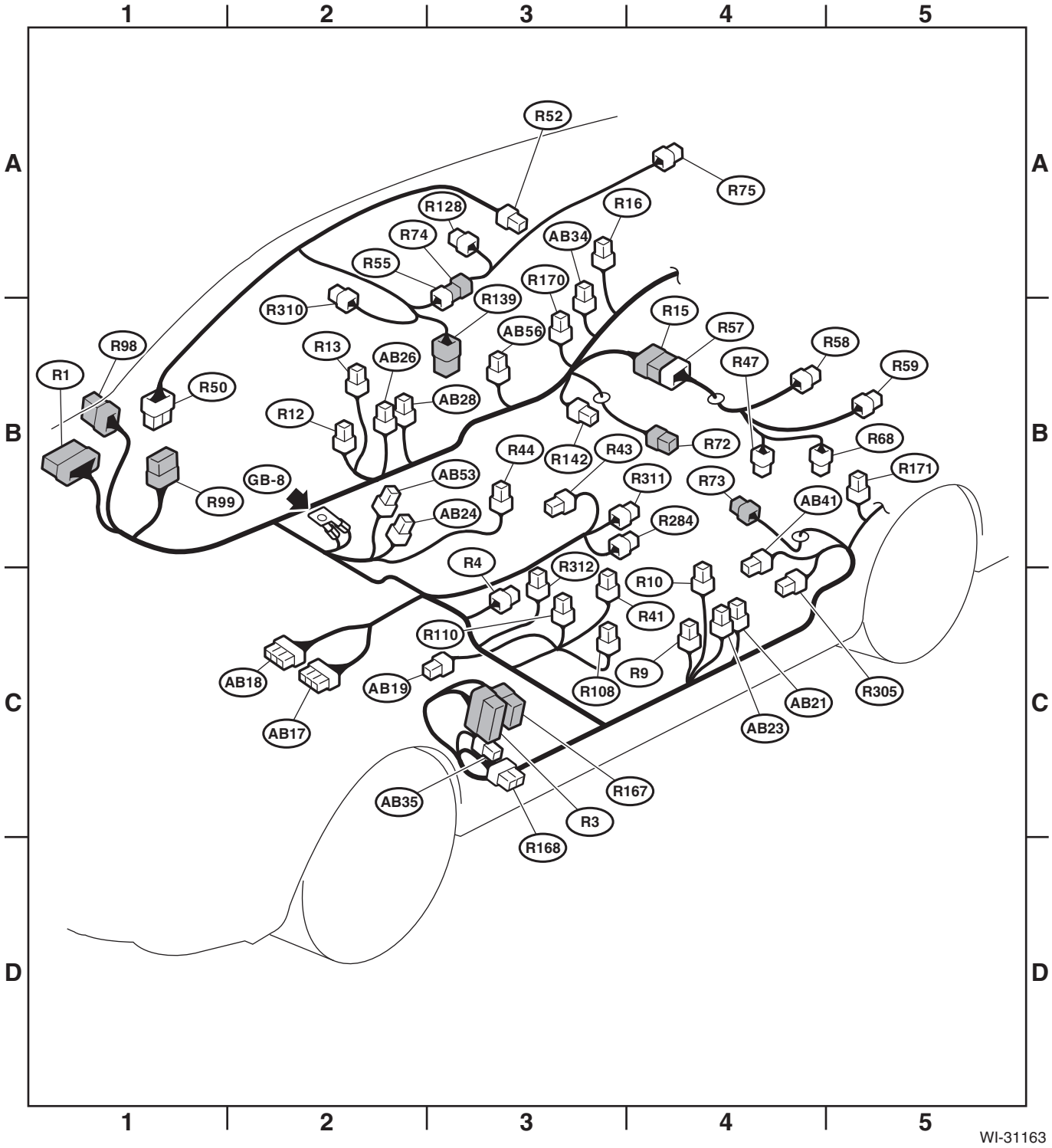
61.Rear Wiring Harness

A: LOCATION

Connector				Connecting to	
No.	Pole	Color	Area	No.	Description
R1	24	★	B-1	B97	Bulkhead wiring harness
R3	24	★	C-3	B99	
R4	1	★	C-3		Parking brake switch
R9	3	★	C-4		Front door switch LH
R10	8	★	C-4	D22	Rear door cord LH
R12	3	★	B-2		Front door switch RH
R13	8	★	B-2	D28	Rear door cord RH
R15	12	★	B-4	R57	Fuel cord
R16	3	★	A-3		Rear door switch RH
R41	4	★	C-3		Seat heater LH
R43	8	★	B-3		Seat heater switch
R44	4	★	B-3		Seat heater RH
R47	3	Black	B-4		Fuel tank pressure sensor
R50	16	★	B-1	B90	Bulkhead wiring harness
R52	3	★	A-3		Room light
R55	2	★	A-3	R74	Sunroof cord
R57	12	★	B-4	R15	Rear wiring harness
R58	6	Gray	B-4		Fuel pump ASSY
R59	2	★	B-5		Fuel sub level sensor
R68	2	Dark gray	B-4		Pressure control solenoid valve
R72	2	Gray	B-4		Rear ABS wheel speed sensor RH
R73	2	Gray	B-4		Rear ABS wheel speed sensor LH
R74	2	★	A-3	R55	Roof cord
R75	6	★	A-4		Sunroof motor assembly
R98	16	★	B-1	i53	Instrument panel wiring harness
R99	12	★	B-1	i54	
R108	4	★	C-3		Seat belt switch LH
R110	2	Black	C-3		Power seat LH
R128	5	★	A-3		Sunroof switch
R139	3	★	B-3		Rear view mirror
R142	2	Black	B-3		Fuel pump condenser
R167	20	★	C-3	i102	Instrument panel wiring harness
R168	20	★	C-3		Fuse & relay box (F/B)
R170	2	★	B-3		Remote control back rest actuator RH
R171	2	★	B-5		Remote control back rest actuator LH
R284	6	★	B-3		AUX input terminal
R305	2	★	C-4		Cup holder
R310	8	★	B-2		Spot map light (handsfree microphone)
R311	2	★	B-3		Rear accessory power supply socket (console)
R312	6	★	C-3		Sub woofer
★: White or natural color					

Connector				Connecting to	
No.	Pole	Color	Area	No.	Description
AB17	24	Yellow	C-2		Airbag CM
AB18	24	Yellow	C-2		
AB19	4	Yellow	C-3		Side airbag module LH
AB21	2	Black	C-4		Pretensioner LH
AB23	4	Yellow	C-4		Side airbag sensor LH
AB24	4	Yellow	B-2		Side airbag module RH
AB26	2	Black	B-2		Pretensioner RH
AB28	4	Yellow	B-2		Side airbag sensor RH
AB34	4	Yellow	A-3		Curtain airbag sensor RH
AB35	2	Black	C-3		Fuse & relay box (F/B)
AB41	2	Yellow	B-4		Satellite safing sensor
AB53	6	Gray	B-2		Occupant detection control module
AB56	3	Brown	B-3		Belt tension sensor

Rear Wiring Harness

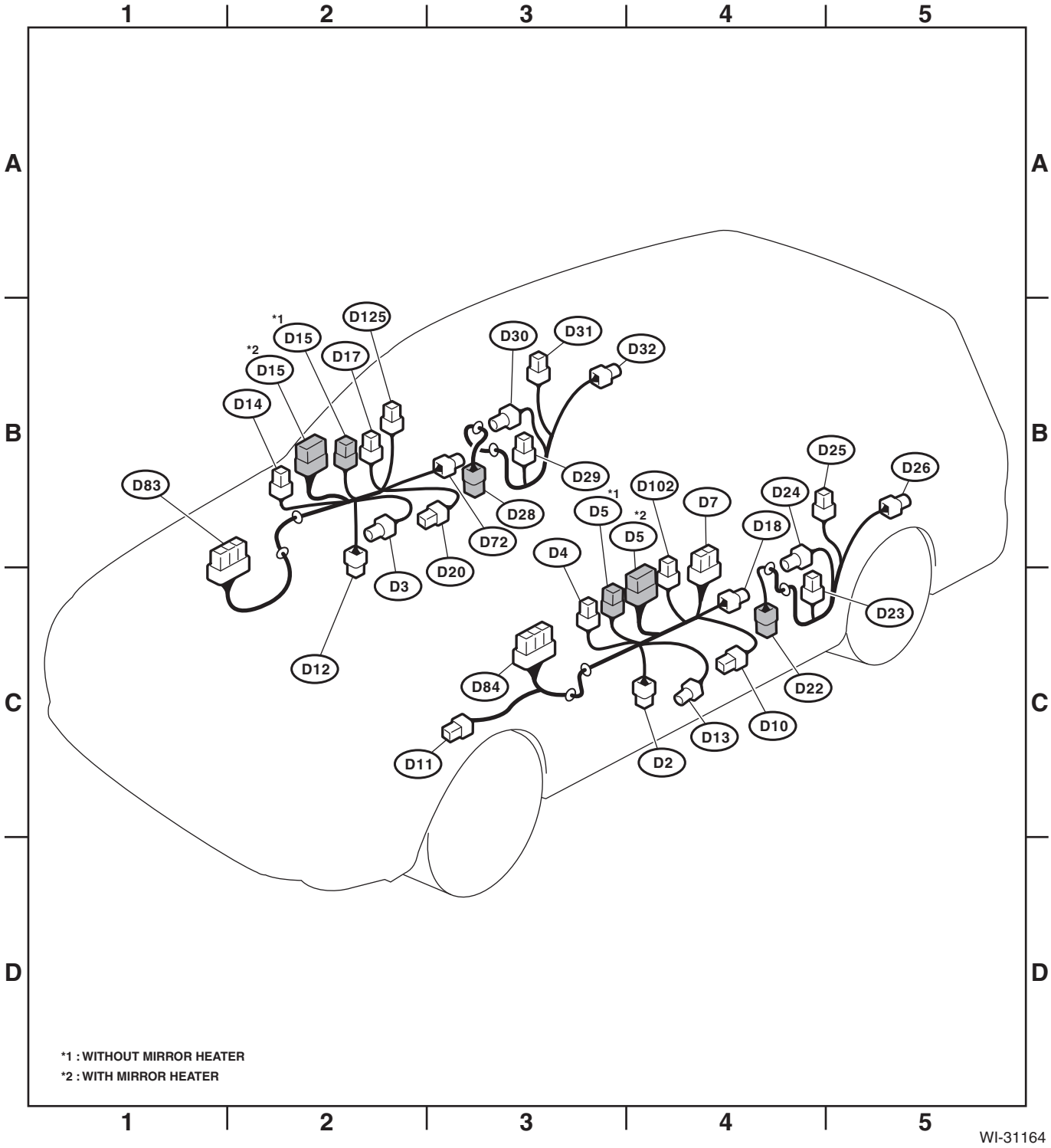


62.Door Cord

A: LOCATION

Connector				Connecting to	
No.	Pole	Color	Area	No.	Description
D2	2	★	C-4		Front door speaker LH
D3	6	★	B-2		Front power window motor RH
D4	2	Black	C-3		Front door tweeter LH
D5	8	★	C-3		Outer mirror assembly LH (without mirror heater)
	10	★	C-3		Outer mirror assembly LH (with mirror heater)
D7	16	★	B-4		Power window main switch
D10	2	★	C-4		Door step light LH
D11	8	Black	C-3	B101	Bulkhead wiring harness
D12	2	★	B-2		Front door speaker RH
D13	6	Dark gray	C-4		Front power window motor LH
D14	2	Black	B-2		Front door tweeter RH
D15	8	★	B-2		Outer mirror assembly RH (without mirror heater)
	10	★	B-2		Outer mirror assembly RH (with mirror heater)
D17	8	★	B-2		Front power window sub-switch
D18	2	★	C-4		Front door lock actuator LH
D20	2	★	B-3		Door step light RH
D22	8	★	C-4	R10	Rear wiring harness
D23	2	★	C-4		Rear door speaker LH
D24	6	★	B-4		Rear power window motor LH
D25	8	★	B-4		Rear power window sub-switch LH
D26	2	★	B-5		Rear door lock actuator LH
D28	8	★	B-3	R13	Rear wiring harness
D29	2	★	B-3		Rear door speaker RH
D30	6	★	B-3		Rear power window motor RH
D31	8	★	B-3		Rear power window sub-switch RH
D32	2	★	B-3		Rear door lock actuator RH
D72	2	★	B-3		Front door lock actuator RH
D83	25	★	B-2	i76	Instrument panel wiring harness
D84	28	★	C-3	i101	
D102	3	★	C-4		Power window main switch
D125	5	★	B-2		Passenger's seat door lock switch
★: White or natural color					

Door Cord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D15
D125
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D30
D31
D32
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D83
D28
D72
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D20
D12
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D102
D5
*2
D5
D7
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D18
D24
D25
D26
D23
D84
D22
D10
D13
D11
D2
*1 : WITHOUT MIRROR HEATER
*2 : WITH MIRROR HEATER
WI-31164

63.Rear Wiring Harness and Rear Gate Cord

A: LOCATION

Connector				Connecting to	
No.	Pole	Color	Area	No.	Description
R22	3	★	C-1		Rear door switch LH
R26	6	Black	C-5		Rear combination light RH
R28	6	Light gray	C-2		Rear combination light LH
R29	3	Black	C-3		Rear vehicle height sensor
R32	2	★	C-2		Rear accessory power supply socket (luggage room)
R38	8	★	C-4	D34	Rear gate cord
R39	14	Gray	B-4	D35	
R79	8	★	C-2		Trailer connector
R80	8	★	C-1		Keyless entry CM
R86	2	Black	C-3		Drain valve
R97	1	★	C-2		Antenna amplifier
R122	10	★	C-4		Fuel pump CM
R172	5	★	C-4		Remote control back rest switch RH
R173	5	★	C-2		Remote control back rest switch LH
R221	12	★	C-1		TPMS & keyless entry CM
R285	6	★	C-2	D36	Rear gate cord (rearview camera)
R400	8	Gray	C-3		ELCM
★: White or natural color					

Connector				Connecting to	
No.	Pole	Color	Area	No.	Description
D34	8	★	B-4	R38	Rear wiring harness
D35	14	★	B-4	R39	
D36	6	★	C-2	R285	Rear wiring harness
D37	3	★	C-4		Luggage room light
D39	2	★	B-3		High-mounted stop light
D43	4	★	B-4		Rear wiper motor
D44	2	★	B-4		License plate light
D46	4	★	A-4		Rear gate lock actuator & latch switch
D48	1	★	B-3		Rear defogger (–)
D80	12	★	B-4	D81	Rear gate cord
D81	12	★	B-5	D80	
D85	7	★	B-4		Rearview camera
D89	1	★	B-4		Rear defogger (+)
D99	6	★	B-4		Rear gate opener button
D103	4	★	A-3	D104	License plate light cord
D104	4	★	A-3	D103	Rear gate cord (rearview camera)
★: White or natural color					

Connector				Connecting to	
No.	Pole	Color	Area	No.	Description
AB31	2	Black	C-2		Curtain airbag module LH
AB32	4	Yellow	C-1		Curtain airbag sensor LH
AB33	2	Black	C-4		Curtain airbag module RH

Rear Wiring Harness and Rear Gate Cord