

COOLING

1. General Description

A: SPECIFICATION

Specifications for STI model are same as turbo model. <Ref. to CO(H4DOTC)-2, General Description.>

EMISSION CONTROL
(AUX. EMISSION CONTROL DEVICES)

General Description

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

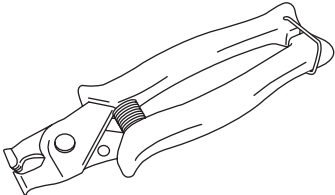
1. General Description

A: CAUTION

- Wear work clothing, including a cap, protective goggles and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.

- Be careful not to burn your hands, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

B: PREPARATION TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18353AA000	18353AA000	CLAMP PLIERS	Used for removing and installing PCV hose.

Front Catalytic Converter

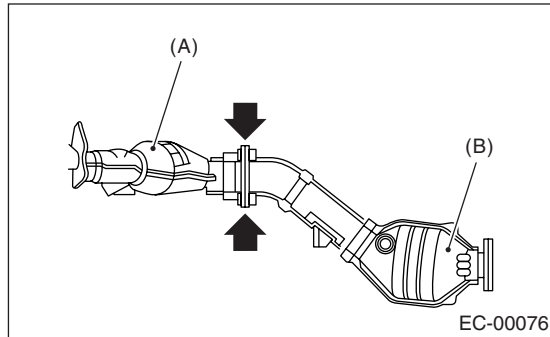
EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

2. Front Catalytic Converter

A: REMOVAL

1) Remove the center exhaust pipe. <Ref. to EX(H4DOTC)-10, REMOVAL, Center Exhaust Pipe.>

2) Separate the front catalytic converter (A) from rear catalytic converter (B).



B: INSTALLATION

Install in the reverse order of removal.

NOTE:

Replace the gaskets with new ones.

C: INSPECTION

1) Make sure there are no exhaust leaks from connections and welds.

2) Make sure there are no holes or rusting.

Rear Catalytic Converter

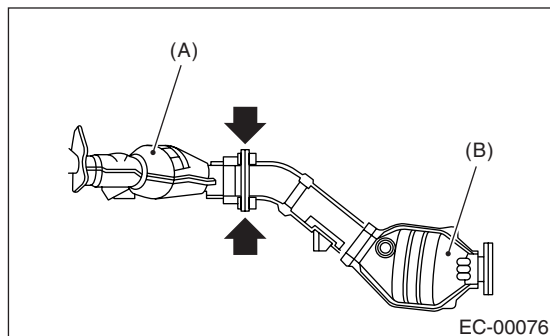
EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

3. Rear Catalytic Converter

A: REMOVAL

1) Remove the center exhaust pipe. <Ref. to EX(H4DOTC)-10, REMOVAL, Center Exhaust Pipe.>

2) Separate the rear catalytic converter (B) from front catalytic converter (A).



B: INSTALLATION

Install in the reverse order of removal.

NOTE:

Replace the gaskets with new ones.

C: INSPECTION

1) Make sure there are no exhaust leaks from connections and welds.

2) Make sure there are no holes or rusting.

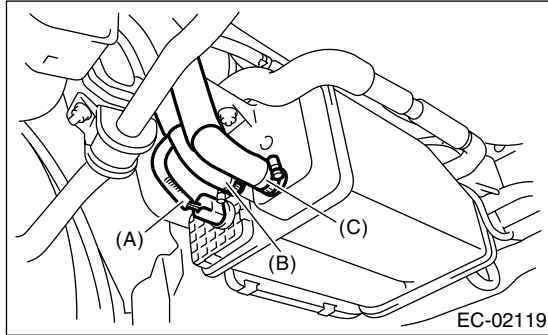
Canister

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

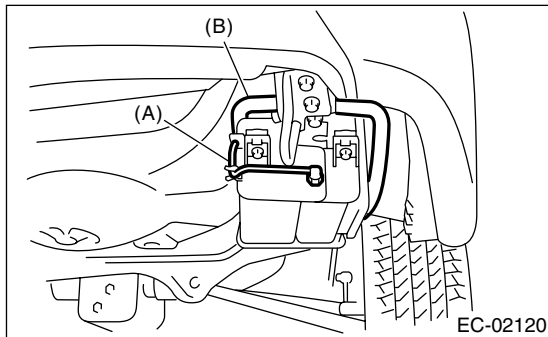
4. Canister

A: REMOVAL

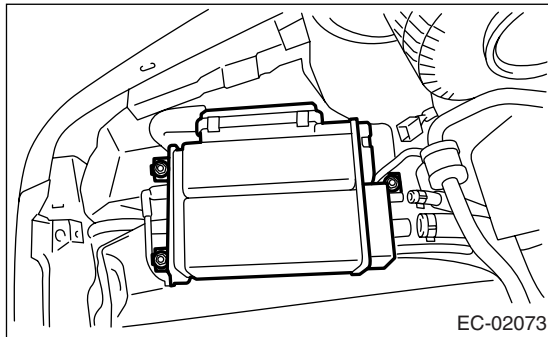
- 1) Disconnect the ground cable from battery.
- 2) Lift up the vehicle.
- 3) Disconnect connector (A) from drain valve.
- 4) Disconnect evaporation hoses (B) and (C) from canister.



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



- 7) Remove the canister from vehicle.



B: INSTALLATION

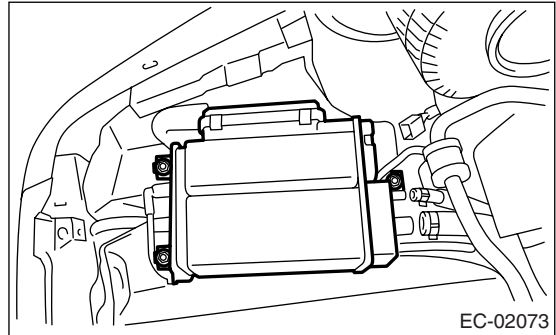
Install in the reverse order of removal.

NOTE:

Replace the retainer of quick connector with new one.

Tightening torque:

23 N·m (2.3 kgf-m, 17 ft-lb)



C: INSPECTION

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

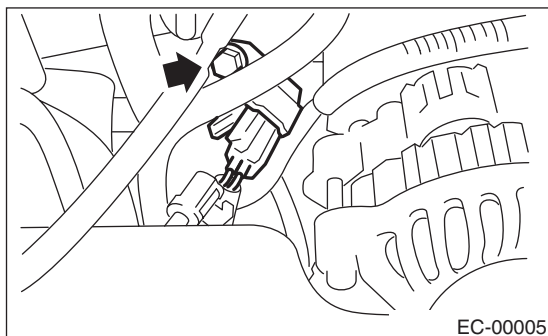
Purge Control Solenoid Valve

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

5. Purge Control Solenoid Valve

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Disconnect the connector and hoses from purge control solenoid valve.
- 3) Remove the bolt which installs the purge control solenoid valve onto intake manifold.

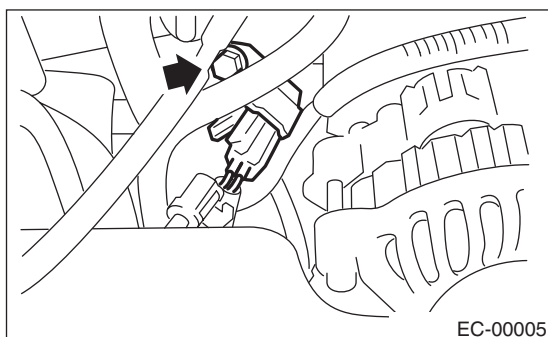


B: INSTALLATION

Install in the reverse order of removal.

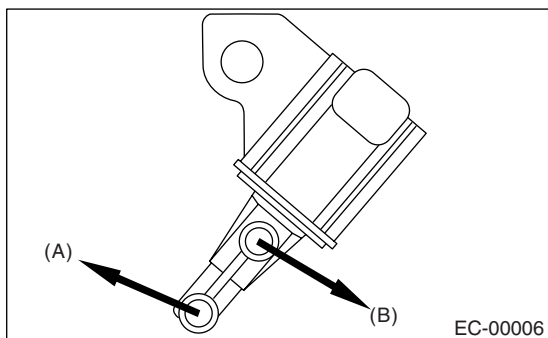
Tightening torque:

16 N·m (1.6 kgf-m, 11.6 ft-lb)



NOTE:

Connect the evaporation hoses as shown in the figure.



(A) To purge valve

(B) To intake manifold

C: INSPECTION

Make sure the hoses are not cracked or loose.

6. Fuel Level Sensor

A: REMOVAL

For work procedures, refer to FU(STI) section.
<Ref. to FU(STI)-54, REMOVAL, Fuel Level Sensor.>

B: INSTALLATION

For work procedures, refer to FU(STI) section.
<Ref. to FU(STI)-54, INSTALLATION, Fuel Level Sensor.>

7. Fuel Temperature Sensor

A: REMOVAL

Fuel temperature sensor and fuel level sensor are integrated into one unit; therefore, the removal procedure is the same as that for fuel level sensor. <Ref. to FU(STI)-54, REMOVAL, Fuel Level Sensor.>

B: INSTALLATION

Fuel temperature sensor and fuel level sensor are integrated into one unit; therefore, the installation procedure is the same as that for fuel level sensor. <Ref. to FU(STI)-54, INSTALLATION, Fuel Level Sensor.>

Fuel Sub Level Sensor

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

8. Fuel Sub Level Sensor

A: REMOVAL

For removal procedures, refer to FU(STI) section.
<Ref. to FU(STI)-55, REMOVAL, Fuel Sub Level Sensor.>

B: INSTALLATION

For installation procedures, refer to FU(STI) section.
<Ref. to FU(STI)-56, INSTALLATION, Fuel Sub Level Sensor.>

Fuel Tank Pressure Sensor

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

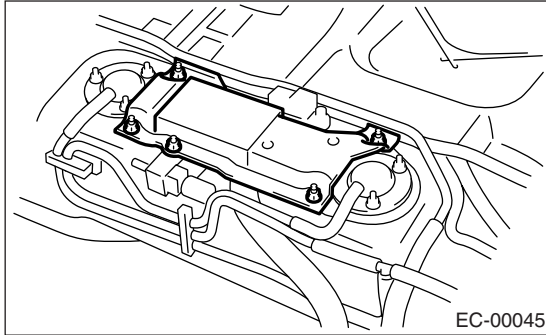
9. Fuel Tank Pressure Sensor

A: REMOVAL

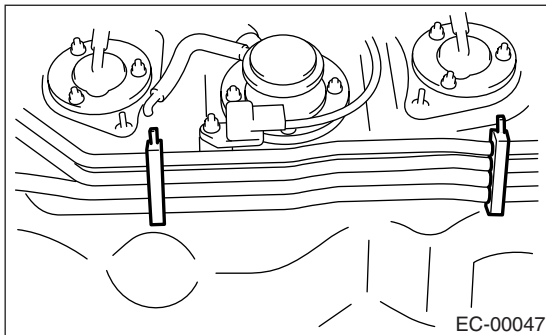
WARNING:

- Place “NO FIRE” signs near the working area.
- Be careful not to spill fuel on the floor.

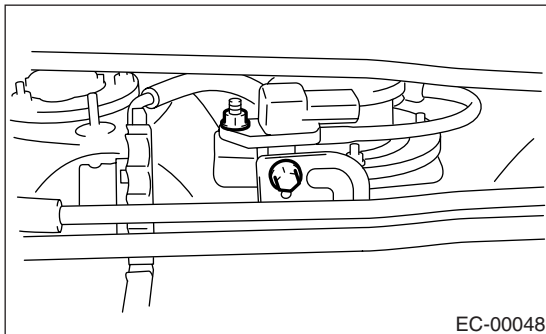
- 1) Remove the fuel tank. <Ref. to FU(STI)-45, REMOVAL, Fuel Tank.>
- 2) Remove the protector cover.



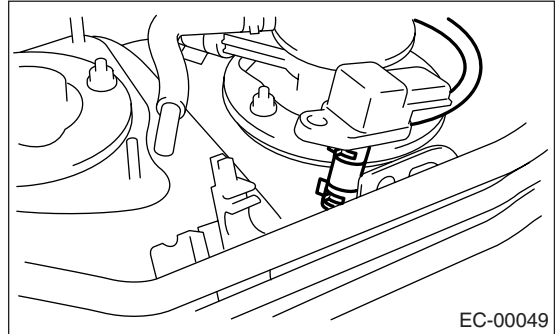
- 3) Disconnect the connector from fuel tank pressure sensor.
- 4) Release the clips which hold fuel pipes onto fuel tank.



- 5) Remove the bolt and nut which hold the fuel tank pressure sensor onto the bracket.



- 6) Disconnect the pressure hose from fuel tank pressure sensor.

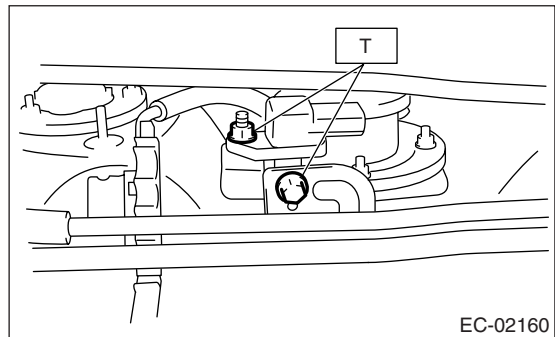


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

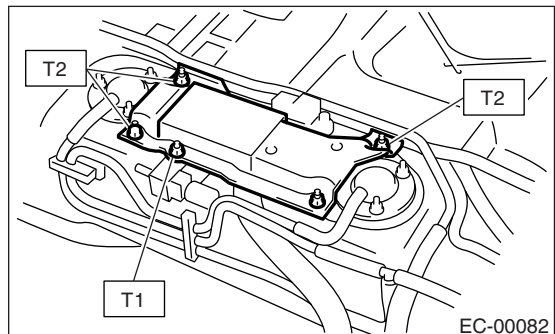
7.4 N·m (0.75 kgf-m, 5.4 ft-lb)



Tightening torque:

T1: 7.4 N·m (0.75 kgf-m, 5.4 ft-lb)

T2: 4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



C: INSPECTION

Make sure the hoses are not cracked or loose.

10. Fuel Tank Sensor Control Valve

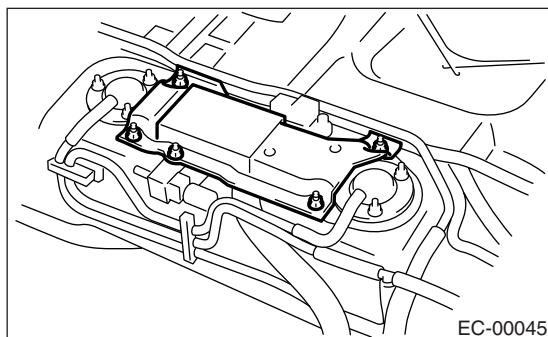
A: REMOVAL

WARNING:

- Place “NO FIRE” signs near the working area.
- Be careful not to spill fuel on the floor.

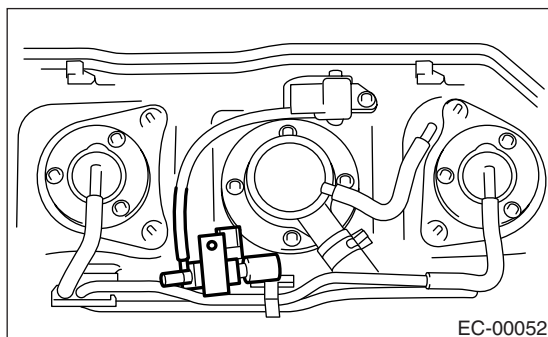
1) Remove the fuel tank. <Ref. to FU(STI)-45, REMOVAL, Fuel Tank.>

2) Remove the protector cover.



3) Disconnect the connector from fuel tank sensor control valve.

4) Disconnect hose and remove fuel tank sensor control valve.



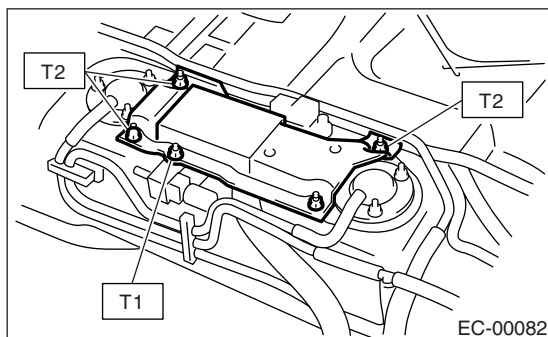
B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

T1: 7.4 N·m (0.75 kgf-m, 5.4 ft-lb)

T2: 4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



C: INSPECTION

Make sure the hoses are not cracked or loose.

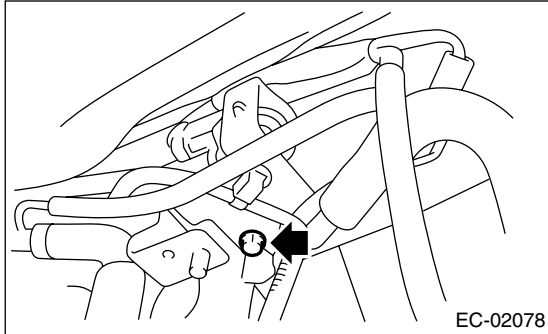
Pressure Control Solenoid Valve

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

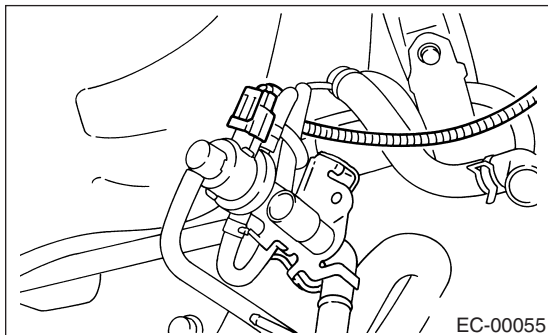
11. Pressure Control Solenoid Valve

A: REMOVAL

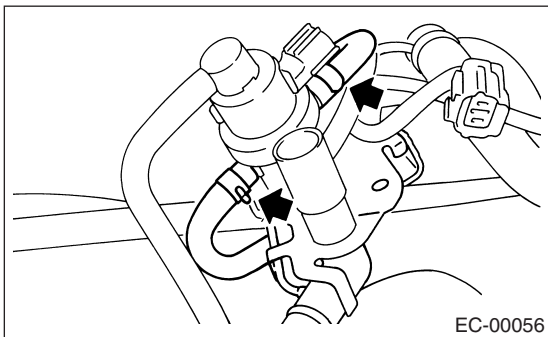
- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from battery.
- 3) Lift up the vehicle.
- 4) Remove the canister. <Ref. to EC(STI)-5, REMOVAL, Canister.>
- 5) Remove the bolt which installs the pressure control solenoid valve holding bracket on body.



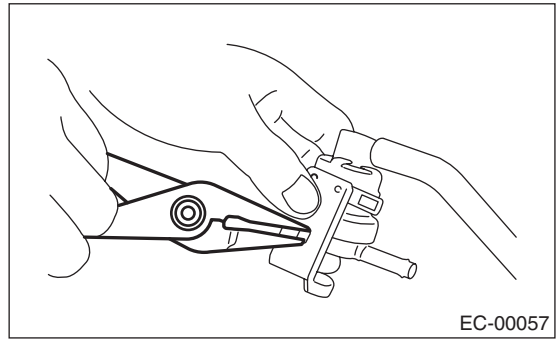
- 6) Remove the pressure control solenoid valve with bracket.
- 7) Disconnect the connector from pressure control solenoid valve.



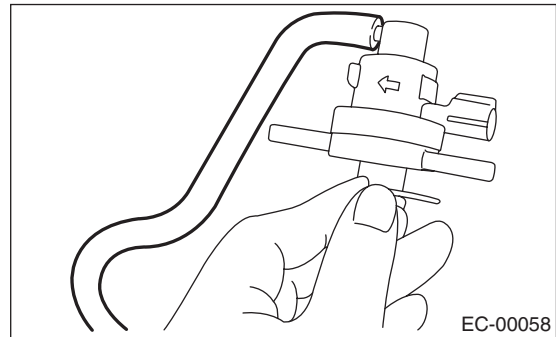
- 8) Disconnect the two evaporation hoses from pressure control solenoid valve.



- 9) Remove the pressure control solenoid valve from bracket.



- 10) Disconnect the pressure control valve hose from pressure control solenoid valve.

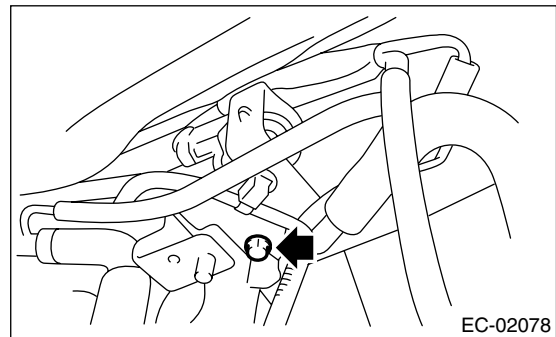


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

25 N·m (2.6 kgf-m, 18.8 ft-lb)



C: INSPECTION

Make sure the hoses are not cracked or loose.

12.Drain Filter

A: SPECIFICATION

Drain filter is built in the canister, and it is a part which cannot be disassembled.

Vent Valve

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

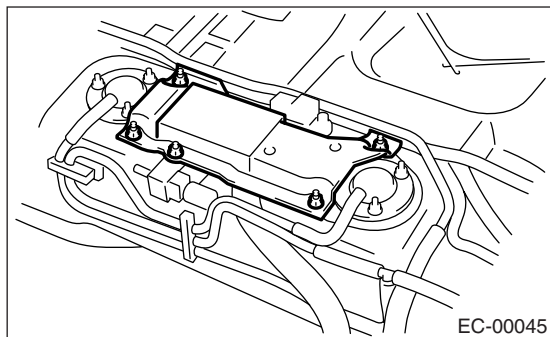
13.Vent Valve

A: REMOVAL

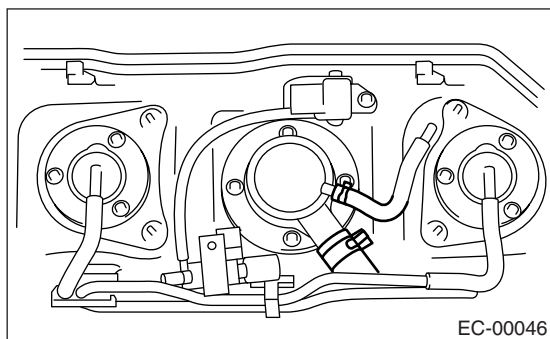
WARNING:

- Place “NO FIRE” signs near the working area.
- Be careful not to spill fuel on the floor.

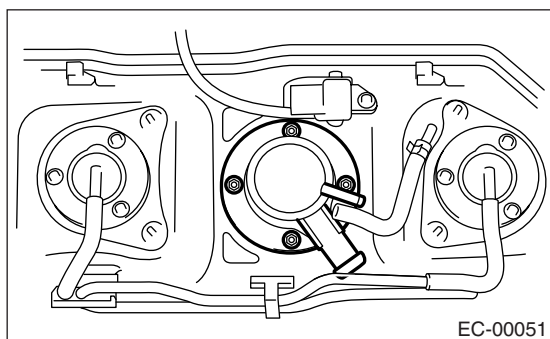
- 1) Remove the fuel tank. <Ref. to FU(STI)-45, REMOVAL, Fuel Tank.>
- 2) Remove the protector cover.



- 3) Remove the clips, and disconnect the hoses from vent valve.



- 4) Remove the nuts and then remove the vent valve.



B: INSTALLATION

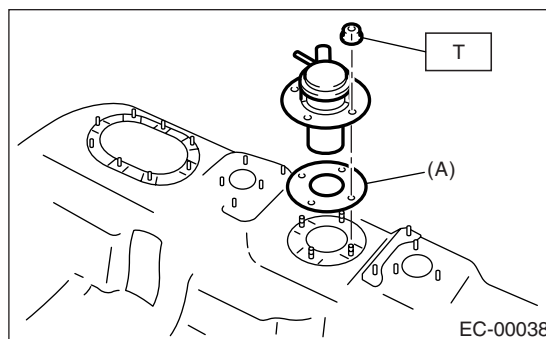
Install in the reverse order of removal.

NOTE:

Use a new gasket.

Tightening torque:

T: 4.4 N·m (0.45 kgf-m, 3.3 ft-lb)

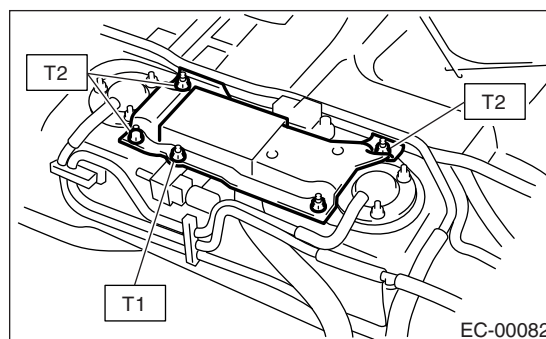


(A) Gasket

Tightening torque:

T1: 7.4 N·m (0.75 kgf-m, 5.4 ft-lb)

T2: 4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



C: INSPECTION

Make sure the hoses are not cracked or loose.

Shut Valve

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

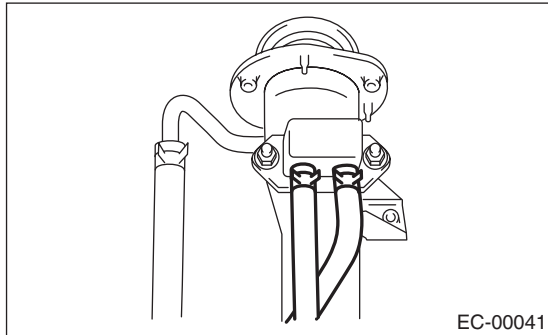
14.Shut Valve

A: REMOVAL

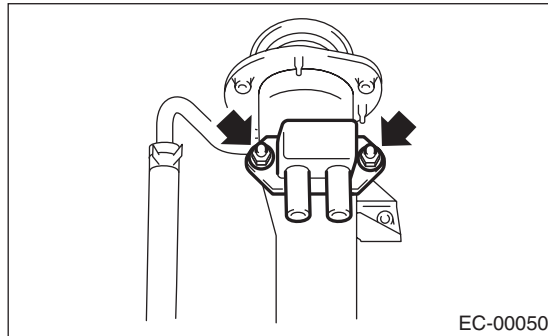
WARNING:

- Place “NO FIRE” signs near the working area.
- Be careful not to spill fuel on the floor.

- 1) Remove the fuel filler pipe. <Ref. to FU(STI)-48, REMOVAL, Fuel Filler Pipe.>
- 2) Disconnect the evaporation hoses from shut valve.



- 3) Remove the shut valve from fuel filler pipe.

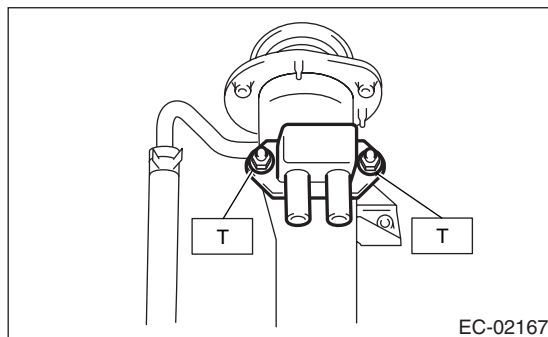


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

4.5 N·m (0.46 kgf-m, 3.3 ft-lb)



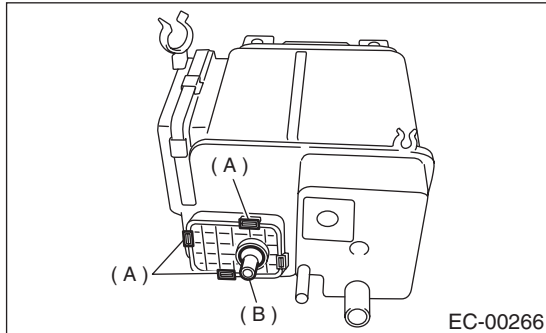
C: INSPECTION

Make sure the hoses are not cracked or loose.

15.Drain Valve

A: REMOVAL

- 1) Set the vehicle on the lift.
- 2) Disconnect the ground cable from battery.
- 3) Lift up the vehicle.
- 4) Remove the canister. <Ref. to EC(STI)-5, REMOVAL, Canister.>
- 5) Remove clip (A), and then remove drain valve (B) from canister.
- 6) Remove the filter from drain valve (B).



B: INSTALLATION

Install in the reverse order of removal.

CAUTION:

- Assemble the drain valve filter without any clearance.
- Make sure the packing in the groove before assembling drain valve to canister.
- Replace the clip with new one.

C: INSPECTION

- 1) Make sure that all hoses are installed securely.
- 2) Make sure that hoses are not cracked or loose.

16.PCV Hose Assembly

A: REMOVAL

CAUTION:

Removal is not allowed except for the damage of PCV hose, diagnosis connector and PCV valve.

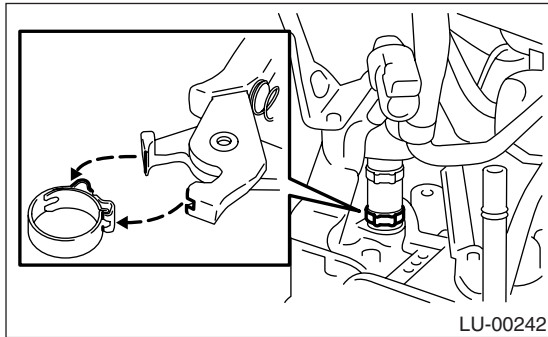
1) Remove the intake manifold.

<Ref. to FU(STI)-13, REMOVAL, Intake Manifold.>

2) Clip the protrusion of clamp after aligning the concave portion of ST with protrusion of clamp, and then unlock the lock.

3) Remove the PCV hose assembly.

ST 18353AA000 CLAMP PLIERS



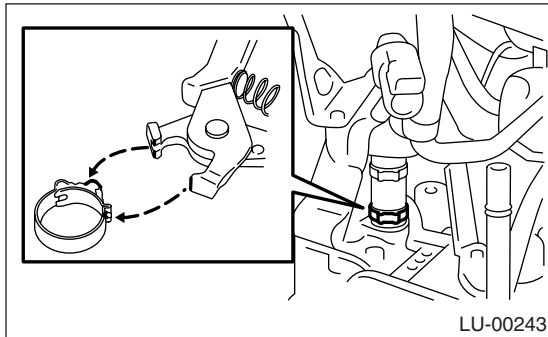
B: INSTALLATION

NOTE:

Replace the clamp with a new one.

1) Install the PCV hose assembly, and then lock the clamp with protrusion of clamp clipped by pliers.

ST 18353AA000 CLAMP PLIERS



2) Install the intake manifold.

<Ref. to FU(STI)-16, INSTALLATION, Intake Manifold.>

PCV Hose Assembly

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

ENGINE (DIAGNOSTICS)

Basic Diagnostic Procedure

ENGINE (DIAGNOSTICS)

1. Basic Diagnostic Procedure

A: PROCEDURE

1. ENGINE

Step	Check	Yes	No
1 CHECK ENGINE START FAILURE. 1) Ask the customer when and how trouble occurred using the interview check list. <Ref. to EN(STI)(diag)-3, CHECK, Check List for Interview.> 2) Start the engine.	Does the engine start?	Go to step 2.	Inspection using "Diagnostics for Engine Start Failure". <Ref. to EN(STI)(diag)-57, 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 Diagnostics Table". <Ref. to EN(STI)(diag)-371, General Diagnostic Table.>
3 CHECK INDICATION OF DTC ON DISPLAY. 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor or general scan tool to data link connector. 3) Turn the ignition switch to ON and the Subaru Select Monitor or general scan tool power switch to ON. 4) Read the DTC on Subaru Select Monitor or general scan tool.	Does the Subaru Select Monitor or general scan tool indicate DTC?	Record the DTC code. Repair the trouble cause. <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).> Go to step 4.	Repair the related parts. NOTE: If a DTC is not shown on display although malfunction indicator light illuminates, perform diagnostics of malfunction indicator light circuit or combination meter. <Ref. to EN(STI)(diag)-48, Malfunction Indicator Light.>
4 PERFORM THE DIAGNOSIS. 1) Perform the clear memory mode. <Ref. to EN(STI)(diag)-45, Clear Memory Mode.> 2) Perform the inspection mode. <Ref. to EN(STI)(diag)-36, Inspection Mode.>	Does the Subaru Select Monitor or general scan tool indicate DTC?	Inspect using "Diagnostics Procedure with Diagnostic Trouble Code (DTC)". <Ref. to EN(STI)(diag)-76, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Complete the diagnosis.

2. Check List for Interview

A: CHECK

1. CHECK LIST No. 1

Check the following items when problem has occurred.

NOTE:

Use copies of this page for interviewing customers.

Customer's name		Engine No.	
Date of sale		Fuel brand	
Date of repair		Odometer reading	km
VIN			miles
Weather	☐ Fine ☐ Cloudy ☐ Rainy ☐ Snowy ☐ Various/Others:		
Outdoor temperature	°C (°F)		
	☐ Hot ☐ Warm ☐ Cool ☐ Cold		
Place	☐ Highway ☐ Suburbs ☐ Inner city ☐ Uphill ☐ Downhill ☐ Rough road ☐ Others:		
Engine temperature	☐ Cold ☐ Warming-up ☐ After warming-up ☐ Any temperature ☐ Others:		
Engine speed	rpm		
Vehicle speed	MPH		
Driving conditions	☐ Not affected ☐ At starting ☐ While idling ☐ At racing ☐ While accelerating ☐ While cruising ☐ While decelerating ☐ While turning (RH/LH)		
Headlight	☐ ON / ☐ OFF	Rear defogger	☐ ON / ☐ OFF
Blower	☐ ON / ☐ OFF	Radio	☐ ON / ☐ OFF
A/C compressor	☐ ON / ☐ OFF	CD/Cassette	☐ ON / ☐ OFF
Cooling fan	☐ ON / ☐ OFF	Car phone	☐ ON / ☐ OFF
Front wiper	☐ ON / ☐ OFF	CB	☐ ON / ☐ OFF
Rear wiper	☐ ON / ☐ OFF		

Check List for Interview

ENGINE (DIAGNOSTICS)

2. CHECK LIST No. 2

Check the following items about the vehicle's state when malfunction indicator light turns on.

NOTE:

Use copies of this page for interviewing customers.

a) Other warning lights or indicators turn on. ☐ Yes / ☐ No
☐ Low fuel warning light ☐ Charge indicator light ☐ AT diagnostics indicator light ☐ ABS warning light ☐ Engine oil pressure warning light
b) Fuel level
• Lack of gasoline: ☐ Yes / ☐ No • Indicator position of fuel gauge: • Had run out of gas before: ☐ 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 parts other than 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 ☐ No 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:

- All airbag system connectors are colored yellow. Do not use the electrical test equipment on these circuit.
- Be careful not to damage the airbag system wiring harness when servicing the ECM, TCM, main relay and fuel pump relay.

2) Never connect the battery in reverse polarity.

- The ECM will be destroyed instantly.
- The fuel injector and other part will be damaged in just a few minutes more.

3) Do not disconnect the battery cables while the engine is running.

- A large counter electromotive force will be generated in the alternator, and this voltage may damage electronic parts such as ECM, etc.

4) Before disconnecting the connectors of each sensor and the ECM, be sure to turn the ignition switch to OFF.

5) Poor contact has been identified as a primary cause of this problem. To measure the voltage and/or resistance of individual sensors or all electrical control modules at the harness side connector, use a tapered pin with a diameter of less than 0.64 mm (0.025 in). Do not insert the pin more than 5 mm (0.20 in) into the part.

6) Before removing the ECM from located position, disconnect two cables on battery.

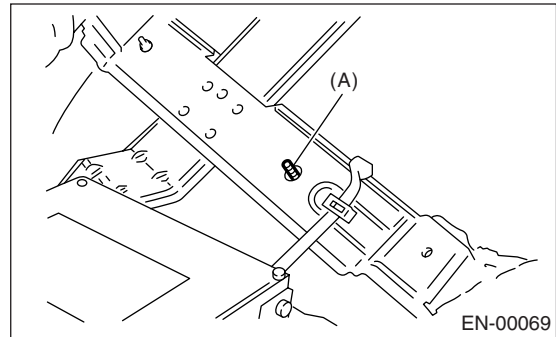
- Otherwise, the ECM may be damaged.

CAUTION:

When replacing the ECM, be careful not to use the wrong spec. ECM to avoid any damage on the fuel injection system.

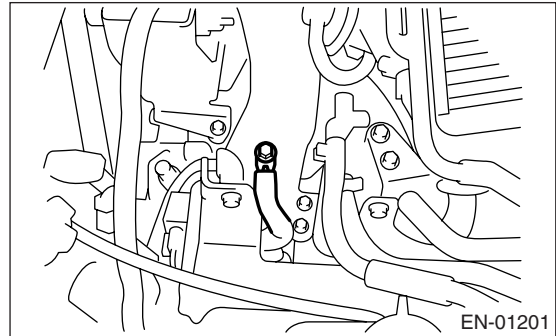
7) The connectors to each sensor in the engine compartment and the harness connectors on the engine side and body side are all designed to be waterproof. However, it is still necessary to take care not to allow water to get into the connectors when washing the vehicle, or when servicing the vehicle on a rainy day.

8) Use the ECM mounting stud bolt at the body head grounding points when measuring voltage and resistance inside the passenger compartment.



(A) Stud bolt

9) Use the engine grounding terminal or engine proper as the grounding point to the body, when measuring voltage and resistance in the engine compartment.



10) Every MFI-related part is a precision part. Do not drop them.

11) Observe the following cautions when installing a radio in MFI equipped models.

CAUTION:

- The antenna must be kept as far apart as possible from the control unit.

(The ECM is located under the steering column, inside of the instrument panel lower trim panel.)

- The antenna feeder must be placed as far as possible from ECM and MFI harness.

- Carefully adjust the antenna for correct matching.

- When mounting a large power type radio, pay special attention to the three items above mentioned.

- Incorrect installation of the radio may affect the operation of ECM.

12) Before disconnecting the fuel hose, disconnect the fuel pump connector and crank the engine for more than 5 seconds to release pressure in the fuel system. If the engine starts during this operation, run it until it stops.

General Description

ENGINE (DIAGNOSTICS)

13) Diagnostics should be conducted by rotating with simple, easy operations and proceeding to complicated, difficult operations. The most important thing in diagnostics is to understand the customer's complaint, and distinguish between the three causes.

14) On model with ABS, when performing driving test in jacked-up or lifted-up position, sometimes the warning light may be lit, but this is not a malfunction of the system. The reason for this is the speed difference between front and rear wheels. After diagnosis of engine control system, perform the ABS memory clearance procedure of self-diagnosis function.

B: INSPECTION

Before performing diagnostics, check the following items which might affect engine problems:

1. BATTERY

1) Measure the battery voltage and specific gravity of electrolyte.

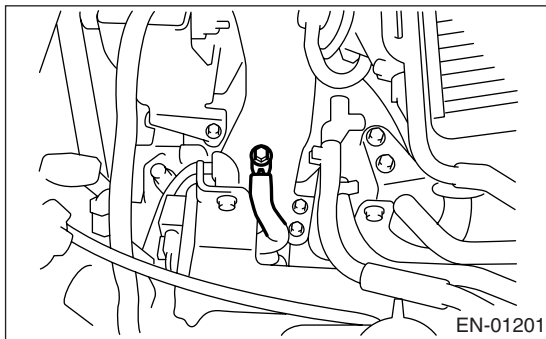
Standard voltage: 12 V

Specific gravity: Above 1.260

2) Check the condition of main and other fuses, and harnesses and connectors. Also check for proper grounding.

2. ENGINE GROUND

Make sure the engine grounding terminal is properly connected to engine.



C: NOTE

1. DESCRIPTION

- The on-board diagnostics (OBD) system detects and indicates a fault in various inputs and outputs of the complex electronic control. Malfunction indicator light in the combination meter indicates occurrence of a fault or trouble.
- Further, against such a failure or sensors as may disable the drive, the fail-safe function is provided to ensure the minimal driveability.

- The OBD system incorporated with the vehicles within this engine family 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 first.
- If the OBD system detects the various malfunctions including the fault of fuel trim or misfire, the OBD system first stores freeze frame engine conditions about the fuel trim or misfire.
- When the malfunction does not occur again for three consecutive driving cycles, malfunction indicator light is turned off, but DTC remains at on-board computer.
- When troubleshooting the vehicle which complies with OBD-II Regulations, connect the Subaru Select Monitor or general scan tool to the vehicle.

2. ENGINE AND EMISSION CONTROL SYSTEM

- The Multipoint Fuel Injection (MFI) system is a system that supplies the optimum air-fuel mixture to the engine for all the various operating conditions through the use of the latest electronic technology.

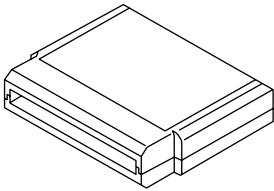
With this system fuel, which is pressurized at a constant pressure, is injected into the intake air passage of the cylinder head. The injection quantity of fuel is controlled by an intermittent injection system where the electro-magnetic injection valve (fuel injector) opens only for a short period of time, depending on the quantity of air required for one cycle of operation. In actual operation, the injection quantity is determined by the duration of an electric pulse applied to the fuel injector and this permits simple, yet highly precise metering of the fuel.

- Further, all the operating conditions of the engine are converted into electric signals, and this results in additional features of the system, such as large improved adaptability, easier addition of compensating element, etc.

The MFI system also has the following features:

- Reduced emission of harmful exhaust gases.
- Reduced in fuel consumption.
- Increased engine output.
- Superior acceleration and deceleration.
- Superior startability and warm-up performance in cold weather since compensation is made for coolant and intake air temperature.

D: PREPARATION TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18482AA010	18482AA010 (Newly adopted tool)	CARTRIDGE	Troubleshooting for electrical systems.
 ST22771AA030	22771AA030	SUBARU SELECT MONITOR KIT	Troubleshooting for electrical systems.

Electrical Component Location

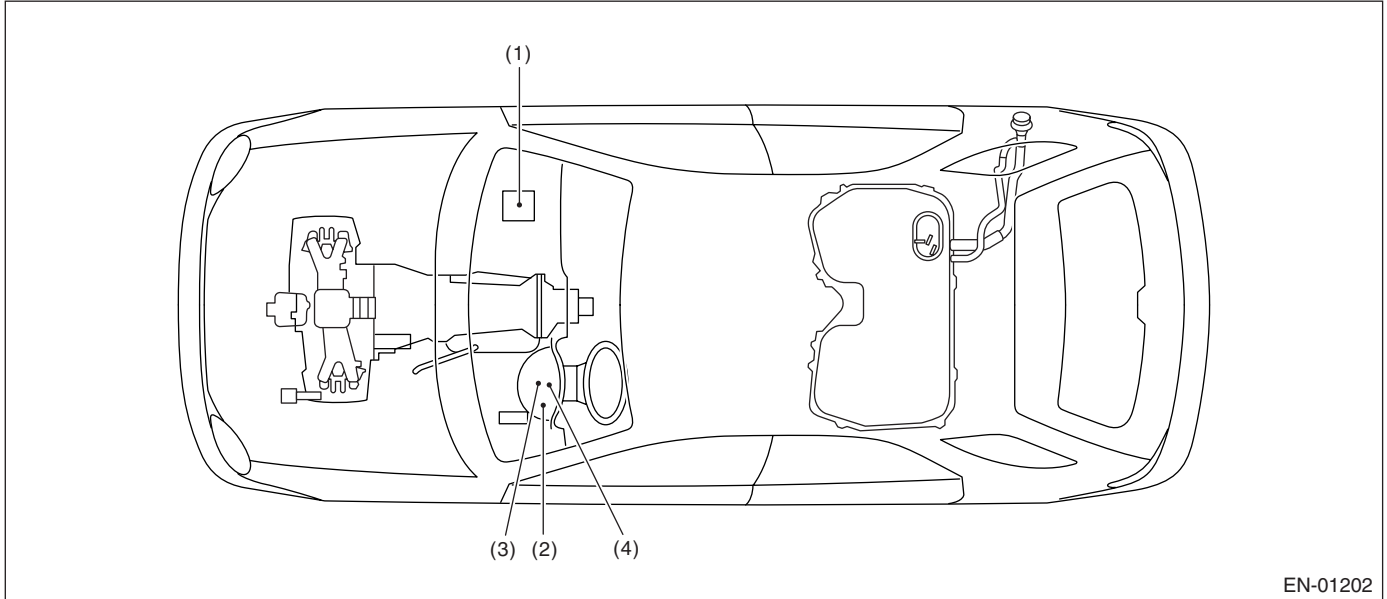
ENGINE (DIAGNOSTICS)

4. Electrical Component Location

A: LOCATION

1. ENGINE

• Control module



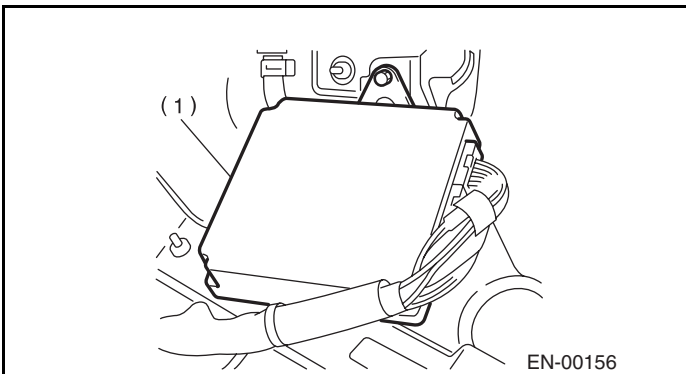
EN-01202

(1) Engine control module (ECM)

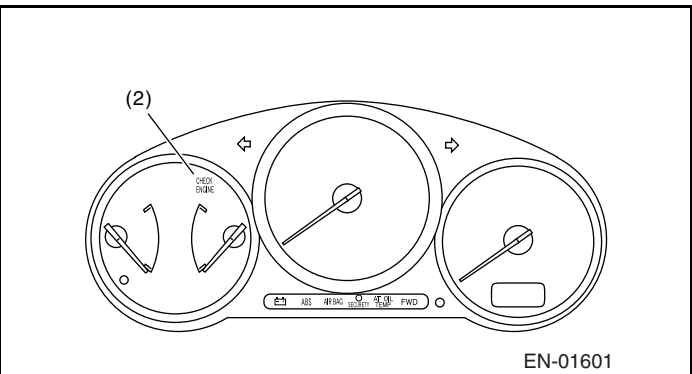
(3) Data link connector

(4) Test mode connector

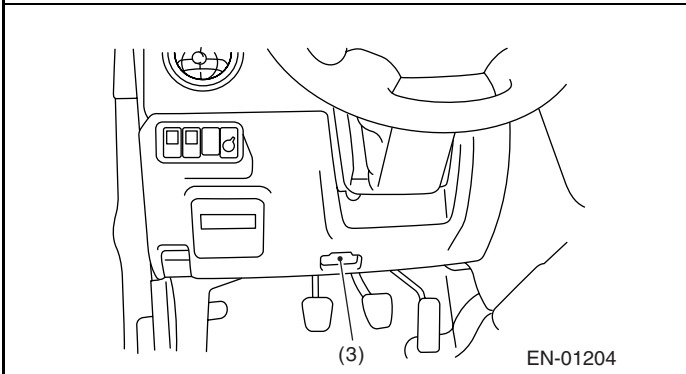
(2) Malfunction indicator light



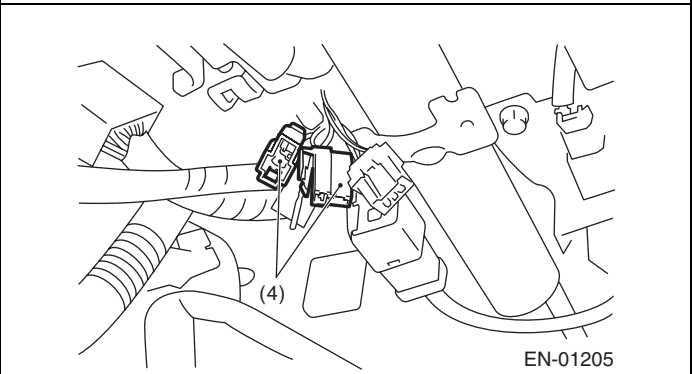
EN-00156



EN-01601

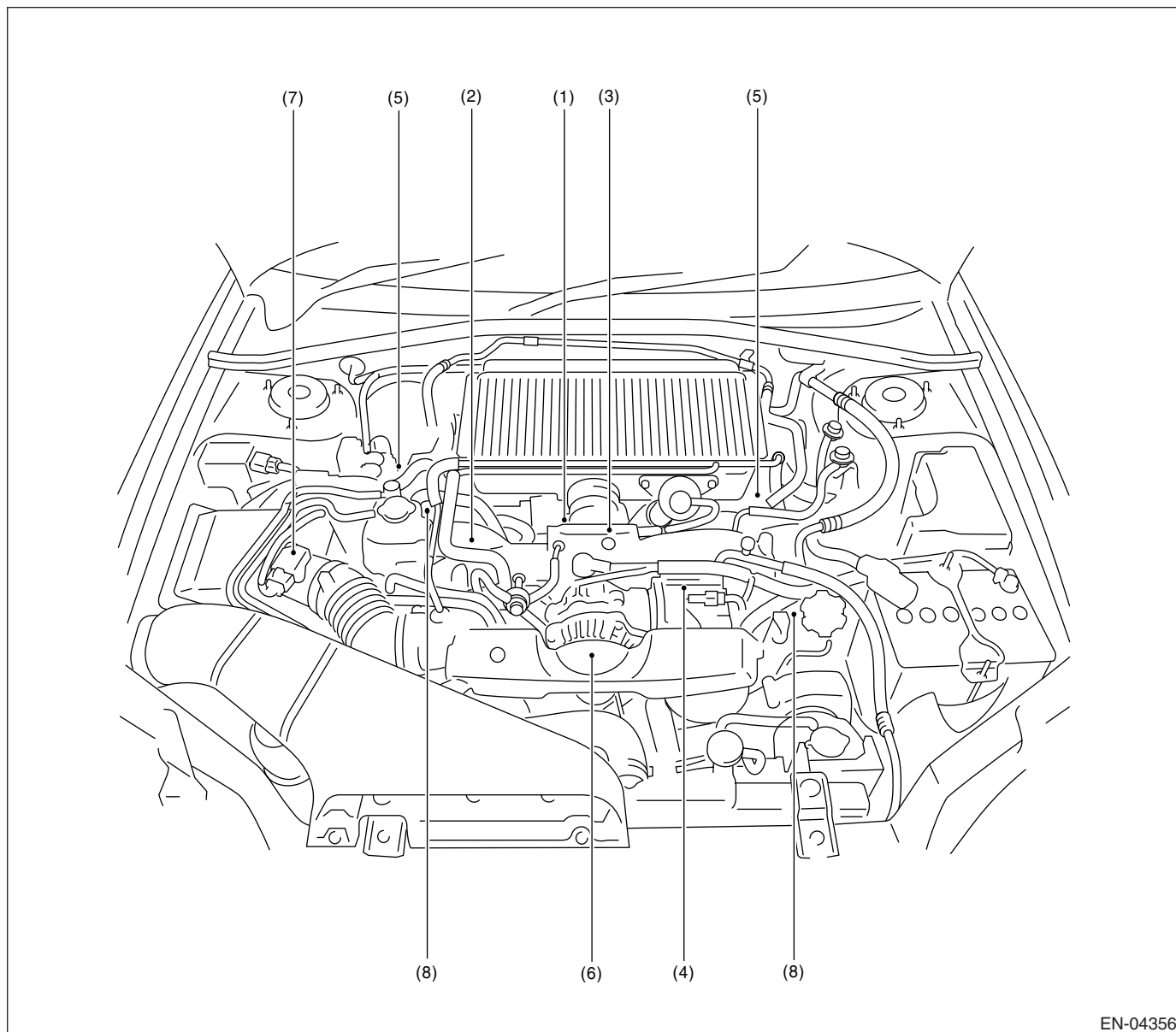


EN-01204



EN-01205

• Sensor

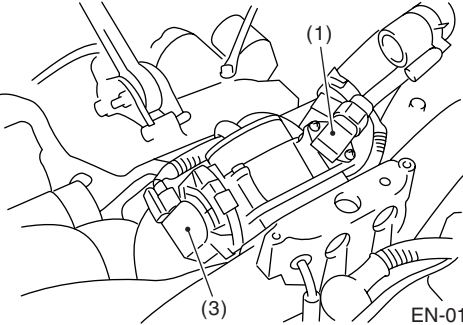
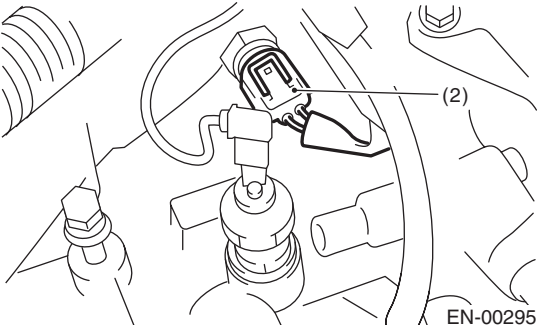
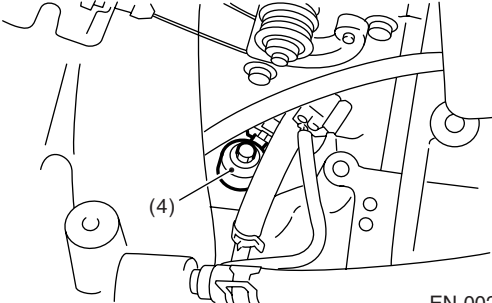
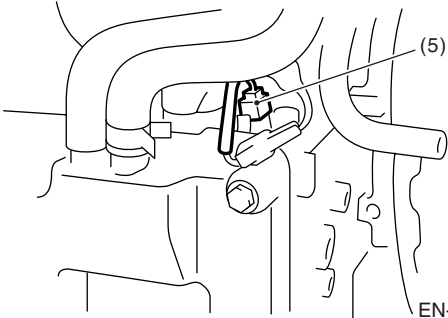
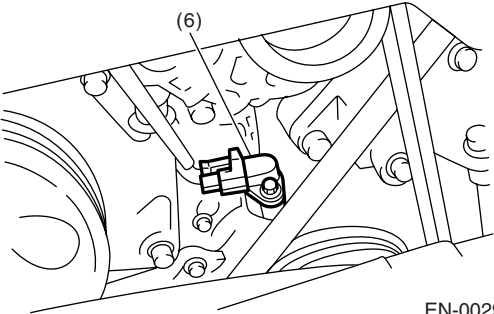
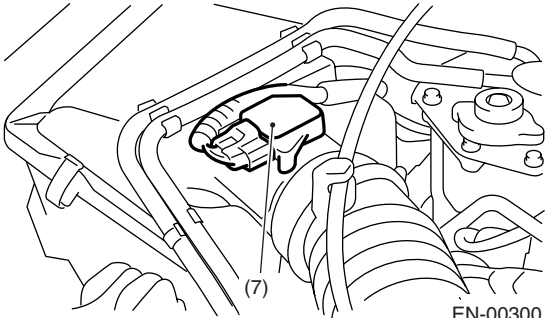
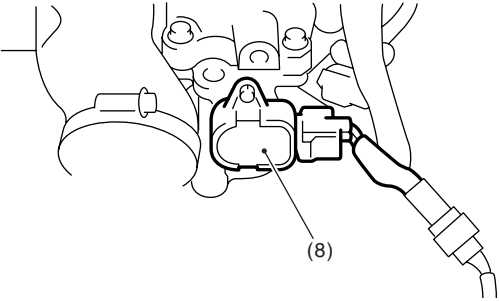


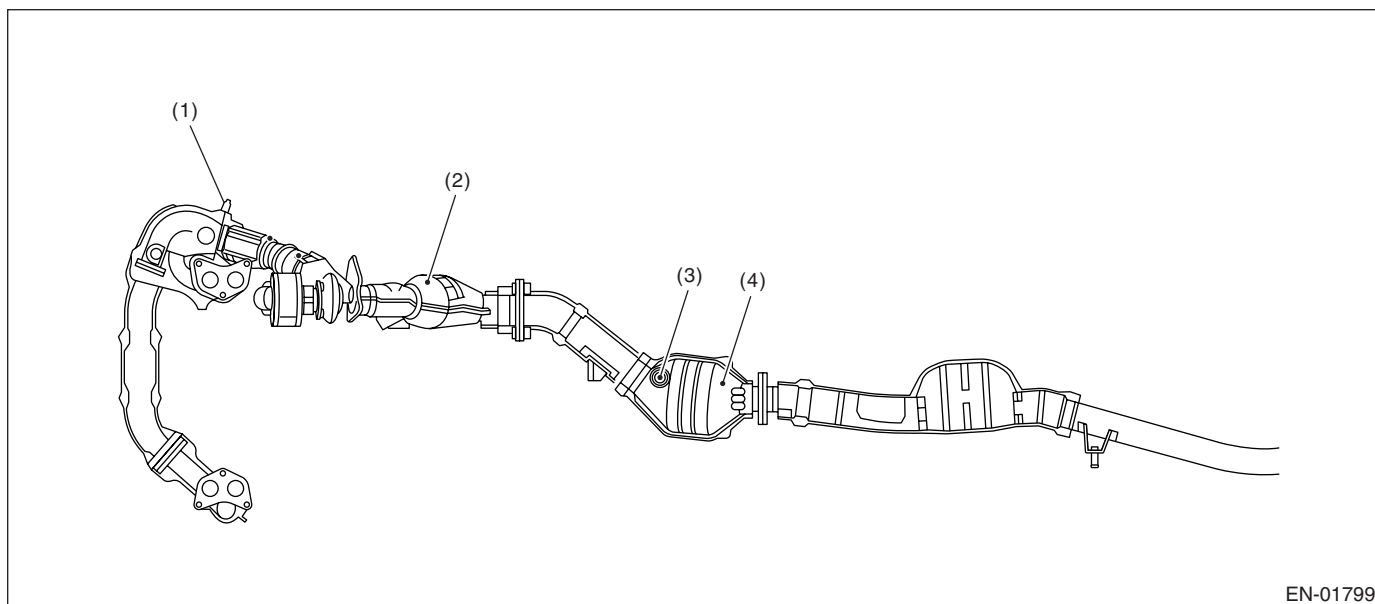
EN-04356

(1) Manifold absolute pressure sensor	(5) Camshaft position sensor	(8) Tumble generator valve position sensor
(2) Engine coolant temperature sensor	(6) Crankshaft position sensor	
(3) Electronic throttle control	(7) Mass air flow and intake air temperature sensor	
(4) Knock sensor		

Electrical Component Location

ENGINE (DIAGNOSTICS)

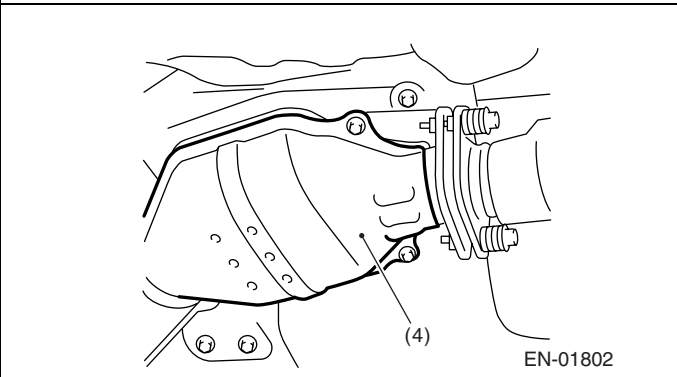
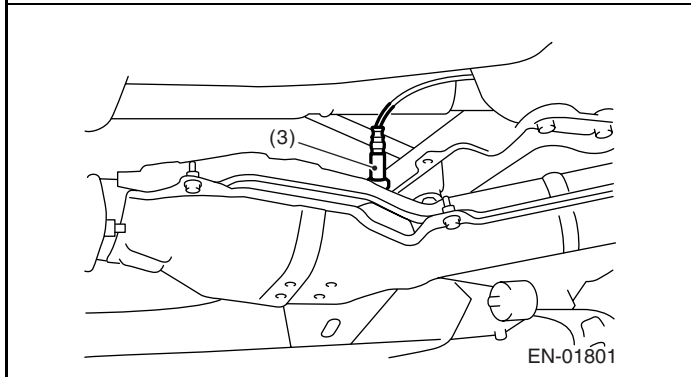
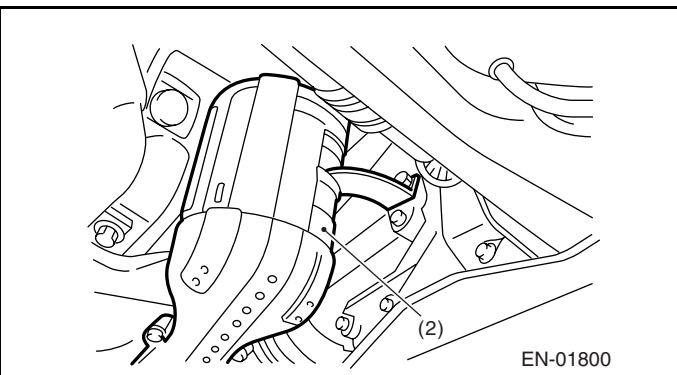
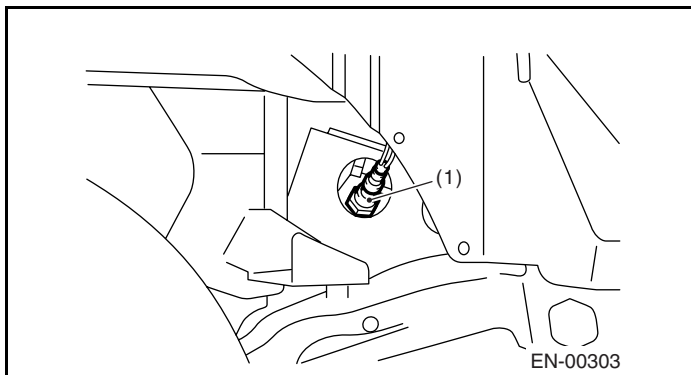
 EN-01797	 EN-00295
 EN-00297	 EN-01798
 EN-00299	 EN-00300
 EN-00301	



- (1) Front oxygen (A/F) sensor
(2) Front catalytic converter

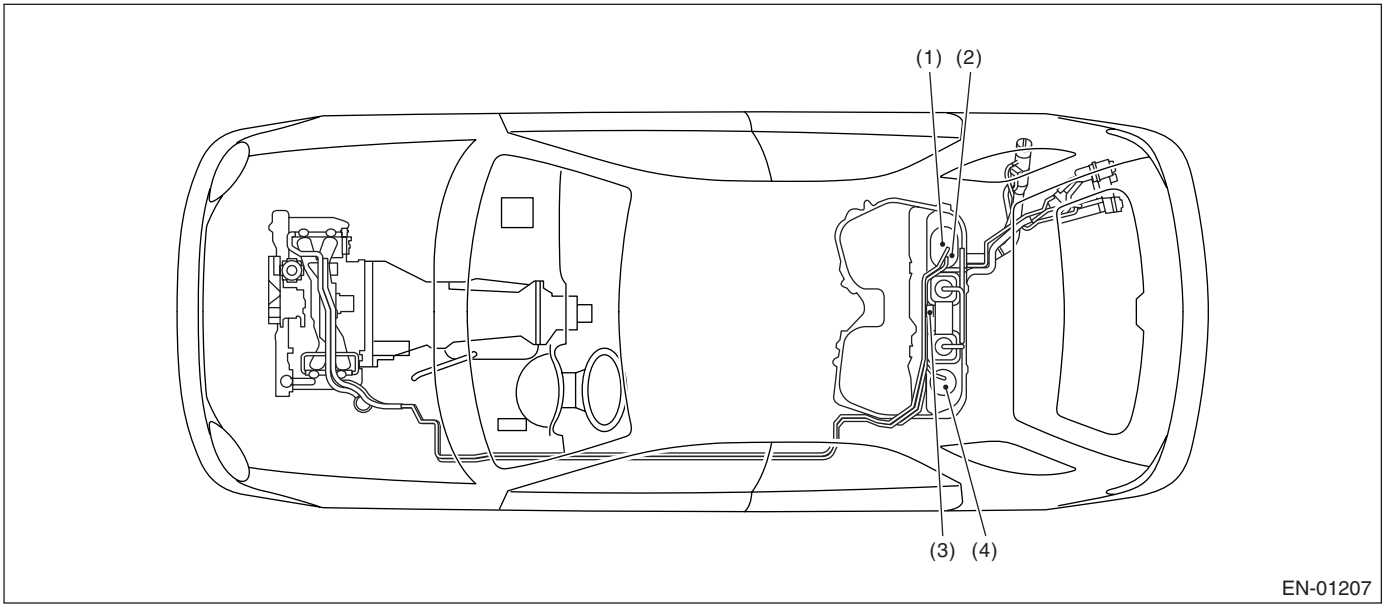
- (3) Rear oxygen sensor

- (4) Rear catalytic converter

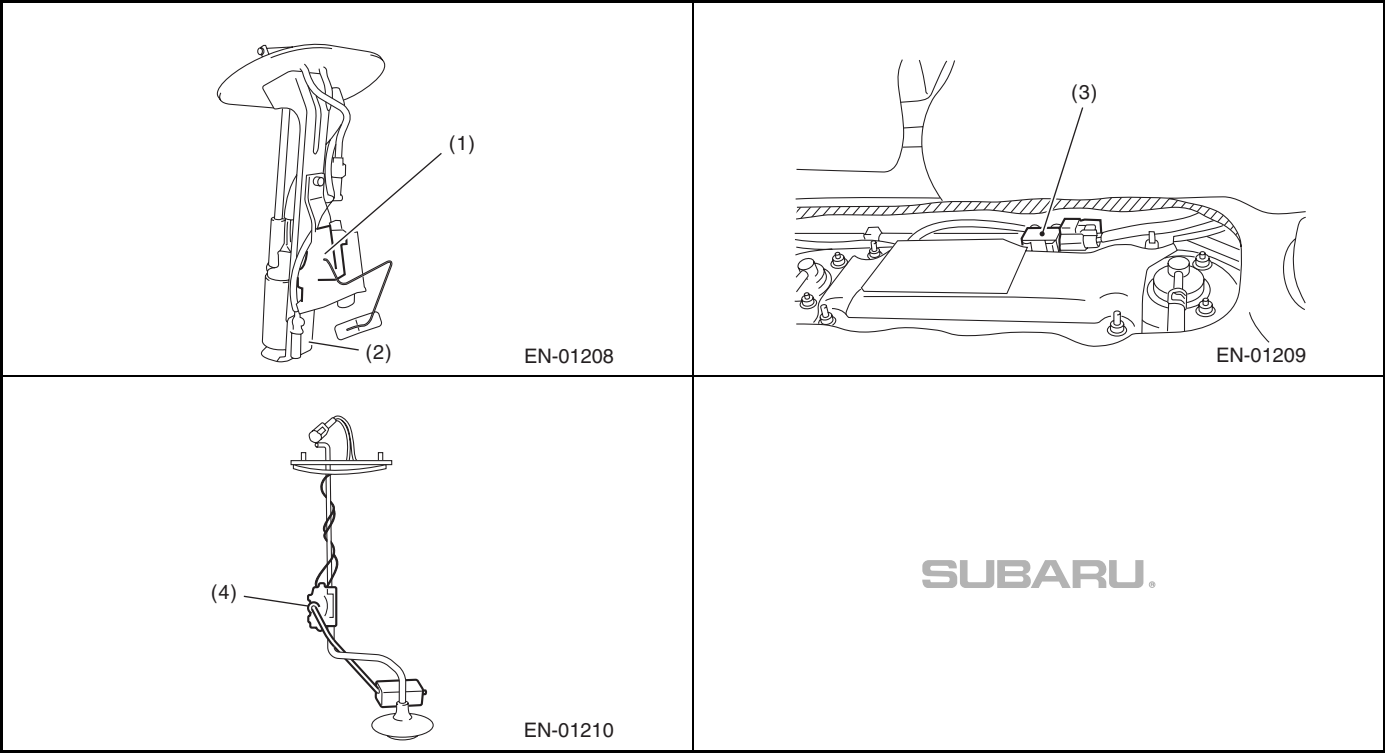


Electrical Component Location

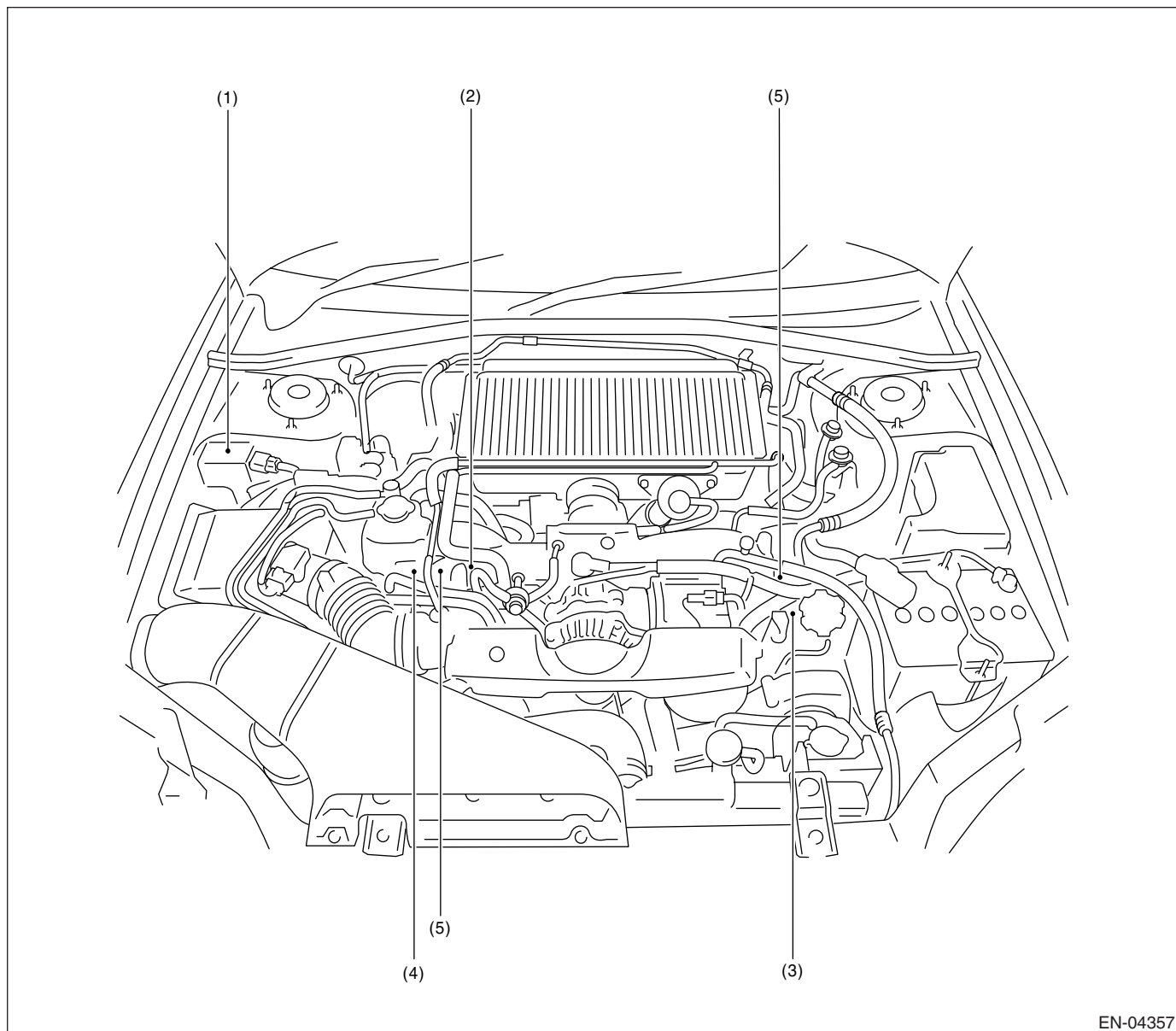
ENGINE (DIAGNOSTICS)



- (1) Fuel level sensor
- (2) Fuel temperature sensor
- (3) Fuel tank pressure sensor
- (4) Fuel sub level sensor



- Solenoid Valve, Actuator, Emission Control System Parts and Ignition System Parts



EN-04357

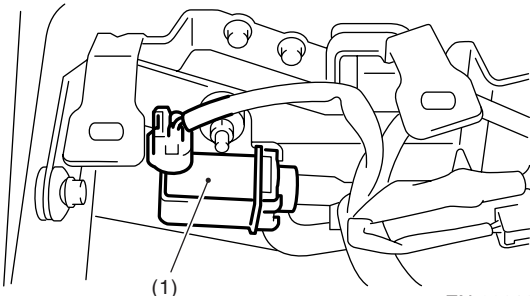
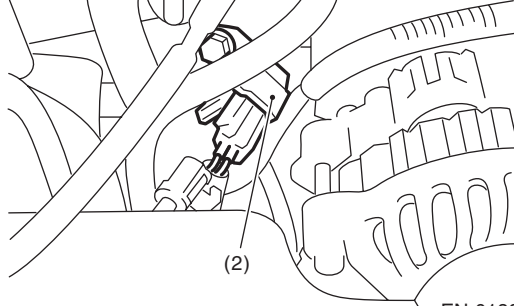
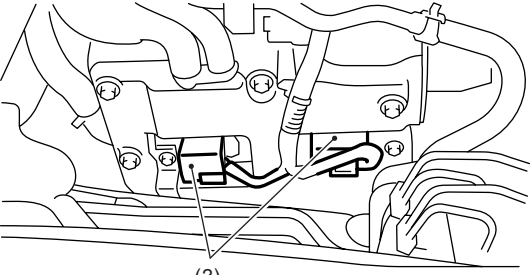
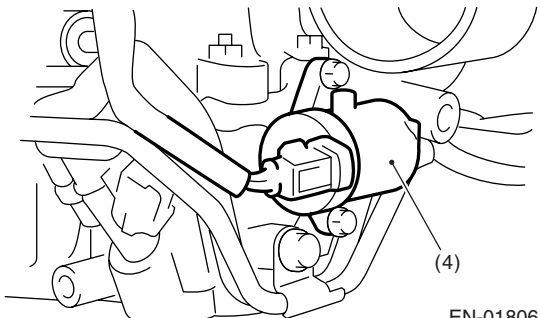
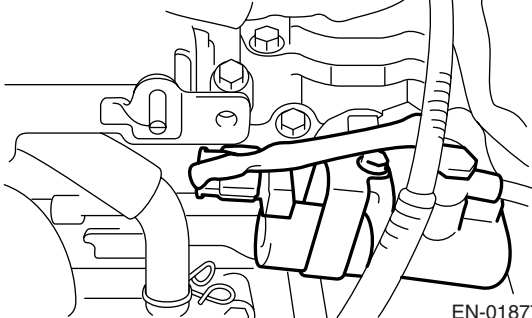
(1) Wastegate control solenoid valve
(2) Purge control solenoid valve

(3) Ignition coil and ignitor ASSY
(4) Tumble generator valve actuator

(5) Oil flow control solenoid valve

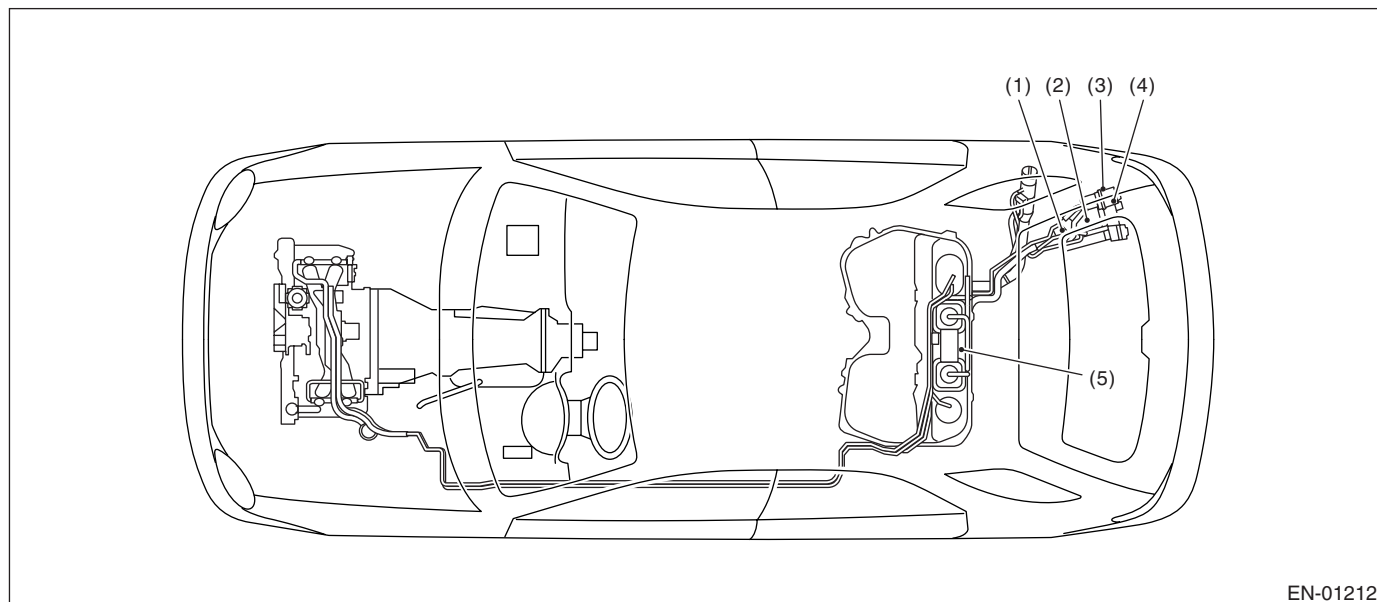
Electrical Component Location

ENGINE (DIAGNOSTICS)

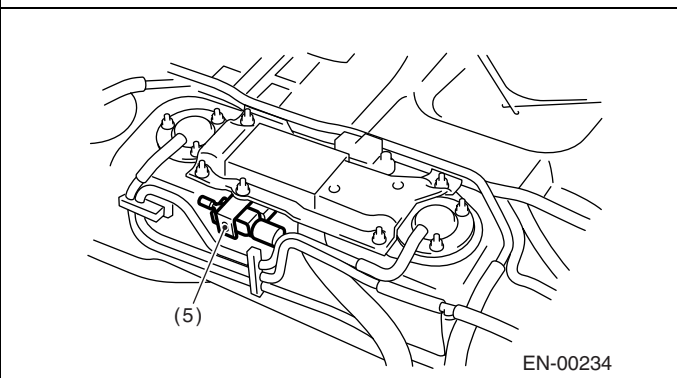
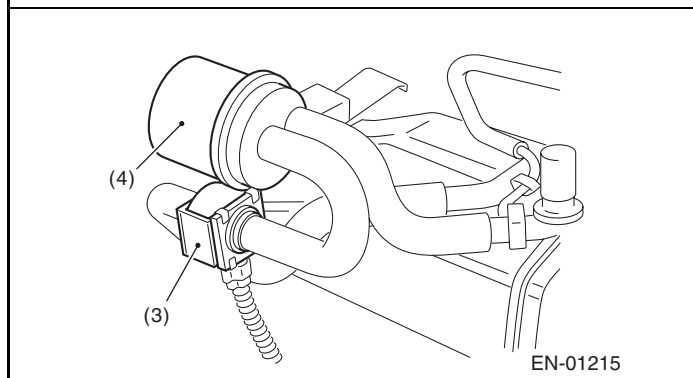
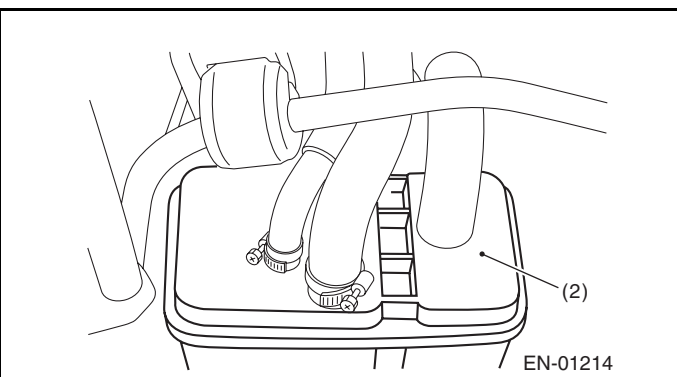
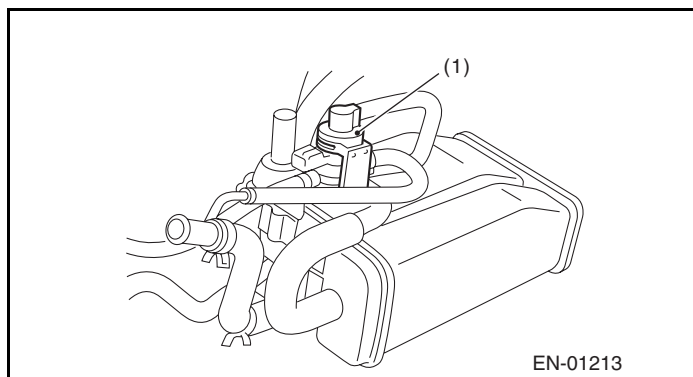
 (1) EN-00313	 (2) EN-01804
 (3) EN-01805	 (4) EN-01806
 EN-01877	SUBARU.

Electrical Component Location

ENGINE (DIAGNOSTICS)

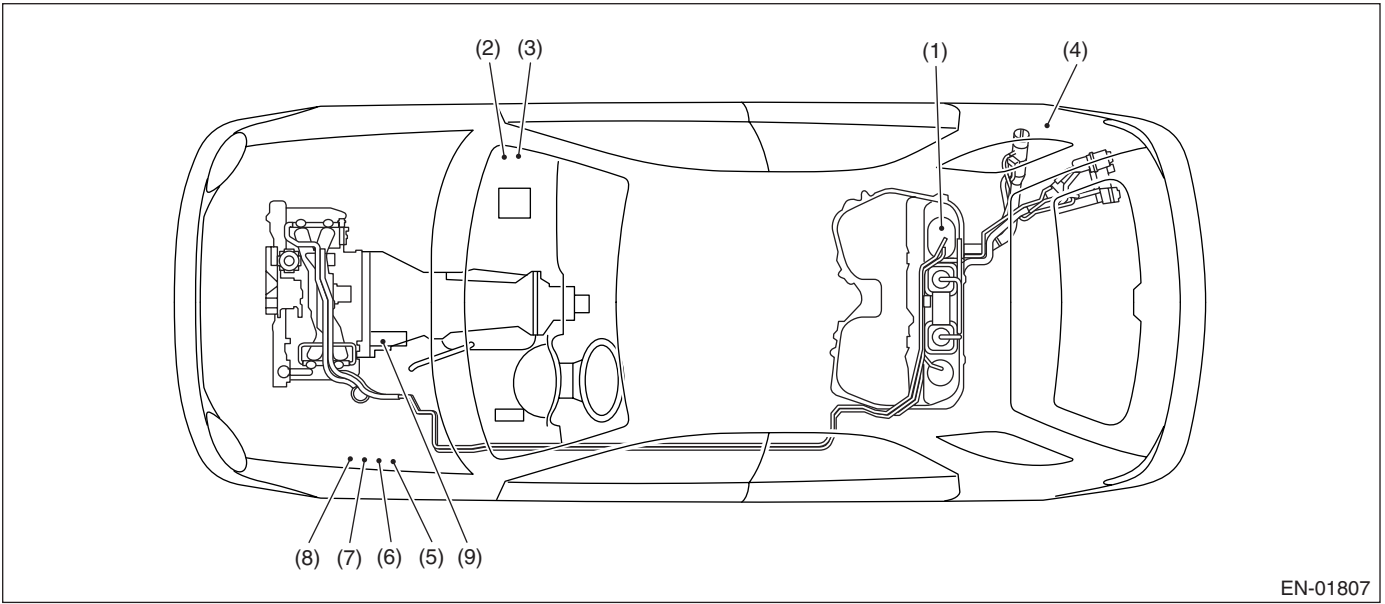


(1) Pressure control solenoid valve	(3) Drain valve	(5) Fuel tank sensor control valve
(2) Canister	(4) Drain filter	

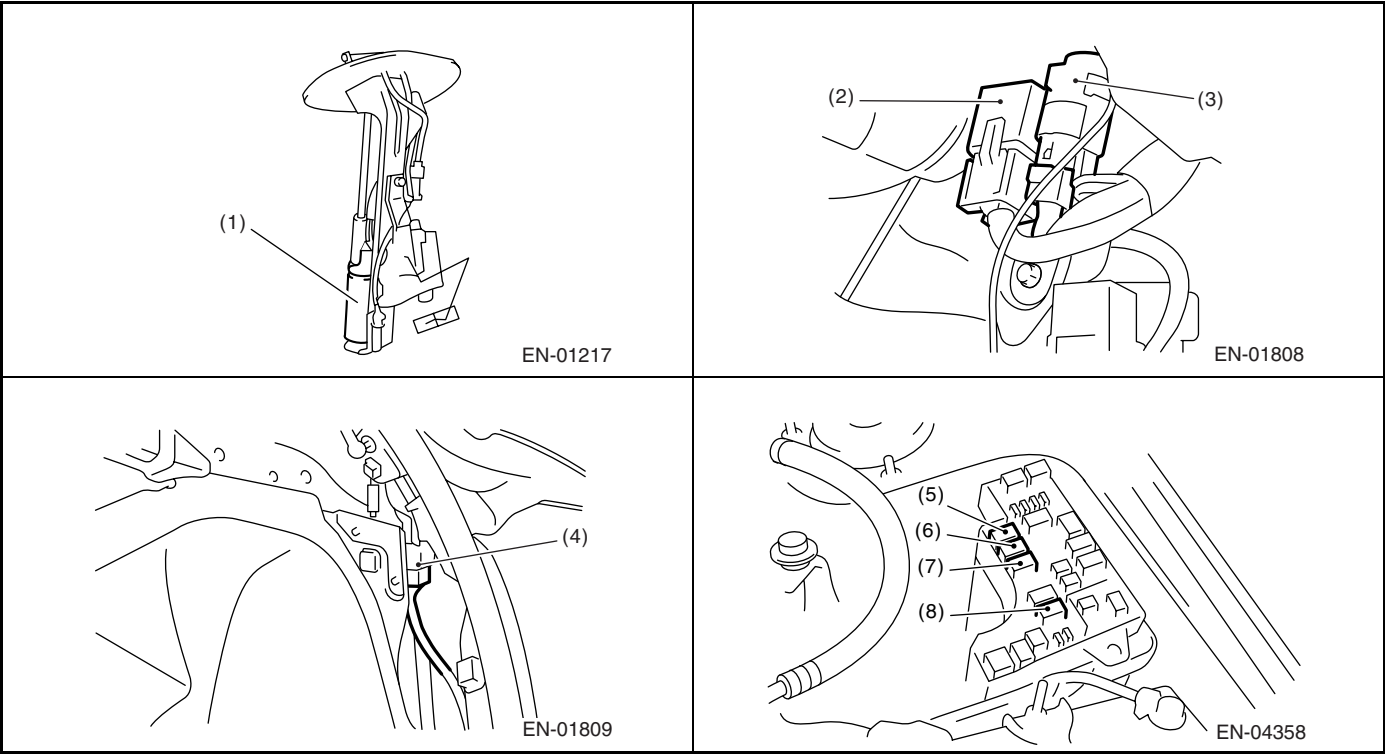


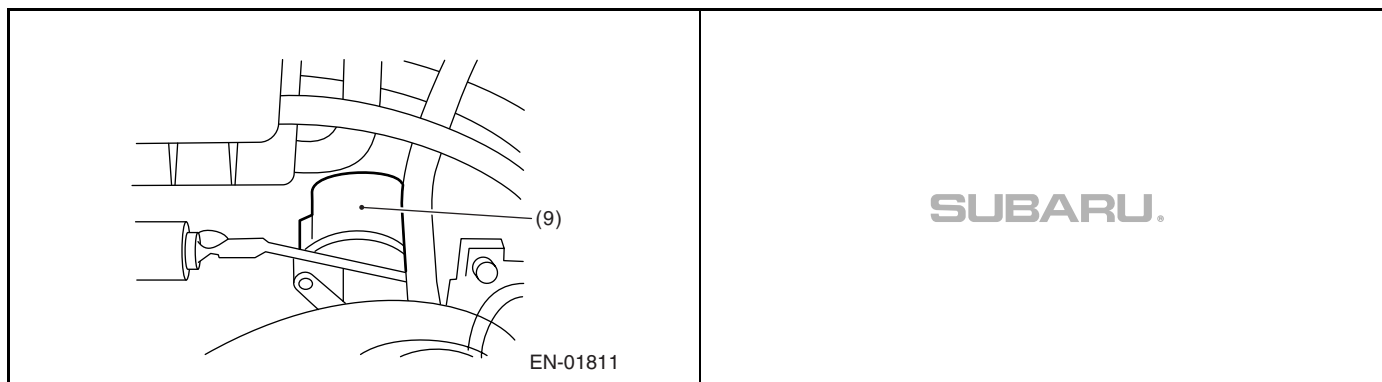
Electrical Component Location

ENGINE (DIAGNOSTICS)



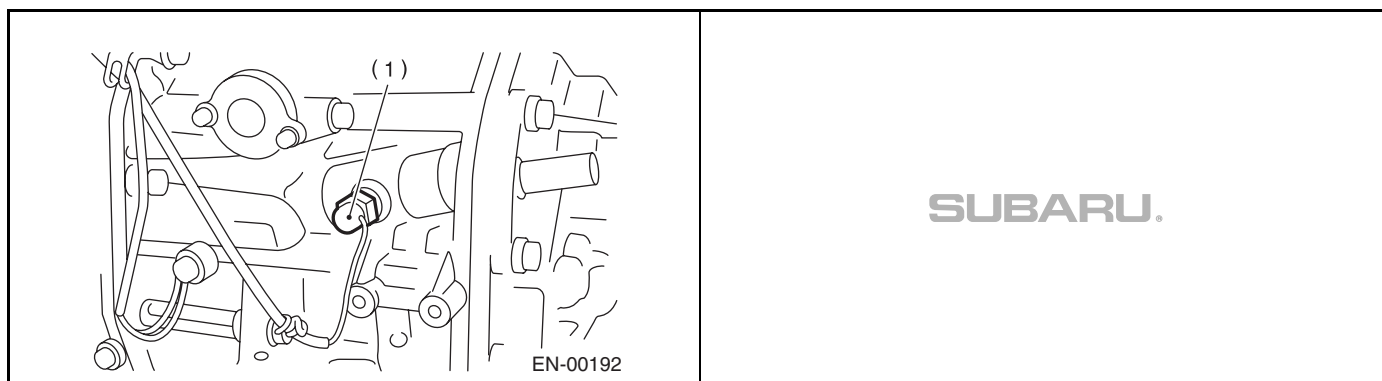
(1) Fuel pump	(4) Fuel pump control unit	(7) Radiator sub fan relay 1
(2) Main relay	(5) Radiator main fan relay 1	(8) Radiator sub fan relay 2
(3) Fuel pump relay	(6) Radiator main fan relay 2	(9) Starter





2. TRANSMISSION

• Solenoid Valve and Switch



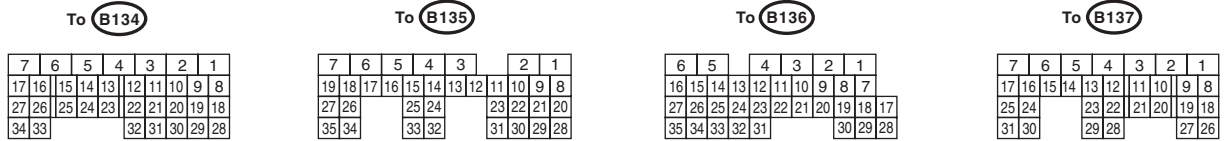
(1) Neutral position switch

Engine Control Module (ECM) I/O Signal

ENGINE (DIAGNOSTICS)

5. Engine Control Module (ECM) I/O Signal

A: ELECTRICAL SPECIFICATION



EN-01812

Content		Con- nector No.	Termi- nal No.	Signal (V)		Note
				Ignition SW ON (Engine OFF)	Engine ON (Idling)	
Crankshaft position sensor	Signal (+)	B135	10	0	-7 — +7	Sensor output waveform
	Signal (-)	B135	22	0	0	—
	Shield	B135	31	0	0	—
Rear oxy- gen sensor	Signal	B137	25	0	0 — 0.9	—
	Shield	B137	31	0	0	—
	GND (sen- sor)	B136	35	0	0	—
Front oxy- gen (A/F) sensor heater	Signal 1	B134	3	0 — 1.0	—	Sensor output waveform
	Signal 2	B134	2	0 — 1.0	—	Sensor output waveform
Rear oxygen sensor heater signal		B135	2	0 — 1.0	—	Sensor output waveform
Engine coolant tempera- ture sensor	Signal	B136	14	1.0 — 1.4	1.0 — 1.4	After warm-up the engine.
	GND (sen- sor)	B136	35	0	0	After warm-up the engine.
Vehicle speed signal		B135	26	0 or 5	0 or 5	"5" and "0" are repeatedly dis- played when vehicle is driven.
Mass air flow sensor	Signal	B136	23	—	0.3 — 4.5	—
	Shield	B136	32	0	0	—
	GND	B136	31	0	0	—
Intake air temperature sensor signal		B136	13	0.3 — 4.6	0.3 — 4.6	—
Tumble generator valve posi- tion sensor RH	Signal	B136	27	Fully closed: 3.8 — 4.9 Fully opened: 0.2 — 0.9		—
	Power sup- ply	B136	16	5	5	—
	GND (sen- sor)	B136	35	0	0	—

Engine Control Module (ECM) I/O Signal

ENGINE (DIAGNOSTICS)

Content		Con- nector No.	Termi- nal No.	Signal (V)		Note
				Ignition SW ON (Engine OFF)	Engine ON (Idling)	
Tumble generator valve posi- tion sensor LH	Signal	B136	26	Fully closed: 3.8 — 4.9 Fully opened: 0.2 — 0.9		—
	Power sup- ply	B136	16	5	5	—
	GND (sen- sor)	B136	35	0	0	—
Tumble generator valve RH (open)		B134	9	0 or 10 — 13	0 or 12 — 14	Sensor output waveform
Tumble generator valve RH (close)		B134	8	0 or 10 — 13	0 or 12 — 14	Sensor output waveform
Tumble generator valve LH (open)		B134	11	0 or 10 — 13	0 or 12 — 14	Sensor output waveform
Tumble generator valve LH (close)		B134	10	0 or 10 — 13	0 or 12 — 14	Sensor output waveform
Wastegate control sole- noid valve		B134	32	0 or 10 — 13	0 or 12 — 14	Sensor output waveform
Starter switch		B137	8	0	0	Cranking: 8 — 14
A/C switch		B137	17	ON: 10 — 13 OFF: 0	ON: 12 — 14 OFF: 0	—
Ignition switch		B137	14	10 — 13	12 — 14	—
Neutral position switch		B137	9	ON: 10 — 13 OFF: 0	ON: 12 — 14 OFF: 0	—
Test mode connector		B137	15	10 — 13	12 — 14	When connected: 0
Knock sen- sor	Signal	B136	25	2.8	2.8	—
	Shield	B136	33	0	0	—
Back-up power supply		B135	19	10 — 13	12 — 14	Ignition switch "OFF": 10 — 13
Control unit power supply		B135	5	10 — 13	12 — 14	—
		B135	6	10 — 13	12 — 14	—
Sensor power supply		B136	16	5	5	—
Ignition control	#1	B135	18	0	12 — 14	Waveform
	#2	B135	17	0	12 — 14	Waveform
	#3	B135	16	0	12 — 14	Waveform
	#4	B135	15	0	12 — 14	Waveform
Fuel injec- tor	#1	B136	6	10 — 13	1 — 14	Waveform
	#2	B136	5	10 — 13	1 — 14	Waveform
	#3	B136	4	10 — 13	1 — 14	Waveform
	#4	B136	3	10 — 13	1 — 14	Waveform
Fuel pump control unit	Signal 1	B135	27	0 or 5	0 or 5	Sensor output waveform
	Signal 2	B137	28	10 — 13	12 — 14	—
A/C relay control		B135	33	ON: 0.5 or less OFF: 10 — 13	ON: 0.5 or less OFF: 12 — 14	—
Radiator fan relay 1 con- trol		B135	25	ON: 0.5 or less OFF: 10 — 13	ON: 0.5 or less OFF: 12 — 14	—
Radiator fan relay 2 con- trol		B135	24	ON: 0.5 or less OFF: 10 — 13	ON: 0.5 or less OFF: 12 — 14	—
Malfunction indicator lamp		B134	17	—	—	Light "ON": 1 or less Light "OFF": 10 — 14
Engine speed output		B134	23	—	0 — 13, or more	Waveform
Purge control solenoid valve		B134	14	ON: 1 or less OFF: 10 — 13	ON: 1 or less OFF: 12 — 14	Sensor output waveform

Engine Control Module (ECM) I/O Signal

ENGINE (DIAGNOSTICS)

Content		Con- nector No.	Termi- nal No.	Signal (V)		Note
				Ignition SW ON (Engine OFF)	Engine ON (Idling)	
Manifold absolute pressure sensor	Signal	B136	22	1.7 — 2.4	1.1 — 1.6	—
	Power sup- ply	B136	16	5	5	
	GND (sen- sor)	B136	35	0	0	
Fuel tank pressure sensor	Signal	B136	21	2.3 — 2.7	2.3 — 2.7	The valve operates when fuel filler cap is removed and rein- stalled.
	GND (sen- sor)	B136	35	0	0	—
Pressure control sole- noid valve		B134	12	ON: 1 or less OFF: 10 — 13	ON: 1 or less OFF: 12 — 14	—
Drain valve		B134	13	ON: 1 or less OFF: 10 — 13	ON: 1 or less OFF: 12 — 14	—
Fuel tank sensor control valve		B134	24	ON: 1 or less OFF: 10 — 13	ON: 1 or less OFF: 12 — 14	—
Fuel level sensor		B136	20	0.12 — 4.75	0.12 — 4.75	—
Fuel temperature sensor signal		B136	12	2.5 — 3.8	2.5 — 3.8	Ambient temperature: 25°C (77°F)
Blow-by leak diagnosis signal		B137	24	0	0	When disconnection (mal- function): 5
Small light switch		B137	12	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	—
Blower fan switch		B137	13	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	—
Rear defogger switch		B137	11	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	—
Power steering oil pres- sure switch		B137	10	10 — 13	ON: 0 OFF: 12 — 14	—
Front oxygen (A/F) sen- sor signal (+)		B134	33	2.8 — 3.2	2.8 — 3.2	—
Front oxygen (A/F) sen- sor signal (–)		B134	26	2.4 — 2.7	2.4 — 2.7	—
Front oxygen (A/F) sen- sor shield		B134	25	0	0	—
SSM/GST communica- tion line		B137	20	Less than 1 ↔ More than 4	Less than 1 ↔ More than 4	—
GND (injectors)		B137	7	0	0	—
GND (ignition system)		B135	12	0	0	—
GND (power supply)		B135	4	0	0	—
		B135	1	0	0	—
GND (control systems)		B137	1	0	0	—
		B137	2	0	0	—
GND (front oxygen (A/F) sensor heater 1)		B134	7	0	0	—
GND (front oxygen (A/F) sensor heater 2)		B134	6	0	0	—
Camshaft position sen- sor (LH)		B135	8	0 — 0.9	ON: 0 OFF: 4.7 — 5.3	Sensor output waveform
Camshaft position sen- sor (RH)		B135	9	0 — 0.9	ON: 0 OFF: 4.7 — 5.3	Sensor output waveform

Engine Control Module (ECM) I/O Signal

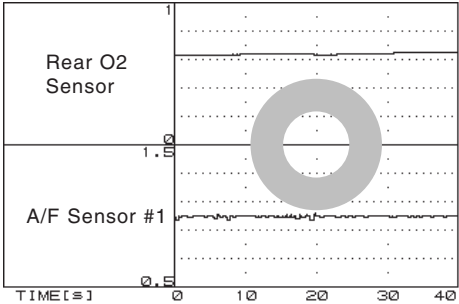
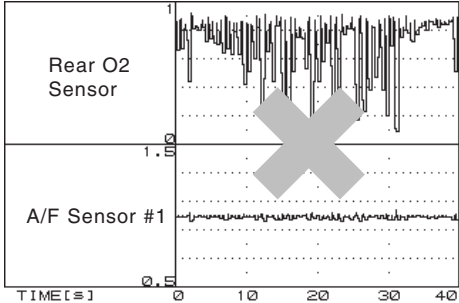
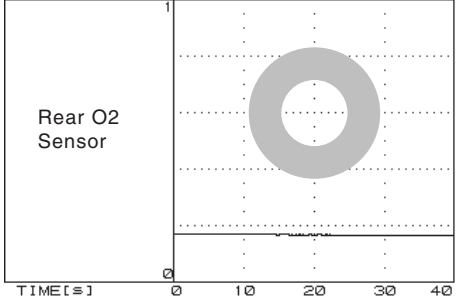
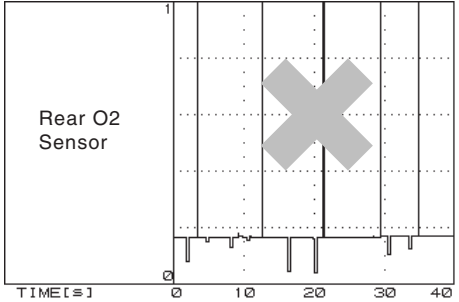
ENGINE (DIAGNOSTICS)

Content		Con- nector No.	Termi- nal No.	Signal (V)		Note
				Ignition SW ON (Engine OFF)	Engine ON (Idling)	
Electronic throttle con- trol	Main	B136	18	0.64 — 0.72 Fully opened: 3.96	0.64 — 0.72 (After engine warm-up)	Fully closed: 0.6 Fully opened: 3.96
	Sub	B136	29	1.51 — 1.58 Fully opened: 4.17	1.51 — 1.58 (After engine warm-up)	Fully closed: 1.48 Fully opened: 4.17
	Power sup- ply	B136	16	5	5	—
	GND (sen- sor)	B137	3	0	0	—
Electronic throttle control motor (+)		B137	5	Duty waveform	Duty waveform	Driving frequency: 500 Hz
Electronic throttle control motor (–)		B137	4	Duty waveform	Duty waveform	Driving frequency: 500 Hz
Electronic throttle control motor power supply		B137	6	10 — 13	12 — 14	—
Electronic throttle control motor relay		B135	35	ON: 010 OFF: — 13	ON: 0 OFF: 12 — 14	When ignition switch is ON: ON
Oil flow control solenoid valve (LH)	Signal (+)	B134	19	ON: 10 — 13 OFF: 0	ON: 12 — 14 OFF: 0	—
	Signal (–)	B134	29	0	0	—
Oil flow control solenoid valve (RH)	Signal (+)	B134	18	ON: 10 — 13 OFF: 0	ON: 12 — 14 OFF: 0	—
	Signal (–)	B134	28	0	0	—
Accelera- tor pedal position sensor	Main sen- sor signal	B136	17	Fully closed: 1 Fully opened: 3.5	Fully closed: 1 Fully opened: 3.5	—
	Main power supply	B136	15	5	5	—
	GND (main sensor)	B136	34	0	0	—
	Sub sen- sor signal	B136	28	Fully closed: 1 Fully opened: 3.5	Fully closed: 1 Fully opened: 3.5	—
	Sub power supply	B136	16	5	5	—
	GND (sub sensor)	B136	35	0	0	—
Cruise control set light		B134	16	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	—
Main light		B134	15	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	—
Clutch switch		B134	1	When clutch pedal is depressed: 0 When clutch pedal is released: 10 — 13	When clutch pedal is depressed: 0 When clutch pedal is released: 12 — 14	—
SET/COAST switch		B136	11	ON: 10 — 13 OFF: 0	ON: 12 — 14 OFF: 0	—
Brake switch 1		B136	9	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	8	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	—

Engine Control Module (ECM) I/O Signal

ENGINE (DIAGNOSTICS)

Content	Con- nector No.	Termi- nal No.	Signal (V)		Note
			Ignition SW ON (Engine OFF)	Engine ON (Idling)	
RESUME/ACCEL switch	B136	10	ON: 10 — 13 OFF: 0	ON: 12 — 14 OFF: 0	—
Main switch	B136	7	ON: 10 — 13 OFF: 0	ON: 12 — 14 OFF: 0	—

Input/Output	Measuring condition	Waveform
1. Rear oxygen sensor	5 minutes after driving at a constant speed of 80 — 113 km/h (50 — 70 MPH)	  EN-04680
2. Rear oxygen sensor	While idling (Oxygen sensor in active status)	  EN-04681

6. Engine Condition Data

A: ELECTRICAL SPECIFICATION

Content	Specified data
Engine load	19.2 — 38.88 (%): Idling
	23.7 — 50.0 (%): 2,500 rpm racing

Measuring condition:

- After warm-up the engine.
- Gear position is in neutral position.
- A/C is turned to OFF.
- All accessory switches are turned to OFF.

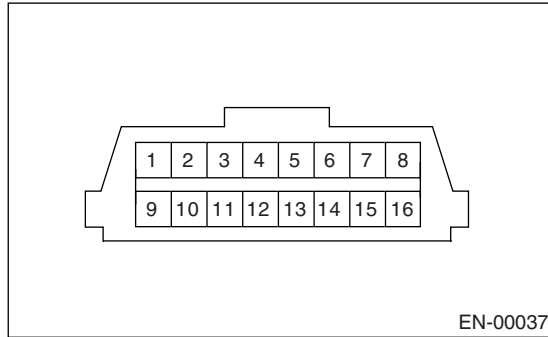
7. Data Link Connector

A: NOTE

This connector is used both for the general scan tools and Subaru Select Monitor.

CAUTION:

Do not connect any scan tools other than the general scan tools and Subaru Select Monitor, because the circuit for Subaru Select Monitor may be damaged.



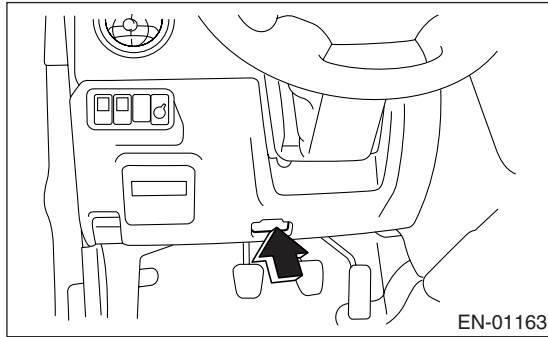
Terminal No.	Contents	Terminal No.	Contents
1	Power supply	9	Blank
2	Blank	10	Subaru Select Monitor/general scan tool signal
3	Blank	11	Blank
4	Blank	12	Ground
5	Blank	13	Ground
6	Blank	14	Blank
7	Blank	15	Blank
8	Blank	16	Blank

8. General Scan Tool

A: OPERATION

1. HOW TO USE GENERAL SCAN TOOL

- 1) Prepare a general scan tool required by SAE J1978.
- 2) Open the cover and connect the general scan tool to 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.

2. MODE \$01 (CURRENT POWERTRAIN DIAGNOSTIC DATA)

Refers to data denoting the current operating condition of analog input/output, digital input/output and/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 revolution	rpm
0D	Vehicle speed	km/h
0E	Ignition timing advance	°
0F	Intake air temperature	°C
10	Air flow rate from mass air flow sensor	g/sec
11	Throttle valve absolute opening angle	%
13	Check whether oxygen sensor is installed.	—
15	Oxygen sensor output voltage and short term fuel trim associated with oxygen sensor	V and %
1C	Supporting OBD system	—
24	A/F value and A/F sensor output voltage	— and V
34	A/F value and A/F sensor current	— and mA

NOTE:

Refer to general scan tool manufacturer's instruction manual to access generic OBD-II PIDs (MODE \$01).

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 non-continuously 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 procedures, refer to the General Scan Tool Operation Manual.)

NOTE:

For details concerning DTC, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).>

General Scan Tool

ENGINE (DIAGNOSTICS)

3. MODE \$02 (POWERTRAIN FREEZE FRAME DATA)

Refers to data denoting the operating condition when trouble is sensed by the on-board diagnosis system. A list of the support data and PID (Parameter Identification) codes are shown in the following table.

PID	Data	Unit of measure
02	DTC that caused CARB required freeze frame data storage	—
03	Fuel system control status	—
04	Calculated engine load value	%
05	Engine coolant temperature	°C
06	Short term fuel trim	%
07	Long term fuel trim	%
0B	Intake manifold absolute pressure	mmHg
0C	Engine revolution	rpm
0D	Vehicle speed	km/h
0E	Ignition timing advance	°
0F	Intake air temperature	°C
10	Air flow rate from mass air flow sensor	g/sec
11	Throttle valve opening angle	%
15	O ₂ sensor output voltage and O ₂ sensor short term fuel trim	V and %

NOTE:

Refer to general scan tool manufacturer's instruction manual to access freeze frame data (MODE \$02).

4. MODE \$03 (EMISSION-RELATED POWERTRAIN DIAGNOSTIC TROUBLE CODE (DTC))

Refer to Read Diagnostic Trouble Code (DTC) for information about data denoting emission-related powertrain DTC. <Ref. to EN(STI)(diag)-35, Read Diagnostic Trouble Code (DTC).>

5. MODE \$04 (CLEAR/RESET EMISSION-RELATED DIAGNOSTIC INFORMATION)

Refers 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 or reset emission-related diagnostic information (MODE \$04).

6. MODE \$06

Refer to test value of troubleshooting and data of test limit on support data bit sequence table. List of support data is shown in the following table.

TID	CID	Test value & Test limit
\$01	\$01	Catalyst system efficiency below threshold
\$03	\$01	Evaporative emission control system large leak
	\$02	Evaporative emission control system small leak
	\$03	Evaporative emission control system very small leak
\$05	\$01	O ₂ sensor circuit slow response (Bank 1 Sensor 1)
\$06	\$01	O ₂ sensor circuit (Bank 1 Sensor 2)
	\$02	
\$07	\$01	O ₂ sensor circuit slow response (Bank 1 Sensor 2)
\$0C	\$01	Coolant thermostat (Coolant temperature below thermostat regulating temperature)
\$0F	\$01	Drain valve range/performance
	\$02	

7. MODE \$07

Refer to data of DTC (pending code) for troubleshooting result about emission in first time.

8. MODE \$09

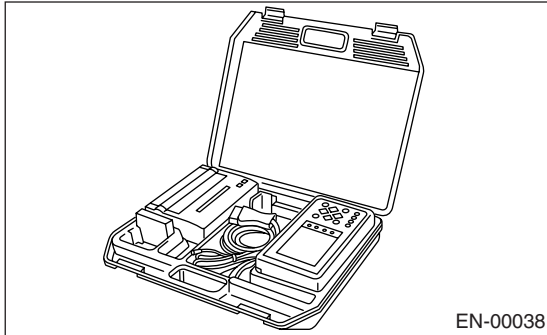
Refer to data of vehicle specification (VIN, calibration ID, etc.).

9. Subaru Select Monitor

A: OPERATION

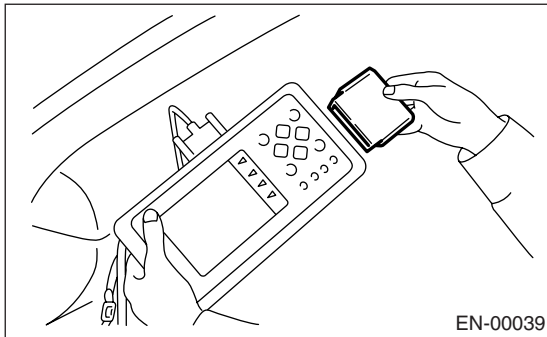
1. HOW TO USE SUBARU SELECT MONITOR

1) Prepare the Subaru Select Monitor kit. <Ref. to EN(STI)(diag)-7, PREPARATION TOOL, General Description.>



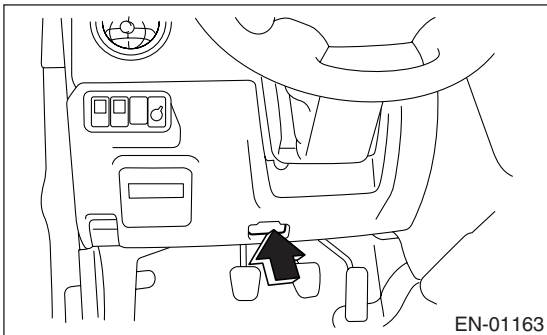
2) Connect the diagnosis cable to Subaru Select Monitor.

3) Insert the cartridge into Subaru Select Monitor. <Ref. to EN(STI)(diag)-7, PREPARATION TOOL, General Description.>



4) 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).

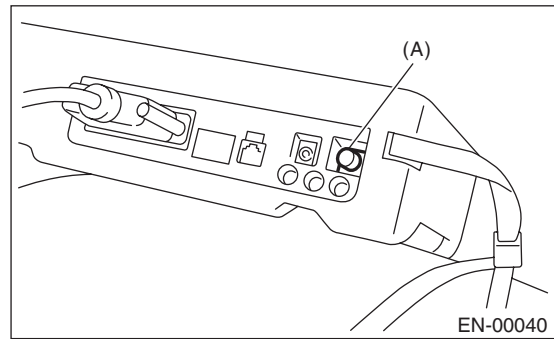


(2) Connect the diagnosis cable to data link connector.

CAUTION:

Do not connect the scan tools except for Subaru Select Monitor and general scan tool.

5) Turn the ignition switch to ON (engine OFF) and Subaru Select Monitor power switch to ON.



(A) Power switch

6) Using the Subaru Select Monitor, call up the DTC and various data, and then record them.

2. READ DIAGNOSTIC TROUBLE CODE (DTC) FOR ENGINE. (NORMAL MODE)

Refer to Read Diagnostic Trouble Code (DTC) for information about how to indicate DTC. <Ref. to EN(STI)(diag)-35, Read Diagnostic Trouble Code (DTC).>

3. READ DIAGNOSTIC TROUBLE CODE (DTC) FOR ENGINE. (OBD MODE)

Refer to Read Diagnostic Trouble Code (DTC) for information about how to indicate DTC. <Ref. to EN(STI)(diag)-35, Read Diagnostic Trouble Code (DTC).>

4. READ CURRENT DATA FOR ENGINE. (NORMAL MODE)

- 1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
 - 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
 - 3) Press the [YES] key after the information of engine type is displayed.
 - 4) On the «Engine Diagnosis» display screen, select the {Current Data Display & Save} and press the [YES] key.
 - 5) On the «Data Display Menu» display screen, select the {Data Display} and press the [YES] key.
 - 6) Using the scroll key, move the display screen up or down until desired data is shown.
- A list of the support data is shown in the following table.

Contents	Display	Unit of measure
Battery voltage	Battery Voltage	V
Vehicle speed signal	Vehicle Speed	km/h or MPH
Engine speed signal	Engine Speed	rpm
Engine coolant temperature signal	Coolant Temp.	°C or °F
Ignition timing signal	Ignition Timing	deg
Throttle position signal	Throttle Opening Angle	%
Injection pulse width	Fuel Injection #1 Pulse	ms
Fuel pump duty control signal	Fuel Pump Duty	%
A/F sensor current	A/F Sensor #1 Current	mA
A/F sensor resistance	A/F Sensor #1 Resistance	ohm
Front oxygen (A/F) sensor lambda value	A/F Sensor #1	—
Rear oxygen sensor output signal	Rear O ₂ Sensor	V
Short term fuel trim	A/F Correction #1	%
Knock sensor correction	Knocking Correction	deg
Atmospheric absolute pressure signal	Atmosphere Pressure	mmHg or kPa or inHg or psi
Intake manifold relative pressure signal	Mani. Relative Pressure	mmHg or kPa or inHg or psi
Intake manifold absolute pressure signal	Mani. Absolute Pressure	mmHg or kPa or inHg or psi
A/F correction (short term fuel trim) by rear oxygen sensor	A/F Correction #3	%
Long term whole fuel trim	A/F Learning #1	%
Canister purge control solenoid valve duty ratio	CPC Valve Duty Ratio	%
Primary supercharged pressure control signal	Primary Control	%
Tumble generator valve position sensor signal (right side)	TGV Position Sensor R	V
Tumble generator valve position sensor signal (left side)	TGV Position Sensor L	V
Accelerator position	Accel. Opening Angle	%
VVT advanced timing (R)	VVTAdv.Amount R	deg
VVT advanced timing (L)	VVTAdv.Amount L	deg
OCV duty ratio (R)	OCV Duty R	%
OCV duty ratio (L)	OCV Duty L	%
OCV duty current (R)	OCV Current R	mA
OCV duty current (L)	OCV Current L	mA
Throttle motor duty	Throttle Motor Duty	%
Throttle power supply voltage	Throttle Motor Voltage	V
Sub-throttle sensor voltage	Sub-Throttle Sensor	V
Main-throttle sensor voltage	Main-Throttle Sensor	V
Sub-accelerator sensor voltage	Sub-Accelerator Sensor	V
Main-accelerator sensor voltage	Main-Accelerator Sensor	V
Memorized cruise speed	Memorized Cruise Speed	km/h
Roughness Monitor for #1 cylinder	Roughness Monitor #1	—

Subaru Select Monitor

ENGINE (DIAGNOSTICS)

Contents	Display	Unit of measure
Roughness Monitor for #2 cylinder	Roughness Monitor #2	—
Roughness Monitor for #3 cylinder	Roughness Monitor #3	—
Roughness Monitor for #4 cylinder	Roughness Monitor #4	—
Fuel level signal	Fuel Level	V
Intake air temperature signal	Intake Air Temp.	°C or °F
Mass air flow sensor signal	Mass Air Flow	g/s
Mass air flow sensor signal	Air Flow Sensor Voltage	V
Fuel tank pressure signal	Fuel Tank Pressure	mmHg or kPa or inHg or psi
Fuel temperature signal	Fuel Temp.	°C or °F
AT/MT identification signal	AT Vehicle ID Signal	ON or OFF
Fuel pressure control signal	PCV Solenoid Valve	ON or OFF
Drain valve signal	Vent. Solenoid Valve	ON or OFF
Tank sensor control solenoid valve signal	Tank Sensor Cntl Valve	ON or OFF
ETC Motor Relay	ETC Motor Relay	ON or OFF
Clutch SW	Clutch Switch	ON or OFF
Stop light SW	Stop Light Switch	ON or OFF
SET/COAST SW	SET/COAST Switch	ON or OFF
RESUME/ACCEL SW	RESUME/ACCEL Switch	ON or OFF
Brake SW	Brake Switch	ON or OFF
Main SW	Main Switch	ON or OFF
Ignition switch signal	Ignition Switch	ON or OFF
Test mode signal	Test Mode Signal	ON or OFF
Neutral position switch signal	Neutral Position Switch	ON or OFF
Air conditioning switch signal	A/C Switch	ON or OFF
Air conditioning signal	A/C Compressor Signal	ON or OFF
Radiator main fan relay signal	Radiator Fan Relay #1	ON or OFF
Blow-by leak diagnosis SW	Blow-by Leak Connector	ON or OFF
Knocking signal	Knocking Signal	ON or OFF
Radiator sub fan relay signal	Radiator Fan Relay #2	ON or OFF
Power steering switch signal	P/S Switch	ON or OFF
Rear oxygen sensor rich signal	Rear O ₂ Rich Signal	ON or OFF
Starter switch signal	Starter Switch	ON or OFF
Idle switch signal	Idle Switch	ON or OFF
Crankshaft position sensor signal	Crankshaft Position Sig.	ON or OFF
Camshaft position sensor signal	Camshaft Position Sig.	ON or OFF
Rear defogger switch signal	Rear Defogger SW	ON or OFF
Blower fan switch signal	Blower Fan SW	ON or OFF
Small light switch signal	Light Switch	ON or OFF
Tumble generator valve output signal	TGV Output	ON or OFF
Tumble generator valve drive signal	TGV Drive	OPEN or CLOSE

NOTE:

For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

5. READ CURRENT DATA FOR ENGINE. (OBD MODE)

- 1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
 - 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
 - 3) Press the [YES] key after the information of engine type is displayed.
 - 4) On the «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
 - 5) On the «OBD Menu» display screen, select the {Current Data Display & Save} and press the [YES] key.
 - 6) On the «Data Display Menu» display screen, select the {Data Display} and press the [YES] key.
 - 7) Using the scroll key, move the display screen up or down until desired data is shown.
- A list of the support data is shown in the following table.

Contents	Display	Unit of measure
Number of DTC	Number of DTC	—
Malfunction indicator light status	MI (MIL)	ON or OFF
Monitoring test of misfire	Misfire monitoring	Complete or incomplete
Monitoring test of fuel system	Fuel system monitoring	Complete or incomplete
Monitoring test of comprehensive component	Component monitoring	Complete or incomplete
Test of catalyst	Catalyst Diagnosis	Complete or incomplete
Test of heated catalyst	Heated catalyst	No support
Test of evaporative emission purge control system	Evaporative purge system	Complete or incomplete
Test of secondary air system	Secondary air system	No support
Test of air conditioning system refrigerant	A/C system refrigerant	No support
Test of oxygen sensor	Oxygen sensor	Complete or incomplete
Test of oxygen sensor heater	O ₂ Heater Diagnosis	Complete or incomplete
Test of EGR system	EGR system	No support
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 or kPa or inHg or psi
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
Throttle position signal	Throttle Opening Angle	%
Oxygen sensor #11	Oxygen Sensor #11	—
Oxygen sensor #12	Oxygen Sensor #12	—
Rear oxygen sensor output signal	Oxygen Sensor #12	V
Air fuel ratio correction by rear oxygen sensor	Short term fuel trim #12	%
On-board diagnostic system	OBD System	CARB-OBD2
A/F sensor output signal	A/F sensor #11	V
A/F lambda signal	A/F sensor #11	—
A/F lambda signal #11	A/F sensor #11	—
A/F sensor current #11	A/F sensor #11	mA

NOTE:

For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

Subaru Select Monitor

ENGINE (DIAGNOSTICS)

6. READ FREEZE FRAME DATA FOR ENGINE. (OBD MODE)

- 1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
 - 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
 - 3) Press the [YES] key after the information of engine type is displayed.
 - 4) On the «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
 - 5) On the «OBD Menu» display screen, select the {Freeze Frame Data} and press the [YES] key.
- A list of the support data is shown in the following table.

Contents	Display	Unit of measure
DTC for freeze frame data	Freeze frame data	DTC
Air fuel ratio control system for bank 1	Fuel system for Bank1	Closed loop or Open loop
Air fuel ratio control system for bank 2	Fuel system for Bank2	Open loop
O ₂ sensor output voltage	Oxygen Sensor #12	V
Short term fuel trim by O ₂ sensor	Short term fuel trim #12	%
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 psi
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
Throttle position signal	Throttle Opening Angle	%

NOTE:

For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

7. LED OPERATION MODE FOR ENGINE

- 1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
 - 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
 - 3) Press the [YES] key after the information of engine type is displayed.
 - 4) On the «Engine Diagnosis» display screen, select the {Current Data Display & Save} and press the [YES] key.
 - 5) On the «Data Display Menu» display screen, select the {Data & LED Display} and press the [YES] key.
 - 6) Using the scroll key, move 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	Message	LED "ON" requirements
Ignition switch signal	Ignition Switch	ON or OFF	When ignition switch is turned to ON.
Test mode signal	Test Mode Signal	ON or OFF	When test mode connector is connected.
Neutral position switch signal	Neutral Position Switch	ON or OFF	When neutral position signal is entered.
Air conditioning switch signal	A/C Switch	ON or OFF	When air conditioning switch is turned ON.
Air conditioning relay signal	A/C Compressor Signal	ON or OFF	When air conditioning relay is in function.
Radiator main fan relay signal	Radiator Fan Relay #1	ON or OFF	When radiator main fan relay is in function.
Knocking signal	Knocking Signal	ON or OFF	When knocking signal is entered.
Radiator sub fan relay signal	Radiator Fan Relay #2	ON or OFF	When radiator sub fan relay is in function.
Rear oxygen sensor rich signal	Rear O ₂ Rich Signal	ON or OFF	When rear oxygen sensor mixture ratio is rich.
Starter switch signal	Starter Switch Signal	ON or OFF	When starter switch signal is entered.
Idle switch signal	Idle Switch Signal	ON or OFF	When idle switch signal is entered.
Crankshaft position sensor signal	Crankshaft Position Signal	ON or OFF	When crankshaft position sensor signal is entered.
Camshaft position sensor signal	Camshaft Position Signal	ON or OFF	When camshaft position sensor signal is entered.
Power steering switch signal	P/S Switch	ON or OFF	When power steering switch is entered.
Rear defogger switch signal	Rear Defogger Switch	ON or OFF	When rear defogger switch is turned ON.
Blower fan switch signal	Blower Fan Switch	ON or OFF	When blower fan switch is turned ON.
Small light switch signal	Light Switch	ON or OFF	When small light switch is turned ON.
Tumble generator valve actuator signal	TGV Output	ON or OFF	When TGV actuator signal is entered.
Tumble generator valve drive signal	TGV Drive	Close or Open	When TGV moves and valve opens.
Fuel pressure control solenoid	PCV Solenoid Valve	ON or OFF	When fuel pressure control solenoid valve is in function.
Drain valve signal	Vent. Solenoid Valve	ON or OFF	When drain valve is in function.
Fuel tank sensor control solenoid valve signal	Fuel Tank Sensor Ctrl Valve	ON or OFF	When tank sensor control solenoid valve is in function.
Blow-by leak diagnosis SW	Blow-by Leak Connector	ON or OFF	When connected.
Handle SW	Handle SW	RHD/LHD	When the vehicle is LHD model.
ETC motor relay	ETC Motor Relay	ON or OFF	When electronic throttle control is in function.
Clutch SW	Clutch SW	ON or OFF	When clutch switch is turned ON.
Stop SW	Stop Light Switch	ON or OFF	When stop light switch is turned ON.
SET/CST SW	SET/COAST Switch	ON or OFF	When SET/COAST switch is turned ON.
RES/ACC SW	RESUME/ACCEL Switch	ON or OFF	When RESUME/ACCEL switch is turned ON.
Brake SW	Brake Switch	ON or OFF	When brake switch is turned ON.
Main SW	Main Switch	ON or OFF	When main switch is turned ON.

NOTE:

For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

8. VIN REGISTRATION

- 1) On «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
- 2) On «System Selection Menu» display screen, select the {Engine} and press the [YES] key.
- 3) Press the [YES] key after the information of engine type is displayed.
- 4) On «Engine Diagnosis» display screen, select the {VIN Registration}, and then press the [YES] key.
- 5) Perform the procedure shown on the display.

NOTE:

For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

10. Read Diagnostic Trouble Code (DTC)

A: OPERATION

1. SUBARU SELECT MONITOR (NORMAL MODE)

- 1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
- 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
- 3) Press the [YES] key after the information of engine type is displayed.
- 4) On the «Engine Diagnosis» display screen, select the {DTC Display} and press the [YES] key.
- 5) On the «DTC Display» display screen, select the {Current DTC} or {History DTC} and press the [YES] key.

NOTE:

- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
- For detailed concerning DTC, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).>

2. SUBARU SELECT MONITOR (OBD MODE)

- 1) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
- 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
- 3) Press the [YES] key after the information of engine type is displayed.
- 4) On the «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
- 5) On the «OBD Menu» display screen, select the {DTC Display} and press the [YES] key.
- 6) Make sure that a DTC is shown on the display screen.

NOTE:

- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
- For detailed concerning DTC, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).>

3. GENERAL SCAN TOOL

Refers to data denoting emission-related powertrain DTC.

For details concerning DTC, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).>

NOTE:

Refer to general scan tool manufacturer's instruction manual to access emission-related powertrain DTC (MODE \$03).

11. Inspection Mode

A: PROCEDURE

Carry out trouble diagnosis shown in the following DTC table.

When performing trouble diagnosis which is not shown in the DTC table, refer to the next item Drive cycle.

<Ref. to EN(STI)(diag)-41, Drive Cycle.>

DTC	Item	Condition
P0011	"A" Camshaft Position-Timing Over-Advanced or System Performance (Bank 1)	—
P0021	"A" Camshaft Position-Timing Over-Advanced or System Performance (Bank 2)	—
P0031	HO2S Heater Control Circuit Low (Bank 1 Sensor 1)	—
P0032	HO2S Heater Control Circuit High (Bank 1 Sensor 1)	—
P0037	HO2S Heater Control Circuit Low (Bank 1 Sensor 2)	—
P0038	HO2S Heater Control Circuit High (Bank 1 Sensor 2)	—
P0102	Mass or Volume Air Flow Circuit Low Input	—
P0103	Mass or Volume Air Flow Circuit High Input	—
P0107	Manifold Absolute Pressure/Barometric Pressure Circuit Low Input	—
P0108	Manifold Absolute Pressure/Barometric Pressure Circuit High Input	—
P0112	Intake Air Temperature Circuit Low Input	—
P0113	Intake Air Temperature Circuit High Input	—
P0117	Engine Coolant Temperature Circuit Low Input	—
P0118	Engine Coolant Temperature Circuit High Input	—
P0122	Throttle/Pedal Position Sensor/Switch "A" Circuit Low Input	—
P0123	Throttle/Pedal Position Sensor/Switch "A" Circuit High Input	—
P0131	O ₂ Sensor Circuit Low Voltage (Bank 1 Sensor 1)	—
P0132	O ₂ Sensor Circuit High Voltage (Bank 1 Sensor 1)	—
P0137	O ₂ Sensor Circuit Low Voltage (Bank 1 Sensor 2)	—
P0138	O ₂ Sensor Circuit High Voltage (Bank 1 Sensor 2)	—
P0182	Fuel Temperature Sensor "A" Circuit Low Input	—
P0183	Fuel Temperature Sensor "A" Circuit High Input	—
P0222	Throttle/Pedal Position Sensor/Switch "B" Circuit Low Input	—
P0223	Throttle/Pedal Position Sensor/Switch "B" Circuit High Input	—
P0230	Fuel Pump Primary Circuit	—
P0245	Turbo/Super Charger Wastegate Solenoid "A" Low	—
P0327	Knock Sensor 1 Circuit Low Input (Bank 1 or Single Sensor)	—
P0328	Knock Sensor 1 Circuit High Input (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)	—
P0447	Evaporative Emission Control System Vent Control Circuit Open	—
P0448	Evaporative Emission Control System Vent Control Circuit Shorted	—
P0452	Evaporative Emission Control System Pressure Sensor Low Input	—
P0453	Evaporative Emission Control System Pressure Sensor High Input	—
P0458	Evaporative Emission Control System Purge Control Valve Circuit Low	—
P0462	Fuel Level Sensor Circuit Low Input	—
P0463	Fuel Level Sensor Circuit High Input	—
P0502	Vehicle Speed Sensor Circuit Low Input	—
P0503	Vehicle Speed Sensor Intermittent/Erratic/High	—
P0512	Starter Request Circuit	—

Inspection Mode

ENGINE (DIAGNOSTICS)

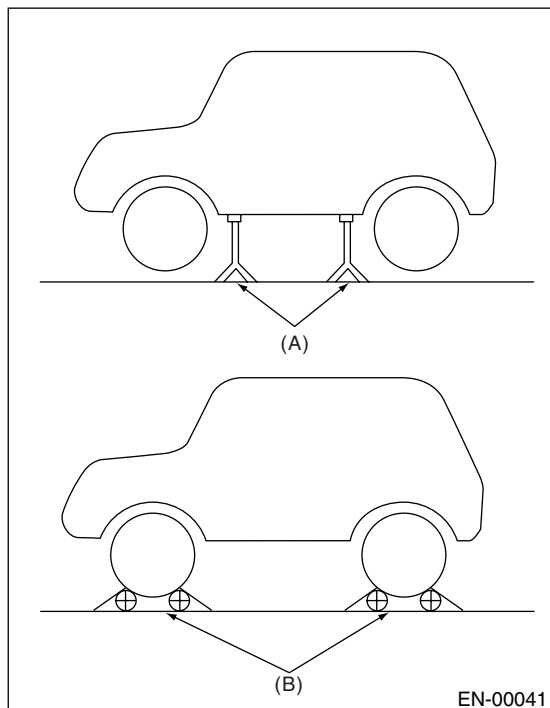
DTC	Item	Condition
P0519	Idle Control System Malfunction (Fail-Safe)	—
P0604	Internal Control Module Random Access Memory (RAM) Error	—
P0605	Internal Control Module Read Only Memory (ROM) Error	—
P0607	Control Module Performance	—
P0638	Throttle Actuator Control Range/Performance (Bank 1)	—
P0691	Cooling Fan 1 Control Circuit Low	—
P0851	Neutral Switch Input Circuit Low	—
P0852	Neutral Switch Input Circuit High	—
P1152	O ₂ Sensor Circuit Range/Performance (Low) (Bank1 Sensor1)	—
P1153	O ₂ Sensor Circuit Range/Performance (High) (Bank1 Sensor1)	—
P1160	Return Spring Failure	—
P1400	Fuel Tank Pressure Control Solenoid Valve Circuit Low	—
P1420	Fuel Tank Pressure Control Sol. Valve Circuit High	—
P1446	Fuel Tank Sensor Control Valve Circuit Low	—
P1447	Fuel Tank Sensor Control Valve Circuit High	—
P1491	Positive Crankcase Ventilation (Blow-by) Function Problem	—
P1518	Starter Switch Circuit Low Input	—
P1560	Back-up Voltage Circuit Malfunction	—
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 (Bank1)	—
P2017	Intake Manifold Runner Position Sensor / Switch Circuit High (Bank1)	—
P2021	Intake Manifold Runner Position Sensor / Switch Circuit Low (Bank 2)	—
P2022	Intake Manifold Runner Position Sensor / Switch Circuit High (Bank 2)	—
P2088	OCV Solenoid Valve Signal A Circuit Open (Bank 1)	—
P2089	OCV Solenoid Valve Signal A Circuit Short (Bank 1)	—
P2092	OCV Solenoid Valve Signal A Circuit Open (Bank 2)	—
P2093	OCV Solenoid Valve Signal A Circuit Short (Bank 2)	—
P2101	Throttle Actuator Control Motor Circuit Range/Performance	—
P2102	Throttle Actuator Control Motor Circuit Low	—
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 Rationality	—
P2138	Throttle/Pedal Position Sensor/Switch "D" / "E" Voltage Rationality	—
P2227	Barometric Pressure Circuit Range/Performance	—
P2228	Barometric Pressure Circuit Low Input	—
P2229	Barometric Pressure Circuit High Input	—

1. PREPARATION FOR THE INSPECTION MODE

- 1) Make sure that the fuel remains approx. half amount [20 — 40 ℓ (5.3 — 10.6 US gal, 4.4 — 8.8 Imp gal)] and the battery voltage is 12 V or more.
- 2) Raise the vehicle using a garage jack and place on rigid racks or drive the vehicle onto free rollers.

WARNING:

- Before raising the vehicle, ensure the parking brake is applied.
- Do not use a pantograph jack in place of a rigid rack.
- Secure a rope or wire to the front and rear towing or tie-down hooks to prevent the lateral runout of front wheels.
- Do not abruptly depress/release the clutch pedal or accelerator pedal during works even when engine is operating at low speeds since this may cause vehicle to jump off free rollers.
- In order to prevent the vehicle from slipping due to vibration, do not place any wooden blocks or similar items between the rigid racks and the vehicle.
- Since the rear wheels will also rotate, do not place anything near them. Also, make sure that nobody goes in front of the vehicle.



EN-00041

- (A) Rigid rack
(B) Free rollers

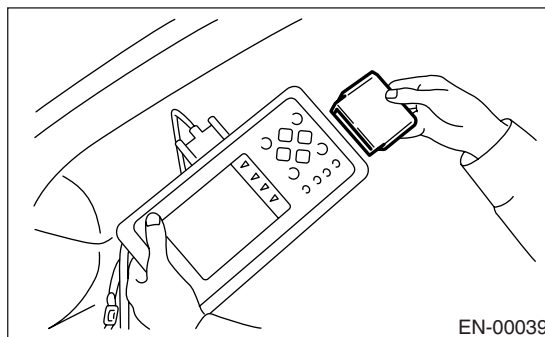
2. SUBARU SELECT MONITOR

- 1) After cleaning the memory, check for any remaining unsolved trouble data. <Ref. to EN(STI)(diag)-45, Clear Memory Mode.>
- 2) Warm up the engine.
- 3) Prepare the Subaru Select Monitor kit. <Ref. to EN(STI)(diag)-7, PREPARATION TOOL, General Description.>



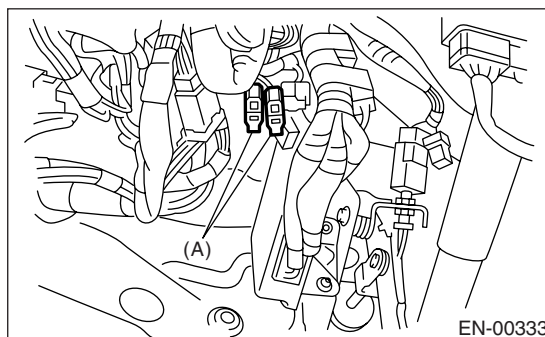
EN-00038

- 4) Connect the diagnosis cable to Subaru Select Monitor.
- 5) Insert the cartridge into Subaru Select Monitor. <Ref. to EN(STI)(diag)-7, PREPARATION TOOL, General Description.>



EN-00039

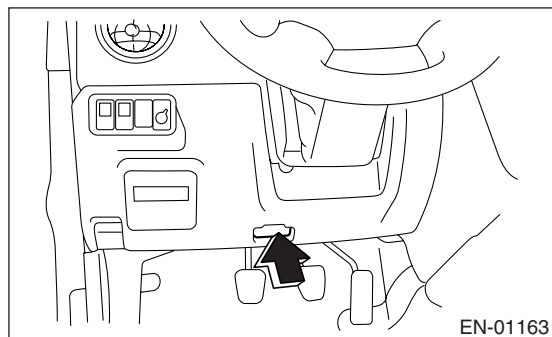
- 6) Connect the test mode connector (A) at the lower portion of instrument panel (on the driver's side).



EN-00333

- (A) Test mode connector

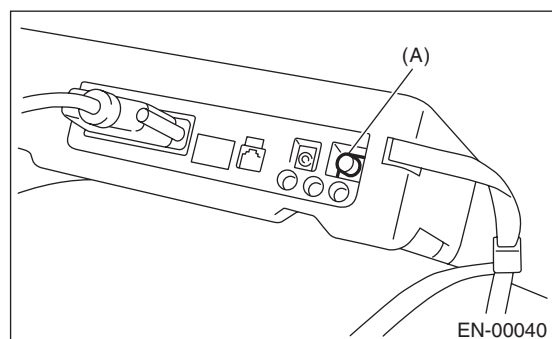
7) Connect the Subaru Select Monitor to data link connector located in the lower portion of the instrument panel (on the driver's side).



CAUTION:

Do not connect the scan tools except for Subaru Select Monitor and general scan tool.

8) Turn the ignition switch to ON (engine OFF) and Subaru Select Monitor power switch to ON.



(A) Power switch

9) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.

10) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.

11) Press the [YES] key after the information of engine type is displayed.

12) On the «Engine Diagnosis» display screen, select the {Dealer Check Mode Procedure} and press the [YES] key.

13) When the "Perform Inspection (Dealer Check) Mode?" is shown on the display screen, press the [YES] key.

14) Perform subsequent procedures as instructed on the display screen.

- If trouble still remains in the memory, the corresponding DTC appears on the display screen.

NOTE:

- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

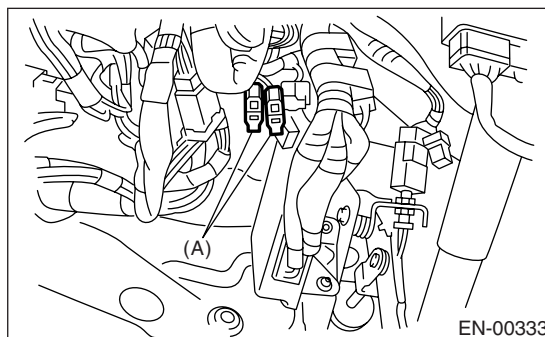
- For detailed concerning the DTC, refer to the List of Diagnostic Trouble Code (DTC).

<Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).>

- Release the parking brake.
- The speed difference between front and rear wheels may light either the ABS warning light, but this indicates no malfunctions. When the engine control diagnosis is finished, perform the ABS memory clearance procedure of self-diagnosis function.

3. GENERAL SCAN TOOL

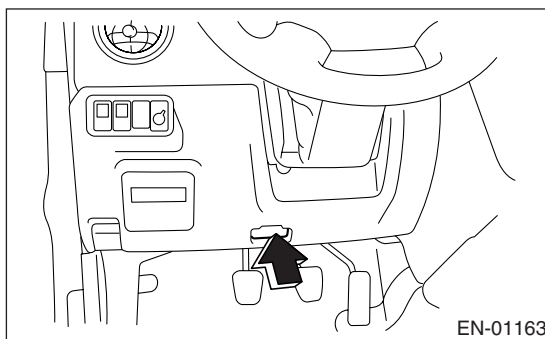
- 1) Warm up the engine.
- 2) Connect the test mode connector (A) at the lower side of instrument panel (on the driver's side).



- 3) Connect the general scan tool to its data link connector in the lower portion of instrument panel (on the driver's side).

CAUTION:

Do not connect the scan tools except for Subaru Select Monitor and general scan tool.



- 4) Start the engine.

NOTE:

Depress the clutch pedal when starting engine.

5) Using the shift lever, turn the "N" position switch to ON.

6) Keep the engine speed in 2,500 — 3,000 rpm range for 40 seconds.

7) Place the shift lever in "1st" gear and drive the vehicle at 5 to 10 km/h (3 to 6 MPH).

NOTE:

- On AWD model, release the parking brake.

- The speed difference between front and rear wheels may light ABS warning light, but this indicates no malfunctions. When the engine control diagnosis is finished, perform the ABS memory clearance procedure of self-diagnosis function.

8) Using the general scan tool, check for DTC and record the result(s).

NOTE:

- For detailed operation procedures, refer to the General Scan Tool Instruction Manual.
- For detailed concerning DTC, refer to the List of Diagnostic Trouble Code (DTC).

<Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).>

12. Drive Cycle

A: PROCEDURE

There are six drive patterns of drive cycles A — F for the trouble diagnosis. Performing the specified drive pattern allows to diagnose malfunctioning items listed below. After the malfunctioning items listed below are repaired, always check if they correctly resume their functions by performing the required drive pattern.

1. PREPARATION FOR THE DRIVE CYCLE

- 1) Make sure that the fuel remains approx. half amount [20 — 40 ℓ (5.3 — 10.6 US gal, 4.4 — 8.8 Imp gal)], and battery voltage is 12 V or more.
- 2) Disconnect the test mode connector.

NOTE:

- Except for the engine coolant temperature specified items at starting, the diagnosis is carried out after engine warm up.
- Carry out the diagnosis which is marked * on DTC twice, then, after finishing first diagnosis, stop the engine and do second time at the same condition.

2. DRIVE CYCLE A (AFTER RUNNING 20 MINUTES AT 80 KM/H (50 MPH), IDLE ENGINE FOR 1 MINUTE).

DTC	Item	Condition
*P0125	Insufficient Coolant Temperature for Closed Loop Fuel Control	Engine coolant temperature is less than 20°C (68°F) at engine start.
*P0126	Insufficient Coolant Temperature for Stable Operation	—
*P0128	Coolant Thermostat	Engine coolant temperature is less than 55°C (131°F) at engine start.
*P0133	O ₂ Sensor Circuit Slow Response (Bank 1 Sensor 1)	—
*P0171	System Too Lean (Bank 1)	Diagnosis completes in drive cycle B or C as well.
*P0172	System Too Rich (Bank 1)	Diagnosis completes in drive cycle B or C as well.
*P0301	Cylinder 1 Misfire Detected	Diagnosis completes in drive cycle B or C as well.
*P0302	Cylinder 2 Misfire Detected	Diagnosis completes in drive cycle B or C as well.
*P0303	Cylinder 3 Misfire Detected	Diagnosis completes in drive cycle B or C as well.
*P0304	Cylinder 4 Misfire Detected	Diagnosis completes in drive cycle B or C as well.
*P0420	Catalyst System Efficiency Below Threshold (Bank 1)	—
*P0442	Evaporative Emission Control System Leak Detected (small leak)	Engine coolant temperature is less than 25°C (77°F) at engine start.
*P0451	Evaporative Emission Control System Pressure Sensor Range/Performance	—
*P0456	Evaporative Emission Control System Leak Detected (very small leak)	Engine coolant temperature is less than 25°C (77°F) at engine start.
*P0457	Evaporative Emission Control System Leak Detected (fuel cap loose/off)	Engine coolant temperature is less than 25°C (77°F) at engine start.
*P0459	Evaporative Emission Control System Purge Control Valve Circuit High	—
*P0692	Cooling Fan 1 Control Circuit High	—
P1443	Vent Control Solenoid Valve Function Problem	—
*P2096	Post Catalyst Fuel Trim System Too Lean Bank 1	Diagnosis completes in drive cycle B or C as well.
*P2097	Post Catalyst Fuel Trim System Too Rich Bank 1	Diagnosis completes in drive cycle B or C as well.
P2103	Throttle Actuator Control Motor Circuit High	Diagnosis completes in drive cycle B or C as well.

Drive Cycle

ENGINE (DIAGNOSTICS)

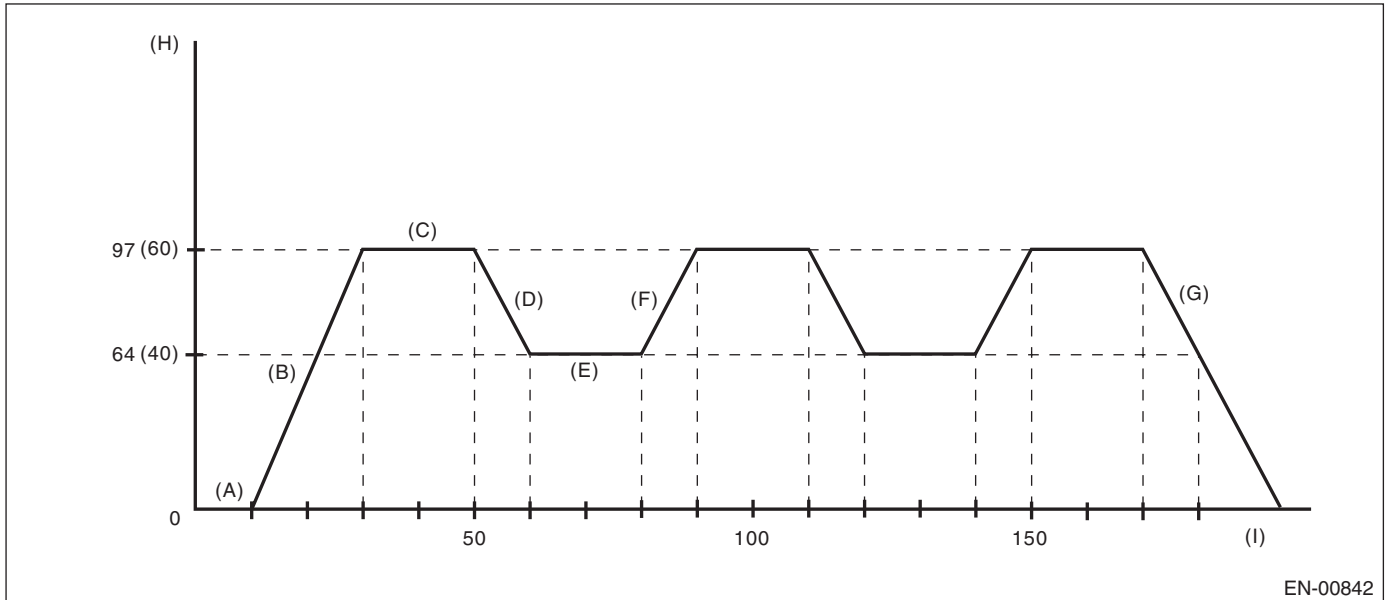
3. DRIVE CYCLE B (IDLE FOR 10 MINUTES)

NOTE:

Before the diagnosis, drive the vehicle at 10 km/h (6 MPH) or more.

DTC	Item	Condition
*P0111	Intake Air Temperature Sensor Range/Performance Problem	Engine coolant temperature is less than 30°C (86°F) at engine start.
*P0171	System too Lean (Bank 1)	Diagnosis completes in drive cycle A or C as well.
*P0172	System too Rich (Bank 1)	Diagnosis completes in drive cycle A or C as well.
*P0301	Cylinder 1 Misfire Detected	Diagnosis completes in drive cycle A or C as well.
*P0302	Cylinder 2 Misfire Detected	Diagnosis completes in drive cycle A or C as well.
*P0303	Cylinder 3 Misfire Detected	Diagnosis completes in drive cycle A or C as well.
*P0304	Cylinder 4 Misfire Detected	Diagnosis completes in drive cycle A or C as well.
*P0464	Fuel Level Sensor Circuit Intermittent	—
*P0483	Cooling Fan Rationality Check	—
*P0506	Idle Control System RPM Lower Than Expected	—
*P0507	Idle Control System RPM Higher Than Expected	—
*P2096	Post Catalyst Fuel Trim System Too Lean Bank 1	Diagnosis completes in drive cycle A or C as well.
*P2097	Post Catalyst Fuel Trim System Too Rich Bank 1	Diagnosis completes in drive cycle A or C as well.
P2103	Throttle Actuator Control Motor Circuit High	Diagnosis completes in drive cycle A or C as well.

4. DRIVE CYCLE C (DRIVE ACCORDING TO THE FOLLOWING DRIVE PATTERN)



(A) Idle engine for 10 seconds or more.	(D) Decelerate with fully closed throttle to 64 km/h (40 MPH).	(G) Stop vehicle with throttle fully closed.
(B) Accelerate to 97 km/h (60 MPH) within 20 seconds.	(E) Drive vehicle at 64 km/h (40 MPH) for 20 seconds.	(H) km/h (MPH)
(C) Drive vehicle at 97 km/h (60 MPH) for 20 seconds.	(F) Accelerate to 97 km/h (60 MPH) within 10 seconds.	(I) second

DTC	Item	Condition
*P0030	HO2S Heater Control Circuit (Bank 1 Sensor 1)	—
*P0068	Manifold Absolute Pressure/Barometric Pressure Circuit Range/Performance	—
*P0101	Mass or Volume Air Flow Circuit Range/Performance	—
P0134	O ₂ Sensor Circuit No Activity Detected (Bank 1 Sensor 1)	—
*P0139	O ₂ Sensor Circuit Slow Response (Bank 1 Sensor 2)	—
*P0171	System too Lean (Bank 1)	Diagnosis completes in drive cycle A or B as well.
*P0172	System too Rich (Bank 1)	Diagnosis completes in drive cycle A or B as well.
P0244	Turbo/Supercharger Wastegate Solenoid "A" Range/Performance	—
P0246	Turbo/Supercharger Wastegate Solenoid "A" High	—
P0301	Cylinder 1 Misfire Detected	Diagnosis completes in drive cycle A or B as well.
P0302	Cylinder 2 Misfire Detected	Diagnosis completes in drive cycle A or B as well.
P0303	Cylinder 3 Misfire Detected	Diagnosis completes in drive cycle A or B as well.
P0304	Cylinder 4 Misfire Detected	Diagnosis completes in drive cycle A or B as well.
P2004	Intake Manifold Runner Control Stuck Open (Bank 1)	—
P2005	Intake Manifold Runner Control Stuck Open (Bank 2)	—
*P2096	Post Catalyst Fuel Trim System Too Lean Bank 1	Diagnosis completes in drive cycle A or B as well.
*P2097	Post Catalyst Fuel Trim System Too Rich Bank 1	Diagnosis completes in drive cycle A or B as well.

Drive Cycle

ENGINE (DIAGNOSTICS)

DTC	Item	Condition
P2103	Throttle Actuator Control Motor Circuit High	Diagnosis completes in drive cycle A or B as well.

5. DRIVE CYCLE D

• DRIFT DIAGNOSIS

- 1) Make sure that the engine coolant temperature at engine starting is less than 30°C (86°F).
- 2) Make sure that fuel of more than 10 ℓ (2.6 US gal, 2.2 Imp gal) remains and the battery voltage is more than 10.9 V.
- 3) Make sure that the engine coolant temperature rises for more than 10°C (50°F) from the level of engine starting and is also more than 75°C (167°F).
- 4) Idle the engine for more than 120 seconds in the condition of step 3.

• STUCK DIAGNOSIS

- 1) Make sure that the battery voltage is more than 10.9 V.
- 2) Perform the clear memory mode. <Ref. to EN(STI)(diag)-45, Clear Memory Mode.>
- 3) Drive the vehicle for the distance equal to fuel of 50 ℓ (13.2 US gal, 11 Imp gal).

NOTE:

- It is possible to drive intermittently.
- Do not disconnect the terminal of battery during diagnosis. (If disconnecting the terminal of battery, the data will be cleared.)

DTC	Item	Condition
P0181	Fuel Temperature Sensor "A" Circuit Range/Performance	—

6. DRIVE CYCLE E

- 1) Make sure that the battery voltage is more than 10.9 V.
- 2) Perform the clear memory mode. <Ref. to EN(STI)(diag)-45, Clear Memory Mode.>
- 3) Drive the vehicle for the distance equal to fuel of 30 ℓ (7.9 US gal, 6.6 Imp gal).

NOTE:

- It is possible to drive intermittently.
- Do not disconnect the terminal of battery during diagnosis. (If disconnecting the terminal of battery, the data will be cleared.)

DTC	Item	Condition
P0461	Fuel Level Sensor Circuit Range/Performance	—

7. DRIVE CYCLE F

- 1) Make sure that the battery voltage is more than 10.9 V.
- 2) Drive the vehicle at 80 km/h (50 MPH) for 20 minutes, and then idle the engine for a minute.
- 3) Read the current data of engine using Subaru Select Monitor. Make sure that the item of evaporative emission purge control system is displayed as "Completed". <Ref. to EN(STI)(diag)-31, READ CURRENT DATA FOR ENGINE. (OBD MODE), OPERATION, Subaru Select Monitor.>
- 4) Drive down for difference of elevation of 52 m (164 ft) within 80 seconds. (Ex: Drive down a incline with grade of 6% at 40 km/h (25 MPH).)
- 5) Repeat the step 4 for five times.

NOTE:

- Do not drive at than 68 km/h (42 MPH) in step 4 and 5.
- Do not disconnect the terminal of battery during diagnosis. (If disconnecting the terminal of battery, the data will be cleared.)
- Do not perform the Clear Memory in diagnosis. (If the Clear Memory is performed, the data will be cleared.)

DTC	Item	Condition
P1448	Fuel Tank Sensor Control Valve Range/Performance	—

13. Clear Memory Mode

A: OPERATION

1. SUBARU SELECT MONITOR (NORMAL MODE)

- 1) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
- 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
- 3) Press the [YES] key after the information of engine type is displayed.
- 4) On the «Engine Diagnosis» display screen, select the {Clear Memory} and press the [YES] key.
- 5) When the 'Done' and 'Turn Ignition Switch OFF' are shown on the display screen, turn the ignition switch to OFF, and then turn the Subaru Select Monitor to OFF.

NOTE:

For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

2. SUBARU SELECT MONITOR (OBD MODE)

- 1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
- 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
- 3) Press the [YES] key after the information of engine type is displayed.
- 4) On the «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
- 5) On the «OBD Menu» display screen, select the {Diagnosis Code(s) Cleared} and press the [YES] key.
- 6) When the 'Clear Diagnostic Code?' is shown on the display screen, press the [YES] key.
- 7) Turn the ignition switch to OFF, and then turn the Subaru Select Monitor power switch to OFF.

NOTE:

For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

3. GENERAL SCAN TOOL

For clear memory procedures using the general scan tool, refer to the General Scan Tool Instruction Manual.

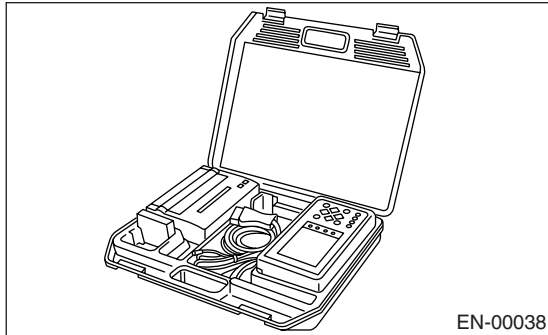
Compulsory Valve Operation Check Mode

ENGINE (DIAGNOSTICS)

14. Compulsory Valve Operation Check Mode

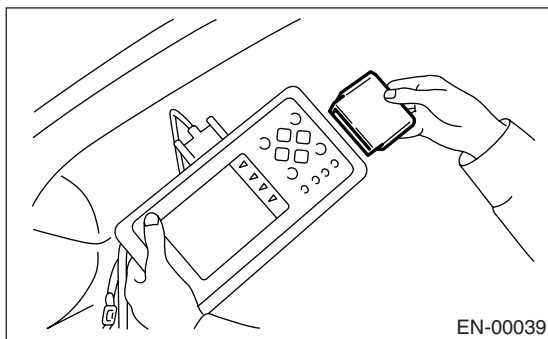
A: OPERATION

1) Prepare the Subaru Select Monitor kit. <Ref. to EN(STI)(diag)-7, PREPARATION TOOL, General Description.>

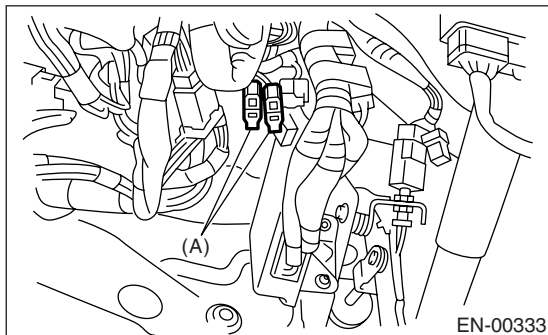


2) Connect the diagnosis cable to Subaru Select Monitor.

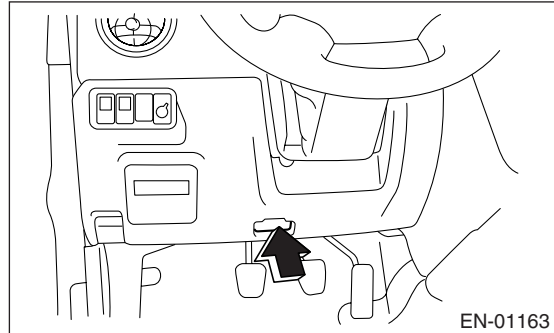
3) Insert the cartridge into Subaru Select Monitor. <Ref. to EN(STI)(diag)-7, PREPARATION TOOL, General Description.>



4) Connect the test mode connector (A) at the lower portion of instrument panel (on the driver's side).



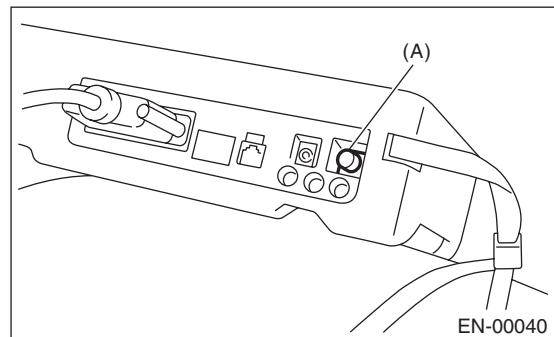
5) Connect the Subaru Select Monitor to data link connector located in the lower portion of instrument panel (on the driver's side).



CAUTION:

Do not connect scan tools except for the Subaru Select Monitor and general scan tool.

6) Turn the ignition switch to ON (engine OFF) and Subaru Select Monitor power switch to ON.



(A) Power switch

7) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.

8) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.

9) Press the [YES] key after the information of engine type is displayed.

10) On the «Engine Diagnosis» display screen, select the {System Operation Check Mode} and press the [YES] key.

11) On the «System Operation Check Mode» display screen, select the {Actuator ON/OFF Operation} and press the [YES] key.

12) Select the desired compulsory actuator on the «Actuator ON/OFF Operation» display screen and press the [YES] key.

13) Pressing the [NO] key completes the compulsory operation check mode. The display will then return to the «Actuator ON/OFF Operation» screen.

- A list of support data is shown in the following table.

Compulsory Valve Operation Check Mode

ENGINE (DIAGNOSTICS)

Contents	Display
Compulsory fuel pump relay operation check	Fuel Pump Relay
Compulsory radiator fan relay operation check	Radiator Fan Relay
Compulsory air conditioning relay operation check	A/C Compressor Relay
Compulsory purge control solenoid valve operation check	CPC Solenoid Valve
Compulsory pressure control solenoid valve operation check	PCV Solenoid Valve
Compulsory drain valve operation check	Vent. Control Solenoid Valve
Compulsory fuel tank sensor control valve operation check	Fuel Tank Sensor Control Valve

NOTE:

- The following parts will be displayed but not functional because they are not installed on the vehicle.

Display
EGR Solenoid Valve
ASV Solenoid Valve
FICD Solenoid
Pressure Switching Sol. 1
Pressure Switching Sol. 2
AAI Solenoid Valve
Turbocharger Wastegate Solenoid

- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

Malfunction Indicator Light

ENGINE (DIAGNOSTICS)

15. Malfunction Indicator Light

A: PROCEDURE

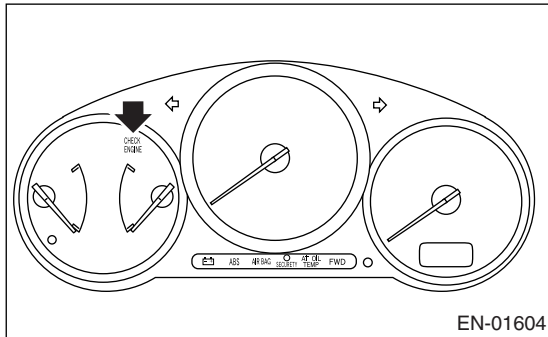
1. Activation of check malfunction indicator light. <Ref. to EN(STI)(diag)-49, ACTIVATION OF MALFUNCTION INDICATOR LIGHT, Malfunction Indicator Light.>
↓
2. Check that the malfunction indicator light does not come on. <Ref. to EN(STI)(diag)-50, MALFUNCTION INDICATOR LIGHT DOES NOT COME ON., Malfunction Indicator Light.>
↓
3. Check that the malfunction indicator light does not go off. <Ref. to EN(STI)(diag)-52, MALFUNCTION INDICATOR LIGHT DOES NOT GO OFF., Malfunction Indicator Light.>
↓
4. Check that the malfunction indicator light does not blink at a cycle of 3 Hz. <Ref. to EN(STI)(diag)-53, MALFUNCTION INDICATOR LIGHT DOES NOT BLINK AT A CYCLE OF 3 HZ., Malfunction Indicator Light.>
↓
5. Check that the malfunction indicator light remains blinking at a cycle of 3 Hz. <Ref. to EN(STI)(diag)-55, MALFUNCTION INDICATOR LIGHT REMAINS BLINKING AT A CYCLE OF 3 HZ., Malfunction Indicator Light.>

B: ACTIVATION OF MALFUNCTION INDICATOR LIGHT

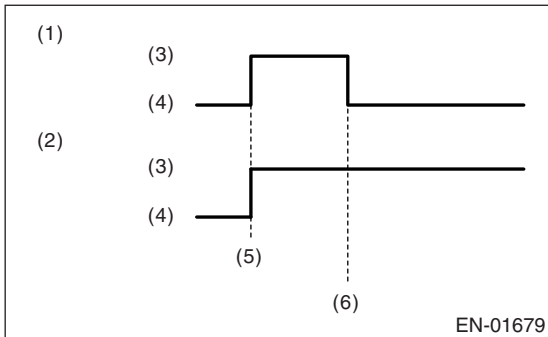
1) When the ignition switch is turned to ON (engine off), the malfunction indicator light in the combination meter illuminates.

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(STI)(diag)-50, MALFUNCTION INDICATOR LIGHT DOES NOT COME ON., Malfunction Indicator Light.>

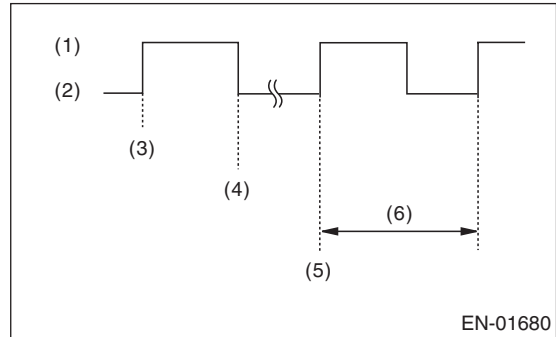


2) After starting the engine, the malfunction indicator light goes out. If it does not, either the engine or the emission control system is malfunctioning.



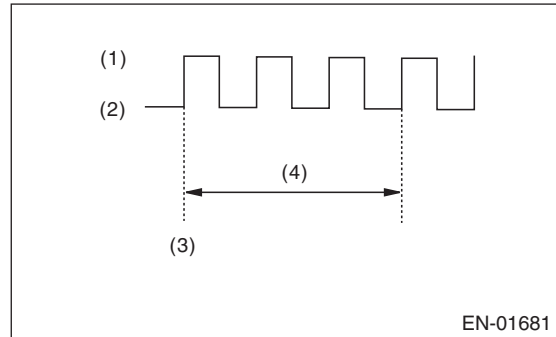
- (1) No trouble
- (2) Trouble occurs
- (3) ON
- (4) OFF
- (5) Ignition switch ON
- (6) Engine start

3) If the diagnosis system senses a misfire which could damage the catalyzer, 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) When the ignition switch is turned to ON (engine off) or to START with the test mode connector connected, the malfunction indicator light blinks at a cycle of 3 Hz.



- (1) ON
- (2) OFF
- (3) Ignition switch ON
- (4) 1 second

Malfunction Indicator Light

ENGINE (DIAGNOSTICS)

C: MALFUNCTION INDICATOR LIGHT DOES NOT COME ON.

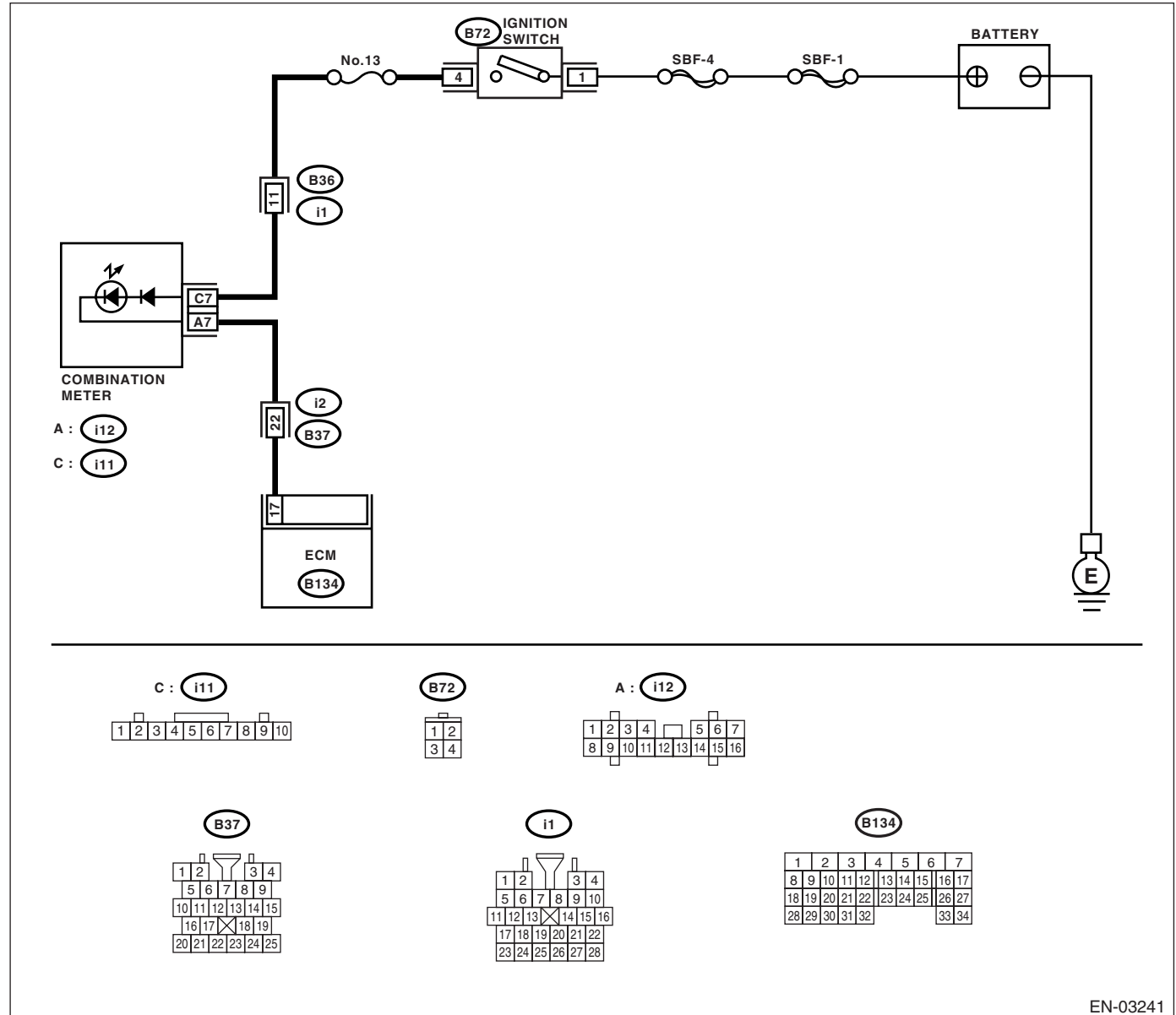
DIAGNOSIS:

The malfunction indicator light circuit is shorted.

TROUBLE SYMPTOM:

When the ignition switch is turned to ON (engine OFF), malfunction indicator light does not come on.

WIRING DIAGRAM:



EN-03241

Step	Check	Yes	No
1	CHECK OUTPUT SIGNAL FROM ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and chassis ground. Connector & terminal (B134) No. 17 (+) — Chassis ground (-):	Go to step 4.	Go to step 2.
2	CHECK POOR CONTACT.	Does the malfunction indicator light come on when shaking or pulling ECM connector and harness?	Repair the poor contact in ECM connector. Go to step 3.

Malfunction Indicator Light

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
3 CHECK ECM CONNECTOR.	Is the ECM connector correctly connected?	Replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).>	Repair the connection of ECM connector.
4 CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Remove the combination meter. <Ref. to IDI-10, Combination Meter.> 3) Disconnect the connector from ECM and combination meter. 4) Measure the resistance of harness between ECM and combination meter connector. Connector & terminal (B134) No. 17 — (i12) 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: • Open circuit in harness between ECM and combination meter connector • Poor contact in coupling connector
5 CHECK POOR CONTACT. Check poor contact in combination meter connector.	Is there poor contact in combination meter connector?	Repair the poor contact in combination meter connector.	Go to step 6.
6 CHECK HARNESS BETWEEN COMBINATION METER AND IGNITION SWITCH CONNECTOR. 1) Turn the ignition switch to ON. 2) Measure the voltage between combination meter connector and chassis ground. Connector & terminal (i11) No. 7 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Replace the combination meter circuit board. <Ref. to IDI-10, Combination Meter.>	Check the following and repair if necessary. NOTE: • Blown out fuse (No. 13) • Open or short circuit in harness between fuse (No. 13) and battery terminal • Poor contact in ignition switch connector

Malfunction Indicator Light

ENGINE (DIAGNOSTICS)

D: MALFUNCTION INDICATOR LIGHT DOES NOT GO OFF.

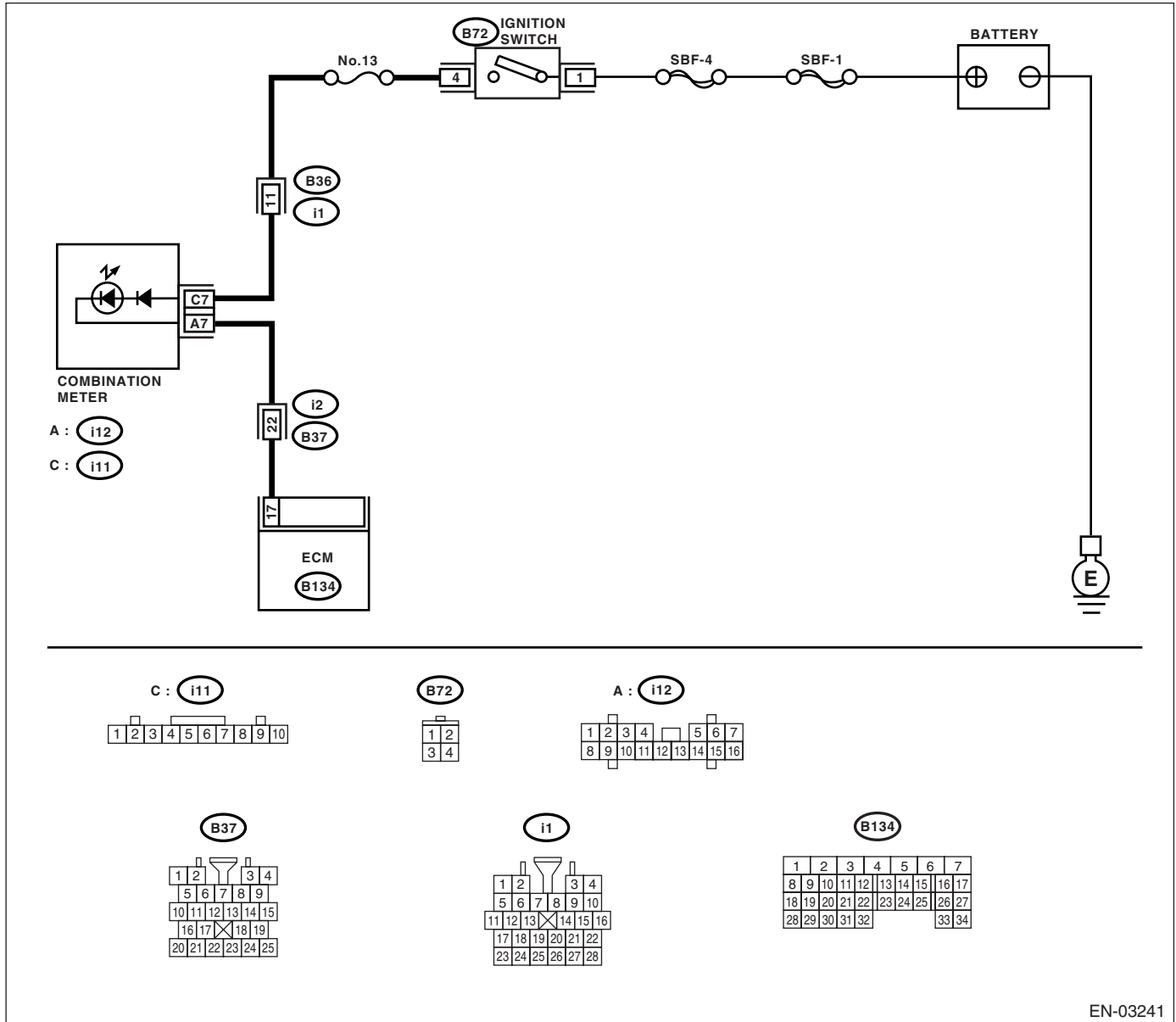
DIAGNOSIS:

The malfunction indicator light circuit is shorted.

TROUBLE SYMPTOM:

Although malfunction indicator light comes on when engine runs, but DTC is not shown on Subaru Select Monitor or general scan tool display.

WIRING DIAGRAM:



EN-03241

Step	Check	Yes	No
1	CHECK HARNESS BETWEEN COMBINATION METER AND ECM 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 come on? Repair the short circuit in harness between combination meter and ECM connector.	Replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).>

E: MALFUNCTION INDICATOR LIGHT DOES NOT BLINK AT A CYCLE OF 3 Hz.

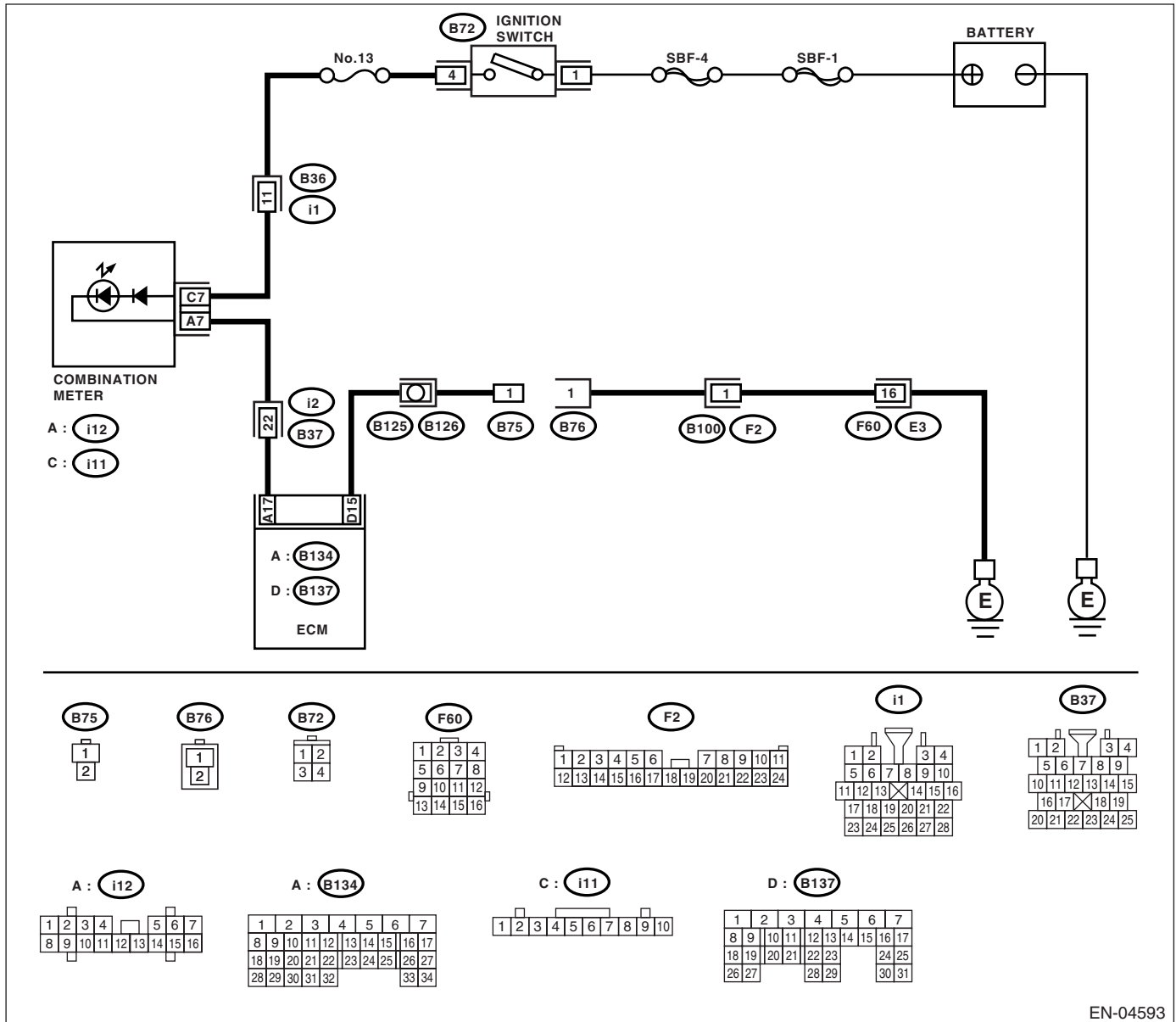
DIAGNOSIS:

- The malfunction indicator light circuit is open or shorted.
- Test mode connector circuit is open.

TROUBLE SYMPTOM:

During inspection mode, malfunction indicator light does not blink at a cycle of 3 Hz.

WIRING DIAGRAM:



EN-04593

Malfunction Indicator Light

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK STATUS OF MALFUNCTION INDICATOR LIGHT. 1) Turn the ignition switch to OFF. 2) Disconnect the test mode connector. 3) Turn the ignition switch to ON. (engine OFF)	Does the malfunction indicator light come on?	Go to step 2.	Repair the malfunction indicator light circuit. <Ref. to EN(STI)(diag)-50, MALFUNCTION INDICATOR LIGHT DOES NOT COME ON., Malfunction Indicator Light.>
2 CHECK HARNESS BETWEEN COMBINATION METER AND ECM 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 come on?	Repair the ground short circuit in harness between combination meter and ECM connector.	Go to step 3.
3 CHECK HARNESS BETWEEN TEST MODE CONNECTOR AND CHASSIS GROUND. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between test mode connector and chassis ground. <i>Connector & terminal (B76) No. 1 — Chassis ground:</i>	Is the resistance less than 1 Ω ?	Go to step 4.	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between test mode connector and chassis ground
4 CHECK POOR CONTACT. Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Go to step 5.
5 CHECK HARNESS BETWEEN ECM AND TEST MODE CONNECTOR. 1) Connect the test mode connector. 2) Measure the resistance of harness between ECM and chassis ground. <i>Connector & terminal (B137) No. 15 — Chassis ground:</i>	Is the resistance less than 1 Ω ?	Go to step 6.	Repair the open circuit in harness between ECM and test mode connector.
6 CHECK POOR CONTACT. Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).>

Malfunction Indicator Light

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
2 CHECK HARNESS BETWEEN ECM CONNECTOR AND ENGINE GROUNDING TERMINAL. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM connector and chassis ground. Connector & terminal (B137) No. 15 — Chassis ground:	Is the resistance less than 5 Ω ?	Repair the short circuit in harness between ECM and test mode connector.	Replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).>

16.Diagnostics for Engine Starting Failure

A: PROCEDURE

1. Check the fuel level.
↓
2. Inspection of starter motor circuit. <Ref. to EN(STI)(diag)-58, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
3. Inspection of ECM power supply and ground line. <Ref. to EN(STI)(diag)-61, CONTROL MODULE POWER SUPPLY AND GROUND LINE, Diagnostics for Engine Starting Failure.>
↓
4. Inspection of ignition control system. <Ref. to EN(STI)(diag)-63, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>
↓
5. Inspection of fuel pump circuit. <Ref. to EN(STI)(diag)-66, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
6. Inspection of fuel injector circuit. <Ref. to EN(STI)(diag)-67, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

Diagnostics for Engine Starting Failure

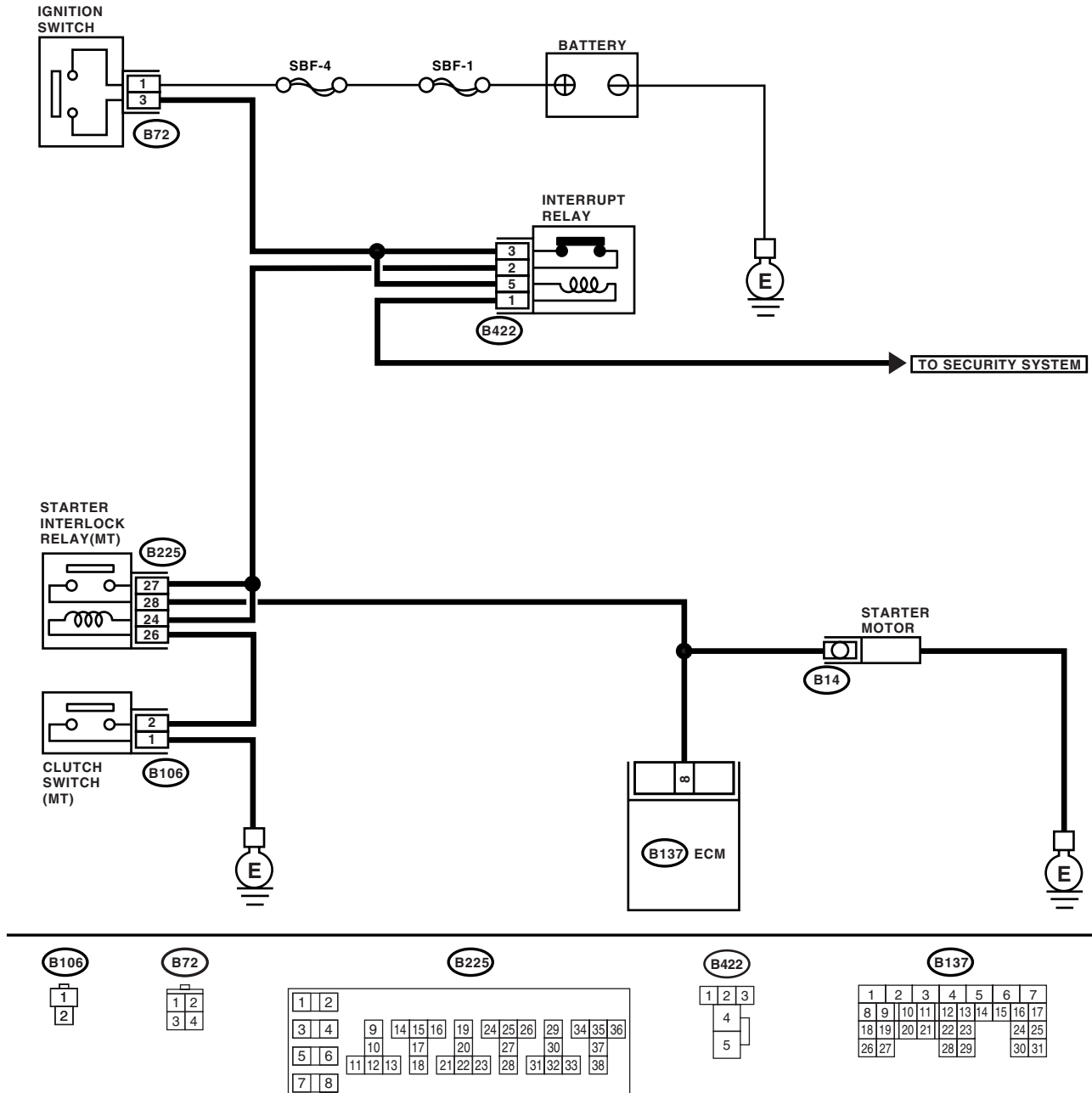
ENGINE (DIAGNOSTICS)

B: STARTER MOTOR CIRCUIT

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04153

Diagnostics for Engine Starting Failure

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK BATTERY Check the battery voltage.	Is the voltage more than 12 V?	Go to step 2.	Charge or replace the battery.
2 CHECK OPERATION OF STARTER MOTOR.	Does the starter motor operate?	Go to step 3.	Go to step 4.
3 CHECK DTC.	Is the DTC displayed? <Ref. to EN(STI)(diag)-35, OPERATION, Read Diagnostic Trouble Code (DTC).>	Using the List of Diagnostic Trouble Code (DTC), check the appropriate DTC. <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).>	Repair the poor contact in ECM connector.
4 CHECK INPUT SIGNAL FOR STARTER MOTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from starter motor. 3) Turn the ignition switch to START. 4) Measure the power supply voltage between starter motor connector terminal and engine ground. Connector & terminal (B14) No. 1 (+) — Engine ground (-): NOTE: Depress the clutch pedal.	Is the voltage more than 10 V?	Check the starter motor. <Ref. to SC(H4SO)-8, Starter.>	Go to step 5.
5 CHECK HARNESS BETWEEN BATTERY AND IGNITION SWITCH CONNECTOR. 1) Disconnect the connector from ignition switch. 2) Measure the power supply voltage between ignition switch connector and chassis ground. Connector & terminal (B72) No. 1 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 6.	Check the following, repair if necessary. • Blown out fuse • Open circuit in harness between ignition switch and battery
6 CHECK IGNITION SWITCH. 1) Disconnect the connector from ignition switch. 2) Measure the resistance between ignition switch terminals while turning ignition switch to START. Terminals No. 1 — No. 3:	Is the resistance less than 5 Ω?	Go to step 7.	Replace the ignition switch.
7 CHECK INPUT VOLTAGE OF STARTER INTERLOCK RELAY. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from starter interlock relay. 3) Connect the connector to ignition switch. 4) Measure the input voltage between starter interlock relay connector and chassis ground while turning ignition switch to START. Connector & terminal (B225) No. 27 (+) — Chassis ground (-): (B225) No. 24 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 8.	Repair open or short circuit to ground in harness between starter interlock relay and ignition switch. NOTE: Check security system. <Ref. to SL-21, Security System.>

Diagnostics for Engine Starting Failure

ENGINE (DIAGNOSTICS)

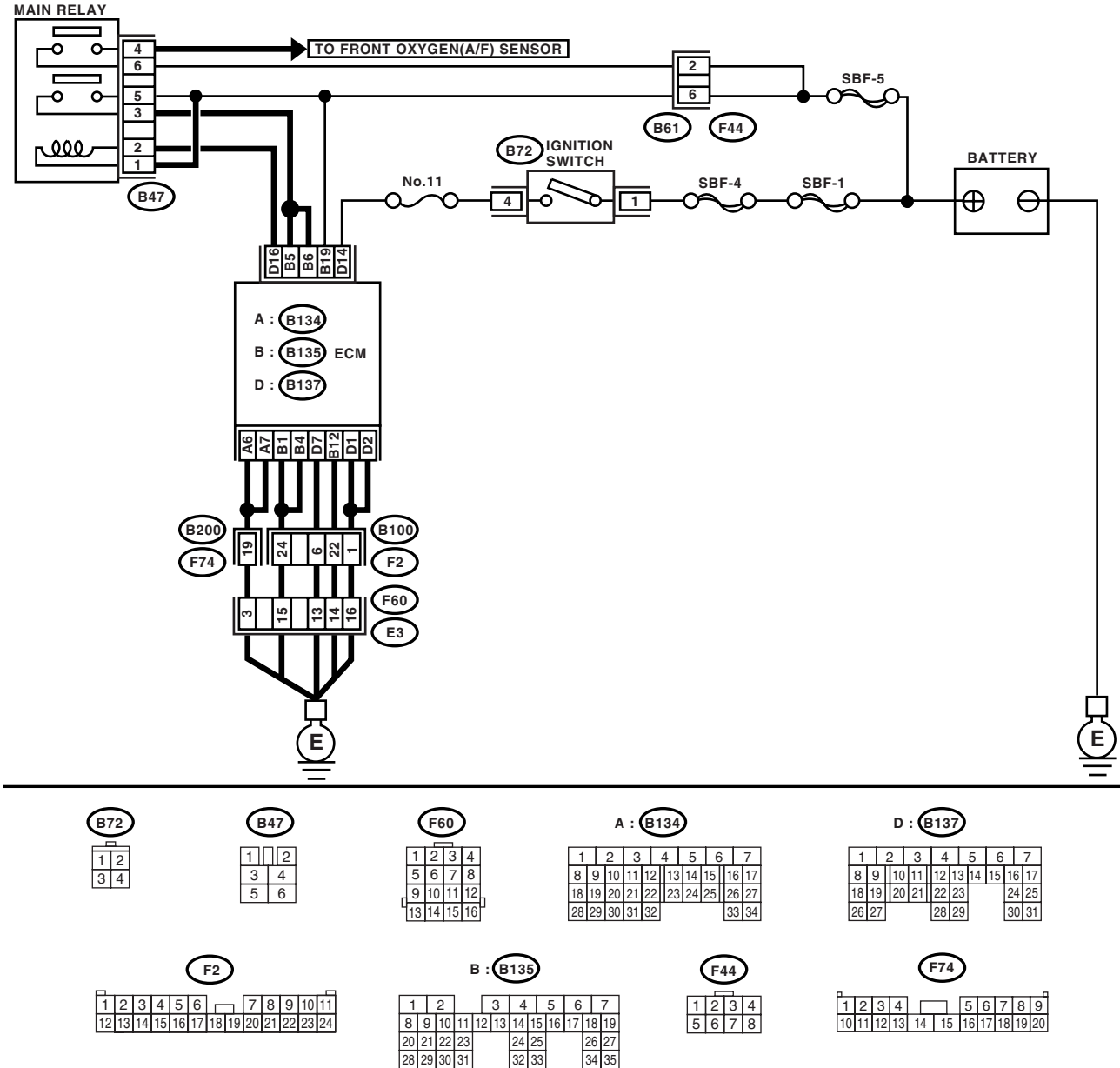
Step	Check	Yes	No
8 CHECK STARTER INTERLOCK RELAY. 1) Connect the battery to starter interlock relay terminals No. 26 and No. 24. 2) Measure the resistance between starter interlock relay terminals. <i>Terminals</i> <i>No. 27 — No. 28:</i>	Is the resistance less than 1 Ω ?	Go to step 9.	Replace the starter interlock relay.
9 CHECK GROUND CIRCUIT OF CLUTCH SWITCH. 1) Disconnect the connector from clutch switch. 2) Measure the resistance between clutch switch connector and chassis ground. <i>Connector & terminal</i> <i>(B106) No. 1 — Chassis ground:</i>	Is the resistance less than 5 Ω ?	Go to step 10.	Repair open circuit of ground cable.
10 CHECK CLUTCH SWITCH. Measure the resistance between clutch switch terminals while depressing the clutch pedal. <i>Terminals</i> <i>No. 1 — No. 2:</i>	Is the resistance less than 1 Ω ?	Go to step 11.	Replace the clutch switch. <Ref. to CL-36, Clutch Switch.>
11 CHECK CLUTCH SWITCH CIRCUIT. 1) Connect the connector to clutch switch. 2) Measure the resistance between starter interlock relay connector and chassis ground while depressing the clutch pedal. <i>Connector & terminal</i> <i>(B225) No. 26 — Chassis ground:</i>	Is the resistance less than 1 Ω ?	Repair short circuit to ground in harness between starter interlock relay and starter motor.	Repair open circuit in harness between starter interlock relay and clutch switch.

C: CONTROL MODULE POWER SUPPLY AND GROUND LINE

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Diagnostics for Engine Starting Failure

ENGINE (DIAGNOSTICS)

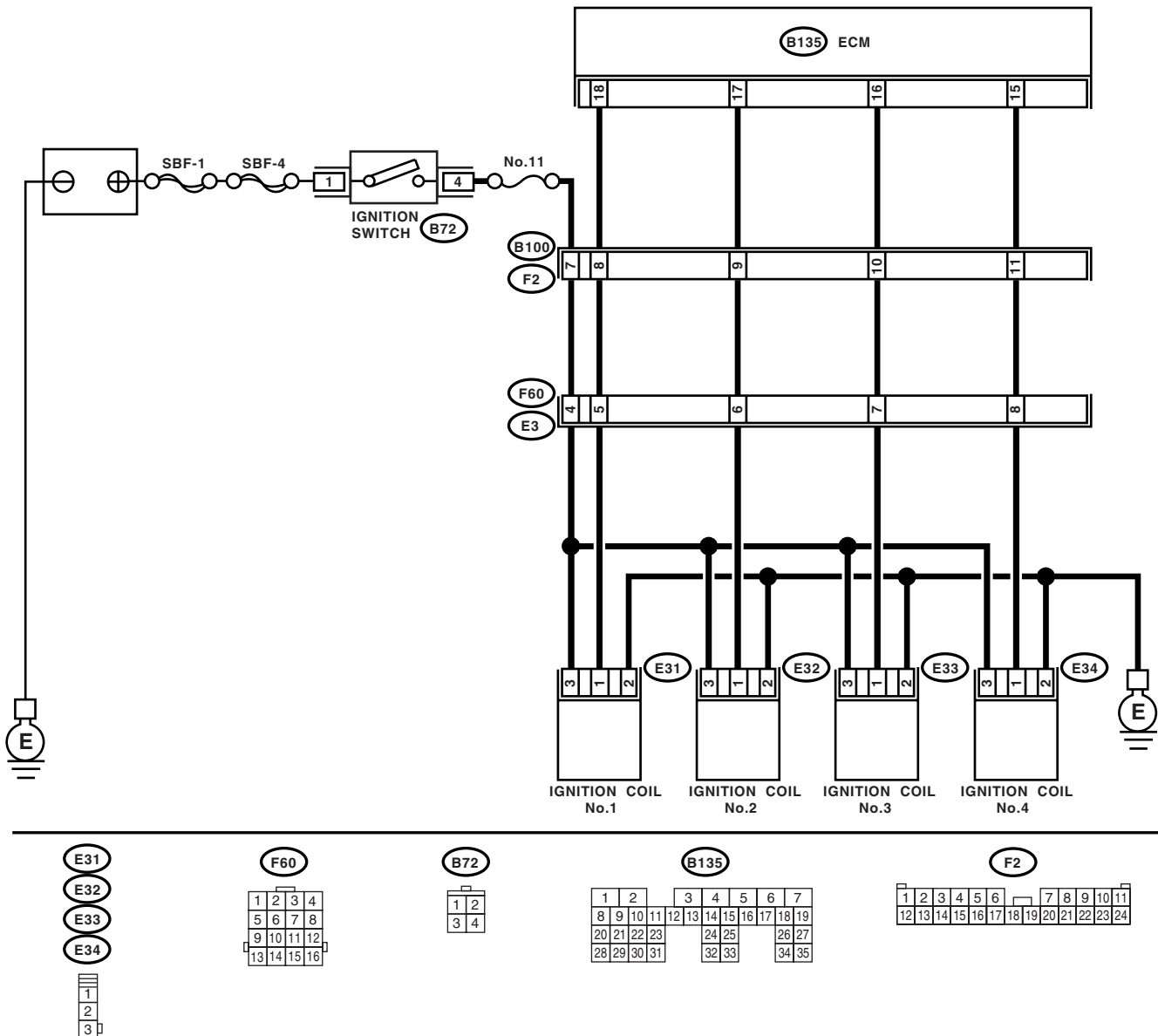
Step	Check	Yes	No
1 CHECK MAIN RELAY. 1) Turn the ignition switch to OFF. 2) Remove the main relay. 3) Connect the battery to main relay terminals No. 1 and No. 2. 4) Measure the resistance between main relay terminals. Terminals No. 3 — No. 5: No. 4 — No. 6:	Is the resistance less than 10 Ω ?	Go to step 2.	Replace the main relay.
2 CHECK GROUND CIRCUIT OF ECM. 1) Disconnect the connector from ECM. 2) Measure the resistance of harness between ECM and chassis ground. Connector & terminal (B134) No. 6 — Chassis ground: (B134) No. 7 — Chassis ground: (B135) No. 1 — Chassis ground: (B135) No. 4 — Chassis ground: (B135) No. 12 — Chassis ground: (B137) No. 1 — Chassis ground: (B137) No. 2 — Chassis ground: (B137) No. 7 — Chassis ground:	Is the resistance less than 5 Ω ?	Go to step 3.	Repair the open circuit in harness between ECM connector and engine grounding terminal.
3 CHECK INPUT VOLTAGE OF ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 19 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 4.	Repair the open or ground short circuit of power supply circuit.
4 CHECK INPUT VOLTAGE OF MAIN RELAY. Measure the voltage between main relay connector and chassis ground. Connector & terminal (B47) No. 1 (+) — Chassis ground (-): (B47) No. 5 (+) — Chassis ground (-): (B47) No. 6 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 5.	Repair the open or short circuit in harness of power supply circuit.
5 CHECK INPUT VOLTAGE OF ECM. 1) Connect the main relay connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 5 (+) — Chassis ground (-): (B135) No. 6 (+) — Chassis ground (-): (B137) No. 16 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Check the ignition control system. <Ref. to EN(STI)(diag)-63, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>	Repair the open or short circuit in harness between ECM connector and main relay connector.

D: IGNITION CONTROL SYSTEM

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Diagnostics for Engine Starting Failure

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK SPARK PLUG CONDITION. 1) Remove the spark plug. <Ref. to IG(STI)-4, INSTALLATION, Spark Plug.> 2) Check the spark plug condition. <Ref. to IG(STI)-5, INSPECTION, Spark Plug.>	Is the spark plug's status OK?	Go to step 2.	Replace the spark plug.
2 CHECK IGNITION SYSTEM FOR SPARKS. 1) Connect the spark plug to ignition coil. 2) Release the fuel pressure. <Ref. to FU(STI)-44, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.> 3) Contact the spark plug's thread portion on engine. 4) While opening the throttle valve fully, crank engine to check that spark occurs at each cylinder.	Does spark occur at each cylinder?	Check the fuel pump system. <Ref. to EN(STI)(diag)-66, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>	Go to step 3.
3 CHECK POWER SUPPLY CIRCUIT FOR IGNITION COIL AND IGNITOR ASSEMBLY. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ignition coil and ignitor assembly. 3) Turn the ignition switch to ON. 4) Measure the power supply voltage between ignition coil and ignitor assembly connector and engine ground. Connector & terminal <i>(E31) No. 3 (+) — Engine ground (-):</i> <i>(E32) No. 3 (+) — Engine ground (-):</i> <i>(E33) No. 3 (+) — Engine ground (-):</i> <i>(E34) No. 3 (+) — Engine ground (-):</i>	Is the voltage more than 10 V?	Go to step 4.	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ignition coil and ignitor assembly, and ignition switch connector • Poor contact in coupling connectors
4 CHECK HARNESS OF IGNITION COIL AND IGNITOR ASSEMBLY GROUND CIRCUIT. 1) Turn the ignition switch to OFF. 2) Measure the resistance between ignition coil and ignitor assembly connector and engine ground. Connector & terminal <i>(E31) No. 2 — Engine ground:</i> <i>(E32) No. 2 — Engine ground:</i> <i>(E33) No. 2 — Engine ground:</i> <i>(E34) No. 2 — Engine ground:</i>	Is the resistance less than 5 Ω ?	Go to step 5.	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ignition coil and ignitor assembly connector and engine grounding terminal
5 CHECK HARNESS BETWEEN ECM AND IGNITION COIL AND IGNITOR ASSEMBLY CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from ignition coil and ignitor assembly. 4) Measure the resistance of harness between ECM and ignition coil and ignitor assembly connector. Connector & terminal <i>(B135) No. 15 — (E34) No. 1:</i> <i>(B135) No. 16 — (E33) No. 1:</i> <i>(B135) No. 17 — (E32) No. 1:</i> <i>(B135) No. 18 — (E31) No. 1:</i>	Is the resistance less than 1 Ω ?	Go to step 6.	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and ignition coil and ignitor assembly connector • Poor contact in coupling connector

Diagnostics for Engine Starting Failure

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
6 CHECK HARNESS BETWEEN ECM AND IGNITION COIL AND IGNITOR ASSEMBLY CONNECTOR. Measure the resistance of harness between ECM and engine ground. Connector & terminal: <i>(B135) No. 15 — Engine ground:</i> <i>(B135) No. 16 — Engine ground:</i> <i>(B135) No. 17 — Engine ground:</i> <i>(B135) No. 18 — Engine ground:</i>	Is the resistance more than 1 MΩ?	Go to step 7.	Repair the ground short circuit in harness between ECM and ignition coil and ignitor assembly connector.
7 CHECK POOR CONTACT. Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ignition coil and ignitor assembly.

Diagnostics for Engine Starting Failure

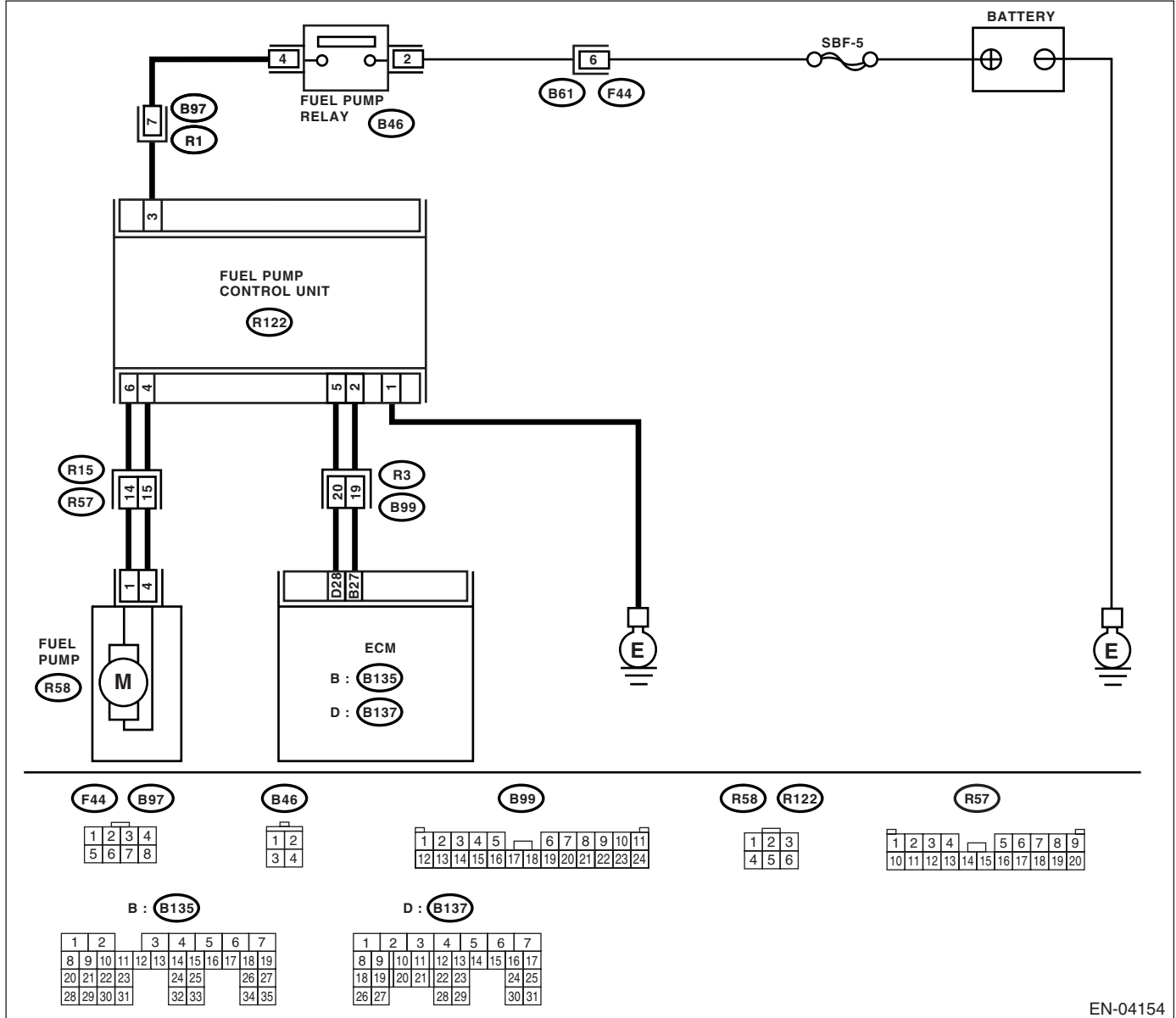
ENGINE (DIAGNOSTICS)

E: FUEL PUMP CIRCUIT

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04154

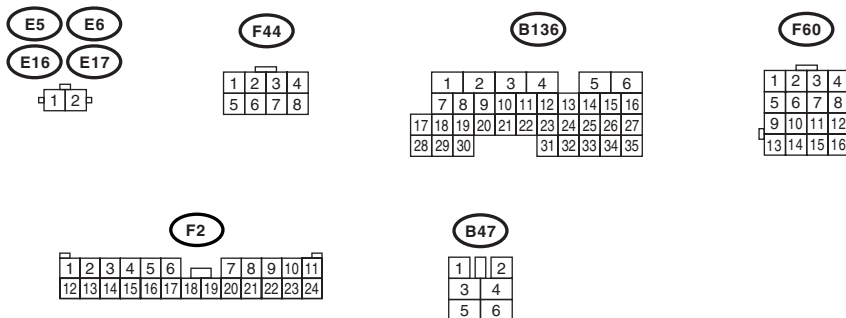
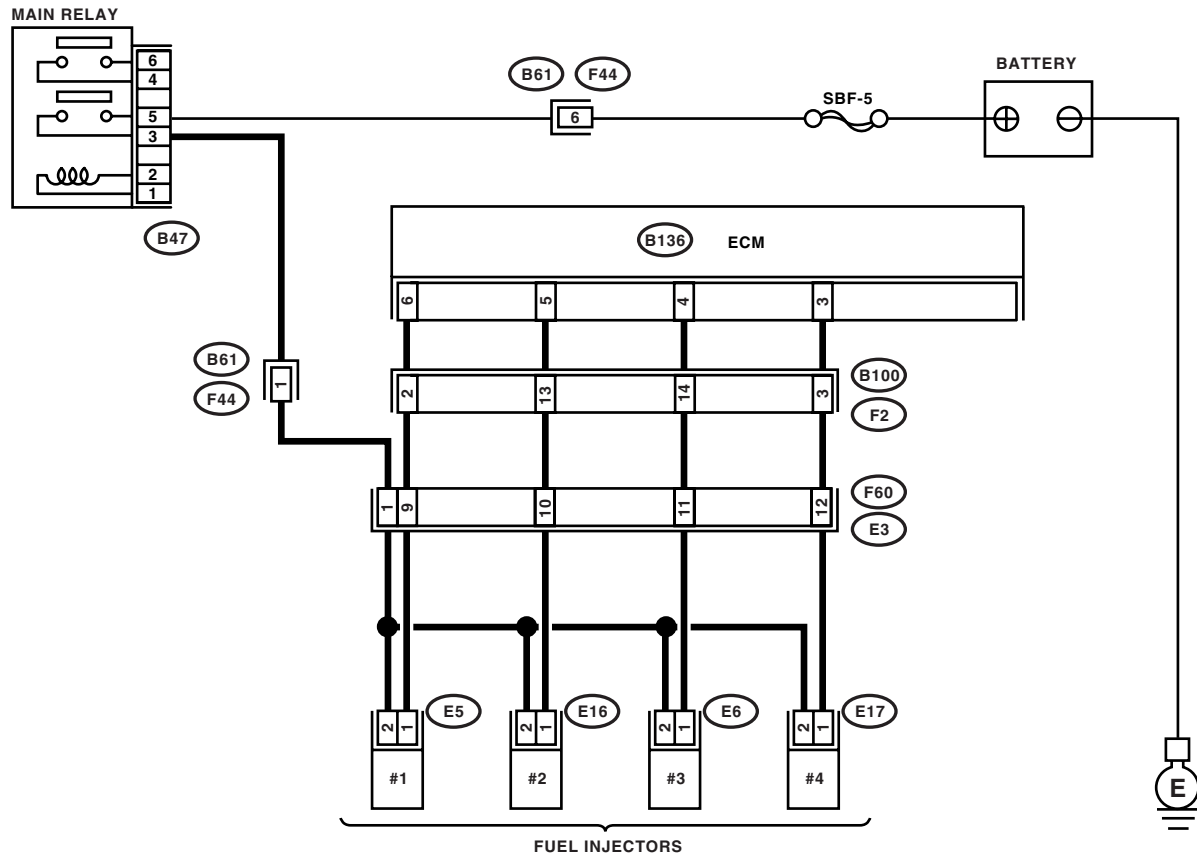
Step	Check	Yes	No
1 CHECK OPERATING SOUND OF FUEL PUMP. Make sure that the fuel pump is in operation for 2 seconds when turning ignition switch to ON. NOTE: Fuel pump operation check can also be executed using the Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(STI)(diag)-46, Compulsory Valve Operation Check Mode.>	Does the fuel pump produce "operating" sound?	Check the fuel injector circuit. <Ref. to EN(STI)(diag)-67, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>	Display the DTC. <Ref. to EN(STI)(diag)-35, OPERATION, Read Diagnostic Trouble Code (DTC).>

F: FUEL INJECTOR CIRCUIT

CAUTION:

- Inspect or repair the faulty parts only.
- After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Diagnostics for Engine Starting Failure

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OPERATION OF EACH FUEL INJECTOR. While cranking the engine, check that each fuel injector emits "operating" sound. Use a sound scope or attach a screwdriver to injector for this check.	Does the fuel injector emit "operating" sound?	Check the fuel pressure. <Ref. to ME(STI)-26, INSPECTION, Fuel Pressure.>	Go to step 2.
2 CHECK POWER SUPPLY TO EACH FUEL INJECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel injector. 3) Turn the ignition switch to ON. 4) Measure the power supply voltage between the fuel injector terminal and engine ground. Connector & terminal <i>#1 (E5) No. 2 (+) — Engine ground (-):</i> <i>#2 (E16) No. 2 (+) — Engine ground (-):</i> <i>#3 (E6) No. 2 (+) — Engine ground (-):</i> <i>#4 (E17) No. 2 (+) — Engine ground (-):</i>	Is the voltage more than 10 V?	Go to step 3.	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between main relay and fuel injector connector • Poor contact in main relay connector • Poor contact in coupling connector • Poor contact in fuel injector connector
3 CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR. 1) Disconnect the connector from ECM. 2) Measure the resistance of harness between ECM and fuel injector connector. Connector & terminal <i>(B136) No. 6 — (E5) No. 1:</i> <i>(B136) No. 5 — (E16) No. 1:</i> <i>(B136) No. 4 — (E6) No. 1:</i> <i>(B136) No. 3 — (E6) No. 1:</i>	Is the resistance less than 1 Ω ?	Go to step 4.	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and fuel injector connector • Poor contact in coupling connector
4 CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR. Measure the resistance of harness between ECM and fuel injector connector. Connector & terminal <i>(B136) No. 6 — Chassis ground:</i> <i>(B136) No. 5 — Chassis ground:</i> <i>(B136) No. 4 — Chassis ground:</i> <i>(B136) No. 3 — Chassis ground:</i>	Is the resistance less than 1 Ω ?	Repair the ground short circuit in harness between ECM and fuel injector connector.	Go to step 5.
5 CHECK EACH FUEL INJECTOR. 1) Turn the ignition switch to OFF. 2) Measure the resistance between each fuel injector terminals. Terminals <i>No. 1 — No. 2:</i>	Is the resistance 5 — 20 Ω ?	Go to step 6.	Replace the faulty fuel injector.
6 CHECK POOR CONTACT. Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Inspection using "General Diagnostic Table". <Ref. to EN(STI)(diag)-371, INSPECTION, General Diagnostic Table.>

List of Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

17.List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Item	Index
P0011	"A" Camshaft Position-Timing Over-Advanced or System Performance (Bank 1)	<Ref. to EN(STI)(diag)-76, DTC P0011 "A" CAMSHAFT POSITION-TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0021	"A" Camshaft Position-Timing Over-Advanced or System Performance (Bank 2)	<Ref. to EN(STI)(diag)-77, DTC P0021 "A" 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(STI)(diag)-78, DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0031	HO2S Heater Control Circuit Low (Bank 1 Sensor 1)	<Ref. to EN(STI)(diag)-80, DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0032	HO2S Heater Control Circuit High (Bank 1 Sensor 1)	<Ref. to EN(STI)(diag)-83, DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0037	HO2S Heater Control Circuit Low (Bank 1 Sensor 2)	<Ref. to EN(STI)(diag)-85, DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0038	HO2S Heater Control Circuit High (Bank 1 Sensor 2)	<Ref. to EN(STI)(diag)-88, DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0068	Map/Maf – Throttle Position Correlation	<Ref. to EN(STI)(diag)-90, 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(STI)(diag)-92, 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(STI)(diag)-94, 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(STI)(diag)-97, 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(STI)(diag)-99, 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(STI)(diag)-101, DTC P0108 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0111	Intake Air Temperature Circuit Range/Performance	<Ref. to EN(STI)(diag)-103, DTC P0111 INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0112	Intake Air Temperature Circuit Low Input	<Ref. to EN(STI)(diag)-105, DTC P0112 INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0113	Intake Air Temperature Circuit High Input	<Ref. to EN(STI)(diag)-107, DTC P0113 INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0117	Engine Coolant Temperature Circuit Low Input	<Ref. to EN(STI)(diag)-110, DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0118	Engine Coolant Temperature Circuit High Input	<Ref. to EN(STI)(diag)-112, DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

List of Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

DTC	Item	Index
P0122	Throttle/Pedal Position Sensor/Switch "A" Circuit Low Input	<Ref. to EN(STI)(diag)-115, DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0123	Throttle/Pedal Position Sensor/Switch "A" Circuit High Input	<Ref. to EN(STI)(diag)-118, DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0125	Insufficient Coolant Temperature for Closed Loop Fuel Control	<Ref. to EN(STI)(diag)-121, DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0126	Insufficient Coolant Temperature for Stable Operation	<Ref. to EN(STI)(diag)-123, DTC P0126 INSUFFICIENT COOLANT TEMPERATURE FOR STABLE OPERATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0128	Coolant Thermostat (Coolant Temperature Below Thermostat Regulating Temperature)	<Ref. to EN(STI)(diag)-125, DTC P0128 COOLANT THERMOSTAT (COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0131	O ₂ Sensor Circuit Low Voltage (Bank 1 Sensor 1)	<Ref. to EN(STI)(diag)-126, DTC P0131 O ₂ SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0132	O ₂ Sensor Circuit High Voltage (Bank 1 Sensor 1)	<Ref. to EN(STI)(diag)-128, DTC P0132 O ₂ SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0133	O ₂ Sensor Circuit Slow Response (Bank 1 Sensor 1)	<Ref. to EN(STI)(diag)-130, DTC P0133 O ₂ SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0134	O ₂ Sensor Circuit No Activity Detected (Bank 1 Sensor 1)	<Ref. to EN(STI)(diag)-132, DTC P0134 O ₂ SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0137	O ₂ Sensor Circuit Low Voltage (Bank 1 Sensor 2)	<Ref. to EN(STI)(diag)-134, DTC P0137 O ₂ SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0138	O ₂ Sensor Circuit High Voltage (Bank 1 Sensor 2)	<Ref. to EN(STI)(diag)-137, DTC P0138 O ₂ SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0139	O ₂ Sensor Circuit Slow Response (Bank 1 Sensor 2)	<Ref. to EN(STI)(diag)-140, DTC P0139 O ₂ SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0171	System too Lean (Bank 1)	<Ref. to EN(STI)(diag)-142, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0172	System too Rich (Bank 1)	<Ref. to EN(STI)(diag)-142, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0181	Fuel Temperature Sensor "A" Circuit Range/Performance	<Ref. to EN(STI)(diag)-145, 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(STI)(diag)-147, 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(STI)(diag)-149, 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 Input	<Ref. to EN(STI)(diag)-152, DTC P0222 THROTTLE/PEDAL POSITION SENSOR/SWITCH "B" CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0223	Throttle/Pedal Position Sensor/Switch "B" Circuit High Input	<Ref. to EN(STI)(diag)-155, DTC P0223 THROTTLE/PEDAL POSITION SENSOR/SWITCH "B" CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

List of Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

DTC	Item	Index
P0230	Fuel Pump Primary Circuit	<Ref. to EN(STI)(diag)-159, 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(STI)(diag)-162, 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(STI)(diag)-164, 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(STI)(diag)-166, DTC P0246 TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0301	Cylinder 1 misfire detected	<Ref. to EN(STI)(diag)-168, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0302	Cylinder 2 misfire detected	<Ref. to EN(STI)(diag)-168, DTC P0302 CYLINDER 2 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0303	Cylinder 3 misfire detected	<Ref. to EN(STI)(diag)-168, DTC P0303 CYLINDER 3 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0304	Cylinder 4 misfire detected	<Ref. to EN(STI)(diag)-168, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0327	Knock Sensor 1 Circuit Low Input (Bank 1 or Single Sensor)	<Ref. to EN(STI)(diag)-173, DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0328	Knock Sensor 1 Circuit High Input (Bank 1 or Single Sensor)	<Ref. to EN(STI)(diag)-175, DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0335	Crankshaft Position Sensor "A" Circuit	<Ref. to EN(STI)(diag)-177, 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(STI)(diag)-179, 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(STI)(diag)-181, 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(STI)(diag)-183, DTC P0345 CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0420	Catalyst System Efficiency Below Threshold (Bank 1)	<Ref. to EN(STI)(diag)-185, 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(STI)(diag)-189, 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(STI)(diag)-193, 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(STI)(diag)-196, DTC P0448 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0451	Evaporative Emission Control System Pressure Sensor Range/Performance	<Ref. to EN(STI)(diag)-198, DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0452	Evaporative Emission Control System Pressure Sensor Low Input	<Ref. to EN(STI)(diag)-200, DTC P0452 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

List of Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

DTC	Item	Index
P0453	Evaporative Emission Control System Pressure Sensor High Input	<Ref. to EN(STI)(diag)-203, 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(STI)(diag)-206, 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(STI)(diag)-210, DTC P0457 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0458	Evaporative Emission Control System Purge Control Valve Circuit Low	<Ref. to EN(STI)(diag)-214, DTC P0458 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0459	Evaporative Emission Control System Purge Control Valve Circuit High	<Ref. to EN(STI)(diag)-216, DTC P0459 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0461	Fuel Level Sensor Circuit Range/Performance	<Ref. to EN(STI)(diag)-218, DTC P0461 FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0462	Fuel Level Sensor Circuit Low Input	<Ref. to EN(STI)(diag)-221, DTC P0462 FUEL LEVEL SENSOR CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0463	Fuel Level Sensor Circuit High Input	<Ref. to EN(STI)(diag)-225, DTC P0463 FUEL LEVEL SENSOR CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0464	Fuel Level Sensor Circuit Intermittent	<Ref. to EN(STI)(diag)-229, DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0483	Cooling Fan Rationality Check	<Ref. to EN(STI)(diag)-232, DTC P0483 COOLING FAN RATIONALITY CHECK, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0502	Vehicle Speed Sensor Circuit Low Input	<Ref. to EN(STI)(diag)-235, DTC P0502 VEHICLE SPEED SENSOR CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0503	Vehicle Speed Sensor Intermittent/Erratic/High	<Ref. to EN(STI)(diag)-237, DTC P0503 VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0506	Idle Control System RPM Lower Than Expected	<Ref. to EN(STI)(diag)-239, DTC P0506 IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0507	Idle Control System RPM Higher Than Expected	<Ref. to EN(STI)(diag)-242, DTC P0507 IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0512	Starter Request Circuit	<Ref. to EN(STI)(diag)-245, DTC P0512 STARTER REQUEST CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0513	Incorrect Immobilizer Key	<Ref. to IM(diag)-21, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0519	Idle Control System Malfunction (Fail-Safe)	<Ref. to EN(STI)(diag)-248, DTC P0519 IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0604	Internal Control Module Random Access Memory (RAM) Error	<Ref. to EN(STI)(diag)-251, 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(STI)(diag)-253, DTC P0605 INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0607	Control Module Performance	<Ref. to EN(STI)(diag)-254, DTC P0607 CONTROL MODULE PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0638	Throttle Actuator Control Range/Performance (Bank 1)	<Ref. to EN(STI)(diag)-256, DTC P0638 THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

List of Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

DTC	Item	Index
P0691	Cooling Fan 1 Control Circuit Low	<Ref. to EN(STI)(diag)-257, DTC P0691 COOLING FAN 1 CONTROL CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0692	Cooling Fan 1 Control Circuit High	<Ref. to EN(STI)(diag)-260, DTC P0692 COOLING FAN 1 CONTROL CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0851	Neutral Switch Input Circuit Low	<Ref. to EN(STI)(diag)-263, DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0852	Neutral Switch Input Circuit High	<Ref. to EN(STI)(diag)-266, DTC P852 NEUTRAL SWITCH INPUT CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1152	O ₂ Sensor Circuit Range/Performance (Low) (Bank1 Sensor1)	<Ref. to EN(STI)(diag)-268, DTC P1152 O ₂ SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK1 SENSOR1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1153	O ₂ Sensor Circuit Range/Performance (High) (Bank1 Sensor1)	<Ref. to EN(STI)(diag)-270, DTC P1153 O ₂ SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1160	Return Spring Failure	<Ref. to EN(STI)(diag)-272, DTC P1160 RETURN SPRING FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1400	Fuel Tank Pressure Control Solenoid Valve Circuit Low	<Ref. to EN(STI)(diag)-273, DTC P1400 FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1420	Fuel Tank Pressure Control Sol. Valve Circuit High	<Ref. to EN(STI)(diag)-276, 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(STI)(diag)-277, DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1446	Fuel Tank Sensor Control Valve Circuit Low	<Ref. to EN(STI)(diag)-280, DTC P1446 FUEL TANK SENSOR CONTROL VALVE CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1447	Fuel Tank Sensor Control Valve Circuit High	<Ref. to EN(STI)(diag)-283, DTC P1447 FUEL TANK SENSOR CONTROL VALVE CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1448	Fuel Tank Sensor Control Valve Range/Performance	<Ref. to EN(STI)(diag)-285, DTC P1448 FUEL TANK SENSOR CONTROL VALVE RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1491	Positive Crankcase Ventilation (Blow-by) Function Problem	<Ref. to EN(STI)(diag)-287, 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(STI)(diag)-289, DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1560	Back-Up Voltage Circuit Malfunction	<Ref. to EN(STI)(diag)-292, DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1570	ANTENNA	<Ref. to IM(diag)-22, DTC P1570 ANTENNA, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1571	Reference Code Incompatibility	<Ref. to IM(diag)-15, DTC P1571 REFERENCE CODE INCOMPATIBILITY, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1572	EGI Immobilizer Communication (Except Antenna Circuit)	<Ref. to IM(diag)-16, DTC P1572 EGI IMMOBILIZER COMMUNICATION (EXCEPT ANTENNA CIRCUIT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1574	Key Immobilizer Communication	<Ref. to IM(diag)-20, DTC P1574 KEY IMMOBILIZER COMMUNICATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1576	EGI Control Module EEPROM	<Ref. to IM(diag)-21, DTC P1576 EGI CONTROL MODULE EEPROM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1577	IMM Control Module EEPROM	<Ref. to IM(diag)-21, DTC P1577 IMM CONTROL MODULE EEPROM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

List of Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

DTC	Item	Index
P2004	Intake Manifold Runner Control Stuck Open (Bank 1)	<Ref. to EN(STI)(diag)-295, 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(STI)(diag)-295, 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(STI)(diag)-296, 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(STI)(diag)-296, DTC P2007 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2008	Intake Manifold Runner Control Circuit / Open (Bank 1)	<Ref. to EN(STI)(diag)-297, 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(STI)(diag)-299, 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(STI)(diag)-301, DTC P2011 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2012	Intake Manifold Runner Control Circuit Low (Bank 2)	<Ref. to EN(STI)(diag)-303, 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 (Bank1)	<Ref. to EN(STI)(diag)-305, 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 (Bank1)	<Ref. to EN(STI)(diag)-308, 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(STI)(diag)-310, 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(STI)(diag)-313, DTC P2022 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT HIGH (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2088	OCV Solenoid Valve Signal A Circuit Open (Bank 1)	<Ref. to EN(STI)(diag)-315, DTC P2088 OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2089	OCV Solenoid Valve Signal A Circuit Short (Bank 1)	<Ref. to EN(STI)(diag)-317, DTC P2089 OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2092	OCV Solenoid Valve Signal A Circuit Open (Bank 2)	<Ref. to EN(STI)(diag)-319, DTC P2092 OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2093	OCV Solenoid Valve Signal A Circuit Short (Bank 2)	<Ref. to EN(STI)(diag)-321, DTC P2093 OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2096	Post Catalyst Fuel Trim System Too Lean Bank 1	<Ref. to EN(STI)(diag)-323, 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(STI)(diag)-329, 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(STI)(diag)-335, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

List of Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

DTC	Item	Index
P2102	Throttle Actuator Control Motor Circuit Low	<Ref. to EN(STI)(diag)-342, 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(STI)(diag)-345, 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(STI)(diag)-347, 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(STI)(diag)-348, 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(STI)(diag)-351, 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(STI)(diag)-354, 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(STI)(diag)-357, 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 Rationality	<Ref. to EN(STI)(diag)-360, DTC P2135 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A"/"B" VOLTAGE RATIONALITY, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2138	Throttle/Pedal Position Sensor/Switch "D"/"E" Voltage Rationality	<Ref. to EN(STI)(diag)-365, DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D"/"E" VOLTAGE RATIONALITY, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2227	Barometric Pressure Circuit Range/Performance	<Ref. to EN(STI)(diag)-369, DTC P2227 BAROMETRIC PRESSURE CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2228	Barometric Pressure Circuit Low Input	<Ref. to EN(STI)(diag)-369, DTC P2228 BAROMETRIC PRESSURE CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2229	Barometric Pressure Circuit High Input	<Ref. to EN(STI)(diag)-370, DTC P2229 BAROMETRIC PRESSURE CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

18. Diagnostic Procedure with Diagnostic Trouble Code (DTC)

A: DTC P0011 “A” CAMSHAFT POSITION-TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1)

DTC DETECTING CONDITION:

Immediately at fault recognition

TROUBLE SYMPTOM:

- Engine stalls.
- Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, Inspection Mode.>.

Step	Check	Yes	No
1 CHECK FOR ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK CURRENT DATA. 1) Start the engine and let it idle. 2) Inspect the AVCS operating angle and oil flow control solenoid valve duty output using Subaru Select Monitor and general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(STI)(diag)-28, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the AVCS operating angle more than approx. 0°C and the oil flow control solenoid valve duty output more than approx. 10%?	Inspect the following items and repair or replace if necessary. • Oil pipe (clog) • Oil flow control solenoid valve (clog or contamination in oil passage, settling at spring, stuck at valve) • Intake camshaft (sludge, damage at camshaft) • Timing belt (timing mark aligning)	A temporary malfunction. Conduct the following to clean the oil passage. Replace the engine oil and idle the engine for 5 minutes, then replace the oil filter and engine oil.

B: DTC P0021 “A” CAMSHAFT POSITION-TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 2)

DTC DETECTING CONDITION:

Immediately at fault recognition

TROUBLE SYMPTOM:

- Engine stalls.
- Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

Step	Check	Yes	No
1 CHECK FOR ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK CURRENT DATA. 1) Start the engine and let it idle. 2) Inspect the AVCS operating angle and oil flow control solenoid valve duty output using Subaru Select Monitor and general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(STI)(diag)-28, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the AVCS operating angle more than approx. 0°C and the oil flow control solenoid valve duty output more than approx. 10%?	Inspect the following items and repair or replace if necessary. • Engine oil (amount, contamination) • Oil pipe (clog) • Oil flow control solenoid valve (clog or contamination in oil passage, settling at spring, stuck at valve) • Intake camshaft (sludge, damage at camshaft) • Timing belt (timing mark aligning)	A temporary malfunction. Conduct the following to clean the oil passage. Replace the engine oil and idle the engine for 5 minutes, then replace the oil filter and engine oil.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

C: DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1)

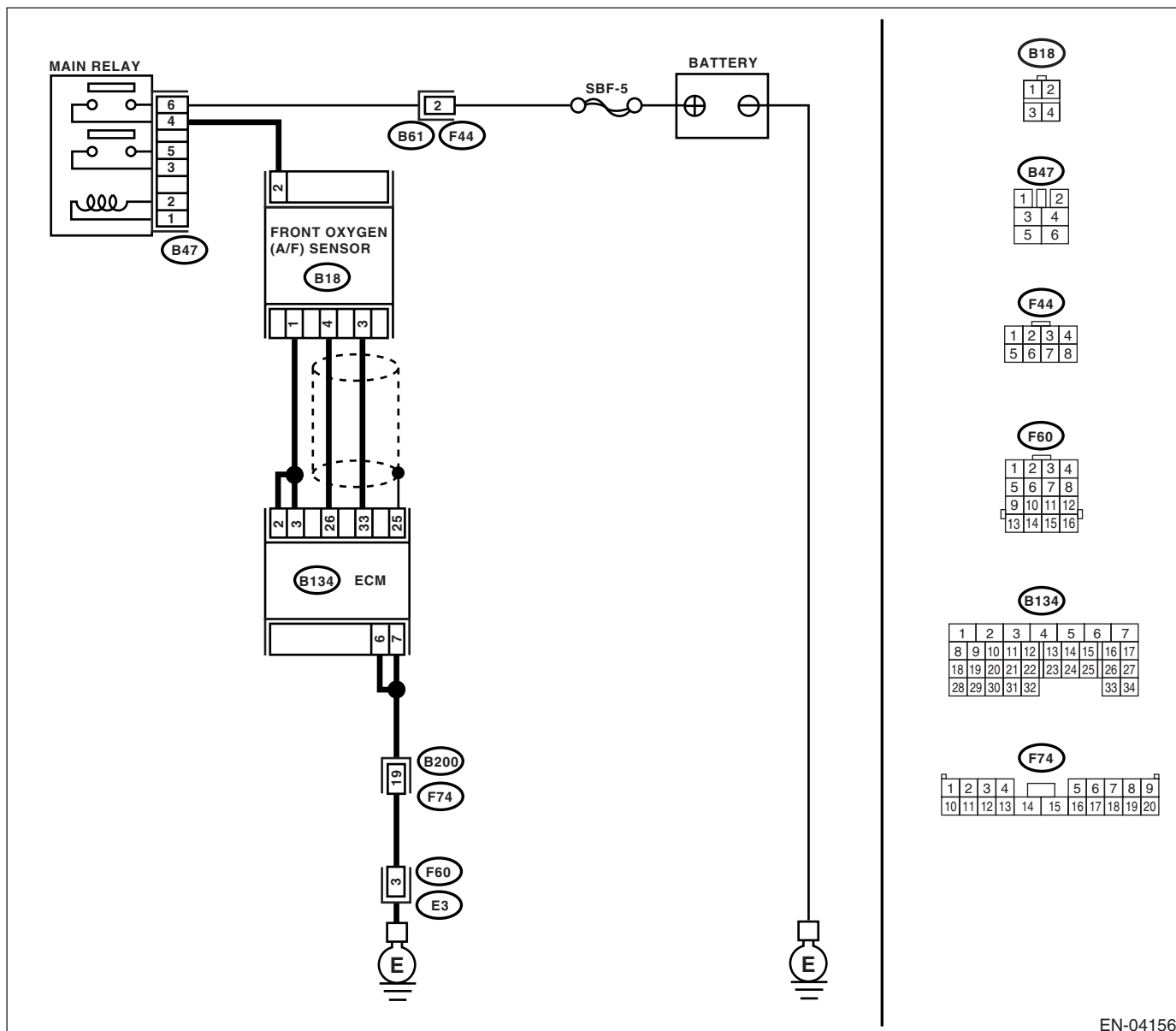
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-11, DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04156

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR. 1) Start the engine and warm-up 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 (B134) No. 2 — (B18) No. 1: (B134) No. 3 — (B18) No. 1:	Is the resistance less than 1 Ω ?	Go to step 2.	Repair the open circuit in harness between ECM and front oxygen (A/F) sensor connector.
2 CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR. Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. Connector & terminal (B134) No. 26 — (B18) No. 4: (B134) No. 33 — (B18) No. 3:	Is the resistance less than 1 Ω ?	Go to step 3.	Repair the open circuit in harness between ECM and front oxygen (A/F) sensor connector.
3 CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR. Measure the resistance of harness between main relay and front oxygen (A/F) sensor connector. Connector & terminal (B47) No. 4 — (B18) No. 2:	Is the resistance less than 1 Ω ?	Go to step 4.	Repair the open circuit in harness between ECM and front oxygen (A/F) sensor connector.
4 CHECK FRONT OXYGEN (A/F) SENSOR. Measure the resistance between front oxygen (A/F) sensor connector terminals. Terminals No. 2 — No. 1:	Is the resistance less than 5 Ω ?	Go to step 5.	Replace the front oxygen (A/F) sensor. <Ref. to FU(STI)-36, Front Oxygen (A/F) Sensor.>
5 CHECK POOR CONTACT. Check the poor contact in ECM or front oxygen (A/F) sensor connector.	Is there poor contact in ECM or front oxygen (A/F) sensor connector?	Repair the poor contact in ECM or front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(STI)-36, Front Oxygen (A/F) Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

D: DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1)

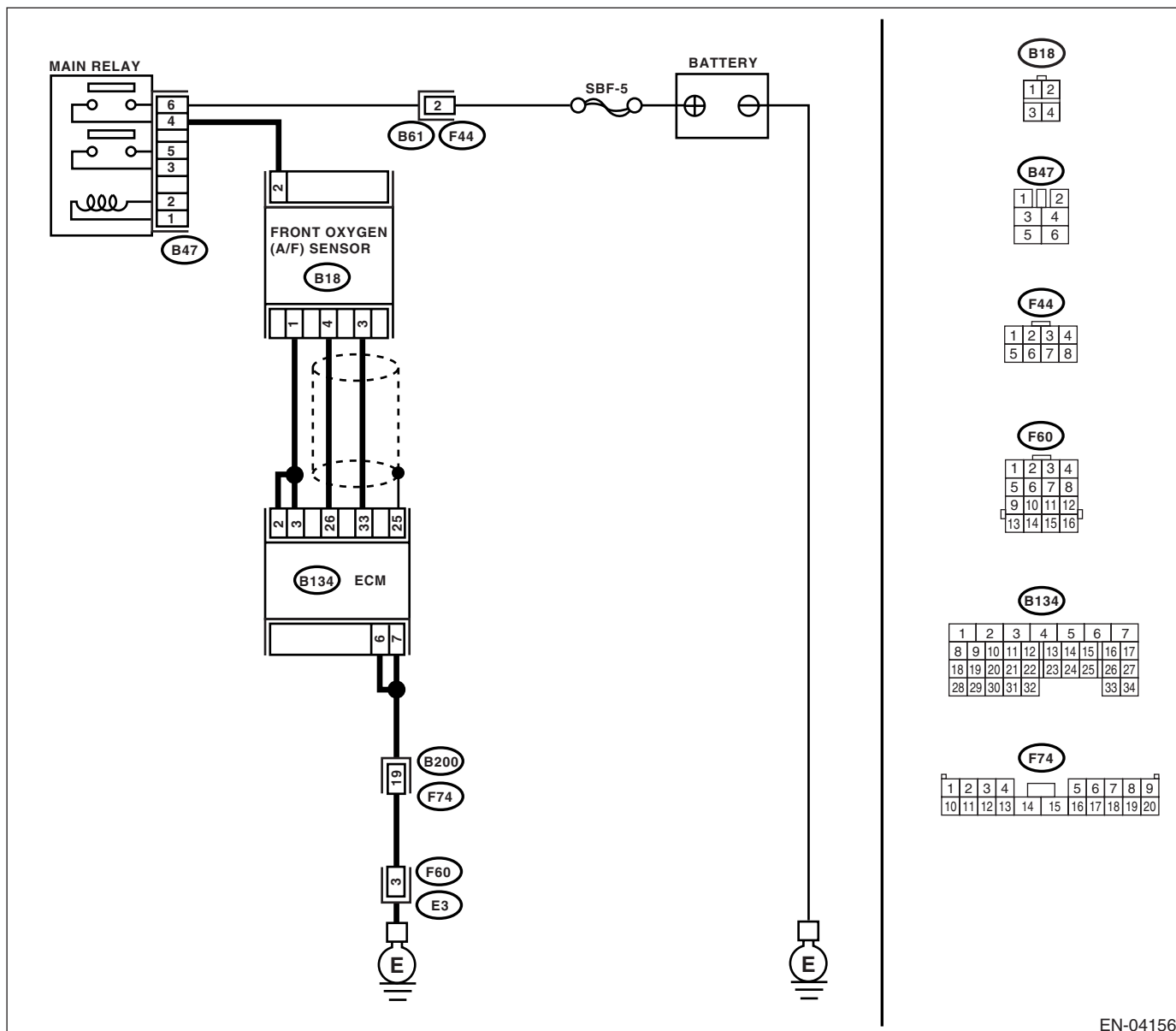
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-13, DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04156

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK POWER SUPPLY TO FRONT OXY-GEN (A/F) SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from front oxygen (A/F) sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between front oxygen (A/F) sensor connector and engine ground. Connector & terminal (B18) No. 2 (+) — Engine ground (-):	Is the voltage more than 10 V?	Go to step 2.	Repair the power supply line. NOTE: In this case, repair the following: • Open circuit in harness between main relay and front oxygen (A/F) sensor connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in main relay connector
2 CHECK GROUND CIRCUIT OF ECM. Measure the resistance of harness between ECM connector and chassis ground. Connector & terminal (B134) No. 6 — Chassis ground: (B134) No. 7 — 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: • Open circuit in harness between ECM and engine ground cable • Poor contact in ECM connector • Poor contact in coupling connector
3 CHECK CURRENT DATA. 1) Start the engine. 2) Read the data of front oxygen (A/F) sensor heater current using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STI)(diag)-28, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the current more than 0.2 A?	Repair the poor contact in connector. NOTE: In this case, repair the following: • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector	Go to step 4.
4 CHECK OUTPUT SIGNAL FROM ECM. 1) Start and idle the engine. 2) Measure the voltage between ECM connector and chassis ground. Connector & terminal (B134) No. 2 (+) — Chassis ground (-): (B134) No. 3 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Go to step 6.	Go to step 5.
5 CHECK OUTPUT SIGNAL FROM ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B134) No. 2 (+) — Chassis ground (-): (B134) No. 3 (+) — Chassis ground (-):	Shake the ECM harness and connector, while monitoring value of voltage meter. Does the voltage change?	Repair the poor contact in ECM connector.	Go to step 6.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
6 CHECK FRONT OXYGEN (A/F) SENSOR. 1) Turn the ignition switch to OFF. 2) Measure the resistance between front oxygen (A/F) sensor connector terminals. Terminals No. 2 — No. 1:	Is the resistance less than 10 Ω ?	Repair the harness and connector. NOTE: In this case, repair the following: • Open or ground short circuit in harness between front oxygen (A/F) sensor and ECM connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector	Replace the front oxygen (A/F) sensor. <Ref. to FU(STI)-36, Front Oxygen (A/F) Sensor.>

E: DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1)

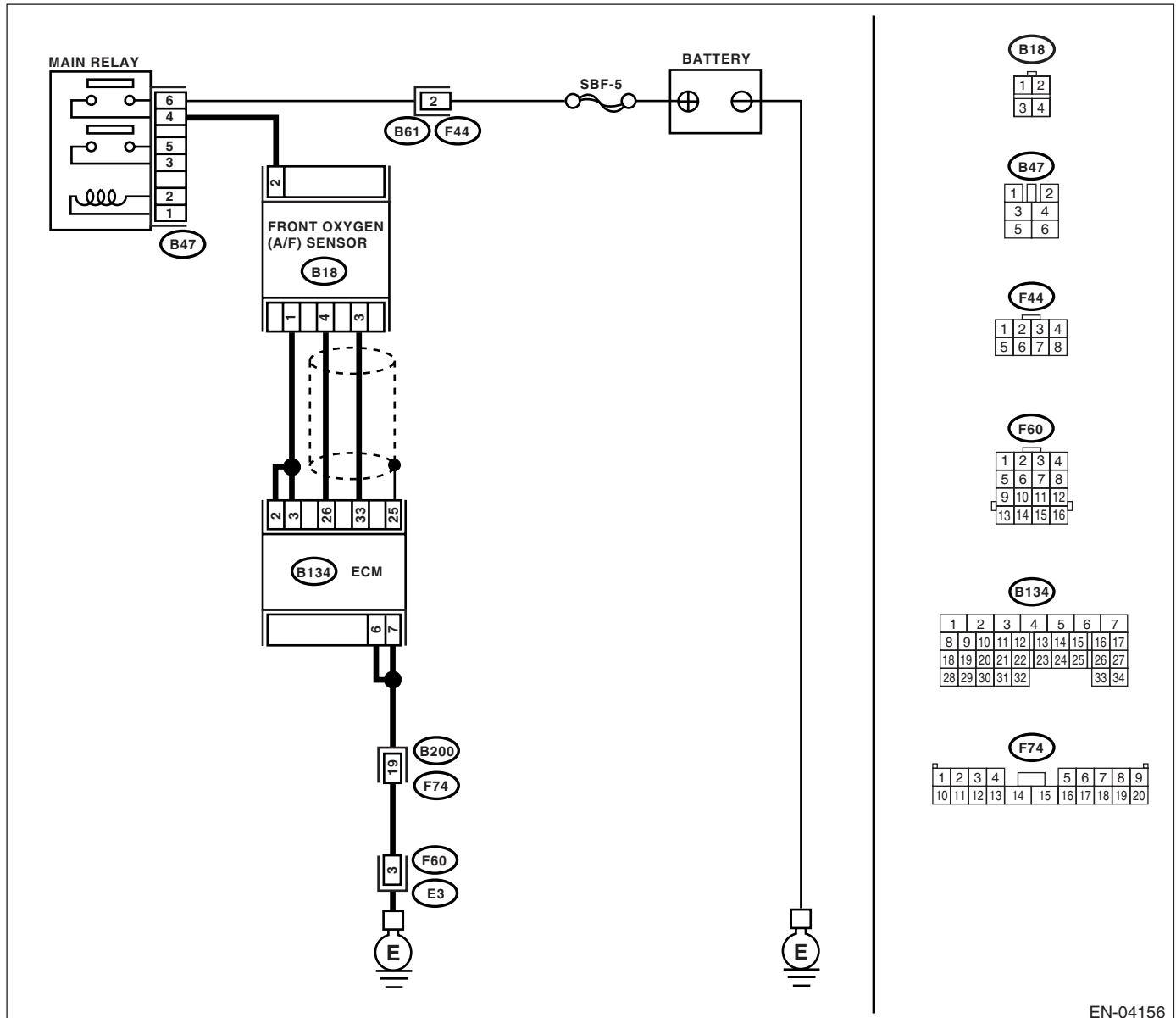
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-15, DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04156

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OUTPUT SIGNAL FROM ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and chassis ground. Connector & terminal (B134) No. 2 (+) — Chassis ground (-): (B134) No. 3 (+) — Chassis ground (-):	Is the voltage more than 8 V?	Go to step 3.	Go to step 2.
2 CHECK FRONT OXYGEN (A/F) SENSOR HEATER CURRENT. 1) Turn the ignition switch to OFF. 2) Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. 3) Turn the ignition switch to ON. 4) Read the data of front oxygen (A/F) sensor heater current using Subaru Select Monitor or the general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STI)(diag)-28, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the General Scan Tool Instruction Manual.	Is the current more than 2.3 A?	Replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).>	Finish the diagnosis.
3 CHECK OUTPUT SIGNAL FROM ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B134) No. 2 (+) — Chassis ground (-): (B134) No. 3 (+) — Chassis ground (-):	Shake the ECM harness and connector, while monitoring value of voltage meter. Does the voltage change?	Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector.	Finish the diagnosis.

F: DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2)

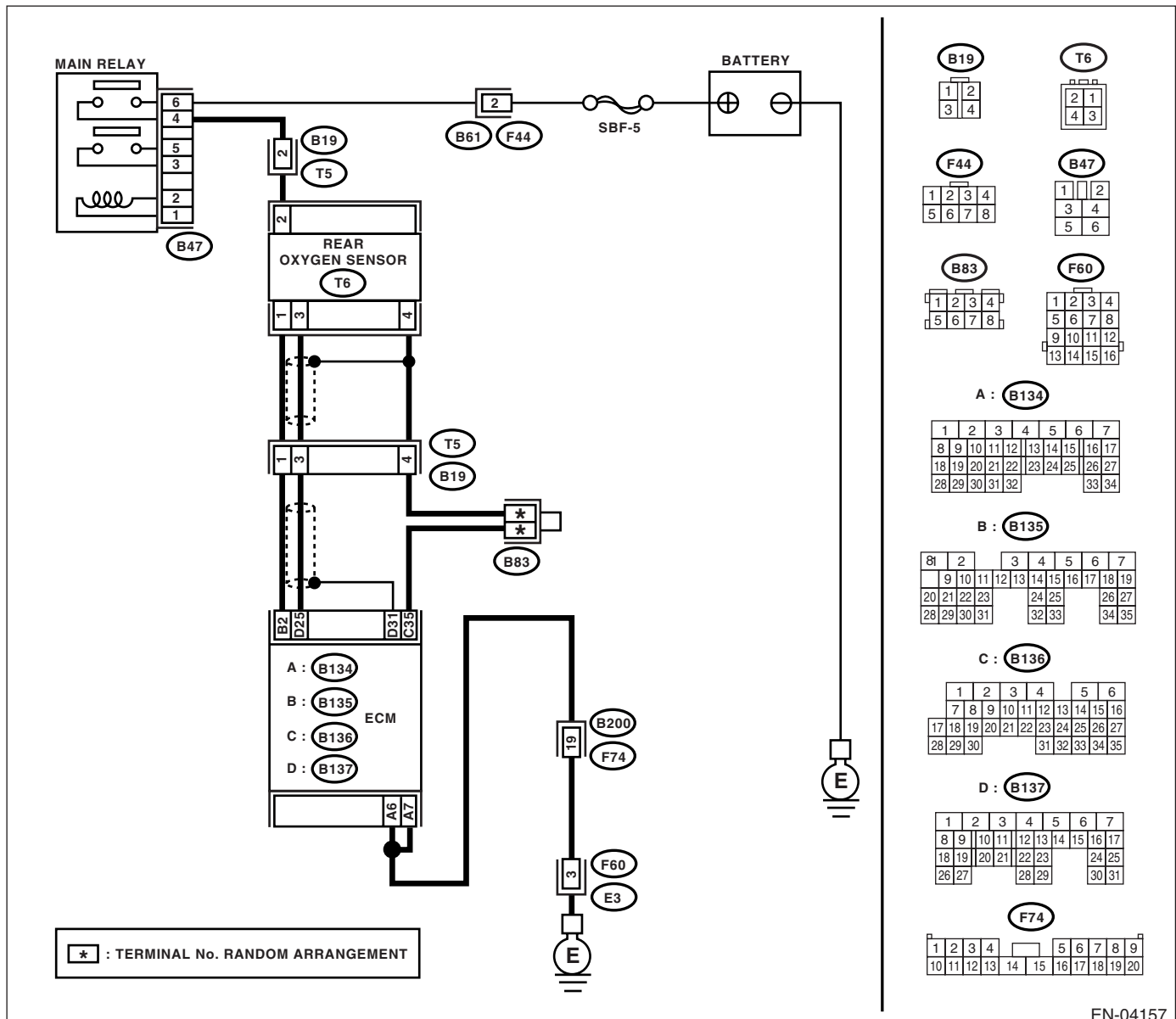
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-17, DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04157

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK GROUND CIRCUIT OF ECM. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM connector and chassis ground. Connector & terminal (B134) No. 6 — Chassis ground: (B134) No. 7 — Chassis ground:	Is the resistance less than 5 Ω ?	Go to step 2.	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and engine ground cable • Poor contact in ECM connector • Poor contact in coupling connector
2 CHECK CURRENT DATA. 1) Start the engine. 2) Read the data of rear oxygen sensor heater current using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STI)(diag)-28, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the current more than 0.2 A?	Repair the connector. NOTE: In this case, repair the following: • Poor contact in rear oxygen sensor connector • Poor contact in rear oxygen sensor connecting harness connector • Poor contact in ECM connector	Go to step 3.
3 CHECK OUTPUT SIGNAL FROM ECM. 1) Start and idle the engine. 2) Measure the voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 2 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Go to step 6.	Go to step 4.
4 CHECK OUTPUT SIGNAL FROM ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 2 (+) — Chassis ground (-):	Shake the ECM harness and connector, while monitoring value of voltage meter. Does the voltage change?	Repair the poor contact in ECM connector.	Go to step 5.
5 CHECK OUTPUT SIGNAL FROM ECM. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from rear oxygen sensor. 3) Measure the voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 2 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).>	Repair the battery short circuit in harness between ECM and rear oxygen sensor connector. After repair, replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
6 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 or chassis ground. Connector & terminal (T6) No. 2 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 7.	Repair the power supply line. NOTE: In this case, repair the following: • Open circuit in harness between main relay and rear oxygen sensor connector • Poor contact in rear oxygen sensor connector • Poor contact in coupling connector
7 CHECK REAR OXYGEN SENSOR. 1) Turn the ignition switch to OFF. 2) Measure the resistance between rear oxygen sensor connector terminals. Terminals No. 1 — No. 2:	Is the resistance less than 30 Ω ?	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector • Poor contact in coupling connector	Replace the rear oxygen sensor. <Ref. to FU(STI)-38, Rear Oxygen Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

G: DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2)

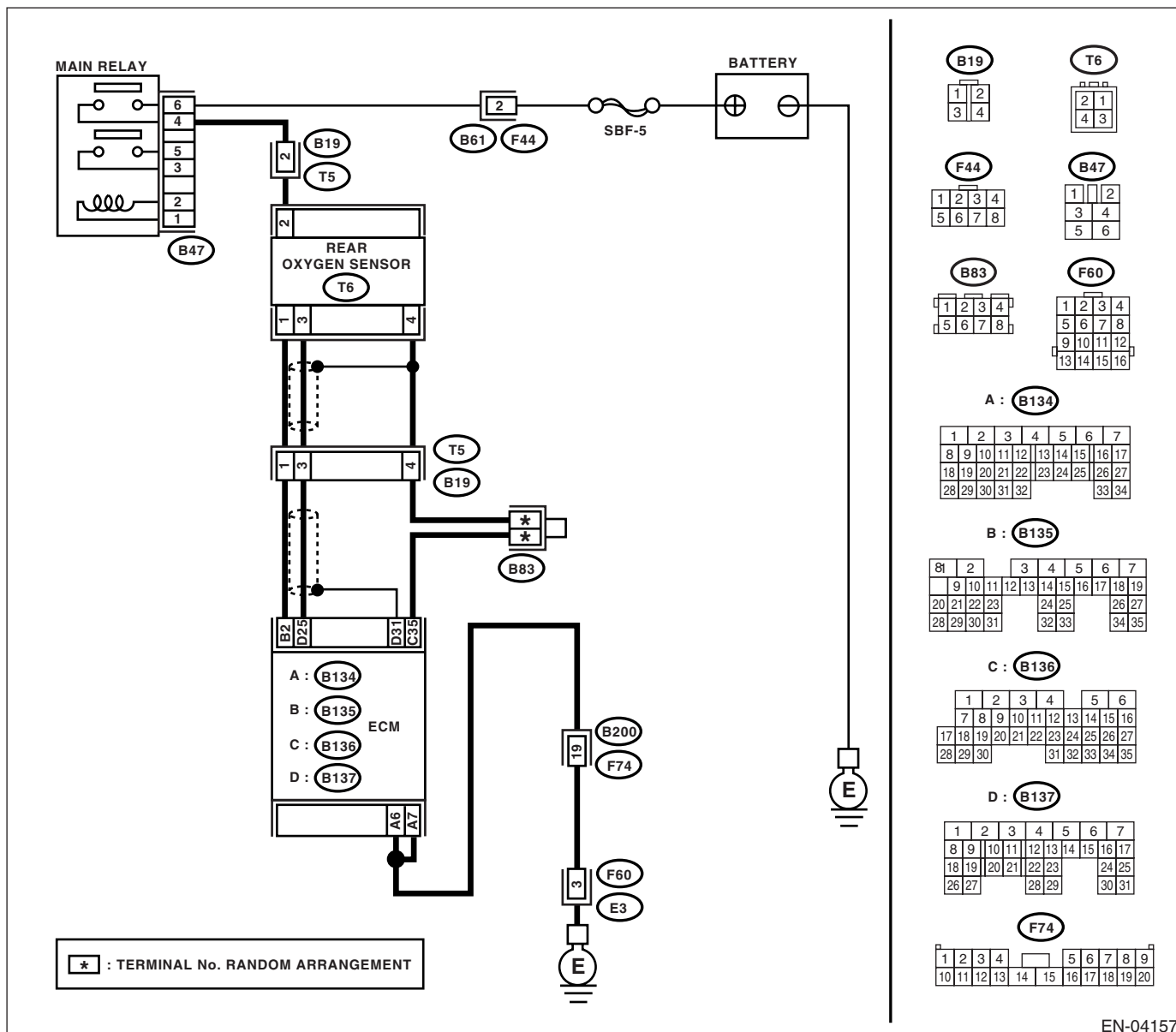
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-19, DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04157

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK INPUT SIGNAL FOR ECM. 1) Turn the ignition switch to OFF. 2) Measure the voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 2 (+) — Chassis ground (-):	Is the voltage more than 8 V?	Go to step 2.	Go to step 3.
2 CHECK CURRENT DATA. 1) Repair the battery short circuit in harness between ECM and rear oxygen sensor connector. 2) Turn the ignition switch to ON. 3) Read the data of rear oxygen sensor heater current using Subaru Select Monitor or the general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STI)(diag)-28, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the General Scan Tool Instruction Manual.	Is the current more than 7 A?	Replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).>	Finish the diagnosis.
3 CHECK POOR CONTACT. Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Finish the diagnosis.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

H: DTC P0068 MAP/MAF – THROTTLE POSITION CORRELATION

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-21, DTC P0068 MAP/MAF – THROTTLE POSITION CORRELATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

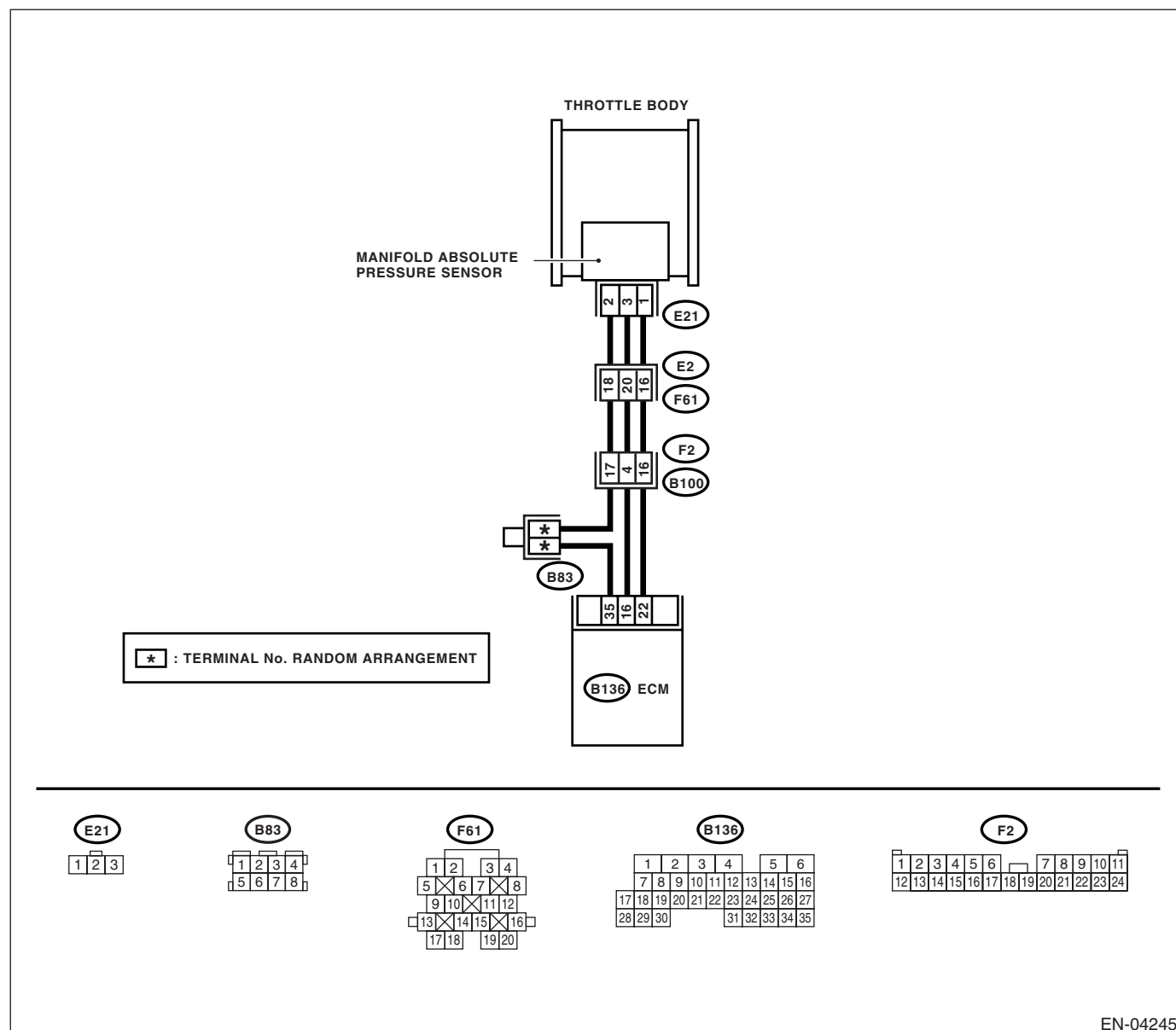
TROUBLE SYMPTOM:

Failure of engine to start

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04245

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK IDLE SWITCH SIGNAL. 1) Turn the ignition switch to ON. 2) Operate the LED operation mode for engine using Subaru Select Monitor. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "LED OPERATION MODE FOR ENGINE". <Ref. to EN(STI)(diag)-28, Subaru Select Monitor.>	Does the LED of {Idle Switch Signal} come on?	Go to step 2.	Check the throttle position sensor circuit. <Ref. to EN(STI)(diag)-360, DTC P2135 THROTTLE/ PEDAL POSITION SENSOR/ SWITCH "A"/"B" VOLTAGE RATIO- NALITY, Diagnos- tic Procedure with Diagnostic Trou- ble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0068.
2 CHECK FOR ANY OTHER DTC ON DIS- PLAY.	Is any other DTC displayed?	Inspect the rele- vant DTC. "List of Diagnostic Trou- ble Code (DTC)". <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0068.	Go to step 3.
3 CHECK CONDITION OF MANIFOLD ABSO- LUTE PRESSURE SENSOR.	Is the manifold absolute pres- sure sensor installation bolt tightened securely?	Go to step 4.	Tighten the mani- fold absolute pres- sure sensor installation bolt securely.
4 CHECK CONDITION OF THROTTLE BODY.	Is the throttle body installation bolt tightened securely?	Replace the mani- fold absolute pres- sure sensor. <Ref. to FU(STI)-30, Manifold Absolute Pressure Sensor.>	Tighten the throttle body installation bolt securely.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

I: DTC P0101 MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-23, DTC P0101 MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

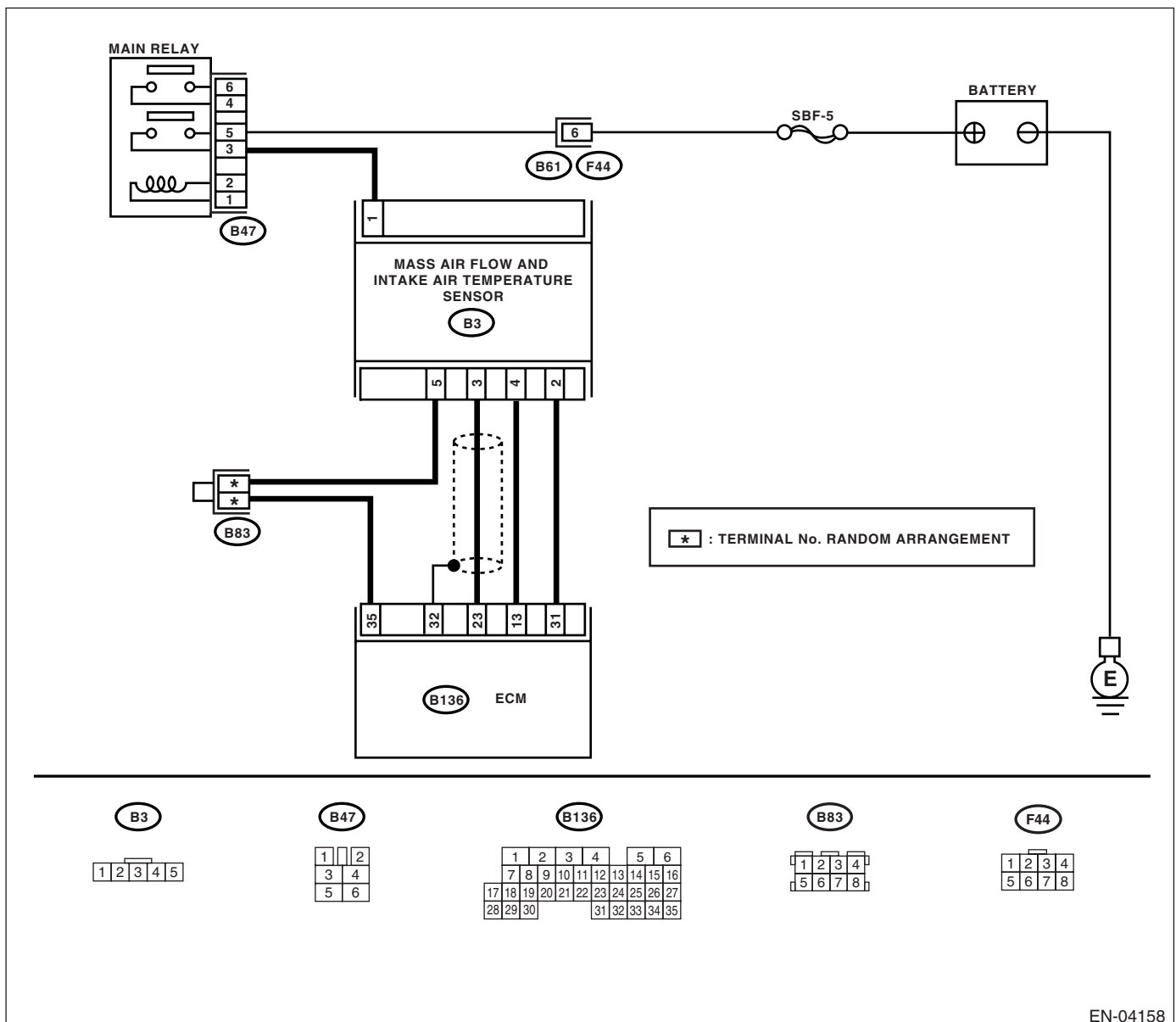
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04158

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK FOR ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0101.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(STI)-29, Mass Air Flow and Intake Air Temperature Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

J: DTC P0102 MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-26, DTC P0102 MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

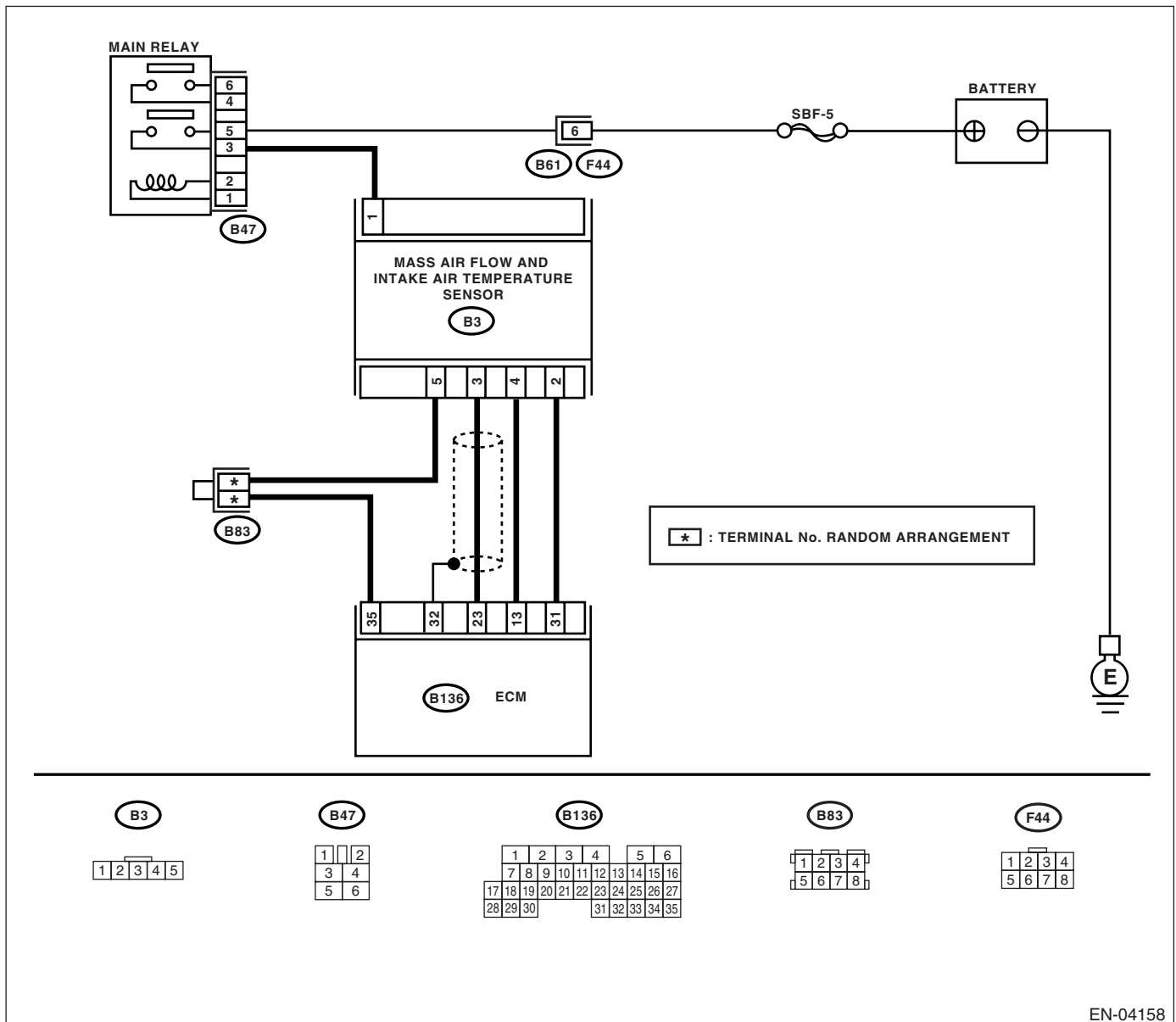
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04158

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CONNECT SUBARU SELECT MONITOR OR THE GENERAL SCAN TOOL, AND READ DATA. 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 Subaru Select Monitor or the general scan tool power switch to ON. 4) Start the engine. 5) Read the mass air flow sensor voltage using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STI)(diag)-28, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the voltage 0.2 — 4.7 V?	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in the mass air flow and intake air temperature sensor. NOTE: In this case, repair the following: • Open or ground short circuit in harness between mass air flow and intake air temperature sensor and ECM connector • Poor contact in mass air flow and intake air temperature sensor or ECM connector	Go to step 2.
2 CHECK INPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground while engine is idling. Connector & terminal (B136) No. 23 (+) — Chassis ground (-):	Is the voltage less than 0.2 V?	Go to step 4.	Go to step 3.
3 CHECK INPUT SIGNAL FOR ECM (USING SUBARU SELECT MONITOR). Measure the voltage between ECM connector and chassis ground while engine is idling.	Shake the ECM harness and connector, while monitoring value of Subaru Select Monitor. Does the voltage change?	Repair the poor contact in ECM connector.	Contact your SOA Service Center since deterioration of some parts may be the cause.
4 CHECK POWER SUPPLY TO MASS AIR FLOW SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from mass air flow sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between mass air flow and intake air temperature sensor connector and chassis ground. Connector & terminal (B3) No. 1 (+) — Chassis ground (-):	Is the voltage more than 5 V?	Go to step 5.	Repair the open circuit in harness between mass air flow and intake air temperature sensor and main relay.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
5 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 mass air flow and intake air temperature sensor connector. Connector & terminal (B136) No. 23 — (B3) No. 3: (B136) No. 31 — (B3) No. 2: (B136) No. 35 — (B3) No. 5:	Is the resistance less than 1 Ω ?	Go to step 6.	Repair the open circuit in harness between ECM and mass air flow and intake air temperature sensor connector.
6 CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR CONNECTOR Measure the resistance of harness between ECM and chassis ground. Connector & terminal (B136) No. 23 — Chassis ground: (B136) No. 31 — Chassis ground: (B136) No. 35 — Chassis ground:	Is the resistance more than 1 M Ω ?	Go to step 7.	Repair the ground short circuit in harness between ECM and mass air flow and intake air temperature sensor connector.
7 CHECK POOR CONTACT Check poor contact in mass air flow and intake air temperature sensor connector.	Is there poor contact in mass air flow and intake air temperature sensor connector?	Repair the poor contact in mass air flow and intake air temperature sensor connector.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(STI)-29, Mass Air Flow and Intake Air Temperature Sensor.>

K: DTC P0103 MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-28, DTC P0103 MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

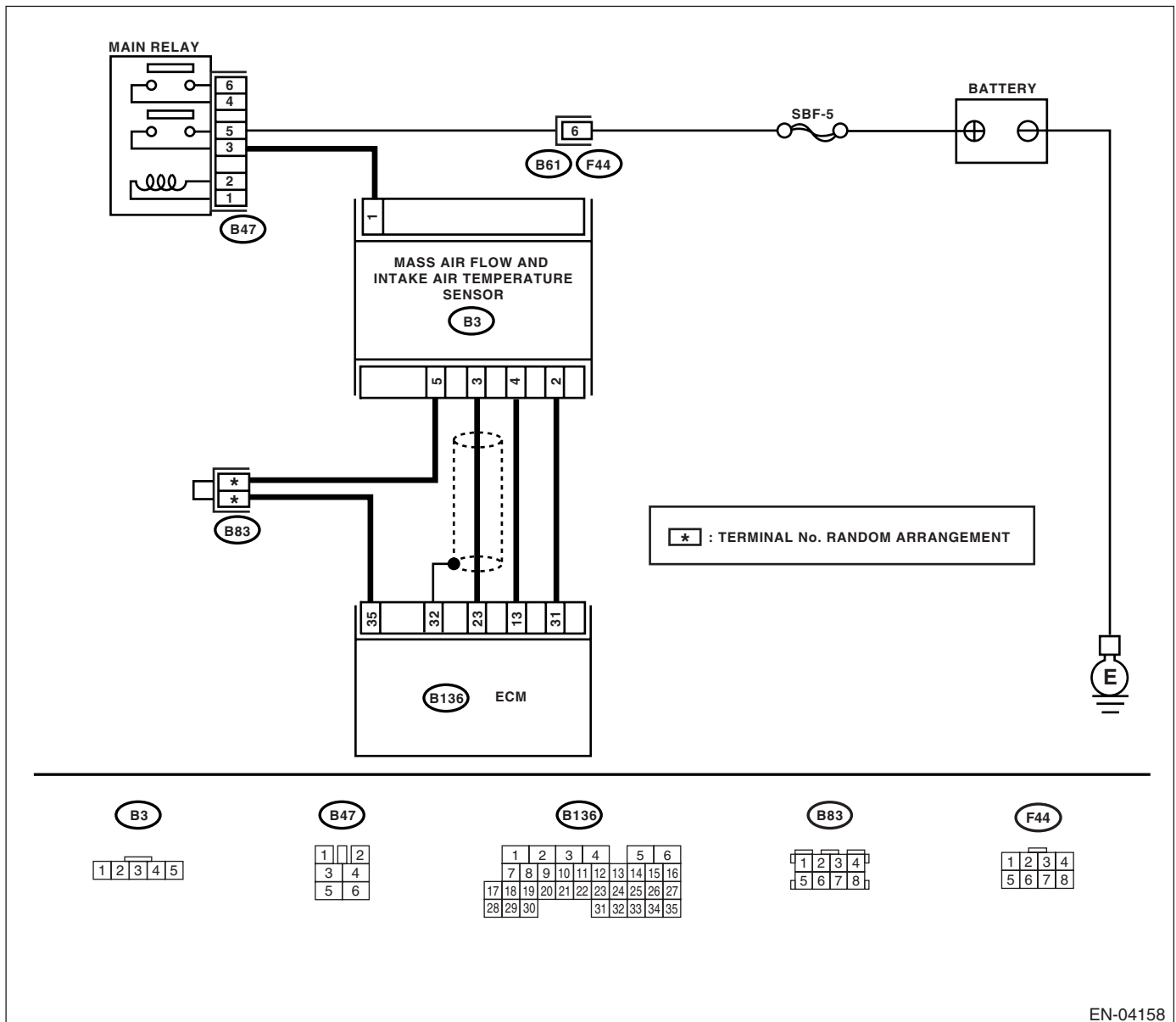
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04158

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CONNECT SUBARU SELECT MONITOR OR THE GENERAL SCAN TOOL, AND READ DATA. 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 Subaru Select Monitor or general scan tool power switch to ON. 4) Start the engine. 5) Read the mass air flow and intake air temperature sensor voltage using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STI)(diag)-28, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the voltage 0.2 — 4.7 V?	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time.	Go to step 2.
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 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 chassis ground. Connector & terminal (B3) No. 3 (+) — Chassis ground (-):	Is the voltage more than 5 V?	Repair the battery short of harness between mass air flow and intake air temperature sensor connector and ECM 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. 3) Measure the resistance between ECM connector and mass air flow and intake air temperature sensor connector. Connector & terminal (B3) No. 2 — (B136) No. 31:	Is the resistance less than 1 Ω ?	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(STI)-29, Mass Air Flow and Intake Air Temperature Sensor.>	Repair the open harness between mass air flow and intake air temperature sensor connector and ECM connector.

L: DTC P0107 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT

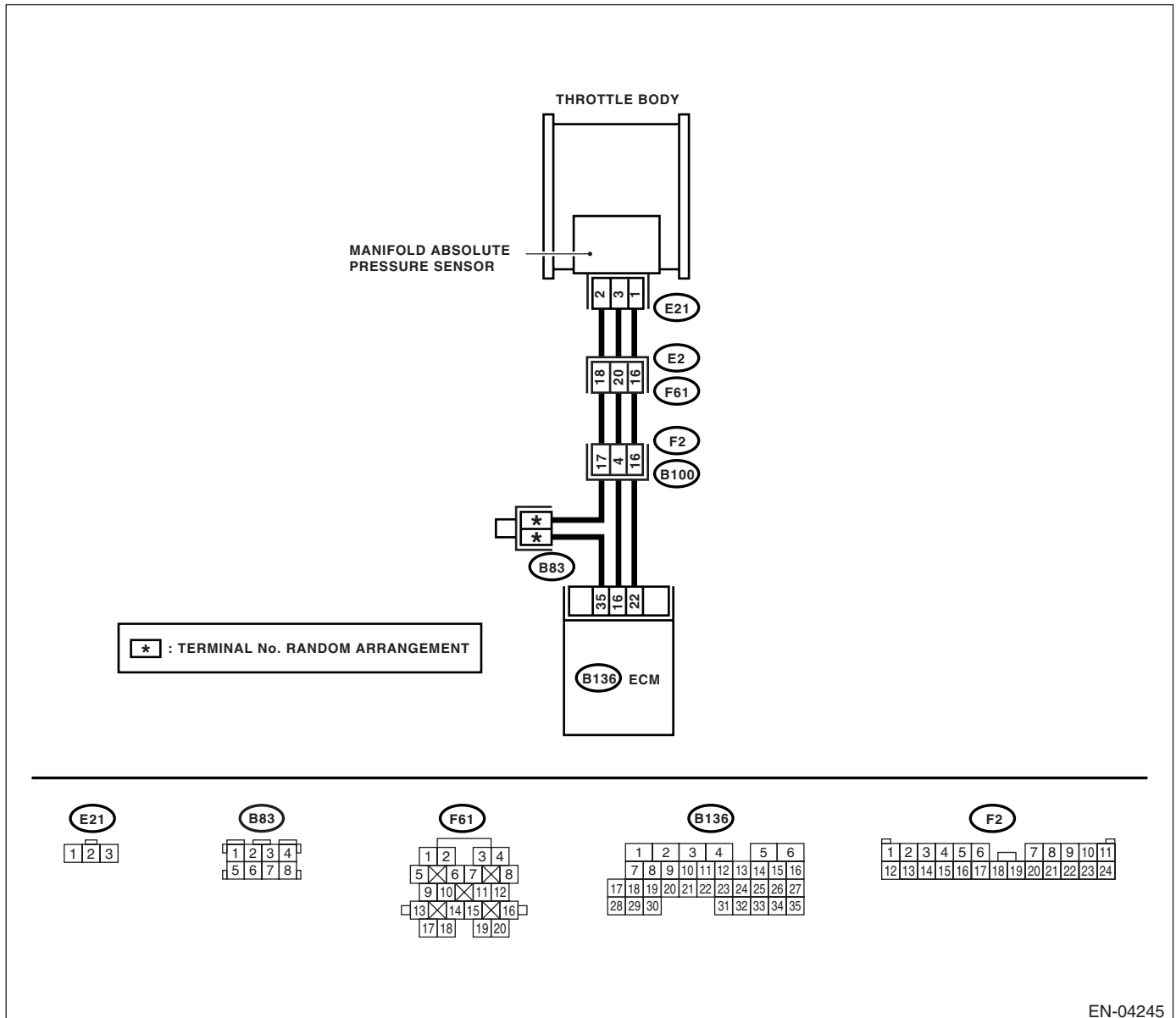
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-30, DTC P0107 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04245

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK INPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B136) No. 16 (+) — Chassis ground (-):	Is the voltage more than 4.5 V?	Go to step 3.	Go to step 2.
2 CHECK INPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B136) No. 16 (+) — Chassis ground (-):	Shake the ECM harness and connector, while monitoring value of voltage meter. Does the voltage change?	Repair the poor contact in ECM connector.	Contact your SOA Service Center since deterioration of some parts may be the cause.
3 CHECK INPUT SIGNAL FOR ECM. Measure the voltage between ECM and chassis ground. Connector & terminal (B136) No. 22 (+) — Chassis ground (-):	Is the voltage less than 0.7 V?	Go to step 4.	Contact your SOA Service Center since deterioration of some parts may be the cause.
4 CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from manifold absolute pressure sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between manifold absolute pressure sensor connector and engine ground. Connector & terminal (E21) No. 3 (+) — Engine ground (-):	Is the voltage more than 4.5 V?	Go to step 5.	Repair the open circuit in harness between ECM and manifold absolute pressure sensor connector.
5 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 (B136) No. 35 — (E21) No. 2:	Is the resistance less than 1 Ω ?	Go to step 6.	Repair the open circuit in harness between ECM and manifold absolute pressure sensor connector.
6 CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR. Measure the resistance of harness between manifold absolute pressure sensor connector and engine ground. Connector & terminal (E21) No. 1 — Engine ground:	Is the resistance more than 1 M Ω ?	Go to step 7.	Repair the ground short circuit in harness between ECM and manifold absolute pressure sensor connector.
7 CHECK POOR CONTACT. Check poor contact in manifold absolute pressure sensor connector.	Is there poor contact in manifold absolute pressure sensor connector?	Repair the poor contact in manifold absolute pressure sensor connector.	Replace the manifold absolute pressure sensor. <Ref. to FU(STI)-30, Manifold Absolute Pressure Sensor.>

M: DTC P0108 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT

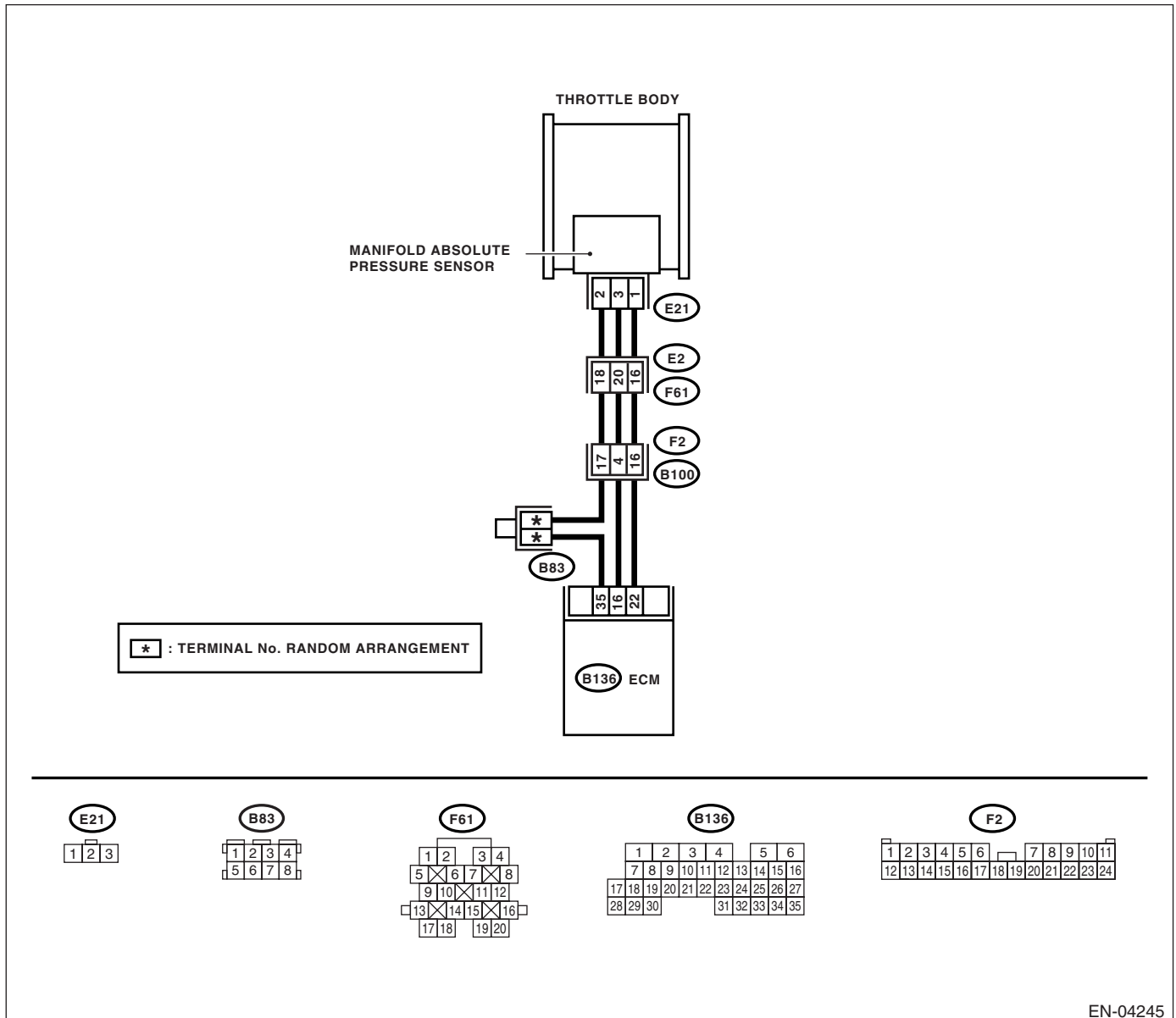
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-32, DTC P0108 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04245

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK INPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B136) No. 16 (+) — Chassis ground (-):	Is the voltage more than 4.5 V?	Go to step 3.	Go to step 2.
2 CHECK INPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B136) No. 16 (+) — Chassis ground (-):	Shake the ECM harness and connector, while monitoring value of voltage meter. Does the voltage change?	Repair the poor contact in ECM connector.	Contact your SOA Service Center since deterioration of some parts may be the cause.
3 CHECK INPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B136) No. 22 (+) — Chassis ground (-):	Is the voltage more than 4.5 V?	Go to step 4.	Contact your SOA Service Center since deterioration of some parts may be the cause.
4 CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from manifold absolute pressure sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between manifold absolute pressure sensor connector and engine ground. Connector & terminal (E21) No. 3 (+) — Engine ground (-):	Is the voltage more than 4.5 V?	Go to step 5.	Repair the open circuit in harness between ECM and manifold absolute pressure sensor connector.
5 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 (B136) No. 22 — (E21) No. 1:	Is the resistance less than 1 Ω ?	Go to step 6.	Repair the open circuit in harness between ECM and manifold absolute pressure sensor connector.
6 CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR. Measure the resistance of harness between ECM and manifold absolute pressure sensor connector. Connector & terminal (B136) No. 35 — (E21) No. 2:	Is the resistance less than 1 Ω ?	Go to step 7.	Repair the open circuit in harness between ECM and manifold absolute pressure sensor connector.
7 CHECK POOR CONTACT. Check poor contact in manifold absolute pressure sensor connector.	Is there poor contact in manifold absolute pressure sensor connector?	Repair the poor contact in manifold absolute pressure sensor connector.	Replace the manifold absolute pressure sensor. <Ref. to FU(STI)-30, Manifold Absolute Pressure Sensor.>

N: DTC P0111 INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-34, DTC P0111 INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

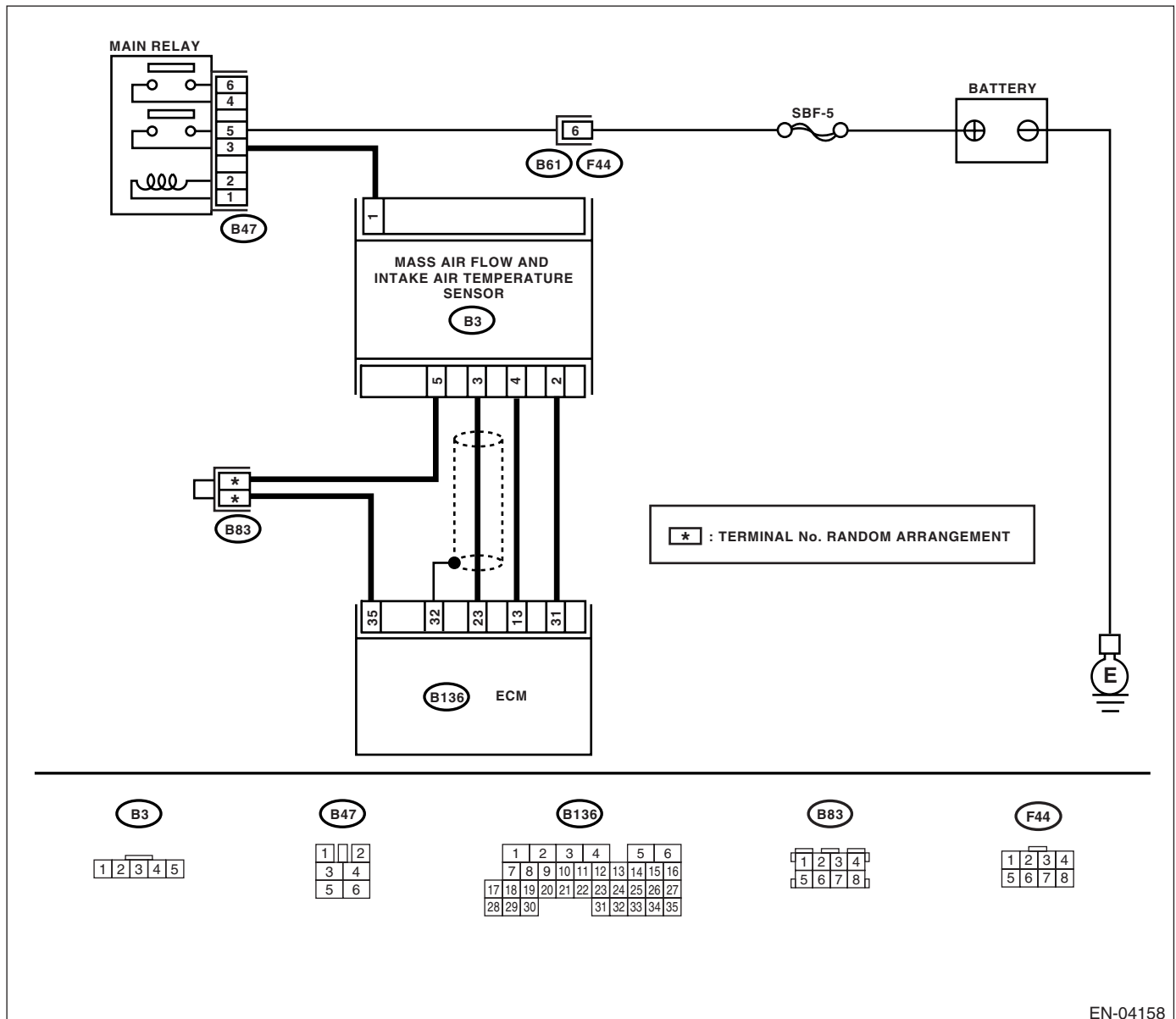
TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04158

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK FOR ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0111.	Go to step 2.
2 CHECK ENGINE COOLANT TEMPERATURE. 1) Start the engine and warm it up completely. 2) Measure the engine coolant temperature using Subaru Select Monitor or general scan tool. NOTE: - Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STI)(diag)-28, Subaru Select Monitor.> - General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the engine coolant temperature 75°C (167°F) — 95°C (203°F)?	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(STI)-29, Mass Air Flow and Intake Air Temperature Sensor.>	Inspect the DTC P0125 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).>

O: DTC P0112 INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-36, DTC P0112 INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

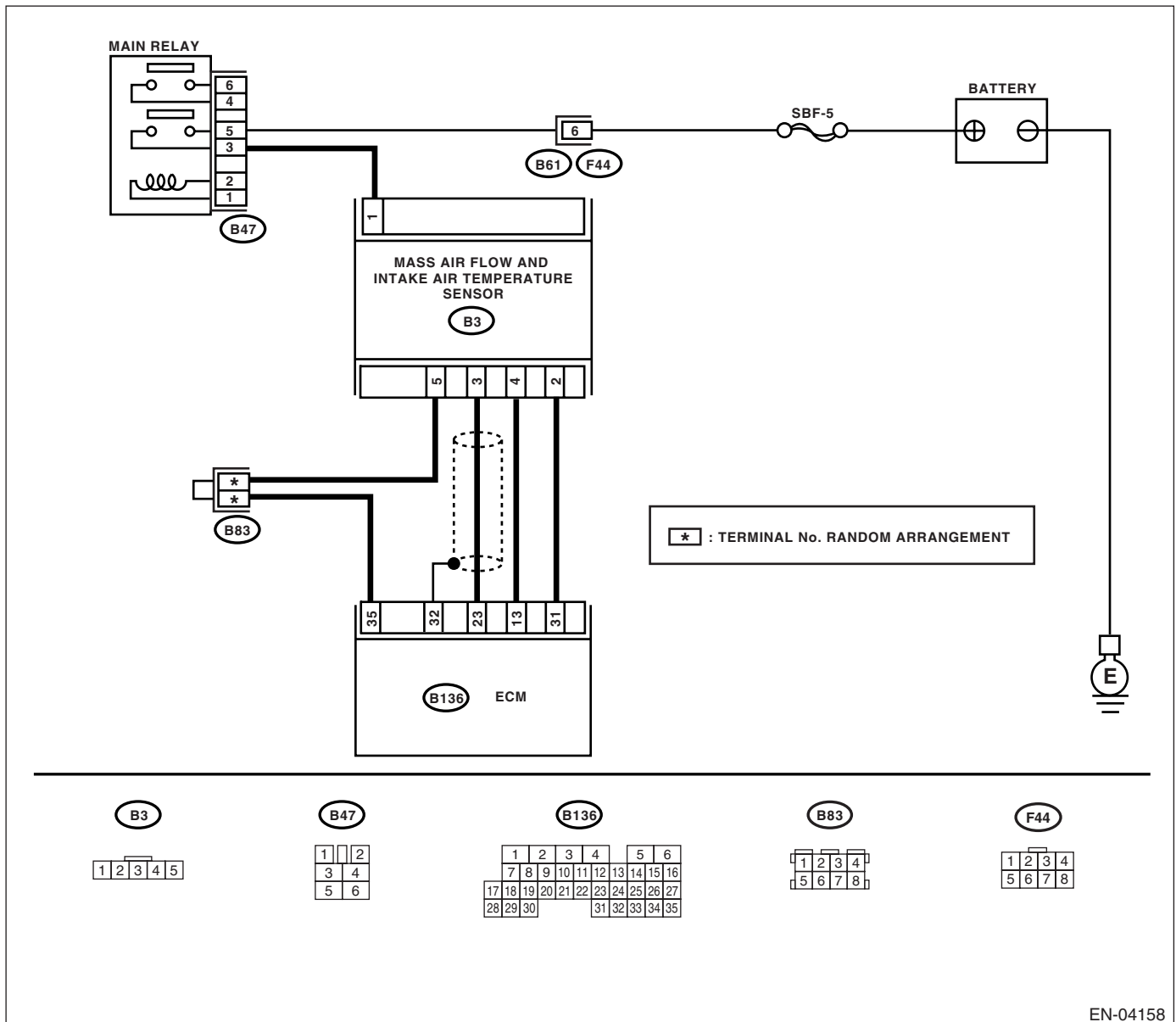
TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04158

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK CURRENT DATA. 1) Start the engine. 2) Read the data of intake air temperature sensor signal using Subaru Select Monitor or the general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STI)(diag)-28, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the General Scan Tool Instruction Manual.	Is the temperature more than 55°C (131°F)?	Go to step 2.	Repair the poor contact. NOTE: In this case, repair the following: • Poor contact mass air flow and intake air temperature sensor • Poor contact in ECM • Poor contact in joint connector
2 CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from mass air flow and intake air temperature sensor. 3) Turn the ignition switch to ON. 4) Read the data of intake air temperature sensor signal using Subaru Select Monitor or the general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STI)(diag)-28, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the General Scan Tool Instruction Manual.	Is the temperature less than -36°C (-33°F)?	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(STI)-29, Mass Air Flow and Intake Air Temperature Sensor.>	Repair the ground short circuit in harness between mass air flow and intake air temperature sensor and ECM connector.

P: DTC P0113 INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-38, DTC P0113 INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

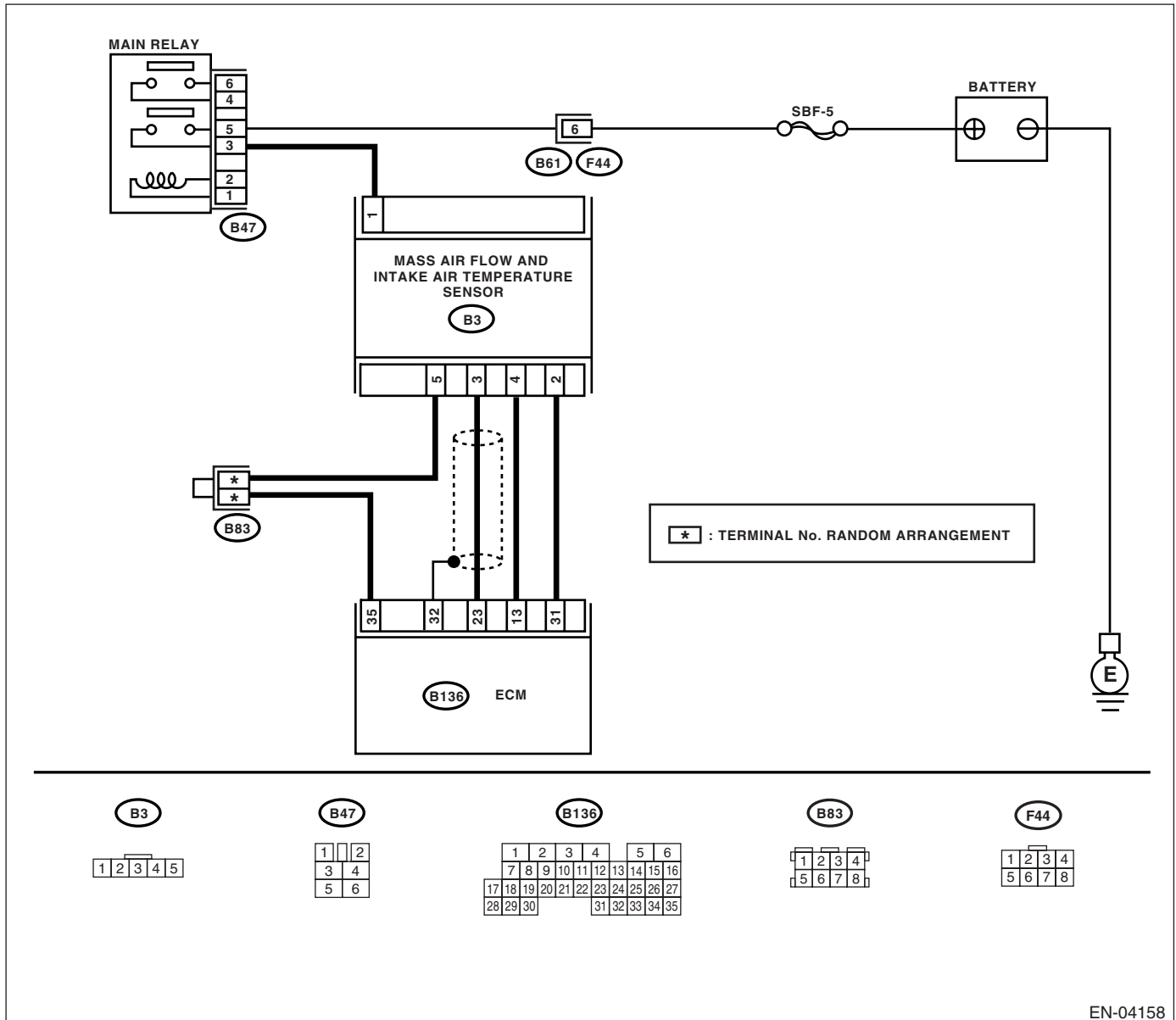
TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04158

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK CURRENT DATA. 1) Start the engine. 2) Read the data of intake air temperature sensor signal using Subaru Select Monitor or the general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STI)(diag)-28, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the General Scan Tool Instruction Manual.	Is the temperature less than -36°C (-33°F)?	Go to step 2.	Repair the poor contact. NOTE: In this case, repair the following: • Poor contact in mass air flow and intake air temperature sensor • Poor contact in ECM • Poor contact in joint connector
2 CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from mass air flow and intake air temperature sensor. 3) Measure the voltage between mass air flow and intake air temperature sensor connector and engine ground. Connector & terminal (B3) No. 4 (+) — Engine ground (-):	Is the voltage more than 10 V?	Repair the battery short circuit in harness between mass air flow and intake air temperature sensor and ECM connector.	Go to step 3.
3 CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR. 1) Turn the ignition switch to ON. 2) Measure the voltage between mass air flow and intake air temperature sensor connector and engine ground. Connector & terminal (B3) No. 4 (+) — Engine ground (-):	Is the voltage more than 10 V?	Repair the battery short circuit in harness between mass air flow and intake air temperature sensor and ECM connector.	Go to step 4.
4 CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR. Measure the voltage between mass air flow and intake air temperature sensor and manifold absolute pressure sensor connector and engine ground. Connector & terminal (B3) No. 4 (+) — Engine ground (-):	Is the voltage more than 4 V?	Go to step 5.	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between mass air flow and intake air temperature sensor and ECM connector • Poor contact in mass air flow and intake air temperature sensor • Poor contact in ECM • Poor contact in joint connector

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
5 CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between mass air flow and intake air temperature sensor and engine ground. Connector & terminal (B3) No. 5 — Engine ground:	Is the resistance less than 5 Ω ?	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(STI)-29, Mass Air Flow and Intake Air Temperature Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between mass air flow and intake air temperature sensor and ECM connector • Poor contact in mass air flow and intake air temperature sensor • Poor contact in ECM • Poor contact in joint connector

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Q: DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-40, DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

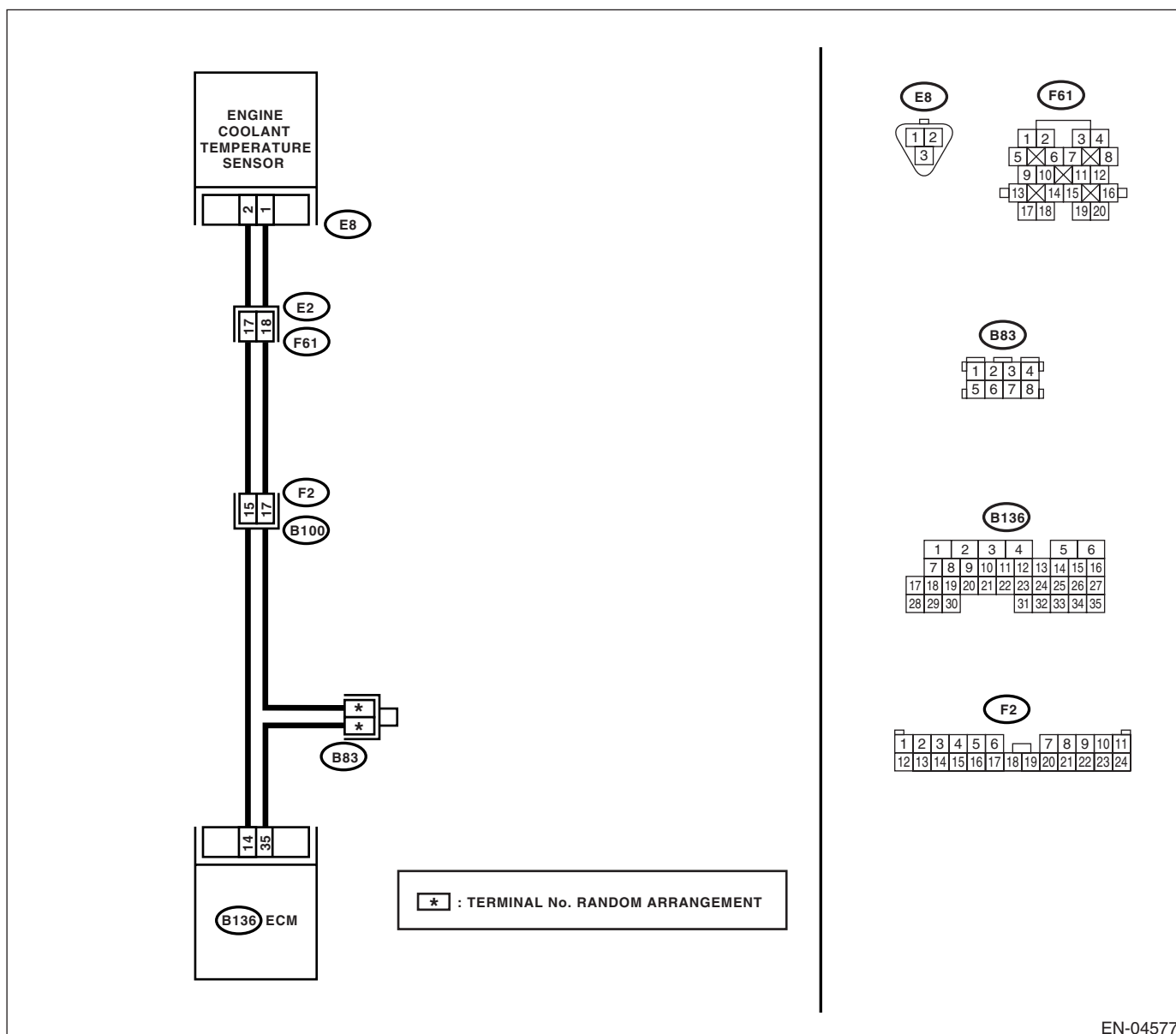
TROUBLE SYMPTOM:

- Hard to start
- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04577

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK CURRENT DATA. 1) Start the engine. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STI)(diag)-28, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the temperature more than 120°C (248°F)?	Go to step 2.	Repair the poor contact. NOTE: In this case, repair the following: • Poor contact in engine coolant temperature sensor • Poor contact in ECM • Poor contact in coupling connector • Poor contact in joint connector
2 CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from engine coolant temperature sensor. 3) Turn the ignition switch to ON. 4) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STI)(diag)-28, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the temperature less than -40°C (-40°F)?	Replace the engine coolant temperature sensor. <Ref. to FU(STI)-25, Engine Coolant Temperature Sensor.>	Repair the ground short circuit in harness between engine coolant temperature sensor and ECM connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

R: DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-42, DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

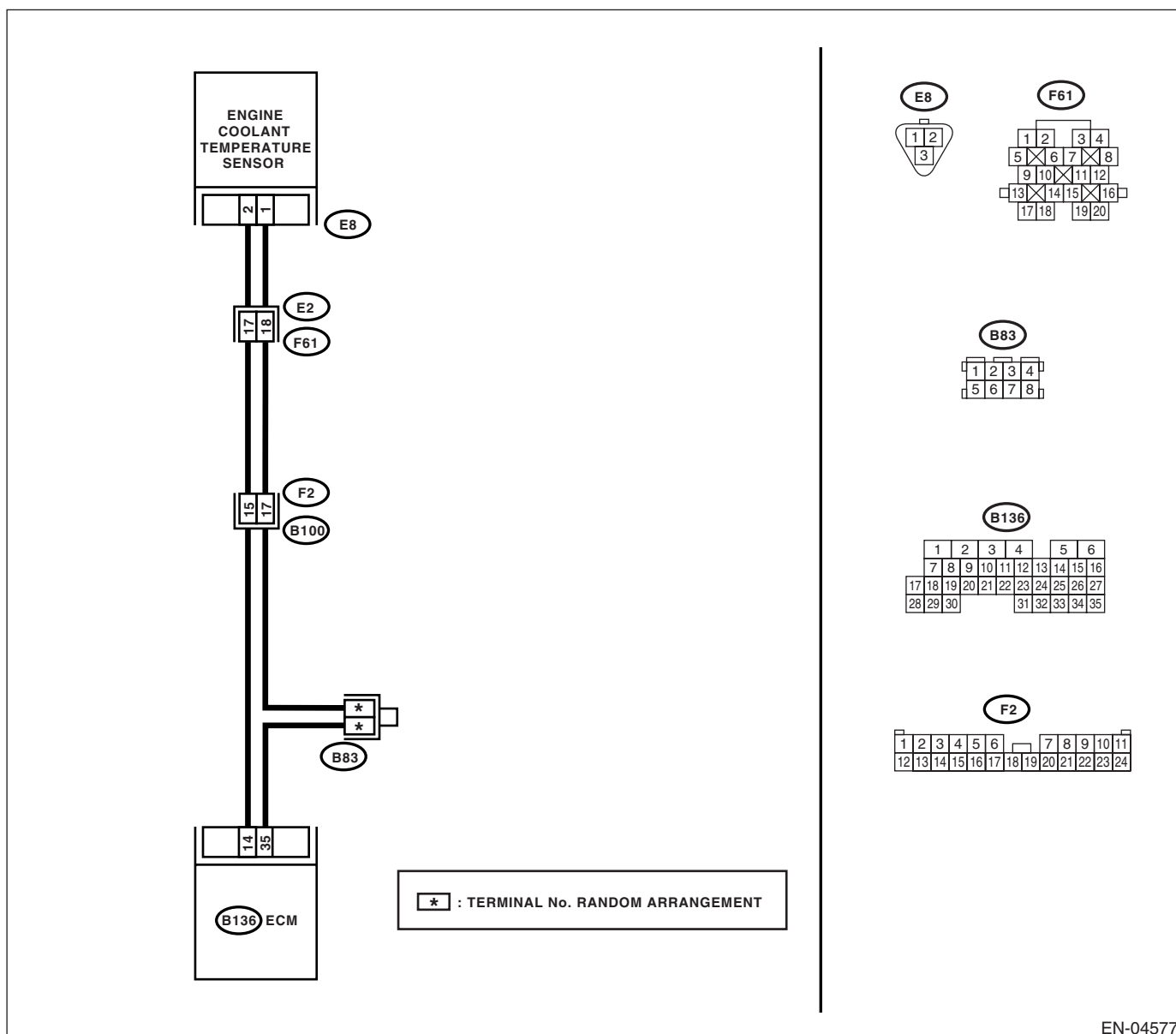
TROUBLE SYMPTOM:

- Hard to start
- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04577

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK CURRENT DATA. 1) Start the engine. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STI)(diag)-28, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the temperature less than – 40°C (–40°F)?	Go to step 2.	Repair the poor contact. NOTE: In this case, repair the following: • Poor contact in engine coolant temperature sensor • Poor contact in ECM • Poor contact in coupling connector • Poor contact in joint connector
2 CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from engine coolant temperature sensor. 3) Measure the voltage between engine coolant temperature sensor connector and engine ground. Connector & terminal (E8) No. 2 (+) — Engine ground (–):	Is the voltage more than 10 V?	Repair the battery short circuit in harness between ECM and engine coolant temperature sensor connector.	Go to step 3.
3 CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR. 1) Turn the ignition switch to ON. 2) Measure the voltage between engine coolant temperature sensor connector and engine ground. Connector & terminal (E8) No. 2 (+) — Engine ground (–):	Is the voltage more than 10 V?	Repair the battery short circuit in harness between ECM and engine coolant temperature sensor connector.	Go to step 4.
4 CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR. Measure the voltage between engine coolant temperature sensor connector and engine ground. Connector & terminal (E8) No. 2 (+) — Engine ground (–):	Is the voltage more than 4 V?	Go to step 5.	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and engine coolant temperature sensor connector • Poor contact in engine coolant temperature sensor connector • Poor contact in ECM connector • Poor contact in coupling connector • Poor contact in joint connector

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
5 CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between engine coolant temperature sensor connector and engine ground. Connector & terminal (E8) No. 1 — Engine ground:	Is the resistance less than 5 Ω ?	Replace the engine coolant temperature sensor. <Ref. to FU(STI)-25, Engine Coolant Temperature Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and engine coolant temperature sensor connector • Poor contact in engine coolant temperature sensor connector • Poor contact in ECM connector • Poor contact in coupling connector • Poor contact in joint connector

S: DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-44, DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

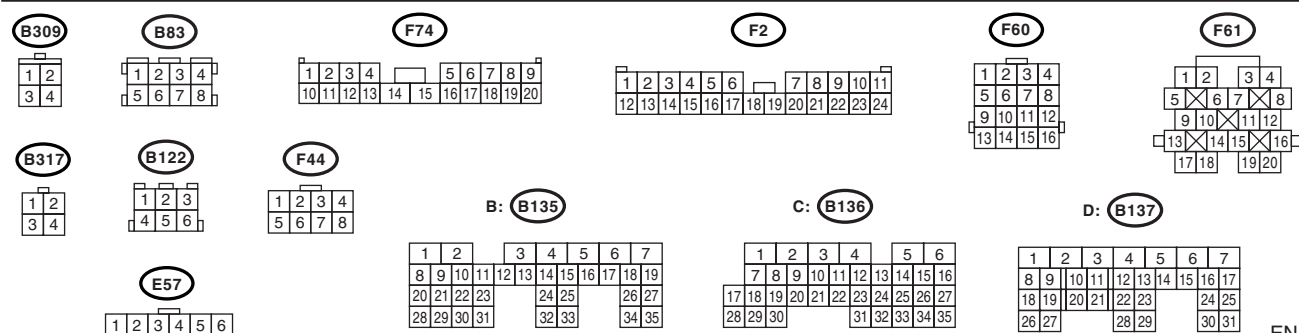
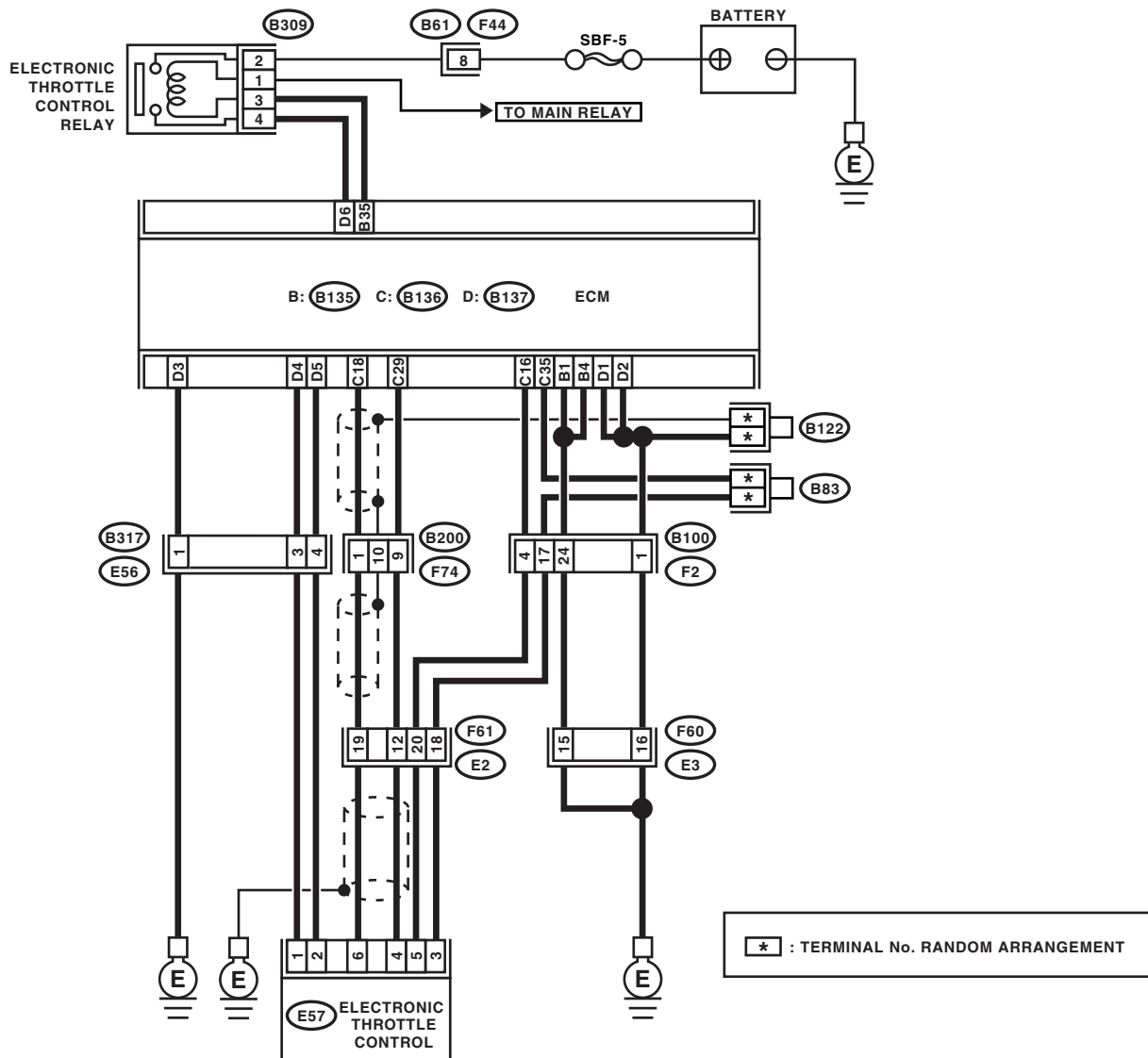
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-04159

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OUTPUT VOLTAGE OF SENSOR. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector terminals. Connector & terminal (B136) No. 29 (+) — (B136) No. 35 (-): 3) Shake the ECM harness and connector, engine harness connectors and electronic throttle control.	Is the voltage more than 0.4 V?	Go to step 2.	Go to step 3.
2 CHECK POOR CONTACT IN CONNECTORS. Check poor contact in connectors between ECM and electronic throttle control.	Is there poor contact in the connectors between ECM and electronic throttle control?	Repair the poor contact in connectors.	Connector has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause.
3 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. Connector & terminal (B136) No. 16 — (E57) No. 5:	Is the resistance less than 1 Ω ?	Go to step 4.	Repair open of harness connector.
4 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. Measure the resistance between ECM connector and chassis ground. Connector & terminal (B136) No. 18 — Chassis ground: (B136) No. 16 — Chassis ground:	Is the resistance more than 1 M Ω ?	Go to step 5.	Repair the ground short of harness.
5 CHECK POWER SUPPLY TO SENSOR. 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control connector and engine ground. Connector & terminal (E57) No. 5 (+) — Engine ground (-): 4) Shake the ECM harness and connector, engine harness connectors, while monitoring value of voltage meter.	Is the voltage 4.5 — 5.5 V?	Go to step 6.	Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).>
6 CHECK SHORT OF ECM. 1) Turn the ignition switch to OFF. 2) Measure the resistance between electronic throttle control connector and engine ground. Connector & terminal (E57) No. 6 — Engine ground:	Is the resistance more than 10 Ω ?	Repair the poor contact in electronic throttle control connector. If problem persists, replace the electronic throttle control. <Ref. to FU(STI)-12, Throttle Body.>	Repair the poor the contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

T: DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-46, DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

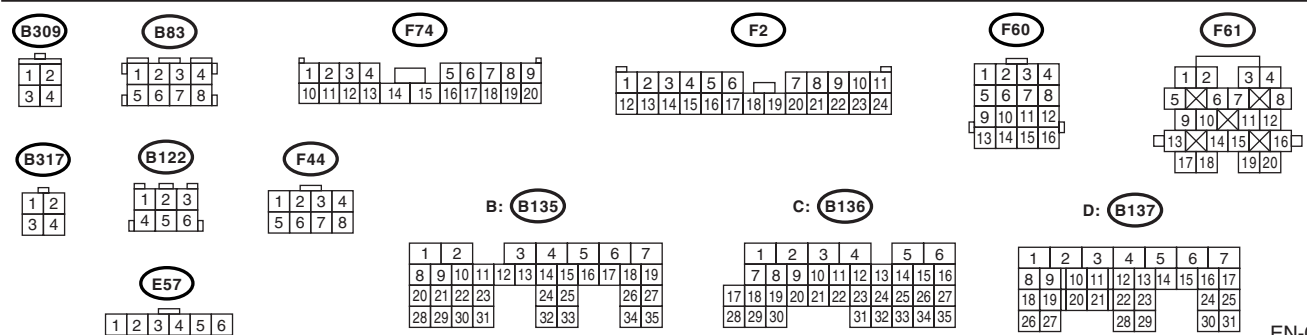
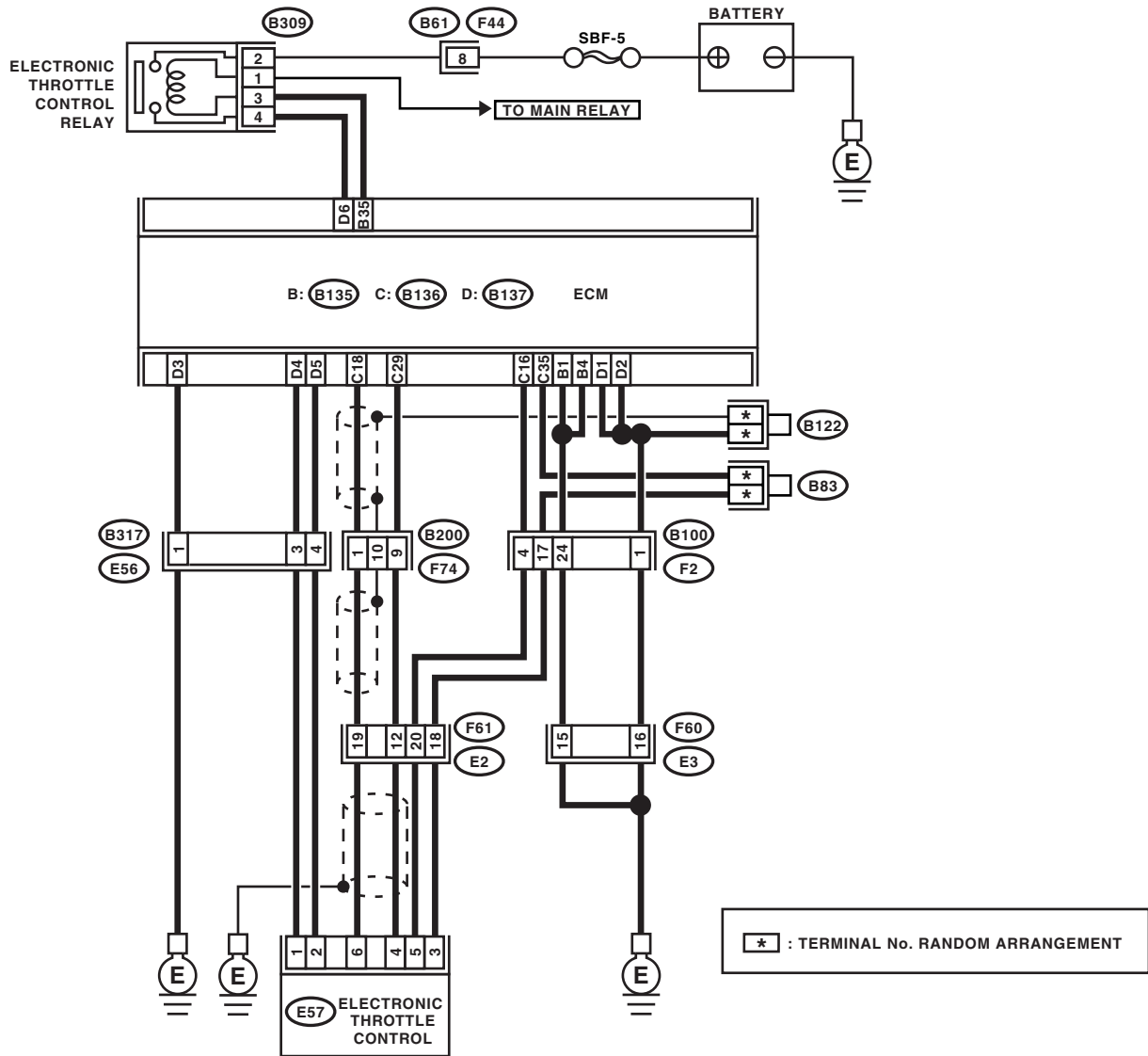
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-04159

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OUTPUT VOLTAGE OF SENSOR. 1) Turn the ignition switch to ON. 2) Read the data of main throttle sensor signals, using the Subaru Select Monitor. 3) Shake the ECM harness and connector, engine harness connectors, electronic throttle control connector harness while monitoring value of voltage meter.	Is the voltage less than 4.63 V?	Go to step 2.	Go to step 3.
2 CHECK POOR CONTACT IN CONNECTORS. Check poor contact in connectors between ECM and electronic throttle control.	Is there poor contact in the connectors between ECM and electronic throttle control?	Repair the poor contact in connectors.	Connector has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause.
3 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connectors from electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. Connector & terminal (B136) No. 18 — (E57) No. 6: (B136) No. 35 — (E57) No. 3:	Is the resistance less than 1 Ω ?	Go to step 4.	Repair the open of harness connector.
4 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Connect the ECM connector. 2) Measure the resistance between the electronic throttle control connector and engine ground. Connector & terminal (E57) No. 3 — Engine ground:	Is the resistance less than 1 Ω ?	Go to step 5.	Repair the poor contact in ECM connector. If the problem persists, replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).>
5 CHECK POWER SUPPLY TO SENSOR. 1) Measure the voltage between the electronic throttle control connector and engine ground. Connector & terminal (E57) No. 6 (+) — Engine ground (-): 2) Shake the ECM harness and connector, engine harness connectors, while monitoring value of voltage meter.	Is the voltage less than 10 V?	Replace the electronic throttle control. <Ref. to FU(STI)-12, Throttle Body.>	Repair the short of harness between ECM connector and electronic throttle control connector.

U: DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL**DTC DETECTING CONDITION:**

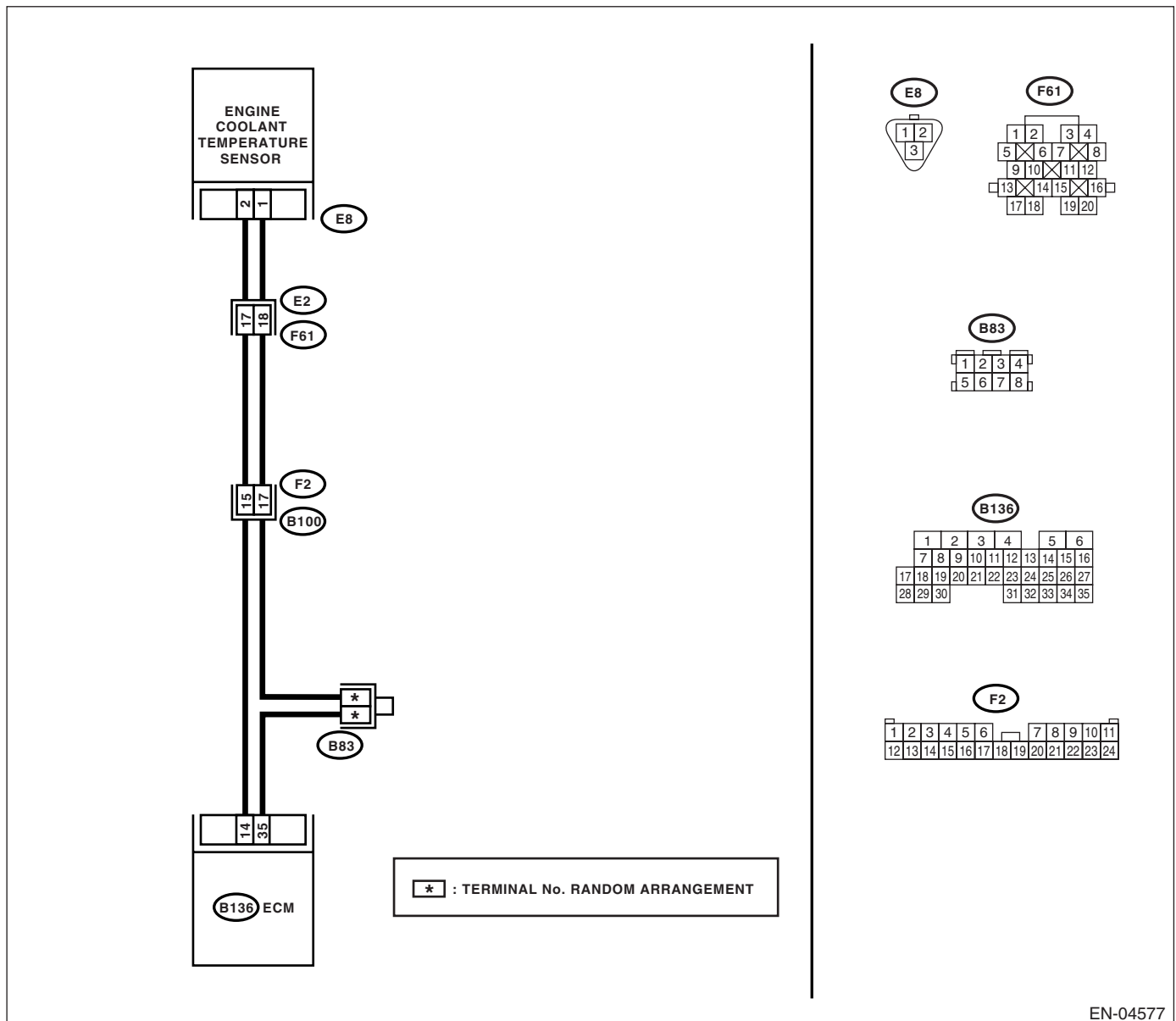
- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-48, DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

Engine will not return to idling.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:

EN-04577

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK FOR ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0125.	Go to step 2.
2 CHECK ENGINE COOLING SYSTEM. NOTE: Check the following items. • Thermostat open stuck • Coolant level • Coolant freeze • Tire diameter	Is there any fault in engine cooling system?	Replace the thermostat. <Ref. to CO(H4SO)-21, Thermostat.>	Replace the engine coolant temperature sensor. <Ref. to FU(STI)-25, Engine Coolant Temperature Sensor.>

V: DTC P0126 INSUFFICIENT COOLANT TEMPERATURE FOR STABLE OPERATION

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-50, DTC P0126 INSUFFICIENT ENGINE COOLANT TEMPERATURE FOR STABLE OPERATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

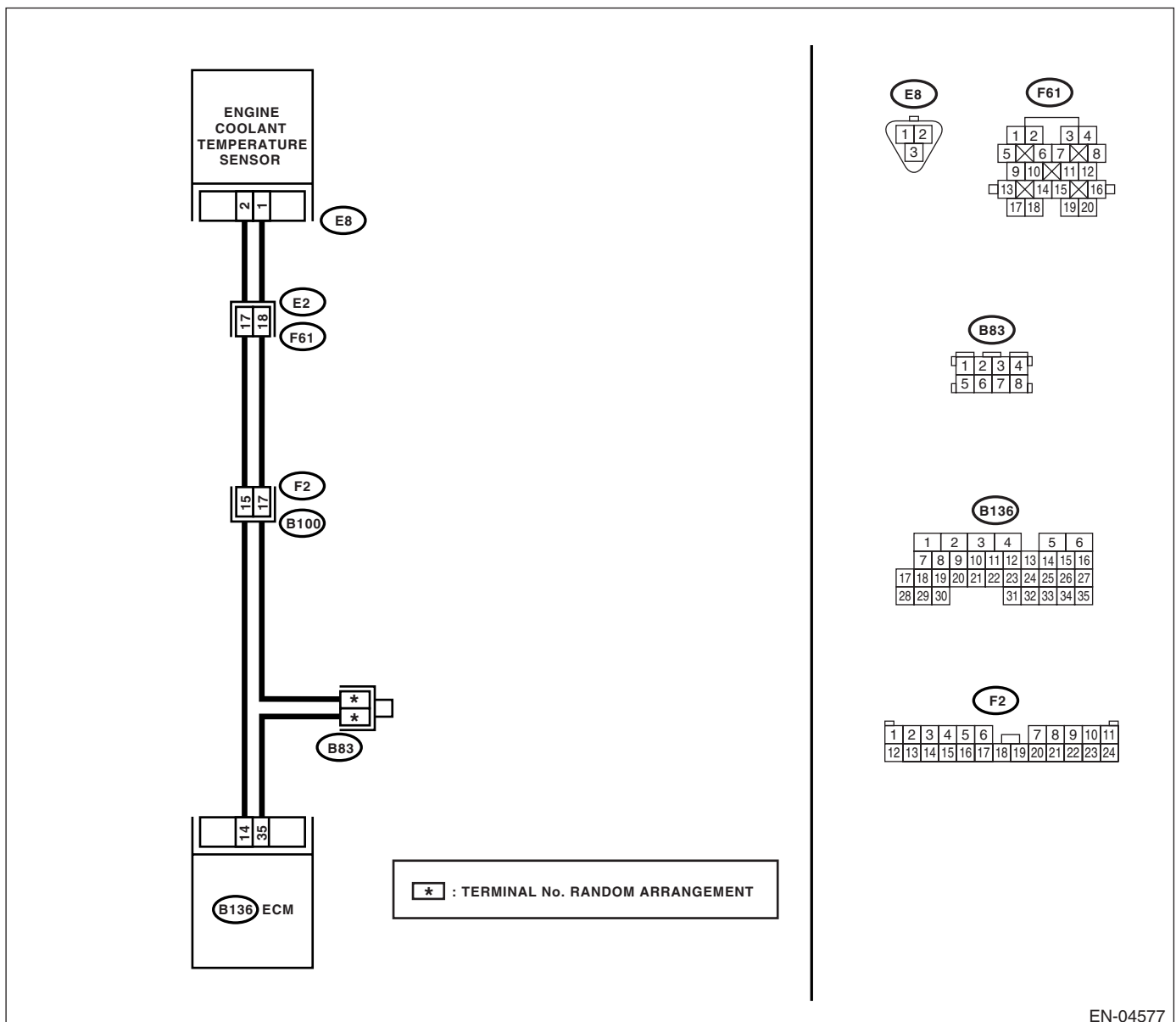
TROUBLE SYMPTOM:

- Hard to start
- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04577

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK FOR ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK ENGINE COOLANT TEMPERATURE SENSOR. Measure the resistance between engine coolant temperature sensor terminals when engine coolant is cold and after warmed-up. <i>Terminals</i> <i>No. 1 — No. 2:</i>	Is the resistance of engine coolant temperature sensor different between when engine coolant is cold and after warmed-up?	Contact your SOA Service Center since deterioration of some parts may be the cause.	Replace the engine coolant temperature sensor. <Ref. to FU(STI)-25, Engine Coolant Temperature Sensor.>

W: DTC P0128 COOLANT THERMOSTAT (COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-52, DTC P0128 COOLANT THERMOSTAT (COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

Thermostat remains open.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

Step	Check	Yes	No
1 CHECK VEHICLE CONDITION.	Was the vehicle driven or idled with the engine partially submerged under water?	In this case, it is not necessary to inspect DTC P0128.	Go to step 2.
2 CHECK FOR ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Codes (DTC)". <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).>	Go to step 3.
3 CHECK ENGINE COOLANT.	Are coolant level and mixture ratio of cooling water to anti-freeze solution correct?	Go to step 4.	Replace the engine coolant. <Ref. to CO(H4SO)-16, REPLACEMENT, Engine Coolant.>
4 CHECK RADIATOR FAN. 1) Start the engine. 2) Check radiator fan operation.	Does the radiator fan continuously rotate for more than 3 minutes during idling?	Repair radiator fan circuit. <Ref. to CO(H4SO)-27, Radiator Main Fan and Fan Motor.> and <Ref. to CO(H4SO)-28, Radiator Sub Fan and Fan Motor.>.	Replace the thermostat. <Ref. to CO(H4SO)-21, Thermostat.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

X: DTC P0131 O₂ SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1)

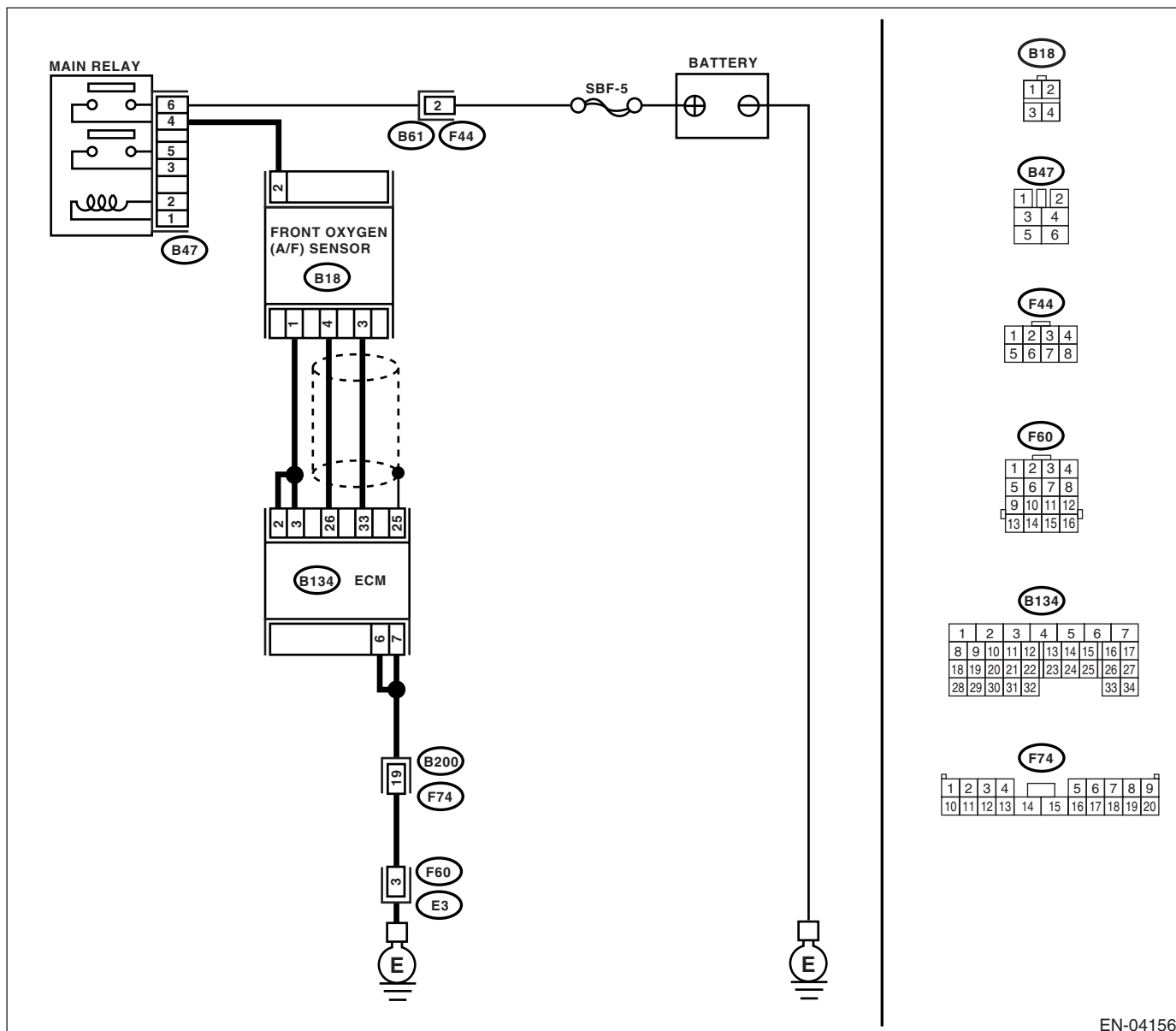
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-54, DTC P0131 O₂ SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04156

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.	Is there water in connector?	Remove infiltrating water completely.	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 connector. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. Connector & terminal (B134) No. 26 — Chassis ground: (B134) No. 33 — Chassis ground:	Is the resistance more than 1 MΩ?	Replace the front oxygen (A/F) sensor. <Ref. to FU(STI)-36, Front Oxygen (A/F) Sensor.>	Repair ground short circuit in harness between ECM and front oxygen (A/F) sensor connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Y: DTC P0132 O₂ SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1)

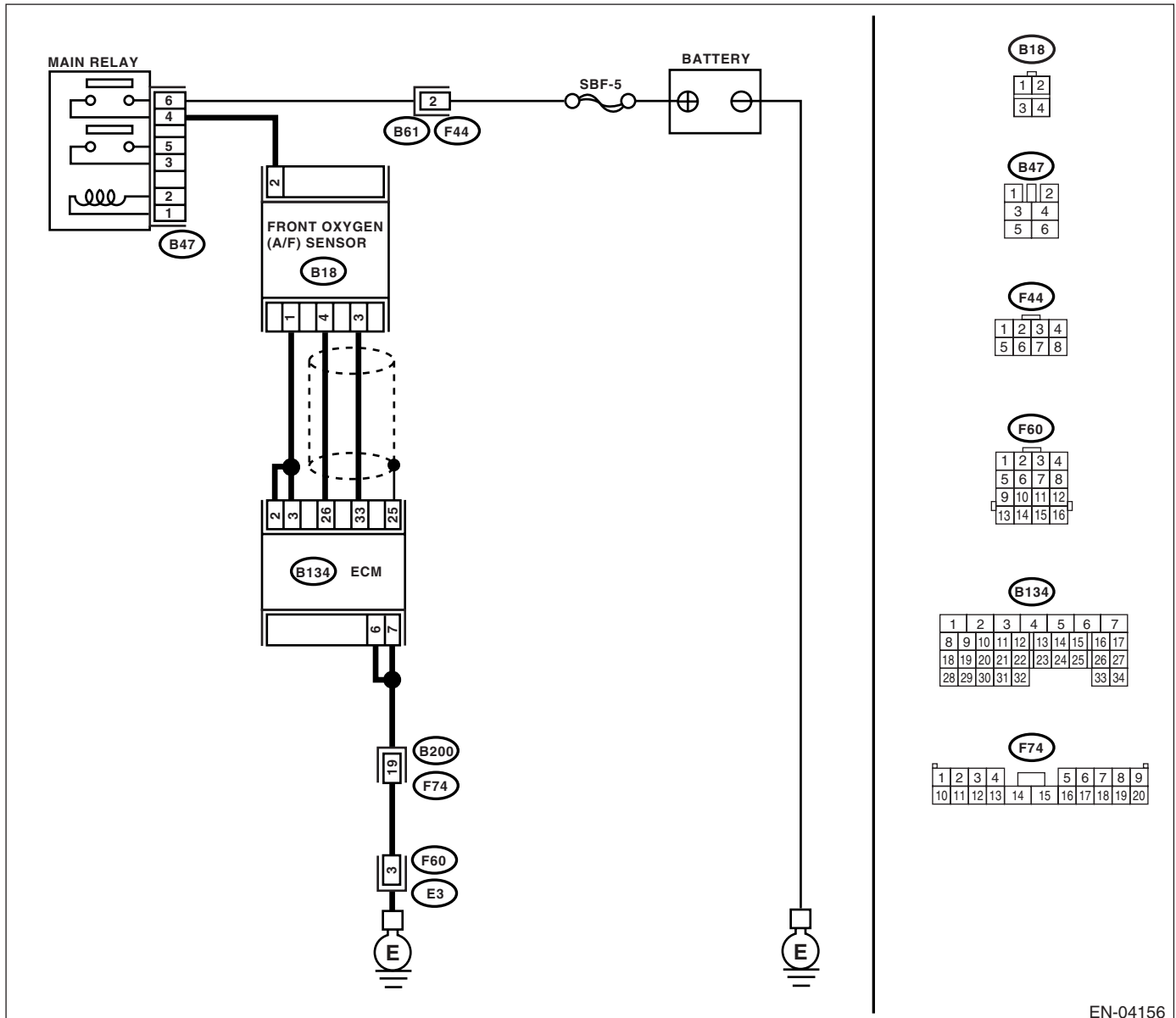
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-56, DTC P0132 O₂ SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04156

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.	Is there water in connector?	Remove infiltrating water completely.	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 front oxygen (A/F) sensor. 3) Measure the voltage of harness between ECM connector and chassis ground. Connector & terminal (B134) No. 26 (+) — Chassis ground (-): (B134) No. 33 (+) — Chassis ground (-):	Is the voltage more than 8 V?	Repair battery short circuit in harness between ECM and front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(STI)-36, Front Oxygen (A/F) Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Z: DTC P0133 O₂ SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1)

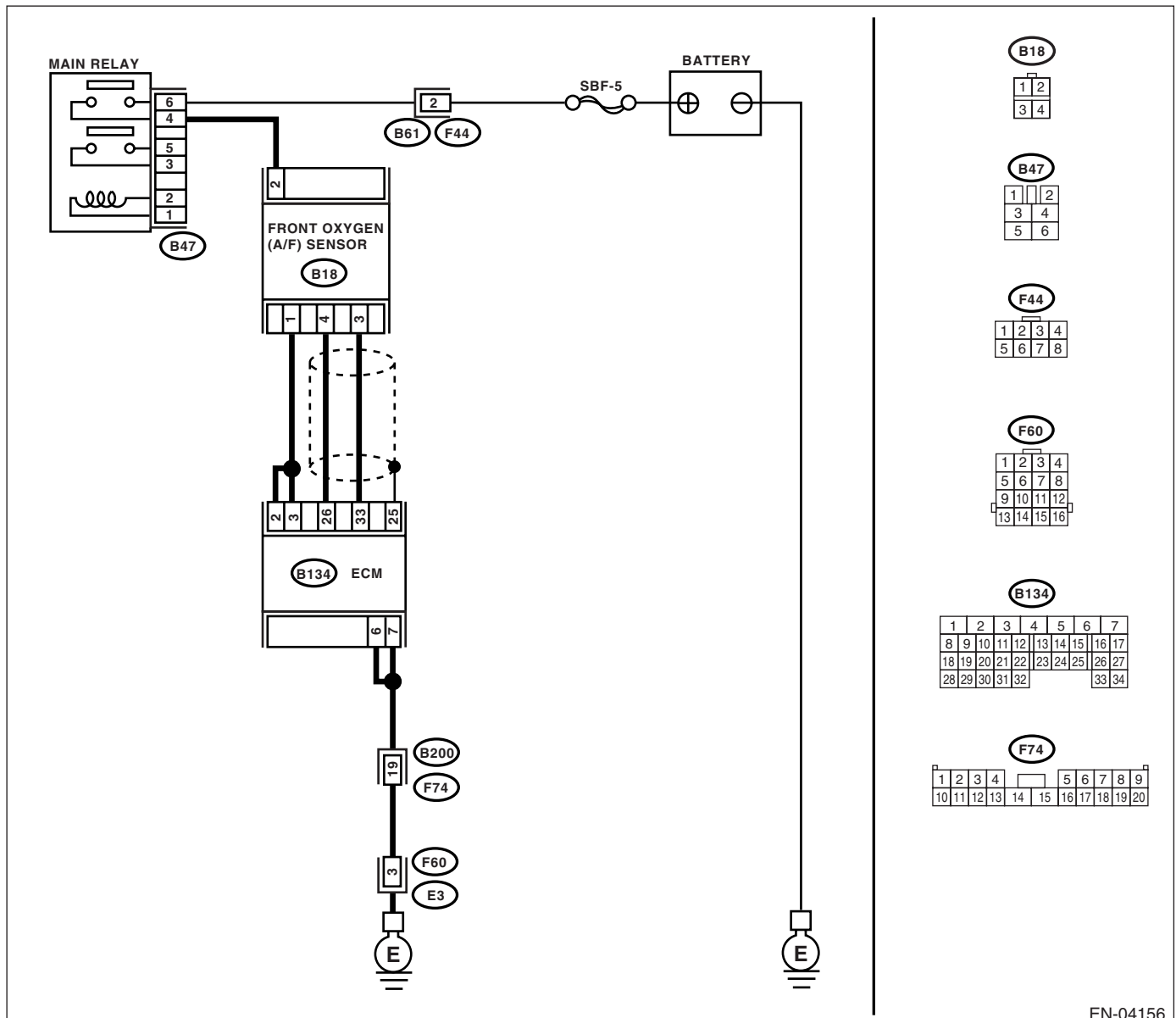
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-58, DTC P0133 O₂ SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04156

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK FOR ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0133.	Go to step 2.
2 CHECK EXHAUST SYSTEM. NOTE: Check the following items. • 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(STI)-36, Front Oxygen (A/F) Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

AA:DTC P0134 O₂ SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1)

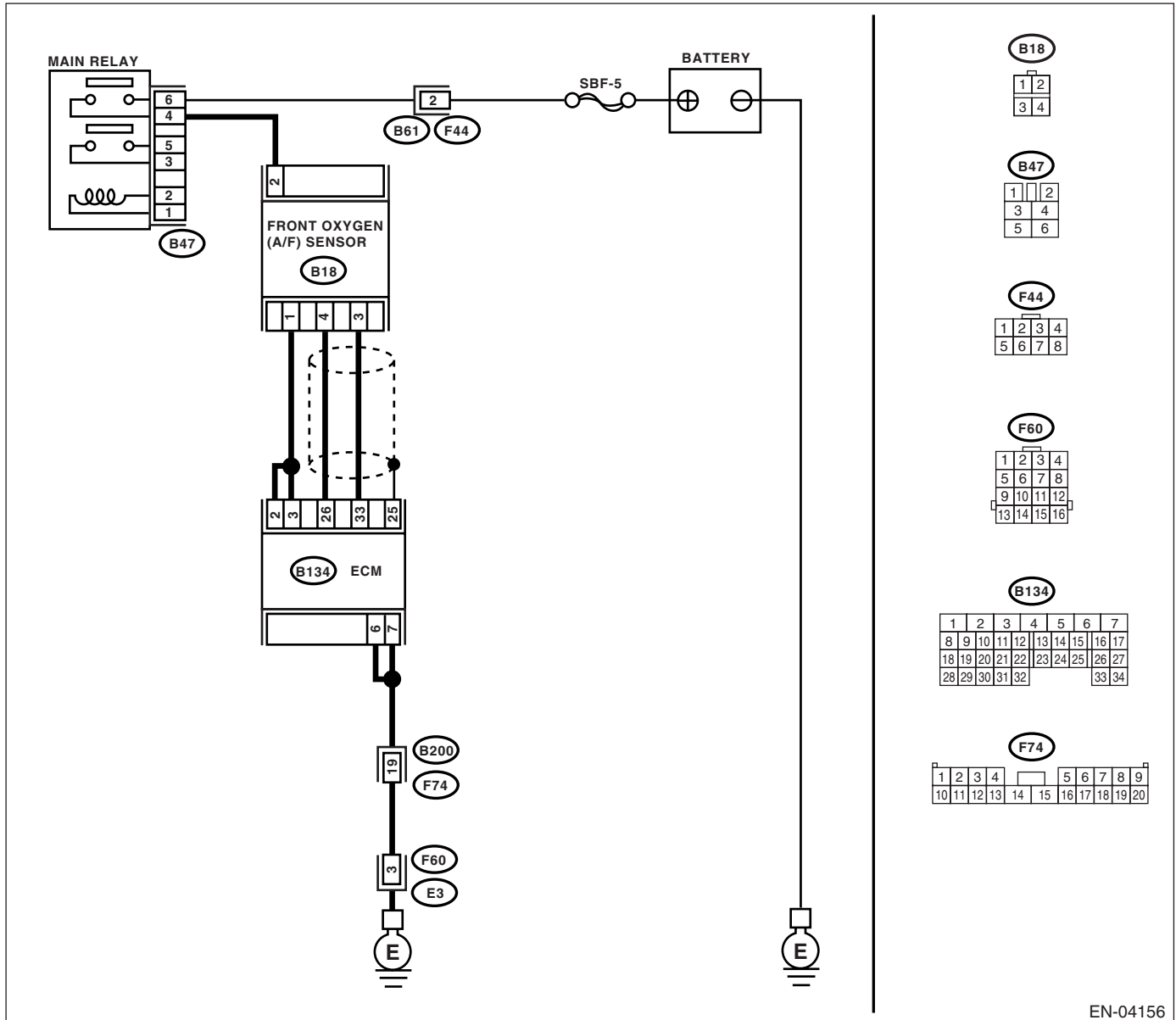
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-61, DTC P0134 O₂ SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04156

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR. 1) 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 (B134) No. 26 — (B18) No. 4: (B134) No. 33 — (B18) No. 3:	Is the resistance less than 1 Ω ?	Replace the front oxygen (A/F) sensor. <Ref. to FU(STI)-36, Front Oxygen (A/F) Sensor.>	Repair open circuit in harness between ECM and front oxygen (A/F) sensor connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

AB:DTC P0137 O₂ SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2)

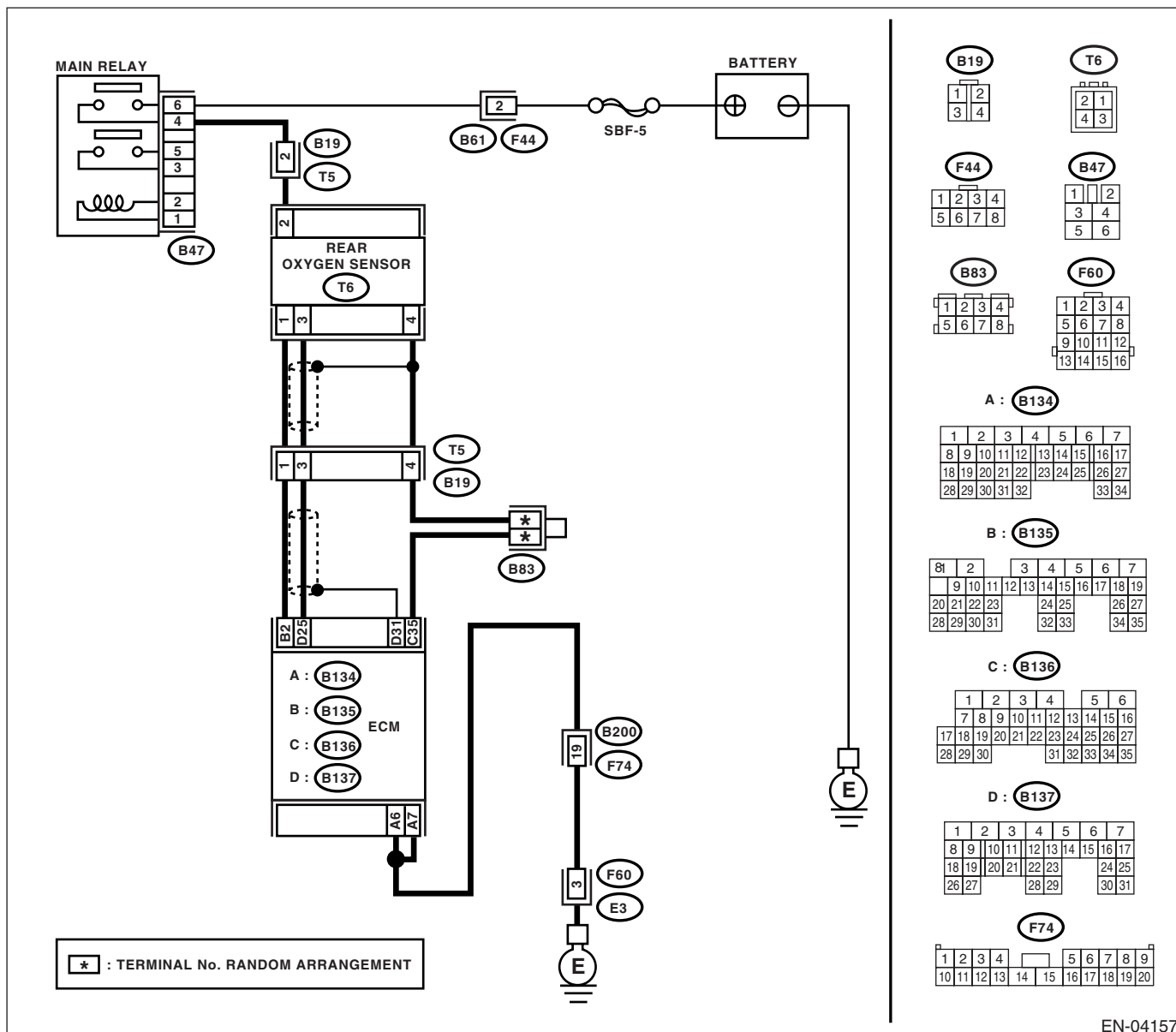
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-63, DTC P0137 O₂ SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04157

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK FOR ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Using the List of Diagnostic Trouble Code (DTC), check the appropriate DTC. <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0137.	Go to step 2.
2 CHECK REAR OXYGEN SENSOR DATA. 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and keep the engine speed at 3,000 rpm. (2 minutes at the longest) 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Depress the clutch pedal. • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(STI)(diag)-28, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the voltage more than 490 mV?	Go to step 6.	Go to step 3.
3 CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.	Is there water in connector?	Remove infiltrating water completely.	Go to step 4.
4 CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. Connector & terminal (B136) No. 35 — (T6) No. 4: (B137) No. 25 — (T6) No. 3:	Is the resistance more than 3 Ω?	Repair the open circuit in harness between ECM and rear oxygen sensor connector.	Go to step 5.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
5 CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR. 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 harness connector and engine ground or chassis ground. Connector & terminal (T6) No. 3 (+) — Engine ground (-):	Is the voltage 0.2 — 0.5 V?	Replace the rear oxygen sensor. <Ref. to FU(STI)-38, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector
6 CHECK EXHAUST SYSTEM. Check the exhaust system parts. NOTE: Check the following items. • Loose installation of portions • Damage (crack, hole etc.) of parts • Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor	Is there any fault in exhaust system?	Repair or replace the faulty parts.	Replace the rear oxygen sensor. <Ref. to FU(STI)-38, Rear Oxygen Sensor.>

AC:DTC P0138 O₂ SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2)

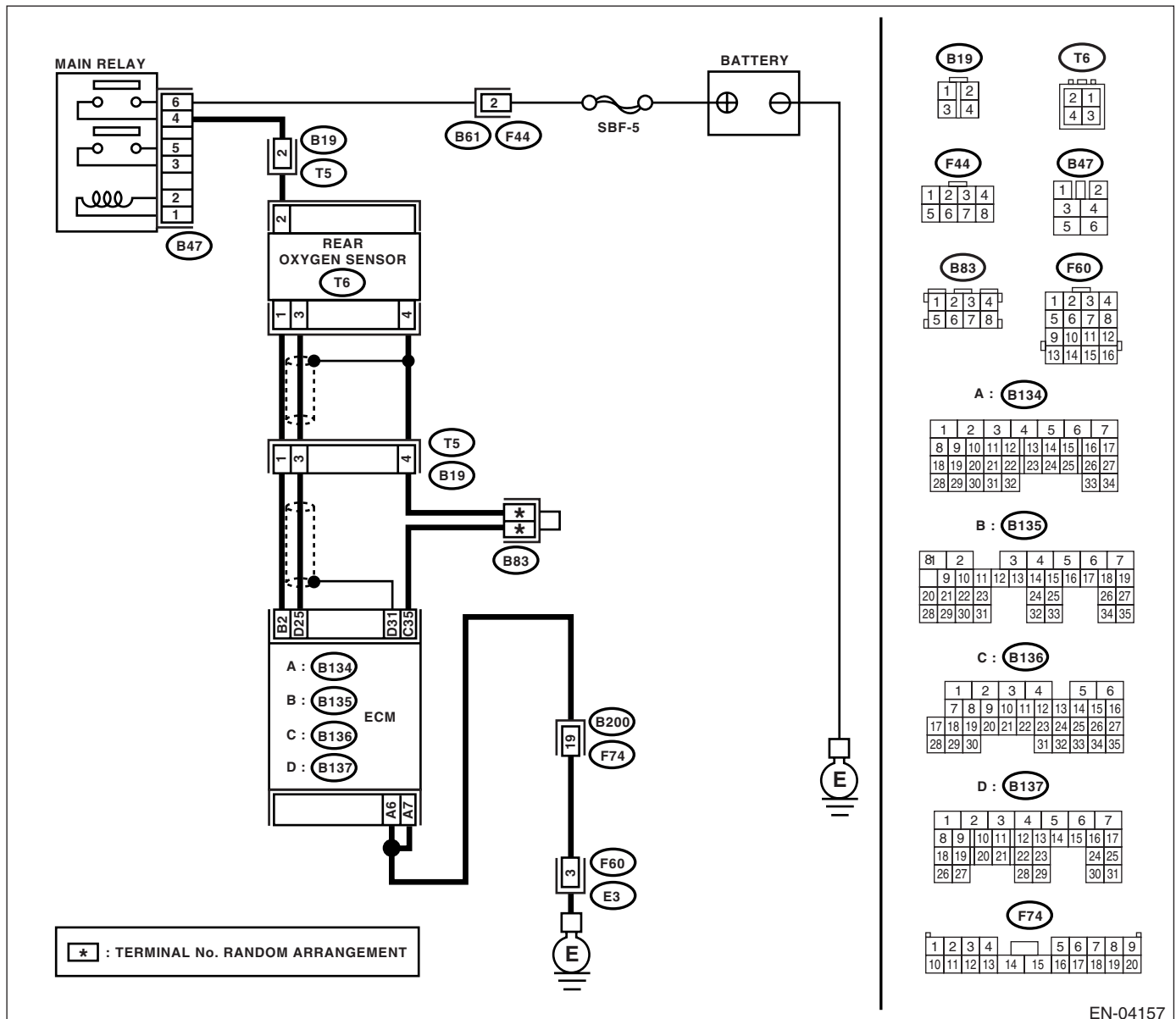
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-65, DTC P0138 O₂ SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04157

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK FOR ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Using the List of Diagnostic Trouble Code (DTC), check the appropriate DTC. <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0138.	Go to step 2.
2 CHECK REAR OXYGEN SENSOR DATA. 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and immediately decrease 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. • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(STI)(diag)-28, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the voltage less than 250 mV?	Go to step 6.	Go to step 3.
3 CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.	Is there water in connector?	Remove infiltrating water completely.	Go to step 4.
4 CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. Connector & terminal (B137) No. 25 — (T6) No. 3: (B136) No. 35 — (T6) No. 4:	Is the resistance more than 3 Ω?	Repair the open circuit in harness between ECM and rear oxygen sensor connector.	Go to step 5.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
5 CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR. 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 harness connector and engine ground or chassis ground. Connector & terminal (T6) No. 3 (+) — Engine ground (-):	Is the voltage 0.2 — 0.5 V?	Replace the rear oxygen sensor. <Ref. to FU(STI)-38, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector
6 CHECK EXHAUST SYSTEM. Check the exhaust system parts. NOTE: Check the following items. • Loose installation of portions • Damage (crack, hole etc.) of parts • Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor	Is there any fault in exhaust system?	Repair or replace the faulty parts.	Replace the rear oxygen sensor. <Ref. to FU(STI)-38, Rear Oxygen Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

AD:DTC P0139 O₂ SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2)

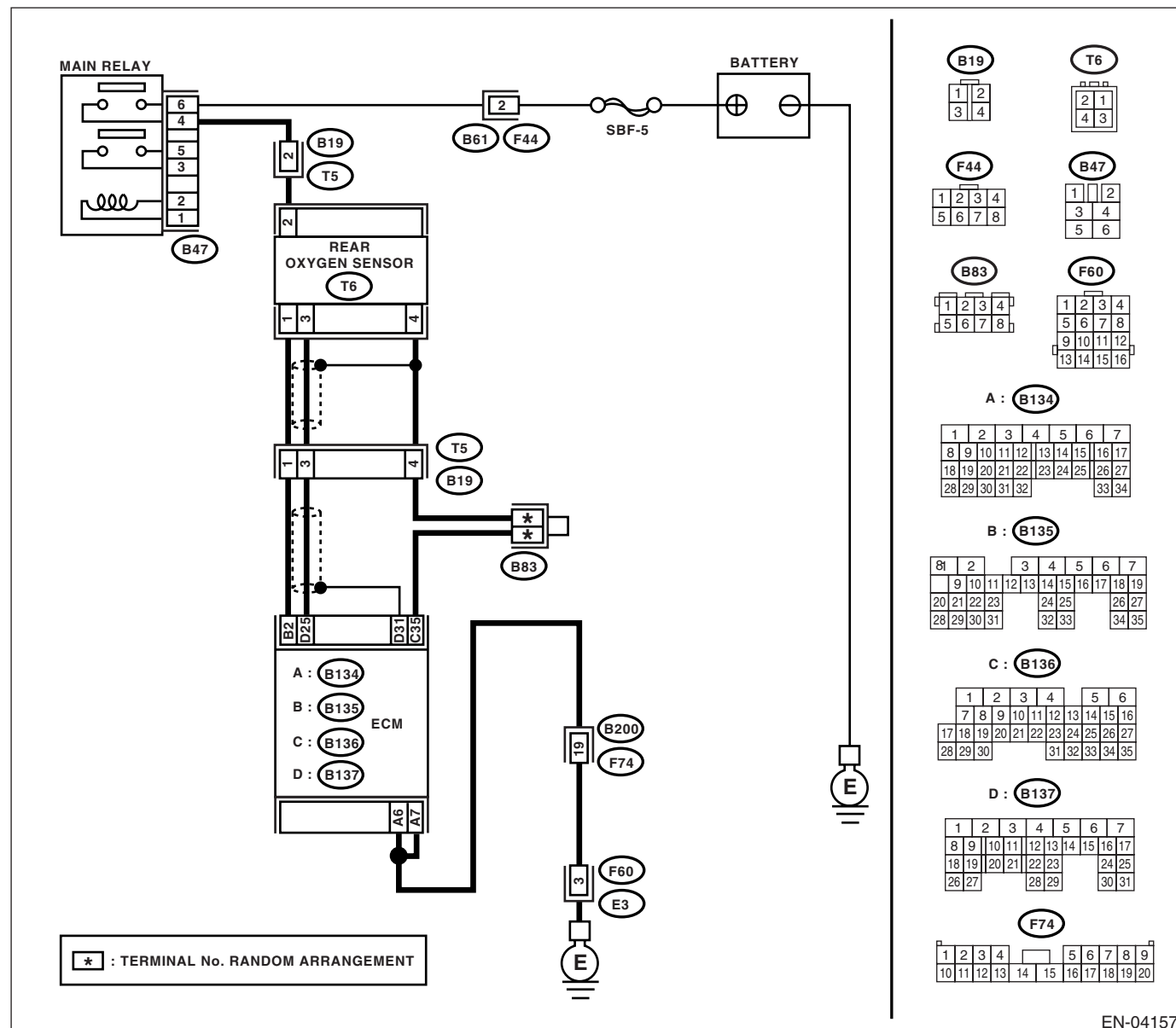
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-67, DTC P0139 O₂ SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04157

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK FOR ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0139.	Replace the rear oxygen sensor. <Ref. to FU(STI)-38, Rear Oxygen Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

AE:DTC P0171 SYSTEM TOO LEAN (BANK 1)

NOTE:

For the diagnostic procedure, refer to DTC P0172. <Ref. to EN(STI)(diag)-142, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AF:DTC P0172 SYSTEM TOO RICH (BANK 1)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-72, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.> and <Ref. to GD(STI)-75, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

Step	Check	Yes	No
1 CHECK EXHAUST SYSTEM.	Are there holes or loose bolts on exhaust system?	Repair the exhaust system.	Go to step 2.
2 CHECK AIR INTAKE SYSTEM.	Are there holes, loose bolts or disconnection of hose on air intake system?	Repair the air intake system.	Go to step 3.
3 CHECK FUEL PRESSURE. Warning: • Place “NO FIRE” signs near the working area. • Be careful not to spill fuel on the floor. Measure the fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold. <Ref. to ME(STI)-26, INSPECTION, Fuel Pressure.> Warning: Before removing the fuel pressure gauge, release fuel pressure. NOTE: If the fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again.	Is the measured value 284 — 314 kPa (2.9 — 3.2 kgf/cm ² , 41 — 46 psi)?	Go to step 4.	Repair the following items. Fuel pressure too high: • Clogged fuel return line or bent hose Fuel pressure too low: • Improper fuel pump discharge • Clogged fuel supply line

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
4 CHECK FUEL PRESSURE. After connecting the pressure regulator vacuum hose, measure fuel pressure. <Ref. to ME(STI)-26, INSPECTION, Fuel Pressure.> Warning: Before removing the fuel pressure gauge, release fuel pressure. NOTE: - If the fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again. - If out of specification as measured at this step, check or replace the pressure regulator and pressure regulator vacuum hose.	Is the measured value 230 — 260 kPa (2.35 — 2.65 kgf/cm ² , 33 — 38 psi)?	Go to step 5.	Repair the following items. Fuel pressure too high: - Faulty pressure regulator - Clogged fuel return line or bent hose Fuel pressure too low: - Faulty pressure regulator - Improper fuel pump discharge - Clogged fuel supply line
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 procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STI)(diag)-28, Subaru Select Monitor.> - General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the temperature more than 60°C (140°F)?	Go to step 6.	Replace the engine coolant temperature sensor. <Ref. to FU(STI)-25, Engine Coolant Temperature Sensor.>
6 CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE. 1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F). 2) Place the shift lever in neutral position. 3) Turn the A/C switch to OFF. 4) Turn all 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 procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STI)(diag)-28, Subaru Select Monitor.> - General scan tool For detailed operation procedure, refer to the General Scan Tool Instruction Manual.	Is the measured value 2.7 — 4.7 g/s (0.36 — 0.62 lb/m)?	Go to step 7.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(STI)-29, Mass Air Flow and Intake Air Temperature Sensor.>

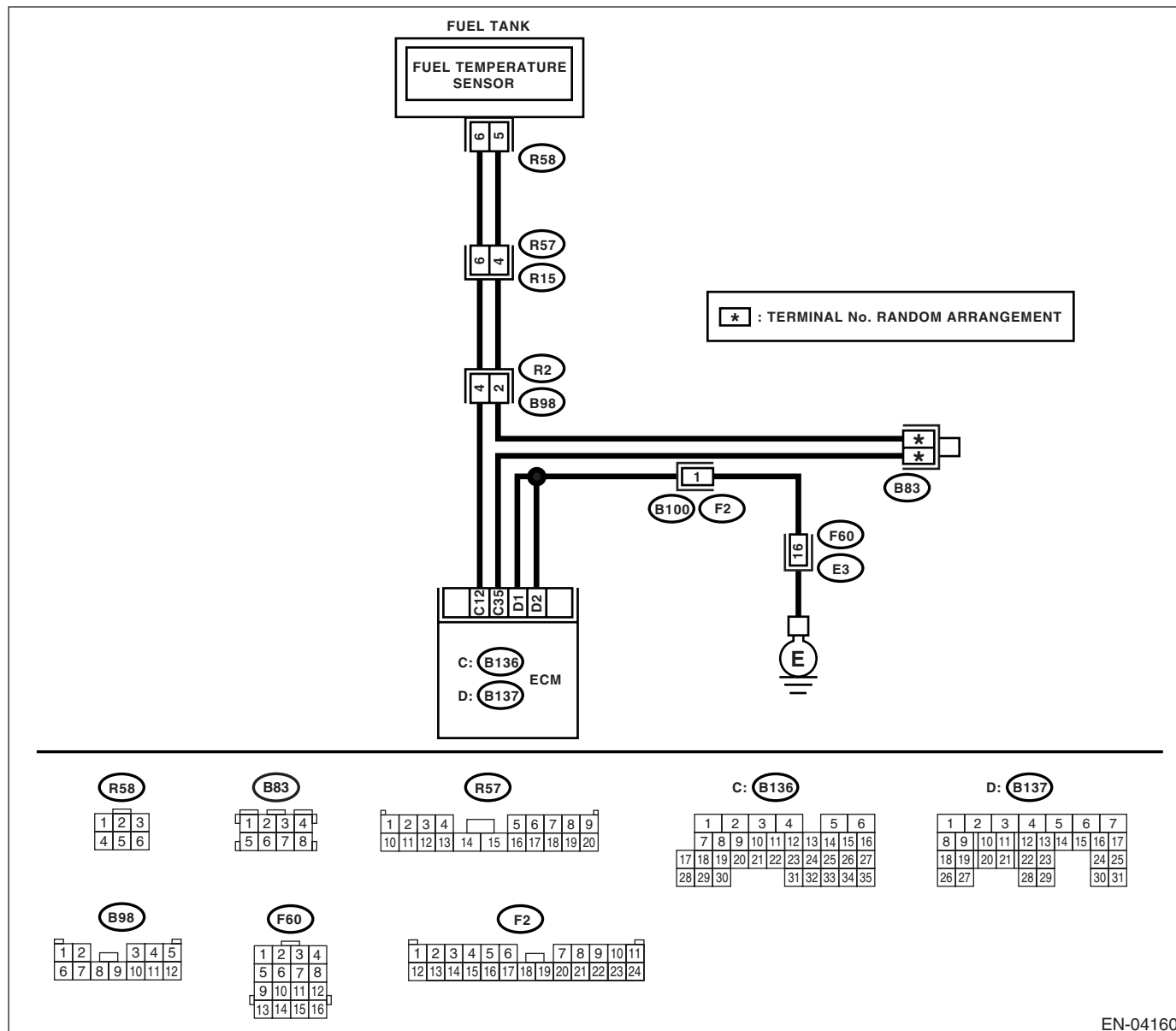
Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
7 CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR. 1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F). 2) Place the shift lever in neutral position. 3) Turn the A/C switch to OFF. 4) Turn all 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 procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STI)(diag)-28, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the General Scan Tool Instruction Manual.	Subtract ambient temperature from intake air temperature. Is the obtained value -10 — 50°C (-18 — 90°F)?	Replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).>	Check the mass air flow and intake air temperature sensor. <Ref. to FU(STI)-29, Mass Air Flow and Intake Air Temperature Sensor.>

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK FOR ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Codes (DTC)". <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0181.	Replace the fuel temperature sensor. <Ref. to EC(STI)-8, Fuel Temperature Sensor.>

AH:DTC P0182 FUEL TEMPERATURE SENSOR "A" CIRCUIT LOW INPUT

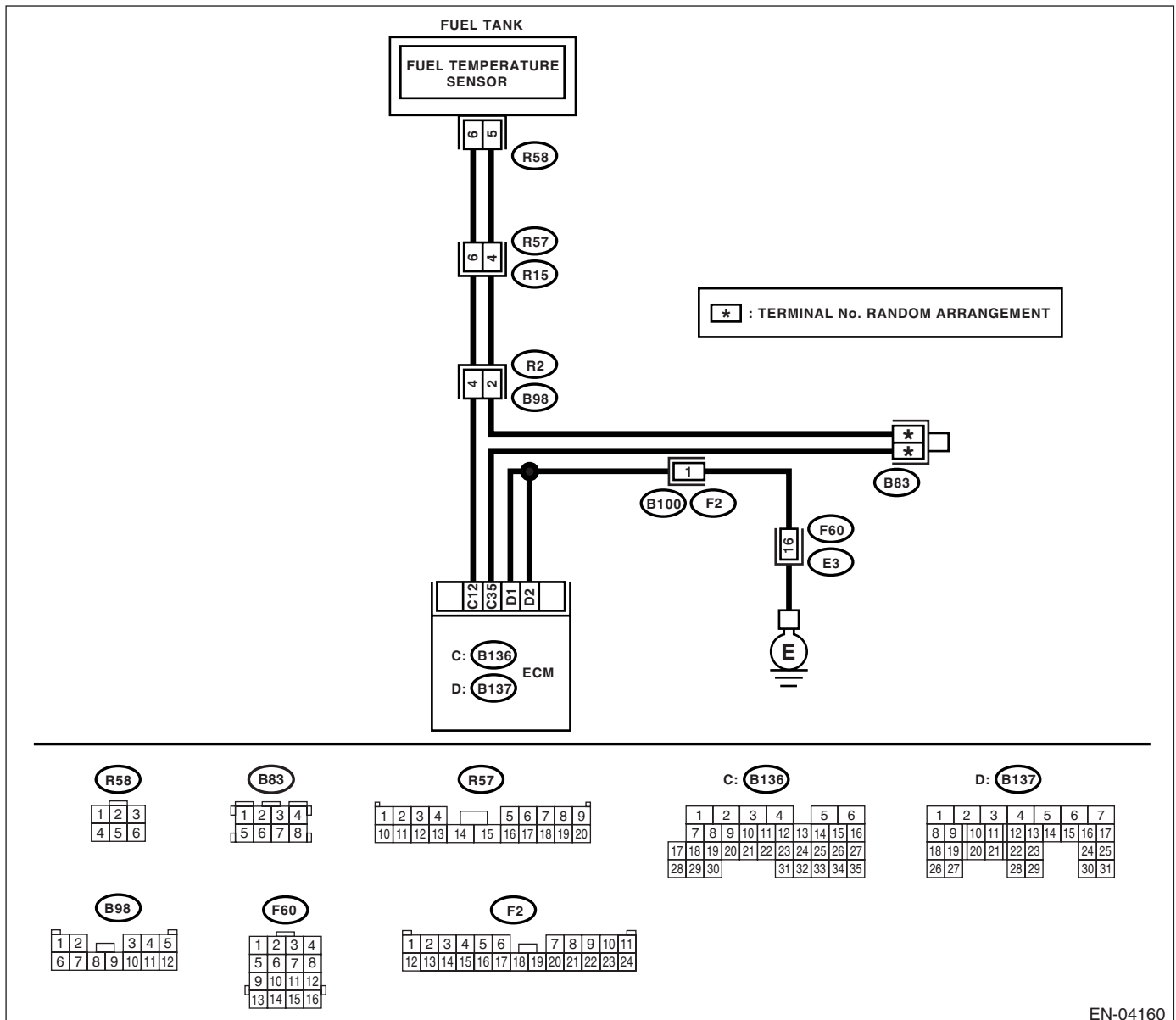
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-81, DTC P0182 FUEL TEMPERATURE SENSOR "A" CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK CURRENT DATA. 1) Start the engine. 2) Read the data of fuel 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(STI)(diag)-28, Subaru Select Monitor.> - General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the temperature more than 150°C (302°F)?	Go to step 2.	The malfunction indicator light may light up, however, the circuit is returned to the normal status at the moment.
2 CHECK CURRENT DATA. 1) Turn ignition switch to OFF. 2) Remove the access hole lid. 3) Disconnect the connector from fuel pump. 4) Turn ignition switch to ON. 5) Read the data of fuel 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(STI)(diag)-28, Subaru Select Monitor.> - General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the temperature less than -40°C (-40°F)?	Replace the fuel temperature sensor. <Ref. to EC(STI)-8, Fuel Temperature Sensor.>	Repair short circuit to ground in harness between fuel pump and ECM connector.

AI: DTC P0183 FUEL TEMPERATURE SENSOR "A" CIRCUIT HIGH INPUT

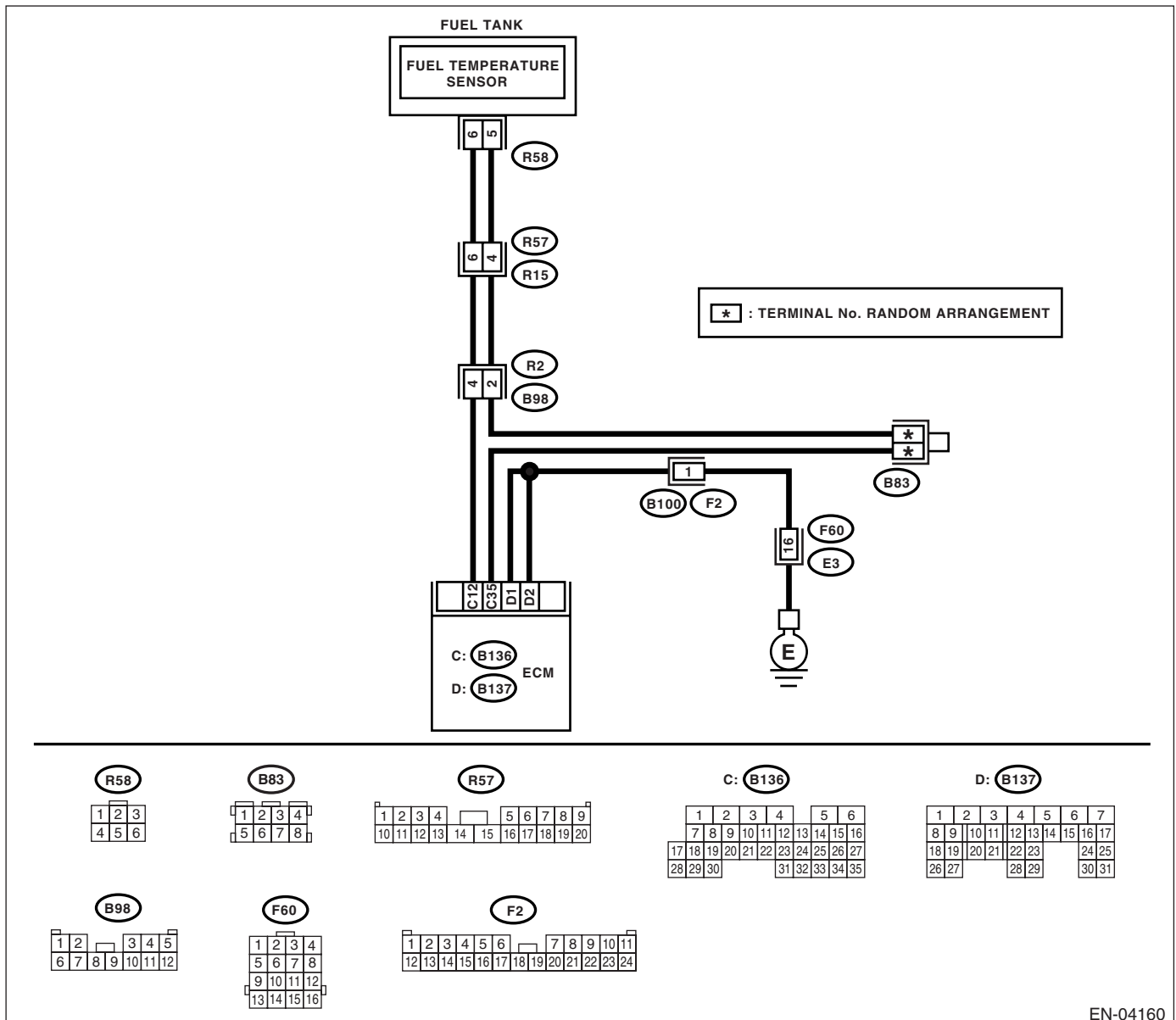
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-83, DTC P0183 FUEL TEMPERATURE SENSOR "A" CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04160

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK CURRENT DATA. 1) Start the engine. 2) Read the data of fuel 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(STI)(diag)-28, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the temperature less than -40°C (-40°F)?	Go to step 2.	Repair poor contact. NOTE: In this case, repair the following: • Poor contact in fuel pump connector • Poor contact in ECM connector • Poor contact in coupling connector • Poor contact in joint connector
2 CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR. 1) Turn ignition switch to OFF. 2) Remove the access hole lid. 3) Disconnect the connector from fuel pump. 4) Measure the voltage between fuel pump connector and chassis ground. Connector & terminal (R58) No. 6 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Repair short circuit to battery in harness between ECM and fuel pump connector.	Go to step 3.
3 CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR. 1) Turn ignition switch to ON. 2) Measure the voltage between fuel pump connector and chassis ground. Connector & terminal (R58) No. 6 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Repair short circuit to battery in harness between ECM and fuel pump connector.	Go to step 4.
4 CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR. Measure the voltage between fuel pump connector and chassis ground. Connector & terminal (R58) No. 6 (+) — Chassis ground (-):	Is the voltage more than 4 V?	Go to step 5.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and fuel pump connector • Poor contact in fuel pump connector • Poor contact in ECM connector • Poor contact in coupling connector

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
5 CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between fuel pump connector and ECM. Connector & terminal (R58) No. 5 — (B136) No. 35:	Is the resistance less than 1 Ω ?	Replace the fuel temperature sensor. <Ref. to EC(STI)-8, Fuel Temperature Sensor.>	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and fuel pump connector • Poor contact in fuel pump connector • Poor contact in ECM connector • Poor contact in coupling connector • Poor contact in joint connector

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

AJ:DTC P0222 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-85, DTC P0222 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance
- Engine stalls.

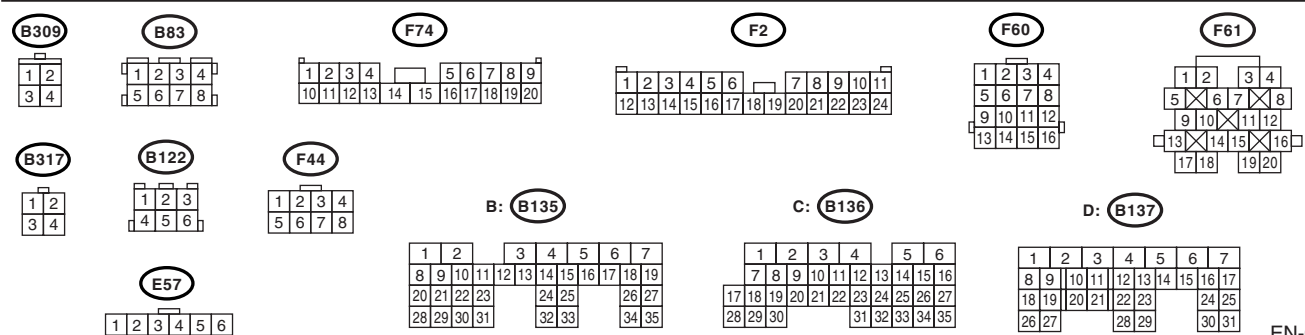
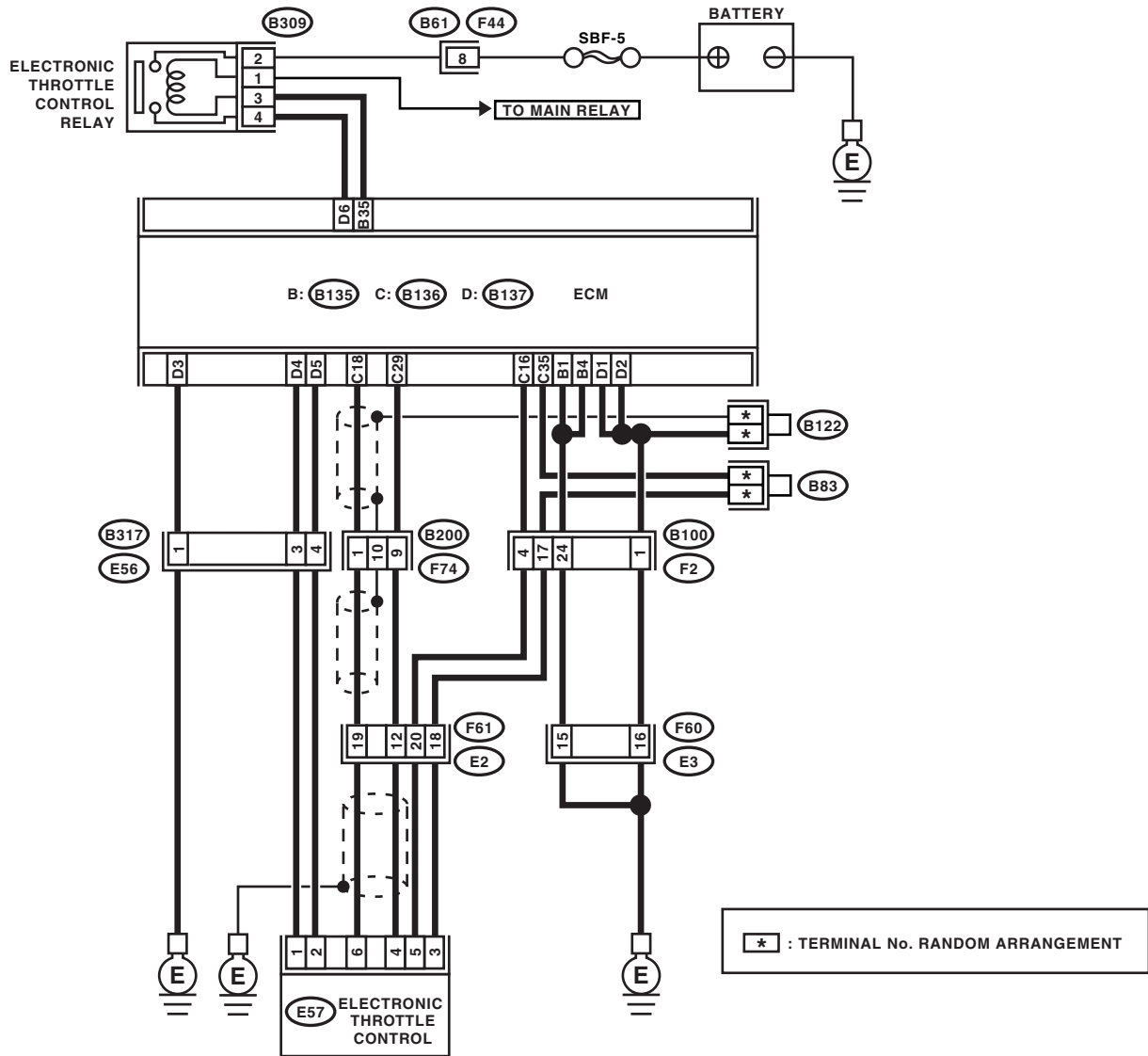
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-04159

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OUTPUT VOLTAGE OF SENSOR. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector terminals. Connector & terminal (B136) No. 29 (+) — (B136) No. 35 (-): 3) Shake the ECM harness and connector, engine harness connectors (E84, E22), electronic throttle control connector harness while monitoring value of voltage meter.	Is the voltage more than 0.8 V?	Go to step 2.	Go to step 3.
2 CHECK POOR CONTACT IN CONNECTORS. Check poor contact in the connectors between the ECM and electronic throttle control.	Is there poor contact in the connectors between ECM and electronic throttle control?	Repair the poor contact in connectors.	Connector has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause.
3 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from electronic throttle control. 4) Measure the resistance between the ECM connector and electronic throttle control connector. Connector & terminal (B136) No. 16 — (E57) No. 5:	Is the resistance less than 1 Ω ?	Go to step 4.	Repair the open harness connector.
4 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. Check the resistance between the ECM connector and chassis ground. Connector & terminal (B136) No. 29 — Chassis ground: (B136) No. 16 — Chassis ground:	Is the resistance more than 1 M Ω ?	Go to step 5.	Repair the ground short of harness.
5 CHECK POWER SUPPLY TO SENSOR. 1) Connect the ECM connectors. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control connector and engine ground. Connector & terminal (E57) No. 5 (+) — Engine ground (-): 4) Shake the ECM harness and connector, engine harness connectors, while monitoring value of voltage meter.	Is the voltage 4.5 — 5.5 V?	Go to step 6.	Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).>
6 CHECK SHORT OF ECM. 1) Turn the ignition switch to OFF. 2) Measure the resistance between electronic throttle control connector and engine ground. Connector & terminal (E57) No. 4 — Engine ground:	Is the resistance more than 10 Ω ?	Repair the poor contact in electronic throttle control connector. If problem persists, replace the electronic throttle control.	Repair the poor contact in ECM connectors. If problem persists, replace the ECM.

**AK:DTC P0223 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT
HIGH INPUT**

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-87, DTC P0223 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance
- Engine stalls.

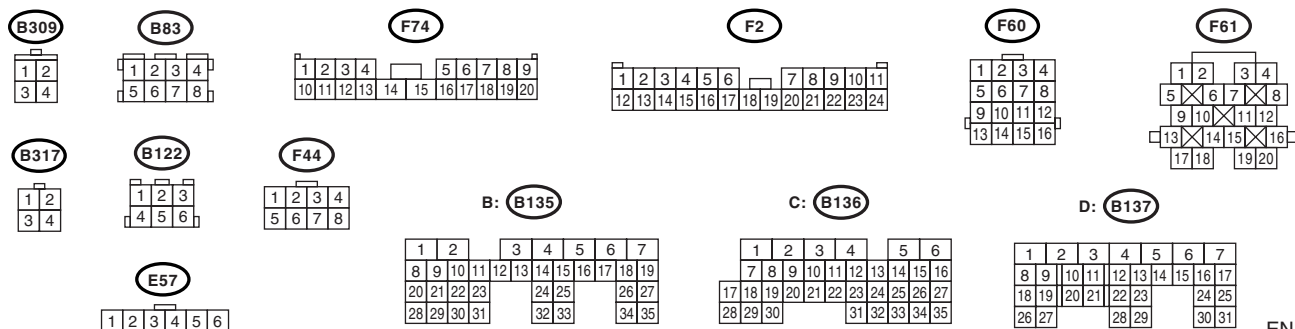
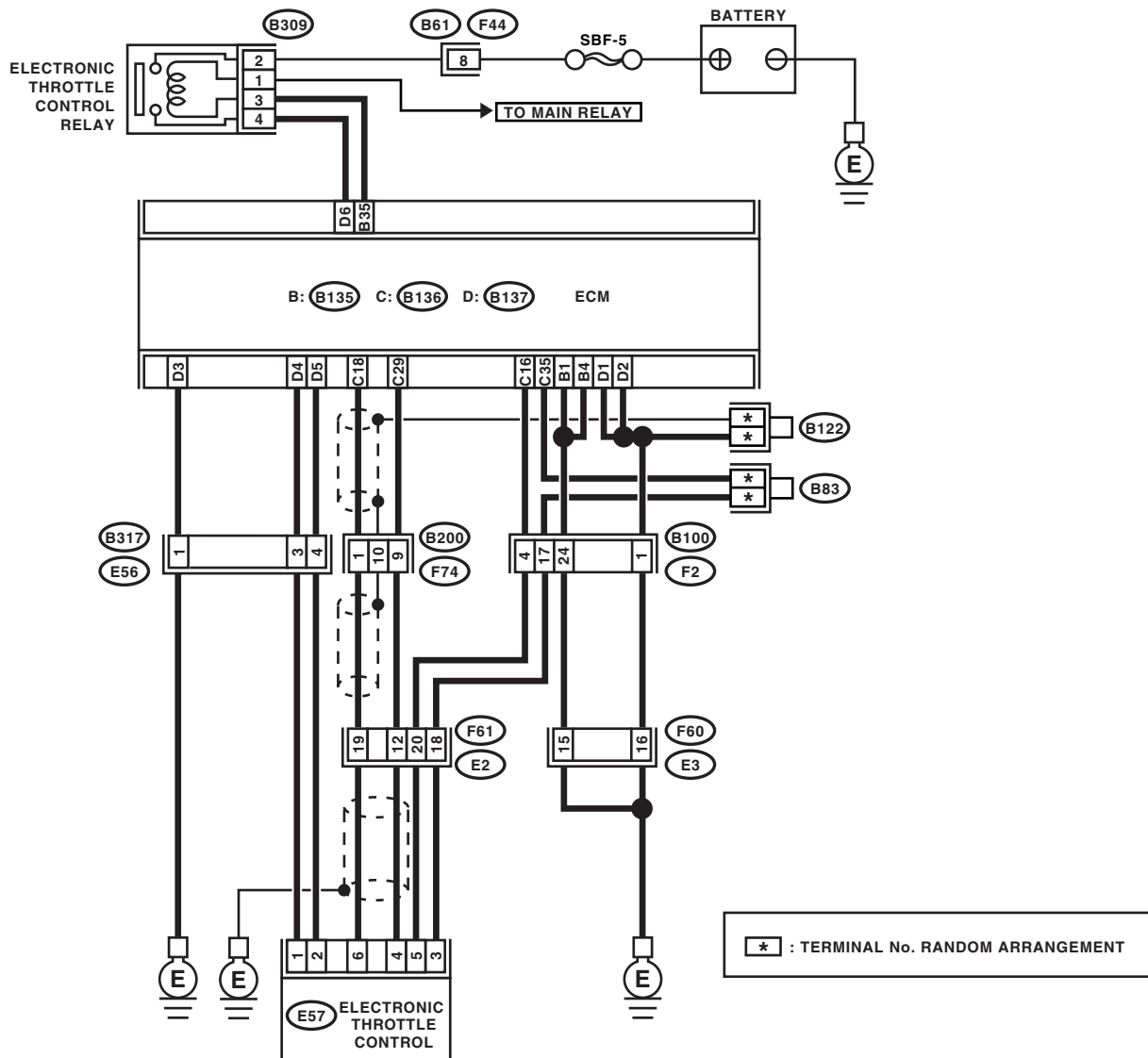
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-04159

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OUTPUT VOLTAGE OF SENSOR. 1) Turn the ignition switch to ON. 2) Read the data of sub throttle sensor signals, using the Subaru Select Monitor. 3) Shake the ECM harness and connector, engine harness connectors (E84, E22), electronic throttle control connector harness while monitoring value of voltage meter.	Is the voltage less than 4.73 V?	Go to step 2.	Go to step 3.
2 CHECK POOR CONTACT IN CONNECTORS. Check poor contact in connectors between ECM and electronic throttle control.	Is there poor contact in the connectors between ECM and electronic throttle control?	Repair the poor contact in connectors.	Connector has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause.
3 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connectors from electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. Connector & terminal (B136) No. 35 — (E57) No. 3: (B136) No. 29 — (E57) No. 4:	Is the resistance less than 1 Ω ?	Go to step 4.	Repair the open circuit of harness connector.
4 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Connect the ECM connector. 2) Measure the resistance between the 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 poor contact in ECM connector. If the problem persists, replace the ECM.
5 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control connector and engine ground. Connector & terminal (E57) No. 5 — Engine ground: 4) Shake the ECM harness and connector, engine harness connectors, while monitoring value of voltage meter.	Is the voltage more than 10 V?	Go to step 6.	Repair the battery short of harness between ECM connector and electronic throttle control connector.
6 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Measure the voltage between the electronic throttle control connector and engine ground. Connector & terminal (E57) No. 4 (+) — Engine ground (-): 2) Shake the ECM harness and connector, engine harness connectors, while monitoring value of voltage meter.	Is the voltage less than 10 V?	Go to step 7.	Repair the short of harness between ECM connector and electronic throttle control connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
7 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the voltage between connectors. Connector & terminal (B136) No. 29 — (B136) No. 16:	Is the resistance more than 1 M Ω ?	Repair the poor contact in electronic throttle control connector. If problem persists, replace the electronic throttle control.	Short circuit of sensor power supply may be the cause.

AL:DTC P0230 FUEL PUMP PRIMARY CIRCUIT

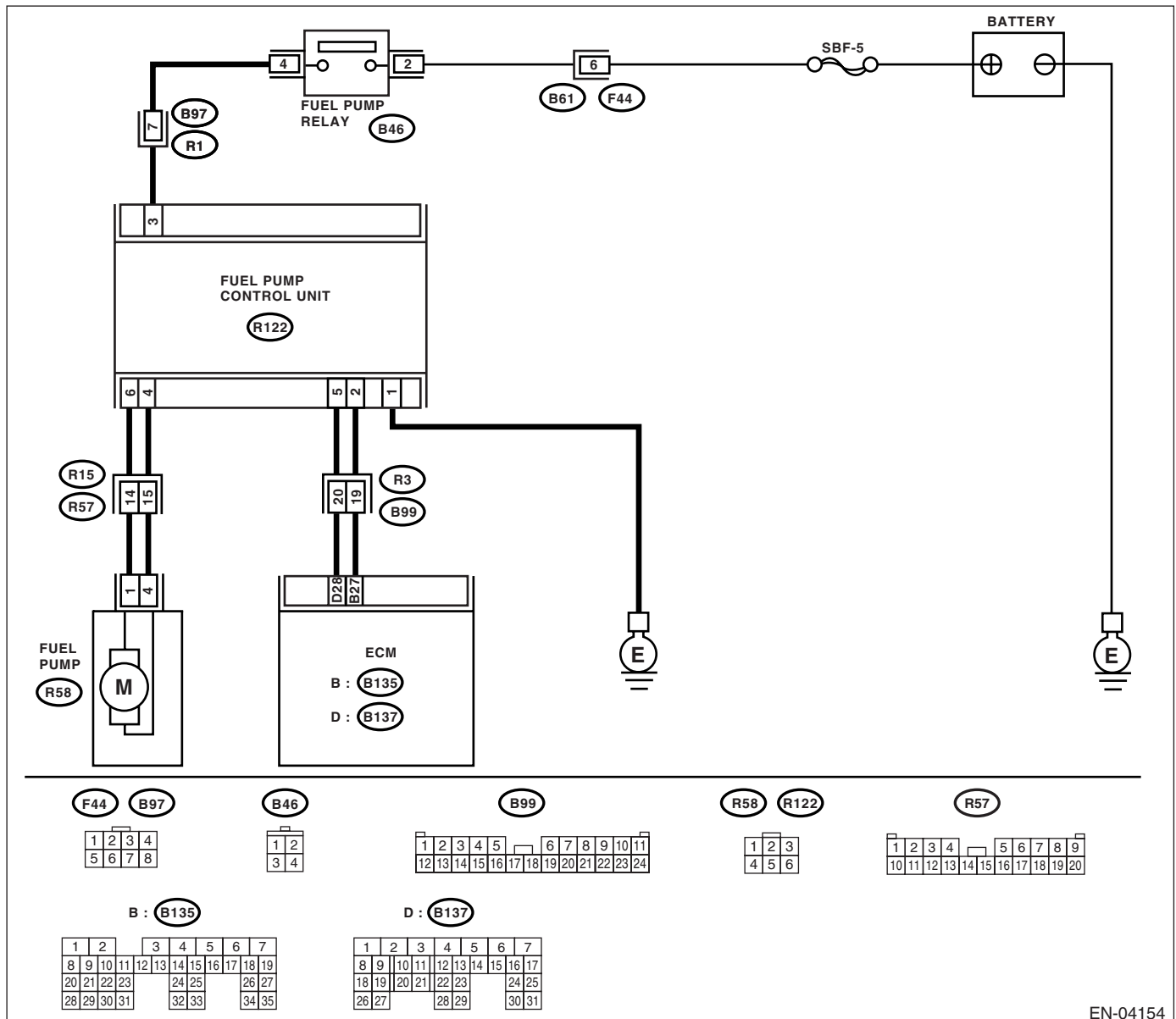
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-89, DTC P0230 FUEL PUMP PRIMARY CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04154

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

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. 3 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 2.	Repair the power supply circuit. NOTE: In this case repair the following: • Open or ground short circuit in harness between fuel pump relay and fuel pump control unit • Poor contact in fuel pump control unit connector • Poor contact in fuel pump relay 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 and chassis ground. Connector & terminal (R122) No. 1 — 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: • Open circuit between fuel pump control unit and chassis ground • Poor contact in fuel pump control unit connector
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. 4 — (R58) No. 4: (R122) No. 6 — (R58) No. 1:	Is the resistance less than 1 Ω ?	Go to step 4.	Repair the open circuit in harness between fuel pump control unit and fuel pump.
4 CHECK HARNESS BETWEEN FUEL PUMP CONTROL UNIT AND FUEL PUMP CONNECTOR. Measure the resistance of harness between fuel pump control unit and chassis ground. Connector & terminal (R122) No. 4 — Chassis ground: (R122) No. 6 — Chassis ground:	Is the resistance more than 1 M Ω ?	Go to step 5.	Repair the ground short circuit in harness between fuel pump control unit and fuel pump.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
5 CHECK HARNESS BETWEEN FUEL PUMP CONTROL UNIT AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between fuel pump control unit and ECM connector. Connector & terminal (R122) No. 5 — (B137) No. 28: (R122) No. 2 — (B135) No. 27:	Is the resistance less than 1 Ω ?	Go to step 6.	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit between fuel pump control unit and ECM • Poor contact in fuel pump control unit and ECM connector
6 CHECK HARNESS BETWEEN FUEL PUMP CONTROL UNIT AND ECM CONNECTOR. Measure the resistance of harness between fuel pump control unit and chassis ground. Connector & terminal (R122) No. 5 — Chassis ground: (R122) No. 2 — Chassis ground:	Is the resistance more than 1 M Ω ?	Go to step 7.	Repair the ground short circuit in harness between fuel pump control unit and ECM.
7 CHECK POOR CONTACT. Check poor contact in ECM and fuel pump control unit connector.	Is there poor contact in ECM and fuel pump control unit connector?	Repair the poor contact in ECM and fuel pump control unit.	Go to step 8.
8 CHECK EXPERIENCE OF OUT OF GAS.	Have the vehicle been out of gas before?	Complete the diagnosis. NOTE: DTC may be recorded due to the idle running of fuel pump at out of gas.	Replace the fuel pump control unit. <Ref. to FU(STI)-43, Fuel Pump Control Unit.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

AM:DTC P0244 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” RANGE/PERFORMANCE

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-91, DTC P0244 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

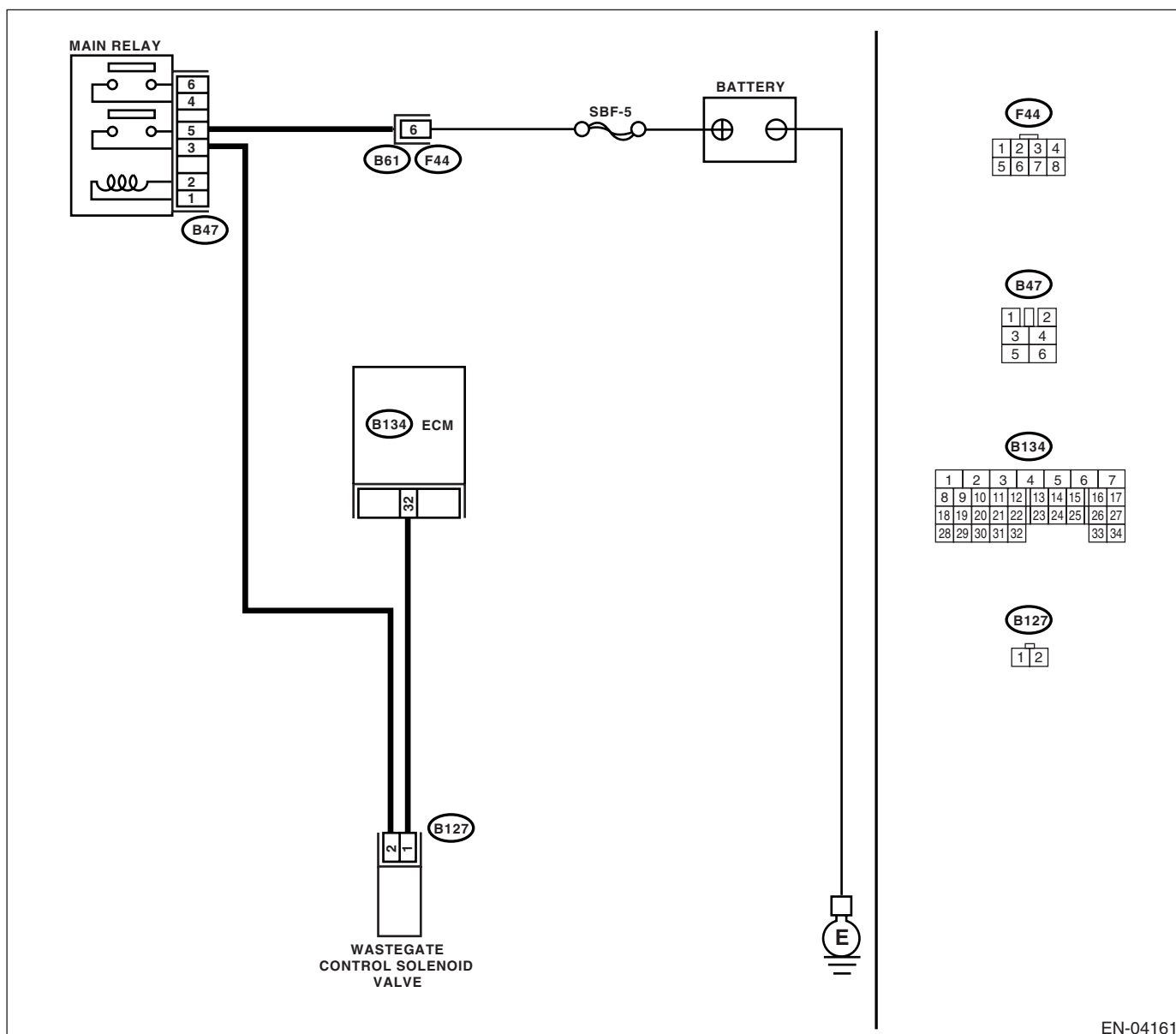
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04161

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK FOR ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0244.	Replace the wastegate control solenoid valve. <Ref. to FU(STI)-35, Wastegate Control Solenoid Valve.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

AN:DTC P0245 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” LOW DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-93, DTC P0245 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

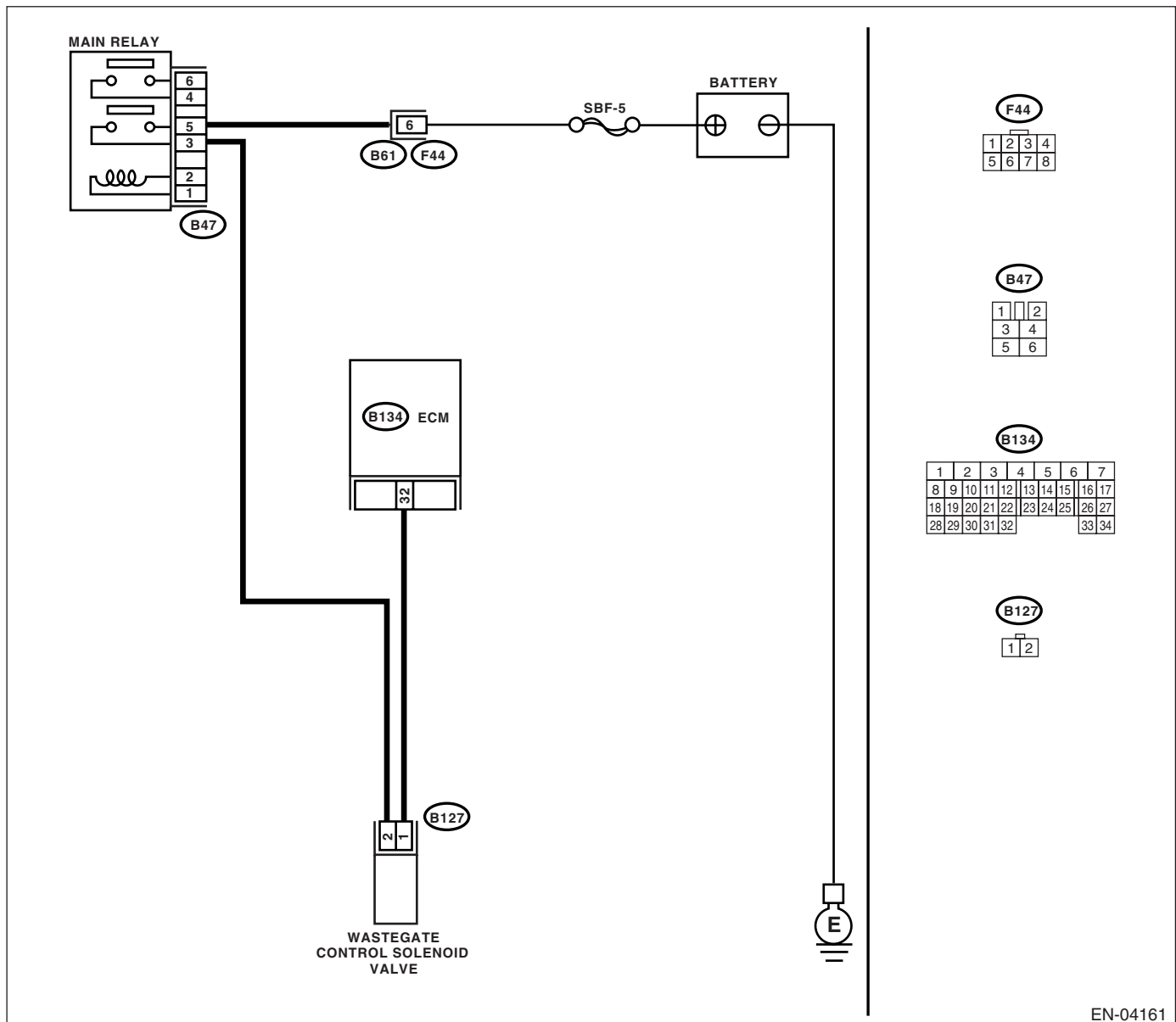
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04161

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OUTPUT SIGNAL FROM ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. Connector & terminal (B134) No. 32 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time.	Go to step 2.
2 CHECK HARNESS BETWEEN WASTEGATE CONTROL SOLENOID VALVE AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from wastegate control solenoid valve and ECM. 3) Measure the resistance of harness between wastegate control solenoid valve connector and engine ground. Connector & terminal (B127) No. 1 — Engine ground:	Is the resistance less than 10 Ω ?	Repair the ground short circuit in harness between ECM and wastegate control solenoid valve connector.	Go to step 3.
3 CHECK HARNESS BETWEEN WASTEGATE CONTROL SOLENOID VALVE AND ECM CONNECTOR. Measure the resistance of harness between ECM and wastegate control solenoid valve of harness connector. Connector & terminal (B134) No. 32 — (B127) No. 1:	Is the resistance less than 1 Ω ?	Go to step 4.	Repair the open circuit in harness between ECM and wastegate control solenoid valve connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and wastegate control solenoid valve connector
4 CHECK WASTEGATE CONTROL SOLENOID VALVE. 1) Remove the wastegate control solenoid valve. 2) Measure the resistance between wastegate control solenoid valve terminals. Terminals No. 1 — No. 2:	Is the resistance 30 — 40 Ω ?	Go to step 5.	Replace the wastegate control solenoid valve. <Ref. to FU(STI)-35, Wastegate Control Solenoid Valve.>
5 CHECK POWER SUPPLY TO WASTEGATE CONTROL SOLENOID VALVE. 1) Turn the ignition switch to ON. 2) Measure the voltage between wastegate control solenoid valve and engine ground. Connector & terminal (B127) No. 2 (+) — Engine ground (-):	Is the voltage more than 10 V?	Go to step 6.	Repair the open circuit in harness between main relay and wastegate control solenoid valve connector.
6 CHECK POOR CONTACT. Check poor contact in wastegate control solenoid valve connector.	Is there poor contact in wastegate control solenoid valve connector?	Repair the poor contact in wastegate control solenoid valve connector.	Contact your SOA Service Center since deterioration of some parts may be the cause.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

AO:DTC P0246 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” HIGH DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-95, DTC P0246 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

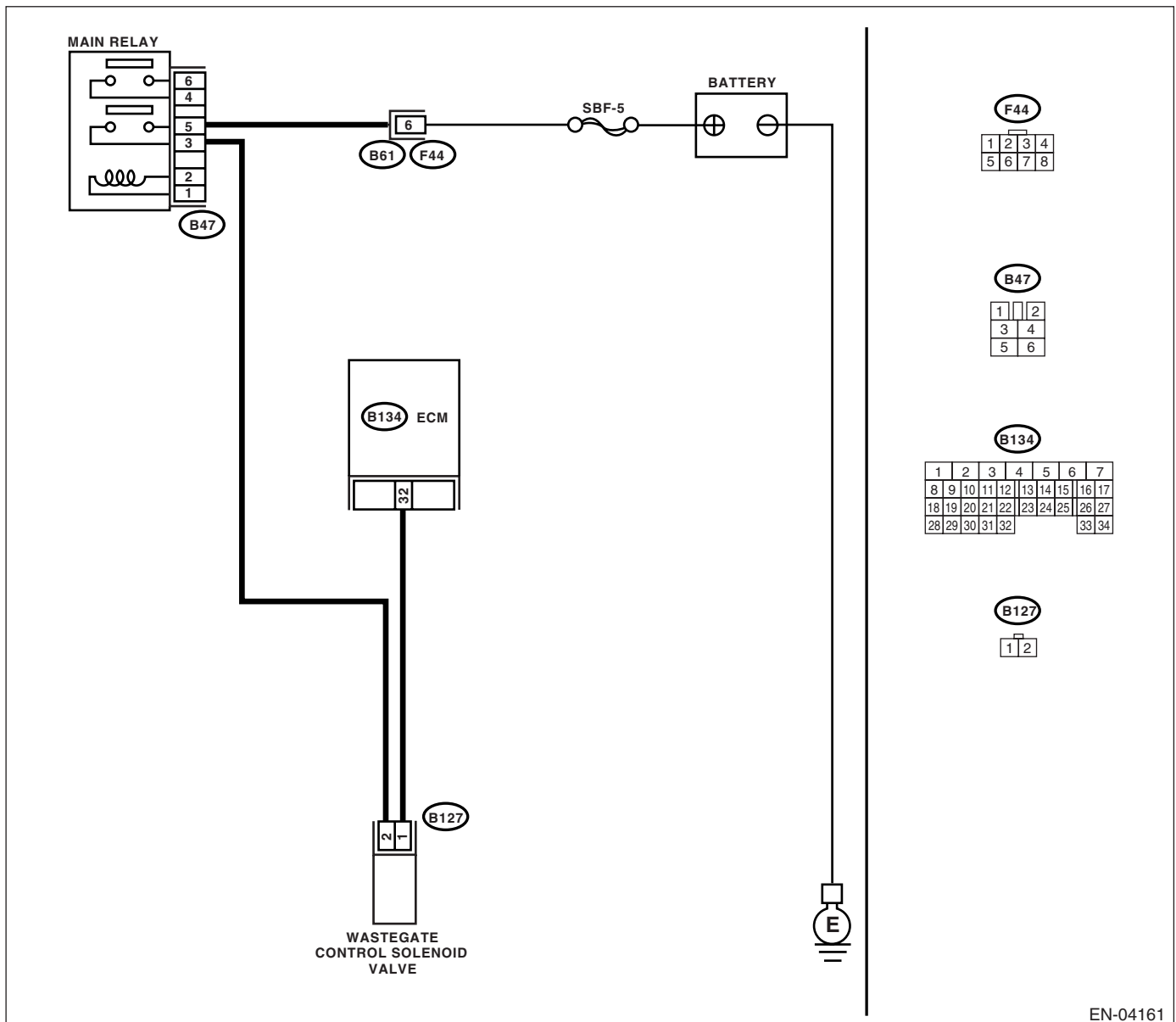
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OUTPUT SIGNAL FROM ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. Connector & terminal (B134) No. 32 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 3.	Go to step 2.
2 CHECK POOR CONTACT. Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).>
3 CHECK HARNESS BETWEEN WASTEGATE CONTROL SOLENOID VALVE AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from wastegate control solenoid valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. Connector & terminal (B134) No. 32 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Repair the battery short circuit in harness between ECM and wastegate control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).>	Go to step 4.
4 CHECK WASTEGATE CONTROL SOLENOID VALVE. 1) Turn the ignition switch to OFF. 2) Measure the resistance between wastegate control solenoid valve terminals. Terminals No. 1 — No. 2:	Is the resistance less than 1 Ω ?	Replace the wastegate control solenoid valve <Ref. to FU(STI)-35, Wastegate Control Solenoid Valve.> and ECM <Ref. to FU(STI)-39, Engine Control Module (ECM).>	Go to step 5.
5 CHECK POOR CONTACT. Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

AP:DTC P0301 CYLINDER 1 MISFIRE DETECTED

NOTE:

For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(STI)(diag)-168, 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(STI)(diag)-168, 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(STI)(diag)-168, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AS:DTC P0304 CYLINDER 4 MISFIRE DETECTED

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- Immediately at fault recognition (A misfire which could damage catalyst occurs.)
- GENERAL DESCRIPTION <Ref. to GD(STI)-97, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Engine stalls.
- Erroneous idling
- Rough driving

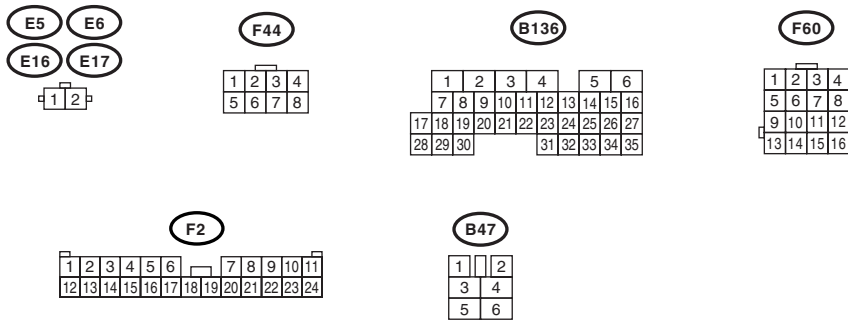
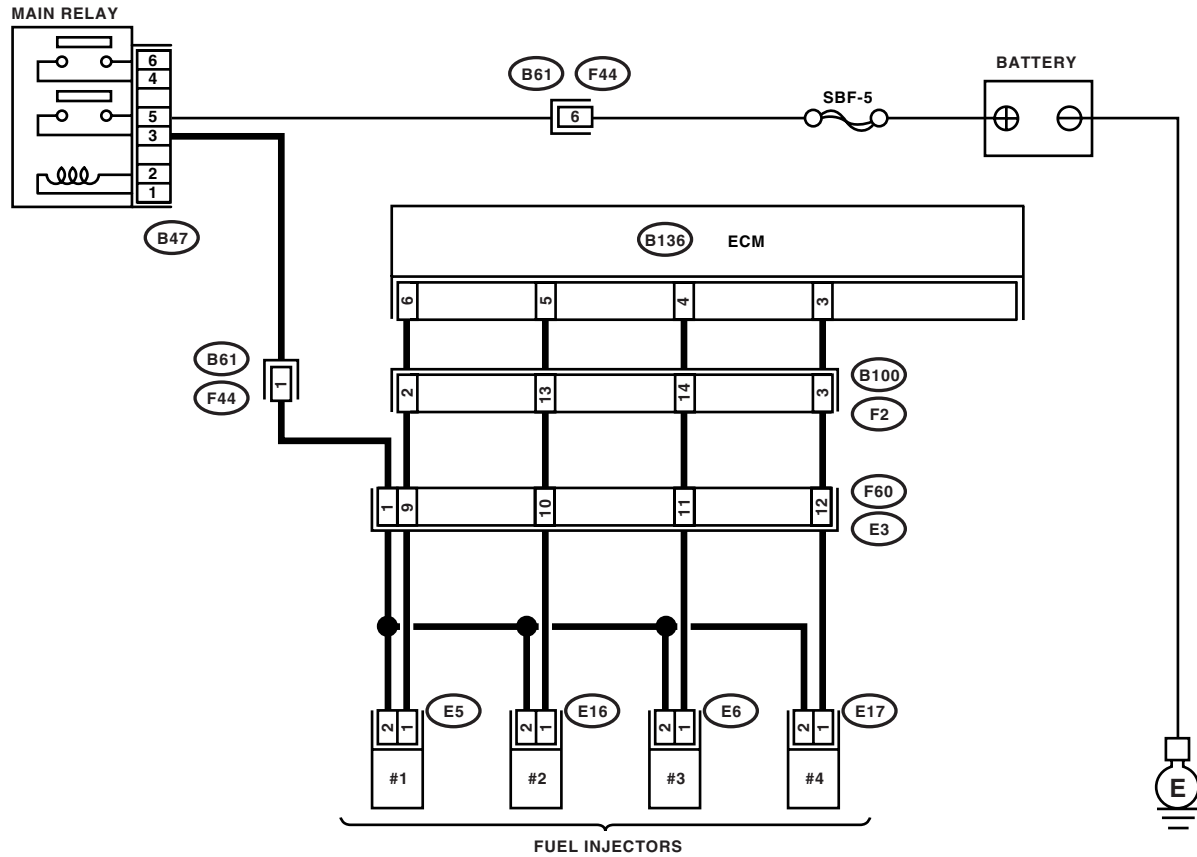
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-04155

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK FOR ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK OUTPUT SIGNAL FROM ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and chassis ground on faulty cylinders. Connector & terminal #1 (B136) No. 6 (+) — Chassis ground (-): #2 (B136) No. 5 (+) — Chassis ground (-): #3 (B136) No. 4 (+) — Chassis ground (-): #4 (B136) No. 3 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 7.	Go to step 3.
3 CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel injector on faulty cylinders. 3) Disconnect the connector from ECM. 4) 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 more than 1 MΩ?	Go to step 4.	Repair the ground short circuit in harness between fuel injector and ECM connector.
4 CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR. Measure the resistance of harness connector between ECM connector and fuel injector on faulty cylinders. Connector & terminal #1 (B136) No. 6 — (E5) No. 1: #2 (B136) No. 5 — (E16) No. 1: #3 (B136) No. 4 — (E6) No. 1: #4 (B136) No. 3 — (E17) No. 1:	Is the resistance less than 1 Ω?	Go to step 5.	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and fuel injector connector • Poor contact in coupling connector
5 CHECK FUEL INJECTOR. Measure the resistance between fuel injector terminals on faulty cylinder. Terminals No. 1 — No. 2:	Is the resistance 5 — 20 Ω?	Go to step 6.	Replace the faulty fuel injector. <Ref. to FU(STI)-31, Fuel Injector.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
6 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 more than 10 V?	Repair the poor contact in all connectors in fuel injector circuit.	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between main relay and fuel injector connector on faulty cylinders • Poor contact in coupling connector • Poor contact in main relay connector • Poor contact in fuel injector connector on faulty cylinders
7 CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel injector on faulty cylinder. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM connector and chassis ground on faulty cylinders. Connector & terminal #1 (B136) No. 6 (+) — Chassis ground (-): #2 (B136) No. 5 (+) — Chassis ground (-): #3 (B136) No. 4 (+) — Chassis ground (-): #4 (B136) No. 3 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Repair the battery short circuit in harness between ECM and fuel injector. After repair, replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).>	Go to step 8.
8 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 less than 1 Ω ?	Replace the faulty fuel injector <Ref. to FU(STI)-31, Fuel Injector.> and ECM <Ref. to FU(STI)-39, Engine Control Module (ECM).>	Go to step 9.
9 CHECK INSTALLATION OF CAMSHAFT POSITION SENSOR/CRANKSHAFT POSITION SENSOR.	Is the camshaft position sensor or crankshaft position sensor installing bolt loose?	Tighten the camshaft position sensor or crankshaft position sensor.	Go to step 10.
10 CHECK CRANK SPROCKET. Remove the timing belt cover.	Is the crank sprocket rusted or its teeth damaged?	Replace the crank sprocket. <Ref. to ME(STI)-53, Crank Sprocket.>	Go to step 11.
11 CHECK INSTALLATION CONDITION OF TIMING BELT. Turn the crankshaft, and align alignment mark on crank sprocket with alignment mark on cylinder block.	Is the timing belt dislocated from its proper position?	Repair the installation condition of timing belt. <Ref. to ME(STI)-44, Timing Belt.>	Go to step 12.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
12 CHECK FUEL LEVEL.	Is the fuel meter indication higher than the "Lower" level?	Go to step 13 .	Replenish the fuel so fuel meter indication is higher than the "Lower" level. After replenishing fuel; Go to step 13 .
13 CHECK STATUS OF MALFUNCTION INDICATOR LIGHT. 1) Clear the memory using Subaru Select Monitor. <Ref. to EN(STI)(diag)-28, Subaru Select Monitor.> 2) Start the engine, and drive the vehicle more than 10 minutes.	Is the malfunction indicator light coming on or blinking?	Go to step 15 .	Go to step 14 .
14 CHECK CAUSE OF MISFIRE DIAGNOSED.	Was the cause of misfire diagnosed when the engine is running?	Finish the diagnostics operation, if the engine has no abnormality.	Repair the poor contact. NOTE: In this case, repair the following: • Poor contact in ignition coil connector • Poor contact in fuel injector connector on faulty cylinders • Poor contact in ECM connector • Poor contact in coupling connector
15 CHECK AIR INTAKE SYSTEM.	Is there any fault in air intake system?	Repair the air intake system. NOTE: Check the following items: • Are there air leaks or air suction caused by loose or dislocated nuts and bolts? • Are there cracks or any disconnection of hoses?	Go to step 16 .
16 CHECK CYLINDER.	Is there any fault in that cylinder?	Repair or replace the faulty parts. NOTE: Check the following items. • Spark plug • Fuel injector • Compression pressure	Go to DTC P0171 and P0172. <Ref. to EN(STI)(diag)-142, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AT:DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR)**DTC DETECTING CONDITION:**

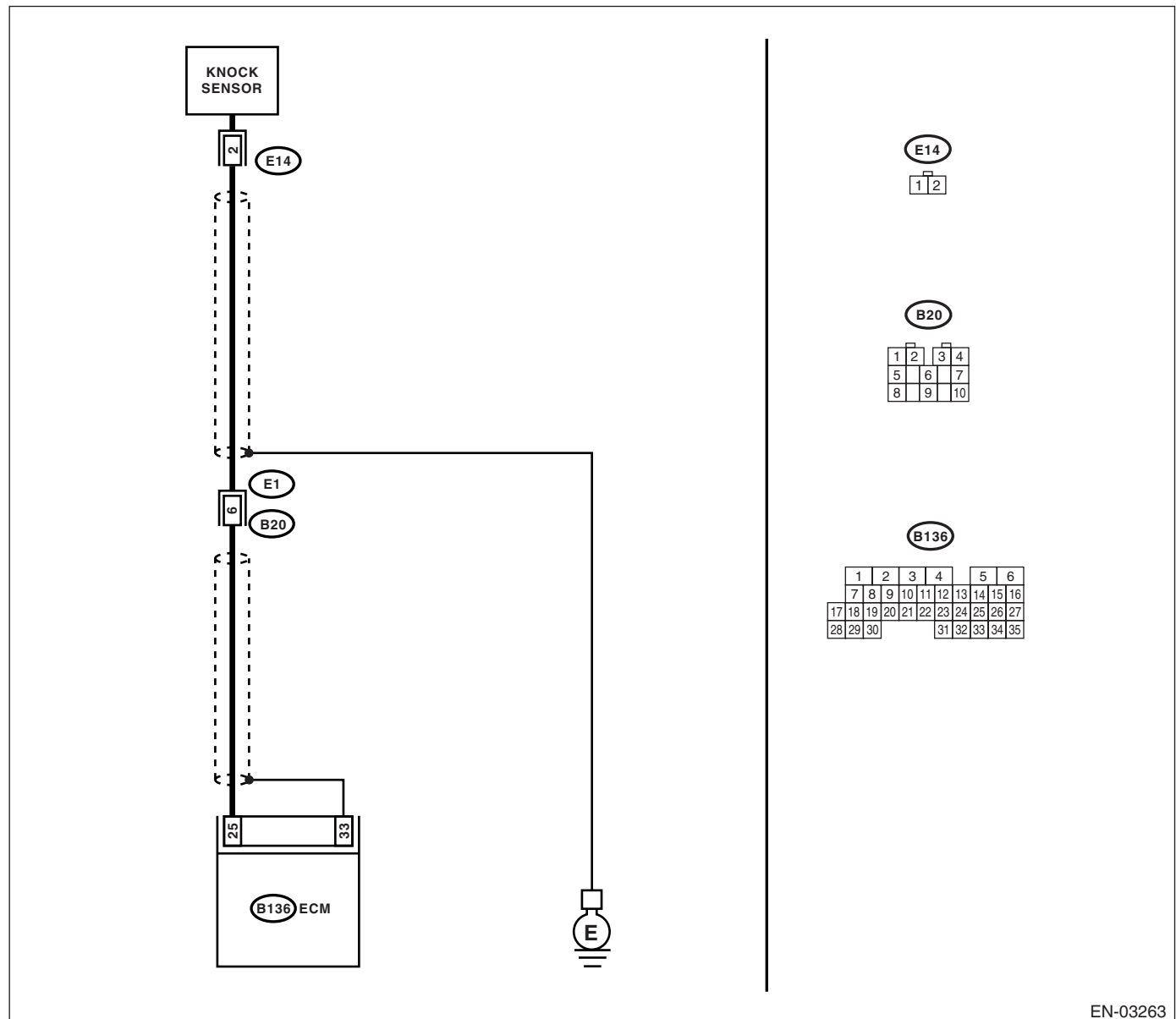
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-103, DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Poor driving performance
- Knocking occurs.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:

EN-03263

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN KNOCK SENSOR AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between ECM harness connector and chassis ground. Connector & terminal (B136) No. 25 — Chassis ground:	Is the resistance more than 700 k Ω ?	Go to step 2.	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between knock sensor and ECM connector • Poor contact in knock sensor connector • Poor contact in coupling connector
2 CHECK KNOCK SENSOR. 1) Disconnect the connector from knock sensor. 2) Measure the resistance between knock sensor connector terminal and engine ground. Terminals No. 2 — Engine ground:	Is the resistance more than 700 k Ω ?	Go to step 3.	Repair the harness and connector. NOTE: In this case, repair the following: • Poor contact in knock sensor connector • Poor contact in coupling connector
3 CHECK CONDITION OF KNOCK SENSOR INSTALLATION.	Is the knock sensor installation bolt tightened securely?	Replace the knock sensor. <Ref. to FU(STI)-28, Knock Sensor.>	Tighten the knock sensor installation bolt securely.

AU:DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR)**DTC DETECTING CONDITION:**

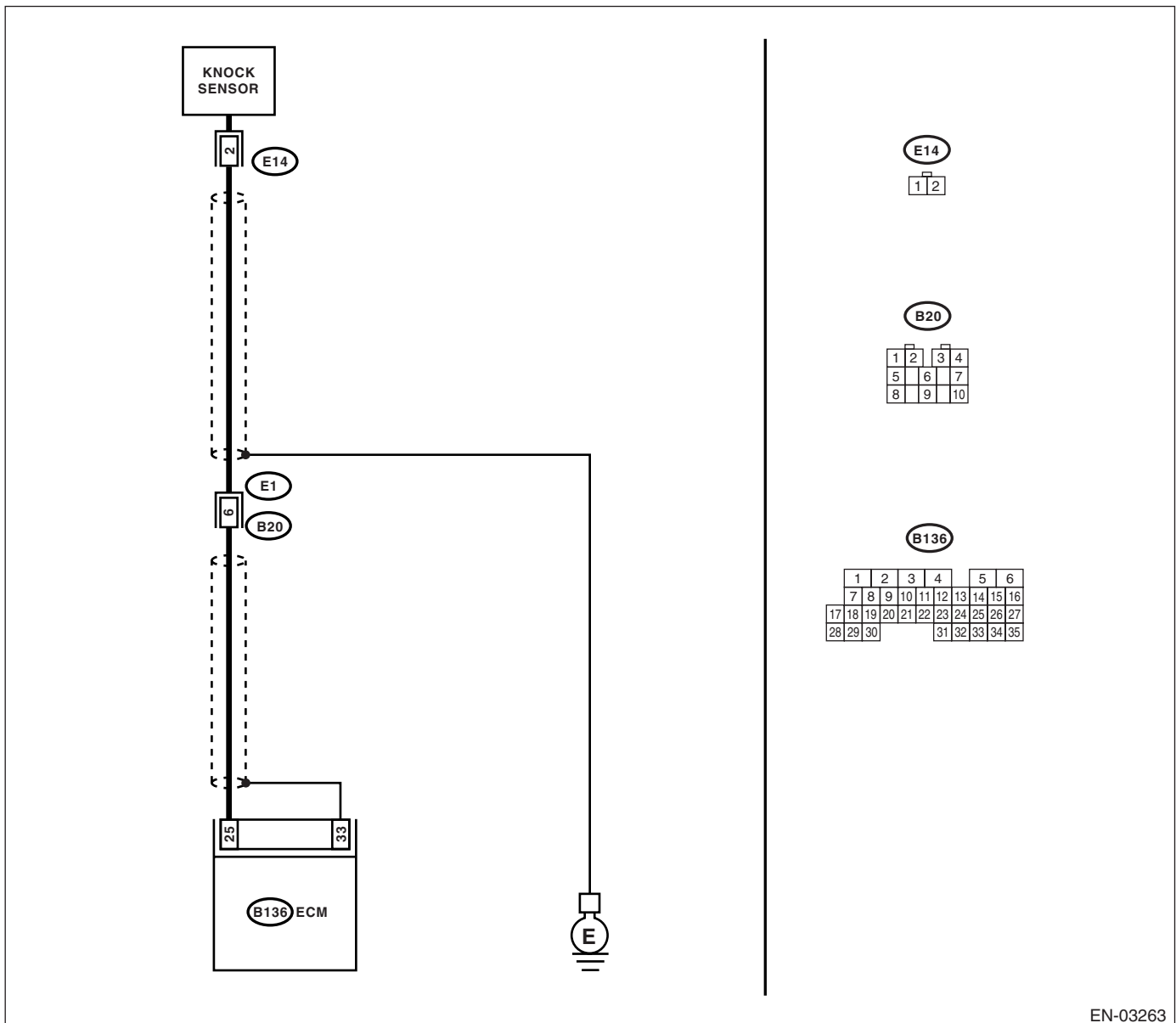
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-105, DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Poor driving performance
- Knocking occurs.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN KNOCK SENSOR AND ECM CONNECTOR. Measure the resistance of harness between ECM connector and chassis ground. Connector & terminal (B136) No. 25 — Chassis ground:	Is the resistance less than 400 k Ω ?	Go to step 2.	Go to step 3.
2 CHECK KNOCK SENSOR. 1) Disconnect the connector from knock sensor. 2) Measure the resistance between knock sensor connector terminal and engine ground. Terminals No. 2 — Engine ground:	Is the resistance less than 400 k Ω ?	Replace the knock sensor. <Ref. to FU(STI)-28, Knock Sensor.>	Repair the ground short circuit in harness between knock sensor connector and ECM connector. NOTE: The harness between both connectors is shielded. Repair the short circuit of harness together with shield.
3 CHECK INPUT SIGNAL FOR ECM. 1) Connect the connectors to ECM and knock sensor. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM and chassis ground. Connector & terminal (B136) No. 25 (+) — Chassis ground (-):	Is the voltage more than 2 V?	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. (However, the possibility of poor contact still remains.) NOTE: In this case, repair the following: • Poor contact in knock sensor connector • Poor contact in ECM connector • Poor contact in coupling connector	Repair the poor contact in ECM connector.

AV:DTC P0335 CRANKSHAFT POSITION SENSOR "A" CIRCUIT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-107, DTC P0335 CRANKSHAFT POSITION SENSOR "A" CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

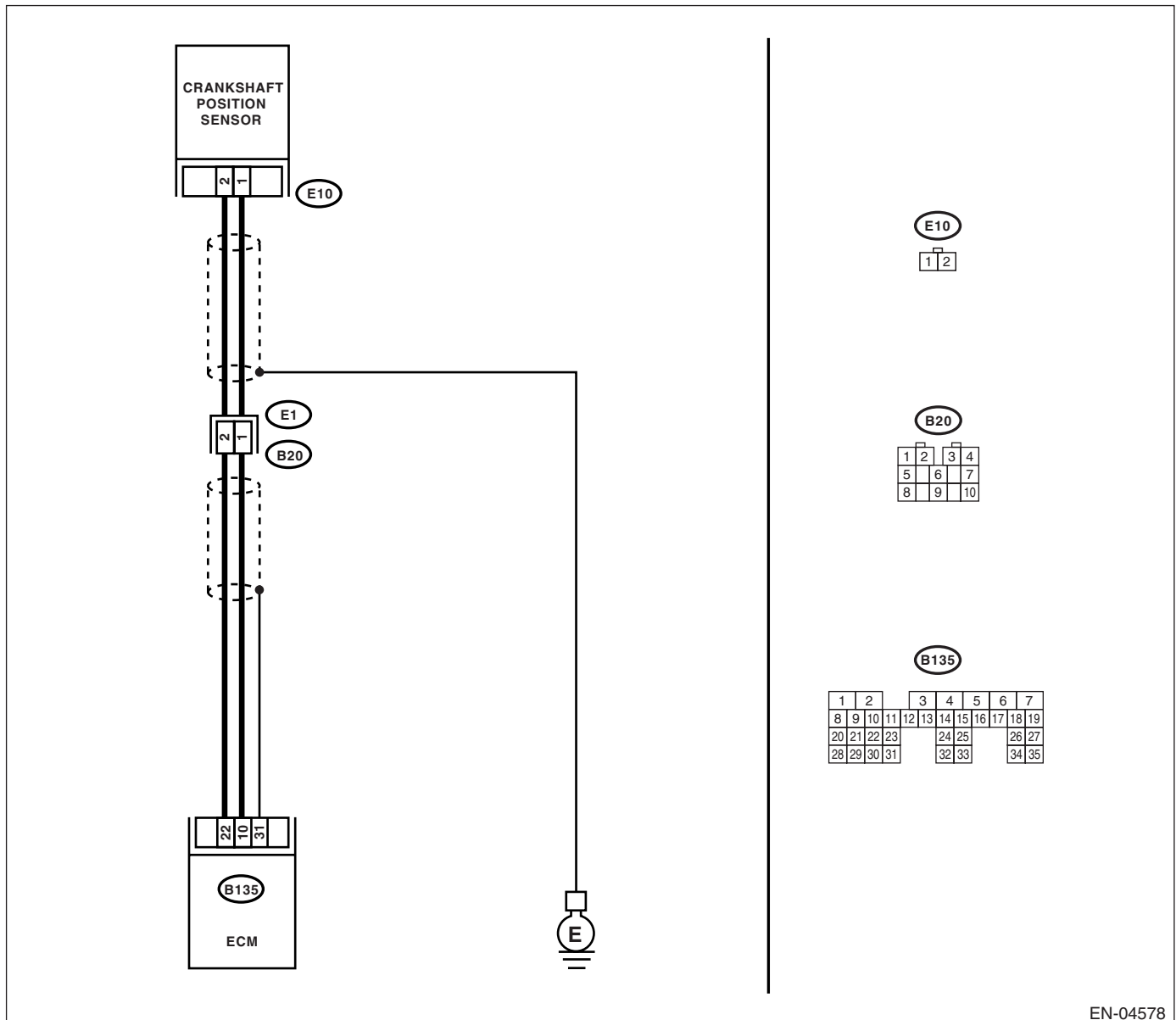
TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04578

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from crankshaft position sensor. 3) Measure the resistance of harness between crankshaft position sensor connector and engine ground. Connector & terminal (E10) No. 1 — Engine ground:	Is the resistance more than 100 k Ω ?	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between crankshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector	Go to step 2.
2 CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR. Measure the resistance of harness between crankshaft position sensor connector and engine ground. Connector & terminal (E10) No. 1 — Engine ground:	Is the resistance more than 1 M Ω ?	Go to step 3.	Repair the ground short circuit in harness between crankshaft position sensor and ECM connector. NOTE: The harness between both connectors are shielded. Repair ground short circuit in harness together with shield.
3 CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR. Measure the resistance of harness between crankshaft position sensor connector and engine ground. Connector & terminal (E10) 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: • Open circuit in harness between crankshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector
4 CHECK CONDITION OF CRANKSHAFT POSITION SENSOR.	Is the crankshaft position sensor installation bolt tightened securely?	Go to step 5.	Tighten the crankshaft position sensor installation bolt securely.
5 CHECK CRANKSHAFT POSITION SENSOR. 1) Remove the crankshaft position sensor. 2) Measure the resistance between connector terminals of crankshaft position sensor. Terminals No. 1 — No. 2:	Is the resistance 1 — 4 k Ω ?	Repair the poor contact in crankshaft position sensor connector.	Replace the crankshaft position sensor. <Ref. to FU(STI)-26, Crankshaft Position Sensor.>

AW:DTC P0336 CRANKSHAFT POSITION SENSOR "A" CIRCUIT RANGE/PERFORMANCE**DTC DETECTING CONDITION:**

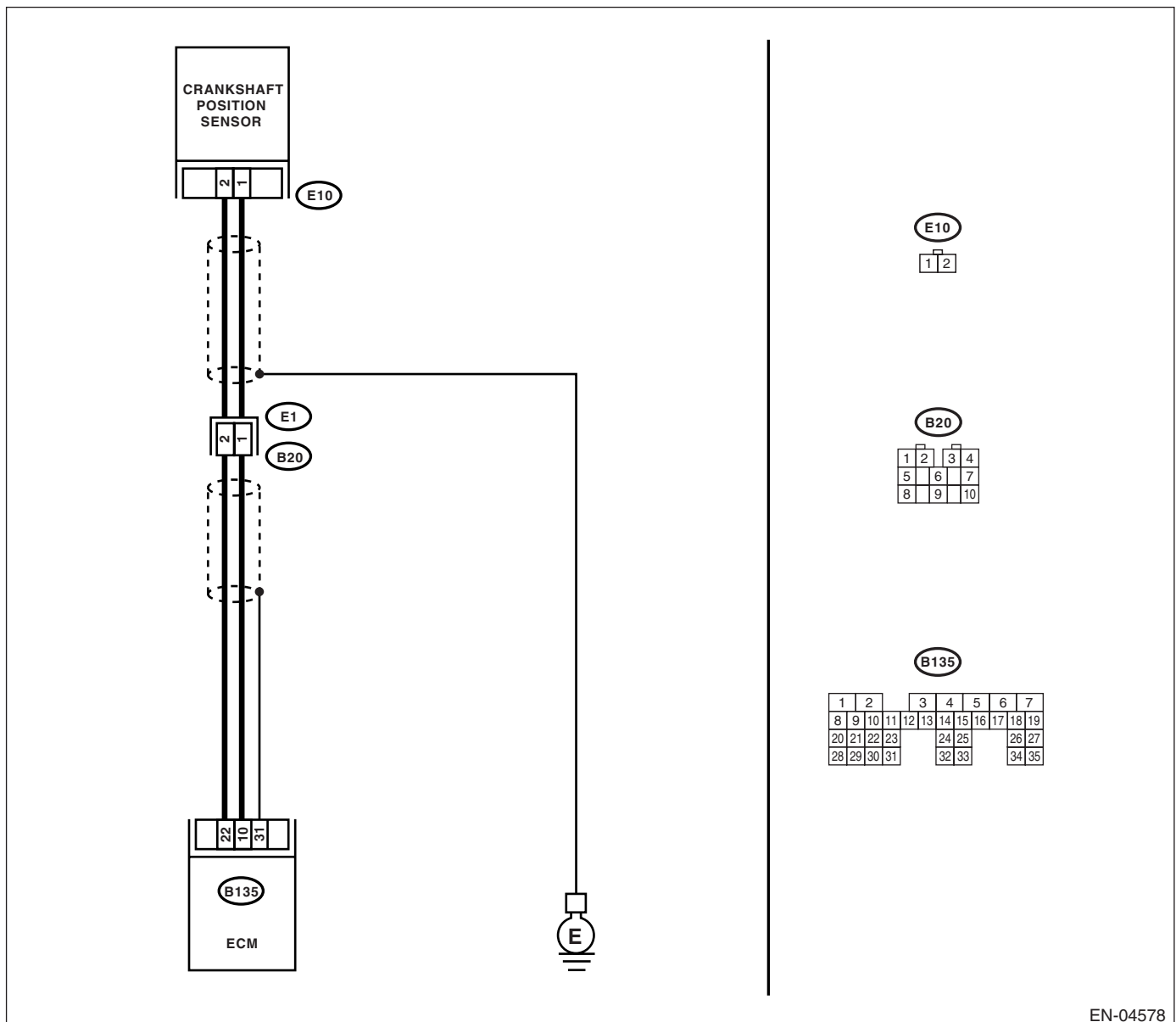
- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-109, DTC P0336 CRANKSHAFT POSITION SENSOR "A" CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:

EN-04578

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK FOR ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK CONDITION OF CRANKSHAFT POSITION SENSOR. Turn the ignition switch to OFF.	Is the crankshaft position sensor installation bolt tightened securely?	Go to step 3.	Tighten the crankshaft position sensor installation bolt securely.
3 CHECK CRANK SPROCKET. Remove the front belt cover.	Are the crank sprocket teeth cracked or damaged?	Replace the crank sprocket. <Ref. to FU(STI)-26, Crankshaft Position Sensor.>	Go to step 4.
4 CHECK INSTALLATION CONDITION OF TIMING BELT. Turn the crankshaft, and align alignment mark on crank sprocket with alignment mark on cylinder block.	Is the timing belt dislocated from its proper position?	Repair the installation condition of timing belt. <Ref. to ME(STI)-44, Timing Belt.>	Replace the crankshaft position sensor. <Ref. to FU(STI)-26, Crankshaft Position Sensor.>

AX:DTC P0340 CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 1 OR SINGLE SENSOR)**DTC DETECTING CONDITION:**

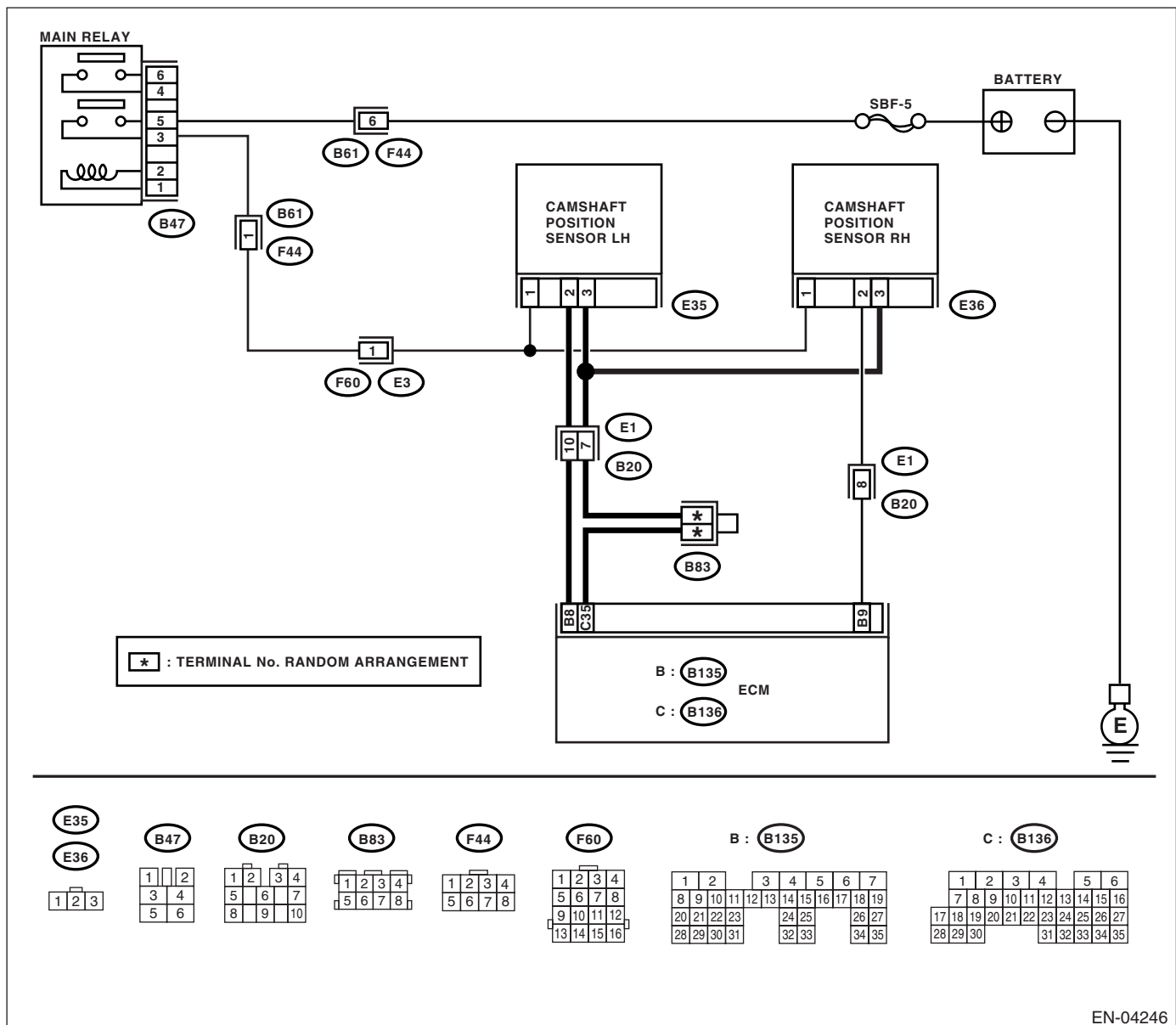
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-111, DTC P0340 CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:

EN-04246

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK POWER SUPPLY TO CAMSHAFT POSITION SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from camshaft position sensor. 3) Measure the voltage between camshaft position sensor and engine ground. Connector & terminal (E36) No. 1 (+) — Engine ground (-):	Is the voltage more than 10 V?	Repair the battery short circuit in harness between main relay connector and camshaft position sensor connector.	Go to step 2.
2 CHECK POWER SUPPLY TO CAMSHAFT POSITION SENSOR. 1) Turn the ignition switch to ON. 2) Measure the voltage between camshaft position sensor and engine ground. Connector & terminal (E36) No. 1 (+) — Engine ground (-):	Is the voltage more than 10 V?	Go to step 3.	Repair the open or ground short circuit in harness between main relay connector and camshaft position sensor connector.
3 CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between camshaft position sensor and ECM. Connector & terminal (E36) No. 2 — (E135) No. 9: (E36) No. 3 — (E136) No. 35:	Is the resistance less than 1 Ω ?	Go to step 4.	Repair the open circuit in harness between camshaft position sensor and ECM.
4 CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM. Measure the resistance of harness between camshaft position sensor and engine ground. Connector & terminal (E36) No. 2 — Engine ground: (E36) No. 3 — Engine ground:	Is the resistance more than 1 M Ω ?	Go to step 5.	Repair the ground short circuit in harness between camshaft position sensor and ECM.
5 CHECK CONDITION OF CAMSHAFT POSITION SENSOR.	Is the camshaft position sensor installation bolt tightened securely?	Go to step 6.	Tighten the camshaft position sensor installation bolt securely.
6 CHECK CAMSHAFT POSITION SENSOR. Check the camshaft position sensor waveform. <Ref. to EN(STI)(diag)-18, Engine Control Module (ECM) I/O Signal.>	Is any abnormality found in waveform?	Replace the camshaft position sensor. <Ref. to FU(STI)-27, Camshaft Position Sensor.>	Go to step 7.
7 CHECK POOR CONTACT. Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).>

AY:DTC P0345 CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 2)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-112, DTC P0345 CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

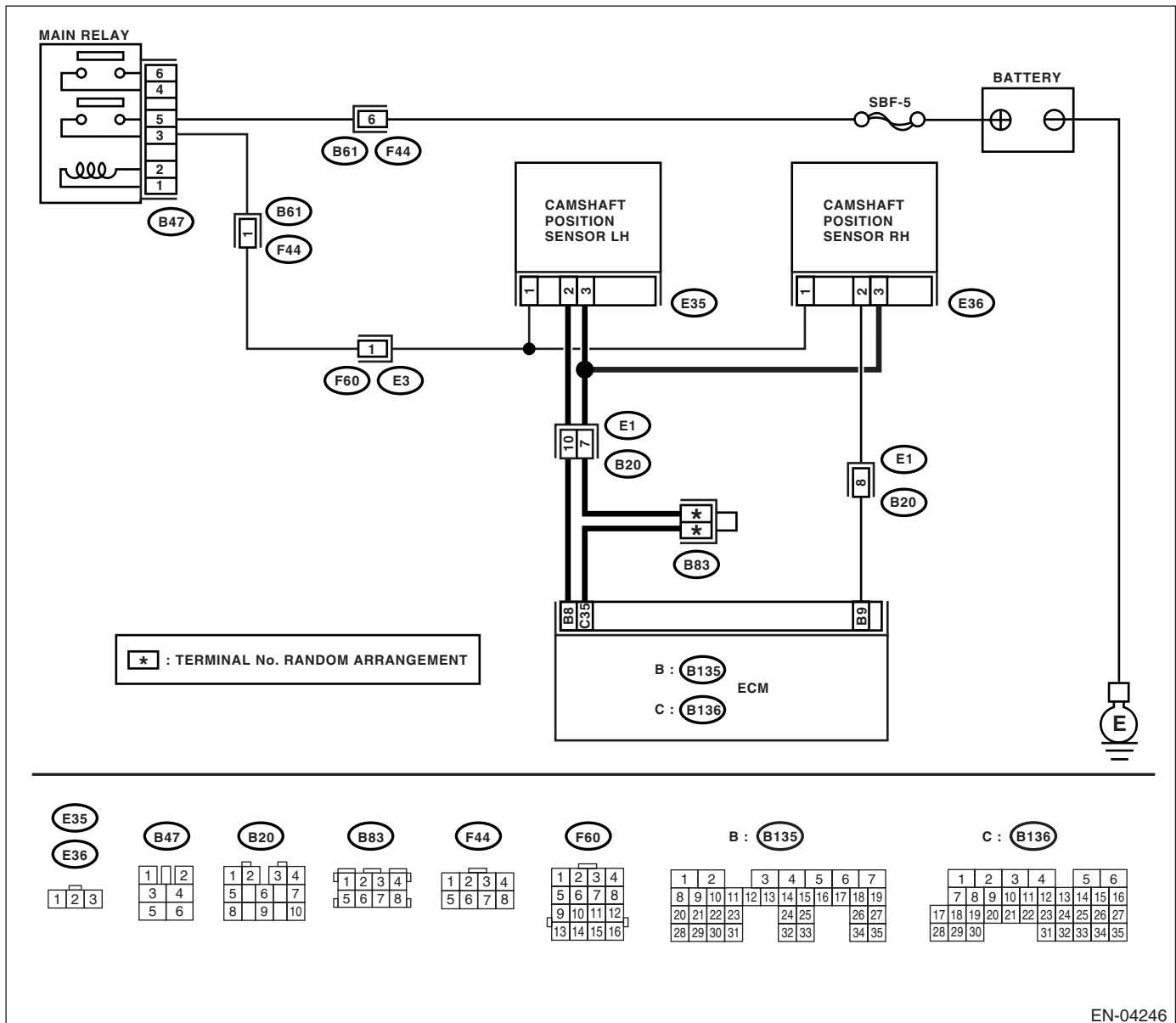
TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04246

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK POWER SUPPLY TO CAMSHAFT POSITION SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from camshaft position sensor. 3) Measure the voltage between camshaft position sensor and engine ground. Connector & terminal (E35) No. 1 (+) — Engine ground (-):	Is the voltage more than 10 V?	Repair the battery short circuit in harness between main relay connector and camshaft position sensor connector.	Go to step 2.
2 CHECK POWER SUPPLY TO CAMSHAFT POSITION SENSOR. 1) Turn the ignition switch to ON. 2) Measure the voltage between camshaft position sensor and engine ground. Connector & terminal (E35) No. 1 (+) — Engine ground (-):	Is the voltage more than 10 V?	Go to step 3.	Repair the open or ground short circuit in harness between main relay connector and camshaft position sensor connector.
3 CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between camshaft position sensor and ECM. Connector & terminal (E35) No. 2 — (B135) No. 8: (E35) No. 3 — (B136) No. 35:	Is the resistance less than 1 Ω ?	Go to step 4.	Repair the open circuit in harness between camshaft position sensor and ECM.
4 CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM. Measure the resistance of harness between camshaft position sensor and engine ground. Connector & terminal (E35) No. 2 — Engine ground: (E35) No. 3 — Engine ground:	Is the resistance more than 1 M Ω ?	Go to step 5.	Repair the ground short circuit in harness between camshaft position sensor and ECM.
5 CHECK CONDITION OF CAMSHAFT POSITION SENSOR.	Is the camshaft position sensor installation bolt tightened securely?	Go to step 6.	Tighten the camshaft position sensor installation bolt securely.
6 CHECK CAMSHAFT POSITION SENSOR. Check the camshaft position sensor waveform. <Ref. to EN(STI)(diag)-18, Engine Control Module (ECM) I/O Signal.>	Is any abnormality found in waveform?	Replace the camshaft position sensor. <Ref. to FU(STI)-27, Camshaft Position Sensor.>	Go to step 7.
7 CHECK POOR CONTACT. Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).>

AZ:DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1)**DTC DETECTING CONDITION:**

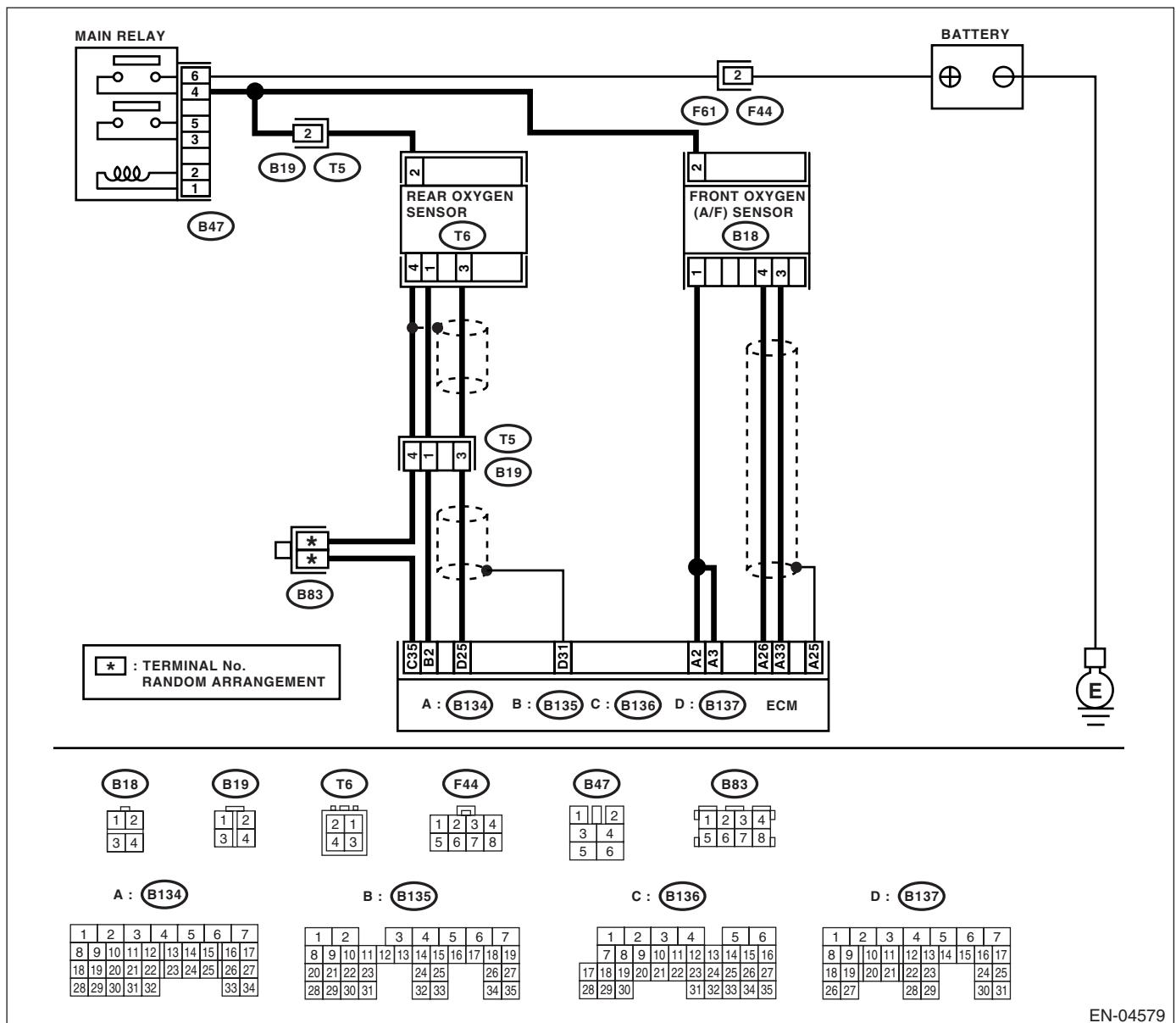
- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-113, DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Engine stalls.
- Idle mixture is out of specifications.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:

EN-04579

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0420.	Go to step 2.
2 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 - Looseness and incomplete installation of front oxygen (A/F) sensor and rear oxygen sensor	Is there a fault in exhaust system?	Repair or replace the exhaust system. <Ref. to EX(STI)-2, General Description.>	Go to step 3.
3 CHECK WAVEFORM ON SUBARU SELECT MONITOR. (DURING DRIVING) 1) Drive at a constant speed of 80 — 113 km/h (50 — 70 MPH). 2) After leaving it in the condition of Step 1) for 5 minutes, read the waveform data using Subaru Select Monitor while driving. <Ref. to EN(STI)(diag)-18, ELECTRICAL SPECIFICATION, Engine Control Module (ECM) I/O Signal.>	Is normal waveform displayed?	Contact your SOA Service Center since deterioration of some parts may be the cause.	Go to step 4.
4 CHECK WAVEFORM ON SUBARU SELECT MONITOR. (DURING IDLING) 1) Run the vehicle at idle. 2) In the condition of Step 1), read the waveform data using Subaru Select Monitor. <Ref. to EN(STI)(diag)-18, ELECTRICAL SPECIFICATION, Engine Control Module (ECM) I/O Signal.>	Is normal waveform displayed?	Go to step 10.	Go to step 5.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
5 CHECK VOLTAGE OF REAR OXYGEN SENSOR. 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and keep the engine speed at 3,000 rpm. (2 minutes at the longest) 2) Read the rear oxygen sensor voltage using Subaru Select Monitor. NOTE: - Depress the clutch pedal. - Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STI)(diag)-28, Subaru Select Monitor.> - General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the voltage more than 490 mV?	Go to step 9.	Go to step 6.
6 CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.	Is there water in connector?	Remove infiltrating water completely.	Go to step 7.
7 CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. Connector & terminal (B137) No. 25 — (T6) No. 3: (B136) No. 35 — (T6) No. 4:	Is the resistance more than 3 Ω?	Repair the open circuit in harness between ECM and rear oxygen sensor connector.	Go to step 8.
8 CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR. 1) Turn the ignition switch to ON. 2) 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 11.	Repair the harness and connector. NOTE: Repair the following items. - Open circuit in harness between rear oxygen sensor and ECM connector - Poor contact of rear oxygen sensor and ECM connector - Poor contact in ECM connector

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
9 CHECK VOLTAGE OF REAR OXYGEN SENSOR. 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and immediately decrease the engine speed from 3,000 rpm. 2) Read the rear oxygen sensor voltage using Subaru Select Monitor. NOTE: • Depress the clutch pedal. • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STI)(diag)-28, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the voltage less than 250 mV?	Contact your SOA Service Center since deterioration of some parts may be the cause.	Go to step 6.
10 CHECK CATALYTIC CONVERTER.	Is the catalytic converter damaged?	Replace the catalytic converter. <Ref. to EC(STI)-3, Front Catalytic Converter.>	Contact your SOA Service Center since deterioration of some parts may be the cause.
11 CHECK REAR OXYGEN SENSOR SHIELD. 1) Turn the ignition switch to OFF. 2) Bare the sensor shield of body side harness of rear oxygen sensor connector. 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(STI)-38, Rear Oxygen Sensor.>	Repair the open circuit in rear oxygen sensor harness.

BA:DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-116, 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.

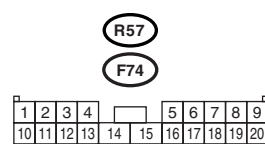
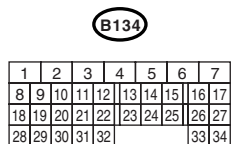
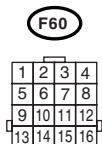
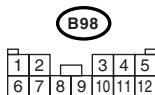
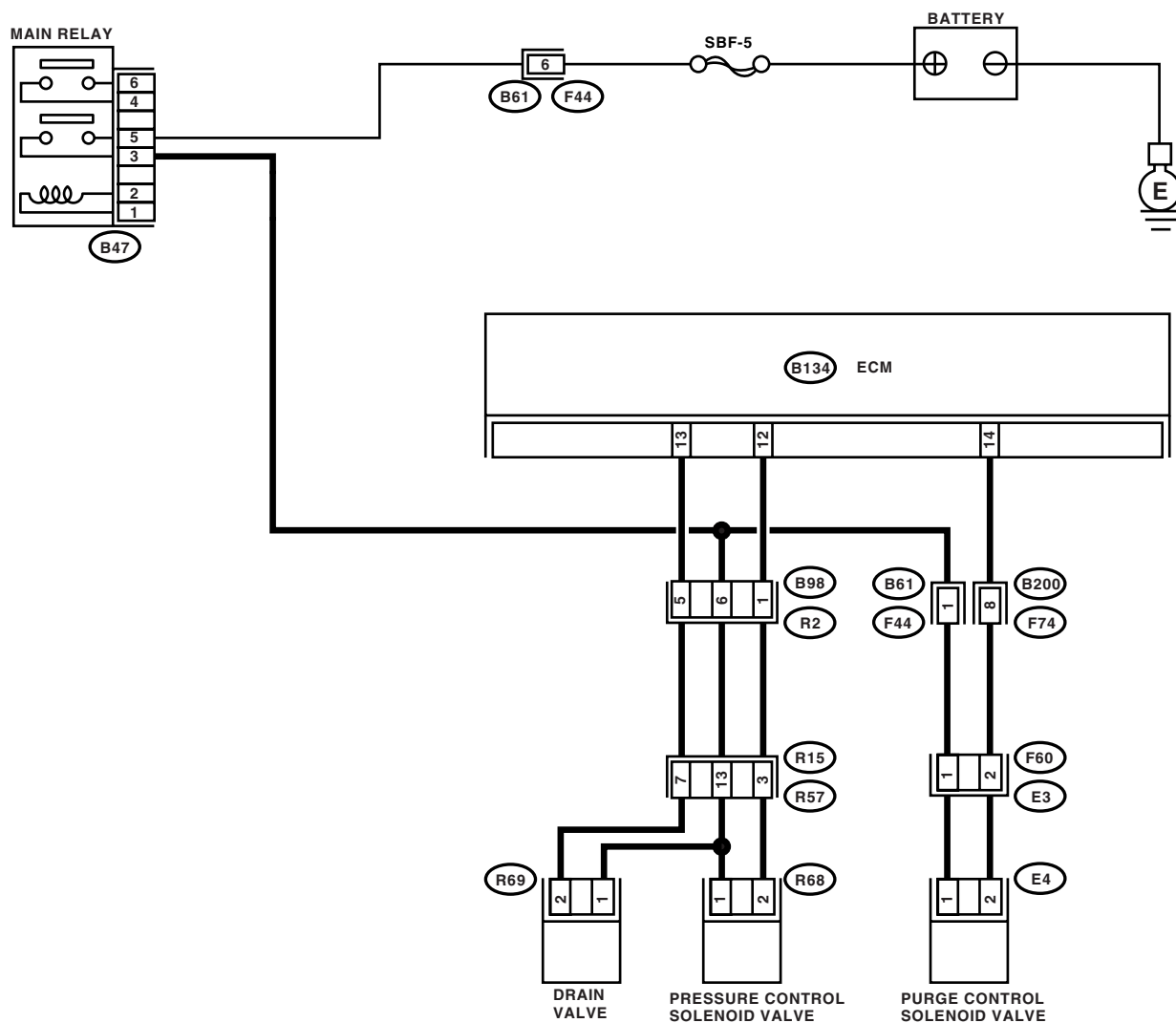
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-04162

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK FOR ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK FUEL FILLER CAP. 1) Turn ignition switch to OFF. 2) Check the fuel filler cap. NOTE: The DTC is stored in memory if fuel filler cap is or was loose or if the cap chain was caught while tightening.	Is the fuel filler cap tightened securely?	Go to step 3.	Tighten fuel filler cap securely.
3 CHECK FUEL FILLER CAP.	Is the fuel filler cap SUBARU genuine?	Go to step 4.	Replace with a SUBARU genuine fuel filler cap.
4 CHECK FUEL FILLER PIPE PACKING.	Is there any damage to the seal between fuel filler cap and fuel filler pipe?	Repair or replace the fuel filler cap and fuel filler pipe. <Ref. to FU(STI)-48, Fuel Filler Pipe.>	Go to step 5.
5 CHECK DRAIN VALVE. 1) Connect the test mode connector. 2) Turn ignition switch to ON. 3) Operate the drain valve. NOTE: Drain valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(STI)(diag)-46, Compulsory Valve Operation Check Mode.>	Does the drain valve operate?	Go to step 6.	Replace the drain valve. <Ref. to EC(STI)-16, Drain Valve.>
6 CHECK PURGE CONTROL SOLENOID VALVE. Operate the purge control solenoid valve. NOTE: Purge control solenoid valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(STI)(diag)-46, Compulsory Valve Operation Check Mode.>	Does the purge control solenoid valve operate?	Go to step 7.	Replace the purge control solenoid valve. <Ref. to EC(STI)-6, Purge Control Solenoid Valve.>
7 CHECK PRESSURE CONTROL SOLENOID VALVE. Operate the pressure control solenoid valve. NOTE: Pressure control solenoid valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(STI)(diag)-46, Compulsory Valve Operation Check Mode.>	Does the pressure control solenoid valve operate?	Go to step 8.	Replace the pressure control solenoid valve. <Ref. to EC(STI)-12, Pressure Control Solenoid Valve.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

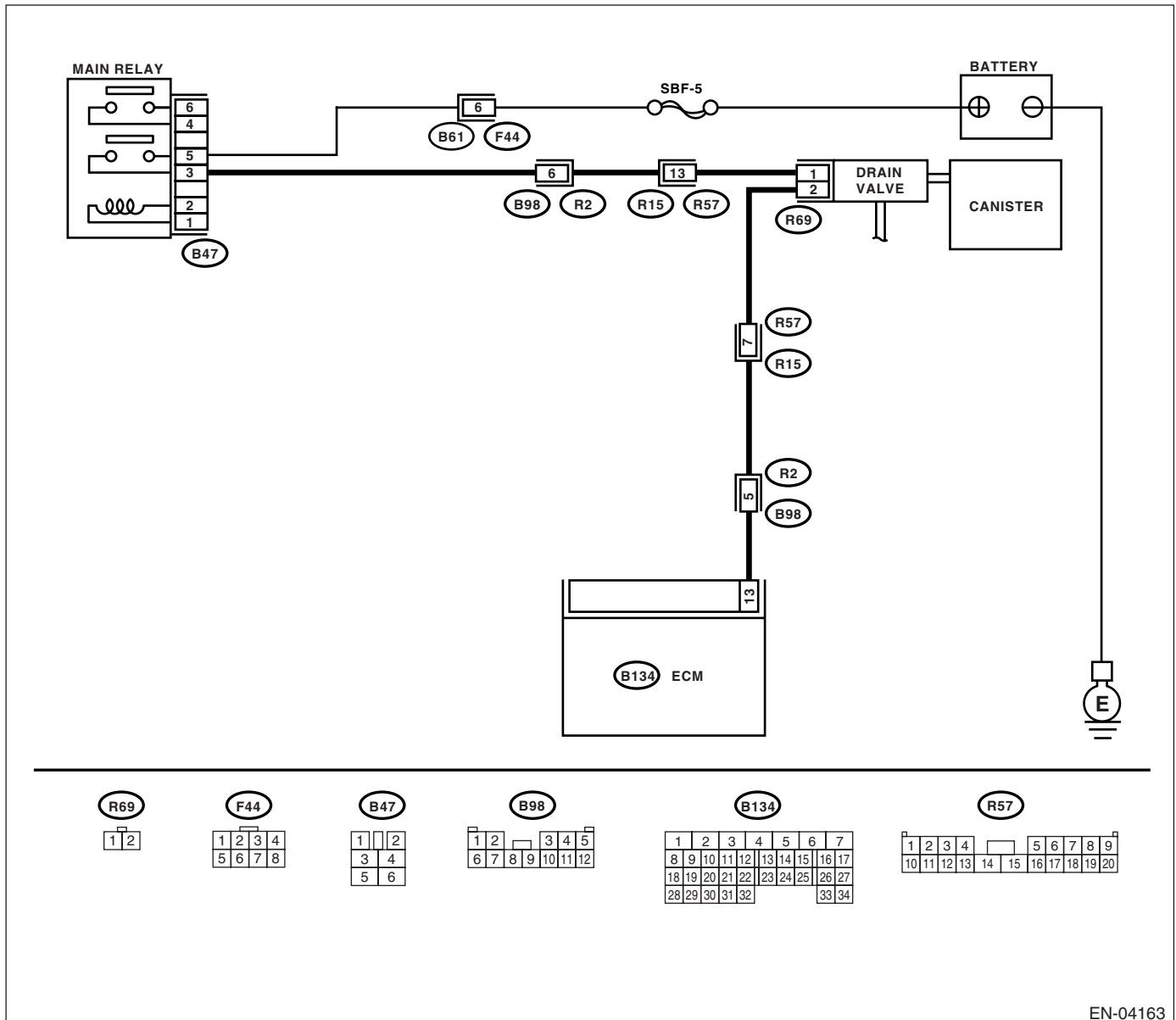
Step	Check	Yes	No
8 CHECK EVAPORATIVE EMISSION CONTROL SYSTEM LINE. Turn ignition switch to OFF.	Is there a hole of more than 1.0 mm (0.04 in) dia. on evaporation line?	Repair or replace the evaporation line. <Ref. to FU(STI)-60, Fuel Delivery, Return and Evaporation Lines.>	Go to step 9 .
9 CHECK CANISTER.	Is the canister damaged or is there a hole of more than 1.0 mm (0.04 in) dia. in it?	Repair or replace the canister. <Ref. to EC(STI)-5, Canister.>	Go to step 10 .
10 CHECK FUEL TANK. Remove the fuel tank. <Ref. to FU(STI)-45, Fuel Tank.>	Is the fuel tank damaged or is there a hole of more than 1.0 mm (0.04 in) dia. in it?	Repair or replace the fuel tank. <Ref. to FU(STI)-45, Fuel Tank.>	Go to step 11 .
11 CHECK ANY OTHER MECHANICAL TROUBLE IN EVAPORATIVE EMISSION CONTROL SYSTEM.	Are there holes of more than 1.0 mm (0.04 in) dia., cracks, clogging, or disconnections, bend, misconnection of hoses or pipes in evaporative emission control system?	Repair or replace the hoses or pipes.	Contact your SOA Service Center since deterioration of some parts may be the cause.

BB:DTC P0447 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN**DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-139, DTC P0447 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:

EN-04163

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OUTPUT SIGNAL FROM ECM. 1) Turn ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. Connector & terminal (B134) No. 13 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 2.	Go to step 3.
2 CHECK FOR POOR CONTACT. Check for poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	The malfunction indicator light may light up, however, the circuit is returned to the normal status at the moment. (However, the possibility of poor contact still remains.) NOTE: In this case, repair the following: • Poor contact in drain valve connector • Poor contact in ECM connector • Poor contact in coupling connector
3 CHECK HARNESS BETWEEN DRAIN VALVE AND ECM CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect the connectors from drain valve and ECM. 3) Measure the resistance of harness between drain valve connector and chassis ground. Connector & terminal (R69) No. 2 — Chassis ground:	Is the resistance more than 1 MΩ?	Go to step 4.	Repair short circuit to ground in harness between ECM and drain valve connector.
4 CHECK HARNESS BETWEEN DRAIN VALVE AND ECM CONNECTOR. Measure the resistance of harness between ECM and drain valve connector. Connector & terminal (B134) No. 13 — (R69) No. 2:	Is the resistance less than 1 Ω?	Go to step 5.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and drain valve connector • Poor contact in coupling connector
5 CHECK DRAIN VALVE. Measure the resistance between drain valve terminals. Terminals No. 1 — No. 2:	Is the resistance 10 — 100 Ω?	Go to step 6.	Replace the drain valve. <Ref. to EC(STI)-16, Drain Valve.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
6 CHECK POWER SUPPLY TO DRAIN VALVE. 1) Turn ignition switch to ON. 2) Measure the voltage between drain valve and chassis ground. Connector & terminal (R69) No. 1 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 7.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between main relay and drain valve • Poor contact in coupling connector • Poor contact in main relay connector
7 CHECK FOR POOR CONTACT. Check for poor contact in drain valve connector.	Is there poor contact in drain valve connector?	Repair poor contact in drain valve connector.	Contact your SOA Service Center since deterioration of some parts may be the cause.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

BC:DTC P0448 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED

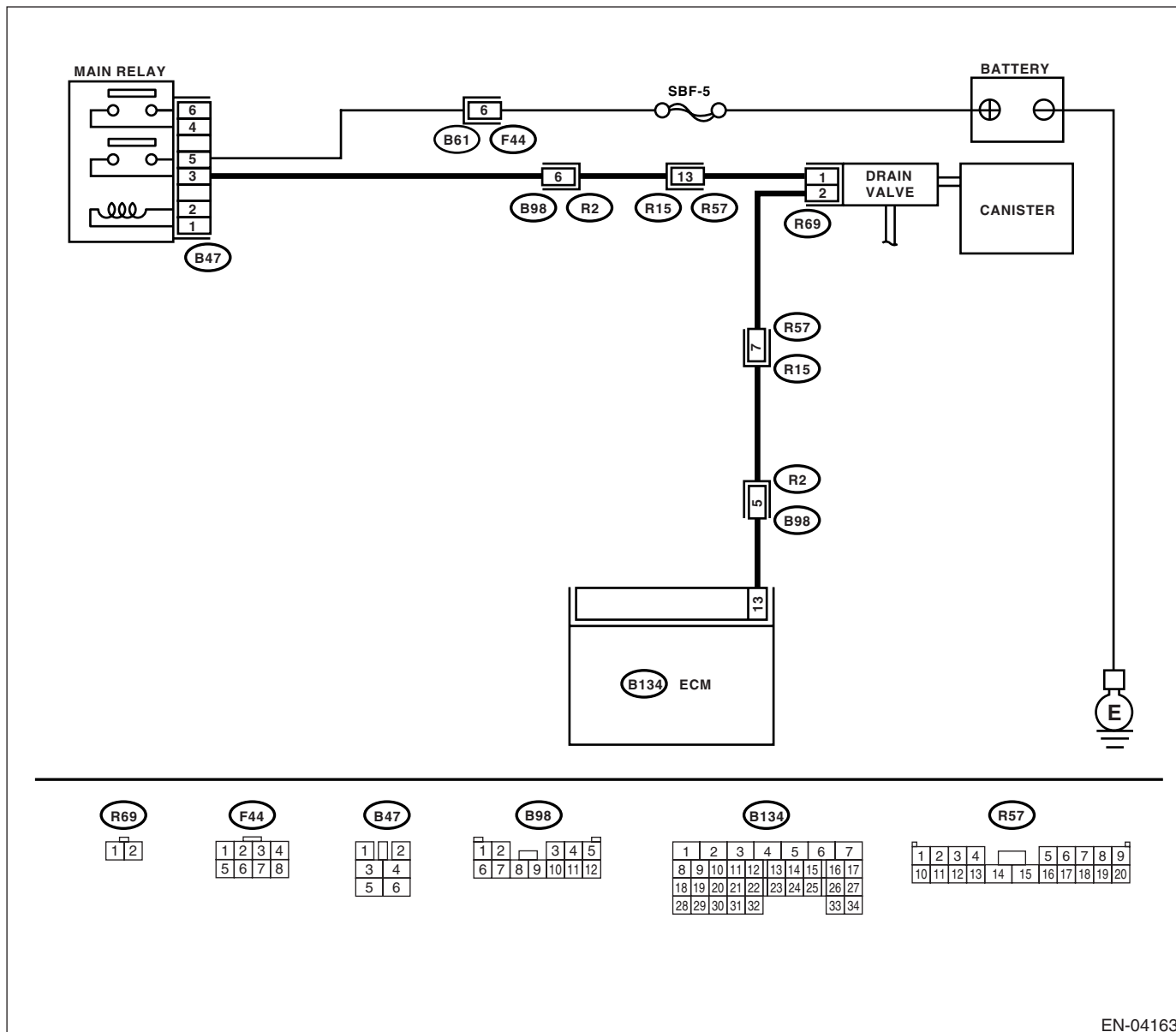
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-141, DTC P0448 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04163

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK INPUT SIGNAL FOR ECM. 1) Turn ignition switch to OFF. 2) Connect the test mode connector at the lower portion of instrument panel (on the driver's side). 3) Turn ignition switch to ON. 4) While operating the drain valve, measure voltage between ECM and chassis ground. NOTE: Drain valve operation can be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(STI)(diag)-46, Compulsory Valve Operation Check Mode.> Connector & terminal (B134) No. 13 (+) — Chassis ground (-):	Does the resistance change within 0 — 10 V?	Go to step 2.	The malfunction indicator light may light up, however, the circuit is returned to the normal status at the moment. In this case, repair poor contact in ECM connector.
2 CHECK INPUT SIGNAL FOR ECM. 1) Turn ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. Connector & terminal (B134) No. 13 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 4.	Go to step 3.
3 CHECK FOR POOR CONTACT. Check for poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).>
4 CHECK HARNESS BETWEEN DRAIN VALVE AND ECM CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect the connector from drain valve. 3) Turn ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. Connector & terminal (B134) No. 13 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Repair short circuit to battery in harness between ECM and drain valve connector. After repair, replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).>	Go to step 5.
5 CHECK DRAIN VALVE. 1) Turn 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(STI)-16, Drain Valve.> and ECM <Ref. to FU(STI)-39, Engine Control Module (ECM).>.	Go to step 6.
6 CHECK FOR POOR CONTACT. Check for poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

BD:DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE

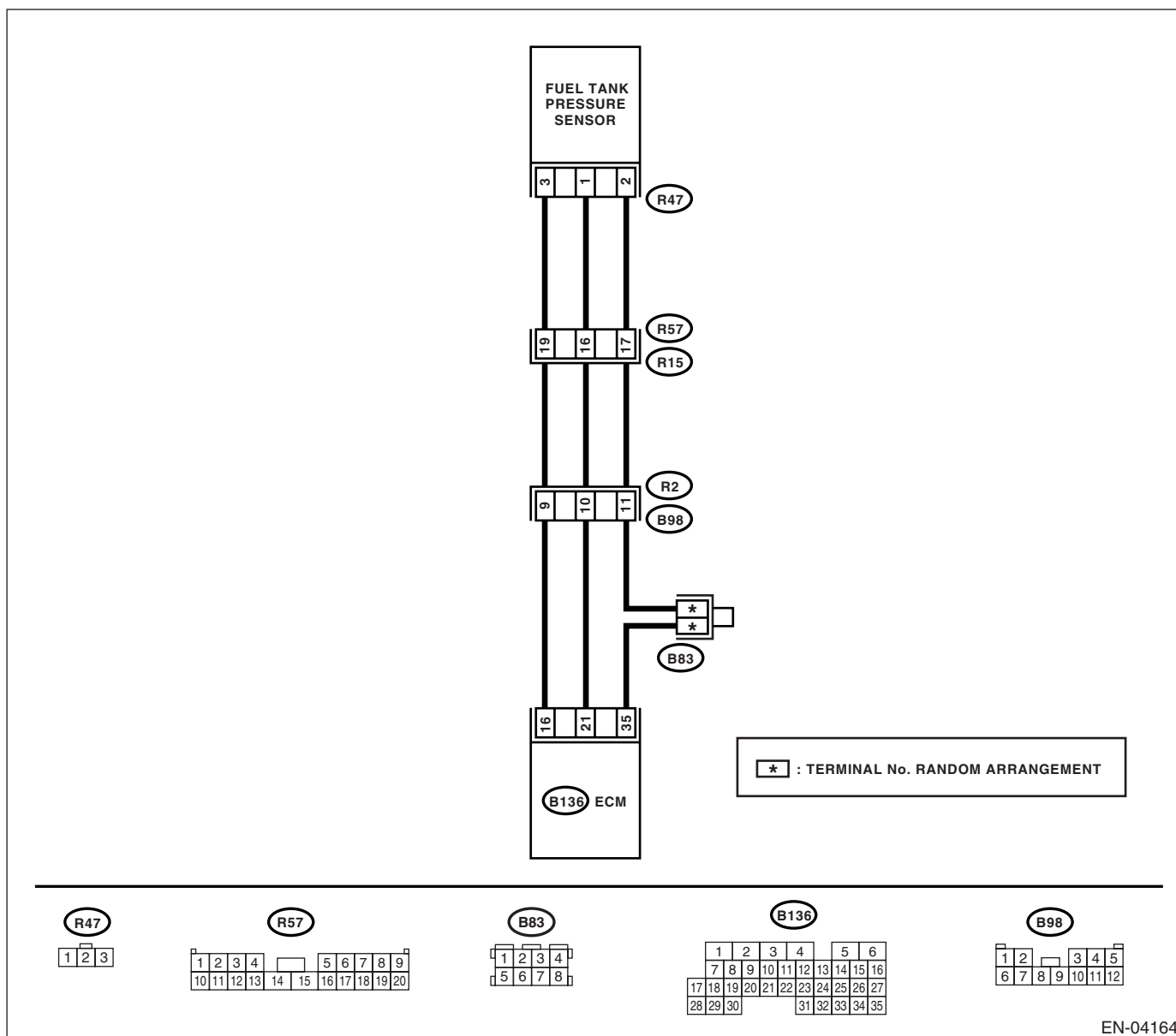
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-143, DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04164

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK FOR ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK FUEL FILLER CAP. 1) Turn ignition switch to OFF. 2) Open the fuel filler flap lid.	Is the fuel filler cap tightened securely?	Go to step 3.	Tighten fuel filler cap securely.
3 CHECK PRESSURE/VACUUM LINE. NOTE: Check the following items. • 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(STI)-10, Fuel Tank Pressure Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

BE:DTC P0452 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT

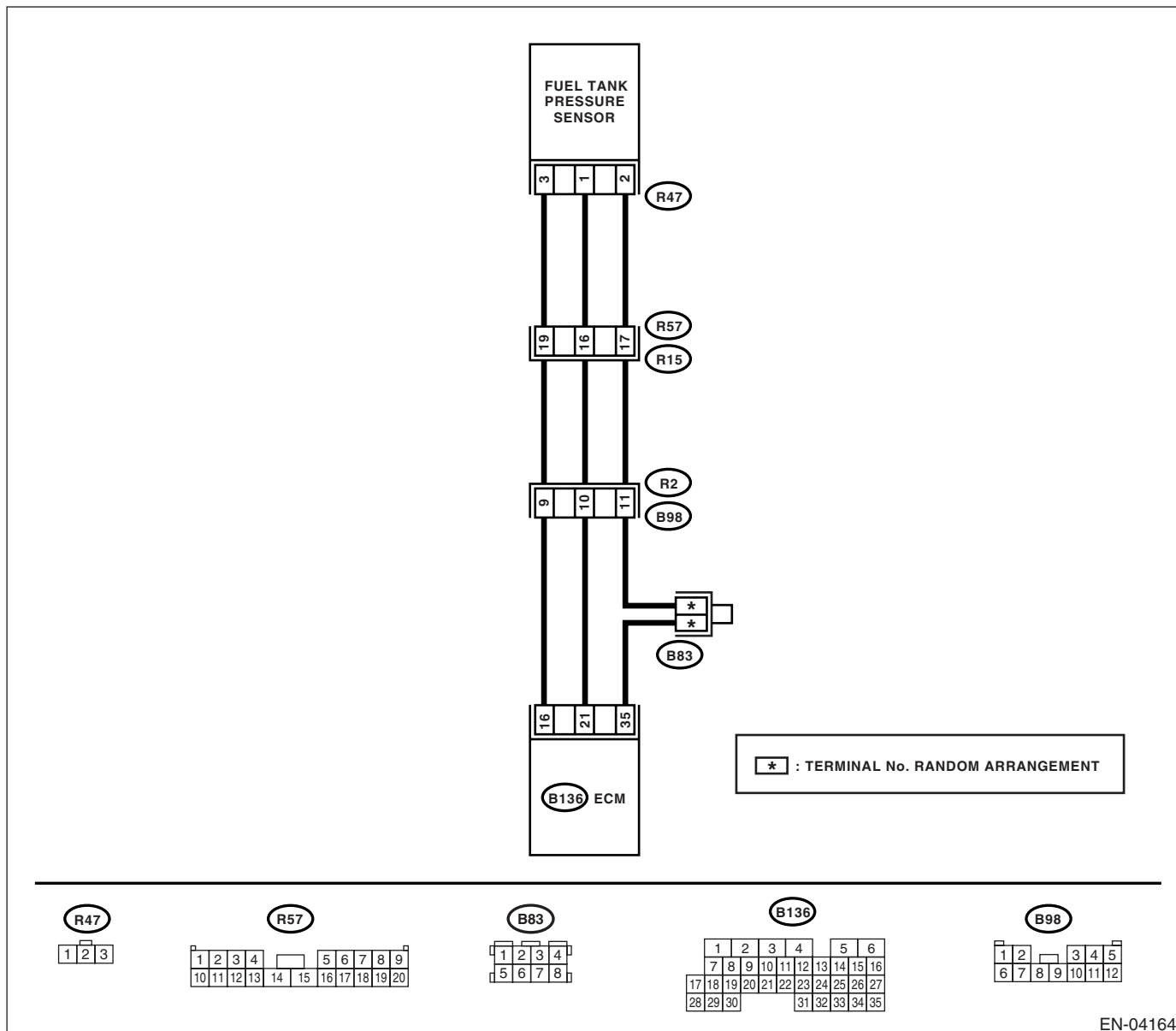
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-145, DTC P0452 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04164

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK CURRENT DATA. 1) Turn ignition switch to OFF. 2) Remove the fuel filler cap. 3) Install the fuel filler cap. 4) Turn ignition switch to ON. 5) Read the data of fuel tank pressure sensor signal using Subaru Select Monitor or the general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STI)(diag)-28, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the measured value less than -2.8 kPa (-21.0 mmHg, -0.827 inHg)?	Go to step 2.	The malfunction indicator light may light up, however, the circuit is returned to the normal status at the moment.
2 CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B136) No. 16 (+) — Chassis ground (-):	Is the voltage more than 4.5 V?	Go to step 4.	Go to step 3.
3 CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B136) No. 16 (+) — Chassis ground (-):	Does the measured value exceed the specified value by shaking the ECM harness and connector?	Repair poor contact in ECM connector.	Contact your SOA Service Center since deterioration of some parts may be the cause.
4 CHECK INPUT SIGNAL FOR ECM. Measure the voltage between ECM and chassis ground. Connector & terminal (B136) No. 21 (+) — Chassis ground (-):	Is the voltage less than 0.2 V?	Go to step 6.	Go to step 5.
5 CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.) Read the data of fuel tank pressure sensor signal using Subaru Select Monitor. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STI)(diag)-28, Subaru Select Monitor.>	Does the measured value exceed the specified value by shaking the ECM harness and connector?	Repair poor contact in ECM connector.	Go to step 6.
6 CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS. 1) Turn ignition switch to OFF. 2) Remove the rear seat cushion. 3) Separate rear wiring harness and fuel tank cord. 4) Turn ignition switch to ON. 5) Measure the voltage between rear wiring harness connector and chassis ground. Connector & terminal (R15) No. 19 (+) — Chassis ground (-):	Is the voltage more than 4.5 V?	Go to step 7.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and rear wiring harness connector • Poor contact in coupling connector

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
7 CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS. 1) Turn ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM and rear wiring harness connector. Connector & terminal (B136) No. 35 — (R15) No. 17:	Is the resistance less than 1 Ω ?	Go to step 8.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and rear wiring harness connector • Poor contact in coupling connector • Poor contact in joint connector
8 CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS. Measure the resistance of harness between rear wiring harness connector and chassis ground. Connector & terminal (R15) No. 17 — Chassis ground:	Is the resistance more than 1 $M\Omega$?	Go to step 9.	Repair short circuit to ground in harness between ECM and rear wiring harness connector.
9 CHECK FUEL TANK CORD. 1) Disconnect the connector from fuel tank pressure sensor. 2) Measure the resistance of fuel tank cord. Connector & terminal (R57) No. 19 — (R47) No. 3:	Is the resistance less than 1 Ω ?	Go to step 10.	Repair open circuit in fuel tank cord.
10 CHECK FUEL TANK CORD. Measure the resistance of fuel tank cord. Connector & terminal (R57) No. 17 — (R47) No. 2:	Is the resistance less than 1 Ω ?	Go to step 11.	Repair open circuit in fuel tank cord.
11 CHECK FUEL TANK CORD. Measure the resistance of harness between fuel tank pressure sensor connector and engine ground. Connector & terminal (R47) No. 1 — Chassis ground:	Is the resistance more than 1 $M\Omega$?	Go to step 12.	Repair short circuit to ground in fuel tank cord.
12 CHECK FOR POOR CONTACT. Check for poor contact in fuel tank pressure sensor connector.	Is there poor contact in fuel tank pressure sensor connector?	Repair poor contact in fuel tank pressure sensor connector.	Replace the fuel tank pressure sensor. <Ref. to EC(STI)-10, Fuel Tank Pressure Sensor.>

BF:DTC P0453 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT

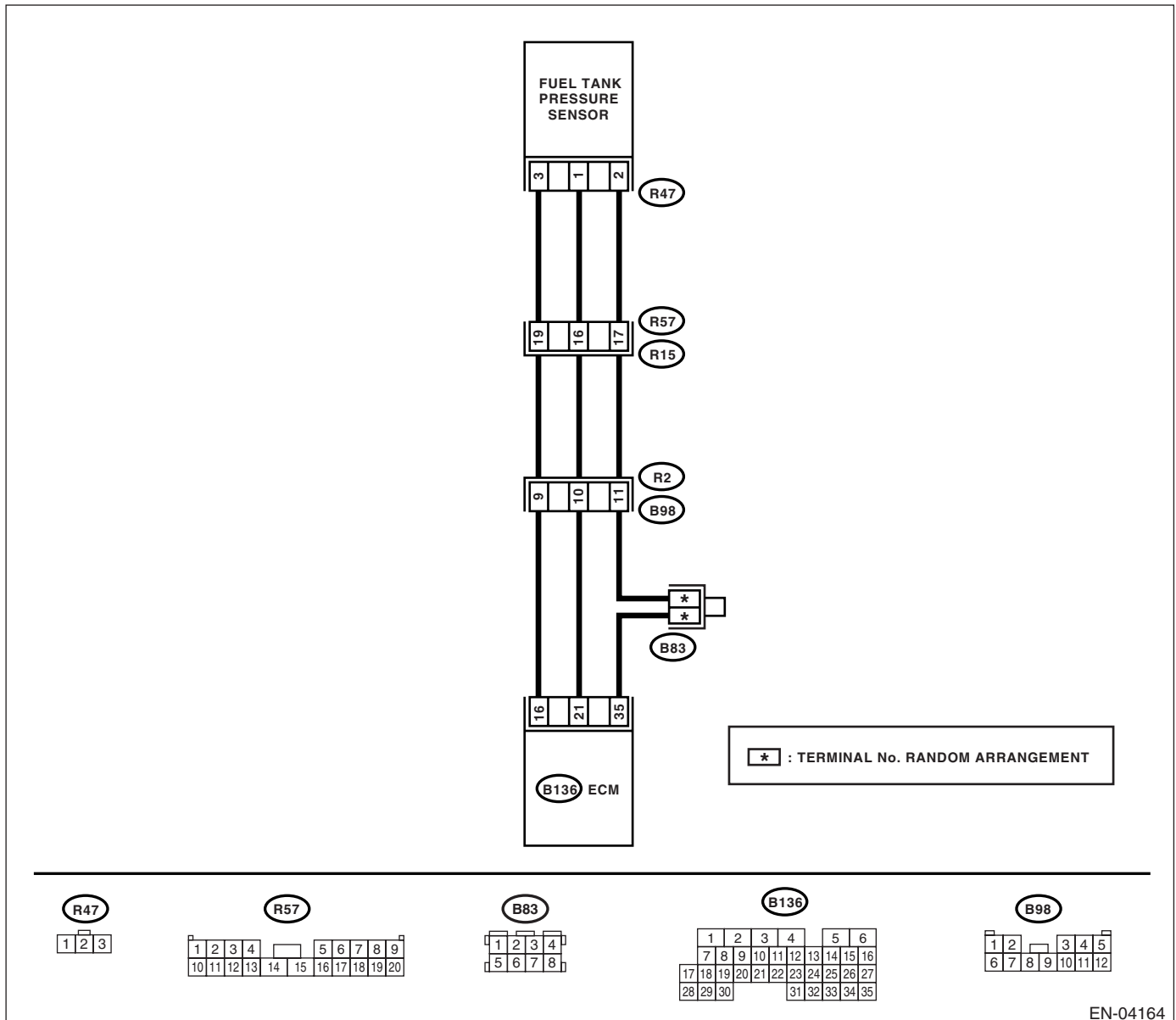
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-147, DTC P0453 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04164

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK CURRENT DATA. 1) Turn ignition switch to OFF. 2) Remove the fuel filler cap. 3) Install the fuel filler cap. 4) Turn ignition switch to ON. 5) Read the data of fuel tank pressure sensor signal using Subaru Select Monitor or the general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STI)(diag)-28, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the measured value more than 2.8 kPa (21.0 mmHg, 0.827 inHg)	Go to step 11.	Go to step 2.
2 CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B136) No. 16 (+) — Chassis ground (-):	Is the voltage more than 4.5 V?	Go to step 4.	Go to step 3.
3 CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B136) No. 16 (+) — Chassis ground (-):	Does the measured value exceed the specified value by shaking the ECM harness and connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).>
4 CHECK INPUT SIGNAL FOR ECM. Measure the voltage between ECM and chassis ground. Connector & terminal (B136) No. 21 (+) — Chassis ground (-):	Is the voltage less than 0.2 V?	Go to step 6.	Go to step 5.
5 CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.) Read the data of fuel tank pressure sensor signal using Subaru Select Monitor. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STI)(diag)-28, Subaru Select Monitor.>	Does the measured value exceed -2.8 kPa (-21.0 mmHg, -0.827 inHg) by shaking the ECM harness and connector?	Repair poor contact in ECM connector.	Go to step 6.
6 CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS. 1) Turn ignition switch to OFF. 2) Remove the rear seat cushion. 3) Separate rear wiring harness and fuel tank cord. 4) Turn ignition switch to ON. 5) Measure the voltage between rear wiring harness connector and chassis ground. Connector & terminal (R15) No. 19 (+) — Chassis ground (-):	Is the voltage more than 4.5 V?	Go to step 7.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and rear wiring harness connector • Poor contact in coupling connector

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
7 CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS. 1) Turn ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM and rear wiring harness connector. Connector & terminal (B136) No. 21 — (R15) No. 16: (B136) No. 35 — (R15) No. 17:	Is the resistance less than 1 Ω ?	Go to step 8.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and rear wiring harness connector • Poor contact in coupling connector
8 CHECK FUEL TANK CORD. 1) Disconnect the connector from fuel tank pressure sensor. 2) Measure the resistance of fuel tank cord. Connector & terminal (R57) No. 16 — (R47) No. 1:	Is the resistance less than 1 Ω ?	Go to step 9.	Repair open circuit in fuel tank cord.
9 CHECK FUEL TANK CORD. Measure the resistance of fuel tank cord. Connector & terminal (R57) No. 17 — (R47) No. 2:	Is the resistance less than 1 Ω ?	Go to step 10.	Repair open circuit in fuel tank cord.
10 CHECK FOR POOR CONTACT. Check for poor contact in fuel tank pressure sensor connector.	Is there poor contact in fuel tank pressure sensor connector?	Repair poor contact in fuel tank pressure sensor connector.	Replace the fuel tank pressure sensor. <Ref. to EC(STI)-10, Fuel Tank Pressure Sensor.>
11 CHECK HARNESS BETWEEN ECM AND FUEL TANK PRESSURE SENSOR CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect the connector from fuel tank pressure sensor. 3) Turn ignition switch to ON. 4) Read the data of fuel tank pressure sensor signal using Subaru Select Monitor or the general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STI)(diag)-28, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the measured value more than 2.8 kPa (21.0 mmHg, 0.827 inHg)?	Repair short circuit to battery in harness between ECM and fuel tank pressure sensor connector.	Replace the fuel tank pressure sensor. <Ref. to EC(STI)-10, Fuel Tank Pressure Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

BG:DTC P0456 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-148, 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.

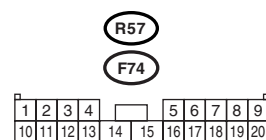
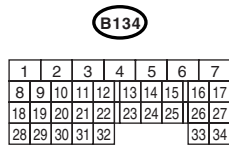
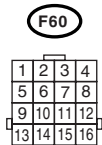
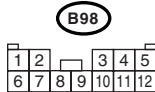
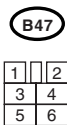
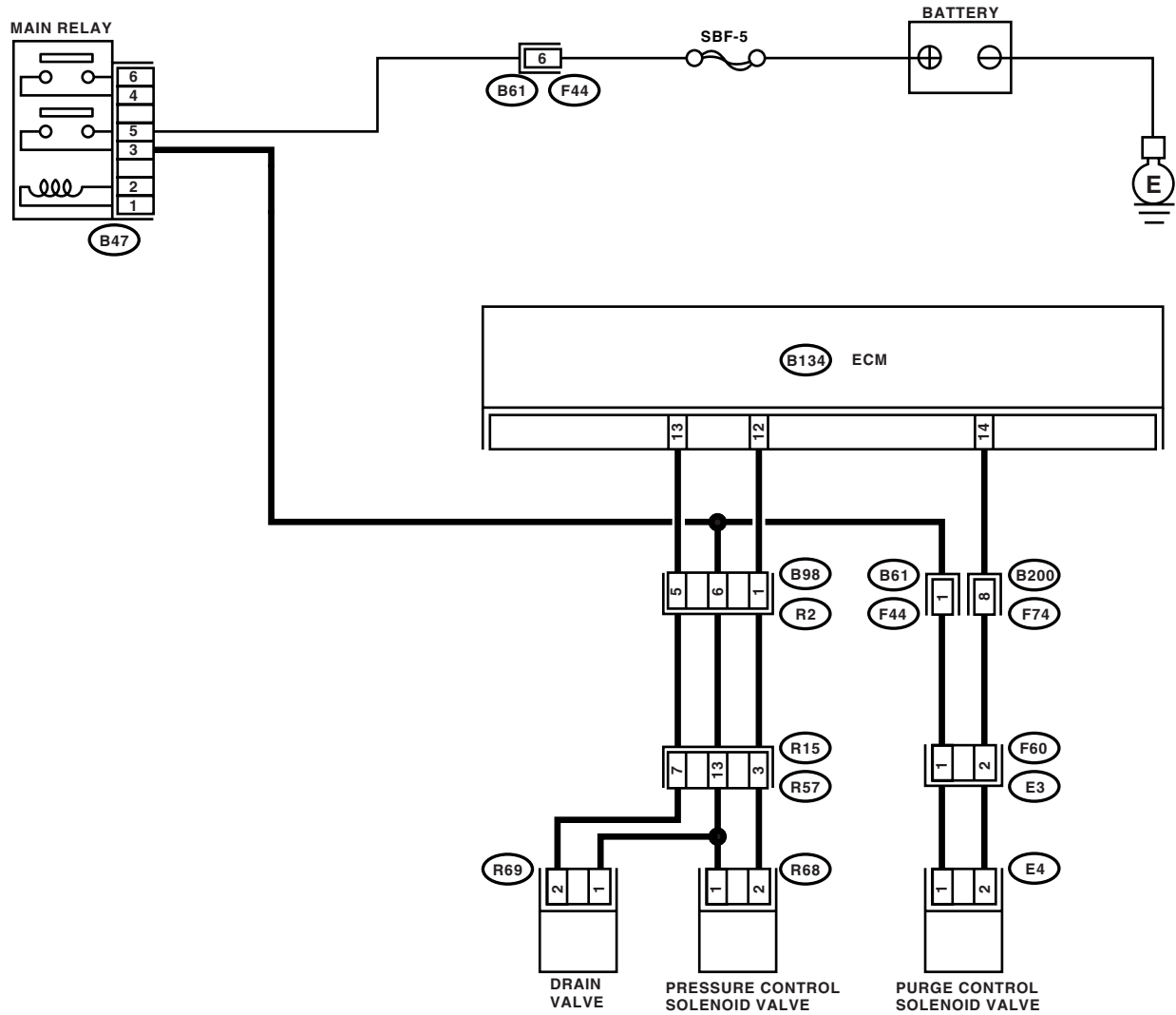
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-04162

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK FOR ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK FUEL FILLER CAP. 1) Turn ignition switch to OFF. 2) Check the fuel filler cap. NOTE: The DTC is stored in memory if fuel filler cap is or was loose or if the cap chain was caught while tightening.	Is the fuel filler cap tightened securely?	Go to step 3.	Tighten fuel filler cap securely.
3 CHECK FUEL FILLER CAP.	Is the fuel filler cap SUBARU genuine?	Go to step 4.	Replace with a SUBARU genuine fuel filler cap.
4 CHECK FUEL FILLER PIPE PACKING.	Is there any damage to the seal between fuel filler cap and fuel filler pipe?	Repair or replace the fuel filler cap and fuel filler pipe. <Ref. to FU(STI)-48, Fuel Filler Pipe.>	Go to step 5.
5 CHECK DRAIN VALVE. 1) Connect the test mode connector. 2) Turn ignition switch to ON. 3) Operate the drain valve. NOTE: Drain valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(STI)(diag)-46, Compulsory Valve Operation Check Mode.>	Does the drain valve operate?	Go to step 6.	Replace the drain valve. <Ref. to EC(STI)-16, Drain Valve.>
6 CHECK PURGE CONTROL SOLENOID VALVE. Operate the purge control solenoid valve. NOTE: Purge control solenoid valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(STI)(diag)-46, Compulsory Valve Operation Check Mode.>	Does the purge control solenoid valve operate?	Go to step 7.	Replace the purge control solenoid valve. <Ref. to EC(STI)-6, Purge Control Solenoid Valve.>
7 CHECK PRESSURE CONTROL SOLENOID VALVE. Operate the pressure control solenoid valve. NOTE: Pressure control solenoid valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(STI)(diag)-46, Compulsory Valve Operation Check Mode.>	Does the pressure control solenoid valve operate?	Go to step 8.	Replace the pressure control solenoid valve. <Ref. to EC(STI)-6, Purge Control Solenoid Valve.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
8 CHECK EVAPORATIVE EMISSION CONTROL SYSTEM LINE. Turn ignition switch to OFF.	Is there a hole of more than 0.5 mm (0.020 in) dia. on evaporation line?	Repair or replace the evaporation line. <Ref. to FU(STI)-60, Fuel Delivery, Return and Evaporation Lines.>	Go to step 9 .
9 CHECK CANISTER.	Is the canister damaged or is there a hole of more than 0.5 mm (0.020 in) dia. in it?	Repair or replace the canister. <Ref. to EC(STI)-5, Canister.>	Go to step 10 .
10 CHECK FUEL TANK. Remove the fuel tank. <Ref. to FU(H4DOTC)-51, Fuel Tank.>	Is the fuel tank damaged or is there a hole of more than 0.5 mm (0.020 in) dia. in it?	Repair or replace the fuel tank. <Ref. to FU(STI)-45, Fuel Tank.>	Go to step 11 .
11 CHECK ANY OTHER MECHANICAL TROUBLE IN EVAPORATIVE EMISSION CONTROL SYSTEM.	Are there holes of more than 0.5 mm (0.020 in) dia., cracks, clogging, or disconnections, bend, misconnection of hoses or pipes in evaporative emission control system?	Repair or replace the hoses or pipes.	Contact your SOA Service Center since deterioration of some parts may be the cause.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

BH:DTC P0457 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-148, DTC P0457 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Fuel odor
- Fuel filler cap is loose or not installed.

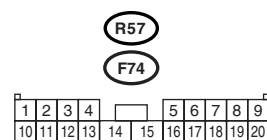
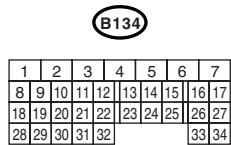
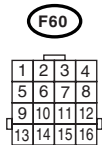
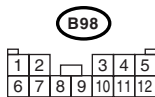
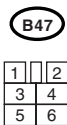
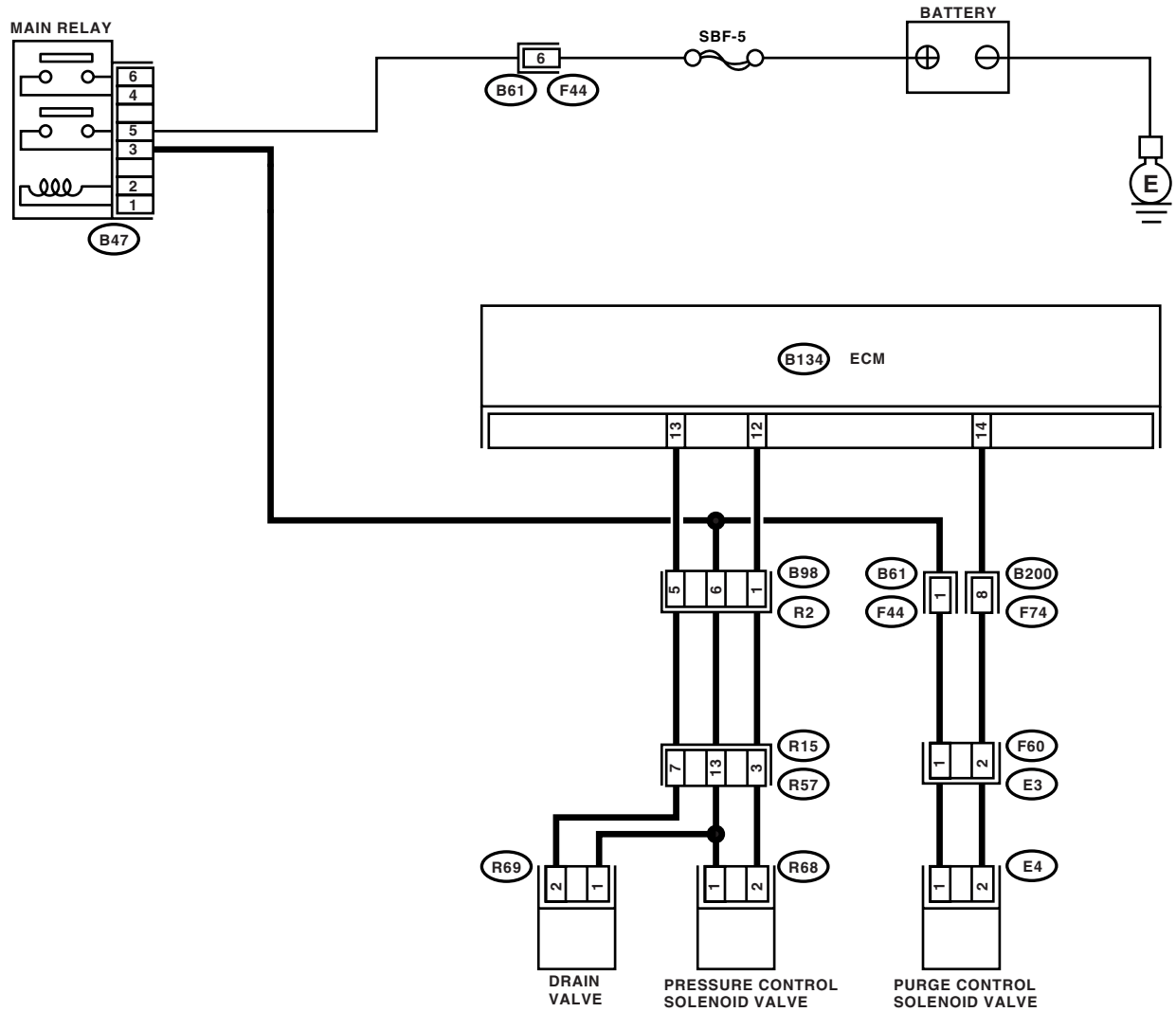
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-04162

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK FOR ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK FUEL FILLER CAP. 1) Turn ignition switch to OFF. 2) Check the fuel filler cap. NOTE: The DTC is stored in memory if fuel filler cap is or was loose or if the cap chain was caught while tightening.	Is the fuel filler cap tightened securely?	Go to step 3.	Tighten fuel filler cap securely.
3 CHECK FUEL FILLER CAP.	Is the fuel filler cap SUBARU genuine?	Go to step 4.	Replace with a SUBARU genuine fuel filler cap.
4 CHECK FUEL FILLER PIPE PACKING.	Is there any damage to the seal between fuel filler cap and fuel filler pipe?	Repair or replace the fuel filler cap and fuel filler pipe. <Ref. to FU(STI)-48, Fuel Filler Pipe.>	Go to step 5.
5 CHECK DRAIN VALVE. 1) Connect the test mode connector. 2) Turn ignition switch to ON. 3) Operate the drain valve. NOTE: Drain valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(STI)(diag)-46, Compulsory Valve Operation Check Mode.>	Does the drain valve operate?	Go to step 6.	Replace the drain valve. <Ref. to EC(STI)-16, Drain Valve.>
6 CHECK PURGE CONTROL SOLENOID VALVE. Operate the purge control solenoid valve. NOTE: Purge control solenoid valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).>	Does the purge control solenoid valve operate?	Go to step 7.	Replace the purge control solenoid valve. <Ref. to EC(STI)-6, Purge Control Solenoid Valve.>
7 CHECK PRESSURE CONTROL SOLENOID VALVE. Operate the pressure control solenoid valve. NOTE: Pressure control solenoid valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(STI)(diag)-46, Compulsory Valve Operation Check Mode.>	Does the pressure control solenoid valve operate?	Go to step 8.	Replace the pressure control solenoid valve. <Ref. to EC(STI)-6, Purge Control Solenoid Valve.>
8 CHECK CANISTER.	Is the canister damaged?	Repair or replace the canister. <Ref. to EC(STI)-5, Canister.>	Go to step 9.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
9 CHECK FUEL TANK. Remove the fuel tank. <Ref. to FU(STI)-45, Fuel Tank.>	Is the fuel tank damaged?	Repair or replace the fuel tank. <Ref. to FU(STI)-45, Fuel Tank.>	Go to step 10 .
10 CHECK ANY OTHER MECHANICAL TROUBLE IN EVAPORATIVE EMISSION CONTROL SYSTEM.	Are there holes of more than 0.5 mm (0.020 in) dia., cracks, clogging, or disconnections, misconnection of hoses or pipes in evaporative emission control system?	Repair or replace the hoses or pipes.	Contact your SOA Service Center since deterioration of some parts may be the cause.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

BI: DTC P0458 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-149, DTC P0458 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

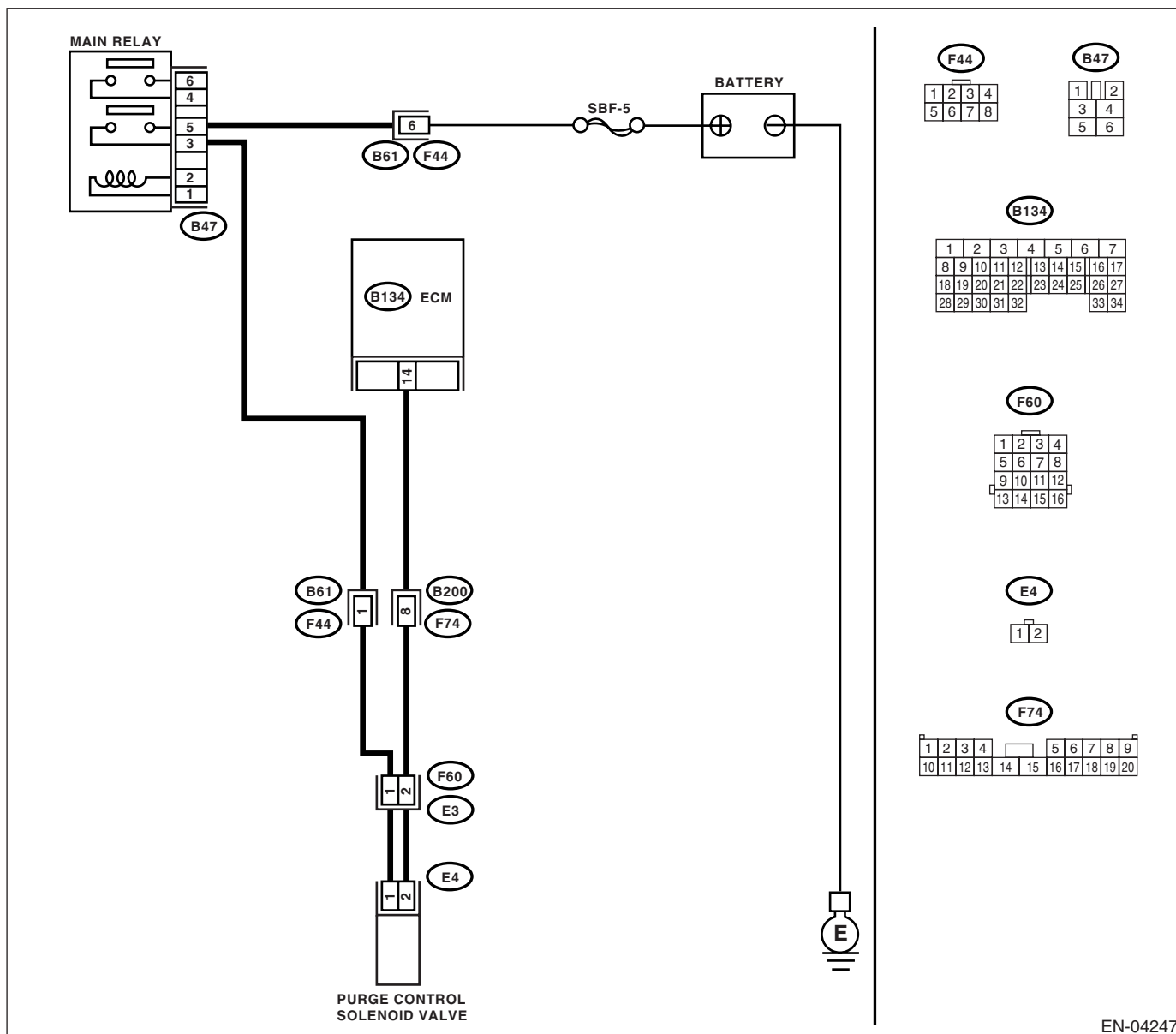
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04247

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OUTPUT SIGNAL FROM ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. Connector & terminal (B134) No. 14 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time.	Go to step 2.
2 CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from purge control solenoid valve and ECM. 3) Measure the resistance of harness between purge control solenoid valve connector and engine ground. Connector & terminal (E4) No. 2 — Engine ground:	Is the resistance more than 1 M Ω ?	Go to step 3.	Repair the ground short circuit in harness between ECM and purge control solenoid valve connector.
3 CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR. Measure the resistance of harness between ECM and purge control solenoid valve of harness connector. Connector & terminal (B134) No. 14 — (E4) No. 2:	Is the resistance less than 1 Ω ?	Go to step 4.	Repair the open circuit in harness between ECM and purge control solenoid valve connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and purge control solenoid valve connector • Poor contact in coupling connector
4 CHECK PURGE CONTROL SOLENOID VALVE. 1) Remove the purge control solenoid valve. 2) Measure the resistance between purge control solenoid valve terminals. Terminals No. 1 — No. 2:	Is the resistance 10 — 100 Ω ?	Go to step 5.	Replace the purge control solenoid valve. <Ref. to EC(STI)-6, Purge Control Solenoid Valve.>
5 CHECK POWER SUPPLY TO PURGE CONTROL SOLENOID VALVE. 1) Turn the ignition switch to ON. 2) Measure the voltage between purge control solenoid valve and engine ground. Connector & terminal (E4) No. 1 (+) — Engine ground (-):	Is the voltage more than 10 V?	Go to step 6.	Repair the open circuit in harness between main relay and purge control solenoid valve connector.
6 CHECK POOR CONTACT. Check poor contact in purge control solenoid valve connector.	Is there poor contact in purge control solenoid valve connector?	Repair the poor contact in purge control solenoid valve connector.	Contact your SOA Service Center since deterioration of some parts may be the cause.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

BJ:DTC P0459 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-151, DTC P0459 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

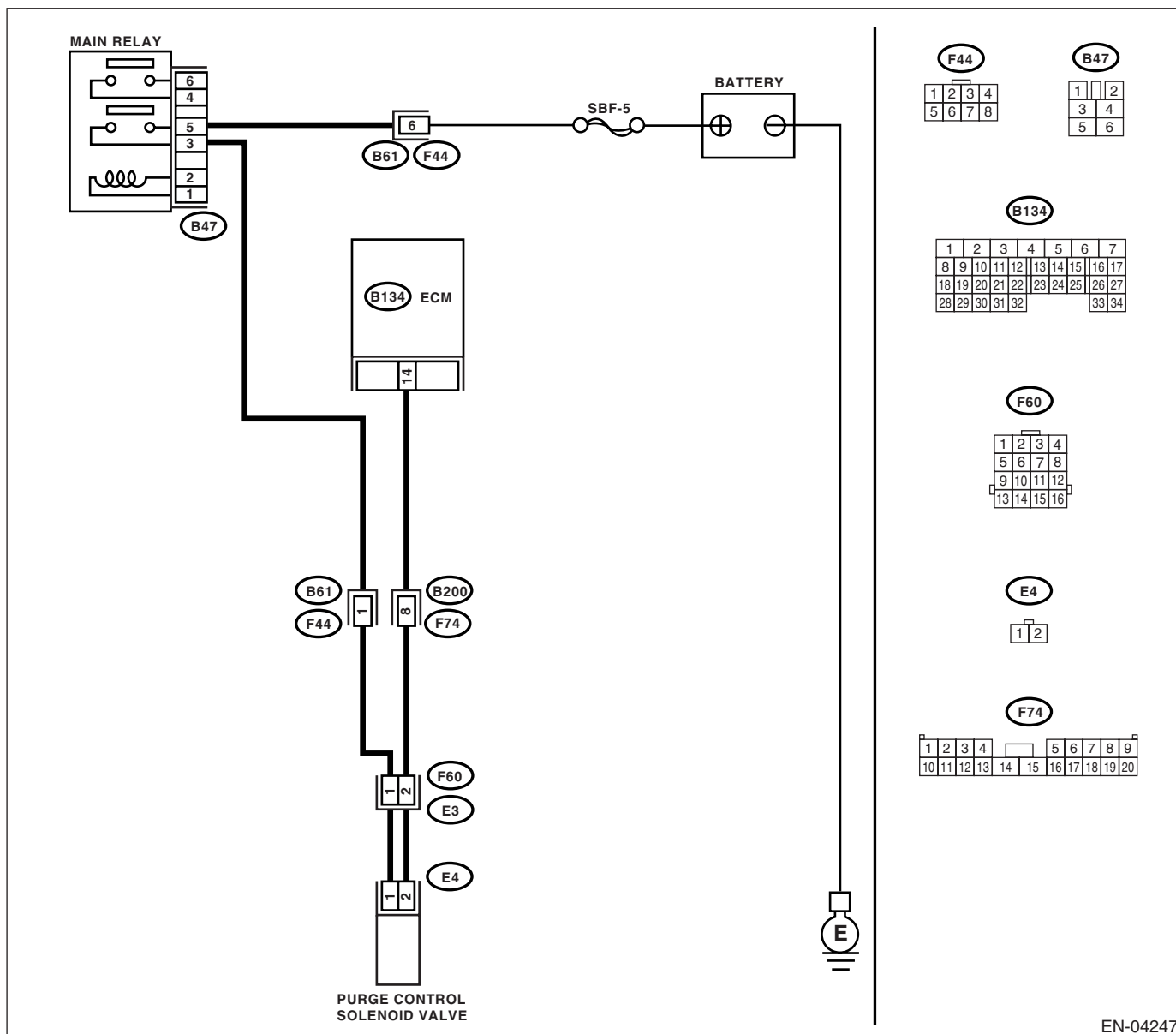
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04247

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OUTPUT SIGNAL FROM ECM. 1) Turn the ignition switch to OFF. 2) Connect the test mode connector at the lower portion of instrument panel (on the driver's side). 3) Turn the ignition switch to ON. 4) While operating the purge control solenoid valve, measure the voltage between ECM and chassis ground. NOTE: Purge control solenoid valve operation can be executed using the Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(STI)(diag)-46, Compulsory Valve Operation Check Mode.> Connector & terminal (B134) No. 14 (+) — Chassis ground (-):	Is the voltage 0 — 13 V?	Go to step 2.	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. In this case, repair the poor contact in ECM connector.
2 CHECK OUTPUT SIGNAL FROM ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. Connector & terminal (B134) No. 14 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 4.	Go to step 3.
3 CHECK POOR CONTACT. Check the poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).>
4 CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from purge control solenoid valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. Connector & terminal (B134) No. 14 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Repair the battery short circuit in harness between ECM and purge control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).>	Go to step 5.
5 CHECK PURGE CONTROL SOLENOID VALVE. 1) Turn the ignition switch to OFF. 2) Measure the resistance between purge control solenoid valve terminals. Terminals No. 1 — No. 2:	Is the resistance less than 1 Ω ?	Replace the purge control solenoid valve and ECM <Ref. to EC(STI)-6, Purge Control Solenoid Valve.> ECM <Ref. to FU(STI)-39, Engine Control Module (ECM).>	Go to step 6.
6 CHECK POOR CONTACT. Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

BK:DTC P0461 FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-153, DTC P0461 FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

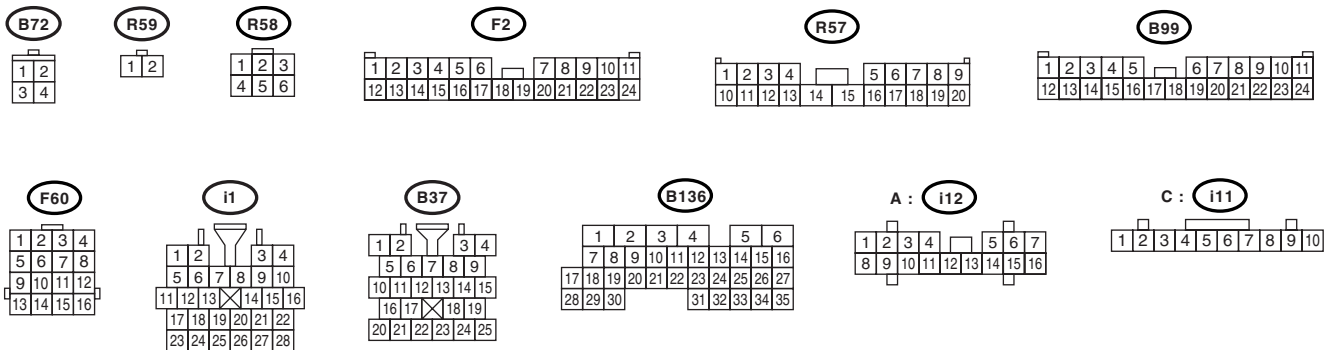
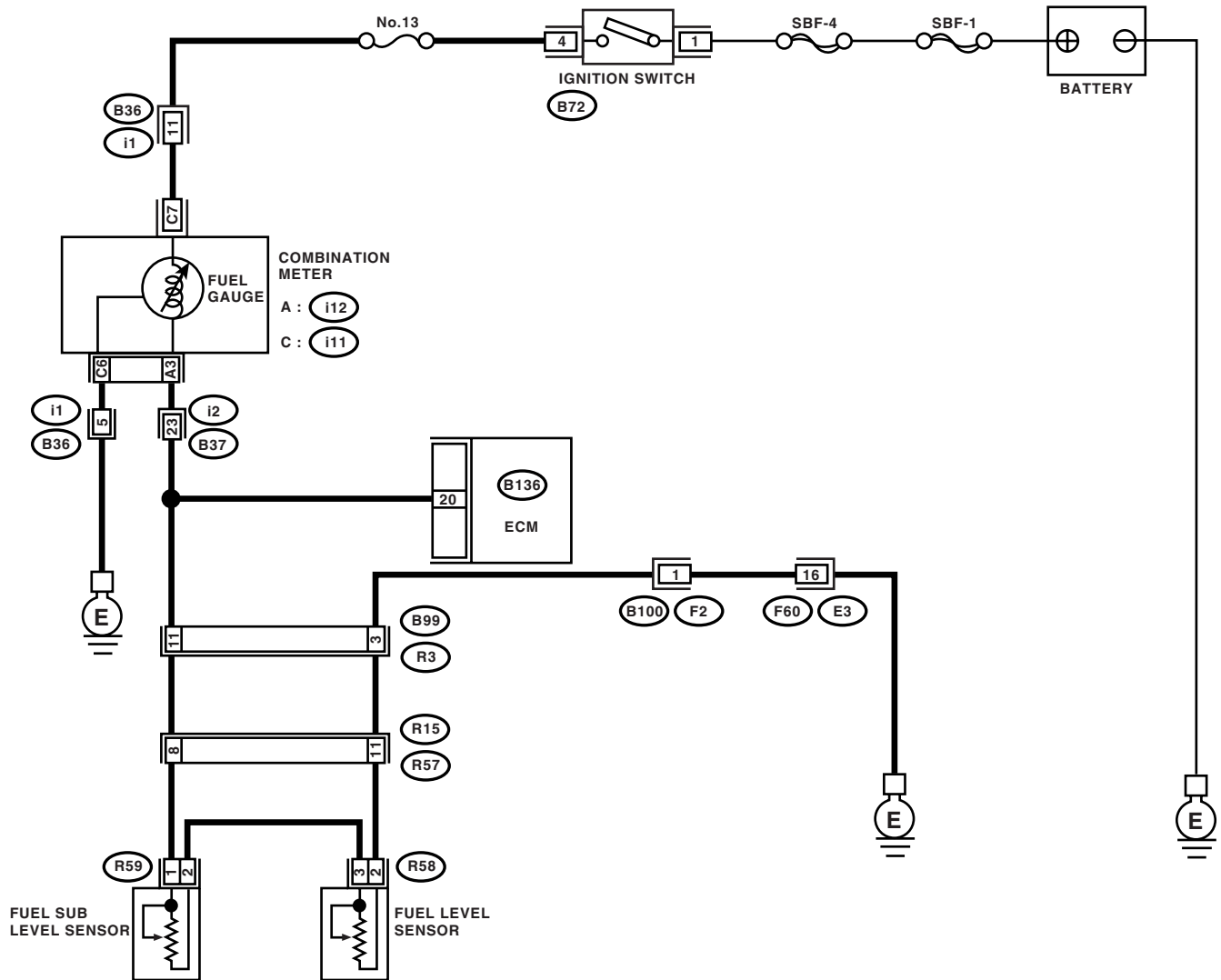
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-04712

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK FOR ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0461.	Replace the fuel level sensor. <Ref. to FU(STI)-54, Fuel Level Sensor.> and fuel sub level sensor <Ref. to FU(STI)-55, Fuel Sub Level Sensor.>

BL:DTC P0462 FUEL LEVEL SENSOR CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-155, DTC P0462 FUEL LEVEL SENSOR CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

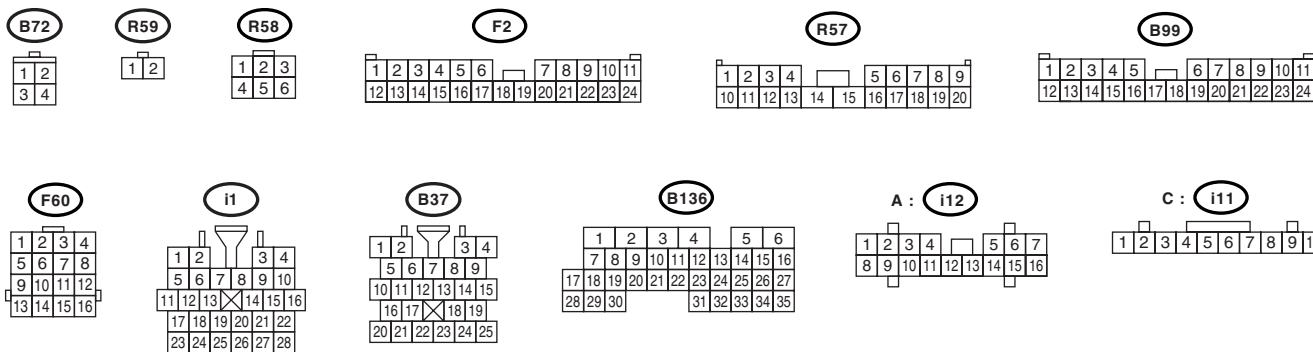
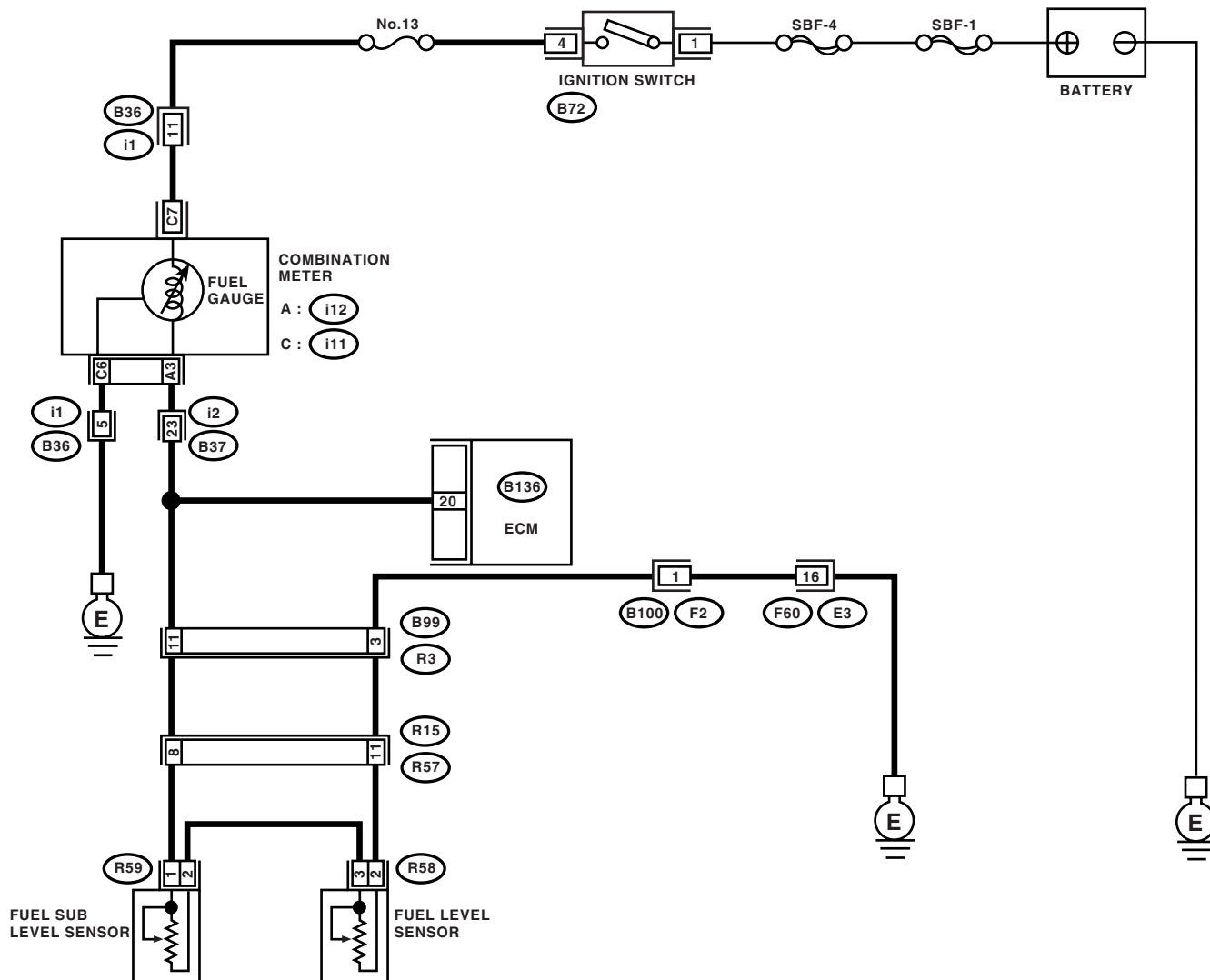
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-04712

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1	CHECK SPEEDOMETER AND TACHOMETER OPERATION IN COMBINATION METER.	Go to step 2.	Repair or replace the combination meter. <Ref. to IDI-3, Combination Meter System.>
2	CHECK INPUT SIGNAL FOR ECM. 1) Turn the ignition switch to ON. (engine OFF) 2) Measure the voltage between ECM connector and chassis ground. Connector & terminal (B136) No. 20 (+) — Chassis ground (-):	Go to step 4.	Go to step 3.
3	CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR) Read the data of fuel level sensor signal using Subaru Select Monitor. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STI)(diag)-28, Subaru Select Monitor.>	Repair the poor contact in ECM connector.	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following: • Poor contact in combination meter connector • Poor contact in ECM connector • Poor contact in coupling connectors
4	CHECK INPUT VOLTAGE OF ECM. 1) Turn the ignition switch to OFF. 2) Separate the fuel tank cord connector (R57) and rear wiring harness connector (R15). 3) Turn the ignition switch to ON. 4) Measure the voltage of harness between ECM connector and chassis ground. Connector & terminal (B136) No. 20 (+) — Chassis ground (-):	Go to step 5.	Go to step 6.
5	CHECK HARNESS BETWEEN ECM AND COMBINATION METER. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from connector (i11), (i12) and ECM connector. 3) Measure the resistance between ECM and chassis ground. Connector & terminal (B136) No. 20 — Chassis ground:	Go to step 7.	Repair the ground short circuit in harness between ECM and combination meter connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
6 CHECK HARNESS BETWEEN ECM AND COMBINATION METER. Measure the resistance between ECM and combination meter connector. Connector & terminal (B136) No. 20 — (i12) No. 3:	Is the resistance less than 10 Ω ?	Repair or replace the combination meter. <Ref. to IDI-3, Combination Meter System.>	Repair the open circuit between ECM and combination meter connector. NOTE: In this case, repair the following: Poor contact in coupling connector
7 CHECK FUEL TANK CORD. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel sub level sensor. 3) Measure the resistance between fuel sub level sensor and chassis ground. Connector & terminal (R59) No. 1 — Chassis ground:	Is the resistance more than 1 M Ω ?	Go to step 8.	Repair the ground short circuit in fuel tank cord.
8 CHECK FUEL TANK CORD. 1) Disconnect the connector from fuel pump assembly. 2) Measure the resistance between fuel pump assembly and chassis ground. Connector & terminal (R59) No. 2 — Chassis ground:	Is the resistance more than 1 M Ω ?	Go to step 9.	Repair the ground short circuit in fuel tank cord.
9 CHECK FUEL LEVEL SENSOR. 1) Remove the fuel pump assembly. <Ref. to FU(STI)-52, Fuel Pump.> 2) Measure the resistance between fuel level sensor and terminals with its float set to the full position. Terminals No. 2 — No. 3:	Is the resistance 0.5 — 2.5 Ω ?	Go to step 10.	Replace the fuel level sensor.
10 CHECK FUEL SUB LEVEL SENSOR. 1) Remove the fuel sub level sensor. <Ref. to FU(STI)-55, Fuel Sub Level Sensor.> 2) Measure the resistance between fuel sub level sensor and terminals with its float set to the full position. Terminals No. 1 — No. 2:	Is the resistance 0.5 — 2.5 Ω ?	Repair the poor contact in harness between ECM and combination meter connector.	Replace the fuel sub level sensor.

BM:DTC P0463 FUEL LEVEL SENSOR CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-157, DTC P0463 FUEL LEVEL SENSOR CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

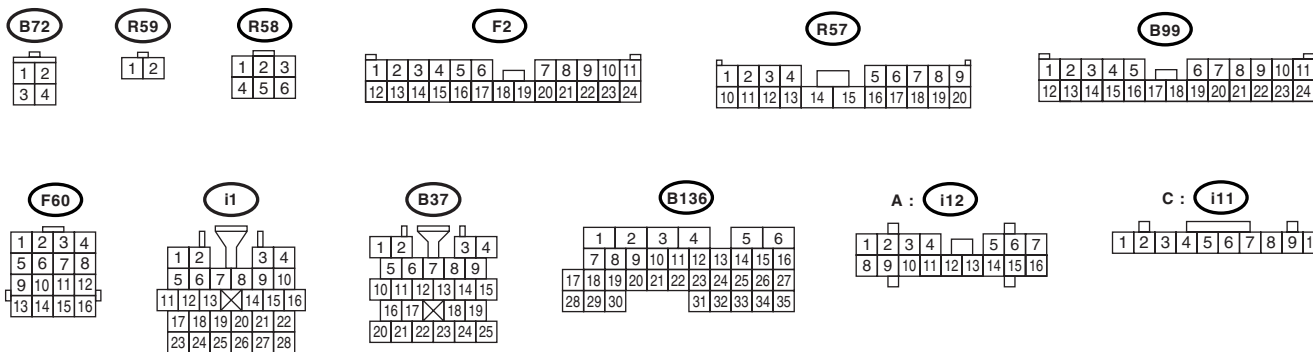
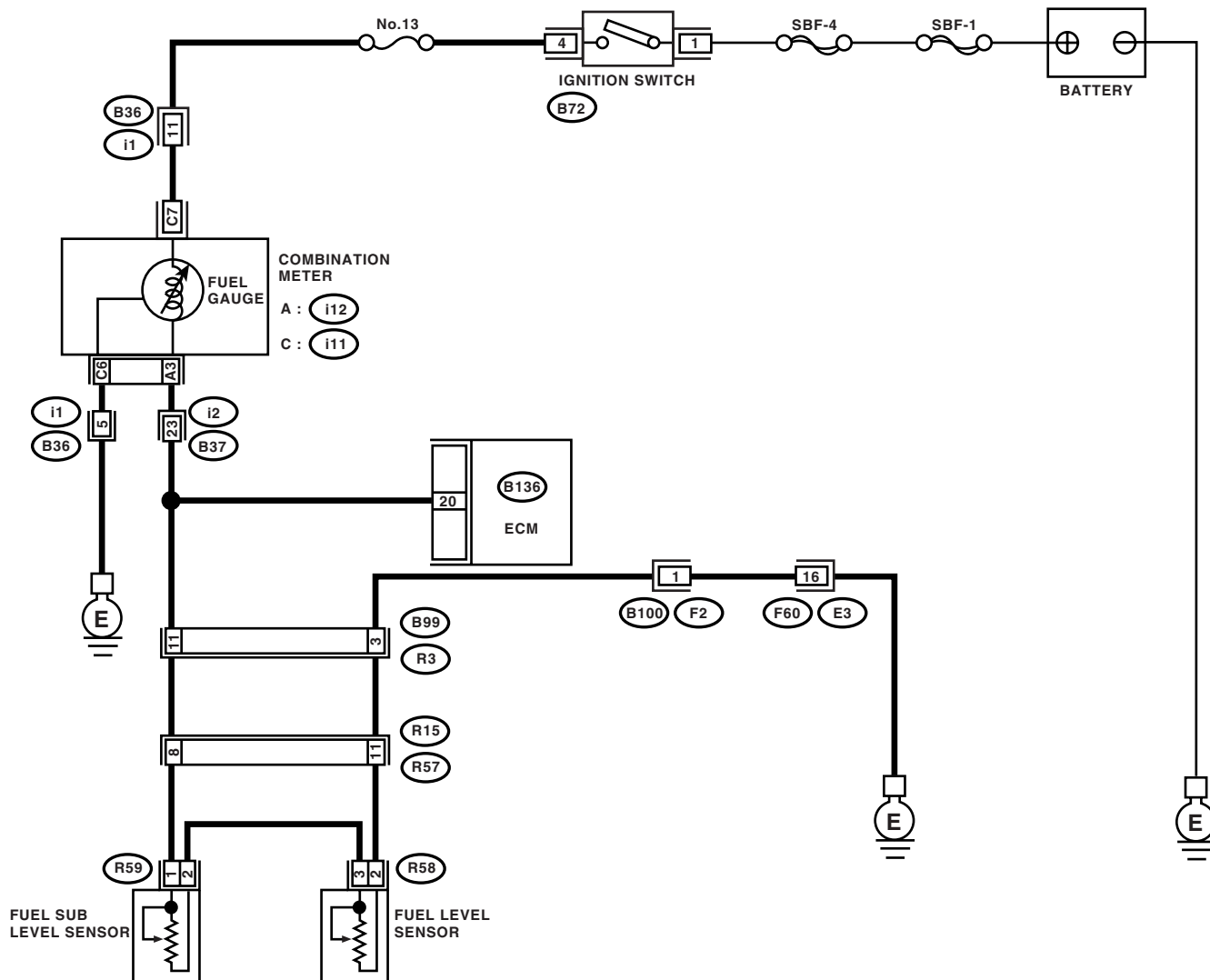
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-04712

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK SPEEDOMETER AND TACHOMETER OPERATION IN COMBINATION METER.	Does the speedometer and tachometer operate normally?	Go to step 2.	Repair or replace the combination meter. <Ref. to IDI-3, Combination Meter System.>
2 CHECK INPUT SIGNAL FOR ECM. 1) Turn the ignition switch to ON. (engine OFF) 2) Measure the voltage between ECM connector and chassis ground. Connector & terminal (B136) No. 20 (+) — Chassis ground (-):	Is the voltage more than 4.75 V?	Go to step 3.	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following: • Poor contact in fuel pump connector • Poor contact in coupling connector
3 CHECK INPUT VOLTAGE OF ECM. 1) Turn the ignition switch to OFF. 2) Disconnect the combination meter connector (i11) and ECM connector. 3) Turn the ignition switch to ON. 4) Measure the voltage of harness between ECM and chassis ground. Connector & terminal (B136) No. 20 (+) — Chassis ground (-):	Is the voltage more than 4.75 V?	Go to step 4.	Repair the battery short circuit between ECM and combination meter connector.
4 CHECK HARNESS BETWEEN ECM AND FUEL TANK CORD. 1) Turn the ignition switch to OFF. 2) Separate the fuel tank cord connector (R57) and rear wiring harness connector (R15). 3) Measure the resistance between ECM and fuel tank cord. Connector & terminal (B136) No. 20 — (R15) No. 8:	Is the resistance less than 5 Ω ?	Go to step 5.	Repair the open circuit between ECM and fuel tank cord.
5 CHECK HARNESS BETWEEN FUEL TANK CORD AND CHASSIS GROUND. Measure the resistance between fuel tank cord and chassis ground. Connector & terminal (R15) No. 11 — Chassis ground:	Is the resistance less than 5 Ω ?	Go to step 6.	Repair the open circuit between fuel tank cord and chassis ground. NOTE: In this case, repair the following: Poor contact in coupling connectors
6 CHECK FUEL TANK CORD. 1) Disconnect the connector from fuel level sensor. 2) Measure the resistance between fuel level sensor and coupling connector. Connector & terminal (R57) No. 11 — (R58) No. 2:	Is the resistance less than 10 Ω ?	Go to step 7.	Repair the open circuit between coupling connector and fuel level sensor.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
7 CHECK FUEL TANK CORD. 1) Disconnect the connector from fuel sub level sensor. 2) Measure the resistance between fuel level sensor and fuel sub level sensor. Connector & terminal (R58) No. 3 — (R59) No. 2:	Is the resistance less than 10 Ω ?	Go to step 8.	Repair the open circuit between fuel level sensor and fuel sub level sensor.
8 CHECK FUEL TANK CORD. Measure the resistance between fuel sub level sensor and coupling connector. Connector & terminal (R57) No. 8 — (R59) No. 1:	Is the resistance less than 10 Ω ?	Go to step 9.	Repair the open circuit between coupling connector and fuel sub level sensor.
9 CHECK FUEL LEVEL SENSOR. 1) Remove the fuel pump assembly. <Ref. to FU(STI)-52, Fuel Pump.> 2) While moving the fuel level sensor float up and down, measure the resistance between fuel level sensor terminals. Terminals No. 2 — No. 3:	Is the resistance more than 53 Ω ?	Replace the fuel level sensor. <Ref. to FU(STI)-54, Fuel Level Sensor.>	Go to step 10.
10 CHECK FUEL SUB LEVEL SENSOR. 1) Remove the fuel sub level sensor. <Ref. to FU(STI)-55, Fuel Sub Level Sensor.> 2) While moving the fuel sub level sensor float up and down, measure the resistance between fuel sub level sensor terminals. Terminals No. 1 — No. 2:	Is the resistance more than 45 Ω ?	Replace the fuel sub level sensor. <Ref. to FU(STI)-55, Fuel Sub Level Sensor.>	Replace the combination meter. <Ref. to IDI-10, Combination Meter.>

BN:DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-159, DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

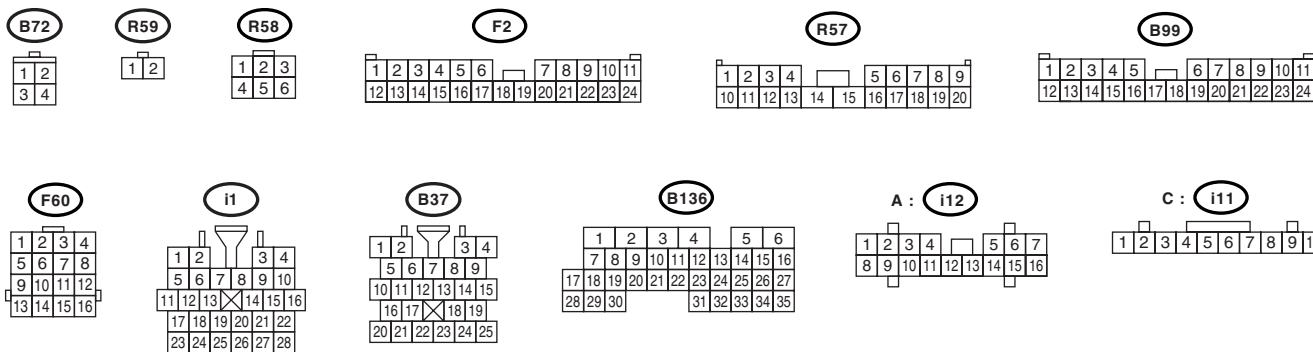
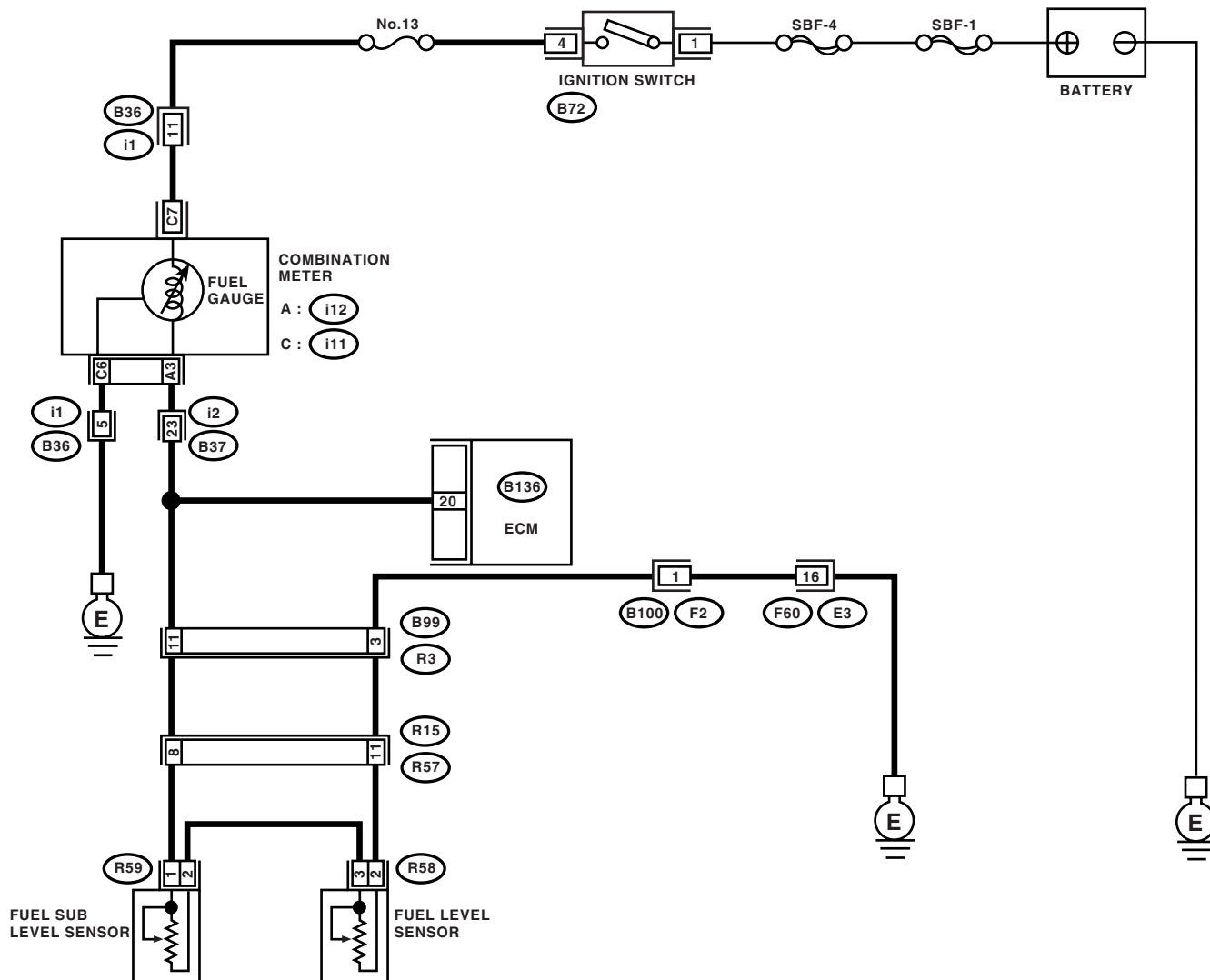
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-04712

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK FOR ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK FUEL LEVEL SENSOR. 1) Remove the fuel pump assembly. <Ref. to FU(STI)-52, Fuel Pump.> 2) While moving the fuel level sensor float up and down, make sure that the resistance between fuel level sensor terminals changes smoothly. Terminals No. 3 — No. 2:	Does the resistance change smoothly?	Go to step 3.	Replace the fuel level sensor. <Ref. to FU(STI)-54, Fuel Level Sensor.>
3 CHECK FUEL SUB LEVEL SENSOR. 1) Remove the fuel sub level sensor. <Ref. to FU(STI)-55, Fuel Sub Level Sensor.> 2) While moving the fuel sub level sensor float up and down, make sure that the resistance between fuel level sensor terminals changes smoothly. Terminals No. 1 — No. 2:	Does the resistance change smoothly?	Repair the poor contact in ECM, combination meter and coupling connectors.	Replace the fuel sub level sensor. <Ref. to FU(STI)-55, Fuel Sub Level Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

BO:DTC P0483 COOLING FAN RATIONALITY CHECK

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-162, DTC P0483 COOLING FAN RATIONALITY CHECK, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Occurrence of noise
- Overheating

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

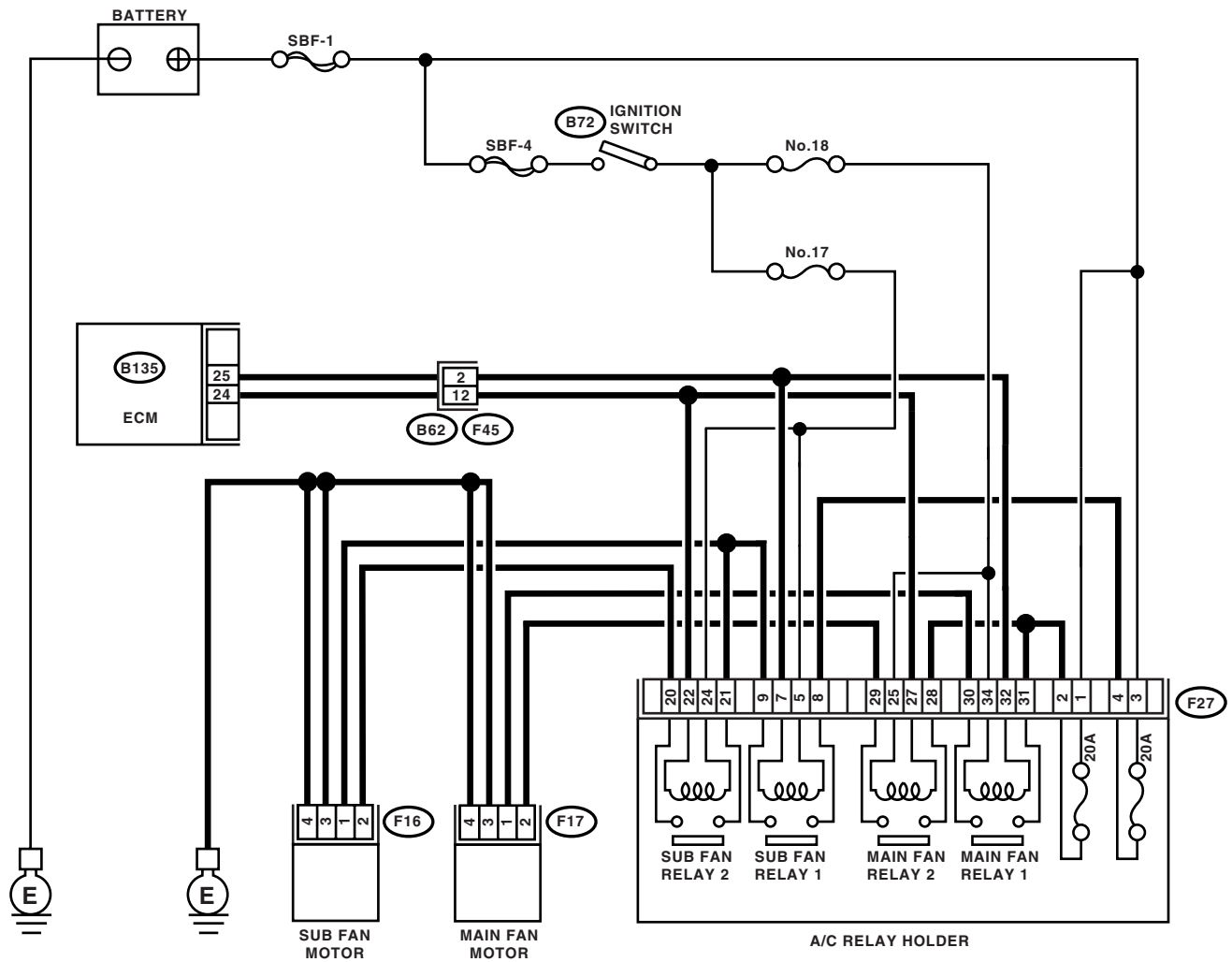
NOTE:

If the vehicle, with the engine idling, is placed very close to a wall or another vehicle, preventing normal cooling function, the OBD system may detect malfunction.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



B72

1	2
3	4

F27

1	2	5	6	7	10	15	16	17	20	25	26	27	30	35
3	4	8	11	18	21	28	31	34	36					
9	12	13	14	19	22	23	24	29	32	33				

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

F45

1	2	3	4	5	6	7	8	9	10	11
12	13	14	15	16	17	18	19	20	21	22
23	24									

F16

1	2
3	4

EN-04604

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

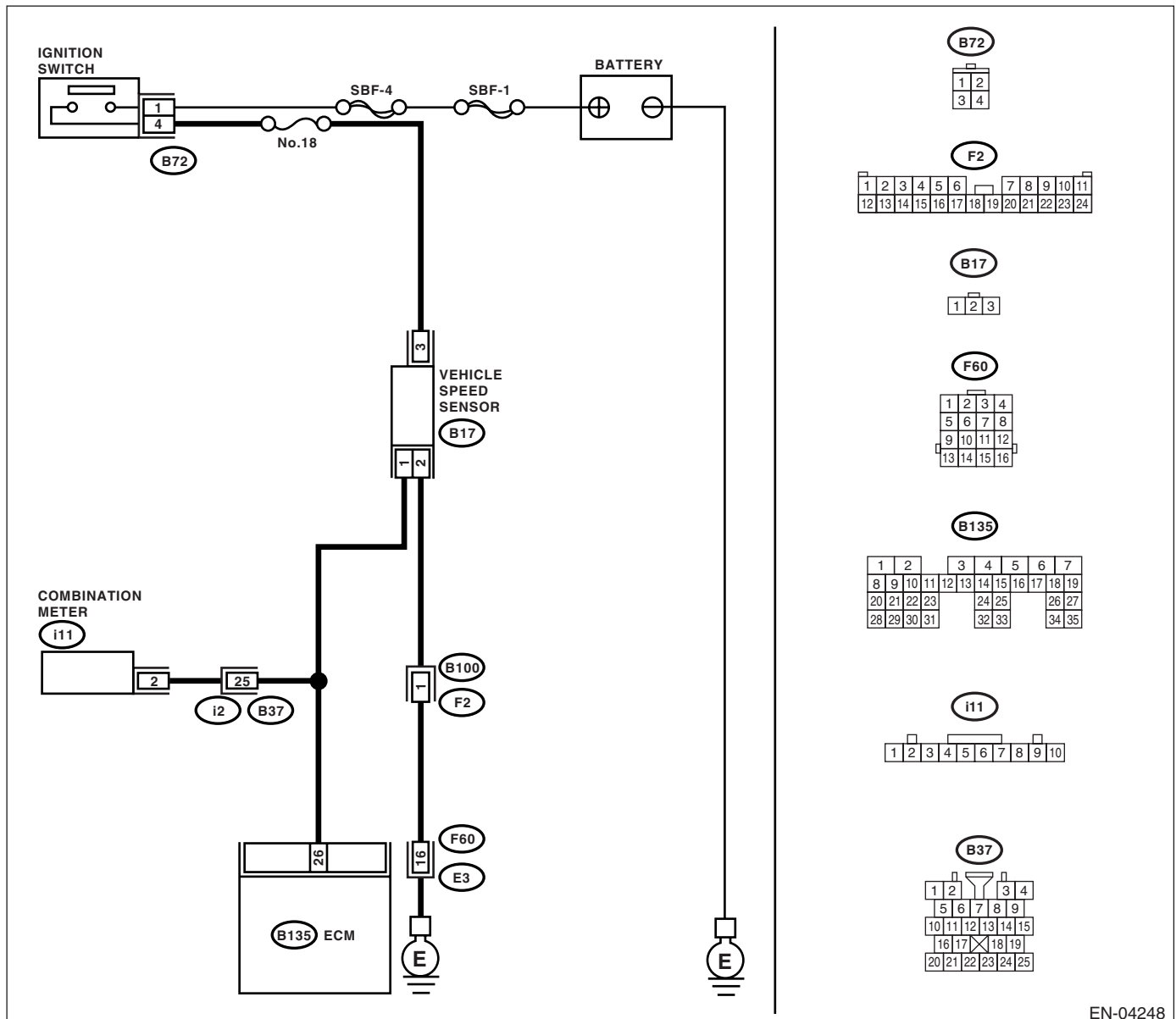
Step	Check	Yes	No
1 CHECK FOR ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).>	Check the radiator fan, fan motor and thermostat. If thermostat is stuck, replace thermostat. <Ref. to CO(H4SO)-27, Radiator Main Fan and Fan Motor.> <Ref. to CO(H4SO)-28, Radiator Sub Fan and Fan Motor.>

BP:DTC P0502 VEHICLE SPEED SENSOR CIRCUIT LOW INPUT**DTC DETECTING CONDITION:**

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-164, DTC P0502 VEHICLE SPEED SENSOR CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:

EN-04248

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

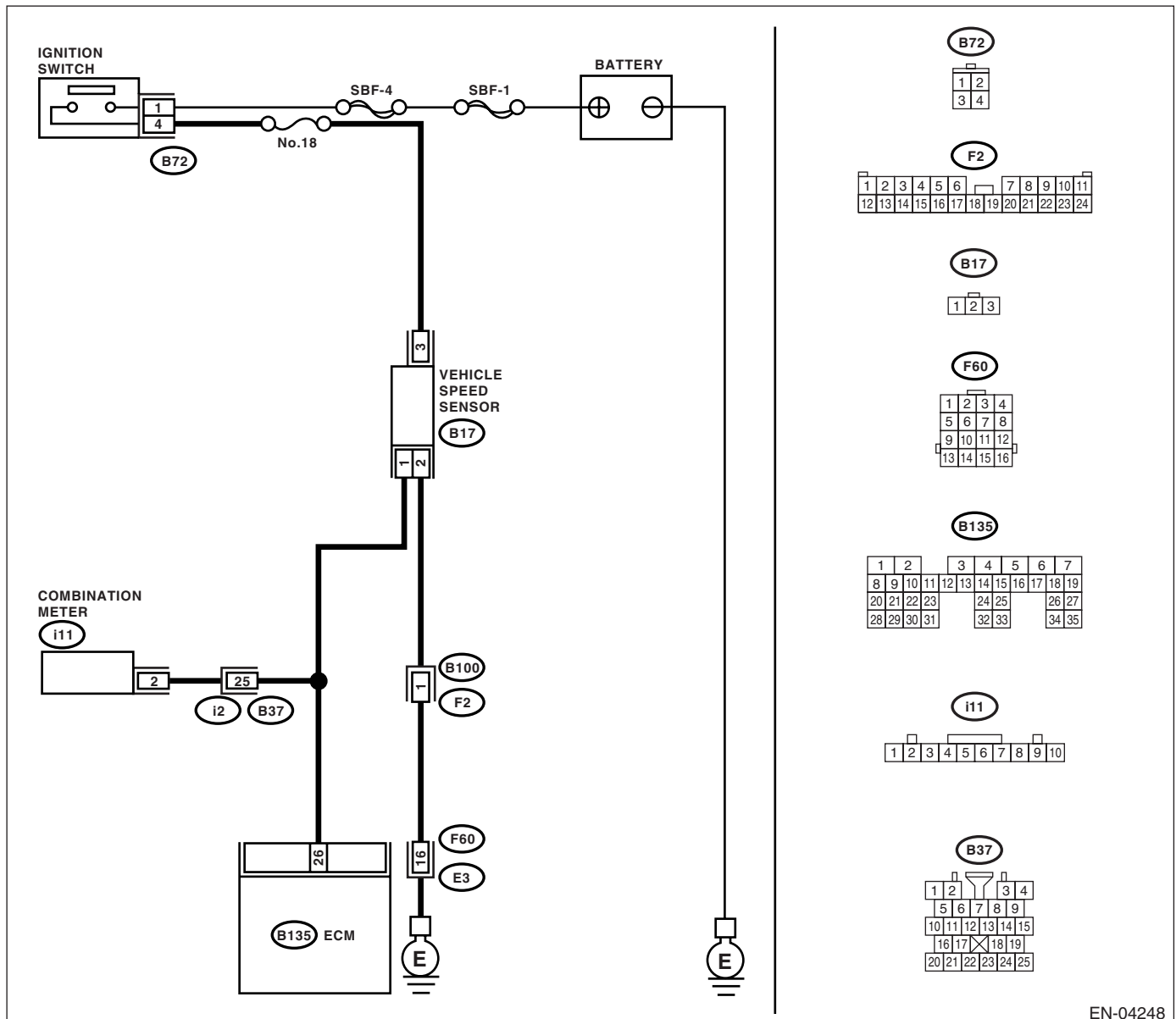
Step	Check	Yes	No
1 CHECK HARNESS BETWEEN VEHICLE SPEED SENSOR AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from vehicle speed sensor and ECM. 3) Measure the resistance of harness between vehicle speed sensor connector and chassis ground. Connector & terminal (B17) No. 1 — Chassis ground:	Is the resistance more than 1 MΩ?	Go to step 2.	Repair the ground short circuit in harness between vehicle speed sensor and ECM connector.
2 CHECK POOR CONTACT. Check poor contact in the vehicle speed sensor connector.	Is there poor contact in the vehicle speed sensor connector?	Repair poor contact in the vehicle speed sensor connector.	Replace the vehicle speed sensor. <Ref. to 5MT-38, Vehicle Speed Sensor.>

BQ:DTC P0503 VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH**DTC DETECTING CONDITION:**

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-165, DTC P0503 VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:

EN-04248

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK SPEEDOMETER OPERATION IN COMBINATION METER.	Does the speedometer operate normally?	Go to step 2.	Check the speedometer. <Ref. to IDI-13, Speedometer.>
2 CHECK HARNESS BETWEEN ECM AND COMBINATION METER CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from combination meter. 3) Measure the resistance between ECM and combination meter. Connector & terminal (B135) No. 26 — (i11) No. 2:	Is the resistance less than 10 Ω ?	Repair the poor contact in ECM connector.	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and combination meter connector • Poor contact in ECM connector • Poor contact in combination meter connector • Poor contact in coupling connector

BR:DTC P0506 IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-167, DTC P0506 IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Engine is difficult to start.
- Engine does not start.
- Erroneous idling
- Engine stalls.

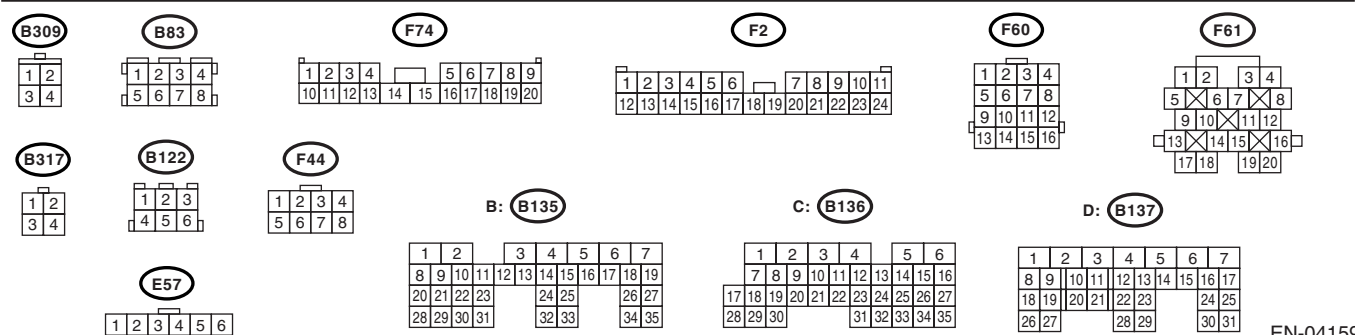
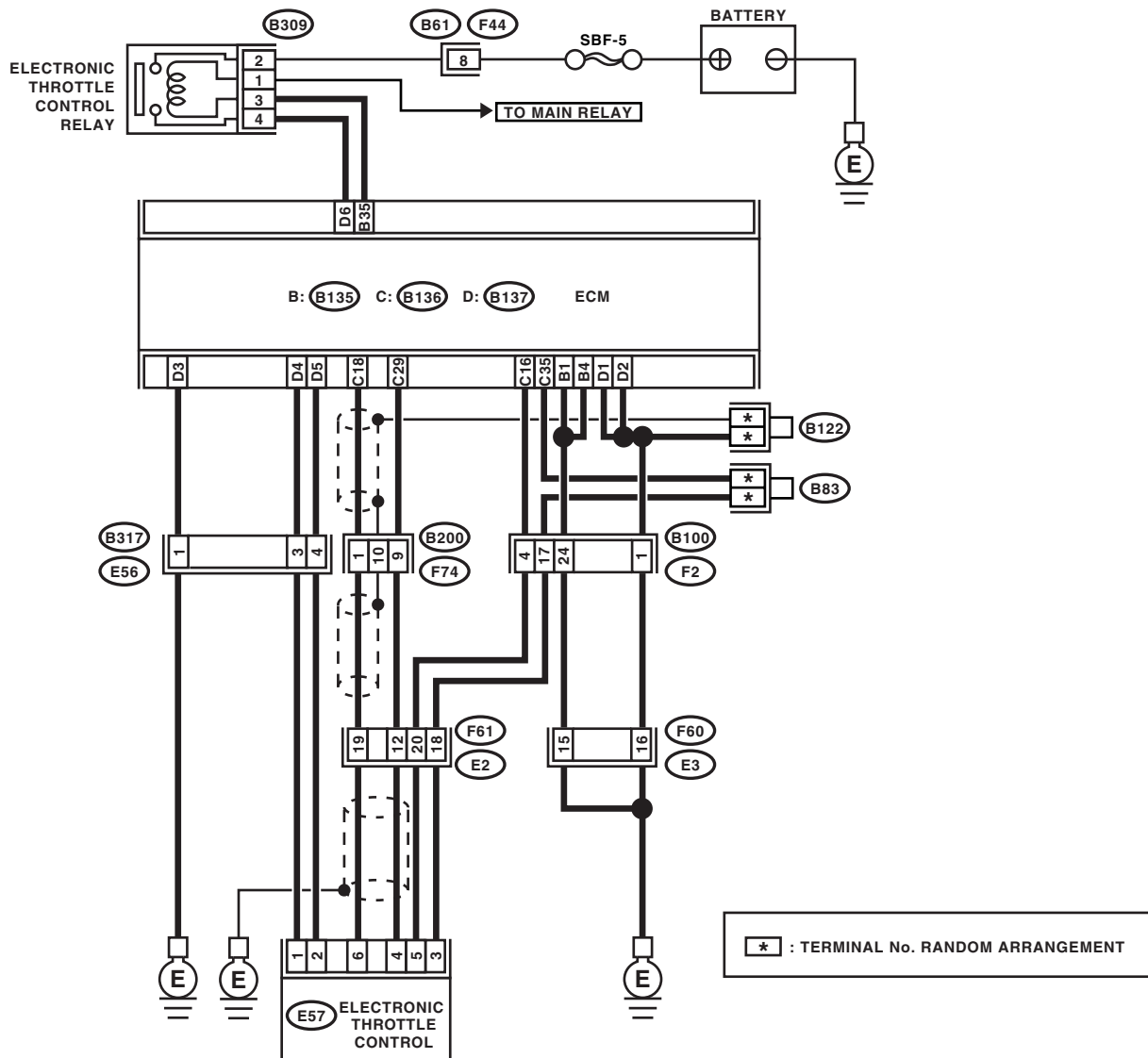
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-04159

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK FOR ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0506.	Go to step 2.
2 CHECK AIR CLEANER ELEMENT. 1) Turn the ignition switch to OFF. 2) Check air cleaner element.	Is there excessive clogging on air cleaner element.	Replace the air cleaner element. <Ref. to IN(STI)-8, Air Cleaner Case.>	Go to step 3.
3 CHECK ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Remove the electronic throttle control. 3) Check the electronic throttle control.	Are there foreign particles in electronic throttle control?	Remove the foreign particles from electronic throttle control.	Perform the diagnosis of DTC P2101.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

BS:DTC P0507 IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-169, DTC P0507 IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

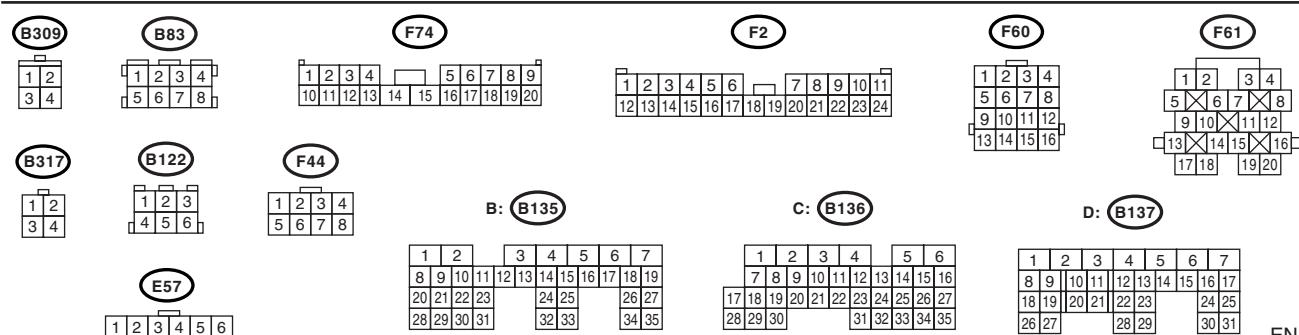
TROUBLE SYMPTOM:

Engine keeps running at higher revolution than specified idling revolution.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

ENGINE (DIAGNOSTICS)



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK FOR ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0507.	Go to step 2.
2 CHECK AIR INTAKE SYSTEM. 1) Turn the ignition switch to ON. 2) Start the engine, and idle it. 3) Check the following items. • Loose installation of intake manifold and throttle body • Cracks of intake manifold gasket and throttle body gasket • Disconnections of vacuum hoses	Is there any fault in air intake system?	Repair the 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 there foreign particles in electronic throttle control?	Remove the foreign particles from electronic throttle control.	Perform the diagnosis of DTC P2101.

BT:DTC P0512 STARTER REQUEST CIRCUIT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-171, DTC P0512 STARTER REQUEST CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

Failure of engine to start

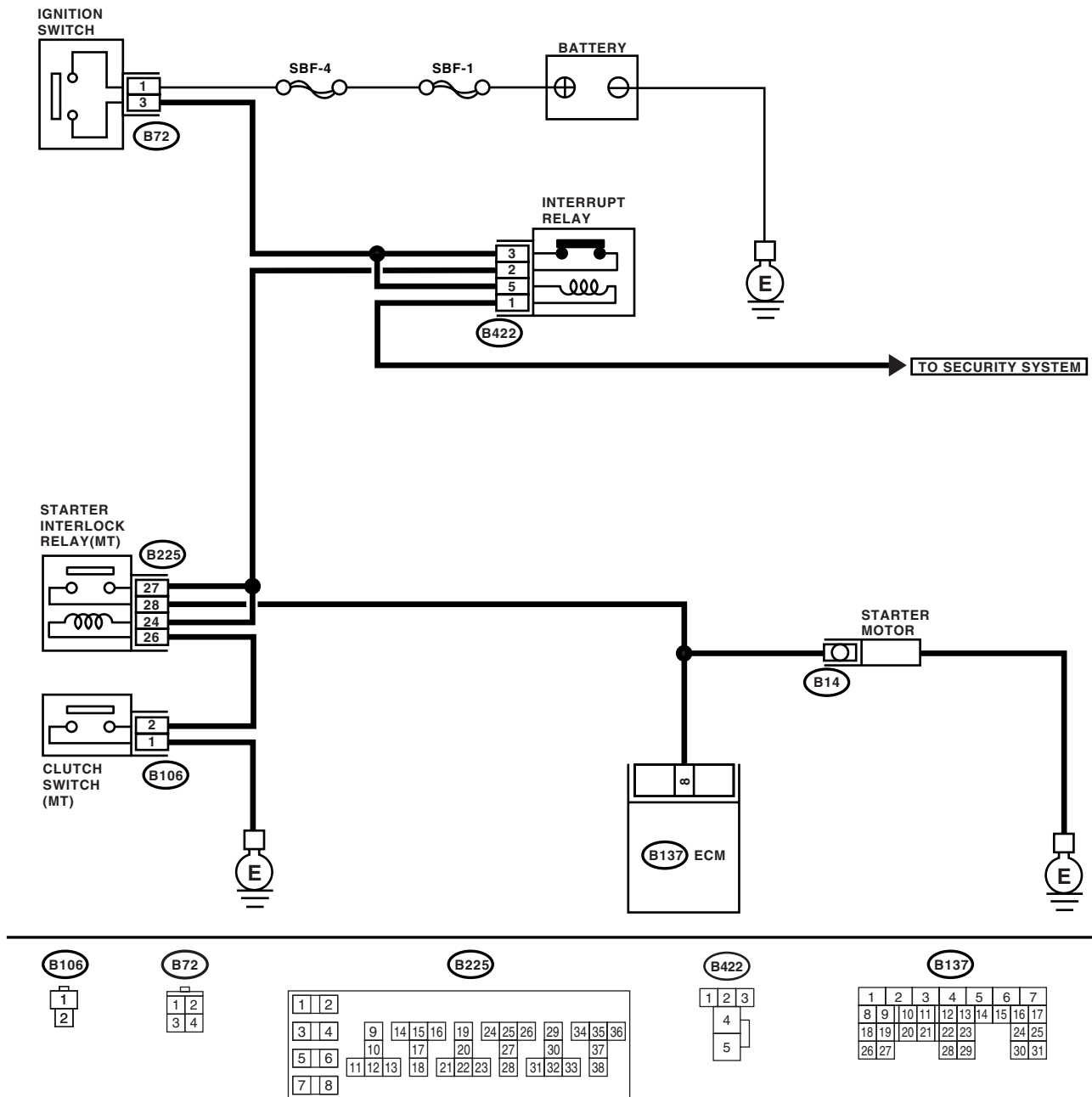
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-04153

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OPERATION OF STARTER MOTOR.	Does the starter motor operate when ignition switch is turned to ON?	Repair the battery short circuit in starter motor circuit. After repair, replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).>	Check the starter motor circuit. <Ref. to EN(STI)(diag)-58, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

BU:DTC P0519 IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-173, DTC P0519 IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Engine keeps running at higher revolution than specified idling revolution.
- Fuel is cut according to fail-safe function.

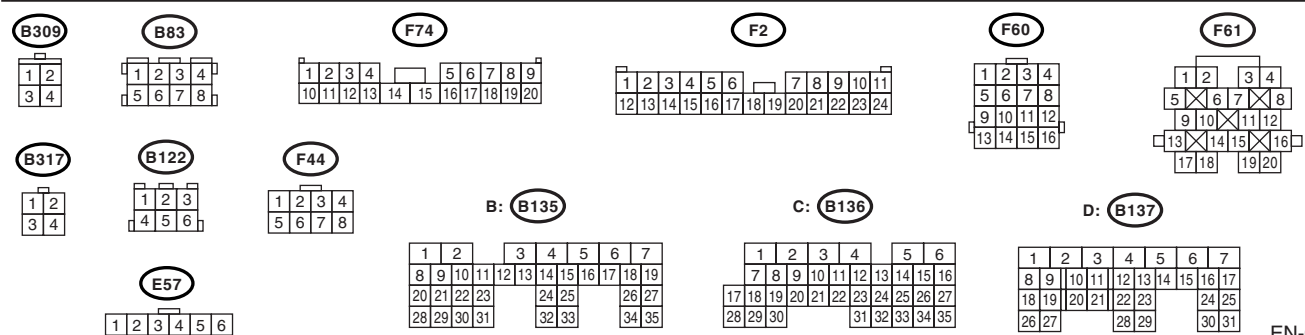
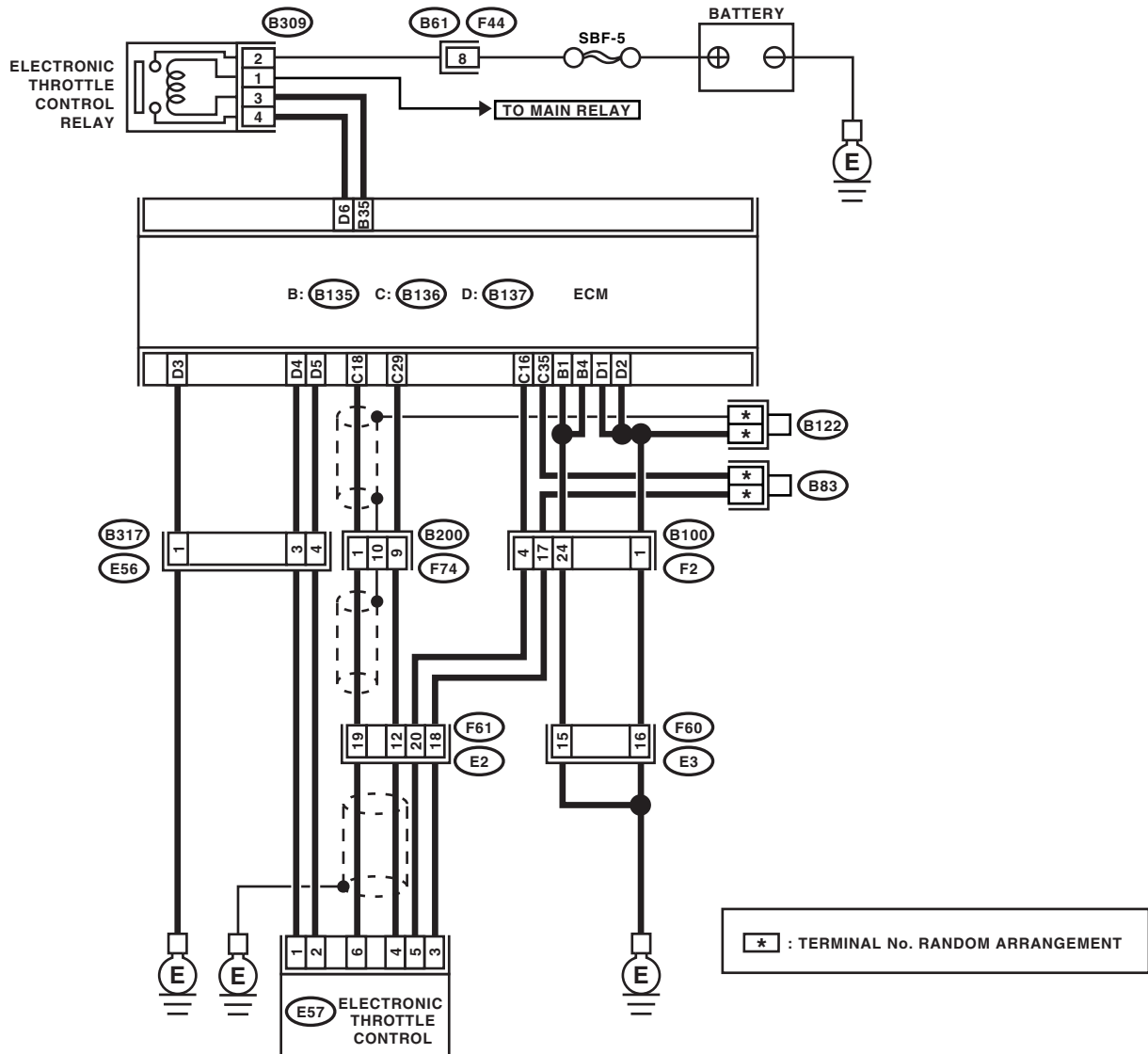
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-04159

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK FOR ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0519.	Go to step 2.
2 CHECK AIR INTAKE SYSTEM. 1) Turn the ignition switch to ON. 2) Start the engine, and idle it. 3) Check the following items. • Loose installation of intake manifold and throttle body • Cracks of intake manifold gasket and throttle body gasket • Disconnections of vacuum hoses	Is there any fault in air intake system?	Repair the 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 there foreign particles in electronic throttle control?	Remove the foreign particles from electronic throttle control.	Perform the diagnosis of DTC P2101.

BV:DTC P0604 INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-174, DTC P0604 INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Engine does not start.
- Engine stalls.

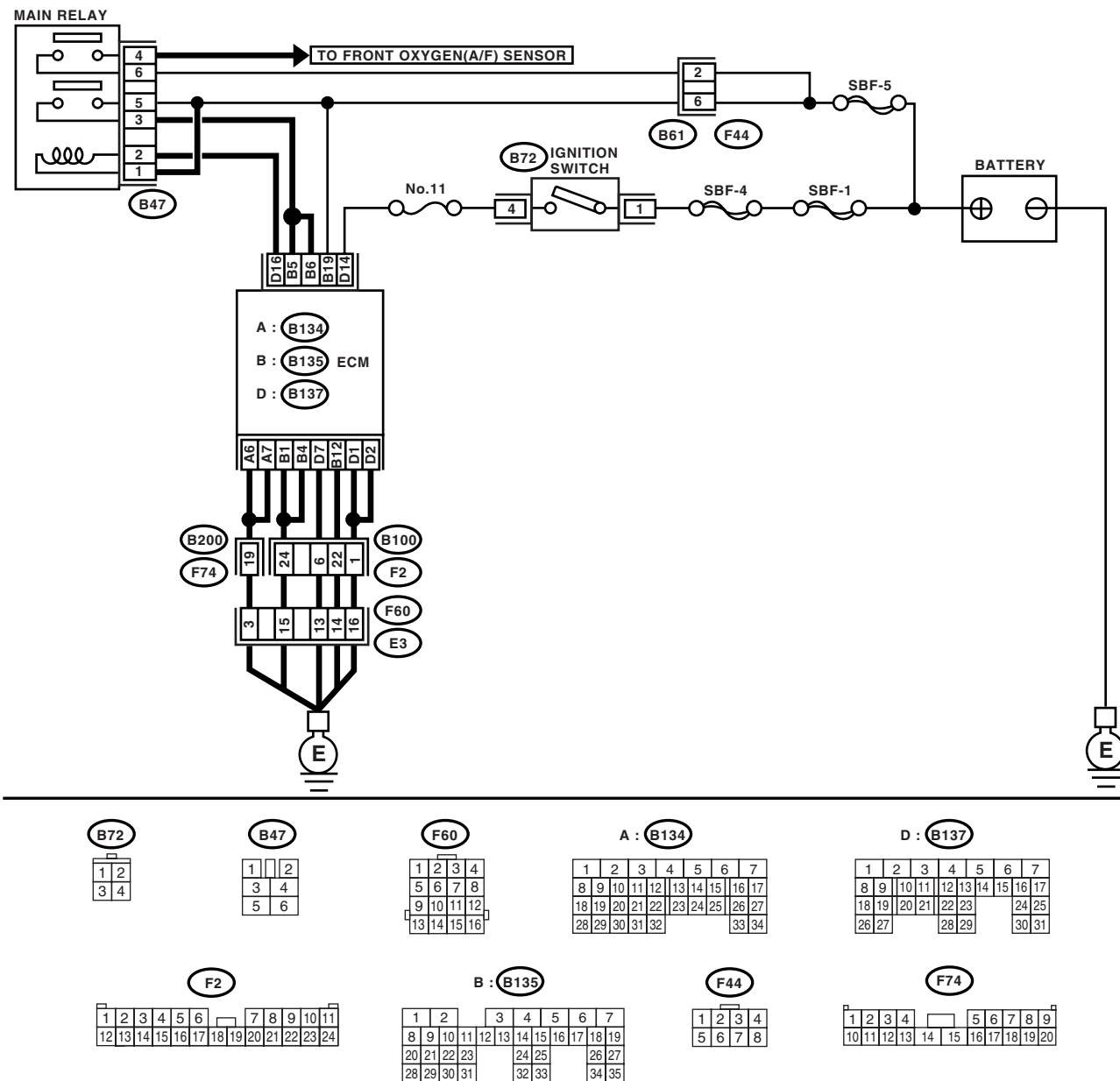
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-04249

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK FOR ANY OTHER DTC ON DISPLAY.	Does the Subaru Select Monitor or general scan tool indicate DTC P0604?	Replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).>	A temporary poor contact.

BW:DTC P0605 INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR

NOTE:

For the diagnostic procedure, refer to DTC P0607. <Ref. to EN(STI)(diag)-254, DTC P0607 CONTROL MODULE PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

BX:DTC P0607 CONTROL MODULE PERFORMANCE

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-175, DTC P0605 INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR, Diagnostic Trouble Code (DTC) Detecting Criteria.> and <Ref. to GD(STI)-176, DTC P0607 CONTROL MODULE PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

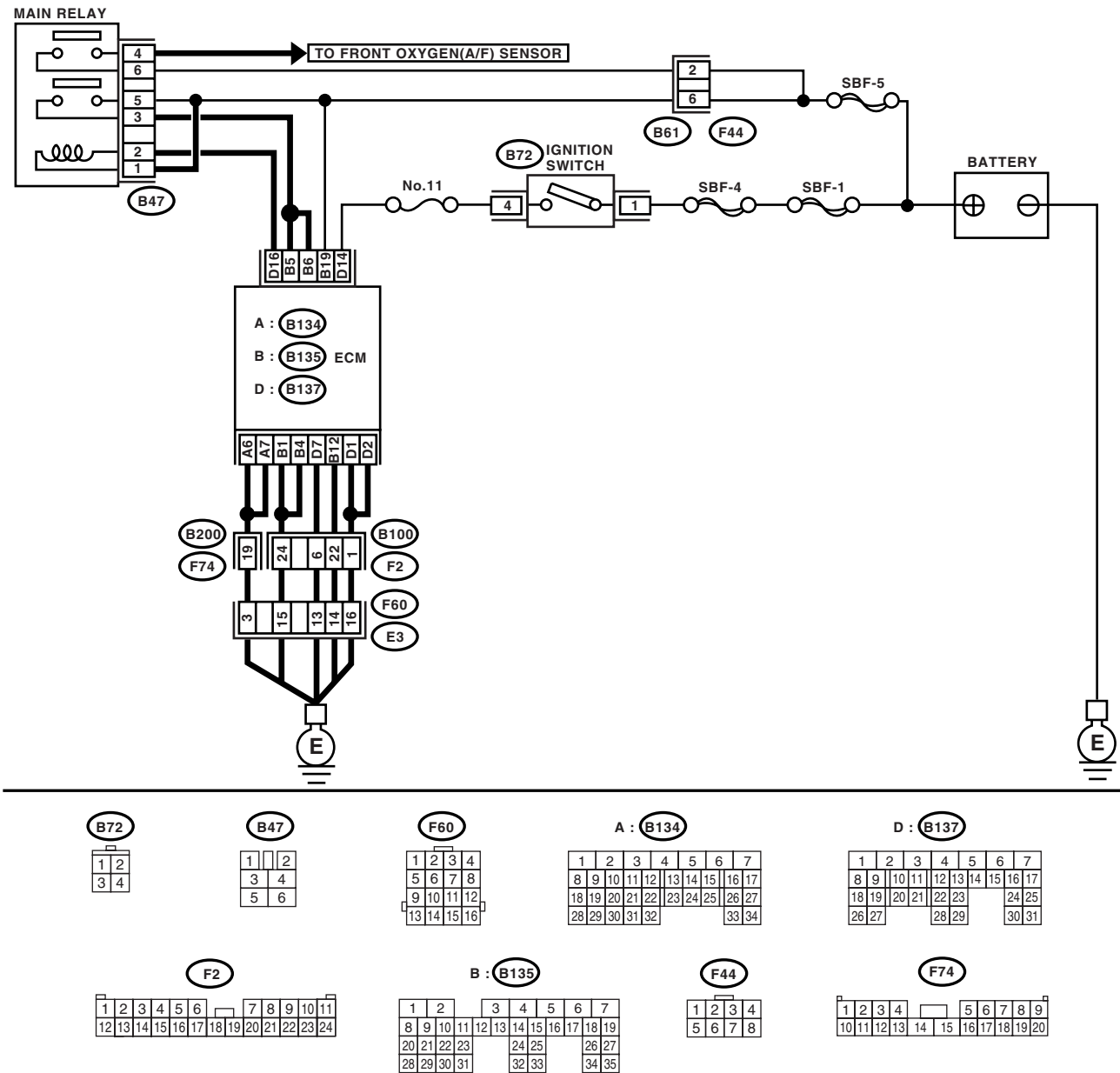
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-04249

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK INPUT VOLTAGE OF ECM 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and ground. Connector & terminal (B135) No. 5 (+) — Chassis ground (-): (B135) No. 6 (+) — Chassis ground (-):	Is the voltage 10 — 13 V?	Go to step 2.	Repair the open circuit or ground short of power supply circuit.
2 CHECK INPUT VOLTAGE OF ECM 1) Start the engine. 2) Measure the voltage between ECM connector and ground. Connector & terminal (B135) No. 5 (+) — Chassis ground (-): (B135) No. 6 (+) — Chassis ground (-):	Is the voltage 13 — 15 V?	Go to step 3.	Repair the open circuit or ground short of power supply circuit.
3 CHECK GROUND HARNESS OF ECM Measure the voltage between ECM connector and ground. Connector & terminal (B137) No. 1 (+) — Chassis ground (-): (B137) No. 2 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).>	Repair the following: • Retighten the engine ground terminal. • Poor contact in ECM connector • Poor contact in coupling connector

BY:DTC P0638 THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1)

NOTE:

For the diagnostic procedure, refer to DTC P2101. <Ref. to EN(STI)(diag)-335, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BZ:DTC P0691 COOLING FAN 1 CONTROL CIRCUIT LOW

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-182, DTC P0691 COOLING FAN 1 CONTROL CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Radiator fan does not operate properly.
- Overheating

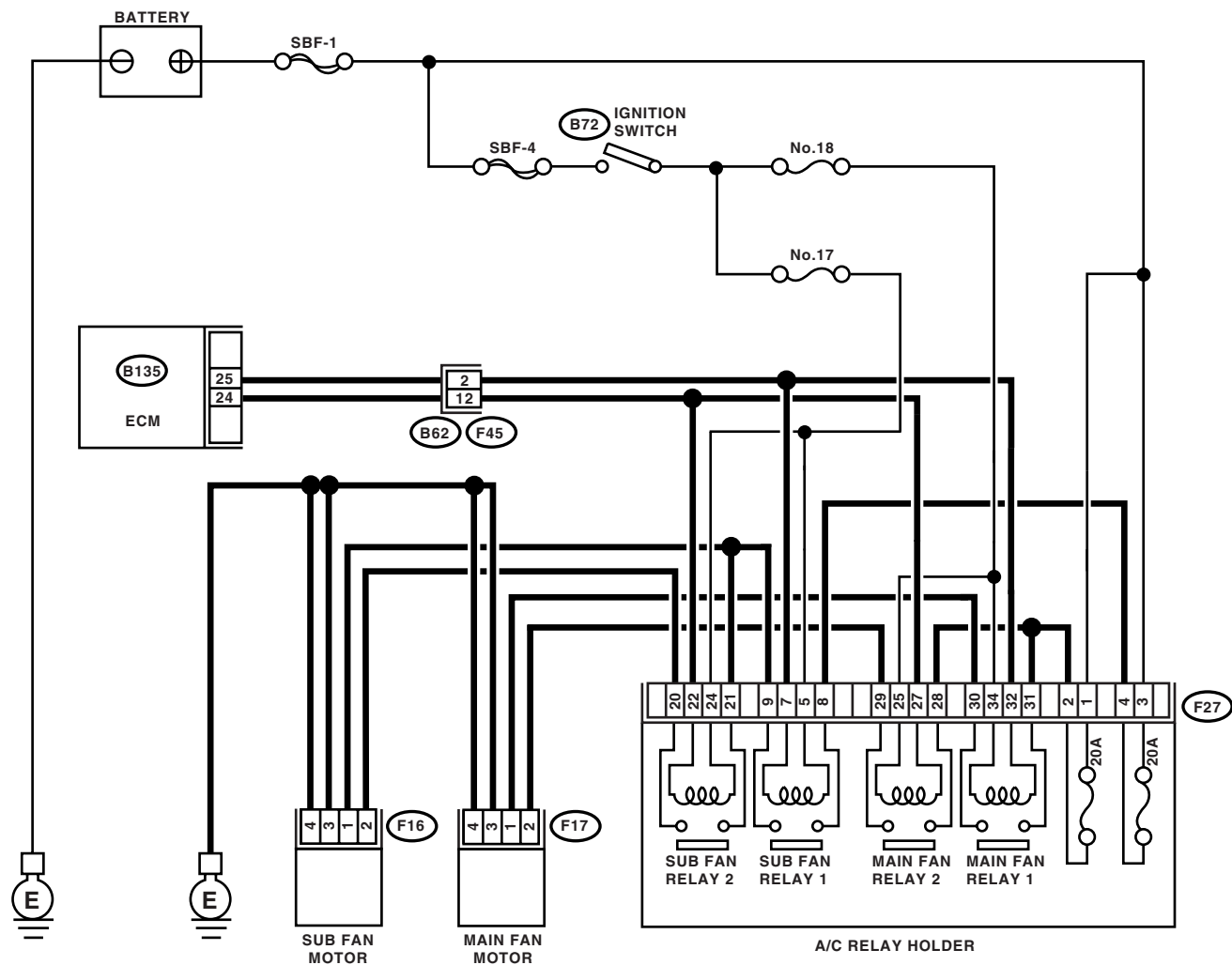
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



(B72)

1	2
3	4

(F27)

1	2	5	6	7	10	15	16	17	20	25	26	27	30	35
3	4	8	11	18	21	28	31	34	36					
9	12	13	14	19	22	23	24	29	32	33	34			

(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

(F45)

1	2	3	4	5	6	7	8	9	10	11
12	13	14	15	16	17	18	19	20	21	22
23	24									

(F16)

1	2
3	4

EN-04604

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OUTPUT SIGNAL FROM ECM. 1) Turn the ignition switch to OFF. 2) Connect the test mode connector. 3) Turn the ignition switch to ON. 4) While operating the radiator fan relay, measure voltage between ECM terminal and ground. NOTE: Radiator fan relay operation can be executed using Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(STI)(diag)-28, Subaru Select Monitor.> Connector & terminal (B135) No. 25 (+) — Chassis ground (-): (B135) No. 24 (+) — Chassis ground (-):	Does the voltage change 0 — 10 V?	Repair poor contact in ECM connector.	Go to step 2.
2 CHECK GROUND SHORT CIRCUIT IN RADIATOR FAN RELAY CONTROL CIRCUIT. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance of harness between ECM connector and chassis ground. Connector & terminal (B135) No. 25 — Chassis ground: (B135) No. 24 — Chassis ground:	Is the resistance more than 1 MΩ?	Go to step 3.	Repair ground short circuit in radiator fan relay control circuit.
3 CHECK POWER SUPPLY FOR RELAY. 1) Remove the main fan relay 1 and main fan relay 2 from A/C relay holder. 2) Turn the ignition switch to ON. 3) Measure the voltage between fuse and relay box (F/B) connector and chassis ground. Connector & terminal (F27) No. 27 (+) — Chassis ground (-): (F27) No. 32 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 4.	Repair open circuit in harness between ignition switch and fuse and relay box (F/B) connector.
4 CHECK MAIN FAN RELAY. 1) Turn the ignition switch to OFF. 2) Measure the resistance between main fan relay terminals. Terminals No. 32 — No. 34: (Main fan relay 1) No. 25 — No. 27: (Main fan relay 2)	Is the resistance 87 — 107 Ω?	Go to step 5.	Replace the main fan relay.
5 CHECK OPEN CIRCUIT IN MAIN FAN RELAY CONTROL CIRCUIT. Measure the resistance of harness between ECM and fan relay connector. Connector & terminal (B135) No. 25 — (F27) No. 32: (B135) No. 24 — (F27) No. 27:	Is the resistance less than 1 Ω?	Go to step 6.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and fan relay connector • Poor contact in coupling connector
6 CHECK POOR CONTACT. Check poor contact in ECM or fan relay connector.	Is there poor contact in ECM or fan relay connector?	Repair poor contact in ECM or fan relay connector.	Contact your SOA Service Center since deterioration of some parts may be the cause.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

CA:DTC P0692 COOLING FAN 1 CONTROL CIRCUIT HIGH

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-183, DTC P0692 COOLING FAN 1 CONTROL CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Radiator fan does not operate properly.
- Overheating

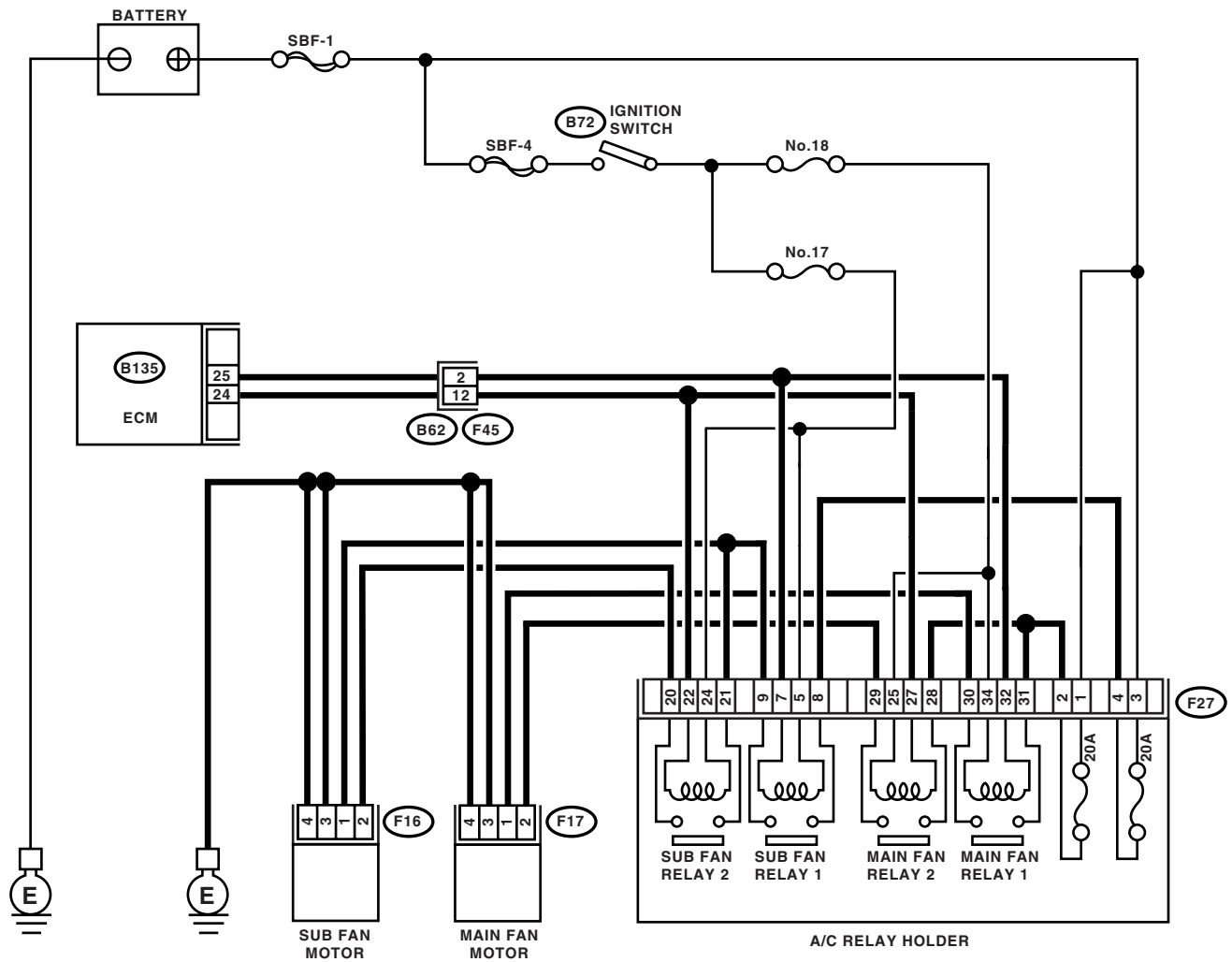
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



B72

1	2
3	4

F27

1	2	5	6	7	10	15	16	17	20	25	26	27	30	35
3	4	8	11	18	21	28	31	34	36					
9	12	13	14	19	22	23	24	29	32	33				

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

F45

1	2	3	4	5	6	7	8	9	10	11
12	13	14	15	16	17	18	19	20	21	22
23	24									

F16

F17

1	2
3	4

EN-04604

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OUTPUT SIGNAL FROM ECM. 1) Turn the ignition switch to OFF. 2) Connect the test mode connector. 3) Turn the ignition switch to ON. 4) While operating the radiator fan relay, measure the voltage between ECM and chassis ground. NOTE: Radiator fan relay operation can be executed using the Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(STI)(diag)-46, Compulsory Valve Operation Check Mode.> Connector & terminal (B135) No. 25 (+) — Chassis ground (-): (B135) No. 24 (+) — Chassis ground (-):	Does the voltage change 0 — 10 V?	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. In this case, repair the poor contact in ECM connector.	Go to step 2.
2 CHECK SHORT CIRCUIT IN RADIATOR FAN RELAY CONTROL CIRCUIT. 1) Turn the ignition switch to OFF. 2) Remove the fan relay 1, fan relay 2 and fan mode relay. 3) Disconnect the test mode connector. 4) Turn the ignition switch to ON. 5) Measure the voltage between ECM and chassis ground. Connector & terminal (B135) No. 25 (+) — Chassis ground (-): (B135) No. 24 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Repair the battery short circuit in radiator fan relay control circuit. After repair, replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).>	Go to step 3.
3 CHECK MAIN FAN RELAY. 1) Turn the ignition switch to OFF. 2) Remove the main fan relay. 3) Measure the resistance between main fan relay terminals. Terminals No. 30 — No. 31: (Main fan relay 1) No. 28 — No. 29: (Main fan relay 2)	Is the resistance less than 1 Ω ?	Replace the main fan relay and ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).>	Go to step 4.
4 CHECK SUB FAN RELAY. 1) Remove the sub fan relay. 2) Measure the resistance between sub fan relay terminals. Terminals No. 8 — No. 9: (Sub fan relay 1) No. 20 — No. 21: (Sub fan relay 2)	Is the resistance less than 1 Ω ?	Replace the sub fan relay and ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).>	Go to step 5.
5 CHECK POOR CONTACT. Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).>

CB:DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-184, DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

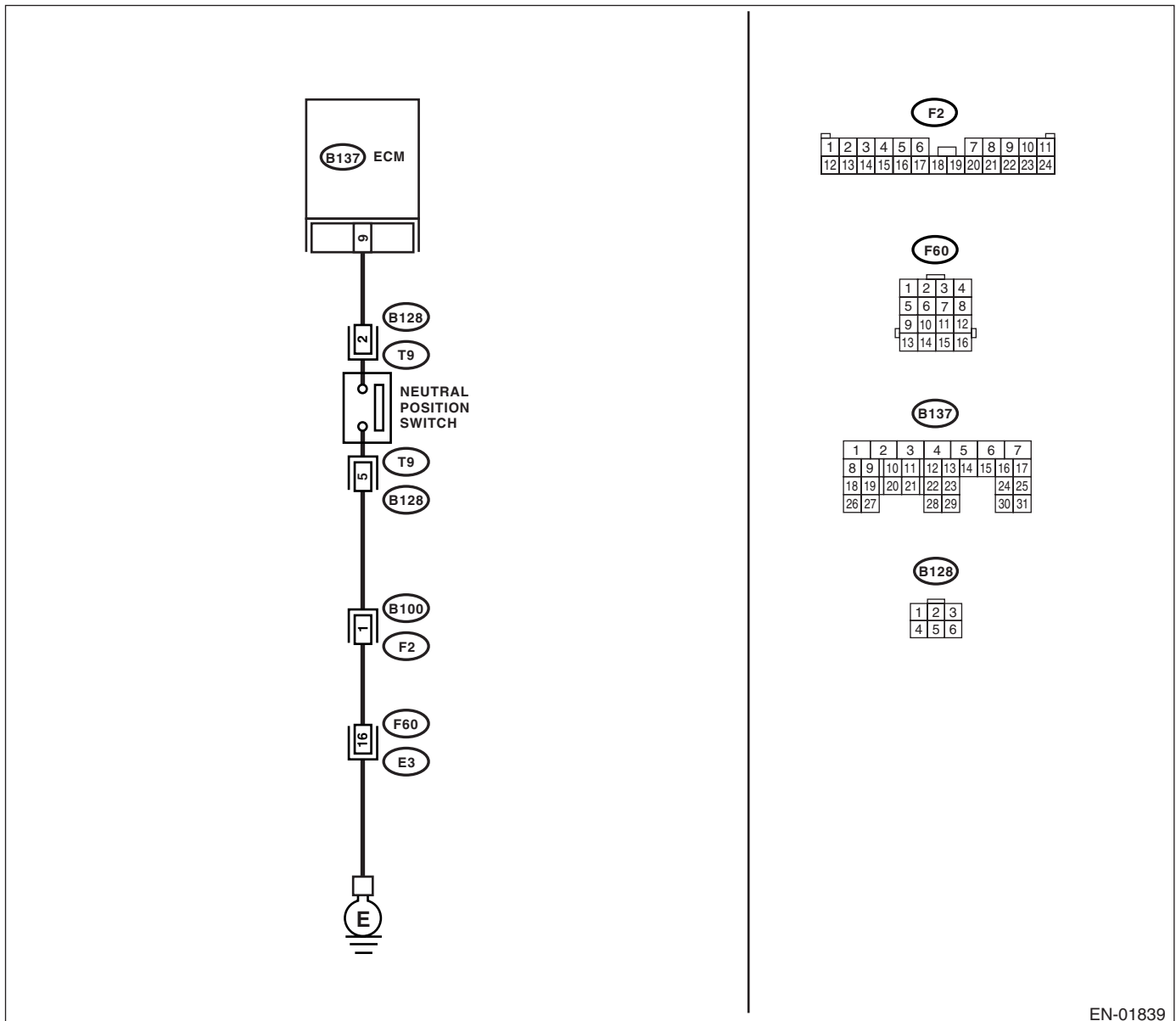
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-01839

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK INPUT SIGNAL FOR 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 (B137) No. 9 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 2.	Go to step 4.
2 CHECK INPUT SIGNAL FOR ECM. 1) Place the shift lever in a position except for neutral. 2) Measure the voltage between ECM and chassis ground. Connector & terminal (B137) No. 9 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Go to step 3.	Go to step 4.
3 CHECK POOR CONTACT. Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Contact your SOA Service Center since deterioration of some parts may be the cause.
4 CHECK NEUTRAL POSITION SWITCH. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from transmission harness. 3) Place the shift lever in neutral. 4) Measure the resistance between transmission harness and connector terminals. Connector & terminal (T9) No. 2 — No. 5:	Is the resistance more than 1 M Ω ?	Go to step 5.	Repair short circuit in transmission harness or replace neutral position switch.
5 CHECK NEUTRAL POSITION SWITCH. 1) Place the shift lever in a position except for neutral. 2) Measure the resistance between transmission harness connector terminals.	Is the resistance less than 1 Ω ?	Go to step 6.	Repair short circuit in transmission harness or replace neutral position switch.
6 CHECK HARNESS BETWEEN ECM AND NEUTRAL POSITION SWITCH CONNECTOR. Measure the resistance between ECM and chassis ground. Connector & terminal (B137) No. 9 — Chassis ground:	Is the resistance more than 1 M Ω ?	Go to step 7.	Repair ground short circuit in harness between ECM and transmission harness connector.
7 CHECK HARNESS BETWEEN ECM AND NEUTRAL POSITION SWITCH CONNECTOR. 1) Disconnect the connector from ECM. 2) Measure the resistance of harness between ECM and transmission harness connector. Connector & terminal (B137) No. 9 — (B128) No. 2:	Is the resistance less than 1 Ω ?	Go to step 8.	Repair open circuit in harness between ECM and transmission harness connector.
8 CHECK HARNESS BETWEEN ECM AND NEUTRAL POSITION SWITCH CONNECTOR. Measure the resistance of harness between transmission harness connector and engine ground. Connector & terminal (B128) No. 2 — Engine ground:	Is the resistance less than 5 Ω ?	Go to step 9.	Repair open circuit in harness between transmission harness connector and engine ground terminal.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step		Check	Yes	No
9	CHECK POOR CONTACT. Check poor contact in transmission harness connector.	Is there poor contact in transmission harness connector?	Repair poor contact in transmission harness connector.	Contact your SOA Service Center since deterioration of some parts may be the cause.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

CC:DTC P852 NEUTRAL SWITCH INPUT CIRCUIT HIGH

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-185, DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

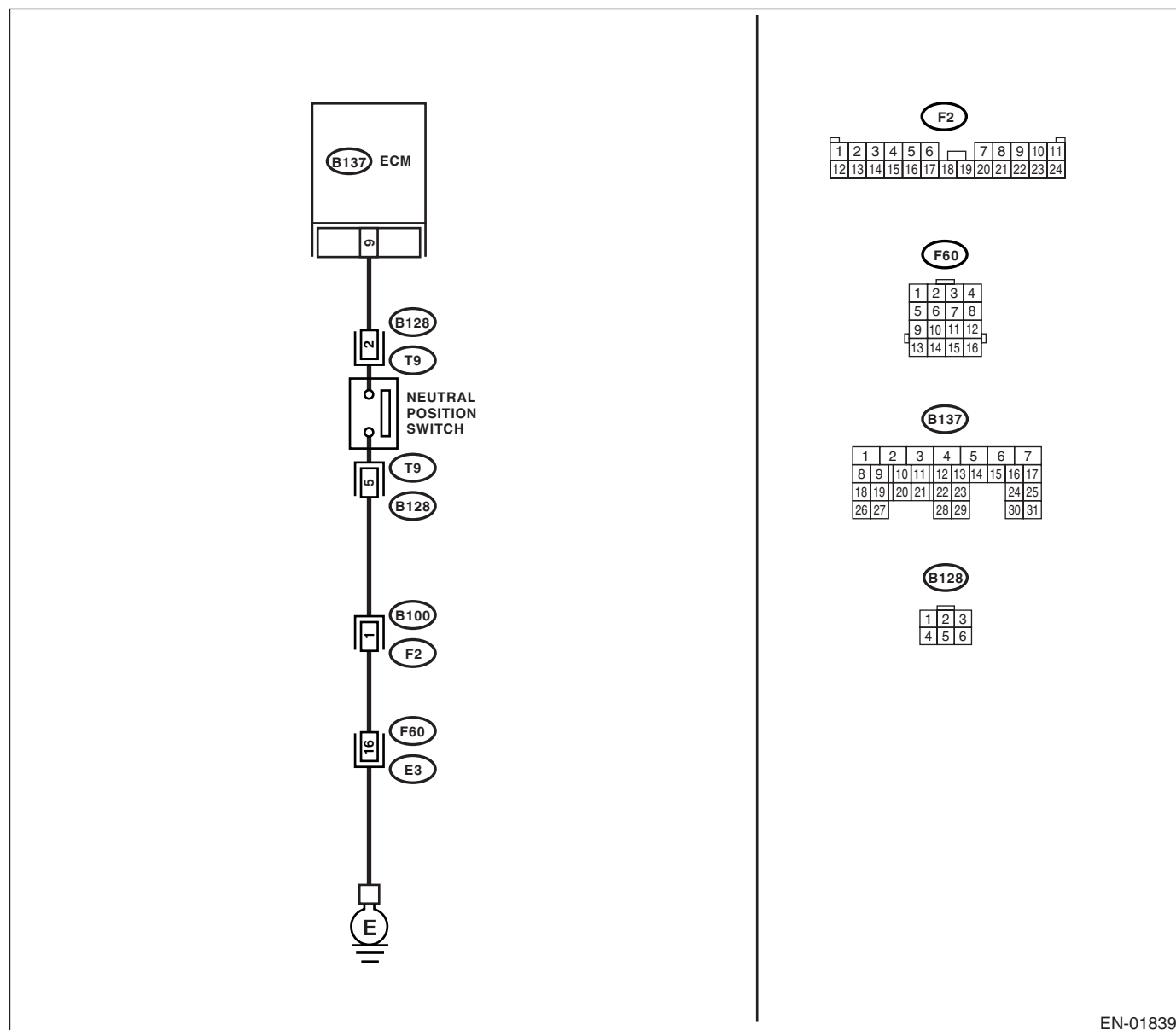
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-01839

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK INPUT SIGNAL FOR ECM. 1) Turn the ignition switch to ON. 2) Set the shift lever to except neutral position. 3) Measure the voltage between ECM and chassis ground. Connector & terminal (B137) No. 9 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Go to step 2.	Go to step 4.
2 CHECK INPUT SIGNAL FOR ECM. 1) Set the shift lever to neutral position. 2) Measure the voltage between ECM and chassis ground. Connector & terminal (B137) No. 9 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 3.	Go to step 4.
3 CHECK POOR CONTACT. Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Contact your SOA Service Center since deterioration of some parts may be the cause.
4 CHECK INPUT SIGNAL FOR ECM. 1) Disconnect ECM connector from ECM. 2) Measure the voltage between ECM and chassis ground. Connector & terminal (B137) No. 9 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Repair the battery short circuit in harness between ECM and transmission connector.	Go to step 5.
5 CHECK HARNESS BETWEEN ECM AND TRANSMISSION HARNESS CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and transmission harness connector (T9). 3) Measure the resistance of harness between ECM and neutral switch connector. Connector & terminal (B137) No. 9 — (B128) 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: • Open circuit in harness between ECM and transmission harness • Poor contact in transmission harness connector • Poor contact in ECM connector
6 CHECK NEUTRAL POSITION SWITCH GROUND LINE. Measure the resistance of harness between transmission harness connector and engine ground. Connector & terminal (B128) No. 5 — Engine ground:	Is the resistance less than 5 Ω ?	Go to step 7.	Repair the open circuit in harness of neutral position switch ground line.
7 CHECK NEUTRAL POSITION SWITCH. 1) Set the shift lever to except neutral position. 2) Measure the resistance between transmission harness connector receptacle's terminals. Terminals No. 2 — No. 5:	Is the resistance less than 1 Ω ?	Go to step 8.	Replace the neutral position switch.
8 CHECK POOR CONTACT. Check poor contact in the transmission harness connector.	Is there poor contact in the transmission harness connector?	Repair poor contact in transmission harness connector.	Contact your SOA Service Center since deterioration of some parts may be the cause.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

CD:DTC P1152 O₂ SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK1 SENSOR1)

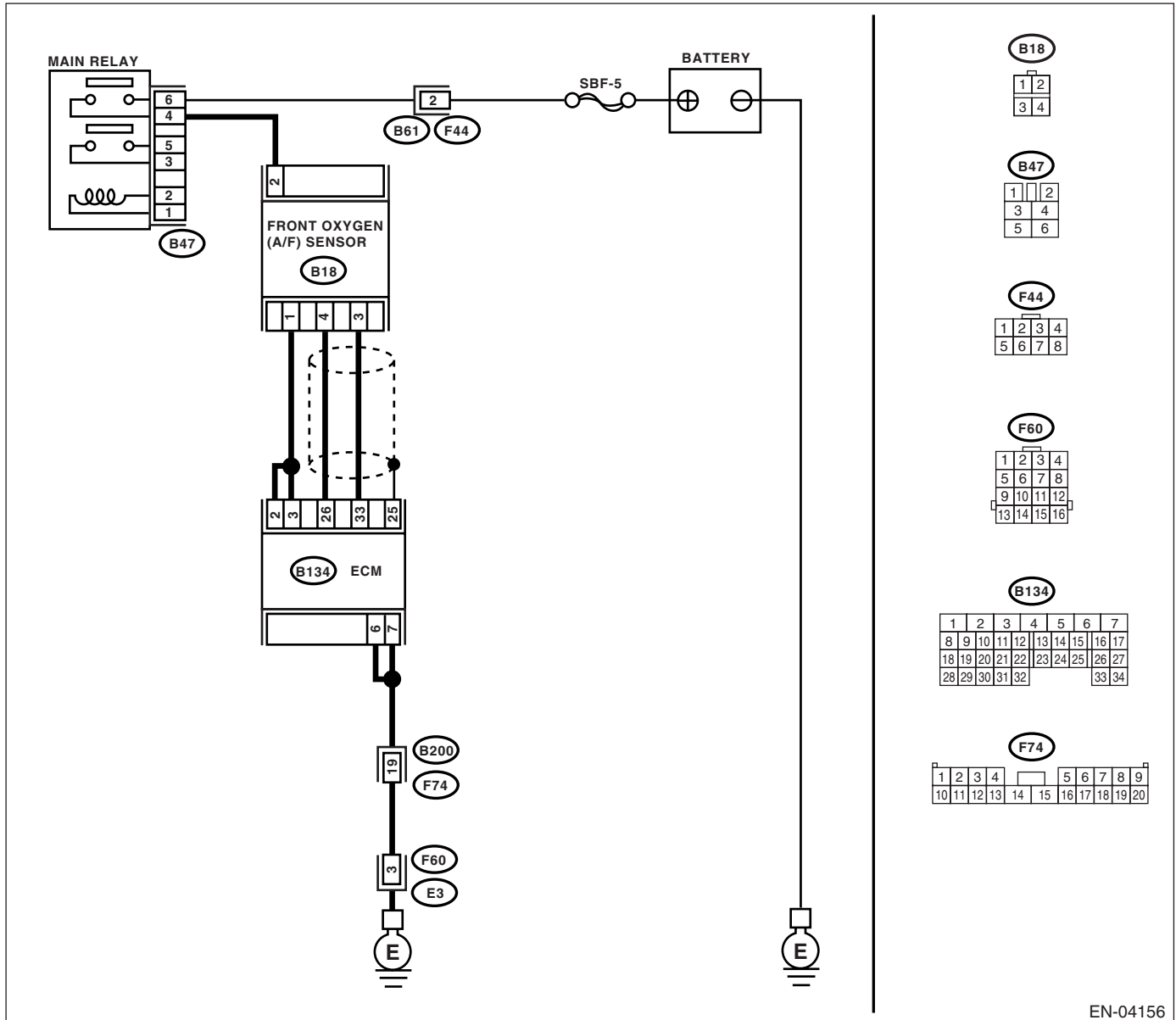
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-186, DTC P1152 O₂ SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK1 SENSOR1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04156

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.	Is there water in connector?	Remove infiltrating water completely.	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 connector. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. Connector & terminal (B134) No. 33 — (B18) No. 3: (B134) No. 26 — (B18) 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: • Open circuit in harness between ECM and front oxygen (A/F) sensor connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector
3 CHECK POOR CONTACT. Check poor contact in front oxygen (A/F) sensor connector.	Is there poor contact in front oxygen (A/F) sensor connector?	Repair the poor contact in front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(STI)-36, Front Oxygen (A/F) Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

CE:DTC P1153 O₂ SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1)

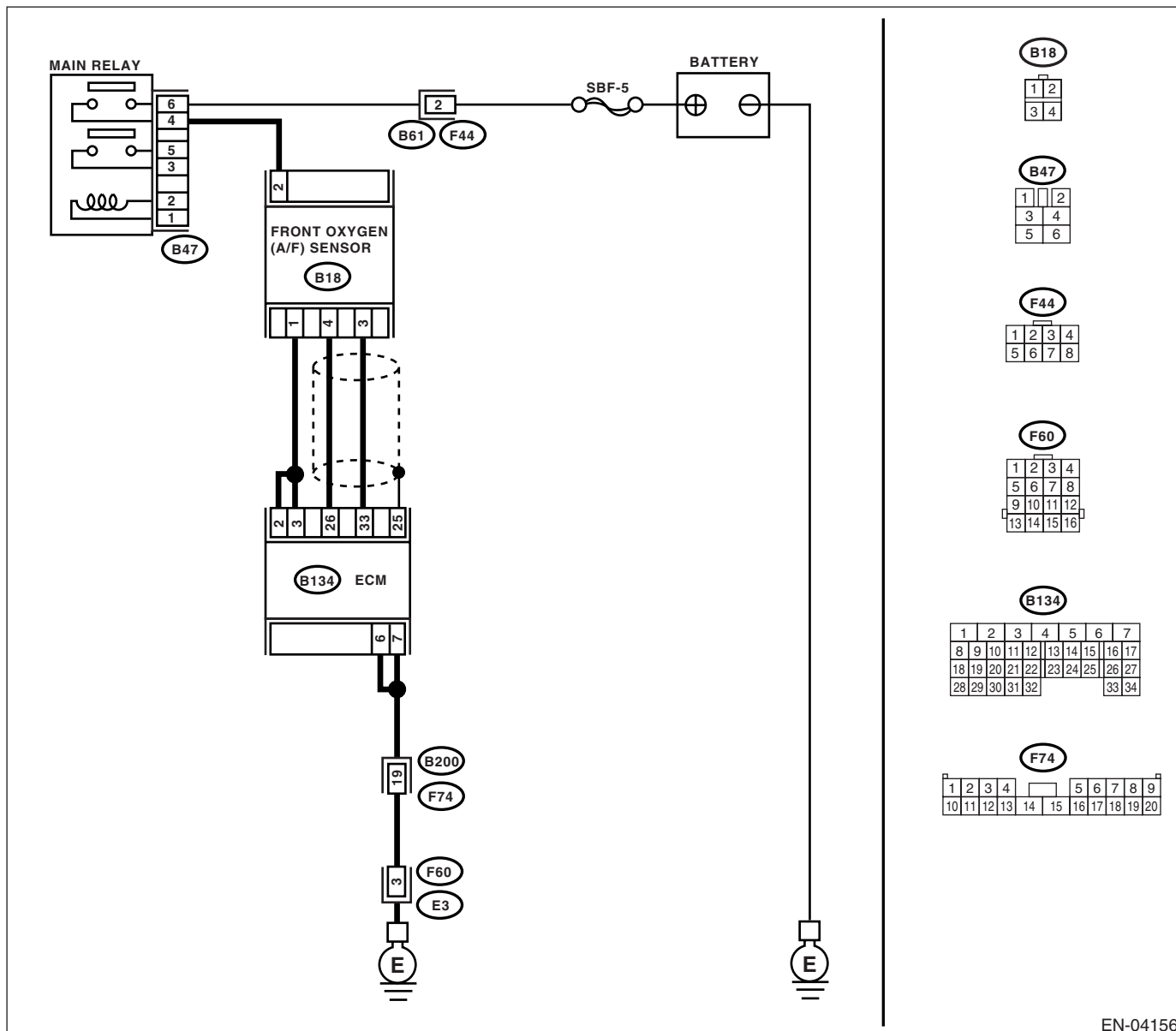
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-188, DTC P1153 O₂ SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04156

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.	Is there water in connector?	Remove infiltrating water completely.	Go to step 2.
2 CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM connector and chassis ground. Connector & terminal (B134) No. 26 — Chassis ground:	Is the resistance more than 1 MΩ?	Go to step 3.	Repair the ground short circuit in harness between ECM and front oxygen (A/F) sensor connector.
3 CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR. Measure the resistance of harness between ECM connector and chassis ground. Connector & terminal (B134) No. 33 — Chassis ground:	Is the resistance more than 1 MΩ?	Go to step 4.	Repair the ground short circuit in harness between ECM and front oxygen (A/F) sensor connector.
4 CHECK OUTPUT SIGNAL FOR ECM. 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM connector and chassis ground. Connector & terminal (B134) No. 26 (+) — Chassis ground (-):	Is the voltage more than 4.5 V?	Go to step 5.	Go to step 6.
5 CHECK OUTPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B134) No. 26 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. After repair, replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).>	Repair the poor contact in ECM connector.
6 CHECK OUTPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B134) No. 33 (+) — Chassis ground (-):	Is the voltage more than 4.95 V?	Go to step 7.	Replace the front oxygen (A/F) sensor. <Ref. to FU(STI)-36, Front Oxygen (A/F) Sensor.>
7 CHECK OUTPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B134) No. 33 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. After repair, replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).>	Repair the poor contact in ECM connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

CF:DTC P1160 RETURN SPRING FAILURE

NOTE:

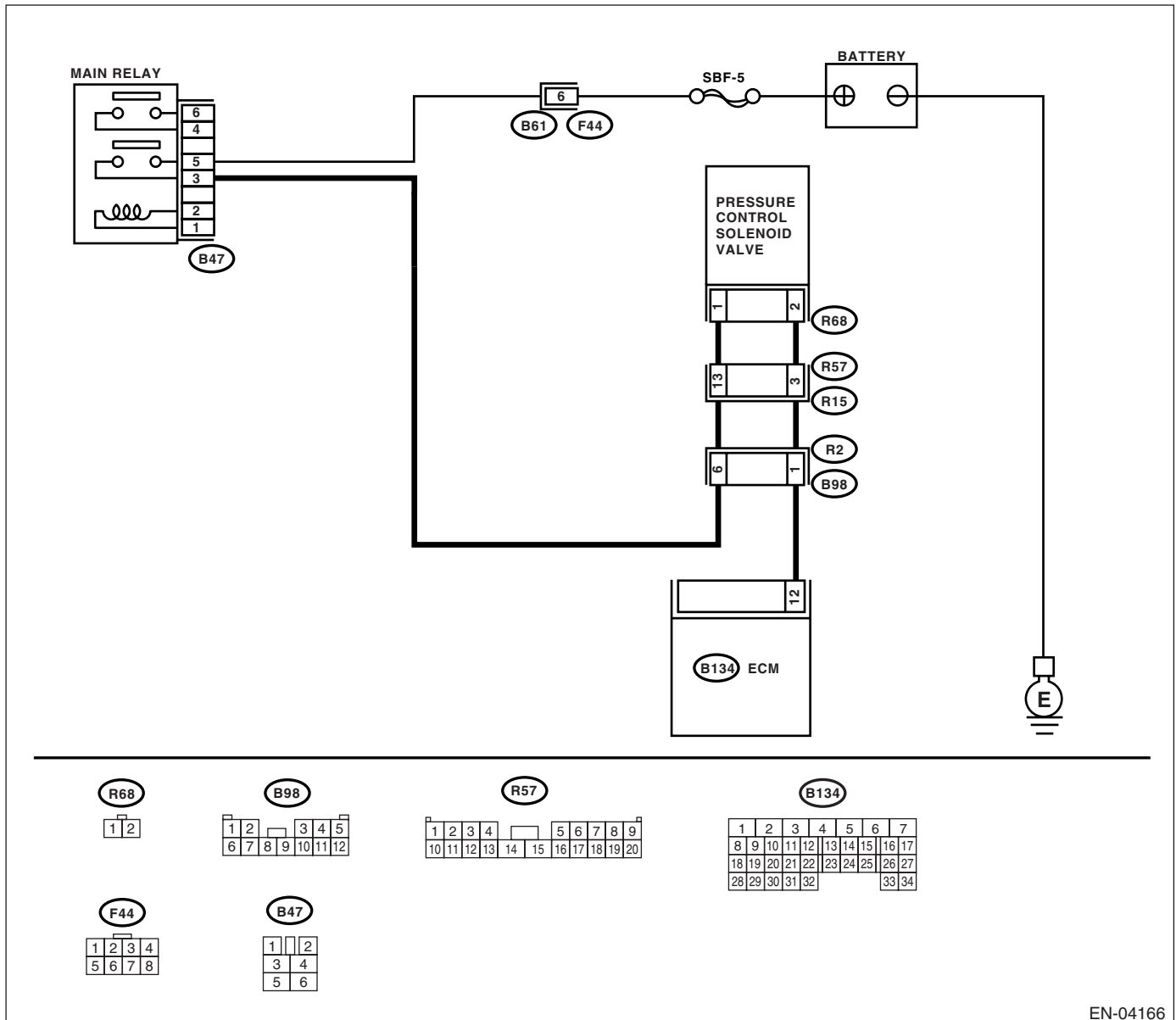
For the diagnostic procedure, refer to DTC P2101. <Ref. to EN(STI)(diag)-335, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CG:DTC P1400 FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW**DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-192, DTC P1400 FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:

EN-04166

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OUTPUT SIGNAL FROM ECM. 1) Turn ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. Connector & terminal (B134) No. 12 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 2.	Go to step 3.
2 CHECK FOR POOR CONTACT. Check for poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Contact your SOA Service Center since deterioration of some parts may be the cause.
3 CHECK HARNESS BETWEEN PRESSURE CONTROL SOLENOID VALVE AND ECM CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect the connectors from pressure control solenoid valve and ECM. 3) Measure the resistance of harness between pressure control solenoid valve connector and chassis ground. Connector & terminal (R68) No. 2 — Chassis ground:	Is the resistance more than 1 M Ω ?	Go to step 4.	Repair short circuit to ground in harness between ECM and pressure control solenoid valve connector.
4 CHECK HARNESS BETWEEN PRESSURE CONTROL SOLENOID VALVE AND ECM CONNECTOR. Measure the resistance of harness between ECM and pressure control solenoid valve connector. Connector & terminal (B134) No. 12 — (R68) No. 2:	Is the resistance less than 1 Ω ?	Go to step 5.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and pressure control solenoid valve connector • Poor contact in coupling connector
5 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 ?	Go to step 6.	Replace the pressure control solenoid valve. <Ref. to EC(STI)-12, Pressure Control Solenoid Valve.>
6 CHECK POWER SUPPLY TO PRESSURE CONTROL SOLENOID VALVE. 1) Turn ignition switch to ON. 2) Measure the voltage between pressure control solenoid valve and chassis ground. Connector & terminal (R68) No. 1 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 7.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between main relay and pressure control solenoid valve connector • Poor contact in coupling connector • Poor contact in main relay connector

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
7 CHECK FOR POOR CONTACT. Check for poor contact in pressure control solenoid valve connector.	Is there poor contact in pressure control solenoid valve connector?	Repair poor contact in pressure control solenoid valve connector.	Contact your SOA Service Center since deterioration of some parts may be the cause.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

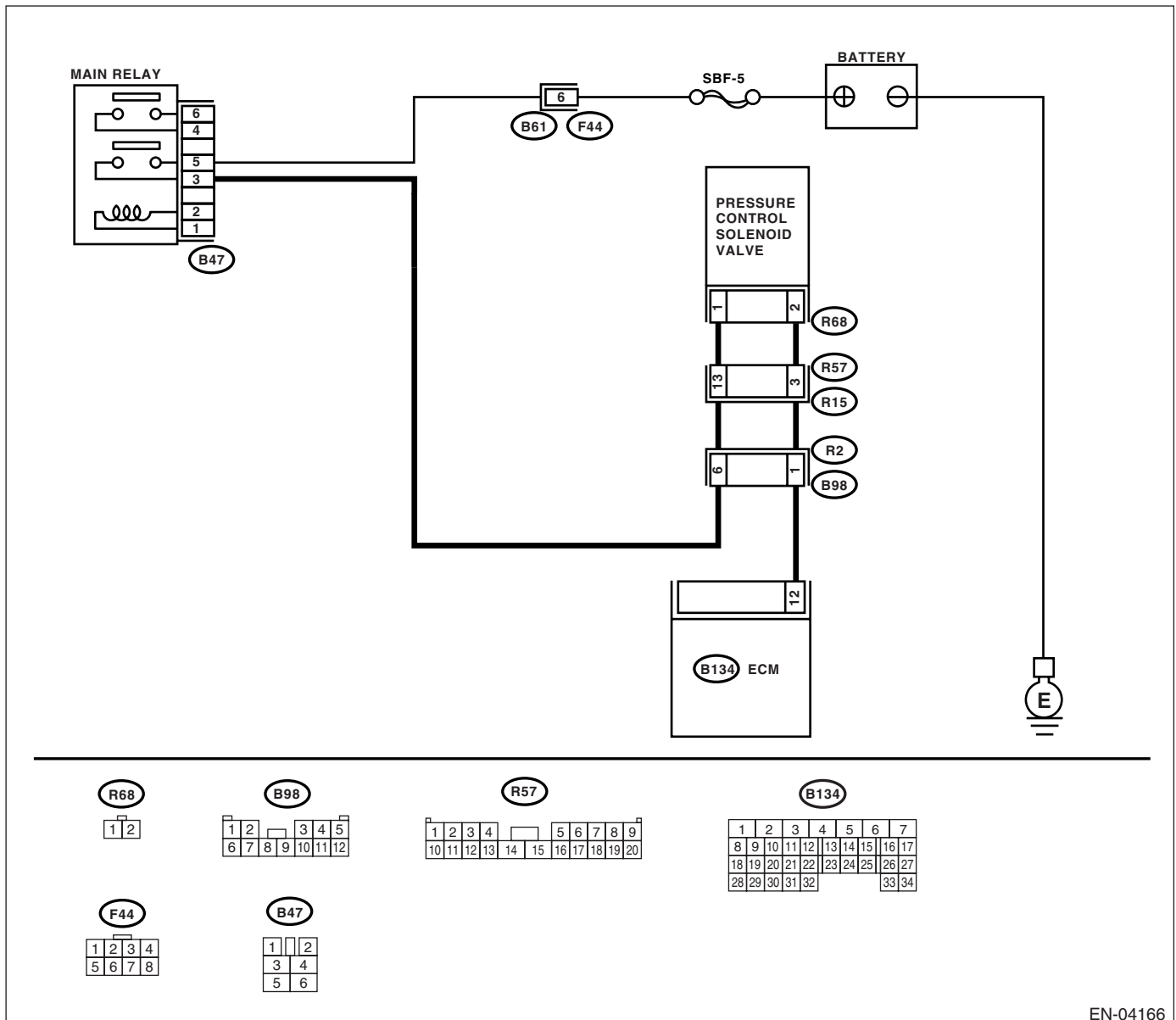
CH:DTC P1420 FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-194, DTC P1420 FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04166

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK INPUT SIGNAL FOR ECM. 1) Turn ignition switch to OFF. 2) Connect the test mode connector at the lower portion of instrument panel (on the driver's side). 3) Turn ignition switch to ON. 4) While operating the pressure control solenoid valve, measure voltage between ECM and chassis ground. NOTE: Pressure control solenoid valve operation can be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(STI)(diag)-46, Compulsory Valve Operation Check Mode.> Connector & terminal (B134) No. 12 (+) — Chassis ground (-):	Does the voltage value change 0 — 10 V?	Go to step 2.	The malfunction indicator light may light up, however, the circuit is returned to the normal status at the moment. In this case, repair poor contact in ECM connector.
2 CHECK INPUT SIGNAL FOR ECM. 1) Turn ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. Connector & terminal (B134) No. 12 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 4.	Go to step 3.
3 CHECK FOR POOR CONTACT. Check for poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).>
4 CHECK HARNESS BETWEEN PRESSURE CONTROL SOLENOID VALVE AND ECM CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect the connector from pressure control solenoid valve. 3) Turn ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. Connector & terminal (B134) No. 12 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Repair short circuit to battery in harness between ECM and pressure control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).>	Go to step 5.
5 CHECK PRESSURE CONTROL SOLENOID VALVE. 1) Turn 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(STI)-12, Pressure Control Solenoid Valve.> and the ECM <Ref. to FU(STI)-39, Engine Control Module (ECM).>.	Go to step 6.
6 CHECK FOR POOR CONTACT. Check for poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).>

CI: DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM
DTC DETECTING CONDITION:

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-196, DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

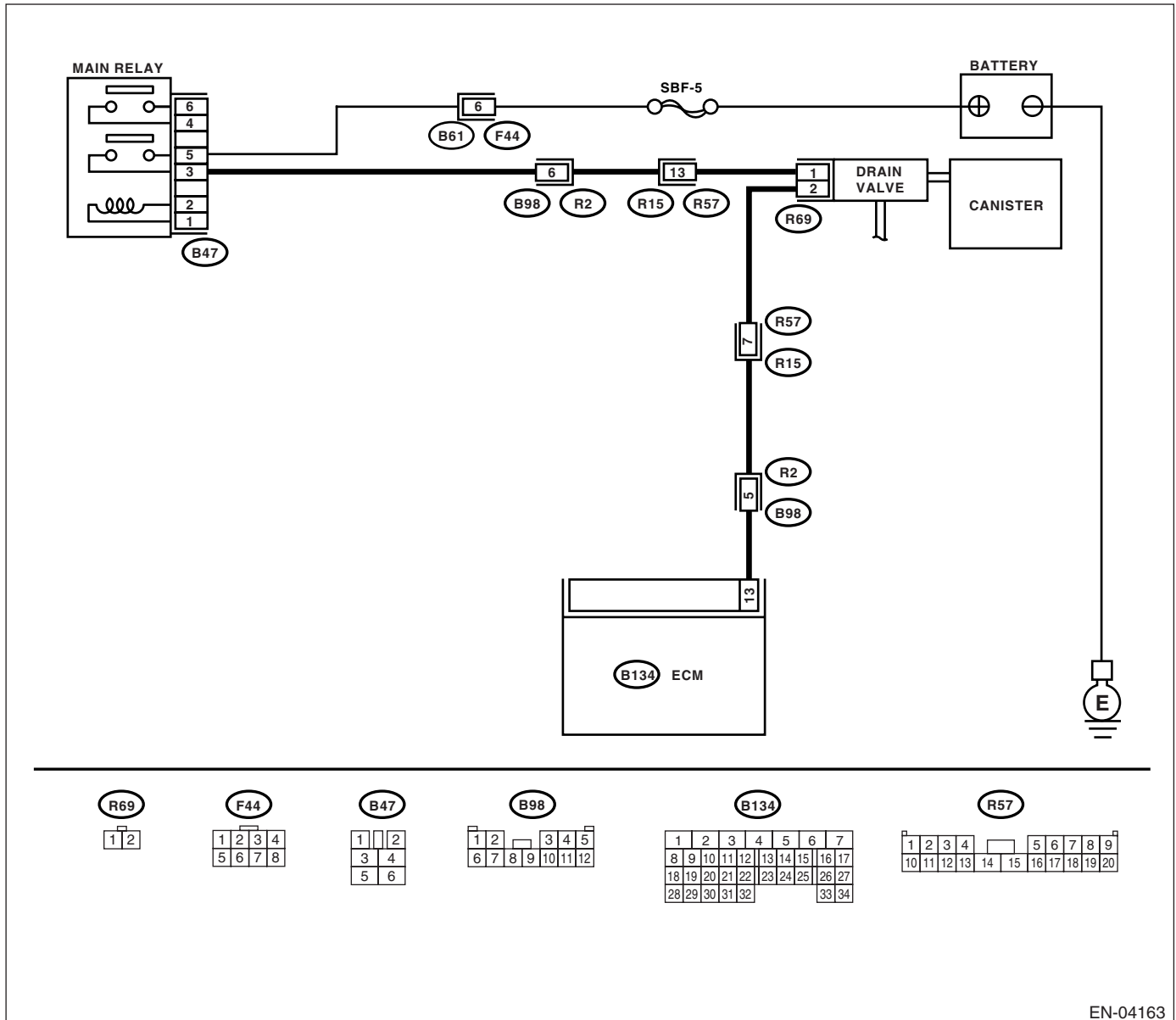
TROUBLE SYMPTOM:

Improper fuel supply

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04163

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK FOR ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK VENT LINE HOSES. Check the following items. • Clogging of vent hoses between canister and drain valve • Clogging of vent hose between drain valve and air filter • Clogging of drain filter	Is there any fault in vent line?	Repair or replace faulty parts.	Go to step 3.
3 CHECK DRAIN VALVE OPERATION. 1) Turn ignition switch to OFF. 2) Connect the test mode connector at the lower portion of instrument panel (on the driver's side). 3) Turn ignition switch to ON. 4) Operate the drain valve. NOTE: Drain valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(STI)(diag)-46, Compulsory Valve Operation Check Mode.>	Does the drain valve operate?	Contact your SOA Service Center since deterioration of some parts may be the cause.	Replace the drain valve. <Ref. to EC(STI)-16, Drain Valve.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

CJ:DTC P1446 FUEL TANK SENSOR CONTROL VALVE CIRCUIT LOW

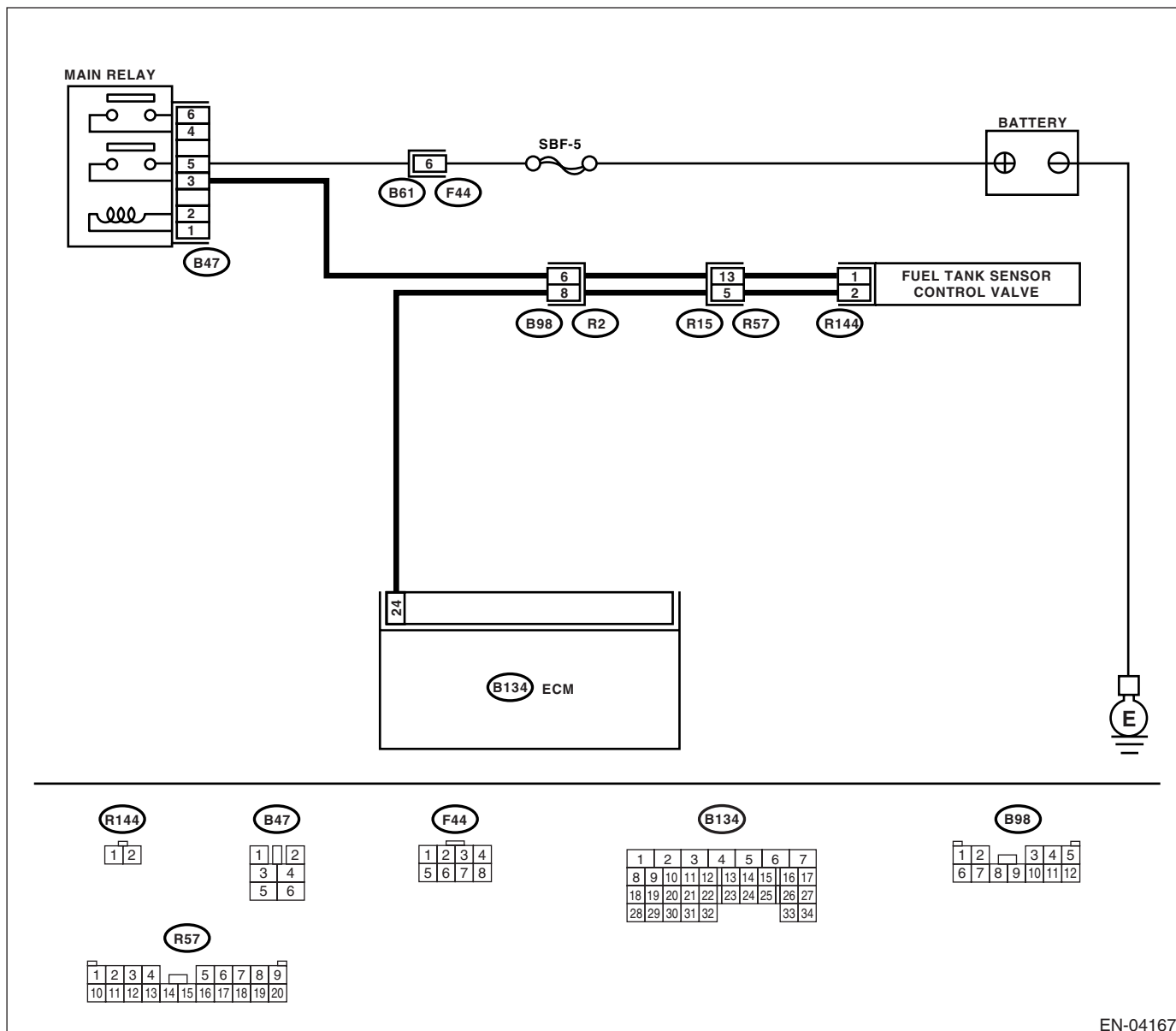
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-198, DTC P1446 FUEL TANK SENSOR CONTROL VALVE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04167

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OUTPUT SIGNAL FROM ECM. 1) Turn ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. Connector & terminal (B134) No. 24 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 2.	Go to step 3.
2 CHECK FOR POOR CONTACT. Check for poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	The malfunction indicator light may light up, however, the circuit is returned to the normal status at the moment. (However, the possibility of poor contact still remains.) NOTE: In this case, repair the following: • Poor contact in fuel tank sensor control valve connector • Poor contact in ECM connector • Poor contact in coupling connector
3 CHECK HARNESS BETWEEN FUEL TANK SENSOR CONTROL VALVE AND ECM CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect the connectors from fuel tank sensor control valve and ECM. 3) Measure the resistance of harness between fuel tank sensor control valve connector and chassis ground. Connector & terminal (R144) No. 2 — Chassis ground:	Is the resistance more than 1 MΩ?	Go to step 4.	Repair short circuit to ground in harness between ECM and fuel tank sensor control valve connector.
4 CHECK HARNESS BETWEEN FUEL TANK SENSOR CONTROL VALVE AND ECM CONNECTOR. Measure the resistance of harness between ECM and fuel tank sensor control valve connector. Connector & terminal (B134) No. 24 — (R144) No. 2:	Is the resistance less than 1 Ω?	Go to step 5.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and fuel tank sensor control valve connector • Poor contact in coupling connector
5 CHECK FUEL TANK SENSOR CONTROL VALVE. Measure the resistance between fuel tank sensor control valve terminals. Terminals No. 1 — No. 2:	Is the resistance 10 — 100 Ω?	Go to step 6.	Replace the fuel tank sensor control valve. <Ref. to EC(STI)-16, Drain Valve.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
6 CHECK POWER SUPPLY TO FUEL TANK SENSOR CONTROL VALVE. 1) Turn ignition switch to ON. 2) Measure the voltage between fuel tank sensor control valve and chassis ground. Connector & terminal (R144) No. 1 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 7.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between main relay and fuel tank sensor control valve • Poor contact in coupling connector • Poor contact in main relay connector
7 CHECK FOR POOR CONTACT. Check for poor contact in fuel tank sensor control valve connector.	Is there poor contact in fuel tank sensor control valve connector?	Repair poor contact in fuel tank sensor control valve connector.	Contact your SOA Service Center since deterioration of some parts may be the cause.

CK:DTC P1447 FUEL TANK SENSOR CONTROL VALVE CIRCUIT HIGH

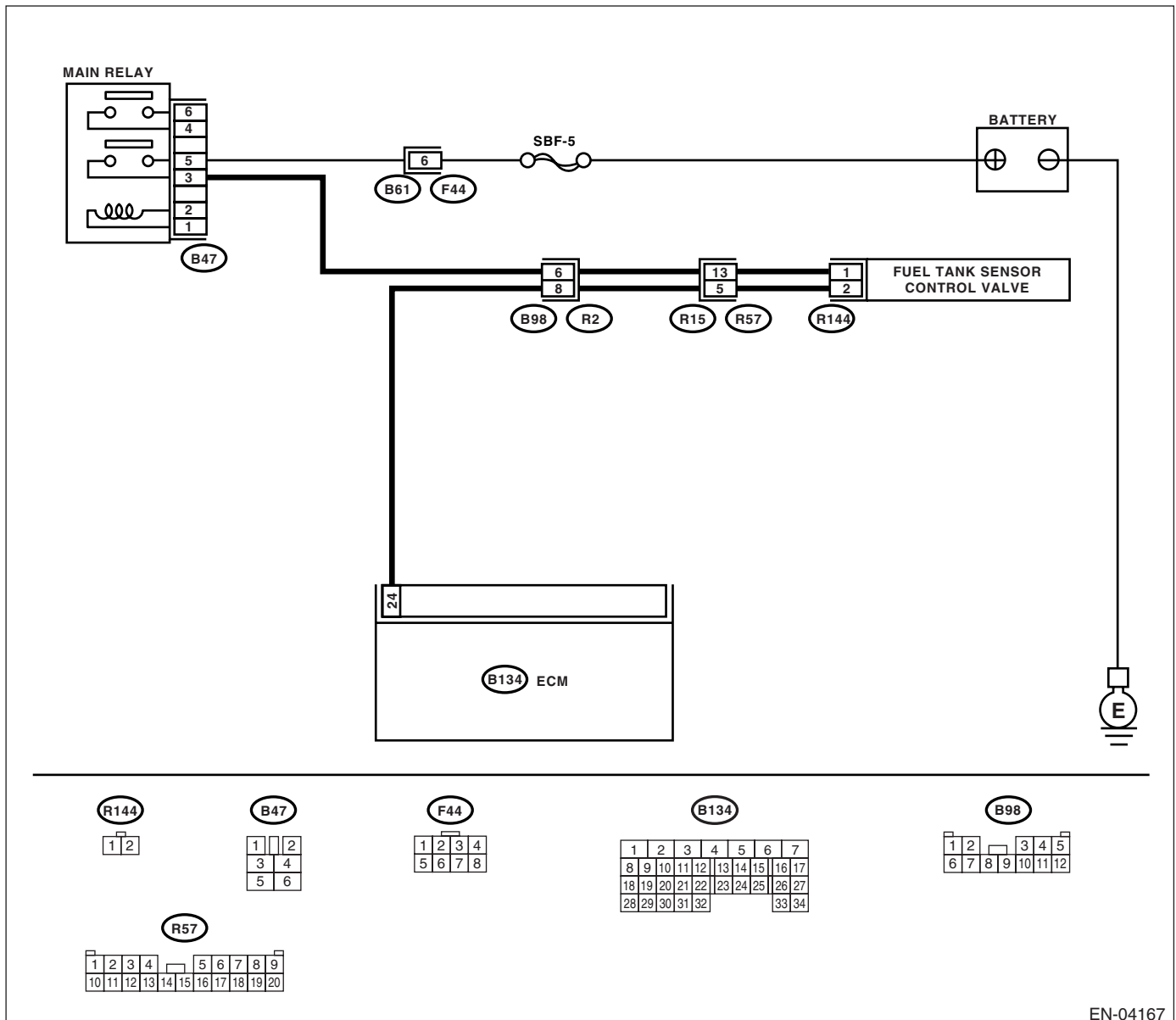
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-200, DTC P1447 FUEL TANK SENSOR CONTROL VALVE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



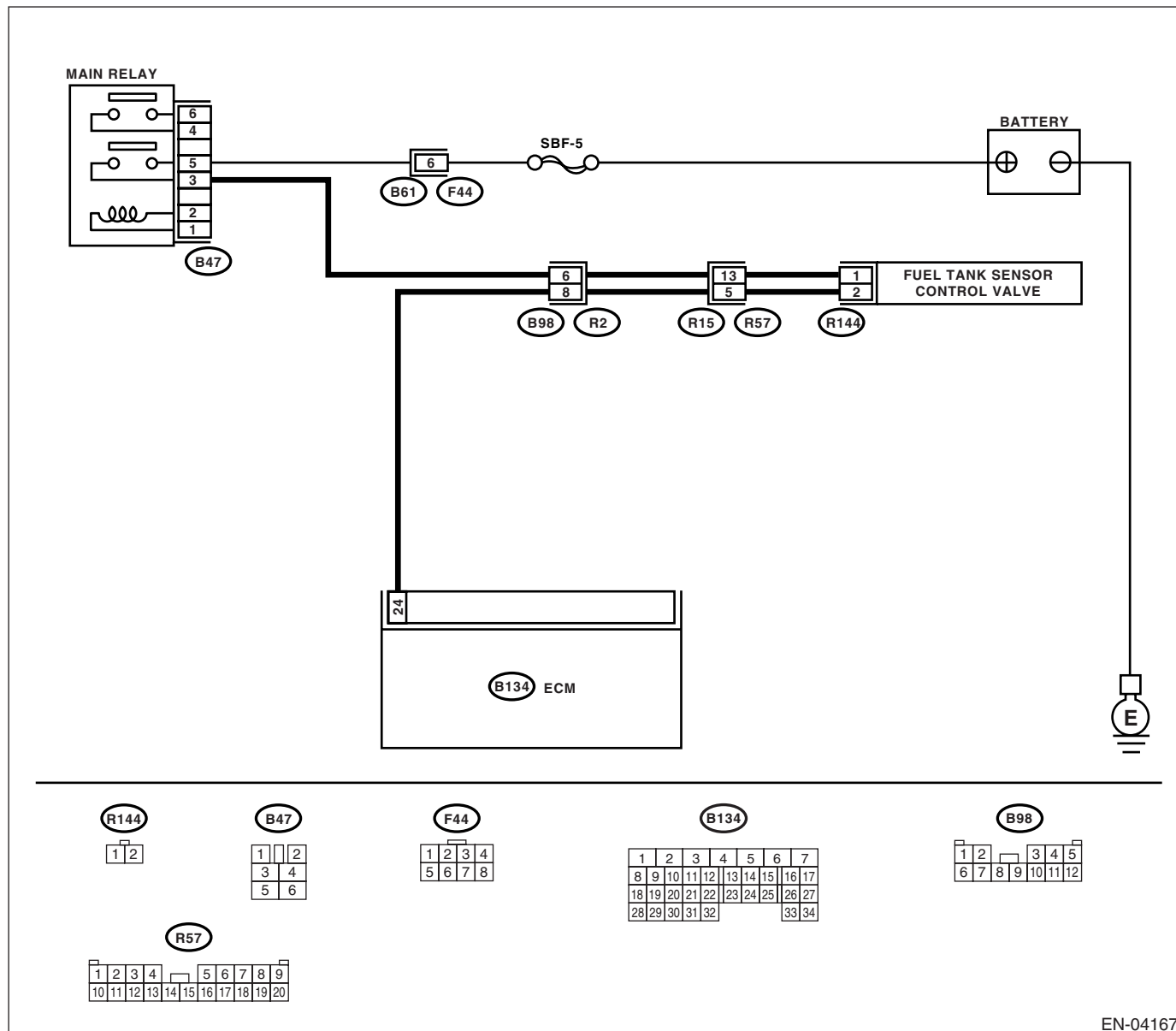
EN-04167

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OUTPUT SIGNAL FROM ECM. 1) Turn ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. Connector & terminal (B134) No. 24 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 3.	Go to step 2.
2 CHECK FOR POOR CONTACT. Check for poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).>
3 CHECK HARNESS BETWEEN FUEL TANK SENSOR CONTROL VALVE AND ECM CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect the connector from fuel tank sensor control valve. 3) Turn ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. Connector & terminal (B134) No. 24 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Repair short circuit to battery in harness between ECM and fuel tank sensor control valve connector. After repair, replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).>	Go to step 4.
4 CHECK FUEL TANK SENSOR CONTROL VALVE. 1) Turn ignition switch to OFF. 2) Measure the resistance between fuel tank sensor control valve terminals. Terminals No. 1 — No. 2:	Is the resistance less than 1 Ω ?	Replace the fuel tank sensor control valve <Ref. to EC(STI)-11, Fuel Tank Sensor Control Valve.> and the ECM <Ref. to FU(STI)-39, Engine Control Module (ECM).>.	Go to step 5.
5 CHECK FOR POOR CONTACT. Check for poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).>

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK FOR ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using the "List of Diagnostic Trouble Codes (DTC)". <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).>	Go to step 2 .
2 CHECK FUEL FILLER CAP. 1) Turn ignition switch to OFF. 2) Open the fuel filler flap lid.	Is the fuel filler cap tightened securely?	Go to step 3 .	Tighten fuel filler cap securely.
3 CHECK EVAPORATIVE EMISSION LINE. NOTE: Check the following items. • Disconnection, leakage and clogging of hoses between fuel tank pressure sensor and fuel tank • Disconnection, leakage and clogging of hoses and pipes between fuel filler pipe and fuel tank	Is there any trouble in evaporative emission line?	Repair the hoses and pipes.	Replace the fuel tank pressure sensor.

CM:DTC P1491 POSITIVE CRANKCASE VENTILATION (BLOW-BY) FUNCTION PROBLEM**DTC DETECTING CONDITION:**

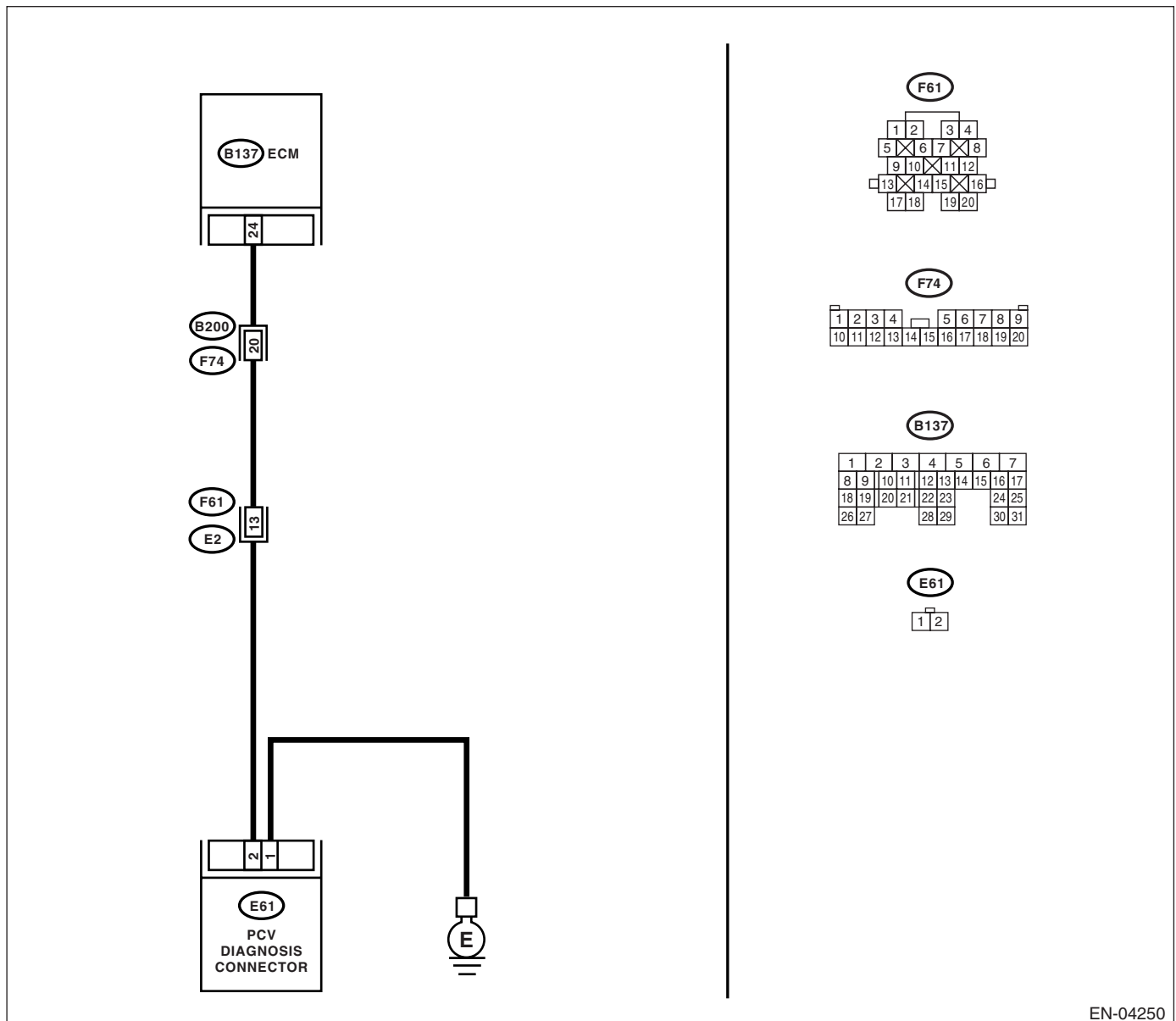
- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-205, DTC P1491 POSITIVE CRANKCASE VENTILATION (BLOW-BY) FUNCTION PROBLEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:

EN-04250

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK BLOW-BY HOSE. Check the blow-by hose.	Is there disconnection or crack in blow-by hose?	Replace or repair blow-by hose.	Go to step 2.
2 INSPECT HARNESS BETWEEN PCV DIAGNOSIS CONNECTOR AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from PCV diagnosis connector and ECM. 3) Measure the resistance of harness between PCV diagnosis connector and ECM connector. Connector & terminal (B137) No. 24 — (E61) No. 2:	Is the resistance less than 1 Ω ?	Go to step 3.	Repair open circuit in harness between PCV diagnosis connector and ECM.
3 INSPECT HARNESS BETWEEN PCV DIAGNOSIS CONNECTOR AND ECM CONNECTOR. Measure the resistance of harness between PCV diagnosis connector and chassis ground. Connector & terminal (B137) No. 24 — Chassis ground:	Is the resistance more than 1 M Ω ?	Go to step 4.	Repair short circuit to chassis ground in harness between PCV diagnosis connector and ECM.
4 INSPECT PCV DIAGNOSIS CONNECTOR GROUND CIRCUIT. Measure the resistance between PCV diagnosis connector and engine ground. Connector & terminal (B61) No. 1 — Engine ground:	Is the resistance less than 5 Ω ?	Go to step 5.	Repair PCV diagnosis connector ground circuit.
5 INSPECT PCV DIAGNOSIS CONNECTOR. Measure the resistance between PCV diagnosis connector and terminal. Terminals No. 1 — No. 2:	Is the resistance less than 1 Ω ?	Repair poor contact in ECM and PCV diagnosis connector.	Replace PCV diagnosis connector.

CN:DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-207, DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

Failure of engine to start

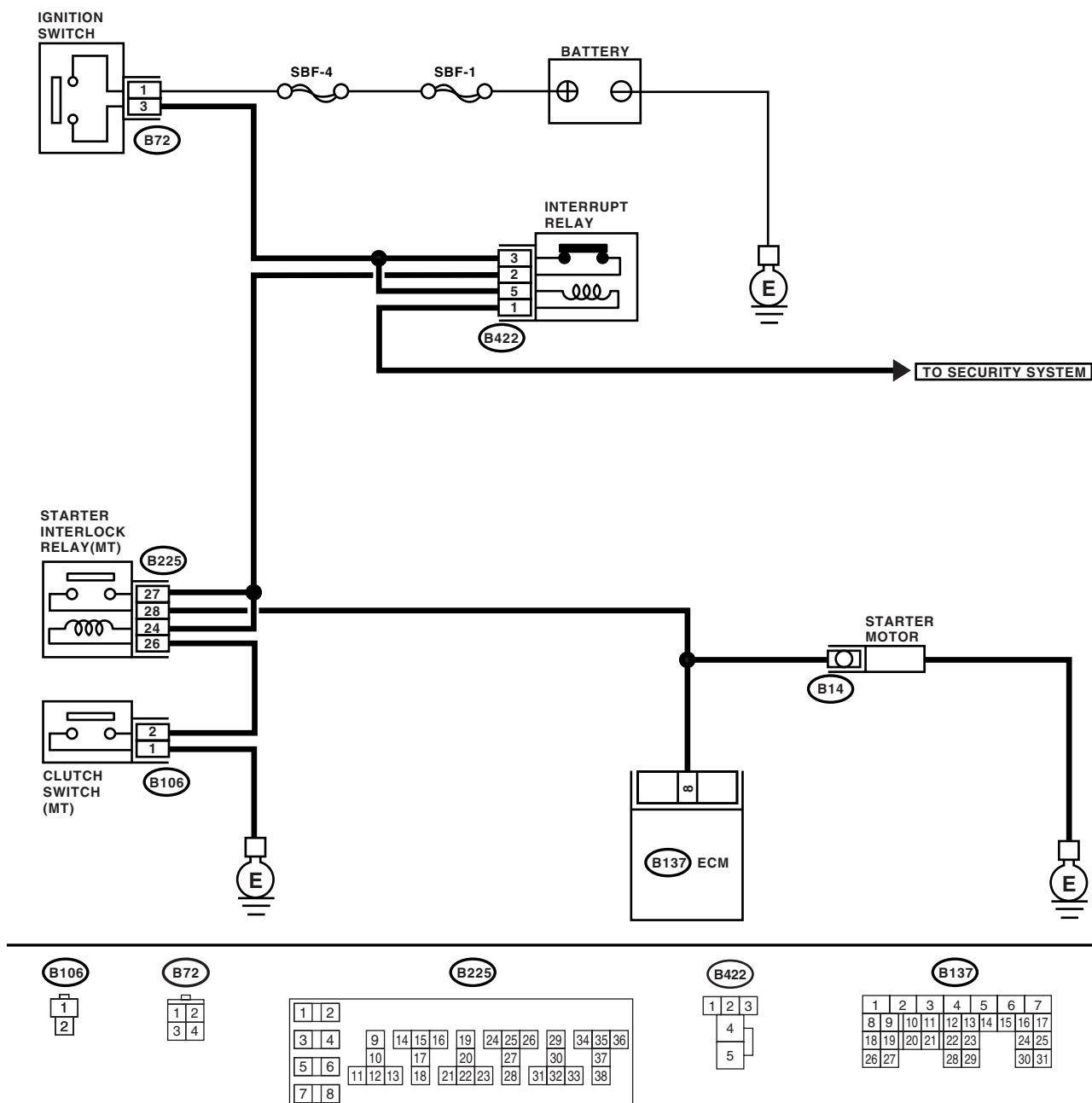
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-04153

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OPERATION OF STARTER MOTOR.	Does the starter motor operate when ignition switch is turned to START?	Repair the harness and connector. NOTE: In this case, repair the following: • Open or ground short circuit in harness between ECM and starter motor connector • Poor contact in ECM connector	Check the starter motor circuit. <Ref. to EN(STI)(diag)-58, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

CO:DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-208, DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK INPUT SIGNAL FOR ECM. 1) Turn the ignition switch to OFF. 2) Measure the voltage between ECM and chassis ground. Connector & terminal (B135) No. 19 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Repair the poor contact in ECM connector.	Go to step 2.
2 CHECK HARNESS BETWEEN ECM AND MAIN FUSE BOX CONNECTOR. 1) Disconnect the connector from ECM. 2) Measure the resistance of harness between ECM and chassis ground. Connector & terminal (B135) No. 19 — Chassis ground:	Is the resistance less than 10 Ω ?	Repair the ground short circuit in harness between ECM connector and battery terminal.	Go to step 3.
3 CHECK FUSE SBF-5.	Is the fuse blown?	Replace the fuse.	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and battery • Poor contact in ECM connector • Poor contact in battery terminal

CP:DTC P2004 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 1)**DTC DETECTING CONDITION:**

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-210, DTC P2004 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

Step	Check	Yes	No
1 CHECK FOR ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK TUMBLE GENERATOR VALVE RH. 1) Remove the tumble generator valve assembly. 2) Check the tumble generator valve body.	Does the tumble generator valve move smoothly? (No dirt or foreign materials clogged)	Replace the tumble generator valve assembly. <Ref. to FU(STI)-32, Tumble Generator Valve Assembly.>	Clean the tumble generator valve.

CQ:DTC P2005 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 2)**DTC DETECTING CONDITION:**

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-211, DTC P2005 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

Step	Check	Yes	No
1 CHECK FOR ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK TUMBLE GENERATOR VALVE LH. 1) Remove the tumble generator valve assembly. 2) Check the tumble generator valve body.	Does the tumble generator valve move smoothly? (No dirt or foreign materials clogged)	Replace the tumble generator valve assembly. <Ref. to FU(STI)-32, Tumble Generator Valve Assembly.>	Clean the tumble generator valve.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

CR:DTC P2006 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-212, DTC P2006 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

Step	Check	Yes	No
1 CHECK FOR ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)" <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK TUMBLE GENERATOR VALVE RH. 1) Remove the tumble generator valve assembly. 2) Check the tumble generator valve body.	Does the tumble generator valve move smoothly? (No dirt or foreign materials clogged)	Replace the tumble generator valve assembly. <Ref. to FU(STI)-32, Tumble Generator Valve Assembly.>	Clean the tumble generator valve.

CS:DTC P2007 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK2)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-213, DTC P2007 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

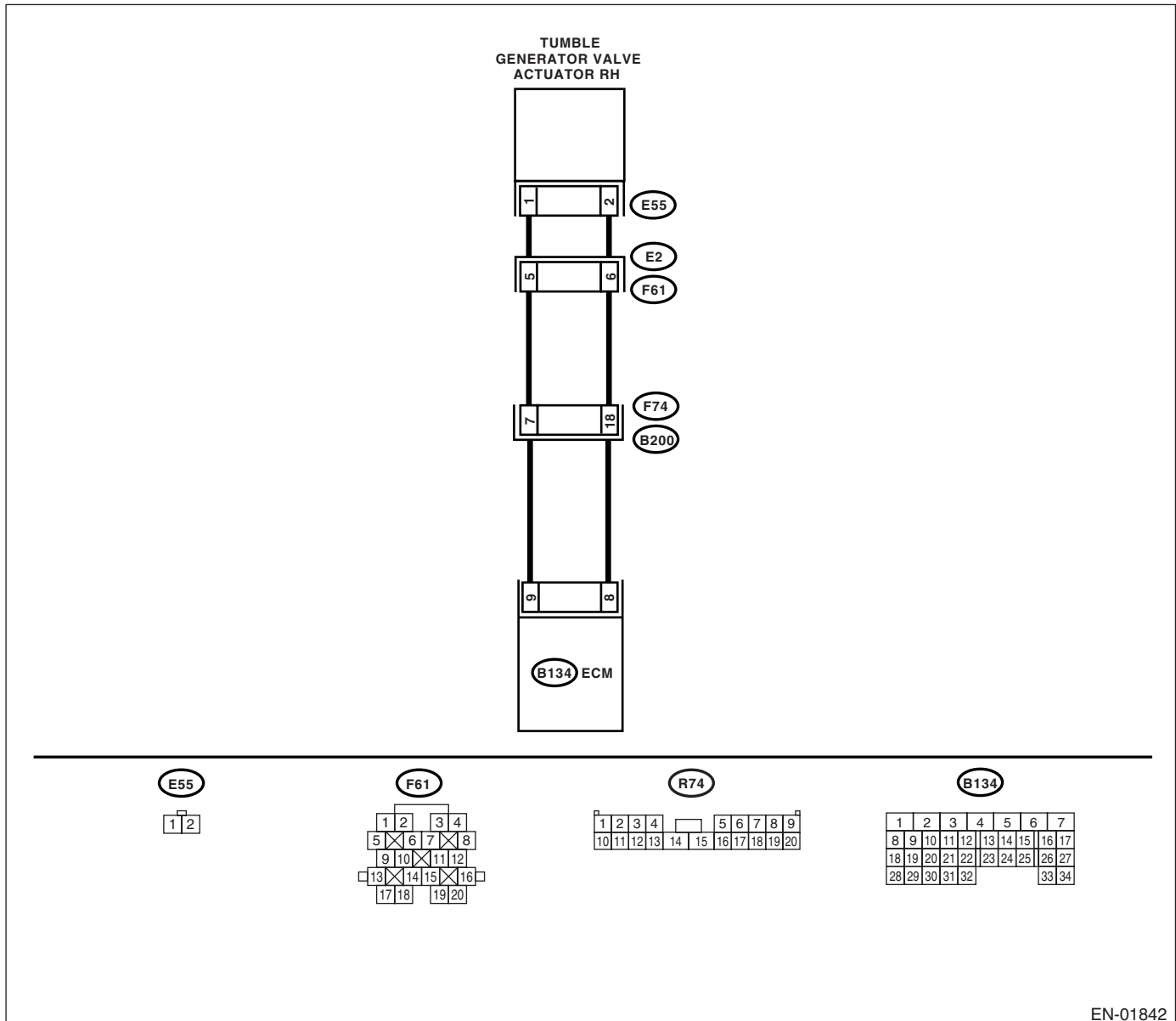
Step	Check	Yes	No
1 CHECK FOR ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK TUMBLE GENERATOR VALVE LH. 1) Remove the tumble generator valve assembly. 2) Check the tumble generator valve body.	Does the tumble generator valve move smoothly? (No dirt or foreign materials clogged)	Replace the tumble generator valve assembly. <Ref. to FU(STI)-32, Tumble Generator Valve Assembly.>	Clean the tumble generator valve.

**CT:DTC P2008 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN
(BANK 1)****DTC DETECTING CONDITION:**

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-214, DTC P2008 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

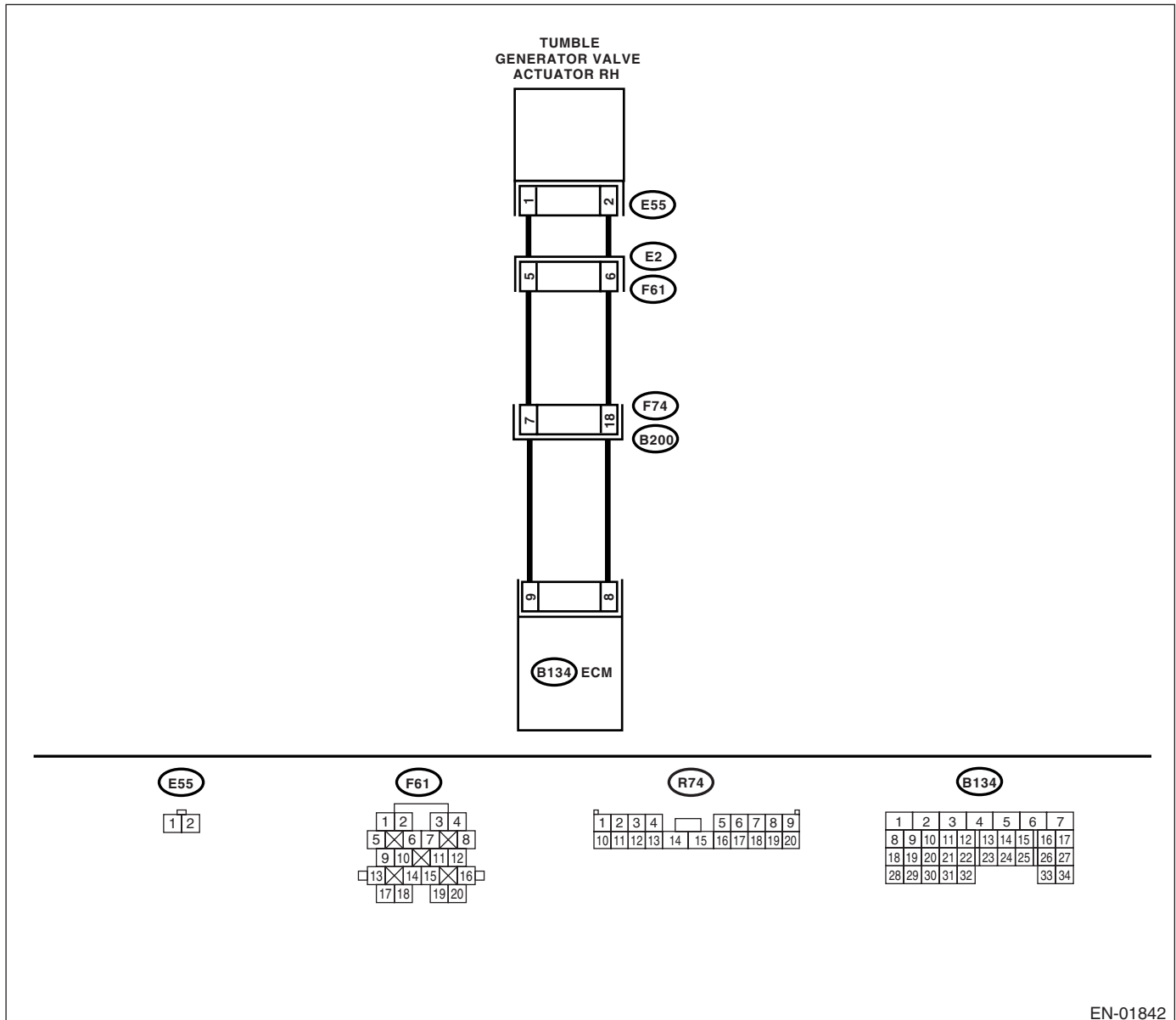
Step	Check	Yes	No
1 CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ACTUATOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from tumble generator valve and ECM connector. 3) Measure the resistance between tumble generator valve actuator and ECM connector. Connector & terminal (E55) No. 1 — (B134) No. 9: (E55) No. 2 — (B134) No. 8:	Is the resistance less than 1 Ω ?	Go to step 2.	Repair the open circuit between ECM and tumble generator valve connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and tumble generator valve actuator connector. • Poor contact in coupling connector.
2 CHECK POOR CONTACT. Check poor contact in tumble generator valve actuator connector.	Is there poor contact in tumble generator valve actuator connector?	Repair the poor contact in tumble generator valve actuator connector.	Replace the tumble generator valve actuator. <Ref. to FU(STI)-34, Tumble Generator Valve Actuator.>

CU:DTC P2009 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 1)**DTC DETECTING CONDITION:**

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-216, DTC P2009 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

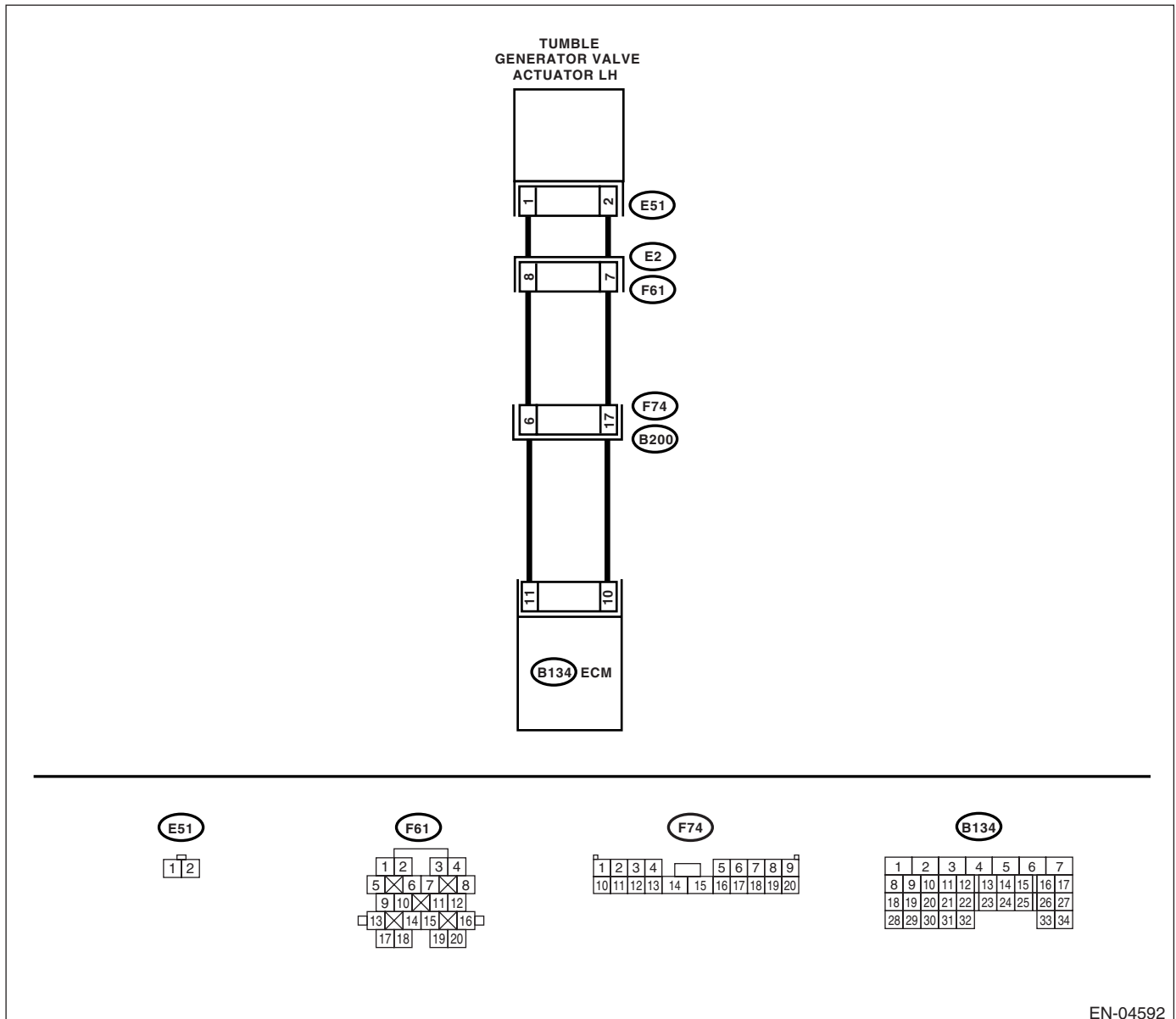
Step	Check	Yes	No
1 CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ACTUATOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from tumble generator valve connector. 3) Measure the voltage between tumble generator valve actuator and chassis ground. Connector & terminal (E55) No. 1 (+) — Chassis ground (-): (E55) No. 2 (+) — Chassis ground (-):	Is the voltage less than 5 V?	Replace the tumble generator valve actuator. <Ref. to FU(STI)-34, Tumble Generator Valve Actuator.>	Repair the battery short circuit in harness between ECM and tumble generator valve actuator.

**CV:DTC P2011 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN
(BANK 2)****DTC DETECTING CONDITION:**

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-218, DTC P2011 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

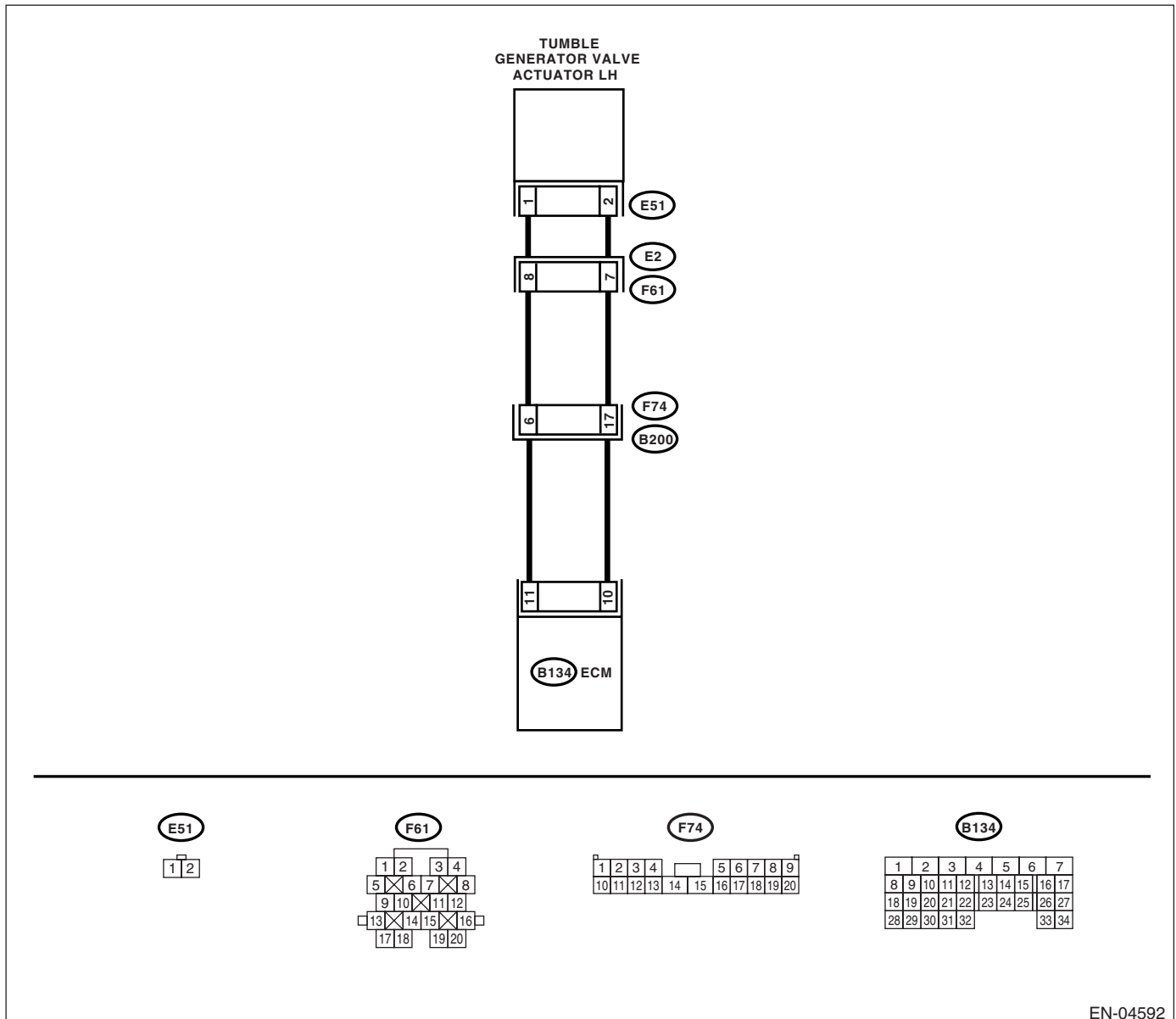
Step	Check	Yes	No
1 CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ACTUATOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from tumble generator valve and ECM connector. 3) Measure the resistance between tumble generator valve actuator and ECM connector. Connector & terminal (E51) No. 1 — (B134) No. 11: (E51) No. 2 — (B134) No. 10:	Is the resistance less than 1 Ω ?	Go to step 2.	Repair the open circuit between ECM and tumble generator valve connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and tumble generator valve actuator connector. • Poor contact in coupling connector.
2 CHECK POOR CONTACT. Check poor contact in tumble generator valve actuator connector.	Is there poor contact in tumble generator valve actuator connector?	Repair the poor contact in tumble generator valve actuator connector.	Replace the tumble generator valve actuator. <Ref. to FU(STI)-34, Tumble Generator Valve Actuator.>

CW:DTC P2012 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 2)**DTC DETECTING CONDITION:**

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-220, DTC P2012 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:

EN-04592

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ACTUATOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from tumble generator valve connector. 3) Measure the voltage between tumble generator valve actuator and chassis ground. Connector & terminal (E51) No. 1 (+) — Chassis ground (-): (E51) No. 2 (+) — Chassis ground (-):	Is the voltage less than 5 V?	Replace the tumble generator valve actuator. <Ref. to FU(STI)-34, Tumble Generator Valve Actuator.>	Repair the battery short circuit in harness between ECM and tumble generator valve actuator.

CX:DTC P2016 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT LOW (BANK 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-222, DTC P2016 INTAKE MANIFOLD RUNNER POSITION SENSOR/SWITCH CIRCUIT LOW (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

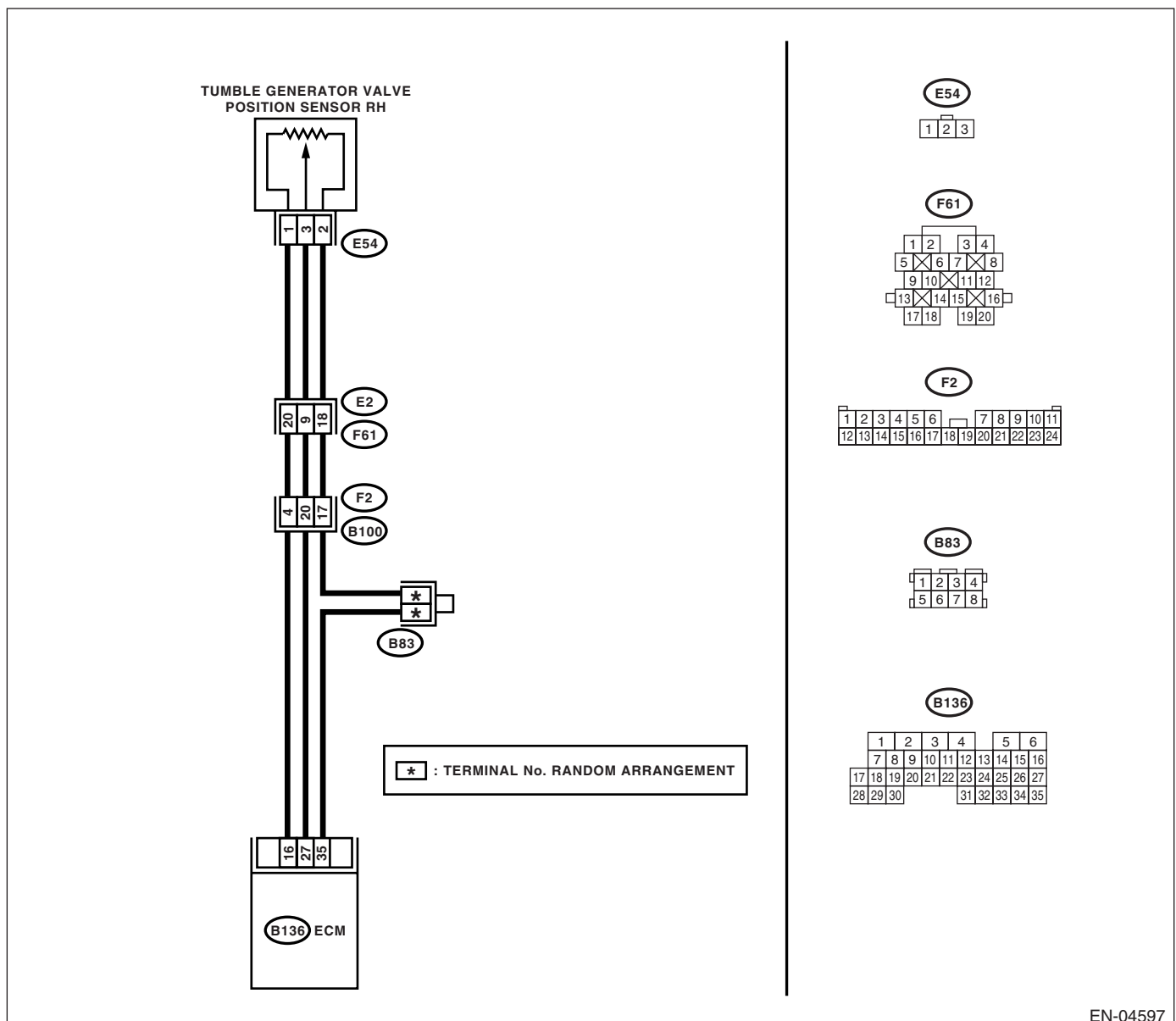
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04597

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK CURRENT DATA. 1) Start the engine. 2) Read the data of tumble generator valve position sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STI)(diag)-28, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the voltage less than 0.1 V?	Go to step 2.	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following: • Poor contact in tumble generator valve position sensor connector • Poor contact in ECM connector • Poor contact in coupling connector
2 CHECK INPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B136) No. 16 (+) — Chassis ground (-):	Is the voltage more than 4.5 V?	Go to step 4.	Go to step 3.
3 CHECK INPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B136) No. 16 (+) — Chassis ground (-):	Shake the ECM harness and connector, while monitoring value of voltage meter. Does the voltage change?	Repair the poor contact in ECM connector.	Contact your SOA Service Center since deterioration of some parts may be the cause.
4 CHECK INPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B136) No. 27 (+) — Chassis ground (-):	Is the voltage less than 0.1 V?	Go to step 6.	Go to step 5.
5 CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR) Measure the voltage between ECM connector and chassis ground.	Shake the ECM harness and connector, while monitoring value of Subaru Select Monitor. Does the voltage change?	Repair the poor contact in ECM connector.	Go to step 6.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
6 CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from tumble generator valve position sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between tumble generator valve position sensor connector and engine ground. Connector & terminal (E54) No. 1 (+) — Engine ground (-):	Is the voltage more than 4.5 V?	Go to step 7.	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between tumble generator valve position sensor and ECM connector • Poor contact in tumble generator valve position sensor connector • Poor contact in ECM connector • Poor contact in coupling connector • Poor contact in joint connector
7 CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between ECM connector and tumble generator valve position sensor connector. Connector & terminal (B136) No. 27 — (E54) No. 3:	Is the resistance less than 1 Ω ?	Go to step 8.	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between tumble generator valve position sensor and ECM connector • Poor contact in ECM connector • Poor contact in tumble generator valve position sensor connector • Poor contact in coupling connector
8 CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR. Measure the resistance of harness between tumble generator valve position sensor connector and engine ground. Connector & terminal (E54) No. 3 — Engine ground:	Is the resistance more than 1 M Ω ?	Go to step 9.	Repair the ground short circuit in harness between tumble generator valve position sensor and ECM connector.
9 CHECK POOR CONTACT. Check poor contact in tumble generator valve position sensor connector.	Is there poor contact in tumble generator valve position sensor connector?	Repair the poor contact in tumble generator valve position sensor connector.	Replace the tumble generator valve position sensor. <Ref. to FU(STI)-33, Tumble Generator Valve Position Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

CY:DTC P2017 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT HIGH (BANK 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-224, DTC P2017 INTAKE MANIFOLD RUNNER POSITION SENSOR/SWITCH CIRCUIT HIGH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

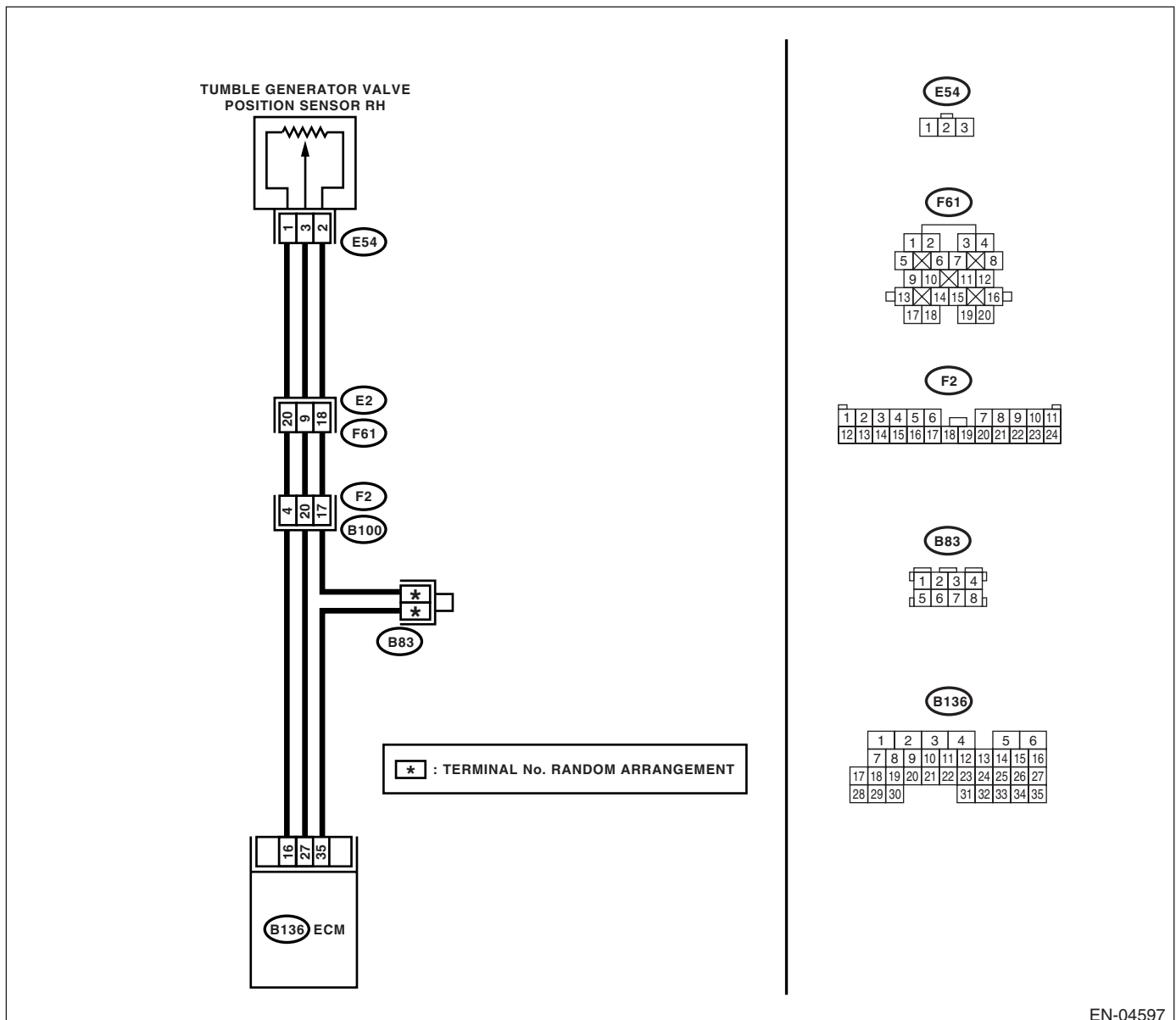
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04597

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK CURRENT DATA. 1) Start the engine. 2) Read the data of tumble generator valve position sensor signal using Subaru Select Monitor or general scan tool. NOTE: - Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STI)(diag)-28, Subaru Select Monitor.> - General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the voltage more than 4.9 V?	Go to step 2.	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following: - Poor contact in tumble generator valve position sensor connector - Poor contact in ECM connector - Poor contact in coupling connector
2 CHECK HARNESS BETWEEN TUMBLE GENERATOR VALVE POSITION SENSOR AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from tumble generator valve position sensor. 3) Measure the resistance of harness between tumble generator valve position sensor connector and engine ground. Connector & terminal (E54) No. 2 — 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: - Open circuit in harness between tumble generator valve position sensor and ECM connector - Poor contact in coupling connector - Poor contact in joint connector
3 CHECK HARNESS BETWEEN TUMBLE GENERATOR VALVE POSITION SENSOR AND ECM CONNECTOR. 1) Turn the ignition switch to ON. 2) Measure the voltage between tumble generator valve position sensor connector and engine ground. Connector & terminal (E54) No. 3 (+) — Engine ground (-):	Is the voltage more than 4.9 V?	Repair the battery short circuit in harness between tumble generator valve position sensor and ECM connector. After repair, replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).>	Replace the tumble generator valve position sensor. <Ref. to FU(STI)-33, Tumble Generator Valve Position Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

CZ:DTC P2021 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT LOW (BANK 2)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-226, DTC P2021 INTAKE MANIFOLD RUNNER POSITION SENSOR/ SWITCH CIRCUIT LOW (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

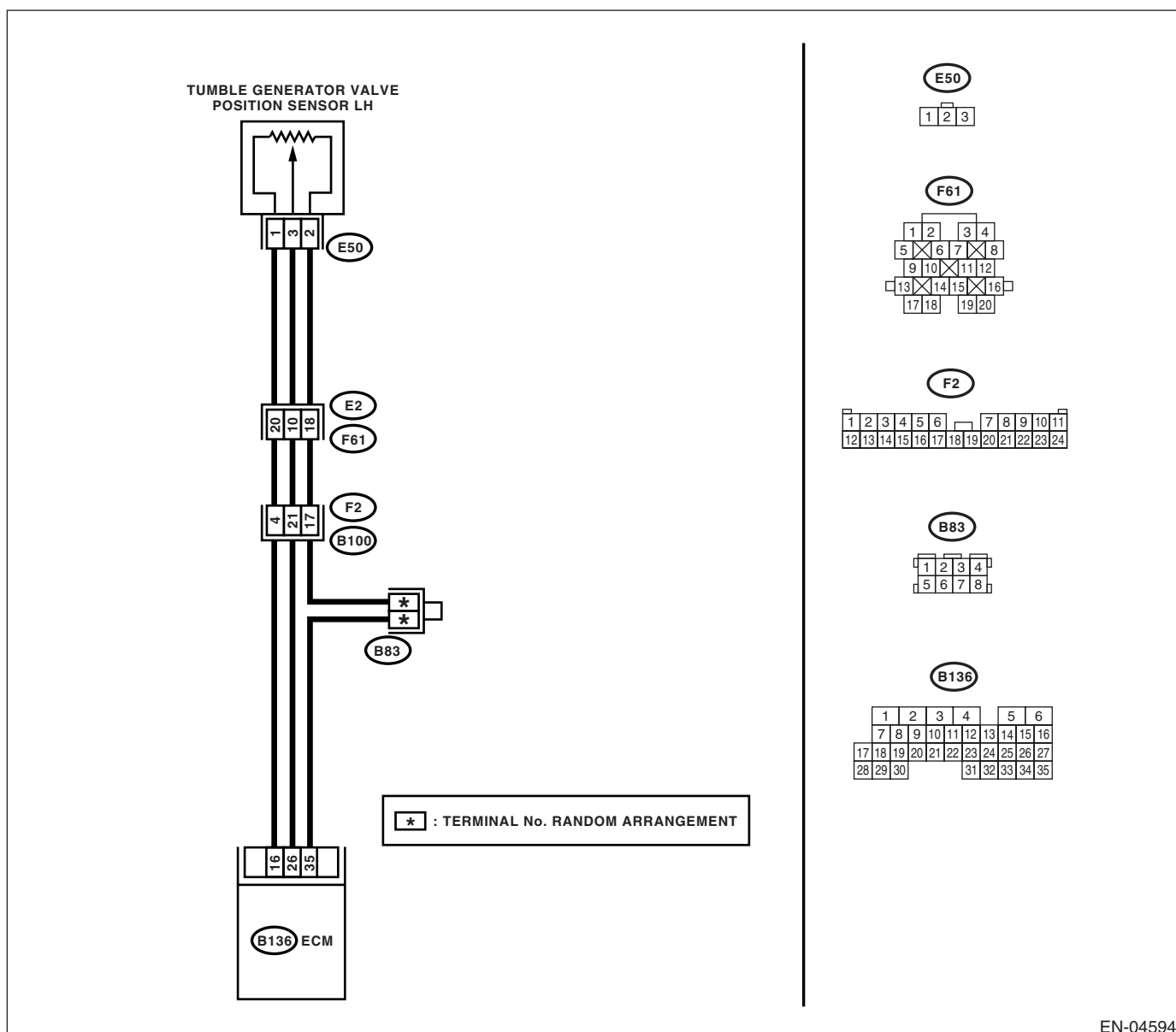
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04594

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK CURRENT DATA. 1) Start the engine. 2) Read the data of tumble generator valve position sensor signal using Subaru Select Monitor or general scan tool. NOTE: - Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STI)(diag)-28, Subaru Select Monitor.> - General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the voltage less than 0.1 V?	Go to step 2.	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following: - Poor contact in tumble generator valve position sensor connector - Poor contact in ECM connector - Poor contact in coupling connector
2 CHECK INPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B136) No. 16 (+) — Chassis ground (-):	Is the voltage more than 4.5 V?	Go to step 4.	Go to step 3.
3 CHECK INPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B136) No. 16 (+) — Chassis ground (-):	Shake the ECM harness and connector, while monitoring value of voltage meter. Does the voltage change?	Repair the poor contact in ECM connector.	Contact your SOA Service Center since deterioration of some parts may be the cause.
4 CHECK INPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B136) No. 26 (+) — Chassis ground (-):	Is the voltage less than 0.1 V?	Go to step 6.	Go to step 5.
5 CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR) Measure the voltage between ECM connector and chassis ground.	Shake the ECM harness and connector, while monitoring value of Subaru Select Monitor. Does the voltage change?	Repair the poor contact in ECM connector.	Go to step 6.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
6 CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from tumble generator valve position sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between tumble generator valve position sensor connector and engine ground. Connector & terminal (E50) No. 1 (+) — Engine ground (-):	Is the voltage more than 4.5 V?	Go to step 7.	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between tumble generator valve position sensor and ECM connector • Poor contact in tumble generator valve position sensor connector • Poor contact in ECM connector • Poor contact in coupling connector • Poor contact in joint connector
7 CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between ECM connector and tumble generator valve position sensor connector. Connector & terminal (B136) No. 26 — (E50) No. 3:	Is the resistance less than 1 Ω ?	Go to step 8.	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between tumble generator valve position sensor and ECM connector • Poor contact in ECM connector • Poor contact in tumble generator valve position sensor connector • Poor contact in coupling connector
8 CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR. Measure the resistance of harness between tumble generator valve position sensor connector and engine ground. Connector & terminal (E50) No. 3 — Engine ground:	Is the resistance more than 1 M Ω ?	Go to step 9.	Repair the ground short circuit in harness between tumble generator valve position sensor and ECM connector.
9 CHECK POOR CONTACT. Check poor contact in tumble generator valve position sensor connector.	Is there poor contact in tumble generator valve position sensor connector?	Repair the poor contact in tumble generator valve position sensor connector.	Replace the tumble generator valve position sensor. <Ref. to FU(STI)-33, Tumble Generator Valve Position Sensor.>

DA:DTC P2022 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT HIGH (BANK 2)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-228, DTC P2022 INTAKE MANIFOLD RUNNER POSITION SENSOR/ SWITCH CIRCUIT HIGH (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

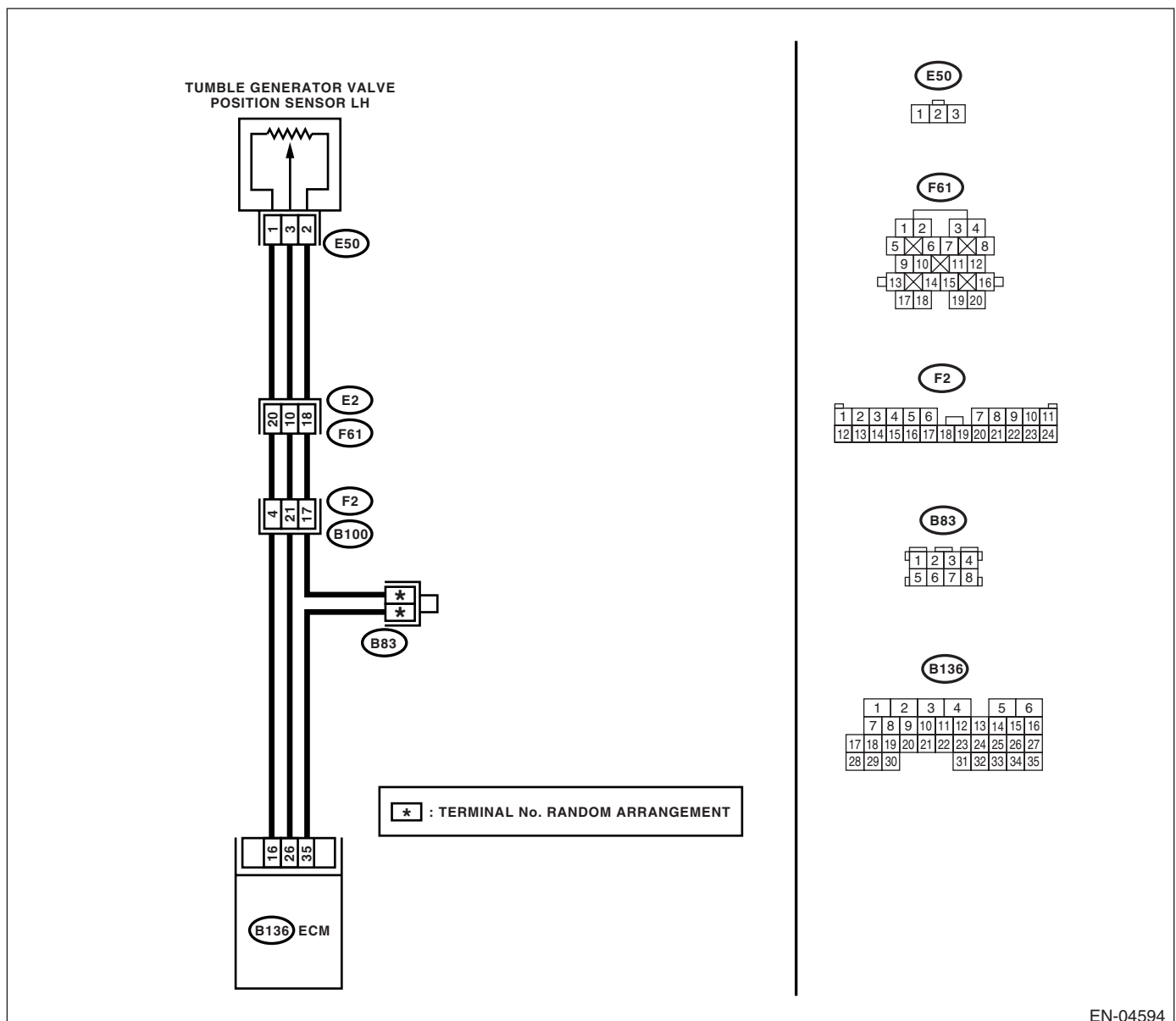
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04594

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK CURRENT DATA. 1) Start the engine. 2) Read the data of tumble generator valve position sensor signal using Subaru Select Monitor or general scan tool. NOTE: - Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STI)(diag)-28, Subaru Select Monitor.> - General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the voltage more than 4.9 V?	Go to step 2.	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following: - Poor contact in tumble generator valve position sensor connector - Poor contact in ECM connector - Poor contact in coupling connector
2 CHECK HARNESS BETWEEN TUMBLE GENERATOR VALVE POSITION SENSOR AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from tumble generator valve position sensor. 3) Measure the resistance of harness between tumble generator valve position sensor connector and engine ground. Connector & terminal (E50) No. 2 — 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: - Open circuit in harness between tumble generator valve position sensor and ECM connector - Poor contact in coupling connector - Poor contact in joint connector
3 CHECK HARNESS BETWEEN TUMBLE GENERATOR VALVE POSITION SENSOR AND ECM CONNECTOR. 1) Turn the ignition switch to ON. 2) Measure the voltage between tumble generator valve position sensor connector and engine ground. Connector & terminal (E50) No. 3 (+) — Engine ground (-):	Is the voltage more than 4.9 V?	Repair the battery short circuit in harness between tumble generator valve position sensor and ECM connector. After repair, replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).>	Replace the tumble generator valve position sensor. <Ref. to FU(STI)-33, Tumble Generator Valve Position Sensor.>

DB:DTC P2088 OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 1)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-230, DTC P2088 OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

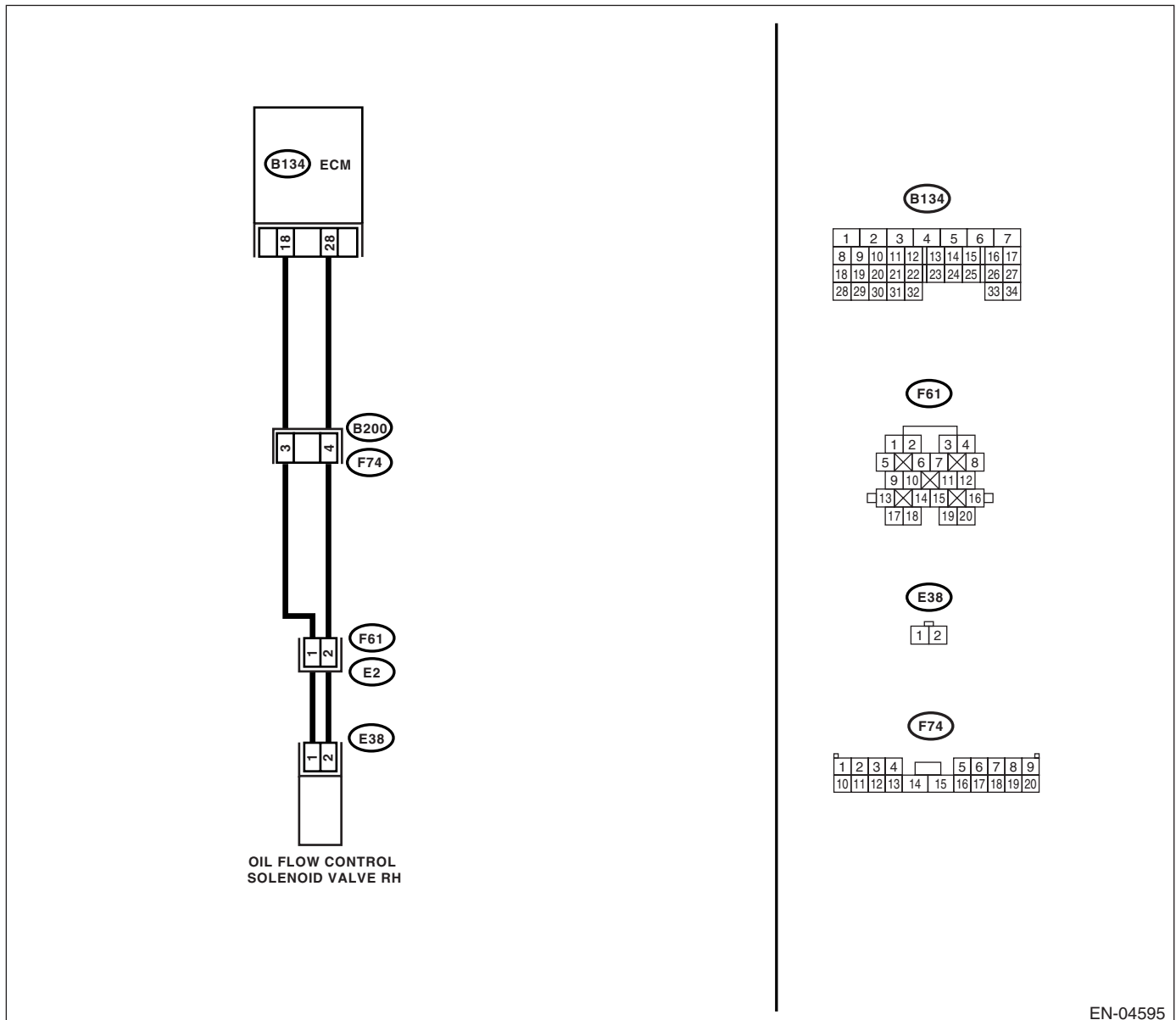
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04595

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and oil flow control solenoid valve. 3) Measure the resistance between ECM and oil flow control solenoid valve. Connector & terminal (B134) No. 18 — (E38) No. 1: (B134) No. 28 — (E38) No. 2:	Is the resistance less than 1 Ω ?	Go to step 2.	Repair the open circuit in harness between ECM and oil flow control solenoid valve connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and oil flow control solenoid valve connector • Poor contact in coupling connector
2 CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE. Measure the resistance between ECM and oil flow control solenoid valve. Connector & terminal (E38) No. 1 — Engine ground: (E38) No. 2 — Engine ground:	Is the resistance more than 1 M Ω ?	Go to step 3.	Repair the ground short circuit in harness between ECM and oil flow control solenoid valve connector.
3 CHECK OIL FLOW CONTROL SOLENOID VALVE. 1) Remove the oil flow control solenoid valve. 2) 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 in ECM and oil flow control solenoid valve.	Replace the oil flow control solenoid valve. <Ref. to ME(STI)-54, Camshaft.>

DC:DTC P2089 OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 1)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-232, DTC P2089 OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

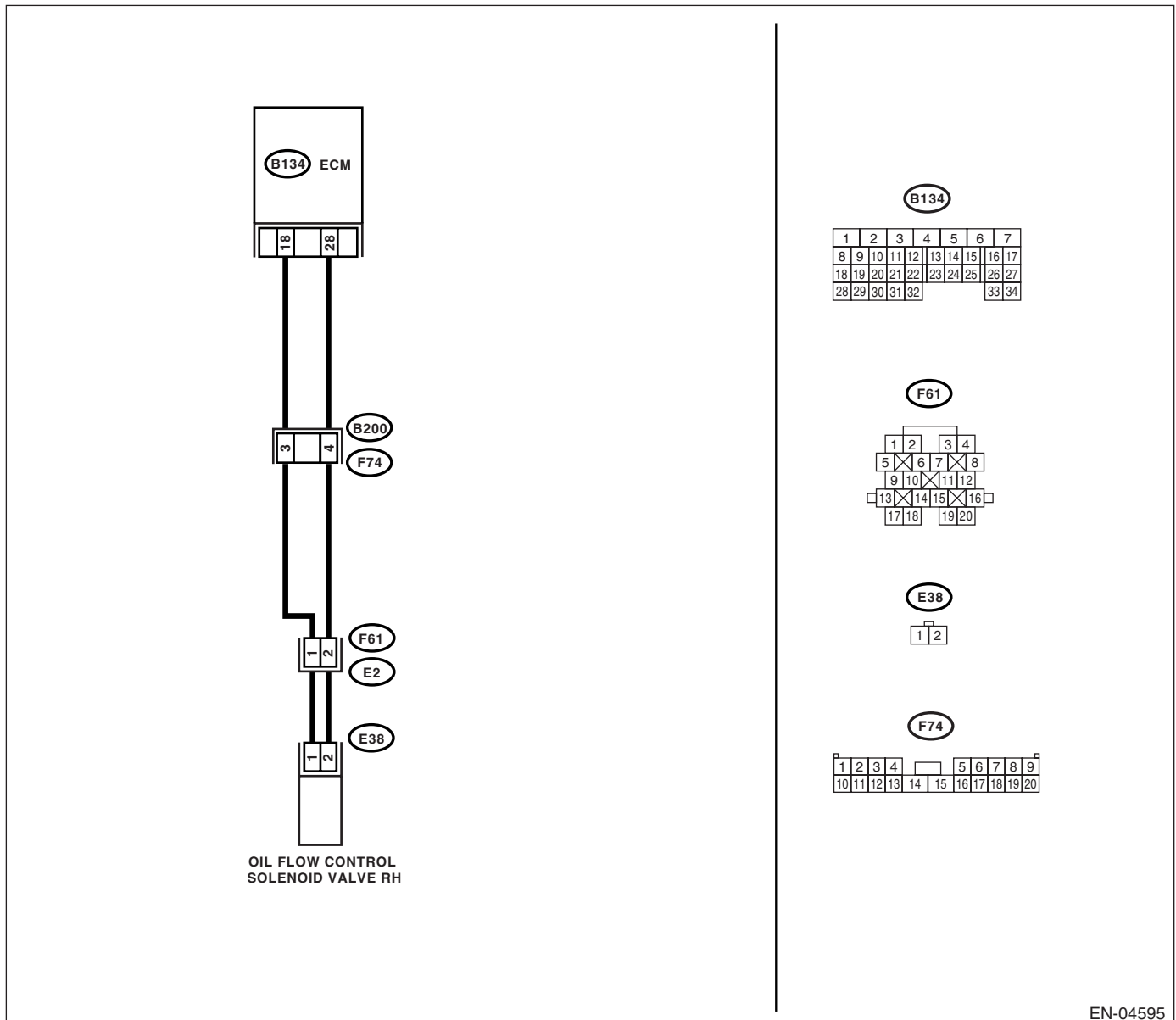
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04595

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and oil flow control solenoid valve. 3) Measure the resistance between ECM and oil flow control solenoid valve. Connector & terminal (B134) No. 18 — (E38) No. 1: (B134) No. 28 — (E38) No. 2:	Is the resistance less than 1 Ω ?	Go to step 2.	Repair the open circuit in harness between ECM and oil flow control solenoid valve connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and oil flow control solenoid valve connector • Poor contact in coupling connector
2 CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and oil flow control solenoid valve. 3) Measure the resistance between ECM and oil flow control solenoid valve. Connector & terminal (E38) No. 1 — Engine ground: (E38) No. 2 — Engine ground:	Is the resistance more than 1 M Ω ?	Go to step 3.	Repair the ground short circuit in harness between ECM and oil flow control solenoid valve connector.
3 CHECK OIL FLOW CONTROL SOLENOID VALVE. 1) Remove the oil flow control solenoid valve. 2) 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 in ECM and oil flow control solenoid valve.	Replace the oil flow control solenoid valve. <Ref. to ME(STI)-54, Camshaft.>

DD:DTC P2092 OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 2)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-234, DTC P2092 OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

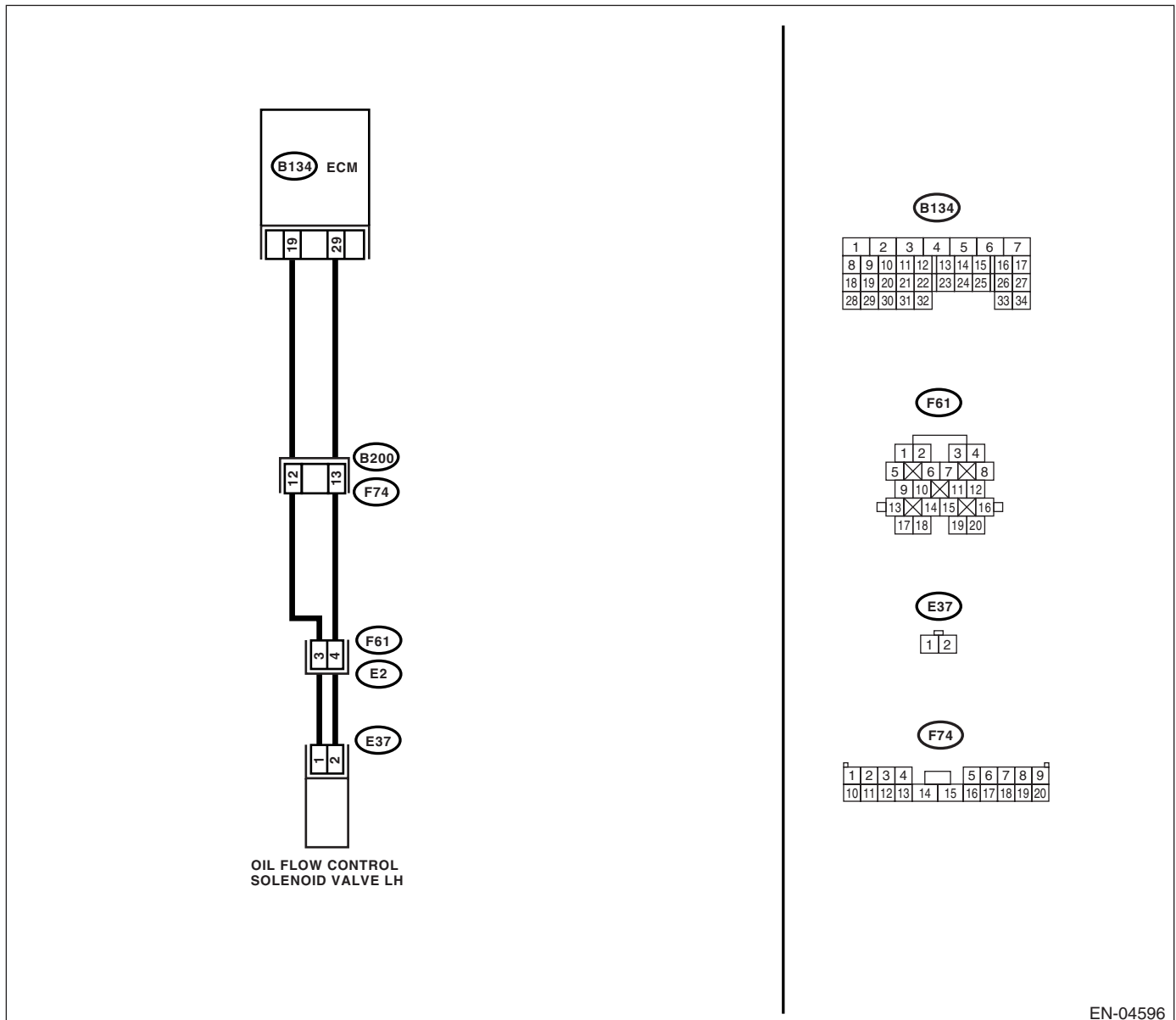
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and oil flow control solenoid valve. 3) Measure the resistance between ECM and oil flow control solenoid valve. Connector & terminal (B134) No. 19 — (E37) No. 1: (B134) No. 29 — (E37) No. 2:	Is the resistance less than 1 Ω ?	Go to step 2.	Repair the open circuit in harness between ECM and oil flow control solenoid valve connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and oil flow control solenoid valve connector • Poor contact in coupling connector
2 CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE. Measure the resistance between ECM and oil flow control solenoid valve. Connector & terminal (E37) No. 1 — Engine ground: (E37) No. 2 — Engine ground:	Is the resistance more than 1 M Ω ?	Go to step 3.	Repair the ground short circuit in harness between ECM and oil flow control solenoid valve connector.
3 CHECK OIL FLOW CONTROL SOLENOID VALVE. 1) Remove the oil flow control solenoid valve. 2) 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 in ECM and oil flow control solenoid valve.	Replace the oil flow control solenoid valve. <Ref. to ME(STI)-54, Camshaft.>

DE:DTC P2093 OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 2)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-236, DTC P2093 OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

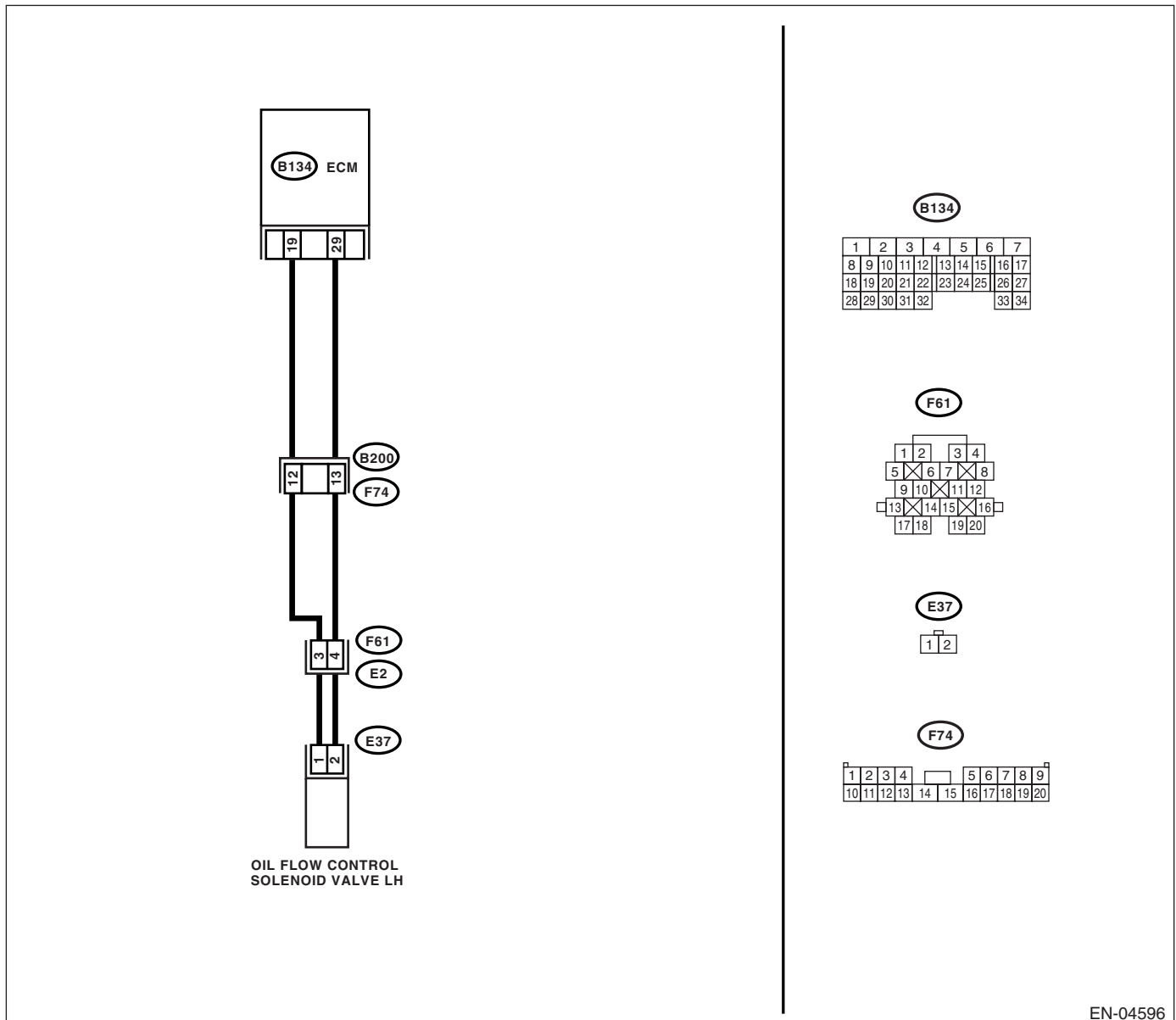
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04596

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and oil flow control solenoid valve. 3) Measure the resistance between ECM and oil flow control solenoid valve. Connector & terminal (B134) No. 19 — (E37) No. 1: (B134) No. 29 — (E37) No. 2:	Is the resistance less than 1 Ω ?	Go to step 2.	Repair the open circuit in harness between ECM and oil flow control solenoid valve connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and oil flow control solenoid valve connector • Poor contact in coupling connector
2 CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and oil flow control solenoid valve. 3) Measure the resistance between ECM and oil flow control solenoid valve. Connector & terminal (E37) No. 1 — Engine ground: (E37) No. 2 — Engine ground:	Is the resistance more than 1 M Ω ?	Go to step 3.	Repair the ground short circuit in harness between ECM and oil flow control solenoid valve connector.
3 CHECK OIL FLOW CONTROL SOLENOID VALVE. 1) Remove the oil flow control solenoid valve. 2) Measure the resistance between oil flow control solenoid valve terminal. Terminals No. 1 — No. 2:	Is the resistance 6 — 12 Ω ?	Repair the poor contact in ECM and oil flow control solenoid valve.	Replace the oil flow control solenoid valve. <Ref. to ME(STI)-54, Camshaft.>

DF:DTC P2096 POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1

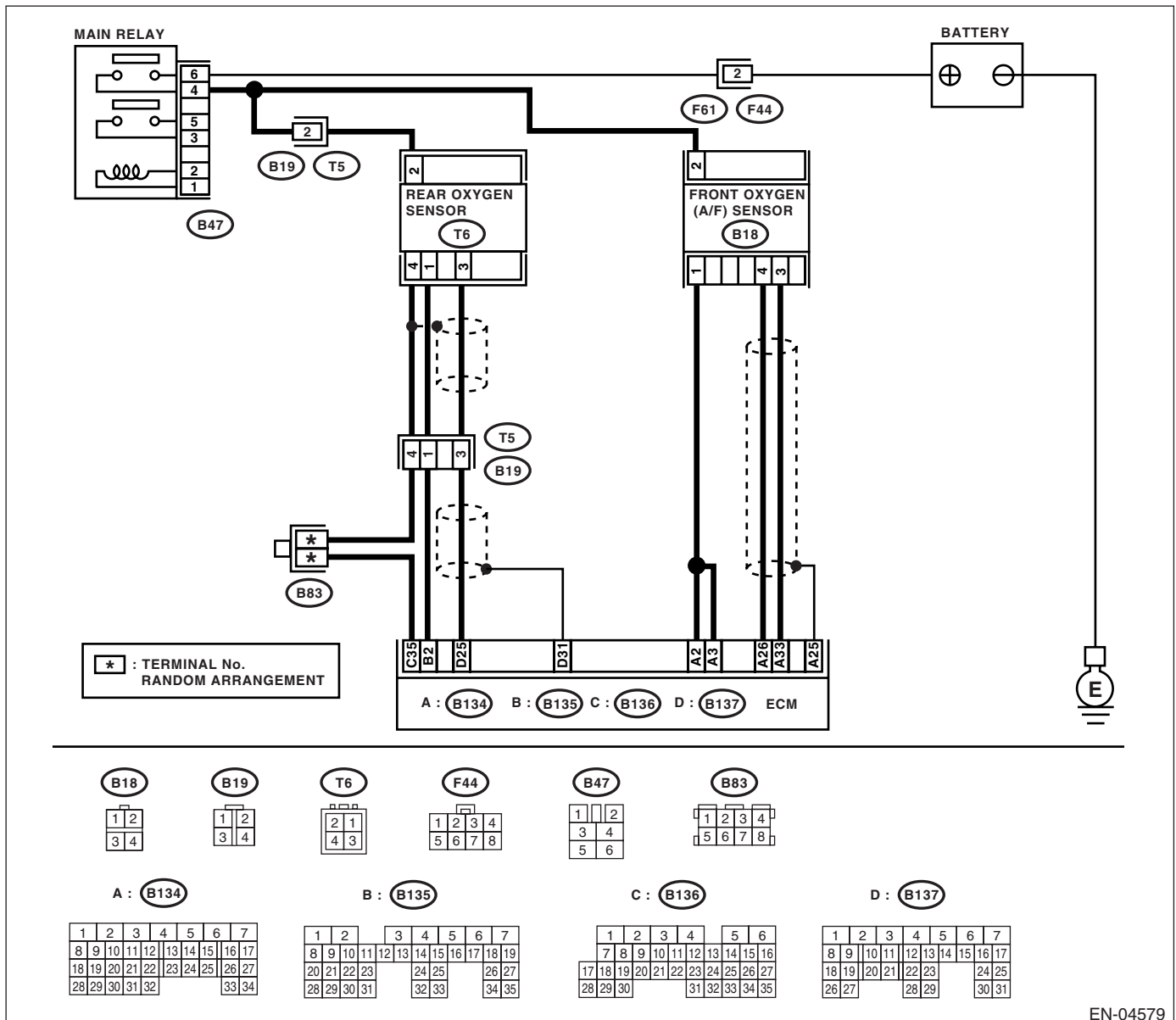
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-238, DTC P2096 POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04579

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P2096.	Go to step 2.
2 CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.	Is there water in connector?	Remove infiltrating water completely.	Go to step 3.
3 CHECK HARNESS BETWEEN ECM AND REAR 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 (B134) No. 26 — (B18) No. 4: (B134) No. 33 — (B18) 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: • Open circuit in harness between ECM and front oxygen (A/F) sensor connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector
4 CHECK HARNESS BETWEEN ECM AND REAR OXYGEN (A/F) SENSOR CONNECTOR. Measure the resistance of harness between ECM connector and chassis ground. Connector & terminal (B134) No. 26 — Chassis ground: (B134) No. 33 — Chassis ground:	Is the resistance more than 1 M Ω ?	Go to step 5.	Repair the ground short circuit in harness between ECM and front oxygen (A/F) sensor connector.
5 CHECK OUTPUT SIGNAL FOR ECM. 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM connector and chassis ground. Connector & terminal (B134) No. 26 (+) — Chassis ground (-):	Is the voltage more than 4.5 V?	Go to step 6.	Go to step 7.
6 CHECK OUTPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B134) No. 26 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. After repair, replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).>	Repair the poor contact in ECM connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
7 CHECK OUTPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B134) No. 33 (+) — Chassis ground (-):	Is the voltage more than 4.95 V?	Go to step 8.	Go to step 9.
8 CHECK OUTPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B134) No. 33 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. After repair, replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).>	Repair the poor contact in ECM connector.
9 CHECK EXHAUST SYSTEM.	Are there holes or loose bolts on exhaust system?	Repair the exhaust system.	Go to step 10.
10 CHECK AIR INTAKE SYSTEM.	Are there holes, loose bolts or disconnection of hose on air intake system?	Repair the air intake system.	Go to step 11.
11 CHECK FUEL PRESSURE. Warning: - Place “NO FIRE” signs near the working area. - Be careful not to spill fuel on the floor. Measure the fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold. <Ref. to ME(STI)-26, INSPECTION, Fuel Pressure.> Warning: Before removing the fuel pressure gauge, release fuel pressure. NOTE: If the fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again.	Is the measured value 284 — 314 kPa (2.9 — 3.2 kgf/cm ² , 41 — 46 psi)?	Go to step 12.	Repair the following items. Fuel pressure too high: - Clogged fuel return line or bent hose Fuel pressure too low: - Improper fuel pump discharge - Clogged fuel supply line
12 CHECK FUEL PRESSURE. After connecting the pressure regulator vacuum hose, measure fuel pressure. <Ref. to ME(STI)-26, INSPECTION, Fuel Pressure.> Warning: Before removing the fuel pressure gauge, release fuel pressure. NOTE: - If the 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 the pressure regulator and pressure regulator vacuum hose.	Is the measured value 230 — 260 kPa (2.35 — 2.65 kgf/cm ² , 33 — 38 psi)?	Go to step 13.	Repair the following items. Fuel pressure too high: - Faulty pressure regulator - Clogged fuel return line or bent hose Fuel pressure too low: - Faulty pressure regulator - Improper fuel pump discharge - Clogged fuel supply line

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
13 CHECK ENGINE COOLANT TEMPERATURE SENSOR. 1) Start the engine and warm-up completely. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STI)(diag)-28, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool instruction manual.	Is the temperature above 60°C (140°F)?	Go to step 14.	Replace the engine coolant temperature sensor. <Ref. to FU(STI)-25, Engine Coolant Temperature Sensor.>
14 CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE. 1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F). 2) Place the shift lever in neutral position. 3) Turn the A/C switch to OFF. 4) Turn all 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 procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STI)(diag)-28, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool instruction manual.	Is the measured value 2.7 — 4.7 g/s (0.36 — 0.62 lb/m)?	Go to step 15.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(STI)-29, Mass Air Flow and Intake Air Temperature Sensor.>
15 CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR. 1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F). 2) Place the shift lever in neutral position. 3) Turn the A/C switch to OFF. 4) Turn all 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 procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STI)(diag)-28, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool instruction manual.	Subtract ambient temperature from intake air temperature. Is the obtained value -10 — 50°C (-18 — 90°F)?	Go to step 16.	Check the mass air flow and intake air temperature sensor. <Ref. to FU(STI)-29, Mass Air Flow and Intake Air Temperature Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
16 CHECK REAR OXYGEN SENSOR DATA. 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and keep the engine speed at 3,000 rpm. (2 minutes at the longest) 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: - Depress the clutch pedal. - Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(STI)(diag)-28, Subaru Select Monitor.> - General scan tool For detailed operation procedure, refer to the general scan tool instruction manual.	Is the voltage more than 490 mV?	Go to step 20.	Go to step 17.
17 CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.	Is there water in connector?	Remove infiltrating water completely.	Go to step 18.
18 CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. Connector & terminal (B137) No. 25 — (T6) No. 3: (B136) No. 35 — (T6) No. 4:	Is the resistance more than 3 Ω?	Repair open circuit in harness between ECM and rear oxygen sensor connector.	Go to step 19.
19 CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR. 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 harness connector and engine ground or chassis ground. Connector & terminal (T6) No. 3 (+) — Engine ground (-):	Is the voltage 0.2 — 0.5 V?	Replace the rear oxygen sensor. <Ref. to FU(STI)-38, Rear Oxygen Sensor.>	Repair harness and connector. NOTE: In this case, repair the following: - Open circuit in harness between rear oxygen sensor and ECM connector - Poor contact in rear oxygen sensor connector - Poor contact in ECM connector

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
20 CHECK REAR OXYGEN SENSOR DATA. 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and rapidly reduce the engine speed from 3,000 rpm. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: - Depress the clutch pedal. - Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(STI)(diag)-28, Subaru Select Monitor.> - General scan tool For detailed operation procedure, refer to the general scan tool instruction manual.	Is the voltage less than 250 mV?	Go to step 21.	Go to step 17.
21 CHECK FRONT OXYGEN (A/F) SENSOR AND REAR OXYGEN SENSOR DATA. 1) Warm-up the engine until engine coolant temperature exceeds 70°C (158°F), and leave it for 5 minutes or more with idling. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: - Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(STI)(diag)-28, Subaru Select Monitor.> - General scan tool For detailed operation procedure, refer to the general scan tool instruction manual.	Is the voltage more than 0.8 V for more than 5 minutes during idling?	Replace the front oxygen (A/F) sensor. <Ref. to FU(STI)-36, Front Oxygen (A/F) Sensor.>	Go to step 18.

DG:DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1

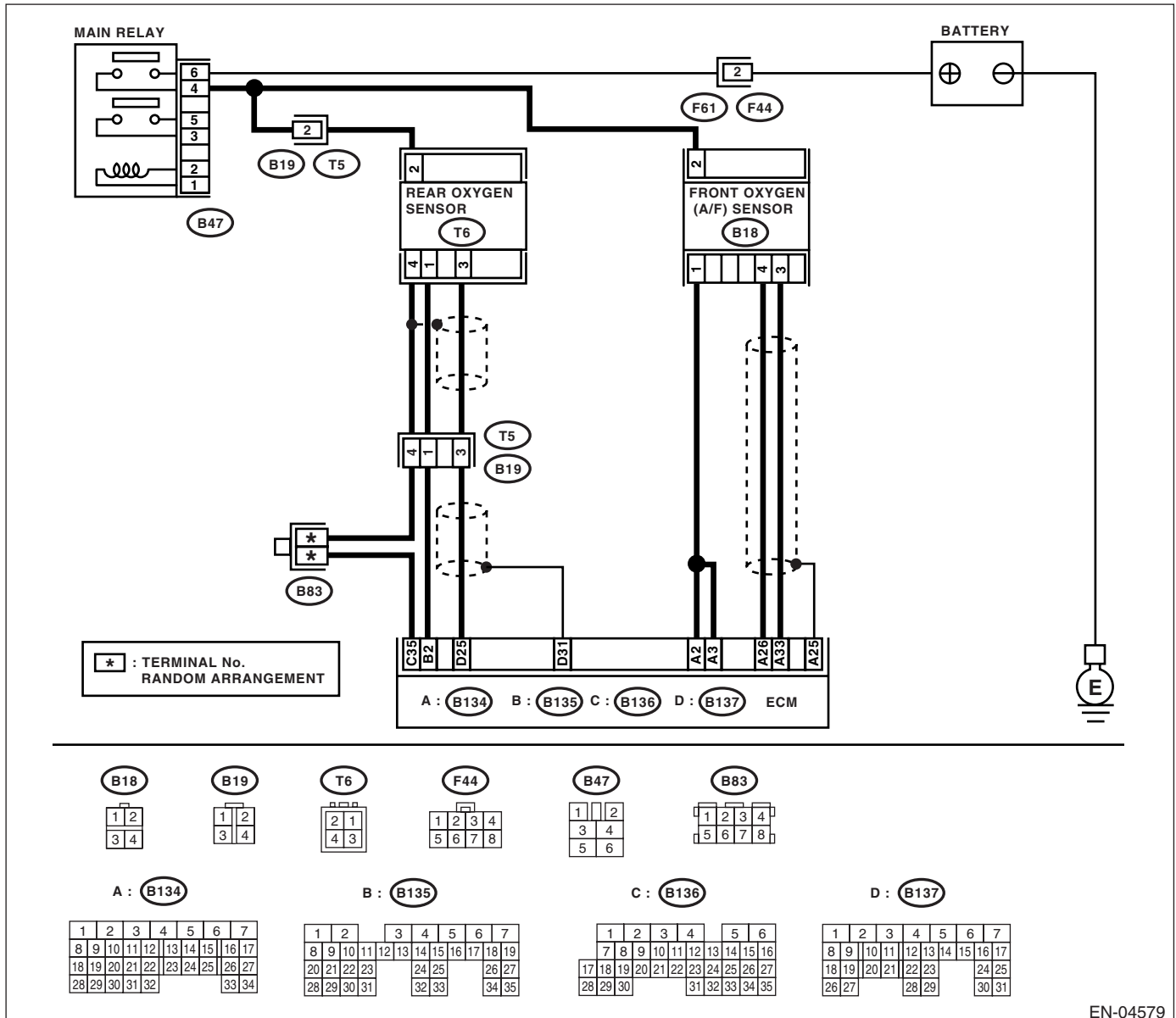
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-240, DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04579

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P2097.	Go to step 2.
2 CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.	Is there water in connector?	Remove infiltrating water completely.	Go to step 3.
3 CHECK HARNESS BETWEEN ECM AND REAR 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 (B134) No. 26 — (B18) No. 4: (B134) No. 33 — (B18) 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: • Open circuit in harness between ECM and front oxygen (A/F) sensor connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector
4 CHECK HARNESS BETWEEN ECM AND REAR OXYGEN (A/F) SENSOR CONNECTOR. Measure the resistance of harness between ECM connector and chassis ground. Connector & terminal (B134) No. 26 — Chassis ground: (B134) No. 33 — Chassis ground:	Is the resistance more than 1 M Ω ?	Go to step 5.	Repair the ground short circuit in harness between ECM and front oxygen (A/F) sensor connector.
5 CHECK OUTPUT SIGNAL FOR ECM. 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM connector and chassis ground. Connector & terminal (B134) No. 26 (+) — Chassis ground (-):	Is the voltage more than 4.5 V?	Go to step 6.	Go to step 7.
6 CHECK OUTPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B134) No. 26 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. After repair, replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).>	Repair the poor contact in ECM connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
7 CHECK OUTPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B134) No. 33 (+) — Chassis ground (-):	Is the voltage more than 4.95 V?	Go to step 8.	Go to step 9.
8 CHECK OUTPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B134) No. 33 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. After repair, replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).>	Repair the poor contact in ECM connector.
9 CHECK EXHAUST SYSTEM.	Are there holes or loose bolts on exhaust system?	Repair the exhaust system.	Go to step 10.
10 CHECK AIR INTAKE SYSTEM.	Are there holes, loose bolts or disconnection of hose on air intake system?	Repair the air intake system.	Go to step 11.
11 CHECK FUEL PRESSURE. Warning: - Place “NO FIRE” signs near the working area. - Be careful not to spill fuel on the floor. Measure the fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold. <Ref. to ME(STI)-26, INSPECTION, Fuel Pressure.> Warning: Before removing the fuel pressure gauge, release fuel pressure. NOTE: If the fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again.	Is the measured value 284 — 314 kPa (2.9 — 3.2 kgf/cm ² , 41 — 46 psi)?	Go to step 12.	Repair the following items. Fuel pressure too high: - Clogged fuel return line or bent hose Fuel pressure too low: - Improper fuel pump discharge - Clogged fuel supply line
12 CHECK FUEL PRESSURE. After connecting the pressure regulator vacuum hose, measure fuel pressure. <Ref. to ME(STI)-26, INSPECTION, Fuel Pressure.> Warning: Before removing the fuel pressure gauge, release fuel pressure. NOTE: - If the 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 the pressure regulator and pressure regulator vacuum hose.	Is the measured value 230 — 260 kPa (2.35 — 2.65 kgf/cm ² , 33 — 38 psi)?	Go to step 13.	Repair the following items. Fuel pressure too high: - Faulty pressure regulator - Clogged fuel return line or bent hose Fuel pressure too low: - Faulty pressure regulator - Improper fuel pump discharge - Clogged fuel supply line

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
13 CHECK ENGINE COOLANT TEMPERATURE SENSOR. 1) Start the engine and warm-up completely. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STI)(diag)-28, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool instruction manual.	Is the temperature above 60°C (140°F)?	Go to step 14.	Replace the engine coolant temperature sensor. <Ref. to FU(STI)-25, Engine Coolant Temperature Sensor.>
14 CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE. 1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F). 2) Place the shift lever in neutral position. 3) Turn the A/C switch to OFF. 4) Turn all 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 procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STI)(diag)-28, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool instruction manual.	Is the measured value 2.7 — 4.7 g/s (0.36 — 0.62 lb/m)?	Go to step 15.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(STI)-29, Mass Air Flow and Intake Air Temperature Sensor.>
15 CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR. 1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F). 2) Place the shift lever in neutral position. 3) Turn the A/C switch to OFF. 4) Turn all 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 procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STI)(diag)-28, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool instruction manual.	Subtract ambient temperature from intake air temperature. Is the obtained value -10 — 50°C (-18 — 90°F)?	Go to step 16.	Check the mass air flow and intake air temperature sensor. <Ref. to FU(STI)-29, Mass Air Flow and Intake Air Temperature Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
16 CHECK REAR OXYGEN SENSOR DATA. 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and keep the engine speed at 3,000 rpm. (2 minutes at the longest) 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: - Depress the clutch pedal. - Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(STI)(diag)-28, Subaru Select Monitor.> - General scan tool For detailed operation procedure, refer to the general scan tool instruction manual.	Is the voltage more than 490 mV?	Go to step 20.	Go to step 17.
17 CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.	Is there water in connector?	Remove infiltrating water completely.	Go to step 18.
18 CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. Connector & terminal (B137) No. 25 — (T6) No. 3: (B136) No. 35 — (T6) No. 4:	Is the resistance more than 3 Ω?	Repair open circuit in harness between ECM and rear oxygen sensor connector.	Go to step 19.
19 CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR. 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 harness connector and engine ground or chassis ground. Connector & terminal (T6) No. 3 (+) — Engine ground (-):	Is the voltage 0.2 — 0.5 V?	Replace the rear oxygen sensor. <Ref. to FU(STI)-38, Rear Oxygen Sensor.>	Repair harness and connector. NOTE: In this case, repair the following: - Open circuit in harness between rear oxygen sensor and ECM connector - Poor contact in rear oxygen sensor connector - Poor contact in ECM connector

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
20 CHECK REAR OXYGEN SENSOR DATA. 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and rapidly reduce the engine speed from 3,000 rpm. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Depress the clutch pedal. • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(STI)(diag)-28, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool instruction manual.	Is the voltage less than 250 mV?	Go to step 21.	Go to step 17.
21 CHECK FRONT OXYGEN (A/F) SENSOR AND REAR OXYGEN SENSOR DATA. 1) Warm-up the engine until engine coolant temperature exceeds 70°C (158°F), and leave it for 5 minutes or more with idling. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(STI)(diag)-28, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool instruction manual.	Is the voltage more than 0.8 V for more than 5 minutes during idling?	Replace the front oxygen (A/F) sensor. <Ref. to FU(STI)-36, Front Oxygen (A/F) Sensor.>	Go to step 18.

**DH:DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/
PERFORMANCE**

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-179, DTC P0638 THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>, <Ref. to GD(STI)-190, DTC P1160 RETURN SPRING FAILURE, Diagnostic Trouble Code (DTC) Detecting Criteria.> and <Ref. to GD(STI)-242, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance
- Engine stalls.

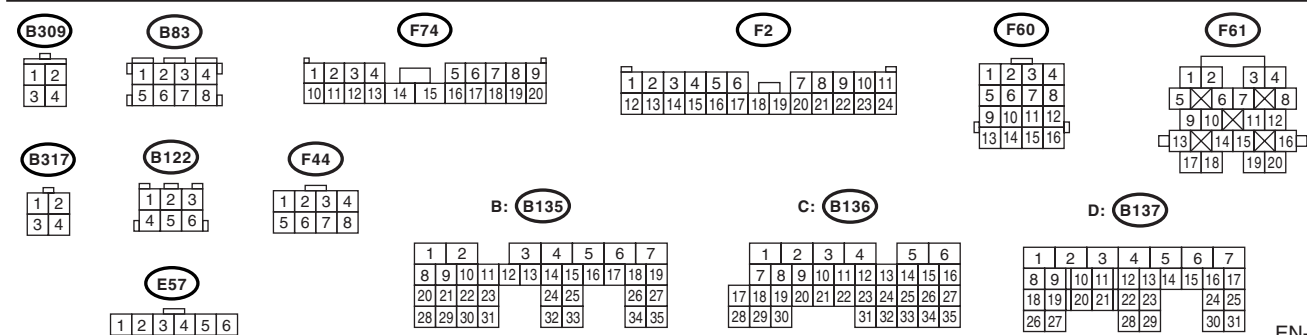
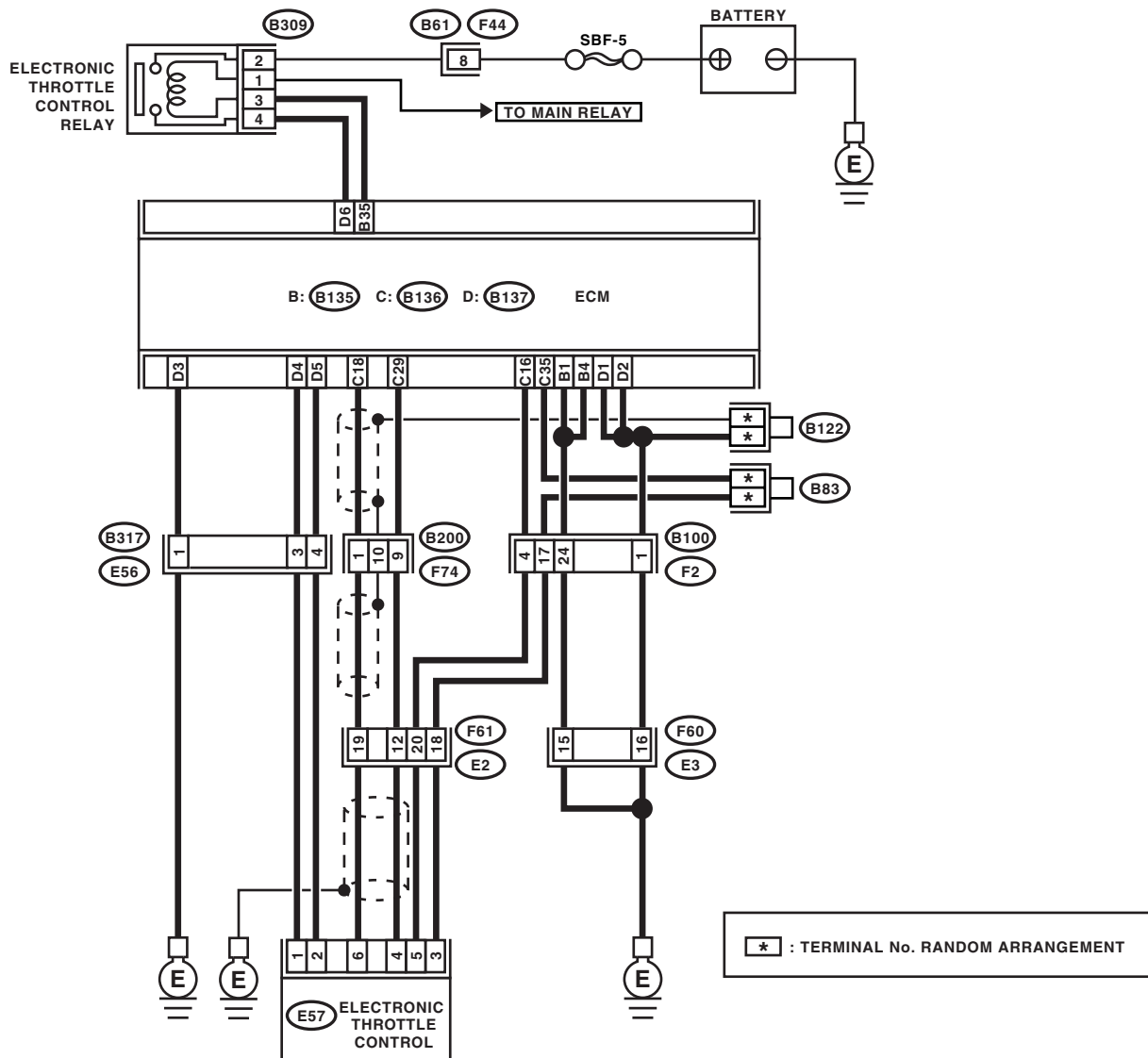
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-04159

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ELECTRONIC THROTTLE CONTROL RELAY. 1) Turn the ignition switch to OFF. 2) Remove the electronic throttle control relay. 3) Using a lead wire, connect the positive terminal of battery to electronic throttle control relay terminal No. 1, and ground terminal of battery to electronic throttle control relay terminal No. 3. 4) Measure the resistance between electronic throttle control relay terminals. Terminals No. 2 — No. 4:	Is the resistance less than 1 Ω ?	Go to step 2.	Replace the electronic throttle control relay.
2 CHECK POWER SUPPLY TO ELECTRONIC THROTTLE CONTROL RELAY. Measure the voltage between electronic throttle control relay connector and engine ground. Connector & terminal (B309) No. 1 (+) — Engine ground (-): (B309) No. 2 (+) — Engine ground (-):	Is the voltage more than 10 V?	Go to step 3.	Repair the open power supply circuit or ground short.
3 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Disconnect the connector from ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control relay connector and engine ground. Connector & terminal (B309) No. 3 (+) — Engine ground (-):	Is the voltage less than 5 V?	Repair the ground short of harness between ECM and electronic throttle control relay.	Go to step 4.
4 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Measure the resistance between electronic throttle control relay connector and chassis ground. Connector & terminal (B309) No. 3 — Engine ground: (B309) No. 4 — Engine ground:	Is the resistance more than 1 M Ω ?	Go to step 5.	Repair the ground short of harness between ECM and electronic throttle control relay.
5 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY. 1) Turn the ignition switch to OFF. 2) Measure the resistance between electronic throttle control connector and electronic throttle control relay connector. Connector & terminal (B135) No. 35 — (B309) No. 3: (B137) No. 6 — (B309) No. 4:	Is the resistance less than 1 Ω ?	Go to step 6.	Repair the open circuit of harness between ECM and electronic throttle control relay.
6 CHECK OUTPUT VOLTAGE OF SENSOR. 1) Connect all the connectors. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM connector terminals. Connector & terminal (B136) No. 18 (+) — (B136) No. 35 (-): 4) Shake the ECM harness and connector, engine harness connectors (B136, F61), electronic throttle control connector harness while monitoring value of voltage meter.	Is the voltage more than 0.4 V?	Go to step 7.	Go to step 9.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
7 CHECK OUTPUT VOLTAGE OF SENSOR. 1) Connect all the connectors. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM connector terminals. Connector & terminal (B136) No. 29 (+) — (B136) No. 35 (-): 4) Shake the ECM harness and connector, engine harness connectors, electronic throttle control connector harness while monitoring value of voltage meter.	Is the voltage more than 0.8 V?	Go to step 8.	Go to step 9.
8 CHECK POOR CONTACT. Check poor contact between ECM connector and electronic throttle control connector.	Is there poor contact between ECM connector and electronic throttle control connector?	Repair the poor contact.	Go to step 13.
9 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. Connector & terminal (B136) No. 16 — (E57) No. 5:	Is the resistance less than 1 Ω ?	Go to step 10.	Repair the open harness connector.
10 CHECK THE HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. Measure the resistance between ECM connector and chassis ground. Connector & terminal (B136) No. 16 — Chassis ground: (B136) No. 18 — Chassis ground: (B136) No. 29 — Chassis ground:	Is the resistance more than 1 M Ω ?	Go to step 11.	Repair the ground short of harness.
11 CHECK POWER SUPPLY TO SENSOR. 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the resistance between electronic throttle control connector and engine ground. Connector & terminal (E57) No. 5 (+) — Engine ground (-): 4) Shake the ECM harness and connector, engine harness connectors, while monitoring value of voltage meter.	Is the voltage 4.5 — 5.5 V?	Go to step 12.	Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).>
12 CHECK SHORT OF ECM. 1) Turn the ignition switch to OFF. 2) Measure the resistance between electronic throttle control connector and engine ground. Connector & terminal (E57) No. 6 — Engine ground: (E57) No. 4 — Engine ground:	Is the resistance more than 10 Ω ?	Go to step 13.	Repair the poor contact in ECM connector. If problem persists, replace the ECM.
13 CHECK OUTPUT VOLTAGE OF SENSOR. 1) Connect all the connectors. 2) Turn the ignition switch to ON. 3) Read the data of main throttle sensor signal, using the Subaru Select Monitor. 4) Shake the ECM harness and connector, engine harness connectors, electronic throttle control connector harness while monitoring value of voltage meter.	Is the voltage 4.63 V?	Go to step 14.	Go to step 16.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
14 CHECK OUTPUT VOLTAGE OF SENSOR. 1) Read the data of sub throttle sensor signal, using the Subaru Select Monitor. 2) Shake the ECM harness and connector, engine harness connectors, electronic throttle control connector harness while monitoring value of voltage meter.	Is the voltage 4.73 V?	Go to step 15.	Go to step 16.
15 CHECK POOR CONTACT IN CONNECTORS. Check poor contact in connectors between ECM and electronic throttle control?	Is there poor contact in connectors between ECM and electronic throttle control?	Repair the poor contact in connectors.	Go to step 21.
16 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. Connector & terminal (B136) No. 35 — (E57) No. 3: (B136) No. 18 — (E57) No. 6: (B136) No. 29 — (E57) No. 4:	Is the resistance less than 1 Ω ?	Go to step 17.	Repair the open harness connector.
17 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Connect the ECM connector. 2) Measure the resistance between electronic throttle control connector and engine ground. Connector & terminal (E57) No. 3 — Engine ground:	Is the resistance less than 5 Ω ?	Go to step 18.	Repair the poor contact in ECM connector. If problem persists, replace the ECM.
18 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to ON. 2) Measure the voltage between electronic throttle control connector and engine ground. Connector & terminal (E57) No. 5 (+) — Engine ground (-): 3) Shake the ECM harness and connector, engine harness connectors, while monitoring value of voltage meter.	Is the voltage more than 10 V?	Go to step 19.	Repair the battery short of harness between ECM connector and electronic throttle control connector.
19 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Measure the voltage between electronic throttle control connector and engine ground. Connector & terminal (E57) No. 6 (+) — Engine ground (-): (E57) No. 4 (+) — Engine ground (-): 2) Shake the ECM harness and connector, engine harness connectors, while monitoring value of voltage meter.	Is the voltage less than 10 V?	Go to step 20.	Repair the short of harness between ECM connector and electronic throttle control connector.
20 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Remove the ECM. 3) Measure the voltage between ECM connectors. Connector & terminal (B136) No. 18 — (B136) No. 35: (B136) No. 29 — (B136) No. 35:	Is the resistance more than 1 M Ω ?	Go to step 21.	Repair the short of sensor power supply.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
21 CHECK OUTPUT VOLTAGE OF SENSOR. 1) Turn the ignition switch to OFF. 2) Connect all the connectors except electronic throttle control replay. 3) Turn the ignition switch to ON. 4) Read the data of main throttle sensor signals, using Subaru Select Monitor.	Is the voltage 0.81 — 0.87 V?	Go to step 22.	Repair the poor contact in electronic throttle control connector. If problem persists, replace the electronic throttle control.
22 CHECK OUTPUT VOLTAGE OF SENSOR. Read the data of sub throttle sensor signals, using Subaru Select Monitor.	Is the voltage 1.64 — 1.70 V?	Go to step 23.	Repair the poor contact in electronic throttle control connector. If problem persists, replace the electronic throttle control.
23 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL MOTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connectors from electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. <i>Connector & terminal</i> <i>(B137) No. 5 — (E57) No. 2:</i> <i>(B137) No. 4 — (E57) No. 1:</i>	Is the resistance less than 1 Ω ?	Go to step 24.	Repair the open harness connector.
24 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL MOTOR. 1) Connect the connectors to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control connector and engine ground. <i>Connector & terminal</i> <i>(E57) No. 2 (+) — Engine ground (-):</i> <i>(E57) No. 1 (+) — Engine ground (-):</i>	Is the voltage less than 5 V?	Go to step 25.	Repair the short of harness to power supply circuit between ECM and electronic throttle control.
25 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL MOTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between electronic throttle control connector and engine ground. <i>Connector & terminal</i> <i>(E57) No. 2 — Engine ground:</i> <i>(E57) No. 1 — Engine ground:</i>	Is the resistance more than 1 M Ω ?	Go to step 26.	Repair the short of harness.
26 CHECK ELECTRONIC THROTTLE CONTROL MOTOR HARNESS. Measure the resistance between electronic throttle control connector terminals. <i>Connector & terminal</i> <i>(E57) No. 2 — (E57) No. 1:</i>	Is the resistance more than 1 M Ω ?	Go to step 27.	Repair the short of harness.
27 CHECK ELECTRONIC THROTTLE CONTROL GROUND CIRCUIT. Measure the resistance between ECM connector and engine ground. <i>Connector & terminal</i> <i>(B137) No. 3 — Engine ground:</i>	Is the resistance less than 10 Ω ?	Go to step 28.	Repair the open circuit harness.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
28 CHECK ELECTRONIC THROTTLE CONTROL. Measure the resistance between electronic throttle control terminals. Terminals No. 1 — No. 2:	Is the resistance less than 5 Ω ?	Go to step 29 .	Replace the electronic throttle control.
29 CHECK ELECTRONIC THROTTLE CONTROL. Open and close the throttle valve to its full width with finger.	Does it return to specified position (3 mm (0.12 in) open from fully closed position.) when finger is released?	Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).>	Replace the electronic throttle control.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

DI: DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-244, DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance
- Engine stalls.

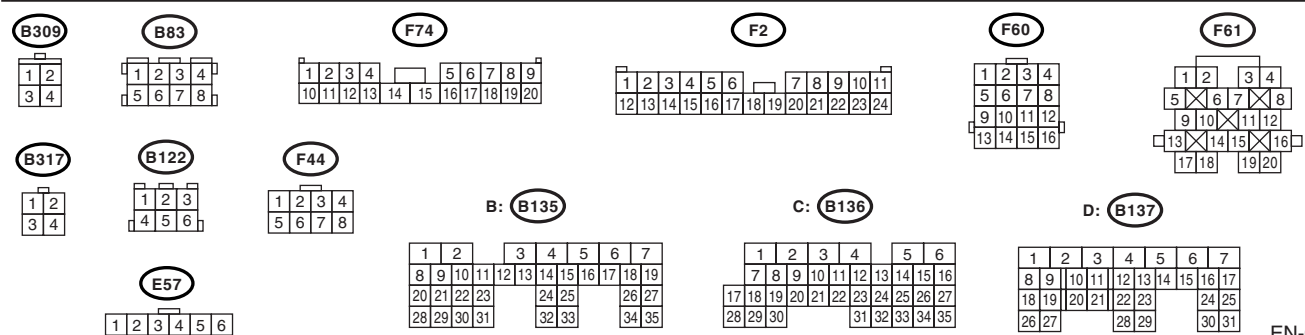
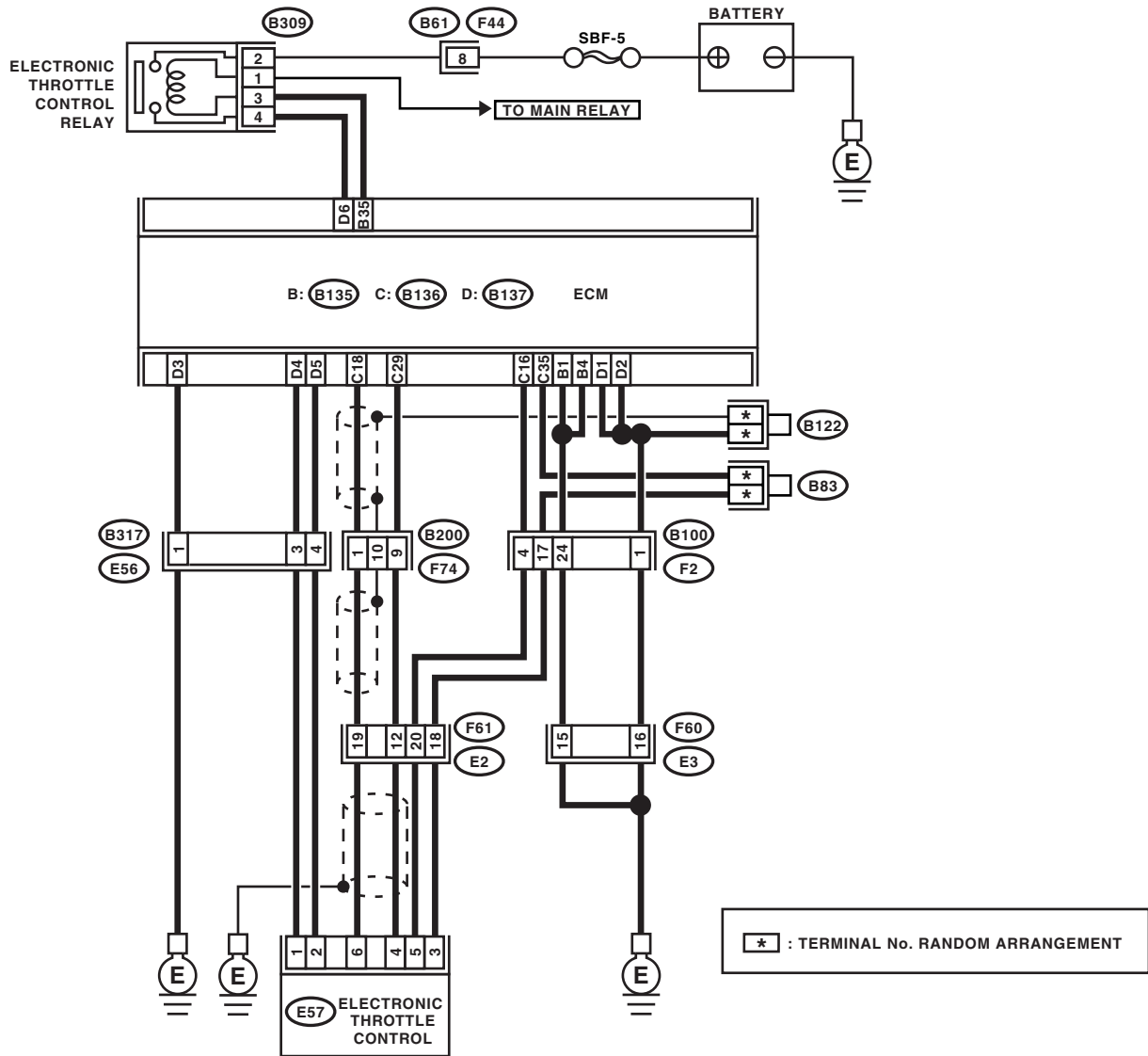
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-04159

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ELECTRONIC THROTTLE CONTROL RELAY. 1) Turn the ignition switch to OFF. 2) Remove the electronic throttle control relay. 3) Using a lead wire, connect the positive terminal of battery to electronic throttle control terminal No. 1, and ground terminal of battery to electronic throttle control terminal No. 3. 4) Measure the resistance between electronic throttle control terminals. Connector & terminal (B309) No. 2 — (B309) No. 4:	Is the resistance less than 1 Ω ?	Go to step 2.	Replace the electronic throttle control relay.
2 CHECK POWER TO ELECTRONIC THROTTLE CONTROL RELAY Measure the voltage between electronic throttle control relay connector and engine ground. Connector & terminal (B309) No. 1 (+) — Engine ground (-): (B309) No. 2 (+) — Engine ground (-):	Is the voltage more than 10 V?	Go to step 3.	Repair the open power supply circuit or ground short.
3 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Disconnect the connector from ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control relay connector and engine ground. Connector & terminal (B309) No. 3 (+) — Engine ground (-):	Is the voltage less than 5 V?	Repair the ground short of harness between ECM and electronic throttle control relay.	Go to step 4.
4 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY. 1) Turn the ignition switch to OFF. 2) Measure the resistance between electronic throttle control relay connector and chassis ground. Connector & terminal (B309) No. 3 — Engine ground: (B309) No. 4 — Engine ground:	Is the resistance more than 1 $M\Omega$?	Go to step 5.	Repair the ground short of harness between ECM and electronic throttle control relay.
5 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY. Measure the resistance between ECM connector and electronic throttle control relay connector. Connector & terminal (B135) No. 35 — (B309) No. 3: (B137) No. 6 — (B309) No. 4:	Is the resistance less than 1 Ω ?	Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).>	Repair the open harness between ECM and electronic throttle control relay.

DJ:DTC P2103 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-246, DTC P2103 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

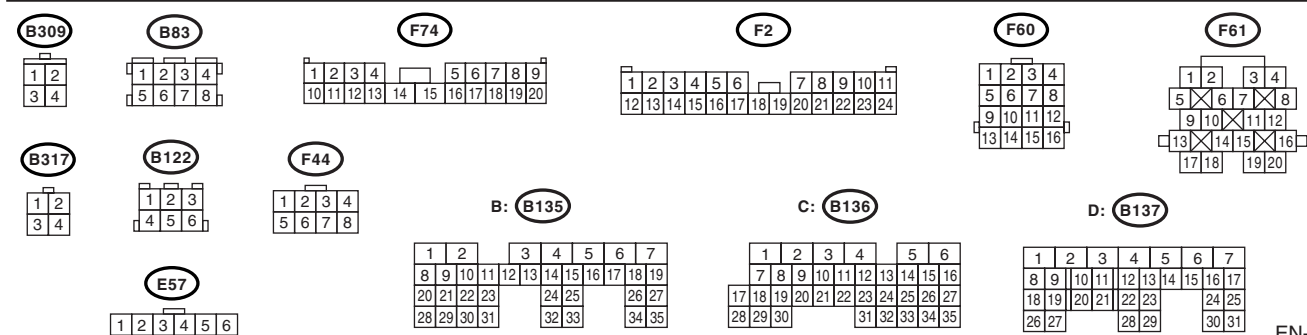
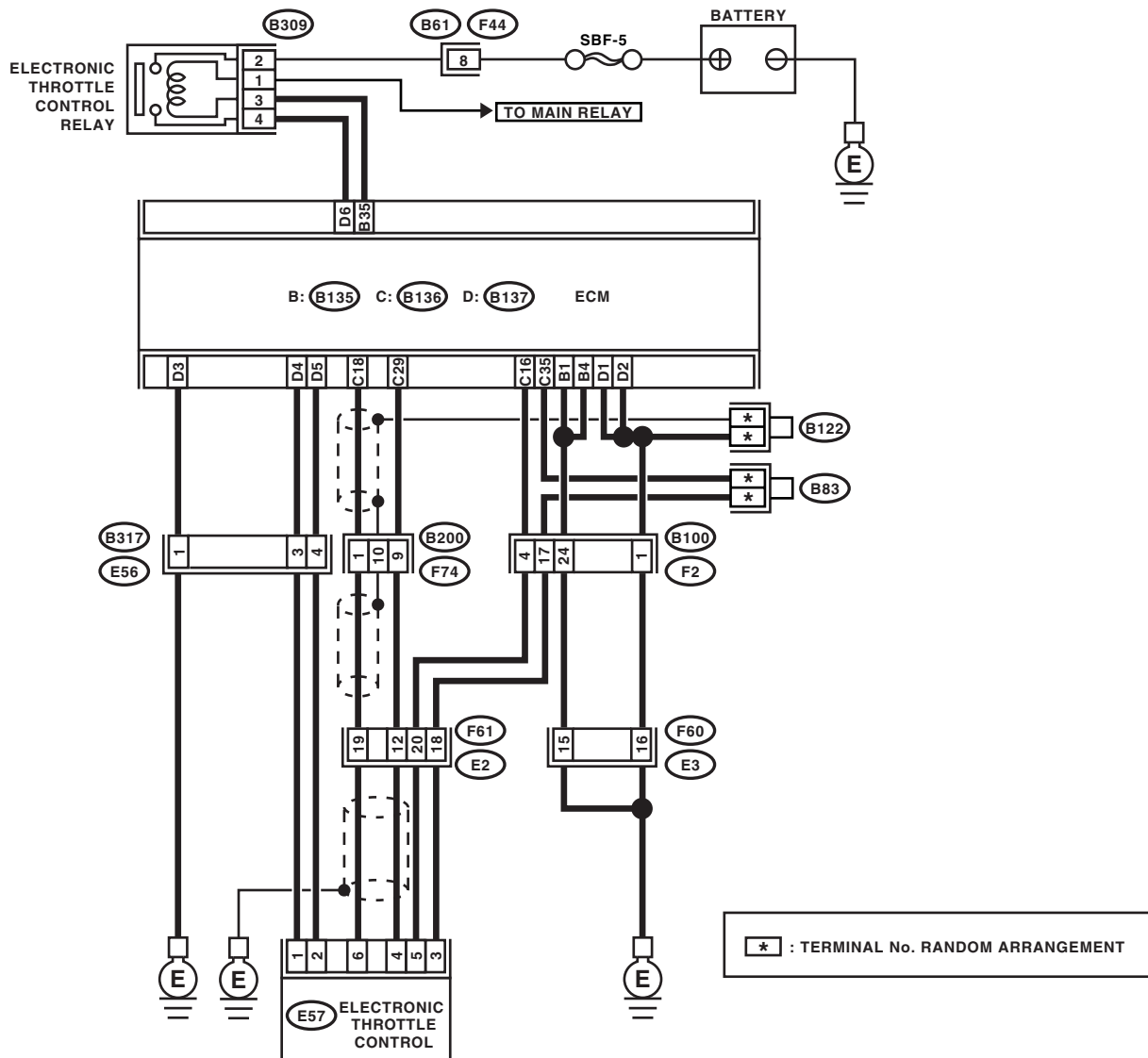
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-04159

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ELECTRONIC THROTTLE CONTROL RELAY. 1) Turn the ignition switch to OFF. 2) Remove the electronic throttle control relay. 3) Measure the resistance between electronic throttle control relay terminals. <i>Terminals</i> <i>No. 2 — No. 4:</i>	Is the resistance more than 1 MΩ?	Go to step 2.	Replace the electronic throttle control relay.
2 CHECK SHORT OF ELECTRONIC THROTTLE CONTROL RELAY POWER SUPPLY CIRCUIT. 1) Turn the ignition switch to ON. 2) Measure the voltage between electronic throttle control relay connector and engine ground. <i>Connector & terminal</i> <i>(B309) No. 4 (+) — Engine ground (-):</i>	Is the voltage more than 5 V?	Go to step 3.	Repair the short of power supply to harness between ECM and electronic throttle control relay.
3 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance between ECM connector and engine ground. <i>Connector & terminal</i> <i>(B135) No. 35 — Engine ground:</i>	Is the resistance more than 1 MΩ?	Repair the poor contact in ECM connector. If problem persists, replace the ECM.	Repair the ground short of harness between ECM and electronic throttle control relay.

DK:DTC P2109 THROTTLE/PEDAL POSITION SENSOR A MINIMUM STOP PERFORMANCE

NOTE:

For the diagnostic procedure, refer to DTC P2101. <Ref. to EN(STI)(diag)-335, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

DL:DTC P2122 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-250, DTC P2122 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

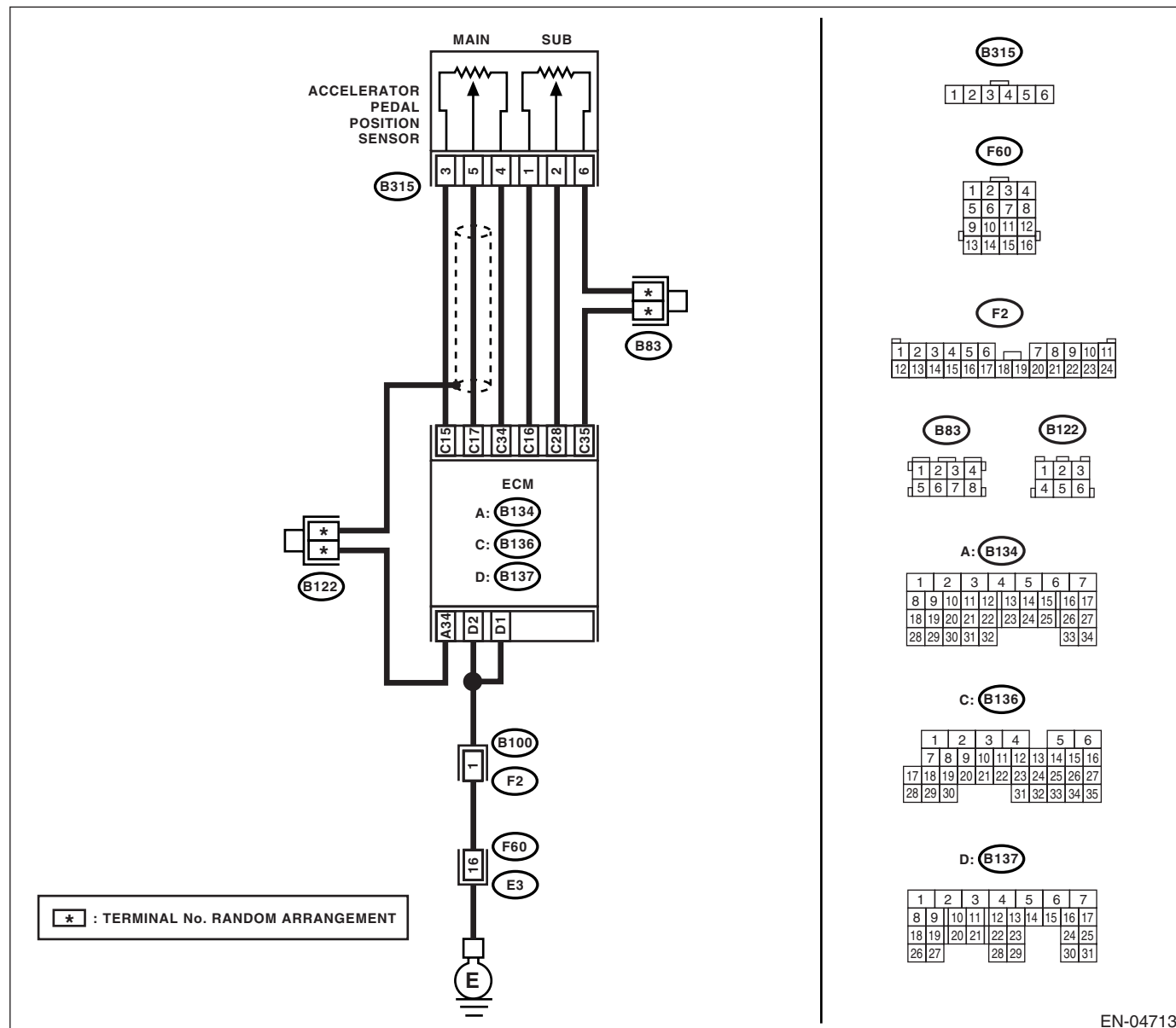
TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04713

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OUTPUT VOLTAGE OF ACCELERATOR PEDAL POSITION SENSOR. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector terminals. <i>Connector & terminal</i> <i>(B136) No. 17 (+) — (B136) No. 34 (-):</i> 3) Shake the ECM harness and connector, accelerator pedal position sensor.	Is the voltage more than 0.4 V?	Go to step 2.	Go to step 3.
2 CHECK POOR CONTACT IN CONNECTORS. Check poor contact in connectors between ECM and accelerator pedal position sensor.	Is there poor contact in connectors between ECM and accelerator pedal position sensor?	Repair the poor contact in connectors.	Connector has returned to its normal condition at this time. A temporary poor contact of the connector may be the cause.
3 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from accelerator pedal position sensor. 4) Measure the resistance between ECM connector and accelerator pedal position sensor. <i>Connector & terminal</i> <i>(B136) No. 17 — (B315) No. 5:</i> <i>(B136) No. 15 — (B315) No. 3:</i>	Is the resistance less than 1 Ω ?	Go to step 4.	Repair the open harness connector.
4 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR. Measure the resistance between ECM connector and chassis ground. <i>Connector & terminal</i> <i>(B136) No. 17 — Chassis ground:</i> <i>(B136) No. 15 — Chassis ground:</i>	Is the resistance more than 1 M Ω ?	Go to step 5.	Repair the ground short of harness.
5 CHECK ACCELERATOR PEDAL POSITION SENSOR POWER SUPPLY 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between accelerator pedal position sensor connector and engine ground. <i>Connector & terminal</i> <i>(B315) No. 3 (+) — Engine ground (-):</i> 4) Shake the ECM harness and connector, while monitoring value of voltage meter.	Is the voltage 4.5 — 5.5 V?	Go to step 6.	Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).>
6 CHECK ACCELERATOR PEDAL POSITION SENSOR. Measure the resistance of accelerator pedal position sensor. <i>Terminals</i> <i>No. 3 — No. 4:</i>	Is the resistance 1.2 — 4.8 k Ω ?	Go to step 7.	Replace the accelerator pedal. <Ref. to SP(STI)-3, Accelerator Pedal.>
7 CHECK ACCELERATOR PEDAL POSITION SENSOR. Measure the resistance of accelerator pedal position sensor when accelerator pedal is released. <i>Terminals</i> <i>No. 5 — No. 4:</i>	Is the resistance 0.2 — 1.0 k Ω ?	Go to step 8.	Replace the accelerator pedal. <Ref. to SP(STI)-3, Accelerator Pedal.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
8 CHECK ACCELERATOR PEDAL POSITION SENSOR. Measure the resistance of accelerator pedal position sensor when accelerator pedal is depressed. <i>Terminals</i> <i>No. 5 — No. 4:</i>	Is the resistance 0.5 — 2.5 k Ω ?	Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).>	Replace the accelerator pedal. <Ref. to SP(STI)-3, Accelerator Pedal.>

DM:DTC P2123 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-252, DTC P2123 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

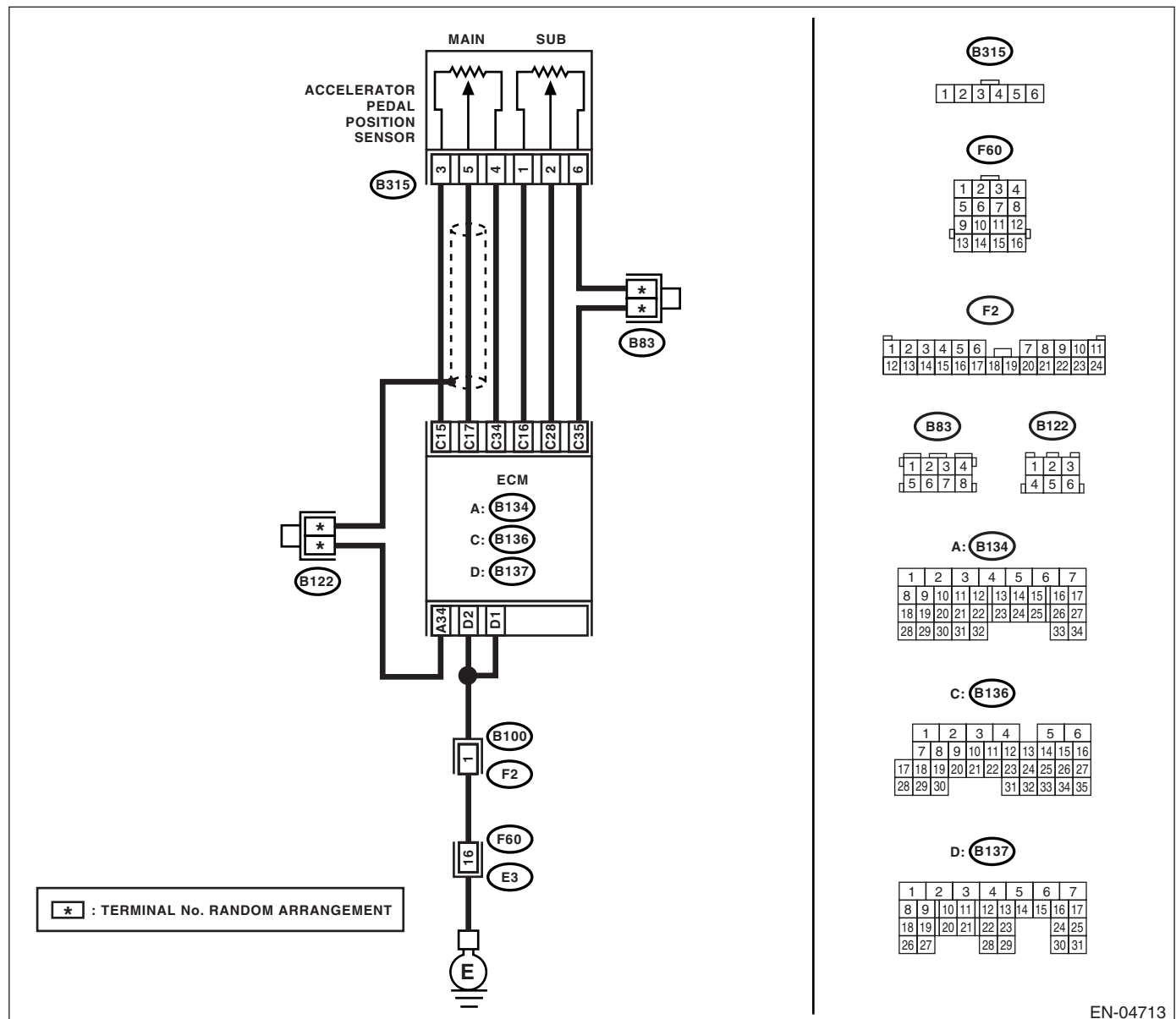
TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04713

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OUTPUT VOLTAGE OF ACCELERATOR PEDAL POSITION SENSOR. 1) Turn the ignition switch to ON. 2) Read the data of main accelerator pedal position sensor signals, using Subaru Select Monitor. 3) Shake the ECM harness and connector, engine harness connector, accelerator pedal position sensor connector harness while monitoring value of voltage meter.	Is the voltage less than 4.8 V?	Go to step 2.	Go to step 3.
2 CHECK POOR CONTACT IN CONNECTORS. Check poor contact in connectors between ECM and accelerator pedal position sensor.	Is there any poor contact in connectors between ECM and accelerator pedal position sensor?	Repair the poor contact in connectors.	Connector has returned to its normal condition at this time. A temporary poor contact in the connector might have been the cause.
3 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from accelerator pedal position sensor. 4) Measure the resistance between ECM connector and accelerator pedal position sensor connector. Connector & terminal (B136) No. 34 — (B315) No. 4:	Is the resistance less than 1 Ω ?	Go to step 4.	Repair the open harness connector.
4 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR. 1) Connect the ECM connector. 2) Measure the resistance between accelerator pedal position sensor and engine ground. Connector & terminal (B315) No. 4 — Engine ground:	Is the resistance less than 5 Ω ?	Go to step 5.	Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).>
5 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR. 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between accelerator pedal position sensor connector and engine ground. Connector & terminal (B315) No. 3 (+) — Engine ground (-): 4) Shake the ECM harness and connector, while monitoring value of voltage meter.	Is the voltage more than 6 V?	Go to step 6.	Repair the battery short of harness between ECM connector and accelerator pedal position sensor connector.
6 CHECK POWER SUPPLY TO ACCELERATOR PEDAL POSITION SENSOR. 1) Measure the voltage between accelerator pedal position sensor connector and engine ground. Connector & terminal (B315) No. 5 (+) — Engine ground (-): 2) Shake the ECM harness and connector, while monitoring value of voltage meter.	Is the voltage less than 4.8 V?	Go to step 7.	Repair the short of harness between ECM connector and accelerator pedal position sensor connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
7 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR. 1) Turn the ignition switch to OFF. 2) Connect the accelerator pedal position sensor connector. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM connector and chassis ground. Connector & terminal (B136) No. 17 (+) — Chassis ground (-):	Is the voltage 4.8 V?	Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).>	Repair the poor contact in accelerator pedal position sensor connector. If problem persists, replace the accelerator pedal. <Ref. to SP(STI)-3, Accelerator Pedal.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

DN:DTC P2127 THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-254, DTC P2127 THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

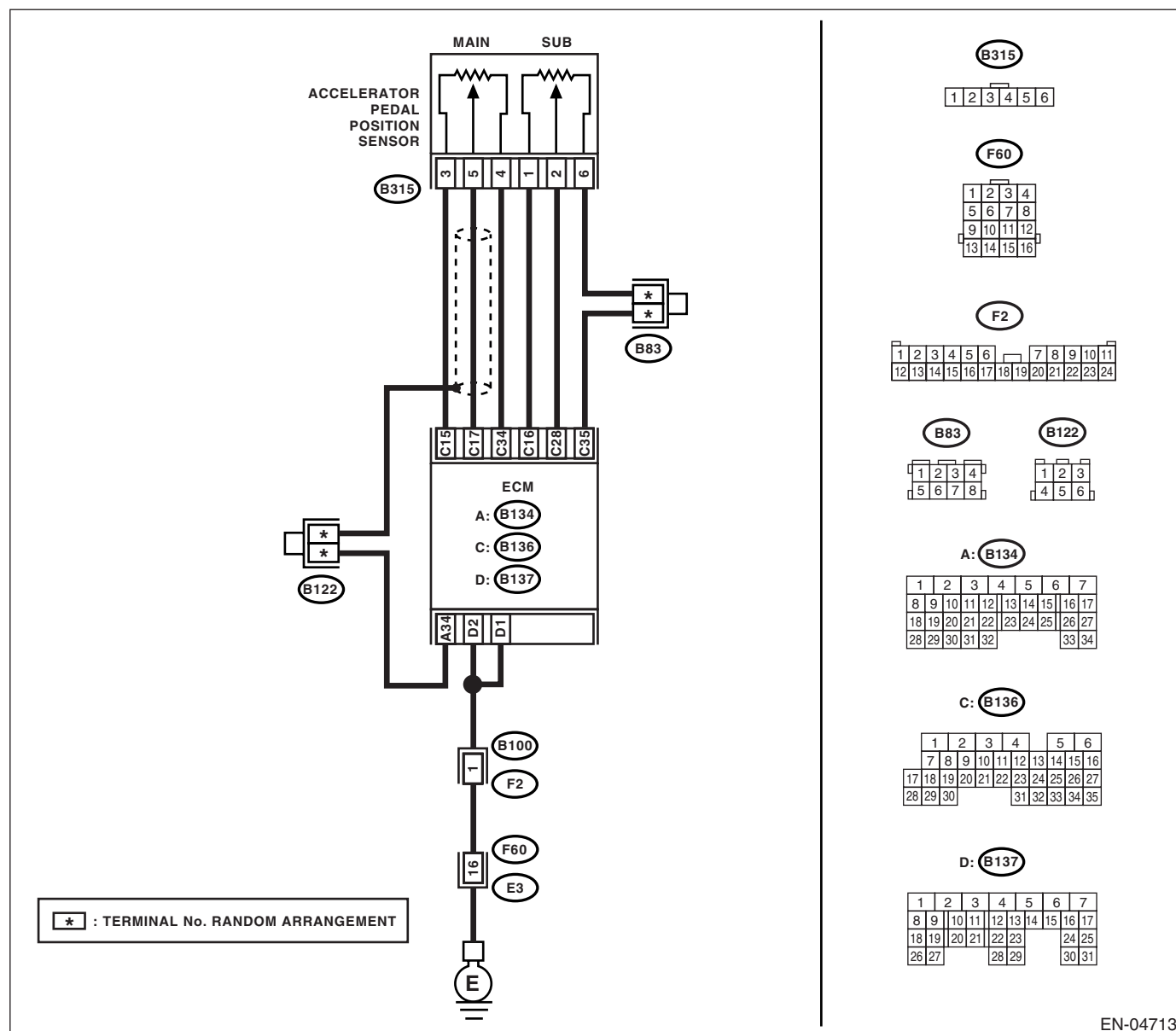
TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04713

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OUTPUT VOLTAGE OF ACCELERATOR PEDAL POSITION SENSOR. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector terminals. <i>Connector & terminal</i> <i>(B136) No. 28 (+) — (B136) No. 35 (-):</i> 3) Shake the ECM harness and connector, accelerator pedal position sensor connector.	Is the voltage more than 0.4 V?	Go to step 2.	Go to step 3.
2 CHECK POOR CONTACT IN CONNECTORS. Check poor contact in connectors between ECM and accelerator pedal position sensor.	Is there any poor contact in connectors between ECM and accelerator pedal position sensor?	Repair the poor contact in connectors.	Connector has returned to its normal condition at this time. A temporary poor contact in the connector might have been the cause.
3 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from accelerator pedal position sensor. 4) Measure the resistance between ECM connector and accelerator pedal position sensor connector. <i>Connector & terminal</i> <i>(B136) No. 28 — (B315) No. 2:</i> <i>(B136) No. 16 — (B315) No. 1:</i>	Is the resistance less than 1 Ω ?	Go to step 4.	Repair the open harness connector.
4 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR. Measure the resistance between ECM connector and chassis ground. <i>Connector & terminal</i> <i>(B136) No. 28 — Chassis ground:</i> <i>(B136) No. 16 — Chassis ground:</i>	Is the resistance more than 1 M Ω ?	Go to step 5.	Repair the ground short of harness.
5 CHECK POWER SUPPLY TO ACCELERATOR PEDAL POSITION SENSOR. 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between accelerator pedal position sensor connector and engine ground. <i>Connector & terminal</i> <i>(B315) No. 1 (+) — Engine ground (-):</i> 4) Shake the ECM harness and connector, while monitoring value of voltage meter.	Is the voltage 4.5 — 5.5 V?	Go to step 6.	Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).>
6 CHECK ACCELERATOR PEDAL POSITION SENSOR. Measure the resistance of accelerator pedal position sensor. <i>Terminals</i> <i>No. 1 — No. 6:</i>	Is the resistance 0.75 — 3.15 k Ω ?	Go to step 7.	Replace the accelerator pedal. <Ref. to SP(STI)-3, Accelerator Pedal.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
7 CHECK ACCELERATOR PEDAL POSITION SENSOR. Measure the resistance of accelerator pedal position sensor when accelerator pedal is released. <i>Terminals</i> <i>No. 2 — No. 6:</i>	Is the resistance 0.15 — 0.63 k Ω ?	Go to step 8.	Replace the accelerator pedal. <Ref. to SP(STI)-3, Accelerator Pedal.>
8 CHECK ACCELERATOR PEDAL POSITION SENSOR. Measure the resistance of accelerator pedal position sensor when accelerator pedal is depressed. <i>Terminals</i> <i>No. 2 — No. 6:</i>	Is the resistance 0.28 — 1.68 k Ω ?	Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).>	Replace the accelerator pedal. <Ref. to SP(STI)-3, Accelerator Pedal.>

DO:DTC P2128 THROTTLE/PEDAL POSITION SENSOR / SWITCH "E" CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-256, DTC P2128 THROTTLE/PEDAL POSITION SENSOR/ SWITCH "E" CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

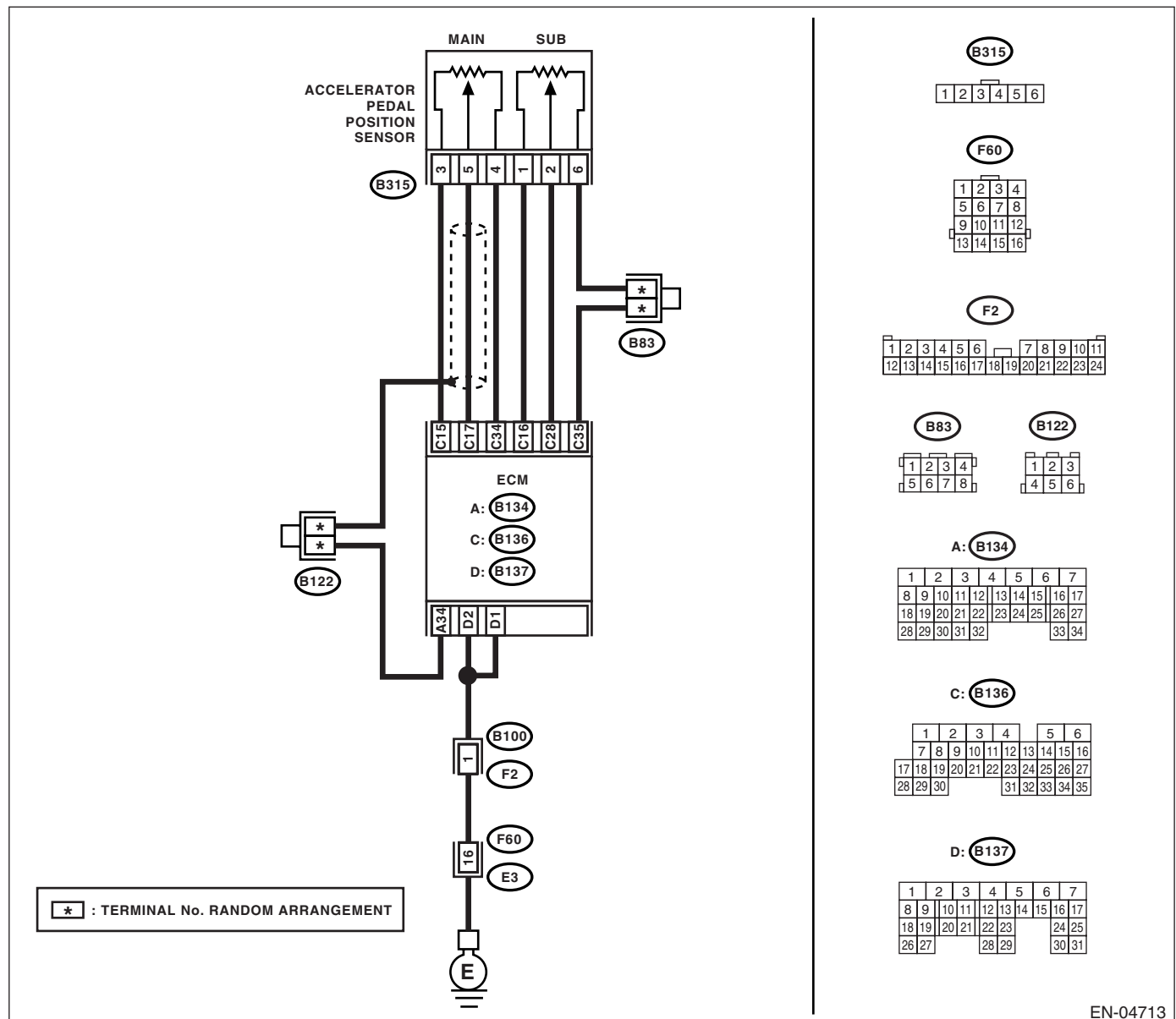
TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04713

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OUTPUT VOLTAGE OF ACCELERATOR PEDAL POSITION SENSOR. 1) Turn the ignition switch to ON. 2) Read the data of sub accelerator pedal position sensor signals, using Subaru Select Monitor. 3) Shake the ECM harness and connector, engine harness connector, accelerator pedal position sensor connector harness while monitoring value of voltage meter.	Is the voltage less than 4.8 V?	Go to step 2.	Go to step 3.
2 CHECK POOR CONTACT IN CONNECTORS. Check poor contact in connectors between ECM and accelerator pedal position sensor.	Is there any poor contact in connectors between ECM and accelerator pedal position sensor?	Repair the poor contact in connectors.	Connector has returned to its normal condition at this time. A temporary poor contact in the connector might have been the cause.
3 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from accelerator pedal position sensor. 4) Measure the resistance between ECM connector and accelerator pedal position sensor. <i>Connector & terminal</i> <i>(B136) No. 35 — (B315) No. 6:</i>	Is the resistance less than 1 Ω ?	Go to step 4.	Repair the open harness connector.
4 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR. 1) Connect the ECM connector. 2) Measure the resistance between accelerator pedal position sensor connector and engine ground. <i>Connector & terminal</i> <i>(B315) No. 6 — Engine ground:</i>	Is the resistance less than 5 Ω ?	Go to step 5.	Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).>
5 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR. 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between accelerator pedal position sensor connector and engine ground. <i>Connector & terminal</i> <i>(B315) No. 1 (+) — Engine ground (-):</i> 4) Shake the ECM harness and connector, while monitoring value of voltage meter.	Is the voltage less than 6 V?	Go to step 6.	Repair the battery short of harness between ECM connector and accelerator pedal position sensor connector.
6 CHECK POWER SUPPLY TO ACCELERATOR PEDAL POSITION SENSOR. 1) Measure the voltage between accelerator pedal position sensor connector and engine ground. <i>Connector & terminal</i> <i>(B315) No. 2 (+) — Engine ground (-):</i> 2) Shake the ECM harness and connector, while monitoring value of voltage meter.	Is the voltage less than 4.8 V?	Go to step 7.	Repair the short of harness between ECM connector and accelerator pedal position sensor connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
7 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR. 1) Turn the ignition switch to OFF. 2) Connect the accelerator pedal position sensor connector. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM connector and chassis ground. Connector & terminal (B136) No. 16 (+) — Chassis ground (-):	Is the voltage 4.8 V?	Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).>	Repair the poor contact in accelerator pedal position sensor connector. If problem persists, replace the accelerator pedal. <Ref. to SP(STI)-3, Accelerator Pedal.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

DP:DTC P2135 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A”/“B” VOLTAGE RATIONALITY

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-258, DTC P2135 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” / “B” VOLTAGE RATIONALITY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

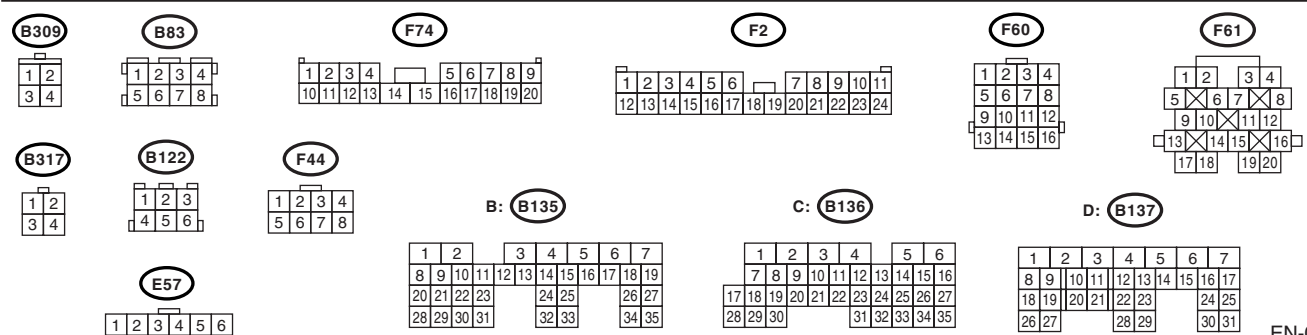
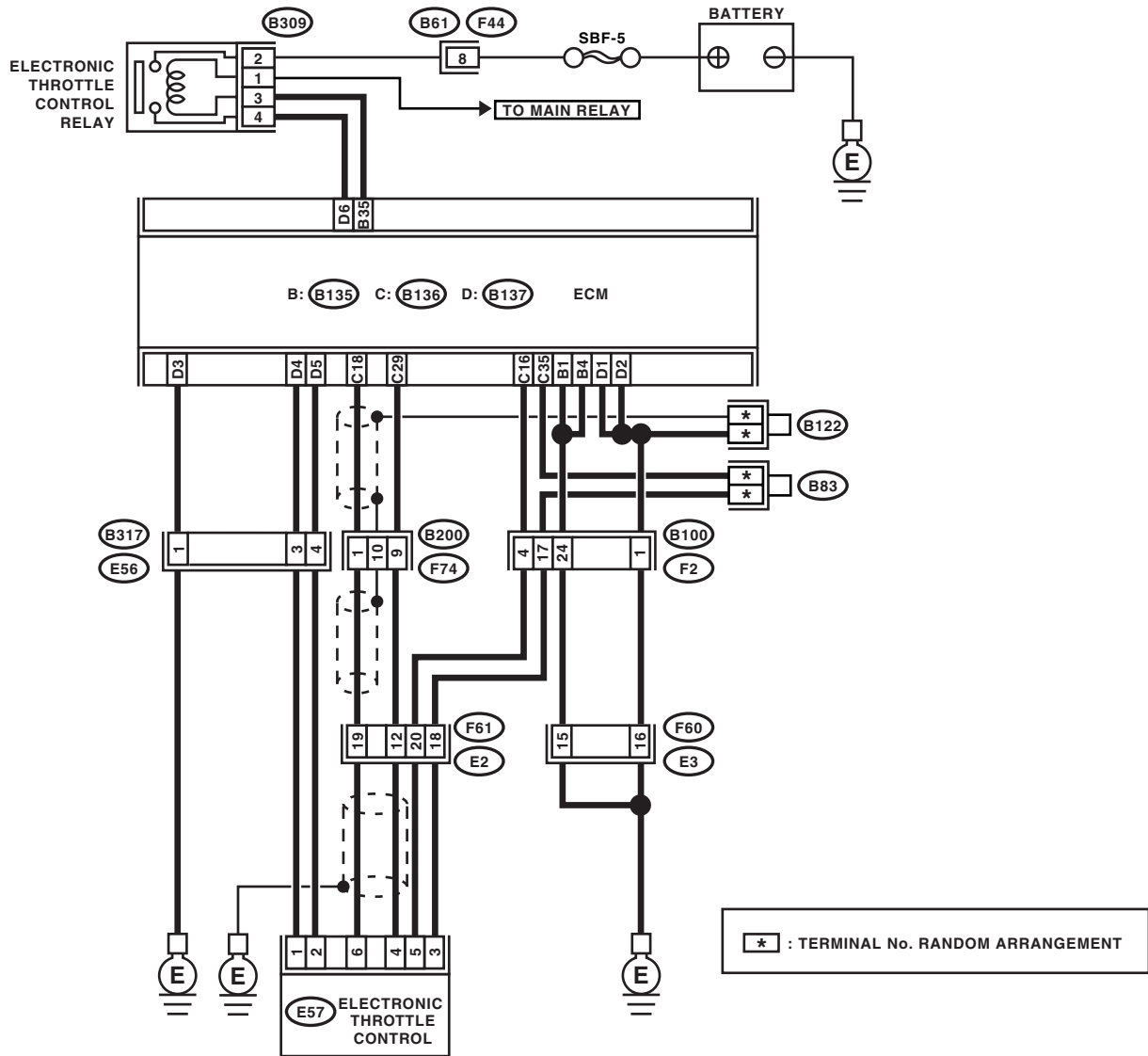
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-04159

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OUTPUT VOLTAGE OF ACCELERATOR PEDAL POSITION SENSOR. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector terminals. Connector & terminal (B136) No. 18 (+) — (B136) No. 35 (-): 3) Shake the ECM harness and connector, engine harness connectors, electronic throttle control connector harness while monitoring value of voltage meter.	Is the voltage more than 0.4 V?	Go to step 2.	Go to step 4.
2 CHECK OUTPUT VOLTAGE OF ACCELERATOR PEDAL POSITION SENSOR. 1) Measure the voltage between ECM connector terminals. Connector & terminal (B136) No. 29 (+) — (B136) No. 35 (-): 2) Shake the ECM harness and connector, engine harness connectors, electronic throttle control connector harness while monitoring value of voltage meter.	Is the voltage more than 0.8 V?	Go to step 3.	Go to step 4.
3 CHECK POOR CONTACT IN CONNECTORS. Check poor contact in connectors between ECM and electronic throttle control.	Is there any poor contact in connectors between ECM and electronic throttle control?	Repair the poor contact in connectors.	Go to step 14.
4 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. Connector & terminal (B136) No. 16 — (E57) No. 5:	Is the resistance less than 1 Ω ?	Go to step 5.	Repair the open harness connector.
5 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. Measure the resistance between ECM connector and chassis ground. Connector & terminal (B136) No. 18 — Chassis ground: (B136) No. 29 — Chassis ground: (B136) No. 16 — Chassis ground:	Is the resistance more than 1 M Ω ?	Go to step 6.	Repair the ground short of harness.
6 CHECK POWER SUPPLY TO SENSOR. 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control connector and engine ground. Connector & terminal (E57) No. 5 (+) — Engine ground (-): 4) Shake the ECM harness and connector, engine harness connectors, while monitoring value of voltage meter.	Is the voltage 4.5 — 5.5 V?	Go to step 7.	Repair the poor contact in ECM connector. If problem persists, replace the ECM.
7 CHECK SHORT OF ECM. 1) Turn the ignition switch to OFF. 2) Measure the resistance between electronic throttle control connector and engine ground. Connector & terminal (E57) No. 6 — Engine ground: (E57) No. 4 — Engine ground:	Is the resistance more than 10 Ω ?	Go to step 8.	Repair the poor contact in ECM connector. If problem persists, replace the ECM.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
8 CHECK OUTPUT VOLTAGE OF ACCELERATOR PEDAL POSITION SENSOR. 1) Connect all the connectors. 2) Turn the ignition switch to ON. 3) Read the data of main throttle sensor signals, using Subaru Select Monitors. 4) Shake the ECM harness and connector, engine harness connector, electronic throttle control connector harness while monitoring value of voltage meter.	Is the voltage less than 4.63 V?	Go to step 9.	Go to step 11.
9 CHECK OUTPUT VOLTAGE OF ACCELERATOR PEDAL POSITION SENSOR. 1) Read the data of sub throttle sensor signals, using Subaru Select Monitors. 2) Shake the ECM harness and connector, engine harness connector, electronic throttle control connector harness while monitoring value of voltage meter.	Is the voltage less than 4.73 V?	Go to step 10.	Go to step 11.
10 CHECK POOR CONTACT IN CONNECTORS. Check poor contact in connectors between ECM and electronic throttle control.	Is there any poor contact in connectors between ECM and electronic throttle control?	Repair the poor contact in connectors.	Connector has returned to a normal condition at this time. A temporary poor contact in the connector might have been the cause.
11 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. Connector & terminal (B136) No. 35 — (E57) No. 3: (B136) No. 18 — (E57) No. 6: (B136) No. 29 — (E57) No. 4:	Is the resistance less than 1 Ω ?	Go to step 12.	Repair the open harness connector.
12 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Connect the ECM connector. 2) Measure the resistance between electronic throttle control connector and engine ground. Connector & terminal (E57) No. 3 — Engine ground:	Is the resistance less than 5 Ω ?	Go to step 13.	Repair the poor contact in ECM connector. If problem persists, replace the ECM.
13 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control connector and engine ground. Connector & terminal (E57) No. 5 (+) — Engine ground (-): 4) Shake the ECM harness and connector, engine harness connectors, while monitoring value of voltage meter.	Is the voltage more than 10 V?	Go to step 14.	Repair the battery short of harness between ECM connector and electronic throttle control connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
14 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Measure the voltage between electronic throttle control connector and engine ground. Connector & terminal (E57) No. 6 (+) — Engine ground (-): (E57) No. 4 (+) — Engine ground (-): 2) Shake the ECM harness and connector, engine harness connectors, while monitoring value of voltage meter.	Is the voltage less than 10 V?	Go to step 15.	Repair the short of harness between ECM connector and electronic throttle control connector.
15 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Disconnect the electronic throttle control connector. 3) Measure the resistance between ECM connectors. Connector & terminal (B136) No. 18 (+) — (B136) No. 35 (-): (B136) No. 29 (+) — (B136) No. 35 (-):	Is the resistance more than 1 MΩ?	Go to step 16.	Repair the short of power supply sensor.
16 CHECK ELECTRONIC THROTTLE CONTROL HARNESS. 1) Disconnect the connector from ECM. 2) Disconnect the connector from electronic throttle control. 3) Measure the resistance between electronic throttle control connector terminals. Connector & terminal (E57) No. 6 — (E57) No. 4:	Is the resistance more than 1 MΩ?	Repair the poor contact in ECM connector. If problem persists, replace the ECM.	Repair the short of harness.

DQ:DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D”/“E” VOLTAGE RATIONALITY

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-260, DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” / “E” VOLTAGE RATIONALITY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

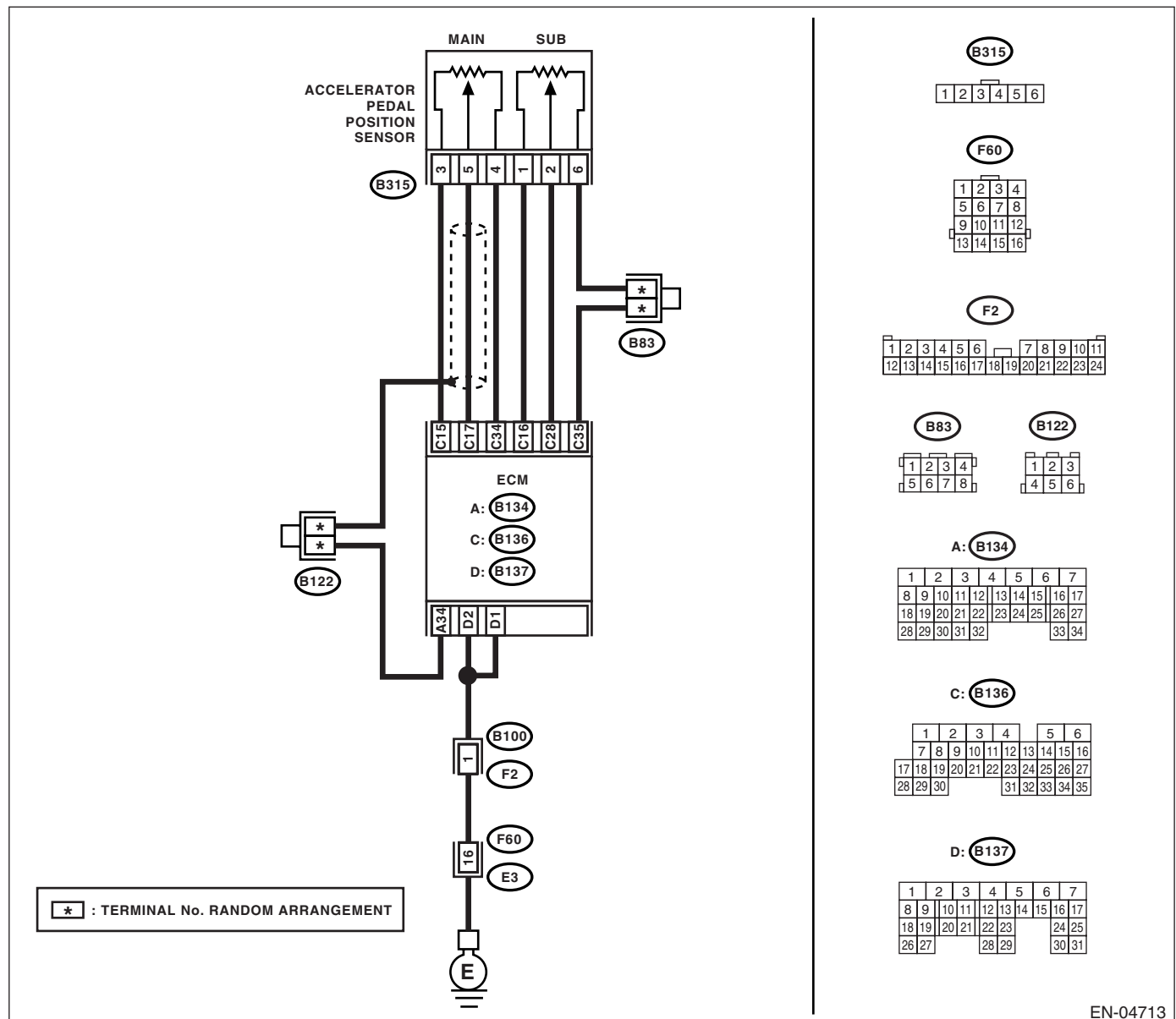
TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04713

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OUTPUT VOLTAGE OF ACCELERATOR PEDAL POSITION SENSOR. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector terminals. <i>Connector & terminal</i> <i>(B136) No. 17 (+) — (B136) No. 34 (-):</i> <i>(B136) No. 28 (+) — (B136) No. 35 (-):</i> 3) Shake the ECM harness and connector, accelerator pedal position sensor connector and harness.	Is the voltage more than 0.4 V?	Go to step 2.	Go to step 3.
2 CHECK POOR CONTACT IN CONNECTORS. Check poor contact in connectors between ECM and accelerator pedal position sensor.	Is there any poor contact in connectors between ECM and electronic throttle control?	Repair the poor contact in connectors.	Go to step 12.
3 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from accelerator pedal position sensor. 4) Measure the resistance between ECM connector and accelerator pedal position sensor connector. <i>Connector & terminal</i> <i>(B136) No. 17 — (B315) No. 5:</i> <i>(B136) No. 15 — (B315) No. 3:</i> <i>(B136) No. 28 — (B315) No. 2:</i> <i>(B136) No. 16 — (B315) No. 1:</i>	Is the resistance less than 1 Ω ?	Go to step 4.	Repair the open harness connector.
4 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR. Measure the resistance between ECM connector and chassis ground. <i>Connector & terminal</i> <i>(B136) No. 17 — Chassis ground:</i> <i>(B136) No. 15 — Chassis ground:</i> <i>(B136) No. 28 — Chassis ground:</i> <i>(B136) No. 16 — Chassis ground:</i>	Is the resistance more than 1 M Ω ?	Go to step 5.	Repair the ground short of harness.
5 CHECK POWER SUPPLY TO ACCELERATOR PEDAL POSITION SENSOR. 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between accelerator pedal position sensor connector and engine ground. <i>Connector & terminal</i> <i>(B315) No. 3 (+) — Engine ground (-):</i> <i>(B315) No. 1 (+) — Engine ground (-):</i> 4) Shake the ECM harness and connector, while monitoring value of voltage meter.	Is the voltage 4.5 — 5.5 V?	Go to step 6.	Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).>
6 CHECK ACCELERATOR PEDAL POSITION SENSOR. Measure the resistance of accelerator pedal position sensor. <i>Terminals</i> <i>No. 3 — No. 4:</i>	Is the resistance 1.2 — 4.8 k Ω ?	Go to step 7.	Replace the accelerator pedal. <Ref. to SP(STI)-3, Accelerator Pedal.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
7 CHECK ACCELERATOR PEDAL POSITION SENSOR. Measure the resistance of accelerator pedal position sensor. Terminals No. 1 — No. 6:	Is the resistance 0.75 — 3.15 k Ω ?	Go to step 8.	Replace the accelerator pedal. <Ref. to SP(STI)-3, Accelerator Pedal.>
8 CHECK ACCELERATOR PEDAL POSITION SENSOR. Measure the resistance of accelerator pedal position sensor when the acceleration pedal is released. Terminals No. 5 — No. 4:	Is the resistance 0.2 — 0.8 k Ω ?	Go to step 9.	Replace the accelerator pedal. <Ref. to SP(STI)-3, Accelerator Pedal.>
9 CHECK ACCELERATOR PEDAL POSITION SENSOR. Measure the resistance of accelerator pedal position sensor when the acceleration pedal is released. Connector & terminal No. 2 — No. 6:	Is the resistance 0.15 — 0.63 k Ω ?	Go to step 10.	Replace the accelerator pedal. <Ref. to SP(STI)-3, Accelerator Pedal.>
10 CHECK ACCELERATOR PEDAL POSITION SENSOR. Measure the resistance of accelerator pedal position sensor when the acceleration pedal is depressed. Terminals No. 5 — No. 4:	Is the resistance 0.5 — 2.5 k Ω ?	Go to step 11.	Replace the accelerator pedal. <Ref. to SP(STI)-3, Accelerator Pedal.>
11 CHECK ACCELERATOR PEDAL POSITION SENSOR. Measure the resistance of accelerator pedal position sensor when the acceleration pedal is depressed. Terminals No. 2 — No. 6:	Is the resistance 0.28 — 1.68 k Ω ?	Go to step 12.	Replace the accelerator pedal. <Ref. to SP(STI)-3, Accelerator Pedal.>
12 CHECK OUTPUT VOLTAGE OF ACCELERATOR PEDAL POSITION SENSOR. 1) Turn the ignition switch to OFF. 2) Connect all the connectors. 3) Turn the ignition switch to ON. 4) Read the data of main accelerator pedal position sensor signals and sub accelerator pedal position sensor signals, using Subaru Select Monitor. 5) Shake the ECM harness and connector, engine harness connector, accelerator pedal position sensor connector harness while monitoring value of voltage meter.	Is the voltage less than 4.8 V?	Go to step 13.	Go to step 14.
13 CHECK POOR CONTACT IN CONNECTORS. Check poor contact in connectors between ECM and electronic throttle control.	Is there any poor contact in connectors between ECM and electronic throttle control?	Repair the poor contact in connectors.	Go to step 19.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
14 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from accelerator pedal position sensor. 4) Measure the resistance between ECM connector and accelerator pedal position sensor connector. Connector & terminal (B136) No. 34 — (B315) No. 4: (B136) No. 35 — (B315) No. 6:	Is the resistance less than 1 Ω ?	Go to step 15.	Repair the open harness connector.
15 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR. 1) Connect the ECM connector. 2) Measure the resistance between accelerator pedal position sensor and engine ground. Connector & terminal (B315) No. 4 — Engine ground: (B315) No. 6 — Engine ground:	Is the resistance less than 5 Ω ?	Go to step 16.	Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).>
16 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR. 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between accelerator pedal position sensor and engine ground. Connector & terminal (B315) No. 3 (+) — Engine ground (-): (B315) No. 1 (+) — Engine ground (-): 4) Shake the ECM harness and connector, while monitoring value of voltage meter.	Is the voltage less than 6 V?	Go to step 17.	Repair the battery short of harness between ECM connector and accelerator pedal position sensor.
17 CHECK POWER SUPPLY TO ACCELERATOR PEDAL POSITION SENSOR. 1) Measure the voltage between accelerator pedal position sensor connector and engine ground. Connector & terminal (B315) No. 5 (+) — Engine ground (-): (B315) No. 2 (+) — Engine ground (-): 2) Shake the ECM harness and connector, while monitoring value of voltage meter.	Is the voltage less than 4.8 V?	Go to step 18.	Repair the short of harness between ECM connector and accelerator pedal position sensor connector.
18 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR. 1) Turn the ignition switch to OFF. 2) Connect the accelerator pedal position sensor connector. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM connector and chassis ground. Connector & terminal (B136) No. 17 (+) — Chassis ground (-): (B136) No. 28 (+) — Chassis ground (-):	Is the voltage less than 4.8 V?	Go to step 19.	Repair the poor contact in accelerator pedal position sensor connector. If problem persists, replace the accelerator pedal. <Ref. to SP(STI)-3, Accelerator Pedal.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
19 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from accelerator pedal position sensor. 4) Measure the resistance between terminals of accelerator pedal position sensor connector. Connector & terminal (B315) No. 5 — (B315) No. 2:	Is the resistance less than 1 MΩ?	Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).>	Repair the short of harness between accelerator pedal position sensor connector and accelerator pedal position sensor connector.

DR:DTC P2227 BAROMETRIC PRESSURE CIRCUIT RANGE/PERFORMANCE

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STI)-262, DTC P2227 BAROMETRIC PRESSURE CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, 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(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).>	Replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).> NOTE: Atmospheric pressure sensor is built into ECM.

DS:DTC P2228 BAROMETRIC PRESSURE CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-263, DTC P2228 BAROMETRIC PRESSURE CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, 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(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).>	Replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).> NOTE: Atmospheric pressure sensor is built into ECM.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

DT:DTC P2229 BAROMETRIC PRESSURE CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STI)-264, DTC P2229 BAROMETRIC PRESSURE CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STI)(diag)-36, 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(STI)(diag)-69, List of Diagnostic Trouble Code (DTC).>	Replace the ECM. <Ref. to FU(STI)-39, Engine Control Module (ECM).> NOTE: Atmospheric pressure sensor is built into ECM.

19. General Diagnostic Table

A: INSPECTION

1. ENGINE

NOTE:

Malfunction of parts other than those listed is also possible. <Ref. to ME(STI)-90, Engine Trouble in General.>

Symptom	Problem parts
1. Engine stalls during idling.	1) Electronic throttle control 2) Manifold absolute pressure sensor 3) Mass air flow and intake 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 temperature sensor 4) Engine coolant temperature sensor (*2) 5) Ignition parts (*1) 6) Air intake system (*5) 7) Fuel injection parts (*4) 8) Crankshaft position sensor (*3) 9) Camshaft position sensor (*3) 10) Oxygen sensor 11) Fuel pump and fuel pump relay
3. Engine does not return to idle.	1) Electronic throttle control 2) Engine coolant temperature sensor 3) Manifold absolute pressure sensor 4) Mass air flow sensor
4. Poor acceleration	1) Manifold absolute pressure sensor 2) Mass air flow and intake temperature sensor 3) Electronic throttle control 4) Fuel injection parts (*4) 5) Fuel pump and fuel pump relay 6) Engine coolant temperature sensor (*2) 7) Crankshaft position sensor (*3) 8) Camshaft position sensor (*3) 9) A/C switch and A/C cut relay 10) Engine torque control signal circuit 11) Ignition parts (*1)
5. Engine stalls or engine sags or hesitates at acceleration.	1) Manifold absolute pressure sensor 2) Mass air flow and intake temperature sensor 3) Engine coolant temperature sensor (*2) 4) Crankshaft position sensor (*3) 5) Camshaft position sensor (*3) 6) Purge control solenoid valve 7) Fuel injection parts (*4) 8) Fuel pump and fuel pump relay
6. Surge	1) Manifold absolute pressure sensor 2) Mass air flow and intake temperature sensor 3) Engine coolant temperature sensor (*2) 4) Crankshaft position sensor (*3) 5) Camshaft position sensor (*3) 6) Fuel injection parts (*4) 7) Throttle position sensor 8) Fuel pump and fuel pump relay

General Diagnostic Table

ENGINE (DIAGNOSTICS)

Symptom	Problem parts
7. Spark knock	1) Manifold absolute pressure sensor 2) Mass air flow and intake 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 temperature sensor 3) Engine coolant temperature sensor (*2) 4) Fuel injection parts (*4) 5) Fuel pump and fuel pump relay

*1: Check ignition coil and ignitor assembly and spark plug.

*2: Indicate the symptom occurring only in cold temperatures.

*3: Ensure the secure installation.

*4: Check fuel injector, fuel pressure regulator and fuel filter.

*5: Inspect air leak in air intake system.

EXHAUST

1. General Description

A: SPECIFICATION

Specifications for STI model is as same as turbo model. <Ref. to EX(H4DOTC)-2, General Description.>

FUEL INJECTION (FUEL SYTEMS)

General Description

FUEL INJECTION (FUEL SYSTEMS)

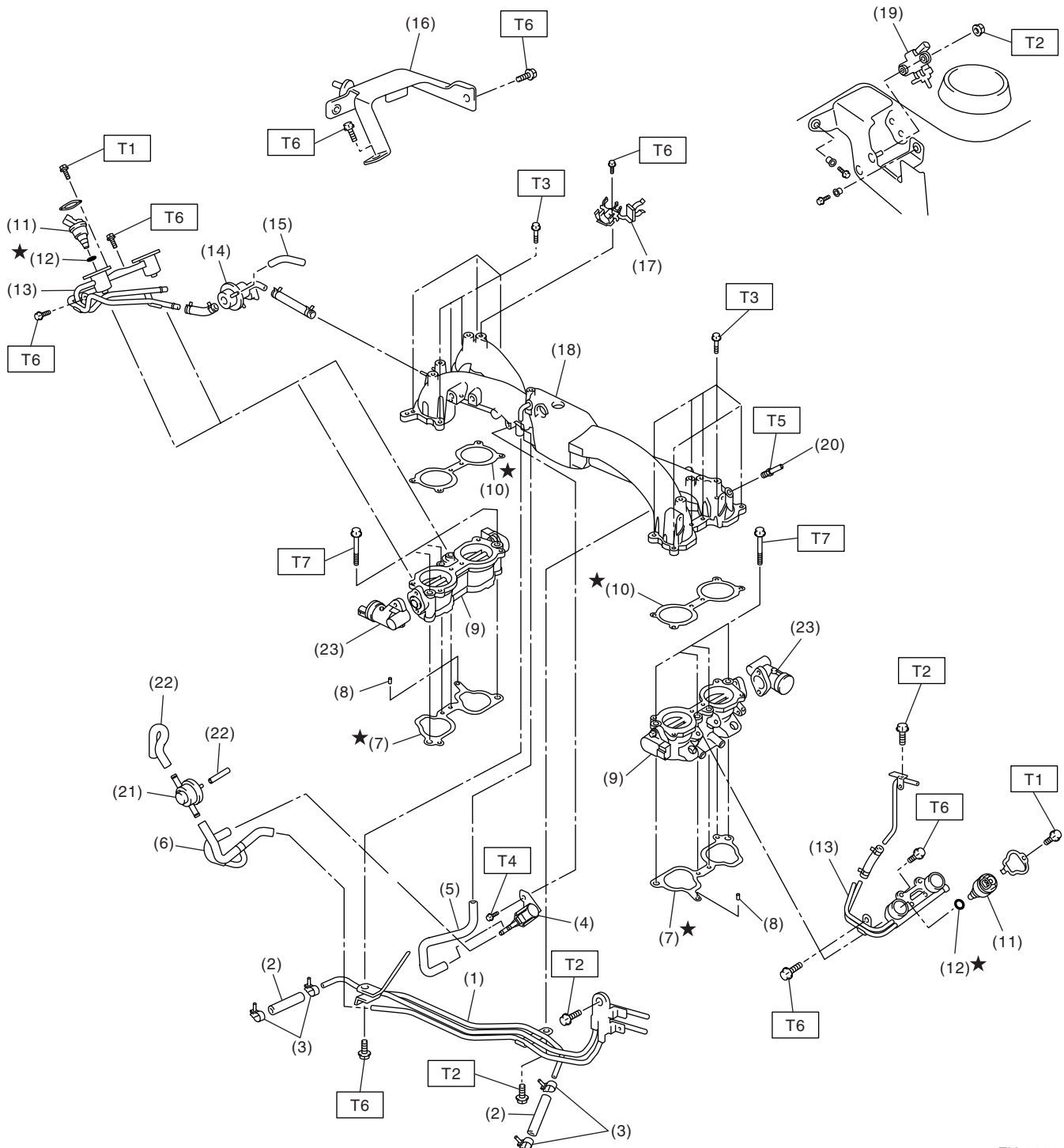
1. General Description

A: SPECIFICATION

Fuel tank	Capacity	60 ℓ (15.9 US gal, 13.2 Imp gal)
	Location	Under rear seat
Fuel pump	Type	Impeller
	Shutoff discharge pressure	450 — 677 kPa (4.59 — 6.9 kgf/cm ² , 65.27 — 98.2 psi)
	Discharge flow	More than 145 ℓ (38.3 US gal, 31.9 Imp gal)/h [12 V at 300 kPa (3.06 kgf/cm ² , 43.5 psi)]
Fuel filter		Cartridge type

B: COMPONENT

1. INTAKE MANIFOLD



FU-02909

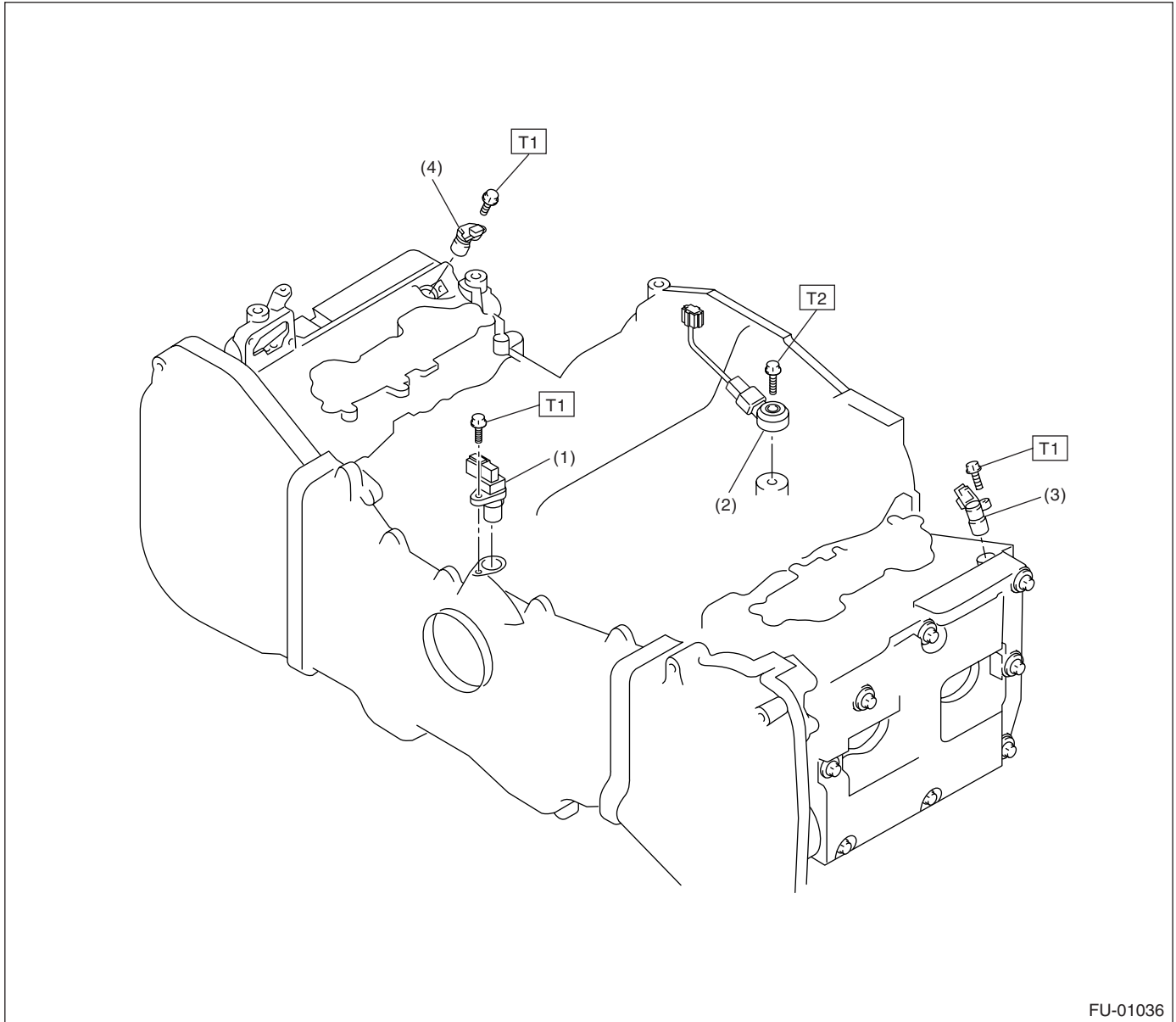
FUEL INJECTION (FUEL SYSTEMS)

- Tightening torque: N·m (kgf-m, ft-lb)**
- | | |
|------------|-------------------------|
| T1: | 3.5 (0.36, 2.6) |
| T2: | 6.4 (0.65, 4.7) |
| T3: | 8.25 (0.84, 6.1) |
| T4: | 16 (1.6, 11.8) |
| T5: | 17 (1.73, 12.5) |
| T6: | 19 (1.94, 13.7) |
| T7: | 25 (2.5, 18.1) |

This diagram shows an exploded view of a mechanical assembly. The main component is a large, curved metal housing. A circular flange with four mounting holes is shown being aligned with the housing, indicated by dashed lines and a star symbol next to the callout (1). A cylindrical component with a flange is shown being inserted into the housing, indicated by dashed lines and the callout (2). A small, rectangular component with a circular feature is shown being attached to the side of the housing, indicated by dashed lines and the callout (3). A small, circular component is shown being attached to the top of the housing, indicated by dashed lines and the callout (4). Two additional components, T1 and T2, are shown being attached to the top of the housing, indicated by dashed lines and their respective callouts. T1 is a small, rectangular component with a circular feature, and T2 is a long, cylindrical component with a flange.

- Tightening torque: N·m (kgf·m, ft·lb)**
T1: 1.6 (0.16, 1.2)
T2: 8 (0.8, 5.8)

3. CRANKSHAFT POSITION, CAMSHAFT POSITION AND KNOCK SENSORS



FU-01036

- (1) Crankshaft position sensor
- (2) Knock sensor

- (3) Camshaft position sensor LH
- (4) Camshaft position sensor RH

Tightening torque: N·m (kgf-m, ft-lb)

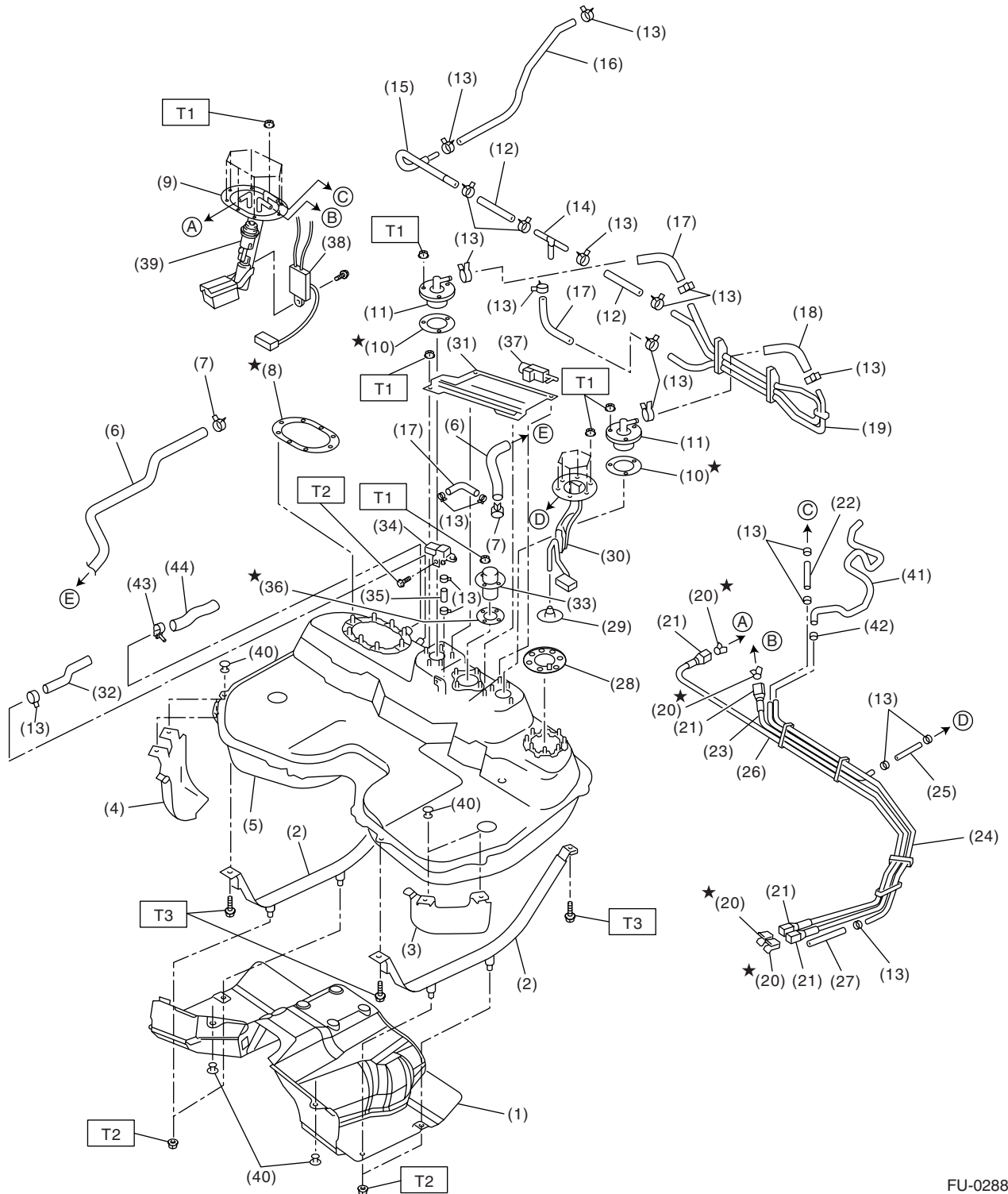
T1: 6.4 (0.65, 4.7)

T2: 24 (2.4, 17.4)

General Description

FUEL INJECTION (FUEL SYSTEMS)

4. FUEL TANK



FU-02880

General Description

FUEL INJECTION (FUEL SYSTEMS)

(1) Heat shield cover	(18) Evaporation hose D	(35) Fuel tank pressure sensor hose
(2) Fuel tank band	(19) Evaporation pipe ASSY	(36) Vent valve gasket
(3) Protector LH	(20) Retainer	(37) Fuel tank sensor control valve
(4) Protector RH	(21) Quick connector	(38) Fuel level sensor
(5) Fuel tank	(22) Jet pump hose A	(39) Fuel filter
(6) Canister hose A	(23) Fuel return tube	(40) Clip
(7) Clamp	(24) Fuel pipe ASSY	(41) Evaporation hose G
(8) Fuel pump gasket	(25) Jet pump hose B	(42) Clamp
(9) Fuel pump ASSY	(26) Fuel delivery tube	(43) Clamp
(10) Fuel cut valve gasket	(27) Evaporation hose E	(44) Fuel filler hose
(11) Fuel cut valve	(28) Fuel sub level sensor gasket	
(12) Evaporation hose A	(29) Jet pump filter	
(13) Clip	(30) Fuel sub level sensor	
(14) Joint pipe	(31) Protector cover	
(15) Evaporation pipe	(32) Evaporation hose F	
(16) Evaporation hose B	(33) Vent valve	
(17) Evaporation hose C	(34) Fuel tank pressure sensor	

Tightening torque: N·m (kgf-m, ft-lb)

T1: 4.4 (0.45, 3.3)

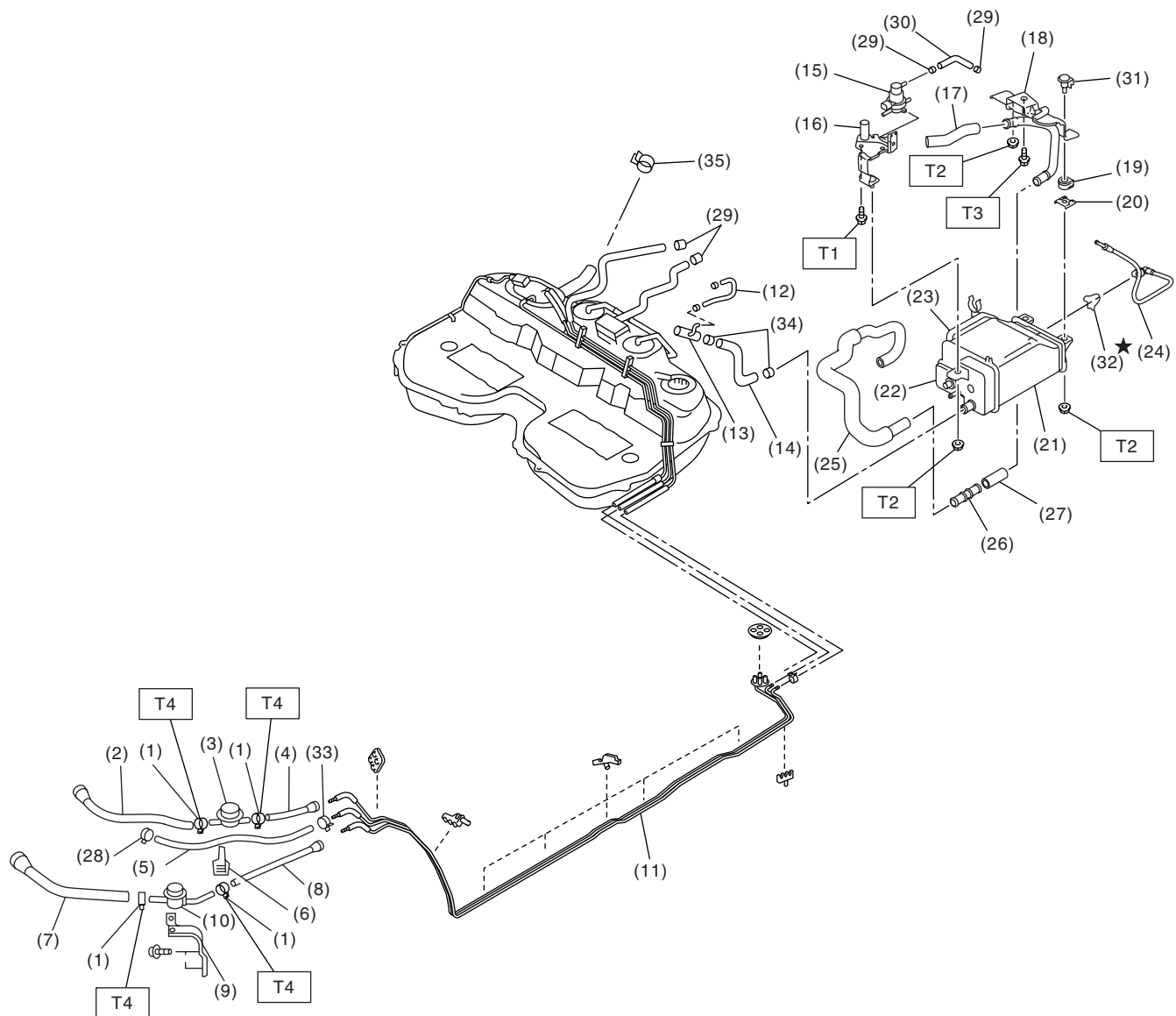
T2: 7.4 (0.75, 5.4)

T3: 33 (3.4, 25)

General Description

FUEL INJECTION (FUEL SYSTEMS)

5. FUEL LINE



FU-02881

FU(STI)-8

General Description

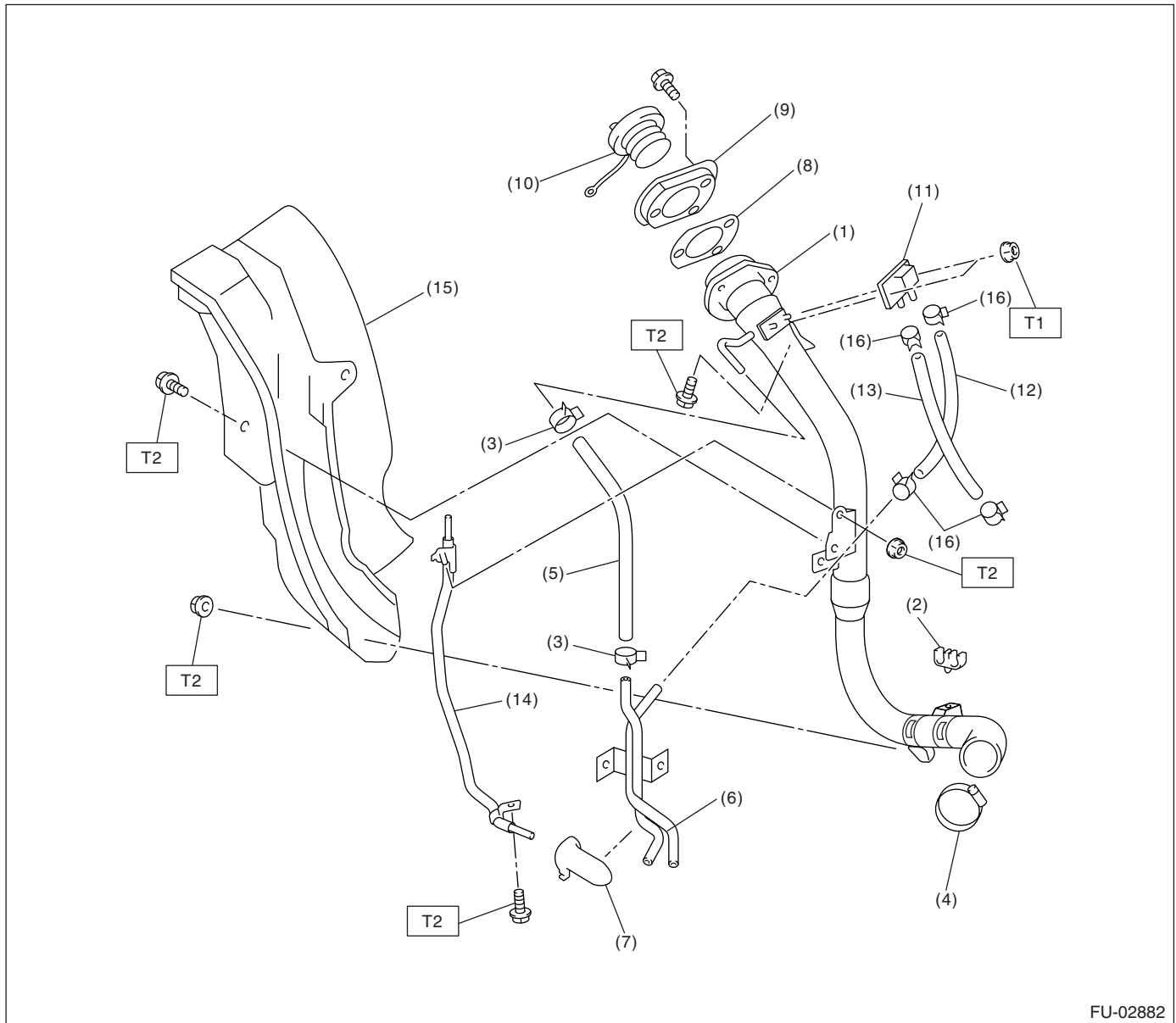
FUEL INJECTION (FUEL SYSTEMS)

(1) Clamp	(16) Pressure control solenoid valve bracket	(29) Clamp
(2) Fuel return hose A	(17) Drain hose C	(30) Pressure control solenoid valve hose
(3) Fuel damper valve (return)	(18) Canister upper bracket	(31) Canister bracket spacer
(4) Fuel return hose B	(19) Cushion rubber	(32) Retainer
(5) Evaporation hose A	(20) Canister lower bracket	(33) Clamp
(6) Clip	(21) Canister	(34) Clamp
(7) Fuel delivery hose A	(22) Drain valve	(35) Clamp
(8) Fuel delivery hose B	(23) Drain filter	
(9) Fuel damper valve bracket	(24) Pressure control solenoid valve tube	<i>Tightening torque: N·m (kgf-m, ft-lb)</i>
(10) Fuel damper valve (delivery)	(25) Drain hose A	<i>T1: 25 (2.5, 18.1)</i>
(11) Fuel pipe ASSY	(26) Connector drain	<i>T2: 23 (2.3, 16.6)</i>
(12) Evaporation hose B	(27) Drain hose B	<i>T3: 33 (3.4, 25)</i>
(13) Joint pipe	(28) Clamp	<i>T4: 1.25 (0.13, 0.94)</i>
(14) Canister hose A		
(15) Pressure control solenoid valve		

General Description

FUEL INJECTION (FUEL SYSTEMS)

6. FUEL FILLER PIPE



- (1) Fuel filler pipe ASSY
- (2) Evaporation hose holder
- (3) Clamp
- (4) Clamp
- (5) Evaporation hose A
- (6) Evaporation pipe
- (7) Evaporation pipe holder

- (8) Filler pipe packing
- (9) Filler ring
- (10) Filler cap
- (11) Shut valve
- (12) Evaporation hose B
- (13) Evaporation hose C
- (14) Joint pipe

- (15) Fuel filler pipe protector
- (16) Clamp

Tightening torque: N·m (kgf-m, ft-lb)

T1: 4.4 (0.45, 3.3)

T2: 7.5 (0.76, 5.5)

General Description

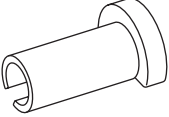
FUEL INJECTION (FUEL SYSTEMS)

C: CAUTION

- Wear work clothing, including a cap, protective goggles and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.

- Be careful not to burn yourself, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect ground cable from battery.
- Place "NO FIRE" signs near the working area.
- Be careful not to spill fuel on the floor.

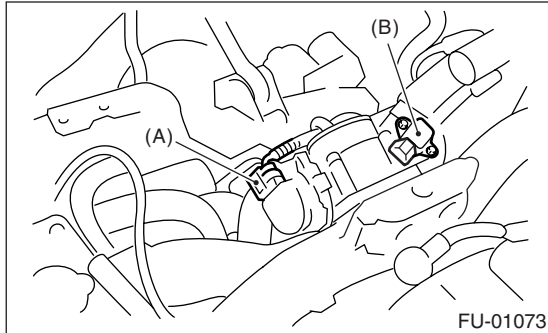
D: PREPARATION TOOL

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

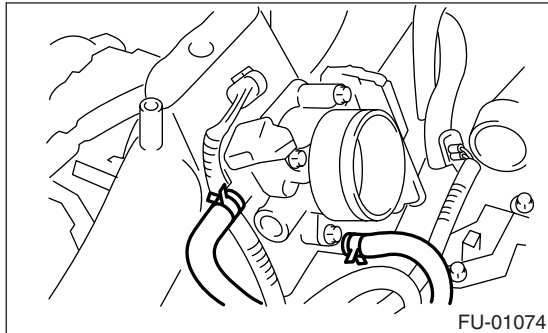
2. Throttle Body

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the intercooler. <Ref. to IN(STI)-11, REMOVAL, Intercooler.>
- 3) Disconnect the connector from the throttle position sensor (A) and manifold absolute pressure sensor (B).



- 4) Disconnect the engine coolant hoses from the throttle body.



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

B: INSTALLATION

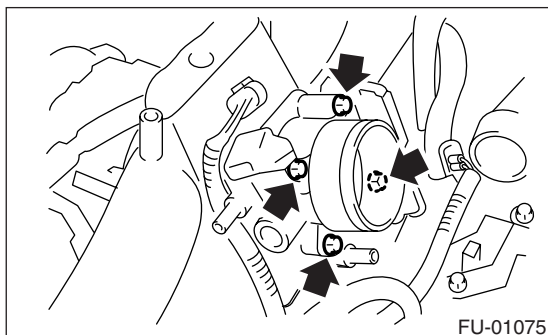
Install in the reverse order of removal.

NOTE:

Always use a new gasket.

Tightening torque:

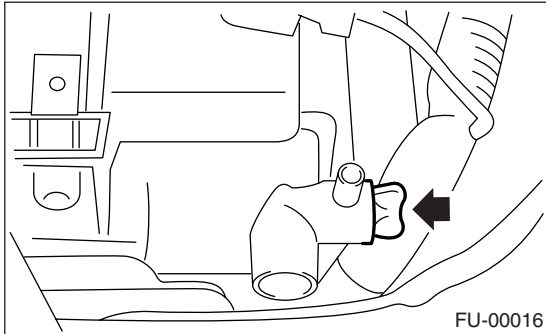
8 N·m (0.8 kgf-m, 5.8 ft-lb)



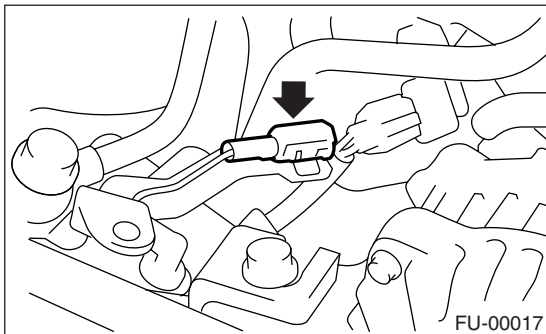
3. Intake Manifold

A: REMOVAL

- 1) Release the fuel pressure. <Ref. to FU(STI)-44, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
- 2) Open the fuel filler flap lid and remove the fuel filler cap.
- 3) Disconnect the ground cable from battery.
- 4) Lift up the vehicle.
- 5) Remove the under cover.
- 6) Drain the engine coolant about 3.0 ℓ (3.2 US qt, 2.6 Imp qt).



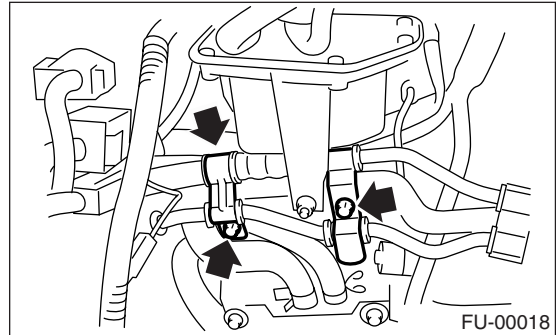
- 7) Remove the air cleaner upper cover and air intake boot. <Ref. to IN(STI)-8, REMOVAL, Air Cleaner Case.>
- 8) Remove the air cleaner element.
- 9) Remove the intercooler. <Ref. to IN(STI)-11, REMOVAL, Intercooler.>
- 10) Remove the coolant filler tank. <Ref. to CO(H4DOTC)-33, REMOVAL, Coolant Filler Tank.>
- 11) Remove the power steering pump.
 - (1) Remove the front side V-belt. <Ref. to ME(STI)-40, REMOVAL, V-belt.>
 - (2) Disconnect the power steering switch connector.



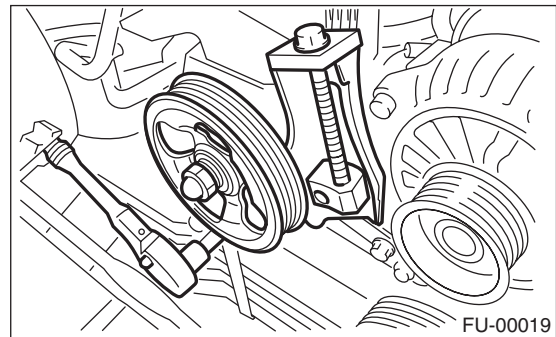
- (3) Remove the bolts which secure the power steering pipe brackets to the intake manifold.

NOTE:

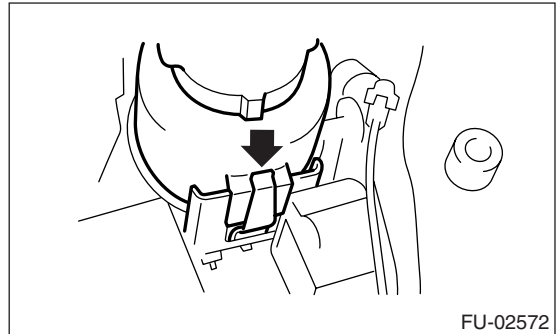
Do not disconnect the power steering hose.



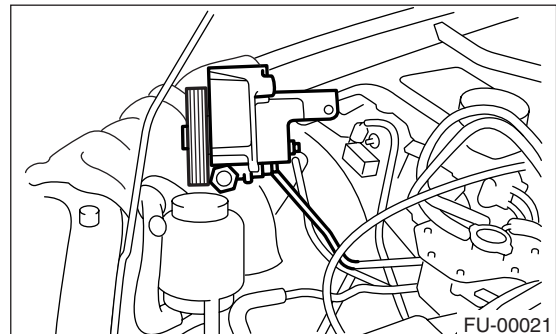
- (4) Remove the bolts which secure the power steering pump bracket.



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



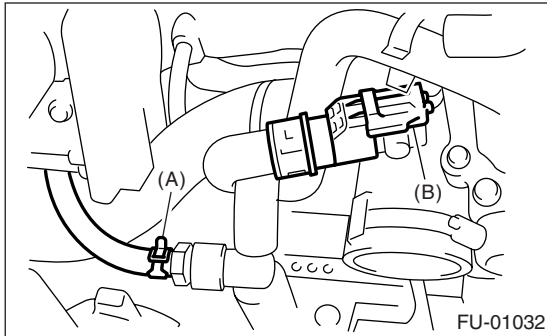
- (6) Place the power steering pump on the right side wheel apron.



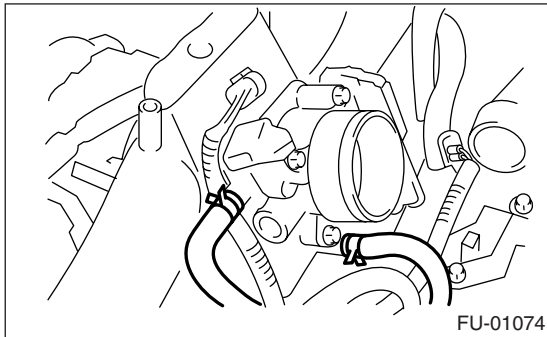
Intake Manifold

FUEL INJECTION (FUEL SYSTEMS)

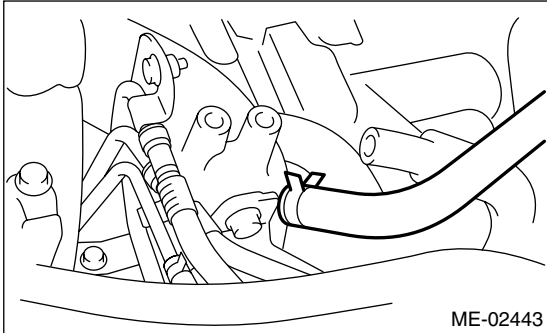
12) Disconnect the emission hose (A) and connector (B) from the PCV hose assembly.



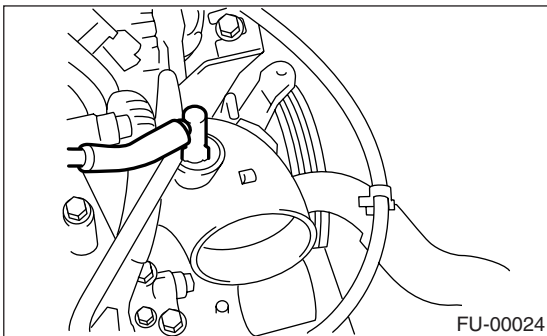
13) Disconnect the engine coolant hoses from the throttle body.



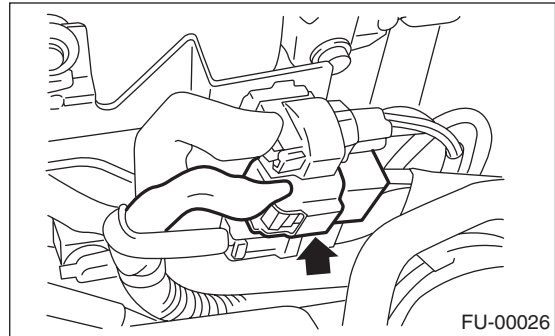
14) Disconnect the brake booster hose.



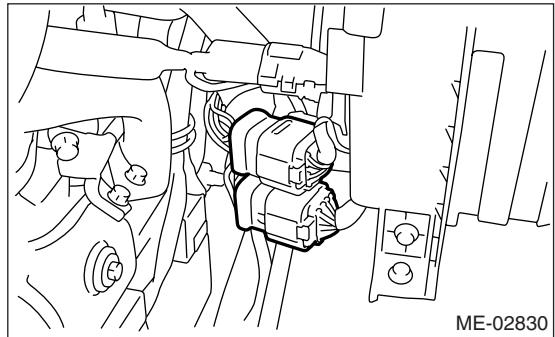
15) Disconnect the pressure hose from the intake duct.



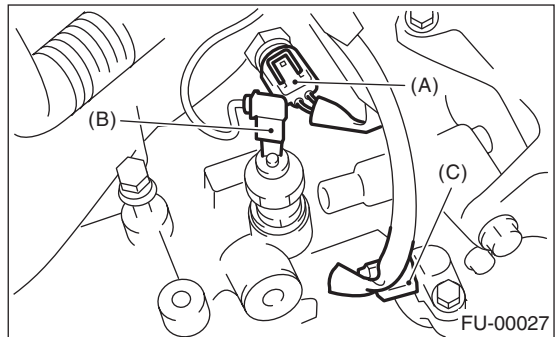
16) Disconnect the engine harness connectors from the bulkhead harness connectors.



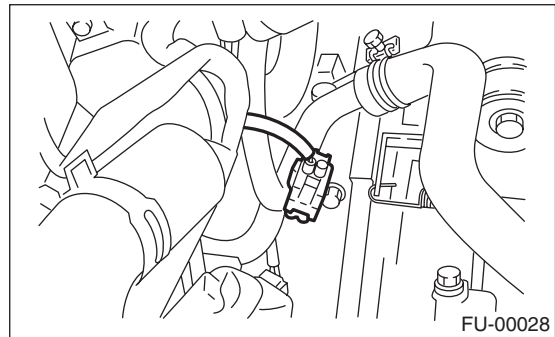
17) Disconnect the engine harness connector from front harness connector.



18) Disconnect the connectors from the engine coolant temperature sensor (A), oil pressure switch (B) and crankshaft position sensor (C).



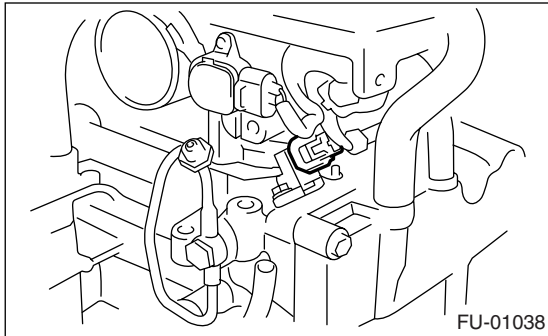
19) Disconnect the knock sensor connector.



Intake Manifold

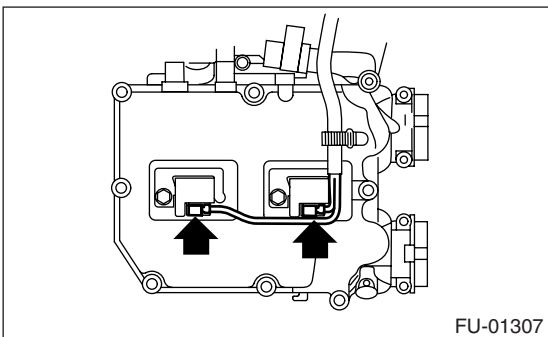
FUEL INJECTION (FUEL SYSTEMS)

20) Disconnect the connector from the camshaft position sensor.

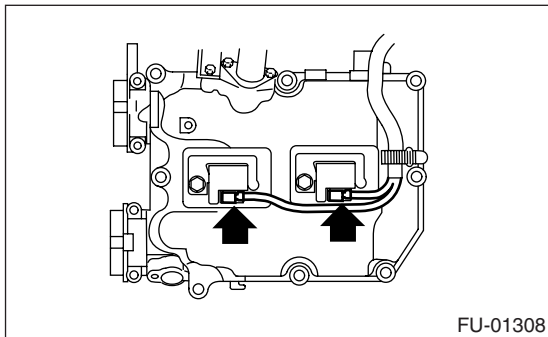


21) Disconnect the connector from the ignition coil and ignitor assembly.

- RH side

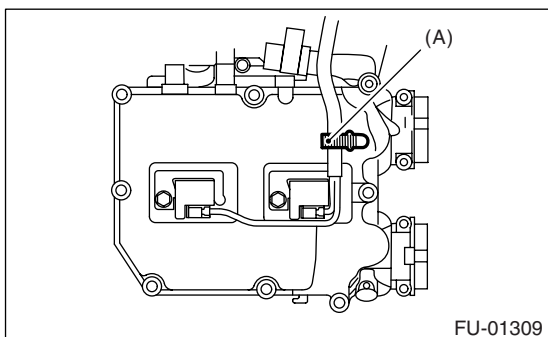


- LH side

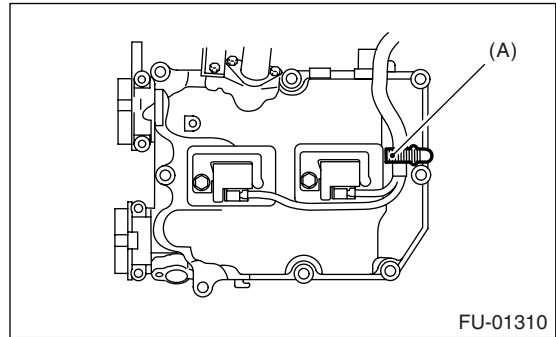


22) Disconnect the engine harness fixed by clip (A) from the rocker cover.

- RH side



- LH side

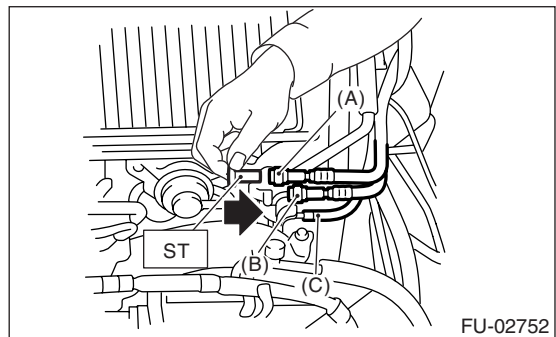


23) Using ST, disconnect fuel hoses from fuel pipes. <Ref. to FU(STI)-60, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>

CAUTION:

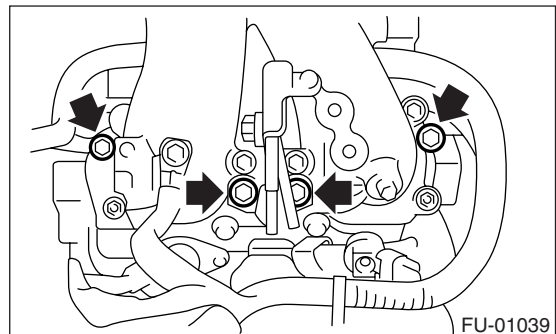
- Be careful not to spill fuel.
- Catch fuel from hoses using a container or cloth.

ST 42099AE000 CONNECTOR REMOVER



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

24) Remove the bolts which secure the intake manifold to the cylinder heads.



25) Remove the intake manifold.

Intake Manifold

FUEL INJECTION (FUEL SYSTEMS)

B: INSTALLATION

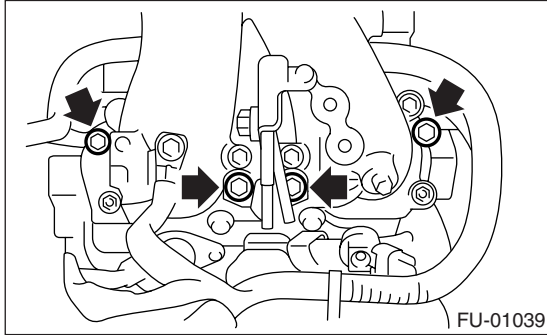
1) Install the intake manifold onto cylinder heads.

NOTE:

Always use new gaskets.

Tightening torque:

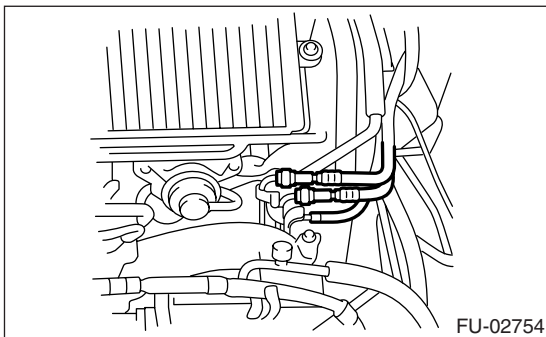
25 N·m (2.5 kgf-m, 18.1 ft-lb)



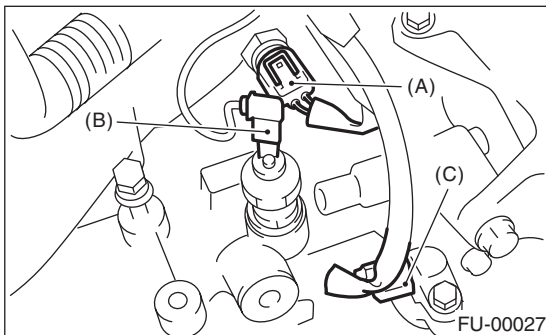
2) Connect the fuel delivery hose, return hose and evaporation hose.

NOTE:

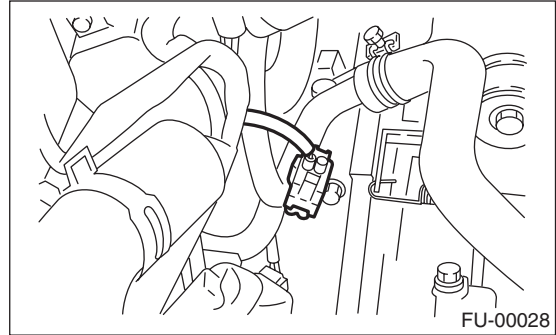
If fuel hoses or clamps are damaged, replace them with new ones.



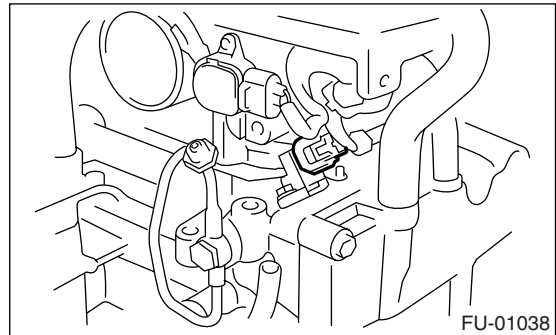
3) Connect the connector to the oil pressure switch (B), crankshaft position sensor (C) and engine coolant temperature sensor (A).



4) Connect the connector to the knock sensor.

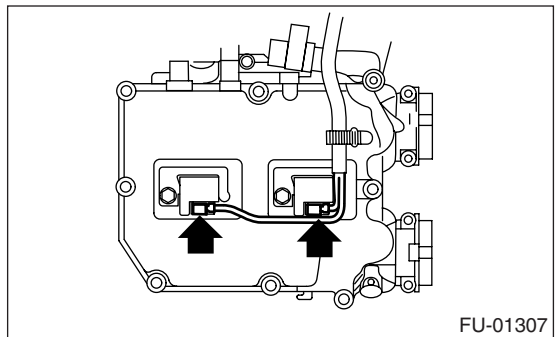


5) Connect the connector to the camshaft position sensor.

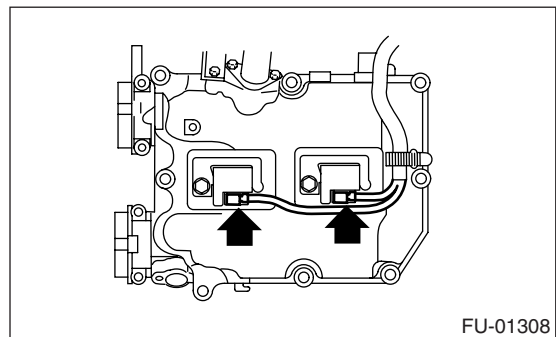


6) Connect the connector to the ignition coil and ignitor assembly.

- RH side



- LH side

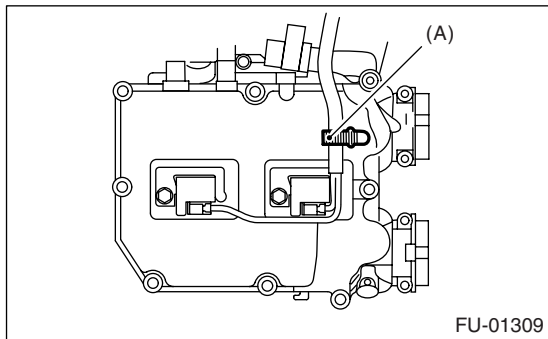


Intake Manifold

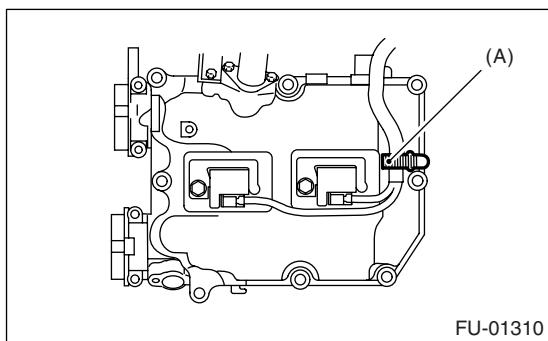
FUEL INJECTION (FUEL SYSTEMS)

7) Connect the engine harness with clip (A) to the rocker cover.

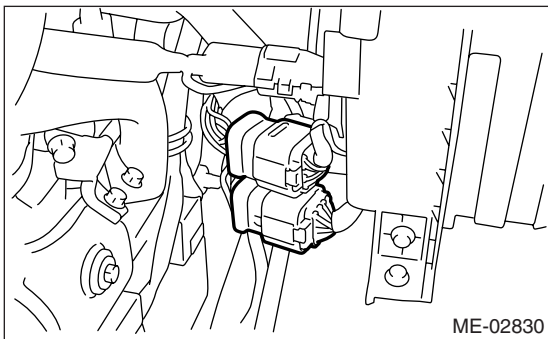
- RH side



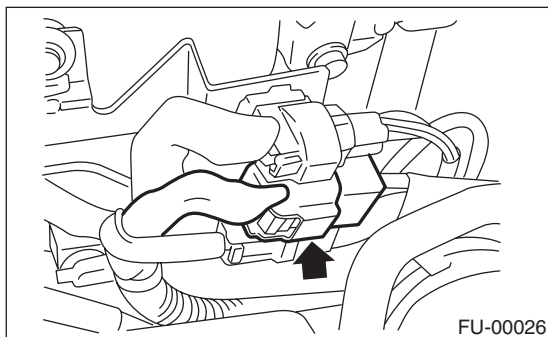
- LH side



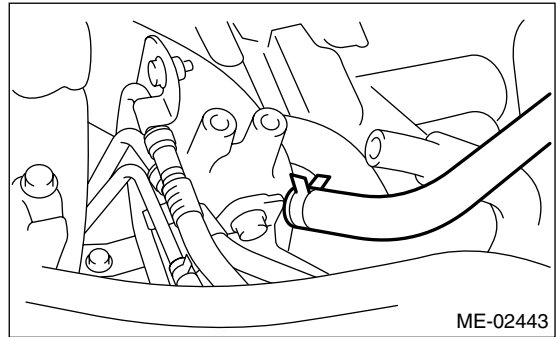
8) Connect the engine harness connector to the front harness connectors.



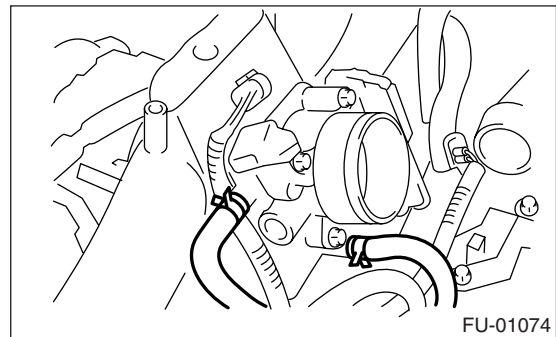
9) Connect the engine harness connector to the bulkhead harness connectors.



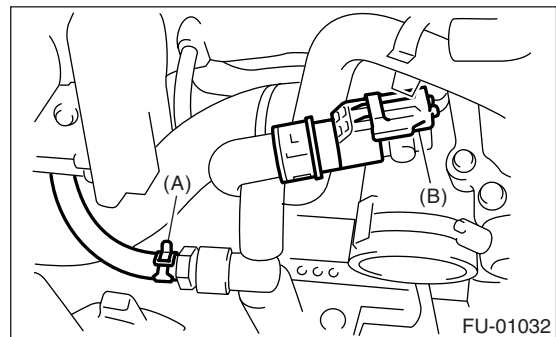
10) Connect the brake booster vacuum hose.



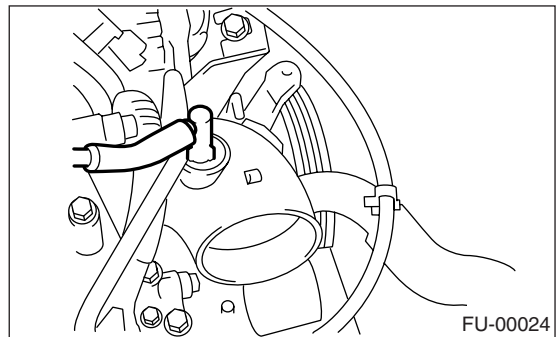
11) Connect the engine coolant hoses to the throttle body.



12) Connect the emission hose (A) and connector (B) to the PCV hose assembly.



13) Connect the pressure hose to the intake duct.

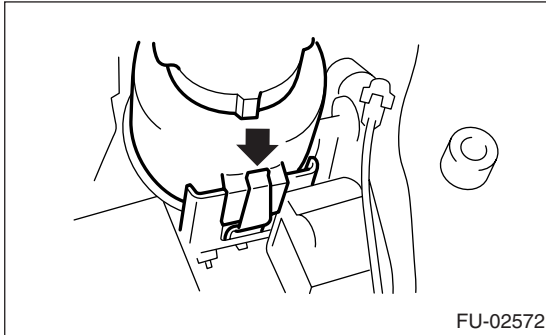


Intake Manifold

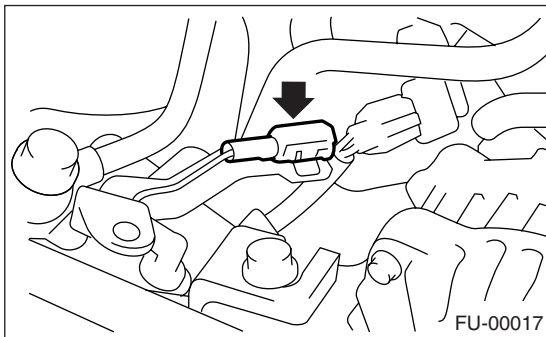
FUEL INJECTION (FUEL SYSTEMS)

14) Install the power steering pump.

(1) Install the power steering tank on the bracket.



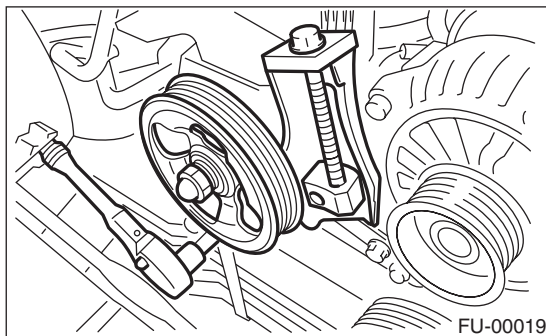
(2) Connect the connector to the power steering pump switch.



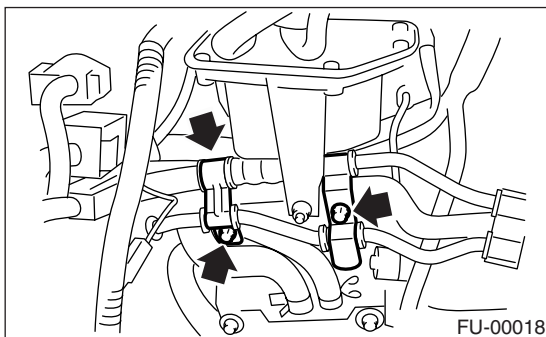
(3) Install the power steering pump, and tighten the bolts.

Tightening torque:

22 N·m (2.2 kgf-m, 15.9 ft-lb)



(4) Install the power steering pipe brackets on the intake manifold RH.



(5) Install the front side V-belt. <Ref. to ME(STI)-40, INSTALLATION, V-belt.>

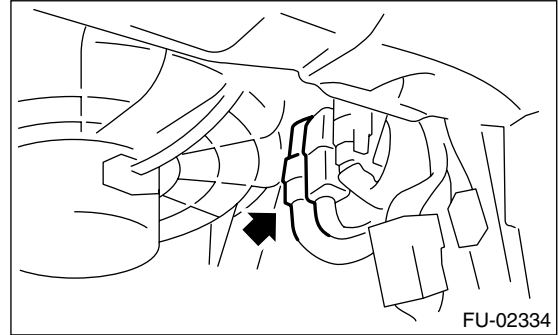
15) Install the coolant filler tank. <Ref. to CO(H4DOTC)-33, INSTALLATION, Coolant Filler Tank.>

16) Install the intercooler. <Ref. to IN(STI)-11, INSTALLATION, Intercooler.>

17) Install the air cleaner element.

18) Install the air cleaner upper cover and air intake duct as a unit. <Ref. to IN(STI)-8, INSTALLATION, Air Cleaner Case.>

19) Connect the connector to the fuel pump relay.



20) Connect the battery ground cable to battery.

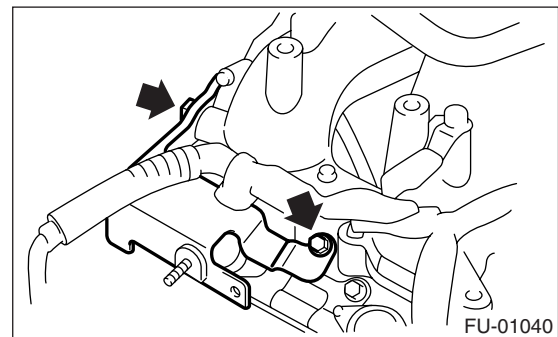
21) Lift up the vehicle.

22) Install the under cover.

23) Fill the engine coolant. <Ref. to CO(H4DOTC)-17, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

C: DISASSEMBLY

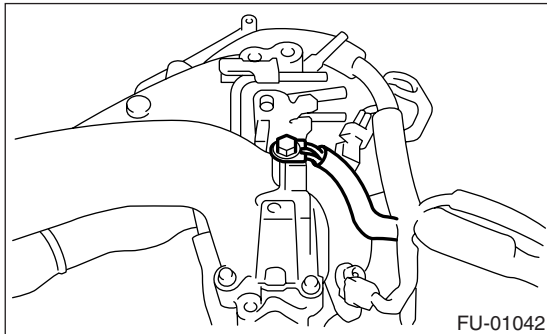
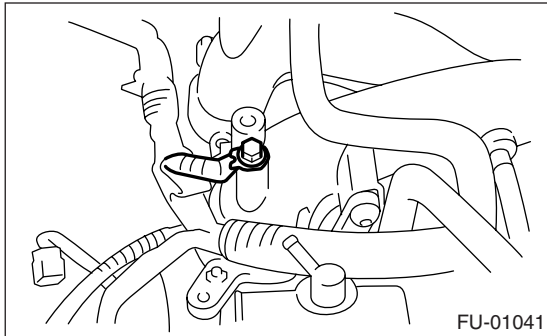
1) Remove the fuel pipe protector RH.



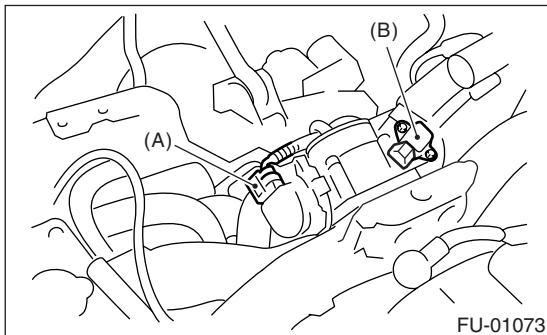
Intake Manifold

FUEL INJECTION (FUEL SYSTEMS)

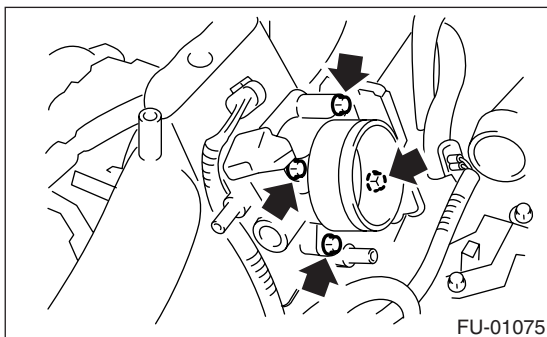
2) Remove the engine ground terminal from the intake manifold.



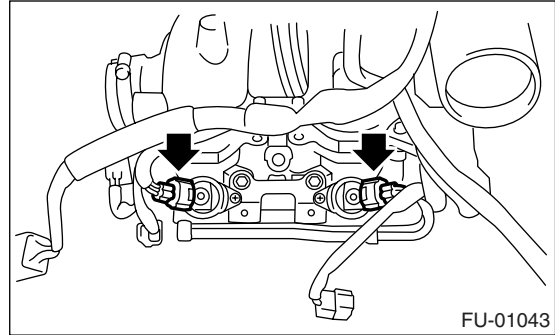
3) Disconnect the connector from the throttle position sensor (A) and manifold absolute pressure sensor (B).



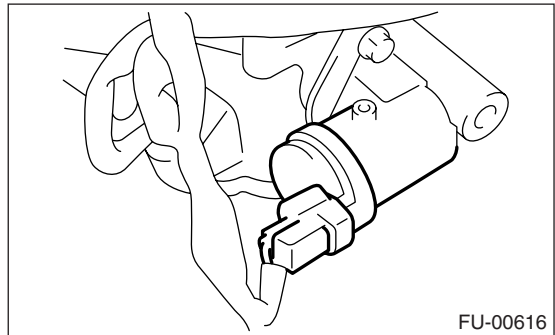
4) Remove the throttle body from the intake manifold.



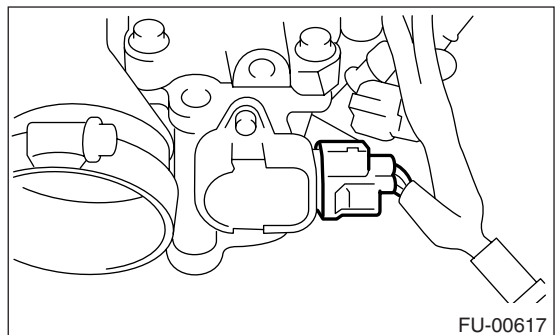
5) Disconnect the connector from the fuel injector.



6) Disconnect the connector from the tumble generator valve actuator.

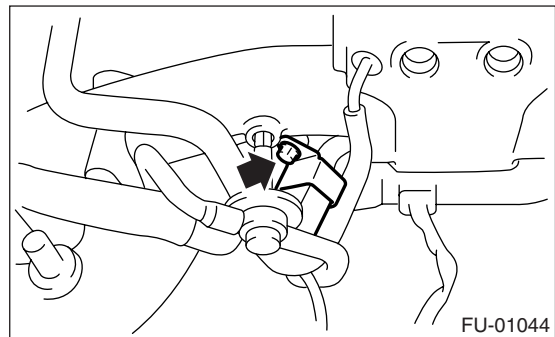


7) Disconnect the connector from the tumble generator valve sensor.



8) Disconnect the connector from the purge control solenoid valve.

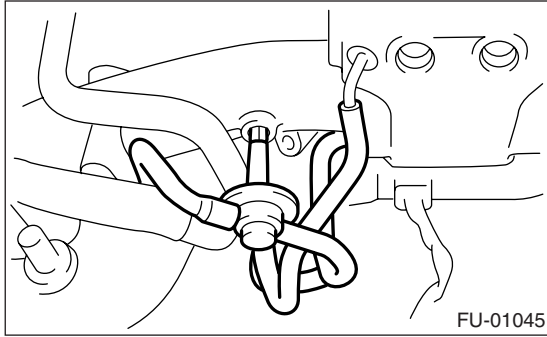
9) Remove the purge control solenoid valve.



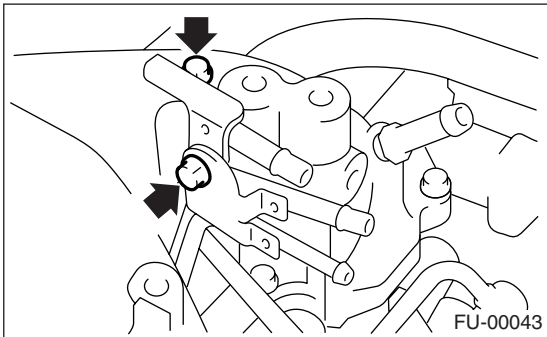
Intake Manifold

FUEL INJECTION (FUEL SYSTEMS)

10) Disconnect the evaporation hose and purge valve from the intake manifold.

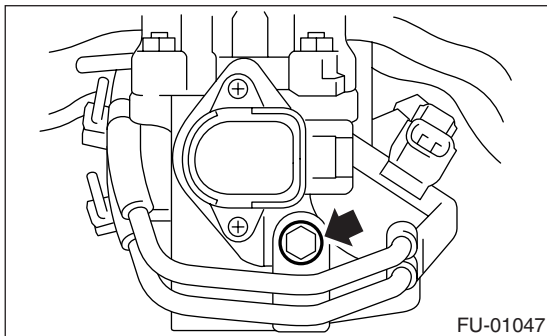
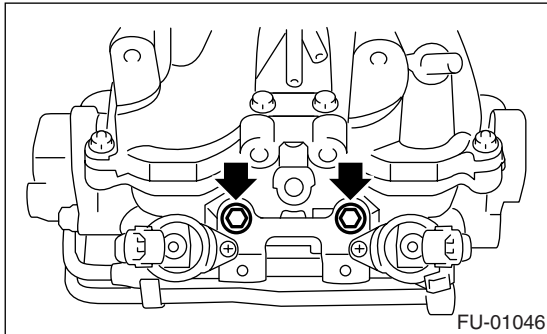


11) Remove the two bolts which hold the fuel pipes on the left side of intake manifold.

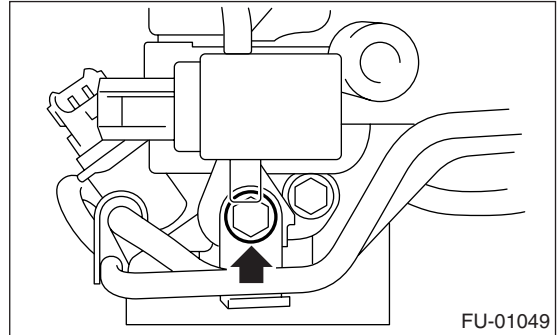
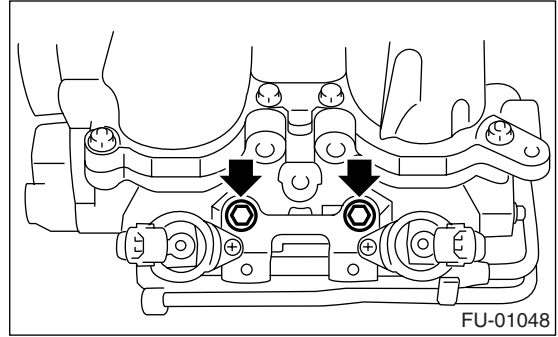


12) Remove the bolt which holds the fuel injector pipe onto intake manifold.

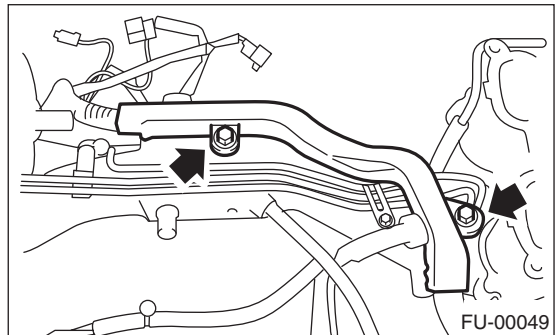
• LH SIDE



• RH SIDE

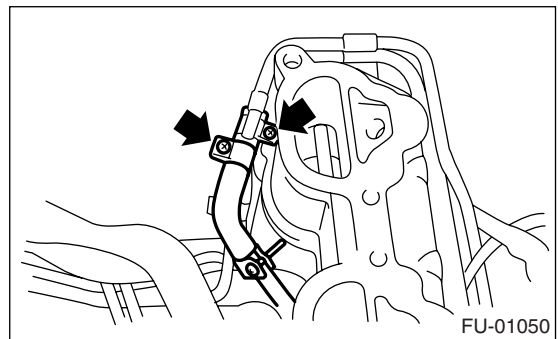


13) Remove the harness bracket which holds the engine harness onto intake manifold.

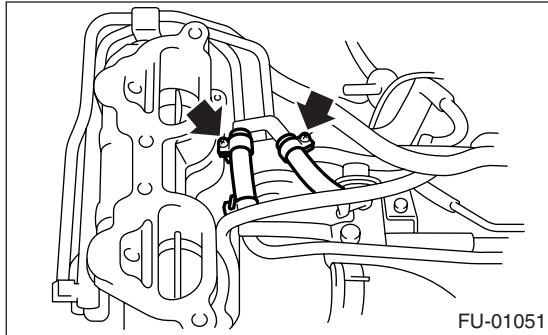


14) Remove the engine harness from the intake manifold.

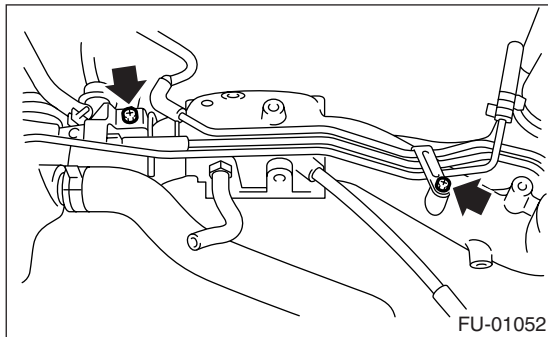
15) Loosen the clamp which holds the front left side fuel hose to injector pipe, and then remove the pipe from clamp.



16) Loosen the clamp which holds the right side fuel hose to injector pipe, and then remove the pipe from clamp.

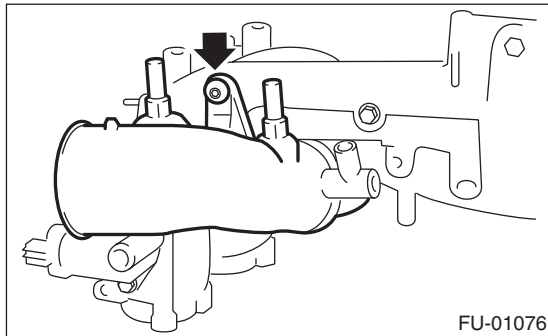


17) Remove the bolts which install the fuel pipe on intake manifold.

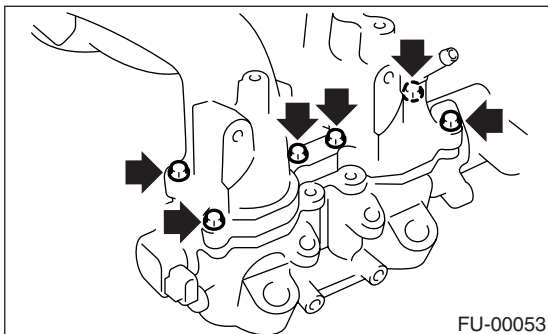


18) Remove the fuel pipe assembly and pressure regulator from the intake manifold.

19) Remove the intake duct from the intake manifold.



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



D: ASSEMBLY

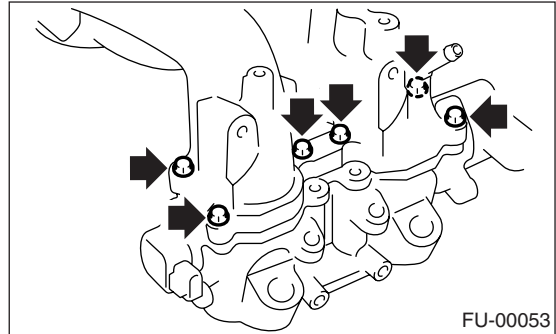
NOTE:

Replace the gasket with a new one.

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

Tightening torque:

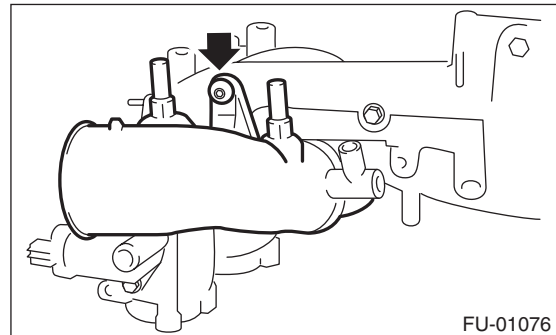
8.25 N·m (0.84 kgf-m, 6.1 ft-lb)



2) Install the air intake duct to the intake manifold.

Tightening torque:

19 N·m (1.94 kgf-m, 13.7 ft-lb)

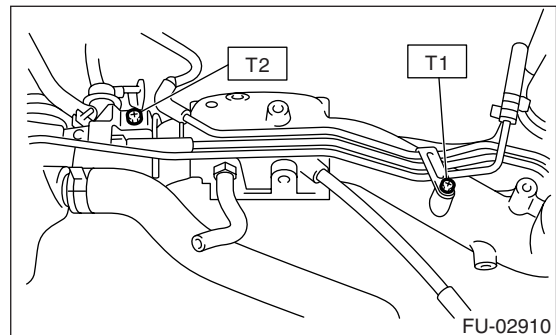


3) Install the fuel pipe assembly and pressure regulator to the intake manifold.

Tightening torque:

T1: 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

T2: 19 N·m (1.94 kgf-m, 13.7 ft-lb)

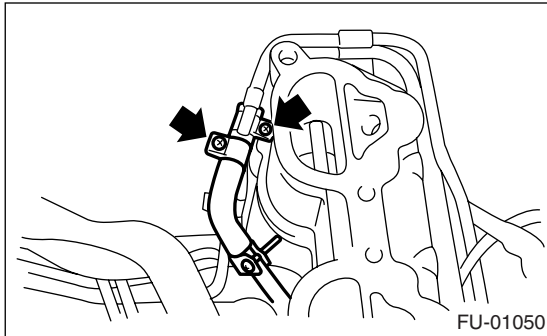


4) Install the fuel injector pipe LH.

Intake Manifold

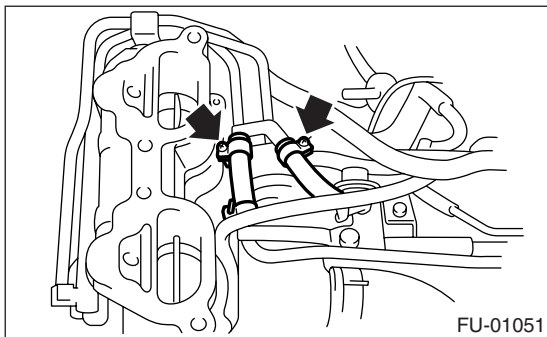
FUEL INJECTION (FUEL SYSTEMS)

5) Connect the left side fuel hose to injector pipe, and tighten the clamp screw.



6) Install the fuel injector pipe RH.

7) Connect the right side fuel hose to injector pipe, and tighten the clamp screw.

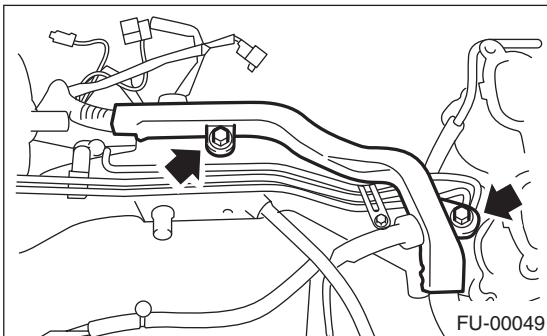


8) Install the engine harness to the intake manifold.

9) Install the harness bracket which holds the engine harness onto intake manifold.

Tightening torque:

19 N·m (1.94 kgf-m, 13.7 ft-lb)

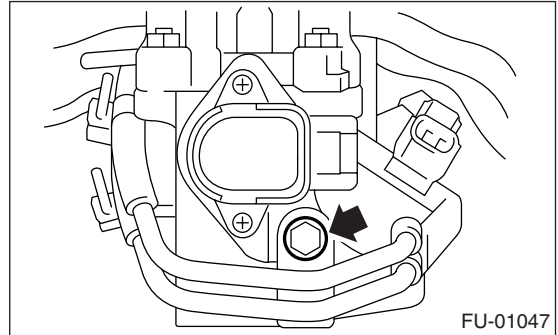
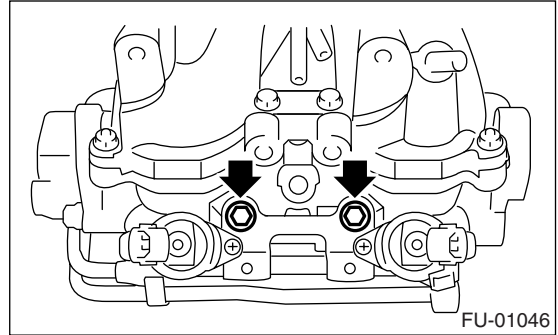


10) Tighten the bolts which install the fuel injector pipe onto intake manifold.

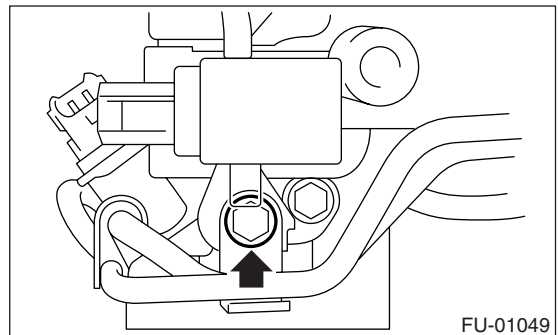
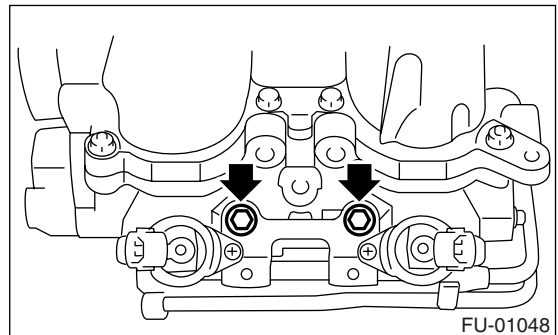
Tightening torque:

19 N·m (1.94 kgf-m, 13.7 ft-lb)

• LH SIDE

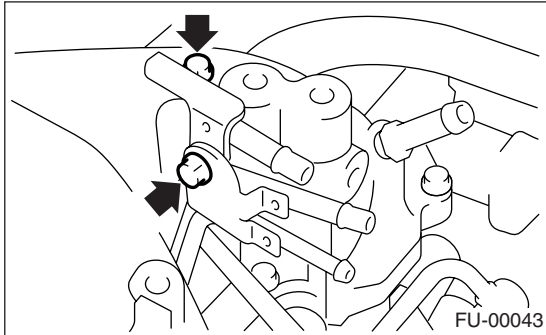


• RH SIDE



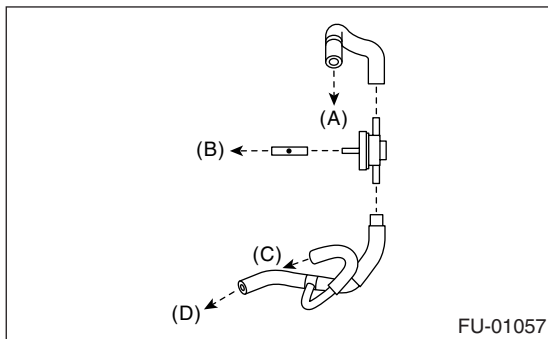
11) Tighten the two bolts which install the fuel pipes on the left side of intake manifold.

Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



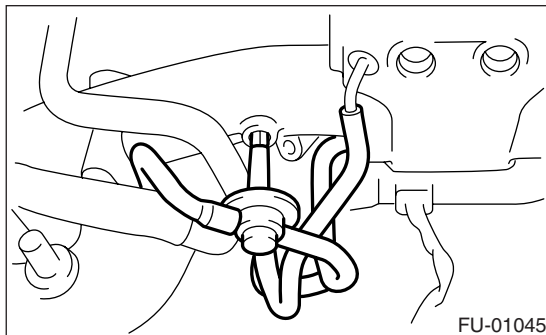
12) Connect the evaporation hoses to the purge valve.

NOTE:
 Connect the evaporation hoses as shown in the figure.



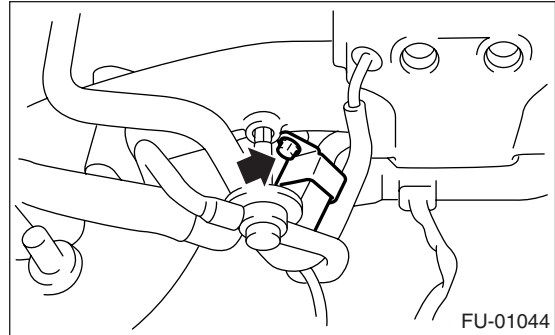
- (A) To intake duct
- (B) To intake manifold
- (C) To purge control solenoid valve
- (D) To fuel pipe ASSY

13) Connect the evaporation hose and purge valve to the intake manifold.



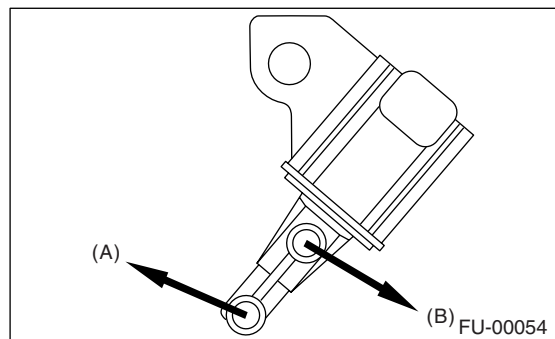
14) Install the purge control solenoid valve.

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



15) Connect the hoses to the purge control solenoid valve.

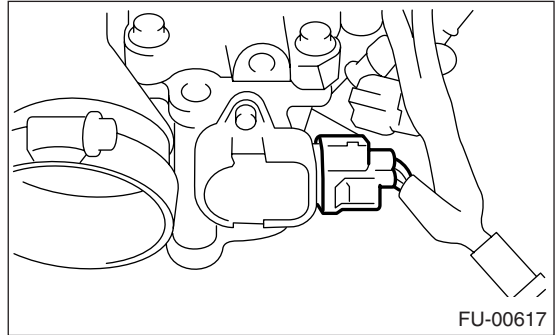
NOTE:
 Connect the evaporation hoses as shown in the figure.



- (A) To purge valve
- (B) To intake manifold

16) Connect the connector to the purge control solenoid valve.

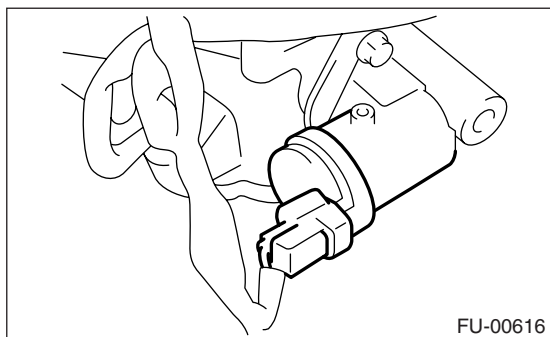
17) Connect the connector to the tumble generator valve sensor.



Intake Manifold

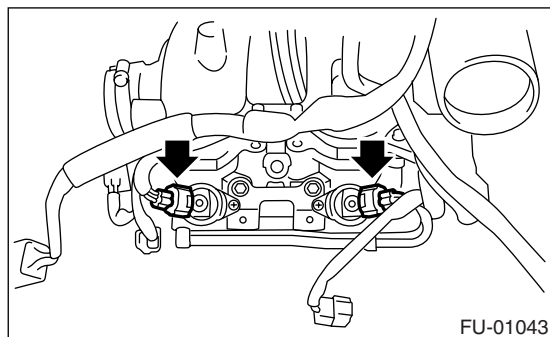
FUEL INJECTION (FUEL SYSTEMS)

18) Connect the connector to the tumble generator valve actuator.



FU-00616

19) Connect the connector to the fuel injector.



FU-01043

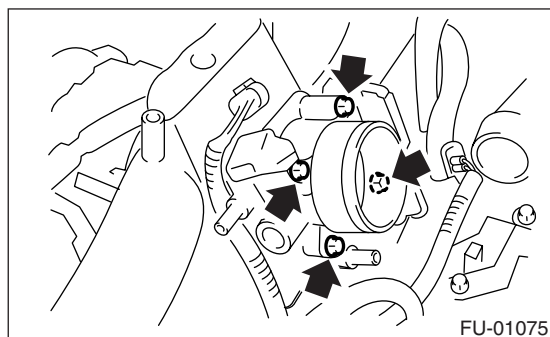
20) Install the throttle body to the intake manifold.

NOTE:

Replace the gasket with a new one.

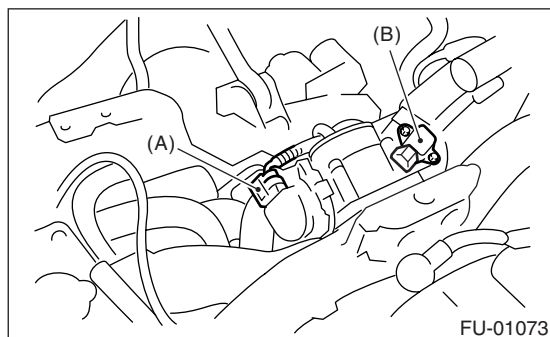
Tightening torque:

8 N·m (0.8 kgf-m, 5.8 ft-lb)



FU-01075

21) Connect the connector to the throttle position sensor (A) and manifold absolute pressure sensor (B).

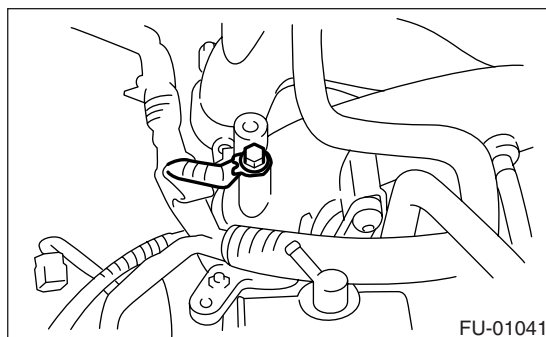


FU-01073

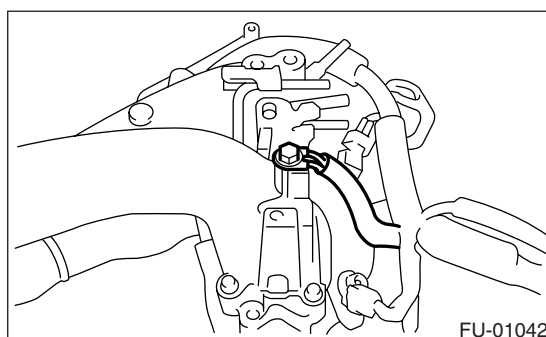
22) Install the engine ground terminal to the intake manifold.

Tightening torque:

19 N·m (1.94 kgf-m, 13.7 ft-lb)



FU-01041

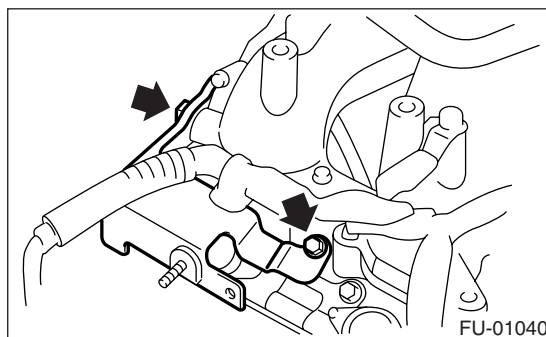


FU-01042

23) Install the fuel pipe protector RH.

Tightening torque:

19 N·m (1.94 kgf-m, 13.7 ft-lb)



FU-01040

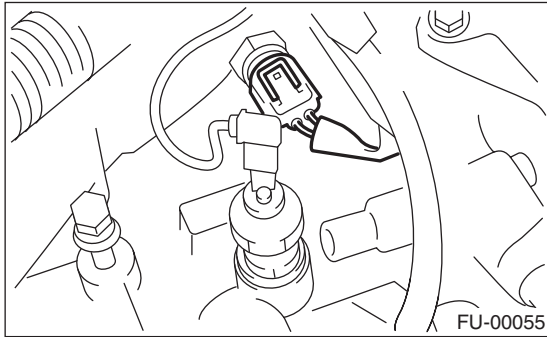
E: INSPECTION

Make sure the fuel pipe and fuel hoses are not cracked and the connections are tightened securely.

4. Engine Coolant Temperature Sensor

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the generator. <Ref. to SC(H4SO)-14, REMOVAL, Generator.>
- 3) Drain the engine coolant. <Ref. to CO(H4DOTC)-17, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
- 4) Disconnect the connector from the engine coolant temperature sensor.



- 5) Remove the engine coolant temperature sensor.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:

Use a new gasket.

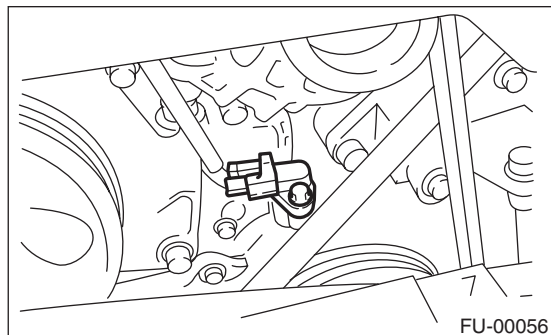
Tightening torque:

18 N·m (1.8 kgf-m, 13.3 ft-lb)

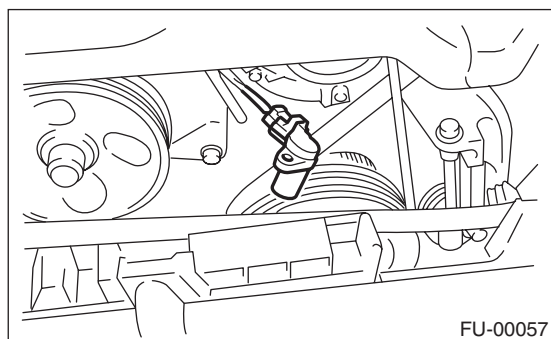
5. Crankshaft Position Sensor

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the bolt which installs the crankshaft position sensor to cylinder block.



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

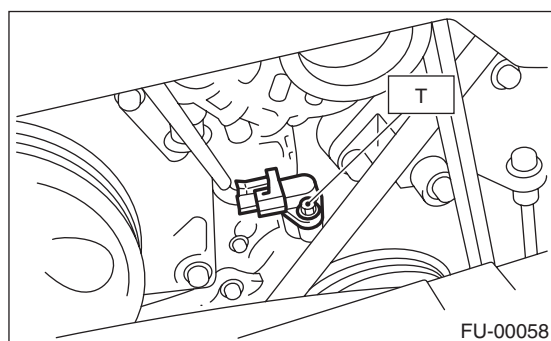


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

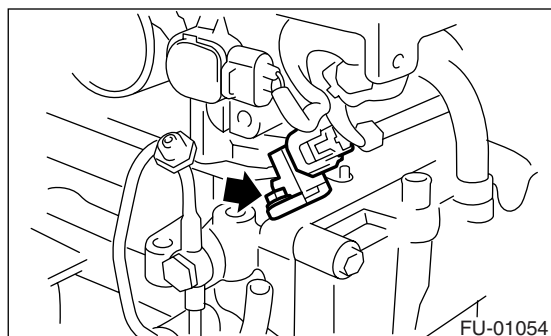
T: 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



6. Camshaft Position Sensor

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Disconnect the connector from the camshaft position sensor RH.
- 3) Remove the camshaft position sensor RH from the backside of cylinder head.



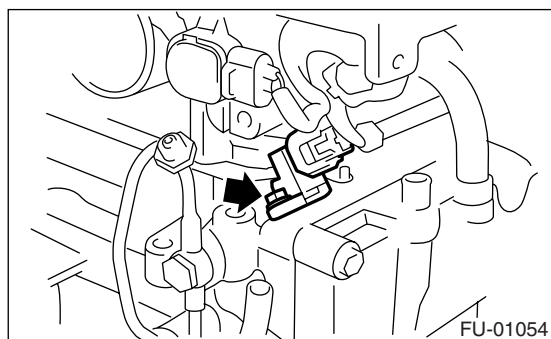
- 4) Remove the camshaft position sensor LH same as RH side.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



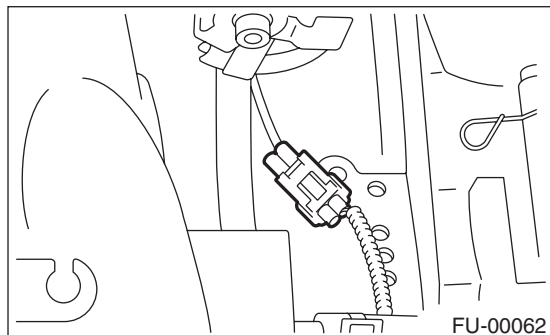
Knock Sensor

FUEL INJECTION (FUEL SYSTEMS)

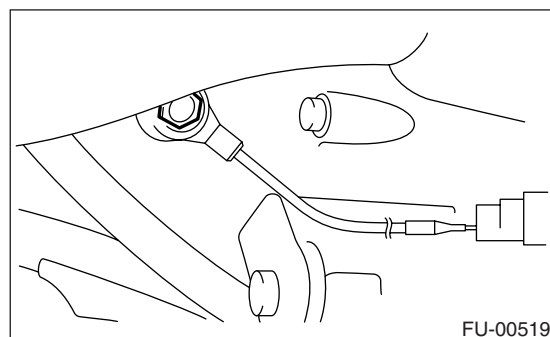
7. Knock Sensor

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the intercooler. <Ref. to IN(STI)-11, REMOVAL, Intercooler.>
- 3) Disconnect the knock sensor connector.



- 4) Remove the knock sensor from the cylinder block.



B: INSTALLATION

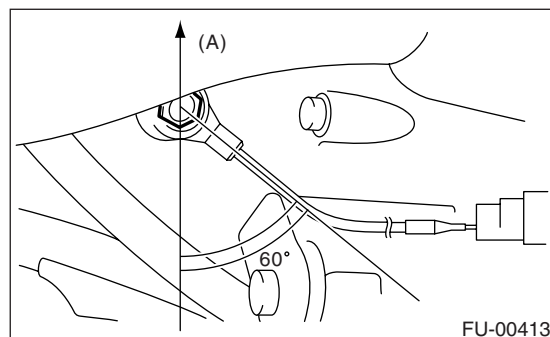
- 1) Install the knock sensor to the cylinder block.

Tightening torque:

24 N·m (2.4 kgf-m, 17.4 ft-lb)

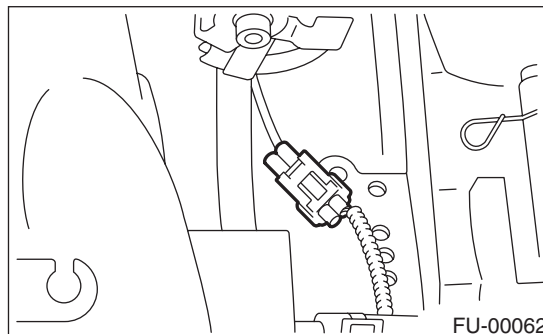
NOTE:

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



(A) Front side

- 2) Connect the knock sensor connector.

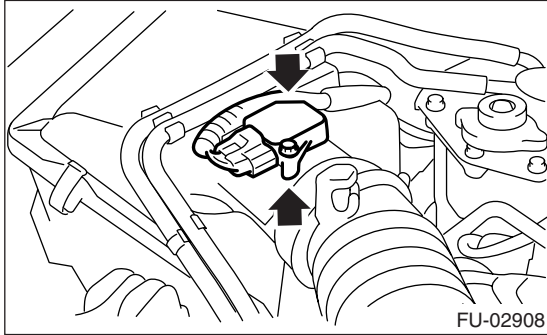


- 3) Install the intercooler. <Ref. to IN(STI)-11, INSTALLATION, Intercooler.>
- 4) Connect the battery ground cable to battery.

8. Mass Air Flow and Intake Air Temperature Sensor

A: REMOVAL

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



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

1.7 N·m (0.17 kgf-m, 1.3 ft-lb)

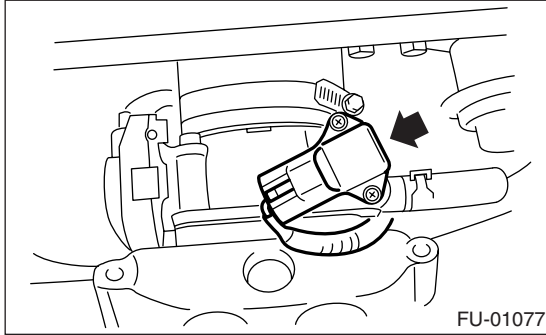
Manifold Absolute Pressure Sensor

FUEL INJECTION (FUEL SYSTEMS)

9. Manifold Absolute Pressure Sensor

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Disconnect the connectors from manifold absolute pressure sensor.



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

B: INSTALLATION

Install in the reverse order of removal.

NOTE:

Replace the O-rings for the manifold absolute pressure sensor with new ones.

Tightening torque:

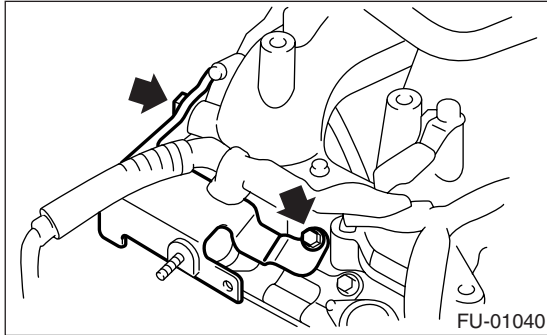
1.6 N·m (0.16 kgf-m, 1.2 ft-lb)

10. Fuel Injector

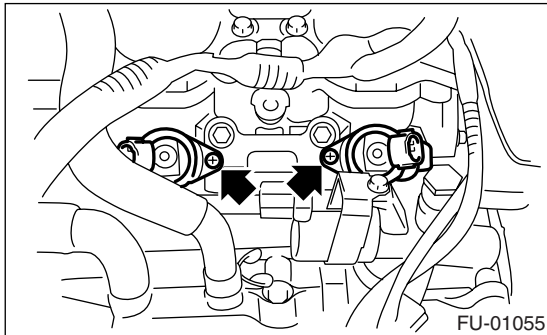
A: REMOVAL

1. RH SIDE

- 1) Release the fuel pressure. <Ref. to FU(STI)-44, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
- 2) Open the fuel filler flap lid and remove the fuel filler cap.
- 3) Disconnect the ground cable from battery.
- 4) Remove the fuel pipe protector RH.



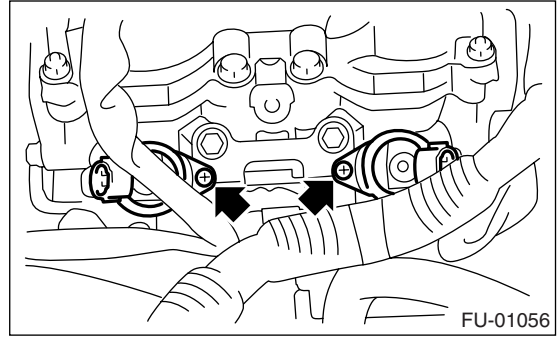
- 5) Disconnect the connector from the fuel injector.
- 6) Remove the screw and remove the fuel injector.



2. LH SIDE

- 1) Release the fuel pressure. <Ref. to FU(STI)-44, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
- 2) Open the fuel filler flap lid and remove the fuel filler cap.
- 3) Disconnect the ground cable from battery.
- 4) Remove the intake manifold. <Ref. to FU(STI)-13, REMOVAL, Intake Manifold.>
- 5) Disconnect the connector from the fuel injector.

- 6) Remove the screw and remove the fuel injector.



B: INSTALLATION

1. RH SIDE

Install in the reverse order of removal.

NOTE:

Replace the O-rings with new ones.

2. LH SIDE

Install in the reverse order of removal.

NOTE:

Replace the O-rings with new ones.

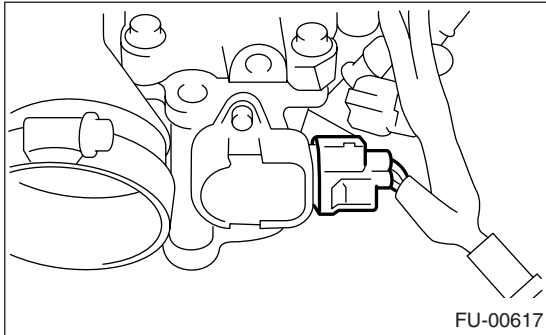
Tumble Generator Valve Assembly

FUEL INJECTION (FUEL SYSTEMS)

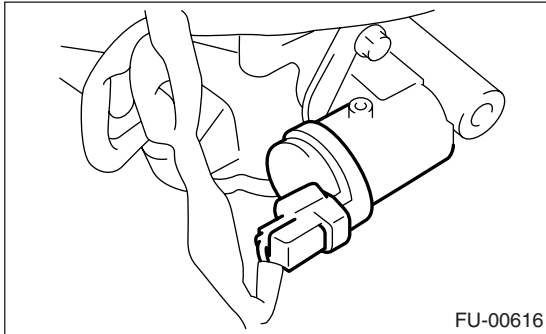
11. Tumble Generator Valve Assembly

A: REMOVAL

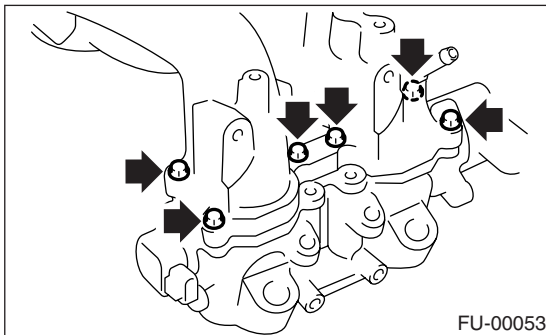
- 1) Release the fuel pressure. <Ref. to FU(STI)-44, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
- 2) Open the fuel filler flap lid and remove the fuel filler cap.
- 3) Disconnect the ground cable from battery.
- 4) Remove the intake manifold. <Ref. to FU(STI)-13, REMOVAL, Intake Manifold.>
- 5) Disconnect the connector from the tumble generator valve sensor.



- 6) Disconnect the connector from the tumble generator valve actuator.



- 7) Remove the fuel injector. <Ref. to FU(STI)-31, REMOVAL, Fuel Injector.>
- 8) Remove the tumble generator valve body from the intake manifold.



B: INSTALLATION

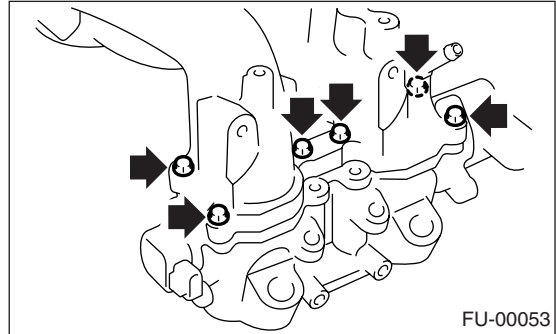
Install in the reverse order of removal.

NOTE:

Always use new gaskets.

Tightening torque:

8.25 N·m (0.84 kgf-m, 6.1 ft-lb)



12.Tumble Generator Valve Position Sensor

A: SPECIFICATION

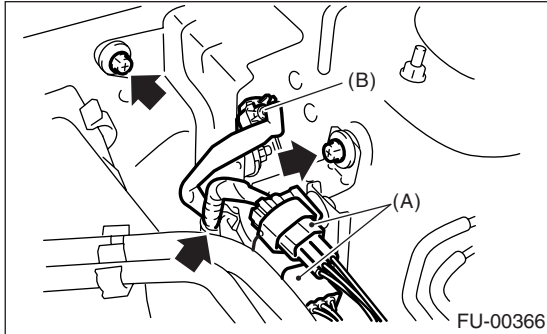
Do not remove the tumble generator valve position sensor from tumble generator valve assembly, since it cannot be adjusted during installation.

Refer to “Tumble Generator Valve Assembly” for removal and installation procedures. <Ref. to FU(STI)-32, REMOVAL, Tumble Generator Valve Assembly.> <Ref. to FU(STI)-32, INSTALLATION, Tumble Generator Valve Assembly.>

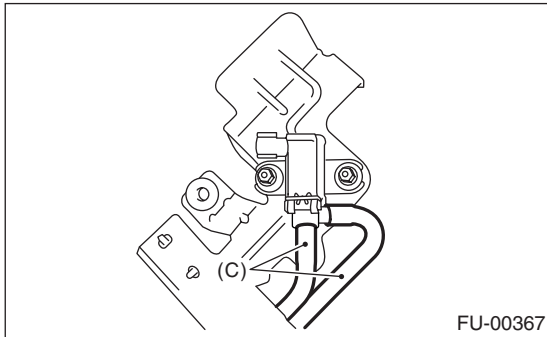
14. Wastegate Control Solenoid Valve

A: REMOVAL

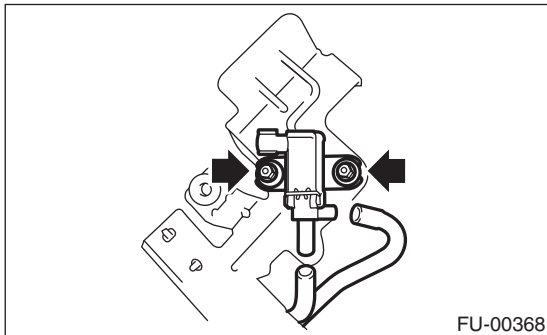
- 1) Disconnect the ground cable from battery.
- 2) Disconnect the engine harness connector (A) from bracket.
- 3) Disconnect the connector (B) from wastegate control solenoid valve.
- 4) Remove the bracket from body.



- 5) Disconnect the pressure hoses (C) from wastegate control solenoid valve.



- 6) Remove the wastegate control solenoid valve from bracket.

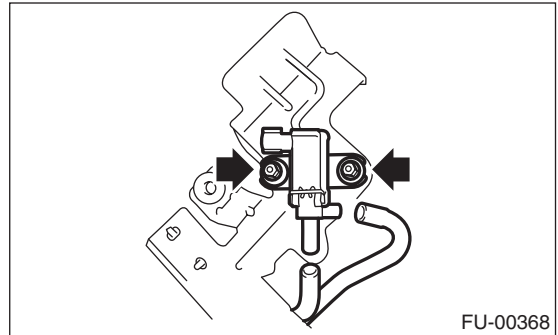


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

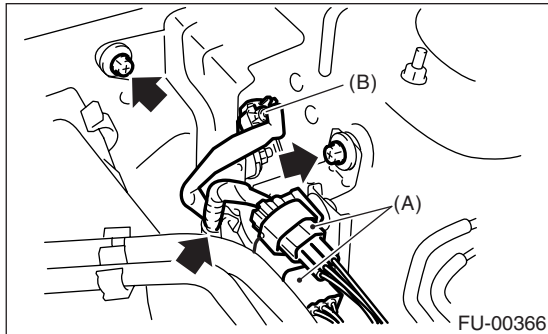
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



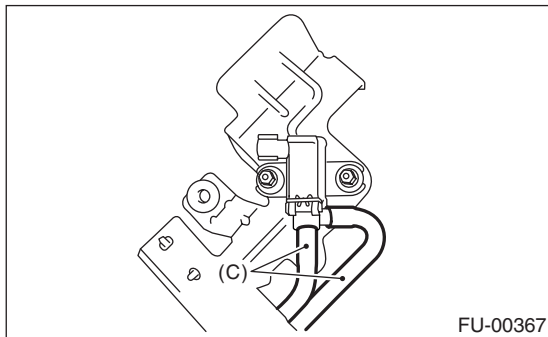
14. Wastegate Control Solenoid Valve

A: REMOVAL

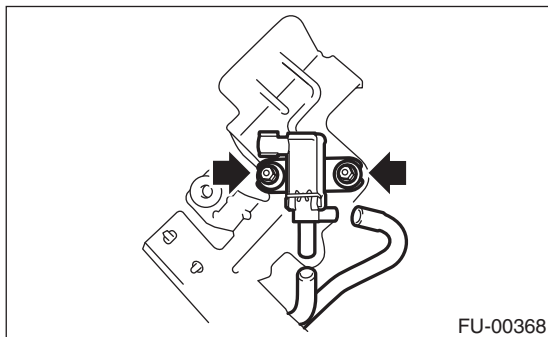
- 1) Disconnect the ground cable from battery.
- 2) Disconnect the engine harness connector (A) from bracket.
- 3) Disconnect the connector (B) from wastegate control solenoid valve.
- 4) Remove the bracket from body.



- 5) Disconnect the pressure hoses (C) from wastegate control solenoid valve.



- 6) Remove the wastegate control solenoid valve from bracket.

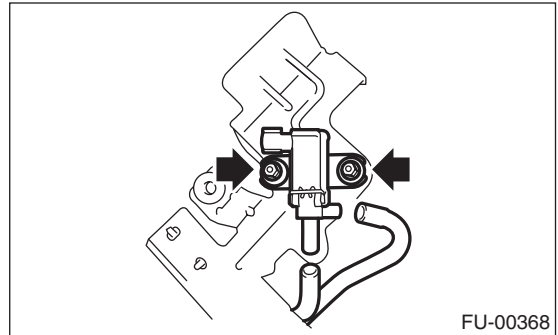


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



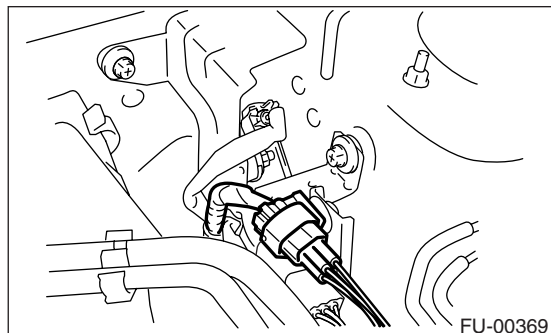
Front Oxygen (A/F) Sensor

FUEL INJECTION (FUEL SYSTEMS)

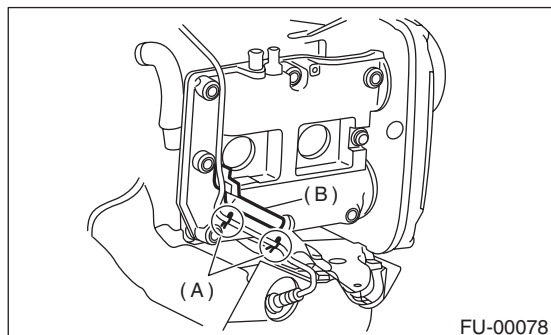
15. Front Oxygen (A/F) Sensor

A: REMOVAL

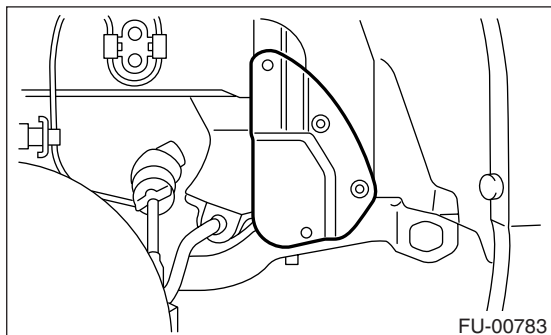
- 1) Disconnect the ground cable from battery.
- 2) Disconnect the connector from the front oxygen (A/F) sensor.



- 3) Disconnect the engine harness fixed by clip (A) from the bracket (B).



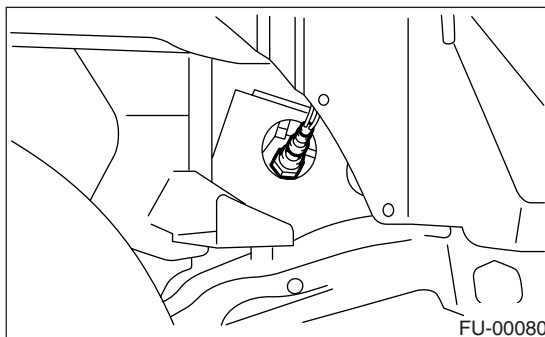
- 4) Remove the front right side wheel.
- 5) Lift-up the vehicle.
- 6) Remove the service hole cover.



- 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 oxygen (A/F) sensor, wait until exhaust pipe cools; otherwise, it will damage exhaust pipe.



B: INSTALLATION

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

Anti-seize compound:

NEVER-SEEZ NS-165 or equivalent

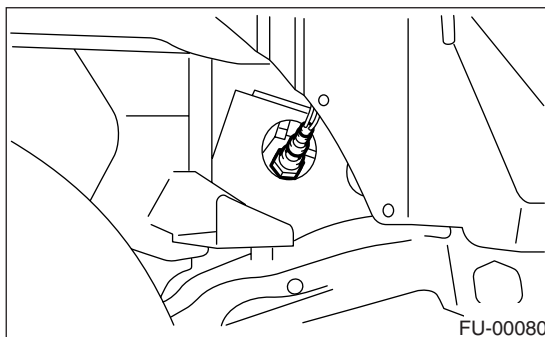
CAUTION:

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

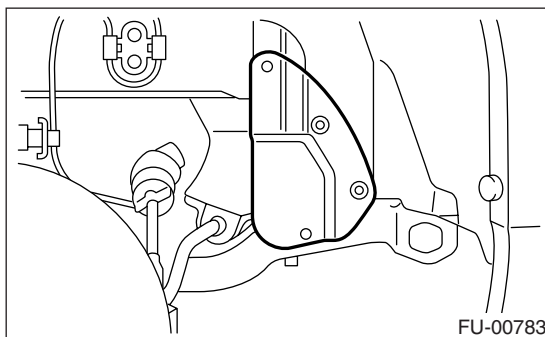
- 2) Install the front oxygen (A/F) sensor.

Tightening torque:

30 N·m (3.1 kgf-m, 22.1 ft-lb)



- 3) Install the service hole cover.

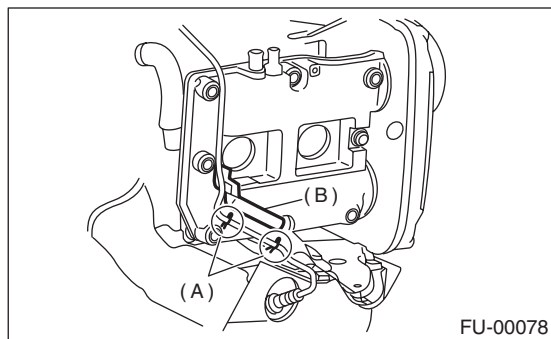


- 4) Lower the vehicle.
- 5) Install the front right side wheel.

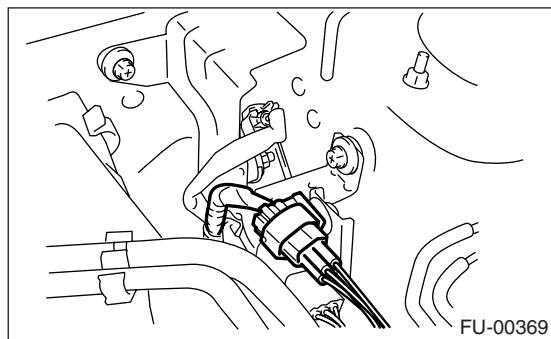
Front Oxygen (A/F) Sensor

FUEL INJECTION (FUEL SYSTEMS)

- 6) Connect the engine harness to the bracket (B) using clips (A).



- 7) Connect the connector of front oxygen (A/F) sensor.

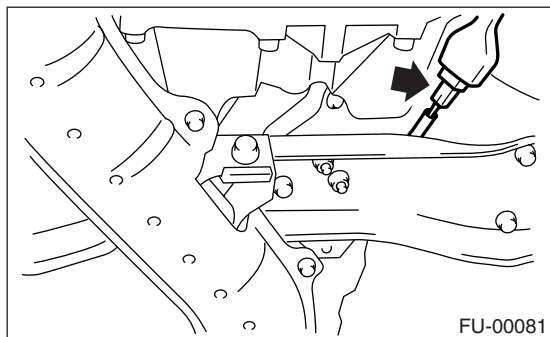


- 8) Connect the battery ground cable to battery.

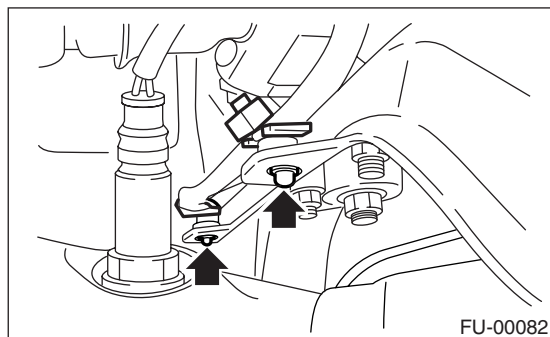
16.Rear Oxygen Sensor

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Lift-up the vehicle.
- 3) Disconnect the connector from the rear oxygen sensor.



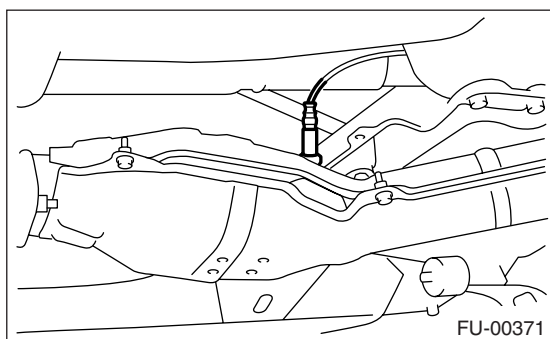
- 4) Remove the clip by pulling out from the upper side of crossmember.



- 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 exhaust pipe.



B: INSTALLATION

- 1) Before installing rear oxygen sensor, apply 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 protector of rear oxygen sensor.

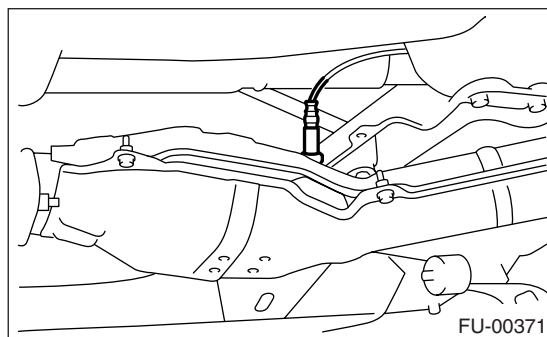
Anti-seize compound:

NEVER-SEEZ NS-165 or equivalent

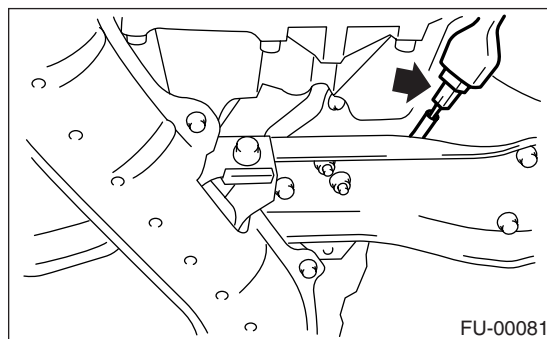
- 2) Install the rear oxygen sensor.

Tightening torque:

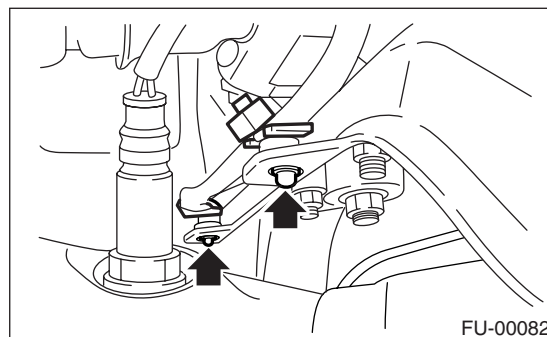
21 N·m (2.1 kgf-m, 15.2 ft-lb)



- 3) Connect the connector to the rear oxygen sensor.



- 4) Connect the clip to the crossmember.

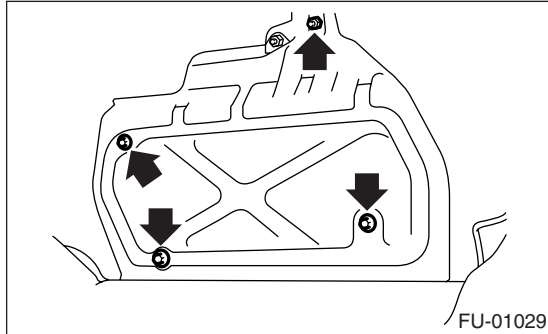


- 5) Lower the vehicle.
- 6) Connect the battery ground cable to battery.

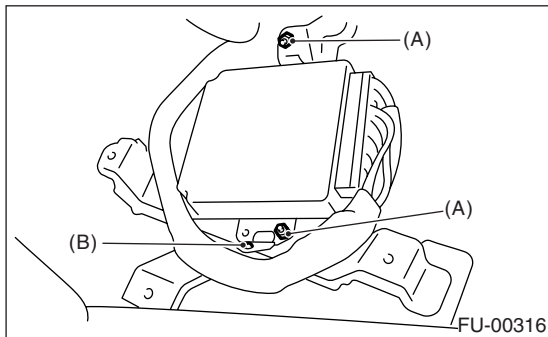
17.Engine Control Module (ECM)

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the lower inner trim of the passenger side.
<Ref. to EI-51, REMOVAL, Lower Inner Trim.>
- 3) Detach the floor mat of the front passenger seat.
- 4) Remove the protect cover.



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



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

B: INSTALLATION

Install in the reverse order of removal.

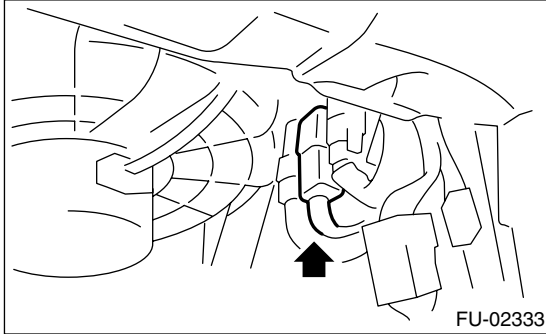
NOTE:

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

18.Main Relay

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the passenger's side front side sill cover.
- 3) Remove the bolt which holds the relay bracket on the body.
- 4) Disconnect the connectors from the main relay.



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

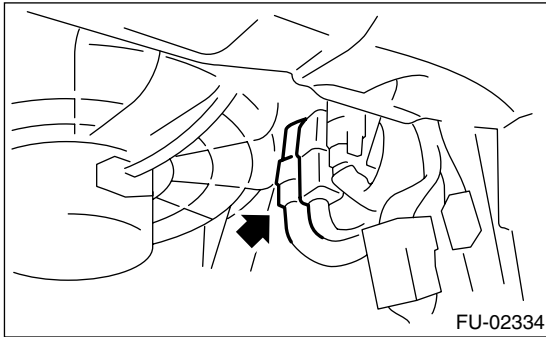
B: INSTALLATION

Install in the reverse order of removal.

19. Fuel Pump Relay

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the passenger's side front side sill cover.
- 3) Remove the bolt which holds relay bracket on the body.
- 4) Disconnect the connector from the fuel pump relay.



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

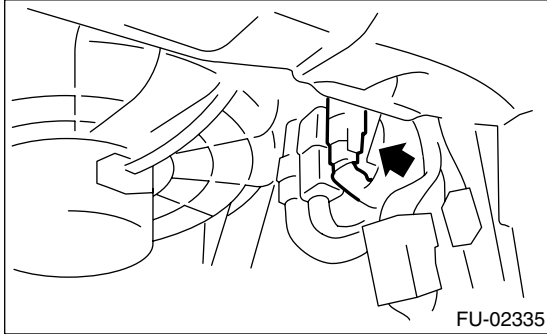
B: INSTALLATION

Install in the reverse order of removal.

20. Electronic Throttle Control Relay

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the passenger's side front side sill cover.
- 3) Remove the bolt which holds relay bracket on the body.
- 4) Disconnect the connector from electronic throttle control relay.



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

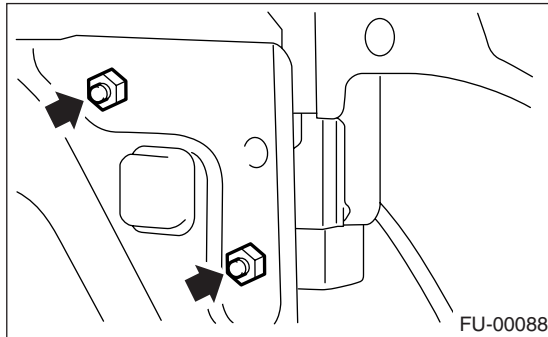
B: INSTALLATION

Install in the reverse order of removal.

21. Fuel Pump Control Unit

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the rear quarter trim. <Ref. to EI-52, REMOVAL, Rear Quarter Trim.>
- 3) Disconnect the connector from the fuel pump control unit.
- 4) Remove the fuel pump control unit.



B: INSTALLATION

Install in the reverse order of removal.

22. Fuel

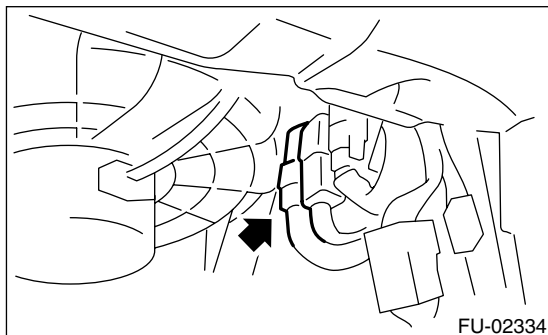
A: PROCEDURE

1. RELEASING OF FUEL PRESSURE

WARNING:

- Place “NO FIRE” signs near the working area.
- Be careful not to spill fuel on the floor.

1) Disconnect the connector from the fuel pump relay.



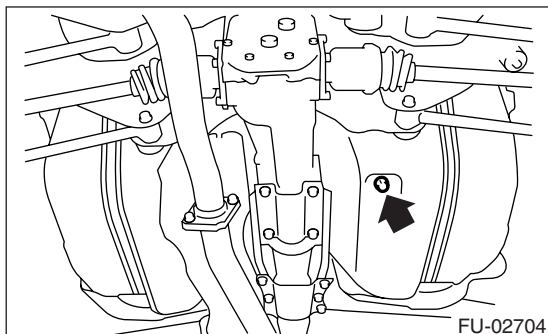
- 2) Start and run the engine until it stalls.
 3) After the engine stalls, crank it for five more seconds.
 4) Turn the ignition switch to OFF.

2. DRAINING FUEL

WARNING:

- Place “NO FIRE” signs near the working area.
- Be careful not to spill fuel on the floor.

- 1) Set the vehicle on a lift.
 2) Disconnect the ground cable from battery.
 3) Open the fuel filler flap lid, and remove the fuel filler cap.
 4) Lift-up the vehicle.
 5) Set a container under the vehicle, and remove drain plug from the fuel tank to drain fuel.



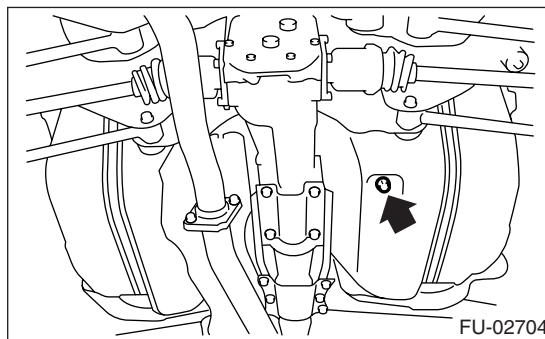
6) Tighten the fuel drain plug.

NOTE:

Use a new gasket.

Tightening torque:

26 N·m (2.65 kgf-m, 19.2 ft-lb)



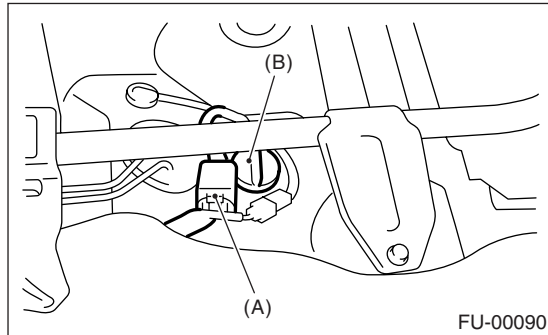
23. Fuel Tank

A: REMOVAL

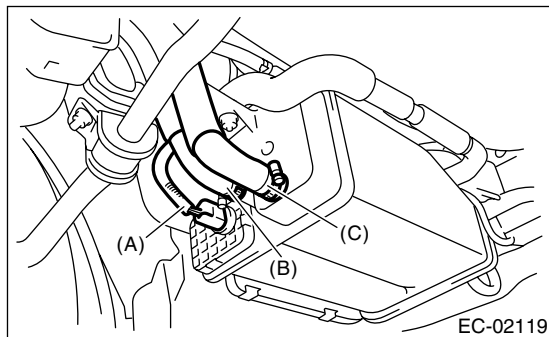
WARNING:

- Place “NO FIRE” signs near the working area.
- Be careful not to spill fuel on the floor.

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

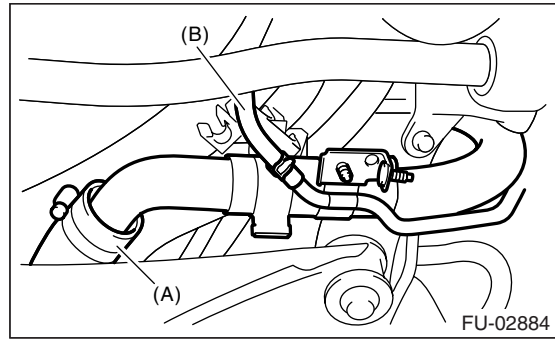


- 7) Remove the rear crossmember. <Ref. to RS-17, REMOVAL, Rear Crossmember.>
- 8) Disconnect connector (A) from drain valve.
- 9) Disconnect evaporation hoses (B) and (C) from canister.

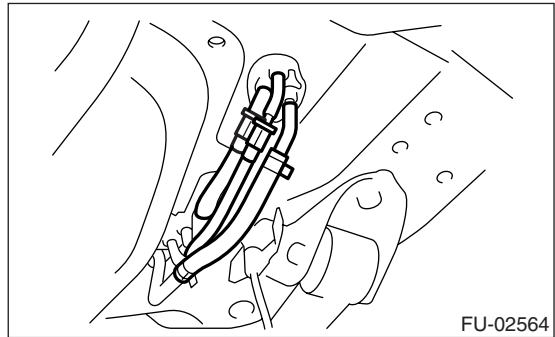


- 10) Disconnect the connector from the pressure control solenoid valve.
- 11) Loosen the clamp and disconnect the fuel filler hose (A) from fuel filler pipe.

- 12) Move the clip, and disconnect the evaporation hose (B).



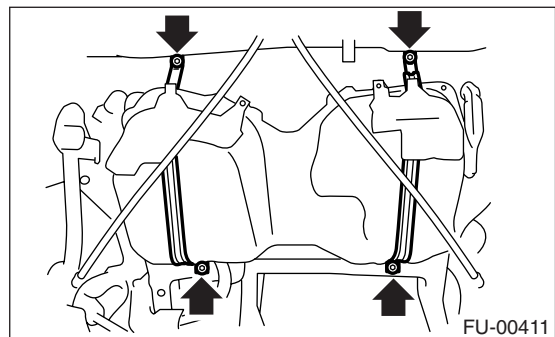
- 13) Move the clips, and disconnect the quick connector. <Ref. to FU(STI)-60, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>
- 14) Disconnect the fuel hoses.



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

WARNING:

- A helper is required to perform this work.
- Fuel may be left in the side, which has no drain plug, of the fuel tank. In this case, the tank is imbalanced between right and left sides. Be careful not to drop it when removing.



B: INSTALLATION

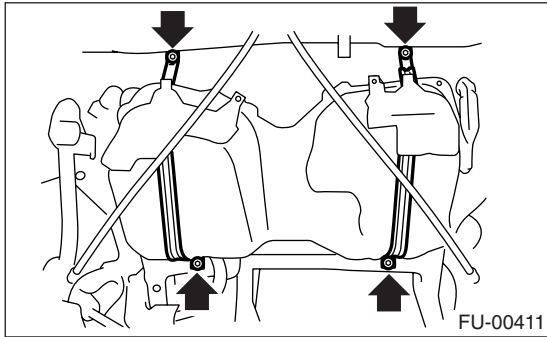
- 1) Support the fuel tank with transmission jack and push the fuel tank harness into the access hole with grommet.
- 2) Set the fuel tank and temporarily tighten the bolts of fuel tank bands.

Fuel Tank

FUEL INJECTION (FUEL SYSTEMS)

WARNING:

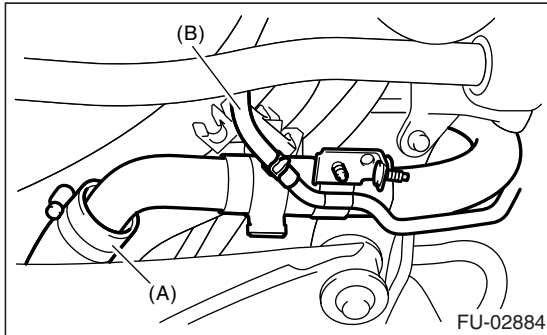
A helper is required to perform this work.



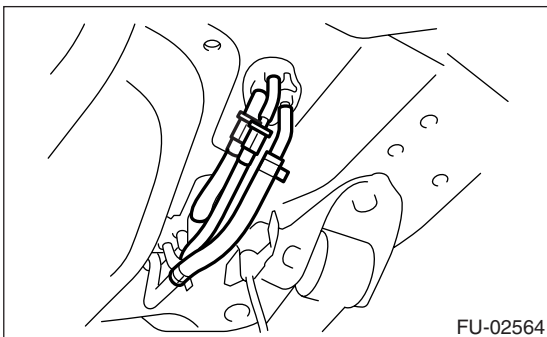
3) Insert the fuel filler hose (A) approx. 35 to 40 mm (1.38 to 1.57 in) over the lower end of fuel filler pipe and tighten the clamp.

CAUTION:

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



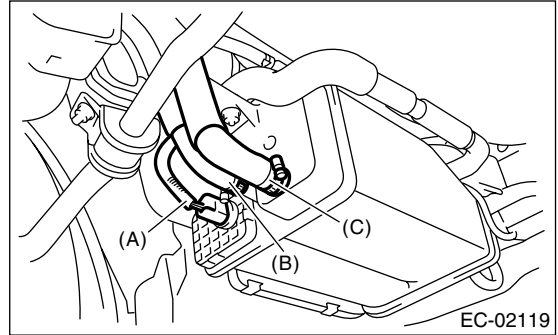
4) Connect the fuel hoses, and hold them with clips and quick connector. <Ref. to FU(STI)-61, INSTALLATION, Fuel Delivery, Return and Evaporation Lines.>



5) Connect the connector to the pressure control solenoid valve.

6) Connect the evaporation hoses (B) and (C) to the canister, and hold them with clamps.

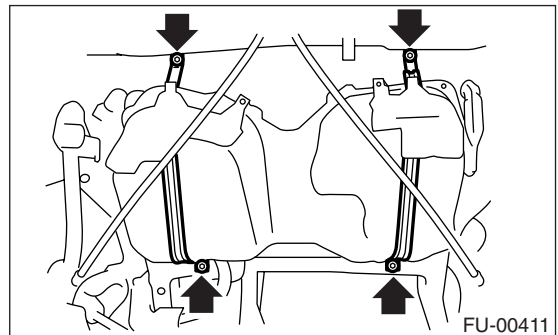
7) Connect the connector (A) to drain valve.



8) Tighten the band mounting bolts.

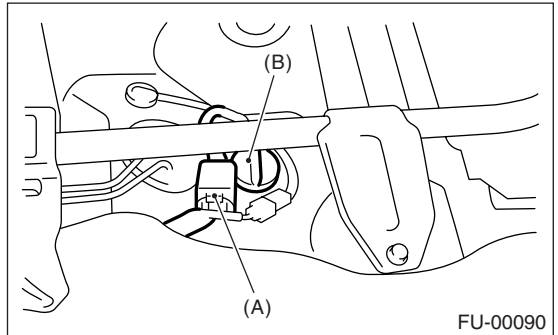
Tightening torque:

33 N·m (3.4 kgf-m, 25 ft-lb)



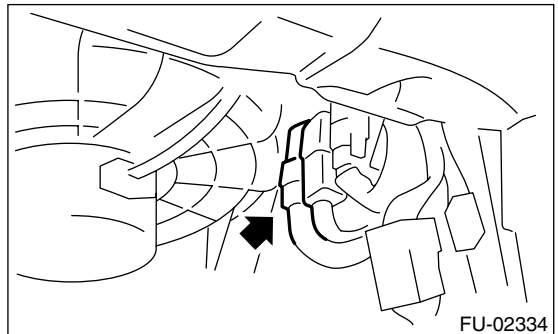
9) Install the rear crossmember. <Ref. to RS-17, INSTALLATION, Rear Crossmember.>

10) Connect the connector (A) to the fuel tank cord and plug the service hole with grommet (B).



11) Set the rear seat and floor mat.

12) Connect the connector to the fuel pump relay.



C: INSPECTION

- 1) Make sure there are no cracks, holes, or other damage on the fuel tank.
- 2) Make sure that the fuel hoses and fuel pipes are not cracked and the connections are tightened firmly.

Fuel Filler Pipe

FUEL INJECTION (FUEL SYSTEMS)

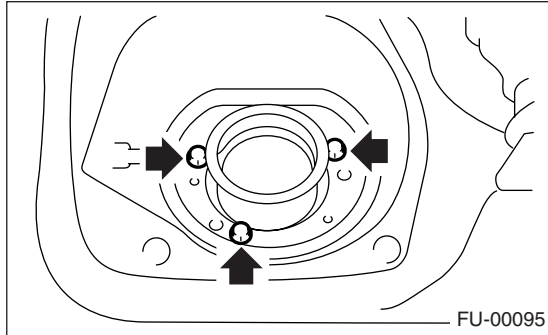
24. Fuel Filler Pipe

A: REMOVAL

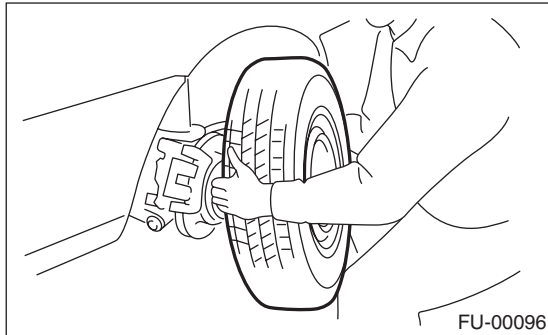
WARNING:

- Place “NO FIRE” signs near the working area.
- Be careful not to spill fuel on the floor.

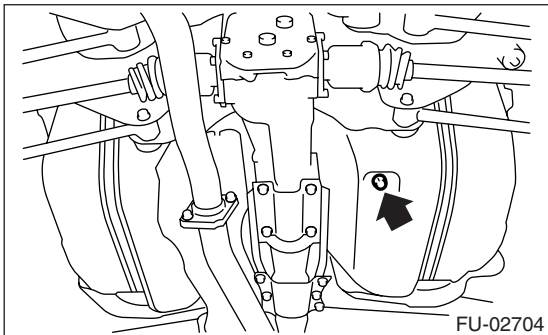
- 1) Set the vehicle on a lift.
- 2) Open the fuel filler flap lid and remove the filler cap.
- 3) Disconnect the ground cable from battery.
- 4) Remove the screws holding packing.



- 5) Loosen the rear right side wheel nuts.
- 6) Lift-up the vehicle.
- 7) Remove the rear right side wheel.



- 8) Set a container under the vehicle and remove the drain plug from fuel tank to drain fuel.



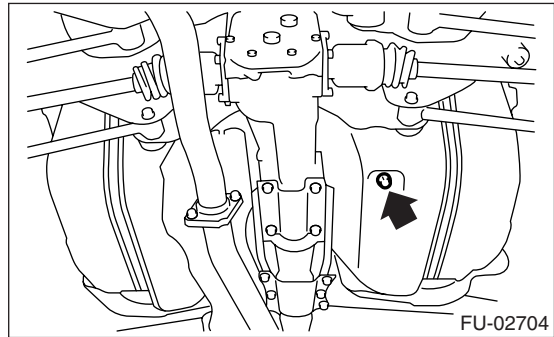
- 9) Tighten the fuel drain plug and then install the front right side tank cover.

NOTE:

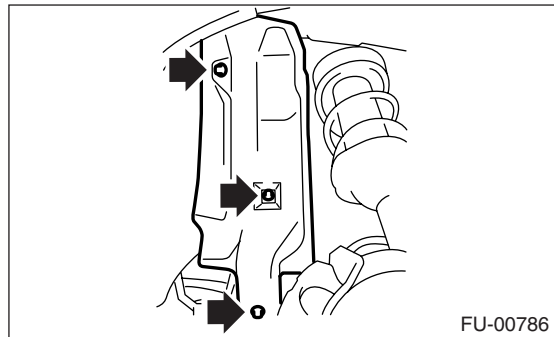
Use a new gasket.

Tightening torque:

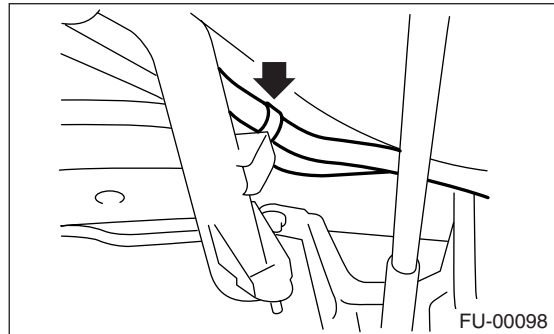
26 N·m (2.65 kgf-m, 19.2 ft-lb)



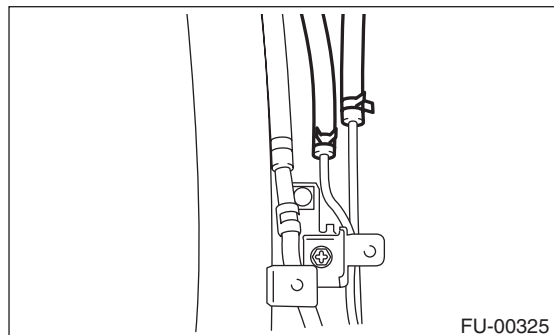
- 10) Remove the fuel filler pipe protector.



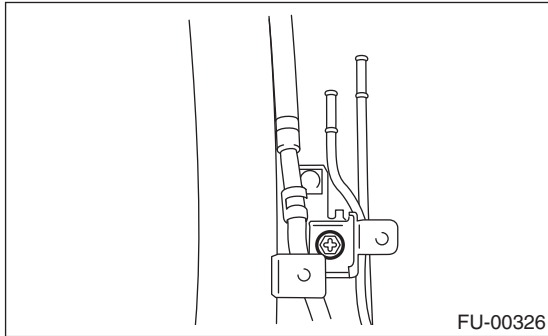
- 11) Separate the evaporation hoses from the clip of fuel filler pipe.



- 12) Disconnect the evaporation hoses from the pipes.



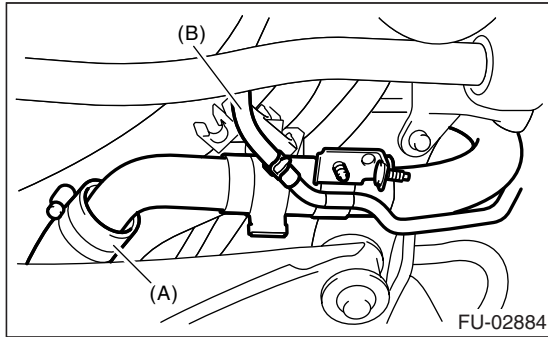
- 13) Remove the bolts which hold fuel filler pipe bracket on the body.



FU-00326

- 14) Loosen the clamp, and disconnect the fuel filler hose (A) from fuel filler pipe.

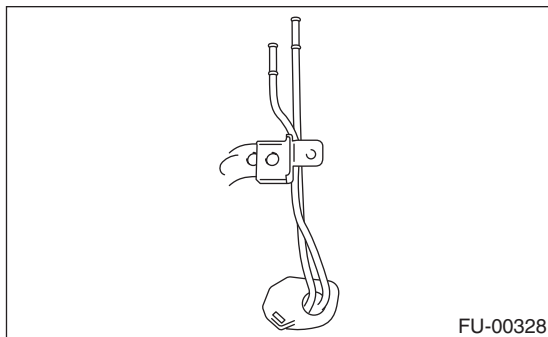
- 15) Move the clip, and disconnect the evaporation hose (B).



FU-02884

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

- 17) Remove the air vent pipe together with clip from the body.

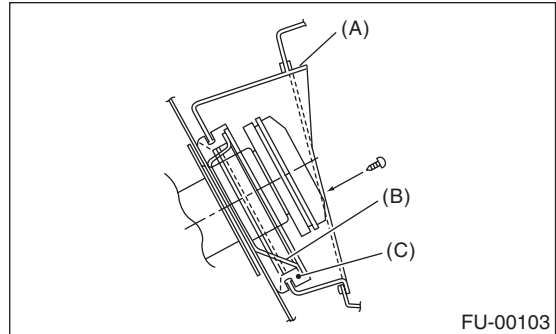


FU-00328

B: INSTALLATION

- 1) Open the fuel filler flap lid.

- 2) Set the fuel saucer (A) with rubber packing (C), and then insert the fuel filler pipe into the hole from the inside of apron.

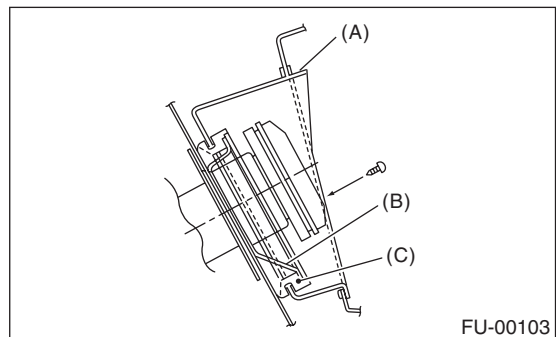


FU-00103

- 3) Align the holes in fuel filler pipe neck and set the cup (B), and tighten the screws.

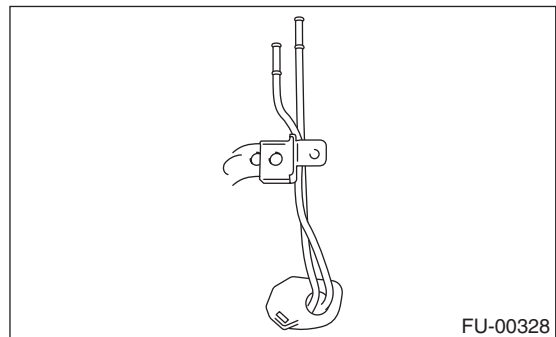
NOTE:

If the edges of rubber packing are folded toward the inside, straighten them with a flat-tip screwdriver.



FU-00103

- 4) Install the evaporation pipes.

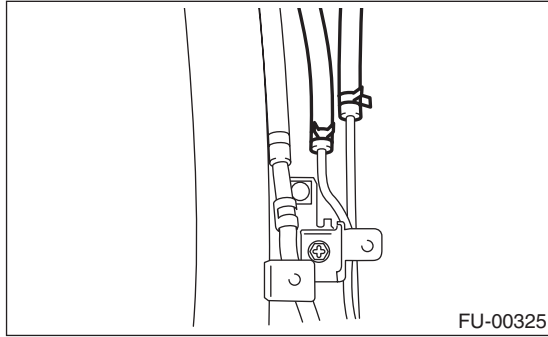


FU-00328

Fuel Filler Pipe

FUEL INJECTION (FUEL SYSTEMS)

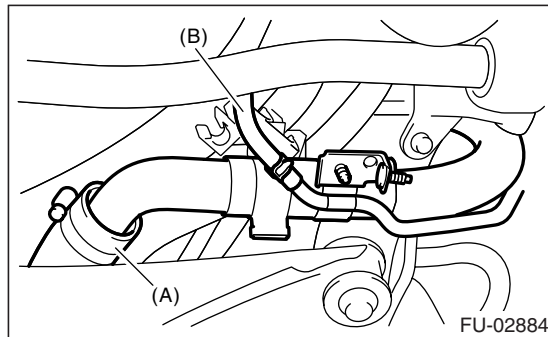
5) Connect the evaporation hose to pipes.



6) Insert the fuel filler hose (A) approx. 35 to 40 mm (1.38 to 1.57 in) over the lower end of fuel filler pipe, and then tighten the clamp.

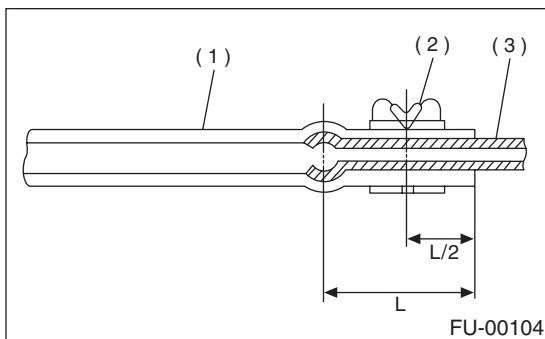
CAUTION:

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



7) Insert the air vent hose approx. 25 to 30 mm (0.98 to 1.18 in) into the lower end of air vent pipe, and then hold the clip.

$L = 27.5 \pm 2.5 \text{ mm} (1.083 \pm 0.098 \text{ in})$

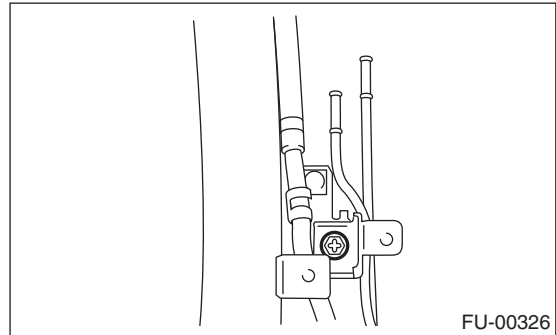


- (1) Hose
- (2) Clip or clamp
- (3) Pipe

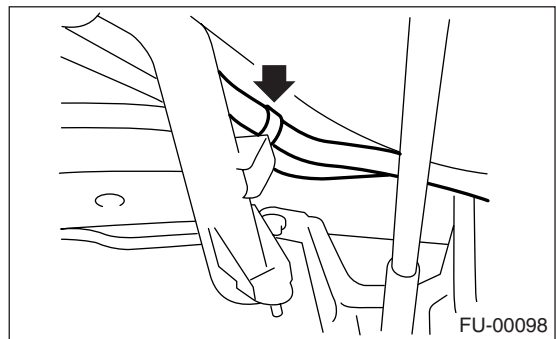
8) Tighten the bolt which holds fuel filler pipe bracket on the body.

Tightening torque:

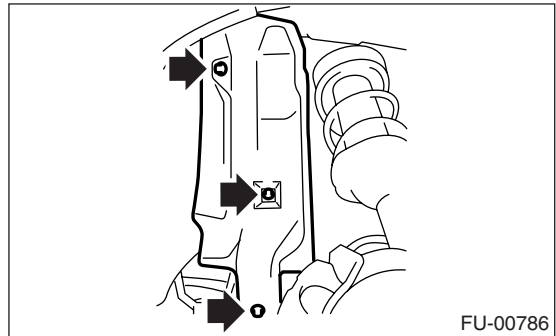
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)



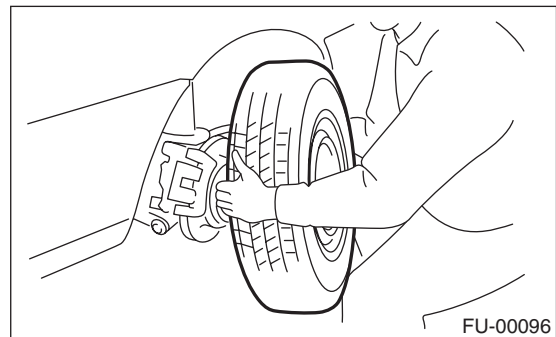
9) Tighten the bolts which hold evaporation hoses onto the clip of fuel filler pipe.



10) Install the fuel filler pipe protector.



11) Install the rear right wheel.



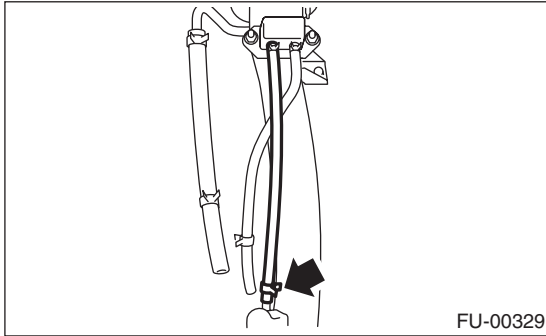
12) Lower the vehicle.

13) Tighten the wheel nuts.

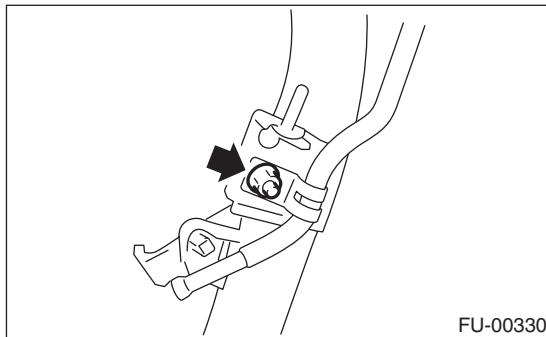
14) Connect the battery ground cable to battery.

C: DISASSEMBLY

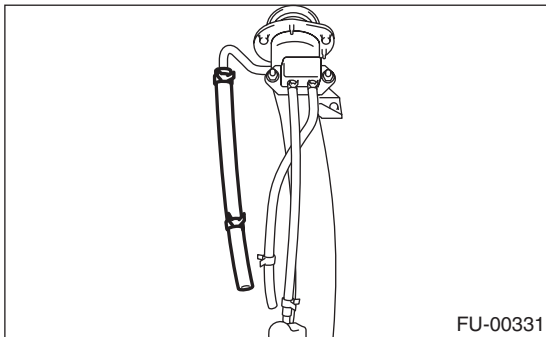
1) Move the clip, and disconnect the evaporation hose from joint pipe.



2) Remove the bolt which installs the joint pipe on fuel filler pipe.



3) Disconnect the evaporation hose from the fuel filler pipe.

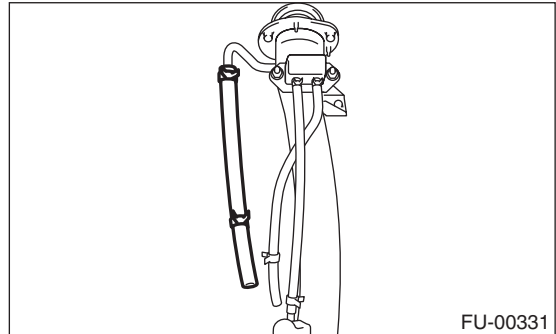


4) Remove the shut valve from the fuel filler pipe. <Ref. to EC(STI)-15, REMOVAL, Shut Valve.>

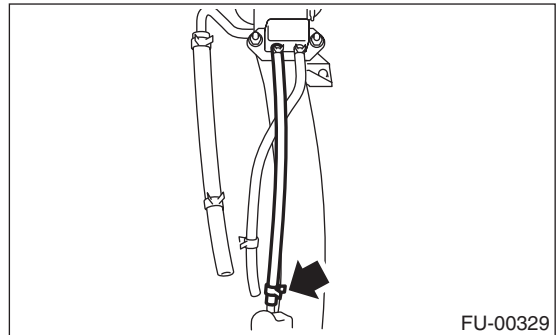
D: ASSEMBLY

1) Install the shut valve on the fuel filler pipe. <Ref. to EC(STI)-15, INSPECTION, Shut Valve.>

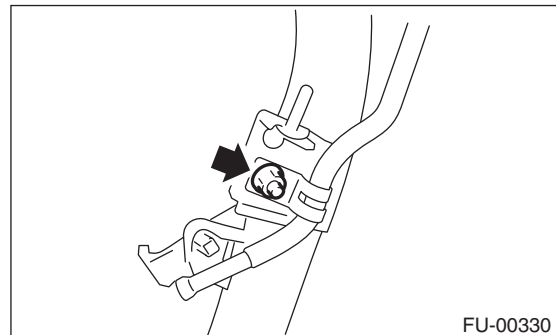
2) Connect the evaporation hose to the fuel filler pipe.



3) Connect the evaporation hose to the evaporation pipe.



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



25. Fuel Pump

A: REMOVAL

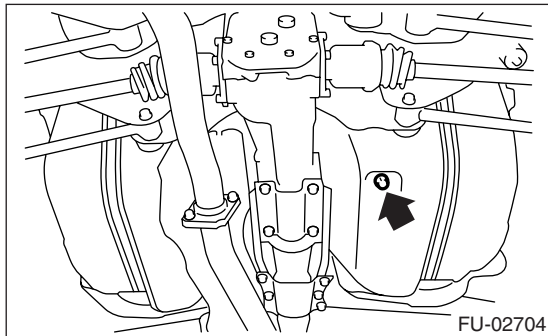
WARNING:

- Place “NO FIRE” signs near the working area.
- Be careful not to spill fuel on the floor.
- Reduce the fuel in the fuel tank to less than 3/4 beforehand. Be careful that fuel may spill when the fuel is more than 3/4.

NOTE:

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

- 1) Release the fuel pressure. <Ref. to FU(STI)-44, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
- 2) Open the fuel filler flap lid and remove the fuel filler cap.
- 3) Disconnect the ground cable from battery.
- 4) Lift-up the vehicle.
- 5) Drain the fuel from fuel tank. Set a container under the vehicle and remove the drain plug from fuel tank.



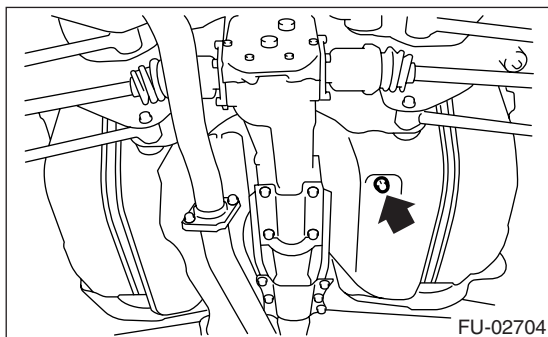
- 6) Tighten the fuel drain plug.

NOTE:

Use a new gasket.

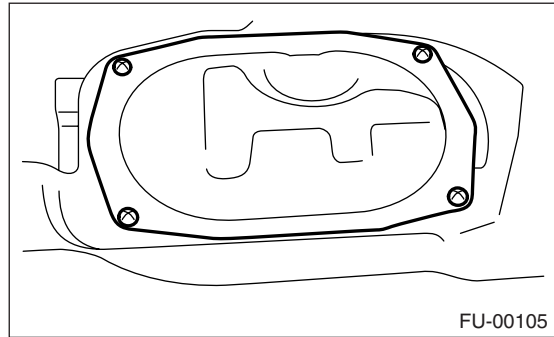
Tightening torque:

26 N·m (2.65 kgf·m, 19.2 ft-lb)

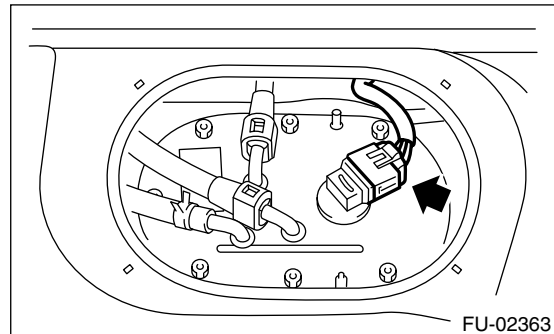


- 7) Remove the luggage floor mat. <Ref. to EI-61, REMOVAL, Luggage Floor Mat.>

- 8) Remove the service hole cover.

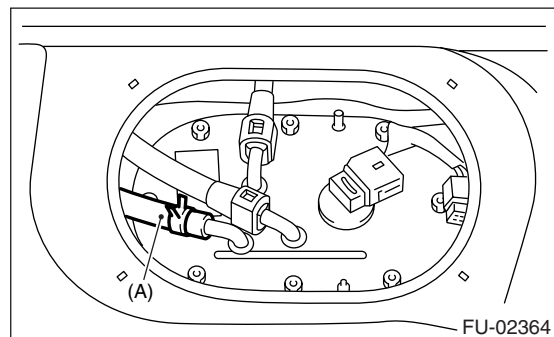


- 9) Disconnect the connector from the fuel pump.

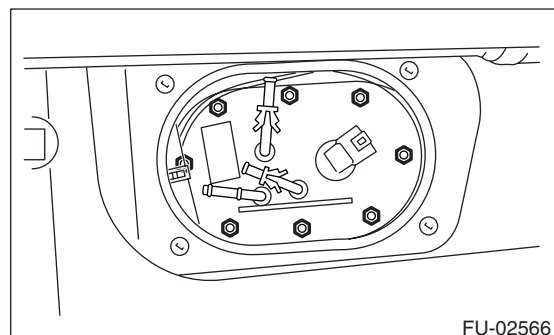


- 10) Disconnect the quick connector and then disconnect the fuel delivery hose and return hose. <Ref. to FU(STI)-60, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>

- 11) Move the clips, and then disconnect the jet pump hose (A).



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



- 13) Take off the fuel pump assembly from the fuel tank.

B: INSTALLATION

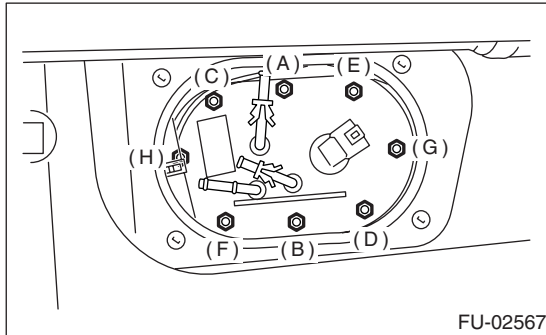
Carefully following the steps below, install in the reverse order of removal.

NOTE:

- Replace the gasket and retainer with new ones.
- Ensure the sealing portion is free from fuel or foreign particles before installation.
- Tighten the nuts to the specified torque in alphabetical sequence as shown in the figure.

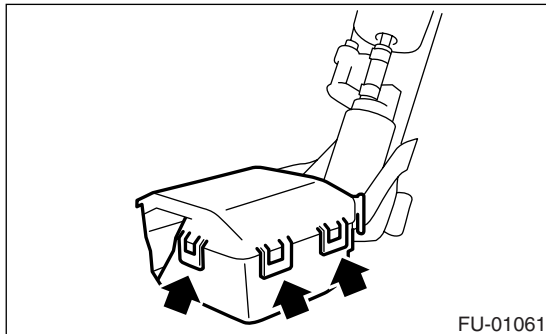
Tightening torque:

4.4 N·m (0.45 kgf-m, 3.3 ft-lb)

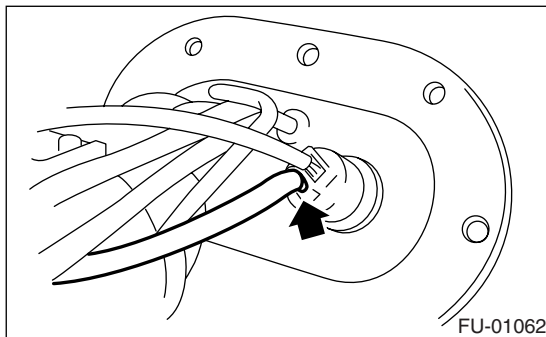


C: DISASSEMBLY

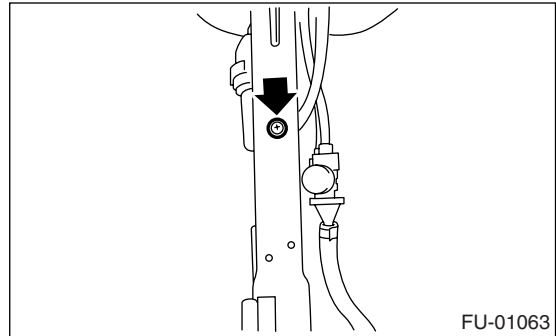
1) Separate the chamber into upper and lower parts, and then remove them.



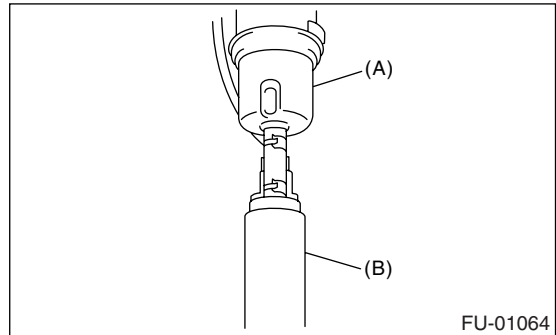
2) Disconnect the connector of fuel pump.



3) Remove the screw and remove the fuel pump and fuel filter.



4) Separate the fuel filter from fuel pump.



(A) Fuel filter

(B) Fuel pump

D: ASSEMBLY

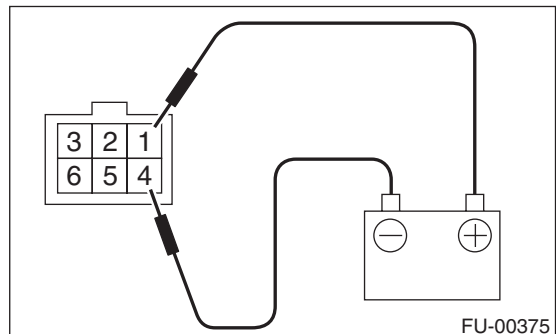
Assemble in the reverse order of disassembly.

E: INSPECTION

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

WARNING:

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



26. Fuel Level Sensor

A: REMOVAL

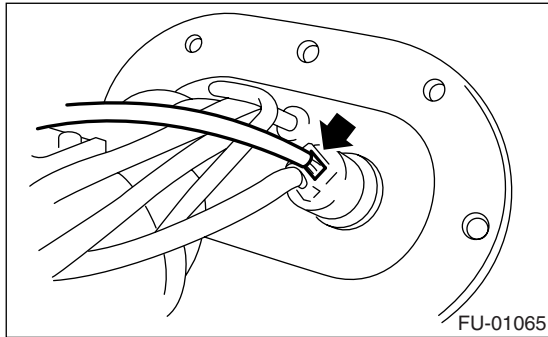
WARNING:

- Place “NO FIRE” signs near the working area.
- Be careful not to spill fuel on the floor.

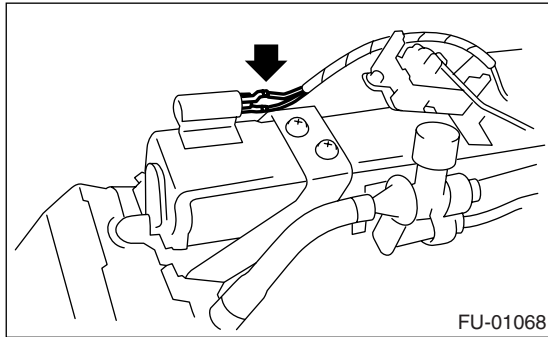
NOTE:

Fuel level sensor is built in fuel pump assembly.

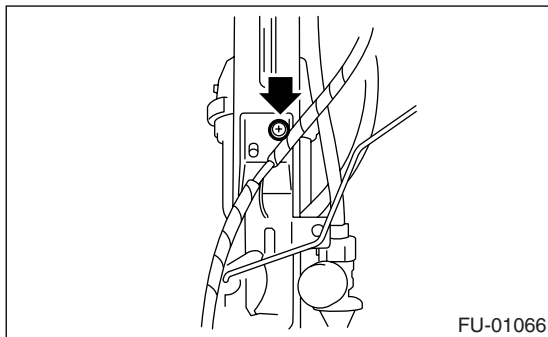
- 1) Remove the fuel pump assembly. <Ref. to FU(STI)-52, REMOVAL, Fuel Pump.>
- 2) Disconnect the connector from the fuel pump bracket.



- 3) Remove the fuel temperature sensor.



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



B: INSTALLATION

Install in the reverse order of removal.

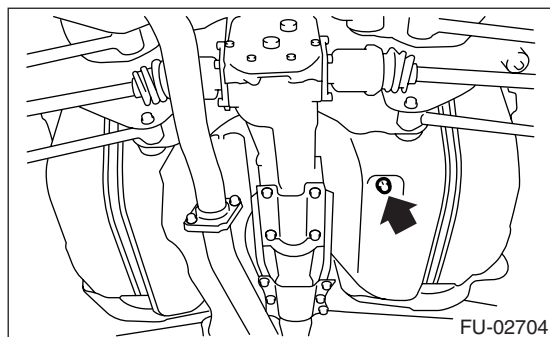
27. Fuel Sub Level Sensor

A: REMOVAL

WARNING:

- Place "NO FIRE" signs near the working area.
- Be careful not to spill fuel on the floor.
- Reduce the fuel on the fuel tank to less than 3/4 beforehand. Be careful that fuel may spill when the fuel is more than 3/4.

- 1) Disconnect the ground cable from battery.
- 2) Lift-up the vehicle.
- 3) Set a container under the vehicle and remove the drain plug from fuel tank to drain fuel.



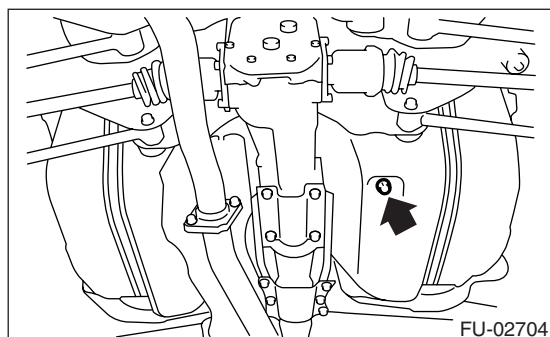
- 4) Tighten the fuel drain plug.

NOTE:

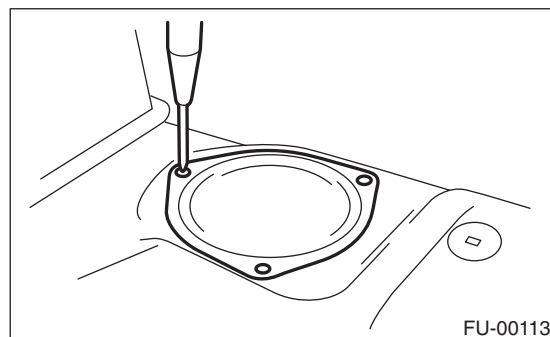
Use a new gasket.

Tightening torque:

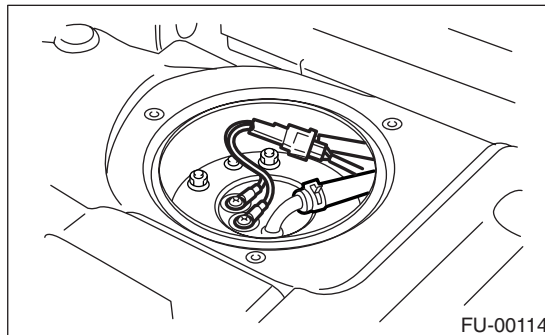
26 N·m (2.65 kgf-m, 19.2 ft-lb)



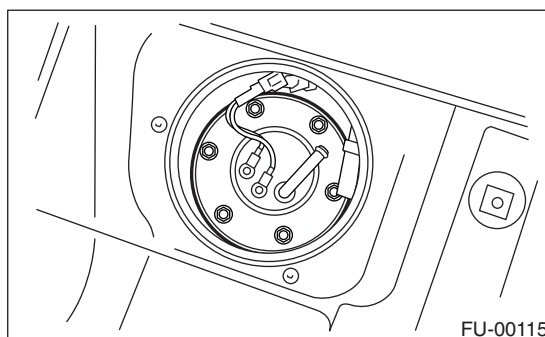
- 5) Remove the luggage floor mat. <Ref. to EI-61, REMOVAL, Luggage Floor Mat.>
- 6) Remove the service hole cover.



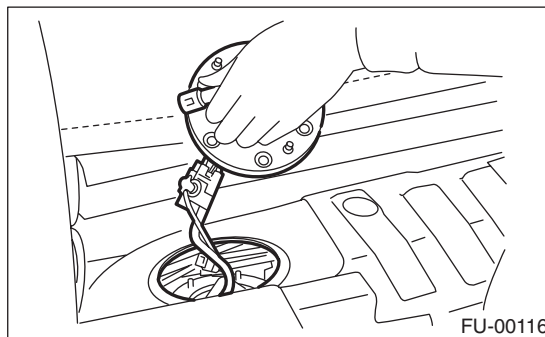
- 7) Disconnect the connector from the fuel sub level sensor.
- 8) Disconnect the fuel jet pump hose.



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



- 10) Remove the fuel sub level sensor.



Fuel Sub Level Sensor

FUEL INJECTION (FUEL SYSTEMS)

B: INSTALLATION

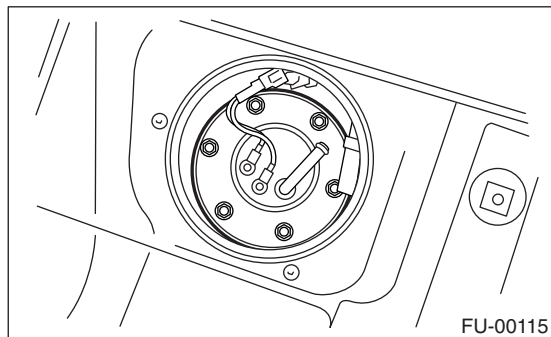
Install in the reverse order of removal.

NOTE:

- Use a new gasket.
- Ensure the sealing portion is free from fuel or foreign particles before installation.

Tightening torque:

4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



28. Fuel Filter

A: REMOVAL

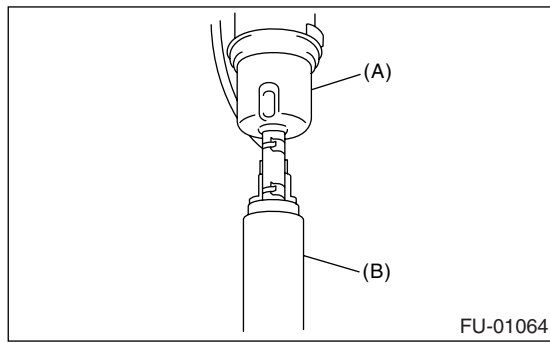
WARNING:

- Place “NO FIRE” signs near the working area.
- Be careful not to spill fuel on the floor.

NOTE:

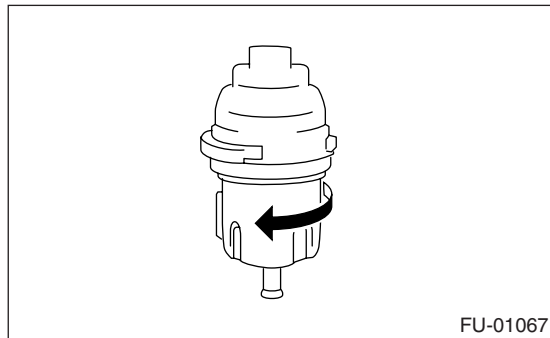
Fuel filter is built into the fuel pump assembly.

- 1) Release the fuel pressure. <Ref. to FU(STI)-44, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
- 2) Remove the fuel pump assembly. <Ref. to FU(STI)-52, REMOVAL, Fuel Pump.>
- 3) Remove the fuel pump. <Ref. to FU(STI)-53, DISASSEMBLY, Fuel Pump.>
- 4) Separate the fuel filter from fuel pump.



- (A) Fuel filter
(B) Fuel pump

- 5) Turn the filter holder around to the arrow direction, and then remove the filter.



B: INSTALLATION

CAUTION:

- If fuel hoses are damaged at the connecting portion, replace them with new ones.
- If clamps are badly damaged, replace them with new ones.

Install in the reverse order of removal.

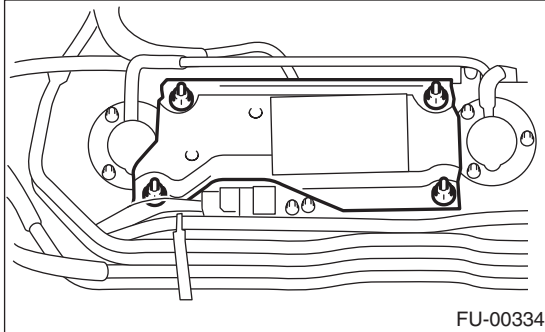
C: INSPECTION

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

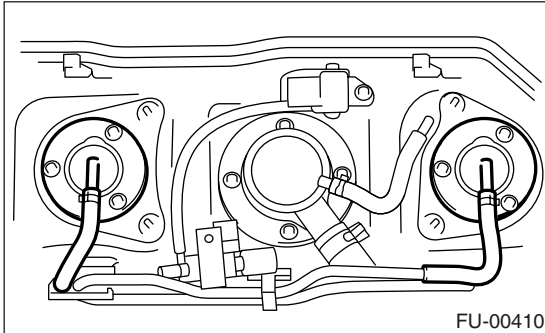
29. Fuel Cut Valve

A: REMOVAL

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



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



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

B: INSTALLATION

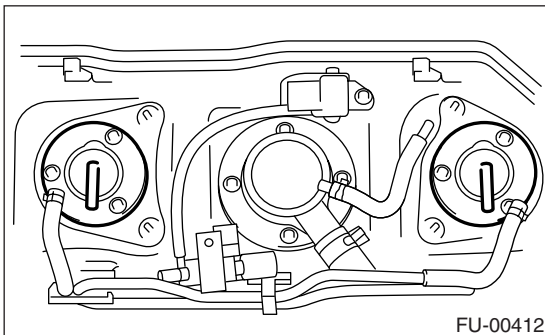
Install in the reverse order of removal.

NOTE:

Use a new gasket.

Tightening torque:

4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



30. Fuel Damper Valve

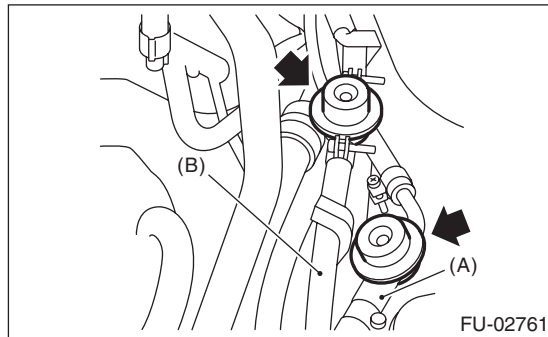
A: REMOVAL

1) Release the fuel pressure. <Ref. to FU(STI)-44, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>

2) Remove the fuel damper valve from the fuel delivery line (A) and fuel return line (B).

WARNING:

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



B: INSTALLATION

Install in the reverse order of removal.

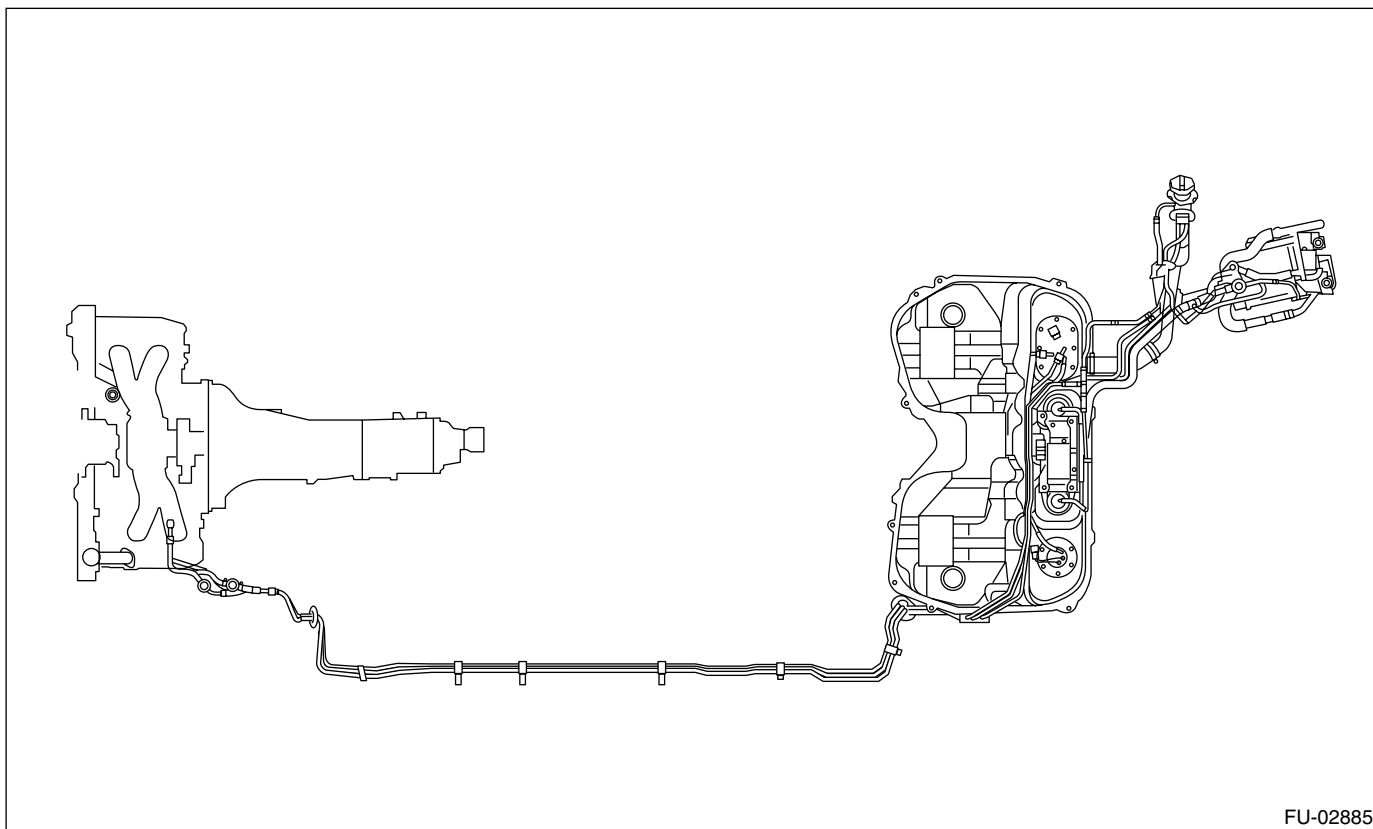
Tightening torque:

1.25 N·m (0.13 kgf-m, 0.94 ft-lb)

31. Fuel Delivery, Return and Evaporation Lines

A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Release the fuel pressure. <Ref. to FU(STI)-44, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
- 3) Open the fuel filler flap lid and remove the fuel filler cap.
- 4) Remove the floor mat. <Ref. to EI-60, REMOVAL, Floor Mat.>
- 5) Disconnect the fuel delivery pipes and hoses, and disconnect the fuel return pipes and hoses, evaporation pipes and hoses.



6) In engine compartment, detach the fuel delivery hoses, return hoses and evaporation hose.

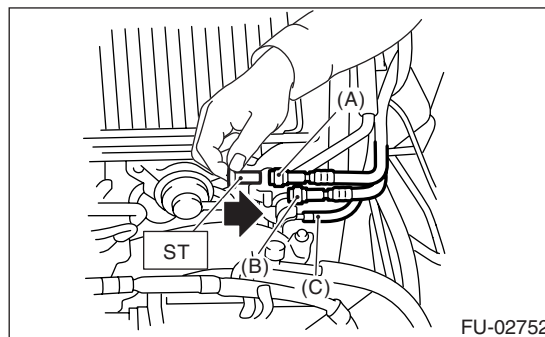
- (1) Separate the quick connectors of fuel delivery line and return line by pushing the ST to the direction of arrow.

ST 42099AE000 CONNECTOR REMOVER

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

WARNING:

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



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

- 7) Lift-up the vehicle.

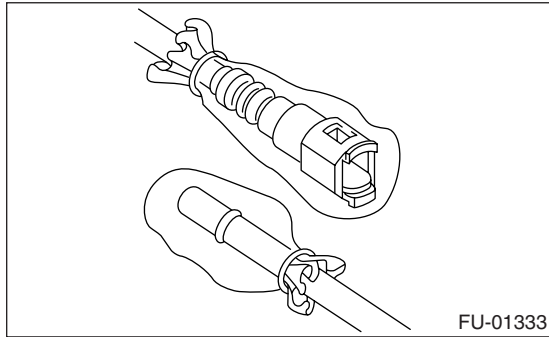
Fuel Delivery, Return and Evaporation Lines

FUEL INJECTION (FUEL SYSTEMS)

8) Disconnect the quick connector on the fuel delivery line.

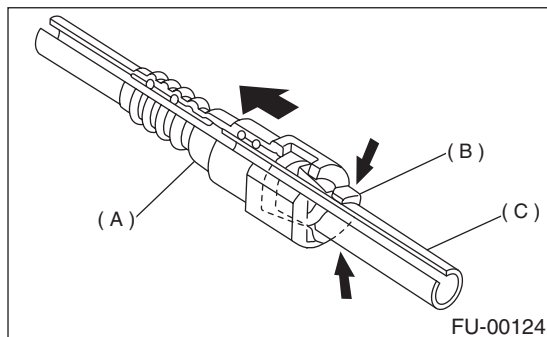
(1) Clean the pipe and connector, if they are covered with dust.

(2) To prevent from damaging or entering foreign matter, wrap the pipes and connectors with plastic bag, etc.



(3) Hold the connector (A) and push retainer (B) down.

(4) Pull out the connector (A) from retainer (B).



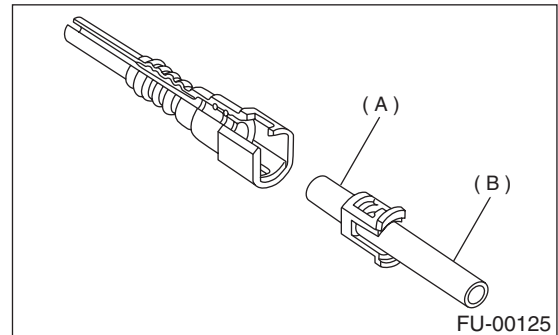
- (A) Connector
- (B) Retainer
- (C) Pipe

B: INSTALLATION

1) Connect the quick connector on the fuel line.

CAUTION:

- Always use a new retainer.
- Make sure that the connected portion is not damaged or has no dust. If necessary, clean seal surface of pipe.



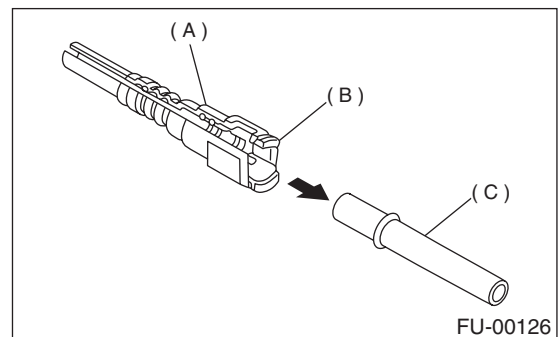
- (A) Seal surface
- (B) Pipe

(1) Set a new retainer (B) to connector (A).

(2) Push the pipe into the connector completely.

NOTE:

At this time, two clicking sounds are heard.



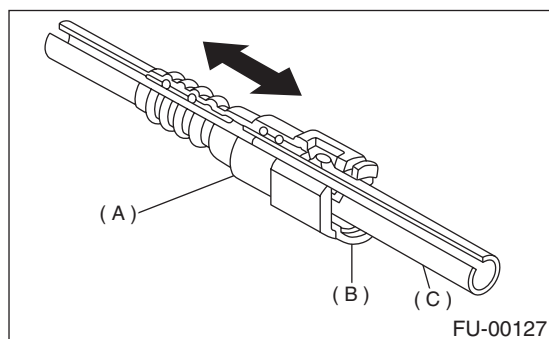
- (A) Connector
- (B) Retainer
- (C) Pipe

Fuel Delivery, Return and Evaporation Lines

FUEL INJECTION (FUEL SYSTEMS)

CAUTION:

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



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

2) Connect the fuel delivery hose and return hose by inserting them into the pipe for 20 to 25 mm (0.79 to 0.98 in) in length.

Type A: When the fitting length is specified.

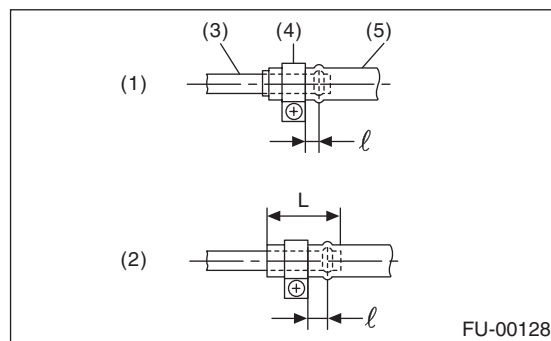
Type B: When the fitting length is not specified.

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

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

CAUTION:

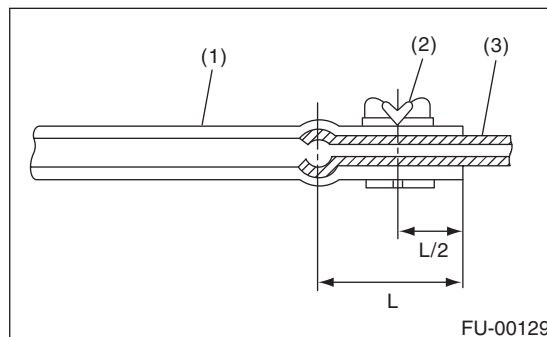
Be sure to inspect hoses and their connections for any leakage of fuel.



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

3) Connect the evaporation hose by inserting it into the pipe for 15 to 20 mm (0.59 to 0.79 in) in length.

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



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

C: INSPECTION

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

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

32. Fuel System Trouble in General

A: INSPECTION

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

NOTE:

- When the vehicle is left unattended for an extended period of time, water may accumulate in the fuel tank. Fill fuel fully to prevent those problem. And also drain the water condensation from fuel filter.
- In snow-covered areas, mountainous areas, skiing areas, etc. where ambient temperatures drop below 0°C (32°F) throughout the winter season, use water removing agent in the fuel system to prevent freezing fuel system and accumulating water. Fill the water removing agent at the time when the fuel reduced at half to maintain the advantage.
- When water condensation is noticed in the fuel filter, drain the water from both the fuel filter and fuel tank or use water removing agent in the fuel tank.
- Before using water removing agent, follow the cautions noted on the bottle.

Fuel System Trouble in General

FUEL INJECTION (FUEL SYSTEMS)

GENERAL DESCRIPTION

List of Diagnostic Trouble Code (DTC)

GENERAL DESCRIPTION

1. List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Item	Index
P0011	"A" Camshaft Position-Timing Over-Advanced or System Performance (Bank 1)	<Ref. to GD(STI)-9, DTC P0011 "A" CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0021	"A" Camshaft Position-Timing Over-Advanced or System Performance (Bank 2)	<Ref. to GD(STI)-11, DTC P0021 "A" 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(STI)-11, DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0031	HO2S Heater Control Circuit Low (Bank 1 Sensor 1)	<Ref. to GD(STI)-13, DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0032	HO2S Heater Control Circuit High (Bank 1 Sensor 1)	<Ref. to GD(STI)-15, DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0037	HO2S Heater Control Circuit Low (Bank 1 Sensor 2)	<Ref. to GD(STI)-17, DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0038	HO2S Heater Control Circuit High (Bank 1 Sensor 2)	<Ref. to GD(STI)-19, DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0068	MAP/MAF – Throttle Position Correlation	<Ref. to GD(STI)-21, 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(STI)-23, 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(STI)-26, 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(STI)-28, 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(STI)-30, 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(STI)-32, DTC P0108 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0111	Intake Air Temperature Circuit Range/Performance	<Ref. to GD(STI)-34, DTC P0111 INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0112	Intake Air Temperature Circuit Low Input	<Ref. to GD(STI)-36, DTC P0112 INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0113	Intake Air Temperature Circuit High Input	<Ref. to GD(STI)-38, DTC P0113 INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0117	Engine Coolant Temperature Circuit Low Input	<Ref. to GD(STI)-40, DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0118	Engine Coolant Temperature Circuit High Input	<Ref. to GD(STI)-42, DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0122	Throttle/Pedal Position Sensor/Switch "A" Circuit Low Input	<Ref. to GD(STI)-44, DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0123	Throttle/Pedal Position Sensor/Switch "A" Circuit High Input	<Ref. to GD(STI)-46, DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

List of Diagnostic Trouble Code (DTC)

GENERAL DESCRIPTION

DTC	Item	Index
P0125	Insufficient Coolant Temperature for Closed Loop Fuel Control	<Ref. to GD(STI)-48, 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(STI)-50, DTC P0126 INSUFFICIENT ENGINE COOLANT TEMPERATURE FOR STABLE OPERATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0128	Coolant Thermostat (Coolant Temperature Below Thermostat Regulating Temperature)	<Ref. to GD(STI)-52, DTC P0128 COOLANT THERMOSTAT (COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0131	O ₂ Sensor Circuit Low Voltage (Bank 1 Sensor 1)	<Ref. to GD(STI)-54, DTC P0131 O ₂ SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0132	O ₂ Sensor Circuit High Voltage (Bank 1 Sensor 1)	<Ref. to GD(STI)-56, DTC P0132 O ₂ SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0133	O ₂ Sensor Circuit Slow Response (Bank 1 Sensor 1)	<Ref. to GD(STI)-58, DTC P0133 O ₂ SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0134	O ₂ Sensor Circuit No Activity Detected (Bank 1 Sensor 1)	<Ref. to GD(STI)-61, DTC P0134 O ₂ SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0137	O ₂ Sensor Circuit Low Voltage (Bank 1 Sensor 2)	<Ref. to GD(STI)-63, DTC P0137 O ₂ SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0138	O ₂ Sensor Circuit High Voltage (Bank 1 Sensor 2)	<Ref. to GD(STI)-65, DTC P0138 O ₂ SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0139	O ₂ Sensor Circuit Slow Response (Bank 1 Sensor 2)	<Ref. to GD(STI)-67, DTC P0139 O ₂ SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0171	System too Lean (Bank 1)	<Ref. to GD(STI)-72, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0172	System too Rich (Bank 1)	<Ref. to GD(STI)-75, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0181	Fuel Temperature Sensor "A" Circuit Range/Performance	<Ref. to GD(STI)-78, 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(STI)-81, 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(STI)-83, DTC P0183 FUEL TEMPERATURE SENSOR "A" CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0222	Throttle/Pedal Position Sensor/Switch "B" Circuit Low Input	<Ref. to GD(STI)-85, DTC P0222 THROTTLE/PEDAL POSITION SENSOR/SWITCH "B" CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0223	Throttle/Pedal Position Sensor/Switch "B" Circuit High Input	<Ref. to GD(STI)-87, DTC P0223 THROTTLE/PEDAL POSITION SENSOR/SWITCH "B" CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0230	Fuel Pump Primary Circuit	<Ref. to GD(STI)-89, DTC P0230 FUEL PUMP PRIMARY CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0244	Turbo/Super Charger Wastegate Solenoid "A" Range/Performance	<Ref. to GD(STI)-91, 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(STI)-93, 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(STI)-95, DTC P0246 TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0301	Cylinder 1 misfire detected	<Ref. to GD(STI)-97, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

List of Diagnostic Trouble Code (DTC)

GENERAL DESCRIPTION

DTC	Item	Index
P0302	Cylinder 2 misfire detected	<Ref. to GD(STI)-102, DTC P0302 CYLINDER 2 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0303	Cylinder 3 misfire detected	<Ref. to GD(STI)-102, DTC P0303 CYLINDER 3 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0304	Cylinder 4 misfire detected	<Ref. to GD(STI)-102, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0327	Knock Sensor 1 Circuit Low Input (Bank 1 or Single Sensor)	<Ref. to GD(STI)-103, DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0328	Knock Sensor 1 Circuit High Input (Bank 1 or Single Sensor)	<Ref. to GD(STI)-105, DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0335	Crankshaft Position Sensor "A" Circuit	<Ref. to GD(STI)-107, DTC P0335 CRANKSHAFT POSITION SENSOR "A" CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0336	Crankshaft Position Sensor "A" Circuit Range/Performance	<Ref. to GD(STI)-109, 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(STI)-111, 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(STI)-112, DTC P0345 CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0420	Catalyst System Efficiency Below Threshold (Bank 1)	<Ref. to GD(STI)-113, 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(STI)-116, 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(STI)-139, 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(STI)-141, DTC P0448 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0451	Evaporative Emission Control System Pressure Sensor Range/Performance	<Ref. to GD(STI)-143, DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0452	Evaporative Emission Control System Pressure Sensor Low Input	<Ref. to GD(STI)-145, 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(STI)-147, 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(STI)-148, 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(STI)-148, DTC P0457 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0458	Evaporative Emission Control System Purge Control Valve Circuit Low	<Ref. to GD(STI)-149, DTC P0458 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0459	Evaporative Emission Control System Purge Control Valve Circuit High	<Ref. to GD(STI)-151, DTC P0459 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

List of Diagnostic Trouble Code (DTC)

GENERAL DESCRIPTION

DTC	Item	Index
P0461	Fuel Level Sensor Circuit Range/Performance	<Ref. to GD(STI)-153, DTC P0461 FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0462	Fuel Level Sensor Circuit Low Input	<Ref. to GD(STI)-155, DTC P0462 FUEL LEVEL SENSOR CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0463	Fuel Level Sensor Circuit High Input	<Ref. to GD(STI)-157, DTC P0463 FUEL LEVEL SENSOR CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0464	Fuel Level Sensor Circuit Intermittent	<Ref. to GD(STI)-159, DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0483	Cooling Fan Rationality Check	<Ref. to GD(STI)-162, DTC P0483 COOLING FAN RATIONALITY CHECK, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0502	Vehicle Speed Sensor Circuit Low Input	<Ref. to GD(STI)-164, DTC P0502 VEHICLE SPEED SENSOR CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0503	Vehicle Speed Sensor Intermittent/Erratic/High	<Ref. to GD(STI)-165, DTC P0503 VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0506	Idle Control System RPM Lower Than Expected	<Ref. to GD(STI)-167, DTC P0506 IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0507	Idle Control System RPM Higher Than Expected	<Ref. to GD(STI)-169, DTC P0507 IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0512	Starter Request Circuit	<Ref. to GD(STI)-171, DTC P0512 STARTER REQUEST CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0513	Incorrect Immobilizer Key	<Ref. to GD(STI)-172, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0519	Idle Control System Malfunction (Fail-Safe)	<Ref. to GD(STI)-173, DTC P0519 IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0604	Internal Control Module Random Access Memory (RAM) Error	<Ref. to GD(STI)-174, 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(STI)-175, DTC P0605 INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0607	Control Module Performance	<Ref. to GD(STI)-176, DTC P0607 CONTROL MODULE PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0638	Throttle Actuator Control Range/Performance (Bank 1)	<Ref. to GD(STI)-179, DTC P0638 THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0691	Cooling Fan 1 Control Circuit Low	<Ref. to GD(STI)-182, DTC P0691 COOLING FAN 1 CONTROL CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0692	Cooling Fan 1 Control Circuit High	<Ref. to GD(STI)-183, DTC P0692 COOLING FAN 1 CONTROL CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0851	Neutral Switch Input Circuit Low	<Ref. to GD(STI)-184, DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0852	Neutral Switch Input Circuit High	<Ref. to GD(STI)-185, DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1152	O ₂ Sensor Circuit Range/Performance (Low) (Bank1 Sensor1)	<Ref. to GD(STI)-186, DTC P1152 O ₂ SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK1 SENSOR1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1153	O ₂ Sensor Circuit Range/Performance (High) (Bank1 Sensor1)	<Ref. to GD(STI)-188, DTC P1153 O ₂ SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1160	Return Spring Failure	<Ref. to GD(STI)-190, DTC P1160 RETURN SPRING FAILURE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1400	Fuel Tank Pressure Control Solenoid Valve Circuit Low	<Ref. to GD(STI)-192, DTC P1400 FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

List of Diagnostic Trouble Code (DTC)

GENERAL DESCRIPTION

DTC	Item	Index
P1420	Fuel Tank Pressure Control Sol. Valve Circuit High	<Ref. to GD(STI)-194, 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(STI)-196, DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1446	Fuel Tank Sensor Control Valve Circuit Low	<Ref. to GD(STI)-198, DTC P1446 FUEL TANK SENSOR CONTROL VALVE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1447	Fuel Tank Sensor Control Valve Circuit High	<Ref. to GD(STI)-200, DTC P1447 FUEL TANK SENSOR CONTROL VALVE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1448	Fuel Tank Sensor Control Valve Range/Performance	<Ref. to GD(STI)-202, DTC P1448 FUEL TANK SENSOR CONTROL VALVE RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1491	Positive Crankcase Ventilation (Blow-by) Function Problem	<Ref. to GD(STI)-205, DTC P1491 POSITIVE CRANKCASE VENTILATION (BLOW-BY) FUNCTION PROBLEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1518	Starter Switch Circuit Low Input	<Ref. to GD(STI)-207, DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1560	Back-Up Voltage Circuit Malfunction	<Ref. to GD(STI)-208, DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1570	Antenna	<Ref. to GD(STI)-209, DTC P1570 ANTENNA, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1571	Reference Code Incompatibility	<Ref. to GD(STI)-209, DTC P1571 REFERENCE CODE INCOMPATIBILITY, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1572	IMM Circuit Failure (Except Antenna Circuit)	<Ref. to GD(STI)-209, DTC P1572 IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1574	Key Communication Failure	<Ref. to GD(STI)-209, DTC P1574 KEY COMMUNICATION FAILURE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1576	EGI Control Module EEPROM	<Ref. to GD(STI)-209, DTC P1576 EGI CONTROL MODULE EEPROM, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1577	IMM Control Module EEPROM	<Ref. to GD(STI)-209, DTC P1577 IMM CONTROL MODULE EEPROM, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2004	Intake Manifold Runner Control Stuck Open (Bank 1)	<Ref. to GD(STI)-210, 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(STI)-211, 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(STI)-212, 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(STI)-213, 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(STI)-214, 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(STI)-216, 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(STI)-218, 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(STI)-220, DTC P2012 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

List of Diagnostic Trouble Code (DTC)

GENERAL DESCRIPTION

DTC	Item	Index
P2016	Intake Manifold Runner Position Sensor/Switch Circuit Low (Bank 1)	<Ref. to GD(STI)-222, 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(STI)-224, 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(STI)-226, 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(STI)-228, DTC P2022 INTAKE MANIFOLD RUNNER POSITION SENSOR/SWITCH CIRCUIT HIGH (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2088	OCV Solenoid Valve Signal A Circuit Open (Bank 1)	<Ref. to GD(STI)-230, DTC P2088 OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2089	OCV Solenoid Valve Signal A Circuit Short (Bank 1)	<Ref. to GD(STI)-232, DTC P2089 OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2092	OCV Solenoid Valve Signal A Circuit Open (Bank 2)	<Ref. to GD(STI)-234, DTC P2092 OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2093	OCV Solenoid Valve Signal A Circuit Short (Bank 2)	<Ref. to GD(STI)-236, DTC P2093 OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2096	Post Catalyst Fuel Trim System Too Lean Bank 1	<Ref. to GD(STI)-238, 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(STI)-240, 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(STI)-242, 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(STI)-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(STI)-246, 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(STI)-248, 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(STI)-250, 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(STI)-252, 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(STI)-254, 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(STI)-256, 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 Rationality	<Ref. to GD(STI)-258, DTC P2135 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" / "B" VOLTAGE RATIONALITY, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2138	Throttle/Pedal Position Sensor/Switch "D"/"E" Voltage Rationality	<Ref. to GD(STI)-260, DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" / "E" VOLTAGE RATIONALITY, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2227	Barometric Pressure Circuit Range/Performance	<Ref. to GD(STI)-262, DTC P2227 BAROMETRIC PRESSURE CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

List of Diagnostic Trouble Code (DTC)

GENERAL DESCRIPTION

DTC	Item	Index
P2228	Barometric Pressure Circuit Low Input	<Ref. to GD(STI)-263, DTC P2228 BAROMETRIC PRESSURE CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2229	Barometric Pressure Circuit High Input	<Ref. to GD(STI)-264, DTC P2229 BAROMETRIC PRESSURE CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

2. Diagnostic Trouble Code (DTC) Detecting Criteria

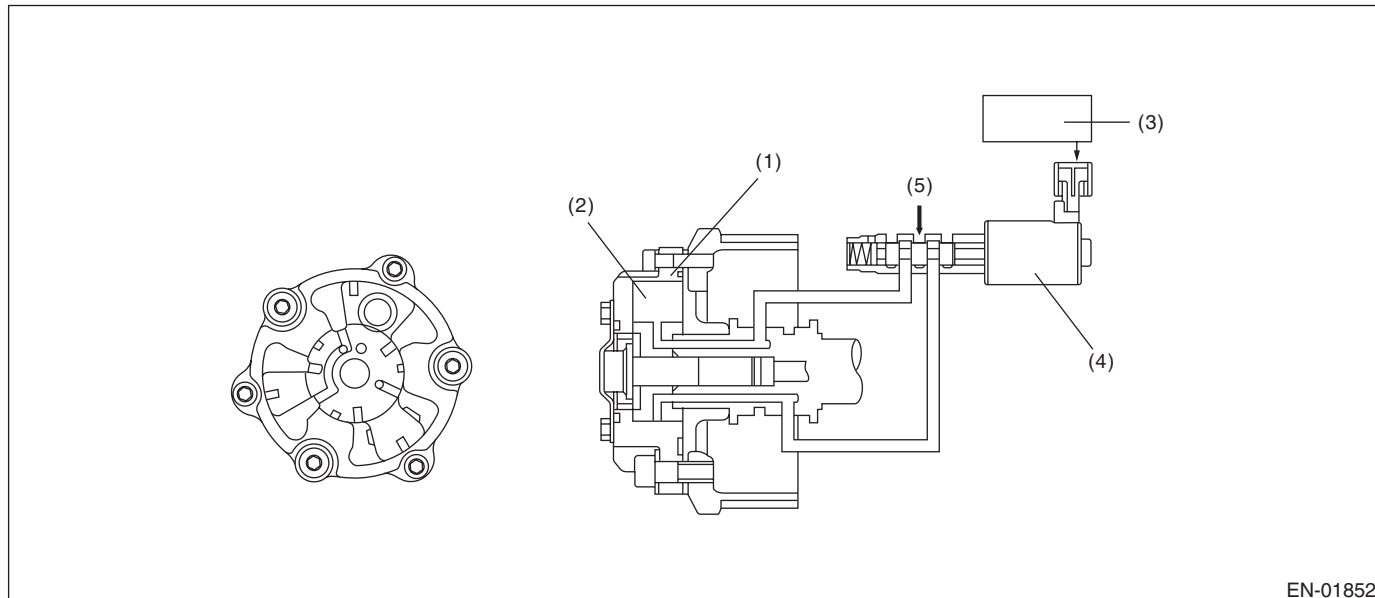
A: DTC P0011 “A” CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of AVCS system.

Judge NG when the amount of AVCS actual timing advance does not approach to the amount of AVCS target timing advance.

2. COMPONENT DESCRIPTION



EN-01852

- (1) AVCS timing controller
- (2) Vane
- (3) Engine control module (ECM)
- (4) Oil flow control valve
- (5) Oil pressure

3. ENABLE CONDITION (FOR ABNORMALITY JUDGMENT ONLY)

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 10.9 \text{ V}$
Engine speed	$\geq 600 \text{ rpm}$
Engine coolant temperature	$\geq 60^{\circ}\text{C}$
Amount of AVCS target timing advance	$= 0^{\circ}\text{CA}$

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after idling when the amount of AVCS target timing advance is equal to 0.

5. DIAGNOSTIC METHOD

Judge NG when the difference of the amount of AVCS target timing advance and the amount of AVCS actual timing advance becomes large, and judge OK when the difference becomes small.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 10 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
AVCS target position – AVCS actual position	$\geq 20^\circ$

Time Needed for Diagnosis: 10 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
AVCS control	During feedback
Amount of AVCS target timing advance	5 — 30°CA
AVCS target position – AVCS actual position	$< 10^\circ$

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Ignition timing whole learning compensation:
 - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when IG OFF, and then make the whole learning incomplete.
 - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when making a normality judgment from abnormality judgment, and then make the whole learning incomplete.
- Ignition timing partial learning compensation:
 - Enter the initial value (0°CA) to the compensation value of partial learning zone when IG OFF.
 - Enter the initial value (0°CA) to the compensation value of partial learning zone when making a normality judgment from abnormality judgment.
- AVCS control: Most timing retard learning is not complete or most timing retard learning completion is not experienced.
- ISC feedback compensation: Do not perform the AVCS actual timing advance compensation. Make the OCV driving Duty to be the given value (9.36%).

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

B: DTC P0021 “A” CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 2)

1. OUTLINE OF DIAGNOSIS

For the diagnostic procedure, refer to DTC P0011. <Ref. to GD(STI)-9, DTC P0011 “A” CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

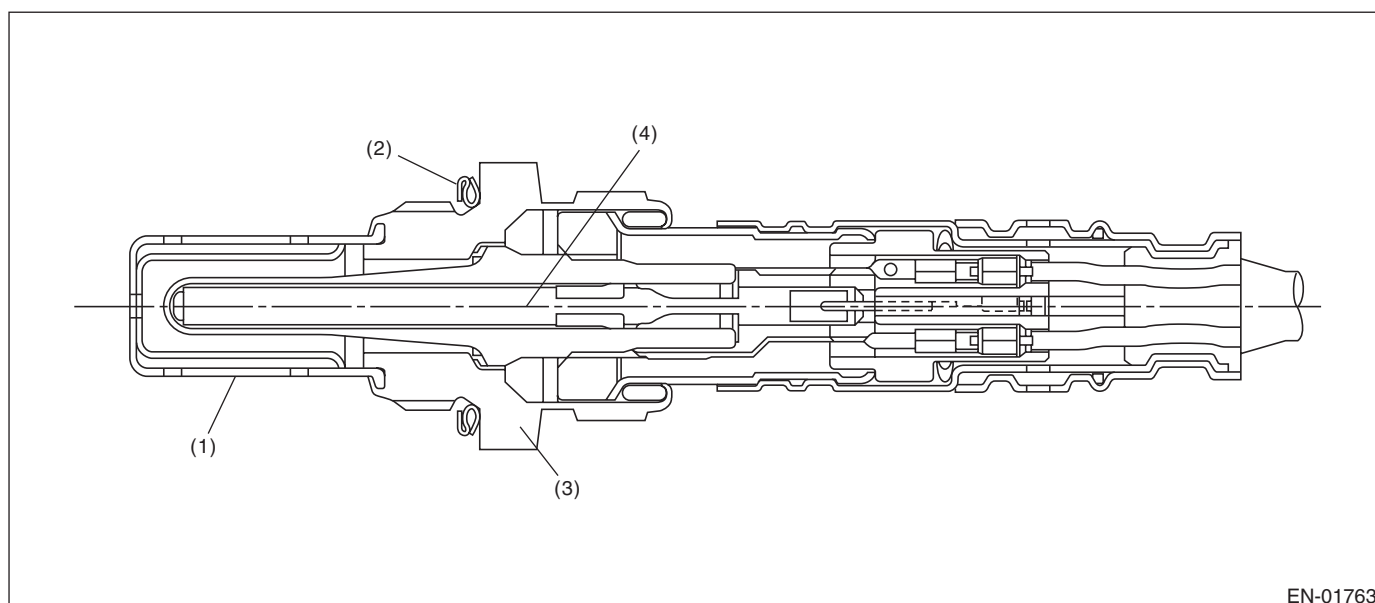
C: DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of front oxygen (A/F) sensor heater.

Judge NG when impedance of front oxygen (A/F) sensor is larger than the standard value by referring to the engine condition such as fuel shut-off in deceleration, etc.

2. COMPONENT DESCRIPTION



EN-01763

- (1) Protection tube
- (2) Gasket
- (3) Sensor housing
- (4) Ceramic heater

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Time needed for all secondary parameters to be in enable conditions	60 seconds or more
Battery voltage	> 10.9 V
After fuel shut-off	20 seconds or more
Front oxygen (A/F) sensor heater control duty $\geq$ 70%	Experienced

4. GENERAL DRIVING CYCLE

Perform diagnosis continuously in 60 seconds after starting engine.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (10 seconds). Judge OK and clear NG when the continuous time of not completing the malfunction criteria below becomes more than the time needed for diagnosis (10 seconds).

Judgment Value

Malfunction Criteria	Threshold Value
Impedance of front oxygen (A/F) sensor	> 50 Ω

Time Needed for Diagnosis: 10 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor main learning correction: Not allowed to calculate
- Correction when re-starting at high temperature: Normally minimum value 0.3 → 0
- Purge control: Not allowed to purge

9. ECM OPERATION AT DTC SETTING

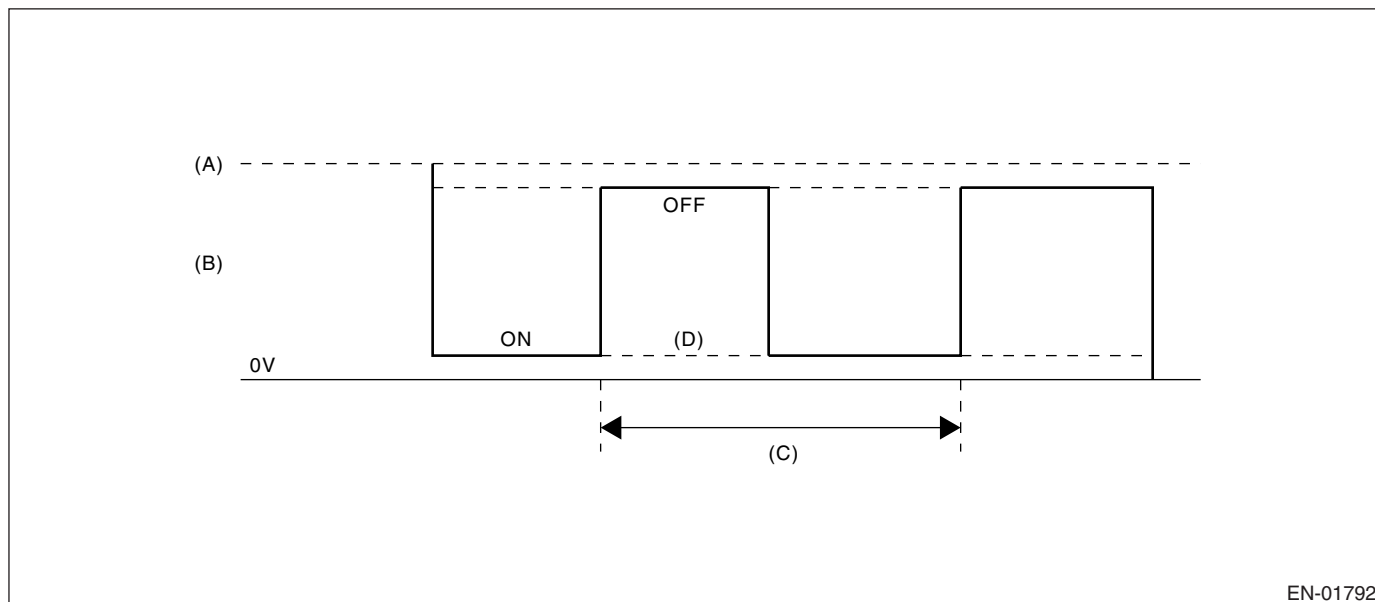
Memorize the freeze frame data. (For test mode \$02)

D: DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1)**1. OUTLINE OF DIAGNOSIS**

Detect the open or short circuit of heater.

The heater conducts the duty control. The output terminal voltage at ON becomes 0 V, and the output terminal voltage at OFF becomes battery voltage.

Judge NG when the terminal voltage remains to be Low.

2. COMPONENT DESCRIPTION

EN-01792

- (A) Battery voltage
- (B) Front oxygen (A/F) sensor heater output voltage
- (C) 128 milliseconds
- (D) Low abnormality

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 10.9 \text{ V}$

4. GENERAL DRIVING CYCLE

Always perform diagnosis continuously.

5. DIAGNOSTIC METHOD**• Abnormality Judgment**

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 1 second (8 cycles).

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	Low
Front oxygen (A/F) sensor heater control duty	$< 87.5\%$

Time Needed for Diagnosis: 1 second

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

• Normality Judgment

Judge OK and clear the NG when all the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	High

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor activation judgment: Front oxygen (A/F) sensor full activation is not complete, or front oxygen (A/F) sensor half activation is not complete.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- Compensation when starting the engine at high temperature: Make the MIN value to be 0 from 0.3 normally.
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

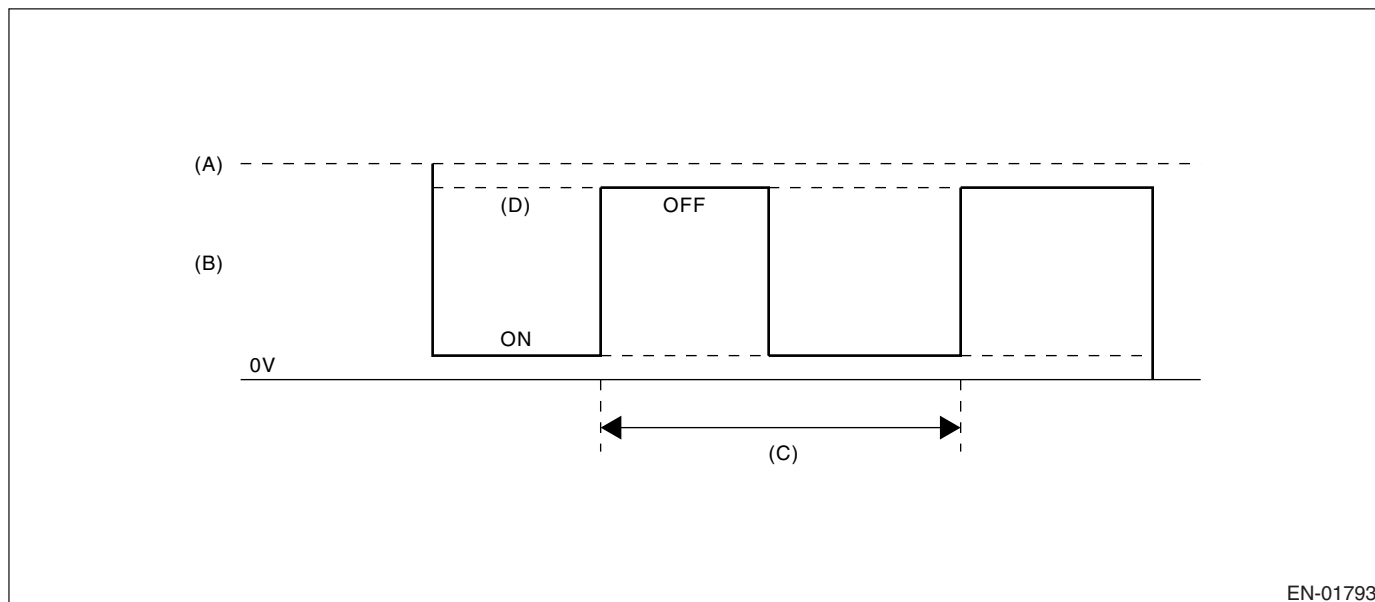
Memorize the freeze frame data. (For test mode \$02)

E: DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1)**1. OUTLINE OF DIAGNOSIS**

Detect the open or short circuit of heater.

The heater conducts the duty control. The output terminal voltage at ON becomes 0 V, and the output terminal voltage at OFF becomes battery voltage.

Judge NG when the terminal voltage remains to be High.

2. COMPONENT DESCRIPTION

EN-01793

- (A) Battery voltage
- (B) Front oxygen (A/F) sensor heater output voltage
- (C) 128 milliseconds
- (D) High abnormality

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 10.9 \text{ V}$

4. GENERAL DRIVING CYCLE

Always perform diagnosis continuously.

5. DIAGNOSTIC METHOD**• Abnormality Judgment**

Judge NG when the continuous time of completing the malfunction criteria below becomes 1 second (8 cycles).

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	High
Front oxygen (A/F) sensor heater control duty	$\geq 12.5\%$

Time Needed for Diagnosis: 1 second

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

• Normality Judgment

Judge OK and clear the NG when all the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	Low

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor activation judgment: Front oxygen (A/F) sensor full activation is not complete, or front oxygen (A/F) sensor half activation is not complete.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- Compensation when starting the engine at high temperature: Make the MIN value to be 0 from 0.3 normally.
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

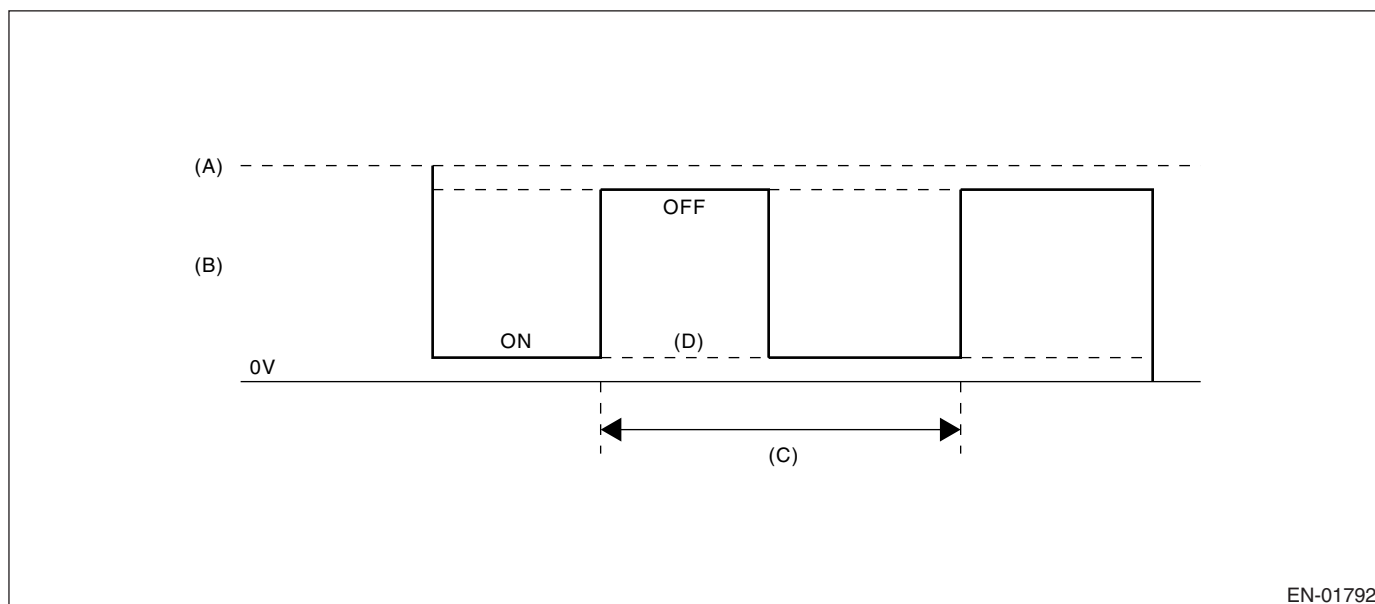
Memorize the freeze frame data. (For test mode \$02)

F: DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2)**1. OUTLINE OF DIAGNOSIS**

Detect open or short circuit of rear oxygen sensor heater.

Rear oxygen sensor heater conducted the duty control, and the output terminal voltage at ON is 0 V and the output terminal voltage at OFF is the battery voltage.

Judge NG when the terminal voltage remains to be Low.

2. COMPONENT DESCRIPTION

- (A) Battery voltage
- (B) Rear oxygen sensor heater output voltage
- (C) 256 milliseconds (cycles)
- (D) Low malfunction

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
Elapsed time after engine starting	≥ 1 second

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 1 second after engine starting.

5. DIAGNOSTIC METHOD**• Abnormality Judgment**

Judge NG when the continuous time of completing all the malfunction criteria below becomes more than 2,560 millisecond (10 cycles).

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	Low
Rear oxygen sensor heater control duty	< 75%

Time Needed for Diagnosis: 2.56 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

• Normality Judgment

Judge OK and clear the NG when all the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	High

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

Sub feedback control: Not allowed

9. ECM OPERATION AT DTC SETTING

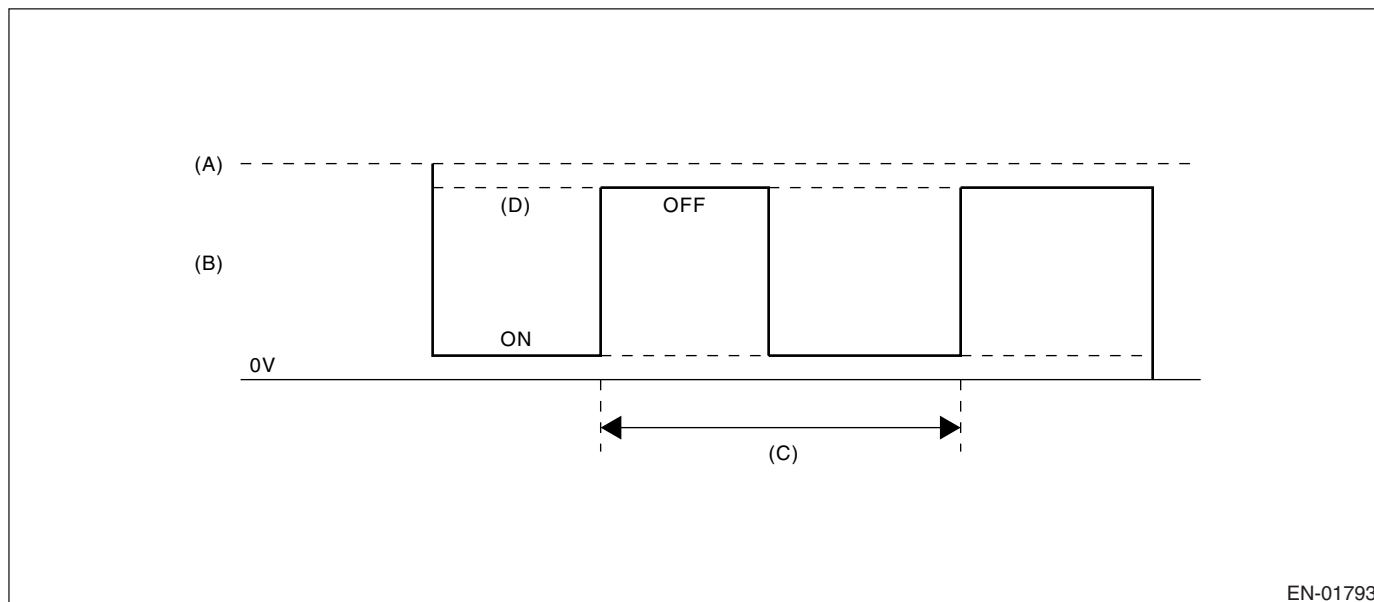
Memorize the freeze frame data. (For test mode \$02)

G: DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2)**1. OUTLINE OF DIAGNOSIS**

Detect open or short circuit of rear oxygen heater.

Rear oxygen heater conducted the duty control, and the output terminal voltage at ON is 0 V and the output terminal voltage at OFF is the battery voltage.

Judge NG when the terminal voltage remains to be High.

2. COMPONENT DESCRIPTION

- (A) Battery voltage
- (B) Rear oxygen sensor heater output voltage
- (C) 256 milliseconds (cycle)
- (D) High malfunction

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
Elapsed time after engine starting	≥ 21 second

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 1 second after engine starting.

5. DIAGNOSTIC METHOD**• Abnormality Judgment**

Judge NG when the continuous time of completing all the malfunction criteria below becomes more than 2,560 milliseconds (10 cycles).

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	High
Rear oxygen sensor heater control duty	≥ 25%

Time Needed for Diagnosis: 2.56 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

• Normality Judgment

Judge OK and clear the NG when all the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	Low

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

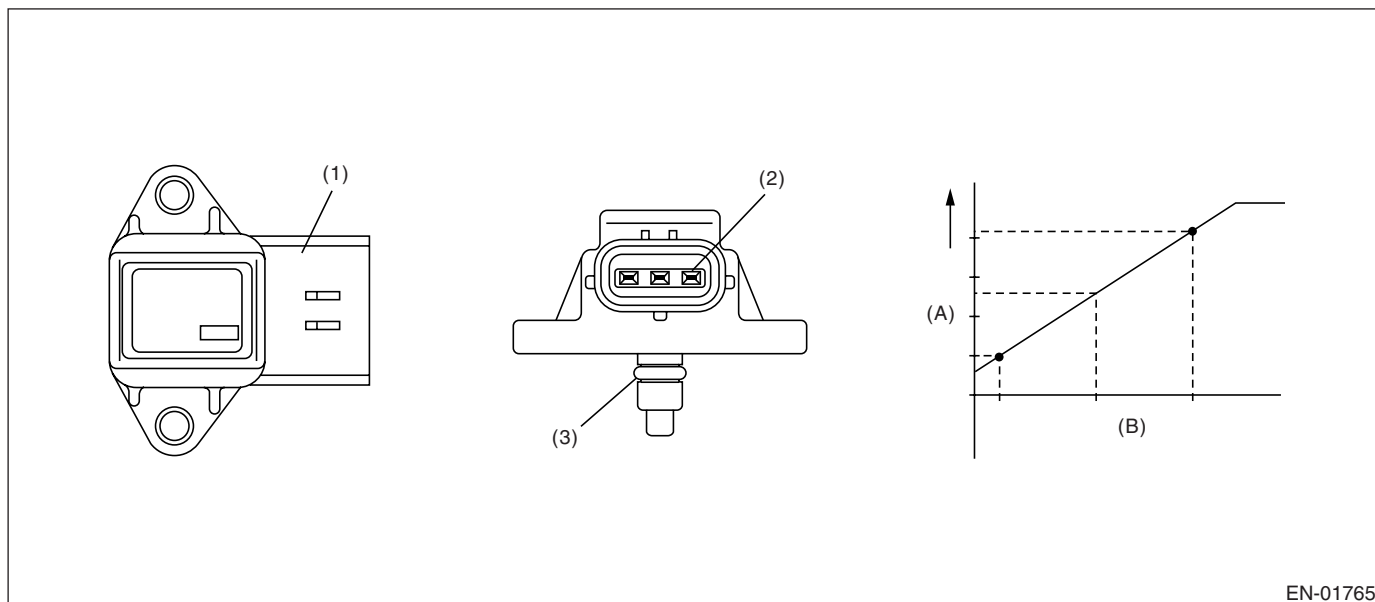
Sub feedback control: Not allowed

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

H: DTC P0068 MAP/MAF – THROTTLE POSITION CORRELATION**1. OUTLINE OF DIAGNOSIS**

Detect the malfunction of intake manifold pressure sensor output property. Judge NG when the intake air pressure AD value is Low whereas it seemed to be High from the viewpoint of engine condition, or when it is High whereas it seemed to be Low from the engine condition.

2. COMPONENT DESCRIPTION

- (1) Connector
(2) Terminal
(3) O-ring

- (A) Output voltage
(B) Absolute pressure

EN-01765

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	$\geq 75^{\circ}\text{C}$ (167°F)

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after idling.

5. DIAGNOSTIC METHOD**• Abnormality Judgment**

Judge NG when either Low side or High side becomes NG. Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Low side	
Engine speed	$< 2,500$ rpm
Throttle position	$\geq 10^{\circ}$
Output voltage	< 1.0 V
High side	
Engine speed	$600 \longleftrightarrow 900$ rpm
Throttle position	$< 1.3^{\circ}$
Output voltage	≥ 2.6 V

Time Needed for Diagnosis: 3 seconds

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when both Low side and High side become OK. Judge OK when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Low side	
Engine speed	< 2,500 rpm
Throttle position	$\geq 10^\circ$
Output voltage	$\geq 1.0 \text{ V}$
High side	
Engine speed	600 $\longleftrightarrow$ 900 rpm
Throttle position	< 1.3°
Output voltage	< 2.6 V

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

- Intake manifold pressure sensor process: Estimate the pressure from engine load.
- ISC feedback: Not allowed to calculate the amount of feedback.
- Heavy fuel judgment: Not allowed to carry out the heavy judgment.
- Fuel cut control: Not allowed to cut the over pressure charged fuel.

9. ECM OPERATION AT DTC SETTING

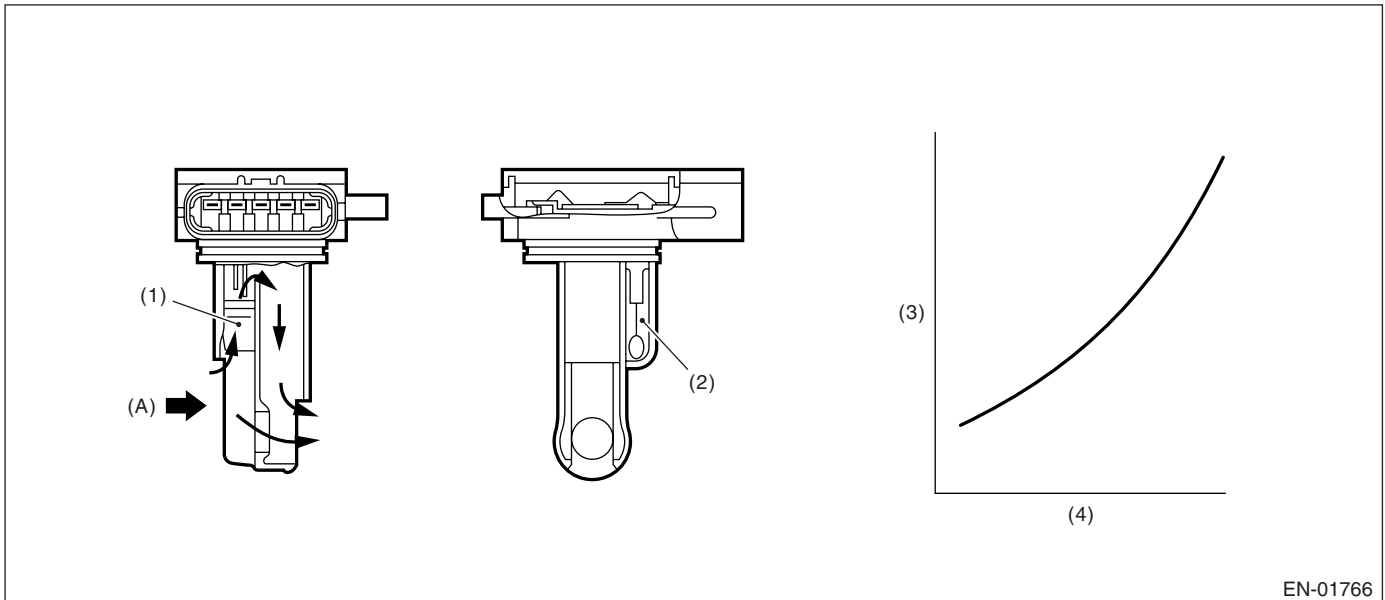
Memorize the freeze frame data. (For test mode \$02)

I: DTC P0101 MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of air flow sensor output property. Judge Low side NG when the air flow voltage indicates low value in spite of the driving condition that the air flow voltage might be high; otherwise, judge High side NG when the air flow voltage indicates high value in spite of the driving condition that the air flow voltage might be low. Judge air flow sensor property NG when the Low side or High side becomes NG.

2. COMPONENT DESCRIPTION



- (1) Air flow sensor
- (2) Intake air temperature sensor
- (3) Voltage (V)
- (4) Intake air volume (kg/s)

(A) Air

EN-01766

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	$\geq 70^{\circ}\text{C}$ (167°F)

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after idling.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis.

Judgment Value

Malfunction Criteria	Threshold Value
Low side NG Output voltage Engine speed Throttle angle Intake manifold pressure	< 1.5 V ≥ 2,500 rpm ≥ 15° ≥ 53.3 kPa (400 mmHg, 15.7 inHg)
High side NG 1 Output voltage Engine speed Throttle angle Intake manifold pressure	≥ 1.95 V 600 ↔ 1,200 rpm < 2.75° < 46.7 kPa (350 mmHg, 13.8 inHg)
High side NG 2 Output voltage Engine speed Throttle angle Intake manifold pressure Diagnosis for fuel system	≥ 1.7 V 600 ↔ 1,200 rpm < 2.75° < 46.7 kPa (350 mmHg, 13.8 inHg) Rich side malfunction

Time Needed for Diagnosis:

Low side	3 seconds
High side	10 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK the when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Low side NG Output voltage Engine speed Throttle angle Intake manifold pressure	≥ 1.5 V ≥ 2,500 rpm ≥ 15° ≥ 53.3 kPa (400 mmHg, 15.7 inHg)
High side NG Output voltage Engine speed Throttle angle Intake manifold pressure	< 2.5 V 550 ↔ 900 rpm < 1.92° < 46.7 kPa (350 mmHg, 13.8 inHg)

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

- Air flow meter: Engine load is normally calculated by manifold pressure and engine speed; however, calculated only by manifold pressure.
- EVAP conc. learning (fuel): Not allowed to learn.
- Knock compensation:
 - Knock compensation final timing advance and retard value = knock compensation + whole learning compensation value + partial learning compensation value.
 - At normal: knock compensation = 0°CA is fixed.
 - At trouble: knock compensation ≠ 0°CA is fixed. (Retard max. 12°CA at knock.)
 - Not allowed to update the whole learning compensation factor.
 - Not allowed to calculate the partial learning zone compensation value.
- ISC control: Make the open loop compensation to be the given value (1 g/s). Stop calculating the throttle sensor temperature compensation. (Hold the previous value.)
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

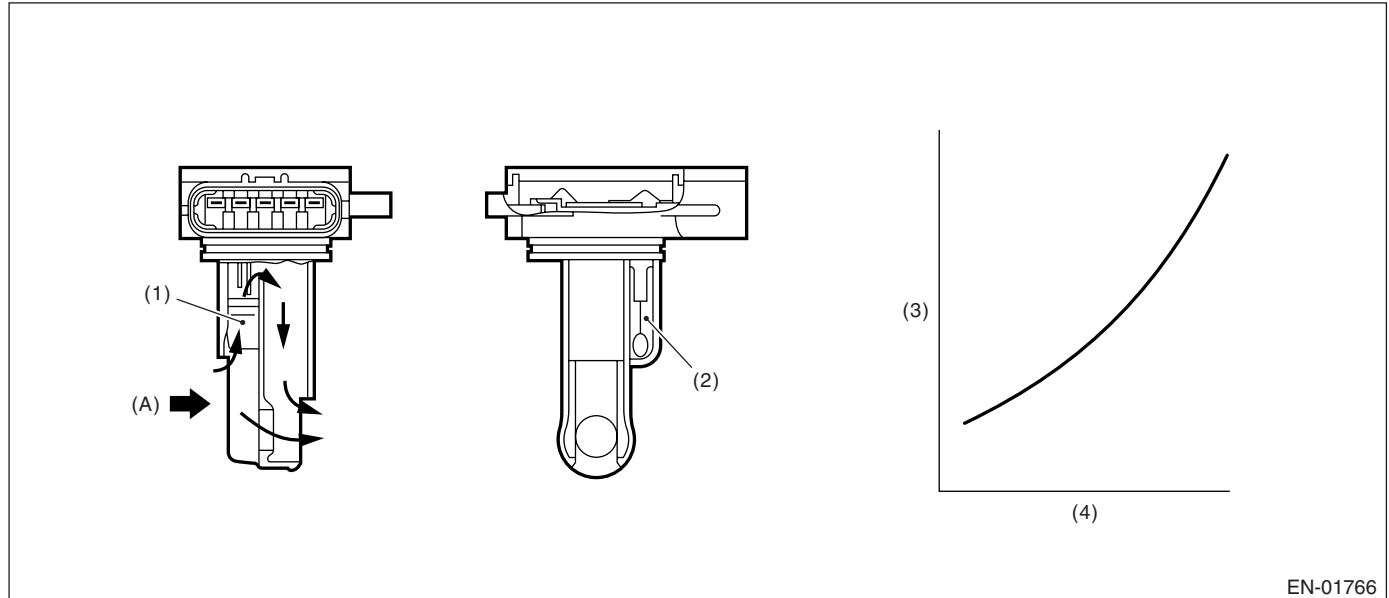
GENERAL DESCRIPTION

J: DTC P0102 MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of air flow sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



- (1) Air flow sensor
 - (2) Intake air temperature sensor
 - (3) Voltage (V)
 - (4) Intake air volume (kg/s)
- (A) Air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 10.9 \text{ V}$

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	$\leq 0.2 \text{ V}$

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

- Air flow meter: Engine load is normally calculated by manifold pressure and engine speed; however, calculated only by manifold pressure.
- EVAP conc. learning (fuel): Not allowed to learn.
- Knock compensation:
 - Knock compensation final timing advance and retard value = knock compensation + whole learning compensation value + partial learning compensation value.
 - At normal: knock compensation = 0°CA is fixed.
 - At trouble: knock compensation ≠ 0°CA is fixed. (Retard max. 12°CA at knock.)
 - Not allowed to update the whole learning compensation factor.
 - Not allowed to calculate the partial learning zone compensation value.
- ISC control: Make the open loop compensation to be the given value (1 g/s). Stop calculating the throttle sensor temperature compensation. (Hold the previous value.)
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

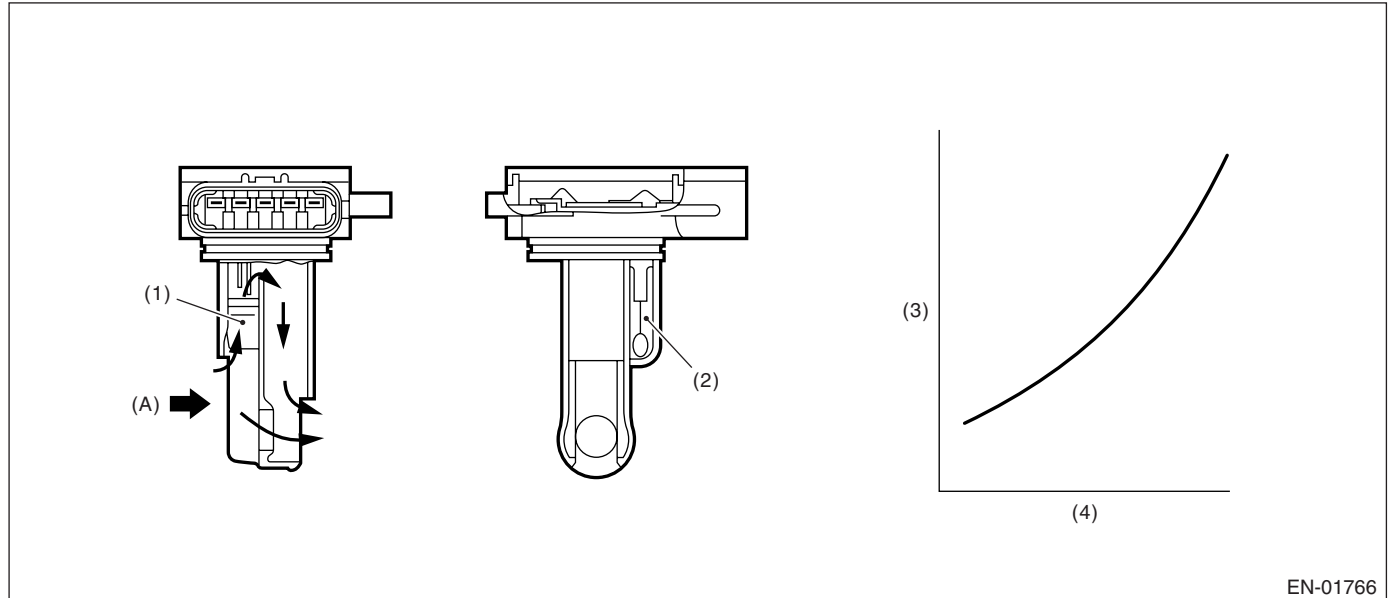
GENERAL DESCRIPTION

K: DTC P0103 MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of air flow sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



- (1) Air flow sensor
(2) Intake air temperature sensor
(3) Voltage (V)
(4) Intake air volume (kg/s)
- (A) Air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 10.9 \text{ V}$

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time until completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	$\geq 4.985 \text{ V}$

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

- Air flow meter: Engine load is normally calculated by manifold pressure and engine speed; however, calculated only by manifold pressure.
- EVAP conc. learning (fuel): Not allowed to learn.
- Knock compensation:
 - Knock compensation final timing advance and retard value = knock compensation + whole learning compensation value + partial learning compensation value.
 - At normal: knock compensation = 0°CA is fixed.
 - At trouble: knock compensation ≠ 0°CA is fixed. (Retard max. 12°CA at knock.)
 - Not allowed to update the whole learning compensation factor.
 - Not allowed to calculate the partial learning zone compensation value.
- ISC control: Make the open loop compensation to be the given value (1 g/s). Stop calculating the throttle sensor temperature compensation. (Hold the previous value.)
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

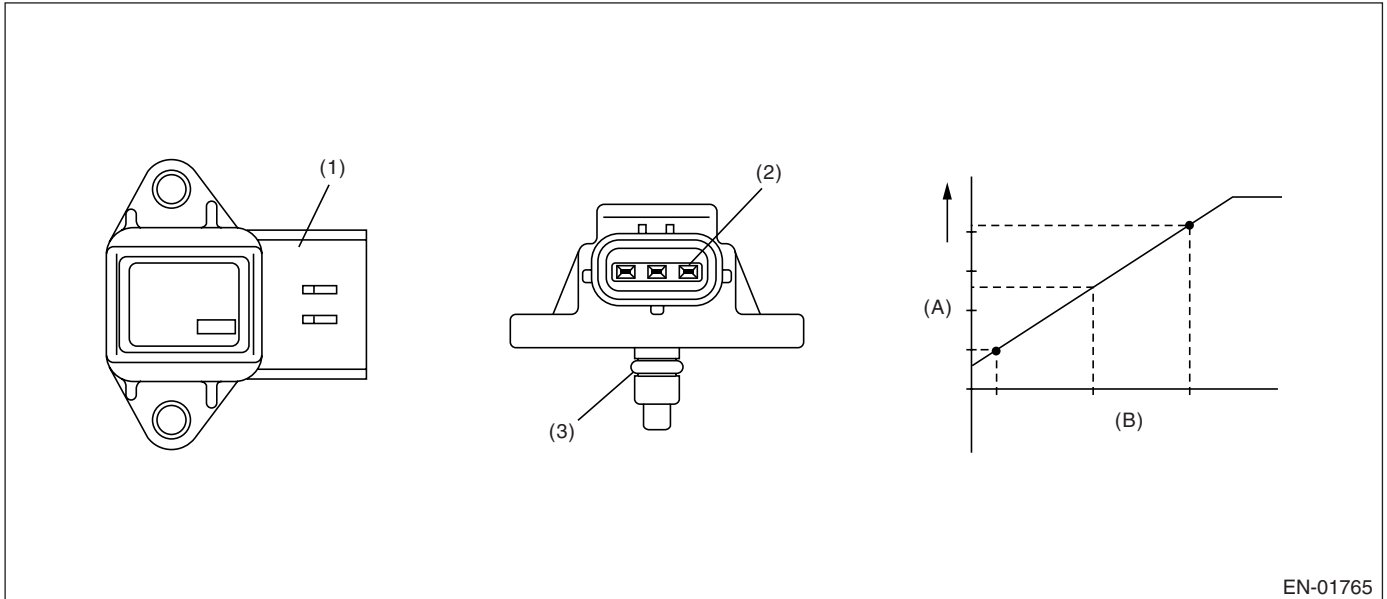
GENERAL DESCRIPTION

L: DTC 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 NG when out of the standard value.

2. COMPONENT DESCRIPTION



- (1) Connector
- (2) Terminal
- (3) O-ring

- (A) Output voltage
- (B) Absolute pressure

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.568 V

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

- Intake manifold pressure sensor process: Estimate the pressure from engine load.
- ISC feedback: Not allowed to calculate the amount of feedback.
- Heavy fuel judgment: Not allowed to carry out the heavy judgment.
- Fuel cut control: Not allowed to cut the over pressure charged fuel.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

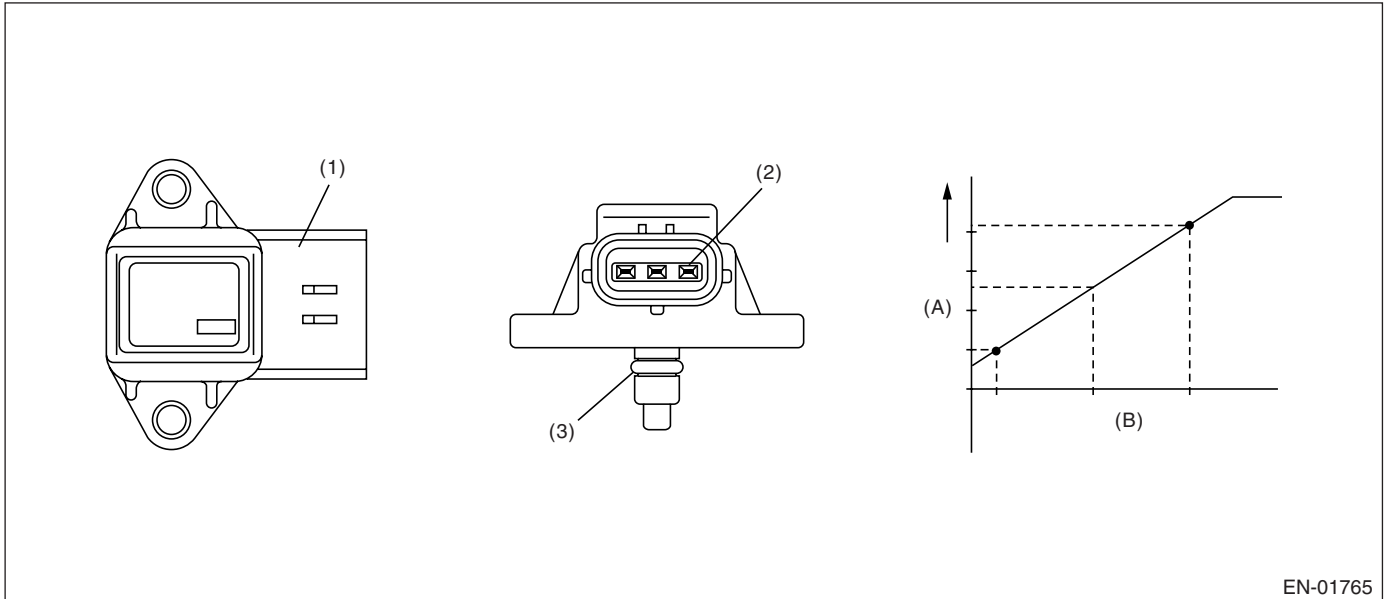
GENERAL DESCRIPTION

M: 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 NG when out of the standard value.

2. COMPONENT DESCRIPTION



- (1) Connector
- (2) Terminal
- (3) O-ring

- (A) Output voltage
- (B) Absolute pressure

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.921 V

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

- Intake manifold pressure sensor process: Estimate the pressure from engine load.
- ISC feedback: Not allowed to calculate the amount of feedback.
- Heavy fuel judgment: Not allowed to carry out the heavy judgment.
- Fuel cut control: Not allowed to cut the over pressure charged fuel.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

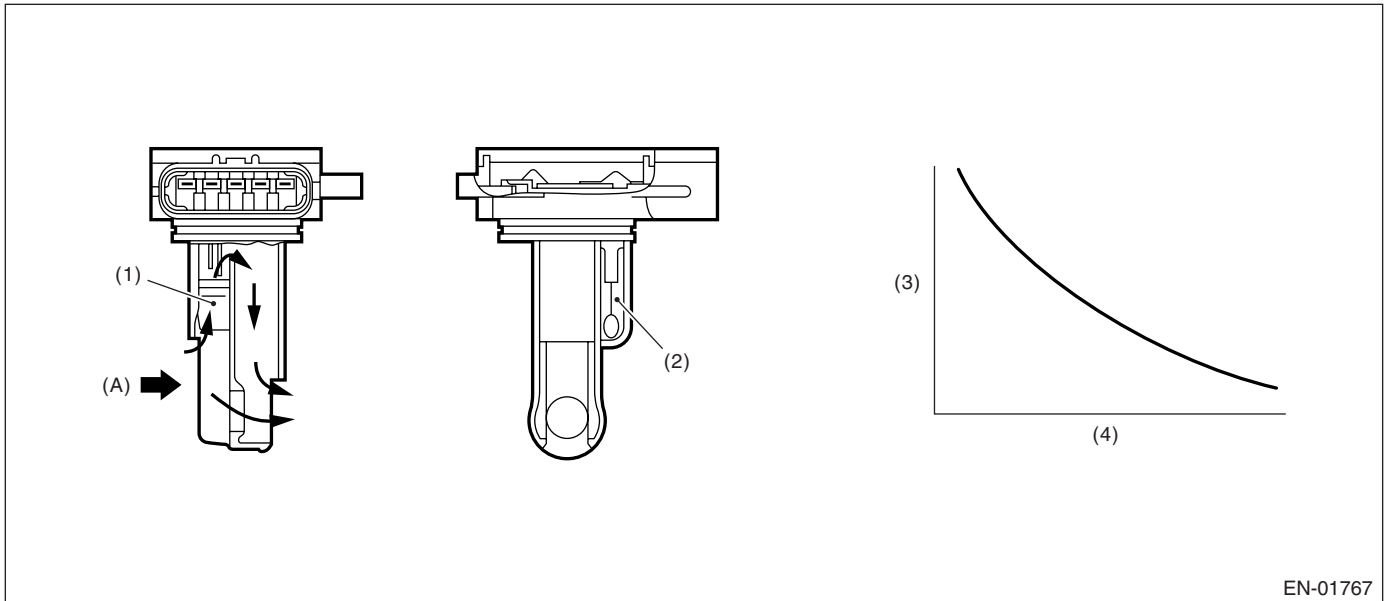
GENERAL DESCRIPTION

N: DTC P0111 INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of intake air temperature sensor output property. Judge NG when the intake air temperature is not varied whereas it seemed to be varied from the viewpoint of engine condition.

2. COMPONENT DESCRIPTION



- (1) Air flow sensor
 - (2) Intake air temperature sensor
 - (3) Resistance value (Ω)
 - (4) Intake air temperature °C (°F)
- (A) Air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Coolant temp. before engine start	< 30°C (86°F)
Engine coolant temperature	> 75°C (167°F)
Battery voltage	≥ 10.9 V
Continuous time when the vehicle speed is less than 50 km/h (31 MPH)	600 seconds or more

4. GENERAL DRIVING CYCLE

Perform the diagnosis when the vehicle speed condition is completed after idling from starting the cooled engine.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 1 second.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage difference between Max. and Min.	< 20 mV (It is equal to approx. 0.5°C (33°F) around 25°.)
Exhaust temperature above 500°C (932°F)	60 seconds or more

Time Needed for Diagnosis: 1 second

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage difference between Max. and Min.	≥ 20 mV

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

Intake air temperature sensor process: Intake air temperature is fixed at 20°C (68°F).

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

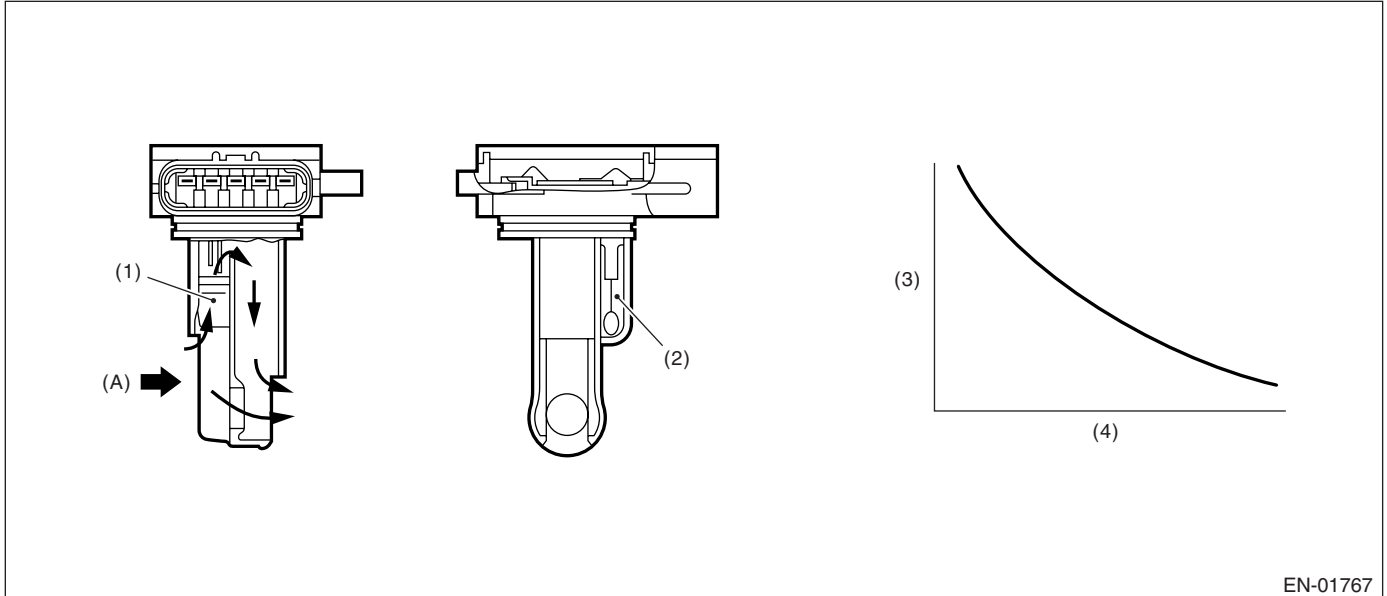
GENERAL DESCRIPTION

O: DTC P0112 INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of intake air temperature sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



- (1) Air flow sensor
 - (2) Intake air temperature sensor
 - (3) Resistance value (Ω)
 - (4) Intake air temperature °C (°F)
- (A) Air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.165 V
Ignition switch	ON

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 0.165 V
Ignition switch	ON

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

Intake air temperature sensor process: Intake air temperature is fixed at 20°C (68°F).

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

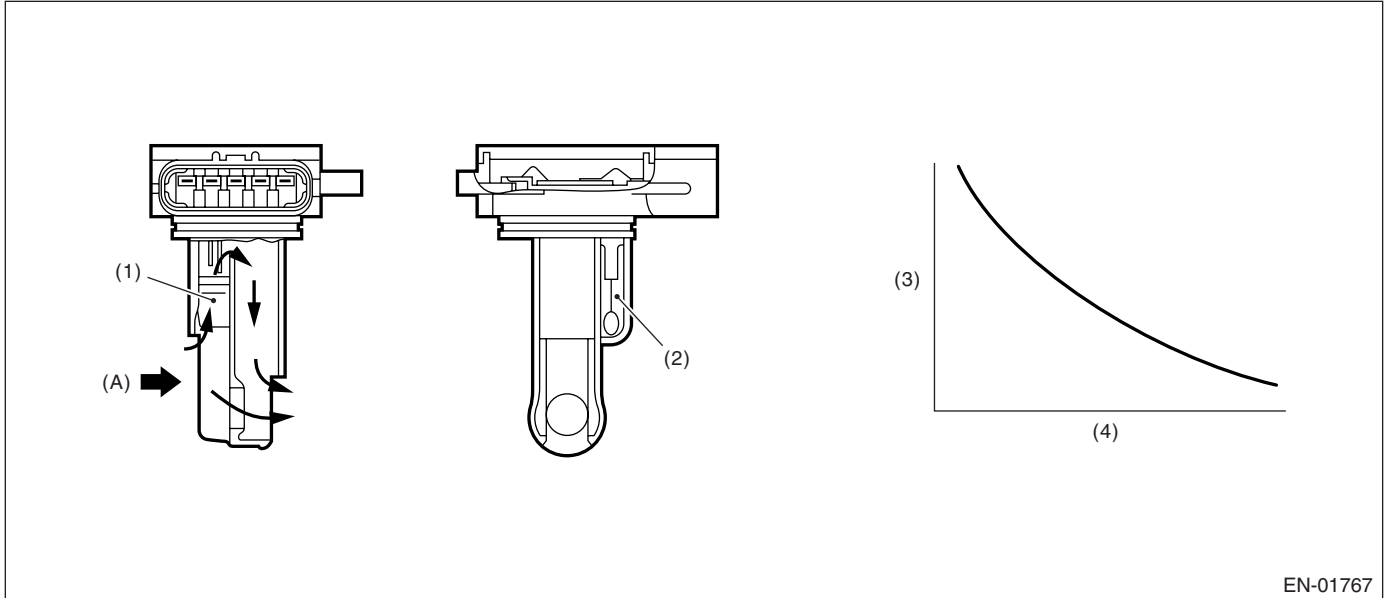
GENERAL DESCRIPTION

P: DTC P0113 INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of intake air temperature sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



- (1) Air flow sensor
 - (2) Intake air temperature sensor
 - (3) Resistance value (Ω)
 - (4) Intake air temperature °C (°F)
- (A) Air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.72 V
Ignition switch	ON

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 0.23 V
Ignition switch	ON

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

Intake air temperature sensor process: Intake air temperature is fixed at 20°C (68°F).

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

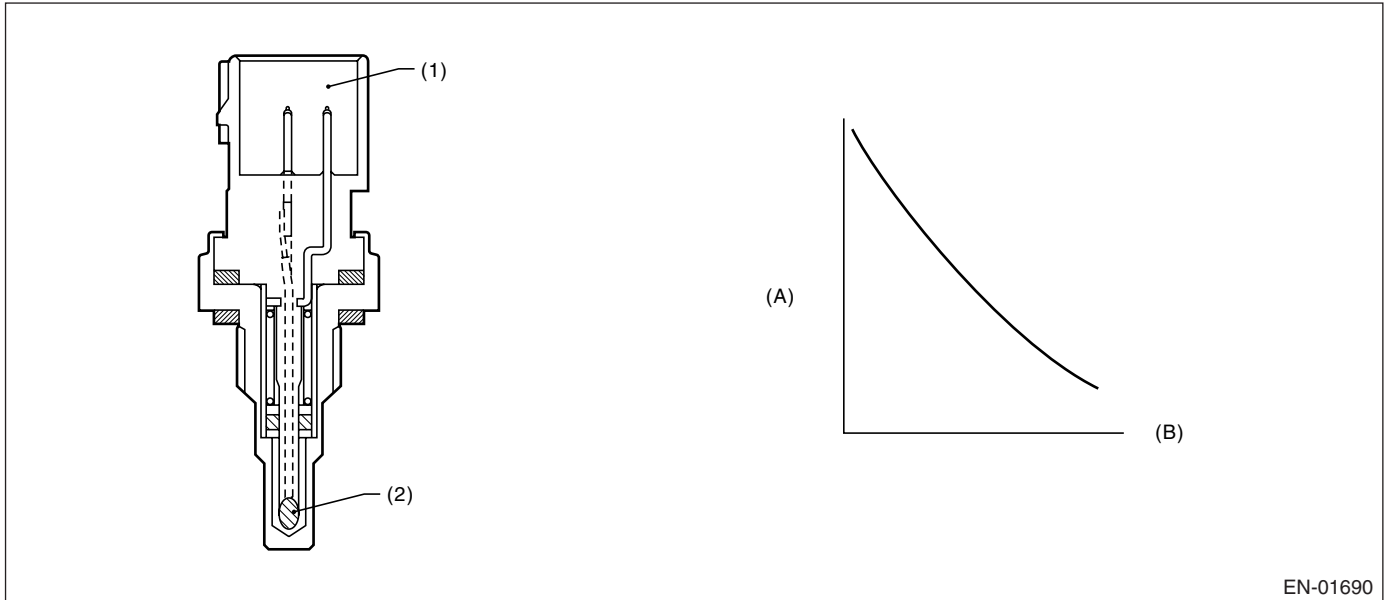
GENERAL DESCRIPTION

Q: DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of engine coolant temperature sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



- (1) Connector
(2) Thermistor element

- (A) Resistance value (k Ω)
(B) Temperature $^{\circ}\text{C}$ ($^{\circ}\text{F}$)

EN-01690

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.165 V

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. FAIL SAFE

- Engine coolant temperature process: Fix the engine coolant temperature at 70°C (158°F).
- ISC feedback: Calculate the target engine speed setting the engine coolant temperature to 70°C (158°F).
- ISC learning: Not allowed to learn.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.
- Air conditioner control: Not allowed to turn the air conditioner to ON.
- Radiator fan control: Both main and sub fan are in High driving.
- Increase compensation factor at high engine coolant temperature: Increase normally occurs with high temperature and other conditions; however, occurs with other conditions except engine coolant temperature condition.
- AVCS control: Make the oil flow control valve driving output to be Duty=0%.
- Tumble generator valve control: Open the tumble generator valve.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

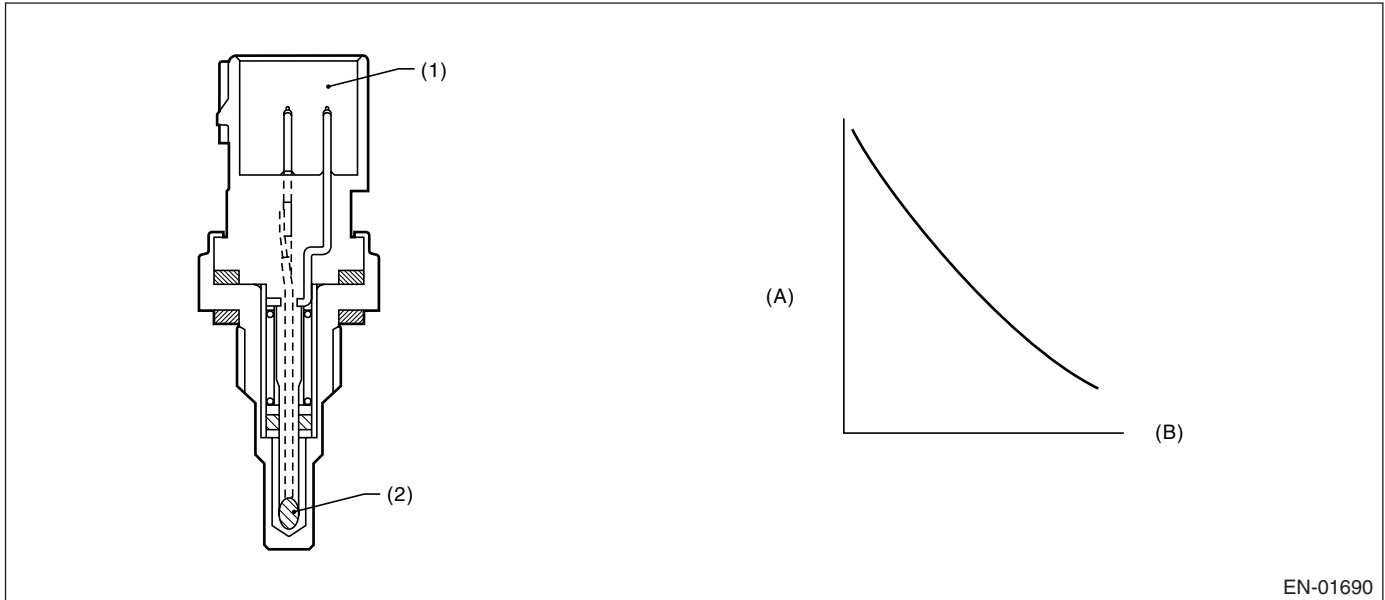
GENERAL DESCRIPTION

R: DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of engine coolant temperature sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



EN-01690

- (1) Connector
(2) Thermistor element

- (A) Resistance value (kΩ)
(B) Temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.716 V

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. FAIL SAFE

- Engine coolant temperature process: Fix the engine coolant temperature at 70°C (158°F).
- ISC feedback: Calculate the target engine speed setting the engine coolant temperature to 70°C (158°F).
- ISC learning: Not allowed to learn.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.
- Air conditioner control: Not allowed to turn the air conditioner to ON.
- Radiator fan control: Both main and sub fan are in High driving.
- Increase compensation factor at high engine coolant temperature: Increase normally occurs with high temperature and other conditions; however, occurs with other conditions except engine coolant temperature condition.
- AVCS control: Make the oil flow control valve driving output to be Duty=0%.
- Tumble generator valve control: Open the tumble generator valve.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

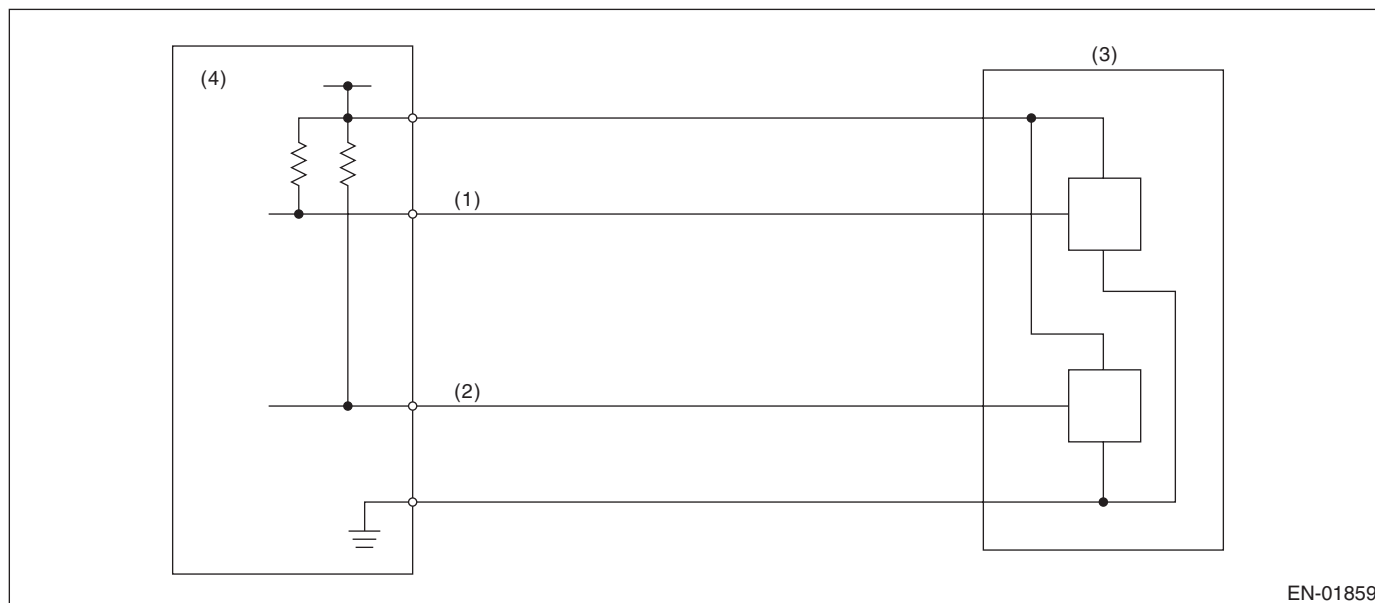
GENERAL DESCRIPTION

S: DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor 1.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



- (1) Throttle position sensor 1 signal
- (2) Throttle position sensor 2 signal
- (3) Throttle position sensor
- (4) Engine control module (ECM)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	≤ 0.309 V

Time Needed for Diagnosis: 24 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only with engine stopped)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

8. FAIL SAFE

Stop power distribution to electronic throttle control motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

Diagnostic Trouble Code (DTC) Detecting Criteria

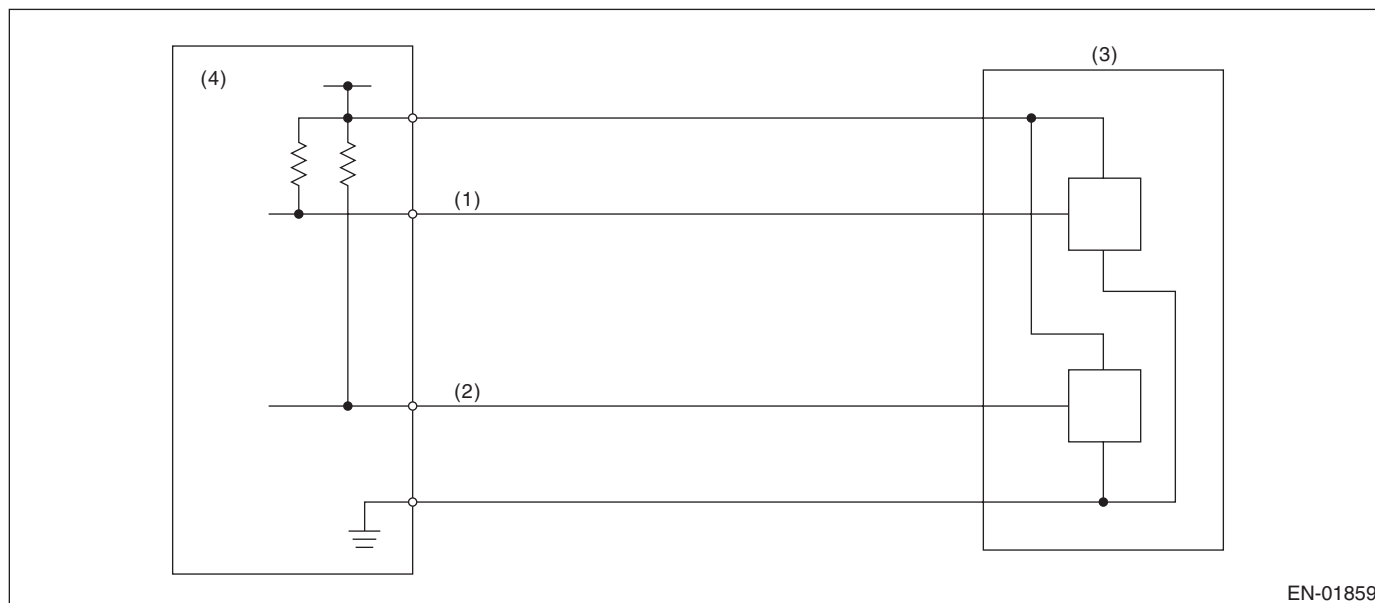
GENERAL DESCRIPTION

T: DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT HIGH INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor 1.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



- (1) Throttle position sensor 1 signal
- (2) Throttle position sensor 2 signal
- (3) Throttle position sensor
- (4) Engine control module (ECM)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	≥ 4.646 V

Time Needed for Diagnosis: 24 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only with engine stopped)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

8. FAIL SAFE

Stop power distribution to electronic throttle control motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

Diagnostic Trouble Code (DTC) Detecting Criteria

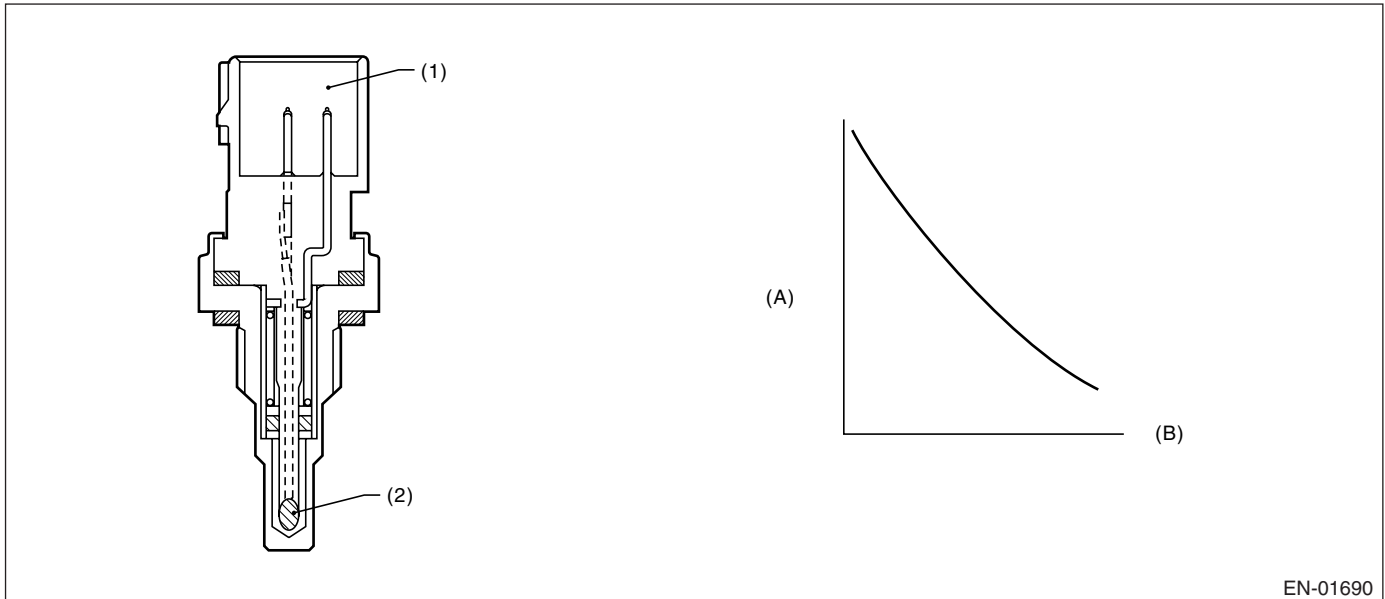
GENERAL DESCRIPTION

U: DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of engine coolant temperature output property. Judge NG when the engine coolant temperature does not rise whereas it seemed to rise from the viewpoint of the engine condition.

2. COMPONENT DESCRIPTION



- (1) Connector
(2) Thermistor element

- (A) Resistance value (kΩ)
(B) Temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Diagnosis of engine coolant temperature sensor property	Not finished
Engine speed	≥ 500 rpm
Battery voltage	> 10.9 V

4. GENERAL DRIVING CYCLE

Perform the diagnosis only once after engine starting.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature	< 20°C (68°F)
Timer for diagnosis after engine starting	≥ Timer judgment value after engine starting

Timer for diagnosis after engine starting

- a) Timer stop at fuel cut mode.
b) During the driving conditions (except a) above), timer count up by 64 milliseconds + TWCNT milliseconds at every 64 milliseconds.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Where, TWCNT is determined as follows,

TWCNT = 0 at idle switch ON,

TWCNT show on the following table at idle switch OFF.

Temperature °C (°F)	Vehicle speed km/h (MPH)							
	0 (0)	8 (4.97)	16 (9.94)	24 (14.9)	32 (19.9)	40 (24.9)	48 (29.8)	56 (34.8)
-20 (-4)	0 ms	37.14 ms	74.27 ms	111.41 ms	126.66 ms	141.91 ms	163.59 ms	185.26 ms
-10 (14)	0 ms	27.39 ms	54.78 ms	82.17 ms	99.65 ms	117.13 ms	135.96 ms	154.80 ms
0 (32)	0 ms	17.65 ms	35.29 ms	52.94 ms	72.64 ms	92.34 ms	108.34 ms	124.33 ms
10 (50)	0 ms	7.90 ms	15.80 ms	23.70 ms	45.63 ms	67.56 ms	80.71 ms	93.87 ms
20 (68)	0 ms	7.90 ms	15.80 ms	23.70 ms	45.63 ms	67.56 ms	80.71 ms	93.87 ms

Judgment value of timer after engine starting

$$t = 451.1 - 25.9 \times T_i$$

T_i is the lowest engine coolant temperature after starting the engine.

Time Needed for Diagnosis: To be determined. (It is varied by the Min. engine coolant temperature and engine conditions such as vehicle speed and engine coolant temperature.)

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature	$\geq 20^{\circ}\text{C}$ (68°F)

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

- Engine coolant temperature process: Fix the engine coolant temperature at 70°C (158°F).
- ISC feedback: Calculate the target engine speed setting the engine coolant temperature to 70°C (158°F).
- ISC learning: Not allowed to learn.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.
- Air conditioner control: Not allowed to turn the air conditioner to ON.
- Radiator fan control: Both main and sub fan are in High driving.
- Increase compensation factor at high engine coolant temperature: Increase normally occurs with high temperature and other conditions; however, occurs with other conditions except engine coolant temperature condition.
- AVCS control: Make the oil flow control valve driving output to be Duty=0%.
- Tumble generator valve control: Open the tumble generator valve.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

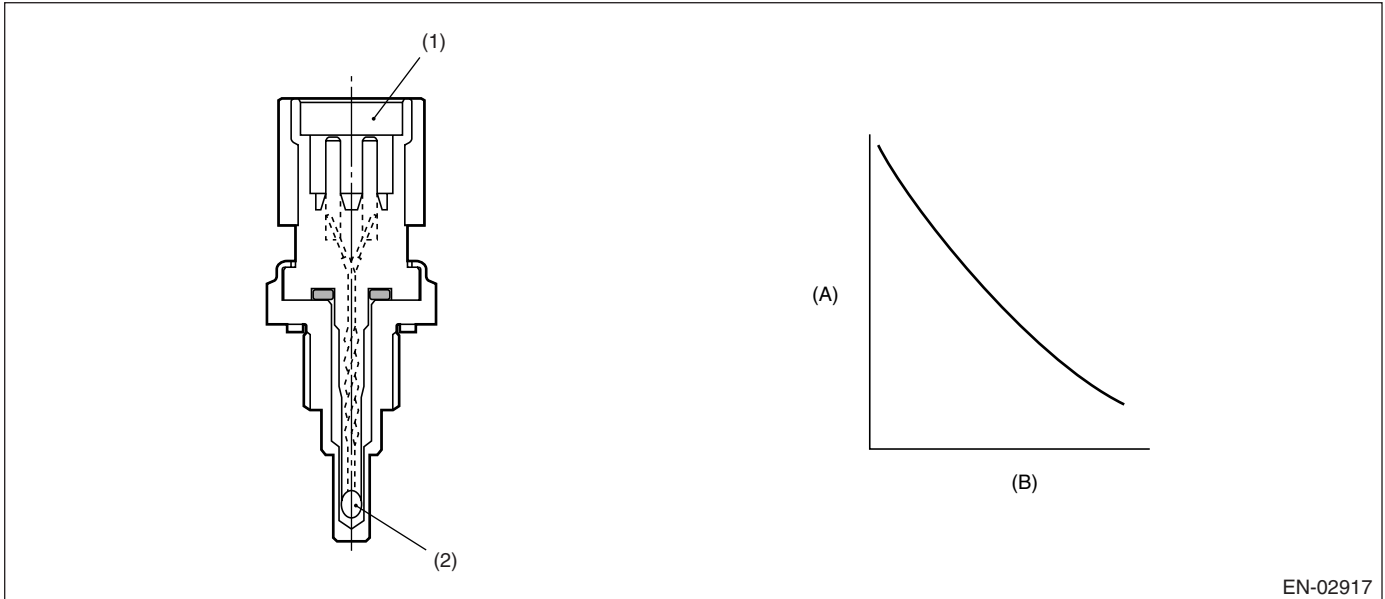
V: DTC P0126 INSUFFICIENT ENGINE COOLANT TEMPERATURE FOR STABLE OPERATION

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of engine coolant temperature sensor property.

The engine coolant temperature and fuel temperature are memorized when stopping the engine at the previous time. Judge NG when the engine coolant temperature does not decrease in the case the engine coolant temperature seems to decrease after starting the engine this time.

2. COMPONENT DESCRIPTION



EN-02917

- (1) Connector
(2) Thermistor element

- (A) Resistance value (k Ω)
(B) Temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Filling fuel from stopping engine at the previous time to starting it this time	No
Fuel level	≥ 15 ℓ
Engine coolant temperature when stopping engine at the previous time	$\geq 70^{\circ}\text{C}$ (158°F) and $< 95^{\circ}\text{C}$ (203°F)

4. GENERAL DRIVING CYCLE

Perform the diagnosis once after starting the engine.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time of completing the malfunction criteria below becomes more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature when stopping engine at the previous time – The lowest engine coolant temperature after starting engine	< 2.5°C (4.5°F)
Fuel temperature when stopping engine at the previous time – Fuel temperature	≥ 5°C (9°F)
Intake air temperature – Fuel temperature	< 2.5°C (4.5°F)
Fuel temperature	< 35°C (95°F)

• Normality Judgment

Judge OK when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature when stopping engine at the previous time – The lowest engine coolant temperature after starting engine	≥ 2.5°C (4.5°F)

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illuminations: Detect when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

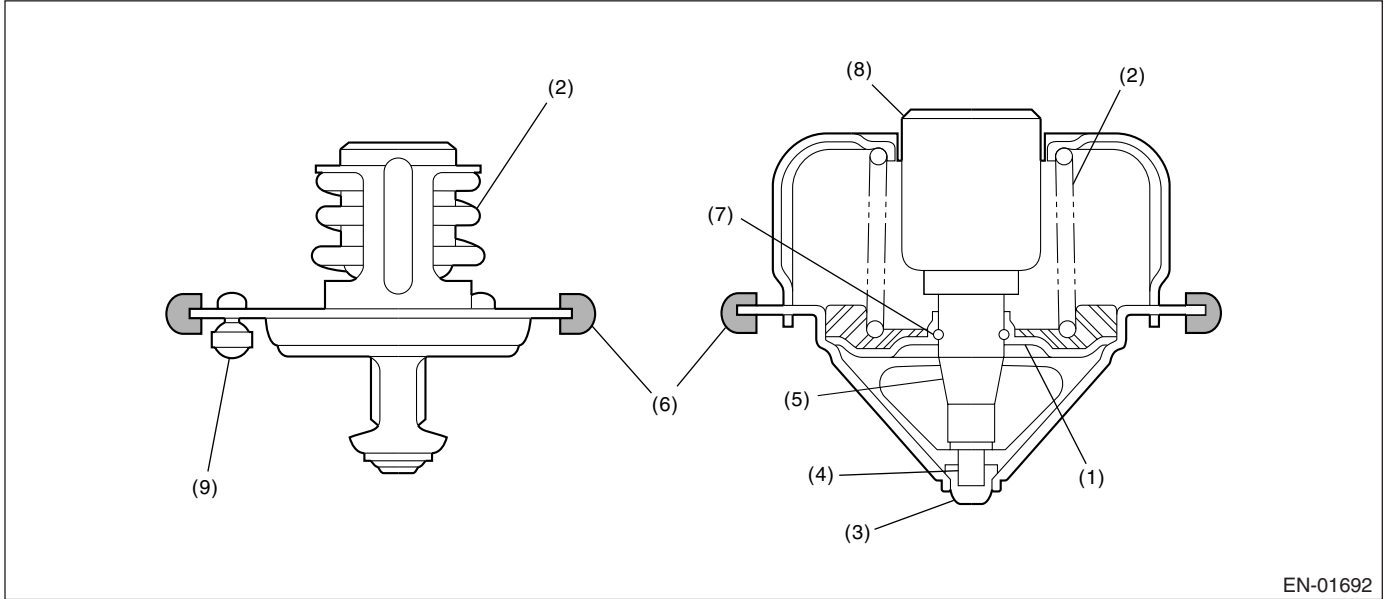
GENERAL DESCRIPTION

W: DTC P0128 COOLANT THERMOSTAT (COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE)

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of thermostat function. Judge NG when the engine coolant temperature is lower than the estimated engine coolant temperature and the difference between them is large. Judge OK when the engine coolant temperature becomes 75°C (167°F) and the difference is small before judging NG.

2. COMPONENT DESCRIPTION



EN-01692

- (1) Valve
- (2) Spring
- (3) Stopper
- (4) Piston
- (5) Guide

- (6) Rubber packing
- (7) Stop ring
- (8) Wax element
- (9) Jiggle valve

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 30 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	$\geq 10.9 \text{ V}$
Estimated ambient air temperature	$\geq -7^{\circ}\text{C}$ (19.4°F)
Thermostat malfunction diagnosis	Not finished
Engine coolant temperature at engine starting	$< 55^{\circ}\text{C}$ (131°F)
Estimated engine coolant temperature	$\geq 75^{\circ}\text{C}$ (167°F)
Engine coolant temperature	$< 75^{\circ}\text{C}$ (167°F)
(Estimated – measured) engine coolant temperature	$> 20^{\circ}\text{C}$ (68°F)

Time Needed for Diagnosis: 30 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	$\geq 10.9 \text{ V}$
Estimated ambient air temperature	$\geq -7^{\circ}\text{C}$ (19.4°F)
Thermostat malfunction diagnosis	Not finished
Engine coolant temperature at engine starting	$< 55^{\circ}\text{C}$ (131°F)
Engine coolant temperature	$\geq 75^{\circ}\text{C}$ (167°F)
(Estimated – measured) engine coolant temperature	$\leq 30^{\circ}\text{C}$ (86°F)

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

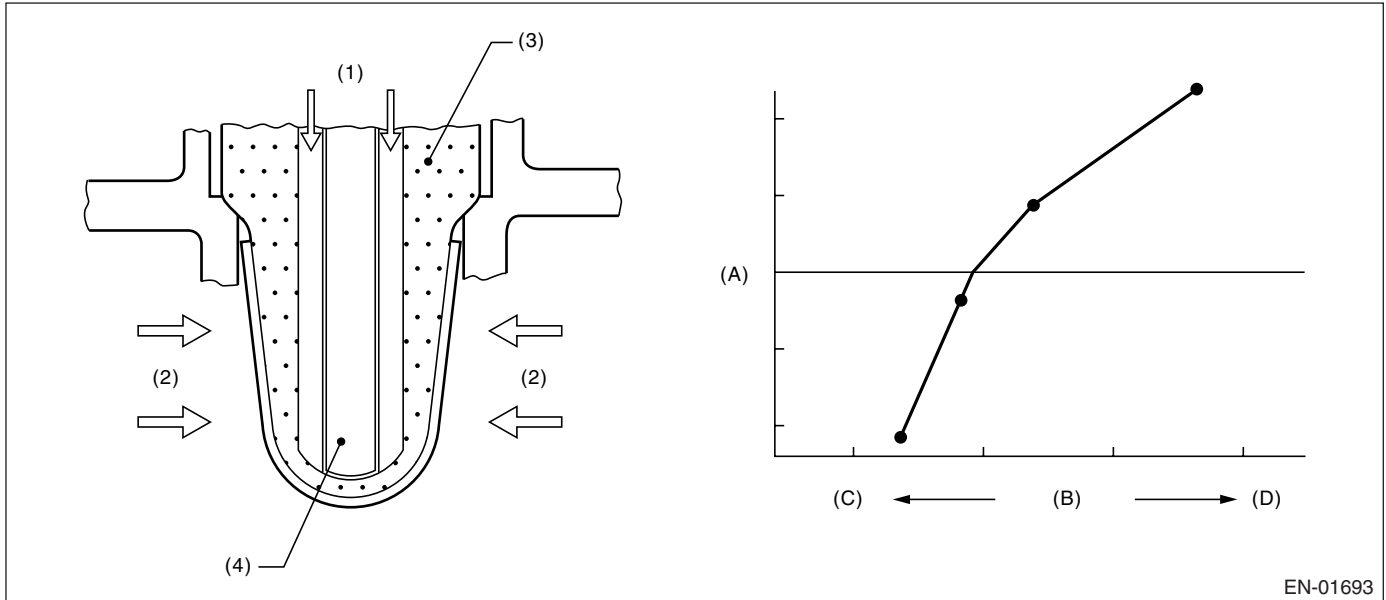
X: DTC P0131 O₂ SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of sensor.

Judge NG when the element impressed voltage is out of range, or the element current is out of range.

2. COMPONENT DESCRIPTION



- (1) Atmosphere
- (2) Exhaust
- (3) ZrO₂
- (4) Ceramic heater

- (A) Electromotive force
- (B) Air fuel ratio
- (C) Lean
- (D) Rich

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing any malfunction criteria below becomes more than 1 second.

Judgment Value

Malfunction Criteria	Threshold Value
Input voltage	< 1.8 V
Input current	< -0.01 A

Time Needed for Diagnosis: 1 second

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor activation judgment: Front oxygen (A/F) sensor full activation is not complete, or front oxygen (A/F) sensor half activation is not complete.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- Compensation when starting the engine at high temperature: Make the MIN value to be 0 from 0.3 normally.
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

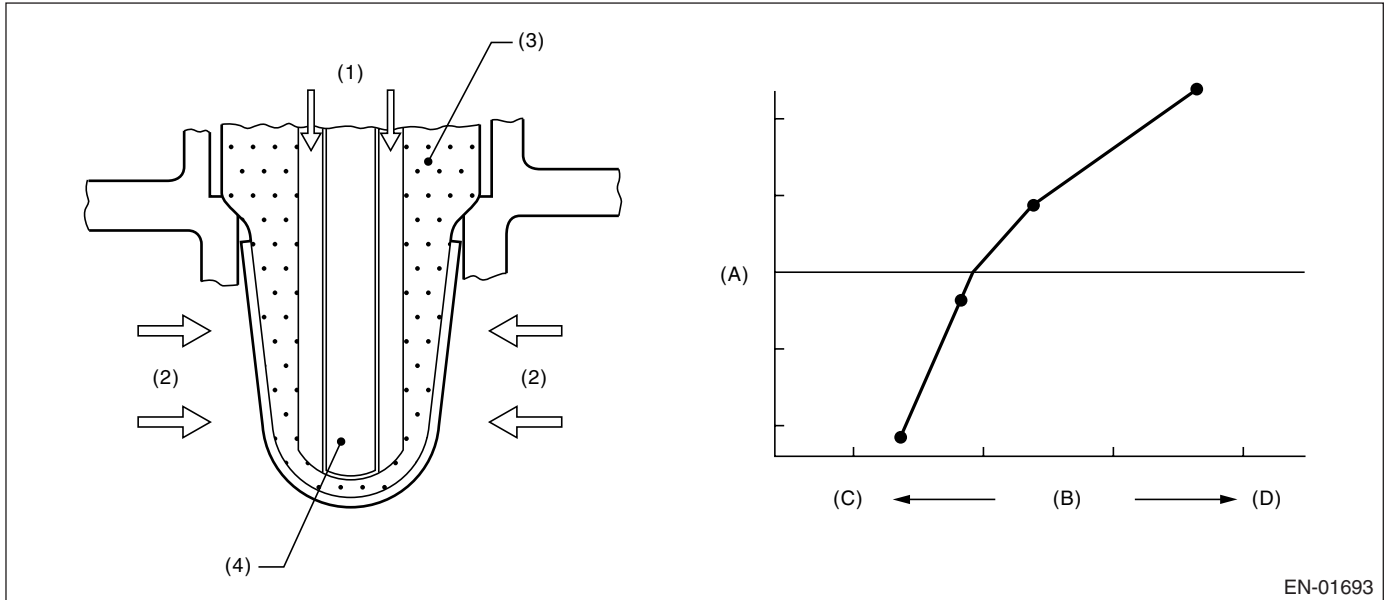
Y: DTC P0132 O₂ SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of sensor.

Judge NG when the element impressed voltage is out of range, or the element current is out of range.

2. COMPONENT DESCRIPTION



- (1) Atmosphere
- (2) Exhaust
- (3) ZrO₂
- (4) Ceramic heater

- (A) Electromotive force
- (B) Air fuel ratio
- (C) Lean
- (D) Rich

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing any malfunction criteria below becomes more than 1 second.

Judgment Value

Malfunction Criteria	Threshold Value
Input voltage	≥ 3.8 V
Input current	≥ 0.01 A

Time Needed for Diagnosis: 1 second

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor activation judgment: Front oxygen (A/F) sensor full activation is not complete, or front oxygen (A/F) sensor half activation is not complete.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- Compensation when starting the engine at high temperature: Make the MIN value to be 0 from 0.3 normally.
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

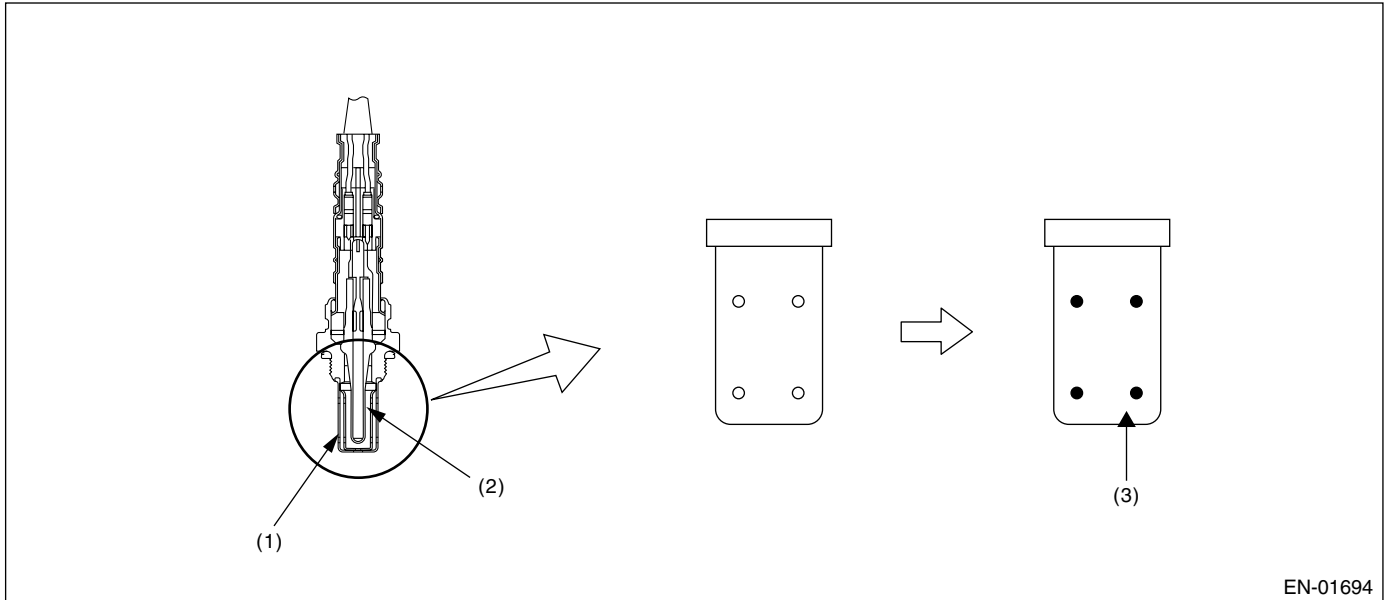
Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Z: DTC P0133 O₂ SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

Detect time-lag of front oxygen (A/F) sensor response. 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 cover has clogged holes, the rich to lean judgment in ECM is delayed when the change from rich to lean is caused.

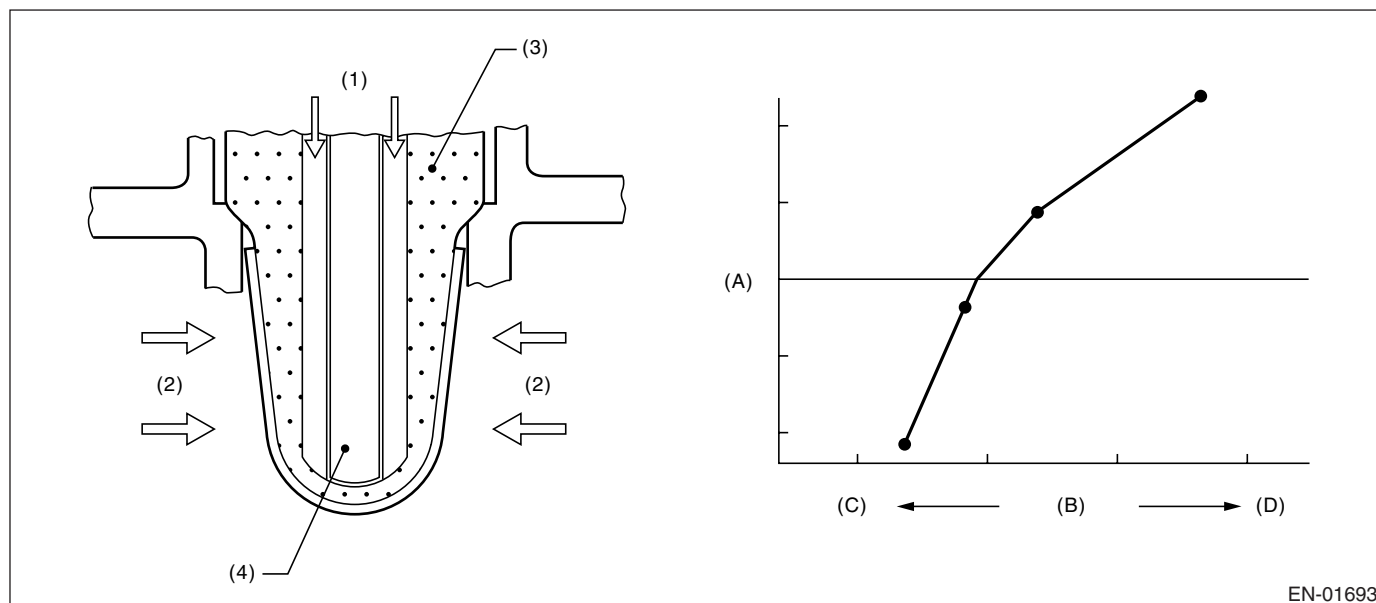


- (1) Cover
- (2) Zirconia
- (3) Clogging

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

2. COMPONENT DESCRIPTION



EN-01693

- (1) Atmosphere
- (2) Exhaust
- (3) ZrO₂
- (4) Ceramic heater

- (A) Electromotive force
- (B) Air fuel ratio
- (C) Lean
- (D) Rich

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
All secondary parameter enable conditions	more than 1 second
Diagnosis of A/F response	Not done
Battery voltage	> 10.9 V
Atmospheric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Closed loop control with main feedback	operating
Impedance of front oxygen (A/F) sensor	0 ↔ 50 Ω
After engine starting	120 seconds or more
Engine coolant temperature	≥ 75°C (167°F)
Engine speed	1,000 ↔ 3,200 rpm
Vehicle speed	10 ↔ 120 km/h (6.21 ↔ 74.6 MPH)
Amount of intake air	10 ↔ 31 g/s
Engine load change during 0.5 engine rev.	≤ 0.01 g/rev
All conditions for EVAP canister purge	to be in enable
Learning value of EVAP conc. during purge	≤ 0.2
Accumulated time of operating canister purge	20 seconds or more

4. GENERAL DRIVING CYCLE

Perform diagnosis only once at a constant speed of 10 to 120 km/h (6.21 to 74.6 MPH) in 120 seconds after starting the engine.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Integrate the difference of faf in every 128 milliseconds and difference of λ value.

After integrate 1,640 times (210 seconds), calculate the diagnosis value.

Judge NG when the malfunction criteria below are completed. Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
$para_{fca} = td2_{faf}/td2_{lmd}$ where, $td2_{faf}(N) = td2_{faf}(n-1) + d2_{faf}(n) $ $td2_{lmd}(N) = td2_{lmd}(n-1) + d2_{lmd}(n) $ add up for a total of 210 seconds $d2_{faf}(n) = (faf(n) - faf(n-1)) - (faf(n-1) - faf(n-2))$ $d2_{lmd}(n) = (lmd(n) - lmd(n-1)) - (lmd(n-1) - lmd(n-2))$ faf = main feedback compensation coefficient every 128 milliseconds lmd = output lambda every 128 milliseconds	≥ 0.30

Time Needed for Diagnosis: 210 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor main learning correction: Not allowed to calculate.
- Correction when re-starting at high temperature: Normally minimum value $0.3 \rightarrow 0$.
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

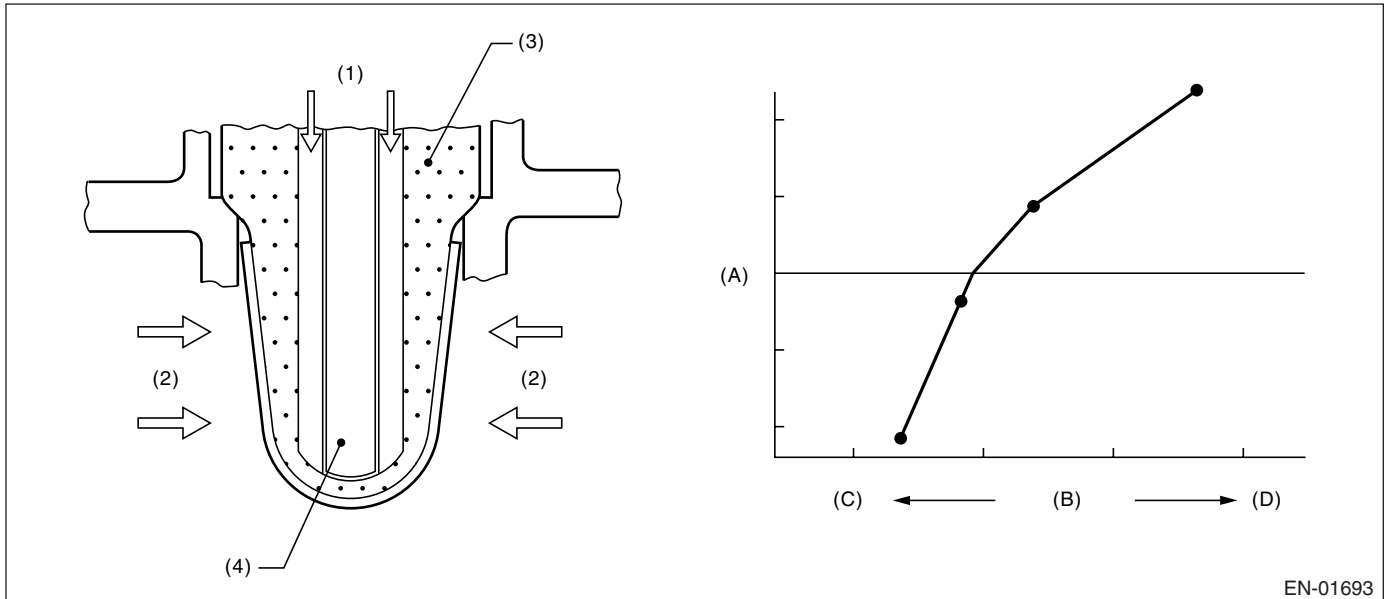
AA:DTC P0134 O₂ SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

Detect the open circuit of sensor.

Judge NG when the element impedance is large.

2. COMPONENT DESCRIPTION



- (1) Atmosphere
- (2) Exhaust
- (3) ZrO₂
- (4) Ceramic heater

- (A) Electromotive force
- (B) Air fuel ratio
- (C) Lean
- (D) Rich

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Voltage	≥ 10.9 V
Time after engine starting	≥ 50 seconds
Variable amount of Front O ₂ (A/F) sensor heater control duty every 128 milliseconds	$\geq 28,000\%$
Front lambda sensor impedance	$\geq 500 \Omega$

Time Needed for Diagnosis: 2 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor activation judgment: Front oxygen (A/F) sensor full activation is not complete, or front oxygen (A/F) sensor half activation is not complete.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- Compensation when starting the engine at high temperature: Make the MIN value to be 0 from 0.3 normally.
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

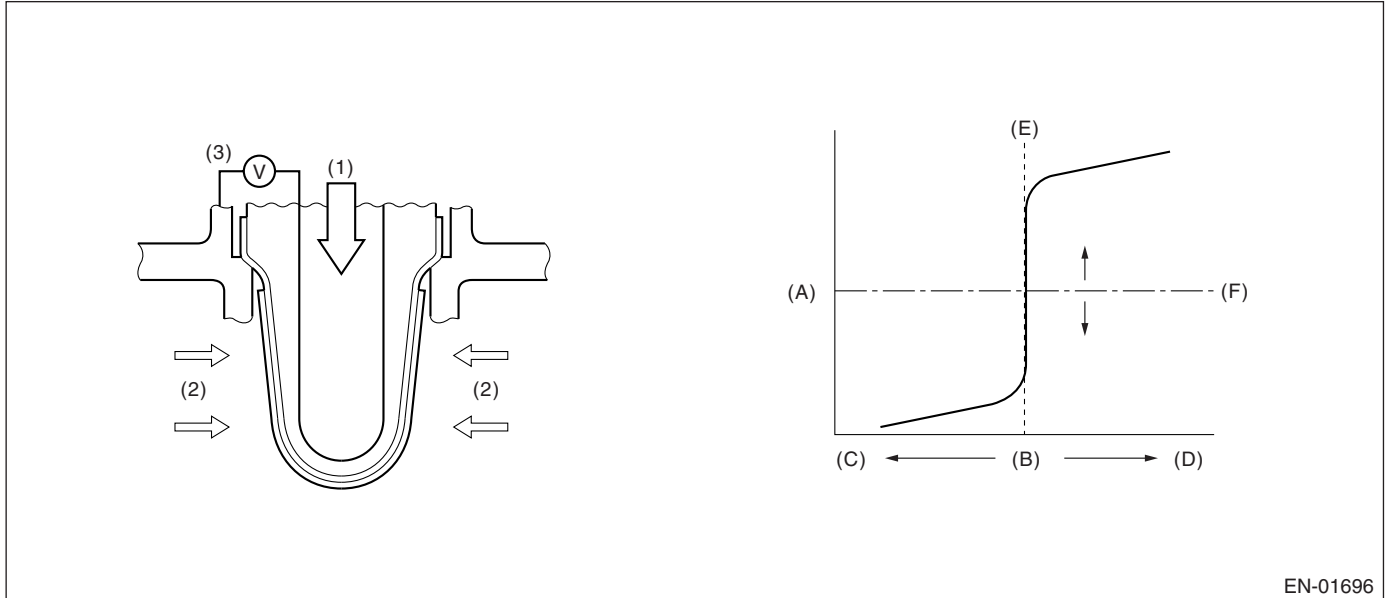
Memorize the freeze frame data. (For test mode \$02)

AB:DTC P0137 O₂ SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2)

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of rear oxygen sensor open or short circuit. Judge NG when the rear oxygen sensor voltage may be abnormal from rear oxygen sensor voltage value with considering the conditions such as intake air amount, engine coolant temperature, main feedback control.

2. COMPONENT DESCRIPTION



EN-01696

- (1) Atmosphere
- (2) Exhaust
- (3) Electromotive force

- (A) Electromotive force
- (B) Air fuel ratio
- (C) Rich
- (D) Lean
- (E) Theoretical air fuel ratio
- (F) Comparative voltage

3. ENABLE CONDITION (USED ONLY FOR MALFUNCTION JUDGMENT)

Secondary Parameters	Enable Conditions
Low side diagnosis of rear oxygen sensor voltage with main feedback control	Incomplete
Closed loop control with main feedback control	In operation
Target output voltage of rear oxygen sensor with main feedback control	$\geq 0.54 \text{ V}$
Amount of intake air with main feedback control	$\geq 10 \text{ g/s}$
Engine coolant temperature with main feedback control	$\geq 75^{\circ}\text{C}$ (167°F)
Misfire detection during 200 engine revs.	< 5 times
Compensation factor for front oxygen (A/F) sensor with main feedback control	Not in limit value
Battery voltage with main feedback control	$> 10.9 \text{ V}$
Cumulative time for completing the conditions with main feedback control	≥ 200 seconds
5 seconds or more fuel shut-off in decel.	Experienced

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

4. GENERAL DRIVING CYCLE

Perform the diagnosis once after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Max. output voltage	< 490 mV

Time Needed for Diagnosis: 200 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Low side diagnosis of rear oxygen sensor voltage	Incomplete
Max. output voltage	≥ 490 mV

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

Sub feedback control: Not allowed

9. ECM OPERATION AT DTC SETTING

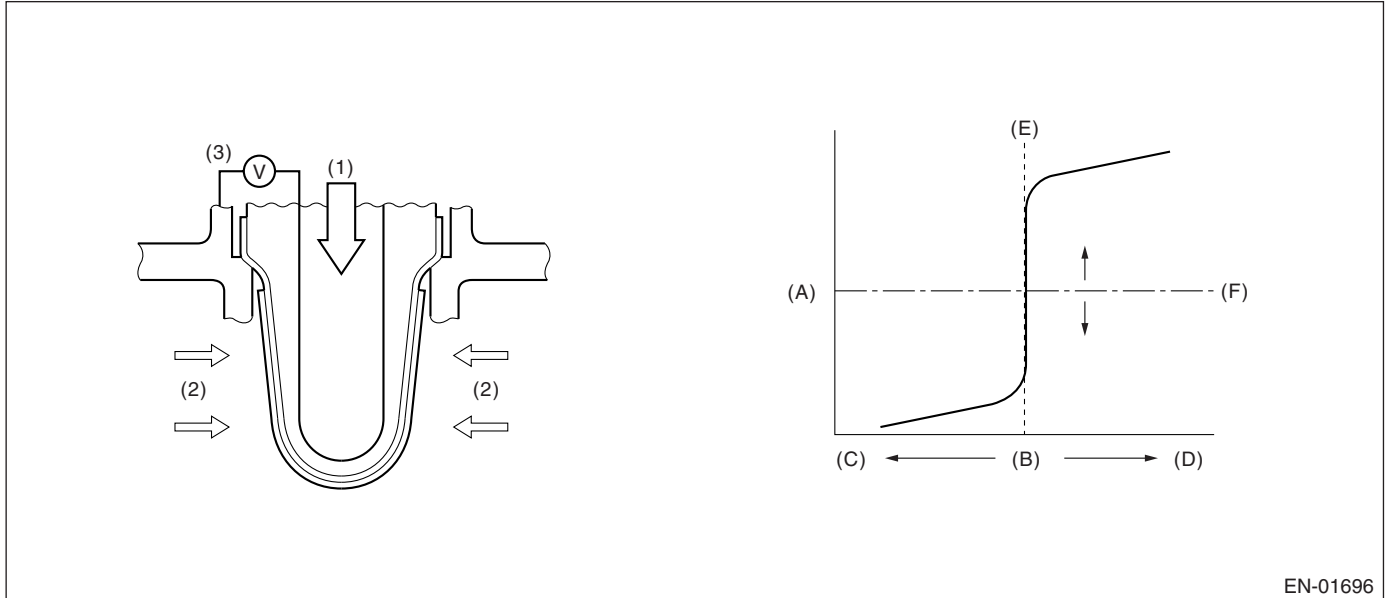
Memorize the freeze frame data. (For test mode \$02)

AC:DTC P0138 O₂ SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2)

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of rear oxygen sensor open or short circuit. Judge NG when the rear oxygen sensor voltage may be abnormal with considering the conditions such as intake air amount, engine coolant temperature, main feedback control.

2. COMPONENT DESCRIPTION



EN-01696

- (1) Atmosphere
- (2) Exhaust
- (3) Electromotive force

- (A) Electromotive force
- (B) Air fuel ratio
- (C) Rich
- (D) Lean
- (E) Theoretical air fuel ratio
- (F) Comparative voltage

3. ENABLE CONDITION (USED ONLY FOR MALFUNCTION JUDGMENT)

Secondary Parameters	Enable Conditions
High side diagnosis of rear oxygen sensor voltage with main feedback control	Incomplete
Closed loop control with main feedback control	In operation
Target output voltage of rear oxygen sensor with main feedback control	$\geq 0.54 \text{ V}$
Amount of intake air with main feedback control	$\geq 10 \text{ g/s}$
Engine coolant temperature with main feedback control	$\geq 75^{\circ}\text{C}$ (167°F)
Misfire detection during 200 engine revs.	< 5 times
Compensation factor for front oxygen (A/F) sensor with main feedback control	Not in limit value
Battery voltage with main feedback control	$> 10.9 \text{ V}$
Cumulative time for completing the conditions with main feedback control	≥ 200 seconds
5 seconds or more fuel shut-off in decel.	Experienced

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

4. GENERAL DRIVING CYCLE

Perform the diagnosis once after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Min. output voltage	> 250 mV

Time Needed for Diagnosis: 200 seconds

Malfunction Indicator Light Illumination: Detect when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
High side diagnosis of rear oxygen sensor voltage	Incomplete
Min. output voltage	≤ 250 mV

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

Sub feedback control: Not allowed

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

AD:DTC P0139 O₂ SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2)

1. OUTLINE OF DIAGNOSIS

Detect the slow response of rear oxygen sensor.

Judge NG when the Rich → Lean response diagnosis or Lean → Rich response diagnosis is NG and judge OK when both response diagnoses are OK.

[Rich → Lean diagnosis response]

(1) When the measured response time is larger than a threshold, since the A/F ratio is rich, the response time of the output change of O₂ sensor when changing from Rich to Lean is measured, and it judges with NG, and when small, it judges with OK.

(2) When O₂ sensor voltage at the time of a fuel shut-off in deceleration return is large (rich), it judges with NG.

[Lean → Rich diagnosis response]

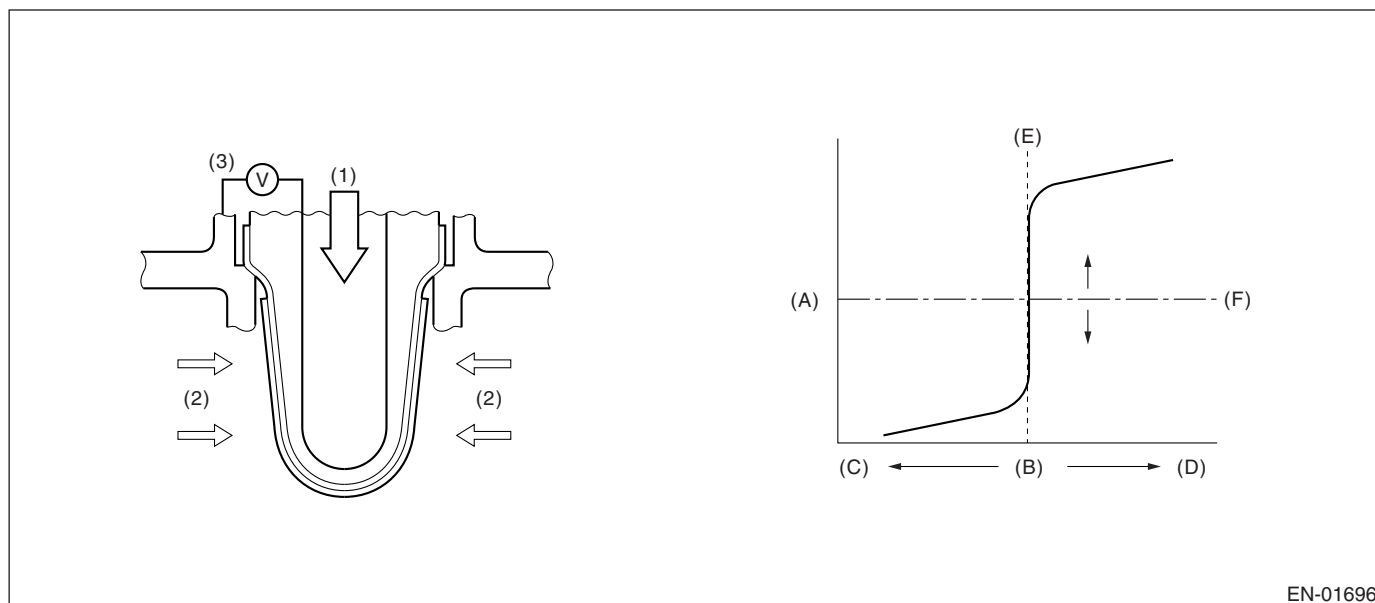
(1) The response time of output change of O₂ sensor when an A/F ratio changes from Lean to Rich is measured, and it is referred to as NG when the measured response time is larger than a threshold.

(2) It is referred to as NG when O₂ sensor voltage after recovery of fuel shut-off in deceleration is small and still small.

• Diagnostic Method

Measure the response time of the output change of the oxygen sensor when the A/F ratio changes from rich to lean. And Judge NG when the measured response time is larger than the threshold value.

2. COMPONENT DESCRIPTION



EN-01696

- (1) Atmosphere
- (2) Exhaust
- (3) Electromotive force

- (A) Electromotive force
- (B) Air fuel ratio
- (C) Rich

- (D) Lean
- (E) Theoretical air fuel ratio
- (F) Comparative voltage

3. ENABLE CONDITION

- Rich → Lean response diagnosis

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

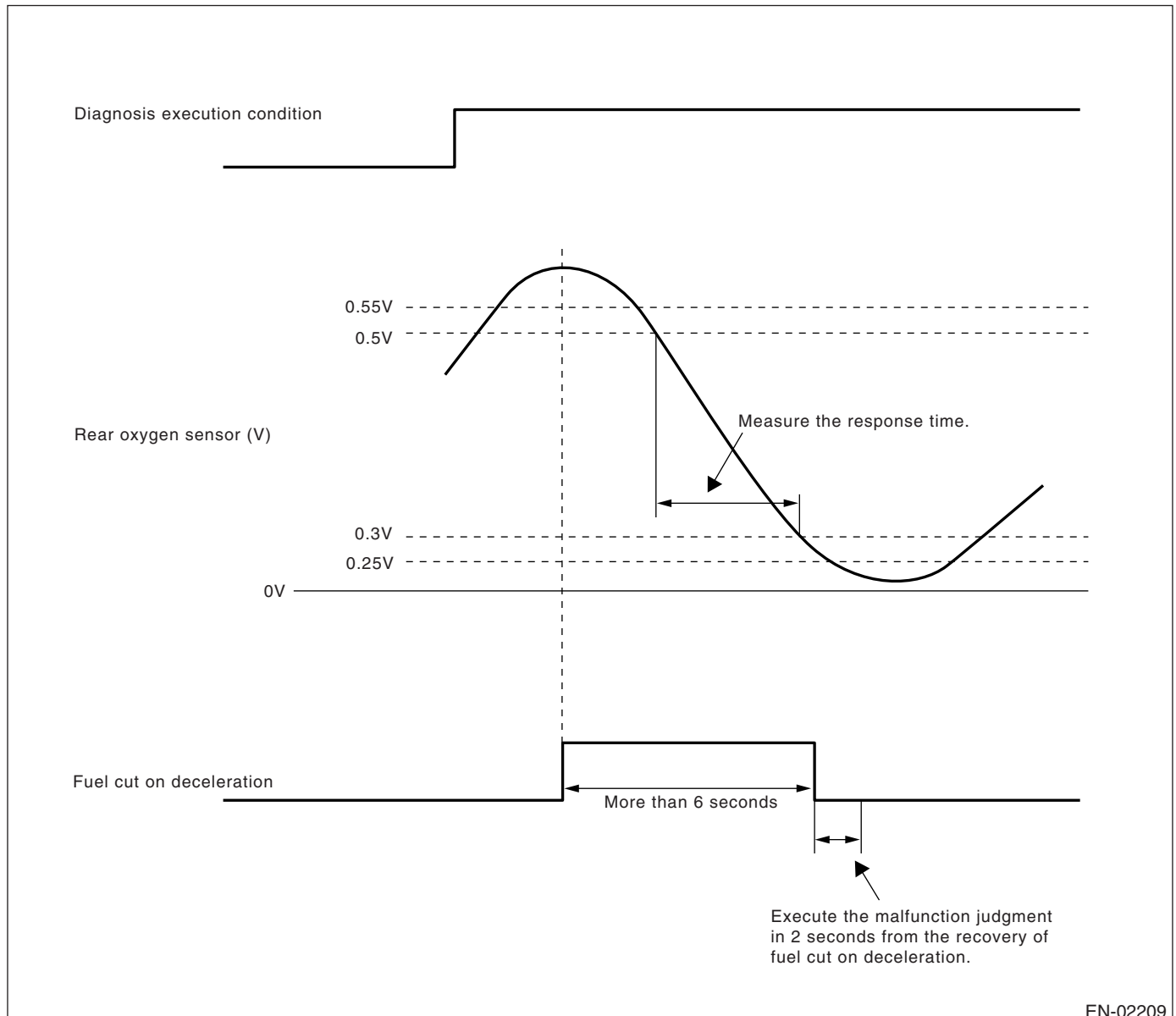
Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
A/F sub feedback control condition	Completed
6 seconds or more fuel shut-off indecel.	Experienced
After fuel cut	≥ 2 seconds
Accumulated time with rear oxygen sensor heater ON	≥ 60 seconds
Continuous time with rear oxygen sensor heater ON	≥ 30 seconds
Catalyst warm-up counter	≥ 11,000 times

4. GENERAL DRIVING CYCLE

Perform the diagnosis only once when fuel shut-off in deceleration after rapid acceleration. (Pay attention to oxygen sensor voltage for the timing of deceleration.)

5. DIAGNOSTIC METHOD

When the oxygen sensor output voltage changes from 0.55 V (rich) to 0.25 V (lean), calculate the Min. value of response time regarded as judgment value while the output varies from 0.5 V to 0.3 V.



Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

• Abnormality Judgment

(1) Judge NG when the judgment value is larger than the threshold value after fuel shut-off in deceleration.
Response time (Diagnosis value) > Threshold value → Abnormal

NOTE:

Variation time of rear oxygen sensor output voltage is short during fuel shut-off in deceleration. Carry out the NG judgment only after the fuel shut-off in deceleration. As for OK judgment, without the condition of fuel shut-off in deceleration, judge OK if the value is below the threshold value.

Judge NG when the malfunction criteria below are completed in 2 seconds after the recovery of fuel shut-off in deceleration which requires 6 seconds or more.

(2) Judge NG when the O₂ sensor voltage after recovery of fuel shut-off in deceleration is large. Judge NG when fuel shut-off in deceleration is also long (6 sec. or more), and although carried out the fuel shut-off in deceleration cut return, when O₂ sensor voltage is large (more than 0.55 V).

Judgment Value

Malfunction Criteria	Threshold Value
Shortest time change from rich (500 mV O ₂ output) to lean (300 mV) if voltage reduces from 550 mV to 250 mV. or Time when more than 550 mV	> 0.698 milliseconds > 2 seconds

Time Needed for Diagnosis: Once

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgement

(1) Judge Normal when the response time (diagnostic value) is smaller than threshold (judgment value) when changing to lean since O₂ sensor voltage.

(2) A normal judging is not carried out.

Judgment Value

Judge OK when the following standards value are completed.

Malfunction Criteria	Threshold Value
Change of the shortest time from rich (500 mV O ₂ output) to lean (300 mV), when voltage decreases from 550 mV to 250 mV.	≤ 0.698 seconds

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

Sub feedback control: Not allowed

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

10.ENABLE CONDITION

- Lean → Rich response diagnosis

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

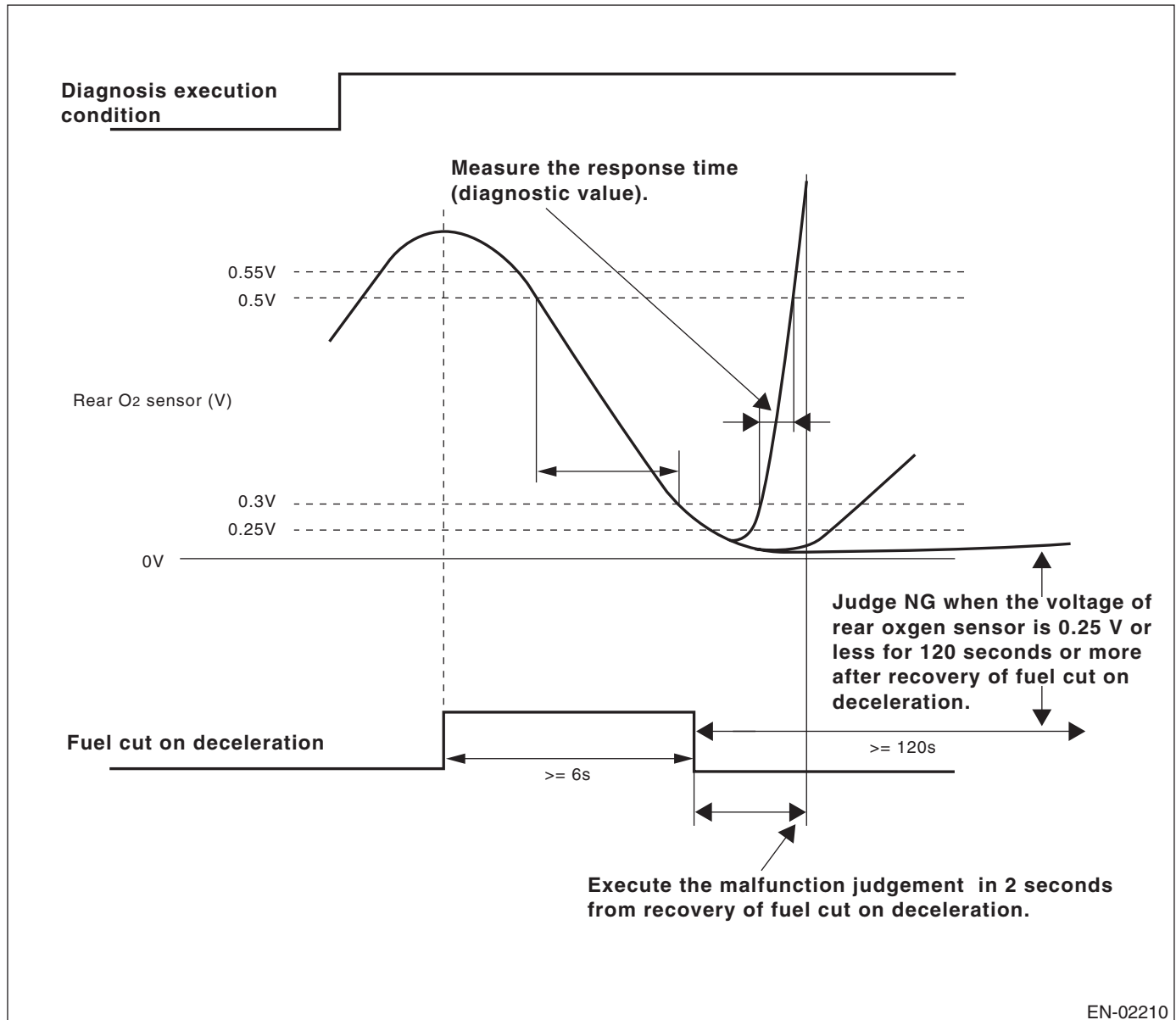
Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
A/F main feedback control condition	Completed
Fuel cut on deceleration ≥ 6 seconds	Experienced
After fuel cut	≥ 2 seconds

11.GENERAL DRIVING CYCLE

Perform the diagnosis only once when fuel shut-off in deceleration after rapid acceleration. (Pay attention to oxygen sensor voltage for the timing of deceleration.)

12.DIAGNOSTIC METHOD

When the oxygen sensor output voltage changes from 0.25 V (lean) to 0.55 V (rich), calculate the Min. value of response time regarded as judgment value while the output varies from 0.3 V to 0.5 V.



EN-02210

• Abnormality Judgment

(1) Judge NG when the judgment value is larger than the threshold value after recovery of fuel shut-off in deceleration.

Response time (Diagnosis value) > Threshold value → Abnormal

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

(2) Judge NG when the O₂ sensor voltage after recovery of fuel shut-off in deceleration is small.

Judgment Value

Malfunction Criteria	Threshold Value
Shortest time change from lean (300 mV O ₂ output) to rich (500 mV) if voltage reduces from 500 mV to 250 mV.	> 2 seconds
Or longest time to change to 250 mV	> 120 seconds

Time Needed for Diagnosis: Once

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgement

(1) Judge Normal when the response time (diagnostic value) is smaller than threshold (judgment value) when changing to lean since O₂ sensor voltage.

Response Time (diagnosis value) ≤ Threshold value → Normal

(2) A normal judging is not carried out.

Judgment Value

Judge OK when the following standards value are completed.

Malfunction Criteria	Threshold Value
Change of the shortest time from rich (300 mV O ₂ output) to lean (500 mV), when voltage decreases from 550 mV to 250 mV.	≤ 2 seconds

13.DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

14.MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

15.FAIL SAFE

Sub feedback control: Not allowed

16.ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

Diagnostic Trouble Code (DTC) Detecting Criteria

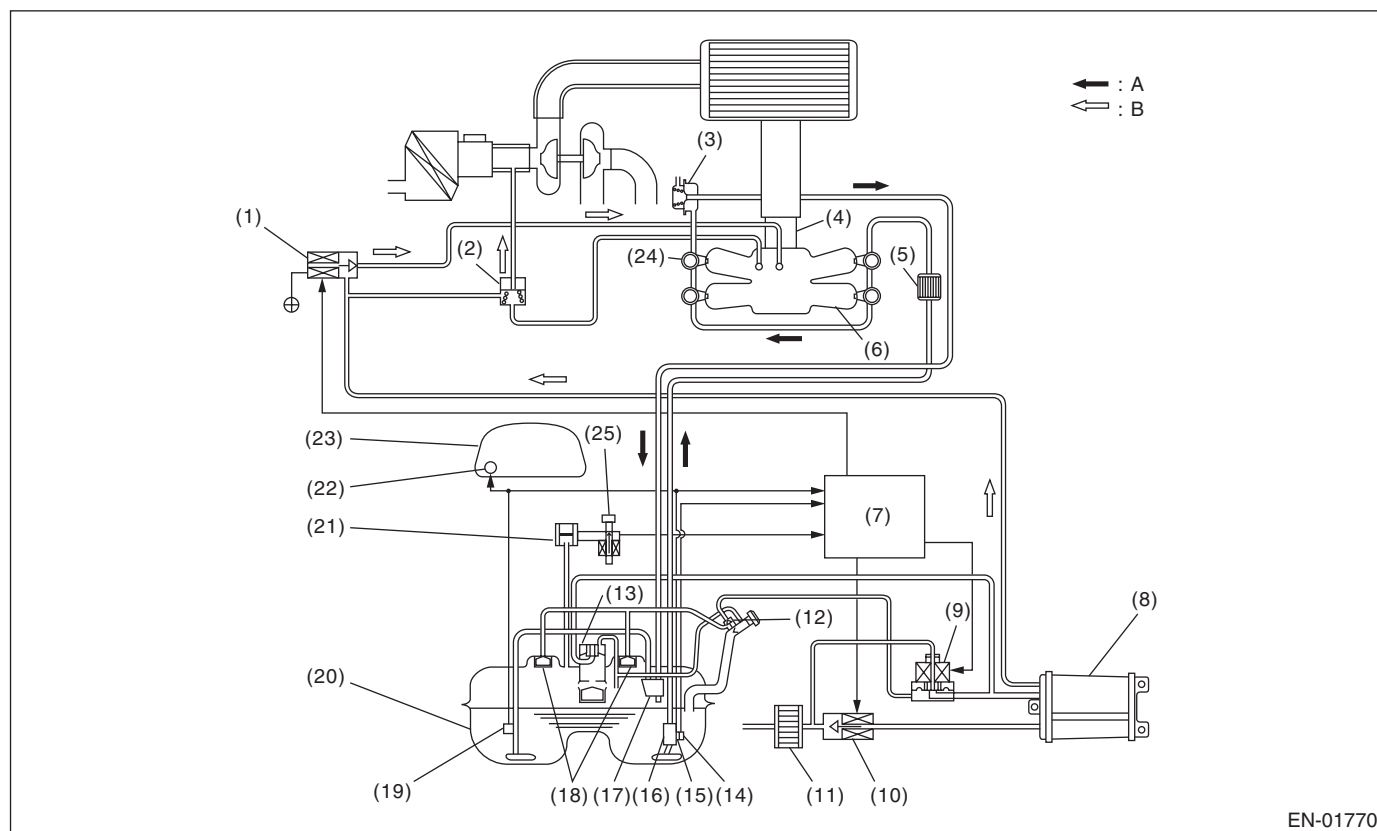
GENERAL DESCRIPTION

AE:DTC P0171 SYSTEM TOO LEAN (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect the fuel system malfunction by the amount of main feedback control.

• Fuel System Diagnosis



EN-01770

(1) Purge control solenoid valve	(14) Fuel temperature sensor
(2) Purge valve	(15) Fuel level sensor
(3) Pressure regulator	(16) Fuel pump
(4) Throttle body	(17) Jet pump
(5) Fuel filter	(18) Fuel cut valve
(6) Intake manifold	(19) Fuel sub level sensor
(7) Engine control module (ECM)	(20) Fuel tank
(8) Canister	(21) Fuel tank pressure sensor
(9) Pressure control solenoid valve	(22) Fuel meter
(10) Drain valve	(23) Combination meter
(11) Drain filter	(24) Fuel injector
(12) Shut-off valve	(25) Tank pressure switching solenoid valve
(13) Vent valve	

• Diagnostic Method

Fuel system is diagnosed by comparing the target air fuel ratio calculated by ECM with the actual air fuel ratio measured by sensor.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
A/F main learning system	In operation
Engine coolant temperature	75 $\longleftrightarrow$ 119°C (167 $\longleftrightarrow$ 246°F)
Engine load	$\geq$ Map 5
Intake air change during 0.5 engine rev.	$\leq$ 0.02 g/rev
Learning value of EVAP conc. during purge	$\leq$ 0.1
Cumulative time of canister purge after engine start	20 seconds or more
Continuous period after canister purge starting	30 seconds or more

Map 5

Engine speed (rpm)	idle	800	1,200	1,600	2,000	2,400	2,800	3,200	3,600	4,000	4,400
Measured value (g/rev)	NA	0.237	0.224	0.221	0.238	0.255	0.267	0.242	0.243	0.258	0.263

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at a constant 60 km/h (37.3 MPH).

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge that the fuel system malfunction occurs when the time during completing the malfunction criteria below continues 30 seconds or more by comparing the diagnosed value (fsobd) with threshold value.

Judgment Value

Malfunction Criteria	Threshold Value
$fsobd = (sglmd - tglmda) + faf + flaf$ where, $sglmd$ = measured lambda $tglmda$ = target lambda faf = main feedback compensation coefficient every 64 milliseconds $flaf$ = main feedback learning compensation coefficient	$\geq fsobdL1$ See Map 4 $fsobdL1$ = lean side threshold value of fsobd

Map 4 Threshold value for fuel system malfunction criteria

Amount of air (g/s)	0	2.4	4.7	7	9.4	11.7
fsobdL1 (%)	40	40	36.9	32.0	27.0	26.5

Time Needed for Diagnosis: 10 seconds $\times$ 3 times

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK when the malfunction criteria below are continued for 10 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
$fsobd = (sglmd - tglmda) + faf + flaf$	$< 19\%$

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When OK with similar drive in 3 driving cycles.
- When "Clear Memory" was performed

7. FAIL SAFE

Rich side malfunction

- Purge control solenoid valve control: Not allowed to purge.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.

8. ECM OPERATION AT DTC SETTING

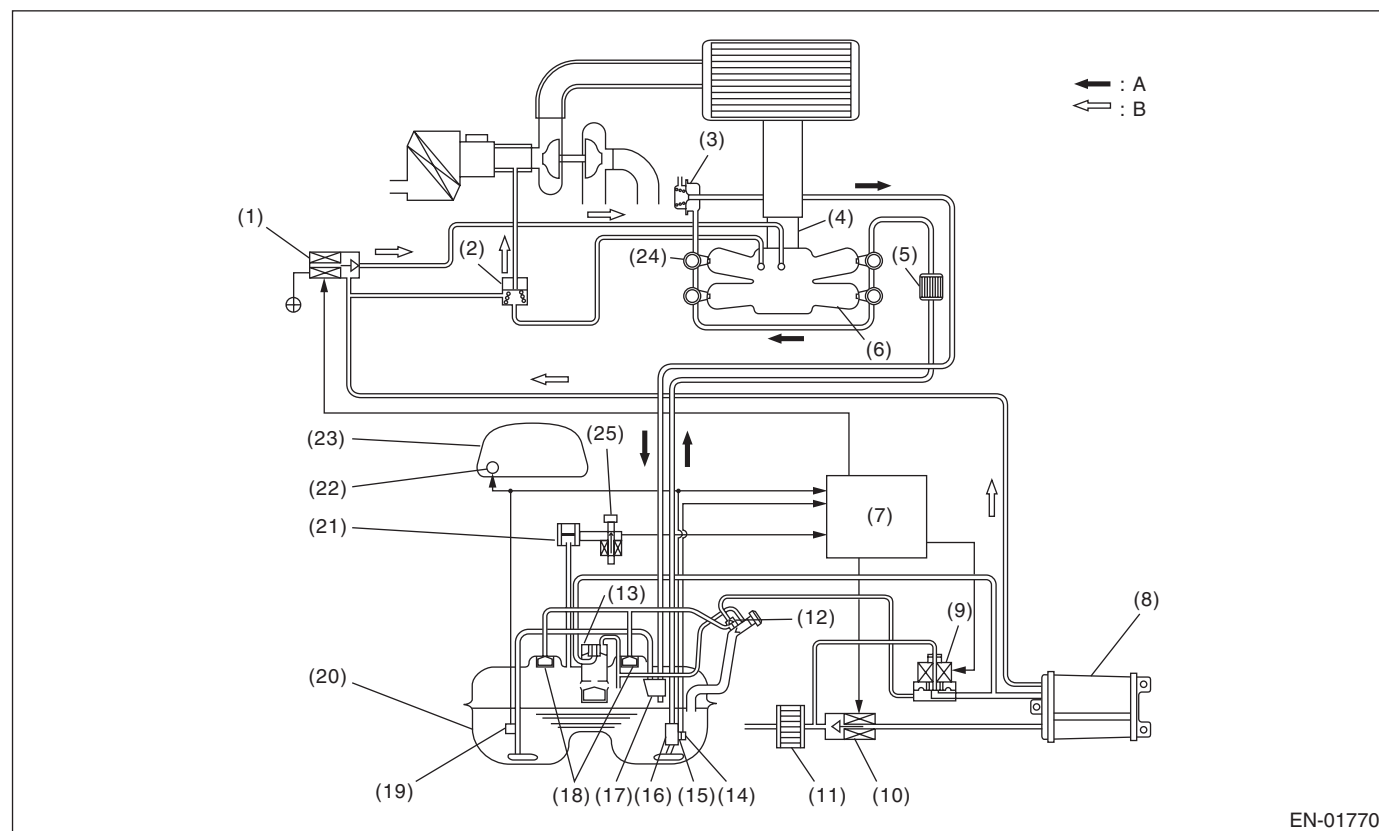
Memorize the freeze frame data. (For test mode \$02)

AF:DTC P0172 SYSTEM TOO RICH (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect the fuel system malfunction by the amount of main feedback control.

• Fuel System Diagnosis



EN-01770

(1) Purge control solenoid valve	(14) Fuel temperature sensor
(2) Purge valve	(15) Fuel level sensor
(3) Pressure regulator	(16) Fuel pump
(4) Throttle body	(17) Jet pump
(5) Fuel filter	(18) Fuel cut valve
(6) Intake manifold	(19) Fuel sub level sensor
(7) Engine control module (ECM)	(20) Fuel tank
(8) Canister	(21) Fuel tank pressure sensor
(9) Pressure control solenoid valve	(22) Fuel meter
(10) Drain valve	(23) Combination meter
(11) Drain filter	(24) Fuel injector
(12) Shut-off valve	(25) Tank pressure switching solenoid valve
(13) Vent valve	

• Diagnostic Method

Fuel system is diagnosed by comparing the target air fuel ratio calculated by ECM with the actual air fuel ratio measured by sensor.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
A/F main learning system	In operation
Engine coolant temperature	75 $\longleftrightarrow$ 119°C (167 $\longleftrightarrow$ 246°F)
Engine load	$\geq$ Map 5
Intake air change during 0.5 engine rev.	$\leq$ 0.02 g/rev
Learning value of EVAP conc. during purge	$\leq$ 0.1
Cumulative time of canister purge after engine start	20 seconds or more
Continuous period after canister purge starting	30 seconds or more

Map 5

Engine speed (rpm)	idle	800	1,200	1,600	2,000	2,400	2,800	3,200	3,600	4,000	4,400
Measured value (g/rev)	NA	0.237	0.224	0.221	0.238	0.255	0.267	0.242	0.243	0.258	0.263

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at a constant 60 km/h (37.3 MPH).

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge that the fuel system malfunction occurs when the time during completing the malfunction criteria below continues 30 seconds or more by comparing the diagnosed value (fsobd) with threshold value.

Judgment Value

Malfunction Criteria	Threshold Value
$fsobd = (sglmd - tglmda) + faf + flaf$ where, $sglmd = \text{measured lambda}$ $tglmda = \text{target lambda}$ $faf = \text{main feedback compensation coefficient every 64 milliseconds}$ $flaf = \text{main feedback learning compensation coefficient}$	$\leq fsobdR1$ See Map 4 $fsobdR1 = \text{rich side threshold value of fsobd}$

Map 4 Threshold value for fuel system malfunction criteria for System E

Amount of air (g/s)	0	2.4	4.7	7	9.4	11.7
fsobdR1 (%)	-40	-40	-36.9	-32.0	-27.0	-27.0

Time Needed for Diagnosis: 10 seconds $\times$ 3 times

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK when the malfunction criteria below are continued for 10 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
$fsobd = (sglmd - tglmda) + faf + flaf$	$\geq -20\%$

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When OK with similar drive in 3 drive cycles.
- When "Clear Memory" was performed

7. FAIL SAFE

Rich side malfunction

- Purge control solenoid valve control: Not allowed to purge.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

AG:DTC P0181 FUEL TEMPERATURE SENSOR “A” CIRCUIT RANGE/PERFORMANCE

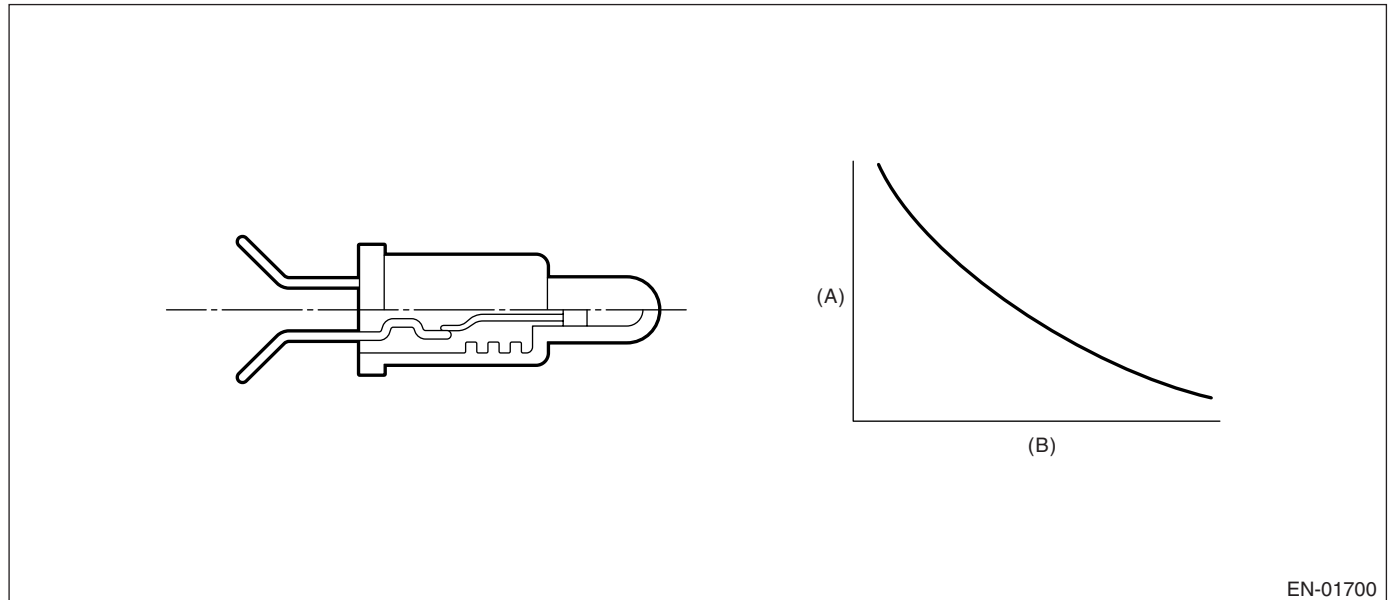
1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel temperature sensor output property. Perform the diagnosis in two methods; namely, drift diagnosis and stuck diagnosis. Judge NG when either of them results in NG, and judge OK when both of them result in OK.

• 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 make an NG judgment.

2. COMPONENT DESCRIPTION



(A) Resistance value (Ω)

(B) Fuel temperature $^{\circ}\text{C}$ ($^{\circ}\text{F}$)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 120 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel level	$\geq 10 \text{ } \emptyset$ (2.64 US gal, 2.20 Imp gal)
After engine starting	20 seconds or more
Engine coolant temperature – engine coolant temperature at engine starting	$> 10^{\circ}\text{C}$ (50°F)
Fuel temperature – engine coolant temperature	$\geq 10^{\circ}\text{C}$ (50°F)
Battery voltage	$> 10.9 \text{ V}$

Time Needed for Diagnosis: 120 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel level	$\geq 10 \text{ } \emptyset$ (2.64 US gal, 2.20 Imp gal)
After engine starting	20 seconds or more
Engine coolant temperature – engine coolant temperature at engine starting	$> 10^{\circ}\text{C}$ (50°F)
Fuel temperature – engine coolant temperature	$< 10^{\circ}\text{C}$ (50°F)
Battery voltage	$> 10.9 \text{ V}$

• Stuck Diagnosis

If the fuel temperature which might rise along with the engine idling (the cumulative amount of intake air after engine starting is large) does not increase, the engine is considered to be stuck and make an NG judgment.

6. ENABLE CONDITION

Secondary Parameters	Enable Conditions
After engine starting	20 seconds or more
Battery voltage	$> 10.9 \text{ V}$

7. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 20 seconds or more after starting the engine.

8. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Accumulated amount of intake air	$\geq 550 \text{ kg}$ (1,212.5 lb)
Fuel temperature difference between Max. and Min.	$< 3^{\circ}\text{C}$ (37.4°F)

Time Needed for Diagnosis: To be determined.

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

• Normality Judgment

Judge OK when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Accumulated amount of intake air	≥ 550 kg (1,212.5 lb)
Fuel temperature difference between Max. and Min.	$\geq 3^{\circ}\text{C}$ (37.4°F)

9. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

10.MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

11.FAIL SAFE

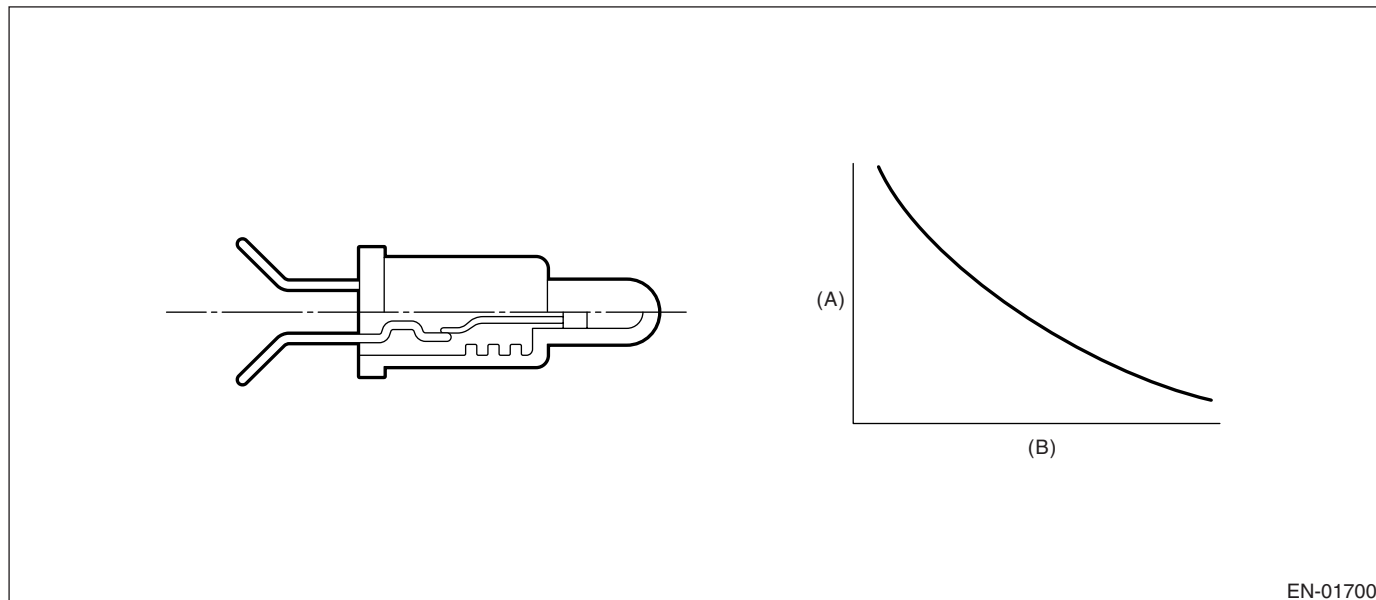
None

12.ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

AH:DTC P0182 FUEL TEMPERATURE SENSOR “A” CIRCUIT LOW INPUT**1. OUTLINE OF DIAGNOSIS**

Detect the open or short circuit of fuel temperature sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION

EN-01700

(A) Resistance value (Ω)

(B) Fuel temperature $^{\circ}\text{C}$ ($^{\circ}\text{F}$)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD**• Abnormality Judgment**

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	$< 0.1646 \text{ V}$
Battery voltage	$\geq 10.9 \text{ V}$

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	$\geq 0.1646 \text{ V}$
Battery voltage	$\geq 10.9 \text{ V}$

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

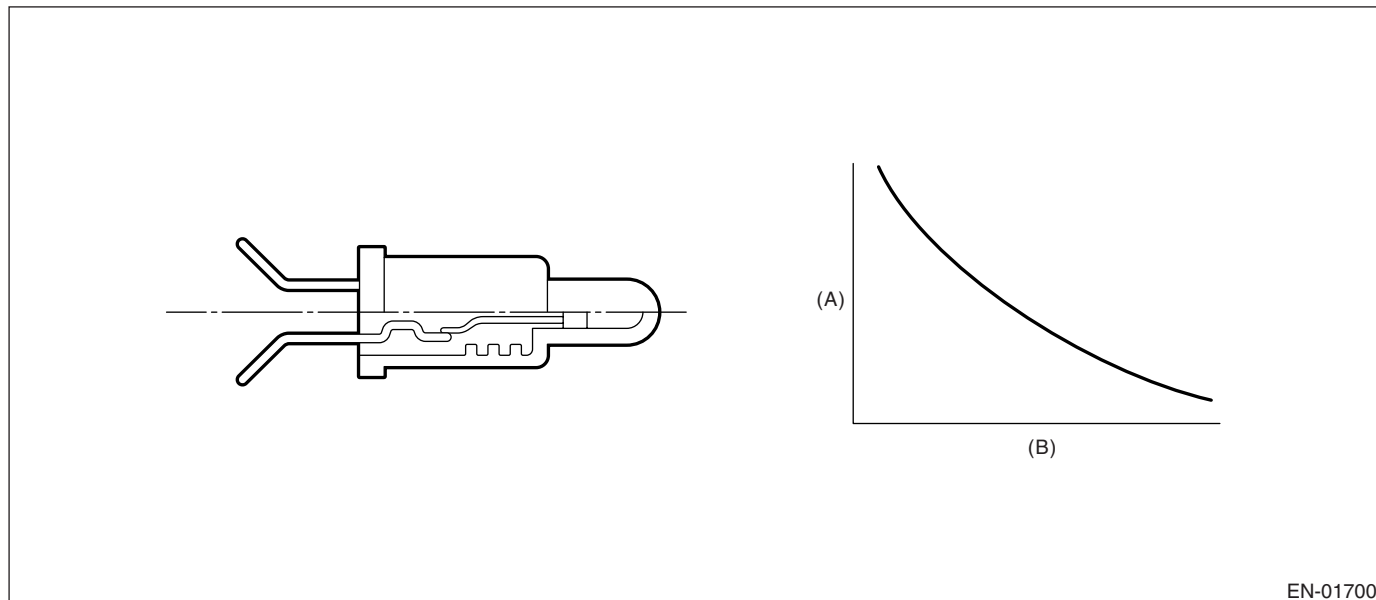
None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

AI: DTC P0183 FUEL TEMPERATURE SENSOR “A” CIRCUIT HIGH INPUT**1. OUTLINE OF DIAGNOSIS**

Detect the open or short circuit of fuel temperature sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION

EN-01700

(A) Resistance value (Ω)

(B) Fuel temperature $^{\circ}\text{C}$ ($^{\circ}\text{F}$)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD**• Abnormality Judgment**

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	$\geq 4.72 \text{ V}$
Battery voltage	$\geq 10.9 \text{ V}$

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	$< 4.72 \text{ V}$
Battery voltage	$\geq 10.9 \text{ V}$

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

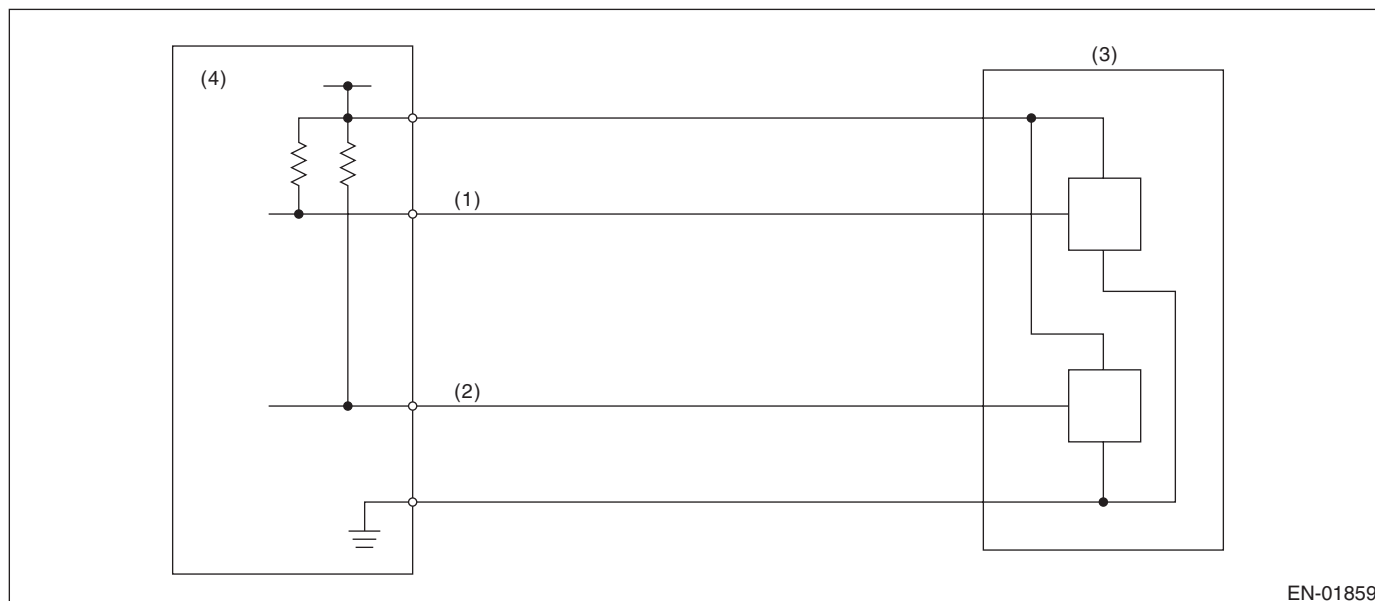
Memorize the freeze frame data. (For test mode \$02)

AJ:DTC P0222 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor 2.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



EN-01859

- (1) Throttle position sensor 1 signal
- (2) Throttle position sensor 2 signal
- (3) Throttle position sensor
- (4) Engine control module (ECM)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	≤ 0.749 V

Time Needed for Diagnosis: 24 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only with engine stopped)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

8. FAIL SAFE

Stop power distribution to electronic throttle control motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

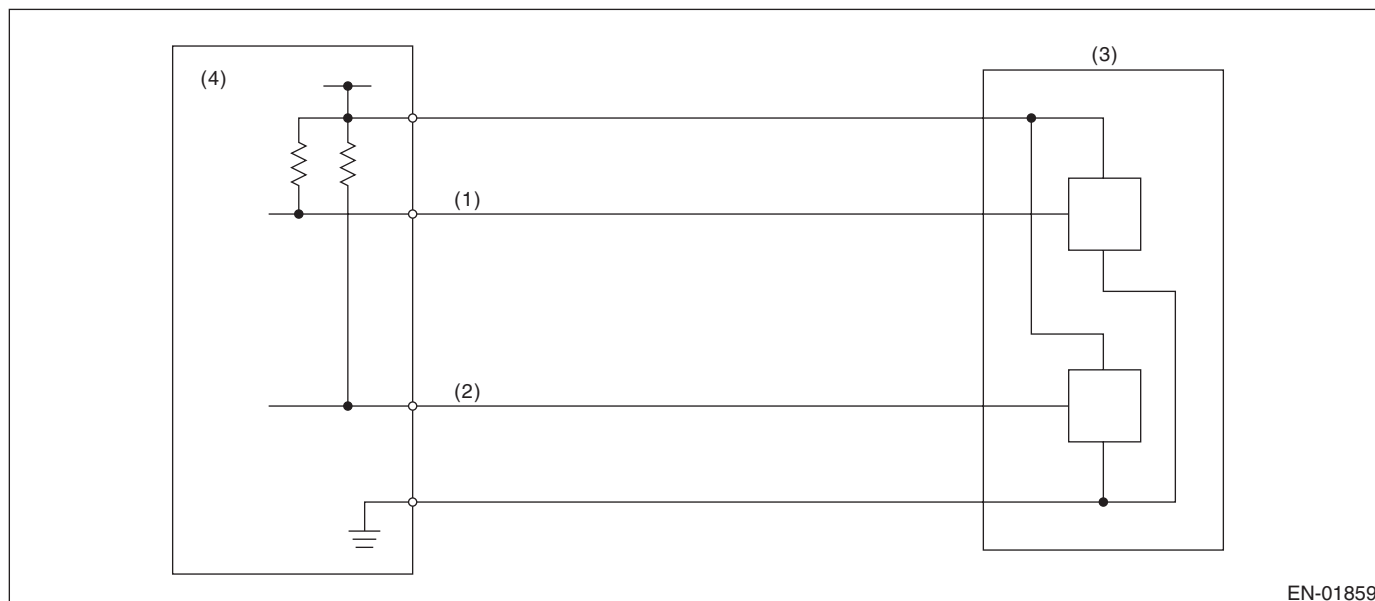
- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

AK:DTC P0223 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT HIGH INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor 2.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



- (1) Throttle position sensor 1 signal
- (2) Throttle position sensor 2 signal
- (3) Throttle position sensor
- (4) Engine control module (ECM)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	≥ 4.747 V

Time Needed for Diagnosis: 24 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only with engine stopped)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only with engine stopped)

8. FAIL SAFE

Stop power distribution to electronic throttle control motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

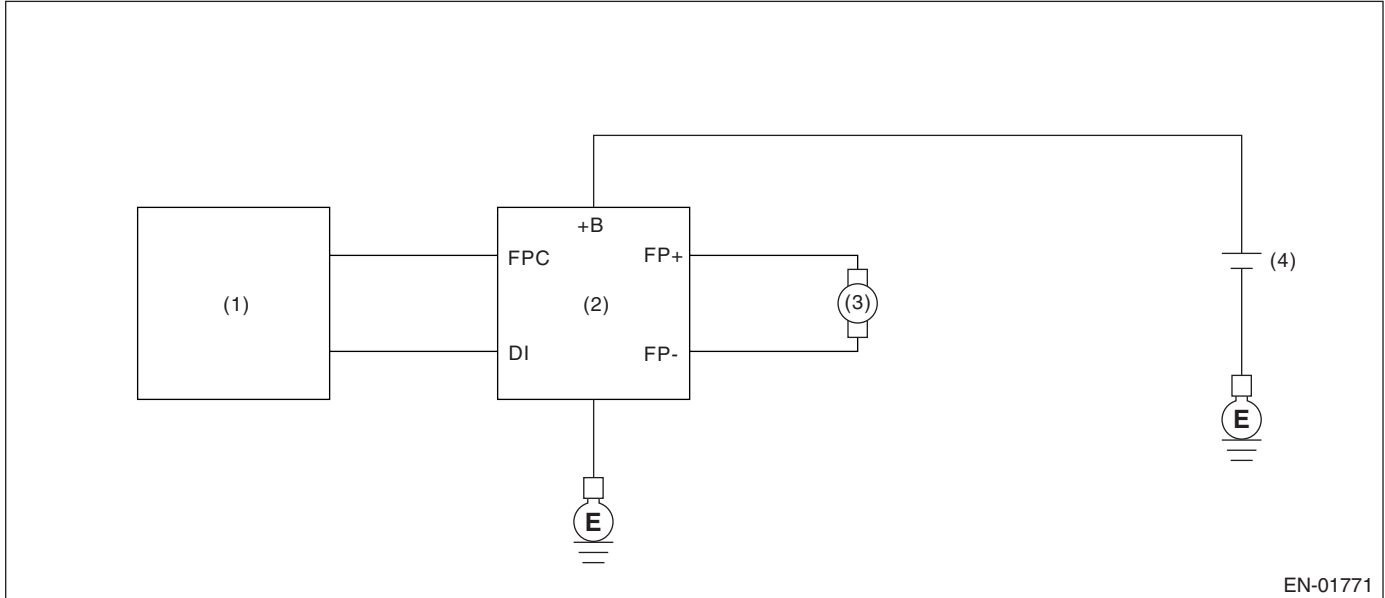
- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

AL:DTC P0230 FUEL PUMP PRIMARY CIRCUIT

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel pump control unit. Judge 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

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 8 V
After engine starting	180 seconds or more
Fuel pump control	ON
Fuel pump control unit output diagnosis signal	Low
Fuel level	≥ 10 ℓ (2.6 US gal, 2.2 Imp gal)

Time Needed for Diagnosis: 2.5 seconds

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

- **Normality Judgment**

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 8 V
After engine starting	30 seconds or more
Fuel pump control	ON
Fuel pump control unit output diagnosis signal	High

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

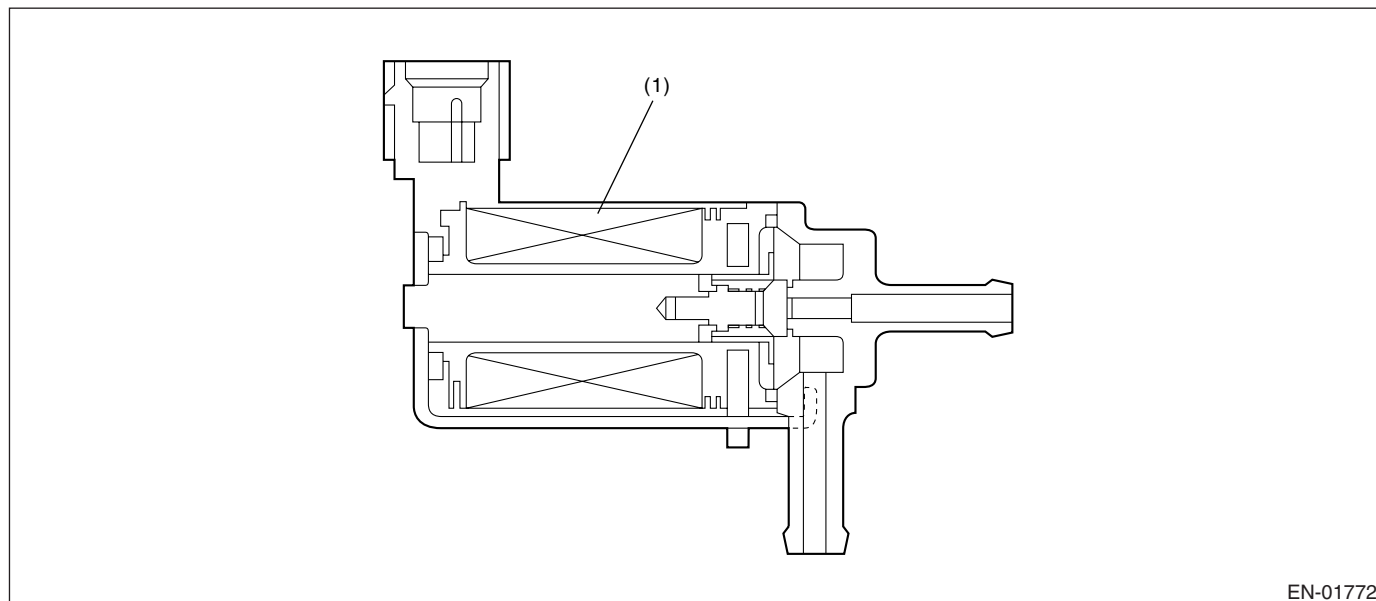
OFF setting may be needed depending on the NG portion.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

**AM:DTC P0244 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A”
RANGE/PERFORMANCE****1. OUTLINE OF DIAGNOSIS**

Detect the malfunction of wastegate control solenoid valve function. Judge NG when becoming high wastegate pressure.

2. COMPONENT DESCRIPTION

(1) Coil

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD**• Abnormality Judgment**

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Intake manifold pressure	≥ Map 10

Map 10

Pa (kPa (mmHg, inHg))	56.7 (440,17.3)	67.2 (504, 19.8)	75.7 (568, 22.4)	84.3 (632, 24.9)	92.8 (696, 27.4)	101.3 (760, 29.9)
Abnormal threshold (kPa (mmHg, inHg))	170.0 (1,275, 50.2)	184.4 (1,383, 54.4)	199.1 (1,493, 58.8)	213.3 (1,600, 63.0)	228.0 (1,710, 67.3)	228.0 (1,710, 67.3)
Normal threshold (kPa (mmHg, inHg))	147.6 (1,107, 43.6)	162.0 (1,215, 47.8)	176.7 (1,325, 52.2)	190.9 (1,432, 56.4)	205.6 (1,542, 60.7)	205.6 (1,542, 60.7)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Intake manifold pressure	< Map 10

Time Needed for Diagnosis: 1 second

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

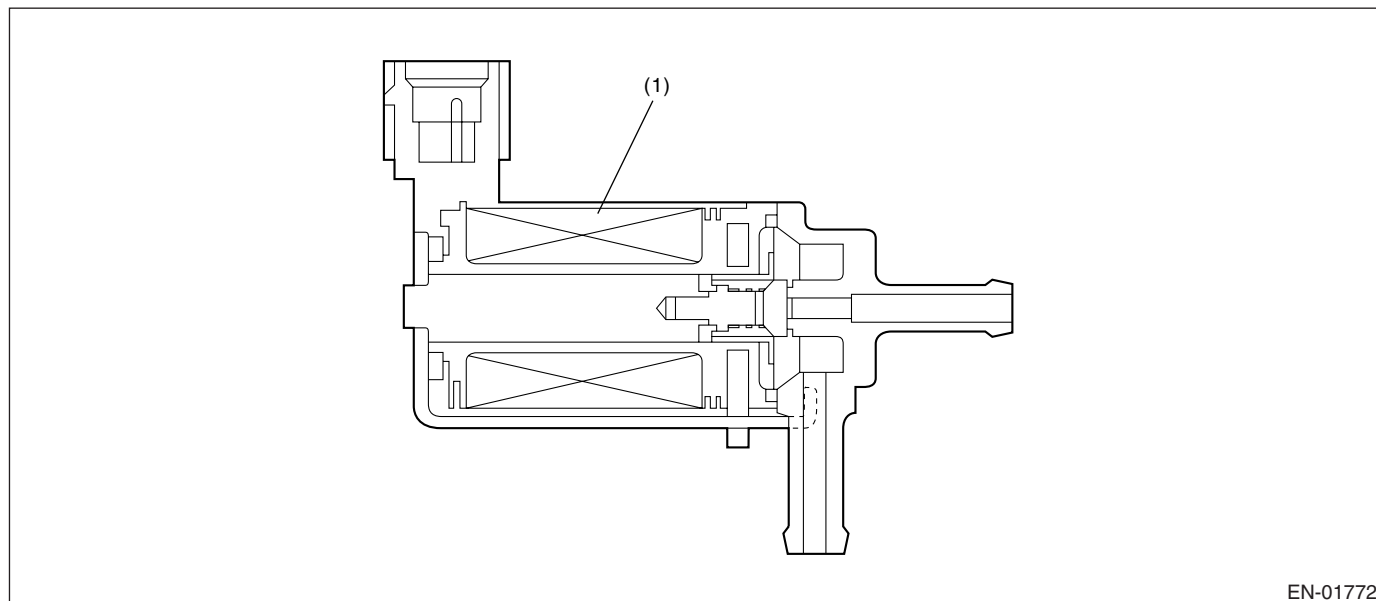
None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

AN:DTC P0245 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” LOW**1. OUTLINE OF DIAGNOSIS**

Detect the open or short circuit of wastegate control solenoid valve. Judge NG when the terminal output voltage remains Low during outputting the duty signal.

2. COMPONENT DESCRIPTION

EN-01772

(1) Coil

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
After engine starting	1 second or more

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after engine starts.

5. DIAGNOSTIC METHOD**• Abnormality Judgment**

Judge NG when the continuous time until completing the malfunction criteria below becomes more than 655 milliseconds.

Judgment Value

Malfunction Criteria	Threshold Value
Duty ratio for turbocharged pressure control when terminal output voltage is Low	< 75%

Time Needed for Diagnosis: 655 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage	High

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

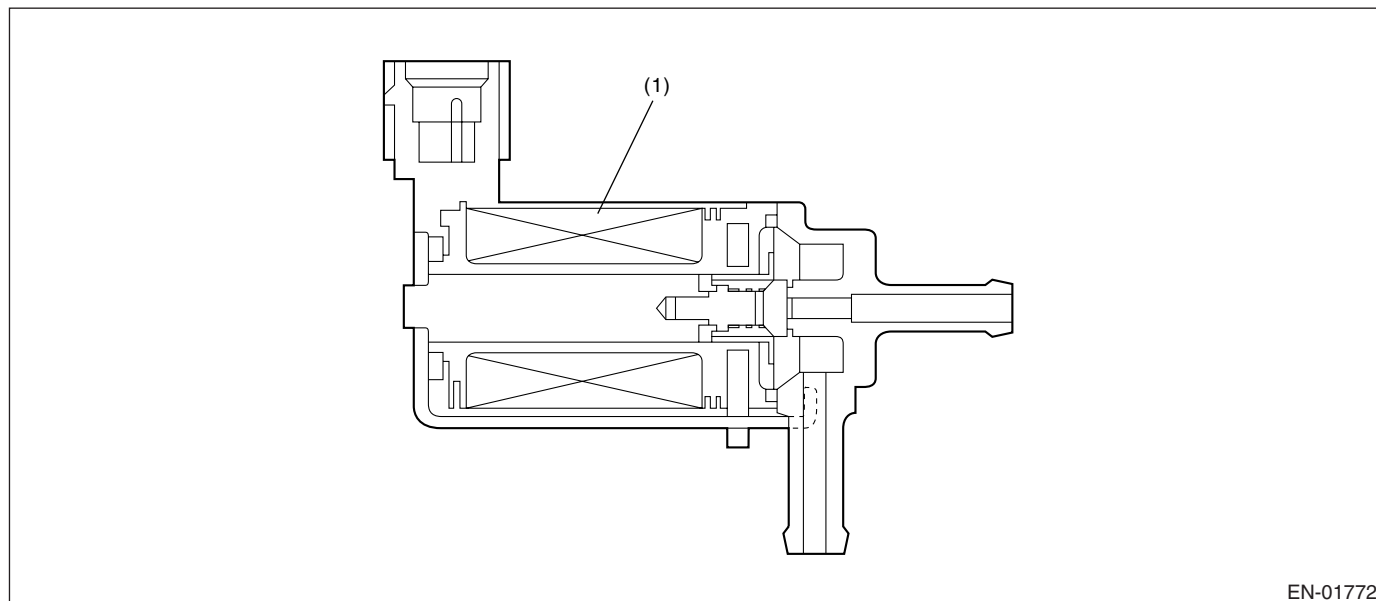
None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

AO:DTC P0246 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” HIGH**1. OUTLINE OF DIAGNOSIS**

Detect the open or short circuit of wastegate control solenoid valve. Judge NG when the terminal output voltage remains 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
After engine starting	1 second or more

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after engine starts.

5. DIAGNOSTIC METHOD**• Abnormality Judgment**

Judge NG when the continuous time until completing the malfunction criteria below becomes more than 655 milliseconds.

Judgment Value

Malfunction Criteria	Threshold Value
Duty ratio for turbocharged pressure control when output terminal voltage is High	> 25%

Time Needed for Diagnosis: 655 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage	Low

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

AP:DTC P0301 CYLINDER 1 MISFIRE DETECTED

1. OUTLINE OF DIAGNOSIS

Detect whether the misfire occurred or not. (Revolution fluctuation method) Monitoring the misfire which influences exhaust deterioration (1.5 times of FTP) and catalyst damage is made obligatory by the law. Misfire affecting these two has three 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 less)

2) Every time misfire: FTP 1.5 times misfire, Catalyst damage misfire

- 360° Interval Difference Method

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Intake manifold pressure change during 0.5 engine rev.	< 16.0 kPa (120 mmHg, 4.72 inHg)
Engine speed change	< 500 rpm/32 milliseconds
Throttle position change during 16 milliseconds	< 10°
Fuel shut-off function	Not operating
Atmospheric pressure	≥ 75.1 kPa (563 mmHg, 22.2 inHg)
Fuel level	≥ 9 ℓ (2.38 US gal, 1.98 Imp gal)
Evaporative system leak check	Not in operation
Engine speed	500 — 7,000 rpm
Intake manifold pressure	> Map 3
Battery voltage	≥ 8 V
All secondary parameters approval	≥ 1 second

Map3

Vehicle Speed < 64.4 km/h (40 MPH)

rpm	700	1,000	1,500	2,000	2,500	3,000	3,500	4,000	4,500	5,000	5,500	6,000	6,500	6,700
kPa	25.1	24.8	25.6	23.3	26.3	25.9	28.9	30.0	31.7	33.0	37.1	41.9	47.0	51.1
(mmHg, inHg)	(188, 7.40)	(186, 7.32)	(192, 7.56)	(175, 6.89)	(197, 7.76)	(194, 7.64)	(216.5, 8.52)	(225, 8.86)	(237.5, 9.35)	(248, 9.76)	(278.5, 11.0)	(314, 12.4)	(352.5, 13.9)	(383, 15.1)

Vehicle Speed ≥ 64.4 km/h (40 MPH)

rpm	700	1,000	1,500	2,000	2,500	3,000	3,500	4,000	4,500	5,000	5,500	6,000	6,500	6,700
kPa	25.5	25.1	30.4	35.6	38.5	40.4	41.1	40.8	44.8	47.3	49.1	50.9	52.8	52.8
(mmHg, inHg)	(191, 7.52)	(188, 7.40)	(227.7, 8.96)	(267.4, 10.5)	(288.9, 11.4)	(302.9, 11.9)	(308.6, 12.1)	(306, 12.0)	(335.8, 13.2)	(354.5, 14.0)	(368.2, 14.5)	(381.9, 15.0)	(396, 15.6)	(396, 15.6)

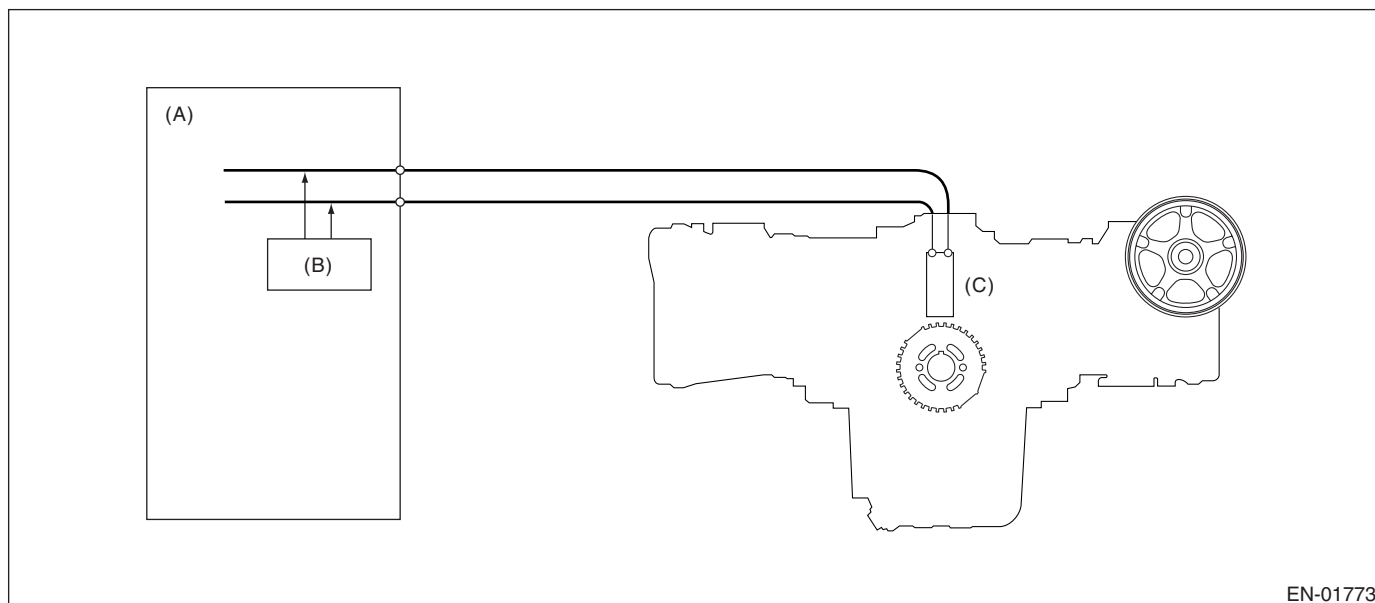
3. GENERAL DRIVING CYCLE

- Detecting misfire is able to be carried out in the condition between idling and high revolution; however, idling condition is better for detecting misfire from the viewpoint of engine load and damage.
- Perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

4. DIAGNOSTIC METHOD



- (A) Engine control module (ECM)
(B) Diagnosis circuit
(C) Crankshaft position sensor

When the misfire occurred, the engine speed is 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 the misfire occurs or not comparing the calculated result with judgment value. Counting the number of misfire up, and if the misfire ratio is higher during 1,000 rev. or 200 rev., judge NG for the corresponding cylinder.

Calculate the diagnostic value (from crankshaft position speed)

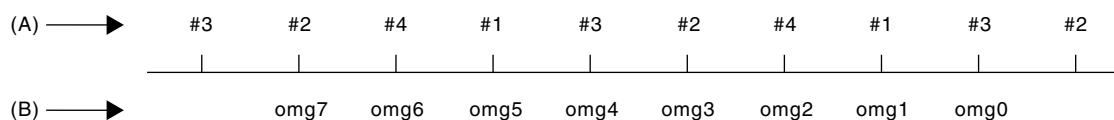
- Misfire detection every single ignition (Compare diagnostic value with judgment value)
- 180° Interval Difference Method
 - 360° Interval Difference Method
 - 720° Interval Difference Method

- NG judgment (Judge misfire occurrence required by the law) (Compare number of misfire with judgment)
- FTP1.5 times misfire NG judgment
 - Catalyst damage misfire NG judgment

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

As the following figure, pick out a random 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, and the following is the same.



EN-01774

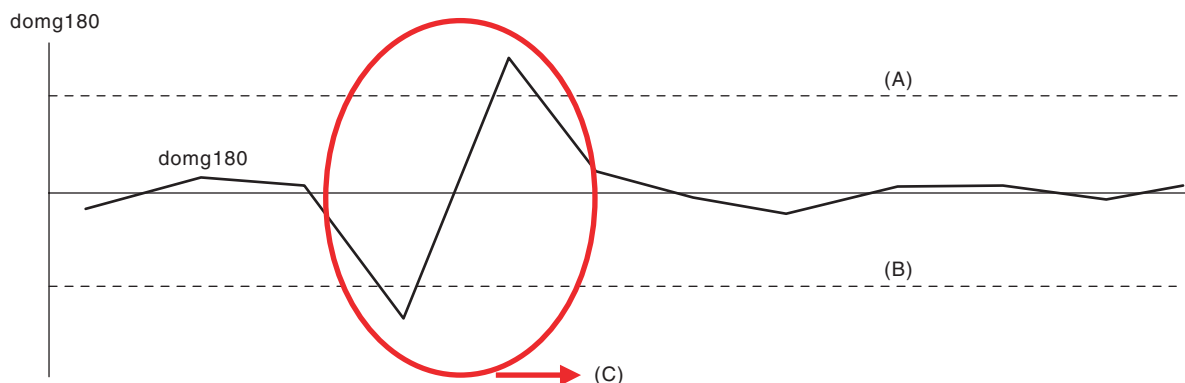
- (A) Ignition order
- (B) Crankshaft position speed

• 180° Interval Difference Method

Diagnosis value $\text{domg180} = (\text{omg} -1 \text{ omg} 0) - (\text{omg} 7 - \text{omg} 1)/6$

Judge misfire occurs in the following cases.

- $\text{domg180} > \text{judgment value of positive side}$
 - $\text{domg180} \leq \text{judgment value of negative side}$
- (judgment value before 180°CA)



EN-01775

- (A) Threshold value (Judgment value of positive side)
- (B) Threshold value (Judgment value of negative side)
- (C) Judged as misfire

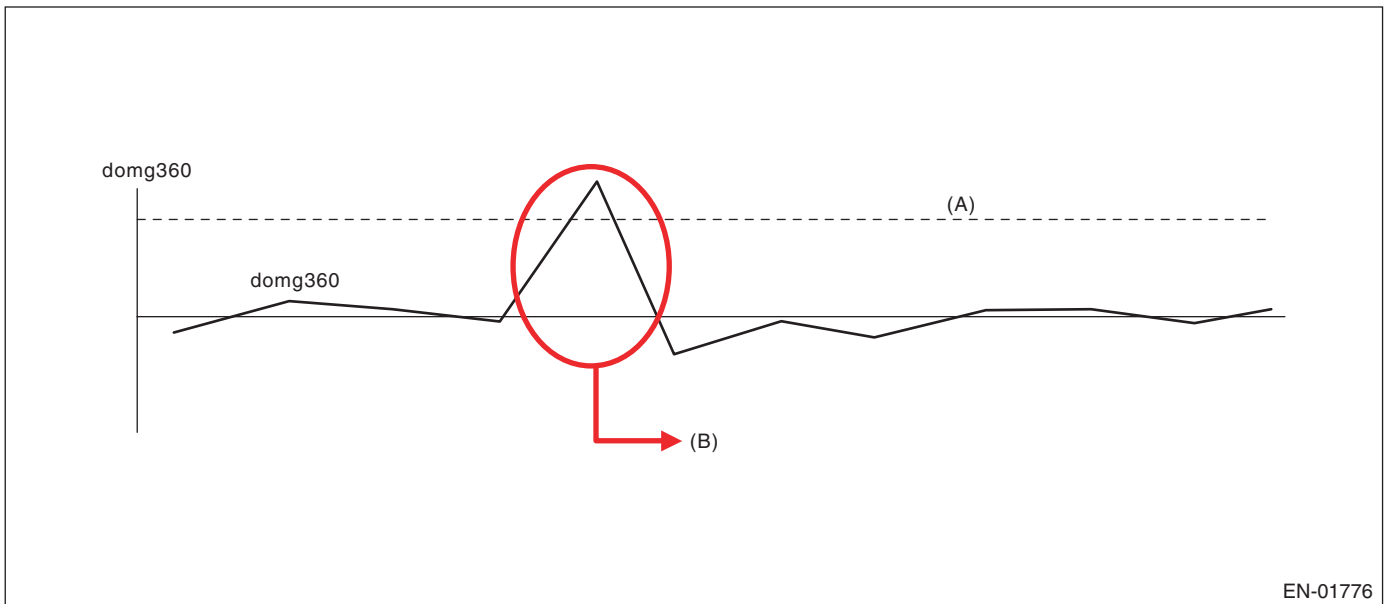
Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

• 360° Interval Difference Method

Diagnosis value $\text{domg } 360 = (\text{omg } 1 - \text{omg } 0) - (\text{omg } 4 - \text{omg } 3)$

Misfire judgment $\text{domg } 360 > \text{judgment value} \rightarrow \text{Misfire occurs}$



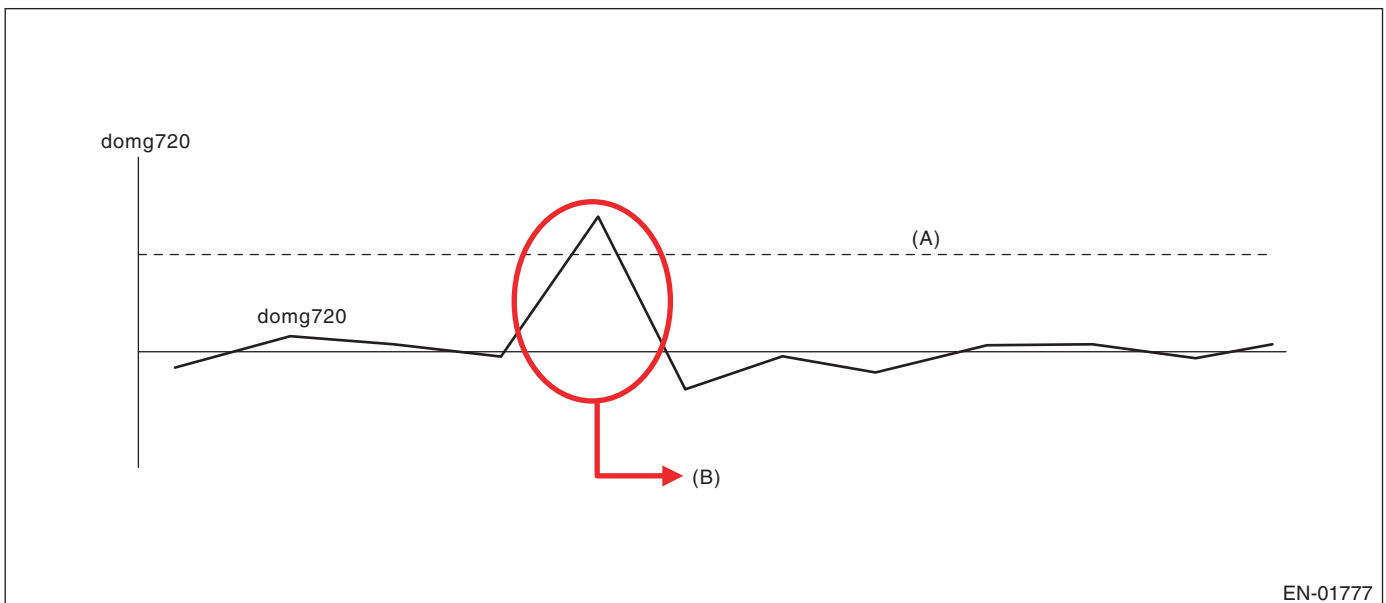
EN-01776

- (A) Threshold value
- (B) Judged as misfire

• 720° Interval Difference Method

Diagnosis value $\text{domg } 720 = (\text{omg } 1 - \text{omg } 0) - (\text{omg } 7 - \text{omg } 6)$

Misfire judgment $\text{domg } 720 > \text{judgment value} \rightarrow \text{Misfire occurs}$



EN-01777

- (A) Threshold value
- (B) Judged as misfire

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

- FTP 1.5 times misfire (Misfire occurrence level affecting exhaust gas)

Judgment Value (Judge that malfunction occurs when the misfire ratio is high in 1,000 engine revs.)

Malfunction Criteria	Threshold Value
FTP emission judgment value	> 1.0% in 1,000 revs.

Time Needed for Diagnosis: 1,000 engine revs.

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

- Catalyst damage misfire (Misfire occurrence level damaging catalyst)

Judgment Value (Judge that malfunction occurs when the misfire ratio is high in 200 engine revs. (400 ignitions))

Malfunction Criteria	Threshold Value
Catalyst damage misfire judgment value	See Map 1

Map 1 Fault criteria threshold for misfire which would result in catalyst damage

Percentage		Intake air (g/rev.)											
		0.2	0.4	0.6	0.8	1.0	1.2	1.4	1.6	1.8	2.0	2.2	2.4
Engine speed (rpm)	1000	45.8	45.8	37.5	33.3	25.0	23.8	—	—	—	—	—	—
	1500	43.7	38.5	31.3	27.3	21.3	20.1	—	—	—	—	—	—
	2000	41.7	31.3	25.0	21.3	17.5	16.5	15.5	14.3	12.0	6.8	5.0	—
	2500	38.5	27.5	21.3	17.8	14.3	12.4	10.6	9.7	9.2	7.5	6.3	5.0
	3000	35.4	23.8	17.5	14.3	11.1	8.4	5.6	5.0	5.0	6.4	6.0	5.0
	3500	25.0	22.5	14.3	12.2	10.1	8.4	6.7	6.2	5.8	5.8	5.6	5.0
	4000	—	21.3	11.1	10.1	9.1	8.4	7.7	7.4	7.1	5.0	5.0	5.0
	4500	—	19.0	12.3	10.9	9.6	9.2	8.9	7.7	6.5	5.0	5.0	5.0
	5000	—	16.7	13.4	11.7	10.0	10.0	10.0	8.0	5.9	5.1	5.0	5.0
	5500	—	16.1	12.0	10.6	9.2	8.8	8.4	6.3	5.0	5.0	5.0	5.0
	6000	—	15.5	10.6	9.5	8.3	7.5	6.7	5.0	5.0	5.0	5.0	5.0
	6500	—	15.5	10.0	9.2	8.2	7.3	5.9	5.0	5.0	5.0	5.0	—
	7000	—	15.0	9.5	9.0	7.5	6.5	5.0	5.0	5.0	5.0	—	—

EN-03266

These figures mean the misfire ratio (%) in 400 ignitions; for example, 22.5 (%) means 400 (ignition) × 22.5 (%) = 90 (ignition) or more, so this case is judged misfire.

Time Needed for Diagnosis: 200 engine revs.

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

None

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

AQ:DTC P0302 CYLINDER 2 MISFIRE DETECTED

1. OUTLINE OF DIAGNOSIS

For the diagnostic procedure, refer to DTC P0301. <Ref. to GD(STI)-97, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

AR:DTC P0303 CYLINDER 3 MISFIRE DETECTED

1. OUTLINE OF DIAGNOSIS

For the diagnostic procedure, refer to DTC P0301. <Ref. to GD(STI)-97, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

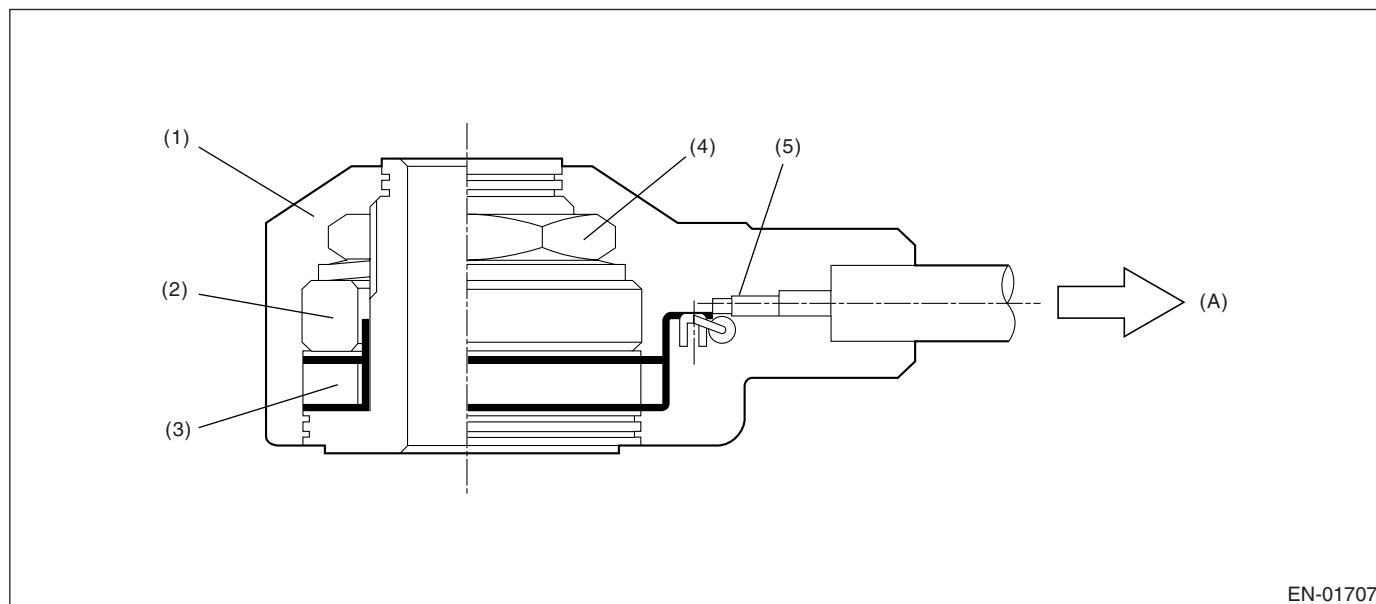
AS:DTC P0304 CYLINDER 4 MISFIRE DETECTED

1. OUTLINE OF DIAGNOSIS

For the diagnostic procedure, refer to DTC P0301. <Ref. to GD(STI)-97, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

AT:DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR)**1. OUTLINE OF DIAGNOSIS**

Detect the open or short circuit of the knock sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION

- (1) Case
- (2) Weight
- (3) Piezoelectric element
- (4) Nut
- (5) Resistance

(A) To knock sensor harness

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD**• Abnormality Judgment**

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 1 second.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.238 V
Ignition switch	ON

Time Needed for Diagnosis: 1 second

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

• Normality Judgment

Judge OK and clear NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 0.238 V
Ignition switch	ON

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

Knock compensation:

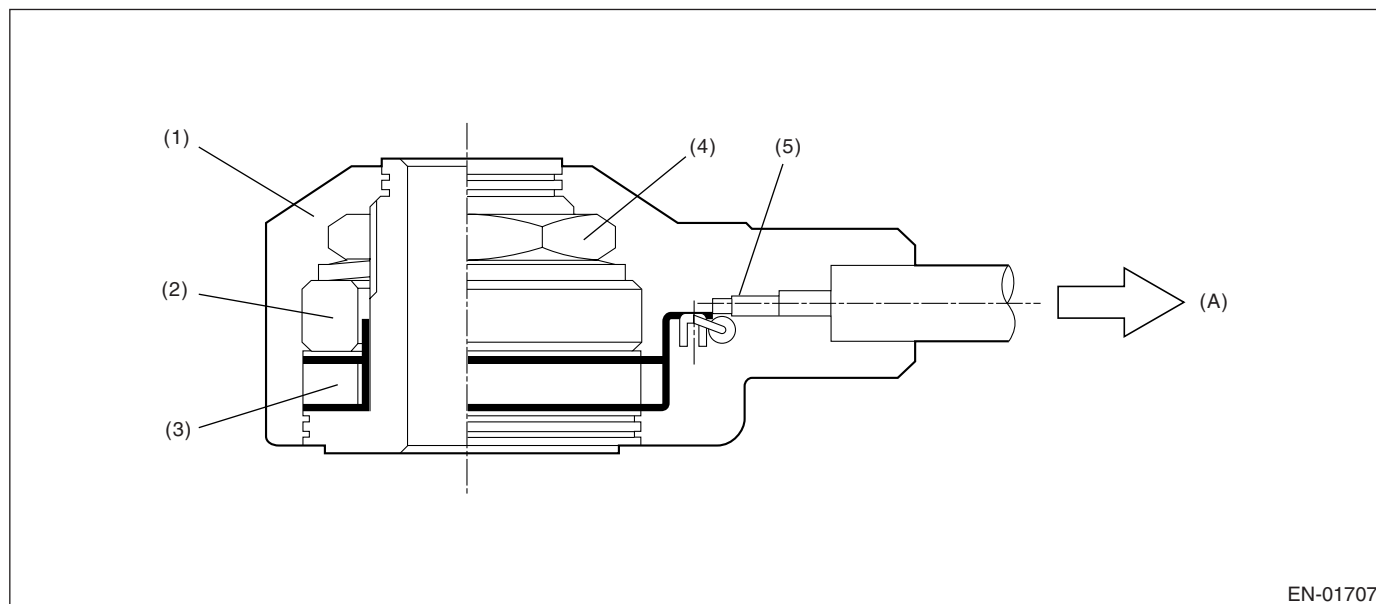
- Knock compensation final timing advance and retard value = knock compensation + whole learning compensation value + partial learning compensation value.
- At normal: knock compensation = 0°CA is fixed.
- At trouble: knock compensation = -5°CA . (Retard 5°CA .)
- Not allowed to update the whole learning compensation factor.
- Not allowed to calculate the partial learning zone compensation value.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

AU:DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR)**1. OUTLINE OF DIAGNOSIS**

Detect the open or short circuit of the knock sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION

- (1) Case
- (2) Weight
- (3) Piezoelectric element
- (4) Nut
- (5) Resistance

(A) To knock sensor harness

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform diagnosis continuously.

5. DIAGNOSTIC METHOD**• Abnormality Judgment**

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 1 second.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	$\geq 4.714 \text{ V}$
Ignition switch	ON

Time Needed for Diagnosis: 1 second

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

• Normality Judgment

Judge OK and clear NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 4.714 V
Ignition switch	ON

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

Knock compensation:

- Knock compensation final timing advance and retard value = knock compensation + whole learning compensation value + partial learning compensation value.
- At normal: knock compensation = 0°CA is fixed.
- At trouble: knock compensation = -5°CA. (Retard 5°CA.)
- Not allowed to update the whole learning compensation factor.
- Not allowed to calculate the partial learning zone compensation value.

9. ECM OPERATION AT DTC SETTING

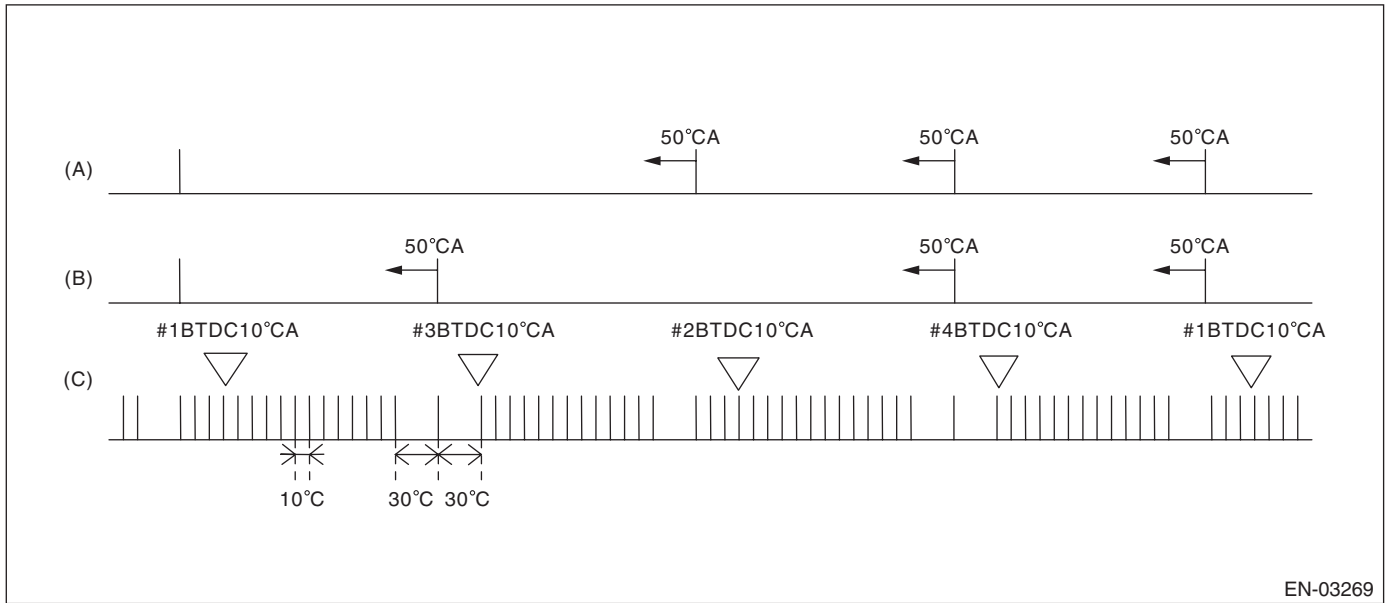
Memorize the freeze frame data. (For test mode \$02)

AV:DTC P0335 CRANKSHAFT POSITION SENSOR "A" CIRCUIT

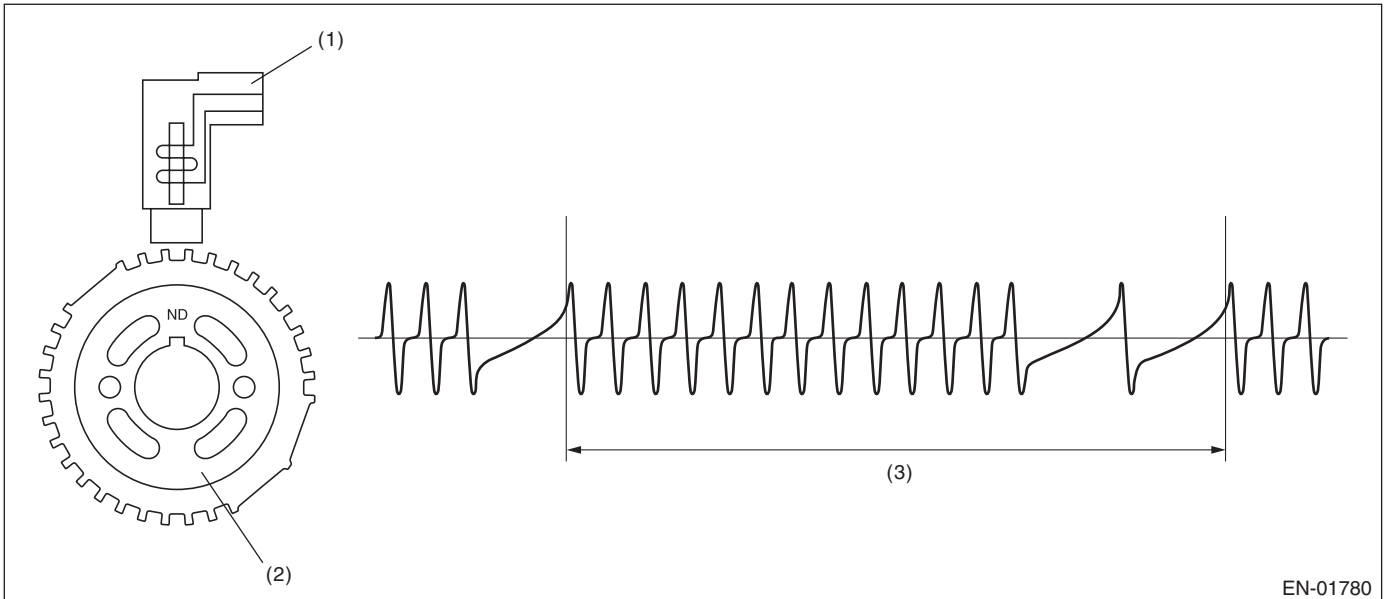
1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of crankshaft position sensor. Judge NG when the crankshaft signal does not input regardless of turning the starter.

2. COMPONENT DESCRIPTION



- (A) Camshaft signal RH
- (B) Camshaft signal LH
- (C) Crankshaft signal



- (1) Crankshaft position sensor
- (2) Crank sprocket
- (3) Crankshaft half-turn

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Starter switch	ON
Crankshaft position sensor signal	Not detected
Battery voltage	$\geq 8 \text{ V}$

Time Needed for Diagnosis: 3 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Crankshaft position sensor signal	Input exists
Battery voltage	$\geq 8 \text{ V}$

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

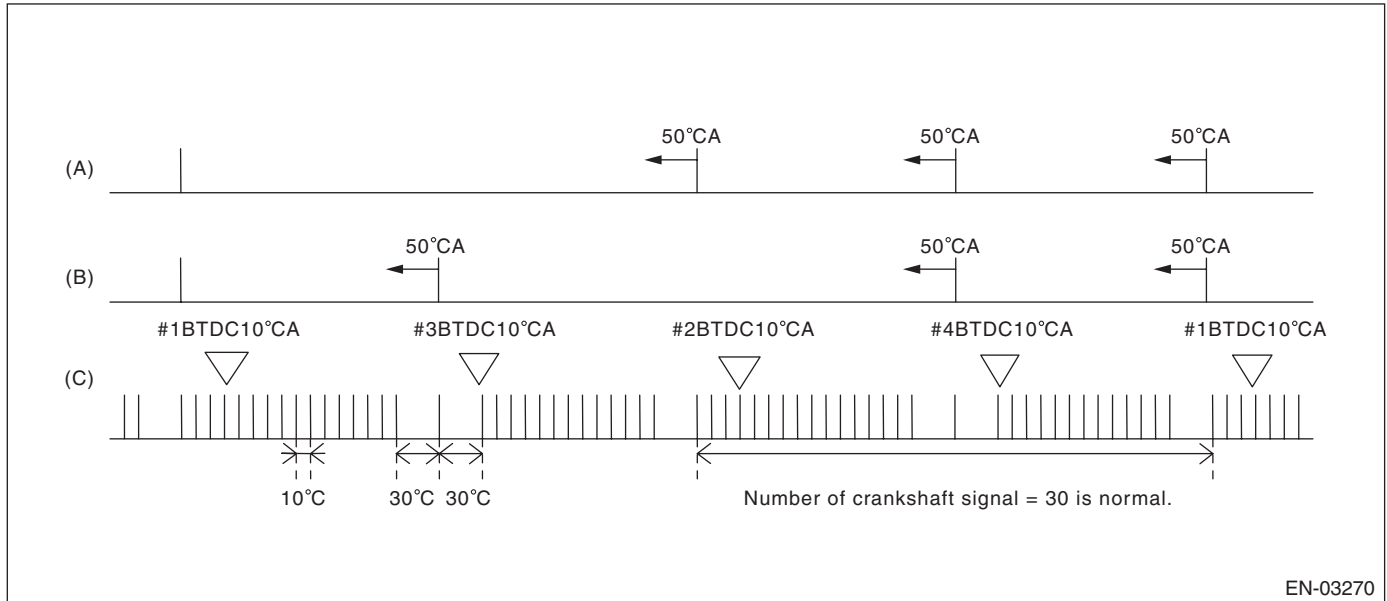
Memorize the freeze frame data. (For test mode \$02)

AW:DTC P0336 CRANKSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE

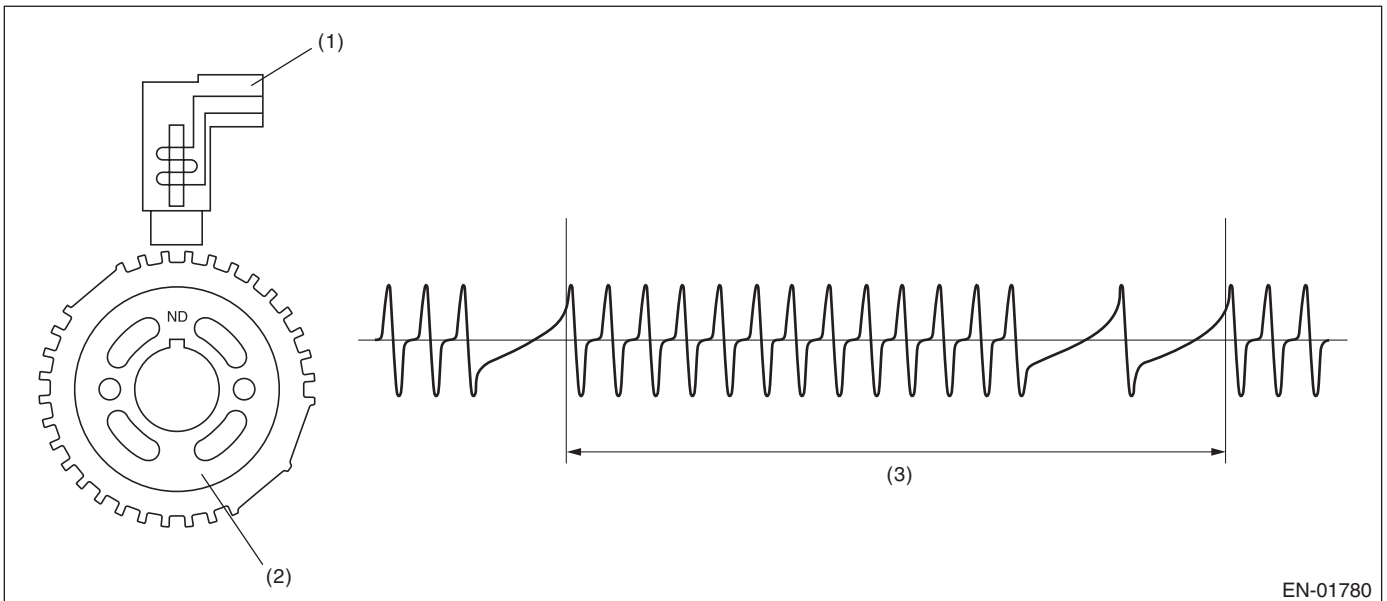
1. OUTLINE OF DIAGNOSIS

Detect the malfunction of crankshaft position sensor output property. Judge NG when the number of crankshaft signal every 1 revolution becomes abnormal.

2. COMPONENT DESCRIPTION



- (A) Camshaft signal RH
- (B) Camshaft signal LH
- (C) Crankshaft signal



- (1) Crankshaft position sensor
- (2) Crank sprocket
- (3) Crankshaft half-turn

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 8 \text{ V}$
Engine speed	$< 3,000 \text{ rpm}$

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously under 3,000 rpm engine speed.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when all the malfunction criteria below are completed more than 10 times in a row.

Judgment Value

Malfunction Criteria	Threshold Value
Cylinder number distinction	Completed
Amount of crank sensor signal during 1 rev.	Not = 30

Time Needed for Diagnosis: 10 engine revs.

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Cylinder number distinction	Completed
Amount of crank sensor signal during 1 rev.	= 30

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

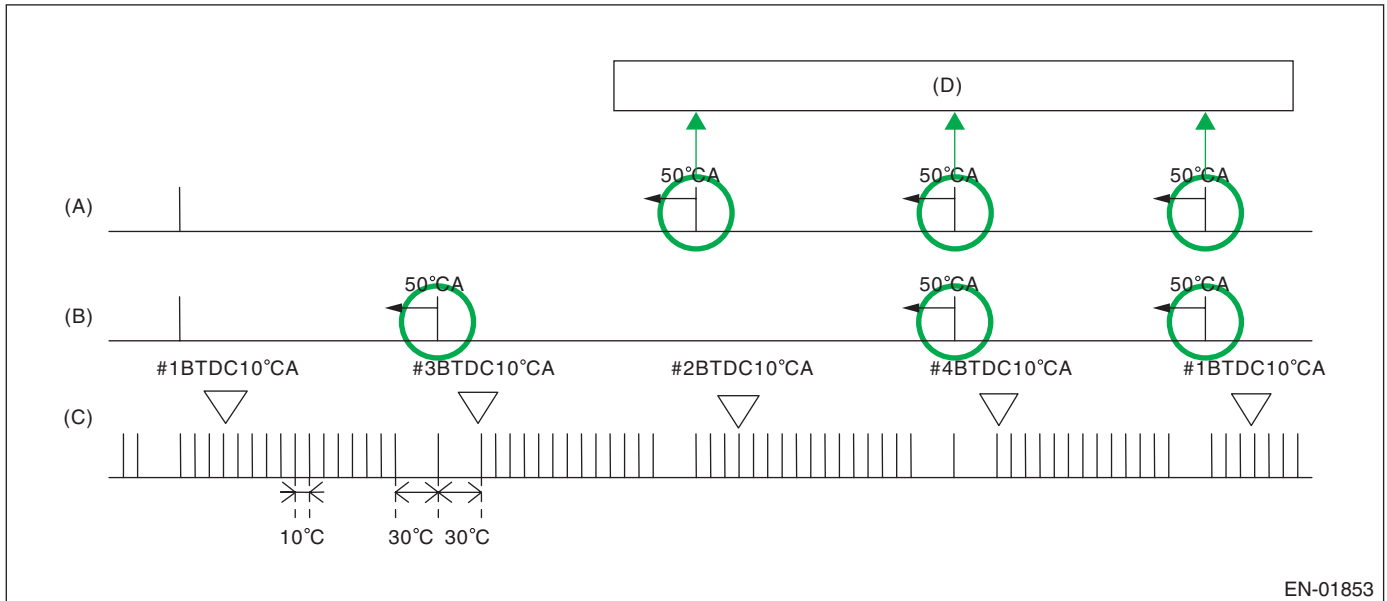
Memorize the freeze frame data. (For test mode \$02)

AX:DTC P0340 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of camshaft position sensor. Judge NG when the number of camshaft signal remains to be abnormal.

2. COMPONENT DESCRIPTION



- (A) Camshaft signal RH
(B) Camshaft signal LH
(C) Crankshaft signal

- (D) Number of camshaft signal = 3 is normal at two engine revolution.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Voltage	$\geq 8 \text{ V}$

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment 1

The camshaft signal normally enters three times by two rev. of engine speed; however, judge NG when the camshaft signal does not enter three times continuously.

Judge NG when the malfunction criteria below are completed more than 100 rev. of engine speed. Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Number of camshaft position sensor signal during 2 rev.	Except 3

Time Needed for Diagnosis: 100 rev.

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

• Abnormality Judgment 2

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Starter switch	ON
Camshaft angle signal	None

Time Needed for Diagnosis: 3 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Camshaft angle signal	Exists

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

- Ignition timing whole learning compensation:
 - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when IG OFF, and then make the whole learning incomplete.
 - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when making a normality judgment from abnormality judgment, and then make the whole learning incomplete.
- Ignition timing partial learning compensation:
 - Enter the initial value (0°CA) to the compensation value of partial learning zone when IG OFF.
 - Enter the initial value (0°CA) to the compensation value of partial learning zone when making a normality judgment from abnormality judgment.
- AVCS control: Most timing retard learning is not complete or most timing retard learning completion is not experienced.
- ISC feedback compensation: Do not perform the AVCS actual timing advance compensation. Make the OCV driving Duty to be the given value (9.36%).

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

AY:DTC P0345 CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 2)

1. OUTLINE OF DIAGNOSIS

For diagnostic procedure, refer to DTC P0340. <Ref. to GD(STI)-111, DTC P0340 CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

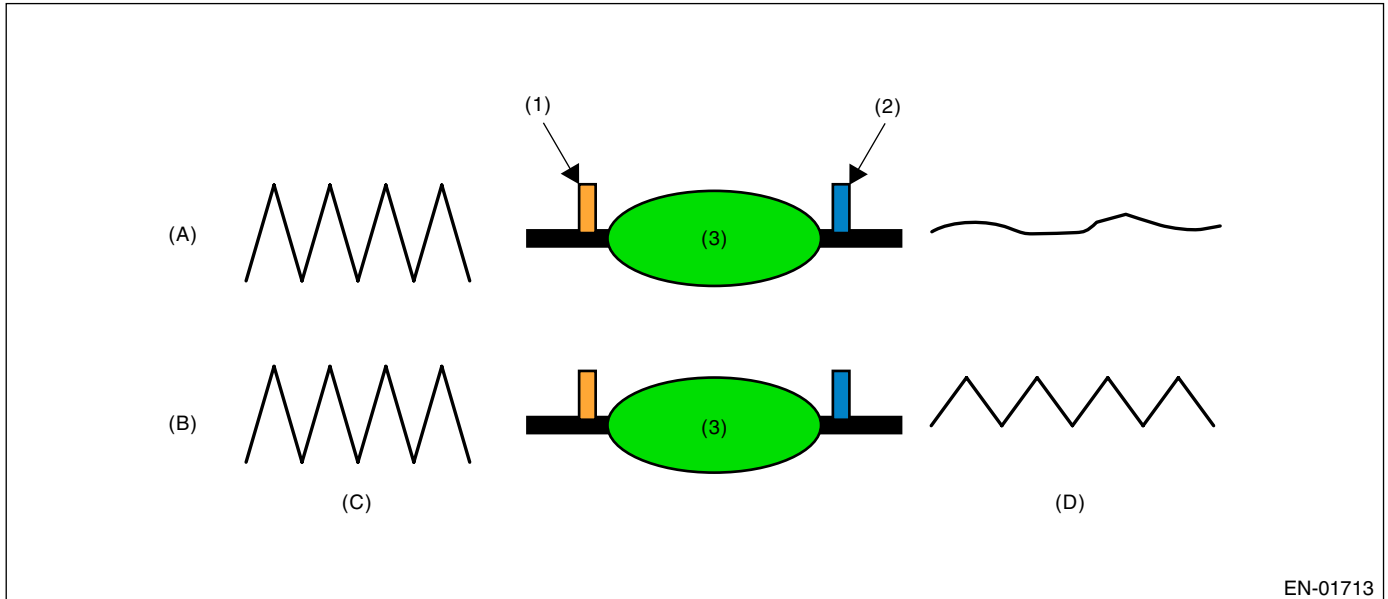
AZ:DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect the deterioration of catalyst function.

Though the rear oxygen sensor output would change slowly with a new catalyst, the sensor output with a deteriorated catalyst becomes high and the inversion time is shortened. For this reason, the catalyst diagnosis is carried out by monitoring the rear oxygen sensor output and comparing it with the front A/F sensor output.

2. COMPONENT DESCRIPTION



- (1) Front oxygen (A/F) sensor
- (2) Rear oxygen sensor
- (3) Catalyst

- (A) Normal
- (B) Deterioration
- (C) Front oxygen (A/F) sensor waveform
- (D) Rear oxygen sensor waveform

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Time for keep completing all secondary parameters	1.2 seconds or more
Catalyst deterioration diagnosis	Not finished
Battery voltage	> 10.9 V
Atmospheric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Engine coolant temperature	≥ 65°C (149°F)
Catalyst warm-up counter on Map 2	≥ 7,600
Misfire detection during 200 engine revs.	< 5 times
Learning value of evaporation gas density	< 0.20
Sub feedback	Operating
Evaporative system diagnostic	Not in operation
Difference between actual and target time lambda < 0.10	1,000 milliseconds or more
Vehicle speed	≥ 75 km/h (46.6 MPH)
Amount of intake air	10 ↔ 40 g/s
Engine load change every 0.5 engine revs.	< 0.03 g/rev
Rear O ₂ output change from below 600 mV to over	Experienced after fuel cut
After engine starting	≥ 150 seconds

• Map 2

Add the following value every 512 milliseconds.

Catalyst warm-up counter ≤ 8,000

Amount of intake air (g/s)	0	5	10	15	20	25	30	35	40	45	50	55
Integrated value for warm-up counter	-20	-8	15	36	57	79	100	121	127	127	127	127

Catalyst warm-up counter > 8,000

Amount of intake air (g/s)	0	5	10	15	20	25	30	35	40	45	50	55
Integrated value for warm-up counter	-2	-1	5	7	8	9	11	12	13	13	13	13

4. GENERAL DRIVING CYCLE

Perform the diagnosis once at the constant vehicle speed from 80 to 100 km/h (49.7 to 62.1 MPH).

5. DIAGNOSTIC METHOD

After the malfunction criteria are completed, calculate the output fluctuation value of front oxygen (A/F) sensor and output fluctuation value of rear oxygen sensor.

Calculate the diagnosis value when the front oxygen (A/F) sensor output fluctuation value more than specified value.

Regard the A/F response properties and diagnosis value as parameters for judgment value.

Judge NG when the malfunction criteria below are completed, and judge OK when they are not completed.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Judgment Value

Malfunction Criteria	Threshold Value
Accumulated variation of output voltage of rear oxygen sensor per 32 milliseconds $\times$ 4 divided by accumulated variation of lambda of front oxygen (A/F) sensor per 32 milliseconds $\times$ 4	$\geq$ Map 3

Map 3

Diagnosis value	0.1	0.162	0.214	0.266	0.318
Judgment value	4.51	4.51	10.45	16.39	22.34

Time Needed for Diagnosis: 55 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

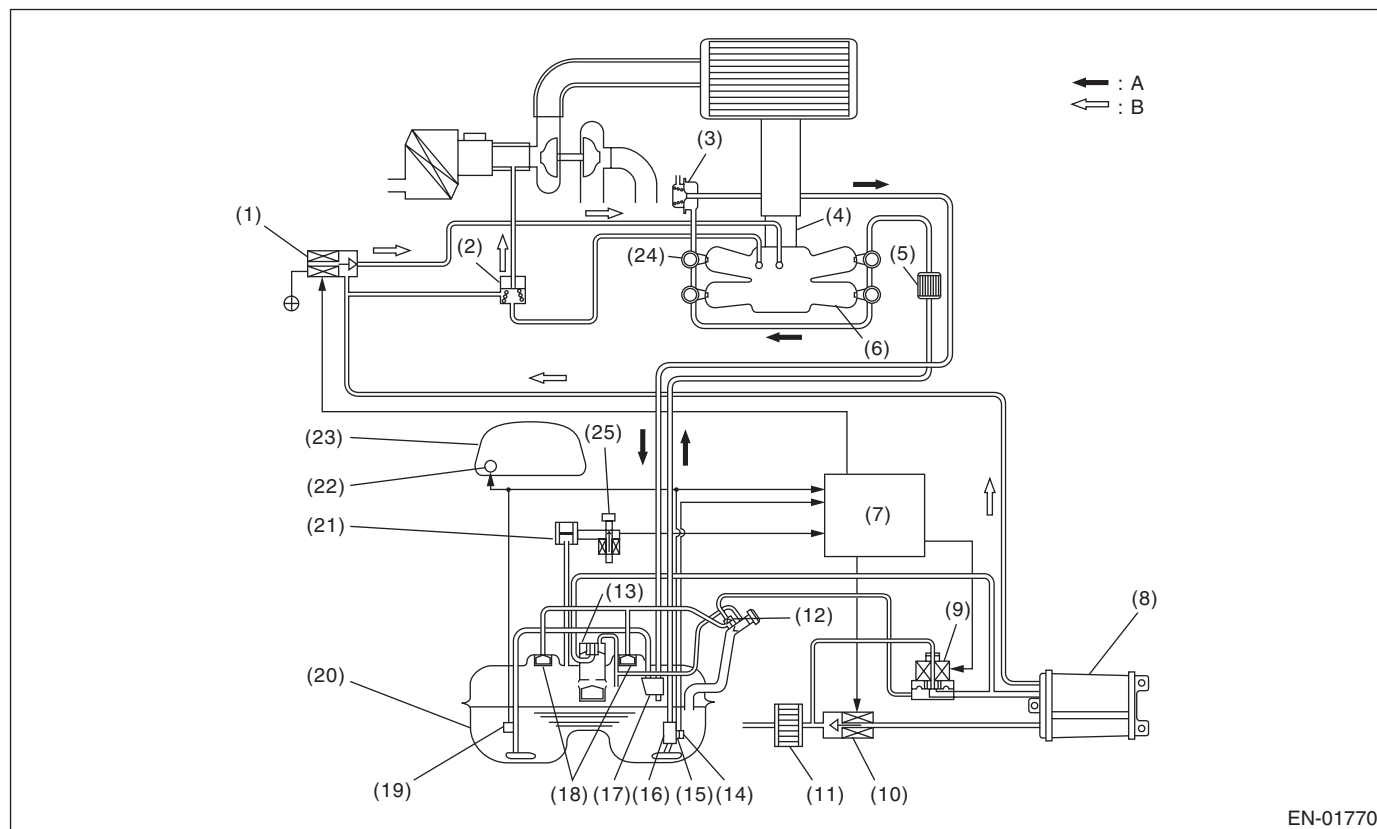
Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

BA:DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECT-ED (SMALL LEAK)

1. OUTLINE OF DIAGNOSIS

Perform the diagnosis of leakage of fuels system and valve functions.



EN-01770

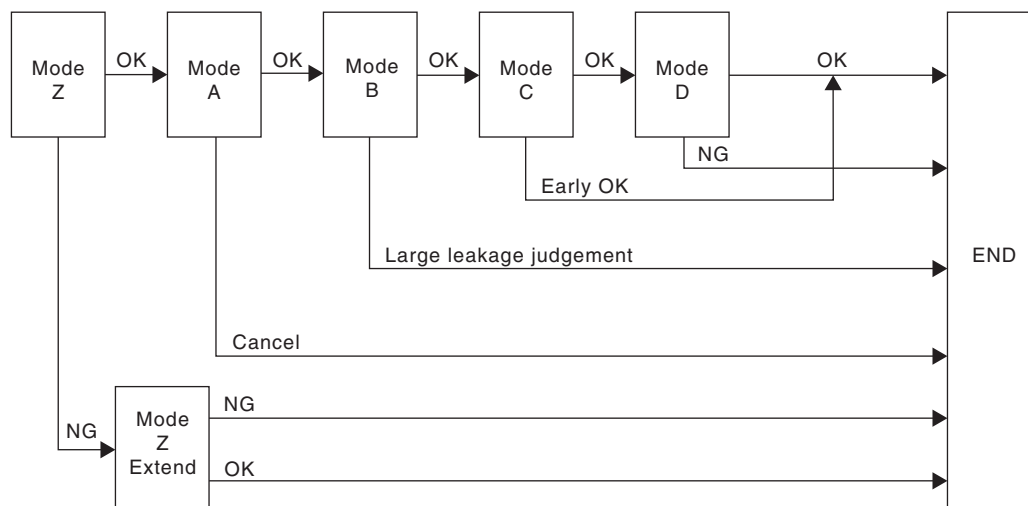
(1) Purge control solenoid valve	(14) Fuel temperature sensor
(2) Purge valve	(15) Fuel level sensor
(3) Pressure regulator	(16) Fuel pump
(4) Throttle body	(17) Jet pump
(5) Fuel filter	(18) Fuel cut valve
(6) Intake manifold	(19) Fuel sub level sensor
(7) Engine control module (ECM)	(20) Fuel tank
(8) Canister	(21) Fuel tank pressure sensor
(9) Pressure control solenoid valve	(22) Fuel meter
(10) Drain valve	(23) Combination meter
(11) Drain filter	(24) Fuel injector
(12) Shut-off valve	(25) Tank pressure switching solenoid valve
(13) Vent valve	

In this system diagnosis, checking for leakage and valve function is conducted by changing the fuel tank pressure and monitoring the pressure change using the fuel tank pressure sensor. 0.04 inch diagnosis is performed in the order of mode Z, mode A, mode B, mode C, mode D and mode E, and 0.02 inch diagnosis is performed in the order of mode Y, mode A, mode B, mode C, mode D and mode E.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

• 0.04-inch Diagnosis



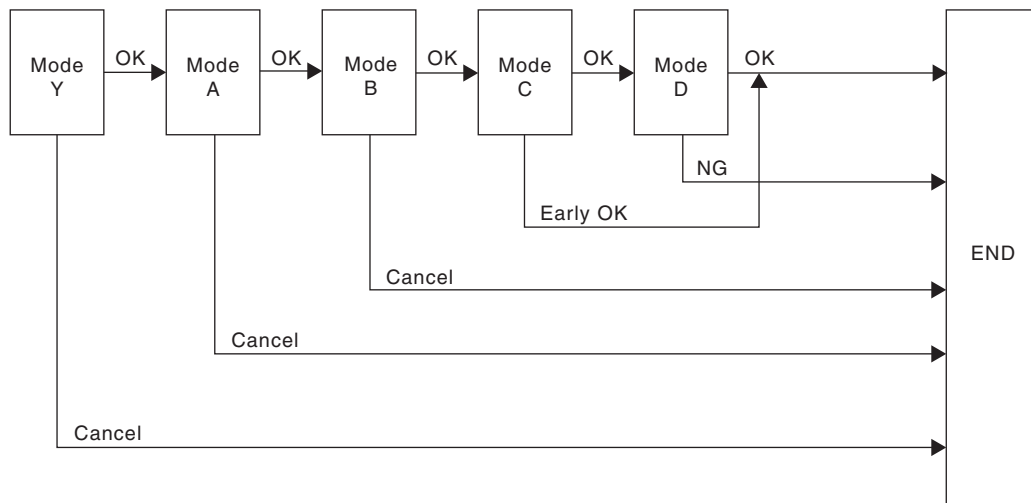
EN-02872

Mode	Mode Description	Diagnosis Period
Mode Z (CPC abnormal open diagnosis)	Carry out CPC open trouble and CCV close trouble diagnosis according to tank pressure change amount after diagnosis started.	3 — 16 seconds
Mode A (Estimated evaporation amount)	Calculate the tank pressure change amount (P1).	16 seconds
Mode B (Sealed negative pressure, large leakage judgment)	Introduce the intake manifold pressure to the fuel tank and reduce the tank pressure to the desired value. If the tank pressure cannot be reduced, it is diagnosed as large leak.	4 — 35 seconds
Mode C (Pressure increase check advanced OK judgment)	Wait until the tank pressure becomes the desired value. If the tank pressure does not become the value, make advanced OK judgment.	4 — 15 seconds
Mode D (Negative pressure variation measurement evaporation leakage diagnosis)	Calculate the tank pressure variation (P2), and obtain the diagnostic value using P1 of Mode 1. Perform the evaporation leakage diagnosis using the diagnostic value.	12 — 16 seconds

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

• 0.02-inch Diagnosis



EN-04451

Mode	Mode Description	Diagnosis Period
Mode Y (Tank pressure stabilization)	Return the tank pressure to atmosphere.	15 seconds
Mode A (Estimated evaporation amount)	Calculate the tank pressure change amount (P1).	29 seconds
Mode B (Negative pressure sealed)	Introduce the intake manifold pressure to the fuel tank and reduce the tank pressure to the desired value.	10 — 20 seconds
Mode C (Pressure increase check advanced OK judgment)	Wait until the tank pressure becomes the desired value. If the tank pressure does not become the value, make advanced OK judgment.	5 — 20 seconds
Mode D (Negative pressure variation measurement evaporation leakage diagnosis)	Calculate the tank pressure variation (P2), and obtain the diagnostic value using P1 of Mode 1. Perform the evaporation leakage diagnosis using the diagnostic value.	20 — 25 seconds

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

• Mode Table for Evaporative Emission Control System Diagnosis

0.04-inch Diagnosis

Mode	Behavior of tank internal pressure under normal conditions	Diagnostic item	DTC
Mode Z	Nearly same as atmospheric pressure (equivalent pressure of 0 kPa (0 mmHg, 0 inHg))	CPC is judged to be stuck open.	P0457
Mode A	Pressure is in proportion to amount of evaporative emission.	—	—
Mode B	Negative pressure is formed due to intake manifold negative pressure	Large leakage	P0457
Mode C	Target pressure is reached.	—	—
Mode D	Pressure change is small.	EVAP system is judged to have large leak [1.0 mm (0.04 in.)].	P0442
		P2 measurement of small leak in system. EVAP. system is judged to have small leak [0.5 mm (0.02 in.)].	P0456

0.02-inch Diagnosis

Mode	Behavior of tank internal pressure under normal conditions	Diagnostic item	DTC
Mode Y	Return to atmosphere	—	—
Mode A	Pressure is in proportion to amount of evaporation gas occurrence.	—	—
Mode B	Negative pressure is formed due to intake manifold negative pressure	—	—
Mode C	Target pressure is reached.	—	—
Mode D	Pressure change is small.	P2 measurement of small leak in system. Evaporation system is judged to have small leak [0.5 mm (0.02 in.)].	P0456

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

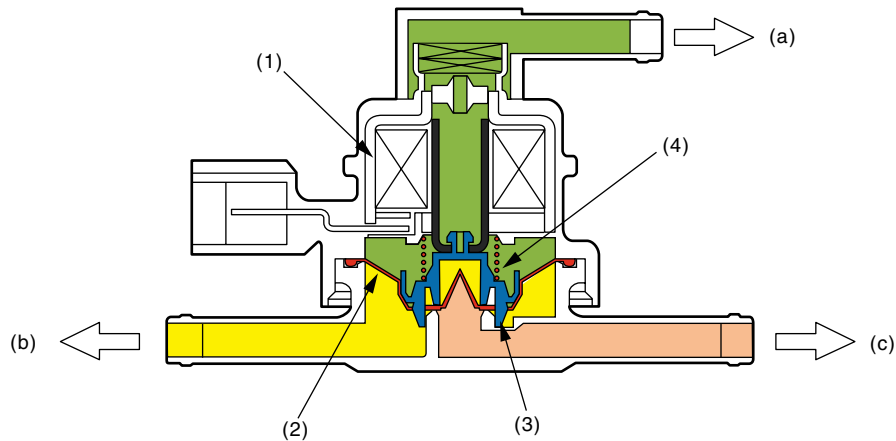
2. COMPONENT DESCRIPTION

• Pressure Control Solenoid Valve

PCV controls the fuel tank pressure to be equal to the atmospheric air pressure.

Normally, the solenoid is set to OFF. And the valve opens and closes mechanically in accordance with the pressure difference between tank and atmospheric air, or tank and canister.

The solenoid which is set to ON forces to open the valve.



EN-01715

- (1) Solenoid
- (2) Diaphragm
- (3) Valve
- (4) Spring

- (a) Atmospheric pressure
- (b) Fuel tank
- (c) Canister

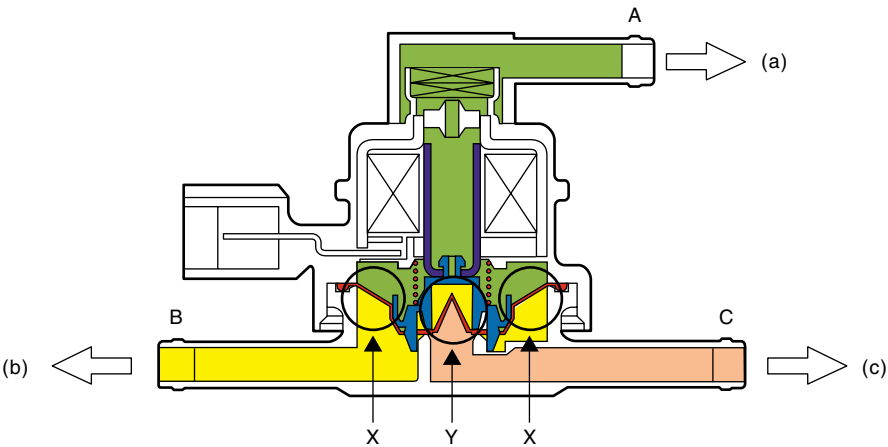
Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

• Valve Operation and Air Flow

In the figure below, divided by the diaphragm, the part above X is charged with atmospheric air pressure, and the part below X is charged with tank pressure. Also, the part above Y is charged with tank pressure, and the part below Y is charged with canister pressure.

If the atmospheric air pressure port is A, tank pressure port is B, and canister pressure port is C, the air flows according to pressure difference from each port as shown in the table below.



EN-01716

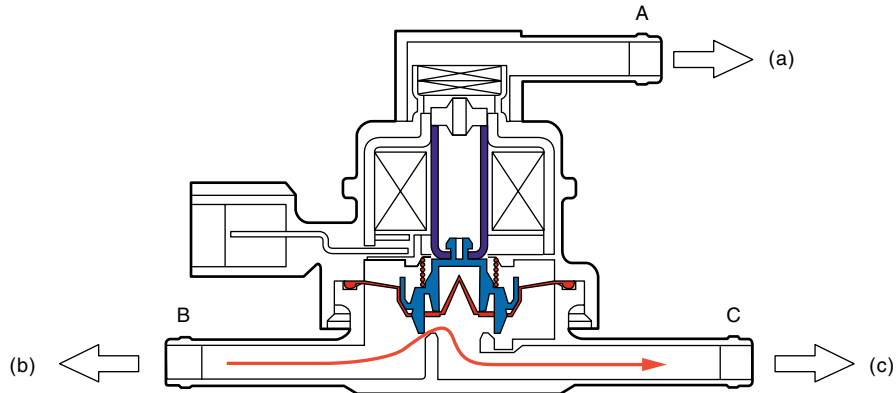
- (a) Atmospheric pressure
- (b) Fuel tank
- (c) Canister

Condition of pressure	Flow
A < B (solenoid OFF)	B → C
B < C (solenoid OFF)	C → B
Solenoid ON	B ↔ C

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

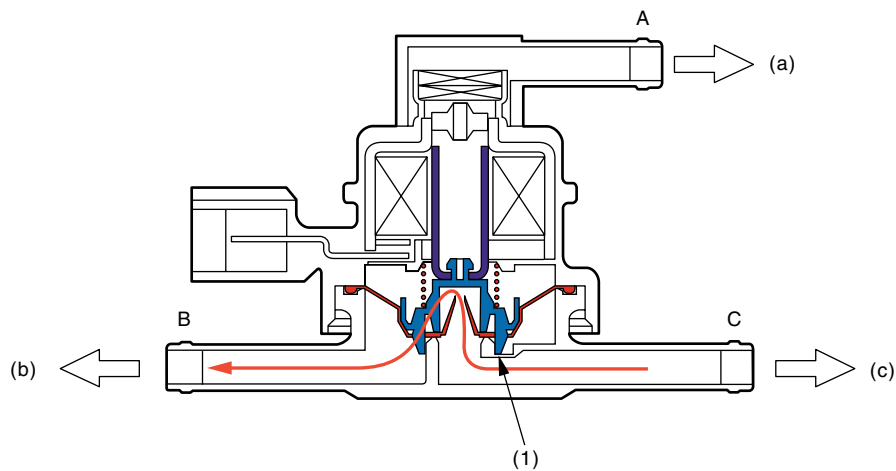
• When $A < B$ (Solenoid OFF)



EN-01717

- (a) Atmospheric pressure
- (b) Fuel tank
- (c) Canister

• When $B < C$ (Solenoid OFF)



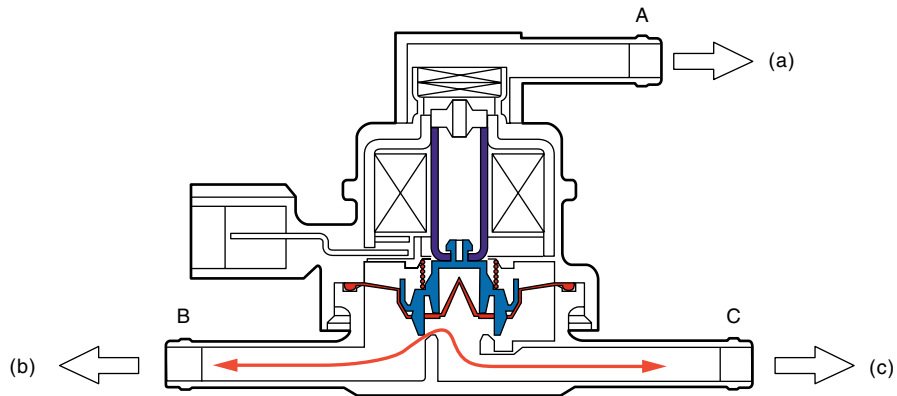
EN-01718

- (1) Valve
- (a) Atmospheric pressure
- (b) Fuel tank
- (c) Canister

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

- When Solenoid is ON



EN-01719

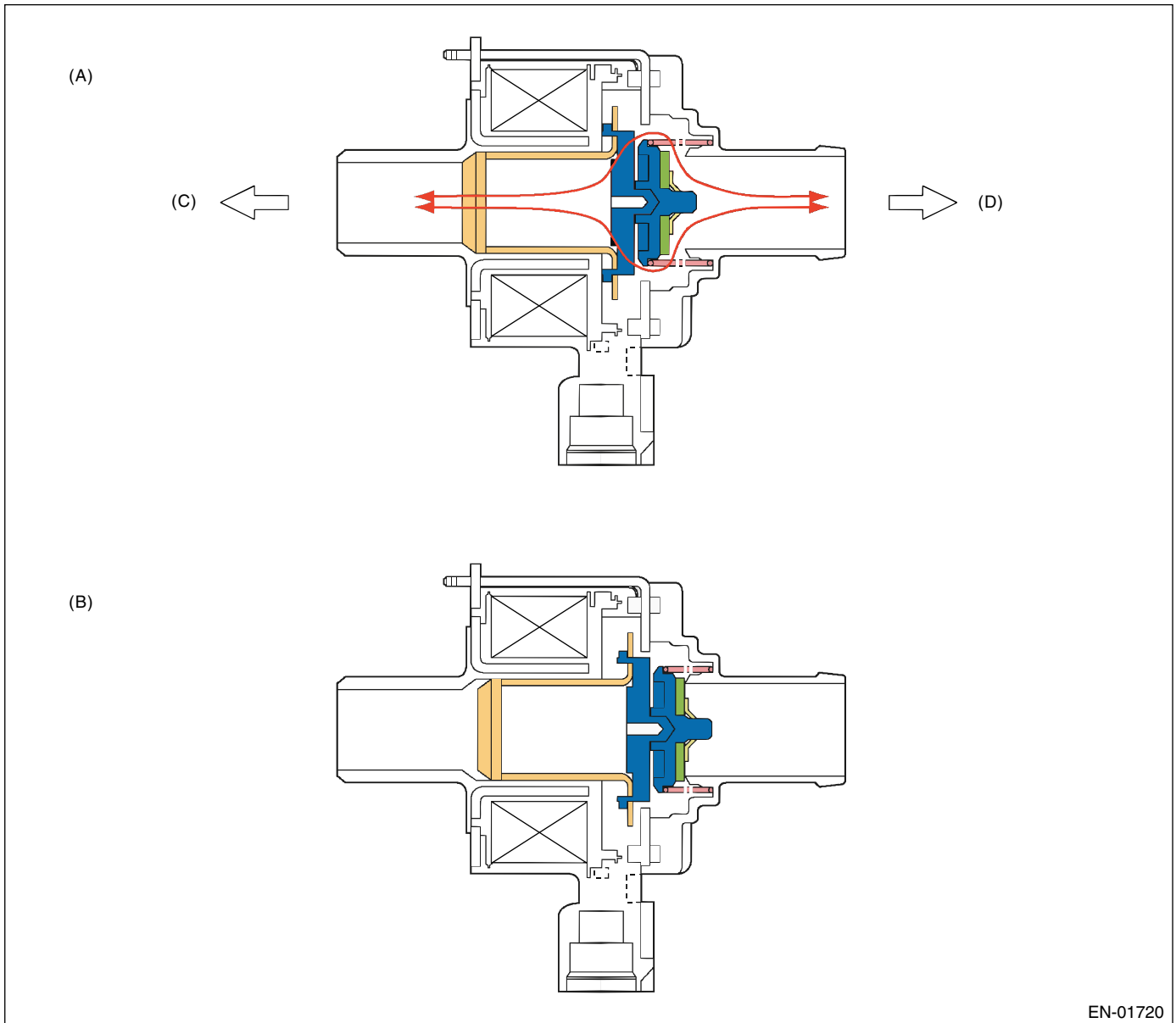
- (a) Atmospheric pressure
- (b) Fuel tank
- (c) Canister

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

• CCV

CCV controls the ambient air to be introduced to the canister.



EN-01720

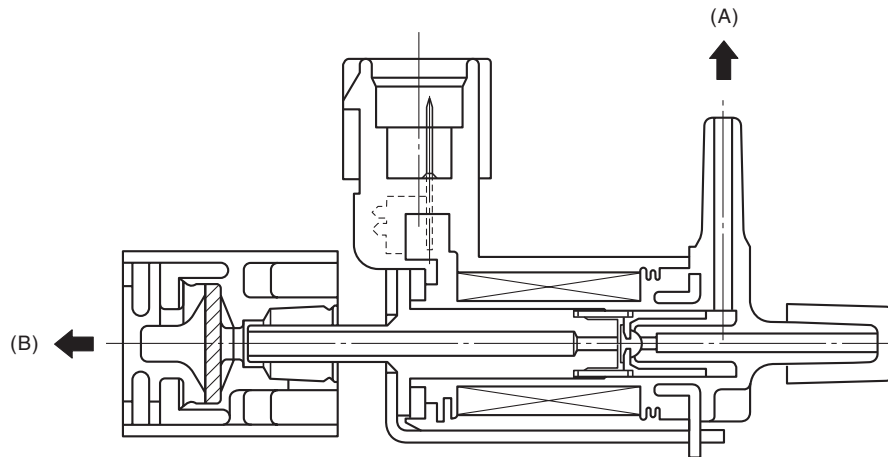
- (A) Open (Solenoid OFF)
- (B) Close (Solenoid ON)
- (C) Filter
- (D) Canister

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

• Tank Pressure Switching Solenoid

One of the atmospheric pressure switching solenoid valves is connected to fuel tank pressure sensor and the other is released to atmosphere. The passage to fuel tank pressure sensor is usually released to atmosphere because the solenoid is set to OFF, but the solenoid which is set to ON closes the passage open to atmosphere.



EN-01721

- (A) Fuel tank pressure sensor
- (B) Atmosphere

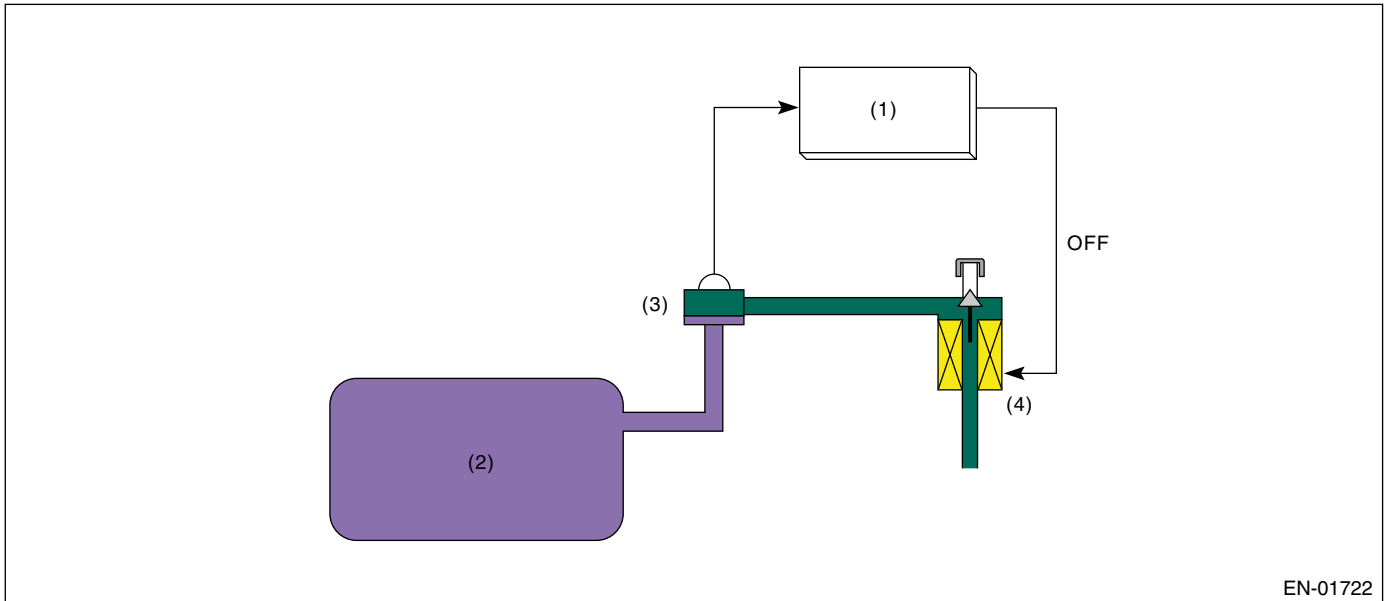
Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

• Purpose of this solenoid

Fuel tank pressure sensor detects the difference between the atmospheric air pressure and the tank pressure and the ECM monitors the pressure difference.

Even if the tank pressure is constant, the atmospheric air pressure varies depending on the driving height, and the pressure signal transmitted to ECM will change.

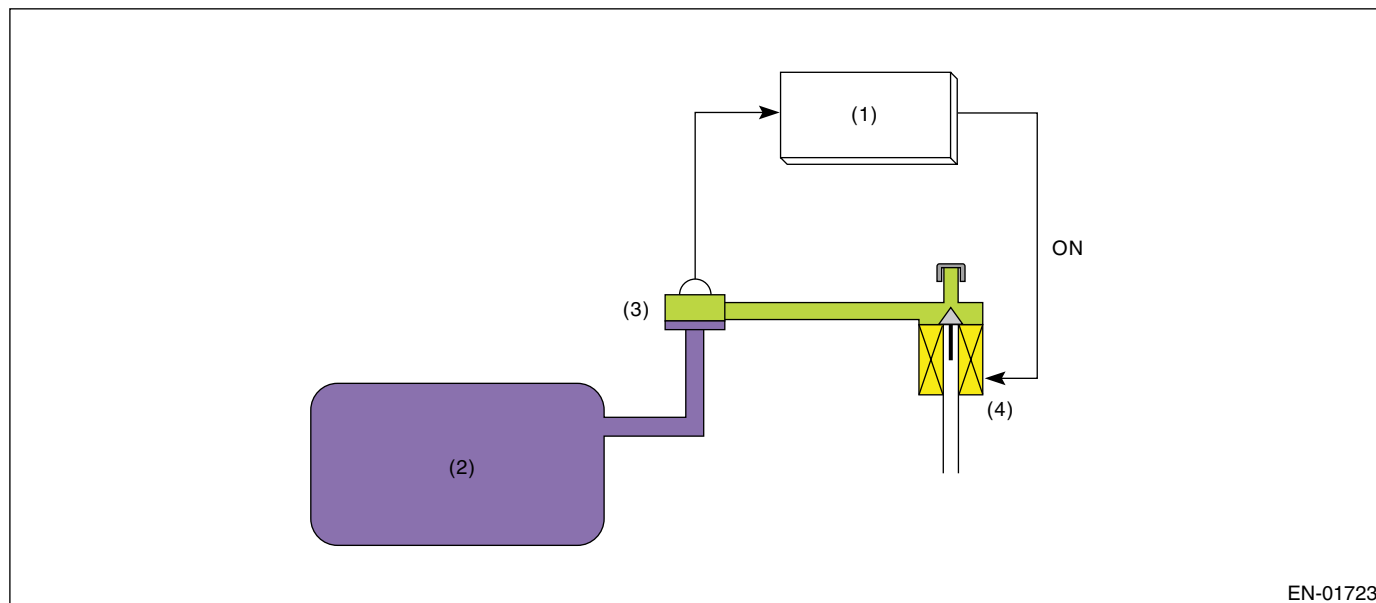


- (1) Engine control module (ECM)
- (2) Fuel tank
- (3) Fuel tank pressure sensor
- (4) Atmospheric pressure switching solenoid

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Especially, in the small leakage [0.5 mm (0.02 in)], minute change in the tank pressure has to be detected. This diagnosis period is long (approx. 29 seconds). And if the driving height changes during the diagnosis, the atmospheric air pressure changes. In this case, it becomes difficult to precisely detect the tank pressure variation, causing erroneous diagnosis. Therefore, using the atmospheric pressure switching solenoid, atmospheric air is sealed between the fuel tank pressure sensor and atmospheric pressure switching solenoid, maintaining the air pressure constant and enabling the detection of minute variation of tank pressure.



- (1) Engine control module (ECM)
- (2) Fuel tank
- (3) Fuel tank pressure sensor
- (4) Atmospheric pressure switching solenoid

NOTE:

ECM also has the atmospheric air pressure sensor, and always monitors atmospheric air. However, as the monitoring range is large, that is, 53 to 107 kPa (400 to 800 mmHg, 16 to 32 inHg) it is not suitable for detection of minute pressure variation.

In the case of small leakage diagnosis, the tank pressure variation is very small, that is, 0.13 to 0.27 kPa (1 to 2 mmHg, 0.04 to 0.08 inHg) and the fuel tank pressure sensor is equipped.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

3. ENABLE CONDITION

0.04-inch Diagnosis

Secondary Parameters	Enable Conditions
Evaporation diagnosis	Incomplete
Battery voltage	$\geq 10.9 \text{ V}$
Barometric pressure	$\geq 75.1 \text{ kPa}$ (563 mmHg, 22.2 inHg)
Accumulated time of canister purge operation	120 seconds or more
After engine starting	856 seconds or more
Learning value of evaporation gas density	≤ 0.04
Engine speed	$1,050 \longleftrightarrow 6,500 \text{ rpm}$
Fuel tank pressure	$< 1.03 \text{ kPa}$ (7.72 mmHg, 0.30 inHg)
Intake manifold vacuum (relative pressure)	$< -13.3 \text{ kPa}$ (-100 mmHg, -3.92 inHg)
Vehicle speed	$\geq 32 \text{ km/h}$ (20 MPH)
Fuel level	$9 \longleftrightarrow 51 \text{ l}$ (2.38 $\longleftrightarrow$ 13.5 US gal, 1.98 $\longleftrightarrow$ 11.2 Imp gal)
Closed air/fuel ratio control	In operation
Fuel temperature	$-10 \longleftrightarrow 45^\circ\text{C}$ (14 $\longleftrightarrow$ 113°F)
Intake air temperature	$\geq -10^\circ\text{C}$ (14°F)
Pressure change per second	$< 0.13 \text{ kPa}$ (0.95 mmHg, 0.04 inHg)
Min. pressure change per second – Max. pressure change per second	$< 0.23 \text{ kPa}$ (1.75 mmHg, 0.07 inHg)
Fuel level change	$< 2.5 \text{ l}$ (0.66 US gal, 0.55 Imp gal)/128 milliseconds
Air fuel ratio	0.76 — 1.25

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

0.02-inch Diagnosis

Secondary Parameters	Enable Conditions
(At starting a diagnosis)	
EVAP. diagnosis	Incomplete
Battery voltage	$\geq 10.9 \text{ V}$
Atmospheric pressure	$\geq 75.1 \text{ kPa}$ (563 mmHg, 22.2 inHg)
Since last incomplete diagnosis event of 0.02-inch leakage	$\geq 120 \text{ seconds}$
Accumulated time of canister purge operation	120 second or more
After engine starting	335 second or more
Fuel temperature	$-10 \longleftrightarrow 35^{\circ}\text{C}$ (14 $\longleftrightarrow$ 95°F)
Or engine coolant temperature at engine start	$< 40^{\circ}\text{C}$ (104°F)
And time after engine start	$< 2,400 \text{ seconds}$
Fuel level	9 $\longleftrightarrow$ 51 $\varnothing$ (2.38 $\longleftrightarrow$ 13.5 US gal, 1.98 $\longleftrightarrow$ 11.2 Imp gal)
(Ambient – fuel) temperature	$< 1^{\circ}\text{C}$ (1.8°F)
Fuel tank pressure below -3.01 kPa (-22.8 mmHg , -0.88 inHg) (during same driving cycle)	Up to 2 times
Intake manifold vacuum (relative pressure)	$< -13.3 \text{ kPa}$ (-100 mmHg , -3.92 inHg)
Fuel tank pressure	$-0.67 \text{ — } 1 \text{ kPa}$ ($-5 \text{ — } 7.72 \text{ mmHg}$, $-0.2 \text{ — } 0.3 \text{ inHg}$)
Vehicle speed	$\geq 68 \text{ km/h}$ (42 MPH)
Closed air/fuel ratio control	In operation
Engine speed	1,500 $\longleftrightarrow$ 6,500 rpm
(During diagnosis)	
P1	$-0.13 \longleftrightarrow 0.13 \text{ kPa}$ ($-1 \longleftrightarrow 1 \text{ mmHg}$, $-0.04 \longleftrightarrow 0.04 \text{ inHg}$)
Pressure change per second	$< 0.13 \text{ kPa}$ (0.95 mmHg, 0.04 inHg)
Fuel level change	$< 2.5 \varnothing$ (0.66 US gal, 0.55 Imp gal)
Tank pressure	$< 1.03 \text{ kPa}$ (7.72 mmHg, 0.30 inHg)
Min. tank pressure change per second – Max. tank pressure change per second	$< 0.23 \text{ kPa}$ (1.75 mmHg, 0.07 inHg)
Change of atmospheric pressure during P1 calculation	$-0.04 \longleftrightarrow 0.17 \text{ kPa}$ ($-0.3 \longleftrightarrow 1.2 \text{ mmHg}$, $-0.01 \longleftrightarrow 0.05 \text{ inHg}$)
Change of atmospheric pressure during P2 calculation	$-0.08 \longleftrightarrow 0.12 \text{ kPa}$ ($-0.6 \longleftrightarrow 0.9 \text{ mmHg}$, $0.02 \longleftrightarrow 0.04 \text{ inHg}$)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

4. GENERAL DRIVING CYCLE

• 0.04-inch Diagnosis

- Perform the diagnosis only once in more than 856 seconds after the engine start at the constant driving speed of 32 km/h (20 MPH) or more.
- Pay attention to the fuel temperature and fuel level.

• 0.02-inch Diagnosis

- Perform diagnosis in more than 335 seconds after engine start at the constant speed of 68 km/h (42 MPH) or more, and then terminate the diagnosis when judged OK or NG.
- If not judged OK or NG, repeat the diagnosis until judged OK or NG.
- Pay attention to the fuel temperature and fuel level.

5. DIAGNOSTIC METHOD

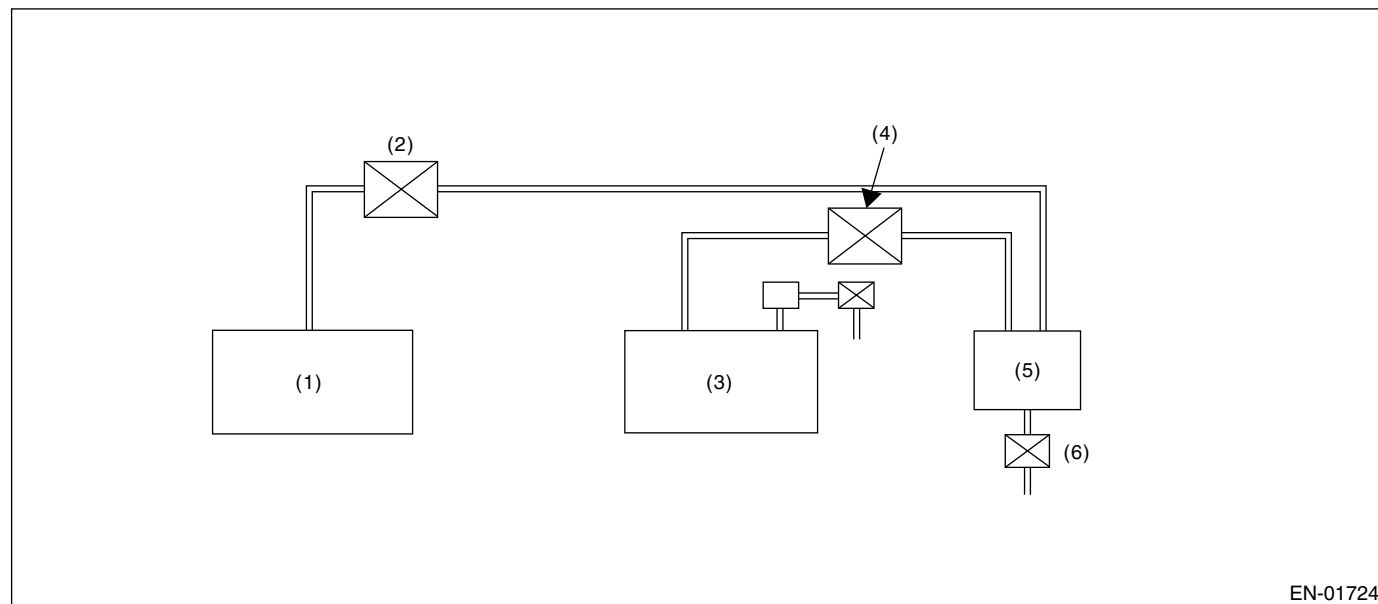
• MODE Z (Purge control solenoid valve open malfunction diagnosis)

DTC P0457

• Purpose of Mode Z

When performing the leakage diagnosis of EVAP system, CPC has to operate normally. Therefore, mode Z is used to diagnose the CPC open fixation.

If the CPC open fixation trouble is detected, the EVAP system leakage diagnosis is cancelled.



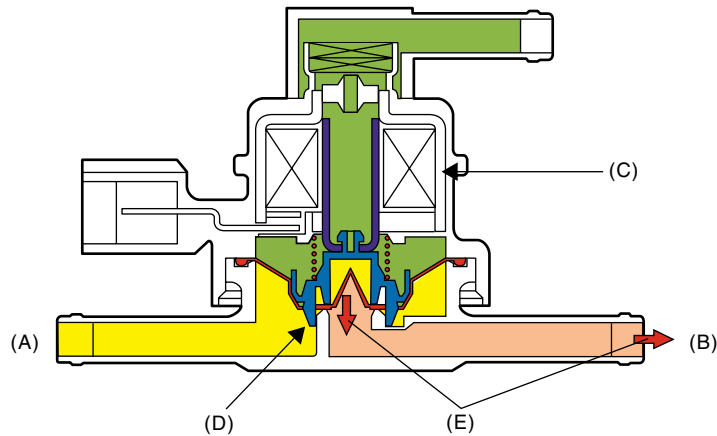
EN-01724

(1)	Engine
(2)	Purge control solenoid valve open
(3)	Fuel tank

(4)	Pressure control solenoid valve close
(5)	Canister
(6)	CCV stuck close

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

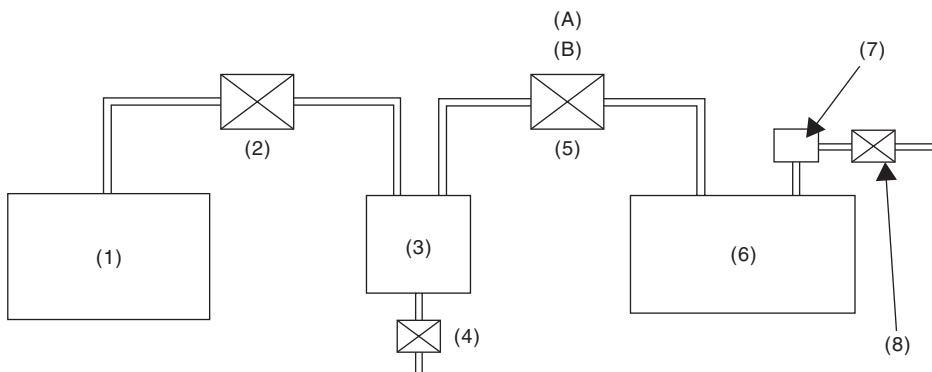


EN-01725

- (A) To fuel tank
- (B) To canister (Negative pressure)
- (C) Solenoid ON
- (D) Valve cannot be open.
- (E) Negative pressure

• Diagnostic method

CPC open fixation diagnosis is performed in mode Z as shown in the figure below.



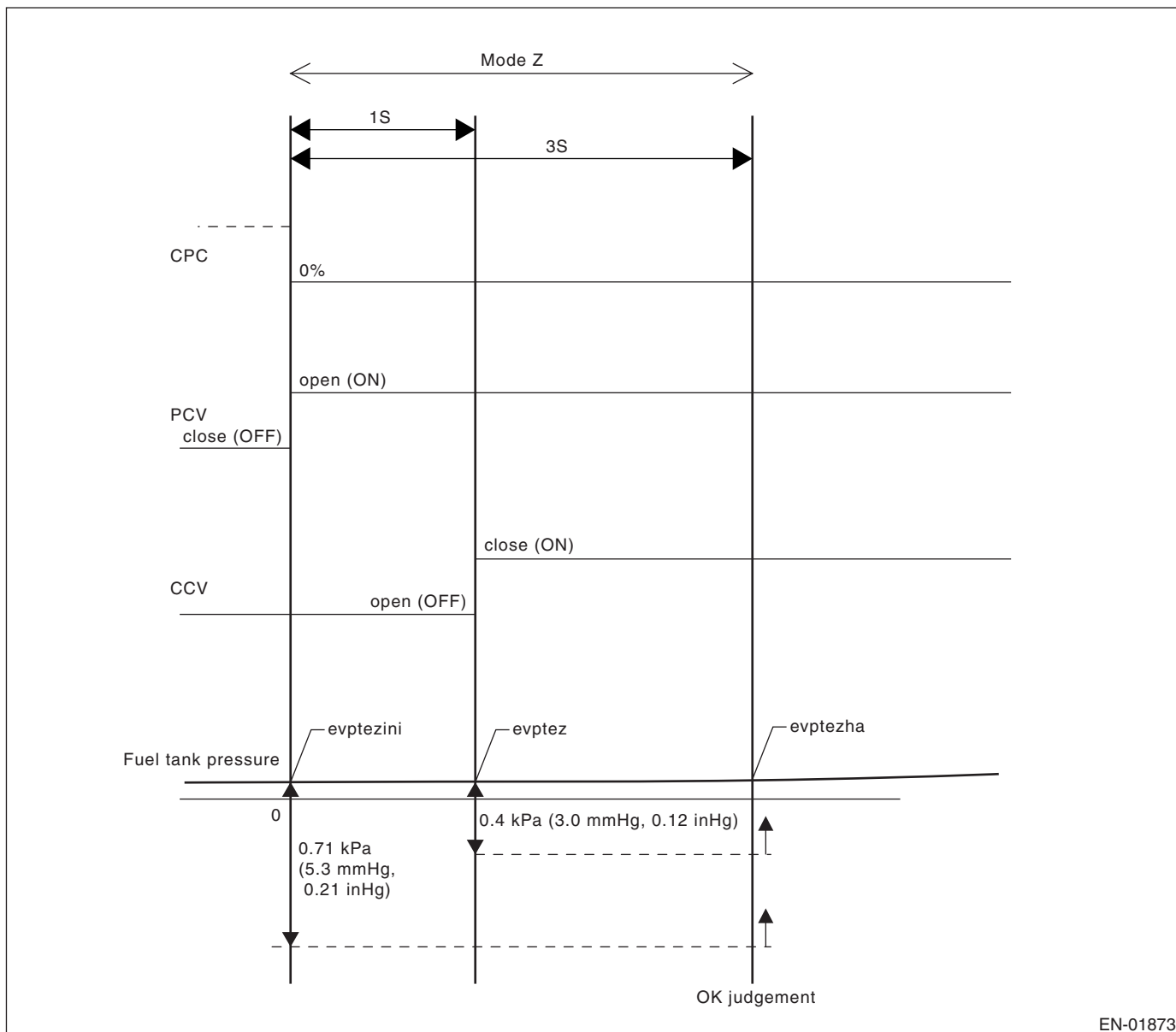
EN-01726

(1) Engine	(5) Pressure control solenoid valve
(2) Purge control solenoid valve	(6) Fuel tank
(3) Canister	(7) Fuel tank pressure sensor
(4) Drain valve	(8) Tank pressure switching solenoid valve

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

• Normal Operation



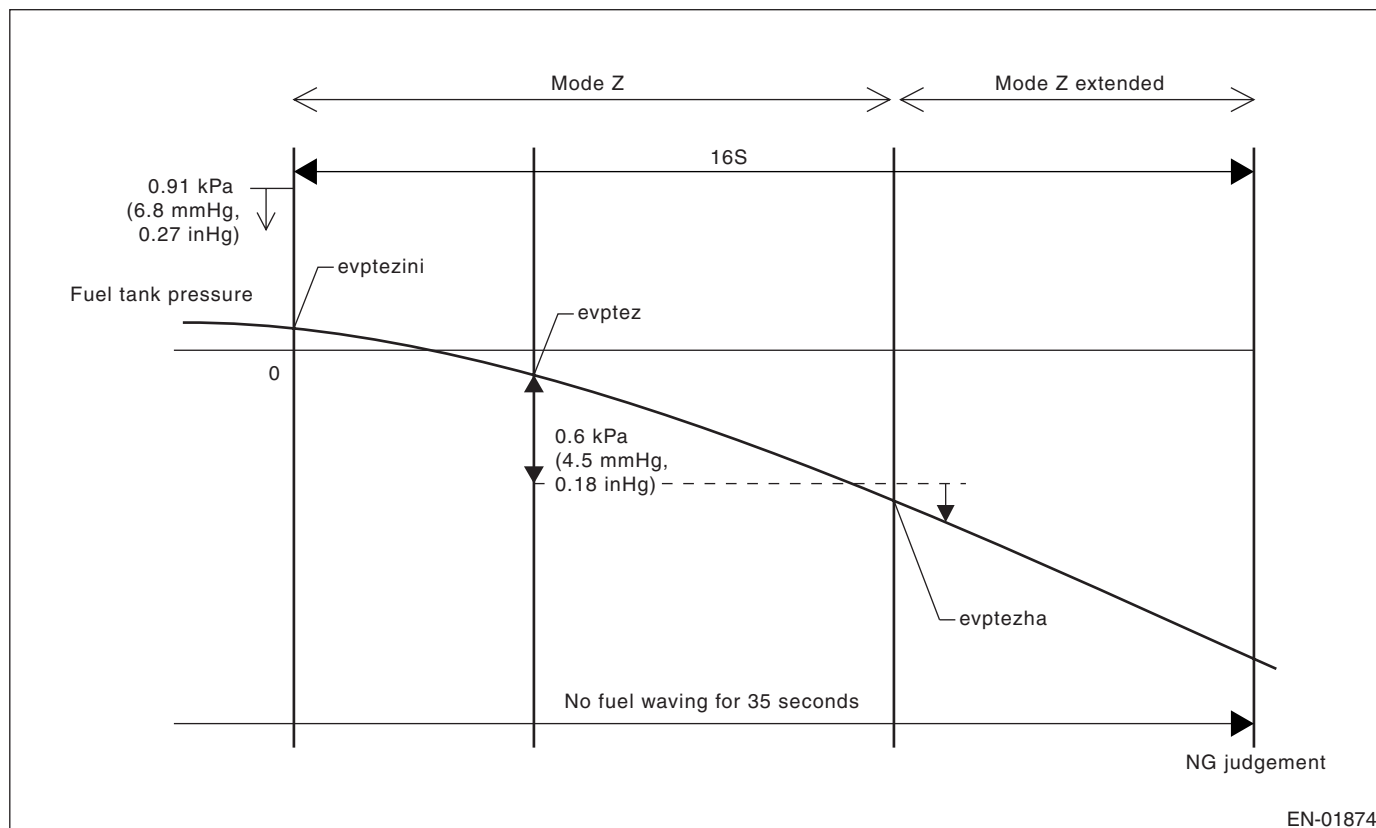
EN-01873

- $evptez - evptezha \leq 0.4 \text{ kPa (3.0 mmHg, 0.12 inHg)}$
 - $evptezini - evptezha \leq 0.71 \text{ kPa (5.3 mmHg, 0.21 inHg)}$
- Judge normal when both of above calculations are completed.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

• Purge Control Solenoid Valve Open Fixation



- $evptez - evptezha > 0.6 \text{ kPa (4.5 mmHg, 0.18 inHg)}$
- $evptezini \leq 0.91 \text{ kPa (6.8 mmHg, 0.27 inHg)}$
- No fuel rolling of above 32(0.79 US gal, 0.67 Imp gal) for more than 35 seconds.

Judge normal when both of above calculations are completed.

Normality Judgment

Judge OK and change to Mode A when the criteria below are completed in 3 seconds after Mode Z started.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
(Tank pressure when Mode Z started) – (Tank pressure when Mode Z finished)	$\leq 0.7 \text{ kPa (5.3 mmHg, 0.21 inHg)}$	P0457

• Diagnosing function of CPC [P0457]

CPC functional diagnosis is performed by monitoring the tank pressure in Mode Z.

Normality Judgment

Make OK judgment in 3 seconds after Mode Z started, and change to Mode A if OK.

Both diagnostic method and judgment value are the same as PCV normality judgment.

Abnormality Judgment

If OK judgment cannot be made, extend Mode Z 16 seconds more, and judge NG when all the criteria below are completed in 16 seconds.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
(Tank pressure in 1 second after Mode Z started) – (Tank pressure when Mode Z finished)	$> 0.6 \text{ kPa (4.5 mmHg, 0.18 inHg)}$	P0457
Tank pressure when Mode Z started	$\leq 0.91 \text{ kPa (6.8 mmHg, 0.27 inHg)}$	
No fuel locking time	$\geq 35 \text{ seconds}$	

Time Needed for Diagnosis: 16 seconds

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Finish the Evap. diagnosis when making NG judgment for purge control solenoid valve open fixation.

Cancel the Evap. diagnosis when the OK/NG judgment for purge control solenoid valve open fixation cannot be made in Mode Z.

• Leak Diagnosis

DTC P0442

DTC P0456

DTC P0457

• Diagnostic method

- The diagnostic method consists of creating a sealed vacuum in the fuel tank and then determining the presence of leakage from the speed at which the tank internal pressure returns to atmospheric pressure.

- The diagnosis is divided into the following five phases.

Mode A; (Estimation of evaporation gas yield)

Calculate the tank pressure variation amount (P1). After calculating P1, change to Mode B.

Mode B; (Seal negative pressure)

Introduce the negative pressure in the intake manifold to the tank.

Approx. 0 → -1.4 kPa (0 → -10.5 mmHg, 0 → -0.41 inHg) (0.04-in diagnosis)

Approx. 0 → -3.05 kPa (0 → -22.9 mmHg, 0 → -0.9 inHg) (0.02-in diagnosis)

When the pressure above (desired negative pressure) is reached, Mode C is entered.

In this case, if the tank pressure does not become the desired negative pressure, judge that there is a large leakage in the system.

Judge NG when the malfunction criteria below is completed.

Finish the Evap. diagnosis when judging large leak (10 seconds or 25 seconds) in 0.04-inch diagnosis. Cancel the diagnosis (10 to 20 seconds) in 0.02-inch diagnosis.

Abnormality Judgment

Judge NG (large leak) when the criteria below are completed in the specified time.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
(0.04-inch diagnosis) Time for reaching desired negative pressure Or time for Mode B (Min. value of tank pressure during Mode B) – (Tank pressure when Mode B started)	≥ 25 seconds ≥ 10 seconds < -0.5 kPa (-4 mmHg, -0.16 inHg)	P0457

Mode C; (Check increasing pressure)

Stop the introduction of negative pressure. (Wait until returning target pressure.)

When returning to target pressure, move to Mode D.

Judge immediate OK and change to Mode E when it does not return in spite of spending the specified time.

	Target pressure	Time for immediate OK judgment
0.04-inch diagnosis	-1.3 kPa (-9.75 mmHg, -0.38 inHg)	15 seconds
0.02-inch diagnosis	-3 kPa (-22.5 mmHg, -0.89 inHg)	20 seconds

Mode D; (Measurement of negative pressure changes)

Monitor the tank pressure variation in Mode D. In this case, the tank pressure increases, that is, the pressure becomes as high as the atmospheric air pressure, because evaporator is generated. 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 small leak diagnosis and change to Mode E if normal. Complete Evap. diagnosis if abnormal.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

• After Mode D

Assigning P1 and P2, which are tank variations measured in Mode A and Mode B, to the formula below, judge the small leakage of the system. If the measured judgment value exceeds the threshold value, it is judged to be malfunction.

• 0.04-inch Diagnosis

Abnormality Judgment

Judge NG when the criteria below are completed and judge OK when not completed.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
$P2 - 1.5 \times P1$ P2: Change of tank pressure within 16 seconds on Mode D P1: Change of tank pressure within 16 seconds on Mode A	> Value on map 7. *Threshold value: Figure (Fuel level vs Tank temperature)	P0442

*1.5: Compensation value of the amount of evaporator occurrence. (Because evaporator increases more when becoming negative pressure.)

Map 7 Limit of malfunction criteria for 0.04-inch leak as Evap. diagnosis.

Fuel temperature & Fuel level	5°C (41°F)	15°C (59°F)	25°C (77°F)	35°C (95°F)	45°C (113°F)
10 L (2.6 US gal, 2.2 Imp gal)	0.49 kPa (3.68 mmHg, 0.14 inHg)	0.49 kPa (3.68 mmHg, 0.14 inHg)	0.53 kPa (3.95 mmHg, 0.16 inHg)	0.54 kPa (4.07 mmHg, 0.16 inHg)	0.56 kPa (4.17 mmHg, 0.16 inHg)
20 L (5.3 US gal, 4.4 Imp gal)	0.50 kPa (3.77 mmHg, 0.15 inHg)	0.51 kPa (3.79 mmHg, 0.15 inHg)	0.53 kPa (4.01 mmHg, 0.16 inHg)	0.56 kPa (4.17 mmHg, 0.16 inHg)	0.57 kPa (4.27 mmHg, 0.17 inHg)
30 L (7.9 US gal, 6.6 Imp gal)	0.51 kPa (3.85 mmHg, 0.15 inHg)	0.52 kPa (3.90 mmHg, 0.15 inHg)	0.54 kPa (4.06 mmHg, 0.16 inHg)	0.57 kPa (4.27 mmHg, 0.17 inHg)	0.60 kPa (4.48 mmHg, 0.18 inHg)
40 L (10.6 US gal, 8.8 Imp gal)	0.65 kPa (4.88 mmHg, 0.19 inHg)	0.65 kPa (4.90 mmHg, 0.19 inHg)	0.66 kPa (4.98 mmHg, 0.20 inHg)	0.71 kPa (5.32 mmHg, 0.21 inHg)	0.76 kPa (5.73 mmHg, 0.23 inHg)
50 L (13.2 US gal, 11.0 Imp gal)	0.79 kPa (5.96 mmHg, 0.23 inHg)	0.79 kPa (5.96 mmHg, 0.23 inHg)	0.79 kPa (5.96 mmHg, 0.23 inHg)	0.85 kPa (6.38 mmHg, 0.25 inHg)	0.88 kPa (6.60 mmHg, 0.26 inHg)

• 0.02-inch Diagnosis

Abnormality Judgment

Judge NG when the criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
$P2 - 1.5 \times P1$ P2: Change of tank pressure within 16 seconds on Mode D P1: Change of tank pressure within 16 seconds on Mode A	> Value on map 8. *Threshold value: Figure (Fuel level vs Tank temperature)	P0456

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Map 8 Limit of malfunction criteria for 0.02-inch leak as Evap. diagnosis.

Fuel temperature & Fuel level	15°C (59°F)	25°C (77°F)	35°C (95°F)	40°C (104°F)
10 L (2.6 US gal, 2.2 Imp gal)	0.48 kPa (3.60 mmHg, 0.14 inHg)	0.53 kPa (4.00 mmHg, 0.16 inHg)	0.59 kPa (4.40 mmHg, 0.17 inHg)	0.92 kPa (6.90 mmHg, 0.27 inHg)
20 L (5.3 US gal, 4.4 Imp gal)	0.55 kPa (4.15 mmHg, 0.16 inHg)	0.60 kPa (4.50 mmHg, 0.18 inHg)	0.65 kPa (4.90 mmHg, 0.19 inHg)	1.00 kPa (7.50 mmHg, 0.30 inHg)
30 L (7.9 US gal, 6.6 Imp gal)	0.61 kPa (4.60 mmHg, 0.18 inHg)	0.65 kPa (4.90 mmHg, 0.19 inHg)	0.70 kPa (5.30 mmHg, 0.21 inHg)	1.08 kPa (8.10 mmHg, 0.32 inHg)
40 L (10.6 US gal, 8.8 Imp gal)	0.69 kPa (5.15 mmHg, 0.20 inHg)	0.73 kPa (5.50 mmHg, 0.22 inHg)	0.77 kPa (5.80 mmHg, 0.23 inHg)	1.21 kPa (9.10 mmHg, 0.36 inHg)
50 L (13.2 US gal, 11.0 Imp gal)	0.77 kPa (5.80 mmHg, 0.23 inHg)	0.83 kPa (6.20 mmHg, 0.24 inHg)	0.90 kPa (6.70 mmHg, 0.26 inHg)	1.35 kPa (10.10 mmHg, 0.40 inHg)

Normality Judgment

Judge OK when the criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
P2 – 1.5 × P1	> Valve on map 9.	P0456

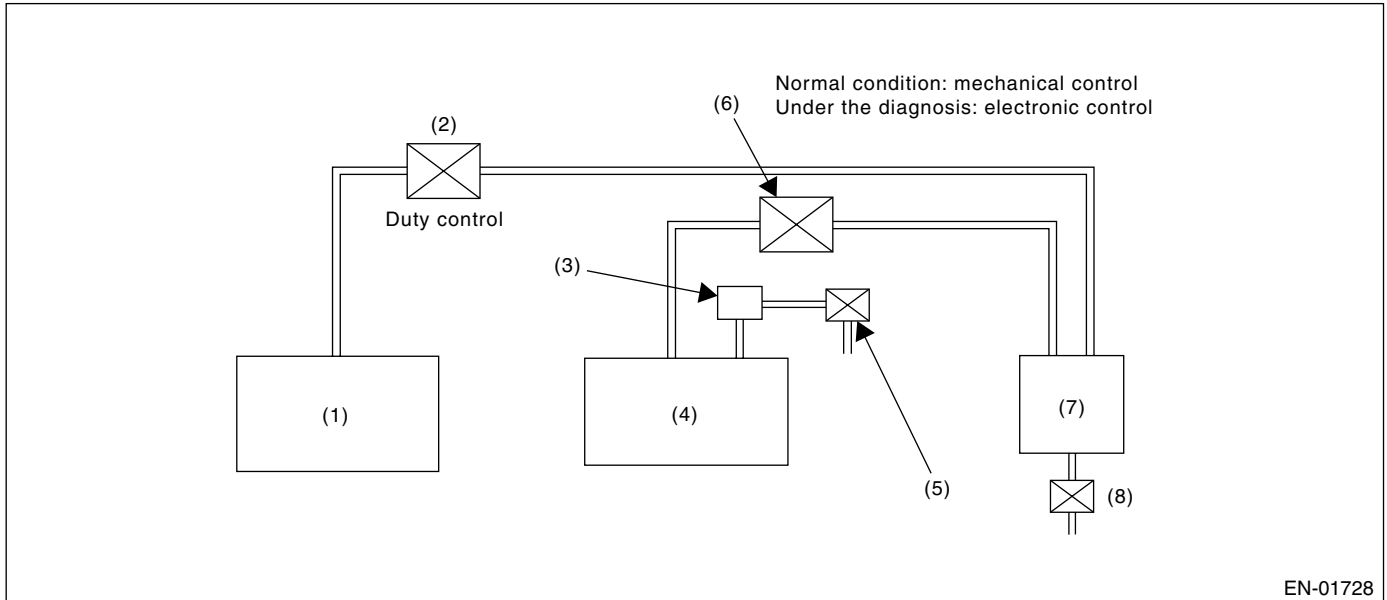
Map 9

Fuel temperature & Fuel level	15°C (59°F)	25°C (77°F)	35°C (95°F)	40°C (104°F)
10 L (2.6 US gal, 2.2 Imp gal)	2.1 kPa (15.75 mmHg, 0.62 inHg)	2.5 kPa (18.75 mmHg, 0.74 inHg)	2.9 kPa (21.75 mmHg, 0.86 inHg)	2.9 kPa (21.75 mmHg, 0.86 inHg)
20 L (5.3 US gal, 4.4 Imp gal)	2.65 kPa (19.88 mmHg, 0.78 inHg)	3 kPa (22.5 mmHg, 0.89 inHg)	3.4 kPa (25.5 mmHg, 1.0 inHg)	3.4 kPa (25.5 mmHg, 1.0 inHg)
30 L (7.9 US gal, 6.6 Imp gal)	3.1 kPa (23.25 mmHg, 0.92 inHg)	3.4 kPa (25.5 mmHg, 1.0 inHg)	3.8 kPa (28.5 mmHg, 1.12 inHg)	3.8 kPa (28.5 mmHg, 1.12 inHg)
40 L (10.6 US gal, 8.8 Imp gal)	3.65 kPa (27.38 mmHg, 1.08 inHg)	4 kPa (30.0 mmHg, 1.18 inHg)	4.3 kPa (32.25 mmHg, 1.27 inHg)	4.3 kPa (32.25 mmHg, 1.27 inHg)
50 L (13.2 US gal, 11.0 Imp gal)	4.3 kPa (32.25 mmHg, 1.27 inHg)	4.7 kPa (35.25 mmHg, 1.39 inHg)	5.2 kPa (39.0 mmHg, 1.54 inHg)	5.2 kPa (39.0 mmHg, 1.54 inHg)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

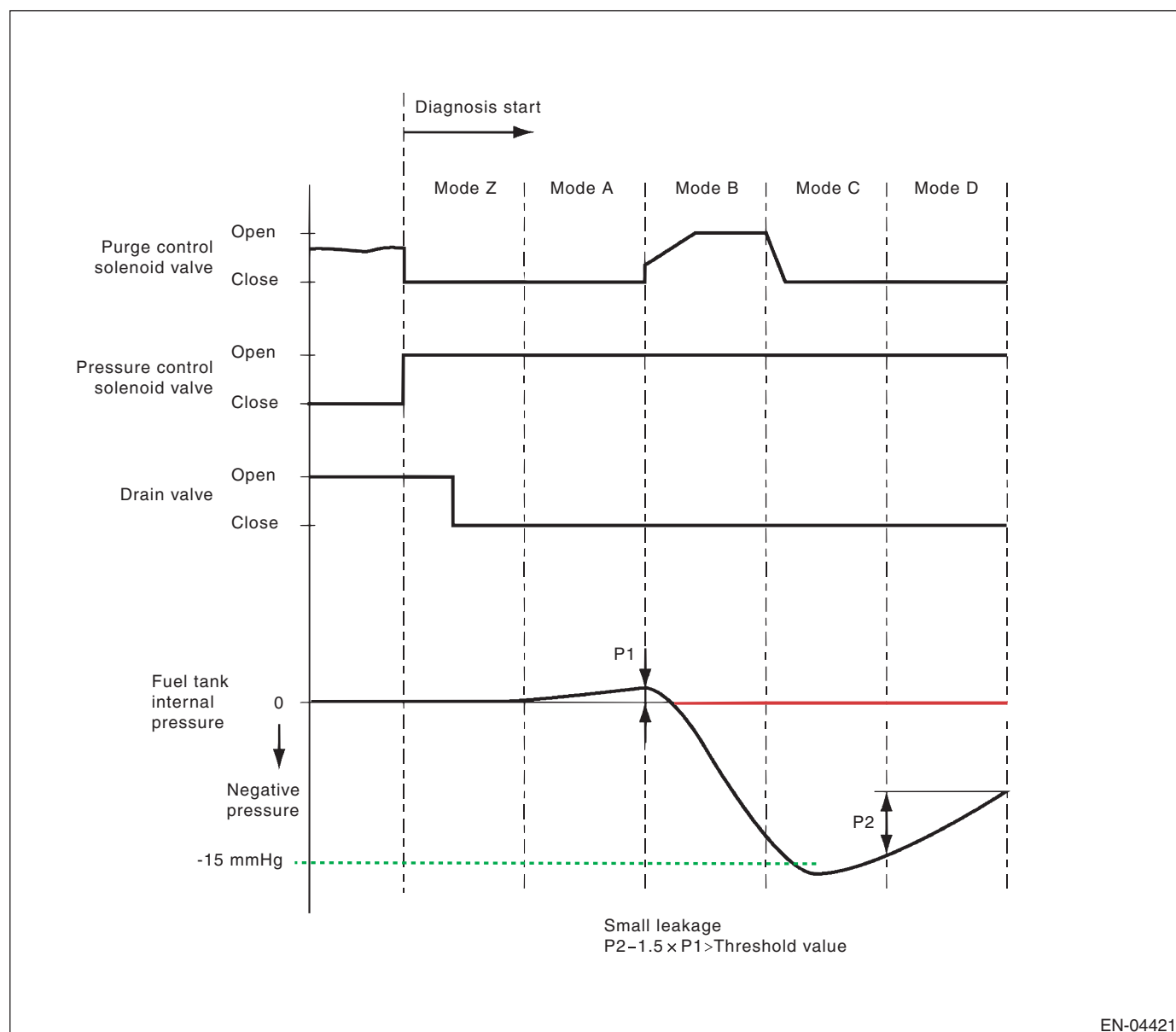
If not judged OK or NG, repeat the diagnosis until judged OK or NG.



(1)	Engine	(5)	Atmospheric pressure switching solenoid
(2)	Purge control solenoid valve	(6)	Pressure control solenoid valve
(3)	Fuel tank pressure sensor	(7)	Canister
(4)	Fuel tank	(8)	Drain valve

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION



Time Needed for Diagnosis:

- 0.04-inch: 50 — 70 seconds
- 0.02-inch: 90 — 105 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous drive cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Atmospheric purge solenoid function malfunction; Open the pressure control solenoid valve.

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

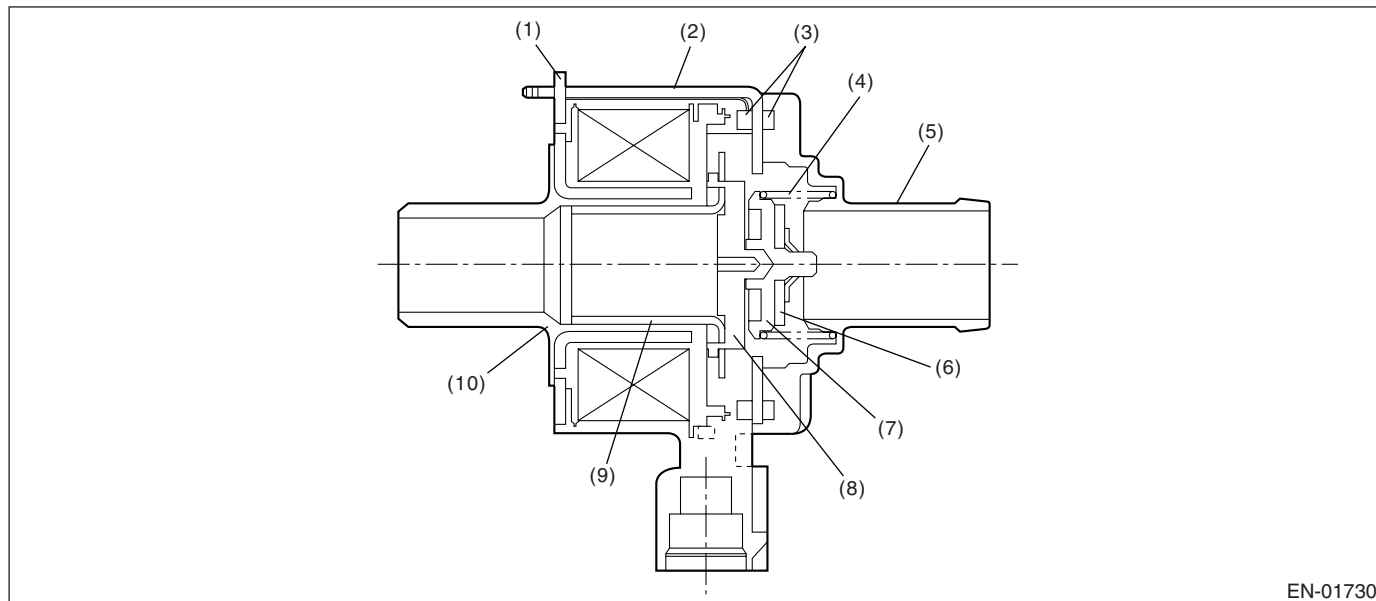
BB:DTC P0447 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of drain valve.

Judge NG when the ECM output level is different from the actual terminal level.

2. COMPONENT DESCRIPTION



EN-01730

(1) Magnetic plate	(6) Valve
(2) Yoke	(7) Plate
(3) Packing	(8) Retainer
(4) Spring	(9) Movable core
(5) Valve seat	(10) Bobbin

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM sends OFF signal	Low

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM sends OFF signal	High

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

PCV control: Open the PCV solenoid.

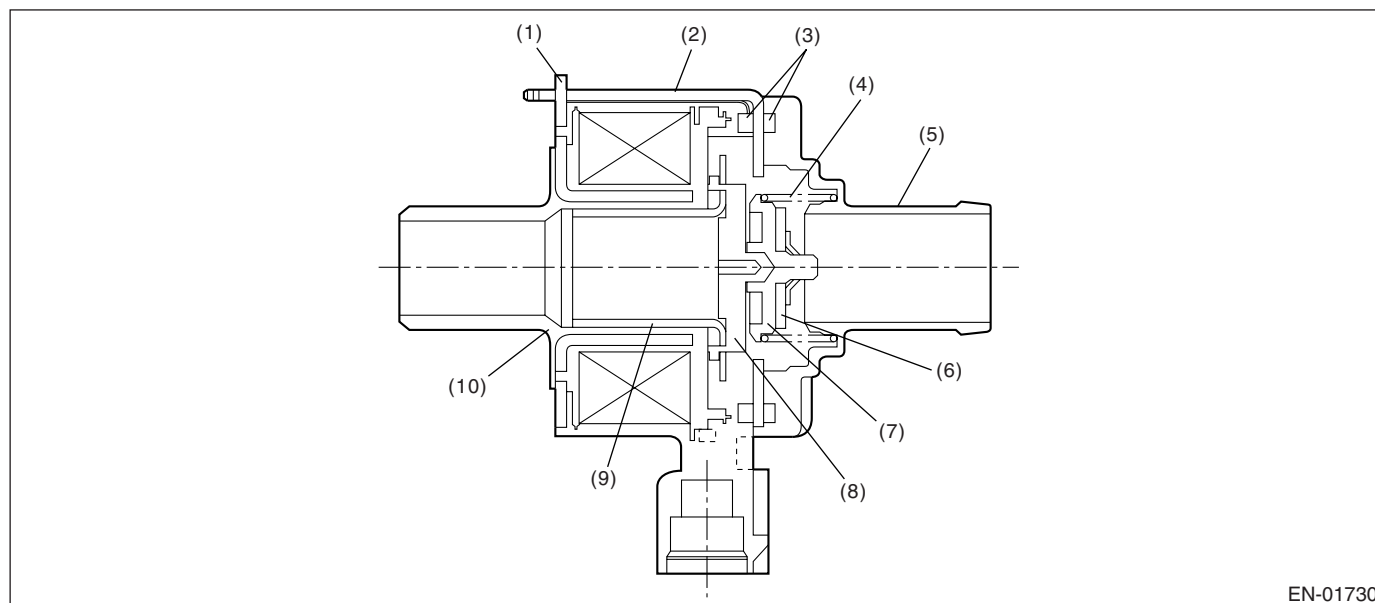
9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

BC:DTC P0448 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED**1. OUTLINE OF DIAGNOSIS**

Detect the open or short circuit of drain valve.

Judge NG when the ECM output level is different from the actual terminal level.

2. COMPONENT DESCRIPTION

- (1) Magnetic plate
- (2) Yoke
- (3) Packing
- (4) Spring
- (5) Valve seat

- (6) Valve
- (7) Plate
- (8) Retainer
- (9) Movable core
- (10) Bobbin

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD**• Abnormality Judgment**

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	$\geq 10.9 \text{ V}$
After engine starting	1 second or more
Terminal output voltage when ECM sends ON signal	High

Time Needed for Diagnosis: 2.5 seconds

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• **Normality Judgment**

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM sends ON signal	Low

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

PCV control: Open the PCV solenoid.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

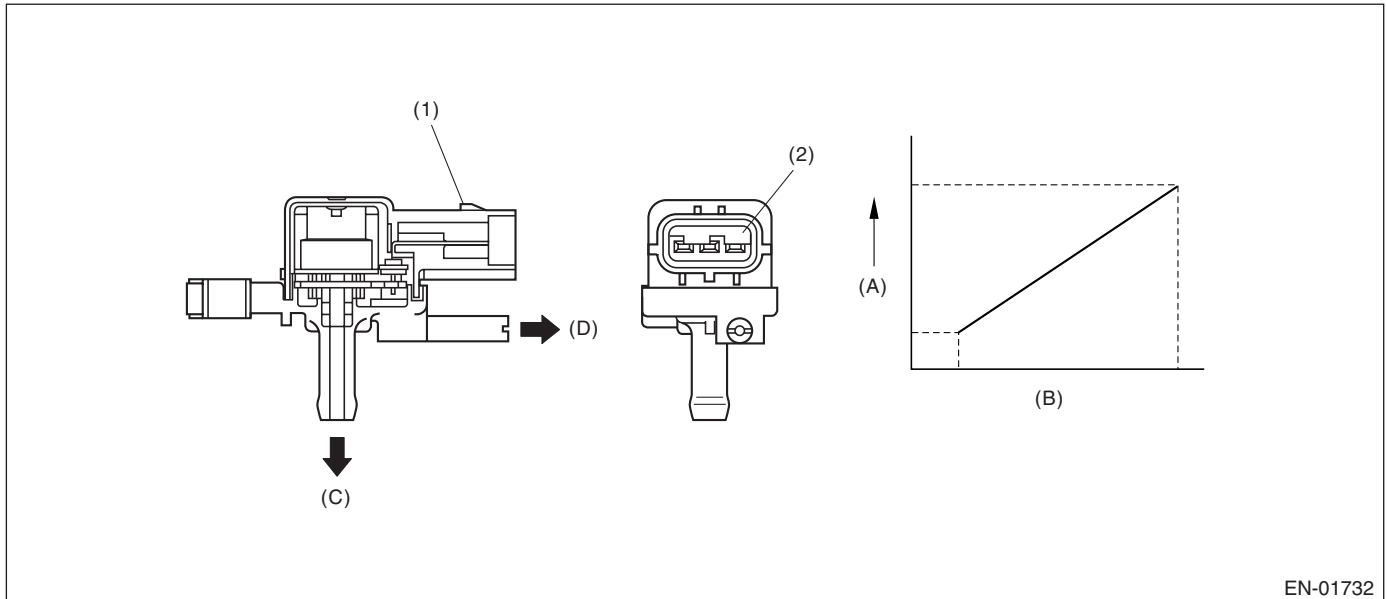
BD:DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect the tank pressure sensor output property abnormality.

Judge NG when there is no pressure variation, which should exist in the tank, considering the engine status.

2. COMPONENT DESCRIPTION



EN-01732

- (1) Connector
- (2) Terminal

- (A) Output voltage
- (B) Input voltage
- (C) To fuel tank
- (D) To atmospheric pressure switching solenoid

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
After starting the engine	60 second or more
Fuel level	$\geq 18 \text{ l}$ (4.76 US gal, 3.96 Imp gal)
Fuel temperature	$< 35^{\circ}\text{C}$ (95°F)
Battery voltage	$\geq 10.9 \text{ V}$
Atmospheric pressure	$> 75.1 \text{ kPa}$ (563 mmHg, 22.2 inHg)
Engine speed	$< 6,500 \text{ rpm}$

4. GENERAL DRIVING CYCLE

- Perform the diagnosis continuously in 60 seconds or more after starting the engine.
- Be sure to check the fuel level and fuel temperature.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below is completed.

Judgment Value

Malfunction Criteria	Threshold Value
Number of times when the difference between the Max. fuel level and the Min. fuel level every 60 seconds is 2 ℓ (0.53 US gal, 0.44Imp gal) or more (with enable condition completed)	≥ 16 times
Max. – Min. tank pressure (with enable condition completed)	< 0.05 kPa (0.375 mmHg, 0.02 inHg)
Max. – Min. fuel temperature (with enable condition completed)	≥ 7°C (44.6 °F)

If the fuel level (Max. – Min.) in every 60 seconds is less than 2 ℓ , extend 60 seconds more and make judgment with the Max. and Min. fuel level in 120 seconds.

If the difference did not appear though the time extended, extend the time (180, 240, 300 seconds) and continue the judgment.

Diagnosis counter will count up when the difference of fuel level (Max. – Min.) is more than 2 ℓ .

Time Needed for Diagnosis: 1 second × 16 times or more

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in two continuous drive cycles.

• Normality Judgment

Judge OK when the malfunction criteria below is completed.

Judgment Value

Malfunction Criteria	Threshold Value
Max. – Min. tank pressure	≥ 0.05 kPa (0.375 mmHg, 0.02 inHg)

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Purge control solenoid valve control: Purge fixation mode is prohibited.

9. ECM OPERATION AT DTC SETTING

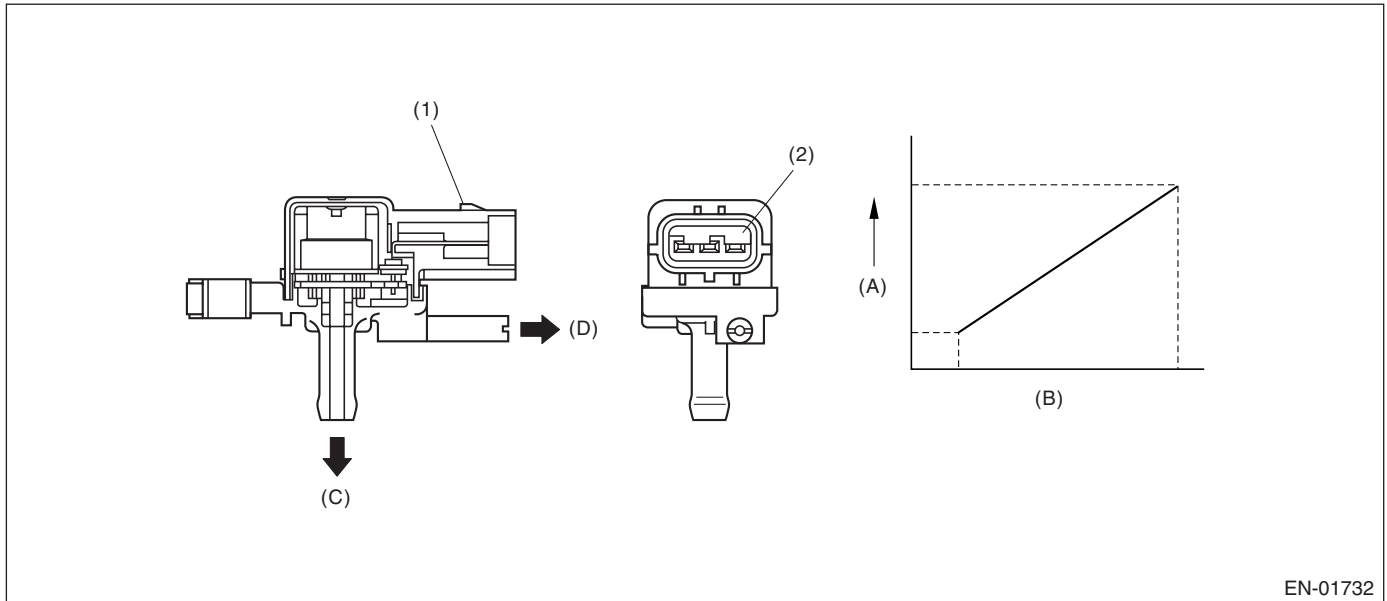
Memorize the freeze frame data. (For test mode \$02)

BE: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 NG when out of the standard value.

2. COMPONENT DESCRIPTION



- (1) Connector
- (2) Terminal

- (A) Output voltage
- (B) Input voltage
- (C) To fuel tank
- (D) To atmospheric pressure switching solenoid

3. ENABLE CONDITION (USED WITH HIGH SIDE NORMAL/ABNORMAL JUDGMENT)

Secondary Parameters	Enable Conditions
Continuous time of completing all condition	≥ 5 seconds
Vehicle speed	≥ 2 km/h (1 MPH)
All conditions of EVAP canister purge	Possible
Learning value of EVAP conc. during purge	≤ 0.08
Feedback lambda coefficient	≥ 0.9
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 15 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	< -7.45 kPa (-55.85 mmHg, -2.20 inHg)
Feedback lambda coefficient	≥ 0.9

Time Needed for Diagnosis: 15 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK when the malfunction criteria below is completed.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	≥ -7.33 kPa (-55 mmHg, -2.17 inHg)
Feedback lambda coefficient	≥ 0.9

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

Purge control solenoid valve control: Purge fixation mode is prohibited.

9. ECM OPERATION AT DTC SETTING

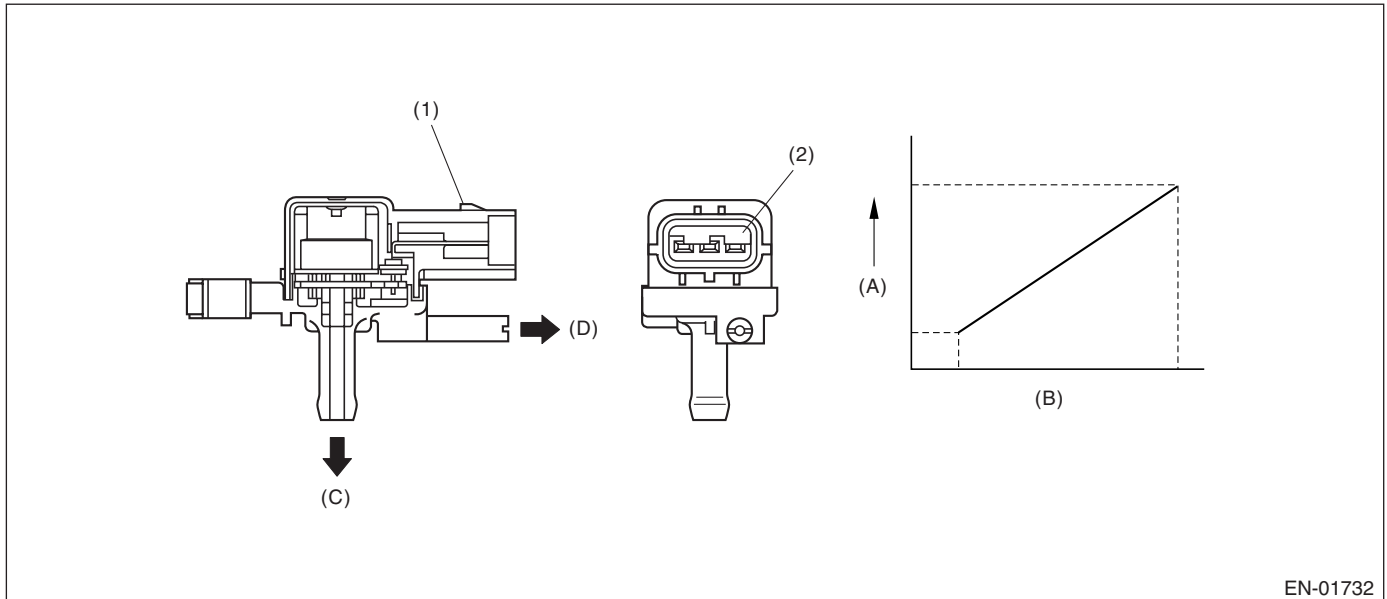
Memorize the freeze frame data. (For test mode \$02)

BF:DTC P0453 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT

1. OUTLINE OF DIAGNOSIS

Detect the breaking/shortage of the fuel tank pressure sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



- (1) Connector
- (2) Terminal

- (A) Output voltage
- (B) Input voltage
- (C) To fuel tank
- (D) To atmospheric pressure switching solenoid

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Continuous time when all conditions are completed.	≥ 5 seconds
Vehicle speed	≥ 2 km/h (1.24 MPH)
All conditions of EVAP canister purge	Complete
Evaporation gas density learning value	≤ 0.08
Main feedback compensation coefficient	≥ 0.9
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Perform the diagnosis when purging.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time until completing the malfunction criteria below becomes more than 15 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	≥ 7.98 kPa (59.85 mmHg, 2.36 inHg)
Fuel temperature	< 35°C (95°F)
Atmospheric pressure	≥ 75.1 kPa (563 mmHg, 22.2 inHg)

Time Needed for Diagnosis: 15 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK when the malfunction criteria below is completed.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	< 7.33 kPa (55 mmHg, 2.17 inHg)

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

Purge control solenoid valve control: Purge fixation mode is prohibited.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

BG:DTC P0456 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK)

1. OUTLINE OF DIAGNOSIS

For detecting conditions, refer to DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK). <Ref. to GD(STI)-116, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

BH:DTC P0457 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF)

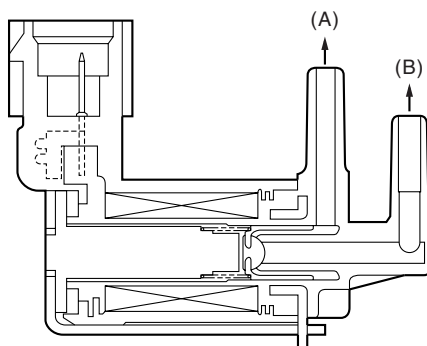
1. OUTLINE OF DIAGNOSIS

For detecting conditions, refer to DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK). <Ref. to GD(STI)-116, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

BI: DTC P0458 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW**1. OUTLINE OF DIAGNOSIS**

Detect open or short circuit of purge control solenoid valve.

Judge NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION

EN-01733

(A) To intake manifold

(B) To canister

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	$\geq 10.9 \text{ V}$
After engine starting	1 second or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

5. DIAGNOSTIC METHOD**• Abnormality Judgment**

Judge NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Continuous time of completing criteria below.	$\geq 2.5 \text{ seconds}$
Duty ratio of 'ON'	$< 75\%$
Terminal output voltage	Low

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

• Normality Judgment

Judge OK and clear NG when the malfunction criterion below is completed.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage	High

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

None

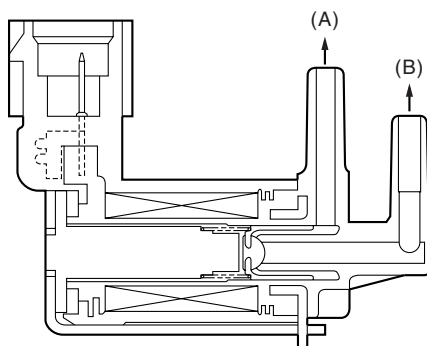
9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

BJ:DTC P0459 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH**1. OUTLINE OF DIAGNOSIS**

Detect open or short circuit of purge control solenoid valve.

Judge NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION

EN-01733

(A) To intake manifold

(B) To canister

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	$\geq 10.9 \text{ V}$
After engine starting	1 second or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

5. DIAGNOSTIC METHOD**• Abnormality Judgment**

Judge NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Continuous time of completing criteria below.	$\geq 2.5 \text{ seconds}$
Duty ratio of 'ON'	$\geq 25\%$
Terminal output voltage	High

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

• Normality Judgment

Judge OK and clear NG when the malfunction criterion below is completed.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage	Low

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

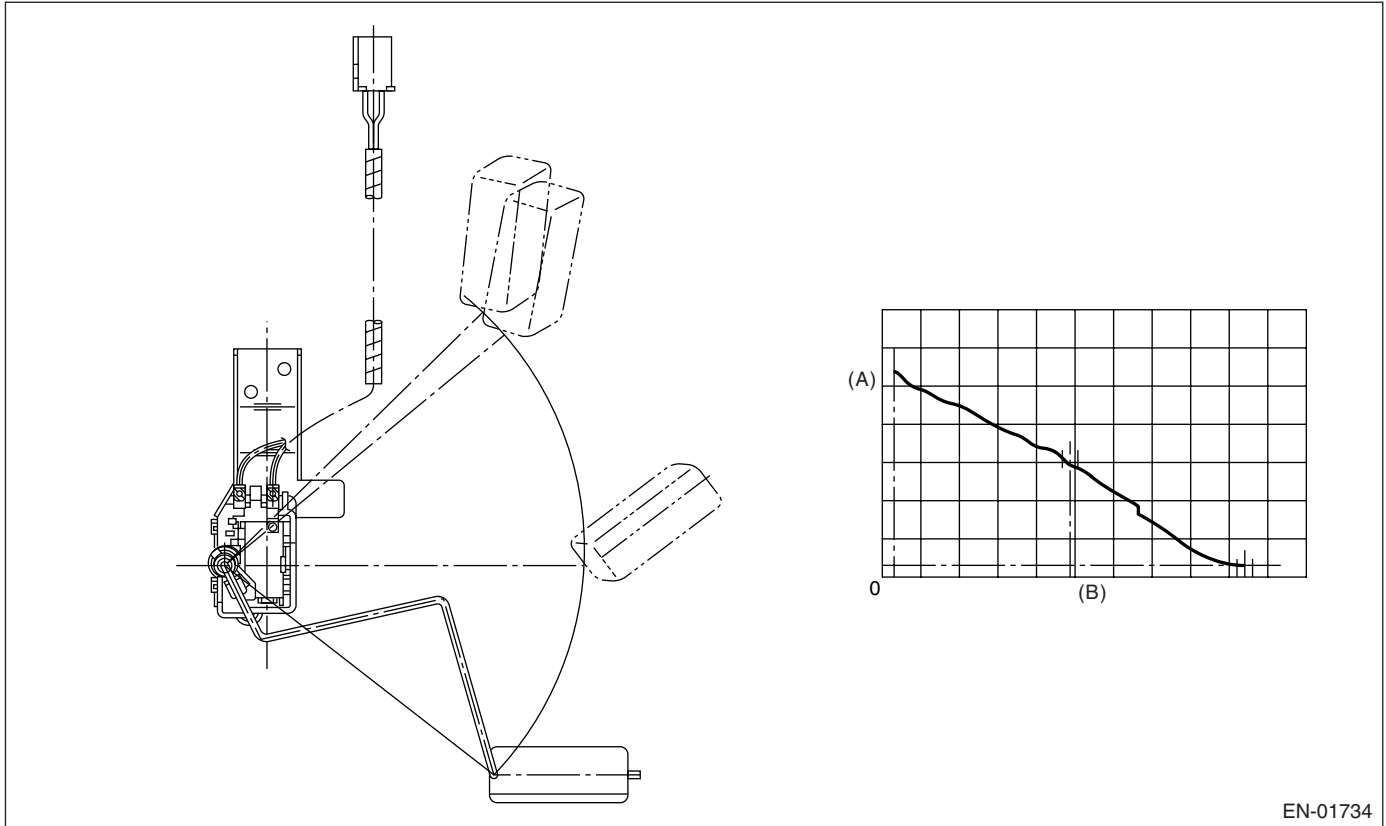
BK:DTC P0461 FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel level sensor output property.

Judge NG when the fuel level does not vary whereas it seemed to vary be in a usual driving speed.

2. COMPONENT DESCRIPTION



EN-01734

- (A) Fuel level
- (B) Resistance

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Accumulated amount of intake air	> 331 kg (729.7 lb)
Max. – Min. fuel level output	< 2.6 ℓ (0.69 US gal, 0.57 Imp gal)
Battery voltage	≥ 10.9 V
Engine speed	< 6,500 rpm
After engine start	More than 5 seconds

Time Needed for Diagnosis: To be determined.

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Accumulated amount of intake air	> 331 kg (729.7 lb)
Max. – Min. fuel level output	≥ 2.6 ℓ (0.69 US gal, 0.57 Imp gal)
Battery voltage	≥ 10.9 V
Engine speed	< 6,500 rpm
After engine start	More than 5 seconds

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

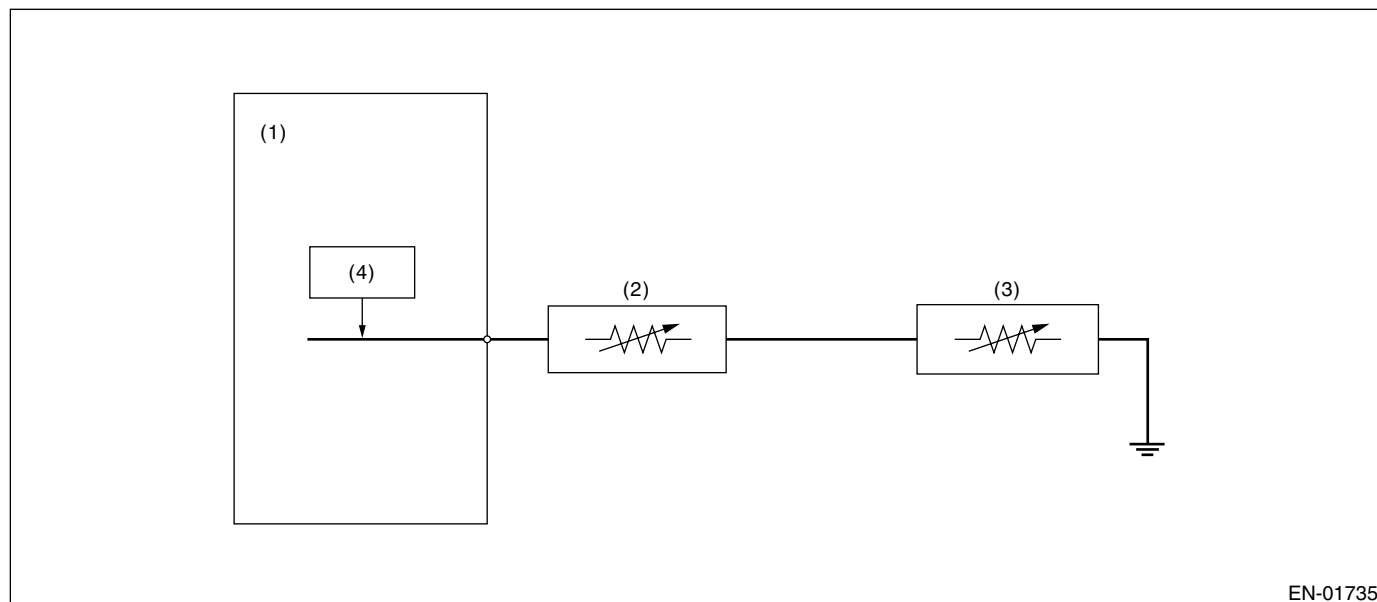
None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

BL:DTC P0462 FUEL LEVEL SENSOR CIRCUIT LOW INPUT**1. OUTLINE OF DIAGNOSIS**

Detect the open or short circuit of fuel level sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION

- (1) Engine control module (ECM)
- (2) Fuel level sensor
- (3) Fuel sub level sensor
- (4) Detecting circuit

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously

5. DIAGNOSTIC METHOD**• Abnormality Judgment**

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (2.5 seconds).

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	$\geq 10.9 \text{ V}$
After engine starting	3 seconds or more
Output voltage	$< 0.015 \text{ V}$

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	3 seconds or more
Output voltage	≥ 0.015 V

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

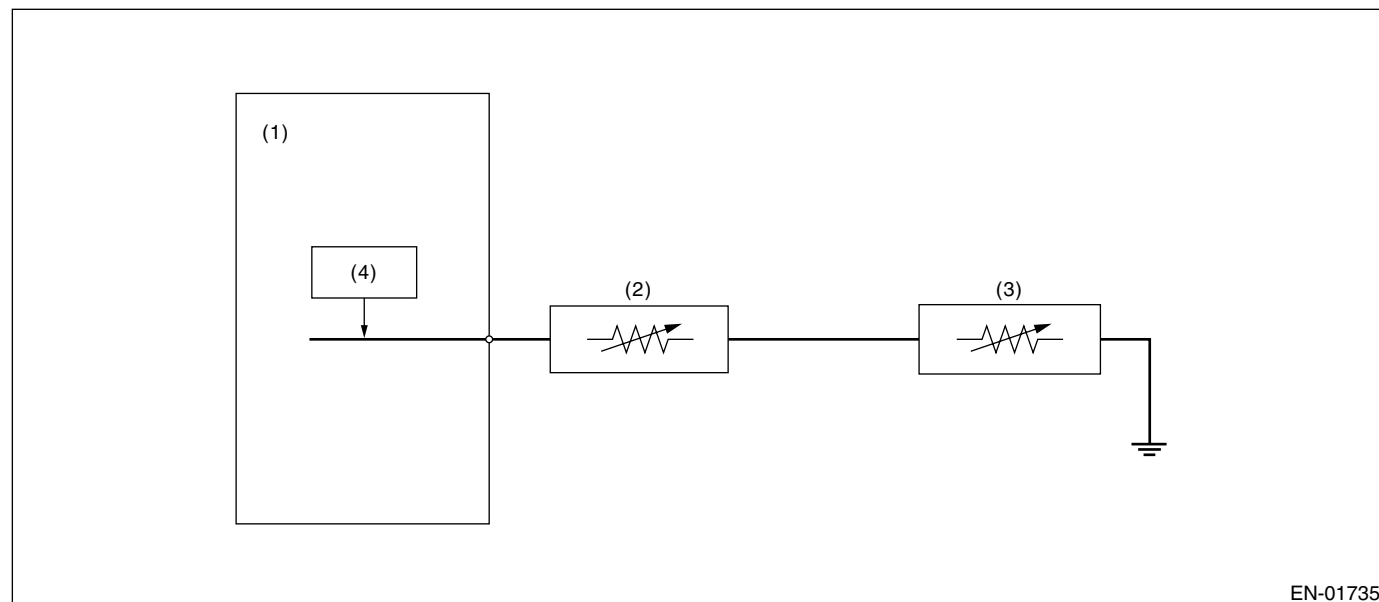
None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

BM:DTC P0463 FUEL LEVEL SENSOR CIRCUIT HIGH INPUT**1. OUTLINE OF DIAGNOSIS**

Detect the open or short circuit of fuel level sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION

- (1) Engine control module (ECM)
- (2) Fuel level sensor
- (3) Fuel sub level sensor
- (4) Detecting circuit

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD**• Abnormality Judgment**

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (one second).

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	$\geq 10.9 \text{ V}$
After engine starting	3 seconds or more
Output voltage	$\geq 4.958 \text{ V}$

Time Needed for Diagnosis: 1 second

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	3 seconds or more
Output voltage	< 4.958 V

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

BN:DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT**1. OUTLINE OF DIAGNOSIS**

Detect the malfunction of unstable output from fuel level sensor caused by noise.

Judge NG when the max. value and cumulative value of output voltage variation of fuel level sensor is larger than the threshold value.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	≥ 500 rpm
After engine starting	1 second or more
Ignition switch	ON
Battery voltage	> 10.9 V
Idle switch	ON
Fuel level	9 ↔ 51 ℓ (2.4 ↔ 13.4 US gal, 1.98 ↔ 11.2 Imp gal)
Vehicle speed = 0 km/h (0 MPH)	10 seconds or more

3. GENERAL DRIVING CYCLE

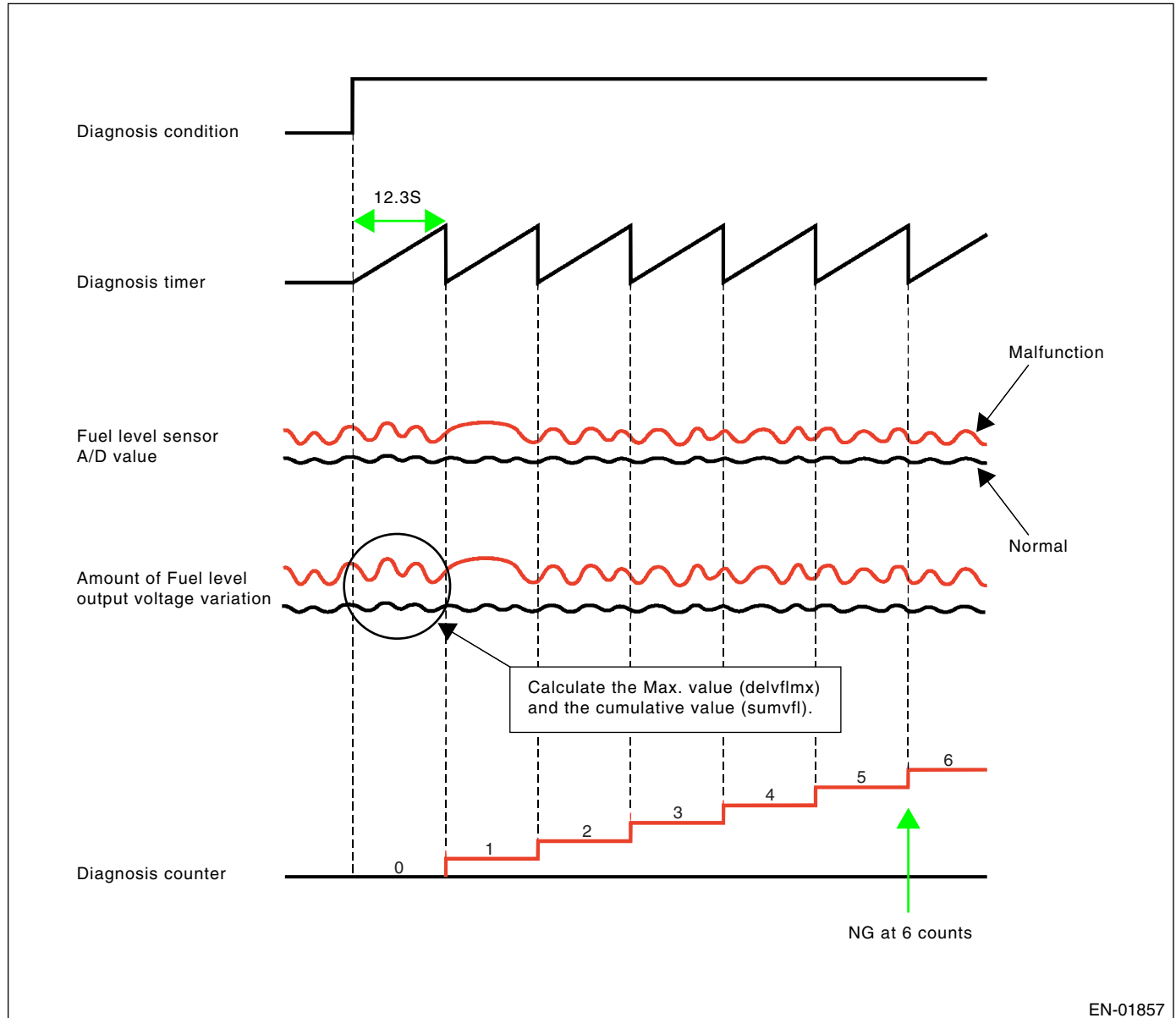
- Perform the diagnosis continuously in idling condition.
- Pay attention to the fuel level.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

4. DIAGNOSTIC METHOD

Calculate the Max. value (delflmax) and cumulative value (sumfl) of output voltage variation of fuel level sensor during 12.3 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, count the diagnosis counter up. And judge NG if the counter indicated 6 counts.



EN-01857

• Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Integrated times of the condition reaching follows, $DELFLMAX \geq 0.2 \text{ V}$ or $SUMFL \geq 15 \text{ V}$ where, DELFLMAX is Max. deviation of sensor output during 12.3 seconds. SUMFL is integrated value of sensor output deviation during 12.3 seconds.	≥ 4 times

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Do not count the diagnosis counter up when the following conditions are completed during 12.3 seconds.

Max – Min of tank pressure during 12.3 seconds	≥ 0.05 kPa (0.375 mmHg, 0.02 inHg)
Max – Min of battery voltage during 12.3 seconds	≥ 0.4 V

Time Needed for Diagnosis: 12.3 seconds $\times$ 4 times

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
DELFLMAX	< 0.2 V
SUMFL	< 15 V
Where, DELFLMAX is Max. deviation of sensor output during 12.3 seconds. SUMFL is integrated value of sensor output deviation during 12.3 seconds.	

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

BO:DTC P0483 COOLING FAN RATIONALITY CHECK

1. OUTLINE OF DIAGNOSIS

Detect the function abnormality of the radiator fan.

Judge NG when the engine coolant temperature slowly decreases even when the radiator fan is rotating.

2. ENABLE CONDITION

Diagnostic enable condition is completed if the radiator fan changes from OFF to ON when all of the conditions below are completed. When one of the conditions below is not completed, the diagnostic enable condition is not completed.

Secondary Parameters	Enable Conditions
Engine Speed	600 — 900 rpm
Idle switch	ON
Vehicle speed	< 2 km/h (1.2 MPH)
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when the radiator fan changes from OFF to ON when idling.

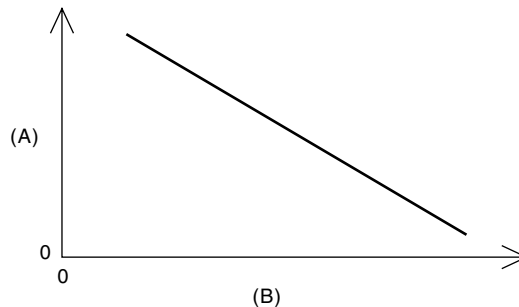
4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 5 minutes.

Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature	≥ 96°C (204.8°F)
Engine coolant temperature sensor A/D value – Engine coolant temperature sensor A/D value Min. value (Min. value with radiator fan OFF → ON)	< 15 mV (Approx. 1°C (1.8°F))



EN-01737

(A) Engine coolant temperature °C (°F)

(B) A/D value (V)

Time Needed for Diagnosis: 5 minutes

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature sensor A/D value – Engine coolant temperature sensor A/D value Min. value (Min. value with radiator fan OFF → ON)	$\geq 15 \text{ mV}$ (Approx. 1°C (1.8°F))

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

BP:DTC P0502 VEHICLE SPEED SENSOR CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of vehicle speed sensor.

Judge NG when low vehicle speed (0 km/h (0 MPH)) remains whereas it seemed to be in a usual driving speed.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	< 4,000 rpm
Fuel cut in decel.	Operating
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously during fuel cut in deceleration.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 4 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Vehicle speed	< 1

Time Needed for Diagnosis: 4 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when all malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Vehicle speed	≥ 1
Starter switch	OFF
Time after starter switch ON → OFF	≥ 3 seconds

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

- Accelerator sensor signal process: Not allowed all closed points learning.
- Vehicle speed sensor signal process: Vehicle speed = 10 km/h (6 MPH)
- Fuel cut control: Not allowed vehicle speed 0 km/h (0 MPH) fuel cut. Normally the high vehicle speed fuel cut performs on "and" of vehicle speed condition and engine speed, but perform the fuel cut only on engine speed condition (4,800 rpm or more).
- ISC control: Set the open loop compensation to specified value (1 g/s). Not allowed ISC feedback volume calculation.
- Air conditioner control: Not allowed air conditioner cut at accelerating.
- Radiator fan control: Hi drive both main/sub.
- Judge gear ratio: Control as gear fixed on 6th.
- Tumble generator valve control: Open the tumble generator valve.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

BQ:DTC P0503 VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of vehicle speed sensor.

Judge NG when high vehicle speed (240 km/h (149.1 MPH) or more) remains whereas it seemed to be in a usual driving speed.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	< 4,000 rpm
Fuel cut in decel.	Operating
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously during fuel cut in deceleration.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time of completing the malfunction criteria below becomes more than 4 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Vehicle speed	≥ 240

Time Needed for Diagnosis: 4 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when all malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Vehicle speed	≥ 300
Starter switch	OFF
Time after starter switch ON → OFF	≥ 3 seconds

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. FAIL SAFE

- Accelerator sensor signal process: Not allowed all closed points learning.
- Vehicle speed sensor signal process: Vehicle speed = 10 km/h (6 MPH)
- Fuel cut control: Not allowed vehicle speed 0 km/h (0 MPH) fuel cut. Normally the high vehicle speed fuel cut performs on “and” of vehicle speed condition and engine speed, but perform the fuel cut only on engine speed condition (4,800 rpm or more).
- ISC control: Set the open loop compensation to specified value (1 g/s). Not allowed ISC feedback volume calculation.
- Air conditioner control: Not allowed air conditioner cut at accelerating.
- Radiator fan control: Hi drive both main/sub.
- Judge gear ratio: Control as gear fixed on 6th.
- Tumble generator valve control: Open the tumble generator valve.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

BR:DTC P0506 IDLE 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 NG when actual engine speed is not close to target engine speed during idling.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	$\geq 75^{\circ}\text{C}$ (167°F)
Battery voltage	$\geq 10.9\text{ V}$
Atmospheric pressure	$> 75.1\text{ kPa}$ (563 mmHg, 22.2 inHg)
Fuel level	$\geq 9\text{ l}$ (2.38 US gal, 1.98 Imp gal)
After engine starting	10 seconds or more
Feedback in ISC	In operation
Measured lambda	$0.90 \longleftrightarrow 1.1$
After air condition switching ON-OFF, OFF-ON	5 seconds or more
After in-manifold pressure change more than 4 kPa (30 mmHg, 1.2 inHg)	> 5 seconds
After neutral switch ON-OFF event	> 5 seconds
Vehicle speed	0 km/h (0 MPH)

3. GENERAL DRIVING CYCLE

Always perform diagnosis during idling after engine warmed.

4. DIAGNOSTIC METHOD**• Abnormality Judgment**

Judge NG when the cumulative time of completing the malfunction criterion below becomes more than the time needed for diagnosis (10 seconds $\times$ 3 times).

Judgment Value

Malfunction Criteria	Threshold Value
Actual – target engine speed	$< -100\text{ rpm}$
Feedback correction for idle air control solenoid valve	Max.

Time Needed for Diagnosis: 10 seconds $\times$ 3 times

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear NG when the continuous time of completing the malfunction criterion below becomes more than the time needed for diagnosis (10 seconds).

Judgment Value

Malfunction Criteria	Threshold Value
Actual – target engine speed	$\geq -100\text{ rpm}$

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. FAIL SAFE

- Judgment of heavy fuel: Not allowed to make the judgment of heavy fuel.
- Knock compensation:
 - Knock compensation final retard/advance value: Knock compensation value + Total learning compensation value + Partial learning compensation value
 - AT normal: Knock compensation value = Fixed on 0°CA
 - AT abnormal: Knock compensation value ≠ Fixed on 0°CA (Maximum 12°CA retard on knocking)
 - Not allowed to refresh learning compensation coefficient
 - Not allowed to calculate partial learning zone compensation value

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

BS:DTC P0507 IDLE 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 NG when actual engine speed is not close to target engine speed during idling.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	$\geq 75^{\circ}\text{C}$ (167°F)
Battery voltage	$\geq 10.9\text{ V}$
Atmospheric pressure	$> 75.1\text{ kPa}$ (563 mmHg, 22.2 inHg)
Fuel level	$\geq 9\text{ l}$ (2.38 US gal, 1.98 Imp gal)
After engine starting	10 seconds or more
Feedback in ISC	In operation
Lambda	$0.90 \longleftrightarrow 1.1$
After air condition switching ON-OFF, OFF-ON	5 seconds or more
After in-manifold pressure change more than 4 kPa (30 mmHg, 1.2 inHg)	$> 5\text{ seconds}$
After neutral switch ON-OFF event	$> 5\text{ seconds}$
Vehicle speed	0 km/h (0 MPH)

3. GENERAL DRIVING CYCLE

Always perform diagnosis during idling after engine warmed.

4. DIAGNOSTIC METHOD**• Abnormality Judgment**

Judge NG when the continuous time of completing the malfunction criterion below becomes more than the time needed for diagnosis (10 seconds $\times$ 3 times).

Judgment Value

Malfunction Criteria	Threshold Value
Actual – target eng. speed	$\geq 200\text{ rpm}$
Feedback correction for idle air control solenoid valve	Min.

Time Needed for Diagnosis: 10 seconds $\times$ 3 times

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear NG when the continuous time of completing the malfunction criterion below becomes more than the time needed for diagnosis (10 seconds).

Judgment Value

Malfunction Criteria	Threshold Value
Actual – target eng. speed	$< 200\text{ rpm}$

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. FAIL SAFE

- Judgment of heavy fuel: Not allowed to make the judgment of heavy fuel.
- Knock compensation:
 - Knock compensation final retard/advance value: Knock compensation value + Total learning compensation value + Partial learning compensation value
 - AT normal: Knock compensation value = Fixed on 0°C A
 - AT abnormal: Knock compensation value $\neq$ Fixed on 0°C A (Maximum 12°C A retard on knocking)
 - Not allowed to refresh learning compensation coefficient
 - Not allowed to calculate partial learning zone compensation value

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

BT:DTC P0512 STARTER REQUEST CIRCUIT**1. OUTLINE OF DIAGNOSIS**

Detect the open or short circuit of starter SW.

Judge ON NG when the starter SW signal remains on.

Judge OFF NG when the engine starts without starter experience.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD**• Abnormality Judgment**

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 minutes.

Judgment Value

Malfunction Criteria	Threshold Value
Engine speed	> 500 rpm
Starter SW	ON
Battery voltage	> 8 V

Time Needed for Diagnosis: 180 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge ON OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Starter SW	OFF
Battery voltage	> 8 V

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

BU:DTC P0513 INCORRECT IMMOBILIZER KEY

1. OUTLINE OF DIAGNOSIS

DTC	ITEM	OUTLINE OF DIAGNOSIS
P0513	Incorrect Immobilizer Key	Incorrect immobilizer key (Use of key not registered in body integrated module)
P1570	Antenna	Improper antenna
P1571	Reference Code Incompatibility	Unmatched reference code between body integrated module and ECM
P1572	IMM Circuit Failure (Except Antenna Circuit)	Communication malfunction between body integrated module and ECM
P1574	Key Communication Failure	Malfunction of body integrated module that check the key (transponder) ID or abnormality of transponder.
P1576	EGI Control Module EEPROM	Abnormality of ECM
P1577	IMM Control Module EEPROM	Malfunction of body integrated module.

2. ENABLE CONDITION

When the engine starting

3. GENERAL DRIVING CYCLE

Perform the diagnosis only once engine starting.

4. DIAGNOSTIC METHOD

Judge NG, when the outline of diagnosis consists.

BV:DTC P0519 IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE)**1. OUTLINE OF DIAGNOSIS**

Detect the malfunction that engine speed increases more than that in normal condition during idling.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Feedback in ISC	In operation
Vehicle speed	< 4 km/h (2.49 MPH)
After engine starting	1 seconds or more

3. GENERAL DRIVING CYCLE

Always perform diagnosis at less than 4 km/h (2.49 MPH) of vehicle speed.

4. DIAGNOSTIC METHOD**• Abnormality Judgment 1**

Judge NG when the continuous time until completing the all malfunction criteria below becomes more than the time needed for diagnosis (2 seconds).

Judgment Value

Malfunction Criteria	Threshold Value
Engine speed – target eng. speed	$\geq 1,000$ rpm
Feedback value for ISC	≤ 0
Engine speed change every 180 degree engine rev.	≥ -5 rpm

• Abnormality Judgment 2

Judge NG when the continuous time until completing the all malfunction criteria below becomes more than the time needed for diagnosis (5 seconds).

Judgment Value

Malfunction Criteria	Threshold Value
Engine speed – target eng. speed	$\geq 1,000$ rpm
Feedback value for ISC	≤ 0

Time Needed for Diagnosis: 2 seconds or 5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear NG when the continuous time until completing the malfunction criteria below becomes more than the time needed for diagnosis (5 seconds).

Judgment Value

Malfunction Criteria	Threshold Value
Engine speed – target eng. speed	< 200 rpm

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

Fuel shut-off: Shut-off fuel for only #1 and #2 cylinder, or for all cylinder in accordance with vehicle speed, engine speed, throttle position

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

BW:DTC P0604 INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR

1. OUTLINE OF DIAGNOSIS

Detect the function abnormality of the micro-computer (RAM).

Judge NG when either the main CPU normal RAM or sub CPU normal RAM is abnormal. Judge OK when both of them are normal.

At initial routine, write the data to all area of RAM. Judge OK when same data can be read out, and judge NG when same data cannot be read out.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

Perform the diagnosis in the initial routine.

3. GENERAL DRIVING CYCLE

Perform the diagnosis immediately after IG key SW is turned ON.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Main CPU normal RAM abnormality Write 5AA5A55A, and read out. (All area of RAM) Or write A55A5AA5, and read out. (All area of RAM)	Cannot be read out 5AA5A55A. Cannot be read out A55A5AA5.
Sub CPU normal RAM abnormality. Write 5AA5, and read out. (All area of RAM) Or write A55A, and read out. (All area of RAM)	Cannot be read out 5AA5. Cannot be read out A55A.

Time Needed for Diagnosis: 100 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Main CPU normal RAM abnormality Write 5AA5A55A, and read out. (All area of RAM) Or write A55A5AA5, and read out. (All area of RAM)	Can be read out 5AA5A55A. Can be read out A55A5AA5.
Sub CPU normal RAM abnormality. Write 5AA5, and read out. (All area of RAM) Or write A55A, and read out. (All area of RAM)	Can be read out 5AA5. Can be read out A55A.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

BX:DTC P0605 INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR

1. OUTLINE OF DIAGNOSIS

Judge NG when SUM value of ROM is out of 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 NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
SUM value of ROM	Standard value

Time Needed for Diagnosis: To be determined

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed (Only at engine stop)

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

Stop the current to electronic throttle control motor. (Fix the throttle opening angle to 6°.)

8. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnosis value and malfunction criteria value. (For test mode \$06)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

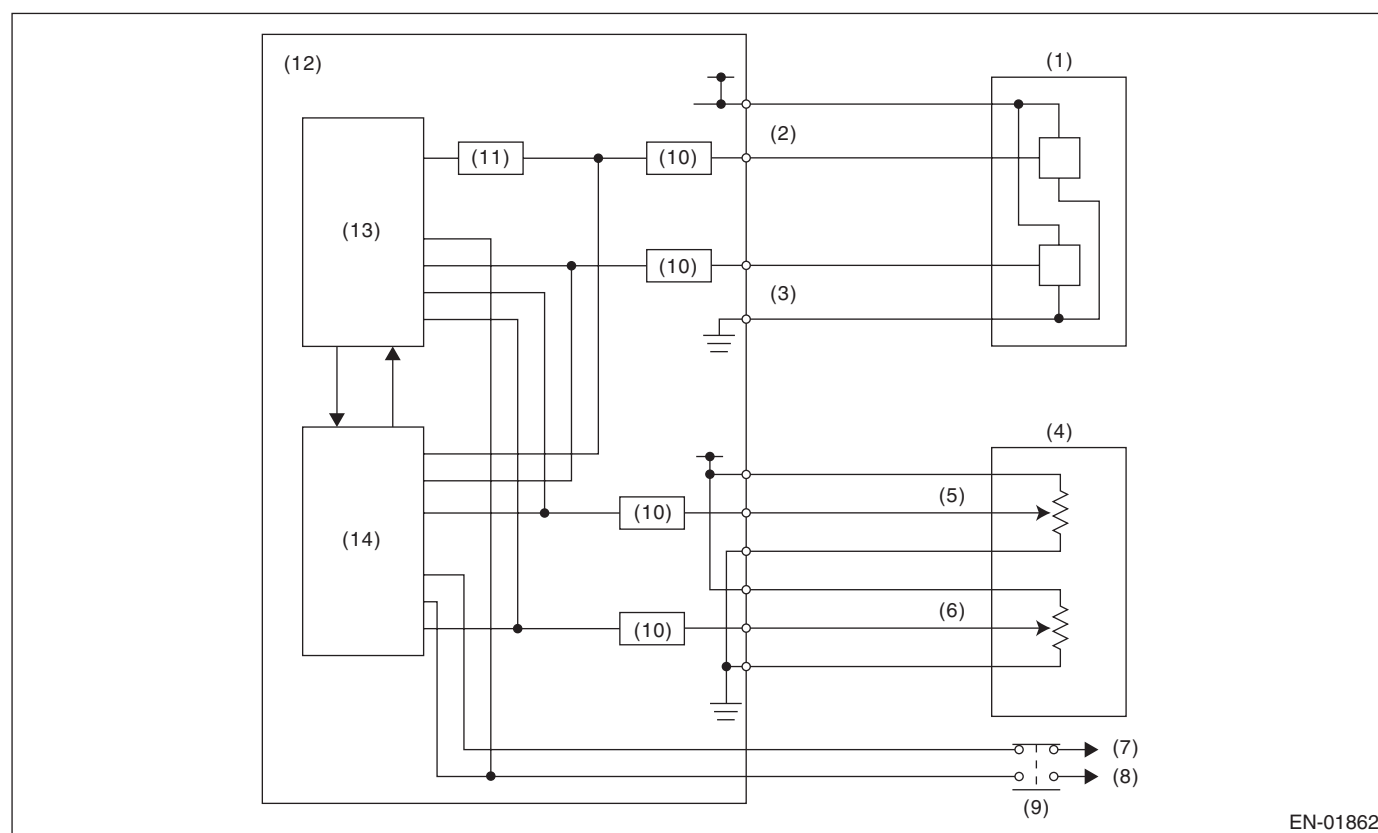
BY:DTC P0607 CONTROL MODULE PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Judge NG when either the following is completed.

- When the read value of throttle position sensor 1 signal is mismatched between main CPU and sub CPU.
- When the read value of accelerator pedal position sensor 1 signal is mismatched between main CPU and sub CPU.
- When the sub CPU operates abnormally.
- When the communication between main CPU and sub CPU is abnormal.
- When the input amplifier circuit of throttle position sensor 1 is abnormal.
- When the cruise control cannot be canceled correctly.
- When the signal of brake SW1 and 2 is mismatched.
- When the directed angle from main CPU is abnormal.

2. COMPONENT DESCRIPTION



EN-01862

(1) Throttle position sensor	(8) Stop light
(2) Throttle position sensor 1	(9) Brake switch
(3) Throttle position sensor 2	(10) I/F circuit
(4) Accelerator pedal position sensor	(11) Amplifier circuit
(5) Accelerator pedal position sensor 1	(12) Engine control module (ECM)
(6) Accelerator pedal position sensor 2	(13) Sub CPU
(7) Battery	(14) Main CPU

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
(1) Ignition switch	ON
(2) Ignition switch	ON
(3) None	—
(4) None	—
(5) Throttle opening angle	
(6) Brake SW (with cruise control)	ON
(7) None	—
(8) Cruise control	OFF

4. GENERAL DRIVING CYCLE

- (1) — (4): Always perform the diagnosis continuously.
(5): Always perform the diagnosis continuously on idling.
(6): Perform the diagnosis when the brake pedal is depressed.
(7): Always perform the diagnosis continuously.
(8): Always perform the diagnosis continuously when the cruise control pedal is not operating.

5. DIAGNOSTIC METHOD

Judge OK and clear NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
(1) Difference of CPU on reading value of throttle position sensor signal	Within 0.12 V
(2) Difference of CPU on reading value of accelerator position sensor signal	Within 0.07 V
(3) WD pulse from sub CPU	WD pulse occur
(4) Communication between CPU	Possible to communicate
(5) Difference of signal on connection of amplifier	Within $\times 4 \pm 0.6$ V
(6) Cruise control cancel signal at brake ON	Cruise control cancel signal ON
(7) Brake switch 1, 2 signal	SW 1 and 2 are matched
(8) Throttle opening angle directing value	Within the opening angle $+3.4^\circ$ which calculated from accelerator opening angle coefficient.

Time Needed for Diagnosis:

- (1) 250 milliseconds
(2) 250 milliseconds
(3) 200 milliseconds
(4) 200 milliseconds
(5) 24 milliseconds
(6) 250 milliseconds
(7) 200 milliseconds
(8) 250 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Stop the current to electronic throttle control motor. (Fix the throttle opening angle to 6°.)

9. ECM OPERATION AT DTC SETTING

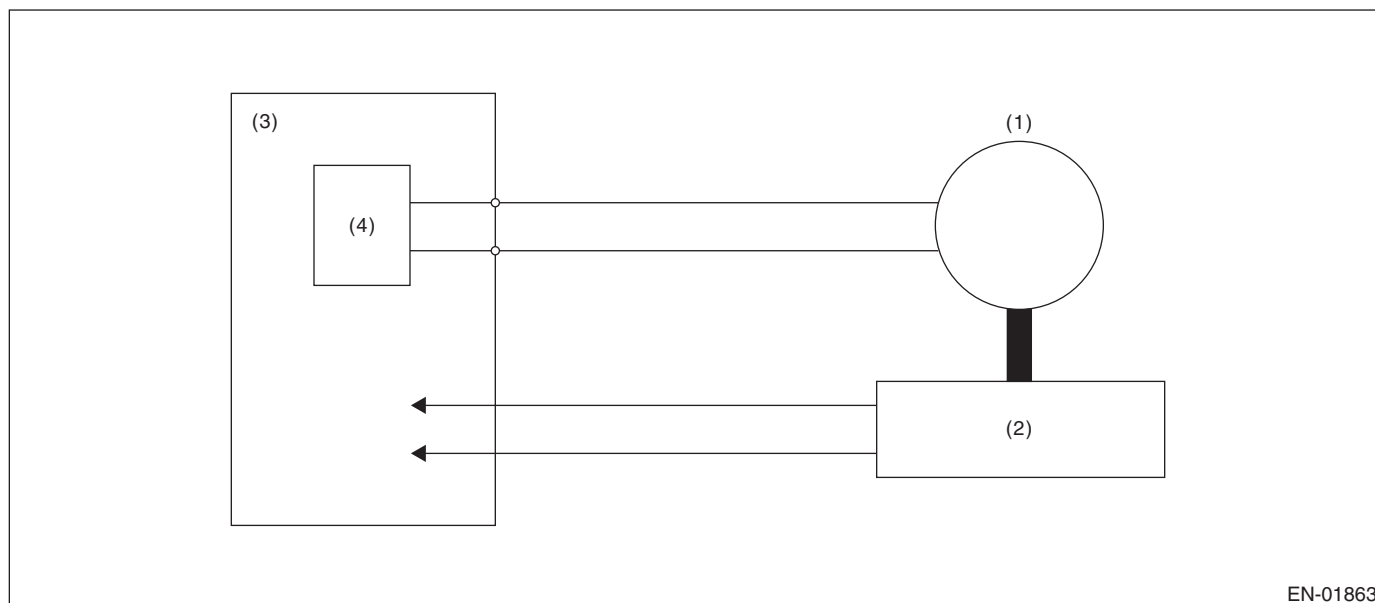
- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnosis value and malfunction criteria value. (For test mode \$06)

BZ:DTC P0638 THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1)

1. OUTLINE OF DIAGNOSIS

Judge NG when the target opening angle and actual opening angle is mismatched or the current to motor is more than specified duty for specified time continuously.

2. COMPONENT DESCRIPTION



EN-01863

- (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 OK and clear NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Difference between target opening angle and actual opening angle	Less than 3.5°
Output duty to drive circuit	Less than 95%

Time Needed for Diagnosis:

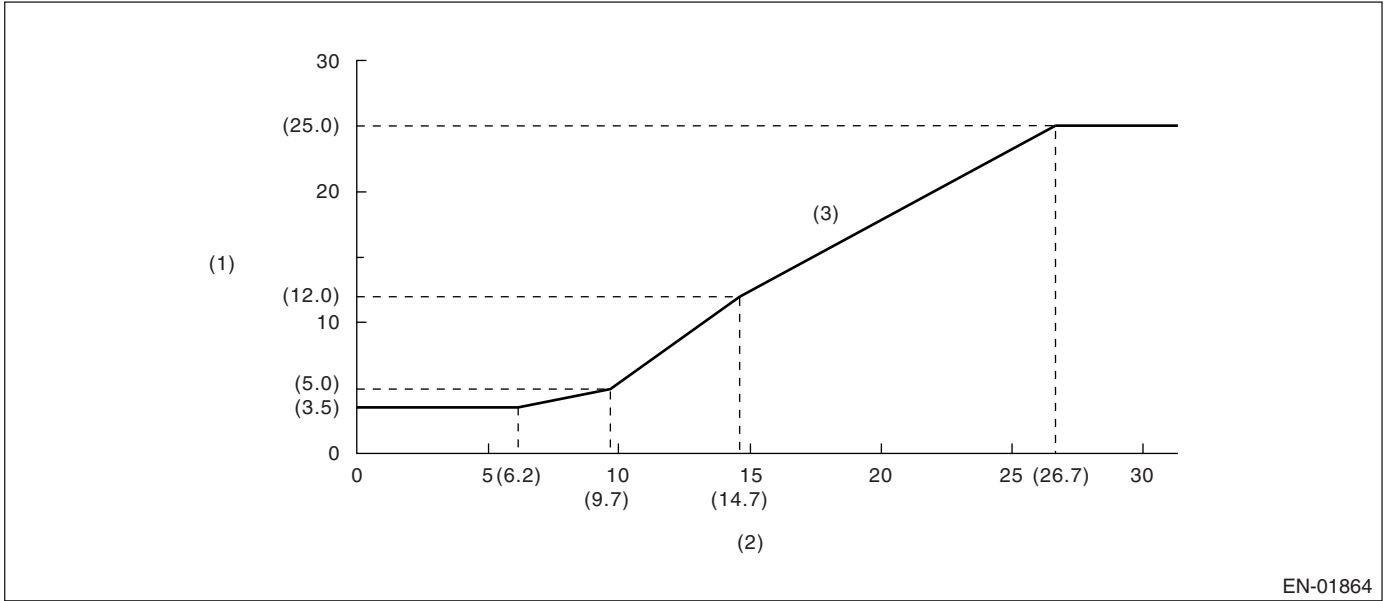
Target opening angle and actual opening angle: 250 milliseconds (For NG) 2,000 milliseconds (For OK)

Output duty to drive circuit: 2,000 milliseconds

Diagnostic Trouble Code (DTC) Detecting Criteria

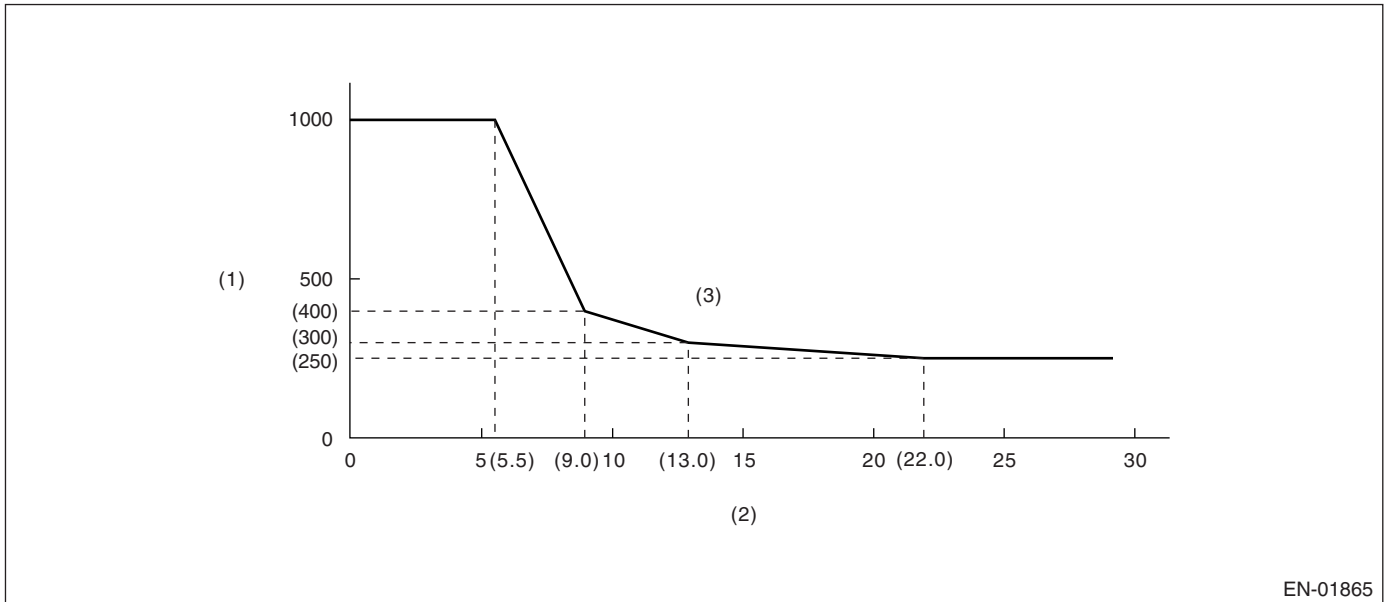
GENERAL DESCRIPTION

Details of Judgment



- (1) Difference between target opening angle and actual opening angle (°)
- (2) Target throttle opening angle (°)
- (3) NG area

Details of Judgment (Always 1,000 milliseconds when the actual opening angle ≤ target opening angle)



- (1) Judgment time (milliseconds)
- (2) Throttle position sensor 1 opening angle
- (3) NG area

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only with engine stopped)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

8. FAIL SAFE

Stop the current to electronic throttle control motor. (Fix the throttle opening angle to 6°.)

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnosis value and malfunction criteria value. (For test mode \$06)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CA:DTC P0691 COOLING FAN 1 CONTROL CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the radiator fan circuit.

Judge NG when the ECM output level differs from the actual terminal level.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time of completing the malfunction criteria below becomes more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
After starting the engine	1 seconds or more
Engine speed	≥ 500 rpm
Ignition switch	ON
Battery voltage	≥ 10.9 V
Terminal voltage level when ECM transmits OFF signal	Low level

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
After starting the engine	1 seconds or more
Engine speed	≥ 500 rpm
Ignition switch	ON
Battery voltage	≥ 10.9 V
Terminal voltage level when ECM transmits OFF signal	High level

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

CB:DTC P0692 COOLING FAN 1 CONTROL CIRCUIT HIGH**1. OUTLINE OF DIAGNOSIS**

Detect the open or short circuit of the radiator fan circuit.

Judge NG when the ECM output level differs from the actual terminal level.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD**• Abnormality Judgment**

Judge NG when the cumulative time of completing the malfunction criteria below becomes more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
After starting the engine	1 seconds or more
Engine speed	≥ 500 rpm
Ignition switch	ON
Battery voltage	≥ 10.9 V
Terminal voltage level when ECM transmits ON signal	High level

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
After starting the engine	1 seconds or more
Engine speed	≥ 500 rpm
Ignition switch	ON
Battery voltage	≥ 10.9 V
Terminal voltage level when ECM transmits ON signal	Low level

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CC:DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Judge the open or short circuit of the neutral SW.

Judge NG when there is no change in the neutral SW even if the driving shift was applied. (There is neutral SW ON/OFF inversion from the vehicle speed and engine speed.)

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	$\geq 10.9 \text{ V}$
After starting the engine	2 seconds or more
Starter switch	OFF
Engine speed	$\geq 500 \text{ rpm}$

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds or more after starting the engine.

4. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed 3 time or more after the neutral SW change. And clear NG if there is change in the neutral SW.

Judgment Value

Malfunction Criteria	Threshold Value
Neutral switch signal (while changing from a to b below)	ON continues
Driving condition change	a) to b)
a) Vehicle speed = 0 km/h (0 MPH) & engine speed 600 — 900 rpm	
b) Vehicle speed = 64 km/h (40 MPH) & engine speed 1,600 — 2,550 rpm	

Time Needed for Diagnosis: 3 monitoring

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

Cruise control command: Not allowed to command cruise control

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

CD:DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH**1. OUTLINE OF DIAGNOSIS**

Judge the open or short circuit of the neutral SW.

Judge NG when there is no change in the neutral SW even if the driving shift was applied. (There is neutral SW ON/OFF inversion from the vehicle speed and engine speed.)

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	$\geq 10.9 \text{ V}$
After starting the engine	2 seconds or more
Starter switch	OFF
Engine speed	$\geq 500 \text{ rpm}$

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds or more after starting the engine.

4. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed 3 time or more after the neutral SW change. And clear NG if there is change in the neutral SW.

Judgment Value

Malfunction Criteria	Threshold Value
Neutral switch signal (while changing from a to b below)	OFF continues
Driving condition change	a) to b)
a) Vehicle speed = 0 km/h (0 MPH) & engine speed 600 — 900 rpm	
b) Vehicle speed = 64 km/h (40 MPH) & engine speed 1,600 — 2,550 rpm	

Time Needed for Diagnosis: 3 monitoring

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CE:DTC P1152 O₂ SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK1 SENSOR1)

1. OUTLINE OF DIAGNOSIS

Detect that lambda value remains Low.

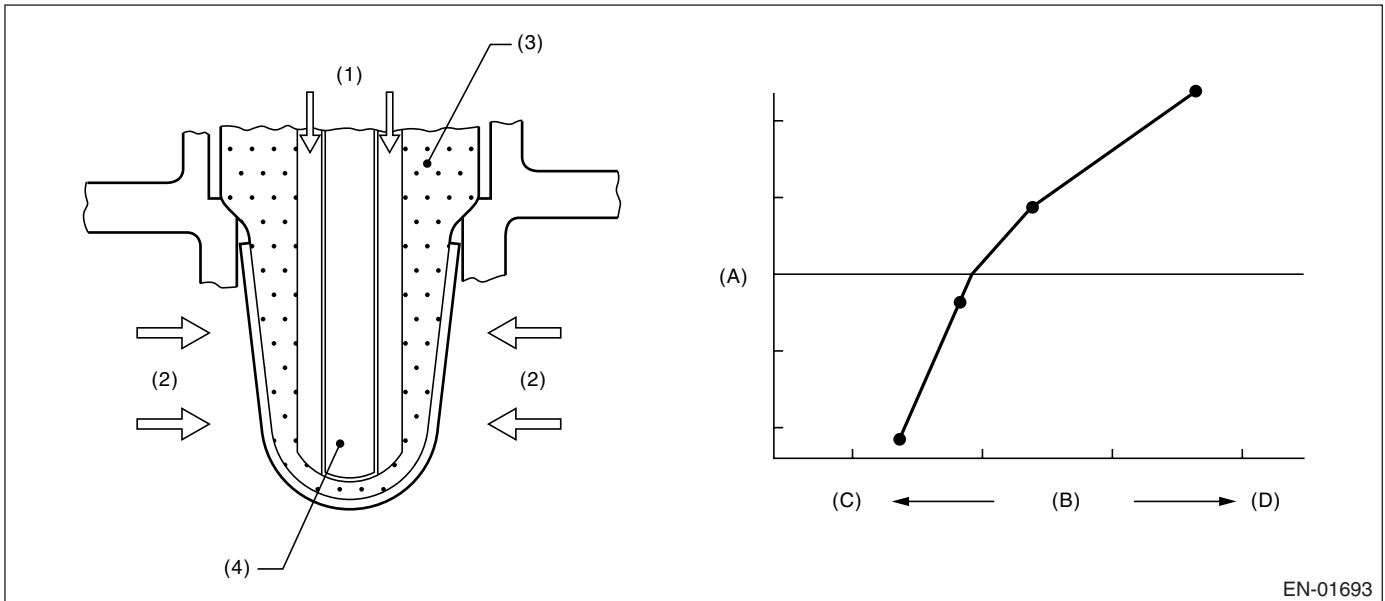
Judge NG when lambda value is abnormal in accordance with lambda value of front oxygen (A/F) sensor and running condition that is vehicle speed, amount of intake air engine coolant temperature, sub feedback control, etc.

Lambda value = Actual air fuel ratio/Theoretical air fuel ratio

Lambda > 1: Lean

Lambda < 1: Rich

2. COMPONENT DESCRIPTION



EN-01693

- (1) Atmosphere
- (2) Exhaust
- (3) ZrO₂
- (4) Ceramic heater

- (A) Electromotive force
- (B) Air fuel ratio
- (C) Lean
- (D) Rich

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
All secondary parameters to be in enable conditions	4 seconds or more
Battery voltage	> 10.9 V
Atmospheric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Rear oxygen sensor sub feedback	Operating
Rear oxygen sensor output voltage – feedback target voltage	–0.2 V ↔ 0.1 V
or rear oxygen sensor sub feedback compensation coefficient	On Min.
or rear oxygen sensor sub feedback compensation coefficient	On Max.
After engine starting	60 seconds or more
Engine coolant temperature	≥ 75°C (167°F)
Vehicle speed	≥ 20 km/h (12 MPH)
Amount of intake air	≥ 6 g/s
Load change during 0.5 engine rev.	≤ 0.01 g/rev
Impedance of front oxygen (A/F) sensor	0 ↔ 50 Ω
Learning value of evaporation gas density	≤ 0.2
Accumulated time of operating canister purge	20 seconds or more

4. GENERAL DRIVING CYCLE

Perform diagnosis continuously at a constant speed of 20 km/h (12 MPH) or more since 60 seconds after starting the engine.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (10 seconds). Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output lambda when rear oxygen sensor sub feedback compensation coefficient being at not high limit	≤ 0.85

Time Needed for Diagnosis: 10 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor main learning correction: Not allowed to calculate
- Correction when re-starting at high temperature: Normally minimum value 0.3 → 0
- Purge control: Not allowed to purge

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

CF:DTC P1153 O₂ SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1)

1. OUTLINE OF DIAGNOSIS

Detect that lambda value remains High.

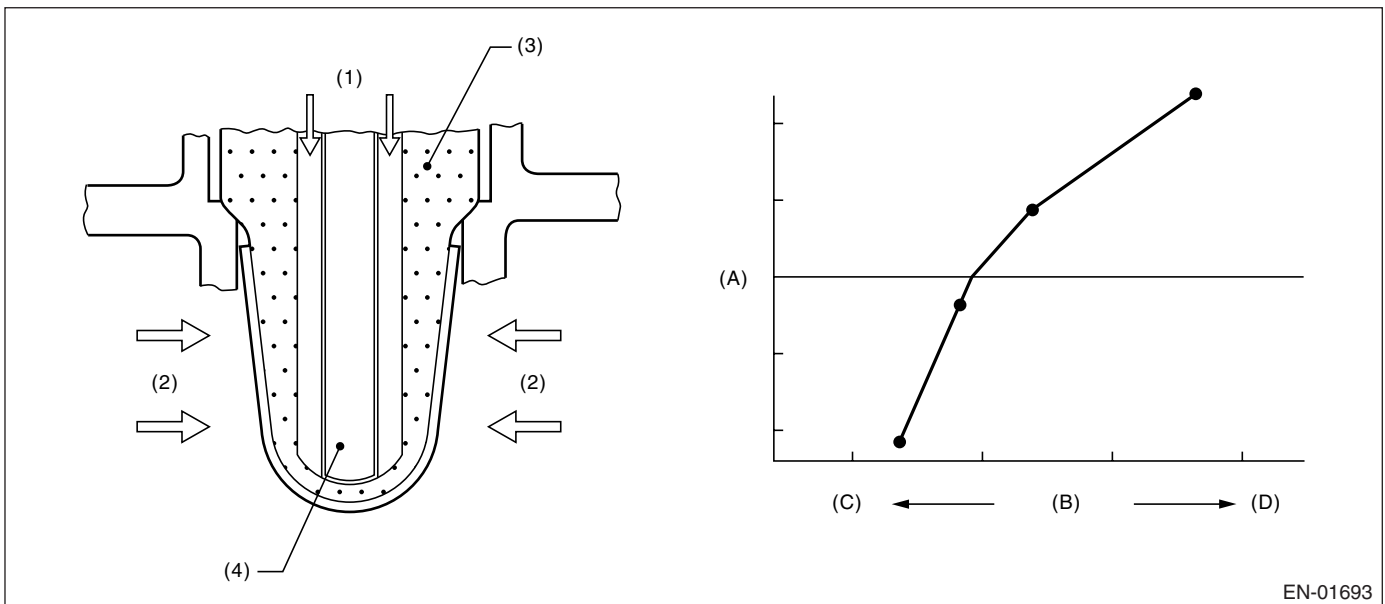
Judge NG when lambda value is abnormal in accordance with lambda value of front oxygen (A/F) sensor and running condition that is vehicle speed, amount of intake air engine coolant temperature, sub feedback control, etc.

Lambda value = Actual air fuel ratio/Theoretical air fuel ratio

Lambda > 1: Lean

Lambda < 1: Rich

2. COMPONENT DESCRIPTION



EN-01693

- (1) Atmosphere
- (2) Exhaust
- (3) ZrO₂
- (4) Ceramic heater

- (A) Electromotive force
- (B) Air fuel ratio
- (C) Lean
- (D) Rich

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
All secondary parameters to be in enable conditions	4 seconds or more
Battery voltage	> 10.9 V
Atmospheric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Rear oxygen sensor sub feedback	Operating
Rear oxygen sensor output voltage – feedback target voltage	–0.2 V ↔ 0.1 V
or rear oxygen sensor sub feedback compensation coefficient	On Min.
or rear oxygen sensor sub feedback compensation coefficient	On Max.
After engine starting	60 seconds or more
Engine coolant temperature	≥ 75°C (167°F)
Vehicle speed	≥ 20 km/h (12 MPH)
Amount of intake air	≥ 6 g/s
Load change during 0.5 engine rev.	≤ 0.01 g/rev
Impedance of front oxygen (A/F) sensor	0 ↔ 50 Ω
Learning value of evaporation gas density	≤ 0.2
Accumulated time of operating canister purge	20 seconds or more

4. GENERAL DRIVING CYCLE

Perform diagnosis continuously at a constant speed of 20 km/h (12 MPH) or more since 60 seconds after starting the engine.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (10 seconds). Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output lambda when rear O ₂ sensor sub feedback compensation coefficient value being at not low limit	≥ 1.15

Time Needed for Diagnosis: 10 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor main learning correction: Not allowed to calculate
- Correction when re-starting at high temperature: Normally minimum value 0.3 → 0
- Purge control: Not allowed to purge

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

9. ECM OPERATION AT DTC SETTING

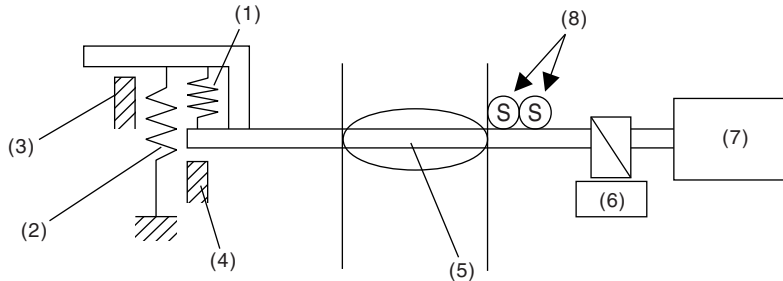
Memorize the freeze frame data. (For test mode \$02)

CG:DTC P1160 RETURN SPRING FAILURE

1. OUTLINE OF DIAGNOSIS

Judge NG when the valve does not move to the close direction with the motor power stopped and the valve open more than the default opening.

2. COMPONENT DESCRIPTION



EN-01866

(1) Opener spring	(5) Throttle valve
(2) Return spring	(6) Gear
(3) Intermediate stopper	(7) DC motor
(4) Full closed stopper	(8) Main and sub throttle sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Throttle opening	OFF
Motor continuity	OFF

4. GENERAL DRIVING CYCLE

- Ignition switch ON → OFF
- Ignition switch OFF → ON (After clear memory only)

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Opening variation after continuity is set to OFF	$\geq 2^\circ$

Time Needed for Diagnosis: 600 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

8. FAIL SAFE

Fix the throttle opening to 6°.

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

Diagnostic Trouble Code (DTC) Detecting Criteria

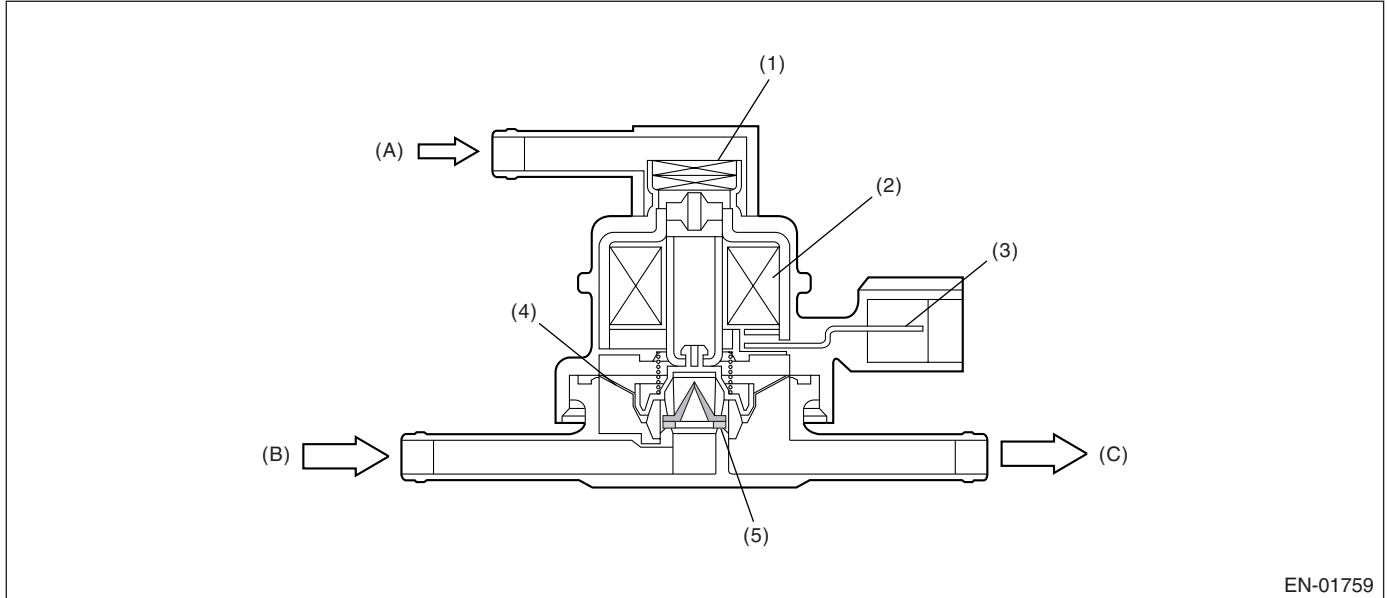
GENERAL DESCRIPTION

CH:DTC P1400 FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of pressure control solenoid valve. Judge NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



- (1) Filter
- (2) Coil
- (3) Connector terminal
- (4) Diaphragm
- (5) Valve

- (A) Atmospheric pressure
- (B) Shut off valve
- (C) To fuel tank

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	$\geq 10.9 \text{ V}$
After engine starting	1 second or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than time needed for diagnosis (2.5 seconds). Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage when ECM outputs off signal	Low

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in two continuous drive cycles.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

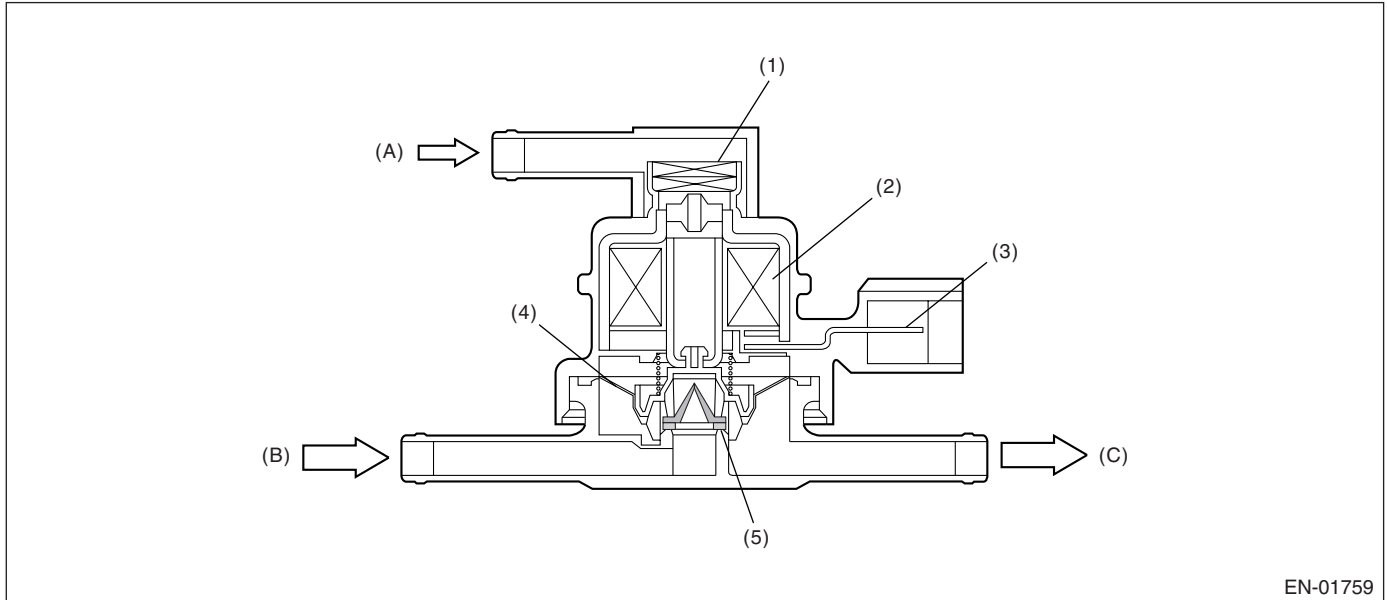
CI: DTC P1420 FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of pressure control solenoid valve.

Judge NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



- (1) Filter
- (2) Coil
- (3) Connector terminal
- (4) Diaphragm
- (5) Valve

- (A) Atmospheric pressure
- (B) Shut off valve
- (C) To fuel tank

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	$\geq 10.9 \text{ V}$
After engine starting	1 second or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than time needed for diagnosis (2.5 seconds). Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage when ECM outputs off signal	High

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in two continuous drive cycles.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

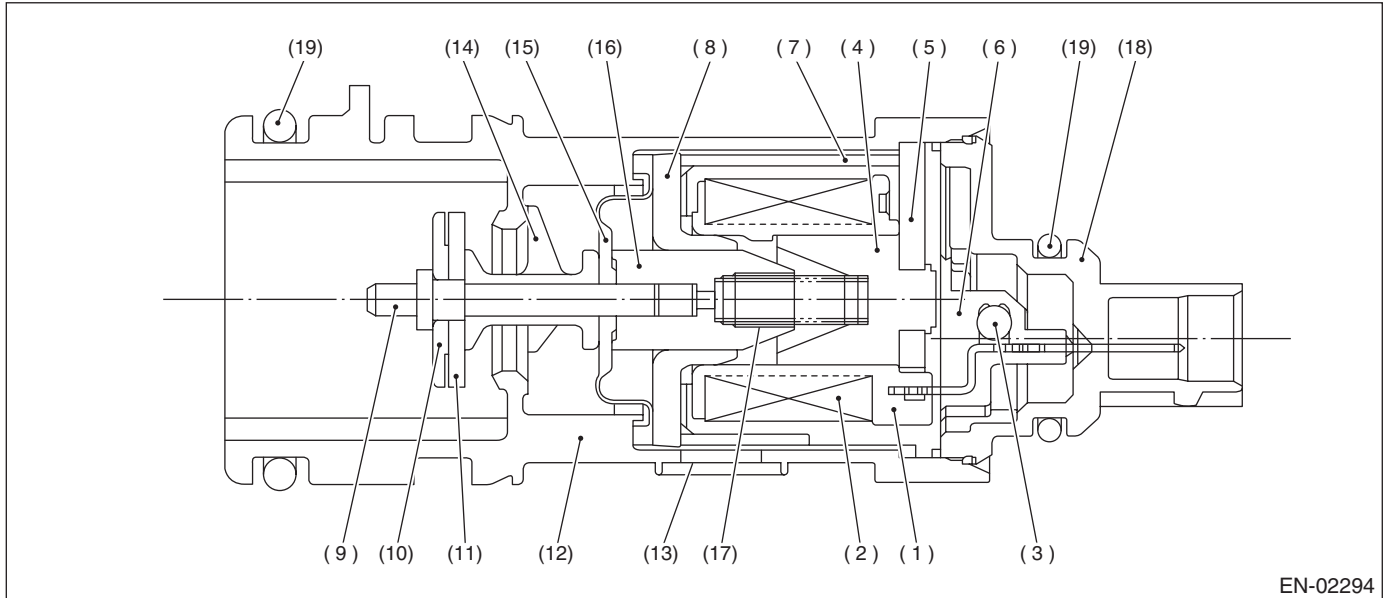
CJ:DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM

1. OUTLINE OF DIAGNOSIS

Detect the drain valve function abnormality.

Judge NG when the fuel tank pressure is small.

2. COMPONENT DESCRIPTION



(1) Bobbin	(11) Valve
(2) Coil	(12) Housing
(3) Diode	(13) Filter
(4) Stator core	(14) Retainer
(5) End plate	(15) Diaphragm
(6) Body	(16) Movable core
(7) Yoke	(17) Spring
(8) Magnetic plate	(18) Cover
(9) Shaft	(19) O-ring
(10) Plate	

3. ENABLE CONDITION

Secondary Parameter	Enable Condition
Drain valve	Open
Battery voltage	$\geq 10.9\text{ V}$
Atmospheric pressure	$\geq 75.0\text{ kPa}$ (563 mmHg, 22.17 inHg)
Tank pressure when starter ON → OFF	$-0.67 \leftrightarrow 1.43\text{ kPa}$ ($-5 \leftrightarrow 10.7\text{ mmHg}$, $-0.20 \leftrightarrow 0.42\text{ inHg}$)

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Tank pressure	≤ -4.0 kPa (-30 mmHg, -1.18 inHg)

Time Needed for Diagnosis: 3 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Tank pressure	> -4.0 kPa (-30 mmHg, -1.18 inHg)
Cumulative time when the malfunction criteria below are completed	≥ 30 seconds
Duty ratio of purge control solenoid valve	Except 0
Fuel temperature	$-10 \longleftrightarrow 45^{\circ}\text{C}$ ($14 \longleftrightarrow 113^{\circ}\text{F}$)
Relative ratio of intake manifold	-26.7 kPa (-200 mmHg, -7.87 inHg)

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

PCV control: Open the PCV solenoid.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

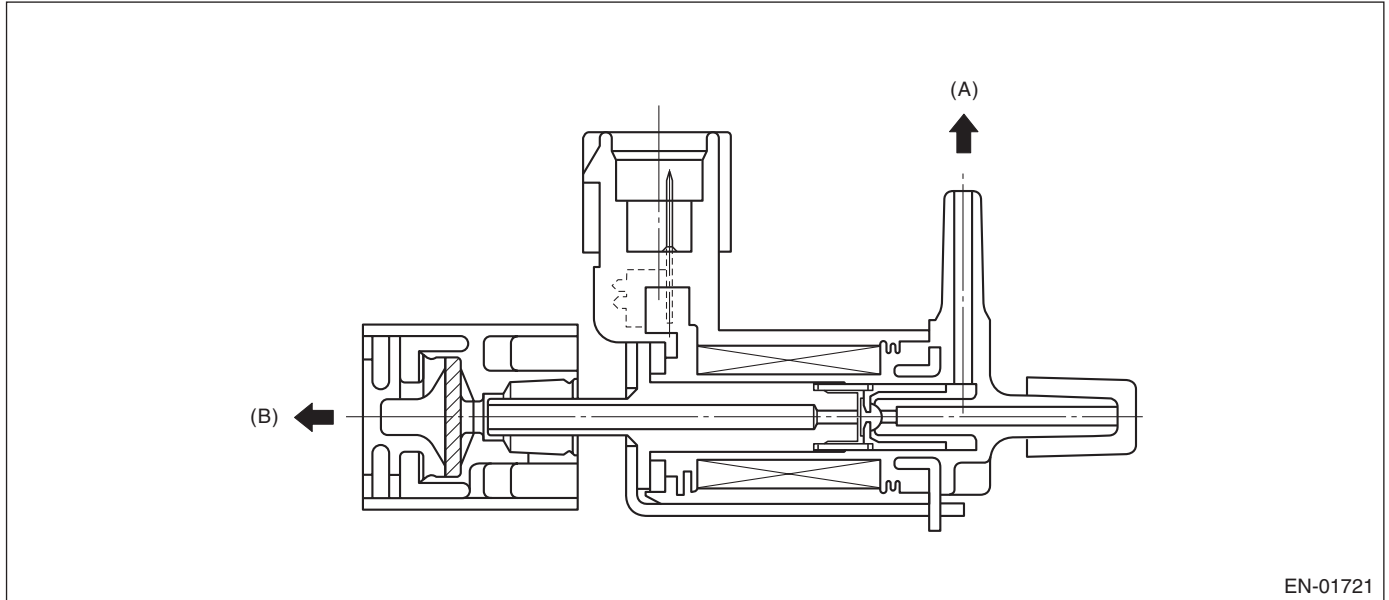
GENERAL DESCRIPTION

CK:DTC P1446 FUEL TANK SENSOR CONTROL VALVE CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tank pressure switching solenoid.
Judge NG when the ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



- (A) Fuel tank pressure sensor
(B) Ambient air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	$\geq 10.9 \text{ V}$
After engine starting	1 second or more
Terminal output voltage when ECM sent OFF signals	Low

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM sent OFF signals	High

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

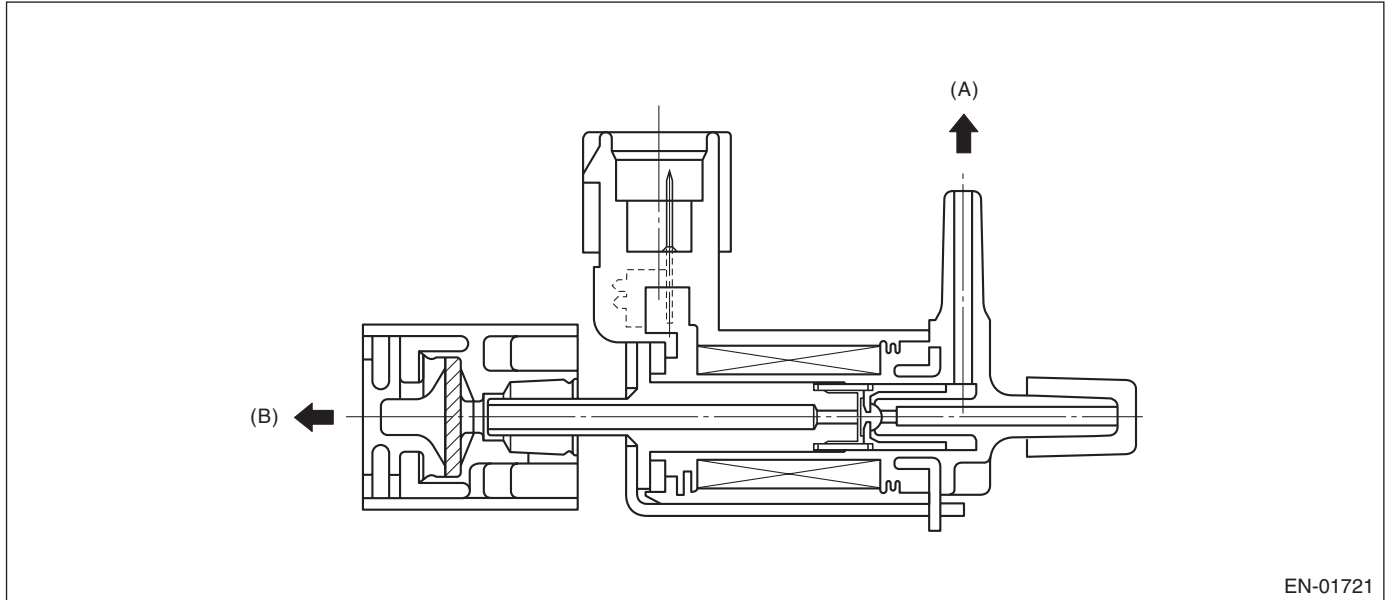
GENERAL DESCRIPTION

CL:DTC P1447 FUEL TANK SENSOR CONTROL VALVE CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tank pressure switching solenoid.
Judge NG when the ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



- (A) Fuel tank pressure sensor
(B) Ambient air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time of completing the malfunction criteria below becomes more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	$\geq 10.9 \text{ V}$
After engine starting	1 second or more
Terminal output voltage when ECM sent ON signals	High

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in two continuous drive cycles.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM sent OFF signals	Low

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CM:DTC P1448 FUEL TANK SENSOR CONTROL VALVE RANGE/PERFORMANCE

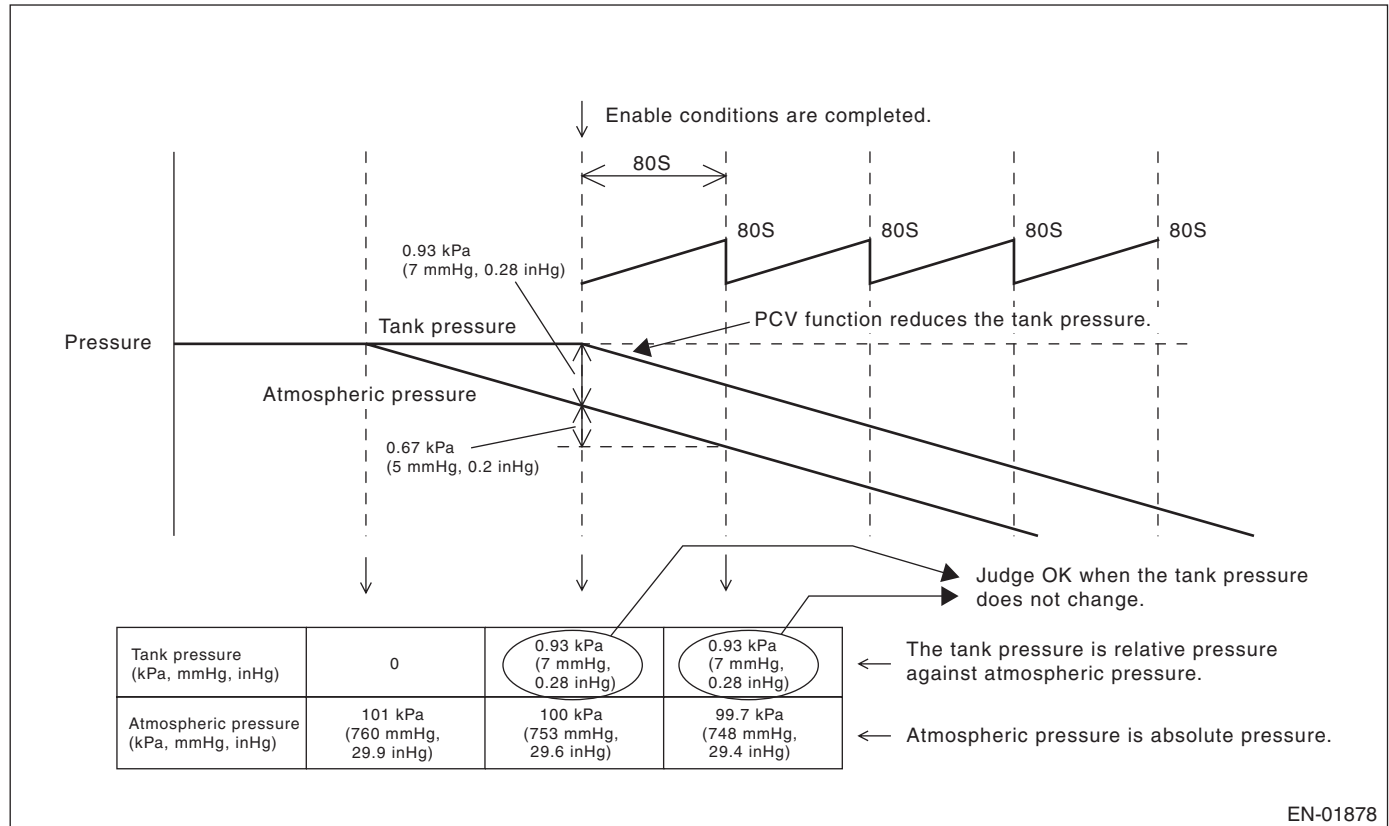
1. OUTLINE OF DIAGNOSIS

Detect the tank pressure switching solenoid function abnormality.

The tank pressure sensor is a relative pressure sensor, which normally compares the pressure with the atmospheric pressure. The tank pressure switching solenoid is a solenoid, which shifts the compare space from opening to closed during the EVAP diagnosis. Detect the malfunction that the compare space remains closed. (Not judge NG after enable condition completed but assume NG before enable condition completed.)

• Normality Judgment

Judge OK when the fuel tank pressure does not change (or changes by less than 0.67 kPa (5 mmHg, 0.2 inHg)) at atmospheric pressure changing by 0.67 kPa (5 mmHg, 0.2 inHg) or more per 80 seconds.

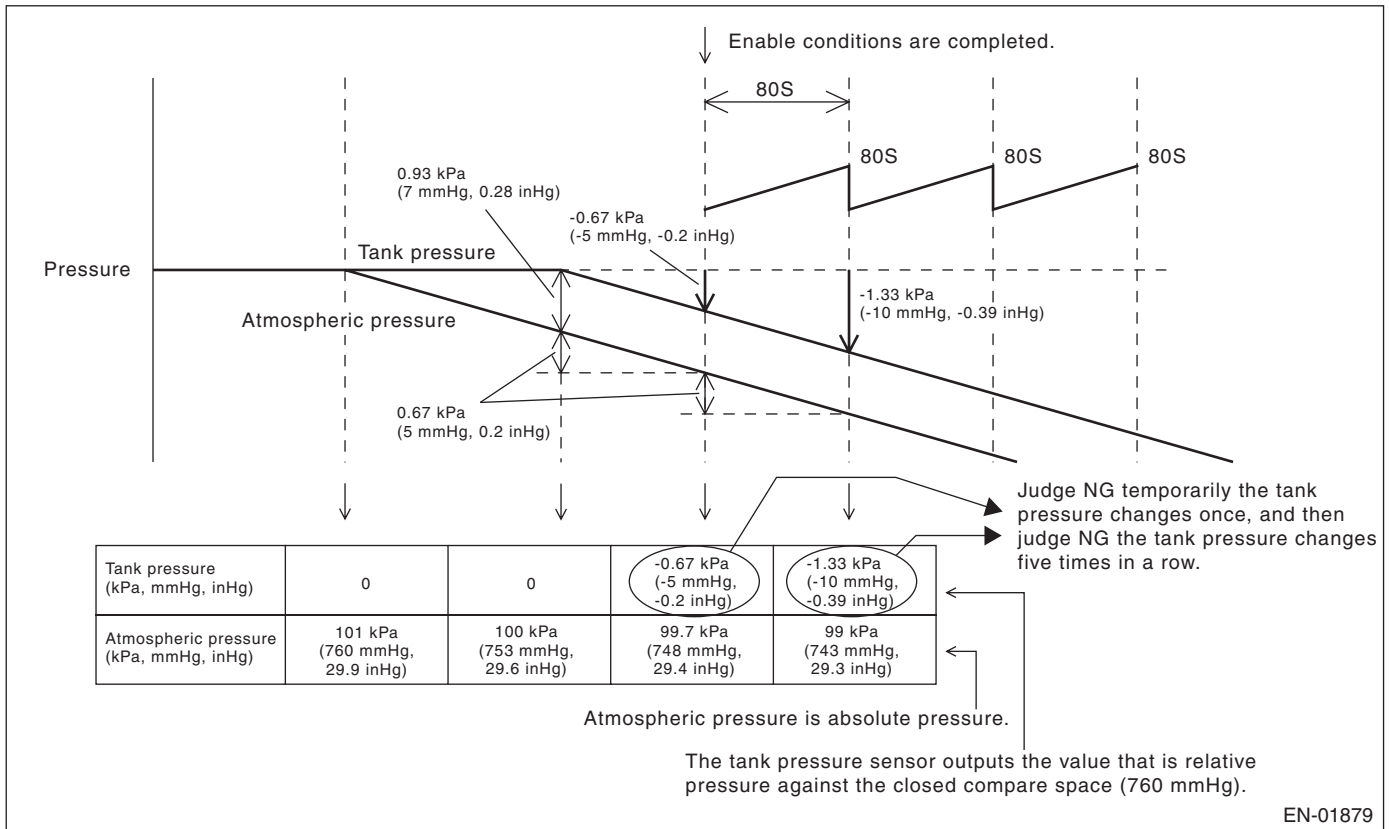


Diagnostic Trouble Code (DTC) Detecting Criteria

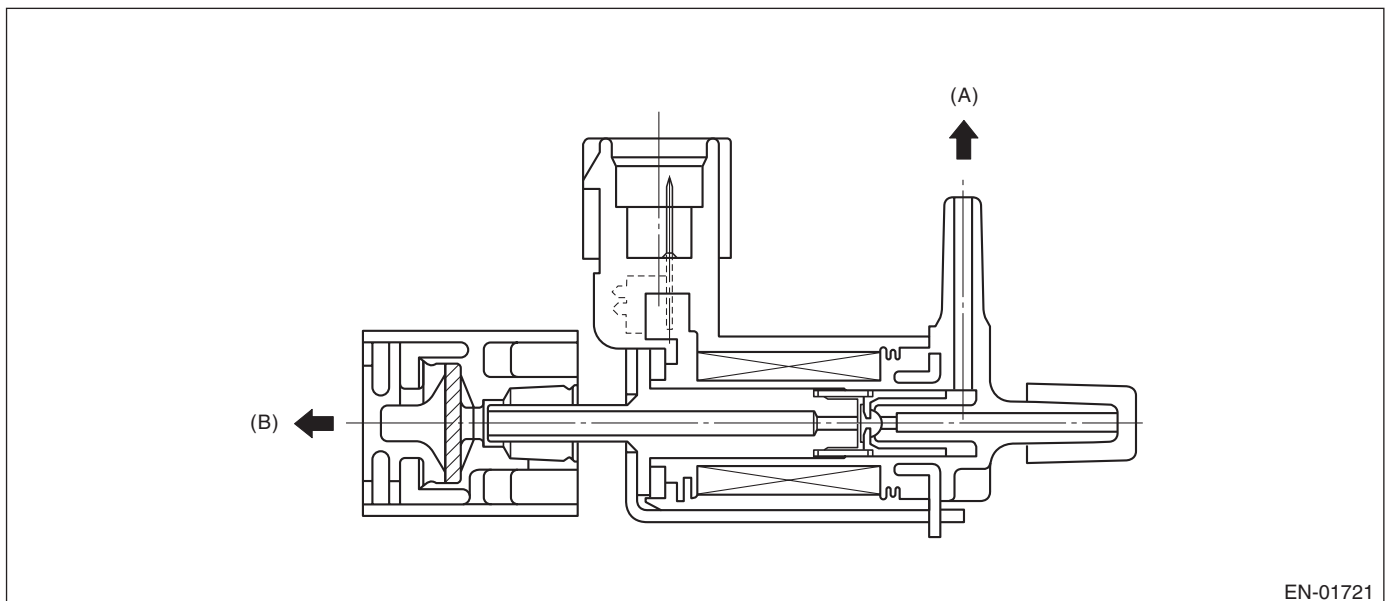
GENERAL DESCRIPTION

• Abnormality Judgment

Judge NG temporarily when the fuel tank pressure changes by 0.67 kPa (5 mmHg, 0.2 inHg) or more at atmospheric pressure changing by 0.67 kPa (5 mmHg, 0.2 inHg) or more per 80 seconds, and then judge NG when the previous condition is completed 5 times in a row.



2. COMPONENT DESCRIPTION



- (A) Fuel tank pressure sensor
- (B) Ambient air

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

3. ENABLE CONDITION

Secondary Parameter	Enable Condition
Battery voltage	≥ 10.9 V
Fuel level	$9 \longleftrightarrow 51$ ℓ (2.38 $\longleftrightarrow$ 13.3 US gal, 1.98 $\longleftrightarrow$ 11.2 Imp gal)
Evaporation system diagnosis	Not in operation
After starting the engine	80 seconds or more
Fuel tank pressure	< -0.67 kPa (-5 mmHg, -0.2 inHg) or > -0.93 kPa (7 mmHg, 0.28 inHg)

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when the fuel tank pressure is large or small in 80 seconds or more after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below is completed 5 times.

Judgment Value

Malfunction Criteria	Threshold Value
Atmospheric air change in 80 seconds	≥ 0.67 kPa (4.5 mmHg, 0.2 inHg)
Fuel tank pressure change in 80 seconds	≥ 0.67 kPa (4.5 mmHg, 0.2 inHg)
Fuel level change	< 2.25 ℓ (0.59 US gal, 0.49 Imp gal)

Time Needed for Diagnosis: 80 seconds $\times$ 5 times

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear NG when the malfunction criteria below is completed.

Judgment Value

Malfunction Criteria	Threshold Value
Atmospheric air change in 80 seconds	≥ 0.67 kPa (4.5 mmHg, 0.2 inHg)
Fuel tank pressure change in 80 seconds	< 0.67 kPa (4.5 mmHg, 0.2 inHg)

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

None

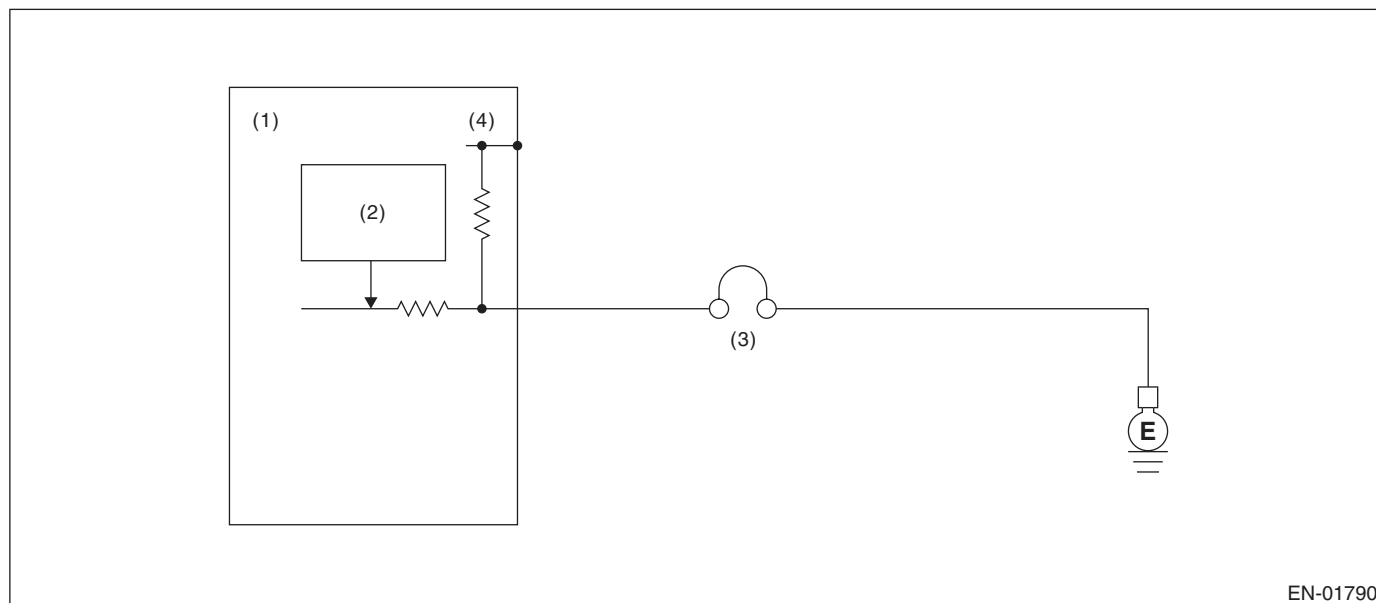
9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

CN:DTC P1491 POSITIVE CRANKCASE VENTILATION (BLOW-BY) FUNCTION PROBLEM**1. OUTLINE OF DIAGNOSIS**

Detect the blow-by hose release abnormality.

Judge NG when the diagnosis terminal voltage is high.

2. COMPONENT DESCRIPTION

EN-01790

- (1) Engine control module (ECM)
- (2) Detecting circuit
- (3) PCV diagnosis connector
- (4) 5 V

3. ENABLE CONDITION

Secondary Parameter	Enable Condition
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSIS METHOD**• Abnormality Judgment**

Judge NG when the continuous time until completing the malfunction criteria below becomes more than 1 second.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	> 10.9 V
Before and after starting the engine	After starting the engine
Positive crankcase ventilation diagnosis voltage	High

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

• Normality Judgment

Judge OK and clear NG when the malfunction criteria below is completed.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	> 10.9 V
Before and after starting the engine	After starting the engine
Positive crankcase ventilation diagnosis voltage	Low

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was performed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnosis value and trouble standard value. (For test mode \$06)

CO:DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT**1. OUTLINE OF DIAGNOSIS**

Detect the open or short circuit of starter SW.

Judge OFF NG when it turns to “after engine starting” while the starter has never been set to ON.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD**• Abnormality Judgment**

Judge OFF NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Vehicle speed It took more than 0.8 seconds at engine starting, and then it turned after engine starting.	< 1 km/h (0.62 MPH)
Starter ON	Not experienced
Starter ON diagnosis	Not diagnosed
Battery voltage	> 8 V

Time Needed for Diagnosis:

Not determined.

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OFF OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Starter ON	Experienced
Starter ON diagnosis	Diagnosed
Battery voltage	> 8 V

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CP:DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the back-up voltage circuit.

Judge NG when the back-up voltage becomes smaller than the battery voltage.

2. ENABLE CONDITION

Secondary Parameter	Enable Condition
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Voltage of back-up power	Low
Battery voltage	≥ 10.9 V
Before and after starting the engine	After starting the engine

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear NG when the malfunction criteria below is completed.

Judgment Value

Malfunction Criteria	Threshold Value
Voltage of back-up power supply	High
Battery voltage	≥ 10.9 V
Before and after starting the engine	After starting the engine

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

CQ:DTC P1570 ANTENNA

1. OUTLINE OF DIAGNOSIS

For the detection standard, refer to P0513.

<Ref. to GD(STI)-172, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CR:DTC P1571 REFERENCE CODE INCOMPATIBILITY

1. OUTLINE OF DIAGNOSIS

For the detection standard, refer to P0513.

<Ref. to GD(STI)-172, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CS:DTC P1572 IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT)

1. OUTLINE OF DIAGNOSIS

For the detection standard, refer to P0513.

<Ref. to GD(STI)-172, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CT:DTC P1574 KEY COMMUNICATION FAILURE

1. OUTLINE OF DIAGNOSIS

For the detection standard, refer to P0513.

<Ref. to GD(STI)-172, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CU:DTC P1576 EGI CONTROL MODULE EEPROM

1. OUTLINE OF DIAGNOSIS

For the detection standard, refer to P0513.

<Ref. to GD(STI)-172, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CV:DTC P1577 IMM CONTROL MODULE EEPROM

1. OUTLINE OF DIAGNOSIS

For the detection standard, refer to P0513.

<Ref. to GD(STI)-172, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CW: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 open driving.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 10.9 \text{ V}$
Engine coolant temperature	$\geq 0^{\circ}\text{C}$ (32°F)
Ambient temperature	$\geq 0^{\circ}\text{C}$ (32°F)

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generator valve angle	$\geq 67.4^{\circ}$
Tumble generator valve "close" signal output	2.2 seconds or more

Time Needed for Diagnosis: 3 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generator valve angle	$< 67.4^{\circ}$
Tumble generator valve "close" signal output	2.2 seconds or more

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

Tumble generator valve opening

- For tumble generator valve all closing points learning, not allowed to update to the closing side.
- For tumble generator valve all opening points learning, not allowed to update to the opening side.

Tumble generator valve control

- Output the open signal.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

CX:DTC P2005 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 2)**1. OUTLINE OF DIAGNOSIS**

Detect the malfunction of tumble generator valve motor function.

Judge open fixing malfunction when the opening degree is large even after finishing the tumble generator valve closing driving.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 10.9 \text{ V}$
Engine coolant temperature	$\geq 0^{\circ}\text{C}$ (32°F)

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD**• Abnormality Judgment**

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generator valve angle	$\geq 67.4^{\circ}$
Tumble generator valve "close" signal output	2.2 seconds or more

Time Needed for Diagnosis: 3 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generator valve angle	$< 67.4^{\circ}$
Tumble generator valve "close" signal output	2.2 seconds or more

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

Tumble generator valve opening

- For tumble generator valve all closing points learning, not allowed to update to the closing side.
- For tumble generator valve all opening points learning, not allowed to update to the opening side.

Tumble generator valve control

- Output the open signal.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CY: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	$\geq 10.9 \text{ V}$
Engine coolant temperature	$\geq 0^{\circ}\text{C}$ (32°F)

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generator valve angle	$< 67.4^{\circ}$
Tumble generator valve "open" signal output	1.4 seconds or more

Time Needed for Diagnosis: 3 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generator valve angle	$\geq 67.4^{\circ}$
Tumble generator valve "open" signal output	1.4 seconds or more

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

Tumble generator valve opening

- For tumble generator valve all closing points learning, not allowed to update to the closing side.
- For tumble generator valve all opening points learning, not allowed to update to the opening side.

Tumble generator valve control

- Output the close signal.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

**CZ: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	$\geq 10.9 \text{ V}$
Engine coolant temperature	$\geq 0^{\circ}\text{C}$ (32°F)

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD**• Abnormality Judgment**

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generator valve angle	$< 67.4^{\circ}$
Tumble generator valve "open" signal output	1.4 seconds or more

Time Needed for Diagnosis: 3 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generator valve angle	$\geq 67.4^{\circ}$
Tumble generator valve "open" signal output	1.4 seconds or more

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

Tumble generator valve opening

- For tumble generator valve all closing points learning, not allowed to update to the closing side.
- For tumble generator valve all opening points learning, not allowed to update to the opening side.

Tumble generator valve control

- Output the close signal.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

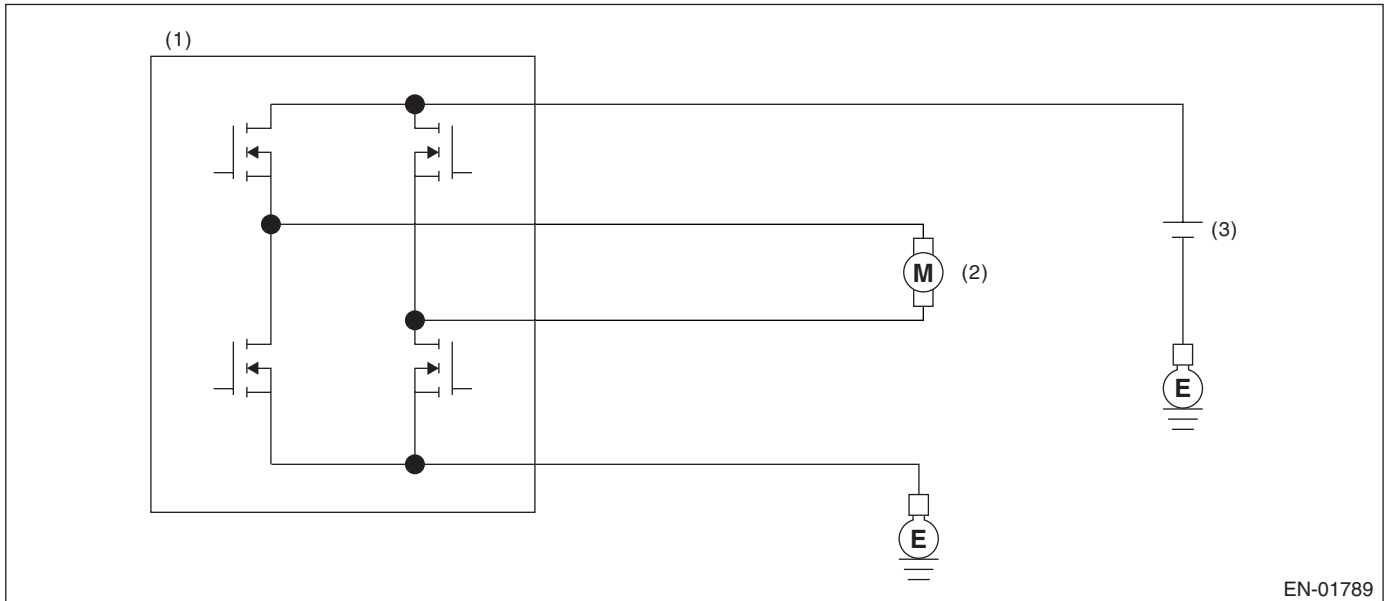
DA:DTC P2008 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tumble generator valve motor.

Judge NG when the open signal is sent from IC after tumble generator valve driving IC diagnosis.

2. COMPONENT DESCRIPTION



- (1) Engine control module (ECM)
- (2) Tumble generator valve
- (3) Battery

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed by tumble generator valve driving IC, and then NG signal is sent to main IC. At the main IC, check the sent signal at each timing which occurs just before the tumble generator valve output is set to ON and OFF, and judge open NG when the open NG signal is sent 20 times in a row. Judge OK and clear the NG when the OK signal is sent.

Judgment Value

Malfunction Criteria	Threshold Value
Current	< 5 mA

Time Needed for Diagnosis: 2 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

Tumble generator valve control: Not allowed to move tumble generator valve.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

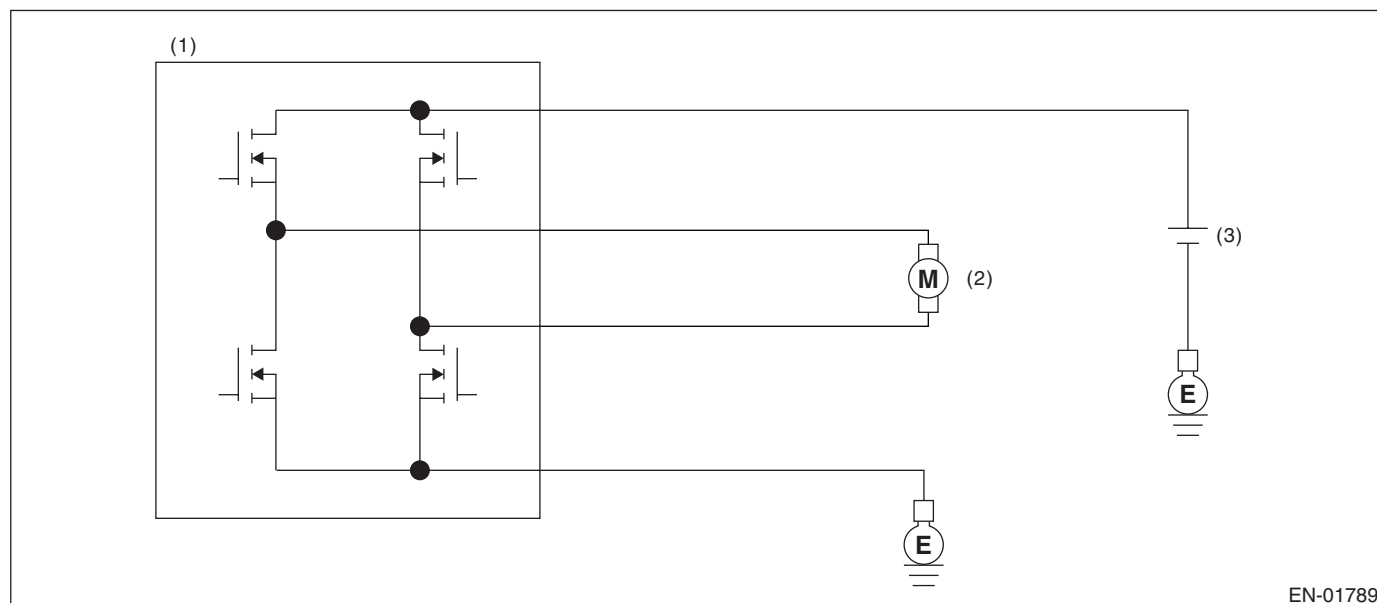
DB:DTC P2009 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tumble generator valve motor.

Judge NG when the overcurrent signal is sent from IC after tumble generator valve driving IC diagnosis.

2. COMPONENT DESCRIPTION



- (1) Engine control module (ECM)
- (2) Tumble generator valve
- (3) Battery

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed by tumble generator valve driving IC, and then NG signal is sent to main IC. At the main IC, check the sent signal at each timing which occurs just before the tumble generator valve output is set to ON and OFF, and judge overcurrent NG when the overcurrent NG signal is sent 10 times in a row. Judge OK and clear the NG when the OK signal is sent.

Judgment Value

Malfunction Criteria	Threshold Value
Current	> 3 A

Time Needed for Diagnosis: 1 second

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

Tumble generator valve control: Not allowed to move tumble generator valve.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

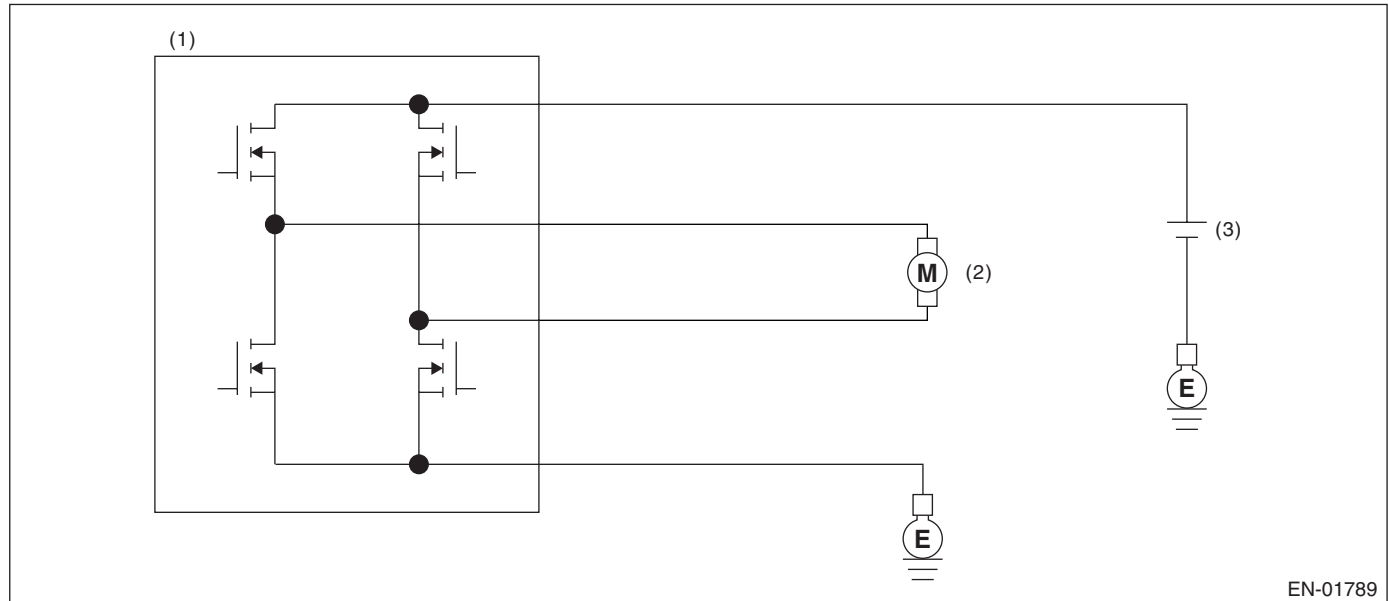
DC:DTC P2011 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 2)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tumble generator valve motor.

Judge NG when the open signal is sent from IC after tumble generator valve driving IC diagnosis.

2. COMPONENT DESCRIPTION



- (1) Engine control module (ECM)
- (2) Tumble generator valve
- (3) Battery

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed by tumble generator valve driving IC, and then NG signal is sent to main IC. At the main IC, check the sent signal at each timing which occurs just before the tumble generator valve output is set to ON and OFF, and judge open NG when the open NG signal is sent 20 times in a row. Judge OK and clear the NG when the OK signal is sent.

Judgment Value

Malfunction Criteria	Threshold Value
Current	< 5 mA

Time Needed for Diagnosis: 2 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

Tumble generator valve control: Not allowed to move tumble generator valve.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

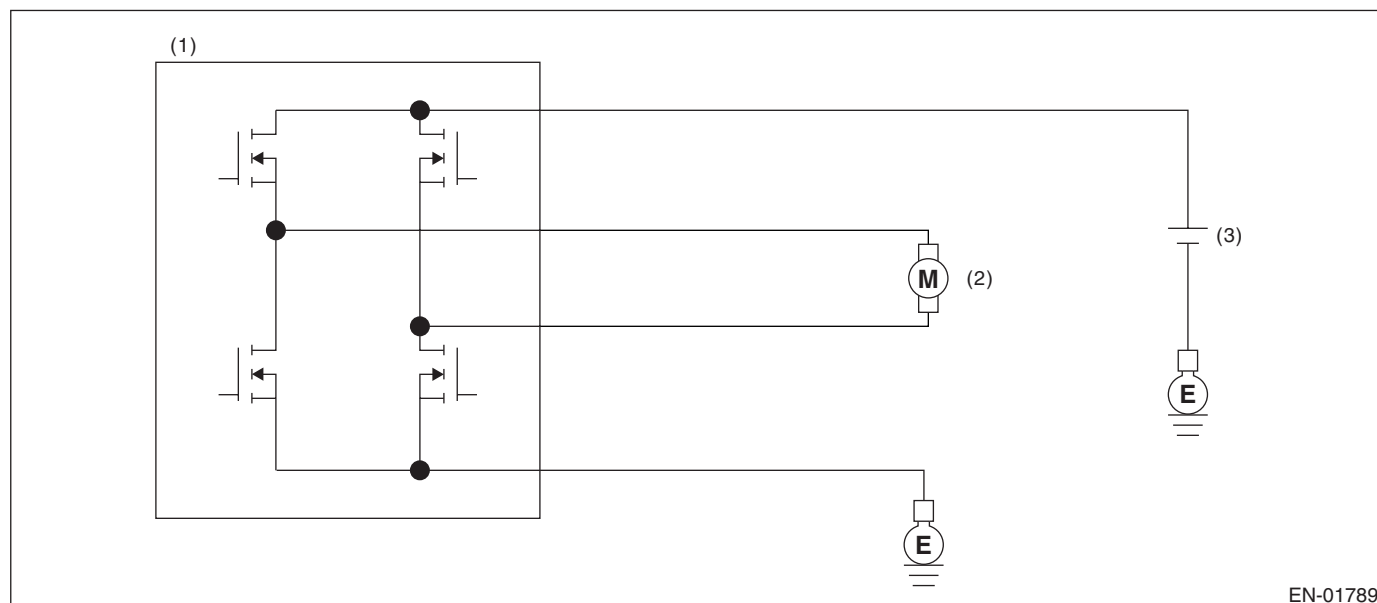
DD:DTC P2012 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 2)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tumble generator valve motor.

Judge NG when the overcurrent signal is sent from IC after tumble generator valve driving IC diagnosis.

2. COMPONENT DESCRIPTION



- (1) Engine control module (ECM)
- (2) Tumble generator valve
- (3) Battery

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 10.9 \text{ V}$

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed by tumble generator valve driving IC, and then NG signal is sent to main IC. At the main IC, check the sent signal at each timing which occurs just before the tumble generator valve output is set to ON and OFF, and judge overcurrent NG when the overcurrent NG signal is sent 10 times in a row.

Judge OK and clear the NG when the OK signal is sent.

Judgment Value

Malfunction Criteria	Threshold Value
Current	$> 3 \text{ A}$

Time Needed for Diagnosis: 1 second

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

Tumble generator valve control: Not allowed to move tumble generator valve.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

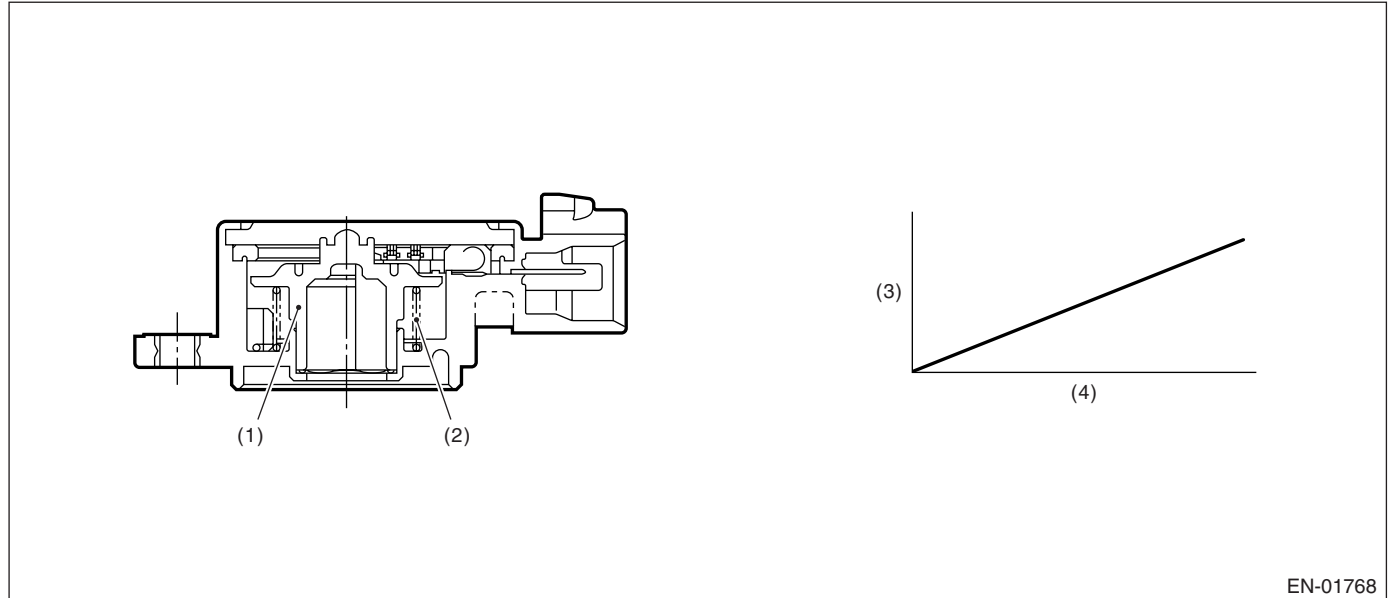
GENERAL DESCRIPTION

DE: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 NG when the value is out of standard range.

2. COMPONENT DESCRIPTION



- (1) Rotor
- (2) Return spring
- (3) Voltage (V)
- (4) Tumble generator valve angle (°)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform diagnosis.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (0.5 seconds). Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.167 V

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

Tumble generator valve position

- Learning of tumble generator valve position fully closed and date renewed to close side.
- Learning of tumble generator valve position fully opened and date renewed to open side.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

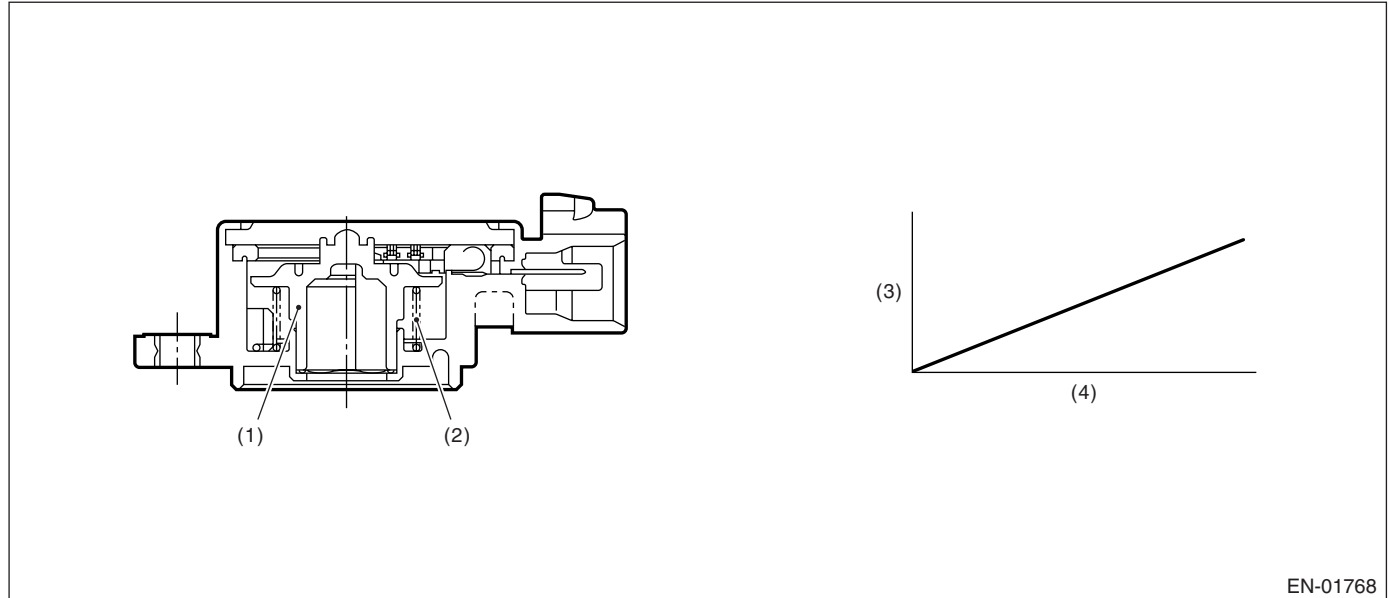
GENERAL DESCRIPTION

DF: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 NG when the value is out of standard range.

2. COMPONENT DESCRIPTION



- (1) Rotor
- (2) Return spring
- (3) Voltage (V)
- (4) Tumble generator valve angle (°)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform diagnosis.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (0.5 seconds). Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.843 V

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

Tumble generator valve position

- Learning of tumble generator valve position fully closed and date renewed to close side.
- Learning of tumble generator valve position fully opened and date renewed to open side.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

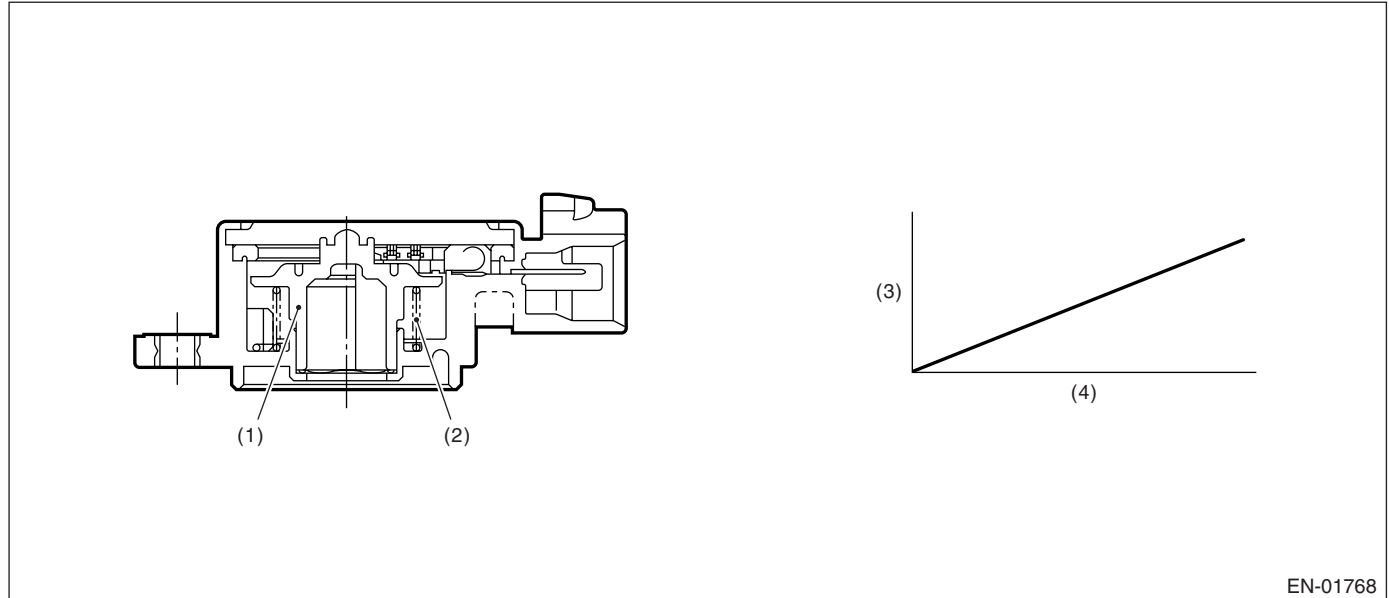
GENERAL DESCRIPTION

DG: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 NG when the value is out of standard range.

2. COMPONENT DESCRIPTION



- (1) Rotor
- (2) Return spring
- (3) Voltage (V)
- (4) Tumble generator valve angle (°)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform diagnosis.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (0.5 seconds). Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.167 V

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

Tumble generator valve position

- Learning of tumble generator valve position fully closed and date renewed to close side.
- Learning of tumble generator valve position fully opened and date renewed to open side.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

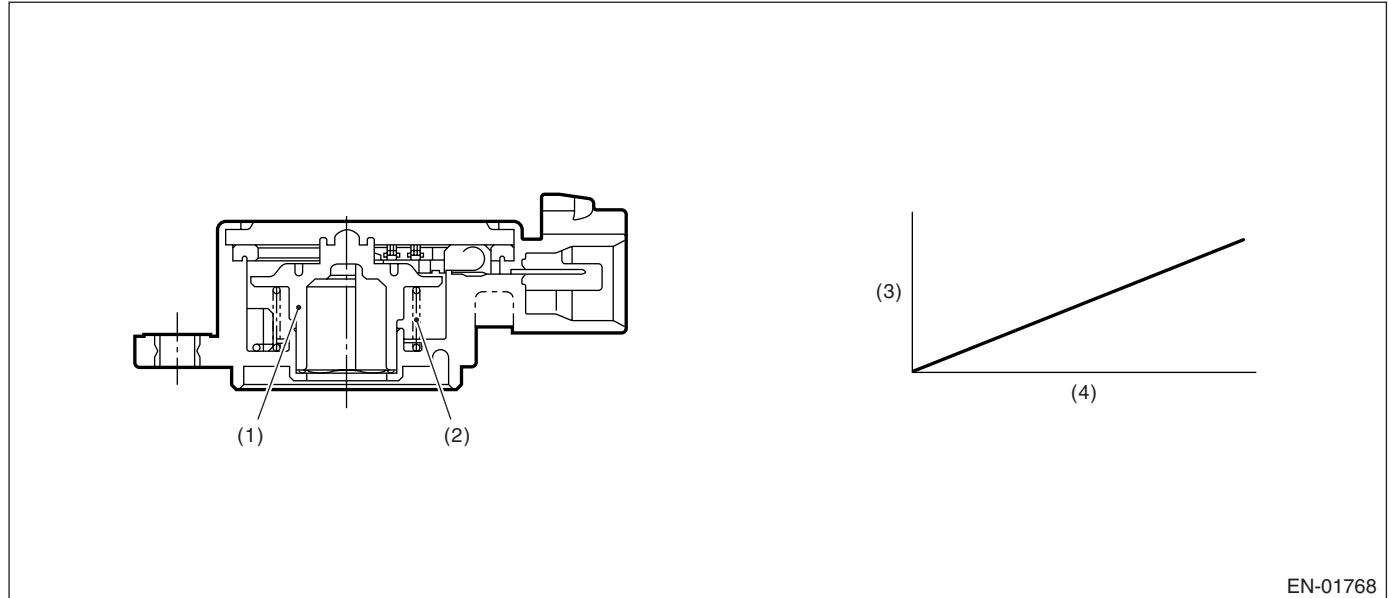
GENERAL DESCRIPTION

DH: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 NG when the value is out of standard range.

2. COMPONENT DESCRIPTION



- (1) Rotor
- (2) Return spring
- (3) Voltage (V)
- (4) Tumble generator valve angle (°)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform diagnosis.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (0.5 seconds). Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.843 V

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

Tumble generator valve position

- Learning of tumble generator valve position fully closed and date renewed to close side.
- Learning of tumble generator valve position fully opened and date renewed to open side.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

DI: DTC P2088 OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of oil flow control valve solenoid.

Judge open NG when the current flow is small whereas duty signal is large, and judge short NG when the current flow is large whereas duty signal is small.

2. ENABLE CONDITION

Secondary Parameter	Enable Condition
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
OCV control duty	$\geq 99.61\%$
OCV control present current	< 0.306 A

Time Needed for Diagnosis: 2,000 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Target current value of OCV	$\geq 0.14\%$
Target current value of OCV – Control current value of OCV	≥ 0.08 A

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

- Ignition timing whole learning compensation:
 - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when IG OFF, and then make the whole learning incomplete.
 - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when making a normality judgment from abnormality judgment, and then make the whole learning incomplete.
- Ignition timing partial learning compensation:
 - Enter the initial value (0°CA) to the compensation value of partial learning zone when IG OFF.
 - Enter the initial value (0°CA) to the compensation value of partial learning zone when making a normality judgment from abnormality judgment.
- AVCS control:
 - Most timing retard learning is not complete or most timing retard learning completion is not experienced.
 - ISC feedback compensation: Do not perform the AVCS actual timing advance compensation.
 - Make the OCV driving Duty to be the given value (9.36%).

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

DJ:DTC P2089 OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of oil flow control valve solenoid.

Judge open NG when the current flow is small whereas duty signal is large, and judge short NG when the current flow is large whereas duty signal is small.

2. ENABLE CONDITION

Secondary Parameter	Enable Condition
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
OCV control duty	$< 0.39\%$
OCV control present current	≥ 0.306 A

Time Needed for Diagnosis: 2,000 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
$ \text{Target current value of OCV} - \text{Control current value of OCV} $	< 0.08 A

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

- Ignition timing whole learning compensation:
 - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when IG OFF, and then make the whole learning incomplete.
 - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when making a normality judgment from abnormality judgment, and then make the whole learning incomplete.
- Ignition timing partial learning compensation:
 - Enter the initial value (0°CA) to the compensation value of partial learning zone when IG OFF.
 - Enter the initial value (0°CA) to the compensation value of partial learning zone when making a normality judgment from abnormality judgment.
- AVCS control:
 - Most timing retard learning is not complete or most timing retard learning completion is not experienced.
 - ISC feedback compensation: Do not perform the AVCS actual timing advance compensation.
 - Make the OCV driving Duty to be the given value (9.36%).

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

DK:DTC P2092 OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 2)

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of oil flow control valve solenoid.

Judge open NG when the current flow is small whereas duty signal is large, and judge short NG when the current flow is large whereas duty signal is small.

2. ENABLE CONDITION

Secondary Parameter	Enable Condition
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
OCV control duty	$\geq 99.61\%$
OCV control present current	< 0.306 A

Time Needed for Diagnosis: 2,000 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Target current value of OCV	$\geq 0.14\%$
Target current value of OCV – Control current value of OCV	≥ 0.08 A

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

- Ignition timing whole learning compensation:
 - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when IG OFF, and then make the whole learning incomplete.
 - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when making a normality judgment from abnormality judgment, and then make the whole learning incomplete.
- Ignition timing partial learning compensation:
 - Enter the initial value (0°CA) to the compensation value of partial learning zone when IG OFF.
 - Enter the initial value (0°CA) to the compensation value of partial learning zone when making a normality judgment from abnormality judgment.
- AVCS control:
 - Most timing retard learning is not complete or most timing retard learning completion is not experienced.
 - ISC feedback compensation: Do not perform the AVCS actual timing advance compensation.
 - Make the OCV driving Duty to be the given value (9.36%).

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

DL:DTC P2093 OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 2)

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of oil flow control valve solenoid.

Judge open NG when the current flow is small whereas duty signal is large, and judge short NG when the current flow is large whereas duty signal is small.

2. ENABLE CONDITION

Secondary Parameter	Enable Condition
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
OCV control duty	$< 0.39\%$
OCV control present current	≥ 0.306 A

Time Needed for Diagnosis: 2,000 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
$ \text{Target current value of OCV} - \text{Control current value of OCV} $	< 0.08 A

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

- Ignition timing whole learning compensation:
 - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when IG OFF, and then make the whole learning incomplete.
 - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when making a normality judgment from abnormality judgment, and then make the whole learning incomplete.
- Ignition timing partial learning compensation:
 - Enter the initial value (0°CA) to the compensation value of partial learning zone when IG OFF.
 - Enter the initial value (0°CA) to the compensation value of partial learning zone when making a normality judgment from abnormality judgment.
- AVCS control:
 - Most timing retard learning is not complete or most timing retard learning completion is not experienced.
 - ISC feedback compensation: Do not perform the AVCS actual timing advance compensation.
 - Make the OCV driving Duty to be the given value (9.36%).

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

DM:DTC P2096 POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1

1. OUTLINE OF DIAGNOSIS

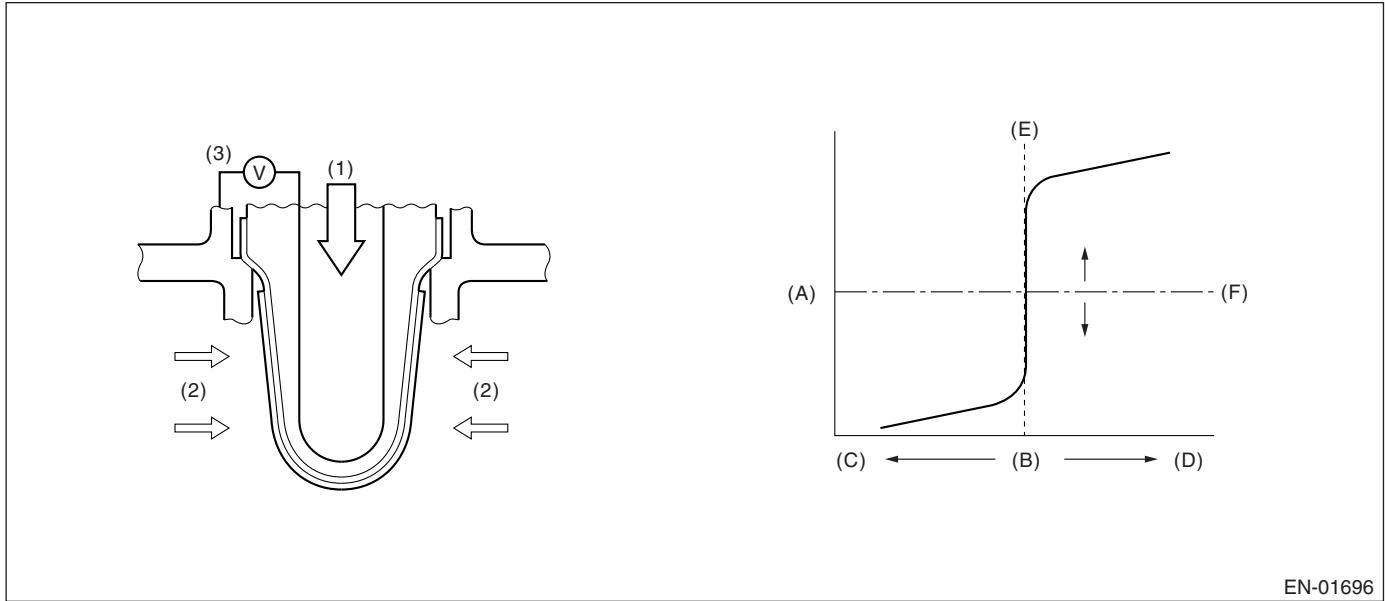
Detect the malfunction of fuel system from the amount of sub feedback control, if it is shifted to lean.

If the sub feedback amount from the engine started till ignition switch OFF is shifted to rich or lean, judge as insufficient sub feedback amount.

If insufficient, change the sub feedback amount guard value and shift judge line, and increment the guard operation counter (tentative NG counter).

Judge NG when the guard operation counter (tentative NG counter) exceeds the specified value and sub feedback amount is shifted to lean.

2. COMPONENT DESCRIPTION



EN-01696

- (1) Atmosphere
- (2) Exhaust gas
- (3) Electromotive force

- (A) Electromotive force
- (B) Air fuel ratio
- (C) Rich
- (D) Lean
- (E) Theoretical air fuel ratio
- (F) Comparative voltage

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	≥ 40 degC and < 105 degC
Accumulative time of closed loop control with secondary oxygen sensor	130 secs.
Closed loop control with secondary oxygen sensor	In operation
Idling SW	Off
Accumulative time of vehicle speed above 75 km/h (rich side only)	55 secs.

4. GENERAL DRIVING CYCLE

Perform the diagnosis at a speed of more than 75 km/h (47 MPH).

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 5 seconds.

Judge OK and clear NG when the continuous time of completing the malfunction criteria below becomes more than 5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Average of fuel trim parameter based on a secondary oxygen sensor	< -0.03
Count of limits moving to rich	≥ 4 count
Ratio of time for oxygen sensor upper or lower to time or rich time/lean time	≥ 1.5

Time Needed for Diagnosis: 600 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When OK with similar drive in 3 drive cycles
- When "Clear Memory" was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

DN:DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1

1. OUTLINE OF DIAGNOSIS

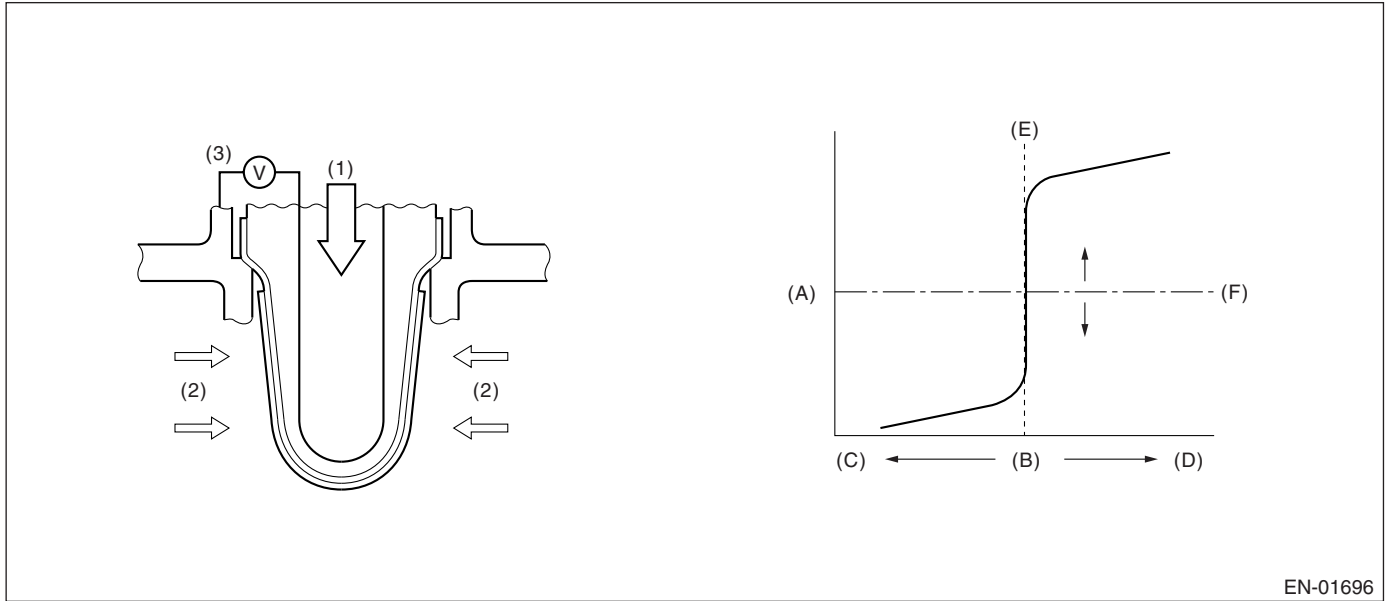
Detect the malfunction of fuel system from the amount of sub feedback control, if it is shifted to lean.

If the sub feedback amount from the engine started till ignition switch OFF is shifted to rich or lean, judge as insufficient sub feedback amount.

If insufficient, change the sub feedback amount guard value and shift judge line, and increment the guard operation counter (tentative NG counter).

Judge NG when the guard operation counter (tentative NG counter) exceeds the specified value and sub feedback amount is shifted to lean.

2. COMPONENT DESCRIPTION



- (1) Atmosphere
- (2) Exhaust gas
- (3) Electromotive force

- (A) Electromotive force
- (B) Air fuel ratio
- (C) Rich
- (D) Lean
- (E) Theoretical air fuel ratio
- (F) Comparative voltage

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	≥ 40 degC and < 105 degC
Accumulative time of closed loop control with secondary oxygen sensor	130 secs.
Closed loop control with secondary oxygen sensor	In operation
Idling SW	Off
Accumulative time of vehicle speed above 75 km/h (rich side only)	55 secs.

4. GENERAL DRIVING CYCLE

Perform the diagnosis at a speed of more than 75 km/h (47 MPH).

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 5 seconds.

Judge OK and clear NG when the continuous time of completing the malfunction criteria below becomes more than 5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Average of fuel trim parameter based on a secondary oxygen sensor	≥ 0.025
Count of limits moving to lean	≥ 4 count
Ratio of time for oxygen sensor upper or lower to time or rich time/lean time	≤ 5.6

Time Needed for Diagnosis: 600 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous drive cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When OK with similar drive in 3 drive cycles.
- When "Clear Memory" was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

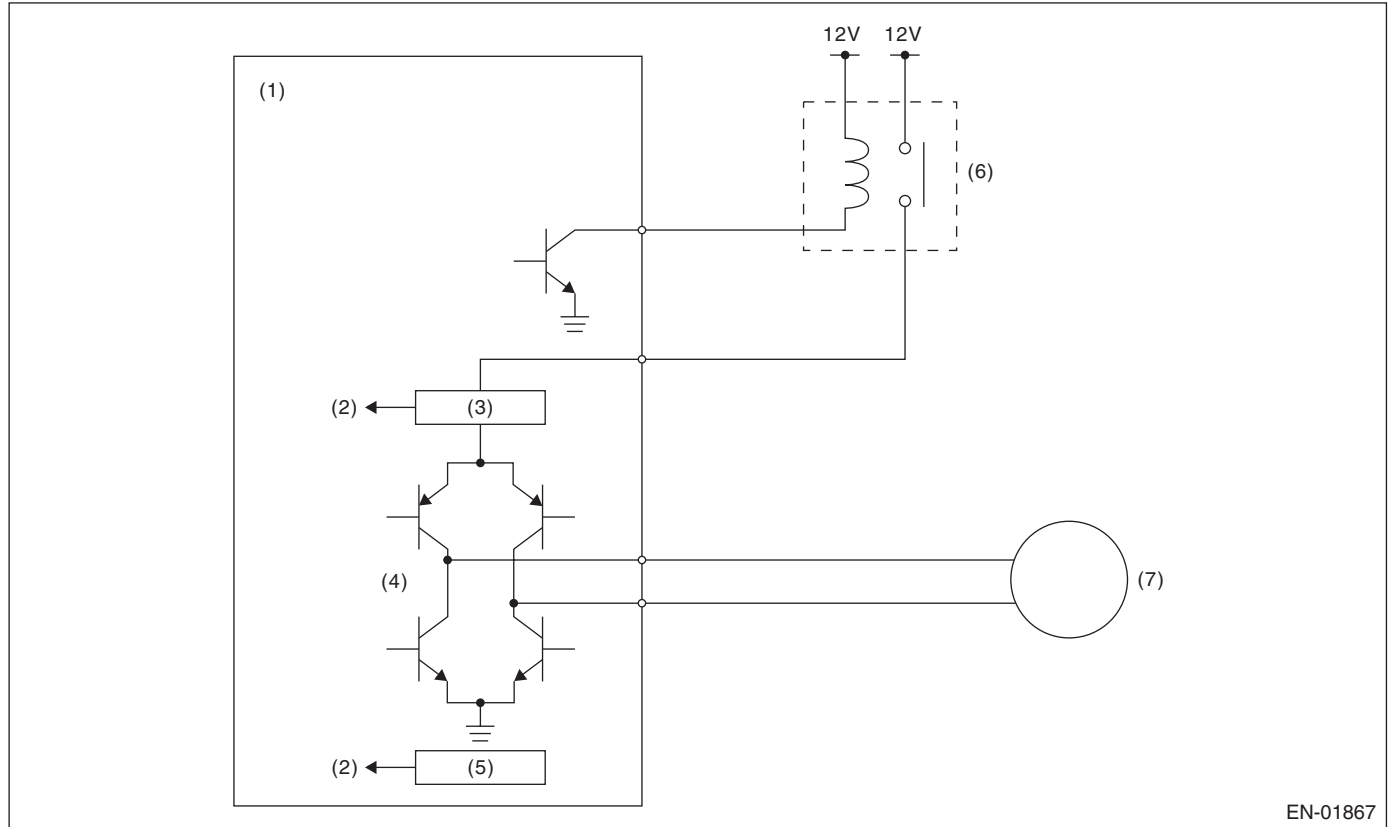
GENERAL DESCRIPTION

DO:DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/ PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Judge NG when the motor current becomes large or drive circuit is heated.

2. COMPONENT DESCRIPTION



EN-01867

(1) Engine control unit (ECM)	(5) Temperature detection circuit
(2) Detection circuit	(6) Electronic control throttle relay
(3) Overcurrent detection circuit	(7) Motor
(4) Drive circuit	

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Under control of electronic control throttle	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Motor current	$\leq 8 \text{ A}$
Drive circuit inner temperature	$\leq 175^{\circ}\text{C}$ (347°F)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Time Needed for Diagnosis:

- 500 milliseconds (NG judgment)
- 2,000 milliseconds (OK judgment)

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

8. FAIL SAFE

Stop the continuity to the electronic control throttle motor. (Fix the throttle opening angle to 6°.)

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

Diagnostic Trouble Code (DTC) Detecting Criteria

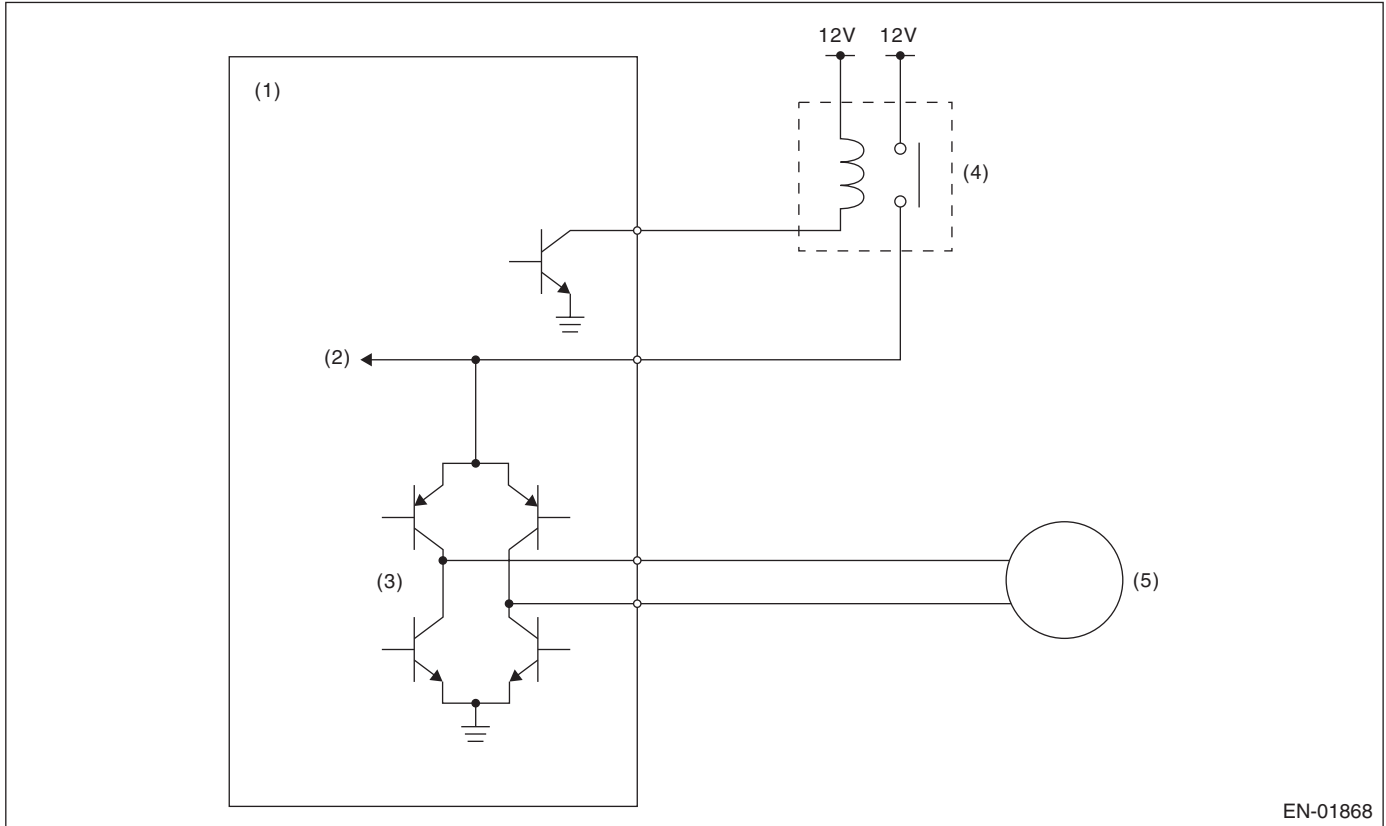
GENERAL DESCRIPTION

DP:DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Judge NG when the electronic control throttle 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 control throttle relay
- (5) Motor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Electronic control throttle relay output	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Motor power voltage	≥ 5 V

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Time Needed for Diagnosis:

- 400 milliseconds (For NG)
- 2,000 milliseconds (For OK)

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

8. FAIL SAFE

Stop the continuity to the electronic control throttle motor. (Fix the throttle opening angle to 6°.)

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

Diagnostic Trouble Code (DTC) Detecting Criteria

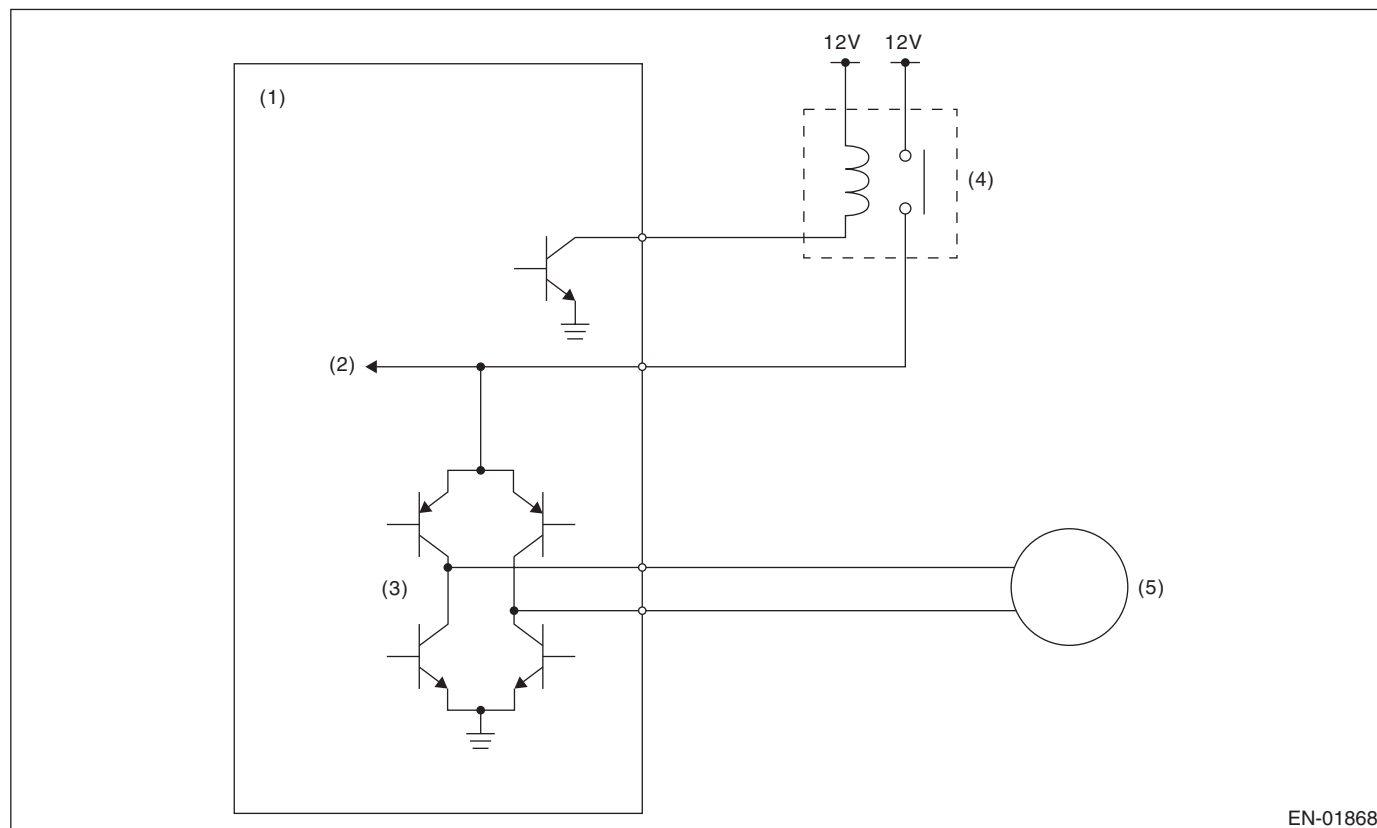
GENERAL DESCRIPTION

DQ:DTC P2103 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Judge NG when the electronic control throttle power is not supplied even when ECM sets the electronic throttle control relay to OFF.

2. COMPONENT DESCRIPTION



EN-01868

- (1) Engine control module (ECM)
- (2) Voltage detection circuit
- (3) Drive circuit
- (4) Electronic control throttle relay
- (5) Motor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Electronic control throttle relay output	OFF

4. GENERAL DRIVING CYCLE

- Ignition switch ON → OFF
- Ignition switch OFF → ON (After clear memory only)

5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Motor power voltage	≤ 5 V

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Time Needed for Diagnosis:

- 600 milliseconds (For NG)
- 400 milliseconds (For OK)

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

8. FAIL SAFE

Stop the continuity to the electronic control throttle motor. (Fix the throttle opening angle to 6°.)

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

Diagnostic Trouble Code (DTC) Detecting Criteria

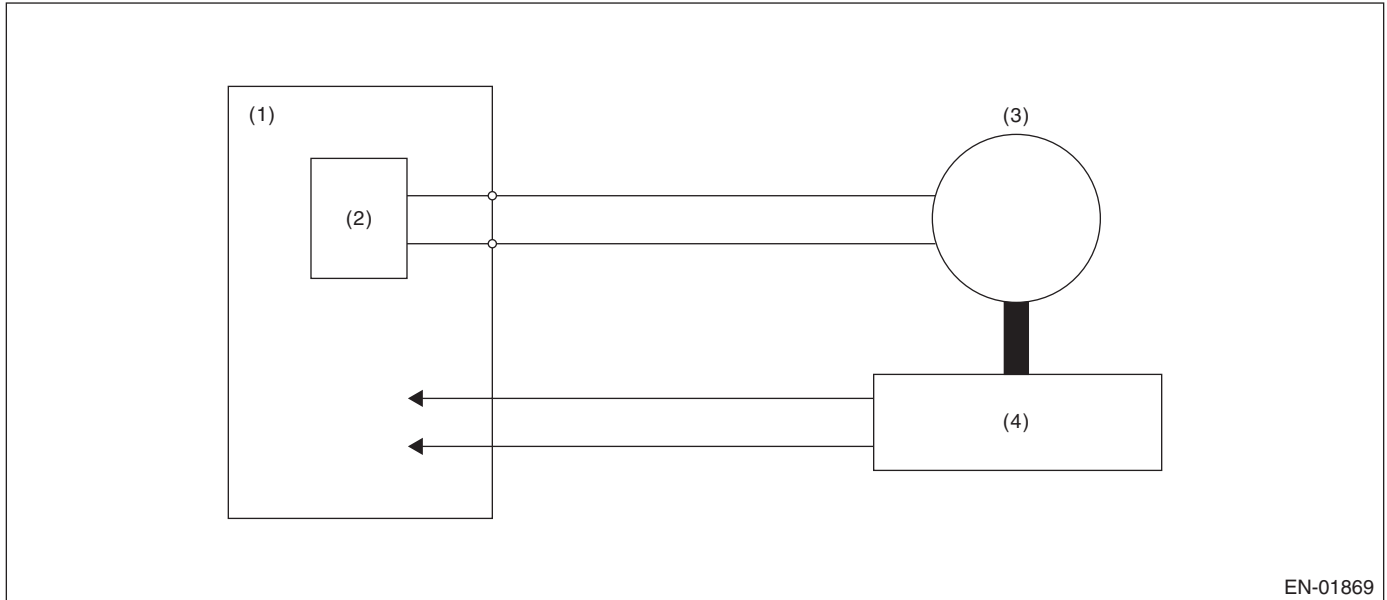
GENERAL DESCRIPTION

DR:DTC P2109 THROTTLE/PEDAL POSITION SENSOR A MINIMUM STOP PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Judge NG when all 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 (after clear memory only)	OFF → ON

4. GENERAL DRIVING CYCLE

Perform the diagnosis at all close point learning.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Throttle sensor voltage at all close point learning	0.41 — 0.79 V
Time for all close point learning completion	Within 80 milliseconds

Time Needed for Diagnosis: None

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

8. FAIL SAFE

Stop the continuity to the electronic control throttle motor. (Fix the throttle opening angle to 6°.)

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

Diagnostic Trouble Code (DTC) Detecting Criteria

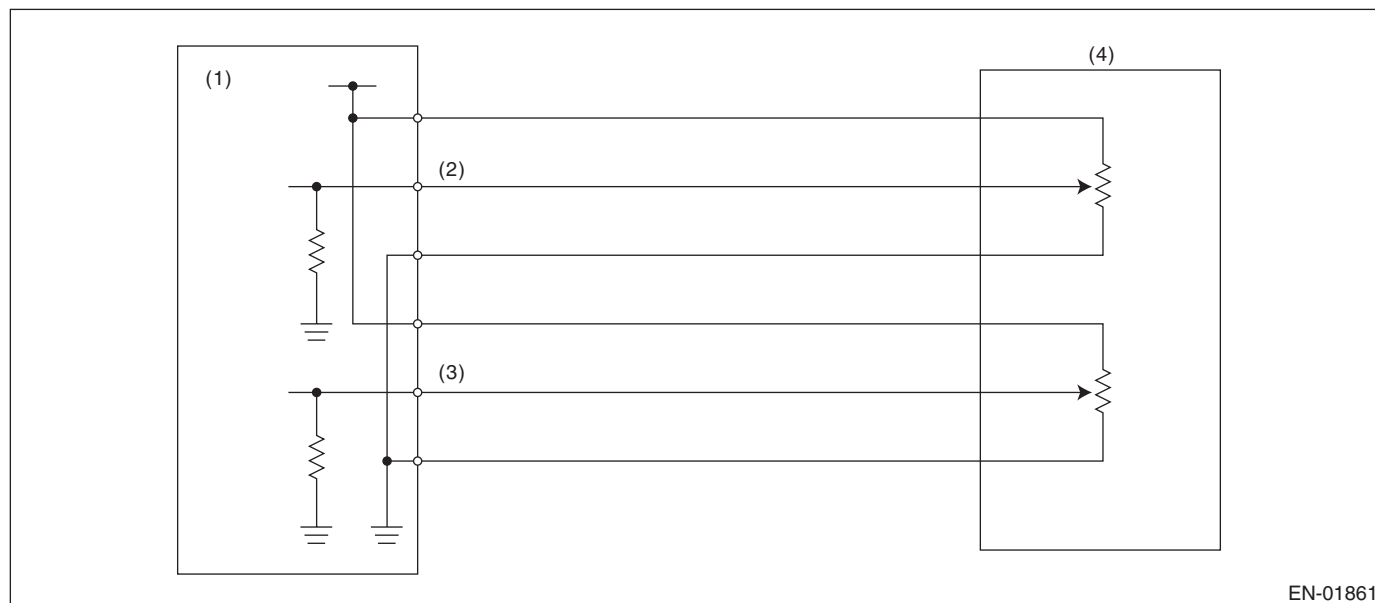
GENERAL DESCRIPTION

DS: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 NG when out of the standard value.

2. COMPONENT DESCRIPTION



- (1) Engine control module (ECM)
- (2) Accelerator pedal position sensor 1 signal
- (3) Accelerator pedal position sensor 2 signal
- (4) Accelerator pedal position sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	≥ 0.308 V

Time Needed for Diagnosis: 100 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only with engine stopped)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Multi malfunction: Fix the throttle opening angle to 6°.

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

Diagnostic Trouble Code (DTC) Detecting Criteria

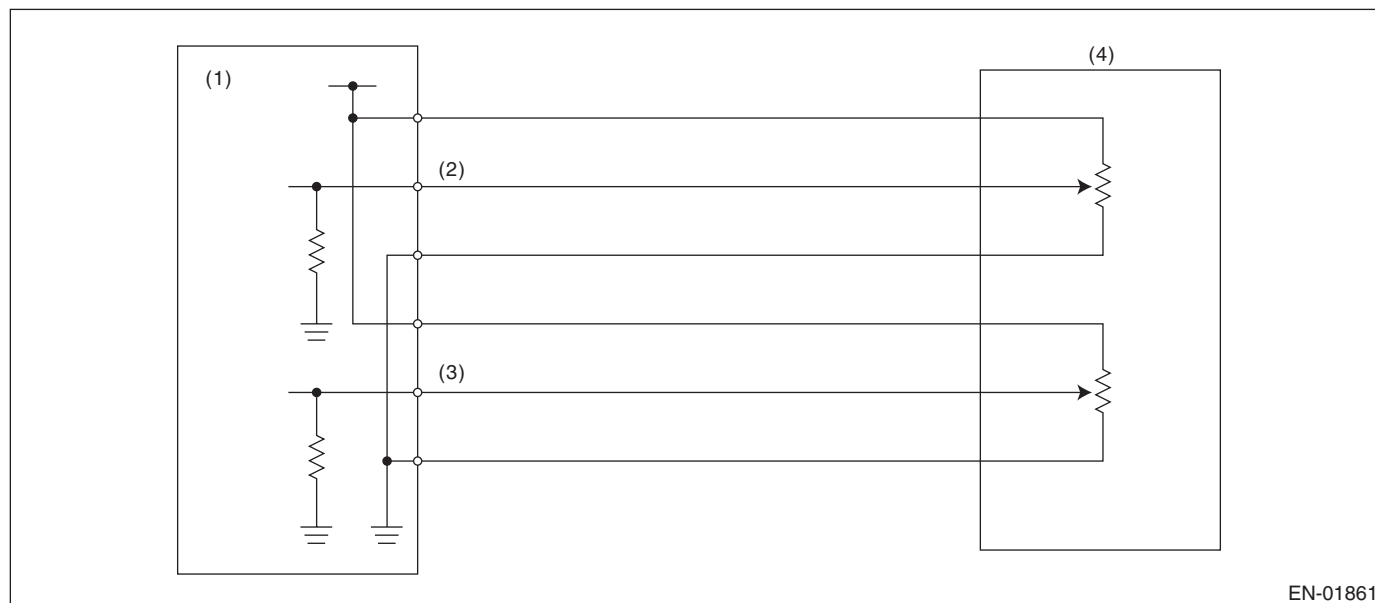
GENERAL DESCRIPTION

DT: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 NG when out of the standard value.

2. COMPONENT DESCRIPTION



- (1) Engine control module (ECM)
- (2) Accelerator pedal position sensor 1 signal
- (3) Accelerator pedal position sensor 2 signal
- (4) Accelerator pedal position sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	≤ 4.856 V

Time Needed for Diagnosis: 100 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only with engine stopped)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Multi malfunction: Fix the throttle opening angle to 6°.

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

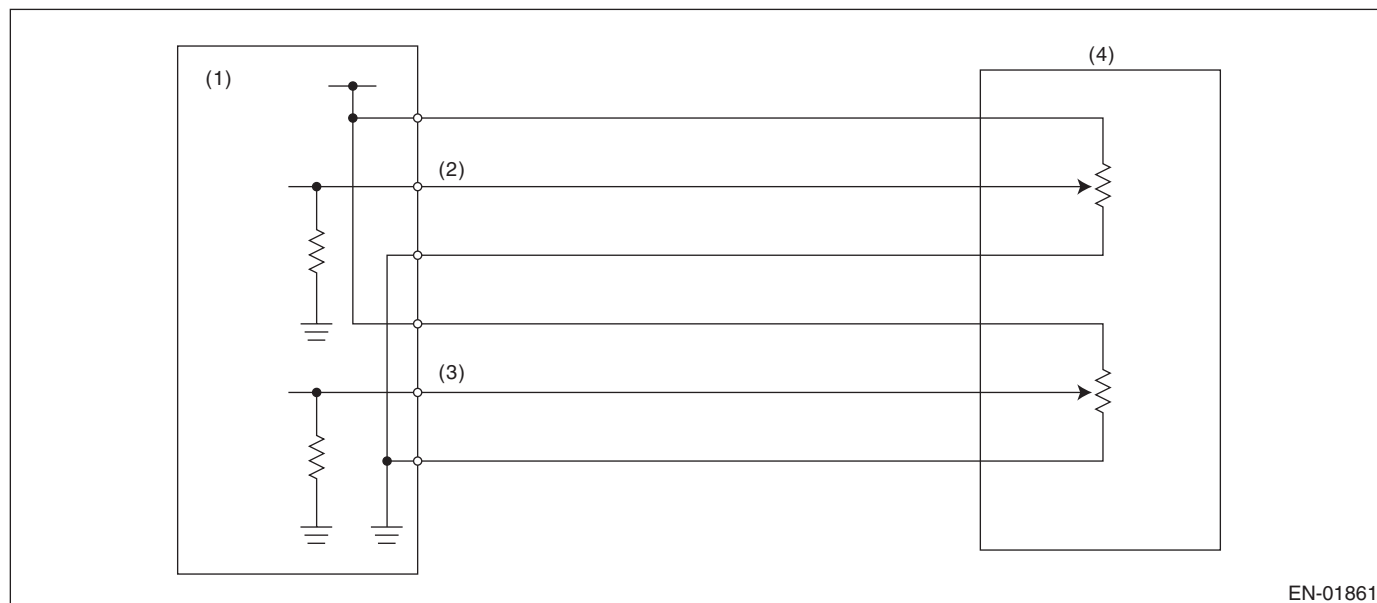
DU:DTC P2127 THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of accelerator pedal position sensor 2.

Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



- (1) Engine control module (ECM)
- (2) Accelerator pedal position sensor 1 signal
- (3) Accelerator pedal position sensor 2 signal
- (4) Accelerator pedal position sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	≥ 0.308 V

Time Needed for Diagnosis: 100 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only with engine stopped)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Multi malfunction: Fix the throttle opening angle to 6°.

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

Diagnostic Trouble Code (DTC) Detecting Criteria

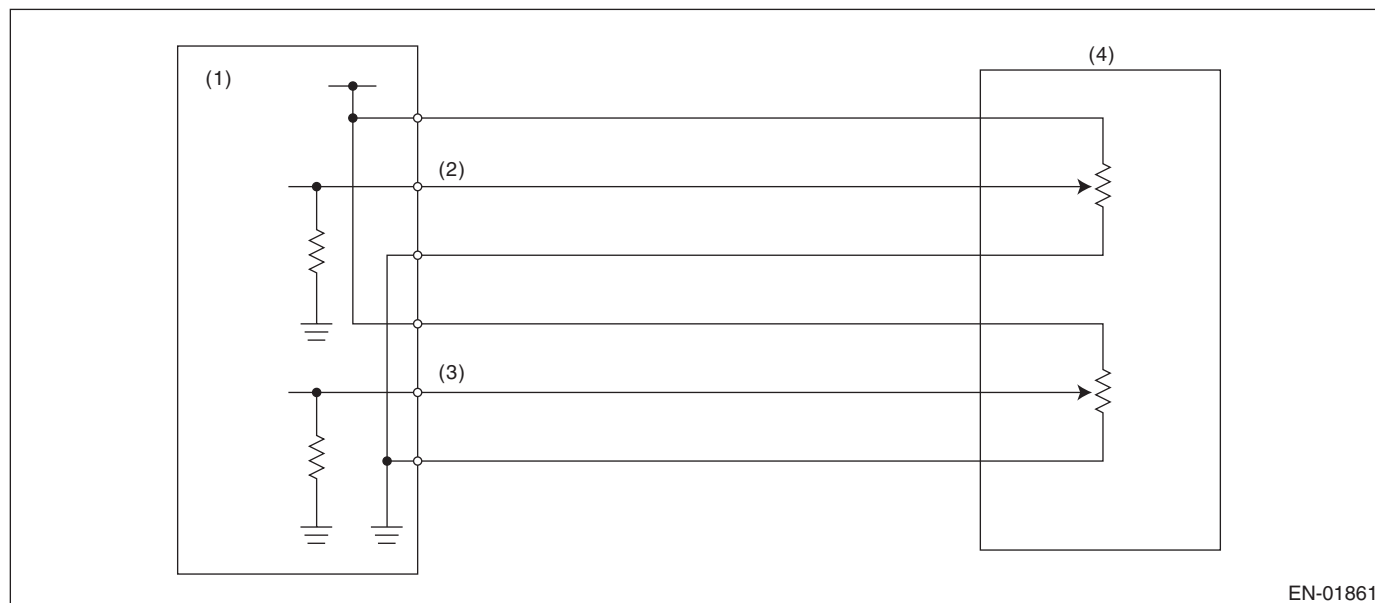
GENERAL DESCRIPTION

DV: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 NG when out of the standard value.

2. COMPONENT DESCRIPTION



- (1) Engine control module (ECM)
- (2) Accelerator pedal position sensor 1 signal
- (3) Accelerator pedal position sensor 2 signal
- (4) Accelerator pedal position sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	≥ 0.308 V

Time Needed for Diagnosis: 100 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only with engine stopped)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Multi malfunction: Fix the throttle opening angle to 6°.

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

Diagnostic Trouble Code (DTC) Detecting Criteria

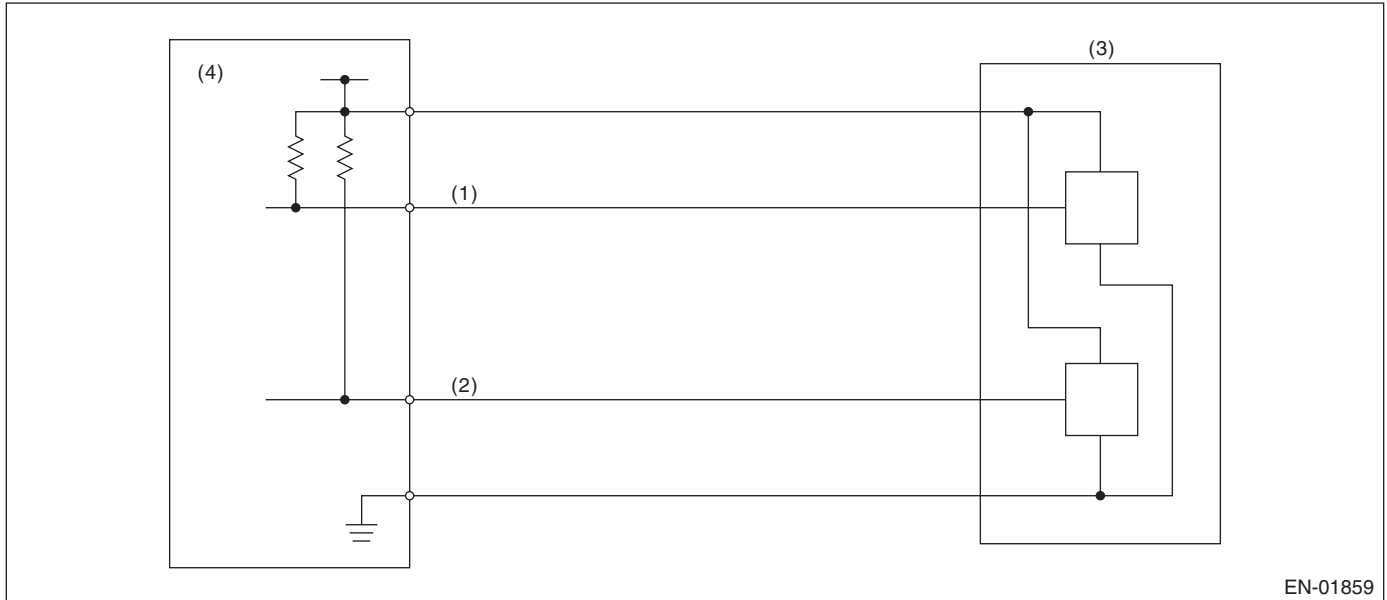
GENERAL DESCRIPTION

DW:DTC P2135 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” / “B” VOLTAGE RATIONALITY

1. OUTLINE OF DIAGNOSIS

Judge NG when the signal level of throttle position sensor 1 is different from the throttle position sensor 2.

2. COMPONENT DESCRIPTION



EN-01859

- (1) Throttle position sensor 1 signal.
- (2) Throttle position sensor 2 signal.
- (3) Throttle position sensor
- (4) Engine control module (ECM)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

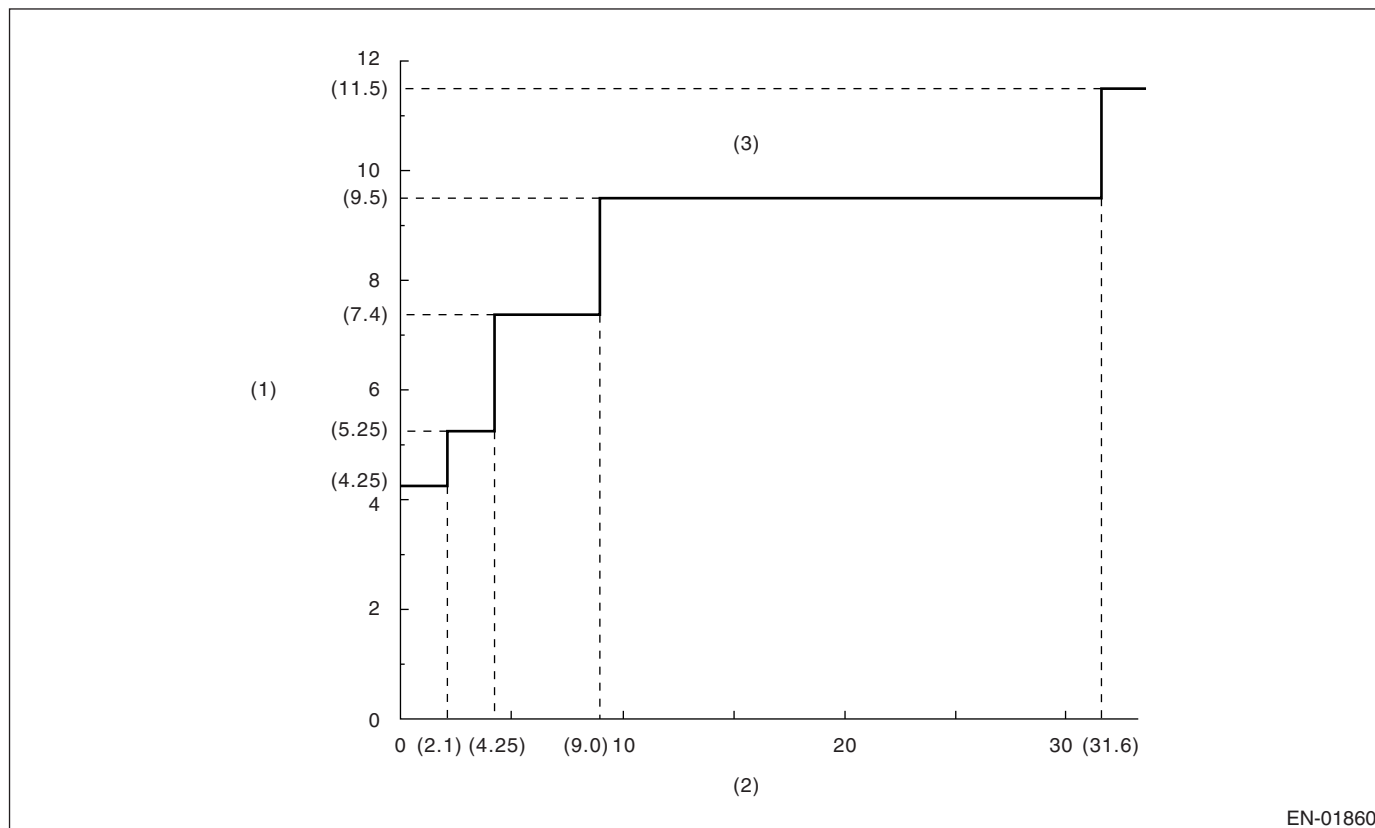
Judgment Value

Malfunction Criteria	Threshold Value
Signal difference between two sensors	≤ 4.25

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Details of Judgment Value



- (1) Sensor output difference (°)
- (2) Throttle position sensor 1 opening angle (°)
- (3) NG area

Time Needed for Diagnosis: 212 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only with engine stopped)

8. FAIL SAFE

Stop the continuity to ETC motor. (Fix the throttle opening angle to 6°.)

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

Diagnostic Trouble Code (DTC) Detecting Criteria

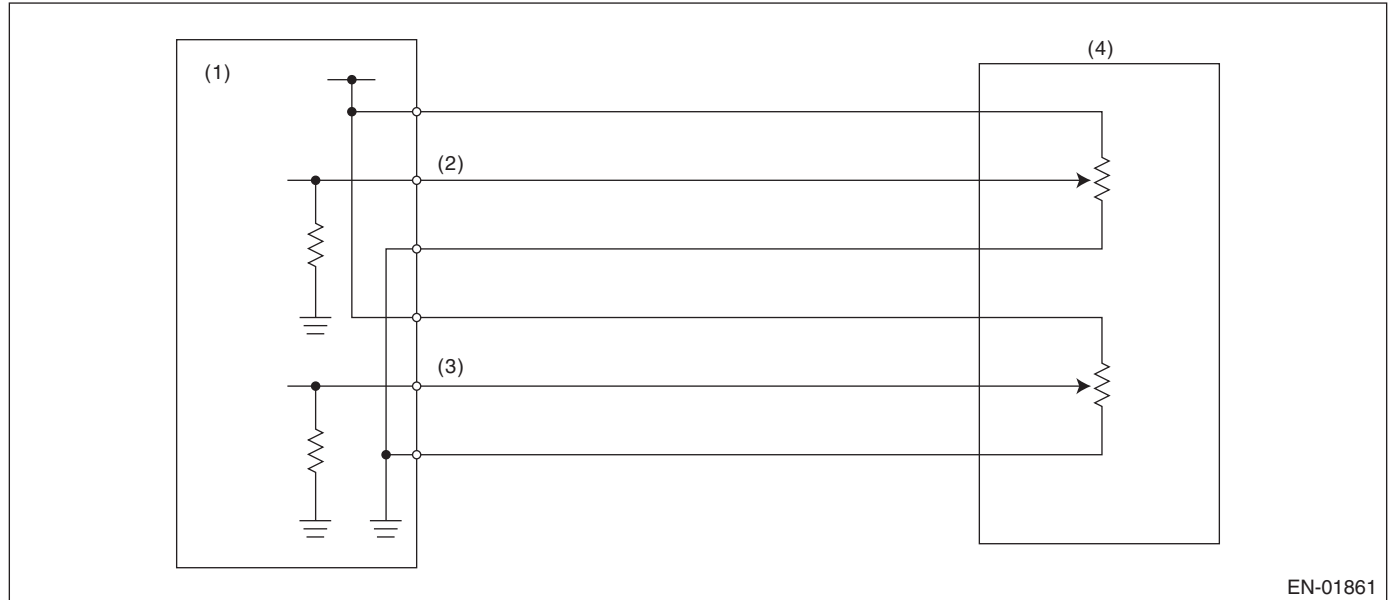
GENERAL DESCRIPTION

DX:DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” / “E” VOLTAGE RATIONALITY

1. OUTLINE OF DIAGNOSIS

Judge NG when the signal level of throttle position sensor 1 is different from the throttle position sensor 2.

2. COMPONENT DESCRIPTION



- (1) Engine control module (ECM)
- (2) Accelerator pedal position sensor 1 signal
- (3) Accelerator pedal position sensor 2 signal
- (4) Accelerator pedal position sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

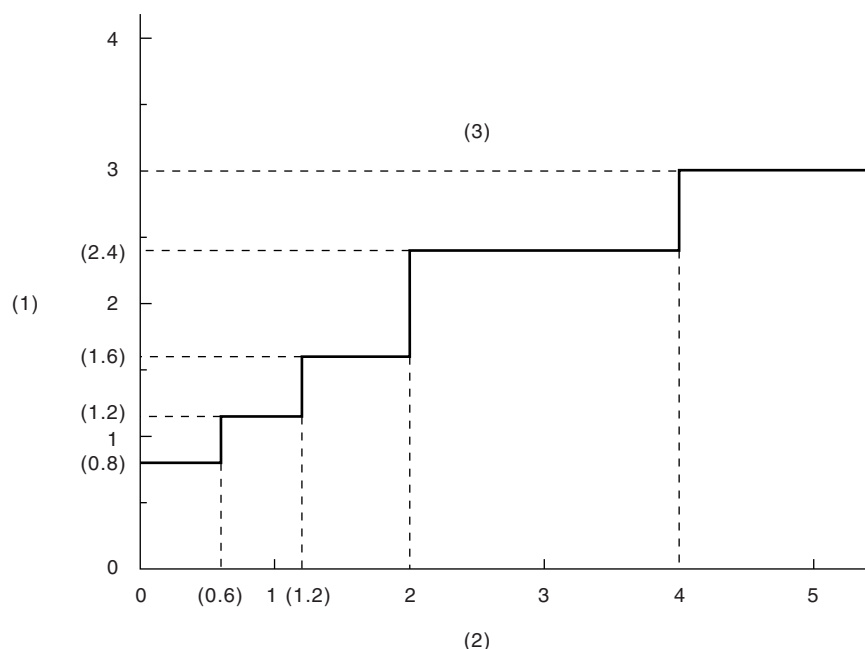
Judgment Value

Malfunction Criteria	Threshold Value
Signal difference between two sensors	$\leq 0.8^\circ$

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Details of Judgment Value



EN-01870

- (1) Sensor output difference (°)
- (2) Accelerator pedal position sensor 2 opening angle (°)
- (3) NG area

Time Needed for Diagnosis:

- 116 milliseconds (For NG)
- 1,000 milliseconds (For OK)

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

Fix the throttle opening angle to 6°.

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

DY:DTC P2227 BAROMETRIC PRESSURE CIRCUIT RANGE/PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of atmospheric pressure sensor output property. Judge NG when the atmospheric pressure sensor output is largely different from the intake manifold pressure at engine starting.

2. COMPONENT DESCRIPTION

Atmospheric pressure sensor is built in ECM.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed at engine starting	< 300 rpm
Vehicle speed	< 1 km/h (0.62 MPH)
Diagnosis for atmospheric pressure sensor property	Not finished

4. GENERAL DRIVING CYCLE

Perform the diagnosis once turning the ignition switch to ON.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.33 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Atmospheric – manifold absolute pressure	≥ 26.7 kPa (200 mmHg, 7.88 inHg)
Intake manifold pressure at engine starting – manifold absolute pressure	< 1.33 kPa (10 mmHg, 2.95 inHg)

Time Needed for Diagnosis: 0.3 seconds

Malfunction Indicator Light Illumination: Detect when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the continuous time of completing the malfunction criteria below becomes more than 0.26 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Atmospheric – manifold absolute pressure	< 26.7 kPa (200 mmHg, 7.88 inHg)

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

Atmospheric pressure sensor process: Fix the atmospheric pressure to 101 kPa (760 mmHg, 29.8 inHg).

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DZ:DTC P2228 BAROMETRIC PRESSURE CIRCUIT LOW INPUT**1. OUTLINE OF DIAGNOSIS**

Detect the open or short circuit of atmospheric pressure sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION

Atmospheric pressure sensor is built in ECM.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD**• Abnormality Judgment**

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Output voltage	< 0.118 V

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Output voltage	≥ 0.118 V

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

Atmospheric pressure sensor process: Fix the atmospheric pressure to 101.3 kPa (760 mmHg, 29.9 inHg).

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

EA:DTC P2229 BAROMETRIC PRESSURE CIRCUIT HIGH INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of atmospheric pressure sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION

Atmospheric pressure sensor is built in ECM.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Output voltage	≥ 4.936 V

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Output voltage	< 4.936 V

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

Atmospheric pressure sensor process: Fix the atmospheric pressure to 101.3 kPa (760 mmHg, 29.9 inHg).

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

IGNITION

General Description

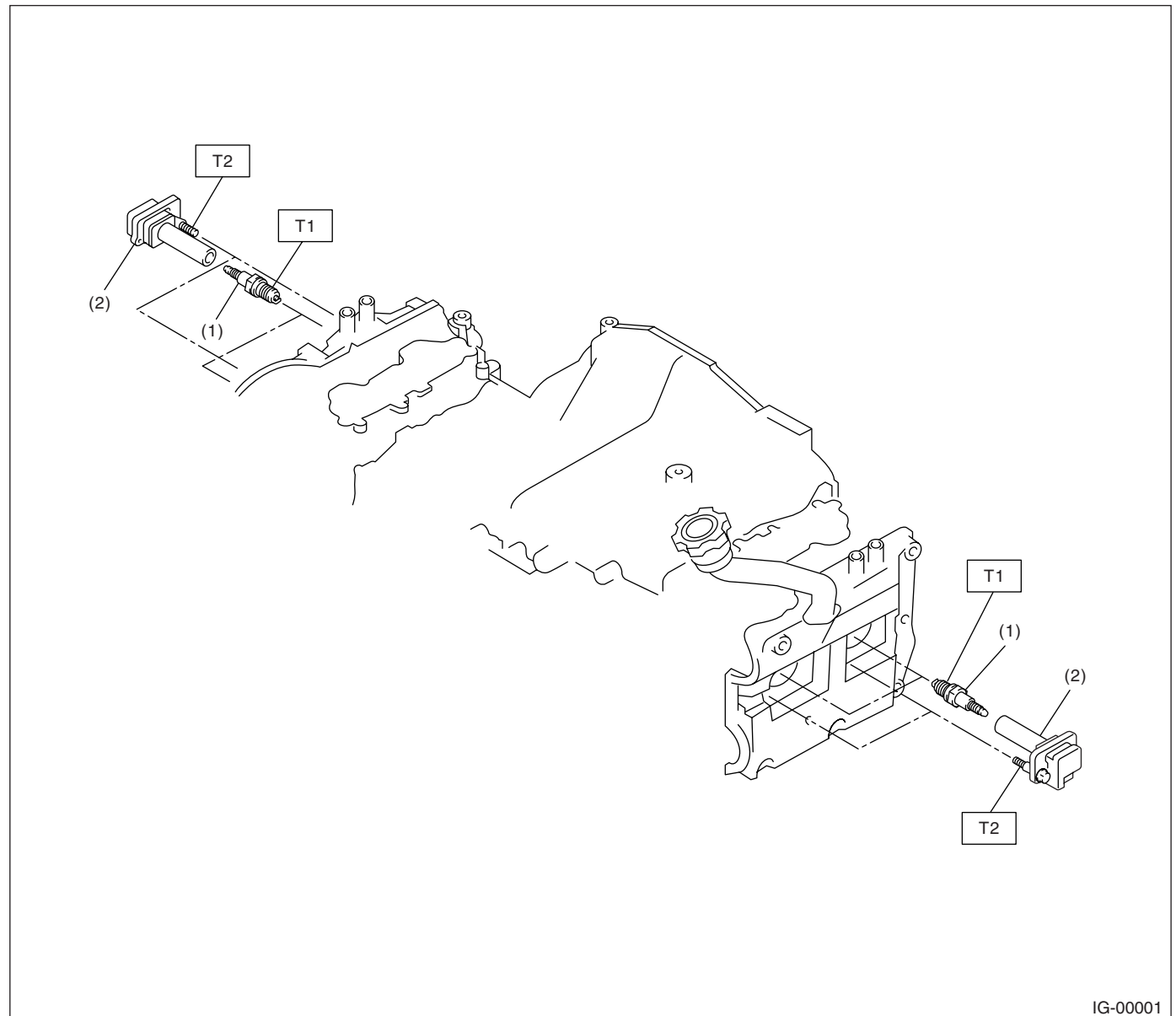
IGNITION

1. General Description

A: SPECIFICATION

Item		Designation
Ignition coil and ignitor assembly	Model	FK0186
	Ignition type	Direct ignition
	Manufacturer	DIAMOND
Spark plug	Type and manufacturer	NGK: ILFR6B
	Thread diameter, pitch, length mm	14, 1.25, 26.5
	Spark plug gap mm (in)	0.7 — 0.8 (0.028 — 0.031)
	Electrode	Iridium

B: COMPONENT



- (1) Spark plug
- (2) Ignition coil and ignitor ASSY

Tightening torque: N·m (kgf-m, ft-lb)
T1: 21 (2.1, 15.2)
T2: 16 (1.6, 11.7)

C: CAUTION

- Wear work clothing, including a cap, protective goggles and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Be careful not to burn your hands, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

Spark Plug

IGNITION

2. Spark Plug

A: REMOVAL

CAUTION:

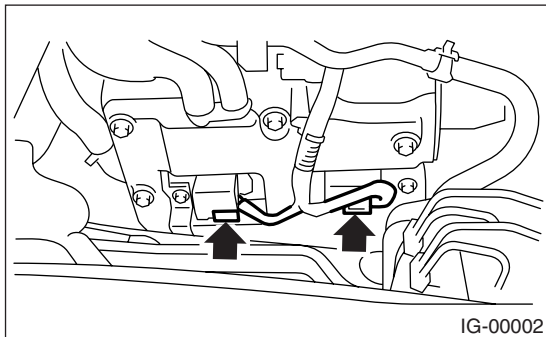
All spark plugs installed on an engine, must be of the same heat range.

Spark plug:

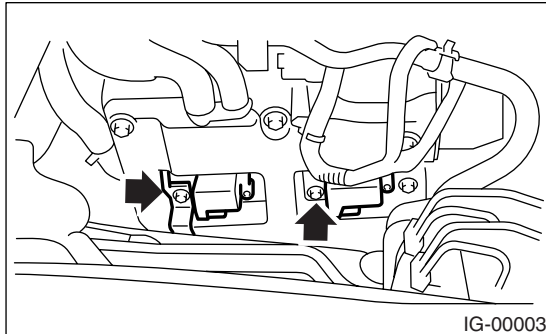
NGK: ILFR6B

1. RH SIDE

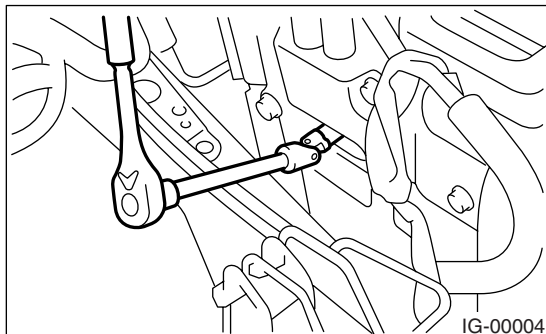
- 1) Disconnect the ground cable from battery.
- 2) Remove the air cleaner lower case. <Ref. to IN(STI)-8, REMOVAL, Air Cleaner Case.>
- 3) Disconnect the connector from ignition coil and ignitor assembly.



- 4) Remove the ignition coil and ignitor assembly.

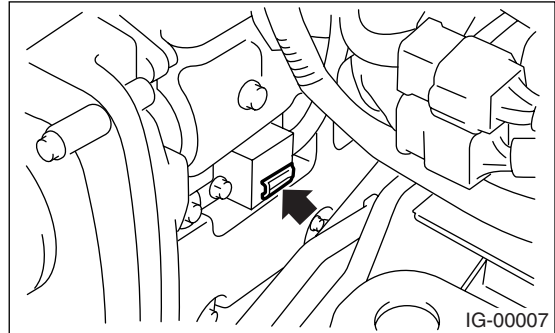


- 5) Remove the spark plugs with the spark plug sockets.

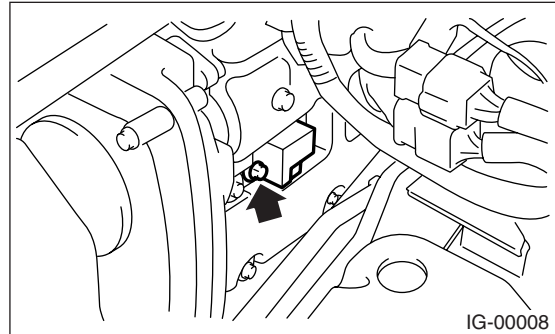


2. LH SIDE

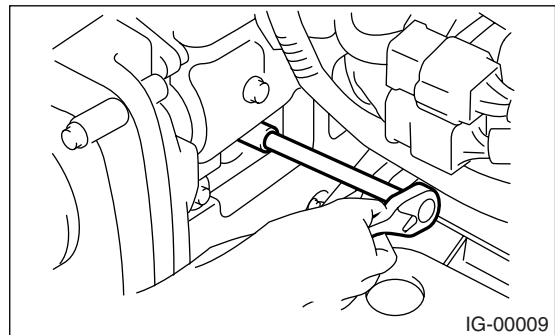
- 1) Disconnect the battery cables, and then remove the battery and battery carrier.
- 2) Disconnect the connector from ignition coil and ignitor assembly.



- 3) Remove the ignition coil and ignitor assembly.



- 4) Remove the spark plugs with the spark plug sockets.



B: INSTALLATION

1. RH SIDE

Install in the reverse order of removal.

Tightening torque (Spark plug):

21 N·m (2.1 kgf-m, 15.2 ft-lb)

Tightening torque (Ignition coil and ignitor assembly):

16 N·m (1.6 kgf-m, 11.7 ft-lb)

NOTE:

The above torque should be only applied to new spark plugs without oil on their threads. In case their threads are lubricated, the torque should be reduced by approx. 1/3 of the specified torque in order to avoid over-stressing.

2. LH SIDE

Install in the reverse order of removal.

Tightening torque (Spark plug):

21 N·m (2.1 kgf-m, 15.2 ft-lb)

Tightening torque (Ignition coil and ignitor assembly):

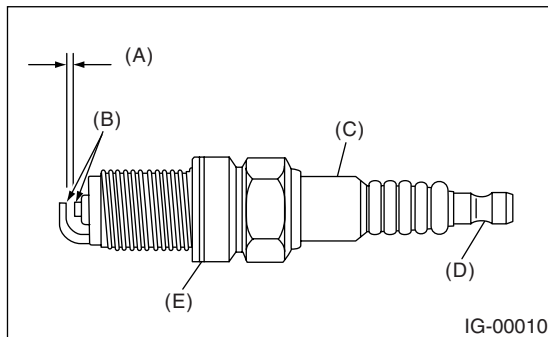
16 N·m (1.6 kgf-m, 11.7 ft-lb)

NOTE:

The above torque should be only applied to new spark plugs without oil on their threads. In case their threads are lubricated, the torque should be reduced by approx. 1/3 of the specified torque in order to avoid over-stressing.

C: INSPECTION

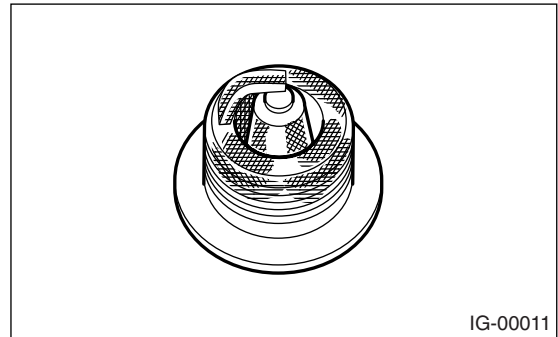
Check the electrodes and inner and ceramic insulator of plugs, noting the type of deposits and the degree of electrode erosion.



- (A) Spark plug gap
- (B) Carbon accumulation or wear
- (C) Cracks
- (D) Damage
- (E) Damaged gasket

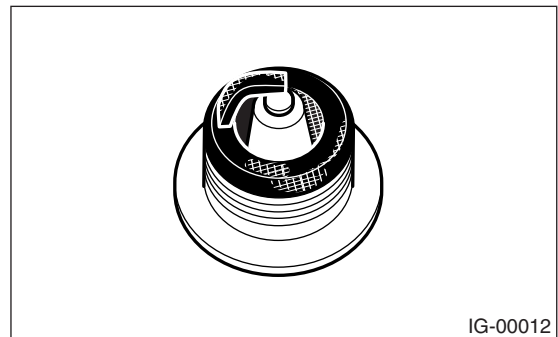
1) Normal:

Brown to grayish-tan deposits and slight electrode wear indicates correct spark plug heat range.



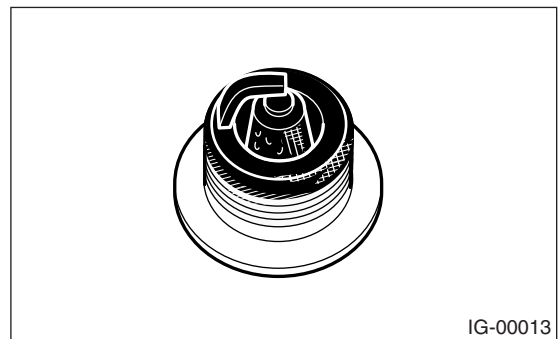
2) Carbon fouled:

Dry fluffy carbon deposits on insulator and electrode are mostly caused by slow speed driving in city, weak ignition, too rich fuel mixture and dirty air cleaner.



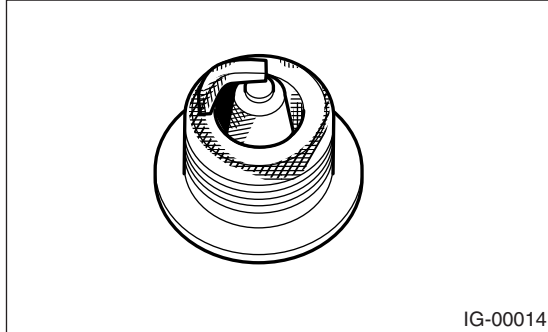
3) Oil fouled:

Wet black deposits show oil entrance into combustion chamber through worn rings and pistons or excessive clearance between valve guides and stems.



4) Overheating:

White or light gray insulator with black or brown spots and bluish burnt electrodes indicates engine overheating. Moreover, the appearance results from incorrect ignition timing, loose spark plugs, wrong selection of fuel, hotter range plug, etc.



D: ADJUSTMENT

Clean the spark plugs with a wire brush. Clean and remove the carbon or oxide deposits, but do not wear away ceramic insulator.

If deposits are too stubborn, replace the plugs.

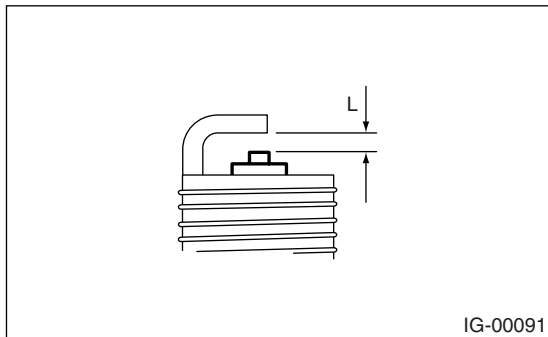
After cleaning the spark plugs, correct the spark plug gap using a gap gauge.

NOTE:

Do not use spark plug cleaners, because the spark plugs are applied with iridium tips.

Spark plug gap L:

0.7 — 0.8 mm (0.028 — 0.031 in)



3. Ignition Coil and Ignitor Assembly

A: REMOVAL

Direct ignition type has been adopted. Refer to the "Spark Plug Removal" for removal procedure.
<Ref. to IG(STI)-4, REMOVAL, Spark Plug.>

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

16 N·m (1.6 kgf-m, 11.7 ft-lb)

C: INSPECTION

For inspection, refer to "Ignition Control System".
<Ref. to EN(STI)(diag)-63, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>

Ignition Coil and Ignitor Assembly

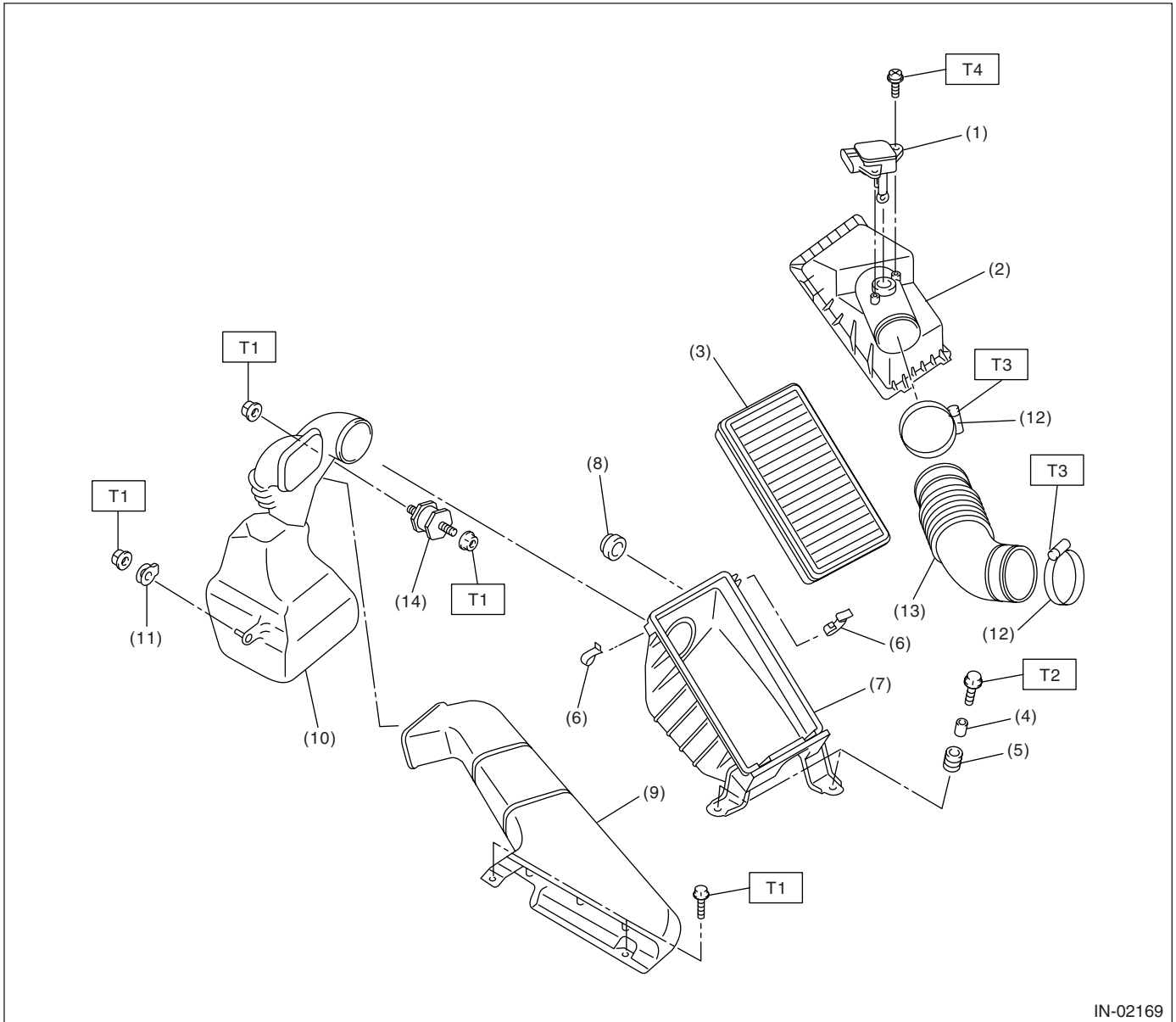
IGNITION

INTAKE (INDUCTION)

1. General Description

A: COMPONENT

1. AIR CLEANER



(1) Mass air flow and intake air temperature sensor	(7) Air cleaner lower case
(2) Air cleaner upper cover	(8) Cushion rubber
(3) Air cleaner element	(9) Air intake duct
(4) Spacer	(10) Resonator chamber ASSY
(5) Bushing	(11) Cushion rubber
(6) Clip	(12) Clamp
	(13) Air intake boot
	(14) Cushion

- (14) Cushion

Tightening torque: N·m (kgf-m, ft-lb)

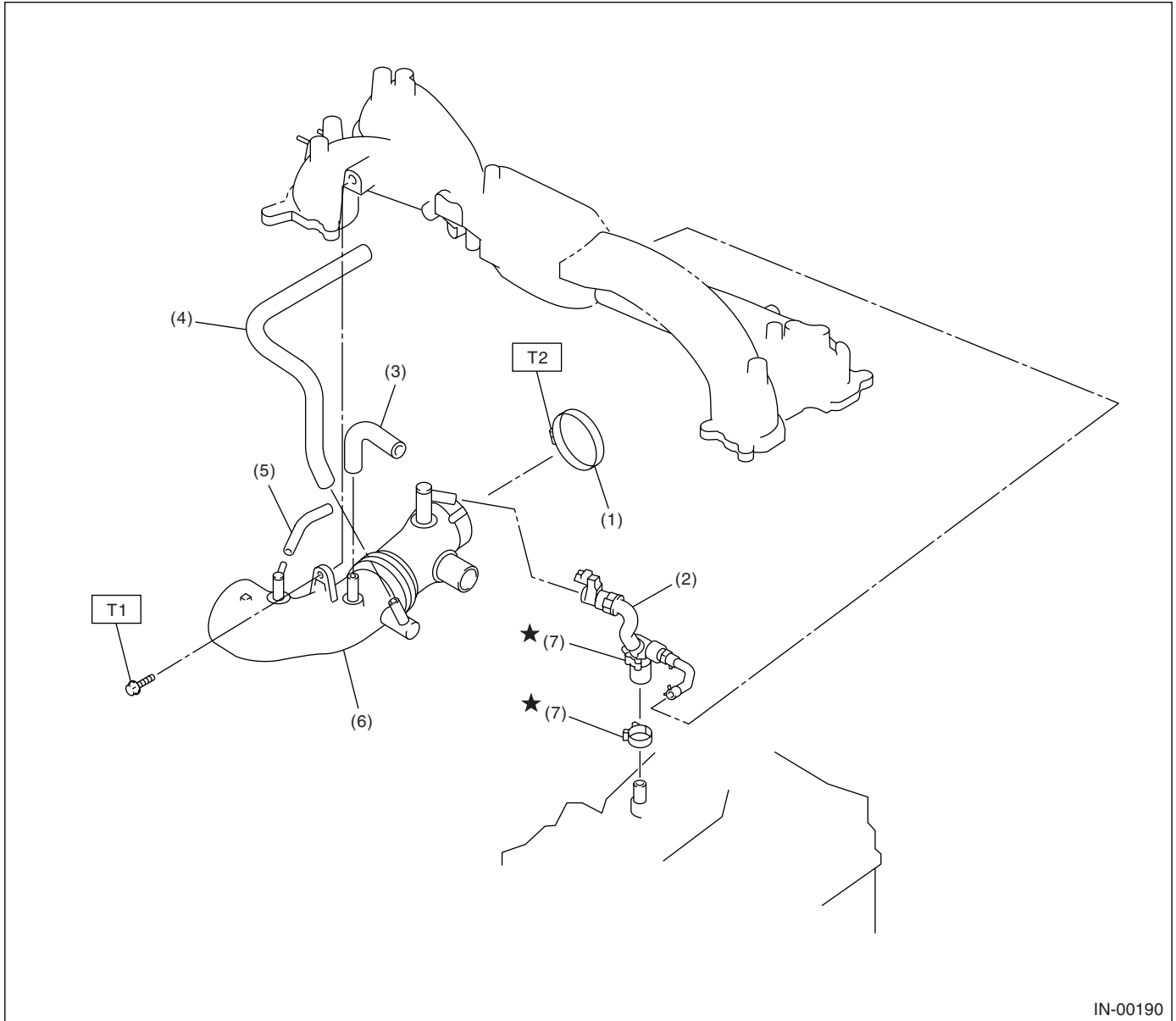
T1: 7.5 (0.76, 5.5)

T2: 33 (3.4, 24.6)

T3: 2.5 (0.25, 1.8)

T4: 1.7 (0.17, 1.2)

2. INTAKE DUCT



(1) Clamp	(5) Air by-pass hose C
(2) PCV hose ASSY	(6) Intake duct
(3) Air by-pass hose A	(7) Clamp
(4) Air by-pass hose B	

Tightening torque: N·m (kgf-m, ft-lb)

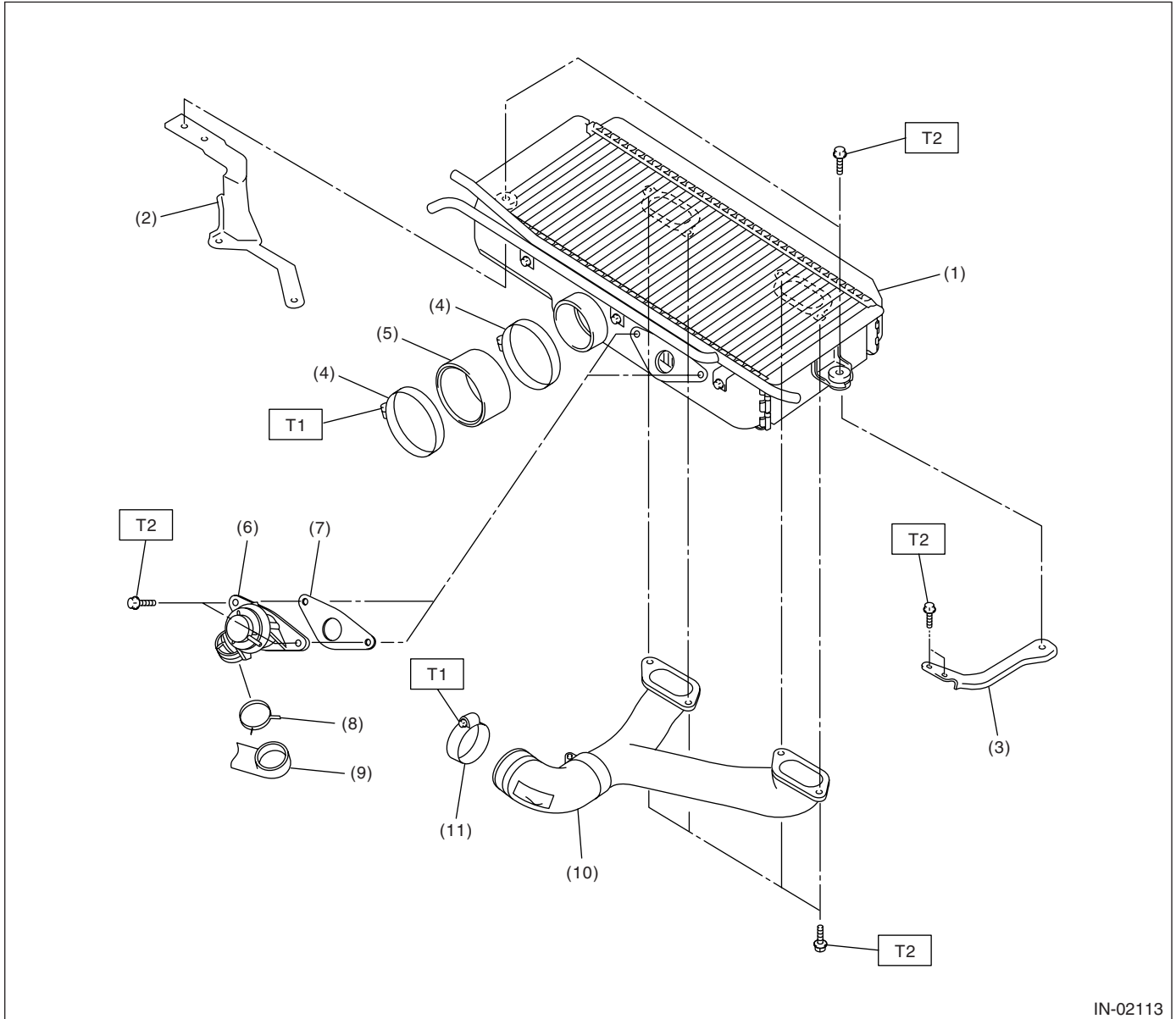
T1: 19 (1.9, 13.7)

T2: 3 (0.3, 2.2)

General Description

INTAKE (INDUCTION)

3. INTERCOOLER



IN-02113

(1) Intercooler	(6) Air by-pass valve
(2) Intercooler bracket RH	(7) Gasket
(3) Intercooler bracket LH	(8) Clamp
(4) Clamp	(9) Air by-pass hose A
(5) Air intake duct	(10) Intercooler duct
	(11) Clamp

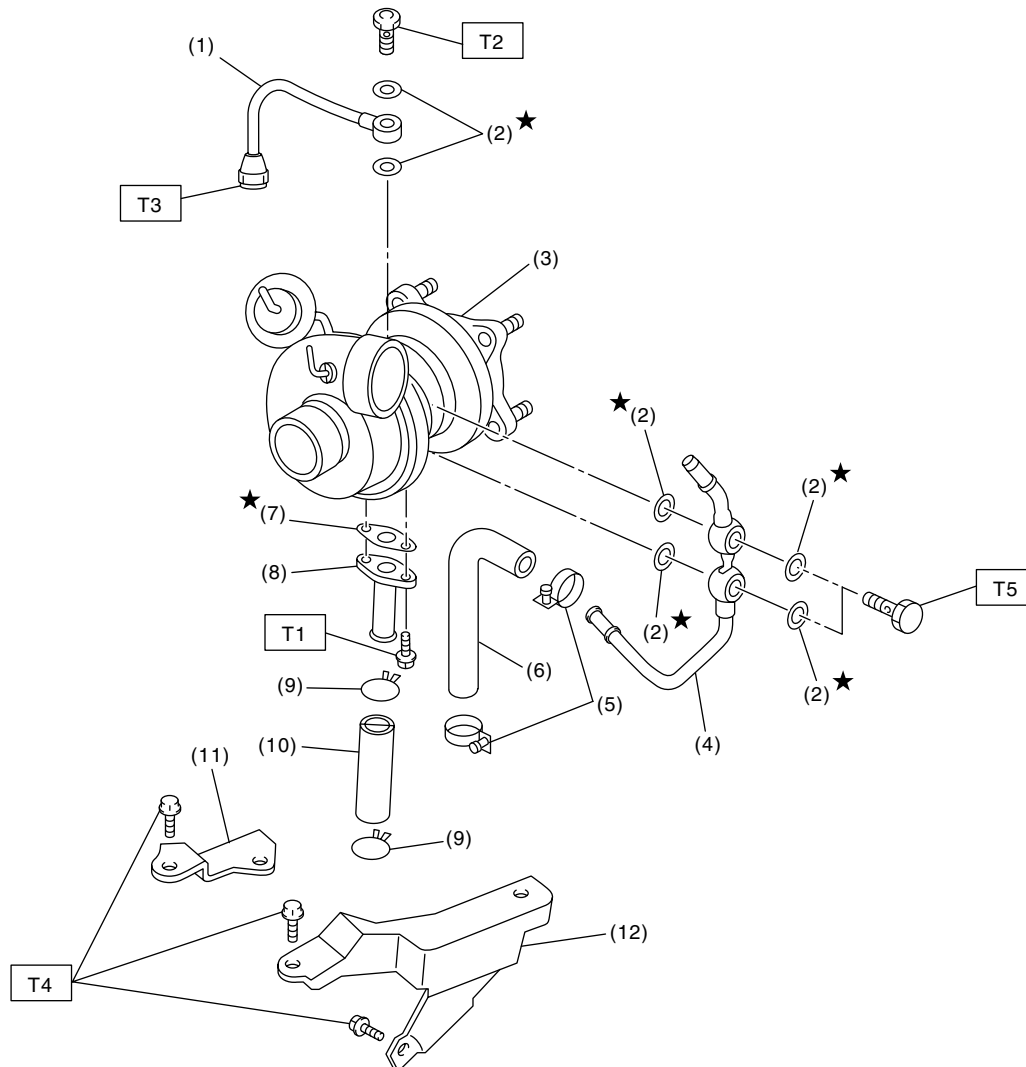
(11) Clamp

Tightening torque: N-m (kgf-m, ft-lb)

T1: 3 (0.3, 2.2)

T2: 16 (1.6, 11.8)

4. TURBOCHARGER



IN-02112

(1) Oil inlet pipe	(7) Gasket
(2) Metal gasket	(8) Oil outlet pipe
(3) Turbocharger	(9) Clip
(4) Water pipe	(10) Oil outlet hose
(5) Clamp	(11) Turbocharger bracket RH
(6) Engine coolant hose	(12) Turbocharger bracket LH

Tightening torque: N·m (kgf·m, ft·lb)

T1: 4.4 (0.45, 3.3)

T2: 16±1.5 (1.6±0.15, 11.8±1.1)

T3: 20±2.0 (2.0±0.2, 14.8±1.5)

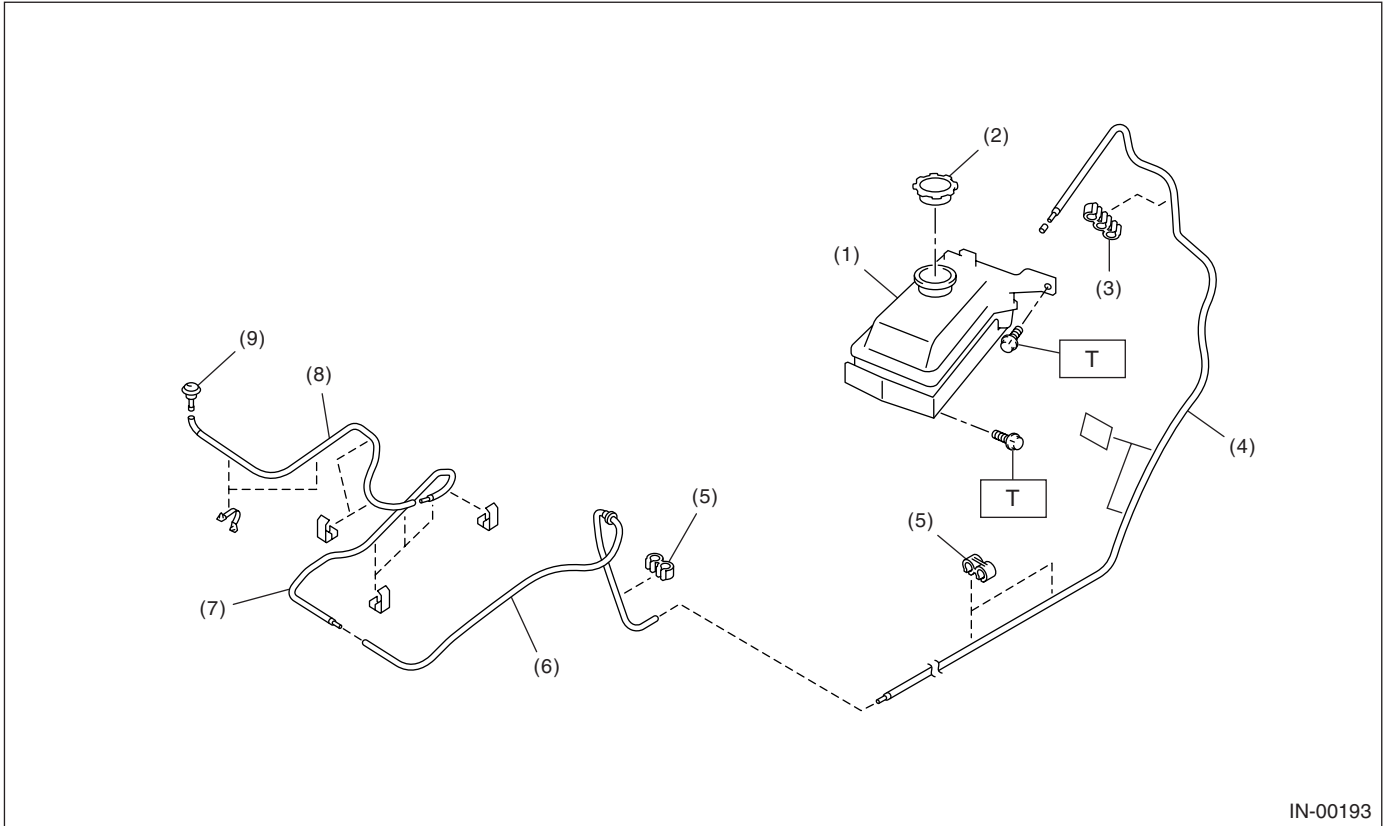
T4: 33 (3.4, 24.6)

T5: 35 (3.6, 25.8)

General Description

INTAKE (INDUCTION)

5. INTERCOOLER WATER SPRAY



(1) Water tank ASSY	(5) Clamp
(2) Water tank cap	(6) Center hose
(3) Clamp	(7) Front hose
(4) Rear hose	(8) Intercooler hose

- (9) Nozzle

Tightening torque: N·m (kgf-m, ft-lb)

T: 6.0 (0.61, 4.4)

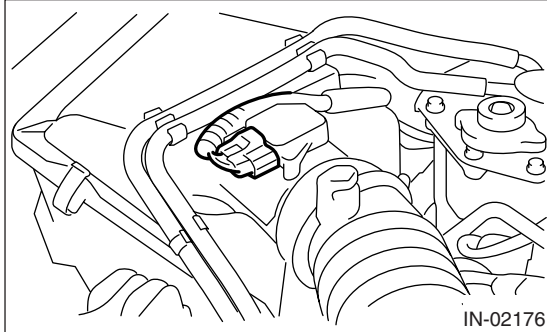
B: CAUTION

- Wear work clothing, including a cap, protective goggles and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Be careful not to burn your hands, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before disconnecting electrical connectors of sensor or units, be sure to disconnect the ground cable from battery.

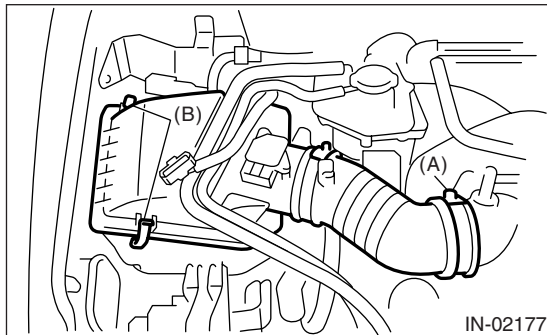
2. Air Cleaner Element

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Disconnect the connector from mass air flow and intake air temperature sensor.



- 3) Loosen the clamp (A) which connects the air intake boot and intake duct.
- 4) Remove the clip (B) from air cleaner upper cover.



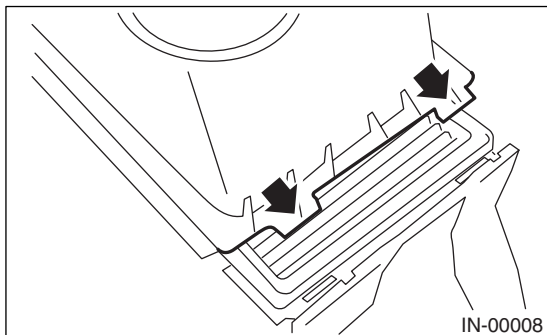
- 5) Remove the air cleaner upper cover.
- 6) Remove the air cleaner element.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:

Before installing the air cleaner upper cover, align the holes with protruding portions of air cleaner lower case, then secure the upper cover to the lower case.



C: INSPECTION

Replace it if excessively damaged or dirty.

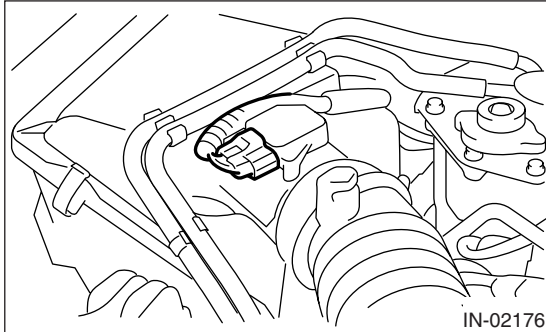
Air Cleaner Case

INTAKE (INDUCTION)

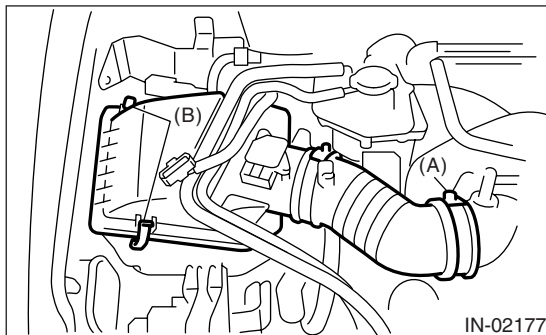
3. Air Cleaner Case

A: REMOVAL

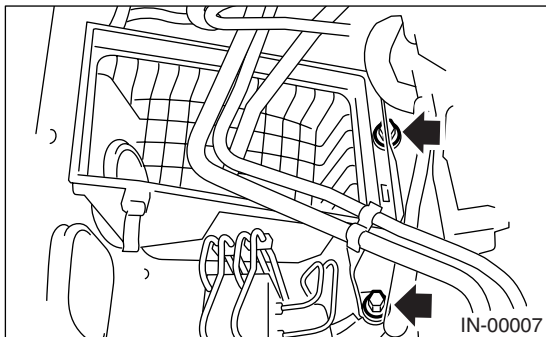
- 1) Disconnect the ground cable from battery.
- 2) Disconnect the connector from mass air flow and intake air temperature sensor.



- 3) Loosen the clamp (A) which connects the air intake boot and intake duct.
- 4) Remove the clip (B) from air cleaner upper cover.



- 5) Remove the air cleaner upper cover.
- 6) Remove the air cleaner element.
- 7) Remove the air cleaner lower case.

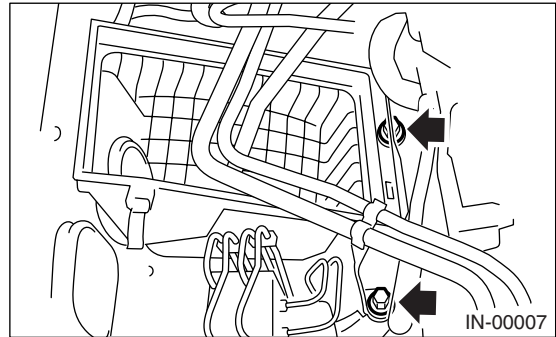


B: INSTALLATION

Install in the reverse order of removal.

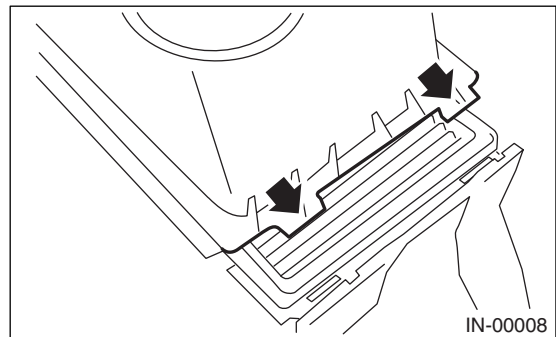
Tightening torque:

33 N·m (3.4 kgf-m, 24.6 ft-lb)



NOTE:

Before installing the air cleaner upper cover, align the holes with protruding portions of air cleaner lower case, then secure the upper cover to the lower case.



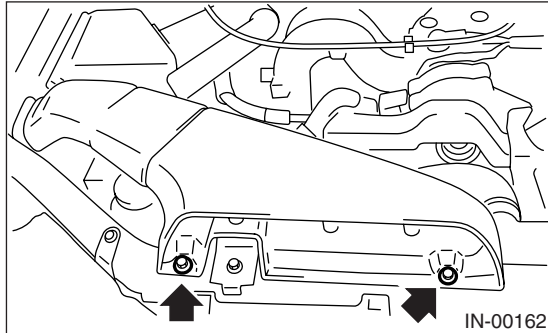
C: INSPECTION

Inspect for cracks and loose connections.

4. Air Intake Duct

A: REMOVAL

Remove the bolts which install the air intake duct on front side of body.

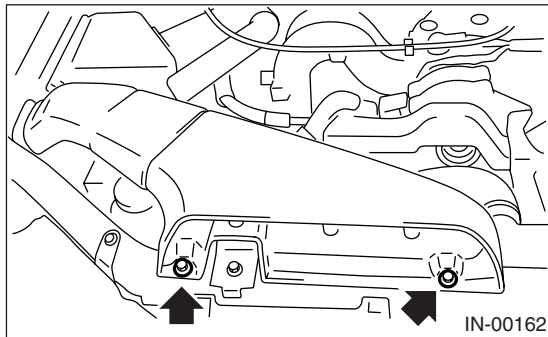


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

7.5 N·m (0.76 kgf-m, 5.5 ft-lb)



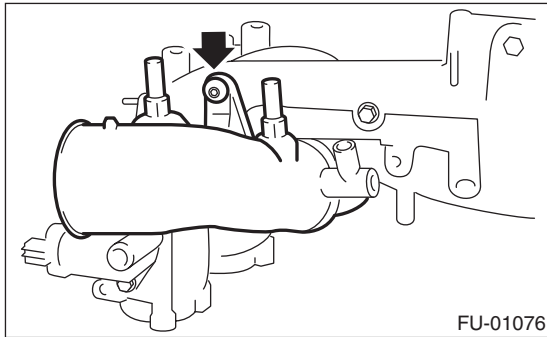
C: INSPECTION

- 1) Inspect for cracks and loose connections.
- 2) Inspect that no foreign objects are mixed in air intake duct.

5. Intake Duct

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the intake manifold. <Ref. to FU(STI)-13, REMOVAL, Intake Manifold.>
- 3) Remove the sensor, engine harness and fuel pipe attached to intake manifold. <Ref. to FU(STI)-18, DISASSEMBLY, Intake Manifold.>
- 4) Remove the intake duct from intake manifold.

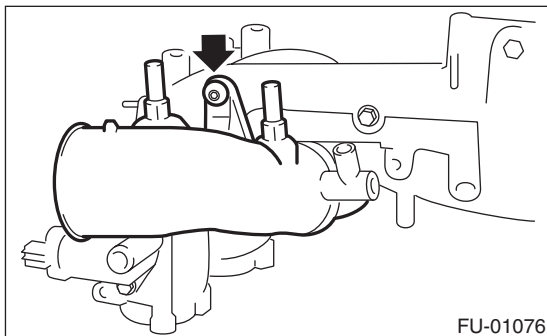


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

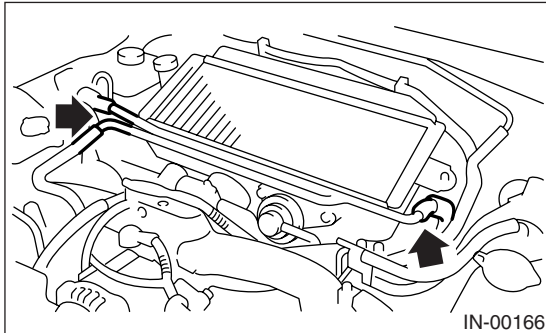
19 N·m (1.9 kgf-m, 13.7 ft-lb)



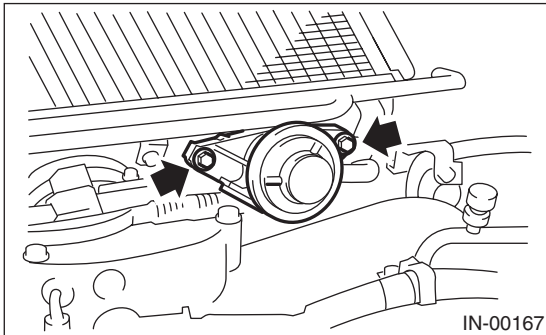
6. Intercooler

A: REMOVAL

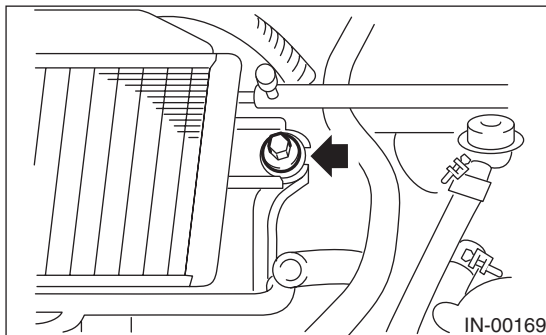
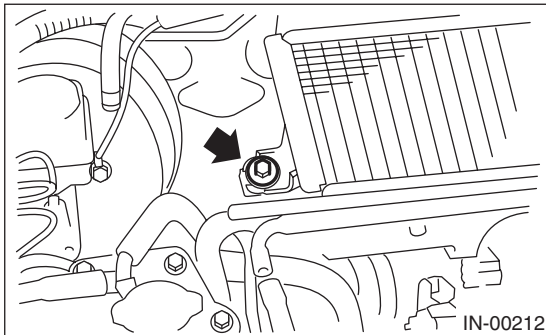
1) Disconnect the air by-pass hoses from intercooler.



2) Remove the air by-pass valve from intercooler.

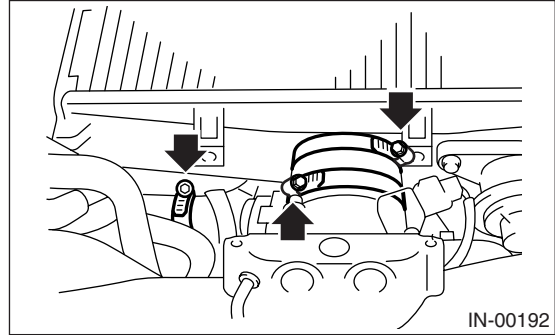


3) Remove the bolts which secure the intercooler to bracket.



4) Remove the intercooler air duct from turbocharger.

5) Remove the intercooler from throttle body.

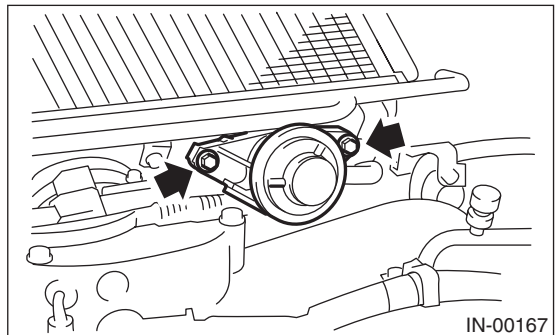
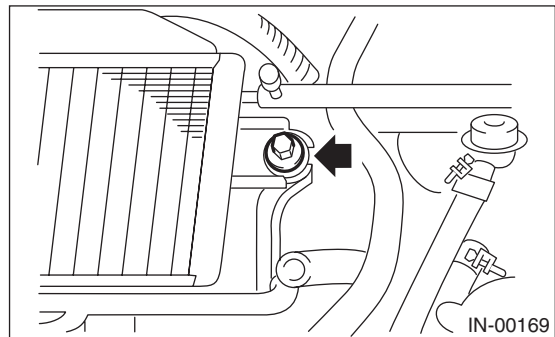
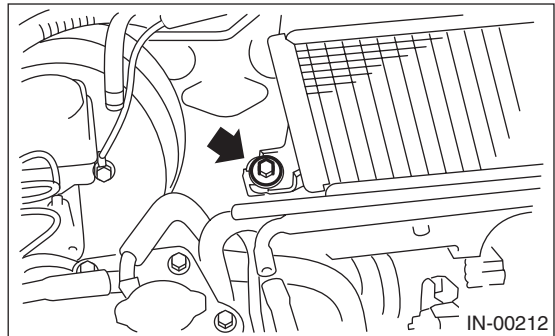


B: INSTALLATION

Install in the reverse order of removal.

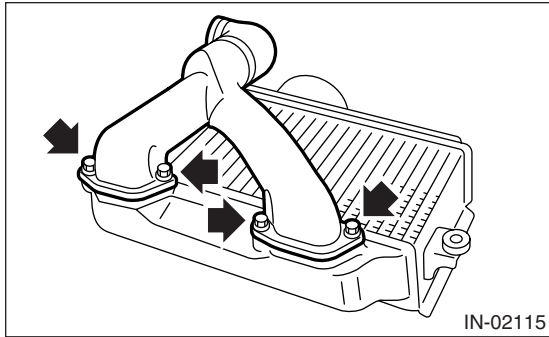
Tightening torque:

16 N·m (1.6 kgf-m, 11.8 ft-lb)



C: DISASSEMBLY

Remove the intercooler ducts from intercooler.

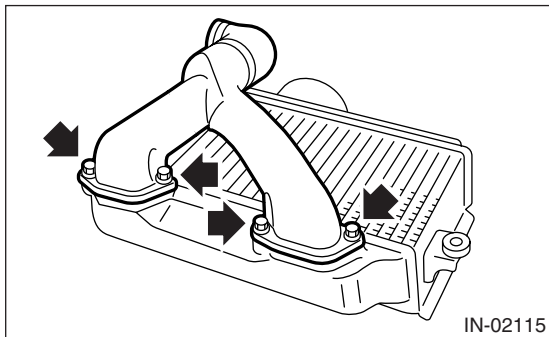


D: ASSEMBLY

Assemble in the reverse order of disassembly.

Tightening torque:

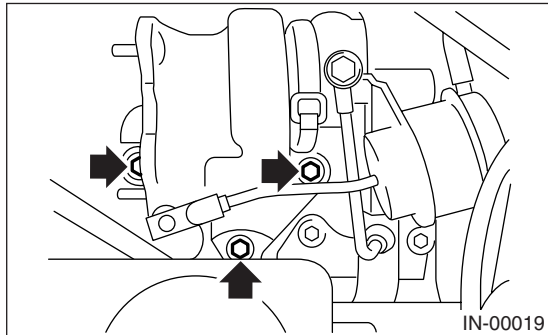
16 N·m (1.6 kgf-m, 11.8 ft-lb)



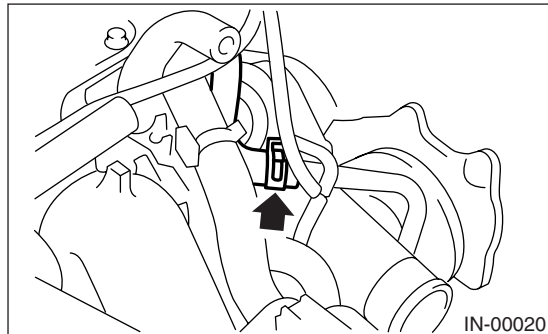
7. Turbocharger

A: REMOVAL

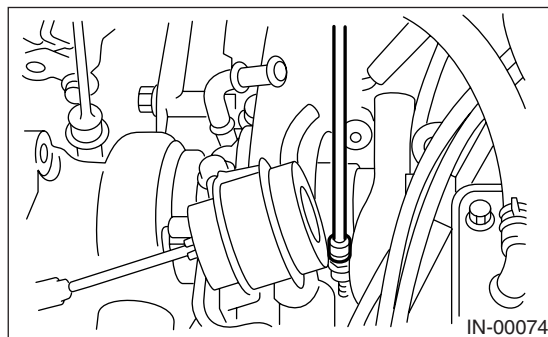
- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from battery.
- 3) Remove the center exhaust pipe. <Ref. to EX(H4DOTC)-10, REMOVAL, Center Exhaust Pipe.>
- 4) Lower the vehicle.
- 5) Disconnect the turbocharger joint pipe from turbo-charger.



- 6) Disconnect the engine coolant hose which is connected to coolant filler tank.

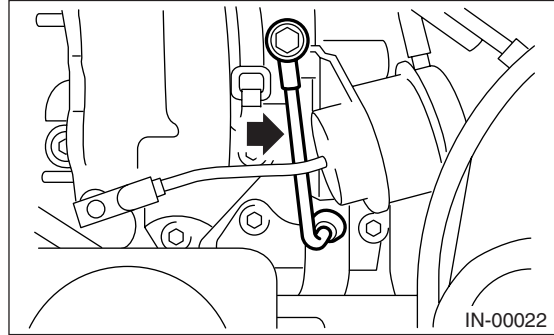


- 7) Loosen the clamp which secures the turbocharger to intake duct.

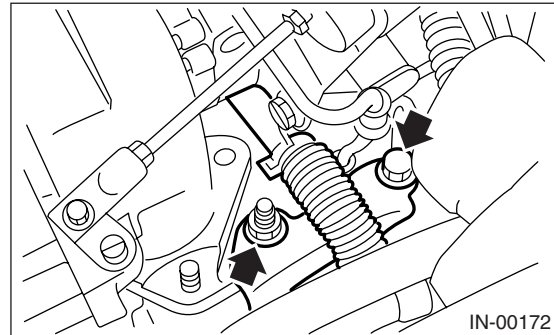


- 8) Loosen the flare joint of oil inlet pipe, and disconnect the flare joint.

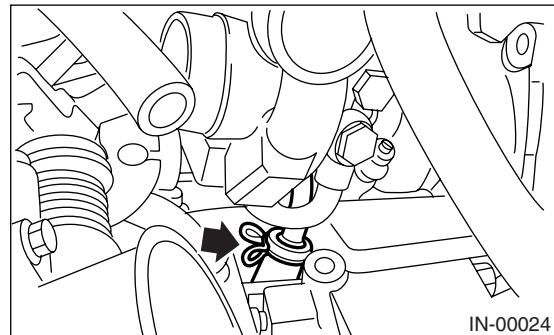
- 9) Remove the oil inlet pipe from turbocharger.



- 10) Disconnect the engine coolant hose.
- 11) Remove the turbocharger bracket.



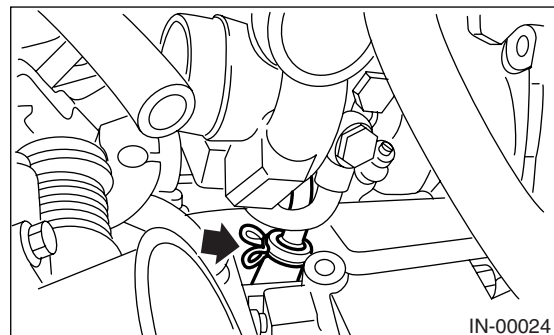
- 12) Disconnect the oil outlet hose from pipe.



- 13) Take out the turbocharger from engine compartment.

B: INSTALLATION

- 1) Connect the oil outlet hose to outlet pipe.



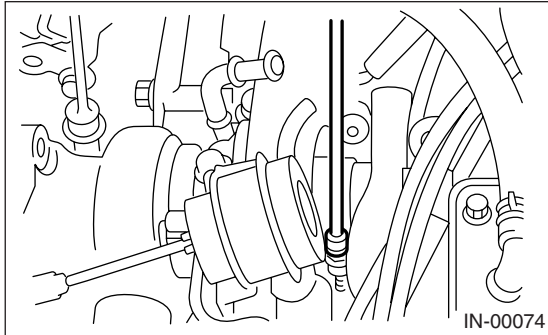
- 2) Install the turbocharger to intake duct.

Turbocharger

INTAKE (INDUCTION)

Tightening torque:

3 N·m (0.3 kgf-m, 2.2 ft-lb)



3) Install the oil inlet pipe to turbocharger, and connect the flare joint.

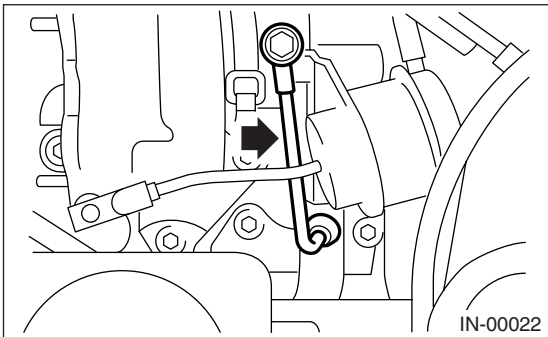
Tightening torque:

Union bolt

16±1.5 N·m (1.6±0.15 kgf-m, 11.8±1.1 ft-lb)

Flare joint

20±2.0 N·m (2.0±0.2 kgf-m, 14.8±1.5 ft-lb)



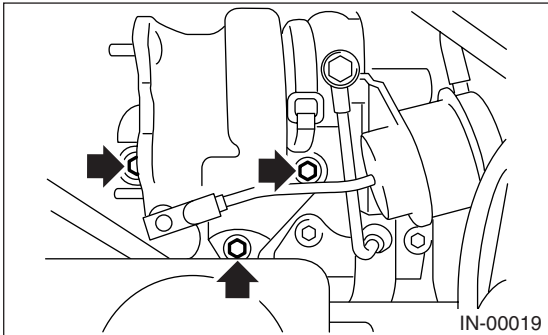
4) Install the turbocharger joint pipe to turbocharger.

NOTE:

Replace the gasket with a new one.

Tightening torque:

35 N·m (3.6 kgf-m, 25.8 ft-lb)

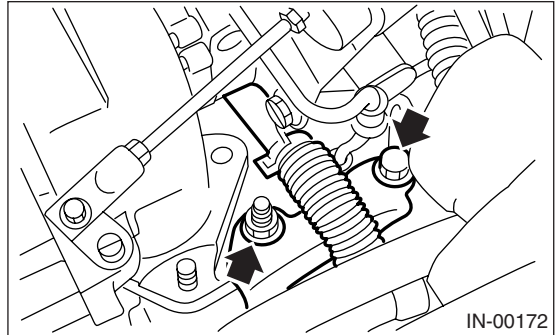


5) Connect the engine coolant hose.

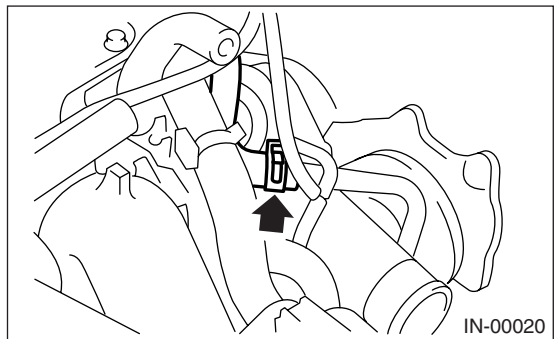
6) Install the turbocharger bracket.

Tightening torque:

33 N·m (3.4 kgf-m, 24.6 ft-lb)



7) Connect the engine coolant hose which is connected to coolant filler tank.



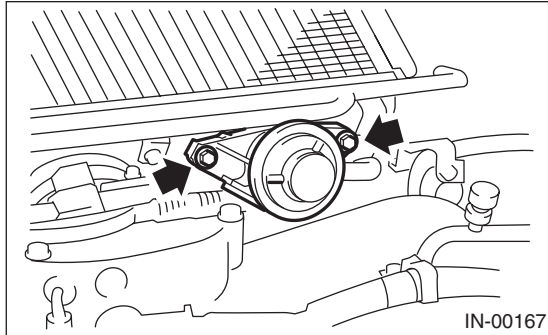
8) Lift-up the vehicle.

9) Install the center exhaust pipe. <Ref. to EX(H4DOTC)-11, INSTALLATION, Center Exhaust Pipe.>

8. Air By-pass Valve

A: REMOVAL

1) Remove the air by-pass valve from intercooler.



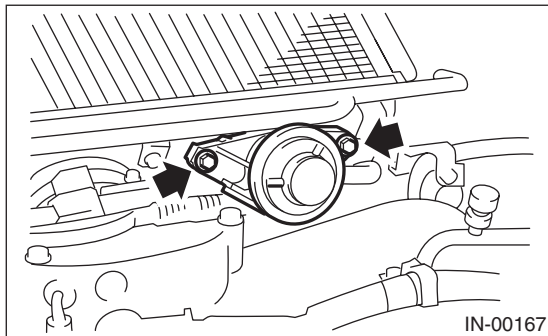
2) Disconnect the air by-pass hoses from air by-pass valve.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

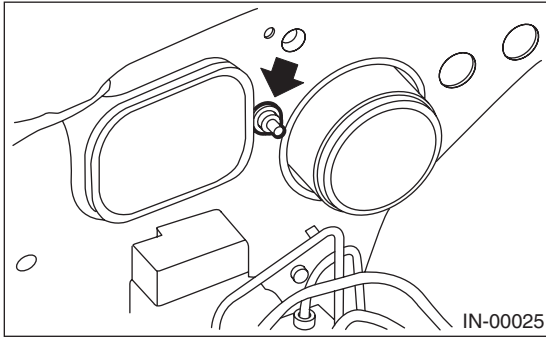
16 N·m (1.6 kgf-m, 11.8 ft-lb)



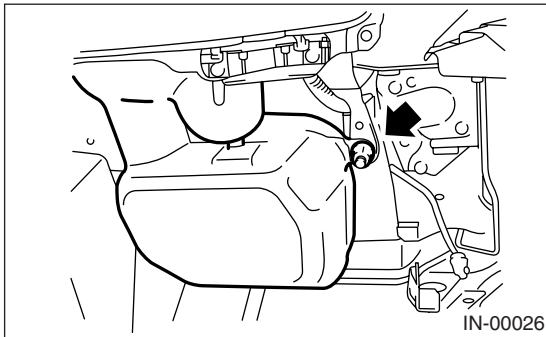
9. Resonator Chamber

A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Remove the air intake duct. <Ref. to IN(STI)-9, REMOVAL, Air Intake Duct.>
- 3) Remove the air cleaner lower case. <Ref. to IN(STI)-8, REMOVAL, Air Cleaner Case.>
- 4) Remove the resonator chamber mounting nut on right side of engine compartment.



- 5) Lift-up the vehicle, and then remove the front wheel RH.
- 6) Remove the front mud guard RH.
- 7) Remove the resonator chamber from the inside front fender.

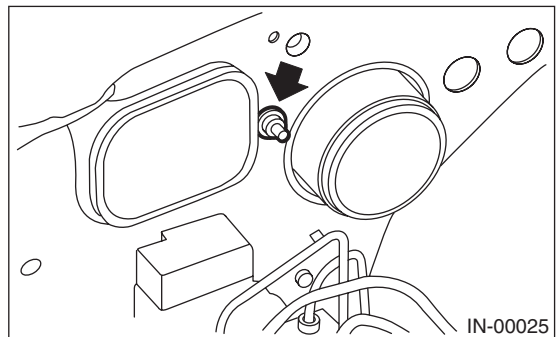
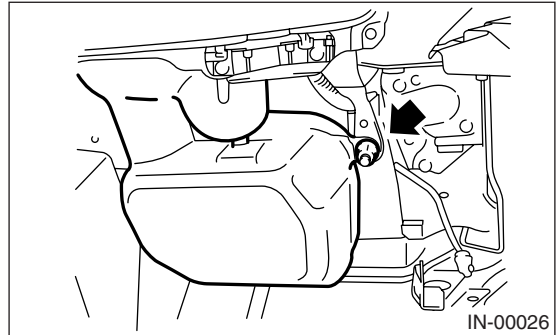


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

7.5 N·m (0.76 kgf-m, 5.5 ft-lb)



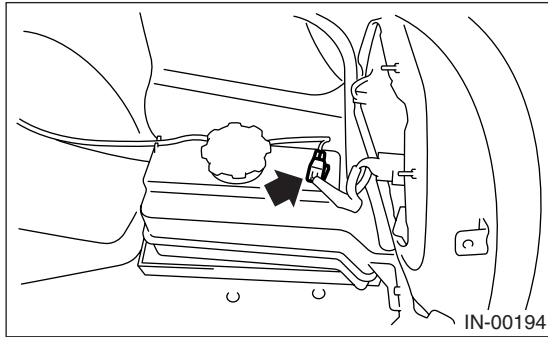
C: INSPECTION

- 1) Inspect for cracks and loose connections.
- 2) Inspect that no foreign objects are mixed in resonator chamber.

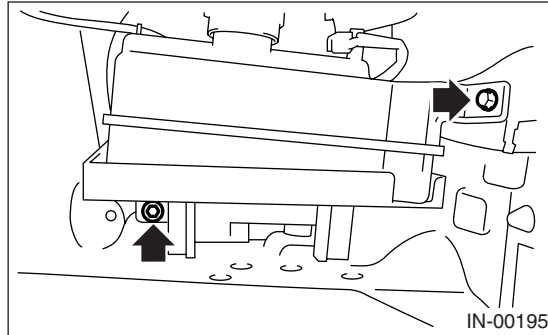
10. Intercooler Water Spray Tank

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the trunk room trim. <Ref. to EI-59, REMOVAL, Trunk Room Trim.>
- 3) Disconnect the water tank connector.



- 4) Remove the two water tank installation bolts.



- 5) Remove the hose between body and water tank, then remove the water tank.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

6.0 N·m (0.61 kgf-m, 4.4 ft-lb)

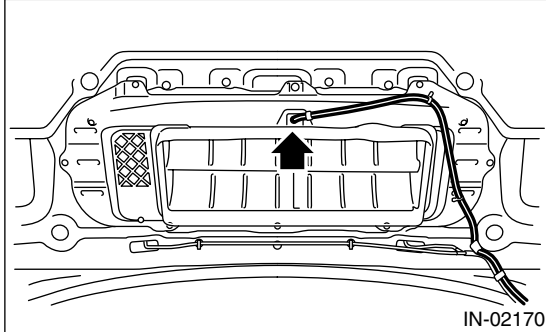
C: INSPECTION

- 1) Make sure the hose is not deformed, damaged, cracked or clogged.
- 2) Make sure the water tank is not damaged or cracked.

11. Intercooler Water Spray Nozzle

A: REMOVAL

- 1) Open the front hood.
- 2) Disconnect the connecting part of hose.
- 3) Push the clip of nozzle upward with the clip pressed by fingers from inside of front hood.



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Make sure the hose and nozzle are not deformed, damaged, cracked or clogged.

LUBRICATION

General Description

LUBRICATION

1. General Description

A: SPECIFICATION

Lubrication method				Forced lubrication	
Oil pump	Pump type			Trochoid type	
	Number of teeth	Inner rotor		9	
		Outer rotor		10	
	Outer rotor diameter × thickness			78 × 10 mm (3.07 × 0.39 in)	
	Tip clearance between inner and outer rotor		STANDARD	0.04 — 0.14 mm (0.0016 — 0.0055 in)	
			LIMIT	0.18 mm (0.0071 in)	
	Side clearance between inner rotor and pump case		STANDARD	0.02 — 0.07 mm (0.0008 — 0.0028 in)	
			LIMIT	0.12 mm (0.0047 in)	
	Case clearance between outer rotor and pump case		STANDARD	0.10 — 0.175 mm (0.0039 — 0.0069 in)	
			LIMIT	0.20 mm (0.0079 in)	
	Capacity at 80°C (176°F)	600 rpm	Discharge pressure	98 kPa (1.0 kgf/cm ² , 14 psi)	
			Discharge quantity	4.6 ℓ (4.9 US qt, 4.0 Imp qt)/min.	
5,000 rpm		Discharge pressure	294 kPa (3.0 kgf/cm ² , 43 psi)		
		Discharge quantity	47.0 ℓ (49.7 US qt, 41.4 Imp qt)/min.		
Relief valve operation pressure				588 kPa (6.0 kgf/cm ² , 85 psi)	
Oil filter	Type			Full-flow filter type	
	Filtration area	Diameter 65 mm (2.56 in)		470 cm ² (73 sq in)	
		Diameter 68 mm (2.68 in)		800 cm ² (124 sq in)	
	By-pass valve opening pressure			160 kPa (1.63 kgf/cm ² , 23.2 psi)	
	Outer diameter × width	Diameter 68 mm (2.68 in)		68 × 65 mm (2.68 × 2.56 in)	
		Diameter 65 mm (2.56 in)		65 × 74.4 mm (2.56 × 2.93 in)	
Oil filter to engine thread size				M 20 × 1.5	
Oil pressure switch	Type			Immersed contact point type	
	Working voltage — wattage			12 V — 3.4 W or less	
	Warning light activation pressure			14.7 kPa (0.15 kgf/cm ² , 2.1 psi)	
	Proof pressure			More than 981 kPa (10 kgf/cm ² , 142 psi)	
Oil capacity (at replacement)				4.0 ℓ (4.2 US qt, 3.5 Imp qt)	

Recommended oil:

API standard SM with the “Energy Conserving” logo is printed.
ILSAC standard, GF4 “Star burst mark” label is on the container.

SAE (1)						
(°C)	-30	-20	-15	0	15	30 40
(°F)	-22	-4	5	32	59	86 104
10W-30, 10W-50 5W-30 (2)						
LU-02250						

(1) SAE viscosity No. and applicable temperature

(2) Recommended

The proper viscosity helps vehicle get good cold and hot starting by reducing viscous friction and thus increasing cranking speed.

CAUTION:

When replenishing oil, it does not matter if the oil to be added is a different brand from that in the engine; however, use oil having the API standard and SAE viscosity No. designated by SUBARU.

NOTE:

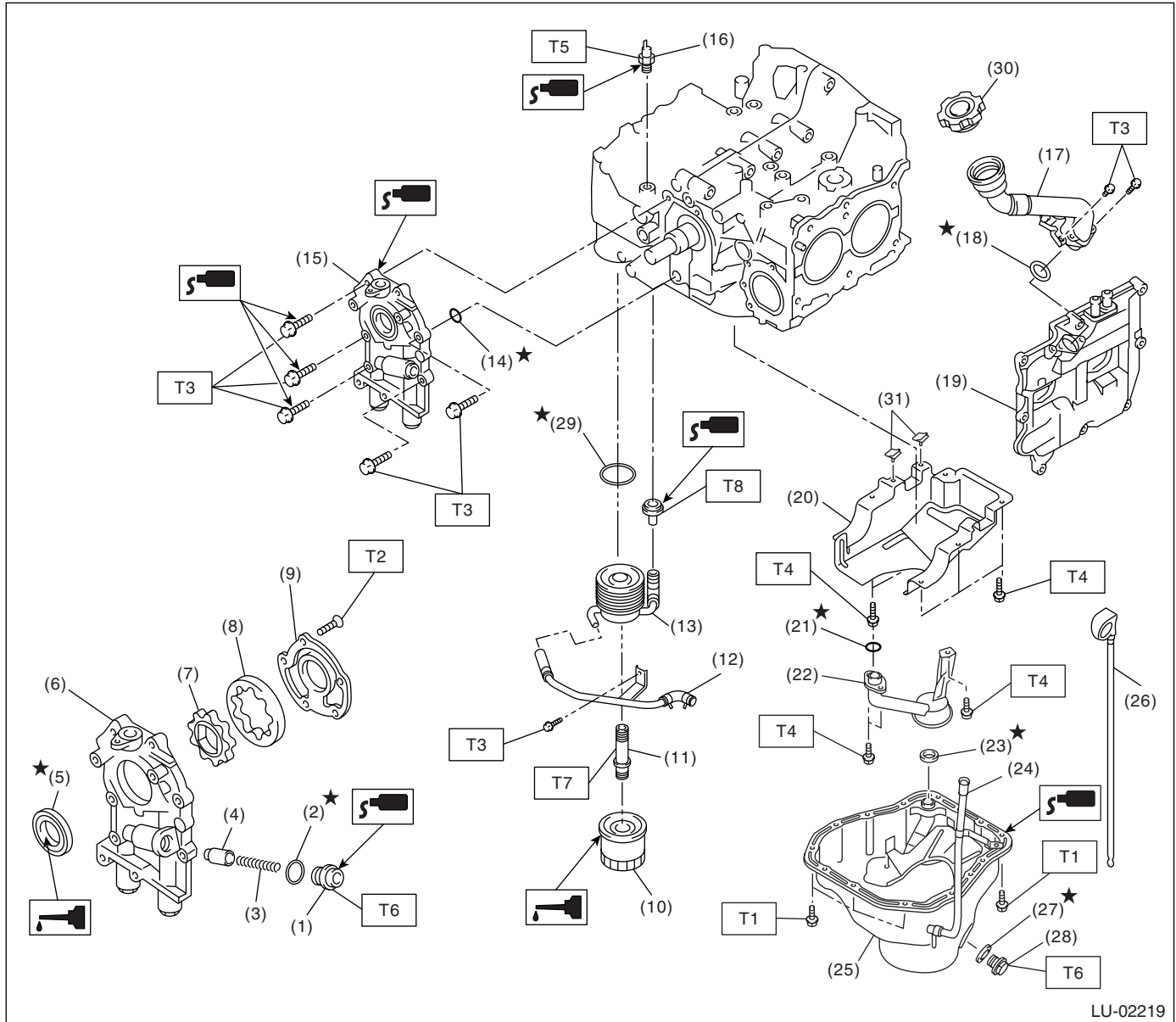
If the vehicle is used in areas with very high temperatures or for other heavy duty applications, the following viscosity oils may be used: API standard: SM or SL

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

General Description

LUBRICATION

B: COMPONENT



LU-02219

(1) Plug	(15) Oil pump ASSY	(29) O-ring
(2) Gasket	(16) Oil pressure switch	(30) Oil filler cap
(3) Relief valve spring	(17) Oil filler duct	(31) Seal
(4) Relief valve	(18) O-ring	
(5) Oil seal	(19) Rocker cover	
(6) Oil pump case	(20) Baffle plate	
(7) Inner rotor	(21) O-ring	
(8) Outer rotor	(22) Oil strainer	
(9) Oil pump cover	(23) Gasket	
(10) Oil filter	(24) Oil level gauge guide	
(11) Oil cooler connector	(25) Oil pan	
(12) Water by-pass pipe	(26) Oil level gauge	
(13) Oil cooler	(27) Metal gasket	
(14) O-ring	(28) Drain plug	

Tightening torque: N·m (kgf-m, ft-lb)

T1:	5 (0.5, 3.6)
T2:	5.4 (0.55, 4.0)
T3:	6.4 (0.65, 4.7)
T4:	10 (1.0, 7.2)
T5:	25 (2.5, 18.1)
T6:	44 (4.5, 32.5)
T7:	54 (5.5, 40)
T8:	69 (7.0, 50.9)

C: CAUTION

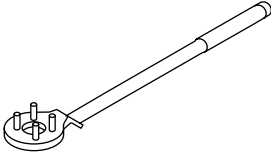
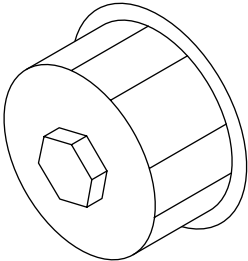
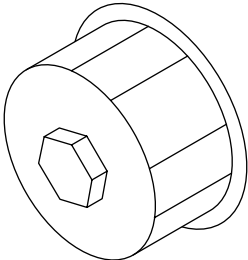
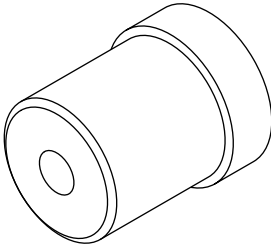
- Wear work clothing, including a cap, protective goggles and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Be careful not to burn your hands, because each part in the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

General Description

LUBRICATION

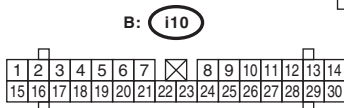
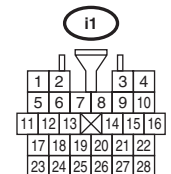
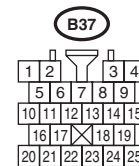
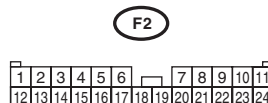
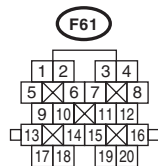
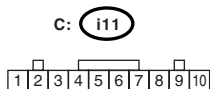
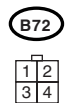
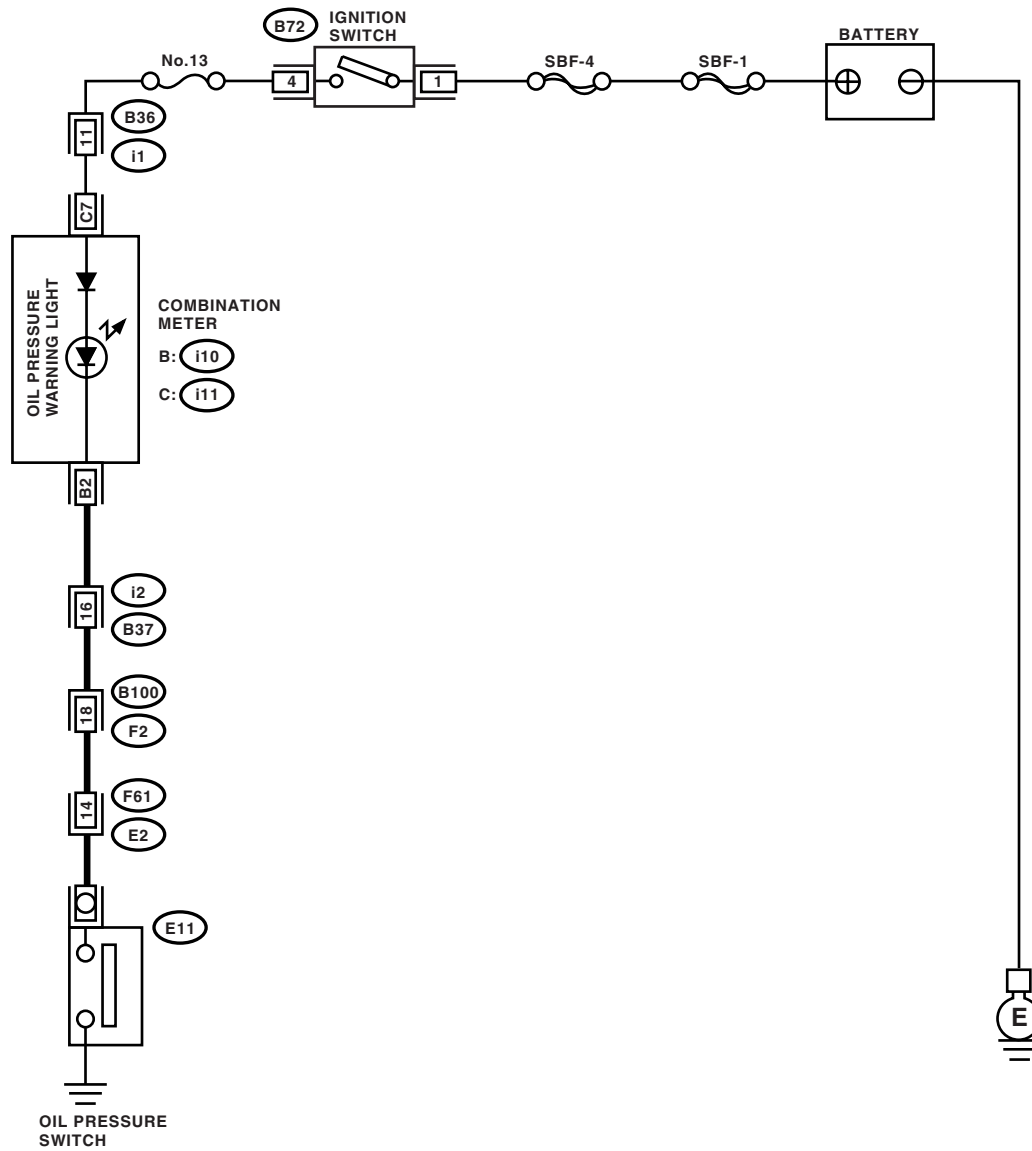
D: PREPARATION TOOL

1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499977100	499977100	CRANK PULLEY WRENCH	Used for stopping rotation of crank pulley when loosening and tightening crank pulley bolt.
 ST18332AA000	18332AA000	OIL FILTER WRENCH	Used for removing and installing oil filter. (Outer diameter: 68 mm (2.68 in))
 ST18332AA010	18332AA010	OIL FILTER WRENCH	Used for removing and installing oil filter. (Outer diameter: 65 mm (2.56 in))
 ST-499587100	499587100	OIL SEAL INSTALLER	Used for installing oil seal to oil pump.

2. Oil Pressure System

A: WIRING DIAGRAM



LU-02125

Oil Pressure System

LUBRICATION

B: INSPECTION

Step	Check	Yes	No
1 CHECK COMBINATION METER. 1) Turn the ignition switch to ON. (engine OFF) 2) Check warning lights in the combination meter.	Do the warning lights illuminate?	Go to step 2.	Repair or replace the combination meter. <Ref. to IDI-3, 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 ON. 4) Measure the voltage of harness between the combination meter connector and chassis ground. Connector & terminal (E11) No. 1 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Replace the oil pressure switch.	Go to step 3.
3 CHECK COMBINATION METER. 1) Turn the ignition switch to OFF. 2) Remove the combination meter. 3) Measure the resistance of combination meter. Terminals No. C7 — No. B2:	Is the resistance less than 10 Ω ?	Replace the harness connector between combination meter and oil pressure switch.	Repair or replace the combination meter. <Ref. to IDI-3, INSPECTION, Combination Meter System.>

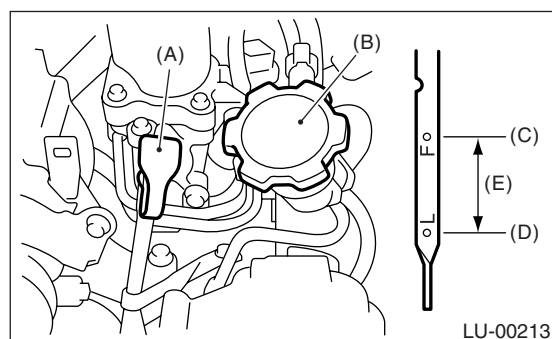
3. Engine Oil

A: INSPECTION

- 1) Park the vehicle on a level surface.
- 2) After turning off the engine, wait a few minutes for oil to drain back into the oil pan before checking the level.
- 3) Just after driving or while the engine is warm, engine oil level may show in the range between the "F" line and notch mark. This is caused by thermal expansion of engine oil.
- 4) Remove the oil level gauge and wipe it clean.
- 5) Reinsert the level gauge all the way. Be sure that the level gauge is correctly inserted and in proper orientation.
- 6) Remove it again and check the engine oil level. If the engine oil level is below the "L" line, add oil to bring the level up to "F" line.

NOTE:

To prevent overfilling the engine oil, do not add oil above "F" line when the engine is cold.



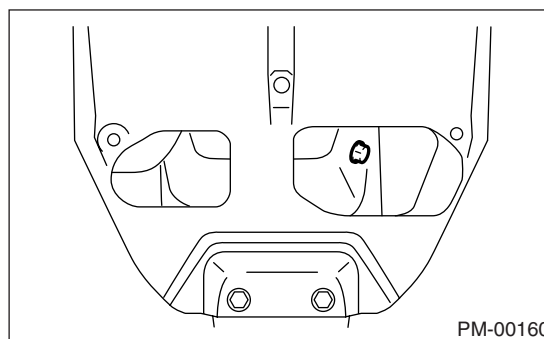
- (A) Oil level gauge
- (B) Engine oil filler cap
- (C) Upper level
- (D) Lower level
- (E) Approx. 1.0 ̶ (1.1 US qt, 0.9 Imp qt)

B: REPLACEMENT

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

NOTE:

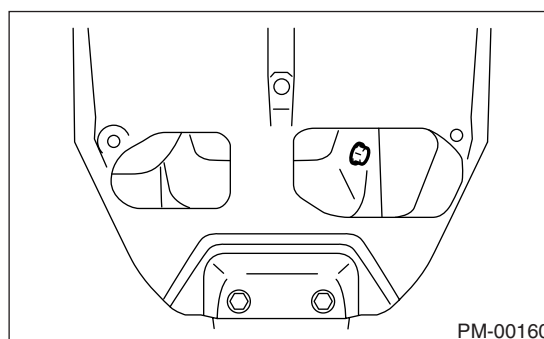
Prepare the container for draining of engine oil.



- 4) Replace the drain plug gasket.
- 5) Tighten the engine oil drain plug after draining engine oil.

Tightening torque:

44 N·m (4.5 kgf-m, 32.5 ft-lb)



- 6) Install the service hole cover.
- 7) Use the engine oil of proper quality and viscosity, fill engine oil through the oil filler duct up to upper level on level gauge. Make sure that the vehicle is placed level when checking oil level.

Recommended oil:

API standard SM with the "Energy Conserving" logo is printed.

ILSAC standard, GF4 "Star burst mark" label is on the container.

Engine Oil

LUBRICATION

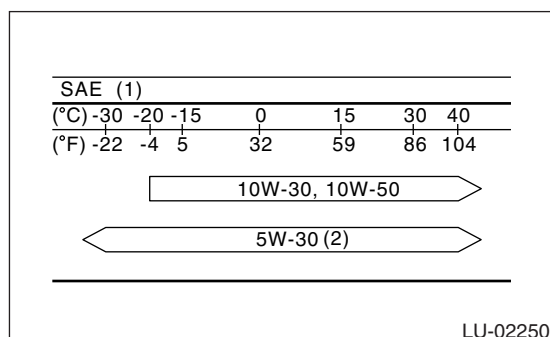
Engine oil capacity:

Upper level

4.0 ℓ (4.2 US qt, 3.5 Imp qt)

Lower level

3.0 ℓ (3.2 US qt, 2.6 Imp qt)



(1) SAE viscosity No. and applicable temperature

(2) Recommended

The proper viscosity helps vehicle get good cold and hot starting by reducing viscous friction and thus increasing cranking speed.

CAUTION:

When replenishing oil, it does not matter if the oil to be added is a different brand from that in the engine; however, use oil having the API standard and SAE viscosity No. designated by SUBARU.

NOTE:

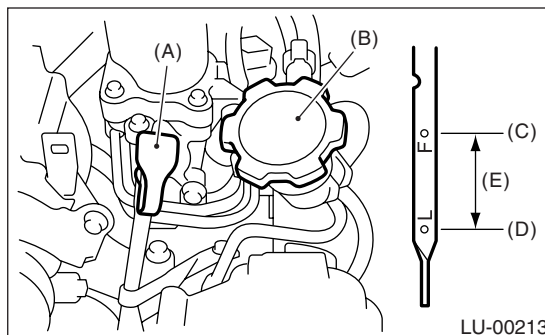
If the vehicle is used in areas with very high temperatures or for other heavy duty applications, the following viscosity oils may be used: API standard: SM or SL

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

8) Close the engine oil filler cap.

9) Start the engine and warm it up for a time.

10) After the engine stops, recheck the oil level. If necessary, add engine oil up to the upper level on level gauge.



(A) Oil level gauge

(B) Engine oil filler cap

(C) Upper level

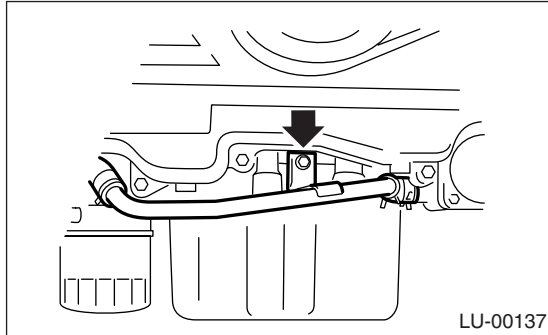
(D) Lower level

(E) Approx. 1.0 ℓ (1.1 US qt, 0.9 Imp qt)

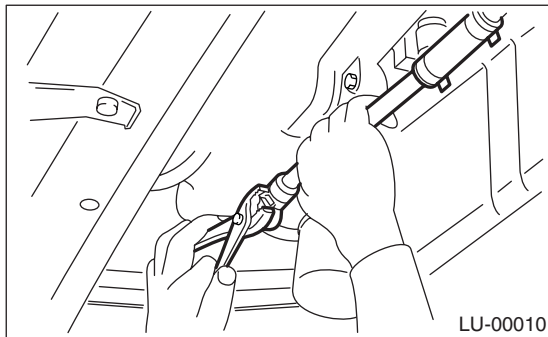
4. Oil Pump

A: REMOVAL

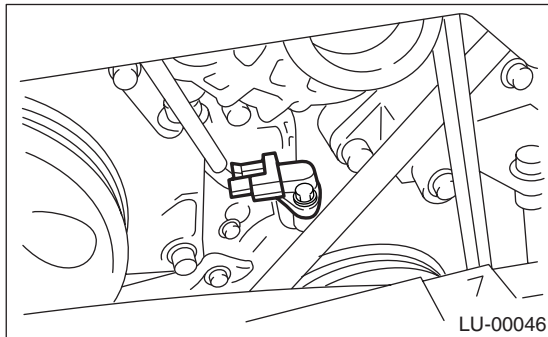
- 1) Disconnect the ground cable from battery.
- 2) Lift-up the vehicle.
- 3) Remove the under cover.
- 4) Remove the bolts which install the water pipe of oil cooler to oil pump.



- 5) Remove the water pipe and hoses between oil cooler and water pump.

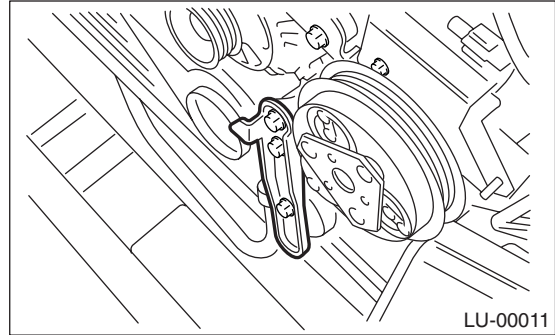


- 6) Remove the radiator. <Ref. to CO(H4DOTC)-23, REMOVAL, Radiator.>
- 7) Remove the crankshaft position sensor.

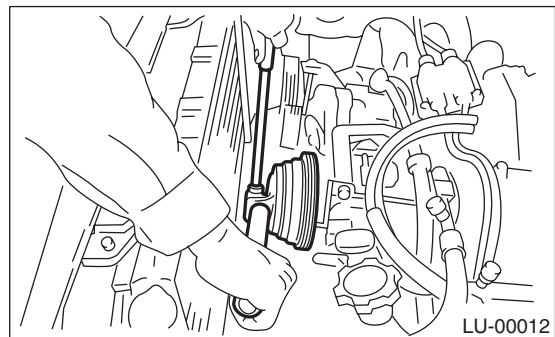


- 8) Remove the V-belts.
<Ref. to ME(STI)-40, REMOVAL, V-belt.>

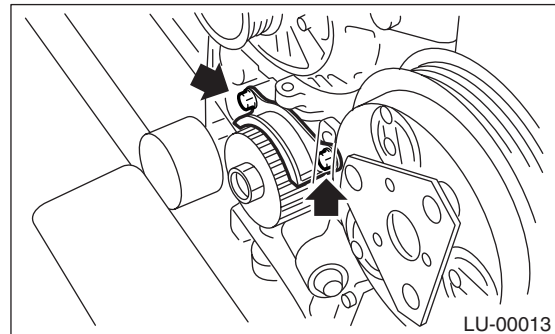
- 9) Remove the rear side V-belt tensioner.



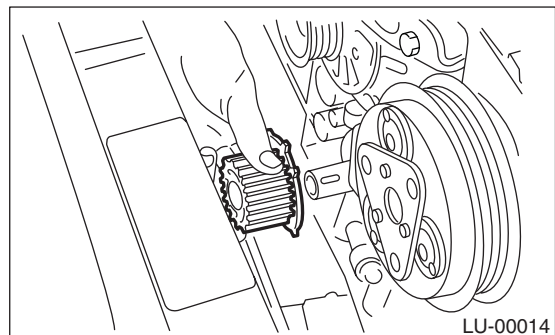
- 10) Remove the crank pulley by using ST.
<Ref. to ME(STI)-42, REMOVAL, Crank Pulley.>
ST 499977100 CRANK PULLEY WRENCH



- 11) Remove the timing belt. <Ref. to ME(STI)-44, REMOVAL, Timing Belt.>
- 12) Remove the timing belt guide. (MT model)



- 13) Remove the water pump. <Ref. to CO(H4DOTC)-19, REMOVAL, Water Pump.>
- 14) Remove the crank sprocket.



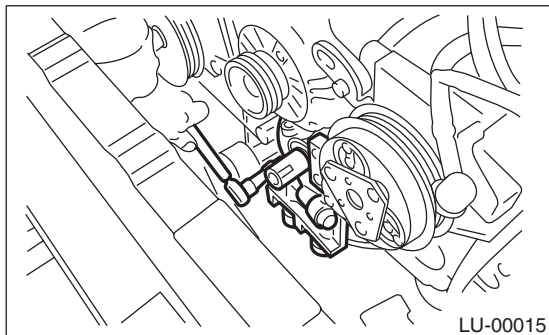
Oil Pump

LUBRICATION

15) Remove the bolts which install the oil pump onto cylinder block.

NOTE:

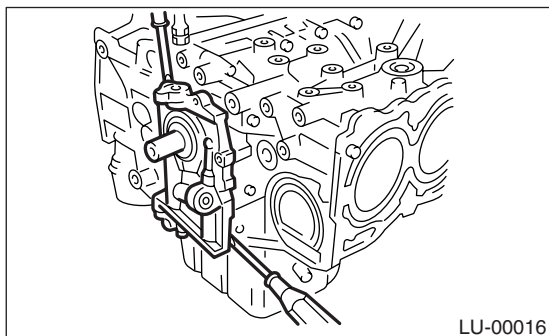
If disassembling or inspecting the oil pump, loosen the plug of relief valve before removing the oil pump.



16) Remove the oil pump using flat tip screwdriver.

CAUTION:

Be careful not to scratch the mating surfaces of cylinder block and oil pump.



B: INSTALLATION

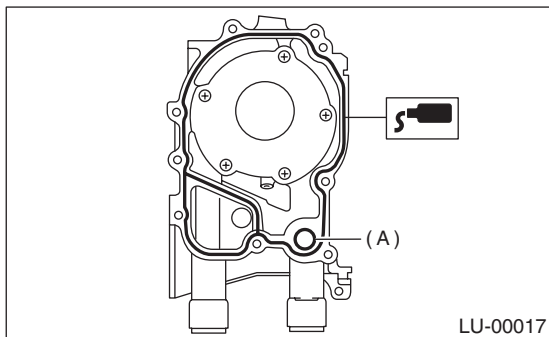
Install in the reverse order of removal.

Do the following:

1) Apply liquid gasket to the matching surfaces of oil pump.

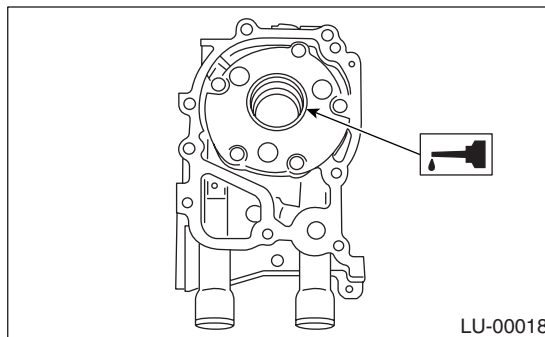
Liquid gasket:

THREE BOND 1215 (Part No. 004403007) or equivalent



2) Replace the O-ring (A) with a new one.

3) Apply a coat of engine oil to the inside of oil seal.



4) Be careful not to scratch the oil seal when installing the oil pump on cylinder block.

5) Position the oil pump, aligning the notched area with crankshaft, and push the oil pump straight.

CAUTION:

- **Make sure the oil seal lip is not folded.**
- **Be careful not to scratch the oil seal when installing oil pump on cylinder block.**

6) Install the oil pump.

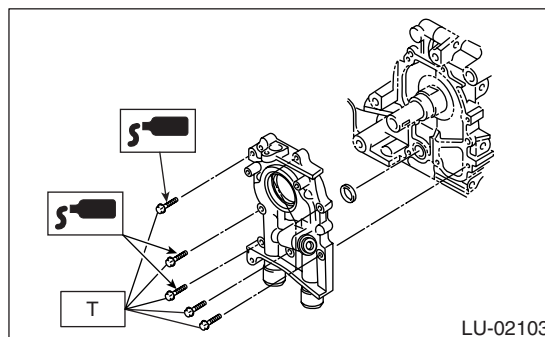
7) Apply liquid gasket to the threaded portion of three bolts. (If to be reuse the bolts.)

Liquid gasket:

THREE BOND 1324 (Part No. 004403042) or equivalent

Tightening torque:

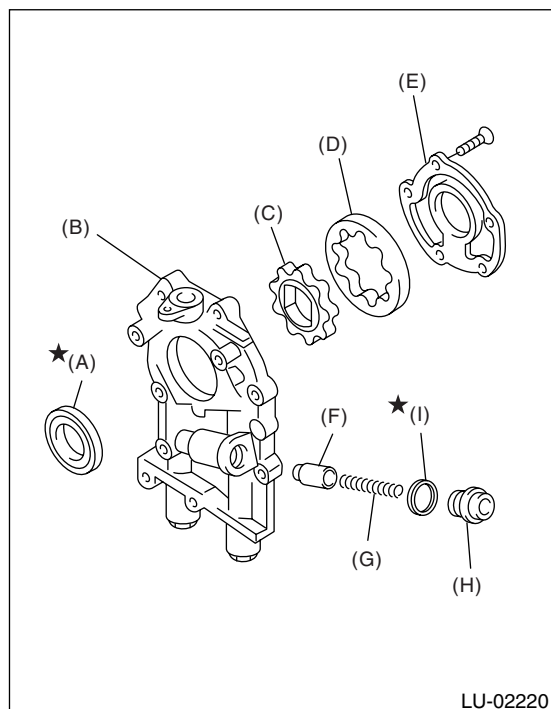
6.4 N-m (0.65 kgf-m, 4.7 ft-lb)



C: DISASSEMBLY

Remove the screws which secure the oil pump cover and disassemble oil pump. Inscribe alignment marks on the inner and outer rotors so that they can be replaced in their original positions during reassembly.

CAUTION:
Before disassembling the oil pump, remove the relief valve.

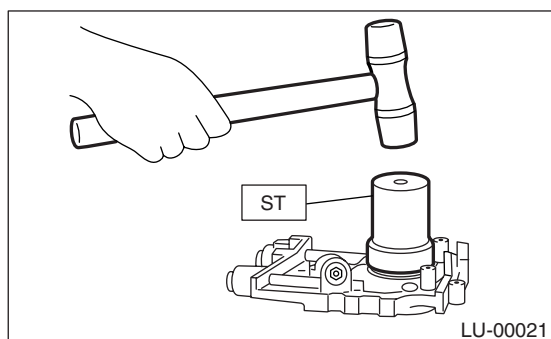


- (A) Oil seal
- (B) Pump case
- (C) Inner rotor
- (D) Outer rotor
- (E) Pump cover
- (F) Relief valve
- (G) Relief valve spring
- (H) Plug
- (I) Gasket

D: ASSEMBLY

1) Install the front oil seal by using ST.
ST 499587100 OIL SEAL INSTALLER

NOTE:
Use a new oil seal.

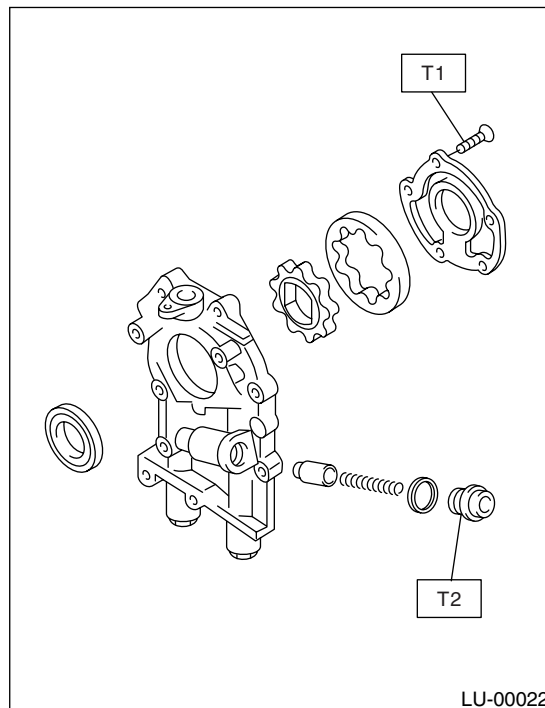


2) Apply a coat of engine oil to the inner and outer rotors.

- 3) Install the inner and outer rotors in their original positions.
- 4) Install the oil relief valve, relief valve spring and plug.

NOTE:
Use a new gasket.
5) Install the oil pump cover.

Tightening torque:
T1: 5.4 N·m (0.55 kgf-m, 4.0 ft-lb)
T2: 44 N·m (4.5 kgf-m, 32.5 ft-lb)

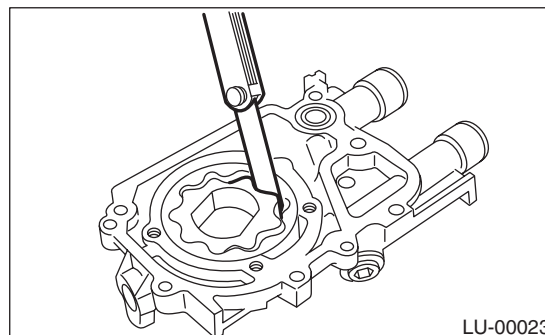


E: INSPECTION

1. TIP CLEARANCE

Measure the tip clearance of rotors. If clearance exceeds the limit, replace the rotors as a matched set.

Tip clearance:
Standard
0.04 — 0.14 mm (0.0016 — 0.0055 in)
Limit
0.18 mm (0.0071 in)



2. CASE CLEARANCE

Measure the clearance between outer rotor and oil pump rotor housing. If clearance exceeds the limit, replace the rotor.

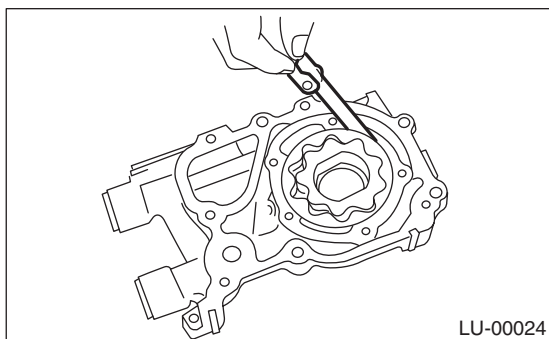
Case clearance:

Standard

0.10 — 0.175 mm (0.0039 — 0.0069 in)

Limit

0.20 mm (0.0079 in)



3. SIDE CLEARANCE

Measure the clearance between the oil pump inner rotor and pump cover. If clearance exceeds the limit, replace the rotor or pump body.

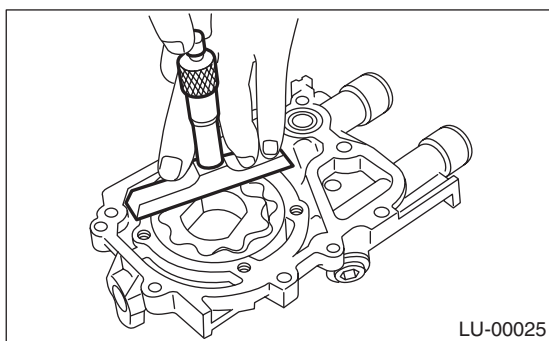
Side clearance:

Standard

0.02 — 0.07 mm (0.0008 — 0.0028 in)

Limit

0.12 mm (0.0047 in)



4. OIL RELIEF VALVE

Check the valve for fitting condition and damage, and the relief valve spring for damage and deterioration. Replace the parts if defective.

Relief valve spring:

Free length

73.7 mm (2.902 in)

Installed length

54.7 mm (2.154 in)

Load when installed

93.1 N (9.49 kgf, 20.88 lbf)

5. OIL PUMP CASE

Check the oil pump case for worn shaft hole, clogged oil passage, worn rotor chamber, cracks, and other faults.

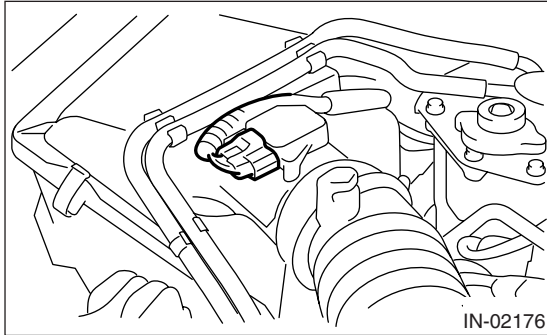
6. OIL SEAL

Check the oil seal lips for deformation, hardening, wear, etc. and replace if defective.

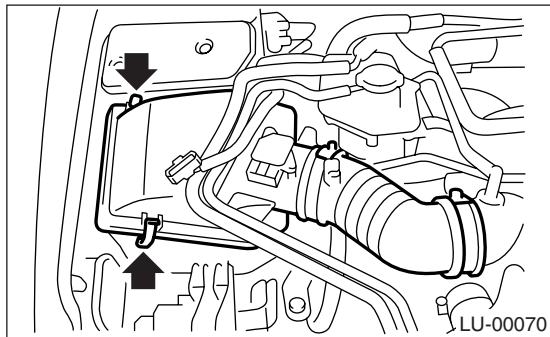
5. Oil Pan and Strainer

A: REMOVAL

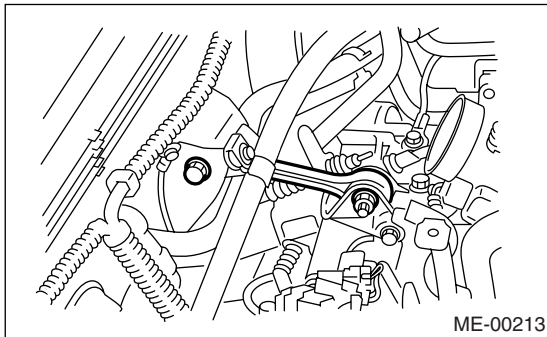
- 1) Set the vehicle on a lift.
- 2) Remove the front wheels.
- 3) Disconnect the ground cable from battery.
- 4) Disconnect the connector from mass air flow and intake air temperature sensor.



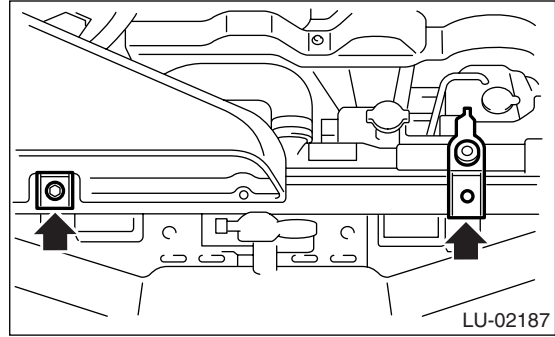
- 5) Remove the air intake boot and air cleaner upper cover.



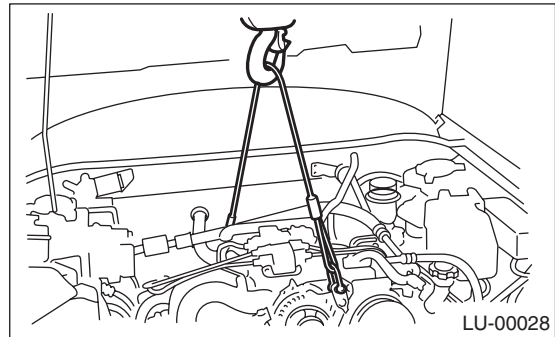
- 6) Remove the intercooler. <Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>
- 7) Remove the pitching stopper.



- 8) Remove the radiator upper brackets.



- 9) Support the engine with a lifting device and wire ropes.

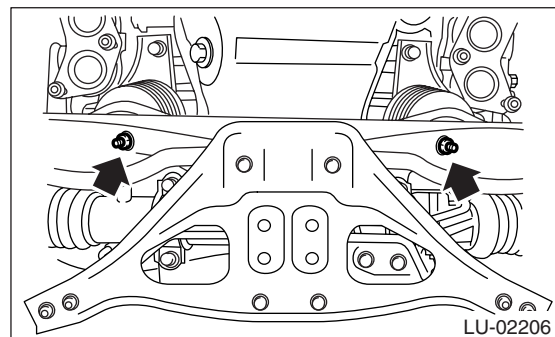


- 10) Lift-up the vehicle.

CAUTION:

When lifting up the vehicle, rise up the wire rope together.

- 11) Remove the under cover.
- 12) Drain the engine oil.
- 13) Remove the front exhaust pipe assembly. <Ref. to EX(H4DOTC)-8, REMOVAL, Front Exhaust Pipe.>
- 14) Remove the nuts which install the front cushion rubber onto front crossmember.



- 15) Remove the bolts which install the oil pan on cylinder block while raising up engine.
- 16) Insert the oil pan cutter blade between cylinder block-to-oil pan clearance.

CAUTION:

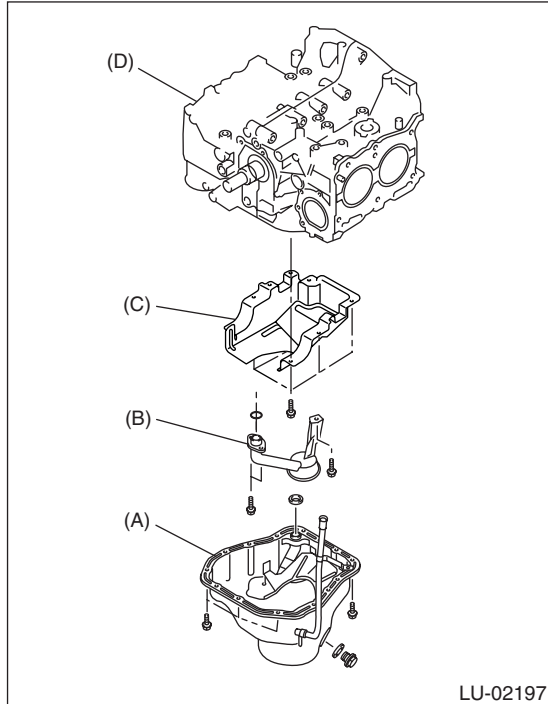
Do not use a screwdriver or similar tool in place of oil pan cutter.

- 17) Remove the oil strainer.

Oil Pan and Strainer

LUBRICATION

18) Remove the baffle plate.



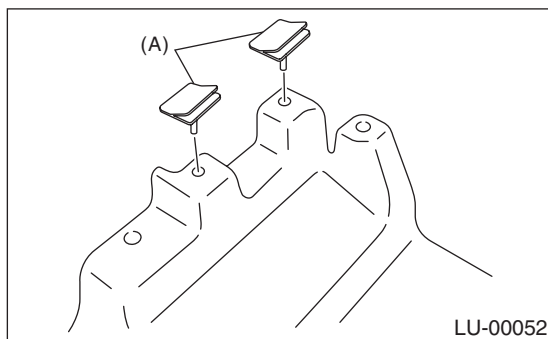
- (A) Oil pan
- (B) Oil strainer
- (C) Baffle plate
- (D) Cylinder block

B: INSTALLATION

CAUTION:

Before installing the oil pan, clean sealant from oil pan and engine block.

1) Check the seal (A) is securely installed in baffle plate in the direction as shown in the figure.



2) Install the baffle plate.

Tightening torque:

6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

3) Install the oil strainer onto baffle plate.

NOTE:

Replace the O-ring with a new one.

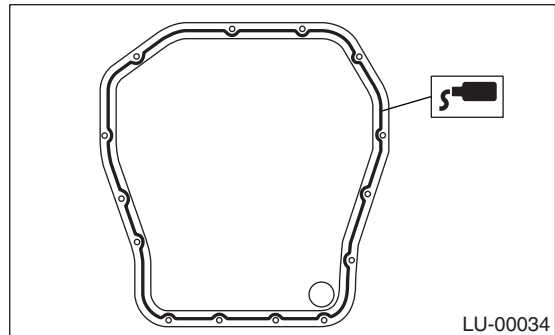
Tightening torque:

10 N·m (1.0 kgf-m, 7.2 ft-lb)

4) Apply liquid gasket to the mating surfaces, and then install the oil pan.

Liquid gasket:

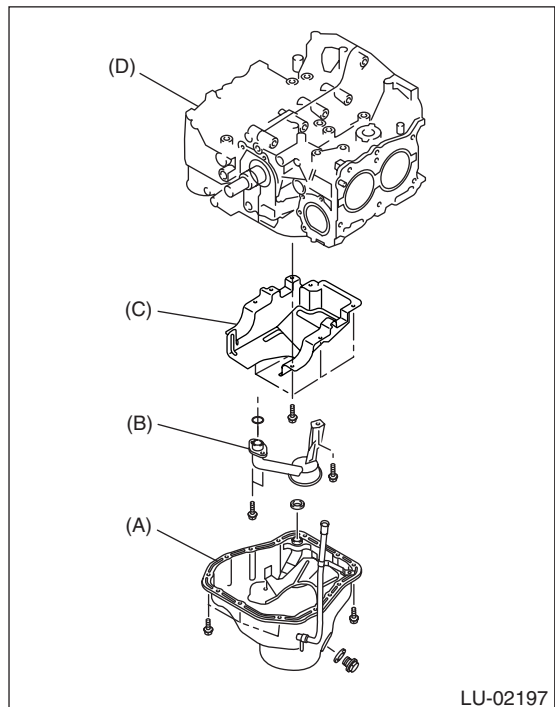
THREE BOND 1207C (Part No. 004403012) or equivalent



5) Tighten the bolts which install the oil pan onto engine block.

Tightening torque:

5 N·m (0.5 kgf-m, 3.6 ft-lb)



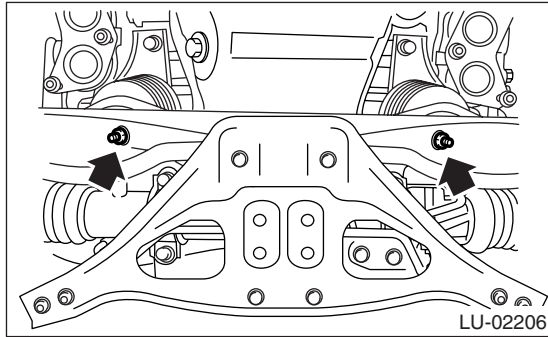
- (A) Oil pan
- (B) Oil strainer
- (C) Baffle plate
- (D) Cylinder block

6) Lower the engine onto front crossmember.

7) Tighten the nuts which install the front cushion rubber onto front crossmember.

Tightening torque:

85 N·m (8.7 kgf-m, 62.7 ft-lb)



8) Install the front exhaust pipe assembly. <Ref. to EX(H4DOTC)-8, INSTALLATION, Front Exhaust Pipe.>

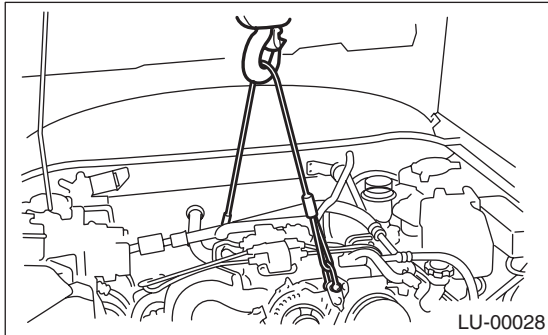
9) Install the under cover.

10) Lower the vehicle.

CAUTION:

When lowering the vehicle, lower the lifting device and wire rope together.

11) Remove the lifting device and wire ropes.

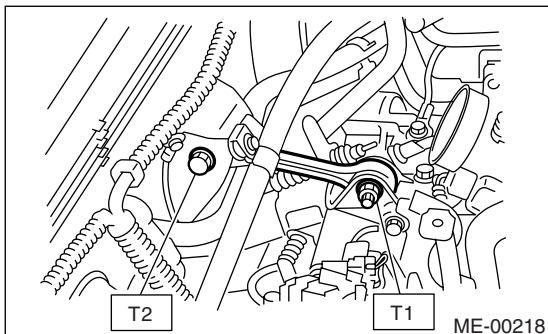


12) Install the pitching stopper.

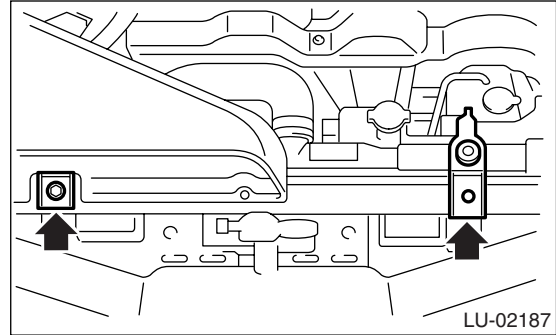
Tightening torque:

T1: 50 N·m (5.1 kgf-m, 36.9 ft-lb)

T2: 58 N·m (5.9 kgf-m, 42.8 ft-lb)

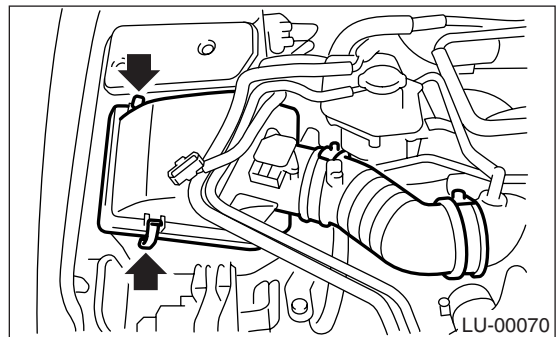


13) Install the radiator upper brackets.

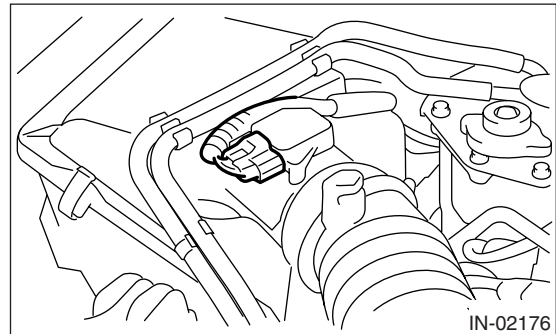


14) Install the intercooler. <Ref. to IN(H4DOTC)-11, INSTALLATION, Intercooler.>

15) Install the air intake boot and air cleaner upper cover.



16) Connect the connector to mass air flow and intake air temperature sensor.



17) Install the front wheels.

18) Connect the battery ground cable to battery.

19) Fill engine oil. <Ref. to LU(STI)-9, INSPECTION, Engine Oil.>

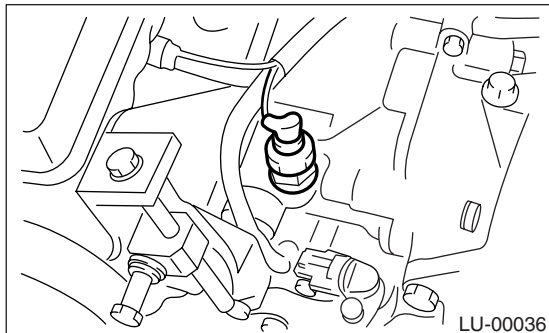
C: INSPECTION

By visual check, make sure the oil pan, oil strainer, oil strainer stay and baffle plate are not damaged.

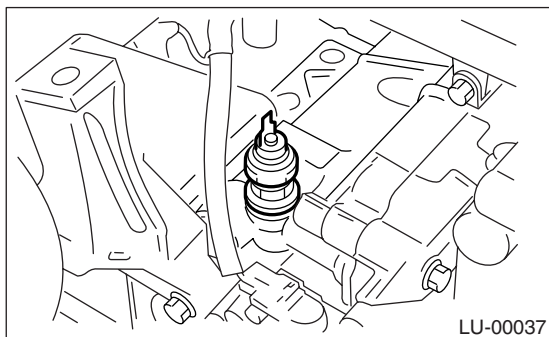
6. Oil Pressure Switch

A: REMOVAL

- 1) Remove the generator from bracket. <Ref. to SC(H4SO)-14, REMOVAL, Generator.>
- 2) Disconnect the terminal from oil pressure switch.



- 3) Remove the oil pressure switch.

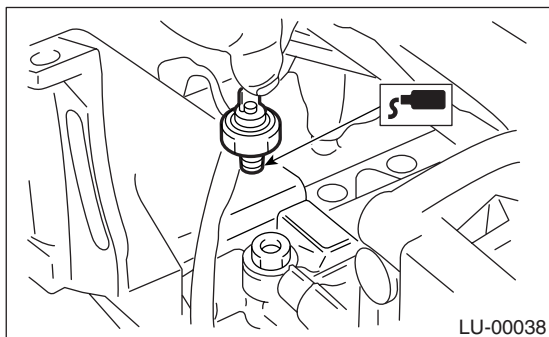


B: INSTALLATION

- 1) Apply liquid gasket to the oil pressure switch threads.

Liquid gasket:

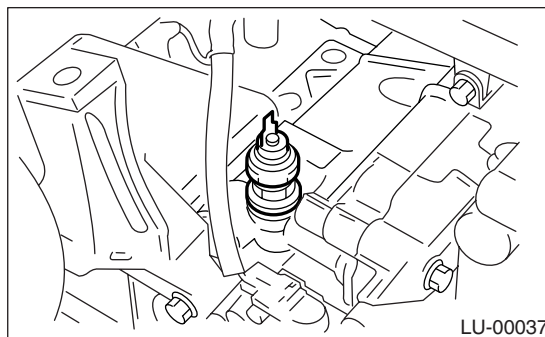
THREE BOND 1324 (Part No. 004403042) or equivalent



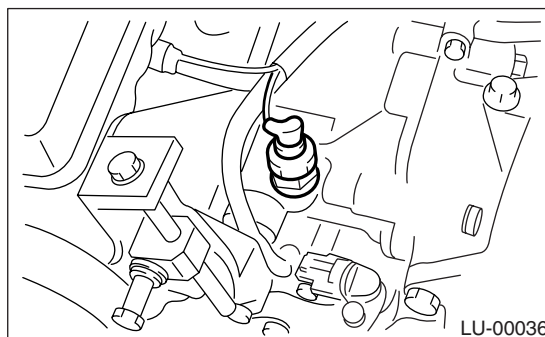
- 2) Install the oil pressure switch onto engine block.

Tightening torque:

25 N·m (2.5 kgf-m, 18.1 ft-lb)



- 3) Connect the terminal of oil pressure switch.



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

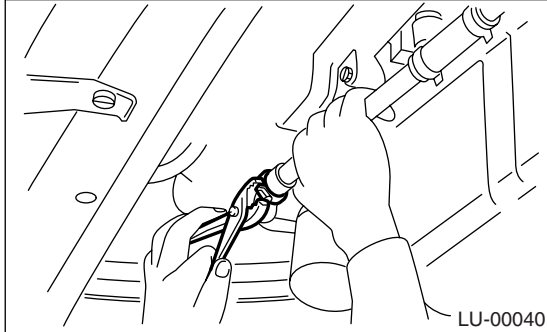
C: INSPECTION

Make sure oil does not leak or seep from where the oil pressure switch is installed.

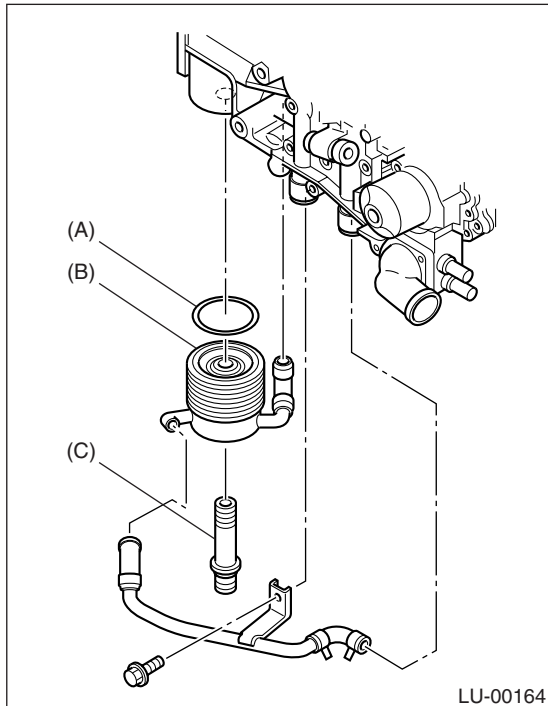
7. Engine Oil Cooler

A: REMOVAL

- 1) Lift-up the vehicle.
- 2) Remove the under cover.
- 3) Drain the engine oil.
- 4) Drain the engine coolant.
- 5) Remove the water by-pass pipe between oil cooler and water pump.



- 6) Remove the engine oil filter. <Ref. to LU(STI)-20, REMOVAL, Engine Oil Filter.>
- 7) Remove the connector, and then remove the oil cooler.



- (A) O-ring
- (B) Oil cooler
- (C) Oil cooler connector

B: INSTALLATION

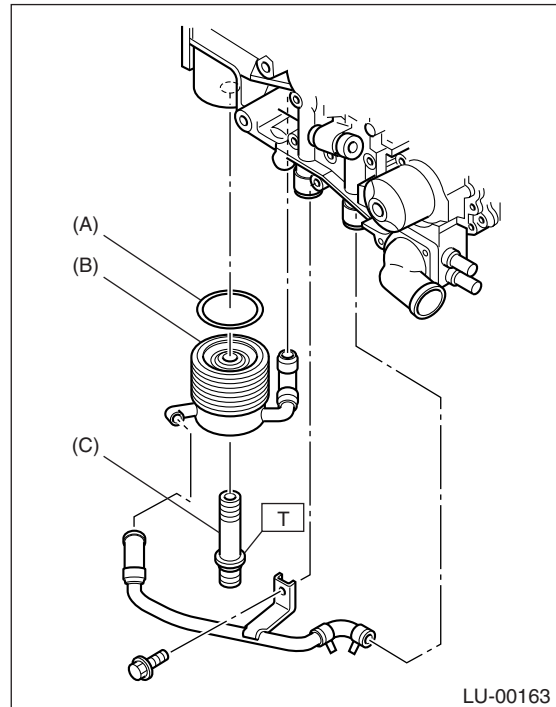
Install in the reverse order of removal.

Tightening torque:

T: 54 N·m (5.5 kgf-m, 40 ft-lb)

NOTE:

Always use a new O-ring.



- (A) O-ring
- (B) Oil cooler
- (C) Oil cooler connector

C: INSPECTION

- 1) Check the coolant passages are not clogged by blowing compressed air.
- 2) Check the mating surfaces of cylinder block, O-ring groove and oil filter for damage.

8. Engine Oil Filter

A: REMOVAL

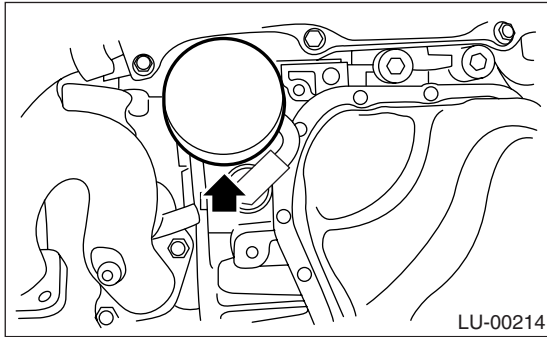
- 1) Lift-up the vehicle.
- 2) Remove the under cover.
- 3) Remove the oil filter with ST.

ST 18332AA000 OIL FILTER WRENCH (Outer diameter: 68 mm (2.68 in))

ST 18332AA010 OIL FILTER WRENCH (Outer diameter: 65 mm (2.56 in))

NOTE:

Standard oil filter is outer diameter of 68 mm (2.68 in). However, SUBARU genuine oil filter having outer diameter of 65 mm (2.56 in) can also be used.



B: INSTALLATION

- 1) Get a new oil filter and apply a thin coat of engine oil to seal rubber.
- 2) Install the oil filter by turning it by hand, being careful not to damage seal rubber.
 - Tighten the oil filter 68 mm (2.68 in) in diameter by approx. 1 rotation more after the seal rubber of oil filter comes in contact with cylinder block or oil cooler. If using a torque wrench, tighten it to 14 N·m (1.4 kgf-m, 10.3 ft-lb).
 - Tighten the oil filter 65 mm (2.56 in) in diameter by approx. 2/3 — 3/4 rotation more after the seal rubber of oil filter comes in contact with cylinder block or oil cooler. If using a torque wrench, tighten it to 12 N·m (1.2 kgf-m, 8.7 ft-lb).

CAUTION:

Do not tighten excessively, or oil may leak.

- 3) Install the under cover.
- 4) Lower the vehicle.

C: INSPECTION

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

NOTE:

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

- 2) Check the engine oil level. <Ref. to LU(STI)-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.

Symptom	Possible cause		Corrective action
1. Warning light remains on.	1) Oil pressure switch failure	Cracked diaphragm or oil leakage within switch	Replace.
		Broken spring or seized contacts	Replace.
	2) Low oil pressure	Clogged oil filter	Replace.
		Malfunction of oil by-pass valve of oil filter	Clean or replace.
		Malfunction of oil relief valve of oil pump	Clean or replace.
		Clogged oil passage	Clean.
		Excessive tip clearance and side clearance of oil pump rotor and gear	Replace.
		Clogged oil strainer or broken pipe	Clean or replace.
	3) No oil pressure	Insufficient engine oil	Replenish.
		Broken pipe of oil strainer	Replace.
		Stuck oil pump rotor	Replace.
2. Warning light does not turn on.	1) Malfunction of combination meter		Replace.
	2) Poor contact of switch contact points		Replace.
	3) Disconnection of wiring		Repair.
3. Warning light flickers momentarily.	1) Poor contact at terminals		Repair.
	2) Defective wiring harness		Repair.
	3) Low oil pressure		Check for the same possible causes as listed in 1. — 2).

MECHANICAL

General Description

MECHANICAL

1. General Description

A: SPECIFICATION

Engine	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 (3.917 × 3.110)
	Piston displacement		cm ³ (cu in)	2,457 (150)
	Compression ratio			8.2
	Compression pressure (at 200 — 300 rpm)		kPa (kgf/cm ² , psi)	981 — 1,177 (10 — 12, 142 — 171)
	Number of piston rings			Pressure ring: 2, Oil ring: 1
	Intake valve timing	Opening	Max. retard	ATDC 5°
			Min. advance	BTDC 15°
		Closing	Max. retard	ABDC 65°
			Min. advance	ABDC 45°
	Exhaust valve timing	Opening		BBDC 55°
		Closing		ATDC 5°
	Valve clearance	Intake	mm (in)	0.20±0.02 (0.0079±0.0008)
		Exhaust	mm (in)	0.35±0.02 (0.0138±0.0008)
	Idling speed [At neutral position on MT]		rpm	700±100 (No load) 800±100 (A/C switch ON)
	Firing order			1 → 3 → 2 → 4
	Ignition timing		BTDC/rpm	17°±10°/700

NOTE:

STD: Standard I.D.: Inner Diameter O.D.: Outer Diameter OS: Oversize US: Undersize

Belt tension adjuster	Protrusion of adjuster rod		mm (in)	5.2 — 6.2 (0.205 — 0.244)
Belt tensioner	Spacer O.D.		mm (in)	17.955 — 17.975 (0.7069 — 0.7077)
	Tensioner bushing I.D.		mm (in)	18.0 — 18.08 (0.7087 — 0.7118)
	Clearance between spacer and bushing	mm (in)	STD	0.025 — 0.125 (0.0010 — 0.0049)
			Limit	0.175 (0.0069)
	Side clearance of spacer	mm (in)	STD	0.2 — 0.55 (0.0079 — 0.0217)
			Limit	0.81 (0.0319)
Camshaft	Bend limit		mm (in)	0.020 (0.00079)
	Thrust clearance	mm (in)	STD	0.068 — 0.116 (0.0027 — 0.0046)
			Limit	0.14 (0.0055)
	Cam lobe height	Intake	STD	46.55 — 46.65 (1.833 — 1.837)
			Limit	46.45 (1.829)
		Exhaust	STD	46.75 — 46.85 (1.841 — 1.844)
			Limit	46.65 (1.837)
	Journal O.D.	mm (in)	STD	37.946 — 37.963 (1.4939 — 1.4946)
			Center rear	29.946 — 29.963 (1.1790 — 1.1796)
	Oil clearance at journal	mm (in)	STD	0.037 — 0.072 (0.0015 — 0.0028)
			Limit	0.10 (0.0039)
Cylinder head	Surface warpage limit		mm (in)	0.035 (0.0014)
	Surface grinding limit		mm (in)	0.3 (0.012)
	Standard height		mm (in)	127.5 (5.02)

General Description

MECHANICAL

Valve seat	Refacing angle			90°
	Contacting width mm (in)	Intake	STD	0.6 — 1.4 (0.024 — 0.055)
			Limit	1.7 (0.067)
		Exhaust	STD	1.2 — 1.8 (0.047 — 0.071)
			Limit	2.2 (0.087)
Valve guide	Inner diameter mm (in)			6.000 — 6.012 (0.2362 — 0.2367)
	Protrusion above head mm (in)			15.8 — 16.2 (0.622 — 0.638)
Valve	Head edge thickness mm (in)	Intake	STD	1.0 — 1.4 (0.039 — 0.055)
			Limit	0.8 (0.031)
		Exhaust	STD	1.3 — 1.7 (0.051 — 0.067)
			Limit	0.8 (0.031)
	Stem diameter mm (in)		Intake	5.955 — 5.970 (0.2344 — 0.2350)
			Exhaust	5.945 — 5.960 (0.2341 — 0.2346)
	Stem oil clear- ance mm (in)	STD	Intake	0.030 — 0.057 (0.0012 — 0.0022)
			Exhaust	0.040 — 0.067 (0.0016 — 0.0026)
		Limit	—	0.15 (0.0059)
	Overall length mm (in)		Intake	104.4 (4.110)
Exhaust			104.65 (4.120)	
Valve spring	Free length mm (in)			47.32 (1.863)
	Squareness			2.5°, 2.1 mm (0.083 in) or less
	Tension/spring height N (kgf, lbf)/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)
Cylinder block	Surface warpage limit (mating with cyl- inder head) mm (in)			0.025 (0.00098)
	Surface grinding limit mm (in)			0.1 (0.004)
	Standard height mm (in)			201.0 (7.91)
	Cylinder bore mm (in)	STD	A	99.505 — 99.515 (3.9175 — 3.9179)
			B	99.495 — 99.505 (3.9171 — 3.9175)
	Taper mm (in)		STD	0.015 (0.0006)
			Limit	0.050 (0.0020)
	Out-of-roundness mm (in)		STD	0.010 (0.0004)
			Limit	0.050 (0.0020)
	Piston clearance mm (in)		STD	–0.010 — 0.010 (–0.0004 — 0.0004)
Limit			0.030 (0.0012)	
Cylinder enlarging (boring) limit (dia.) mm (in)			To 100.005 (3.937)	
Piston	Outer diameter mm (in)	STD	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	Standard clearance between piston pin and hole in piston mm (in)		STD	0.004 — 0.008 (0.0002 — 0.0003)
			Limit	0.020 (0.0008)
	Degree of fit			Piston pin must be fitted into position with thumb at 20°C (68°F).

General Description

MECHANICAL

Piston ring	Piston ring gap mm (in)	Top ring	STD	0.20 — 0.25 (0.0079 — 0.0098)
			Limit	1.0 (0.039)
		Second ring	STD	0.37 — 0.52 (0.015 — 0.020)
			Limit	1.0 (0.039)
		Oil ring	STD	0.20 — 0.50 (0.0079 — 0.0197)
			Limit	1.5 (0.059)
	Ring groove gap mm (in)	Top ring	STD	0.040 — 0.080 (0.0016 — 0.0031)
			Limit	0.15 (0.0059)
Second ring		STD	0.030 — 0.070 (0.0012 — 0.0028)	
		Limit	0.15 (0.0059)	
Connecting rod	Bend twist per 100 mm (3.94 in) in length mm (in)	Limit	0.10 (0.0039)	
	Side clearance mm (in)	STD	0.070 — 0.330 (0.0028 — 0.0130)	
		Limit	0.4 (0.016)	
Connecting rod bearing	Oil clearance mm (in)	STD	0.017 — 0.045 (0.0007 — 0.0018)	
		Limit	0.05 (0.0020)	
	Thickness at center portion mm (in)	STD	1.490 — 1.502 (0.0587 — 0.0591)	
		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)	
Connecting rod bushing	Clearance between piston pin and bushing mm (in)	STD	0 — 0.022 (0 — 0.0009)	
		Limit	0.030 (0.0012)	

General Description

MECHANICAL

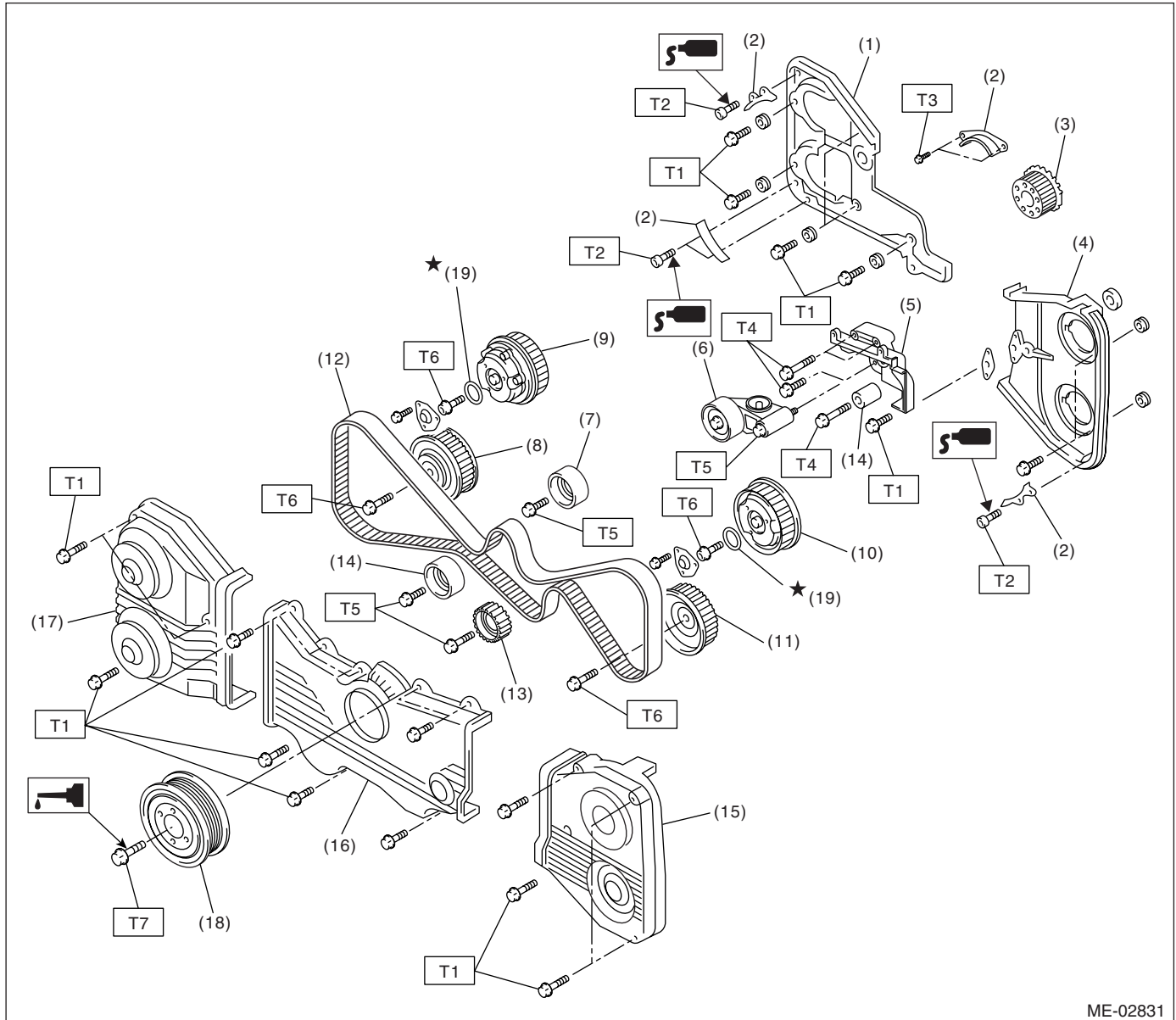
Crankshaft	Bend limit		mm (in)	0.035 (0.0014)
	Crank pin	mm (in)	Out-of-roundness	0.003 (0.0001)
			Cylindricity	0.004 (0.0002)
			Grinding limit (dia.)	To 51.750 (2.0374)
	Crank journal	mm (in)	Out-of-roundness	0.005 (0.0002)
			Cylindricity	0.006 (0.0002)
			Grinding limit (dia.)	To 59.750 (2.3524)
	Crank pin outer diameter	mm (in)	STD	51.984 — 52.000 (2.0466 — 2.0472)
			0.03 (0.0012) US	51.954 — 51.970 (2.0454 — 2.0461)
			0.05 (0.0020) US	51.934 — 51.950 (2.0447 — 2.0453)
			0.25 (0.0098) US	51.734 — 51.750 (2.0368 — 2.0374)
	Crank journal outer diameter	mm (in)	STD	59.992 — 60.008 (2.3619 — 2.3625)
			0.03 (0.0012) US	59.962 — 59.978 (2.3607 — 2.3613)
			0.05 (0.0020) US	59.942 — 59.958 (2.3599 — 2.3605)
			0.25 (0.0098) US	59.742 — 59.758 (2.3520 — 2.3527)
	Side clearance	mm (in)	STD	0.030 — 0.115 (0.0012 — 0.0045)
			Limit	0.25 (0.0098)
	Oil clearance	mm (in)	STD	0.010 — 0.030 (0.0004 — 0.0012)
			Limit	0.040 (0.0016)
Main bearing	Main bearing thickness	#1, #3	STD	1.998 — 2.011 (0.0787 — 0.0792)
			0.03 (0.0012) US	2.017 — 2.020 (0.0794 — 0.0795)
			0.05 (0.0020) US	2.027 — 2.030 (0.0798 — 0.0799)
			0.25 (0.0098) US	2.127 — 2.130 (0.0837 — 0.0839)
		#2, #4, #5	STD	2.000 — 2.013 (0.0787 — 0.0793)
			0.03 (0.0012) US	2.019 — 2.022 (0.0795 — 0.0796)
			0.05 (0.0020) US	2.029 — 2.032 (0.0799 — 0.0800)
			0.25 (0.0098) US	2.129 — 2.132 (0.0838 — 0.0839)

General Description

MECHANICAL

B: COMPONENT

1. TIMING BELT



ME-02831

(1) Timing belt cover No. 2 (RH)	(11) Exhaust cam sprocket (LH)
(2) Timing belt guide	(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)	

Tightening torque: N·m (kgf-m, ft-lb)

T1: 5 (0.5, 3.6)

T2: 6.4 (0.65, 4.7)

T3: 9.75 (1.0, 7)

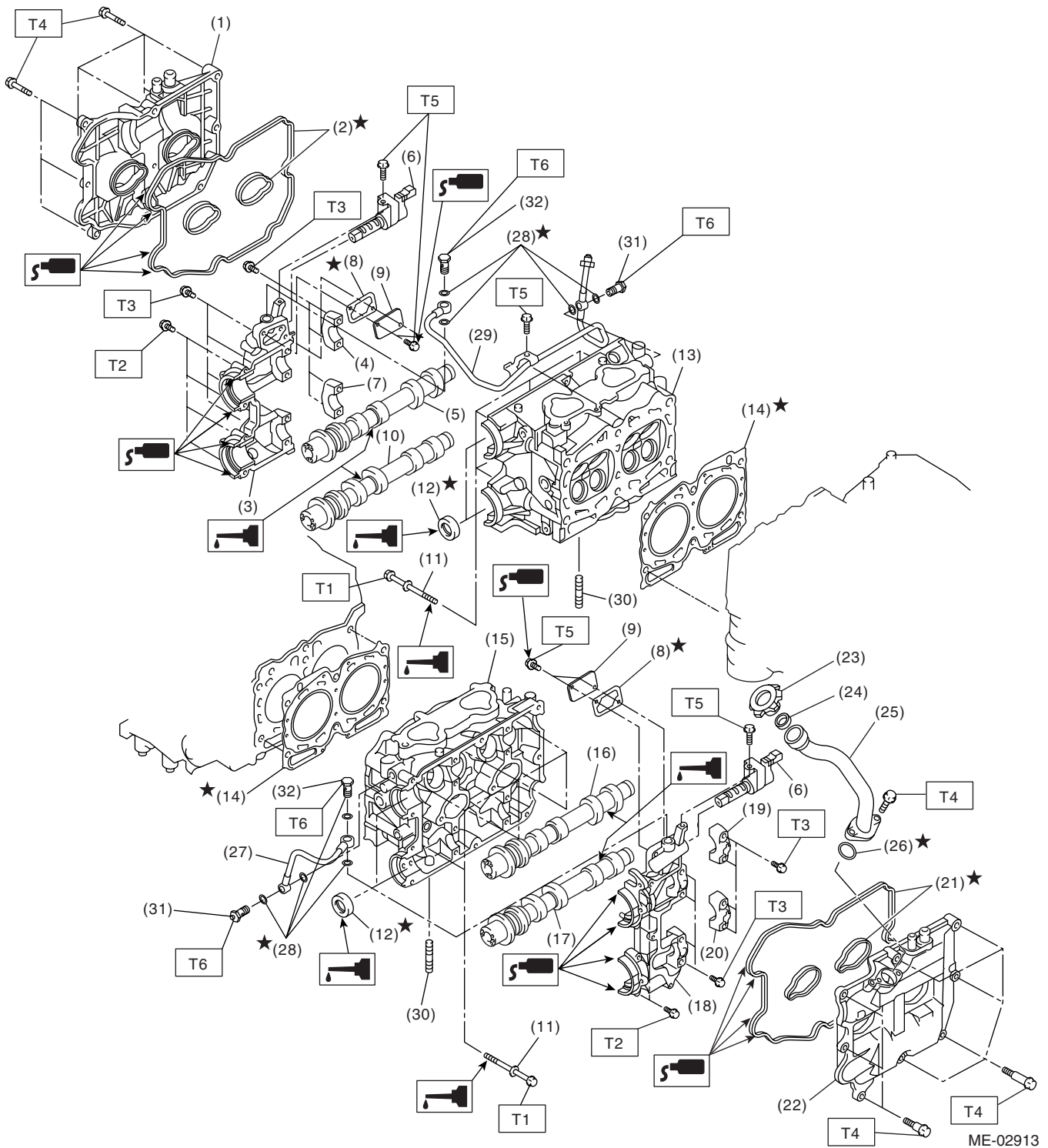
T4: 24.5 (2.5, 18.1)

T5: 39 (4.0, 28.9)

T6: <Ref. to ME(STI)-53, INSTALLATION, Crank Sprocket.>

T7: <Ref. to ME(STI)-42, INSTALLATION, Crank Pulley.>

2. CYLINDER HEAD AND CAMSHAFT

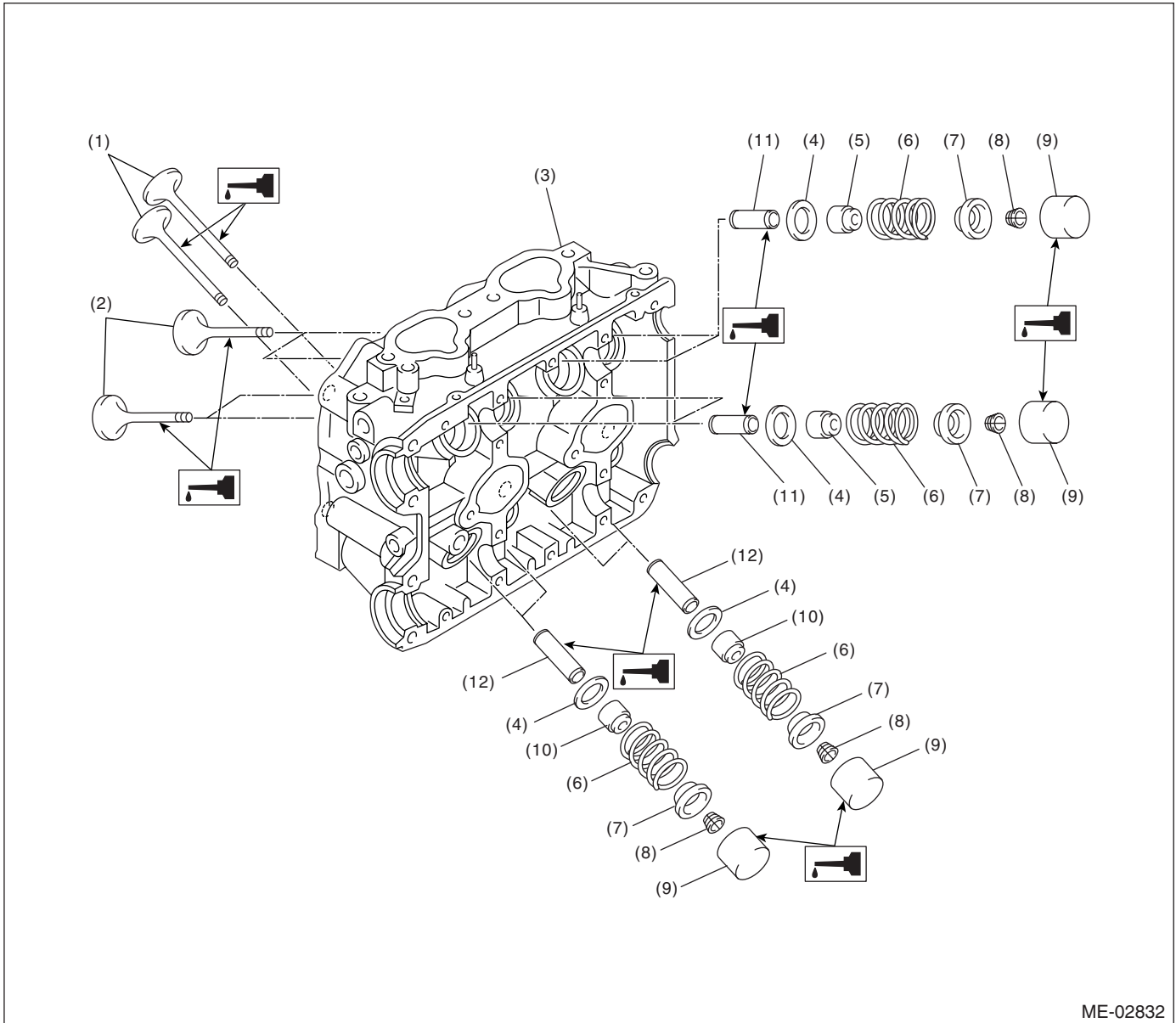


General Description

MECHANICAL

(1) Rocker cover (RH)	(16) Intake camshaft (LH)	(31) Union screw (with protrusion)
(2) Rocker cover gasket (RH)	(17) Exhaust camshaft (LH)	(32) Union screw (without protrusion)
(3) Camshaft cap (Front RH)	(18) Camshaft cap (Front LH)	
(4) Intake camshaft cap (Rear RH)	(19) Intake camshaft cap (Rear LH)	<i>Tightening torque: N·m (kgf-m, ft-lb)</i>
(5) Intake camshaft (RH)	(20) Exhaust camshaft cap (Rear LH)	<i>T1: <Ref. to ME(STI)-60, INSTALLATION, Cylinder Head.></i>
(6) Oil flow control solenoid valve	(21) Rocker cover gasket (LH)	
(7) Exhaust camshaft cap (Rear RH)	(22) Rocker cover (LH)	<i>T2: <Ref. to ME(STI)-55, INSTALLATION, Camshaft.></i>
(8) Gasket	(23) Oil filler cap	
(9) Oil return cover	(24) Gasket	<i>T3: <Ref. to ME(STI)-55, INSTALLATION, Camshaft.></i>
(10) Exhaust camshaft (RH)	(25) Oil filler duct	
(11) Cylinder head bolt	(26) O-ring	<i>T4: 6.4 (0.65, 4.7)</i>
(12) Oil seal	(27) Oil pipe (LH)	<i>T5: 8 (0.8, 5.9)</i>
(13) Cylinder head (RH)	(28) Gasket	<i>T6: 29 (3.0, 21.4)</i>
(14) Cylinder head gasket	(29) Oil pipe (RH)	
(15) Cylinder head (LH)	(30) Stud bolt	

3. CYLINDER HEAD AND VALVE ASSEMBLY



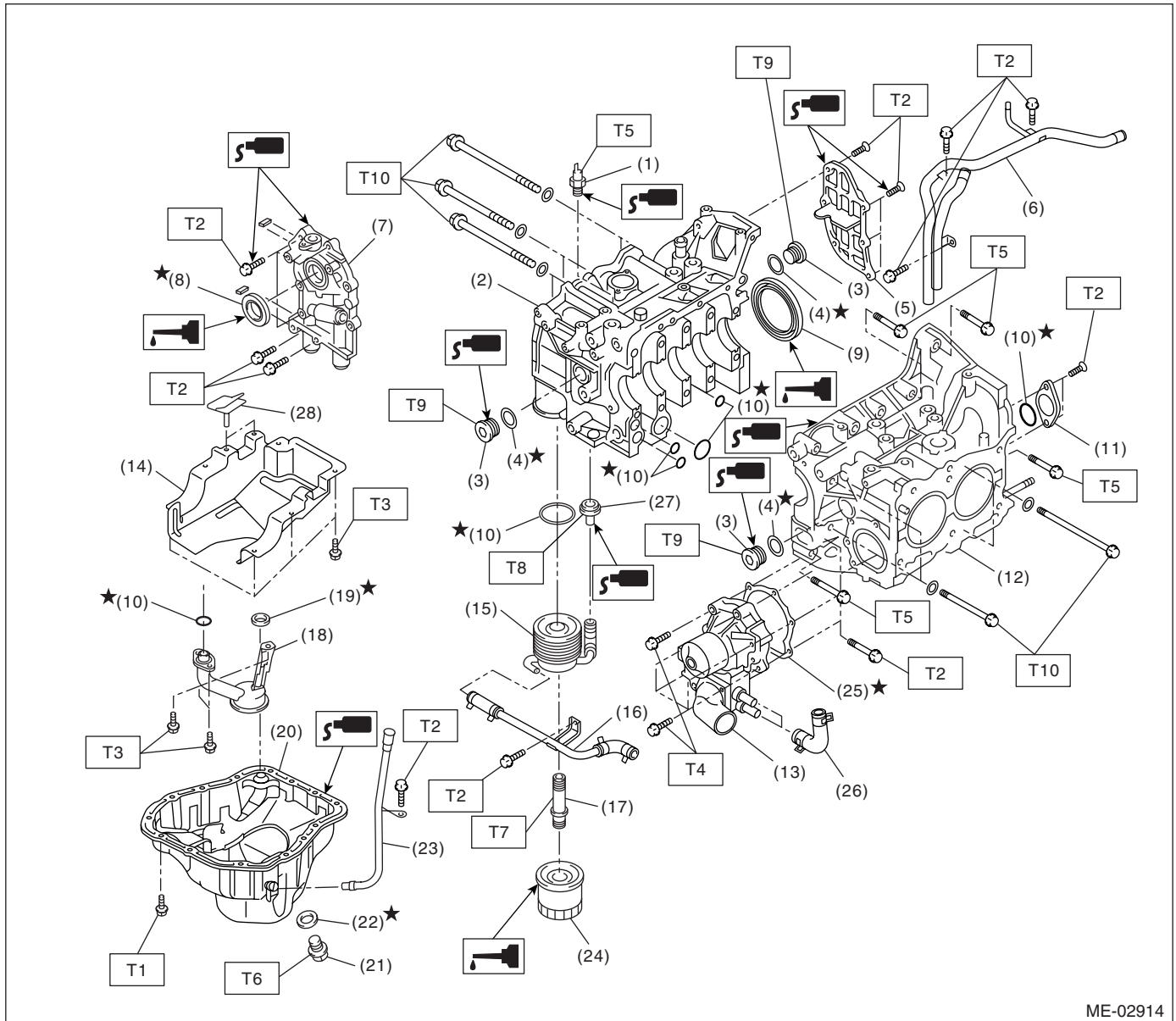
ME-02832

(1) Exhaust valve	(5) Intake valve oil seal	(9) Valve lifter
(2) Intake valve	(6) Valve spring	(10) Exhaust valve oil seal
(3) Cylinder head	(7) Retainer	(11) Intake valve guide
(4) Valve spring seat	(8) Retainer key	(12) Exhaust valve guide

General Description

MECHANICAL

4. CYLINDER BLOCK



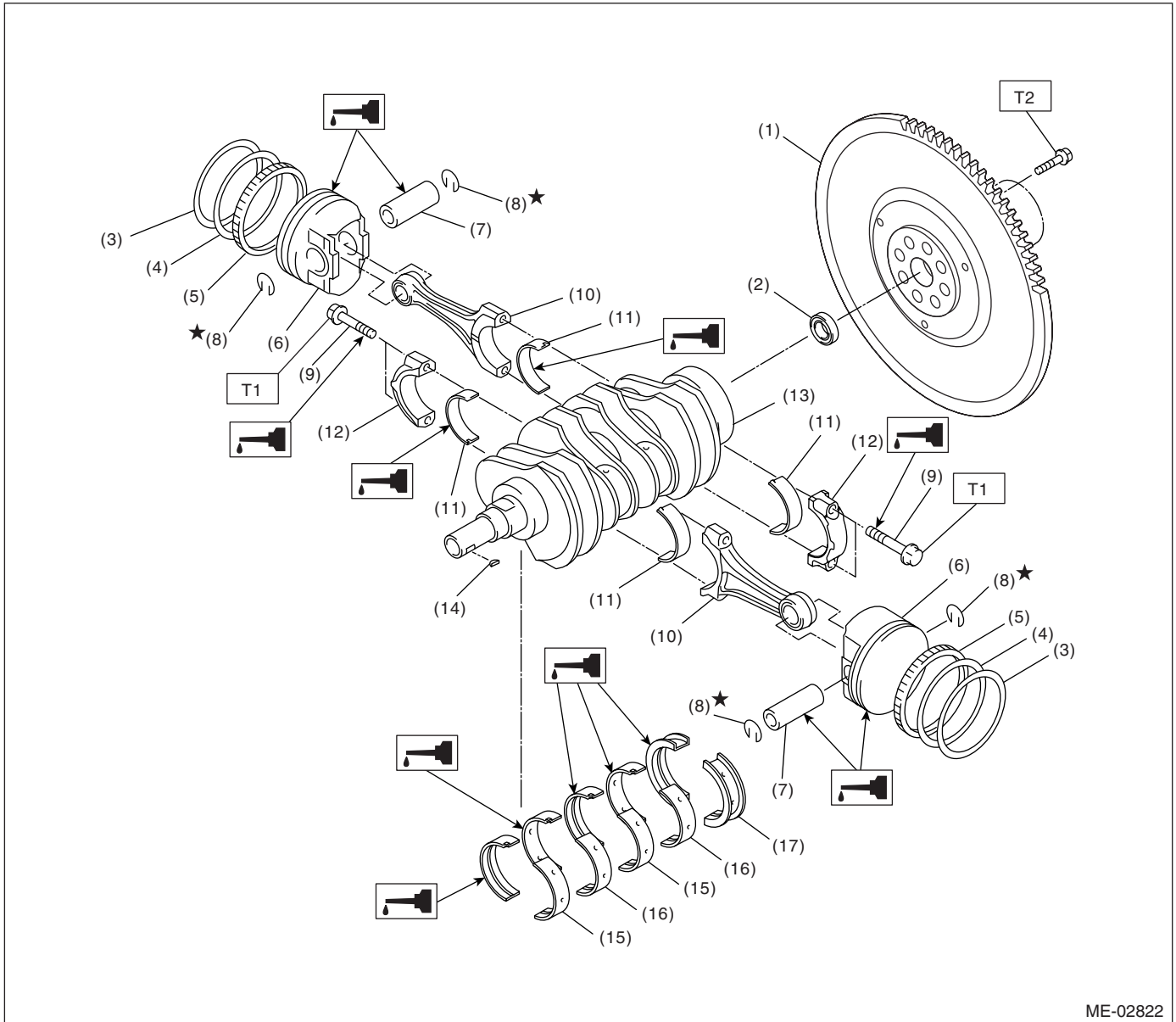
ME-02914

(1) Oil pressure switch	(15) Oil cooler
(2) Cylinder block (RH)	(16) Water by-pass pipe
(3) Service hole plug	(17) Connector
(4) Gasket	(18) Oil strainer
(5) Oil separator cover	(19) Gasket
(6) Water by-pass pipe	(20) Oil pan
(7) Oil pump	(21) Drain plug
(8) Front oil seal	(22) Metal gasket
(9) Rear oil seal	(23) Oil level gauge guide
(10) O-ring	(24) Oil filter
(11) Service hole cover	(25) Gasket
(12) Cylinder block (LH)	(26) Water pump hose
(13) Water pump	(27) Plug
(14) Baffle plate	(28) Seal

Tightening torque: N·m (kgf-m, ft-lb)

- T1: 5 (0.5, 3.6)**
T2: 6.4 (0.65, 4.7)
T3: 10 (1.0, 7.4)
T4: First 12 (1.2, 8.7)
Second 12 (1.2, 8.7)
T5: 25 (2.5, 18.4)
T6: 44 (4.5, 33)
T7: 54 (5.5, 40)
T8: 69 (7.0, 50.9)
T9: 70 (7.1, 51.6)
T10: <Ref. to ME(STI)-70,
INSTALLATION, Cylinder
Block.>

5. CRANKSHAFT AND PISTON



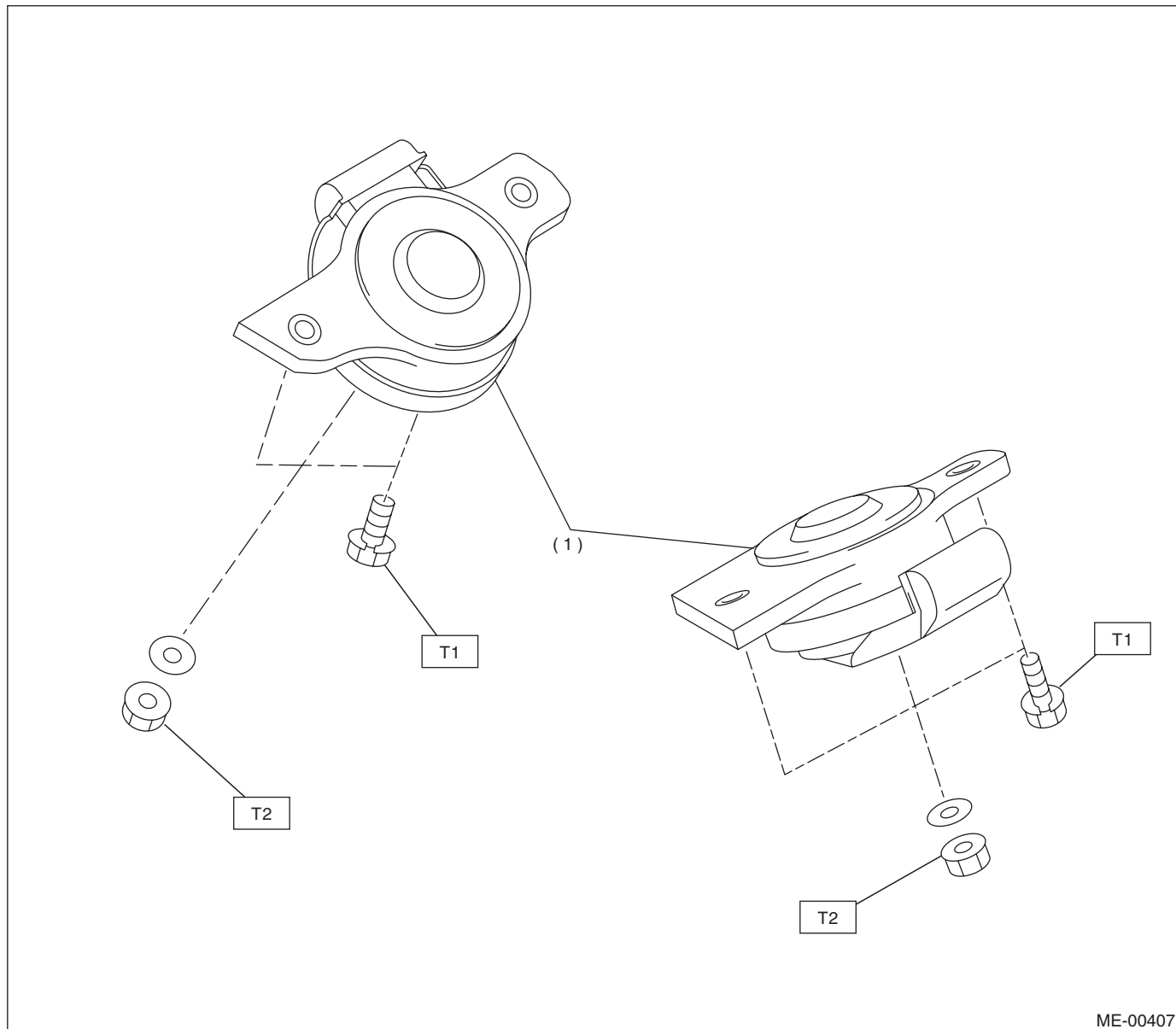
(1) Flywheel	(8) Snap ring	(15) Crankshaft bearing #1, #3
(2) Ball bearing	(9) Connecting rod bolt	(16) Crankshaft bearing #2, #4
(3) Top ring	(10) Connecting rod	(17) Crankshaft bearing #5
(4) Second ring	(11) Connecting rod bearing	
(5) Oil ring	(12) Connecting rod cap	
(6) Piston	(13) Crankshaft	
(7) Piston pin	(14) Woodruff key	

Tightening torque: N·m (kgf-m, ft-lb)

T1: 52 (5.3, 38.4)

T2: 75 (7.6, 55.3)

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

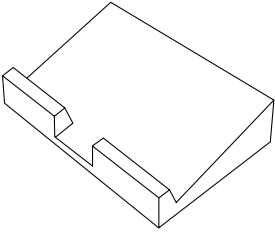
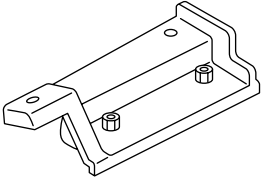
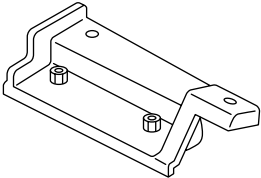
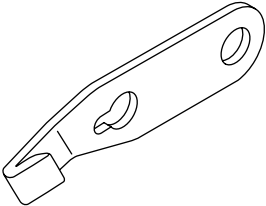
- Wear work clothing, including a cap, protective goggles and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Be careful not to burn yourself, because each part in the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.
- All parts should be thoroughly cleaned, paying special attention to the engine oil passages, pistons and bearings.
- Rotating parts and sliding parts such as piston, bearing and gear should be coated with oil prior to assembly.
- Be careful not to let oil, grease or coolant contact the timing belt, clutch disc and flywheel.
- All removed parts, if to be reused, should be reinstalled in the original positions and directions.
- Bolts, nuts and washers should be replaced with new ones as required.
- Even if necessary inspections have been made in advance, proceed with assembly work while making rechecks.
- Remove or install the engine in an area where chain hoists, lifting devices, etc. are available for ready use.
- Be sure not to damage coated surfaces of body panels with tools or stain seats and windows with coolant or oil. Place a cover over fenders, as required, for protection.
- Prior to starting work, prepare the following: Service tools, clean cloth, containers to catch coolant and oil, wire ropes, chain hoist, transmission jacks, etc.
- Lift-up or lower the vehicle when necessary. Make sure to support the correct positions.

General Description

MECHANICAL

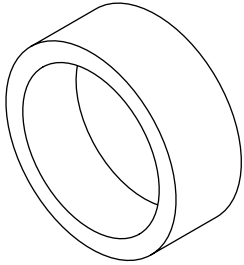
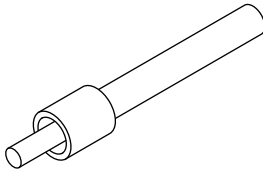
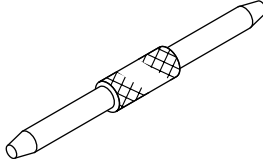
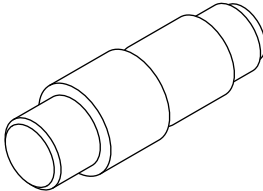
D: PREPARATION TOOL

1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498267600	498267600	CYLINDER HEAD TABLE	- Used for replacing valve guides. - Used for removing and installing valve springs.
 ST-498457000	498457000	ENGINE STAND ADAPTER RH	Used with ENGINE STAND (499817000).
 ST-498457100	498457100	ENGINE STAND ADAPTER LH	Used with ENGINE STAND (499817000).
 ST-498497100	498497100	CRANKSHAFT STOPPER	Used for stopping rotation of flywheel when loosening and tightening crank pulley bolt, etc.

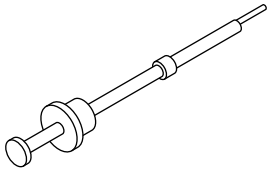
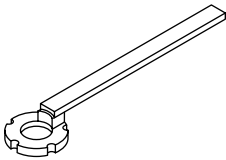
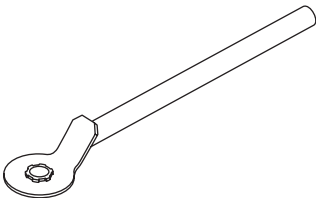
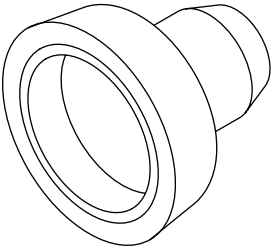
General Description

MECHANICAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498747300	498747300	PISTON GUIDE	Used for installing piston in cylinder for 2.5 L engine.
 ST-498857100	498857100	VALVE OIL SEAL GUIDE	Used for press-fitting of intake 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.

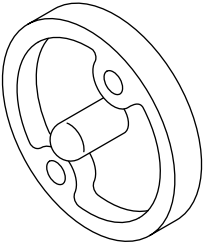
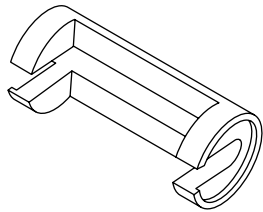
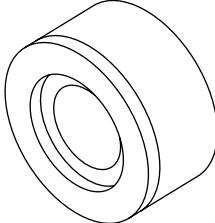
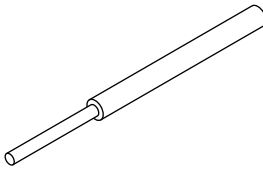
General Description

MECHANICAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499097700	499097700	PISTON PIN REMOVER ASSY	Used for removing piston pin.
 ST-499207400	499207400	CAM SPROCKET WRENCH	Used for removing and installing exhaust cam sprocket.
 ST-499977500	499977500	CAM SPROCKET WRENCH	Used for removing and installing intake cam sprocket.
 ST-499587200	499587200	CRANKSHAFT OIL SEAL INSTALLER	• Used for installing crankshaft oil seal. • Used with CRANKSHAFT OIL SEAL GUIDE (499597100).

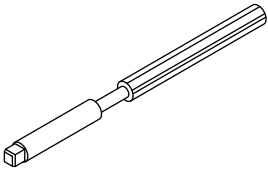
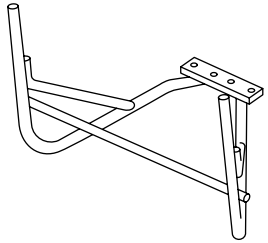
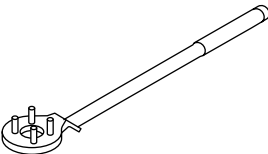
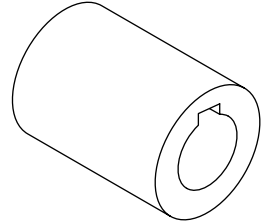
General Description

MECHANICAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499597100	499597100	CRANKSHAFT OIL SEAL GUIDE	- Used for installing crankshaft oil seal. - Used with CRANKSHAFT OIL SEAL INSTALLER (499587200).
 ST-499718000	499718000	VALVE SPRING REMOVER	Used for removing and installing valve spring.
 ST18251AA020	18251AA020	VALVE GUIDE ADJUSTER	Used for installing intake and exhaust valve guides.
 ST-499767200	499767200	VALVE GUIDE REMOVER	Used for removing valve guides.

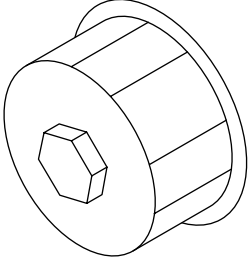
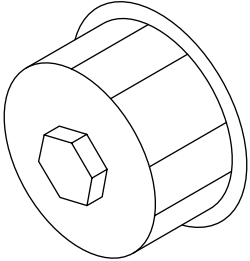
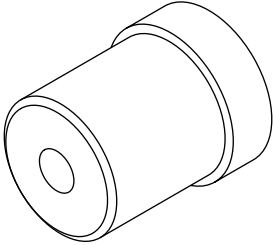
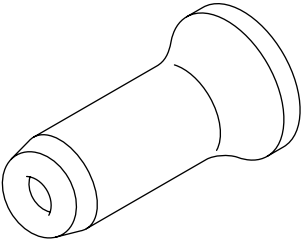
General Description

MECHANICAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499767400	499767400	VALVE GUIDE REAMER	Used for reaming valve guides.
 ST-499817000	499817000	ENGINE STAND	- Stand used for engine disassembly and assembly. - Used with ENGINE STAND ADAPTER RH (498457000) and LH (498457100).
 ST-499977100	499977100	CRANK PULLEY WRENCH	Used for stopping rotation of crank pulley when loosening and tightening crank pulley bolts.
 ST-499987500	499987500	CRANKSHAFT SOCKET	Used for rotating crankshaft.

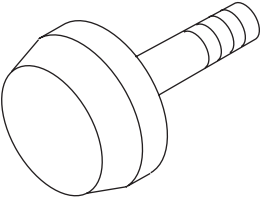
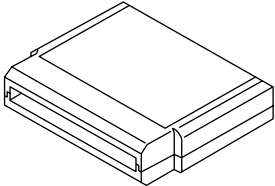
General Description

MECHANICAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18332AA000	18332AA000	OIL FILTER WRENCH	Used for removing and installing the oil filter. (Outer diameter: 68 mm (2.68 in))
 ST18332AA010	18332AA010	OIL FILTER WRENCH	Used for removing and installing the oil filter. (Outer diameter: 65 mm (2.56 in))
 ST-499587100	499587100	OIL SEAL INSTALLER	Used for installing oil pump oil seal.
 ST-499587600	499587600	OIL SEAL GUIDE	Used for installing camshaft oil seal for DOHC engine.

General Description

MECHANICAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499597200	499597200	OIL SEAL GUIDE	- Used for installing camshaft oil seal for DOHC engine. - Used with OIL SEAL GUIDE (499587600).
 ST18482AA010	18482AA010 (Newly adopted tool)	CARTRIDGE	Troubleshooting for electrical systems.
 ST22771AA030	22771AA030	SUBARU SELECT MONITOR KIT	Troubleshooting for electrical systems.

2. GENERAL TOOL

TOOL NAME	REMARKS
Compression gauge	Used for measuring compression.

E: PROCEDURE

It is possible to conduct the following service procedures with engine on the vehicle, however, the procedures described in this section are based on the condition that the engine is removed from the vehicle.

- V-belt
- Timing Belt
- Camshaft
- Cylinder Head

2. Compression

A: INSPECTION

CAUTION:

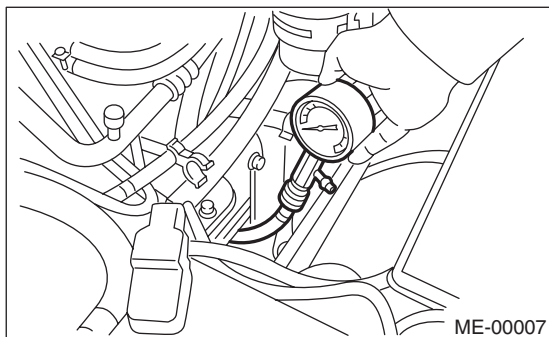
After warming-up, engine becomes very hot. Be careful not to burn yourself during measurement.

- 1) After warming-up the engine, turn the ignition switch to OFF.
- 2) Make sure that the battery is fully charged.
- 3) Release the fuel pressure. <Ref. to FU(STI)-44, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
- 4) Remove all the spark plugs. <Ref. to IG(STI)-4, REMOVAL, Spark Plug.>
- 5) Fully open the throttle valve.
- 6) Check the starter motor for satisfactory performance and operation.
- 7) Fix the compression gauge securely against spark plug hole.

NOTE:

The screw of screw-in type compression gauge (put into cylinder head spark plug hole) should be less than 18 mm (0.71 in) long.

- 8) Crank the engine by means of starter motor, and then read the maximum value on the gauge when the needle of gauge is steady.



- 9) Perform at least two measurements per cylinder, and make sure that the values are correct.

Compression (at 200 — 300 rpm):

Standard:

981 — 1,177 kPa (10 — 12 kgf/cm², 142 — 171 psi)

Limit:

882 kPa (9.0 kgf/cm², 128 psi)

Difference between cylinders

Less than 49 kPa (0.5 kgf/cm², 7 psi)

3. Idle Speed

A: INSPECTION

1) Before checking the idle speed, check the following:

(1) Ensure the air cleaner element is free from clogging, ignition timing is correct, spark plugs are in good condition, and that the hoses are connected properly.

(2) Ensure the malfunction indicator light does not illuminate.

2) Warm-up the engine.

3) Stop the engine, and then turn the ignition switch to OFF.

4) Insert the cartridge to Subaru Select Monitor.

5) Connect the Subaru Select Monitor to data link connector.

6) Turn the ignition switch to ON, and Subaru Select Monitor power switch to ON.

7) Select the {2. Each System Check} in Main Menu.

8) Select the {Engine Control System} in Selection Menu.

9) Select the {1. Current Data Display & Save} in Engine Control System Diagnosis.

10) Select the {1.12 Data Display} in Data Display Menu.

11) Start the engine, and then read the engine idle speed.

12) Check the idle speed when unloaded. (With headlights, heater fan, rear defroster, radiator fan, air conditioning, etc. OFF)

Idle speed [No load and gears in neutral]:

700±100 rpm

13) Check the idle speed when loaded. (Turn the air conditioning switch to “ON” and operate the compressor for at least 1 minute before measurement.)

Idle speed [A/C “ON”, no load and gears in neutral]:

800±100 rpm

NOTE:

As the idle speed is automatically controlled, it can not be adjusted manually. If the idle speed is out of specifications, refer to General On-board Diagnosis Table under “Engine Control System”. <Ref. to EN(STI)(diag)-2, Basic Diagnostic Procedure.>

4. Ignition Timing

A: INSPECTION

CAUTION:

After warming-up, engine becomes very hot. Be careful not to burn yourself during measurement.

- 1) Before checking the ignition timing speed, check the following:
 - (1) Ensure the air cleaner element is free from clogging, spark plugs are in good condition, and that hoses are connected properly.
 - (2) Ensure the malfunction indicator light does not illuminate.
- 2) Warm-up the engine.
- 3) Stop the engine, and then turn the ignition switch to OFF.
- 4) Insert the cartridge to Subaru Select Monitor.
- 5) Connect the Subaru Select Monitor to data link connector.
- 6) Turn the ignition switch to ON, and Subaru Select Monitor power switch to ON.
- 7) Select the {2. Each System Check} in Main Menu.
- 8) Select the {Engine Control System} in Selection Menu.
- 9) Select the {1. Current Data Display & Save} in Engine Control System Diagnosis.
- 10) Select the {1.12 Data Display} in Data Display Menu.
- 11) Start the engine and check the ignition timing at idle speed.

Ignition timing [BTDC/rpm]:

$17^{\circ} \pm 10^{\circ} / 700$

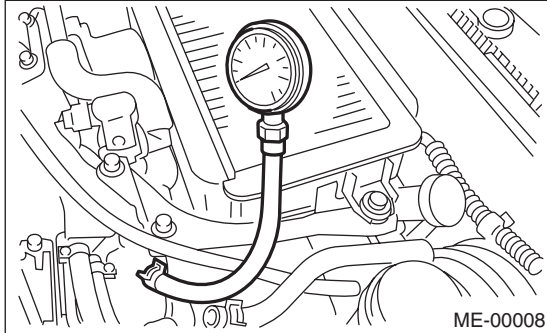
If the timing is not correct, check the ignition control system. Refer to Engine Control System. <Ref. to EN(STI)(diag)-2, Basic Diagnostic Procedure.>

5. Intake Manifold Vacuum

A: INSPECTION

- 1) Warm-up the engine.
- 2) Disconnect the brake vacuum hose from intake manifold, and then install the vacuum gauge.
- 3) Keep the engine at the idle speed, and then read the vacuum gauge indication.

By observing the gauge needle movement, the internal condition of engine can be diagnosed as described below.



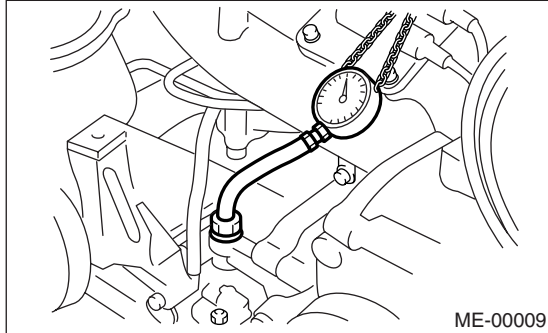
Vacuum pressure (at idling, A/C “OFF”):
Less than -60.0 kPa (-450 mmHg, -17.72 in-Hg)

Diagnosis of engine condition by measurement of manifold vacuum	
Vacuum gauge indication	Possible engine condition
1. Needle is steady but lower than normal position. This tendency becomes more evident as engine temperature rises.	Leakage around intake manifold gasket or disconnection or damaged vacuum hose
2. Needle intermittently drops to position lower than normal position.	Leakage around cylinder
3. Needle drops suddenly and intermittently from normal position.	Sticky valves
4. When engine speed is gradually increased, needle begins to vibrate rapidly at certain speed, and then vibration increases as engine speed increases.	Weak or broken valve springs
5. Needle vibrates above and below normal position in narrow range.	Defective ignition system or throttle chamber idle adjustment

6. Engine Oil Pressure

A: INSPECTION

- 1) Remove the oil pressure switch from engine cylinder block. <Ref. to LU(STI)-18, REMOVAL, Oil Pressure Switch.>
- 2) Connect the oil pressure gauge hose to cylinder block.
- 3) Connect the battery ground cable to battery.
- 4) Start the engine, and then measure the oil pressure.



Oil pressure:

98 kPa (1.0 kgf/cm², 14 psi) or more at 600 rpm

294 kPa (3.0 kgf/cm², 43 psi) or more at 5,000 rpm

CAUTION:

- If the oil pressure is out of specification, check oil pump, oil filter and lubrication line. <Ref. to LU(STI)-21, INSPECTION, Engine Lubrication System Trouble in General.>
- If the oil pressure warning light is turned ON and oil pressure is in specification, replace the oil pressure switch. <Ref. to LU(STI)-21, INSPECTION, Engine Lubrication System Trouble in General.>

NOTE:

The specified data is based on an engine oil temperature of 80°C (176°F).

- 5) After measuring the oil pressure, install the oil pressure switch. <Ref. to LU(STI)-18, INSTALLATION, Oil Pressure Switch.>

Tightening torque:

25 N·m (2.5 kgf-m, 18.4 ft-lb)

7. Fuel Pressure

A: INSPECTION

CAUTION:

Before removing the fuel pressure gauge, release the fuel pressure.

NOTE:

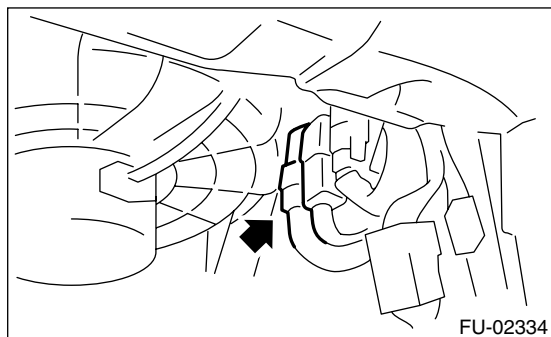
If out of specification, check or replace the pressure regulator and pressure regulator vacuum hose.

1) Release the fuel pressure. <Ref. to FU(STI)-44, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>

2) Open the fuel filler flap lid, and then remove the fuel filler cap.

3) Disconnect the fuel delivery hoses, and then connect the fuel pressure gauge.

4) Connect the connector of fuel pump relay.

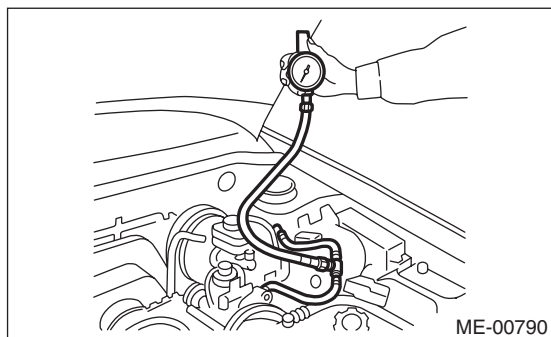


5) Start the engine.

6) Measure the fuel pressure while disconnecting the pressure regulator vacuum hose from intake manifold.

Fuel pressure:

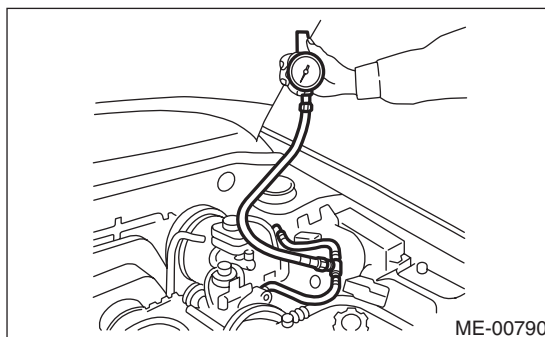
Standard: 284 — 314 kPa (2.9 — 3.2 kgf/cm², 41 — 46 psi)



7) After connecting the pressure regulator vacuum hose, measure the fuel pressure.

Fuel pressure:

Standard: 230 — 260 kPa (2.35 — 2.65 kgf/cm², 33 — 38 psi)



NOTE:

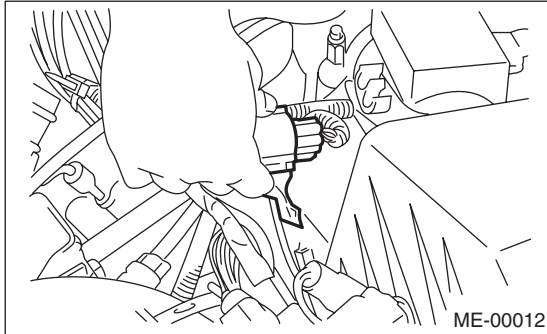
The fuel pressure gauge registers 10 to 20 kPa (0.1 to 0.2 kgf/cm², 1 to 3 psi) higher than standard values during high-altitude operations.

8. Valve Clearance

A: INSPECTION

Inspection and adjustment of the valve clearance should be performed while engine is cold.

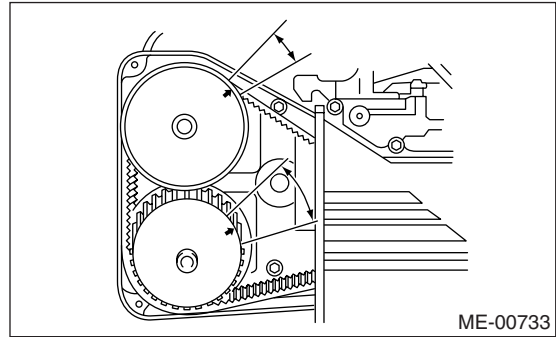
- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from battery.
- 3) Remove the air intake duct. <Ref. to IN(H4DOTC)-9, REMOVAL, Air Intake Duct.>
- 4) Remove the bolts which secure the timing belt cover (RH).
- 5) Lift-up the vehicle.
- 6) Remove the under cover.
- 7) Loosen the remaining bolts which secure the timing belt cover (RH), and then remove the timing belt cover.
- 8) Lower the vehicle.
- 9) When inspecting the #1 and #3 cylinders:
 - (1) Pull out the engine harness connector with bracket from air cleaner upper cover.



- (2) Remove the air cleaner case. <Ref. to IN(H4DOTC)-8, REMOVAL, Air Cleaner Case.>
- (3) Disconnect the ignition coil connector.
- (4) Remove the ignition coil.
- (5) Place a suitable container under the vehicle.
- (6) Disconnect the PCV hose from rocker cover (RH).
- (7) Remove the bolts, and then remove the rocker cover (RH).
- 10) When inspecting the #2 and #4 cylinders:
 - (1) Disconnect the battery cable, and then remove the battery and battery carrier.
 - (2) Disconnect the ignition coil connector.
 - (3) Remove the ignition coil.
 - (4) Place a suitable container under the vehicle.
 - (5) Disconnect the PCV hose from rocker cover (LH).
 - (6) Remove the bolts, and then remove the rocker cover (LH).
- 11) Turn the crank pulley clockwise until arrow mark on the cam sprocket is set to position shown in the figure.

NOTE:

Turn the crankshaft using socket wrench.



- 12) Measure the #1 cylinder intake valve and #3 cylinder exhaust valve clearance by using thickness gauge (A).

NOTE:

- Insert the thickness gauge (A) as horizontally as possible with respect to the shim.
- Measure the exhaust valve clearances while lifting-up the vehicle.

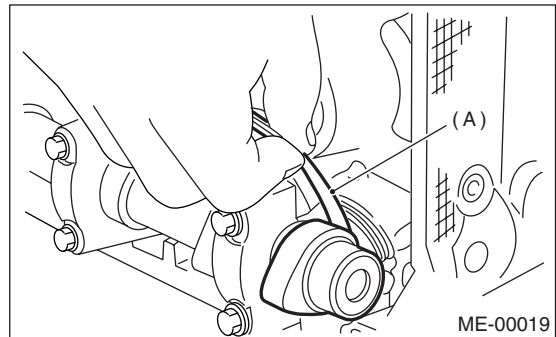
Valve clearance:

Intake: 0.20 ± 0.02 mm (0.0079 ± 0.0008 in)

Exhaust: 0.35 ± 0.02 mm (0.0138 ± 0.0008 in)

NOTE:

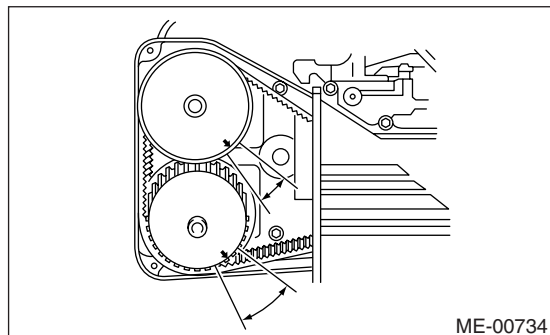
If the measured value is not within specification, take notes of the value in order to adjust the valve clearance later on.



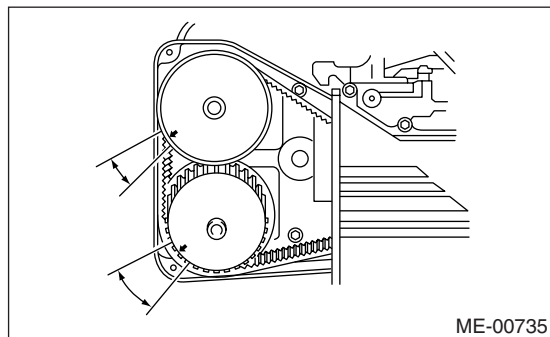
- 13) If necessary, adjust the valve clearance. <Ref. to ME(STI)-28, ADJUSTMENT, Valve Clearance.>
- 14) Further turn the crank pulley clockwise. Using the same procedures described previously, measure the valve clearances again.

Valve Clearance

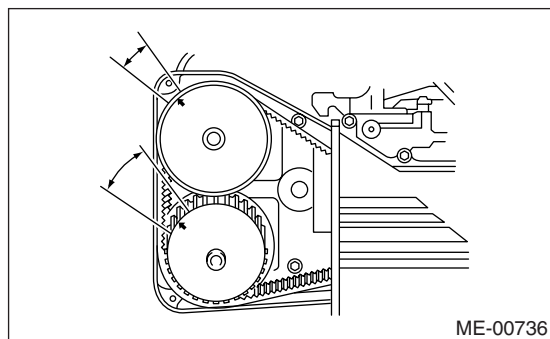
- (1) Set the arrow mark on cam sprocket to position shown in the figure, and then measure the #2 cylinder exhaust valve and #3 cylinder intake valve clearances.



- (2) Set the arrow mark on cam sprocket to position shown in the figure, and then measure the #2 cylinder intake valve and #4 cylinder exhaust valve clearances.

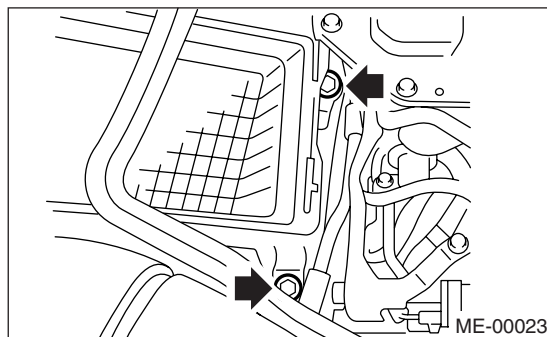


- (3) Set the arrow mark on cam sprocket to position shown in the figure, and then measure the #1 cylinder exhaust valve and #4 cylinder intake valve clearances.



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

Tightening torque:
33 N·m (3.4 kgf-m, 25 ft-lb)



B: ADJUSTMENT

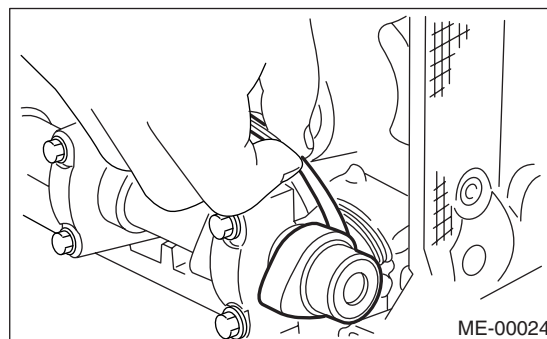
CAUTION:

Adjustment of the valve clearance should be performed while engine is cold.

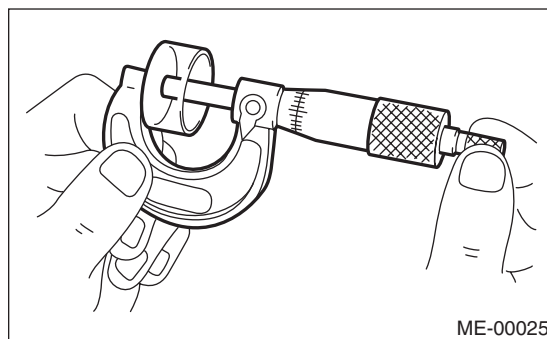
- 1) Measure all valve clearances. <Ref. to ME(STI)-27, INSPECTION, Valve Clearance.>

NOTE:

Record each valve clearance after it has been measured.



- 2) Remove the camshaft. <Ref. to ME(STI)-54, REMOVAL, Camshaft.>
 3) Remove the valve lifter.
 4) Measure the thickness of valve lifter with a micrometer.



- 5) Select a valve lifter of suitable thickness using measured valve clearance and valve lifter thickness, by referring to the following table.

Valve Clearance

MECHANICAL

Unit: mm
Intake valve: $S = (V + T) - 0.20$
Exhaust valve: $S = (V + T) - 0.35$
S: Required thickness of valve lifter
V: Measured valve clearance
T: Used valve lifter thickness

Part No.	Thickness mm (in)
13228 AB102	4.68 (0.1843)
13228 AB112	4.69 (0.1846)
13228 AB122	4.70 (0.1850)
13228 AB132	4.71 (0.1854)
13228 AB142	4.72 (0.1858)
13228 AB152	4.73 (0.1862)
13228 AB162	4.74 (0.1866)
13228 AB172	4.75 (0.1870)
13228 AB182	4.76 (0.1874)
13228 AB192	4.77 (0.1878)
13228 AB202	4.78 (0.1882)
13228 AB212	4.79 (0.1886)
13228 AB222	4.80 (0.1890)
13228 AB232	4.81 (0.1894)
13228 AB242	4.82 (0.1898)
13228 AB252	4.83 (0.1902)
13228 AB262	4.84 (0.1906)
13228 AB272	4.85 (0.1909)
13228 AB282	4.86 (0.1913)
13228 AB292	4.87 (0.1917)
13228 AB302	4.88 (0.1921)
13228 AB312	4.89 (0.1925)
13228 AB322	4.90 (0.1929)
13228 AB332	4.91 (0.1933)
13228 AB342	4.92 (0.1937)
13228 AB352	4.93 (0.1941)
13228 AB362	4.94 (0.1945)
13228 AB372	4.95 (0.1949)
13228 AB382	4.96 (0.1953)
13228 AB392	4.97 (0.1957)
13228 AB402	4.98 (0.1961)
13228 AB412	4.99 (0.1965)
13228 AB422	5.00 (0.1969)
13228 AB432	5.01 (0.1972)
13228 AB442	5.02 (0.1976)
13228 AB452	5.03 (0.1980)
13228 AB462	5.04 (0.1984)
13228 AB472	5.05 (0.1988)
13228 AB482	5.06 (0.1992)
13228 AB492	5.07 (0.1996)
13228 AB502	5.08 (0.2000)
13228 AB512	5.09 (0.2004)
13228 AB522	5.10 (0.2008)
13228 AB532	5.11 (0.2012)

Part No.	Thickness mm (in)
13228 AB542	5.12 (0.2016)
13228 AB552	5.13 (0.2020)
13228 AB562	5.14 (0.2024)
13228 AB572	5.15 (0.2028)
13228 AB582	5.16 (0.2031)
13228 AB592	5.17 (0.2035)
13228 AB602	5.18 (0.2039)
13228 AB612	5.19 (0.2043)
13228 AB622	5.20 (0.2047)
13228 AB632	5.21 (0.2051)
13228 AB642	5.22 (0.2055)
13228 AB652	5.23 (0.2059)
13228 AB662	5.24 (0.2063)
13228 AB672	5.25 (0.2067)
13228 AB682	5.26 (0.2071)
13228 AB692	5.27 (0.2075)
13228 AB702	4.38 (0.1724)
13228 AB712	4.40 (0.1732)
13228 AB722	4.42 (0.1740)
13228 AB732	4.44 (0.1748)
13228 AB742	4.46 (0.1756)
13228 AB752	4.48 (0.1764)
13228 AB762	4.50 (0.1771)
13228 AB772	4.52 (0.1780)
13228 AB782	4.54 (0.1787)
13228 AB792	4.56 (0.1795)
13228 AB802	4.58 (0.1803)
13228 AB812	4.60 (0.1811)
13228 AB822	4.62 (0.1819)
13228 AB832	4.64 (0.1827)
13228 AB842	4.66 (0.1835)
13228 AB852	5.29 (0.2083)
13228 AB862	5.31 (0.2091)
13228 AB872	5.33 (0.2098)
13228 AB882	5.35 (0.2106)
13228 AB892	5.37 (0.2114)
13228 AB902	5.39 (0.2122)
13228 AB912	5.41 (0.2123)
13228 AB922	5.43 (0.2138)
13228 AB932	5.45 (0.2146)
13228 AB942	5.47 (0.2154)
13228 AB952	5.49 (0.2161)
13228 AB962	5.51 (0.2169)
13228 AB972	5.53 (0.2177)
13228 AB982	5.55 (0.2185)
13228 AB992	5.57 (0.2193)
13228 AC002	5.59 (0.2201)
13228 AC012	5.61 (0.2209)
13228 AC022	5.63 (0.2217)
13228 AC032	5.65 (0.2224)

Valve Clearance

MECHANICAL

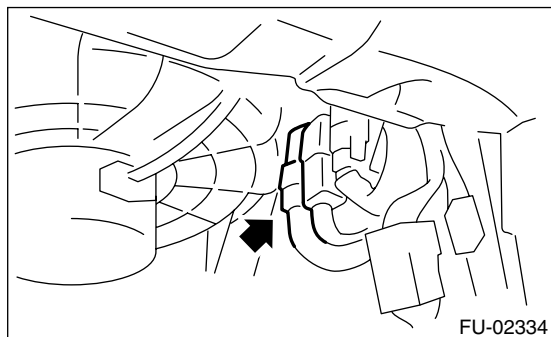
- 6) Inspect all valves for clearance again at this stage. If the valve clearance is not correct, repeat the procedure over again from the first step.
- 7) After inspection, install the related parts in the reverse order of removal.

9. Engine Assembly

A: REMOVAL

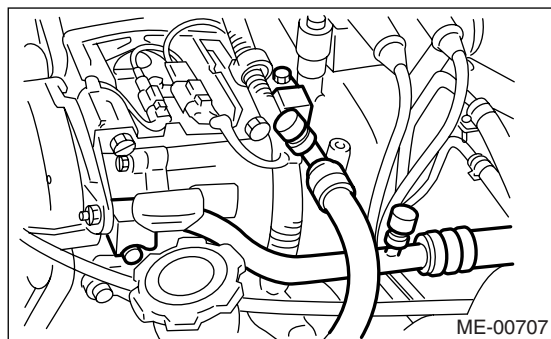
- 1) Set the vehicle on a lift.
- 2) Open the front hood fully, and then support with the hood stay.
- 3) Collect the refrigerant from A/C system.
- 4) Release the fuel pressure.

- (1) Disconnect the fuel pump relay connector.



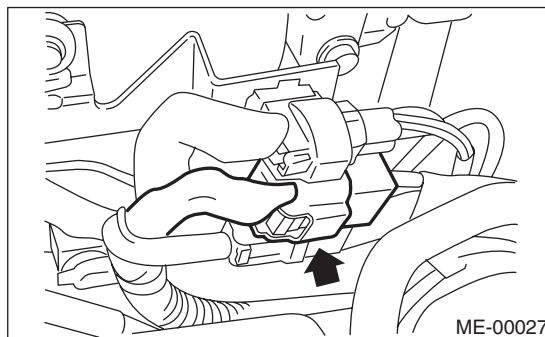
- (2) Start the engine, and run until it stalls.
- (3) After the engine stalls, crank it for 5 seconds more.
- (4) Turn the ignition switch to OFF.

- 5) Remove the fuel filler cap.
- 6) Disconnect the ground cable from battery.
- 7) Remove the radiator from vehicle. <Ref. to CO(H4DOTC)-23, REMOVAL, Radiator.>
- 8) Remove the coolant filler tank. <Ref. to CO(H4DOTC)-33, REMOVAL, Coolant Filler Tank.>
- 9) Disconnect the A/C pressure hoses from A/C compressor.

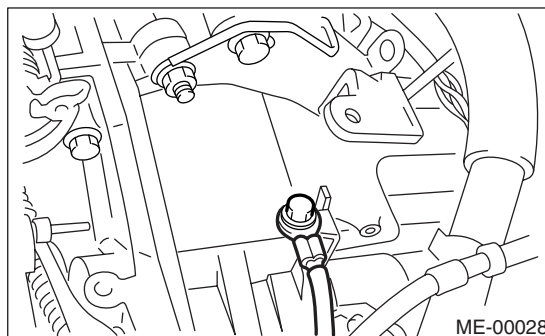


- 10) Remove the intercooler. <Ref. to IN(STI)-11, REMOVAL, Intercooler.>
- 11) Disconnect the following connectors and cable.

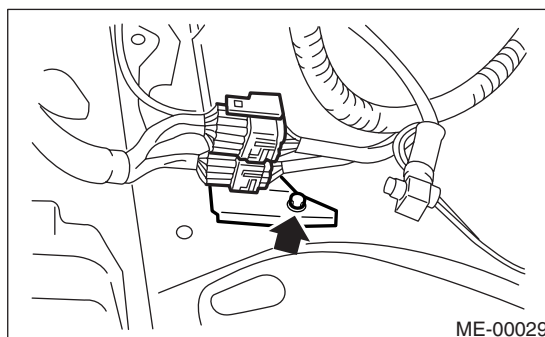
- (1) Engine harness connector



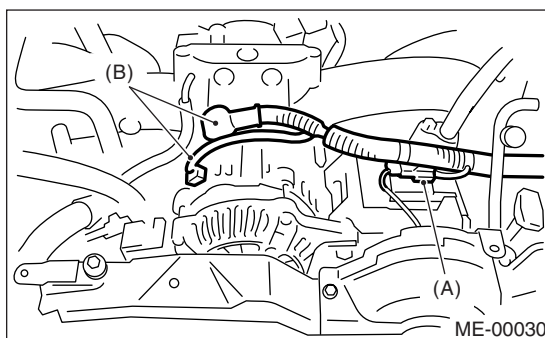
- (2) Engine ground terminal



- (3) Engine harness connector



- (4) Generator connector, terminal and A/C compressor connectors

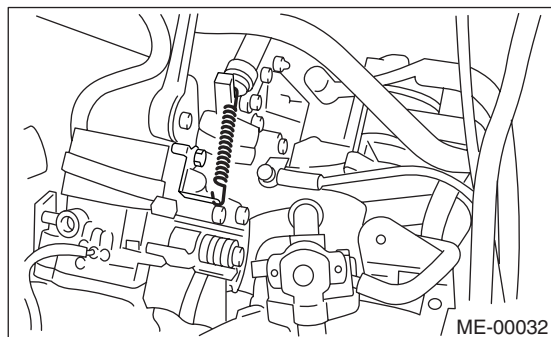


- (A) A/C compressor connector
- (B) Generator connector and terminal

Engine Assembly

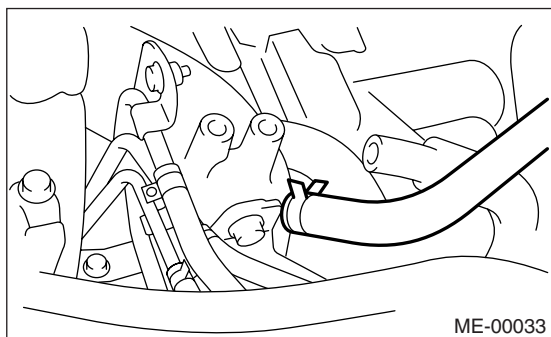
MECHANICAL

(5) Clutch release spring



12) Disconnect the following hoses.

(1) Brake booster vacuum hose

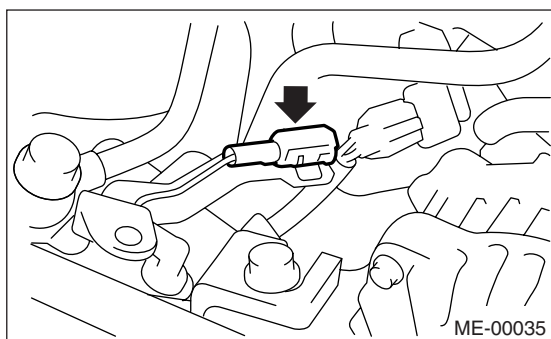


(2) Heater inlet outlet hose

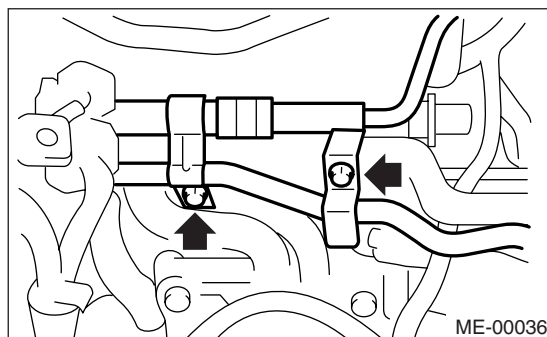
13) Remove the power steering pump from bracket.

(1) Loosen the lock bolt and slider bolt, and then remove the front side V-belt. <Ref. to ME(STI)-40, FRONT SIDE BELT, REMOVAL, V-belt.>

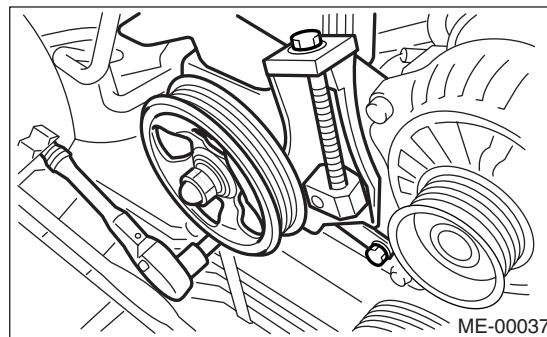
(2) Disconnect the power steering switch connector.



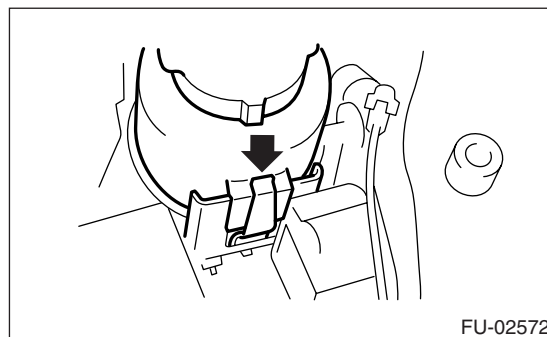
(3) Remove the pipe with bracket from intake manifold.



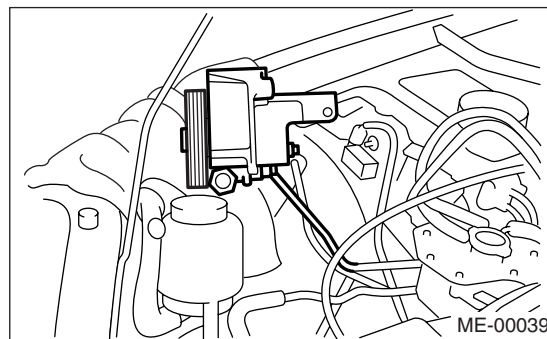
(4) Remove the power steering pump from engine.



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



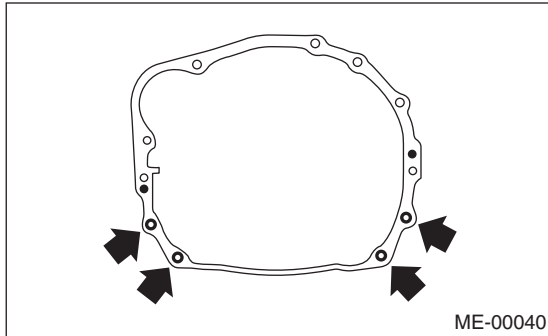
(6) Place the power steering pump on right side wheel apron.



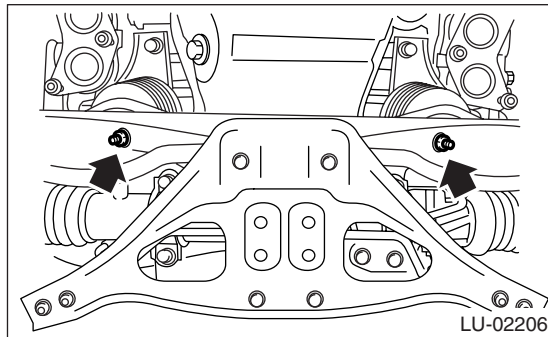
14) Lift-up the vehicle.

15) Remove the center exhaust pipe. <Ref. to EX(H4DOTC)-10, REMOVAL, Center Exhaust Pipe.>

16) Remove the nuts which hold the lower side of transmission to engine.



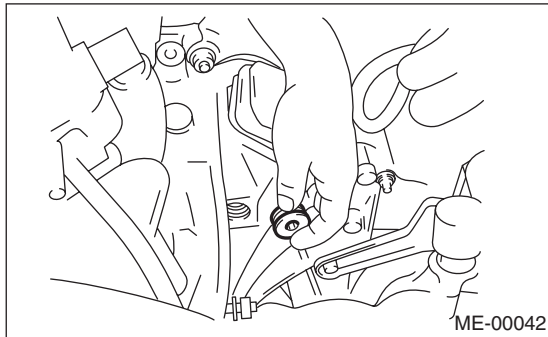
17) Remove the nuts which install the front cushion rubber onto front crossmember.



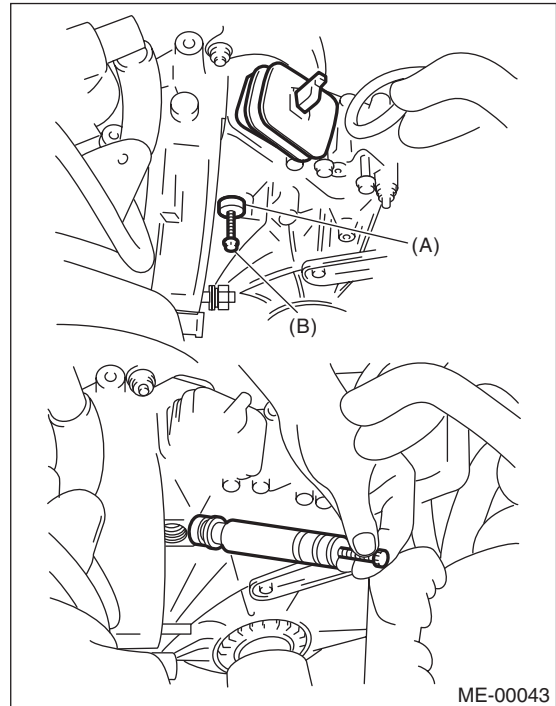
18) Lower the vehicle.

19) Separate the clutch release fork from release bearing.

- (1) Remove the clutch operating cylinder from transmission.
- (2) Remove the plug using a 10 mm hexagon wrench.



(3) Screw the 6 mm dia. bolt into release fork shaft, and remove it.



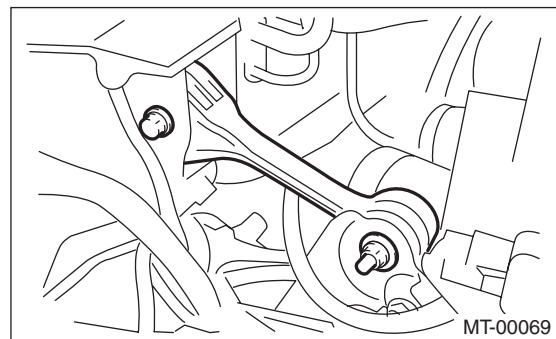
- (A) Shaft
(B) Bolt

(4) Raise the release fork, and then unfasten the release bearing tabs to free release fork.

NOTE:

Step (4) is required to prevent interference with engine when removing the engine from transmission.

20) Remove the pitching stopper.



21) Disconnect the fuel delivery hose (A), return hose (B) and evaporation hose (C).

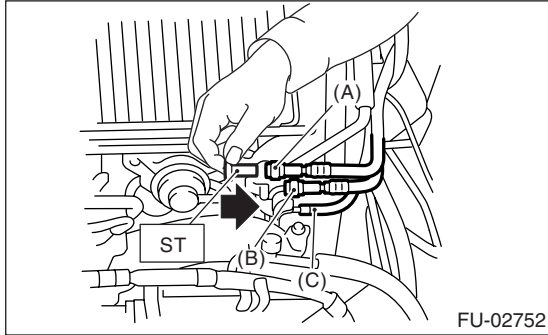
NOTE:

- Catch fuel from the hose into container.
- Disconnect the hose with its end wrapped with cloth to prevent fuel from splashing.

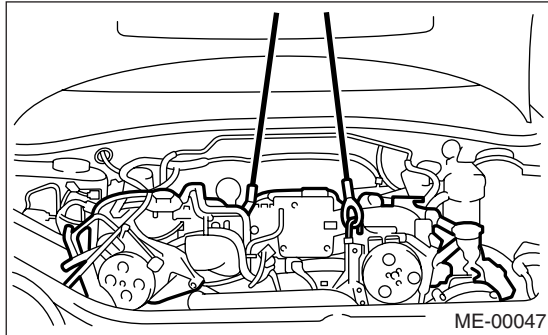
Engine Assembly

MECHANICAL

ST 42099AE000 CONNECTOR REMOVER



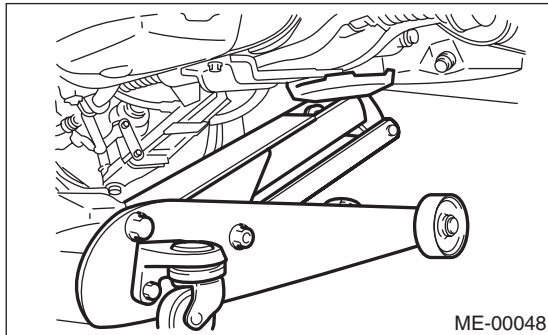
22) Support the engine with a lifting device and wire ropes.



23) Support the transmission with a garage jack.

CAUTION:

Doing this is very important in order to facilitate re-installation and because transmission lowers under its own weight.

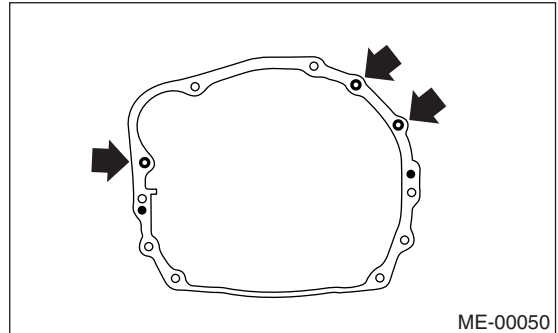


CAUTION:

Before removing the engine away from transmission, check to be sure no work has been overlooked.

24) Separation of the engine and transmission

- (1) Remove the starter. <Ref. to SC(H4SO)-8, REMOVAL, Starter.>
- (2) Remove the bolts which hold the right upper side of transmission to engine.



25) Remove the engine from vehicle.

- (1) Slightly raise the engine.
- (2) Raise the transmission with garage jack.
- (3) Move the engine horizontally until the main-shaft is withdrawn from clutch cover.
- (4) Slowly move the engine away from engine compartment.

NOTE:

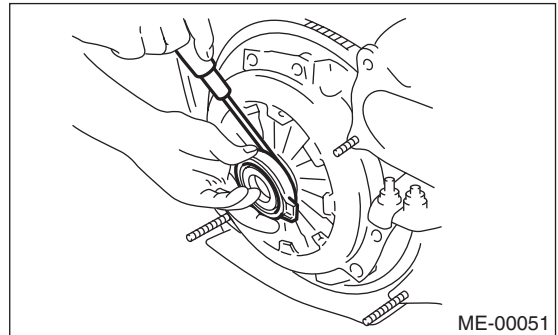
Be careful not to damage adjacent parts or body panels with crank pulley, oil pressure gauge, etc.

26) Remove the front cushion rubbers.

B: INSTALLATION

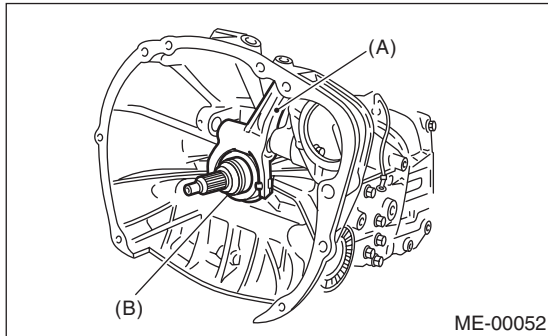
1) Install the clutch release fork and bearing onto transmission.

- (1) Remove the release bearing from clutch cover with flat-tip screwdriver.



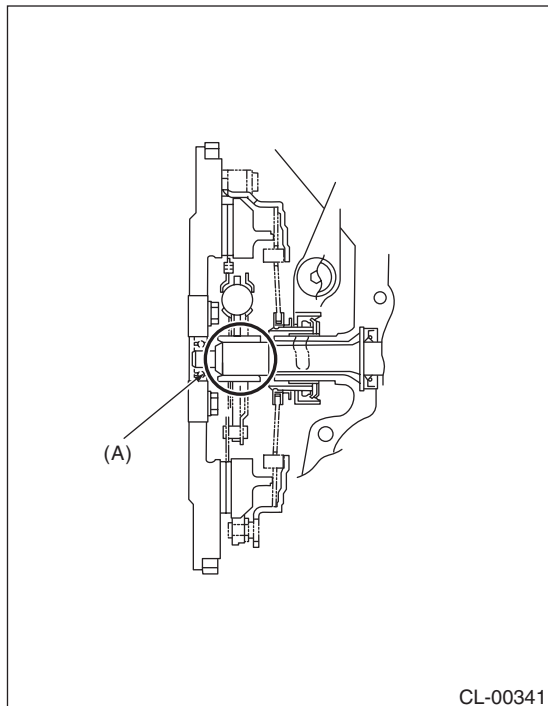
- (2) Install the release bearing on transmission.

- (3) Install the release fork into release bearing tab.



- (A) Release fork
(B) Release bearing

- (4) Apply grease to the specified points.
• Spline NICHIMOLY 130

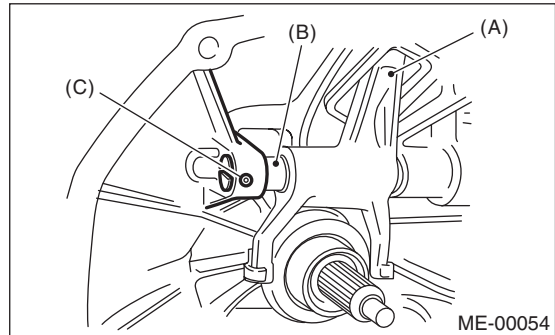


- (A) Spline

- (5) Insert the release fork shaft into release fork.

CAUTION:

Make sure the cutout portion of release fork shaft contacts spring pin.

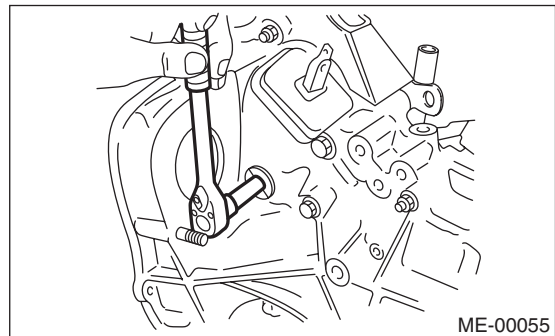


- (A) Release fork
(B) Release shaft
(C) Spring pin

- (6) Tighten the plug.

Tightening torque:

44 N·m (4.5 kgf-m, 33.5 ft-lb)



- 2) Install the front cushion rubbers to engine.

Tightening torque:

35 N·m (3.6 kgf-m, 25.8 ft-lb)

- 3) Install the engine onto transmission.

- (1) Position the engine in engine compartment, and then align it with the transmission.

NOTE:

Be careful not to damage the adjacent parts or body panels with crank pulley, oil pressure gauge, etc.

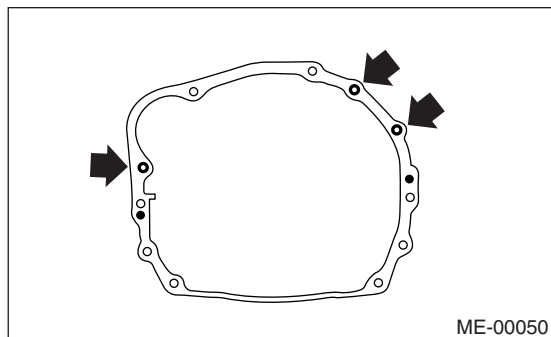
- (2) Apply a small amount of grease to the splines of mainshaft.

- 4) Tighten the bolts which hold the upper side of transmission to engine.

Engine Assembly

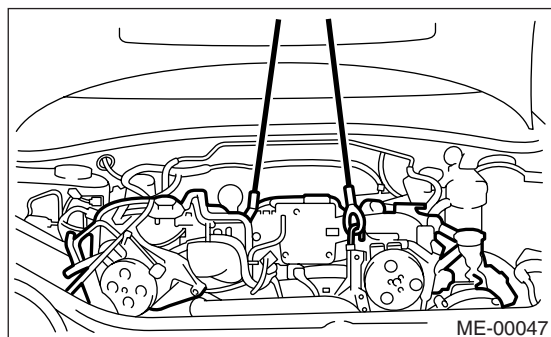
Tightening torque:

50 N·m (5.1 kgf-m, 36.9 ft-lb)



ME-00050

5) Remove the lifting device and wire ropes.



ME-00047

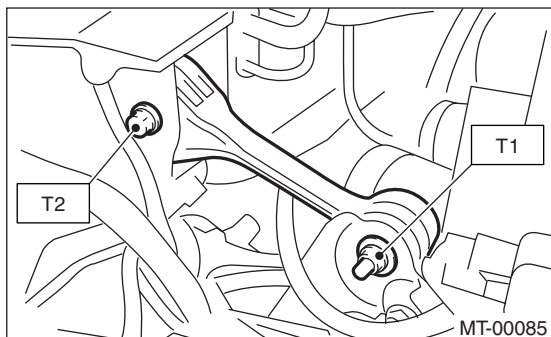
6) Remove the garage jack.

7) Install the pitching stopper.

Tightening torque:

T1: 50 N·m (5.1 kgf-m, 36.9 ft-lb)

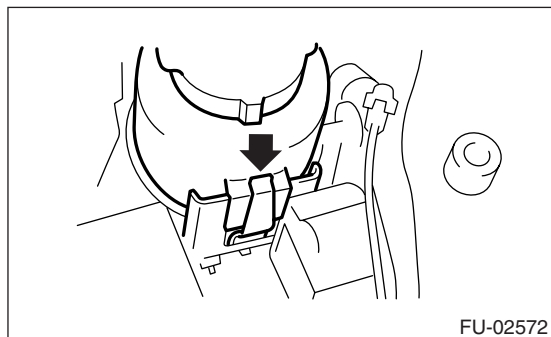
T2: 58 N·m (5.9 kgf-m, 42.8 ft-lb)



MT-00085

8) Install the power steering pump on bracket.

(1) Install the power steering tank on bracket.

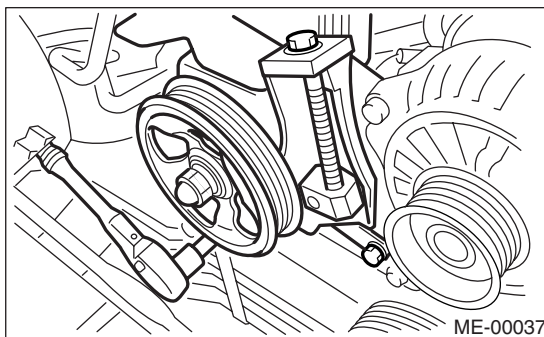


FU-02572

(2) Install the power steering pump.

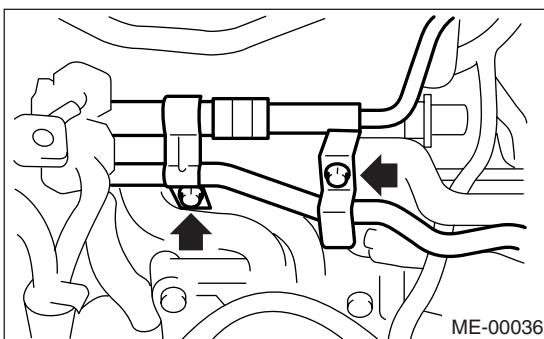
Tightening torque:

20 N·m (2.0 kgf-m, 14.5 ft-lb)



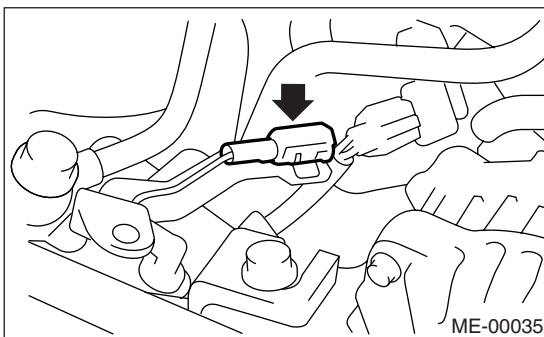
ME-00037

(3) Install the power steering pipe bracket on intake manifold RH.



ME-00036

(4) Connect the power steering switch connector.



ME-00035

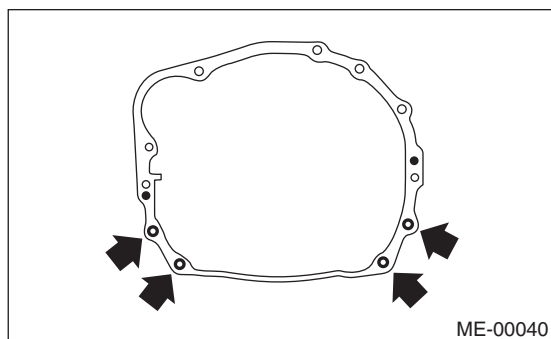
(5) Install the front side V-belt, and adjust it.
<Ref. to ME(STI)-40, FRONT SIDE BELT, INSTALLATION, V-belt.>

9) Lift-up the vehicle.

10) Tighten the nuts which hold the lower side of transmission to engine.

Tightening torque:

50 N·m (5.1 kgf-m, 36.9 ft-lb)



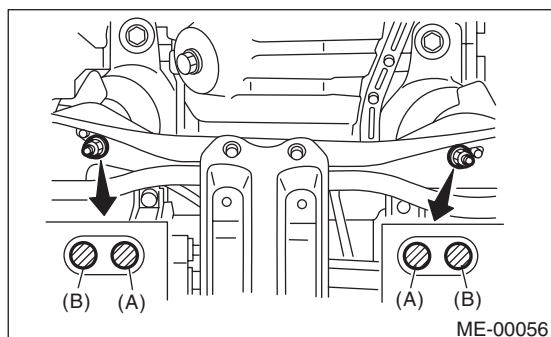
11) Tighten the nuts which install the front cushion rubber onto crossmember.

Tightening torque:

85 N·m (8.7 kgf-m, 62.7 ft-lb)

NOTE:

Make sure the front cushion rubber mounting bolts (A) and locator (B) are securely installed.



12) Install the center exhaust pipe.

<Ref. to EX(H4DOTC)-11, INSTALLATION, Center Exhaust Pipe.>

13) Lower the vehicle.

14) Connect the following hoses:

- (1) Fuel delivery hose, return hose and evaporation hose
- (2) Heater inlet and outlet hoses
- (3) Brake booster vacuum hose

15) Connect the following connectors and terminals:

- (1) Engine ground terminal
- (2) Engine harness connectors
- (3) Generator connector and terminal
- (4) A/C compressor connectors

16) Install the air intake system.

- (1) Install the intercooler. <Ref. to IN(STI)-11, INSTALLATION, Intercooler.>
- (2) Install the air cleaner element and air cleaner upper cover.
- (3) Install the engine harness connector bracket.
- (4) Install the filler hose to air cleaner case.

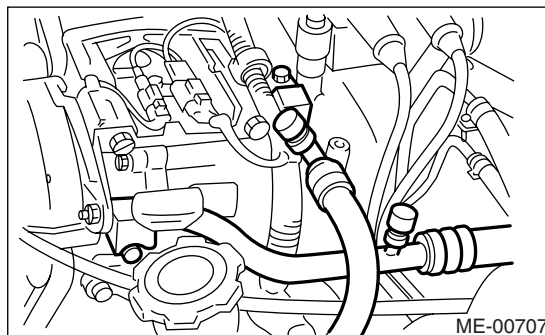
17) Install the A/C pressure hoses.

NOTE:

Use new O-rings.

Tightening torque:

25 N·m (2.5 kgf-m, 18.4 ft-lb)



18) Install the radiator. <Ref. to CO(H4DOTC)-24, INSTALLATION, Radiator.>

19) Install the coolant filler tank. <Ref. to CO(H4DOTC)-33, INSTALLATION, Coolant Filler Tank.>

20) Install the window washer tank.

21) Install the battery in the vehicle, and then connect the cables.

22) Fill coolant.

<Ref. to CO(H4DOTC)-17, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

23) Charge the A/C system with refrigerant.

<Ref. to AC-21, PROCEDURE, Refrigerant Charging Procedure.>

24) Remove the front hood stay, and close the front hood.

25) Take off the vehicle from lift arms.

C: INSPECTION

1) Check that the pipes and hoses are installed firmly.

2) Check that the engine coolant is at specified level.

10.Engine Mounting

A: REMOVAL

- 1) Remove the engine assembly. <Ref. to ME(STI)-31, REMOVAL, Engine Assembly.>
- 2) Remove the engine mounting from engine assembly.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

Engine mounting;

35 N·m (3.6 kgf-m, 25.8 ft-lb)

C: INSPECTION

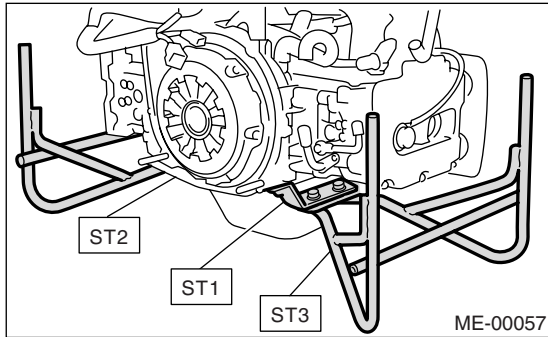
Make sure there are no cracks or other damage.

11.Preparation for Overhaul

A: PROCEDURE

1) After removing the engine from body, secure it in the STs shown below.

ST1	498457000	ENGINE STAND ADAPTER RH
ST2	498457100	ENGINE STAND ADAPTER LH
ST3	499817000	ENGINE STAND



2) In this section the procedures described under each index are all connected and stated in order. It will be the complete procedure for overhauling of the engine itself when you go through all steps in the process.

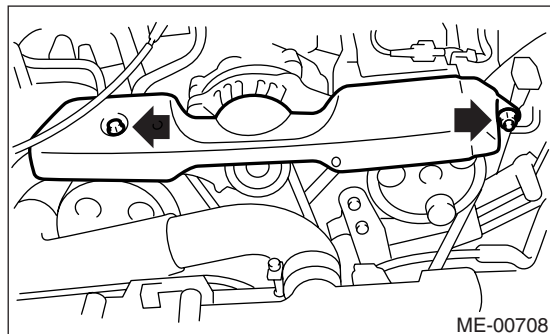
Therefore, in this section, to conduct the particular procedure within the flow of a section, you need to go back and conduct the procedure described previously in order to do that particular procedure.

12.V-belt

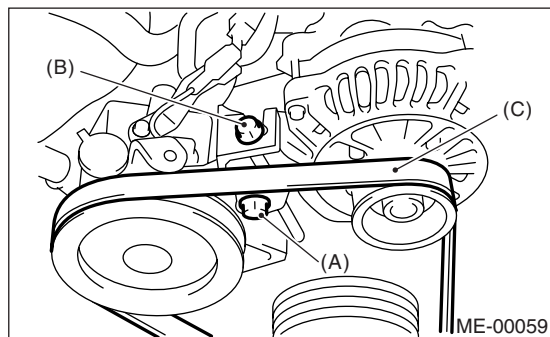
A: REMOVAL

1. FRONT SIDE BELT

- 1) Remove the V-belt cover.

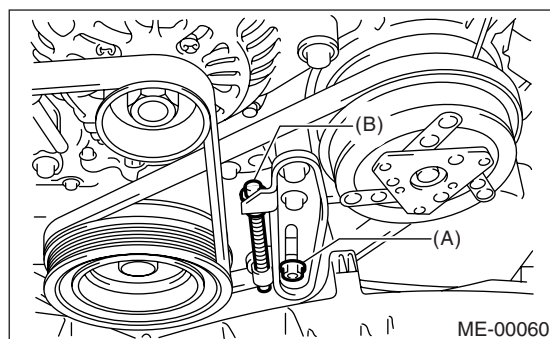


- 2) Loosen the lock bolt (A).
- 3) Loosen the slider bolt (B).
- 4) Remove the front side belt (C).



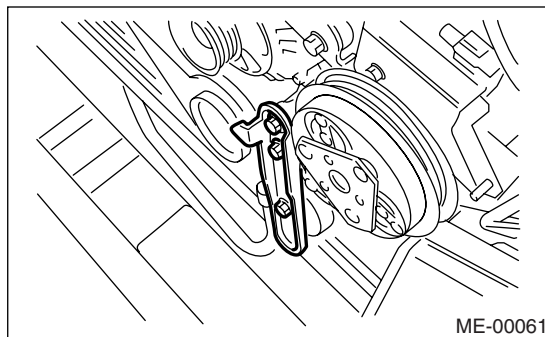
2. REAR SIDE BELT

- 1) Loosen the lock nut (A).
- 2) Loosen the slider bolt (B).



- 3) Remove the A/C belt.

- 4) Remove the A/C belt tensioner.



B: INSTALLATION

NOTE:

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

1. FRONT SIDE BELT

- 1) Install the belt (C), and tighten the slider bolt so as to obtain the specified belt tension <Ref. to ME(STI)-41, INSPECTION, V-belt.>
- 2) Tighten the lock bolt (A).
- 3) Tighten the slider bolt (B).

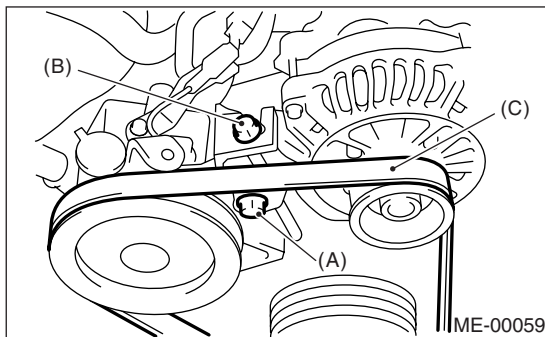
Tightening torque:

Lock bolt through bolt:

25 N·m (2.5 kgf-m, 18.4 ft-lb)

Slider bolt:

8 N·m (0.8 kgf-m, 5.9 ft-lb)



- 4) Idle the engine for approx. 5 min. to normalize the V-belt. (With using tension gauge)
- 5) Stop the engine, and then check the belt tension and adjust it. (With using tension gauge)
- 6) Idle the engine for approx. 1 min. to normalize the V-belt. (With using tension gauge)
- 7) Stop the engine, and then check that the belt tension is within specified value. (With using tension gauge)
- 8) Adjust the belt tension within the specification. (With using tension gauge)

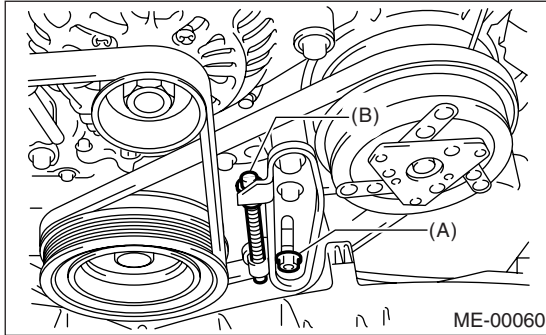
2. REAR SIDE BELT

- 1) Install the belt, and tighten the slider bolt (B) so as to obtain the specified belt tension. <Ref. to ME(STI)-41, INSPECTION, V-belt.>
- 2) Tighten the lock nut (A).

Tightening torque:

Lock nut (A):

23 N·m (2.3 kgf-m, 17.0 ft-lb)



- 3) Idle the engine for approx. 5 min. to normalize the V-belt. (With using tension gauge)
- 4) Stop the engine, and then check the belt tension and adjust it. (With using tension gauge)
- 5) Idle the engine for approx. 1 min. to normalize the V-belt. (With using tension gauge)
- 6) Stop the engine, and then check the belt tension is within specified value. (With using tension gauge)
- 7) Adjust the belt tension within the specification. (With using tension gauge)

C: INSPECTION

- 1) Replace the belts, if cracks, fraying or wear are found.
- 2) Check the V-belt tension and adjust it if necessary by changing generator installing position and/or idler pulley installing position.

Belt tension (without using belt tension gauge)

(A)

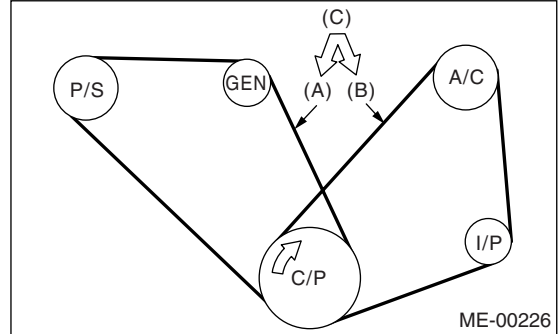
replaced: 7 — 9 mm (0.276 — 0.354 in)

reused: 9 — 11 mm (0.354 — 0.433 in)

(B)

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

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



(A) Front side belt

(B) Rear side belt

(C) 98 N (10 kgf, 22 lbf)

C/P Crank pulley

GEN Generator

P/S Power steering oil pump pulley

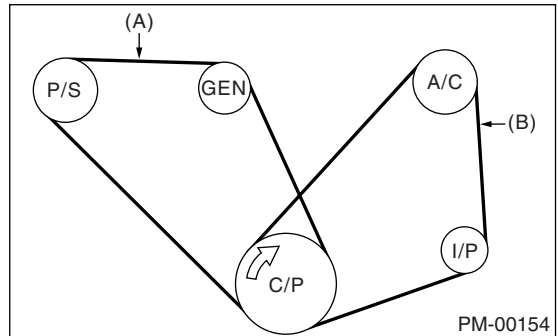
A/C Air conditioning compressor pulley

I/P Idler pulley

Belt tension (with using belt tension gauge)

(A) 490 — 640 N (50 — 65 kgf, 110 — 144 lbf)

(B) 350 — 450 N (36 — 46 kgf, 79 — 101 lbf)



(A) Front side belt

(B) Rear side belt

C/P Crank pulley

GEN Generator

P/S Power steering oil pump pulley

A/C A/C compressor pulley

I/P Idler pulley

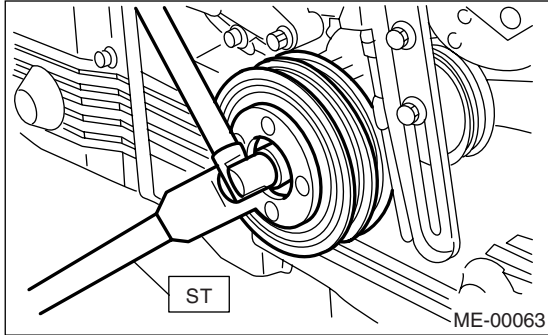
13.Crank Pulley

A: REMOVAL

1) Remove the V-belt. <Ref. to ME(STI)-40, REMOVAL, V-belt.>

2) Remove the crank pulley bolt. To lock the crankshaft, use ST.

ST 499977100 CRANK PULLEY WRENCH



3) Remove the crank pulley.

B: INSTALLATION

1) Install the crank pulley.

2) Install the pulley bolt.

To lock the crankshaft, use ST.

ST 499977100 CRANK PULLEY WRENCH

(1) Clean the crank pulley thread using an compressed air.

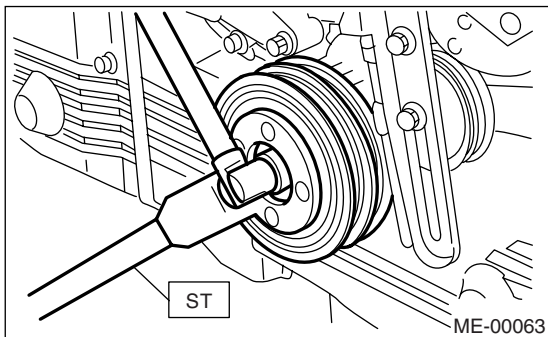
(2) Apply engine oil to the crank pulley bolt seat and thread.

(3) Tighten the bolts temporarily with tightening torque of 44 N·m (4.5 kgf·m, 33 ft-lb).

(4) Tighten the crank pulley bolts.

Tightening torque:

180 N·m (18.4 kgf·m, 132.8 ft-lb)



3) Confirm that the tightening angle of crank pulley bolt is 65 degrees or more. If the tightening angle of crank pulley bolt is less than 65 degrees, conduct the following procedures.

CAUTION:

If the tightening angle of crank pulley bolt is less than 65 degrees, the bolt should be damaged. In this case, the bolt must be replaced.

(1) Replace the crank pulley bolts and clean them.

Crank pulley bolt:

Part No. 12369AA011

(2) Clean the crankshaft thread using an compressed air.

(3) Apply engine oil to the crank pulley bolt seat and thread.

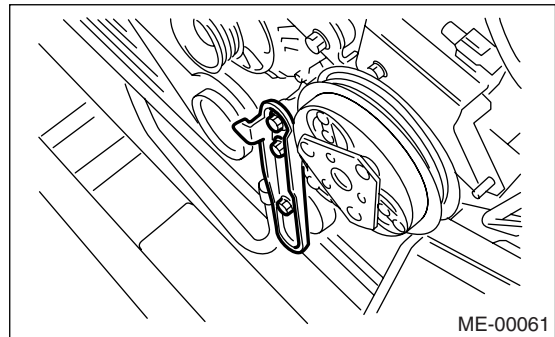
(4) Tighten the bolts temporarily with tightening torque of 44 N·m (4.5 kgf·m, 33 ft-lb).

(5) Tighten the crank pulley bolts keeping them in an angle between 65 degrees and 75 degrees.

NOTE:

Conduct the tightening procedures by confirming the turning angle of crank pulley bolt referring to the gauge indicated on timing belt cover.

4) Install the A/C belt tensioner.



5) Install the V-belt. <Ref. to ME(STI)-40, INSTALLATION, V-belt.>

C: INSPECTION

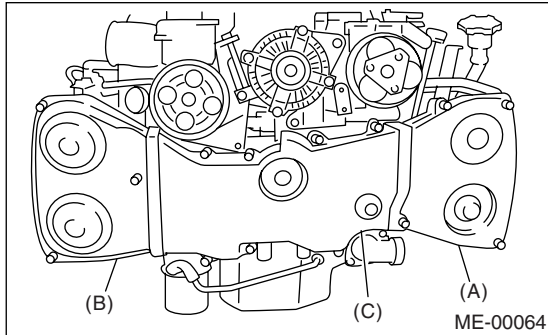
1) Make sure the V-belt is not worn or otherwise damaged.

2) Check the tension of the belt. <Ref. to ME(STI)-41, INSPECTION, V-belt.>

14. Timing Belt Cover

A: REMOVAL

- 1) Remove the V-belt. <Ref. to ME(STI)-40, REMOVAL, V-belt.>
- 2) Remove the crank pulley. <Ref. to ME(STI)-42, REMOVAL, Crank Pulley.>
- 3) Remove the timing belt cover (LH) (A).
- 4) Remove the timing belt cover (RH) (B).
- 5) Remove the front timing belt cover (C).



B: INSTALLATION

- 1) Install the front timing belt cover (C).

Tightening torque:

5 N·m (0.5 kgf-m, 3.6 ft-lb)

- 2) Install the timing belt cover (RH) (B).

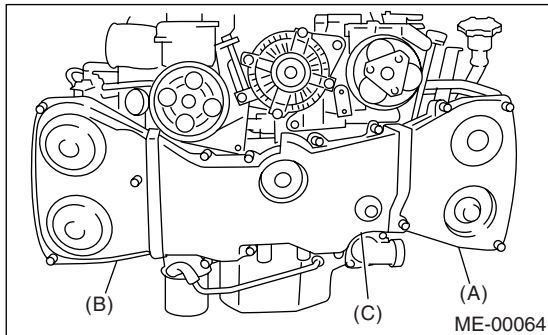
Tightening torque:

5 N·m (0.5 kgf-m, 3.6 ft-lb)

- 3) Install the timing belt cover (LH) (A).

Tightening torque:

5 N·m (0.5 kgf-m, 3.6 ft-lb)



- 4) Install the crank pulley. <Ref. to ME(STI)-42, INSTALLATION, Crank Pulley.>
- 5) Install the V-belt. <Ref. to ME(STI)-40, INSTALLATION, V-belt.>

C: INSPECTION

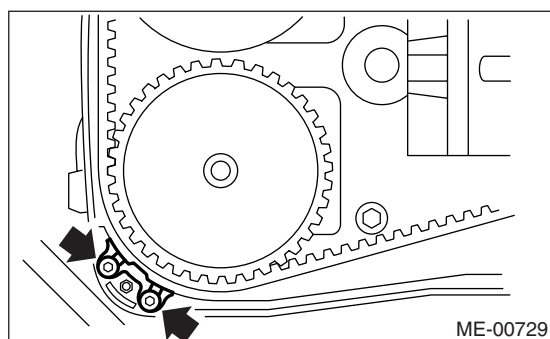
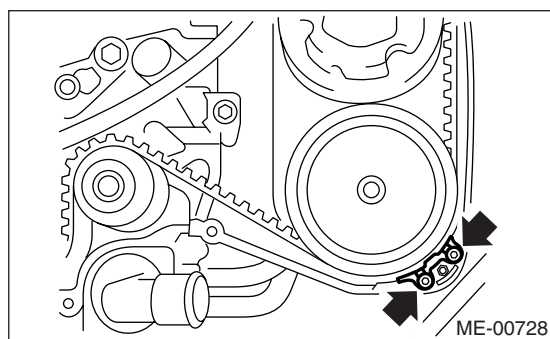
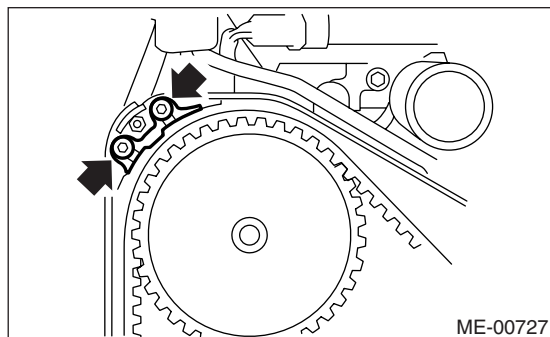
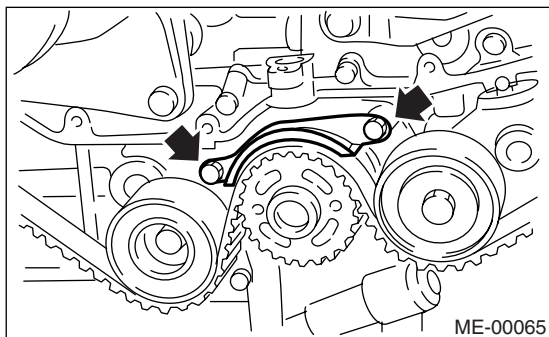
Make sure the cover is not damaged.

15. Timing Belt

A: REMOVAL

1. TIMING BELT

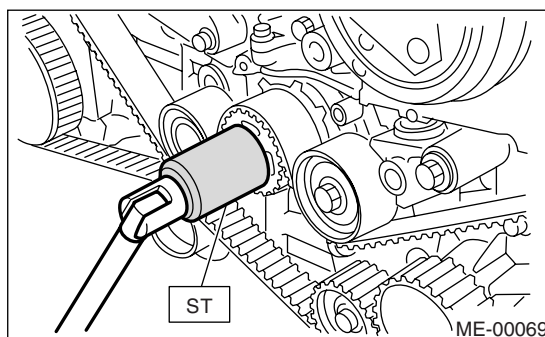
- 1) Remove the V-belt. <Ref. to ME(STI)-40, REMOVAL, V-belt.>
- 2) Remove the crank pulley. <Ref. to ME(STI)-42, REMOVAL, Crank Pulley.>
- 3) Remove the timing belt cover. <Ref. to ME(STI)-43, REMOVAL, Timing Belt Cover.>
- 4) Remove the timing belt guides.



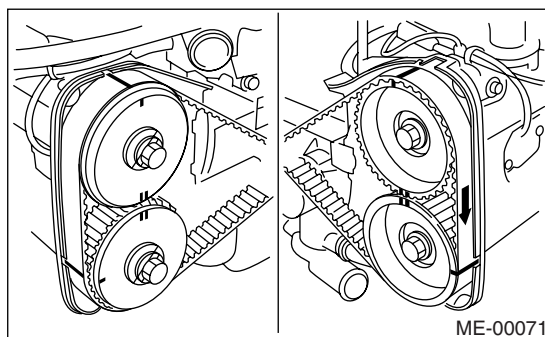
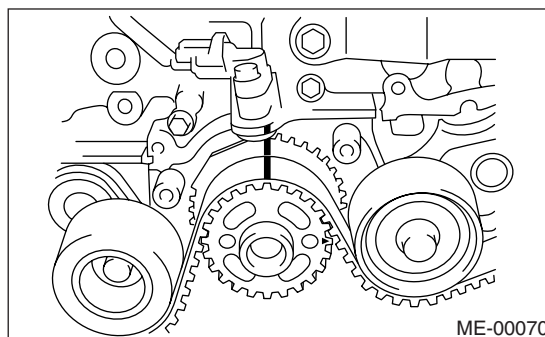
5) If the alignment mark and/or arrow mark (which indicates rotation direction) on timing belt fade away, put new marks before removing the timing belt as follows:

- (1) Turn the crankshaft using ST, and align the alignment marks on crank sprocket, intake cam sprocket (LH), exhaust cam sprocket (LH), intake cam sprocket (RH) and exhaust cam sprocket (RH) with notches of timing belt cover and cylinder block.

ST 499987500 CRANKSHAFT SOCKET



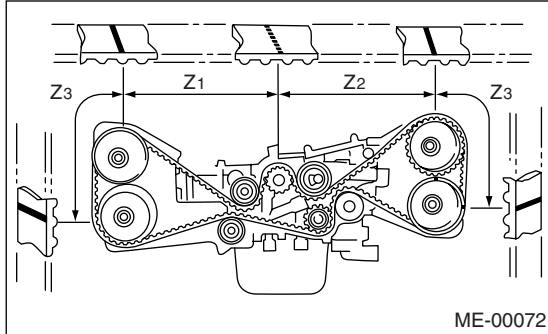
- (2) Using white paint, put alignment and/or arrow marks on the timing belts in relation to the sprockets.



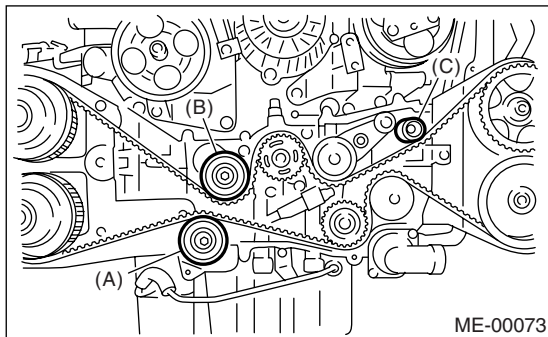
Z_1 : 54.5 tooth length

Z_2 : 51 tooth length

Z_3 : 28 tooth length



6) Remove the belt idler (A).



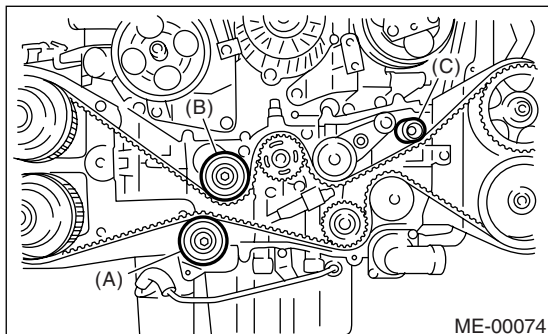
7) Remove the timing belt.

CAUTION:

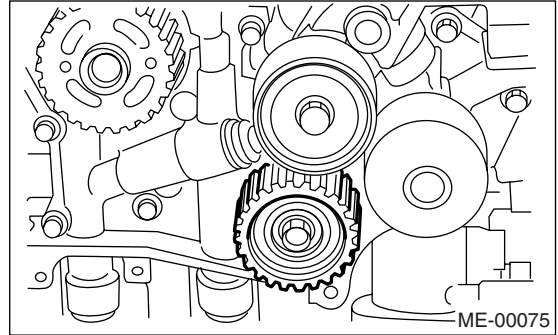
After the timing belt has been removed, never rotate the intake and exhaust cam sprocket. If the cam sprockets are rotated, the intake and exhaust valve heads strike together and valve stems are bent.

2. BELT IDLER AND AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY

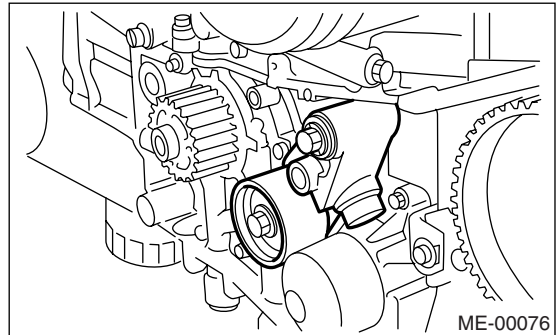
1) Remove the belt idler (B) and (C).



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) Preparation for installation of automatic belt tension adjuster assembly:

CAUTION:

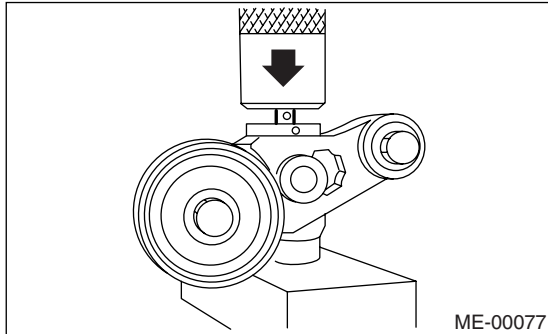
- Always use a vertical type pressing tool to move the adjuster rod down.
- Do not use a lateral type vise.
- Push the adjuster rod vertically.
- Press-in the push adjuster rod gradually taking more than 3 minutes.
- Do not allow press pressure to exceed 9,807 N (1,000 kgf, 2,205 lbf).
- Press the adjuster rod as far as the end surface of cylinder. Do not press the adjuster rod into 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 the vertical pressing tool.

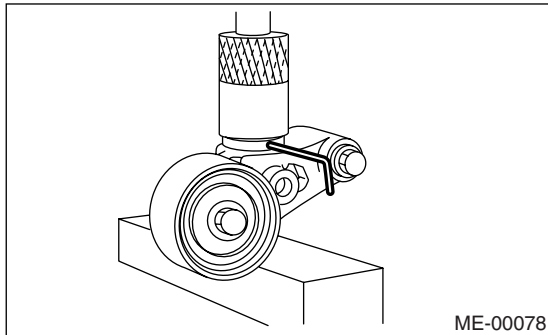
Timing Belt

MECHANICAL

(2) Slowly move the adjuster rod down with a pressure of more than 294 N (30 kgf, 66 lbf) until the adjuster rod is aligned with the stopper pin hole in the cylinder.



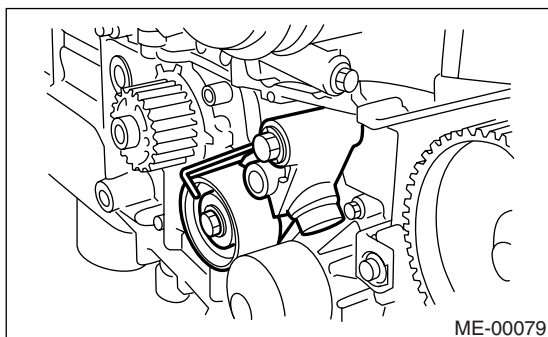
(3) With a 2 mm (0.08 in) dia. stopper pin or a 2 mm (nominal) dia. hex bar wrench inserted into the stopper pin hole in the cylinder, secure the adjuster rod.



2) Install the automatic belt tension adjuster assembly.

Tightening torque:

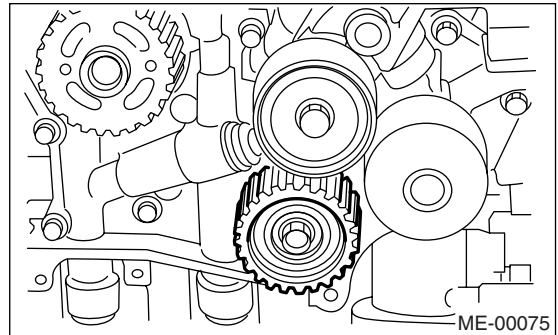
39 N·m (4.0 kgf-m, 28.9 ft-lb)



3) Install the belt idler No. 2.

Tightening torque:

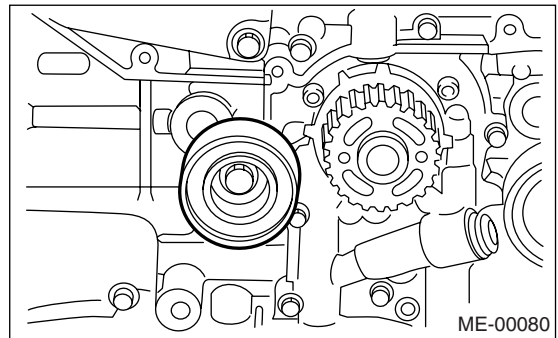
39 N·m (4.0 kgf-m, 28.9 ft-lb)



4) Install the belt idler.

Tightening torque:

39 N·m (4.0 kgf-m, 28.9 ft-lb)

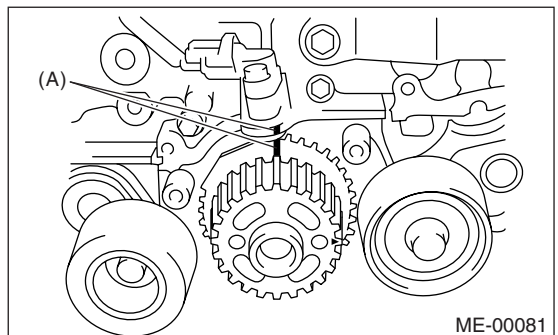


2. TIMING BELT

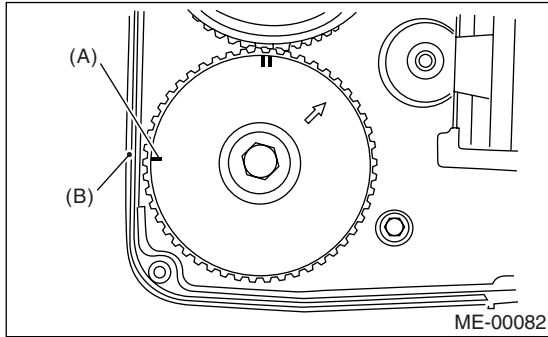
1) Preparation for installation of automatic belt tension adjuster assembly <Ref. to ME(STI)-51, AUTOMATIC BELT TENSION ADJUSTER, INSPECTION, Timing Belt.>

2) Crankshaft and cam sprocket alignment

(1) Align mark (A) on the crank sprocket with mark on the oil pump cover at cylinder block.

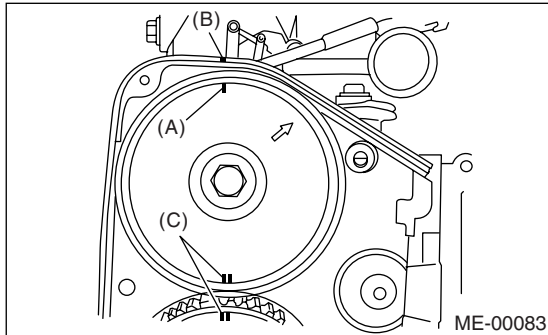


(2) Align single line mark (A) on the exhaust cam sprocket (RH) with notch (B) on timing belt cover.

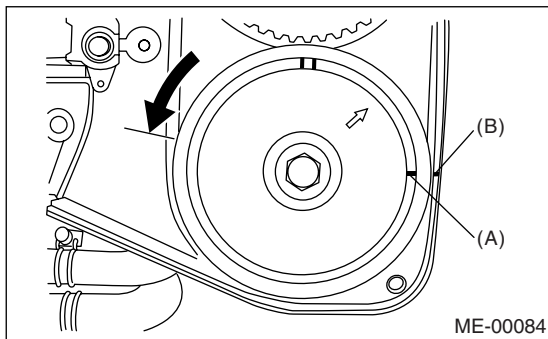


(3) Align single line mark (A) on the intake cam sprocket (RH) with notch (B) on timing belt cover.

(Make sure double lines (C) on intake camshaft and exhaust cam sprockets are aligned.)

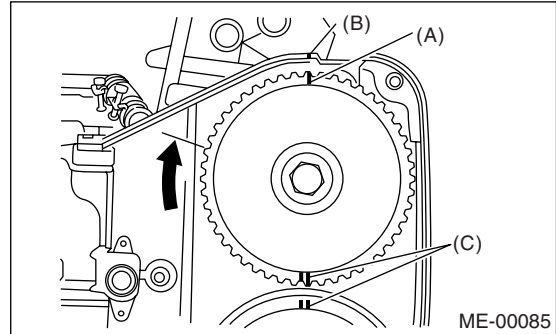


(4) Align single line mark (A) on exhaust cam sprocket (LH) with notch (B) on timing belt cover by turning the sprocket counterclockwise (as viewed from front of engine).



(5) Align the single line mark (A) on intake cam sprocket (LH) with notch (B) on timing belt cover by turning the sprocket clockwise (as viewed from front of engine).

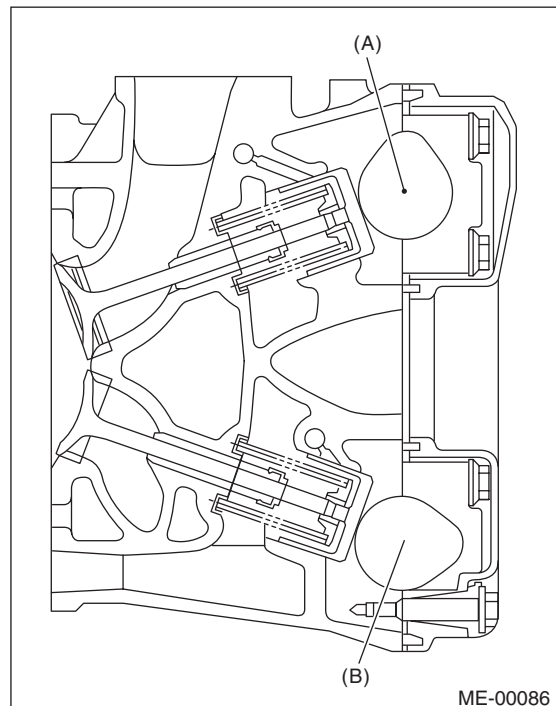
Ensure the double lines (C) on intake and exhaust cam sprockets are aligned.



(6) Ensure the camshaft 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, their heads will interfere with each other, resulting in bent valves.



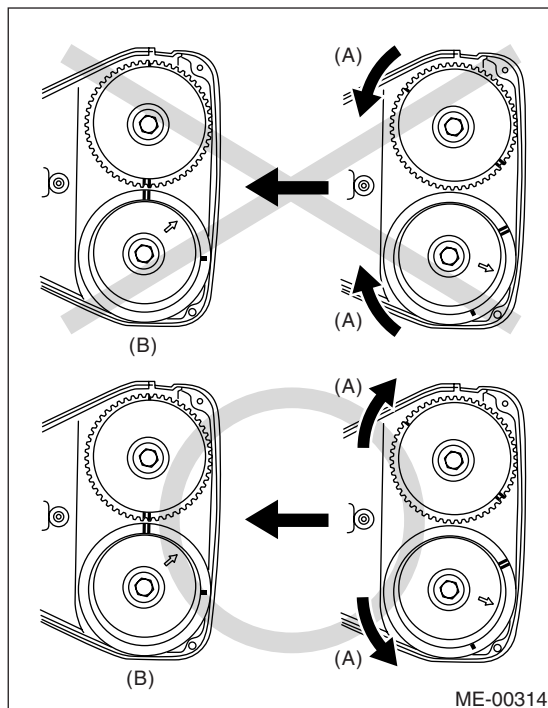
(A) Intake camshaft

(B) Exhaust camshaft

Timing Belt

MECHANICAL

- When the timing belts are not installed, four camshafts are held at the “zero-lift” position, where all cams on camshafts do not push the intake and exhaust valves down. (Under this condition, all valves remain unlifted.)
- When the camshafts are rotated to install the timing belts, #2 intake and #4 exhaust cam of camshafts (LH) are held to push their corresponding valves down. (Under this condition, these valves are held lifted.) Camshafts (RH) are held so that their cams do not push valves down.
- Camshafts (LH) must be rotated from the “zero-lift” position to the position where the timing belt is to be installed at as small an angle as possible, in order to prevent mutual interference of intake and exhaust valve heads.
- Do not allow the camshafts to rotate in the direction shown by the upper illustration in the figure as this causes both intake and exhaust valves to lift simultaneously, resulting in interference with their heads.



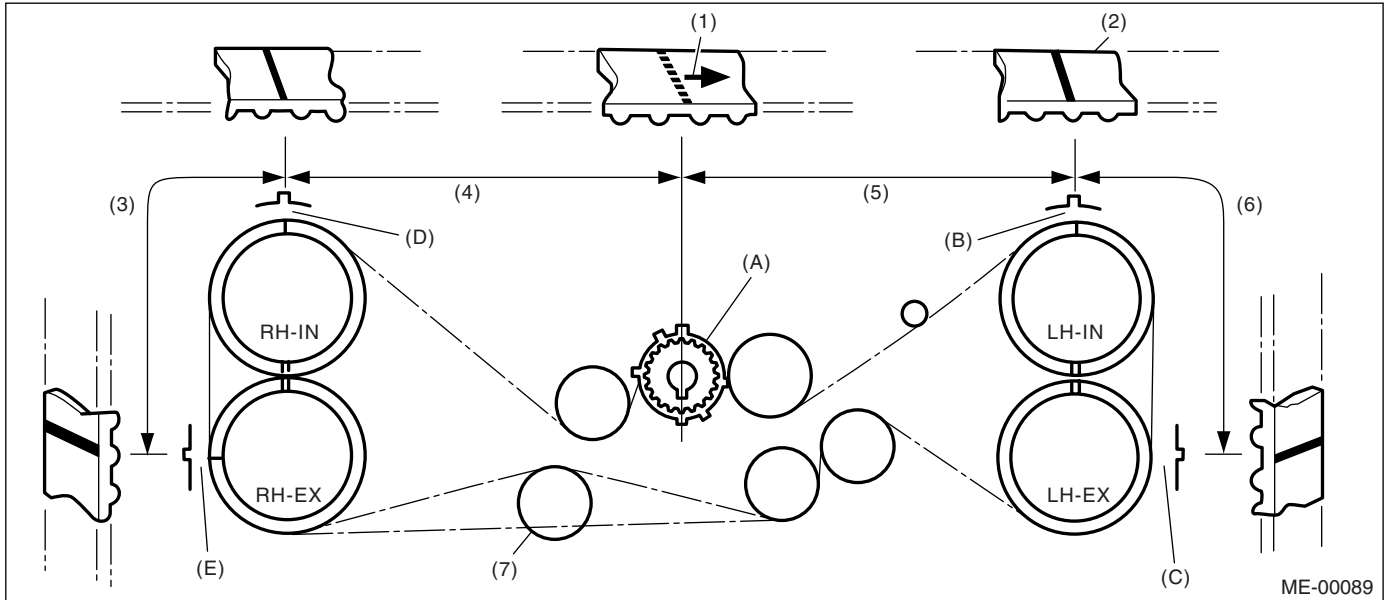
- (A) Rotating direction
(B) Timing belt installation position

3) Installation of timing belt

Align the alignment mark on timing belt with marks on sprockets in alphabetical order shown in the figure. While aligning marks, position the timing belt properly.

CAUTION:

- Disengagement of more than three timing belt teeth may result in interference between the valve and piston.
- Ensure the belt's rotating direction is correct.



(1) Arrow mark

(2) Timing belt

(3) 28 tooth length

(4) 54.5 tooth length

(5) 51 tooth length

(6) 28 tooth length

(7) Install it in the end

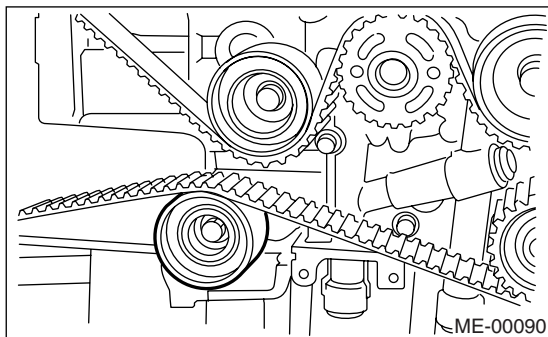
4) Install the belt idlers.

Tightening torque:

39 N·m (4.0 kgf-m, 28.9 ft-lb)

NOTE:

Make sure that the marks on the timing belt and sprockets are aligned.



5) After ensuring that the marks on the timing belt and sprockets are aligned, remove the stopper pin from tensioner adjuster.

6) Install the timing belt guide.

CAUTION:

- Before installing the bolts, clean the threaded portion of timing belt cover.

- Apply liquid gasket to the threaded portion of bolts. (Cam sprocket side only)

Liquid gasket:

THREE BOND 1324 (Part No. 004403042) or equivalent

(1) Temporarily tighten the bolts.

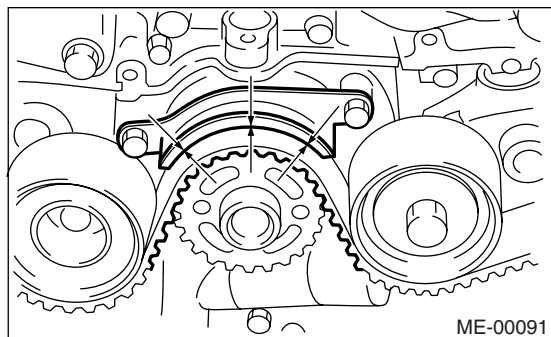
(2) Check and adjust the clearance between timing belt and timing belt guide.

Timing Belt

MECHANICAL

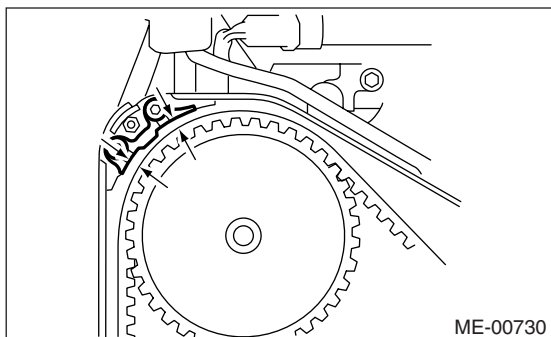
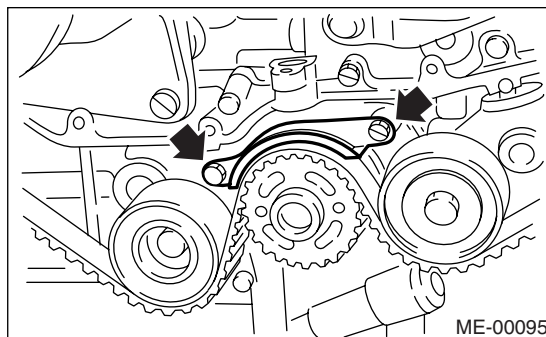
Clearance:

$1.0 \pm 0.5 \text{ mm}$ ($0.039 \pm 0.020 \text{ in}$)



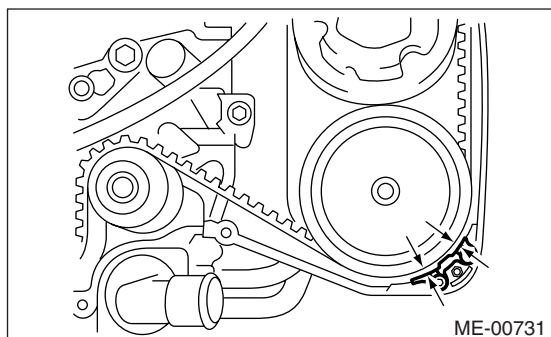
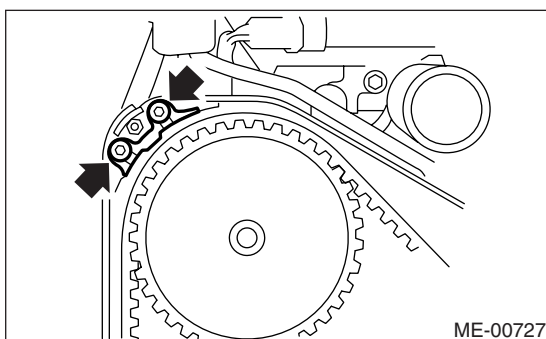
Tightening torque:

$9.75 \text{ N}\cdot\text{m}$ ($1.0 \text{ kgf}\cdot\text{m}$, $7 \text{ ft}\cdot\text{lb}$)



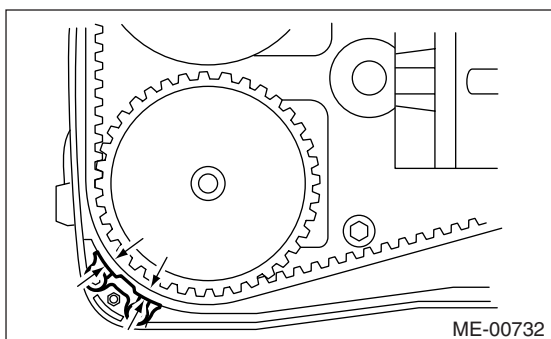
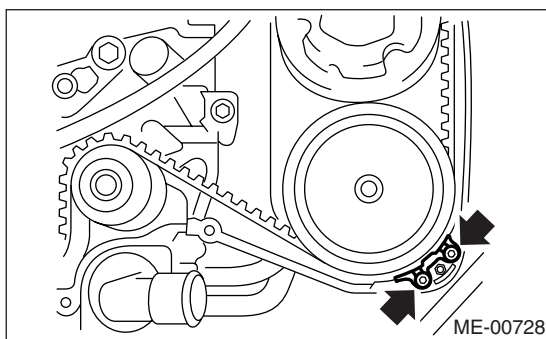
Tightening torque:

$6.4 \text{ N}\cdot\text{m}$ ($0.65 \text{ kgf}\cdot\text{m}$, $4.7 \text{ ft}\cdot\text{lb}$)



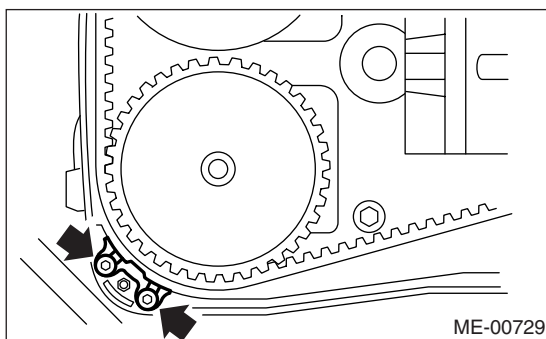
Tightening torque:

$6.4 \text{ N}\cdot\text{m}$ ($0.65 \text{ kgf}\cdot\text{m}$, $4.7 \text{ ft}\cdot\text{lb}$)



Tightening torque:

$6.4 \text{ N}\cdot\text{m}$ ($0.65 \text{ kgf}\cdot\text{m}$, $4.7 \text{ ft}\cdot\text{lb}$)



(3) Tighten the bolts.

7) Install the timing belt cover. <Ref. to ME(STI)-43, INSTALLATION, Timing Belt Cover.>

8) Install the crank pulley. <Ref. to ME(STI)-42, INSTALLATION, Crank Pulley.>

9) Install the V-belt. <Ref. to ME(STI)-40, INSTALLATION, V-belt.>

C: INSPECTION

1. TIMING BELT

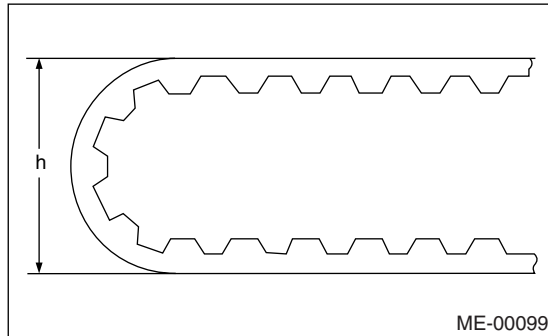
- 1) Check the timing belt teeth for breaks, cracks, and wear. If any fault is found, replace the belt.
- 2) Check the condition of back side of belt; if any crack is found, replace the belt.

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 belt sharply.

Bending radius 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 or scratches. If necessary, replace the automatic belt tension adjuster assembly.

NOTE:

Slight traces of oil at rod's oil seal does not indicate a problem.

- 2) Check that the adjuster rod does not move when a pressure of 294 N (30 kgf, 66 lbf) is applied to it. This is to check adjuster rod stiffness.

- 3) If the adjuster rod is not stiff and moves freely when applying 294 N (30 kgf, 66 lbf), check it using the following procedures:

- (1) Slowly press the adjuster rod down to the end surface of the cylinder. Repeat this motion 2 or 3 times.

- (2) With the adjuster rod moved all the way up, apply a pressure of 294 N (30 kgf, 66 lbf) to it. 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 one.

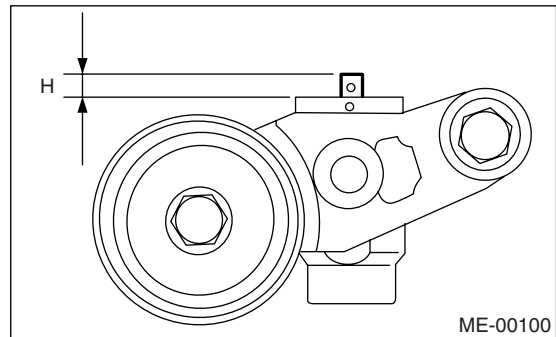
CAUTION:

- Always use a vertical type pressing tool to move the adjuster rod down.
- Do not use a lateral type vise.
- Push the adjuster rod vertically.
- Press-in the push adjuster rod gradually taking more than 3 minutes.
- Do not allow press pressure to exceed 9,807 N (1,000 kgf, 2,205 lbf).
- Press the adjuster rod till the end of the surface of the cylinder. Do not press the adjuster rod into the cylinder. Doing so may damage the cylinder.

- 4) Measure the extension of rod beyond the body. If it is not within specifications, replace with a new one.

Rod extension H:

5.7±0.5 mm (0.224±0.020 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 belt tension pulley if faulty.
- 2) Check the belt tension pulley for smooth rotation. Replace if noise or excessive play is noted.
- 3) Check the belt tension pulley for grease leakage.

4. BELT IDLER

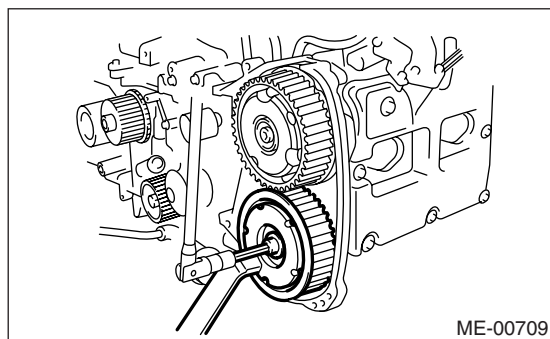
- 1) Check the belt idler for smooth rotation. Replace if noise or excessive play is noted.
- 2) Check the outer contacting surfaces of idler pulley for abnormal wear and scratches.
- 3) Check the belt idler for grease leakage.

16. Cam Sprocket

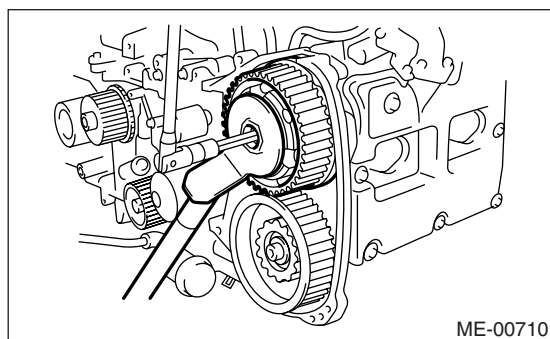
A: REMOVAL

- 1) Remove the V-belt. <Ref. to ME(STI)-40, REMOVAL, V-belt.>
- 2) Remove the crank pulley. <Ref. to ME(STI)-42, REMOVAL, Crank Pulley.>
- 3) Remove the timing belt cover. <Ref. to ME(STI)-43, REMOVAL, Timing Belt Cover.>
- 4) Remove the timing belt. <Ref. to ME(STI)-44, REMOVAL, Timing Belt.>
- 5) Remove the cam sprockets. To lock the camshaft, use ST.

ST 499207400 CAM SPROCKET WRENCH



ST 499977500 CAM SPROCKET WRENCH



B: INSTALLATION

- 1) Install the cam sprocket. To lock the camshaft, use ST.

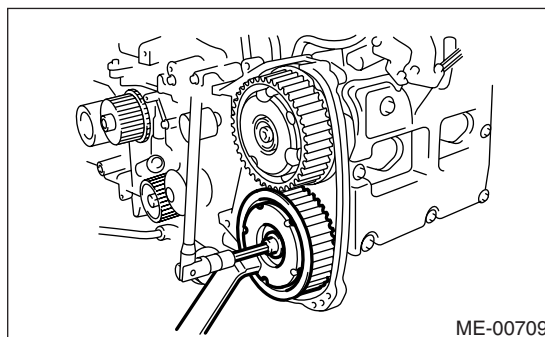
NOTE:

Do not confuse cam sprockets (RH) and (LH) during installation.

ST 499207400 CAM SPROCKET WRENCH

Tightening torque:

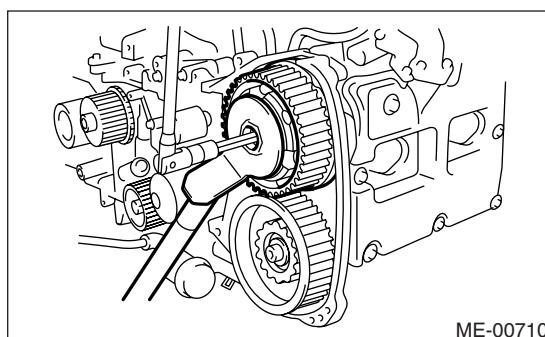
30 N·m (3.0 kgf-m, 21.8 ft-lb), and then tighten 45° furthermore



ST 499977500 CAM SPROCKET WRENCH

Tightening torque:

30 N·m (3.0 kgf-m, 21.8 ft-lb), and then tighten 45° furthermore



- 2) Install the timing belt. <Ref. to ME(STI)-45, INSTALLATION, Timing Belt.>
- 3) Install the timing belt cover. <Ref. to ME(STI)-43, INSTALLATION, Timing Belt Cover.>
- 4) Install the crank pulley. <Ref. to ME(STI)-42, INSTALLATION, Crank Pulley.>
- 5) Install the V-belt. <Ref. to ME(STI)-40, INSTALLATION, V-belt.>

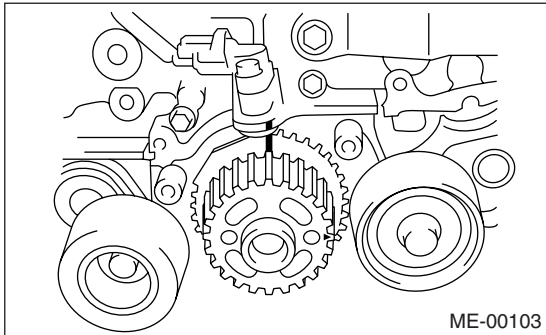
C: INSPECTION

- 1) Check the sprocket teeth for abnormal wear and scratches.
- 2) Make sure there is no free play between sprocket and key.
- 3) Check the crank sprocket notch used for sensor for damage and contamination of foreign matter.

17.Crank Sprocket

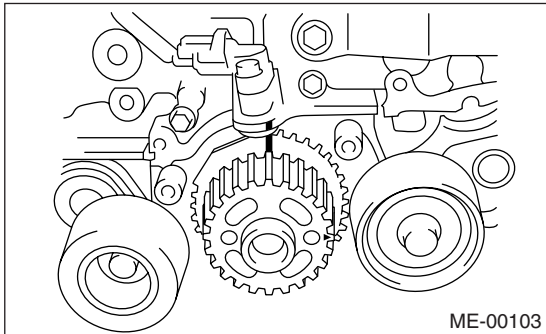
A: REMOVAL

- 1) Remove the V-belt. <Ref. to ME(STI)-40, REMOVAL, V-belt.>
- 2) Remove the crank pulley. <Ref. to ME(STI)-42, REMOVAL, Crank Pulley.>
- 3) Remove the timing belt cover. <Ref. to ME(STI)-43, REMOVAL, Timing Belt Cover.>
- 4) Remove the timing belt. <Ref. to ME(STI)-44, REMOVAL, Timing Belt.>
- 5) Remove the cam sprocket. <Ref. to ME(STI)-52, REMOVAL, Cam Sprocket.>
- 6) Remove the crank sprocket.



B: INSTALLATION

- 1) Install the crank sprocket.



- 2) Install the cam sprocket. <Ref. to ME(STI)-52, INSTALLATION, Cam Sprocket.>
- 3) Install the timing belt. <Ref. to ME(STI)-45, INSTALLATION, Timing Belt.>
- 4) Install the timing belt cover. <Ref. to ME(STI)-43, INSTALLATION, Timing Belt Cover.>
- 5) Install the crank pulley. <Ref. to ME(STI)-42, INSTALLATION, Crank Pulley.>
- 6) Install the V-belt. <Ref. to ME(STI)-40, INSTALLATION, V-belt.>

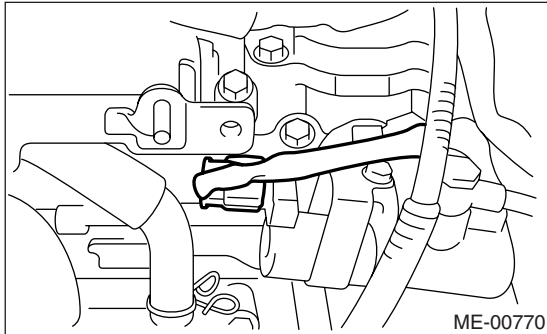
C: INSPECTION

- 1) Check the sprocket teeth for abnormal wear and scratches.
- 2) Make sure there is no free play between sprocket and key.
- 3) Check the crank sprocket notch used for sensor for damage and contamination of foreign matter.

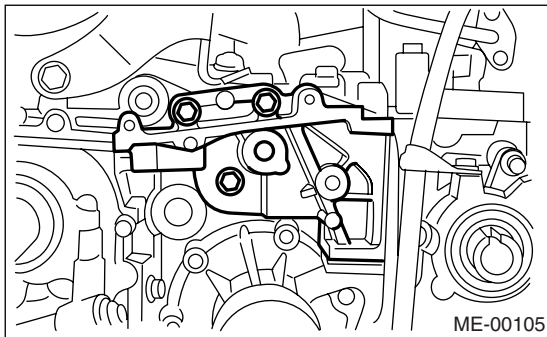
18. Camshaft

A: REMOVAL

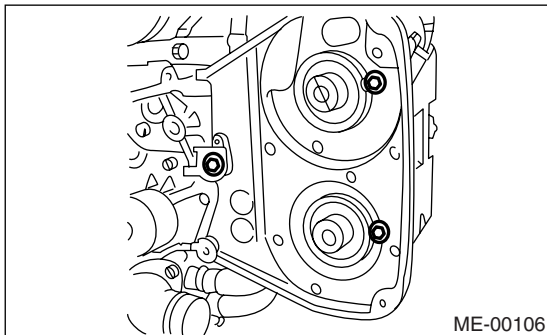
- 1) Remove the V-belt. <Ref. to ME(STI)-40, REMOVAL, V-belt.>
- 2) Remove the crank pulley. <Ref. to ME(STI)-42, REMOVAL, Crank Pulley.>
- 3) Remove the timing belt cover. <Ref. to ME(STI)-43, REMOVAL, Timing Belt Cover.>
- 4) Remove the timing belt. <Ref. to ME(STI)-44, REMOVAL, Timing Belt.>
- 5) Remove the cam sprocket. <Ref. to ME(STI)-42, REMOVAL, Crank Pulley.>
- 6) Remove the crank sprocket. <Ref. to ME(STI)-53, REMOVAL, Crank Sprocket.>
- 7) Disconnect the oil flow control solenoid valve assembly connector.



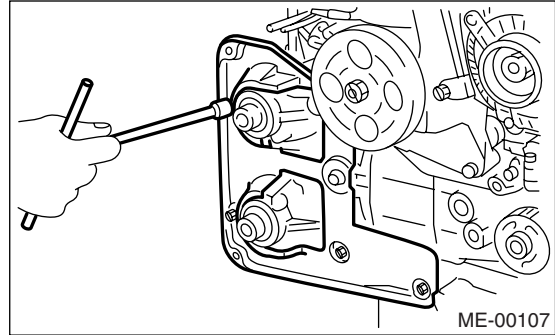
- 8) Remove the tensioner bracket.



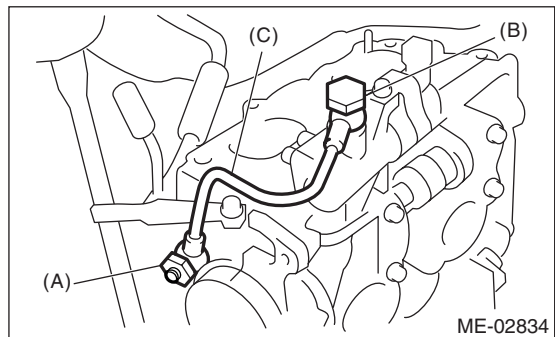
- 9) Remove the timing belt cover No. 2 (LH).



- 10) Remove the timing belt cover No. 2 (RH).

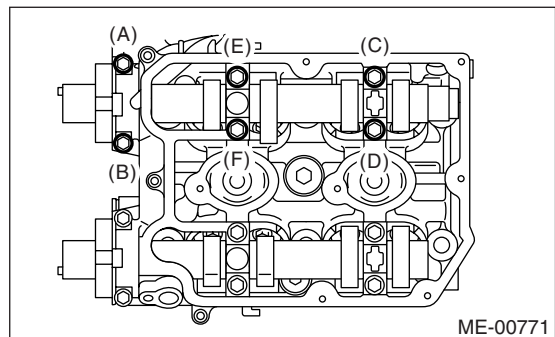


- 11) Remove the spark plug cord.
- 12) Remove the oil level gauge guide. (LH side)
- 13) Remove the rocker cover and gasket.
- 14) Remove the oil pipe.

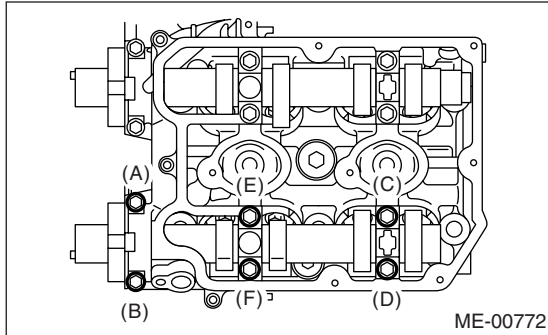


- (A) Union screw (with protrusion)
- (B) Union screw (without protrusion)
- (C) Oil pipe

- 15) Loosen the oil flow control solenoid valve assembly and intake camshaft cap bolts equally, a little at a time in alphabetical sequence shown in the figure.



16) Loosen the exhaust camshaft cap bolts equally, a little at a time in alphabetical sequence shown in the figure.



17) Remove the oil flow control solenoid valve assembly, intake camshaft cap, and camshaft.

18) Remove the exhaust camshaft cap and camshaft.

NOTE:

Arrange the camshaft caps in order so that they can be reinstalled in their original positions.

19) Similarly, remove the camshafts (RH) and related parts.

B: INSTALLATION

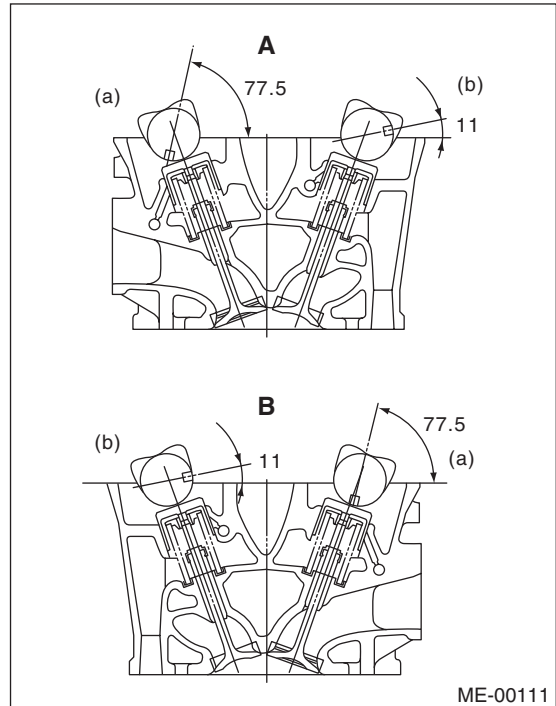
1) Camshaft installation

Apply engine oil to cylinder head at camshaft bearing location before installing the camshaft. Install the camshaft so that each valve is close to or in contact with “base circle” of cam lobe.

NOTE:

- When the camshafts are positioned as shown in the figure, camshafts need to be rotated at a minimum to align with the timing belt during installation.

- Camshaft (RH) need not be rotated when set at position shown in the figure. 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) Camshaft cap and oil flow control solenoid valve assembly installation

(1) Apply liquid gasket sparingly to cap mating surface.

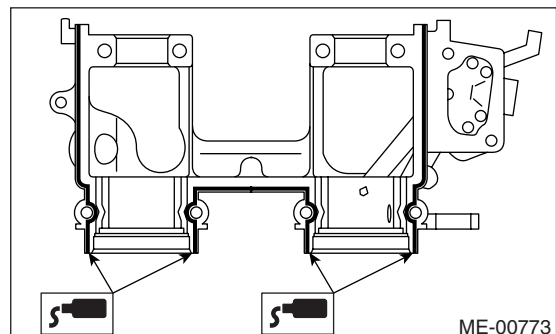
NOTE:

Do not apply liquid gasket excessively. Failure to do so may cause excess gasket to come out and flow toward the oil seal, resulting in oil leaks.

Liquid gasket:

Part No. 004403007

THREE BOND 1215 or equivalent



Camshaft

MECHANICAL

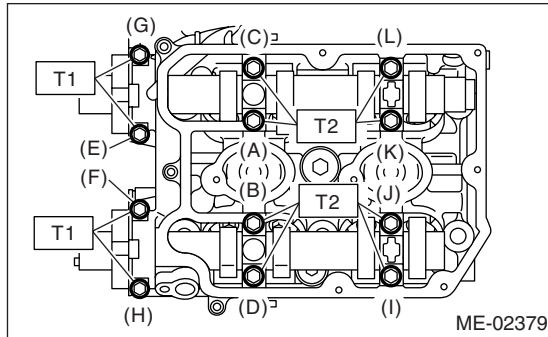
(2) Apply engine oil to cap bearing surface and install the cap on camshaft.

(3) Gradually tighten the camshaft cap and oil control valve assembly in at least two stages in alphabetical sequence shown in the figure, and then tighten to specified torque.

Tightening torque:

T1: 9.75 N·m (1.0 kgf-m, 7 ft-lb)

T2: 20 N·m (2.0 kgf-m, 14.8 ft-lb)



(4) After tightening camshaft cap, ensure the camshaft rotates only slightly while holding it at “base” circle.

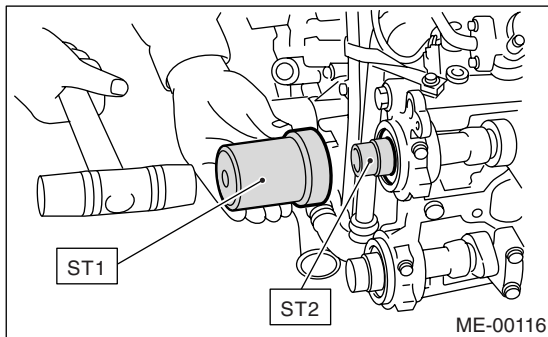
3) Apply engine oil to the outer perimeter and lips of oil seal, and install the oil seal on camshaft using ST1 and ST2.

NOTE:

Use a new oil seal.

ST1 499587600 OIL SEAL GUIDE

ST2 499597200 OIL SEAL GUIDE



4) Rocker cover installation

(1) Install the gasket on rocker cover. Install the nearby gaskets and ignition coil gasket.

NOTE:

Use a new gasket.

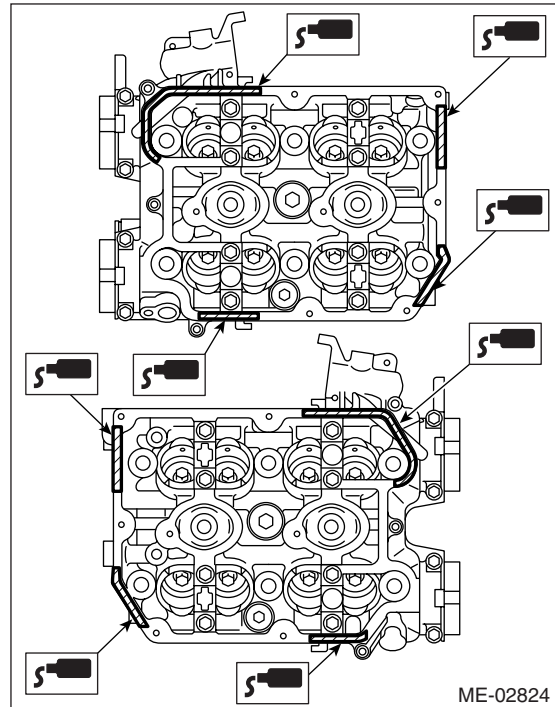
(2) Apply liquid gasket to the specified point of cylinder head.

NOTE:

Apply liquid gasket to the half moon plug portion with sticking out more than 5 mm (0.2 in).

Liquid gasket:

THREE BOND 1215 (Part No. 004403007) or equivalent

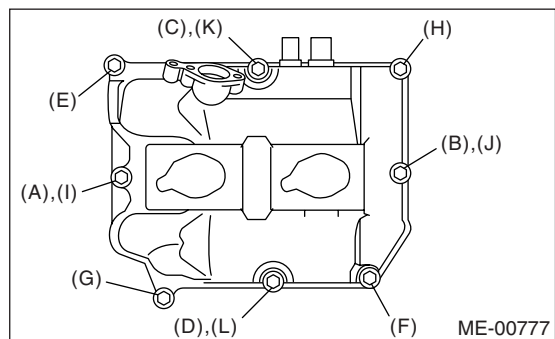


(3) Install the rocker cover on cylinder head. Ensure the gasket is properly positioned during installation.

(4) Tighten the rocker cover tightening bolt in alphabetical sequence shown in the figure, and then tighten to specified torque.

Tightening torque:

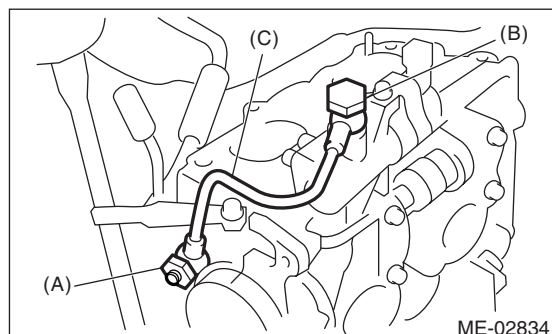
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



5) Install the oil pipe. Assemble the union screw to the location as shown in the figure during installation.

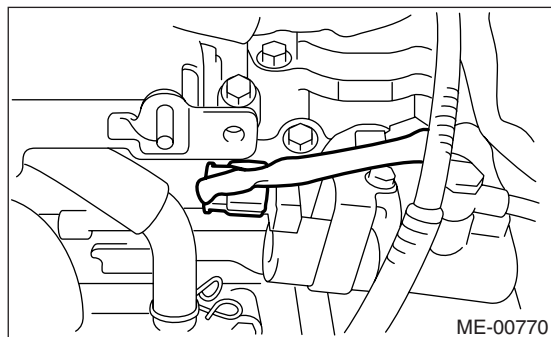
Tightening torque:

29 N·m (3.0 kgf-m, 21.4 ft-lb)



- (A) Union screw (with protrusion)
- (B) Union screw (without protrusion)
- (C) Oil pipe

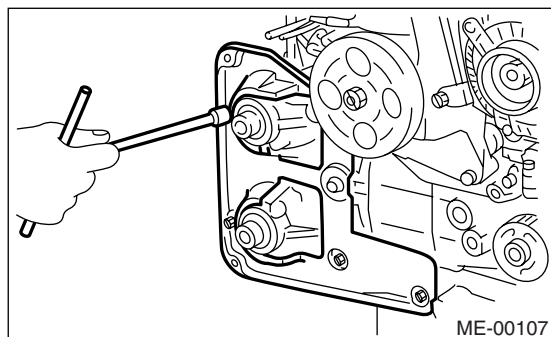
6) Connect the oil flow control solenoid valve connector.



- 7) Install the spark plug cord.
- 8) Similarly, install the parts on right-hand side.
- 9) Install the timing belt cover No. 2 (RH).

Tightening torque:

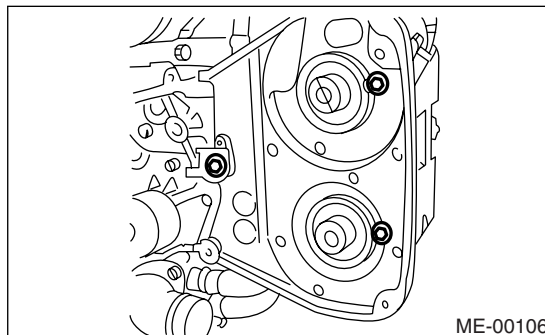
5 N·m (0.5 kgf-m, 3.6 ft-lb)



10) Install the timing belt cover No. 2 (LH).

Tightening torque:

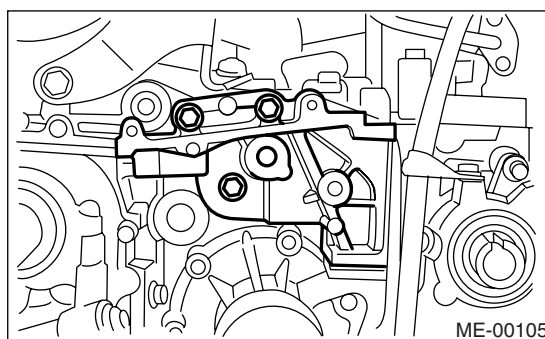
5 N·m (0.5 kgf-m, 3.6 ft-lb)



11) Install the tensioner bracket.

Tightening torque:

24.5 N·m (2.5 kgf-m, 18.1 ft-lb)



12) Install the crank sprocket. <Ref. to ME(STI)-53, INSTALLATION, Crank Sprocket.>

13) Install the cam sprockets. <Ref. to ME(STI)-52, INSTALLATION, Cam Sprocket.>

14) Install the timing belt. <Ref. to ME(STI)-45, INSTALLATION, Timing Belt.>

15) Install the timing belt cover. <Ref. to ME(STI)-43, INSTALLATION, Timing Belt Cover.>

16) Install the crank pulley. <Ref. to ME(STI)-42, INSTALLATION, Crank Pulley.>

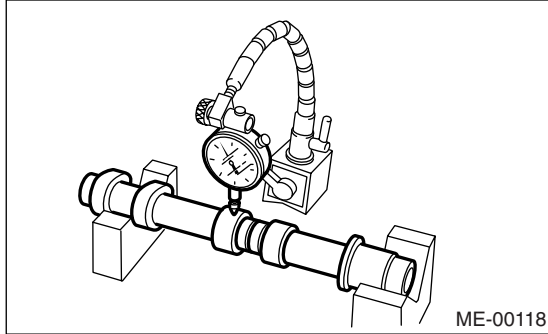
17) Install the V-belt. <Ref. to ME(STI)-40, INSTALLATION, V-belt.>

C: INSPECTION

1) Measure the bend, and repair or replace if necessary.

Limit:

0.020 mm (0.00079 in)



2) Check the journal for damage and wear. Replace if faulty.

3) Measure the outside diameter of camshaft journal. If the journal diameter is not as specified, check the oil clearance.

	Camshaft journal	
	Front	Center, rear
Standard	37.946 — 37.963 mm (1.4939 — 1.4946 in)	29.946 — 29.963 mm (1.1790 — 1.1796 in)

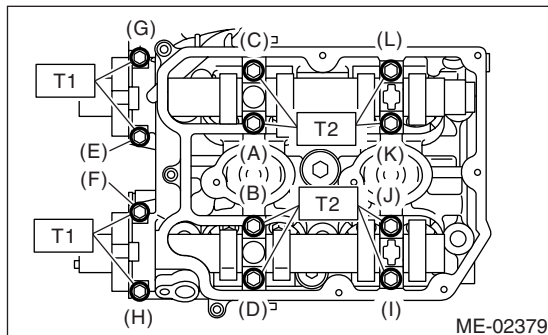
4) Measurement of the camshaft journal oil clearance

- (1) Clean the bearing caps and camshaft journals.
- (2) Place the camshafts on cylinder head.
- (3) Place a plastigauge across each of the camshaft journals.
- (4) Gradually tighten the cap in at least two stages in alphabetical sequence shown in the figure, and then tighten to specified torque. Do not turn the camshaft.

Tightening torque:

T1: 10 N·m (1.0 kgf-m, 7.4 ft-lb)

T2: 20 N·m (2.0 kgf-m, 14.8 ft-lb)



(5) Remove the bearing caps.

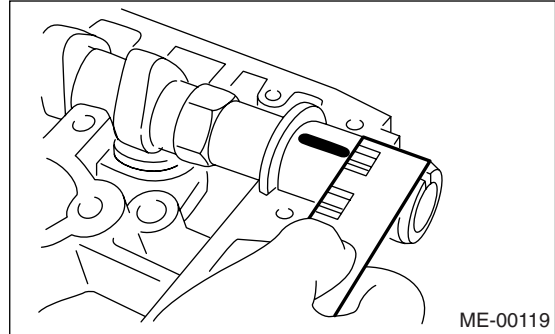
(6) Measure the widest point of plastigauge on each journal. If the oil clearance exceeds the limit, replace the camshaft. If necessary, replace the camshaft caps and cylinder head as a set.

Standard:

0.037 — 0.072 mm (0.0015 — 0.0028 in)

Limit:

0.10 mm (0.0039 in)



(7) Completely remove the plastigauge.

5) Check the cam face condition, and remove the minor faults by grinding with oil stone. Measure the cam height H. If it exceeds the limit or offset wear occurs, replace the camshaft.

Cam height H:

Standard:

Intake:

46.55 — 46.65 mm (1.833 — 1.837 in)

Exhaust:

46.75 — 46.85 mm (1.841 — 1.844 in)

Limit:

Intake:

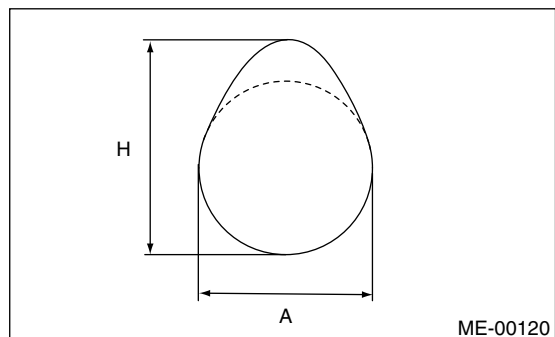
46.45 mm (1.829 in)

Exhaust:

46.65 mm (1.837 in)

Cam base circle diameter A:

37.0 mm (1.457 in)



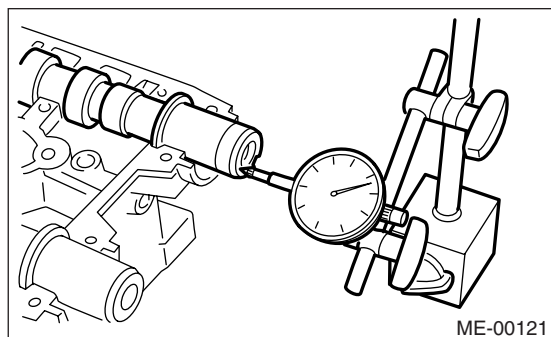
6) Measure the thrust clearance of camshaft with dial gauge. If the thrust clearance exceeds the limit, replace the caps and cylinder head as a set. If necessary, replace the camshaft.

Standard:

0.068 — 0.116 mm (0.0027 — 0.0046 in)

Limit:

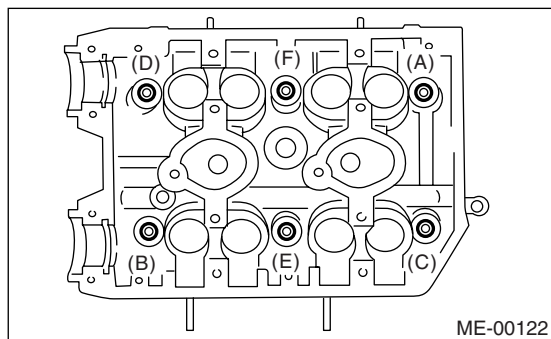
0.14 mm (0.0055 in)



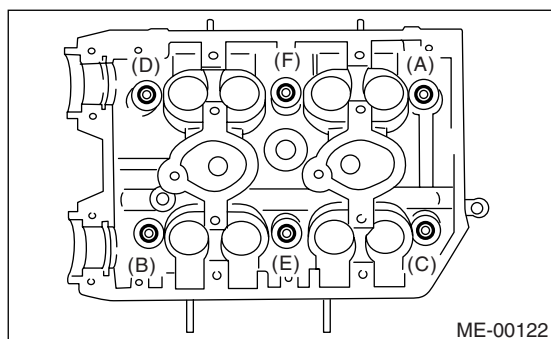
19. Cylinder Head

A: REMOVAL

- 1) Remove the V-belt. <Ref. to ME(STI)-40, REMOVAL, V-belt.>
 - 2) Remove the crank pulley. <Ref. to ME(STI)-42, REMOVAL, Crank Pulley.>
 - 3) Remove the timing belt cover. <Ref. to ME(STI)-43, REMOVAL, Timing Belt Cover.>
 - 4) Remove the timing belt. <Ref. to ME(STI)-44, REMOVAL, Timing Belt.>
 - 5) Remove the cam sprocket. <Ref. to ME(STI)-52, REMOVAL, Cam Sprocket.>
 - 6) Remove the intake manifold. <Ref. to FU(STI)-13, REMOVAL, Intake Manifold.>
 - 7) Remove the bolt which installs the A/C compressor bracket on cylinder head.
 - 8) Remove the camshaft. <Ref. to ME(STI)-54, REMOVAL, Camshaft.>
 - 9) Remove the cylinder head bolts in alphabetical sequence shown in the figure.
- Leave bolts (A) and (D) engaged by three or four threads to prevent the cylinder head from falling.



- 10) While tapping the cylinder head with a plastic hammer, separate it from cylinder block. Remove the bolts (A) and (D) to remove cylinder head.



- 11) Remove the cylinder head gasket.

CAUTION:

Be careful not to scratch the mating surface of cylinder head and cylinder block.

- 12) Similarly, remove the cylinder head (RH).

B: INSTALLATION

- 1) Install the cylinder head and gaskets on cylinder block.

CAUTION:

- Use new cylinder head gaskets.
- Be careful not to scratch the mating surface of cylinder head and cylinder block.

- 2) Tighten the cylinder head bolts.
 - (1) Apply a coat of engine oil to the washers and bolt threads.
 - (2) Tighten all bolts to 29 N·m (3.0 kgf-m, 21.4 ft-lb) in alphabetical sequence.
 - (3) Tighten all bolts to 69 N·m (7.0 kgf-m, 50.9 ft-lb) in alphabetical sequence again.
 - (4) Back off all bolts by 180° first; back them off by 180° again in reverse order of installation.
 - (5) Tighten all bolts to 49 N·m (5.0 kgf-m, 36 ft-lb) in alphabetical sequence.
 - (6) Tighten all bolts 80 to 90° in alphabetical sequence.
 - (7) Tighten all bolts by 40 to 45° in alphabetical sequence again.

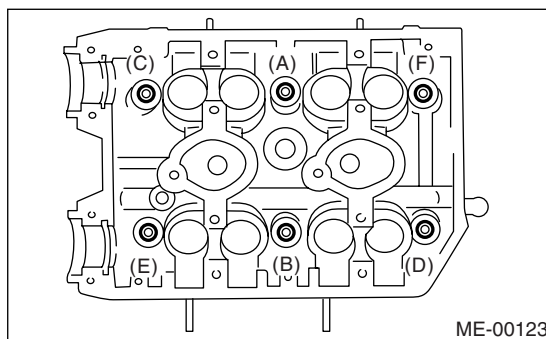
CAUTION:

Do not tighten the bolts by more than 45°.

- (8) Further tighten all bolts (A) and (B) by 40 to 45°.

CAUTION:

Ensure that the total “re-tightening angle” in the previous two steps do not exceed 90°.



- 3) Install the camshaft. <Ref. to ME(STI)-55, INSTALLATION, Camshaft.>
- 4) Install the A/C compressor bracket on cylinder head.
- 5) Install the intake manifold. <Ref. to FU(STI)-16, INSTALLATION, Intake Manifold.> <Ref. to FU(STI)-44, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
- 6) Install the cam sprocket. <Ref. to ME(STI)-52, INSTALLATION, Cam Sprocket.>
- 7) Install the timing belt. <Ref. to ME(STI)-45, INSTALLATION, Timing Belt.>
- 8) Install the timing belt cover. <Ref. to ME(STI)-43, INSTALLATION, Timing Belt Cover.>

9) Install the crank pulley. <Ref. to ME(STI)-42, INSTALLATION, Crank Pulley.>

10) Install the V-belt. <Ref. to ME(STI)-40, INSTALLATION, V-belt.>

C: DISASSEMBLY

1) Remove the valve lifters.

2) Compress the valve spring and remove the valve spring retainer key. Remove each valve and valve spring.

ST1 498267600 CYLINDER HEAD TABLE

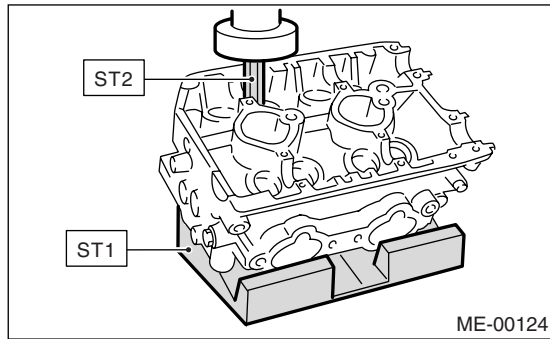
ST2 499718000 VALVE SPRING REMOVER

NOTE:

Keep the removed parts in order for re-installing in their original positions.

CAUTION:

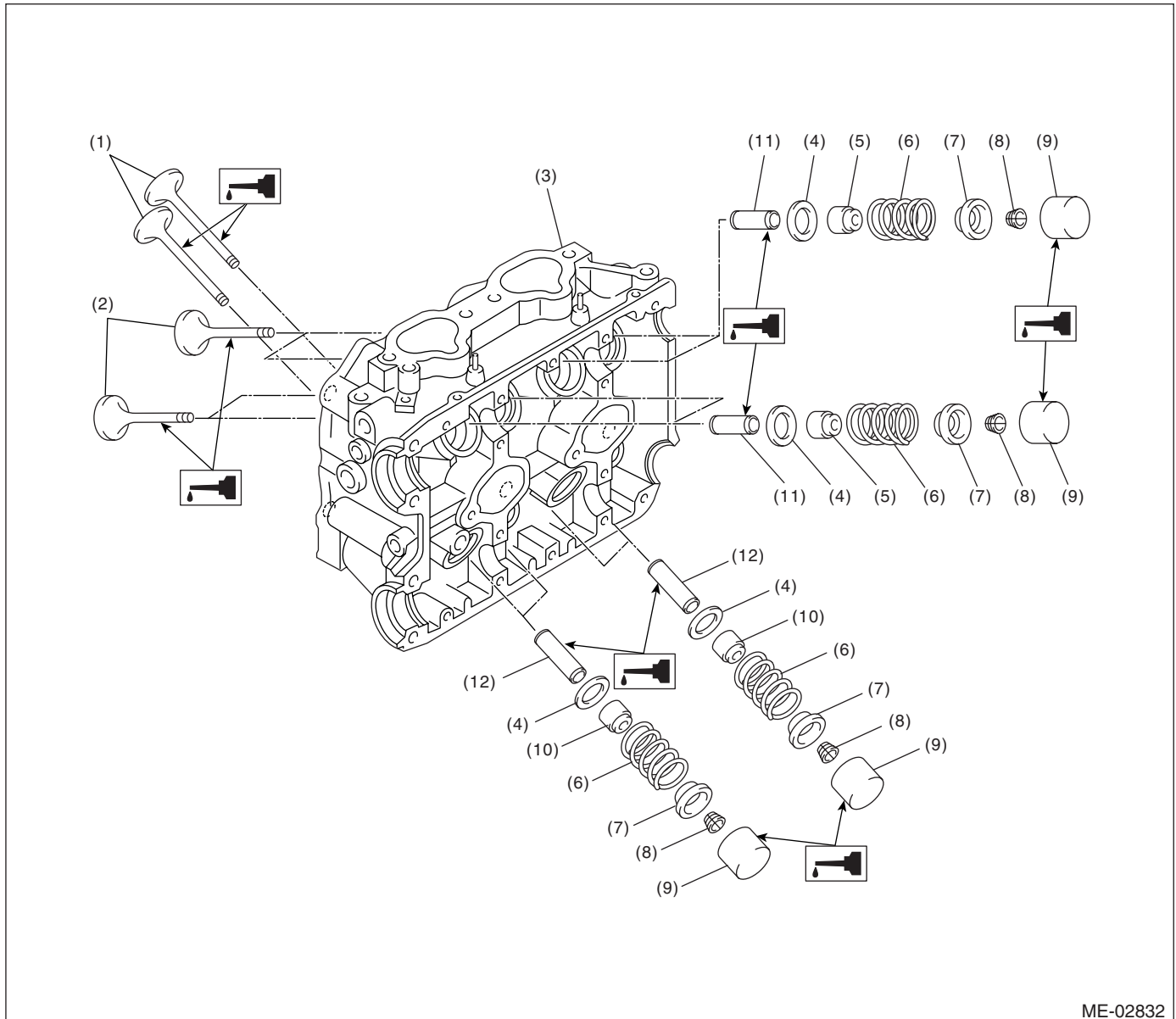
- Mark each valve to prevent confusion.
- Use extreme care not to damage the lips of the intake valve oil seals and exhaust valve oil seals.



Cylinder Head

MECHANICAL

D: ASSEMBLY



ME-02832

(1) Exhaust valve	(5) Intake valve oil seal	(9) Valve lifter
(2) Intake valve	(6) Valve spring	(10) Exhaust valve oil seal
(3) Cylinder head	(7) Retainer	(11) Intake valve guide
(4) Valve spring seat	(8) Retainer key	(12) Exhaust valve guide

1) Installation of valve spring and valve:

- (1) Coat the stem of each valve with engine oil and insert the valve into valve guide.

NOTE:

When inserting the valve into valve guide, use special care not to damage the oil seal lip.

- (2) Set the cylinder head on ST1.

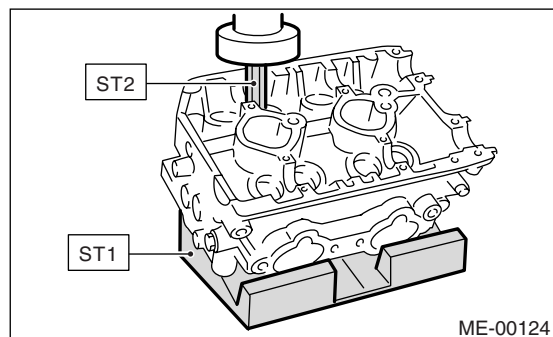
- (3) Install the valve spring and retainer using ST2.

ST1 498267600 CYLINDER HEAD TABLE

ST2 499718000 VALVE SPRING REMOVER

NOTE:

Be sure to install the valve springs with their close-coiled end facing the seat on cylinder head.



ME-00124

(4) Compress the valve spring, and then fit the valve spring retainer key.

(5) After installing, tap the valve spring retainers lightly with wooden hammer for better seating.

2) Apply oil to the surface of the valve lifter.

3) Install the valve lifter.

E: INSPECTION

1. CYLINDER HEAD

1) Make sure that no crack or other damage exists. In addition to visual inspection, inspect the important areas by means of liquid penetrant tester.

2) Measure the warping of the cylinder head surface that mates with crankcase by using a straight edge (A) and thickness gauge (B).

If the warping exceeds the limit, grind the surface with a surface grinder.

Warping limit:

0.035 mm (0.0014 in)

Grinding limit:

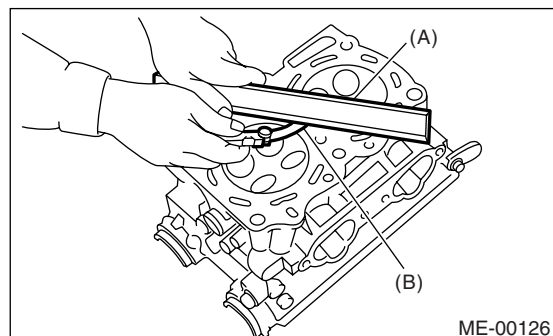
0.3 mm (0.012 in)

Standard height of cylinder head:

127.5 mm (5.02 in)

NOTE:

Uneven torque for the cylinder head nuts can cause warping. When reassembling, pay special attention to the torque so as to tighten evenly.



ME-00126

2. VALVE SEAT

Inspect the intake and exhaust valve seats, and then correct the contact surfaces with valve seat cutter if they are defective or when valve guides are replaced.

Valve seat contact width W:

Intake

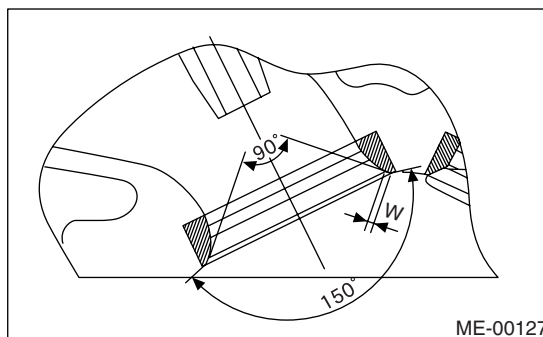
Standard 0.6 — 1.6 mm (0.024 — 0.055 in)

Limit 1.7 mm (0.067 in)

Exhaust

Standard 1.2 — 1.8 mm (0.047 — 0.071 in)

Limit 2.2 mm (0.087 in)



ME-00127

3. VALVE GUIDE

1) Check the clearance between valve guide and stem. The clearance can be checked by measuring the outside diameter of valve stem and the inside diameter of valve guide with outside and inside micrometers respectively.

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)

Limit

0.15 mm (0.0059 in)

2) If the clearance between valve guide and stem exceeds the limit, replace the valve guide or valve itself whichever shows greater amount of wear. See the following procedure for valve guide replacement.

Valve guide inner diameter:

6.000 — 6.012 mm (0.2362 — 0.2367 in)

Valve stem outer diameters:

Intake

5.955 — 5.970 mm (0.2344 — 0.2350 in)

Exhaust

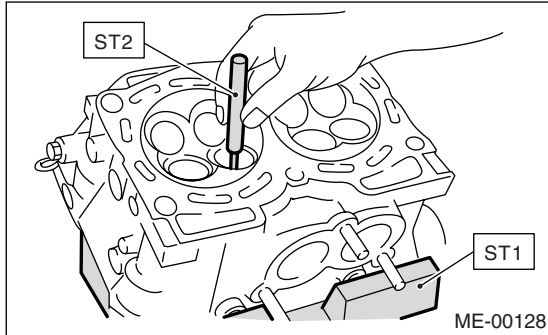
5.945 — 5.960 mm (0.2341 — 0.2346 in)

Cylinder Head

MECHANICAL

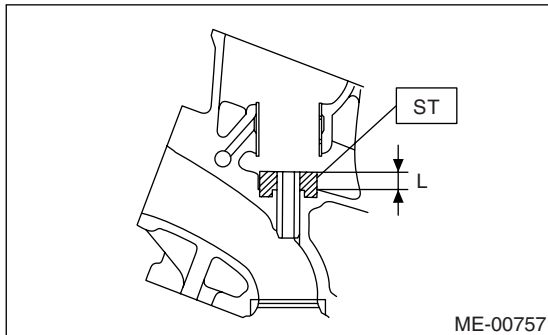
- (1) Place the cylinder head on ST1 with the combustion chamber upward so that valve guides enter the holes in ST1.
- (2) Insert the ST2 into valve guide and press it down to remove the valve guide.

ST1 498267600 CYLINDER HEAD TABLE
ST2 499767200 VALVE GUIDE REMOVER



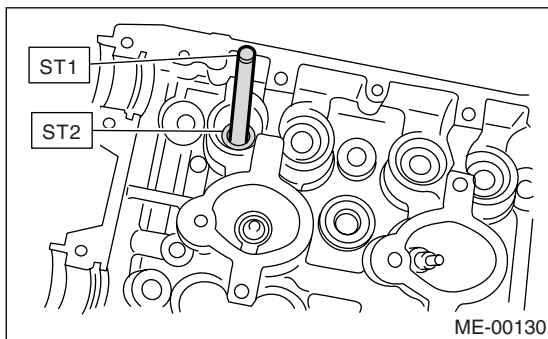
- (3) Turn the cylinder head upside down and place ST as shown in the figure.

ST 18251AA020 VALVE GUIDE ADJUSTER



- (4) Before installing a new valve guide, make sure that neither scratches nor damages exist on the inside surface of the valve guide holes in cylinder head.
- (5) Put a new valve guide, coated with sufficient oil, in cylinder, and insert ST1 into valve guide. Press in until the valve guide upper end is flush with the upper surface of ST2.

ST1 499767200 VALVE GUIDE REMOVER
ST2 18251AA020 VALVE GUIDE ADJUSTER



- (6) Check the valve guide protrusion.

Valve guide protrusion L:

15.8 — 16.2 mm (0.622 — 0.638 in)

- (7) Ream the inside of valve guide with ST. Gently rotate the reamer clockwise while pressing it lightly into the valve guide, and return it also rotating clockwise. After reaming, clean the valve guide to remove chips.

ST 499767400 VALVE GUIDE REAMER

NOTE:

- Apply engine oil to the reamer when reaming.
- If the inner surface of the valve guide is torn, the edge of the reamer should be slightly ground with an oil stone.
- If the inner surface of the valve guide becomes lustrous and the reamer does not chip, use a new reamer or remedy the reamer.

- (8) Recheck the contact condition between valve and valve seat after replacing the valve guide.

4. INTAKE AND EXHAUST VALVE

1) Inspect the flange and stem of valve, and replace if damaged, worn, or deformed, or if head edge thickness "H" is less than the specified limit.

Head edge thickness H:

Intake (A)

Standard 1.0 — 1.4 mm (0.039 — 0.055 in)

Limit 0.8 mm (0.031 in)

Exhaust (B)

Standard 1.3 — 1.7 mm (0.051 — 0.067 in)

Limit 0.8 mm (0.031 in)

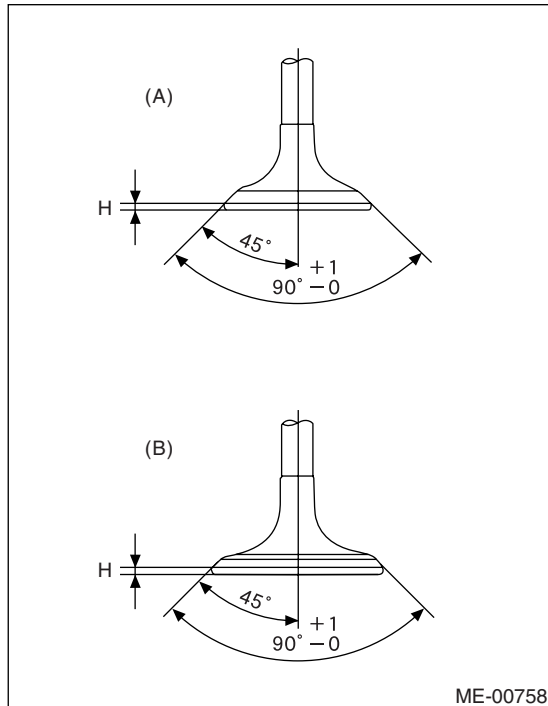
Valve overall length:

Intake (A)

104.4 mm (4.110 in)

Exhaust (B)

104.65 mm (4.120 in)



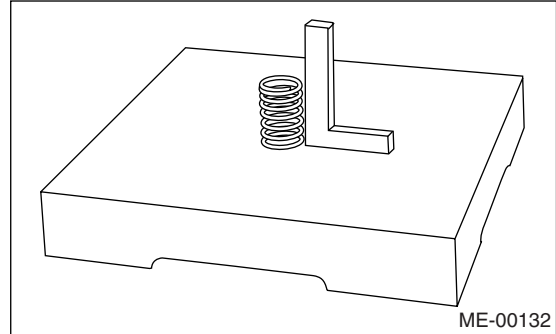
2) Put a small amount of grinding compound on the seat surface and lap the valve and seat surface. Install a new intake valve oil seal after lapping.

5. VALVE SPRINGS

1) Check the valve springs for damage, free length, and tension. Replace the valve spring if it is not within specifications presented in the table.

2) To measure the squareness of valve spring, stand the spring on a surface plate and measure its deflection at the top using a try square.

Valve spring	
Free length	47.32 mm (1.863 in)
Tension/spring height	Set 205 — 235 N (20.9 — 24.0 kgf, 46.1 — 52.8 lbf) /36.0 mm (1.417 in)
	Lift 426 — 490 N (43.4 — 50.0 kgf, 95.8 — 110 lbf) /26.50 mm (1.043 in)
Squareness	2.5°, 2.1 mm (0.083 in) or less



6. INTAKE AND EXHAUST VALVE OIL SEAL

In the following case, pinch and remove the oil seal from valve using pliers, and then replace it with a new one.

- 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 intake valve guide.

1) Place the cylinder head on ST1.

2) Press in the oil seal to the specified dimension indicated in the figure by using ST2.

ST1 498267600 CYLINDER HEAD TABLE

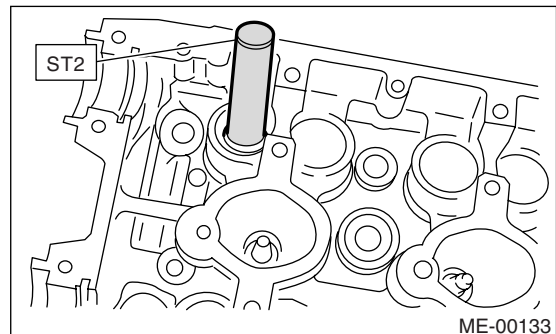
ST2 498857100 VALVE OIL SEAL GUIDE

NOTE:

- Apply engine oil to oil seal before press-fit.
- Differentiate between the intake valve oil seal and exhaust valve oil seal by noting their difference in color.

Color of rubber part:

Intake [Gray] Exhaust [Green]

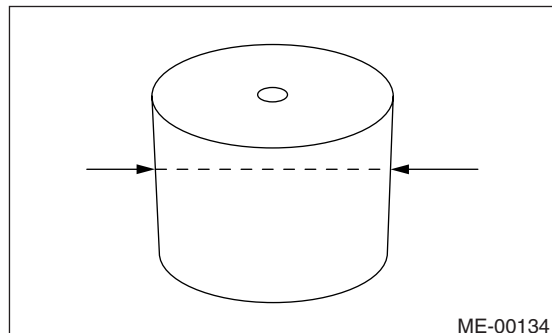


7. VALVE LIFTER

- 1) Visually check the valve lifter.
- 2) Measure the outer diameter of valve lifter.

Outer diameter:

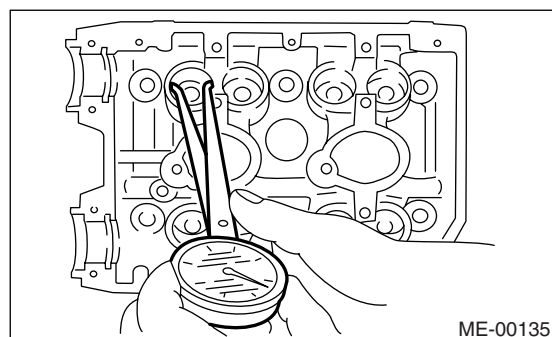
34.959 — 34.975 mm (1.3763 — 1.3770 in)



- 3) Measure the inner diameter of valve lifter mating part on cylinder head.

Inner diameter:

34.994 — 35.016 mm (1.3777 — 1.3786 in)



NOTE:

If difference between outer diameter of valve lifter and inner diameter of valve lifter mating part is over the limit, replace the cylinder head.

Standard:

0.019 — 0.057 mm (0.0007 — 0.0022 in)

Limit:

0.100 mm (0.0039 in)

F: DISPOSAL

CAUTION:

- Metallic sodium is enclosed in the exhaust valve. Metallic sodium is extremely alkaline and may produce severe chemical reactions. Full consideration must therefore be given to the following points when handling or disposing of the valve.
- Since metallic sodium may cause blindness if contacted with the eyes, burns if contacted with the skin, and fire, do not deliberately take the valve apart.

If the valve is damaged, remove the valve and neutralize it by immersing it in water, and dispose of it in the same way that general steel materials are disposed of. The disposal method is described in the following.

- 1) Wearing rubber gloves, remove the damaged valve from the cylinder head.
- 2) Prepare a large receptacle (bucket or other container) in a well ventilated location, and fill the receptacle with water (at least 10 ℓ (21.14 US qt, 17.6 Imp qt)).
- 3) Immerse the damaged valve in the receptacle.

CAUTION:

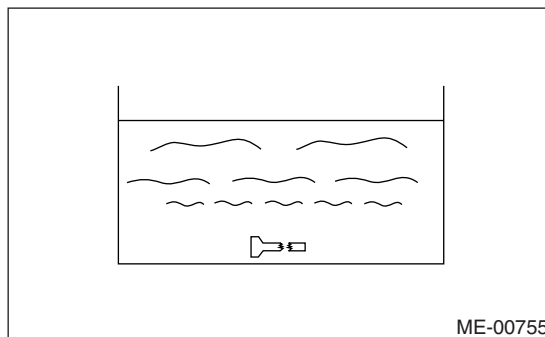
A severe reaction may occur, so stand at least 2 — 3 m from the receptacle. Because the reaction will produce hydrogen gas, moreover, keep the receptacle away from sparks or flames.

- 4) Once the reaction is completed (about 4 — 5 hours have elapsed), carefully remove the valve using large pincers so that the reaction liquid does not contact your skin, and dispose of it with other parts that are being disposed of.

- 5) The reaction liquid is a strong alkaline solution, so it must be disposed of in accordance with local regulations.

CAUTION:

Make sure the reaction liquid does not contact your skin. If contact with skin occurs, immediately wash the affected area with large quantities of water.



20. Cylinder Block

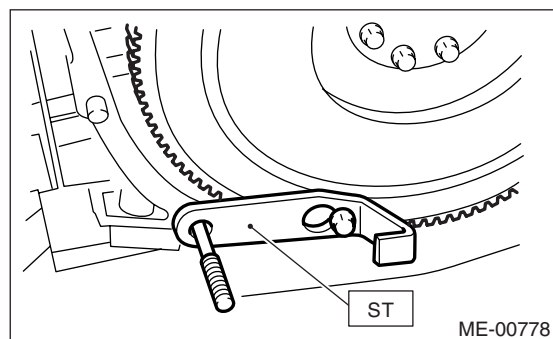
A: REMOVAL

NOTE:

Before conducting this procedure, drain the engine oil completely if applicable.

- 1) Remove the intake manifold. <Ref. to FU(STI)-13, REMOVAL, Intake Manifold.>
- 2) Remove the V-belt. <Ref. to ME(STI)-40, REMOVAL, V-belt.>
- 3) Remove the crank pulley. <Ref. to ME(STI)-42, REMOVAL, Crank Pulley.>
- 4) Remove the timing belt cover. <Ref. to ME(STI)-43, REMOVAL, Timing Belt Cover.>
- 5) Remove the timing belt. <Ref. to ME(STI)-44, REMOVAL, Timing Belt.>
- 6) Remove the cam sprocket. <Ref. to ME(STI)-52, REMOVAL, Cam Sprocket.>
- 7) Remove the crank sprocket. <Ref. to ME(STI)-53, REMOVAL, Crank Sprocket.>
- 8) Remove the generator and A/C compressor with their brackets.
- 9) Remove the cylinder head. <Ref. to ME(STI)-60, REMOVAL, Cylinder Head.>
- 10) Remove the clutch disc and cover. <Ref. to CL-14, REMOVAL, Clutch Disc and Cover.>
- 11) Remove the flywheel. <Ref. to CL-17, REMOVAL, Flywheel.>

ST 498497100 CRANKSHAFT STOPPER

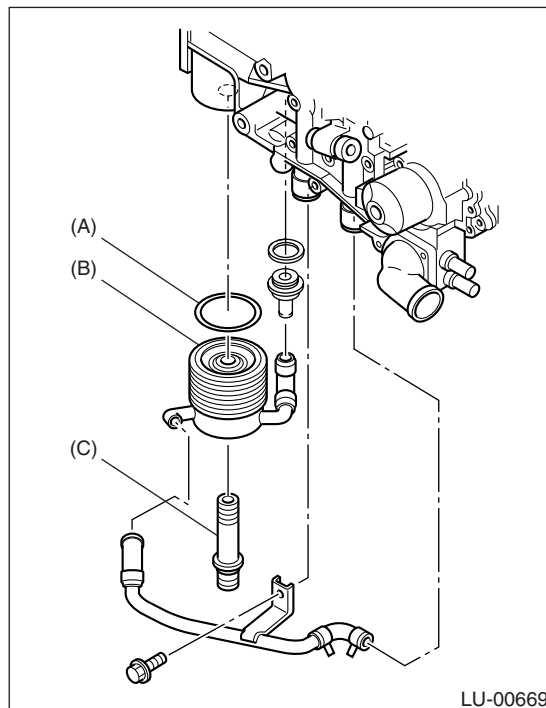


- 12) Remove the oil separator cover.
 - 13) Remove the water by-pass pipe for heater.
 - 14) Remove the oil filter using ST.
- ST 18332AA010 OIL FILTER WRENCH (Outer diameter: 65 mm (2.56 in))
- ST 18332AA000 OIL FILTER WRENCH (Outer diameter: 68 mm (2.68 in))

NOTE:

Standard oil filter is outer diameter of 65 mm (2.56 in). However, SUBARU genuine oil filter having outer diameter of 68 mm (2.68 in) can also be used.

- 15) Remove the oil cooler.



- (A) Gasket
(B) Oil cooler
(C) Oil cooler connector

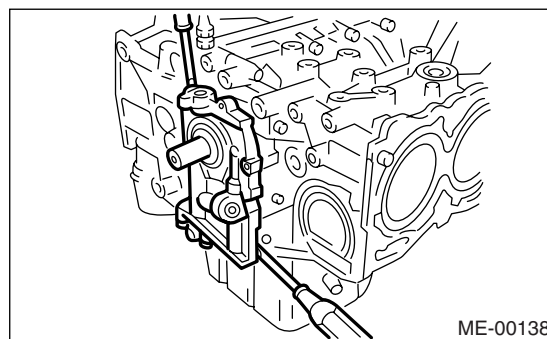
- 16) Remove the water pump.

- 17) Remove the oil pump from cylinder block.

Use a flat-bladed screwdriver as shown in the figure when removing the oil pump.

NOTE:

Be careful not to scratch the mating surface of cylinder block and oil pump.



- 18) Removal of oil pan:

- (1) Turn the cylinder block with #2 and #4 piston sides facing upward.
- (2) Remove the bolts which secure oil pan to cylinder block.
- (3) Insert an oil pan cutter blade between cylinder block-to-oil pan clearance, and then remove the oil pan.

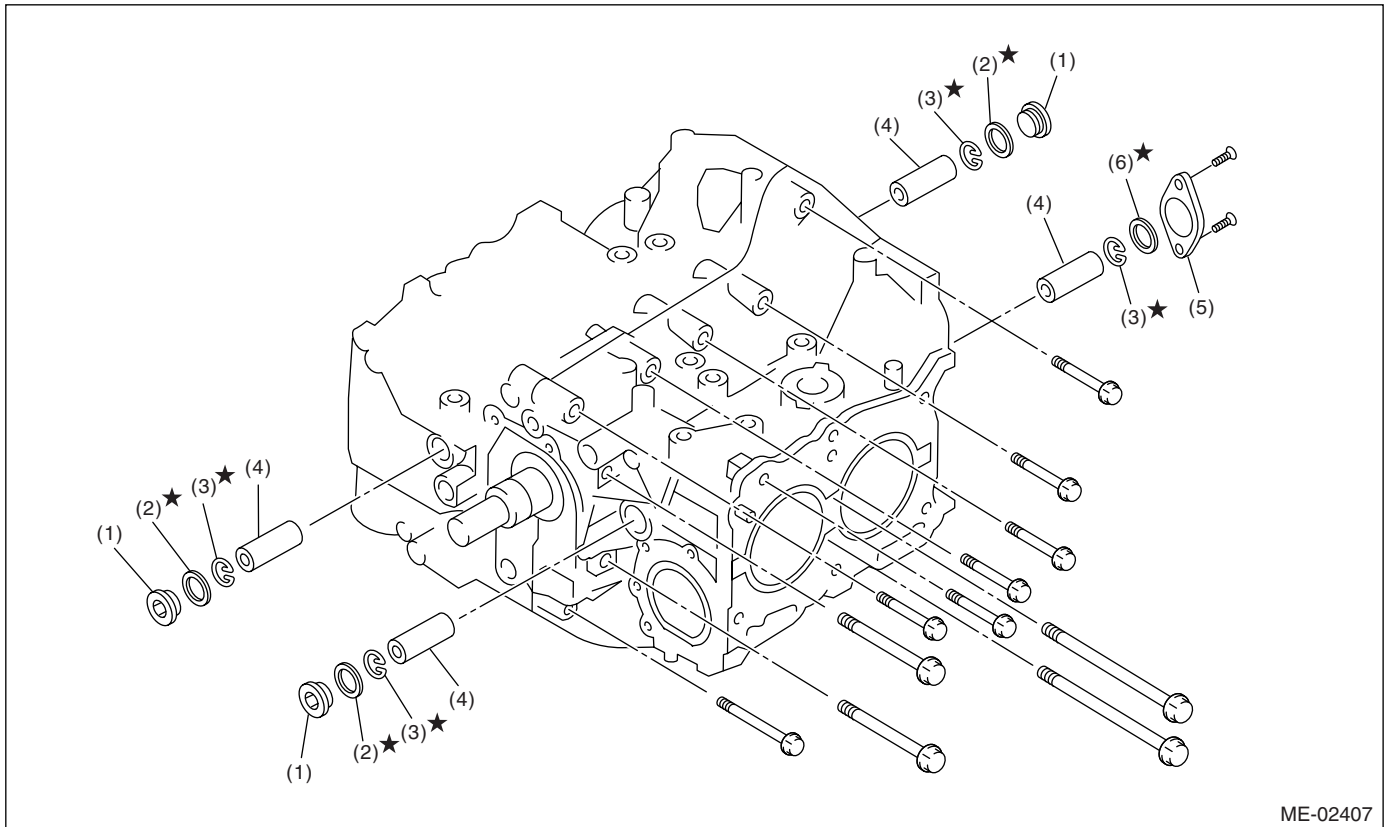
Do not use a screwdriver or similar tool in place of oil pan cutter.

Cylinder Block

MECHANICAL

- 19) Remove the oil strainer stay.
- 20) Remove the oil strainer.

- 21) Remove the baffle plate.
- 22) Remove the water pipes.



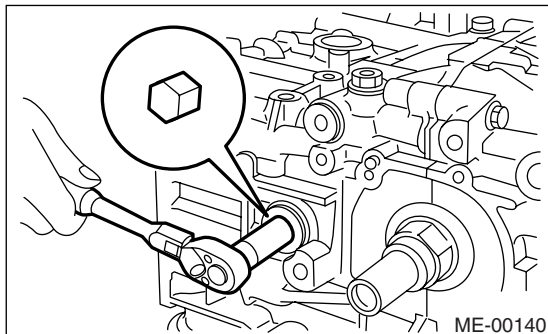
ME-02407

- (1) Service hole plug
- (2) Gasket

- (3) Snap ring
- (4) Piston pin

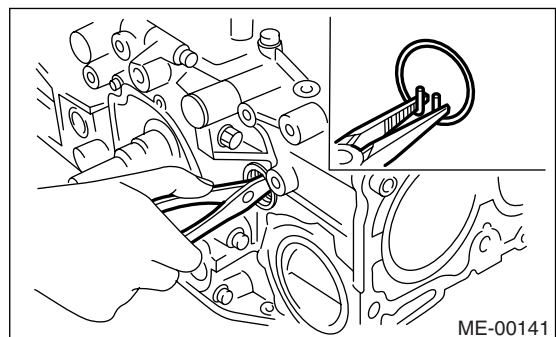
- (5) Service hole cover
- (6) O-ring

- 23) Remove the service hole cover and service hole plugs using hexagon wrench (14 mm).



ME-00140

- 24) Rotate the crankshaft to bring #1 and #2 pistons to bottom dead center position, and then remove the piston snap ring through service hole of #1 and #2 cylinders.



ME-00141

- 25) Draw out the piston pin from #1 and #2 pistons using ST.

ST 499097700

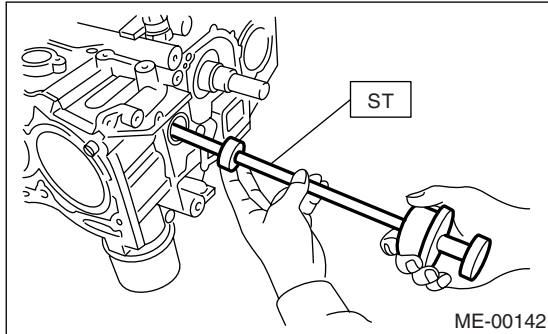
PISTON PIN REMOVER
ASSY

Cylinder Block

MECHANICAL

NOTE:

Be careful not to confuse the original combination of piston, piston pin and cylinder.



26) Similarly remove the piston pins from #3 and #4 pistons.

27) Remove the bolts which connect the cylinder block on the side of #2 and #4 cylinders.

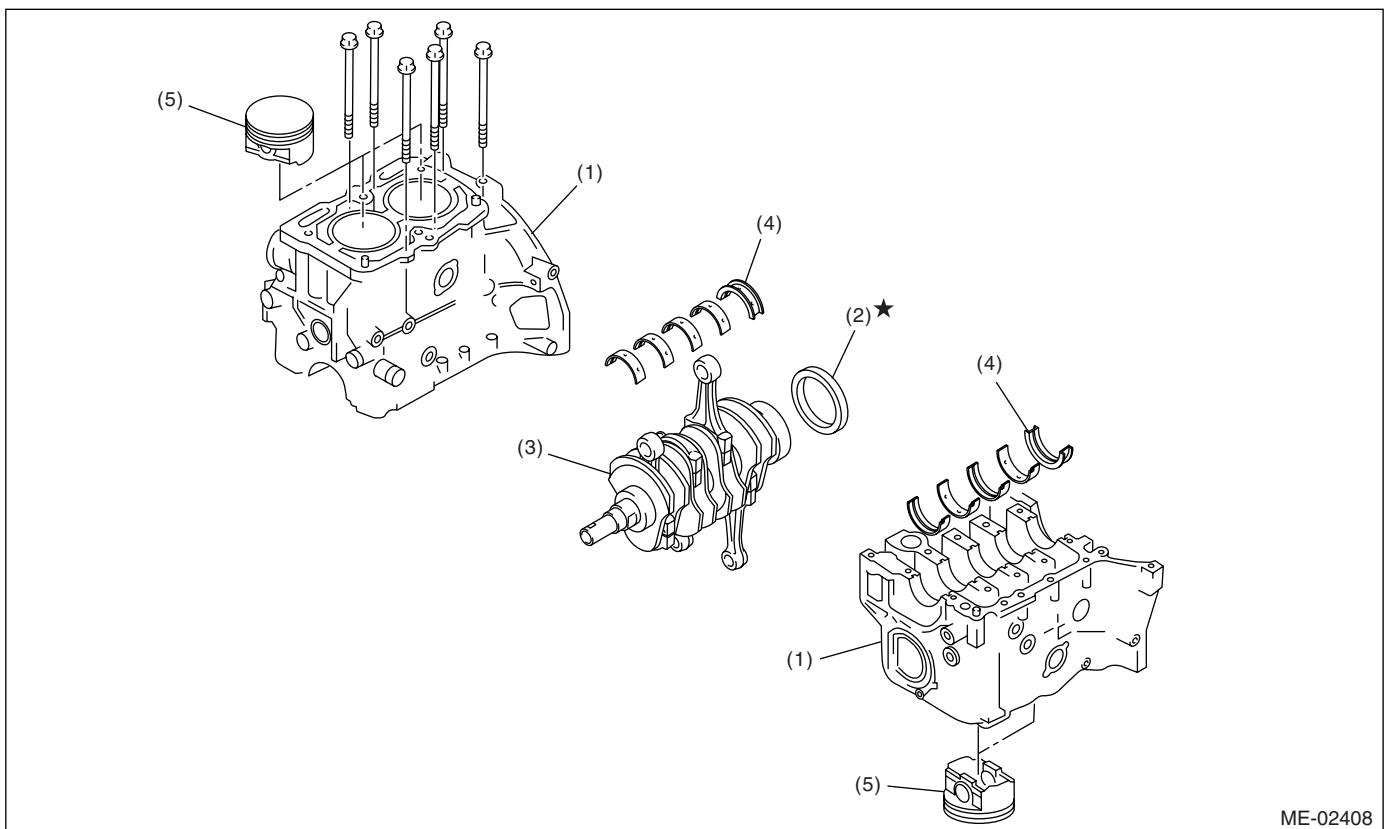
28) Back off the bolts which connect the cylinder block on the side of #1 and #3 cylinders two or three turns.

29) Set up the cylinder block so that #1 and #3 cylinders are on the upper side, then remove the cylinder block connecting bolts.

30) Separate the cylinder blocks (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

(3) Crankshaft

(5) Piston

(2) Rear oil seal

(4) Crankshaft bearing

31) Remove the rear oil seal.

32) Remove the crankshaft together with connecting rod.

33) Remove the crankshaft bearings from cylinder block using a hammer handle.

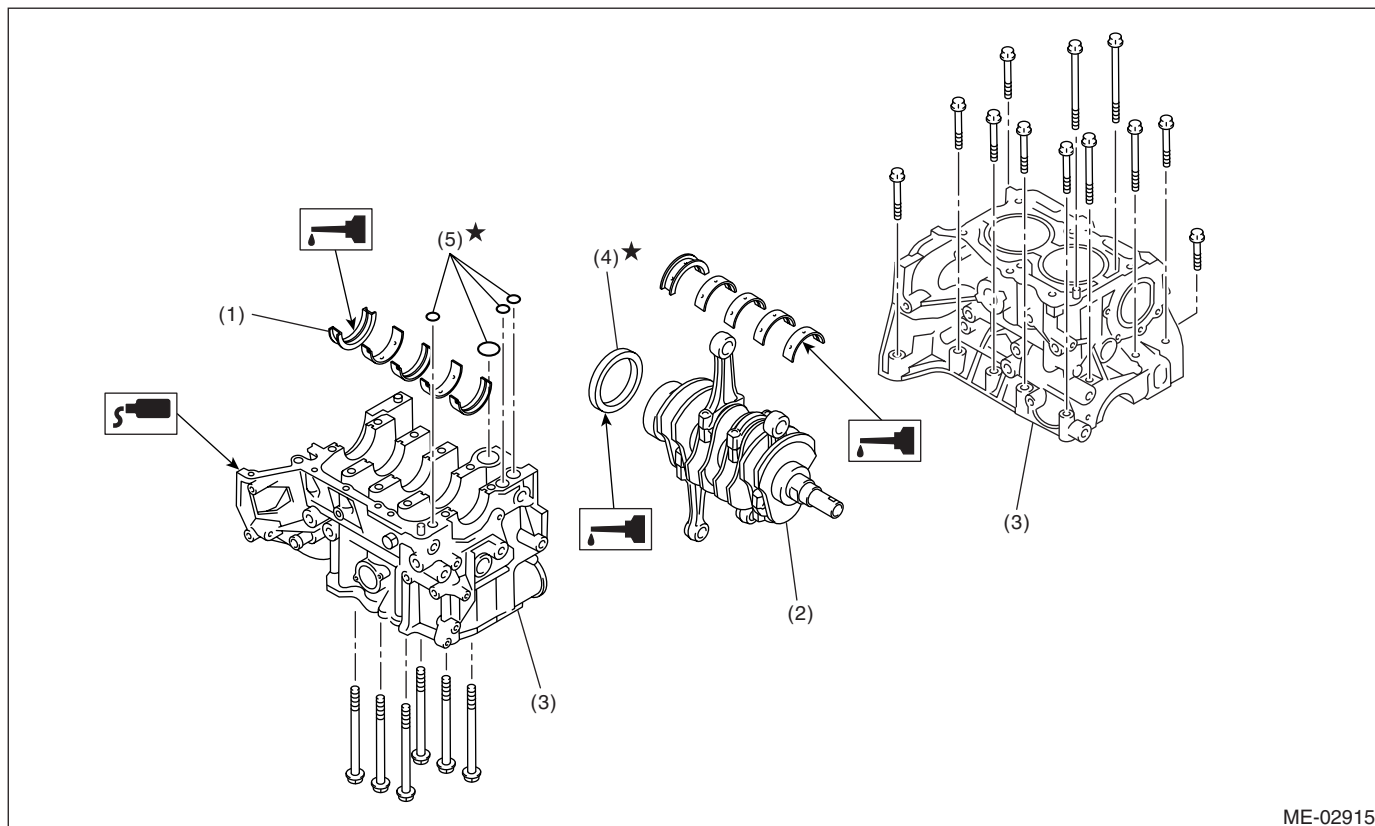
NOTE:

Do not confuse the combination of crankshaft bearings. Press the bearing at the end opposite to locking lip.

34) Draw out each piston from cylinder block using a wooden bar or hammer handle.

NOTE:

Be careful not to confuse the original combination of piston and cylinder.

B: INSTALLATION

ME-02915

- (1) Crankshaft bearing (3) Cylinder block
(2) Crankshaft (4) Rear oil seal

- (5) O-ring

1) Remove oil in the mating surface of bearing and cylinder block before installation. Also apply engine oil to crankshaft pins.

2) Position the crankshaft and O-ring on #1 and #3 cylinder block.

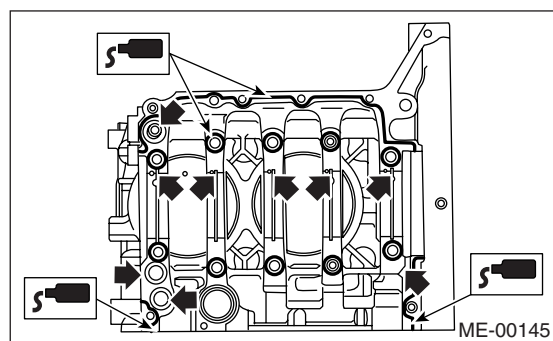
3) Apply liquid gasket to the mating surface of #1 and #3 cylinder block, and position #2 and #4 cylinder block.

Liquid gasket:

THREE BOND 1215 (Part No. 004403007) or equivalent

NOTE:

Do not allow liquid gasket to jut into O-ring grooves, oil passages, bearing grooves, etc.



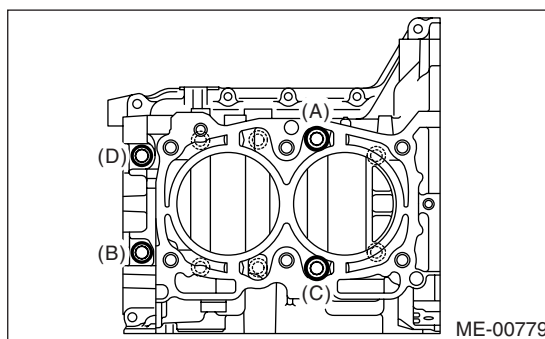
ME-00145

4) Apply engine oil to washers and thread of bolts.

5) Tighten the 10 mm cylinder block connecting bolts in alphabetical sequence shown in the figure. (LH side)

Tightening torque:

10 N·m (1.0 kgf-m, 7.4 ft-lb)

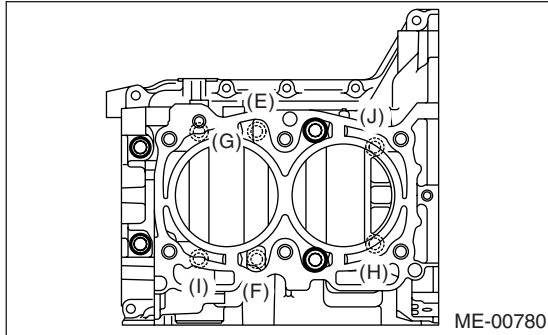


ME-00779

6) Tighten the 10 mm cylinder block connecting bolts in alphabetical sequence shown in the figure. (RH side)

Tightening torque:

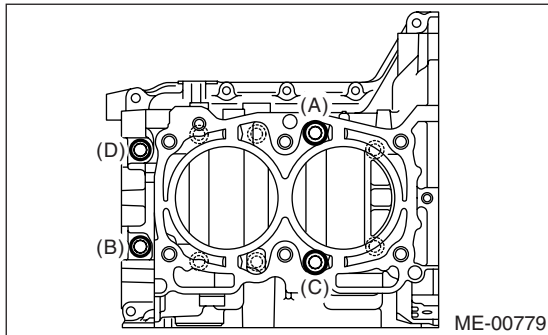
10 N·m (1.0 kgf-m, 7.4 ft-lb)



7) Further tighten the LH side bolts (A) — (D) in alphabetical sequence.

Tightening torque:

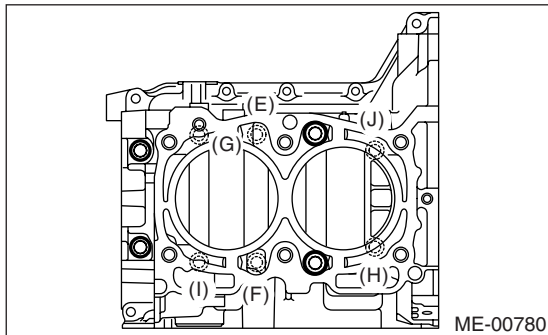
18 N·m (1.8 kgf-m, 13.3 ft-lb)



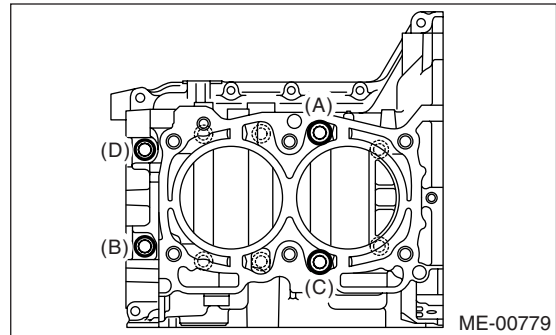
8) Further tighten the RH side bolts (E) — (J) in alphabetical sequence.

Tightening torque:

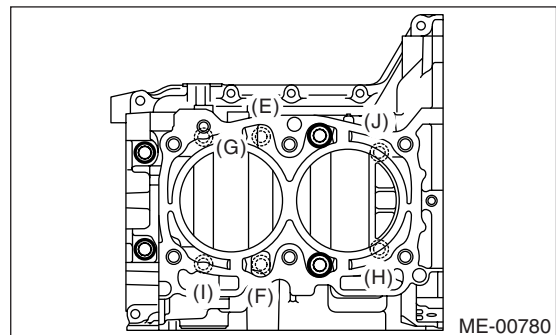
18 N·m (1.8 kgf-m, 13.3 ft-lb)



9) Further tighten the LH side bolts (A) — (D) in alphabetical sequence, by 90° for (A) and (C), and to 40 N·m (4.1 kgf-m, 29.5 ft-lb) for (B) and (D).



10) Further tighten the RH side bolts (E) — (J) by 90° in alphabetical sequence.

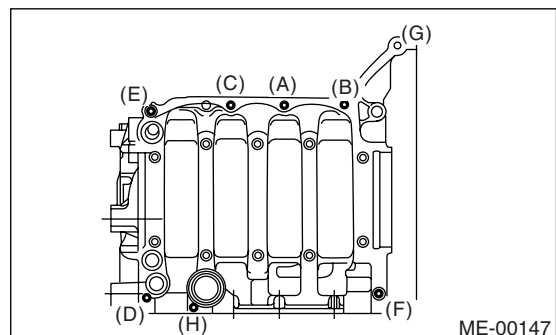


11) Tighten the 8 mm and 6 mm cylinder block connecting bolts in alphabetical sequence shown in the figure.

Tightening torque:

(A) — (G): 25 N·m (2.5 kgf-m, 18.4 ft-lb)

(H): 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



12) Apply engine oil to the outer perimeter of rear oil seal, and install the rear oil seal using ST1 and ST2.

NOTE:

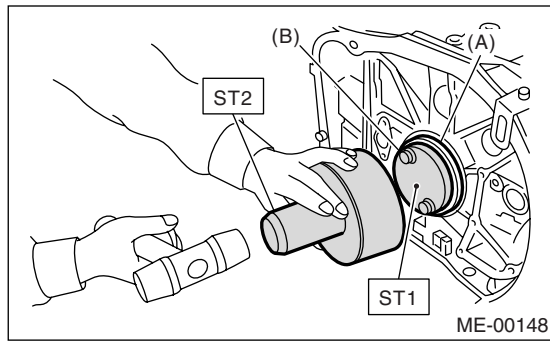
Use a new rear oil seal.

ST1 499597100 CRANKSHAFT OIL SEAL GUIDE

Cylinder Block

MECHANICAL

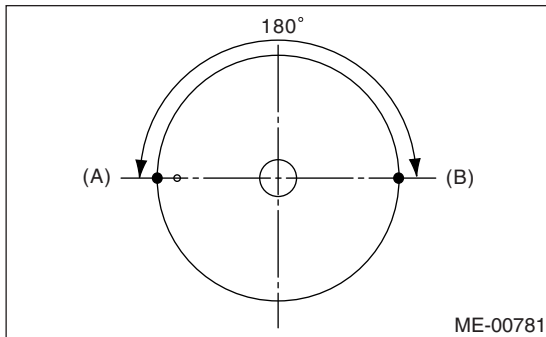
ST2 499587200 CRANKSHAFT OIL SEAL INSTALLER



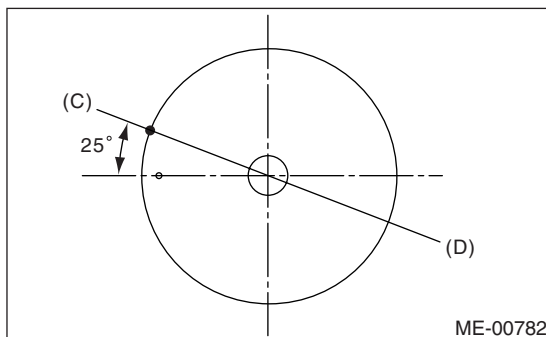
- (A) Rear oil seal
- (B) Flywheel attaching bolt

13) Position the top ring gap at (A) or (B) in the figure.

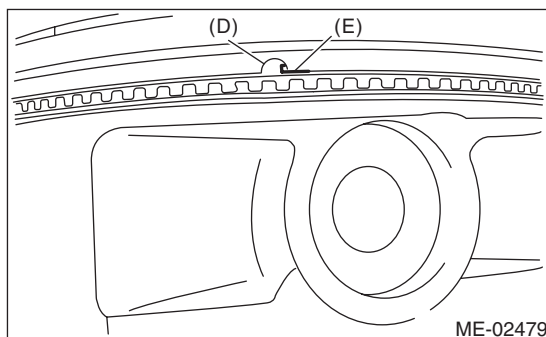
14) Position the second ring gap at 180° on the reverse side for the top ring gap.



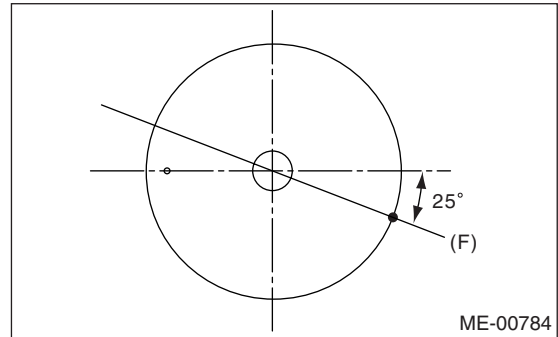
15) Position the upper rail gap at (C) in the figure.



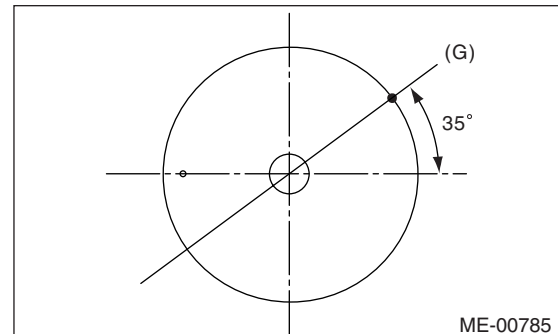
16) Align upper rail spin stopper (D) with piston side surface hole (E).



17) Position the expander gap at (F) in the figure.



18) Position the lower rail gap at (G) in the figure.



CAUTION:

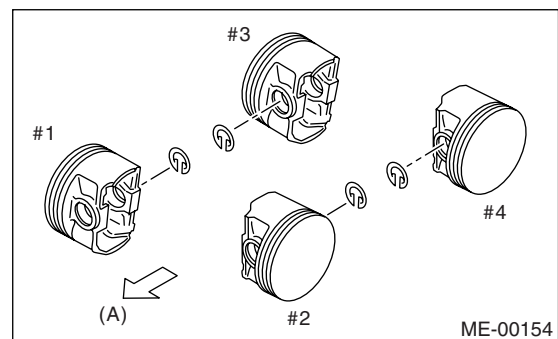
- Ensure ring gaps do not face the same direction.
- Ensure ring gaps are not within the piston skirt area.

19) Install the snap ring.

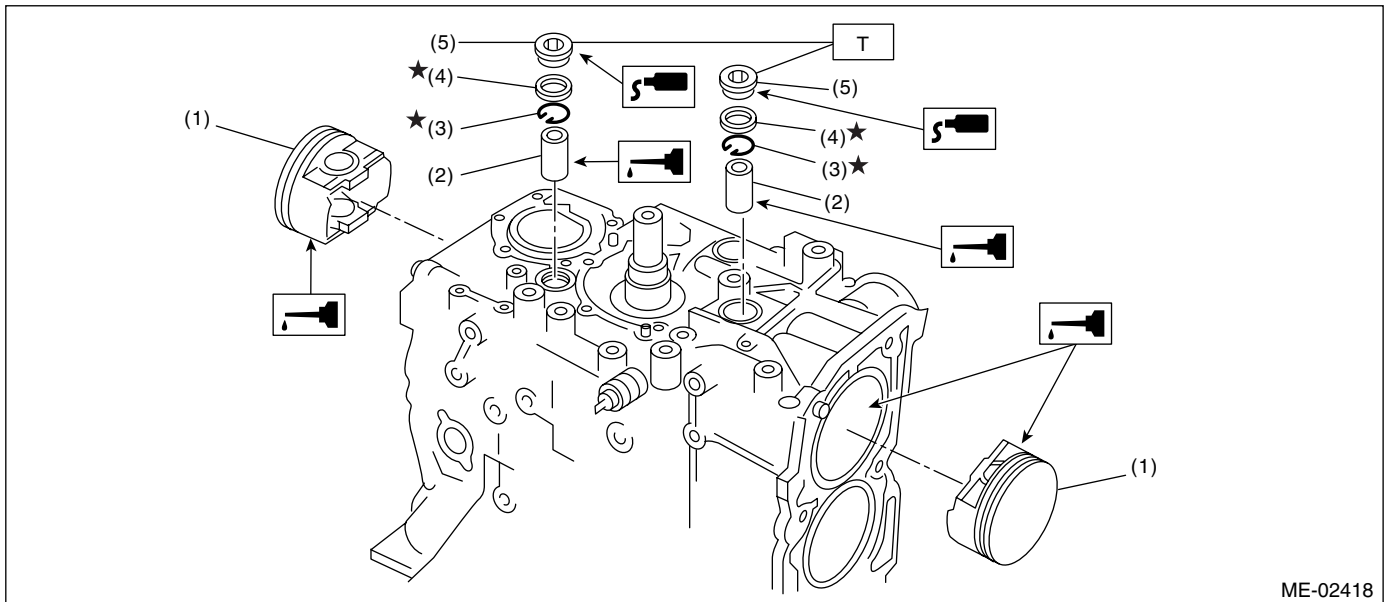
Install the snap rings in piston holes located opposite of service holes in cylinder block, when positioning all pistons in the corresponding cylinders.

NOTE:

Use new snap rings.



(A) Front side



(1) Piston	(4) Gasket
(2) Piston pin	(5) Service hole plug
(3) Snap ring	

Tightening torque: N·m (kgf-m, ft-lb)
T: 70 (7.1, 51.6)

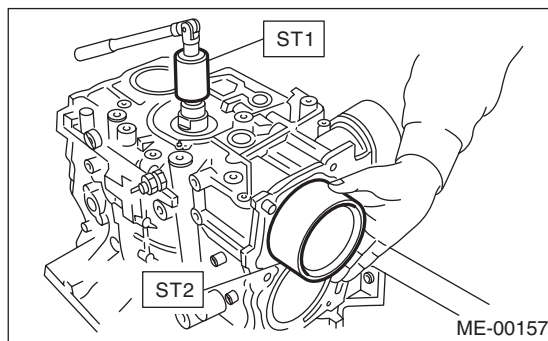
20) Piston installation:

- (1) Turn the cylinder block so that #1 and #2 cylinders face upward.
- (2) Using the ST1, turn the crankshaft so that #1 and #2 connecting rods are set at bottom dead center.

ST1 499987500 CRANKSHAFT SOCKET

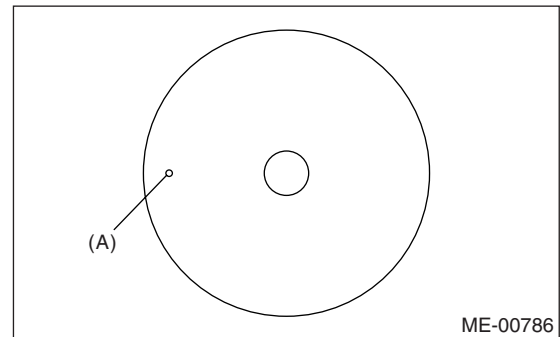
- (3) Apply a coat of engine oil to the pistons and cylinders and insert pistons in their cylinders using ST2.

ST2 498747300 PISTON GUIDE



NOTE:

Piston front mark faces towards the front of the engine.

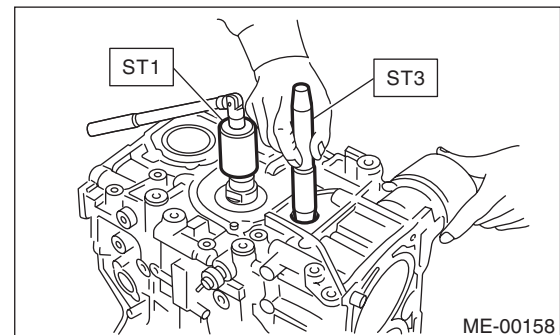


(A) Front mark

21) Piston pin installation:

- (1) Apply a coat of engine oil to ST3, and then insert the ST3 into service hole to align piston pin hole with connecting rod small end.

ST3 499017100 PISTON PIN GUIDE



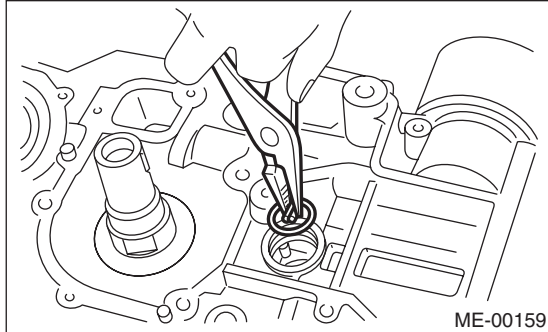
Cylinder Block

MECHANICAL

- (2) Apply a coat of engine oil to the piston pin and insert piston pin into piston and connecting rod through service hole.
- (3) Using the ST, install the snap ring.

NOTE:

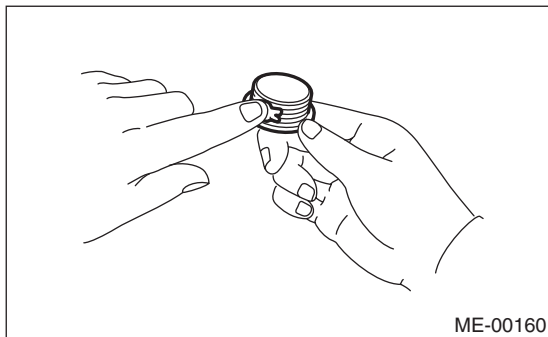
Use new snap rings.



- (4) Apply liquid gasket around the service hole plug.

Liquid gasket:

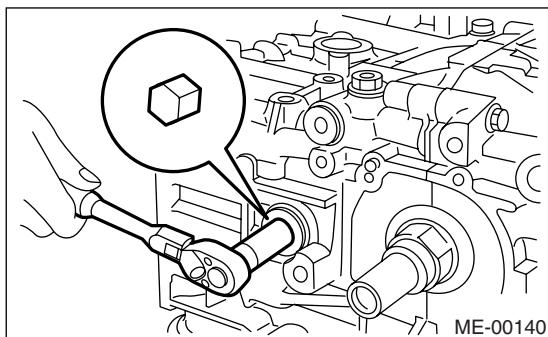
THREE BOND 1105 (Part No. 004403010) or equivalent

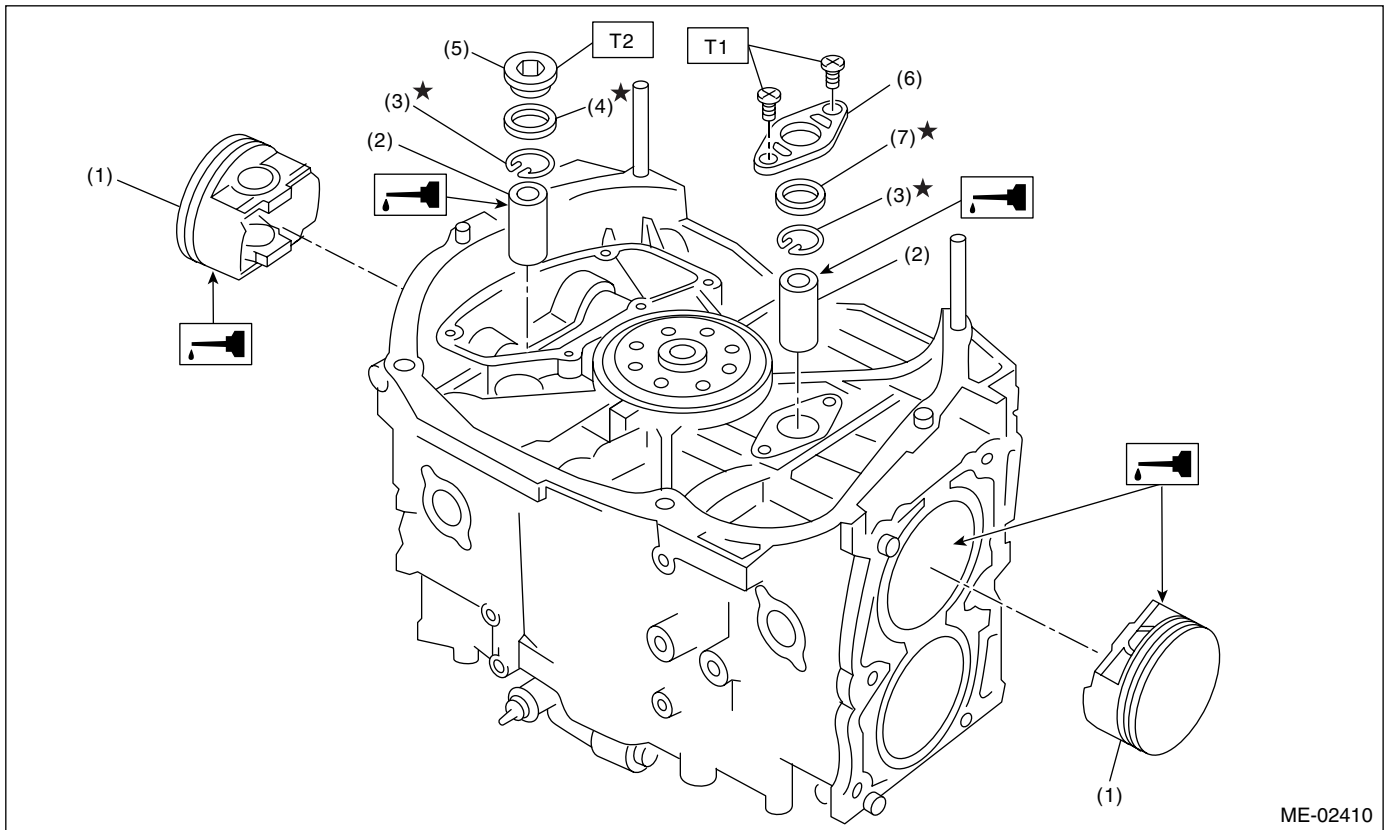


- (5) Install the service hole plug and gasket.

NOTE:

Use a new gasket.





ME-02410

(1) Piston	(5) Service hole plug
(2) Piston pin	(6) Service hole cover
(3) Snap ring	(7) O-ring
(4) Gasket	

Tightening torque: N·m (kgf-m, ft-lb)

T1: 6.4 (0.65, 4.7)

T2: 70 (7.1, 51.6)

(6) Turn the cylinder block so that #3 and #4 cylinders face upward. Using the same procedures as used for #1 and #2 cylinders, install the pistons and piston pins.

22) Install the water pipe.

23) Install the baffle plate.

Tightening torque:

6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

24) Install the oil strainer and O-ring

Tightening torque:

10 N·m (1.0 kgf-m, 7.4 ft-lb)

25) Install the oil strainer stay.

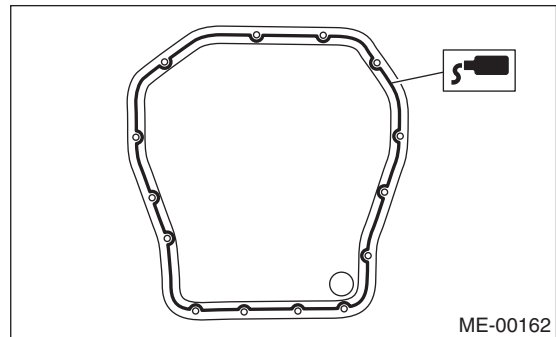
26) Apply liquid gasket to the matching surfaces, and then install the oil pan.

Liquid gasket:

THREE BOND 1207C (Part No. 004403012) or equivalent

Tightening torque:

5 N·m (0.5 kgf-m, 3.6 ft-lb)



ME-00162

27) Apply liquid gasket to the mating surfaces and threaded portion of bolt (A) as shown in the figure, and then install the oil separator cover.

Liquid gasket:

Mating surface

THREE BOND 1207C (Part No. 004403012) or equivalent

Threaded portion of bolt (A)

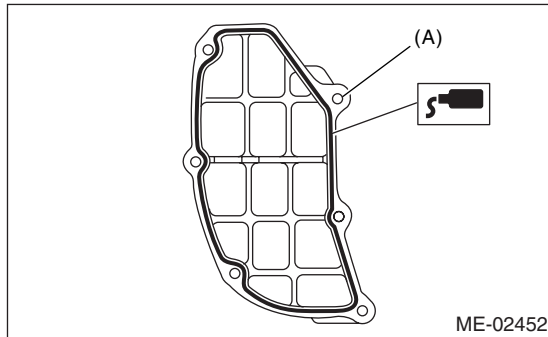
THREE BOND 1324 (Part No. 004403042) or equivalent

Cylinder Block

MECHANICAL

Tightening torque:

6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



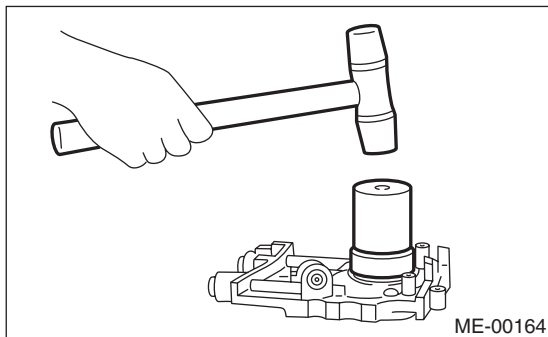
28) Install the flywheel. <Ref. to CL-17, INSTALLATION, Flywheel.>

29) Install the clutch disc and cover. <Ref. to CL-14, INSTALLATION, Clutch Disc and Cover.>

30) Installation of oil pump:

(1) Discard the front oil seal after removal. Replace with a new one using the ST.

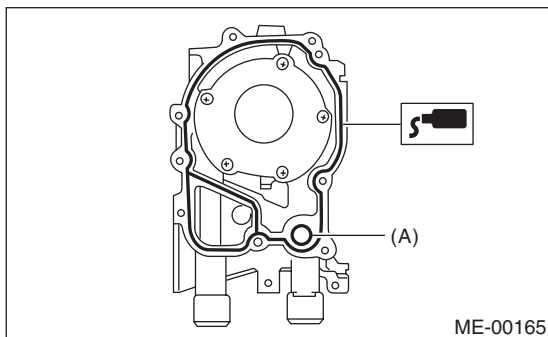
ST 499587100 OIL SEAL INSTALLER



(2) Apply liquid gasket to the matching surface of oil pump.

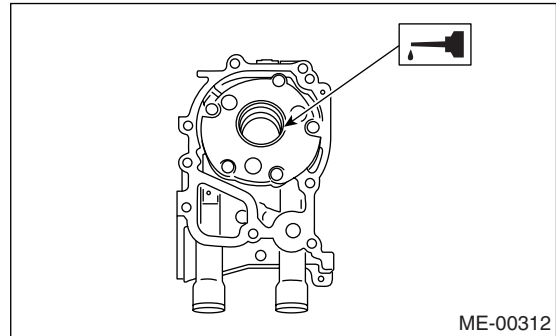
Liquid gasket:

THREE BOND 1215 (Part No. 004403007) or equivalent



(A) O-ring

(3) Apply a coat of engine oil to the inside of the oil seal.



(4) Install the oil pump on cylinder block. Be careful not to damage the oil seal during installation.

(5) Position the oil pump, aligning the notched area with crankshaft, and push the oil pump straight.

CAUTION:

Make sure the oil seal lip is not folded.

(6) Install the oil pump.

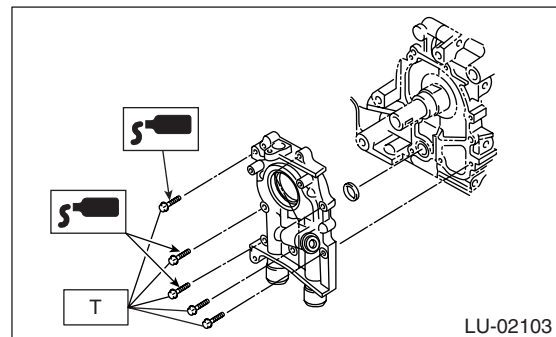
(7) Apply liquid gasket to the threaded portion of three bolts.

Liquid gasket:

THREE BOND 1324 (Part No. 004403042) or equivalent

Tightening torque:

6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



CAUTION:

- Use new O-ring and seal.
- Do not forget to install the O-ring and seal when installing the oil pump.

31) Install the water pump and gasket.

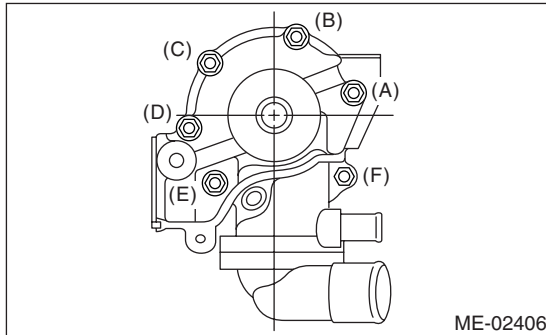
Tightening torque:

First; 12 N·m (1.2 kgf-m, 8.7 ft-lb)

Second; 12 N·m (1.2 kgf-m, 8.7 ft-lb)

CAUTION:

- Be sure to use a new gasket.
- When installing the water pump, tighten the bolts in two stages in alphabetical sequence as shown in the figure.



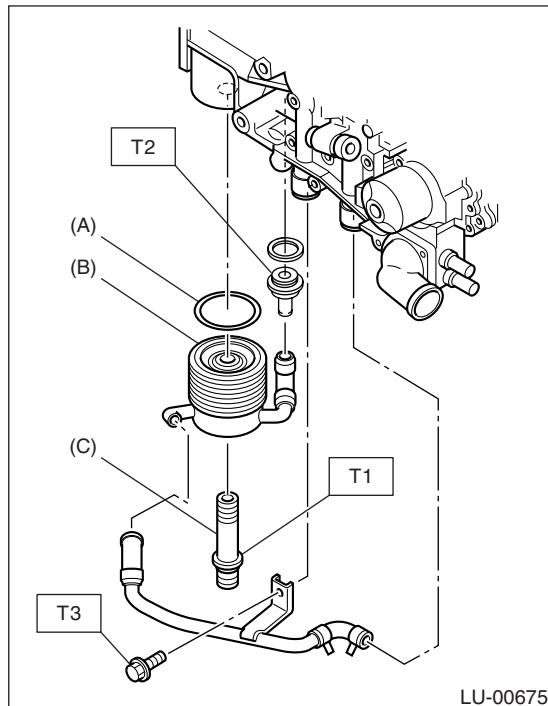
- 32) Install the water by-pass pipe for heater.
33) Install the oil cooler.

CAUTION:

Always use a new O-ring.

Tightening torque:

- T1: 54 N·m (5.5 kgf-m, 40 ft-lb)**
T2: 69 N·m (7.0 kgf-m, 50.9 ft-lb)
T3: 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



- (A) O-ring
(B) Oil cooler
(C) Oil cooler connector

- 34) Install the oil filter using ST.

ST 18332AA000 OIL FILTER WRENCH (Outer diameter: 68 mm (2.68 in))

ST 18332AA010 OIL FILTER WRENCH (Outer diameter: 65 mm (2.56 in))

NOTE:

- Standard oil filter is outer diameter of 68 mm (2.68 in). However, SUBARU genuine oil filter having outer diameter of 65 mm (2.56 in) can also be used.
- Install the oil filter by turning it by hand, being careful not to damage the seal rubber.
- Tighten the oil filter 68 mm (2.68 in) in diameter by approx. 1 rotation more after the seal rubber of oil filter comes in contact with oil cooler. If using a torque wrench, tighten it to 14 N·m (1.4 kgf-m, 10.3 ft-lb).
- Tighten the oil filter 65 mm (2.56 in) in diameter by approx. 2/3 — 3/4 rotation more after the seal rubber of oil filter comes in contact with oil cooler. If using a torque wrench, tighten it to 12 N·m (1.2 kgf-m, 8.7 ft-lb).

CAUTION:

Do not tighten excessively, or oil may leak.

- 35) Install the water by-pass pipe between oil cooler and water pump.
36) Install the water pipe.

NOTE:

Always use a new O-ring.

- 37) Install the cylinder head. <Ref. to ME(STI)-60, INSTALLATION, Cylinder Head.>
38) Install the oil level gauge guide and tighten the attaching bolt (LH side).
39) Install the rocker cover.

NOTE:

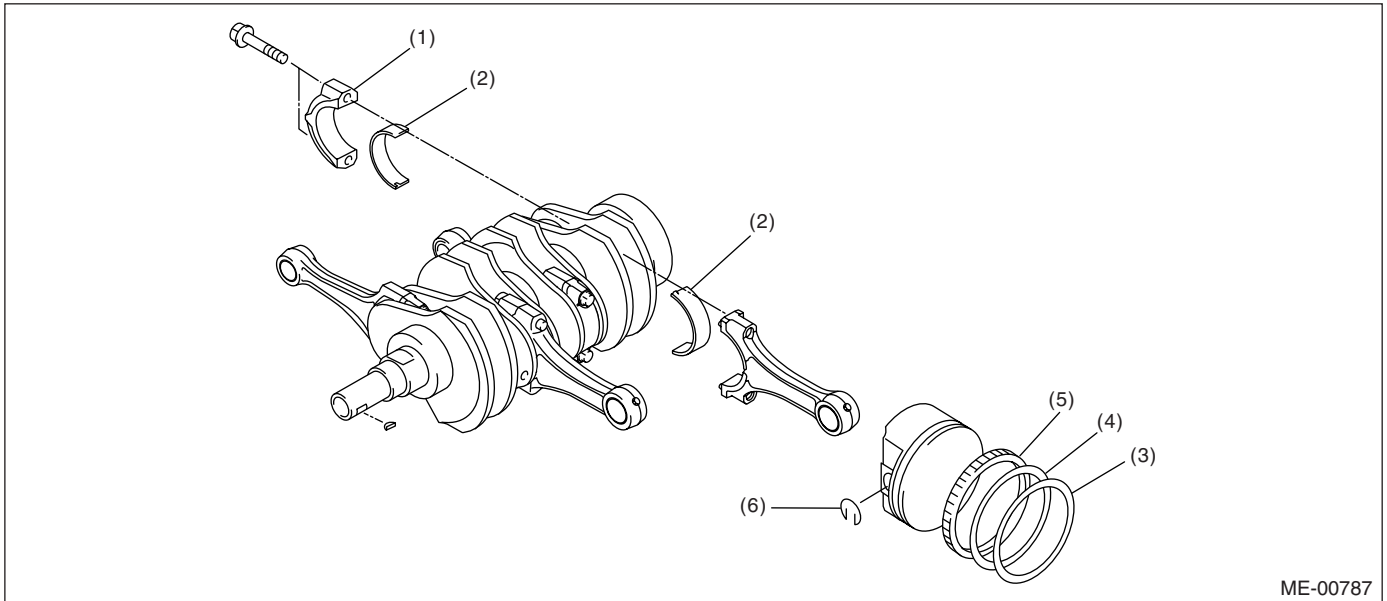
Be sure to use a new gasket of rocker cover.

- 40) Install the crank sprocket. <Ref. to ME(STI)-53, INSTALLATION, Crank Sprocket.>
41) Install the cam sprocket. <Ref. to ME(STI)-52, INSTALLATION, Cam Sprocket.>
42) Install the timing belt. <Ref. to ME(STI)-45, INSTALLATION, Timing Belt.>
43) Install the timing belt cover. <Ref. to ME(STI)-43, INSTALLATION, Timing Belt Cover.>
44) Install the crank pulley. <Ref. to ME(STI)-42, INSTALLATION, Crank Pulley.>
45) Install the generator and A/C compressor brackets on cylinder head.
46) Install the V-belt. <Ref. to ME(STI)-40, INSTALLATION, V-belt.>
47) Install the intake manifold. <Ref. to FU(STI)-13, REMOVAL, Intake Manifold.>

Cylinder Block

MECHANICAL

C: DISASSEMBLY



ME-00787

(1) Connecting rod cap

(3) Top ring

(5) Oil ring

(2) Connecting rod bearing

(4) Second ring

(6) Snap ring

1) Remove the connecting rod cap.

2) Remove the connecting rod bearing.

NOTE:

Arrange the removed connecting rod, connecting rod cap and bearing in order to prevent confusion.

3) Remove the piston rings using the piston ring expander.

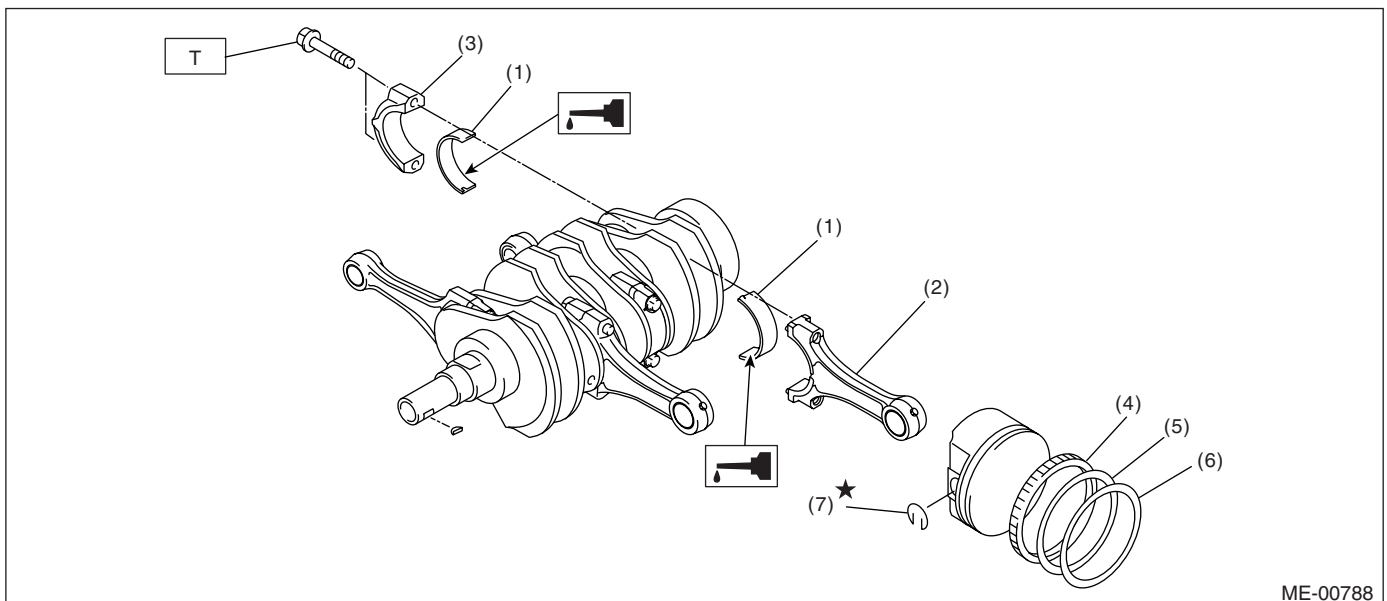
4) Remove the oil ring by hand.

NOTE:

Arrange the removed piston rings in proper order to prevent confusion.

5) Remove the snap ring.

D: ASSEMBLY



ME-00788

(1) Connecting rod bearing

(5) Second ring

(2) Connecting rod

(6) Top ring

(3) Connecting rod cap

(7) Snap ring

(4) Oil ring

Tightening torque: N·m (kgf-m, ft-lb)

T: 52 (5.3, 38.4)

- 1) Apply oil to the surfaces of the connecting rod bearings. Install the connecting rod bearings on connecting rods and connecting rod caps.
- 2) Install the connecting rod on crankshaft.

NOTE:

Position each connecting rod with the side marked facing forward.

- 3) Install the connecting rod cap.

Ensure the arrow on connecting rod cap faces the front during installation.

CAUTION:

- Each connecting rod has its own mating cap. Make sure that they are assembled correctly by checking their matching number.
- When tightening the connecting rod nuts, apply oil on the threads.

- 4) Install the oil ring spacer, upper rail and lower rail in this order by hand. Then install the second ring and top ring with a piston ring expander.

E: INSPECTION

1. CYLINDER BLOCK

- 1) Visually check for cracks and damage. Especially, inspect the important parts by means of liquid penetrant tester.
- 2) Check the oil passages for clogging.
- 3) Inspect the crankcase surface that mates with cylinder head for warping by using a straight edge, and correct by grinding if necessary.

Warping limit:

0.025 mm (0.00098 in)

Grinding limit:

0.1 mm (0.004 in)

Standard height of cylinder block:

201.0 mm (7.91 in)

2. CYLINDER AND PISTON

- 1) The cylinder bore size is stamped on cylinder block's front upper surface.

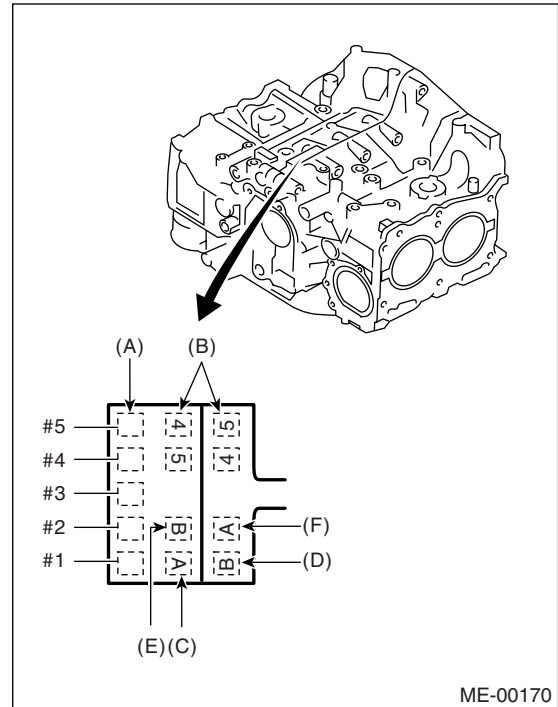
NOTE:

- Measurement should be performed at a temperature of 20°C (68°F).
- Standard sized pistons are classified into two grades, "A" and "B". These grades should be used as a guide line in selecting a standard piston.

Standard inner diameter:

A: 99.505 — 99.515 mm (3.9175 — 3.9179 in)

B: 99.495 — 99.505 mm (3.9171 — 3.9175 in)



- (A) Main journal size mark
- (B) Cylinder block (RH)-(LH) combination mark
- (C) #1 cylinder bore size mark
- (D) #2 cylinder bore size mark
- (E) #3 cylinder bore size mark
- (F) #4 cylinder bore size mark

- 2) How to measure the inner diameter of each cylinder

Measure the inner diameter of each cylinder in both the thrust and piston pin directions at the heights shown in the figure, using a cylinder bore gauge.

NOTE:

Measurement should be performed at a temperature of 20°C (68°F).

Cylinder Block

MECHANICAL

Taper:

Standard

0.015 mm (0.0006 in)

Limit

0.050 mm (0.0020 in)

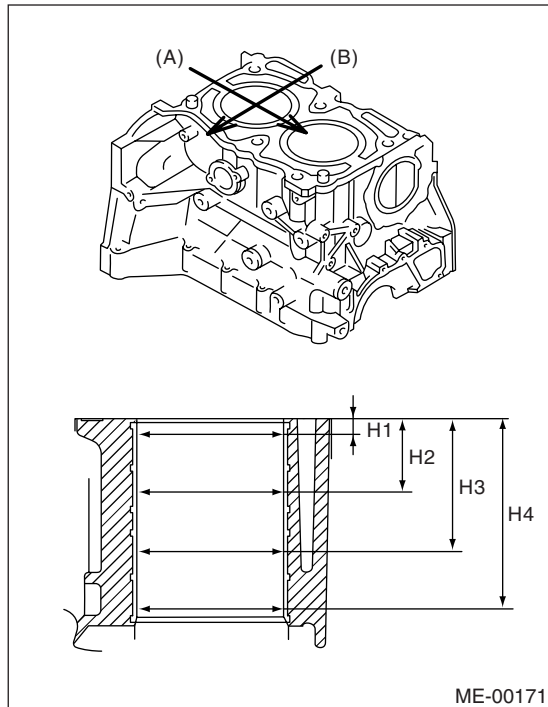
Out-of-roundness:

Standard

0.010 mm (0.0004 in)

Limit

0.050 mm (0.0020 in)



(A) Piston pin direction

(B) Thrust direction

H1: 10 mm (0.39 in)

H2: 45 mm (1.77 in)

H3: 80 mm (3.15 in)

H4: 115 mm (4.53 in)

3) When the piston is to be replaced due to general or cylinder wear, determine a suitable sized piston by measuring the piston clearance.

4) How to measure the outer diameter of each piston:

Measure the outer diameter of each piston at the height shown in the figure. (Thrust direction)

NOTE:

Measurement should be performed at a temperature of 20°C (68°F).

Piston grade point H:

38.2 mm (1.50 in)

Piston outer diameter:

Standard

A: 99.505 — 99.515 mm (3.9175 — 3.9179 in)

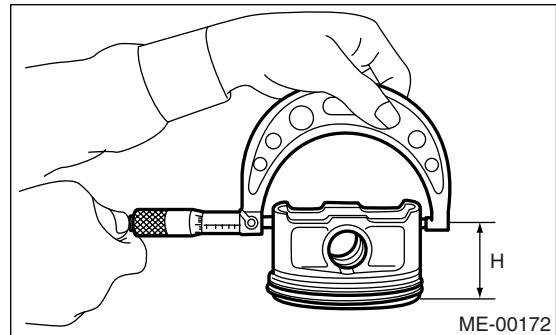
B: 99.495 — 99.505 mm (3.9171 — 3.9175 in)

0.25 mm (0.0098 in) oversize

99.745 — 99.765 mm (3.9270 — 3.9278 in)

0.50 mm (0.0197 in) oversize

99.995 — 100.015 mm (3.9368 — 3.9376 in)



5) Calculate the clearance between cylinder and piston.

NOTE:

Measurement should be performed at a temperature of 20°C (68°F).

Cylinder to piston clearance at 20°C (68°F):

Standard

-0.010 — 0.010 mm (-0.0004 — 0.0004 in)

Limit

0.030 mm (0.0012 in)

6) Boring and honing

(1) If the measured value of either taper, out-of-roundness, or cylinder-to-piston clearance exceeds the specified limit, or if there is any damage on the cylinder wall, reboring it to use an oversize piston.

CAUTION:

When any of the cylinders needs reboring, all other cylinders must be bored at the same time, and use oversize pistons. Do not perform boring on one cylinder only, nor use an oversize piston for one cylinder only.

(2) If the cylinder inner diameter exceeds the limit after boring and honing, replace the crankcase.

NOTE:

Immediately after reboring, the cylinder diameter may differ from its real diameter due to temperature rise. Thus, pay attention to this when measuring the cylinder diameter.

Cylinder enlarging (boring) limit (dia.):

To 100.005 mm (3.937 in)

3. PISTON AND PISTON PIN

- 1) Check the pistons and piston pins for damage, cracks, and wear and the piston ring grooves for wear and damage. Replace if defective.
- 2) Measure the piston-to-cylinder clearance at each cylinder. <Ref. to ME(STI)-79, CYLINDER AND PISTON, INSPECTION, Cylinder Block.> If any of the clearances is not within specification, replace the piston or bore the cylinder to use an over-size piston.
- 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 defective.

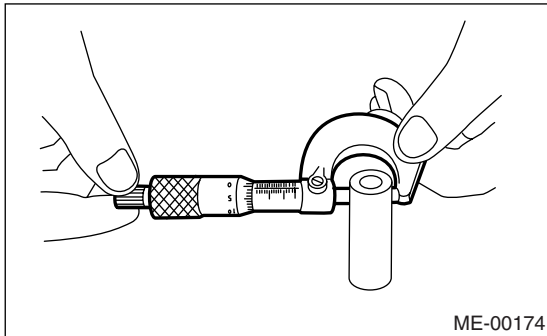
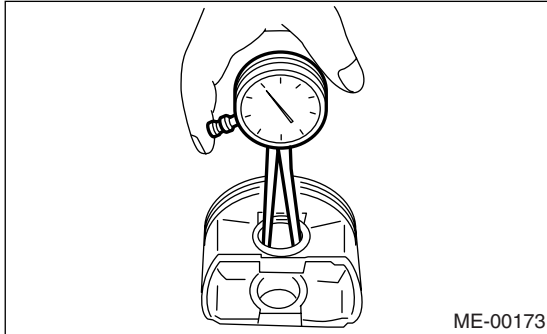
Standard clearance between piston pin and hole in piston:

Standard

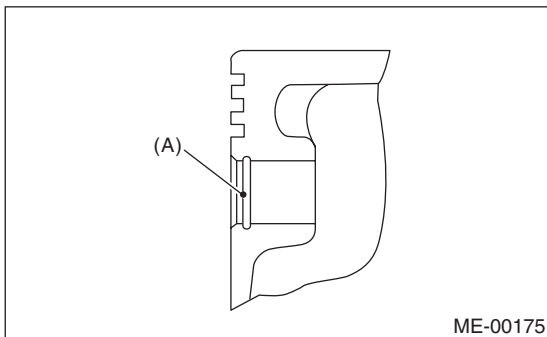
0.004 — 0.008 mm (0.0002 — 0.0003 in)

Limit

0.020 mm (0.0008 in)



- 4) Check the snap ring installation groove (A) on piston for burr. If necessary, remove the burr from groove so that the piston pin can lightly move.



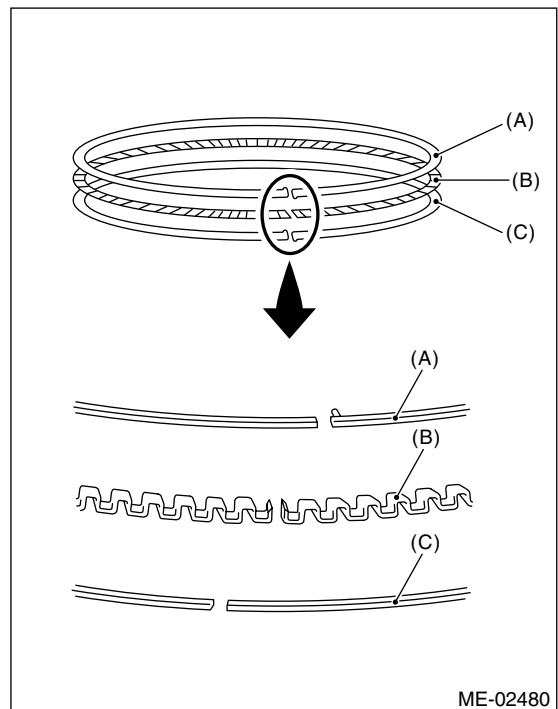
- 5) Check the piston pin snap ring for distortion, cracks and wear.

4. PISTON RING

- 1) If the piston ring is broken, damaged, or worn, or if its tension is insufficient, or when the piston is replaced, replace the piston ring with a new one of the same size as the piston.

NOTE:

- Marks are shown on the end of top and second rings. When installing the rings to piston, face this mark upward.
- Oil ring consists of upper rail, expander and lower rail. When installing on piston, be careful of each rail's direction.



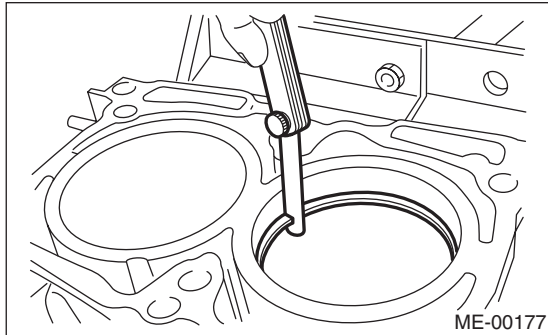
- (A) Upper rail
- (B) Expander
- (C) Lower rail

Cylinder Block

MECHANICAL

2) Squarely place the piston ring and oil ring in cylinder, and then measure the piston ring closed gap with a thickness gauge.

		Unit: mm (in)	
		Standard	Limit
Piston ring closed gap	Top ring	0.20 — 0.25 (0.0079 — 0.0098)	1.0 (0.039)
	Second ring	0.37 — 0.52 (0.015 — 0.020)	1.0 (0.039)
	Oil ring rail	0.20 — 0.50 (0.0079 — 0.0197)	1.5 (0.059)

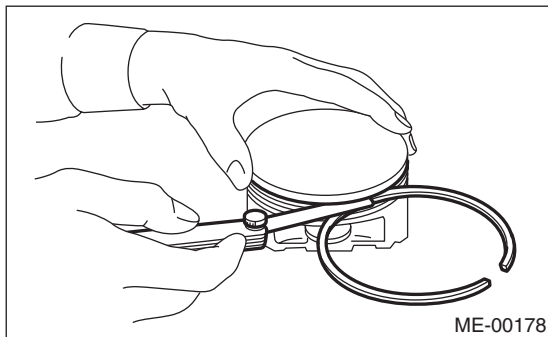


3) Measure the clearance between piston ring and piston ring groove with a thickness gauge.

NOTE:

Before measuring the clearance, clean the piston ring groove and piston ring.

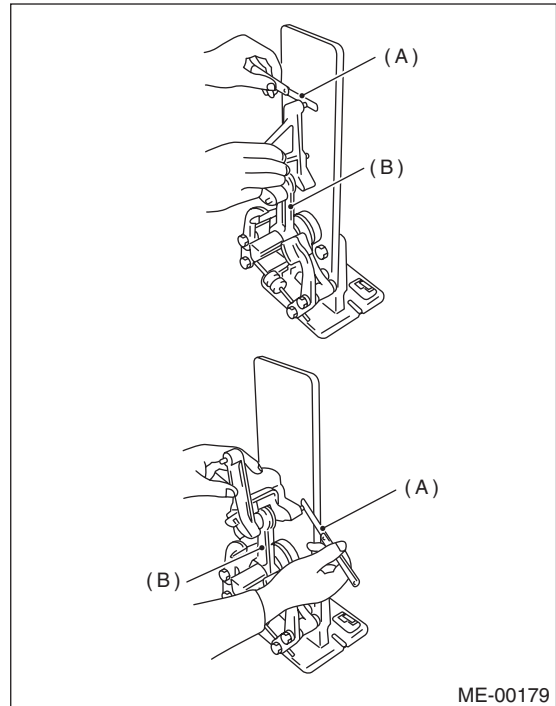
		Unit: mm (in)	
		Standard	Limit
Clearance between piston ring and piston ring groove	Top ring	0.040 — 0.080 (0.0016 — 0.0031)	0.15 (0.0059)
	Second ring	0.030 — 0.070 (0.0012 — 0.0028)	0.15 (0.0059)



5. CONNECTING ROD

- 1) Replace the connecting rod, if the large or small end thrust surface is damaged.
- 2) Check for bend or twist using a connecting rod aligner. Replace the connecting rod if the bend or twist exceeds the limit.

Limit of bend or twist per 100 mm (3.94 in) in length:
0.10 mm (0.0039 in)



- (A) Thickness gauge
 (B) Connecting rod

3) Install the connecting rod fitted with bearing to crankshaft, and then measure the side clearance (thrust clearance). Replace the connecting rod if the side clearance exceeds the specified limit.

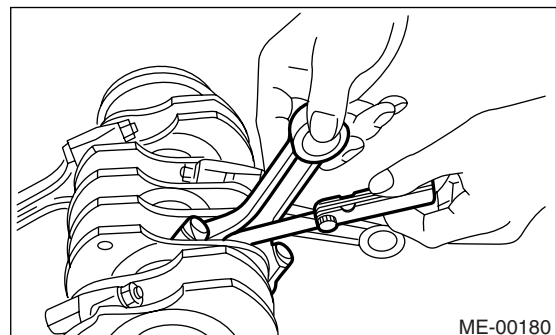
Connecting rod side clearance:

Standard

0.070 — 0.330 mm (0.0028 — 0.0130 in)

Limit

0.40 mm (0.016 in)



4) Inspect the connecting rod bearing for scar, peeling, seizure, melting, wear, etc.

5) Measure the oil clearance on individual connecting rod bearings by means of plastigauge. If any oil clearance is not within specification, replace the defective bearing with a new one of standard size or undersize as necessary. (See the table below.)

Connecting rod oil clearance:

Standard

0.017 — 0.045 mm (0.0007 — 0.0018 in)

Limit

0.050 mm (0.0020 in)

Unit: mm (in)		
Bearing	Bearing size (Thickness at center)	Outer diameter of crank pin
Standard	1.490 — 1.502 (0.0587 — 0.0591)	51.984 — 52.000 (2.0466 — 2.0472)
0.03 (0.0012) undersize	1.504 — 1.512 (0.0592 — 0.0595)	51.954 — 51.970 (2.0454 — 2.0461)
0.05 (0.0020) undersize	1.514 — 1.522 (0.0596 — 0.0599)	51.934 — 51.950 (2.0447 — 2.0453)
0.25 (0.0098) undersize	1.614 — 1.622 (0.0635 — 0.0639)	51.734 — 51.750 (2.0368 — 2.0374)

6) Inspect the bushing at connecting rod small end, and replace if worn or damaged. Also measure the piston pin clearance at connecting rod small end.

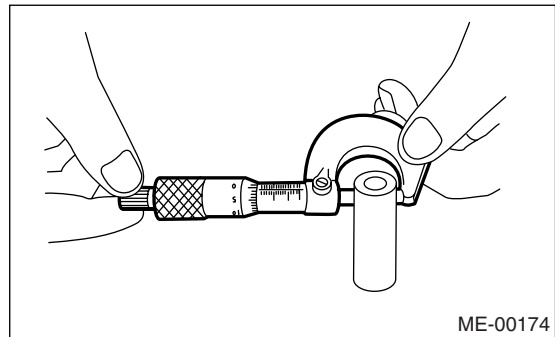
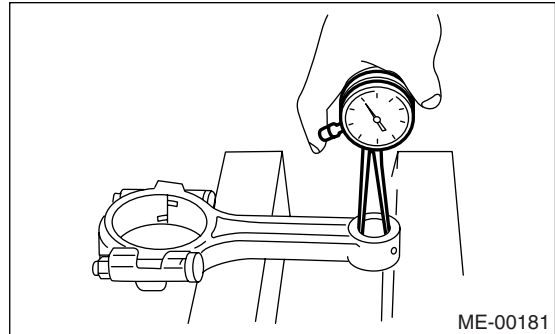
Clearance between piston pin and bushing:

Standard

0 — 0.022 mm (0 — 0.0009 in)

Limit

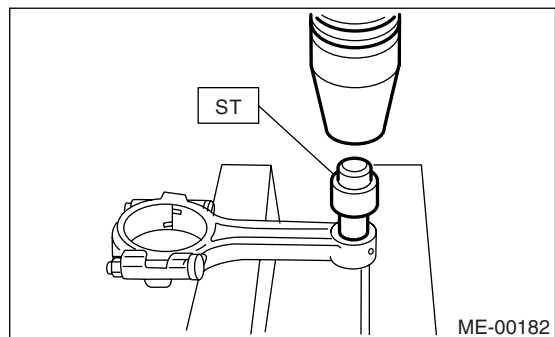
0.030 mm (0.0012 in)



7) Replacement procedure is as follows:

- (1) Remove the bushing from connecting rod with ST and press.
- (2) Press the bushing with ST after applying oil on the periphery of bushing.

ST 499037100 CONNECTING ROD BUSHING REMOVER AND INSTALLER



- (3) Make two 3 mm (0.12 in) holes in bushing. Ream the inside of bushing.
- (4) After the completion of reaming, clean the bushing to remove chips.

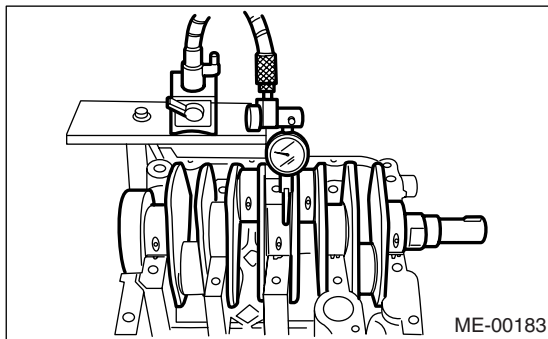
6. CRANKSHAFT AND CRANKSHAFT BEARING

- 1) Clean the crankshaft completely and check for cracks by means of liquid penetrant tester etc., and replace if defective.
- 2) Measure the crankshaft bend, and correct or replace if it exceeds the limit.

NOTE:

If a suitable V-block is not available, install the #1 and #5 crankshaft bearing on cylinder block, position the crankshaft on these bearings and measure the crankshaft bend using a dial gauge.

Crankshaft bend limit:
0.035 mm (0.0014 in)



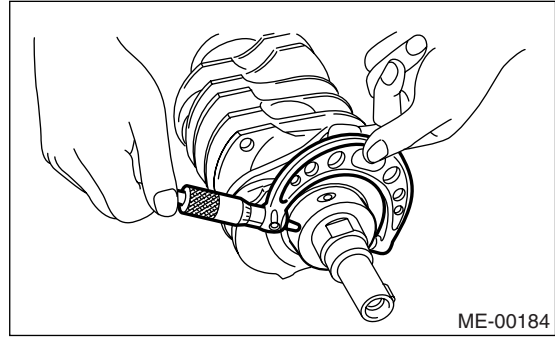
- 3) Inspect the crank journal and crank pin for wear. If they are not within the specifications, replace the bearing with a suitable (undersize) one, and then replace or recondition the crankshaft as necessary. When grinding the crank journal or crank pin, finish them to specified dimensions according to the undersize bearing to be used.

Crank pin:

Out-of-roundness
0.003 mm (0.0001 in)
Cylindricality
0.004 mm (0.0002 in)
Grinding limit
To 51.750 mm (2.0374 in) dia.

Crank journal:

Out-of-roundness
0.005 mm (0.0002 in)
Cylindricality
0.006 mm (0.0002 in)
Grinding limit
To 59.750 mm (2.3524 in) dia.



Cylinder Block

MECHANICAL

Unit: mm (in)				
		Crank journal diameter		Crank pin outer diameter
		#1, #3	#2, #4, #5	
Standard	Journal O.D.	59.992 — 60.008 (2.3619 — 2.3625)	59.992 — 60.008 (2.3619 — 2.3625)	51.984 — 52.000 (2.0466 — 2.0472)
	Bearing size (Thickness at center)	1.998 — 2.011 (0.0787 — 0.0792)	2.000 — 2.013 (0.0787 — 0.0793)	1.490 — 1.502 (0.0587 — 0.0591)
0.03 (0.0012) undersize	Journal O.D.	59.962 — 59.978 (2.3607 — 2.3613)	59.962 — 59.978 (2.3607 — 2.3613)	51.954 — 51.970 (2.0454 — 2.0461)
	Bearing size (Thickness at center)	2.017 — 2.020 (0.0794 — 0.0795)	2.019 — 2.022 (0.0795 — 0.0796)	1.504 — 1.512 (0.0592 — 0.0595)
0.05 (0.0020) undersize	Journal O.D.	59.942 — 59.958 (2.3599 — 2.3605)	59.942 — 59.958 (2.3599 — 2.3605)	51.934 — 51.950 (2.0447 — 2.0453)
	Bearing size (Thickness at center)	2.027 — 2.030 (0.0798 — 0.0799)	2.029 — 2.032 (0.0799 — 0.0800)	1.514 — 1.522 (0.0596 — 0.0599)
0.25 (0.0098) undersize	Journal O.D.	59.742 — 59.758 (2.3520 — 2.3527)	59.742 — 59.758 (2.3520 — 2.3527)	51.734 — 51.750 (2.0368 — 2.0374)
	Bearing size (Thickness at center)	2.127 — 2.130 (0.0837 — 0.0839)	2.129 — 2.132 (0.0838 — 0.0839)	1.614 — 1.622 (0.0635 — 0.0639)

O.D.: Outer Diameter

4) Measure the thrust clearance of crankshaft at center bearing. If the clearance exceeds the limit, replace the bearing.

Crankshaft side clearance:

Standard

0.030 — 0.115 mm (0.0012 — 0.0045 in)

Limit

0.25 mm (0.0098 in)

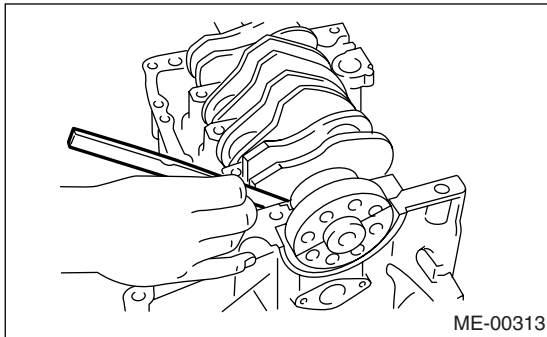
Crankshaft oil clearance:

Standard

0.010 — 0.030 mm (0.0004 — 0.0012 in)

Limit

0.040 mm (0.0016 in)



5) Inspect individual crankshaft bearings for signs of flaking, seizure, melting, and wear.

6) Measure the oil clearance on each crankshaft bearing by means of plastigauge. If the measurement is not within the specification, replace the defective bearing with an undersize one, and replace or recondition the crankshaft as necessary.

21.Intake and Exhaust Valve

A: SPECIFICATION

For the removal and installation procedure of intake and exhaust valve, refer to "Cylinder Head". <Ref. to ME(STI)-60, REMOVAL, Cylinder Head.> and <Ref. to ME(STI)-60, INSTALLATION, Cylinder Head.>

22.Piston

A: SPECIFICATION

For the removal and installation procedure of piston, refer to "Cylinder Block". <Ref. to ME(STI)-67, REMOVAL, Cylinder Block.> and <Ref. to ME(STI)-70, INSTALLATION, Cylinder Block.>

23.Connecting Rod

A: SPECIFICATION

For the removal and installation procedure of connecting rod, refer to "Cylinder Block". <Ref. to ME(STI)-67, REMOVAL, Cylinder Block.> and <Ref. to ME(STI)-70, INSTALLATION, Cylinder Block.>

24.Crankshaft

A: SPECIFICATION

For the removal and installation procedure of crankshaft, refer to "Cylinder Block". <Ref. to ME(STI)-67, REMOVAL, Cylinder Block.> and <Ref. to ME(STI)-70, INSTALLATION, Cylinder Block.>

Engine Trouble in General

MECHANICAL

25.Engine Trouble in General

A: INSPECTION

NOTE:

“RANK” shown in the chart refers to the possibility of reason for the trouble in order (“Very often” to “Rarely”)

A — Very often

B — Sometimes

C — Rarely

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
1. Engine does not start.			
1) Starter does not turn.	Starter	Defective battery-to-starter harness	B
		Defective starter switch	C
		Defective inhibitor switch or neutral switch	C
		Defective starter	B
	Battery	Poor terminal connection	A
		Run-down battery	A
		Defective charging system	B
	Friction	Seizure of crankshaft and connecting rod bearing	C
		Seized camshaft	C
		Seized or stuck piston and cylinder	C
2) Initial combustion does not occur.	Starter	Defective starter	C
	Engine control system <Ref. to EN(STI)(diag)-2, Basic Diagnostic Procedure.>		A
	Fuel line	Defective fuel pump and relay	A
		Lack of or insufficient fuel	B
	Belt	Defective	B
		Defective timing	B
	Compression	Incorrect valve clearance	C
		Loosened spark plugs or defective gasket	C
		Loosened cylinder head bolts or defective gasket	C
		Improper valve sealing	C
		Defective valve stem	C
		Worn or broken valve spring	B
		Worn or stuck piston rings, cylinder and piston	C
		Incorrect valve timing	B
		Improper engine oil (low viscosity)	B
3) Initial combustion occurs.	Engine control system <Ref. to EN(STI)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Defective intake manifold gasket	B
		Defective throttle body gasket	B
	Fuel line	Defective fuel pump and relay	C
		Clogged fuel line	C
		Lack of or insufficient fuel	B
	Belt	Defective	B
		Defective timing	B
	Compression	Incorrect valve clearance	C
		Loosened spark plugs or defective gasket	C
		Loosened cylinder head bolts or defective gasket	C
		Improper valve sealing	C
		Defective valve stem	C
		Worn or broken valve spring	B
		Worn or stuck piston rings, cylinder and piston	C
		Incorrect valve timing	B
		Improper engine oil (low viscosity)	B

Engine Trouble in General

MECHANICAL

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
4) Engine stalls after initial combustion.	Engine control system <Ref. to EN(STI)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened or cracked intake duct	B
		Loosened or cracked PCV hose	C
		Loosened or cracked vacuum hose	C
		Defective intake manifold gasket	B
		Defective throttle body gasket	B
		Dirty air cleaner element	C
	Fuel line	Clogged fuel line	C
		Lack of or insufficient fuel	B
	Belt	Defective	B
		Defective timing	B
	Compression	Incorrect valve clearance	C
		Loosened spark plugs or defective gasket	C
		Loosened cylinder head bolts or defective gasket	C
		Improper valve sealing	C
		Defective valve stem	C
		Worn or broken valve spring	B
		Worn or stuck piston rings, cylinder and piston	C
		Incorrect valve timing	B
		Improper engine oil (low viscosity)	B
2. Rough idle and engine stall	Engine control system <Ref. to EN(STI)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened or cracked intake duct	A
		Loosened or cracked PCV hose	A
		Loosened or cracked vacuum hose	A
		Defective intake manifold gasket	B
		Defective throttle body gasket	B
		Defective PCV valve	C
		Loosened oil filler cap	B
		Dirty air cleaner element	C
	Fuel line	Defective fuel pump and relay	C
		Clogged fuel line	C
		Lack of or insufficient fuel	B
	Belt	Defective timing	C
	Compression	Incorrect valve clearance	B
		Loosened spark plugs or defective gasket	B
		Loosened cylinder head bolts or defective gasket	B
		Improper valve sealing	B
		Defective valve stem	C
		Worn or broken valve spring	B
		Worn or stuck piston rings, cylinder and piston	B
		Incorrect valve timing	A
		Improper engine oil (low viscosity)	B
	Lubrication system	Incorrect oil pressure	B
		Defective rocker cover gasket	C
	Cooling system	Overheating	C
	Others	Malfunction of evaporative emission control system	A
		Stuck or damaged throttle valve	B

Engine Trouble in General

MECHANICAL

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
3. Low output, hesitation and poor acceleration	Engine control system <Ref. to EN(STI)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened or cracked intake duct	A
		Loosened or cracked PCV hose	A
		Loosened or cracked vacuum hose	B
		Defective intake manifold gasket	B
		Defective throttle body gasket	B
		Defective PCV valve	B
		Loosened oil filler cap	B
		Dirty air cleaner element	A
	Fuel line	Defective fuel pump and relay	B
		Clogged fuel line	B
		Lack of or insufficient fuel	C
	Belt	Defective timing	B
	Compression	Incorrect valve clearance	B
		Loosened spark plugs or defective gasket	B
		Loosened cylinder head bolts or defective gasket	B
		Improper valve sealing	B
		Defective valve stem	C
		Worn or broken valve spring	B
		Worn or stuck piston rings, cylinder and piston	C
		Incorrect valve timing	A
		Improper engine oil (low viscosity)	B
	Lubrication system	Incorrect oil pressure	B
	Cooling system	Overheating	C
		Over cooling	C
	Others	Malfunction of evaporative emission control system	A
4. Surging	Engine control system <Ref. to EN(STI)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened or cracked intake duct	A
		Loosened or cracked PCV hose	A
		Loosened or cracked vacuum hose	A
		Defective intake manifold gasket	B
		Defective throttle body gasket	B
		Defective PCV valve	B
		Loosened oil filler cap	B
		Dirty air cleaner element	B
	Fuel line	Defective fuel pump and relay	B
		Clogged fuel line	B
		Lack of or insufficient fuel	C
	Belt	Defective timing	B
	Compression	Incorrect valve clearance	B
		Loosened spark plugs or defective gasket	C
		Loosened cylinder head bolts or defective gasket	C
		Improper valve sealing	C
		Defective valve stem	C
		Worn or broken valve spring	C
		Worn or stuck piston rings, cylinder and piston	C
		Incorrect valve timing	A
		Improper engine oil (low viscosity)	B
	Cooling system	Overheating	B
	Others	Malfunction of evaporative emission control system	C

Engine Trouble in General

MECHANICAL

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
5. Engine does not return to idle.	Engine control system <Ref. to EN(STI)(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(STI)(diag)-2, Basic Diagnostic Procedure.>		A
	Cooling system	Overheating	B
	Others	Malfunction of evaporative emission control system	B
7. Afterburning in exhaust system	Engine control system <Ref. to EN(STI)(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
	Belt	Defective timing	B
	Compression	Incorrect valve clearance	B
		Loosened spark plugs or defective gasket	C
		Loosened cylinder head bolts or defective gasket	C
		Improper valve sealing	B
		Defective valve stem	C
		Worn or broken valve spring	C
		Worn or stuck piston rings, cylinder and piston	C
		Incorrect valve timing	A
	Lubrication system	Incorrect oil pressure	C
	Cooling system	Over cooling	C
	Others	Malfunction of evaporative emission control system	C
8. Knocking	Engine control system <Ref. to EN(STI)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened oil filler cap	B
	Belt	Defective timing	B
	Compression	Incorrect valve clearance	C
		Incorrect valve timing	B
	Cooling system	Overheating	A
9. Excessive engine oil consumption	Intake system	Loosened or cracked PCV hose	A
		Defective PCV valve	B
		Loosened oil filler cap	C
	Compression	Defective valve stem	A
		Worn or stuck piston rings, cylinder and piston	A
	Lubrication system	Loosened oil pump attaching bolts and defective gasket	B
		Defective oil filter o-ring	B
		Defective crankshaft oil seal	B
		Defective rocker cover gasket	B
		Loosened oil drain plug or defective gasket	B
		Loosened oil pan fitting bolts or defective oil pan	B

Engine Trouble in General

MECHANICAL

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
10. Excessive fuel consumption	Engine control system <Ref. to EN(STI)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Dirty air cleaner element	A
	Belt	Defective timing	B
	Compression	Incorrect valve clearance	B
		Loosened spark plugs or defective gasket	C
		Loosened cylinder head bolts or defective gasket	C
		Improper valve sealing	B
		Defective valve stem	C
		Worn or broken valve spring	C
		Worn or stuck piston rings, cylinder and piston	B
		Incorrect valve timing	B
	Lubrication system	Incorrect oil pressure	C
	Cooling system	Over cooling	C

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.	- Loose flywheel mounting bolts - Damaged engine mounting
High-pitched clank (Spark knock)	Sound is noticeable when accelerating with an overload.	- Ignition timing advanced - Accumulation of carbon inside combustion chamber - Wrong spark plug - Improper gasoline
Clank when engine speed is medium (1,000 to 2,000 rpm).	Sound is reduced when fuel injector connector of noisy cylinder is disconnected. (NOTE*)	- Worn crankshaft main bearing - Worn bearing at crankshaft end of connecting rod
Knocking sound when engine is operating under idling speed and engine is warm	Sound is reduced when fuel injector connector of noisy cylinder is disconnected. (NOTE*)	- Worn cylinder liner and piston ring - Broken or stuck piston ring - Worn piston pin and hole at piston end of connecting rod
	Sound is not reduced if each fuel injector connector is disconnected in turn. (NOTE*)	- Unusually worn valve lifter - Worn cam sprocket - Worn camshaft journal bore in cylinder head assembly
Squeaky sound	—	Insufficient generator lubrication
Rubbing sound	—	Defective generator brush and rotor contact
Gear scream when starting engine	—	- Defective ignition starter switch - Worn gear and starter pinion
Sound like polishing glass with a dry cloth	—	- Loose drive belt - Defective water pump shaft
Hissing sound	—	- Loss of compression - Air leakage in air intake system, hoses, connections or manifolds
Timing belt noise	—	- Loose timing belt - Belt contacting case/adjacent part
Valve noise	—	Incorrect valve clearance

NOTE*:

When disconnecting the fuel injector connector, Malfunction Indicator Light illuminates and DTC is stored in ECM memory. Therefore, carry out the CLEAR MEMORY MODE <Ref. to EN(STI)(diag)-45, OPERATION, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(STI)(diag)-36, PROCEDURE, Inspection Mode.> after connecting the fuel injector connector.

STARTING/CHARGING SYSTEMS

1. General Description

A: SPECIFICATION

Specifications for STI model are included in SC(H4SO) section. <Ref. to SC(H4SO)-2, General Description.>

SECTION 2

STi ENGINE

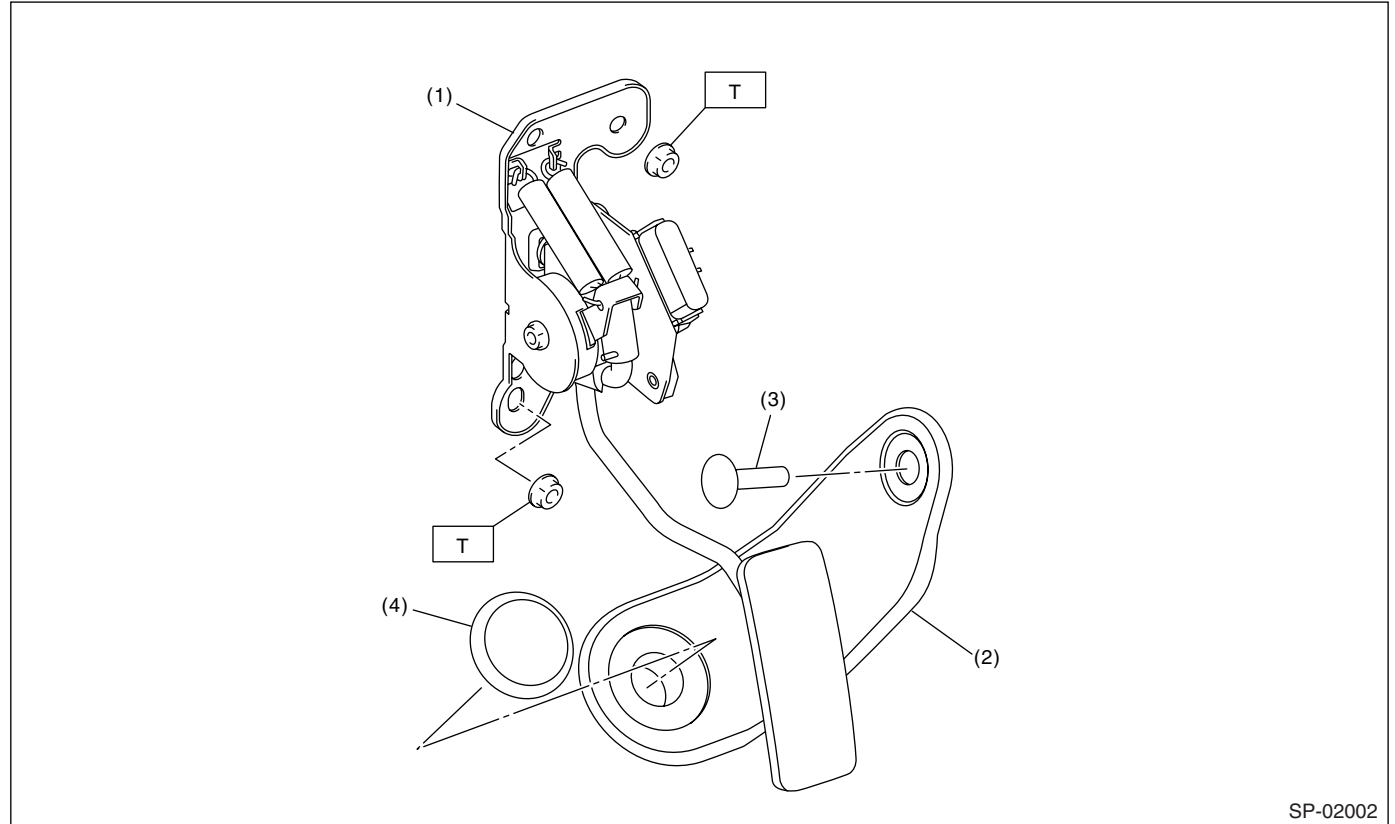
SPEED CONTROL SYSTEMS

1. General Description

A: SPECIFICATION

Accelerator pedal	Stroke	At pedal pad	52 — 57 mm (2.05 — 2.24 in)

B: COMPONENT



SP-02002

(1) Accelerator pedal ASSY	(3) Clip
(2) Accelerator plate	(4) Stopper

Tightening torque: N·m (kgf-m, ft-lb)
T: 18 (1.8, 13.0)

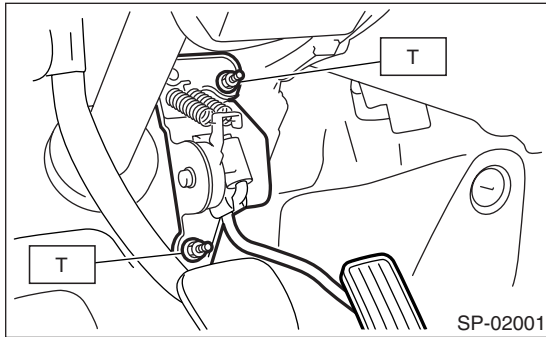
C: CAUTION

- Wear work clothing, including a cap, protective goggles and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Be careful not to burn yourself, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

2. Accelerator Pedal

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Disconnect the connector.
- 3) Remove the nut securing accelerator pedal assembly.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

18 N·m (1.8 kgf-m, 13.0 ft-lb)

C: DISASSEMBLY

NOTE:

Accelerator pedal cannot be disassembled.

