

1. General Description

A: SPECIFICATION

Specifications for the turbo model are included in the CO (H4SO) section. <Ref. to CO(H4SO)-2, General Description.>

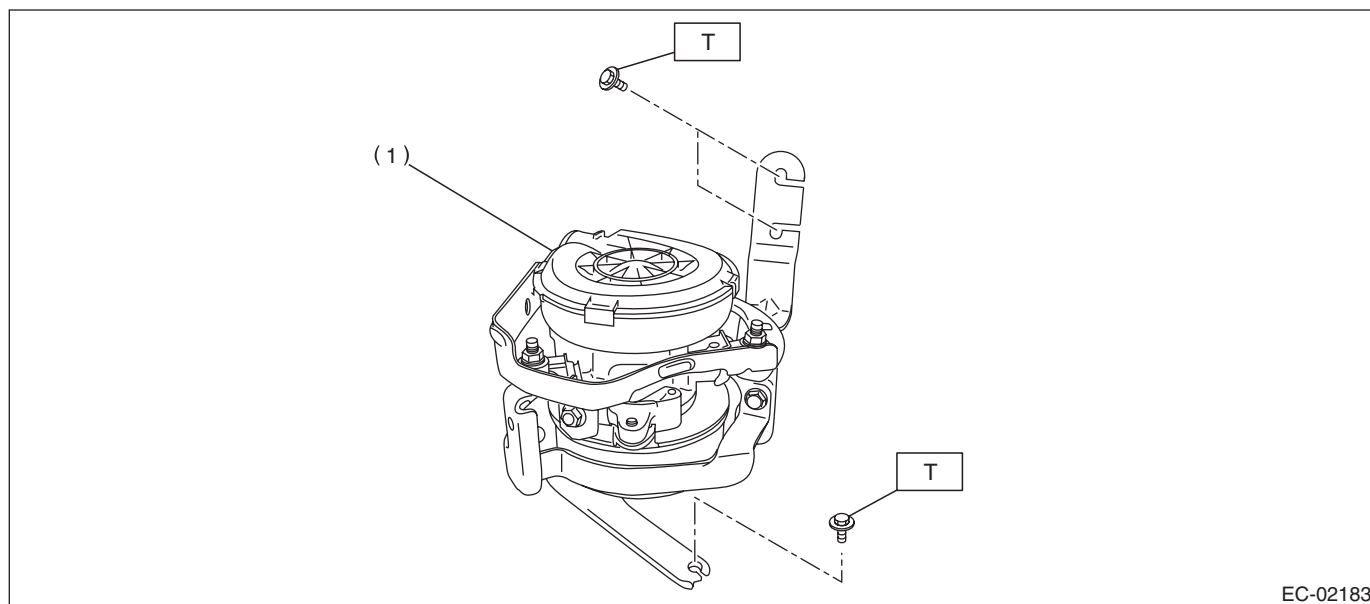
General Description

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

1. General Description

A: COMPONENT

1. SECONDARY AIR PUMP



EC-02183

(1) Secondary air pump

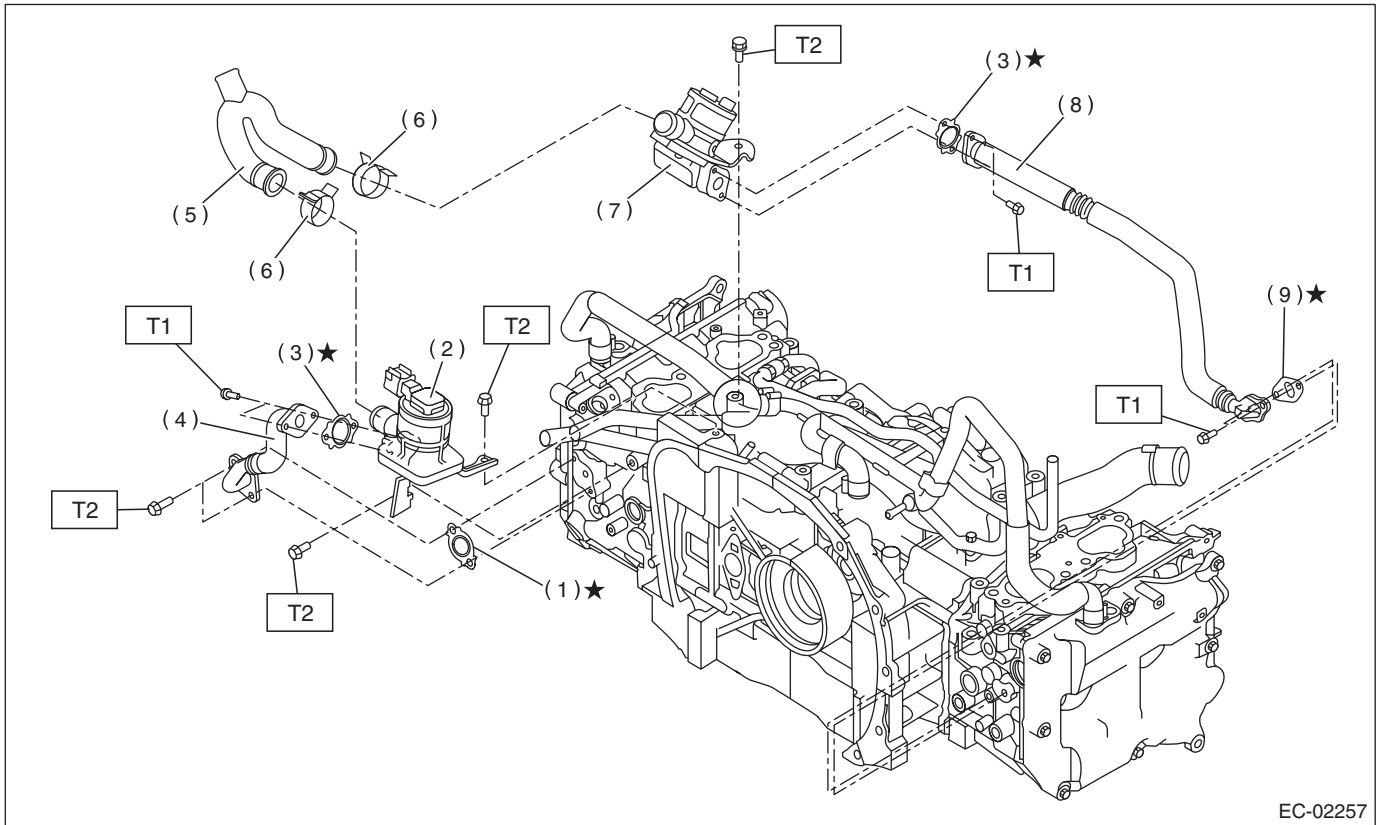
Tightening torque: N·m (kgf-m, ft-lb)

T: 5 (0.5, 3.7)

General Description

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

2. SECONDARY AIR COMBINATION VALVE



- (1) Gasket
- (2) Secondary air combination valve LH
- (3) Gasket
- (4) Pipe LH

- (5) Air duct
- (6) Clamp
- (7) Secondary air combination valve RH
- (8) Pipe RH

- (9) Gasket

Tightening torque: N·m (kgf-m, ft-lb)

T1: 9 (0.9, 6.6)

T2: 19 (1.9, 14.0)

General Description

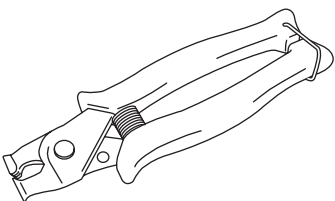
EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

B: CAUTION

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

C: PREPARATION TOOL

1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18353AA000	18353AA000	CLAMP PLIERS	• Used for removing and installing the PCV hose. • This is a general tool made by the French company CAILLAU. (code) 54.0.000.205 To make this easier to obtain in the same way as genuine Subaru parts, it has been provided with a tool number as an ST.

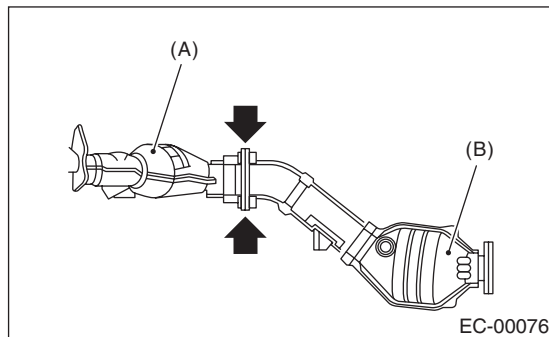
Front Catalytic Converter

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

2. Front Catalytic Converter

A: REMOVAL

- 1) Remove the center exhaust pipe. <Ref. to EX(H4DOTC)-8, REMOVAL, Center Exhaust Pipe.>
- 2) Disconnect the front catalytic converter (A) from the rear catalytic converter (B).



B: INSTALLATION

Install in the reverse order of removal.

NOTE:

Use a new gasket.

C: INSPECTION

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

Rear Catalytic Converter

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

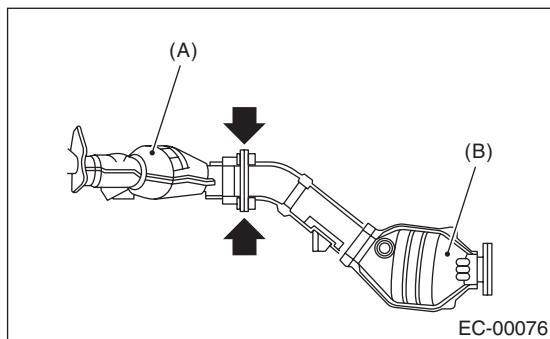
3. Rear Catalytic Converter

A: REMOVAL

1) Remove the center exhaust pipe.

<Ref. to EX(H4DOTC)-8, REMOVAL, Center Exhaust Pipe.>

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



B: INSTALLATION

Install in the reverse order of removal.

NOTE:

Use a new gasket.

C: INSPECTION

1) Check the connections and welds for exhaust leaks.

2) Make sure there are no holes or rusting.

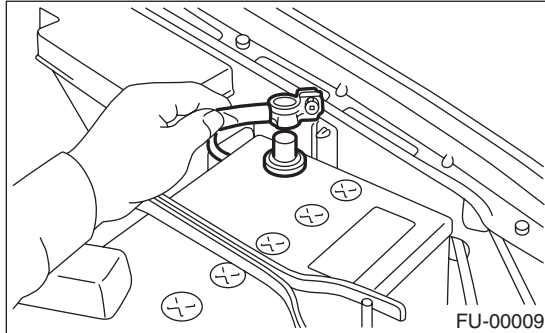
Canister

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

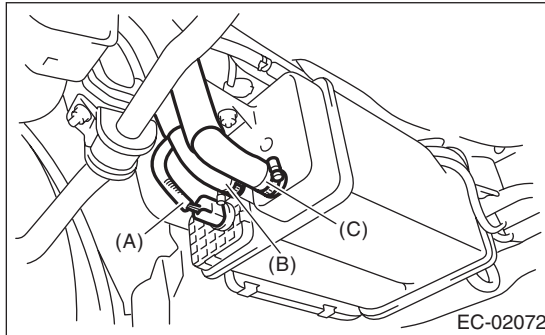
4. Canister

A: REMOVAL

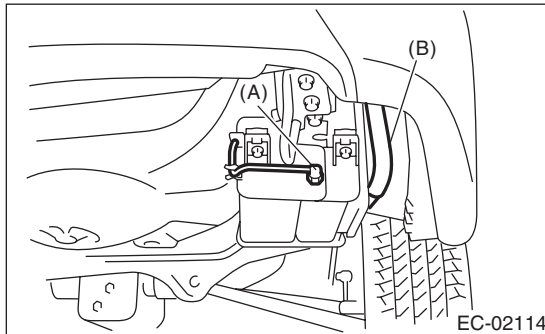
- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from the battery.



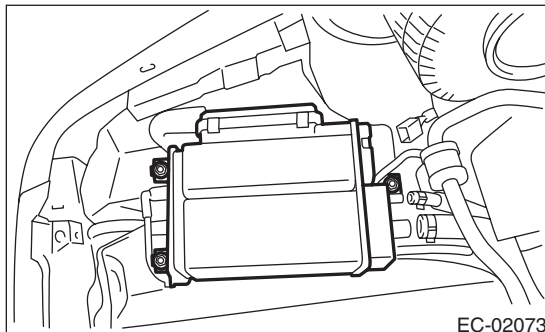
- 3) Lift up the vehicle.
- 4) Disconnect the connector (A) from drain valve.
- 5) Disconnect the evaporation hoses (B) and (C) from the canister.



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



- 8) Remove the canister from the body.



B: INSTALLATION

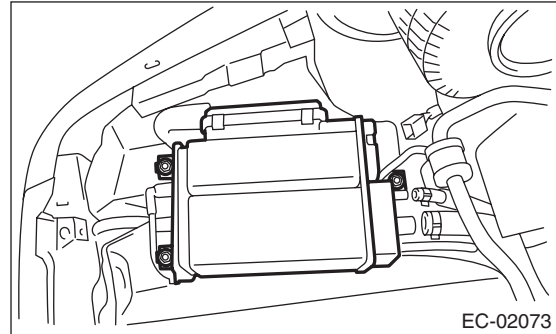
Install in the reverse order of removal.

NOTE:

Use a new retainer.

Tightening torque:

23 N·m (2.3 kgf-m, 17.0 ft-lb)



C: INSPECTION

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

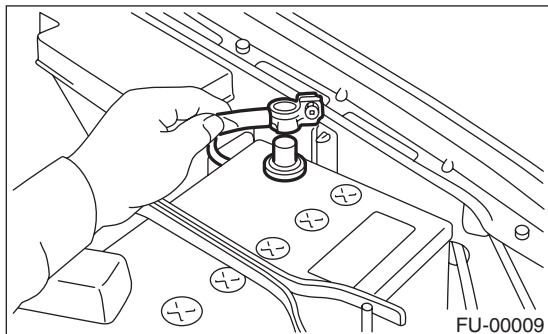
Purge Control Solenoid Valve

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

5. Purge Control Solenoid Valve

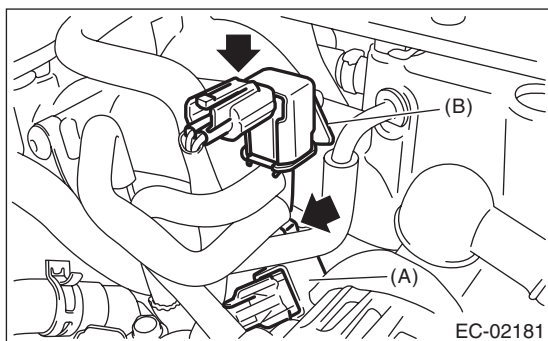
A: REMOVAL

1) Disconnect the ground cable from the battery.



2) Disconnect the connector and hoses from purge control solenoid valve.

3) Loosen the bolt and remove the purge control solenoid valve from the intake manifold.



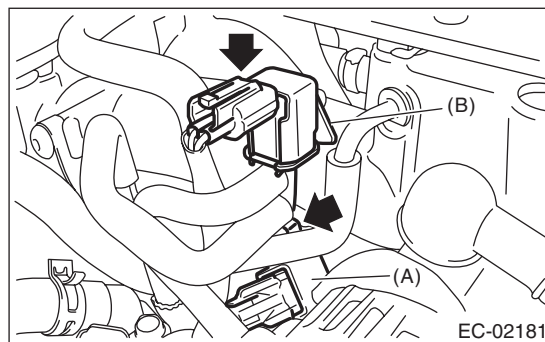
- (A) Purge control solenoid valve 1
- (B) Purge control solenoid valve 2

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

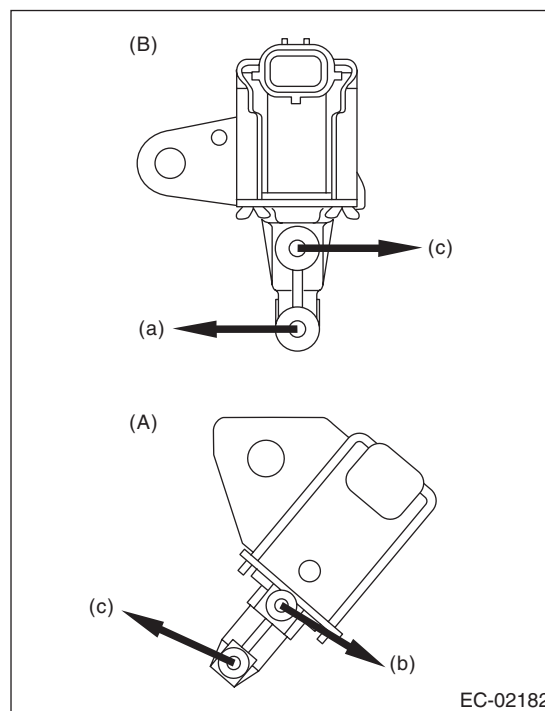
19 N·m (1.9 kgf-m, 14.0 ft-lb)



- (A) Purge control solenoid valve 1
- (B) Purge control solenoid valve 2

NOTE:

Connect the evaporation hose as shown in the figure.



- (A) Purge control solenoid valve 1
- (B) Purge control solenoid valve 2
- (a) To intake duct
- (b) To intake manifold
- (c) To splitter and then to fuel pipe

C: INSPECTION

Make sure the hoses are not cracked or loose.

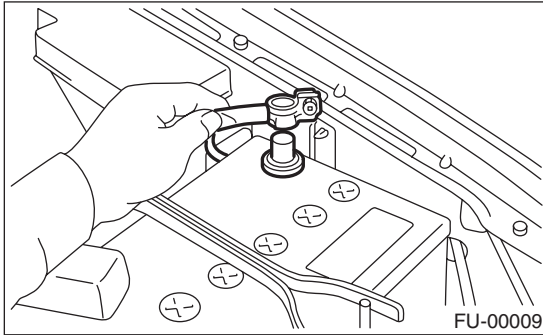
Secondary Air Pump

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

6. Secondary Air Pump

A: REMOVAL

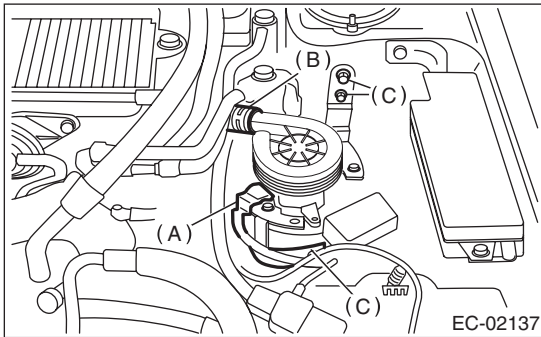
1) Disconnect the ground cable from the battery.



2) Disconnect the connector (A) from secondary air pump.

3) Disconnect the hose (B) from secondary air pump.

4) Remove the bolt (C) which secures the secondary air pump to the body.

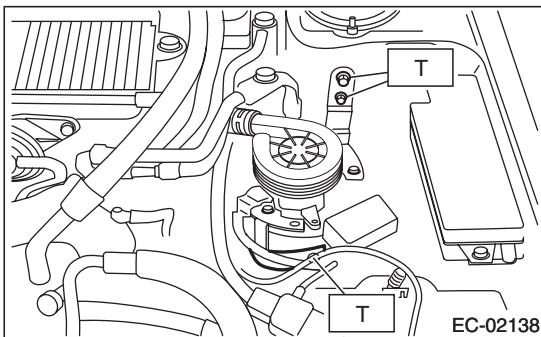


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

5 N·m (0.5 kgf-m, 3.7 ft-lb)



C: INSPECTION

Make sure the hoses are not cracked or loose.

Secondary Air Combination Valve

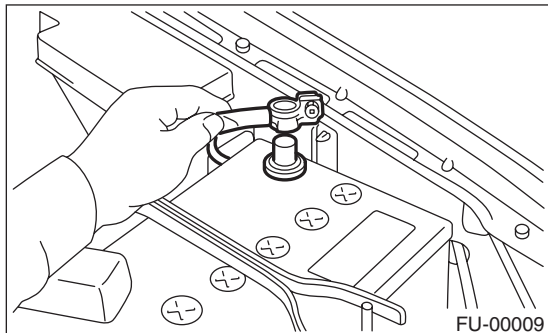
EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

7. Secondary Air Combination Valve

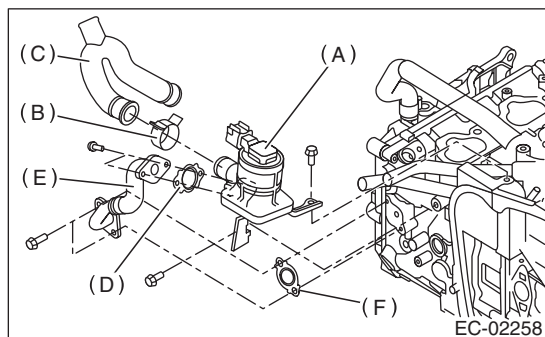
A: REMOVAL

1. SECONDARY AIR COMBINATION VALVE LH

- 1) Disconnect the ground cable from the battery.



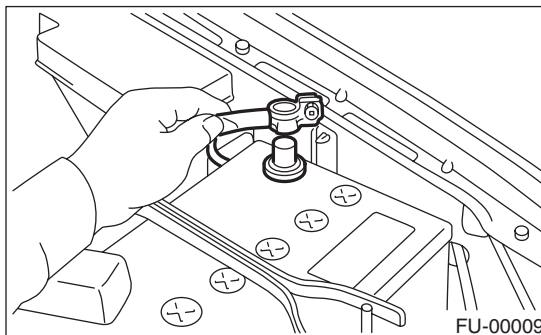
- 2) Remove the intercooler. <Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>
- 3) Disconnect the connector from the secondary air combination valve LH.
- 4) Disconnect the air duct.
- 5) Disconnect the pipe LH.
- 6) Remove the secondary air combination valve LH.



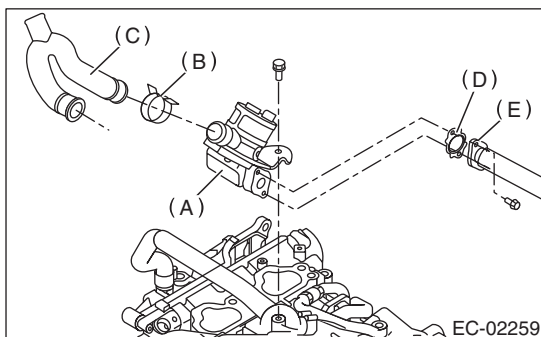
- (A) Secondary air combination valve LH
- (B) Clamp
- (C) Air duct
- (D) Gasket
- (E) Pipe LH
- (F) Gasket

2. SECONDARY AIR COMBINATION VALVE RH

- 1) Disconnect the ground cable from the battery.



- 2) Remove the intercooler. <Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>
- 3) Remove the secondary air combination valve LH. <Ref. to EC(H4DOTC)-10, SECONDARY AIR COMBINATION VALVE LH, REMOVAL, Secondary Air Combination Valve.>
- 4) Remove the intake manifold. <Ref. to FU (H4DOTC)-14, REMOVAL, Intake Manifold.>
- 5) Disconnect the connector from the secondary air combination valve RH.
- 6) Disconnect the pipe RH.
- 7) Remove the secondary air combination valve RH.



- (A) Secondary air combination valve RH
- (B) Clamp
- (C) Air duct
- (D) Gasket
- (E) Pipe RH

Secondary Air Combination Valve

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

B: INSTALLATION

1. SECONDARY AIR COMBINATION VALVE LH

Install in the reverse order of removal.

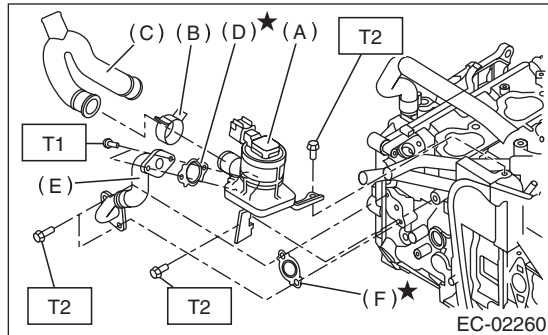
NOTE:

Use a new gasket.

Tightening torque:

T1: 9 N·m (0.9 kgf-m, 6.6 ft-lb)

T2: 19 N·m (1.9 kgf-m, 14.0 ft-lb)



- (A) Secondary air combination valve LH
- (B) Clamp
- (C) Air duct
- (D) Gasket
- (E) Pipe LH
- (F) Gasket

2. SECONDARY AIR COMBINATION VALVE RH

Install in the reverse order of removal.

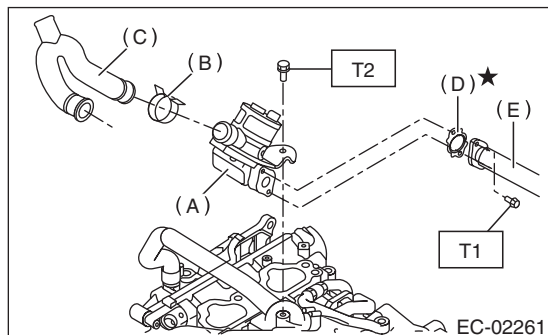
NOTE:

Use a new gasket.

Tightening torque:

T1: 9 N·m (0.9 kgf-m, 6.6 ft-lb)

T2: 19 N·m (1.9 kgf-m, 14.0 ft-lb)



- (A) Secondary air combination valve RH
- (B) Clamp
- (C) Air duct
- (D) Gasket
- (E) Pipe RH

C: INSPECTION

Check the air duct and pipe for looseness.

Fuel Level Sensor

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

8. Fuel Level Sensor

A: REMOVAL

Refer to the FU (H4DOTC) section for removal procedure. <Ref. to FU(H4DOTC)-61, REMOVAL, Fuel Level Sensor.>

B: INSTALLATION

Refer to the FU (H4DOTC) section for installation procedure. <Ref. to FU(H4DOTC)-61, INSTALLATION, Fuel Level Sensor.>

9. Fuel Temperature Sensor

A: REMOVAL

The fuel temperature sensor and fuel level sensor are integrated into one unit; therefore, refer to “Fuel Level Sensor” for removal procedure. <Ref. to FU(H4DOTC)-61, REMOVAL, Fuel Level Sensor.>

B: INSTALLATION

The fuel temperature sensor and fuel level sensor are integrated into one unit; therefore, refer to “Fuel Level Sensor” for installation procedure. <Ref. to FU(H4DOTC)-61, INSTALLATION, Fuel Level Sensor.>

10. Fuel Sub Level Sensor

A: REMOVAL

Refer to the FU (H4DOTC) section for removal procedure. <Ref. to FU(H4DOTC)-62, REMOVAL, Fuel Sub Level Sensor.>

B: INSTALLATION

Refer to the FU (H4DOTC) section for installation procedure. <Ref. to FU(H4DOTC)-62, INSTALLATION, Fuel Sub Level Sensor.>

Fuel Tank Pressure Sensor

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

11. Fuel Tank Pressure Sensor

A: REMOVAL

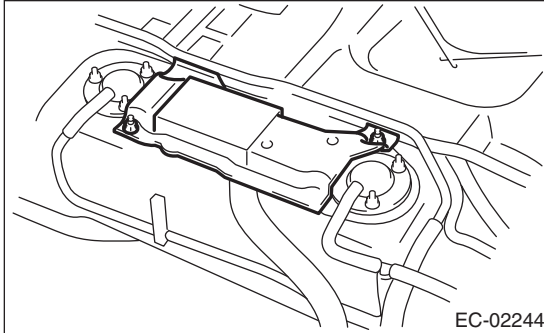
WARNING:

Place "NO FIRE" signs near the working area.

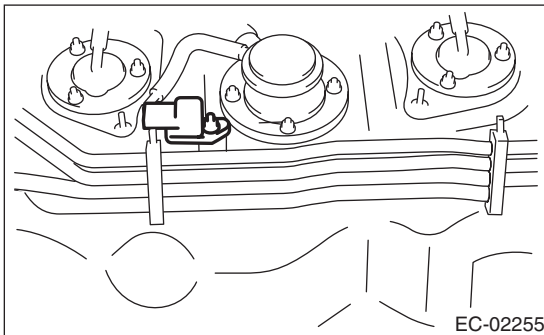
CAUTION:

Be careful not to spill fuel.

- 1) Remove the fuel tank. <Ref. to FU(H4DOTC)-52, REMOVAL, Fuel Tank.>
- 2) Remove the protect cover.



- 3) Disconnect the connector from the fuel pressure sensor.
- 4) Remove the nuts that secure the fuel tank pressure sensor to the bracket, and disconnect the pressure hose from the fuel tank pressure sensor.

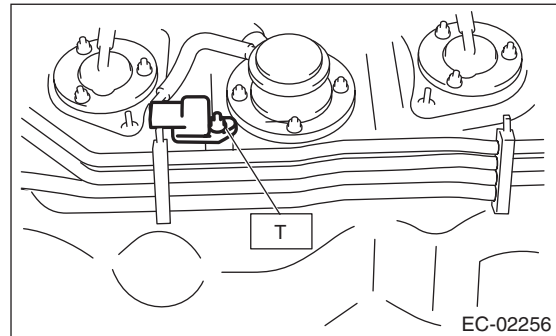


B: INSTALLATION

Install in the reverse order of removal.

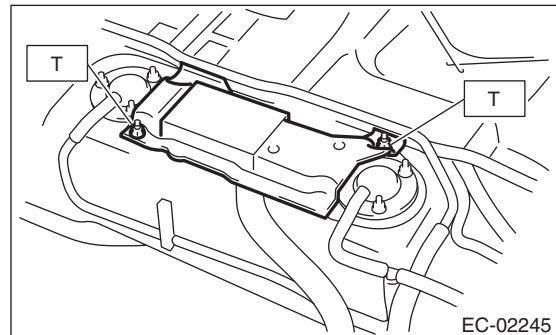
Tightening torque:

7.4 N·m (0.75 kgf-m, 5.4 ft-lb)



Tightening torque:

4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



C: INSPECTION

Make sure the hoses are not cracked or loose.

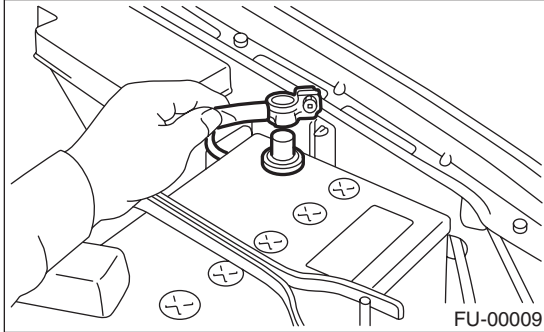
Pressure Control Solenoid Valve

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

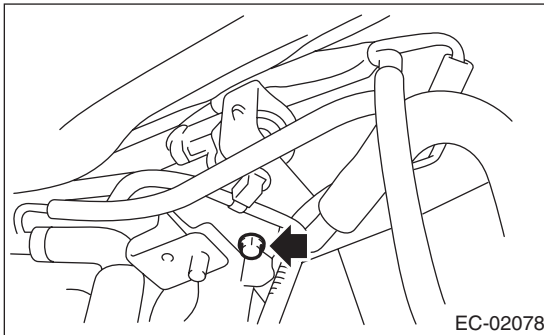
12. Pressure Control Solenoid Valve

A: REMOVAL

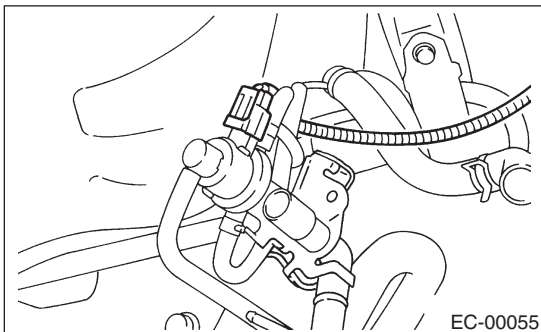
- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from the battery.



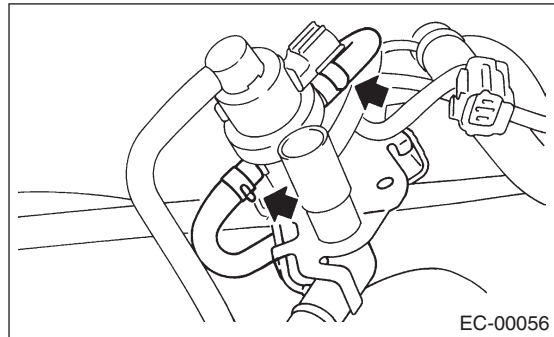
- 3) Lift up the vehicle.
- 4) Remove the canister. <Ref. to EC(H4DOTC)-7, REMOVAL, Canister.>
- 5) Remove the bolt which installs the pressure control solenoid valve holding bracket to the body.



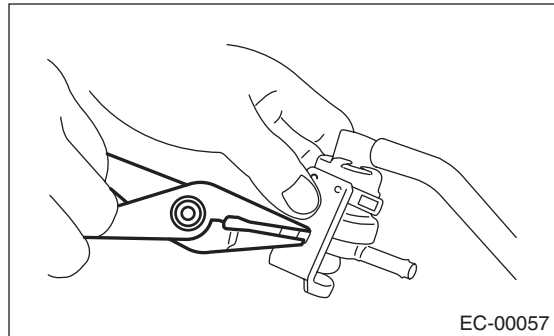
- 6) Disconnect the connector from the pressure control solenoid valve.



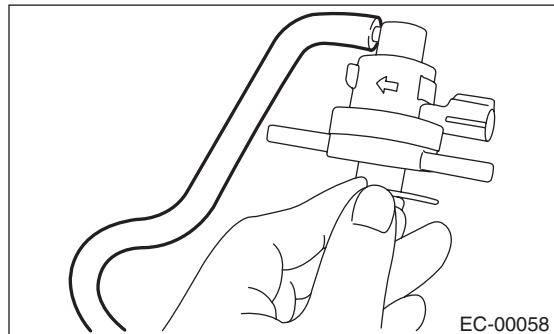
- 7) Disconnect the two evaporation hoses from the pressure control solenoid valve.



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



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



Pressure Control Solenoid Valve

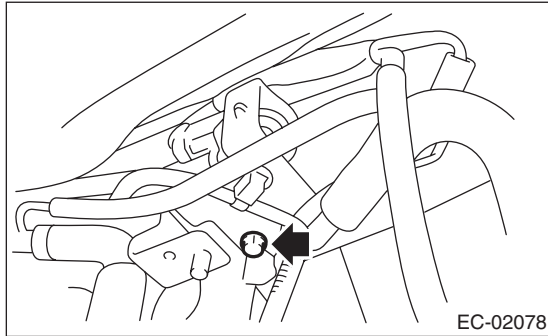
EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

25 N·m (2.5 kgf-m, 18.4 ft-lb)



C: INSPECTION

Make sure the hoses are not cracked or loose.

13.Drain Filter

A: SPECIFICATION

The drain filter is embedded in the canister and therefore cannot be disassembled.

Vent Valve

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

14.Vent Valve

A: REMOVAL

WARNING:

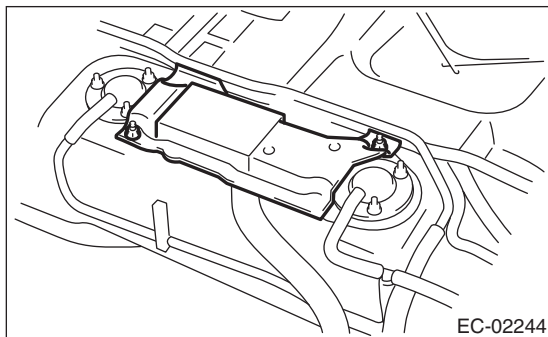
Place “NO FIRE” signs near the working area.

CAUTION:

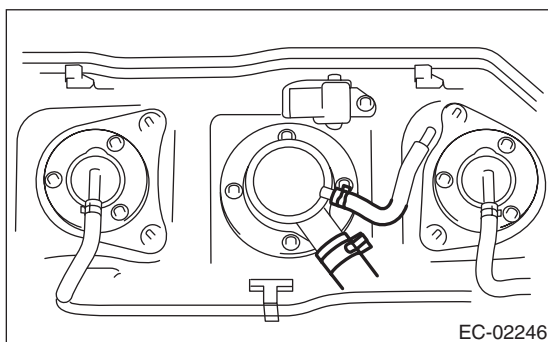
Be careful not to spill fuel.

1) Remove the fuel tank. <Ref. to FU(H4DOTC)-52, REMOVAL, Fuel Tank.>

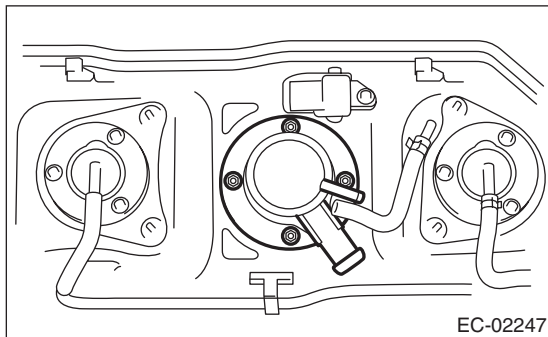
2) Remove the protect cover.



3) Remove the clip and disconnect the hose from the vent valve.



4) Remove the nut and then remove the vent valve.



B: INSTALLATION

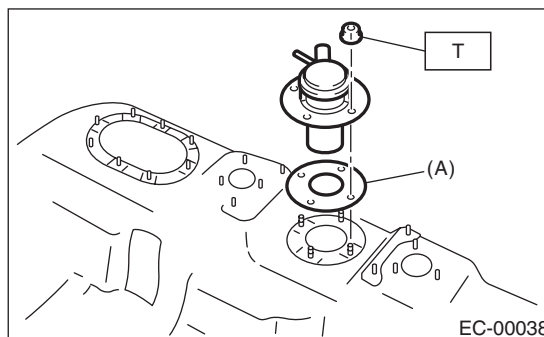
Install in the reverse order of removal.

NOTE:

Use a new gasket.

Tightening torque:

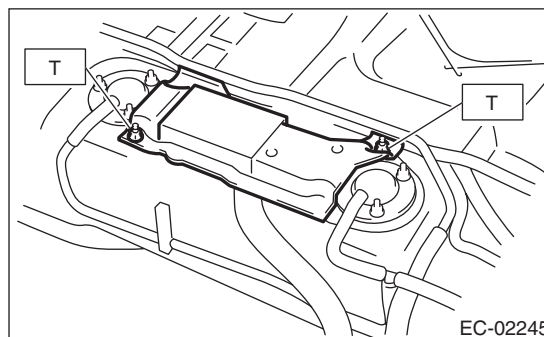
4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



(A) Gasket

Tightening torque:

4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



C: INSPECTION

Make sure the hoses are not cracked or loose.

Shut Valve

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

15.Shut Valve

A: REMOVAL

WARNING:

Place “NO FIRE” signs near the working area.

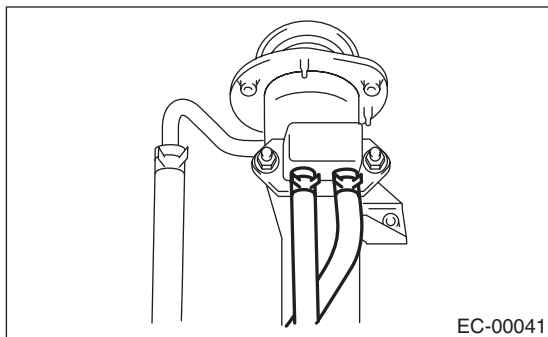
CAUTION:

Be careful not to spill fuel.

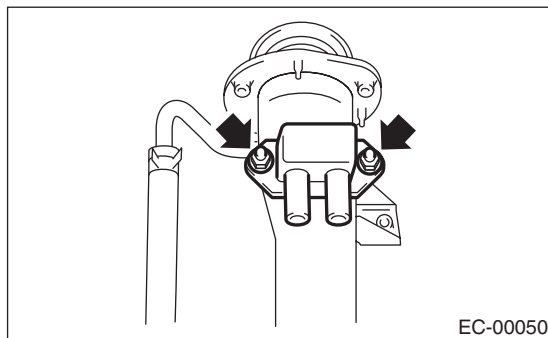
1) Remove the fuel filler pipe.

<Ref. to FU(H4DOTC)-55, REMOVAL, Fuel Filler Pipe.>

2) Disconnect the evaporation hose from shut valve.



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

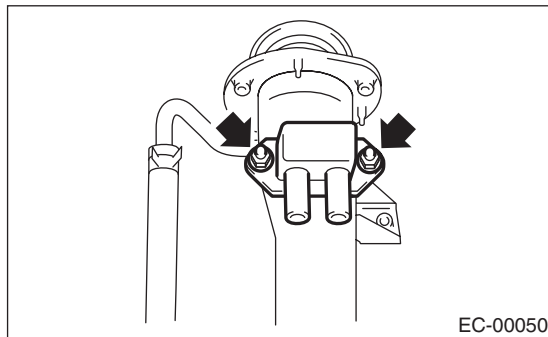


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

4.5 N·m (0.46 kgf-m, 3.3 ft-lb)



C: INSPECTION

Make sure the hoses are not cracked or loose.

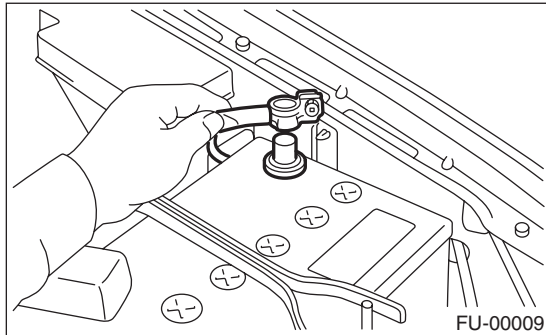
Drain Valve

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

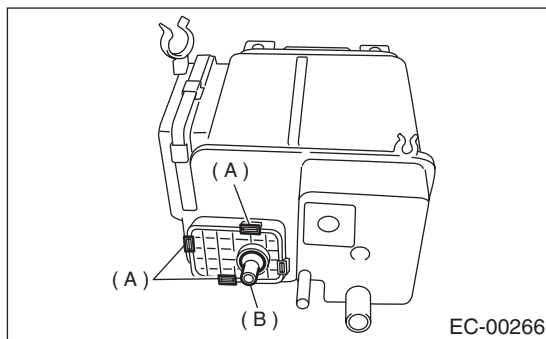
16.Drain Valve

A: REMOVAL

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



- 3) Lift up the vehicle.
- 4) Remove the canister. <Ref. to EC(H4DOTC)-7, REMOVAL, Canister.>
- 5) Disengage the clip, then remove the drain valve from the canister.



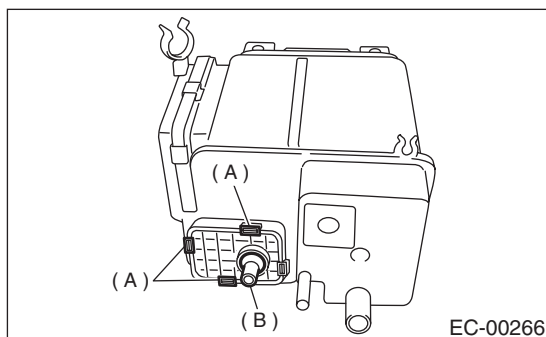
- (A) Clip
(B) Drain valve

B: INSTALLATION

Install in the reverse order of removal.

NOTE:

Use a new clip.



- (A) Clip
(B) Drain valve

PCV Hose Assembly

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

17.PCV Hose Assembly

A: REMOVAL

CAUTION:

Do not remove if the PCV hose, diagnostics connector and PCV valve are not damaged.

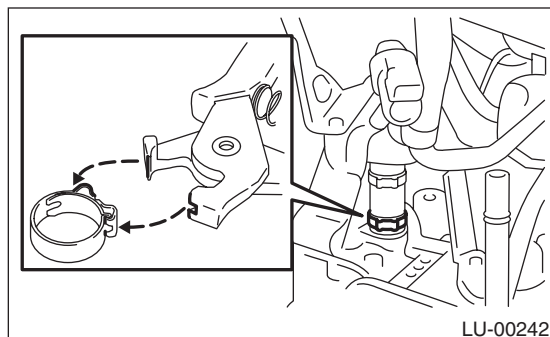
1) Remove the intake manifold.

<Ref. to FU(H4DOTC)-14, REMOVAL, Intake Manifold.>

2) Fit the depression in the ST with the protrusion on the clamp to unlock.

3) Remove the PCV hose assembly.

ST 18353AA000 CLAMP PLIERS



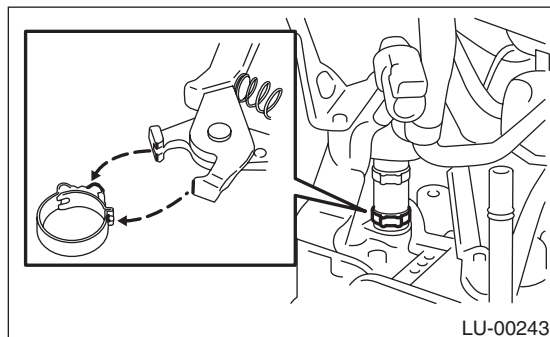
B: INSTALLATION

1) Install the PCV hose assembly, then lock by fitting the ST on the clamp protrusion.

NOTE:

Use a new clamp.

ST 18353AA000 CLAMP PLIERS



2) Install the intake manifold.

<Ref. to FU(H4DOTC)-17, INSTALLATION, Intake Manifold.>

Basic Diagnostic Procedure

ENGINE (DIAGNOSTICS)

1. Basic Diagnostic Procedure

A: PROCEDURE

Step	Check	Yes	No
1 CHECK ENGINE START FAILURE. 1) Ask the customer when and how the trouble occurred using the interview check list. <Ref. to EN(H4DOTC)(diag)-3, CHECK, Check List for Interview.> 2) Start the engine.	Does the engine start?	Go to step 2.	Inspection using "Diagnostics for Engine Start Failure". <Ref. to EN(H4DOTC)(diag)-63, Diagnostics for Engine Starting Failure.>
2 CHECK ILLUMINATION OF MALFUNCTION INDICATOR LIGHT.	Does the malfunction indicator light illuminate?	Go to step 3.	Inspection using "General Diagnostic Table". <Ref. to EN(H4DOTC)(diag)-380, General Diagnostic Table.>
3 CHECK INDICATION OF DTC ON SCREEN. 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor or general scan tool to data link connector. 3) Turn the ignition switch to ON, and run the Subaru Select Monitor or general scan tool. 4) Read DTC using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor Refer to "Read Diagnostic Trouble Code" for detailed operation procedure. <Ref. to EN(H4SO)(diag)-51, Read Diagnostic Trouble Code (DTC).> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is DTC displayed on the Subaru Select Monitor or general scan tool?	Record the DTC. Repair the trouble cause. <Ref. to EN(H4DOTC)(diag)-76, List of Diagnostic Trouble Code (DTC).> Go to step 4.	Repair the related parts. NOTE: If DTC is not shown on display although the malfunction indicator light illuminates, perform the diagnosis of malfunction indicator light circuit or combination meter. <Ref. to EN(H4DOTC)(diag)-59, Malfunction Indicator Light.>
4 PERFORM DIAGNOSIS. 1) Perform the Clear Memory Mode. <Ref. to EN(H4DOTC)(diag)-54, Clear Memory Mode.> 2) Perform the Inspection Mode. <Ref. to EN(H4DOTC)(diag)-44, Inspection Mode.>	Is DTC displayed on the Subaru Select Monitor or general scan tool?	Inspect using "Diagnostic Procedure with Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-84, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

Check List for Interview

ENGINE (DIAGNOSTICS)

2. Check List for Interview

A: CHECK

1. CHECK LIST NO. 1

Check the following item when problem has occurred.

NOTE:

Use copies of this page for interviewing customers.

Customer's name		Engine No.	
Date of purchase		Fuel brand	
Date of repair		Odometer reading	km
V.I.N.			miles
Weather	☐ Fine ☐ Cloudy ☐ Rainy ☐ Snowy ☐ Various/Others:		
Ambient air 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
Radiator fan	☐ ON/ ☐ OFF	Car phone	☐ ON/ ☐ OFF
Front wiper	☐ ON/ ☐ OFF	Wireless device	☐ ON/ ☐ OFF
Rear wiper	☐ ON/ ☐ OFF		

Check List for Interview

ENGINE (DIAGNOSTICS)

2. CHECK LIST NO. 2

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

NOTE:

Use copies of this page for interviewing customers.

a) Other warning lights or indicators turn on. ☐ Yes / ☐ No
☐ Low fuel warning light ☐ Charge indicator light ☐ AT diagnostic indicator light ☐ ABS warning light ☐ Oil pressure warning light
b) Fuel level
• Lack of gasoline: ☐ Yes/ ☐ No • Indicator position of fuel gauge: • Experienced running out of fuel: ☐ Yes/ ☐ No
c) Intentional connecting or disconnecting of harness connectors or spark plug cords: ☐ Yes / ☐ No
• What:
d) Intentional connecting or disconnecting of hoses: ☐ Yes / ☐ No
• What:
e) Installing of other parts except genuine parts: ☐ Yes / ☐ No
• What: • Where:
f) Occurrence of noise: ☐ Yes/ ☐ No
• From where: • What kind:
g) Occurrence of smell: ☐ Yes/ ☐ No
• From where: • What kind:
h) Intrusion of water into engine compartment or passenger compartment: ☐ Yes/ ☐ No
i) Troubles occurred
☐ Engine does not start. ☐ Engine stalls during idling. ☐ Engine stalls while driving. ☐ Engine speed decreases. ☐ Engine speed does not decrease. ☐ Rough idling ☐ Poor acceleration ☐ Back fire ☐ After fire ☐ Does not shift. ☐ Excessive shift shock

3. General Description

A: CAUTION

1) Airbag system wiring harness is routed near the ECM, main relay and fuel pump relay.

CAUTION:

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

2) Never connect the battery in reverse polarity. Failure to do so will damage the ECM instantly, and the fuel injector and other parts will also be damaged.

3) Do not disconnect the battery terminals while the engine is running. A large counter electromotive force will be generated in the generator, and this voltage may damage electronic parts such as ECM etc.

4) Before disconnecting the connectors of each sensor and ECM, be sure to turn the ignition switch to OFF. Perform the Clear Memory Mode after connecting the connectors. <Ref. to EN(H4DOTC)(diag)-54, Clear Memory Mode.>

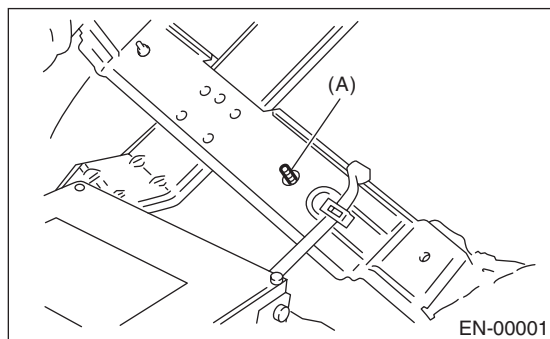
5) Measure the voltage or resistance of individual sensor or all electrical control modules using a tapered pin with a diameter of less than 0.6 mm (0.024 in). Do not insert the pin 4 mm (0.16 in) or more into the part.

CAUTION:

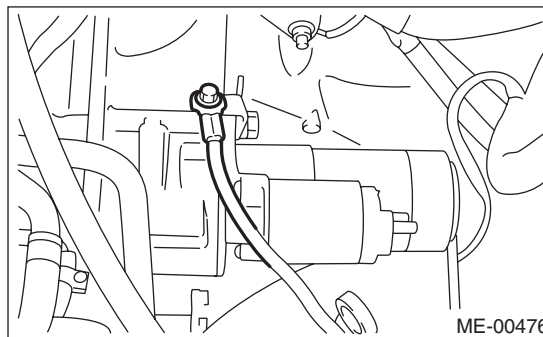
When replacing the ECM, be careful not to use the wrong spec. ECM to avoid damaging the fuel injection system.

6) Take care not to allow water to get into the connectors when servicing or washing the vehicle in rainy weather. Avoid exposure to water even if the connectors are waterproof.

7) Use ECM mounting stud bolts at the body side grounding point when measuring voltage and resistance inside the passenger compartment.



8) Use the engine ground terminal or engine assembly as the grounding point to the body when measuring the voltage and resistance in engine compartment.



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

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

CAUTION:

- The antenna must be kept as far apart as possible from control unit. (The ECM is located under the passenger's seat floor mat.)
- The antenna feeder must be placed as far apart as possible from the ECM and MFI harness.
- Carefully adjust the antenna for correct matching.
- When mounting a large power type radio, pay special attention to the three items above mentioned.
- Incorrect installation of the radio may affect the operation of ECM.

11) When disconnecting the fuel hose, release the fuel pressure. <Ref. to FU(H4DOTC)-51, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>

12) For the model with ABS, the ABS warning light may illuminate when performing driving test with jacked-up or lifted-up condition, but this is not a system malfunction. The reason for this is the speed difference between the front and rear wheels. After diagnosis of engine control system, perform the ABS memory clear procedure of self-diagnosis function.

General Description

ENGINE (DIAGNOSTICS)

B: INSPECTION

Before performing diagnostics, check the following item which might affect engine problems.

1. BATTERY

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

Standard voltage:

12 V

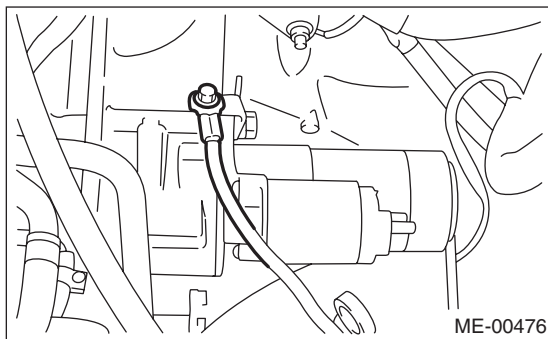
Specific gravity:

1.260 or more

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

2. ENGINE GROUND

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



C: NOTE

1. GENERAL DESCRIPTION

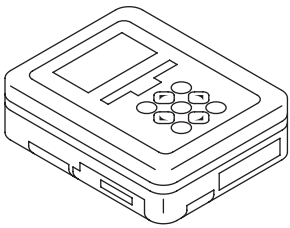
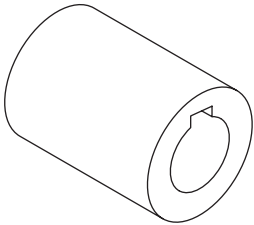
- The on-board diagnosis (OBD) system detects and indicates a fault in various inputs and outputs of the complex electronic control. Malfunction indicator light in the combination meter indicates occurrence of a fault or trouble.
- Further, against such a failure or sensors as may disable the drive, the fail-safe function is provided to ensure the minimal driveability.
- The OBD system incorporated with the vehicles within this type of engine complies with OBD-II regulations. The OBD system monitors the components and the system malfunction listed in "Engine Section" which affects on emissions.
- When the system decides that a malfunction occurs, malfunction indicator light illuminates. At the same time of the malfunction indicator light illumination or blinking, a DTC and a freeze frame engine conditions are stored into on-board computer.
- The OBD system stores freeze frame engine condition data (engine load, engine coolant temperature, fuel trim, engine speed and vehicle speed, etc.) into on-board computer first when it detects a malfunction.

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

2. ENGINE AND EMISSION CONTROL SYSTEM

- The Multipoint Fuel Injection (MFI) system is a system that supplies the optimum air-fuel mixture to the engine for all the various operating conditions through the use of the latest electronic technology. With this system, the fuel which is pressurized at a constant pressure is injected into the intake air passage of the cylinder head. The injection quantity of fuel is controlled by an intermittent injection system, where the electro-magnetic injection valve (fuel injector) opens for a short period of time depending on the quantity of air required for one cycle of operation. In actual operation, the injection quantity is determined by the duration of an electric pulse applied to the fuel injector and this permits simple, yet highly precise metering of the fuel.
 - Furthermore, all operating conditions of the engine are converted into electronic signals, and this enables additional system features with greatly improved adaptability, making it easier to add compensation features.
- The MFI system also has the following features:
- Reduced emission of harmful exhaust gases.
 - Reduction in fuel consumption.
 - Increased engine output.
 - Superior acceleration and deceleration.
 - Superior start ability and warm-up performance in cold weather since compensation is made for coolant and intake air temperature.

D: PREPARATION TOOL

ILLUSTRATION	TOOL NUMBER	TOOL NAME	REMARKS
 ST1B021XU0	1B021XU0	SUBARU SELECT MONITOR III KIT	Used for troubleshooting the electrical system.
 ST-499987500	499987500	CRANKSHAFT SOCKET	Used for rotating the crankshaft.

Electrical Component Location

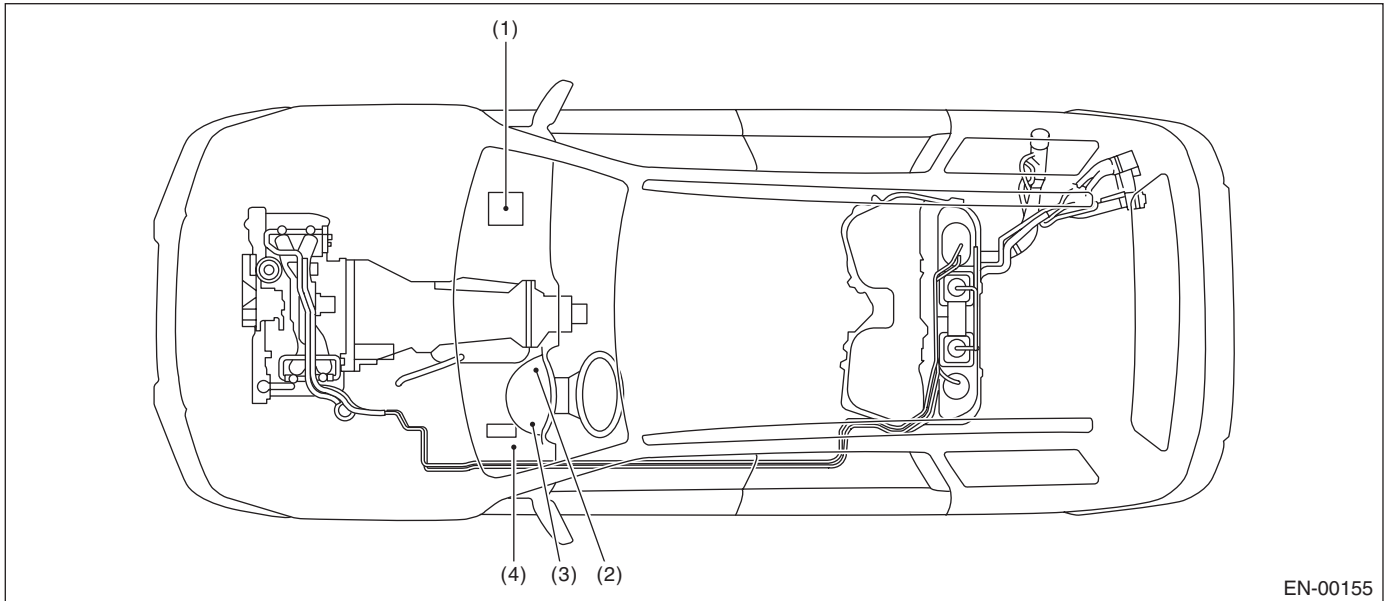
ENGINE (DIAGNOSTICS)

4. Electrical Component Location

A: LOCATION

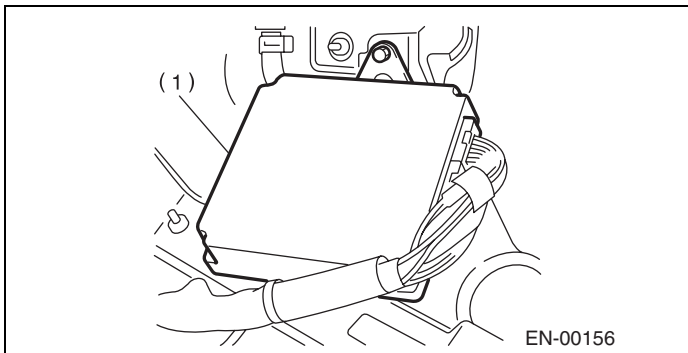
1. ENGINE

- Control module

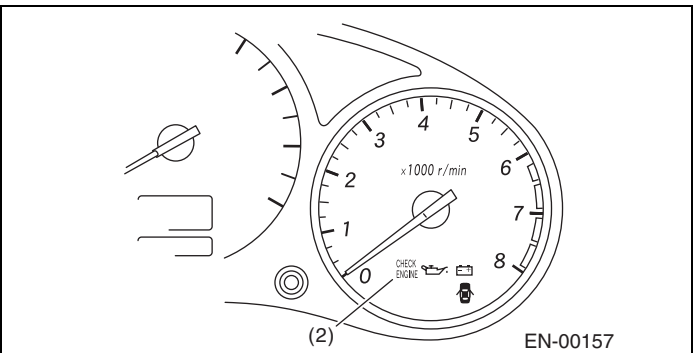


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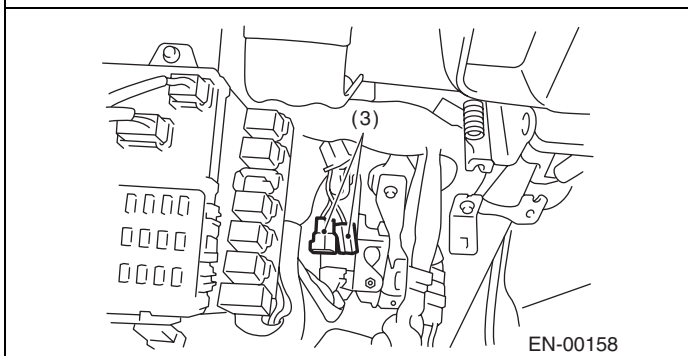
- (1) Engine control module (ECM) (3) Delivery (test) mode connector (4) Data link connector
(2) Malfunction indicator light



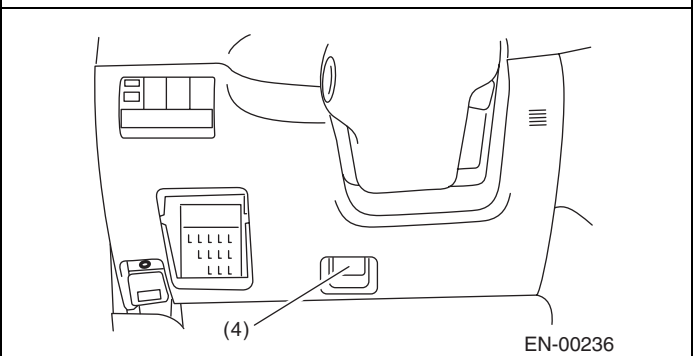
EN-00156



EN-00157

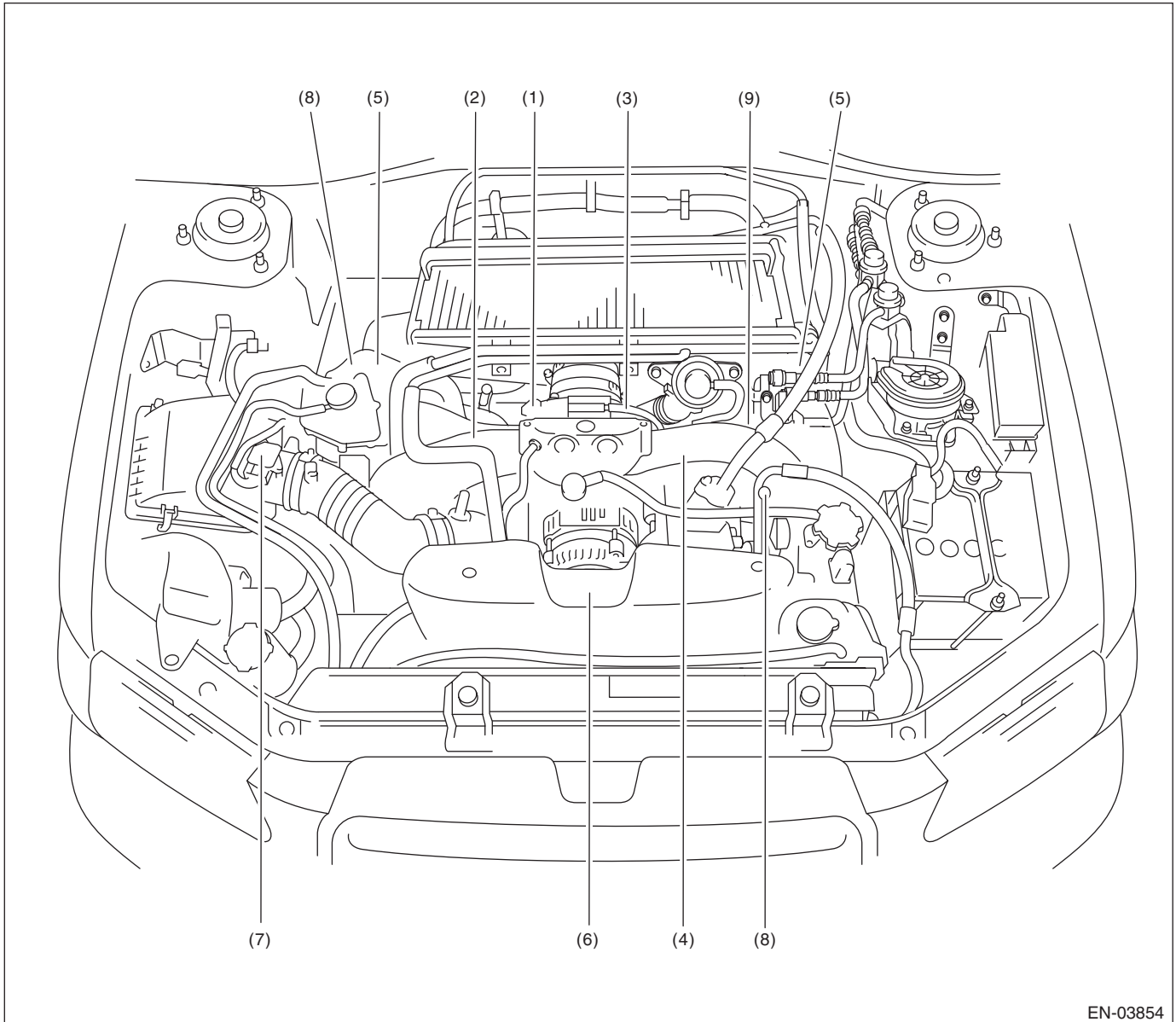


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EN-00236

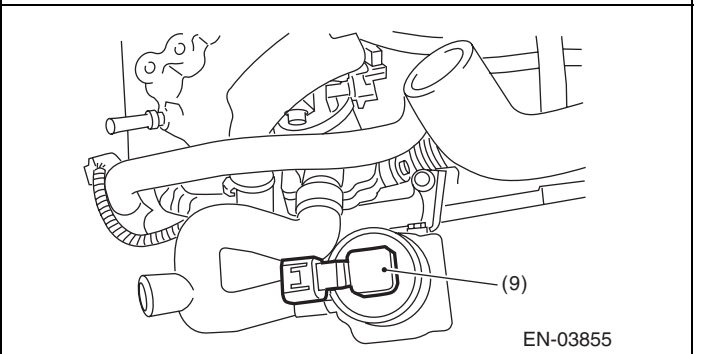
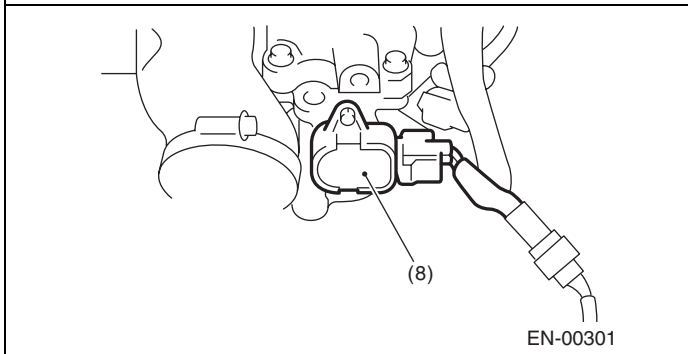
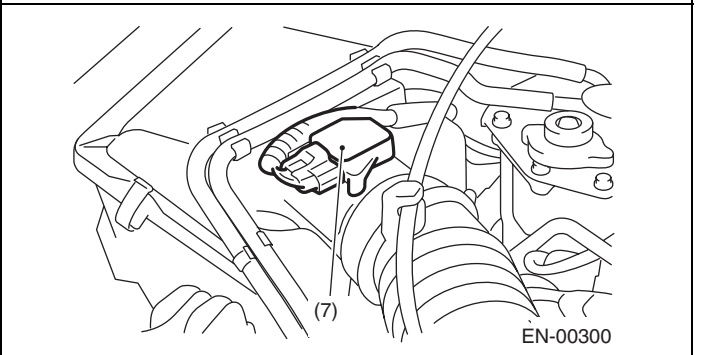
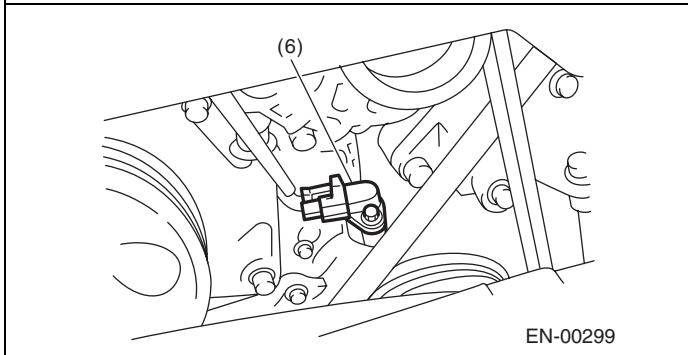
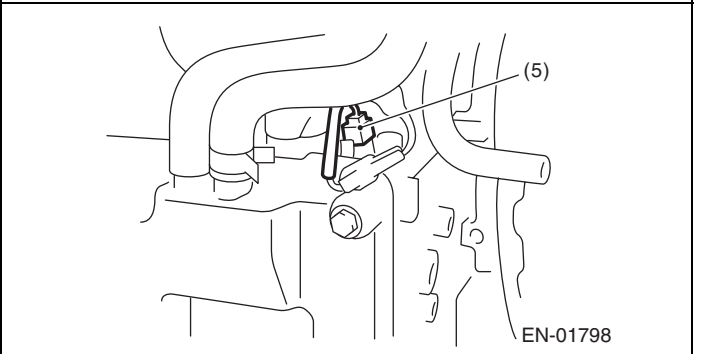
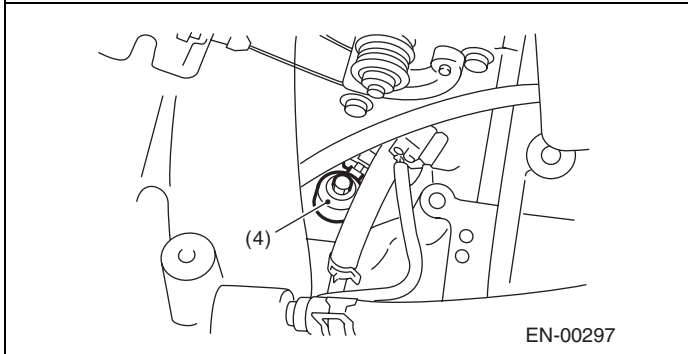
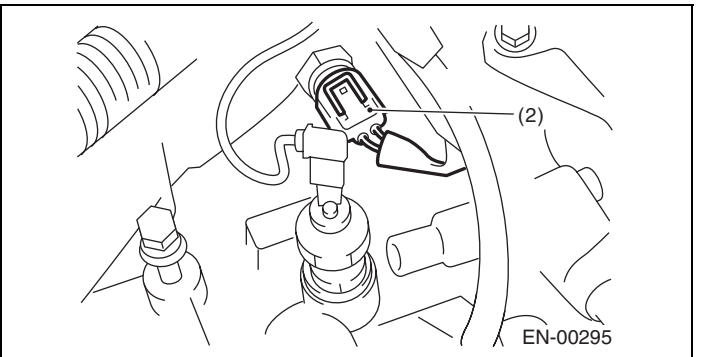
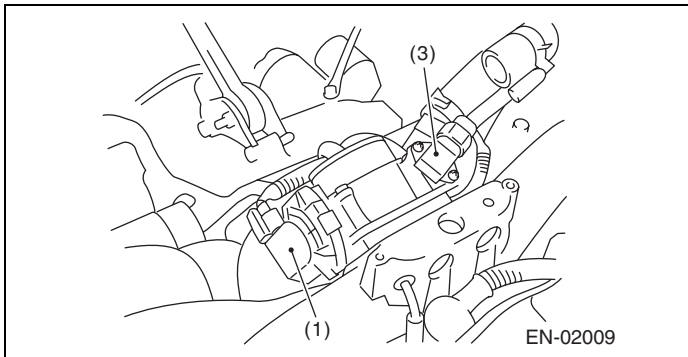
- Sensor

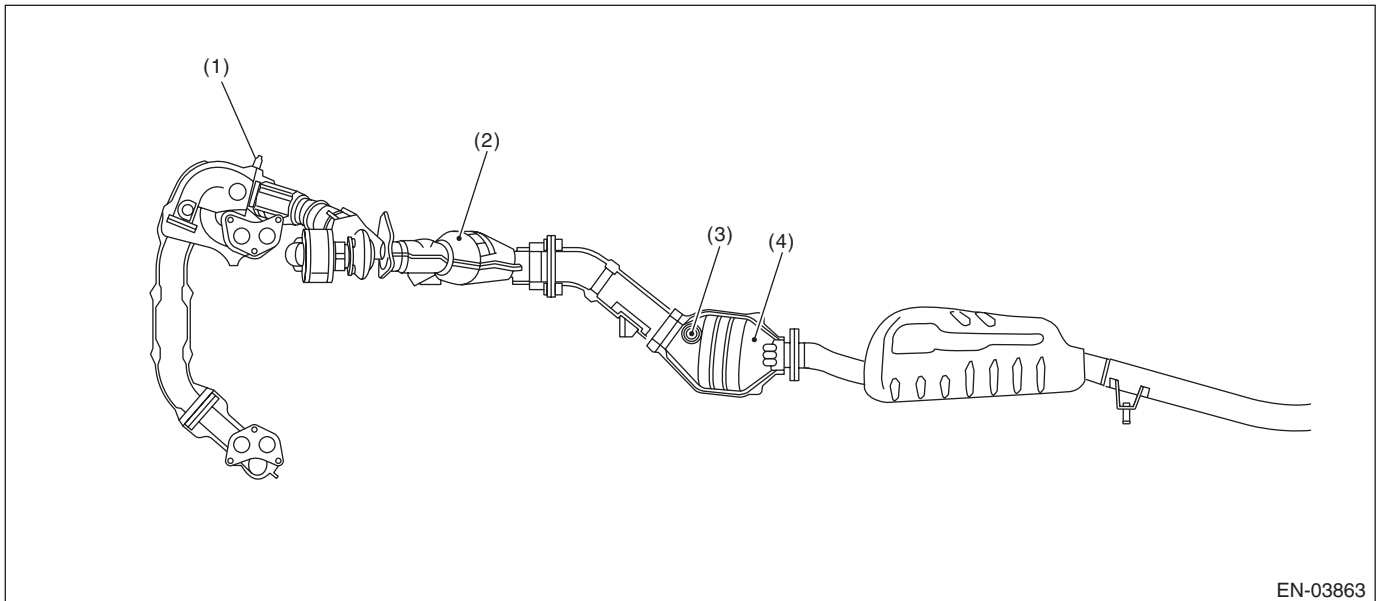


- | | | |
|---------------------------------------|---|--|
| (1) Throttle position sensor | (5) Camshaft position sensor | (8) Tumble generator valve position sensor |
| (2) Engine coolant temperature sensor | (6) Crankshaft position sensor | |
| (3) Manifold absolute pressure sensor | (7) Mass air flow and intake air temperature sensor | (9) Secondary air pressure sensor |
| (4) Knock sensor | | |

Electrical Component Location

ENGINE (DIAGNOSTICS)



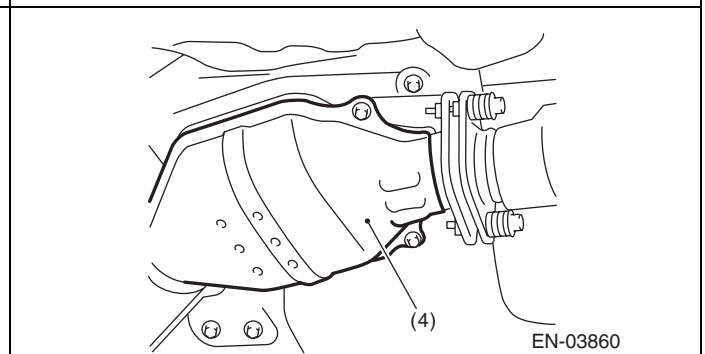
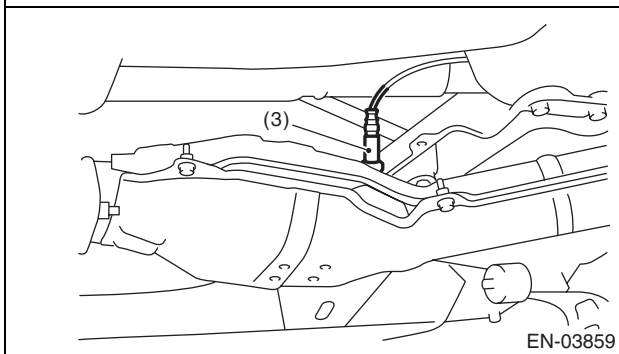
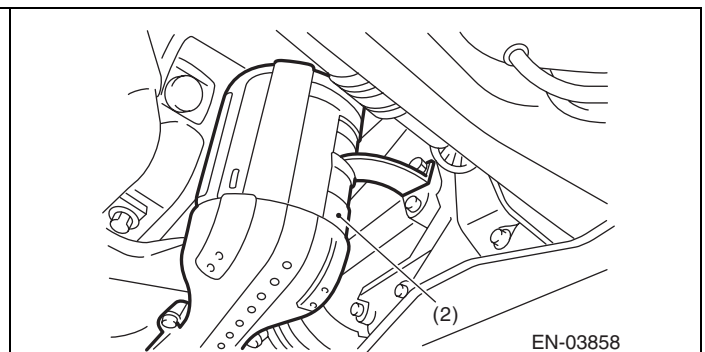
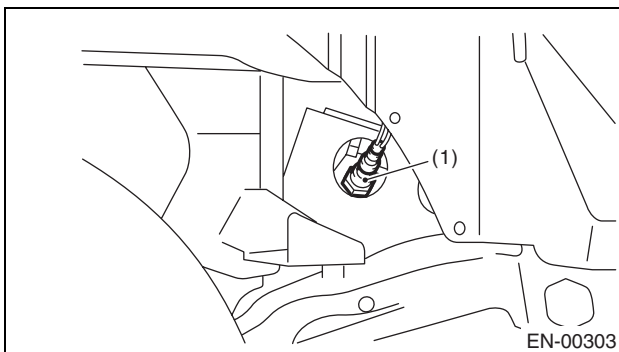


(1) Front oxygen (A/F) sensor

(3) Rear oxygen sensor

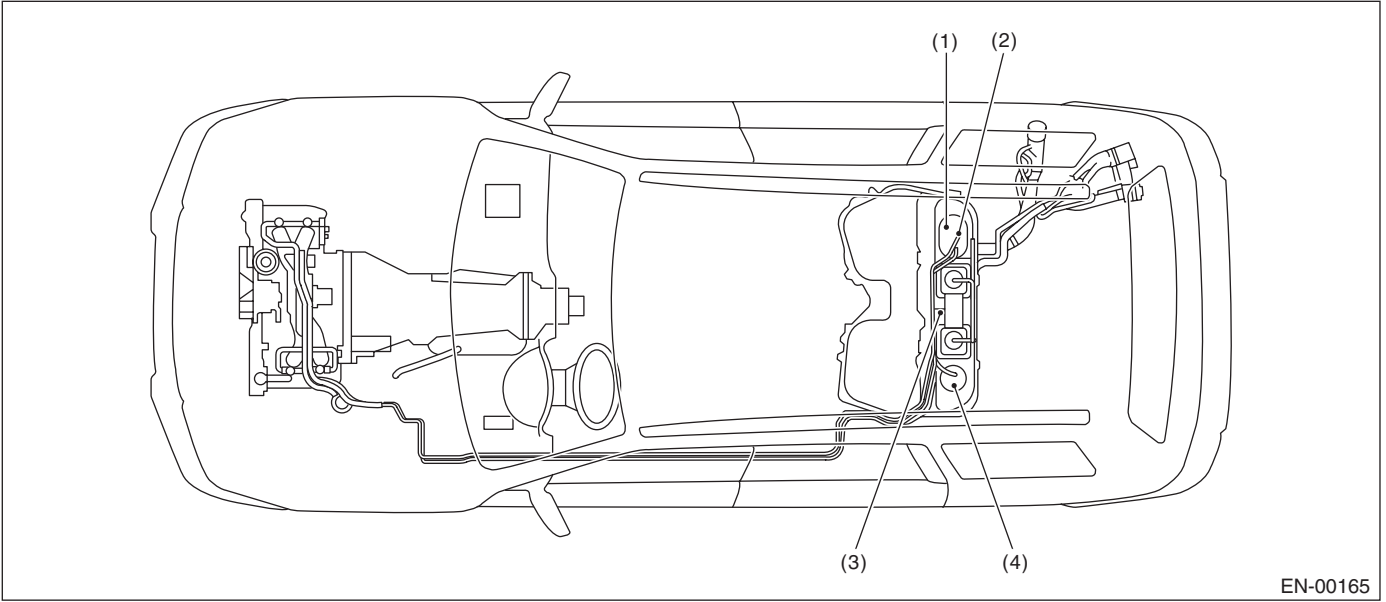
(4) Rear catalytic converter

(2) Front catalytic converter

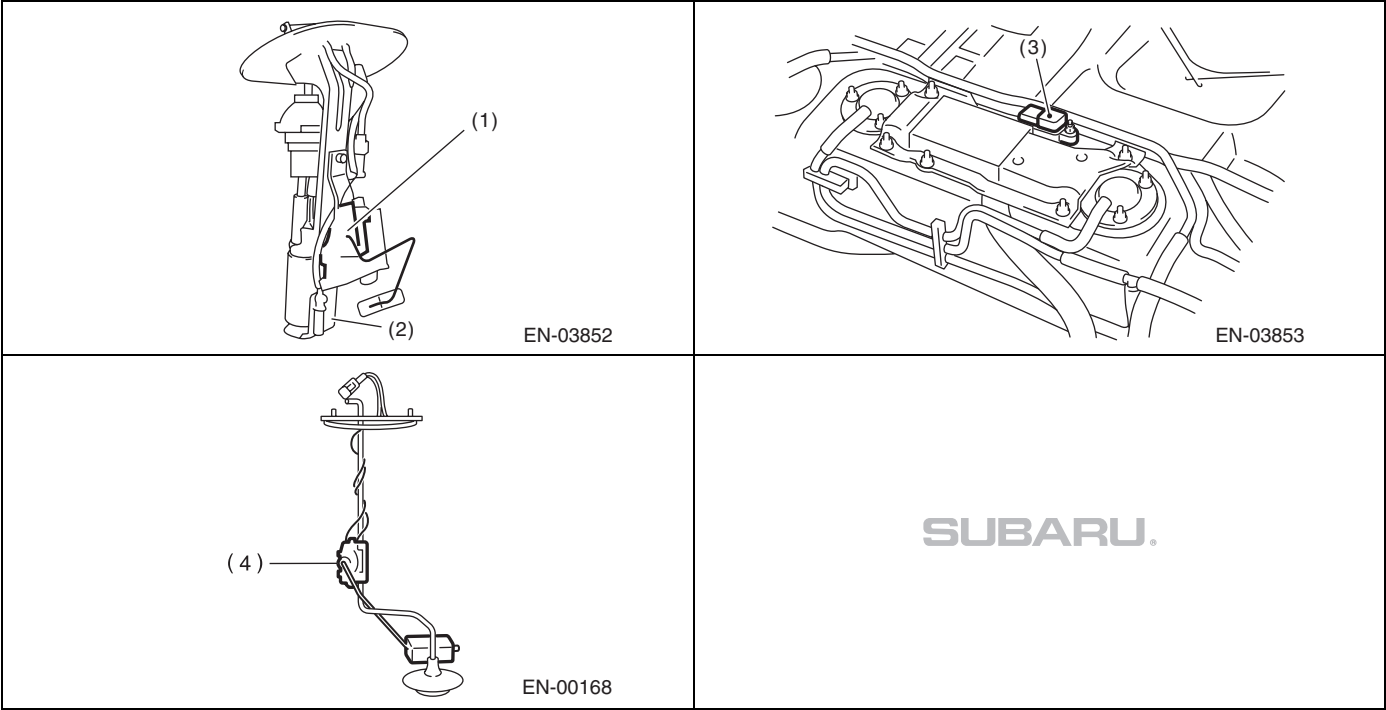


Electrical Component Location

ENGINE (DIAGNOSTICS)



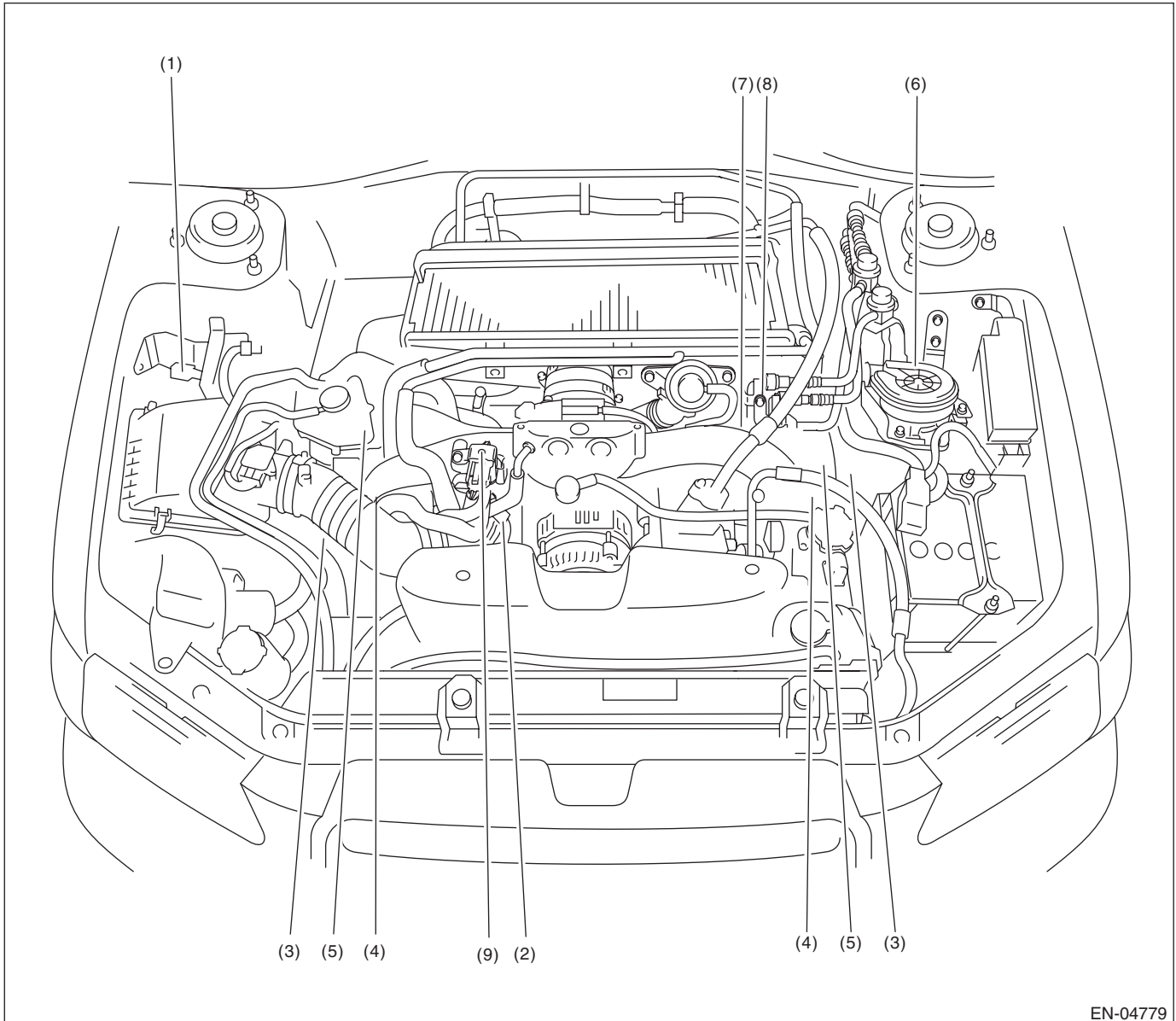
- (1) Fuel level sensor
- (2) Fuel temperature sensor
- (3) Fuel tank pressure sensor
- (4) Fuel sub level sensor



Electrical Component Location

ENGINE (DIAGNOSTICS)

- Solenoid valve, actuator, emission control system parts and ignition system parts

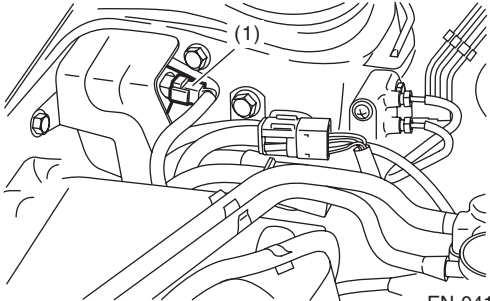
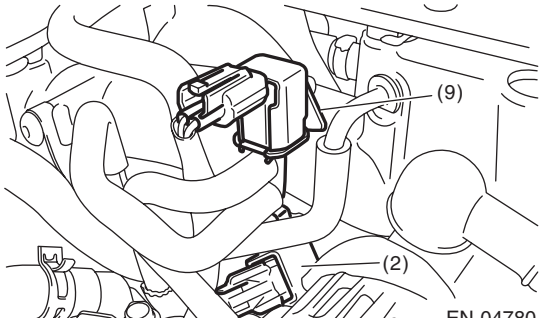
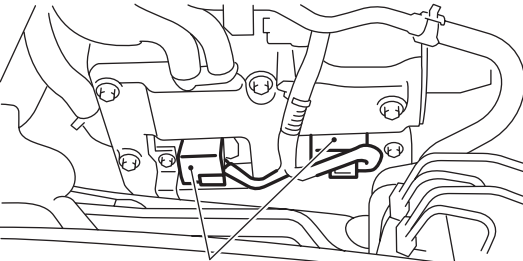
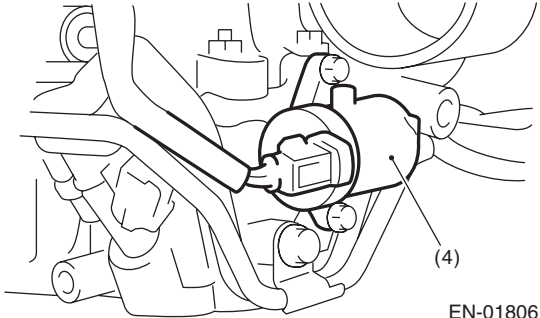
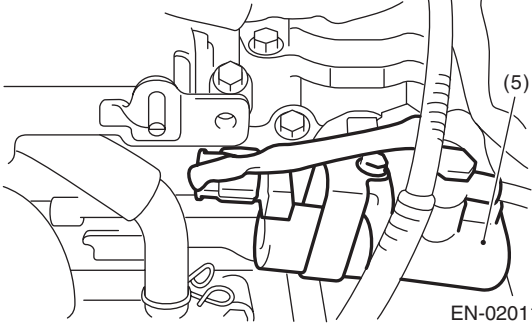
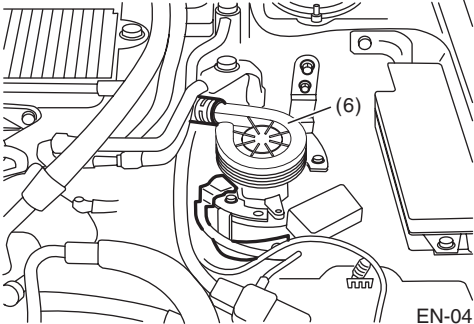
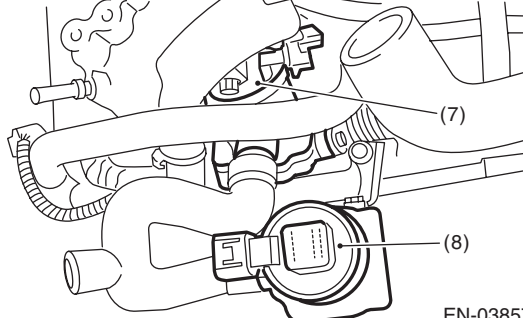


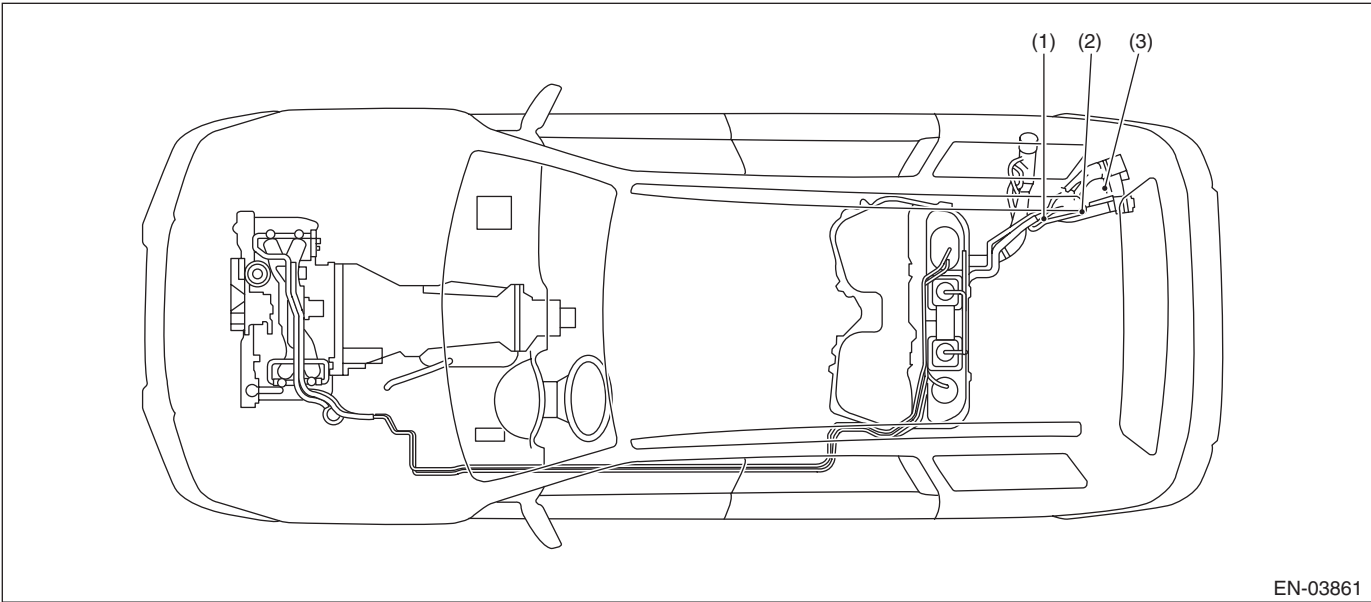
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- | | | |
|--------------------------------------|--|--|
| (1) Wastegate control solenoid valve | (5) Oil flow control solenoid valve | (8) Secondary air combination valve (LH) |
| (2) Purge control solenoid valve 1 | (6) Secondary air pump | (9) Purge control solenoid valve 2 |
| (3) Ignition coil | (7) Secondary air combination valve (RH) | |
| (4) Tumble generator valve actuator | | |

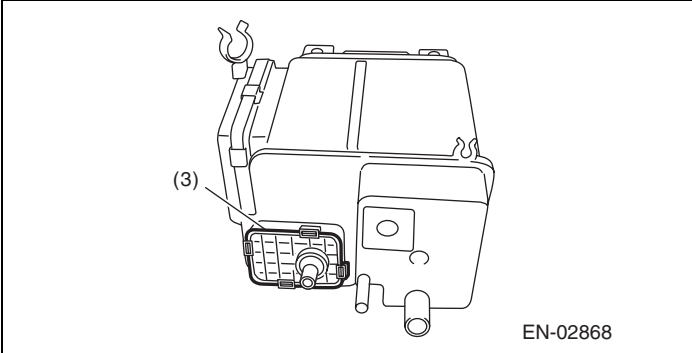
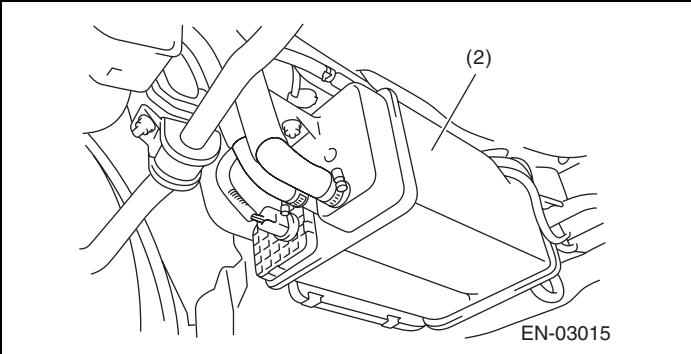
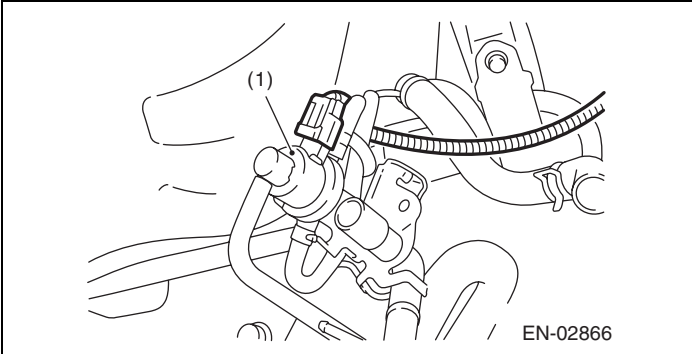
Electrical Component Location

ENGINE (DIAGNOSTICS)

 (1) EN-04111	 (9) (2) EN-04780
 (3) EN-01805	 (4) EN-01806
 (5) EN-02011	 (6) EN-04112
 (7) (8) EN-03857	SUBARU.

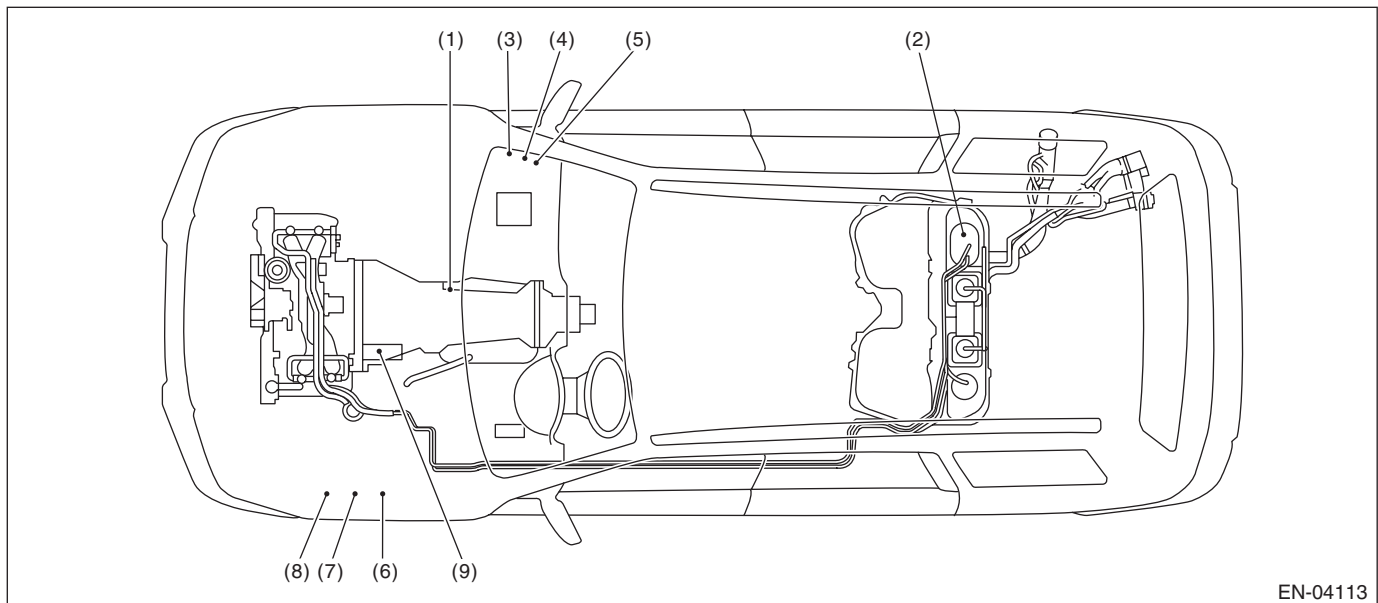


(1) Pressure control solenoid valve (2) Canister (3) Drain valve

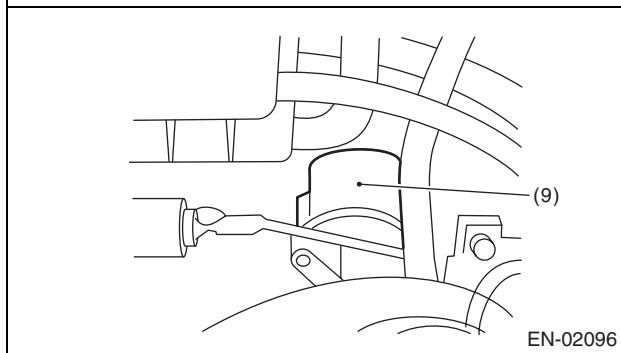
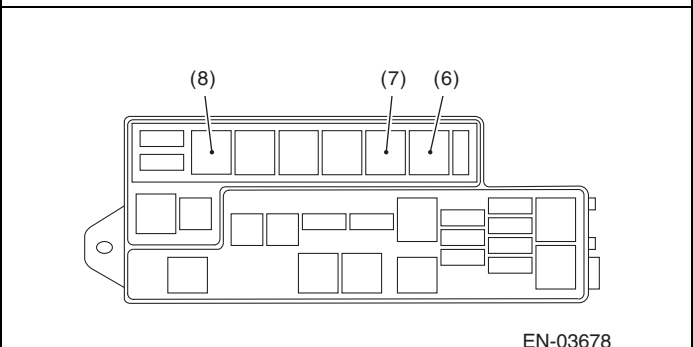
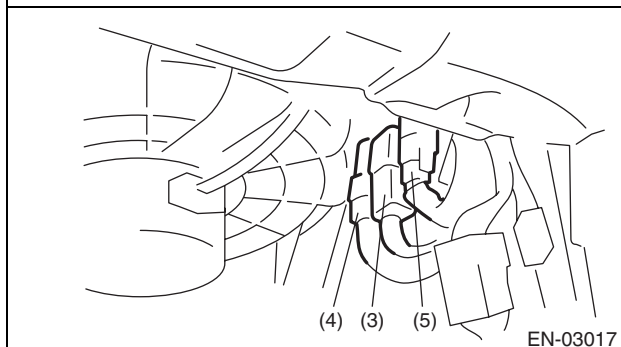
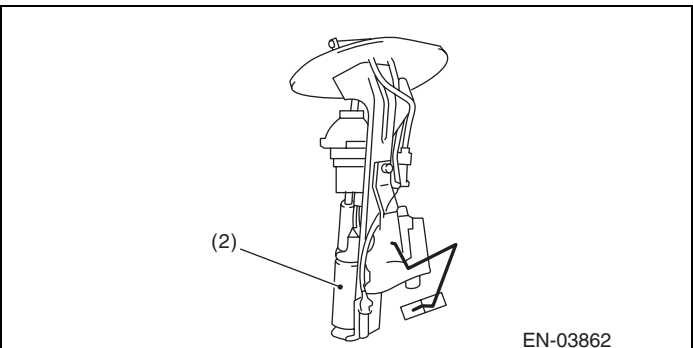
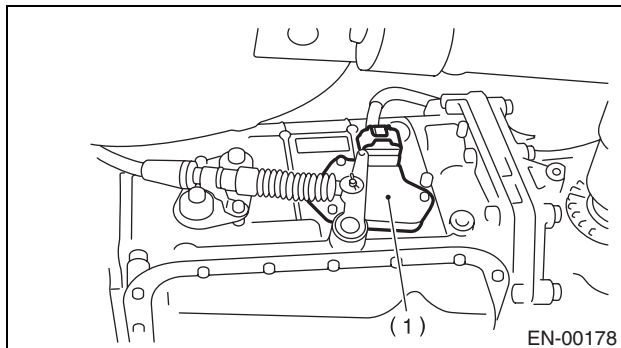


Electrical Component Location

ENGINE (DIAGNOSTICS)



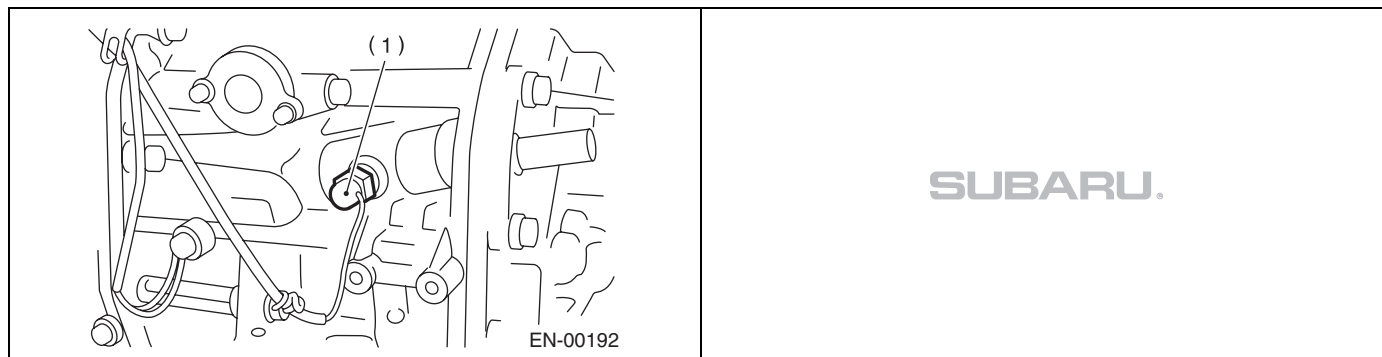
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|----------------------|---------------------------------------|----------------------------|
| (1) Inhibitor switch | (4) Fuel pump relay | (7) Radiator sub fan relay |
| (2) Fuel pump | (5) Electronic throttle control relay | (8) Fan mode relay |
| (3) Main relay | (6) Radiator main fan relay | (9) Starter |



SUBARU.

2. TRANSMISSION

- Solenoid valve and switch (MT vehicles)



- (1) Neutral position switch

Engine Control Module (ECM) I/O Signal

ENGINE (DIAGNOSTICS)

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

A: ELECTRICAL SPECIFICATION

A: TO **B134**

7	6	5	4	3	2	1
17	16	15	14	13	12	11
27	26	25	24	23	22	21
34	33			32	31	30

B: TO **B135**

7	6	5	4	3		2	1
19	18	17	16	15	14	13	12
27	26		25	24		23	22
35	34		33	32		31	30

C: TO **B136**

6	5		4	3	2	1
16	15	14	13	12	11	10
27	26	25	24	23	22	21
35	34	33	32	31		30

D: TO **B137**

7	6	5	4	3	2	1
17	16	15	14	13	12	11
25	24			23	22	21
31	30			29	28	27

EN-05288

Engine Control Module (ECM) I/O Signal

ENGINE (DIAGNOSTICS)

Contents		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (engine OFF)	Engine ON (idling)	
Crankshaft position sensor	Signal (+)	B134	13	0	-7 — +7	Sensor output waveform
	Signal (-)	B134	14	0	0	—
	Shield	B134	24	0	0	—
Rear oxygen sensor	Signal	B135	4	0	0 — 0.9	—
	Shield	B135	1	0	0	—
	GND (sensor)	B135	30	0	0	—
Front oxygen (A/F) sensor heater	Signal 1	B136	3	0 — 1.0	—	Sensor output waveform
	Signal 2	B136	2	0 — 1.0	—	Sensor output waveform
Rear oxygen sensor heater signal		B136	4	0 — 1.0	—	Sensor output waveform
Engine coolant temperature sensor	Signal	B134	34	1.0 — 1.4	1.0 — 1.4	After engine is warmed-up.
	GND (sensor)	B134	29	0	0	After engine is warmed-up.
Vehicle speed signal		B136	13	0 or 5	0 or 5	"5" and "0" are repeatedly displayed when vehicle is driven.
Air flow sensor	Signal	B135	26	—	0.3 — 4.5	—
	Shield	B135	35	0	0	—
	GND	B135	34	0	0	—
Intake air temperature sensor signal		B135	18	0.3 — 4.6	0.3 — 4.6	—
Tumble generator valve position sensor RH	Signal	B134	26	Fully closed: 3.8 — 4.9 Fully open: 0.2 — 0.9		—
	Power supply	B134	19	5	5	—
	GND (sensor)	B134	29	0	0	—
Tumble generator valve position sensor LH	Signal	B134	16	Fully closed: 3.8 — 4.9 Fully open: 0.2 — 0.9		—
	Power supply	B134	19	5	5	—
	GND (sensor)	B134	29	0	0	—
Tumble generator valve RH (open)		B137	22	0 or 10 — 13	0 or 12 — 14	Sensor output waveform
Tumble generator valve RH (close)		B137	23	0 or 10 — 13	0 or 12 — 14	Sensor output waveform
Tumble generator valve LH (open)		B137	12	0 or 10 — 13	0 or 12 — 14	Sensor output waveform
Tumble generator valve LH (close)		B137	13	0 or 10 — 13	0 or 12 — 14	Sensor output waveform
Wastegate control solenoid valve		B137	27	0 or 10 — 13	0 or 12 — 14	Sensor output waveform
Starter switch		B136	32	0	0	Cranking: 8 — 14
A/C switch		B136	24	ON: 10 — 13 OFF: 0	ON: 12 — 14 OFF: 0	—
Ignition switch		B135	19	10 — 13	12 — 14	—
Neutral position switch		B136	31	ON: 10 — 13 OFF: 0	ON: 12 — 14 OFF: 0	—
Delivery (test) mode connector		B135	27	10 — 13	13 — 14	When connected: 0

Engine Control Module (ECM) I/O Signal

ENGINE (DIAGNOSTICS)

Contents		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (engine OFF)	Engine ON (idling)	
Knock sensor	Signal	B134	15	2.8	2.8	—
	Shield	B134	25	0	0	—
Back-up power supply		B135	5	10 — 13	12 — 14	Ignition switch "OFF" : 10 — 13
Control module power supply	B134	7	10 — 13	12 — 14	—	—
	B135	2	10 — 13	12 — 14	—	—
Sensor power supply		B134	19	5	5	—
Ignition control	#1	B137	18	0	12 — 14	Waveform
	#2	B137	19	0	12 — 14	Waveform
	#3	B137	20	0	12 — 14	Waveform
	#4	B137	21	0	12 — 14	Waveform
Fuel injector	#1	B137	8	10 — 13	1 — 14	Waveform
	#2	B137	9	10 — 13	1 — 14	Waveform
	#3	B137	10	10 — 13	1 — 14	Waveform
	#4	B137	11	10 — 13	1 — 14	Waveform
Fuel pump control unit	Signal 1	B136	12	0 or 5	0 or 5	Sensor output waveform
	Signal 2	B135	33	10 — 13	12 — 14	—
A/C relay control		B136	9	ON: 0.5 or less OFF: 10 — 13	ON: 0.5 or less OFF: 12 — 14	—
Radiator fan relay 1 control		B136	18	ON: 0.5 or less OFF: 10 — 13	ON: 0.5 or less OFF: 12 — 14	—
Radiator fan relay 2 control		B136	29	ON: 0.5 or less OFF: 10 — 13	ON: 0.5 or less OFF: 12 — 14	Model with A/C only
Malfunction indicator light		B136	11	—	—	Light "ON": 1 or less Light "OFF": 10 — 14
Engine speed output		B136	22	—	0 — 13 or more	Waveform
Purge control solenoid valve 1		B137	29	ON: 1 or less OFF: 10 — 13	ON: 1 or less OFF: 12 — 14	Sensor output waveform
Purge control solenoid valve 2		B136	7	ON: 1 or less OFF: 10 — 13	ON: 1 or less OFF: 12 — 14	Sensor output waveform
Manifold absolute pressure sensor	Signal	B134	6	1.7 — 2.4	1.1 — 1.6	—
	Power supply	B134	19	5	5	
	GND (sensor)	B134	29	0	0	
Fuel tank pressure sensor	Signal	B135	32	2.3 — 2.7	2.3 — 2.7	The valve operates when fuel filler cap is removed and reinstalled.
	Power supply	B135	22	5	5	
	GND (sensor)	B135	30	0	0	—
Pressure control solenoid valve		B136	28	ON: 1 or less OFF: 10 — 13	ON: 1 or less OFF: 12 — 14	—
Drain valve		B136	17	ON: 1 or less OFF: 10 — 13	ON: 1 or less OFF: 12 — 14	—
Fuel level sensor		B135	10	0.12 — 4.75	0.12 — 4.75	—
Fuel temperature sensor signal		B135	17	2.5 — 3.8	2.5 — 3.8	Ambient temperature: 25°C (77°F)
Blow-by leak diagnosis signal		B134	30	0	0	At the time of open circuit (fault): 5
Small light switch		B135	15	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	—

Engine Control Module (ECM) I/O Signal

ENGINE (DIAGNOSTICS)

Contents		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (engine OFF)	Engine ON (idling)	
Blower fan switch		B135	16	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	—
Rear defogger switch		B135	14	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	—
Power steering oil pressure switch		B134	33	10 — 13	ON: 0 OFF: 12 — 14	—
Front oxygen (A/F) sensor	Signal (+)	B135	9	2.8 — 3.2	2.8 — 3.2	—
	Signal (—)	B135	8	2.4 — 2.7	2.4 — 2.7	—
	Shield	B135	1	0	0	—
SSM/GST communication line		B136	16	1 ↔ 4	1 ↔ 4	—
Ground (engine 4)		B137	1	0	0	—
Ground (ignition system 1)		B137	26	0	0	—
Ground (ignition system 2)		B137	6	0	0	—
Ground (engine 3)		B137	2	0	0	—
Ground (engine 1)		B134	5	0	0	—
Ground (engine 5)		B137	3	0	0	—
Ground (engine 2)		B137	7	0	0	—
Camshaft position sensor (LH)		B134	21	0 — 0.9	ON: 0 OFF: 4.7 — 5.3	Sensor output waveform
Camshaft position sensor (RH)		B134	11	0 — 0.9	ON: 0 OFF: 4.7 — 5.3	Sensor output waveform
Electronic throttle control	Main	B134	18	0.64 — 0.72 Fully opened: 3.96	0.64 — 0.72 (After engine is warmed-up.)	Fully closed: 0.6 Fully opened: 3.96
	Sub	B134	28	1.51 — 1.58 Fully opened: 4.17	1.51 — 1.58 (After engine is warmed-up.)	Fully closed: 1.48 Fully opened: 4.17
	Power supply	B134	19	5	5	—
	GND (sensor)	B134	29	0	0	—
Electronic throttle control motor (+)		B137	5	Duty waveform	Duty waveform	Drive frequency: 500 Hz
Electronic throttle control motor (—)		B137	4	Duty waveform	Duty waveform	Drive frequency: 500 Hz
Electronic throttle control motor power supply		B136	1	10 — 13	12 — 14	—
Electronic throttle control motor relay		B136	21	0	0	—
Oil flow control solenoid (LH)	Signal (+)	B137	15	ON: 10 — 13 OFF: 0	ON: 12 — 14 OFF: 0	—
	Signal (—)	B137	14	0	0	—
Oil flow control solenoid (RH)	Signal (+)	B137	17	ON: 10 — 13 OFF: 0	ON: 12 — 14 OFF: 0	—
	Signal (—)	B137	16	0	0	—

Engine Control Module (ECM) I/O Signal

ENGINE (DIAGNOSTICS)

Contents		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (engine OFF)	Engine ON (idling)	
Accelerator pedal position sensor	Main sensor signal	B135	23	Fully closed: 1 Fully opened: 3.5	Fully closed: 1 Fully opened: 3.5	—
	Main power supply	B135	21	5	5	—
	GND (main sensor)	B135	29	0	0	—
	Sub sensor signal	B135	31	Fully closed: 1 Fully opened: 3.5	Fully closed: 1 Fully opened: 3.5	—
	Sub power supply	B135	22	5	5	—
	GND (Sub sensor)	B135	30	0	0	—
Main light		B135	6	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	—
Cruise control set light		B135	3	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	—
Clutch switch		B136	25	When clutch pedal is depressed: 0 When brake pedal is released: 10 — 13	When clutch pedal is depressed: 0 When brake pedal is released: 12 — 14	—
SET/COAST switch		B135	24	ON: 10 — 13 OFF: 0	ON: 12 — 14 OFF: 0	—
Brake switch 1		B135	20	When brake pedal is depressed: 0 When brake pedal is released: 10 — 13	When brake pedal is depressed: 0 When brake pedal is released: 12 — 14	—
Brake switch 2		B135	28	When brake pedal is depressed: 10 — 13 When brake pedal is released: 0	When brake pedal is depressed: 12 — 14 When brake pedal is released: 0	—
Main switch		B135	12	ON: 10 — 13 OFF: 0	ON: 12 — 14 OFF: 0	—
CAN communication	Signal (+)	B136	27	Pulse signal		—
	Signal (—)	B136	35	Pulse signal		—
Secondary air piping pressure sensor	Signal	B134	27	1.7 — 2.4	1.1 — 1.6	—
	Power supply	B134	19	5	5	
	GND (sensor)	B134	29	0	0	
Secondary air combination valve relay 1		B136	30	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	—
Secondary air combination valve relay 2		B136	19	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	—
Secondary air pump relay		B136	8	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	—

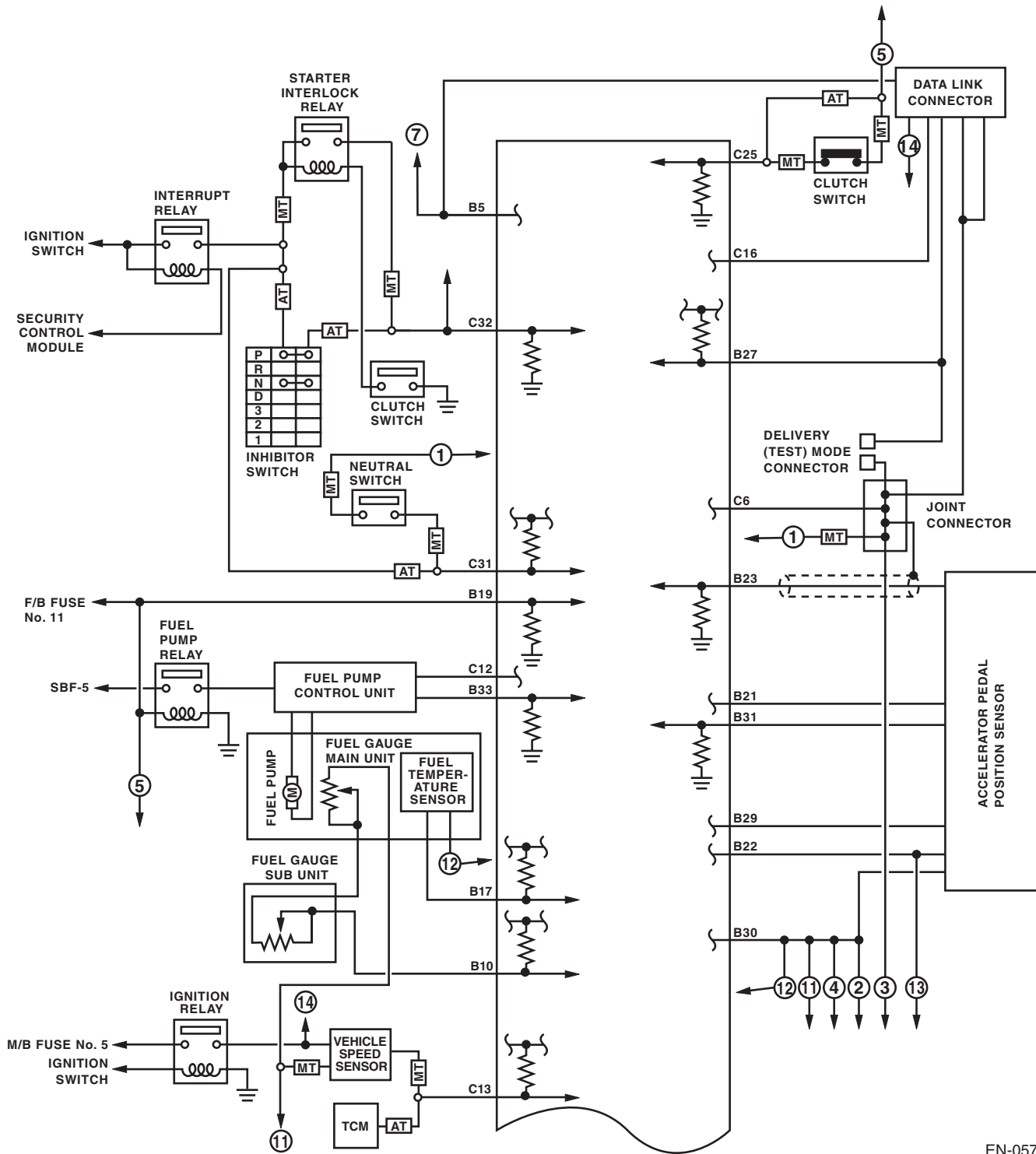
Engine Control Module (ECM) I/O Signal

ENGINE (DIAGNOSTICS)

Input/output name	Measuring condition	Waveform
1. Crankshaft position sensor	During idling	EN-05322
2. Camshaft position sensor	During idling	EN-05359

Engine Control Module (ECM) I/O Signal

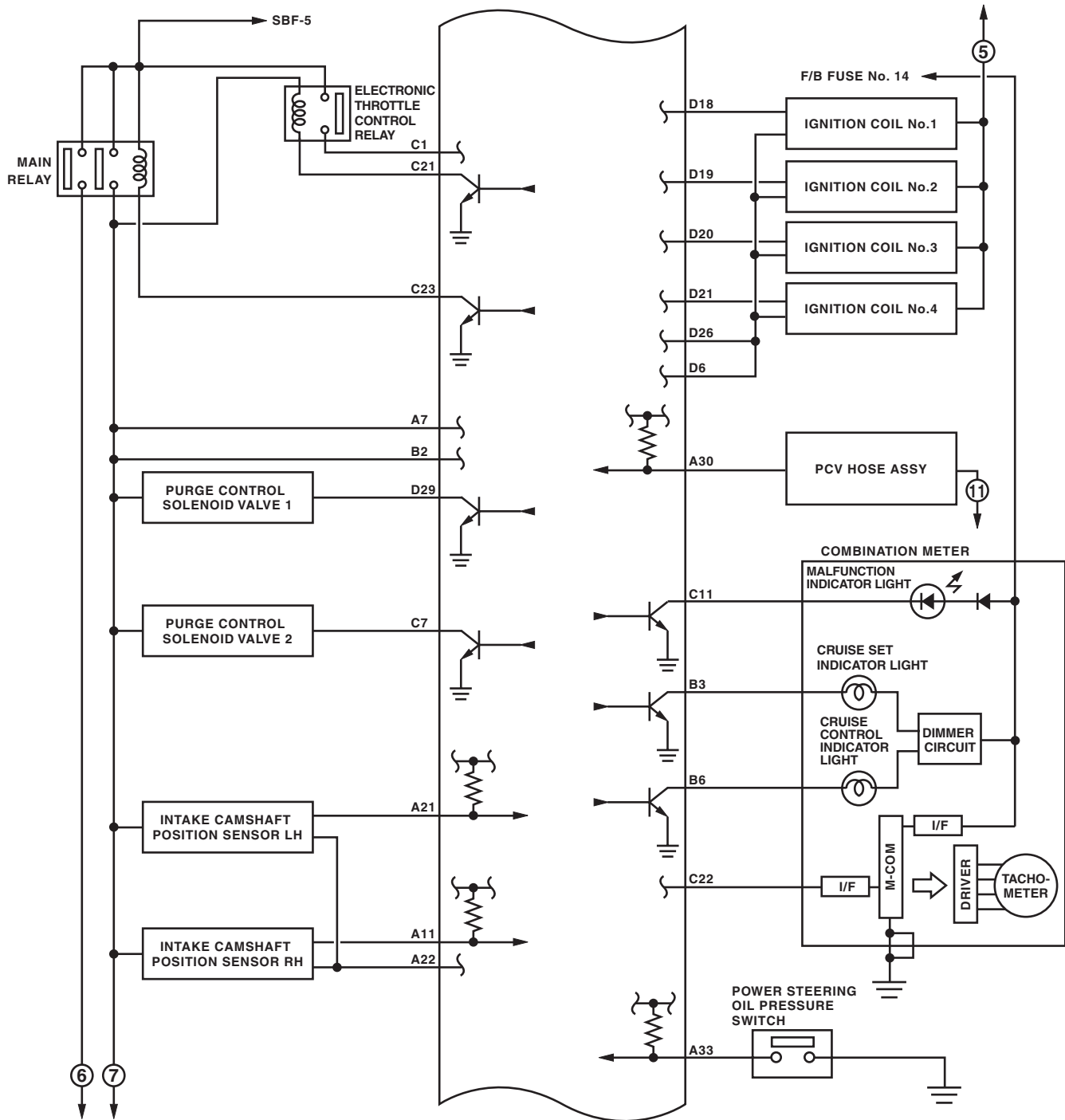
ENGINE (DIAGNOSTICS)



EN-05779

Engine Control Module (ECM) I/O Signal

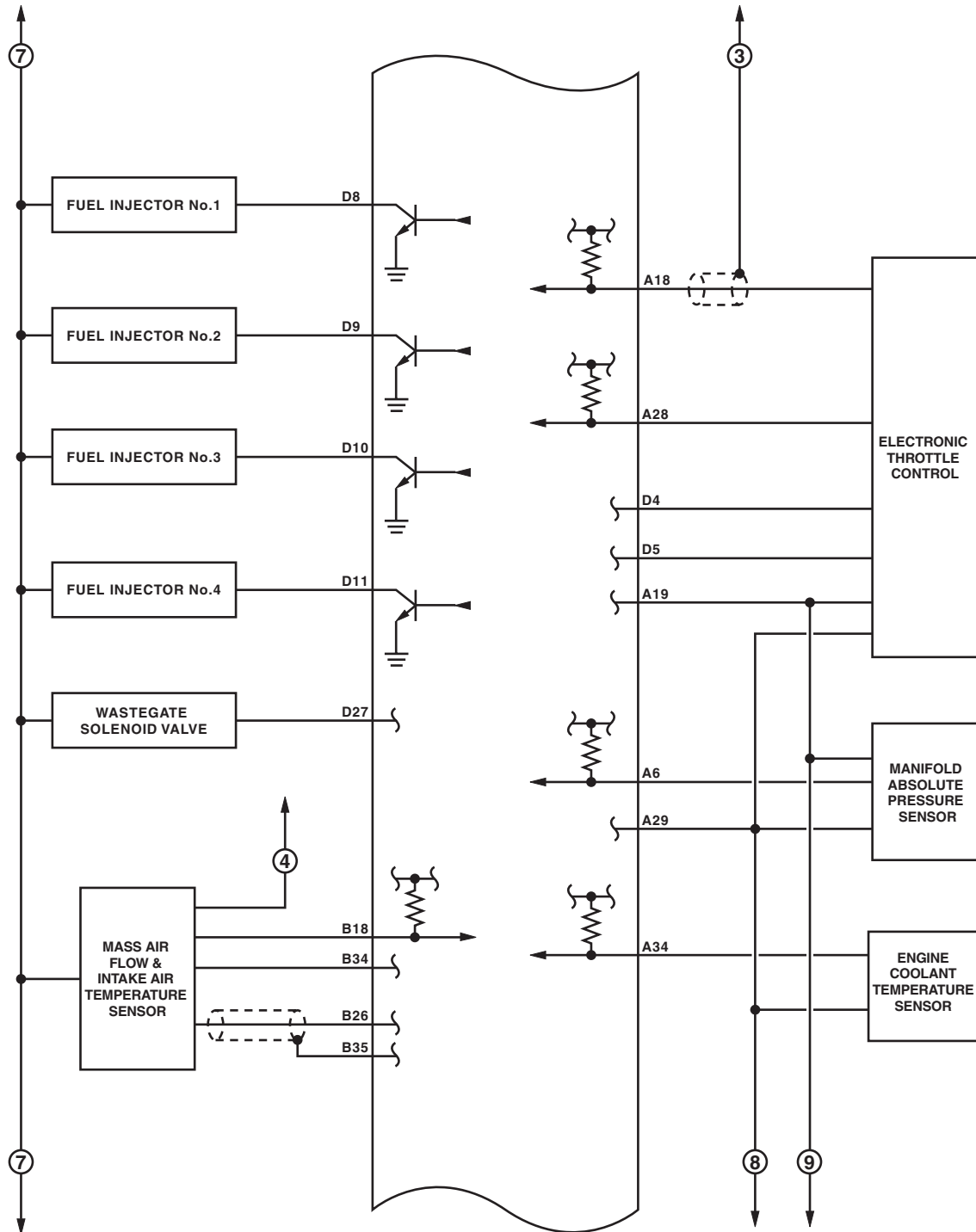
ENGINE (DIAGNOSTICS)



EN-05780

Engine Control Module (ECM) I/O Signal

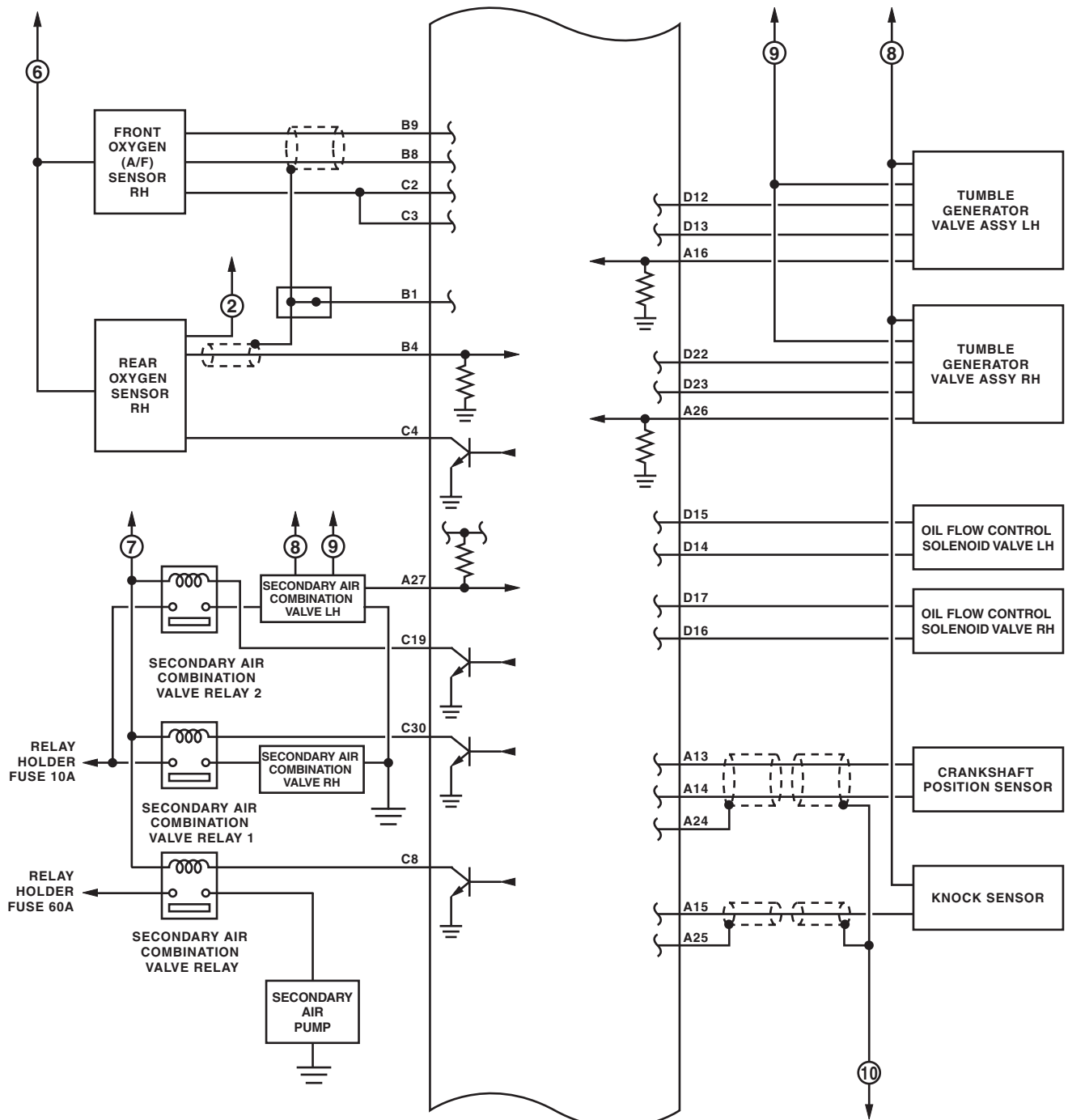
ENGINE (DIAGNOSTICS)



EN-05716

Engine Control Module (ECM) I/O Signal

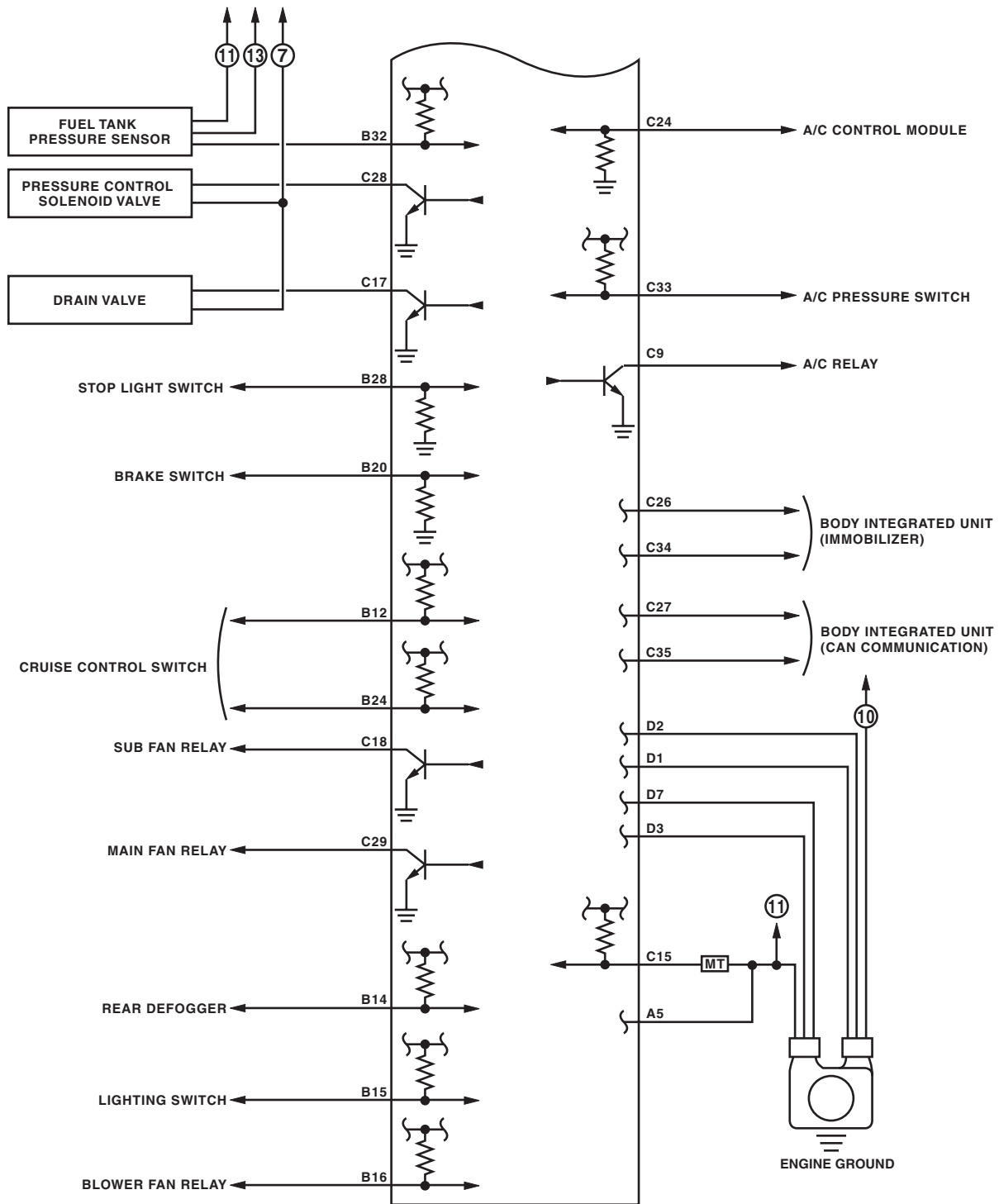
ENGINE (DIAGNOSTICS)



EN-05781

Engine Control Module (ECM) I/O Signal

ENGINE (DIAGNOSTICS)



EN-05782

6. Engine Condition Data

A: ELECTRICAL SPECIFICATION

Content	Specification
Engine load	17.6 — 35.64 (%): Idling
	13.2 — 26.73 (%): 2,500 rpm racing

Measuring condition:

- After engine is warmed-up.
- Gear position is in neutral.
- Turn the A/C off.
- Turn all the accessory switches to OFF.

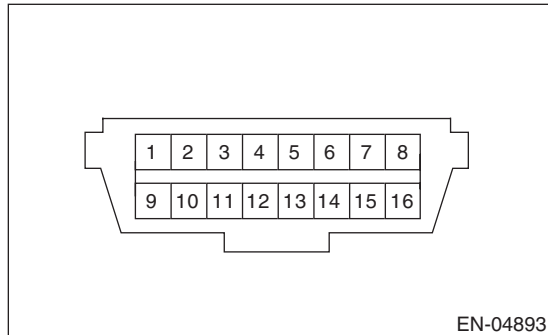
7. Data Link Connector

A: NOTE

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

CAUTION:

Do not connect any scan tools except Subaru Select Monitor or general scan tool because the circuit for Subaru Select Monitor may be damaged.



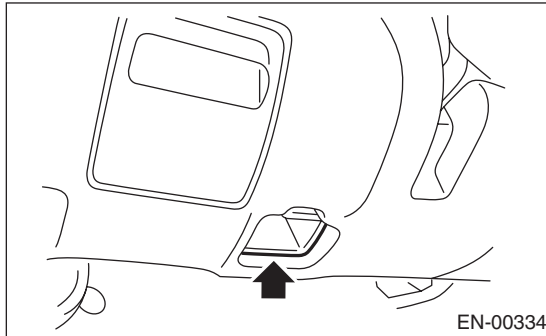
Terminal No.	Content	Terminal No.	Content
1	Empty	9	Empty
2	Empty	10	Empty
3	Empty	11	Empty
4	Ground	12	Empty
5	Ground	13	Empty
6	CAN (+)	14	CAN (–)
7	Subaru select monitor/General scan tool signal	15	Empty
8	Empty	16	Power supply

8. General Scan Tool

A: OPERATION

1. HOW TO USE GENERAL SCAN TOOL

- 1) Prepare a scan tool (general scan tool) required by SAE J1978.
- 2) Open the cover and connect the general scan tool to the data link connector located in the lower portion of instrument panel (on the driver's side).



- 3) Using the general scan tool, call up DTC and freeze frame data.

General scan tool functions consist of:

- (1) MODE \$01: Current power train diagnostic data
- (2) MODE \$02: Powertrain freeze frame data
- (3) MODE \$03: Emission-related powertrain DTC
- (4) MODE \$04: Clear/Reset emission-related diagnostic information
- (5) MODE \$06: Request on-board monitoring test results for intermittently monitored systems
- (6) MODE \$07: Request on-board monitoring test results for continuously monitored systems
- (7) MODE \$09: Request vehicle information

Read data according to repair procedures. (For detailed operation procedure, refer to the general scan tool instruction manual.)

NOTE:

For details concerning DTC, refer to "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-76, List of Diagnostic Trouble Code (DTC).>

General Scan Tool

ENGINE (DIAGNOSTICS)

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

Refer to data denoting the current operating condition of analog input/output, digital input/output or the powertrain system.

A list of the support data and PID (Parameter Identification) codes are shown in the following table.

PID	Data	Unit of measure
\$01	Number of emission-related powertrain DTC and malfunction indicator light status and diagnosis support information	—
\$03	Fuel system control status	—
\$04	Calculated engine load value	%
\$05	Engine coolant temperature	°C
\$06	Short term fuel trim	%
\$07	Long term fuel trim	%
\$0B	Intake manifold absolute pressure	mmHg
\$0C	Engine speed	rpm
\$0D	Vehicle speed	km/h
\$0E	Ignition timing advance	°
\$0F	Intake air temperature	°C
\$10	Air flow rate from mass air flow sensor	g/sec
\$11	Throttle valve absolute opening angle	%
\$12	Secondary air control status	—
\$13	Check whether oxygen sensor is installed.	—
\$15	Oxygen sensor output voltage and short term fuel trim associated with oxygen sensor	V and %
\$1C	Supporting OBD system	—
\$1F	Elapsed time after starting engine	sec
\$21	Travel distance after malfunction indicator light illuminating	km
\$24	A/F value and A/F sensor output voltage	— and V
\$2E	Evaporative purge	%
\$2F	Fuel level	%
\$30	Number of warm ups after DTC clear	—
\$31	Travel distance after DTC clear	km
\$32	Fuel tank pressure	mmHg
\$33	Atmospheric pressure	mmHg
\$34	A/F value and A/F sensor current	— and mA
\$3C	Catalytic temperature #1	°C
\$41	Diagnostic monitor of each drive cycle	—
\$42	ECM power voltage	V
\$43	Absolute load	%
\$44	A/F target lambda	—
\$45	Relative throttle opening angle	%
\$46	Ambient temperature	°C
\$47	Absolute throttle opening angle 2	%
\$49	Absolute accelerator opening angle 1	%
\$4A	Absolute accelerator opening angle 2	%
\$4C	Target throttle opening angle	%
\$4D	Engine operating time during malfunction indicator illuminates	min
\$4E	Elapsed time after DTC clear	min
\$51	Fuel used	—
\$5A	Relative accelerator opening angle	%

NOTE:

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

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

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

PID	Data	Unit of measure
\$02	DTC that caused CARB required freeze frame data storage	—
\$03	Fuel system control status	—
\$04	Calculated engine load value	%
\$05	Engine coolant temperature	°C
\$06	Short term fuel trim	%
\$07	Long term fuel trim	%
\$0B	Intake manifold absolute pressure	mmHg
\$0C	Engine speed	rpm
\$0D	Vehicle speed	km/h
\$0E	Ignition timing advance	°
\$0F	Intake air temperature	°C
\$10	Air flow rate from mass air flow sensor	g/sec
\$11	Throttle valve absolute opening angle	%
\$12	Secondary air control status	—
\$13	Air fuel ratio sensor	—
\$15	Oxygen sensor output voltage and oxygen sensor short term fuel trim	V and %
\$1C	Supporting OBD system	—
\$1F	Elapsed time after starting engine	sec
\$2E	Evaporative purge	%
\$2F	Fuel level	%
\$32	Fuel tank pressure	mmHg
\$33	Atmospheric pressure	mmHg
\$42	ECM power voltage	V
\$43	Absolute load	%
\$44	A/F target lambda	—
\$45	Relative throttle opening angle	%
\$46	Ambient temperature	°C
\$47	Absolute throttle opening angle 2	%
\$49	Absolute accelerator opening angle 1	%
\$4A	Absolute accelerator opening angle 2	%
\$4C	Target throttle opening angle	%

NOTE:

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

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

Refer to "Read Diagnostic Trouble Code (DTC)" for information about data denoting emission-related powertrain DTC. <Ref. to EN(H4DOTC)(diag)-43, Read Diagnostic Trouble Code (DTC).>

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

Refer to the mode used to clear or reset emission-related diagnostic information (OBD-II trouble diagnostic information).

NOTE:

Refer to general scan tool manufacturer's instruction manual to clear the emission-related diagnostic information (MODE \$04).

General Scan Tool

ENGINE (DIAGNOSTICS)

6. MODE \$06

Refer to the test value of troubleshooting and data of test specification on the support data bit sequence table. A list of the support data is shown in the following table.

OBDMID	TID	SID	Diagnostic item
\$01	\$81	\$0A	A/F Sensor Conduction Abnormal (Bank 1 Sensor 1)
	\$82	\$8D	
	\$83	\$14	
	\$84	\$1E	A/F Sensor Range Abnormal (Bank 1 Sensor 1)
	\$85	\$1E	
	\$86	\$20	A/F Sensor Response Abnormal (Bank 1 Sensor 1)
\$02	\$87	\$0B	Oxygen Sensor Circuit Abnormal (Bank 1 Sensor 2)
	\$88	\$0B	
	\$07	\$0B	Oxygen Sensor Drop Abnormal (Bank 1 Sensor 2)
	\$08	\$0B	
	\$A5	\$0B	
	\$05	\$10	Oxygen Sensor Response Abnormal (Bank 1 Sensor 2)
	\$06	\$10	
\$21	\$89	\$20	Catalyst Degradation Diagnosis (Bank 1)
\$39	\$93	\$FE	Evaporative Emission Control System Leak Detected (Cap off)
\$3B	\$94	\$FE	Evaporative Emission Control System (0.04 inch leak)
	\$95	\$FE	
\$3C	\$96	\$FE	Evaporative Emission Control System (0.02 inch leak)
	\$97	\$FE	
\$3D	\$98	\$FE	Evaporative Emission Control System Leak Detected (purge flow)
\$41	\$99	\$24	A/F Sensor Heater Abnormal (Bank 1 Sensor 1)
	\$9A	\$24	
	\$9B	\$14	A/F Sensor Heater Characteristics Abnormal (Bank 1 Sensor 1)
\$42	\$9C	\$24	Oxygen Sensor Heater Abnormal (Bank 1 Sensor 1)
	\$9D	\$24	
\$A1	\$0B	\$24	Misfire Monitoring (All cylinders)
	\$0C	\$24	
\$A2	\$0B	\$24	Misfire Monitoring (#1 cylinder)
	\$0C	\$24	
\$A3	\$0B	\$24	Misfire Monitoring (#2 cylinder)
	\$0C	\$24	
\$A4	\$0B	\$24	Misfire Monitoring (#3 cylinder)
	\$0C	\$24	
\$A5	\$0B	\$24	Misfire Monitoring (#4 cylinder)
	\$0C	\$24	
\$E1	\$A6	\$FE	Purge Control Solenoid Valve 2 Stock Closed

7. MODE \$07

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

8. MODE \$09

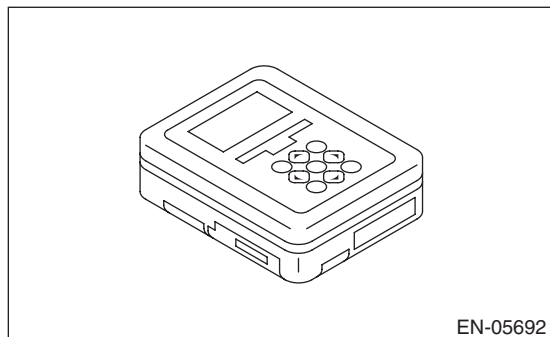
Refer to the data of vehicle specification (V.I.N., calibration ID, etc.).

9. Subaru Select Monitor

A: OPERATION

1. HOW TO USE SUBARU SELECT MONITOR

1) Prepare the Subaru Select Monitor kit. <Ref. to EN(H4DOTC)(diag)-7, PREPARATION TOOL, General Description.>



2) Prepare the personal computer which has been installed the Subaru Select Monitor.

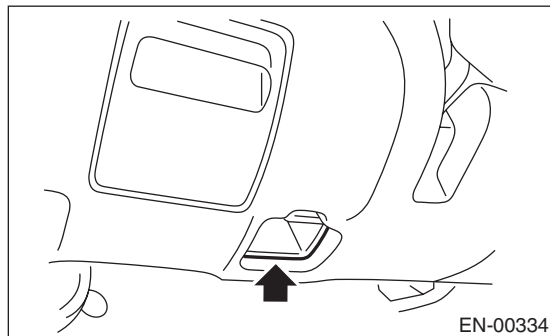
3) Connect the USB cable between SDI (Subaru Diagnosis Interface) and USB port on the personal computer (dedicated port for the Subaru Select Monitor).

NOTE:

The dedicated port for the Subaru Select Monitor means the USB port which was used to install the Subaru Select Monitor.

4) Connect the diagnosis cable to the SDI.

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



CAUTION:

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

6) Start up the personal computer.

7) Turn the ignition switch to ON (engine OFF), and run the "PC application for Subaru Select Monitor".

8) Call up DTC and data, then record them.

NOTE:

For detailed operation procedure, refer to the "PC application help for Subaru Select Monitor".

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

Refer to "Read Diagnostic Trouble Code (DTC)" for information about how to display a DTC. <Ref. to EN(H4DOTC)(diag)-43, Read Diagnostic Trouble Code (DTC).>

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

Refer to "Read Diagnostic Trouble Code (DTC)" for information about how to display a DTC. <Ref. to EN(H4DOTC)(diag)-43, Read Diagnostic Trouble Code (DTC).>

Subaru Select Monitor

ENGINE (DIAGNOSTICS)

4. READ CURRENT DATA FOR ENGINE (NORMAL MODE)

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

Content	Display	Unit of measure	Note (at idling)
Engine load	Engine Load	%	21.0%
Engine coolant temperature signal	Coolant Temp.	°C or °F	80 — 100°C or 176 — 212°F
A/F correction 1	A/F Correction #1	%	-10 — +10%
A/F learning 1	A/F Learning #1	%	-15 — +15%
Intake manifold absolute pressure	Mani. Absolute Pressure	mmHg, kPa, inHg or psig	220 — 275 mmHg, 29.5 — 37 kPa, 8.7 — 10 inHg or 4.2 — 5.3 psig
Engine speed signal	Engine Speed	rpm	700 rpm (Agree with the tachometer indication)
Meter vehicle speed signal	Meter Vehicle Speed	km/h or MPH	0 km/h or 0 MPH (at parking)
Ignition timing signal	Ignition Timing	deg	+17.0 deg
Intake air temperature signal	Intake Air Temp.	°C or °F	20 — 50°C or 68 — 122°F
Amount of intake air	Mass Air Flow	g/s or lb/m	3.6 g/s or 0.48 lb/m
Throttle opening angle signal	Throttle Opening Angle	%	3.0 — 3.2%
Rear oxygen sensor voltage	Rear O2 Sensor	V	0 — 1.0 V
Battery voltage	Battery Voltage	V	12 — 15 V
Mass air flow voltage	Air Flow Sensor Voltage	V	1.0 — 1.7 V
Injection 1 pulse width	Fuel Injection #1 Pulse	ms	1.2 — 2.2 ms
Atmospheric pressure	Atmosphere Pressure	mmHg, kPa, inHg or psig	(Atmosphere pressure)
Intake manifold relative pressure	Mani. Relative Pressure	mmHg, kPa, inHg or psig	(Air intake absolute pressure — atmosphere pressure)
Ignition timing learning value	Learned Ignition Timing	deg	0 deg
Acceleration opening angle signal	Accel. Opening Angle	%	0.0%
Fuel temperature signal	Fuel Temp.	°C or °F	+21°C or 70°F
Fuel level signal	Fuel Level	V	0 — 5 V
Primary supercharged pressure control signal	Primary Control	%	0.0%
Purge control solenoid duty ratio	CPC Valve Duty ratio	%	0 — 25%
Tumble generator valve RH opening signal	TGV Position Sensor R	V	0.44 V
Tumble generator valve LH opening signal	TGV Position Sensor L	V	0.48 V
Fuel pump duty ratio	Fuel Pump Duty	%	33%
AVCS advance angle amount RH	VVT Adv. Ang. Amount R	deg	0 deg
AVCS advance angle amount LH	VVT Adv. Ang. Amount L	deg	0 deg
Oil flow control solenoid valve duty RH (AVCS)	OCV Duty R	%	9.4%
Oil flow control solenoid valve duty LH (AVCS)	OCV Duty L	%	9.4%
Oil flow control solenoid valve current RH	OCV Current R	mA	40 — 100 mA
Oil flow control solenoid valve current LH	OCV Current L	mA	40 — 100 mA
A/F sensor current value 1	A/F Sensor #1 Current	mA	-20 — 20 mA
A/F sensor resistance value 1	A/F Sensor #1 Resistance	Ω	27 — 35 Ω
A/F sensor output lambda 1	A/F Sensor #1	—	1.00
A/F correction 3	A/F Correction #3	%	0.00%
A/F learning 3	A/F learning 3	%	0.00%
Throttle motor duty	Throttle Motor Duty	%	-10%

Subaru Select Monitor

ENGINE (DIAGNOSTICS)

Content	Display	Unit of measure	Note (at idling)
Throttle power supply voltage	Throttle Motor Voltage	V	12 — 15 V
Sub throttle sensor voltage	Sub-throttle Sensor	V	1.52 V
Main throttle sensor voltage	Main-throttle Sensor	V	0.66 V
Sub accelerator sensor voltage	Sub-accelerator Sensor	V	0.68 V
Main accelerator sensor voltage	Main-accelerator Sensor	V	0.66 V
Secondary air supply piping pressure signal	Secondary air supply piping pressure	mmHg, kPa, inHg or psig	765 mmHg, 102 kPa, 30.1 inHg or 14.8 psig
Secondary airflow signal	Secondary airflow amount	g/s or lb/m	0.00 g/s or 0.00 lb/m
Memory vehicle speed	Memorized Cruise Speed	km/h or MPH	0 km/h or 0 MPH
Odo Meter	Estimated Cumulative Driving Distance	km	—
#1 cylinder roughness monitor	Roughness Monitor #1	—	0
#2 cylinder roughness monitor	Roughness Monitor #2	—	0
#3 cylinder roughness monitor	Roughness Monitor #3	—	0
#4 cylinder roughness monitor	Roughness Monitor #4	—	0
Knock sensor correction	Knock Correction	deg	0.0 deg
Fuel tank pressure signal	Fuel Tank Pressure	mmHg, kPa, inHg or psig	+8.8 mmHg, +1.2 kPa, +0.4 inHg or 0.2 psig
AT/MT identification terminal	AT Vehicle ID Signal	—	ON/OFF
Delivery (test) mode terminal	Test Mode Terminal	—	U-check
D check request flag	D-check Flag	—	OFF
Delivery (test) mode terminal	Delivery Mode Connector	—	OFF
Neutral position switch signal	Neutral Position Switch	—	Neutral
Soft idle switch signal	Soft Idle Switch Signal	—	Idling
Ignition switch signal	Ignition Switch	—	ON input
Power steering switch signal	P/S Switch	—	OFF input (At OFF)
Air conditioning switch signal	A/C Switch	—	OFF input (At OFF)
Starter switch signal	Starter Switch	—	OFF input
Rear oxygen monitor	Rear O2 Rich Signal	—	Rich/Lean
Knocking signal	Knock Signal	—	None
Crankshaft position sensor signal	Crankshaft Position Sig.	—	Provided
Camshaft position sensor signal	Camshaft Position Sig.	—	Provided
Rear defogger switch signal	Rear Defogger SW	—	OFF input (At OFF)
Blower fan switch signal	Blower Fan SW	—	OFF input (At OFF)
Light switch signal	Light Switch	—	OFF input (At OFF)
A/C middle pressure switch signal	A/C Mid Pressure Switch	—	OFF input (At OFF)
Air conditioner compressor relay output signal	A/C Compressor Signal	—	OFF output (At OFF)
Radiator fan relay 1 signal	Radiator Fan Relay #1	—	OFF output (At OFF)
Radiator fan relay 2 signal	Radiator Fan Relay #2	—	OFF output (At OFF)
PCV hose assembly diagnosis signal	Blow-by Leak Connector	—	Connected
Pressure control solenoid valve signal	PCV Solenoid	—	OFF output (At OFF)
Tumble generator valve output signal	TGV Output	—	None
Tumble generator valve drive signal	TGV Drive	—	Opening direction
Drain valve signal	Vent Control Solenoid	—	OFF output (At OFF)
Purge control solenoid valve 2 signal	CPC Solenoid 2	—	OFF (At OFF)
AT coordinate retard angle demand signal	Retard Signal from AT	—	None
AT coordinate fuel cut demand signal	Fuel Cut Signal from AT	—	None
Vehicle dynamics control (VDC) torque down prohibition output	Ban of Torque Down	—	Allow
Vehicle dynamics control (VDC) torque down demand	Request Torque Down	—	None

Subaru Select Monitor

ENGINE (DIAGNOSTICS)

Content	Display	Unit of measure	Note (at idling)
Torque control permission signal	AT coordinate permission signal	—	Allow
ETC motor relay signal	ETC Motor Relay	—	ON
Clutch switch signal	Clutch Switch	—	OFF (At OFF)
Stop light switch signal	Stop Light Switch	—	OFF (At OFF)
SET/COAST switch signal	SET/COAST Switch	—	OFF (At OFF)
RES/ACC switch signal	RESUME/ACCEL Switch	—	OFF (At OFF)
Brake switch signal	Brake Switch	—	OFF (At OFF)
Main switch signal	Main Switch	—	OFF (At OFF)
Secondary air combination valve relay 2 signal	Sec. Air Combi V Relay 2	—	OFF (At OFF)
Secondary air pump relay signal	Sec. Air Pump Relay	—	OFF (At OFF)
Secondary air combination valve relay 1 signal	Sec. Air Combi V Relay 1	—	OFF (At OFF)
Cruise control cancel switch signal	CC Cancel SW	—	OFF (At OFF)
Malfunction indicator light signal	MIL Lit	—	OFF (when light is OFF)

NOTE:

For detailed operation procedure, refer to the “PC application help for Subaru Select Monitor”.

5. READ CURRENT DATA FOR ENGINE (OBD MODE)

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

Contents	Display	Referential value (at idling)	Unit of measure
Number of diagnosis code	Number of Diag. Code:	0	—
Condition of malfunction indicator light	MI (MIL)	OFF	—
Monitoring test of misfire	Misfire Monitoring (Supp)	YES	—
Monitoring test of misfire	Misfire Monitoring (Rdy)	YES	—
Monitoring test of fuel system	Fuel system monitoring (Supp)	YES	—
Monitoring test of fuel system	Fuel system monitoring (Rdy)	YES	—
Monitoring test of comprehensive component	Component monitoring (Supp)	YES	—
Monitoring test of comprehensive component	Component monitoring (Rdy)	YES	—
Test of catalyst	Catalyst Diagnosis (Supp)	YES	—
Test of catalyst	Catalyst Diagnosis (Rdy)	NO	—
Test of heating-type catalyst	Heated catalyst (Supp)	NO	—
Test of heating-type catalyst	Heated catalyst (Rdy)	N/A	—
Test of evaporative emission purge control system	Evaporative purge system (Supp)	YES	—
Test of evaporative emission purge control system	Evaporative purge system (Rdy)	NO	—
Secondary air system test	Secondary air system (Supp)	YES	—
Secondary air system test	Secondary air system (Rdy)	NO	—
Test of air conditioning system refrigerant	A/C system refrigerant (Supp)	NO	—
Test of air conditioning system refrigerant	A/C system refrigerant (Rdy)	N/A	—
Oxygen sensor test	Oxygen sensor (Supp)	YES	—
Oxygen sensor test	Oxygen sensor (Rdy)	NO	—
Oxygen sensor heater test	O2 Heater Diagnosis (Supp)	YES	—
Oxygen sensor heater test	O2 Heater Diagnosis (Rdy)	YES	—
Test of EGR system	EGR system (Supp)	NO	—
Test of EGR system	EGR system (Rdy)	N/A	—
Air fuel ratio control system for bank 1	Fuel System for Bank 1	CLOSE NORMAL	—
Engine load data	Calculated load value	21.0	%
Engine coolant temperature signal	Coolant Temp.	91	°C
Short term fuel trim by front oxygen (A/F) sensor	Short term fuel trim B1	0.8	%
Long term fuel trim by front oxygen (A/F) sensor	Long term fuel trim B1	3.9	%
Intake manifold absolute pressure signal	Mani. Absolute Pressure	233	mmHg

Subaru Select Monitor

ENGINE (DIAGNOSTICS)

Contents	Display	Referential value (at idling)	Unit of measure
Engine speed signal	Engine Speed	700	rpm
Vehicle speed signal	Vehicle Speed	0	km/h
#1 Cylinder ignition timing	Ignition timing adv. #1	16.5	°
Intake air temperature signal	Intake Air Temp.	54	°C
Intake air amount	Mass Air Flow	2.8	g/s
Throttle position signal	Throttle Opening Angle	13	%
Secondary air system	Secondary air system	Stop	—
Oxygen sensor (Bank 1 Sensor 2)	Oxygen Sensor #12	0.1 — 0.7	V
Air fuel ratio correction by rear oxygen sensor	A/F Correction #12	0.0	%
On-board diagnostic system	OBD System	OBD/OBD2	—
Front oxygen (A/F) sensor (Bank 1 Sensor 1)	Oxygen Sensor #11	Support	—
Oxygen sensor (Bank 1 Sensor 2)	Oxygen Sensor #12	Support	—
Time elapsed after engine start	Elapsed Time After Start- ing Engine	—	sec
Travel distance after malfunction indicator light illuminating	Time while MIL lighted	—	km
A/F lambda signal	A/F sensor #11	1.001	—
A/F sensor output signal	A/F sensor #11	2.805	V
Evaporative purge	Evaporative purge	0	%
Fuel level signal	Fuel level	—	%
Number of warm ups after DTC clear	Number Of Warm Ups After DTC Clear	—	—
Travel distance after DTC clear	Time since DTC cleared	—	km
Fuel tank pressure signal	Fuel Tank Pressure	8.8	mmHg
Atmospheric absolute pressure signal	Atmospheric Pressure	Atmospheric pressure	mmHg
A/F lambda signal #11	A/F sensor #11	0.999	—
A/F sensor current #11	A/F sensor #11	0.02	mA
Catalyst temperature #1	Catalyst Temperature #11	—	°C
Monitoring test of misfire	Misfire Monitoring (Enable)	YES	—
Monitoring test of misfire	Misfire Monitoring (Comp)	YES	—
Monitoring test of fuel system	Fuel system monitoring (Enable)	YES	—
Monitoring test of fuel system	Fuel system monitoring (Comp)	NO	—
Monitoring test of comprehensive component	Component monitoring (Enable)	NO	—
Monitoring test of comprehensive component	Component monitoring (Comp)	NO	—
Test of catalyst	Catalyst Diagnosis (Enable)	YES	—
Test of catalyst	Catalyst Diagnosis (Comp)	NO	—
Test of heating-type catalyst	Heated catalyst (Enable)	N/A	—
Test of heating-type catalyst	Heated catalyst (Comp)	N/A	—
Test of evaporative emission purge control system	Evaporative purge sys- tem (Enable)	YES	—
Test of evaporative emission purge control system	Evaporative purge sys- tem (Comp)	NO	—
Secondary air system test	Secondary air system (Enable)	YES	—

Subaru Select Monitor

ENGINE (DIAGNOSTICS)

Contents	Display	Referential value (at idling)	Unit of measure
Secondary air system test	Secondary air system (Comp)	NO	—
Test of air conditioning system refrigerant	A/C system refrigerant (Enable)	N/A	—
Test of air conditioning system refrigerant	A/C system refrigerant (Comp)	N/A	—
Oxygen sensor test	Oxygen sensor (Enable)	YES	—
Oxygen sensor test	Oxygen sensor (Comp)	NO	—
Oxygen sensor heater test	O2 Heater Diagnosis (Enable)	YES	—
Oxygen sensor heater test	O2 Heater Diagnosis (Comp)	YES	—
Test of EGR system	EGR system (Enable)	N/A	—
Test of EGR system	EGR system (Comp)	N/A	—
ECM power voltage	ECM power voltage	13.789	V
Absolute load	Absolute load	22	%
A/F ratio target lambda	A/F target lambda	0.976	—
Relative throttle opening angle	Relative throttle position	2	%
Ambient temperature	Ambient temperature	Ambient air temperature	°C
Absolute throttle opening angle 2	Absolute throttle opening angle 2	32	%
Absolute accelerator opening angle 1	Absolute accelerator opening angle 1	13	%
Absolute accelerator opening angle 2	Absolute accelerator opening angle 2	13	%
Target throttle opening angle	Target throttle opening angle	0	%
Engine operating time during malfunction indicator illuminates	Engine operating time during MIL illuminates	—	min
Elapsed time after DTC clear	Elapsed time after DTC clear	—	min
Fuel used	Fuel used	GAS	—
Relative accelerator opening angle	Relative accelerator opening angle	0	%

NOTE:

For detailed operation procedure, refer to the “PC application help for Subaru Select Monitor”.

Subaru Select Monitor

ENGINE (DIAGNOSTICS)

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

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

Content	Display	Unit of measure
DTC of freeze frame data	Freeze frame data	—
Air fuel ratio control system for bank 1	Fuel system for Bank1	—
Engine load data	Calculated load value	%
Engine coolant temperature signal	Coolant Temp.	°C or °F
Short term fuel trim by front oxygen (A/F) sensor	Short term fuel trim B1	%
Long term fuel trim by front oxygen (A/F) sensor	Long term fuel trim B1	%
Intake manifold absolute pressure signal	Mani.Absolute Pressure	mmHg, kPa, inHg or psig
Engine speed signal	Engine Speed	rpm
Vehicle speed signal	Vehicle Speed	km/h or MPH
Ignition timing advance for #1 cylinder	Ignition timing adv. #1	°
Intake air temperature signal	Intake Air Temp.	°C or °F
Amount of intake air	Mass Air Flow	g/s
Throttle position signal	Throttle Opening Angle	%
Secondary air system	Secondary air system	—
Rear oxygen sensor output voltage	Oxygen sensor #12	V
Short term fuel trim by rear oxygen sensor	Short term fuel trim #12	%
On-board diagnostic system	OBD System	—
Oxygen sensor #11	Oxygen sensor #11	—
Oxygen sensor #12	Oxygen sensor #12	—
Time elapsed after engine start	Elapsed Time After Starting Engine	sec
Evaporative purge	Evaporative purge	%
Fuel level signal	Fuel level	%
Fuel tank pressure signal	Tank pressure	mmHg, kPa, inHg or psig
Atmospheric pressure	Atmospheric Pressure	mmHg, kPa, inHg or psig
ECM power voltage	ECM power voltage	V
Absolute load	Absolute load	%
A/F ratio target lambda	A/F target lambda	—
Relative throttle opening angle	Relative throttle position	%
Ambient temperature	Ambient temperature	°C or °F
Absolute throttle opening angle 2	Absolute throttle opening angle 2	%
Absolute accelerator opening angle 1	Absolute accelerator opening angle 1	%
Absolute accelerator opening angle 2	Absolute accelerator opening angle 2	%
Target throttle opening angle	Target throttle opening angle	%

NOTE:

For detailed operation procedure, refer to the “PC application help for Subaru Select Monitor”.

7. V.I.N. REGISTRATION

- 1) On the «Main Menu» display screen, select the {Each System Check}.
- 2) On the «System Selection Menu» display screen, select the {Engine Control System}.
- 3) Click the [OK] button after the information of engine type has been displayed.
- 4) On the «Engine Diagnosis» display screen, select the {V.I.N. Registration}.
- 5) Perform the procedures shown on the display screen.

NOTE:

For detailed operation procedure, refer to the “PC application help for Subaru Select Monitor”.

10. Read Diagnostic Trouble Code (DTC)

A: OPERATION

1. SUBARU SELECT MONITOR (NORMAL MODE)

- 1) On the «Main Menu» display screen, select the {Each System Check}.
- 2) On the «System Selection Menu» display screen, select the {Engine Control System}.
- 3) Select the [OK] button after the information of engine type has been displayed.
- 4) On the «Engine Diagnosis» display screen, select the {Diagnostic Code(s) Display}.
- 5) On the «Diagnostic Code(s) Display» screen, select the {Temporary Code} or {Memory Code}.

NOTE:

- For detailed operation procedure, refer to the “PC application help for Subaru Select Monitor”.
- For details concerning DTC, refer to “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4DOTC)(diag)-76, List of Diagnostic Trouble Code (DTC).>

2. SUBARU SELECT MONITOR (OBD MODE)

- 1) On the «Main Menu» display screen, select the {Each System Check}.
- 2) On the «System Selection Menu» display screen, select the {Engine Control System}.
- 3) Select the [OK] button after the information of engine type has been displayed.
- 4) On the «Engine Diagnosis» display screen, select the {OBD System}.
- 5) On the «OBD Menu» display screen, select the {Diagnostic Code(s) Display}.
- 6) Make sure DTC is shown on the screen.

NOTE:

- For detailed operation procedure, refer to the “PC application help for Subaru Select Monitor”.
- For details concerning DTC, refer to “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4DOTC)(diag)-76, List of Diagnostic Trouble Code (DTC).>

3. GENERAL SCAN TOOL

Refer to the data denoting emission-related powertrain DTC.

For details concerning DTC, refer to “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4DOTC)(diag)-76, List of Diagnostic Trouble Code (DTC).>

NOTE:

Refer to the general scan tool manufacturer’s operation manual to access powertrain DTC (MODE \$03).

Inspection Mode

ENGINE (DIAGNOSTICS)

11. Inspection Mode

A: PROCEDURE

Perform the diagnosis shown in the following DTC table.

When performing the diagnosis not listed in “List of Diagnostic Trouble Code (DTC)”, refer the item on the drive cycle. <Ref. to EN(H4DOTC)(diag)-49, Drive Cycle.>

DTC	Item	Condition
P0011	Intake Camshaft Position - Timing Over-Advanced Or System Performance (Bank 1)	—
P0016	Crankshaft Position - Camshaft Position Correlation (Bank 1)	—
P0018	Crankshaft Position - Camshaft Position Correlation (Bank 2)	—
P0021	Intake Camshaft Position - Timing Over-Advanced Or System Performance (Bank 2)	—
P0031	HO2S Heater Control Circuit Low (Bank 1 Sensor 1)	—
P0032	HO2S Heater Control Circuit High (Bank 1 Sensor 1)	—
P0037	HO2S Heater Control Circuit Low (Bank 1 Sensor 2)	—
P0038	HO2S Heater Control Circuit High (Bank 1 Sensor 2)	—
P0102	Mass or Volume Air Flow Circuit Low Input	—
P0103	Mass or Volume Air Flow Circuit High Input	—
P0107	Manifold Absolute Pressure/Barometric Pressure Circuit Low Input	—
P0108	Manifold Absolute Pressure/Barometric Pressure Circuit High Input	—
P0112	Intake Air Temperature Sensor 1 Circuit Low	—
P0113	Intake Air Temperature Sensor 1 Circuit High	—
P0117	Engine Coolant Temperature Circuit Low	—
P0118	Engine Coolant Temperature Circuit High	—
P0122	Throttle/Pedal Position Sensor/Switch “A” Circuit Low	—
P0123	Throttle/Pedal Position Sensor/Switch “A” Circuit High	—
P0131	O2 Sensor Circuit Low Voltage (Bank 1 Sensor 1)	—
P0132	O2 Sensor Circuit High Voltage (Bank 1 Sensor 1)	—
P0137	O2 Sensor Circuit Low Voltage (Bank 1 Sensor 2)	—
P0138	O2 Sensor Circuit High Voltage (Bank 1 Sensor 2)	—
P0140	O2 Sensor Circuit No Activity Detected (Bank 1 Sensor 2)	—
P0182	Fuel Temperature Sensor “A” Circuit Low Input	—
P0183	Fuel Temperature Sensor “A” Circuit High Input	—
P0222	Throttle/Pedal Position Sensor/Switch “B” Circuit Low	—
P0223	Throttle/Pedal Position Sensor/Switch “B” Circuit High	—
P0230	Fuel Pump Primary Circuit	—
P0245	Turbo/Super Charger Wastegate Solenoid “A” Low	—
P0327	Knock Sensor 1 Circuit Low (Bank 1 or Single Sensor)	—
P0328	Knock Sensor 1 Circuit High (Bank 1 or Single Sensor)	—
P0335	Crankshaft Position Sensor “A” Circuit	—
P0336	Crankshaft Position Sensor “A” Circuit Range/Performance	—
P0340	Camshaft Position Sensor “A” Circuit (Bank 1 or Single Sensor)	—
P0345	Camshaft Position Sensor “A” Circuit (Bank 2 or Single Sensor)	—
P0413	Secondary Air Injection System Switching Valve “A” Circuit Open	—
P0416	Secondary Air Injection System Switching Valve “B” Circuit Open	—
P0418	Secondary Air Injection System Control “A” Circuit	—
P0447	Evaporative Emission Control System Vent Control Circuit Open	—
P0448	Evaporative Emission Control System Vent Control Circuit Shorted	—
P0452	Evaporative Emission Control System Pressure Sensor Low Input	—
P0453	Evaporative Emission Control System Pressure Sensor High Input	—
P0458	Evaporative Emission System Purge Control Valve Circuit Low	—
P0462	Fuel Level Sensor “A” Circuit Low	—

Inspection Mode

ENGINE (DIAGNOSTICS)

DTC	Item	Condition
P0463	Fuel Level Sensor "A" Circuit High	—
P0502	Vehicle Speed Sensor "A" Circuit Low Input	—
P0503	Vehicle Speed Sensor "A" Intermittent/Erratic/High	—
P0512	Starter Request Circuit	—
P0513	Incorrect Immobilizer Key	—
P0519	Idle Air Control System Performance	—
P0600	Serial Communication Link	—
P0604	Internal Control Module Random Access Memory (RAM) Error	—
P0605	Internal Control Module Read Only Memory (ROM) Error	—
P0607	Control Module Performance	—
P0638	Throttle Actuator Control Range/Performance (Bank 1)	—
P0691	Fan 1 Control Circuit Low	—
P0700	Transmission Control System (MIL Request)	—
P0851	Park/Neutral Switch Input Circuit Low	—
P0852	Park/Neutral Switch Input Circuit High	—
P1152	O2 Sensor Circuit Range/Performance (Low) (Bank 1 Sensor 1)	—
P1153	O2 Sensor Circuit Range/Performance (High) (Bank 1 Sensor 1)	—
P1160	Return Spring Failure	—
P1400	Fuel Tank Pressure Control Solenoid Valve Circuit Low	—
P1410	Secondary Air Injection System Switching Valve Stuck Open	—
P1420	Fuel Tank Pressure Control Sol. Valve Circuit High	—
P1491	Positive Crankcase Ventilation (Blow-by) Function Problem	—
P1518	Starter Switch Circuit Low Input	—
P1560	Backup power supply	—
P1570	Antenna	—
P1571	Reference Code Incompatibility	—
P1572	IMM Circuit Failure	—
P1574	Key Communication Failure	—
P1576	EGI Control Module EEPROM	—
P1577	IMM Control Module EEPROM	—
P2006	Intake Manifold Runner Control Stuck Closed (Bank 1)	—
P2007	Intake Manifold Runner Control Stuck Closed (Bank 2)	—
P2008	Intake Manifold Runner Control Circuit / Open (Bank 1)	—
P2009	Intake Manifold Runner Control Circuit Low (Bank 1)	—
P2011	Intake Manifold Runner Control Circuit / Open (Bank 2)	—
P2012	Intake Manifold Runner Control Circuit Low (Bank 2)	—
P2016	Intake Manifold Runner Position Sensor / Switch Circuit Low (Bank 1)	—
P2017	Intake Manifold Runner Position Sensor / Switch Circuit High (Bank 1)	—
P2021	Intake Manifold Runner Position Sensor / Switch Circuit Low (Bank 2)	—
P2022	Intake Manifold Runner Position Sensor / Switch Circuit High (Bank 2)	—
P2088	Intake Camshaft Position Actuator Control Circuit Low (Bank 1)	—
P2089	Intake Camshaft Position Actuator Control Circuit High (Bank 1)	—
P2092	Intake Camshaft Position Actuator Control Circuit Low (Bank 2)	—
P2093	Intake Camshaft Position Actuator Control Circuit High (Bank 2)	—
P2101	Throttle Actuator Control Motor Circuit Range/Performance	—
P2102	Throttle Actuator Control Motor Circuit Low	—
P2103	Throttle Actuator Control Motor Circuit High	—
P2109	Throttle/Pedal Position Sensor "A" Minimum Stop Performance	—
P2122	Throttle/Pedal Position Sensor/Switch "D" Circuit Low Input	—
P2123	Throttle/Pedal Position Sensor/Switch "D" Circuit High Input	—

Inspection Mode

ENGINE (DIAGNOSTICS)

DTC	Item	Condition
P2127	Throttle/Pedal Position Sensor/Switch "E" Circuit Low Input	—
P2128	Throttle/Pedal Position Sensor/Switch "E" Circuit High Input	—
P2135	Throttle/Pedal Position Sensor/Switch "A"/"B" Voltage Correlation	—
P2138	Throttle/Pedal Position Sensor/Switch "D"/"E" Voltage Correlation	—
P2419	Evaporative Emission System Switching Valve Control Circuit Low	—
P2420	Evaporative Emission System Switching Valve Control Circuit High	—
P2431	Secondary Air Injection System Air Flow /Pressure Sensor Circuit Range/Performance	—
P2432	Secondary Air Injection System Air Flow /Pressure Sensor Circuit Low	—
P2433	Secondary Air Injection System Air Flow /Pressure Sensor Circuit High	—
P2444	Secondary Air Injection System Pump Stuck ON	—

1. PREPARATION FOR THE INSPECTION MODE

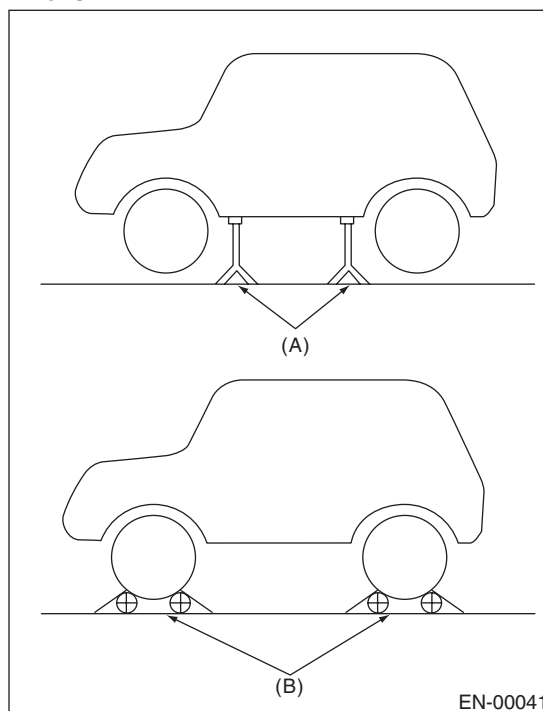
1) Check battery voltage is more than 12 V and fuel remains half [20 — 40 ℓ (5.3 — 10.6 US gal, 4.4 — 8.8 Imp gal)].

2) Lift up the vehicle using a garage jack and place it on rigid racks, or drive the vehicle onto free rollers.

WARNING:

- Before raising the vehicle, ensure parking brakes are applied.
- Do not use a pantograph jack in place of a rigid rack.
- Secure a rope or wire to the front or rear towing hooks to prevent the lateral runout of front wheels.
- Do not abruptly depress/release clutch pedal or accelerator pedal during works even when the engine is operating at low speeds since this may cause vehicle to jump off free rollers.
- In order to prevent the vehicle from slipping due to vibration, do not place any wooden blocks or similar items between the rigid racks and vehicle.

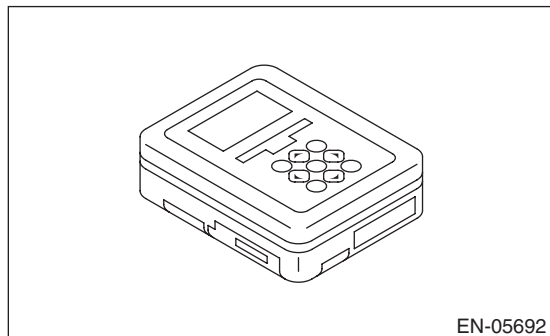
- Since the rear wheels will also rotate, do not place anything near them. Also, make sure that nobody goes in front of the vehicle.



- (A) Rigid rack
(B) Free rollers

2. SUBARU SELECT MONITOR

1) Prepare the Subaru Select Monitor kit. <Ref. to EN(H4DOTC)(diag)-7, PREPARATION TOOL, General Description.>



2) After clearing the memory, check for any remaining unresolved trouble data. <Ref. to EN(H4DOTC)(diag)-54, Clear Memory Mode.>

3) Warm up the engine.

4) Prepare the personal computer which has been installed the Subaru Select Monitor.

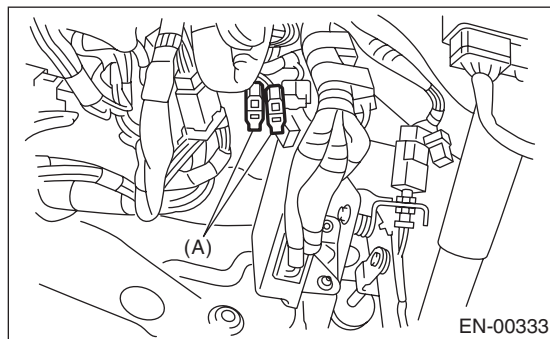
5) Connect the USB cable between SDI (Subaru Diagnosis Interface) and USB port on the personal computer (dedicated port for the Subaru Select Monitor).

NOTE:

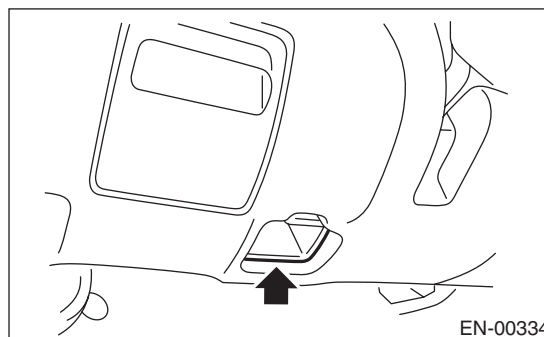
The dedicated port for the Subaru Select Monitor means the USB port which was used to install the Subaru Select Monitor.

6) Connect the diagnosis cable to the SDI.

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



8) Connect the SDI to data link connector located in the lower portion of the instrument panel (on the driver's side).



CAUTION:

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

9) Start up the personal computer.

10) Turn the ignition switch to ON (engine OFF), and run the "PC application for Subaru Select Monitor".

11) On the «Main Menu» display screen, select the {Each System Check}.

12) On the «System Selection Menu» display screen, select the {Engine Control System}.

13) Click the [OK] button after the information of engine type has been displayed.

14) On the «Engine Diagnosis» display screen, select the {D Check}.

15) When the «Perform Inspection (Dealer Check) Mode» is shown on the screen, click the [Next] button.

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

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

NOTE:

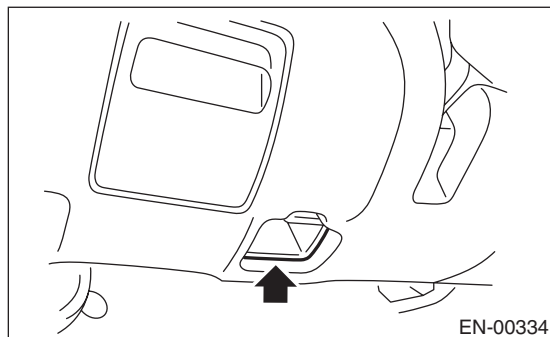
- For detailed operation procedure, refer to the "PC application help for Subaru Select Monitor".
- For details concerning DTC, refer to "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-76, List of Diagnostic Trouble Code (DTC).>
- Release the parking brake.
- The speed difference between front and rear wheels may light the ABS warning light, but this does not indicate a malfunction. When engine control diagnosis is finished, perform the ABS memory clearance procedure of self-diagnosis function. <Ref. to ABS(diag)-26, Clear Memory Mode.>

3. GENERAL SCAN TOOL

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

CAUTION:

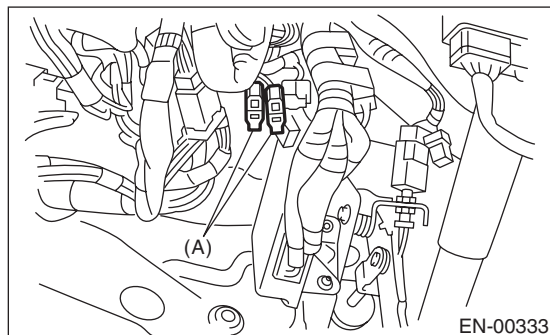
Do not connect the scan tools except for Subaru Select Monitor and general scan tool.



2) After clearing the memory, check for any remaining unresolved trouble data. <Ref. to EN(H4DOTC)(diag)-54, Clear Memory Mode.>

3) Warm up the engine.

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



5) Start the engine.

NOTE:

- Make sure the select lever is placed in the "P" position before starting. (AT model)
- Depress the clutch pedal when starting engine. (MT model)

6) Using the select lever or shift lever, turn the "P" position switch and "N" position switch on.

7) Depress the brake pedal to turn the brake switch ON. (AT model)

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

9) Place the select lever or shift lever in D position (AT model) or 1st gear (MT model) and drive the vehicle at 5 to 10 km/h (3 to 6 MPH).

NOTE:

- For AWD model, release the parking brake.
 - The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunctions. When engine control diagnosis is finished, perform the ABS memory clearance procedure of the self-diagnosis system. <Ref. to ABS(diag)-26, Clear Memory Mode.>
- 10) Using the general scan tool, check DTC and record the result(s).

NOTE:

- For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".
 - For details concerning DTC, refer to "List of Diagnostic Trouble Code (DTC)".
- <Ref. to EN(H4DOTC)(diag)-76, List of Diagnostic Trouble Code (DTC).>

12. Drive Cycle

A: PROCEDURE

For the troubleshooting, there are driving patterns described below. Driving in the specified pattern allows to diagnose malfunctioning items listed below. After the repair of the following trouble items, be sure to drive the vehicle with the specified drive patterns to check whether the function is resumed correctly.

1. PREPARATION FOR DRIVE CYCLE

1) Check battery voltage is more than 12 V and fuel remains half [20 — 40 ℓ (5.3 — 10.6 US gal, 4.4 — 8.8 Imp gal)].

2) After performing the diagnostics and clearing the memory, check for any remaining unresolved trouble data. <Ref. to EN(H4DOTC)(diag)-54, Clear Memory Mode.>

3) Disconnect the delivery (test) mode connector.

NOTE:

- Except for the water temperature specified items at starting, be sure to carry out the diagnosis after the engine is warmed up.
- Perform the diagnosis twice if the DTC marked with *. After completing the first diagnosis, stop the engine and perform second diagnosis in same condition.

Drive Cycle

ENGINE (DIAGNOSTICS)

2. DRIVE CYCLE A DRIVE THE VEHICLE WITH 80 KM/H (50 MPH) FOR 20 MINUTES, AND THEN IDLE THE ENGINE FOR A MINUTE.

DTC	Item	Condition
*P0125	Insufficient Coolant Temperature for Closed Loop Fuel Control	Engine coolant temperature at engine start is 20°C (68°F) or less.
*P0128	Coolant Thermostat (Engine Coolant Temperature Below Thermostat Regulating Temperature)	Engine coolant temperature at engine start is 55°C (131°F) or less.
*P0133	O2 Sensor Circuit Slow Response (Bank 1 Sensor 1)	—
*P0171	System Too Lean (Bank 1)	Diagnosis completes in drive cycle B or C as well.
*P0172	System Too Rich (Bank 2)	Diagnosis completes in drive cycle B or C as well.
P0301	Cylinder 1 Misfire Detected	Diagnosis completes in drive cycle B or C as well.
P0302	Cylinder 2 Misfire Detected	Diagnosis completes in drive cycle B or C as well.
P0303	Cylinder 3 Misfire Detected	Diagnosis completes in drive cycle B or C as well.
P0304	Cylinder 4 Misfire Detected	Diagnosis completes in drive cycle B or C as well.
*P0420	Catalyst System Efficiency Below Threshold (Bank 1)	—
P0441	Evaporative Emission System Incorrect Purge Flow	Coolant temperature at start is less than 25°C (77°F).
*P0442	Evaporative Emission Control System Leak Detected (Small Leak)	Coolant temperature at start is less than 25°C (77°F).
*P0451	Evaporative Emission Control System Pressure Sensor	—
*P0456	Evaporative Emission Control System Leak Detected (Very Small Leak)	Coolant temperature at start is less than 25°C (77°F).
*P0457	Evaporative Emission Control System Leak Detected (Fuel Cap Loose/Off)	Coolant temperature at start is less than 25°C (77°F).
P0459	Evaporative Emission System Purge Control Valve Circuit High	—
P0692	Fan 1 Control Circuit High	—
P1443	Vent Control Solenoid Valve Function Problem	—
*P2096	Post Catalyst Fuel Trim System Too Lean Bank 1	Diagnosis completes in drive cycle B or C as well.
*P2097	Post Catalyst Fuel Trim System Too Rich Bank 1	Diagnosis completes in drive cycle B or C as well.

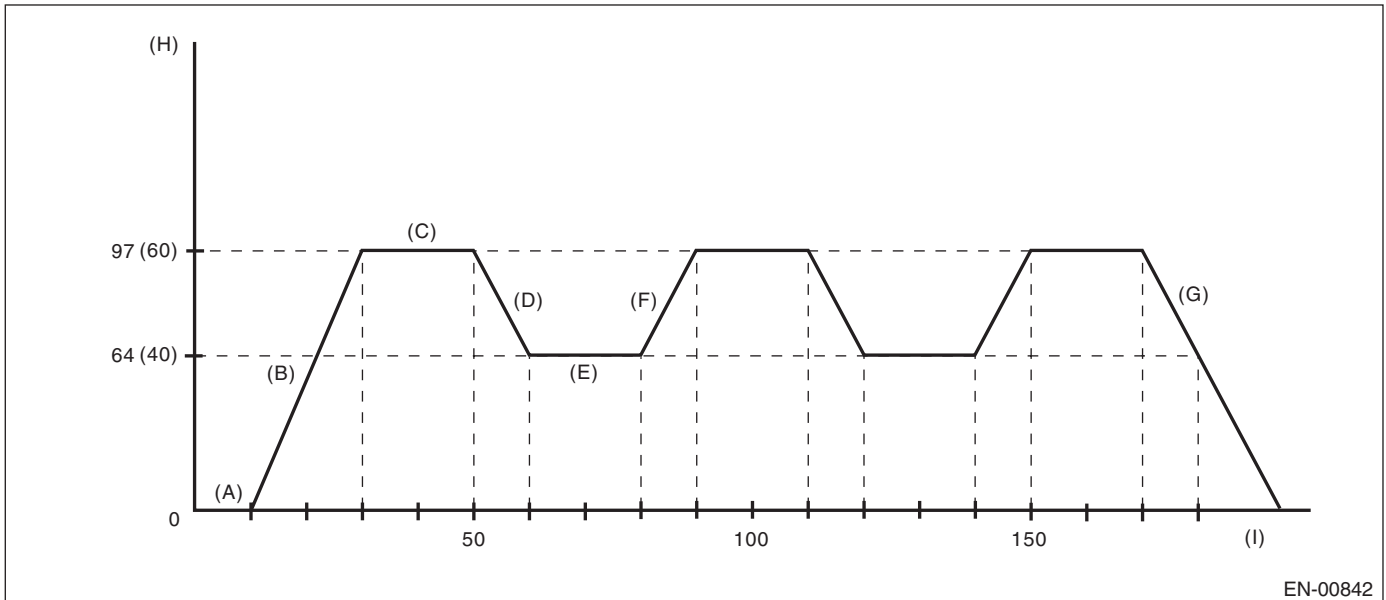
3. DRIVE CYCLE B (10 MINUTES IDLING)

NOTE:

Drive the vehicle in more than 10 km/h (6 MPH) before diagnosis.

DTC	Item	Condition
*P0126	Insufficient Engine Coolant Temperature for Stable Operation	—
*P0171	System Too Lean (Bank 1)	Diagnosis completes in drive cycle A or C as well.
*P0172	System Too Rich (Bank 2)	Diagnosis completes in drive cycle A or C as well.
P0301	Cylinder 1 Misfire Detected	Diagnosis completes in drive cycle A or C as well.
P0302	Cylinder 2 Misfire Detected	Diagnosis completes in drive cycle A or C as well.
P0303	Cylinder 3 Misfire Detected	Diagnosis completes in drive cycle A or C as well.
P0304	Cylinder 4 Misfire Detected	Diagnosis completes in drive cycle A or C as well.
*P0464	Fuel Level Sensor Circuit Intermittent	—
*P0483	Fan Rationality Check	—
*P0506	Idle Air Control System RPM Lower Than Expected	—
*P0507	Idle Air Control System RPM Higher Than Expected	—
*P2096	Post Catalyst Fuel Trim System Too Lean Bank 1	Diagnosis completes in drive cycle A or C as well.
*P2097	Post Catalyst Fuel Trim System Too Rich Bank 1	Diagnosis completes in drive cycle A or C as well.

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



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

DTC	Item	Condition
*P0030	HO2S Heater Control Circuit (Bank 1 Sensor 1)	—
P0068	MAP/MAF - Throttle Position Correlation	—
*P0101	Mass Or Volume Air Flow Circuit Range/Performance	—
P0134	O2 Sensor Circuit No Activity Detected (Bank 1 Sensor 1)	—
*P0139	O2 Sensor Circuit Slow Response (Bank 1 Sensor 2)	—
*P0171	System Too Lean (Bank 1)	Diagnosis completes in drive cycle A or B as well.
*P0172	System Too Rich (Bank 2)	Diagnosis completes in drive cycle A or B as well.
*P0244	Turbo/Super Charger Wastegate Solenoid "A" Range/Performance	—
P0246	Turbo/Super Charger Wastegate Solenoid "A" High	—
*P0301	Cylinder 1 Misfire Detected	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)

5. DRIVE CYCLE D

Drift Diagnosis

- 1) Make sure that the engine coolant temperature at engine starting is less than 30°C (86°F).
- 2) Make sure that fuel remains more than 10 ℓ (2.6 US gal, 2.2 Imp gal) and the battery voltage is more than 10.9 V.
- 3) Make sure that the engine coolant temperature rises for more than 10°C (18°F) from the level of engine starting and is also above 75°C (167°F).
- 4) Idle the engine for 120 seconds or more in the condition of step 3.

Stuck Diagnosis

- 1) Make sure that the battery voltage is more than 10.9 V.
- 2) Perform the Clear Memory Mode. <Ref. to EN(H4DOTC)(diag)-54, Clear Memory Mode.>
- 3) Drive the vehicle for the distance equal to the fuel of 50 ℓ (13.2 US gal, 11 Imp gal).

NOTE:

- It is acceptable to drive the vehicle intermittently.
- Do not disconnect the terminal of battery during diagnosis. (Data will be cleared when disconnecting the battery terminals.)

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

6. DRIVE CYCLE E

- 1) Make sure that the battery voltage is 10.9 V or more.
- 2) Perform the Clear Memory Mode. <Ref. to EN(H4DOTC)(diag)-54, Clear Memory Mode.>
- 3) Drive the vehicle for the distance equal to the fuel of 30 ℓ (7.9 US gal, 6.6 Imp gal).

NOTE:

- It is acceptable to drive the vehicle intermittently.
- Do not disconnect the terminal of battery during diagnosis. (Data will be cleared when disconnecting the battery terminals.)

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

7. DRIVE CYCLE F

- 1) Check that the engine coolant temperature at engine start is less than 30°C (86°F).
- 2) Start the engine, and warm it up until engine coolant temperature increases over 95°C (203°F).
- 3) Idle the engine for more than 10 minutes in the condition of step 2.

NOTE:

Do not disconnect the terminal of battery during diagnosis. (Data will be cleared by disconnecting the battery terminals.)

DTC	Item	Condition
P0111	Intake Air Temperature Sensor 1 Circuit Range/Performance	—

8. DRIVE CYCLE G

- 1) Remove the battery negative terminal, and reconnect after 10 seconds have passed.
- 2) Start the engine and warm-up engine until coolant temperature is 80°C (176°F).
- 3) Start the engine and warm-up engine until coolant temperature is 40°C (104°F).

NOTE:

Do not let engine coolant temperature drop below 5°C (41°F).

- 4) Start the engine and warm-up engine until coolant temperature is 80°C (176°F).
- 5) Start the engine and warm-up engine until coolant temperature is 40°C (104°F).

NOTE:

Do not let engine coolant temperature drop below 5°C (41°F).

- 6) Start and idle the engine.

DTC	Item	Condition
*P0410	Secondary Air Injection System	—
*P0411	Secondary Air Injection System Incorrect Flow Detected	—
P0414	Secondary Air Injection System Switching Valve "A" Circuit Shorted	—
P0417	Secondary Air Injection System Switching Valve "B" Circuit Shorted	—
P1418	Secondary Air Injection System Control "A" Circuit	—
*P2440	Secondary Air Injection System Switching Valve Stuck Open (Bank 1)	—
*P2441	Secondary Air Injection System Switching Valve Stuck Closed (Bank 1)	—
*P2442	Secondary Air Injection System Switching Valve Stuck Open (Bank 2)	—
*P2443	Secondary Air Injection System Switching Valve Stuck Closed (Bank 2)	—

9. DRIVE CYCLE H

- 1) Perform the Clear Memory Mode. <Ref. to EN(H4DOTC)(diag)-54, Clear Memory Mode.>
- 2) Read the engine coolant temperature, intake air temperature and fuel temperature with ignition switch ON. <Ref. to EN(H4DOTC)(diag)-36, READ CURRENT DATA FOR ENGINE (NORMAL MODE), OPERATION, Subaru Select Monitor.>
- 3) If the values from step 2) satisfy the following two conditions, start the engine.

Condition:

$|Engine\ coolant\ temperature - Intake\ air\ temperature| \leq 5^{\circ}C (41^{\circ}F)$

$|Engine\ coolant\ temperature - Fuel\ temperature| \leq 2^{\circ}C (36^{\circ}F)$

NOTE:

- If the value does not meet the conditions, turn the ignition switch to OFF and wait until it meets.
 - Start the engine in P range (AT model) or in N position (MT model).
- 4) Idle the engine for one minute in the condition of step 3.

DTC	Item	Condition
*P1602	Control Module Programming Error	—

13. Clear Memory Mode

A: OPERATION

1. SUBARU SELECT MONITOR (NORMAL MODE)

- 1) On the «Main Menu» display screen, select the {Each System Check}.
- 2) On the «System Selection Menu» display screen, select the {Engine Control System}.
- 3) Click the [OK] button after the information of engine type has been displayed.
- 4) On the «Engine Diagnosis» display screen, select the {Clear Memory}.
- 5) When the «Clear Memory?» is shown on the screen, click the [Yes] button.
- 6) When «Done» and «Turn ignition switch to OFF» is shown on the display screen, turn the ignition switch to OFF.

NOTE:

- Initial diagnosis of electronic throttle control is performed after memory clearance. Therefore, start the engine 10 seconds or more after have turning the ignition switch to ON.
- For detailed operation procedure, refer to the “PC application help for Subaru Select Monitor”.

2. SUBARU SELECT MONITOR (OBD MODE)

- 1) On the «Main Menu» display screen, select the {Each System Check}.
- 2) On the «System Selection Menu» display screen, select the {Engine Control System}.
- 3) Click the [OK] button after the information of engine type has been displayed.
- 4) On the «Engine Diagnosis» display screen, select the {OBD System}.
- 5) On the «OBD Menu» display screen, select the {Clear Diagnostic Code}.
- 6) When the «Clear Diagnostic Code?» is shown on the screen, click the [Yes] button.
- 7) When «Done» and «Turn ignition switch to OFF» is shown on the display screen, turn the ignition switch to OFF.

NOTE:

- Initial diagnosis of electronic throttle control is performed after memory clearance. Therefore, start the engine 10 seconds or more after have turning the ignition switch to ON.
- For detailed operation procedure, refer to the “PC application help for Subaru Select Monitor”.

3. GENERAL SCAN TOOL

For procedures clearing memory using the general scan tool, refer to the general scan tool operation manual.

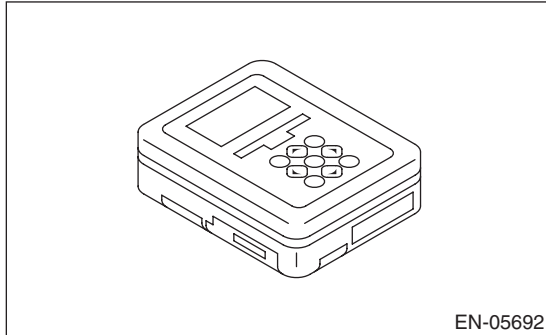
NOTE:

Initial diagnosis of the electronic throttle control is performed after the memory is erased. Therefore, start the engine after 10 seconds or more have passed since turning the ignition switch to ON.

14. Compulsory Valve Operation Check Mode

A: PROCEDURE

1) Prepare the Subaru Select Monitor kit. <Ref. to EN(H4DOTC)(diag)-7, PREPARATION TOOL, General Description.>



2) Prepare the personal computer which has been installed the Subaru Select Monitor.

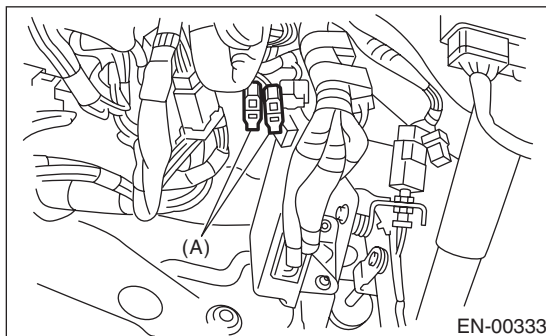
3) Connect the USB cable between SDI (Subaru Diagnosis Interface) and USB port on the personal computer (dedicated port for the Subaru Select Monitor).

NOTE:

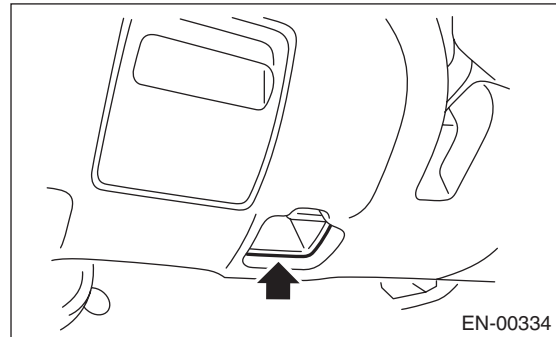
The dedicated port for the Subaru Select Monitor means the USB port which was used to install the Subaru Select Monitor.

4) Connect the diagnosis cable to the SDI.

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



6) Connect the SDI to data link connector located in the lower portion of the instrument panel (on the driver's side).



CAUTION:

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

7) Start up the personal computer.

8) Turn the ignition switch to ON (engine OFF), and run the "PC application for Subaru Select Monitor".

9) On the «Main Menu» display screen, select the {Each System Check}.

10) On the «System Selection Menu» display screen, select the {Engine Control System}.

11) Click the [OK] button after the information of engine type has been displayed.

12) On the «Engine Diagnosis» display screen, select the {System Operation Check Mode}.

13) On the «System operation check mode» display screen, select the {Actuator ON/OFF Operation}.

14) Select the desired compulsory actuator on the «Actuator ON/OFF Operation» display screen and click the [Next] button.

Compulsory Valve Operation Check Mode

ENGINE (DIAGNOSTICS)

15) Clicking the [End] button completes the compulsory valve operation check mode. The display will then return to the «Actuator ON/OFF Operation» screen.

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

Contents	Display
Compulsory fuel pump relay operation check	Fuel Pump
Compulsory radiator fan relay operation check	Radiator Fan Relay
Compulsory air conditioning relay operation check	A/C Compressor Relay
Compulsory purge control solenoid 1 valve operation check	CPC Solenoid
Compulsory purge control solenoid 2 valve operation check	CPC Solenoid 2
Compulsory pressure control solenoid valve operation check	PCV solenoid
Compulsory drain valve operation check	Vent Control Solenoid
Compulsory wastegate control solenoid valve operation check	Wastegate control Solenoid
Secondary air combination valve 1 compulsory operation check	Secondary Air Combination Valve 1
Secondary air combination valve 2 compulsory operation check	Secondary Air Combination Valve 2
Secondary air pump relay compulsory operation check	Secondary air pump relay

NOTE:

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

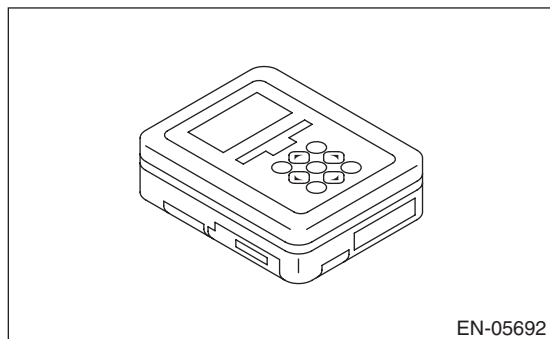
Display
EGR Solenoid
ASV Solenoid
FICD Solenoid
Pressure Switching Sol.1
Pressure Switching Sol.2
AAI Solenoid
EXH. Bypass Control Permit Flag

- For detailed operation procedure, refer to the “PC application help for Subaru Select Monitor”.

15. System Operation Check Mode

A: OPERATION

1) Prepare the Subaru Select Monitor kit. <Ref. to EN(H4DOTC)(diag)-7, PREPARATION TOOL, General Description.>



2) Prepare the personal computer which has been installed the Subaru Select Monitor.

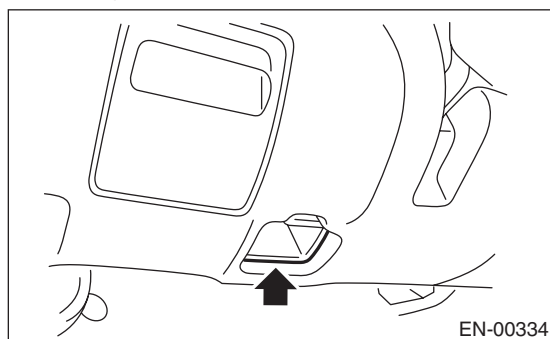
3) Connect the USB cable between SDI (Subaru Diagnosis Interface) and USB port on the personal computer (dedicated port for the Subaru Select Monitor).

NOTE:

The dedicated port for the Subaru Select Monitor means the USB port which was used to install the Subaru Select Monitor.

4) Connect the diagnosis cable to the SDI.

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



CAUTION:

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

6) Start up the personal computer.

7) Turn the ignition switch to ON (engine OFF), and run the "PC application for Subaru Select Monitor".

8) On the «Main Menu» display screen, select the {Each System Check}.

9) On the «System Selection Menu» display screen, select the {Engine Control System}.

10) Click the [OK] button after the information of engine type has been displayed.

11) On the «Engine Diagnosis» display screen, select the {System Operation Check Mode}.

12) The following items are displayed on the monitor.

Display
Actuator ON/OFF Operation
Security System
Fuel Pump Control
Idling Ignition Timing Fixed
Idle Speed Control
Injector Control

1. FUEL PUMP CONTROL (OFF OPERATION)

CAUTION:

After carrying out the Operation Check Mode, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>

1) On the «System operation check mode» display, select the {Fuel Pump Control}.

2) On the «Fuel Pump Control» display screen, select the {OFF Operation}.

3) On the «Start the Engine» display screen, start the engine and click the [OK] button.

4) Click the [Cancel] button to end the OFF drive. The screen will return to the «Fuel Pump Control» screen.

NOTE:

For detailed operation procedure, refer to the "PC application help for Subaru Select Monitor".

2. FUEL PUMP CONTROL (ON/OFF OPERATION)

CAUTION:

After carrying out the Operation Check Mode, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>

1) On the «System operation check mode» display, select the {Fuel Pump Control}.

2) On the «Fuel Pump Control» display screen, select the {ON/OFF Operation}.

3) On the «Turn Ignition Switch ON with Engine Stalled» display screen, click the [YES] button.

4) Click the [Cancel] button to end the ON/OFF drive. The screen will return to the «Fuel Pump Control» screen.

NOTE:

For detailed operation procedure, refer to the "PC application help for Subaru Select Monitor".

System Operation Check Mode

ENGINE (DIAGNOSTICS)

3. IDLING IGNITION TIMING FIXED

CAUTION:

After carrying out the Operation Check Mode, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

- 1) On the «System operation check mode» display screen, select the {Idling Ignition Timing Fixed}.
- 2) On the «Start the Engine» display screen, start the engine and click the [OK] button.
- 3) Click the [Cancel] button to end the idle ignition timing fixed. The screen will return to the «System Operation Check Mode» screen.

NOTE:

For detailed operation procedure, refer to the “PC application help for Subaru Select Monitor”.

4. IDLE SPEED CONTROL

CAUTION:

After carrying out the Operation Check Mode, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

- 1) On the «System operation check mode» display screen, select the {Idle Speed Control}.
- 2) On the «Start the Engine» display screen, start the engine and click the [OK] button.
- 3) In the «Idle Engine Speed Control» screen, click the [△] button or the [▽] button to change the setting values, then click the [OK] button.
It is possible to set by 50 rpm, ranging from 500 rpm to 2,000 rpm. However, the actual idle speed that can be controlled is varied by vehicle type.
- 4) Click the [Cancel] button to end the idle speed control. The screen will return to the «System Operation Check Mode» screen.

NOTE:

For detailed operation procedure, refer to the “PC application help for Subaru Select Monitor”.

5. INJECTOR CONTROL (INJECTION STOP MODE)

CAUTION:

After carrying out the Operation Check Mode, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

- 1) On the «System operation check mode» display, select the {Injector Control}.
- 2) On the «Injector Control» display screen, select the {Injection Stop Mode}.
- 3) Select the desired injector number on the «Injection Stop Mode» screen, and click the [OK] button.
- 4) On the «Start the Engine» display screen, start the engine and click the [OK] button.
- 5) Click the [Cancel] button to return the «Injection Stop Mode» display screen.
- 6) On the «Injection Stop Mode» display screen, click the [Return] button to end the «Injection Stop Mode». The screen will return to the «Injector Control» screen.

NOTE:

For detailed operation procedure, refer to the “PC application help for Subaru Select Monitor”.

6. INJECTOR CONTROL (INJECTION QUANTITY CONTROL)

CAUTION:

After carrying out the Operation Check Mode, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

- 1) On the «System operation check mode» display, select the {Injector Control}.
- 2) On the «Injector Control» display screen, select the {Injection Quantity Control}.
- 3) On the «Start the Engine» display screen, start the engine and click the [OK] button.
- 4) In the «Injection Quantity Control» screen, click the [△] button or the [▽] button to change the setting values, then click the [OK] button.
Setting is possible in a range between 0 — 20%, in increments of 1%.
- 5) Click the [Cancel] button to end the injection quantity control. The screen will return to the «Injector Control» screen.

NOTE:

For detailed operation procedure, refer to the “PC application help for Subaru Select Monitor”.

16.Malfunction Indicator Light

A: PROCEDURE

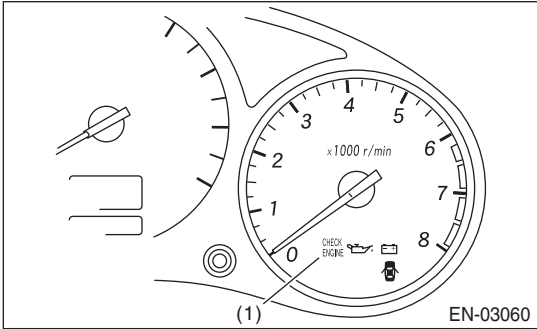
1. Activation of malfunction indicator light. <Ref. to EN(H4DOTC)(diag)-59, ACTIVATION OF MALFUNCTION INDICATOR LIGHT, Malfunction Indicator Light.>
↓
2. Malfunction indicator light does not come on. <Ref. to EN(H4DOTC)(diag)-60, MALFUNCTION INDICATOR LIGHT DOES NOT COME ON, Malfunction Indicator Light.>
↓
3. Malfunction indicator light does not go off. <Ref. to EN(H4DOTC)(diag)-62, MALFUNCTION INDICATOR LIGHT DOES NOT GO OFF, Malfunction Indicator Light.>

B: ACTIVATION OF MALFUNCTION INDICATOR LIGHT

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

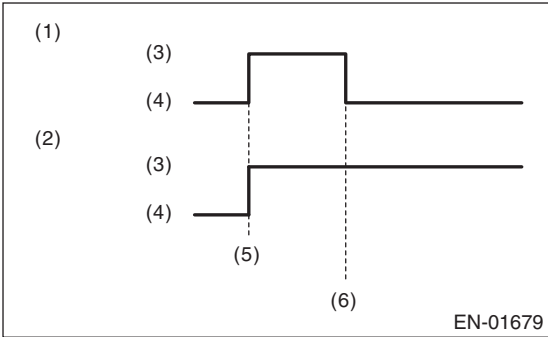
NOTE:

If the malfunction indicator light does not illuminate, perform diagnostics of the malfunction indicator light circuit or the combination meter circuit. <Ref. to EN(H4DOTC)(diag)-60, MALFUNCTION INDICATOR LIGHT DOES NOT COME ON, Malfunction Indicator Light.>



(1) Malfunction indicator light

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



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

Malfunction Indicator Light

ENGINE (DIAGNOSTICS)

C: MALFUNCTION INDICATOR LIGHT DOES NOT COME ON

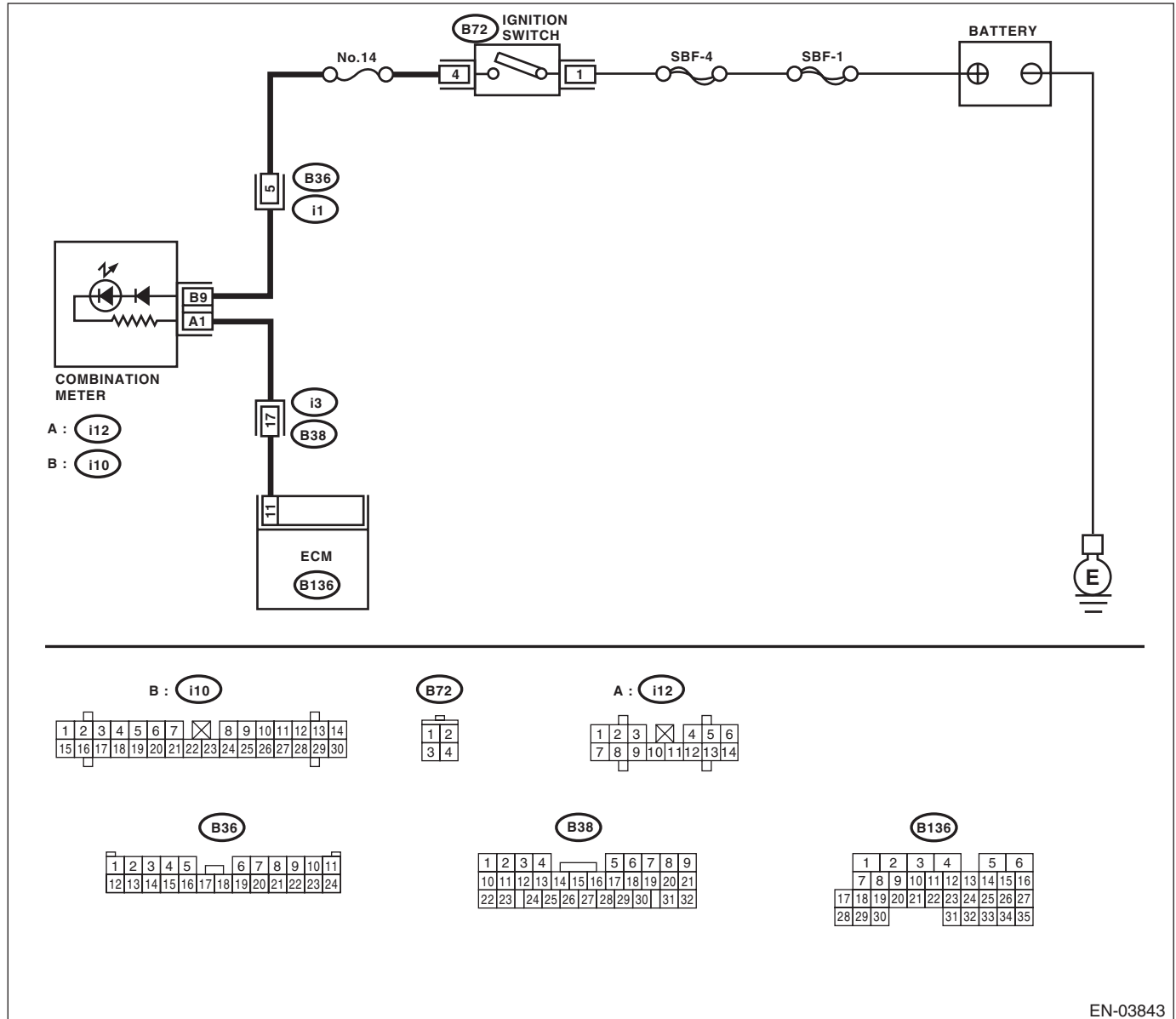
DIAGNOSIS:

The malfunction indicator light circuit is open or shorted.

TROUBLE SYMPTOM:

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

WIRING DIAGRAM:



Malfunction Indicator Light

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OUTPUT SIGNAL OF ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and chassis ground. Connector & terminal (B136) No. 11 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Go to step 4.	Go to step 2.
2 CHECK POOR CONTACT.	Does the malfunction indicator light come on when shaking or pulling the ECM connector and harness?	Repair poor contact in ECM connector.	Go to step 3.
3 CHECK ECM CONNECTOR.	Is the ECM connector correctly connected?	Replace the ECM. <Ref. to FU(H4DOTC)-46, 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 (B136) No. 11 — (i12) No. 1:	Is the resistance less than 1 Ω?	Go to step 5.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and combination meter connector • Poor contact in coupling connector
5 CHECK POOR CONTACT. Check poor contact of combination meter connector.	Is there poor contact in combination meter connector?	Repair the poor contact of combination meter connector.	Go to step 6.
6 CHECK HARNESS BETWEEN COMBINATION METER AND IGNITION SWITCH CONNECTOR. 1) Turn the ignition switch to ON. 2) Measure the voltage between combination meter connector and chassis ground. Connector & terminal (i10) No. 9 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Replace the combination meter circuit board. <Ref. to IDI-10, Combination Meter.>	Check the following item and repair if necessary. NOTE: • Blown out of fuse (No. 14) • Open or short circuit of harness between fuse (No. 14) and battery terminal • Poor contact in ignition switch connector

Malfunction Indicator Light

ENGINE (DIAGNOSTICS)

D: MALFUNCTION INDICATOR LIGHT DOES NOT GO OFF

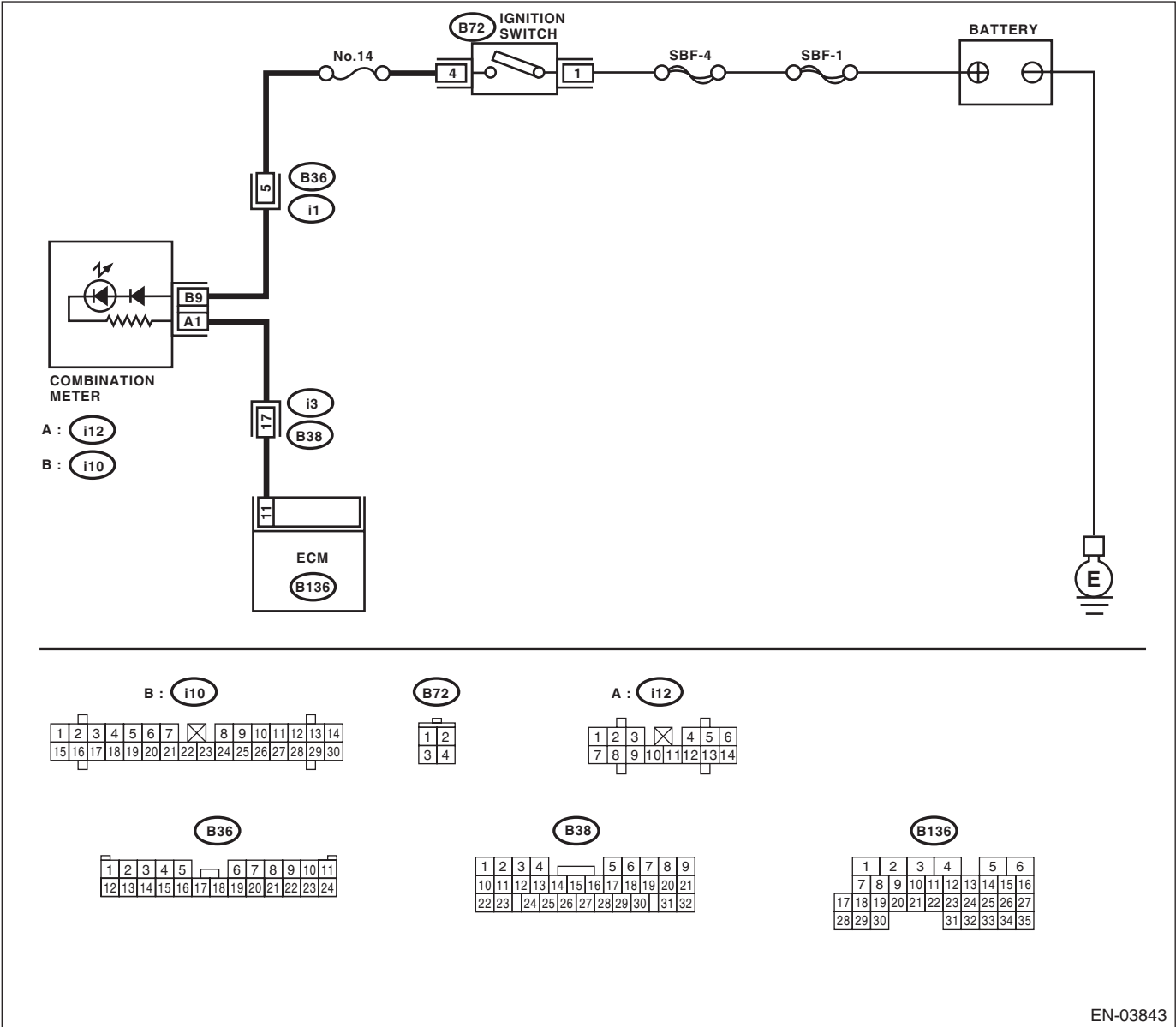
DIAGNOSIS:

The malfunction indicator light circuit is shorted.

TROUBLE SYMPTOM:

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

WIRING DIAGRAM:



EN-03843

Step	Check	Yes	No
1	CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Turn the ignition switch to ON.	Repair the short circuit of harness between combination meter and ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-46, Engine Control Module (ECM).>

17. Diagnostics for Engine Starting Failure

A: PROCEDURE

1. Check for fuel amount.
↓
2. Inspection of starter motor circuit. <Ref. to EN(H4DOTC)(diag)-64, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
3. Inspection of ECM power supply and ground line. <Ref. to EN(H4DOTC)(diag)-68, CHECK POWER SUPPLY AND GROUND LINE OF ENGINE CONTROL MODULE (ECM), Diagnostics for Engine Starting Failure.>
↓
4. Inspection of ignition control system. <Ref. to EN(H4DOTC)(diag)-70, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>
↓
5. Inspection of fuel pump circuit. <Ref. to EN(H4DOTC)(diag)-73, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
6. Inspection of fuel injector circuit. <Ref. to EN(H4DOTC)(diag)-74, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

Diagnostics for Engine Starting Failure

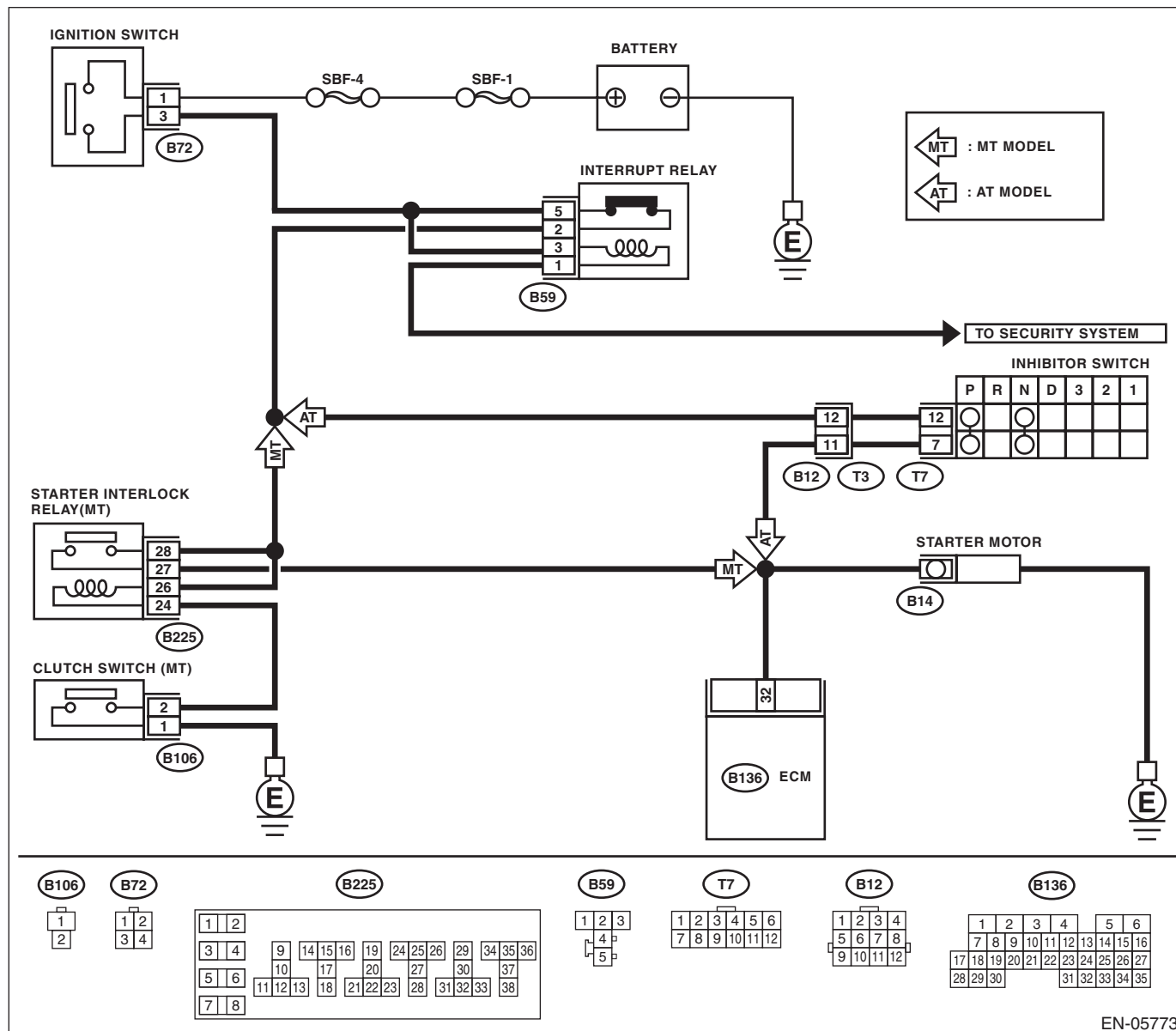
ENGINE (DIAGNOSTICS)

B: STARTER MOTOR CIRCUIT

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-05773

Diagnostics for Engine Starting Failure

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK BATTERY. Check the battery voltage.	Is the voltage 12 V or more?	Go to step 2.	Charge or replace the battery.
2 CHECK OPERATION OF STARTER MOTOR.	Does the starter motor operate?	Go to step 3.	Go to step 4.
3 CHECK DTC.	Is DTC displayed? <Ref. to EN(H4DOTC)(diag)-43, OPERATION, Read Diagnostic Trouble Code (DTC).>	Check the appropriate DTC using the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H4DOTC)(diag)-76, List of Diagnostic Trouble Code (DTC).>	Repair poor contact in ECM connector.
4 CHECK INPUT SIGNAL FOR STARTER MOTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from starter motor. 3) Turn the ignition switch to ST. 4) Measure the power supply voltage between starter motor connector terminal and engine ground. Connector & terminal (B14) No. 1 (+) — Engine ground (-): NOTE: • For AT model, place the select lever in "P" or "N" range. • For MT model, depress the clutch pedal.	Is the voltage 10 V or more?	Check the starter motor. <Ref. to SC(H4SO)-6, Starter.>	Go to step 5.
5 CHECK HARNESS BETWEEN BATTERY AND IGNITION SWITCH CONNECTOR. 1) Disconnect the connector from ignition switch. 2) Measure the power supply voltage between ignition switch connector and chassis ground. Connector & terminal (B72) No. 1 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Go to step 6.	Repair the open circuit of harness between ignition switch and battery, and check fuse SBF No. 4 and SBF No. 1.
6 CHECK IGNITION SWITCH. 1) Disconnect the connector from ignition switch. 2) Measure the resistance between ignition switch terminals after turning the ignition switch to ST. Terminals No. 1 — No. 3:	Is the resistance less than 1 Ω ?	Go to step 7.	Replace the ignition switch.
7 CHECK TRANSMISSION TYPE.	Is the transmission type AT?	Go to step 8.	Go to step 13.
8 CHECK HARNESS BETWEEN IGNITION SWITCH AND INHIBITOR SWITCH CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector of inhibitor switch. 3) Measure the resistance between the ignition switch and inhibitor switch. Connector & terminal (B72) No. 3 — (T7) No. 12:	Is the resistance less than 1 Ω ?	Go to step 9.	Repair open circuit in harness between ignition switch and inhibitor switch.

Diagnostics for Engine Starting Failure

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
9 CHECK HARNESS BETWEEN IGNITION SWITCH AND INHIBITOR SWITCH CONNECTOR. Measure the resistance between the ignition switch and chassis ground. <i>Connector & terminal</i> <i>(B72) No. 3 — Chassis ground:</i>	Is the resistance 1 MΩ or more?	Go to step 10.	Repair short circuit to ground in harness between ignition switch and inhibitor switch.
10 CHECK HARNESS BETWEEN STARTER MOTOR AND INHIBITOR SWITCH CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector of starter motor. 3) Measure the resistance between the starter motor and inhibitor switch. <i>Connector & terminal</i> <i>(B14) No. 1 — (T7) No. 7:</i>	Is the resistance less than 1 Ω?	Go to step 11.	Repair open circuit in harness between starter motor and inhibitor switch.
11 CHECK HARNESS BETWEEN STARTER MOTOR AND INHIBITOR SWITCH CONNECTOR. Measure the resistance between starter motor and chassis ground. <i>Connector & terminal</i> <i>(B14) No. 1 — Chassis ground:</i>	Is the resistance 1 MΩ or more?	Go to step 12.	Repair short circuit to ground in harness between starter motor and inhibitor switch.
12 CHECK POOR CONTACT. Check the poor contact of inhibitor switch connector.	Is there poor contact in inhibitor switch connector?	Repair the poor contact.	Replace the inhibitor switch.
13 CHECK HARNESS BETWEEN IGNITION SWITCH AND STARTER INTERLOCK RELAY CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector of starter interlock relay. 3) Measure the resistance between the ignition switch and starter interlock relay. <i>Connector & terminal</i> <i>(B72) No. 3 — (B225) No. 26:</i> <i>(B72) No. 3 — (B225) No. 28:</i>	Is the resistance less than 1 Ω?	Go to step 14.	Repair the open circuit in harness between ignition switch and starter interlock relay.
14 CHECK HARNESS BETWEEN IGNITION SWITCH AND STARTER INTERLOCK RELAY CONNECTOR. Measure the resistance between the ignition switch and chassis ground. <i>Connector & terminal</i> <i>(B72) No. 3 — Chassis ground:</i>	Is the resistance 1 MΩ or more?	Go to step 15.	Repair short circuit to ground between ignition switch and starter interlock relay.
15 CHECK HARNESS BETWEEN STARTER MOTOR AND STARTER INTERLOCK RELAY CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector of starter motor. 3) Measure the resistance between the starter motor and starter interlock relay. <i>Connector & terminal</i> <i>(B14) No. 1 — (B225) No. 27:</i>	Is the resistance less than 1 Ω?	Go to step 16.	Repair the open circuit in the harness between starter motor and starter interlock relay.
16 CHECK HARNESS BETWEEN STARTER MOTOR AND STARTER INTERLOCK RELAY CONNECTOR. Measure the resistance between starter motor and chassis ground. <i>Connector & terminal</i> <i>(B14) No. 1 — Chassis ground:</i>	Is the resistance 1 MΩ or more?	Go to step 17.	Repair the short circuit to ground in the harness between starter motor and starter interlock relay.

Diagnostics for Engine Starting Failure

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
17 CHECK HARNESS BETWEEN CLUTCH SWITCH AND STARTER INTERLOCK RELAY CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector of clutch switch. 3) Measure the resistance between the clutch switch and starter interlock relay. Connector & terminal (B225) No. 24 — (B106) No. 2:	Is the resistance less than 1 Ω ?	Go to step 18.	Repair the open circuit in harness between clutch switch and starter interlock relay.
18 CHECK GROUND CIRCUIT OF CLUTCH SWITCH. Measure the resistance between the clutch switch and chassis ground. Connector & terminal (B106) No. 1 — Chassis ground:	Is the resistance less than 5 Ω ?	Go to step 19.	Repair the open circuit in harness between clutch switch and chassis ground.
19 CHECK CLUTCH SWITCH. Measure the resistance between clutch switch terminals while depressing the clutch. Connector & terminal (B106) No. 1 — No. 2	Is the resistance less than 10 Ω ?	Replace the starter interlock relay.	Replace the clutch switch.

Diagnostics for Engine Starting Failure

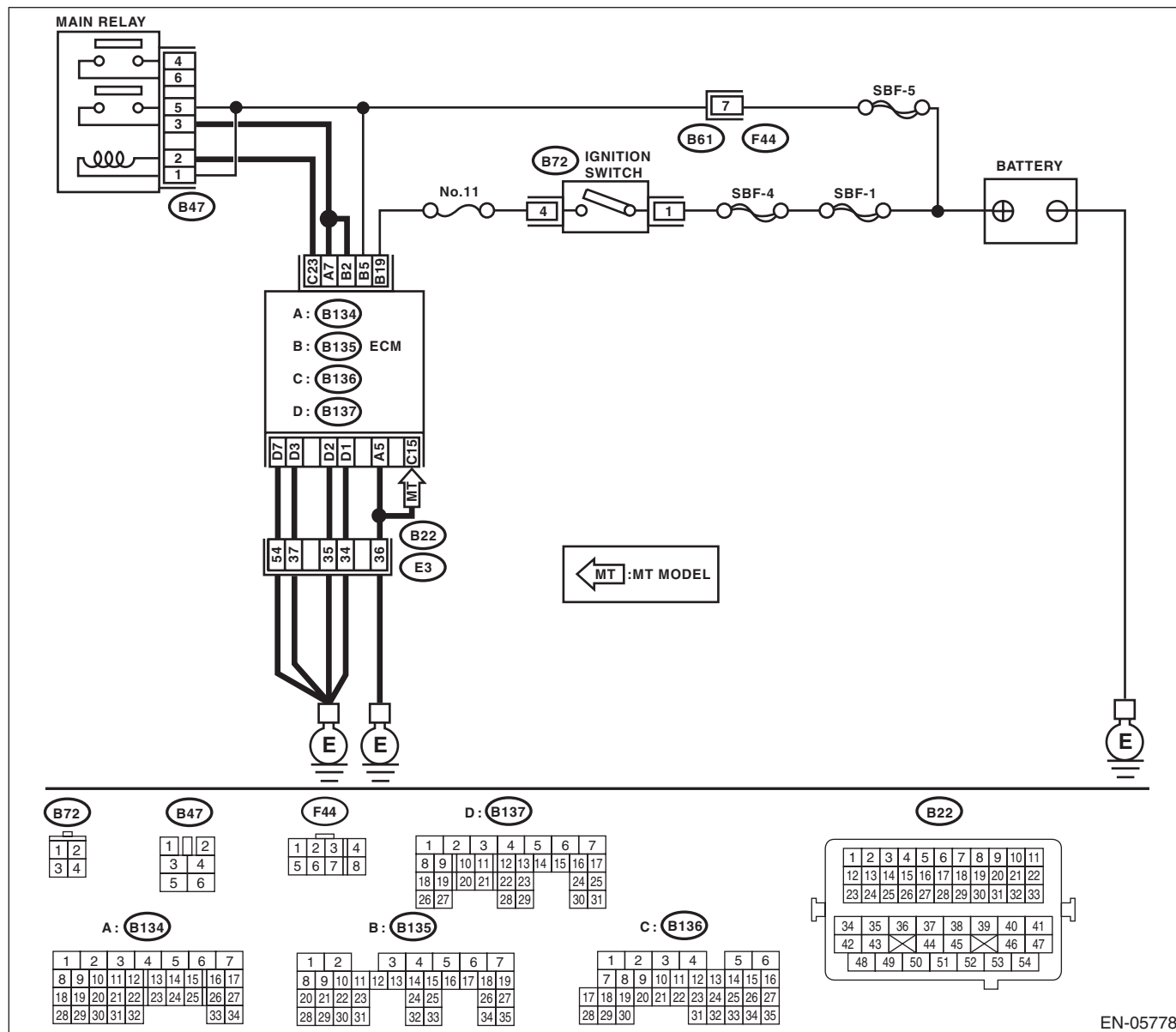
ENGINE (DIAGNOSTICS)

C: CHECK POWER SUPPLY AND GROUND LINE OF ENGINE CONTROL MODULE (ECM)

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-05778

Diagnostics for Engine Starting Failure

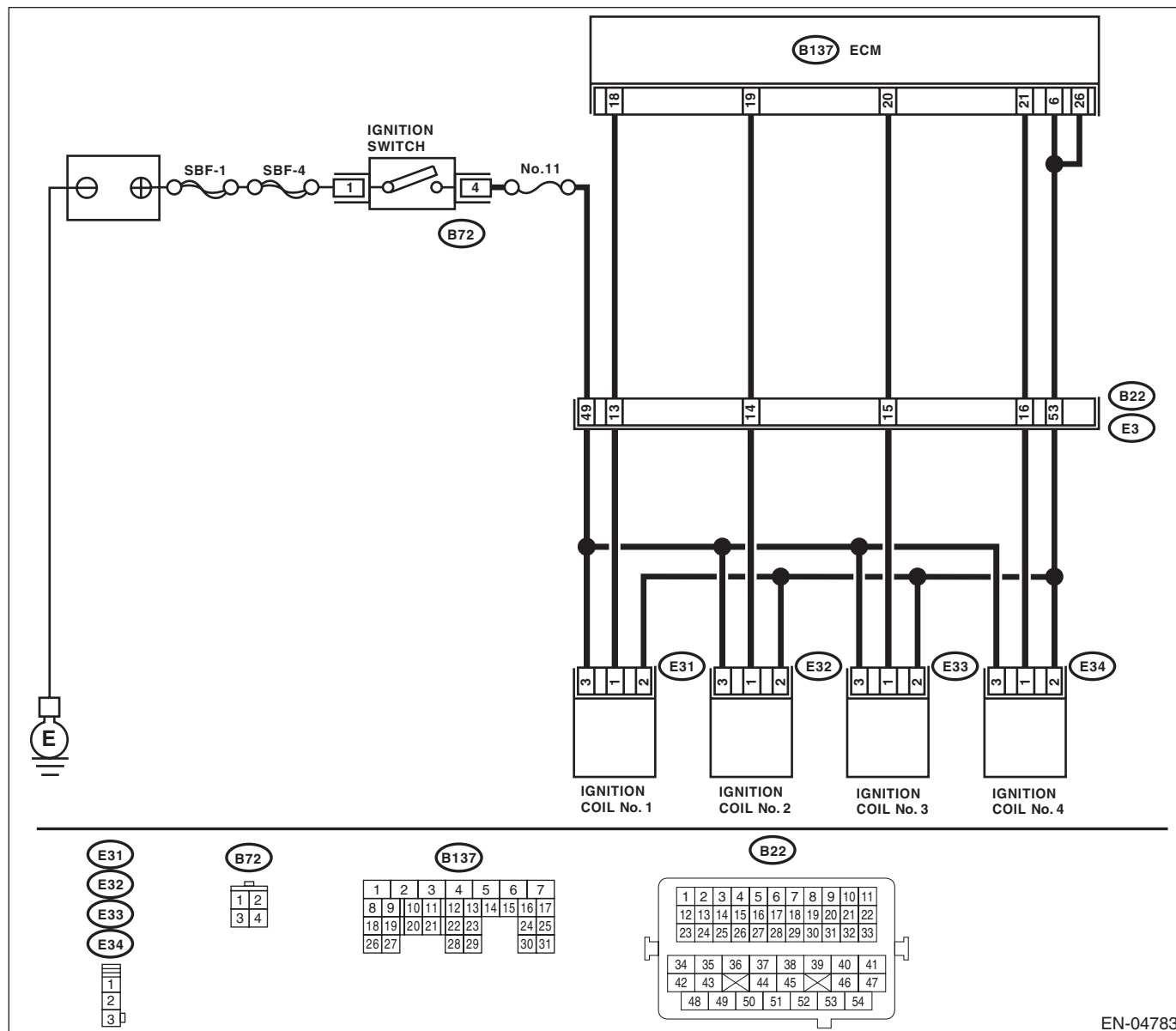
ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK MAIN RELAY. 1) Turn the ignition switch to OFF. 2) Remove the main relay. 3) Connect the battery to main relay terminals No. 1 and No. 2. 4) Measure the resistance between main relay terminals. Terminals No. 3 — No. 5: No. 4 — No. 6:	Is the resistance less than 10 Ω ?	Go to step 2.	Replace the main relay.
2 CHECK GROUND CIRCUIT FOR ECM. 1) Disconnect the connectors from ECM. 2) Measure the resistance of harness between ECM and chassis ground. Connector & terminal (B134) No. 5 — Chassis ground: (B136) No. 15 — Chassis ground: (B137) No. 1 — Chassis ground: (B137) No. 2 — Chassis ground: (B137) No. 3 — Chassis ground: (B137) No. 7 — Chassis ground:	Is the resistance less than 5 Ω ?	Go to step 3.	Repair the open circuit of harness between ECM connector and engine grounding terminal.
3 CHECK INPUT VOLTAGE OF ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 5 (+) — Chassis ground (-): (B135) No. 19 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Go to step 4.	Repair the open or ground short circuit of power supply circuit.
4 CHECK HARNESS BETWEEN ECM AND MAIN RELAY CONNECTOR. 1) Turn the ignition switch to OFF. 2) Measure the resistance between ECM and chassis ground. Connector & terminal (B136) No. 23 — Chassis ground:	Is the resistance 1 M Ω or more?	Go to step 5.	Repair the open circuit to ground in harness between ECM connector and main relay connector.
5 CHECK INPUT VOLTAGE OF MAIN RELAY. Measure the voltage between main relay connector and chassis ground. Connector & terminal (B47) No. 1 (+) — Chassis ground (-): (B47) No. 5 (+) — Chassis ground (-): (B47) No. 6 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Go to step 6.	Repair the open or ground short circuit of harness of power supply circuit.
6 CHECK MAIN RELAY GROUND CIRCUIT. 1) Turn the ignition switch to ON. 2) Measure the voltage of the main relay connector. Connector & terminal (B47) No. 2 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Go to step 7.	Repair the open circuit between main relay and chassis ground.
7 CHECK INPUT VOLTAGE OF ECM. 1) Connect the main relay connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM connector and chassis ground. Connector & terminal (B134) No. 7 (+) — Chassis ground (-): (B135) No. 2 (+) — Chassis ground (-): (B136) No. 23 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Check ignition control system. <Ref. to EN(H4DOTC)(diag)-70, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>	Repair the open or ground short circuit of harness between ECM connector and main relay connector.

ENGINE (DIAGNOSTICS)

CAUTION:

WIRING DIAGRAM:



EN-04783

Diagnostics for Engine Starting Failure

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK SPARK PLUG CONDITION. 1) Remove the spark plug. <Ref. to IG(H4DOTC)-4, REMOVAL, Spark Plug.> 2) Check the spark plug condition. <Ref. to IG(H4DOTC)-5, INSPECTION, Spark Plug.>	Is the spark plug condition status OK?	Go to step 2.	Replace the spark plug.
2 CHECK IGNITION SYSTEM FOR SPARKS. 1) Connect the spark plug to ignition coil. 2) Release the fuel pressure. <Ref. to FU(H4DOTC)-51, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.> 3) Contact the spark plug's thread portion to the engine. 4) While opening the throttle valve fully, crank the engine to check that spark occurs at each cylinder.	Does spark occur at each cylinder?	Check fuel pump system. <Ref. to EN(H4DOTC)(diag)-73, 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 (E31) No. 3 (+) — Engine ground (—): (E32) No. 3 (+) — Engine ground (—): (E33) No. 3 (+) — Engine ground (—): (E34) No. 3 (+) — Engine ground (—):	Is the voltage 10 V or more?	Go to step 4.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between the ignition coil and ignitor assembly and ignition switch connector • Poor contact in coupling connector
4 CHECK HARNESS OF IGNITION COIL AND IGNITOR ASSEMBLY GROUND CIRCUIT. 1) Turn the ignition switch to OFF. 2) Measure the resistance between the ignition coil and ignitor assembly connector and the ECM. Connector & terminal (E31) No. 2 — (B137) No. 6, 26: (E32) No. 2 — (B137) No. 6, 26: (E33) No. 2 — (B137) No. 6, 26: (E34) No. 2 — (B137) No. 6, 26:	Is the resistance less than 5 Ω?	Go to step 5.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and ignition coil and ignitor assembly connector
5 CHECK HARNESS BETWEEN ECM AND IGNITION COIL AND IGNITOR ASSEMBLY CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connector from ignition coil and ignitor assembly. 4) Measure the resistance of harness between ECM and ignition coil and ignitor assembly connector. Connector & terminal (B137) No. 21 — (E34) No. 1: (B137) No. 20 — (E33) No. 1: (B137) No. 19 — (E32) No. 1: (B137) No. 18 — (E31) No. 1:	Is the resistance less than 1 Ω?	Go to step 6.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and ignition coil and ignitor assembly connector • Poor contact in coupling connector

Diagnostics for Engine Starting Failure

ENGINE (DIAGNOSTICS)

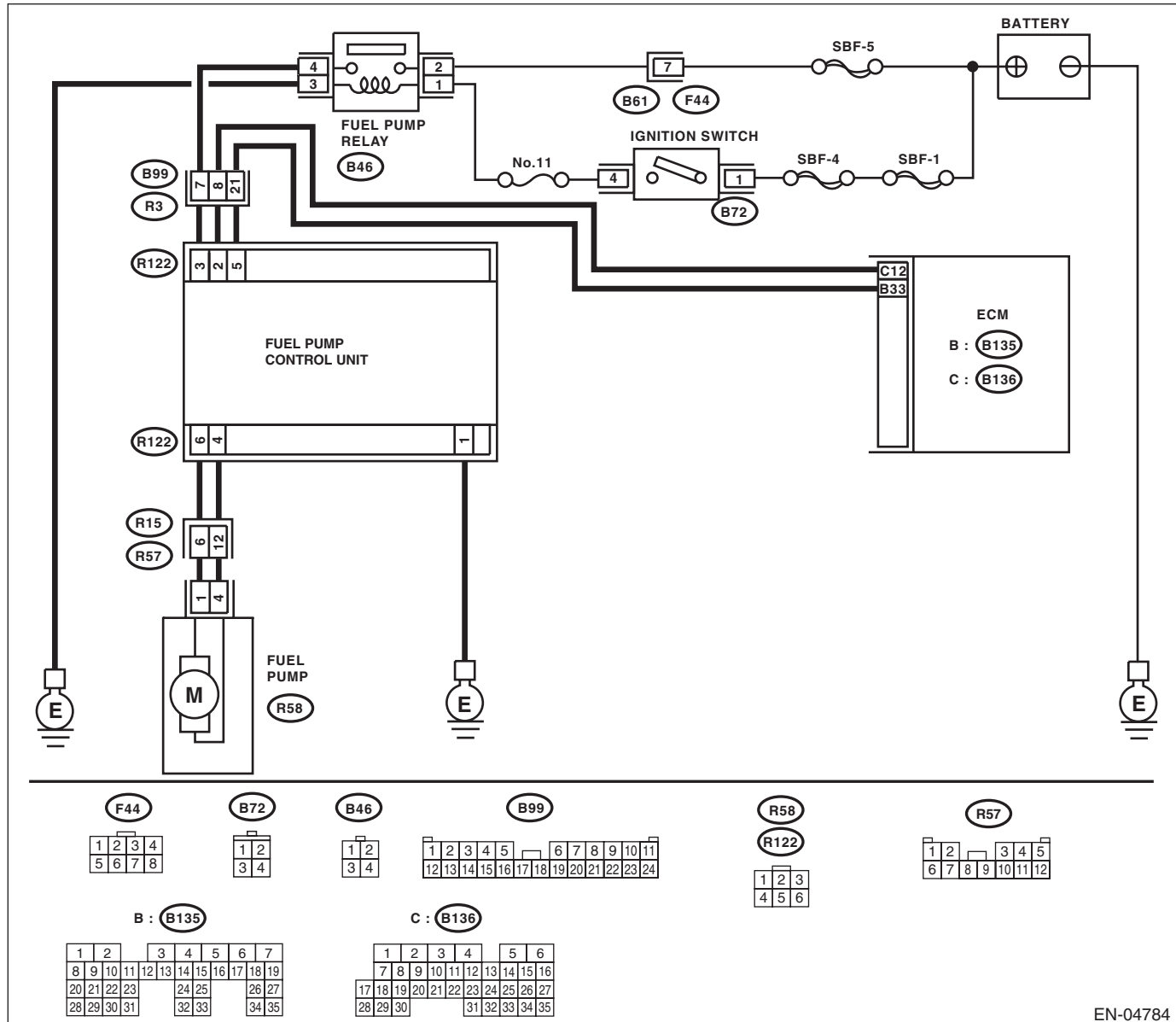
Step	Check	Yes	No
6 CHECK HARNESS BETWEEN ECM AND IGNITION COIL AND IGNITOR ASSEMBLY CONNECTOR. Measure the resistance of harness between ECM and engine ground. Connector & terminal <i>(B137) No. 21 — Engine ground:</i> <i>(B137) No. 20 — Engine ground:</i> <i>(B137) No. 19 — Engine ground:</i> <i>(B137) No. 18 — Engine ground:</i>	Is the resistance 1 MΩ or more?	Go to step 7.	Repair the ground short circuit of harness between ECM and ignition coil and ignitor assembly connector.
7 CHECK POOR CONTACT. Check poor contact of ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Check fuel pump circuit. <Ref. to EN(H4DOTC)(diag)-73, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>

E: FUEL PUMP CIRCUIT

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04784

Step	Check	Yes	No
1	CHECK OPERATING SOUND OF FUEL PUMP. Make sure that the fuel pump operates for 2 seconds when turning the ignition switch to ON. NOTE: Fuel pump operation check can be executed using Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-55, Compulsory Valve Operation Check Mode.>	Does the fuel pump emit operating sound? Check the fuel injector circuit. <Ref. to EN(H4DOTC)(diag)-74, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>	Display the DTC. <Ref. to EN(H4DOTC)(diag)-43, OPERATION, Read Diagnostic Trouble Code (DTC).>

Diagnostics for Engine Starting Failure

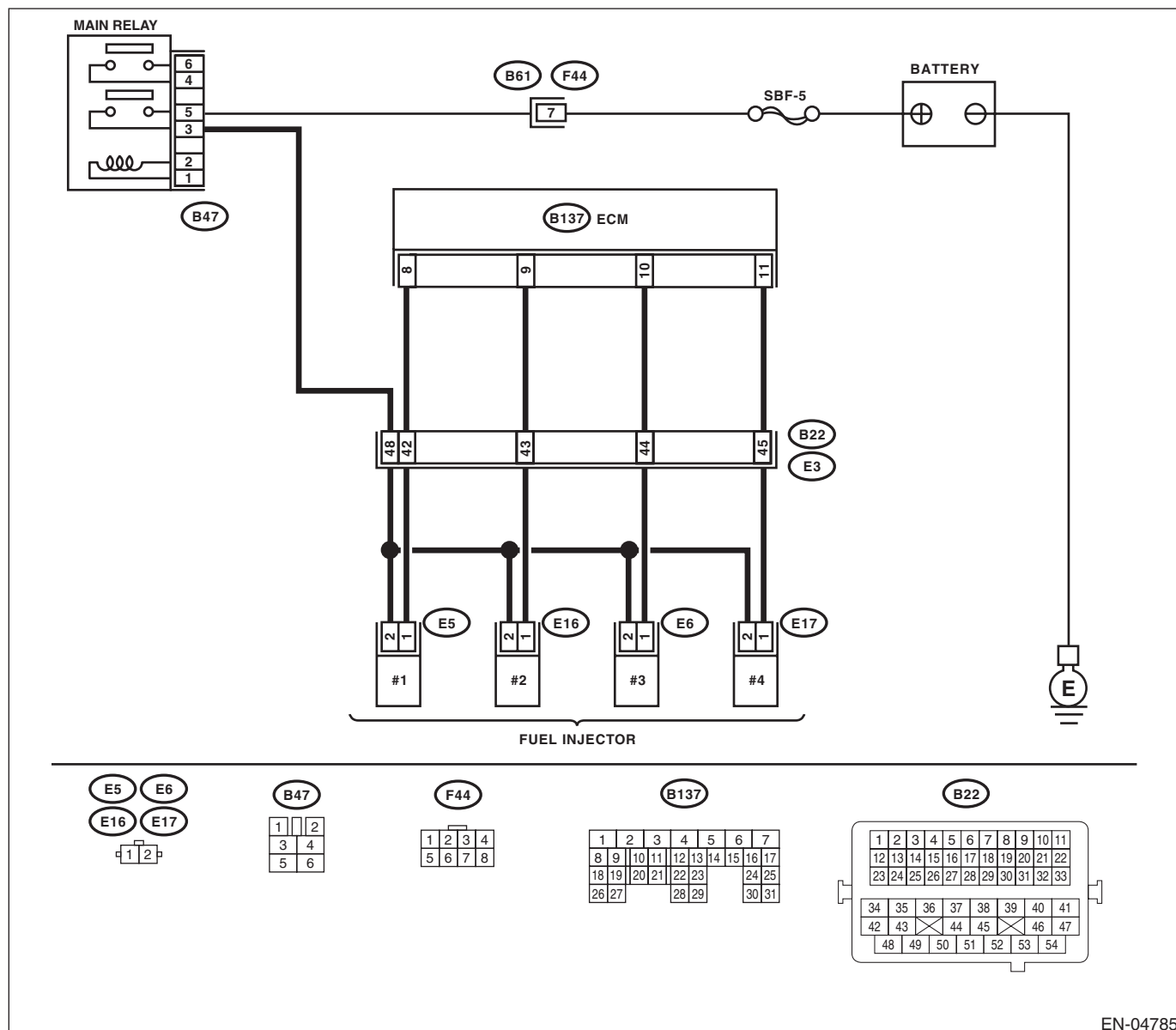
ENGINE (DIAGNOSTICS)

F: FUEL INJECTOR CIRCUIT

CAUTION:

- Check or repair only faulty parts.
- After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04785

Diagnostics for Engine Starting Failure

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OPERATION OF EACH FUEL INJECTOR. While cranking the engine, check each fuel injector emits operating sound. Use a sound scope or attach a screwdriver to the injector for this check.	Does the fuel injector emit operating sound?	Check the fuel pressure. <Ref. to ME(H4DOTC)-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 fuel injector terminal and engine ground. Connector & terminal #1 (E5) No. 2 (+) — Engine ground (-): #2 (E16) No. 2 (+) — Engine ground (-): #3 (E6) No. 2 (+) — Engine ground (-): #4 (E17) No. 2 (+) — Engine ground (-):	Is the voltage 10 V or more?	Go to step 3.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between main relay and fuel injector connector • Poor contact in main relay connector • Poor contact in coupling connector • Poor contact in fuel injector connector
3 CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR. 1) Disconnect the connectors from ECM. 2) Measure the resistance of harness between ECM and fuel injector connector. Connector & terminal (B137) No. 8 — (E5) No. 1: (B137) No. 9 — (E16) No. 1: (B137) No. 10 — (E6) No. 1: (B137) No. 11 — (E17) No. 1:	Is the resistance less than 1 Ω ?	Go to step 4.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and fuel injector connector • Poor contact in coupling connector
4 CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR. Measure the resistance of harness between ECM and fuel injector connector. Connector & terminal (B137) No. 8 — Chassis ground: (B137) No. 9 — Chassis ground: (B137) No. 10 — Chassis ground: (B137) No. 11 — Chassis ground:	Is the resistance less than 1 Ω ?	Repair the ground short circuit of 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 No. 1 — No. 2:	Is the resistance between 5 — 20 Ω ?	Go to step 6.	Replace the faulty fuel injector.
6 CHECK POOR CONTACT. Check poor contact of ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Inspection using "General Diagnostic Table" <Ref. to EN(H4DOTC)(diag)-380, INSPECTION, General Diagnostic Table.>

List of Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

18. List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Item	Note
P0011	Intake Camshaft Position - Timing Over-Advanced Or System Performance (Bank 1)	<Ref. to EN(H4DOTC)(diag)-84, DTC P0011 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0016	Crankshaft Position - Camshaft Position Correlation (Bank 1)	<Ref. to EN(H4DOTC)(diag)-85, DTC P0016 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0018	Crankshaft Position - Camshaft Position Correlation (Bank 2)	<Ref. to EN(H4DOTC)(diag)-86, DTC P0018 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0021	Intake Camshaft Position - Timing Over-Advanced or System Performance (Bank 2)	<Ref. to EN(H4DOTC)(diag)-87, DTC P0021 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0030	HO2S Heater Control Circuit (Bank 1 Sensor 1)	<Ref. to EN(H4DOTC)(diag)-88, DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0031	HO2S Heater Control Circuit Low (Bank 1 Sensor 1)	<Ref. to EN(H4DOTC)(diag)-90, DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0032	HO2S Heater Control Circuit High (Bank 1 Sensor 1)	<Ref. to EN(H4DOTC)(diag)-92, DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0037	HO2S Heater Control Circuit Low (Bank 1 Sensor 2)	<Ref. to EN(H4DOTC)(diag)-94, DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0038	HO2S Heater Control Circuit High (Bank 1 Sensor 2)	<Ref. to EN(H4DOTC)(diag)-96, DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0068	MAP/MAF - Throttle Position Correlation	<Ref. to EN(H4DOTC)(diag)-98, DTC P0068 MAP/MAF - THROTTLE POSITION CORRELATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0101	Mass or Volume Air Flow Circuit Range/Performance	<Ref. to EN(H4DOTC)(diag)-100, DTC P0101 MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0102	Mass or Volume Air Flow Circuit Low Input	<Ref. to EN(H4DOTC)(diag)-102, DTC P0102 MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0103	Mass or Volume Air Flow Circuit High Input	<Ref. to EN(H4DOTC)(diag)-104, DTC P0103 MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0107	Manifold Absolute Pressure/Barometric Pressure Circuit Low Input	<Ref. to EN(H4DOTC)(diag)-106, DTC P0107 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0108	Manifold Absolute Pressure/Barometric Pressure Circuit High Input	<Ref. to EN(H4DOTC)(diag)-108, DTC P0108 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0111	Intake Air Temperature Sensor 1 Circuit Range/Performance	<Ref. to EN(H4DOTC)(diag)-110, DTC P0111 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0112	Intake Air Temperature Sensor 1 Circuit Low	<Ref. to EN(H4DOTC)(diag)-112, DTC P0112 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

List of Diagnostic Trouble Code (DTC)

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DTC	Item	Note
P0113	Intake Air Temperature Sensor 1 Circuit High	<Ref. to EN(H4DOTC)(diag)-114, DTC P0113 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0117	Engine Coolant Temperature Circuit Low	<Ref. to EN(H4DOTC)(diag)-116, DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0118	Engine Coolant Temperature Circuit High	<Ref. to EN(H4DOTC)(diag)-118, DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0122	Throttle/Pedal Position Sensor/Switch "A" Circuit Low	<Ref. to EN(H4DOTC)(diag)-120, DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0123	Throttle/Pedal Position Sensor/Switch "A" Circuit High	<Ref. to EN(H4DOTC)(diag)-122, DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0125	Insufficient Coolant Temperature for Closed Loop Fuel Control	<Ref. to EN(H4DOTC)(diag)-124, DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0126	Insufficient Engine Coolant Temperature for Stable Operation	<Ref. to EN(H4DOTC)(diag)-125, DTC P0126 INSUFFICIENT ENGINE COOLANT TEMPERATURE FOR STABLE OPERATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0128	Coolant Thermostat (Engine Coolant Temperature Below Thermostat Regulating Temperature)	<Ref. to EN(H4DOTC)(diag)-127, DTC P0128 COOLANT THERMOSTAT (ENGINE COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0131	O2 Sensor Circuit Low Voltage (Bank 1 Sensor 1)	<Ref. to EN(H4DOTC)(diag)-128, DTC P0131 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0132	O2 Sensor Circuit High Voltage (Bank 1 Sensor 1)	<Ref. to EN(H4DOTC)(diag)-130, DTC P0132 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0133	O2 Sensor Circuit Slow Response (Bank 1 Sensor 1)	<Ref. to EN(H4DOTC)(diag)-132, DTC P0133 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0134	O2 Sensor Circuit No Activity Detected (Bank 1 Sensor 1)	<Ref. to EN(H4DOTC)(diag)-134, DTC P0134 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0137	O2 Sensor Circuit Low Voltage (Bank 1 Sensor 2)	<Ref. to EN(H4DOTC)(diag)-136, DTC P0137 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0138	O2 Sensor Circuit High Voltage (Bank 1 Sensor 2)	<Ref. to EN(H4DOTC)(diag)-138, DTC P0138 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0139	O2 Sensor Circuit Slow Response (Bank 1 Sensor 2)	<Ref. to EN(H4DOTC)(diag)-140, DTC P0139 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0140	O2 Sensor Circuit No Activity Detected (Bank1 Sensor2)	<Ref. to EN(H4DOTC)(diag)-142, DTC P0140 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0171	System Too Lean (Bank 1)	<Ref. to EN(H4DOTC)(diag)-144, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0172	System Too Rich (Bank 1)	<Ref. to EN(H4DOTC)(diag)-145, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0181	Fuel Temperature Sensor "A" Circuit Range/Performance	<Ref. to EN(H4DOTC)(diag)-148, DTC P0181 FUEL TEMPERATURE SENSOR "A" CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

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DTC	Item	Note
P0182	Fuel Temperature Sensor "A" Circuit Low Input	<Ref. to EN(H4DOTC)(diag)-150, DTC P0182 FUEL TEMPERATURE SENSOR "A" CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0183	Fuel Temperature Sensor "A" Circuit High Input	<Ref. to EN(H4DOTC)(diag)-152, DTC P0183 FUEL TEMPERATURE SENSOR "A" CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0222	Throttle/Pedal Position Sensor/Switch "B" Circuit Low	<Ref. to EN(H4DOTC)(diag)-154, DTC P0222 THROTTLE/PEDAL POSITION SENSOR/SWITCH "B" CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0223	Throttle/Pedal Position Sensor/Switch "B" Circuit High	<Ref. to EN(H4DOTC)(diag)-156, DTC P0223 THROTTLE/PEDAL POSITION SENSOR/SWITCH "B" CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0230	Fuel Pump Primary Circuit	<Ref. to EN(H4DOTC)(diag)-158, DTC P0230 FUEL PUMP PRIMARY CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0244	Turbo/Super Charger Wastegate Solenoid "A" Range/Performance	<Ref. to EN(H4DOTC)(diag)-161, DTC P0244 TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0245	Turbo/Super Charger Wastegate Solenoid "A" Low	<Ref. to EN(H4DOTC)(diag)-163, DTC P0245 TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0246	Turbo/Super Charger Wastegate Solenoid "A" High	<Ref. to EN(H4DOTC)(diag)-165, DTC P0246 TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0301	Cylinder 1 Misfire Detected	<Ref. to EN(H4DOTC)(diag)-166, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0302	Cylinder 2 Misfire Detected	<Ref. to EN(H4DOTC)(diag)-166, DTC P0302 CYLINDER 2 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0303	Cylinder 3 Misfire Detected	<Ref. to EN(H4DOTC)(diag)-166, DTC P0303 CYLINDER 3 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0304	Cylinder 4 Misfire Detected	<Ref. to EN(H4DOTC)(diag)-167, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0327	Knock Sensor 1 Circuit Low (Bank 1 or Single Sensor)	<Ref. to EN(H4DOTC)(diag)-173, DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW (BANK 1 OR SINGLE SENSOR), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0328	Knock Sensor 1 Circuit High (Bank 1 or Single Sensor)	<Ref. to EN(H4DOTC)(diag)-175, DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH (BANK 1 OR SINGLE SENSOR), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0335	Crankshaft Position Sensor "A" Circuit	<Ref. to EN(H4DOTC)(diag)-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(H4DOTC)(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(H4DOTC)(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(H4DOTC)(diag)-183, DTC P0345 CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0410	Secondary Air Injection System	<Ref. to EN(H4DOTC)(diag)-185, DTC P0410 SECONDARY AIR INJECTION SYSTEM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0411	Secondary Air Injection System Incorrect Flow Detected	<Ref. to EN(H4DOTC)(diag)-189, DTC P0411 SECONDARY AIR INJECTION SYSTEM INCORRECT FLOW DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0413	Secondary Air Injection System Switching Valve "A" Circuit Open	<Ref. to EN(H4DOTC)(diag)-192, DTC P0413 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE "A" CIRCUIT OPEN, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

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DTC	Item	Note
P0414	Secondary Air Injection System Switching Valve "A" Circuit Shorted	<Ref. to EN(H4DOTC)(diag)-195, DTC P0414 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE "A" CIRCUIT SHORTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0416	Secondary Air Injection System Switching Valve "B" Circuit Open	<Ref. to EN(H4DOTC)(diag)-198, DTC P0416 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE "B" CIRCUIT OPEN, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0417	Secondary Air Injection System Switching Valve "B" Circuit Shorted	<Ref. to EN(H4DOTC)(diag)-201, DTC P0417 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE "B" CIRCUIT SHORTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0418	Secondary Air Injection System Control "A" Circuit Open	<Ref. to EN(H4DOTC)(diag)-204, DTC P0418 SECONDARY AIR INJECTION SYSTEM CONTROL "A" CIRCUIT OPEN, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0420	Catalyst System Efficiency Below Threshold (Bank 1)	<Ref. to EN(H4DOTC)(diag)-207, DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0441	Evaporative Emission System Incorrect Purge Flow	<Ref. to EN(H4DOTC)(diag)-211, DTC P0441 EVAPORATIVE EMISSION SYSTEM INCORRECT PURGE FLOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0442	Evaporative Emission Control System Leak Detected (Small Leak)	<Ref. to EN(H4DOTC)(diag)-212, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0447	Evaporative Emission Control System Vent Control Circuit Open	<Ref. to EN(H4DOTC)(diag)-215, DTC P0447 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0448	Evaporative Emission Control System Vent Control Circuit Shorted	<Ref. to EN(H4DOTC)(diag)-217, DTC P0448 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0451	Evaporative Emission Control System Pressure Sensor	<Ref. to EN(H4DOTC)(diag)-219, DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0452	Evaporative Emission Control System Pressure Sensor Low Input	<Ref. to EN(H4DOTC)(diag)-221, DTC P0452 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0453	Evaporative Emission Control System Pressure Sensor High Input	<Ref. to EN(H4DOTC)(diag)-223, DTC P0453 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0456	Evaporative Emission Control System Leak Detected (Very Small Leak)	<Ref. to EN(H4DOTC)(diag)-225, DTC P0456 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0457	Evaporative Emission Control System Leak Detected (Fuel Cap Loose/Off)	<Ref. to EN(H4DOTC)(diag)-228, DTC P0457 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0458	Evaporative Emission System Purge Control Valve Circuit Low	<Ref. to EN(H4DOTC)(diag)-231, DTC P0458 EVAPORATIVE EMISSION SYSTEM PURGE CONTROL VALVE CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0459	Evaporative Emission System Purge Control Valve Circuit High	<Ref. to EN(H4DOTC)(diag)-233, DTC P0459 EVAPORATIVE EMISSION SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0461	Fuel Level Sensor "A" Circuit Range/Performance	<Ref. to EN(H4DOTC)(diag)-234, DTC P0461 FUEL LEVEL SENSOR "A" CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0462	Fuel Level Sensor "A" Circuit Low	<Ref. to EN(H4DOTC)(diag)-235, DTC P0462 FUEL LEVEL SENSOR "A" CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0463	Fuel Level Sensor "A" Circuit High	<Ref. to EN(H4DOTC)(diag)-238, DTC P0463 FUEL LEVEL SENSOR "A" CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

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DTC	Item	Note
P0464	Fuel Level Sensor Circuit Intermittent	<Ref. to EN(H4DOTC)(diag)-241, DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0483	Fan Rationality Check	<Ref. to EN(H4DOTC)(diag)-243, DTC P0483 FAN RATIONALITY CHECK, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0502	Vehicle Speed Sensor "A" Circuit Low Input	<Ref. to EN(H4DOTC)(diag)-243, DTC P0502 VEHICLE SPEED SENSOR "A" CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0503	Vehicle Speed Sensor "A" Intermittent/Erratic/High	<Ref. to EN(H4DOTC)(diag)-244, DTC P0503 VEHICLE SPEED SENSOR "A" INTERMITTENT/ERRATIC/HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0506	Idle Air Control System RPM Lower Than Expected	<Ref. to EN(H4DOTC)(diag)-246, DTC P0506 IDLE AIR CONTROL SYSTEM RPM LOWER THAN EXPECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0507	Idle Air Control System RPM Higher Than Expected	<Ref. to EN(H4DOTC)(diag)-248, DTC P0507 IDLE AIR CONTROL SYSTEM RPM HIGHER THAN EXPECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0512	Starter Request Circuit	<Ref. to EN(H4DOTC)(diag)-250, DTC P0512 STARTER REQUEST CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0513	Incorrect Immobilizer Key	<Ref. to IM(diag)-18, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0519	Idle Air Control System Performance	<Ref. to EN(H4DOTC)(diag)-252, DTC P0519 IDLE AIR CONTROL SYSTEM PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0600	Serial Communication Link	<Ref. to EN(H4DOTC)(diag)-253, DTC P0600 SERIAL COMMUNICATION LINK, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0604	Internal Control Module Random Access Memory (RAM) Error	<Ref. to EN(H4DOTC)(diag)-255, DTC P0604 INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0605	Internal Control Module Read Only Memory (ROM) Error	<Ref. to EN(H4DOTC)(diag)-256, DTC P0605 INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0607	Control Module Performance	<Ref. to EN(H4DOTC)(diag)-257, DTC P0607 CONTROL MODULE PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0638	Throttle Actuator Control Range/Performance (Bank 1)	<Ref. to EN(H4DOTC)(diag)-258, DTC P0638 THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0691	Fan 1 Control Circuit Low	<Ref. to EN(H4DOTC)(diag)-259, DTC P0691 FAN 1 CONTROL CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0692	Fan 1 Control Circuit High	<Ref. to EN(H4DOTC)(diag)-259, DTC P0692 FAN 1 CONTROL CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0700	Transmission Control System (MIL Request)	<Ref. to EN(H4DOTC)(diag)-259, DTC P0700 TRANSMISSION CONTROL SYSTEM (MIL REQUEST), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0851	Park/Neutral Switch Input Circuit Low (AT Model)	<Ref. to EN(H4DOTC)(diag)-260, DTC P0851 PARK/NEUTRAL SWITCH INPUT CIRCUIT LOW (AT MODEL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0851	Neutral Switch Input Circuit Low (MT Model)	<Ref. to EN(H4DOTC)(diag)-262, DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW (MT MODEL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0852	Park/Neutral Switch Input Circuit High (AT Model)	<Ref. to EN(H4DOTC)(diag)-264, DTC P0852 PARK/NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT MODEL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0852	Neutral Switch Input Circuit High (MT Model)	<Ref. to EN(H4DOTC)(diag)-266, DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT MODEL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

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DTC	Item	Note
P1152	O2 Sensor Circuit Range/Performance (Low) (Bank1 Sensor1)	<Ref. to EN(H4DOTC)(diag)-268, DTC P1152 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1153	O2 Sensor Circuit Range/Performance (High) (Bank1 Sensor1)	<Ref. to EN(H4DOTC)(diag)-270, DTC P1153 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1160	Return Spring Failure	<Ref. to EN(H4DOTC)(diag)-271, DTC P1160 RETURN SPRING FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1400	Fuel Tank Pressure Control Solenoid Valve Circuit Low	<Ref. to EN(H4DOTC)(diag)-272, DTC P1400 FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1410	Secondary Air Injection System Switching Valve Stuck Open	<Ref. to EN(H4DOTC)(diag)-274, DTC P1410 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1418	Secondary Air Injection System Control "A" Circuit Shorted	<Ref. to EN(H4DOTC)(diag)-277, DTC P1418 SECONDARY AIR INJECTION SYSTEM CONTROL "A" CIRCUIT SHORTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1420	Fuel Tank Pressure Control Sol. Valve Circuit High	<Ref. to EN(H4DOTC)(diag)-280, DTC P1420 FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1443	Vent Control Solenoid Valve Function Problem	<Ref. to EN(H4DOTC)(diag)-282, DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1491	Positive Crankcase Ventilation (Blow-by) Function Problem	<Ref. to EN(H4DOTC)(diag)-284, DTC P1491 POSITIVE CRANKCASE VENTILATION (BLOW-BY) FUNCTION PROBLEM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1518	Starter Switch Circuit Low Input	<Ref. to EN(H4DOTC)(diag)-286, DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1560	Back-up Voltage Circuit Malfunction	<Ref. to EN(H4DOTC)(diag)-288, DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1570	Antenna	<Ref. to IM(diag)-20, DTC P1570 ANTENNA, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1571	Reference Code Incompatibility	<Ref. to IM(diag)-13, DTC P1571 REFERENCE CODE INCOMPATIBILITY, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1572	IMM Circuit Failure (Except Antenna Circuit)	<Ref. to IM(diag)-14, DTC P1572 IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1574	Key Communication Failure	<Ref. to IM(diag)-17, DTC P1574 KEY COMMUNICATION FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1576	EGI Control Module EEPROM	<Ref. to IM(diag)-18, DTC P1576 EGI CONTROL MODULE EEPROM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1577	IMM Control Module EEPROM	<Ref. to IM(diag)-19, DTC P1577 IMM CONTROL MODULE EEPROM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1602	Control Module Programming Error	<Ref. to EN(H4DOTC)(diag)-290, DTC P1602 CONTROL MODULE PROGRAMMING ERROR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2004	Intake Manifold Runner Control Stuck Open (Bank 1)	<Ref. to EN(H4DOTC)(diag)-300, DTC P2004 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2005	Intake Manifold Runner Control Stuck Open (Bank 2)	<Ref. to EN(H4DOTC)(diag)-300, DTC P2005 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2006	Intake Manifold Runner Control Stuck Closed (Bank 1)	<Ref. to EN(H4DOTC)(diag)-301, DTC P2006 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

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DTC	Item	Note
P2007	Intake Manifold Runner Control Stuck Closed (Bank 2)	<Ref. to EN(H4DOTC)(diag)-301, DTC P2007 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2008	Intake Manifold Runner Control Circuit / Open (Bank 1)	<Ref. to EN(H4DOTC)(diag)-302, DTC P2008 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2009	Intake Manifold Runner Control Circuit Low (Bank 1)	<Ref. to EN(H4DOTC)(diag)-304, DTC P2009 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2011	Intake Manifold Runner Control Circuit / Open (Bank 2)	<Ref. to EN(H4DOTC)(diag)-306, DTC P2011 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2012	Intake Manifold Runner Control Circuit Low (Bank 2)	<Ref. to EN(H4DOTC)(diag)-308, DTC P2012 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2016	Intake Manifold Runner Position Sensor / Switch Circuit Low (Bank 1)	<Ref. to EN(H4DOTC)(diag)-310, DTC P2016 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT LOW (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2017	Intake Manifold Runner Position Sensor / Switch Circuit High (Bank 1)	<Ref. to EN(H4DOTC)(diag)-312, DTC P2017 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT HIGH (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2021	Intake Manifold Runner Position Sensor / Switch Circuit Low (Bank 2)	<Ref. to EN(H4DOTC)(diag)-314, DTC P2021 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT LOW (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2022	Intake Manifold Runner Position Sensor / Switch Circuit High (Bank 2)	<Ref. to EN(H4DOTC)(diag)-316, DTC P2022 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT HIGH (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2088	Intake Camshaft Position Actuator Control Circuit Low (Bank 1)	<Ref. to EN(H4DOTC)(diag)-318, DTC P2088 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2089	Intake Camshaft Position Actuator Control Circuit High (Bank 1)	<Ref. to EN(H4DOTC)(diag)-320, DTC P2089 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2092	Intake Camshaft Position Actuator Control Circuit Low (Bank 2)	<Ref. to EN(H4DOTC)(diag)-322, DTC P2092 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2093	Intake Camshaft Position Actuator Control Circuit High (Bank 2)	<Ref. to EN(H4DOTC)(diag)-324, DTC P2093 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2096	Post Catalyst Fuel Trim System Too Lean Bank 1	<Ref. to EN(H4DOTC)(diag)-325, DTC P2096 POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2097	Post Catalyst Fuel Trim System Too Rich Bank 1	<Ref. to EN(H4DOTC)(diag)-326, DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2101	Throttle Actuator Control Motor Circuit Range/Performance	<Ref. to EN(H4DOTC)(diag)-332, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2102	Throttle Actuator Control Motor Circuit Low	<Ref. to EN(H4DOTC)(diag)-337, DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2103	Throttle Actuator Control Motor Circuit High	<Ref. to EN(H4DOTC)(diag)-339, DTC P2103 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2109	Throttle/Pedal Position Sensor "A" Minimum Stop Performance	<Ref. to EN(H4DOTC)(diag)-340, DTC P2109 THROTTLE/PEDAL POSITION SENSOR "A" MINIMUM STOP PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

List of Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

DTC	Item	Note
P2122	Throttle/Pedal Position Sensor/ Switch "D" Circuit Low Input	<Ref. to EN(H4DOTC)(diag)-341, DTC P2122 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2123	Throttle/Pedal Position Sensor/ Switch "D" Circuit High Input	<Ref. to EN(H4DOTC)(diag)-343, DTC P2123 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2127	Throttle/Pedal Position Sensor/ Switch "E" Circuit Low Input	<Ref. to EN(H4DOTC)(diag)-345, DTC P2127 THROTTLE/PEDAL POSITION SENSOR/SWITCH "E" CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2128	Throttle/Pedal Position Sensor/ Switch "E" Circuit High Input	<Ref. to EN(H4DOTC)(diag)-347, DTC P2128 THROTTLE/PEDAL POSITION SENSOR/SWITCH "E" CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2135	Throttle/Pedal Position Sensor/ Switch "A"/"B" Voltage Correlation	<Ref. to EN(H4DOTC)(diag)-349, DTC P2135 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A"/"B" VOLTAGE CORRELATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2138	Throttle/Pedal Position Sensor/ Switch "D"/"E" Voltage Correlation	<Ref. to EN(H4DOTC)(diag)-352, DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D"/"E" VOLTAGE CORRELATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2419	Evaporative Emission System Switching Valve Control Circuit Low	<Ref. to EN(H4DOTC)(diag)-354, DTC P2419 EVAPORATIVE EMISSION SYSTEM SWITCHING VALVE CONTROL CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2420	Evaporative Emission System Switching Valve Control Circuit High	<Ref. to EN(H4DOTC)(diag)-356, DTC P2420 EVAPORATIVE EMISSION SYSTEM SWITCHING VALVE CONTROL CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2431	Secondary Air Injection System Air Flow /Pressure Sensor Circuit Range/Performance	<Ref. to EN(H4DOTC)(diag)-358, DTC P2431 SECONDARY AIR INJECTION SYSTEM AIR FLOW /PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2432	Secondary Air Injection System Air Flow /Pressure Sensor Circuit Low	<Ref. to EN(H4DOTC)(diag)-361, DTC P2432 SECONDARY AIR INJECTION SYSTEM AIR FLOW /PRESSURE SENSOR CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2433	Secondary Air Injection System Air Flow /Pressure Sensor Circuit High	<Ref. to EN(H4DOTC)(diag)-364, DTC P2433 SECONDARY AIR INJECTION SYSTEM AIR FLOW /PRESSURE SENSOR CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2440	Secondary Air Injection System Switching Valve Stuck Open (Bank1)	<Ref. to EN(H4DOTC)(diag)-367, DTC P2440 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2441	Secondary Air Injection System Switching Valve Stuck Closed (Bank1)	<Ref. to EN(H4DOTC)(diag)-371, DTC P2441 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK CLOSED (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2442	Secondary Air Injection System Switching Valve Stuck Open (Bank2)	<Ref. to EN(H4DOTC)(diag)-372, DTC P2442 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2443	Secondary Air Injection System Switching Valve Stuck Closed (Bank2)	<Ref. to EN(H4DOTC)(diag)-376, DTC P2443 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK CLOSED (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2444	Secondary Air Injection System Pump Stuck On	<Ref. to EN(H4DOTC)(diag)-377, DTC P2444 SECONDARY AIR INJECTION SYSTEM PUMP STUCK ON, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

19. Diagnostic Procedure with Diagnostic Trouble Code (DTC)

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

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-10, DTC P0011 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Engine stalls.
- Erroneous idling

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

Step	Check	Yes	No
1 CHECK CURRENT DATA. 1) Start the engine and let it idle. 2) Measure the AVCS system operating angle using the Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the AVCS system operating angle approx. 0°?	Go to step 2.	Check the following item and repair or replace if necessary. • Oil pipe (clog) • Oil flow control solenoid valve (clogged or dirty oil passages, spring settings) • Intake camshaft (dirt, damage of camshaft)
2 CHECK CURRENT DATA. 1) Drive (accelerate or decelerate) the vehicle at 80 km/h (50 MPH) or less. NOTE: Drive the vehicle so that duty output of the oil flow control solenoid valve increases. 2) Measure the AVCS system operating angle and oil flow control solenoid valve duty output using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	When the oil flow control solenoid valve duty output exceeds 10%, is the AVCS system operating angle approx. 0°?	Check the following item and repair or replace if necessary. • Oil pipe (clog) • Oil flow control solenoid valve (clogged or dirty oil passages, spring settings) • Intake camshaft (dirt, damage of camshaft)	Perform the following procedures, and clean the oil routing. Replace the engine oil and idle the engine for 5 minutes, then replace the oil filter and engine oil. <Ref. to LU(H4SO)-10, REPLACEMENT, Engine Oil.> <Ref. to LU(H4SO)-25, Engine Oil Filter.>

B: DTC P0016 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK 1)

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-12, DTC P0016 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Engine stalls.
- Erroneous idling

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

Step	Check	Yes	No
1 CHECK CURRENT DATA. 1) Start the engine and let it idle. 2) Measure the AVCS system operating angle and oil flow control solenoid valve duty output using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the AVCS system operating angle approx. 0°, and oil flow control solenoid valve duty output approx. 10%?	Perform the following procedures, and clean the oil routing. Replace the engine oil and idle the engine for 5 minutes, then replace the oil filter and engine oil. <Ref. to LU(H4SO)-10, REPLACEMENT, Engine Oil.> <Ref. to LU(H4SO)-25, Engine Oil Filter.>	Check the following item and repair or replace if necessary. • Oil pipe (clog) • Oil flow control solenoid valve (clogged or dirty oil passages, spring settings) • Intake camshaft (dirt, damage of camshaft) • Timing belt (matching of timing mark)

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

C: DTC P0018 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK 2)

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-12, DTC P0018 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Engine stalls.
- Erroneous idling

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

Step	Check	Yes	No
1 CHECK CURRENT DATA. 1) Start the engine and let it idle. 2) Measure the AVCS system operating angle and oil flow control solenoid valve duty output using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the AVCS system operating angle approx. 0°, and oil flow control solenoid valve duty output approx. 10%?	Perform the following procedures, and clean the oil routing. Replace the engine oil and idle the engine for 5 minutes, then replace the oil filter and engine oil. <Ref. to LU(H4SO)-10, REPLACEMENT, Engine Oil.> <Ref. to LU(H4SO)-25, Engine Oil Filter.>	Check the following item and repair or replace if necessary. • Oil pipe (clog) • Oil flow control solenoid valve (clogged or dirty oil passages, spring settings) • Intake camshaft (dirt, damage of camshaft) • Timing belt (matching of timing mark)

D: DTC P0021 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 2)

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-12, DTC P0021 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Engine stalls.
- Erroneous idling

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

Step	Check	Yes	No
1 CHECK CURRENT DATA. 1) Start the engine and let it idle. 2) Measure the AVCS system operating angle using the Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the AVCS system operating angle approx. 0°?	Go to step 2.	Check the following item and repair or replace if necessary. • Oil pipe (clog) • Oil flow control solenoid valve (clogged or dirty oil passages, spring settings) • Intake camshaft (dirt, damage of camshaft)
2 CHECK CURRENT DATA. 1) Drive (accelerate or decelerate) the vehicle at 80 km/h (50 MPH) or less. NOTE: Drive the vehicle so that duty output of the oil flow control solenoid valve increases. 2) Measure the AVCS system operating angle and oil flow control solenoid valve duty output using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	When the oil flow control solenoid valve duty output exceeds 10%, is the AVCS system operating angle approx. 0°?	Check the following item and repair or replace if necessary. • Oil pipe (clog) • Oil flow control solenoid valve (clogged or dirty oil passages, spring settings) • Intake camshaft (dirt, damage of camshaft)	Perform the following procedures, and clean the oil routing. Replace the engine oil and idle the engine for 5 minutes, then replace the oil filter and engine oil. <Ref. to LU(H4SO)-10, REPLACEMENT, Engine Oil.> <Ref. to LU(H4SO)-25, Engine Oil Filter.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

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

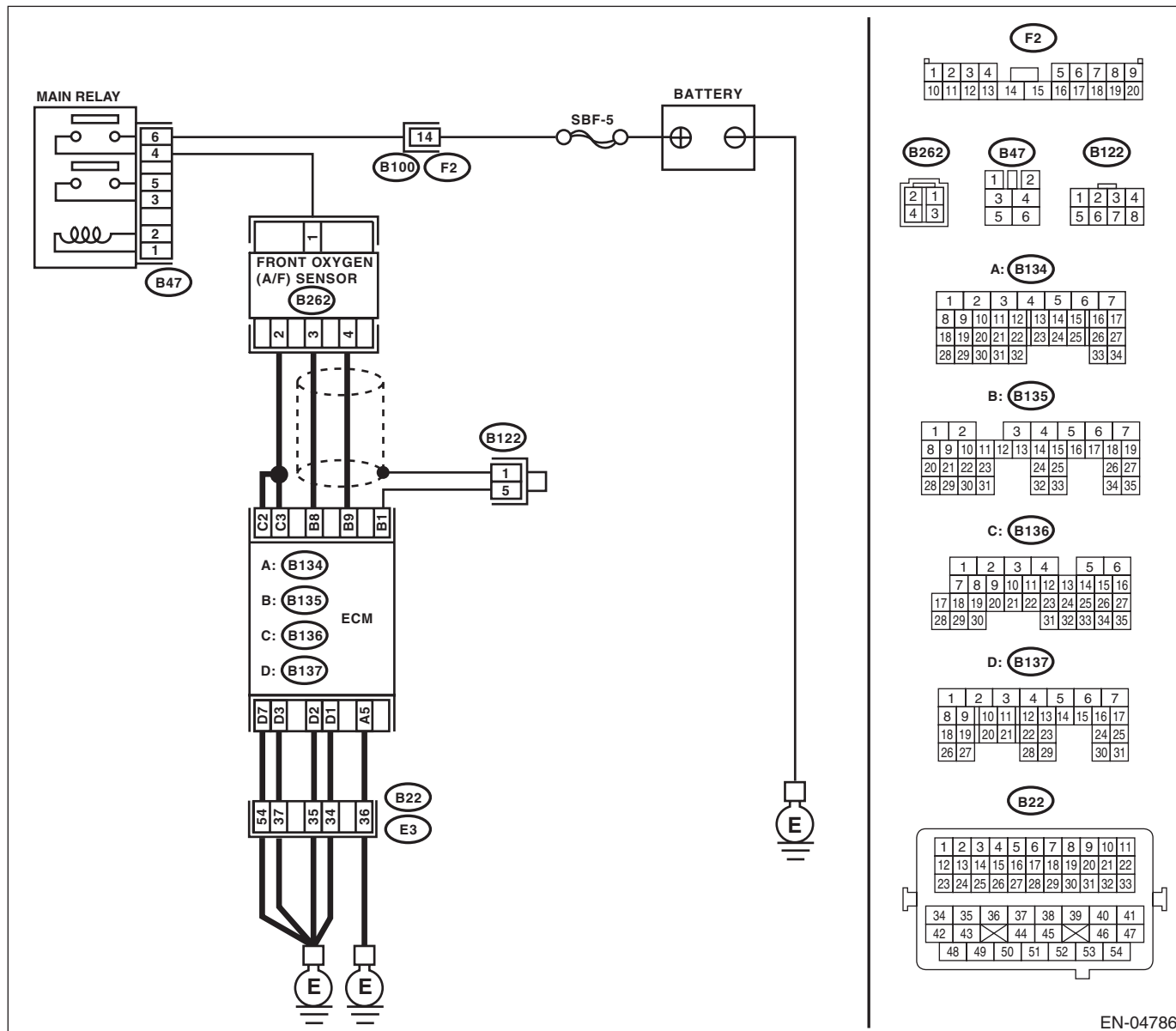
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-13, DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR. 1) Start and warm-up the engine. 2) Turn the ignition switch to OFF. 3) Disconnect the connectors from the ECM and front oxygen (A/F) sensor. 4) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. Connector & terminal (B136) No. 2 — (B262) No. 2: (B136) No. 3 — (B262) No. 2:	Is the resistance less than 1 Ω ?	Go to step 2.	Repair the open circuit of harness between ECM and front oxygen (A/F) sensor connector.
2 CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR. Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. Connector & terminal (B135) No. 9 — (B262) No. 4: (B135) No. 8 — (B262) No. 3:	Is the resistance less than 1 Ω ?	Go to step 3.	Repair the open circuit of harness between ECM and front oxygen (A/F) sensor connector.
3 CHECK FRONT OXYGEN (A/F) SENSOR. Measure the resistance between front oxygen (A/F) sensor connector terminals. Terminals No. 1 — No. 2:	Is the resistance between 2 — 3 Ω ?	Go to step 4.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-42, Front Oxygen (A/F) Sensor.>
4 CHECK POOR CONTACT. Check poor contact of ECM and front oxygen (A/F) sensor connector.	Is there poor contact in ECM or front oxygen (A/F) sensor connector?	Repair the poor contact of ECM or front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-42, Front Oxygen (A/F) Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

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

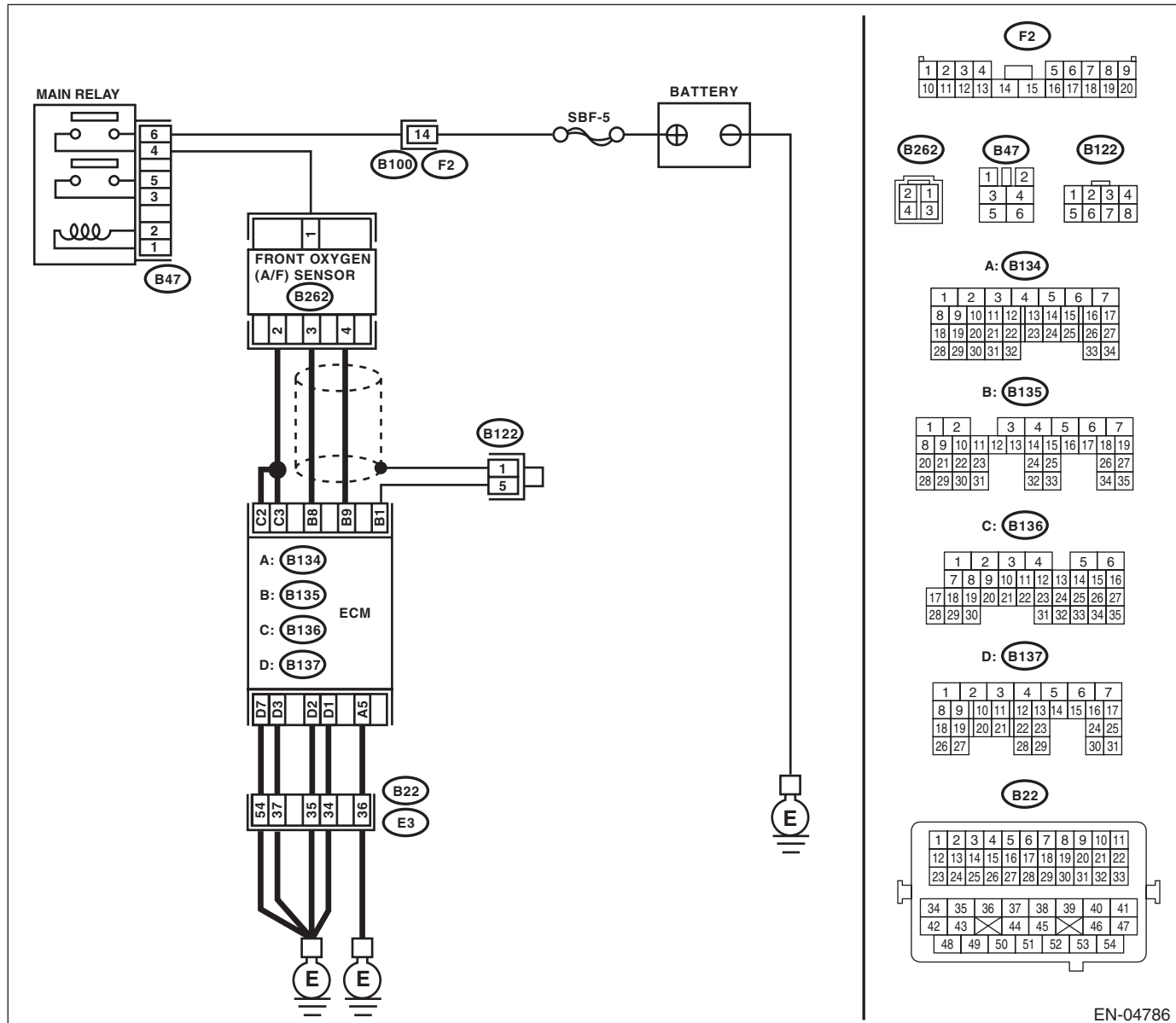
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-15, DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04786

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK POWER SUPPLY TO FRONT OXYGEN (A/F) SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from front oxygen (A/F) sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between front oxygen (A/F) sensor connector and engine ground. Connector & terminal (B262) No. 1 (+) — Engine ground (-):	Is the voltage 10 V or more?	Go to step 2.	Repair the power supply line. NOTE: In this case, repair the following item: • Open circuit of harness between main relay and front oxygen (A/F) sensor connector • Poor contact in main relay connector • Malfunction in main relay
2 CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance between ECM and front oxygen (A/F) sensor connector. Connector & terminal (B136) No. 2 — (B262) No. 2: (B136) No. 3 — (B262) No. 2:	Is the resistance less than 1 Ω ?	Go to step 3.	Repair the open circuit of harness between ECM and front oxygen (A/F) sensor.
3 CHECK GROUND CIRCUIT FOR ECM. Measure the resistance of harness between ECM and chassis ground. Connector & terminal (B134) No. 5 — Chassis ground: (B137) No. 1 — Chassis ground: (B137) No. 2 — Chassis ground: (B137) No. 3 — Chassis ground: (B137) No. 7 — Chassis ground:	Is the resistance less than 5 Ω ?	Go to step 4.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and engine ground • Poor contact in ECM connector • Poor contact of coupling connector
4 CHECK FRONT OXYGEN (A/F) SENSOR. Measure the resistance between front oxygen (A/F) sensor connector terminals. Terminals No. 1 — No. 2:	Is the resistance between 2 — 3 Ω ?	Repair the poor contact of the ECM connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-42, Front Oxygen (A/F) Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

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

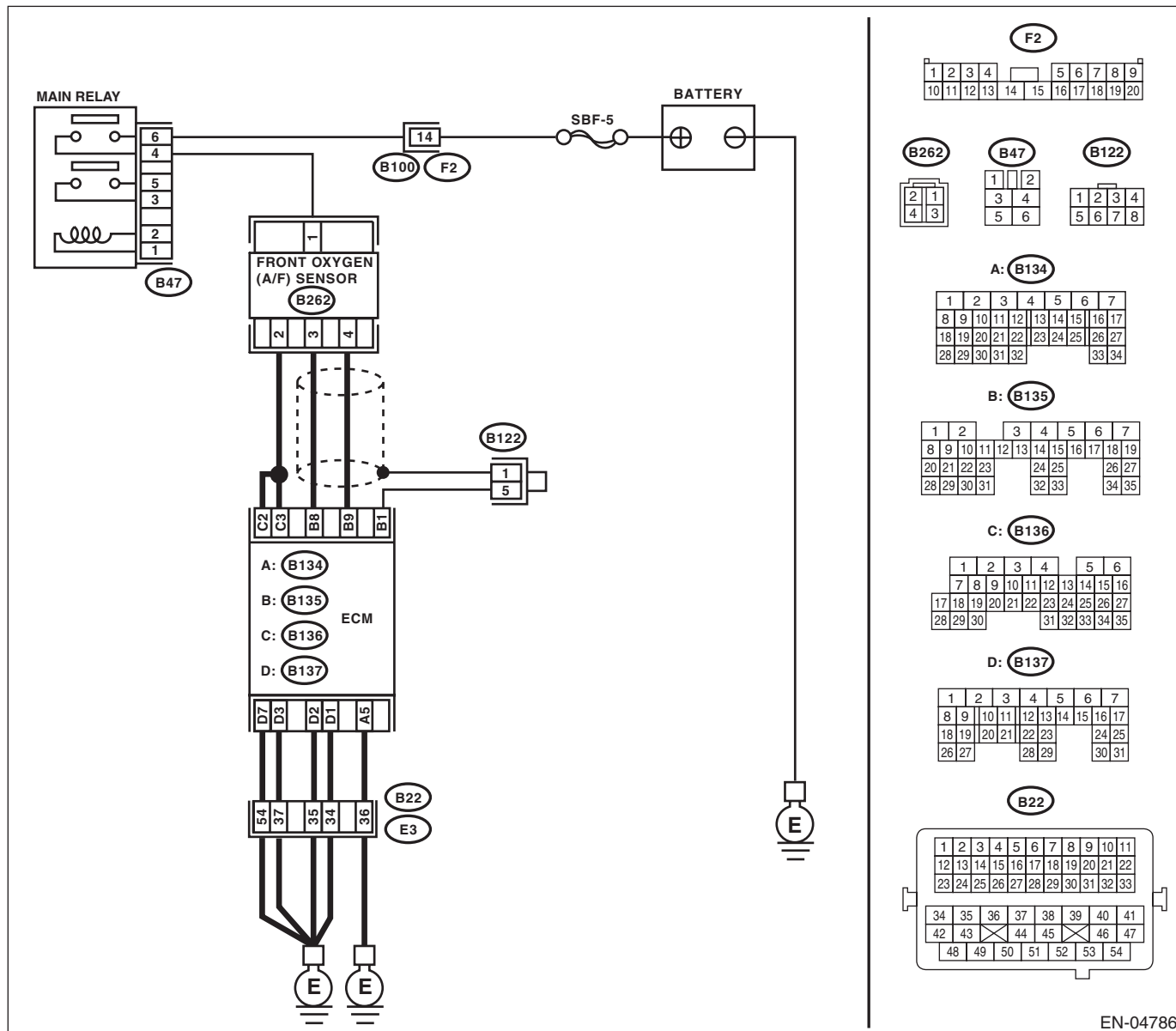
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-17, DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04786

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR. 1) Turn the ignition switch to OFF. 2) Measure the voltage between ECM and chassis ground. Connector & terminal (B136) No. 2 (+) — Chassis ground (-): (B136) No. 3 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Repair the short circuit to power in the harness between the ECM and front oxygen (A/F) sensor connector.	Go to step 2.
2 CHECK GROUND CIRCUIT FOR ECM. 1) Disconnect the connectors from ECM. 2) Measure the resistance between ECM and chassis ground. Connector & terminal (B134) No. 5 — Chassis ground: (B137) No. 1 — Chassis ground: (B137) No. 2 — Chassis ground: (B137) No. 3 — Chassis ground: (B137) No. 7 — Chassis ground:	Is the resistance less than 5 Ω ?	Repair the poor contact of the ECM connector.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and engine ground • Poor contact of coupling connector

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

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

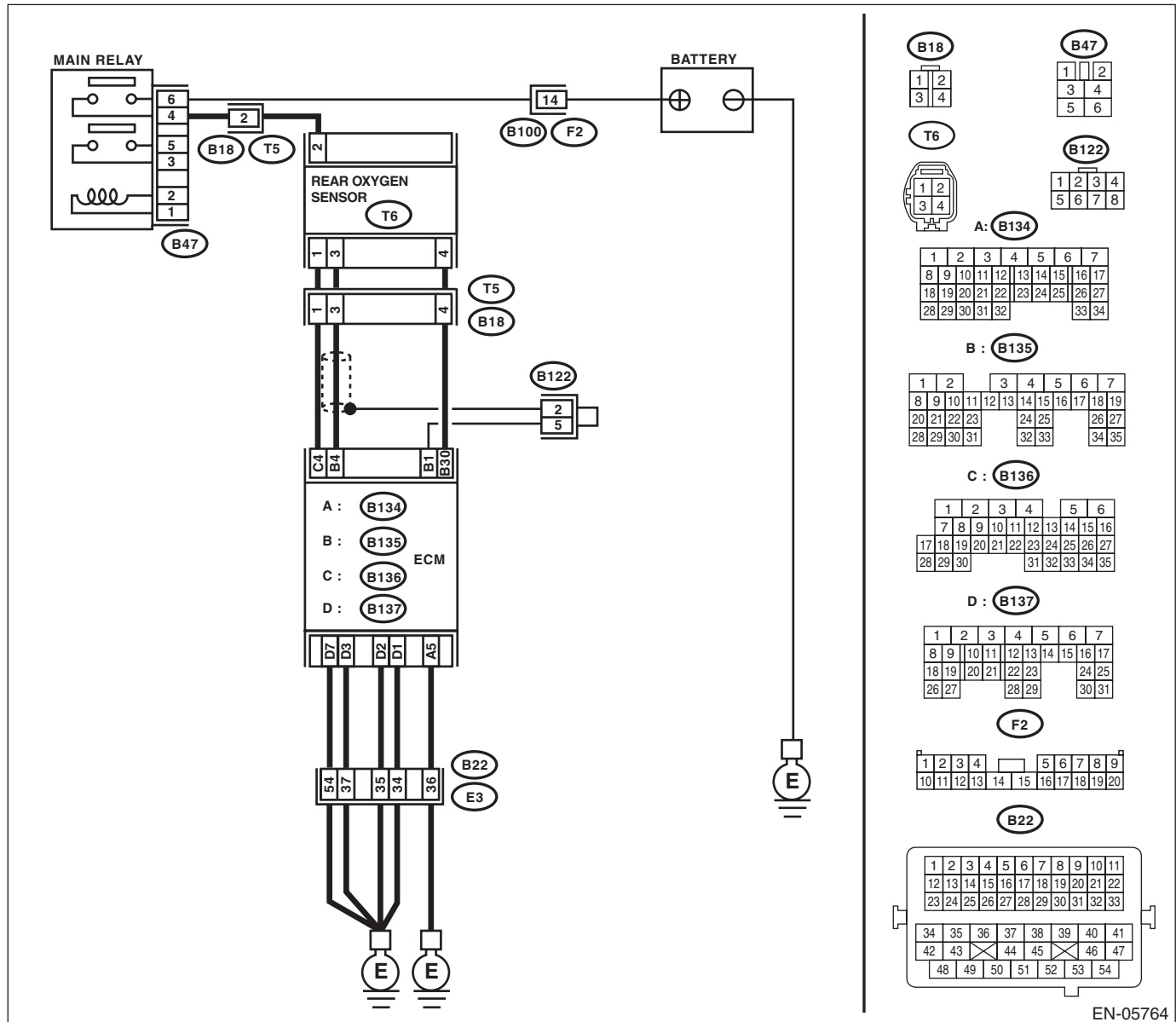
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-19, DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-05764

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

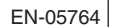
Step	Check	Yes	No
1 CHECK POWER SUPPLY TO REAR OXYGEN SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the rear oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between rear oxygen sensor connector and engine ground. Connector & terminal (T6) No. 2 (+) — Engine ground (-):	Is the voltage 10 V or more?	Go to step 2.	Repair the power supply line. NOTE: In this case, repair the following item: • Open circuit of harness between main relay and rear oxygen sensor • Poor contact of main relay connector • Poor contact in coupling connector • Malfunction in main relay
2 CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance between ECM and rear oxygen sensor connector. Connector & terminal (B136) No. 4 — (T6) No. 1:	Is the resistance less than 1 Ω ?	Go to step 3.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between the ECM and rear oxygen sensor • Poor contact of coupling connector
3 CHECK GROUND CIRCUIT FOR ECM. Measure the resistance of harness between ECM and chassis ground. Connector & terminal (B134) No. 5 — Chassis ground: (B137) No. 1 — Chassis ground: (B137) No. 2 — Chassis ground: (B137) No. 3 — Chassis ground: (B137) No. 7 — Chassis ground:	Is the resistance less than 5 Ω ?	Go to step 4.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and engine ground • Poor contact in ECM connector • Poor contact of coupling connector
4 CHECK REAR OXYGEN SENSOR. Measure the resistance between the rear oxygen sensor connector terminals. Terminals No. 1 — No. 2:	Is the resistance between 5 — 7 Ω ?	Repair the poor contact of the ECM connector.	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-44, Rear Oxygen Sensor.>

ENGINE (DIAGNOSTICS)

DTC DETECTING CONDITION:

- CAUTION:**

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR. 1) Turn the ignition switch to OFF. 2) Measure the voltage between ECM and chassis ground. Connector & terminal (B136) No. 4 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Repair the short circuit to power in the harness between ECM and rear oxygen sensor connector.	Go to step 2.
2 CHECK GROUND CIRCUIT FOR ECM. 1) Disconnect the connectors from ECM. 2) Measure the resistance between ECM and chassis ground. Connector & terminal (B134) No. 5 — Chassis ground: (B137) No. 1 — Chassis ground: (B137) No. 2 — Chassis ground: (B137) No. 3 — Chassis ground: (B137) No. 7 — Chassis ground:	Is the resistance less than 5 Ω ?	Repair the poor contact of the ECM connector.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and engine ground • Poor contact of coupling connector

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

J: DTC P0068 MAP/MAF - THROTTLE POSITION CORRELATION

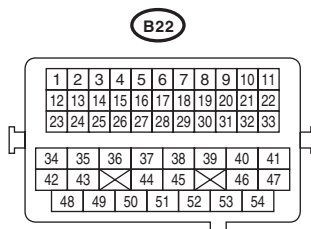
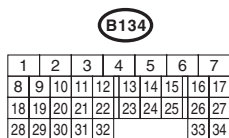
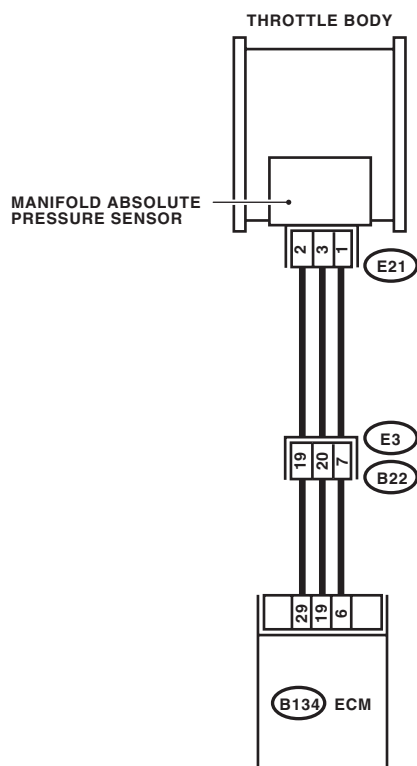
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-23, DTC P0068 MAP/MAF - THROTTLE POSITION CORRELATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04788

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK AIR INTAKE SYSTEM.	Are there holes, loose bolts or disconnection of hose on air intake system?	Repair the air intake system.	Go to step 2.
2 CHECK MANIFOLD ABSOLUTE PRESSURE SENSOR. 1) Start the engine and warm-up engine until coolant temperature is higher than 75°C (167°F). 2) For AT models, set the select lever to the "P" or "N" range, and for MT models, place the shift lever in the neutral position. 3) Turn the A/C switch to OFF. 4) Turn all the accessory switches to OFF. 5) Read the data of intake manifold pressure sensor signal using Subaru Select Monitor or general scan tool. NOTE: - Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> - General scan tool For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".	Is the measured value 73.3 — 106.6 kPa (550 — 800 mmHg, 21.65 — 31.50 inHg) when the ignition is turned ON, and 20.0 — 46.7 kPa (150 — 350 mmHg, 5.91 — 13.78 inHg) during idling?	Go to step 3.	Replace the manifold absolute pressure sensor. <Ref. to FU(H4DOTC)-32, Manifold Absolute Pressure Sensor.>
3 CHECK THROTTLE OPENING ANGLE. Read the data of throttle position signal using Subaru Select Monitor or general scan tool. NOTE: - Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> - General scan tool For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".	Is the measured value less than 5% when throttle is fully closed?	Go to step 4.	Replace the electronic throttle control. <Ref. to FU(H4DOTC)-13, Throttle Body.>
4 CHECK THROTTLE OPENING ANGLE.	Is the measured value 85% or more when throttle is fully open?	Replace the manifold absolute pressure sensor. <Ref. to FU(H4DOTC)-32, Manifold Absolute Pressure Sensor.>	Replace the electronic throttle control. <Ref. to FU(H4DOTC)-13, Throttle Body.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

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

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-25, DTC P0101 MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

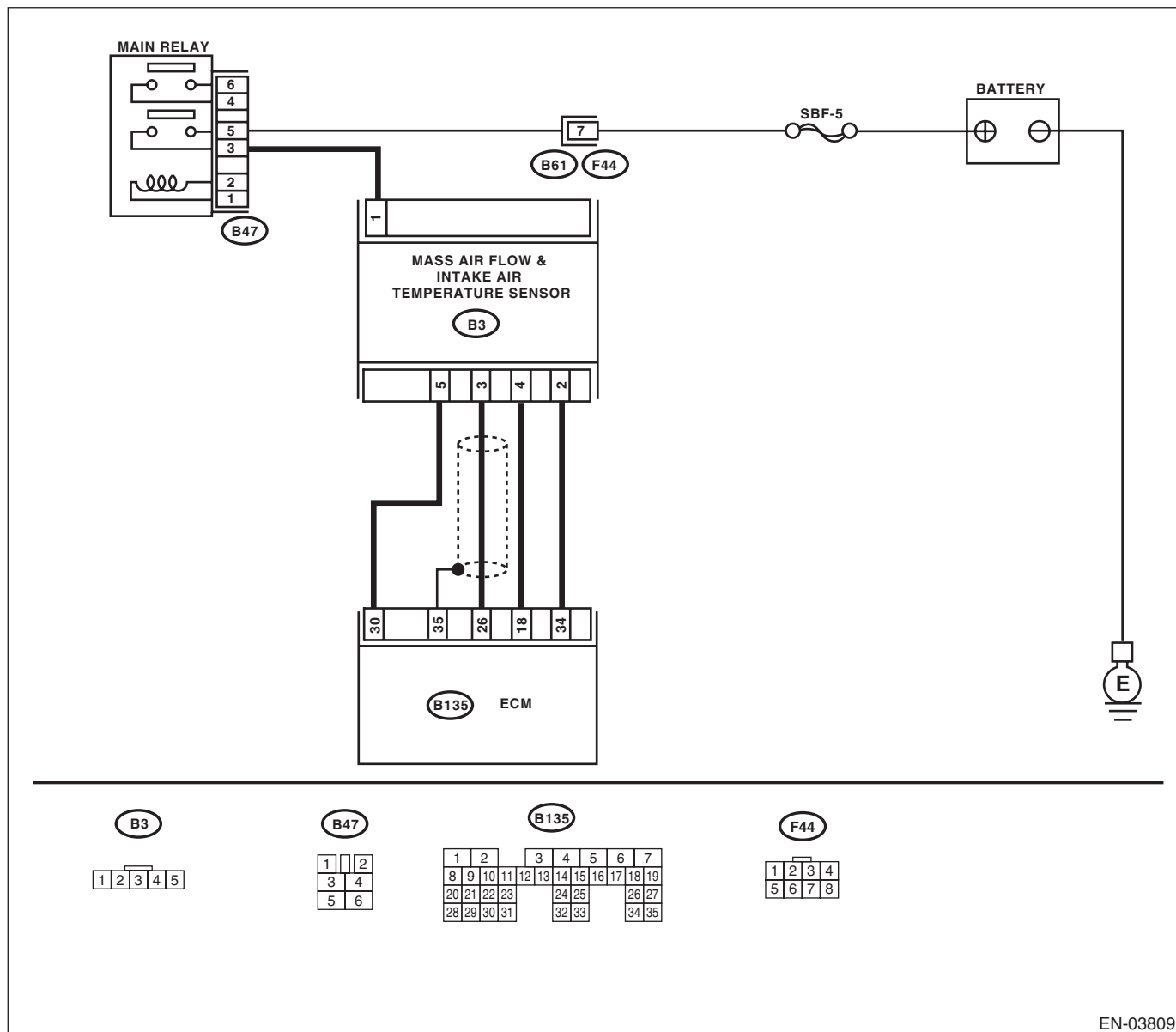
TROUBLE SYMPTOM:

- Improper idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-03809

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?	Check the appropriate DTC using the "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-76, List of Diagnostic Trouble Code (DTC).>	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-31, Mass Air Flow and Intake Air Temperature Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-28, DTC P0102 MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

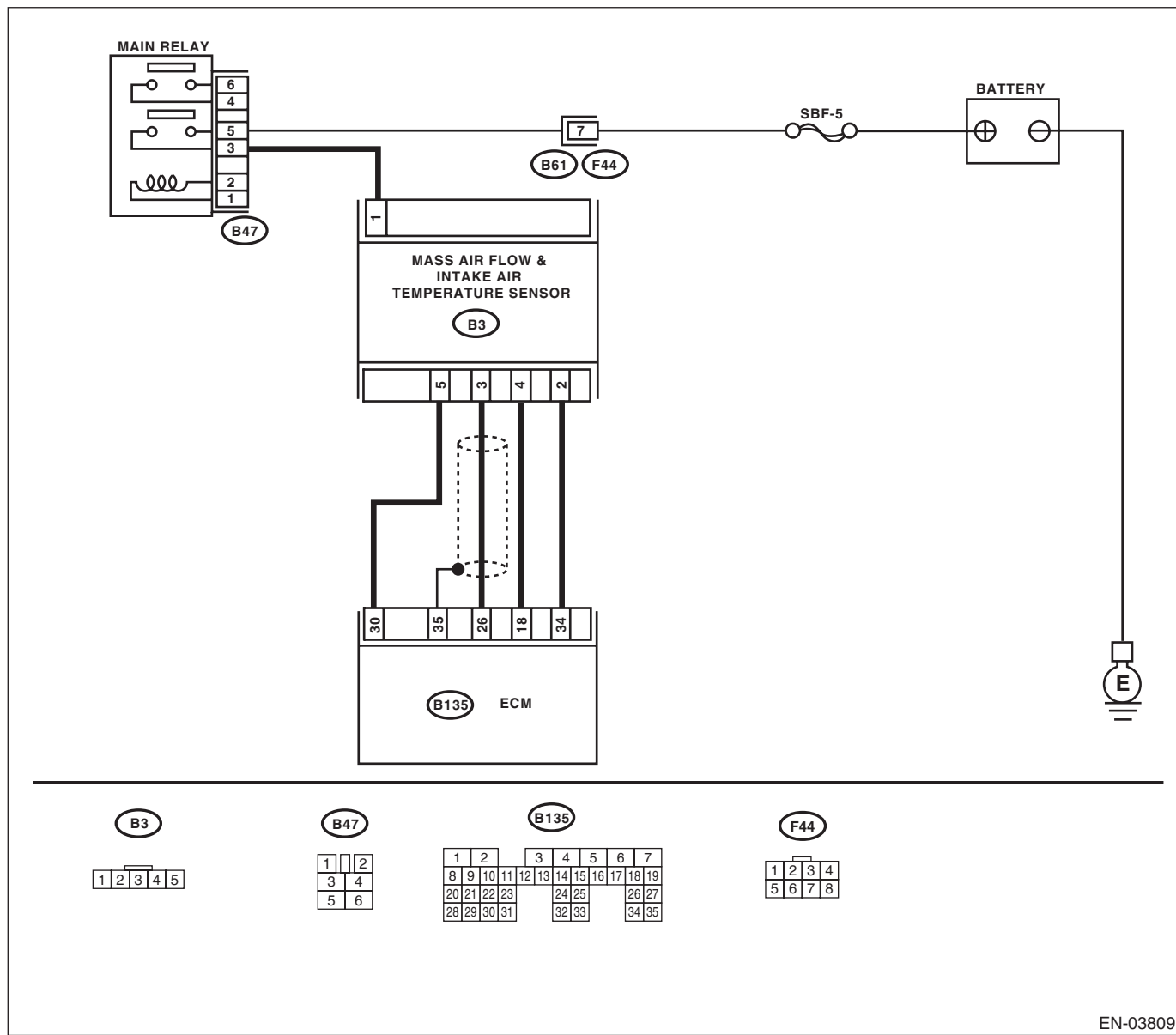
TROUBLE SYMPTOM:

- Improper idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-03809

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 air flow sensor signal using the Subaru Select Monitor or general scan tool. NOTE: - Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> - General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the voltage less than 0.2 V?	Go to step 2.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. Reproduce the fault condition, and reperform the check. NOTE: In this case, there may be a temporary connector contact failure.
2 CHECK POWER SUPPLY OF MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the mass air flow and intake air temperature sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between mass air flow and intake air temperature sensor connector and engine ground. Connector & terminal (B3) No. 1 (+) — Engine ground (–):	Is the voltage 10 V or more?	Go to step 3.	Repair the harness and connector. NOTE: In this case, repair the following item: - Open circuit of harness between the main relay and the mass air flow and intake air temperature sensor connector. - Poor contact of main relay connector
3 CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR CONNECTORS. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance of harness between ECM and the mass air flow and intake air temperature sensor connectors. Connector & terminal (B135) No. 26 — (B3) No. 3:	Is the resistance less than 1 Ω ?	Go to step 4.	Repair the open circuit of harness between the ECM and the mass air flow and intake air temperature sensor connectors.
4 CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR CONNECTORS. Measure the resistance between ECM and chassis ground. Connector & terminal (B135) No. 26 — Chassis ground:	Is the resistance 1 M Ω or more?	Go to step 5.	Repair the short circuit to ground of harness between the ECM and the mass air flow and intake air temperature sensor connectors.
5 CHECK POOR CONTACT. Check for any poor contact in the ECM or the mass air flow and intake air temperature sensor connector.	Is there poor contact in the ECM or the mass air flow and intake air temperature sensor connector?	Repair the poor contact in the ECM or the mass air flow and intake air temperature sensor connector.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-31, Mass Air Flow and Intake Air Temperature Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-30, DTC P0103 MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

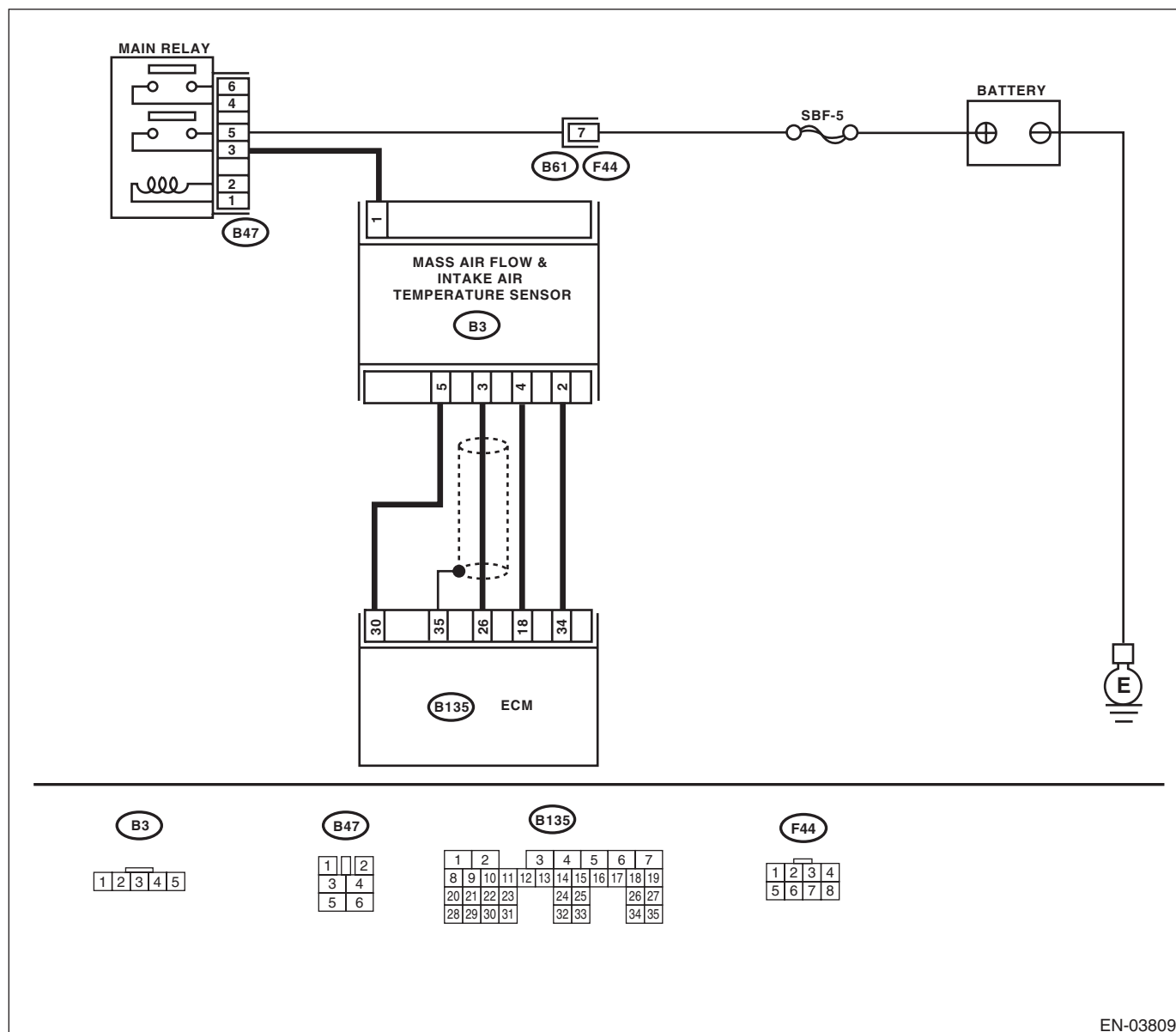
TROUBLE SYMPTOM:

- Improper idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-03809

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 air flow sensor signal using the Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the voltage 5 V or more?	Go to step 2.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. Reproduce the fault condition, and reperform the check. NOTE: In this case, there may be a temporary connector contact failure.
2 CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR CONNECTORS. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the mass air flow and intake air temperature sensor. 3) Start the engine. 4) Read the data of air flow sensor signal using the Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the voltage 5 V or more?	Repair the short circuit to power in the harness between the ECM and the mass air flow and intake air temperature sensor connector.	Go to step 3.
3 CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR CONNECTORS. 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between the mass air flow and intake air temperature sensor connector and engine ground. Connector & terminal (B3) No. 2 — Engine ground:	Is the resistance less than 5 Ω ?	Go to step 4.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and the mass air flow and intake air temperature sensor connector • Poor contact in ECM connector
4 CHECK POOR CONTACT. Check for any poor contact in the mass air flow and intake air temperature sensor connector.	Is there poor contact in the mass air flow and intake air temperature sensor connector?	Repair any poor contact of the mass air flow and intake air temperature sensor connector.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-31, Mass Air Flow and Intake Air Temperature Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

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

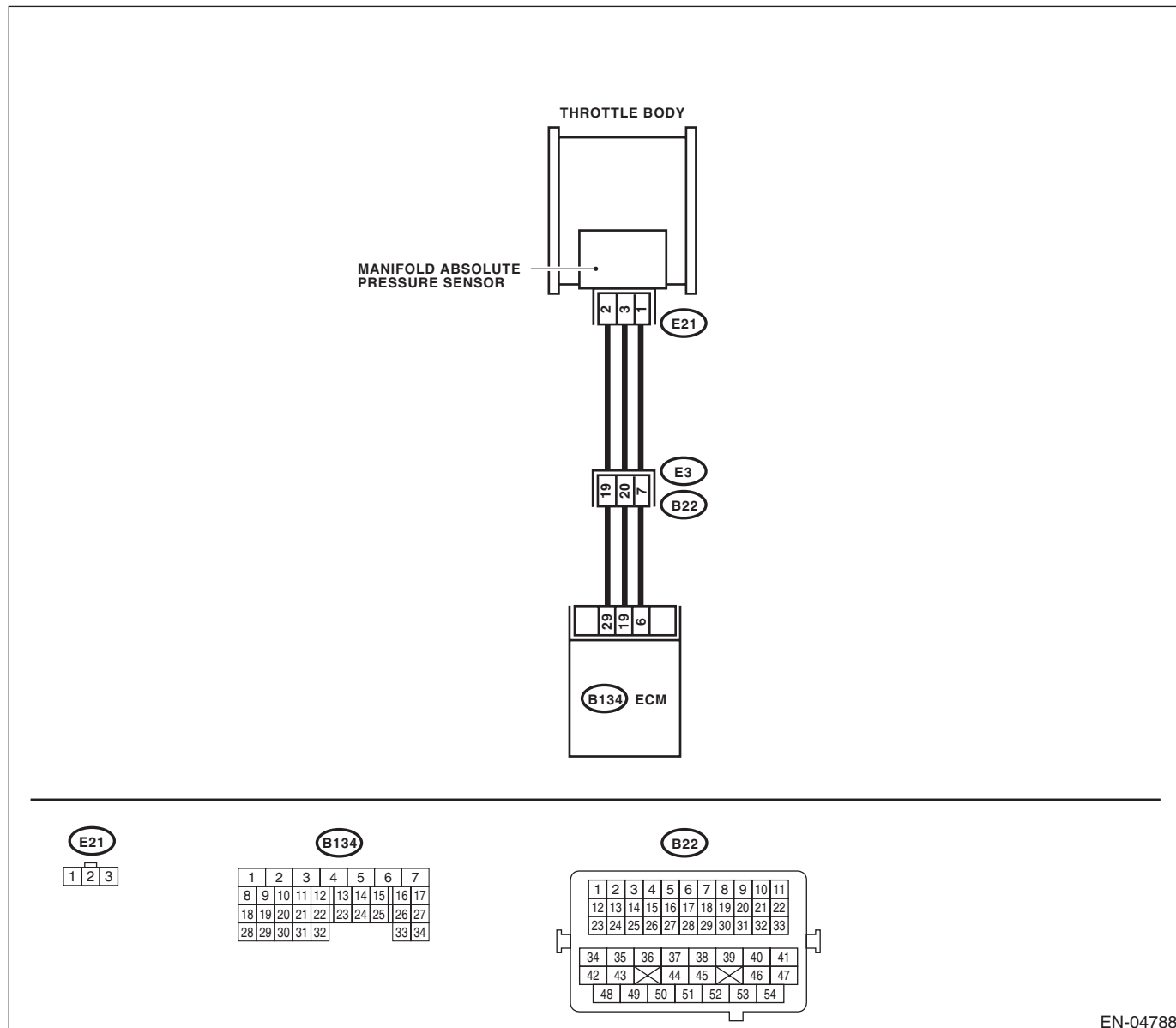
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-32, DTC P0107 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04788

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK CURRENT DATA. 1) Start the engine. 2) Read the data of intake manifold absolute pressure signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the measured value less than 13.3 kPa (100 mmHg, 3.94 inHg) ?	Go to step 2.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. Reproduce the fault condition, and reperform the check. NOTE: In this case, there may be a temporary connector contact failure.
2 CHECK POWER SUPPLY OF THE MANIFOLD ABSOLUTE PRESSURE SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from manifold absolute pressure sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between manifold absolute pressure sensor connector and engine ground. Connector & terminal (E21) No. 3 (+) — Engine ground (-):	Is the voltage 4.5 V or more?	Go to step 3.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and manifold absolute pressure sensor connector. • Poor contact in ECM connector • Poor contact of coupling connector
3 CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance of harness between ECM and manifold absolute pressure sensor connector. Connector & terminal (B134) No. 6 — (E21) No. 1:	Is the resistance less than 1 Ω?	Go to step 4.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and manifold absolute pressure sensor connector. • Poor contact of coupling connector
4 CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR. Measure the resistance between ECM and chassis ground. Connector & terminal (B134) No. 6 — Chassis ground:	Is the resistance 1 MΩ or more?	Go to step 5.	Repair ground short circuit of harness between ECM and manifold absolute pressure sensor connector.
5 CHECK POOR CONTACT. Check for poor contact between the ECM and manifold pressure sensor connector.	Is there poor contact in the ECM or manifold absolute pressure sensor connector?	Repair the poor contact in the ECM or manifold absolute pressure sensor connector.	Replace the manifold absolute pressure sensor. <Ref. to FU(H4DOTC)-32, Manifold Absolute Pressure Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

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

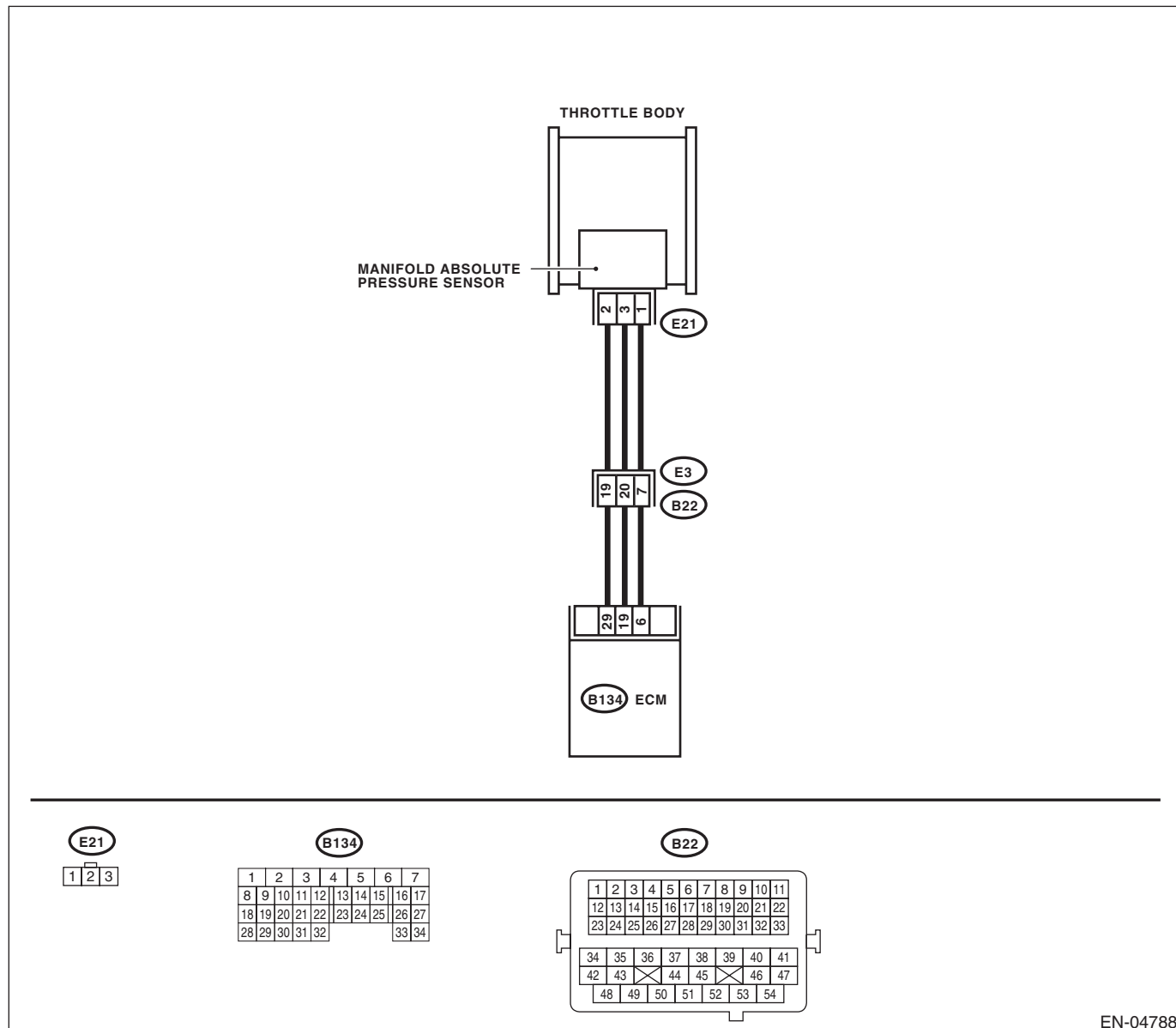
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-34, DTC P0108 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04788

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK CURRENT DATA. 1) Start the engine. 2) Read the data of intake manifold absolute pressure signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the measured value 119.5 kPa (896.5 mmHg, 35.29 inHg) or more?	Go to step 2.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. Reproduce the fault condition, and reperform the check. NOTE: In this case, there may be a temporary connector contact failure.
2 CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from manifold absolute pressure sensor. 3) Start the engine. 4) Read the data of intake manifold absolute pressure signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the measured value 119.5 kPa (896.5 mmHg, 35.29 inHg) or more?	Repair the short circuit to power in the harness between ECM and manifold absolute pressure sensor connector.	Go to step 3.
3 CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between manifold absolute pressure sensor connector and engine ground. Connector & terminal (E21) No. 2 — Engine ground:	Is the resistance less than 5 Ω?	Go to step 4.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and manifold absolute pressure sensor connector. • Poor contact in ECM connector • Poor contact of coupling connector
4 CHECK POOR CONTACT. Check for poor contact of the manifold absolute pressure sensor connector.	Is there poor contact in manifold absolute pressure sensor connector?	Repair the poor contact of manifold absolute pressure sensor connector.	Replace the manifold absolute pressure sensor. <Ref. to FU(H4DOTC)-32, Manifold Absolute Pressure Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step		Check	Yes	No
1	CHECK ENGINE COOLANT TEMPERATURE. 1) Start the engine and warm-up completely. 2) Measure the engine coolant temperature using the Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, 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) or higher?	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-31, Mass Air Flow and Intake Air Temperature Sensor.>	Check DTC P0125 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-76, List of Diagnostic Trouble Code (DTC).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Q: DTC P0112 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT LOW

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-38, DTC P0112 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

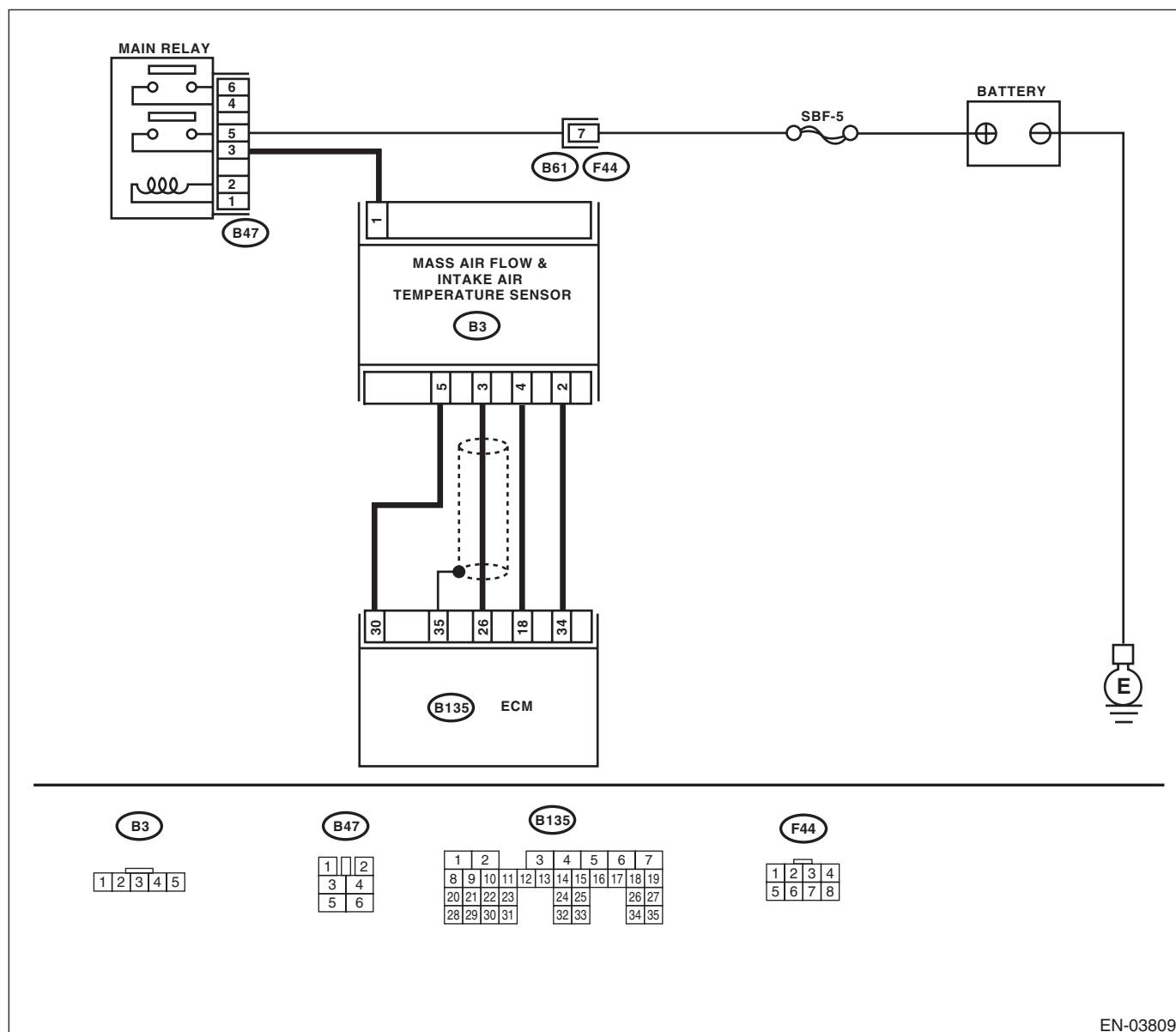
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-03809

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 general scan tool. NOTE: - Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> - General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the intake air temperature 120°C (248°F) or higher?	Go to step 2.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. Reproduce the fault condition, and reperform the check. NOTE: In this case, there may be a temporary connector contact failure.
2 CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR CONNECTORS. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the ECM and the mass air flow and intake air temperature sensor. 3) Measure the resistance between ECM and chassis ground. Connector & terminal (B135) No. 18 — Chassis ground:	Is the resistance 1 MΩ or more?	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-31, Mass Air Flow and Intake Air Temperature Sensor.>	Repair the short circuit to ground in harness between the ECM and the mass air flow and intake air temperature sensor.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

R: DTC P0113 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT HIGH

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-40, DTC P0113 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

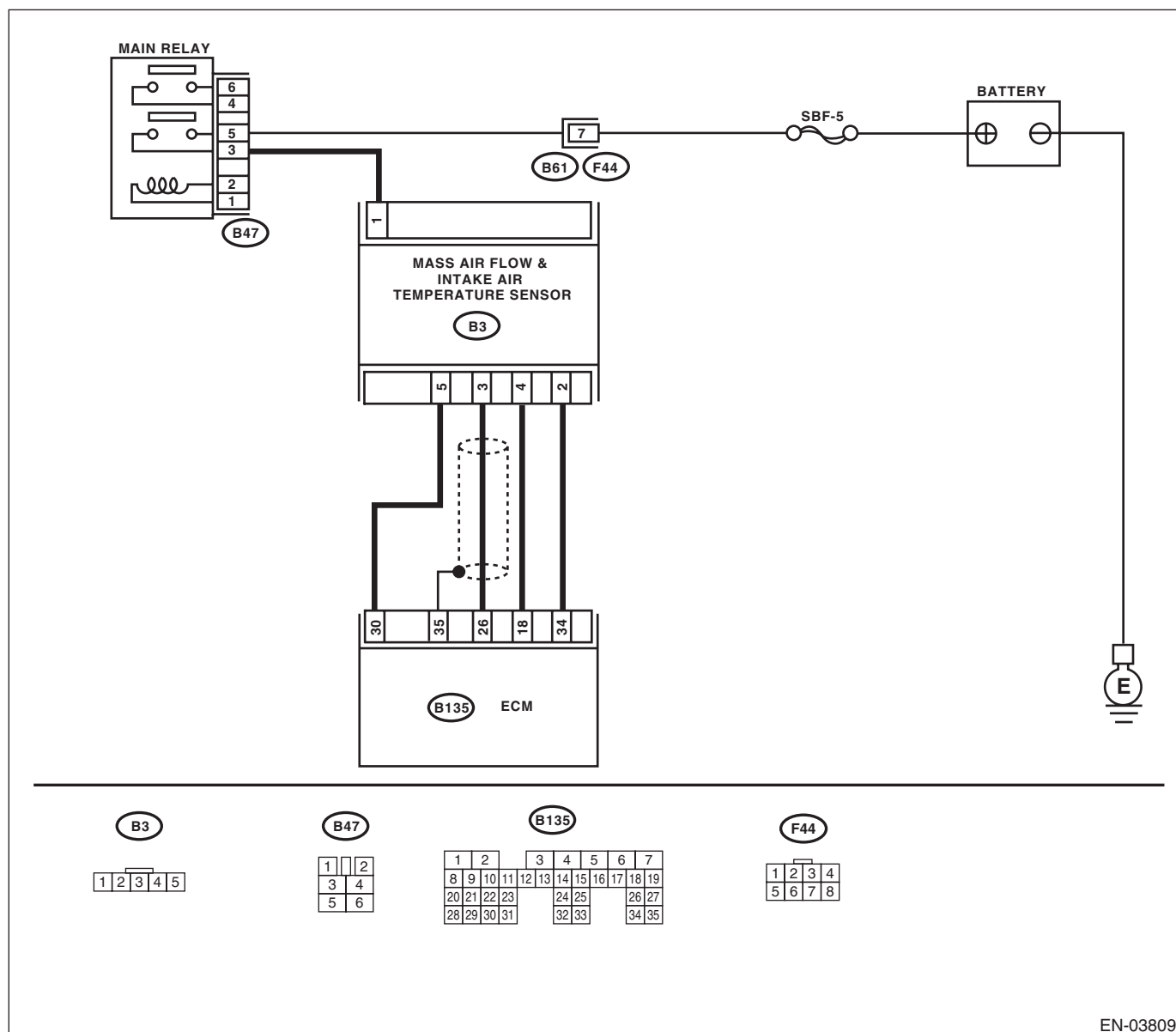
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-03809

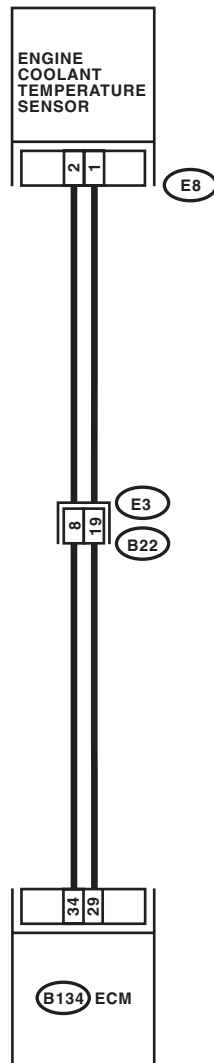
Diagnostic Procedure with Diagnostic Trouble Code (DTC)

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 general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the intake air temperature less than -40°C (-40°F) ?	Go to step 2.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. Reproduce the fault condition, and reperform the check. NOTE: In this case, there may be a temporary connector contact failure.
2 CHECK POOR CONTACT. Check for poor contact in the ECM or the mass air flow and intake air temperature sensor connector.	Is there poor contact in the ECM or the mass air flow and intake air temperature sensor connectors?	Repair the poor contact in the ECM or the mass air flow and intake air temperature sensor connectors.	Go to step 3.
3 CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR CONNECTORS. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the ECM and the mass air flow and intake air temperature sensor. 3) Measure the resistance of harness between ECM and the mass air flow and intake air temperature sensor connectors. Connector & terminal (B135) No. 18 — (B3) No. 4: (B135) No. 30 — (B3) No. 5:	Is the resistance less than $1\ \Omega$?	Go to step 4.	Repair the open circuit of harness between the ECM and the mass air flow and intake air temperature sensor connectors.
4 CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR CONNECTORS. 1) Connect all connectors. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM and chassis ground. Connector & terminal (B135) No. 18 (+) — Chassis ground (-):	Is the voltage 5 V or more?	Repair the short circuit to power in the harness between the ECM and the mass air flow and intake air temperature sensor connector.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-31, Mass Air Flow and Intake Air Temperature Sensor.>

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



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



The diagram shows a 3x11 grid of numbered boxes. The top section is a 3x11 grid with numbers 1 to 33. The bottom section is a 3x11 grid with numbers 34 to 54. The bottom grid has some cells crossed out: 36, 44, 46, and 52.

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

34	35	36	37	38	39	40	41
42	43	44	45	46	47		
48	49	50	51	52	53	54	

EN(H4DOTC)(diag)-116

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 "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> - General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the engine coolant temperature 150°C (302°F) or higher?	Go to step 2.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. Reproduce the fault condition, and reperform the check. NOTE: In this case, there may be a temporary connector contact failure.
2 CHECK HARNESS BETWEEN ECM AND ENGINE COOLANT TEMPERATURE SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM and engine coolant temperature sensor. 3) Measure the resistance between ECM and chassis ground. Connector & terminal (B134) No. 34 — Chassis ground:	Is the resistance 1 MΩ or more?	Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC)-26, Engine Coolant Temperature Sensor.>	Repair the ground short circuit of the harness between the ECM and engine coolant temperature sensor.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

T: DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-44, DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

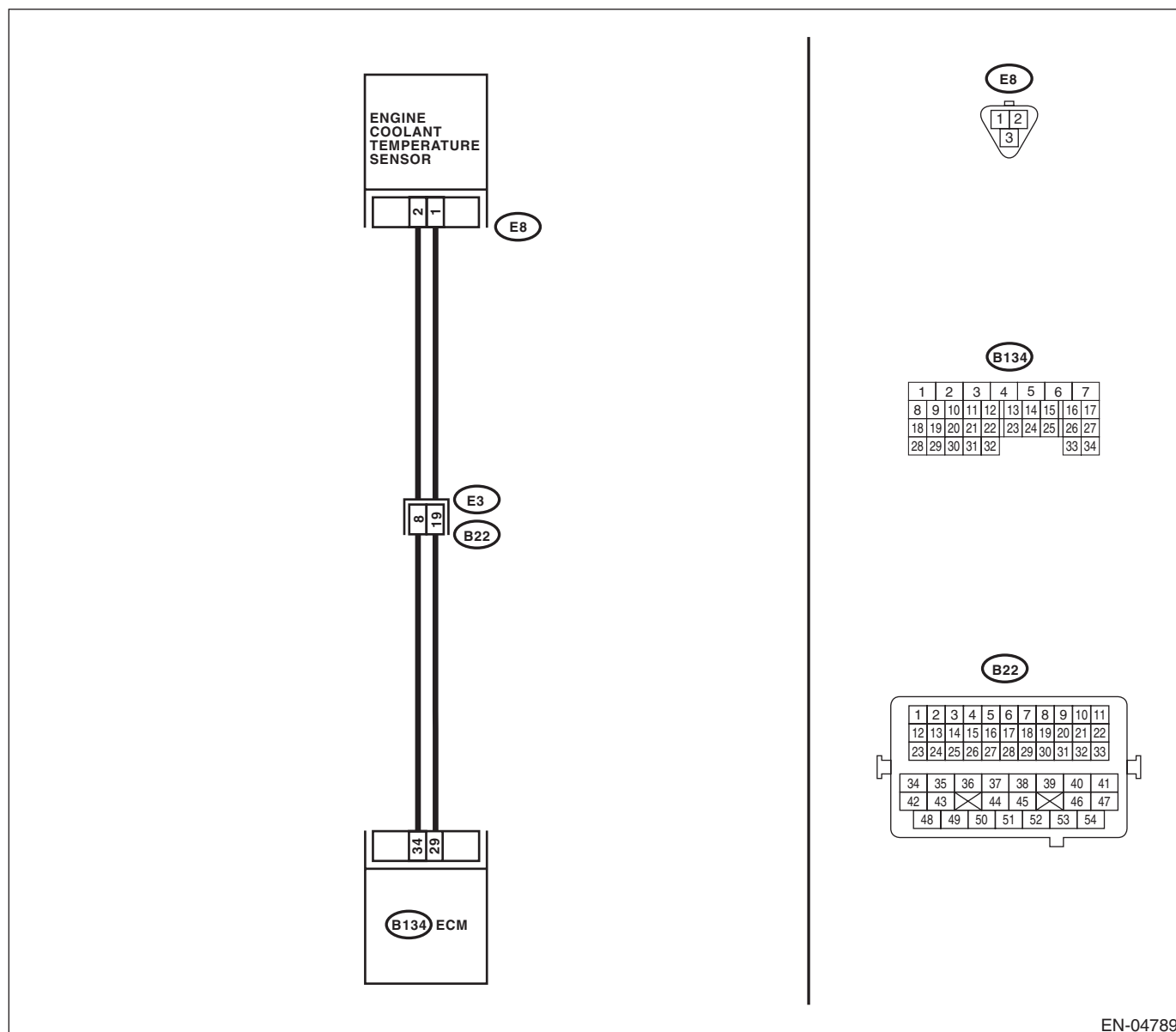
TROUBLE SYMPTOM:

- Hard to start
- Improper idling
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04789

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 "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the engine coolant temperature less than -40°C (-40°F) ?	Go to step 2.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. Reproduce the fault condition, and reperform the check. NOTE: In this case, there may be a temporary connector contact failure.
2 CHECK POOR CONTACT. Repair any poor contact between the ECM and engine coolant temperature sensor connectors.	Is there poor contact in the ECM or engine coolant temperature sensor connector?	Repair any poor contact between the ECM and engine coolant temperature sensor connectors.	Go to step 3.
3 CHECK HARNESS BETWEEN ECM AND ENGINE COOLANT TEMPERATURE SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM and engine coolant temperature sensor. 3) Measure the resistance of the harness between the ECM and engine coolant temperature sensor connector. Connector & terminal (B134) No. 29 — (E8) No. 1: (B134) No. 34 — (E8) No. 2:	Is the resistance less than $1\ \Omega$?	Go to step 4.	Repair the open circuit of the harness between the ECM and engine coolant temperature sensor connector.
4 CHECK HARNESS BETWEEN ECM AND ENGINE COOLANT TEMPERATURE SENSOR CONNECTOR. 1) Connect all connectors. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM and chassis ground. Connector & terminal (B134) No. 34 (+) — Chassis ground (-):	Is the voltage 5 V or more?	Repair the short circuit to power in the harness between the ECM and engine coolant temperature sensor connector.	Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC)-26, Engine Coolant Temperature Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-46, DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

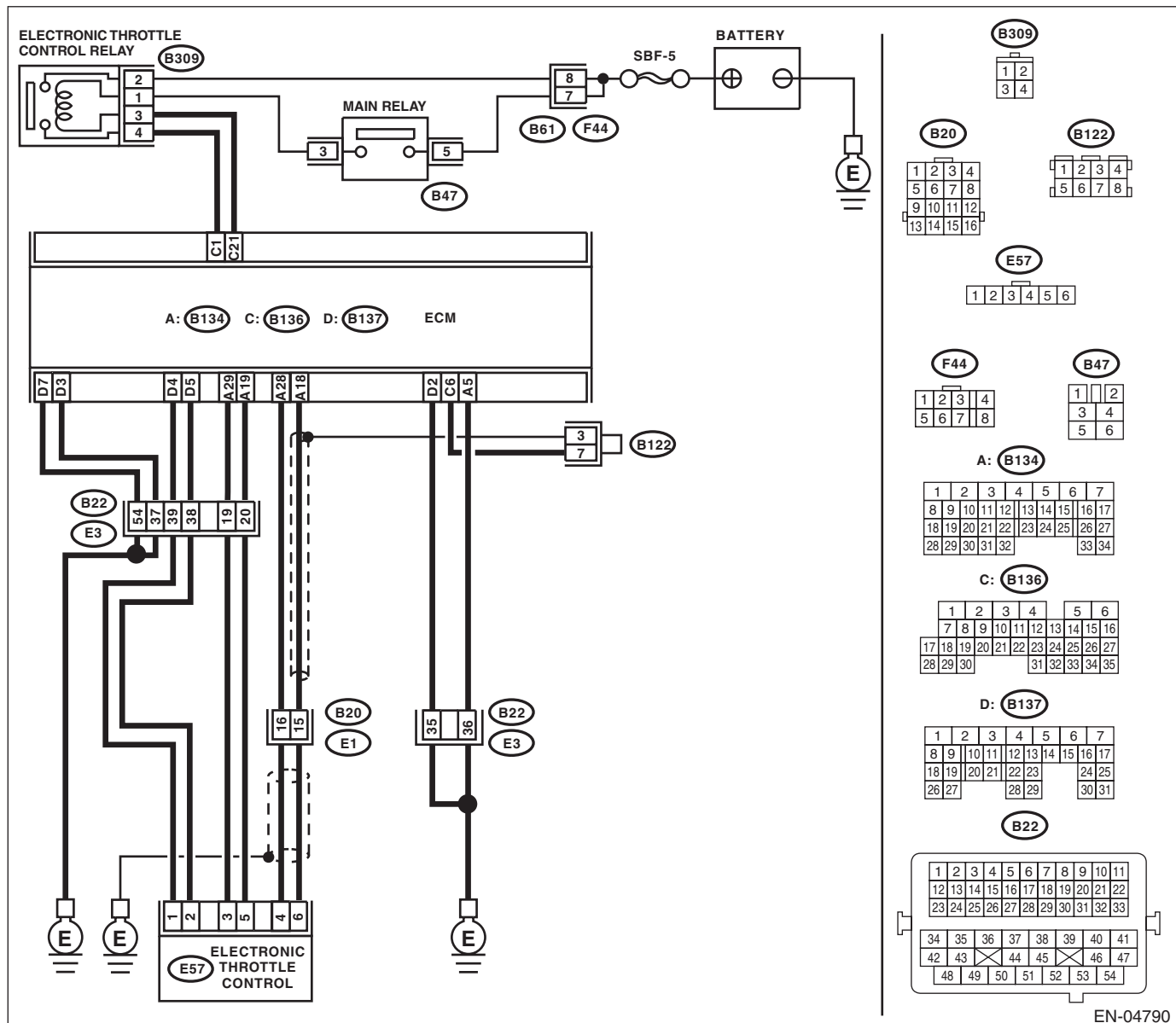
TROUBLE SYMPTOM:

- Improper idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04790

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and electronic throttle control. 3) Measure the resistance between ECM and chassis ground. Connector & terminal (B134) No. 19 — Chassis ground: (B134) No. 18 — Chassis ground: (B134) No. 18 — (B136) No. 6:	Is the resistance 1 MΩ or more?	Go to step 2.	Repair the ground short circuit of harness between ECM and electronic throttle control connector.
2 CHECK SHORT CIRCUIT INSIDE THE ECM. 1) Connect the ECM. 2) Measure the resistance between electronic throttle control connector and engine ground. Connector & terminal (E57) No. 6 — Engine ground:	Is the resistance 1 MΩ or more?	Replace the electronic throttle control. <Ref. to FU(H4DOTC)-13, Throttle Body.>	Repair the ground short circuit of harness between ECM and electronic throttle control connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-46, Engine Control Module (ECM).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

V: DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT HIGH

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-48, DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

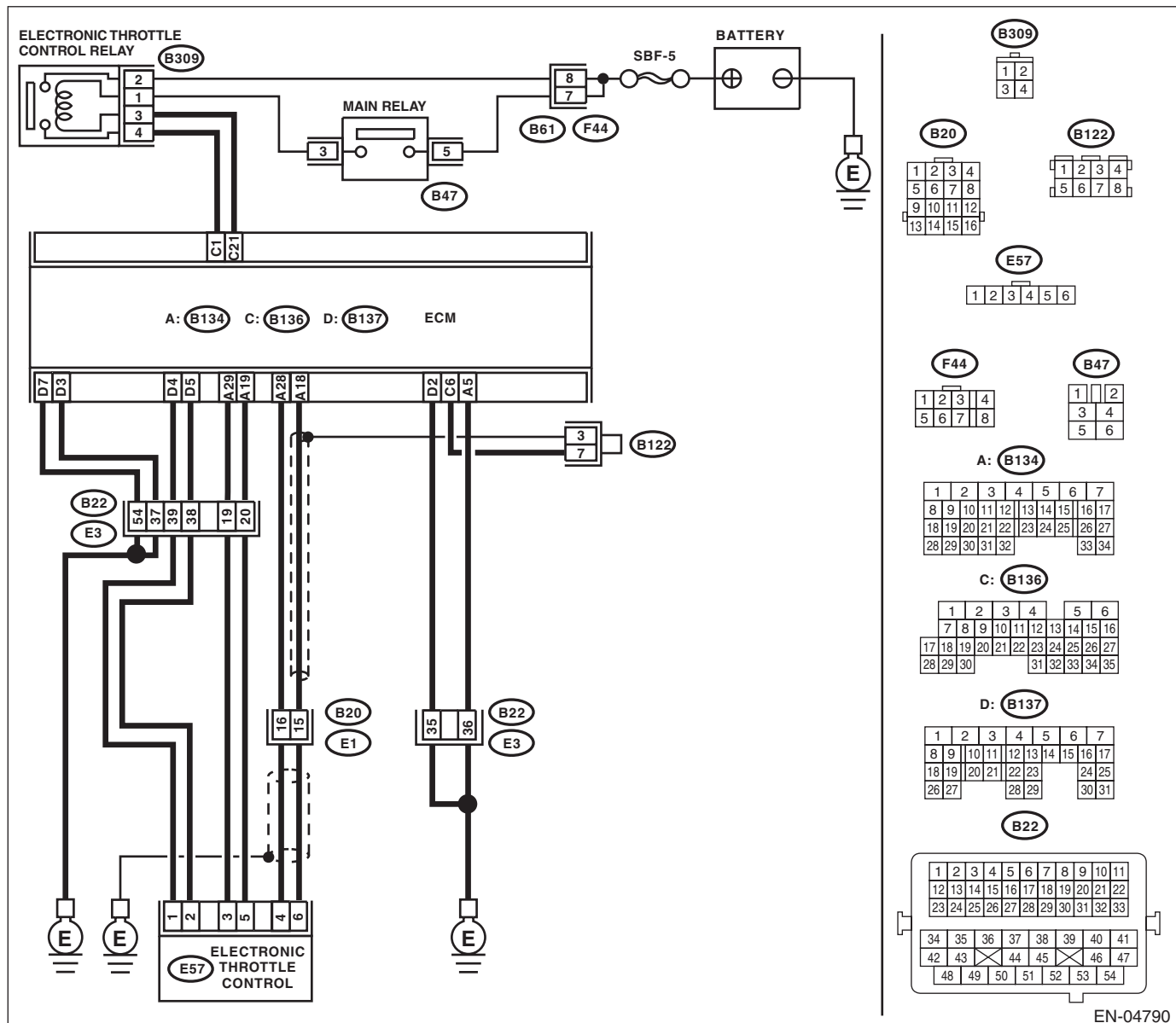
TROUBLE SYMPTOM:

- Improper idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04790

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and electronic throttle control. 3) Measure the resistance of harness between ECM and electronic throttle control connector. Connector & terminal (B134) No. 18 — (E57) No. 6: (B134) No. 29 — (E57) No. 3:	Is the resistance less than 1 Ω ?	Go to step 2.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and electronic throttle control connector • Poor contact of coupling connector
2 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Connect the ECM. 2) Measure the resistance between electronic throttle control connector and engine ground. Connector & terminal (E57) No. 3 — Engine ground:	Is the resistance less than 5 Ω ?	Go to step 3.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and engine ground • Poor contact in ECM connector • Poor contact of coupling connector
3 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. 6 (+) — Engine ground (-):	Is the voltage 4.85 V or more?	Repair the short circuit to power in the harness between ECM and electronic throttle control connector.	Go to step 4.
4 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance between ECM connectors. Connector & terminal (B134) No. 19 — (B134) No. 18:	Is the resistance 1 M Ω or more?	Repair the poor contact of electronic throttle control connector. Replace the electronic throttle control if defective. <Ref. to FU(H4DOTC)-13, Throttle Body.>	Repair the short circuit to power in the harness between ECM and electronic throttle control connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

W: DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-50, DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

Engine does not return to idle.

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

Step	Check	Yes	No
1 CHECK TIRE SIZE.	Do the four tires have the specified size and the same size?	Go to step 2.	Replace the tire.
2 CHECK ENGINE COOLANT. Check the following items: • Amount of engine coolant • Engine coolant freeze • Contamination of engine coolant	Is the engine coolant normal?	Go to step 3.	Fill or replace the engine coolant. <Ref. to CO(H4SO)-18, INSPECTION, Engine Coolant.>
3 CHECK THERMOSTAT.	Does the thermostat remain opened?	Replace the thermostat. <Ref. to CO(H4SO)-23, Thermostat.>	Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC)-26, Engine Coolant Temperature Sensor.>

X: DTC P0126 INSUFFICIENT ENGINE COOLANT TEMPERATURE FOR STABLE OPERATION**DTC DETECTING CONDITION:**

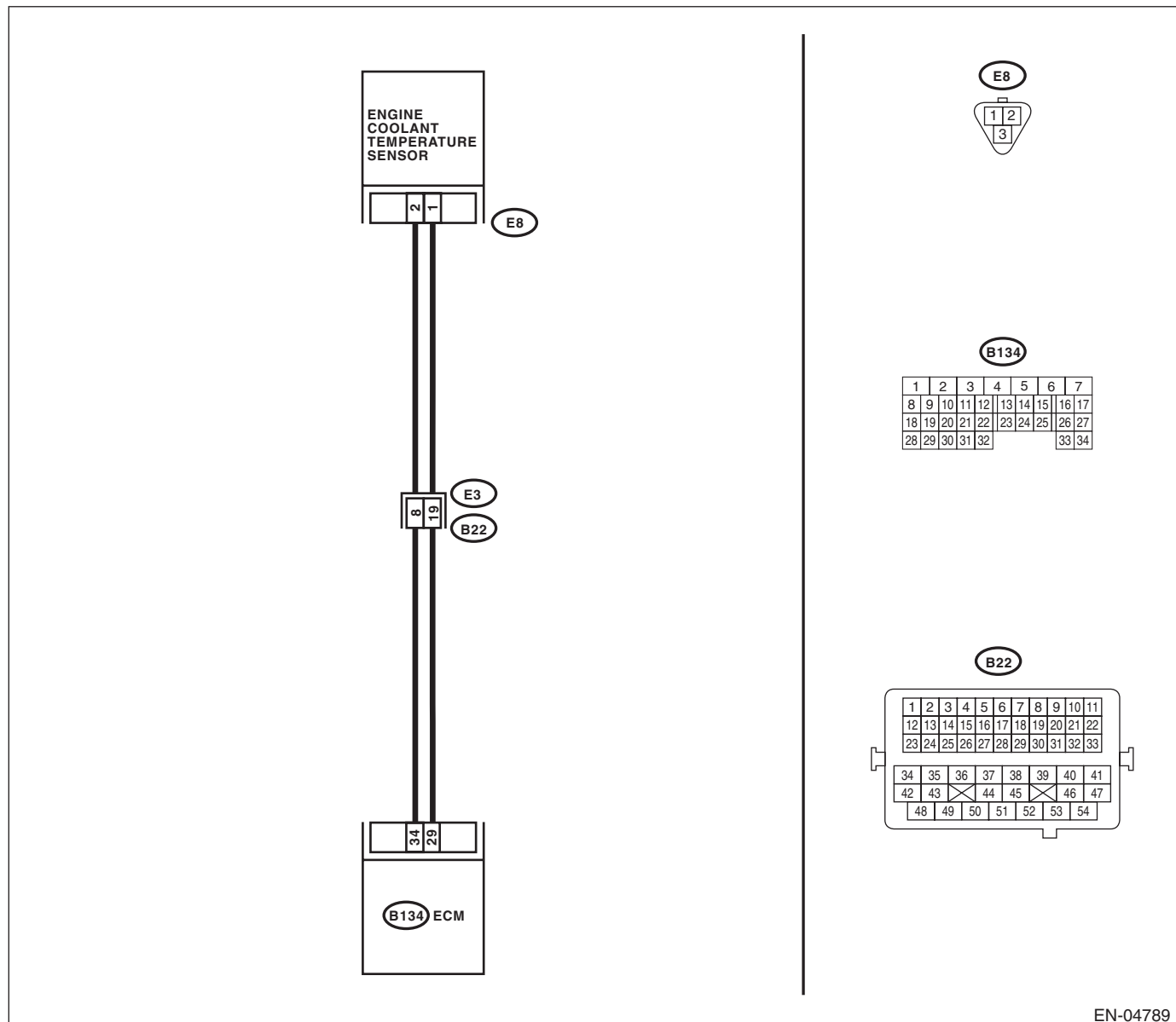
- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-53, DTC P0126 INSUFFICIENT ENGINE COOLANT TEMPERATURE FOR STABLE OPERATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Hard to start
- Erroneous idling
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:

EN-04789

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step		Check	Yes	No
1	CHECK ENGINE COOLANT TEMPERATURE SENSOR. Measure the resistance between engine coolant temperature sensor terminals when the engine coolant is cold and after warmed-up. Terminals No. 1 — No. 2:	Is the resistance of engine coolant temperature sensor different between when engine coolant is cold and after warmed-up?	Repair the poor contact of the ECM connector.	Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC)-26, Engine Coolant Temperature Sensor.>

Y: DTC P0128 COOLANT THERMOSTAT (ENGINE COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE)**DTC DETECTING CONDITION:**

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-55, DTC P0128 COOLANT THERMOSTAT (ENGINE COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

Thermostat remains open.

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

Step	Check	Yes	No
1 CHECK ENGINE COOLANT.	Are the coolant level and mixture ratio of engine coolant to anti-freeze solution correct?	Go to step 2.	Replace the engine coolant. <Ref. to CO(H4SO)-17, REPLACEMENT, Engine Coolant.>
2 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)-32, Radiator Main Fan and Fan Motor.>and <Ref. to CO(H4SO)-38, Radiator Sub Fan and Fan Motor.>	Replace the thermostat. <Ref. to CO(H4SO)-23, Thermostat.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

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

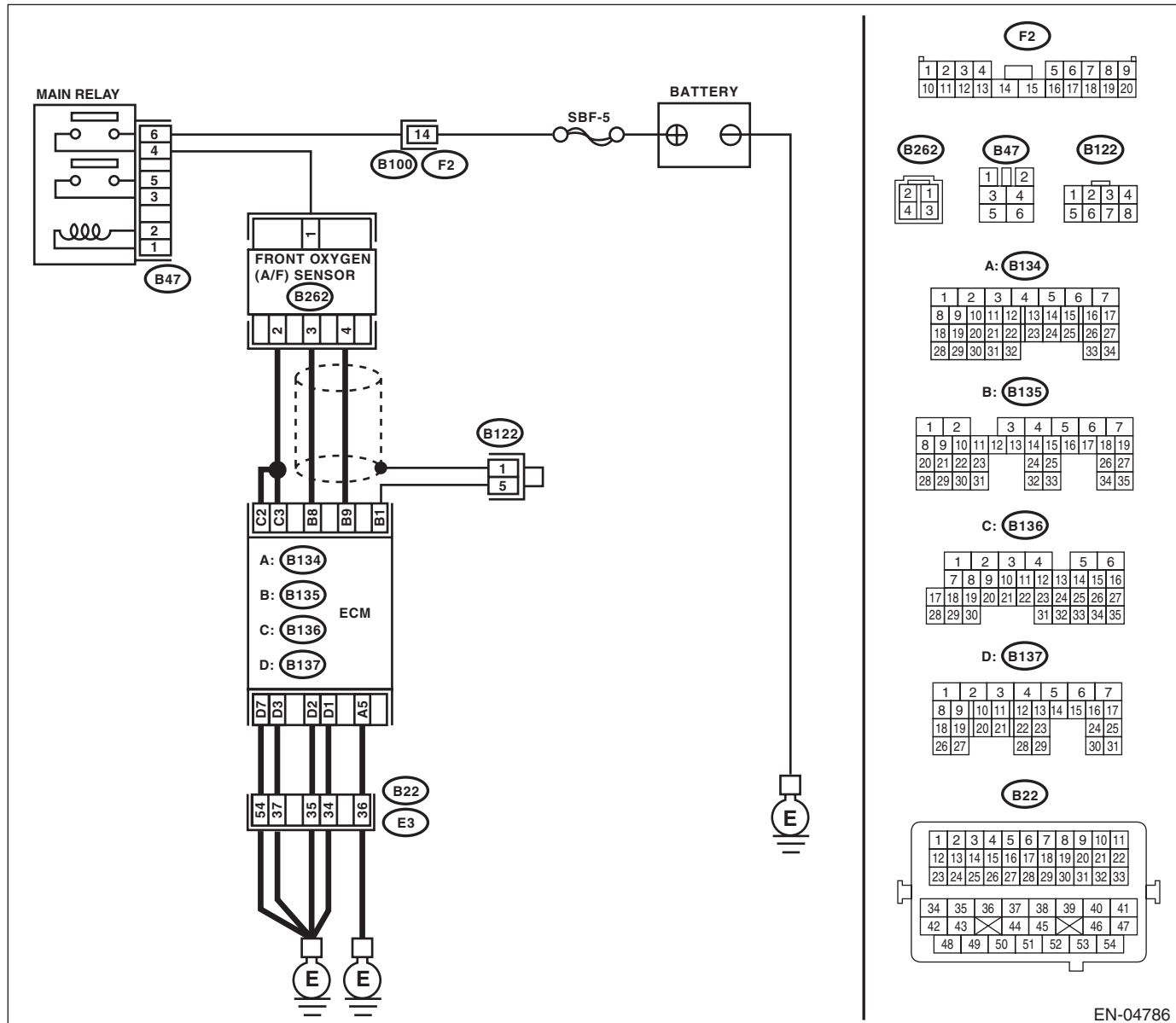
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-57, DTC P0131 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04786

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.	Has water entered the connector?	Completely remove any water inside.	Go to step 2.
2	CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM and front oxygen (A/F) sensor. 3) Measure the resistance between ECM and chassis ground. Connector & terminal (B135) No. 9 — Chassis ground: (B135) No. 8 — Chassis ground:	Is the resistance 1 MΩ or more?	Go to step 3.	Repair the ground short circuit of harness between ECM and front oxygen (A/F) sensor connector.
3	CHECK POOR CONTACT. Check poor contact of front oxygen (A/F) sensor connector.	Is there poor contact in front oxygen (A/F) sensor connector?	Repair the poor contact of the front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-42, Front Oxygen (A/F) Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

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

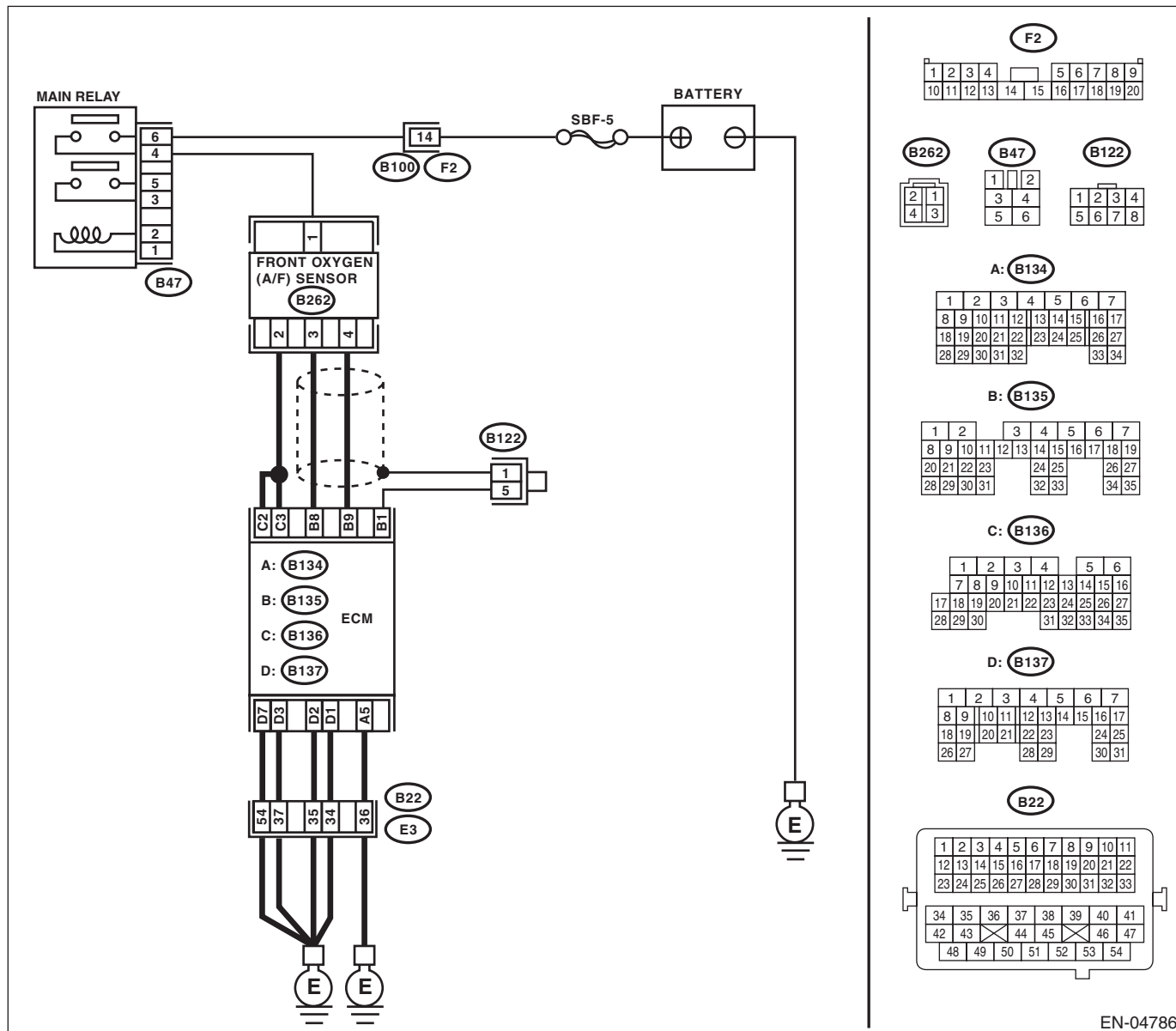
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-59, DTC P0132 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04786

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step		Check	Yes	No
1	CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.	Has water entered the connector?	Completely remove any water inside.	Go to step 2.
2	CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from front oxygen (A/F) sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. Connector & terminal (B135) No. 9 (+) — Chassis ground (-): (B135) No. 8 (+) — Chassis ground (-):	Is the voltage 8 V or more?	Repair the short to power supply in the harness between ECM and front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-42, Front Oxygen (A/F) Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

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

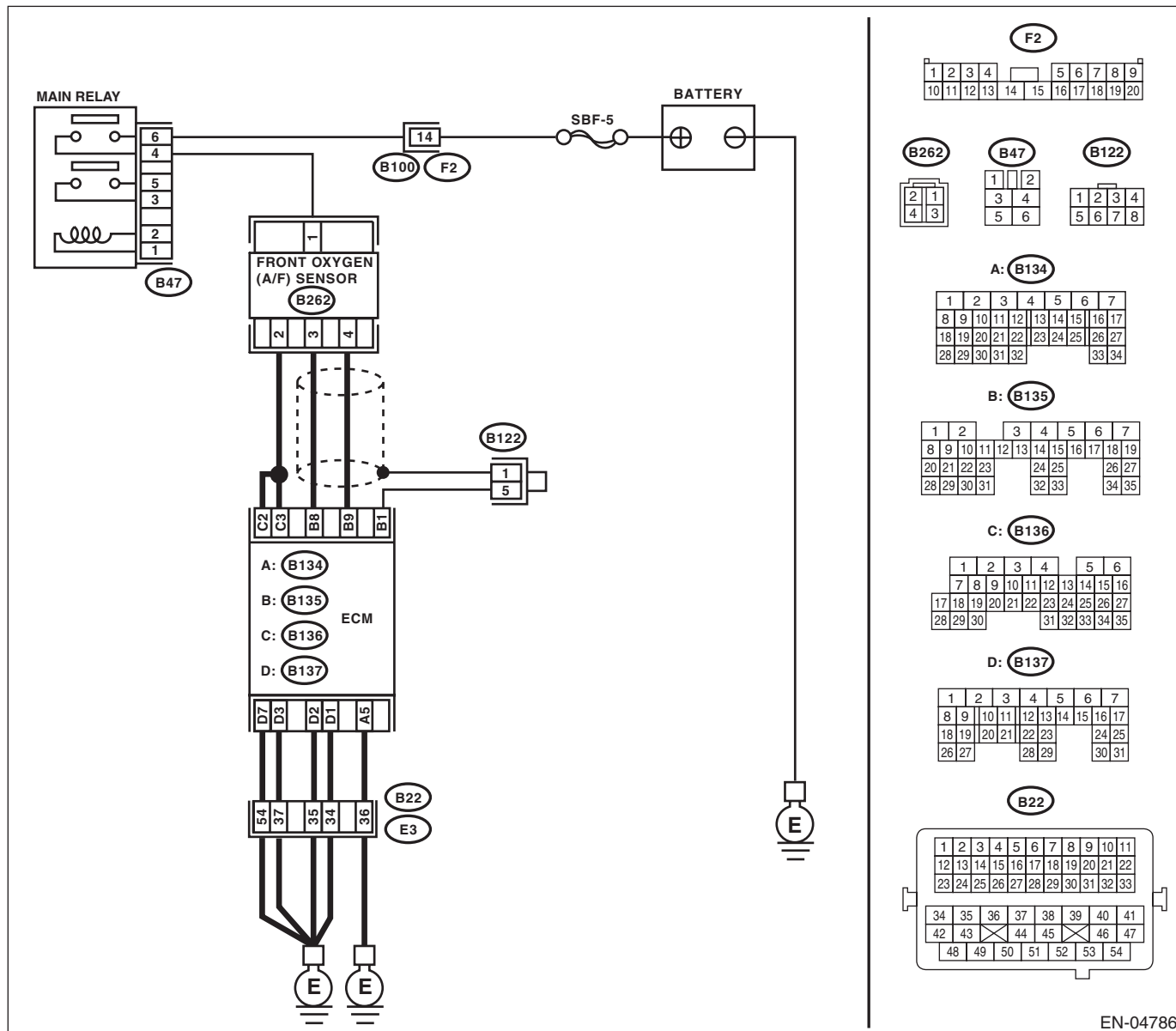
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-61, DTC P0133 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04786

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step		Check	Yes	No
1	CHECK EXHAUST SYSTEM. NOTE: Check the following items. • Loose installation of front portion of exhaust pipe onto cylinder heads • Loose connection between front exhaust pipe and front catalytic converter • Damage of exhaust pipe resulting in a hole	Is there any fault in exhaust system?	Repair the exhaust system.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-42, Front Oxygen (A/F) Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

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

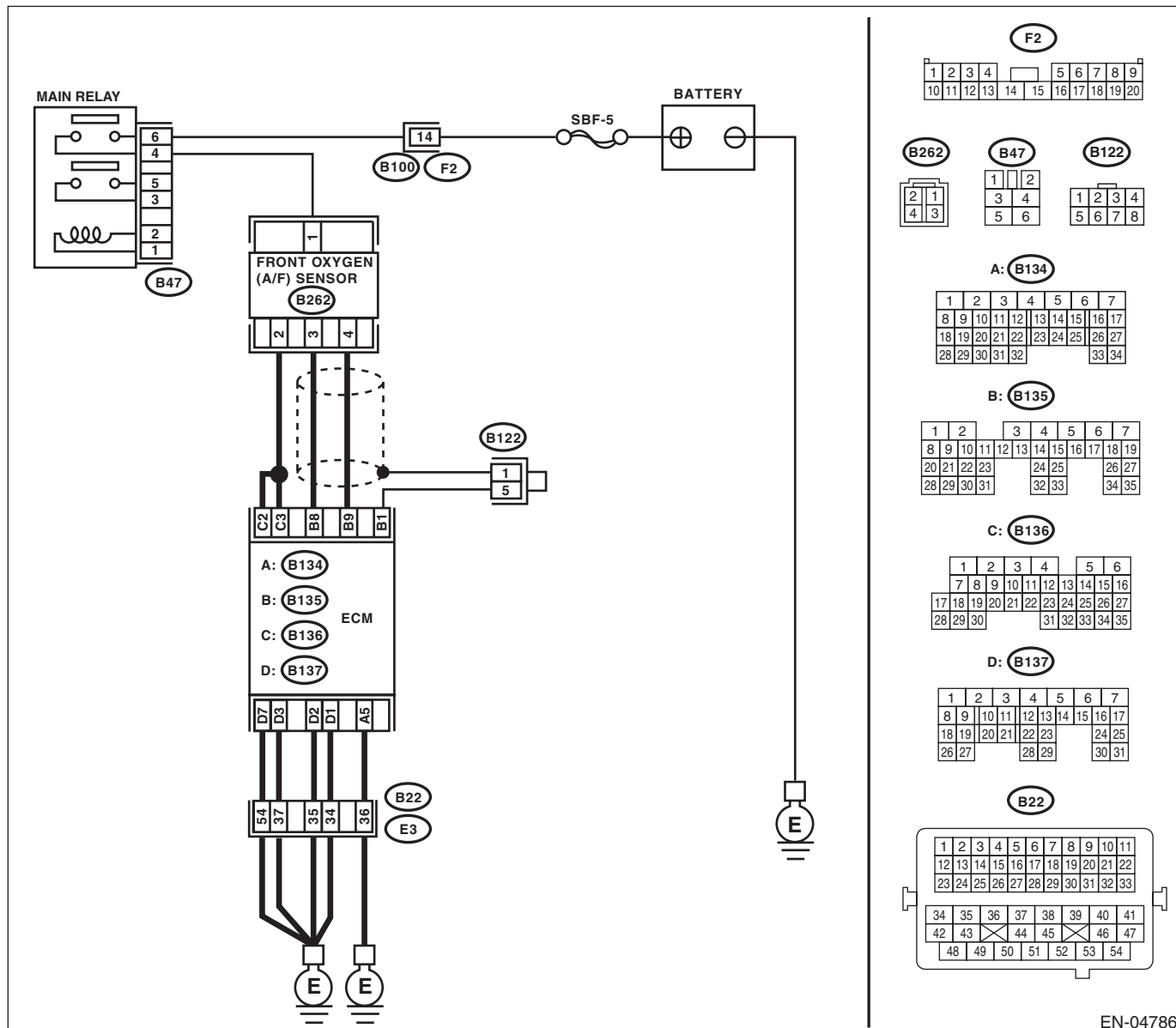
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-64, DTC P0134 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



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 the ECM and front oxygen (A/F) sensor. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. Connector & terminal (B135) No. 9 — (B262) No. 4: (B135) No. 8 — (B262) No. 3:	Is the resistance less than 1 Ω ?	Go to step 2.	Repair the open circuit of harness between ECM and front oxygen (A/F) sensor connector.
2	CHECK POOR CONTACT. Check poor contact of ECM and front oxygen (A/F) sensor connector.	Is there poor contact in ECM or front oxygen (A/F) sensor connector?	Repair the poor contact of ECM or front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-42, Front Oxygen (A/F) Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

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

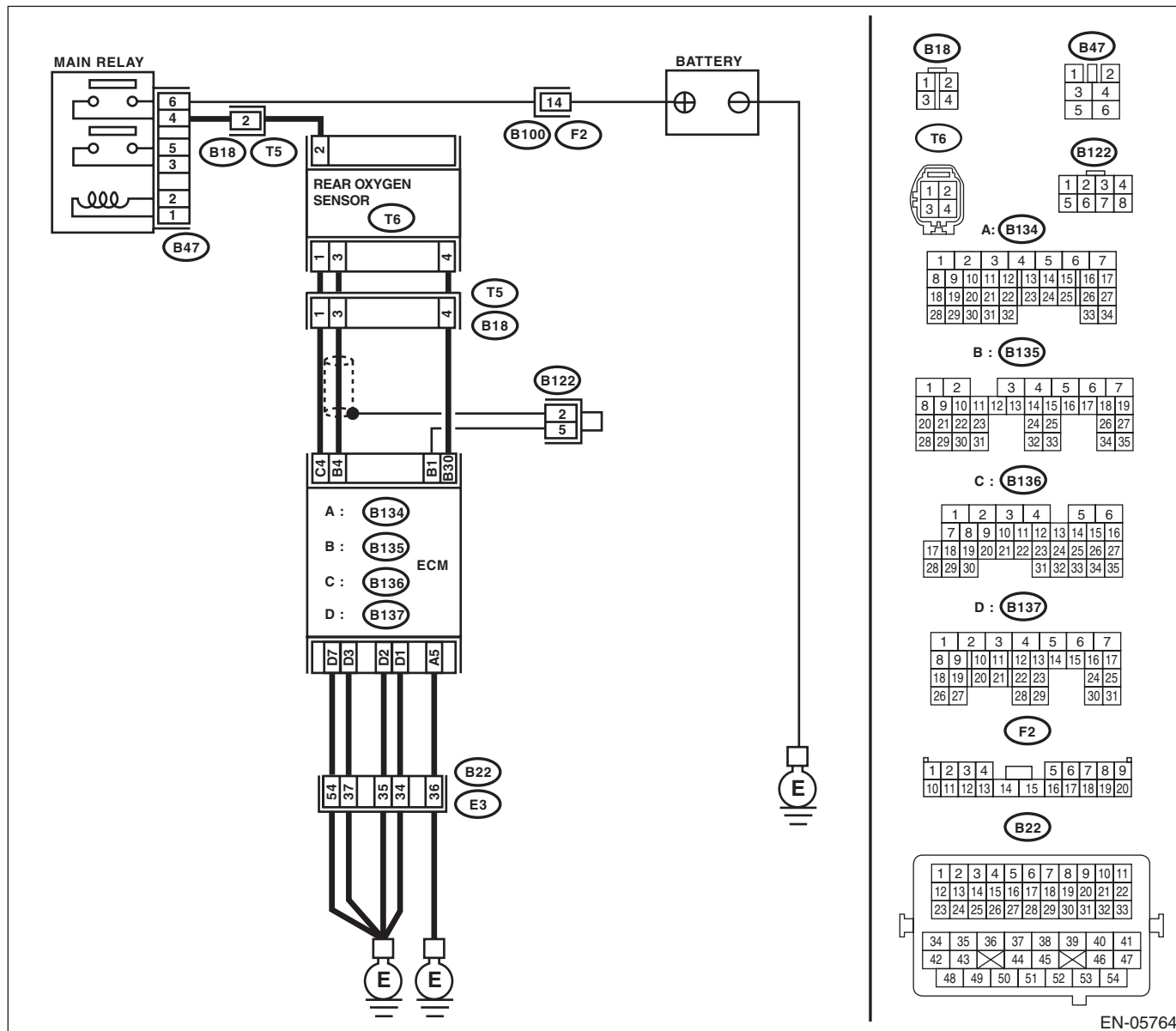
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-66, DTC P0137 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-05764

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK REAR OXYGEN SENSOR DATA. 1) Warm-up the engine until engine coolant temperature is higher than 75°C (167°F), and keep the engine speed at 3,000 rpm. (Max. 2 minutes) 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 "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the voltage 490 mV or more?	Go to step 5.	Go to step 2.
2 CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.	Has water entered the connector?	Completely remove any water inside.	Go to step 3.
3 CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. Connector & terminal (B135) No. 4 — (T6) No. 3: (B135) No. 30 — (T6) No. 4:	Is the resistance less than 1 Ω?	Go to step 4.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between the ECM and rear oxygen sensor connector • Poor contact of coupling connector
4 CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the rear oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between rear oxygen sensor connector and chassis ground. Connector & terminal (T6) No. 3 (+) — Chassis ground (-):	Is the voltage 0.2 — 0.5 V?	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-44, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between the ECM and rear oxygen sensor • Poor contact of the rear oxygen sensor connector • Poor contact in ECM connector • Poor contact of coupling connector
5 CHECK EXHAUST SYSTEM. Check exhaust system parts. NOTE: Check the following items. • Looseness and improper attachment of exhaust system parts • Damage (crack, hole etc.) of parts • Looseness and improper attachment of parts between front oxygen (A/F) sensor and rear oxygen sensor	Is there any fault in exhaust system?	Repair or replace faulty parts.	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-44, Rear Oxygen Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

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

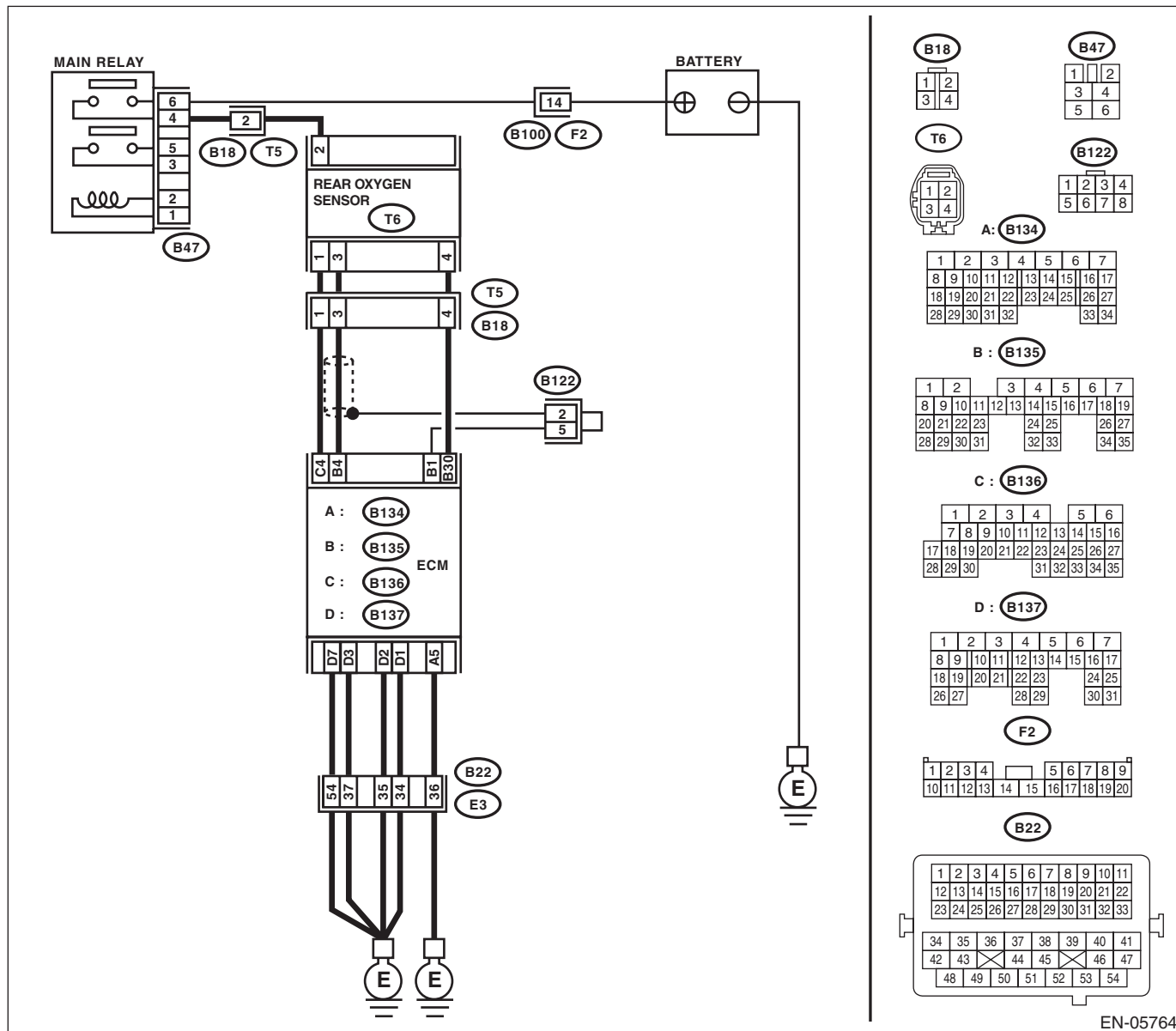
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-68, DTC P0138 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK REAR OXYGEN SENSOR DATA. 1) Warm-up the engine until engine coolant temperature is higher than 75°C (167°F), and rapidly reduce the engine speed from 3,000 rpm. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: - Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> - General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the voltage 250 mV or less?	Go to step 5.	Go to step 2.
2 CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.	Has water entered the connector?	Completely remove any water inside.	Go to step 3.
3 CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. Connector & terminal (B135) No. 4 — (T6) No. 3: (B135) No. 30 — (T6) No. 4:	Is the resistance less than 1 Ω?	Go to step 4.	Repair the harness and connector. NOTE: In this case, repair the following item: - Open circuit in harness between the ECM and rear oxygen sensor connector - Poor contact of coupling connector
4 CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the rear oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between rear oxygen sensor connector and chassis ground. Connector & terminal (T6) No. 3 (+) — Chassis ground (-):	Is the voltage 0.2 — 0.5 V?	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-44, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following item: - Open circuit of harness between the ECM and rear oxygen sensor - Poor contact of the rear oxygen sensor connector - Poor contact in ECM connector - Poor contact of coupling connector
5 CHECK EXHAUST SYSTEM. Check exhaust system parts. NOTE: Check the following items. - Looseness and improper attachment of exhaust system parts - Damage (crack, hole etc.) of parts - Looseness and improper attachment of parts between front oxygen (A/F) sensor and rear oxygen sensor	Is there any fault in exhaust system?	Repair or replace faulty parts.	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-44, Rear Oxygen Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

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

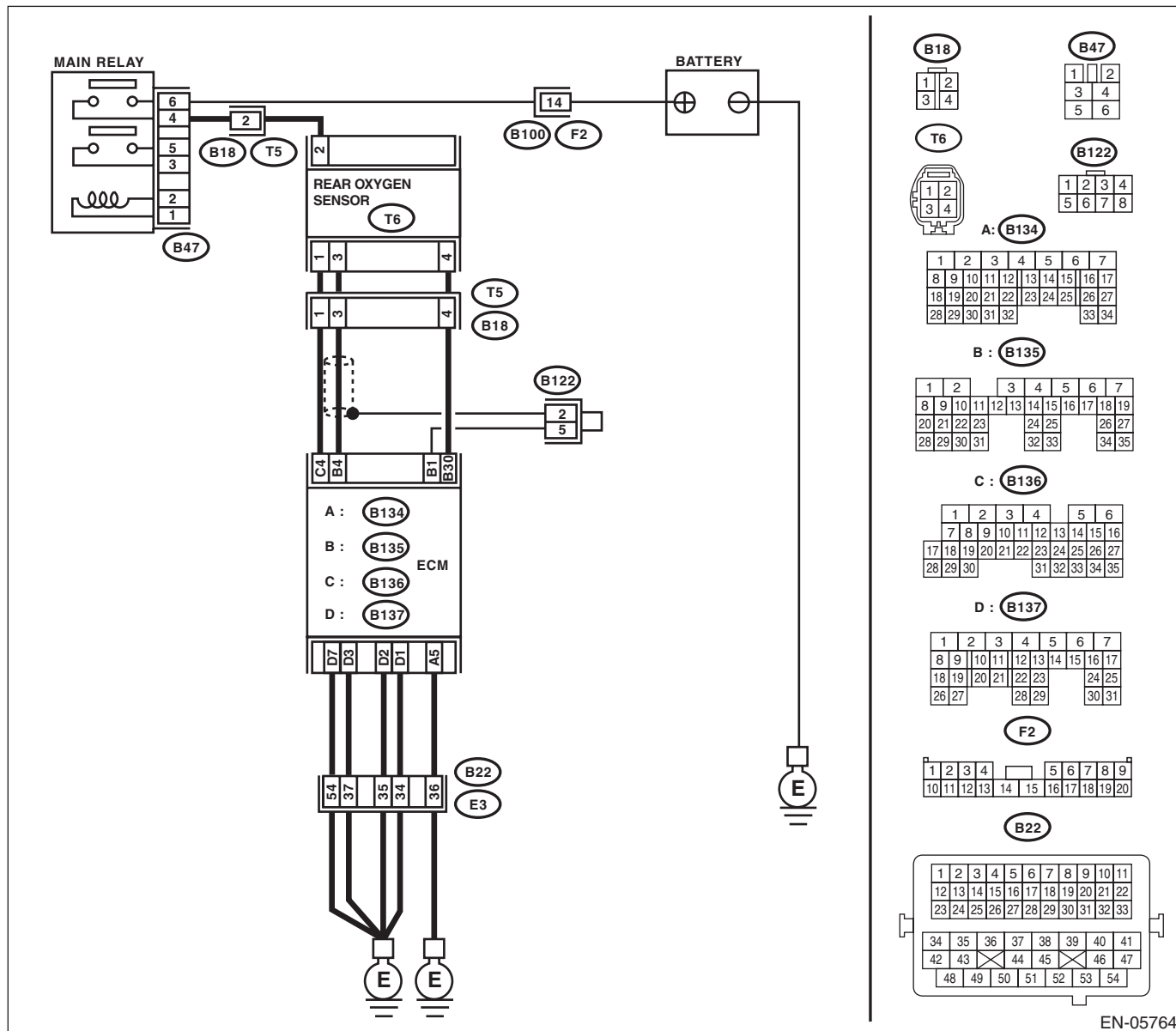
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-69, DTC P0139 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-05764

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. Connector & terminal (B135) No. 4 — (T6) No. 3:	Is the resistance less than 1 Ω ?	Go to step 2.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between the ECM and rear oxygen sensor connector • Poor contact of coupling connector
2 CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR. Measure the resistance between rear oxygen sensor connector and chassis ground. Connector & terminal (T6) No. 3 — Chassis ground:	Is the resistance 1 M Ω or more?	Go to step 3.	Repair the ground short circuit of harness between ECM and rear oxygen sensor connector.
3 CHECK REAR OXYGEN SENSOR. Measure the resistance between rear oxygen sensor terminals. Terminals No. 3 — No. 4	Is the resistance less than 1 Ω ?	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-44, Rear Oxygen Sensor.>	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. Reproduce the fault condition, and reperform the check. NOTE: In this case, there may be a temporary connector contact failure.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

AG:DTC P0140 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 2)

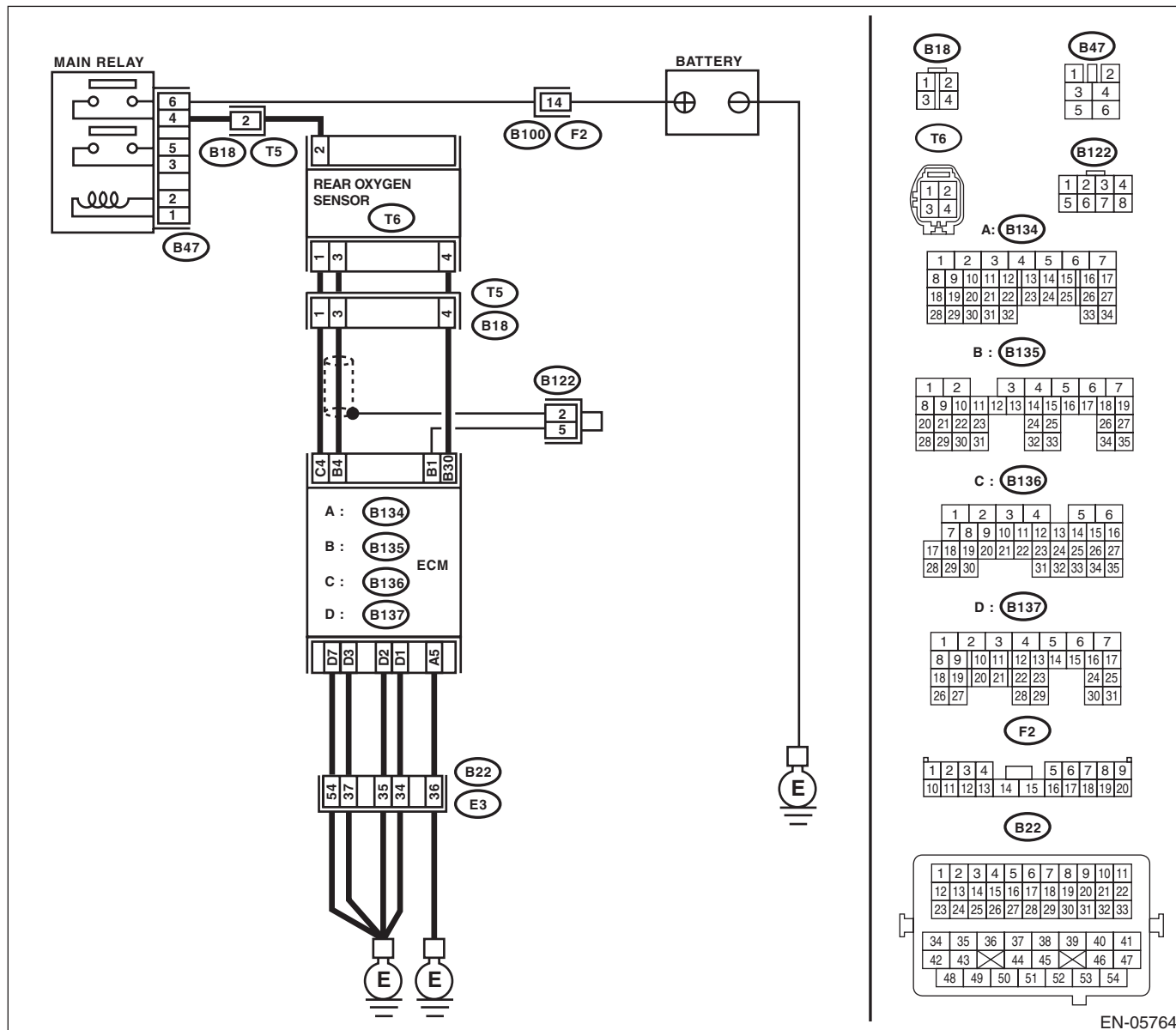
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-74, DTC P0140 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-05764

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK REAR OXYGEN SENSOR DATA. 1) Warm-up the engine until engine coolant temperature is higher than 75°C (167°F), and keep the engine speed at 3,000 rpm. (Max. 2 minutes) 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 "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the voltage 490 mV or more?	Go to step 6.	Go to step 2.
2 CHECK REAR OXYGEN SENSOR DATA. 1) Warm-up the engine until engine coolant temperature is higher than 75°C (167°F), and rapidly reduce the engine speed from 3,000 rpm. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the voltage 250 mV or less?	Go to step 6.	Go to step 3.
3 CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.	Has water entered the connector?	Completely remove any water inside.	Go to step 4.
4 CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. Connector & terminal (B135) No. 4 — (T6) No. 3: (B135) No. 30 — (T6) No. 4:	Is the resistance less than 1 Ω?	Go to step 5.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between the ECM and rear oxygen sensor connector • Poor contact of coupling connector

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
5 CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the rear oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between rear oxygen sensor connector and chassis ground. Connector & terminal (T6) No. 3 (+) — Chassis ground (–):	Is the voltage 0.2 — 0.5 V?	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-44, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between the ECM and rear oxygen sensor • Poor contact of the rear oxygen sensor connector • Poor contact in ECM connector • Poor contact of coupling connector
6 CHECK EXHAUST SYSTEM. Check exhaust system parts. NOTE: Check the following items. • Looseness and improper attachment of exhaust system parts • Damage (crack, hole etc.) of parts • Looseness and improper attachment of parts between front oxygen (A/F) sensor and rear oxygen sensor	Is there any fault in exhaust system?	Repair or replace faulty parts.	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-44, Rear Oxygen Sensor.>

AH:DTC P0171 SYSTEM TOO LEAN (BANK 1)

Refer to DTC P0172 for diagnostic procedure. <Ref. to EN(H4DOTC)(diag)-145, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AI: DTC P0172 SYSTEM TOO RICH (BANK 1)

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-79, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

Step	Check	Yes	No
1 CHECK EXHAUST SYSTEM.	Are there holes or loose bolts on exhaust system?	Repair the exhaust system.	Go to step 2.
2 CHECK AIR INTAKE SYSTEM.	Are there holes, loose bolts or disconnection of hose on air intake system?	Repair the air intake system.	Go to step 3.
3 CHECK FUEL PRESSURE. WARNING: Place "NO OPEN FLAMES" signs near the working area. CAUTION: Be careful not to spill fuel. Measure the fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold. <Ref. to ME(H4DOTC)-26, INSPECTION, Fuel Pressure.> CAUTION: Release fuel pressure before removing the fuel pressure gauge. NOTE: If fuel pressure does not increase, squeeze the fuel return hose 2 to 3 times, then measure fuel pressure again.	Is the measured value 284 — 314 kPa (2.9 — 3.2 kgf/cm ² , 41 — 46 psi)?	Go to step 4.	Repair the following item. Fuel pressure is too high: • Clogged fuel return line or bent hose Fuel pressure is too low: • Improper fuel pump discharge • Clogged fuel supply line
4 CHECK FUEL PRESSURE. After connecting the pressure regulator vacuum hose, measure fuel pressure. <Ref. to ME(H4DOTC)-26, INSPECTION, Fuel Pressure.> CAUTION: Release fuel pressure before removing the fuel pressure gauge. NOTE: • If fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again. • If the measured value at this step is out of specification, check or replace pressure regulator and pressure regulator vacuum hose.	Is the measured value 230 — 260 kPa (2.35 — 2.65 kgf/cm ² , 33 — 38 psi)?	Go to step 5.	Repair the following item. Fuel pressure is too high: • Faulty pressure regulator • Clogged fuel return line or bent hose Fuel pressure is too low: • Faulty pressure regulator • Improper fuel pump discharge • Clogged fuel supply line

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
5 CHECK ENGINE COOLANT TEMPERATURE SENSOR. 1) Start the engine and warm-up completely. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, 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) or higher?	Go to step 6.	Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC)-26, Engine Coolant Temperature Sensor.>
6 CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR. 1) Start the engine and warm-up engine until coolant temperature is higher than 75°C (167°F). 2) For AT models, set the select lever to the "P" or "N" range, and for MT models, place the shift lever in the neutral position. 3) Turn the A/C switch to OFF. 4) Turn all the accessory switches to OFF. 5) Read the data of 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 "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the measured value 2.0 — 5.0 g/s (0.26 — 0.66 lb/m)?	Go to step 7.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-31, 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 higher than 75°C (167°F). 2) For AT models, set the select lever to the “P” or “N” range, and for MT models, place the shift lever in the neutral position. 3) Turn the A/C switch to OFF. 4) Turn all the accessory switches to OFF. 5) Open the front hood. 6) Measure the ambient temperature. 7) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the “General Scan Tool Instruction Manual”.	Subtract the ambient temperature from intake air temperature. Is the obtained value $-10 - 50^{\circ}\text{C}$ ($-18 - 90^{\circ}\text{F}$)?	Repair the poor contact of the ECM connector.	Check the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-31, Mass Air Flow and Intake Air Temperature Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

AJ:DTC P0181 FUEL TEMPERATURE SENSOR “A” CIRCUIT RANGE /PERFORMANCE

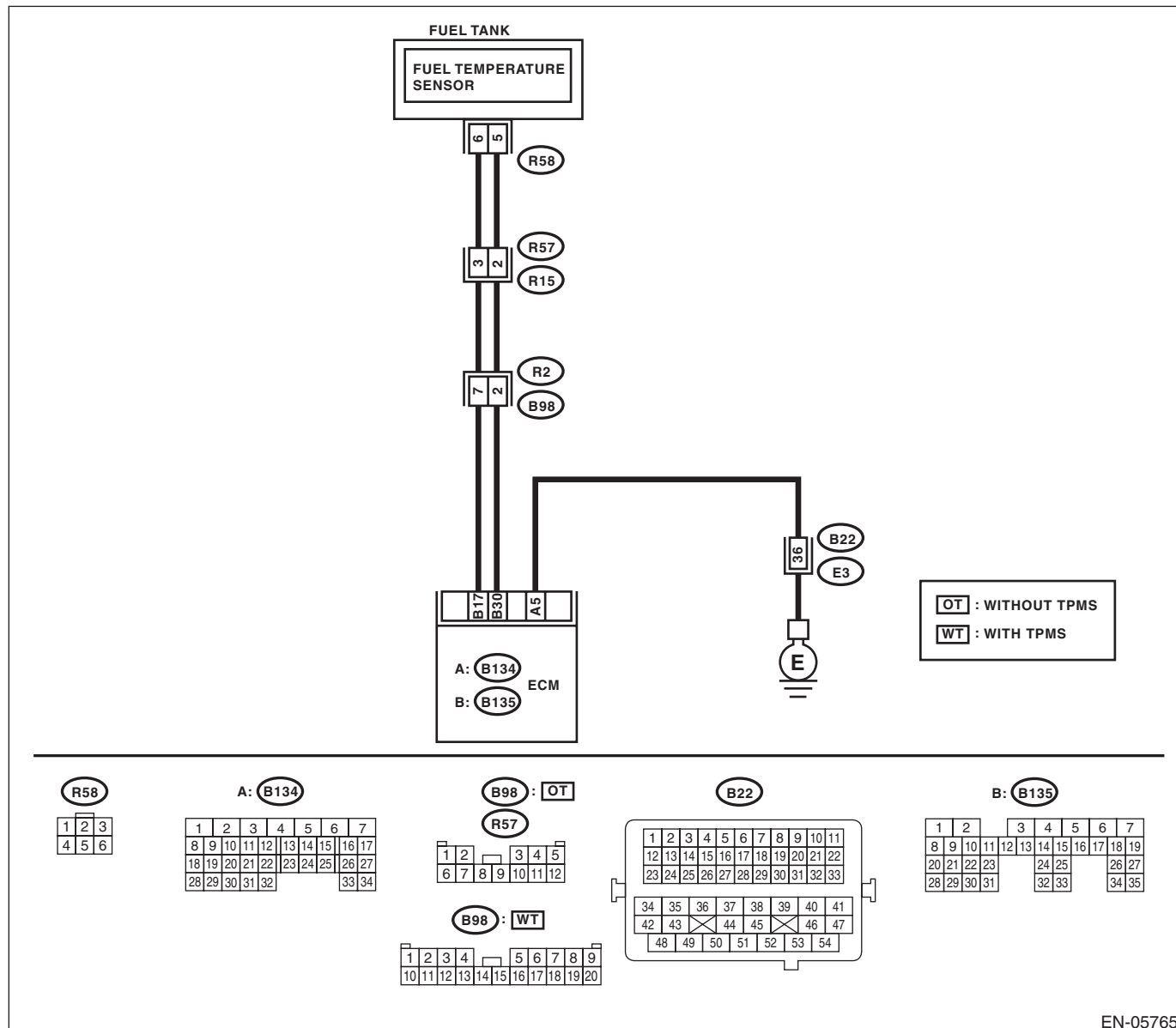
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-82, DTC P0181 FUEL TEMPERATURE SENSOR “A” CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-05765

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?	Check the appropriate DTC using the "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-76, List of Diagnostic Trouble Code (DTC).>	Replace the fuel temperature sensor. <Ref. to EC(H4DOTC)-13, Fuel Temperature Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

AK:DTC P0182 FUEL TEMPERATURE SENSOR “A” CIRCUIT LOW INPUT

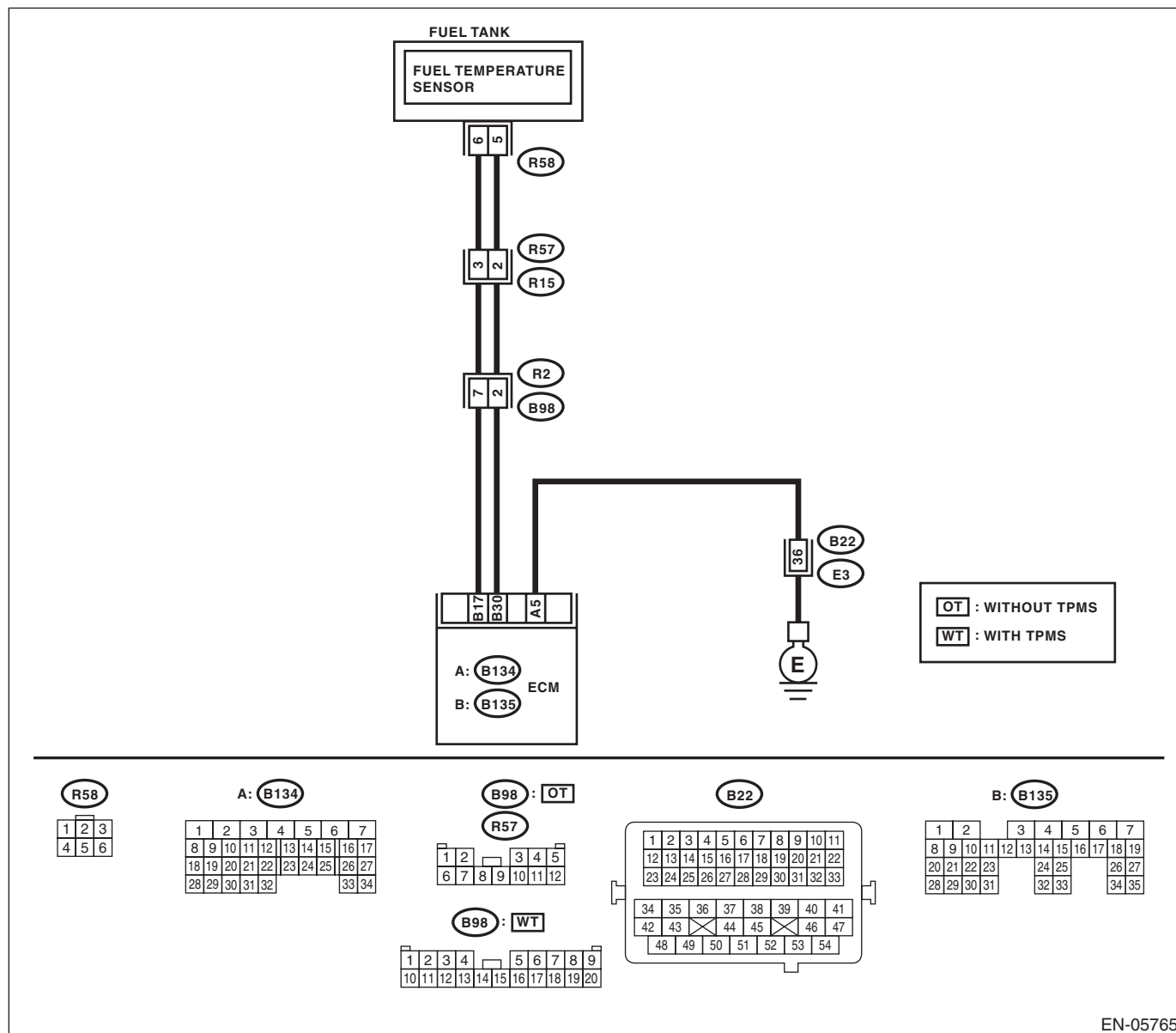
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-85, DTC P0182 FUEL TEMPERATURE SENSOR “A” CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-05765

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. NOTE: For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.>	Is the temperature 120°C (248°F) or more?	Go to step 2.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. Reproduce the fault condition, and reperform the check. NOTE: In this case, there may be a temporary connector contact failure.
2	CHECK HARNESS BETWEEN ECM AND FUEL TEMPERATURE SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM and fuel temperature sensor. 3) Measure the resistance between ECM and chassis ground. Connector & terminal (B135) No. 17 — Chassis ground:	Is the resistance 1 MΩ or more?	Replace the fuel temperature sensor. <Ref. to EC(H4DOTC)-13, Fuel Temperature Sensor.>	Repair the ground short circuit of harness between ECM and fuel pump.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

AL:DTC P0183 FUEL TEMPERATURE SENSOR “A” CIRCUIT HIGH INPUT

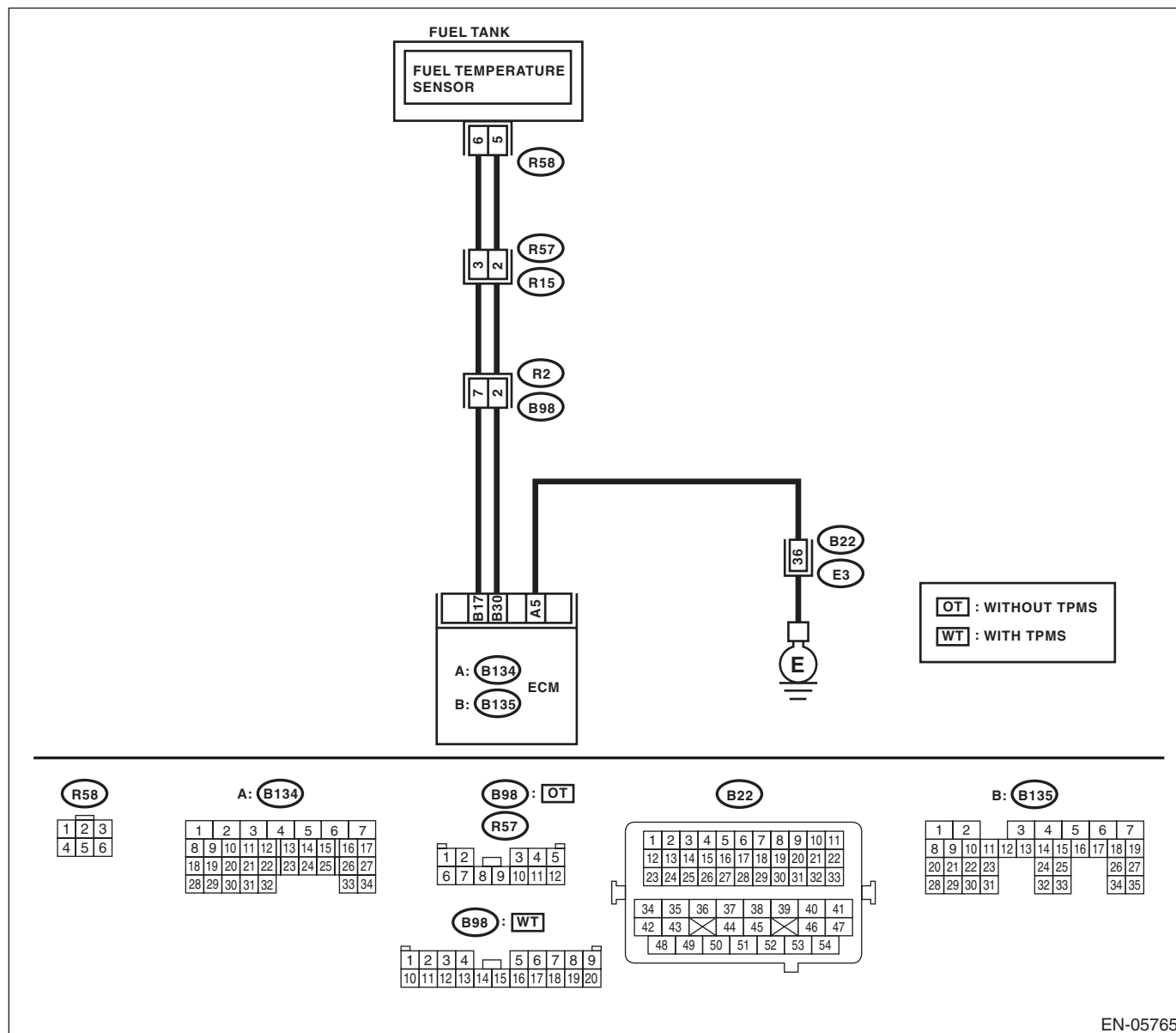
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-87, DTC P0183 FUEL TEMPERATURE SENSOR “A” CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, 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. NOTE: For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.>	Is the temperature less than -40°C (-40°F)?	Go to step 2.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. Reproduce the fault condition, and reperform the check. NOTE: In this case, there may be a temporary connector contact failure.
2 CHECK POOR CONTACT. Repair any poor contact between the ECM and fuel temperature sensor connectors.	Is there poor contact in the ECM or fuel temperature sensor connectors?	Repair any poor contact between the ECM and fuel temperature sensor connectors.	Go to step 3.
3 CHECK HARNESS BETWEEN ECM AND FUEL TEMPERATURE SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM and fuel temperature sensor. 3) Measure the resistance of the harness between the ECM and fuel temperature sensor connector. Connector & terminal (B135) No. 17 — (R58) No. 6: (B135) No. 30 — (R58) No. 5:	Is the resistance less than $1\ \Omega$?	Go to step 4.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and fuel temperature sensor connector • Poor contact of coupling connector
4 CHECK HARNESS BETWEEN ECM AND FUEL TEMPERATURE SENSOR CONNECTOR. 1) Connect all connectors. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM and chassis ground. Connector & terminal (B135) No. 17 (+) — Chassis ground (–):	Is the voltage 5 V or more?	Repair the short circuit to power in the harness between the ECM and fuel temperature sensor connector.	Replace the fuel temperature sensor. <Ref. to EC(H4DOTC)-13, Fuel Temperature Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

AM:DTC P0222 THROTTLE/PEDAL POSITION SENSOR/SWITCH "B" CIRCUIT LOW

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-89, DTC P0222 THROTTLE/PEDAL POSITION SENSOR/SWITCH "B" CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

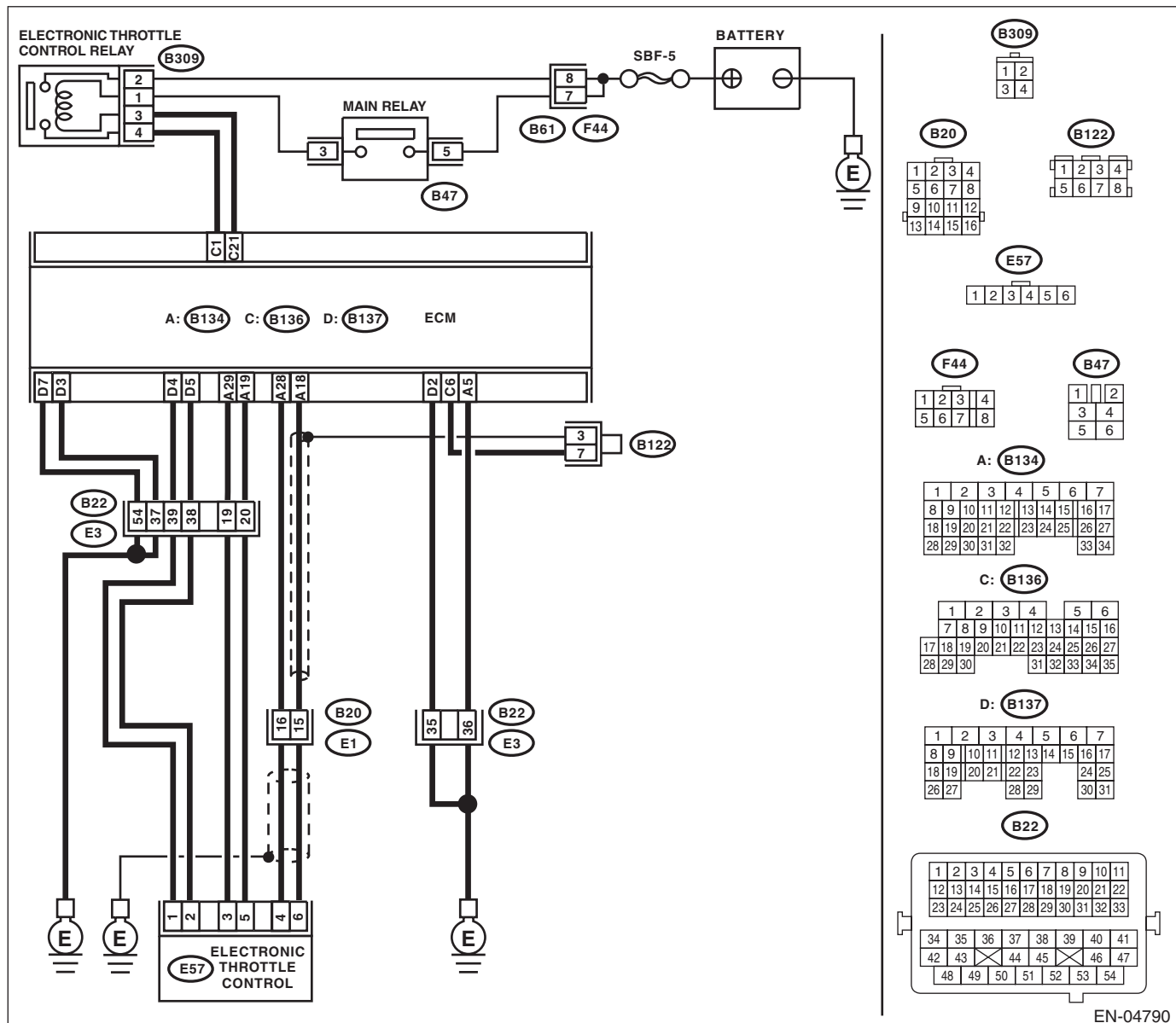
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance
- Engine stalls.

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04790

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and electronic throttle control. 3) Measure the resistance between ECM and chassis ground. Connector & terminal (B134) No. 19 — Chassis ground: (B134) No. 28 — Chassis ground:	Is the resistance 1 MΩ or more?	Go to step 2.	Repair the ground short circuit of harness between ECM and electronic throttle control connector.
2 CHECK SHORT CIRCUIT INSIDE THE ECM. 1) Connect the ECM. 2) Measure the resistance between electronic throttle control connector and engine ground. Connector & terminal (E57) No. 4 — Engine ground:	Is the resistance 1 MΩ or more?	Replace the electronic throttle control. <Ref. to FU(H4DOTC)-13, Throttle Body.>	Repair the ground short circuit of harness between ECM and electronic throttle control connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-46, Engine Control Module (ECM).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

AN:DTC P0223 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT HIGH

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-91, DTC P0223 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

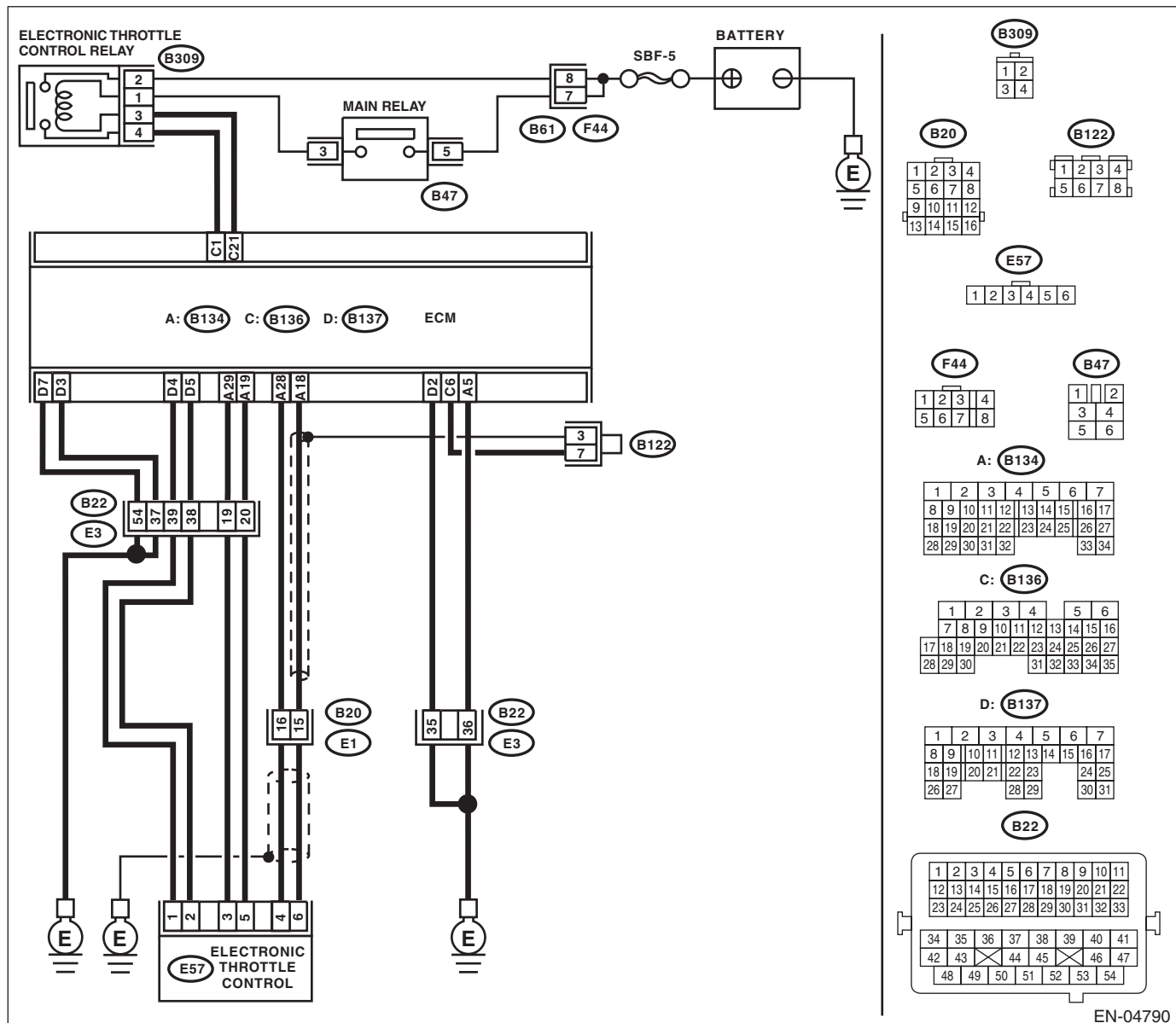
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance
- Engine stalls.

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04790

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and electronic throttle control. 3) Measure the resistance of harness between ECM and electronic throttle control connector. Connector & terminal (B134) No. 28 — (E57) No. 4: (B134) No. 29 — (E57) No. 3:	Is the resistance less than 1 Ω ?	Go to step 2.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and electronic throttle control connector • Poor contact of coupling connector
2 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Connect the ECM. 2) Measure the resistance between electronic throttle control connector and engine ground. Connector & terminal (E57) No. 3 — Engine ground:	Is the resistance less than 5 Ω ?	Go to step 3.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and engine ground • Poor contact in ECM connector • Poor contact of coupling connector
3 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. 4 (+) — Engine ground (-):	Is the voltage 4.85 V or more?	Repair the short circuit to power in the harness between ECM and electronic throttle control connector.	Go to step 4.
4 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance between ECM connectors. Connector & terminal (B134) No. 19 — (B134) No. 28:	Is the resistance 1 M Ω or more?	Repair the poor contact of electronic throttle control connector. Replace the electronic throttle control if defective. <Ref. to FU(H4DOTC)-13, Throttle Body.>	Repair the short circuit to power in the harness between ECM and electronic throttle control connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

AO:DTC P0230 FUEL PUMP PRIMARY CIRCUIT

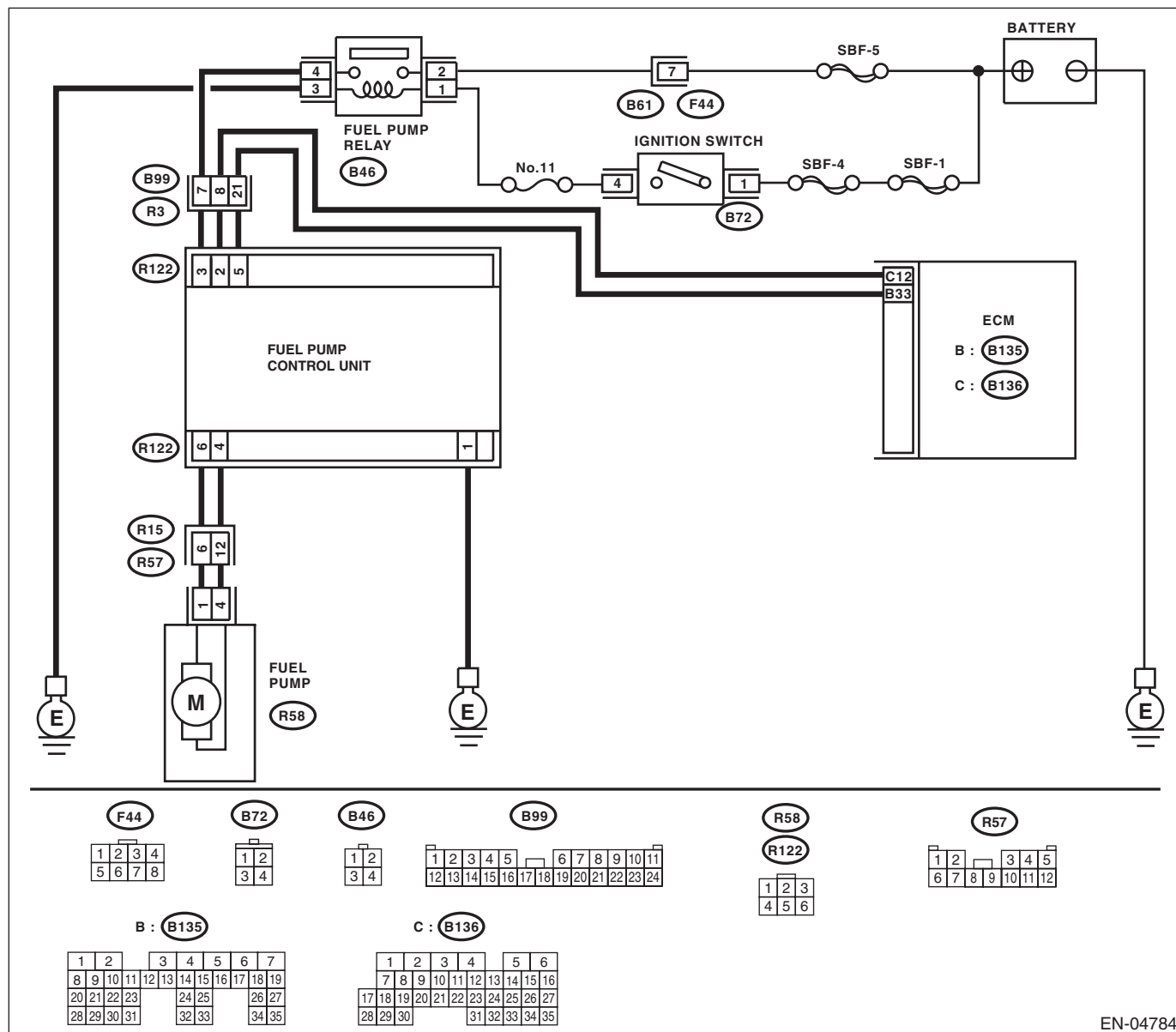
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-93, DTC P0230 FUEL PUMP PRIMARY CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04784

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 10 V or more?	Go to step 2.	Repair the power supply circuit. NOTE: In this case, repair the following item: • Open or ground short circuit of harness between fuel pump relay and fuel pump control unit • Poor contact of fuel pump control unit connector • Poor contact of fuel pump relay connector
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 item: • Open circuit between fuel pump control unit and chassis ground • Poor contact of 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. 6 — (R58) No. 1: (R122) No. 4 — (R58) No. 4:	Is the resistance less than 1 Ω ?	Go to step 4.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit between fuel pump control unit and fuel pump • Poor contact of coupling connector
4 CHECK HARNESS BETWEEN FUEL PUMP CONTROL UNIT AND FUEL PUMP CONNECTOR. Measure the resistance between fuel pump control unit and chassis ground. Connector & terminal (R122) No. 6 — Chassis ground: (R122) No. 4 — Chassis ground:	Is the resistance 1 M Ω or more?	Go to step 5.	Repair the ground short circuit of 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 ECM AND FUEL PUMP CONTROL UNIT. 1) Disconnect the connectors from ECM. 2) Measure the resistance of the harness between the ECM and fuel pump control unit. Connector & terminal (B136) No. 12 — (R122) No. 2: (B135) No. 33 — (R122) No. 5:	Is the resistance less than 1 Ω ?	Go to step 6.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit between the ECM and fuel pump control unit • Poor contact between ECM and fuel pump control unit • Poor contact of coupling connector
6 CHECK HARNESS BETWEEN ECM AND FUEL PUMP CONTROL UNIT. Measure the resistance between fuel pump control unit and chassis ground. Connector & terminal (R122) No. 2 — Chassis ground: (R122) No. 5 — Chassis ground:	Is the resistance 1 M Ω or more?	Go to step 7.	Repair the ground short circuit of harness between ECM and fuel pump control unit.
7 CHECK POOR CONTACT. Check poor contact of ECM and fuel pump control unit connector.	Is there poor contact of ECM and fuel pump control unit connector?	Repair the poor contact of ECM and fuel pump control unit connector.	Go to step 8.
8 CHECK EXPERIENCE OF RUNNING OUT OF FUEL.	Has the vehicle experienced running out of fuel?	Finish the diagnosis. NOTE: DTC may be recorded as a result of fuel pump idling while running out of fuel.	Replace the fuel pump control unit. <Ref. to FU(H4DOTC)-50, Fuel Pump Control Unit.>

AP:DTC P0244 TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" RANGE/PERFORMANCE

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-95, DTC P0244 TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

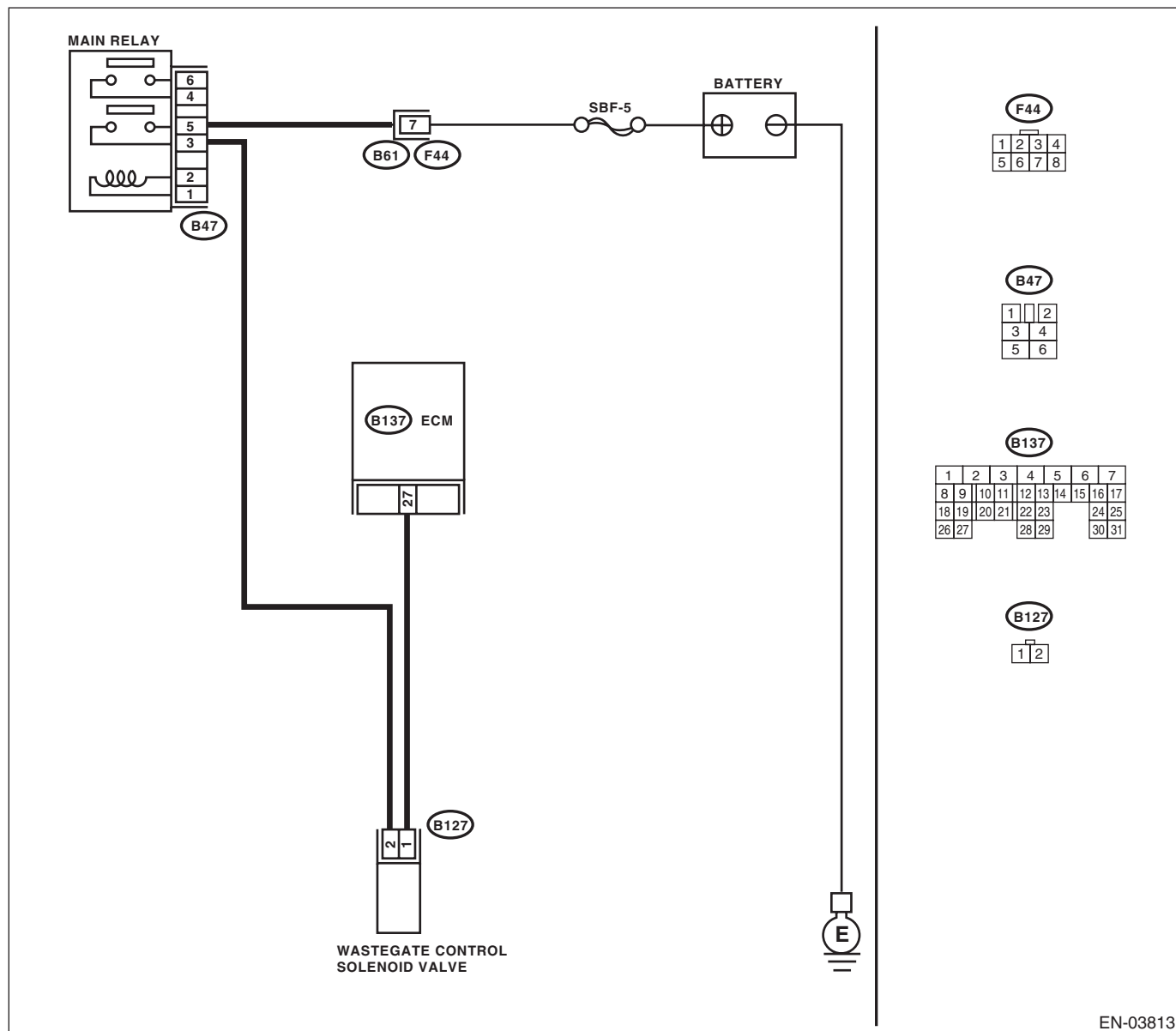
TROUBLE SYMPTOM:

Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

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?	Check the appropriate DTC using the "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-76, List of Diagnostic Trouble Code (DTC).>	Replace the wastegate control solenoid valve. <Ref. to FU(H4DOTC)-41, Wastegate Control Solenoid Valve.>

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

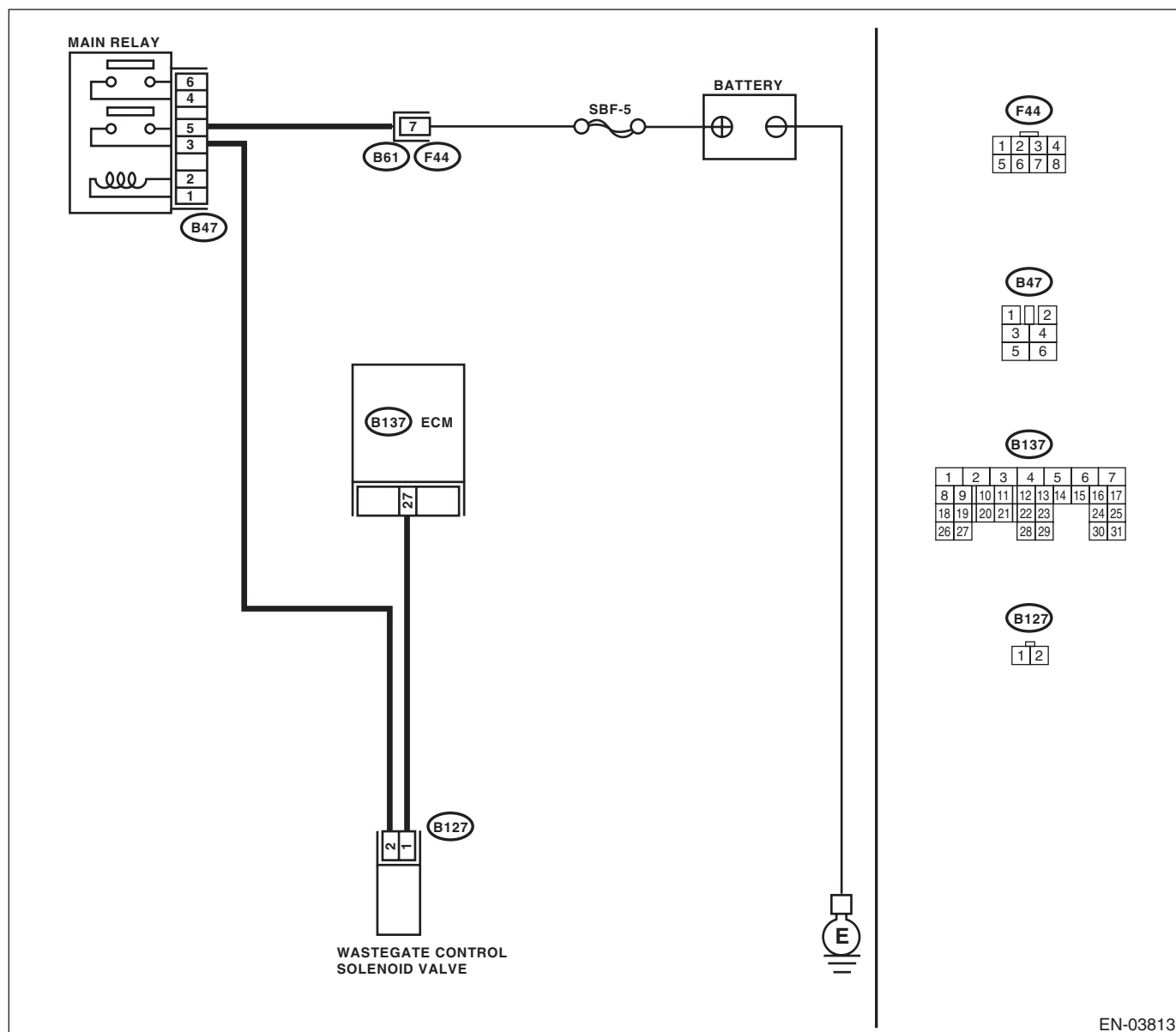
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-97, DTC P0245 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:

EN-03813

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OUTPUT SIGNAL OF ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. Connector & terminal (B137) No. 27 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Repair the poor contact of the ECM connector.	Go to step 2.
2 CHECK HARNESS BETWEEN ECM AND WASTEGATE CONTROL SOLENOID VALVE. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and wastegate control solenoid valve. 3) Measure the resistance between wastegate control solenoid valve connector and engine ground. Connector & terminal (B127) No. 1 — Engine ground:	Is the resistance 1 MΩ or more?	Go to step 3.	Repair ground short circuit of harness between ECM and wastegate control solenoid valve connector.
3 CHECK HARNESS BETWEEN ECM AND WASTEGATE CONTROL SOLENOID VALVE. Measure the resistance of harness between ECM and wastegate control solenoid valve connector. Connector & terminal (B137) No. 27 — (B127) No. 1:	Is the resistance less than 1 Ω?	Go to step 4.	Repair open circuit of harness between ECM and wastegate control solenoid valve connector.
4 CHECK WASTEGATE CONTROL SOLENOID VALVE. 1) Remove the wastegate control solenoid valve. 2) Measure the resistance between wastegate control solenoid valve terminals. Terminals No. 1 — No. 2:	Is the resistance between 10 — 100 Ω?	Go to step 5.	Replace the wastegate control solenoid valve. <Ref. to FU(H4DOTC)-41, 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 10 V or more?	Repair poor contact in wastegate control solenoid valve connector.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between main relay and wastegate control solenoid valve connector • Poor contact of main relay connector

AR:DTC P0246 TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" HIGH

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-99, DTC P0246 TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

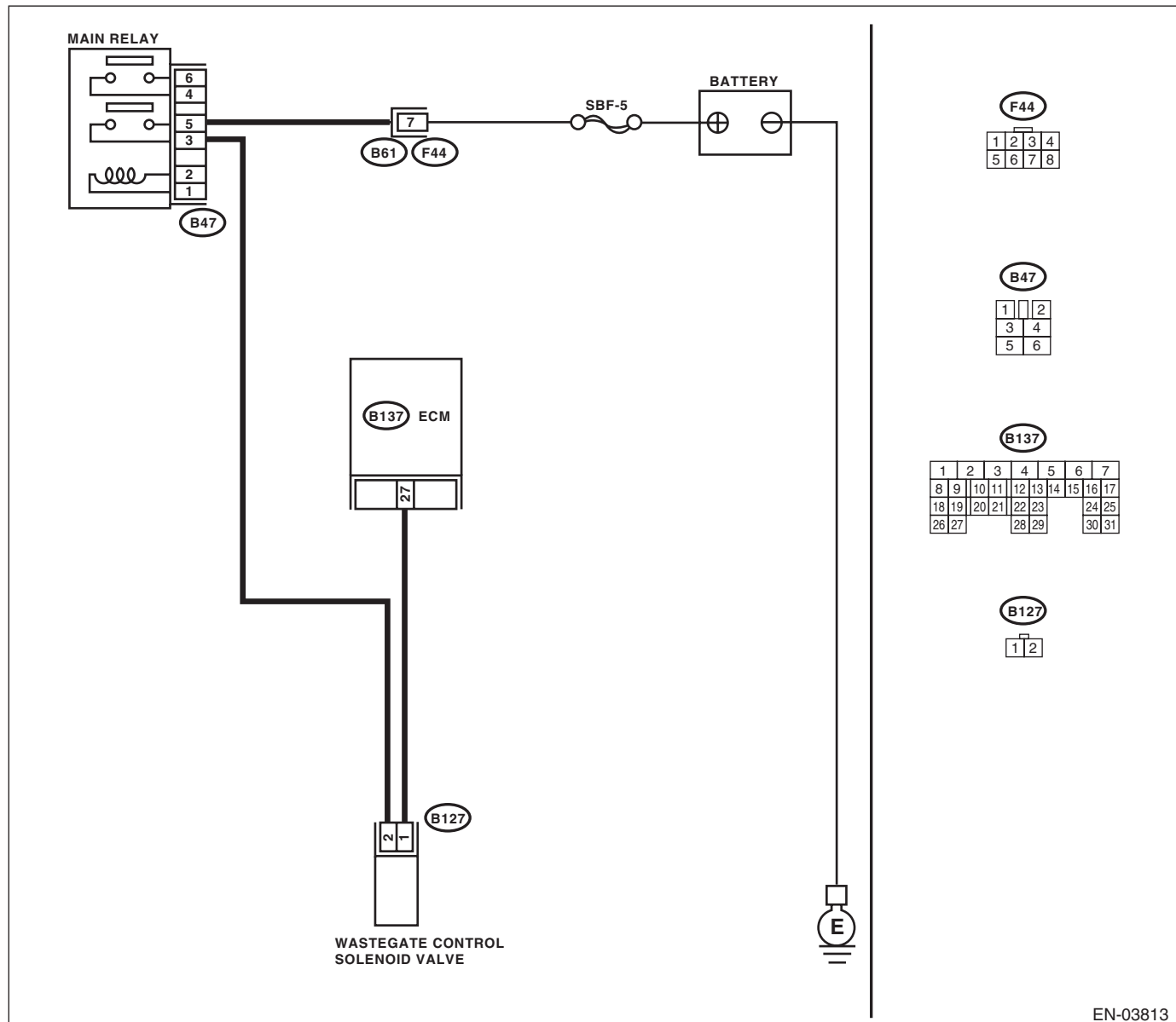
TROUBLE SYMPTOM:

Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-03813

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN ECM AND WASTEGATE CONTROL SOLENOID VALVE. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and wastegate control solenoid valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. Connector & terminal (B137) No. 27 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Repair the short circuit to power supply in the harness between the ECM and wastegate control solenoid valve connector.	Go to step 2.
2 CHECK WASTEGATE CONTROL SOLENOID VALVE. 1) Turn the ignition switch to OFF. 2) Measure the resistance between wastegate control solenoid valve terminals. Terminals No. 1 — No. 2:	Is the resistance less than 1 Ω ?	Replace the wastegate control solenoid valve. <Ref. to FU(H4DOTC)-41, Wastegate Control Solenoid Valve.>	Repair the poor contact of the ECM connector.

AS:DTC P0301 CYLINDER 1 MISFIRE DETECTED

NOTE:

For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(H4DOTC)(diag)-167, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AT:DTC P0302 CYLINDER 2 MISFIRE DETECTED

NOTE:

For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(H4DOTC)(diag)-167, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AU:DTC P0303 CYLINDER 3 MISFIRE DETECTED

NOTE:

For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(H4DOTC)(diag)-167, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AV:DTC P0304 CYLINDER 4 MISFIRE DETECTED**DTC DETECTING CONDITION:**

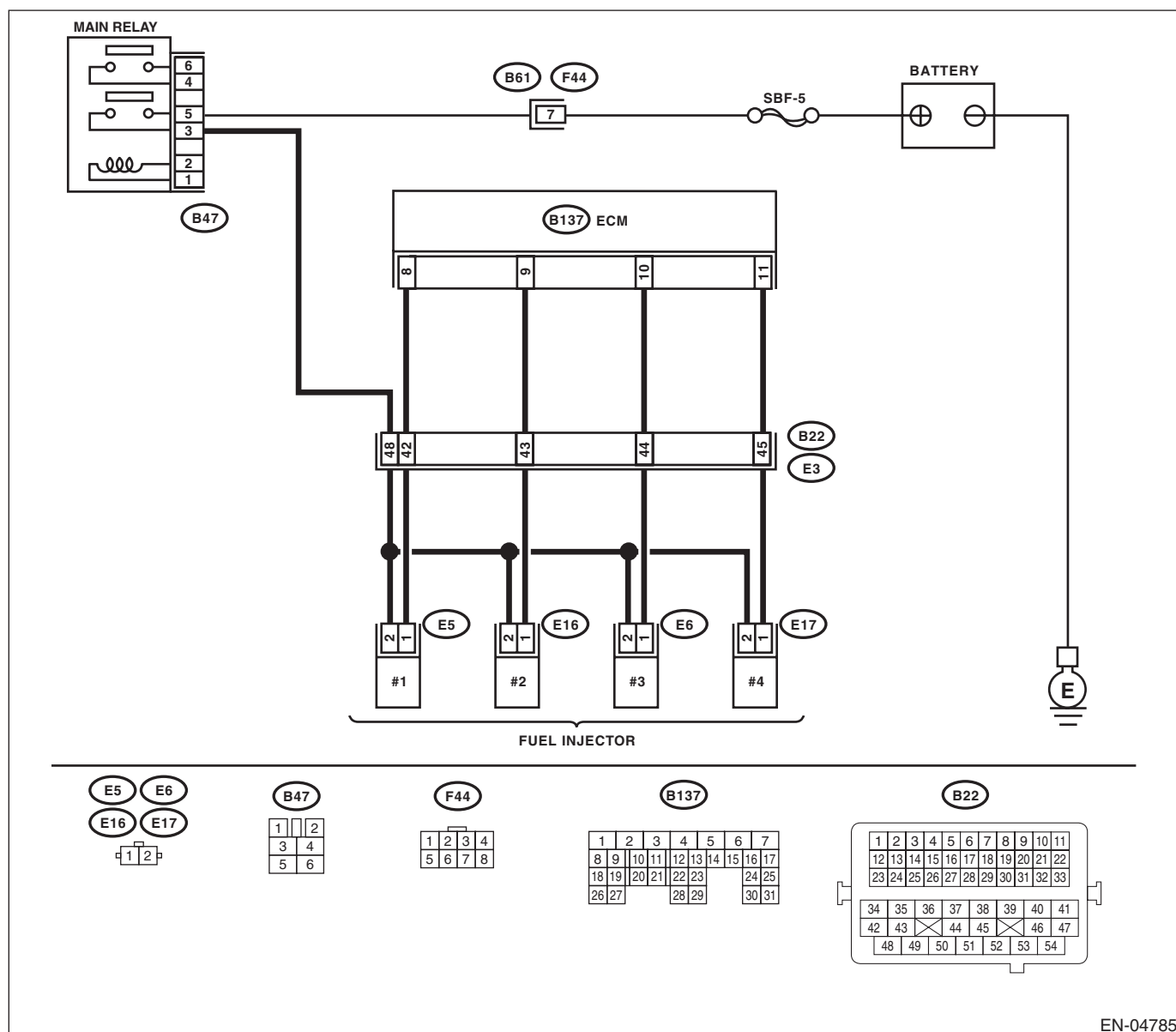
- Detected when two consecutive driving cycles with fault occur.
- Immediately at fault recognition (A misfire which could damage catalyst occurs.)
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-106, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Engine stalls.
- Improper idling
- Rough driving

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:

EN-04785

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OUTPUT SIGNAL OF ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between the ECM and chassis ground for faulty cylinders. Connector & terminal #1 (B137) No. 8 (+) — Chassis ground (-): #2 (B137) No. 9 (+) — Chassis ground (-): #3 (B137) No. 10 (+) — Chassis ground (-): #4 (B137) No. 11 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Go to step 6.	Go to step 2.
2 CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel injector on faulty cylinders. 3) Measure the resistance between the fuel injector connector and engine ground on faulty cylinders. Connector & terminal #1 (E5) No. 1 — Engine ground: #2 (E16) No. 1 — Engine ground: #3 (E6) No. 1 — Engine ground: #4 (E17) No. 1 — Engine ground:	Is the resistance 1 MΩ or more?	Go to step 3.	Repair the ground short circuit of harness between ECM and fuel injector.
3 CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR. Measure the resistance of harness between the ECM and fuel injector on faulty cylinders. Connector & terminal #1 (B137) No. 8 — (E5) No. 1: #2 (B137) No. 9 — (E16) No. 1: #3 (B137) No. 10 — (E6) No. 1: #4 (B137) No. 11 — (E17) No. 1:	Is the resistance less than 1 Ω?	Go to step 4.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and fuel injector connector • Poor contact of coupling connector
4 CHECK FUEL INJECTOR. Measure the resistance between fuel injector terminals on faulty cylinder. Terminals No. 1 — No. 2:	Is the resistance between 5 — 20 Ω?	Go to step 5.	Replace the faulty fuel injector. <Ref. to FU(H4DOTC)-33, Fuel Injector.>
5 CHECK POWER SUPPLY LINE. 1) Turn the ignition switch to ON. 2) Measure the voltage between fuel injector and engine ground on faulty cylinders. Connector & terminal #1 (E5) No. 2 (+) — Engine ground (-): #2 (E16) No. 2 (+) — Engine ground (-): #3 (E6) No. 2 (+) — Engine ground (-): #4 (E17) No. 2 (+) — Engine ground (-):	Is the voltage 10 V or more?	Repair the poor contact of all connectors in fuel injector circuit.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between main relay and fuel injector connector on faulty cylinders • Poor contact of coupling connector • Poor contact of main relay connector • Poor contact of fuel injector connector on faulty cylinders

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
6 CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel injector on faulty cylinders. 3) Turn the ignition switch to ON. 4) Measure the voltage between the ECM and chassis ground for faulty cylinders. Connector & terminal #1 (B137) No. 8 (+) — Chassis ground (-): #2 (B137) No. 9 (+) — Chassis ground (-): #3 (B137) No. 10 (+) — Chassis ground (-): #4 (B137) No. 11 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Repair the short circuit to power in the harness between the ECM and fuel injector.	Go to step 7.
7 CHECK FUEL INJECTOR. 1) Turn the ignition switch to OFF. 2) Measure the resistance between fuel injector terminals on faulty cylinder. Terminals No. 1 — No. 2:	Is the resistance less than 1 Ω ?	Replace the faulty fuel injector. <Ref. to FU(H4DOTC)-33, Fuel Injector.>	Go to step 8.
8 CHECK INSTALLATION OF CAMSHAFT POSITION SENSOR/CRANKSHAFT POSITION SENSOR.	Is the camshaft position sensor or crankshaft position sensor loosely installed?	Tighten the camshaft position sensor or crankshaft position sensor.	Go to step 9.
9 CHECK CRANK SPROCKET. Remove the timing belt cover.	Is the crank sprocket rusted or does it have damaged teeth?	Replace the crank sprocket. <Ref. to ME(H4DOTC)-54, Crank Sprocket.>	Go to step 10.
10 CHECK INSTALLATION CONDITION OF TIMING BELT. Turn the crankshaft, and align alignment mark on crank sprocket with alignment mark on cylinder block. ST 499987500 CRANKSHAFT SOCKET	Is the timing belt dislocated from its proper position?	Repair the installation condition of the timing belt. <Ref. to ME(H4DOTC)-43, Timing Belt.>	Go to step 11.
11 CHECK FUEL LEVEL.	Is the fuel meter indication higher than the "Lower" level?	Go to step 12.	Replenish the fuel so that fuel meter indication is higher than the "Lower" level. After replenishing fuel, Go to step 12.
12 CHECK STATUS OF MALFUNCTION INDICATOR LIGHT. 1) Clear the memory using the Subaru Select Monitor or general scan tool. <Ref. to EN(H4DOTC)(diag)-54, Clear Memory Mode.> 2) Start the engine, and drive the vehicle more than 10 minutes.	Does the malfunction indicator light illuminate or blink?	Go to step 14.	Go to step 13.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
13 CHECK CAUSE OF MISFIRE.	Was the cause of misfire detected while running the engine?	Finish diagnostics operation, if the engine has no abnormality.	Repair the poor contact of connector. NOTE: In this case, repair the following item: • Poor contact of ignition coil connector • Poor contact in fuel injector connector on faulty cylinders • Poor contact in ECM connector • Poor contact in coupling connector
14 CHECK AIR INTAKE SYSTEM.	Is there any fault in air intake system?	Repair the air intake system. NOTE: Check the following items. • Are there air leaks or air suction caused by loose or dislocated nuts and bolts? • Are there cracks or any disconnection of hoses?	Go to step 15.
15 CHECK MISFIRE SYMPTOM. 1) Turn the ignition switch to ON. 2) Read DTC. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is only one DTC displayed on the Subaru Select Monitor or general scan tool?	Go to step 20.	Go to step 16.
16 CHECK DTC.	Are DTCs P0301 and P0302 displayed on the Subaru Select Monitor or general scan tool?	Go to step 21.	Go to step 17.
17 CHECK DTC.	Are DTCs P0303 and P0304 displayed on the Subaru Select Monitor or general scan tool?	Go to step 22.	Go to step 18.
18 CHECK DTC.	Are DTCs P0301 and P0303 displayed on the Subaru Select Monitor or general scan tool?	Go to step 23.	Go to step 19.
19 CHECK DTC.	Are DTCs P0302 and P0304 displayed on the Subaru Select Monitor or general scan tool?	Go to step 24.	Go to step 25.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
20 ONLY ONE CYLINDER.	Is there any fault in the cylinder?	Repair or replace faulty parts. NOTE: Check the following items. • Spark plug • Spark plug cord • Fuel injector • Compression ratio	Go to DTC P0171. <Ref. to EN(H4DOTC)(diag)-144, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
21 GROUP OF #1 AND #2 CYLINDERS.	Are there any faults in #1 and #2 cylinders?	Repair or replace faulty parts. NOTE: • Check the following items. • Spark plug • Fuel injector • Ignition coil • Compression ratio • If any fault is not found, check the "IGNITION CONTROL SYSTEM" of #1 and #2 cylinders side. <Ref. to EN(H4DOTC)(diag)-70, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>	Go to DTC P0171. <Ref. to EN(H4DOTC)(diag)-144, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
22 GROUP OF #3 AND #4 CYLINDERS.	Are there any faults in #3 and #4 cylinders?	Repair or replace faulty parts. NOTE: • Check the following items. • Spark plug • Fuel injector • Ignition coil • Compression ratio • If any fault is not found, check the "IGNITION CONTROL SYSTEM" of #3 and #4 cylinders side. <Ref. to EN(H4DOTC)(diag)-70, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>	Go to DTC P0171. <Ref. to EN(H4DOTC)(diag)-144, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
23 GROUP OF #1 AND #3 CYLINDERS.	Are there any faults in #1 and #3 cylinders?	Repair or replace faulty parts. NOTE: Check the following items. • Spark plug • Fuel injector • Compression ratio • Skipping timing belt teeth	Go to DTC P0171. <Ref. to EN(H4DOTC)(diag)-144, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
24 GROUP OF #2 AND #4 CYLINDERS.	Are there any faults in #2 and #4 cylinders?	Repair or replace faulty parts. NOTE: Check the following items. • Spark plug • Fuel injector • Compression ratio • Skipping timing belt teeth	Go to DTC P0171. <Ref. to EN(H4DOTC)(diag)-144, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
25 CYLINDER AT RANDOM.	Is the engine idle rough?	Go to DTC P0171. <Ref. to EN(H4DOTC)(diag)-144, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Repair or replace faulty parts. NOTE: Check the following items. • Spark plug • Fuel injector • Compression ratio

AW:DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW (BANK 1 OR SINGLE SENSOR)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-107, DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

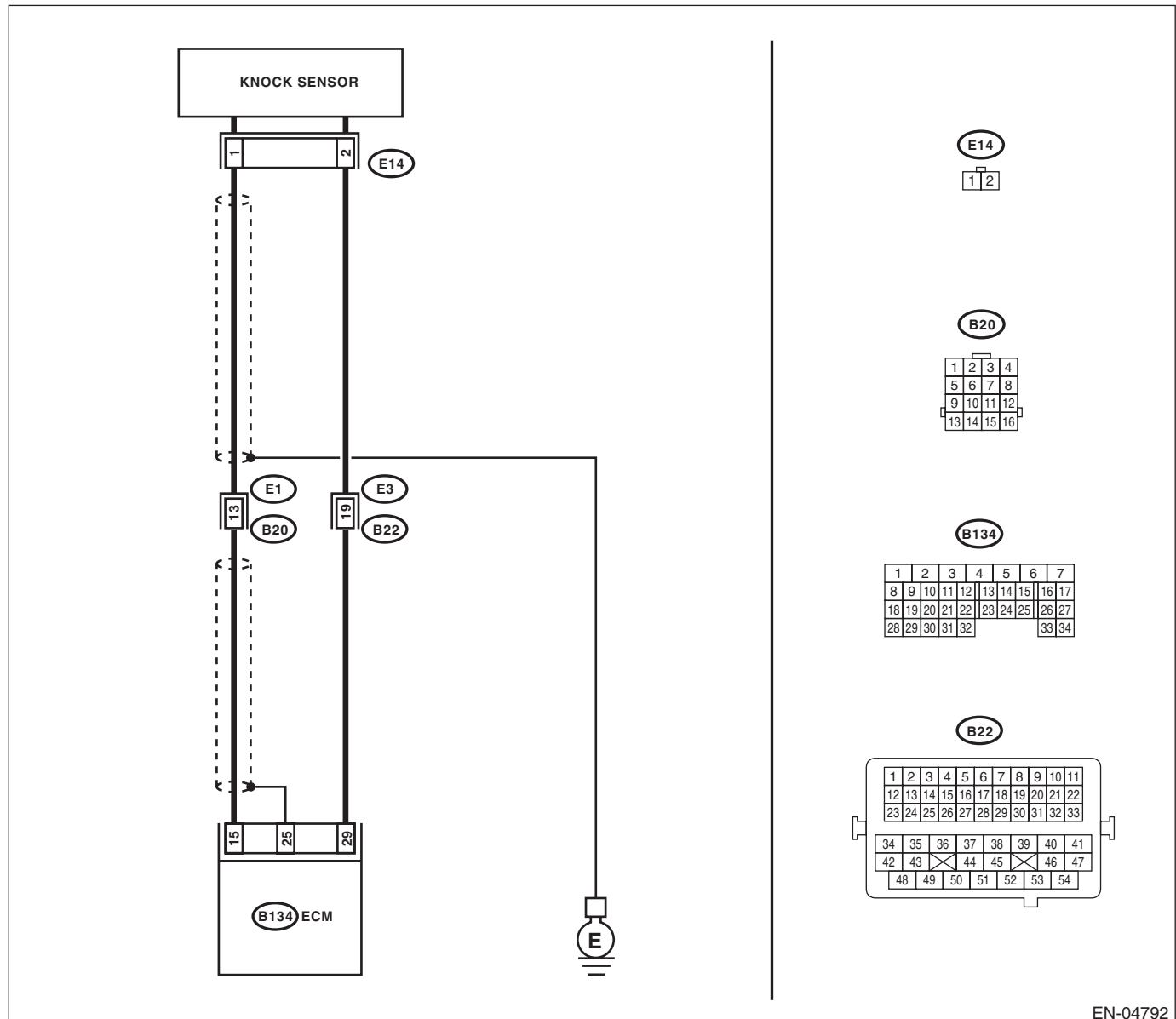
TROUBLE SYMPTOM:

- Poor driving performance
- Knocking occurs.

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04792

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN ECM AND KNOCK SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance between ECM connectors. Connector & terminal (B134) No. 15 — (B134) No. 29:	Is the resistance 600 kΩ or more?	Go to step 2.	Repair the poor contact of the ECM connector.
2 CHECK KNOCK SENSOR. 1) Disconnect the connector from knock sensor. 2) Measure the resistance between knock sensor terminals. Terminals No. 1 — No. 2:	Is the resistance 600 kΩ or more?	Replace the knock sensor. <Ref. to FU(H4DOTC)-29, Knock Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and knock sensor • Poor contact in knock sensor connector • Poor contact in coupling connector

AX:DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH (BANK 1 OR SINGLE SENSOR)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-109, DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

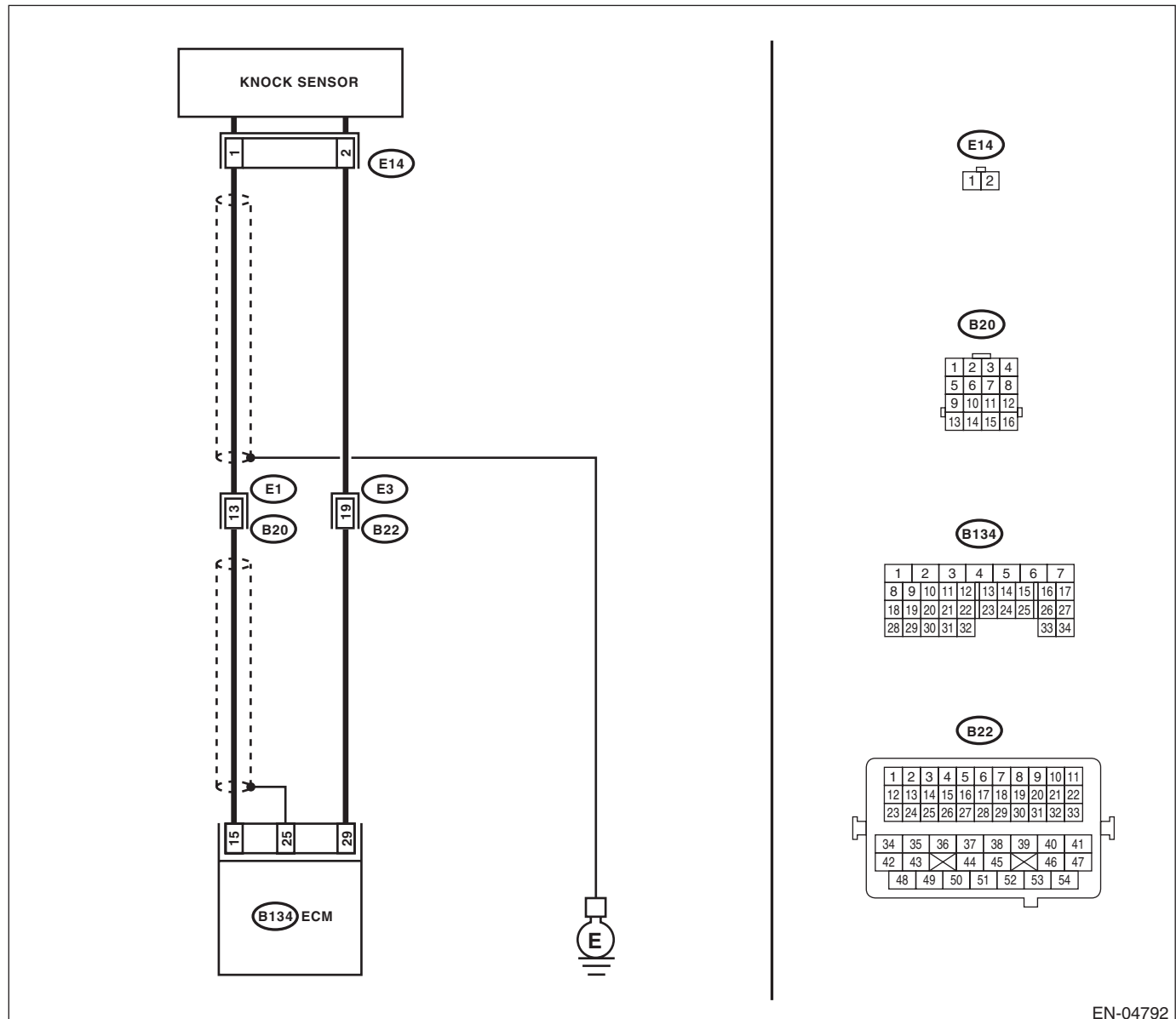
TROUBLE SYMPTOM:

- Poor driving performance
- Knocking occurs.

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04792

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN ECM AND KNOCK SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance between ECM connectors. Connector & terminal (B134) No. 15 — (B134) No. 29:	Is the resistance less than 500 kΩ?	Go to step 2.	Go to step 3.
2 CHECK KNOCK SENSOR. 1) Disconnect the connector from knock sensor. 2) Measure the resistance between knock sensor connectors. Terminals No. 1 — No. 2:	Is the resistance less than 500 kΩ?	Replace the knock sensor. <Ref. to FU(H4DOTC)-29, Knock Sensor.>	Repair the ground short circuit of harness between the ECM and knock sensor connector. NOTE: The harness between both connectors are shielded. Remove the shield and repair the short circuit of the harness circuit.
3 CHECK INPUT SIGNAL OF ECM. 1) Connect the ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM and chassis ground. Connector & terminal (B134) No. 15 (+) — Chassis ground (–):	Is the voltage 2 V or more?	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. Reproduce the fault condition, and reperform the check. NOTE: In this case, there may be a temporary connector contact failure.	Repair the poor contact of the ECM connector.

AY:DTC P0335 CRANKSHAFT POSITION SENSOR "A" CIRCUIT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-111, DTC P0335 CRANKSHAFT POSITION SENSOR "A" CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

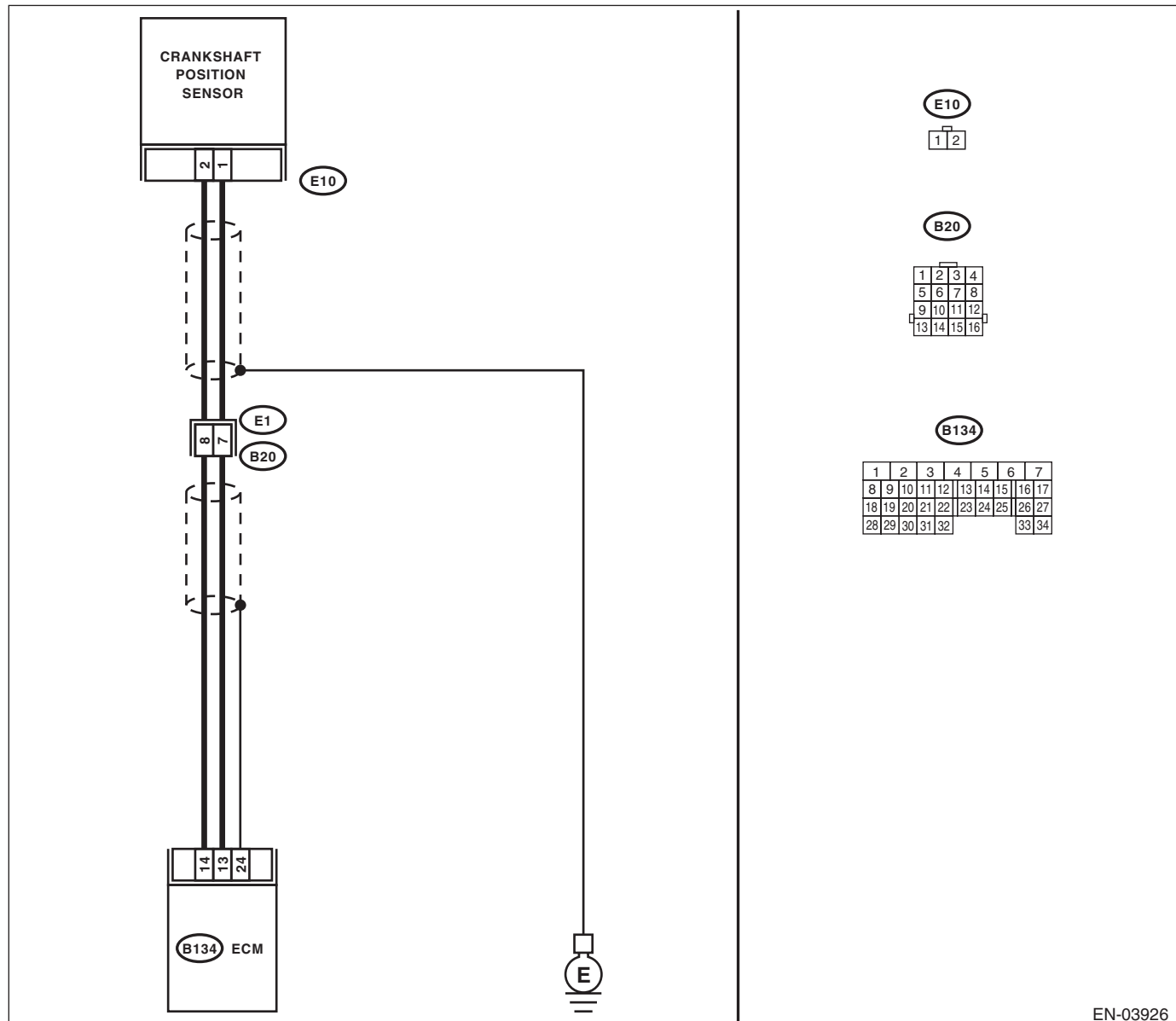
TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK CONDITION OF CRANKSHAFT POSITION SENSOR.	Is the crankshaft position sensor installation bolt tightened securely?	Go to step 2.	Tighten the crankshaft position sensor installation bolt securely.
2 CHECK CRANKSHAFT POSITION SENSOR. 1) Turn the ignition switch to OFF. 2) Remove the crankshaft position sensor. 3) Measure the resistance between connector terminals of crankshaft position sensor. Terminals No. 1 — No. 2:	Is the resistance between 1 — 4 k Ω ?	Go to step 3.	Replace the crankshaft position sensor. <Ref. to FU(H4DOTC)-27, Crankshaft Position Sensor.>
3 CHECK HARNESS BETWEEN ECM AND CRANK SHAFT POSITION SENSOR. 1) Disconnect the connectors from ECM. 2) Measure the resistance of harness between the ECM and crankshaft position sensor connector. Connector & terminal (B134) No. 13 — (E10) No. 1: (B134) No. 14 — (E10) No. 2:	Is the resistance less than 1 Ω ?	Repair the poor contact of the ECM and crankshaft position sensor connector.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and crankshaft position sensor connector • Poor contact of coupling connector

AZ:DTC P0336 CRANKSHAFT POSITION SENSOR “A” CIRCUIT RANGE /PERFORMANCE**DTC DETECTING CONDITION:**

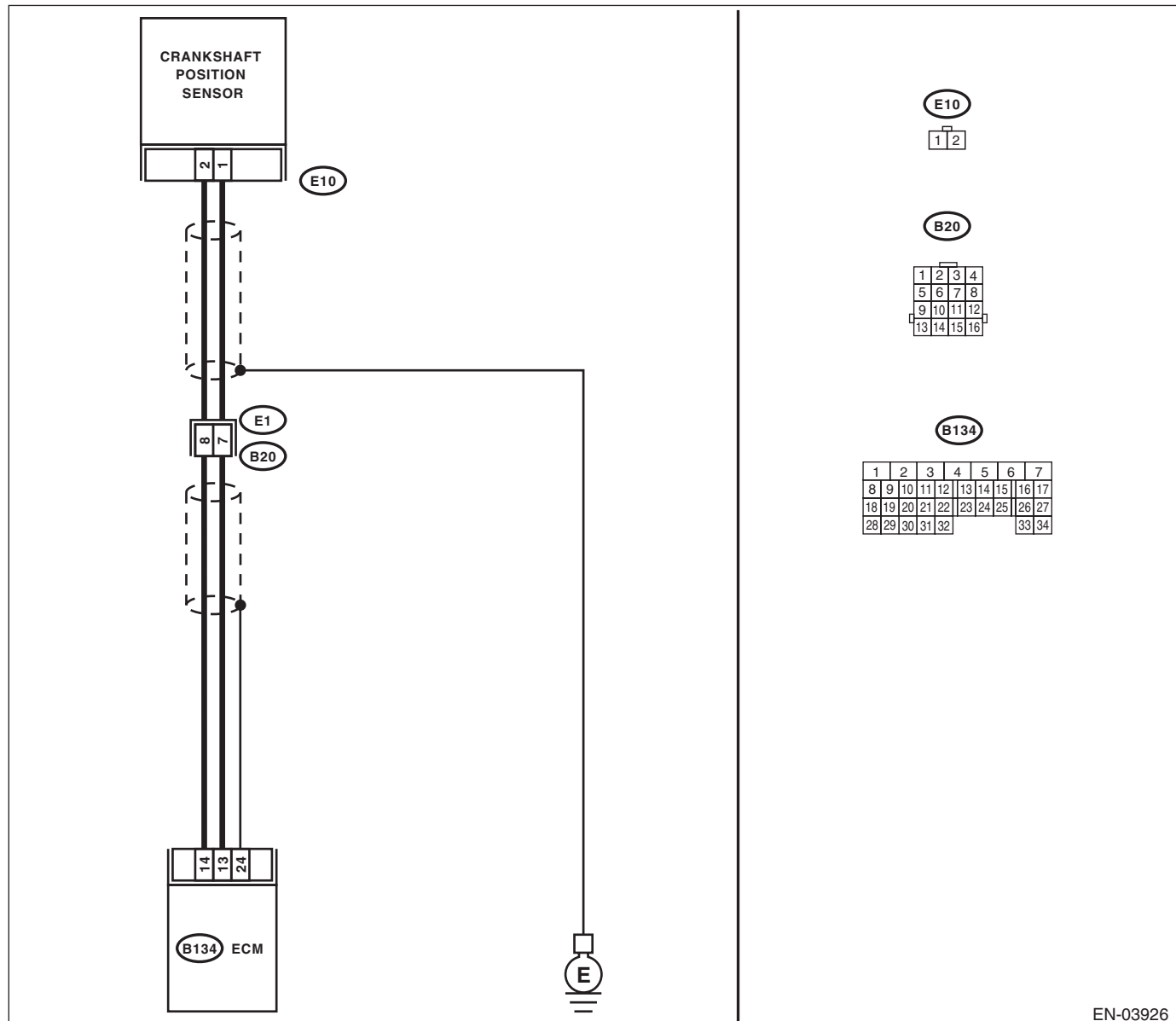
- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-113, DTC P0336 CRANKSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK CONDITION OF CRANKSHAFT POSITION SENSOR. Turn the ignition switch to OFF.	Is the crankshaft position sensor installation bolt tightened securely?	Go to step 2.	Tighten the crankshaft position sensor installation bolt securely.
2	CHECK CRANK SPROCKET. Remove the timing belt cover.	Are crank sprocket teeth cracked or damaged?	Replace the crank sprocket. <Ref. to ME(H4DOTC)-54, Crank Sprocket.>	Go to step 3.
3	CHECK INSTALLATION CONDITION OF TIMING BELT. Turn the crankshaft, and align alignment mark on crank sprocket with alignment mark on cylinder block.	Is the timing belt dislocated from its proper position?	Repair the installation condition of the timing belt. <Ref. to ME(H4DOTC)-43, Timing Belt.>	Replace the crankshaft position sensor. <Ref. to FU(H4DOTC)-27, Crankshaft Position Sensor.>

BA:DTC P0340 CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 1 OR SINGLE SENSOR)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-115, DTC P0340 CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

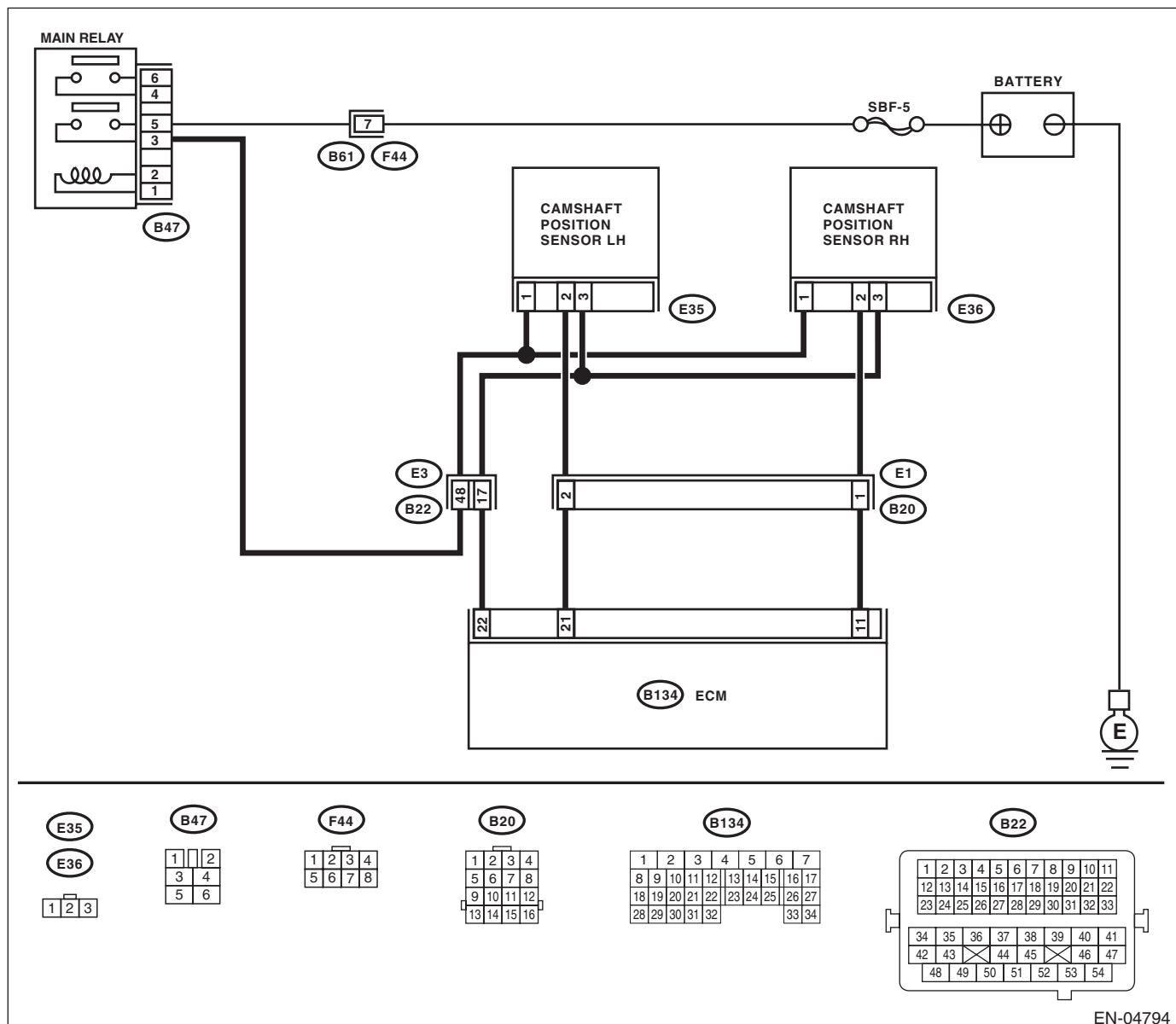
TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK POWER SUPPLY OF CAMSHAFT POSITION SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the camshaft position sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between camshaft position sensor connector and engine ground. Connector & terminal (E36) No. 1 (+) — Engine ground (-):	Is the voltage 10 V or more?	Go to step 2.	Repair the open or ground short circuit of harness between main relay connector and camshaft position sensor connector.
2 CHECK HARNESS BETWEEN ECM AND CAMSHAFT POSITION SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance between the ECM and camshaft position sensor connector. Connector & terminal (B134) No. 11 — (E36) No. 2: (B134) No. 22 — (E36) No. 3:	Is the resistance less than 1 Ω ?	Go to step 3.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of the harness between the ECM and camshaft position sensor • Poor contact of coupling connector
3 CHECK HARNESS BETWEEN ECM AND CAMSHAFT POSITION SENSOR CONNECTOR. Measure the resistance between camshaft position sensor connector and engine ground. Connector & terminal (E36) No. 2 — Engine ground:	Is the resistance 1 M Ω or more?	Go to step 4.	Repair the short circuit to ground of harness between the ECM and camshaft position sensor.
4 CHECK HARNESS BETWEEN ECM AND CAMSHAFT POSITION SENSOR CONNECTOR. Measure the voltage between camshaft position sensor connector and engine ground. Connector & terminal (E36) No. 2 (+) — Engine ground (-):	Is the voltage 5 V or more?	Repair the short circuit to power in the harness between the ECM and camshaft position sensor.	Go to step 5.
5 CHECK CONDITION OF CAMSHAFT POSITION SENSOR.	Is the camshaft position sensor installation bolt tightened securely?	Go to step 6.	Tighten the camshaft position sensor installation bolt securely.
6 CHECK CAMSHAFT POSITION SENSOR. Check the waveform of the camshaft position sensor. <Ref. to EN(H4DOTC)(diag)-18, Engine Control Module (ECM) I/O Signal.>	Is there any abnormality in waveform?	Replace the camshaft position sensor. <Ref. to FU(H4DOTC)-28, Camshaft Position Sensor.>	Repair the following item. • Poor contact in ECM connector • Poor contact of camshaft position sensor connector • Poor contact of coupling connector

BB:DTC P0345 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 2)**DTC DETECTING CONDITION:**

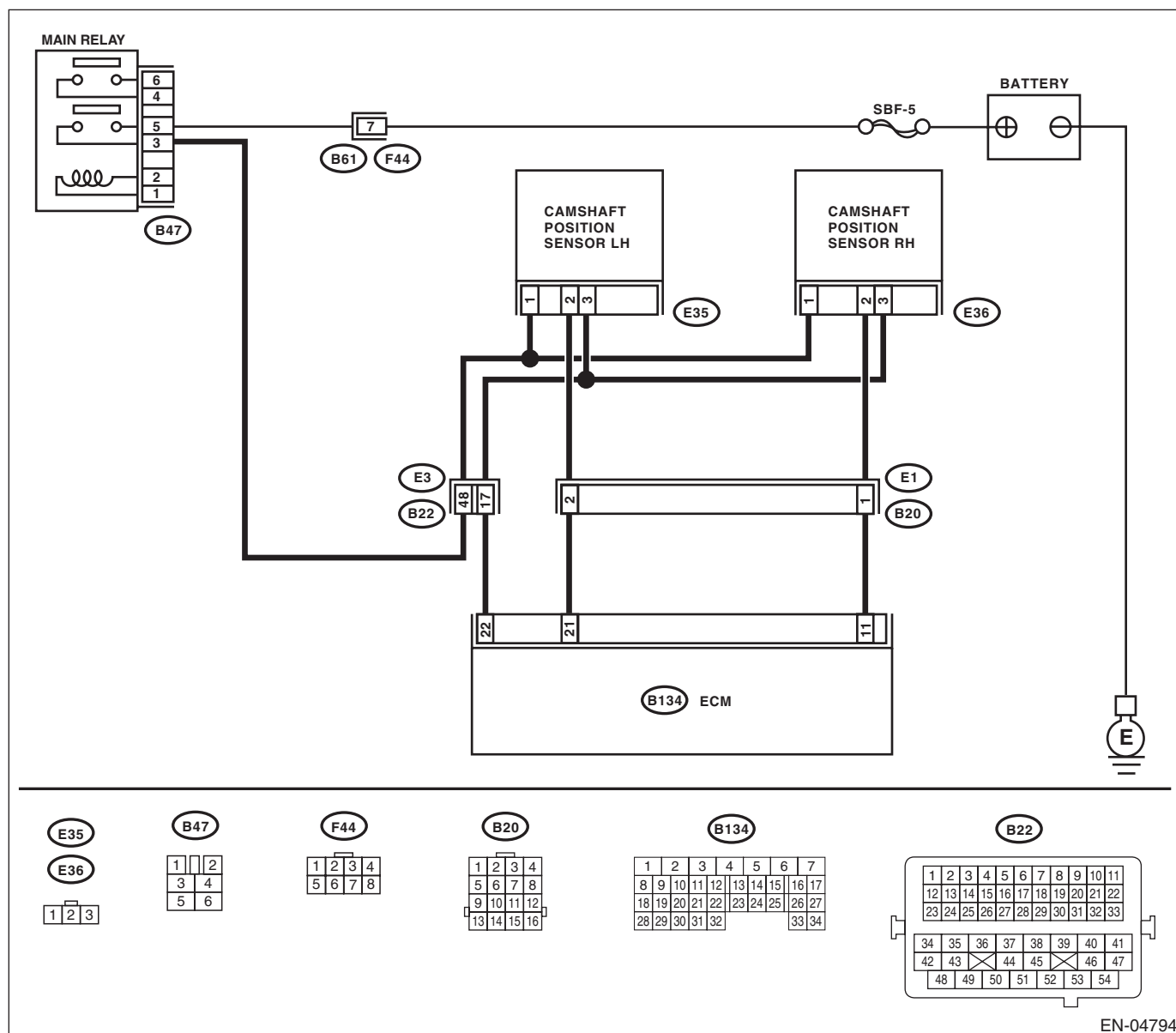
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-116, DTC P0345 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK POWER SUPPLY OF CAMSHAFT POSITION SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the camshaft position sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between camshaft position sensor connector and engine ground. Connector & terminal (E35) No. 1 (+) — Engine ground (-):	Is the voltage 10 V or more?	Go to step 2.	Repair the open or ground short circuit of harness between main relay connector and camshaft position sensor connector.
2 CHECK HARNESS BETWEEN ECM AND CAMSHAFT POSITION SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance between the ECM and camshaft position sensor connector. Connector & terminal (B134) No. 21 — (E35) No. 2: (B134) No. 22 — (E35) No. 3:	Is the resistance less than 1 Ω ?	Go to step 3.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of the harness between the ECM and camshaft position sensor • Poor contact of coupling connector
3 CHECK HARNESS BETWEEN ECM AND CAMSHAFT POSITION SENSOR CONNECTOR. Measure the resistance between camshaft position sensor connector and engine ground. Connector & terminal (E35) No. 2 — Engine ground:	Is the resistance 1 M Ω or more?	Go to step 4.	Repair the short circuit to ground of harness between the ECM and camshaft position sensor.
4 CHECK HARNESS BETWEEN ECM AND CAMSHAFT POSITION SENSOR CONNECTOR. Measure the voltage between camshaft position sensor connector and engine ground. Connector & terminal (E35) No. 2 (+) — Engine ground (-):	Is the voltage 5 V or more?	Repair the short circuit to power in the harness between the ECM and camshaft position sensor.	Go to step 5.
5 CHECK CONDITION OF CAMSHAFT POSITION SENSOR.	Is the camshaft position sensor installation bolt tightened securely?	Go to step 6.	Tighten the camshaft position sensor installation bolt securely.
6 CHECK CAMSHAFT POSITION SENSOR. Check waveform of camshaft position sensor. <Ref. to EN(H4DOTC)(diag)-18, Engine Control Module (ECM) I/O Signal.>	Is there any abnormality in waveform?	Replace the camshaft position sensor. <Ref. to FU(H4DOTC)-28, Camshaft Position Sensor.>	Repair the following item. • Poor contact in ECM connector • Poor contact of camshaft position sensor connector • Poor contact of coupling connector

BC:DTC P0410 SECONDARY AIR INJECTION SYSTEM

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-117, DTC P0410 SECONDARY AIR INJECTION SYSTEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

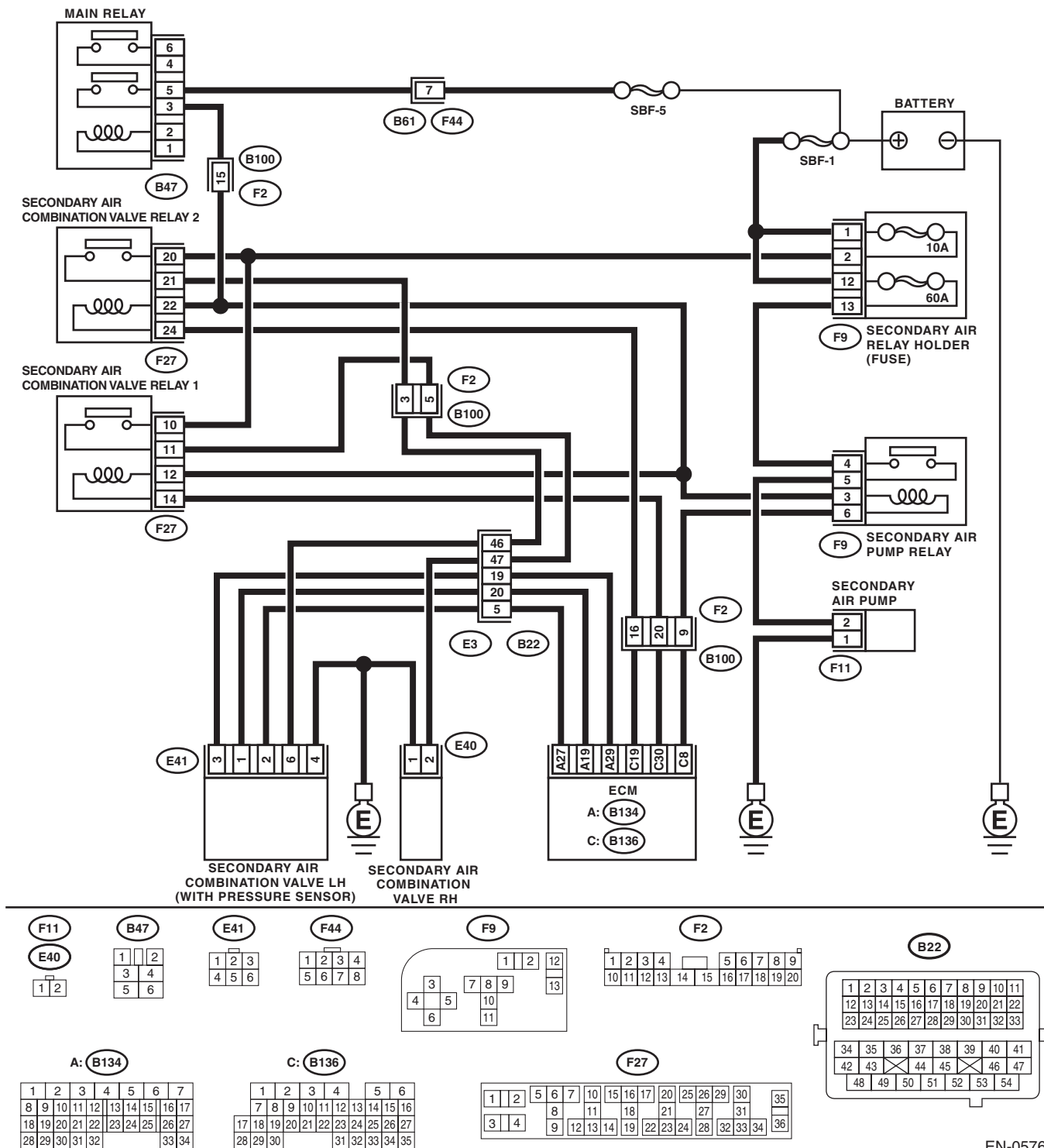
CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-05766

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK SECONDARY AIR PUMP FUSE. Check if the secondary air pump fuse (60 A) is blown out.	Is the fuse blown out?	Go to step 2.	Go to step 3.
2 CHECK HARNESS BETWEEN FUSE BOX AND SECONDARY AIR PUMP. 1) Remove the secondary air pump fuse from the fuse box. 2) Disconnect the secondary air pump connector. 3) Measure the resistance between the secondary air pump fuse and secondary air pump connector, and chassis ground. Connector & terminal (F9) No. 13 — Chassis ground: (F11) No. 2 — Chassis ground:	Is the resistance 1 MΩ or more?	Replace the fuse with a new part, and connect the secondary air pump connector. Go to step 3.	Repair ground short of the harness between the fuse box and the secondary air pump.
3 CHECK SECONDARY AIR PUMP OPERATION. 1) Connect the delivery (test) mode connector. 2) Turn the ignition switch to ON. 3) Perform the Clear Memory Mode. 4) Perform operation check for the secondary air pump using the Subaru Select Monitor. NOTE: • Subaru Select Monitor Refer to “Clear Memory Mode” <Ref. to EN(H4DOTC)(diag)-54, Clear Memory Mode.> and “Compulsory Valve Operation Check Mode” <Ref. to EN(H4DOTC)(diag)-55, Compulsory Valve Operation Check Mode.> for more operation procedures. • The compulsory operation using the Subaru Select Monitor is performed only for 5 seconds in order to protect the secondary air pump. When operating again, perform the Clear Memory Mode.	Does the secondary air pump operate?	Go to step 4.	Go to step 5.
4 CHECK DUCT BETWEEN SECONDARY AIR PUMP AND COMBINATION VALVE. Inspection of the duct between the secondary air pump and combination valve.	Is there damage, clog or disconnection of the duct?	Replace, clean or connect the duct.	Replace the secondary air combination valve LH. <Ref. to EC(H4DOTC)-10, Secondary Air Combination Valve.>
5 CHECK POWER SUPPLY TO SECONDARY AIR PUMP. 1) Perform the Clear Memory Mode. 2) Turn the ignition switch to OFF. 3) Disconnect the secondary air pump connector. 4) In the condition of step 3, measure the voltage between the secondary air pump connector and the chassis ground. NOTE: For detailed procedures, refer to “Clear Memory Mode”. <Ref. to EN(H4DOTC)(diag)-54, Clear Memory Mode.> Connector & terminal (F11) No. 2 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Replace the secondary air pump. <Ref. to EC(H4DOTC)-9, Secondary Air Pump.>	Go to step 6.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
6 CHECK HARNESS BETWEEN SECONDARY AIR PUMP RELAY AND SECONDARY AIR PUMP CONNECTOR. 1) Turn the ignition switch to OFF. 2) Remove the secondary air pump relay. 3) Measure the resistance of harness between secondary air pump relay and secondary air pump connector. Connector & terminal (F9) No. 5 — (F11) No. 2:	Is the resistance less than 1 Ω ?	Go to step 7.	Repair the open circuit of harness between secondary air pump relay and secondary air pump connector.
7 CHECK HARNESS BETWEEN SECONDARY AIR PUMP CONNECTOR AND CHASSIS GROUND. Measure the resistance of the harness between secondary air pump connector and chassis ground. Connector & terminal (F11) No. 1 — Chassis ground:	Is the resistance less than 5 Ω ?	Go to step 8.	Repair the open circuit of the harness between secondary air pump connector and chassis ground.
8 CHECK SECONDARY AIR PUMP RELAY. 1) Connect the battery to the secondary air pump relay terminals No. 3 and No. 6. 2) Measure the resistance between secondary air pump relay terminals. Terminals No. 4 — No. 5:	Is the resistance less than 1 Ω ?	Go to step 9.	Replace the secondary air pump relay.
9 CHECK SECONDARY AIR PUMP RELAY POWER SOURCE. 1) Turn the ignition switch to ON. 2) Measure the voltage between the secondary air pump relay connector and chassis ground. Connector & terminal (F9) No. 4 (+) — Chassis ground (-): (F9) No. 3 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Go to step 10.	Repair the open or ground short circuit of power supply circuit.
10 CHECK HARNESS BETWEEN ECM AND SECONDARY AIR PUMP RELAY CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector of ECM. 3) Measure the resistance of harness between ECM and secondary air pump relay connector. Connector & terminal (B136) No. 8 — (F9) No. 6:	Is the resistance less than 1 Ω ?	Repair the poor contact of the ECM connector.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and secondary air pump relay connector. • Poor contact of coupling connector

BD:DTC P0411 SECONDARY AIR INJECTION SYSTEM INCORRECT FLOW DETECTED

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-125, DTC P0411 SECONDARY AIR INJECTION SYSTEM INCORRECT FLOW DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

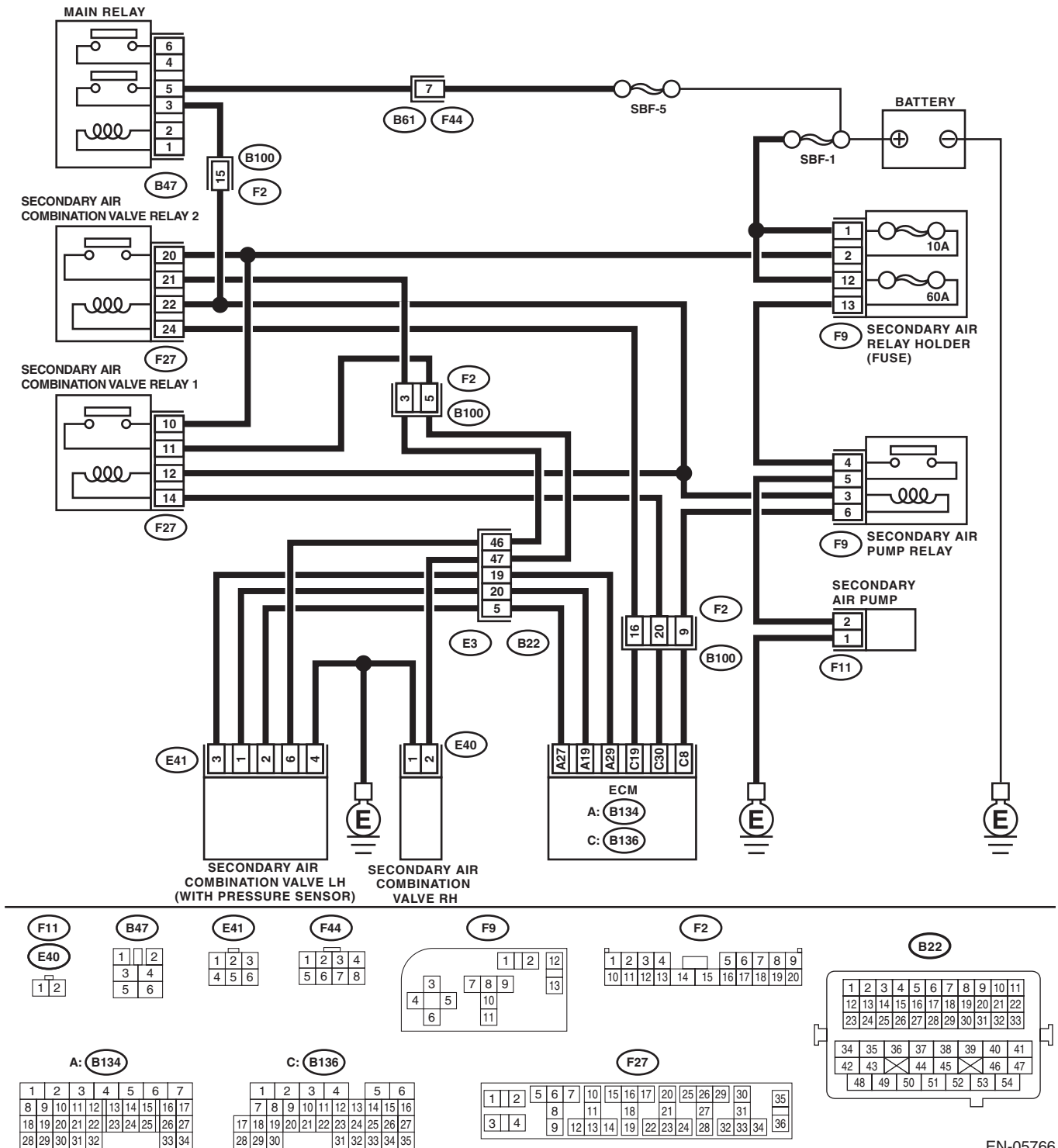
CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-05766

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step		Check	Yes	No
1	CHECK SECONDARY AIR COMBINATION VALVE. Inspection of the pipe between the secondary air combination valve and cylinder head.	Is there damage or disconnection of the pipe?	Replace the pipe between the secondary air combination valve and cylinder head.	Go to step 2.
2	CHECK SECONDARY AIR COMBINATION VALVE. Race the engine at 2000 rpm and check whether an exhaust leak can be heard.	Is there an exhaust leaking sound?	Replace the pipe between the secondary air combination valve and cylinder head.	Repair the poor contact of the ECM connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

BE:DTC P0413 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “A” CIRCUIT OPEN

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-126, DTC P0413 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “A” CIRCUIT OPEN, Diagnostic Trouble Code (DTC) Detecting Criteria.>

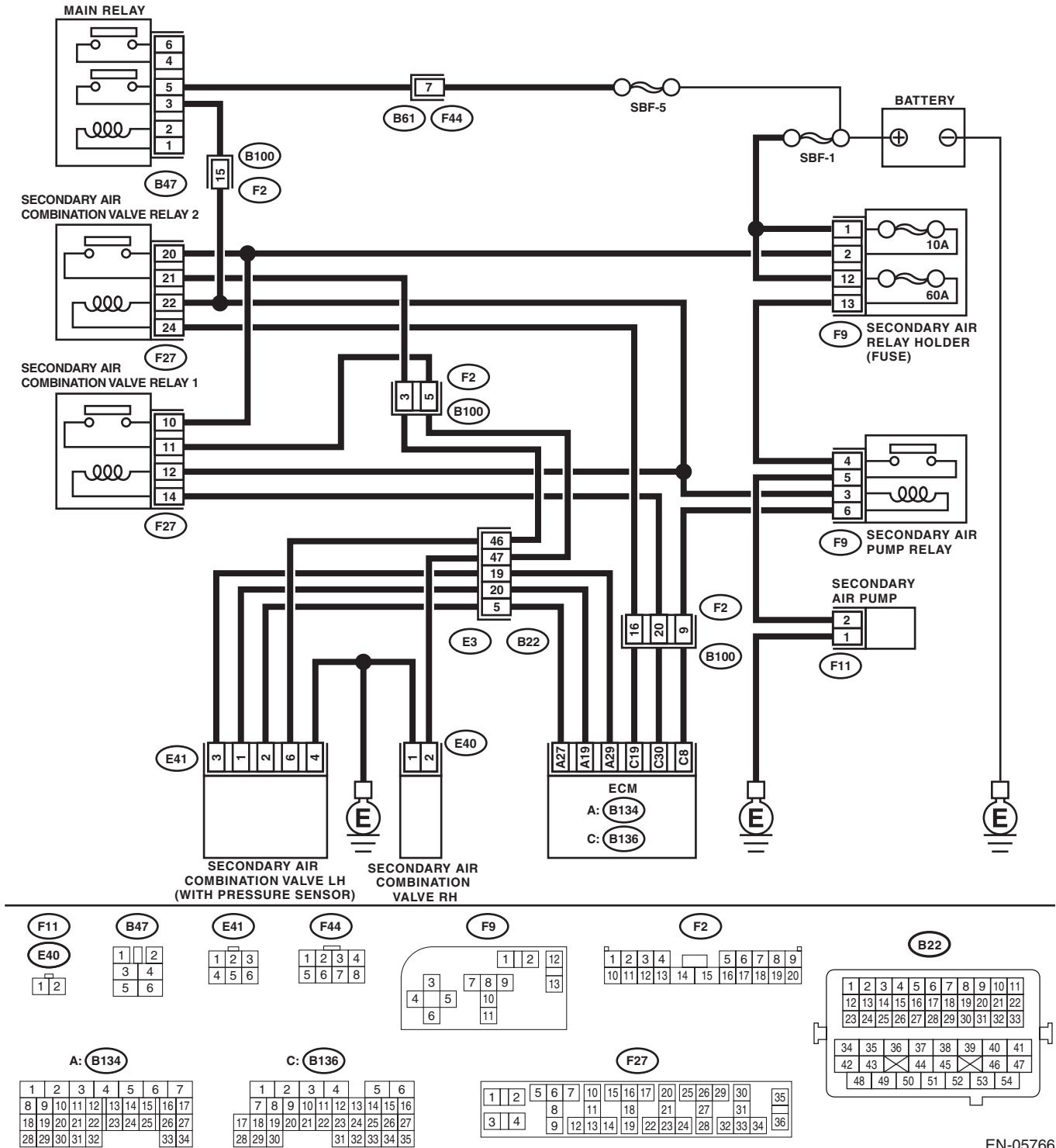
CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-05766

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBINATION VALVE RELAY. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM and secondary air combination valve relay. 3) Measure the resistance of harness between ECM and secondary air combination valve relay. Connector & terminal (B136) No. 30 — (F27) No. 14:	Is the resistance less than 1 Ω ?	Go to step 2.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and secondary air combination valve relay • Poor contact of coupling connector
2 CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBINATION VALVE RELAY. Measure the resistance between ECM and chassis ground. Connector & terminal (B136) No. 30 — Chassis ground:	Is the resistance 1 M Ω or more?	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. Reproduce the fault condition, and reperform the check. NOTE: In this case, there may be a temporary connector contact failure.	Repair the short circuit to ground in harness between ECM and secondary air combination valve relay.

BF:DTC P0414 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “A” CIRCUIT SHORTED

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-127, DTC P0414 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “A” CIRCUIT SHORTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

ENGINE (DIAGNOSTICS)

[illegible]

EN-05766

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step		Check	Yes	No
1	CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBINATION VALVE RELAY. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM and secondary air combination valve relay. 3) Measure the voltage between ECM and chassis ground. Connector & terminal (B136) No. 30 (+) — Chassis ground (–):	Is the voltage 10 V or more?	Repair the short circuit to power in the harness between ECM and secondary air combination valve relay.	Repair the poor contact of the ECM connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

BG:DTC P0416 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “B” CIRCUIT OPEN

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-128, DTC P0416 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “B” CIRCUIT OPEN, Diagnostic Trouble Code (DTC) Detecting Criteria.>

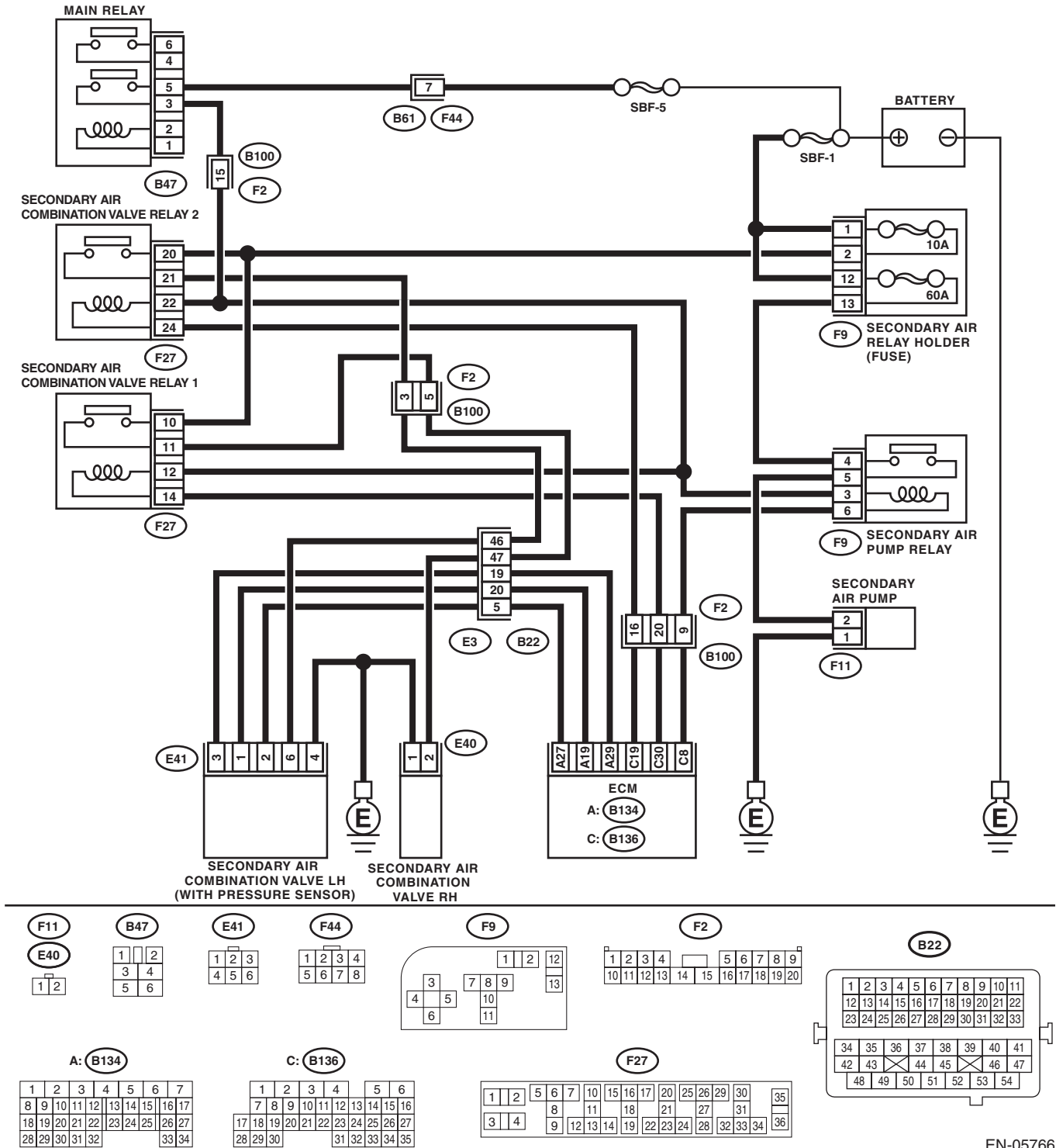
CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-05766

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBINATION VALVE RELAY 2. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and secondary air combination valve relay 2. 3) Measure the resistance of harness between ECM and secondary air combination valve relay 2. Connector & terminal (B136) No. 19 — (F27) No. 24:	Is the resistance less than 1 Ω ?	Go to step 2.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and secondary air combination valve relay 2 • Poor contact of coupling connector
2 CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBINATION VALVE RELAY 2. Measure the resistance between ECM and chassis ground. Connector & terminal (B136) No. 19 — Chassis ground:	Is the resistance 1 M Ω or more?	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. Reproduce the fault condition, and reperform the check. NOTE: In this case, there may be a temporary connector contact failure.	Repair the ground short circuit of harness between ECM and secondary air combination valve relay 2.

BH:DTC P0417 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “B” CIRCUIT SHORTED

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-128, DTC P0417 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “B” CIRCUIT SHORTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

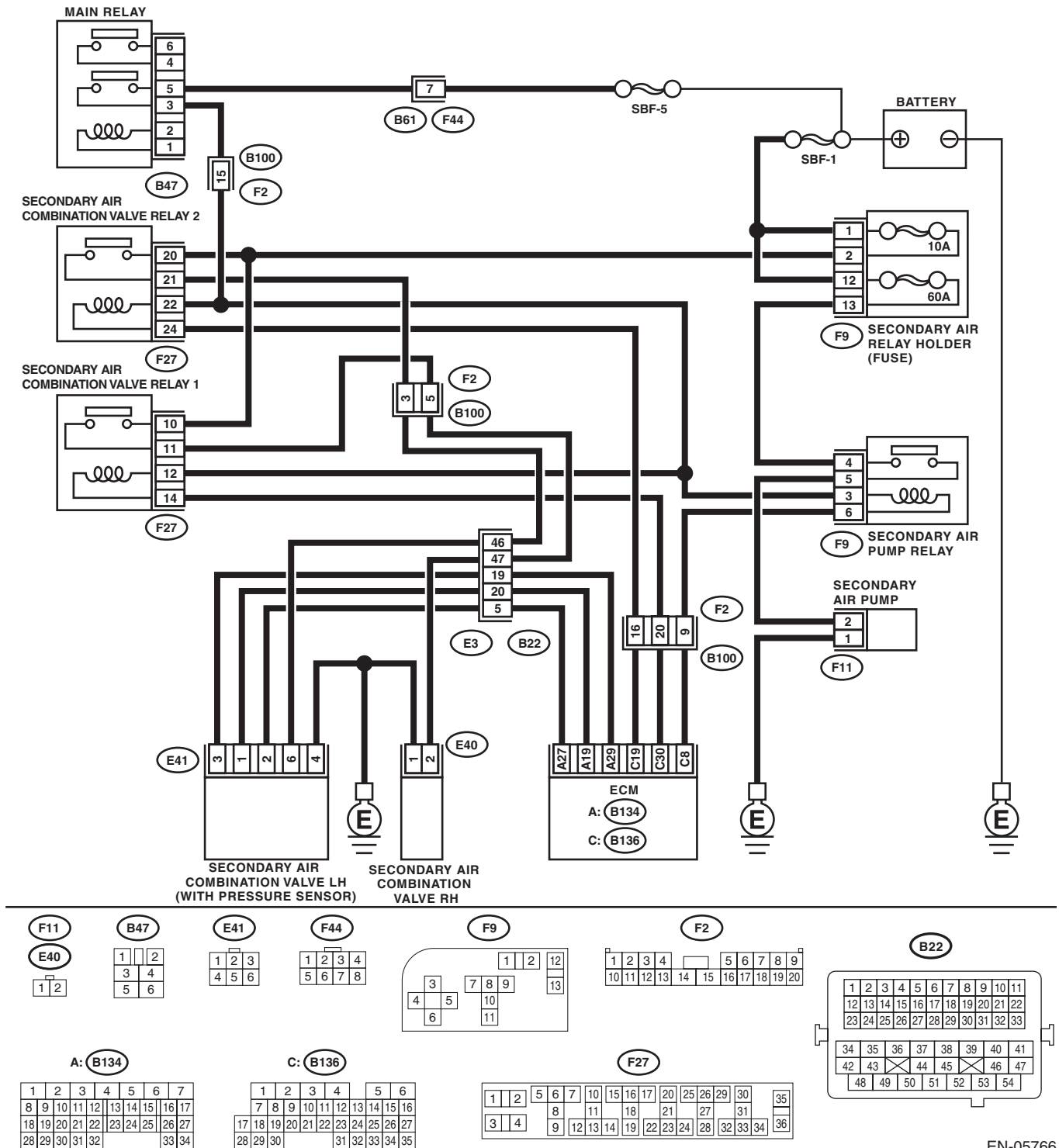
CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBINATION VALVE RELAY 2. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and secondary air combination valve relay 2. 3) Measure the voltage between ECM and chassis ground. Connector & terminal (B136) No. 19 (+) — Chassis ground (–):	Is the voltage 10 V or more?	Repair the short circuit to power in the harness between ECM and secondary air combination valve relay 2.	Repair the poor contact of the ECM connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

BI: DTC P0418 SECONDARY AIR INJECTION SYSTEM CONTROL “A” CIRCUIT OPEN

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-129, DTC P0418 SECONDARY AIR INJECTION SYSTEM CONTROL “A” CIRCUIT OPEN, Diagnostic Trouble Code (DTC) Detecting Criteria.>

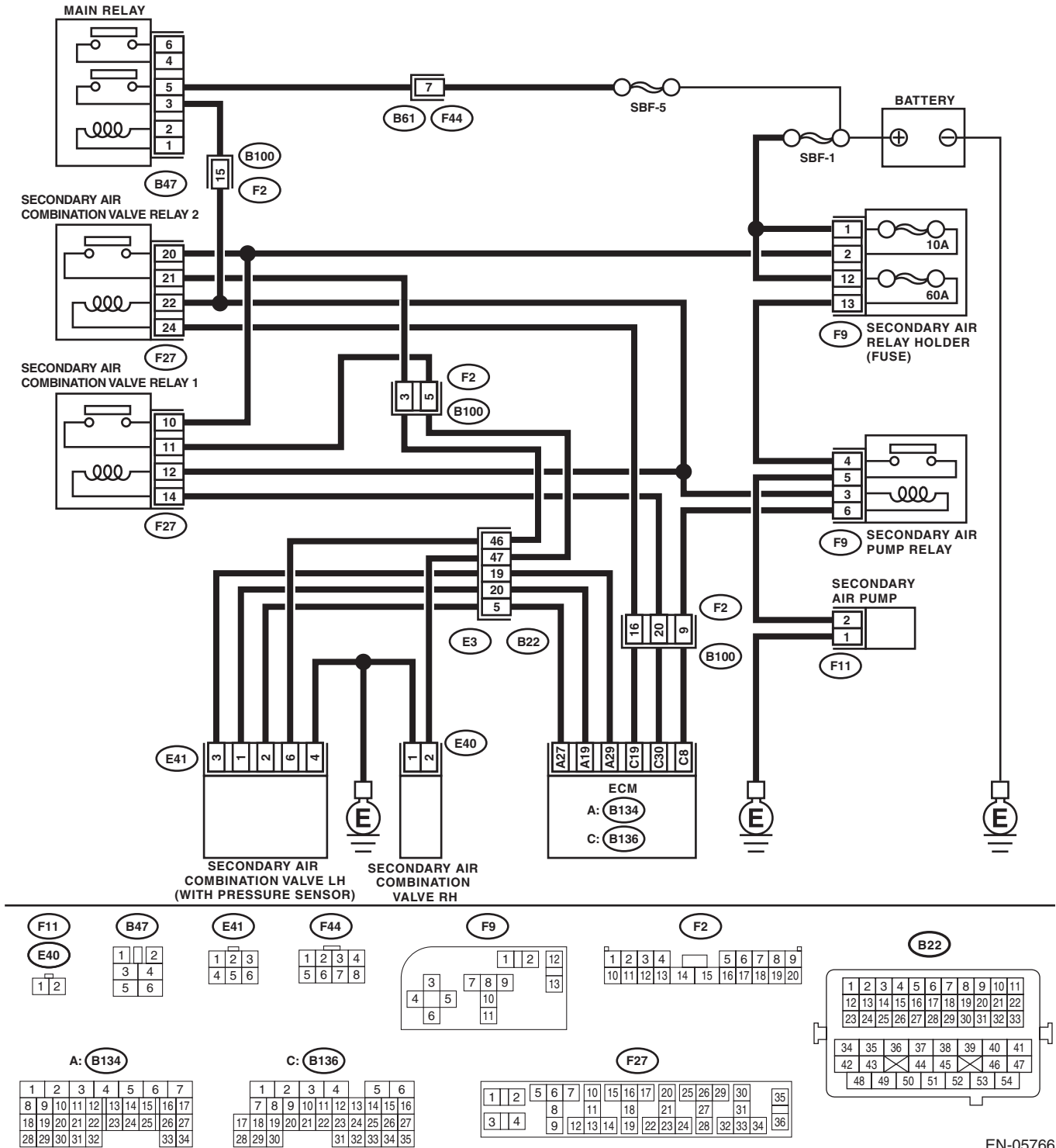
CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-05766

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN ECM AND SECONDARY AIR PUMP RELAY. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the ECM and secondary air pump relay. 3) Measure the resistance of harness between ECM and secondary air pump relay. Connector & terminal (B136) No. 8 — (F9) No. 6:	Is the resistance less than 1 Ω ?	Go to step 2.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and secondary air pump relay • Poor contact of coupling connector
2 CHECK HARNESS BETWEEN ECM AND SECONDARY AIR PUMP RELAY. Measure the resistance between ECM and chassis ground. Connector & terminal (B136) No. 8 — Chassis ground:	Is the resistance 1 M Ω or more?	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. Reproduce the fault condition, and reperform the check. NOTE: In this case, there may be a temporary connector contact failure.	Repair the ground short circuit of harness between ECM and secondary air pump relay.

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

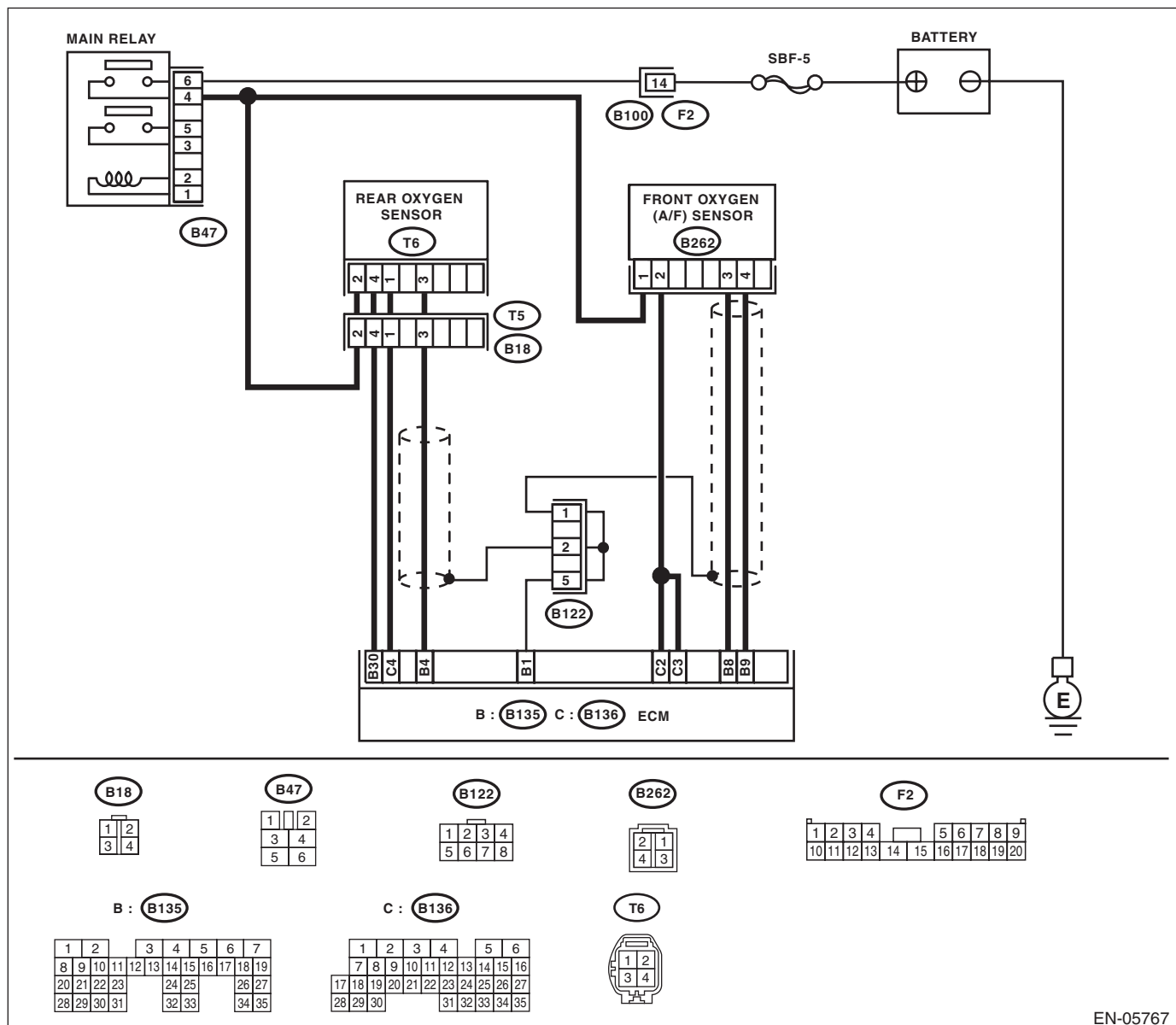
- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-130, DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

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

CAUTION:

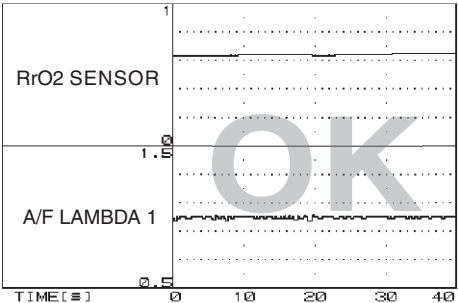
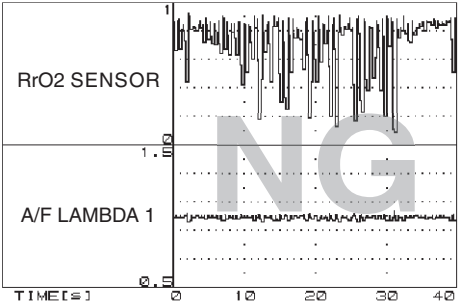
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:

EN-05767

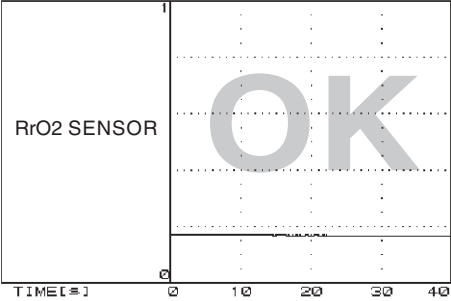
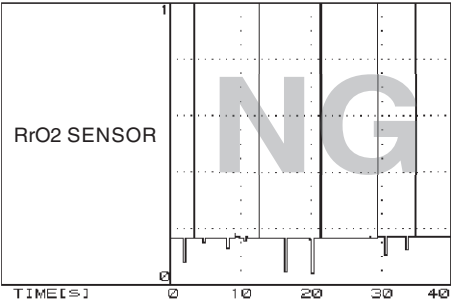
Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK EXHAUST SYSTEM. Check for gas leaks or air suction caused by loose or dislocated nuts and bolts, and open hole at exhaust pipes. NOTE: Check the following positions. • Between cylinder head and front exhaust pipe • Between front exhaust pipe and front catalytic converter • Between front catalytic converter and rear catalytic converter • Looseness and improper attachment of front oxygen (A/F) sensor or rear oxygen sensor	Is there any fault in exhaust system?	Repair or replace the exhaust system. <Ref. to EX(H4DOTC)-2, General Description.>	Go to step 2.
2 CHECK WAVEFORM DATA ON SUBARU SELECT MONITOR (WHILE DRIVING). 1) Drive the vehicle at a constant speed of 80 — 112 km/h (50 — 70 MPH). 2) Keep the condition of step 1) for 5 minutes, then read the waveform data in a driving condition using Subaru Select Monitor.   EN-04895	Is normal waveform pattern displayed?	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. Reproduce the fault condition, and reperform the check. NOTE: In this case, there may be a temporary connector contact failure.	Go to step 3.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
3 CHECK WAVEFORM DATA ON SUBARU SELECT MONITOR (WHILE IDLING). 1) Idle the engine. 2) Under the condition of step 1), read the waveform data using Subaru Select Monitor.  	Is normal waveform pattern displayed?	Go to step 4.	Go to step 5.
4 CHECK CATALYTIC CONVERTER.	Is the catalytic converter damaged?	Replace the catalytic converter. <Ref. to EC(H4DOTC)-5, Front Catalytic Converter.>	Go to step 5.
5 CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.	Has water entered the connector?	Completely remove any water inside.	Go to step 6.
6 CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. Connector & terminal (B135) No. 4 — (T6) No. 3: (B135) No. 30 — (T6) No. 4:	Is the resistance less than 1 Ω?	Go to step 7.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between the ECM and rear oxygen sensor connector • Poor contact of coupling connector

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
7 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 8.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between the ECM and rear oxygen sensor • Poor contact of the ECM and rear oxygen sensor • Poor contact in ECM connector • Poor contact of coupling connector
8 CHECK REAR OXYGEN SENSOR SHIELD. 1) Turn the ignition switch to OFF. 2) Bare the harness sensor shield on the body side of rear oxygen sensor connector. 3) Measure the resistance between sensor shield and chassis ground.	Is the resistance less than 1 Ω ?	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-44, Rear Oxygen Sensor.>	Repair the open circuit in rear oxygen sensor harness.

BK:DTC P0441 EVAPORATIVE EMISSION SYSTEM INCORRECT PURGE FLOW**DTC DETECTING CONDITION:**

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-131, DTC P0441 EVAPORATIVE EMISSION SYSTEM INCORRECT PURGE FLOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check the appropriate DTC using the "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-76, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK PURGE LINE OF THE PURGE CONTROL SOLENOID VALVE 2.	Is there any clogging, flattened part or bent in the purge line of purge control solenoid valve 2?	Repair or replace the purge line of purge control solenoid valve 2.	Go to step 3.
3 CHECK PURGE CONTROL SOLENOID VALVE 2. 1) Connect the delivery (test) mode connector. 2) Turn the ignition switch to ON. 3) Operate the purge control solenoid valve 2 using the Subaru Select Monitor. NOTE: The purge control solenoid valve 2 can be operated using Subaru Select Monitor. Regarding the procedures, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-55, Compulsory Valve Operation Check Mode.>	Does the purge control solenoid valve 2 operate?	Repair the poor contact of the ECM connector.	Replace the purge control solenoid valve 2. <Ref. to EC(H4DOTC)-8, Purge Control Solenoid Valve.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

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

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-132, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

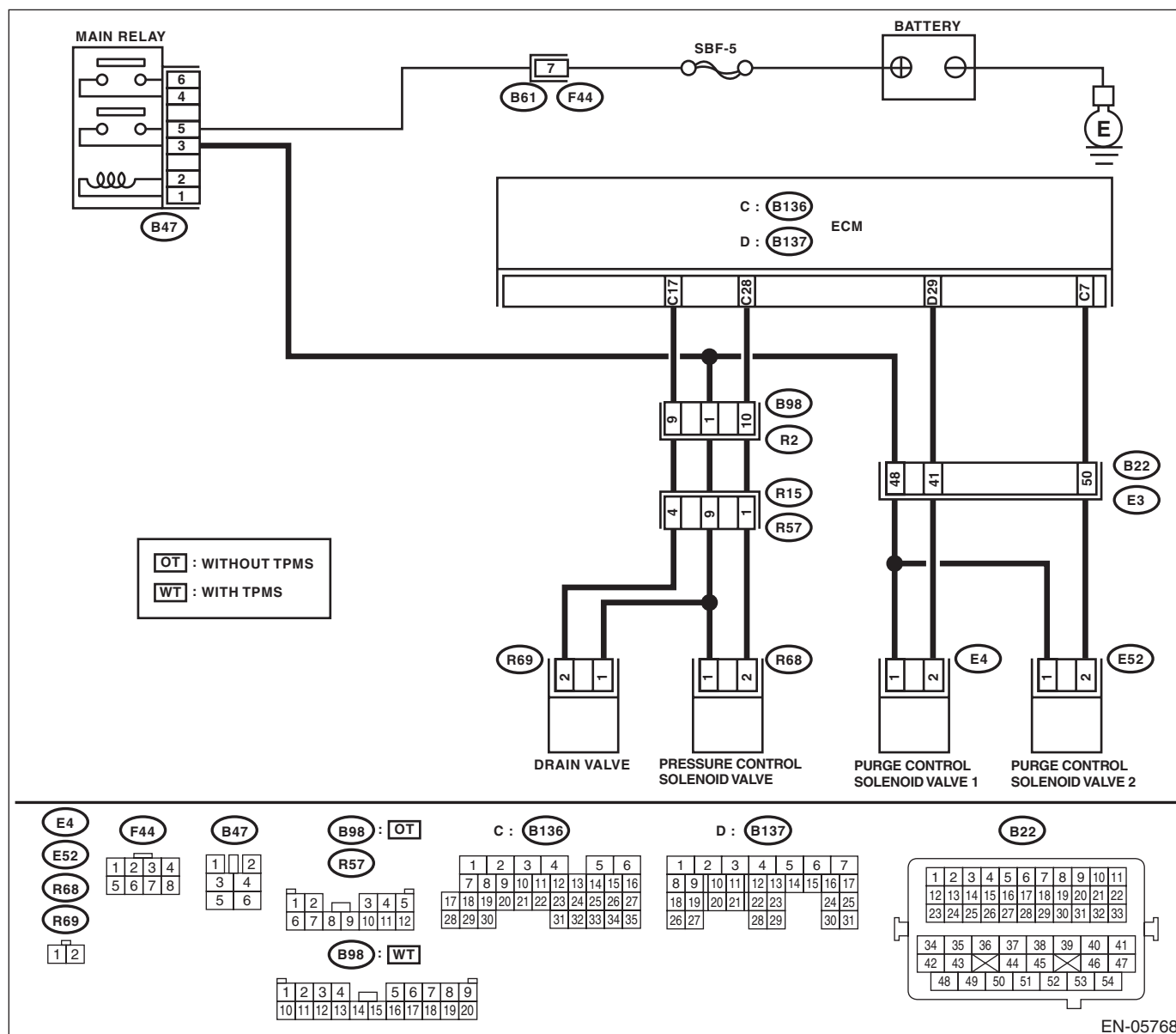
TROUBLE SYMPTOM:

- Fuel odor
- There is a hole of more than 1.0 mm (0.04 in) dia. in evaporation system or fuel tank.

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-05768

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK FUEL FILLER CAP. 1) Turn the ignition switch to OFF. 2) Check the fuel filler cap. NOTE: The DTC is stored in memory if fuel filler cap is or was loose or if the cap chain was caught while tightening.	Is the fuel filler cap tightened securely?	Go to step 2.	Tighten fuel filler cap securely.
2 CHECK FUEL FILLER CAP.	Is the fuel filler cap genuine?	Go to step 3.	Replace with a genuine fuel filler cap.
3 CHECK FUEL FILLER PIPE GASKET.	Is there any damage to the seal between fuel filler cap and fuel filler pipe?	Repair or replace the fuel filler cap and fuel filler pipe. <Ref. to FU(H4DOTC)-55, Fuel Filler Pipe.>	Go to step 4.
4 CHECK DRAIN VALVE. 1) Connect the delivery (test) mode connector. 2) Turn the ignition switch to ON. 3) Operate the drain valve using the Subaru Select Monitor. NOTE: The drain valve can be operated using Subaru Select Monitor. Regarding the procedures, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-55, Compulsory Valve Operation Check Mode.>	Does the drain valve operate?	Go to step 5.	Replace the drain valve. <Ref. to EC(H4DOTC)-21, Drain Valve.>
5 CHECK PURGE CONTROL SOLENOID VALVE. Operate the purge control solenoid valve using the Subaru Select Monitor. NOTE: Purge control solenoid valve operation can be executed using Subaru Select Monitor. Regarding the procedures, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-55, Compulsory Valve Operation Check Mode.>	Does the purge control solenoid valve operate?	Go to step 6.	Replace the purge control solenoid valve. <Ref. to EC(H4DOTC)-8, Purge Control Solenoid Valve.>
6 CHECK PRESSURE CONTROL SOLENOID VALVE. Operate the pressure control solenoid valve using the Subaru Select Monitor. NOTE: The pressure control solenoid valve operation can be executed using the Subaru Select Monitor. Regarding the procedures, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-55, Compulsory Valve Operation Check Mode.>	Does the pressure control solenoid valve operate?	Go to step 7.	Replace the pressure control solenoid valve. <Ref. to EC(H4DOTC)-16, Pressure Control Solenoid Valve.>
7 CHECK EVAPORATIVE EMISSION CONTROL SYSTEM LINE. 1) Turn the ignition switch to OFF. 2) Disconnect the delivery (test) mode connector.	Are there any holes of more than 1.0 mm (0.04 in) dia. in the evaporation line?	Repair or replace the evaporation line. <Ref. to FU(H4DOTC)-66, Fuel Delivery, Return and Evaporation Lines.>	Go to step 8.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

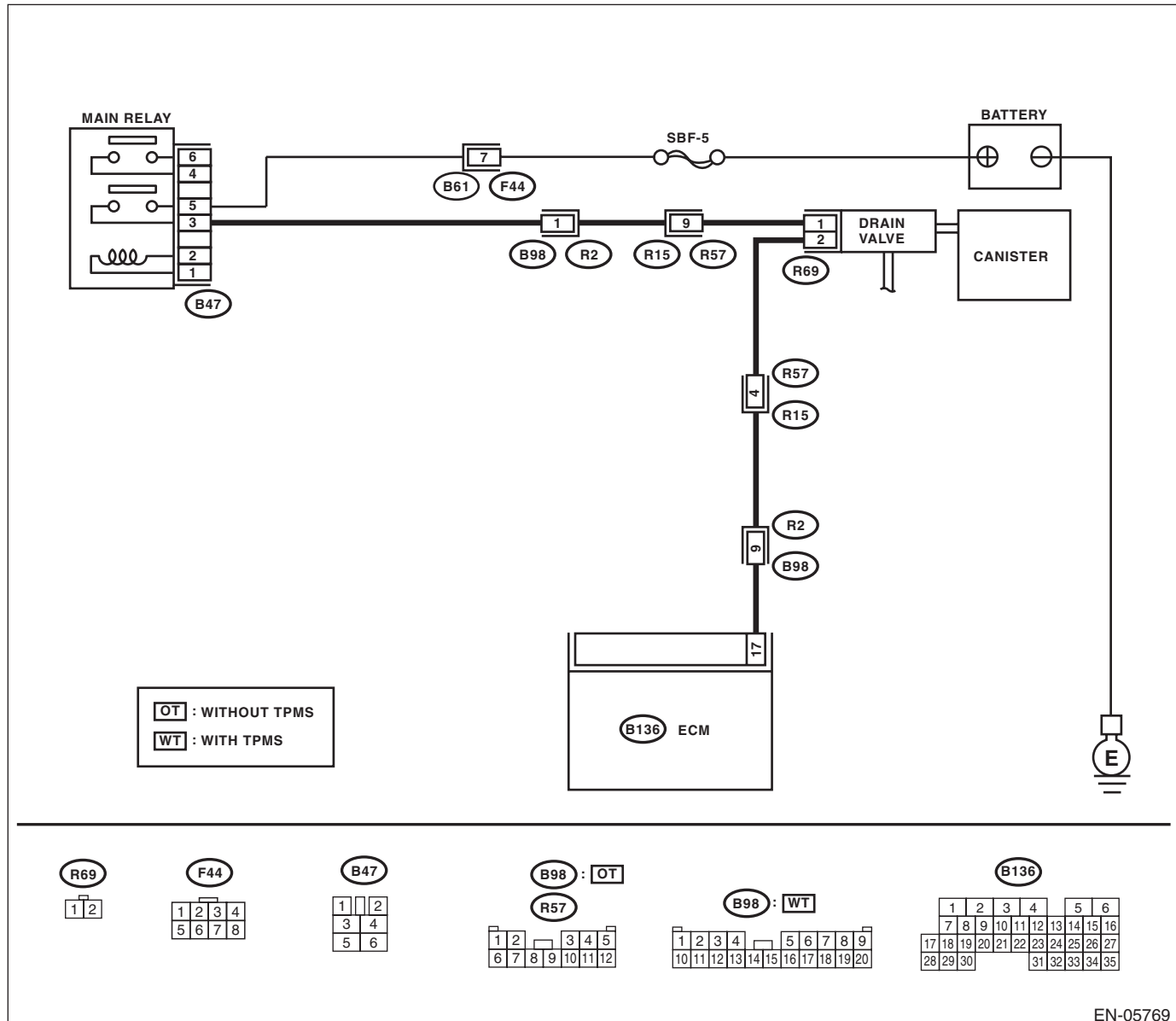
Step	Check	Yes	No
8 CHECK CANISTER.	Is the canister damaged or is there a hole of more than 1.0 mm (0.04 in) dia. in it?	Repair or replace the canister. <Ref. to EC(H4DOTC)-7, Canister.>	Go to step 9 .
9 CHECK FUEL TANK. Remove the fuel tank. <Ref. to FU(H4DOTC)-52, Fuel Tank.>	Is the fuel tank damaged or is there any hole of more than 1.0 mm (0.04 in) dia. in it?	Repair or replace the fuel tank. <Ref. to FU(H4DOTC)-52, Fuel Tank.>	Go to step 10 .
10 CHECK ANY OTHER MECHANICAL TROUBLE IN EVAPORATIVE EMISSION CONTROL SYSTEM.	Is there any hole of more than 1.0 mm (0.04 in) dia., crack, clogging, or disconnections, bend, misconnection of hoses or pipes in evaporative emission control system?	Repair or replace the hoses or pipes.	Repair the poor contact of the ECM connector.

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

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-148, DTC P0447 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:

EN-05769

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

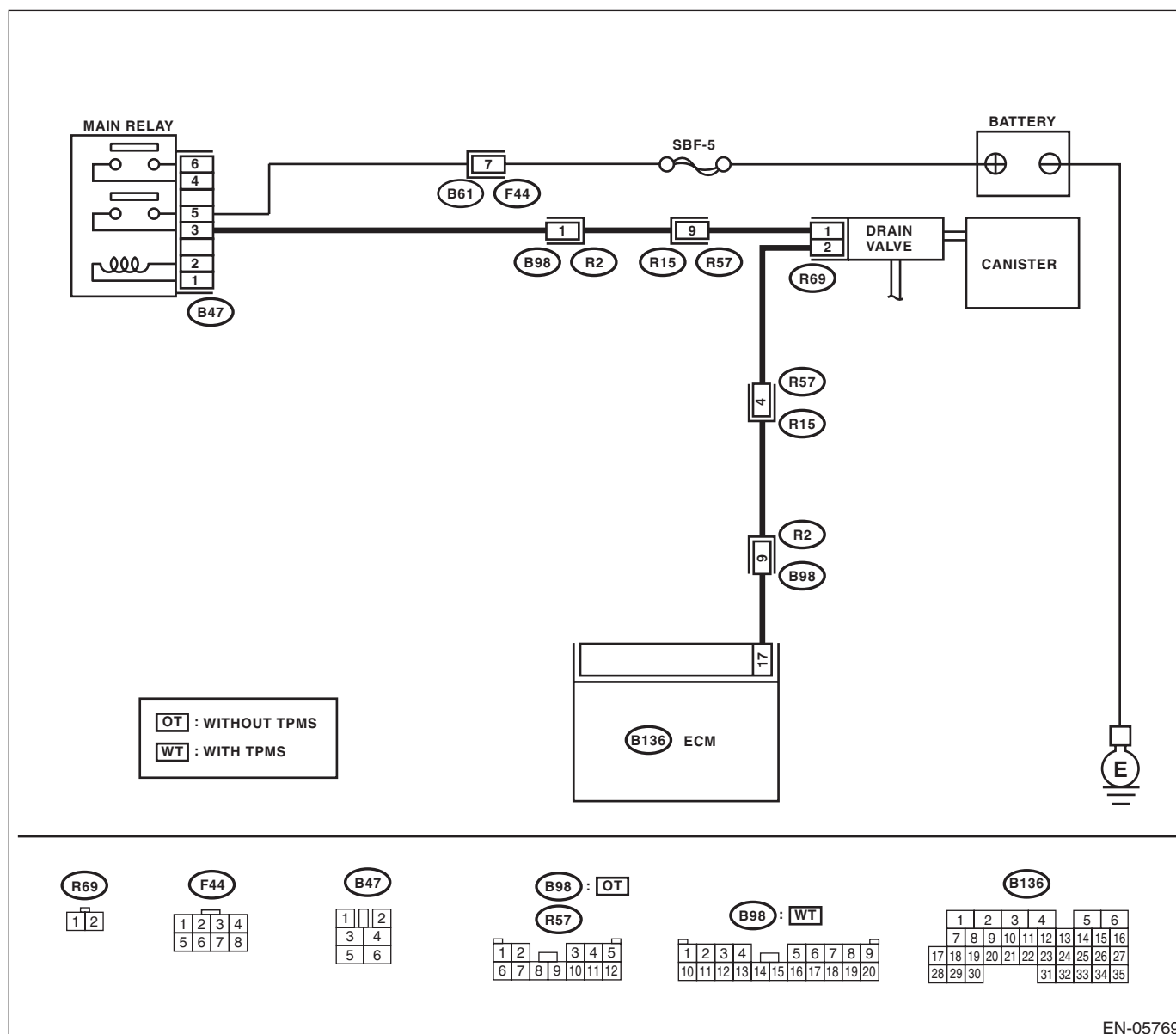
Step	Check	Yes	No
1 CHECK OUTPUT SIGNAL OF ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. Connector & terminal (B136) No. 17 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Repair the poor contact of the ECM connector.	Go to step 2.
2 CHECK HARNESS BETWEEN ECM AND DRAIN VALVE. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM and drain valve. 3) Measure the resistance between the drain valve connector and chassis ground. Connector & terminal (R69) No. 2 — Chassis ground:	Is the resistance 1 MΩ or more?	Go to step 3.	Repair the ground short circuit of harness between ECM and drain valve connector.
3 CHECK HARNESS BETWEEN ECM AND DRAIN VALVE. Measure the resistance of harness between ECM and drain valve connector. Connector & terminal (B136) No. 17 — (R69) No. 2:	Is the resistance less than 1 Ω?	Go to step 4.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and drain valve connector • Poor contact in coupling connector
4 CHECK DRAIN VALVE. Measure the resistance between drain valve terminals. Terminals No. 1 — No. 2:	Is the resistance between 10 — 100 Ω?	Go to step 5.	Replace the drain valve. <Ref. to EC(H4DOTC)-21, Drain Valve.>
5 CHECK POWER SUPPLY TO DRAIN VALVE. 1) Turn the ignition switch to ON. 2) Measure the voltage between drain valve and chassis ground. Connector & terminal (R69) No. 1 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Repair the poor contact of drain valve connector.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between main relay and drain valve • Poor contact in coupling connector • Poor contact in main relay connector

BN:DTC P0448 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED**DTC DETECTING CONDITION:**

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-150, DTC P0448 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:

EN-05769

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

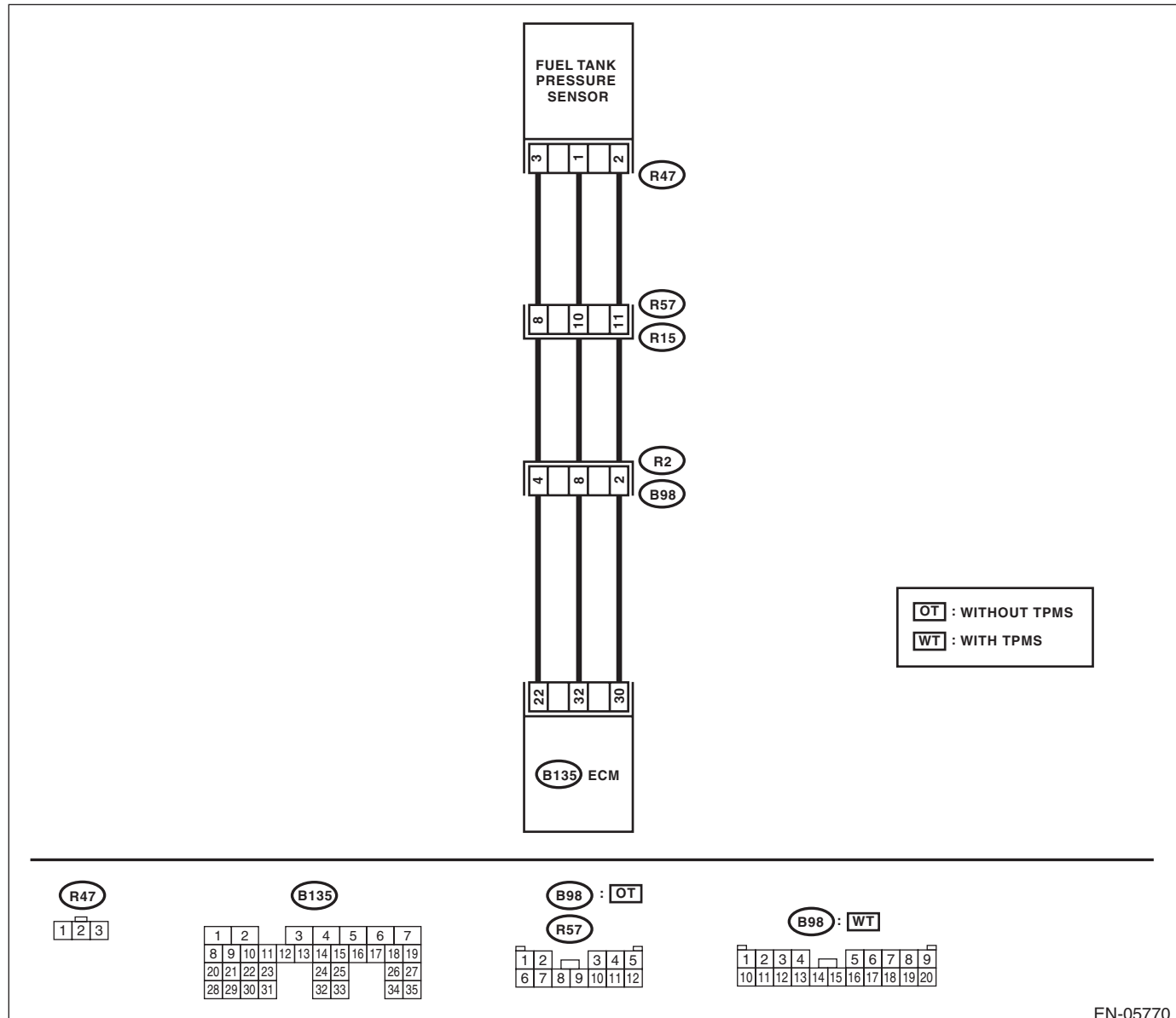
Step		Check	Yes	No
1	CHECK HARNESS BETWEEN ECM AND DRAIN VALVE. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM and drain valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. Connector & terminal (B136) No. 17 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Repair the short circuit to the power supply in the harness between the ECM and drain valve connector.	Go to step 2.
2	CHECK DRAIN VALVE. 1) Turn the ignition switch to OFF. 2) Measure the resistance between drain valve terminals. Terminals No. 1 — No. 2:	Is the resistance less than 1 Ω ?	Replace the drain valve. <Ref. to EC(H4DOTC)-21, Drain Valve.>	Repair the poor contact of the ECM connector.

BO:DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR**DTC DETECTING CONDITION:**

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-152, DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:

EN-05770

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

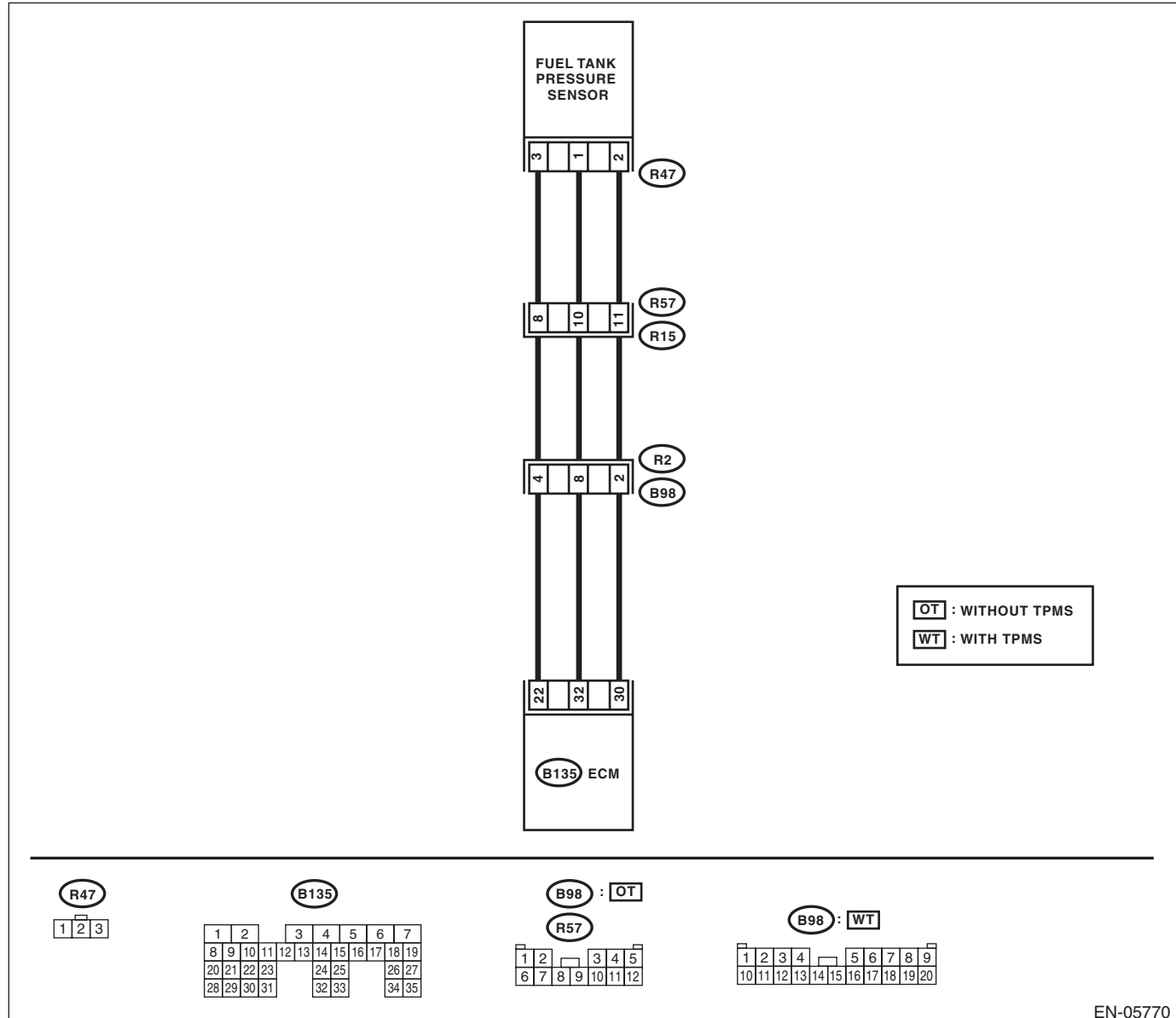
	Step	Check	Yes	No
1	CHECK FUEL FILLER CAP. 1) Turn the ignition switch to OFF. 2) Open the fuel flap.	Is the fuel filler cap tightened securely?	Go to step 2.	Tighten fuel filler cap securely.
2	CHECK PRESSURE VACUUM LINE. NOTE: Check the following items. • Disconnection, leakage and clogging of the vacuum hoses and pipes between fuel tank pressure sensor and fuel tank • Disconnection, leakage and clogging of the air ventilation hoses and pipes between the fuel filler pipe and fuel tank	Is there any fault in pressure/vacuum line?	Repair or replace the hoses and pipes.	Replace the fuel tank pressure sensor. <Ref. to EC(H4DOTC)-15, Fuel Tank Pressure Sensor.>

BP:DTC P0452 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT**DTC DETECTING CONDITION:**

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-154, DTC P0452 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:

EN-05770

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

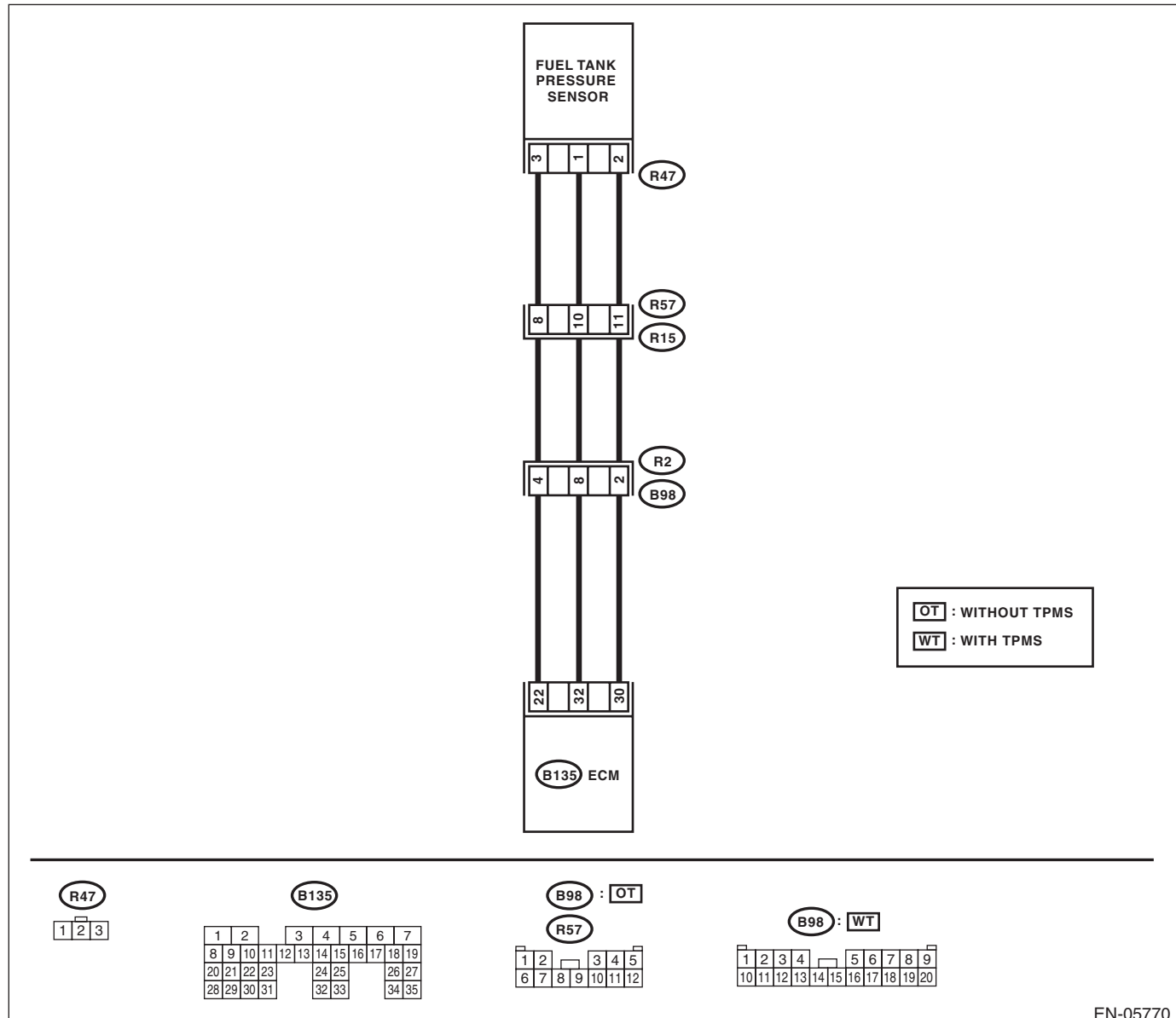
Step	Check	Yes	No
1 CHECK CURRENT DATA. 1) Turn the ignition switch to ON. 2) Read the data of fuel tank pressure sensor signal using the Subaru Select Monitor or general scan tool. NOTE: - Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> - General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the measured value less than -7.49 kPa (-56.15 mmHg, -2.212 inHg)?	Go to step 2.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. Reproduce the fault condition, and reperform the check. NOTE: In this case, there may be a temporary connector contact failure.
2 CHECK FUEL TANK PRESSURE SENSOR POWER SUPPLY. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the fuel tank pressure sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between the fuel tank pressure sensor connector and chassis ground. Connector & terminal (R47) No. 3 (+) — Chassis ground (-):	Is the voltage 4.5 V or more?	Go to step 3.	Repair the harness and connector. NOTE: In this case, repair the following item: - Open circuit of harness between ECM and fuel tank pressure sensor connector - Poor contact in ECM connector - Poor contact of coupling connector
3 CHECK HARNESS BETWEEN ECM AND FUEL TANK PRESSURE SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance of harness between the ECM and fuel tank pressure sensor connector. Connector & terminal (B135) No. 32 — (R47) No. 1:	Is the resistance less than 1 Ω ?	Go to step 4.	Repair the harness and connector. NOTE: In this case, repair the following item: - Open circuit of harness between ECM and fuel tank pressure sensor connector - Poor contact of coupling connector
4 CHECK HARNESS BETWEEN ECM AND FUEL TANK PRESSURE SENSOR CONNECTOR. Measure the resistance between ECM and chassis ground. Connector & terminal (B135) No. 32 — Chassis ground:	Is the resistance 1 M Ω or more?	Go to step 5.	Repair the ground short circuit of harness between ECM and fuel tank pressure sensor connector.
5 CHECK POOR CONTACT. Check for poor contact between the ECM and fuel tank pressure sensor connector.	Is there poor contact in the ECM or fuel tank pressure sensor connector?	Repair the poor contact in the ECM or fuel tank pressure sensor connector.	Replace the fuel tank pressure sensor. <Ref. to EC(H4DOTC)-15, Fuel Tank Pressure Sensor.>

BQ:DTC P0453 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT**DTC DETECTING CONDITION:**

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-156, DTC P0453 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:

EN-05770

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK CURRENT DATA. 1) Turn the ignition switch to ON. 2) Read the data of fuel tank pressure sensor signal using the Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the measured value 7.98 kPa (59.85 mmHg, 2.356 inHg) or more?	Go to step 2.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. Reproduce the fault condition, and reperform the check. NOTE: In this case, there may be a temporary connector contact failure.
2	CHECK HARNESS BETWEEN ECM AND FUEL TANK PRESSURE SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the fuel tank pressure sensor. 3) Turn the ignition switch to ON. 4) Read the data of fuel tank pressure sensor signal using the Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the measured value 7.98 kPa (59.85 mmHg, 2.356 inHg) or more?	Repair the short circuit to power supply in the harness between the ECM and fuel tank pressure sensor connector.	Go to step 3.
3	CHECK HARNESS BETWEEN ECM AND FUEL TANK PRESSURE SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between fuel tank pressure sensor connector and engine ground. Connector & terminal (R47) No. 2 — Engine ground:	Is the resistance less than 5 Ω?	Go to step 4.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and fuel tank pressure sensor connector • Poor contact in ECM connector • Poor contact of coupling connector
4	CHECK POOR CONTACT. Check for poor contact of the fuel tank pressure sensor connector.	Is there poor contact in fuel tank pressure sensor connector?	Repair the poor contact in the fuel tank pressure sensor connector.	Replace the fuel tank pressure sensor. <Ref. to EC(H4DOTC)-15, Fuel Tank Pressure Sensor.>

BR:DTC P0456 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK)**DTC DETECTING CONDITION:**

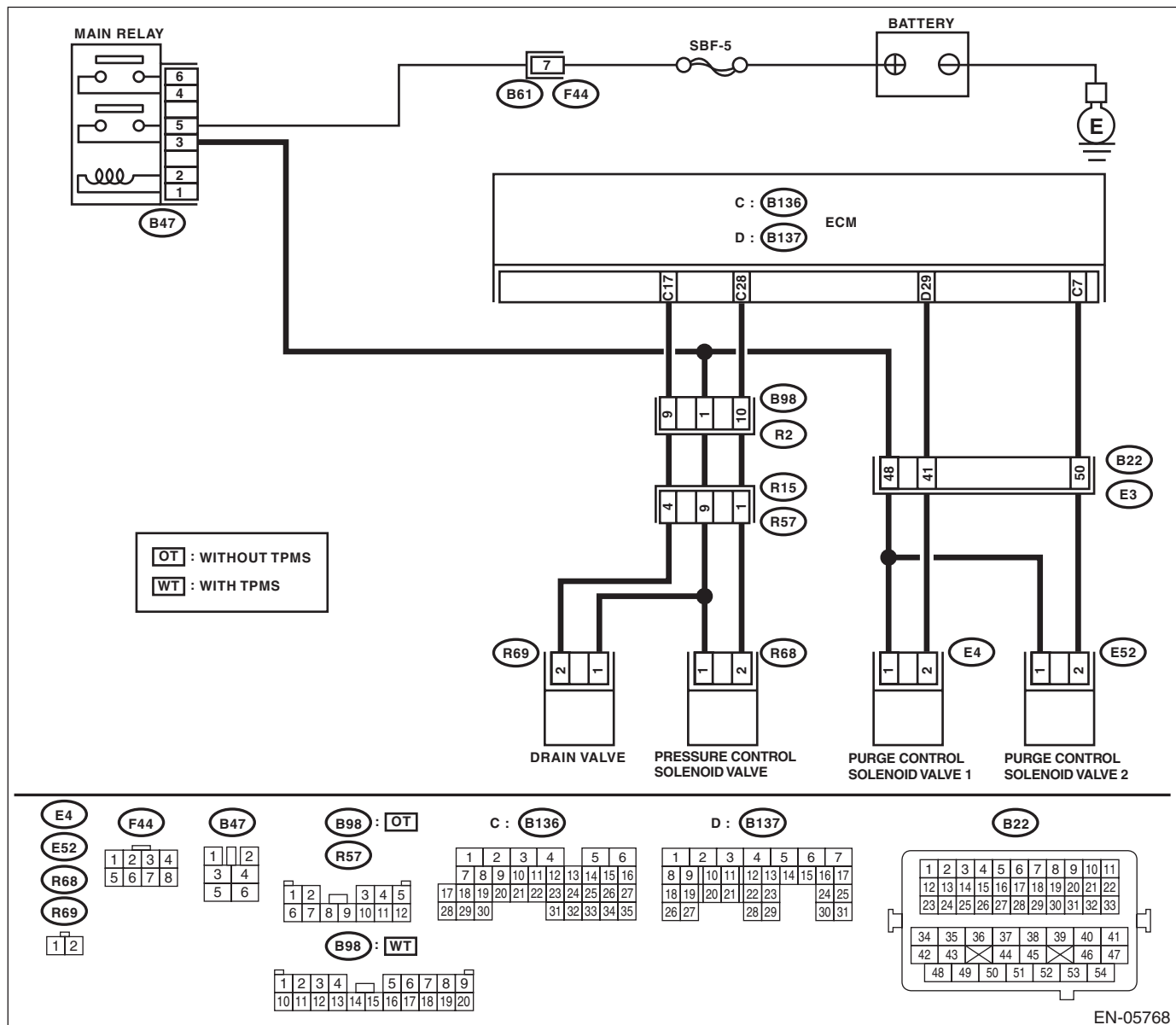
- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-157, DTC P0456 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Fuel odor
- There is a hole of more than 0.5 mm (0.020 in) dia. in evaporation system or fuel tank.

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:

EN-05768

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK FUEL FILLER CAP. 1) Turn the ignition switch to OFF. 2) Check the fuel filler cap. NOTE: The DTC is stored in memory if fuel filler cap is or was loose or if the cap chain was caught while tightening.	Is the fuel filler cap tightened securely?	Go to step 2.	Tighten fuel filler cap securely.
2 CHECK FUEL FILLER CAP.	Is the fuel filler cap genuine?	Go to step 3.	Replace with a genuine fuel filler cap.
3 CHECK FUEL FILLER PIPE GASKET.	Is there any damage to the seal between fuel filler cap and fuel filler pipe?	Repair or replace the fuel filler cap and fuel filler pipe. <Ref. to FU(H4DOTC)-55, Fuel Filler Pipe.>	Go to step 4.
4 CHECK DRAIN VALVE. 1) Connect the delivery (test) mode connector. 2) Turn the ignition switch to ON. 3) Operate the drain valve using the Subaru Select Monitor. NOTE: Drain valve can be operated using the Subaru Select Monitor. Regarding the procedures, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-55, Compulsory Valve Operation Check Mode.>	Does the drain valve operate?	Go to step 5.	Replace the drain valve. <Ref. to EC(H4DOTC)-21, Drain Valve.>
5 CHECK PURGE CONTROL SOLENOID VALVE. Operate the purge control solenoid valve using the Subaru Select Monitor. NOTE: Purge control solenoid valve operation can be executed using Subaru Select Monitor. Regarding the procedures, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-55, Compulsory Valve Operation Check Mode.>	Does the purge control solenoid valve operate?	Go to step 6.	Replace the purge control solenoid valve. <Ref. to EC(H4DOTC)-8, Purge Control Solenoid Valve.>
6 CHECK PRESSURE CONTROL SOLENOID VALVE. Operate the pressure control solenoid valve using the Subaru Select Monitor. NOTE: The pressure control solenoid valve operation can be executed using the Subaru Select Monitor. Regarding the procedures, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-55, Compulsory Valve Operation Check Mode.>	Does the pressure control solenoid valve operate?	Go to step 7.	Replace the pressure control solenoid valve. <Ref. to EC(H4DOTC)-16, Pressure Control Solenoid Valve.>
7 CHECK EVAPORATIVE EMISSION CONTROL SYSTEM LINE. 1) Turn the ignition switch to OFF. 2) Disconnect the delivery (test) mode connector.	Are there any holes of more than 0.5 mm (0.020 in) dia. in the evaporation line?	Repair or replace the evaporation line. <Ref. to FU(H4DOTC)-66, Fuel Delivery, Return and Evaporation Lines.>	Go to step 8.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
8 CHECK CANISTER.	Is the canister damaged or is there a hole of more than 0.5 mm (0.020 in) dia. in it?	Repair or replace the canister. <Ref. to EC(H4DOTC)-7, Canister.>	Go to step 9 .
9 CHECK FUEL TANK. Remove the fuel tank. <Ref. to FU(H4DOTC)-52, Fuel Tank.>	Is the fuel tank damaged or is there any hole of more than 0.5 mm (0.020 in) dia. in it?	Repair or replace the fuel tank. <Ref. to FU(H4DOTC)-52, Fuel Tank.>	Go to step 10 .
10 CHECK ANY OTHER MECHANICAL TROUBLE IN EVAPORATIVE EMISSION CONTROL SYSTEM.	Is there any hole of more than 0.5 mm (0.020 in) dia., crack, clogging, or disconnections, bend, misconnection of hoses or pipes in evaporative emission control system?	Repair or replace the hoses or pipes.	Repair the poor contact of the ECM connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

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

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-157, DTC P0457 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF), Diagnostic Trouble Code (DTC) Detecting Criteria.>

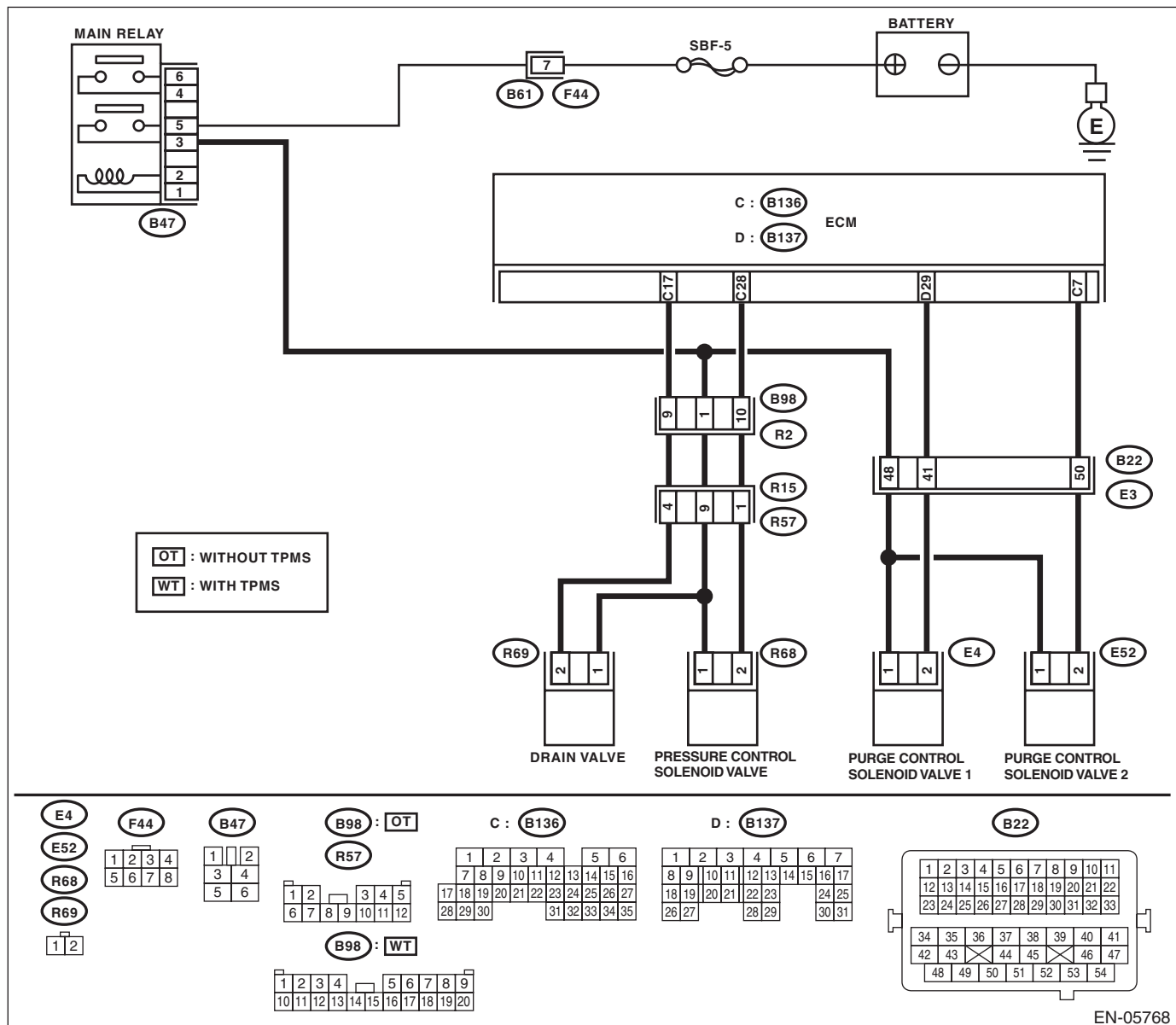
TROUBLE SYMPTOM:

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

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK FUEL FILLER CAP. 1) Turn the ignition switch to OFF. 2) Check the fuel filler cap. NOTE: The DTC is stored in memory if fuel filler cap is or was loose or if the cap chain was caught while tightening.	Is the fuel filler cap tightened securely?	Go to step 2.	Tighten fuel filler cap securely.
2 CHECK FUEL FILLER CAP.	Is the fuel filler cap genuine?	Go to step 3.	Replace with a genuine fuel filler cap.
3 CHECK FUEL FILLER PIPE GASKET.	Is there any damage to the seal between fuel filler cap and fuel filler pipe?	Repair or replace the fuel filler cap and fuel filler pipe. <Ref. to FU(H4DOTC)-55, Fuel Filler Pipe.>	Go to step 4.
4 CHECK DRAIN VALVE. 1) Connect the delivery (test) mode connector. 2) Turn the ignition switch to ON. 3) Operate the drain valve using the Subaru Select Monitor. NOTE: Drain valve can be operated using the Subaru Select Monitor. Regarding the procedures, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-55, Compulsory Valve Operation Check Mode.>	Does the drain valve operate?	Go to step 5.	Replace the drain valve. <Ref. to EC(H4DOTC)-21, Drain Valve.>
5 CHECK PURGE CONTROL SOLENOID VALVE. Operate the purge control solenoid valve using the Subaru Select Monitor. NOTE: Purge control solenoid valve operation can be executed using Subaru Select Monitor. Regarding the procedures, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-55, Compulsory Valve Operation Check Mode.>	Does the purge control solenoid valve operate?	Go to step 6.	Replace the purge control solenoid valve. <Ref. to EC(H4DOTC)-8, Purge Control Solenoid Valve.>
6 CHECK PRESSURE CONTROL SOLENOID VALVE. Operate the pressure control solenoid valve using the Subaru Select Monitor. NOTE: The pressure control solenoid valve operation can be executed using the Subaru Select Monitor. Regarding the procedures, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-55, Compulsory Valve Operation Check Mode.>	Does the pressure control solenoid valve operate?	Go to step 7.	Replace the pressure control solenoid valve. <Ref. to EC(H4DOTC)-16, Pressure Control Solenoid Valve.>
7 CHECK EVAPORATIVE EMISSION CONTROL SYSTEM LINE. 1) Turn the ignition switch to OFF. 2) Disconnect the delivery (test) mode connector.	Is there any disconnection, damage or clogging on the evaporation line?	Repair or replace the evaporation line. <Ref. to FU(H4DOTC)-66, Fuel Delivery, Return and Evaporation Lines.>	Go to step 8.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
8 CHECK CANISTER.	Is the canister damaged?	Repair or replace the canister. <Ref. to EC(H4DOTC)-7, Canister.>	Go to step 9 .
9 CHECK FUEL TANK. Remove the fuel tank. <Ref. to FU(H4DOTC)-52, Fuel Tank.>	Is the fuel tank damaged?	Repair or replace the fuel tank. <Ref. to FU(H4DOTC)-52, Fuel Tank.>	Go to step 10 .
10 CHECK ANY OTHER MECHANICAL TROUBLE IN EVAPORATIVE EMISSION CONTROL SYSTEM.	Are there holes, cracks, clogging, or disconnections, misconnection of hoses or pipes in evaporative emission control system?	Repair or replace the hoses or pipes.	Repair the poor contact of the ECM connector.

ENGINE (DIAGNOSTICS)

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OUTPUT SIGNAL OF ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. Connector & terminal (B137) No. 29 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Repair the poor contact of the ECM connector.	Go to step 2.
2 CHECK HARNESS BETWEEN ECM AND PURGE CONTROL SOLENOID VALVE. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and purge control solenoid valve. 3) Measure the resistance between the purge control solenoid valve connector and engine ground. Connector & terminal (E4) No. 2 — Engine ground:	Is the resistance 1 MΩ or more?	Go to step 3.	Repair the ground short circuit of harness between ECM and purge control solenoid valve connector.
3 CHECK HARNESS BETWEEN ECM AND PURGE CONTROL SOLENOID VALVE. Measure the resistance of harness between ECM and purge control solenoid valve. Connector & terminal (B137) No. 29 — (E4) No. 2:	Is the resistance less than 1 Ω?	Go to step 4.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and purge control solenoid valve connector • Poor contact in coupling connector
4 CHECK PURGE CONTROL SOLENOID VALVE. 1) Remove the purge control solenoid valve. 2) Measure the resistance between purge control solenoid valve terminals. Terminals No. 1 — No. 2:	Is the resistance between 10 — 100 Ω?	Go to step 5.	Replace the purge control solenoid valve. <Ref. to EC(H4DOTC)-8, Purge Control Solenoid Valve.>
5 CHECK POWER SUPPLY TO PURGE CONTROL SOLENOID VALVE. 1) Turn the ignition switch to ON. 2) Measure the voltage between purge control solenoid valve and engine ground. Connector & terminal (E4) No. 1 (+) — Engine ground (-):	Is the voltage 10 V or more?	Repair the poor contact of purge control solenoid valve connector.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between the main relay and purge control solenoid valve • Poor contact of coupling connector • Poor contact of main relay connector

BU:DTC P0459 EVAPORATIVE EMISSION SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH**DTC DETECTING CONDITION:**

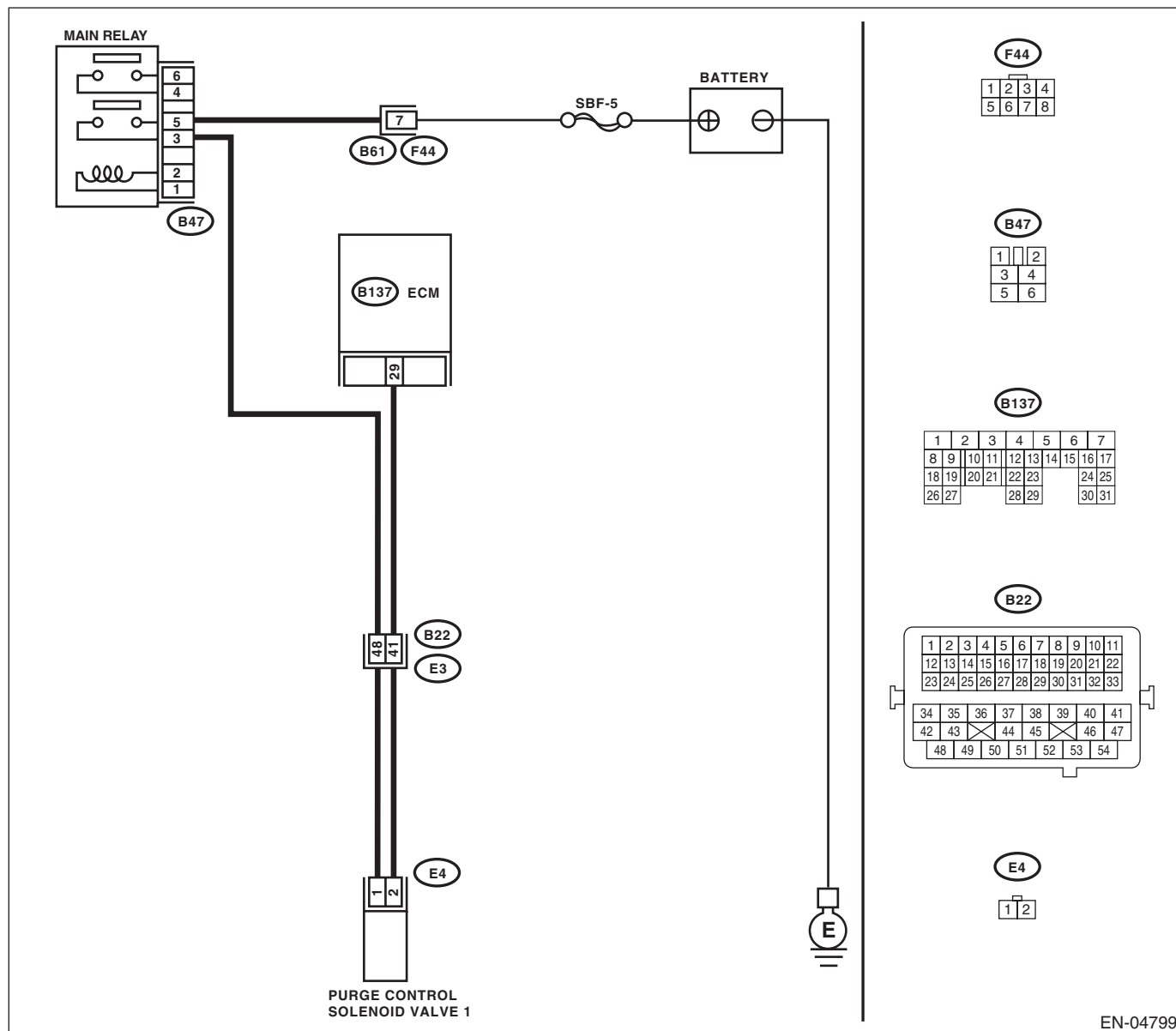
- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-160, DTC P0459 EVAPORATIVE EMISSION SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

Improper idling

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:

EN-04799

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN ECM AND PURGE CONTROL SOLENOID VALVE. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and purge control solenoid valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. Connector & terminal (B137) No. 29 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Repair the short circuit to power supply in the harness between the ECM and purge control solenoid valve connector.	Go to step 2.
2 CHECK PURGE CONTROL SOLENOID VALVE. 1) Turn the ignition switch to OFF. 2) Measure the resistance between purge control solenoid valve terminals. Terminals No. 1 — No. 2:	Is the resistance less than 1 Ω ?	Replace the purge control solenoid valve. <Ref. to EC(H4DOTC)-8, Purge Control Solenoid Valve.>	Repair the poor contact of the ECM connector.

BV:DTC P0461 FUEL LEVEL SENSOR “A” CIRCUIT RANGE/PERFORMANCE

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-162, DTC P0461 FUEL LEVEL SENSOR “A” CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

Step	Check	Yes	No
1 CHECK FOR ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check the appropriate DTC using the “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4DOTC)(diag)-76, List of Diagnostic Trouble Code (DTC).>	Replace the fuel level sensor and fuel sub level sensor. <Ref. to FU(H4DOTC)-61, Fuel Level Sensor.> <Ref. to FU(H4DOTC)-62, Fuel Sub Level Sensor.>

BW:DTC P0462 FUEL LEVEL SENSOR "A" CIRCUIT LOW

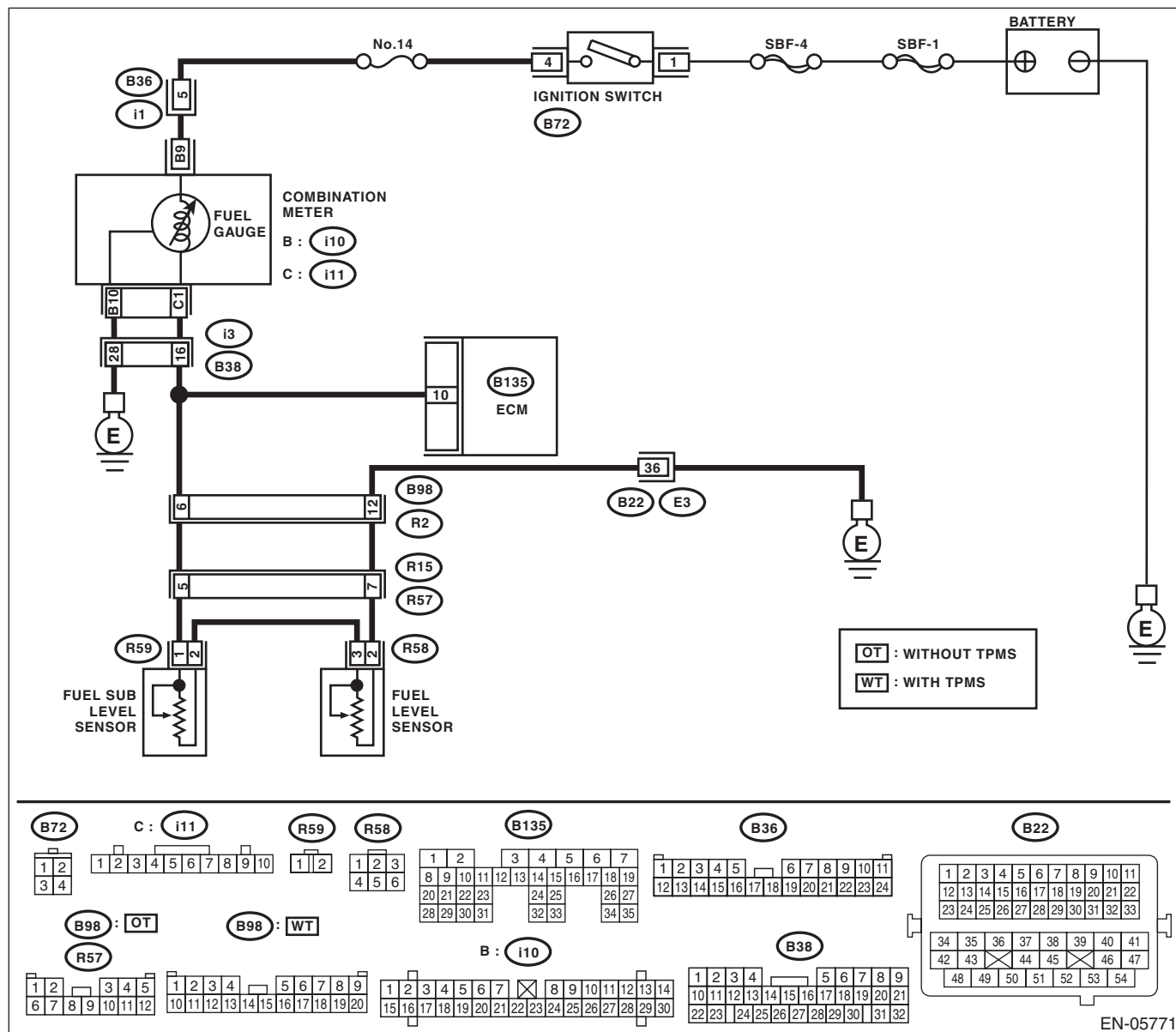
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-164, DTC P0462 FUEL LEVEL SENSOR "A" CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK SPEEDOMETER AND TACHOMETER OPERATION IN COMBINATION METER.	Does the speedometer and tachometer operate normally?	Go to step 2.	Repair or replace the combination meter. <Ref. to IDI-3, Combination Meter System.>
2 CHECK INPUT SIGNAL OF ECM. 1) Turn the ignition switch to ON. (engine OFF) 2) Measure the voltage between ECM and chassis ground. Connector & terminal (B135) No. 10 (+) — Chassis ground (-):	Is the voltage less than 0.04 V?	Go to step 4.	Go to step 3.
3 CHECK INPUT SIGNAL FOR ECM (USING SUBARU SELECT MONITOR). Read the data of fuel level sensor signal using Subaru Select Monitor. NOTE: For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.>	Does the voltage change when shaking the ECM harness and connector?	Repair the poor contact of the ECM connector.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. Reproduce the fault condition, and reperform the check. NOTE: In this case, there may be a temporary connector contact failure.
4 CHECK INPUT VOLTAGE OF ECM. 1) Turn the ignition switch to OFF. 2) Disconnect the fuel tank cord connector (R57) and rear wiring harness connector (R15). 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. Connector & terminal (B135) No. 10 (+) — Chassis ground (-):	Is the voltage less than 0.04 V?	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 connectors from the ECM and combination meter connector (i11). 3) Measure the resistance between ECM and chassis ground. Connector & terminal (B135) No. 10 — Chassis ground:	Is the resistance 1 MΩ or more?	Repair or replace the combination meter. <Ref. to IDI-3, Combination Meter System.>	Repair the harness. NOTE: In this case, repair the following item: • Short circuit to ground in harness between ECM and combination meter connector • Short circuit to ground in harness between ECM and fuel tank cord connector
6 CHECK FUEL TANK CORD. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the fuel sub level sensor. 3) Measure the resistance between fuel sub level sensor and chassis ground. Connector & terminal (R59) No. 1 — Chassis ground:	Is the resistance 1 MΩ or more?	Go to step 7.	Repair the ground short circuit of fuel tank cord.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
7 CHECK FUEL TANK CORD. 1) Disconnect the connector from fuel pump assembly. 2) Measure the resistance between fuel pump assembly and chassis ground. Connector & terminal (R59) No. 2 — Chassis ground:	Is the resistance 1 MΩ or more?	Go to step 8.	Repair the ground short circuit of fuel tank cord.
8 CHECK FUEL LEVEL SENSOR. 1) Remove the fuel pump assembly. <Ref. to FU(H4DOTC)-59, 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 between 0.5 — 2.5 Ω?	Go to step 9.	Replace the fuel level sensor. <Ref. to FU(H4DOTC)-61, Fuel Level Sensor.>
9 CHECK FUEL SUB LEVEL SENSOR. 1) Remove the fuel sub level sensor. <Ref. to FU(H4DOTC)-62, Fuel Sub Level Sensor.> 2) Measure the resistance between fuel sub level sensor and terminals with its float set to the full position. Terminals No. 1 — No. 2:	Is the resistance between 0.5 — 2.5 Ω?	Repair the poor contact in harness between ECM and combination meter connector.	Replace the fuel sub level sensor. <Ref. to FU(H4DOTC)-62, Fuel Sub Level Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

BX:DTC P0463 FUEL LEVEL SENSOR "A" CIRCUIT HIGH

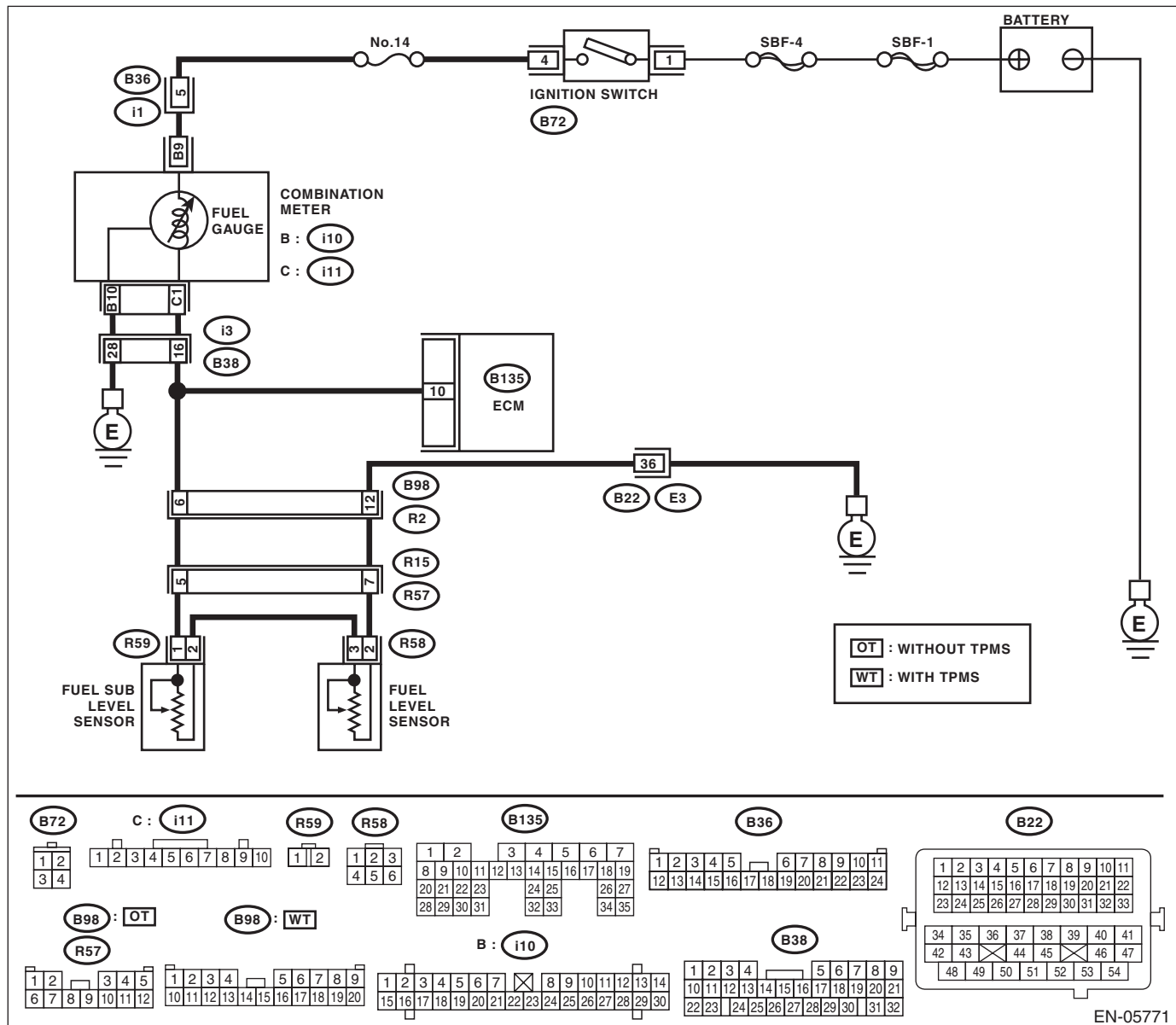
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-166, DTC P0463 FUEL LEVEL SENSOR "A" CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-05771

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK SPEEDOMETER AND TACHOMETER OPERATION IN COMBINATION METER.	Does the speedometer and tachometer operate normally?	Go to step 2.	Repair or replace the combination meter. <Ref. to IDI-3, Combination Meter System.>
2 CHECK INPUT SIGNAL OF ECM. 1) Turn the ignition switch to ON. (engine OFF) 2) Measure the voltage between ECM and chassis ground. Connector & terminal (B135) No. 10 (+) — Chassis ground (-):	Is the voltage 4.9 V or more?	Go to step 4.	Go to step 3.
3 CHECK INPUT SIGNAL FOR ECM (USING SUBARU SELECT MONITOR). Read the data of fuel level sensor signal using Subaru Select Monitor. NOTE: For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.>	Does the voltage change when shaking the ECM harness and connector?	Repair the poor contact of the ECM connector.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. Reproduce the fault condition, and reperform the check. NOTE: In this case, there may be a temporary connector contact failure.
4 CHECK INPUT VOLTAGE OF ECM. 1) Turn the ignition switch to OFF. 2) Disconnect the ECM and combination meter connector (i11). 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. Connector & terminal (B135) No. 10 (+) — Chassis ground (-):	Is the voltage 4.9 V or more?	Repair the short circuit to power in harness between ECM and combination meter connector.	Go to step 5.
5 CHECK HARNESS BETWEEN ECM AND FUEL TANK CORD. 1) Turn the ignition switch to OFF. 2) Disconnect the fuel tank cord connector (R57) and rear wiring harness connector (R15). 3) Measure the resistance between ECM and fuel tank cord. Connector & terminal (B135) No. 10 — (R15) No. 5:	Is the resistance less than 1 Ω ?	Go to step 6.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit between ECM and fuel tank cord • Poor contact of coupling connector
6 CHECK HARNESS BETWEEN FUEL TANK CORD AND CHASSIS GROUND. Measure the resistance between fuel tank cord and chassis ground. Connector & terminal (R15) No. 7 — Chassis ground:	Is the resistance less than 5 Ω ?	Go to step 7.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between fuel tank cord and chassis ground • Poor contact of coupling connector

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
7 CHECK FUEL TANK CORD. 1) Disconnect the connector from the fuel level sensor. 2) Measure the resistance between fuel level sensor and coupling connector. Connector & terminal (R57) No. 7 — (R58) No. 2:	Is the resistance less than 1 Ω ?	Go to step 8.	Repair the open circuit between coupling connector and fuel level sensor.
8 CHECK FUEL TANK CORD. 1) Disconnect the connector from the fuel sub level sensor. 2) Measure the resistance between fuel level sensor and fuel sub level sensor. Connector & terminal (R58) No. 3 — (R59) No. 2:	Is the resistance less than 1 Ω ?	Go to step 9.	Repair the open circuit between fuel level sensor and fuel sub level sensor.
9 CHECK FUEL TANK CORD. Measure the resistance between fuel level sensor and coupling connector. Connector & terminal (R57) No. 5 — (R59) No. 1:	Is the resistance less than 1 Ω ?	Go to step 10.	Repair the open circuit in harness between coupling connector and fuel level sensor.
10 CHECK FUEL LEVEL SENSOR. 1) Remove the fuel pump assembly. <Ref. to FU(H4DOTC)-59, Fuel Pump.> 2) While moving the fuel level sensor float up and down, measure resistance between fuel level sensor terminals. Terminals No. 2 — No. 3:	Is the resistance 52 Ω or more?	Replace the fuel level sensor. <Ref. to FU(H4DOTC)-61, Fuel Level Sensor.>	Go to step 11.
11 CHECK FUEL SUB LEVEL SENSOR. 1) Remove the fuel sub level sensor. <Ref. to FU(H4DOTC)-62, Fuel Sub Level Sensor.> 2) While moving the fuel sub level sensor float up and down, measure resistance between fuel sub level sensor terminals. Terminals No. 1 — No. 2:	Is the resistance 44 Ω or more?	Replace the fuel sub level sensor. <Ref. to FU(H4DOTC)-62, Fuel Sub Level Sensor.>	Replace the combination meter. <Ref. to IDI-10, Combination Meter.>

BY:DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT

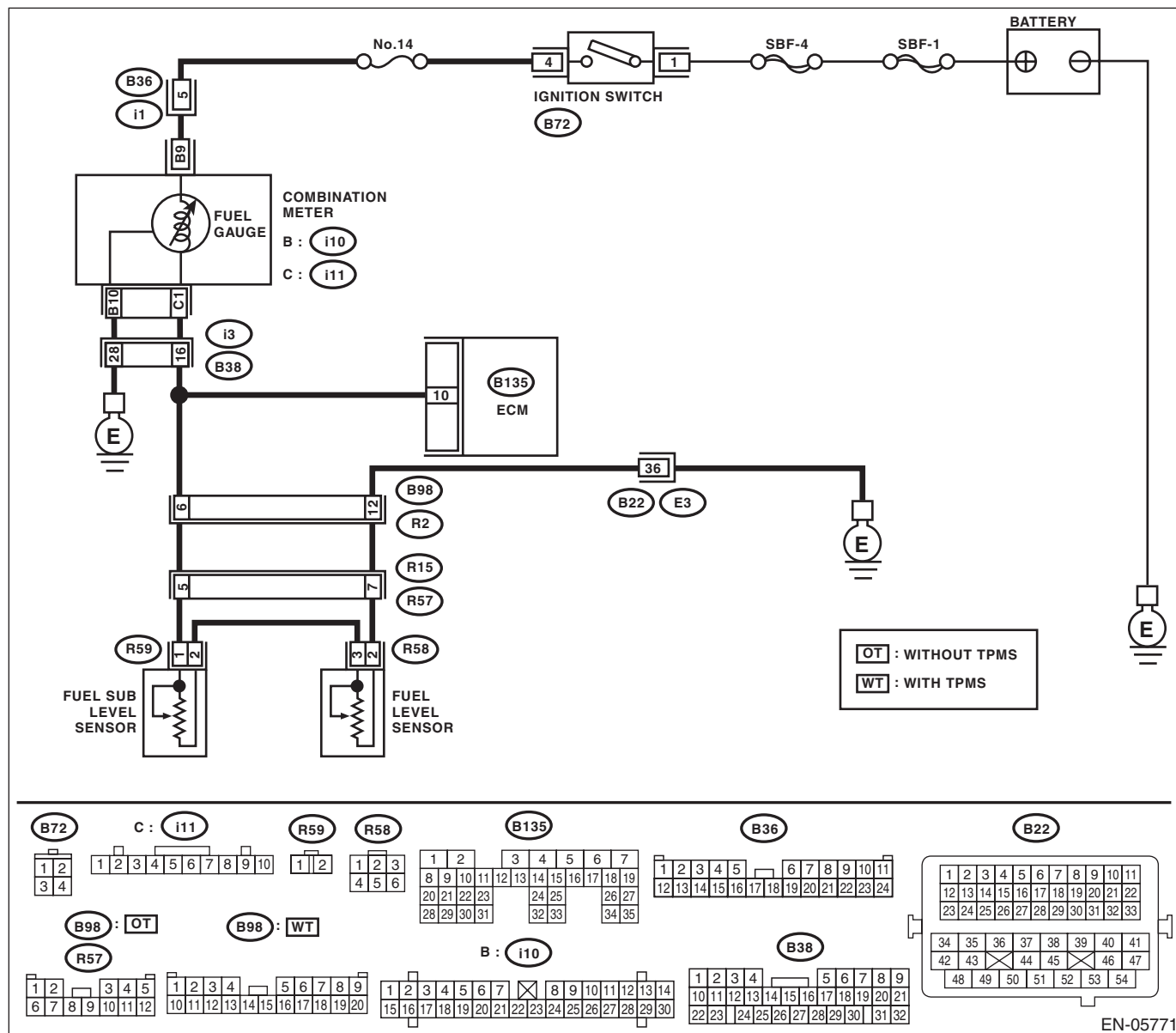
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-168, DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step		Check	Yes	No
1	CHECK FUEL LEVEL SENSOR. 1) Remove the fuel pump assembly. <Ref. to FU(H4DOTC)-59, 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. 2 — No. 3:	Does the resistance change smoothly?	Go to step 2.	Replace the fuel level sensor. <Ref. to FU(H4DOTC)-61, Fuel Level Sensor.>
	CHECK FUEL SUB LEVEL SENSOR. 1) Remove the fuel sub level sensor. <Ref. to FU(H4DOTC)-62, 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:			
2		Does the resistance change smoothly?	Repair the connector. NOTE: In this case, repair the following item: • Poor contact in ECM connector • Poor contact in combination meter connector • Poor contact in coupling connector	Replace the fuel sub level sensor. <Ref. to FU(H4DOTC)-62, Fuel Sub Level Sensor.>

BZ:DTC P0483 FAN RATIONALITY CHECK**DTC DETECTING CONDITION:**

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-171, DTC P0483 FAN RATIONALITY CHECK, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Occurrence of noise
- Overheating

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

NOTE:

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

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check the appropriate DTC using the "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-76, List of Diagnostic Trouble Code (DTC).>	Check radiator fan, fan motor and thermostat and if thermostat is stuck, replace thermostat. <Ref. to CO(H4SO)-32, Radiator Main Fan and Fan Motor.> <Ref. to CO(H4SO)-38, Radiator Sub Fan and Fan Motor.>

CA:DTC P0502 VEHICLE SPEED SENSOR "A" CIRCUIT LOW INPUT**NOTE:**

For the diagnostic procedure, refer to DTC P0503. <Ref. to EN(H4DOTC)(diag)-244, DTC P0503 VEHICLE SPEED SENSOR "A" INTERMITTENT/ERRATIC/HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

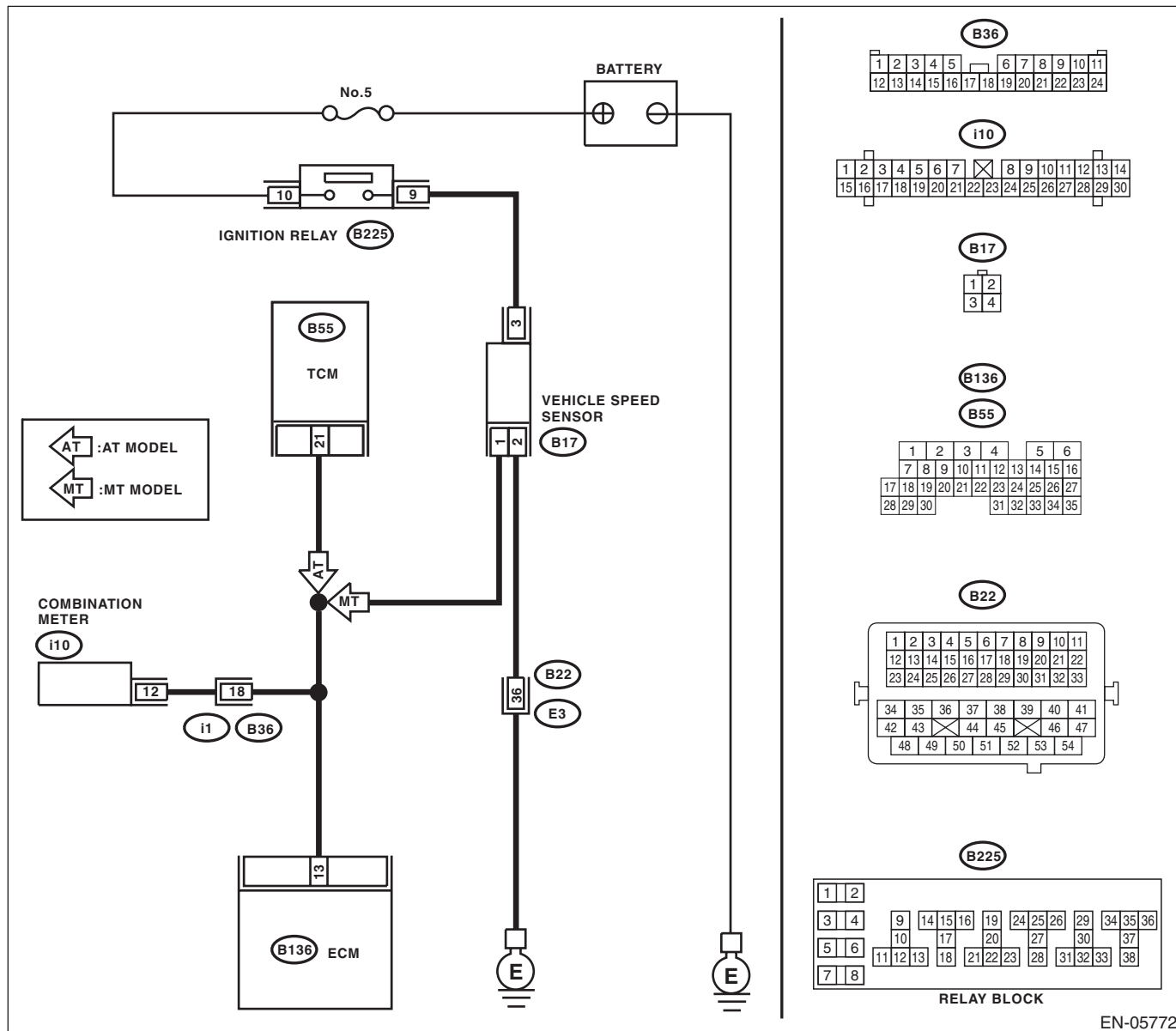
CB:DTC P0503 VEHICLE SPEED SENSOR "A" INTERMITTENT/ERRATIC/HIGH DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-173, DTC P0503 VEHICLE SPEED SENSOR "A" INTERMITTENT/ERRATIC/HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-05772

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1	CHECK TRANSMISSION TYPE. Is the transmission type AT?	Go to step 2.	Go to step 6.
2	CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and TCM. 3) Measure the resistance of harness between ECM and TCM connector. Connector & terminal (B136) No. 13 — (B55) No. 21:	Is the resistance less than 1 Ω ? Go to step 3.	Repair the open circuit of harness between ECM and TCM connector.
3	CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR. Measure the resistance between TCM connector and chassis ground. Connector & terminal (B55) No. 21 — Chassis ground:	Is the resistance 1 M Ω or more? Go to step 4.	Repair the short circuit to ground in harness between ECM and TCM connector.
4	CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR. 1) Turn the ignition switch to ON. 2) Measure the voltage between TCM connector and chassis ground. Connector & terminal (B55) No. 21 (+) — Chassis ground (-):	Is the voltage 10 V or more? Repair the short circuit to power in harness between ECM and TCM connector.	Go to step 5.
5	CHECK POOR CONTACT. Check the poor contact of TCM connector.	Is there any poor contact in TCM connector? Repair the poor contact of TCM connector.	Repair the poor contact of the ECM connector.
6	CHECK VEHICLE SPEED SENSOR POWER SUPPLY. 1) Turn the ignition switch to ON. 2) Measure the voltage between vehicle speed sensor connector and chassis ground. Connector & terminal (B17) No. 3 (+) — Chassis ground (-):	Is the voltage 10 V or more? Go to step 7.	Repair the open or ground short circuit of power supply circuit.
7	CHECK HARNESS BETWEEN ECM AND VEHICLE SPEED SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM and vehicle speed sensor. 3) Measure the resistance of the harness between the ECM and vehicle speed sensor connector. Connector & terminal (B136) No. 13 — (B17) No. 1:	Is the resistance less than 1 Ω ? Go to step 8.	Repair the open circuit in the harness between the ECM and vehicle speed sensor.
8	CHECK HARNESS BETWEEN ECM AND VEHICLE SPEED SENSOR. Measure the resistance between vehicle speed sensor connector and chassis ground. Connector & terminal (B17) No. 1 — Chassis ground:	Is the resistance 1 M Ω or more? Go to step 9.	Repair the ground short circuit in harness between ECM and vehicle speed sensor.
9	CHECK HARNESS BETWEEN ECM AND VEHICLE SPEED SENSOR. 1) Turn the ignition switch to ON. 2) Measure the voltage between vehicle speed sensor connector and chassis ground. Connector & terminal (B17) No. 1 (+) — Chassis ground (-):	Is the voltage 10 V or more? Repair the short circuit to power in the harness between the ECM and vehicle speed sensor.	Go to step 10.
10	CHECK POOR CONTACT. Check poor contact in vehicle speed sensor connector.	Is there poor contact in vehicle speed sensor connector? Repair the poor contact in vehicle speed sensor connector.	Replace the vehicle speed sensor. <Ref. to 5MT-38, Vehicle Speed Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

CC:DTC P0506 IDLE AIR CONTROL SYSTEM RPM LOWER THAN EXPECTED

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-174, DTC P0506 IDLE AIR CONTROL SYSTEM RPM LOWER THAN EXPECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

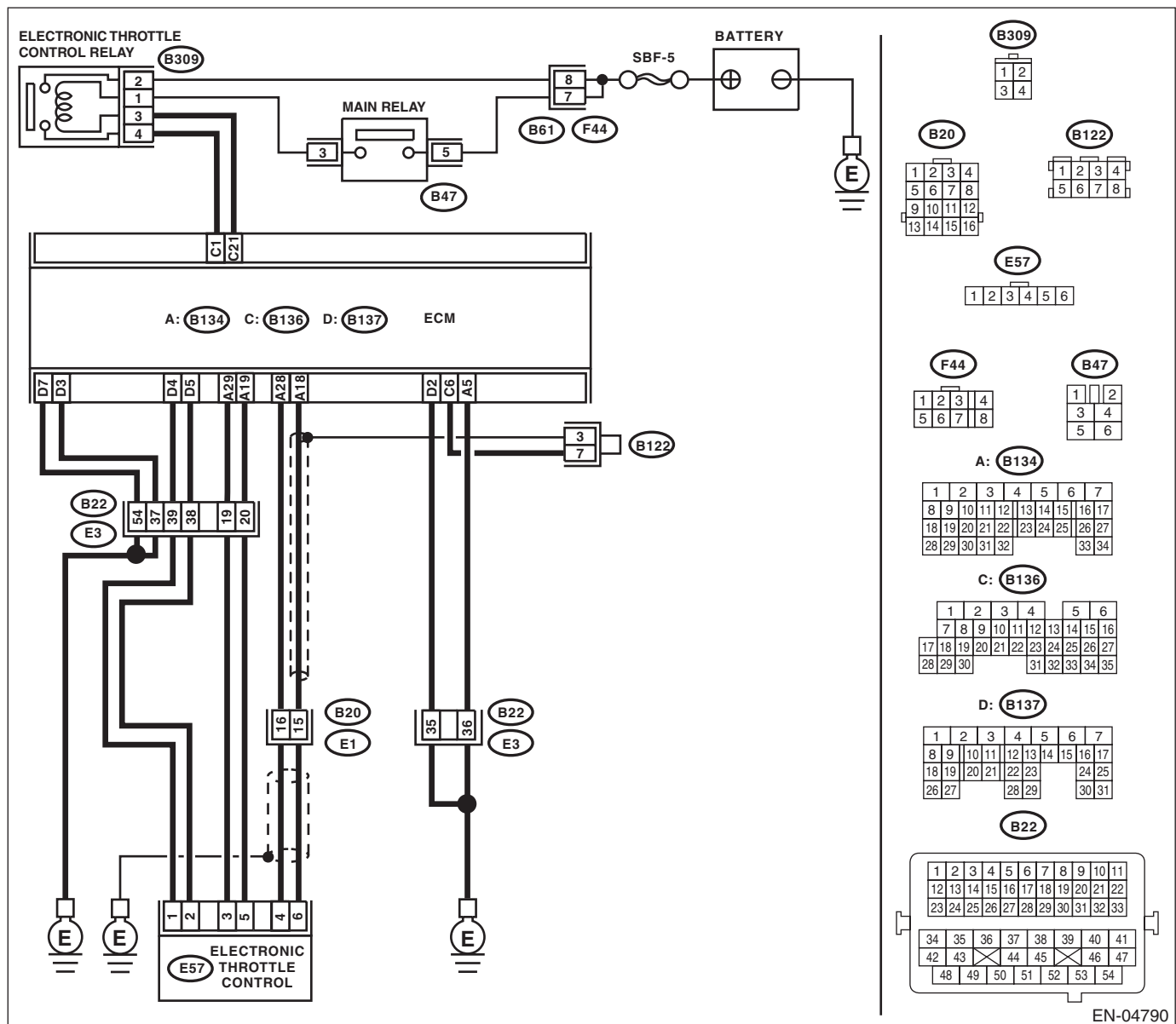
TROUBLE SYMPTOM:

- Hard to start the engine.
- Engine does not start.
- Improper idling
- Engine stalls.

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

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?	Check the appropriate DTC using the "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-76, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK AIR CLEANER ELEMENT. 1) Turn the ignition switch to OFF. 2) Check the air cleaner element.	Is the air cleaner element excessively clogged?	Replace the air cleaner element. <Ref. to IN(H4DOTC)-7, Air Cleaner Element.>	Go to step 3.
3 CHECK ELECTRONIC THROTTLE CONTROL. 1) Remove the electronic throttle control. 2) Check the electronic throttle control.	Are foreign matter found inside electronic throttle control?	Remove foreign matter from electronic throttle control.	Perform the diagnosis of DTC P2101. <Ref. to EN(H4DOTC)(diag)-332, 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)

CD:DTC P0507 IDLE AIR CONTROL SYSTEM RPM HIGHER THAN EXPECTED

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-176, DTC P0507 IDLE AIR CONTROL SYSTEM RPM HIGHER THAN EXPECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

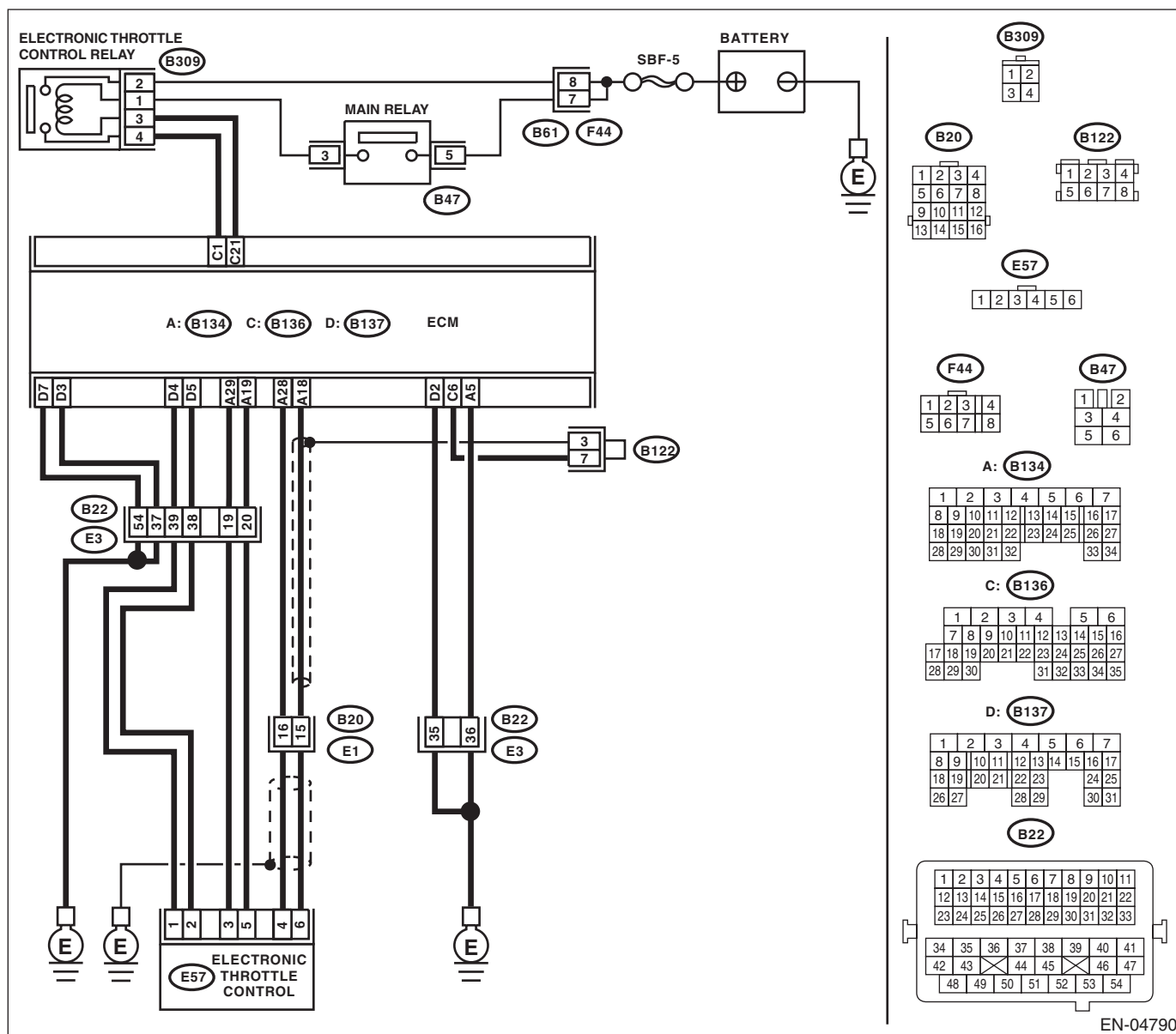
TROUBLE SYMPTOM:

Engine keeps running at higher speed than specified idle speed.

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04790

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?	Check the appropriate DTC using the "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-76, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK AIR INTAKE SYSTEM. 1) Start and idle the engine. 2) Check the following items. • Loose installation of intake manifold and throttle body • Cracks of intake manifold gasket and throttle body gasket • Disconnection of vacuum hoses	Is there any fault in air intake system?	Repair air suction and leaks.	Go to step 3.
3 CHECK ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Remove the electronic throttle control. 3) Check the electronic throttle control.	Are foreign matter found inside electronic throttle control?	Remove foreign matter from electronic throttle control.	Perform the diagnosis of DTC P2101. <Ref. to EN(H4DOTC)(diag)-332, 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)

CE:DTC P0512 STARTER REQUEST CIRCUIT

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-178, DTC P0512 STARTER REQUEST CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

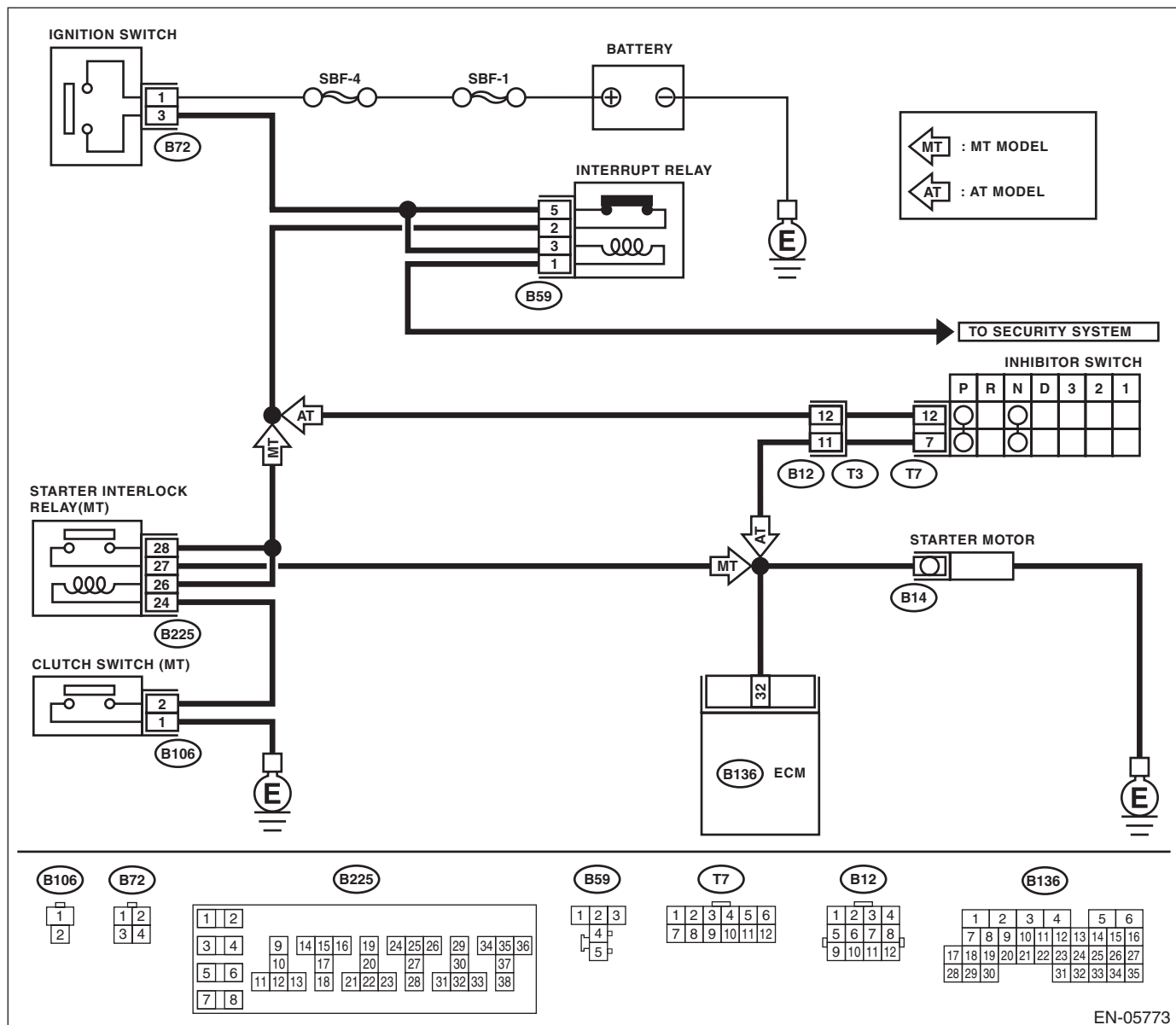
TROUBLE SYMPTOM:

Failure of engine to start

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-05773

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?	Check the appropriate DTC using the "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-76, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK HARNESS BETWEEN ECM AND IGNITION SWITCH. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. Connector & terminal (B136) No. 32 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Repair the short circuit to power in the harness between ECM and ignition switch.	Repair the poor contact of the ECM connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

CF:DTC P0519 IDLE AIR CONTROL SYSTEM PERFORMANCE

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-180, DTC P0519 IDLE AIR CONTROL SYSTEM PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

Engine keeps running at higher speed than specified idle speed.

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

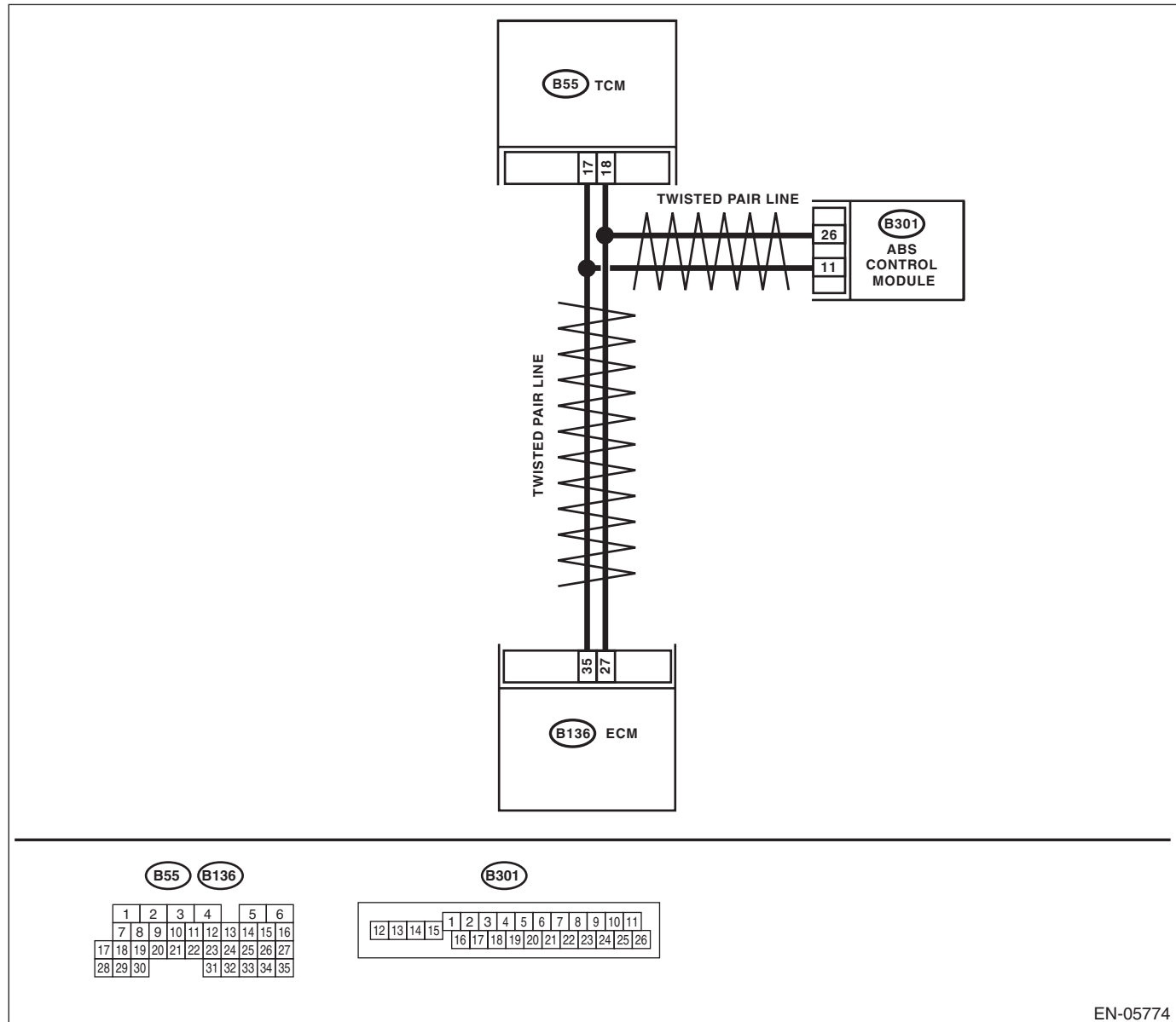
Step	Check	Yes	No
1 CHECK FOR ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check the appropriate DTC using the "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-76, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK AIR INTAKE SYSTEM. 1) Start and idle the engine. 2) Check the following items. • Loose installation of intake manifold and throttle body • Cracks of intake manifold gasket and throttle body gasket • Disconnection of vacuum hoses	Is there any fault in air intake system?	Repair air suction and leaks.	Go to step 3.
3 CHECK ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Remove the electronic throttle control. 3) Check the electronic throttle control.	Is foreign matter found inside electronic throttle control?	Remove foreign matter from electronic throttle control.	Perform the diagnosis of DTC P2101. <Ref. to EN(H4DOTC)(diag)-332, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CG:DTC P0600 SERIAL COMMUNICATION LINK**DTC DETECTING CONDITION:**

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-181, DTC P0600 SERIAL COMMUNICATION LINK, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK HARNESS BETWEEN ECM AND TCM. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and TCM. 3) Measure the resistance between ECM and TCM connectors. Connector & terminal (B136) No. 27 — (B55) No. 18: (B136) No. 35 — (B55) No. 17:	Is the resistance less than 1 Ω ?	Go to step 2.	Repair the open circuit of harness between ECM and TCM connector.
2	CHECK HARNESS BETWEEN ECM AND ABSCM&H/U. 1) Disconnect the connector from ABSCM&H/U. 2) Measure the resistance between ECM and ABSCM&H/U connectors. Connector & terminal (B136) No. 27 — (B301) No. 26: (B136) No. 35 — (B301) No. 11:	Is the resistance less than 1 Ω ?	Go to step 3.	Repair the open circuit in harness between ECM and ABSCM&H/U connector.
3	CHECK HARNESS BETWEEN ECM, TCM AND ABSCM&H/U. Measure the resistance between ECM and chassis ground. Connector & terminal (B136) No. 27 — Chassis ground: (B136) No. 35 — Chassis ground:	Is the resistance 1 M Ω or more?	Go to step 4.	Repair the short circuit to ground in harness between ECM, TCM and ABSCM&H/U.
4	CHECK HARNESS BETWEEN ECM, TCM AND ABSCM&H/U. Measure the resistance between ECM connectors. Connector & terminal (B136) No. 27 — (B136) No. 35:	Is the resistance 1 M Ω or more?	Go to step 5.	Repair the short circuit in harness between ECM, TCM and ABSCM&H/U.
5	CHECK THE STATUS OF THE AT SYSTEM. Diagnose the AT using the Subaru Select Monitor.	Is DTC P1718 displayed?	Check the AT system.	Go to step 6.
6	CHECK STATUS OF ABS SYSTEM. Perform diagnosis of ABS using the Subaru Select Monitor.	Is DTC 47 displayed?	Check the ABS system.	Repair the poor contact of the ECM connector.

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-182, DTC P0604 INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR, Diagnostic Trouble Code (DTC) Detecting Criteria.>

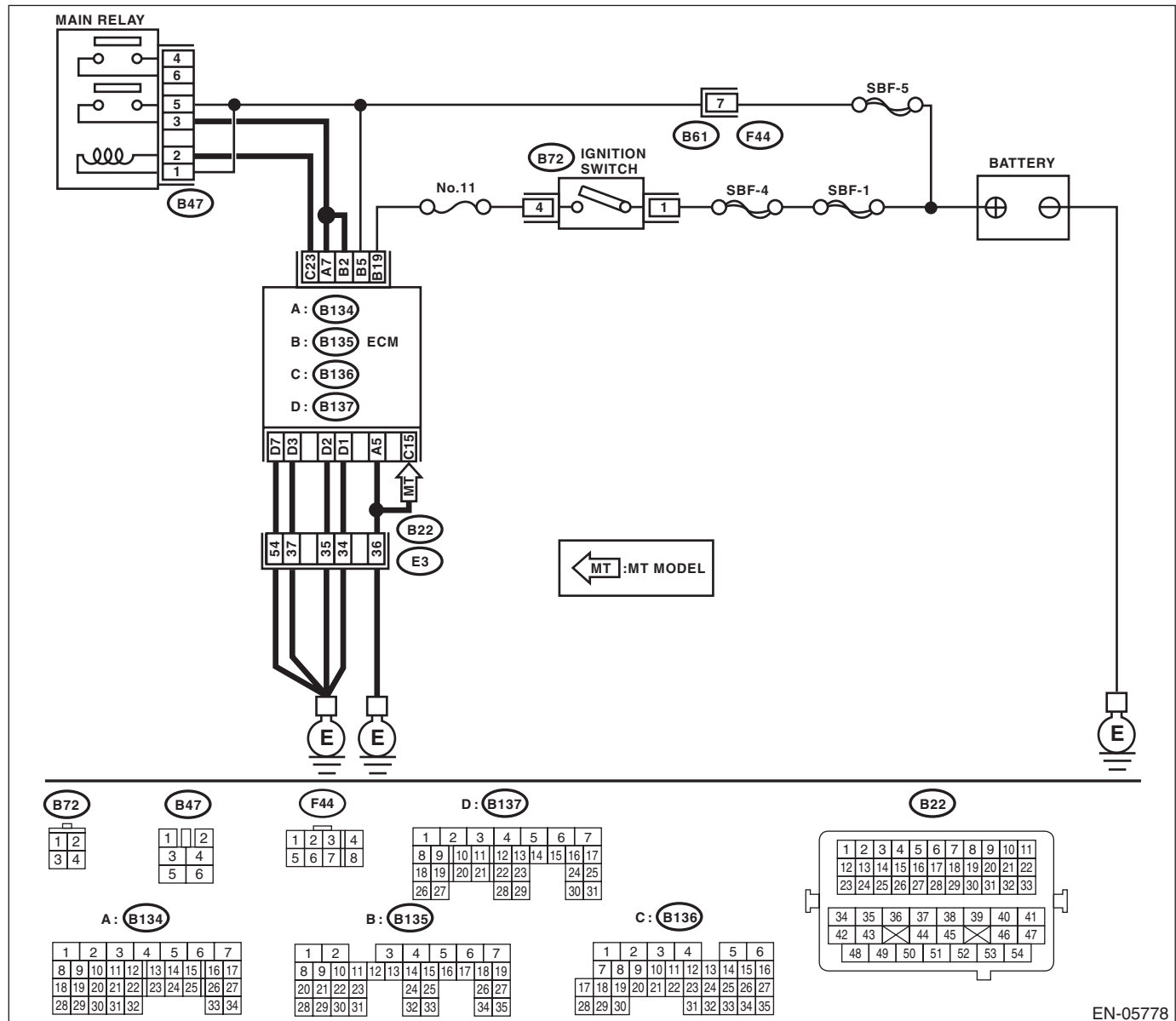
TROUBLE SYMPTOM:

- Engine does not start.
- Engine stalls.

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-05778

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?	Check the appropriate DTC using the "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-76, List of Diagnostic Trouble Code (DTC).>	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. Reproduce the fault condition, and reperform the check. NOTE: In this case, there may be a temporary connector contact failure.

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

NOTE:

For the diagnostic procedure, refer to DTC P0607. <Ref. to EN(H4DOTC)(diag)-257, DTC P0607 CONTROL MODULE PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CJ:DTC P0607 CONTROL MODULE PERFORMANCE

DTC DETECTING CONDITION:

- Depending on the content of malfunction, adapt either of the followings.
 - Immediately at fault recognition
 - Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-184, DTC P0607 CONTROL MODULE PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

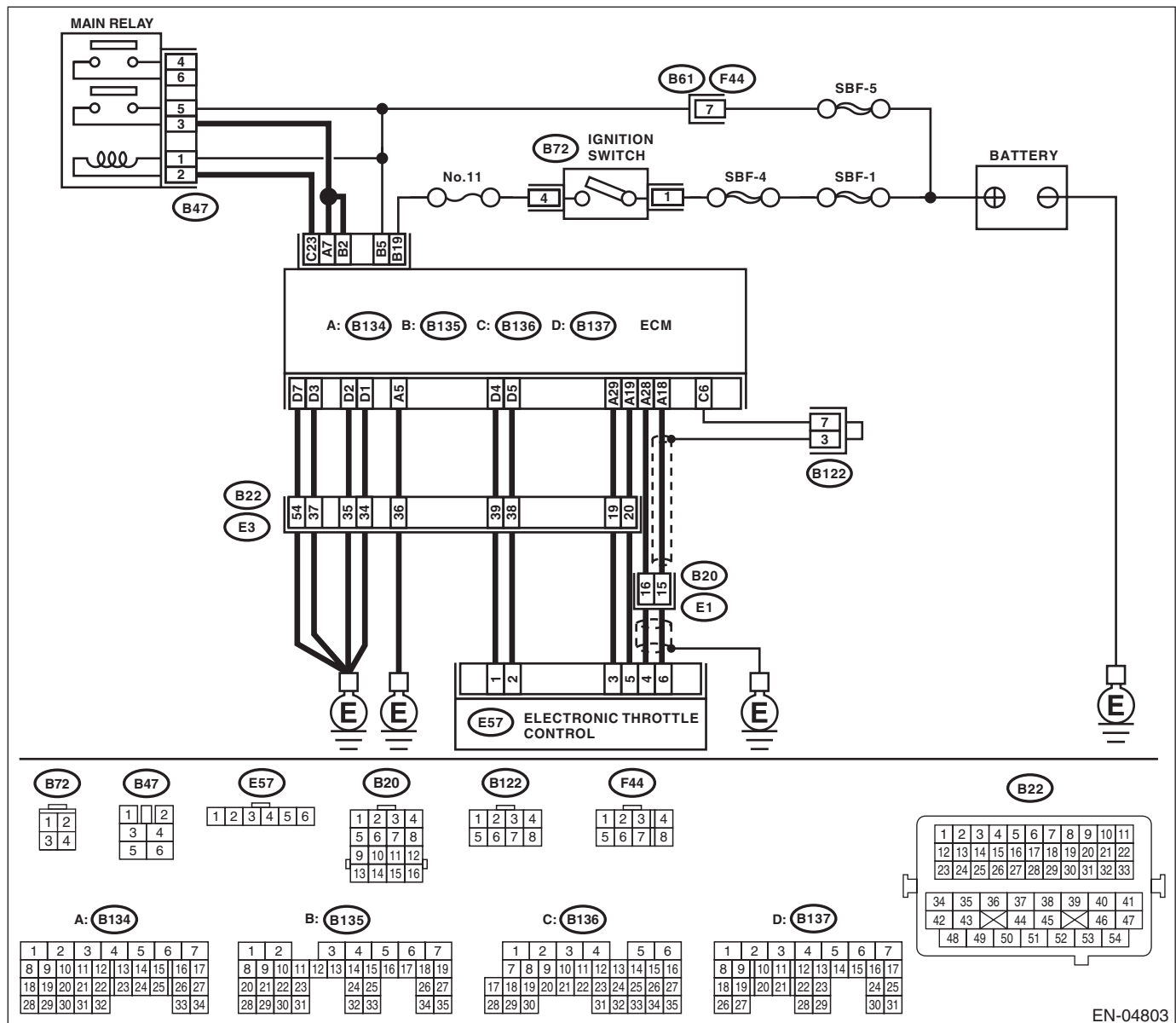
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04803

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK INPUT VOLTAGE OF ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. Connector & terminal (B134) No. 7 (+) — Chassis ground (-): (B135) No. 2 (+) — Chassis ground (-):	Is the voltage 10 — 13 V?	Go to step 2.	Repair the open or ground short circuit of power supply circuit.
2 CHECK INPUT VOLTAGE OF ECM. 1) Start the engine. 2) Measure the voltage between ECM and chassis ground. Connector & terminal (B134) No. 7 (+) — Chassis ground (-): (B135) No. 2 (+) — Chassis ground (-):	Is the voltage 13 — 15 V?	Go to step 3.	Repair the open or ground short circuit of power supply circuit.
3 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM and electronic throttle control. 3) Measure the resistance of harness between ECM and electronic throttle control connector. Connector & terminal (B134) No. 19 — (E57) No. 5: (B134) No. 29 — (E57) No. 3:	Is the resistance less than 1 Ω ?	Go to step 4.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and electronic throttle control connector • Poor contact of coupling connector
4 CHECK ECM GROUND HARNESS. 1) Connect all connectors. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM and chassis ground. Connector & terminal (B134) No. 5 (+) — Chassis ground (-): (B137) No. 1 (+) — Chassis ground (-): (B137) No. 2 (+) — Chassis ground (-): (B137) No. 3 (+) — Chassis ground (-): (B137) No. 7 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Repair the poor contact of the ECM connector.	Repair the following item. • Open circuit of ground circuit • Further tightening of the engine ground terminal • Poor contact in ECM connector • Poor contact of coupling connector

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

NOTE:

For the diagnostic procedure, refer to DTC P2101. <Ref. to EN(H4DOTC)(diag)-332, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CL:DTC P0691 FAN 1 CONTROL CIRCUIT LOW**DTC DETECTING CONDITION:**

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-189, DTC P0691 FAN 1 CONTROL CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Radiator fan does not operate properly.
- Overheating

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-76, List of Diagnostic Trouble Code (DTC).>	Check the radiator fan system. <Ref. to CO(H4SO)-11, Radiator Fan System.>

CM:DTC P0692 FAN 1 CONTROL CIRCUIT HIGH**DTC DETECTING CONDITION:**

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-190, DTC P0692 FAN 1 CONTROL CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Radiator fan does not operate properly.
- Overheating

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-76, List of Diagnostic Trouble Code (DTC).>	Check the radiator fan system. <Ref. to CO(H4SO)-11, Radiator Fan System.>

CN:DTC P0700 TRANSMISSION CONTROL SYSTEM (MIL REQUEST)**NOTE:**

For the diagnostic procedure, refer to AT section. <Ref. to 4AT(diag)-2, Basic Diagnostic Procedure.>

ENGINE (DIAGNOSTICS)

DTC DETECTING CONDITION:

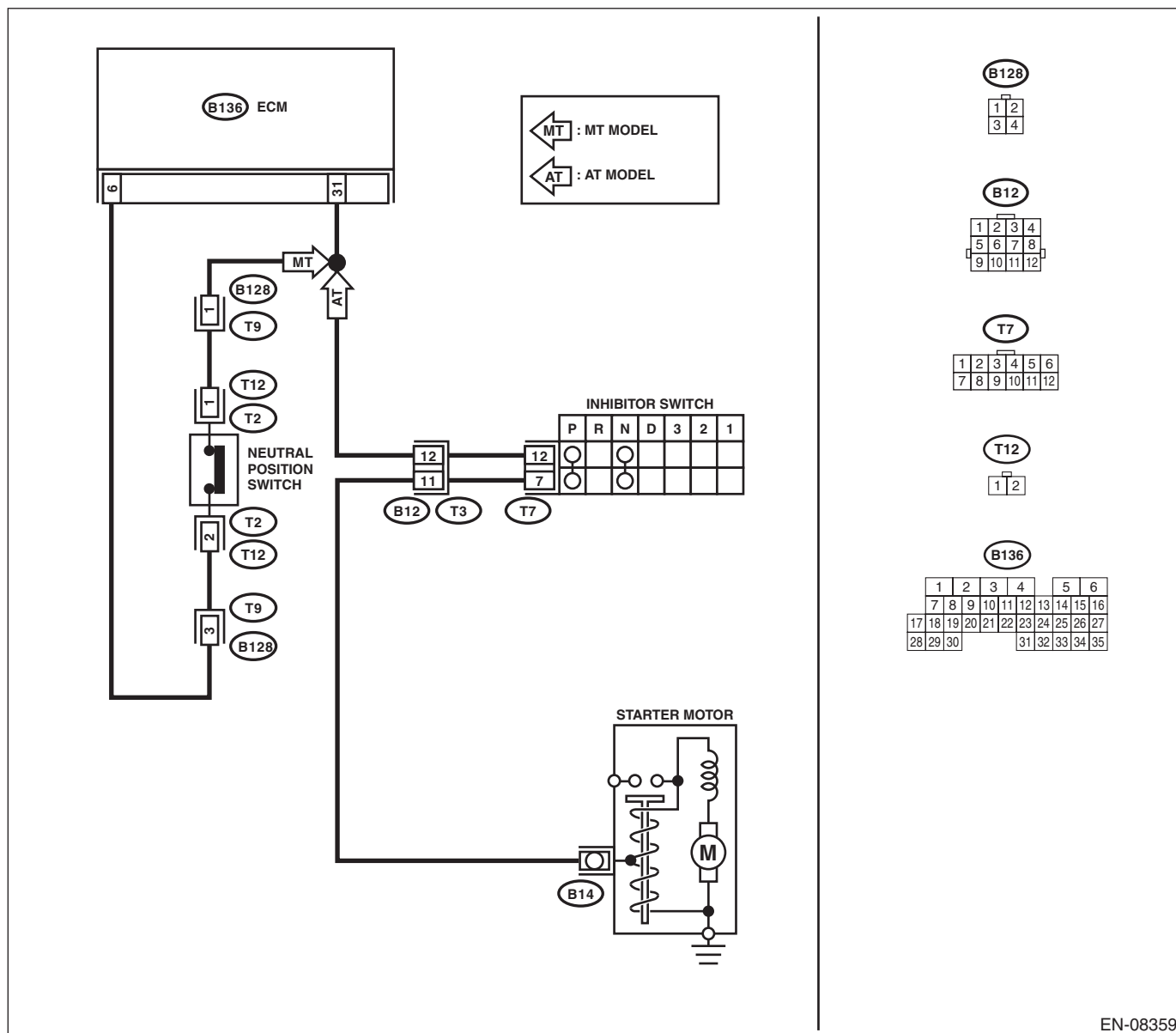
- ### TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK SELECT CABLE.	Is there any fault in the select cable?	Repair or adjust the select cable. <Ref. to CS-25, Select Cable.>	Go to step 2.
2 CHECK INPUT SIGNAL OF ECM. 1) Turn the ignition switch to ON. 2) Place the select lever other than "N" and "P" range. 3) Measure the voltage between ECM and chassis ground. Connector & terminal (B136) No. 31 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Repair the poor contact of the ECM connector.	Go to step 3.
3 CHECK HARNESS BETWEEN ECM AND TRANSMISSION HARNESS CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and transmission harness connector (T3). 3) Measure the resistance between ECM and chassis ground. Connector & terminal (B136) No. 31 — Chassis ground:	Is the resistance 1 MΩ or more?	Go to step 4.	Repair the ground short circuit of harness between ECM and transmission harness connector.
4 CHECK TRANSMISSION HARNESS CONNECTOR. 1) Disconnect the connector from inhibitor switch. 2) Measure the resistance between the transmission harness connector and engine ground. Connector & terminal (T3) No. 12 — Engine ground:	Is the resistance 1 MΩ or more?	Replace the inhibitor switch. <Ref. to 4AT-47, Inhibitor Switch.>	Repair the ground short circuit of harness between transmission harness connector and inhibitor switch connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

CP:DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW (MT MODEL)

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-193, DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW (MT MODEL), Diagnostic Trouble Code (DTC) Detecting Criteria.>

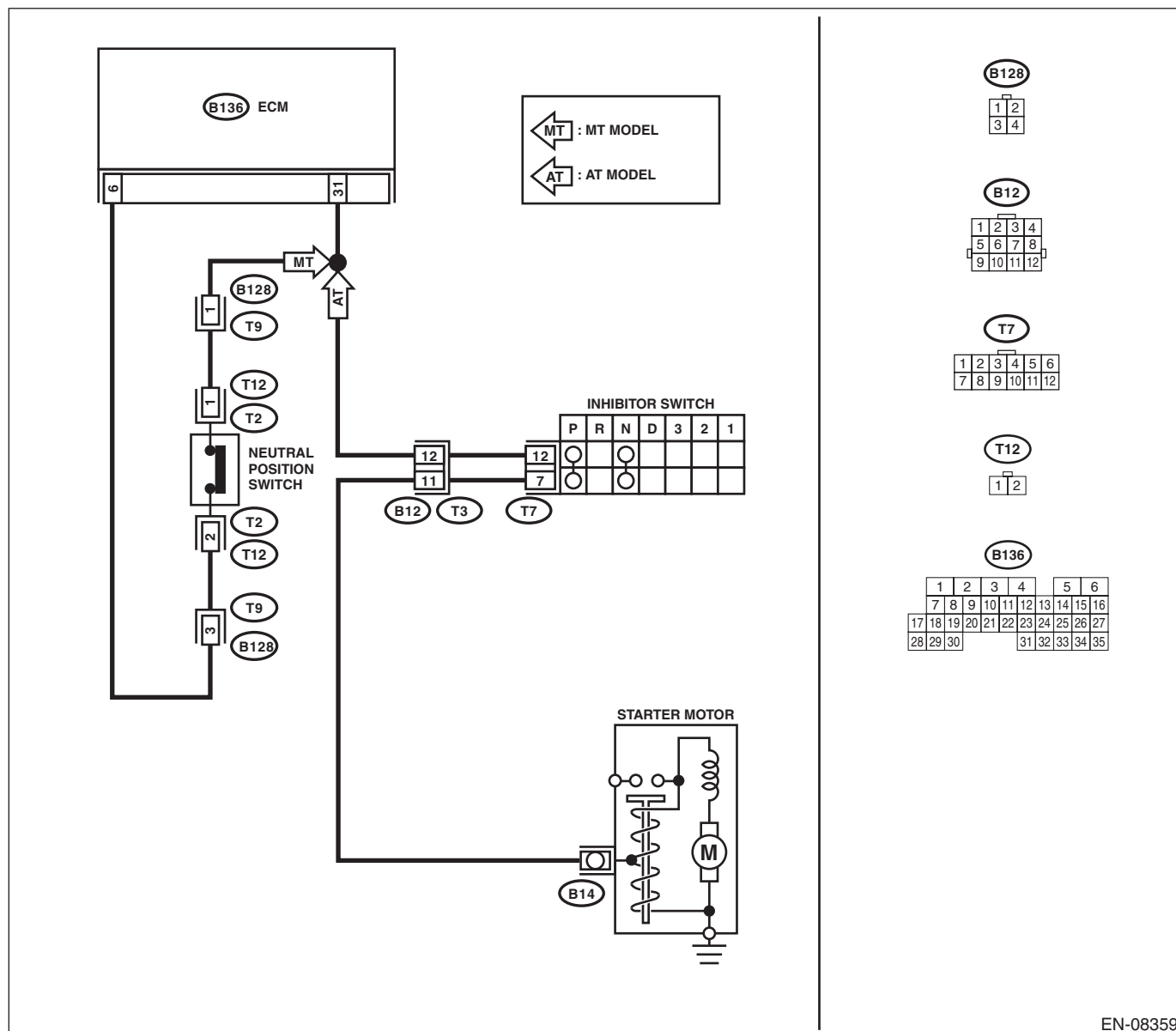
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-08359

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step		Check	Yes	No
1	CHECK INPUT SIGNAL OF ECM. 1) Turn the ignition switch to ON. 2) Place the shift lever in a position except for neutral. 3) Measure the voltage between ECM and chassis ground. Connector & terminal (B136) No. 31 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Repair the poor contact of the ECM connector.	Go to step 2.
2	CHECK HARNESS BETWEEN ECM AND NEUTRAL POSITION SWITCH CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect connectors from the ECM and transmission harness connector (T9). 3) Measure the resistance between ECM and chassis ground. Connector & terminal (B136) No. 31 — Chassis ground:	Is the resistance 1 MΩ or more?	Repair the short circuit of transmission harness, or replace the neutral position switch.	Repair the ground short circuit of harness between ECM and transmission harness connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

CQ:DTC P0852 PARK/NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT MODEL)

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-194, DTC P0852 PARK/NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT MODEL), Diagnostic Trouble Code (DTC) Detecting Criteria.>

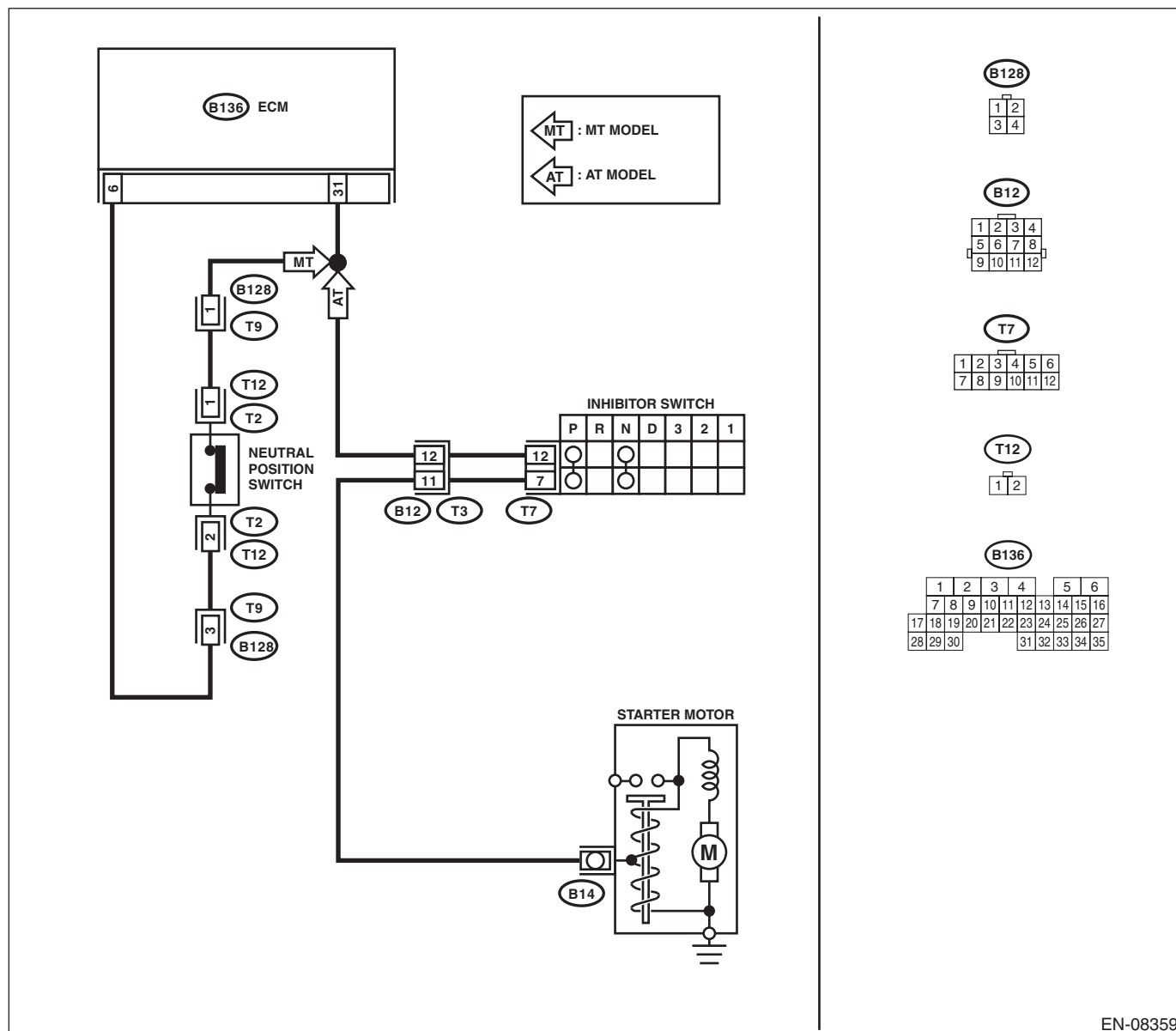
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-08359

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK SELECT CABLE.	Is there any fault in the select cable?	Repair or adjust the select cable. <Ref. to CS-25, Select Cable.>	Go to step 2.
2 CHECK INPUT SIGNAL OF ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground with select lever at "N" and "P" range. Connector & terminal (B136) No. 31 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Repair the poor contact of the ECM connector.	Go to step 3.
3 CHECK HARNESS BETWEEN ECM AND INHIBITOR SWITCH CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and inhibitor switch. 3) Measure the resistance of harness between ECM and inhibitor switch connector. Connector & terminal (B136) No. 31 — (T7) No. 12:	Is the resistance less than 1 Ω ?	Go to step 4.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and inhibitor switch connector • Poor contact in coupling connector
4 CHECK INHIBITOR SWITCH GROUND LINE. Measure the resistance of harness between inhibitor switch connector and engine ground. Connector & terminal (T7) No. 12 — Engine ground:	Is the resistance less than 5 Ω ?	Replace the inhibitor switch. <Ref. to 4AT-47, Inhibitor Switch.>	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between inhibitor switch connector and starter motor ground line • Poor contact of coupling connector • Poor contact in starter motor connector • Poor contact in starter motor ground • Starter motor

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

CR:DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT MODEL)

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-195, DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT MODEL), Diagnostic Trouble Code (DTC) Detecting Criteria.>

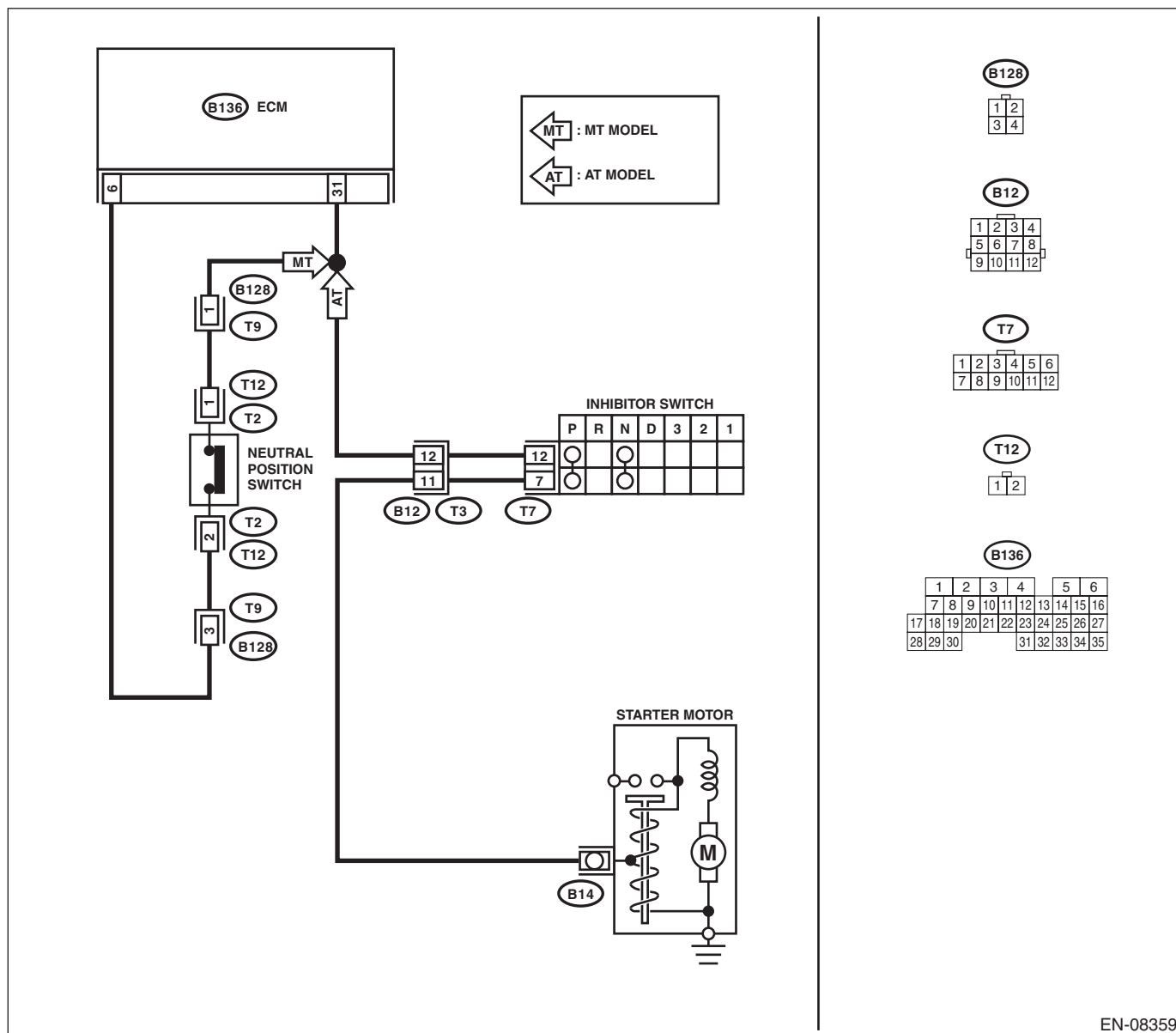
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-08359

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK INPUT SIGNAL OF ECM. 1) Turn the ignition switch to ON. 2) Place the shift lever in neutral. 3) Measure the voltage between ECM and chassis ground. Connector & terminal (B136) No. 31 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Repair the poor contact of the ECM connector.	Go to step 2.
2 CHECK HARNESS BETWEEN ECM AND NEUTRAL SWITCH CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and transmission harness connector (T2). 3) Measure the resistance of harness between ECM and transmission harness connector. Connector & terminal (B136) No. 31 — (T12) No. 1: (B136) No. 6 — (T12) No. 2:	Is the resistance less than 1 Ω ?	Go to step 3.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and transmission harness connector • Poor contact of coupling connector
3 CHECK NEUTRAL SWITCH. 1) Place the shift lever in neutral. 2) Measure the resistance between transmission harness connector terminals. Connector & terminal (T2) No. 1 — No. 2:	Is the resistance less than 1 Ω ?	Repair the poor contact of transmission harness connector.	Repair the open circuit of transmission harness, or replace the neutral switch.

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.	Has water entered the connector?	Completely remove any water inside.	Go to step 2.
2	CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM and front oxygen (A/F) sensor. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. Connector & terminal (B135) No. 9 — (B262) No. 4: (B135) No. 8 — (B262) No. 3:	Is the resistance less than 1 Ω ?	Go to step 3.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and front oxygen (A/F) sensor connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector
3	CHECK POOR CONTACT. Check poor contact of front oxygen (A/F) sensor connector.	Is there poor contact in front oxygen (A/F) sensor connector?	Repair the poor contact of the front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-42, Front Oxygen (A/F) Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

CT:DTC P1153 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK 1 SENSOR 1)

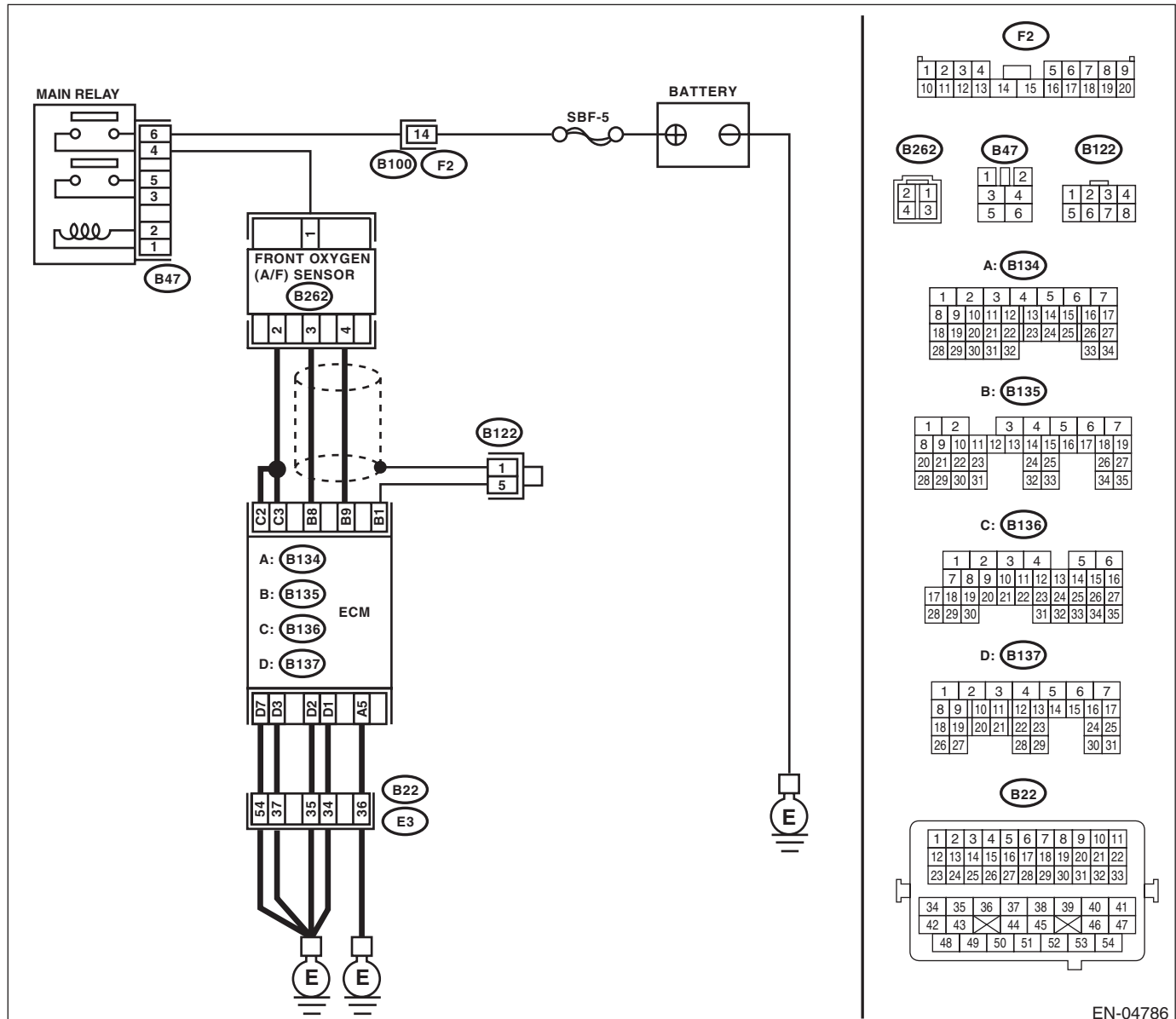
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-198, DTC P1153 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04786

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.	Has water entered the connector?	Completely remove any water inside.	Go to step 2.
2 CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance between ECM and chassis ground. Connector & terminal (B135) No. 9 — Chassis ground: (B135) No. 8 — Chassis ground:	Is the resistance 1 MΩ or more?	Go to step 3.	Repair the ground short circuit of harness between ECM and front oxygen (A/F) sensor connector.
3 CHECK OUTPUT SIGNAL FOR ECM. 1) Connect the ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM and chassis ground. Connector & terminal (B135) No. 9 (+) — Chassis ground (-):	Is the voltage 4.5 V or more?	Go to step 5.	Go to step 4.
4 CHECK OUTPUT SIGNAL FOR ECM. Measure the voltage between ECM and chassis ground. Connector & terminal (B135) No. 8 (+) — Chassis ground (-):	Is the voltage 4.95 V or more?	Go to step 5.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-42, Front Oxygen (A/F) Sensor.>
5 CHECK OUTPUT SIGNAL FOR ECM. Measure the voltage between ECM and chassis ground. Connector & terminal (B135) No. 9 (+) — Chassis ground (-): (B135) No. 8 (+) — Chassis ground (-):	Is the voltage 8 V or more?	Repair the short circuit to power in the harness between the ECM and front oxygen (A/F) sensor connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-46, Engine Control Module (ECM).>	Repair the poor contact of the ECM connector.

CU:DTC P1160 RETURN SPRING FAILURE

NOTE:

For the diagnostic procedure, refer to DTC P2101. <Ref. to EN(H4DOTC)(diag)-332, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

CV:DTC P1400 FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW

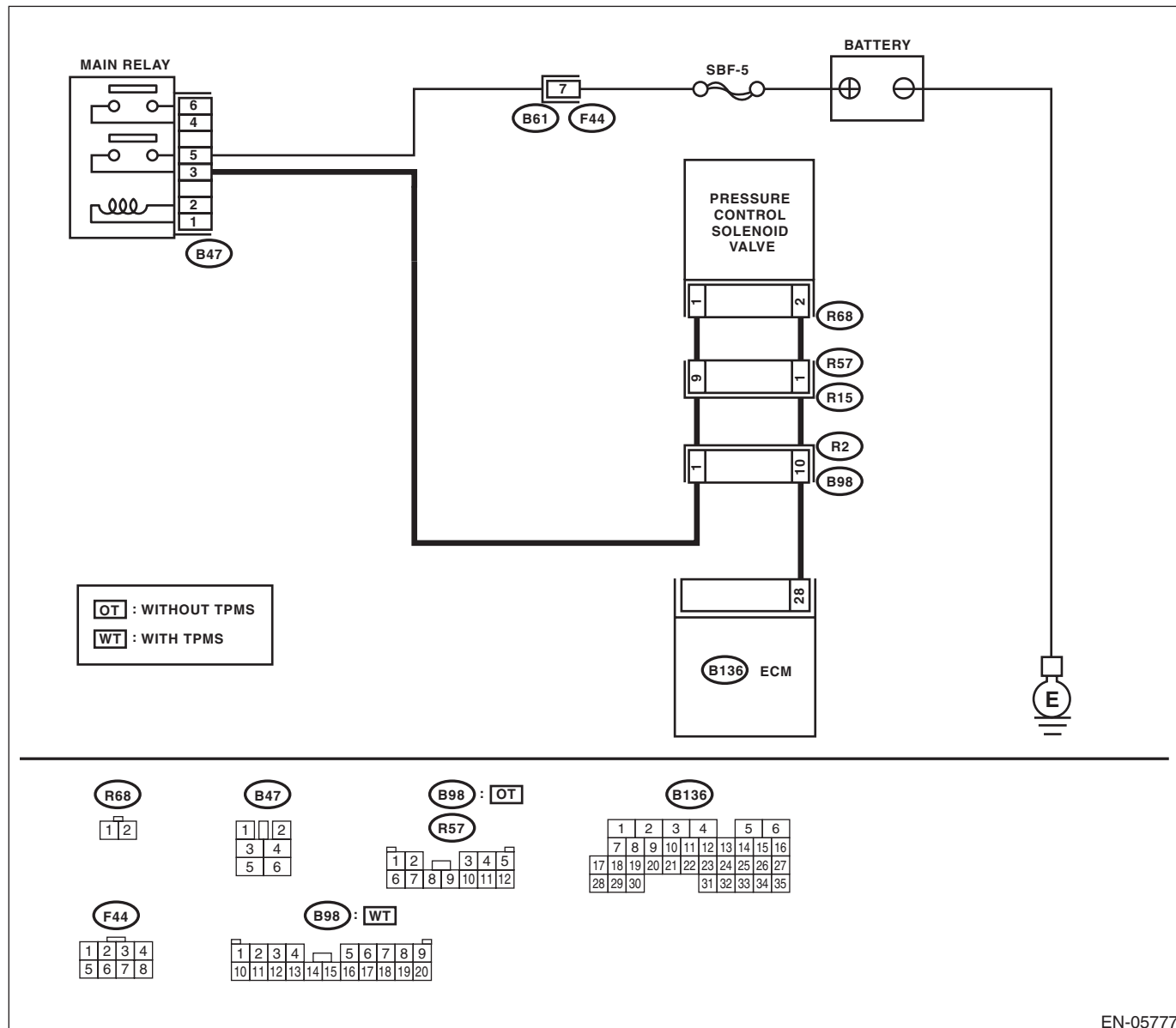
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-202, DTC P1400 FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-05777

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OUTPUT SIGNAL OF ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. Connector & terminal (B136) No. 28 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Repair the poor contact of the ECM connector.	Go to step 2.
2 CHECK HARNESS BETWEEN ECM AND PRESSURE CONTROL SOLENOID VALVE. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the ECM and pressure control solenoid valve. 3) Measure the resistance between pressure control solenoid valve and chassis ground. Connector & terminal (R68) No. 2 — Chassis ground:	Is the resistance 1 MΩ or more?	Go to step 3.	Repair the ground short circuit of harness between ECM and pressure control solenoid valve connector.
3 CHECK HARNESS BETWEEN ECM AND PRESSURE CONTROL SOLENOID VALVE. Measure the resistance of harness between ECM and pressure control solenoid valve connector. Connector & terminal (B136) No. 28 — (R68) No. 2:	Is the resistance less than 1 Ω?	Go to step 4.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and pressure control solenoid valve connector • Poor contact in coupling connector
4 CHECK PRESSURE CONTROL SOLENOID VALVE. Measure the resistance between pressure control solenoid valve terminals. Terminals No. 1 — No. 2:	Is the resistance between 10 — 100 Ω?	Go to step 5.	Replace the pressure control solenoid valve. <Ref. to EC(H4DOTC)-16, Pressure Control Solenoid Valve.>
5 CHECK POWER SUPPLY TO THE PRESSURE CONTROL SOLENOID VALVE. 1) Turn the ignition switch to ON. 2) Measure the voltage between pressure control solenoid valve and chassis ground. Connector & terminal (R68) No. 1 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Repair the poor contact of pressure control solenoid valve connector.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between main relay and pressure control solenoid valve connector • Poor contact in coupling connector • Poor contact in main relay connector

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

CW:DTC P1410 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-204, DTC P1410 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN, Diagnostic Trouble Code (DTC) Detecting Criteria.>

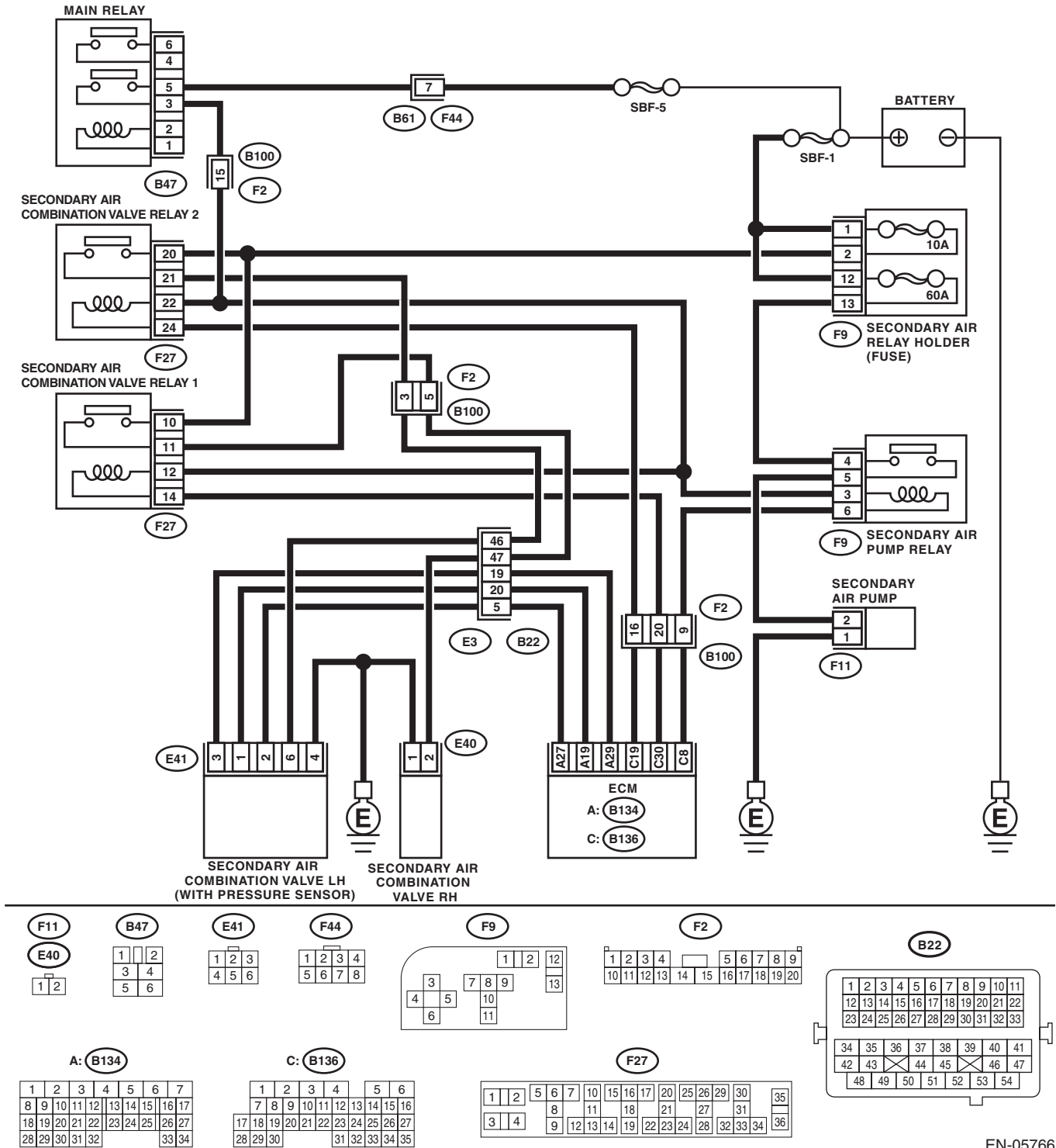
CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-05766

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step		Check	Yes	No
1	CHECK SECONDARY AIR COMBINATION VALVE. 1) Remove the secondary air combination valve. <Ref. to EC(H4DOTC)-10, Secondary Air Combination Valve.> 2) Blow in air from the secondary air combination valve air inlet, and check whether there are leaks at the pipe connections.	Are there air leaks from the pipe connections?	Replace the secondary air combination valve on the side with the air leak. <Ref. to EC(H4DOTC)-10, Secondary Air Combination Valve.>	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. Reproduce the fault condition, and reperform the check. NOTE: In this case, there may be a temporary connector contact failure.

CX:DTC P1418 SECONDARY AIR INJECTION SYSTEM CONTROL “A” CIRCUIT SHORTED

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-205, DTC P1418 SECONDARY AIR INJECTION SYSTEM CONTROL “A” CIRCUIT SHORTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

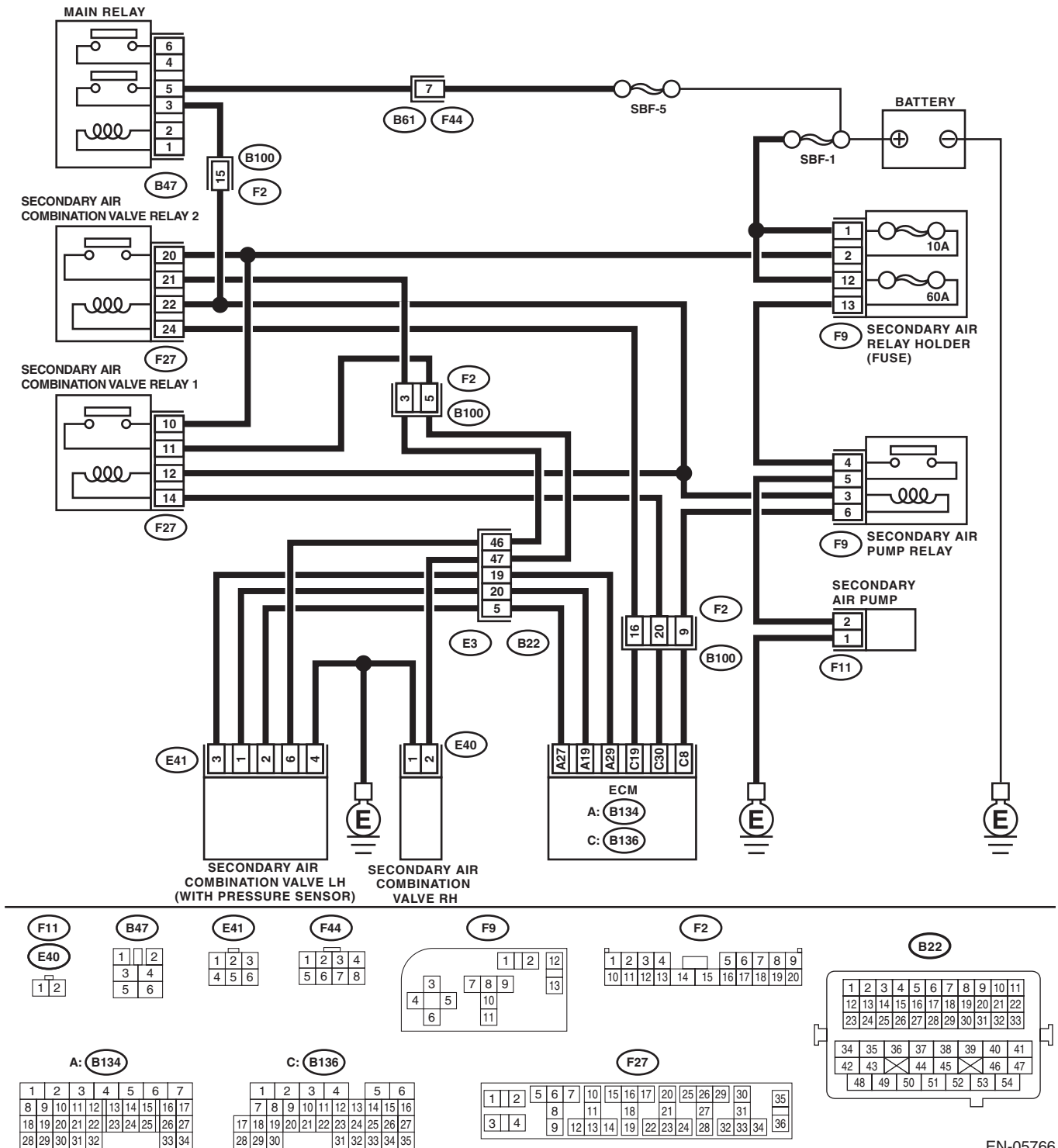
CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-05766

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step		Check	Yes	No
1	CHECK HARNESS BETWEEN ECM AND SECONDARY AIR PUMP RELAY. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the ECM and secondary air pump relay. 3) Measure the voltage between ECM and chassis ground. Connector & terminal (B136) No. 8 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Repair the short circuit to power in the harness between ECM and secondary air pump relay.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. Reproduce the fault condition, and reperform the check. NOTE: In this case, there may be a temporary connector contact failure.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

CY:DTC P1420 FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH

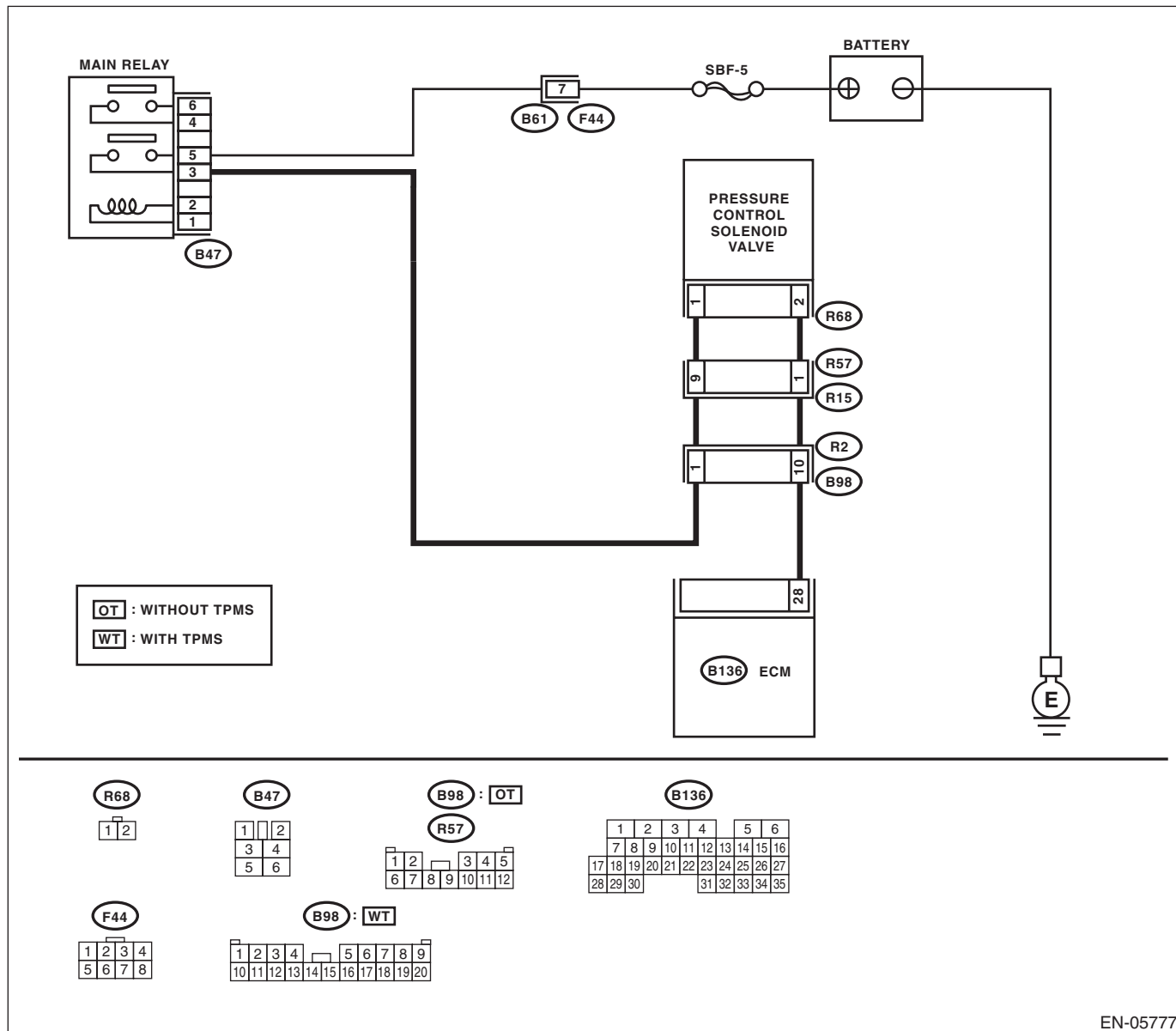
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-206, DTC P1420 FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN ECM AND PRESSURE CONTROL SOLENOID VALVE. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the ECM and pressure control solenoid valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. Connector & terminal (B136) No. 28 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Repair the short circuit to power supply in the harness between the ECM and pressure control solenoid valve connector.	Go to step 2.
2 CHECK PRESSURE CONTROL SOLENOID VALVE. 1) Turn the ignition switch to OFF. 2) Measure the resistance between pressure control solenoid valve terminals. Terminals No. 1 — No. 2:	Is the resistance less than 1 Ω ?	Replace the pressure control solenoid valve. <Ref. to EC(H4DOTC)-16, Pressure Control Solenoid Valve.>	Repair the poor contact of the ECM connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

CZ:DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-208, DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

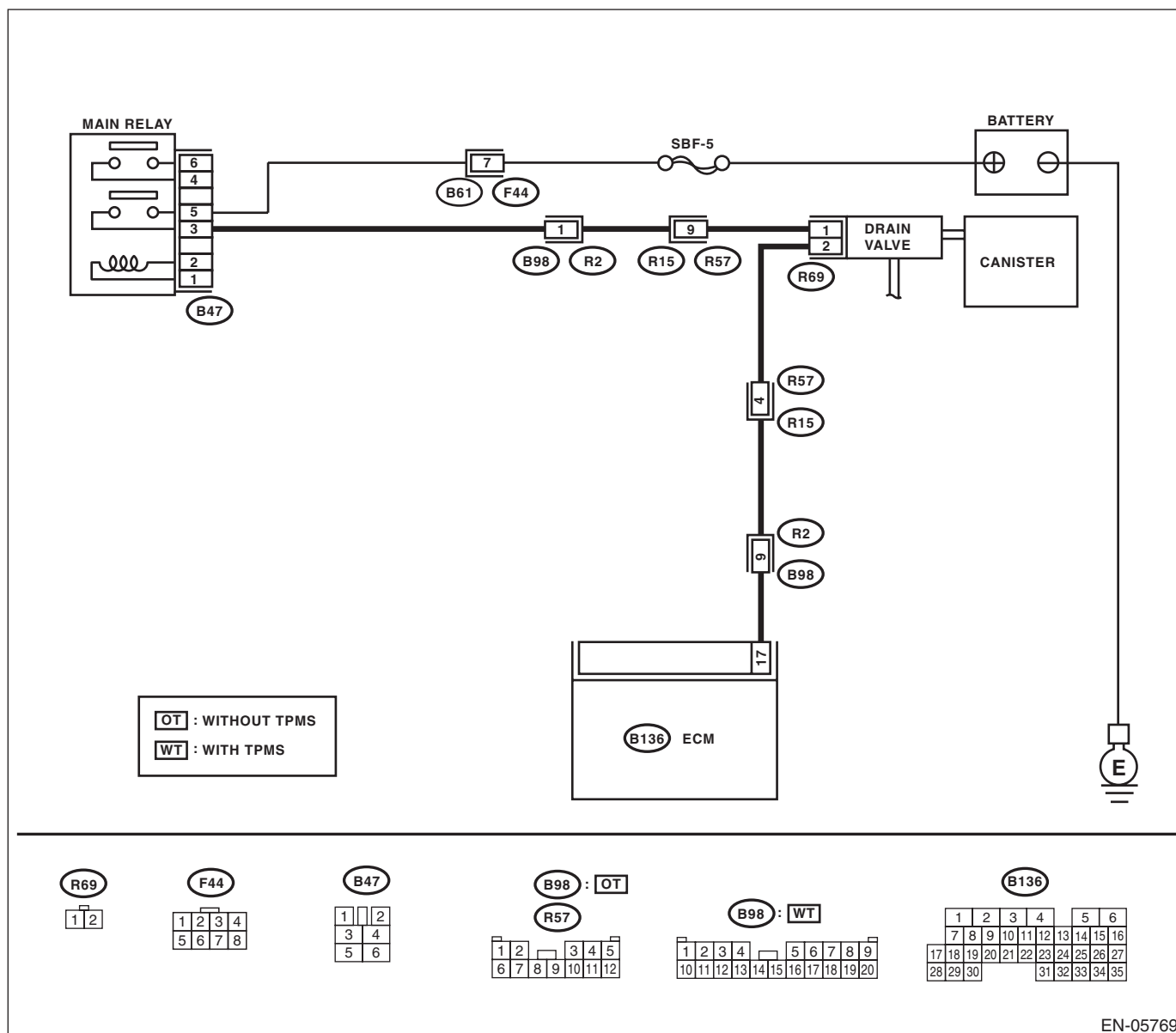
TROUBLE SYMPTOM:

Improper fuel supply

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-05769

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check the appropriate DTC using the "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-76, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK DRAIN HOSE. Check the drain hose for clogging.	Is there clogging in the drain hose?	Replace the drain hose.	Go to step 3.
3 CHECK DRAIN VALVE OPERATION. 1) Turn the ignition switch to OFF. 2) Connect the delivery (test) mode connector. 3) Turn the ignition switch to ON. 4) Operate the drain valve. NOTE: Drain valve can be operated using the Subaru Select Monitor. Regarding the procedures, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-55, Compulsory Valve Operation Check Mode.>	Does the drain valve operate?	Repair the poor contact of the ECM connector.	Replace the drain valve. <Ref. to EC(H4DOTC)-21, Drain Valve.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

DA:DTC P1491 POSITIVE CRANKCASE VENTILATION (BLOW-BY) FUNCTION PROBLEM

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-210, DTC P1491 POSITIVE CRANKCASE VENTILATION (BLOW-BY) FUNCTION PROBLEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

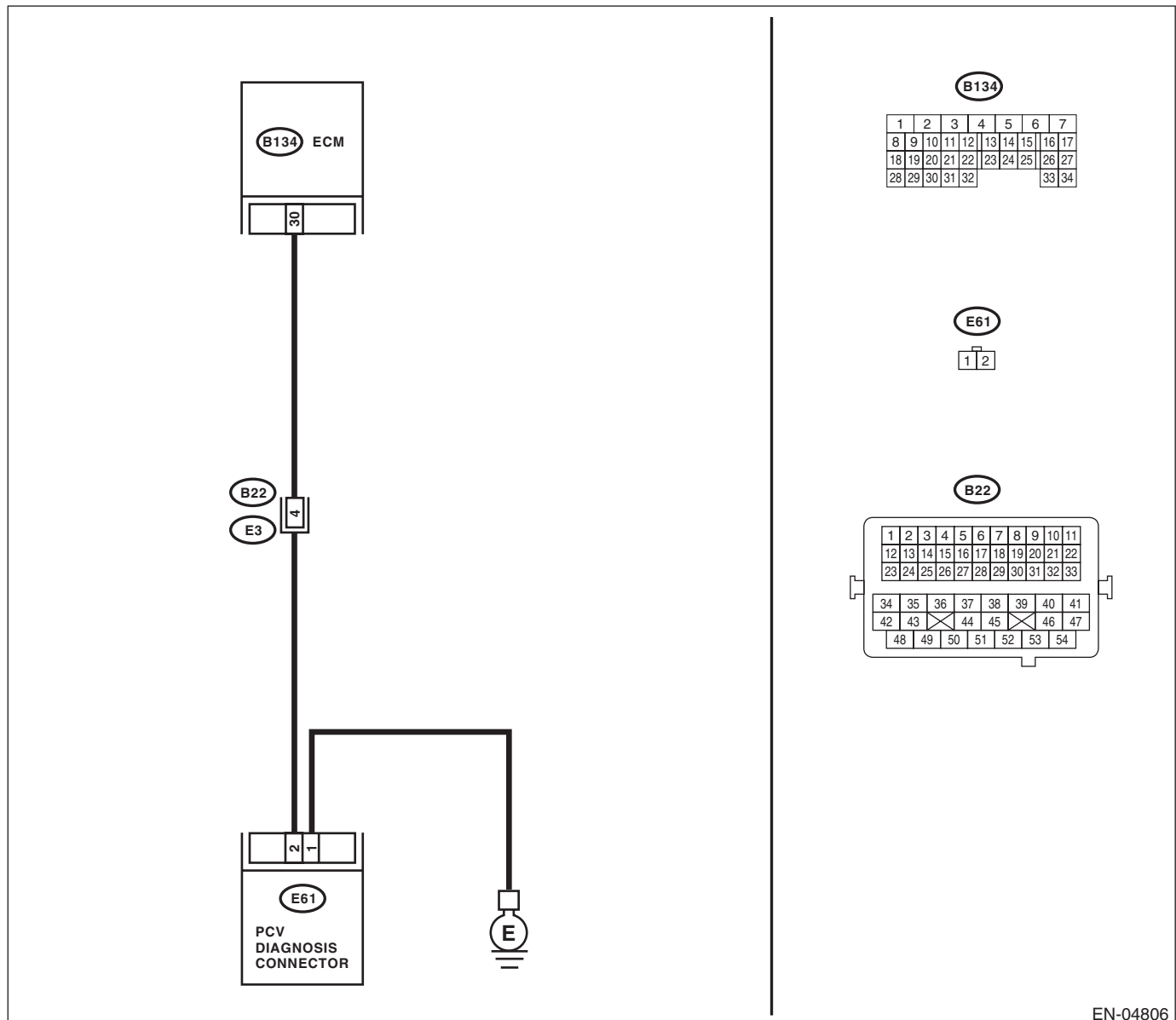
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04806

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK BLOW-BY HOSE. Check the condition of the blow-by hose.	Is there any disconnection or crack in blow-by hose?	Repair or replace the blow-by hose.	Go to step 2.
2	CHECK HARNESS BETWEEN ECM AND PCV HOSE ASSEMBLY. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM and PCV hose assembly. 3) Measure the resistance of harness between ECM and PCV hose assembly. Connector & terminal (B134) No. 30 — (E61) No. 2:	Is the resistance less than 1 Ω ?	Go to step 3.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and PCV hose assembly • Poor contact of coupling connector
3	CHECK HARNESS BETWEEN ECM AND PCV HOSE ASSEMBLY. Measure the resistance between PCV hose assembly and chassis ground. Connector & terminal (B134) No. 30 — Chassis ground:	Is the resistance 1 M Ω or more?	Go to step 4.	Repair the ground short circuit of harness between ECM and PCV hose assembly.
4	CHECK GROUND CIRCUIT OF PCV HOSE ASSEMBLY. Measure the resistance of harness between PCV hose assembly and engine ground. Connector & terminal (E61) No. 1 — Engine ground:	Is the resistance less than 5 Ω ?	Go to step 5.	Repair the open circuit of harness between PCV hose assembly and engine ground.
5	CHECK THE PCV HOSE ASSEMBLY. Measure the resistance between the PCV hose assembly terminals. Terminals No. 1 — No. 2:	Is the resistance less than 1 Ω ?	Repair the poor contact in ECM and PCV hose assembly connector.	Replace the PCV hose assembly.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

DB:DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-212, DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

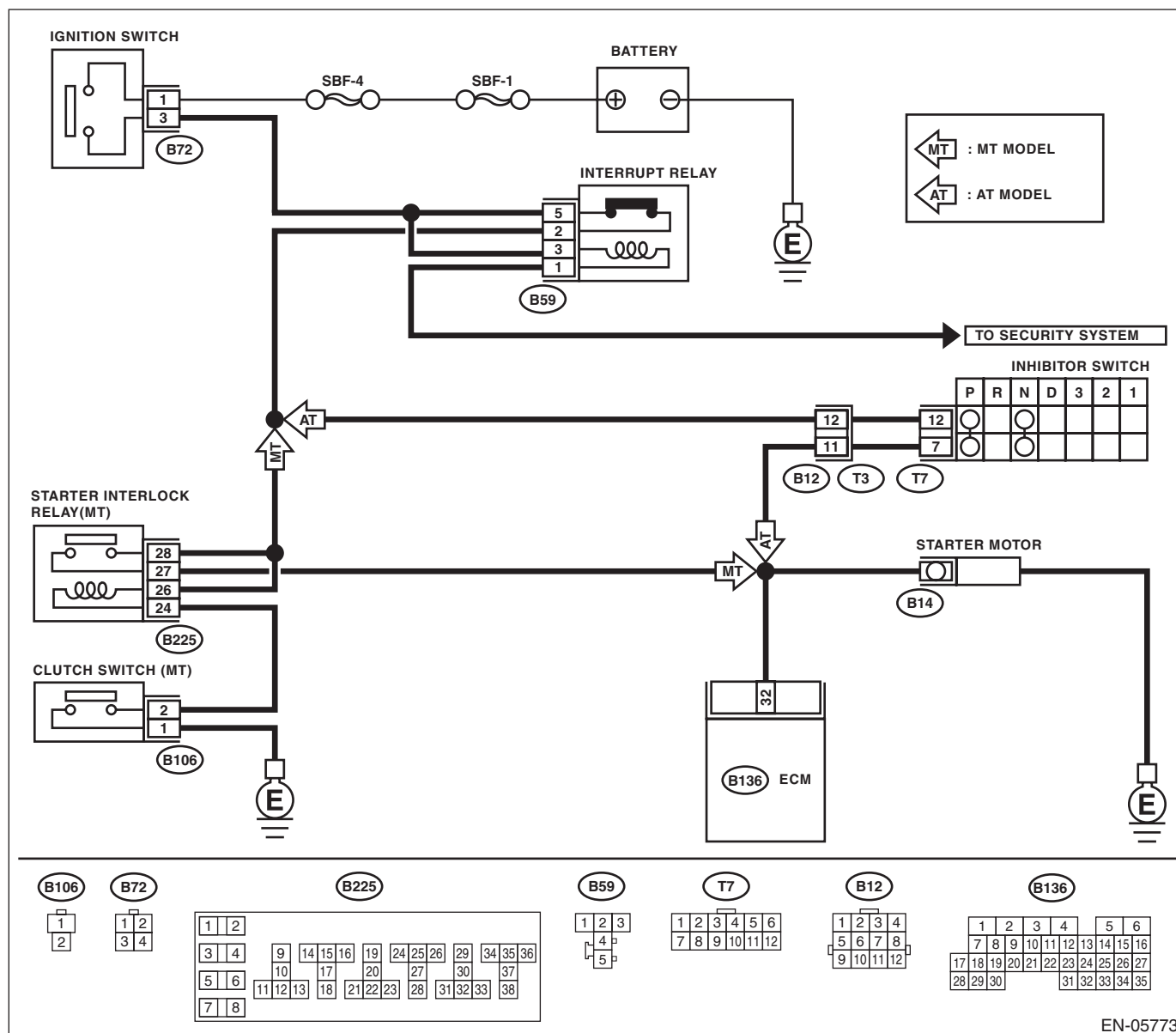
TROUBLE SYMPTOM:

Failure of engine to start

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



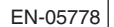
Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK FOR ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-76, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK HARNESS BETWEEN ECM AND IGNITION SWITCH. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from starter motor. 3) Turn the ignition switch to START. 4) Measure the voltage between ECM and chassis ground. Connector & terminal (B136) No. 32 (+) — Chassis ground (-): NOTE: For MT model, measure with the clutch pedal depressed.	Is the voltage 10 V or more?	Repair the poor contact of the ECM connector.	NOTE: Check the following item and repair or replace if necessary. • Open circuit in harness between the ECM and ignition switch connector • Blown out of fuse (SBF-1, SBF-4) • Poor connection of clutch switch connector (MT model) • Poor contact of clutch switch (MT model)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

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

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

DD:DTC P1602 CONTROL MODULE PROGRAMMING ERROR

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-215, DTC P1602 CONTROL MODULE PROGRAMMING ERROR, Diagnostic Trouble Code (DTC) Detecting Criteria.>

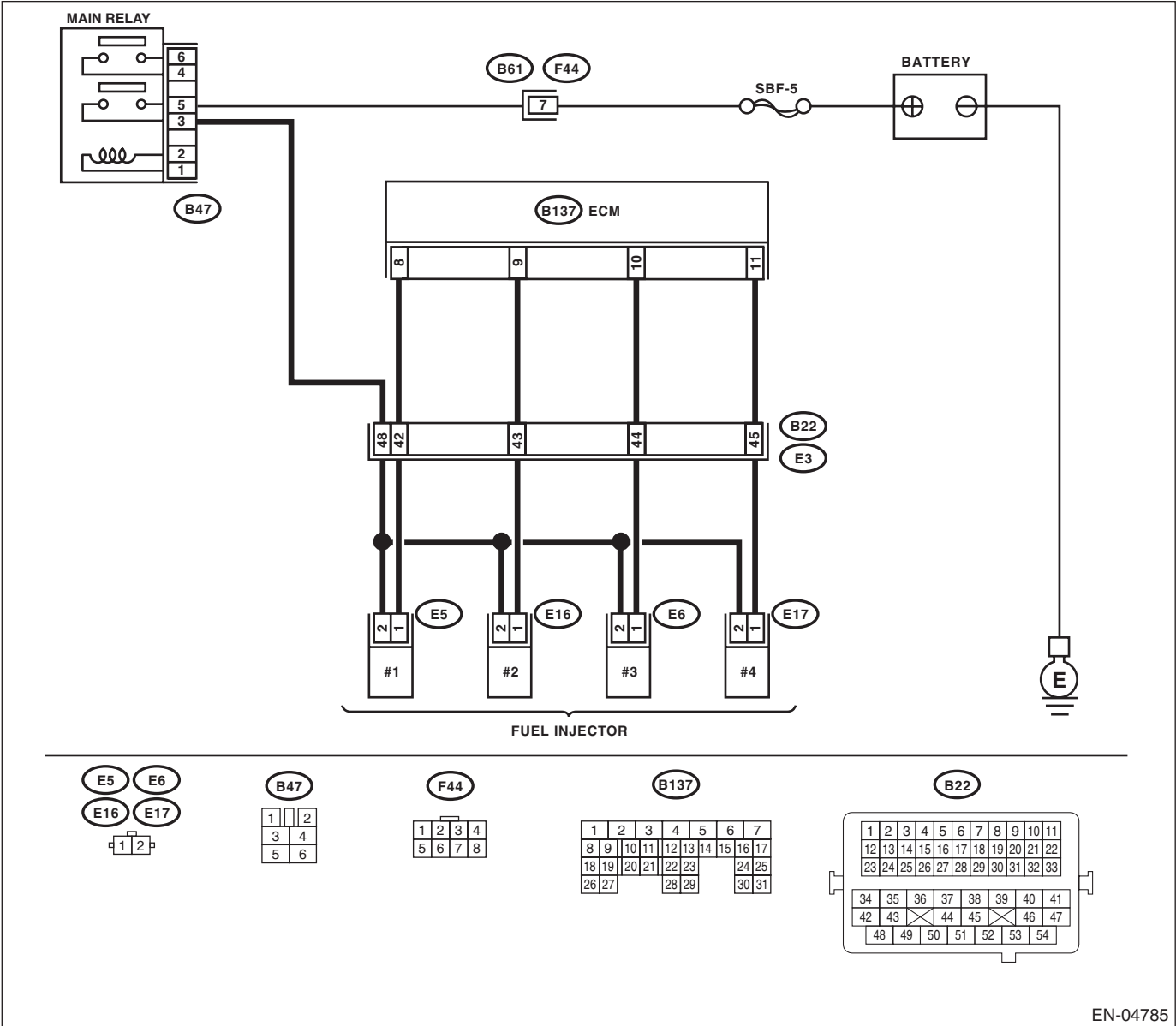
TROUBLE SYMPTOM:

- Engine keeps running at higher speed than specified idle speed.
- Engine keeps running at lower speed than specified idle speed.
- Engine stalls.

CAUTION:

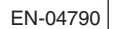
After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04785

ENGINE (DIAGNOSTICS)



EN(H4DOTC)(diag)-292

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
4	CHECK AIR INTAKE SYSTEM.	Are there holes, loose bolts or disconnection of hose on air intake system?	Repair the air intake system.	Go to step 5.
5	CHECK FUEL PRESSURE. WARNING: Place “NO OPEN FLAMES” signs near the working area. CAUTION: Be careful not to spill fuel. Measure the fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold. <Ref. to ME(H4DOTC)-26, INSPECTION, Fuel Pressure.> CAUTION: Release fuel pressure before removing the fuel pressure gauge. NOTE: If fuel pressure does not increase, squeeze the fuel return hose 2 to 3 times, then measure fuel pressure again.	Is the measured value 284 — 314 kPa (2.9 — 3.2 kgf/cm ² , 41 — 46 psi)?	Go to step 6.	Repair the following item. Fuel pressure is too high: • Clogged fuel return line or bent hose Fuel pressure is too low: • Improper fuel pump discharge • Clogged fuel supply line
6	CHECK FUEL PRESSURE. After connecting the pressure regulator vacuum hose, measure fuel pressure. <Ref. to ME(H4DOTC)-26, INSPECTION, Fuel Pressure.> CAUTION: Release fuel pressure before removing the fuel pressure gauge. NOTE: • If fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again. • If the measured value at this step is out of specification, check or replace pressure regulator and pressure regulator vacuum hose.	Is the measured value 230 — 260 kPa (2.35 — 2.65 kgf/cm ² , 33 — 38 psi)?	Go to step 7.	Repair the following item. Fuel pressure is too high: • Faulty pressure regulator • Clogged fuel return line or bent hose Fuel pressure is too low: • Faulty pressure regulator • Improper fuel pump discharge • Clogged fuel supply line
7	CHECK ENGINE COOLANT TEMPERATURE SENSOR. 1) Start the engine and warm-up completely. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the engine coolant temperature 75°C (167°F) or higher?	Go to step 8.	Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC)-26, Engine Coolant Temperature Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
8 CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR. 1) Start the engine and warm-up engine until coolant temperature is higher than 75°C (167°F). 2) For AT models, set the select lever to the "P" or "N" range, and for MT models, place the shift lever in the neutral position. 3) Turn the A/C switch to OFF. 4) Turn all the accessory switches to OFF. 5) Read the data of 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 "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the measured value 2.0 — 5.0 g/s (0.26 — 0.66 lb/m)?	Go to step 9.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-31, Mass Air Flow and Intake Air Temperature Sensor.>
9 CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR. 1) Start the engine and warm-up engine until coolant temperature is higher than 75°C (167°F). 2) For AT models, set the select lever to the "P" or "N" range, and for MT models, place the shift lever in the neutral position. 3) Turn the A/C switch to OFF. 4) Turn all the accessory switches to OFF. 5) Open the front hood. 6) Measure the ambient temperature. 7) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".	Subtract the ambient temperature from intake air temperature. Is the obtained value -10 — 50°C (-18 — 90°F)?	Go to step 10.	Check the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-31, Mass Air Flow and Intake Air Temperature Sensor.>
10 CHECK OUTPUT SIGNAL OF ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between the ECM and chassis ground for faulty cylinders. Connector & terminal #1 (B137) No. 8 (+) — Chassis ground (-): #2 (B137) No. 9 (+) — Chassis ground (-): #3 (B137) No. 10 (+) — Chassis ground (-): #4 (B137) No. 11 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Go to step 15.	Go to step 11.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
11 CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel injector on faulty cylinders. 3) Measure the resistance between the fuel injector connector and engine ground on faulty cylinders. Connector & terminal #1 (E5) No. 1 — Engine ground: #2 (E16) No. 1 — Engine ground: #3 (E6) No. 1 — Engine ground: #4 (E17) No. 1 — Engine ground:	Is the resistance 1 MΩ or more?	Go to step 12.	Repair the ground short circuit of harness between ECM and fuel injector.
12 CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR. Measure the resistance of harness between the ECM and fuel injector on faulty cylinders. Connector & terminal #1 (B137) No. 8 — (E5) No. 1: #2 (B137) No. 9 — (E16) No. 1: #3 (B137) No. 10 — (E6) No. 1: #4 (B137) No. 11 — (E17) No. 1:	Is the resistance less than 1 Ω?	Go to step 13.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and fuel injector connector • Poor contact of coupling connector
13 CHECK FUEL INJECTOR. Measure the resistance between fuel injector terminals on faulty cylinder. Terminals No. 1 — No. 2:	Is the resistance between 5 — 20 Ω?	Go to step 14.	Replace the faulty fuel injector. <Ref. to FU(H4DOTC)-33, Fuel Injector.>
14 CHECK POWER SUPPLY LINE. 1) Turn the ignition switch to ON. 2) Measure the voltage between fuel injector and engine ground on faulty cylinders. Connector & terminal #1 (E5) No. 2 (+) — Engine ground (-): #2 (E16) No. 2 (+) — Engine ground (-): #3 (E6) No. 2 (+) — Engine ground (-): #4 (E17) No. 2 (+) — Engine ground (-):	Is the voltage 10 V or more?	Repair the poor contact of all connectors in fuel injector circuit.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between main relay and fuel injector connector on faulty cylinders • Poor contact of coupling connector • Poor contact of main relay connector • Poor contact of fuel injector connector on faulty cylinders

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
15 CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel injector on faulty cylinders. 3) Turn the ignition switch to ON. 4) Measure the voltage between the ECM and chassis ground for faulty cylinders. Connector & terminal #1 (B137) No. 8 (+) — Chassis ground (-): #2 (B137) No. 9 (+) — Chassis ground (-): #3 (B137) No. 10 (+) — Chassis ground (-): #4 (B137) No. 11 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Repair the short circuit to power in the harness between the ECM and fuel injector.	Go to step 16.
16 CHECK FUEL INJECTOR. 1) Turn the ignition switch to OFF. 2) Measure the resistance between fuel injector terminals on faulty cylinder. Terminals No. 1 — No. 2:	Is the resistance less than 1 Ω ?	Replace the faulty fuel injector. <Ref. to FU(H4DOTC)-33, Fuel Injector.>	Go to step 17.
17 CHECK INSTALLATION OF CAMSHAFT POSITION SENSOR/CRANKSHAFT POSITION SENSOR.	Is the camshaft position sensor or crankshaft position sensor loosely installed?	Tighten the camshaft position sensor or crankshaft position sensor.	Go to step 18.
18 CHECK CRANK SPROCKET. Remove the timing belt cover.	Is the crank sprocket rusted or does it have damaged teeth?	Replace the crank sprocket. <Ref. to ME(H4DOTC)-54, Crank Sprocket.>	Go to step 19.
19 CHECK INSTALLATION CONDITION OF TIMING BELT. Turn the crankshaft, and align alignment mark on crank sprocket with alignment mark on cylinder block.	Is the timing belt dislocated from its proper position?	Repair the installation condition of the timing belt. <Ref. to ME(H4DOTC)-43, Timing Belt.>	Go to step 20.
20 CHECK ELECTRONIC THROTTLE CONTROL RELAY. 1) Turn the ignition switch to OFF. 2) Remove the electronic throttle control relay. 3) Connect the battery to terminals No. 1 and No. 3 of electronic throttle control relay. 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 21.	Replace the electronic throttle control relay.
21 CHECK POWER SUPPLY OF ELECTRONIC THROTTLE CONTROL RELAY. Measure the voltage between electronic throttle control relay connector and chassis ground. Connector & terminal (B309) No. 2 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Go to step 22.	Repair the open or ground short circuit of power supply circuit.
22 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY. 1) Disconnect the connectors from ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control relay connector and chassis ground. Connector & terminal (B309) No. 3 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Repair the short circuit to power in the harness between ECM and electronic throttle control relay.	Go to step 23.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
23 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY. 1) Turn the ignition switch to OFF. 2) Measure the resistance between electronic throttle control relay connector and chassis ground. <i>Connector & terminal</i> <i>(B309) No. 3 — Chassis ground:</i> <i>(B309) No. 4 — Chassis ground:</i>	Is the resistance 1 MΩ or more?	Go to step 24.	Repair the ground short circuit of harness between ECM and electronic throttle control relay.
24 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY. Measure the resistance between the ECM and electronic throttle control relay connector. <i>Connector & terminal</i> <i>(B136) No. 21 — (B309) No. 3:</i> <i>(B136) No. 1 — (B309) No. 4:</i>	Is the resistance less than 1 Ω?	Go to step 25.	Repair the open circuit of harness between ECM and electronic throttle control relay.
25 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and electronic throttle control. 3) Measure the resistance between ECM and chassis ground. <i>Connector & terminal</i> <i>(B134) No. 19 — Chassis ground:</i> <i>(B134) No. 18 — Chassis ground:</i> <i>(B134) No. 18 — (B136) No. 6:</i> <i>(B134) No. 28 — Chassis ground:</i>	Is the resistance 1 MΩ or more?	Go to step 26.	Repair the ground short circuit of harness between ECM and electronic throttle control connector.
26 CHECK SHORT CIRCUIT INSIDE THE ECM. 1) Connect the ECM. 2) Measure the resistance between electronic throttle control connector and engine ground. <i>Connector & terminal</i> <i>(E57) No. 6 — Engine ground:</i> <i>(E57) No. 4 — Engine ground:</i>	Is the resistance 1 MΩ or more?	Go to step 27.	Repair the ground short circuit of harness between ECM and electronic throttle control connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-46, Engine Control Module (ECM).>
27 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Disconnect the connectors from ECM. 2) Measure the resistance of harness between ECM and electronic throttle control connector. <i>Connector & terminal</i> <i>(B134) No. 18 — (E57) No. 6:</i> <i>(B134) No. 28 — (E57) No. 4:</i> <i>(B134) No. 29 — (E57) No. 3:</i>	Is the resistance less than 1 Ω?	Go to step 28.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and electronic throttle control connector • Poor contact of coupling connector

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
28 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Connect the ECM. 2) Measure the resistance between electronic throttle control connector and engine ground. Connector & terminal (E57) No. 3 — Engine ground:	Is the resistance less than 5 Ω?	Go to step 29.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and engine ground • Poor contact in ECM connector • Poor contact of coupling connector
29 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. 6 (+) — Engine ground (-): (E57) No. 4 (+) — Engine ground (-):	Is the voltage 4.85 V or more?	Repair the short circuit to power in the harness between ECM and electronic throttle control connector.	Go to step 30.
30 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance between ECM connectors. Connector & terminal (B134) No. 19 — (B134) No. 18: (B134) No. 19 — (B134) No. 28:	Is the resistance 1 MΩ or more?	Go to step 31.	Repair the short circuit to power in the harness between ECM and electronic throttle control connector.
31 CHECK SENSOR OUTPUT. 1) Connect all connectors. 2) Turn the ignition switch to ON. 3) Read the data of main throttle sensor signal using Subaru Select Monitor. NOTE: For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.>	Is the voltage 0.81 — 0.87 V?	Go to step 32.	Repair the poor contact of electronic throttle control connector. Replace the electronic throttle control if defective. <Ref. to FU(H4DOTC)-13, Throttle Body.>
32 CHECK SENSOR OUTPUT. Read the data of sub throttle sensor signal using Subaru Select Monitor. NOTE: Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.>	Is the voltage 1.64 — 1.70 V?	Go to step 33.	Repair the poor contact of electronic throttle control connector. Replace the electronic throttle control if defective. <Ref. to FU(H4DOTC)-13, Throttle Body.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
33 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL MOTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and electronic throttle control. 3) Measure the resistance between ECM and electronic throttle control connector. Connector & terminal (B137) No. 5 — (E57) No. 2: (B137) No. 4 — (E57) No. 1:	Is the resistance less than 1 Ω ?	Go to step 34.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and electronic throttle control • Poor contact of coupling connector
34 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL MOTOR. 1) Connect the ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control connector and engine ground. Connector & terminal (E57) No. 2 (+) — Engine ground (-): (E57) No. 1 (+) — Engine ground (-):	Is the voltage 5 V or more?	Repair the short circuit to power in the harness between the ECM and electronic throttle control.	Go to step 35.
35 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL MOTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance between electronic throttle control connector and engine ground. Connector & terminal (E57) No. 2 — Engine ground: (E57) No. 1 — Engine ground:	Is the resistance 1 M Ω or more?	Go to step 36.	Repair the ground short circuit of harness between the ECM and electronic throttle control.
36 CHECK ELECTRONIC THROTTLE CONTROL MOTOR HARNESS. Measure the resistance between the electronic throttle control connector terminals. Connector & terminal (E57) No. 2 — (E57) No. 1:	Is the resistance 1 M Ω or more?	Go to step 37.	Repair the short circuit in the harness between the ECM and electronic throttle control.
37 CHECK ELECTRONIC THROTTLE CONTROL GROUND CIRCUIT. Measure the resistance between ECM and chassis ground. Connector & terminal (B134) No. 5 — Chassis ground: (B137) No. 2 — Chassis ground: (B137) No. 3 — Chassis ground: (B137) No. 7 — Chassis ground:	Is the resistance less than 5 Ω ?	Go to step 38.	Repair the open circuit of the harness between the ECM and engine ground.
38 CHECK ELECTRONIC THROTTLE CONTROL. Measure the resistance between electronic throttle control terminals. Terminals No. 1 — No. 2:	Is the resistance 50 Ω or less?	Go to step 39.	Replace the electronic throttle control. <Ref. to FU(H4DOTC)-13, Throttle Body.>
39 CHECK ELECTRONIC THROTTLE CONTROL. Move the throttle valve to the fully open and fully closed positions with fingers. Check that the valve returns to the specified position when releasing fingers.	Does the valve return to the specified position? Specified value: 3 mm (0.12 in) from fully closed position	Repair the poor contact of the ECM connector.	Replace the electronic throttle control. <Ref. to FU(H4DOTC)-13, Throttle Body.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

DE:DTC P2004 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-217, DTC P2004 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

Step	Check	Yes	No
1 CHECK FOR ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check the appropriate DTC using the "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-76, 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.	Is there any dirt or clogging with foreign objects in the tumble generator valve?	Clean the tumble generator valve.	Replace the tumble generator valve assembly. <Ref. to FU(H4DOTC)-37, Tumble Generator Valve Assembly.>

DF:DTC P2005 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 2)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-218, DTC P2005 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

Step	Check	Yes	No
1 CHECK FOR ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check the appropriate DTC using the "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-76, 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.	Is there any dirt or clogging with foreign objects in the tumble generator valve?	Clean the tumble generator valve.	Replace the tumble generator valve assembly. <Ref. to FU(H4DOTC)-37, Tumble Generator Valve Assembly.>

**DG:DTC P2006 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED
(BANK 1)****DTC DETECTING CONDITION:**

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-219, DTC P2006 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

Step	Check	Yes	No
1 CHECK FOR ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check the appropriate DTC using the "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-76, 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.	Is there any dirt or clogging with foreign objects in the tumble generator valve?	Clean the tumble generator valve.	Replace the tumble generator valve assembly. <Ref. to FU(H4DOTC)-37, Tumble Generator Valve Assembly.>

**DH:DTC P2007 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED
(BANK 2)****DTC DETECTING CONDITION:**

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-220, DTC P2007 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

Step	Check	Yes	No
1 CHECK FOR ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check the appropriate DTC using the "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-76, 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.	Is there any dirt or clogging with foreign objects in the tumble generator valve?	Clean the tumble generator valve.	Replace the tumble generator valve assembly. <Ref. to FU(H4DOTC)-37, Tumble Generator Valve Assembly.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

DI: DTC P2008 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 1)

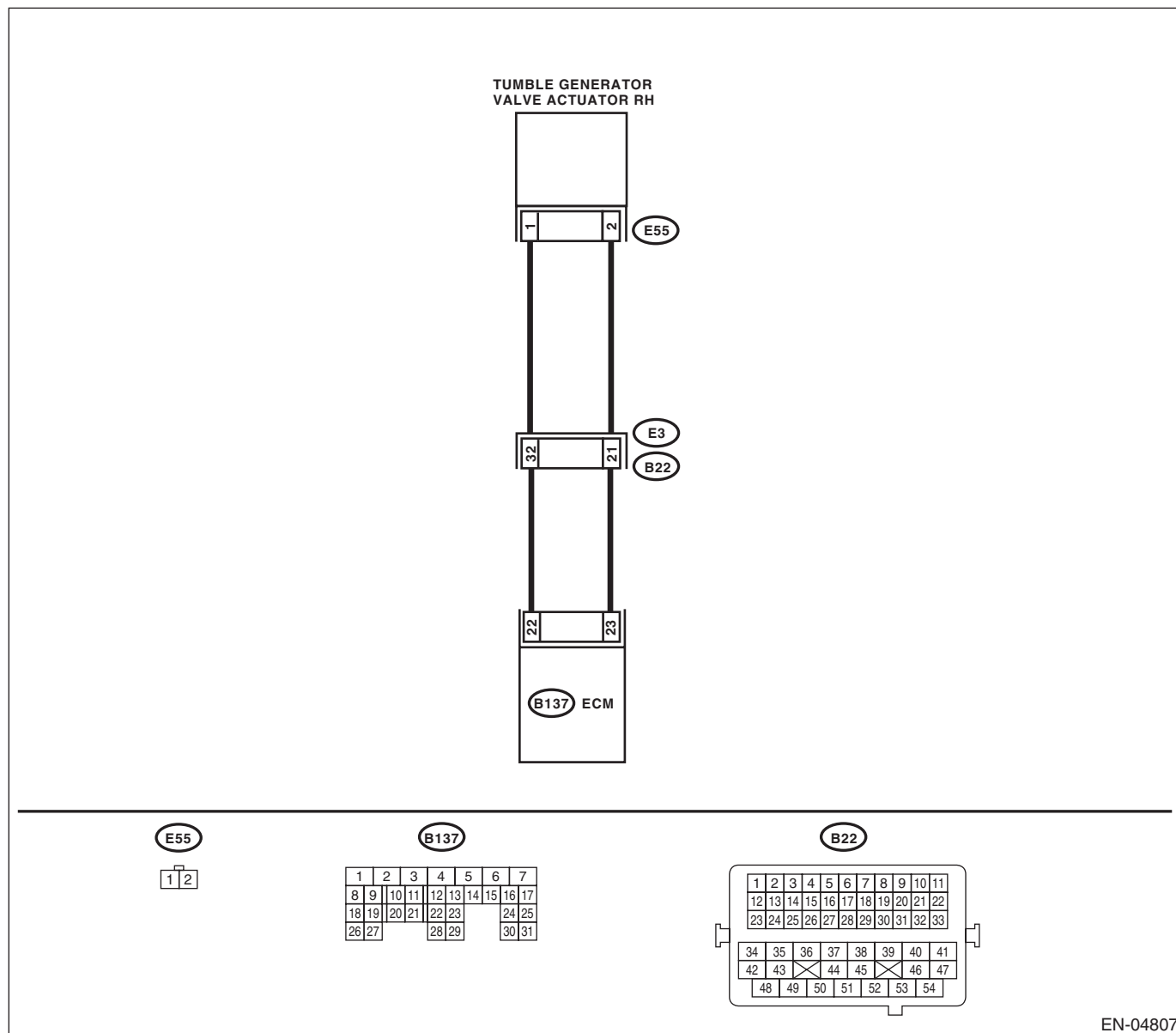
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-221, DTC P2008 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04807

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 connectors from ECM and tumble generator valve. 3) Measure the resistance of harness between ECM and tumble generator valve actuator. Connector & terminal (B137) No. 22 — (E55) No. 1: (B137) No. 23 — (E55) No. 2:	Is the resistance less than 1 Ω ?	Go to step 2.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and tumble generator valve actuator connector • Poor contact of coupling connector
2 CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ACTUATOR CONNECTOR. Measure the resistance between ECM and chassis ground. Connector & terminal (B137) No. 22 — Chassis ground: (B137) No. 23 — Chassis ground:	Is the resistance 1 M Ω or more?	Go to step 3.	Repair the short circuit to ground in harness between ECM and tumble generator valve actuator connector.
3 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 of tumble generator valve actuator connector.	Replace the tumble generator valve actuator. <Ref. to FU(H4DOTC)-38, Tumble Generator Valve Actuator.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

DJ:DTC P2009 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 1)

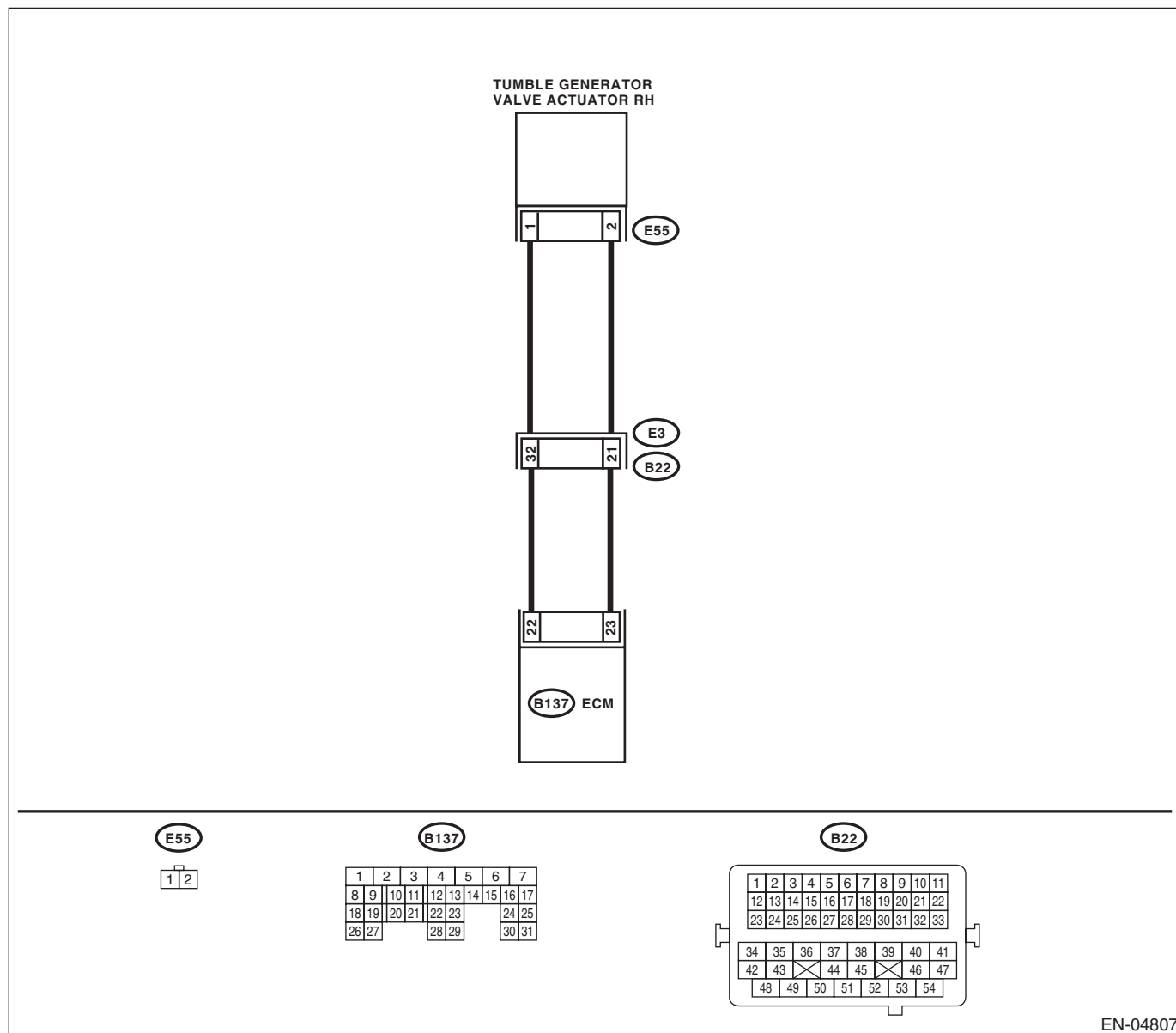
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-223, DTC P2009 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, 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 connectors from ECM. 3) Measure the voltage between ECM and chassis ground. Connector & terminal (B137) No. 22 (+) — Chassis ground (-): (B137) No. 23 (+) — Chassis ground (-):	Is the voltage 5 V or more?	Repair the short circuit to power in the harness between ECM and tumble generator valve actuator.	Replace the tumble generator valve actuator. <Ref. to FU(H4DOTC)-38, Tumble Generator Valve Actuator.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

DK:DTC P2011 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 2)

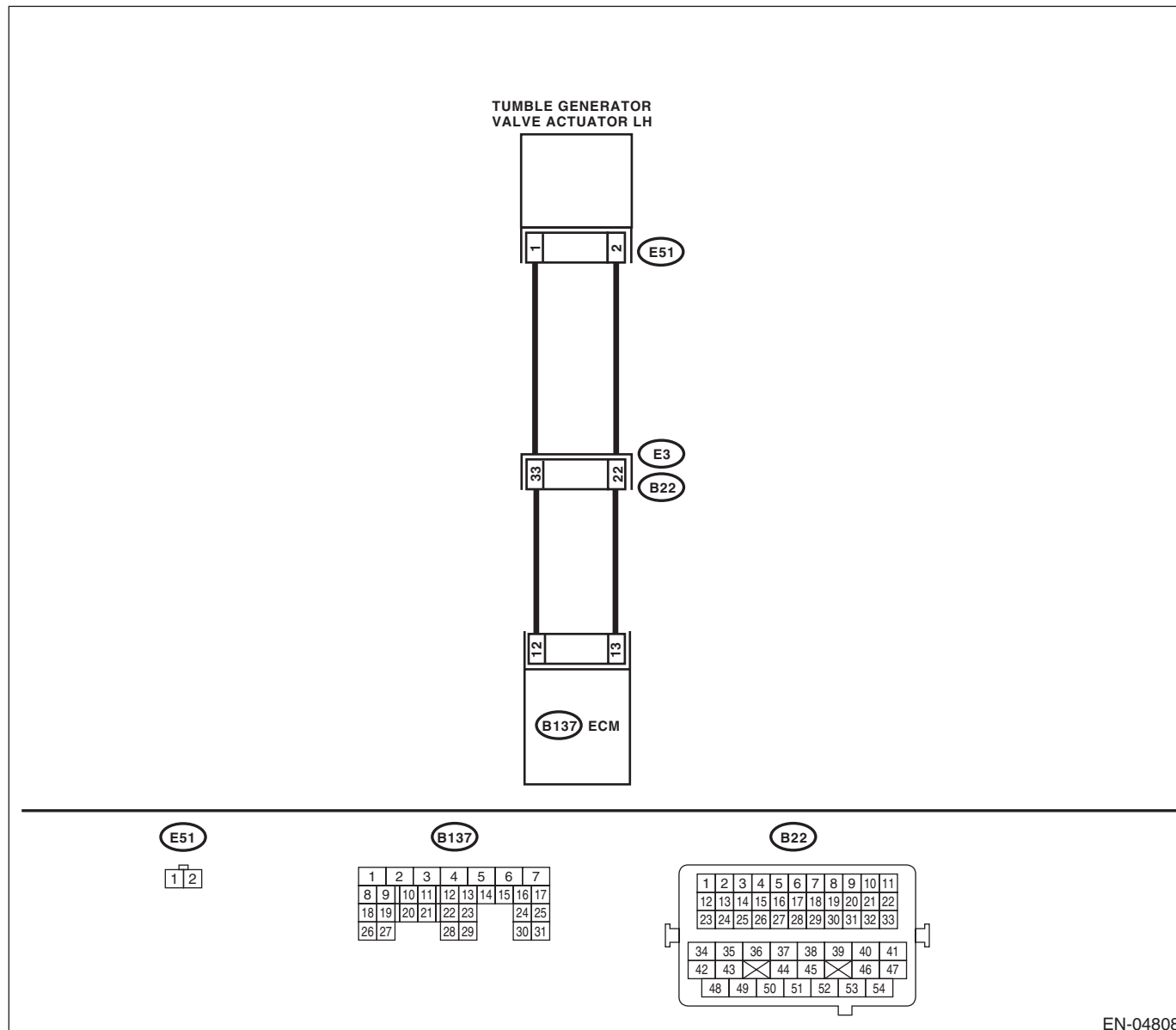
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-225, DTC P2011 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, 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 connectors from ECM and tumble generator valve. 3) Measure the resistance of harness between ECM and tumble generator valve actuator. Connector & terminal (B137) No. 12 — (E51) No. 1: (B137) No. 13 — (E51) No. 2:	Is the resistance less than 1 Ω ?	Go to step 2.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and tumble generator valve actuator connector • Poor contact of coupling connector
2 CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ACTUATOR CONNECTOR. Measure the resistance between ECM and chassis ground. Connector & terminal (B137) No. 12 — Chassis ground: (B137) No. 13 — Chassis ground:	Is the resistance 1 M Ω or more?	Go to step 3.	Repair the short circuit to ground in harness between ECM and tumble generator valve actuator connector.
3 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 of tumble generator valve actuator connector.	Replace the tumble generator valve actuator. <Ref. to FU(H4DOTC)-38, Tumble Generator Valve Actuator.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

DL:DTC P2012 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 2)

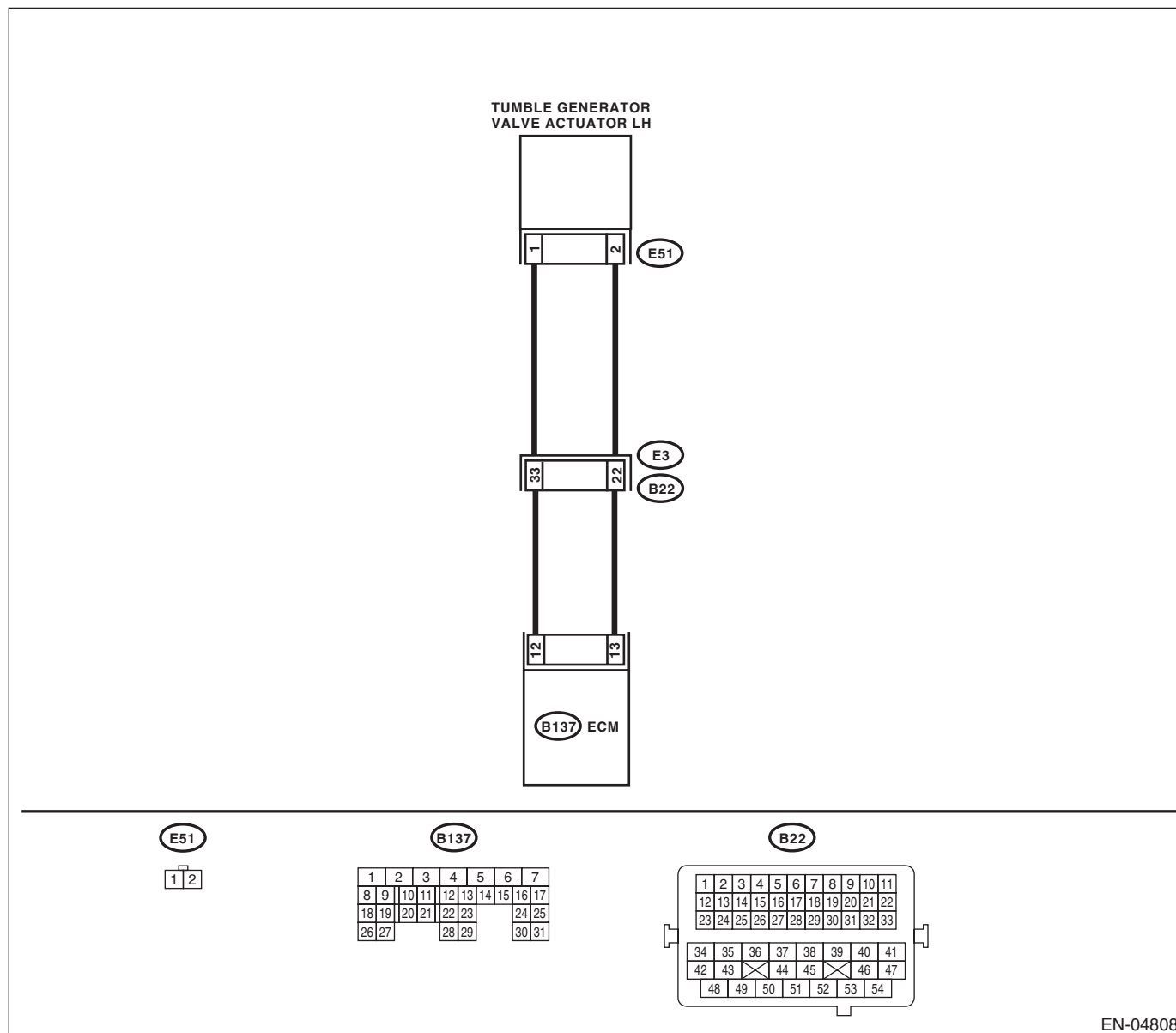
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-227, DTC P2012 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04808

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 connectors from ECM. 3) Measure the voltage between ECM and chassis ground. Connector & terminal (B137) No. 12 (+) — Chassis ground (-): (B137) No. 13 (+) — Chassis ground (-):	Is the voltage 5 V or more?	Repair the short circuit to power in the harness between ECM and tumble generator valve actuator.	Replace the tumble generator valve actuator. <Ref. to FU(H4DOTC)-38, Tumble Generator Valve Actuator.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-229, DTC P2016 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT LOW (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

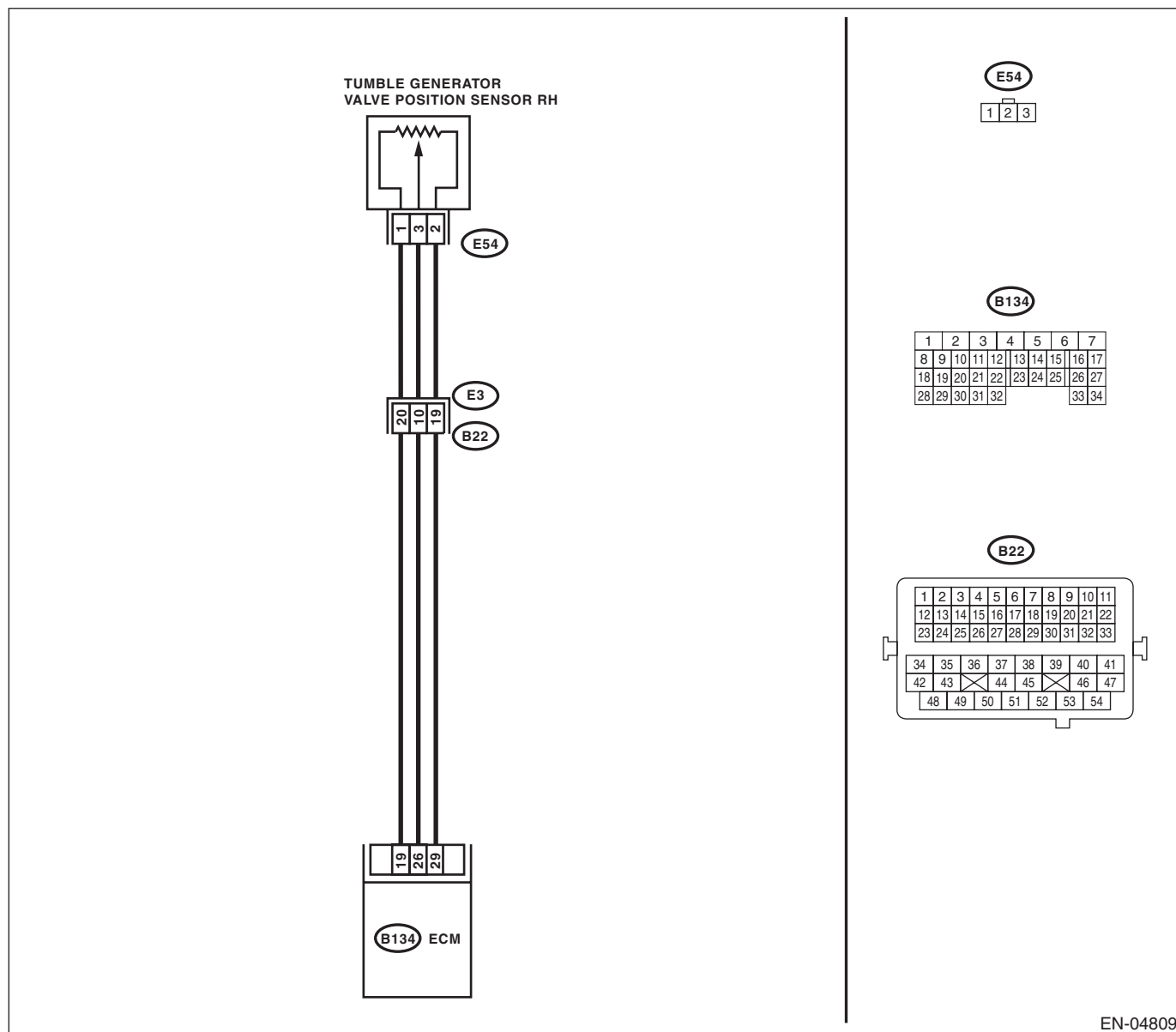
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04809

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 "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> - General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the voltage less than 0.2 V?	Go to step 2.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. Reproduce the fault condition, and reperform the check. NOTE: In this case, there may be a temporary connector contact failure.
2 CHECK POWER SUPPLY OF TUMBLE GENERATOR VALVE POSITION SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from tumble generator valve position sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between the tumble generator valve position sensor connector and engine ground. Connector & terminal (E54) No. 1 (+) — Engine ground (-):	Is the voltage 4.5 V or more?	Go to step 3.	Repair the harness and connector. NOTE: In this case, repair the following item: - Open circuit of harness between ECM and tumble generator valve position sensor connector - Poor contact in ECM connector - Poor contact of coupling connector
3 CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance of harness between ECM and tumble generator valve position sensor connector. Connector & terminal (B134) No. 26 — (E54) No. 3:	Is the resistance less than 1 Ω ?	Go to step 4.	Repair the harness and connector. NOTE: In this case, repair the following item: - Open circuit of harness between ECM and tumble generator valve position sensor connector - Poor contact of coupling connector
4 CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR. Measure the resistance between ECM and chassis ground. Connector & terminal (B134) No. 26 — Chassis ground:	Is the resistance 1 M Ω or more?	Go to step 5.	Repair the ground short circuit of harness between ECM and tumble generator valve position sensor connector.
5 CHECK POOR CONTACT. Check for poor contact in ECM and tumble generator valve position sensor connector.	Is there poor contact in ECM and tumble generator valve position sensor connector?	Repair the poor contact in ECM or tumble generator valve position sensor connector.	Replace the tumble generator valve position sensor. <Ref. to FU(H4DOTC)-40, Tumble Generator Valve Position Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-231, DTC P2017 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT HIGH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

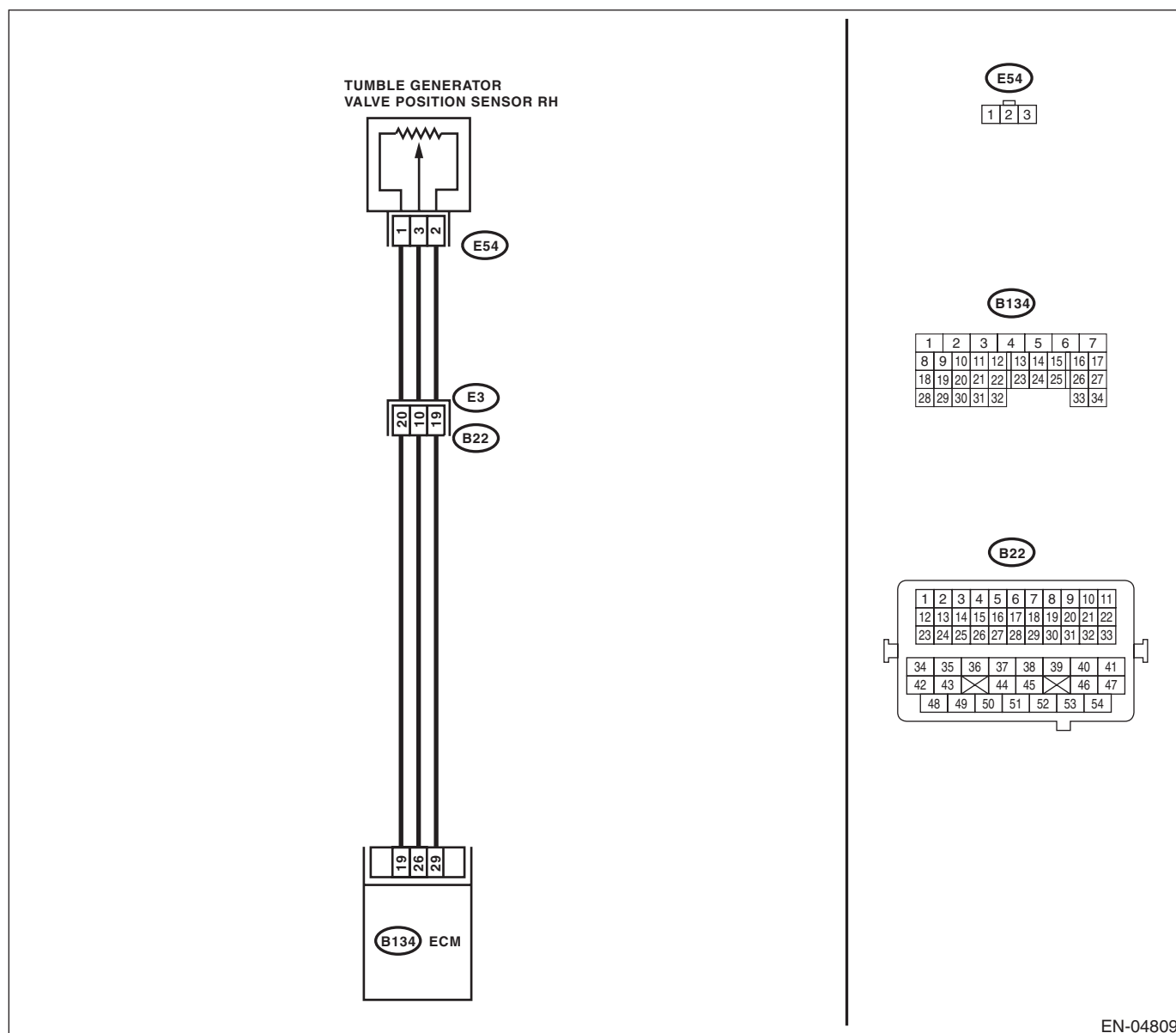
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04809

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 "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the voltage 5 V or more?	Go to step 2.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. Reproduce the fault condition, and reperform the check. NOTE: In this case, there may be a temporary connector contact failure.
2 CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from tumble generator valve position sensor. 3) Start the engine. 4) 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 "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the voltage 5 V or more?	Repair the short circuit to power in the harness between ECM and tumble generator valve position sensor connector.	Go to step 3.
3 CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Measure the resistance of the harness between the 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 4.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and tumble generator valve position sensor connector • Poor contact in ECM connector • Poor contact of coupling connector
4 CHECK POOR CONTACT. Check for poor contact in the tumble generator valve position sensor connector.	Is there poor contact in the tumble generator valve position sensor connector?	Repair the poor contact of the tumble generator valve position sensor connector.	Replace the tumble generator valve position sensor. <Ref. to FU(H4DOTC)-40, Tumble Generator Valve Position Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-233, DTC P2021 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT LOW (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

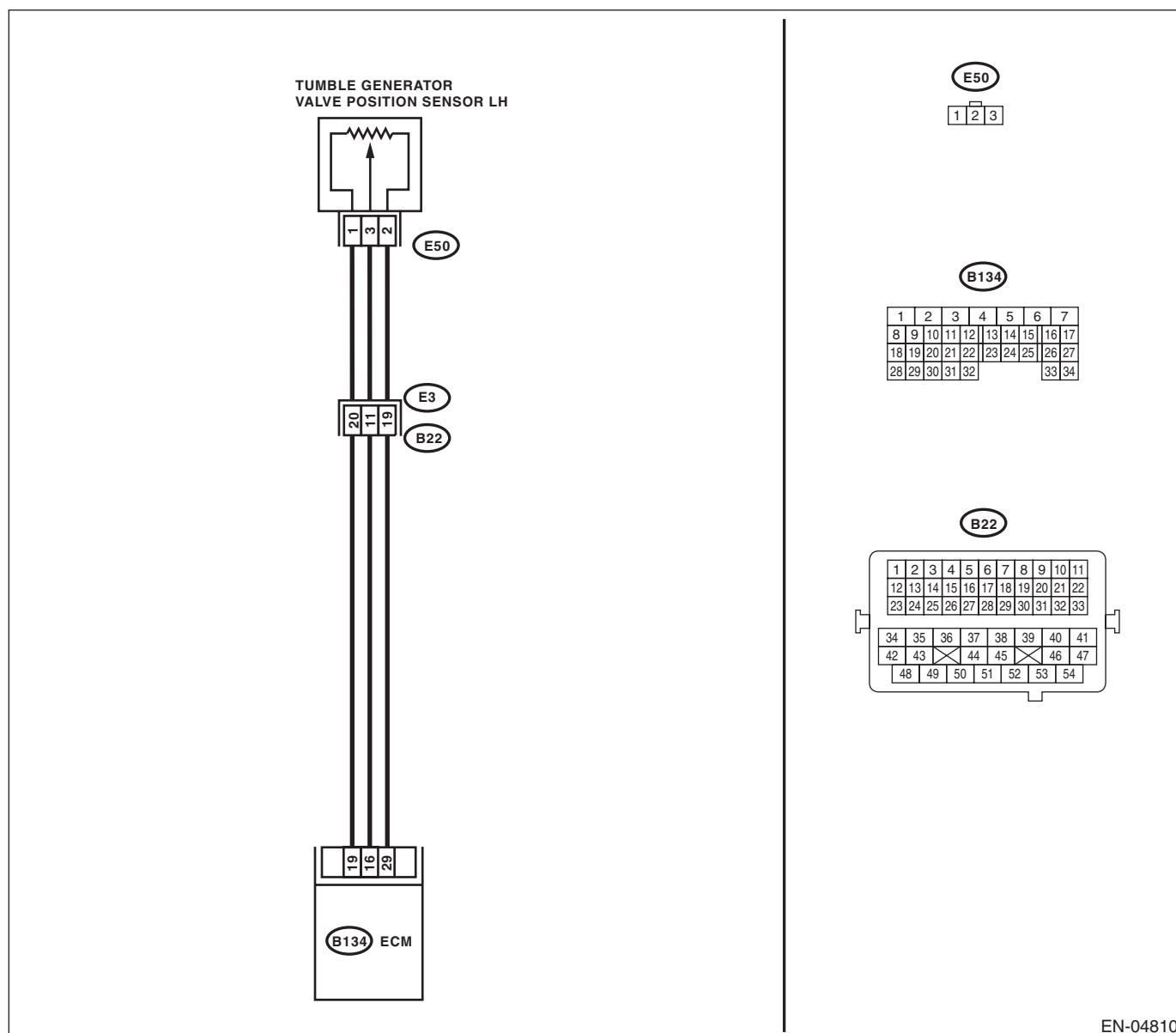
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04810

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 "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> - General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the voltage less than 0.2 V?	Go to step 2.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. Reproduce the fault condition, and reperform the check. NOTE: In this case, there may be a temporary connector contact failure.
2 CHECK POWER SUPPLY OF TUMBLE GENERATOR VALVE POSITION SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from tumble generator valve position sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between the tumble generator valve position sensor connector and engine ground. Connector & terminal (E50) No. 1 (+) — Engine ground (-):	Is the voltage 4.5 V or more?	Go to step 3.	Repair the harness and connector. NOTE: In this case, repair the following item: - Open circuit of harness between ECM and tumble generator valve position sensor connector - Poor contact in ECM connector - Poor contact of coupling connector
3 CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance of harness between ECM and tumble generator valve position sensor connector. Connector & terminal (B134) No. 16 — (E50) No. 3:	Is the resistance less than 1 Ω ?	Go to step 4.	Repair the harness and connector. NOTE: In this case, repair the following item: - Open circuit of harness between ECM and tumble generator valve position sensor connector - Poor contact of coupling connector
4 CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR. Measure the resistance between ECM and chassis ground. Connector & terminal (B134) No. 16 — Chassis ground:	Is the resistance 1 M Ω or more?	Go to step 5.	Repair the ground short circuit of harness between ECM and tumble generator valve position sensor connector.
5 CHECK POOR CONTACT. Check for poor contact in ECM and tumble generator valve position sensor connector.	Is there poor contact in ECM and tumble generator valve position sensor connector?	Repair the poor contact in ECM or tumble generator valve position sensor connector.	Replace the tumble generator valve position sensor. <Ref. to FU(H4DOTC)-40, Tumble Generator Valve Position Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-235, DTC P2022 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT HIGH (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

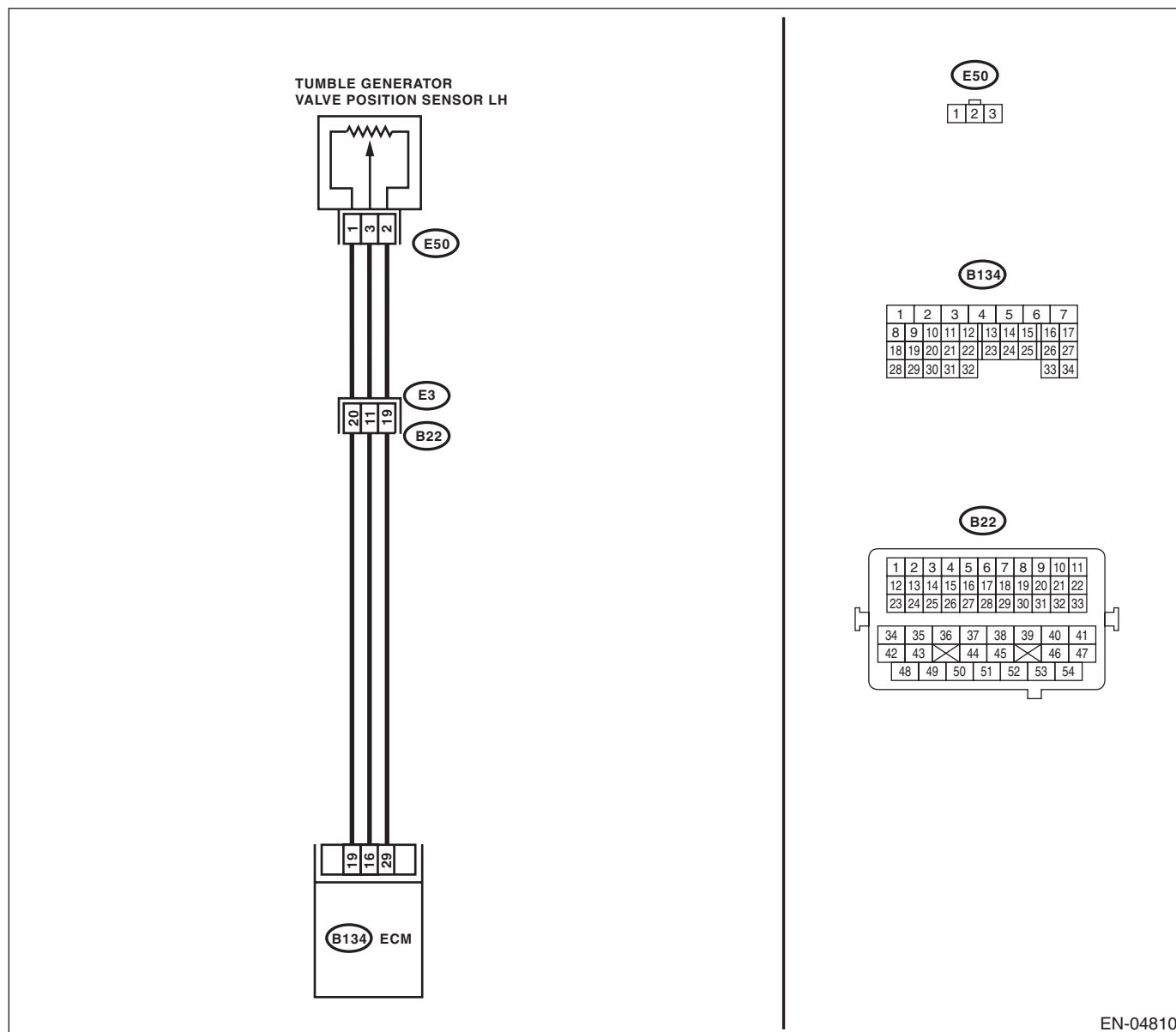
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04810

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 "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> - General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the voltage 5 V or more?	Go to step 2.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. Reproduce the fault condition, and reperform the check. NOTE: In this case, there may be a temporary connector contact failure.
2 CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from tumble generator valve position sensor. 3) Start the engine. 4) 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 "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> - General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the voltage 5 V or more?	Repair the short circuit to power in the harness between ECM and tumble generator valve position sensor connector.	Go to step 3.
3 CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Measure the resistance of the harness between the 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 4.	Repair the harness and connector. NOTE: In this case, repair the following item: - Open circuit of harness between ECM and tumble generator valve position sensor connector - Poor contact in ECM connector - Poor contact of coupling connector
4 CHECK POOR CONTACT. Check for poor contact in the tumble generator valve position sensor connector.	Is there poor contact in the tumble generator valve position sensor connector?	Repair the poor contact of the tumble generator valve position sensor connector.	Replace the tumble generator valve position sensor. <Ref. to FU(H4DOTC)-40, Tumble Generator Valve Position Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

DQ:DTC P2088 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-237, DTC P2088 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

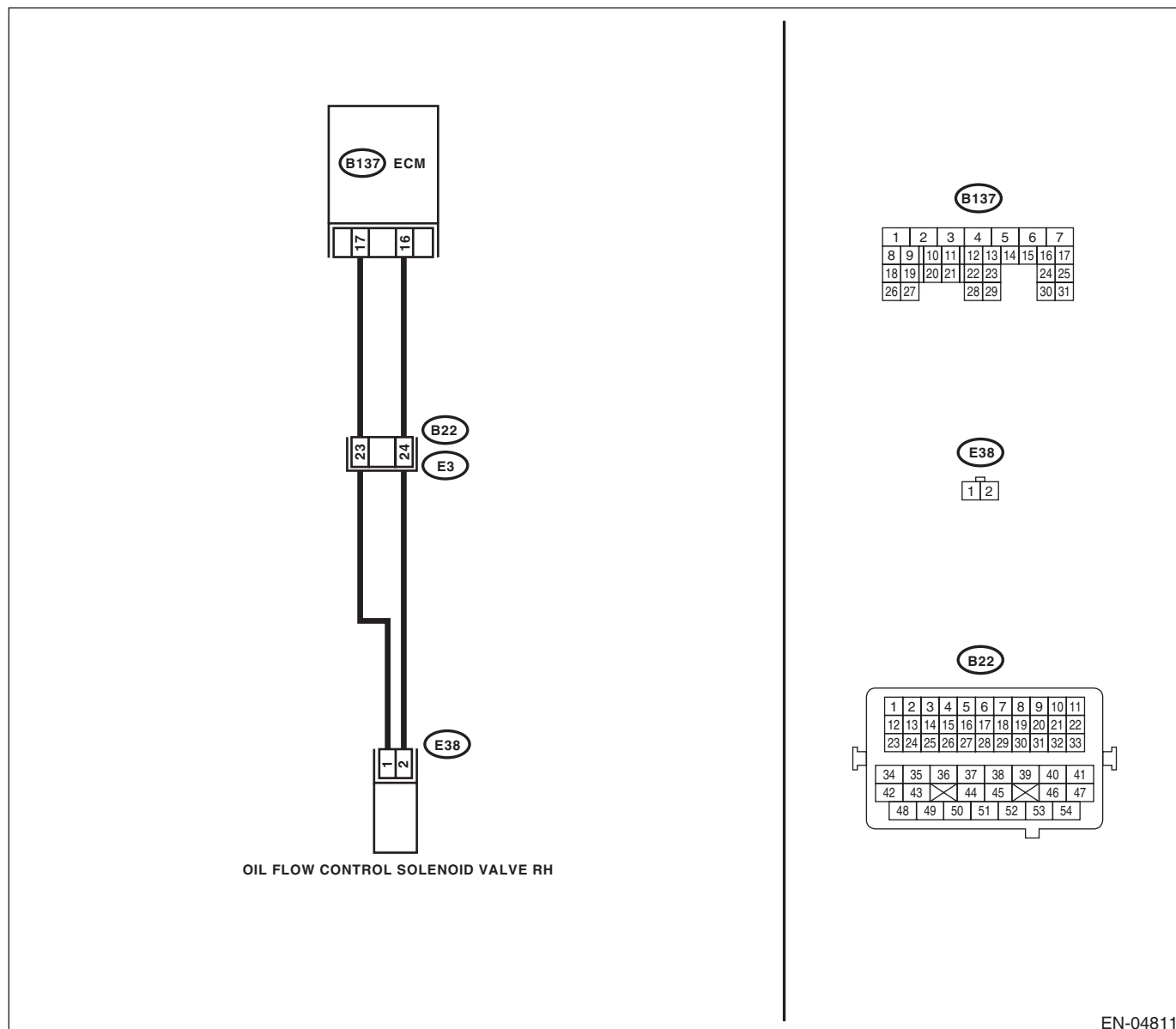
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04811

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 connectors from ECM and oil flow control solenoid valve. 3) Measure the resistance of harness between ECM and oil flow control solenoid valve. Connector & terminal (B137) No. 17 — (E38) No. 1: (B137) No. 16 — (E38) No. 2:	Is the resistance less than 1 Ω ?	Go to step 2.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of the harness between the ECM and oil flow control solenoid valve connector • Poor contact of coupling connector
2 CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE. Measure the resistance between ECM and chassis ground. Connector & terminal (B137) No. 17 — Chassis ground: (B137) No. 16 — Chassis ground:	Is the resistance 1 M Ω or more?	Go to step 3.	Repair the ground short circuit of harness between ECM and oil flow control solenoid valve connector.
3 CHECK OIL FLOW CONTROL SOLENOID VALVE. Measure the resistance between oil flow control solenoid valve terminals. Terminals No. 1 — No. 2:	Is the resistance between 6 — 12 Ω ?	Repair the poor contact of the ECM and oil flow control solenoid valve connector.	Replace the oil flow control solenoid valve. <Ref. to ME(H4DOTC)-55, Camshaft.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

DR:DTC P2089 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-239, DTC P2089 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

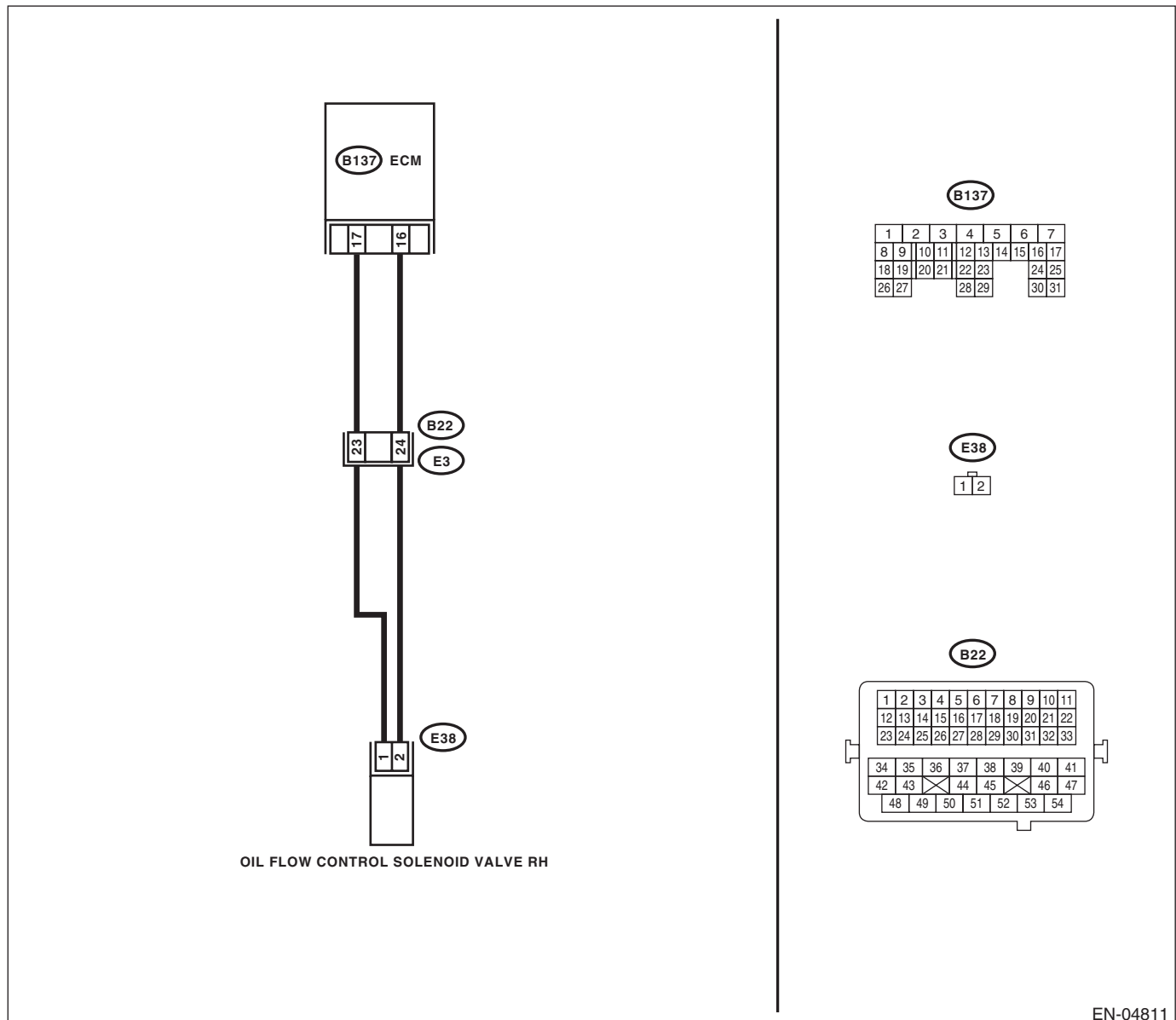
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04811

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 connectors from ECM and oil flow control solenoid valve. 3) Measure the voltage between ECM and chassis ground. Connector & terminal (B137) No. 17 (+) — Chassis ground (-): (B137) No. 16 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Go to step 2.	Repair the short circuit to power in the harness between the ECM and oil flow control solenoid valve connector.
2 CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE. Measure the resistance of harness between ECM and oil flow control solenoid valve connector. Connector & terminal (B137) No. 17 — (E38) No. 1: (B137) No. 16 — (E38) No. 2:	Is the resistance less than 1 Ω ?	Go to step 3.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of the harness between the ECM and oil flow control solenoid valve connector • Poor contact of coupling connector
3 CHECK OIL FLOW CONTROL SOLENOID VALVE. Measure the resistance between oil flow control solenoid valve terminals. Terminals No. 1 — No. 2:	Is the resistance between 6 — 12 Ω ?	Repair the poor contact of the ECM and oil flow control solenoid valve connector.	Replace the oil flow control solenoid valve. <Ref. to ME(H4DOTC)-55, Camshaft.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

DS:DTC P2092 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 2)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-241, DTC P2092 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

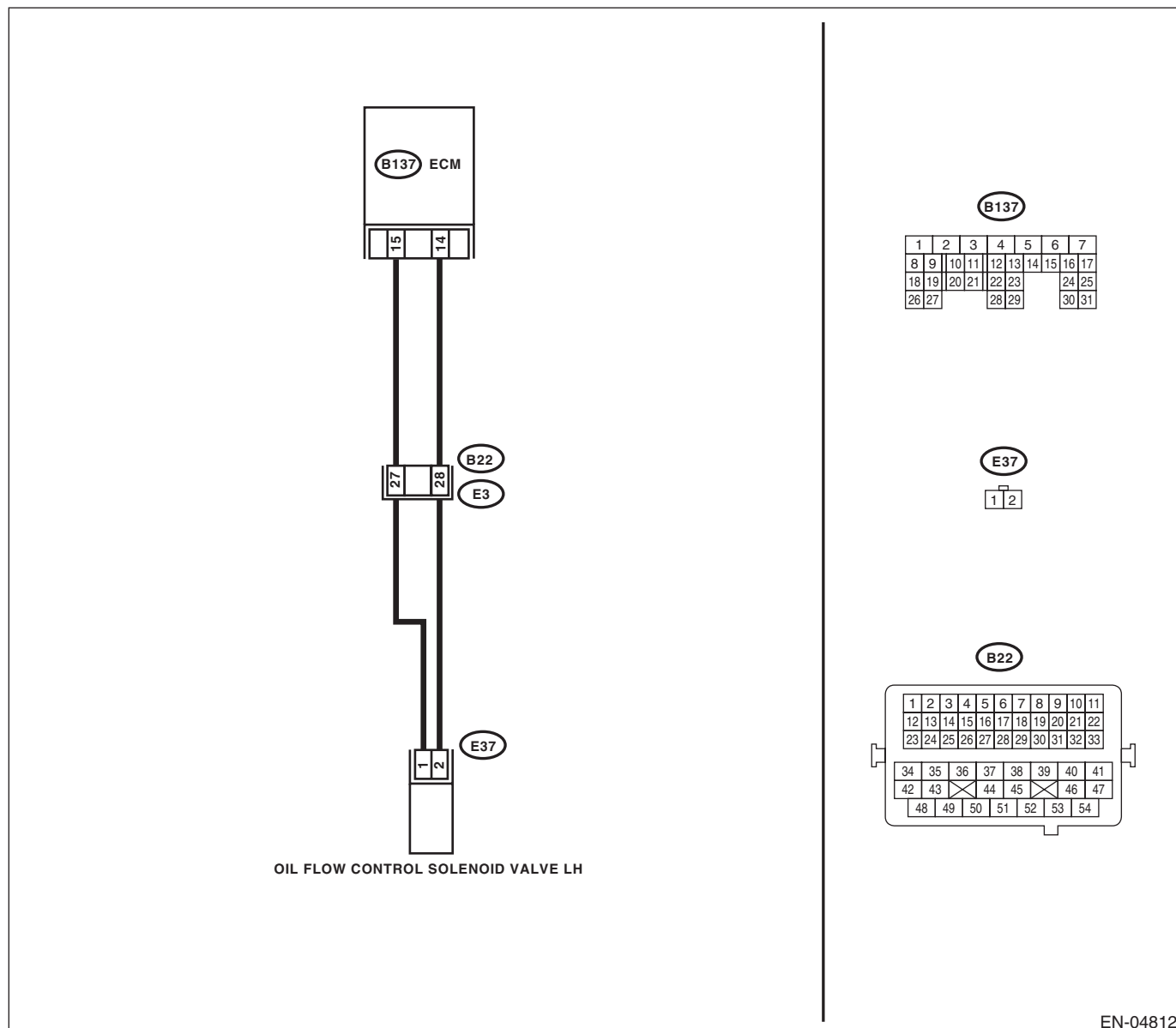
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04812

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 connectors from ECM and oil flow control solenoid valve. 3) Measure the resistance of harness between ECM and oil flow control solenoid valve. Connector & terminal (B137) No. 15 — (E37) No. 1: (B137) No. 14 — (E37) No. 2:	Is the resistance less than 1 Ω ?	Go to step 2.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of the harness between the ECM and oil flow control solenoid valve connector • Poor contact of coupling connector
2 CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE. Measure the resistance between ECM and chassis ground. Connector & terminal (B137) No. 15 — Chassis ground: (B137) No. 14 — Chassis ground:	Is the resistance 1 M Ω or more?	Go to step 3.	Repair the ground short circuit of harness between ECM and oil flow control solenoid valve connector.
3 CHECK OIL FLOW CONTROL SOLENOID VALVE. Measure the resistance between oil flow control solenoid valve terminals. Terminals No. 1 — No. 2:	Is the resistance between 6 — 12 Ω ?	Repair the poor contact of the ECM and oil flow control solenoid valve connector.	Replace the oil flow control solenoid valve. <Ref. to ME(H4DOTC)-55, Camshaft.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

DT:DTC P2093 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 2)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-243, DTC P2093 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

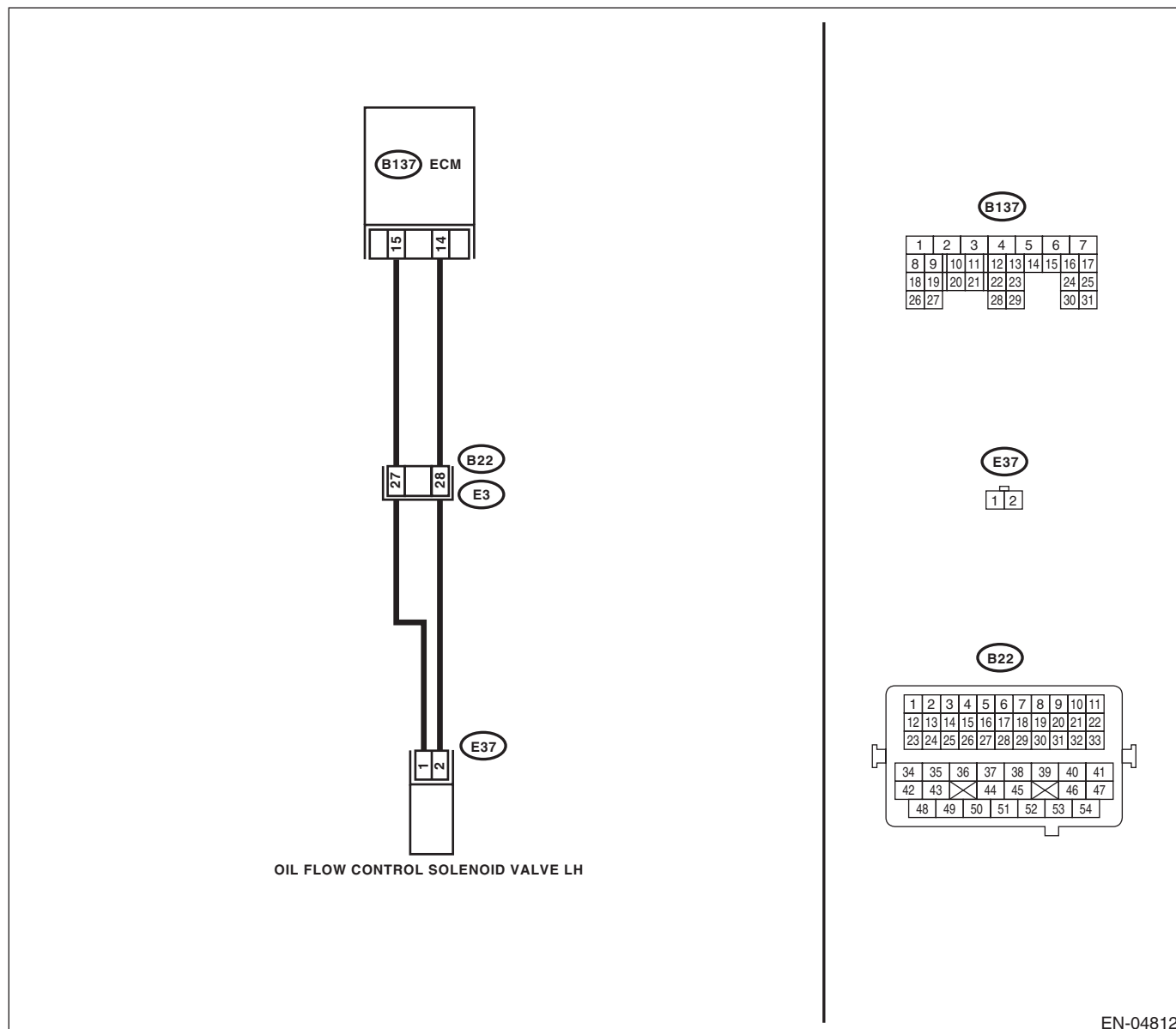
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04812

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 connectors from ECM and oil flow control solenoid valve. 3) Measure the voltage between ECM and chassis ground. Connector & terminal (B137) No. 15 (+) — Chassis ground (-): (B137) No. 14 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Go to step 2.	Repair the short circuit to power in the harness between the ECM and oil flow control solenoid valve connector.
2 CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE. Measure the resistance of harness between ECM and oil flow control solenoid valve connector. Connector & terminal (B137) No. 15 — (E37) No. 1: (B137) No. 14 — (E37) No. 2:	Is the resistance less than 1 Ω ?	Go to step 3.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of the harness between the ECM and oil flow control solenoid valve connector • Poor contact of coupling connector
3 CHECK OIL FLOW CONTROL SOLENOID VALVE. Measure the resistance between oil flow control solenoid valve terminals. Terminals No. 1 — No. 2:	Is the resistance between 6 — 12 Ω ?	Repair the poor contact of the ECM and oil flow control solenoid valve connector.	Replace the oil flow control solenoid valve. <Ref. to ME(H4DOTC)-55, Camshaft.>

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

Refer to DTC P2097 for diagnostic procedure. <Ref. to EN(H4DOTC)(diag)-326, DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

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

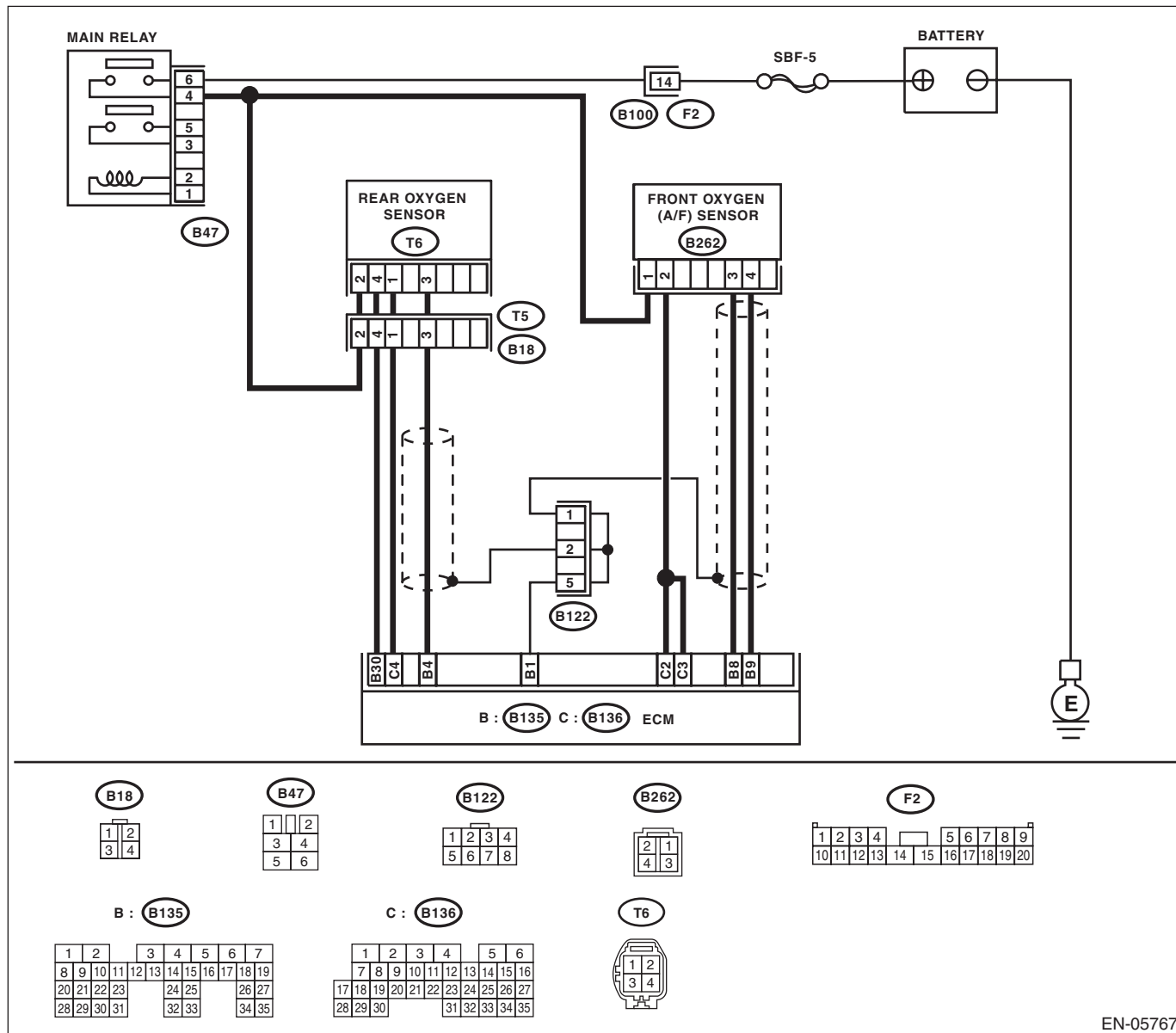
DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-247, DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-05767

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?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-76, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.	Has water entered the connector?	Completely remove any water inside.	Go to step 3.
3 CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM and front oxygen (A/F) sensor. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. Connector & terminal (B135) No. 9 — (B262) No. 4: (B135) No. 8 — (B262) No. 3:	Is the resistance less than 1 Ω?	Go to step 4.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and front oxygen (A/F) sensor connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector
4 CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR. Measure the resistance between ECM and chassis ground. Connector & terminal (B135) No. 9 — Chassis ground: (B135) No. 8 — Chassis ground:	Is the resistance 1 MΩ or more?	Go to step 5.	Repair the ground short circuit of harness between ECM and front oxygen (A/F) sensor connector.
5 CHECK OUTPUT SIGNAL FOR ECM. 1) Connect the ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between front oxygen (A/F) sensor connector and chassis ground. Connector & terminal (B262) No. 4 (+) — Chassis ground (-):	Is the voltage 4.5 V or more?	Go to step 7.	Go to step 6.
6 CHECK OUTPUT SIGNAL FOR ECM. Measure the voltage between front oxygen (A/F) sensor connector and chassis ground. Connector & terminal (B262) No. 3 (+) — Chassis ground (-):	Is the voltage 4.95 V or more?	Go to step 7.	Go to step 8.
7 CHECK OUTPUT SIGNAL FOR ECM. Measure the voltage between front oxygen (A/F) sensor connector and chassis ground. Connector & terminal (B262) No. 4 (+) — Chassis ground (-): (B262) No. 3 (+) — Chassis ground (-):	Is the voltage 8 V or more?	Repair the short circuit to power in the harness between the ECM and front oxygen (A/F) sensor connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-46, Engine Control Module (ECM).>	Repair poor contact in ECM connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
8	CHECK EXHAUST SYSTEM.	Are there holes or loose bolts on exhaust system?	Repair the exhaust system.	Go to step 9.
9	CHECK AIR INTAKE SYSTEM.	Are there holes, loose bolts or disconnection of hose on air intake system?	Repair the air intake system.	Go to step 10.
10	CHECK FUEL PRESSURE. WARNING: Place “NO OPEN FLAMES” signs near the working area. CAUTION: Be careful not to spill fuel. 1) Connect the front oxygen (A/F) sensor connector. 2) Measure the fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold. <Ref. to ME(H4DOTC)-26, INSPECTION, Fuel Pressure.> CAUTION: Release fuel pressure before removing the fuel pressure gauge. NOTE: If fuel pressure does not increase, squeeze the fuel return hose 2 to 3 times, then measure fuel pressure again.	Is the measured value 284 — 314 kPa (2.9 — 3.2 kgf/cm ² , 41 — 46 psi)?	Go to step 11.	Repair the following item. Fuel pressure is too high: • Clogged fuel return line or bent hose Fuel pressure is too low: • Improper fuel pump discharge • Clogged fuel supply line
11	CHECK FUEL PRESSURE. After connecting the pressure regulator vacuum hose, measure fuel pressure. <Ref. to ME(H4DOTC)-26, INSPECTION, Fuel Pressure.> CAUTION: Release fuel pressure before removing the fuel pressure gauge. NOTE: • If fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again. • If the measured value at this step is out of specification, check or replace pressure regulator and pressure regulator vacuum hose.	Is the measured value 230 — 260 kPa (2.35 — 2.65 kgf/cm ² , 33 — 38 psi)?	Go to step 12.	Repair the following item. Fuel pressure is too high: • Faulty pressure regulator • Clogged fuel return line or bent hose Fuel pressure is too low: • Faulty pressure regulator • Improper fuel pump discharge • Clogged fuel supply line
12	CHECK ENGINE COOLANT TEMPERATURE SENSOR. 1) Start the engine and warm-up completely. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H4DOTC)(diag)-35, 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) or higher?	Go to step 13.	Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC)-26, Engine Coolant Temperature Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
13 CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR. 1) Start the engine and warm-up engine until coolant temperature is higher than 75°C (167°F). 2) For AT models, set the select lever to the "P" or "N" range, and for MT models, place the shift lever in the neutral position. 3) Turn the A/C switch to OFF. 4) Turn all the accessory switches to OFF. 5) Read the data of 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 "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the measured value 2.0 — 5.0 g/s (0.26 — 0.66 lb/m)?	Go to step 14.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-31, Mass Air Flow and Intake Air Temperature Sensor.>
14 CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR. 1) Start the engine and warm-up engine until coolant temperature is higher than 75°C (167°F). 2) For AT models, set the select lever to the "P" or "N" range, and for MT models, place the shift lever in the neutral position. 3) Turn the A/C switch to OFF. 4) Turn all the accessory switches to OFF. 5) Open the front hood. 6) Measure the ambient temperature. 7) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".	Subtract the ambient temperature from intake air temperature. Is the obtained value -10 — 50°C (-18 — 90°F)?	Go to step 15.	Check the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-31, Mass Air Flow and Intake Air Temperature Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
15 CHECK REAR OXYGEN SENSOR DATA. 1) Warm-up the engine until engine coolant temperature is higher than 75°C (167°F), and keep the engine speed at 3,000 rpm. (Max. 2 minutes) 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: - Depress the clutch pedal. (MT model) - Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> - General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the voltage 490 mV or more?	Go to step 16.	Go to step 17.
16 CHECK REAR OXYGEN SENSOR DATA. 1) Warm-up the engine until engine coolant temperature is higher than 75°C (167°F), and rapidly reduce the engine speed from 3,000 rpm. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: - Depress the clutch pedal. (MT model) - Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> - General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the voltage 250 mV or less?	Go to step 18.	Go to step 17.
17 CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.	Has water entered the connector?	Completely remove any water inside.	Go to step 19.
18 CHECK FRONT OXYGEN (A/F) SENSOR AND REAR OXYGEN SENSOR DATA. 1) Warm-up the engine until engine coolant temperature is higher than 75°C (167°F), then keep the engine idling for 5 minutes or more. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: - Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> - General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Does voltage keep to be 0.8 V or more for more than five minutes?	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-42, Front Oxygen (A/F) Sensor.>	Go to step 19.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
19 CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. Connector & terminal (B135) No. 4 — (T6) No. 3: (B135) No. 30 — (T6) No. 4:	Is the resistance less than 1 Ω ?	Go to step 20.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between the ECM and rear oxygen sensor connector • Poor contact of coupling connector
20 CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR. 1) Connect the ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between rear oxygen sensor connector and chassis ground. Connector & terminal (T6) No. 3 (+) — Chassis ground (-):	Is the voltage 0.2 — 0.5 V?	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-44, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between the ECM and rear oxygen sensor • Poor contact in ECM connector • Poor contact of coupling connector

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

DW:DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE /PERFORMANCE

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-249, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

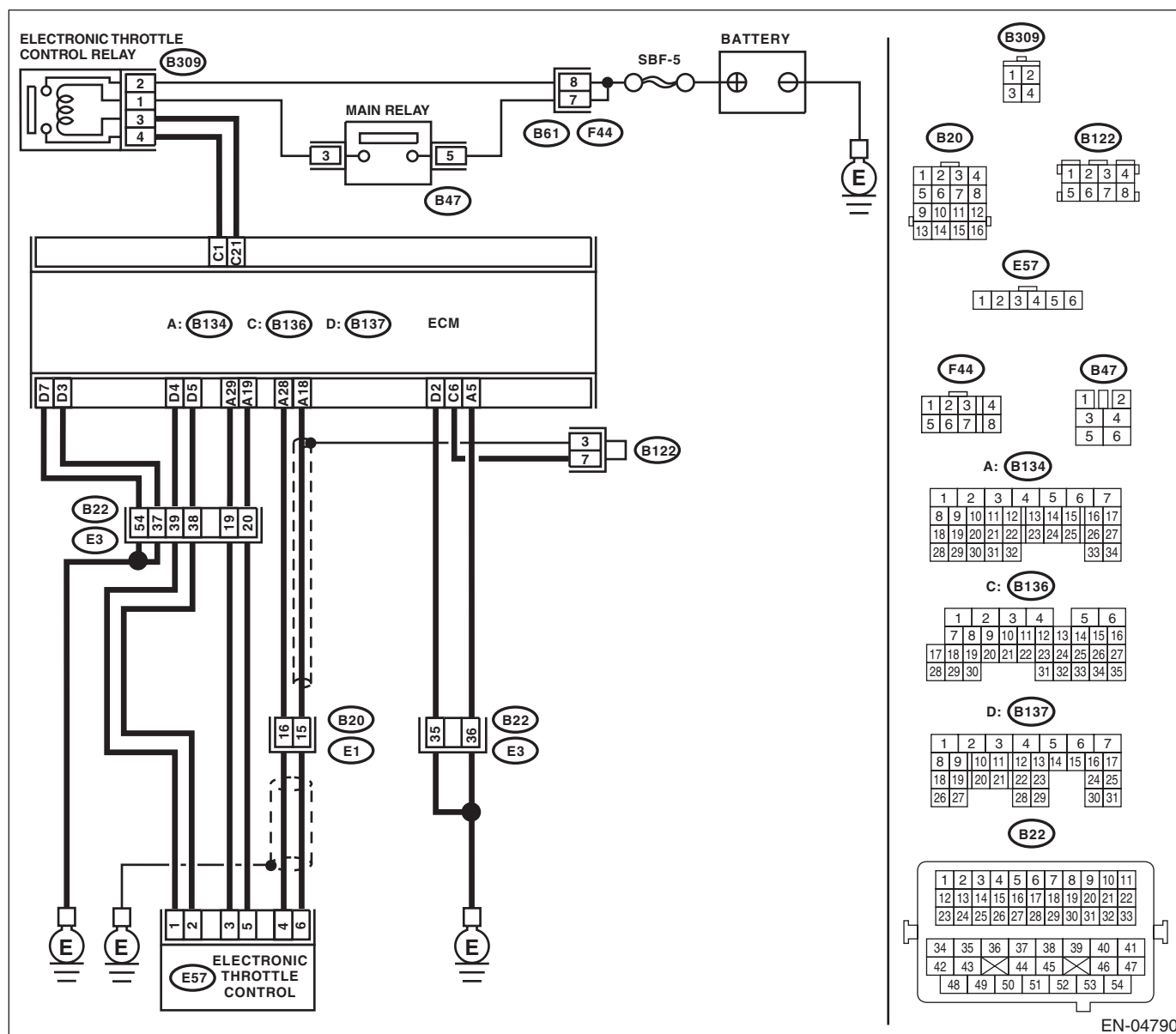
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance
- Engine stalls.

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04790

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ELECTRONIC THROTTLE CONTROL RELAY. 1) Turn the ignition switch to OFF. 2) Remove the electronic throttle control relay. 3) Connect the battery to terminals No. 1 and No. 3 of electronic throttle control relay. 4) Measure the resistance between electronic throttle control relay terminals. 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 OF ELECTRONIC THROTTLE CONTROL RELAY. Measure the voltage between electronic throttle control relay connector and chassis ground. Connector & terminal (B309) No. 2 (+) — Chassis ground (–):	Is the voltage 10 V or more?	Go to step 3.	Repair the open or ground short circuit of power supply circuit.
3 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY. 1) Disconnect the connectors from ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control relay connector and chassis ground. Connector & terminal (B309) No. 3 (+) — Chassis ground (–):	Is the voltage 10 V or more?	Repair the short circuit to power in the harness between ECM and electronic throttle control relay.	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 — Chassis ground: (B309) No. 4 — Chassis ground:	Is the resistance 1 M Ω or more?	Go to step 5.	Repair the ground short circuit of harness between ECM and electronic throttle control relay.
5 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY. Measure the resistance between the ECM and electronic throttle control relay connector. Connector & terminal (B136) No. 21 — (B309) No. 3: (B136) No. 1 — (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 HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from electronic throttle control. 3) Measure the resistance between ECM and chassis ground. Connector & terminal (B134) No. 19 — Chassis ground: (B134) No. 18 — Chassis ground: (B134) No. 18 — (B136) No. 6: (B134) No. 28 — Chassis ground:	Is the resistance 1 M Ω or more?	Go to step 7.	Repair the ground short circuit of harness between ECM and electronic throttle control connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
7 CHECK SHORT CIRCUIT INSIDE THE ECM. 1) Connect the ECM. 2) Measure the resistance between electronic throttle control connector and engine ground. Connector & terminal (E57) No. 6 — Engine ground: (E57) No. 4 — Engine ground:	Is the resistance 1 M Ω or more?	Go to step 8.	Repair the ground short circuit of harness between ECM and electronic throttle control connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-46, Engine Control Module (ECM).>
8 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Disconnect the connectors from ECM. 2) Measure the resistance of harness between ECM and electronic throttle control connector. Connector & terminal (B134) No. 18 — (E57) No. 6: (B134) No. 28 — (E57) No. 4: (B134) No. 29 — (E57) No. 3:	Is the resistance less than 1 Ω ?	Go to step 9.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and electronic throttle control connector • Poor contact of coupling connector
9 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Connect the ECM. 2) Measure the resistance between electronic throttle control connector and engine ground. Connector & terminal (E57) No. 3 — Engine ground:	Is the resistance less than 5 Ω ?	Go to step 10.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and engine ground • Poor contact in ECM connector • Poor contact of coupling connector
10 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. 6 (+) — Engine ground (-): (E57) No. 4 (+) — Engine ground (-):	Is the voltage 4.85 V or more?	Repair the short circuit to power in the harness between ECM and electronic throttle control connector.	Go to step 11.
11 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance between ECM connectors. Connector & terminal (B134) No. 19 — (B134) No. 18: (B134) No. 19 — (B134) No. 28:	Is the resistance 1 M Ω or more?	Go to step 12.	Repair the short circuit to power in the harness between ECM and electronic throttle control connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
12 CHECK SENSOR OUTPUT. 1) Connect all connectors. 2) Turn the ignition switch to ON. 3) Read the data of main throttle sensor signal using Subaru Select Monitor. NOTE: For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.>	Is the voltage 0.81 — 0.87 V?	Go to step 13.	Repair the poor contact of electronic throttle control connector. Replace the electronic throttle control if defective. <Ref. to FU(H4DOTC)-13, Throttle Body.>
13 CHECK SENSOR OUTPUT. Read the data of sub throttle sensor signal using Subaru Select Monitor. NOTE: Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.>	Is the voltage 1.64 — 1.70 V?	Go to step 14.	Repair the poor contact of electronic throttle control connector. Replace the electronic throttle control if defective. <Ref. to FU(H4DOTC)-13, Throttle Body.>
14 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL MOTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and electronic throttle control. 3) Measure the resistance between ECM and electronic throttle control connector. Connector & terminal (B137) No. 5 — (E57) No. 2: (B137) No. 4 — (E57) No. 1:	Is the resistance less than 1 Ω?	Go to step 15.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and electronic throttle control • Poor contact of coupling connector
15 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL MOTOR. 1) Connect the ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control connector and engine ground. Connector & terminal (E57) No. 2 (+) — Engine ground (-): (E57) No. 1 (+) — Engine ground (-):	Is the voltage 5 V or more?	Repair the short circuit to power in the harness between the ECM and electronic throttle control.	Go to step 16.
16 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL MOTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance between electronic throttle control connector and engine ground. Connector & terminal (E57) No. 2 — Engine ground: (E57) No. 1 — Engine ground:	Is the resistance 1 MΩ or more?	Go to step 17.	Repair the ground short circuit of harness between the ECM and electronic throttle control.
17 CHECK ELECTRONIC THROTTLE CONTROL MOTOR HARNESS. Measure the resistance between the electronic throttle control connector terminals. Connector & terminal (E57) No. 2 — (E57) No. 1:	Is the resistance 1 MΩ or more?	Go to step 18.	Repair the short circuit in the harness between the ECM and electronic throttle control.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
18 CHECK ELECTRONIC THROTTLE CONTROL GROUND CIRCUIT. Measure the resistance between ECM and chassis ground. Connector & terminal <i>(B134) No. 5 — Chassis ground:</i> <i>(B137) No. 2 — Chassis ground:</i> <i>(B137) No. 3 — Chassis ground:</i> <i>(B137) No. 7 — Chassis ground:</i>	Is the resistance less than 5 Ω ?	Go to step 19.	Repair the open circuit of the harness between the ECM and engine ground.
19 CHECK ELECTRONIC THROTTLE CONTROL. Measure the resistance between electronic throttle control terminals. Terminals <i>No. 2 — No. 1:</i>	Is the resistance 50 Ω or less?	Go to step 20.	Replace the electronic throttle control. <Ref. to FU(H4DOTC)-13, Throttle Body.>
20 CHECK ELECTRONIC THROTTLE CONTROL. Move the throttle valve to the fully open and fully closed positions with fingers. Check that the valve returns to the specified position when releasing fingers.	Does the valve return to the specified position? Specified value: 3 mm (0.12 in) from fully closed position	Repair the poor contact of the ECM connector.	Replace the electronic throttle control. <Ref. to FU(H4DOTC)-13, Throttle Body.>

DX:DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-251, DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

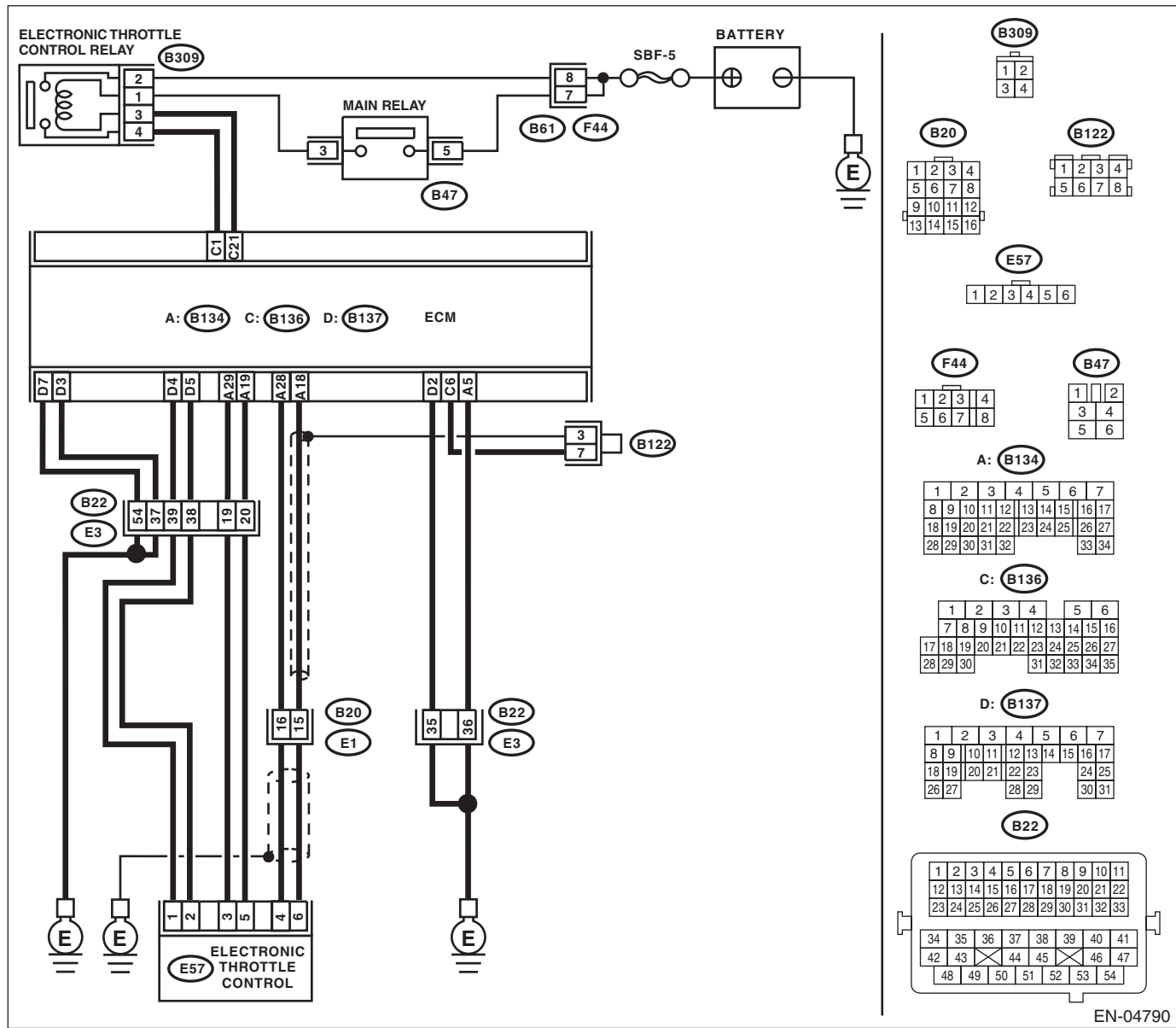
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance
- Engine stalls.

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ELECTRONIC THROTTLE CONTROL RELAY. 1) Turn the ignition switch to OFF. 2) Remove the electronic throttle control relay. 3) Connect the battery to terminals No. 1 and No. 3 of electronic throttle control relay. 4) Measure the resistance between electronic throttle control 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 OF ELECTRONIC THROTTLE CONTROL RELAY. Measure the voltage between electronic throttle control relay connector and chassis ground. Connector & terminal (B309) No. 2 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Go to step 3.	Repair the open or ground short circuit of power supply circuit.
3 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY. 1) Disconnect the connectors from ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control relay connector and chassis ground. Connector & terminal (B309) No. 3 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Repair the short circuit to power in the harness between ECM and electronic throttle control relay.	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 — Chassis ground: (B309) No. 4 — Chassis ground:	Is the resistance 1 M Ω or more?	Go to step 5.	Repair the ground short circuit of harness between ECM and electronic throttle control relay.
5 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY. Measure the resistance between the ECM and electronic throttle control relay connector. Connector & terminal (B136) No. 21 — (B309) No. 3: (B136) No. 1 — (B309) No. 4:	Is the resistance less than 1 Ω ?	Repair poor contact in ECM connector.	Repair the open circuit of harness between ECM and electronic throttle control relay.

DY:DTC P2103 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH

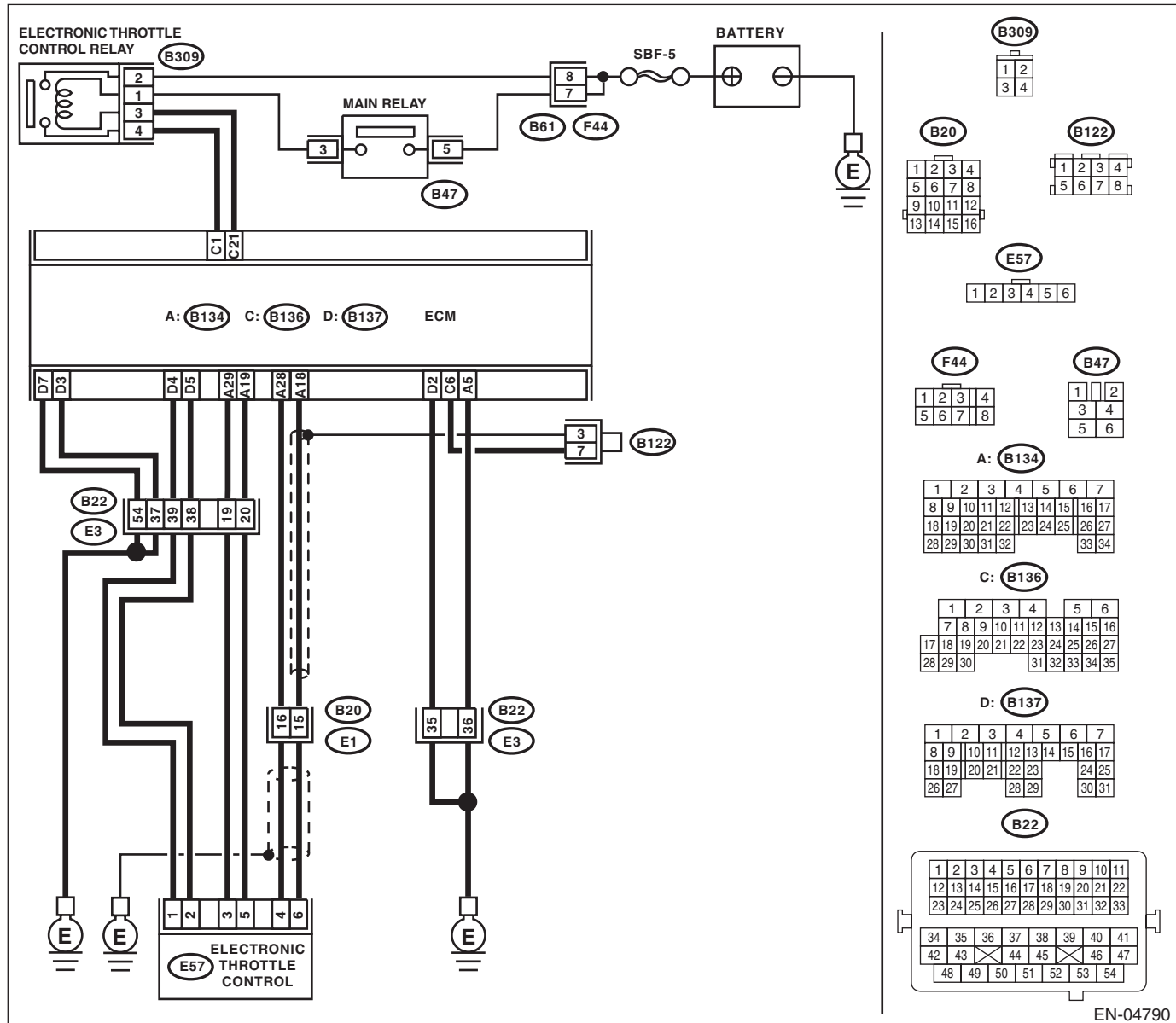
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-253, DTC P2103 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK ELECTRONIC THROTTLE CONTROL RELAY. 1) Turn the ignition switch to OFF. 2) Remove the electronic throttle control relay. 3) Measure the resistance between electronic throttle control relay terminals. Terminals No. 2 — No. 4:	Is the resistance 1 M Ω or more?	Go to step 2.	Replace the electronic throttle control relay.
2	CHECK SHORT CIRCUIT OF ELECTRONIC THROTTLE CONTROL RELAY POWER SUPPLY. 1) Turn the ignition switch to ON. 2) Measure the voltage between electronic throttle control relay connector and chassis ground. Connector & terminal (B309) No. 4 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Repair the short circuit to power in the harness between ECM and electronic throttle control relay.	Go to step 3.
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 and chassis ground. Connector & terminal (B136) No. 21 — Chassis ground:	Is the resistance 1 M Ω or more?	Repair the poor contact of the ECM connector.	Repair the ground short circuit of harness between ECM and electronic throttle control relay.

DZ:DTC P2109 THROTTLE/PEDAL POSITION SENSOR “A” MINIMUM STOP PERFORMANCE

NOTE:

For the diagnostic procedure, refer to DTC P2101. <Ref. to EN(H4DOTC)(diag)-332, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

EA:DTC P2122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-257, DTC P2122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

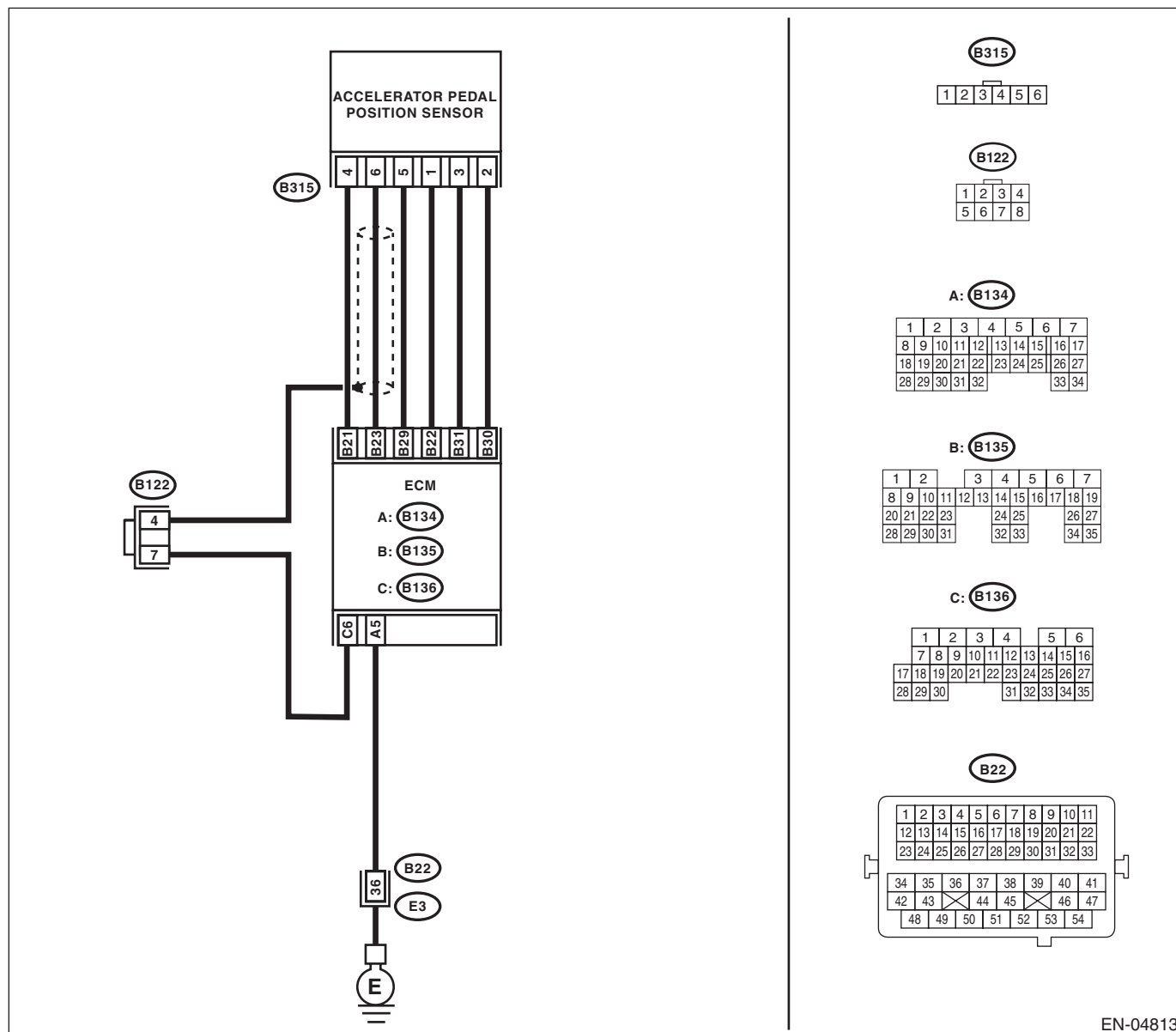
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04813

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the ECM and accelerator pedal position sensor. 3) Measure the resistance between ECM and chassis ground. Connector & terminal (B135) No. 21 — Chassis ground: (B135) No. 23 — Chassis ground: (B135) No. 23 — (B136) No. 6:	Is the resistance 1 MΩ or more?	Go to step 2.	Repair the ground short of the harness between the ECM and accelerator pedal position sensor connector.
2 CHECK SHORT CIRCUIT INSIDE THE ECM. 1) Connect the ECM. 2) Measure the resistance between accelerator pedal position sensor connector and chassis ground. Connector & terminal (B315) No. 6 — Chassis ground:	Is the resistance 1 MΩ or more?	Replace the accelerator pedal. <Ref. to SP(H4SO)-3, Accelerator Pedal.>	Repair the ground short of the harness between the ECM and accelerator pedal position sensor connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-46, Engine Control Module (ECM).>

EB:DTC P2123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT HIGH INPUT**DTC DETECTING CONDITION:**

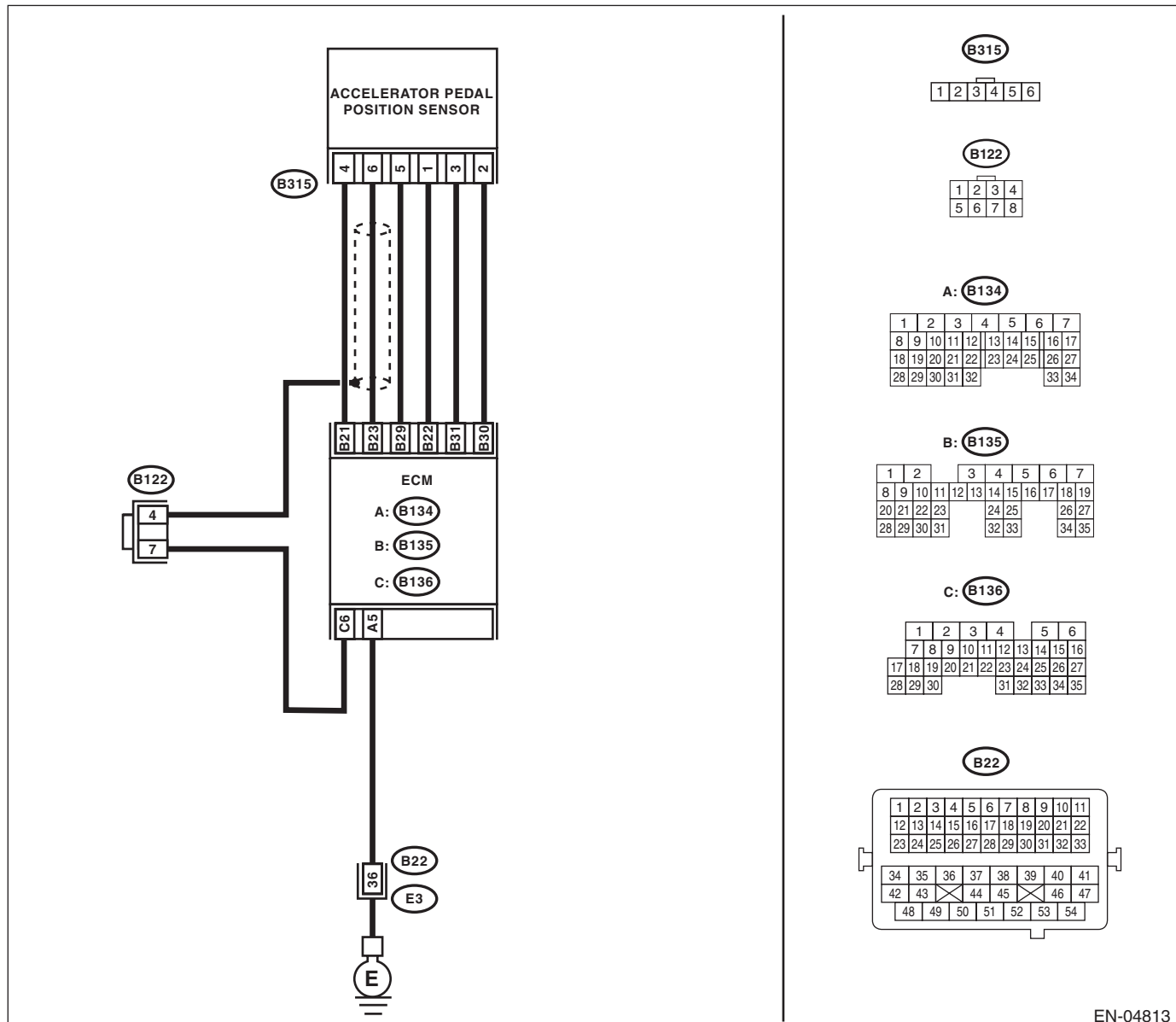
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-259, DTC P2123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:

EN-04813

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the ECM and accelerator pedal position sensor. 3) Measure the resistance of harness between ECM and accelerator pedal position sensor connector. Connector & terminal (B135) No. 23 — (B315) No. 6: (B135) No. 29 — (B315) No. 5:	Is the resistance less than 1 Ω ?	Go to step 2.	Repair the open circuit of the harness between the ECM and accelerator pedal position sensor connector.
2 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR. 1) Connect the ECM. 2) Measure the resistance between accelerator pedal position sensor connector and chassis ground. Connector & terminal (B315) No. 5 — Chassis ground:	Is the resistance less than 5 Ω ?	Go to step 3.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and engine ground • Poor contact in ECM connector • Poor contact of coupling connector
3 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR. 1) Turn the ignition switch to ON. 2) Measure the voltage between accelerator pedal position sensor connector and chassis ground. Connector & terminal (B315) No. 6 (+) — Chassis ground (-):	Is the voltage 4.85 V or more?	Repair the short circuit to power source in the harness between the ECM and accelerator pedal position sensor connector.	Go to step 4.
4 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance between ECM connectors. Connector & terminal (B135) No. 21 — (B135) No. 23:	Is the resistance 1 M Ω or more?	Repair the poor contact of accelerator pedal position sensor connector. Replace the accelerator pedal if defective. <Ref. to SP(H4SO)-3, Accelerator Pedal.>	Repair the short circuit to power source in the harness between the ECM and accelerator pedal position sensor connector.

EC:DTC P2127 THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT LOW INPUT**DTC DETECTING CONDITION:**

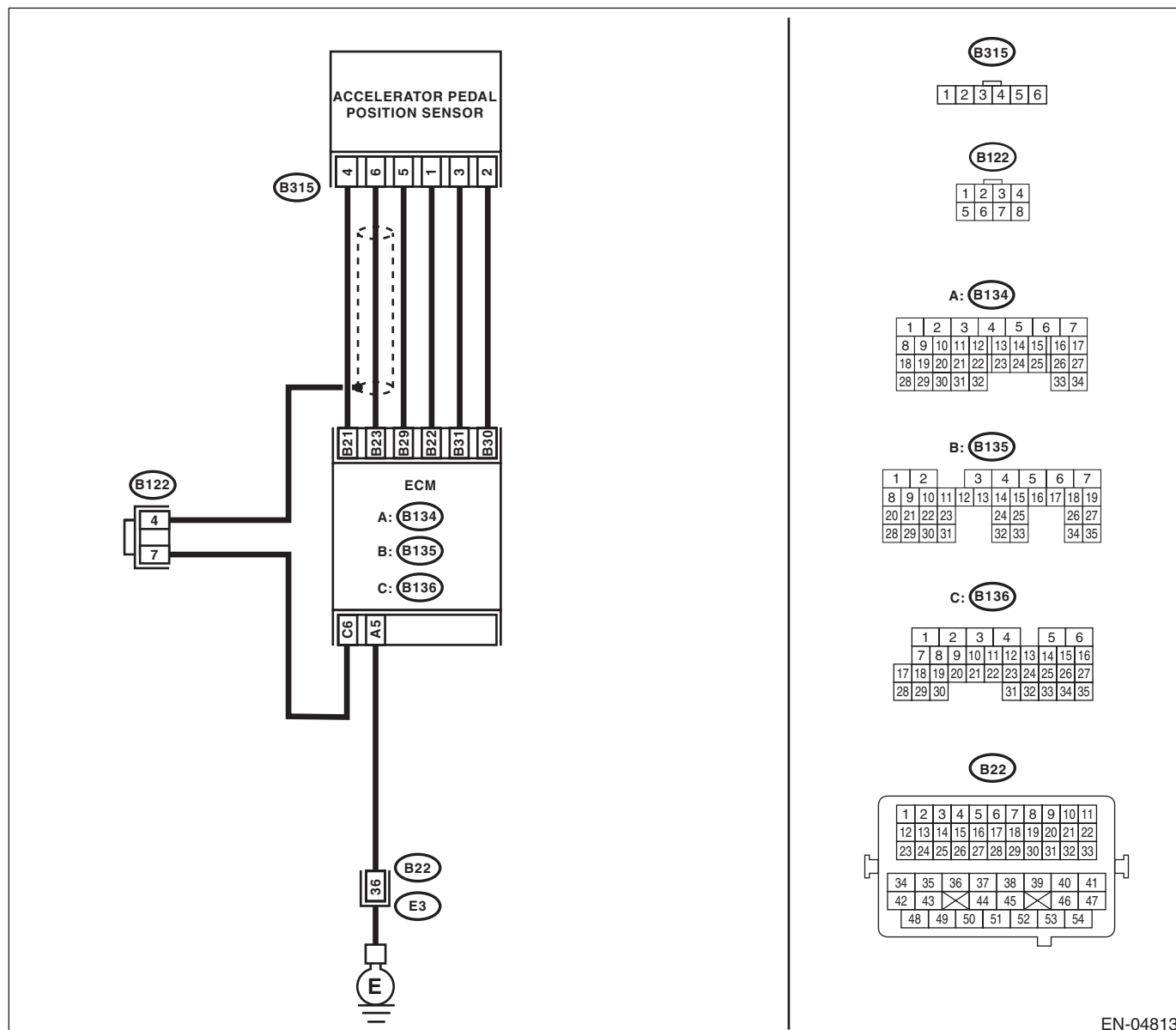
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-261, DTC P2127 THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:

EN-04813

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the ECM and accelerator pedal position sensor. 3) Measure the resistance between ECM and chassis ground. Connector & terminal (B135) No. 22 — Chassis ground: (B135) No. 31 — Chassis ground:	Is the resistance 1 MΩ or more?	Go to step 2.	Repair the ground short of the harness between the ECM and accelerator pedal position sensor connector.
2 CHECK SHORT CIRCUIT INSIDE THE ECM. 1) Connect the ECM. 2) Measure the resistance between accelerator pedal position sensor connector and chassis ground. Connector & terminal (B315) No. 3 — Chassis ground:	Is the resistance 1 MΩ or more?	Replace the accelerator pedal. <Ref. to SP(H4SO)-3, Accelerator Pedal.>	Repair the ground short of the harness between the ECM and accelerator pedal position sensor connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-46, Engine Control Module (ECM).>

ED:DTC P2128 THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-263, DTC P2128 THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

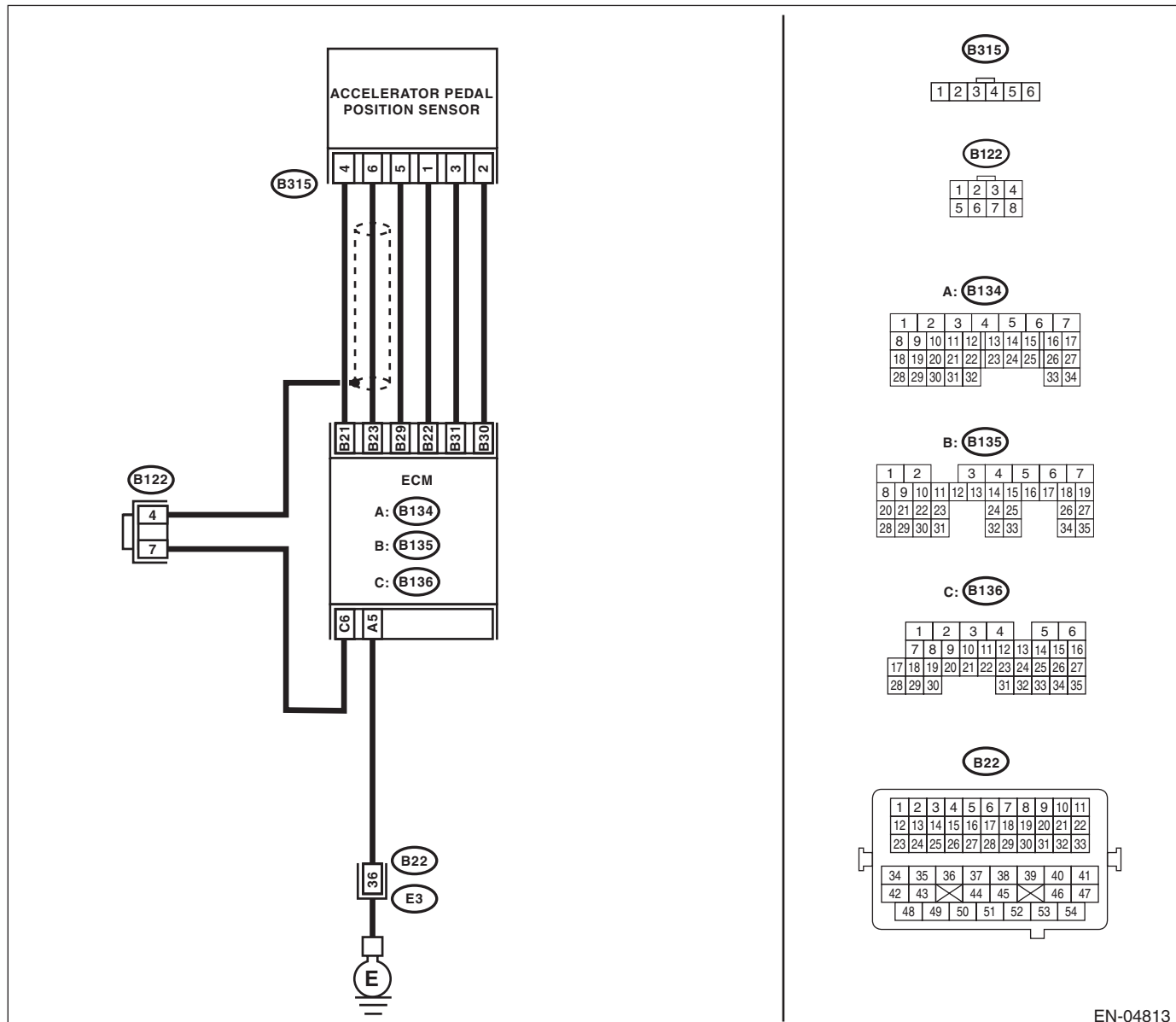
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04813

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the ECM and accelerator pedal position sensor. 3) Measure the resistance of harness between ECM and accelerator pedal position sensor connector. Connector & terminal (B135) No. 31 — (B315) No. 3: (B135) No. 30 — (B315) No. 2:	Is the resistance less than 1 Ω ?	Go to step 2.	Repair the open circuit of the harness between the ECM and accelerator pedal position sensor connector.
2 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR. 1) Connect the ECM. 2) Measure the resistance between accelerator pedal position sensor connector and chassis ground. Connector & terminal (B315) No. 2 — Chassis ground:	Is the resistance less than 1 Ω ?	Go to step 3.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and engine ground • Poor contact in ECM connector • Poor contact of coupling connector
3 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR. 1) Turn the ignition switch to ON. 2) Measure the voltage between accelerator pedal position sensor connector and chassis ground. Connector & terminal (B315) No. 3 (+) — Chassis ground (-):	Is the voltage 4.85 V or more?	Repair the short circuit to power source in the harness between the ECM and accelerator pedal position sensor connector.	Go to step 4.
4 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance between ECM connectors. Connector & terminal (B135) No. 22 — (B135) No. 31:	Is the resistance 1 M Ω or more?	Repair the poor contact of accelerator pedal position sensor connector. Replace the accelerator pedal if defective. <Ref. to SP(H4SO)-3, Accelerator Pedal.>	Repair the short circuit to power source in the harness between the ECM and accelerator pedal position sensor connector.

EE:DTC P2135 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A"/"B" VOLTAGE CORRELATION

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-265, DTC P2135 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A"/"B" VOLTAGE CORRELATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

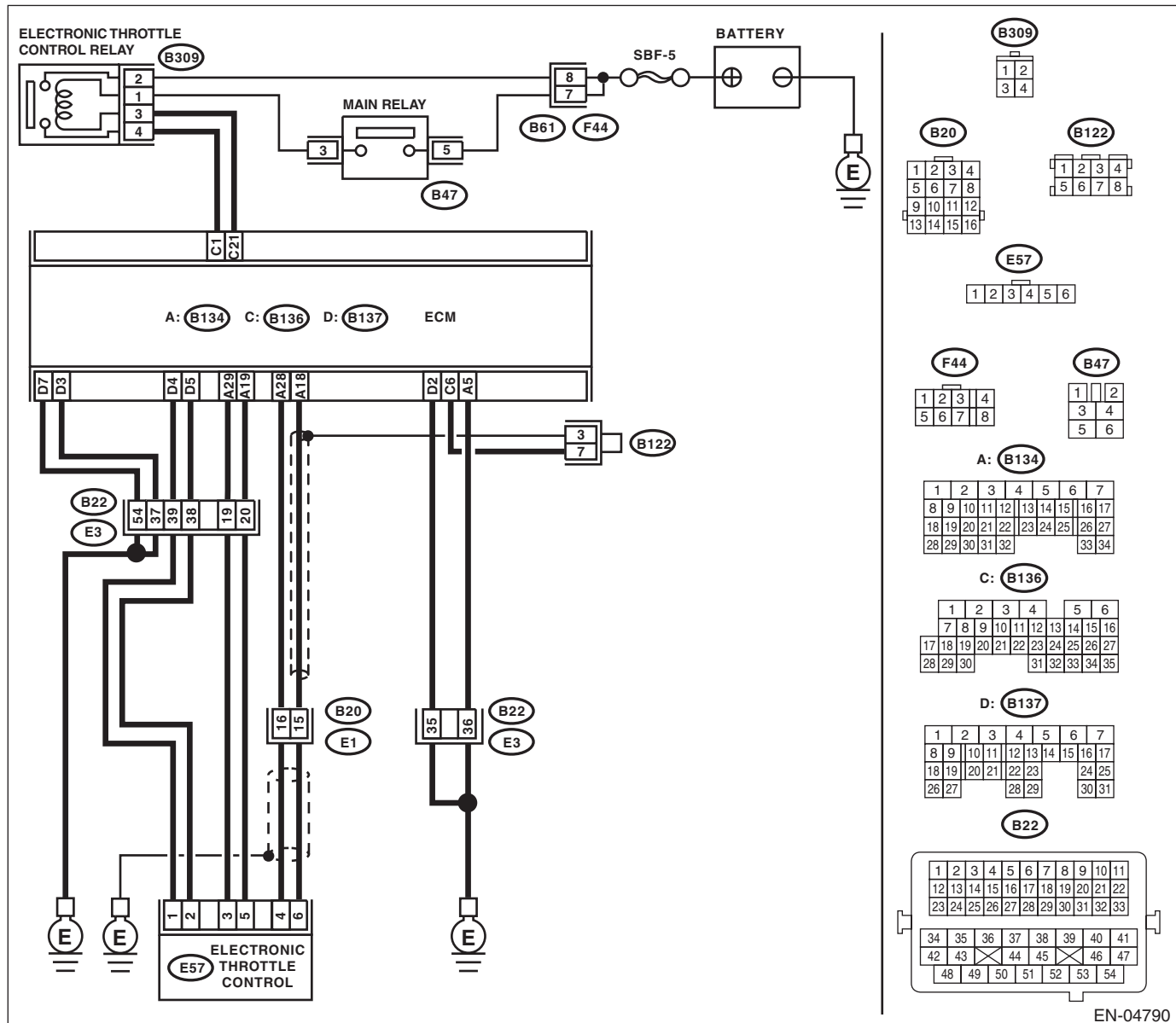
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04790

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and electronic throttle control. 3) Measure the resistance between ECM and chassis ground. Connector & terminal (B134) No. 19 — Chassis ground: (B134) No. 18 — Chassis ground: (B134) No. 18 — (B136) No. 6: (B134) No. 28 — Chassis ground:	Is the resistance 1 MΩ or more?	Go to step 2.	Repair the ground short circuit of harness between ECM and electronic throttle control connector.
2 CHECK SHORT CIRCUIT INSIDE THE ECM. 1) Connect the ECM. 2) Measure the resistance between electronic throttle control connector and engine ground. Connector & terminal (E57) No. 6 — Engine ground: (E57) No. 4 — Engine ground:	Is the resistance 1 MΩ or more?	Go to step 3.	Repair the ground short circuit of harness between ECM and electronic throttle control connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-46, Engine Control Module (ECM).>
3 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Disconnect the connectors from ECM. 2) Measure the resistance of harness between ECM and electronic throttle control connector. Connector & terminal (B134) No. 18 — (E57) No. 6: (B134) No. 28 — (E57) No. 4: (B134) No. 29 — (E57) No. 3:	Is the resistance less than 1 Ω?	Go to step 4.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and electronic throttle control connector • Poor contact of coupling connector
4 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Connect the ECM. 2) Measure the resistance between electronic throttle control connector and engine ground. Connector & terminal (E57) No. 3 — Engine ground:	Is the resistance less than 5 Ω?	Go to step 5.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and engine ground • Poor contact in ECM connector • Poor contact of coupling connector
5 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. 6 (+) — Engine ground (-): (E57) No. 4 (+) — Engine ground (-):	Is the voltage 4.85 V or more?	Repair the short circuit to power in the harness between ECM and electronic throttle control connector.	Go to step 6.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
6 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance between ECM connectors. Connector & terminal (B134) No. 19 — (B134) No. 18: (B134) No. 19 — (B134) No. 28:	Is the resistance 1 M Ω or more?	Repair the poor contact of electronic throttle control connector. Replace the electronic throttle control if defective. <Ref. to FU(H4DOTC)-13, Throttle Body.>	Repair the short circuit to power in the harness between ECM and electronic throttle control connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

EF:DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D”/“E” VOLTAGE CORRELATION

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-267, DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D”/“E” VOLTAGE CORRELATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

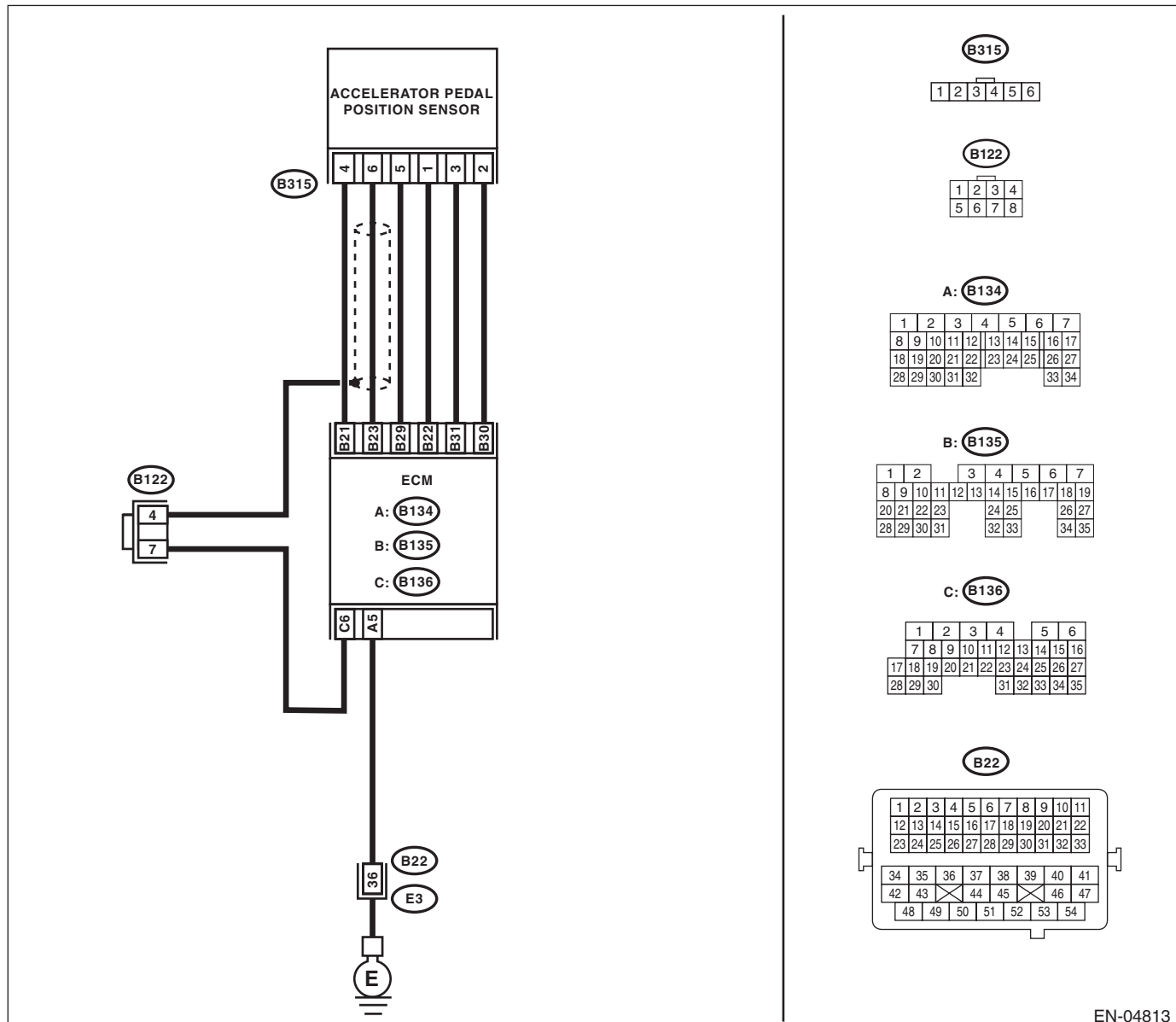
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04813

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ACCELERATOR PEDAL POSITION SENSOR OUTPUT. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. Connector & terminal Main accelerator pedal position sensor signal (B135) No. 23 (+) — Chassis ground (-): Sub accelerator pedal position sensor signal (B135) No. 31 (+) — Chassis ground (-):	Is the difference in measured values for the main accelerator pedal position sensor signal and the sub accelerator pedal position sensor signal 0 V?	Go to step 3.	Go to step 2.
2 CHECK ACCELERATOR PEDAL POSITION SENSOR OUTPUT. Measure the voltage between accelerator pedal position sensor connector and chassis ground. Connector & terminal (B315) No. 6 (+) — Chassis ground (-): (B315) No. 3 (+) — Chassis ground (-):	Is the difference in measured values for the main accelerator pedal position sensor signal and the sub accelerator pedal position sensor signal 0 V?	Replace the accelerator pedal. <Ref. to SP(H4SO)-3, Accelerator Pedal.>	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between the ECM and accelerator pedal position sensor connector. • Ground short circuit of harness between the ECM and accelerator pedal position sensor connectors. • Poor contact of coupling connector
3 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR CONNECTOR. Check the resistance of harness between the accelerator pedal position sensor connector and chassis ground. Connector & terminal (B315) No. 5 — Chassis ground: (B315) No. 2 — Chassis ground:	Is the resistance less than 5 Ω ?	Repair the poor contact of the ECM connector.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between the ECM and accelerator pedal position sensor connector. • Open circuit of harness between ECM and engine ground • Poor contact in ECM connector • Poor contact of coupling connector

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

EG:DTC P2419 EVAPORATIVE EMISSION SYSTEM SWITCHING VALVE CONTROL CIRCUIT LOW

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-269, DTC P2419 EVAPORATIVE EMISSION SYSTEM SWITCHING VALVE CONTROL CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

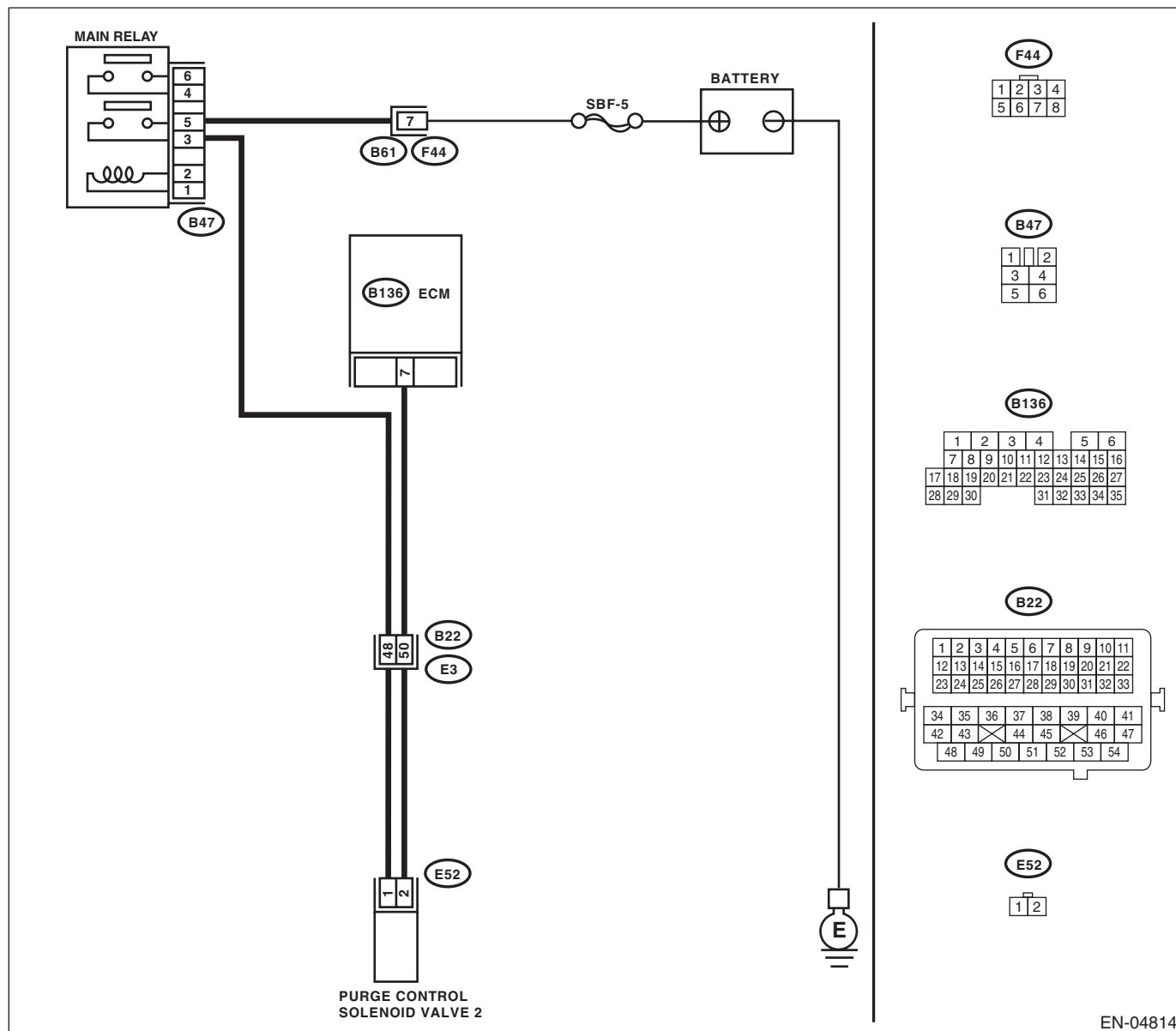
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04814

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OUTPUT SIGNAL OF ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. Connector & terminal (B136) No. 7 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Repair the poor contact of the ECM connector.	Go to step 2.
2 CHECK HARNESS BETWEEN ECM AND PURGE CONTROL SOLENOID VALVE 2. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and purge control solenoid valve 2. 3) Measure the resistance between the purge control solenoid valve 2 connector and engine ground. Connector & terminal (E52) No. 2 — Engine ground:	Is the resistance 1 MΩ or more?	Go to step 3.	Repair the ground short circuit of harness between ECM and purge control solenoid valve 2 connector.
3 CHECK HARNESS BETWEEN ECM AND PURGE CONTROL SOLENOID VALVE 2. Measure the resistance of harness between ECM and purge control solenoid valve 2. Connector & terminal (B136) No. 7 — (E52) No. 2:	Is the resistance less than 1 Ω?	Go to step 4.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and purge control solenoid valve 2 connector • Poor contact in coupling connector
4 CHECK PURGE CONTROL SOLENOID VALVE 2. 1) Remove the purge control solenoid valve 2. 2) Measure the resistance between purge control solenoid valve 2 terminals. Terminals No. 1 — No. 2:	Is the resistance between 10 — 100 Ω?	Go to step 5.	Replace the purge control solenoid valve 2. <Ref. to EC(H4DOTC)-8, Purge Control Solenoid Valve.>
5 CHECK POWER SUPPLY TO PURGE CONTROL SOLENOID VALVE 2. 1) Turn the ignition switch to ON. 2) Measure the voltage between purge control solenoid valve 2 and engine ground. Connector & terminal (E52) No. 1 (+) — Engine ground (-):	Is the voltage 10 V or more?	Repair the poor contact in the purge control solenoid valve 2 connector.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between the main relay and purge control solenoid valve 2 • Poor contact of coupling connector • Poor contact of main relay connector

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

EH:DTC P2420 EVAPORATIVE EMISSION SYSTEM SWITCHING VALVE CONTROL CIRCUIT HIGH

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-270, DTC P2420 EVAPORATIVE EMISSION SYSTEM SWITCHING VALVE CONTROL CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

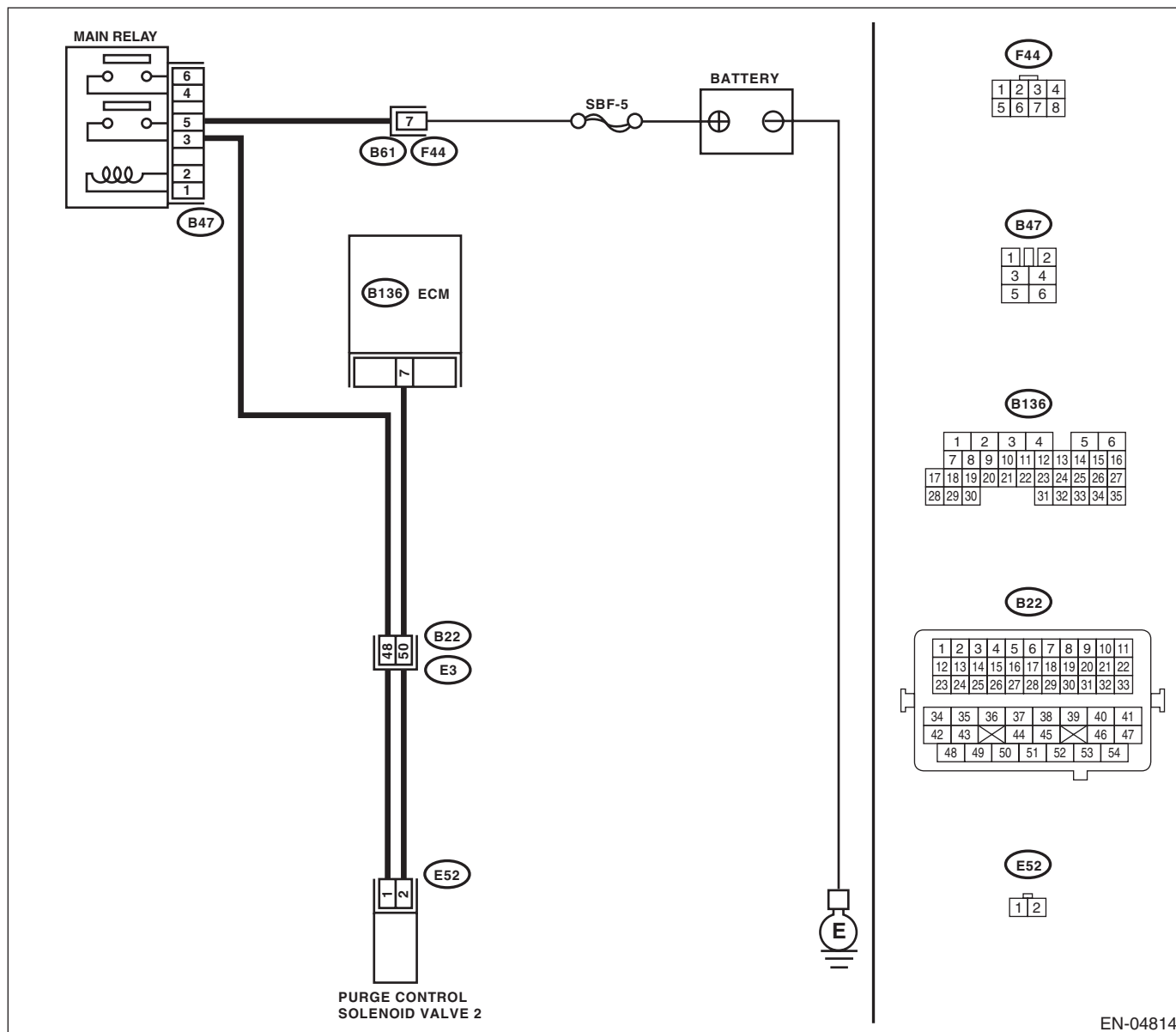
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN ECM AND PURGE CONTROL SOLENOID VALVE 2. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and purge control solenoid valve 2. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. Connector & terminal (B136) No. 7 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Repair the short to power in the harness between ECM and purge control solenoid valve 2 connector.	Go to step 2.
2 CHECK PURGE CONTROL SOLENOID VALVE 2. 1) Turn the ignition switch to OFF. 2) Measure the resistance between purge control solenoid valve 2 terminals. Terminals No. 1 — No. 2:	Is the resistance less than 1 Ω ?	Replace the purge control solenoid valve 2. <Ref. to EC(H4DOTC)-8, Purge Control Solenoid Valve.>	Repair the poor contact of the ECM connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

EI: DTC P2431 SECONDARY AIR INJECTION SYSTEM AIR FLOW /PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-271, DTC P2431 SECONDARY AIR INJECTION SYSTEM AIR FLOW /PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

ENGINE (DIAGNOSTICS)

MAIN RELAY

SECONDARY AIR COMBINATION VALVE RELAY 2

SECONDARY AIR COMBINATION VALVE RELAY 1

SECONDARY AIR COMBINATION VALVE LH (WITH PRESSURE SENSOR)

SECONDARY AIR COMBINATION VALVE RH

SECONDARY AIR PUMP RELAY

SECONDARY AIR PUMP

ECM

BATTERY

Fuses: F1, F2, F9, F11, F27, F44, F47, F48, F49, F50, F51, F52, F53, F54, F55, F56, F57, F58, F59, F60, F61, F62, F63, F64, F65, F66, F67, F68, F69, F70, F71, F72, F73, F74, F75, F76, F77, F78, F79, F80, F81, F82, F83, F84, F85, F86, F87, F88, F89, F90, F91, F92, F93, F94, F95, F96, F97, F98, F99, F100.

Relays: B100, B101, B102, B103, B104, B105, B106, B107, B108, B109, B110, B111, B112, B113, B114, B115, B116, B117, B118, B119, B120, B121, B122, B123, B124, B125, B126, B127, B128, B129, B130, B131, B132, B133, B134, B135, B136, B137, B138, B139, B140, B141, B142, B143, B144, B145, B146, B147, B148, B149, B150, B151, B152, B153, B154, B155, B156, B157, B158, B159, B160, B161, B162, B163, B164, B165, B166, B167, B168, B169, B170, B171, B172, B173, B174, B175, B176, B177, B178, B179, B180, B181, B182, B183, B184, B185, B186, B187, B188, B189, B190, B191, B192, B193, B194, B195, B196, B197, B198, B199, B200.

ECM Pin Numbers: A: B134, C: B136.

Legend:

F11	B47	E41	F44	F9	F2	B22
E40	1 2 3 4 5 6	1 2 3 4 5 6	1 2 3 4 5 6 7 8	1 2 12 13	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54
1 2	1 2 3 4 5 6	1 2 3 4 5 6	1 2 3 4 5 6 7 8	1 2 12 13	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54

A: B134

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

C: B136

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

F27

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
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B22

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
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EN-05766

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?	Check the appropriate DTC using the "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-76, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK CURRENT DATA. 1) Turn the ignition switch to ON (engine OFF). 2) Using the Subaru Select Monitor, read secondary air piping pressure, intake manifold absolute pressure and atmospheric pressure data, and compare with the actual atmospheric pressure. NOTE: For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.>	Is the actual difference with atmospheric pressure 200 mmHg (27 kPa, 8 inHg, 3.9 psig) or more?	Replace the secondary air combination valve LH. <Ref. to EC(H4DOTC)-10, Secondary Air Combination Valve.>	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. Reproduce the fault condition, and reperform the check. NOTE: In this case, there may be a temporary connector contact failure.

EJ:DTC P2432 SECONDARY AIR INJECTION SYSTEM AIR FLOW /PRESSURE SENSOR CIRCUIT LOW

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-272, DTC P2432 SECONDARY AIR INJECTION SYSTEM AIR FLOW /PRESSURE SENSOR CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

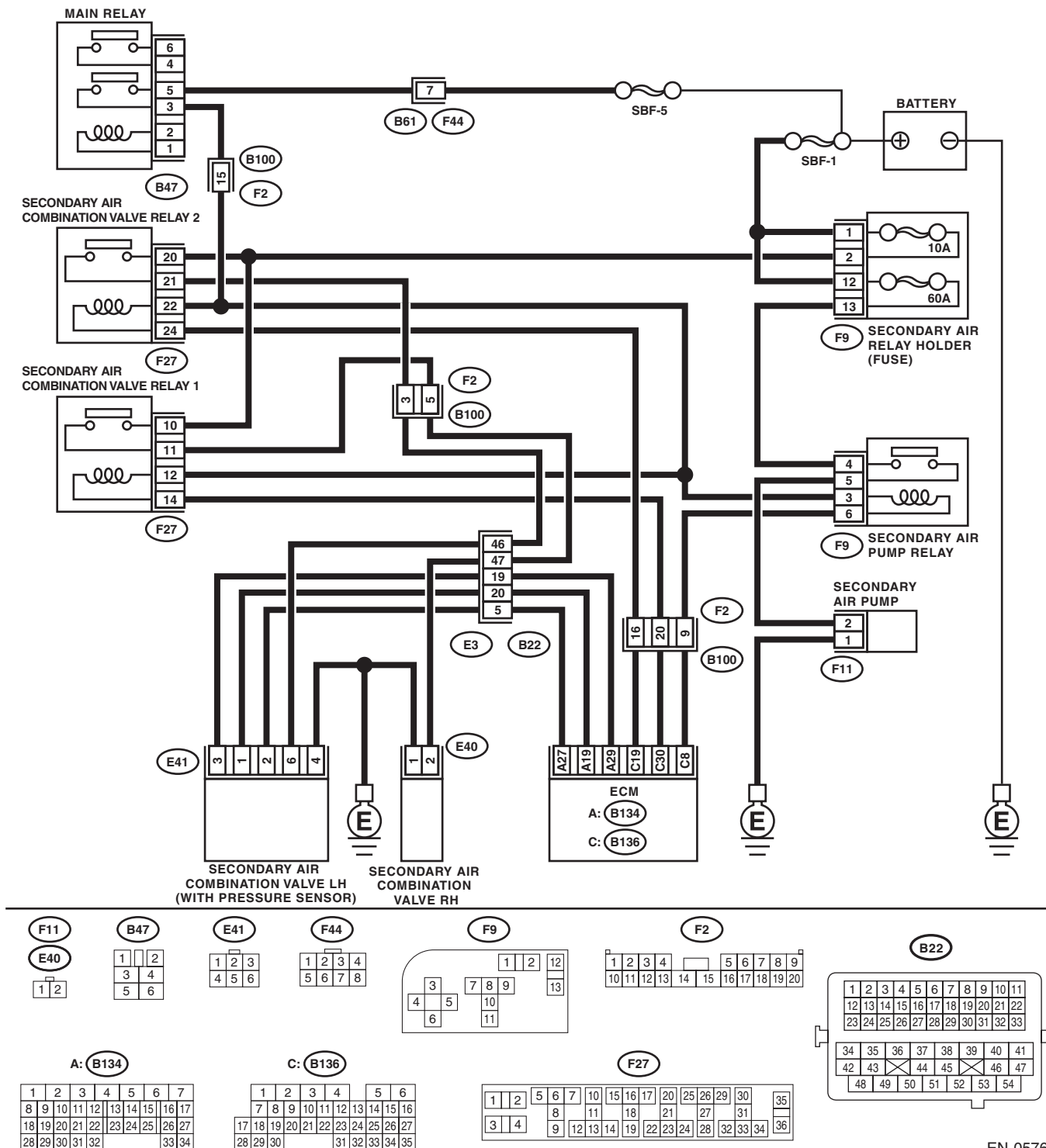
CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-05766

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK CURRENT DATA. 1) Turn the ignition switch to ON. 2) Read the data of secondary air pipe pressure signal using the Subaru Select Monitor or general scan tool. NOTE: - Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> - General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the measured value less than 53.3 kPa (400 mmHg, 15.8 inHg) ?	Go to step 2.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. Reproduce the fault condition, and reperform the check. NOTE: In this case, there may be a temporary connector contact failure.
2 CHECK SECONDARY AIR COMBINATION VALVE LH POWER SOURCE. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the secondary air combination valve LH. 3) Turn the ignition switch to ON. 4) Measure the voltage between the secondary air combination valve LH connector and chassis ground. Connector & terminal (E41) No. 6 (+) — Chassis ground (-):	Is the voltage 4.5 V or more?	Go to step 3.	Repair the harness and connector. NOTE: In this case, repair the following item: - Open circuit in harness between ECM and secondary air combination valve LH connector - Poor contact in ECM connector - Poor contact of coupling connector
3 CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBINATION VALVE LH CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance of the harness between the ECM and secondary air combination valve LH connector. Connector & terminal (B134) No. 27 — (E41) No. 2:	Is the resistance less than 1 Ω ?	Go to step 4.	Repair the harness and connector. NOTE: In this case, repair the following item: - Open circuit in harness between ECM and secondary air combination valve LH connector - Poor contact of coupling connector
4 CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBINATION VALVE LH CONNECTOR. Measure the resistance between ECM and chassis ground. Connector & terminal (B134) No. 27 — Chassis ground:	Is the resistance 1 M Ω or more?	Go to step 5.	Repair the short circuit to ground in harness between ECM and secondary air combination valve LH connector.
5 CHECK POOR CONTACT. Check for poor contact in the ECM and secondary air combination valve LH connector.	Is there poor contact in the ECM or secondary air combination valve LH connector?	Repair the poor contact in the ECM or secondary air combination valve LH connector.	Replace the secondary air combination valve LH. <Ref. to EC(H4DOTC)-10, Secondary Air Combination Valve.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

EK:DTC P2433 SECONDARY AIR INJECTION SYSTEM AIR FLOW /PRESSURE SENSOR CIRCUIT HIGH

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-273, DTC P2433 SECONDARY AIR INJECTION SYSTEM AIR FLOW /PRESSURE SENSOR CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

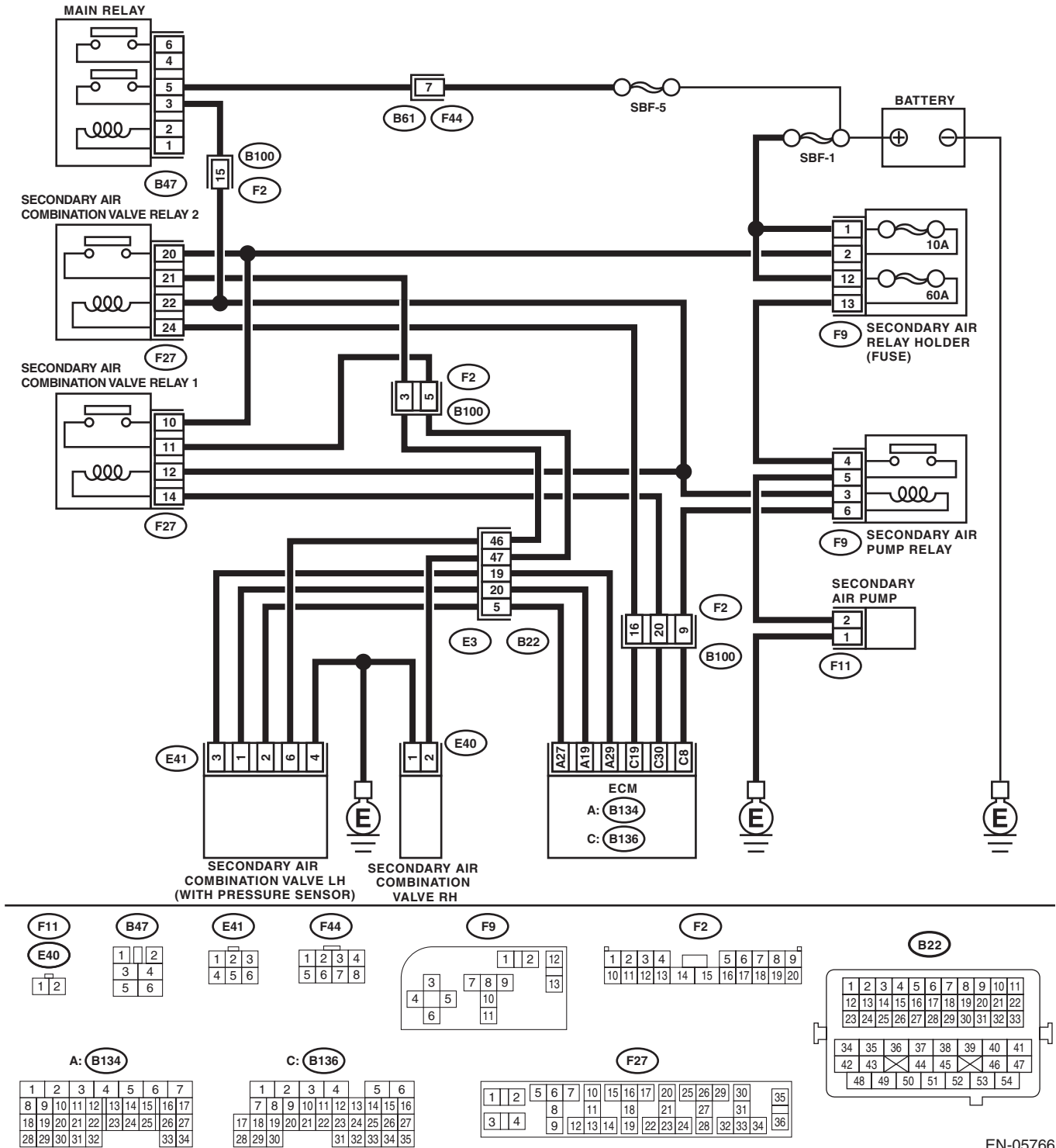
CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-05766

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK CURRENT DATA. 1) Turn the ignition switch to ON. 2) Read the data of secondary air pipe pressure signal using the Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the measured value 133.3 kPa (1000 mmHg, 39.4 inHg) or more?	Go to step 2.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. Reproduce the fault condition, and reperform the check. NOTE: In this case, there may be a temporary connector contact failure.
2 CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBINATION VALVE LH CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the secondary air combination valve LH. 3) Turn the ignition switch to ON. 4) Read the data of secondary air pipe pressure signal using the Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the measured value 133.3 kPa (1000 mmHg, 39.4 inHg) or more?	Repair the short circuit to power in the harness between ECM and secondary air combination valve LH connectors.	Go to step 3.
3 CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBINATION VALVE LH CONNECTOR. 1) Turn the ignition switch to OFF. 2) Measure the resistance of the harness between the secondary air combination valve LH connector and engine ground. Connector & terminal (E41) No. 4 — Engine ground:	Is the resistance less than 5 Ω?	Go to step 4.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and secondary air combination valve LH connector • Poor contact in ECM connector • Poor contact of coupling connector
4 CHECK POOR CONTACT. Check for poor contact of the secondary air combination valve LH connector.	Is there poor contact of the secondary air combination valve LH connector?	Repair the poor contact of the secondary air combination valve LH connector.	Replace the secondary air combination valve LH. <Ref. to EC(H4DOTC)-10, Secondary Air Combination Valve.>

EL:DTC P2440 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK 1)

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-274, DTC P2440 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

ENGINE (DIAGNOSTICS)

EN-05766

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK SECONDARY AIR COMBINATION VALVE FUSE. Check if the secondary air combination valve fuse (10 A) is blown out.	Is the fuse blown out?	Go to step 2.	Go to step 3.
2	CHECK HARNESS BETWEEN FUSE BOX AND SECONDARY AIR COMBINATION VALVE RH. 1) Remove the secondary air combination valve fuse (10 A) from the fuse box. 2) Disconnect the connector from the secondary air combination valve RH. 3) Measure the resistance between the secondary air combination valve fuse and secondary air combination valve RH connector, and chassis ground. Connector & terminal (F9) No. 2 — Chassis ground: (E40) No. 2 — Chassis ground:	Is the resistance 1 MΩ or more?	Replace the fuse with a new part, and connect the secondary air combination valve RH connector. Go to step 3.	Repair the ground short circuit of harness between the fuse box and the secondary air combination valve RH.
3	CHECK SECONDARY AIR COMBINATION VALVE RH OPERATION. 1) Connect the delivery (test) mode connector. 2) Turn the ignition switch to ON. 3) Perform operation check for the secondary air combination valve RH using the Subaru Select Monitor. NOTE: Refer to "Compulsory Valve Operation Check Mode" for more operation procedure. <Ref. to EN(H4DOTC)(diag)-55, Compulsory Valve Operation Check Mode.>	Does the secondary air combination valve RH repeatedly switch to ON and OFF?	Go to step 4.	Go to step 6.
4	CHECK DUCT BETWEEN SECONDARY AIR PUMP AND SECONDARY AIR COMBINATION VALVE RH. Check the duct between the secondary air pump and secondary air combination valve RH.	Is there damage, clog or disconnection of the duct?	Replace, clean or connect the duct.	Go to step 5.
5	CHECK PIPE BETWEEN SECONDARY AIR COMBINATION VALVE RH AND CYLINDER HEAD. Check the pipe between the secondary air combination valve RH and cylinder head.	Is there damage, clog or disconnection of the pipe?	Replace, clean or connect the pipe.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. Reproduce the fault condition, and reperform the check. NOTE: In this case, there may be a temporary connector contact failure.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
6 CHECK POWER SUPPLY TO SECONDARY AIR COMBINATION VALVE RH. 1) Disconnect the connector from the secondary air combination valve RH. 2) In the condition of step 3, measure the voltage between the secondary air combination valve RH and the chassis ground. Connector & terminal (E40) No. 2 (+) — Chassis ground (-):	Does the voltage repeatedly change between 10 V and 0 V?	Replace the secondary air combination valve RH. <Ref. to EC(H4DOTC)-10, Secondary Air Combination Valve.>	Go to step 7.
7 CHECK HARNESS BETWEEN SECONDARY AIR COMBINATION VALVE RH AND CHASSIS GROUND. Measure the resistance between the secondary air combination valve RH connector and chassis ground. Connector & terminal (E40) No. 1 — Chassis ground:	Is the resistance less than 5 Ω ?	Go to step 8.	Repair the open circuit of harness between secondary air combination valve RH and chassis ground.
8 CHECK HARNESS BETWEEN SECONDARY AIR COMBINATION VALVE RELAY 1 AND SECONDARY AIR COMBINATION VALVE RH CONNECTOR. 1) Turn the ignition switch to OFF. 2) Remove the secondary air combination valve relay 1 from the relay box. 3) Measure the resistance of the harness between the secondary air combination valve relay 1 and secondary air combination valve RH connector. Connector & terminal (F27) No. 11 — (E40) No. 2:	Is the resistance less than 1 Ω ?	Go to step 9.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in the harness between the secondary air combination valve relay 1 and secondary air combination valve RH connector • Poor contact of coupling connector
9 CHECK SECONDARY AIR COMBINATION VALVE RELAY 1. 1) Connect the battery to terminals No. 12 and No. 14 of the secondary air combination valve relay 1. 2) Measure the resistance between the secondary air combination valve relay 1 terminals. Terminals No. 10 — No. 11:	Is the resistance less than 1 Ω ?	Go to step 10.	Replace the secondary air combination valve relay 1.
10 CHECK SECONDARY AIR COMBINATION VALVE RELAY 1. Measure the resistance between the secondary air combination valve relay 1 terminals with the battery disconnected. Terminals No. 10 — No. 11:	Is the resistance 1 M Ω or more?	Go to step 11.	Replace the secondary air combination valve relay 1.
11 CHECK SECONDARY AIR COMBINATION VALVE RELAY 1 POWER SOURCE. 1) Turn the ignition switch to ON. 2) Measure the voltage between the secondary air combination valve relay 1 connector and chassis ground. Connector & terminal (F27) No. 10 (+) — Chassis ground (-): (F27) No. 12 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Go to step 12.	Repair the open or ground short circuit of power supply circuit.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
12 CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBINATION VALVE RELAY 1 CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector of ECM. 3) Measure the resistance of harness between ECM and secondary air combination valve relay 1 connector. <i>Connector & terminal</i> <i>(B136) No. 30 — (F27) No. 14:</i>	Is the resistance less than 1 Ω ?	Go to step 13.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and secondary air combination valve relay 1 connector • Poor contact of coupling connector
13 CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBINATION VALVE RELAY 1 CONNECTOR. Measure the resistance between the secondary air combination valve relay 1 connector and chassis ground. <i>Connector & terminal</i> <i>(F27) No. 14 — Chassis ground:</i>	Is the resistance 1 M Ω or more?	Repair the poor contact of the ECM connector.	Repair the ground short circuit of harness between ECM and secondary air combination valve relay 1 connector.

EM:DTC P2441 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK CLOSED (BANK 1)

NOTE:

For the diagnostic procedure, refer to DTC P2440. <Ref. to EN(H4DOTC)(diag)-367, DTC P2440 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

EN:DTC P2442 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK 2)

DTC DETECTING CONDITION:

- Detected when two consecutive driving cycles with fault occur.
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-274, DTC P2442 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

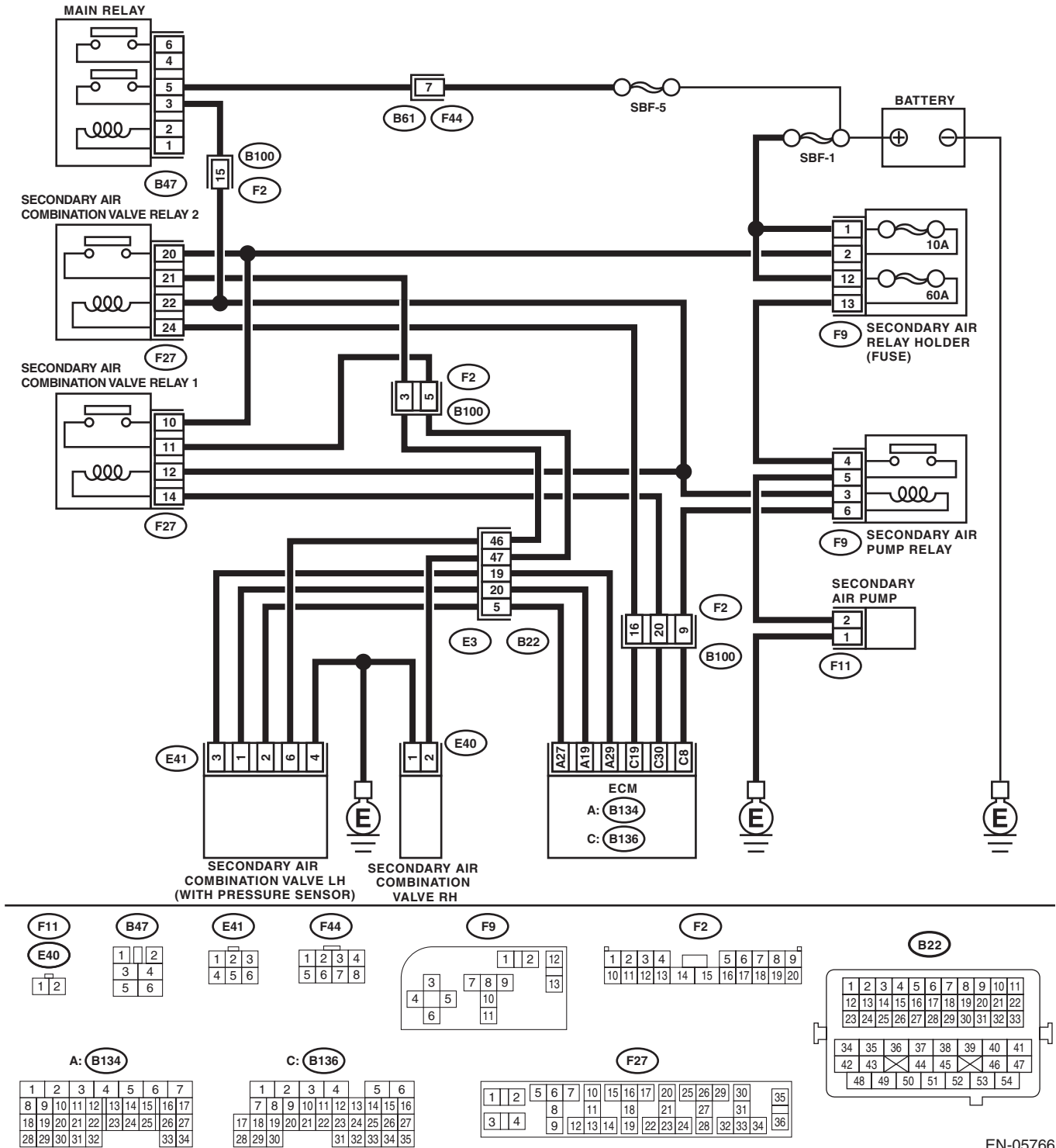
CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-05766

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK SECONDARY AIR COMBINATION VALVE FUSE. Check if the secondary air combination valve fuse (10 A) is blown out.	Is the fuse blown out?	Go to step 2.	Go to step 3.
2	CHECK HARNESS BETWEEN FUSE BOX AND SECONDARY AIR COMBINATION VALVE LH. 1) Remove the secondary air combination valve fuse (10 A) from the fuse box. 2) Disconnect the connector from the secondary air combination valve LH. 3) Measure the resistance between the secondary air combination valve fuse and secondary air combination valve LH connector, and chassis ground. Connector & terminal (F9) No. 2 — Chassis ground: (E41) No. 6 — Chassis ground:	Is the resistance 1 MΩ or more?	Replace the fuse with a new part, and connect the secondary air combination valve LH connector. Go to step 3.	Repair the ground short circuit of harness between the fuse box and the secondary air combination valve LH.
3	CHECK SECONDARY AIR COMBINATION VALVE LH OPERATION. 1) Connect the delivery (test) mode connector. 2) Turn the ignition switch to ON. 3) Perform operation check for the secondary air combination valve LH using the Subaru Select Monitor. NOTE: Refer to "Compulsory Valve Operation Check Mode" for more operation procedure. <Ref. to EN(H4DOTC)(diag)-55, Compulsory Valve Operation Check Mode.>	Does the secondary air combination valve LH repeatedly switch to ON and OFF?	Go to step 4.	Go to step 6.
4	CHECK DUCT BETWEEN SECONDARY AIR PUMP AND SECONDARY AIR COMBINATION VALVE LH. Check the duct between the secondary air pump and secondary air combination valve LH.	Is there damage, clog or disconnection of the duct?	Replace, clean or connect the duct.	Go to step 5.
5	CHECK PIPE BETWEEN SECONDARY AIR COMBINATION VALVE LH AND CYLINDER HEAD. Check the pipe between the secondary air combination valve LH and cylinder head.	Is there damage, clog or disconnection of the pipe?	Replace, clean or connect the pipe.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. Reproduce the fault condition, and reperform the check. NOTE: In this case, there may be a temporary connector contact failure.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
6 CHECK POWER SUPPLY TO SECONDARY AIR COMBINATION VALVE LH. 1) Disconnect the connector from the secondary air combination valve LH. 2) In the condition of step 3, measure the voltage between the secondary air combination valve LH and the chassis ground. Connector & terminal (E41) No. 6 (+) — Chassis ground (-):	Does the voltage repeatedly change between 10 V and 0 V?	Replace the secondary air combination valve LH. <Ref. to EC(H4DOTC)-10, Secondary Air Combination Valve.>	Go to step 7.
7 CHECK HARNESS BETWEEN SECONDARY AIR COMBINATION VALVE LH AND CHASSIS GROUND. Measure the resistance between the secondary air combination valve LH connector and chassis ground. Connector & terminal (E41) No. 4 — Chassis ground:	Is the resistance less than 5 Ω ?	Go to step 8.	Repair the open circuit of harness between secondary air combination valve LH and chassis ground.
8 CHECK HARNESS BETWEEN SECONDARY AIR COMBINATION VALVE RELAY 2 AND SECONDARY AIR COMBINATION VALVE LH CONNECTOR. 1) Turn the ignition switch to OFF. 2) Remove the secondary air combination valve relay 2 from the relay box. 3) Measure the resistance of the harness between the secondary air combination valve relay 2 and secondary air combination valve LH connector. Connector & terminal (F27) No. 21 — (E41) No. 6:	Is the resistance less than 1 Ω ?	Go to step 9.	Repair the harness and connector. NOTE: In this case, repair the following item: - Open circuit in the harness between the secondary air combination valve relay 2 and secondary air combination valve LH connector - Poor contact of coupling connector
9 CHECK SECONDARY AIR COMBINATION VALVE RELAY 2. 1) Connect the battery to terminals No. 22 and No. 24 of the secondary air combination valve relay 2. 2) Measure the resistance between the secondary air combination valve relay 2 terminals. Terminals No. 20 — No. 21:	Is the resistance less than 1 Ω ?	Go to step 10.	Replace the secondary air combination valve relay 2.
10 CHECK SECONDARY AIR COMBINATION VALVE RELAY 2. Measure the resistance between the secondary air combination valve relay 2 terminals with the battery disconnected. Terminals No. 20 — No. 21:	Is the resistance 1 M Ω or more?	Go to step 11.	Replace the secondary air combination valve relay 2.
11 CHECK SECONDARY AIR COMBINATION VALVE RELAY 2 POWER SOURCE. 1) Turn the ignition switch to ON. 2) Measure the voltage between the secondary air combination valve relay 2 connector and chassis ground. Connector & terminal (F27) No. 20 (+) — Chassis ground (-): (F27) No. 22 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Go to step 12.	Repair the open or ground short circuit of power supply circuit.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
12 CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBINATION VALVE RELAY 2 CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector of ECM. 3) Measure the resistance of harness between ECM and secondary air combination valve relay 2 connector. Connector & terminal (B136) No. 19 — (F27) No. 24:	Is the resistance less than 1 Ω ?	Go to step 13.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and secondary air combination valve relay 2 connector • Poor contact of coupling connector
13 CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBINATION VALVE RELAY 2 CONNECTOR. Measure the resistance between the secondary air combination valve relay 2 connector and chassis ground. Connector & terminal (F27) No. 24 — Chassis ground:	Is the resistance 1 M Ω or more?	Repair the poor contact of the ECM connector.	Repair the ground short circuit of harness between ECM and secondary air combination valve relay 2 connector.

EO:DTC P2443 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK CLOSED (BANK 2)

NOTE:

For the diagnostic procedure, refer to DTC P2442. <Ref. to EN(H4DOTC)(diag)-372, DTC P2442 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

EP:DTC P2444 SECONDARY AIR INJECTION SYSTEM PUMP STUCK ON

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-275, DTC P2444 SECONDARY AIR INJECTION SYSTEM PUMP STUCK ON, Diagnostic Trouble Code (DTC) Detecting Criteria.>

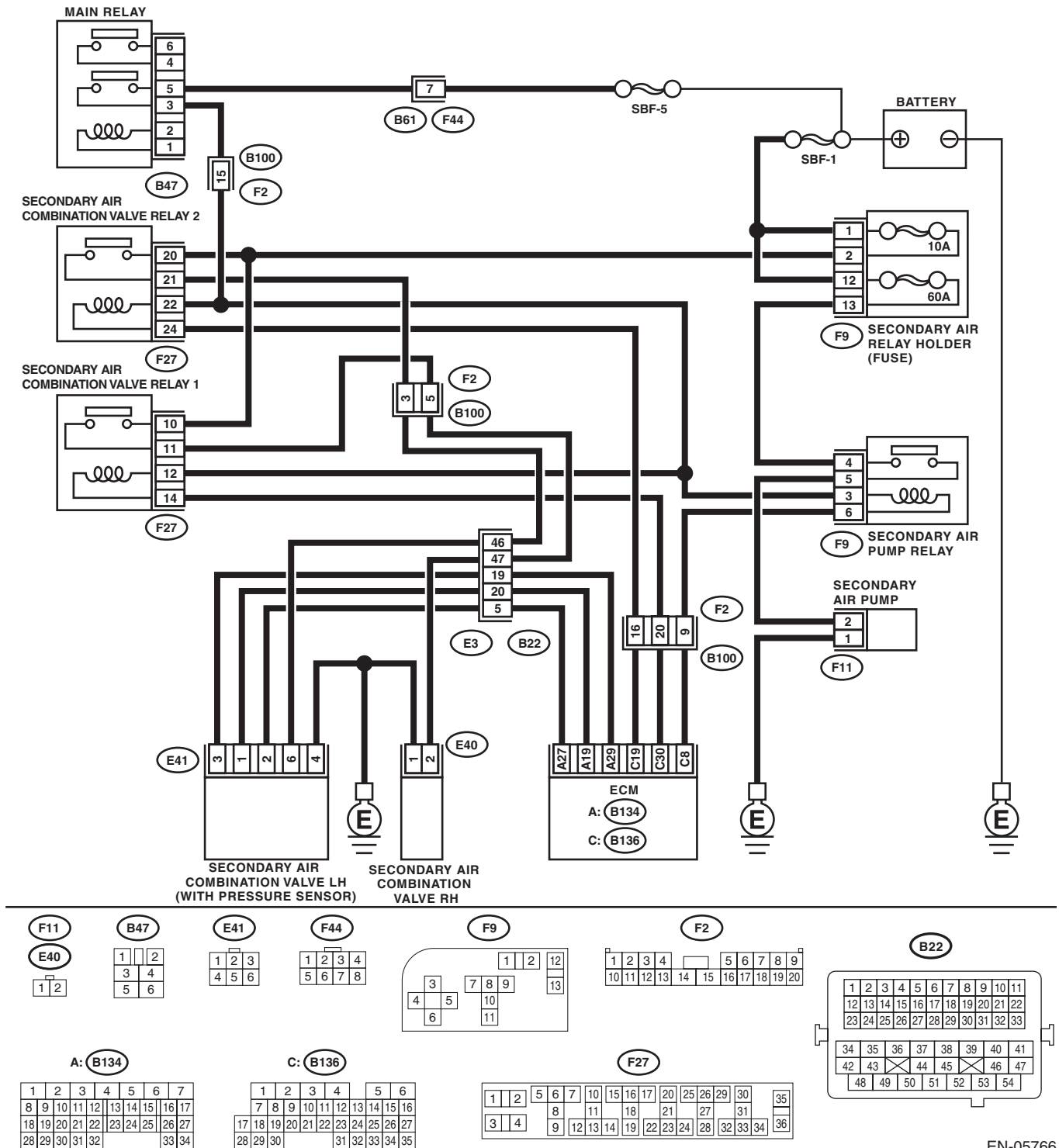
CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-05766

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK SECONDARY AIR PIPING PRESSURE. 1) Turn the ignition switch to ON. 2) Using the Subaru Select Monitor, read secondary air piping pressure data, and compare with the actual atmospheric pressure. NOTE: For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-35, Subaru Select Monitor.>	Is the actual difference with atmospheric pressure 50 mmHg (6.7 kPa, 2.0 inHg, 0.97 psig) or more?	Go to step 2.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. Reproduce the fault condition, and reperform the check. NOTE: In this case, there may be a temporary connector contact failure.
2 CHECK SECONDARY AIR PUMP. 1) Start the engine and warm-up engine until coolant temperature is higher than 75°C (167°F). 2) Check whether or not the secondary air pump is operating.	Is the secondary air pump operating?	Go to step 3.	Replace the secondary air combination valve LH. <Ref. to EC(H4DOTC)-10, Secondary Air Combination Valve.>
3 CHECK HARNESS BETWEEN ECM AND SECONDARY AIR PUMP RELAY CONNECTOR. 1) Turn the ignition switch to OFF. 2) Remove the secondary air pump relay from the relay box. 3) Measure the resistance between the secondary air pump relay connector and engine ground terminals. Connector & terminal (F9) No. 6 — Engine ground:	Is the resistance 1 MΩ or more?	Go to step 4.	Repair the ground short circuit of harness between ECM and secondary air pump relay connector.
4 CHECK SECONDARY AIR PUMP RELAY. Measure the resistance between the secondary air pump relay terminals. Terminals No. 4 — No. 5:	Is the resistance 1 MΩ or more?	Repair the short circuit to power in the harness between secondary air pump relay and secondary air pump connector.	Replace the secondary air pump relay.

General Diagnostic Table

ENGINE (DIAGNOSTICS)

20. General Diagnostic Table

A: INSPECTION

1. ENGINE

NOTE:

Malfunction of parts other than those listed is also possible. <Ref. to ME(H4DOTC)-97, Engine Trouble in General.>

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

General Diagnostic Table

ENGINE (DIAGNOSTICS)

Symptom	Problem parts
7. Spark knock	1) Manifold absolute pressure sensor 2) Mass air flow and intake air temperature sensor 3) Engine coolant temperature sensor 4) Knock sensor 5) Fuel injection parts (*4) 6) Fuel pump and fuel pump relay
8. After-burn in exhaust system	1) Manifold absolute pressure sensor 2) Mass air flow and intake air temperature sensor 3) Engine coolant temperature sensor (*2) 4) Fuel injection parts (*4) 5) Fuel pump and fuel pump relay

*1: Check ignition coil and spark plug.

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

*3: Ensure the secure installation.

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

*5: Inspect air leak in air intake system.

General Diagnostic Table

ENGINE (DIAGNOSTICS)

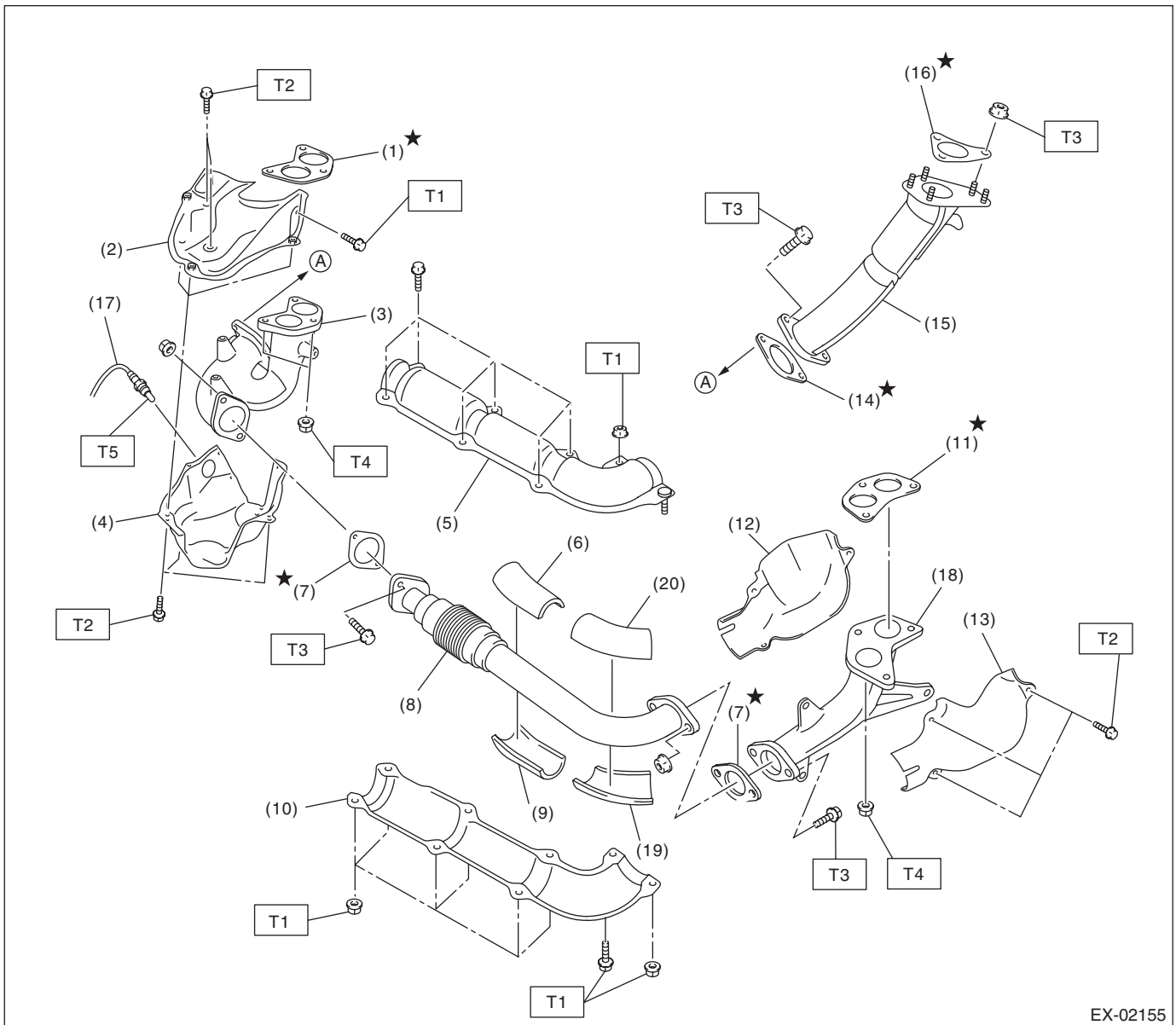
General Description

EXHAUST

1. General Description

A: COMPONENT

1. FRONT EXHAUST PIPE



EX-02155

General Description

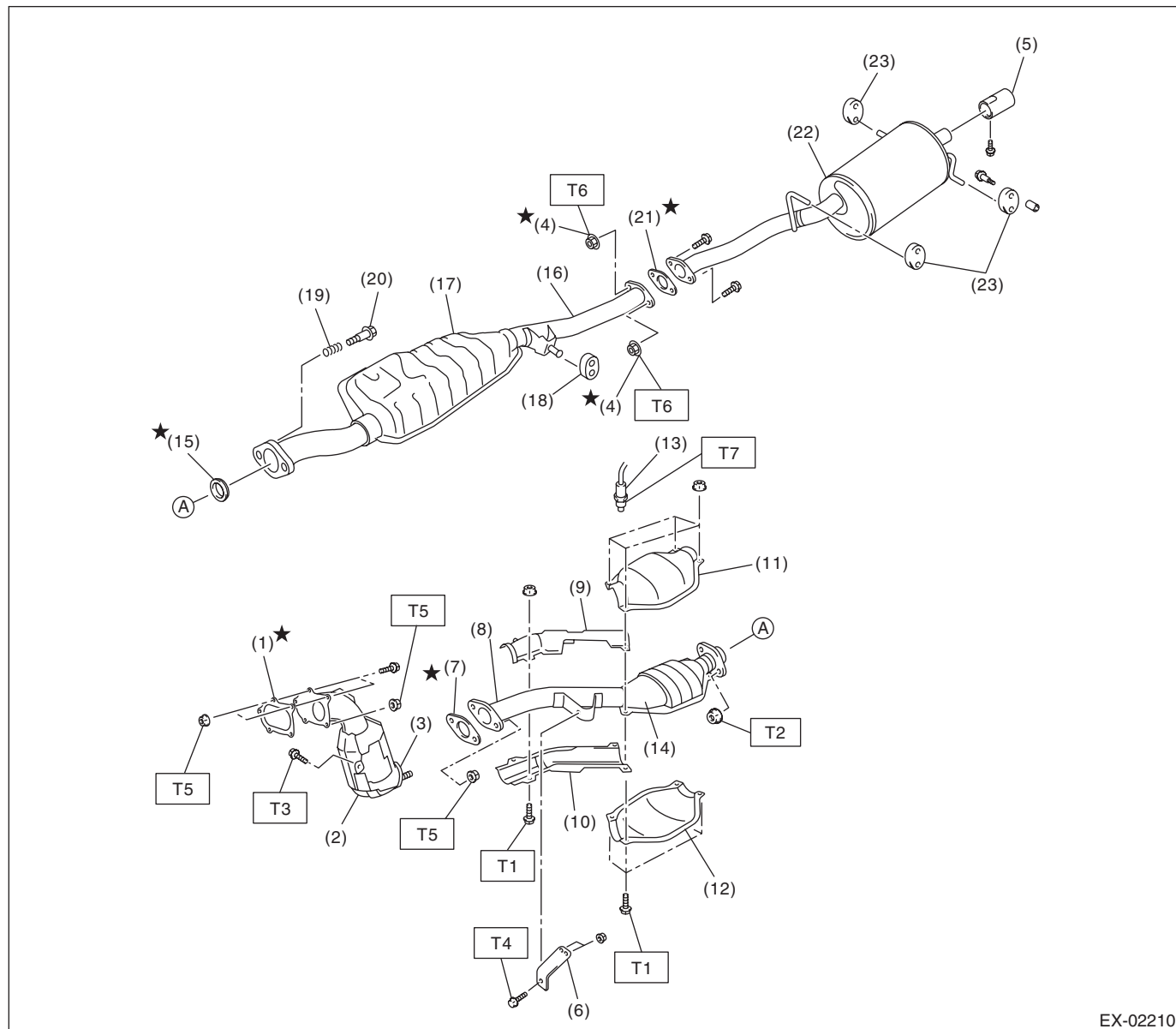
EXHAUST

(1) Gasket	(10) Front exhaust pipe lower cover	(20) Front exhaust pipe upper insulator (LH)
(2) Exhaust manifold upper cover (RH)	(11) Gasket	
(3) Exhaust manifold (RH)	(12) Exhaust manifold inner cover (LH)	
(4) Exhaust manifold lower cover (RH)	(13) Exhaust manifold outer cover (LH)	<i>Tightening torque:N·m (kgf-m, ft-lb)</i>
(5) Front exhaust pipe upper cover	(14) Gasket	<i>T1: 7.5 (0.8, 5.5)</i>
(6) Front exhaust pipe upper insulator (RH)	(15) Turbocharger joint pipe	<i>T2: 19 (1.9, 14.0)</i>
(7) Gasket	(16) Gasket	<i>T3: 42.5 (4.3, 31.3)</i>
(8) Front exhaust pipe	(17) Front oxygen (A/F) sensor	<i>T4: 40 (4.0, 28.9)</i>
(9) Front exhaust pipe lower insulator (RH)	(18) Exhaust manifold (LH)	<i>T5: <Ref. to FU(H4DOTC)-43, INSTALLATION, Front Oxygen (A/F) Sensor.></i>
	(19) Front exhaust pipe lower insulator (LH)	

General Description

EXHAUST

2. CENTER AND REAR EXHAUST PIPE, AND MUFFLER



EX-02210

- | | | |
|---|---|--------------|
| (1) Gasket | (12) Rear catalytic converter lower cover | (23) Cushion |
| (2) Front catalytic converter | (13) Rear oxygen sensor | |
| (3) Center exhaust pipe (Front) | (14) Rear catalytic converter | |
| (4) Self-locking nut | (15) Gasket | |
| (5) Muffler cutter | (16) Rear exhaust pipe | |
| (6) Bracket | (17) Chamber | |
| (7) Gasket | (18) Cushion | |
| (8) Center exhaust pipe (Rear) | (19) Spring | |
| (9) Center pipe upper cover (Rear) | (20) Bolt | |
| (10) Center pipe lower cover (Rear) | (21) Gasket | |
| (11) Rear catalytic converter upper cover | (22) Muffler | |

Tightening torque: N·m (kgf-m, ft-lb)

T1: 13 (1.3, 9.6)

T2: 18 (1.8, 13.3)

T3: 30 (3.1, 22.1)

T4: 35 (3.6, 25.8)

T5: 42.5 (4.3, 31.3)

T6: 48 (4.9, 35.4)

T7: <Ref. to FU(H4DOTC)-45, INSTALLATION, Rear Oxygen Sensor.>

B: CAUTION

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

Front Exhaust Pipe

EXHAUST

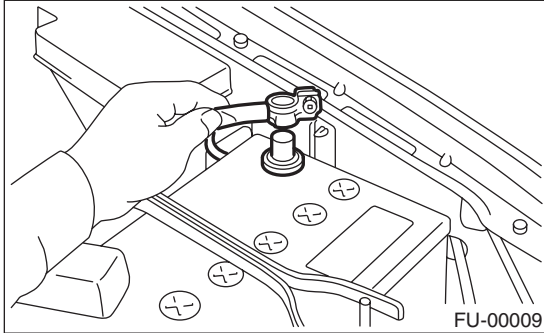
2. Front Exhaust Pipe

A: REMOVAL

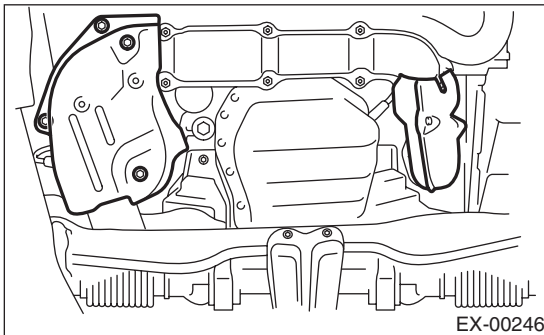
CAUTION:

Vehicle components are extremely hot after driving. Be wary of receiving burns from heated parts.

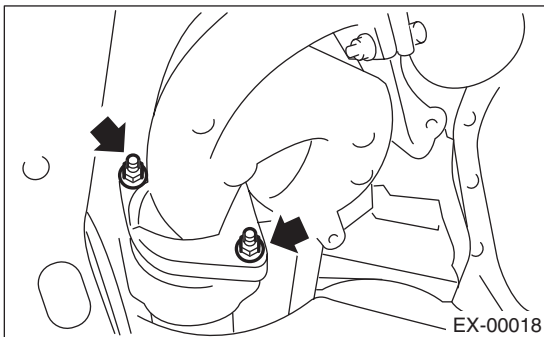
- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from battery.



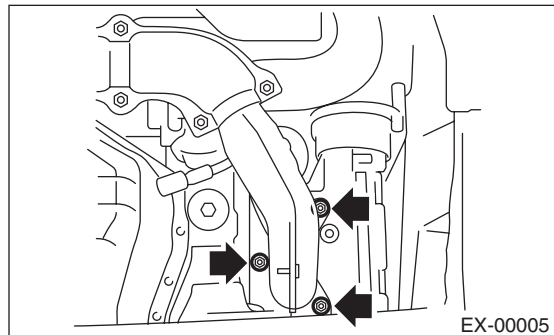
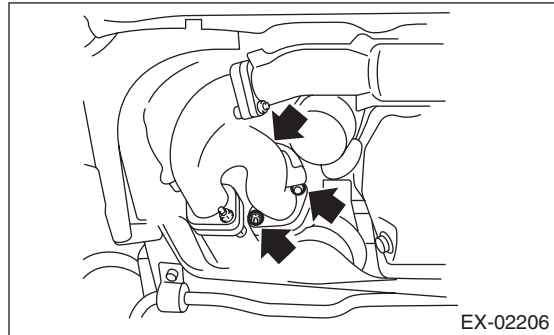
- 3) Remove the collector cover.
- 4) Remove the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-42, REMOVAL, Front Oxygen (A/F) Sensor.>
- 5) Remove the under cover.
- 6) Remove the exhaust manifold lower cover (RH) and the exhaust manifold cover (LH).



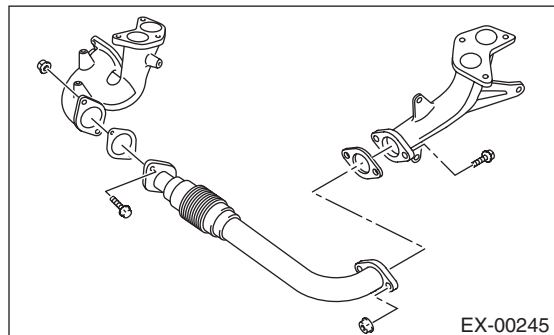
- 7) Remove the bolts and nuts which hold front exhaust pipe assembly onto turbocharger joint pipe.



- 8) While holding the front exhaust pipe assembly with one hand, remove the nuts which hold the front exhaust pipe assembly to cylinder head exhaust port.



- 9) Remove the front exhaust pipe assembly.
- 10) Remove the covers from exhaust manifold and front exhaust pipe.
- 11) Separate the front exhaust pipe from exhaust manifolds.



B: INSTALLATION

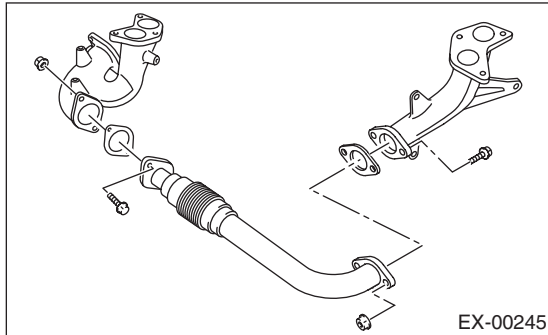
1) Assemble the front exhaust pipe and the exhaust manifold.

NOTE:

Use a new gasket.

Tightening torque:

42.5 N·m (4.3 kgf-m, 31.3 ft-lb)



2) Install the front exhaust pipe cover.

Tightening torque:

7.5 N·m (0.8 kgf-m, 5.5 ft-lb)

3) Install the exhaust manifold upper cover (RH).

Tightening torque:

19 N·m (1.9 kgf-m, 14.0 ft-lb)

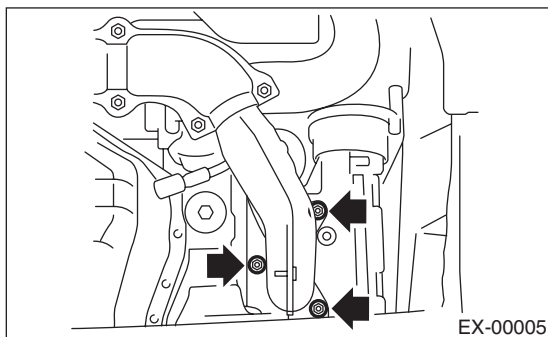
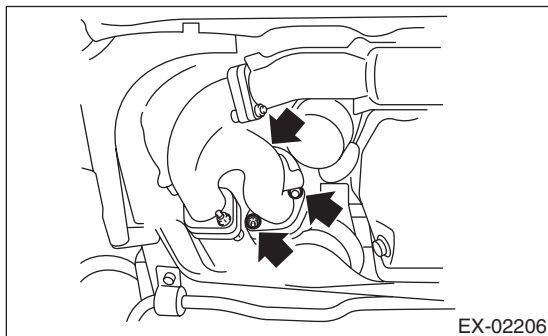
4) Install the front exhaust pipe assembly.

NOTE:

Use a new gasket.

Tightening torque:

40 N·m (4.0 kgf-m, 28.9 ft-lb)



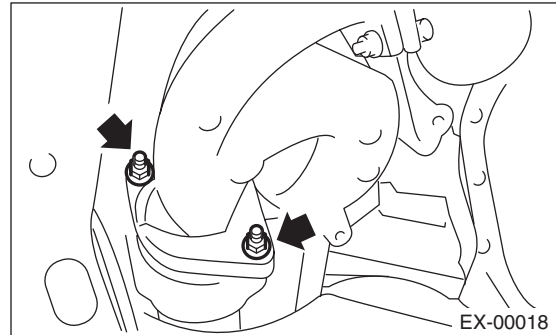
5) Connect the exhaust manifold (RH) to turbo-charger joint pipe.

NOTE:

Use a new gasket.

Tightening torque:

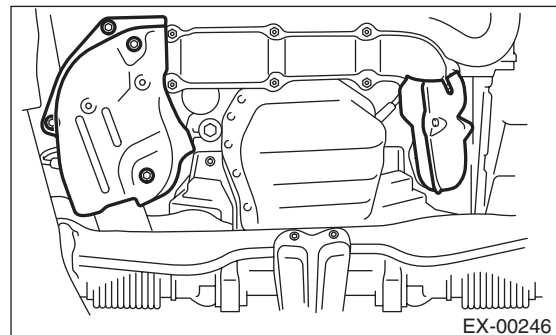
42.5 N·m (4.3 kgf-m, 31.3 ft-lb)



6) Install the exhaust manifold lower cover (RH) and the exhaust manifold cover (LH).

Tightening torque:

19 N·m (1.9 kgf-m, 14.0 ft-lb)

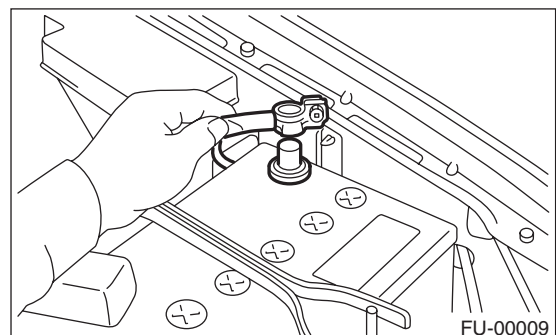


7) Install the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-43, INSTALLATION, Front Oxygen (A/F) Sensor.>

8) Install the under cover.

9) Lower the vehicle.

10) Connect the ground cable to battery.



11) Install the collector cover.

C: INSPECTION

1) Check the connections and welds for exhaust leaks.

2) Make sure there are no holes or rusting.

Center Exhaust Pipe

EXHAUST

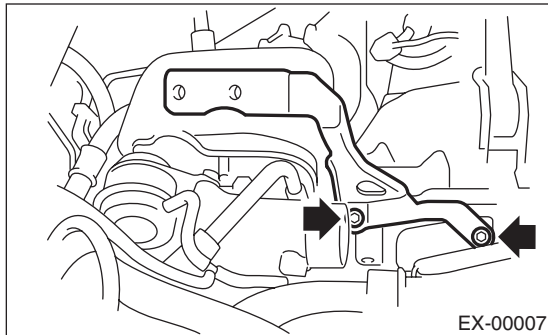
3. Center Exhaust Pipe

A: REMOVAL

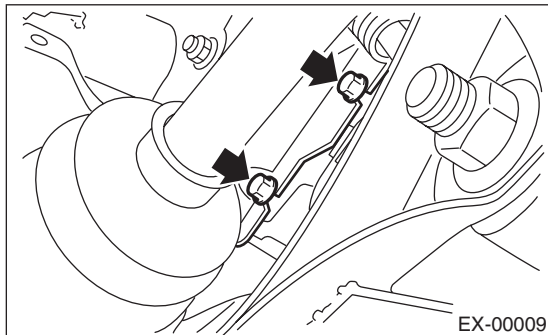
CAUTION:

Vehicle components are extremely hot after driving. Be wary of receiving burns from heated parts.

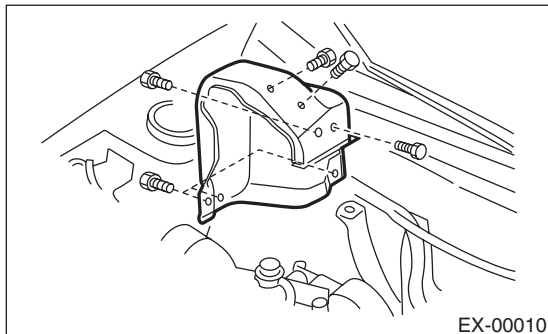
- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from battery.
- 3) Remove the collector cover.
- 4) Remove the intercooler. <Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>
- 5) Remove the intercooler bracket.



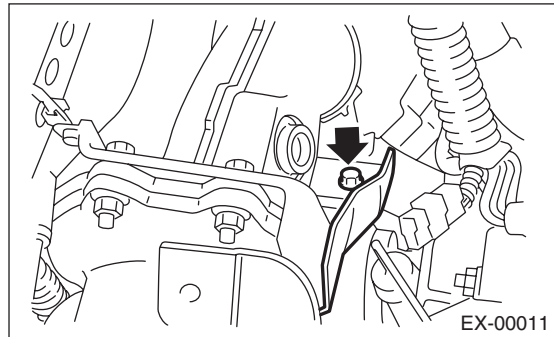
- 6) Lift up the vehicle.
- 7) Remove the under cover.
- 8) Remove the bolts which install the lower portion of turbocharger lower cover.



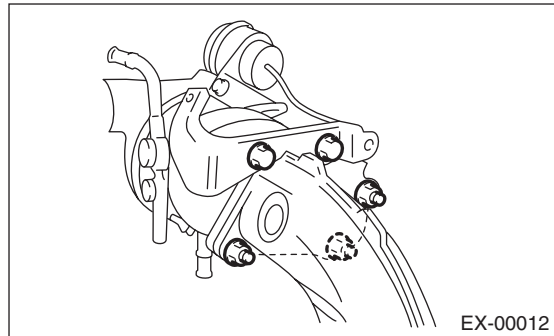
- 9) Lower the vehicle.
- 10) Remove the turbocharger upper cover.



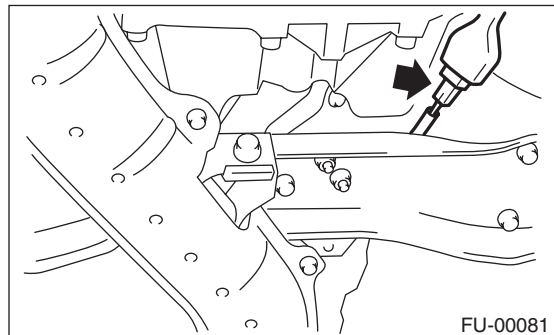
- 11) Remove the bolts which install the upper portion of turbocharger lower cover.



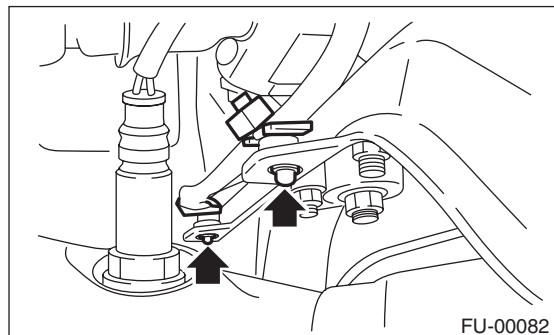
- 12) Separate the center exhaust pipe from turbocharger.



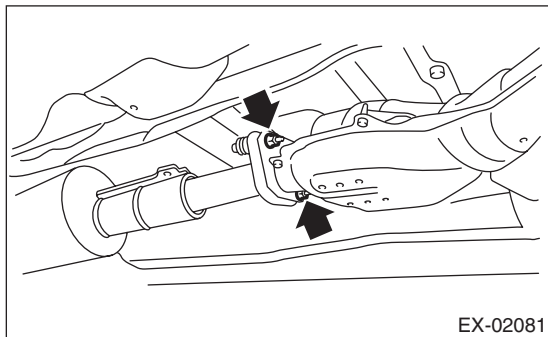
- 13) Lift up the vehicle.
- 14) Disconnect the connector from rear oxygen sensor.



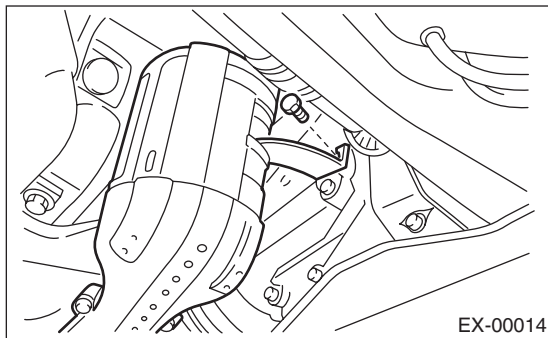
- 15) Vertically draw out clip from crossmember.



- 16) Separate the center exhaust pipe from rear exhaust pipe.



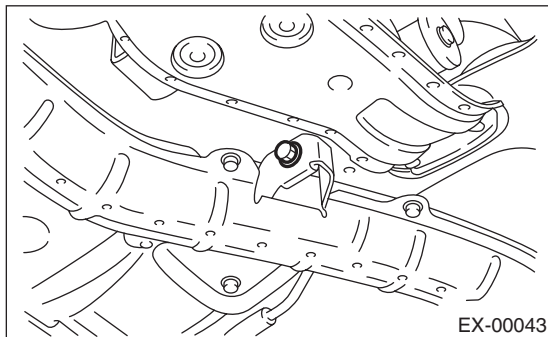
- 17) Remove the bolt which holds center exhaust pipe bracket to transmission.



- 18) Remove the bolt which holds center exhaust pipe to hanger bracket.

CAUTION:

Be careful not to pull down the center exhaust pipe.



- 19) Remove the center exhaust pipe.



B: INSTALLATION

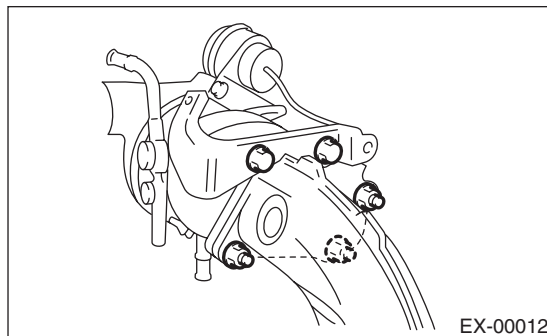
- 1) Install the center exhaust pipe and temporarily tighten the bolt which holds center exhaust pipe to hanger bracket.
- 2) Temporarily tighten the bolt which holds the center pipe to transmission.
- 3) Connect the center exhaust pipe to turbocharger.

NOTE:

Use a new gasket.

Tightening torque:

42.5 N·m (4.3 kgf-m, 31.3 ft-lb)



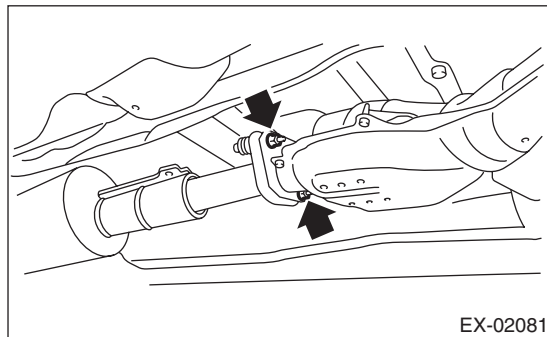
- 4) Install the center exhaust pipe to rear exhaust pipe.

NOTE:

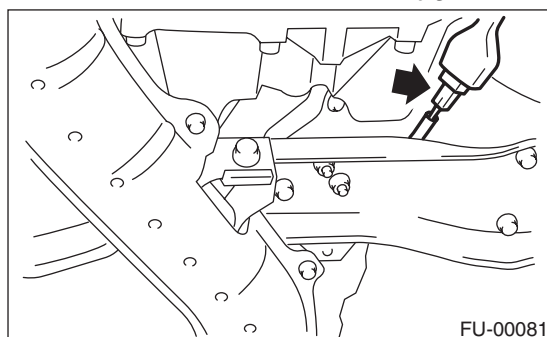
Use a new gasket.

Tightening torque:

18 N·m (1.8 kgf-m, 13.3 ft-lb)



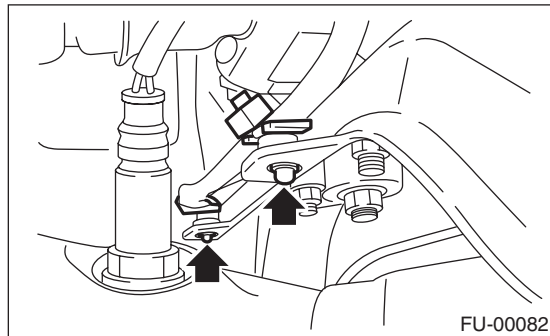
- 5) Connect the connector to rear oxygen sensor.



Center Exhaust Pipe

EXHAUST

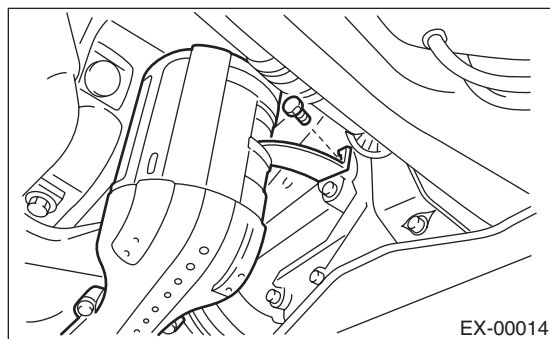
- 6) Secure clip on the crossmember.



- 7) Tighten the bolt which holds center exhaust pipe bracket to transmission.

Tightening torque:

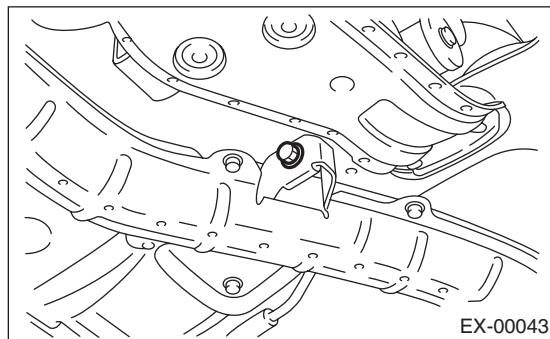
30 N·m (3.1 kgf-m, 22.1 ft-lb)



- 8) Tighten the bolt which holds center exhaust pipe to hanger bracket.

Tightening torque:

35 N·m (3.6 kgf-m, 25.8 ft-lb)

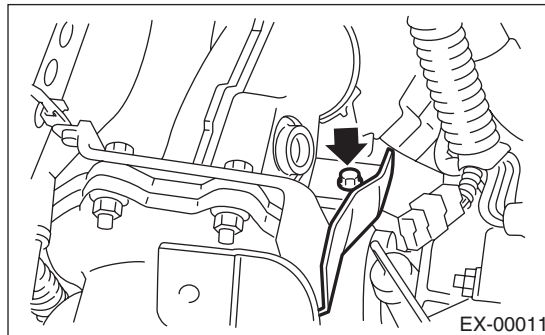


- 9) Lower the vehicle.

- 10) Position the turbocharger lower cover, and tighten the bolts which install the upper side of lower cover.

Tightening torque:

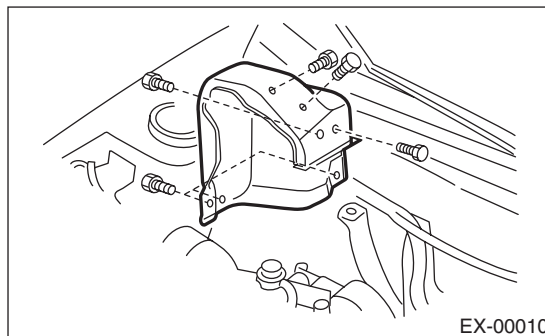
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)



- 11) Position the turbocharger upper cover, and tighten the bolts which install the upper cover.

Tightening torque:

7.5 N·m (0.8 kgf-m, 5.5 ft-lb)

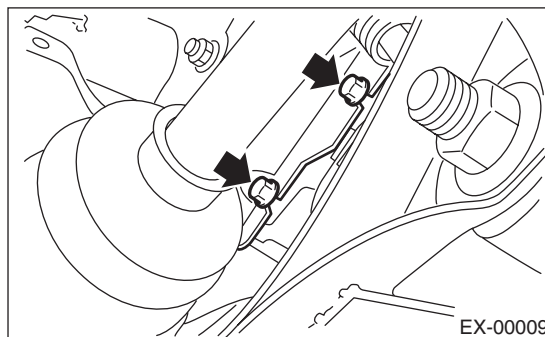


- 12) Lift up the vehicle.

- 13) Tighten the bolts which install the lower portion of turbocharger lower cover.

Tightening torque:

7.5 N·m (0.8 kgf-m, 5.5 ft-lb)



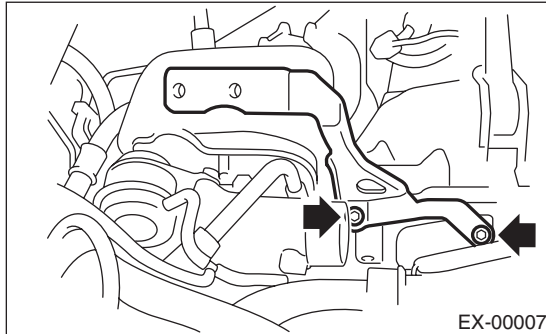
- 14) Install the under cover.

- 15) Lower the vehicle.

16) Install the intercooler bracket.

Tightening torque:

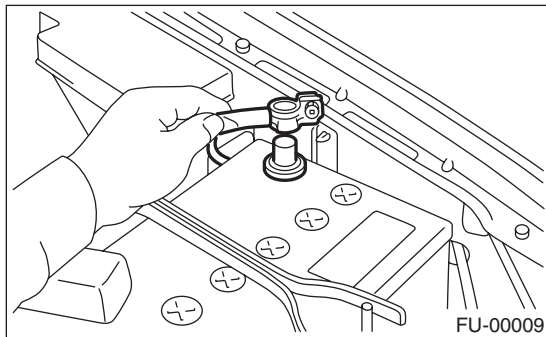
16 N·m (1.6 kgf-m, 11.8 ft-lb)



17) Install the intercooler. <Ref. to IN(H4DOTC)-11, INSTALLATION, Intercooler.>

18) Install the collector cover.

19) Connect the ground cable to battery.



C: INSPECTION

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

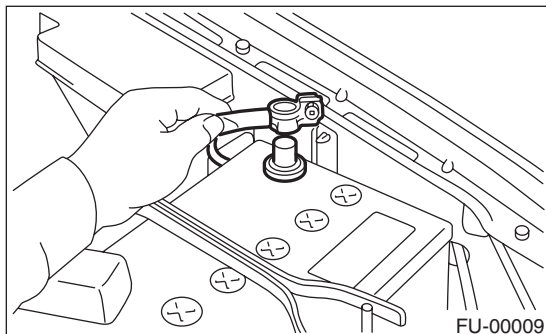
4. Joint Pipe

A: REMOVAL

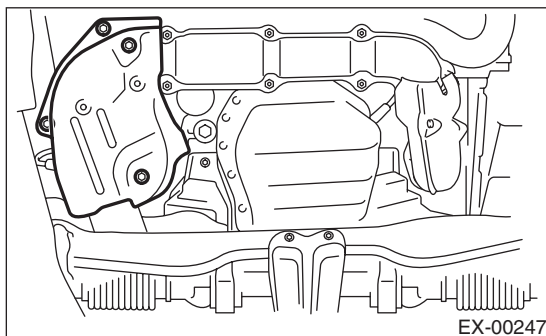
CAUTION:

Vehicle components are extremely hot after driving. Be wary of receiving burns from heated parts.

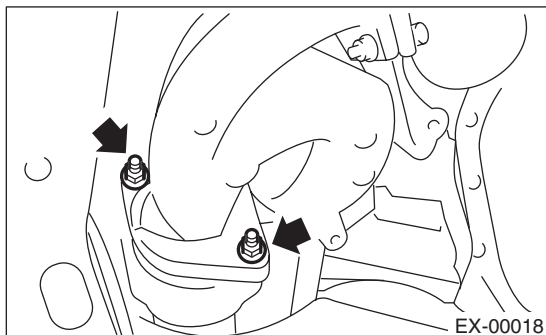
- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from battery.



- 3) Remove the collector cover.
- 4) Remove the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-42, REMOVAL, Front Oxygen (A/F) Sensor.>
- 5) Remove the under cover.
- 6) Remove the exhaust manifold lower cover (RH).



- 7) Remove the bolts and nuts which hold the front exhaust manifold to joint pipe.



- 8) Remove the center exhaust pipe. <Ref. to EX(H4DOTC)-8, REMOVAL, Center Exhaust Pipe.>
- 9) Remove the turbocharger. <Ref. to IN(H4DOTC)-13, REMOVAL, Turbocharger.>
- 10) Take off the joint pipe in the upward direction.

B: INSTALLATION

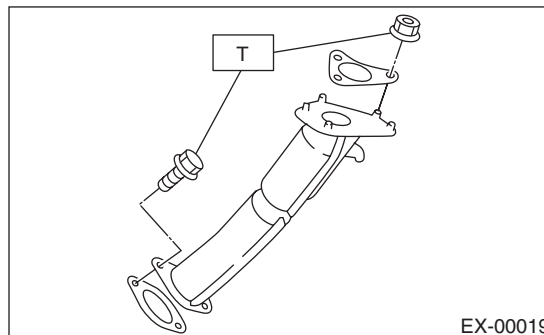
Install in the reverse order of removal.

NOTE:

Use a new gasket.

Tightening torque:

T: 42.5 N·m (4.3 kgf-m, 31.3 ft-lb)



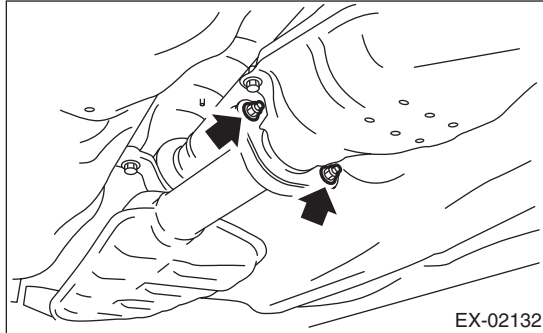
5. Rear Exhaust Pipe

A: REMOVAL

CAUTION:

Vehicle components are extremely hot after driving. Be wary of receiving burns from heated parts.

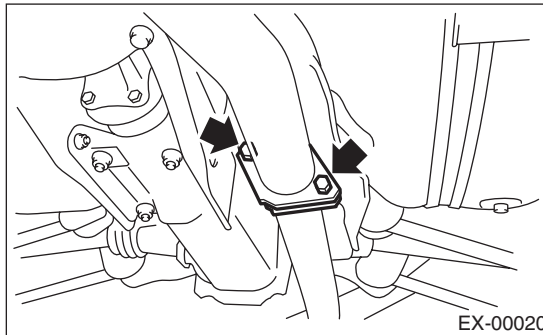
- 1) Set the vehicle on a lift.
- 2) Lift up the vehicle.
- 3) Separate the rear exhaust pipe from center exhaust pipe.



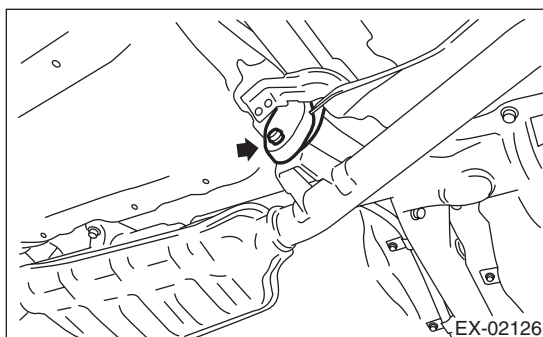
- 4) Separate the rear exhaust pipe from muffler.

CAUTION:

Be careful not to drop the rear exhaust pipe.



- 5) Apply a coat of spray type lubricant to the mating area of cushion rubber.
- 6) Remove the rear exhaust pipe from cushion rubber.

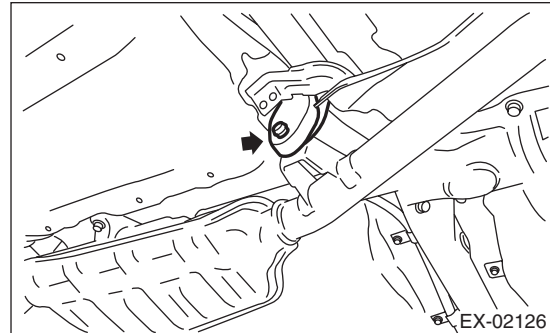


B: INSTALLATION

- 1) Apply a coat of spray type lubricant to the mating area of cushion rubber.
- 2) Install the rear exhaust pipe to cushion rubber.

NOTE:

When the lubricant was applied to the cushion rubber during the removal/installation, degrease it after reassembling.



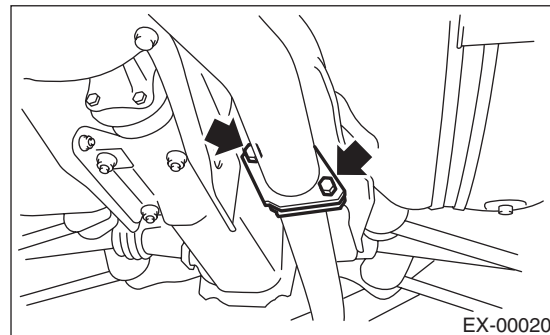
- 3) Install the rear exhaust pipe to muffler.

NOTE:

Use a new gasket and self-locking nut.

Tightening torque:

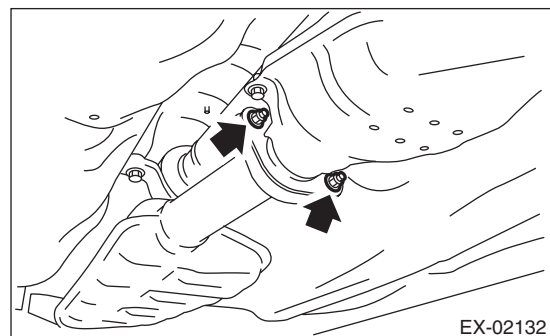
48 N·m (4.9 kgf-m, 35.4 ft-lb)



- 4) Install the rear exhaust pipe to center exhaust pipe.

Tightening torque:

18 N·m (1.8 kgf-m, 13.3 ft-lb)



- 5) Lower the vehicle.

C: INSPECTION

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

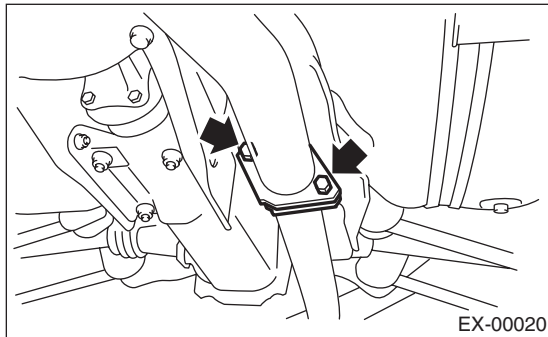
6. Muffler

A: REMOVAL

CAUTION:

Vehicle components are extremely hot after driving. Be wary of receiving burns from heated parts.

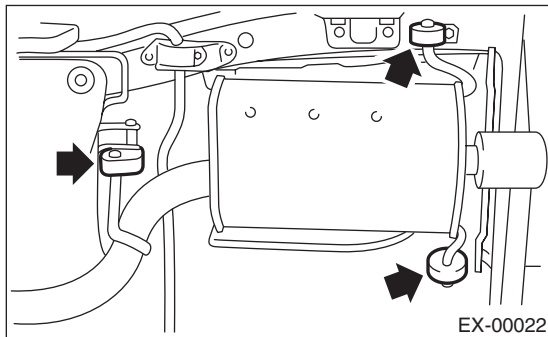
- 1) Set the vehicle on a lift.
- 2) Lift up the vehicle.
- 3) Separate the muffler from rear exhaust pipe.



- 4) Apply a coat of spray type lubricant to the mating area of cushion rubber.
- 5) Remove the cushion rubber, and detach the muffler.

CAUTION:

Be careful not to drop the muffler during removal.



B: INSTALLATION

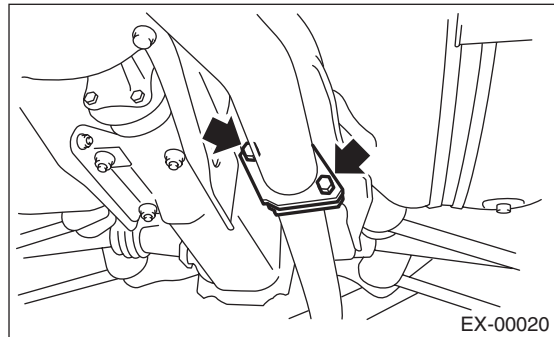
Install in the reverse order of removal.

NOTE:

- Use a new gasket and self-locking nut.
- When the lubricant was applied to the cushion rubber during the removal/installation, degrease it after reassembling.

Tightening torque:

48 N·m (4.9 kgf-m, 35.4 ft-lb)



C: INSPECTION

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

General Description

FUEL INJECTION (FUEL SYSTEMS)

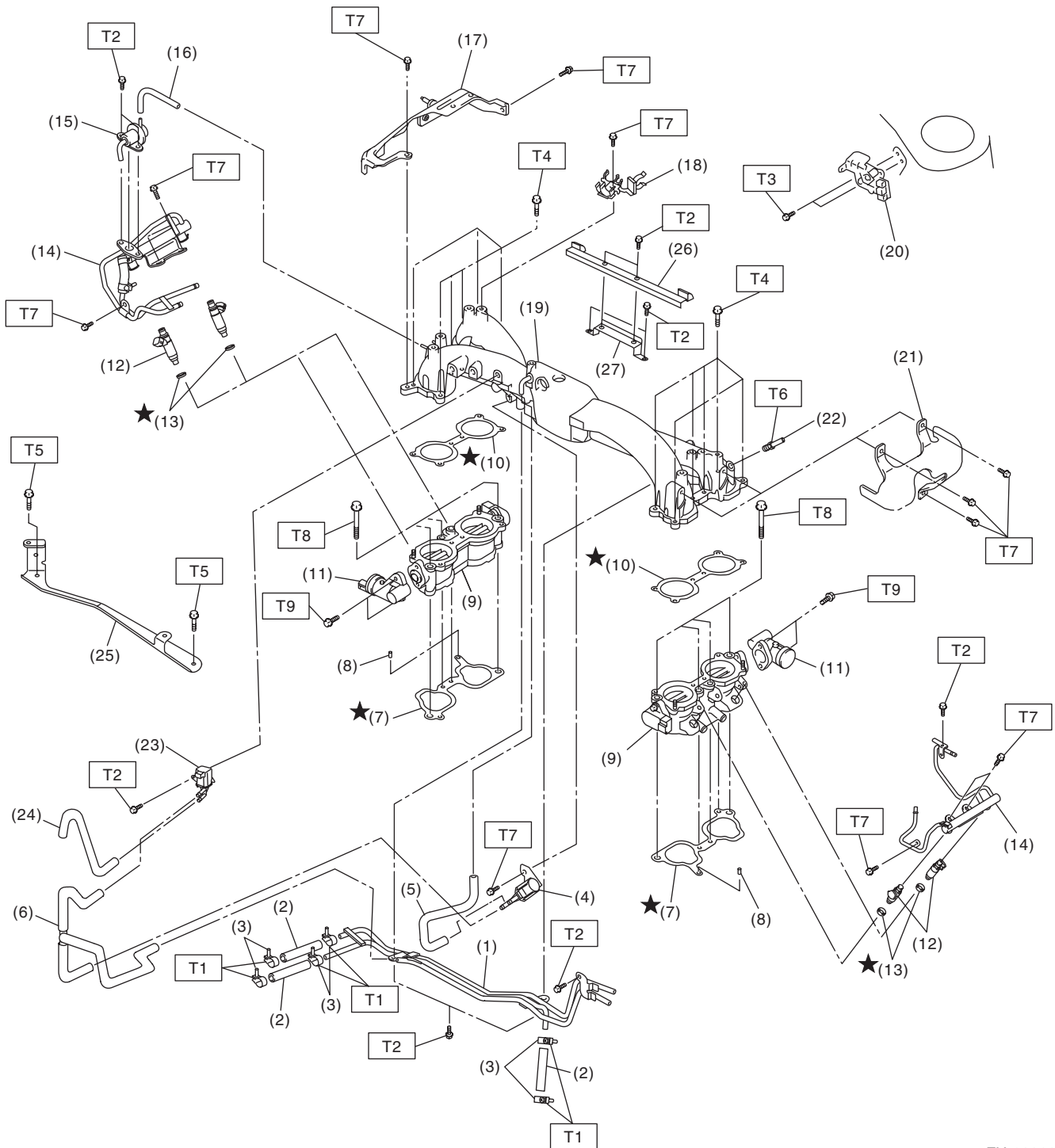
1. General Description

A: SPECIFICATION

Fuel tank	Capacity	60 ℓ (15.9 US gal, 13.2 Imp gal)
	Locations	Under rear seat
Fuel pump	Type	Impeller
	Shutoff discharge pressure	450 — 677 kPa (4.59 — 6.9 kg/cm ² , 65.27 — 98.2 psi)
	Discharge rate	145 ℓ (38.3 US gal, 31.9 Imp gal)/h or more [300 kPa, 12 V (3.06 kg/cm ² , 43.5 psi)]
Fuel filter		Intank type

B: COMPONENT

1. INTAKE MANIFOLD



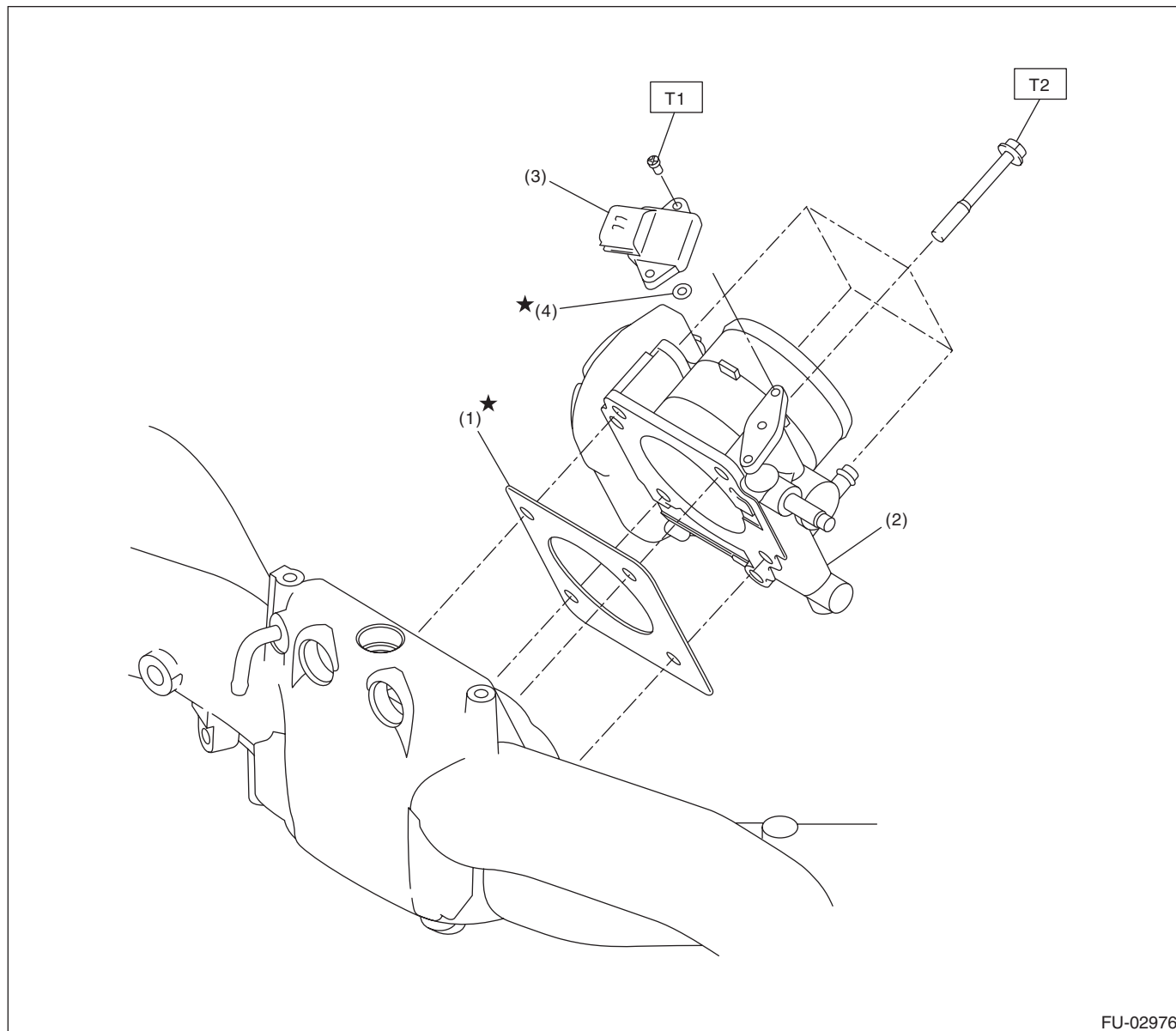
FU-03239

General Description

FUEL INJECTION (FUEL SYSTEMS)

(1) Fuel pipe ASSY	(14) Fuel injector pipe	(26) Collector cover bracket (Rear)
(2) Fuel hose	(15) Pressure regulator	(27) Collector cover bracket (Rear)
(3) Clamp	(16) Pressure regulator hose	
(4) Purge control solenoid valve 1	(17) Fuel pipe protector RH	<i>Tightening torque:N·m (kgf-m, ft-lb)</i>
(5) Vacuum hose A	(18) Blow-by hose stay	<i>T1: 1.25 (0.13, 0.94)</i>
(6) Vacuum control hose	(19) Intake manifold	<i>T2: 6.4 (0.65, 4.7)</i>
(7) Intake manifold gasket	(20) Wastegate control solenoid valve ASSY	<i>T3: 6.5 (0.66, 4.8)</i>
(8) Guide pin	(21) Fuel pipe protector LH	<i>T4: 8.25 (0.84, 6.1)</i>
(9) Tumble generator valve ASSY	(22) Nipple	<i>T5: 8.5 (0.87, 6.3)</i>
(10) Tumble generator valve gasket	(23) Purge control solenoid valve 2	<i>T6: 17 (1.7, 12.5)</i>
(11) Tumble generator valve actuator	(24) Vacuum hose B	<i>T7: 19 (1.9, 14.0)</i>
(12) Fuel injector	(25) Collector cover bracket (Front)	<i>T8: 25 (2.5, 18.4)</i>
(13) O-ring		<i>T9: 6 (0.6, 4.4)</i>

2. AIR INTAKE SYSTEM



- (1) Gasket
- (2) Throttle body

- (3) Manifold absolute pressure sensor
- (4) O-ring

Tightening torque: N·m (kgf-m, ft-lb)

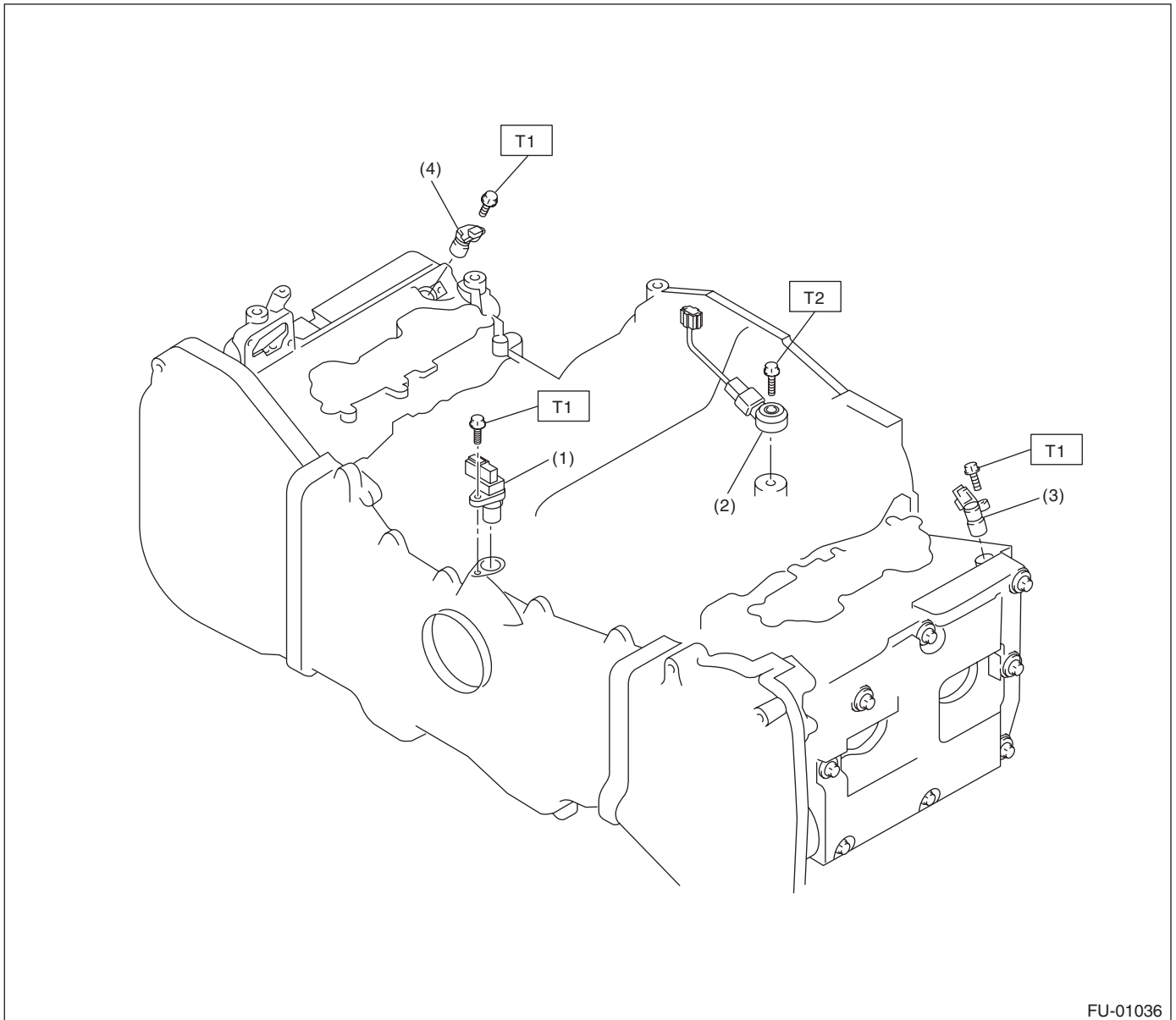
T1: 1.6 (0.16, 1.2)

T2: 8 (0.8, 5.9)

General Description

FUEL INJECTION (FUEL SYSTEMS)

3. CRANKSHAFT POSITION, CAMSHAFT POSITION AND KNOCK SENSORS



(1) Crankshaft position sensor

(2) Knock sensor

(3) Camshaft position sensor LH

(4) Camshaft position sensor RH

Tightening torque: N·m (kgf-m, ft-lb)

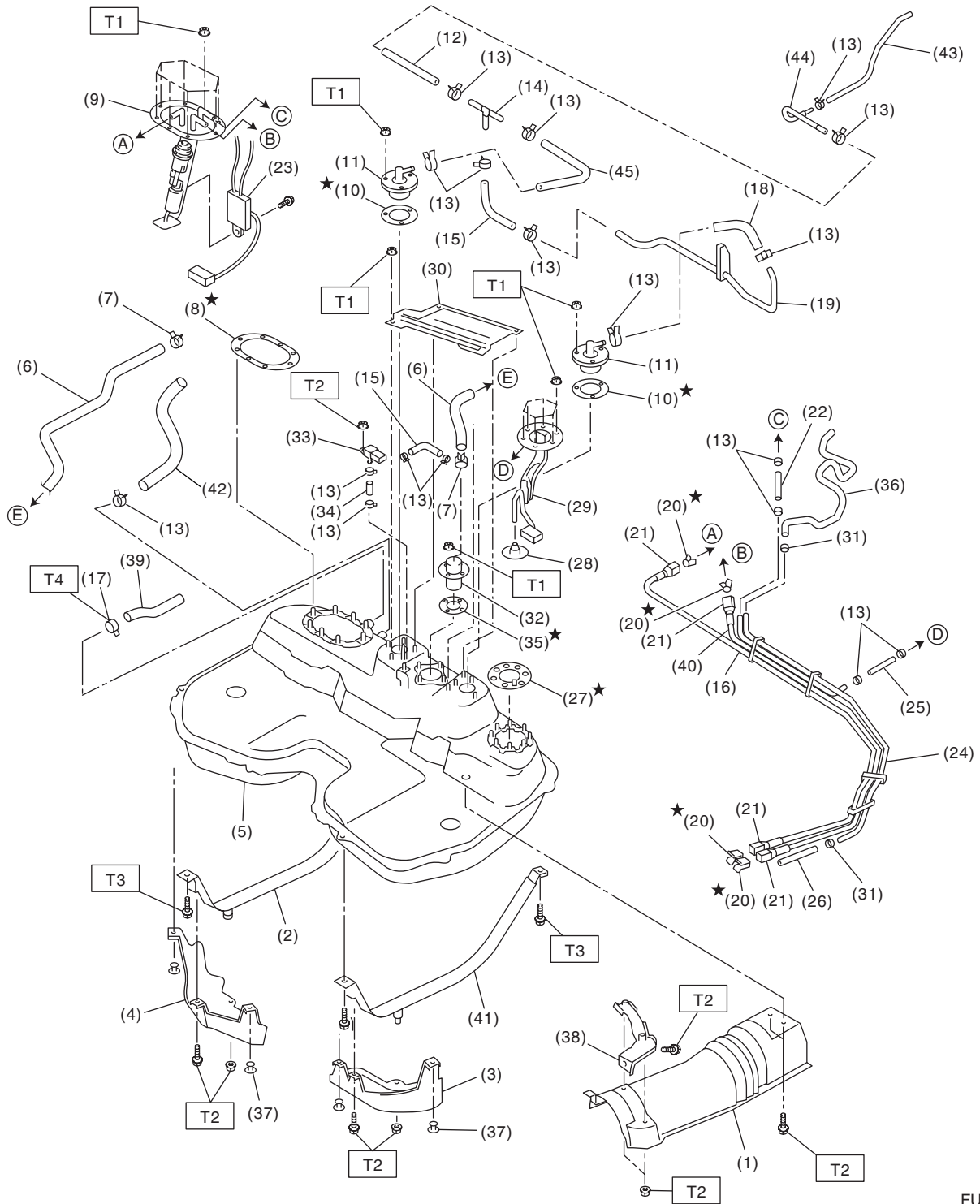
T1: 6.4 (0.65, 4.7)

T2: 24 (2.4, 17.7)

General Description

FUEL INJECTION (FUEL SYSTEMS)

4. FUEL TANK



FU-03240

General Description

FUEL INJECTION (FUEL SYSTEMS)

(1) Heat shield cover	(18) Evaporation hose C	(35) Vent valve gasket
(2) Fuel tank band	(19) Evaporation pipe ASSY	(36) Purge hose
(3) Protector LH	(20) Retainer	(37) Clip
(4) Protector RH	(21) Quick connector	(38) Cover bracket
(5) Fuel tank	(22) Jet pump hose A	(39) Filler hose
(6) Canister hose A	(23) Fuel level sensor	(40) Fuel return tube
(7) Clamp	(24) Fuel pipe ASSY	(41) Fuel tank band LH
(8) Fuel pump gasket	(25) Jet pump hose B	(42) Evaporation hose E
(9) Fuel pump ASSY	(26) Evaporation hose D	(43) Evaporation hose F
(10) Fuel cut valve gasket	(27) Fuel sub level sensor gasket	(44) Evaporation pipe
(11) Fuel cut valve	(28) Jet pump filter	(45) Evaporation hose G
(12) Evaporation hose A	(29) Fuel sub level sensor	
(13) Clip	(30) Protect cover	
(14) Joint pipe	(31) Clip	
(15) Evaporation hose B	(32) Vent valve	
(16) Fuel delivery tube	(33) Fuel tank pressure sensor	
(17) Clamp	(34) Fuel tank pressure sensor hose	

Tightening torque:N·m (kgf-m, ft-lb)

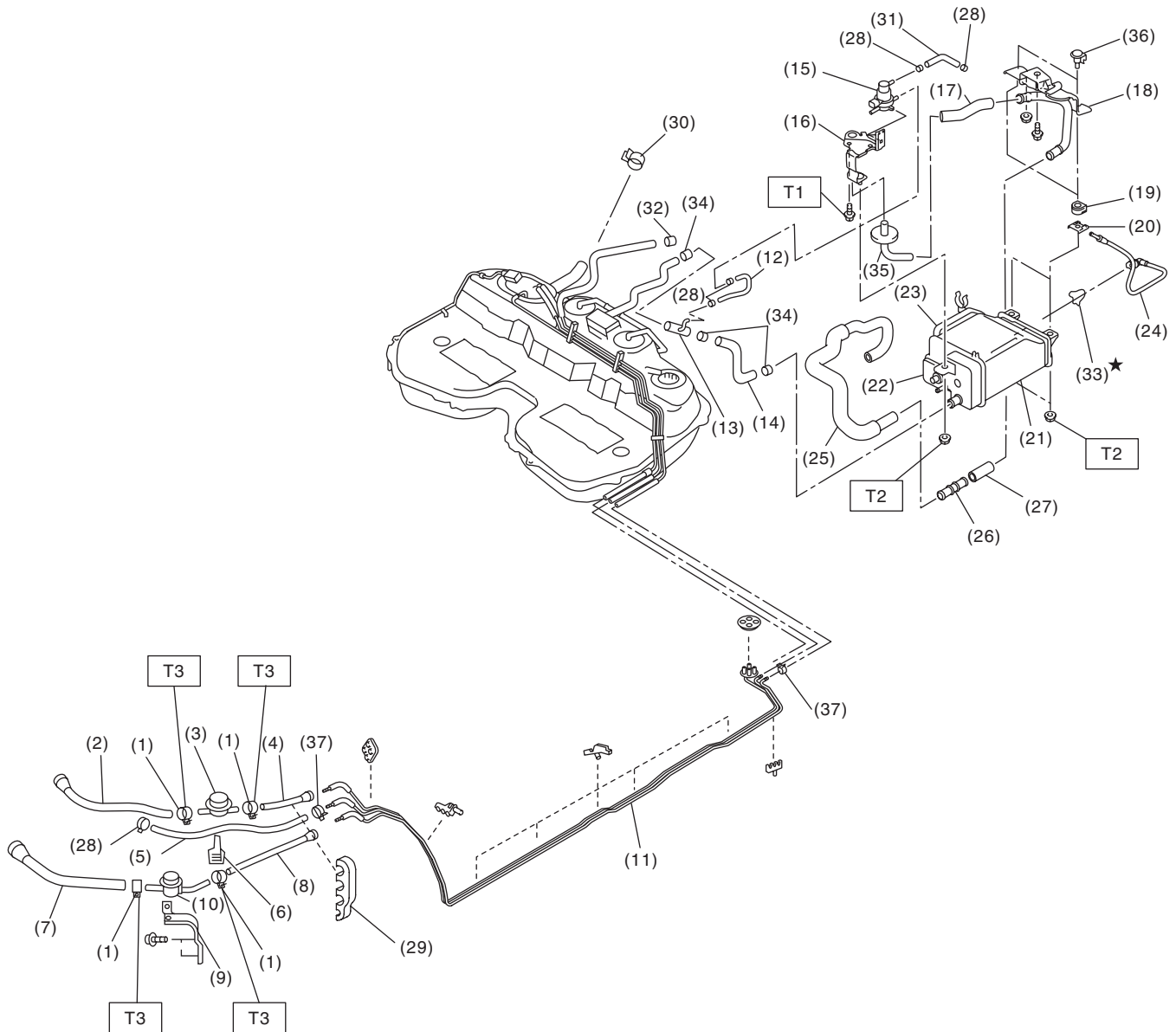
T1: 4.4 (0.45, 3.3)

T2: 7.4 (0.75, 5.4)

T3: 33 (3.4, 24.3)

T4: 1.96 (0.20, 1.45)

5. FUEL LINE



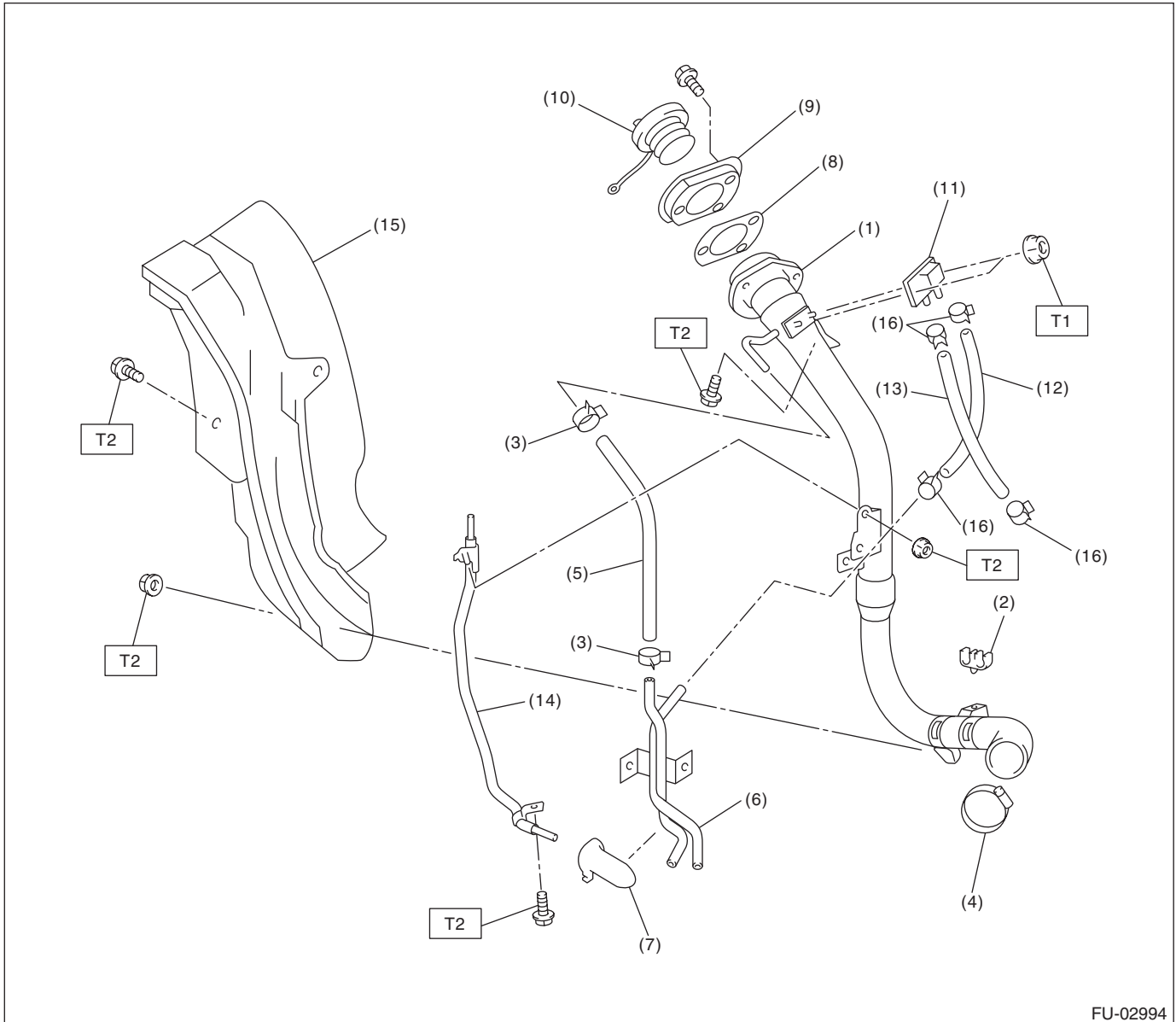
FU-02993

General Description

FUEL INJECTION (FUEL SYSTEMS)

(1) Clamp	(16) Pressure control solenoid valve bracket	(29) Clip
(2) Fuel return hose A	(17) Drain hose C	(30) Clamp
(3) Fuel damper valve (Return)	(18) Canister upper bracket	(31) Pressure control solenoid valve hose
(4) Fuel return hose B	(19) Cushion rubber	(32) Clamp
(5) Evaporation hose A	(20) Canister lower bracket	(33) Retainer
(6) Clip	(21) Canister	(34) Clamp
(7) Fuel delivery hose A	(22) Drain valve	(35) Drain pipe
(8) Fuel delivery hose B	(23) Drain filter	(36) Canister bracket spacer
(9) Fuel damper valve bracket	(24) Pressure control solenoid valve tube	(37) Clamp
(10) Fuel damper valve (Delivery)		
(11) Fuel pipe ASSY		
(12) Evaporation hose B	(25) Drain hose A	<i>Tightening torque:N·m (kgf-m, ft-lb)</i>
(13) Joint pipe	(26) Connector drain	<i>T1: 25 (2.5, 18.4)</i>
(14) Canister hose A	(27) Drain hose B	<i>T2: 23 (2.3, 17.0)</i>
(15) Pressure control solenoid valve	(28) Clip	<i>T3: 1.25 (0.13, 0.9)</i>

6. FUEL FILLER PIPE



FU-02994

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

Tightening torque: N·m (kgf-m, ft-lb)

T1: 4.4 (0.45, 3.3)

T2: 7.5 (0.76, 5.5)

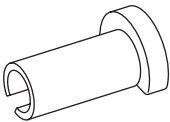
General Description

FUEL INJECTION (FUEL SYSTEMS)

C: CAUTION

- Wear appropriate work clothing, including a cap, protective goggles and protective shoes when performing any work.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Vehicle components are extremely hot after driving. Be wary of receiving burns from heated parts.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before disconnecting connectors of sensors or units, be sure to disconnect the ground cable from the battery.
- Place “NO FIRE” signs near the working area.
- Prepare a container and cloth to prevent scattering of fuels when performing work where fuels can be spilled. If the fuel spills, wipe it off immediately to prevent from penetrating into floor or flowing out for environmental protection.
- Follow all government and local regulations concerning disposal of refuse when disposing fuel.

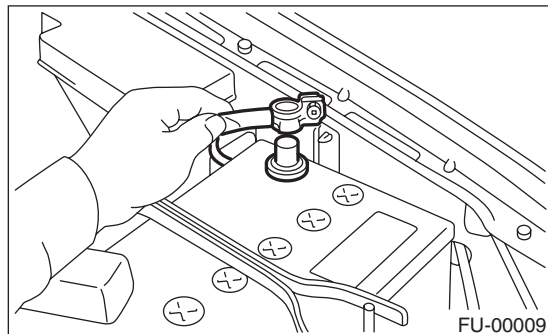
D: PREPARATION TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST42099AE000	42099AE000	CONNECTOR REMOVER	Removal of quick connector

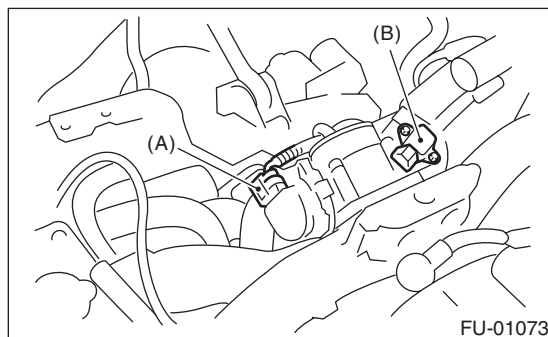
2. Throttle Body

A: REMOVAL

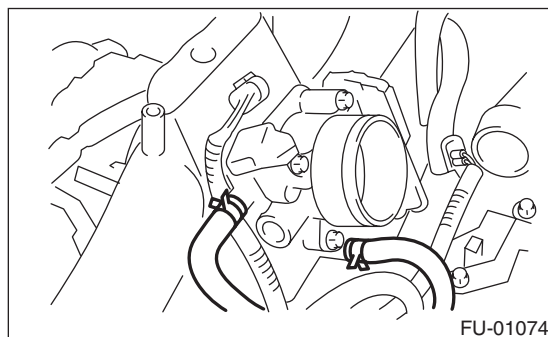
- 1) Disconnect the ground cable from the battery.



- 2) Remove the collector cover.
3) Remove the intercooler. <Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>
4) Disconnect the connector from the throttle position sensor (A), and the manifold pressure sensor (B).



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



- 6) Remove the bolts which install throttle body to the intake manifold, and then remove the throttle body.

B: INSTALLATION

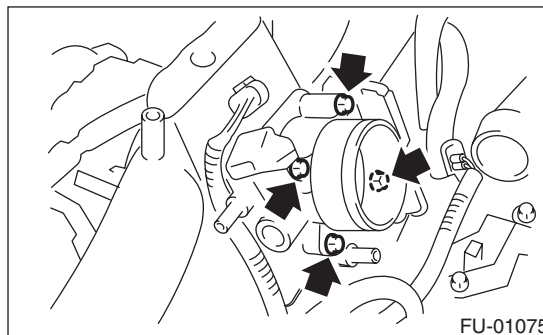
Install in the reverse order of removal.

NOTE:

Use a new gasket.

Tightening torque:

8 N·m (0.8 kgf-m, 5.9 ft-lb)



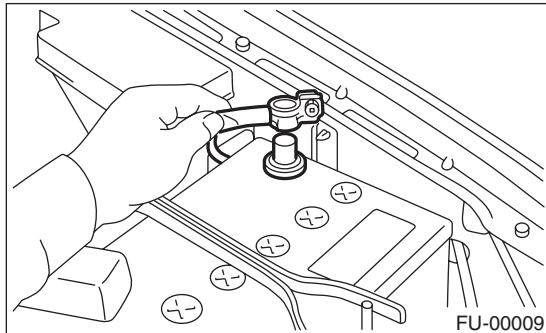
Intake Manifold

FUEL INJECTION (FUEL SYSTEMS)

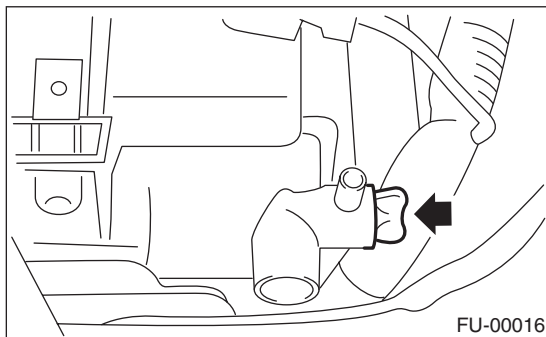
3. Intake Manifold

A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Release the fuel pressure. <Ref. to FU(H4DOTC)-51, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
- 3) Disconnect the ground cable from the battery.

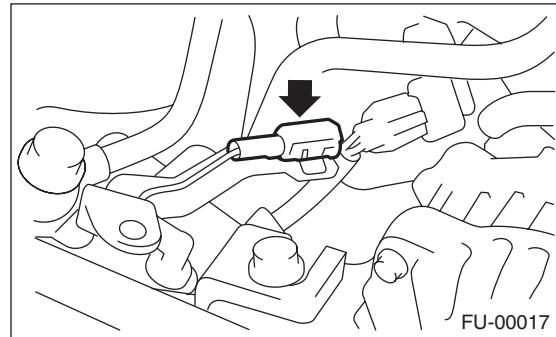


- 4) Open the fuel filler flap lid, and remove the fuel filler cap.
- 5) Remove the collector cover.
- 6) Lift up the vehicle.
- 7) Remove the under cover.
- 8) Drain the coolant about 3.0 ℓ (3.2 US qt, 2.6 Imp qt).



- 9) Remove the air cleaner upper cover and air intake boot. <Ref. to IN(H4DOTC)-8, REMOVAL, Air Cleaner Case.>
- 10) Remove the air cleaner element.
- 11) Remove the intercooler. <Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>
- 12) Remove the coolant filler tank. <Ref. to CO(H4SO)-40, REMOVAL, Coolant Filler Tank.>
- 13) Remove the power steering pump.
 - (1) Remove the front side belts. <Ref. to ME(H4DOTC)-39, FRONT SIDE BELT, REMOVAL, V-belt.>

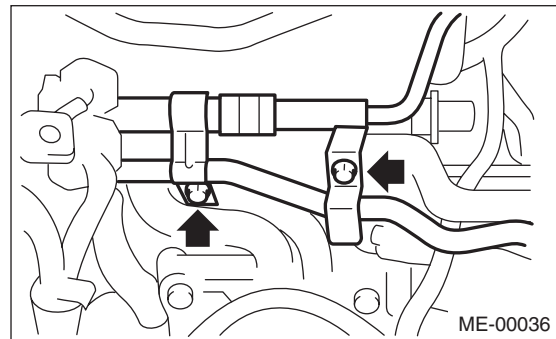
- (2) Disconnect the power steering switch connector.



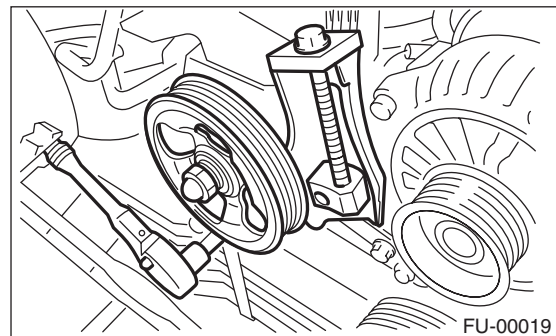
- (3) Remove the bolts which install the power steering pipe bracket to the intake manifold.

NOTE:

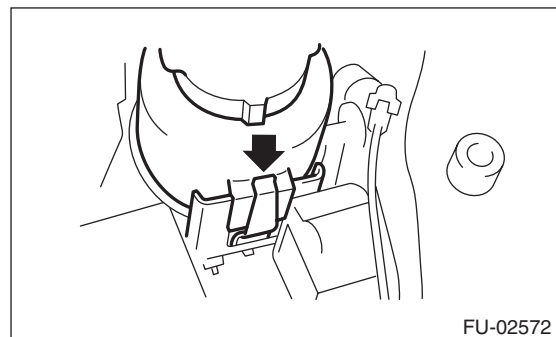
Do not disconnect the power steering hose.



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



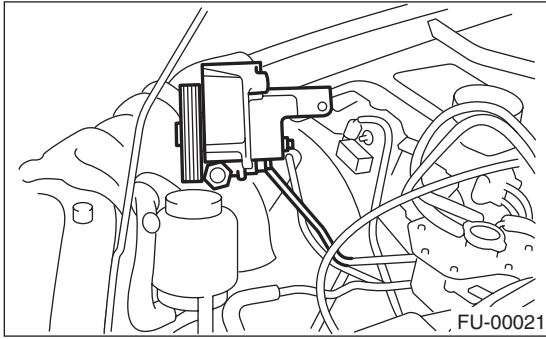
- (5) Remove the reservoir tank from the bracket by pulling it upward.



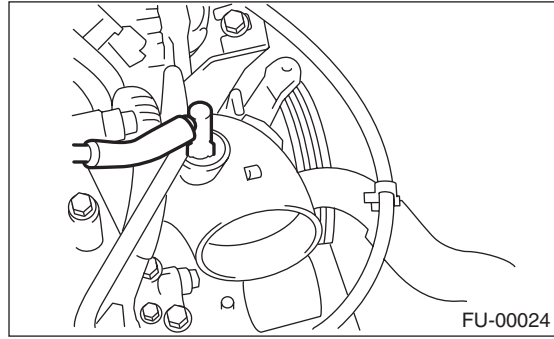
Intake Manifold

FUEL INJECTION (FUEL SYSTEMS)

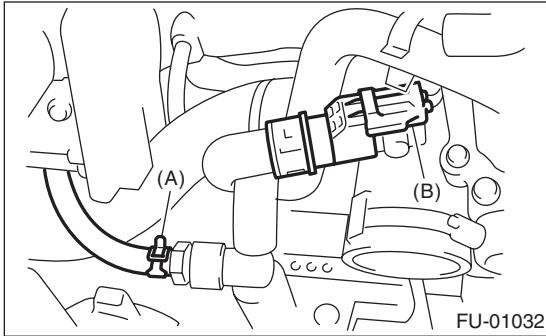
(6) Place the power steering pump on the right side wheel apron.



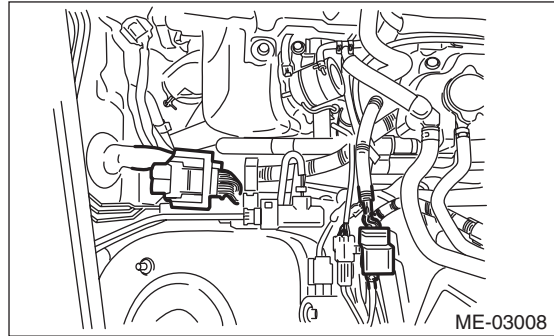
17) Disconnect the pressure hose from the intake duct.



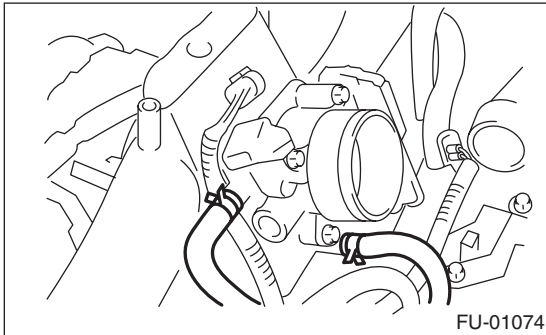
14) Disconnect the emission hose (A) and the connector (B) from the PCV hose assembly.



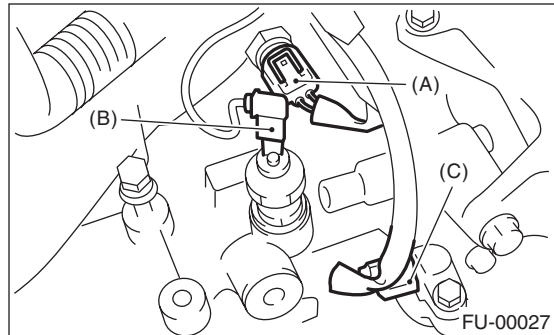
18) Disconnect the engine harness connectors from the bulk head harness connector.



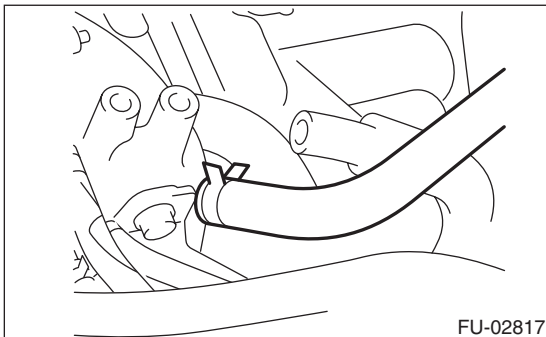
15) Disconnect the engine coolant hose from throttle body.



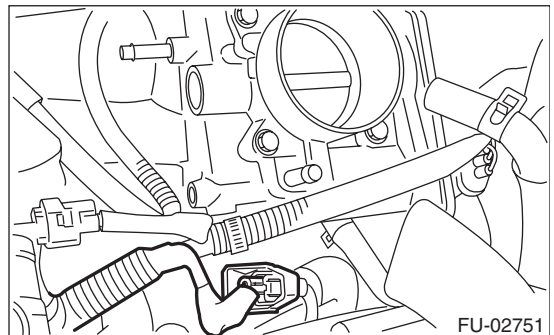
19) Disconnect the connectors from the engine coolant temperature sensor (A), oil pressure switch (B) and crankshaft position sensor (C).



16) Disconnect the brake booster hose.



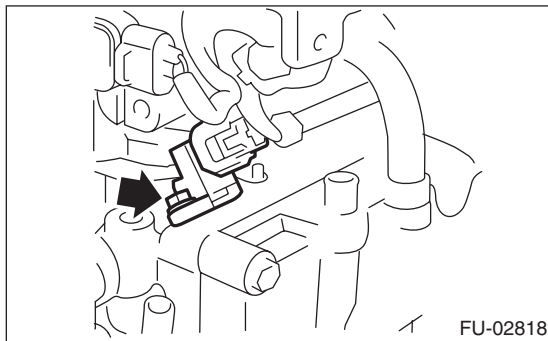
20) Disconnect the knock sensor connector.



Intake Manifold

FUEL INJECTION (FUEL SYSTEMS)

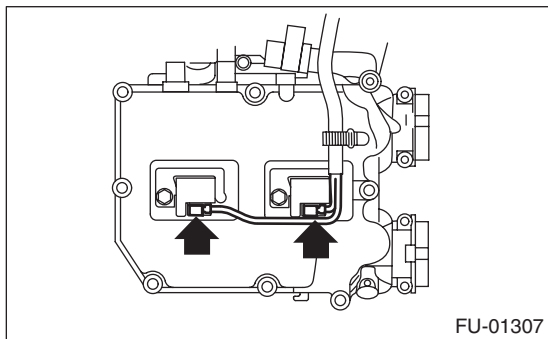
21) Disconnect the connector from camshaft position sensor.



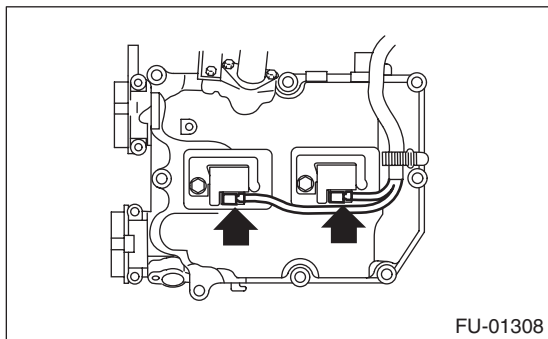
22) Disconnect the connector from the oil flow control solenoid valve.

23) Disconnect the connector from ignition coil.

- RH side

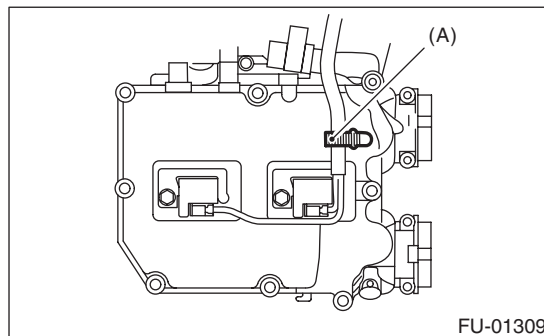


- LH side

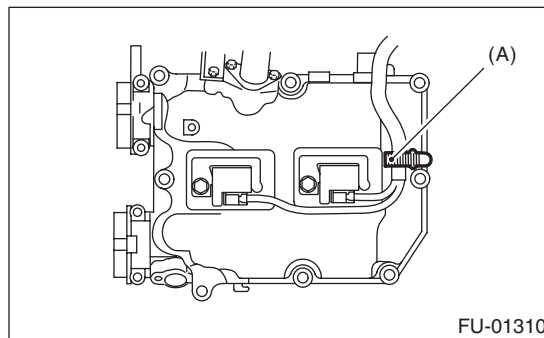


24) Disconnect the engine harness fixed by clip (A) from the bracket.

- RH side



- LH side

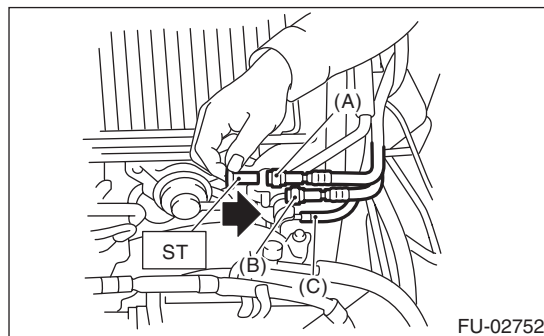


25) Using the ST, disconnect the fuel hose from each fuel pipe. <Ref. to FU(H4DOTC)-66, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>

CAUTION:

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

ST 42099AE000 CONNECTOR REMOVER

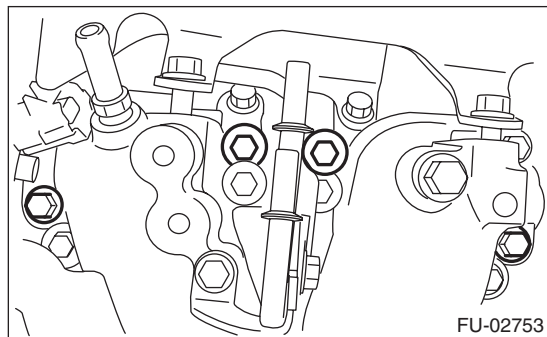


- (A) Fuel delivery hose
- (B) Return hose
- (C) Evaporation hose

Intake Manifold

FUEL INJECTION (FUEL SYSTEMS)

26) Remove the bolts which hold intake manifold onto the cylinder heads.



27) Remove the intake manifold.

B: INSTALLATION

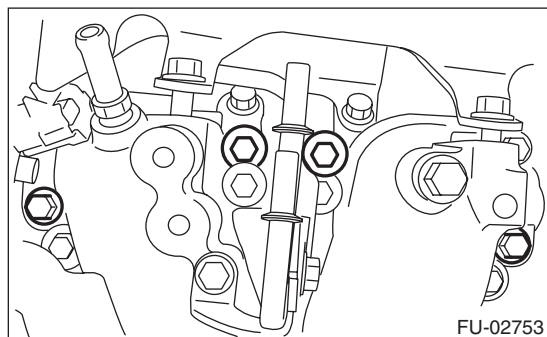
1) Install the intake manifold onto cylinder heads.

NOTE:

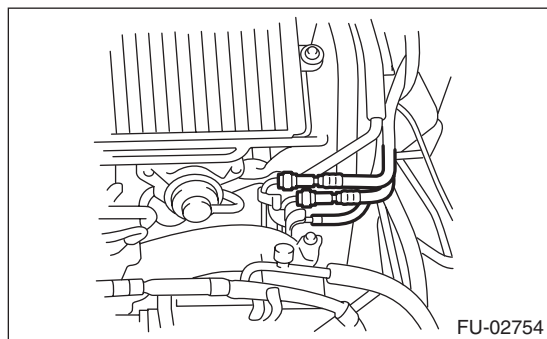
Use a new gasket.

Tightening torque:

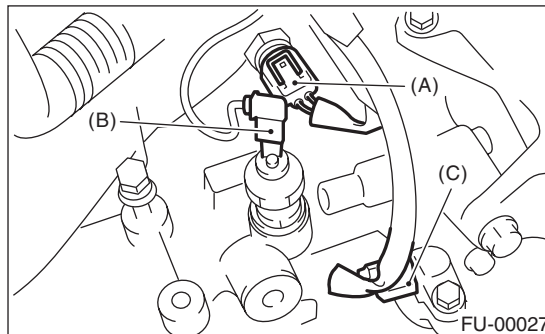
25 N·m (2.5 kgf-m, 18.4 ft-lb)



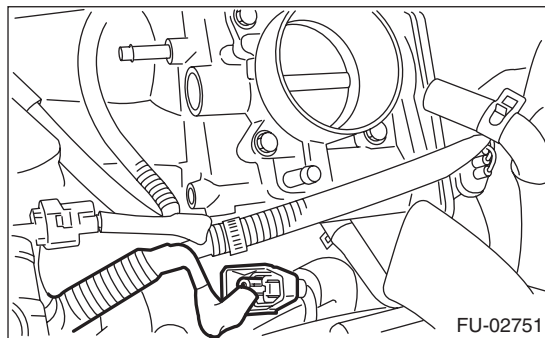
2) Connect the fuel delivery hose, return hose, and evaporation hose.



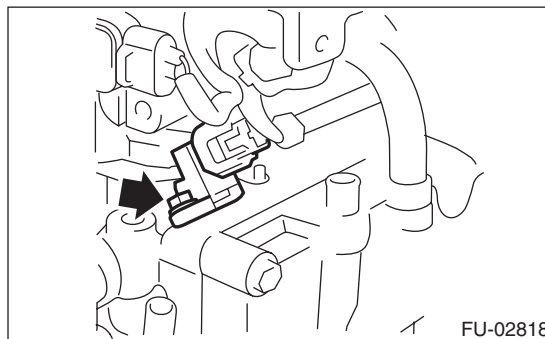
3) Connect the connector to the engine coolant temperature sensor (A), oil pressure switch (B) and crankshaft position sensor (C).



4) Connect the connector to the knock sensor.



5) Connect the connector to camshaft position sensor.



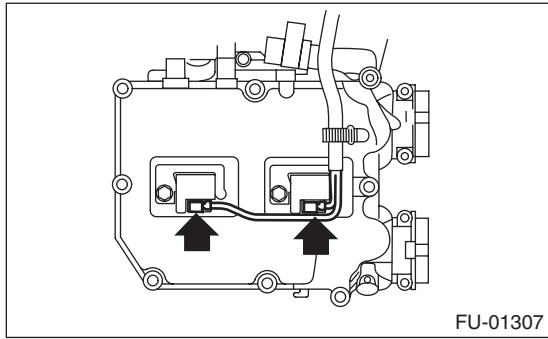
6) Connect the connector to oil flow control solenoid valve.

Intake Manifold

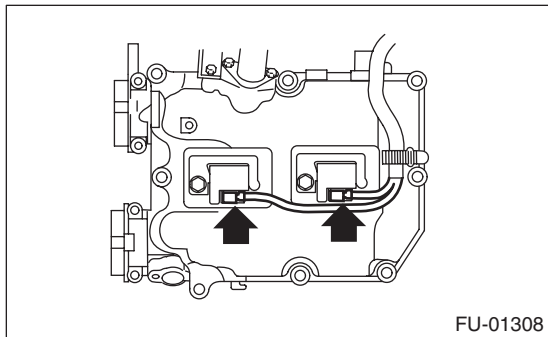
FUEL INJECTION (FUEL SYSTEMS)

7) Connect the connector to the ignition coil.

- RH side

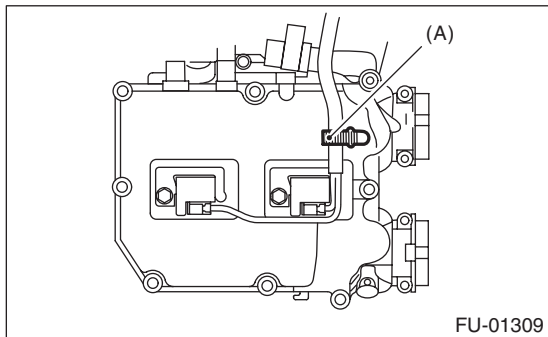


- LH side

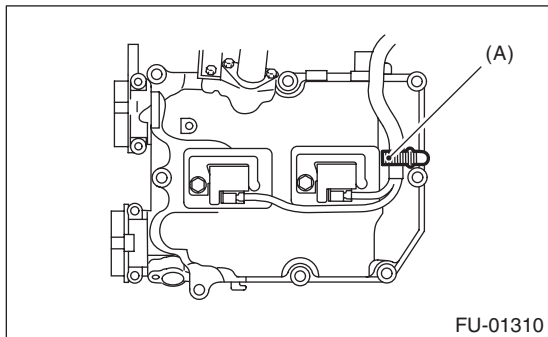


8) Connect the engine harness with clip (A) to the bracket.

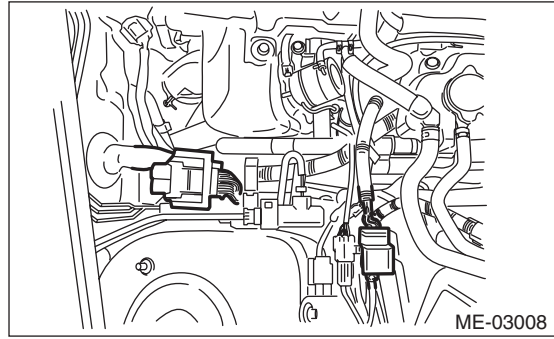
- RH side



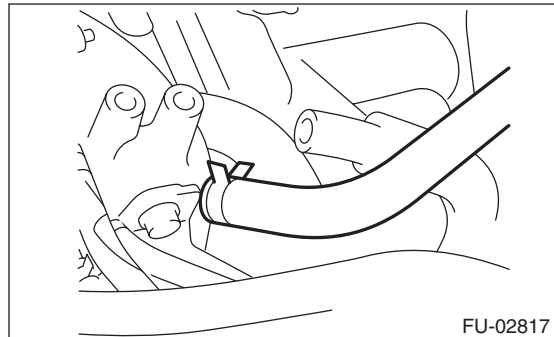
- LH side



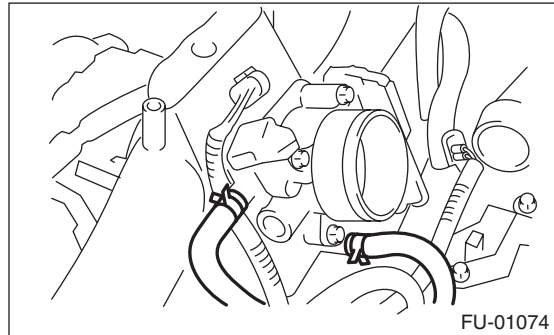
9) Connect the engine harness connectors to bulk-head harness connectors.



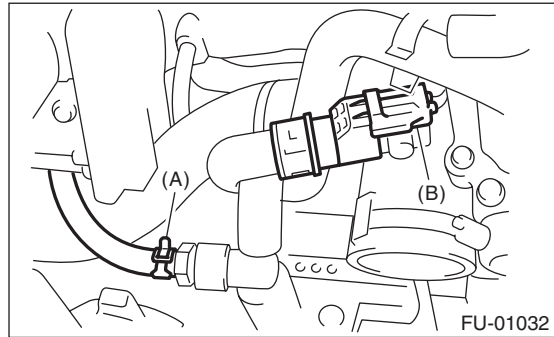
10) Connect the brake booster vacuum hose.



11) Connect the engine coolant hoses to throttle body.



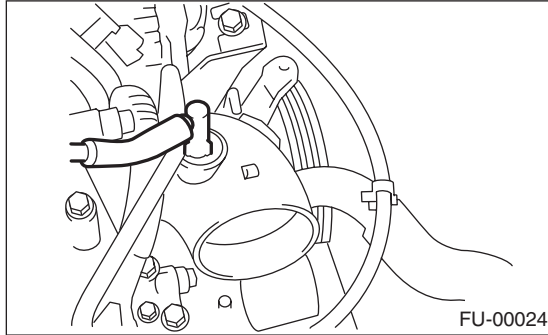
12) Connect the emission hose (A) and the connector (B) to the PCV hose assembly.



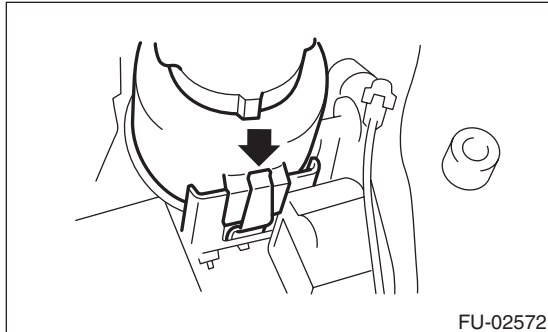
Intake Manifold

FUEL INJECTION (FUEL SYSTEMS)

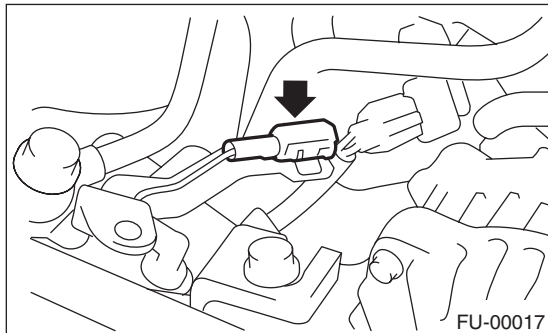
- 13) Connect the pressure hose to the intake duct.



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



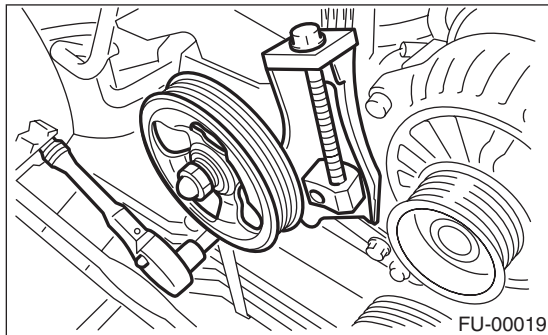
- (2) Connect the connector to the power steering pump switch.



- (3) Install the power steering pump, and tighten the bolts.

Tightening torque:

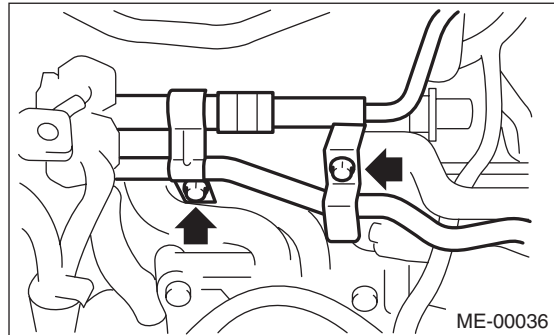
22 N·m (2.2 kgf-m, 16.2 ft-lb)



- (4) Install the power steering pipe bracket onto the right side intake manifold.

Tightening torque:

13 N·m (1.3 kgf-m, 9.6 ft-lb)



- (5) Install the front side belt. <Ref. to ME(H4DOTC)-39, FRONT SIDE BELT, INSTALLATION, V-belt.>

- 15) Install the coolant filler tank.

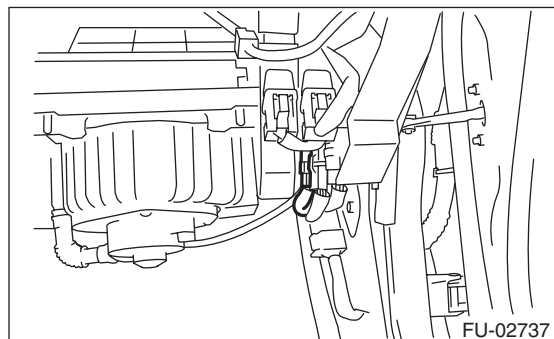
<Ref. to CO(H4SO)-40, INSTALLATION, Coolant Filler Tank.>

- 16) Install the intercooler. <Ref. to IN(H4DOTC)-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(H4DOTC)-8, INSTALLATION, Air Cleaner Case.>

- 19) Connect the connector to fuel pump relay.

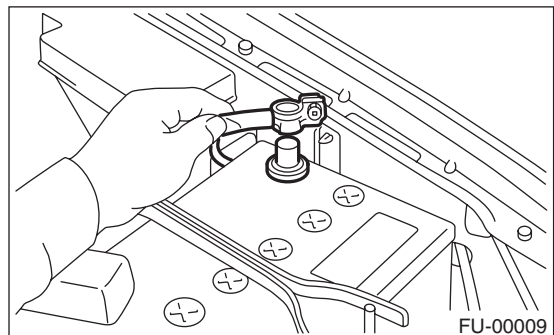


- 20) Install the passenger's side front side sill cover.

- 21) Install the glove box. <Ref. to EI-35, INSTALLATION, Glove Box.>

- 22) Install the collector cover.

- 23) Connect the ground cable to the battery.



- 24) Lift up the vehicle.

- 25) Install the under cover.

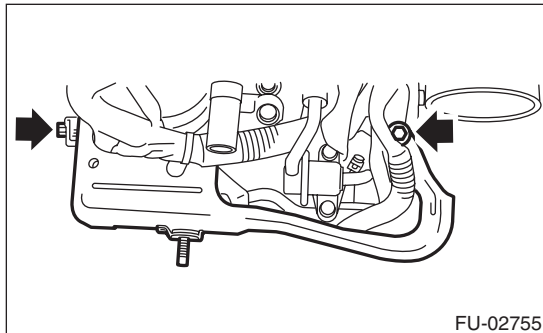
Intake Manifold

FUEL INJECTION (FUEL SYSTEMS)

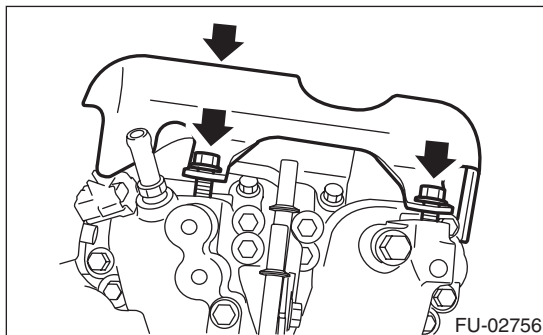
26) Fill engine coolant.
<Ref. to CO(H4SO)-17, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

C: DISASSEMBLY

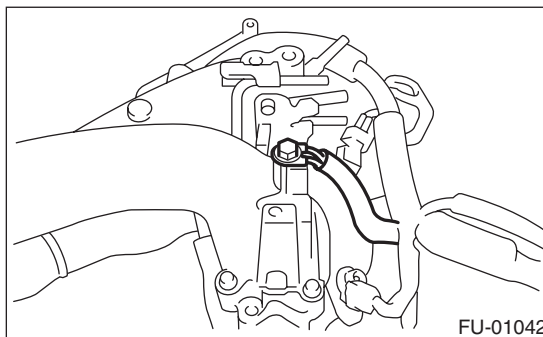
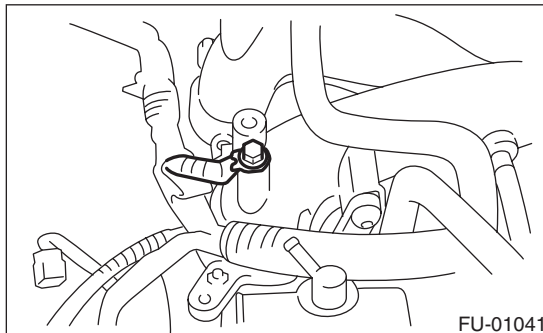
1) Remove the fuel pipe protector RH.



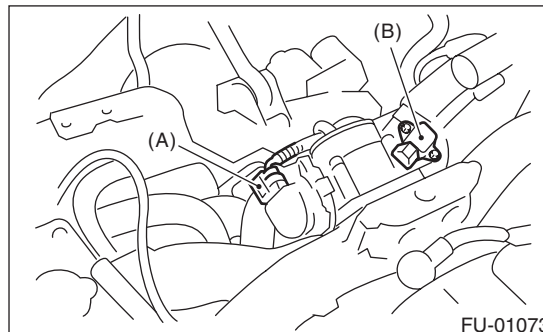
2) Remove the fuel pipe protector LH.



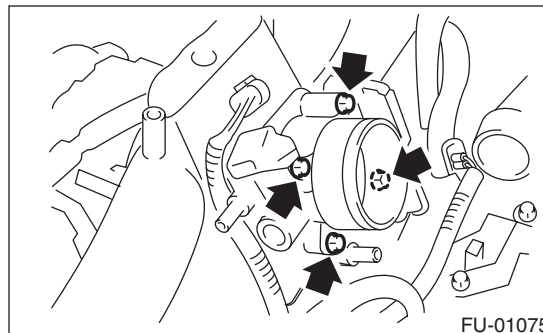
3) Remove the engine ground terminal from the intake manifold.



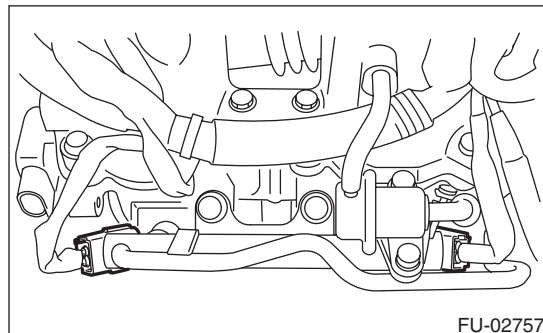
4) Disconnect the connector from the throttle position sensor (A), and the manifold pressure sensor (B).



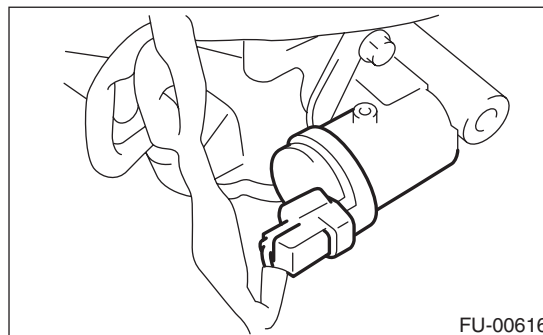
5) Remove the throttle body from intake manifold.



6) Disconnect the connector from fuel injector.



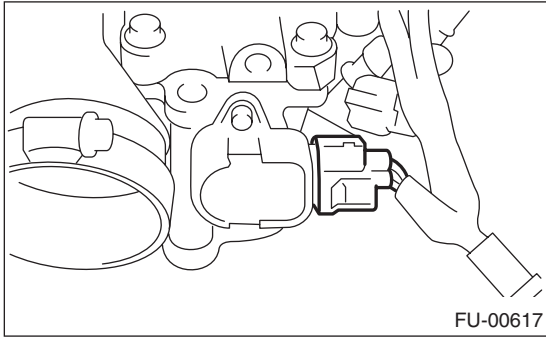
7) Disconnect the connector from tumble generator valve actuator.



Intake Manifold

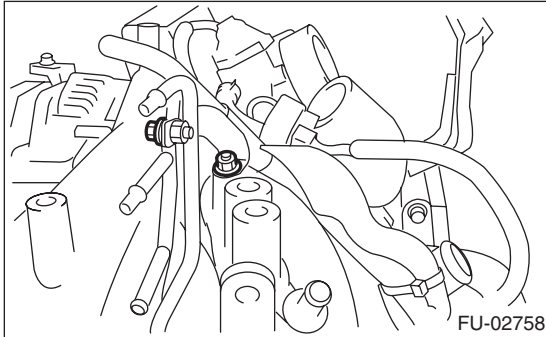
FUEL INJECTION (FUEL SYSTEMS)

8) Disconnect the connector from tumble generator valve sensor.



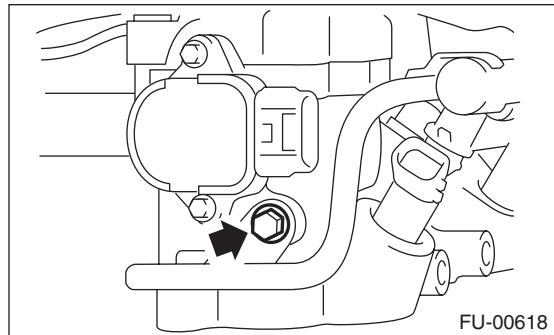
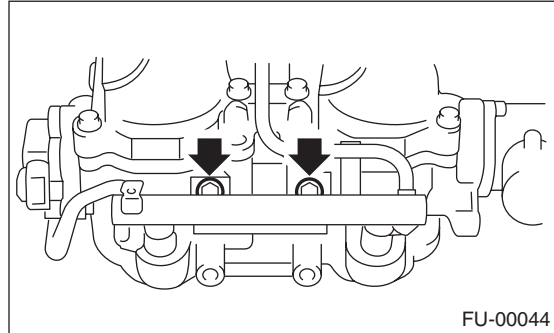
9) Remove the purge control solenoid valve. <Ref. to EC(H4DOTC)-8, REMOVAL, Purge Control Solenoid Valve.>

10) Remove the bolts which hold fuel pipes on the left side of intake manifold.

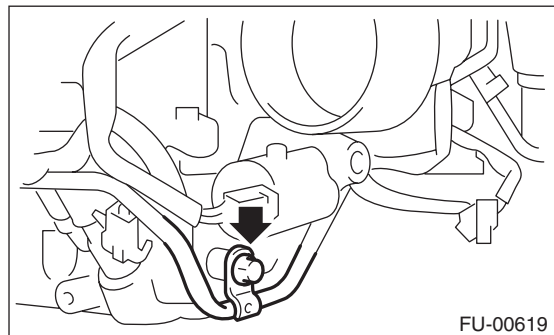
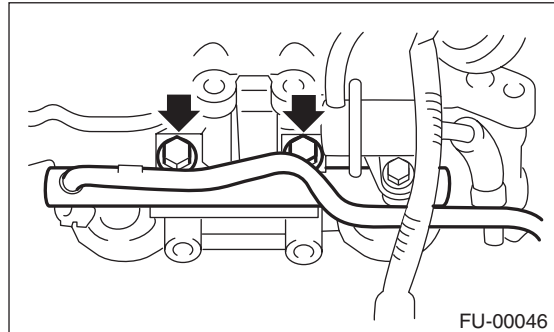


11) Remove the bolt which holds fuel injector pipe onto intake manifold.

• LH side



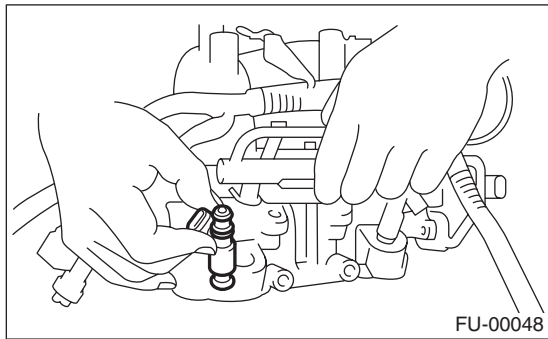
• RH side



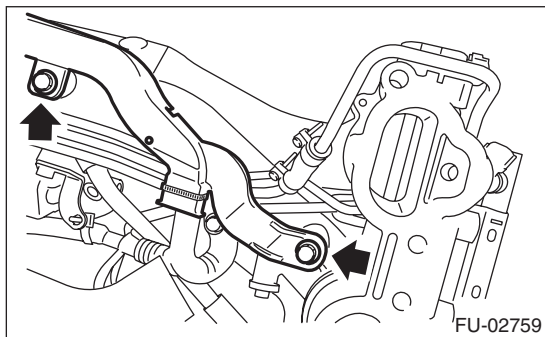
Intake Manifold

FUEL INJECTION (FUEL SYSTEMS)

12) Remove the fuel injector.

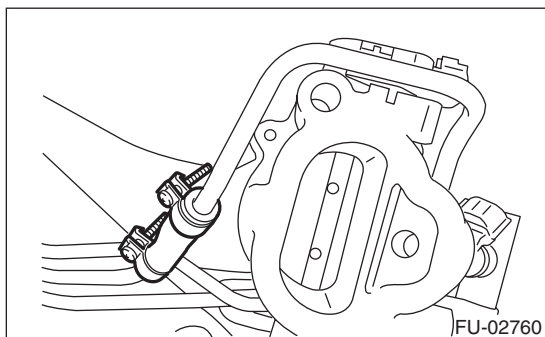


13) Remove the harness bracket which holds the engine harness onto intake manifold.

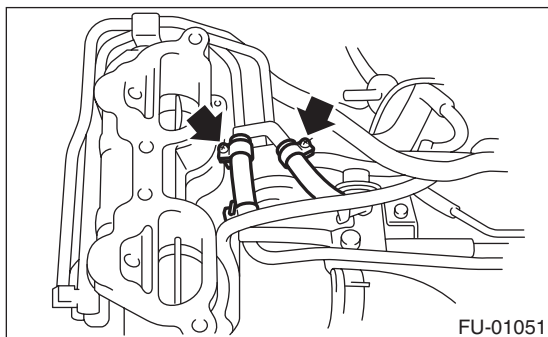


14) Remove the engine harness from intake manifold.

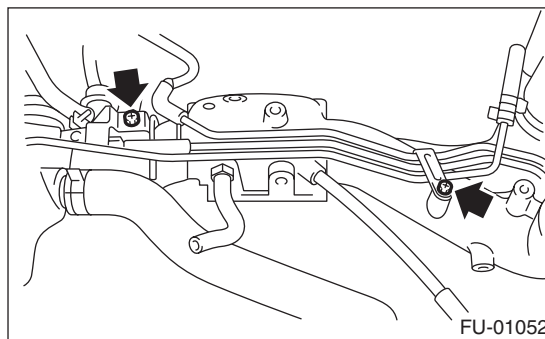
15) Loosen the clamp which holds the LH side fuel hose to fuel injector pipe to remove the fuel injector pipe LH.



16) Loosen the clamp which holds the RH side fuel hose to fuel injector pipe to remove the fuel injector pipe RH.

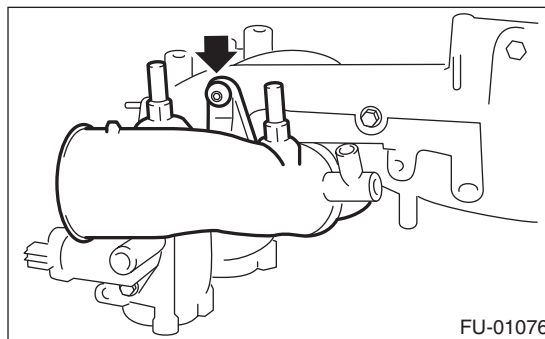


17) Remove the bolts which install fuel pipes on intake manifold.

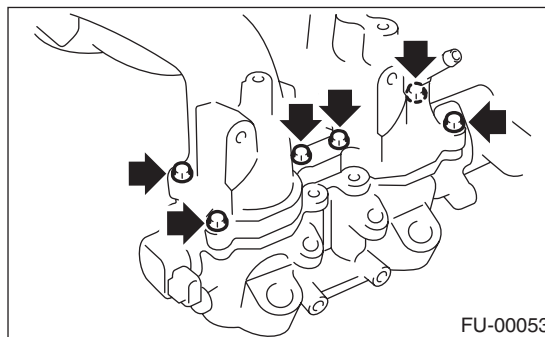


18) Remove the fuel pipe assembly and pressure regulator from intake manifold.

19) Remove the intake duct from intake manifold.



20) Remove the tumble generator assembly from intake manifold.



D: ASSEMBLY

1) Install the tumble generator valve assembly onto intake manifold.

NOTE:

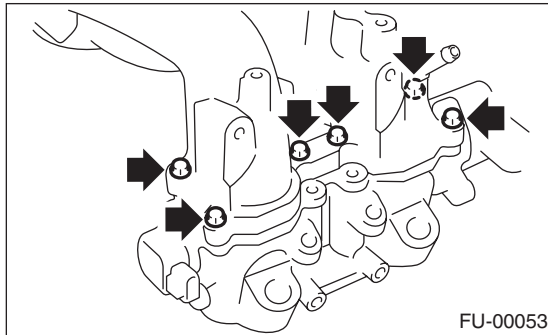
- Use a new gasket.
- When assembling the nipple, apply liquid gasket.

Liquid gasket:

THREE BOND 1105 (Part No. 004403010)

Tightening torque:

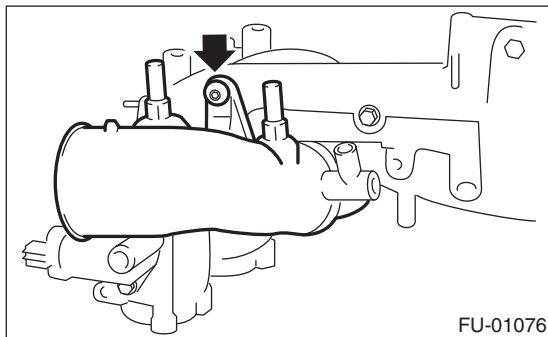
8.25 N·m (0.84 kgf-m, 6.1 ft-lb)



2) Install the air intake duct to the intake manifold.

Tightening torque:

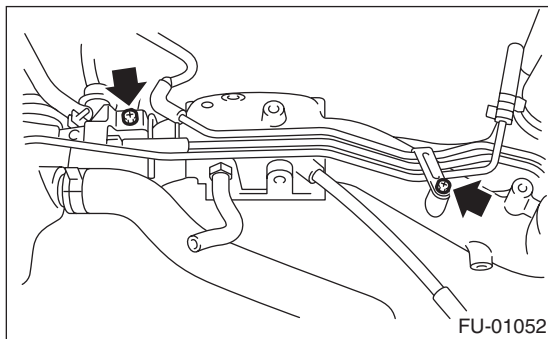
19 N·m (1.9 kgf-m, 14.0 ft-lb)



3) Install the fuel pipe assembly and pressure regulator to intake manifold.

Tightening torque:

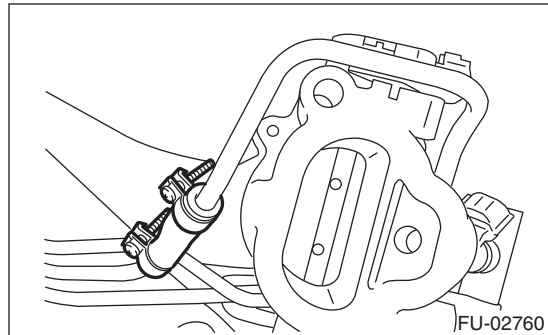
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



4) Connect the LH side fuel hose to the fuel injector pipe, and tighten the clamp screw.

Tightening torque:

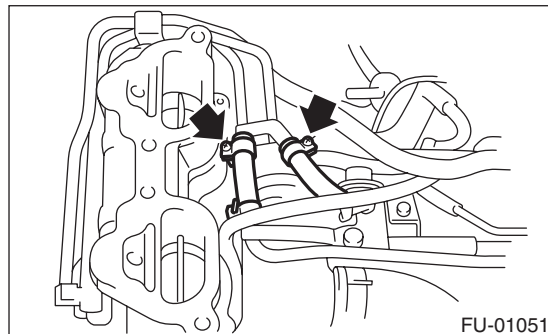
1.25 N·m (0.13 kgf-m, 0.94 ft-lb)



5) Connect the RH side fuel hose to the fuel injector pipe, and tighten the clamp screw.

Tightening torque:

1.25 N·m (0.13 kgf-m, 0.94 ft-lb)

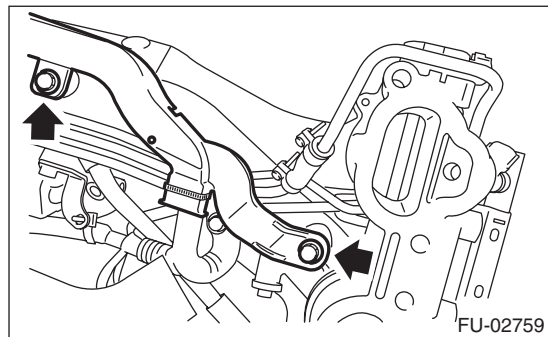


6) Install the engine harness onto intake manifold.

7) Install the harness bracket which holds the engine harness onto intake manifold.

Tightening torque:

19 N·m (1.9 kgf-m, 14.0 ft-lb)



Intake Manifold

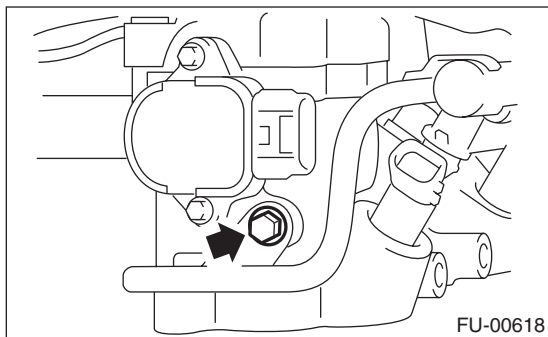
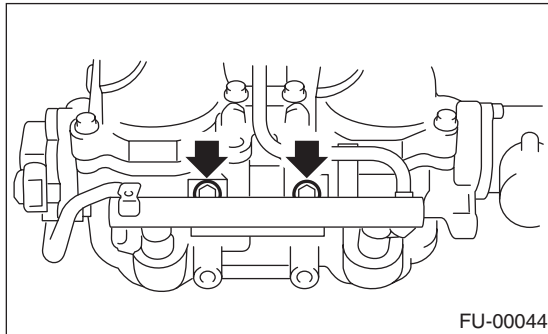
FUEL INJECTION (FUEL SYSTEMS)

8) Tighten the bolts which secure fuel injector pipe onto intake manifold.

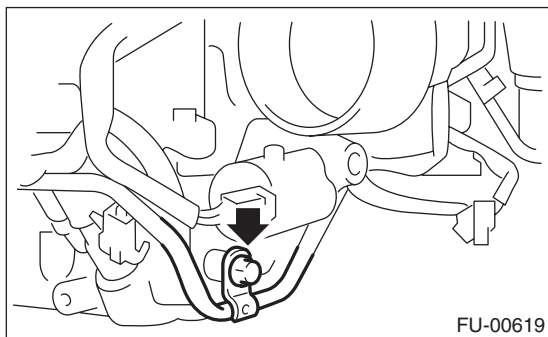
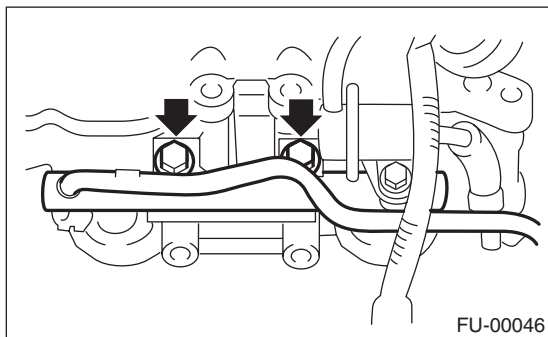
Tightening torque:

19 N·m (1.9 kgf-m, 14.0 ft-lb)

- LH side



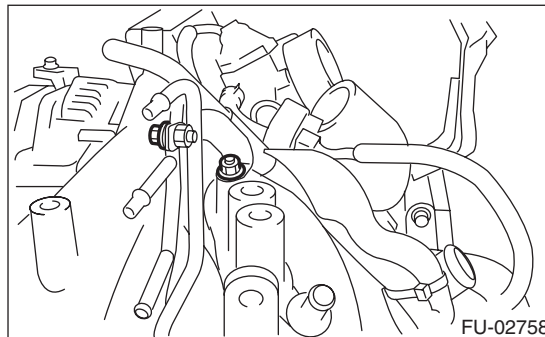
- RH side



9) Tighten the bolts which install the fuel pipe on the left side of intake manifold.

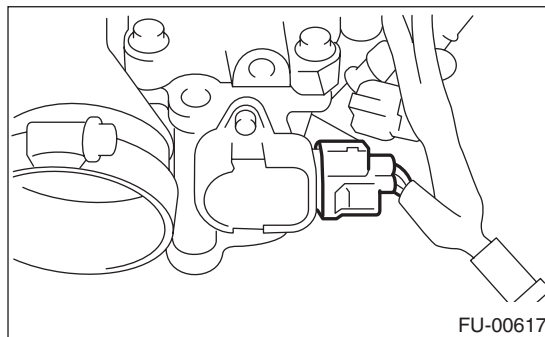
Tightening torque:

6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

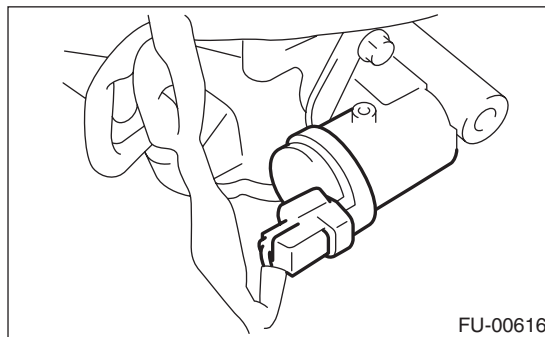


10) Install the purge control solenoid valve. <Ref. to EC(H4DOTC)-8, INSTALLATION, Purge Control Solenoid Valve.>

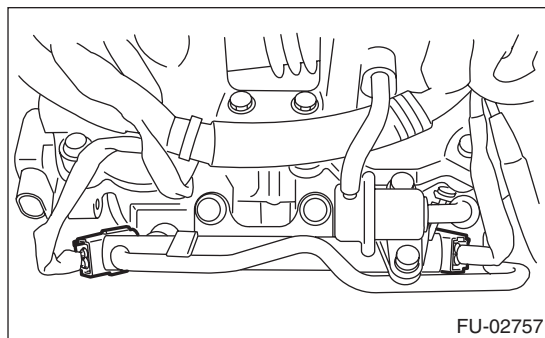
11) Connect the connector to the tumble generator valve sensor.



12) Connect the connector to the tumble generator valve actuator.



13) Connect the connector to the fuel injector.



Intake Manifold

FUEL INJECTION (FUEL SYSTEMS)

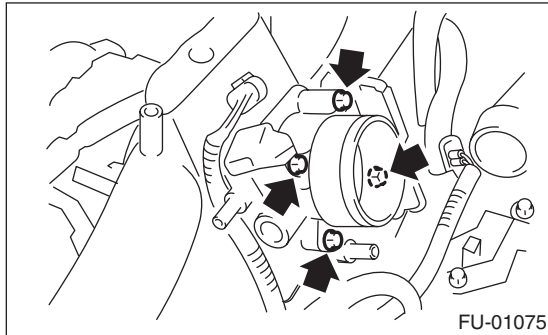
14) Install the throttle body to intake manifold.

NOTE:

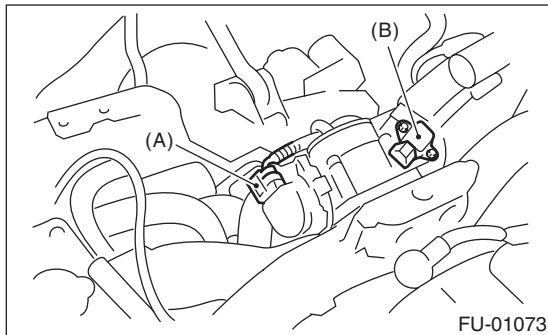
Use a new gasket.

Tightening torque:

8 N·m (0.8 kgf-m, 5.9 ft-lb)



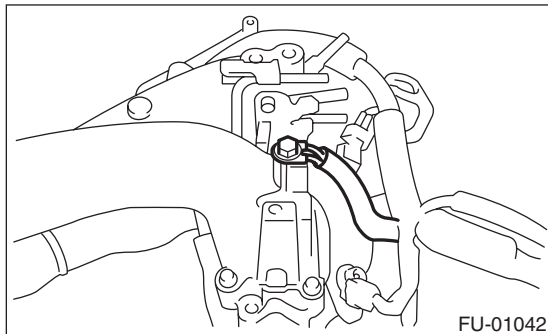
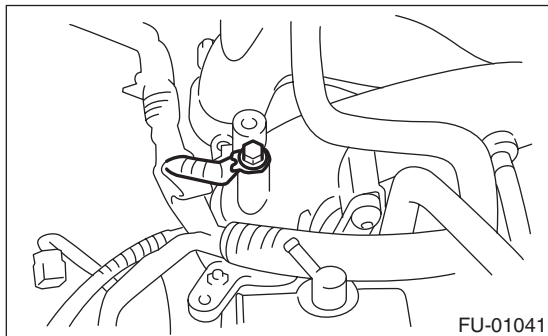
15) Connect the connector to the throttle position sensor (A), and the manifold pressure sensor (B).



16) Install the engine ground terminal to the intake manifold.

Tightening torque:

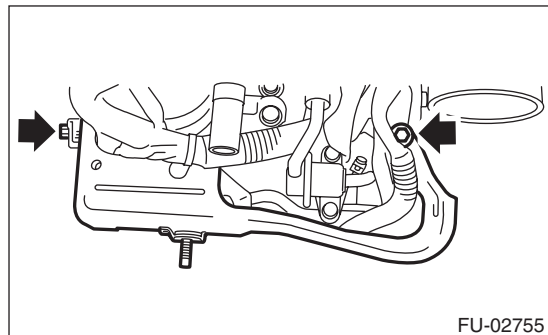
19 N·m (1.9 kgf-m, 14.0 ft-lb)



17) Install the fuel pipe protector RH.

Tightening torque:

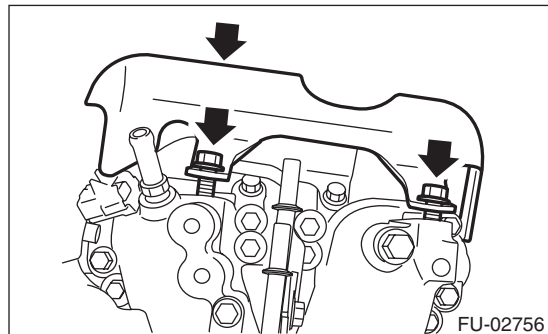
19 N·m (1.9 kgf-m, 14.0 ft-lb)



18) Install the fuel pipe protector LH.

Tightening torque:

19 N·m (1.9 kgf-m, 14.0 ft-lb)



E: INSPECTION

Make sure that the fuel pipe and fuel hose are not cracked and those connections are tight.

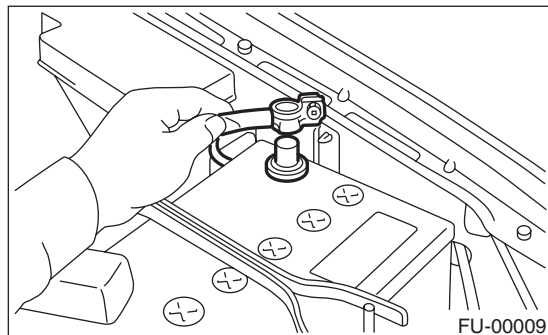
Engine Coolant Temperature Sensor

FUEL INJECTION (FUEL SYSTEMS)

4. Engine Coolant Temperature Sensor

A: REMOVAL

1) Disconnect the ground cable from the battery.

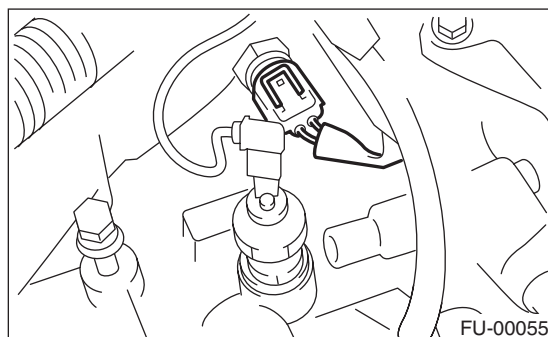


2) Remove the collector cover.

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

4) Drain the engine coolant. <Ref. to CO(H4SO)-17, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

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



6) Remove the engine coolant temperature sensor.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:

Use a new gasket.

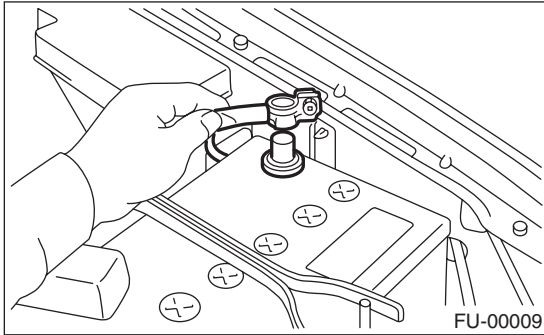
Tightening torque:

18 N·m (1.8 kgf-m, 13.3 ft-lb)

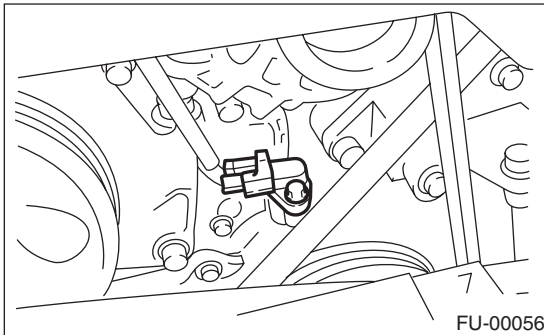
5. Crankshaft Position Sensor

A: REMOVAL

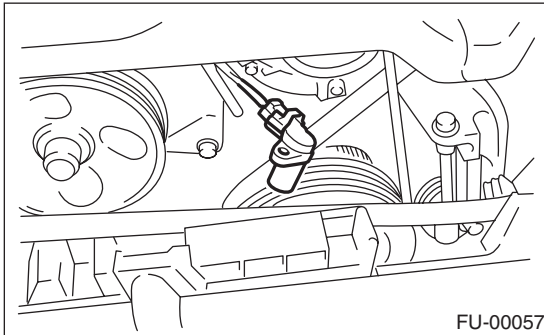
- 1) Disconnect the ground cable from the battery.



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



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

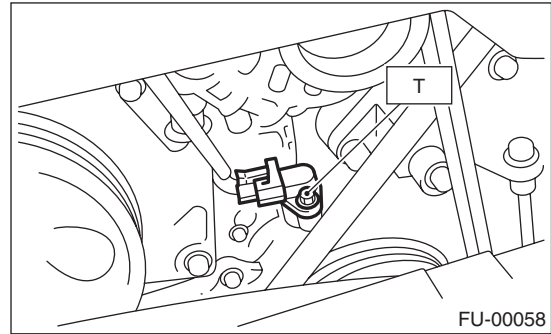


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

T: 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



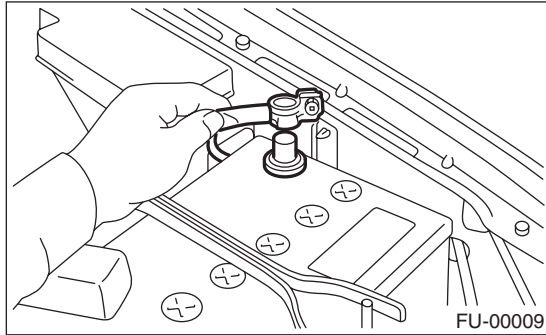
Camshaft Position Sensor

FUEL INJECTION (FUEL SYSTEMS)

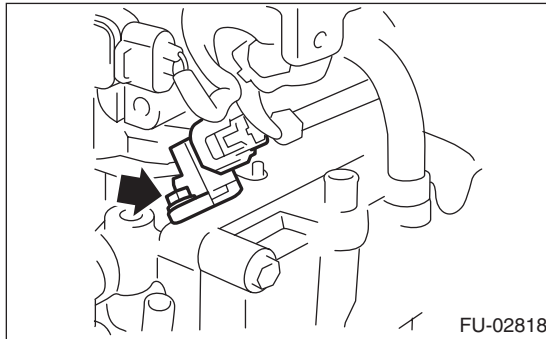
6. Camshaft Position Sensor

A: REMOVAL

- 1) Disconnect the ground cable from the battery.



- 2) Remove the collector cover.
- 3) Disconnect the connector from camshaft position sensor RH.
- 4) Remove the camshaft position sensor RH from the cylinder head rear.



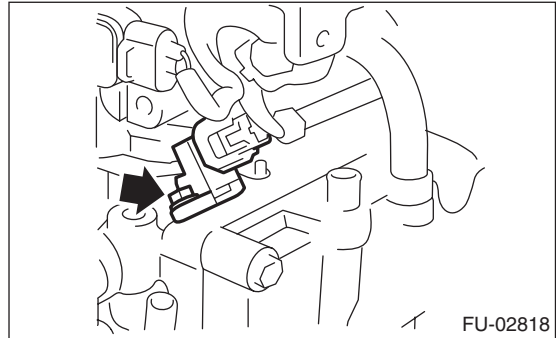
- 5) Remove the camshaft position sensor LH in the same way as RH.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

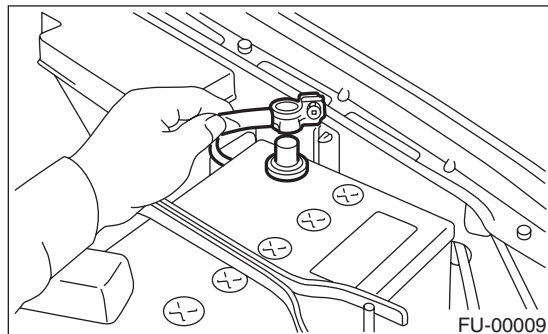
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



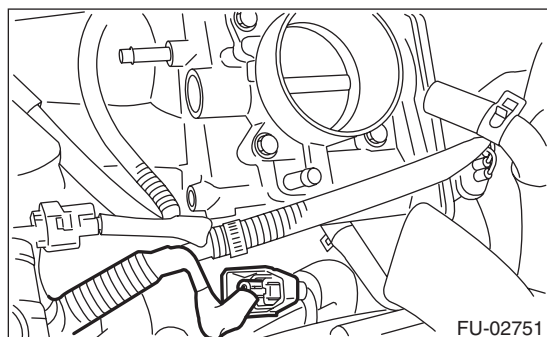
7. Knock Sensor

A: REMOVAL

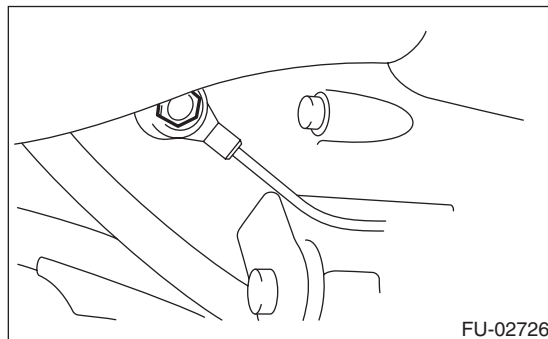
- 1) Disconnect the ground cable from the battery.



- 2) Remove the collector cover.
- 3) Remove the intercooler. <Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>
- 4) Disconnect the knock sensor connector.



- 5) Remove the knock sensor from the cylinder block.



B: INSTALLATION

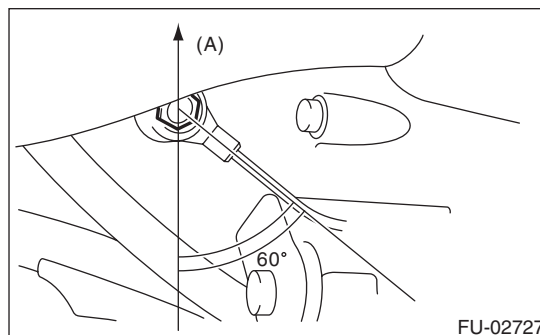
- 1) Install the knock sensor to the cylinder block.

Tightening torque:

24 N·m (2.4 kgf-m, 17.7 ft-lb)

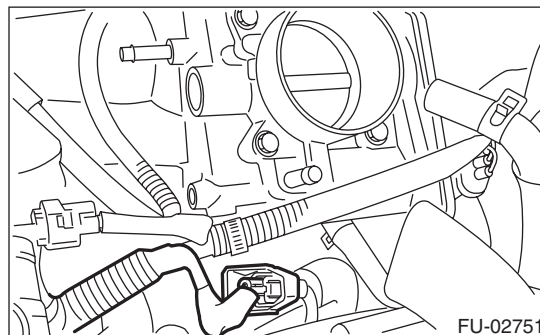
NOTE:

The portion of the knock sensor cord that is pulled out must be positioned at a 60° angle relative to the engine rear.

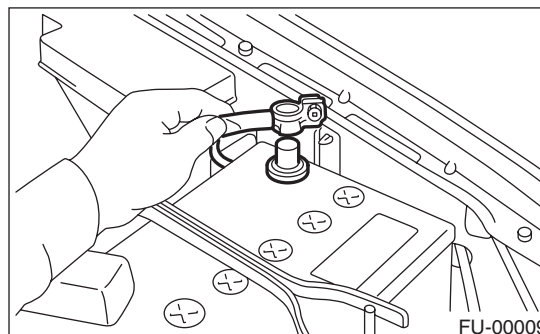


(A) Front side

- 2) Connect the knock sensor connector.



- 3) Install the intercooler.
<Ref. to IN(H4DOTC)-11, INSTALLATION, Intercooler.>
- 4) Install the collector cover.
- 5) Connect the ground cable to the battery.



8. Throttle Position Sensor

A: SPECIFICATION

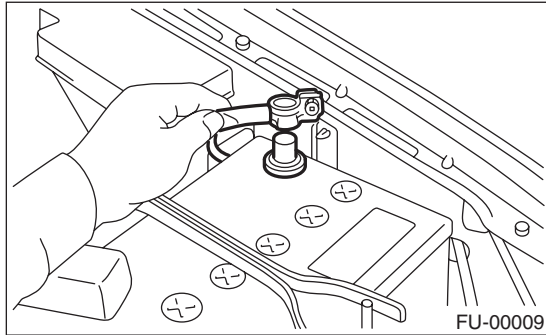
Throttle body is a non-disassembled part, so do not remove the throttle position sensor from throttle body.

Refer to “Throttle Body” for removal and installation procedures. <Ref. to FU(H4DOTC)-13, REMOVAL, Throttle Body.> <Ref. to FU(H4DOTC)-13, INSTALLATION, Throttle Body.>

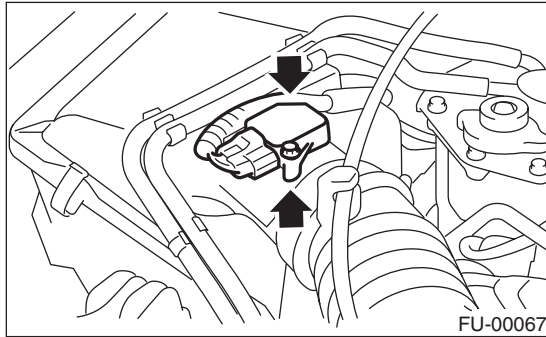
9. Mass Air Flow and Intake Air Temperature Sensor

A: REMOVAL

- 1) Disconnect the ground cable from the battery.



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



B: INSTALLATION

Install in the reverse order of removal.

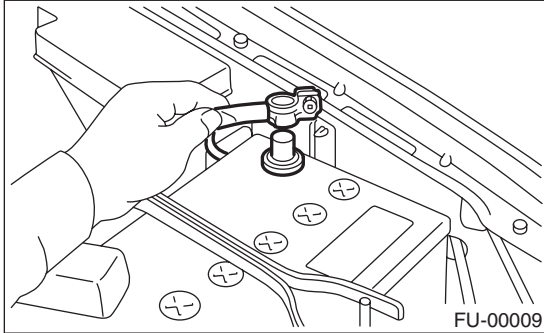
Tightening torque:

1 N·m (0.1 kgf-m, 0.7 ft-lb)

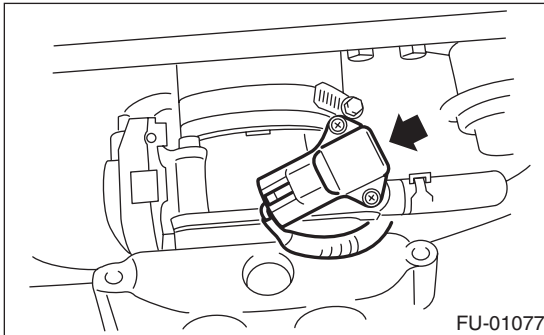
10. Manifold Absolute Pressure Sensor

A: REMOVAL

- 1) Disconnect the ground cable from the battery.



- 2) Remove the collector cover.
- 3) Disconnect the connector from manifold absolute pressure sensor.



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

B: INSTALLATION

Install in the reverse order of removal.

NOTE:

Use new O-rings.

Tightening torque:

1.6 N·m (0.16 kgf-m, 1.2 ft-lb)

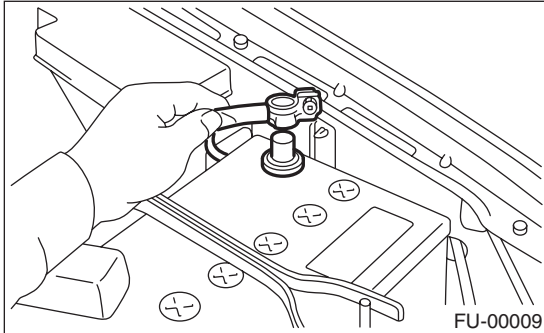
11. Fuel Injector

A: REMOVAL

1. RH SIDE

1) Release the fuel pressure. <Ref. to FU(H4DOTC)-51, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>

2) Disconnect the ground cable from the battery.



3) Open the fuel filler flap lid, and remove the fuel filler cap.

4) Remove the collector cover.

5) Remove the air cleaner upper cover and air intake boot. <Ref. to IN(H4DOTC)-8, REMOVAL, Air Cleaner Case.>

6) Remove the air cleaner element.

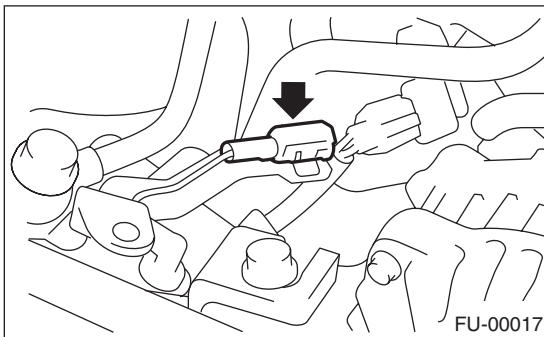
7) Remove the coolant filler tank.

<Ref. to CO(H4SO)-40, REMOVAL, Coolant Filler Tank.>

8) Remove the power steering pump.

(1) Remove the front side belts. <Ref. to ME(H4DOTC)-39, FRONT SIDE BELT, REMOVAL, V-belt.>

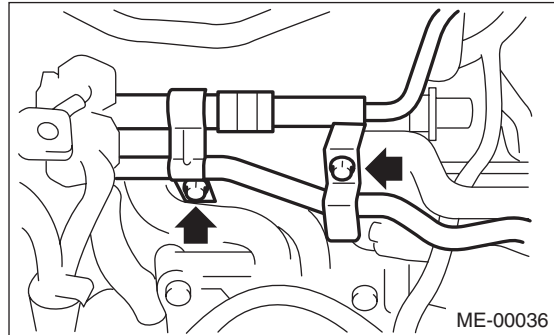
(2) Disconnect the power steering switch connector.



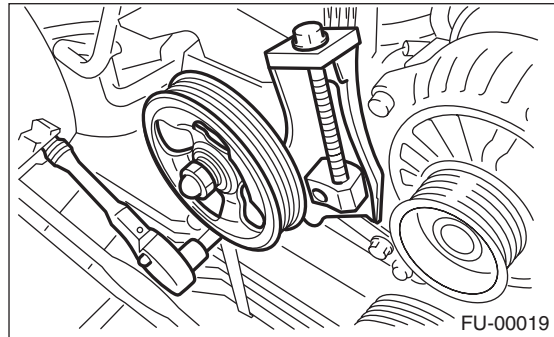
(3) Remove the bolts which install the power steering pipe bracket to the intake manifold.

NOTE:

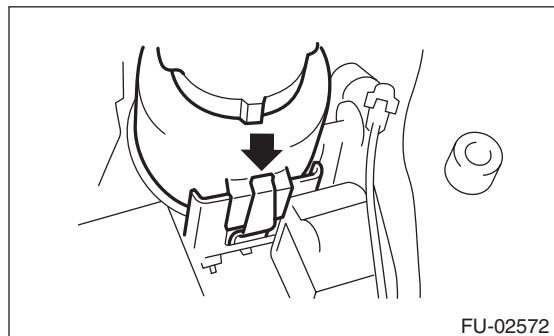
Do not disconnect the power steering hose.



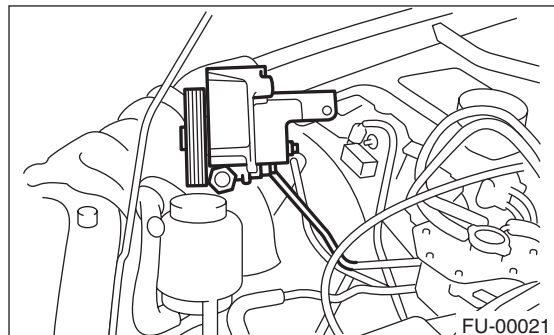
(4) Remove the bolts which install power steering pump bracket.



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



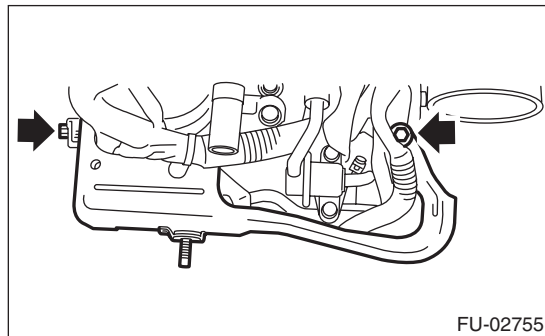
(6) Place the power steering pump on the right side wheel apron.



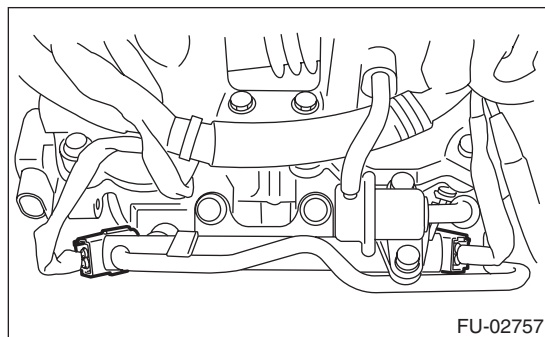
Fuel Injector

FUEL INJECTION (FUEL SYSTEMS)

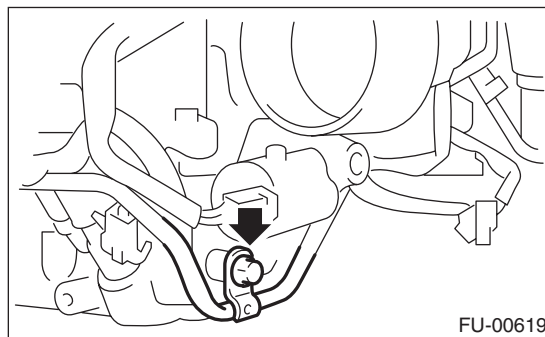
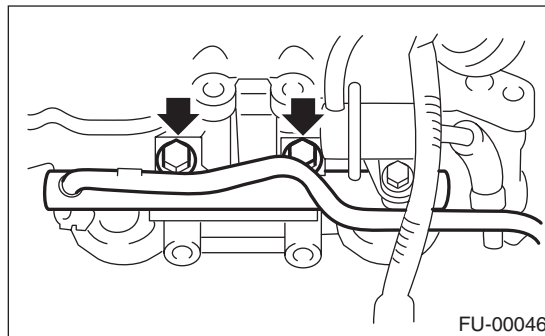
9) Remove the fuel pipe protector RH.



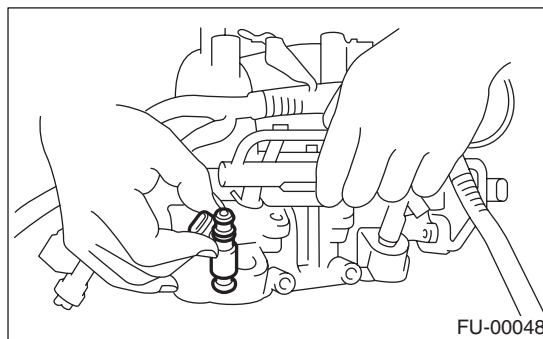
10) Disconnect the connector from fuel injector.



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



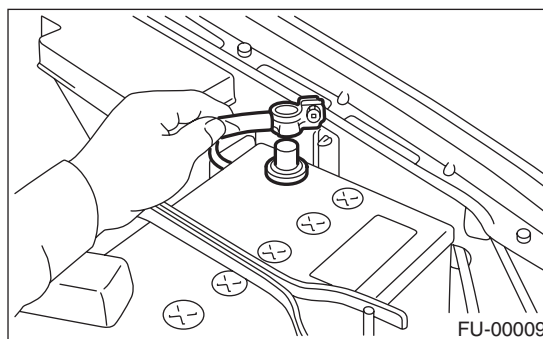
12) Remove the fuel injector while lifting up the fuel injector pipe.



2. LH SIDE

1) Release the fuel pressure. <Ref. to FU(H4DOTC)-51, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>

2) Disconnect the ground cable from the battery.



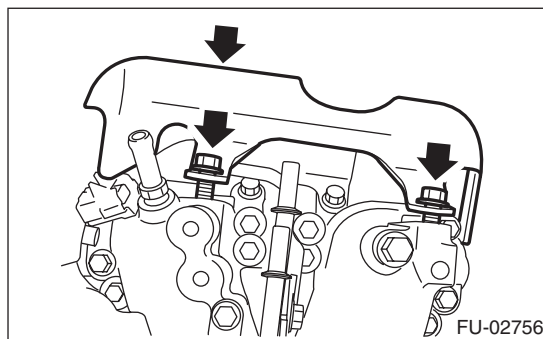
3) Open the fuel filler flap lid, and remove the fuel filler cap.

4) Remove the collector cover.

5) Remove the intake manifold.

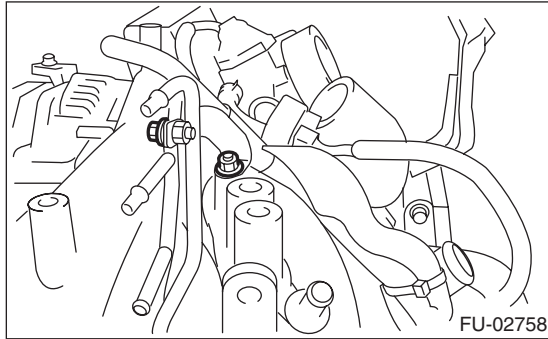
<Ref. to FU(H4DOTC)-14, REMOVAL, Intake Manifold.>

6) Remove the fuel pipe protector LH.

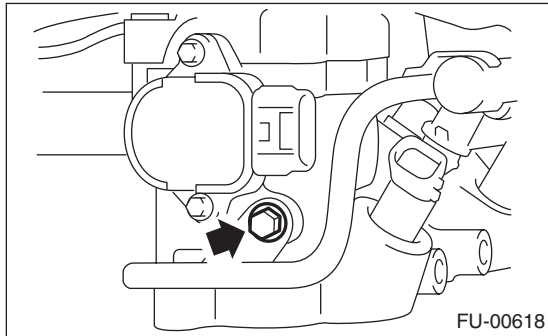
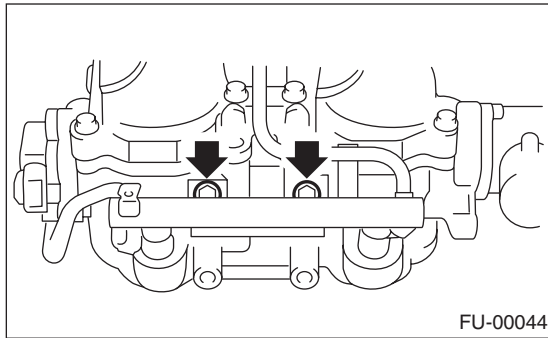


7) Disconnect the connector from fuel injector.

8) Remove the bolts which hold fuel injector pipes on the left side of intake manifold.



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



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

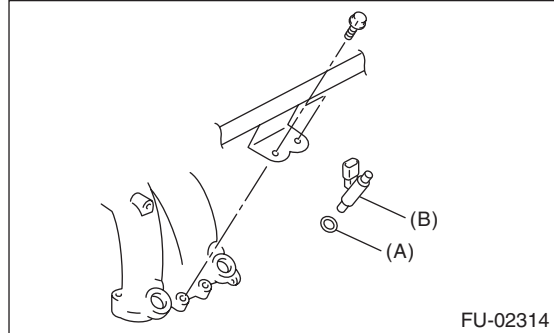
B: INSTALLATION

1. RH SIDE

Install in the reverse order of removal.

NOTE:

Use new O-rings.

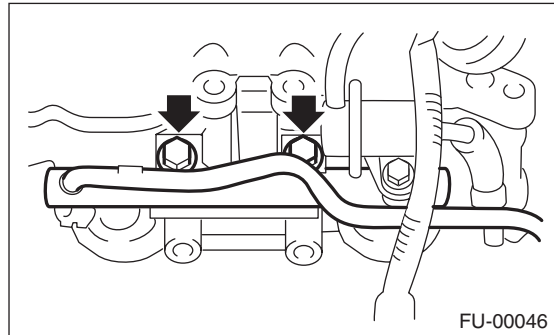


(A) O-ring

(B) Fuel injector

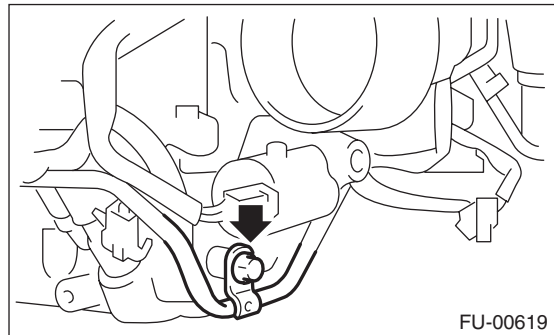
Tightening torque:

19 N·m (1.9 kgf-m, 14.0 ft-lb)



Tightening torque:

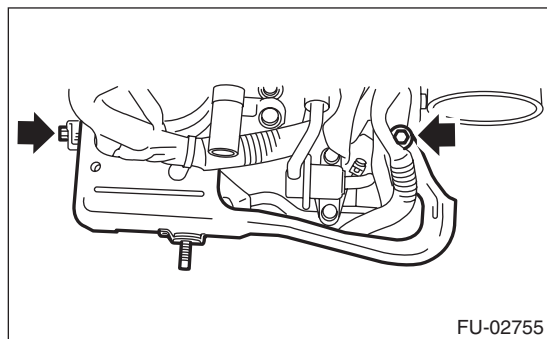
19 N·m (1.9 kgf-m, 14.0 ft-lb)



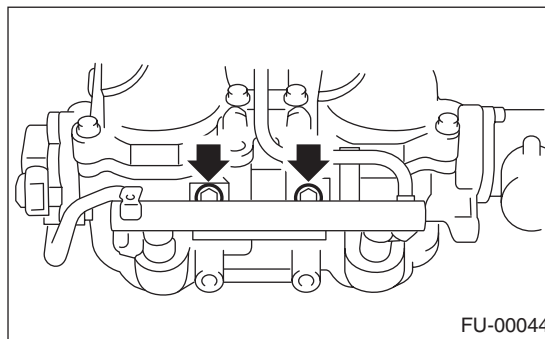
Fuel Injector

FUEL INJECTION (FUEL SYSTEMS)

Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)



Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)

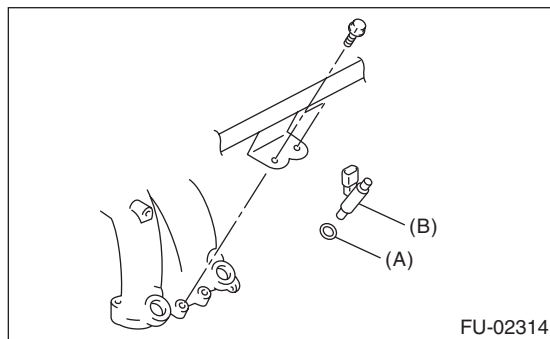


2. LH SIDE

Install in the reverse order of removal.

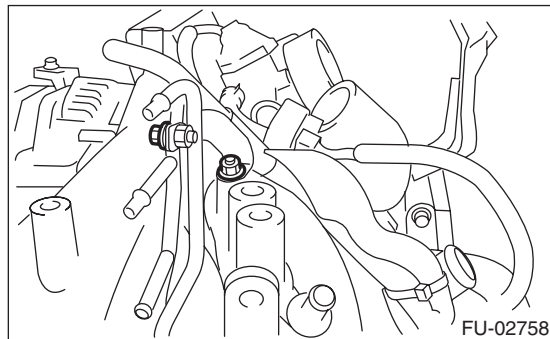
NOTE:

Use new O-rings.

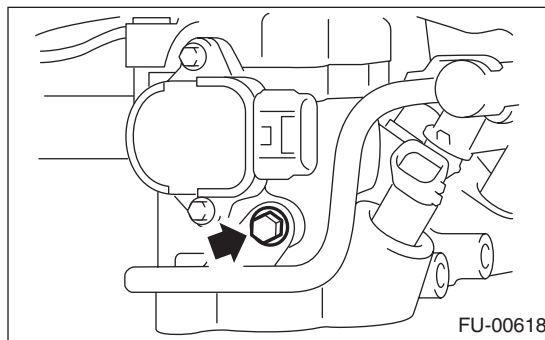


- (A) O-ring
- (B) Fuel injector

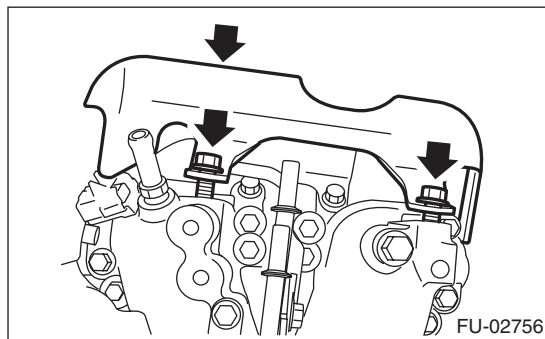
Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)



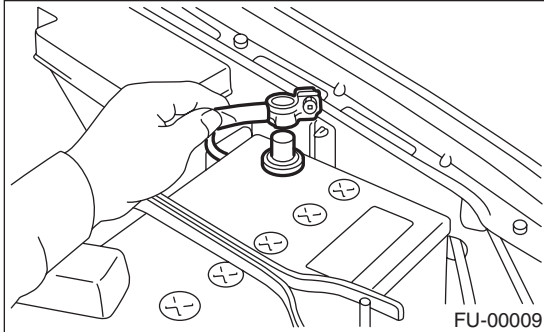
Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)



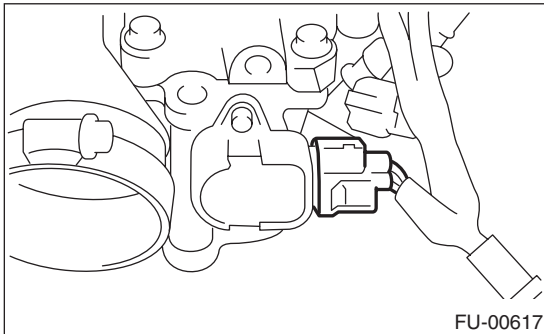
12. Tumble Generator Valve Assembly

A: REMOVAL

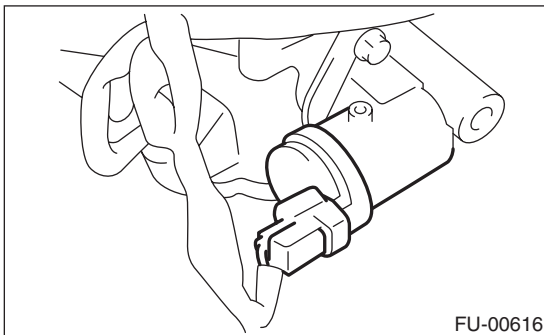
- 1) Release the fuel pressure. <Ref. to FU(H4DOTC)-51, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
- 2) Disconnect the ground cable from the battery.



- 3) Open the fuel filler flap lid, and remove the fuel filler cap.
- 4) Remove the collector cover.
- 5) Remove the intake manifold.
<Ref. to FU(H4DOTC)-14, REMOVAL, Intake Manifold.>
- 6) Disconnect the connector from tumble generator valve sensor.

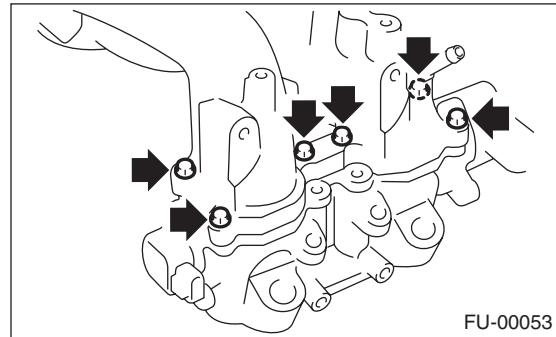


- 7) Disconnect the connector from tumble generator valve actuator.



- 8) Remove the fuel injector.
<Ref. to FU(H4DOTC)-33, REMOVAL, Fuel Injector.>

- 9) Remove the tumble generator valve body from intake manifold.



B: INSTALLATION

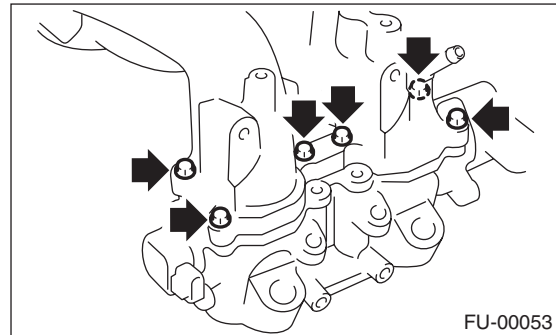
Install in the reverse order of removal.

NOTE:

Use a new gasket.

Tightening torque:

8.25 N·m (0.84 kgf-m, 6.1 ft-lb)



Tumble Generator Valve Actuator

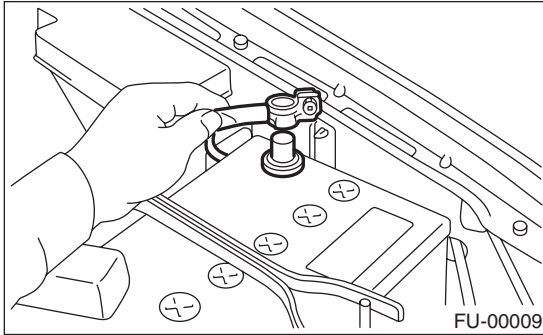
FUEL INJECTION (FUEL SYSTEMS)

13. Tumble Generator Valve Actuator

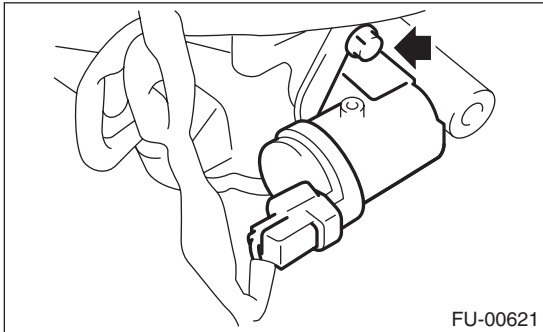
A: REMOVAL

1. RH SIDE

- 1) Release the fuel pressure. <Ref. to FU(H4DOTC)-51, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
- 2) Disconnect the ground cable from the battery.

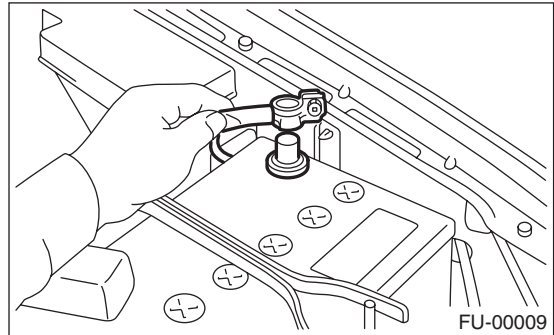


- 3) Open the fuel filler flap lid, and remove the fuel filler cap.
- 4) Remove the collector cover.
- 5) Remove the intake manifold. <Ref. to FU(H4DOTC)-14, REMOVAL, Intake Manifold.>
- 6) Disconnect the connector from tumble generator valve actuator.
- 7) Remove the tumble generator valve actuator.

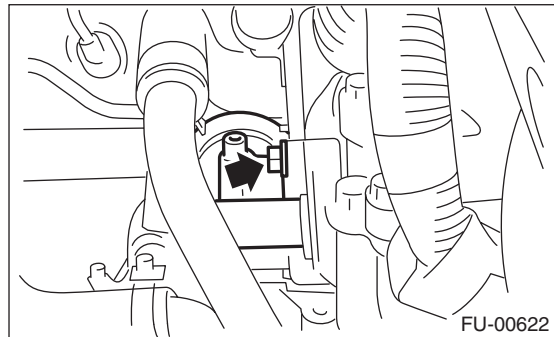


2. LH SIDE

- 1) Disconnect the ground cable from the battery.



- 2) Remove the collector cover.
- 3) Remove the secondary air pump. <Ref. to EC(H4DOTC)-9, REMOVAL, Secondary Air Pump.>
- 4) Disconnect the connector from tumble generator valve actuator.
- 5) Remove the tumble generator valve actuator.



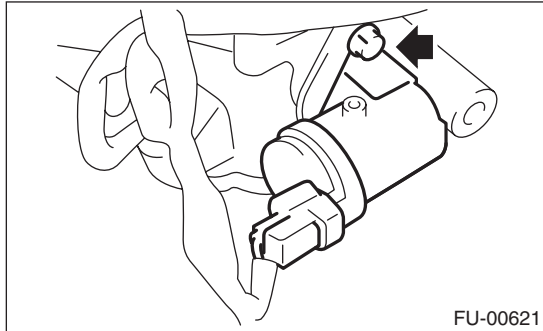
B: INSTALLATION

1. RH SIDE

Install in the reverse order of removal.

Tightening torque:

6 N·m (0.6 kgf-m, 4.4 ft-lb)

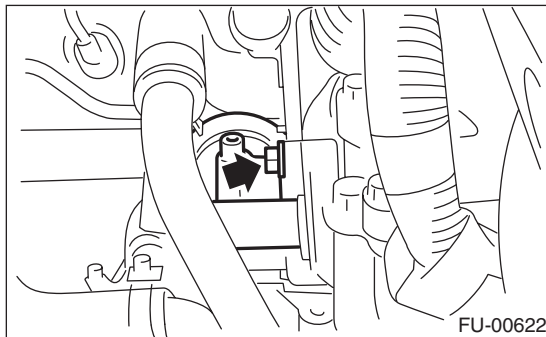


2. LH SIDE

Install in the reverse order of removal.

Tightening torque:

6 N·m (0.6 kgf-m, 4.4 ft-lb)



14. Tumble Generator Valve Position Sensor

A: SPECIFICATION

The tumble generator valve position sensor cannot be adjusted when installed, so it should not be removed from the tumble generator valve assembly. Refer to “Tumble Generator Valve Assembly” for removal and installation procedure. <Ref. to FU(H4DOTC)-37, REMOVAL, Tumble Generator Valve Assembly.> <Ref. to FU(H4DOTC)-37, INSTALLATION, Tumble Generator Valve Assembly.>

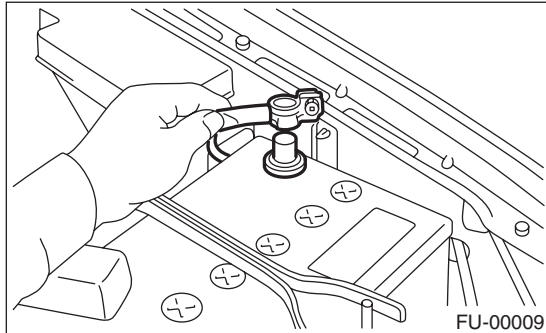
Wastegate Control Solenoid Valve

FUEL INJECTION (FUEL SYSTEMS)

15. Wastegate Control Solenoid Valve

A: REMOVAL

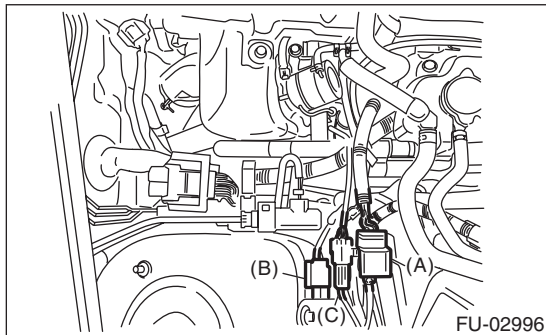
1) Disconnect the ground cable from the battery.



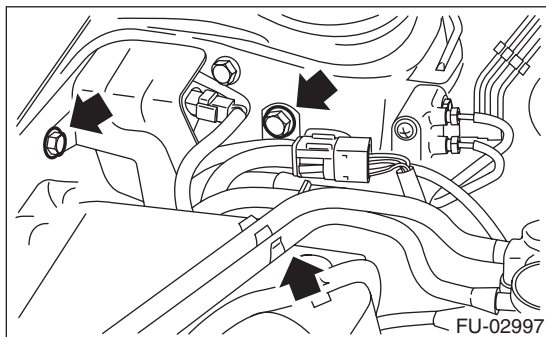
2) Remove the engine harness connector (A) from bracket.

3) Disconnect the connector (B) from wastegate control solenoid valve.

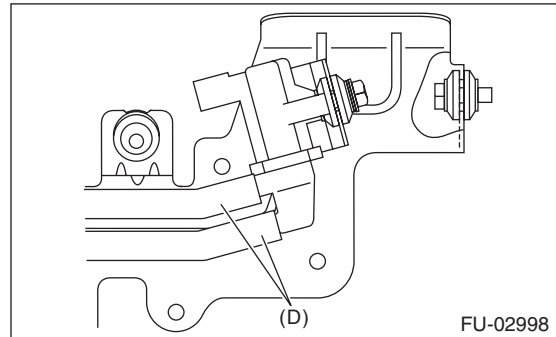
4) Remove the front oxygen (A/F) sensor connector (C) from the bracket.



5) Remove the bracket from vehicle body.



6) Disconnect pressure hose (D) from the wastegate control solenoid valve.



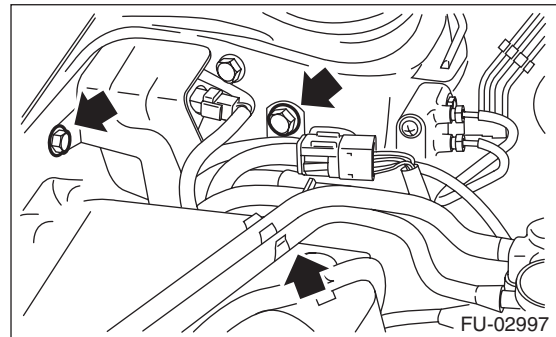
7) Remove the wastegate control solenoid valve from the bracket.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

6.5 N·m (0.66 kgf-m, 4.8 ft-lb)



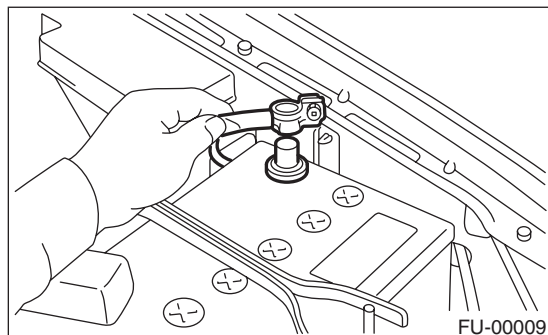
Front Oxygen (A/F) Sensor

FUEL INJECTION (FUEL SYSTEMS)

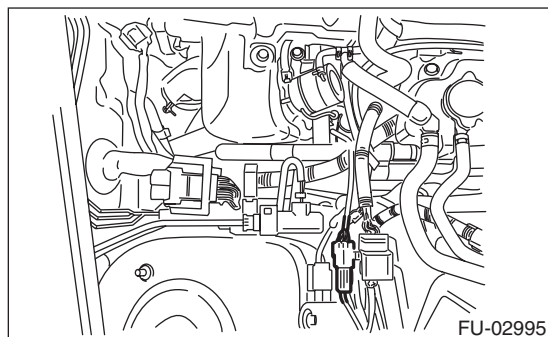
16.Front Oxygen (A/F) Sensor

A: REMOVAL

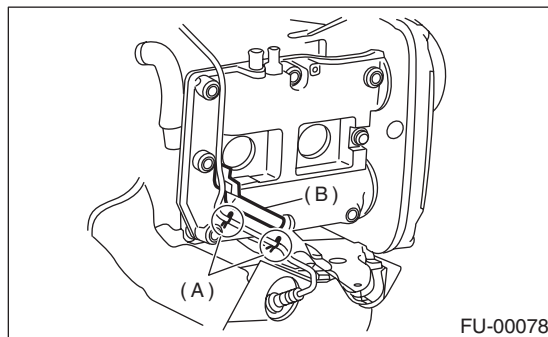
- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from the battery.



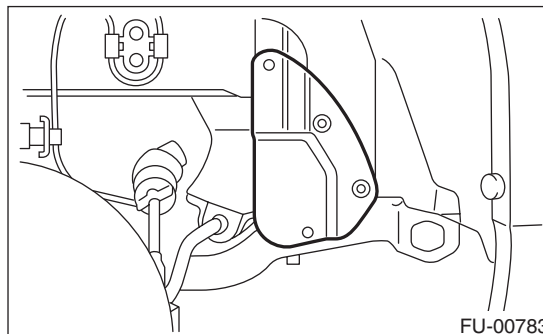
- 3) Disconnect the connector from front oxygen (A/F) sensor.



- 4) Disconnect the engine harness fixed by clip (A) from the bracket (B).



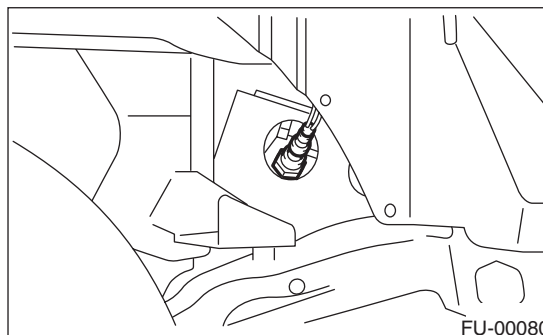
- 5) Remove the front right side wheel.
- 6) Lift up the vehicle.
- 7) Remove the service hole cover.



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

CAUTION:

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



Front Oxygen (A/F) Sensor

FUEL INJECTION (FUEL SYSTEMS)

B: INSTALLATION

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

CAUTION:

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

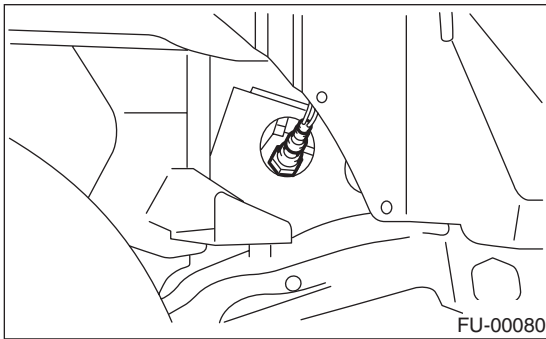
Anti-seize compound:

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

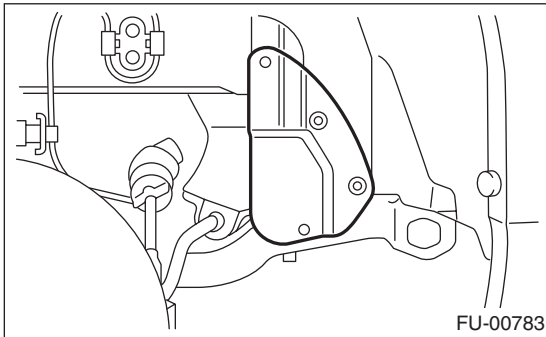
2) Install the front oxygen (A/F) sensor.

Tightening torque:

30 N·m (3.1 kgf-m, 22.1 ft-lb)



3) Install the service hole cover.



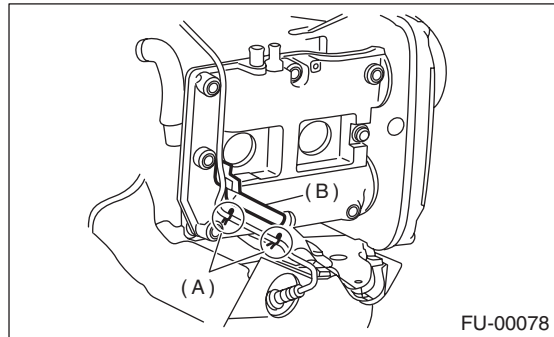
4) Lower the vehicle.

5) Install the front right side wheel.

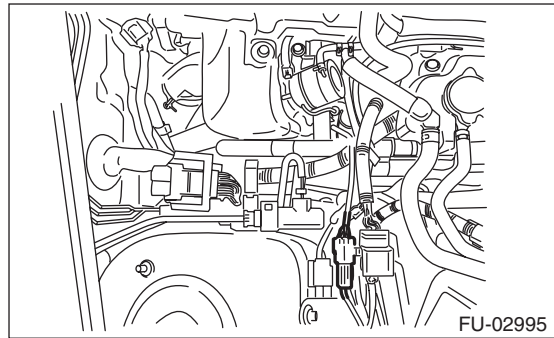
Tightening torque:

100 N·m (10.2 kgf-m, 73.8 ft-lb)

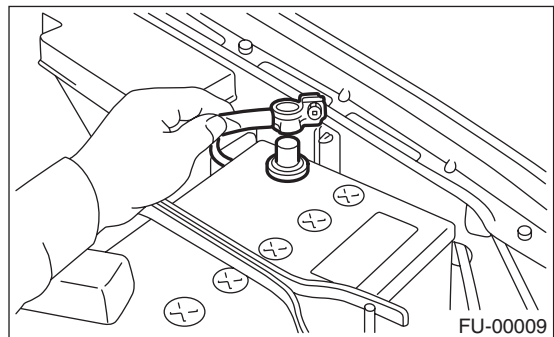
6) Connect the engine harness to the bracket (B) using the clip (A).



7) Connect the connector of front oxygen (A/F) sensor.



8) Connect the ground cable to the battery.



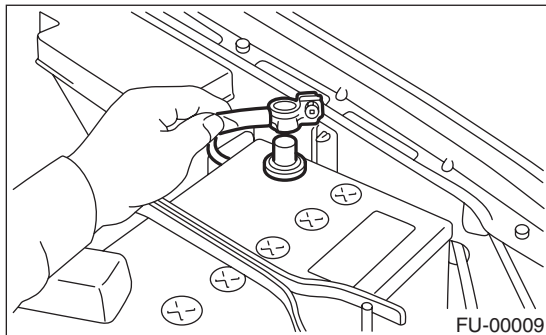
Rear Oxygen Sensor

FUEL INJECTION (FUEL SYSTEMS)

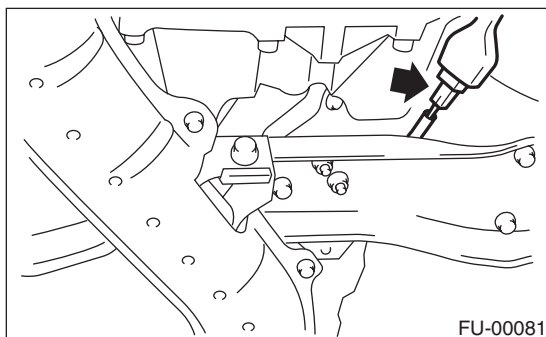
17.Rear Oxygen Sensor

A: REMOVAL

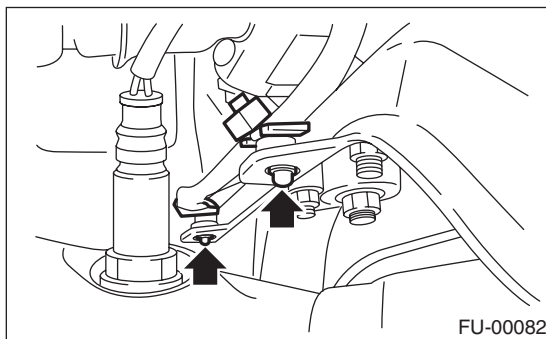
- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from the battery.



- 3) Lift up the vehicle.
- 4) Disconnect the connector from the rear oxygen sensor.



- 5) Remove the clip by pulling out from the upper side of crossmember.

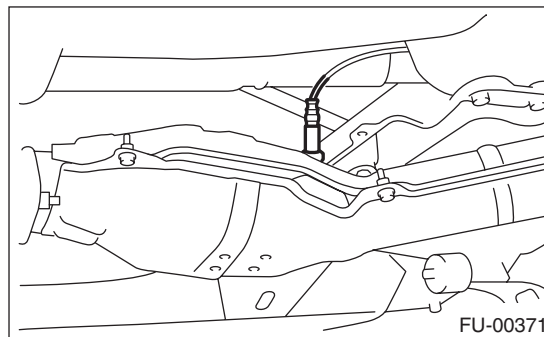


- 6) Apply spray-type lubricant to the threaded portion of rear oxygen sensor, and leave it for one minute or more.

- 7) Remove the rear oxygen sensor.

CAUTION:

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



B: INSTALLATION

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

CAUTION:

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

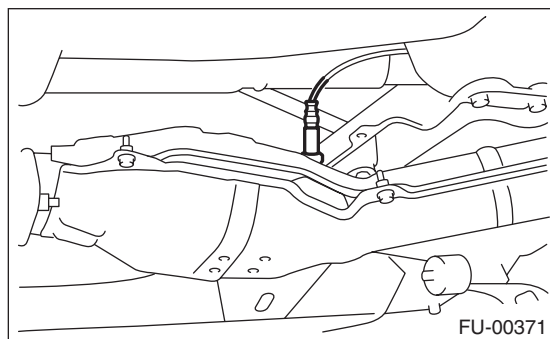
Anti-seize compound:

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

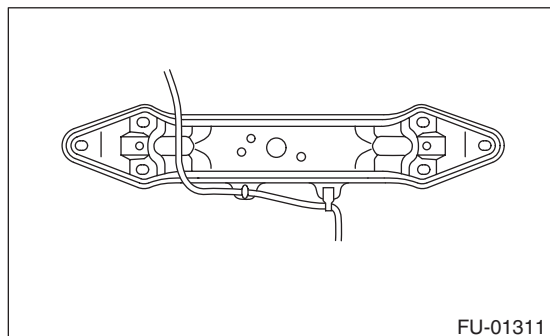
2) Install the rear oxygen sensor.

Tightening torque:

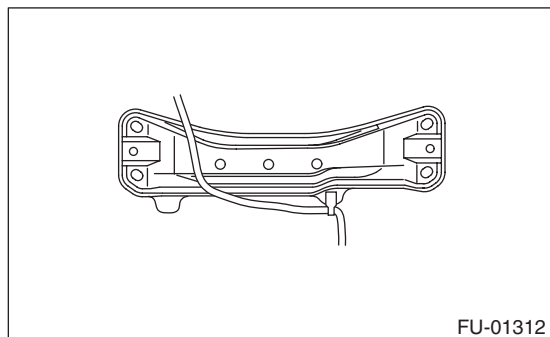
21 N·m (2.1 kgf-m, 15.5 ft-lb)



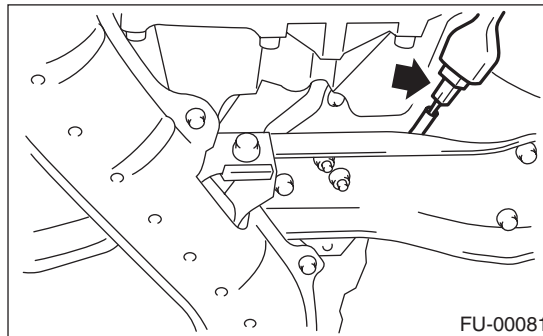
• AT model



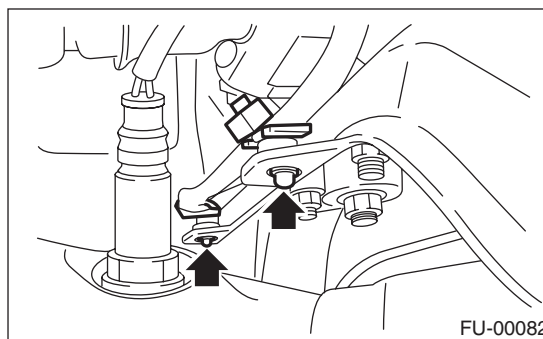
• MT model



3) Connect the rear oxygen sensor connector.

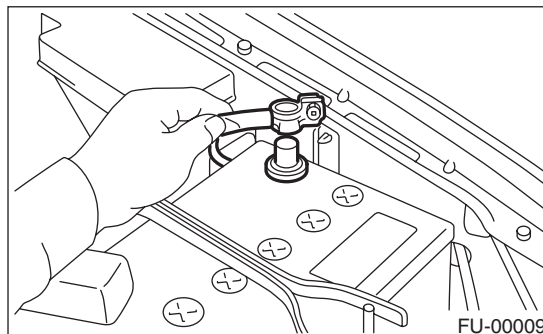


4) Connect the clip to the crossmember.



5) Lower the vehicle.

6) Connect the ground cable to the battery.



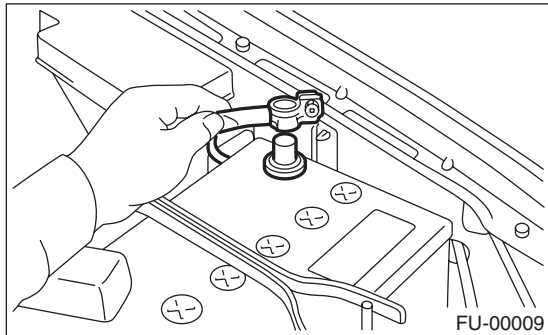
Engine Control Module (ECM)

FUEL INJECTION (FUEL SYSTEMS)

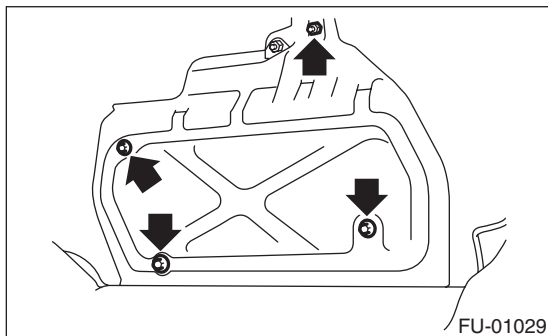
18.Engine Control Module (ECM)

A: REMOVAL

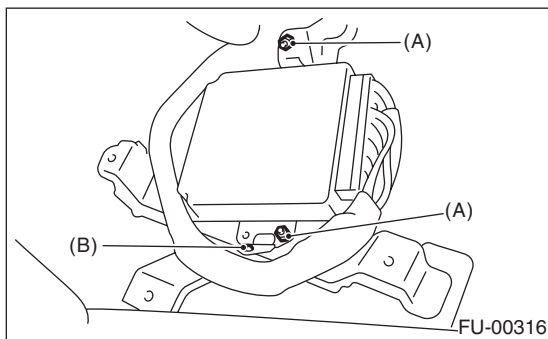
- 1) Disconnect the ground cable from the battery.



- 2) Remove the lower inner trim of passenger's side.
<Ref. to EI-42, REMOVAL, Lower Inner Trim.>
- 3) Detach the floor mat of passenger's seat.
- 4) Remove the protect cover.



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



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

B: INSTALLATION

Install in the reverse order of removal.

NOTE:

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

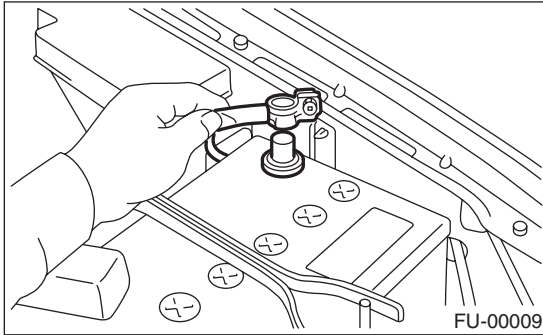
Tightening torque:

7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

19. Main Relay

A: REMOVAL

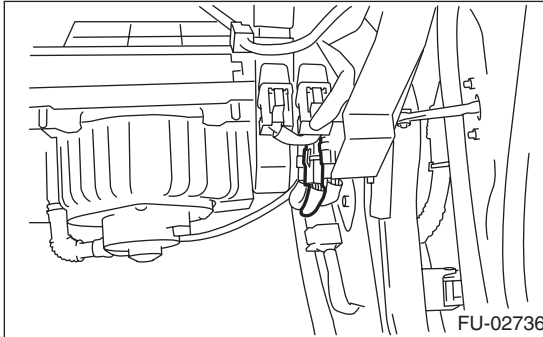
1) Disconnect the ground cable from the battery.



2) Remove the glove box. <Ref. to EI-35, REMOVAL, Glove Box.>

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

4) Disconnect the connectors from main relay.



5) Remove the main relay from the mounting bracket.

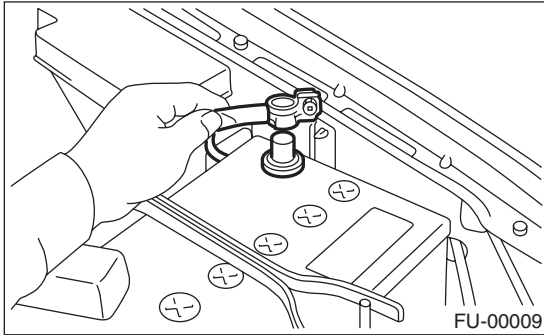
B: INSTALLATION

Install in the reverse order of removal.

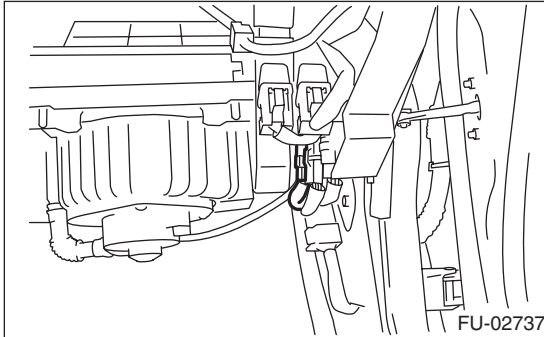
20. Fuel Pump Relay

A: REMOVAL

- 1) Disconnect the ground cable from the battery.



- 2) Remove the glove box. <Ref. to EI-35, REMOVAL, Glove Box.>
- 3) Remove the passenger's side front side sill cover.
- 4) Disconnect the connector from fuel pump relay.



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

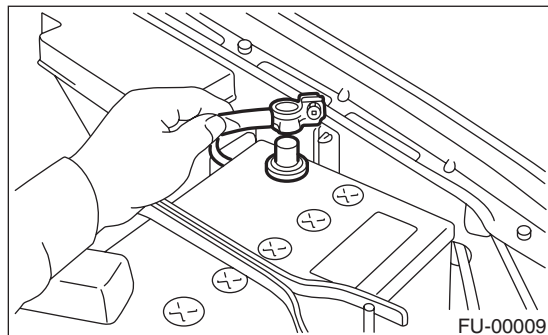
B: INSTALLATION

Install in the reverse order of removal.

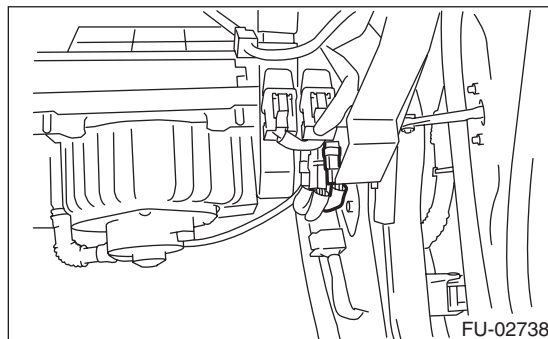
21. Electronic Throttle Control Relay

A: REMOVAL

- 1) Disconnect the ground cable from the battery.



- 2) Remove the glove box. <Ref. to EI-35, REMOVAL, Glove Box.>
- 3) Remove the passenger's side front side sill cover.
- 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.

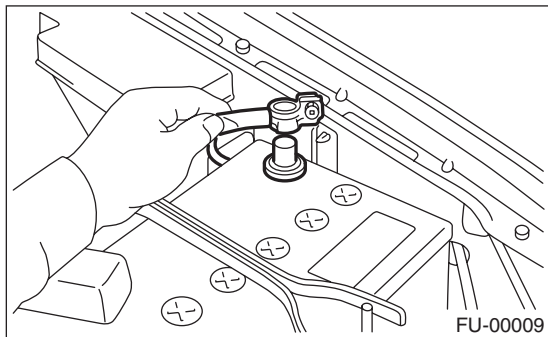
Fuel Pump Control Unit

FUEL INJECTION (FUEL SYSTEMS)

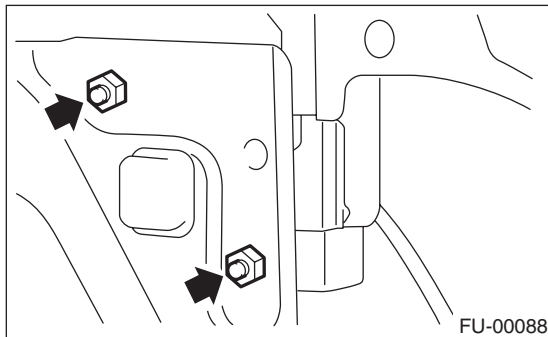
22. Fuel Pump Control Unit

A: REMOVAL

- 1) Disconnect the ground cable from the battery.



- 2) Remove the rear quarter trim. <Ref. to EI-43, REMOVAL, Rear Quarter Trim.>
- 3) Disconnect the connector from fuel pump control unit.
- 4) Remove the fuel pump control unit.

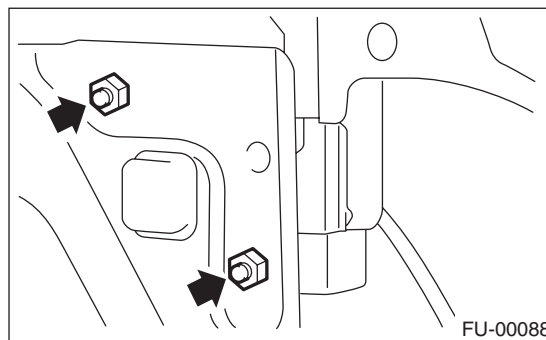


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

5 N·m (0.5 kgf-m, 3.7 ft-lb)



23. Fuel

A: PROCEDURE

1. RELEASING OF FUEL PRESSURE

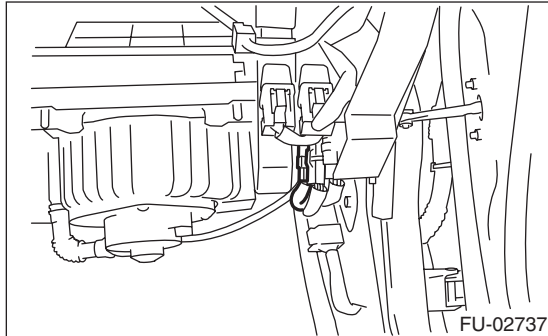
WARNING:

Place “NO FIRE” signs near the working area.

CAUTION:

Be careful not to spill fuel.

- 1) Remove the glove box. <Ref. to EI-35, REMOVAL, Glove Box.>
- 2) Remove the side sill cover on the passenger's side.
- 3) Disconnect the connector from fuel pump relay.



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

2. DRAINING FUEL

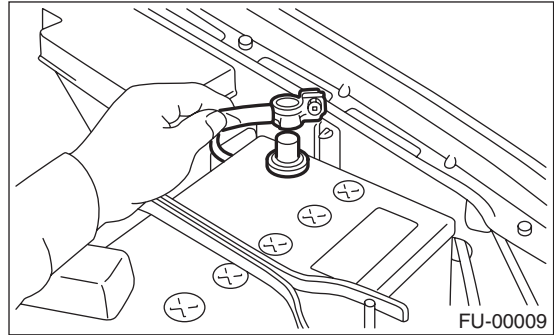
WARNING:

Place “NO FIRE” signs near the working area.

CAUTION:

Be careful not to spill fuel.

- 1) Release the fuel pressure. <Ref. to FU(H4DOTC)-51, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
- 2) Disconnect the ground cable from the battery.



- 3) Remove the fuel pump. <Ref. to FU(H4DOTC)-59, REMOVAL, Fuel Pump.>
- 4) Drain fuel using a pump etc. from installation area of fuel pump.

CAUTION:

Use pumps, etc. which are resistant to gasoline.

- 5) Install the fuel pump. <Ref. to FU(H4DOTC)-59, INSTALLATION, Fuel Pump.>

24. Fuel Tank

A: REMOVAL

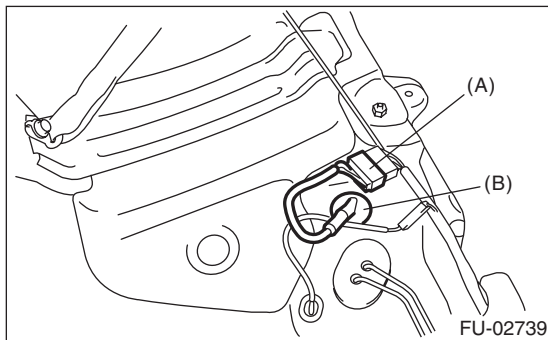
WARNING:

Place "NO FIRE" signs near the working area.

CAUTION:

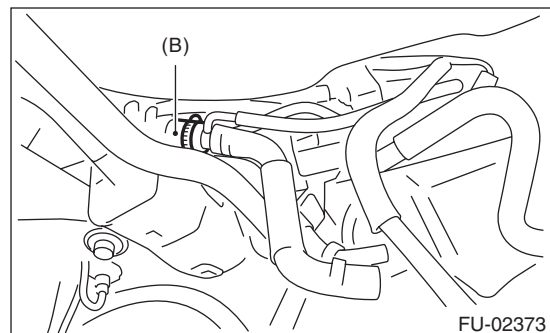
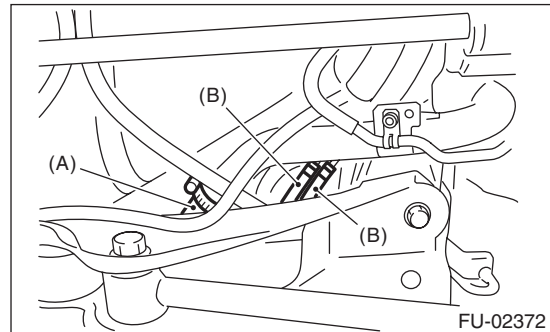
Be careful not to spill fuel.

- 1) Set the vehicle on a lift.
- 2) Release the fuel pressure. <Ref. to FU(H4DOTC)-51, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
- 3) Drain fuel from fuel tank.
<Ref. to FU(H4DOTC)-51, DRAINING FUEL, PROCEDURE, Fuel.>
- 4) Remove the rear seat.
- 5) Disconnect the connector (A) of fuel tank cord to the rear harness.
- 6) Push the grommet (B) which holds the fuel tank cord on the floor panel into under the body.

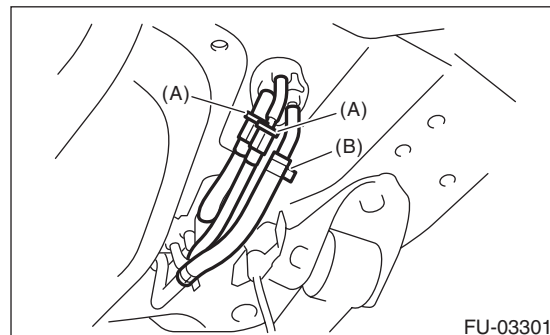


- 7) Remove the rear crossmember. <Ref. to RS-17, REMOVAL, Rear Crossmember.>
- 8) Remove the canisters. <Ref. to EC(H4DOTC)-7, REMOVAL, Canister.>
- 9) Disconnect the connector from the pressure control solenoid valve.

- 10) Loosen the clamp and disconnect the fuel filler hose (A) and evaporation hoses (B) from the fuel filler pipe.



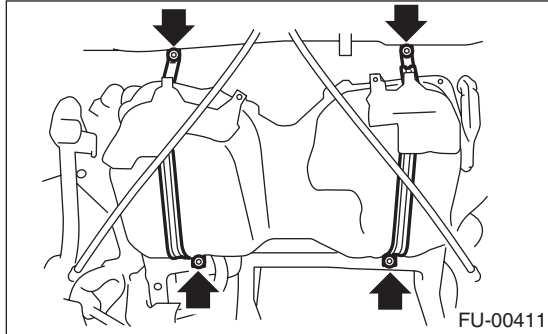
- 11) Move the retainer for fuel delivery tube, and disconnect the quick connector (A). <Ref. to FU(H4DOTC)-66, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>
- 12) Move the clip (B), and disconnect the fuel return hose and evaporation hose.



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

WARNING:

- A helper is required to perform this work.
- Fuel may remain in the fuel tank. Be careful not to lose balance and drop the fuel tank when removing it, as this remaining fuel may offset the weight balance of the tank.

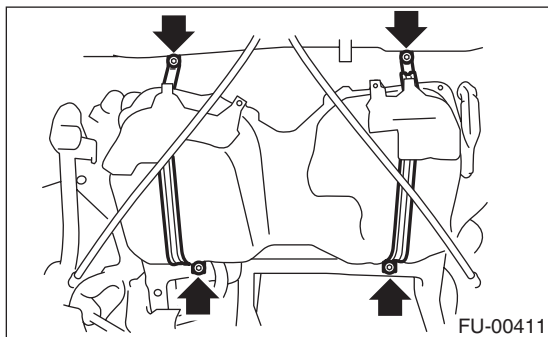


B: INSTALLATION

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

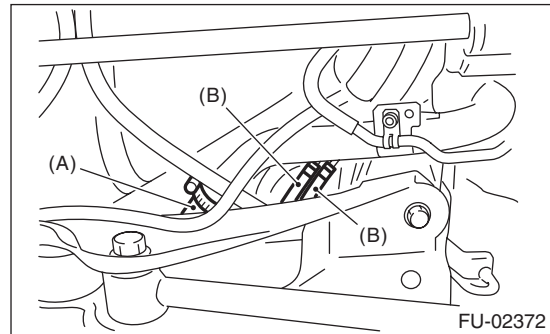
WARNING:

A helper is required to perform this work.



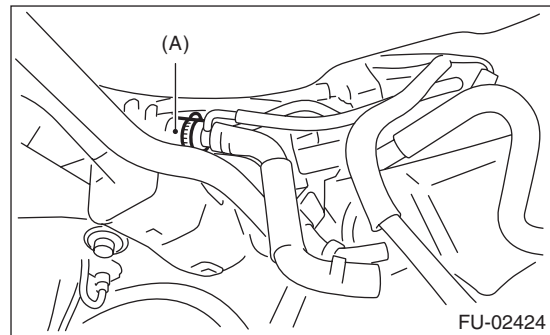
3) Insert the fuel filler hose (A) approx. 35 to 40 mm (1.38 to 1.57 in) over the lower end of fuel filler pipe and tighten the clamp.

4) Insert the evaporation hoses (B) into the lower end of evaporation pipe, and secure the clamps and clips.

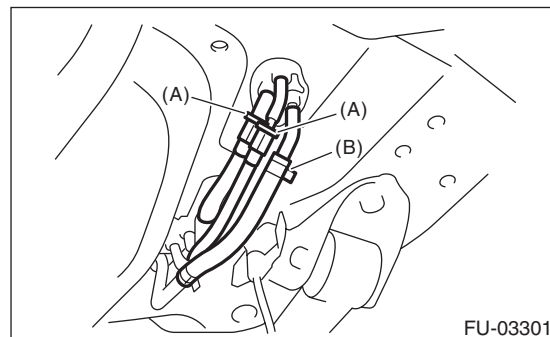


CAUTION:

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



5) Connect the fuel hoses, and hold them with clip (B) and quick connector (A). <Ref. to FU(H4DOTC)-67, INSTALLATION, Fuel Delivery, Return and Evaporation Lines.>



6) Connect the connector to pressure control solenoid valve.

7) Install the canister. <Ref. to EC(H4DOTC)-7, INSTALLATION, Canister.>

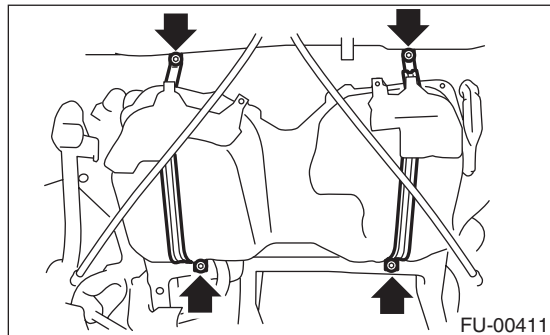
Fuel Tank

FUEL INJECTION (FUEL SYSTEMS)

8) Tighten the fuel tank band bolts.

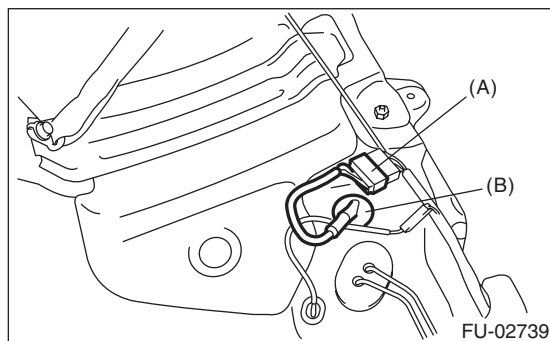
Tightening torque:

33 N·m (3.4 kgf-m, 24.3 ft-lb)



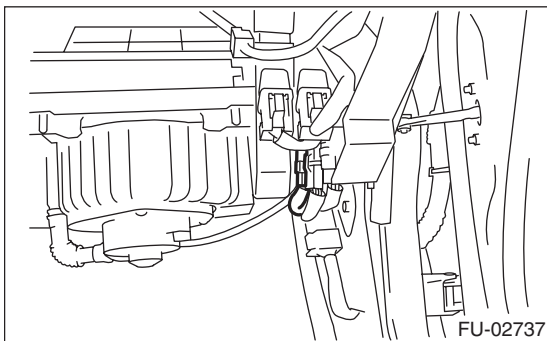
9) Install the rear crossmember. <Ref. to RS-17, INSTALLATION, Rear Crossmember.>

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 mats.

12) Connect the connector to fuel pump relay.



13) Install the passenger's side front side sill cover.

14) Install the glove box. <Ref. to EI-35, INSTALLATION, Glove Box.>

C: INSPECTION

1) Check that there are no cracks, holes or other damage to the fuel tank.

2) Make sure that the fuel pipe and fuel hose are not cracked and those connections are tight.

25. Fuel Filler Pipe

A: REMOVAL

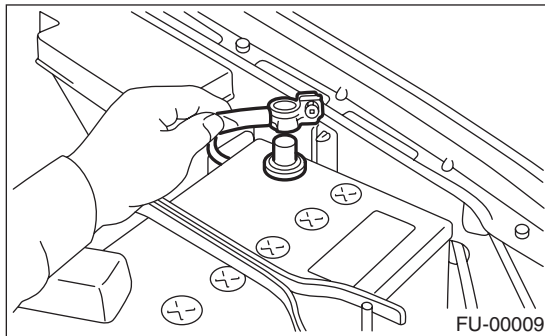
WARNING:

Place "NO FIRE" signs near the working area.

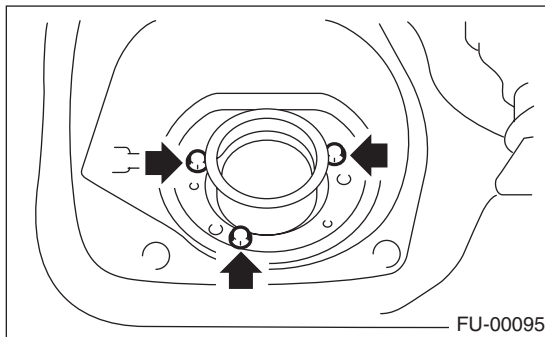
CAUTION:

Be careful not to spill fuel.

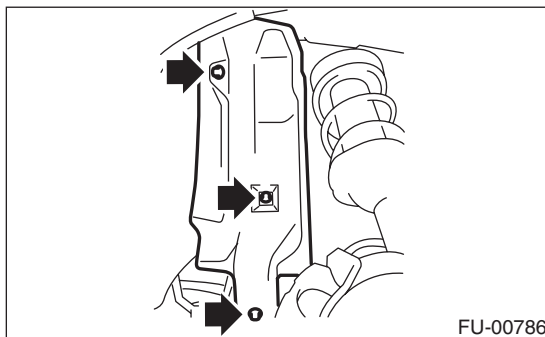
- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from the battery.



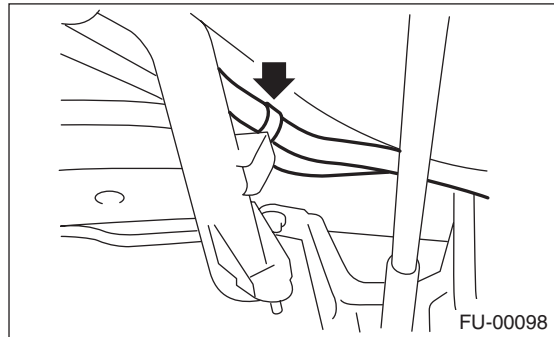
- 3) Open the fuel filler flap lid, and remove the fuel filler cap.
- 4) Remove the screws which secure packing.



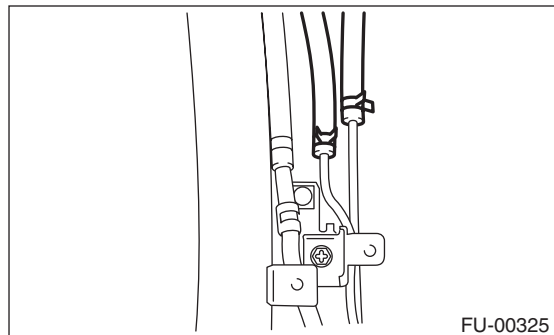
- 5) Remove the rear wheel RH.
- 6) Lift up the vehicle.
- 7) Drain fuel from fuel tank. <Ref. to FU(H4DOTC)-51, DRAINING FUEL, PROCEDURE, Fuel.>
- 8) Remove the fuel filler pipe protector.



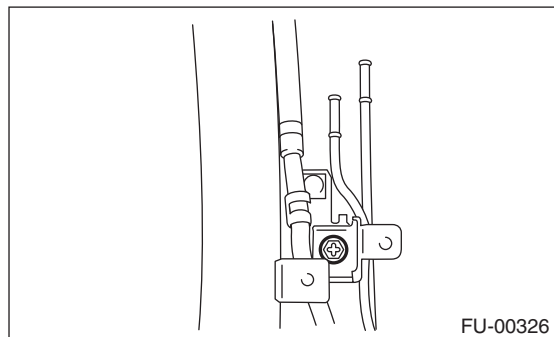
- 9) Disconnect the evaporation hose from the clip of fuel filler pipe.



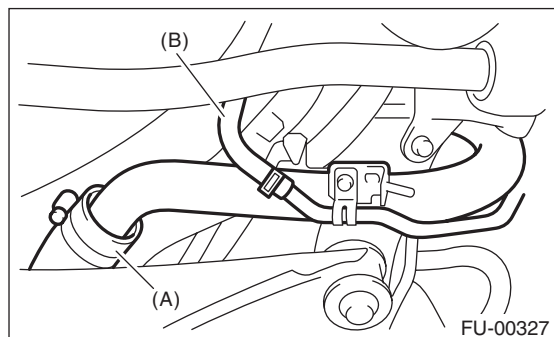
- 10) Disconnect the evaporation hose from the pipe.



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



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

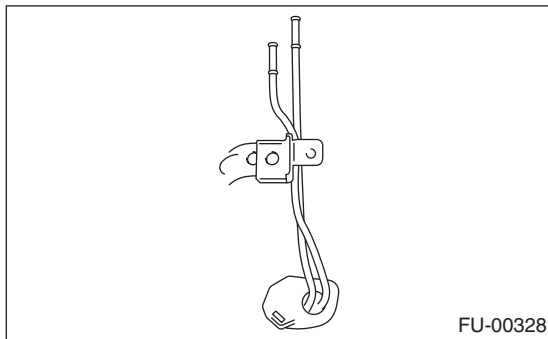


- 14) Remove the fuel filler pipe to the underside of the vehicle.

Fuel Filler Pipe

FUEL INJECTION (FUEL SYSTEMS)

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

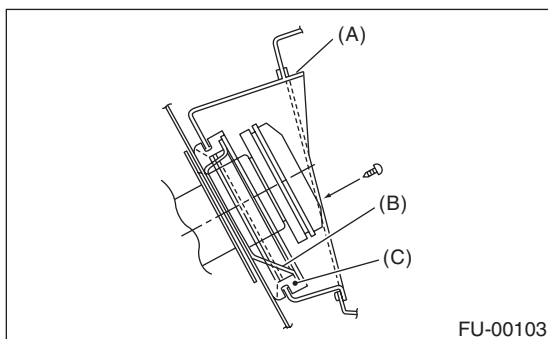


B: INSTALLATION

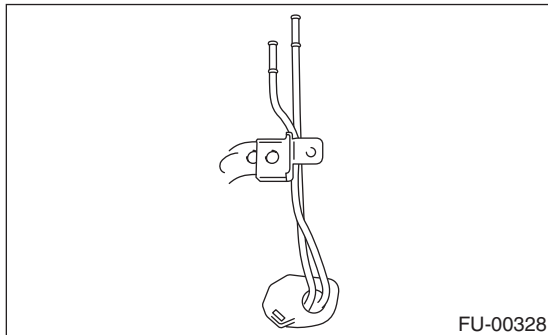
- 1) Open the fuel filler flap lid.
- 2) Set the fuel saucer (A) with rubber packing (C), and insert the fuel filler pipe into hole from the inner side of apron.
- 3) Align the holes in fuel filler pipe neck and set the cup (B), and tighten the screws.

NOTE:

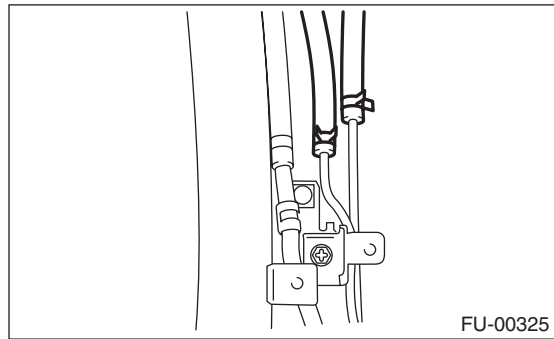
If the edges of rubber packing are folded toward the inside, straighten it with a flat tip screwdriver.



4) Install the evaporation pipe.



5) Connect the evaporation hose to the pipe.



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

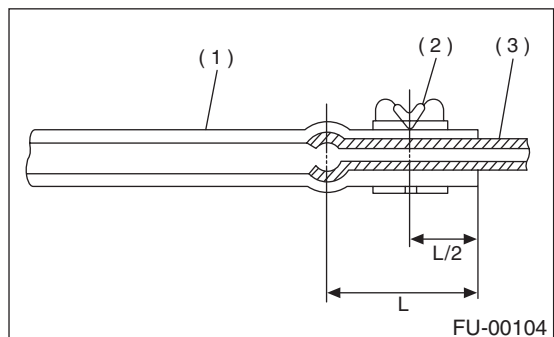
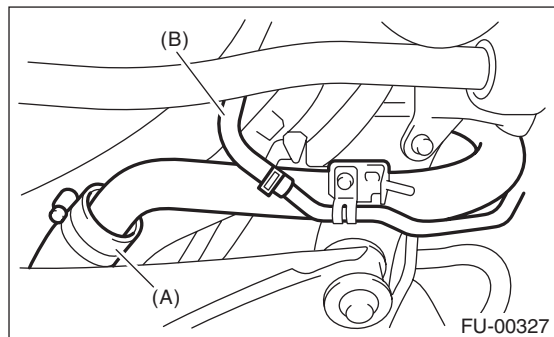
$L = 37.5 \pm 2.5 \text{ mm (1.476} \pm 0.098 \text{ in)}$

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

$L = 27.5 \pm 2.5 \text{ mm (1.083} \pm 0.098 \text{ in)}$

CAUTION:

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

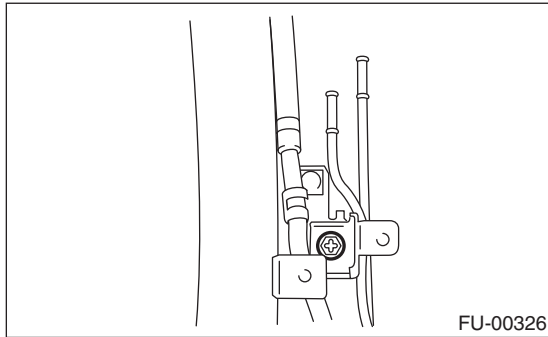


- (1) Hose
- (2) Clip
- (3) Pipe

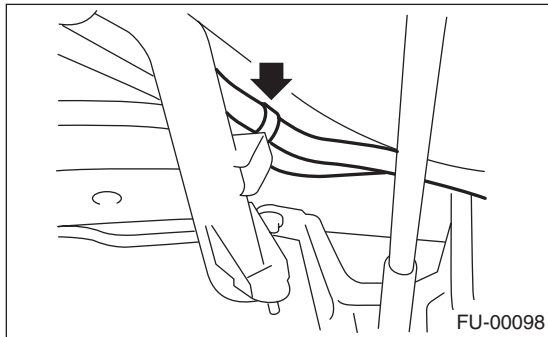
- 8) Tighten the bolts which hold fuel filler pipe bracket on the body.

Tightening torque:

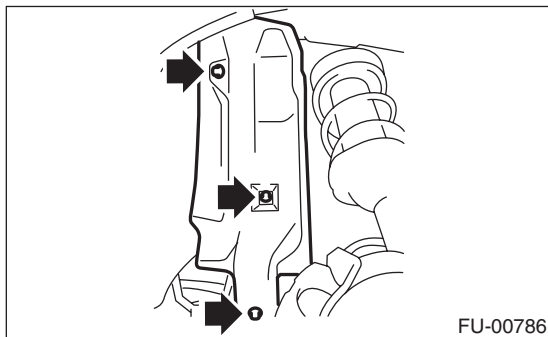
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)



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



- 10) Install the fuel filler pipe protector.



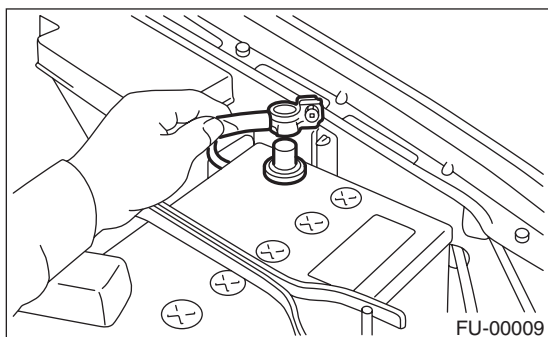
- 11) Lower the vehicle.

- 12) Install the rear wheel RH.

Tightening torque:

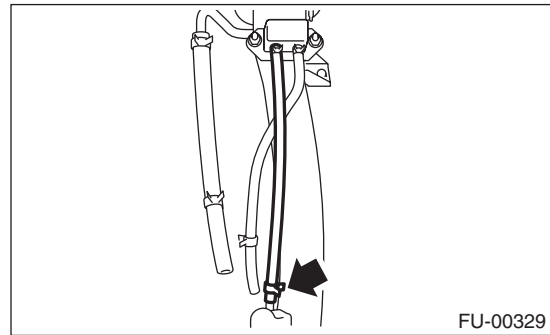
100 N·m (10.2 kgf-m, 73.8 ft-lb)

- 13) Connect the ground cable to the battery.

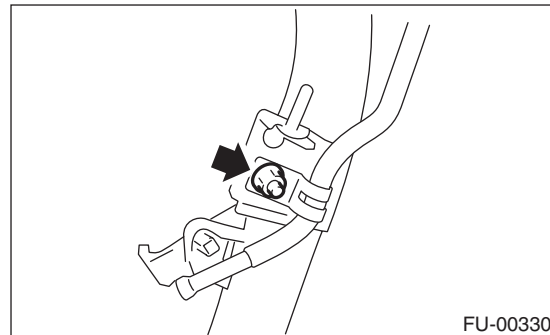


C: DISASSEMBLY

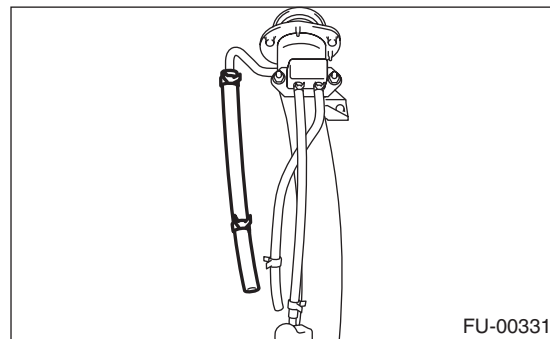
- 1) Move the clamp and disconnect the evaporation hose from the joint pipe.



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



- 3) Disconnect the evaporation hose from fuel filler pipe.



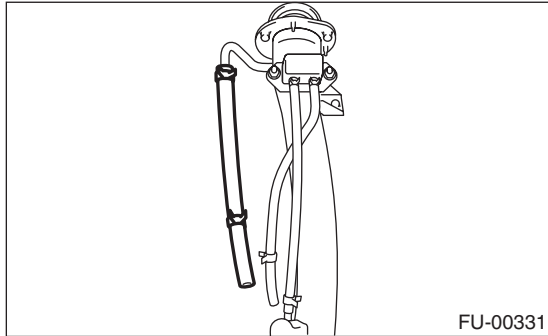
- 4) Remove the shut valve from the fuel filler pipe.
<Ref. to EC(H4DOTC)-20, REMOVAL, Shut Valve.>

Fuel Filler Pipe

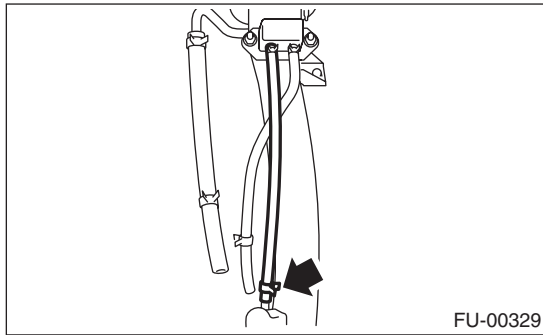
FUEL INJECTION (FUEL SYSTEMS)

D: ASSEMBLY

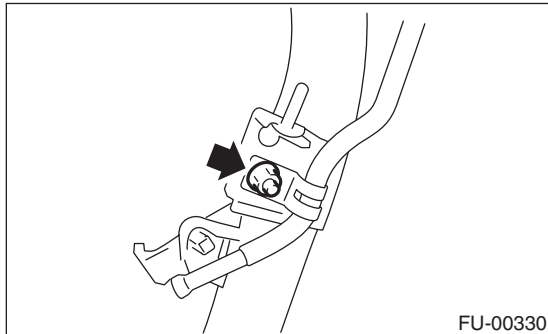
- 1) Install the shut valve to the fuel filler pipe. <Ref. to EC(H4DOTC)-20, INSTALLATION, Shut Valve.>
- 2) Connect the evaporation hose to the fuel filler pipe.



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



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



E: INSPECTION

- 1) Check that there are no cracks, holes or other damage to the fuel filler pipe.
- 2) Make sure that the fuel hose is not cracked and the connection is tight.

26. Fuel Pump

A: REMOVAL

WARNING:

Place “NO FIRE” signs near the working area.

CAUTION:

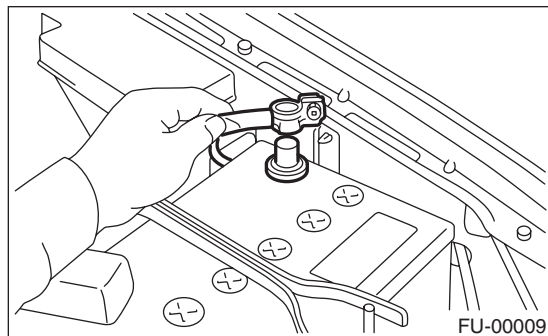
Be careful not to spill fuel.

NOTE:

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

1) Release the fuel pressure. <Ref. to FU(H4DOTC)-51, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>

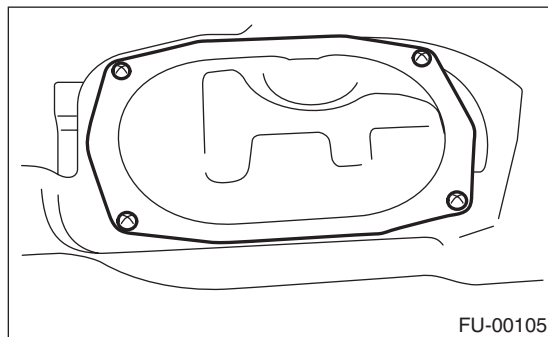
2) Disconnect the ground cable from the battery.



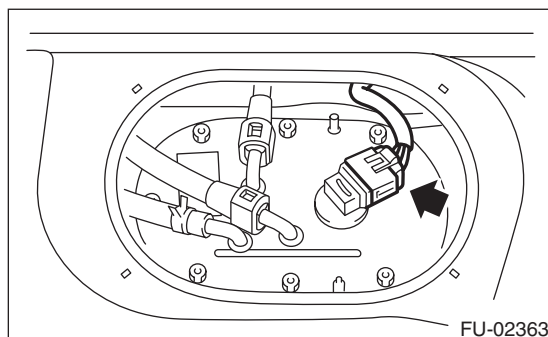
3) Open the fuel filler flap lid, and remove the fuel filler cap.

4) Remove the luggage floor mat. <Ref. to EI-48, REMOVAL, Luggage Floor Mat.>

5) Remove the service hole cover.

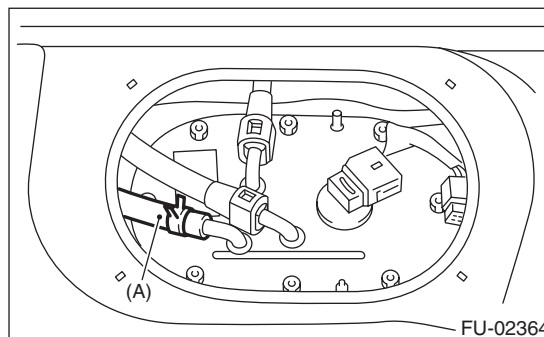


6) Disconnect the connector from fuel pump.

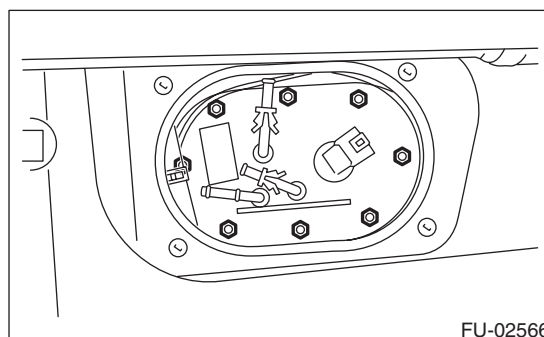


7) Disconnect the quick connector and then disconnect the fuel delivery hose and fuel return tube. <Ref. to FU(H4DOTC)-66, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>

8) Move the clips, and disconnect the jet pump hose (A).



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



10) Remove the fuel pump assembly from the fuel tank.

B: INSTALLATION

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

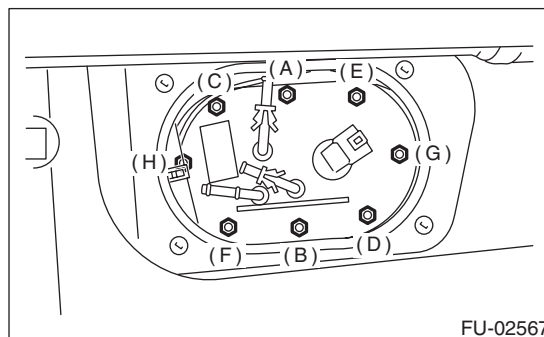
- Make sure the sealing portion is free from fuel or foreign matter before installation.
- Tighten the nuts in alphabetical sequence shown in the figure to the specified torque.

NOTE:

Use a new gasket and retainer.

Tightening torque:

4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



Fuel Pump

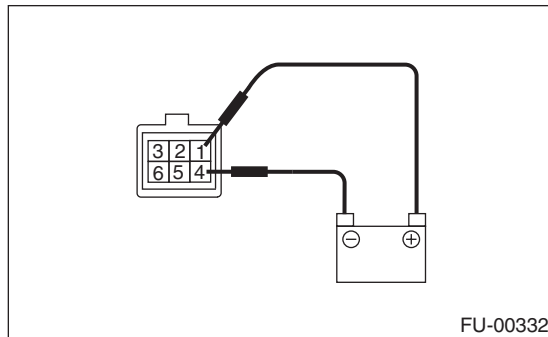
FUEL INJECTION (FUEL SYSTEMS)

C: INSPECTION

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

CAUTION:

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



27. Fuel Level Sensor

A: REMOVAL

WARNING:

Place “NO FIRE” signs near the working area.

CAUTION:

Be careful not to spill fuel.

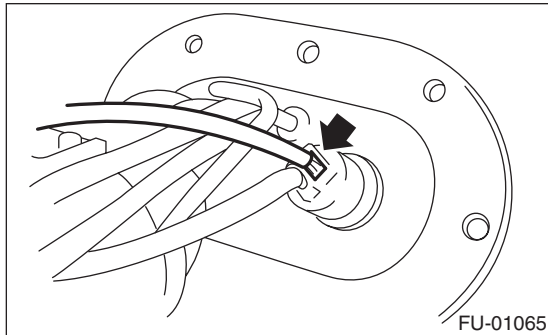
NOTE:

The fuel level sensor is built in fuel pump assembly.

1) Remove the fuel pump assembly.

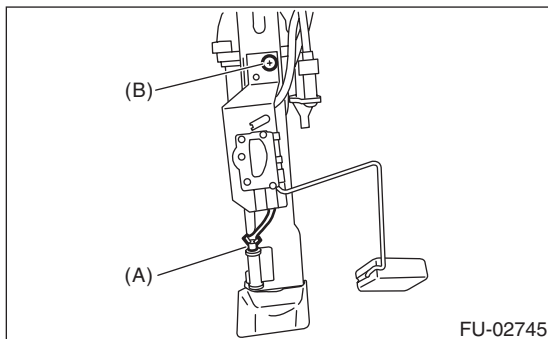
<Ref. to FU(H4DOTC)-59, REMOVAL, Fuel Pump.>

2) Disconnect the connector from fuel pump bracket.



3) Remove the fuel temperature sensor (A).

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



B: INSTALLATION

Install in the reverse order of removal.

NOTE:

Use a new gasket.

Tightening torque:

4.4 N·m (0.45 kgf-m, 3.3 ft-lb)

Fuel Sub Level Sensor

FUEL INJECTION (FUEL SYSTEMS)

28. Fuel Sub Level Sensor

A: REMOVAL

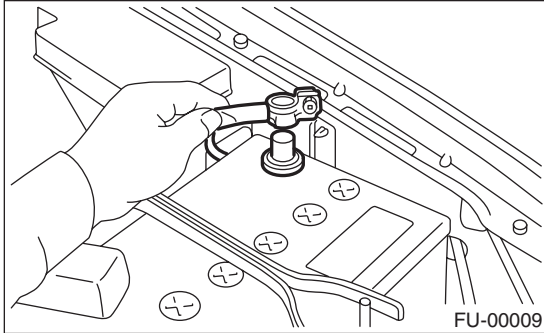
WARNING:

Place "NO FIRE" signs near the working area.

CAUTION:

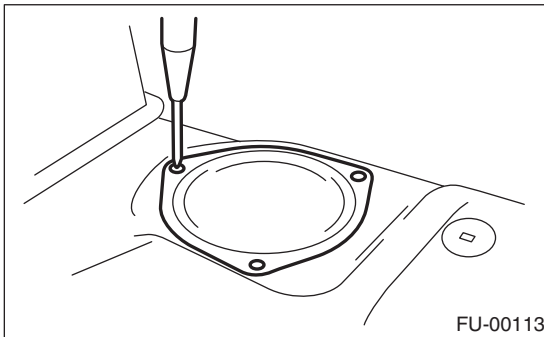
Be careful not to spill fuel.

1) Disconnect the ground cable from the battery.



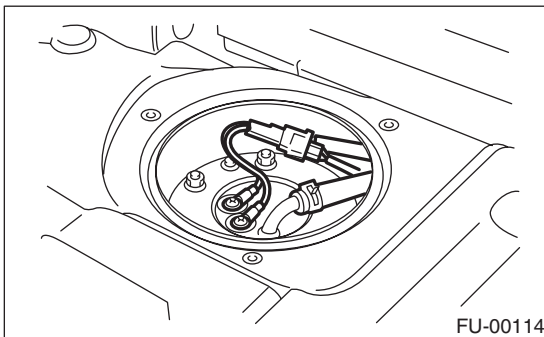
2) Remove the luggage floor mat. <Ref. to EI-48, REMOVAL, Luggage Floor Mat.>

3) Remove the service hole cover.

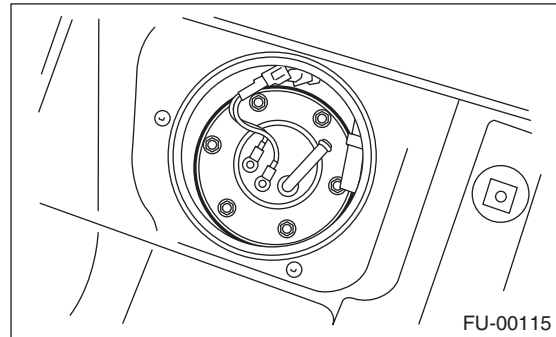


4) Disconnect the connector from the fuel sub level sensor.

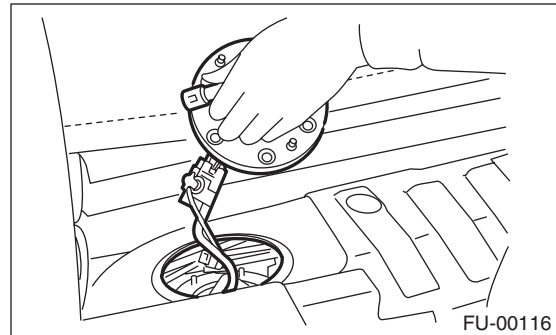
5) Disconnect the fuel jet pump hose.



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



7) Remove the fuel sub level sensor.



B: INSTALLATION

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

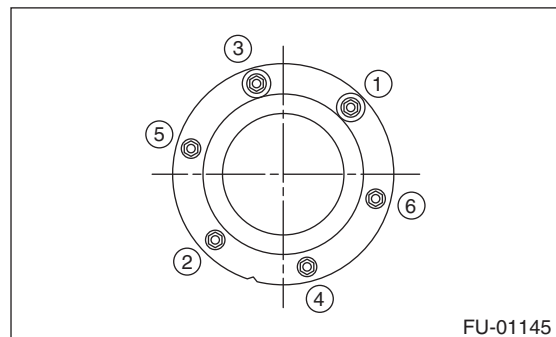
- Make sure the sealing portion is free from fuel or foreign matter before installation.
- Tighten the nuts to the specified torque in the order as shown in the figure.

NOTE:

Use a new gasket.

Tightening torque:

4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



29. Fuel Filter

A: REMOVAL

WARNING:

Place “NO FIRE” signs near the working area.

CAUTION:

Be careful not to spill fuel.

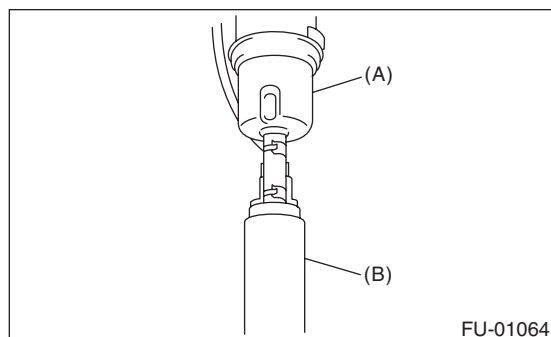
NOTE:

The fuel filter is assembled in fuel pump assembly.

1) Remove the fuel pump assembly.

<Ref. to FU(H4DOTC)-59, REMOVAL, Fuel Pump.>

2) Separate the fuel pump and fuel filter.



(A) Fuel filter

(B) Fuel pump

B: INSTALLATION

CAUTION:

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

Install in the reverse order of removal.

C: INSPECTION

1) Check the inside of fuel filter for dirt and water sediment.

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

Fuel Cut Valve

FUEL INJECTION (FUEL SYSTEMS)

30.Fuel Cut Valve

A: REMOVAL

WARNING:

Place “NO FIRE” signs near the working area.

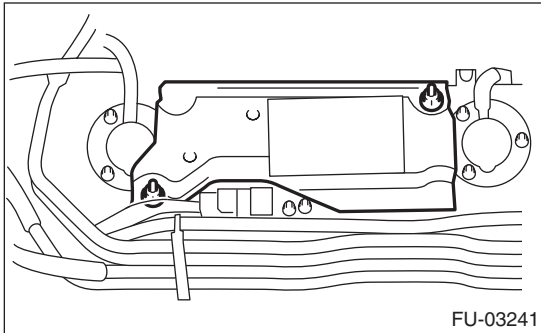
CAUTION:

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

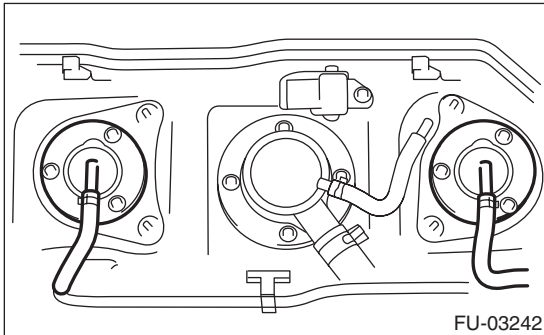
1) Remove the fuel tank.

<Ref. to FU(H4DOTC)-52, REMOVAL, Fuel Tank.>

2) Remove the protect cover.



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



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

B: INSTALLATION

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

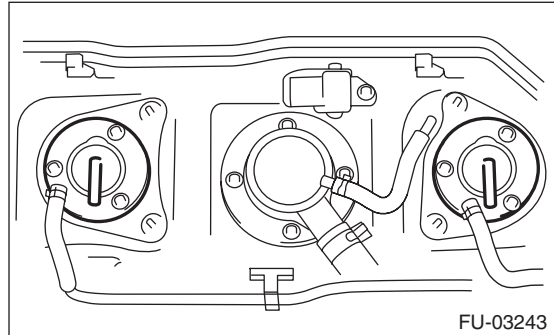
- Make sure the sealing portion is free from fuel or foreign matter before installation.

NOTE:

Use a new gasket.

Tightening torque:

4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



31.Fuel Damper Valve

A: REMOVAL

WARNING:

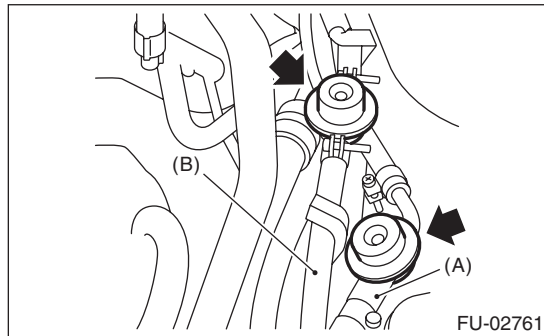
Place “NO FIRE” signs near the working area.

CAUTION:

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

1) Release the fuel pressure. <Ref. to FU(H4DOTC)-51, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>

2) Remove the fuel damper valve from the fuel delivery line (A) and the fuel return line (B).



B: INSTALLATION

CAUTION:

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

Install in the reverse order of removal.

Tightening torque:

1.25 N·m (0.13 kgf-m, 0.94 ft-lb)

32.Fuel Delivery, Return and Evaporation Lines

A: REMOVAL

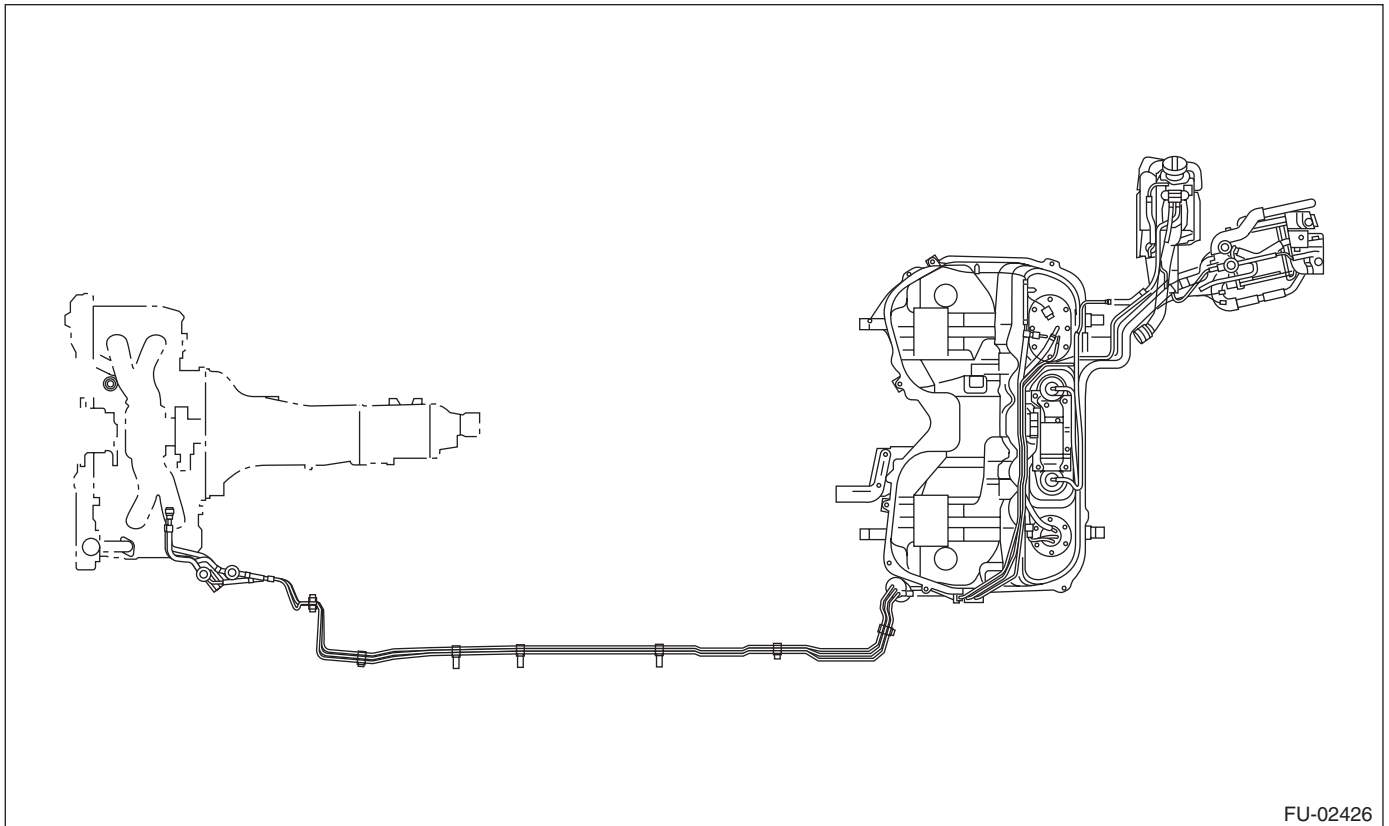
WARNING:

Place “NO FIRE” signs near the working area.

CAUTION:

Be careful not to spill fuel.

- 1) Set the vehicle on a lift.
- 2) Release the fuel pressure. <Ref. to FU(H4DOTC)-51, 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-47, REMOVAL, Floor Mat.>
- 5) Disconnect the fuel delivery tubes and quick connectors, and then disconnect the fuel return pipes and hoses, evaporation pipes and hoses.



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Fuel Delivery, Return and Evaporation Lines

FUEL INJECTION (FUEL SYSTEMS)

6) In the engine room, remove the fuel delivery hose (A), return hose (B) and evaporation hose (C).

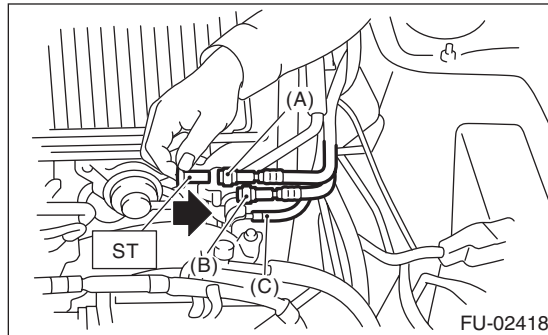
(1) Disconnect the quick connector on the fuel delivery line and return line by pushing the ST in the direction of the arrow.

ST 42099AE000 CONNECTOR REMOVER

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

CAUTION:

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

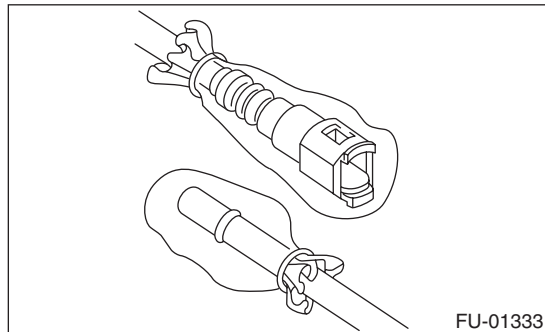


7) Lift up the vehicle.

8) Disconnect the quick connector on the fuel line.

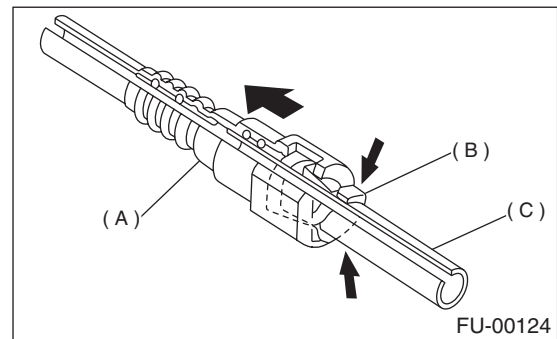
(1) Clean the pipe and connector, if they are covered with dust.

(2) To prevent from damaging or entering foreign matter, wrap the pipes and connectors with plastic bag etc.



(3) Hold the connector (A) and push the retainer (B) down.

(4) Pull out the connector (A) from the retainer (B).



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

B: INSTALLATION

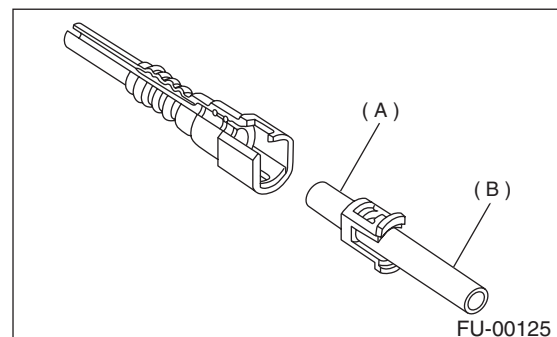
1) Connect the quick connector to the fuel delivery line.

CAUTION:

- Replace the retainer other than in the engine room with a new part.
- Make sure there are no damage or dust on connections. If necessary, clean seal surface of pipe.

NOTE:

Use a new retainer.

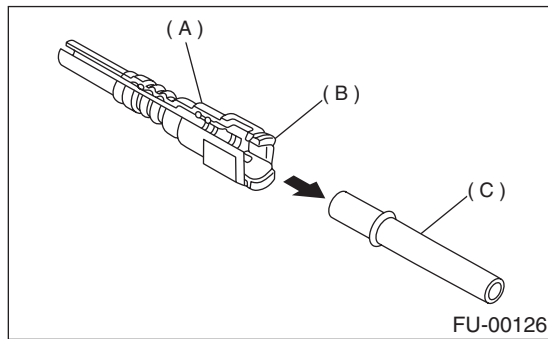


- (A) Seal surface
(B) Pipe

Fuel Delivery, Return and Evaporation Lines

FUEL INJECTION (FUEL SYSTEMS)

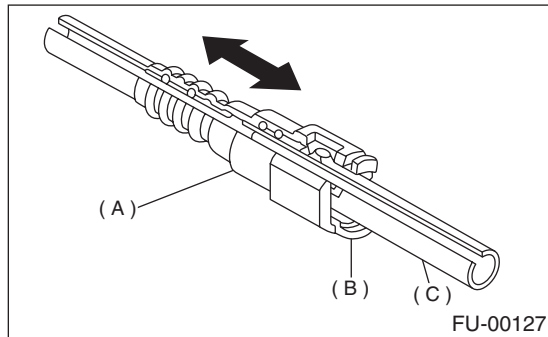
- (1) Set the new retainer (B) to connector (A).
- (2) Push the pipe into the connector completely.



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

CAUTION:

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



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

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

Type A: When the amount of inserting is specified.

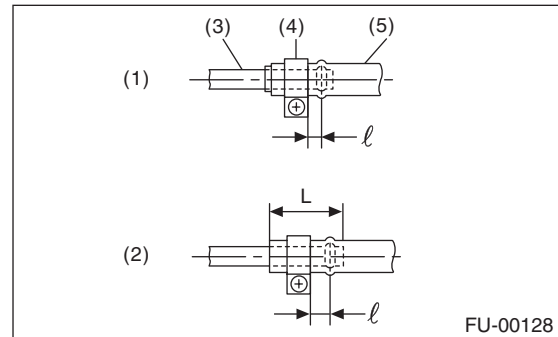
Type B: When the amount to be inserted is not specified.

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

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

CAUTION:

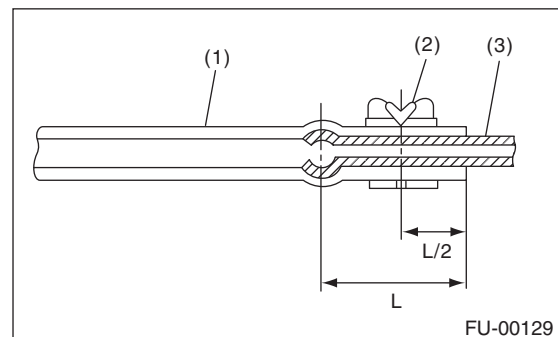
Be sure to inspect hoses and their connections for any leakage of fuel.



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

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

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



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

C: INSPECTION

- 1) Check that there are no cracks, holes or other damage to the fuel pipes and fuel hoses.
- 2) Make sure the fuel pipe and fuel hose connections are tightened firmly.

33. Fuel System Trouble in General

A: INSPECTION

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

NOTE:

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

Fuel System Trouble in General

FUEL INJECTION (FUEL SYSTEMS)

List of Diagnostic Trouble Code (DTC)

GENERAL DESCRIPTION

1. List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Item	Note
P0011	Intake Camshaft Position - Timing Over-Advanced or System Performance (Bank 1)	<Ref. to GD(H4DOTC)-10, DTC P0011 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0016	Crankshaft Position - Camshaft Position Correlation (Bank 1)	<Ref. to GD(H4DOTC)-12, DTC P0016 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0018	Crankshaft Position - Camshaft Position Correlation (Bank 1)	<Ref. to GD(H4DOTC)-12, DTC P0018 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0021	Intake Camshaft Position - Timing Over-Advanced or System Performance (Bank 2)	<Ref. to GD(H4DOTC)-12, DTC P0021 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0030	HO2S Heater Control Circuit (Bank 1 Sensor 1)	<Ref. to GD(H4DOTC)-13, DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0031	HO2S Heater Control Circuit Low (Bank 1 Sensor 1)	<Ref. to GD(H4DOTC)-15, DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0032	HO2S Heater Control Circuit High (Bank 1 Sensor 1)	<Ref. to GD(H4DOTC)-17, DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0037	HO2S Heater Control Circuit Low (Bank 1 Sensor 2)	<Ref. to GD(H4DOTC)-19, DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0038	HO2S Heater Control Circuit High (Bank 1 Sensor 2)	<Ref. to GD(H4DOTC)-21, DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0068	MAP/MAF - Throttle Position Correlation	<Ref. to GD(H4DOTC)-23, DTC P0068 MAP/MAF - THROTTLE POSITION CORRELATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0101	Mass or Volume Air Flow Circuit Range/Performance	<Ref. to GD(H4DOTC)-25, DTC P0101 MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0102	Mass or Volume Air Flow Circuit Low Input	<Ref. to GD(H4DOTC)-28, DTC P0102 MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0103	Mass or Volume Air Flow Circuit High Input	<Ref. to GD(H4DOTC)-30, DTC P0103 MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0107	Manifold Absolute Pressure/Barometric Pressure Circuit Low Input	<Ref. to GD(H4DOTC)-32, DTC P0107 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0108	Manifold Absolute Pressure/Barometric Pressure Circuit High Input	<Ref. to GD(H4DOTC)-34, DTC P0108 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0111	Intake Air Temperature Sensor 1 Circuit Range/Performance	<Ref. to GD(H4DOTC)-36, DTC P0111 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0112	Intake Air Temperature Sensor 1 Circuit Low	<Ref. to GD(H4DOTC)-38, DTC P0112 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0113	Intake Air Temperature Sensor 1 Circuit High	<Ref. to GD(H4DOTC)-40, DTC P0113 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0117	Engine Coolant Temperature Circuit Low	<Ref. to GD(H4DOTC)-42, DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0118	Engine Coolant Temperature Circuit High	<Ref. to GD(H4DOTC)-44, DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

List of Diagnostic Trouble Code (DTC)

GENERAL DESCRIPTION

DTC	Item	Note
P0122	Throttle/Pedal Position Sensor/ Switch "A" Circuit Low	<Ref. to GD(H4DOTC)-46, DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0123	Throttle/Pedal Position Sensor/ Switch "A" Circuit High	<Ref. to GD(H4DOTC)-48, DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0125	Insufficient Coolant Temperature for Closed Loop Fuel Control	<Ref. to GD(H4DOTC)-50, DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0126	Insufficient Engine Coolant Temperature for Stable Operation	<Ref. to GD(H4DOTC)-53, DTC P0126 INSUFFICIENT ENGINE COOLANT TEMPERATURE FOR STABLE OPERATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0128	Coolant Thermostat (Engine Coolant Temperature Below Thermostat Regulating Temperature)	<Ref. to GD(H4DOTC)-55, DTC P0128 COOLANT THERMOSTAT (ENGINE COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0131	O2 Sensor Circuit Low Voltage (Bank 1 Sensor 1)	<Ref. to GD(H4DOTC)-57, DTC P0131 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0132	O2 Sensor Circuit High Voltage (Bank 1 Sensor 1)	<Ref. to GD(H4DOTC)-59, DTC P0132 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0133	O2 Sensor Circuit Slow Response (Bank 1 Sensor 1)	<Ref. to GD(H4DOTC)-61, DTC P0133 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0134	O2 Sensor Circuit No Activity Detected (Bank 1 Sensor 1)	<Ref. to GD(H4DOTC)-64, DTC P0134 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0137	O2 Sensor Circuit Low Voltage (Bank 1 Sensor 2)	<Ref. to GD(H4DOTC)-66, DTC P0137 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0138	O2 Sensor Circuit High Voltage (Bank 1 Sensor 2)	<Ref. to GD(H4DOTC)-68, DTC P0138 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0139	O2 Sensor Circuit Slow Response (Bank 1 Sensor 2)	<Ref. to GD(H4DOTC)-69, DTC P0139 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0140	O2 Sensor Circuit No Activity Detected (Bank 1 Sensor 2)	<Ref. to GD(H4DOTC)-74, DTC P0140 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0171	System Too Lean (Bank 1)	<Ref. to GD(H4DOTC)-76, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0172	System Too Rich (Bank 1)	<Ref. to GD(H4DOTC)-79, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0181	Fuel Temperature Sensor "A" Circuit Range/Performance	<Ref. to GD(H4DOTC)-82, DTC P0181 FUEL TEMPERATURE SENSOR "A" CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0182	Fuel Temperature Sensor "A" Circuit Low Input	<Ref. to GD(H4DOTC)-85, DTC P0182 FUEL TEMPERATURE SENSOR "A" CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0183	Fuel Temperature Sensor "A" Circuit High Input	<Ref. to GD(H4DOTC)-87, DTC P0183 FUEL TEMPERATURE SENSOR "A" CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0222	Throttle/Pedal Position Sensor/ Switch "B" Circuit Low	<Ref. to GD(H4DOTC)-89, DTC P0222 THROTTLE/PEDAL POSITION SENSOR/SWITCH "B" CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0223	Throttle/Pedal Position Sensor/ Switch "B" Circuit High	<Ref. to GD(H4DOTC)-91, DTC P0223 THROTTLE/PEDAL POSITION SENSOR/SWITCH "B" CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

List of Diagnostic Trouble Code (DTC)

GENERAL DESCRIPTION

DTC	Item	Note
P0230	Fuel Pump Primary Circuit	<Ref. to GD(H4DOTC)-93, DTC P0230 FUEL PUMP PRIMARY CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0244	Turbo/Super Charger Wastegate Solenoid "A" Range/Performance	<Ref. to GD(H4DOTC)-95, DTC P0244 TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0245	Turbo/Super Charger Wastegate Solenoid "A" Low	<Ref. to GD(H4DOTC)-97, DTC P0245 TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0246	Turbo/Super Charger Wastegate Solenoid "A" High	<Ref. to GD(H4DOTC)-99, DTC P0246 TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0301	Cylinder 1 Misfire Detected	<Ref. to GD(H4DOTC)-101, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0302	Cylinder 2 Misfire Detected	<Ref. to GD(H4DOTC)-106, DTC P0302 CYLINDER 2 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0303	Cylinder 3 Misfire Detected	<Ref. to GD(H4DOTC)-106, DTC P0303 CYLINDER 3 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0304	Cylinder 4 Misfire Detected	<Ref. to GD(H4DOTC)-106, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0327	Knock Sensor 1 Circuit Low (Bank 1 or Single Sensor)	<Ref. to GD(H4DOTC)-107, DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0328	Knock Sensor 1 Circuit High (Bank 1 or Single Sensor)	<Ref. to GD(H4DOTC)-109, DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0335	Crankshaft Position Sensor "A" Circuit	<Ref. to GD(H4DOTC)-111, DTC P0335 CRANKSHAFT POSITION SENSOR "A" CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0336	Crankshaft Position Sensor "A" Circuit Range/Performance	<Ref. to GD(H4DOTC)-113, DTC P0336 CRANKSHAFT POSITION SENSOR "A" CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0340	Camshaft Position Sensor "A" Circuit (Bank 1 or Single Sensor)	<Ref. to GD(H4DOTC)-115, DTC P0340 CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0345	Camshaft Position Sensor "A" Circuit (Bank 2)	<Ref. to GD(H4DOTC)-116, DTC P0345 CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0410	Secondary Air Injection System	<Ref. to GD(H4DOTC)-117, DTC P0410 SECONDARY AIR INJECTION SYSTEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0411	Secondary Air Injection System Incorrect Flow Detected	<Ref. to GD(H4DOTC)-125, DTC P0411 SECONDARY AIR INJECTION SYSTEM INCORRECT FLOW DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0413	Secondary Air Injection System Switching Valve "A" Circuit Open	<Ref. to GD(H4DOTC)-126, DTC P0413 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE "A" CIRCUIT OPEN, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0414	Secondary Air Injection System Switching Valve "A" Circuit Shorted	<Ref. to GD(H4DOTC)-127, DTC P0414 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE "A" CIRCUIT SHORTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0416	Secondary Air Injection System Switching Valve "B" Circuit Open	<Ref. to GD(H4DOTC)-128, DTC P0416 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE "B" CIRCUIT OPEN, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0417	Secondary Air Injection System Switching Valve "B" Circuit Shorted	<Ref. to GD(H4DOTC)-128, DTC P0417 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE "B" CIRCUIT SHORTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0418	Secondary Air Injection System Control "A" Circuit Open	<Ref. to GD(H4DOTC)-129, DTC P0418 SECONDARY AIR INJECTION SYSTEM CONTROL "A" CIRCUIT OPEN, Diagnostic Trouble Code (DTC) Detecting Criteria.>

List of Diagnostic Trouble Code (DTC)

GENERAL DESCRIPTION

DTC	Item	Note
P0420	Catalyst System Efficiency Below Threshold (Bank 1)	<Ref. to GD(H4DOTC)-130, DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0441	Evaporative Emission System Incorrect Purge Flow	<Ref. to GD(H4DOTC)-131, DTC P0441 EVAPORATIVE EMISSION SYSTEM INCORRECT PURGE FLOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0442	Evaporative Emission Control System Leak Detected (Small Leak)	<Ref. to GD(H4DOTC)-132, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0447	Evaporative Emission Control System Vent Control Circuit Open	<Ref. to GD(H4DOTC)-148, DTC P0447 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0448	Evaporative Emission Control System Vent Control Circuit Shorted	<Ref. to GD(H4DOTC)-150, DTC P0448 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0451	Evaporative Emission Control System Pressure Sensor	<Ref. to GD(H4DOTC)-152, DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0452	Evaporative Emission Control System Pressure Sensor Low Input	<Ref. to GD(H4DOTC)-154, DTC P0452 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0453	Evaporative Emission Control System Pressure Sensor High Input	<Ref. to GD(H4DOTC)-156, DTC P0453 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0456	Evaporative Emission Control System Leak Detected (Very Small Leak)	<Ref. to GD(H4DOTC)-157, DTC P0456 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0457	Evaporative Emission Control System Leak Detected (Fuel Cap Loose/Off)	<Ref. to GD(H4DOTC)-157, DTC P0457 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0458	Evaporative Emission System Purge Control Valve Circuit Low	<Ref. to GD(H4DOTC)-158, DTC P0458 EVAPORATIVE EMISSION SYSTEM PURGE CONTROL VALVE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0459	Evaporative Emission System Purge Control Valve Circuit High	<Ref. to GD(H4DOTC)-160, DTC P0459 EVAPORATIVE EMISSION SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0461	Fuel Level Sensor "A" Circuit Range/Performance	<Ref. to GD(H4DOTC)-162, DTC P0461 FUEL LEVEL SENSOR "A" CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0462	Fuel Level Sensor "A" Circuit Low	<Ref. to GD(H4DOTC)-164, DTC P0462 FUEL LEVEL SENSOR "A" CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0463	Fuel Level Sensor "A" Circuit High	<Ref. to GD(H4DOTC)-166, DTC P0463 FUEL LEVEL SENSOR "A" CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0464	Fuel Level Sensor Circuit Intermittent	<Ref. to GD(H4DOTC)-168, DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0483	Fan Rationality Check	<Ref. to GD(H4DOTC)-171, DTC P0483 FAN RATIONALITY CHECK, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0502	Vehicle Speed Sensor "A" Circuit Low Input	<Ref. to GD(H4DOTC)-172, DTC P0502 VEHICLE SPEED SENSOR "A" CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0503	Vehicle Speed Sensor "A" Intermittent/Erratic/High	<Ref. to GD(H4DOTC)-173, DTC P0503 VEHICLE SPEED SENSOR "A" INTERMITTENT/ERRATIC/HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0506	Idle Air Control System RPM Lower Than Expected	<Ref. to GD(H4DOTC)-174, DTC P0506 IDLE AIR CONTROL SYSTEM RPM LOWER THAN EXPECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

List of Diagnostic Trouble Code (DTC)

GENERAL DESCRIPTION

DTC	Item	Note
P0507	Idle Air Control System RPM Higher Than Expected	<Ref. to GD(H4DOTC)-176, DTC P0507 IDLE AIR CONTROL SYSTEM RPM HIGHER THAN EXPECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0512	Starter Request Circuit	<Ref. to GD(H4DOTC)-178, DTC P0512 STARTER REQUEST CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0513	Incorrect Immobilizer Key	<Ref. to GD(H4DOTC)-179, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0519	Idle Air Control System Performance	<Ref. to GD(H4DOTC)-180, DTC P0519 IDLE AIR CONTROL SYSTEM PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0600	Serial Communication Link	<Ref. to GD(H4DOTC)-181, DTC P0600 SERIAL COMMUNICATION LINK, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0604	Internal Control Module Random Access Memory (RAM) Error	<Ref. to GD(H4DOTC)-182, DTC P0604 INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0605	Internal Control Module Read Only Memory (ROM) Error	<Ref. to GD(H4DOTC)-183, DTC P0605 INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0607	Control Module Performance	<Ref. to GD(H4DOTC)-184, DTC P0607 CONTROL MODULE PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0638	Throttle Actuator Control Range/Performance (Bank 1)	<Ref. to GD(H4DOTC)-186, DTC P0638 THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0691	Fan 1 Control Circuit Low	<Ref. to GD(H4DOTC)-189, DTC P0691 FAN 1 CONTROL CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0692	Fan 1 Control Circuit High	<Ref. to GD(H4DOTC)-190, DTC P0692 FAN 1 CONTROL CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0700	Transmission Control System (MIL Request)	<Ref. to GD(H4DOTC)-191, DTC P0700 TRANSMISSION CONTROL SYSTEM (MIL REQUEST), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0851	Park/Neutral Switch Input Circuit Low (AT Model)	<Ref. to GD(H4DOTC)-192, DTC P0851 PARK/NEUTRAL SWITCH INPUT CIRCUIT LOW (AT MODEL), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0851	Neutral Switch Input Circuit Low (MT Model)	<Ref. to GD(H4DOTC)-193, DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW (MT MODEL), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0852	Park/Neutral Switch Input Circuit High (AT Model)	<Ref. to GD(H4DOTC)-194, DTC P0852 PARK/NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT MODEL), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0852	Neutral Switch Input Circuit High (MT Model)	<Ref. to GD(H4DOTC)-195, DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT MODEL), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1152	O2 Sensor Circuit Range/Performance (Low) (Bank 1 Sensor 1)	<Ref. to GD(H4DOTC)-196, DTC P1152 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1153	O2 Sensor Circuit Range/Performance (High) (Bank 1 Sensor 1)	<Ref. to GD(H4DOTC)-198, DTC P1153 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1160	Return Spring Failure	<Ref. to GD(H4DOTC)-200, DTC P1160 RETURN SPRING FAILURE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1400	Fuel Tank Pressure Control Solenoid Valve Circuit Low	<Ref. to GD(H4DOTC)-202, DTC P1400 FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1410	Secondary Air Injection System Switching Valve Stuck Open	<Ref. to GD(H4DOTC)-204, DTC P1410 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN, Diagnostic Trouble Code (DTC) Detecting Criteria.>

List of Diagnostic Trouble Code (DTC)

GENERAL DESCRIPTION

DTC	Item	Note
P1418	Secondary Air Injection System Control "A" Circuit Shorted	<Ref. to GD(H4DOTC)-205, DTC P1418 SECONDARY AIR INJECTION SYSTEM CONTROL "A" CIRCUIT SHORTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1420	Fuel Tank Pressure Control Sol. Valve Circuit High	<Ref. to GD(H4DOTC)-206, DTC P1420 FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1443	Vent Control Solenoid Valve Function Problem	<Ref. to GD(H4DOTC)-208, DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1491	Positive Crankcase Ventilation (Blow-by) Function Problem	<Ref. to GD(H4DOTC)-210, DTC P1491 POSITIVE CRANKCASE VENTILATION (BLOW-BY) FUNCTION PROBLEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1518	Starter Switch Circuit Low Input	<Ref. to GD(H4DOTC)-212, DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1560	Back-up Voltage Circuit Malfunction	<Ref. to GD(H4DOTC)-213, DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1570	Antenna	<Ref. to GD(H4DOTC)-214, DTC P1570 ANTENNA, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1571	Reference Code Incompatibility	<Ref. to GD(H4DOTC)-214, DTC P1571 REFERENCE CODE INCOMPATIBILITY, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1572	IMM Circuit Failure (Except Antenna Circuit)	<Ref. to GD(H4DOTC)-214, DTC P1572 IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1574	Key Communication Failure	<Ref. to GD(H4DOTC)-214, DTC P1574 KEY COMMUNICATION FAILURE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1576	EGI Control Module EEPROM	<Ref. to GD(H4DOTC)-214, DTC P1576 EGI CONTROL MODULE EEPROM, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1577	IMM Control Module EEPROM	<Ref. to GD(H4DOTC)-214, DTC P1577 IMM CONTROL MODULE EEPROM, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1602	Control Module Programming Error	<Ref. to GD(H4DOTC)-215, DTC P1602 CONTROL MODULE PROGRAMMING ERROR, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2004	Intake Manifold Runner Control Stuck Open (Bank 1)	<Ref. to GD(H4DOTC)-217, DTC P2004 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2005	Intake Manifold Runner Control Stuck Open (Bank 2)	<Ref. to GD(H4DOTC)-218, DTC P2005 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2006	Intake Manifold Runner Control Stuck Closed (Bank 1)	<Ref. to GD(H4DOTC)-219, DTC P2006 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2007	Intake Manifold Runner Control Stuck Closed (Bank 2)	<Ref. to GD(H4DOTC)-220, DTC P2007 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2008	Intake Manifold Runner Control Circuit / Open (Bank 1)	<Ref. to GD(H4DOTC)-221, DTC P2008 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2009	Intake Manifold Runner Control Circuit Low (Bank 1)	<Ref. to GD(H4DOTC)-223, DTC P2009 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2011	Intake Manifold Runner Control Circuit / Open (Bank 2)	<Ref. to GD(H4DOTC)-225, DTC P2011 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2012	Intake Manifold Runner Control Circuit Low (Bank 2)	<Ref. to GD(H4DOTC)-227, DTC P2012 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

List of Diagnostic Trouble Code (DTC)

GENERAL DESCRIPTION

DTC	Item	Note
P2016	Intake Manifold Runner Position Sensor / Switch Circuit Low (Bank 1)	<Ref. to GD(H4DOTC)-229, DTC P2016 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT LOW (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2017	Intake Manifold Runner Position Sensor / Switch Circuit High (Bank 1)	<Ref. to GD(H4DOTC)-231, DTC P2017 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT HIGH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2021	Intake Manifold Runner Position Sensor / Switch Circuit Low (Bank 2)	<Ref. to GD(H4DOTC)-233, DTC P2021 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT LOW (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2022	Intake Manifold Runner Position Sensor / Switch Circuit High (Bank 2)	<Ref. to GD(H4DOTC)-235, DTC P2022 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT HIGH (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2088	Intake Camshaft Position Actuator Control Circuit Low (Bank 1)	<Ref. to GD(H4DOTC)-237, DTC P2088 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2089	Intake Camshaft Position Actuator Control Circuit High (Bank 1)	<Ref. to GD(H4DOTC)-239, DTC P2089 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2092	Intake Camshaft Position Actuator Control Circuit Low (Bank 2)	<Ref. to GD(H4DOTC)-241, DTC P2092 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2093	Intake Camshaft Position Actuator Control Circuit High (Bank 2)	<Ref. to GD(H4DOTC)-243, DTC P2093 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2096	Post Catalyst Fuel Trim System Too Lean Bank 1	<Ref. to GD(H4DOTC)-245, DTC P2096 POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2097	Post Catalyst Fuel Trim System Too Rich Bank 1	<Ref. to GD(H4DOTC)-247, DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2101	Throttle Actuator Control Motor Circuit Range/Performance	<Ref. to GD(H4DOTC)-249, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2102	Throttle Actuator Control Motor Circuit Low	<Ref. to GD(H4DOTC)-251, DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2103	Throttle Actuator Control Motor Circuit High	<Ref. to GD(H4DOTC)-253, DTC P2103 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2109	Throttle/Pedal Position Sensor "A" Minimum Stop Performance	<Ref. to GD(H4DOTC)-255, DTC P2109 THROTTLE/PEDAL POSITION SENSOR "A" MINIMUM STOP PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2122	Throttle/Pedal Position Sensor/ Switch "D" Circuit Low Input	<Ref. to GD(H4DOTC)-257, DTC P2122 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2123	Throttle/Pedal Position Sensor/ Switch "D" Circuit High Input	<Ref. to GD(H4DOTC)-259, DTC P2123 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2127	Throttle/Pedal Position Sensor/ Switch "E" Circuit Low Input	<Ref. to GD(H4DOTC)-261, DTC P2127 THROTTLE/PEDAL POSITION SENSOR/SWITCH "E" CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2128	Throttle/Pedal Position Sensor/ Switch "E" Circuit High Input	<Ref. to GD(H4DOTC)-263, DTC P2128 THROTTLE/PEDAL POSITION SENSOR/SWITCH "E" CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2135	Throttle/Pedal Position Sensor/ Switch "A"/"B" Voltage Correlation	<Ref. to GD(H4DOTC)-265, DTC P2135 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A"/"B" VOLTAGE CORRELATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

List of Diagnostic Trouble Code (DTC)

GENERAL DESCRIPTION

DTC	Item	Note
P2138	Throttle/Pedal Position Sensor/ Switch "D"/"E" Voltage Correlation	<Ref. to GD(H4DOTC)-267, DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D"/"E" VOLTAGE CORRELATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2419	Evaporative Emission System Switching Valve Control Circuit Low	<Ref. to GD(H4DOTC)-269, DTC P2419 EVAPORATIVE EMISSION SYSTEM SWITCHING VALVE CONTROL CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2420	Evaporative Emission System Switching Valve Control Circuit High	<Ref. to GD(H4DOTC)-270, DTC P2420 EVAPORATIVE EMISSION SYSTEM SWITCHING VALVE CONTROL CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2431	Secondary Air Injection System Air Flow /Pressure Sensor Circuit Range/Performance	<Ref. to GD(H4DOTC)-271, DTC P2431 SECONDARY AIR INJECTION SYSTEM AIR FLOW /PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2432	Secondary Air Injection System Air Flow /Pressure Sensor Circuit Low	<Ref. to GD(H4DOTC)-272, DTC P2432 SECONDARY AIR INJECTION SYSTEM AIR FLOW /PRESSURE SENSOR CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2433	Secondary Air Injection System Air Flow /Pressure Sensor Circuit High	<Ref. to GD(H4DOTC)-273, DTC P2433 SECONDARY AIR INJECTION SYSTEM AIR FLOW /PRESSURE SENSOR CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2440	Secondary Air Injection System Switching Valve Stuck Open (Bank 1)	<Ref. to GD(H4DOTC)-274, DTC P2440 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2441	Secondary Air Injection System Switching Valve Stuck Closed (Bank 1)	<Ref. to GD(H4DOTC)-274, DTC P2441 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK CLOSED (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2442	Secondary Air Injection System Switching Valve Stuck Open (Bank 2)	<Ref. to GD(H4DOTC)-274, DTC P2442 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2443	Secondary Air Injection System Switching Valve Stuck Closed (Bank 2)	<Ref. to GD(H4DOTC)-274, DTC P2443 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK CLOSED (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2444	Secondary Air Injection System Pump Stuck On	<Ref. to GD(H4DOTC)-275, DTC P2444 SECONDARY AIR INJECTION SYSTEM PUMP STUCK ON, Diagnostic Trouble Code (DTC) Detecting Criteria.>

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

2. Diagnostic Trouble Code (DTC) Detecting Criteria

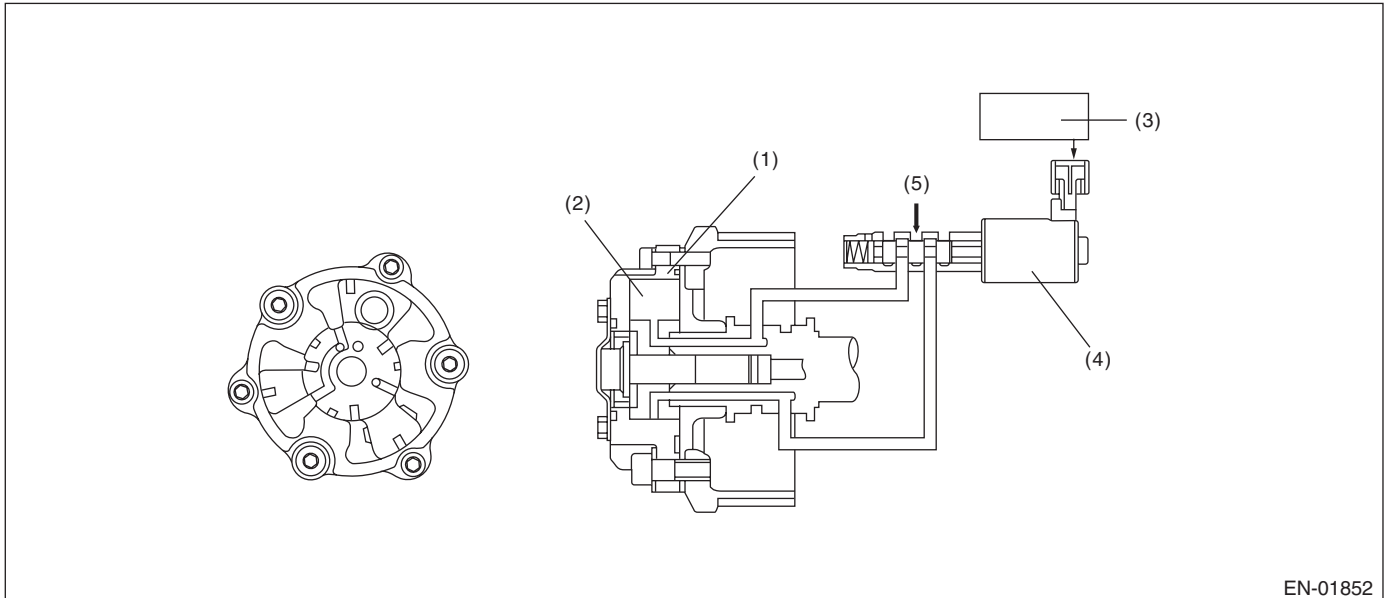
A: DTC P0011 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of AVCS system.

There are two types of diagnosis: Crankshaft cam timing diagnosis, and slow response diagnosis. Either of these is performed according to the status of the engine while running.

2. COMPONENT DESCRIPTION



EN-01852

(A) Air

(1) AVCS timing controller

(3) Engine control module (ECM)

(5) Oil pressure

(2) Vane

(4) Oil flow control solenoid valve

3. ENABLE CONDITION

1. Crankshaft Timing Diagnosis

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 10.9 \text{ V}$
Engine coolant temperature	$> 60^{\circ}\text{C}$ (140°F)
Target timing advance	$= 0^{\circ}\text{CA}$
Engine speed	$\geq 500 \text{ rpm}$
AVCS	Uncontrolled

2. Slow Response Diagnosis

Secondary Parameters	Enable Conditions
All secondary parameters are executable.	1 second or more
Battery voltage	$\geq 10.9 \text{ V}$
Engine coolant temperature	$> 60^{\circ}\text{C}$ (140°F)
Amount of AVCS target timing advance	$\neq 0^{\circ}\text{CA}$
Engine speed	$\geq 1300 \text{ rpm}$
AVCS	Controlled
Target timing advance change amount	$< 1.07^{\circ}\text{CA}$

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

4. GENERAL DRIVING CYCLE

1. Crankshaft Timing Diagnosis

Perform the diagnosis continuously after starting engine and while AVCS is not operating.

2. Slow Response Diagnosis

Perform the diagnosis continuously after starting engine and while AVCS is operating.

5. DIAGNOSTIC METHOD

1. Crankshaft Timing Diagnosis

Judge as NG when the timing advance is outside the normal range. Judge as OK when it within the normal range.

Judge as NG when all the following conditions are established and the continuous time is more than 20 seconds. Judge as OK and clear the NG when the following conditions are not established and the continuous time is more than one second.

Judgment Value

Malfunction Criteria	Threshold Value
Basic timing advance	< -13°C or > 25°C

Time Needed for Diagnosis: 20 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

2. Slow Response Diagnosis

During AVCS control, calculate AVCS deviation separately for positive/negative, and when the calculated value per the set time (30 seconds) is large, this is judged as NG.

Abnormality Judgment

When all of the following conditions are established, judged as OK.

Judgment Value

Malfunction Criteria	Threshold Value
AVCS target position	$\geq 0^\circ\text{CA}$
AVCS positive deviation integrated value	< 8000°C (R bank) < 8000°C (L bank)
or	
AVCS negative deviation integrated value	< -8000°C (R bank) < -8000°C (L bank)

Time Needed for Diagnosis: 30 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judges OK when all of the following conditions are established, and clears the NG.

Judgment Value

Malfunction Criteria	Threshold Value
AVCS target position	$\geq 0^\circ\text{CA}$
AVCS positive deviation integrated value	$\leq 8000^\circ\text{CA}$ (R bank) $\leq 8000^\circ\text{CA}$ (L bank)
or	
AVCS negative deviation integrated value	$\geq -8000^\circ\text{CA}$ (R bank) $\geq -8000^\circ\text{CA}$ (L bank)

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

Make the oil flow control solenoid valve drive duty a predetermined value.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

B: DTC P0016 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK 1)

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P0011. <Ref. to GD(H4DOTC)-10, DTC P0011 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

C: DTC P0018 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK 2)

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P0011. <Ref. to GD(H4DOTC)-10, DTC P0011 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

D: DTC P0021 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 2)

1. OUTLINE OF DIAGNOSIS

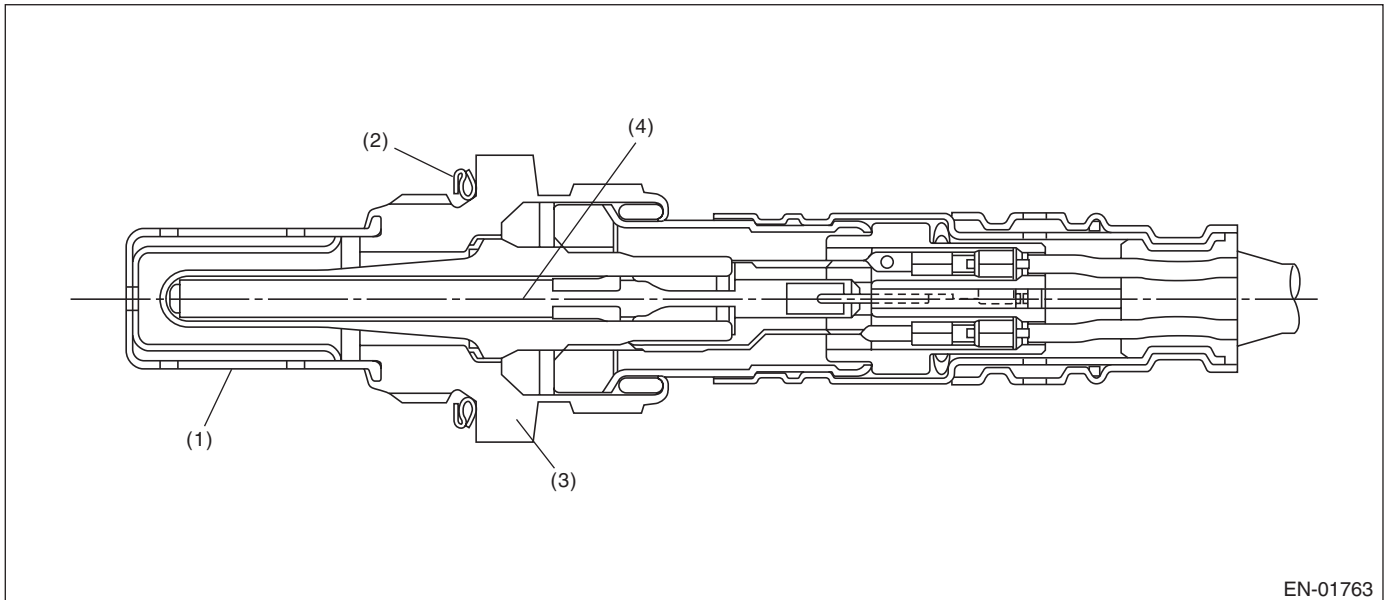
NOTE:

For the detection standard, refer to DTC P0011. <Ref. to GD(H4DOTC)-10, DTC P0011 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

E: DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1)**1. OUTLINE OF DIAGNOSIS**

Detect functional errors of the front oxygen (A/F) sensor heater.

Judge as NG when it is determined that the front oxygen (A/F) sensor impedance is large by referring to the engine condition such as fuel shut-off in deceleration, etc.

2. COMPONENT DESCRIPTION

EN-01763

- (1) Protection tube
(2) Gasket

(3) Sensor housing

(4) Ceramic heater

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Time needed for all secondary parameters to be in enable conditions	30 seconds or more
Battery voltage	> 10.9 V
After fuel cut	10 seconds or more
Front oxygen (A/F) sensor heater control duty $\geq$ 35%	Experienced
Heater current	ON

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after 30 seconds or more have passed since the engine started.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the malfunction criteria below becomes more than the time needed for diagnosis (10 seconds). Judge as OK and clear NG when the continuous time of not completing the malfunction criteria below becomes more than the time needed for diagnosis (10 seconds).

Judgment Value

Malfunction Criteria	Threshold Value
Front oxygen (A/F) sensor impedance	> 50 Ω

Time Needed for Diagnosis: 10 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

- Front oxygen sensor (A/F) sensor main learning compensation: Not allowed to calculate.
- Correction when re-starting at high temperature: Normally minimum value 0.3 → 0.
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

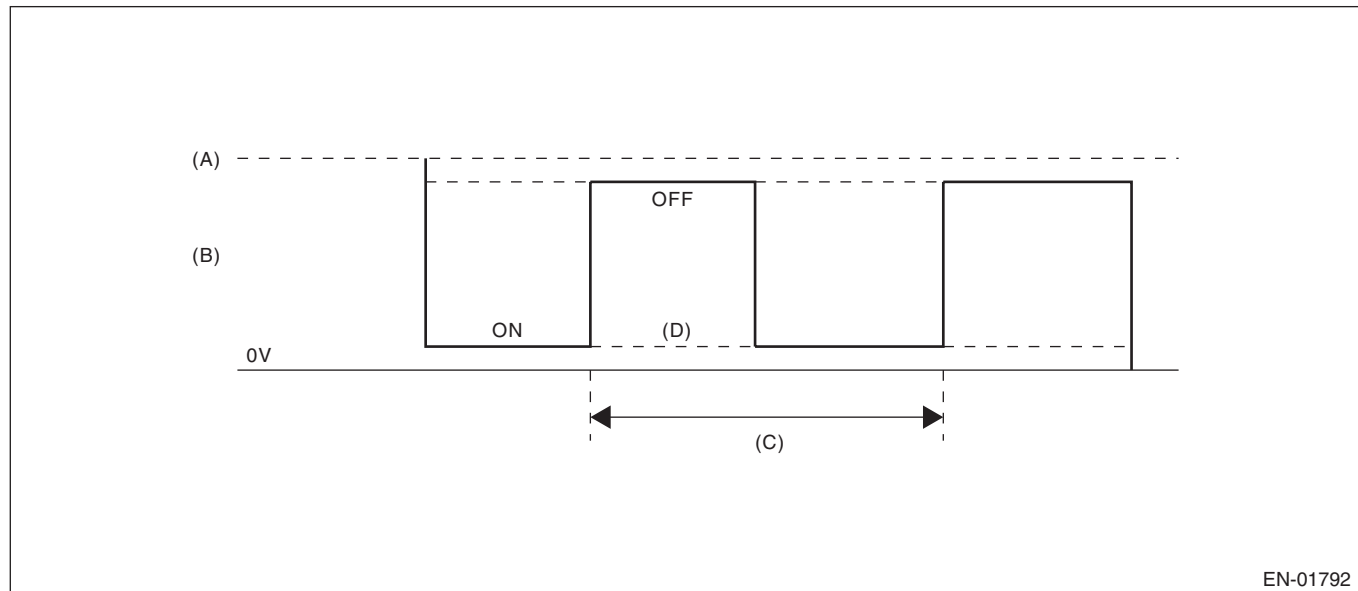
Memorize the freeze frame data. (For test mode \$02)

F: DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1)**1. OUTLINE OF DIAGNOSIS**

Detect the open or short circuit of heater.

The heater performs duty control, and the output terminal voltage at ON is 0 V and the output terminal voltage at OFF is the battery voltage.

Judge NG when the terminal voltage remains Low.

2. COMPONENT DESCRIPTION

EN-01792

(A) Battery voltage

(C) 128 milliseconds

(D) Low error

(B) Front oxygen (A/F) sensor heater
output voltage

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 10.9 \text{ V}$

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge NG when the continuous time of meeting the malfunction criteria below becomes more than 1 second (8 cycles).

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	Low
Front oxygen (A/F) sensor heater control duty	< 87.5%

Time Needed for Diagnosis: 1 second

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	High

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

- Front oxygen (A/F) sensor activation judgment: Front oxygen (A/F) sensor full activation is not complete, or front oxygen (A/F) sensor half activation is not complete.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- Compensation when starting the engine at high temperature: Make the MIN value to be 0.3 → 0, normally.
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

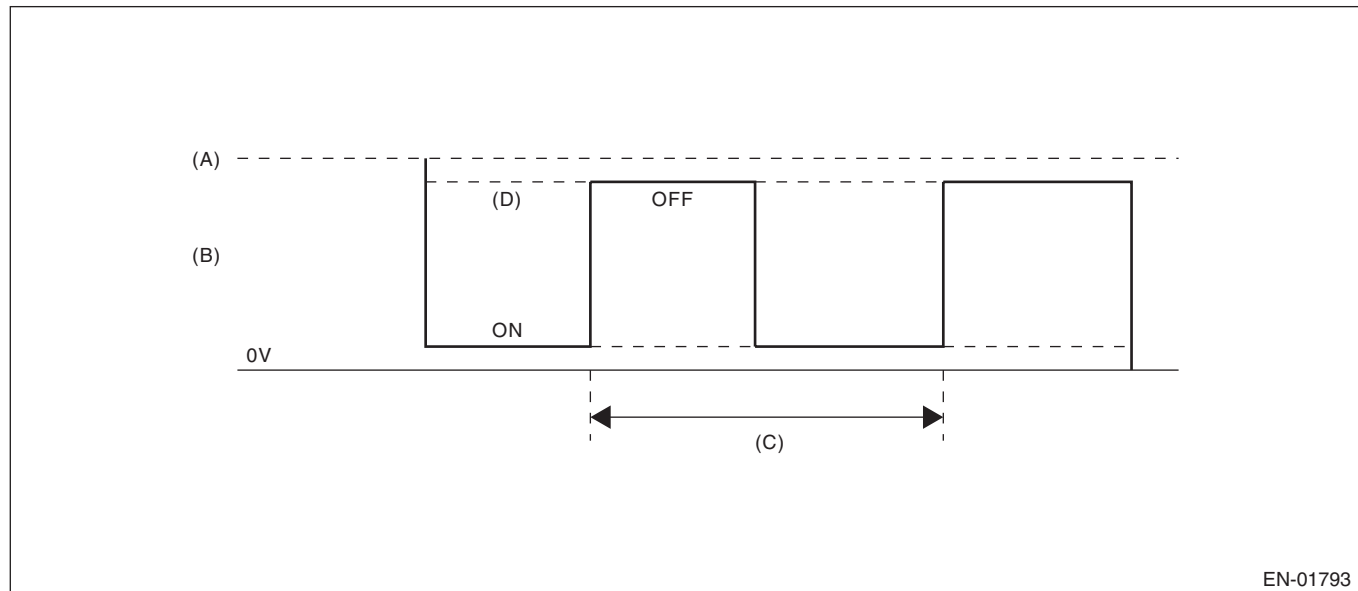
Memorize the freeze frame data. (For test mode \$02)

G: DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1)**1. OUTLINE OF DIAGNOSIS**

Detect the open or short circuit of heater.

The heater performs duty control, and the output terminal voltage at ON is 0 V and the output terminal voltage at OFF is the battery voltage.

Judge NG when the terminal voltage remains High.

2. COMPONENT DESCRIPTION

(A) Battery voltage

(C) 128 milliseconds

(D) High error

(B) Front oxygen (A/F) sensor heater
output voltage

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 10.9 \text{ V}$

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge NG when the continuous time of meeting the malfunction criteria below becomes more than 1 second (8 cycles).

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	High
Front oxygen (A/F) sensor heater control duty	$\geq 12.5\%$

Time Needed for Diagnosis: 1 second

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	Low

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

- Front oxygen (A/F) sensor activation judgment: Front oxygen (A/F) sensor full activation is not complete, or front oxygen (A/F) sensor half activation is not complete.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- Compensation when starting the engine at high temperature: Make the MIN value to be 0.3 $\rightarrow$ 0, normally.
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

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

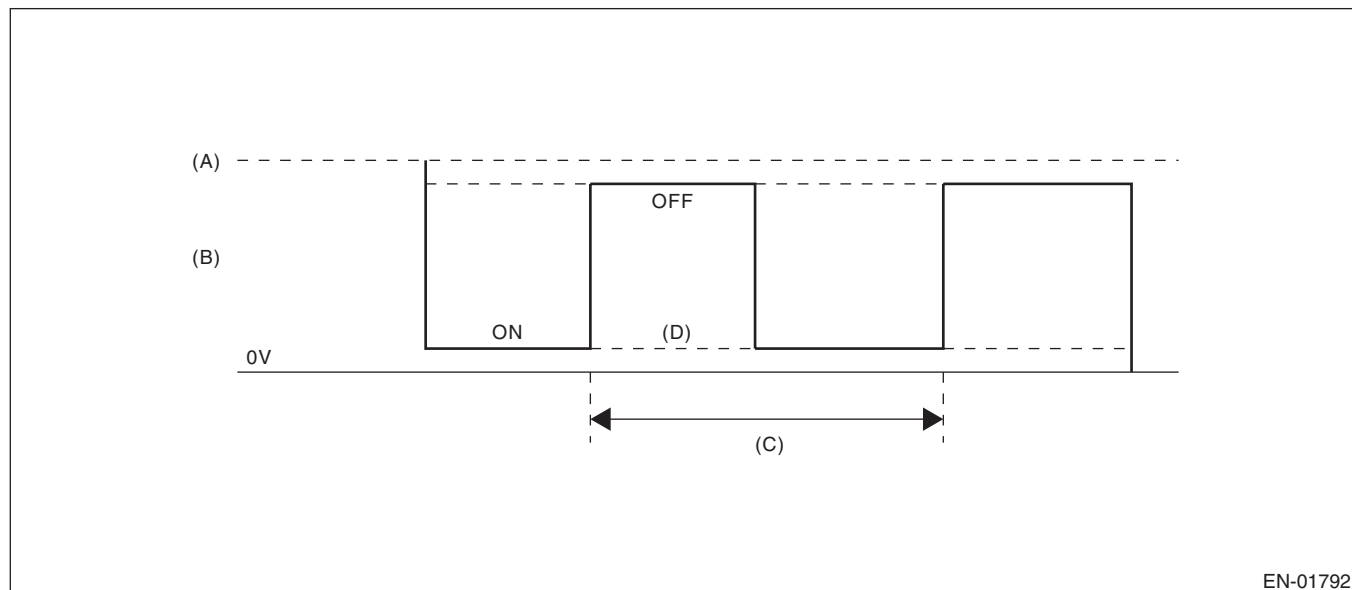
1. OUTLINE OF DIAGNOSIS

Detect the rear oxygen sensor heater open or short circuit.

The rear oxygen sensor heater performs duty control, and the output terminal voltage at ON is 0 V, and the output terminal voltage at OFF is the battery voltage.

Judge NG when the terminal voltage remains Low.

2. COMPONENT DESCRIPTION



(A) Battery voltage

(C) 256 milliseconds (cycles)

(D) Low error

(B) Output voltage of the rear oxygen sensor heater

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time while meeting all of the malfunction criteria below is more than 2560 milliseconds (10 cycles).

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	Low
Rear oxygen sensor heater control duty	< 75%

Time Needed for Diagnosis: 2.56 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	High

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

Sub feedback control: Not allowed

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

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

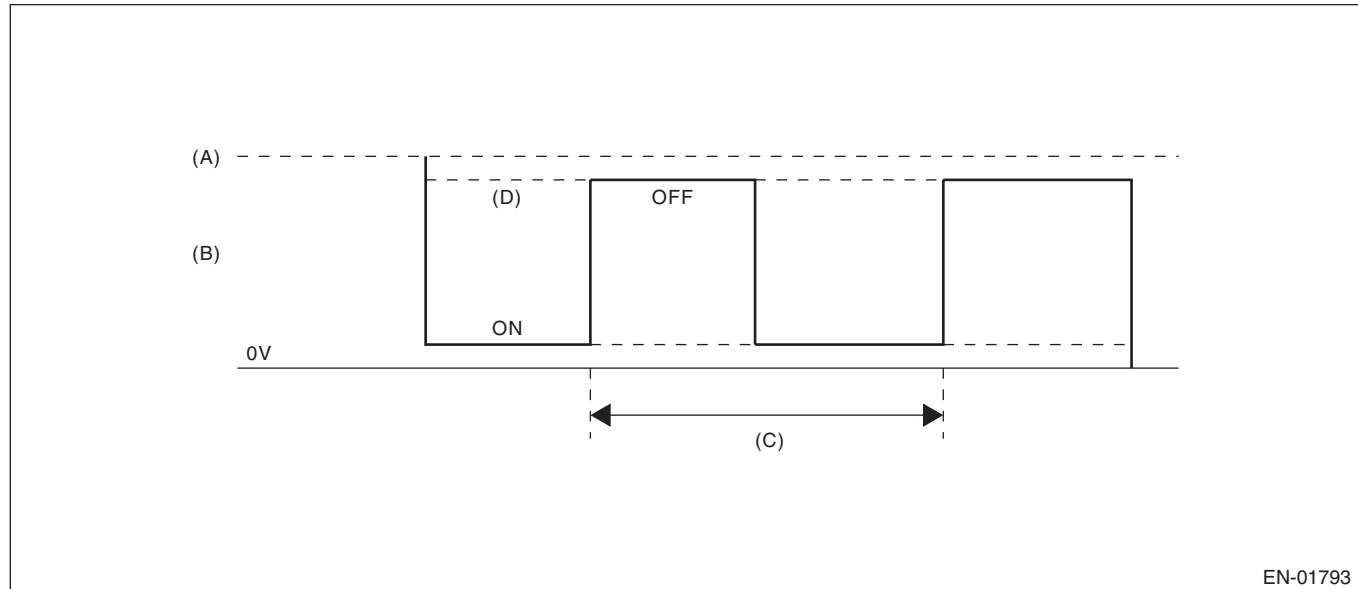
1. OUTLINE OF DIAGNOSIS

Detect the rear oxygen sensor heater open or short circuit.

The rear oxygen sensor heater performs duty control, and the output terminal voltage at ON is 0 V, and the output terminal voltage at OFF is the battery voltage.

Judge NG when the terminal voltage remains High.

2. COMPONENT DESCRIPTION



EN-01793

(A) Battery voltage

(C) 256 milliseconds (cycles)

(D) High error

(B) Output voltage of the rear oxygen sensor heater

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time while meeting all of the malfunction criteria below is more than 2560 milliseconds (10 cycles).

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	High
Rear oxygen sensor heater control duty	≥ 25%

Time Needed for Diagnosis: 2.56 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	Low

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

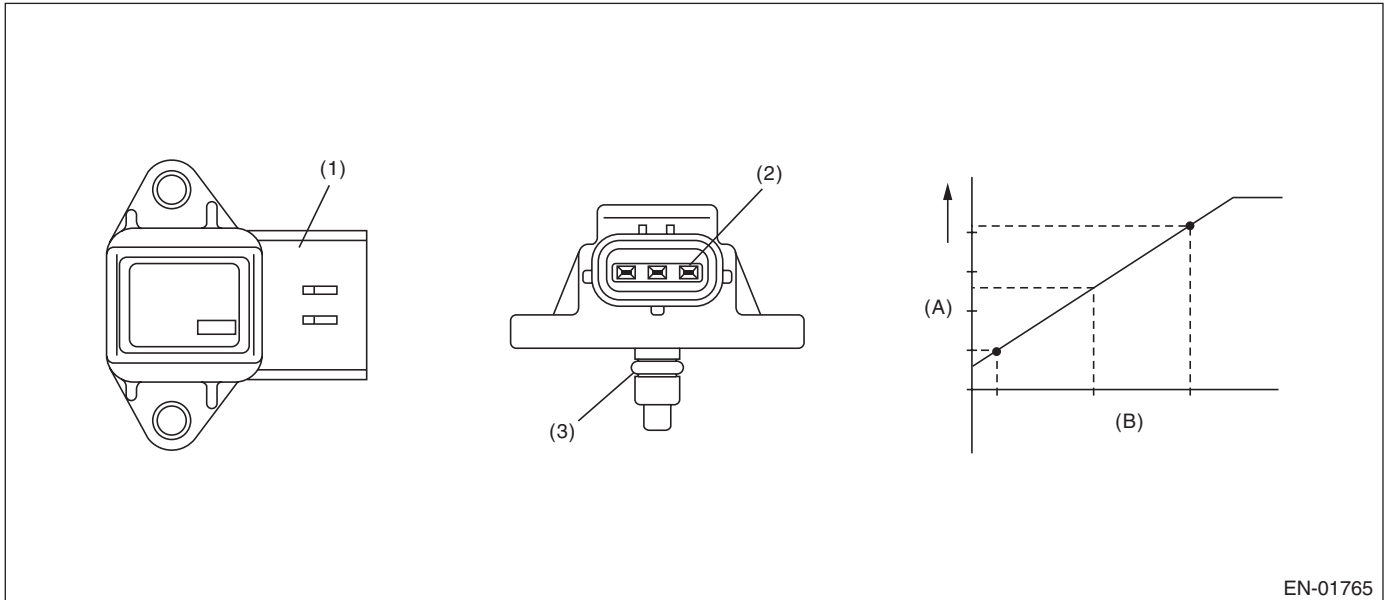
Sub feedback control: Not allowed

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

J: DTC P0068 MAP/MAF - THROTTLE POSITION CORRELATION**1. OUTLINE OF DIAGNOSIS**

Detect the malfunction of intake manifold pressure sensor output property. Judge NG when the intake air pressure AD value is Low whereas it seemed to be High from the viewpoint of engine condition, or when it is High whereas it seemed to be Low from the engine condition.

2. COMPONENT DESCRIPTION

EN-01765

(A) Output voltage

(B) Absolute pressure

(1) Connector

(2) Terminals

(3) O-ring

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	$\geq 70^{\circ}\text{C}$ (158°F)

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after idling.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge NG when either Low side or High side becomes NG.

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 3 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Low side	
Engine speed	< 2500 rpm
Throttle position	$\geq 10^\circ$
Intake air amount every 0.5 engine revs.	> 1.356 g/rev
Output voltage	< 1.0 V
High side	
Engine speed	600 — 900 rpm
Throttle position	< 1.3°
Intake air amount every 0.5 engine revs.	< 0.4 g/rev
Output voltage	≥ 2.36 V

Time Needed for Diagnosis: 3 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK and clear the NG when both Low side and High side become OK.

Judge as OK when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Low side	
Engine speed	< 2500 rpm
Throttle position	$\geq 10^\circ$
Output voltage	≥ 1.0 V
High side	
Engine speed	600 — 900 rpm
Throttle position	< 1.3°
Output voltage	< 2.36 V

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

- Intake manifold pressure sensor process: Estimate the pressure from engine load.
- ISC feedback: Not allowed to calculate the amount of feedback.
- Heavy fuel judgment: Not allowed to carry out the heavy judgment.
- Fuel cut control: Not allowed to cut the over pressure charged fuel.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

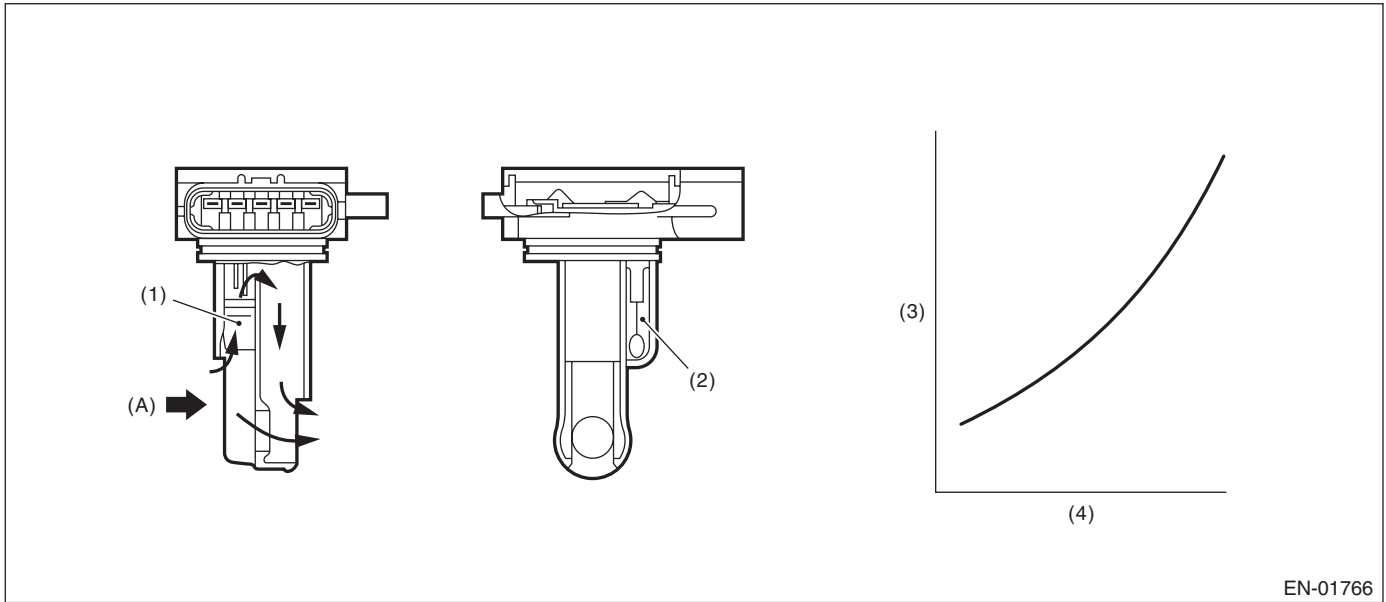
K: DTC P0101 MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of air flow sensor output property.

Judge as a low side NG when the air flow voltage indicates a small value regardless of running in a state where the air flow voltage increases. Judge as a high side NG when the air flow voltage indicates a large value regardless of running in a state where the air flow voltage decreases. Judge air flow sensor property NG when the Low side or High side becomes NG.

2. COMPONENT DESCRIPTION



(A) Air

(1) Air flow sensor

(2) Intake air temperature sensor

(3) Voltage (V)

(4) Amount of intake air (kg/s)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	$\geq 70^{\circ}\text{C}$ (158°F)

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after idling.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time with the following criteria established exceeds the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
(Low side error)	
Output voltage	< 1.5 V
Engine speed	≥ 2500 rpm
Throttle opening angle	≥ 15°
Intake manifold pressure	≥ 53.3 kPa (400 mmHg, 15.7 inHg)
(High side error 1)	
Output voltage	≥ 1.95 V
Engine speed	600 — 900 rpm
Throttle opening angle	< 4.1°
Intake manifold pressure	< 52.7 kPa (395 mmHg, 15.6 inHg)
(High side error 2)	
Output voltage	≥ 1.7 V
Engine speed	600 — 900 rpm
Throttle opening angle	< 4.1°
Intake manifold pressure	< 52.7 kPa (395 mmHg, 15.6 inHg)
Fuel system diagnosis	Rich side fault

Time Needed for Diagnosis:

Low side: 3 seconds

High side: 10 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK when the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
(Low side error)	
Output voltage	≥ 1.5 V
Engine speed	≥ 2500 rpm
Throttle opening angle	≥ 15°
Intake manifold pressure	≥ 53.3 kPa (400 mmHg, 15.7 inHg)
(High side error)	
Output voltage	< 1.95 V
Engine speed	600 — 900 rpm
Throttle opening angle	< 4.1°
Intake manifold pressure	< 52.7 kPa (395 mmHg, 15.6 inHg)

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

- Air flow meter: Engine load is normally calculated by manifold pressure and engine speed; however, calculated only by manifold pressure.
- EVAP conc. learning (fuel): Not allowed to learn.
- Knock compensation:
 - Knock compensation final advance/delay angle value = knock compensation value + whole learning compensation value + portional learning compensation value
 - When normal: Knock compensation value = Fixed at 0°CA
 - Failure: Knock compensation value ≠ Fixed at 0° CA (When knock: Max. 12°CA retard)
 - Whole learning compensation coefficient update not allowed
 - Portional learning zone compensation value calculation not allowed
- ISC control: Open loop compensation is set to (1 g/s). Stop calculating throttle sensor temperature compensation. (Hold previous value)
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

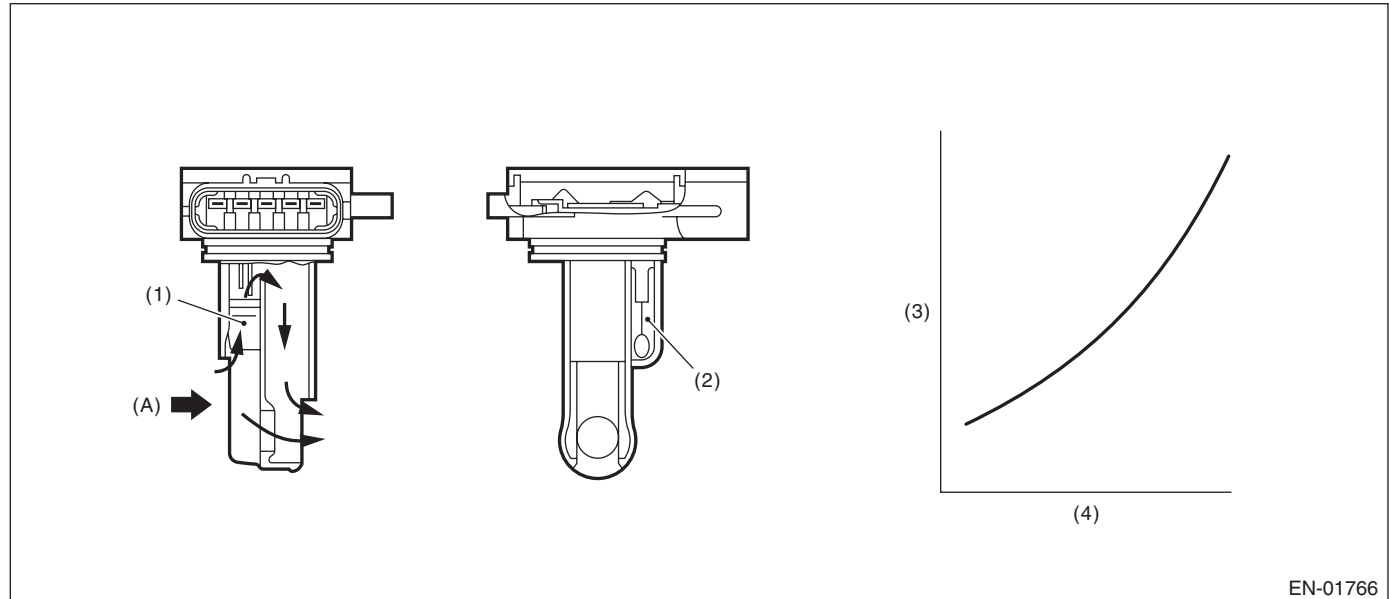
GENERAL DESCRIPTION

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

1. OUTLINE OF DIAGNOSIS

Detect open or short circuits of the air flow sensor.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



(A) Air

(1) Air flow sensor

(3) Voltage (V)

(4) Amount of intake air (kg/s)

(2) Intake air temperature sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 0.5 seconds or more. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≤ 0.2 V

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

- Air flow meter: Engine load is normally calculated by manifold pressure and engine speed; however, calculated only by manifold pressure.
- EVAP conc. learning (fuel): Not allowed to learn.
- Knock compensation:
 - Knock compensation final advance/delay angle value = knock compensation value + whole learning compensation value + portional learning compensation value
 - When normal: Knock compensation value = Fixed at 0°CA
 - Failure: Knock compensation value ≠ Fixed at 0° CA (When knock: Max. 12°CA retard)
 - Whole learning compensation coefficient update not allowed
 - Portional learning zone compensation value calculation not allowed
- ISC control: Open loop compensation is set to (1 g/s). Stop calculating throttle sensor temperature compensation. (Hold previous value)
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

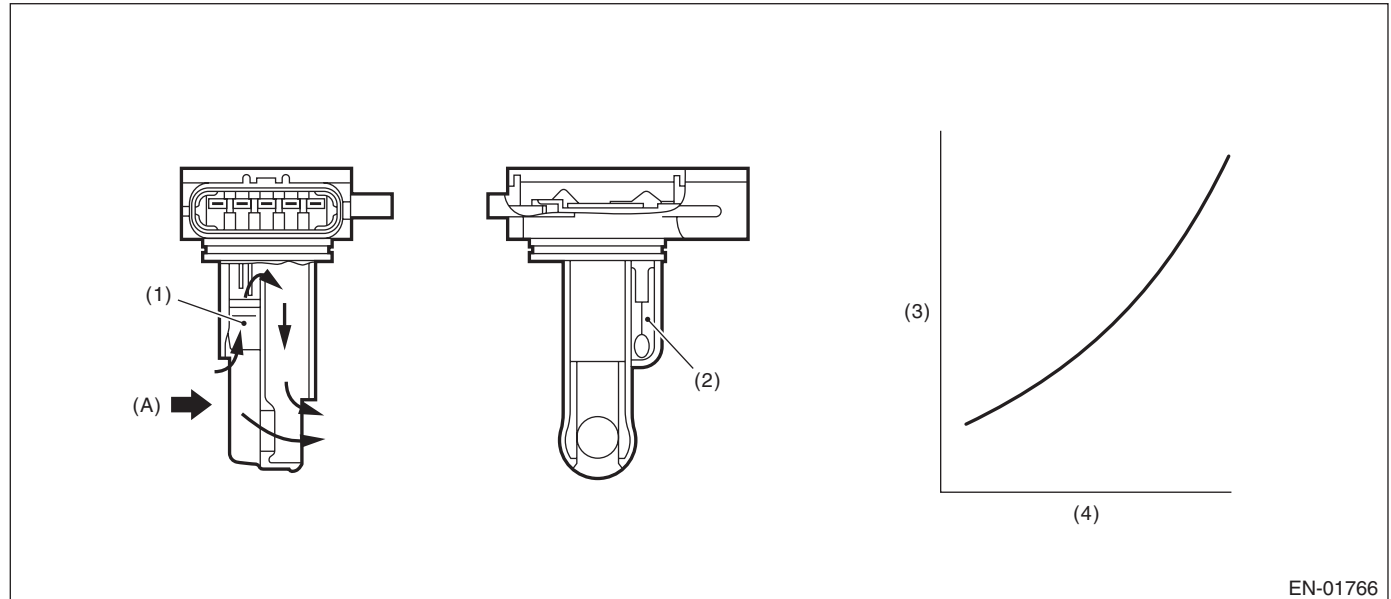
GENERAL DESCRIPTION

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

1. OUTLINE OF DIAGNOSIS

Detect open or short circuits of the air flow sensor.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



(A) Air

(1) Air flow sensor

(2) Intake air temperature sensor

(3) Voltage (V)

(4) Amount of intake air (kg/s)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of the following base value is higher than 0.5 seconds. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.985 V

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

- Air flow meter: Engine load is normally calculated by manifold pressure and engine speed; however, calculated only by manifold pressure.
- EVAP conc. learning (fuel): Not allowed to learn.
- Knock compensation:
 - Knock compensation final advance/delay angle value = knock compensation value + whole learning compensation value + portional learning compensation value
 - When normal: Knock compensation value = Fixed at 0°CA
 - Failure: Knock compensation value ≠ Fixed at 0° CA (When knock: Max. 12°CA retard)
 - Whole learning compensation coefficient update not allowed
 - Portional learning zone compensation value calculation not allowed
- ISC control: Open loop compensation is set to (1 g/s). Stop calculating throttle sensor temperature compensation. (Hold previous value)
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

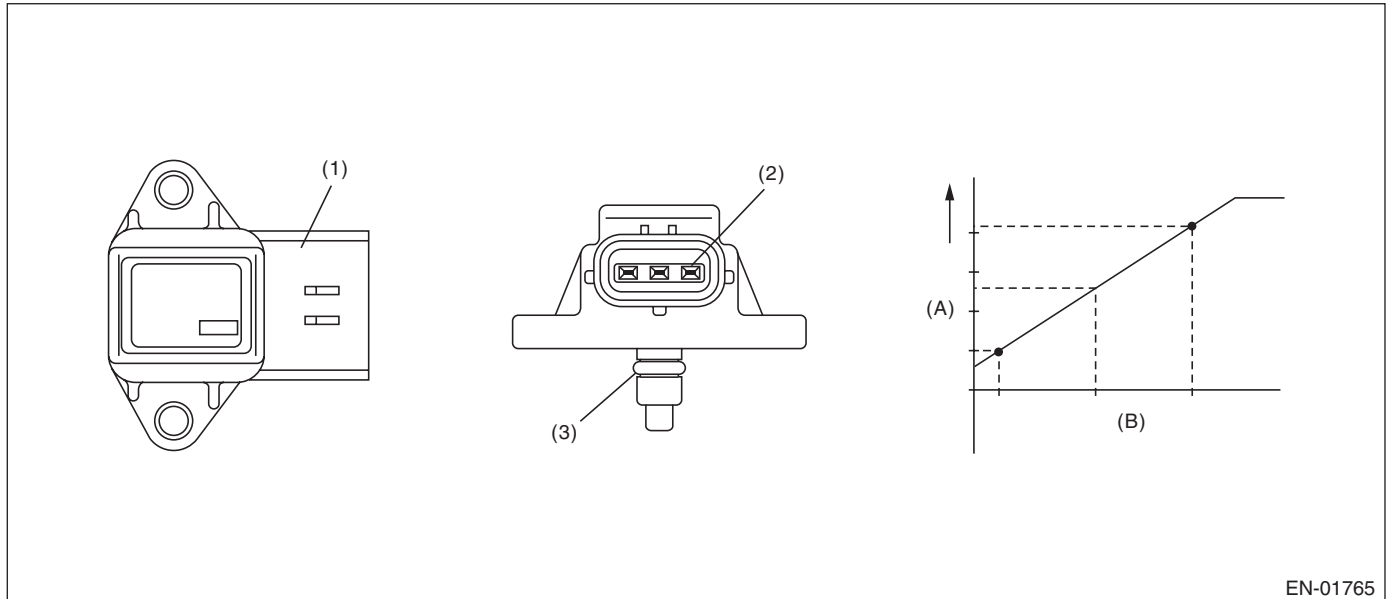
N: DTC P0107 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of intake manifold pressure sensor.

Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



(A) Output voltage

(B) Absolute pressure

(1) Connector

(2) Terminals

(3) O-ring

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 0.5 seconds or more. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.568 V

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. FAIL SAFE

- Intake manifold pressure sensor process: Estimate the pressure from engine load.
- ISC feedback: Not allowed to calculate the amount of feedback.
- Heavy fuel judgment: Not allowed to carry out the heavy judgment.
- Fuel cut control: Not allowed to cut the over pressure charged fuel.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

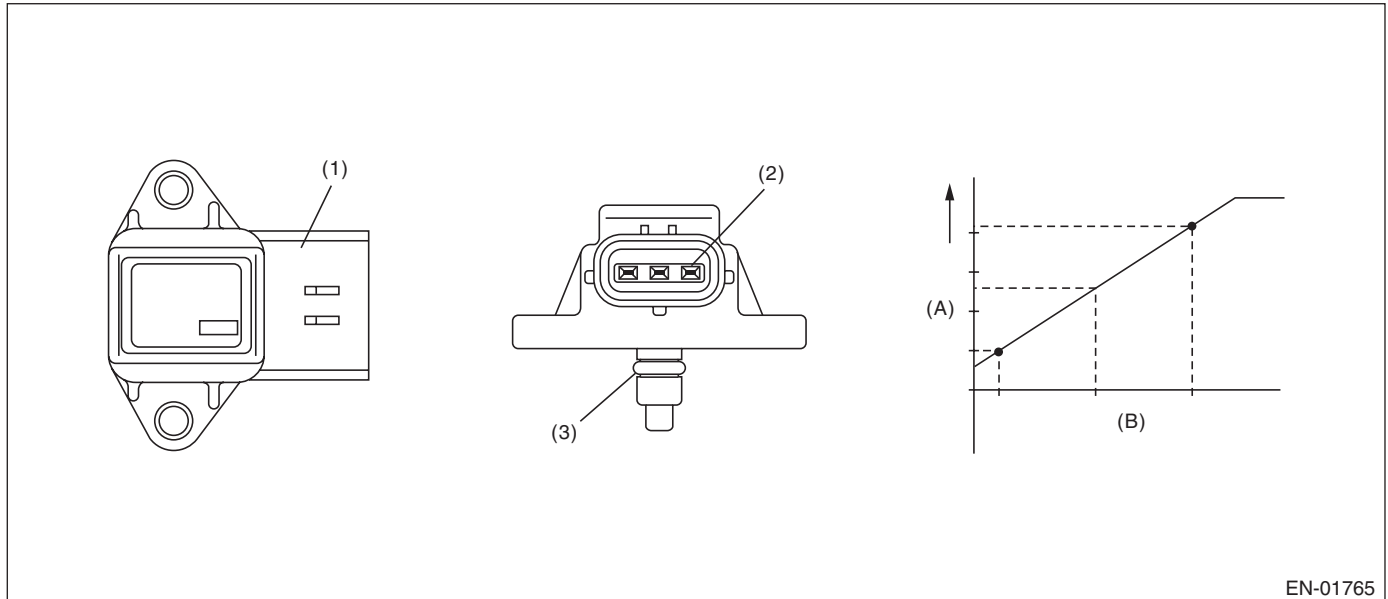
O: DTC P0108 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of intake manifold pressure sensor.

Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



(A) Output voltage

(B) Absolute pressure

(1) Connector

(2) Terminals

(3) O-ring

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 0.5 seconds or more. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.93 V

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. FAIL SAFE

- Intake manifold pressure sensor process: Estimate the pressure from engine load.
- ISC feedback: Not allowed to calculate the amount of feedback.
- Heavy fuel judgment: Not allowed to carry out the heavy judgment.
- Fuel cut control: Not allowed to cut the over pressure charged fuel.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

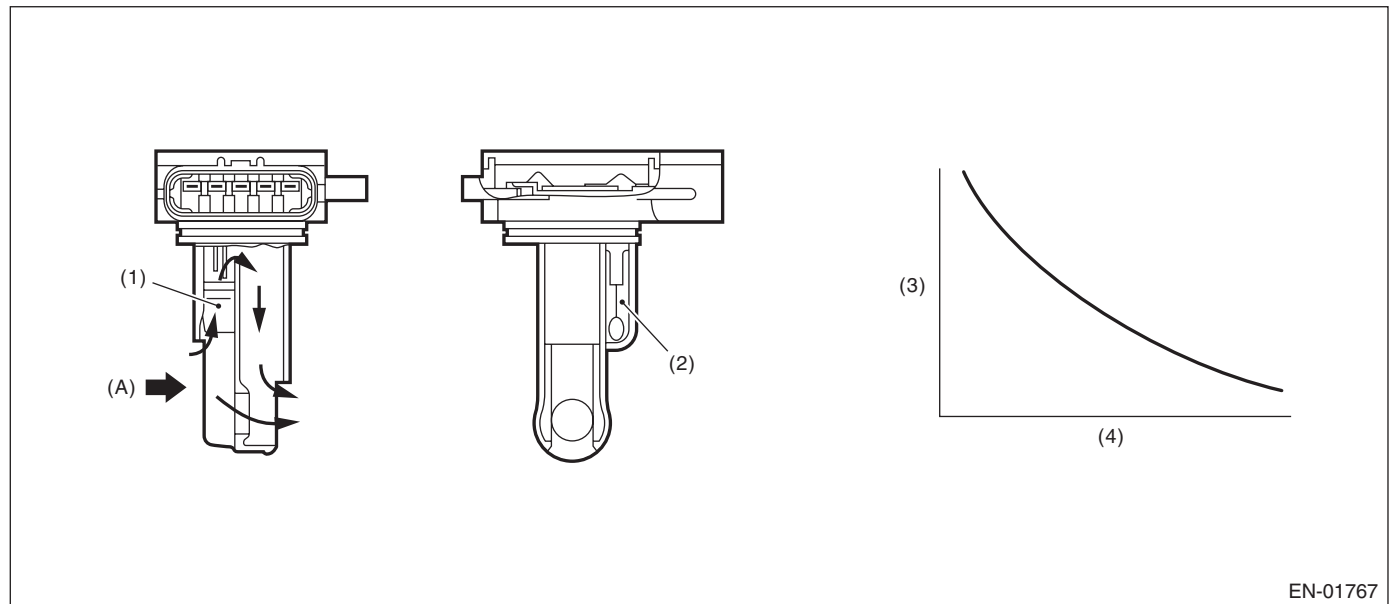
P: DTC P0111 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT RANGE/ PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of intake air temperature sensor output property.

Judge as NG when the intake air temperature is not varied whereas it seemed to be varied from the viewpoint of engine condition.

2. COMPONENT DESCRIPTION



EN-01767

(A) Air

(1) Air flow sensor

(3) Resistance value (Ω)

(4) Intake air temperature °C (°F)

(2) Intake air temperature sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Coolant temp. before engine start	< 30°C (86°F)
Engine coolant temperature	> 95°C (203°F)
Battery voltage	≥ 10.9 V
Continuous time when vehicle speed is less than 50 km/h (31 MPH)	600 seconds or more

4. GENERAL DRIVING CYCLE

Perform the diagnosis when the vehicle speed condition is completed after idling from starting the cooled engine.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 1 second or more.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage difference between Max. and Min.	< 20 mV (Equivalent to approximately 0.5°C (33°F) near 25°C)

Time Needed for Diagnosis: 1 second

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage difference between Max. and Min.	≥ 20 mV

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

Intake air temperature sensor process: Intake air temperature is fixed at 20°C (68°F).

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

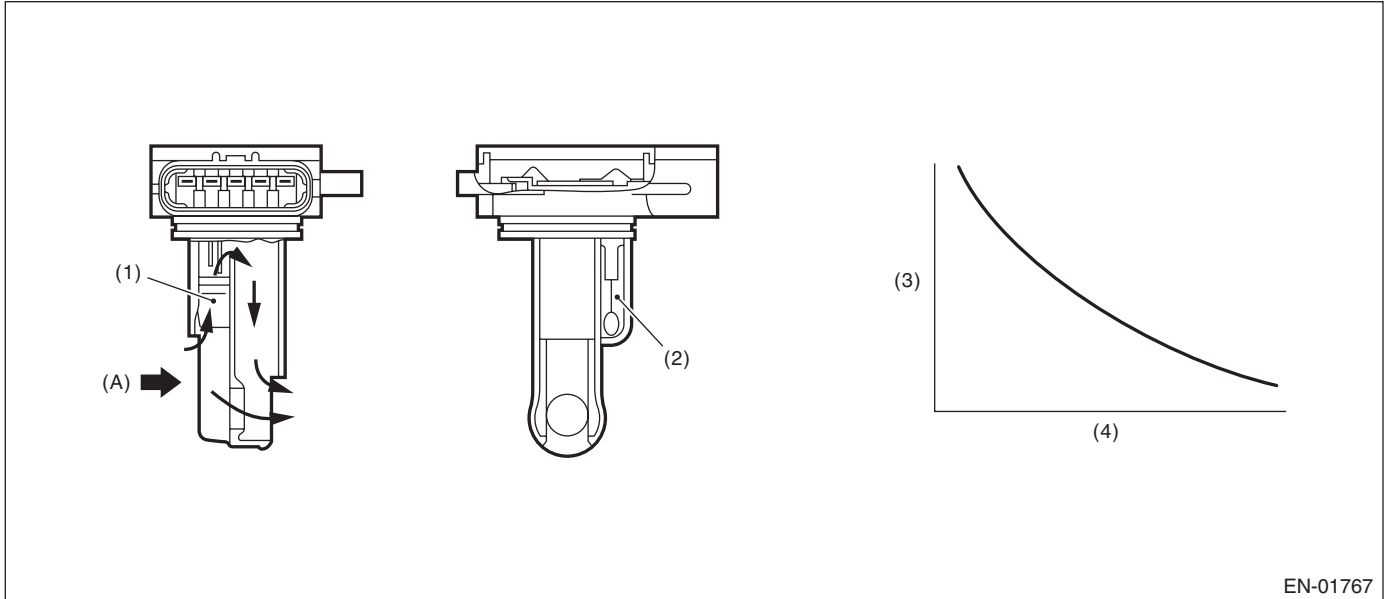
GENERAL DESCRIPTION

Q: DTC P0112 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the intake air temperature sensor.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



(A) Air

(1) Air flow sensor

(3) Resistance value (Ω)

(4) Intake air temperature °C (°F)

(2) Intake air temperature sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 0.5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.165 V
Ignition switch	ON

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 0.165 V
Ignition switch	ON

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

Intake air temperature sensor process: Intake air temperature is fixed at 20°C (68°F).

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

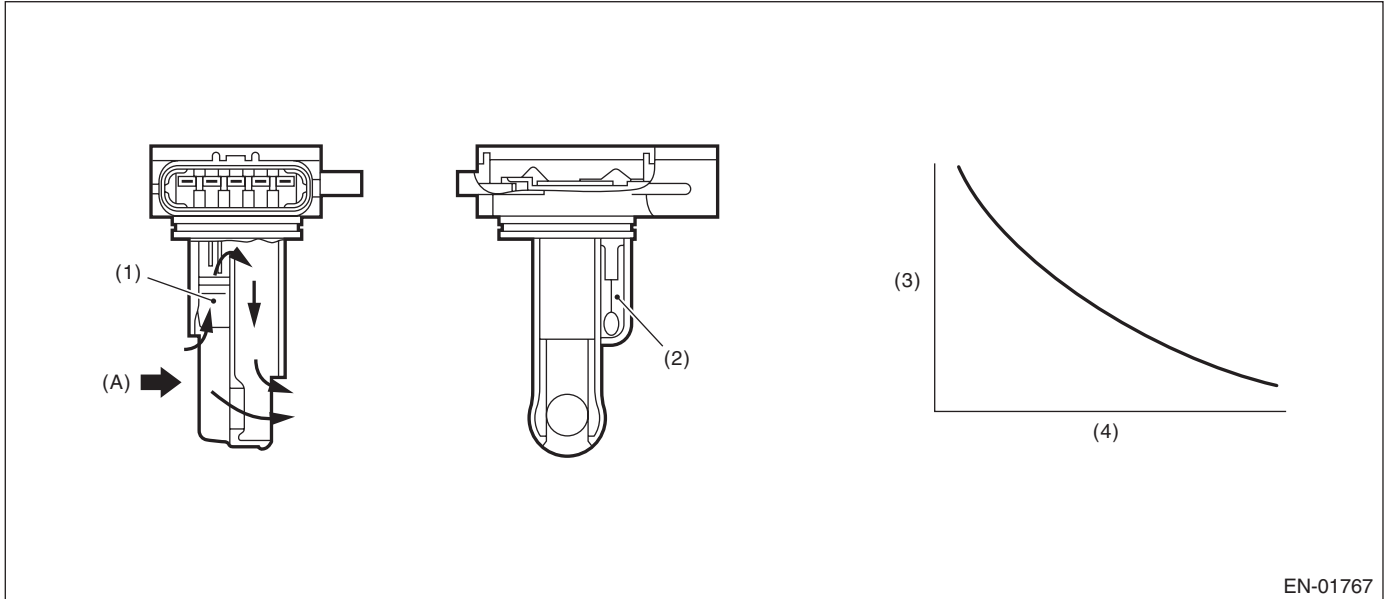
GENERAL DESCRIPTION

R: DTC P0113 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the intake air temperature sensor.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



(A) Air

(1) Air flow sensor

(2) Intake air temperature sensor

(3) Resistance value (Ω)

(4) Intake air temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 0.5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.72 V
Ignition switch	ON

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 0.23 V
Ignition switch	ON

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

Intake air temperature sensor process: Intake air temperature is fixed at 20°C (68°F).

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

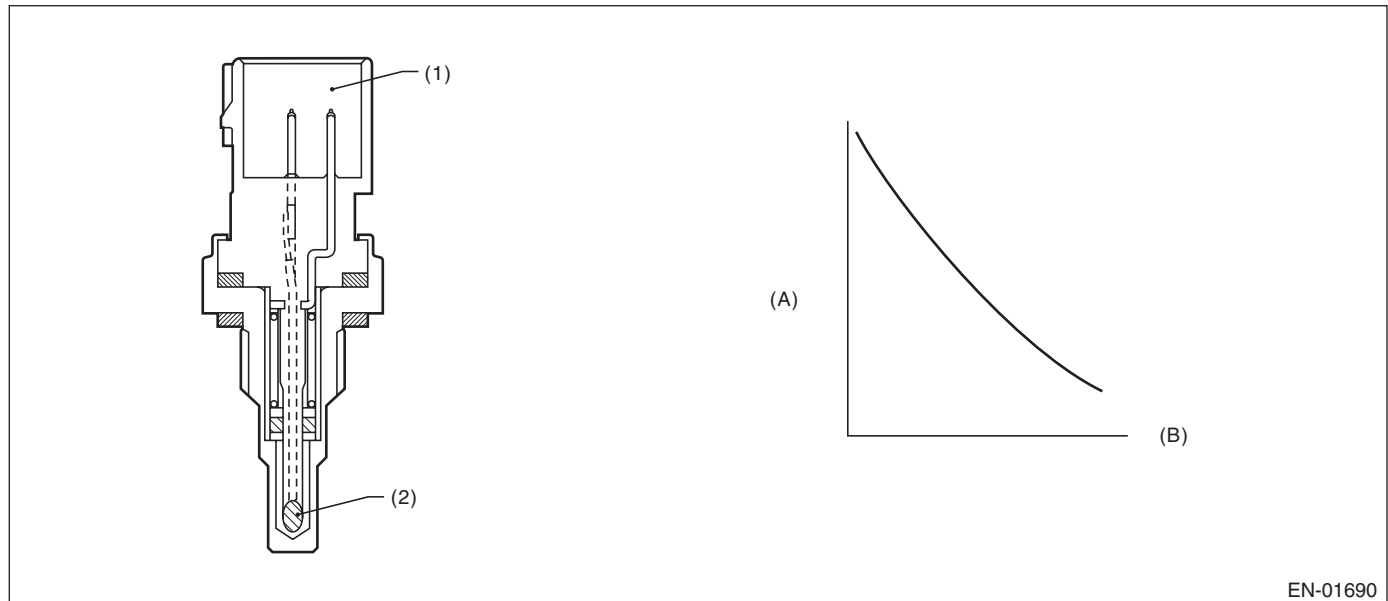
GENERAL DESCRIPTION

S: DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the engine coolant temperature sensor.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



(A) Resistance value (k Ω)

(B) Temperature °C (°F)

(1) Connector

(2) Thermistor element

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 0.5 seconds or more. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.165 V

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

- Engine coolant temperature sensor process: Engine coolant temperature is fixed at 70°C (158°F)
- ISC Feedback: Calculate target engine speed as engine coolant temperature 70°C (158°F).
- ISC learning: Not allowed to learn.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.
- Air conditioner control: Not allowed to turn the air conditioner to ON.
- Radiator fan control: Both main and sub fan are in High driving.
- High water temperature expansion compensation coefficient: Normally, mass expands with high water temperature and other conditions, but this ignores water temperature conditions and expands when other conditions are established.
- AVCS Control: Oil flow control solenoid valve drive output duty = 0 %.
- Tumble generator valve control: Open the tumble generator valve.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

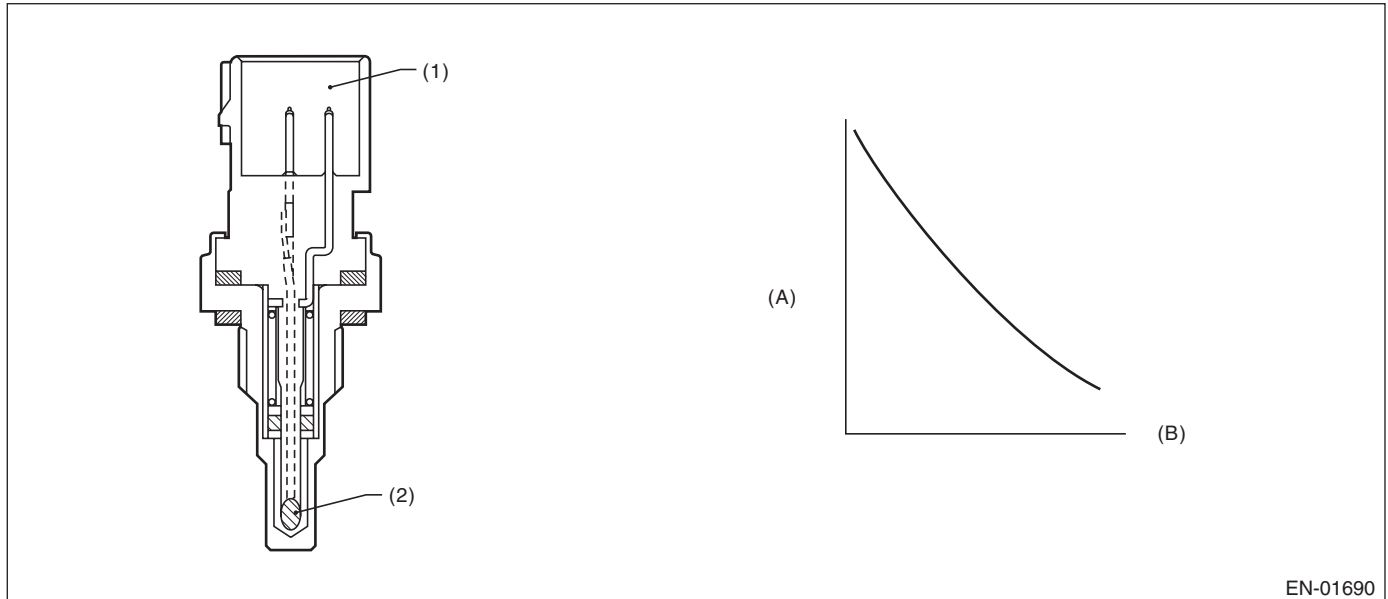
GENERAL DESCRIPTION

T: DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the engine coolant temperature sensor.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



(A) Resistance value (k Ω)

(B) Temperature °C (°F)

(1) Connector

(2) Thermistor element

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 0.5 seconds or more. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.72 V

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. FAIL SAFE

- Engine coolant temperature sensor process: Engine coolant temperature is fixed at 70°C (158°F)
- ISC Feedback: Calculate target engine speed as engine coolant temperature 70°C (158°F).
- ISC learning: Not allowed to learn.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.
- Air conditioner control: Not allowed to turn the air conditioner to ON.
- Radiator fan control: Both main and sub fan are in High driving.
- High water temperature expansion compensation coefficient: Normally, mass expands with high water temperature and other conditions, but this ignores water temperature conditions and expands when other conditions are established.
- AVCS Control: Oil flow control solenoid valve drive output duty = 0%.
- Tumble generator valve control: Open the tumble generator valve.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

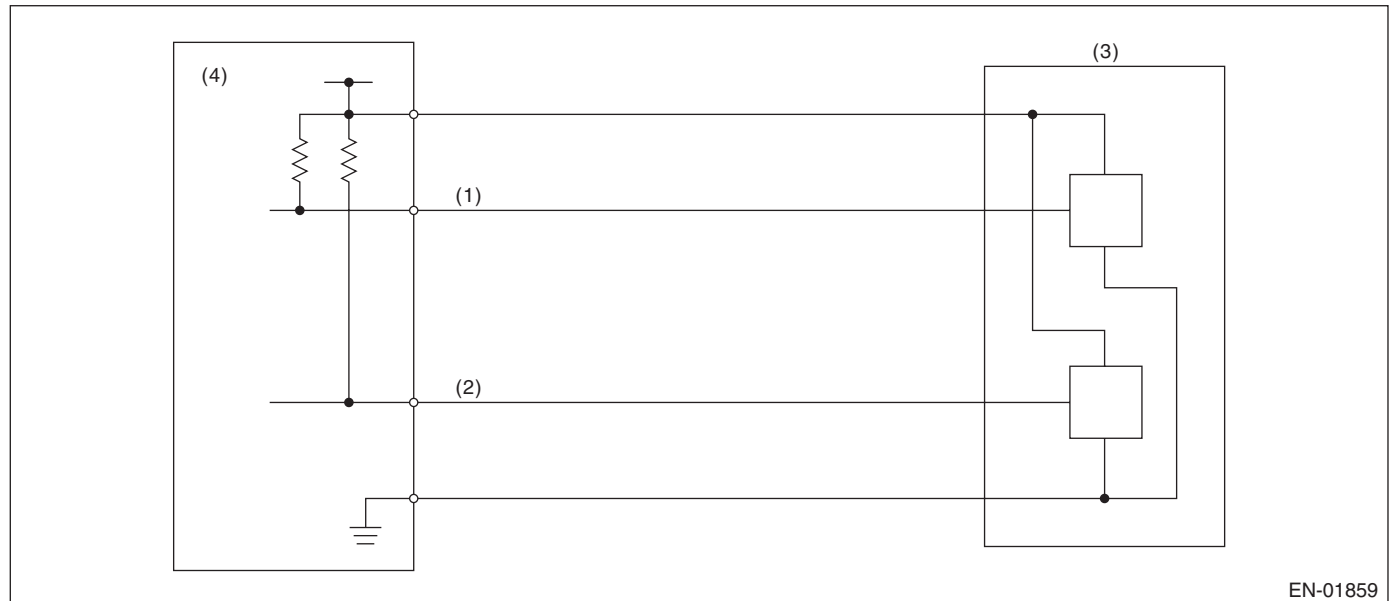
U: DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor 1.

Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



(1) Throttle position sensor 1 signal

(3) Throttle position sensor

(4) Engine control module (ECM)

(2) Throttle position sensor 2 signal

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	≤ 0.224 V

Time Needed for Diagnosis: 24 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. FAIL SAFE

Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

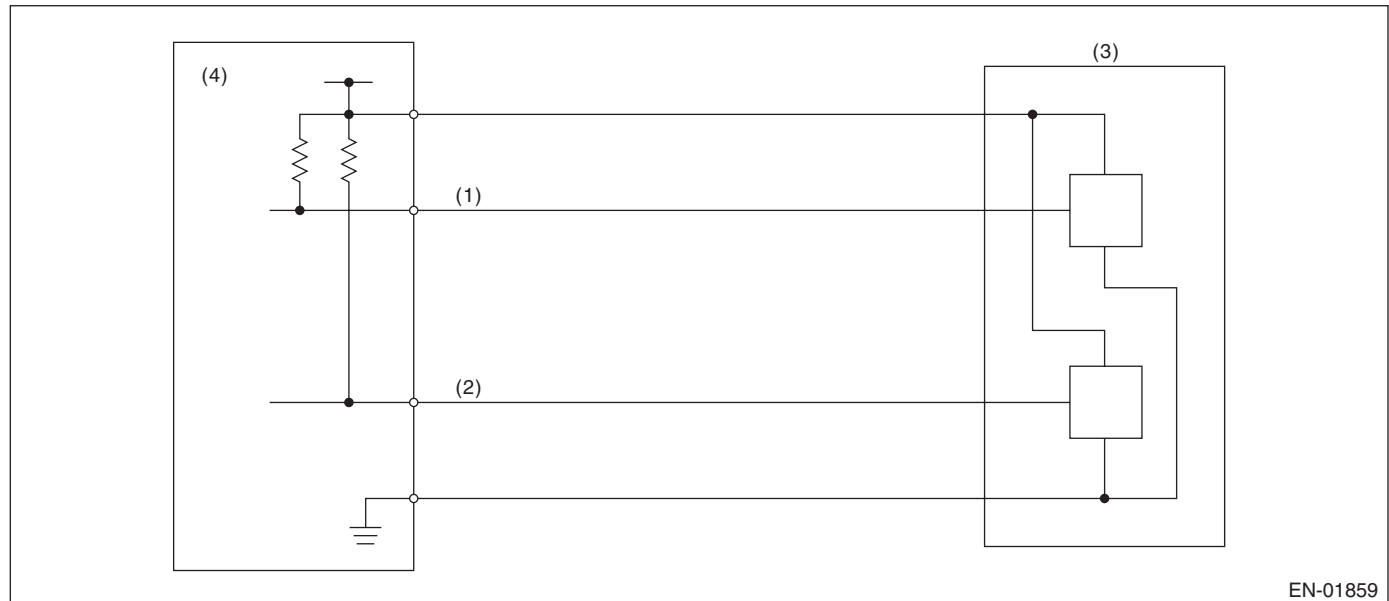
V: DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor 1.

Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



(1) Throttle position sensor 1 signal

(3) Throttle position sensor

(4) Engine control module (ECM)

(2) Throttle position sensor 2 signal

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	≥ 4.851 V

Time Needed for Diagnosis: 24 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. FAIL SAFE

Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

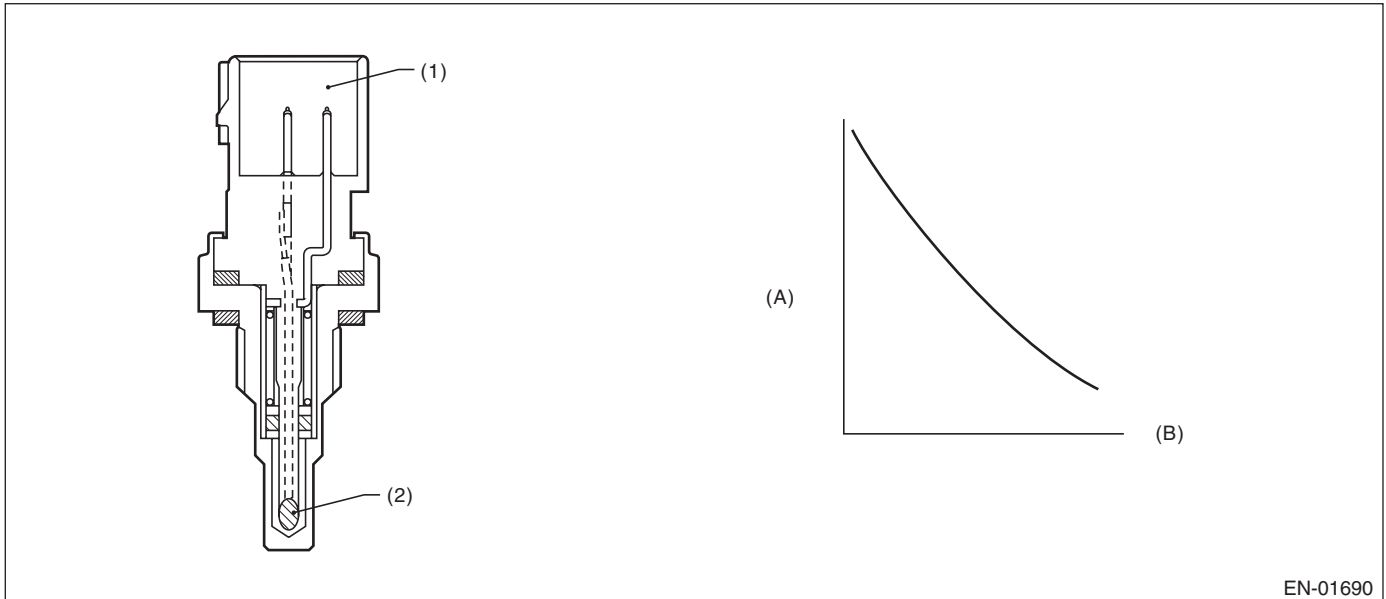
W: DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of engine coolant temperature output property.

Judge as NG when the engine coolant temperature does not rise in driving conditions where it should.

2. COMPONENT DESCRIPTION



(A) Resistance value (k Ω)

(B) Temperature $^{\circ}\text{C}$ ($^{\circ}\text{F}$)

(1) Connector

(2) Thermistor element

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	≥ 500 rpm
Battery voltage	> 10.9 V

4. GENERAL DRIVING CYCLE

Perform the diagnosis only once after engine starting.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature	< 20°C (68°F)
Timer for diagnosis after engine starting	≥ Judgment value of timer 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 counts up.

64 milliseconds + TWCNT milliseconds (at the time of 64 milliseconds)

TWCNT is defined as follows

TWCNT = 0 (at idle switch ON)

TWCNT show on the following table at idle switch OFF.

Temperature °C (°F)	Vehicle speed km/h (MPH)							
	0 (0)	8 (4.97)	16 (9.94)	24 (14.9)	32 (19.9)	40 (24.9)	48 (29.8)	56 (34.8)
-20 (-4)	0 ms	37.14 ms	74.27 ms	111.41 ms	126.66 ms	141.91 ms	163.59 ms	185.26 ms
-10 (14)	0 ms	27.39 ms	54.78 ms	82.17 ms	99.65 ms	117.13 ms	135.96 ms	154.80 ms
0 (32)	0 ms	17.65 ms	35.29 ms	52.94 ms	72.64 ms	92.34 ms	108.34 ms	124.33 ms
10 (50)	0 ms	7.90 ms	15.80 ms	23.70 ms	45.63 ms	67.56 ms	80.71 ms	93.87 ms
20 (68)	0 ms	7.90 ms	15.80 ms	23.70 ms	45.63 ms	67.56 ms	80.71 ms	93.87 ms

Judgment value of timer after engine starting

$$t = 451.1 - 25.9 \times T_i$$

T_i = The lowest engine coolant temperature after starting the engine

Time Needed for Diagnosis: To be determined. (It is varied by the Min. engine coolant temperature and engine conditions such as vehicle speed and engine coolant temperature.)

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature	≥ 20°C (68°F)

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. FAIL SAFE

- Engine coolant temperature sensor process: Engine coolant temperature is fixed at 70°C (158°F)
- ISC Feedback: Calculate target engine speed as engine coolant temperature 70°C (158°F).
- ISC learning: Not allowed to learn.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.
- Air conditioner control: Not allowed to turn the air conditioner to ON.
- Radiator fan control: Both main and sub fan are in High driving.
- High water temperature expansion compensation coefficient: Normally, mass expands with high water temperature and other conditions, but this ignores water temperature conditions and expands when other conditions are established.
- AVCS Control: Oil flow control solenoid valve drive output duty = 0%.
- Tumble generator valve control: Open the tumble generator valve.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

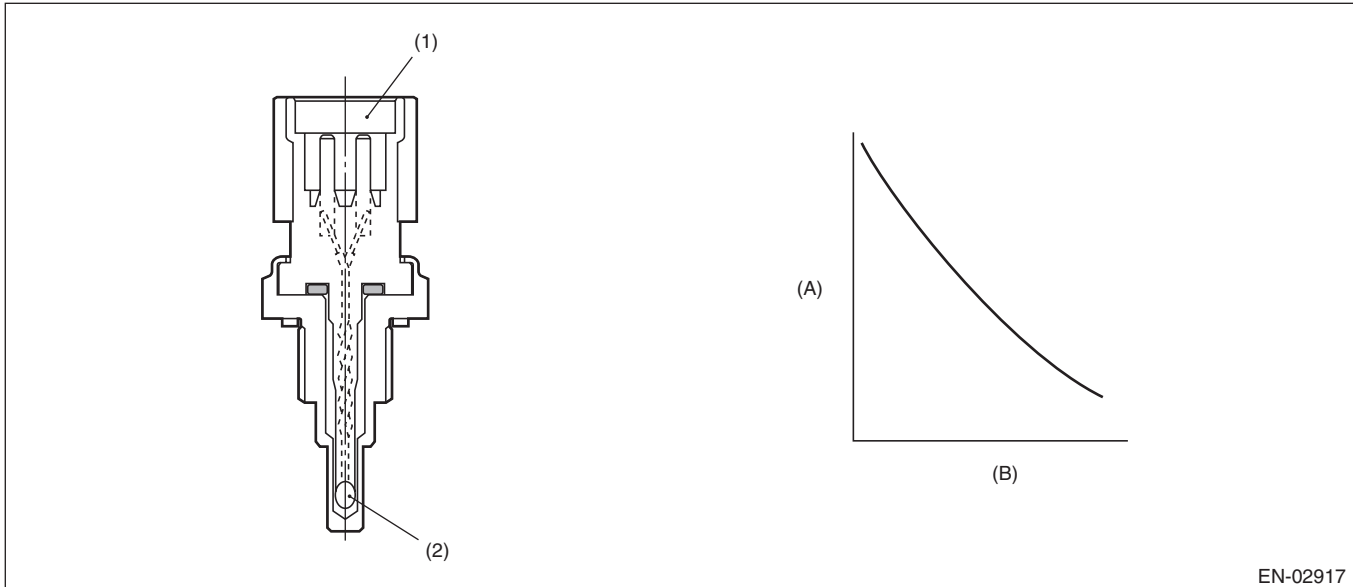
X: DTC P0126 INSUFFICIENT ENGINE COOLANT TEMPERATURE FOR STABLE OPERATION

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of the engine coolant temperature sensor characteristics.

Memorize the engine coolant temperature and fuel temperature at the last engine stop, and use them to judge as NG when the engine coolant temperature does not decrease when it should.

2. COMPONENT DESCRIPTION



(A) Resistance value (k Ω)

(B) Temperature °C (°F)

(1) Connector

(2) Thermistor element

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Refueling from the last engine stop till the current engine start	None
Fuel level	≥ 15 ℓ (3.96 US gal, 3.3 Imp gal)
Engine coolant temperature at the last engine stop	$\geq 70^{\circ}\text{C}$ (158°F) and $< 95^{\circ}\text{C}$ (203°F)

4. GENERAL DRIVING CYCLE

Perform the diagnosis only once after starting the engine.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG if the continuous time with the following conditions established is more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature at the last engine stop — Minimum engine coolant temperature after the engine start	< 2.5°C (4.5°F)
Fuel temperature at the last engine stop — Fuel temperature	≥ 5°C (9°F)
Intake air temperature — Fuel temperature	< 2.5°C (4.5°F)
Fuel temperature	< 35°C (95°F)

Normality Judgment

When the following conditions are established, it is OK.

Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature at the last engine stop — Minimum engine coolant temperature after the engine start	≥ 2.5°C (4.5°F)

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

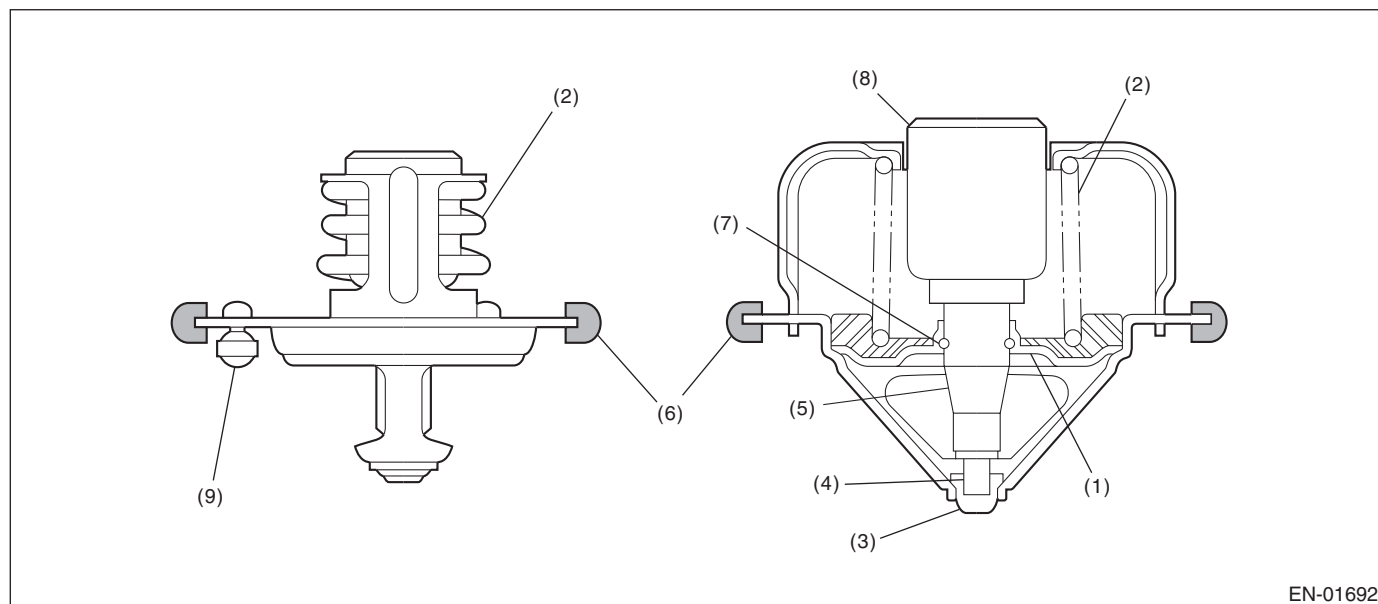
Y: DTC P0128 COOLANT THERMOSTAT (ENGINE COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE)

1. OUTLINE OF DIAGNOSIS

Detect malfunctions of the thermostat function.

Judge as NG when the engine coolant temperature is lower than the estimated engine coolant temperature and the difference between them is large. Judge as OK when the engine coolant temperature becomes to 75°C (167°F), and the difference is small, before judging NG.

2. COMPONENT DESCRIPTION



- | | | |
|-------------|--------------------|------------------|
| (1) Valve | (4) Piston | (7) Stop ring |
| (2) Spring | (5) Guide | (8) Wax element |
| (3) Stopper | (6) Rubber packing | (9) Jiggle valve |

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 30 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	$\geq 10.9 \text{ V}$
Estimate ambient temperature	$\geq -7^{\circ}\text{C}$ (19.4°F)
Engine coolant temperature at engine starting	$< 55^{\circ}\text{C}$ (131°F)
Estimated coolant temperature	$\geq 70^{\circ}\text{C}$ (158°F)
Engine coolant temperature	$< 70^{\circ}\text{C}$ (158°F)
(Estimated - Measured) Engine coolant temperature	$> 30^{\circ}\text{C}$ (54°F)
Vehicle speed	$\geq 30 \text{ km/h}$

Time Needed for Diagnosis: 30 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	$\geq 10.9 \text{ V}$
Estimate ambient temperature	$\geq -7^{\circ}\text{C}$ (19.4°F)
Thermostat malfunction diagnosis	Incomplete
Engine coolant temperature at engine starting	$< 55^{\circ}\text{C}$ (131°F)
Engine coolant temperature	$\geq 70^{\circ}\text{C}$ (158°F)
(Estimated - Measured) Engine coolant temperature	$\leq 30^{\circ}\text{C}$ (54°F)

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

None

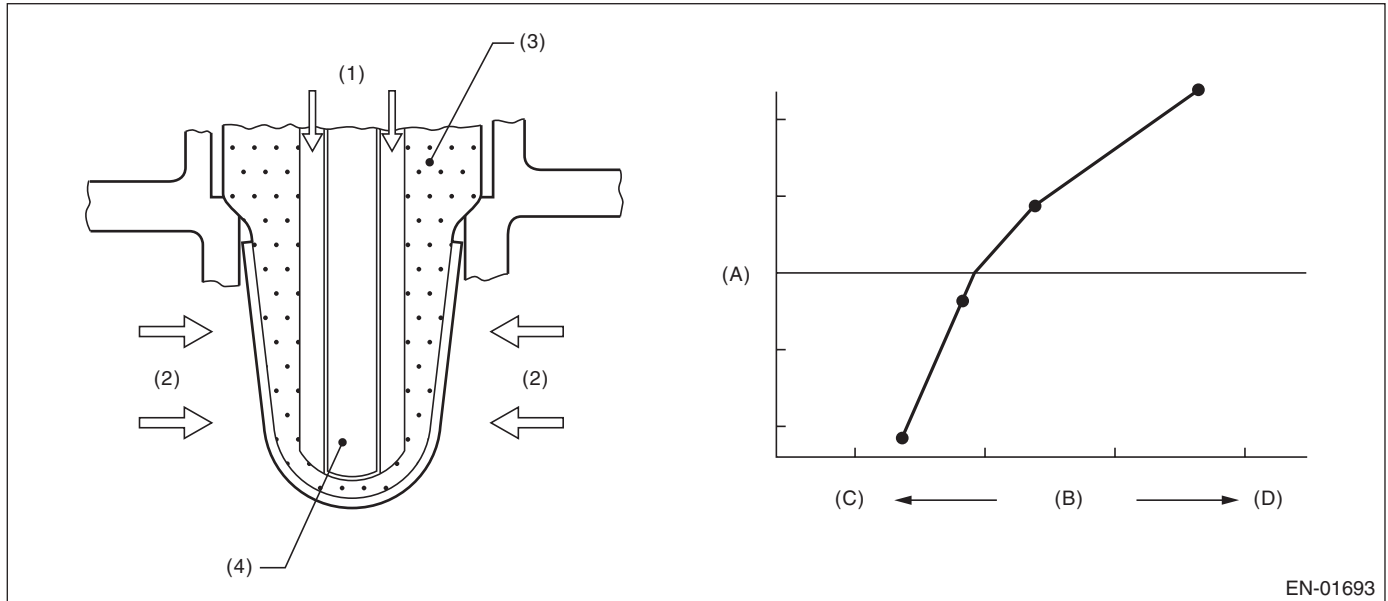
9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Z: DTC P0131 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1)**1. OUTLINE OF DIAGNOSIS**

Detect the open or short circuit of sensor.

Judge as NG when the element impressed voltage is out of range, or the element current is out of range.

2. COMPONENT DESCRIPTION

(A) Electromotive force

(B) Air fuel ratio

(C) Lean

(D) Rich

(1) Atmosphere

(3) ZrO₂

(4) Ceramic heater

(2) Exhaust gas

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting any malfunction criteria below is more than 1 second.

Judgment Value

Malfunction Criteria	Threshold Value
Input voltage	< 1.8 V
Input current	< -0.01 A

Time Needed for Diagnosis: 1 second

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

- Front oxygen (A/F) sensor activation judgment: Front oxygen (A/F) sensor full activation is not complete, or front oxygen (A/F) sensor half activation is not complete.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- Compensation when starting the engine at high temperature: Make the MIN value to be 0.3 → 0, normally.
- Purge control: Not allowed to purge.

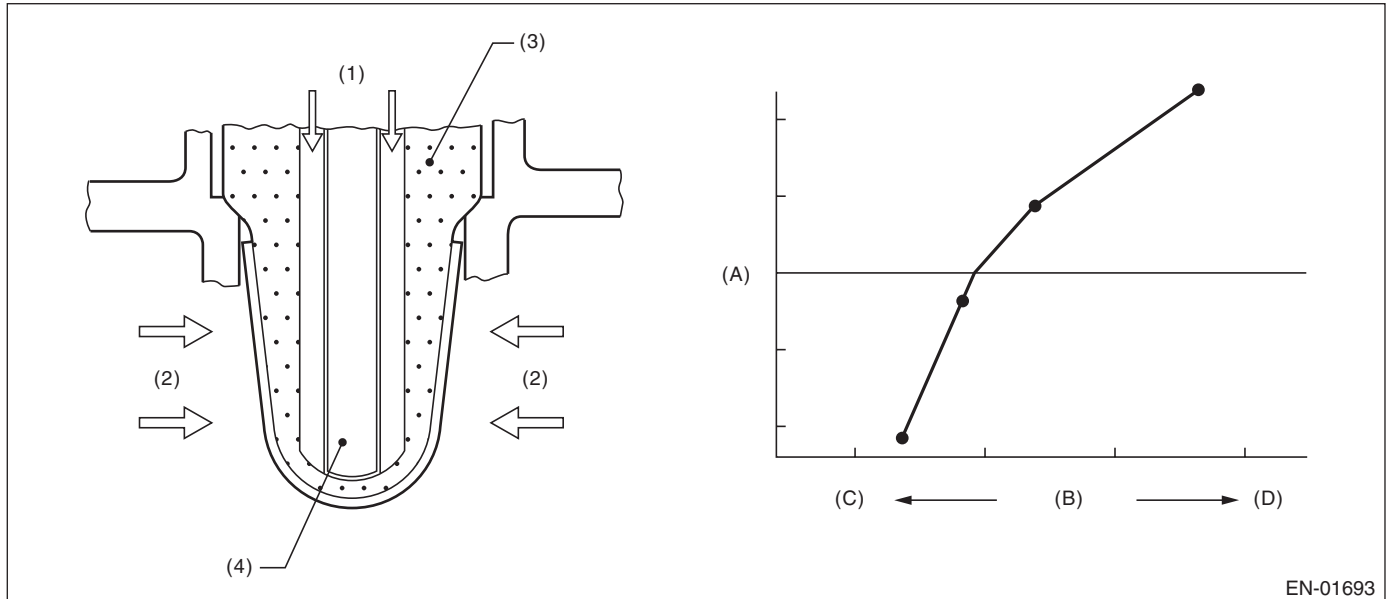
9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

AA:DTC P0132 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1)**1. OUTLINE OF DIAGNOSIS**

Detect the open or short circuit of sensor.

Judge as NG when the element impressed voltage is out of range, or the element current is out of range.

2. COMPONENT DESCRIPTION

(A) Electromotive force

(B) Air fuel ratio

(C) Lean

(D) Rich

(1) Atmosphere

(2) Exhaust gas

(3) ZrO₂

(4) Ceramic heater

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting any malfunction criteria below is more than 1 second.

Judgment Value

Malfunction Criteria	Threshold Value
Input voltage	≥ 3.8 V
Input current	≥ 0.01 A

Time Needed for Diagnosis: 1 second

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

- Front oxygen (A/F) sensor activation judgment: Front oxygen (A/F) sensor full activation is not complete, or front oxygen (A/F) sensor half activation is not complete.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- Compensation when starting the engine at high temperature: Make the MIN value to be 0.3 → 0, normally.
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

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

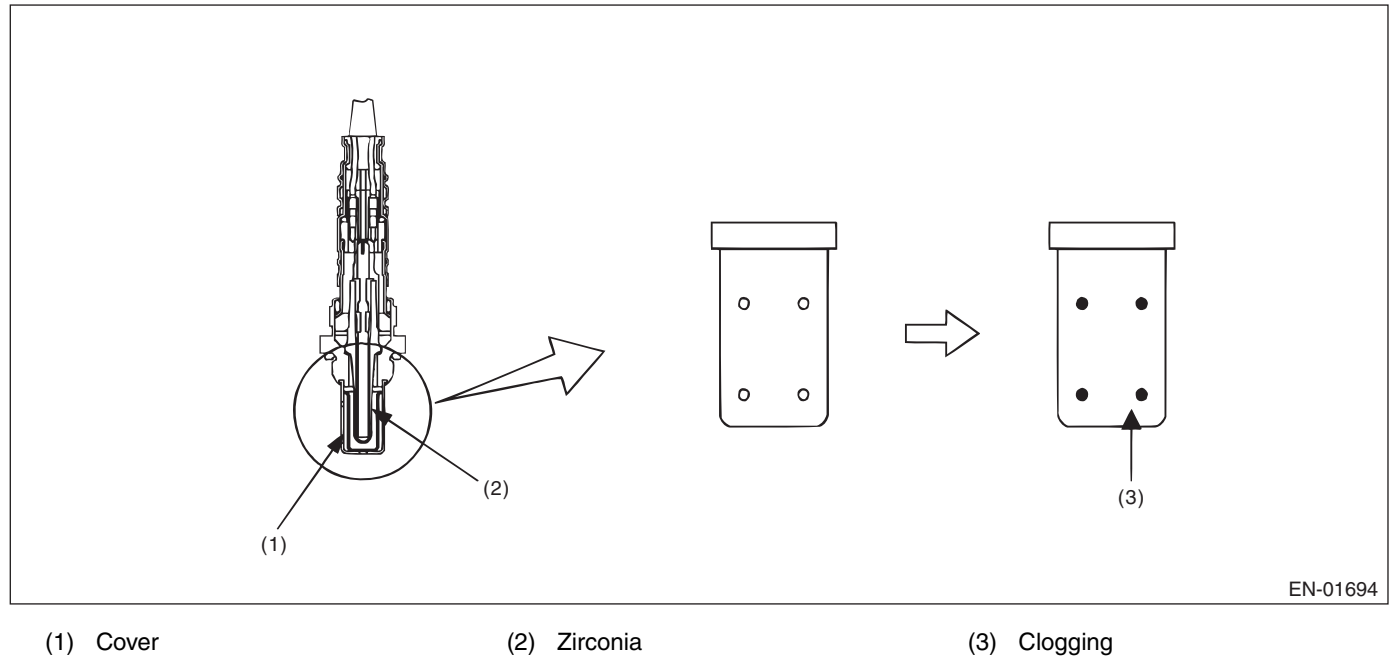
1. OUTLINE OF DIAGNOSIS

Detect the slow response of front oxygen (A/F) sensor.

Front oxygen (A/F) sensor cover has some ventilation holes for exhaust gas. Clogged ventilation holes are diagnosed.

When the holes are clogged, the A/F output variation becomes slow comparing with the actual A/F variation because oxygen which reaches the zirconia layer is insufficient. Therefore, if the sensor cover holes are clogged, the rich to lean judgment in the ECM is delayed when the change from rich to lean occurs.

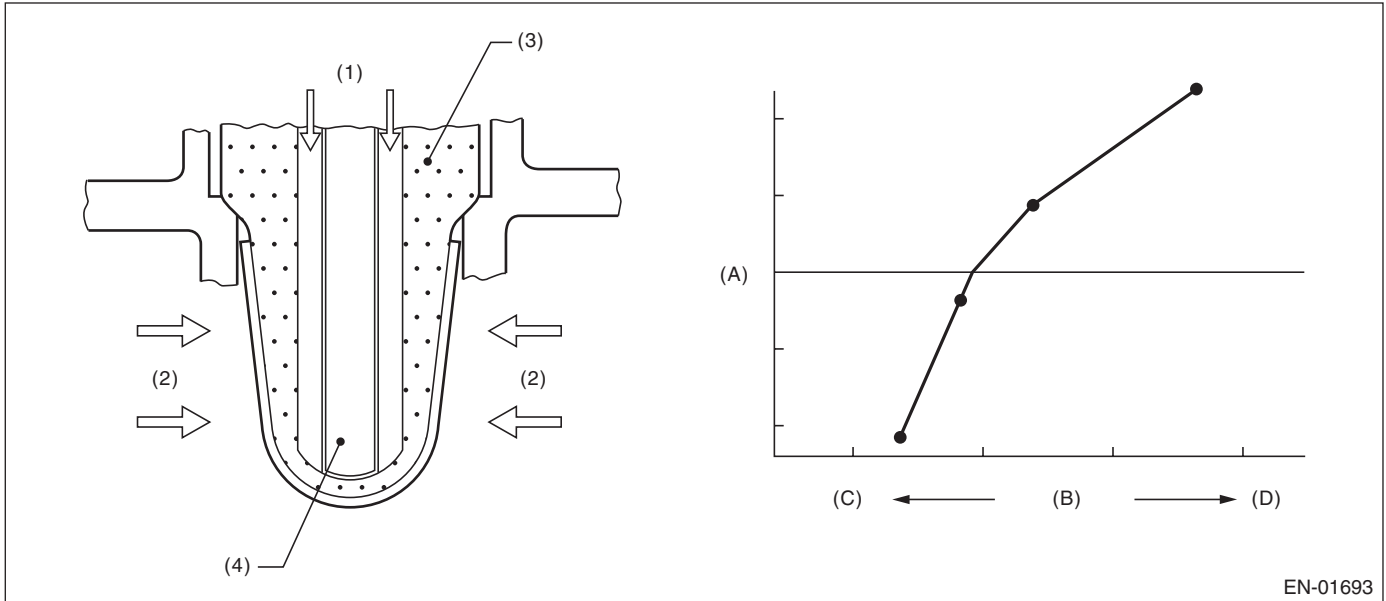
Judge as NG when the actual movement in comparison to the ECM control amount is slow.



Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

2. COMPONENT DESCRIPTION



(A) Electromotive force

(C) Lean

(D) Rich

(B) Air fuel ratio

(1) Atmosphere

(3) ZrO_2

(4) Ceramic heater

(2) Exhaust gas

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
All secondary parameters enable conditions	1 second or more
Battery voltage	> 10.9 V
Atmospheric pressure	> 75.0 kPa (563 mmHg, 22.2 inHg)
Closed loop control with main feedback	Operating
Front oxygen (A/F) sensor impedance	0 — 50 Ω
After engine starting	120 seconds or more
Engine coolant temperature	$\geq 70^\circ\text{C}$ (158°F)
Engine speed	1000 — 3200 rpm
Vehicle speed	10 — 120 km/h (6.21 — 74.6 MPH)
Amount of intake air	10 — 31 g/s
Engine load change during 0.5 engine revs.	≤ 0.02 g/rev
Learning value of EVAP conc. during purge	≤ 0.2
Total time of operating canister purge	20 seconds or more

4. GENERAL DRIVING CYCLE

Perform diagnosis only once, at a constant speed of 10 — 120 km/h (6.21 — 74.6 MPH) in 120 seconds or more after warming up the engine.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Calculate λ difference every 128 milliseconds, and the λ value difference. Calculate the diagnosis value after calculating 1640 times (210 seconds).

Judge as NG when the malfunction criteria below are completed. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
$\text{para}fca = \text{td}2faf / \text{td}2lmd$ where, $\text{td}2faf(N) = \text{td}2faf(n-1) + d2faf(n) $ $\text{td}2lmd(N) = \text{td}2lmd(n-1) + d2lmd(n) $ add up for a total of 210 seconds $d2faf(n) = (faf(n) - faf(n-1)) - (faf(n-1) - faf(n-2))$ $d2lmd(n) = (lmd(n) - lmd(n-1)) - (lmd(n-1) - lmd(n-2))$ faf = main feedback compensation coefficient every 128 milliseconds lmd = output λ every 128 milliseconds	≥ 0.392

Time Needed for Diagnosis: 210 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

- Front oxygen (A/F) sensor main learning compensation: Not allowed to calculate.
- Correction when re-starting at high temperature: Normally minimum value $0.3 \rightarrow 0$.
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

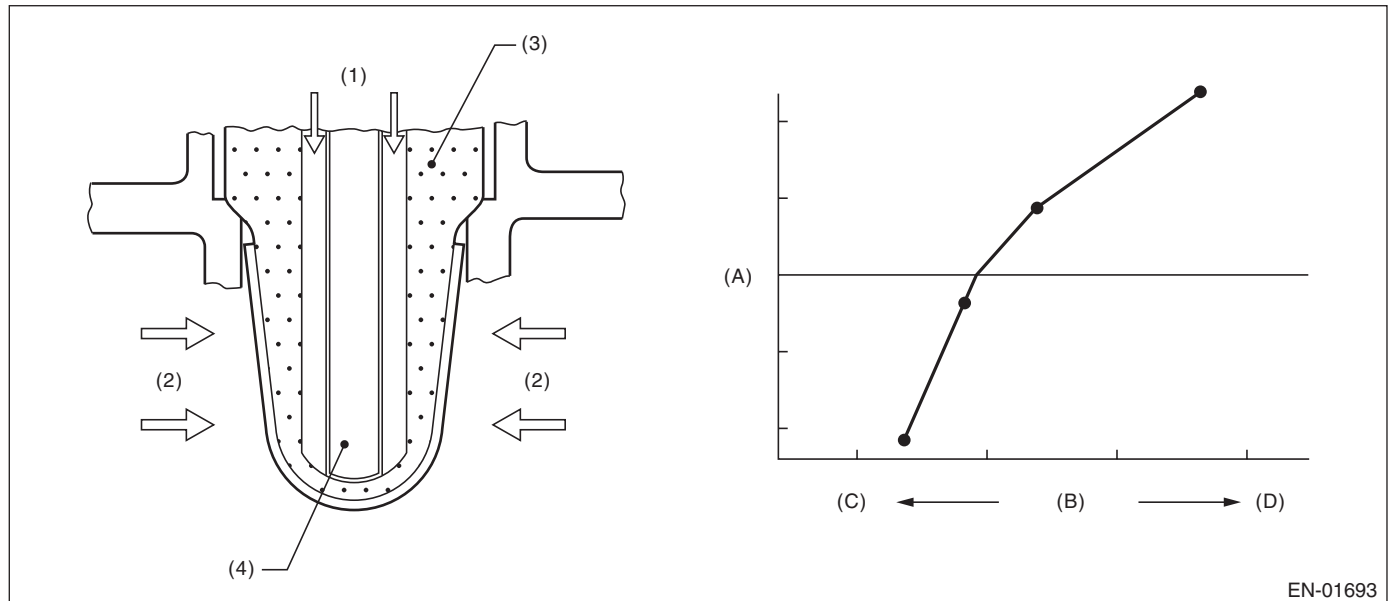
AC:DTC P0134 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

Detect open circuits of the sensor.

Judge as NG when the impedance of the element is large.

2. COMPONENT DESCRIPTION



(A) Electromotive force

(C) Lean

(D) Rich

(B) Air fuel ratio

(1) Atmosphere

(3) ZrO₂

(4) Ceramic heater

(2) Exhaust gas

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the malfunction criteria below becomes more than 5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Voltage	≥ 10.9 V
Time after engine starting	≥ 50 sec.
Cumulative amount of the front lambda sensor heater control duty every 128 milliseconds.	$\geq 28000\%$
Front oxygen (A/F) sensor impedance	$\geq 500 \Omega$

Time Needed for Diagnosis: 5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

- Front oxygen (A/F) sensor activation judgment: Front oxygen (A/F) sensor full activation is not complete, or front oxygen (A/F) sensor half activation is not complete.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- Compensation when starting the engine at high temperature: Make the MIN value to be 0.3 → 0, normally.
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

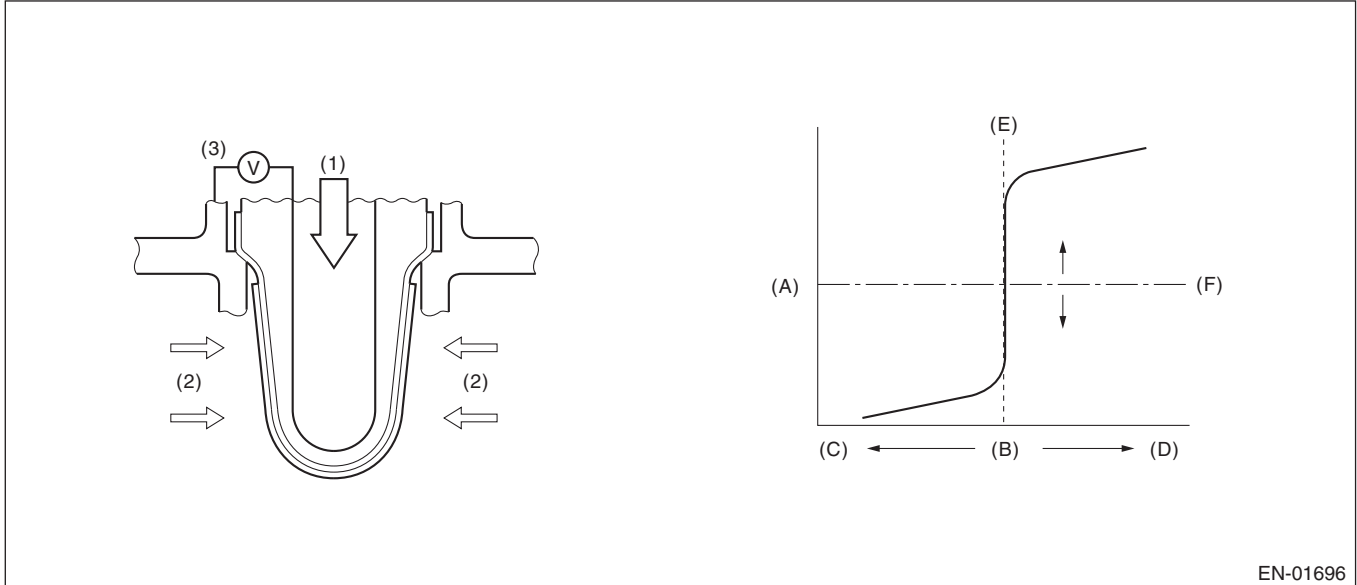
GENERAL DESCRIPTION

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

1. OUTLINE OF DIAGNOSIS

Detect the continuity NG of oxygen sensor. If the oxygen sensor voltage reading is not within the probable range considering the operating conditions, judge as NG.

2. COMPONENT DESCRIPTION



(A) Electromotive force

(B) Air fuel ratio

(1) Atmosphere

(C) Rich

(D) Lean

(2) Exhaust gas

(E) Theoretical air fuel ratio

(F) Comparative voltage

(3) Electromotive force

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

3. ENABLE CONDITION

Used only for abnormality judgment

Secondary Parameters	Enable Conditions
High side	
Secondary air injection system	Not in operation
Closed loop control with the oxygen sensor	In operation
Misfire detection during 200 revs.	< 5 times
Front oxygen (A/F) sensor compensation coefficient	Not in limit value
Battery voltage	> 10.9 V
Low side 1	
Secondary air injection system	Not in operation
Closed loop control with the oxygen sensor	In operation
Misfire detection during 200 revs.	< 5 times
Front oxygen (A/F) sensor compensation coefficient	Not in limit value
Battery voltage	> 10.9 V
Amount of intake air	≥ 10 g (0.35 oz)/second
Low side 2	
Secondary air injection system	Not in operation
Closed loop control with the oxygen sensor	In operation
Misfire detection during 200 revs.	< 5 times
Front oxygen (A/F) sensor compensation coefficient	Not in limit value
Battery voltage	> 10.9 V
Amount of intake air	< 10 g (0.35 oz)/second
Current continuation time of the rear oxygen sensor heater	25 seconds or more
Low side 3	
Secondary air injection system	Not in operation
Closed loop control with the oxygen sensor	In operation
Misfire detection during 200 revs.	< 5 times
Front oxygen (A/F) sensor compensation coefficient	Not in limit value
Battery voltage	> 10.9 V
Amount of intake air	< 10 g (0.35 oz)/second
Current continuation time of the rear oxygen sensor heater	25 seconds or more
Fuel cut	Experienced

Used only for normality judgment

Secondary Parameters	Enable Condition
Secondary air injection system	Not in operation
Closed loop control with the oxygen sensor	In operation
Misfire detection during 200 revs.	< 5 times
Front oxygen (A/F) sensor compensation coefficient	Not in limit value
Battery voltage	> 10.9 V

4. GENERAL DRIVING CYCLE

After starting the engine, perform the diagnosis in series while the engine is in a constant operating condition.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG if the continuous time when the following conditions are established exceeds the predetermined time, and judge as OK if it doesn't.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
High side Maximum output voltage without continuity	≥ 1200 mV	P0138
Low side Minimum output voltage without continuity	< 30 mV	P0137

Time Needed for Diagnosis

High side: 2.5 seconds

Low side 1: 20 seconds

Low side 2: 40 seconds

Low side 3: Refer to the Map.

Map

Fuel Cut Time (Seconds)	Time Needed for Diagnosis (Seconds)
0	40
2	40
10	60

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

Sub feedback control: Not allowed.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

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

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection conditions, refer to DTC P0137. <Ref. to GD(H4DOTC)-66, DTC P0137 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

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

1. OUTLINE OF DIAGNOSIS

Detect the slow response of the oxygen sensor.

Judge as NG if either the rich to lean response diagnosis or lean to rich response diagnosis is NG, and judge as OK if both are OK.

[Rich → lean diagnosis response]

1. Measure the response time for oxygen sensor output changes when the A/F ratio changes to rich to lean. If the measured response time is larger than the threshold value, it is NG. If it is smaller, it is OK.

2. Judge as NG when the oxygen sensor voltage is large (rich) when recovering from a deceleration fuel cut.

[Lean → rich diagnosis response]

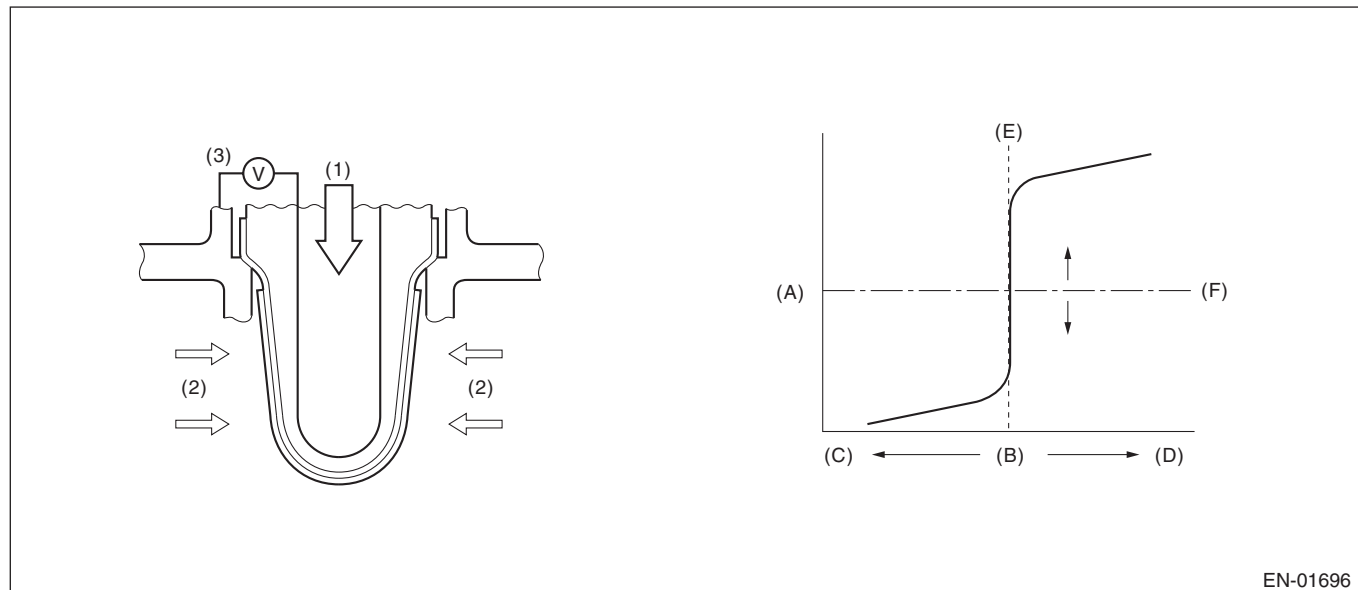
1. Measure the response time for oxygen sensor output changes when the A/F ratio changes to lean to rich. If the measured response time is larger than the threshold value, it is NG.

2. Judge as NG when the oxygen sensor voltage remains small when recovering from a deceleration fuel cut.

DIAGNOSTIC METHOD

Measure the response time of the output change of the oxygen sensor when the A/F ratio changes to rich to lean. And Judge as NG when the measured response time is larger than the threshold value.

2. COMPONENT DESCRIPTION



EN-01696

(A) Electromotive force

(B) Air fuel ratio

(C) Rich

(D) Lean

(E) Theoretical air fuel ratio

(F) Comparative voltage

(1) Atmosphere

(2) Exhaust gas

(3) Electromotive force

3. ENABLE CONDITION

- Rich → lean diagnosis response

Secondary Parameters	Enable Condition
Battery voltage	> 10.9 V
A/F sub feedback control condition	Complete
Deceleration fuel cut time is 5 seconds or more.	Experienced
After fuel cut	≥ 2 sec.
Rear oxygen heater current calculation time	≥ 60 sec.
Rear oxygen heater current continuous time	≥ 30 sec.
Estimated temperature in the catalytic layer	≥ 400°C (752°F)

Diagnostic Trouble Code (DTC) Detecting Criteria

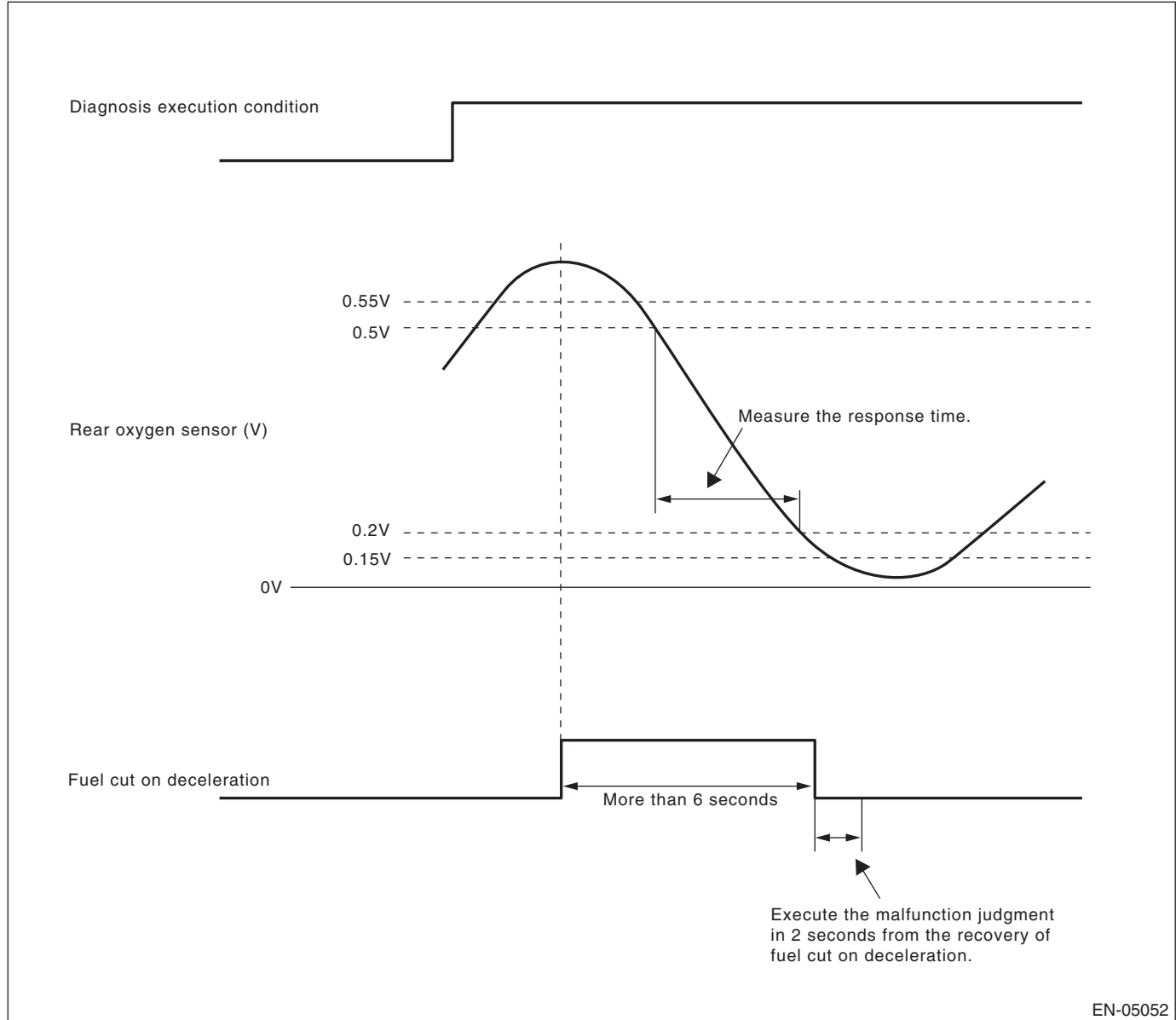
GENERAL DESCRIPTION

4. GENERAL DRIVING CYCLE

Perform the diagnosis only once when deceleration fuel cut occurs after rapid acceleration. (Pay attention to the oxygen sensor voltage for the timing of the deceleration.)

5. DIAGNOSTIC METHOD

When the oxygen sensor output voltage changes from 0.55 V (rich) to 0.15 V (lean), calculate the minimum response time for output change between 0.5 V and 0.2 V for the judgment criteria.



Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Abnormality Judgment

1) Judge as NG when the judgment value is larger than the threshold value after deceleration fuel cut.
Response time (diagnosis value) > threshold value → abnormal

NOTE:

Variation time of rear oxygen sensor output voltage is short during fuel shut-off in deceleration. Carry out the NG judgment only after the fuel shut-off in deceleration. Even without deceleration fuel cut, judge as OK if the value is below the threshold.

When the deceleration fuel cut time is more than 6 seconds, judge as NG if the following criteria are met 2 seconds after recovering from the deceleration fuel cut.

2) Judge as NG when the oxygen sensor voltage at recovery from a deceleration fuel cut is large.

If the fuel cut time in a deceleration fuel cut is long (more than 6 s), and even after recovering from a deceleration fuel cut, the oxygen sensor voltage is high (0.55 V or more), judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Shortest time change from rich (0.5 V O ₂ output) to lean (0.2 V) when voltage reduces from 0.55 V to 0.15 V	> 0.837 seconds
Time at 0.55 V or more	> 2 seconds

Time Needed for Diagnosis: 1 time

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

1) Regardless of a deceleration fuel cut, if the response time (diagnostic value) when the oxygen sensor voltage has changed from rich to lean is shorter than the threshold value (judgment value), judge as a normal condition.

Response time (diagnostic value) ≤ threshold value → normal

2) Normality judgement is not to be performed.

Judge as OK when the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Shortest time change from rich (0.5 V O ₂ output) to lean (0.2 V) when voltage reduces from 0.55 V to 0.15 V	≤ 0.837 second

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

Sub feedback control: Not allowed.

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

10.ENABLE CONDITION

- Lean → rich response diagnosis

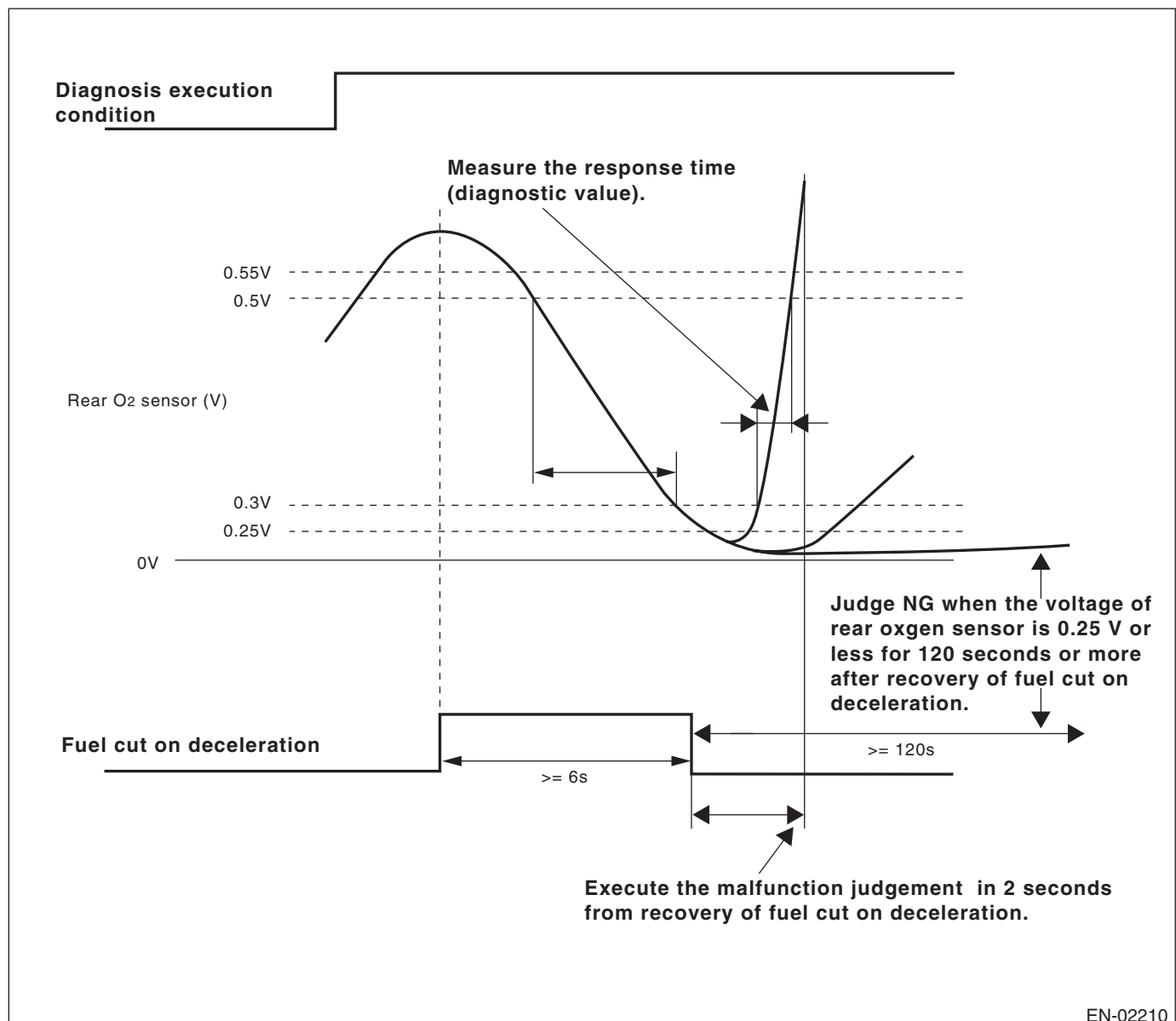
Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
A/F main feedback control condition	Completed
Deceleration fuel cut ≥ 5 seconds	Experienced
After fuel cut	≥ 2 sec.
Current calculation time of the rear oxygen sensor heater	≥ 60 sec.
Current continuation time of the rear oxygen sensor heater	≥ 30 sec.

11.GENERAL DRIVING CYCLE

Perform the diagnosis only once when deceleration fuel cut occurs after rapid acceleration. (Pay attention to the oxygen sensor voltage for the timing of the deceleration.)

12.DIAGNOSTIC METHOD

Calculate the minimum value of 0.3 V to 0.5 V output change response time as judgment value, when the oxygen sensor output voltage changes from 0.25 V (lean) to 0.55 V (rich).



Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Abnormality Judgment

- 1) Judge as NG when the judgment value is larger than the threshold value after deceleration fuel cut.
Response time (diagnosis value) > threshold value → abnormal
- 2) If the oxygen sensor voltage is small after recovering from a deceleration fuel cut, and remains small, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Shortest time change from lean (0.3 V O ₂ output) to rich (0.5 V) when voltage reduces from 0.5 V to 0.25 V	> 2 seconds
Time at less than 0.25 V	> 120 seconds

Time Needed for Diagnosis: 1 time

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

- 1) Regardless of a deceleration fuel cut, if the response time (diagnostic value) when the oxygen sensor voltage has changed from rich to lean is shorter than the threshold value (judgment value), judge as a normal condition.

Response time (diagnostic value) ≤ threshold value → normal

- 2) Do not judge as a normal condition.

Judge as OK when the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Shortest time change from lean (0.3 V O ₂ output) to rich (0.5 V) when voltage reduces from 0.55 V to 0.25 V	≤ 2 sec.

13.DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

14.MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

15.FAIL SAFE

Sub feedback control: Not allowed.

16.ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

AG:DTC P0140 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 2)

1. OUTLINE OF DIAGNOSIS

Detect abnormalities in the rear oxygen sensor output property.

By referring to the intake air amount, engine coolant temperature, main feedback control, deceleration fuel cut and other operating conditions, if the rear oxygen sensor voltage should be moving under those conditions but is showing a low voltage, this is judged as a Low side NG. If the voltage is high, it is judged as a High side NG.

When either Low side or High side is NG, this is judged as an rear oxygen sensor property NG.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	$\geq 70^{\circ}\text{C}$ (158°F)
Target output voltage of rear oxygen sensor	$\geq 0.6\text{ V}$
Air intake amount	10 g (0.35 oz)/seconds or more
Battery voltage	$> 10.9\text{ V}$
Closed loop with the oxygen sensor	In operation
Misfire detection during 200 revs.	5 times or less
Front oxygen (A/F) sensor compensation coefficient	Not in limit value
Deceleration fuel cut of 5 seconds or more	Experienced

3. GENERAL DRIVING CYCLE

Perform the diagnosis only once after engine warm-up.

4. DIAGNOSTIC METHOD

Abnormality Judgment

When the following conditions are established, it is NG.

Judgment Value

Malfunction Criteria	Threshold Value
Maximum output voltage, low side	$< 550\text{ mV}$
Minimum output voltage, high side	$> 250\text{ mV}$

Time Needed for Diagnosis: 200 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

When the following conditions are established, it is OK.

Judgment Value

Malfunction Criteria	Threshold Value
Maximum output voltage, low side	$\geq 550\text{ mV}$
Minimum output voltage, high side	$\leq 250\text{ mV}$

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

Diagnostic Trouble Code (DTC) Detecting Criteria

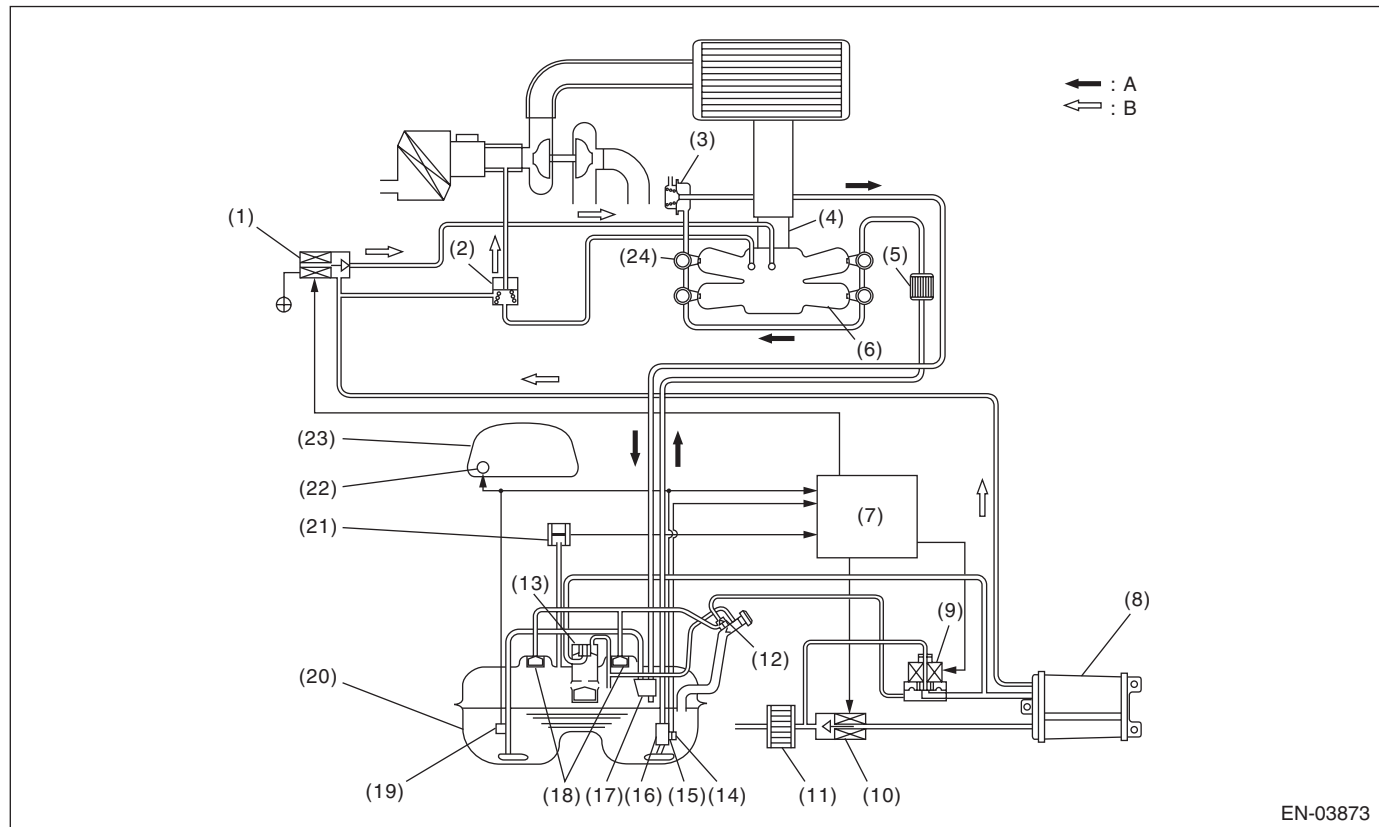
GENERAL DESCRIPTION

AH:DTC P0171 SYSTEM TOO LEAN (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect fuel system malfunction by the amount of main feedback control.

FUEL SYSTEM DIAGNOSIS



(A) Fuel line

(B) Evaporation fuel line

- | | | |
|----------------------------------|-------------------------------------|--------------------------------|
| (1) Purge control solenoid valve | (9) Pressure control solenoid valve | (17) Jet pump |
| (2) Purge valve | (10) Drain valve | (18) Fuel cut valve |
| (3) Pressure regulator | (11) Drain filter | (19) Fuel sub level sensor |
| (4) Throttle body | (12) Shut-off valve | (20) Fuel tank |
| (5) Fuel filter | (13) Vent valve | (21) Fuel tank pressure sensor |
| (6) Intake manifold | (14) Fuel temperature sensor | (22) Fuel gauge |
| (7) Engine control module (ECM) | (15) Fuel level sensor | (23) Combination meter |
| (8) Canister | (16) Fuel pump | (24) Fuel injector |

Diagnostic Method

Fuel system is diagnosed by comparing the target air fuel ratio calculated by ECM with the actual air fuel ratio measured by sensor.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
A/F main learning system	In operation
Engine coolant temperature	$\geq 70^{\circ}\text{C}$ (158°F)
Engine load	$\geq$ Value from Map 5
Intake air change during 0.5 engine revs.	≤ 0.02 g/rev

Map 5

Engine speed (rpm)	idling	800	1200	1600	2000	2400	2800	3200	3600	4000	4400
Measured value (g(oz)/rev)	Non-turbo	0.228 (0.008)	0.22 (0.0078)	0.22 (0.0078)	0.22 (0.0078)	0.228 (0.008)	0.23 (0.0081)	0.234 (0.0083)	0.242 (0.0085)	0.250 (0.0088)	0.250 (0.0088)

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at idling or at a constant speed after warming up the engine.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Compare the diagnosed value (fsobd) with the threshold value, and if a condition where the malfunction criteria below are met continues for more than 50 seconds, judge that there is a fault in the fuel system.

Judgment Value

Malfunction Criteria	Threshold Value
$\text{fsobd} = (\text{sglmd} - \text{tglmda}) + \text{faf} + \text{flaf}$ where, sglmd = measured lambda tglmda = target lambda faf = main feedback compensation coefficient every 64 milliseconds flaf = main feedback learning compensation coefficient	$\geq \text{fsobdL1}$ See Map 4 fsobdL1 = lean side threshold value of fsobd

Map 4 Threshold value for fuel system malfunction criteria

Amount of air (g(oz)/s)	0	2.4 (0.085)	4.7 (0.166)	7 (0.247)	9.4 (0.332)	11.7 (0.413)	14.1 (0.497)
fsobdL1 (%)	40	40	36.9	32.0	27.0	26.5	26.5

Time Needed for Diagnosis: 10 seconds $\times$ 5 time

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK when the malfunction criteria below are completed for 10 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
$\text{fsobd} = (\text{sglmd} - \text{tglmda}) + \text{faf} + \text{flaf}$	$< 19\%$

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When similar driving conditions are repeated 3 times and the result is OK.
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. FAIL SAFE

Rich side malfunction

- Purge control solenoid valve control: Not allowed to purge.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.

8. ECM OPERATION AT DTC SETTING

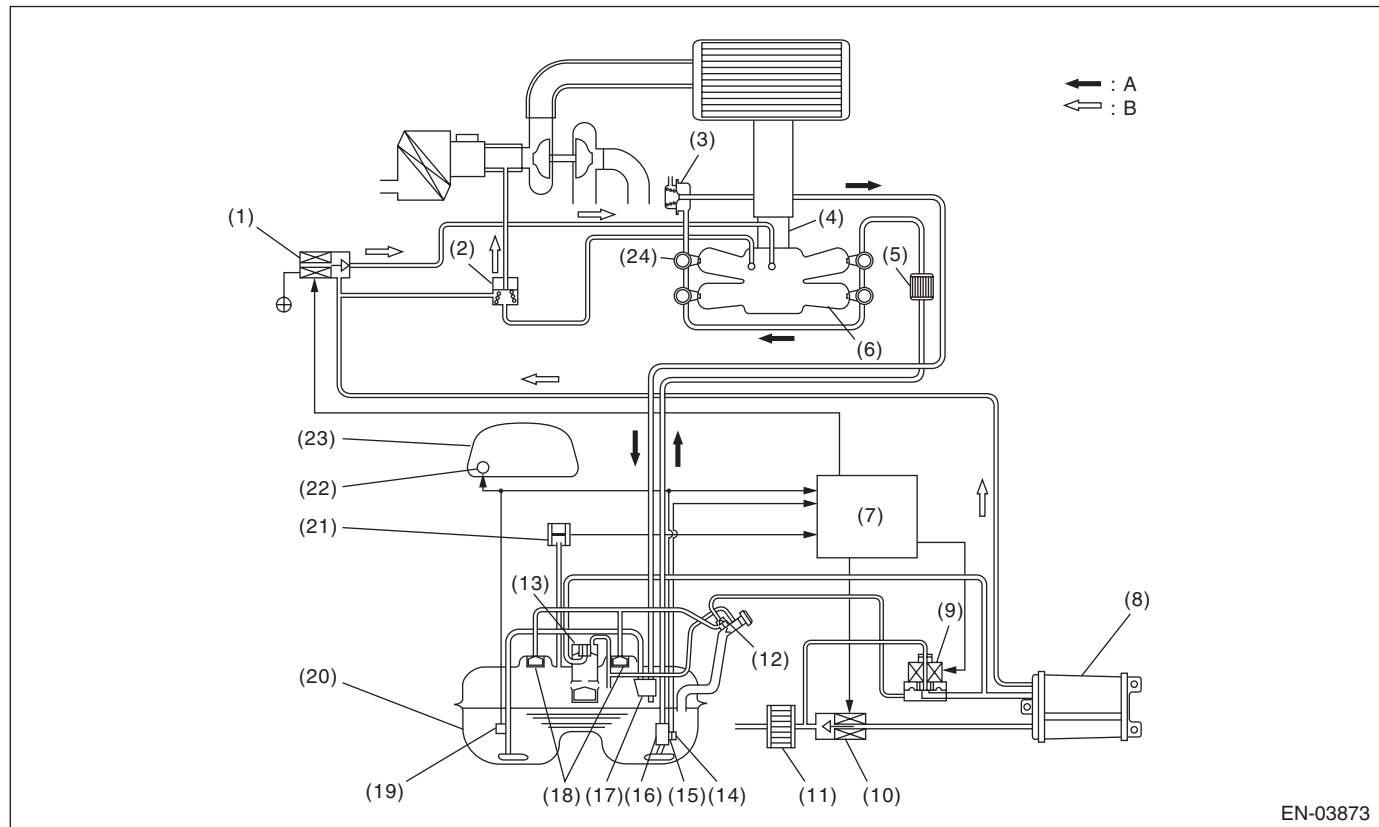
Memorize the freeze frame data. (For test mode \$02)

AI: DTC P0172 SYSTEM TOO RICH (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect fuel system malfunction by the amount of main feedback control.

FUEL SYSTEM DIAGNOSIS



EN-03873

(A) Fuel line

(B) Evaporation fuel line

- | | | |
|----------------------------------|-------------------------------------|--------------------------------|
| (1) Purge control solenoid valve | (9) Pressure control solenoid valve | (17) Jet pump |
| (2) Purge valve | (10) Drain valve | (18) Fuel cut valve |
| (3) Pressure regulator | (11) Drain filter | (19) Fuel sub level sensor |
| (4) Throttle body | (12) Shut-off valve | (20) Fuel tank |
| (5) Fuel filter | (13) Vent valve | (21) Fuel tank pressure sensor |
| (6) Intake manifold | (14) Fuel temperature sensor | (22) Fuel gauge |
| (7) Engine control module (ECM) | (15) Fuel level sensor | (23) Combination meter |
| (8) Canister | (16) Fuel pump | (24) Fuel injector |

Diagnostic Method

Fuel system is diagnosed by comparing the target air fuel ratio calculated by ECM with the actual air fuel ratio measured by sensor.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
A/F main learning system	In operation
Engine coolant temperature	$\geq 70^{\circ}\text{C}$ (158°F)
Engine load	$\geq$ Value from Map 5
Intake air change during 0.5 engine revs.	≤ 0.02 g/rev
Learning value of EVAP conc. during purge	≤ 0.1
Cumulative time of canister purge after engine start	20 seconds or more
Continuous period after canister purge starting	30 seconds or more

Map 5

Engine speed (rpm)	idling	800	1200	1600	2000	2400	2800	3200	3600	4000	4400
Measured value (g(oz)/rev)	Non-turbo	0.228 (0.008)	0.22 (0.0078)	0.22 (0.0078)	0.22 (0.0078)	0.228 (0.008)	0.23 (0.0081)	0.234 (0.0083)	0.242 (0.0085)	0.250 (0.0088)	0.250 (0.0088)

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at idling or at a constant speed after warming up the engine.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Compare the diagnosed value (fsobd) with the threshold value, and if a condition where the malfunction criteria below are met continues for more than 50 seconds, judge that there is a fault in the fuel system.

Judgment Value

Malfunction Criteria	Threshold Value
$\text{fsobd} = (\text{sglmd} - \text{tglmda}) + \text{faf} + \text{flaf}$ where, sglmd = measured lambda tglmda = target lambda faf = Main feedback compensation coefficient (Per 64 milliseconds) flaf = main feedback learning compensation coefficient	$\leq \text{fsobdR1}$ See Map 4 fsobdR1 = rich side threshold value of fsobd

Map 4 Threshold value for fuel system malfunction criteria

Amount of air (g(oz)/s)	0	2.4 (0.085)	4.7 (0.166)	7 (0.247)	9.4 (0.332)	11.7 (0.413)	14.1 (0.497)
fsobdR1 (%)	-40	-40	-36.9	-32.0	-27.0	-27.0	-27.0

Time Needed for Diagnosis: 10 seconds $\times$ 5 time

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK when the malfunction criteria below continues for 10 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
$\text{fsobd} = (\text{sglmd} - \text{tglmda}) + \text{faf} + \text{flaf}$	$\geq -20\%$

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When similar driving conditions are repeated 3 times and the result is OK.
- When “Clear Memory” is performed

7. FAIL SAFE

Rich side malfunction

- Purge control solenoid valve control: Not allowed to purge.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

AJ:DTC P0181 FUEL TEMPERATURE SENSOR “A” CIRCUIT RANGE/ PERFORMANCE

1. OUTLINE OF DIAGNOSIS

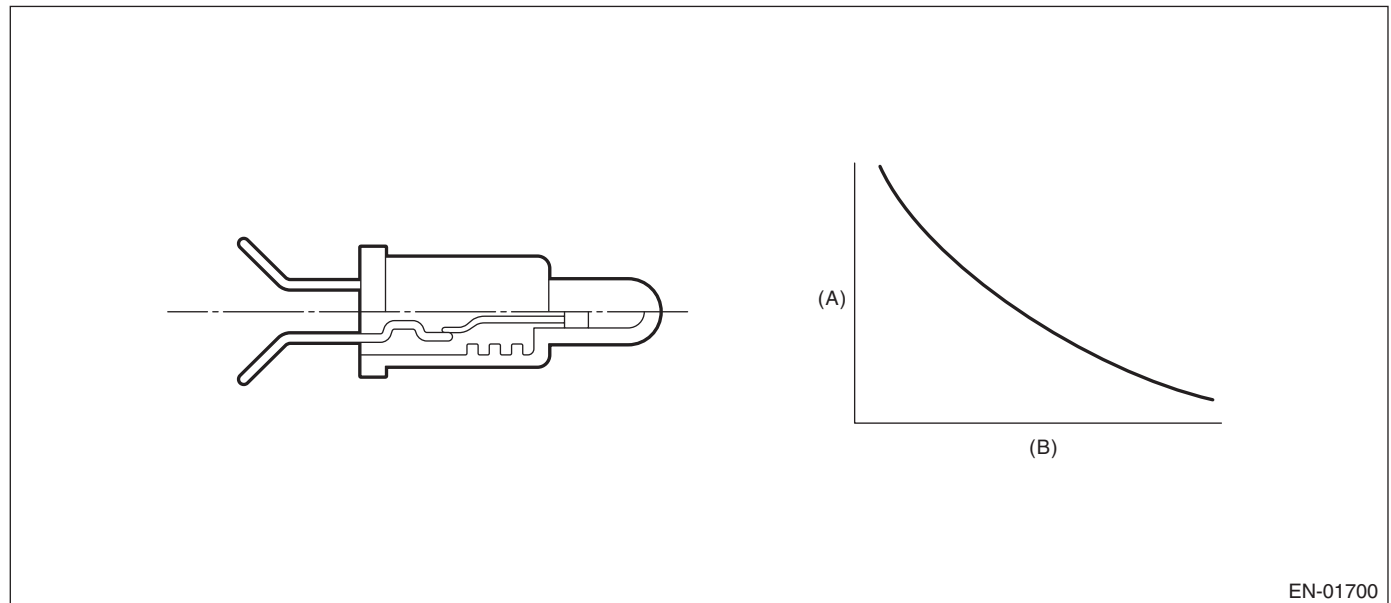
Detect faults in the fuel temperature sensor output properties.

Diagnosis is performed in two methods; drift diagnosis and stuck diagnosis. If either is NG, judge as NG. If both are OK, Judge as OK and clear the NG.

DRIFT DIAGNOSIS

Normally fuel temperature is lower than engine coolant temperature. When the fuel temperature becomes higher than the engine coolant temperature, the range is considered to be shifted, and judged as NG.

2. COMPONENT DESCRIPTION



(A) Resistance value (Ω)

(B) 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 as NG when the continuous time of meeting the malfunction criteria below becomes 120 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel level	$\geq 9 \text{ } \ell$ (2.38 US gal, 1.98 Imp gal)
After engine starting	20 seconds or more
Engine coolant temperature — Engine coolant temperature at engine starting	$> 10^{\circ}\text{C}$ (18°F)
Fuel temperature – Engine coolant temperature	$\geq 10^{\circ}\text{C}$ (18°F)
Battery voltage	$> 10.9 \text{ V}$

Time Needed for Diagnosis: 120 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK when the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel level	$\geq 9 \text{ } \ell$ (2.38 US gal, 1.98 Imp gal)
After engine starting	20 seconds or more
Engine coolant temperature — Engine coolant temperature at engine starting	$> 10^{\circ}\text{C}$ (18°F)
Fuel temperature – Engine coolant temperature	$< 10^{\circ}\text{C}$ (18°F)
Battery voltage	$> 10.9 \text{ V}$
Engine coolant temperature	$< 70^{\circ}\text{C}$ (158°F)

Stuck Diagnosis

As the engine warms up (cumulative amount of intake air after starting is large), if the fuel temperature which should rise does not, determine as being stuck and NG.

6. ENABLE CONDITION

Secondary Parameters	Enable Conditions
After engine starting	20 seconds or more
Battery voltage	$> 10.9 \text{ V}$

7. GENERAL DRIVING CYCLE

Always perform diagnosis continuously after 20 seconds or more have passed since the engine started.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Accumulated amount of intake air	≥ 550 kg (1212.8 lb)
Fuel temperature difference between Max. and Min.	$< 3^{\circ}\text{C}$ (5.4°F)

Time Needed for Diagnosis: Undetermined

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK when the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Accumulated amount of intake air	≥ 550 kg (1212.8 lb)
Fuel temperature difference between Max. and Min.	$\geq 3^{\circ}\text{C}$ (5.4°F)

9. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

10.MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

11.FAIL SAFE

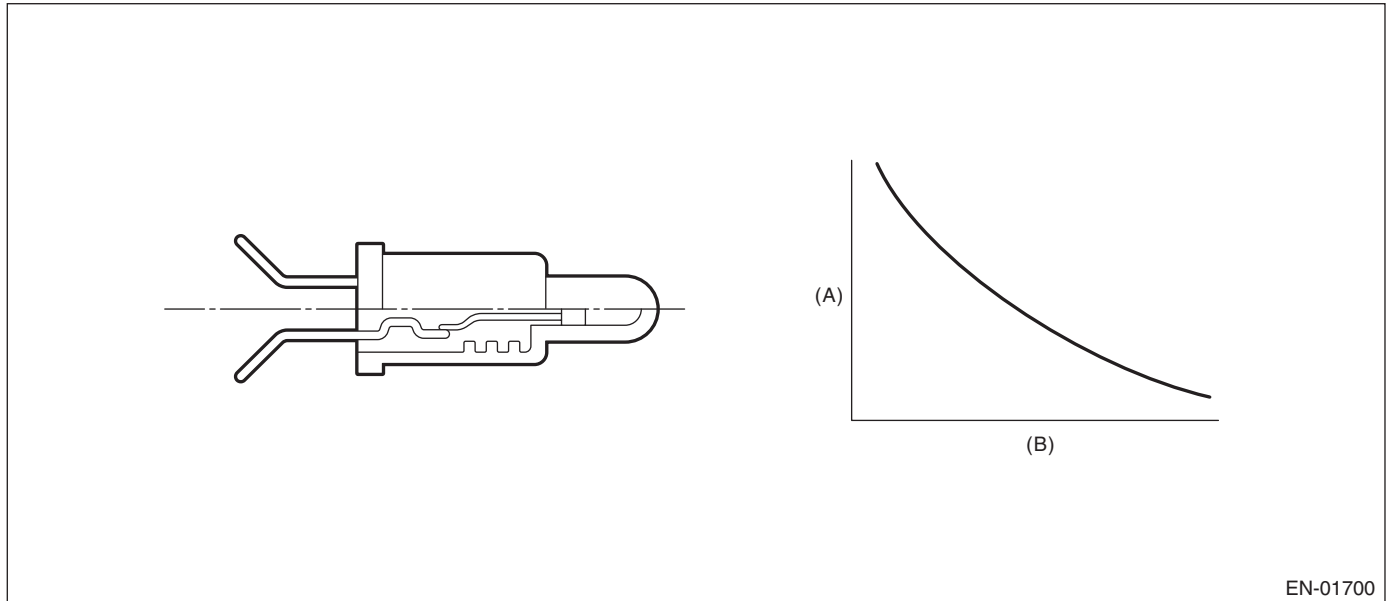
None

12.ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

AK:DTC P0182 FUEL TEMPERATURE SENSOR “A” CIRCUIT LOW INPUT**1. OUTLINE OF DIAGNOSIS**

Detect the open or short circuit of fuel temperature sensor.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION

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 as NG when the continuous time of meeting the malfunction criteria below becomes 2.5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	$< 0.1646 \text{ V}$
Battery voltage	$\geq 10.9 \text{ V}$

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	$\geq 0.1646 \text{ V}$
Battery voltage	$\geq 10.9 \text{ V}$

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

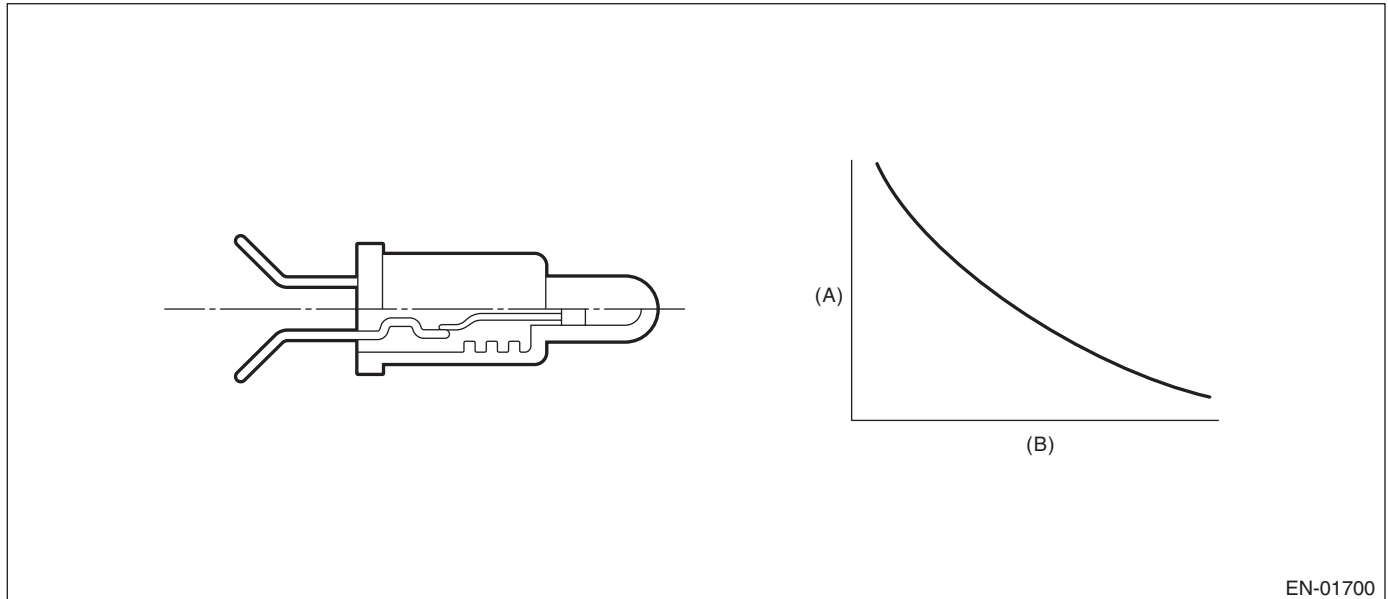
None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

AL:DTC P0183 FUEL TEMPERATURE SENSOR “A” CIRCUIT HIGH INPUT**1. OUTLINE OF DIAGNOSIS**

Detect the open or short circuit of fuel temperature sensor.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION(A) Resistance value (Ω)(B) Fuel temperature $^{\circ}\text{C}$ ($^{\circ}\text{F}$)

EN-01700

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD**Abnormality Judgment**

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 2.5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	$\geq 4.72 \text{ V}$
Battery voltage	$\geq 10.9 \text{ V}$

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	$< 4.72 \text{ V}$
Battery voltage	$\geq 10.9 \text{ V}$

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

None

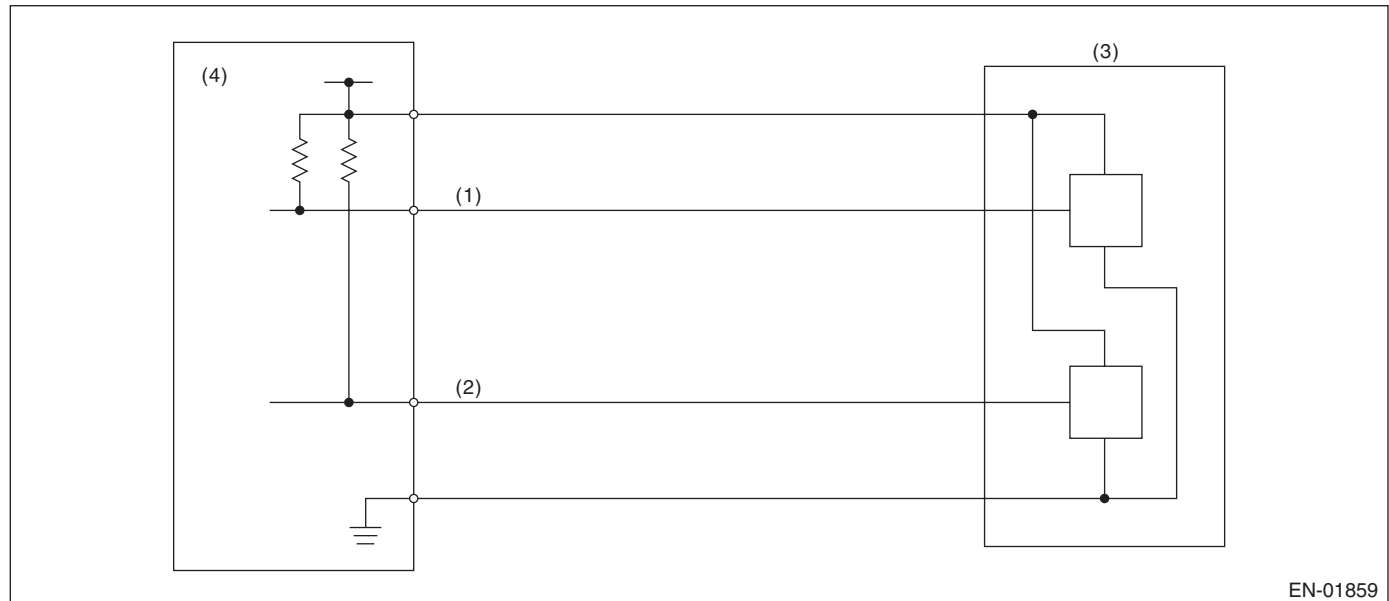
9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

AM:DTC P0222 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT LOW**1. OUTLINE OF DIAGNOSIS**

Detect the open or short circuit of throttle position sensor 2.

Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION

(1) Throttle position sensor 1 signal

(3) Throttle position sensor

(4) Engine control module (ECM)

(2) Throttle position sensor 2 signal

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	> 0.224 V

Time Needed for Diagnosis: 24 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. FAIL SAFE

Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

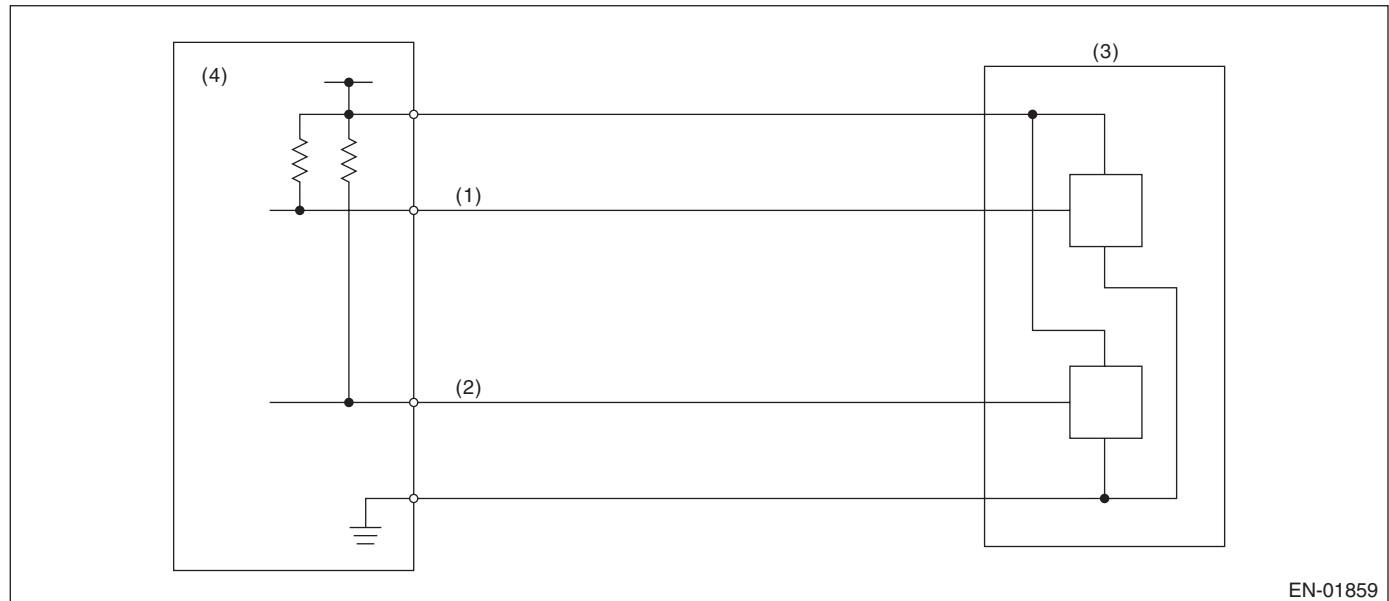
9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

AN:DTC P0223 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT HIGH**1. OUTLINE OF DIAGNOSIS**

Detect the open or short circuit of throttle position sensor 2.

Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION

EN-01859

(1) Throttle position sensor 1 signal

(3) Throttle position sensor

(4) Engine control module (ECM)

(2) Throttle position sensor 2 signal

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	< 4.851 V

Time Needed for Diagnosis: 24 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. FAIL SAFE

Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

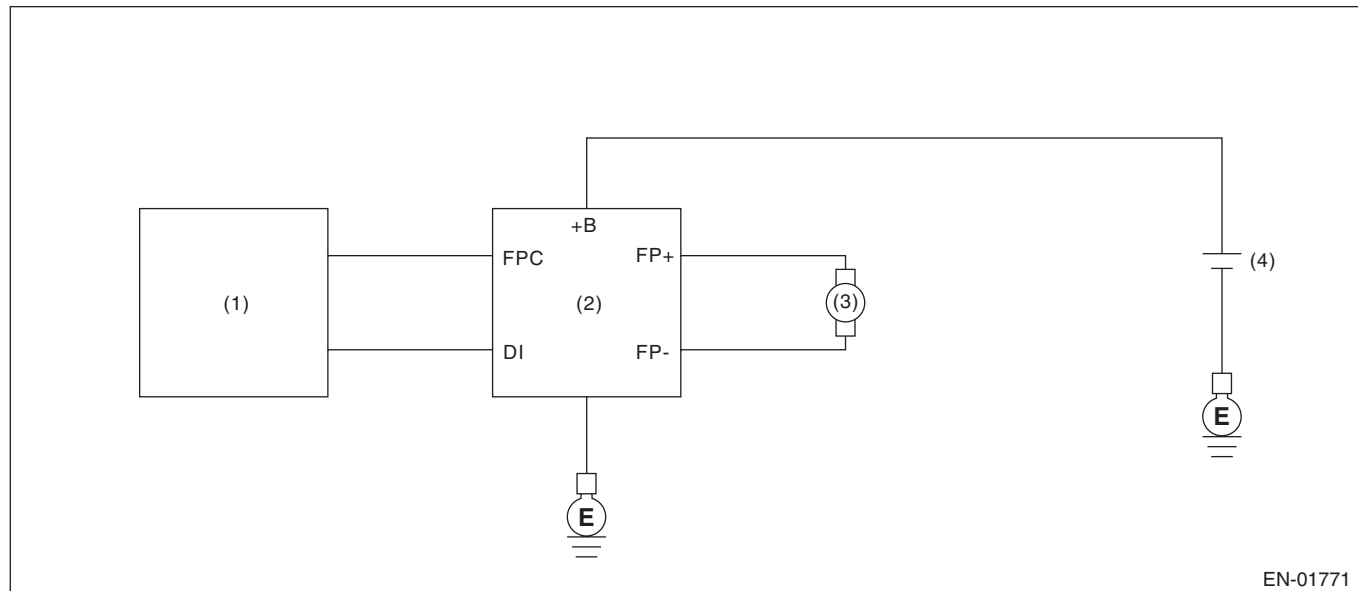
AO:DTC P0230 FUEL PUMP PRIMARY CIRCUIT

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel pump control unit.

Judge as NG when the NG signal is sent through a diagnostic line coming from the fuel pump control unit. Fuel pump control unit detects the open or short circuit malfunction for each line, and then sends NG signals if one of them is found NG.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)

(3) Fuel pump

(4) Battery

(2) Fuel pump control unit

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 2.5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 8 V
After engine starting	30 seconds or more
Fuel pump control	ON
Fuel pump control unit output diagnosis signal	Low
Fuel level	≥ 10 ℓ (2.64 US gal, 2.2 Imp gal)

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 8 V
After engine starting	30 seconds or more
Fuel pump control	ON
Fuel pump control unit output diagnosis signal	High

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

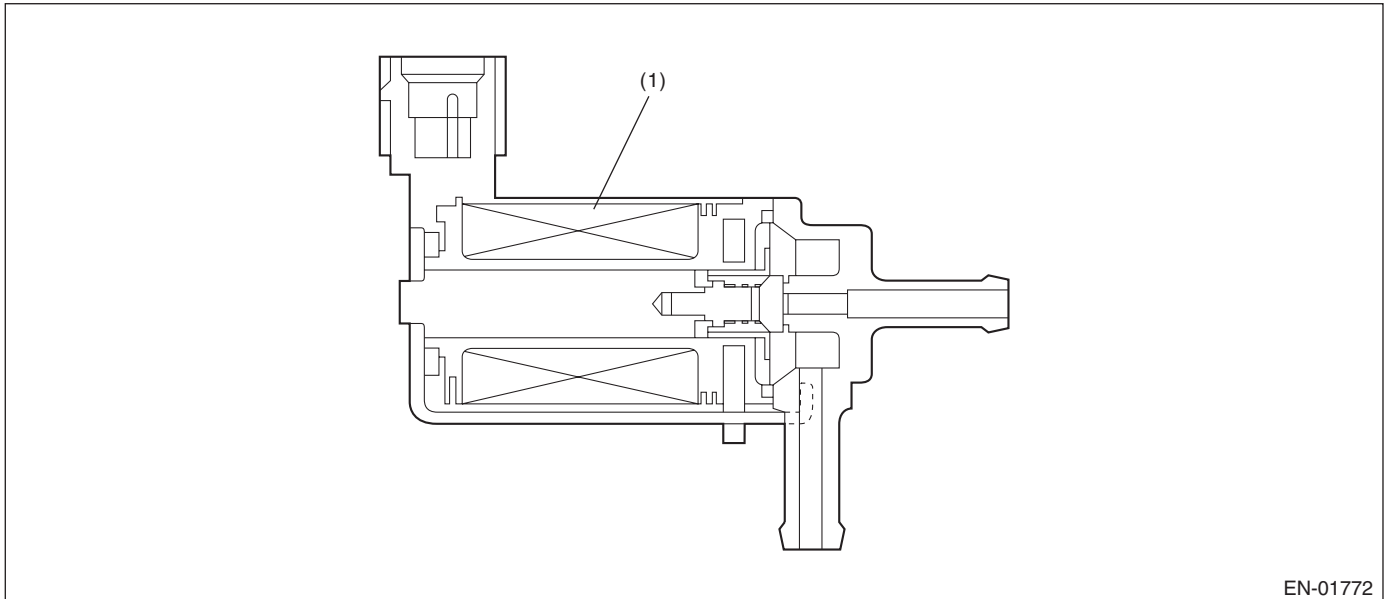
OFF setting may be needed depending on the NG portion.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

**AP:DTC P0244 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A”
RANGE/PERFORMANCE****1. OUTLINE OF DIAGNOSIS**

Detect the malfunction of wastegate control solenoid valve function.
Judge NG when becoming high wastegate pressure.

2. COMPONENT DESCRIPTION

(1) Coil

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 1 second or more.

Judgment Value

Malfunction Criteria	Threshold Value
Intake manifold pressure	$\geq$ Map 10

Map 10

Atmosphere pressure (kPa (mmHg, inHg))	58.7 (440, 17.3)	67.2 (504, 19.8)	75.7 (568, 22.4)	84.2 (632, 24.9)	92.8 (696, 27.4)	101.3 (760, 29.9)
NG pressure (kPa (mmHg, inHg))	142.4 (1068, 42.1)	156.2 (1172, 46.1)	170.2 (1277, 50.3)	184.1 (1381, 54.4)	198.0 (1485, 58.5)	207.9 (1560, 61.4)
OK pressure (kPa (mmHg, inHg))	120.0 (900, 35.4)	113.8 (1004, 33.6)	147.8 (1109, 43.7)	161.7 (1213, 47.8)	175.6 (1317, 51.9)	185.6 (1392, 54.8)

Time Needed for Diagnosis: 1 second

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Intake manifold pressure	$<$ Map 10

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

None

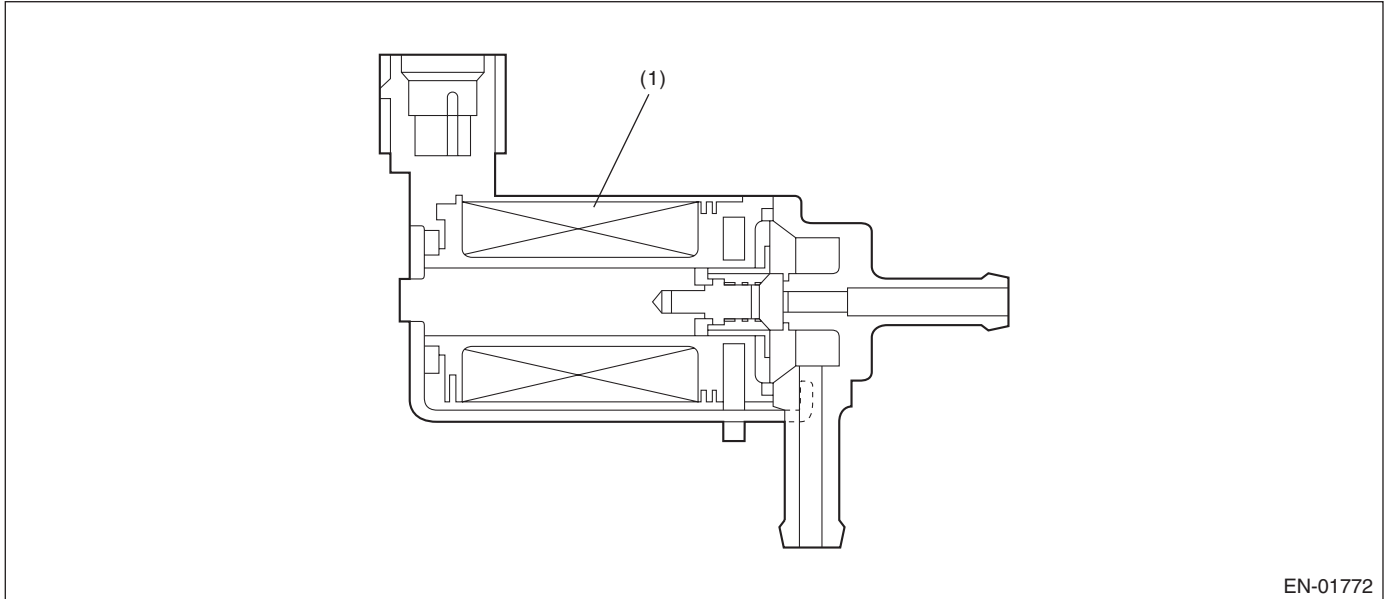
9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

AQ:DTC P0245 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” LOW**1. OUTLINE OF DIAGNOSIS**

Detect the open or short circuit of wastegate control solenoid valve.

Judge NG when the terminal output voltage remains Low during outputting the duty signal.

2. COMPONENT DESCRIPTION

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 starting the engine.

5. DIAGNOSTIC METHOD**Abnormality Judgment**

Judge NG when the continuous time of meeting the malfunction criteria below becomes more than 655 milliseconds.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal output	Low
Duty ratio for turbocharged pressure control	< 75%

Time Needed for Diagnosis: 655 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage	High

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

None

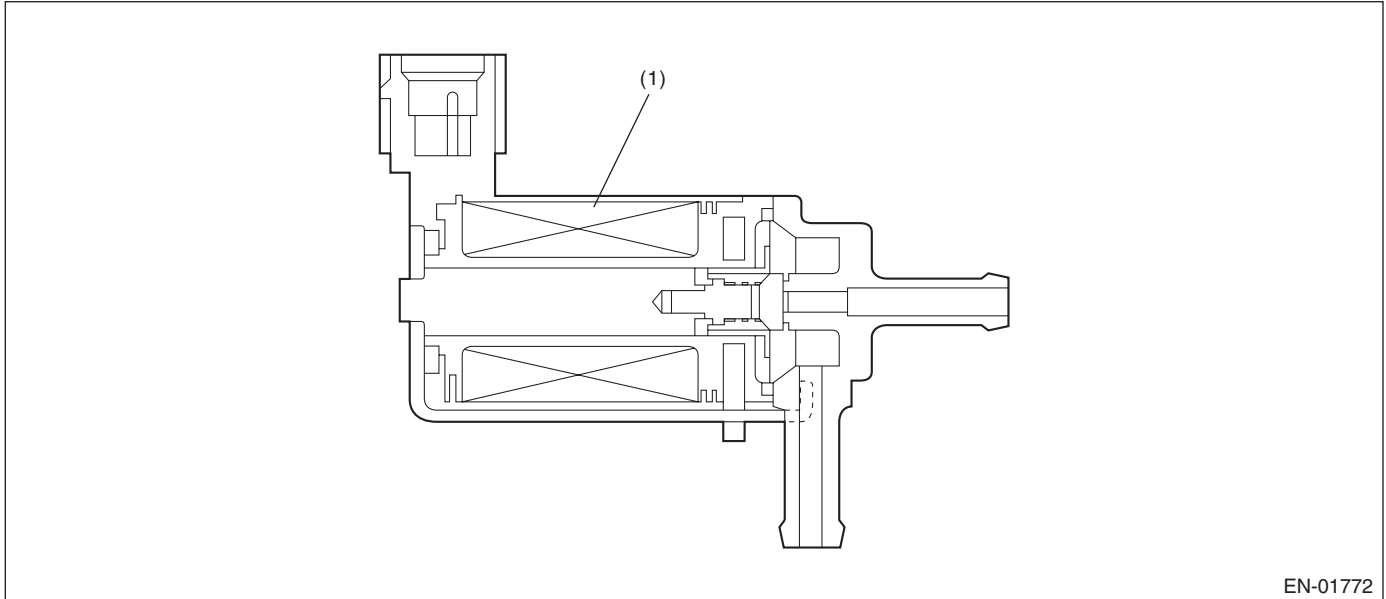
9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

AR:DTC P0246 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” HIGH**1. OUTLINE OF DIAGNOSIS**

Detect the open or short circuit of wastegate control solenoid valve.

Judge NG when the terminal output voltage remains High during outputting the duty signal.

2. COMPONENT DESCRIPTION

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 starting the engine.

5. DIAGNOSTIC METHOD**Abnormality Judgment**

Judge NG when the continuous time of meeting the malfunction criteria below becomes more than 655 milliseconds.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal output	High
Duty ratio for turbocharged pressure control	> 25%

Time Needed for Diagnosis: 655 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage	Low

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

AS:DTC P0301 CYLINDER 1 MISFIRE DETECTED

1. OUTLINE OF DIAGNOSIS

Detect the presence of misfire occurrence. (Revolution fluctuation method)

Monitoring misfire which influences exhaust deterioration (1.5 times of FTP) and catalyst damage is made obligatory by the law. Misfire affecting these two has 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 more)

2) Misfire every time: FTP 1.5 times misfire, Catalyst damage misfire

- 360° Interval Difference Method

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Time for keep completing all secondary parameters	1 second or more
Intake manifold pressure change during 0.5 engine revs.	< 13.3 kPa (100 mmHg, 3.93 inHg (MT model)) < 13.3 kPa (100 mmHg, 3.93 inHg (AT model))
Engine speed change	< 1,000 rpm/32 milliseconds
Throttle position change during 16 milliseconds	< 14°
Fuel shut-off function	Not in operation
Atmosphere pressure	≥ 75.0 kPa (563 mmHg, 22.2 inHg)
Fuel level	≥ 9 ℓ (2.38 US gal, 1.98 Imp gal)
Evaporative system leak check	Not in operation
Engine speed	500 — 6500 rpm
Intake manifold pressure	> Value of map 3 or more
Battery voltage	≥ 8 V

Map 3

MT model

Vehicle Speed < 64.4 km/h (40 MPH)

rpm	700	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	6700
kPa	25.1	24.8	23.3	24.7	24.0	25.6	28.8	30.0	31.6	32.5	37.1	41.9	36.9	51.1
(mmHg, inHg)	(188, 7.40)	(186, 7.32)	(175, 6.89)	(185, 7.30)	(180, 7.09)	(192, 7.56)	(216, 8.51)	(225, 8.86)	(237, 9.33)	(244, 9.60)	(278, 10.96)	(314, 12.4)	(352, 10.90)	(383, 15.1)

Vehicle Speed ≥ 64.4 km/h (40 MPH)

rpm	700	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	6700
kPa	25.1	24.8	23.3	24.7	24.0	25.6	28.8	30.0	31.6	32.5	37.1	41.9	36.9	51.1
(mmHg, inHg)	(188, 7.40)	(186, 7.32)	(175, 6.89)	(185, 7.30)	(180, 7.09)	(192, 7.56)	(216, 8.51)	(225, 8.86)	(237, 9.33)	(244, 9.60)	(278, 10.96)	(314, 12.4)	(352, 10.90)	(383, 15.1)

AT model

rpm	700	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	6700
kPa	26.3	24.7	23.6	26.7	27.3	26.1	29.5	31.3	32.7	34.1	38.2	44.0	49.5	53.3
(mmHg, inHg)	(197, 7.76)	(185, 7.28)	(177, 6.97)	(200, 7.89)	(205, 8.07)	(196, 7.72)	(221.5, 8.72)	(235, 9.25)	(245.5, 9.67)	(256, 10.08)	(286.5, 11.28)	(330, 13.0)	(371.5, 14.63)	(400, 15.74)

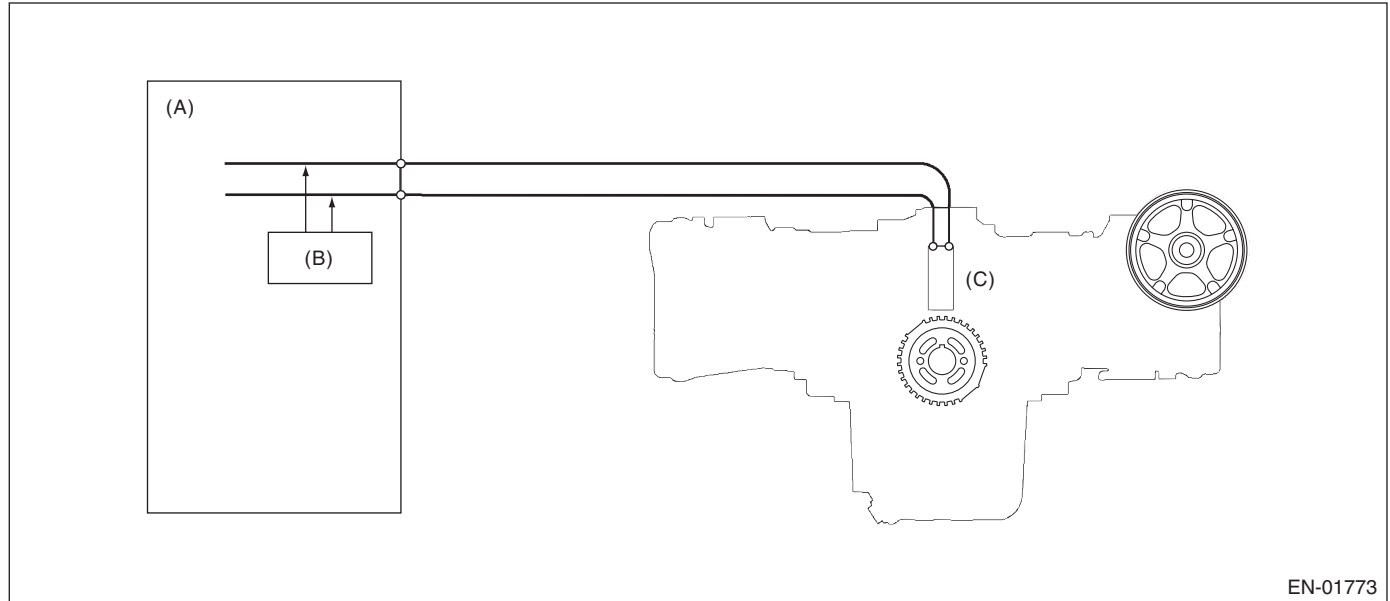
3. GENERAL DRIVING CYCLE

- If conditions are met, detect misfire from idling to high rotation.
- Perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

4. DIAGNOSTIC METHOD



EN-01773

(A) Engine control module (ECM)

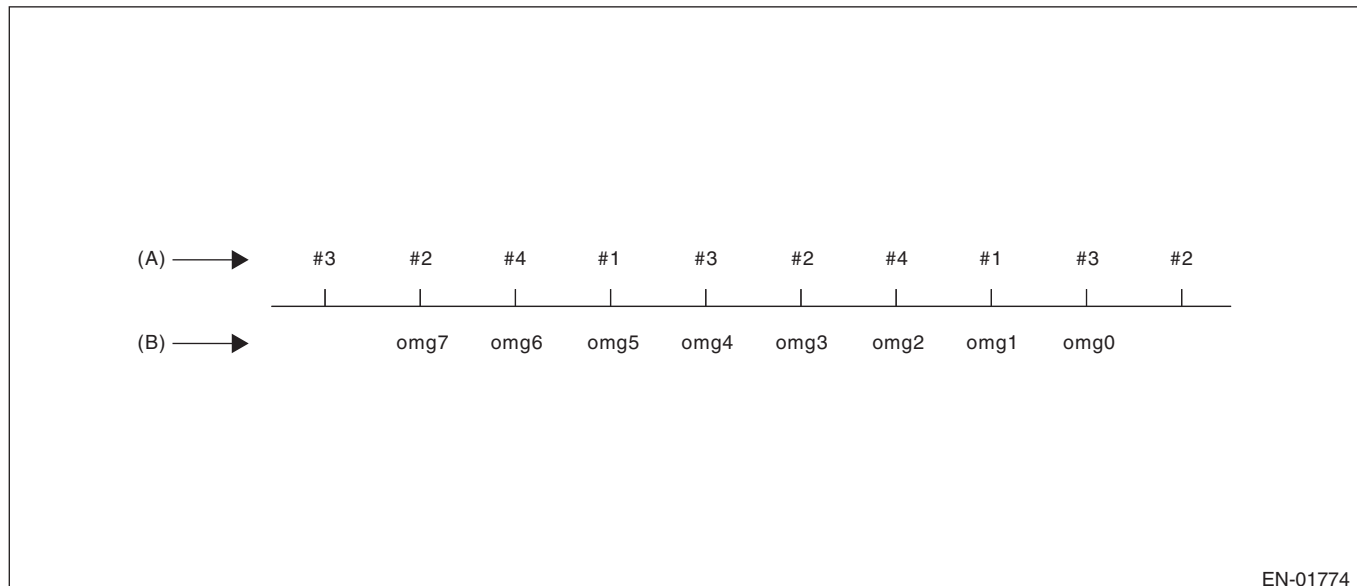
(B) Diagnosis circuit

(C) Crankshaft position sensor

When a misfire occurs, the engine speed will decreased and the crankshaft position speed will change. Calculate the interval difference value (diagnostic value) from crankshaft position speed by the following formula, and judge whether a misfire is occurring or not comparing the calculated result with judgment value. Counting the number of misfires, if the misfire ratio is higher during 1000 rev. or 200 rev. Judge corresponding cylinders as NG.

Diagnostic value calculation (Calculate from angle speed) →	Misfire detection every single ignition (Compare diagnostic value with judgment value) →	NG judgment (Misfire occurrence judgment required by the law) (Compare number of misfire with judgment)
	• 180° Interval Method • 360° Interval Method • 720° Interval Method	• FTP 1.5 times misfire NG judgment • Catalyst damage misfire NG judgment

As shown in the following figure, pick a cylinder as the standard and name it omg 0. And the former crankshaft position speed is named omg 1, the second former crankshaft position speed is named omg 2, the third is named omg 3, etc.



EN-01774

(A) Ignition order

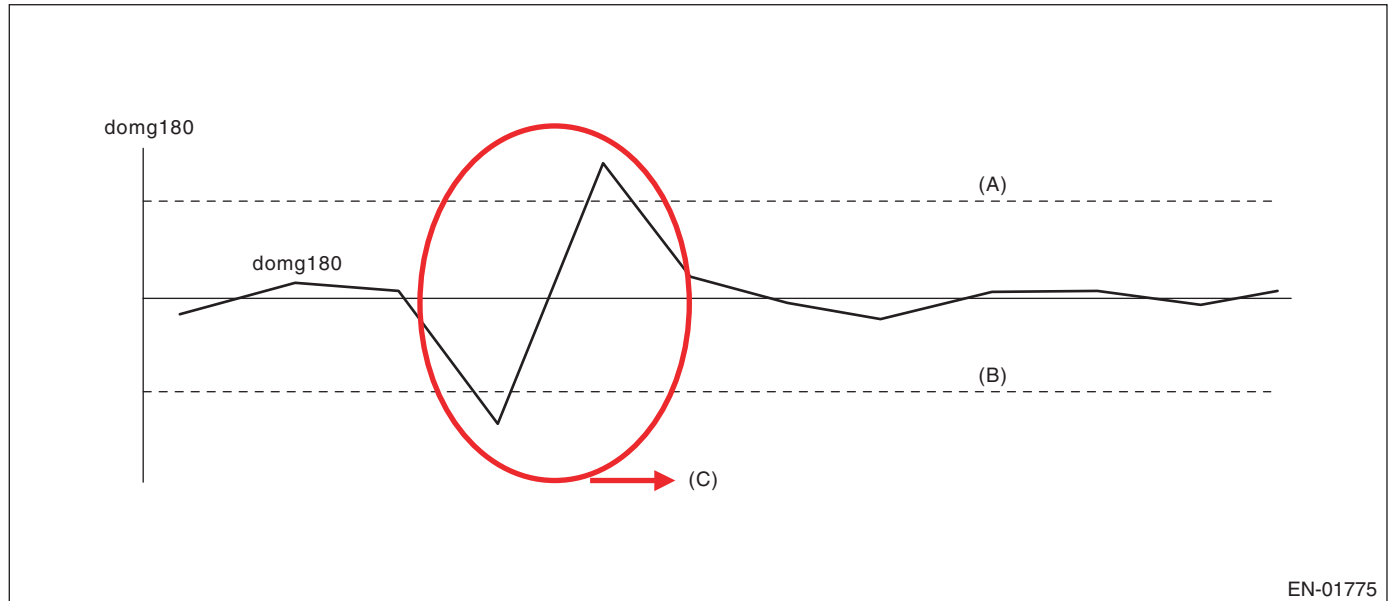
(B) Crankshaft position speed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

180° Interval Difference Method

Diagnostic value	$\text{domg } 180 = (\text{omg } 1 - \text{omg } 0) - (\text{omg } 7 - \text{omg } 1)/6$
Judge as a misfire in the following cases.	
• $\text{domg } 180 > \text{judgment value of positive side}$ • $\text{domg } 180 \leq \text{judgment value of negative side}$	
(Judgment value before 180° CA)	

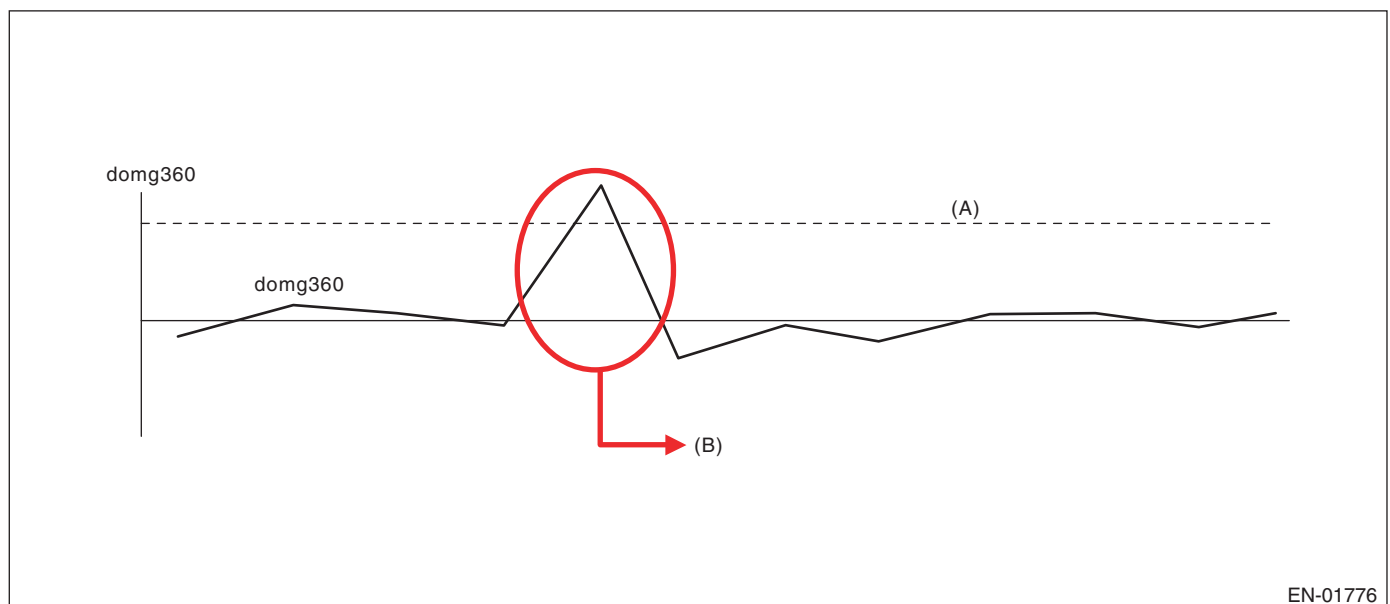


EN-01775

- (A) Threshold value (judgment value of the positive side) (B) Threshold value (judgment value of the negative side) (C) Judged as a misfire

360° Interval Difference Method

Diagnostic value	$\text{domg } 360 = (\text{omg } 1 - \text{omg } 0) - (\text{omg } 4 - \text{omg } 3)$
Misfire judgment	$\text{domg } 360 > \text{Judgment value} \rightarrow \text{Judge as misfire}$



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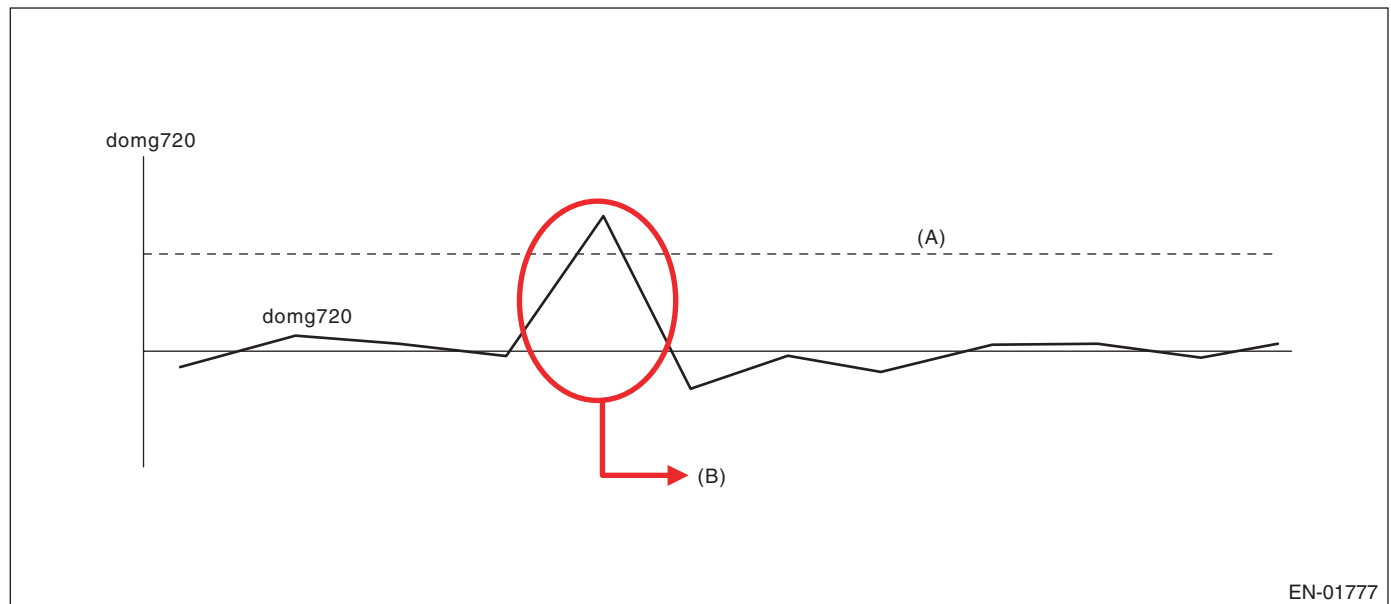
- (A) Threshold value (B) Judged as a misfire

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

720° Interval Difference Method

Diagnostic value	$\text{domg } 720 = (\text{omg } 1 - \text{omg } 0) - (\text{omg } 7 - \text{omg } 6)$
Misfire judgment	$\text{domg } 720 > \text{Judgment value} \rightarrow \text{Judge as misfire}$



(A) Threshold value

(B) Judged as a misfire

FTP 1.5 times misfire (Misfire occurrence level which influences exhaust gas)

Judgment Value (Judge that malfunction occurs when the misfire ratio is high in 1000 engine revs.)

Malfunction Criteria	Threshold Value
FTP emission FTP emission value	> 1.0% in 1000 engine revs.

Time Needed for Diagnosis: 1000 revs.

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Catalyst damage misfire (Misfire occurrence level damaging catalyst)

Judgment Value (Judge that malfunction occurs when the misfire ratio is high in 200 engine revs. (400 ignitions))

Malfunction Criteria	Threshold Value
Catalyst damage misfire judgment value	See Map 1

Map 1 Fault criteria threshold for misfire which would result in catalyst damage

		AIR INTAKE (g/rev.)									
		0.2	0.4	0.6	0.8	1.0	1.2	1.4	1.6	1.8	2.0
ENGINE SPEED (rpm)	1000	37.0	32.0	28.5	26.0	23.0	21.3	21.3	-	-	-
	1500	35.0	29.5	25.5	22.5	21.3	21.3	21.3	18.0	-	-
	2000	32.0	22.5	22.5	18.3	14.5	10.8	10.0	9.0	8.0	5.0
	2500	29.0	21.8	14.3	11.3	9.8	9.0	8.5	8.0	7.5	5.0
	3000	27.0	21.8	14.5	9.8	9.0	9.0	8.0	7.5	7.0	5.0
	3500	24.5	18.5	10.8	6.8	5.8	5.5	5.0	5.0	5.0	5.0
	4000	-	15.3	10.0	6.8	5.5	5.0	5.0	5.0	5.0	5.0
	4500	-	13.8	8.5	6.3	5.0	5.0	5.0	5.0	5.0	-
	5000	-	13.8	8.5	5.8	5.0	5.0	5.0	5.0	5.0	-
	5500	-	13.5	8.3	5.5	5.0	5.0	5.0	5.0	5.0	-
	6000	-	13.0	8.0	5.3	5.0	5.0	5.0	5.0	5.0	-
	6500	-	12.5	7.5	5.0	5.0	5.0	5.0	5.0	-	-
	6700	-	12.3	7.3	5.0	5.0	5.0	5.0	5.0	-	-

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These figures indicate the misfire rate (%) in 400 ignitions; for example, 22.5 (%) means 400 (ignition) × 22.5 (%) = 90 (ignition) misfires. This value or more is judged as a misfire.

Time Needed for Diagnosis: 200 revs.

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When a similar driving cycle is established 3 times in a row
- When "Clear Memory" is performed

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

AT:DTC P0302 CYLINDER 2 MISFIRE DETECTED

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P0301. <Ref. to GD(H4DOTC)-101, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

AU:DTC P0303 CYLINDER 3 MISFIRE DETECTED

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P0301. <Ref. to GD(H4DOTC)-101, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

AV:DTC P0304 CYLINDER 4 MISFIRE DETECTED

1. OUTLINE OF DIAGNOSIS

NOTE:

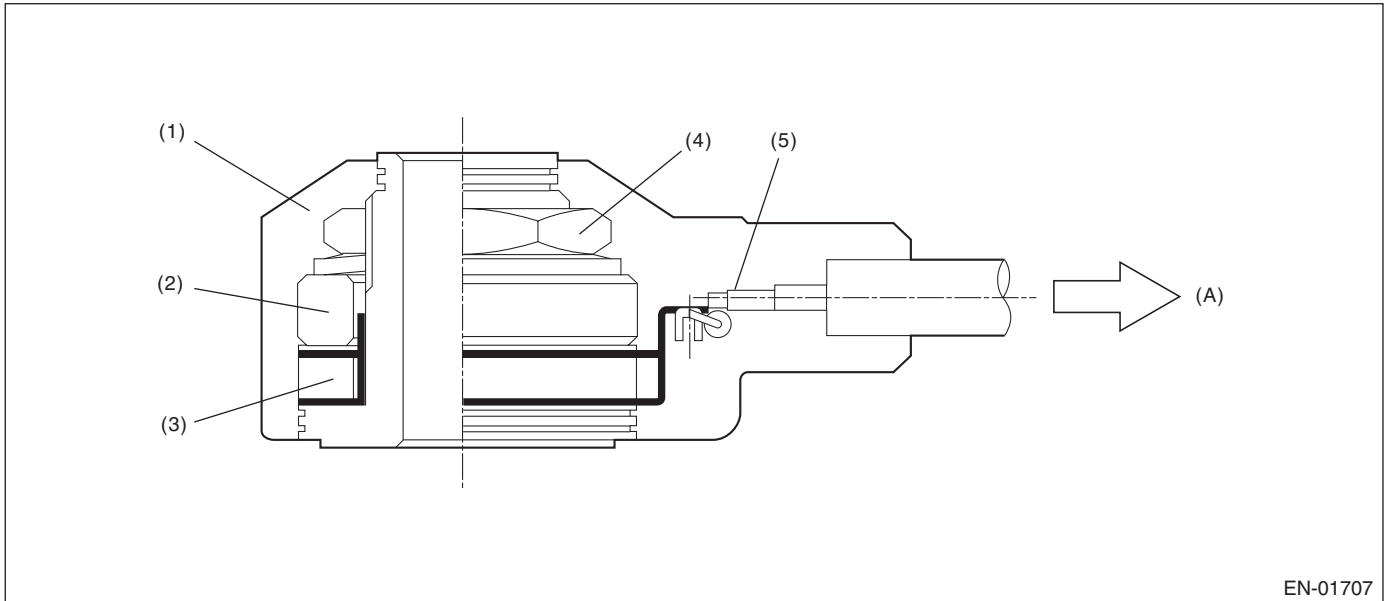
For the detection standard, refer to DTC P0301. <Ref. to GD(H4DOTC)-101, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

AW:DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW (BANK 1 OR SINGLE SENSOR)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of knock sensor.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



(A) To knock sensor harness

(1) Case

(2) Weight

(3) Piezoelectric element

(4) Nut

(5) Resistance

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 1 second or more.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.238 V
Ignition switch	ON

Time Needed for Diagnosis: 1 second

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 0.238 V
Ignition switch	ON

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

Knock compensation:

- Knock compensation final advance/delay angle value = knock compensation value + whole learning compensation value + portional learning compensation value
- When normal: Knock compensation value = Fixed at 0°C.A.
- Failure: Knock compensation value = -5°C.A. (5°C.A retard)
- Whole learning compensation coefficient update not allowed.
- Portional learning zone compensation value calculation not allowed.

9. ECM OPERATION AT DTC SETTING

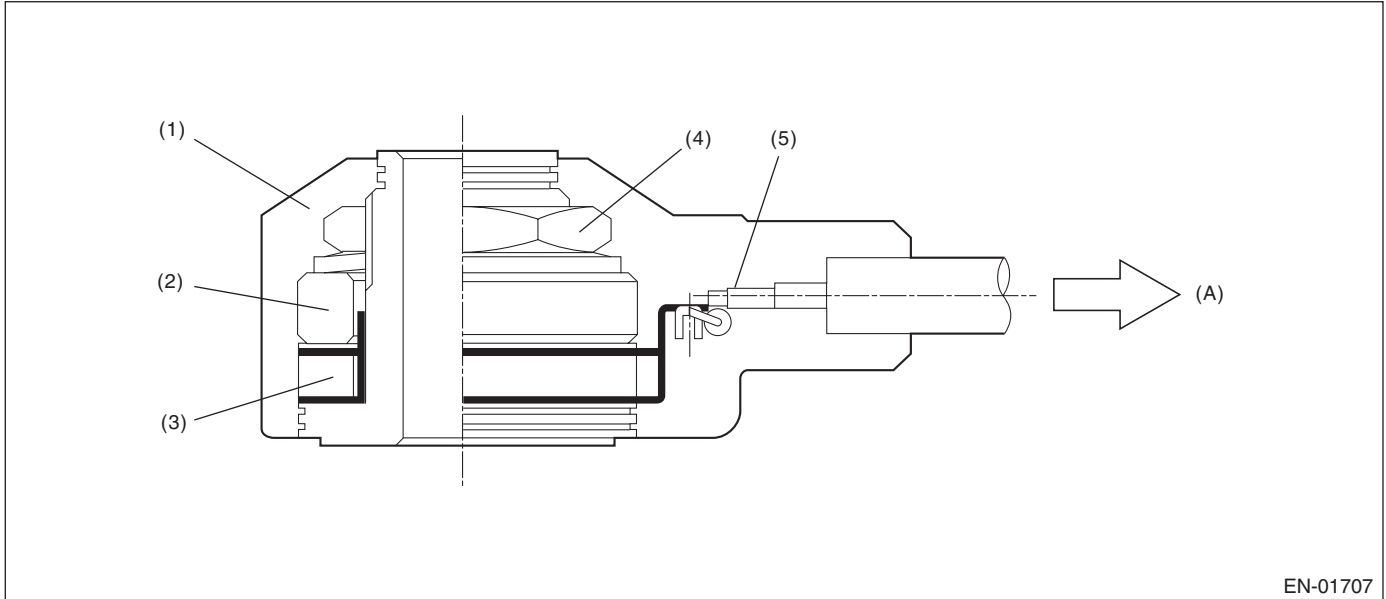
Memorize the freeze frame data. (For test mode \$02)

AX:DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH (BANK 1 OR SINGLE SENSOR)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of knock sensor.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



(A) To knock sensor harness

(1) Case

(2) Weight

(3) Piezoelectric element

(4) Nut

(5) Resistance

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 1 second or more.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.714 V
Ignition switch	ON

Time Needed for Diagnosis: 1 second

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 4.714 V
Ignition switch	ON

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

Knock compensation:

- Knock compensation final advance/delay angle value = knock compensation value + whole learning compensation value + portional learning compensation value
- When normal: Knock compensation value = Fixed at 0°C.A.
- Failure: Knock compensation value = -5°C.A. (5°C.A retard)
- Whole learning compensation coefficient update not allowed.
- Portional learning zone compensation value calculation not allowed.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

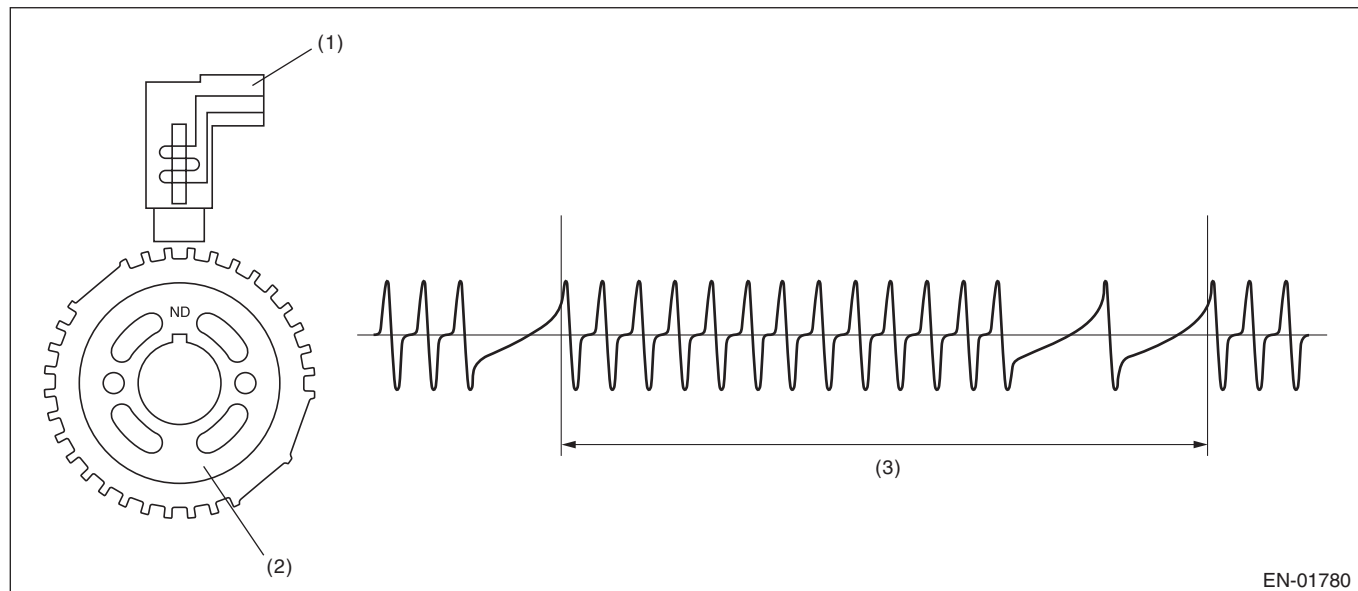
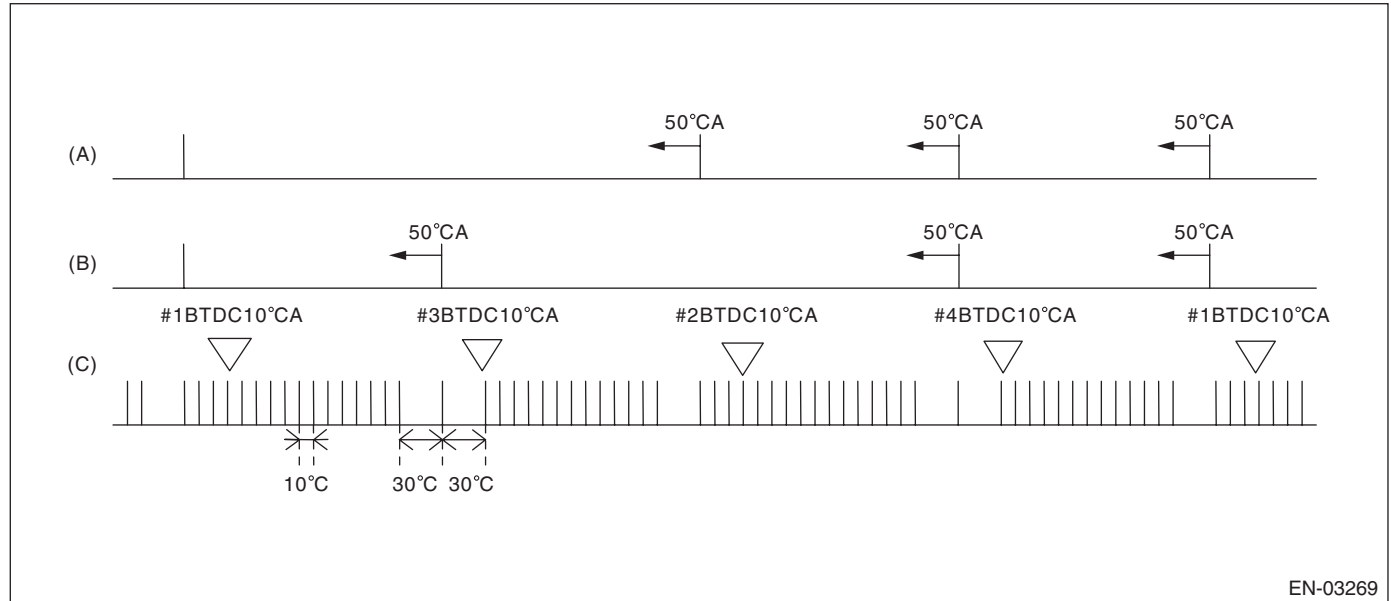
AY:DTC P0335 CRANKSHAFT POSITION SENSOR “A” CIRCUIT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the crankshaft position sensor.

Judge as NG when the crank signal is not input even though the starter was rotated.

2. COMPONENT DESCRIPTION



3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG if the duration of time while the following criteria are all met is 3 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Starter switch	ON
Crankshaft position sensor signal	Not detected
Battery voltage	$\geq 8 \text{ V}$

Time Needed for Diagnosis: 3 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK if the duration of time while the following criteria are all met is 3 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Crankshaft position sensor signal	Input exists
Battery voltage	$\geq 8 \text{ V}$

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

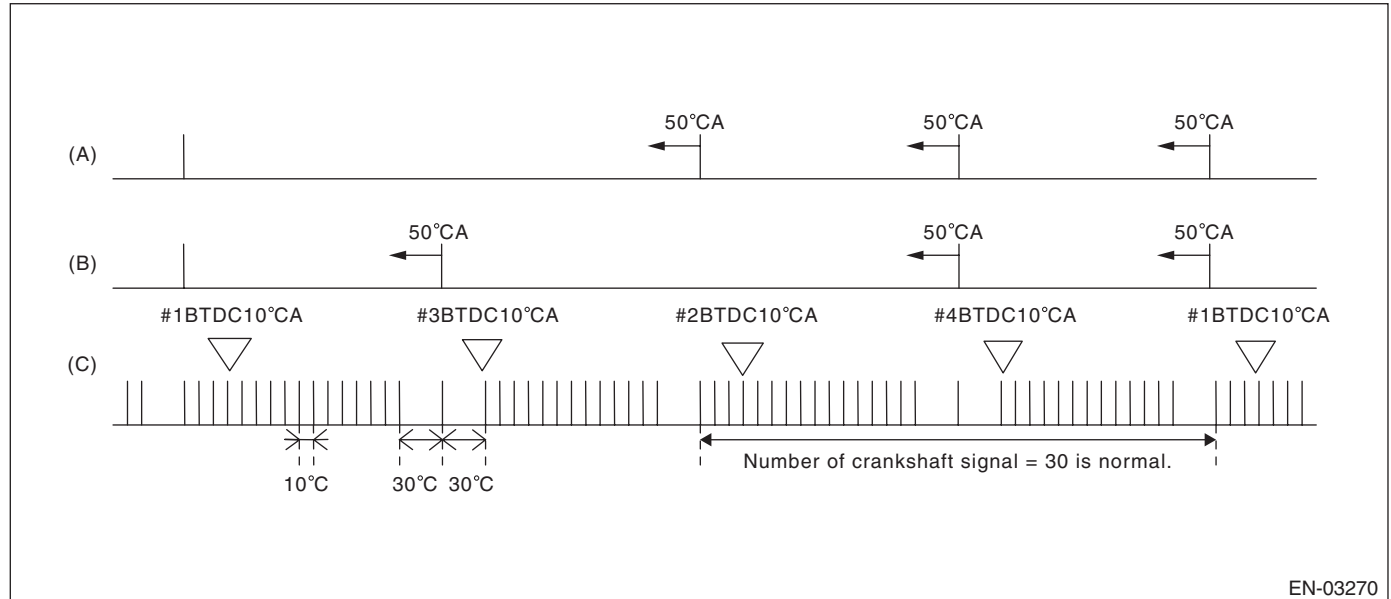
AZ:DTC P0336 CRANKSHAFT POSITION SENSOR “A” CIRCUIT RANGE/ PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect for faults in crankshaft position sensor output properties.

Judge as NG when there is a problem in the number of crankshaft signals for every revolution.

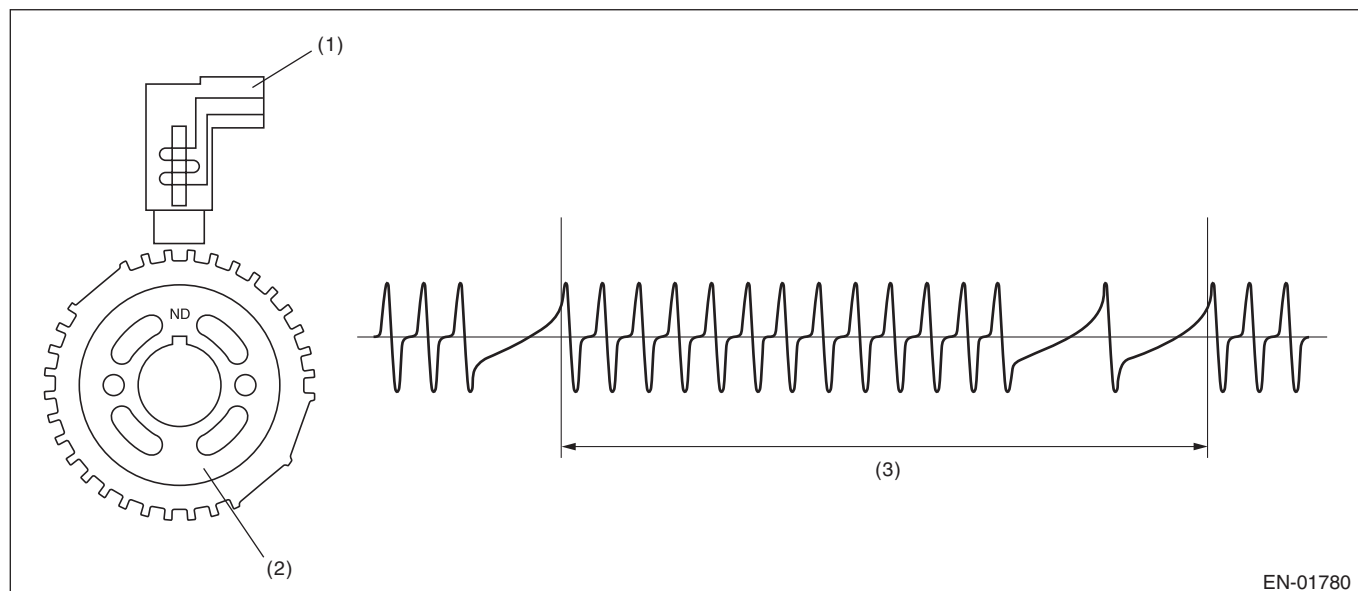
2. COMPONENT DESCRIPTION



(A) Camshaft signal (RH)

(B) Camshaft signal (LH)

(C) Crankshaft signal



(1) Crankshaft position sensor

(2) Crank sprocket

(3) Crankshaft half-turn

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 8 \text{ V}$
Engine speed	$< 3000 \text{ rpm}$

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously under 3000 rpm engine speed.

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when all the malfunction criteria below are completed more than 10 times in a row.

Judgment Value

Malfunction Criteria	Threshold Value
Cylinder number identification	Completed
Number of crankshaft position sensor signal during 1 rev.	Not = 30

Time Needed for Diagnosis: 10 engine revs.

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK and clear the NG when all the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Cylinder number distinction	Completed
Number of crankshaft position sensor signal during 1 rev.	= 30

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

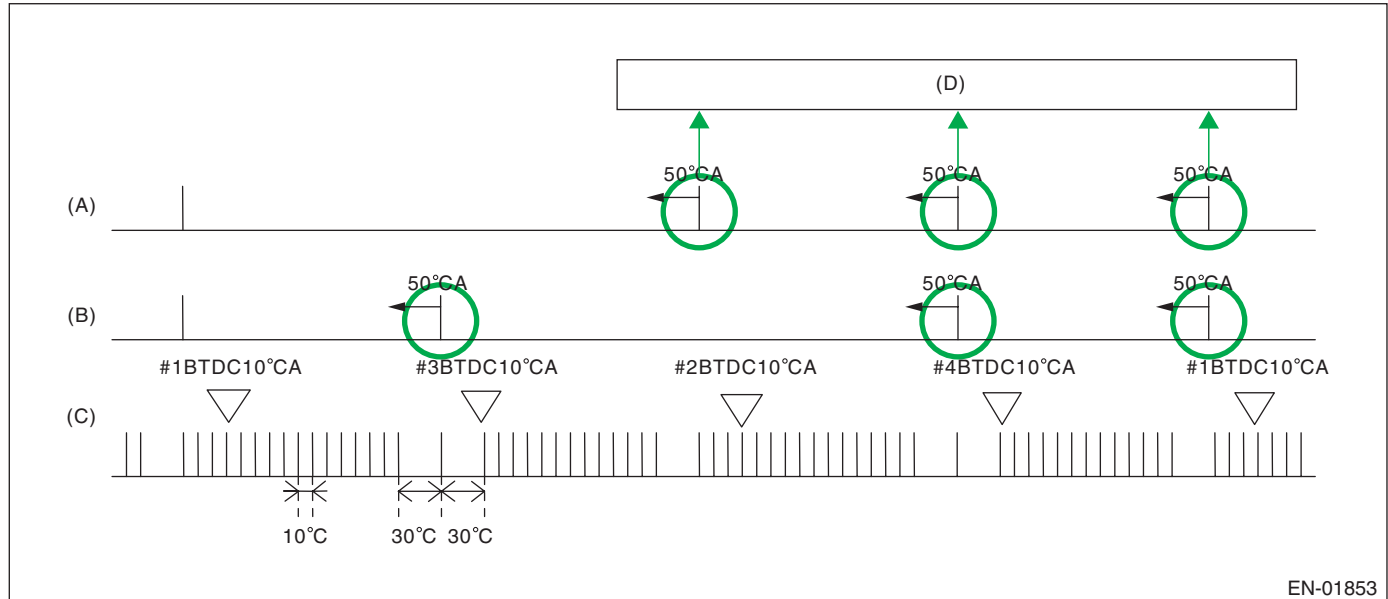
BA:DTC P0340 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the camshaft position sensor.

Judge as NG when the number of camshaft signals remains abnormal.

2. COMPONENT DESCRIPTION



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(A) Camshaft signal (RH)

(C) Crankshaft signal

(D) Number of camshaft position signals = When normal, there will be 3 cam signals for every 2 engine revolutions.

(B) Camshaft signal (LH)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Voltage	$\geq 8 \text{ V}$

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

When normal, there should be 3 cam signals per 2 engine revolutions. If a condition where it is not 3 times continues, It is judged as NG.

When the engine speed is over 100 rpm, if the following conditions are established it is judged as NG. Judge as OK and clear the NG when the following criteria are not established.

Judgment Value

Malfunction Criteria	Threshold Value
Number of camshaft sensor signals during 2 revs.	Not = 3
Engine speed	≥ 600 rpm

Time Needed for Diagnosis: 100 revs.

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when the following criteria are established.

Judgment Value

Malfunction Criteria	Threshold Value
Number of camshaft angle sensor signals during 2 revs.	3

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

- Ignition timing whole learning compensation:
 - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when IG OFF, and then make the whole learning incomplete.
 - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when making a normality judgment from abnormality judgment, and then make the whole learning incomplete.
- Ignition timing partial learning compensation:
 - Enter the initial value (0°CA) to the compensation value of partial learning zone with IG OFF.
 - Enter the initial value (0°CA) to the compensation value of the partial learning zone when making a normality judgment → abnormality judgment.
- AVCS control:
 - Maximum timing retard learning is not complete or maximum timing retard learning completion is not experienced.
 - ⇒ ISC feedback compensation: Do not perform the AVCS actual timing advance compensation.
 - Make the OCV driving Duty to be the given value (9.36%).

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

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

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P0340. <Ref. to GD(H4DOTC)-115, DTC P0340 CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

BC:DTC P0410 SECONDARY AIR INJECTION SYSTEM**1. OUTLINE OF DIAGNOSIS**

Detect NG judging from secondary air delivery pipe pressure, pulse of secondary air delivery pipe pressure and secondary air pipe airflow amount.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Estimate ambient temperature	4.4°C (39.92°F)
Battery voltage	7 V
Atmosphere pressure	563 mmHg
Engine	In operation
Pump supply pressure check	
Amount of intake air	≥ 2 g (0.07 oz)/second
Secondary air pump	Operating
Combination valve	One bank open (Except with both banks closed)
Combination valve either one closed pulse diagnosis	
Diagnosis enabled range	≥ 1 (Refer to Map 10)
After fuel cut	≥ 500 milliseconds
Combination valve both closed pulse diagnosis	
Engine load	≥ 0.2 g (0.007 oz)/rev
After fuel cut	≥ 500 milliseconds
Combination valve changeover pressure diagnosis	
Amount of intake air	≥ 2 g (0.07 oz)/second and ≤ 20 g (0.7 oz)/second
Engine speed	< 4000 rpm
After fuel cut	≥ 500 milliseconds

3. GENERAL DRIVING CYCLE

Perform diagnosis while secondary pump is operating

4. DIAGNOSTIC METHOD

Measure secondary air delivery pipe pressure, pulse of secondary air delivery pipe pressure and secondary air pipe airflow amount.

Pump supply pressure check

Perform the system function diagnosis with how much the pressure rises when the secondary air pump is turned from OFF to ON.

Combination valve either one closed pulse diagnosis

Perform open stuck diagnosis of LH combination valve using delivery pipe pressure pulse when RH combination valve is closed.

Perform open stuck diagnosis of RH combination valve using delivery pipe pressure pulse when LH combination valve is closed.

Combination valve both closed pulse diagnosis

Perform open stuck diagnosis of both combination valves using delivery pipe pressure pulse when both combination valves are closed. Determine which side of valves is stuck open by comparing secondary air flow amount when RH combination valve is closed with that when LH combination valve is closed.

Combination valve changeover pressure diagnosis

Perform the RH combination valve stuck closed diagnosis with the variation of delivery pipe pressure when the RH combination valve turns closed → open.

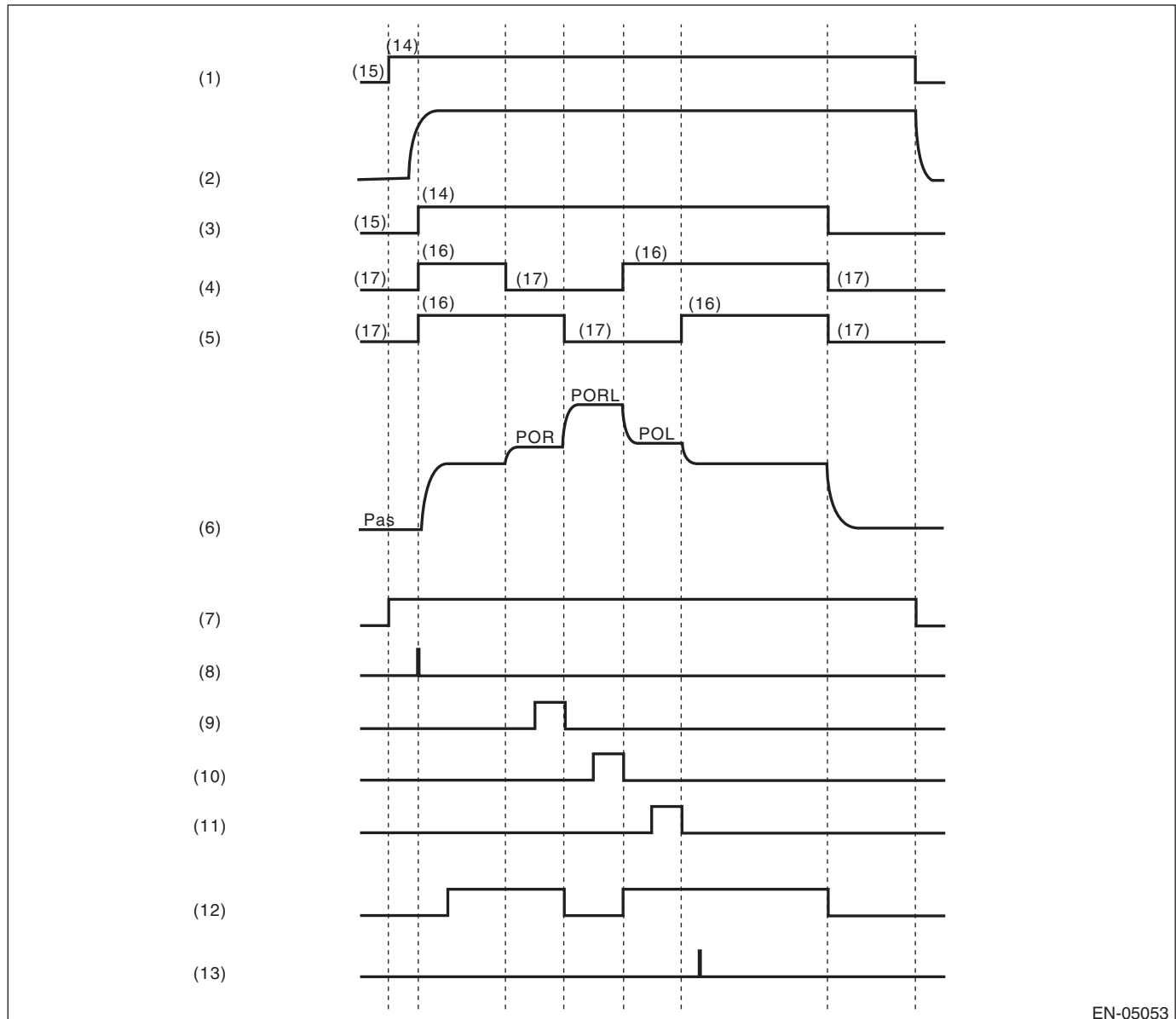
Perform the LH combination valve stuck closed diagnosis with the variation of delivery pipe pressure when the LH combination valve turns open → closed.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Overflow diagnosis

Perform secondary air system flow abnormality diagnosis using both sides of combination valves secondary air amount when both are closed.



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- | | | |
|--|---|--|
| (1) IG | (8) Atmospheric pressure before secondary air control (Pas) measurement | (12) Pump supply pressure check (judgment) |
| (2) Ne | | |
| (3) Secondary air pump drive condition | (9) Right bank all closed pressure (POR) measurement | (13) Flow amount check (judgment) |
| (4) E-COMB valve (Right) condition | (10) Both banks all closed pressure (PORL) measurement | (14) ON |
| (5) E-COMB valve (Left) condition | (11) Left bank all closed pressure (POL) measurement | (15) OFF |
| (6) Secondary air supply piping pressure (psi) | | (16) Open |
| (7) Diagnosis execution conditions | | (17) Close |

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Judgment Value

Pump supply pressure check

Judge as NG if delivery pipe pressure does not rise though it should when the secondary air pump turns OFF → ON.

Judge as NG when the following conditions are met. On the other hand, judge as OK and clear the NG when not.

Malfunction Criteria	Threshold Value	DTC
Secondary air supply pipe pressure (after barometric pressure compensation)	< 1 kPa (7 mmHg, 0.3 inHg)	P0410

Combination valve either one closed pulse diagnosis

Calculate the voltage pulses of pump delivery pipe pressure when RH combination valve is closed and LH combination valve is open. The calculation should be large because there are pulses in the delivery pipe with LH combination valve open. if it is small, judge that LH combination valve is closed stuck.

Judge as NG when the following conditions are met. On the other hand, judge as OK and clear the NG when not.

Malfunction Criteria	Threshold Value	DTC
Pulse calculation value with RH combination valve closed	< Value of Map 1	P2443

Calculate the voltage pulses of pump delivery pipe pressure when LH combination valve is closed and RH combination valve is open. The calculation should be large because there are pulses in the delivery pipe with RH combination valve open. if it is small, judge that RH combination valve is closed stuck.

Judge as NG when the following conditions are met. On the other hand, judge as OK and clear the NG when not.

Malfunction Criteria	Threshold Value	DTC
Pulse calculation value with LH combination valve closed	< Value of Map 2	P2441

Combination valve both closed pulse diagnosis

Calculate voltage pulse of the pump supply pipe pressure when both combination valves are closed. The calculation should be small because there is no pulse from supply pipe pressure with both combination valves closed. When the calculation is large, determine that either of the combination valves is stuck open.

Determine which side of valves is stuck open by comparing secondary air flow amount when the RH combination valve is closed with that when the LH combination valve is closed. Air flow amount is larger on the open stuck valve.

Judge as NG when the following conditions are met. On the other hand, judge as OK and clear the NG when not.

Malfunction Criteria	Threshold Value	DTC
Pulse calculation value when both combination valves are closed	> Value of Map 3	P2440
Air flow amount when the right bank is closed (Value from Map 4)	≥ Air flow amount when the left bank is closed (Value from Map 5)	
Pulse calculation value when both combination valves are closed	> Value of Map 3	P2442
Air flow amount when the left bank is closed (Value from Map 5)	> Air flow amount when the right bank is closed (Value from Map 4)	

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Combination valve changeover pressure diagnosis

Delivery pipe pressure should vary when the LH combination valve turns open → closed. When the variation is small, determine that the LH combination valve is stuck closed.

Judge as NG when the following conditions are met. On the other hand, judge as OK and clear the NG when not.

Malfunction Criteria	Threshold Value	DTC
Pressure variation value when the LH combination valve is switched	< Value of Map 6	P2443

Delivery pipe pressure should vary when the RH combination valve turns closed → open. When the variation is small, determine that the RH combination valve is stuck closed.

Judge as NG when the following conditions are met. On the other hand, judge as OK and clear the NG when not.

Malfunction Criteria	Threshold Value	DTC
Pressure variation value when the RH combination valve is switched	< Value of Map 7	P2441

Overflow diagnosis

Judge as secondary air system flow abnormality either if there is excessive secondary air flow amount with the RH combination valve closed, or if there is excessive secondary air flow amount with the LH combination valve closed.

Malfunction Criteria	Threshold Value	DTC
Air flow amount when the right bank is closed (Value from Map 4) or Air flow amount when the left bank is closed (Value from Map 5)	> Value of Map 8 > Value of Map 9	P0411
Voltage at the time of PORL measurement – Voltage at the time of POR measurement	≤ 4 V	
Voltage at the time of PORL measurement – Voltage at the time of POL measurement	≤ 4 V	

PORL: Both banks all closed pressure

POR: Right bank all closed pressure

POL: Left bank all closed pressure

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Map 1

Engine speed (rpm) Amount of intake air (g (oz)/s)	1000	1500	2000	2100	4000
15 (0.53)	2	2	2	1.04	1.04
20 (0.71)	2	2	2	1.04	1.04
25 (0.88)	2	2	2	1.04	1.04
30 (1.06)	1.04	2	1.6	1.04	1.04
35 (1.23)	1.04	1.8	1.3	1.04	1.04
(V)					

Map 2

Engine speed (rpm) Amount of intake air (g (oz)/s)	1000	1500	2000	2100	4000
15 (0.53)	2	2	2	1.04	1.04
20 (0.71)	2	2	2	1.04	1.04
25 (0.88)	2	2	2	1.04	1.04
30 (1.06)	1.04	1.04	1.04	1.04	1.04
35 (1.23)	1.04	1.04	1.04	1.04	1.04
(V)					

Map 3

Intake air (g (oz)/rev)	0.1 (0.004)	0.3 (0.011)	0.35 (0.012)	1 (0.04)
Threshold value (V)	12	12	4	4

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Map 4

Secondary air pressure in the pipe when both comb. valve is closing kPa (mmHg, inHg) Secondary air pressure in the pipe when LH comb. valve is closing kPa (mmHg, inHg)	69.3 (520, 20.47)	74.7 (560, 22.06)	80.0 (600, 23.63)	85.3 (640, 25.19)	90.7 (680, 26.79)	96.0 (720, 28.35)	101.3 (760, 29.92)	106.7 (800, 31.51)	112.0 (840, 33.08)	117.3 (880, 34.64)	122.7 (920, 36.24)	128.0 (960, 37.80)	133.3 (1000, 39.37)	138.7 (1040, 40.96)	144.0 (1080, 42.53)	149.3 (1120, 44.09)
69.3 (520, 20.47)	0	200	400	600	800	1000	1200	1400	1600	1800	2000	2200	2400	2400	2400	2400
74.7 (560, 22.06)	-200	0	200	400	600	800	1000	1200	1400	1600	1800	2000	2200	2400	2400	2400
80.0 (600, 23.63)	-400	-200	0	200	400	600	800	1000	1200	1400	1600	1800	2000	2200	2400	2400
85.3 (640, 25.19)	-600	-400	-200	0	200	400	600	800	1000	1200	1400	1600	1800	2000	2200	2400
90.7 (680, 26.79)	-800	-600	-400	-200	0	200	400	600	800	1000	1200	1400	1600	1800	2000	2200
96.0 (720, 28.35)	-1000	-800	-600	-400	-200	0	200	400	600	800	1000	1200	1400	1600	1800	2000
101.3 (760, 29.92)	-1200	-1000	-800	-600	-400	-200	0	200	400	600	800	1000	1200	1400	1600	1800
106.7 (800, 31.51)	-1400	-1200	-1000	-800	-600	-400	-200	0	200	400	600	800	1000	1200	1400	1600
112.0 (840, 33.08)	-1600	-1400	-1200	-1000	-800	-600	-400	-200	0	200	400	600	800	1000	1200	1400
117.3 (880, 34.64)	-1800	-1600	-1400	-1200	-1000	-800	-600	-400	-200	0	200	400	600	800	1000	1200
122.7 (920, 36.24)	-2000	-1800	-1600	-1400	-1200	-1000	-800	-600	-400	-200	0	200	400	600	800	1000
128.0 (960, 37.80)	-2200	-2000	-1800	-1600	-1400	-1200	-1000	-800	-600	-400	-200	0	200	400	600	800
133.3 (1000, 39.37)	-2400	-2200	-2000	-1800	-1600	-1400	-1200	-1000	-800	-600	-400	-200	0	200	400	600
138.7 (1040, 40.96)	-2400	-2400	-2200	-2000	-1800	-1600	-1400	-1200	-1000	-800	-600	-400	-200	0	200	400
144.0 (1080, 42.53)	-2400	-2400	-2400	-2200	-2000	-1800	-1600	-1400	-1200	-1000	-800	-600	-400	-200	0	200
149.3 (1120, 44.09)	-2400	-2400	-2400	-2400	-2200	-2000	-1800	-1600	-1400	-1200	-1000	-800	-600	-400	-200	0
(L/min)																

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Map 5

Secondary air pressure in the pipe when both comb. valve is closing kPa (mmHg, inHg) Secondary air pressure in the pipe when RH comb. valve is closing kPa (mmHg, inHg)	69.3 (520, 20.47)	74.7 (560, 22.06)	80.0 (600, 23.63)	85.3 (640, 25.19)	90.7 (680, 26.79)	96.0 (720, 28.35)	101.3 (760, 29.92)	106.7 (800, 31.51)	112.0 (840, 33.08)	117.3 (880, 34.64)	122.7 (920, 36.24)	128.0 (960, 37.80)	133.3 (1000, 39.37)	138.7 (1040, 40.96)	144.0 (1080, 42.53)	149.3 (1120, 44.09)
69.3 (520, 20.47)	0	200	400	600	800	1000	1200	1400	1600	1800	2000	2200	2400	2400	2400	2400
74.7 (560, 22.06)	-200	0	200	400	600	800	1000	1200	1400	1600	1800	2000	2200	2400	2400	2400
80.0 (600, 23.63)	-400	-200	0	200	400	600	800	1000	1200	1400	1600	1800	2000	2200	2400	2400
85.3 (640, 25.19)	-600	-400	-200	0	200	400	600	800	1000	1200	1400	1600	1800	2000	2200	2400
90.7 (680, 26.79)	-800	-600	-400	-200	0	200	400	600	800	1000	1200	1400	1600	1800	2000	2200
96.0 (720, 28.35)	-1000	-800	-600	-400	-200	0	200	400	600	800	1000	1200	1400	1600	1800	2000
101.3 (760, 29.92)	-1200	-1000	-800	-600	-400	-200	0	200	400	600	800	1000	1200	1400	1600	1800
106.7 (800, 31.51)	-1400	-1200	-1000	-800	-600	-400	-200	0	200	400	600	800	1000	1200	1400	1600
112.0 (840, 33.08)	-1600	-1400	-1200	-1000	-800	-600	-400	-200	0	200	400	600	800	1000	1200	1400
117.3 (880, 34.64)	-1800	-1600	-1400	-1200	-1000	-800	-600	-400	-200	0	200	400	600	800	1000	1200
122.7 (920, 36.24)	-2000	-1800	-1600	-1400	-1200	-1000	-800	-600	-400	-200	0	200	400	600	800	1000
128.0 (960, 37.80)	-2200	-2000	-1800	-1600	-1400	-1200	-1000	-800	-600	-400	-200	0	200	400	600	800
133.3 (1000, 39.37)	-2400	-2200	-2000	-1800	-1600	-1400	-1200	-1000	-800	-600	-400	-200	0	200	400	600
138.7 (1040, 40.96)	-2400	-2400	-2200	-2000	-1800	-1600	-1400	-1200	-1000	-800	-600	-400	-200	0	200	400
144.0 (1080, 42.53)	-2400	-2400	-2400	-2200	-2000	-1800	-1600	-1400	-1200	-1000	-800	-600	-400	-200	0	200
149.3 (1120, 44.09)	-2400	-2400	-2400	-2400	-2200	-2000	-1800	-1600	-1400	-1200	-1000	-800	-600	-400	-200	0
(L/min)																

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Map 6

Amount of intake air when LH comb. valve switches (g (oz)/s) Battery voltage when LH comb. valve switches (V)	10 (0.35)	12.5 (0.441)	15 (0.53)	17.5 (0.617)	20 (0.71)
11	0.05	0.05	0.04	0.03	0.03
12	0.05	0.05	0.05	0.05	0.04
13	0.05	0.05	0.05	0.05	0.05
14	0.05	0.05	0.05	0.05	0.05
(V)					

Map 7

Amount of intake air when RH comb. valve switches (g (oz)/s) Battery voltage when RH comb. valve switches (V)	10 (0.35)	12.5 (0.441)	15 (0.53)	17.5 (0.617)	20 (0.71)
11	0.05	0.05	0.04	0.03	0.03
12	0.05	0.05	0.05	0.05	0.04
13	0.05	0.05	0.05	0.05	0.05
14	0.05	0.05	0.05	0.05	0.05
(V)					

Map 8

Amount of intake air when POR is measuring (g (oz)/s) Battery voltage when POR measuring (V)	2 (0.07)	4 (0.14)	6 (0.21)	8 (0.28)	10 (0.35)	12 (0.42)	14 (0.49)	16 (0.56)	18 (0.63)
10.5	290	290	290	290	290	290	290	290	290
11.5	330	330	330	330	330	330	330	330	330
12.5	370	370	370	370	370	370	370	370	370
13.5	420	420	420	420	420	420	420	420	420
14.5	470	470	470	470	470	470	470	470	470
15.5	520	520	520	520	520	520	520	520	520
(L/min)									

Map 9

Amount of intake air when POL is measuring (g (oz)/s) Battery voltage when POL measuring (V)	2 (0.07)	4 (0.14)	6 (0.21)	8 (0.28)	10 (0.35)	12 (0.42)	14 (0.49)	16 (0.56)	18 (0.63)
10.5	290	290	290	290	290	290	290	290	290
11.5	330	330	330	330	330	330	330	330	330
12.5	370	370	370	370	370	370	370	370	370
13.5	420	420	420	420	420	420	420	420	420
14.5	470	470	470	470	470	470	470	470	470
15.5	520	520	520	520	520	520	520	520	520
(L/min)									

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Map 10

Amount of intake air (g (oz)/s) Engine speed (rpm)	10 (0.35)	15 (0.53)	35 (1.23)	50 (1.76)
500	0	1	1	0
1000	0	1	1	0
4000	0	1	1	0
5000	0	0	0	0

Time Needed for Diagnosis: 10 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

BD:DTC P0411 SECONDARY AIR INJECTION SYSTEM INCORRECT FLOW DETECTED

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P0410. <Ref. to GD(H4DOTC)-117, DTC P0410 SECONDARY AIR INJECTION SYSTEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

BE:DTC P0413 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “A” CIRCUIT OPEN

1. OUTLINE OF DIAGNOSIS

Judge as NG when the ECM output level differs from the actual terminal level.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Abnormality Judgment

When the continuous time with following conditions being established exceeds 2.5 seconds, it is judged as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Ignition	ON
Terminal output voltage when ECM outputs OFF signal	Low

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK when the following conditions are established, and clear the NG.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Ignition	ON
Terminal output voltage when ECM outputs OFF signal	High

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

**BF:DTC P0414 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “A”
CIRCUIT SHORTED****1. OUTLINE OF DIAGNOSIS**

Judge as NG when the ECM output level differs from the actual terminal level.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD**Abnormality Judgment**

When the continuous time with following conditions being established exceeds 2.5 seconds, it is judged as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Ignition	ON
Terminal output voltage when ECM outputs ON signal	High

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK when the following conditions are established, and clear the NG.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Ignition	ON
Terminal output voltage when ECM outputs ON signal	Low

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

BG:DTC P0416 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “B” CIRCUIT OPEN

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P0413. <Ref. to GD(H4DOTC)-126, DTC P0413 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “A” CIRCUIT OPEN, Diagnostic Trouble Code (DTC) Detecting Criteria.>

BH:DTC P0417 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “B” CIRCUIT SHORTED

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P0414. <Ref. to GD(H4DOTC)-127, DTC P0414 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “A” CIRCUIT SHORTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

BI: DTC P0418 SECONDARY AIR INJECTION SYSTEM CONTROL “A” CIRCUIT OPEN**1. OUTLINE OF DIAGNOSIS**

Judge as NG when the ECM output level differs from the actual terminal level.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD**Abnormality Judgment**

When the continuous time with following conditions being established exceeds 2.5 seconds, it is judged as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Ignition	ON
Terminal output voltage when ECM outputs OFF signal	Low

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK when the following conditions are established, and clear the NG.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Ignition	ON
Terminal output voltage when ECM outputs OFF signal	High

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

BJ:DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1)

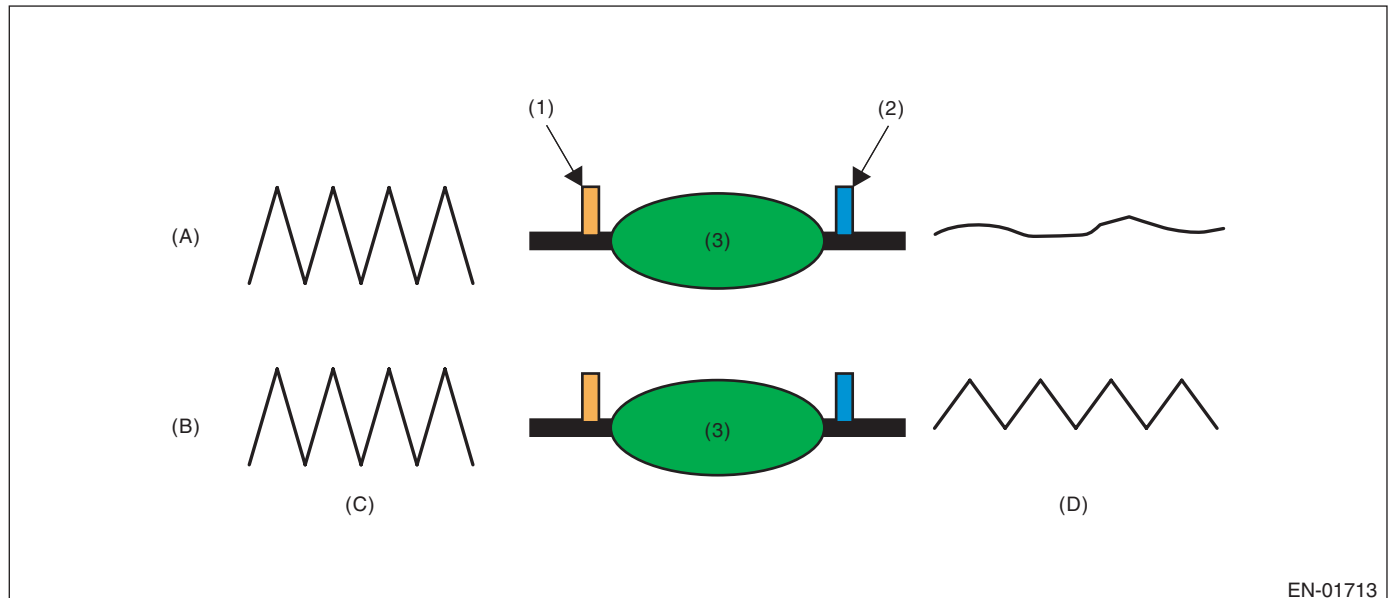
1. OUTLINE OF DIAGNOSIS

Detect the deterioration of the catalyst function.

Though the rear oxygen sensor output would change slowly with a new catalyst, the sensor output with a deteriorated catalyst becomes high and the inversion time is shortened.

For this reason, the catalyst diagnosis is carried out by monitoring the rear oxygen sensor output and comparing it with the front oxygen A/F sensor output.

2. COMPONENT DESCRIPTION



EN-01713

(A) Normal

(B) Deterioration

(C) Output waveform from the front oxygen (A/F) sensor

(D) Output waveform from the rear oxygen sensor

(1) Front oxygen (A/F) sensor

(2) Rear oxygen sensor

(3) Catalytic converter

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
Atmosphere pressure	> 75.0 kPa (563 mmHg, 22.2 inHg)
Engine coolant temperature	≥ 70°C (158°F)
Misfire detection during 200 revs.	< 5 times
Learning value of evaporation gas density	< 0.20
Sub feedback	In operation
Evaporative system diagnosis	Not in operation
Time of difference (< 0.10) between actual and target lambda	1000 milliseconds or more
Vehicle speed	≥ 70 km/h (47 MPH)
Amount of intake air	12 — 40 g/s
Engine load change every 0.5 engine revs.	< 0.02 g/rev
Rear oxygen output change from lower than to higher than 600 mV	Experienced after fuel cut
After engine starting	≥ 235 sec.
Accumulative time of canister purge operation after engine starting	≥ 19.9 sec.
Estimated catalyst layer temperature	≥ 580°C (1076°F)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

4. GENERAL DRIVING CYCLE

Perform the diagnosis only once at a constant vehicle speed of 75 km/h (47 MPH) after warming up.

5. DIAGNOSTIC METHOD

After the execution criteria are established, calculate the output fluctuation value of front oxygen (A/F) sensor and output fluctuation value of rear oxygen sensor. Calculate the diagnosis value when the front oxygen (A/F) sensor output fluctuation value is more than specified value. A/F response properties and diagnosis values are parameters for the judgment value.

Judge as NG when the malfunction criteria below are met. Judge as OK if the criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Accumulated variation of rear oxygen sensor output voltage per 32 milliseconds divided by lambda accumulated variation of the front oxygen (A/F) sensor per 32 milliseconds	≥ 12.6

Time Needed for Diagnosis: 33 — 55 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

BK:DTC P0441 EVAPORATIVE EMISSION SYSTEM INCORRECT PURGE FLOW

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P0442. <Ref. to GD(H4DOTC)-132, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

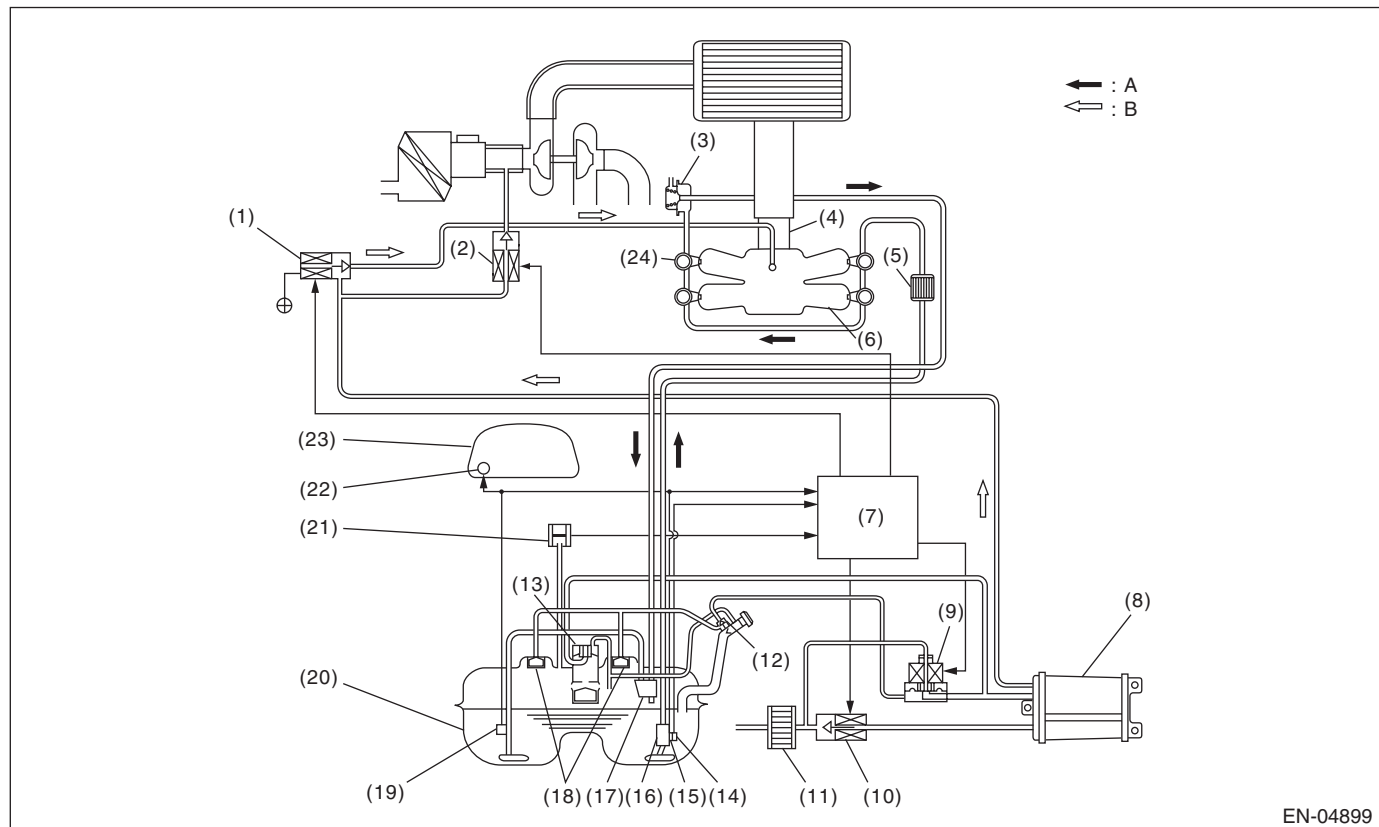
Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

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

1. OUTLINE OF DIAGNOSIS

Check if there is a leakage in fuel system or not, and perform the function diagnosis of valve.



EN-04899

(A) Fuel line

(B) Vaporized fuel line

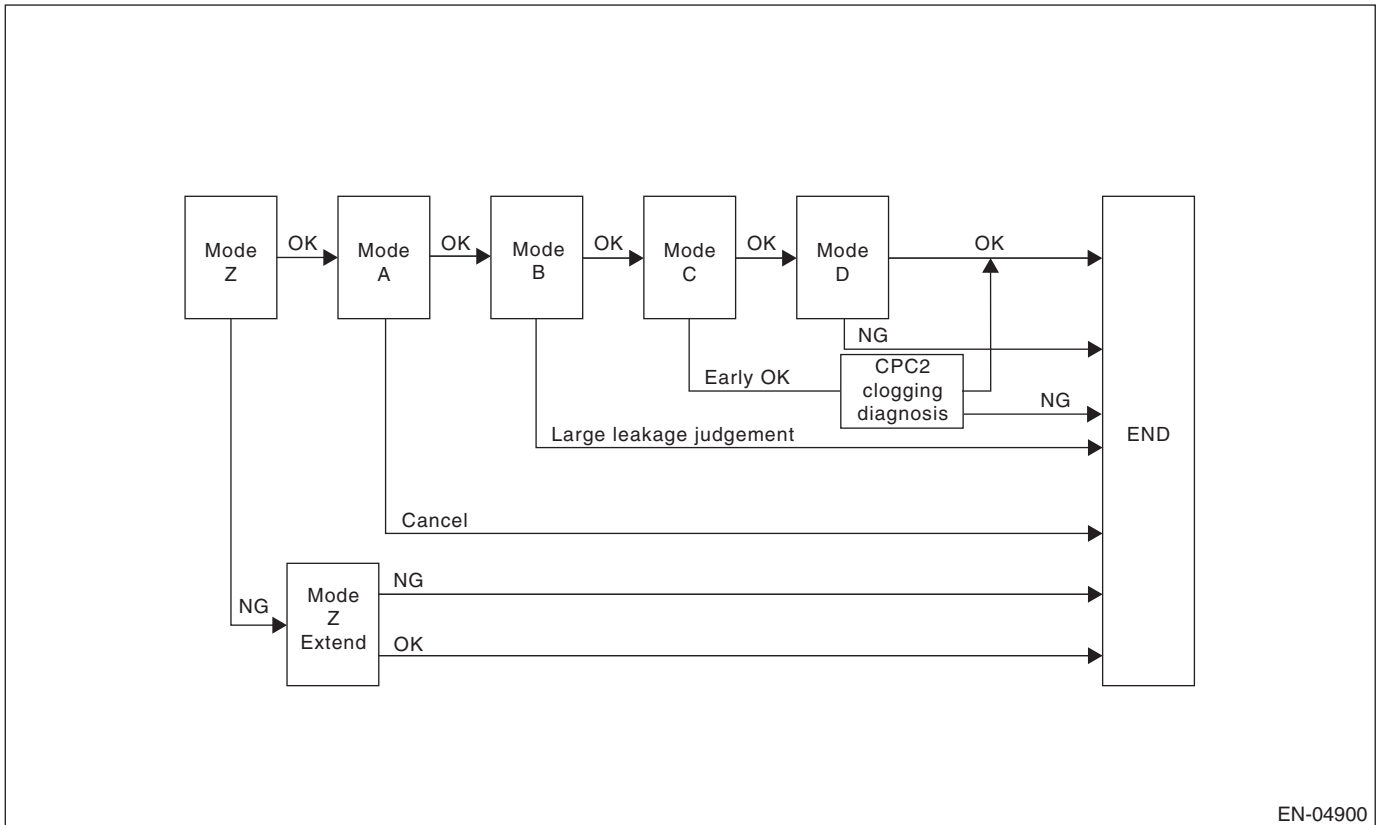
- | | | |
|------------------------------------|-------------------------------------|--------------------------------|
| (1) Purge control solenoid valve | (9) Pressure control solenoid valve | (17) Jet pump |
| (2) Purge control solenoid valve 2 | (10) Drain valve | (18) Fuel cut valve |
| (3) Pressure regulator | (11) Drain filter | (19) Fuel sub level sensor |
| (4) Throttle body | (12) Shut-off valve | (20) Fuel tank |
| (5) Fuel filter | (13) Vent valve | (21) Fuel tank pressure sensor |
| (6) Intake manifold | (14) Fuel temperature sensor | (22) Fuel gauge |
| (7) Engine control module (ECM) | (15) Fuel level sensor | (23) Combination meter |
| (8) Canister | (16) Fuel pump | (24) Fuel injector |

In this system diagnosis, check for leakage and valve function is conducted by changing the fuel tank pressure and monitoring the pressure change using the fuel tank pressure sensor. When in 0.04 inch diagnosis, perform in the order of mode Z → mode A → mode B → mode C and mode D; When in 0.02 inch diagnosis, perform in the order of mode A → mode B → mode C → mode D and mode E.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

0.04-INCH DIAGNOSIS



Mode	Mode Description	Diagnosis Period
Mode Z (Purge control solenoid valve opening failure diagnosis)	Perform purge control solenoid valve opening failure diagnosis from the size of tank pressure variation from diagnosis start.	3 — 16 seconds
Mode A (Estimated evaporation amount)	Calculate the tank pressure change amount (P1).	10 seconds
Mode B (Sealed negative pressure, large leakage judgement)	Decrease the pressure in the tank to the target value by introducing the intake manifold pressure to the fuel tank. If the tank pressure cannot be reduced, it is diagnosed as large leak.	5 — 25 seconds
Mode C (Pressure increase check, advanced OK judgment)	Wait until the tank pressure returns to the target (start level of P2 calculation). If the tank pressure does not become the value, make advanced OK judgment.	1 — 15 seconds
Mode D (Negative pressure variation measurement, evaporation leakage diagnosis)	Calculate the tank pressure variation (P2), and obtain the diagnostic value using P1 found in Mode A. Perform the evaporation diagnosis using the diagnostic value.	10 seconds
Blockage diagnosis of purge control solenoid 2	Depending on the amount of change in tank inner pressure during and after mode C end, perform blockage diagnosis of purge control solenoid 2.	3 seconds

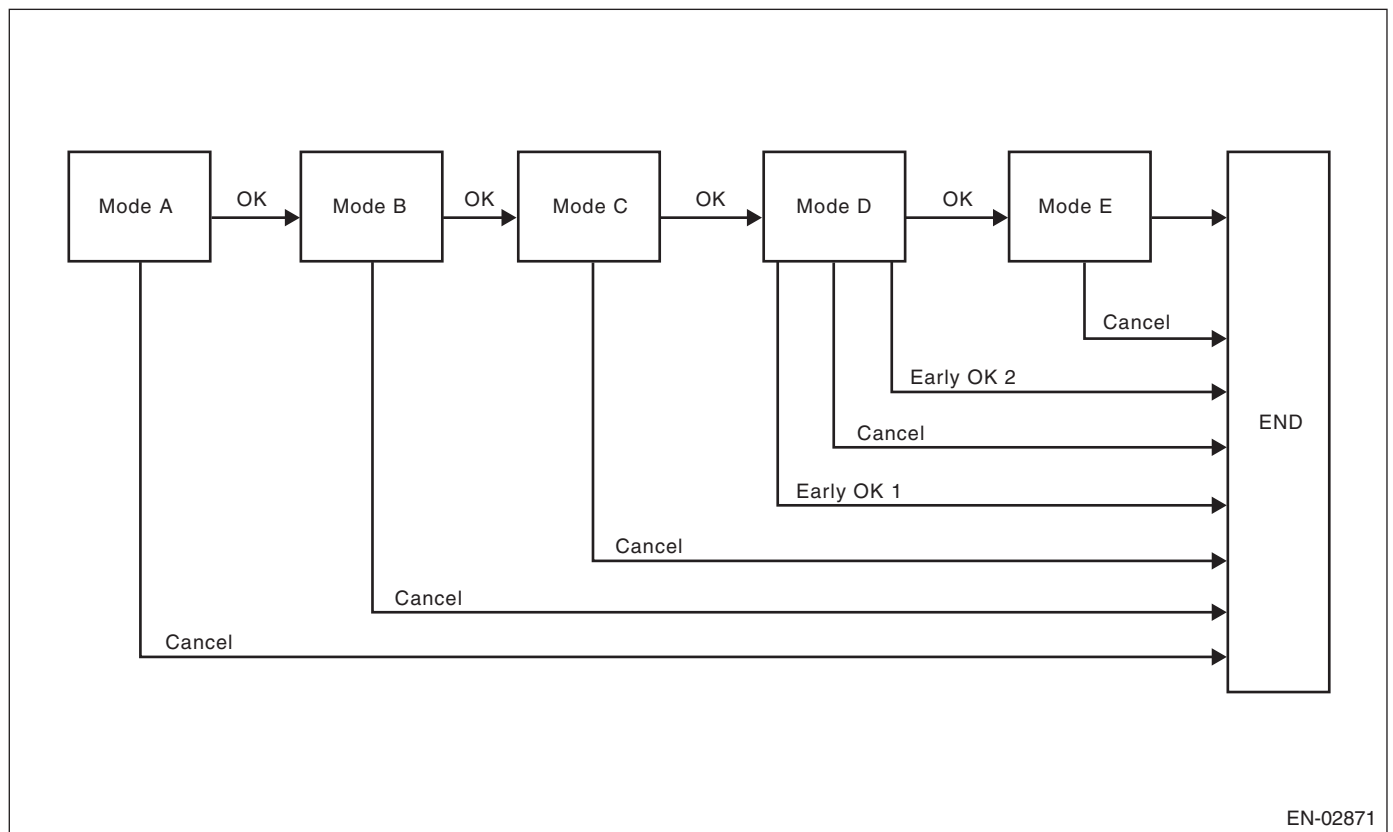
Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Mode Table for Evaporative Emission Control System Diagnosis

Mode	Tank internal pressure under normal conditions	Diagnostic item	DTC
Mode Z	Roughly the same as atmospheric pressure (Same as 0 kPa (0 mmHg, 0 inHg))	Purge control solenoid valve is judged to be open.	P0457
Mode A	Pressure is in proportion to amount of evaporative emission.		
Mode B	Negative pressure is formed due to intake manifold negative pressure.	Large leak	P0457
Mode C	Reaches target pressure		None
Mode D	Pressure change is small.	EVAP system large leak determination. [1.0 mm (0.04 in)]	P0442

0.02-inch Diagnosis



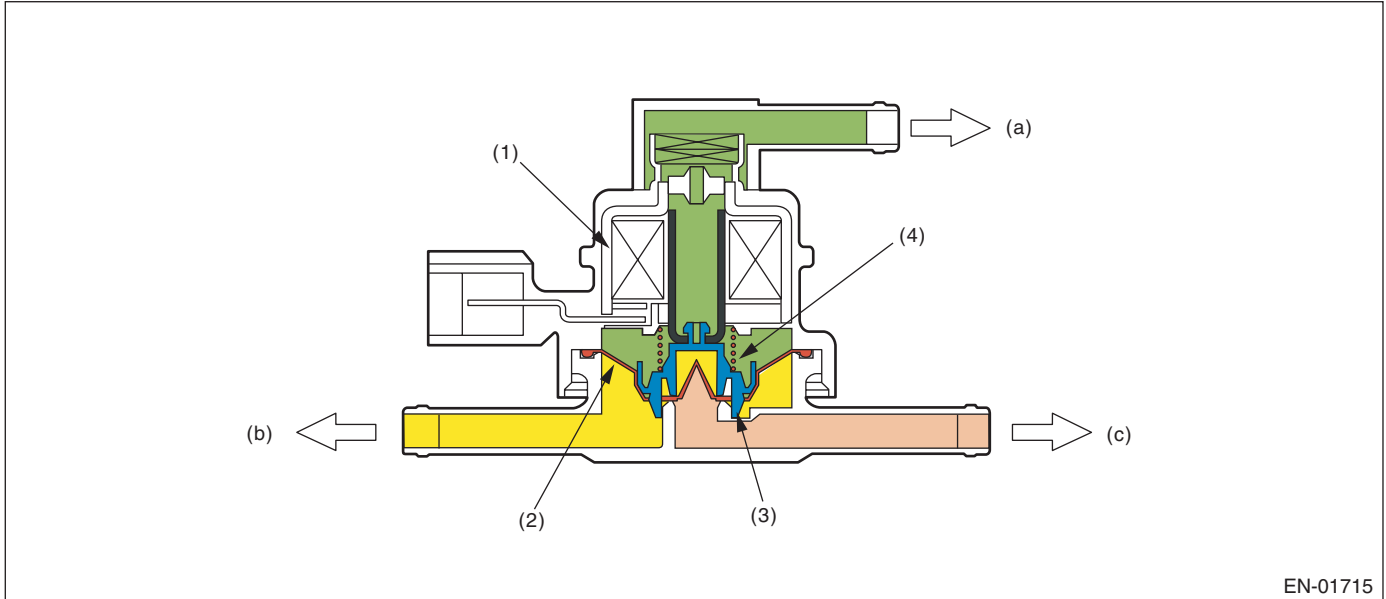
Mode	Mode Description	Diagnosis Period
Mode A (0 point compensation)	When the pressure in the tank is high, wait until it returns to 0 point (Near 0 mmHg).	0 — 12 seconds
Mode B (Negative pressure introduced)	Decrease the pressure in the tank to the target value by introducing the intake manifold pressure to the fuel tank.	0 — 27 seconds
Mode C (Negative pressure maintained)	Wait until the tank pressure returns to the target (start level of P2 calculation).	0 — 20 seconds
Mode D (Negative pressure change calculated)	Calculate the time it takes for the tank pressure to return to the P2 calculation complete pressure. If the tank pressure does not return to the P2 calculation complete pressure, make advanced OK judgment.	0 — 200 seconds
Mode E (Evaporation generated amount calculated)	Calculate the amount of evaporation (P1).	0 — 280 seconds

2. COMPONENT DESCRIPTION

Pressure control solenoid valve

PCV controls the fuel tank pressure to be equal to the atmospheric air pressure. Normally, the solenoid is set to OFF. And the valve opens and closes mechanically in accordance with the pressure difference between tank and atmospheric air, or tank and canister.

The valve is forcibly opened by setting the solenoid to ON at the time of diagnosis.



(a) Atmospheric pressure

(b) Fuel tank

(c) Canister

(1) Solenoid

(3) Valve

(4) Spring

(2) Diaphragm

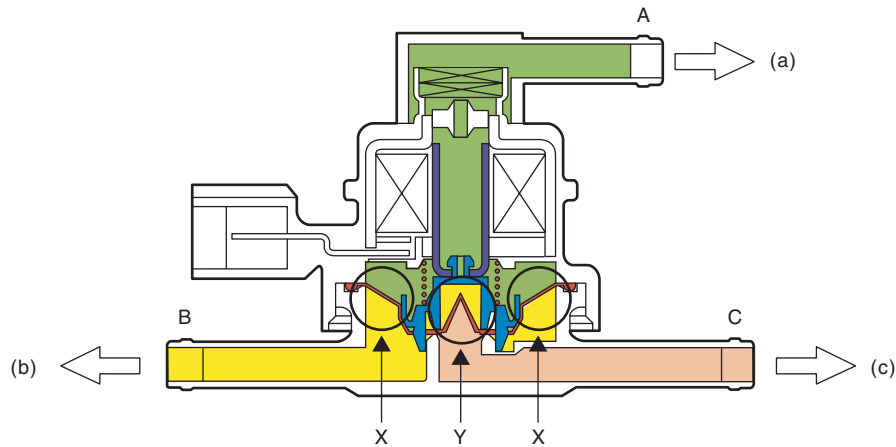
Diagnostic Trouble Code (DTC) Detecting Criteria

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

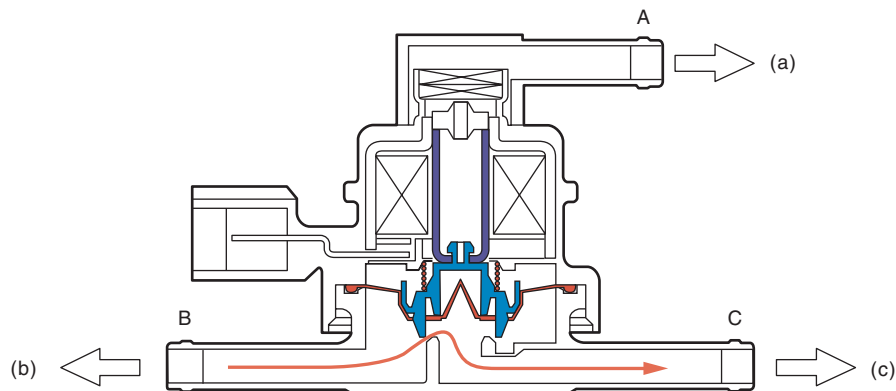
(a) Atmospheric pressure

(b) Fuel tank

(c) Canister

Condition of pressure	Flow
$A < B$ (solenoid OFF)	$B \rightarrow C$
$B < C$ (solenoid OFF)	$C \rightarrow B$
Solenoid ON	$B \leftrightarrow C$

When $A < B$ (Solenoid OFF)



EN-01717

(a) Atmospheric pressure

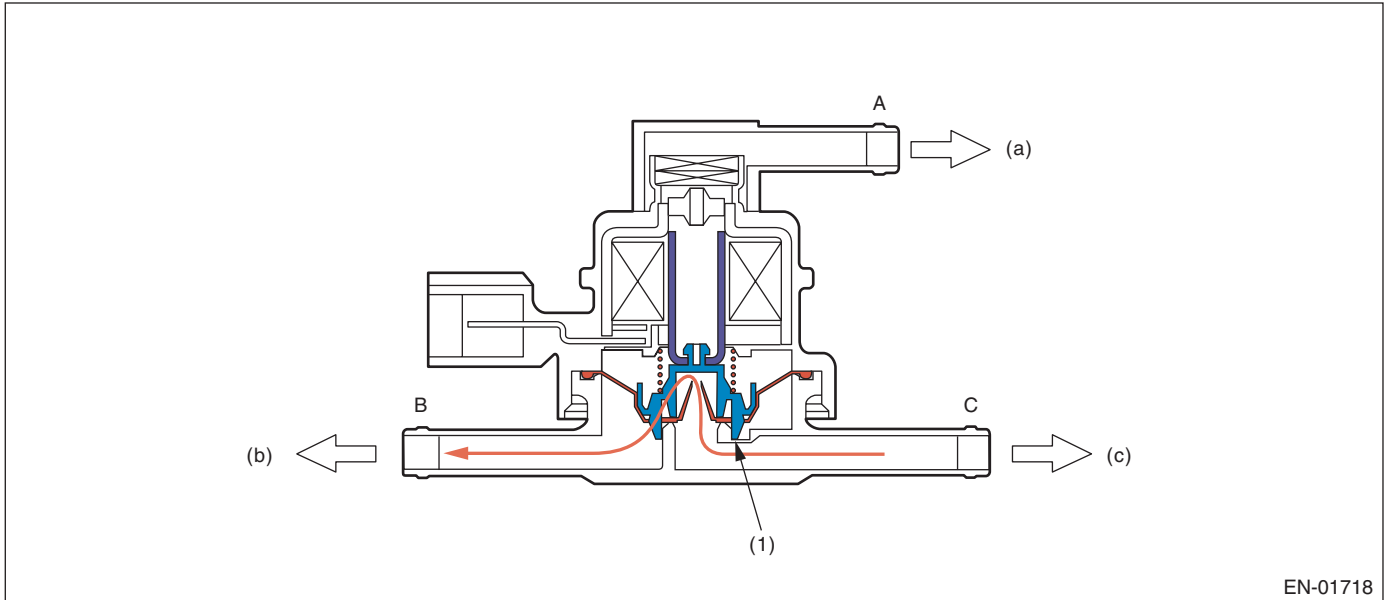
(b) Fuel tank

(c) Canister

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

When $B < C$ (Solenoid OFF)



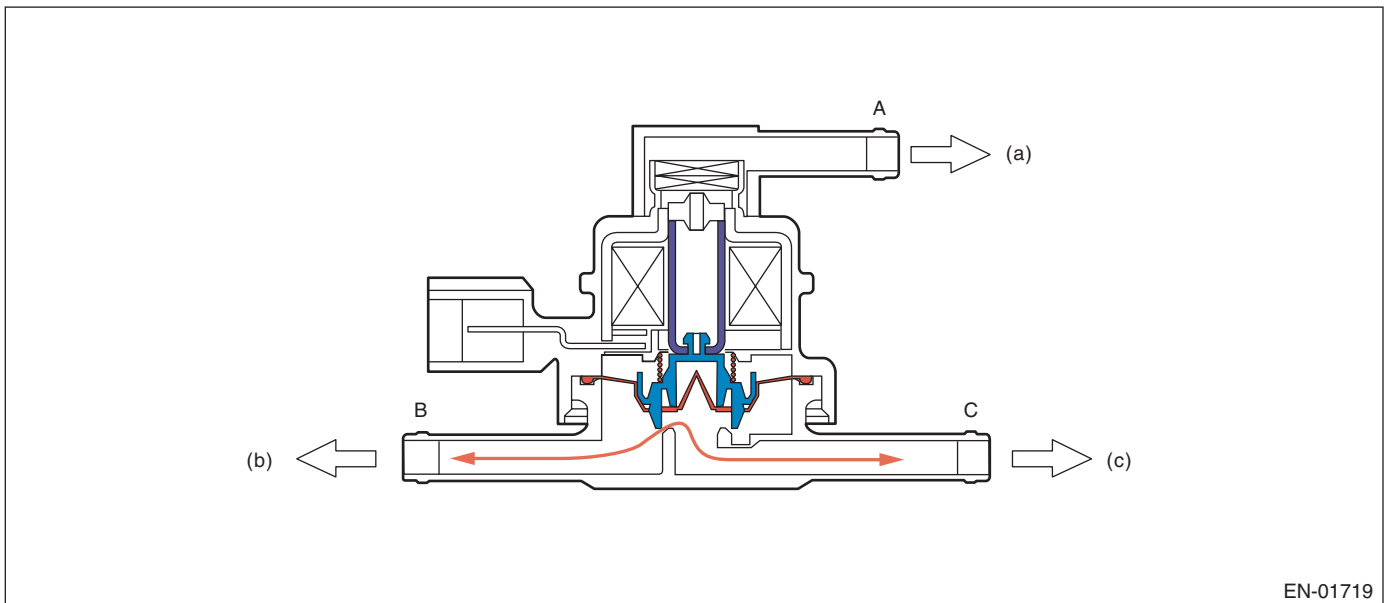
(a) Atmospheric pressure

(b) Fuel tank

(c) Canister

(1) Valve

When Solenoid is ON



(a) Atmospheric pressure

(b) Fuel tank

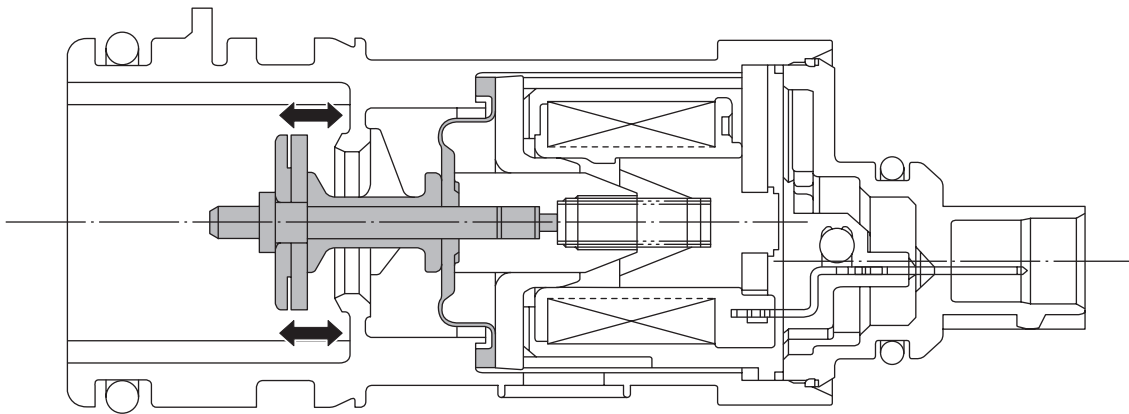
(c) Canister

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Drain valve

Drain valve controls the ambient air to be introduced to the canister.



EN-02293

3. ENABLE CONDITION

0.04-inch Diagnosis

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 10.9 \text{ V}$
Barometric pressure	$\geq 75.0 \text{ kPa}$ (563 mmHg, 22.2 inHg)
Total time of canister purge operation	120 seconds or more
After engine starting	856 seconds or more
Learning value of evaporation gas density	≤ 0.04
Engine speed	1050 — 6500 rpm
Fuel tank pressure	$\geq -1.4 \text{ kPa}$ (-10.7 mmHg , -0.42 inHg)
Intake manifold vacuum (relative pressure)	$< -13.3 \text{ kPa}$ (-100 mmHg , -3.94 inHg)
Vehicle speed	$\geq 32 \text{ km/h}$ (19.9 MPH)
Fuel level	9 — 51 ℓ (2.38 — 13.47 US gal, 1.98 — 11.22 Imp gal)
Closed air/fuel ratio control	In operation
Fuel temperature	$-10 — 45^{\circ}\text{C}$ (14 — 113°F)
Intake air temperature	$\geq -10^{\circ}\text{C}$ (14°F)
Pressure change per second	$< 0.23 \text{ kPa}$ (1.7 mmHg, 0.07 inHg)
Minimum pressure change value every one second — Maximum pressure change value every one second	$< 0.23 \text{ kPa}$ (1.7 mmHg, 0.07 inHg)
Change of fuel level	$< 2.5 \text{ ℓ/128 milliseconds}$ (0.66 US gal/128 milliseconds, 0.55 Imp gal/128 milliseconds)
Air fuel ratio	0.76 — 1.25

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

0.02-inch Diagnosis

Secondary Parameters	Enable Condition
(At starting a diagnosis)	
Evap. diagnosis	Incomplete
Battery voltage	≥ 10.9 V
Atmosphere pressure	≥ 75.0 kPa (563 mmHg, 22.2 inHg)
Time since last incomplete diagnosis event of 0.02-inch leakage	
When cancelling in mode A	> 120 seconds
When cancelling in other than mode A	> 600 seconds
Total time of canister purge operation	120 seconds or more
After engine starting	770 seconds or more
Fuel temperature	$-10 \sim 70^{\circ}\text{C}$ ($14 \sim 158^{\circ}\text{F}$)
Fuel level	$9 \sim 51$ ℓ (2.38 $\sim$ 13.47 US gal, 1.98 $\sim$ 11.22 Imp gal)
Intake manifold vacuum (relative pressure)	< -13.3 kPa (-100 mmHg, -3.93 inHg)
Fuel tank pressure	$-0.67 \sim 1.43$ kPa ($-5 \sim 10.7$ mmHg, $-0.20 \sim 0.42$ inHg)
Vehicle speed	≥ 68 km/h (42 MPH)
Closed air/fuel ratio control	In operation
Engine speed	550 $\sim$ 6000 rpm
(During diagnosis)	
Change of fuel level	$\leq$ Value from Map
Pressure change every one second	< 0.06 kPa (0.44 mmHg, 0.02 inHg)
Minimum pressure change value every one second – Maximum pressure change value every one second	< 0.07 kPa (0.51 mmHg, 0.02 inHg)
Pressure change in tank every second	≤ 0.1 kPa (0.75 mmHg, 0.03 inHg)
Atmospheric pressure change (Mode D)	$-0.47 \sim 0.32$ kPa ($-3.5 \sim 2.4$ mmHg, $-0.14 \sim 0.09$ inHg)
Atmospheric pressure change (Mode E)	$-0.32 \sim 0.32$ kPa ($-2.4 \sim 2.4$ mmHg, $-0.09 \sim 0.09$ inHg)

Map

Fuel level (ℓ , US gal, Imp gal)	0	10, 2.64, 2.2	20, 5.28, 4.4	30, 7.93, 6.6	40, 10.57, 8.8	50, 13.21, 11	60, 15.85, 13.2
Change (ℓ , US gal, Imp gal)	4.2, 1.11, 0.92	4.2, 1.11, 0.92	4.1, 1.08, 0.9	4.0, 1.06, 0.88	3.9, 1.03, 0.86	3.8, 1.0, 0.84	3.8, 1.0, 0.84

4. GENERAL DRIVING CYCLE

0.04-inch Diagnosis

- Perform the diagnosis only once in 856 seconds or more after starting the engine, at a constant speed of 32 km/h (19.9 MPH) or more.
- Pay attention to the fuel temperature and fuel level.

0.02-inch Diagnosis

- Perform the diagnosis 770 seconds or more after the engine start at a constant engine speed of 68 km/h (42 MPH) or higher to judge as NG or OK.
- If judgment cannot be made, repeat the diagnosis.
- Be careful of the remaining fuel level.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Purge control solenoid valve stuck open fault diagnosis

DTC

P0457 Evaporative Emission Control System Leak Detected (Fuel Cap Loose/Off)

Purpose of Mode Z

When performing the leakage diagnosis of EVAP system, the purge control solenoid valve must operate normally. Therefore, mode Z is used to diagnose the purge control solenoid valve stuck open condition. Note that if a purge control solenoid valve stuck open fault is detected, the EVAP system leakage diagnosis is cancelled.

Diagnostic Method

Purge control solenoid valve functional diagnosis is performed by monitoring the tank pressure in mode Z.

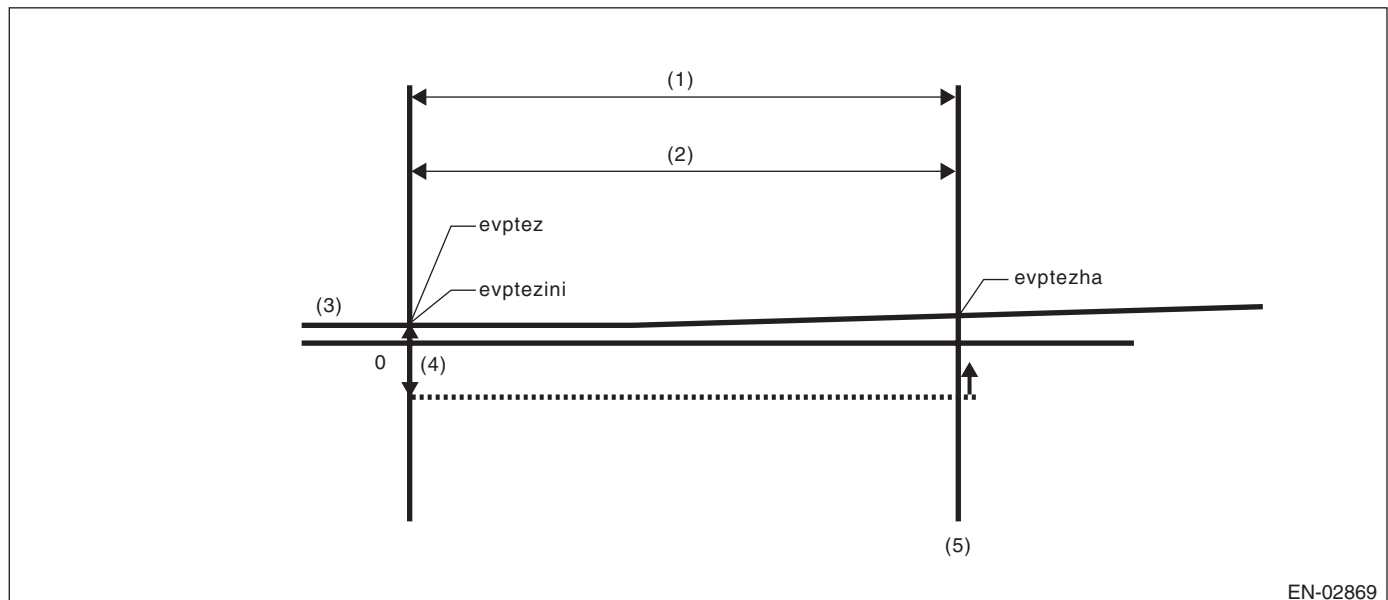
Normality Judgment

Judge OK and change to Mode A when the criteria below are completed in 3 seconds after Mode Z started.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
(Tank pressure when Mode Z started) – (Tank pressure when Mode Z finished)	$\leq 0.4 \text{ kPa}$ (3 mmHg, 0.12 inHg)	P0457

Normal



- | | | |
|---------------|-----------------------------------|-----------------|
| (1) Mode Z | (3) Fuel tank pressure | (5) OK judgment |
| (2) 3 seconds | (4) 0.4 kPa (3.0 mmHg, 0.12 inHg) | |

- $evptez - evptezha \leq 0.4 \text{ kPa}$ (3.0 mmHg, 0.12 inHg)
- $evptezini - evptezha \leq 0.4 \text{ kPa}$ (3.0 mmHg, 0.12 inHg)

Judge as normal when both calculations are established.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Abnormality Judgment

If OK judgment cannot be made, extend Mode Z 16 seconds more, and judge as NG when all the criteria below are completed after 16 seconds.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
(Tank pressure when Mode Z started) – (Tank pressure when Mode Z finished)	> 0.6 kPa (4.5 mmHg, 0.18 inHg)	P0457
Tank pressure when Mode Z started	≤ 1.43 kPa (10.7 mmHg, 0.42 inHg)	
2 ℓ or more fuel must remain in a static (not sloshing) condition for more than:	≥ 40 sec.	

Time Needed for Diagnosis: 16 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

When judgment for purge control solenoid valve stuck open NG is made, end the evaporative diagnosis. Cancel the evaporative diagnosis when the OK/NG judgment for purge control solenoid valve stuck open cannot be made in Mode Z.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Leak Diagnosis

DTC

P0441 CPC Solenoid Function (Blocked)

P0442 Evaporative Emission Control System Leak Detected (Small Leak)

P0457 Evaporative Emission Control System Leak Detected (Fuel Cap Loose/Off)

Diagnostic method

- The diagnostic method consists of creating a sealed vacuum in the fuel tank and then determining the presence of leakage from the speed at which the tank internal pressure returns to atmospheric pressure.
- The diagnosis is divided into the following five phases.

Mode A: (Estimated evaporation gas amount)

Calculate the tank pressure change amount (P1) when using mode A. After calculating P1, switch to mode B.

Mode B: (Negative pressure sealed)

Introduce negative pressure in the intake manifold to the tank.

Approximately 0 → -1.4 kPa (0 → -10.5 mmHg, 0 → -0.41 inHg)

When the pressure above (desired negative pressure) is reached, enters Mode C.

In this case, if the tank pressure does not reach the target negative pressure, judge that there is a large leakage (10 seconds or 25 seconds) in the system and terminate the evaporative emission control system diagnosis.

Abnormality Judgment

Judge as NG (large leak) when the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
Time to reach target negative pressure	≥ 25 sec.	P0457
Or mode B time	≥ 10 sec.	
(Min. pressure value in tank when in mode B) –	> -0.5 kPa	
(Tank pressure when mode B started)	(-4 mmHg, -0.16 inHg)	

Mode C: (Check pressure rise)

Stop the introduction of negative pressure. (Wait until the tank pressure returns to the start level of P2 calculation.)

Change to Mode D when the tank pressure returns to the start level of P2 calculation.

Judge immediate OK and perform the blockage diagnosis of purge control solenoid 2 when it does not return in spite of spending the specified time.

Tank pressure when starting calculation of P2	Time for advanced OK judgment
-1.3 kPa (-9.75 mmHg, -0.38 inHg)	15 seconds

Mode D: (Measure amount of negative pressure change)

Monitor the tank pressure change amount when using mode D. In this case, the tank pressure increases (nears atmospheric pressure), because evaporation occurs. However, if any leakage exists, the pressure increases additionally in proportion to this leakage. The pressure variation of this tank is P2.

After calculating P2, perform a small leak diagnosis according to the items below.

When Mode D is ended

Assign tank variations measured in Mode A and Mode D; P1 and P2, to the formula below, judge small leaks in the system. If the measured judgment value exceeds the threshold value, it is judged to be a malfunction.

Purge control solenoid valve 2 blockage diagnosis

Perform the purge control solenoid valve 2 blockage diagnosis according to the gap value of tank pressure from the end of mode C to afterwards.

Malfunction Criteria	Threshold Value	DTC
Tank pressure change after mode C completion.	3 seconds < 0.115 kPa (0.86 mmHg, 0.034 inHg)	P0441

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Abnormality Judgment

Judge as NG when the criteria below are met and judge as OK and clear NG when not met.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
P2 – 1.5 × P1 P2: Tank pressure that changes every 16 seconds in mode D P1: Tank pressure that changes every 16 seconds in mode A	> Value from Map 7 * Threshold value: Map (Remaining Fuel vs Tank temperature)	P0442

* 1.5: Evaporation amount compensation value when below negative pressure (Amount of evaporation occurrence increases as a vacuum condition increases.)

Map 7 Malfunction criteria limit for evaporation diagnosis

Fuel temperature vs Fuel level	5°C (41°F)	15°C (59°F)	25°C (77°F)	35°C (95°F)	45°C (113°F)
0 ℓ (0 US gal, 0 Imp gal)	0.49 kPa (3.68 mmHg, 0.14 inHg)	0.49 kPa (3.68 mmHg, 0.14 inHg)	0.53 kPa (3.95 mmHg, 0.16 inHg)	0.54 kPa (4.07 mmHg, 0.16 inHg)	0.56 kPa (4.17 mmHg, 0.16 inHg)
10 ℓ (2.64 US gal, 2.2 Imp gal)	0.49 kPa (3.68 mmHg, 0.14 inHg)	0.49 kPa (3.68 mmHg, 0.14 inHg)	0.53 kPa (3.95 mmHg, 0.16 inHg)	0.54 kPa (4.07 mmHg, 0.16 inHg)	0.56 kPa (4.17 mmHg, 0.16 inHg)
20 ℓ (5.28 US gal, 4.4 Imp gal)	0.50 kPa (3.77 mmHg, 0.15 inHg)	0.51 kPa (3.79 mmHg, 0.15 inHg)	0.53 kPa (4.01 mmHg, 0.16 inHg)	0.56 kPa (4.17 mmHg, 0.16 inHg)	0.57 kPa (4.27 mmHg, 0.17 inHg)
30 ℓ (7.93 US gal, 6.6 Imp gal)	0.51 kPa (3.85 mmHg, 0.15 inHg)	0.52 kPa (3.9 mmHg, 0.15 inHg)	0.54 kPa (4.06 mmHg, 0.16 inHg)	0.57 kPa (4.27 mmHg, 0.17 inHg)	0.60 kPa (4.48 mmHg, 0.18 inHg)
40 ℓ (10.57 US gal, 8.8 Imp gal)	0.65 kPa (4.88 mmHg, 0.19 inHg)	0.65 kPa (4.9 mmHg, 0.19 inHg)	0.66 kPa (4.98 mmHg, 0.20 inHg)	0.71 kPa (5.32 mmHg, 0.21 inHg)	0.76 kPa (5.73 mmHg, 0.23 inHg)
50 ℓ (13.21 US gal, 11.0 Imp gal)	0.794 kPa (5.96 mmHg, 0.235 inHg)	0.794 kPa (5.96 mmHg, 0.235 inHg)	0.794 kPa (5.96 mmHg, 0.235 inHg)	0.85 kPa (6.38 mmHg, 0.25 inHg)	0.88 kPa (6.6 mmHg, 0.26 inHg)
60 ℓ (15.85 US gal, 13.2 Imp gal)	0.794 kPa (5.96 mmHg, 0.235 inHg)	0.794 kPa (5.96 mmHg, 0.235 inHg)	0.794 kPa (5.96 mmHg, 0.235 inHg)	0.85 kPa (6.38 mmHg, 0.25 inHg)	0.88 kPa (6.6 mmHg, 0.26 inHg)

Time Needed for Diagnosis: 30 — 100 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Leak Diagnosis

DTC

P0456 Evaporative Emission Control System Leak Detected (very small leak)

Diagnostic method

- The diagnostic method consists of creating a sealed vacuum in the fuel tank and then determining the presence of leakage from the speed at which the tank internal pressure returns to atmospheric pressure.
- The diagnosis is divided into the following five phases.

Mode A: (0 point compensation)

When the pressure in the tank is high, wait until it returns to 0 point (Near 0 mmHg.). Shift to mode B when returned to the 0 point. Cancel the diagnosis when 0 point does not return in the specified time.

Mode B: (Negative pressure introduced)

Introduce negative pressure in the intake manifold to the tank.

Approximately 0 → -2.0 kPa (0 → -15 mmHg, 0 → -0.59 inHg)

When the pressure above (desired negative pressure) is reached, enters Mode C.

When the tank internal pressure does not reach the target vacuum pressure, the diagnosis is cancelled.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Mode C: (Negative pressure maintained)

Stop the introduction of negative pressure. (Wait until the tank pressure returns to the start level of P2 calculation.)

Change to Mode D either when the tank pressure returns to the start level of P2 calculation, or when the predetermined amount of time has passed.

Mode D: (Calculate the amount of negative pressure change)

Monitor the tank pressure in mode D, calculate the pressure change (P2) in the tank, and measure the time (evpdset) for the tank pressure to return to the end level of P2 calculation. Shift to Mode E when the tank pressure returns to the end level of P2 calculation. If it does not return to the P2 calculation end tank internal pressure after the predetermined amount of time has passed, make advanced OK judgment or cancel the diagnosis according to the value of P2.

Normality Judgment

Judge as OK when the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Advanced OK judgment 1	
Mode D time	≥ 30 sec.
Tank internal pressure	≤ -1.8 kPa (-13.4 mmHg, -0.53 inHg)
Advanced OK judgment 2	
Mode D time	≥ 200 sec.
P2	$\leq 0.9 - 1.3$ kPa ($7 - 9.6$ mmHg, $0.28 - 0.38$ inHg)

Mode E: (Evaporation occurrence amount calculation)

Calculate the change of tank pressure (P1) with the time evpdset to judge as NG/OK according to the value of P1. (ambiguous determination acceptable).

Abnormality Judgment

Judge as NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
P1	$<$ Value from Map 7 *Threshold value: Map (Remaining fuel vs evpdset)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Map 7 Malfunction criteria limit for evaporation diagnosis

Time (evpdset) vs Fuel level	0 seconds	30 seconds	80 seconds	100 seconds	150 seconds	200 seconds
0 ℓ (0 US gal, 0 Imp gal)	0 kPa (0 mmHg, 0 inHg)	0.21 kPa (1.6 mmHg, 0.06 inHg)	0.29 kPa (2.2 mmHg, 0.09 inHg)	0.29 kPa (2.2 mmHg, 0.09 inHg)	0.29 kPa (2.2 mmHg, 0.09 inHg)	0.29 kPa (2.2 mmHg, 0.09 inHg)
10 ℓ (2.64 US gal, 2.2 Imp gal)	0 kPa (0 mmHg, 0 inHg)	0.21 kPa (1.6 mmHg, 0.06 inHg)	0.29 kPa (2.2 mmHg, 0.09 inHg)	0.29 kPa (2.2 mmHg, 0.09 inHg)	0.29 kPa (2.2 mmHg, 0.09 inHg)	0.29 kPa (2.2 mmHg, 0.09 inHg)
30 ℓ (7.93 US gal, 6.6 Imp gal)	0 kPa (0 mmHg, 0 inHg)	0.21 kPa (1.6 mmHg, 0.06 inHg)	0.29 kPa (2.2 mmHg, 0.09 inHg)	0.29 kPa (2.2 mmHg, 0.09 inHg)	0.29 kPa (2.2 mmHg, 0.09 inHg)	0 kPa (0 mmHg, 0 inHg)
50 ℓ (13.21 US gal, 11.0 Imp gal)	0 kPa (0 mmHg, 0 inHg)	0.24 kPa (1.8 mmHg, 0.07 inHg)	0.29 kPa (2.2 mmHg, 0.09 inHg)	0.29 kPa (2.2 mmHg, 0.09 inHg)	0 kPa (0 mmHg, 0 inHg)	0 kPa (0 mmHg, 0 inHg)
60 ℓ (15.85 US gal, 13.2 Imp gal)	0 kPa (0 mmHg, 0 inHg)	0.24 kPa (1.8 mmHg, 0.07 inHg)	0.29 kPa (2.2 mmHg, 0.09 inHg)	0.29 kPa (2.2 mmHg, 0.09 inHg)	0 kPa (0 mmHg, 0 inHg)	0 kPa (0 mmHg, 0 inHg)
70 ℓ (18.49 US gal, 15.4 Imp gal)	0 kPa (0 mmHg, 0 inHg)	0.24 kPa (1.8 mmHg, 0.07 inHg)	0.29 kPa (2.2 mmHg, 0.09 inHg)	0.29 kPa (2.2 mmHg, 0.09 inHg)	0 kPa (0 mmHg, 0 inHg)	0 kPa (0 mmHg, 0 inHg)
80 ℓ (21.14 US gal, 17.6 Imp gal)	0 kPa (0 mmHg, 0 inHg)	0.24 kPa (1.8 mmHg, 0.07 inHg)	0.29 kPa (2.2 mmHg, 0.09 inHg)	0.29 kPa (2.2 mmHg, 0.09 inHg)	0 kPa (0 mmHg, 0 inHg)	0 kPa (0 mmHg, 0 inHg)

Normality Judgment

Judge as OK when the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
P1	> Value from Map 8 *Threshold value: Map (Remaining fuel vs evpdset)

Map 8 Fault criteria limit for Evaporative emission control system diagnosis

Time (evpdset) vs Fuel level	0 seconds	30 seconds	80 seconds	100 seconds	150 seconds	200 seconds
0 ℓ (0 US gal, 0 Imp gal)	0.16 kPa (1.2 mmHg, 0.05 inHg)	0.37 kPa (2.8 mmHg, 0.11 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)
10 ℓ (2.64 US gal, 2.2 Imp gal)	0.16 kPa (1.2 mmHg, 0.05 inHg)	0.37 kPa (2.8 mmHg, 0.11 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)
30 ℓ (7.93 US gal, 6.6 Imp gal)	0.16 kPa (1.2 mmHg, 0.05 inHg)	0.37 kPa (2.8 mmHg, 0.11 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)
50 ℓ (13.21 US gal, 11.0 Imp gal)	0.16 kPa (1.2 mmHg, 0.05 inHg)	0.40 kPa (3.0 mmHg, 0.12 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)
60 ℓ (15.85 US gal, 13.2 Imp gal)	0.16 kPa (1.2 mmHg, 0.05 inHg)	0.40 kPa (3.0 mmHg, 0.12 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)
70 ℓ (18.49 US gal, 15.4 Imp gal)	0.16 kPa (1.2 mmHg, 0.05 inHg)	0.40 kPa (3.0 mmHg, 0.12 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)
80 ℓ (21.14 US gal, 17.6 Imp gal)	0.16 kPa (1.2 mmHg, 0.05 inHg)	0.40 kPa (3.0 mmHg, 0.12 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)

Time Needed for Diagnosis: 65 — 516 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

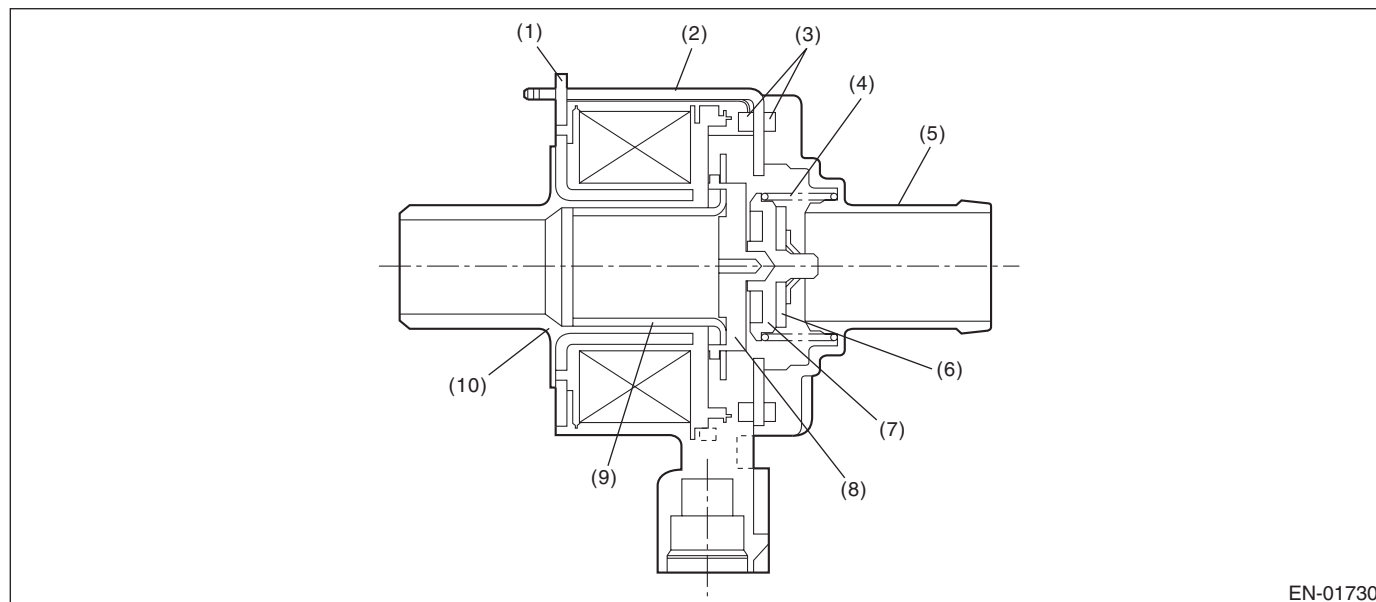
BM:DTC P0447 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the drain valve.

Judge as NG when the ECM output level differs from the actual terminal level.

2. COMPONENT DESCRIPTION



(1) Magnetic plate

(2) Yoke

(3) Gasket

(4) Spring

(5) Valve seat

(6) Valve

(7) Plate

(8) Retainer

(9) Movable core

(10) Bobbin

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM outputs OFF signal	Low

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when all the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM outputs OFF signal	High

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

Pressure control solenoid valve control: Open the pressure control solenoid valve.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

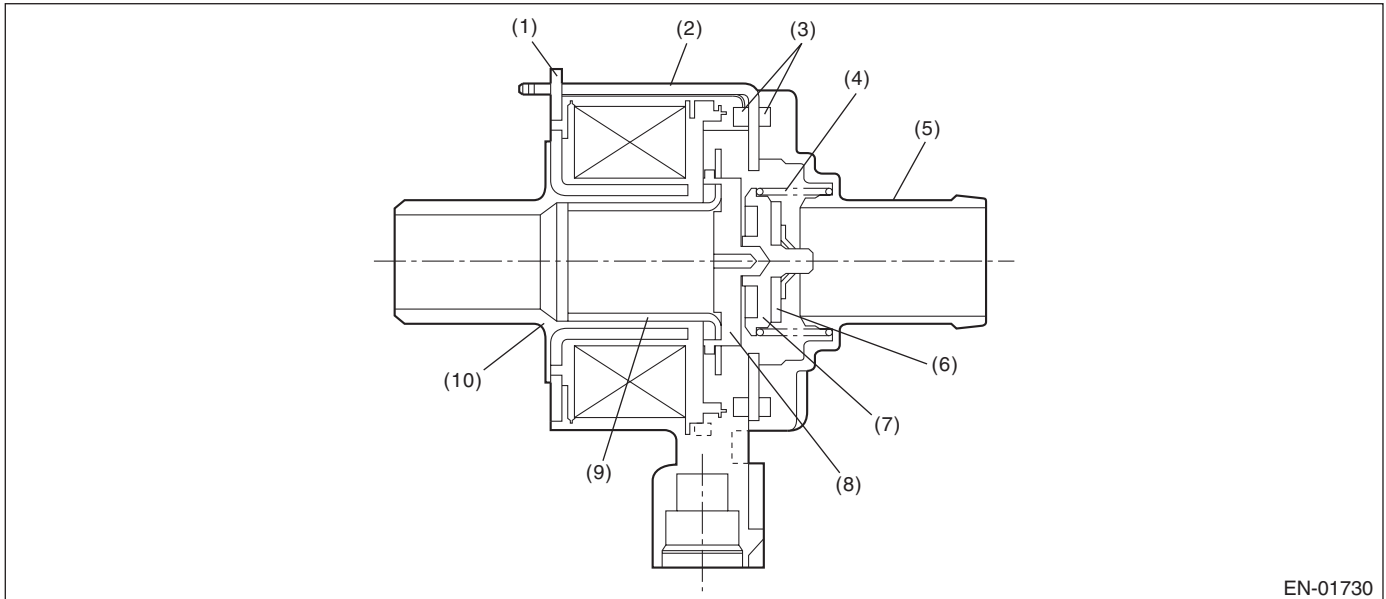
BN:DTC P0448 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the drain valve.

Judge as NG when the ECM output level differs from the actual terminal level.

2. COMPONENT DESCRIPTION



- | | | |
|--------------------|----------------|------------------|
| (1) Magnetic plate | (5) Valve seat | (9) Movable core |
| (2) Yoke | (6) Valve | (10) Bobbin |
| (3) Gasket | (7) Plate | |
| (4) Spring | (8) Retainer | |

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM outputs ON signal	High

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when all the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM outputs ON signal	Low

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

Pressure control solenoid valve control: Open the pressure control solenoid valve.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

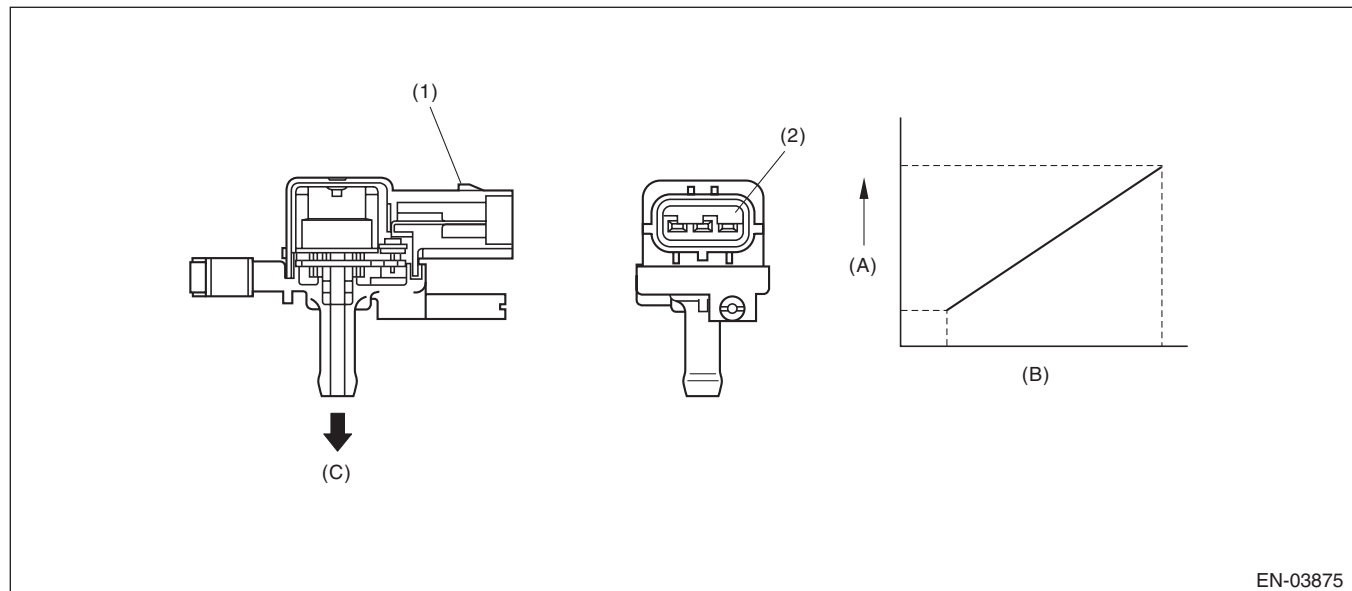
BO:DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR

1. OUTLINE OF DIAGNOSIS

Detect the tank pressure sensor output property abnormality.

Judge NG when there is no pressure variation, which should exist in the tank, considering the engine status.

2. COMPONENT DESCRIPTION



(A) Output voltage

(B) Input voltage

(C) To fuel tank

(1) Connector

(2) Terminals

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
After engine starting	60 seconds or more
Fuel level	$\geq 9 \text{ } \ell$ (2.38 US gal, 1.98 Imp gal)
Fuel temperature	$< 35^{\circ}\text{C}$ (95°F)
Battery voltage	$\geq 10.9 \text{ V}$
Atmospheric pressure	$> 75.0 \text{ kPa}$ (563 mmHg, 22.2 inHg)
Purge control solenoid valve ON/OFF	Experienced

4. GENERAL DRIVING CYCLE

- Perform the diagnosis continuously after 60 seconds or more have passed since the engine started.
- Be sure to check the fuel level and fuel temperature.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Number of times that the difference between the Max. fuel level and Min. fuel level every 60 seconds is 2 ℓ (0.53 US gal, 0.44 Imp gal) or more (with enable condition completed)	≥ 16 times
Maximum – Minimum tank pressure (with enable condition completed)	< 0.05 kPa (0.375 mmHg, 0.01 inHg)
Maximum – Minimum fuel temperature (with enable condition completed)	≥ 7°C (12.6°F)

If the maximum value – minimum value for the fuel level is less than 2 ℓ every 60 seconds, extend 60 seconds more and make judgment with the maximum and minimum values for the fuel level in 120 seconds. If a difference does not appear though the time was extended 60 seconds, extend the time (180, 240, 300 seconds) and continue the judgment. If the maximum value – minimum value for the fuel level is 5 liters or more, the diagnosis counter counts up.

Time Needed for Diagnosis: 1 minute × 16 times or more

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Maximum – Minimum tank pressure	≥ 0.05 kPa (0.375 mmHg, 0.01 inHg)

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Purge control solenoid valve control: Not allowed to purge fixed mode.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

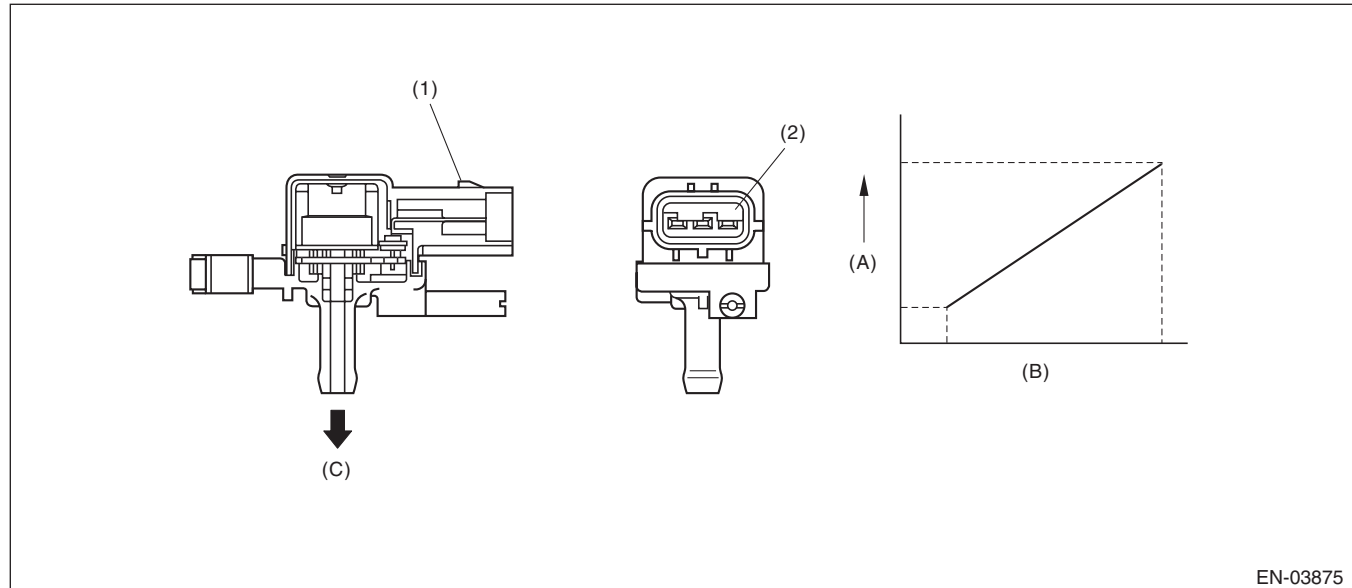
GENERAL DESCRIPTION

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

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the fuel tank pressure sensor.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



(A) Output voltage

(B) Input voltage

(C) To fuel tank

(1) Connector

(2) Terminals

3. ENABLE CONDITION (USED WITH HIGH SIDE NORMAL/ABNORMALITY JUDGMENT ONLY)

Secondary Parameters	Enable Condition
Battery voltage	$\geq 10.9 \text{ V}$

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 15 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	< -6.82 kPa (-56.15 mmHg, -2.01 inHg)

Time Needed for Diagnosis: 15 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK when the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	≥ -6.82 kPa (-56.15 mmHg, -2.01 inHg)
Feedback lambda coefficient	≥ 0.9

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

Purge control solenoid valve control: Not allowed to purge fixed mode.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

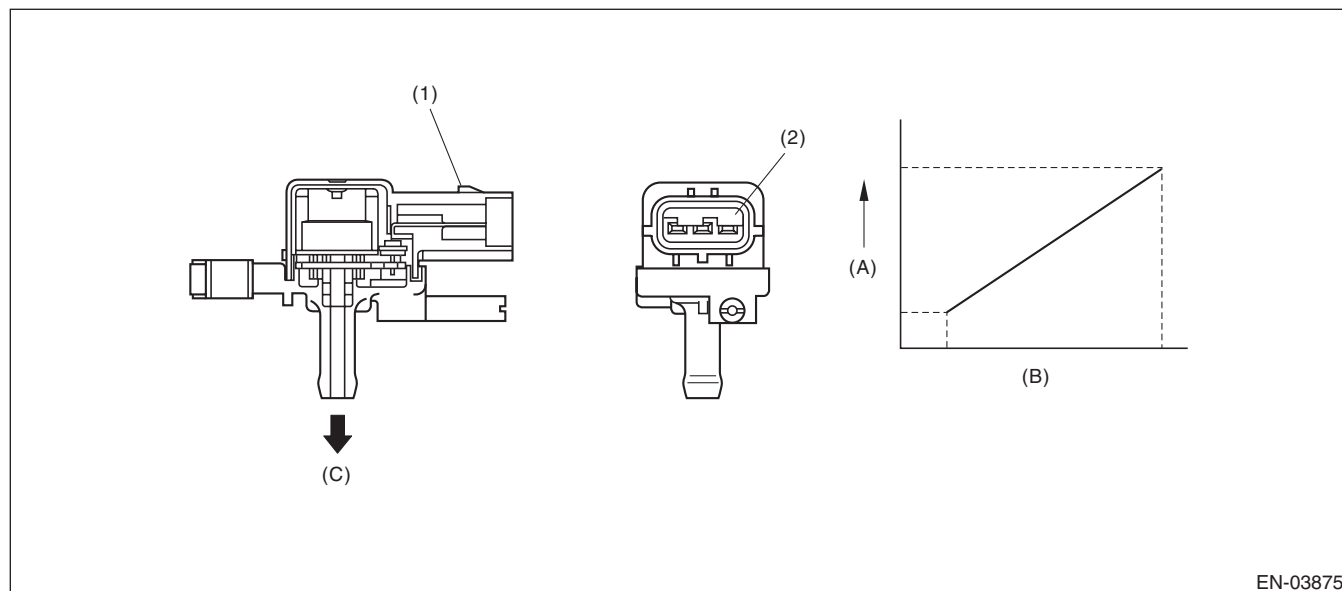
GENERAL DESCRIPTION

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

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the fuel tank pressure sensor.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



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(A) Output voltage

(B) Input voltage

(C) To fuel tank

(1) Connector

(2) Terminals

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Vehicle speed	≥ 2 km/h (1.24 MPH)
All conditions of EVAP canister purge	Complete
Learning value of evaporation gas density	≤ 0.08
Main feedback compensation coefficient	≥ 0.9
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Perform the diagnosis continually when purging.

5. DIAGNOSTIC METHOD**Abnormality Judgment**

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 15 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	≥ 7.98 kPa (59.85 mmHg, 2.36 inHg)
Fuel temperature	$< 35^{\circ}\text{C}$ (95°F)
Atmospheric pressure	≥ 75.0 kPa (563 mmHg, 22.2 inHg)

Time Needed for Diagnosis: 15 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK when the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	< 7.98 kPa (59.85 mmHg, 2.36 inHg)

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

Purge control solenoid valve control: Not allowed to purge fixed mode.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

BR:DTC P0456 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK)**1. OUTLINE OF DIAGNOSIS**

NOTE:

For the detection standard, refer to DTC P0442. <Ref. to GD(H4DOTC)-132, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

BS:DTC P0457 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF)**1. OUTLINE OF DIAGNOSIS**

NOTE:

For the detection standard, refer to DTC P0442. <Ref. to GD(H4DOTC)-132, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

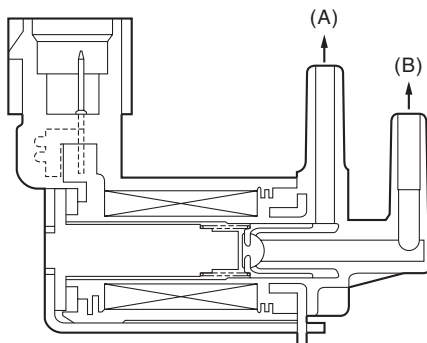
BT:DTC P0458 EVAPORATIVE EMISSION SYSTEM PURGE CONTROL VALVE CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the purge control solenoid valve.

Judge as NG when the ECM output level differs from the actual terminal level.

2. COMPONENT DESCRIPTION



EN-01733

(A) To canister

(B) To intake manifold

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	$\geq 10.9 \text{ V}$
After engine starting	1 second or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Continuous time with the following conditions established:	≥ 2.5 sec.
Duty ratio of "ON"	$< 75\%$
Terminal output voltage	Low

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage	High

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

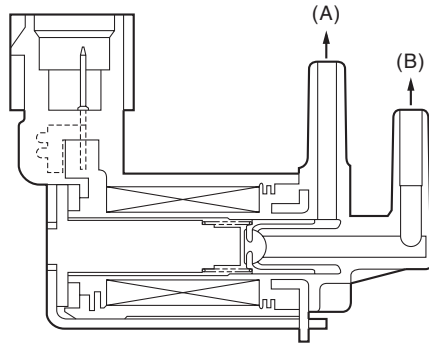
BU:DTC P0459 EVAPORATIVE EMISSION SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the purge control solenoid valve.

Judge as NG when the ECM output level differs from the actual terminal level.

2. COMPONENT DESCRIPTION



EN-01733

(A) To canister

(B) To intake manifold

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	$\geq 10.9 \text{ V}$
After engine starting	1 second or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Continuous time with the following conditions established:	≥ 2.5 sec.
Duty ratio of "ON"	≥ 25%
Terminal output voltage	High

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage	Low

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

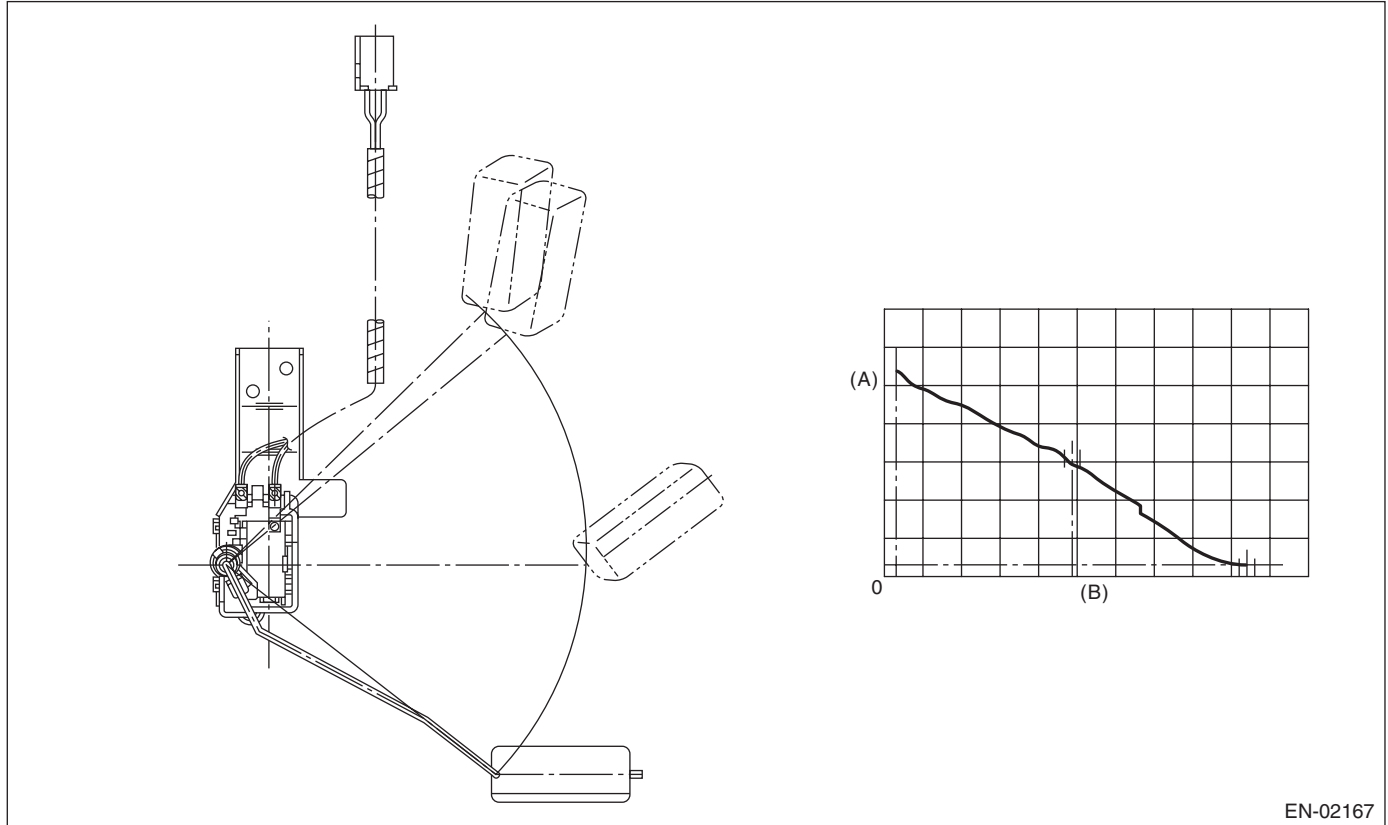
BV:DTC P0461 FUEL LEVEL SENSOR “A” CIRCUIT RANGE/PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect malfunctions of the fuel level sensor output property.

If the fuel level does not vary in a particular driving condition / engine condition where it should, judge as NG.

2. COMPONENT DESCRIPTION



(A) Fuel level (L)

(B) Resistance (Ω)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Accumulated amount of intake air	> 331 kg (729.8 lb)
Max. – Min. values of fuel level output	< 2.6 ℓ (0.69 US gal, 0.57 Imp gal)
Battery voltage	≥ 10.9 V
After engine starting	10 seconds or more

Time Needed for Diagnosis: Undetermined

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Accumulated amount of intake air	> 331 kg (729.8 lb)
Max. – Min. values of fuel level output	≥ 2.6 ℓ (0.69 US gal, 0.57 Imp gal)
Battery voltage	≥ 10.9 V
After engine starting	10 seconds or more

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

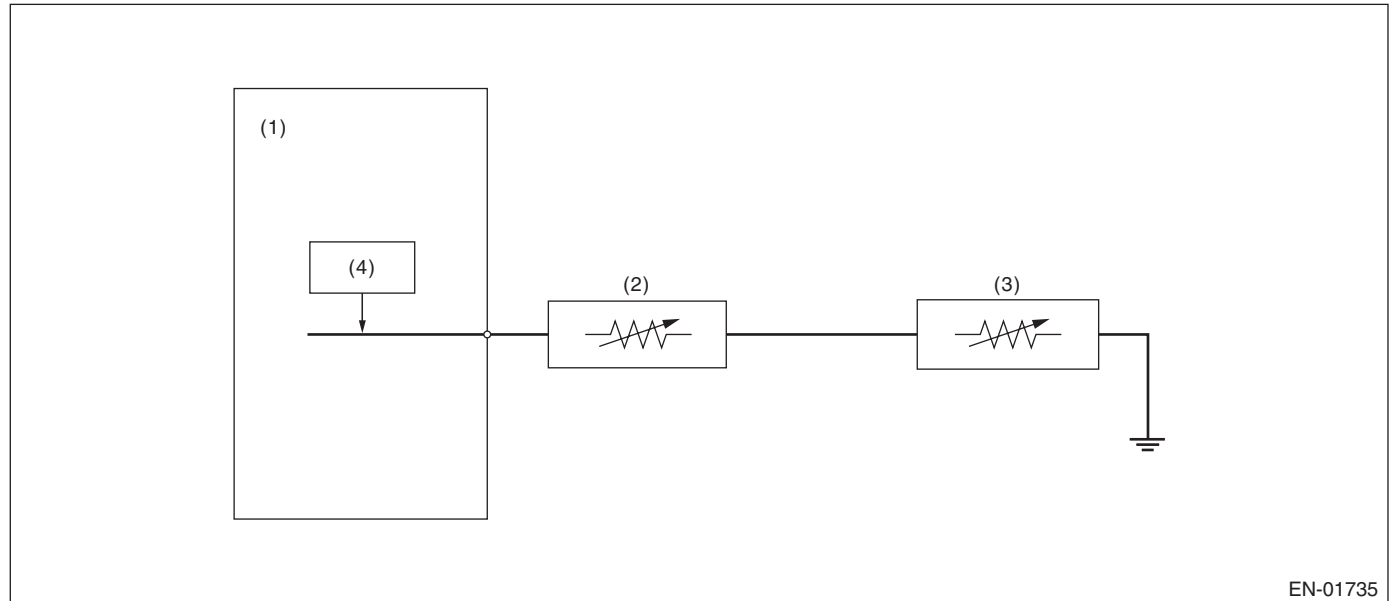
GENERAL DESCRIPTION

BW:DTC P0462 FUEL LEVEL SENSOR “A” CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel level sensor. Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)

(3) Fuel sub level sensor

(4) Detecting circuit

(2) Fuel level sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes more than time needed for diagnosis (2.5 seconds).

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	$\geq 10.9 \text{ V}$
After engine starting	3 seconds or more
Output voltage	$< 0.035 \text{ V}$

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	$\geq 10.9 \text{ V}$
After engine starting	3 seconds or more
Output voltage	$\geq 0.035 \text{ V}$

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

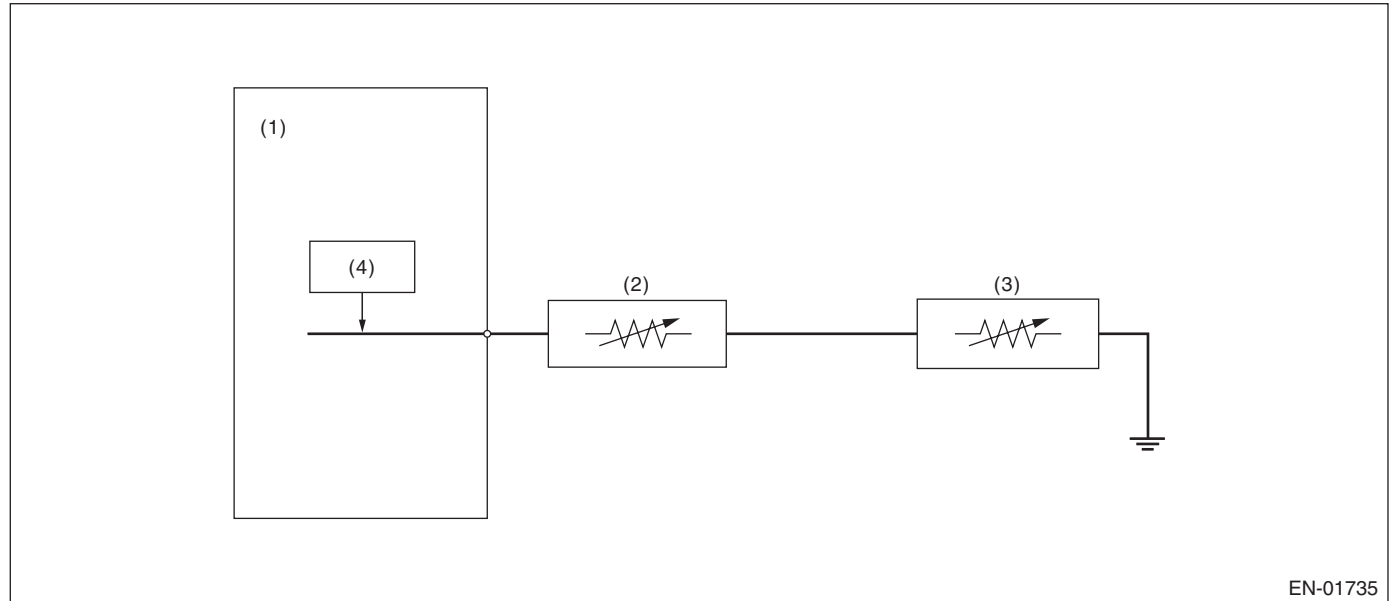
GENERAL DESCRIPTION

BX:DTC P0463 FUEL LEVEL SENSOR “A” CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel level sensor.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)

(3) Fuel sub level sensor

(4) Detecting circuit

(2) Fuel level sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below exceeds the time required for diagnosis (10 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	$\geq 4.911 \text{ V}$

Time Needed for Diagnosis: 10 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	$\geq 10.9 \text{ V}$
After engine starting	3 seconds or more
Output voltage	$< 4.911 \text{ V}$

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

BY:DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT

1. OUTLINE OF DIAGNOSIS

Detect the unstable output faults from the fuel level sensor caused by noise. Judge as NG when the max. value and cumulative value of output voltage variation of the fuel level sensor is larger than the threshold value.

2. ENABLE CONDITION

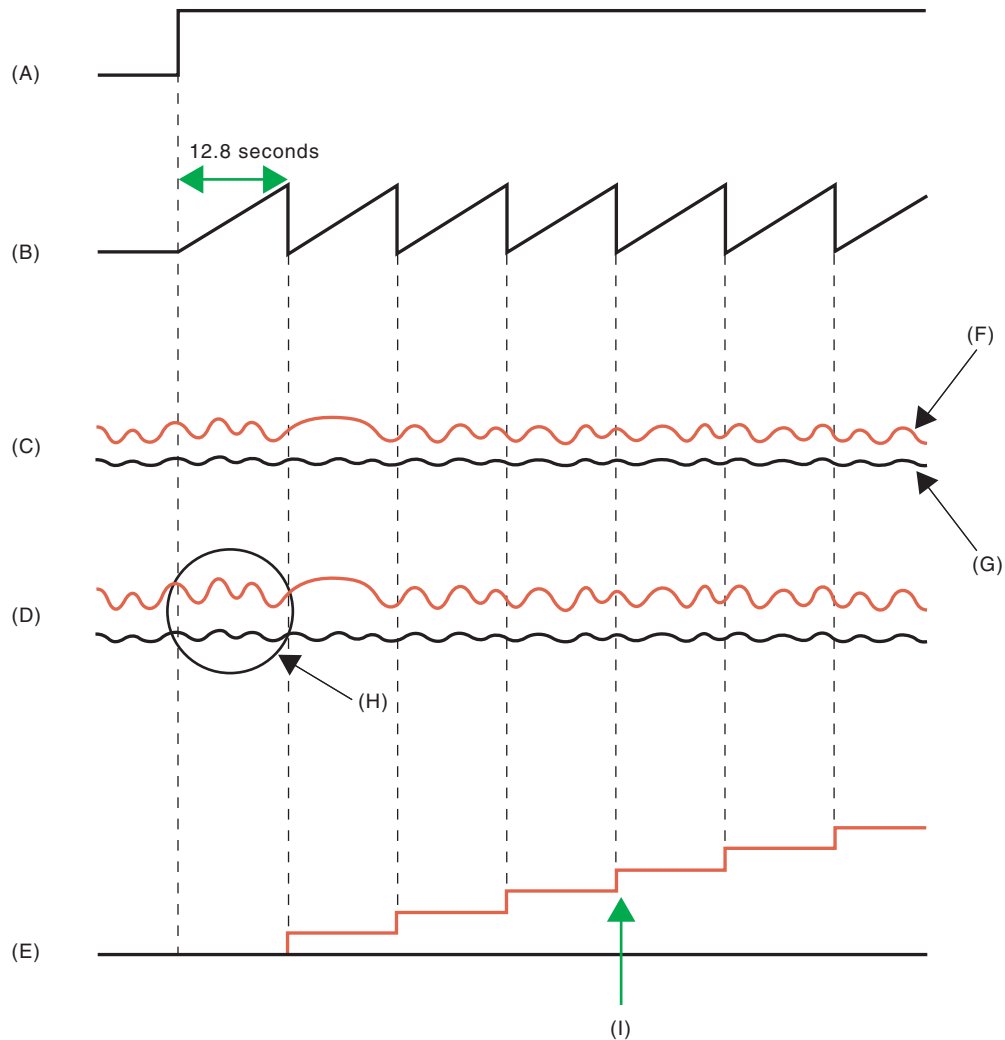
Malfunction Criteria	Threshold Value
Engine speed	≥ 500 rpm
After engine starting	1 second or more
Ignition switch	ON
Battery voltage	> 10.9 V
Idle switch	ON
Fuel level	9 — 51 ℓ (2.38 — 13.47 US gal, 1.98 — 11.22 Imp gal)
Vehicle speed = 0 km/h (0 MPH)	10 seconds or more

3. GENERAL DRIVING CYCLE

- Always perform the diagnosis continuously at idle speed.
- Pay attention to the fuel level.

4. DIAGNOSTIC METHOD

Calculate the Max. value (delflmax) and cumulative value (sumfl) of output voltage variation of fuel level sensor during 12.8 seconds. Judge it normal when both max. and cumulative values are not over the threshold value. Otherwise, when either of them is over the threshold value, the diagnosis counter counts up. Judge as NG if the counter indicated 4 counts.



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- | | | |
|---------------------------------|-----------------------|---|
| (A) Diagnosis condition | (E) Diagnosis counter | (H) The values of DVFLMAX and SUMVFL are regarded as maximum. |
| (B) Diagnosis period | (F) Malfunction | (I) NG at 4 counts |
| (C) Fuel level sensor A/D value | (G) Normal | |
| (D) Fuel level output voltage | | |

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Abnormality Judgment

Judge as NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Total times of the condition reaching follows, DELFLMAX $\geq$ 0.228 V or SUMFL $\geq$ 21.8 V DELFLMAX is Max. deviation of sensor output during 12.8 seconds SUMFL: Integrated value of sensor output deviation in 12.8 seconds	$\geq$ 4 times

The diagnosis counter does not count up when the following conditions are completed within 12.8 seconds.

Maximum value – minimum value of change of tank pressure for 12.8 seconds	$\geq$ 0.05 kPa (0.375 mmHg, 0.01 inHg)
Maximum value – minimum value of battery voltage for 12.8 seconds	$\geq$ 0.465 V

Time required for diagnosis: 12.8 seconds $\times$ 4 times

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
DELFLMAX SUMFL DELFLMAX is Max. deviation of sensor output during 12.8 seconds SUMFL: Integrated value of sensor output deviation in 12.8 seconds	$<$ 0.228 V $<$ 21.8 V

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

BZ:DTC P0483 FAN RATIONALITY CHECK**1. OUTLINE OF DIAGNOSIS**

Detect the function abnormality of the radiator fan.

Judge as NG when the engine coolant temperature slowly decreases even when the radiator fan is rotating.

2. ENABLE CONDITION

Diagnostic enable condition is established if the radiator fan changes from OFF → ON when all of the conditions below are met.

When one of the conditions below is not met, the diagnostic enable condition is not established.

Secondary Parameters	Enable Conditions
Engine speed	550 — 950 rpm
Idle switch	ON
Vehicle speed	0 km/h (0 MPH)
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously at idle speed.

4. DIAGNOSTIC METHOD**Abnormality Judgment**

Judge as NG when the continuous time of meeting the malfunction criteria below becomes more than 5 minutes.

Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature	≥ 95°C (203°F)
Radiator fan	OFF → ON
Engine coolant temperature	Does not decrease

Time Needed for Diagnosis: 5 minutes

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Radiator fan	OFF → ON
Engine coolant temperature	Decreases

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CA:DTC P0502 VEHICLE SPEED SENSOR “A” CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of vehicle speed. Judge NG when low vehicle speed (0 km/h (0 MPH)) remains whereas it seemed to be in a usual driving speed.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	< 4000 rpm
Fuel cut in deceleration	In operation
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Perform diagnosis continually during a deceleration fuel cut, at less than 4000 rpm.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 4 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Vehicle speed	< 1

Time Needed for Diagnosis: 4 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when all of the following criteria are established.

Malfunction Criteria	Threshold Value
Vehicle speed	≥ 1
Starter switch	OFF
Starter switch ON → OFF time	≥ 3 sec.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

- Accelerator sensor signal process: Not allowed fully closed point learning. (Hold previous value)
- Vehicle speed sensor signal process: Vehicle speed = 10 km/h (6.21 MPH)
- Fuel cut control: Not allowed vehicle speed 0 km/h (0 MPH) fuel cut. Normally the high vehicle speed fuel cut performs on “and” of vehicle speed condition and engine speed, but perform the fuel cut only on engine speed condition (4,800 rpm or more).
- ISC control: Open loop compensation is set to (1 g/s). Not allowed ISC feedback volume calculation.
- Air conditioner control: Not allowed air conditioner cut at accelerating.
- Radiator fan control: Both main and sub fan are in High driving.
- Gear ratio judgment: Control as fixed in sixth gear
- Tumble generator valve control: Open the tumble generator valve.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CB:DTC P0503 VEHICLE SPEED SENSOR “A” INTERMITTENT/ERRATIC/HIGH

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of vehicle speed. Judge as NG when high vehicle speed (300 km/h (186.4 MPH) or more) is still present under the driving condition of the vehicle running at a certain speed.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	< 4000 rpm
Fuel cut in deceleration	In operation
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Perform diagnosis continually during a deceleration fuel cut, at less than 4000 rpm.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 4 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Vehicle speed	≥ 300

Time Needed for Diagnosis: 4 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when all of the following criteria are established.

Malfunction Criteria	Threshold Value
Vehicle speed	< 300 km/h (186.4 MPH)
Starter switch	OFF
Starter switch ON → OFF time	≥ 3 sec.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

- Accelerator sensor signal process: Not allowed fully closed point learning. (Hold previous value)
- Vehicle speed sensor signal process: Vehicle speed = 10 km/h (6.21 MPH)
- Fuel cut control: Not allowed vehicle speed 0 km/h (0 MPH) fuel cut. Normally the high vehicle speed fuel cut performs on “and” of vehicle speed condition and engine speed, but perform the fuel cut only on engine speed condition (4,800 rpm or more).
- ISC control: Open loop compensation is set to (1 g/s). Not allowed ISC feedback volume calculation.
- Air conditioner control: Not allowed air conditioner cut at accelerating.
- Radiator fan control: Both main and sub fan are in High driving.
- Gear ratio judgment: Control as fixed in sixth gear
- Tumble generator valve control: Open the tumble generator valve.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CC:DTC P0506 IDLE AIR CONTROL SYSTEM RPM LOWER THAN EXPECTED

1. OUTLINE OF DIAGNOSIS

Detect the malfunction that actual engine speed is not close to target engine speed during idling. Judge as NG when actual engine speed is not close to target engine speed during idling.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	$\geq 70^{\circ}\text{C}$ (158°F)
Battery voltage	$\geq 10.9\text{ V}$
Atmospheric pressure	$> 75.0\text{ kPa}$ (563 mmHg, 22.2 inHg)
Fuel level	$\geq 9\text{ ℓ}$ (2.38 US gal, 1.98 Imp gal)
After engine starting	10 seconds or more
Feedback in ISC	In operation
Lambda value	0.90 — 1.1
After switching air conditioner to ON/OFF	5 seconds or more
After intake manifold pressure varies by 4 kPa (30 mmHg, 1.2 inHg) or more	$> 5\text{ sec.}$
After neutral switch ON-OFF change	$> 5\text{ sec.}$
Vehicle speed	0 km/h (0 MPH)

3. GENERAL DRIVING CYCLE

After 10 seconds from engine starting, perform diagnosis continuously at idling after warming up.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below is 10 seconds $\times$ 3 times.

Judgment Value

Malfunction Criteria	Threshold Value
Actual — Target engine speed	$< -100\text{ rpm}$
Feedback value for ISC	Max.

Time Needed for Diagnosis: 10 seconds $\times$ 3 time

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK and clear NG when the continuous time of meeting the malfunction criteria below becomes more than 10 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Actual — Target engine speed	$\geq -100\text{ rpm}$

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

- Judgment of heavy fuel: Not allowed to make the judgment of heavy fuel.
- Knock compensation:
 - Knock compensation final advance/delay angle value = knock compensation value + whole learning compensation value + portional learning compensation value
 - When normal: Knock compensation value = Fixed at 0°C.A.
 - Failure: Knock compensation value ≠ Fixed at 0°C.A. (When knock: Max. 12°C.A retard)
 - Whole learning compensation coefficient update not allowed.
 - Portional learning zone compensation value calculation not allowed.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CD:DTC P0507 IDLE AIR CONTROL SYSTEM RPM HIGHER THAN EXPECTED

1. OUTLINE OF DIAGNOSIS

Detect the malfunction that actual engine speed is not close to target engine speed during idling. Judge as NG when actual engine speed is not close to target engine speed during idling.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	$\geq 70^{\circ}\text{C}$ (158°F)
Battery voltage	$\geq 10.9\text{ V}$
Atmospheric pressure	$> 75.0\text{ kPa}$ (563 mmHg, 22.2 inHg)
Fuel level	$\geq 9\text{ ℓ}$ (2.38 US gal, 1.98 Imp gal)
After engine starting	10 seconds or more
Feedback in ISC	In operation
Lambda value	0.90 — 1.1
After switching air conditioner to ON/OFF	5 seconds or more
After intake manifold pressure varies by 4 kPa (30 mmHg, 1.2 inHg) or more	$> 5\text{ sec.}$
After neutral switch ON-OFF change	$> 5\text{ sec.}$
Vehicle speed	0 km/h (0 MPH)

3. GENERAL DRIVING CYCLE

After 10 seconds from engine starting, perform diagnosis continuously at idling after warming up.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below is 10 seconds $\times$ 3 times.

Judgment Value

Malfunction Criteria	Threshold Value
Actual – Target engine speed	$\geq 200\text{ rpm}$
Feedback value for ISC	Min.

Time Needed for Diagnosis: 10 seconds $\times$ 3 time

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK and clear NG when the continuous time of meeting the malfunction criteria below becomes more than 10 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Actual – Target engine speed	$< 200\text{ rpm}$

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

- Judgment of heavy fuel: Not allowed to make the judgment of heavy fuel.
- Knock compensation:
 - Knock compensation final advance/delay angle value = knock compensation value + whole learning compensation value + portional learning compensation value
 - When normal: Knock compensation value = Fixed at 0°CA.
 - Failure: Knock compensation value ≠ Fixed at 0°CA. (When knock: Max. 12°CA retard)
 - Whole learning compensation coefficient update not allowed.
 - Portional learning zone compensation value calculation not allowed.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CE:DTC P0512 STARTER REQUEST CIRCUIT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of starter SW.

Judge ON NG when the starter SW signal remains ON.

Judge OFF NG when the engine starts without starter experience.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as ON NG when the continuous time of meeting the malfunction criteria below becomes more than 3 minutes.

Judgment Value

Malfunction Criteria	Threshold Value
Engine speed	> 500 rpm
Starter OFF signal	Not detected
Battery voltage	> 8 V

Time Needed for Diagnosis: 180 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge ON OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Starter switch	OFF
Battery voltage	> 8 V

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CF:DTC P0513 INCORRECT IMMOBILIZER KEY

1. OUTLINE OF DIAGNOSIS

DTC	Item	OUTLINE OF DIAGNOSIS
P0513	Incorrect Immobilizer Key	Incorrect immobilizer key (Use of unregistered key in IMMCM)
P1570	Antenna	Faulty antenna
P1571	Reference Code Incompatibility	Reference code incompatibility between IMMCM and ECM
P1572	IMM Circuit Failure (Except Antenna Circuit)	Communication failure between IMMCM and ECM
P1574	Key Communication Failure	Failure of IMMCM to verify key (transponder) ID code or transponder failure
P1576	EGI Control Module EEPROM	ECM malfunctioning
P1577	IMM Control Module EEPROM	IMMCM malfunctioning

2. ENABLE CONDITION

When starting the engine.

3. GENERAL DRIVING CYCLE

Perform the diagnosis only after starting the engine.

4. DIAGNOSTIC METHOD

Judge as NG when the conditions of the diagnosis outline above are established.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CG:DTC P0519 IDLE AIR CONTROL SYSTEM PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect the malfunction that engine speed increases more than that in normal condition during idling.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Feedback in ISC	In operation
Vehicle speed	< 4 km/h (2.49 MPH)
After engine starting	1 second or more

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when the vehicle is running at a speed of less than 4 km/h (2.49 MPH).

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the all malfunction criteria below becomes more than 2 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Engine speed — Targeted engine speed	≥ 1500 rpm
Feedback value for ISC	$\leq 0\%$
Engine speed change every 180 degree engine revs.	≥ -5 rpm

Time Needed for Diagnosis: 2 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear NG when the continuous time of meeting the malfunction criteria below becomes more than 5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Engine speed — Targeted engine speed	< 200 rpm

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

Fuel cut: Cuts off fuel for only #1 and #2 cylinders, or for all cylinders according to vehicle speed, engine speed, and throttle position.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

CH:DTC P0600 SERIAL COMMUNICATION LINK**1. OUTLINE OF DIAGNOSIS**

Detect malfunction of CAN communication.

Judge as NG when CAN communication is not established, CAN communication with AT is not established, and the data from the AT is not normal.

2. COMPONENT DESCRIPTION

ECM and TCM are connected by high speed CAN.

(Common Specifications)

CAN Protocol 2.0 B (Active)

Frame Format: 11 Bit ID Frame (Standard Frame)

(High speed CAN)

Conforms to ISO11898

Communication Speed: 500 kbps

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Starter switch	OFF
Engine	run

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

5. DIAGNOSTIC METHOD**Abnormality Judgment**

Judge as NG when either of the following conditions is established.

Judge as OK and clear the NG when the continuous time when all of the following criteria are established is more than the predetermined time (1 second).

Judgment Value

Malfunction Criteria	Threshold Value
Bus off flag or warning flag	set
ID is not received from the TCM	= 500 milliseconds

Time Needed for Diagnosis: 1 second

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

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

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of microcomputer (RAM).

Zero clear all normal RAM areas with the initial routine, and judge as NG when the sum of all added RAM after clearing is other than zero.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	OFF → ON

Diagnosis with the initial routine.

3. GENERAL DRIVING CYCLE

Perform the diagnosis as soon as the ignition switch is turned to ON.

4. DIAGNOSTIC METHOD

Judge as NG when the criteria below are met and judge as OK when not met, and clear the NG.

Judgment Value

Malfunction Criteria	Threshold Value
Sum of RAM data after data clear	Cannot be read.

Time Needed for Diagnosis: Undetermined

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

CJ:DTC P0605 INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR**1. OUTLINE OF DIAGNOSIS**

Judge as NG when sum value of ROM is outside the standard value.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD**Abnormality Judgment**

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 0.5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Sum value of ROM	Specification

Time Needed for Diagnosis: Undetermined

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed (Only with engine stopped)

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed (Only with engine stopped)

7. FAIL SAFE

Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

8. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

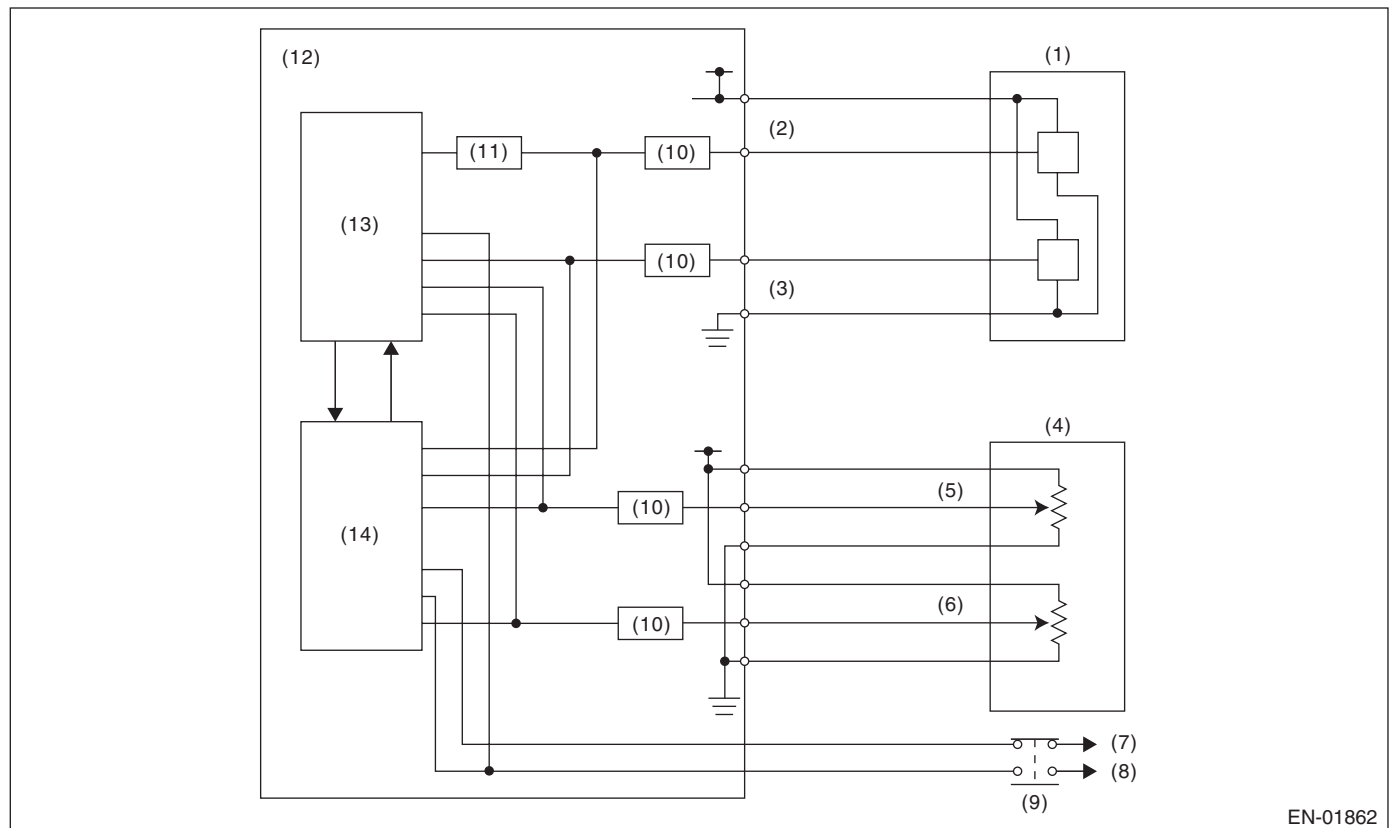
CK:DTC P0607 CONTROL MODULE PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Judge as NG when either the following is completed.

- When the read value of throttle position sensor 1 signal is mismatched between main CPU and sub CPU.
- When the read value of accelerator pedal position sensor 1 signal is mismatched between main CPU and sub CPU.
- When the sub CPU operates abnormally.
- When the communication between main CPU $\longleftrightarrow$ sub CPU is abnormal.
- When the input amplifier circuit of throttle position sensor 1 is abnormal.
- When the cruise control cannot be canceled correctly.
- When the signal of brake SW1 and 2 is mismatched.
- When the directed angle from the main CPU is abnormal.

2. COMPONENT DESCRIPTION



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- | | | |
|---|---|----------------------------------|
| (1) Throttle position sensor | (6) Accelerator pedal position sensor 2 | (11) Amplifier circuit |
| (2) Throttle position sensor 1 | (7) Battery | (12) Engine control module (ECM) |
| (3) Throttle position sensor 2 | (8) Stop light | (13) Sub CPU |
| (4) Accelerator pedal position sensor | (9) Brake switch | (14) Main CPU |
| (5) Accelerator pedal position sensor 1 | (10) I/F circuit | |

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
(1) Ignition switch	ON
(2) Ignition switch	ON
(3) None	—
(4) None	—
(5) Throttle opening angle	
(6) Brake switch (only with cruise control)	ON
(7) None	—

4. GENERAL DRIVING CYCLE

- (1) — (4): Always perform the diagnosis continuously.
(5): Always perform the diagnosis continuously when idling.
(6): Perform the diagnosis when the brake pedal is depressed.
(7): Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
1. Difference of CPU on reading value of throttle position sensor signal	Within 0.858 V
2. Difference of CPU on read value of accelerator pedal position sensor signal	Within 0.042 V
3. WD pulse from sub CPU	WD pulse occur
4. Communication between CPU	Possible to communicate
5. Difference of signal on connection of amplifier	Within $X \pm 3^\circ$
6. Cruise control cancel signal at brake ON	Cruise control cancel signal ON
7. Brake switch 1, 2 signal	SW 1 and 2 are matched

Time Needed for Diagnosis:

1. 250 milliseconds
2. 250 milliseconds
3. 200 milliseconds
4. 200 milliseconds
5. 24 milliseconds
6. 250 milliseconds
7. 200 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6° .)

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

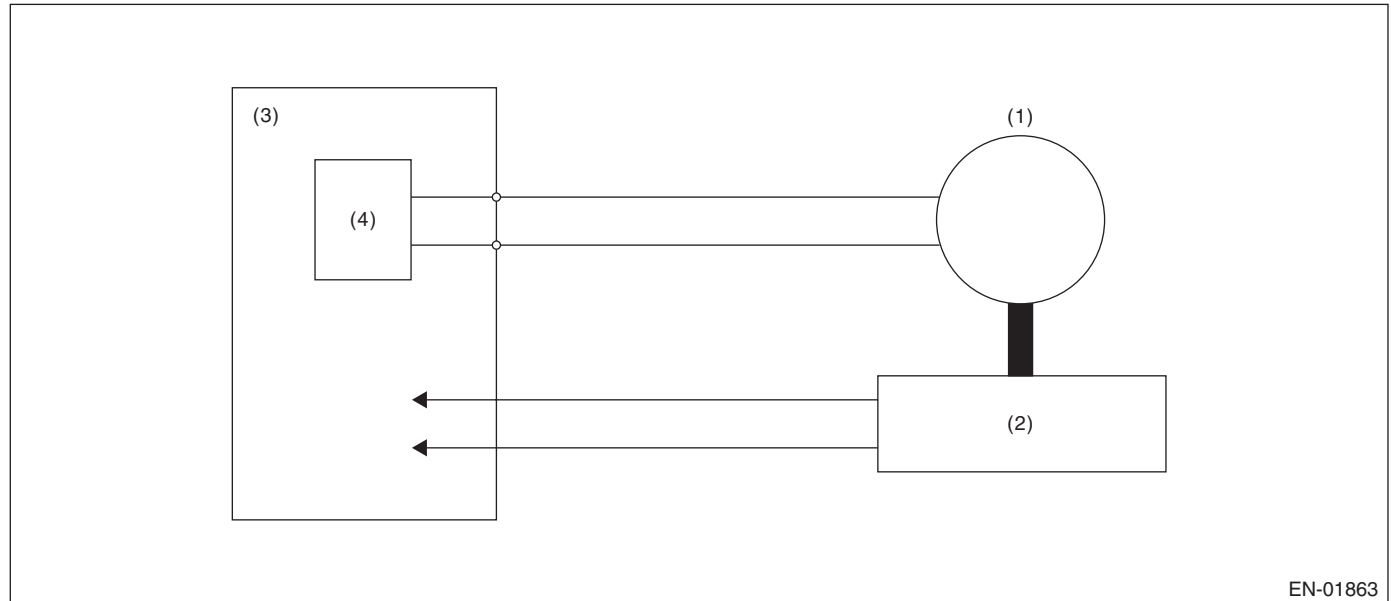
GENERAL DESCRIPTION

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

1. OUTLINE OF DIAGNOSIS

Judge as NG when the target opening angle and actual opening angle is mismatched or the current to motor is more than specified duty for specified time continuously.

2. COMPONENT DESCRIPTION



(1) Motor

(3) Engine control module (ECM)

(4) Drive circuit

(2) Throttle position sensor

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.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

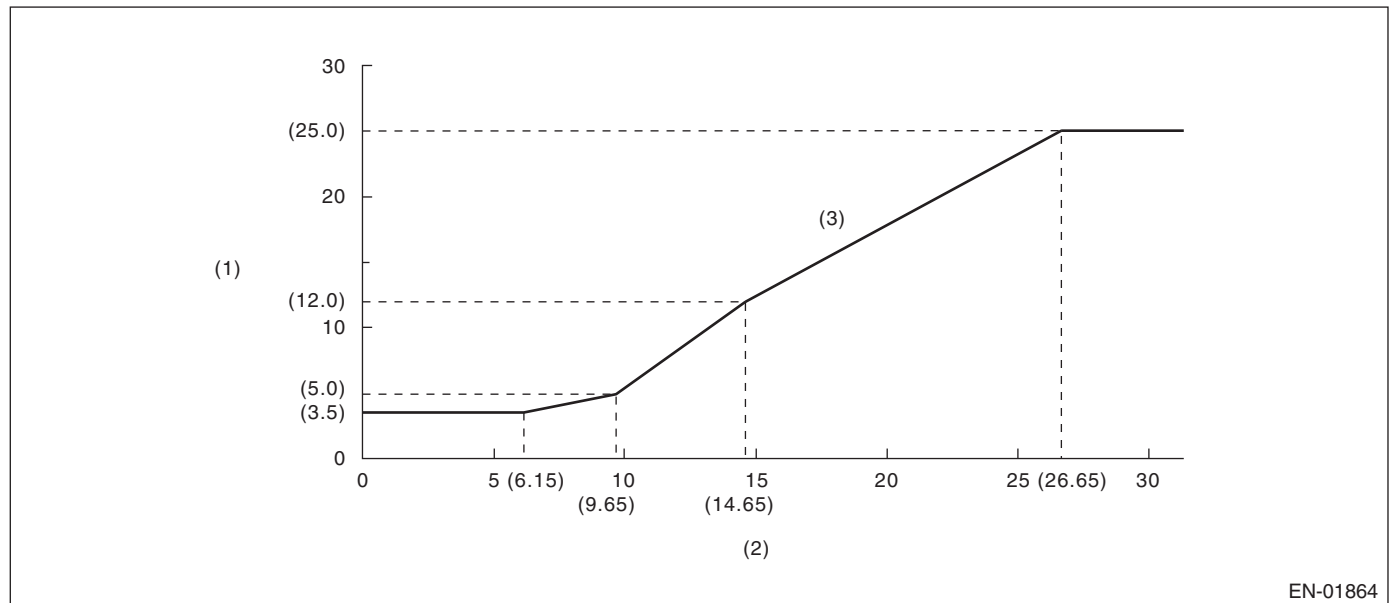
Judgment Value

Malfunction Criteria	Threshold Value
Difference between target opening angle and actual opening angle	3.5° or less
Output duty to drive circuit	95% or less

Time Needed for Diagnosis:

- Target opening angle and actual opening angle: 250 milliseconds (For NG) 2000 milliseconds (For OK)
- Output duty to drive circuit: 2000 milliseconds

Details of Judgment Value



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(1) Difference between target opening angle and actual opening angle (°)

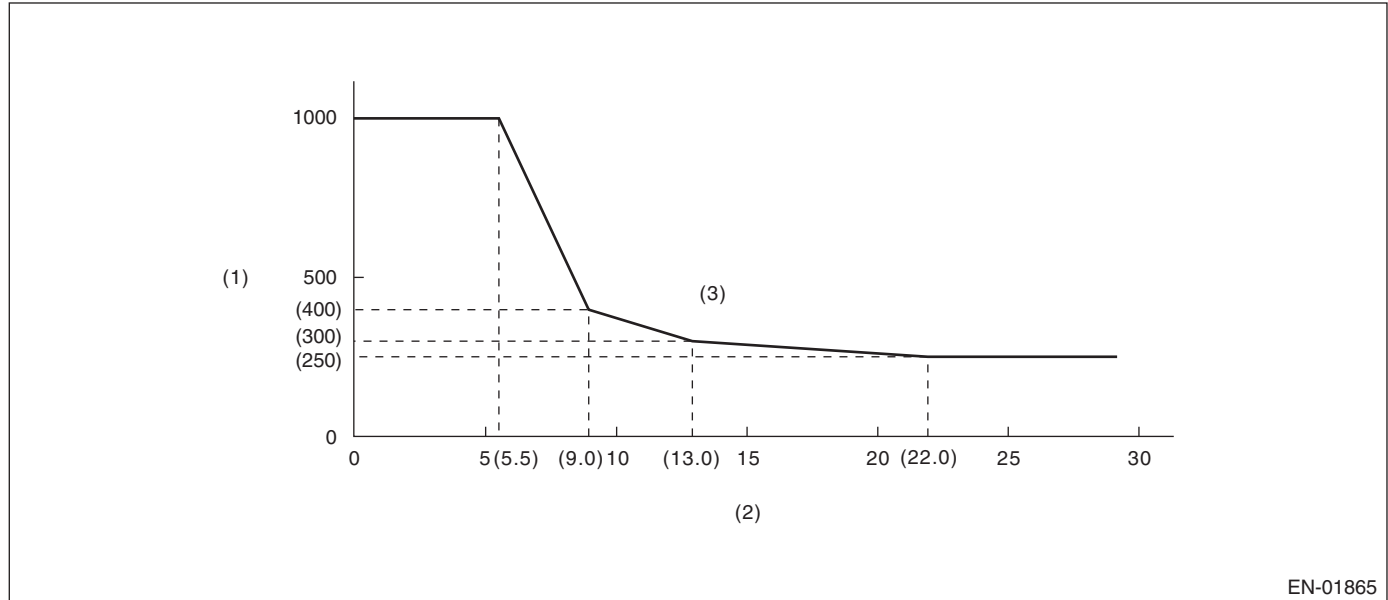
(2) Target throttle opening angle (°)

(3) NG area

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Details of Judgment (The actual opening angle $\leq$ target opening angle is always 1000 milliseconds)



(1) Judgment time (milliseconds)

(2) Throttle position sensor 1 opening angle

(3) NG area

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed (Only with engine stopped)

8. FAIL SAFE

Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CM:DTC P0691 FAN 1 CONTROL CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect the open/short circuit of radiator fan circuit.

Judge as NG when the ECM output level differs from the actual terminal level.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
After engine starting	1 second or more
Engine speed	≥ 500 rpm
Ignition switch	ON
Battery voltage	≥ 10.9 V
Terminal voltage level when ECM outputs OFF signal	Low level

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
After engine starting	1 second or more
Engine speed	≥ 500 rpm
Ignition switch	ON
Battery voltage	≥ 10.9 V
Terminal voltage level when ECM outputs OFF signal	High level

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CN:DTC P0692 FAN 1 CONTROL CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect the open/short circuit of radiator fan circuit.

Judge as NG when the ECM output level differs from the actual terminal level.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
After engine starting	1 second or more
Engine speed	≥ 500 rpm
Ignition switch	ON
Battery voltage	≥ 10.9 V
Terminal voltage level when ECM outputs ON signal	High level

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
After engine starting	1 second or more
Engine speed	≥ 500 rpm
Ignition switch	ON
Battery voltage	≥ 10.9 V
Terminal voltage level when ECM outputs ON signal	Low level

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

CO:DTC P0700 TRANSMISSION CONTROL SYSTEM (MIL REQUEST)**1. OUTLINE OF DIAGNOSIS**

CAN communication is established with AT and, judge as NG when there is a MIL lighting request.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the malfunction criteria below becomes longer than the predetermined amount of time (2.5 seconds).

Judge as OK and clear the NG when the following conditions are not met.

Judgment Value

Malfunction Criteria	Threshold Value
MIL lighting request from TCM	set

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CP:DTC P0851 PARK/NEUTRAL SWITCH INPUT CIRCUIT LOW (AT MODEL)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the neutral SW.

Judge NG when the ECM neutral terminal input differs from the reception data from TCM.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	2 seconds or more
Starter switch	OFF

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds after starting the engine.

4. DIAGNOSTIC METHOD

Judge as NG when the continuous time until meeting the malfunction criteria below becomes more than 6.5 seconds. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Neutral switch signal when park/neutral = "OFF" and any other switches = "ON" on AT	LOW (ON)

Time Needed for Diagnosis: 6.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

CQ:DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW (MT MODEL)**1. OUTLINE OF DIAGNOSIS**

Judge the open or short circuit of the neutral SW.

Judge NG when there is no change in the neutral SW even if the driving shift was applied. (There is neutral SW ON/OFF inversion from the vehicle speed and engine speed.)

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	2 seconds or more
Starter switch	OFF

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds after starting the engine.

4. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed 3 time or more after the neutral SW change. And clear NG if there is change in the neutral SW.

Judgment Value

Malfunction Criteria	Threshold Value
Neutral switch signal (while changing from a to b below)	Low continues
Driving condition change	a) to b)
a) Vehicle speed = 0 km/h (0 MPH) and engine speed 600 — 900 rpm	
b) Vehicle speed ≥ 64 km/h (39.8 MPH) and engine speed 1600 — 2550 rpm	

Time Needed for Diagnosis: Monitoring 3 times

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

Cruise control: Not allowed to command cruise control.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CR:DTC P0852 PARK/NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT MODEL)

1. OUTLINE OF DIAGNOSIS

Judge the open or short circuit of the neutral SW.

Judge NG when the ECM neutral terminal input differs from the reception data from TCM.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	2 seconds or more
Starter switch	OFF

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds after starting the engine.

4. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 6.5 seconds.

Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Neutral switch signal when park/neutral = "ON" and any other switches = "OFF" on AT	HIGH (OFF)

Time Needed for Diagnosis: 6.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

CS:DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT MODEL)**1. OUTLINE OF DIAGNOSIS**

Judge the open or short circuit of the neutral SW.

Judge NG when there is no change in the neutral SW even if the driving shift was applied. (There is neutral SW ON/OFF inversion from the vehicle speed and engine speed.)

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	2 seconds or more
Starter switch	OFF

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds after starting the engine.

4. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed 3 time or more after the neutral SW change. And clear NG if there is change in the neutral SW.

Judgment Value

Malfunction Criteria	Threshold Value
Neutral switch signal (while changing from a to b below)	High continues
Driving condition change	a) to b)
a) Vehicle speed = 0 km/h (0 MPH) and engine speed 600 — 900 rpm	
b) Vehicle speed ≥ 64 km/h (39.8 MPH) and engine speed 1600 — 2550 rpm	

Time Needed for Diagnosis: Monitoring 3 times

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CT:DTC P1152 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK 1 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

Detect that λ value remains Low.

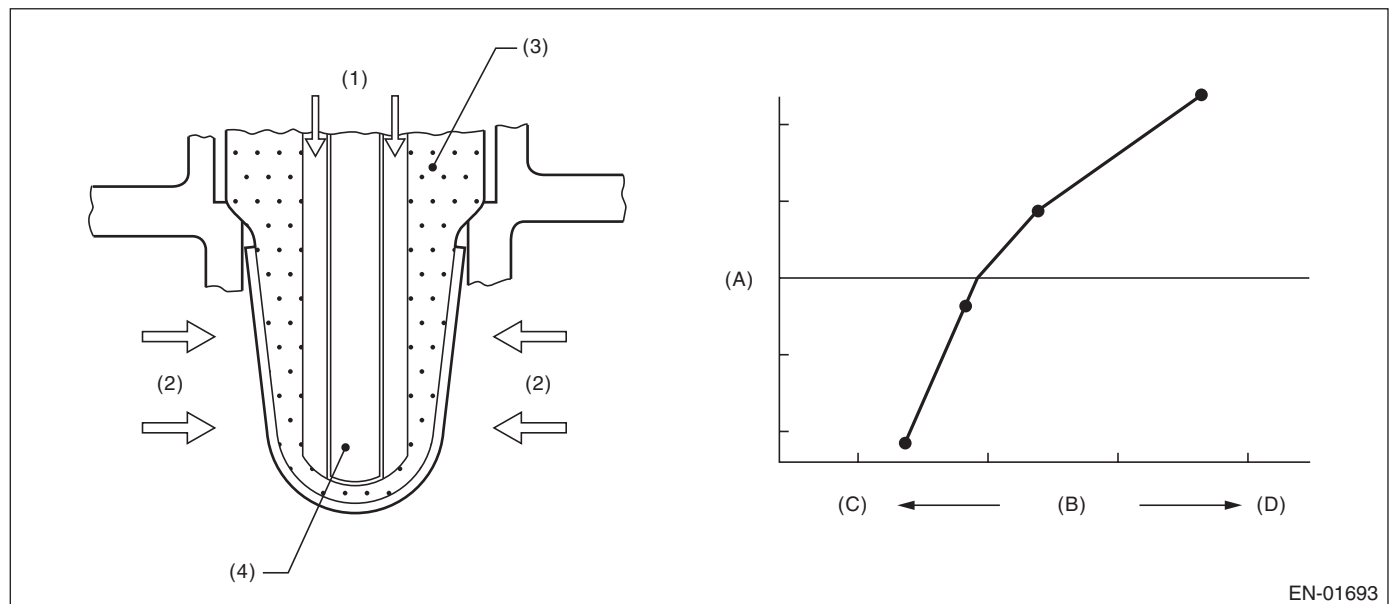
Judge as NG when lambda value is abnormal in accordance with λ value of front oxygen (A/F) sensor and running conditions such as vehicle speed, amount of intake air, engine coolant temperature, sub feedback control, etc.

λ value = Actual air fuel ratio/Theoretical air fuel ratio

$\lambda > 1$: Lean

$\lambda < 1$: Rich

2. COMPONENT DESCRIPTION



EN-01693

(A) Electromotive force

(B) Air fuel ratio

(1) Atmosphere

(2) Exhaust gas

(C) Lean

(3) ZrO₂

(D) Rich

(4) Ceramic heater

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
All secondary parameters enable conditions	4 seconds or more
Battery voltage	> 10.9 V
Atmospheric pressure	> 75.0 kPa (563 mmHg, 22.2 inHg)
Rear oxygen sensor sub feedback	Operate
Rear oxygen sensor output voltage – Feedback target voltage	–0.2 V — 0.1 V
or	
Rear oxygen sensor sub feedback compensation coefficient	On Min.
or	
Rear oxygen sensor sub feedback compensation coefficient	On Max.
After engine starting	60 seconds or more
Engine coolant temperature	≥ 70°C (158°F)
Vehicle speed	≥ 20 km/h (12.4 MPH)
Amount of intake air	≥ 6 g/s
Load change during 0.5 engine revs.	≤ 0.01 g/rev
Front oxygen (A/F) sensor impedance	0 — 50 Ω
Learning value of evaporation gas density	≤ 0.2
Total time of operating canister purge	20 seconds or more

4. GENERAL DRIVING CYCLE

Perform diagnosis continuously at a constant speed of 20 km/h (12 MPH) or more, from 60 seconds after starting the engine.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the malfunction criteria below becomes more than the time needed for diagnosis (10 seconds). Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
λ value when rear oxygen sensor sub feedback compensation coefficient is not at maximum limit	≤ 0.85

Time Needed for Diagnosis: 10 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

- Front oxygen (A/F) sensor main learning compensation: Not allowed to calculate.
- Correction when re-starting at high temperature: Normally minimum value 0.3 → 0.
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CU:DTC P1153 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK 1 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

Detect that λ value remains High.

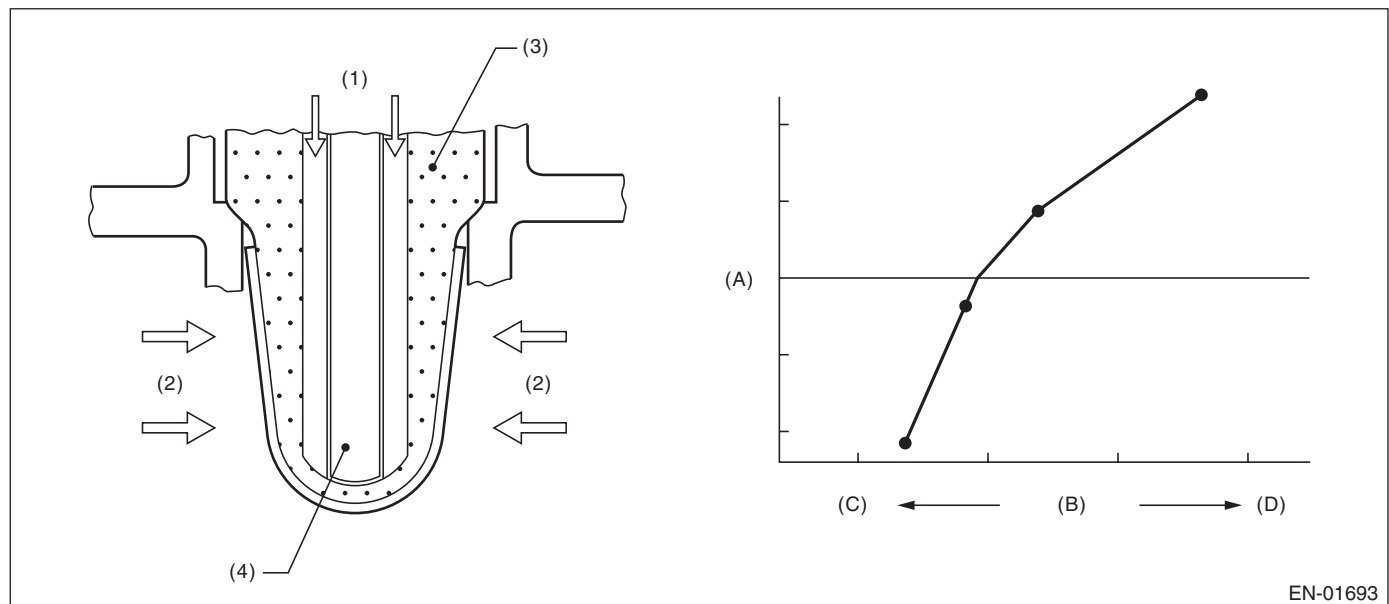
Judge as NG when lambda value is abnormal in accordance with λ value of front oxygen (A/F) sensor and running conditions such as vehicle speed, amount of intake air, engine coolant temperature, sub feedback control, etc.

λ value = Actual air fuel ratio/Theoretical air fuel ratio

$\lambda > 1$: Lean

$\lambda < 1$: Rich

2. COMPONENT DESCRIPTION



(A) Electromotive force

(B) Air fuel ratio

(1) Atmosphere

(2) Exhaust gas

(C) Lean

(3) ZrO₂

(D) Rich

(4) Ceramic heater

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
All secondary parameters enable conditions	4 seconds or more
Battery voltage	> 10.9 V
Barometric pressure	> 75.0 kPa (563 mmHg, 22.2 inHg)
Rear oxygen sensor sub feedback	Operate
Rear oxygen sensor output voltage – Feedback target voltage	–0.2 V — 0.1 V
or	
Rear oxygen sensor sub feedback compensation coefficient	On Min.
or	
Rear oxygen sensor sub feedback compensation coefficient	On Max.
After engine starting	60 seconds or more
Engine coolant temperature	≥ 70°C (158°F)
Vehicle speed	≥ 20 km/h (12.4 MPH)
Amount of intake air	≥ 6 g/s
Load change during 0.5 engine revs.	≤ 0.02 g/rev
Front oxygen (A/F) sensor impedance	0 — 50 Ω
Learning value of evaporation gas density	≤ 0.2
Total time of operating canister purge	20 seconds or more

4. GENERAL DRIVING CYCLE

Perform diagnosis continuously at a constant vehicle speed of 20 km/h (12 MPH) or more, from 60 seconds after starting the engine.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the malfunction criteria below becomes more than the time needed for diagnosis (10 seconds). Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
λ value when rear oxygen sensor sub feedback compensation coefficient cannot be at minimum limit	≥ 1.15

Time Needed for Diagnosis: 10 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

- Front oxygen (A/F) sensor main learning compensation: Not allowed to calculate.
- Correction when re-starting at high temperature: Normally minimum value 0.3 → 0.
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

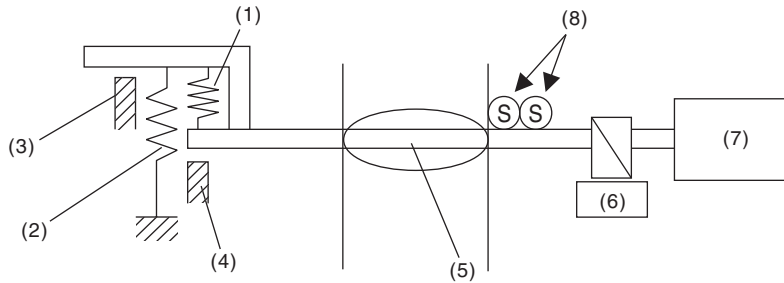
GENERAL DESCRIPTION

CV:DTC P1160 RETURN SPRING FAILURE

1. OUTLINE OF DIAGNOSIS

Judge as NG when the valve does not move to the close direction with the motor power stopped and the valve open more than the default opening.

2. COMPONENT DESCRIPTION



EN-01866

- | | | |
|--------------------------|-------------------------|----------------------------------|
| (1) Opener spring | (4) Full closed stopper | (7) DC motor |
| (2) Return spring | (5) Throttle valve | (8) Main and sub throttle sensor |
| (3) Intermediate stopper | (6) Gear | |

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Throttle opening angle	OFF
Motor continuity	OFF

4. GENERAL DRIVING CYCLE

- Ignition switch ON → OFF
- Ignition switch OFF → ON (Only after clearing memory)

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 0.6 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Opening variation after continuity is set to OFF	< 2°

Time Needed for Diagnosis: 600 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed (Only with engine stopped)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed (Only with engine stopped)

8. FAIL SAFE

Throttle opening is fixed to 6°.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

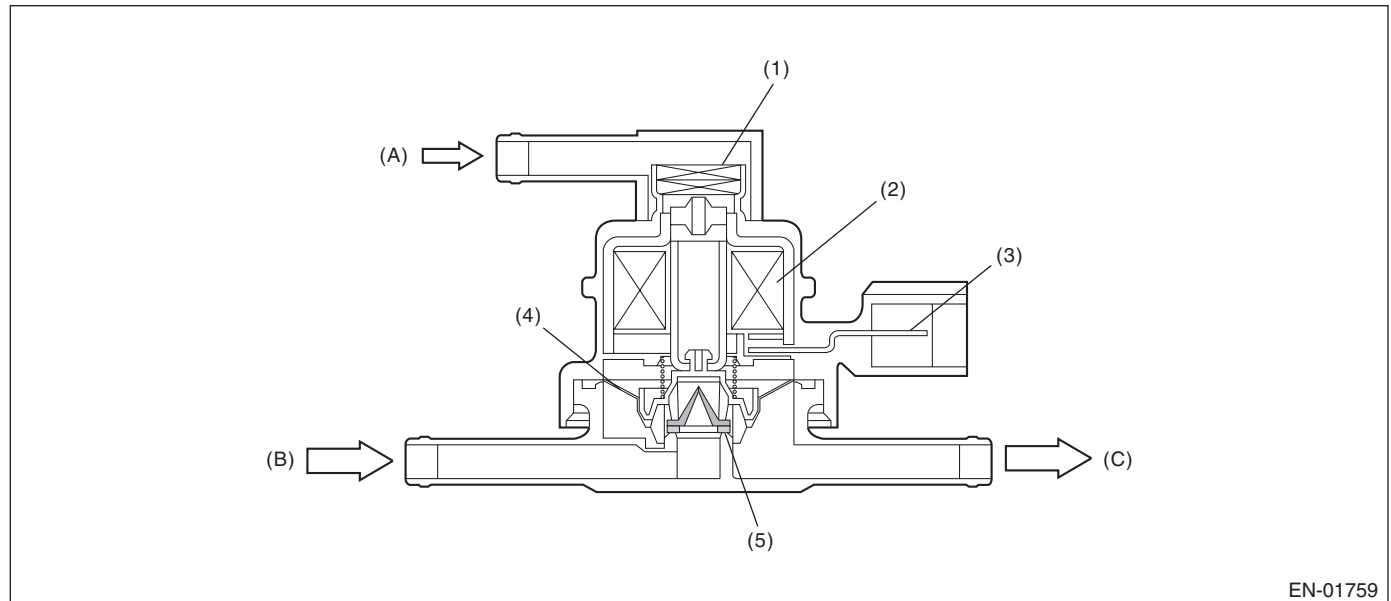
CW:DTC P1400 FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect the open/short circuit of pressure control solenoid valve.

Judge as NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(A) Atmospheric pressure

(B) Shut-off valve

(C) To fuel tank

(1) Filter

(3) Connector terminal

(5) Valve

(2) Coil

(4) Diaphragm

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	$\geq 10.9 \text{ V}$
After engine starting	1 second or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the malfunction criteria below becomes more than time needed for diagnosis (2.5 seconds). Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage when ECM outputs OFF signal	Low

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CX:DTC P1410 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN

1. OUTLINE OF DIAGNOSIS

Continually detects for a combination solenoid valve and lead valve stuck open condition.

Calculate the integrated value of secondary air supply piping pressure sensor output voltage maximum/minimum values and output voltage deviation for a constant time period after engine start, and if the difference between the maximum/minimum is large and the integrated value is also large, judge as NG.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	< 500 rpm
After engine starting	9 seconds or more
After secondary air injection system stop	9 seconds or more
Amount of intake air	2g (0.07 oz)/second or more and Less than 400 g (14.11 oz)/seconds
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Perform diagnosis continuously after engine start with the secondary air pump stopped and with a high air flow amount.

4. DIAGNOSTIC METHOD

When the solenoid and lead valves of the combination valve both are open and malfunctioning, a pulse will appear in the secondary air supply piping pressure sensor output. This pulse is tracked by the following method to detect the problem.

Calculate the maximum and minimum values of the secondary air supply piping pressure sensor output voltage, and integrated value (sum) of the output voltage deviation for kCOTIM seconds. The difference between the maximum/minimum values is compared with the threshold value, and the sum is also compared with the threshold value. If both exceed the threshold, the NG counter is counted up, and when the counter becomes kCOCOT times, an NG judgment is made. If neither exceed the threshold, or only one exceeds the threshold, it is judged as being normal.

Judgment Value

Malfunction Criteria	Threshold Value
Pipe inner pressure difference between Max. and Min.	≥ 0.048 V
Cumulative pipe inner pressure change per 4 milliseconds	≥ 24 V
Amount of atmospheric pressure change	< 4 mmHg

Time Needed for Diagnosis: 10 seconds × 2 time

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

CY:DTC P1418 SECONDARY AIR INJECTION SYSTEM CONTROL “A” CIRCUIT SHORTED**1. OUTLINE OF DIAGNOSIS**

Judge as NG when the ECM output level differs from the actual terminal level.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD**Abnormality Judgment**

When the continuous time with following conditions being established exceeds 2.5 seconds, it is judged as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Ignition	ON
Terminal output voltage when ECM outputs ON signal	High

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK when the following conditions are established, and clear the NG.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Ignition	ON
Terminal output voltage when ECM outputs ON signal	Low

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

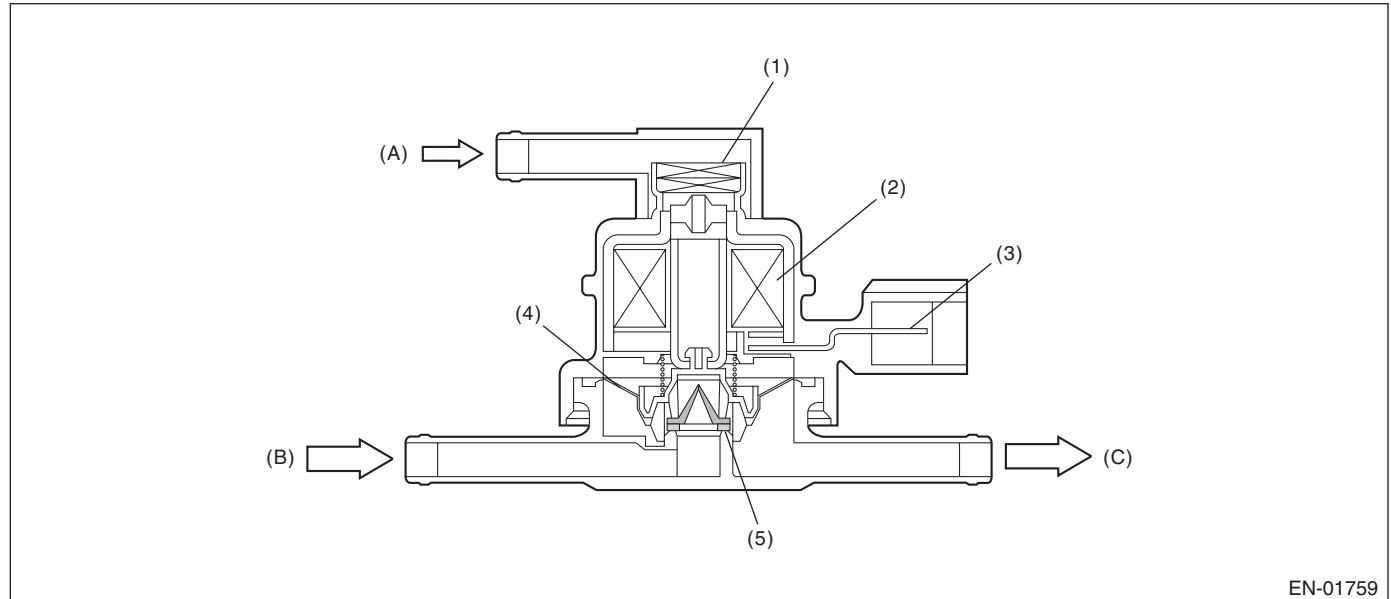
CZ:DTC P1420 FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect the open/short circuit of pressure control solenoid valve.

Judge as NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(A) Atmospheric pressure

(B) Shut-off valve

(C) To fuel tank

(1) Filter

(3) Connector terminal

(5) Valve

(2) Coil

(4) Diaphragm

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the malfunction criteria below becomes more than time needed for diagnosis (2.5 seconds). Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage when ECM outputs ON signal	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

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

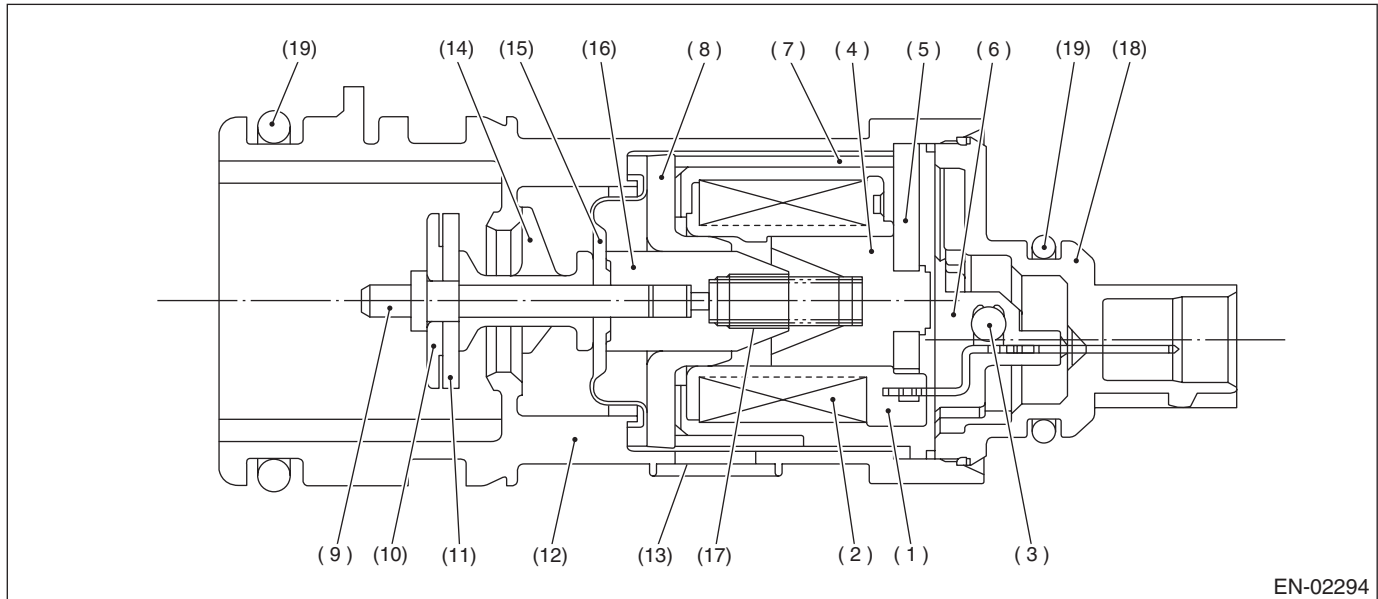
DA:DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM

1. OUTLINE OF DIAGNOSIS

Detect the abnormal function (stuck closed) of the drain valve.

Judge as NG when fuel tank pressure is low.

2. COMPONENT DESCRIPTION



- | | | |
|-----------------|--------------------|-------------------|
| (1) Bobbin | (8) Magnetic plate | (15) Diaphragm |
| (2) Coil | (9) Shaft | (16) Movable core |
| (3) Diode | (10) Plate | (17) Spring |
| (4) Stator core | (11) Valve | (18) Cover |
| (5) End plate | (12) Housing | (19) O-ring |
| (6) Body | (13) Filter | |
| (7) Yoke | (14) Retainer | |

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Drain valve	Open
Battery voltage	$\geq 10.9 \text{ V}$
Atmospheric pressure	$\geq 75.0 \text{ kPa}$ (563 mmHg, 22.2 inHg)
Tank pressure when starter is OFF → ON	$-0.67 \text{ — } 1.43 \text{ kPa}$ ($-5 \text{ — } 10.7 \text{ mmHg}$, $-0.20 \text{ — } 0.42 \text{ inHg}$)

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes more than 3 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Tank pressure	≤ -4.0 kPa (-30 mmHg, -1.18 inHg)

Time Needed for Diagnosis: 3 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when all the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Tank pressure	> -4.0 kPa (-30 mmHg, -1.18 inHg)
Cumulative time when all of the malfunction criteria below is completed.	≥ 30 sec.
Purge control solenoid valve duty ratio	Not = 0
Fuel temperature	-10 — 45°C (14 — 113°F)
Intake manifold relative pressure	≤ -26.7 kPa (-200 mmHg, -7.87 inHg)

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

Pressure control solenoid valve control: Open the pressure control solenoid valve.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

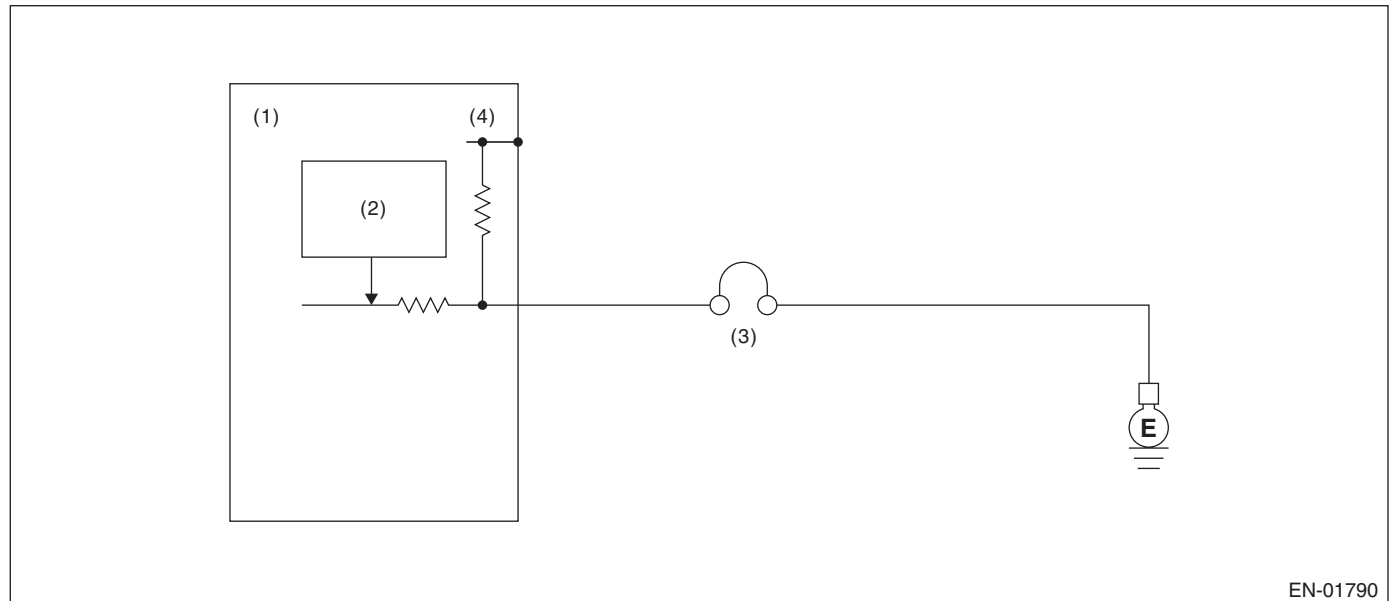
DB:DTC P1491 POSITIVE CRANKCASE VENTILATION (BLOW-BY) FUNCTION PROBLEM

1. OUTLINE OF DIAGNOSIS

Detect the blow-by hose release abnormality.

Judge as NG when the diagnosis terminal voltage is high.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)

(3) PCV diagnosis connector

(4) 5 V

(2) Detecting circuit

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	> 10.9 V
Positive crankcase ventilation diagnosis voltage	High
Engine speed	≥ 500 rpm

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	> 10.9 V
Positive crankcase ventilation diagnosis voltage	Low
Engine speed	≥ 500 rpm

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the diagnostic value and trouble standard value. (For test mode \$06)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

DC:DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of starter SW.

Judge as OFF NG when the engine starts without starter ON experience.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as OFF NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Vehicle speed	< 1 km/h (0.62 MPH)
Starter ON signal	Not detected
Engine speed in 0.8 seconds or more for which the condition that engine speed is less than 500 rpm continues	≥ 500 rpm

Time Needed for Diagnosis: 1 second

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OFF OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Starter ON	Experienced
Starter ON diagnosis	Not diagnosed
Battery voltage	> 8 V

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DD:DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION**1. OUTLINE OF DIAGNOSIS**

Detect the open/short circuit of back-up power supply circuit.

Judge as NG when the backup voltage becomes smaller than the battery voltage.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD**Abnormality Judgment**

Judge as NG when the continuous time of meeting the malfunction criteria below becomes more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Voltage of back-up power supply	$< \text{Battery voltage} \times 0.7$
Battery voltage	$\geq 10.9 \text{ V}$

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Voltage of back-up power supply	$\geq \text{Battery voltage} \times 0.7$
Battery voltage	$\geq 10.9 \text{ V}$

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

DE:DTC P1570 ANTENNA

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P0513. <Ref. to GD(H4DOTC)-179, DTC P0513 INCORRECT IM-MOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DF:DTC P1571 REFERENCE CODE INCOMPATIBILITY

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P0513. <Ref. to GD(H4DOTC)-179, DTC P0513 INCORRECT IM-MOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DG:DTC P1572 IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT)

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P0513. <Ref. to GD(H4DOTC)-179, DTC P0513 INCORRECT IM-MOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DH:DTC P1574 KEY COMMUNICATION FAILURE

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P0513. <Ref. to GD(H4DOTC)-179, DTC P0513 INCORRECT IM-MOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DI: DTC P1576 EGI CONTROL MODULE EEPROM

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P0513. <Ref. to GD(H4DOTC)-179, DTC P0513 INCORRECT IM-MOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DJ:DTC P1577 IMM CONTROL MODULE EEPROM

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P0513. <Ref. to GD(H4DOTC)-179, DTC P0513 INCORRECT IM-MOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DK:DTC P1602 CONTROL MODULE PROGRAMMING ERROR**1. OUTLINE OF DIAGNOSIS**

Detect the malfunction of catalytic converter initial warm-up retard angle control.

Judge as NG if the ECM is not operating properly when performing catalytic converter initial warm-up retard angle control.

Judge as NG when either the exhaust temperature diagnosis or the idle speed diagnosis becomes NG.

- Exhaust temperature diagnosis

Judge as NG if the exhaust temperature is below the specified value at 14 seconds after a cold start.

- Idle speed diagnosis

Judge as NG when actual engine speed is not close to the target engine speed after stopping the retard angle control.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Atmospheric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Battery voltage	> 10.9 V
Cold start diagnosis	Incomplete
Engine	Run
Vehicle speed	≤ 2 km/h (1 MPH)
Misfire in 200 engine revs.	< 5
Time elapsed after engine start	14 seconds

3. GENERAL DRIVING CYCLE

Perform diagnosis during cold start.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

4. DIAGNOSTIC METHOD

- Exhaust temperature diagnosis

Abnormality Judgment

When the diagnostic execution conditions are established, calculate the estimated exhaust temperature. Judge as NG if the following conditions are established within 14 seconds after starting the engine.

Judgment Value

Malfunction Criteria	Threshold Value
Estimated exhaust temperature	< Value from Map 1

Map 1

Coolant temperature at engine start	-40°C (-40°F)	-30°C (-22°F)	-20°C (-4°F)	-10°C (14°F)	0°C (32°F)	10°C (50°F)	20°C (68°F)	30°C (86°F)	40°C (104°F)	50°C (122°F)
Threshold Value	200°C (392°F)	200°C (392°F)	200°C (392°F)	200°C (392°F)	200°C (392°F)	200°C (392°F)	180°C (356°F)	180°C (356°F)	180°C (356°F)	180°C (356°F)

Time Needed for Diagnosis: 14 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK when the following conditions are established after predetermined amount of time has passed.

Judgment Value

Malfunction Criteria	Threshold Value
Estimated exhaust temperature	≥ Value from Map 1

- Idle speed diagnosis

Judge as NG when all the following conditions are established and judge as OK when not met.

Malfunction Criteria	Threshold Value
Continuous time of (target engine RPM – engine RPM > 100)	≥ 10000 milliseconds
Continuous time when (actual retard amount > 5°CA)	≥ 3000 milliseconds

Time Needed for Diagnosis: 6 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

**DL:DTC P2004 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN
(BANK 1)****1. OUTLINE OF DIAGNOSIS**

Detect the malfunction of tumble generator valve motor function.

Judge open fixing malfunction when the opening degree is large even after finishing the tumble generator valve closing driving.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 10.9 \text{ V}$
Engine coolant temperature	$\geq 0^{\circ}\text{C}$ (32°F)
Ambient air temperature	$\geq 0^{\circ}\text{C}$ (32°F)

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD**Abnormality Judgment**

Judge as NG when the continuous time of meeting the malfunction criteria below becomes more than 3 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generator valve opening	$\geq 67.4^{\circ}$
Tumble generator valve "close" signal output	2.2 seconds or more

Time Needed for Diagnosis: 3 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generator valve opening	$< 67.4^{\circ}$
Tumble generator valve "close" signal output	2.2 seconds or more

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

Tumble generator valve opening

- For tumble generator valve full closing points learning, not allowed to update to closing side.
- For tumble generator valve full opening points learning, not allowed to update to opening side.

Tumble generator valve control

- Output the open signal.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

DM:DTC P2005 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 2)

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of tumble generator valve motor function.

Judge open fixing malfunction when the opening degree is large even after finishing the tumble generator valve closing driving.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 10.9 \text{ V}$
Engine coolant temperature	$\geq 0^{\circ}\text{C}$ (32°F)
Ambient air temperature	$\geq 0^{\circ}\text{C}$ (32°F)

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes more than 3 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generator valve opening	$\geq 67.4^{\circ}$
Tumble generator valve "close" signal output	2.2 seconds or more

Time Needed for Diagnosis: 3 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generator valve opening	$< 67.4^{\circ}$
Tumble generator valve "close" signal output	2.2 seconds or more

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

Tumble generator valve opening

- For tumble generator valve full closing points learning, not allowed to update to closing side.
- For tumble generator valve full opening points learning, not allowed to update to opening side.

Tumble generator valve control

- Output the open signal.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DN:DTC P2006 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 1)**1. OUTLINE OF DIAGNOSIS**

Detect the malfunction of tumble generator valve motor function.

Judge close fixing malfunction when the opening degree is small even after finishing the tumble generator valve open driving.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 10.9 \text{ V}$
Engine coolant temperature	$\geq 0^{\circ}\text{C}$ (32°F)
Ambient air temperature	$\geq 0^{\circ}\text{C}$ (32°F)

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD**Abnormality Judgment**

Judge as NG when the continuous time of meeting the malfunction criteria below becomes more than 3 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generator valve opening	$< 67.4^{\circ}$
Tumble generator valve "open" signal output	2.2 seconds or more

Time Needed for Diagnosis: 3 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generator valve opening	$\geq 67.4^{\circ}$
Tumble generator valve "open" signal output	2.2 seconds or more

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

Tumble generator valve opening

- For tumble generator valve full closing points learning, not allowed to update to closing side.
- For tumble generator valve full opening points learning, not allowed to update to opening side.

Tumble generator valve control

- Output the close signal.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

DO:DTC P2007 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 2)

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of tumble generator valve motor function.

Judge close fixing malfunction when the opening degree is small even after finishing the tumble generator valve open driving.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 10.9 \text{ V}$
Engine coolant temperature	$\geq 0^{\circ}\text{C}$ (32°F)
Ambient air temperature	$\geq 0^{\circ}\text{C}$

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes more than 3 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generator valve opening	$< 67.4^{\circ}$
Tumble generator valve "open" signal output	2.2 seconds or more

Time Needed for Diagnosis: 3 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generator valve opening	$\geq 67.4^{\circ}$
Tumble generator valve "open" signal output	2.2 seconds or more

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

Tumble generator valve opening

- For tumble generator valve full closing points learning, not allowed to update to closing side.
- For tumble generator valve full opening points learning, not allowed to update to opening side.

Tumble generator valve control

- Output the close signal.

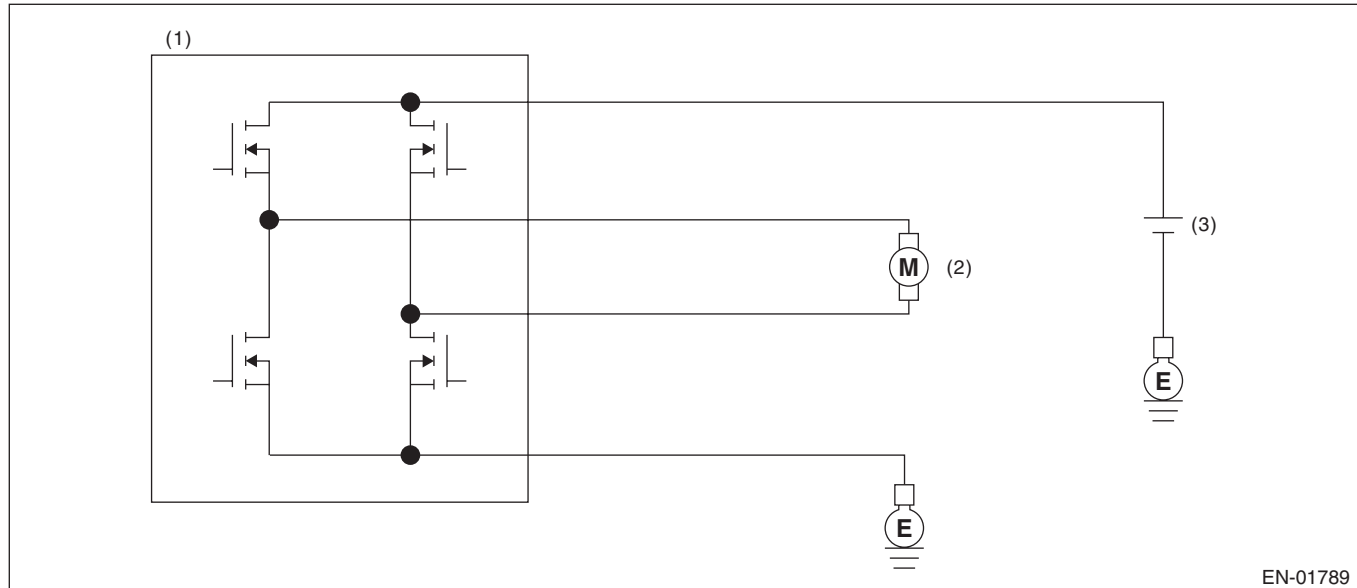
8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

**DP:DTC P2008 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN
(BANK 1)****1. OUTLINE OF DIAGNOSIS**

Detect the open or short circuit of tumble generator valve motor.

Judge as NG when the open signal is sent from IC after tumble generator valve driving IC diagnosis.

2. COMPONENT DESCRIPTION

EN-01789

(1) Engine control module (ECM)

(2) Tumble generator valve

(3) Battery

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
ECM output signal	Before ON → OFF
Time of tumble generator valve ON signal output	20 milliseconds or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

At the main IC, check the sent signal at each timing which occurs just before the tumble generator valve output is set to ON → OFF, and judge open NG when the open NG signal is sent 1 second in a row.

Judge OK and clear the NG when the OK signal is sent.

Judgment Value

Malfunction Criteria	Threshold Value
Open NG signal input	Low
Overcurrent NG signal input	High

Time Needed for Diagnosis: 10 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Tumble generator valve control: Not allowed to move tumble generator valve.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

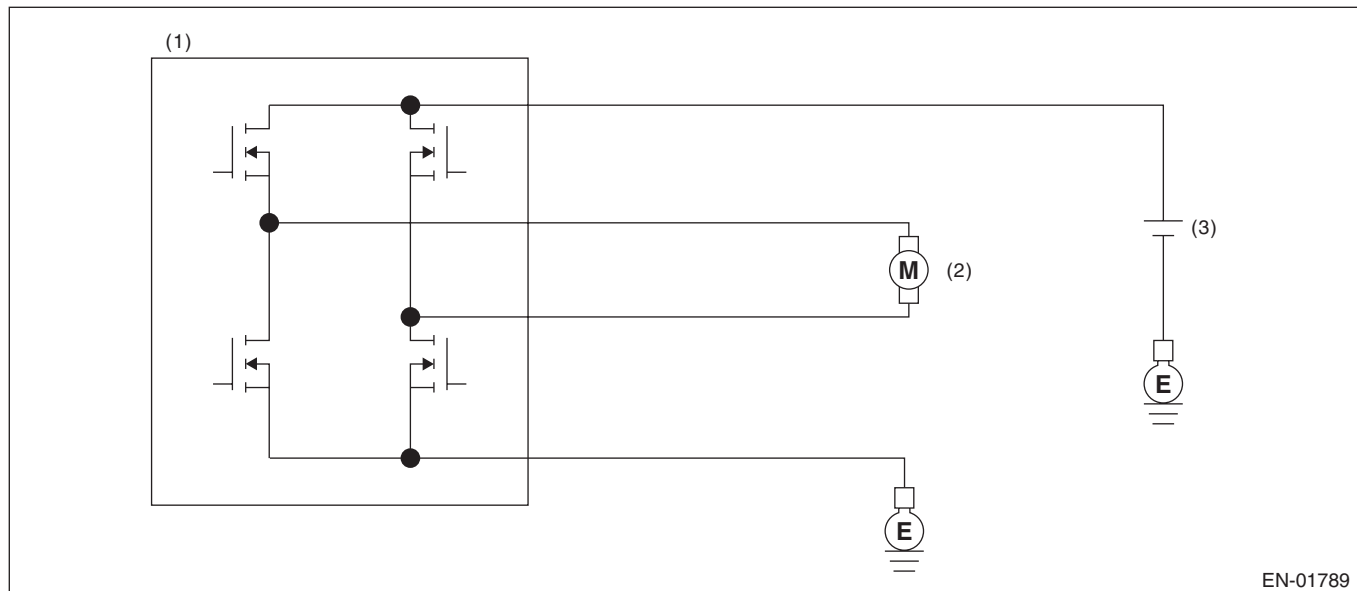
DQ:DTC P2009 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tumble generator valve motor.

Judge as NG when the overcurrent signal is sent from IC after tumble generator valve driving IC diagnosis.

2. COMPONENT DESCRIPTION



EN-01789

(1) Engine control module (ECM)

(2) Tumble generator valve

(3) Battery

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 10.9 \text{ V}$
ECM output signal	Before ON $\rightarrow$ OFF
Time of tumble generator valve ON signal output	20 milliseconds or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

At the main IC, check the sent signal at each timing which occurs just before the tumble generator valve output is set to ON $\rightarrow$ OFF, and judge overcurrent NG when the overcurrent NG signal is sent for 1 second in a row.

Judge as OK and clear the NG when the OK signal is sent.

Judgment Value

Malfunction Criteria	Threshold Value
Open NG signal input	High
Overcurrent NG signal input	Low

Time Needed for Diagnosis: 10 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Tumble generator valve control: Not allowed to move tumble generator valve.

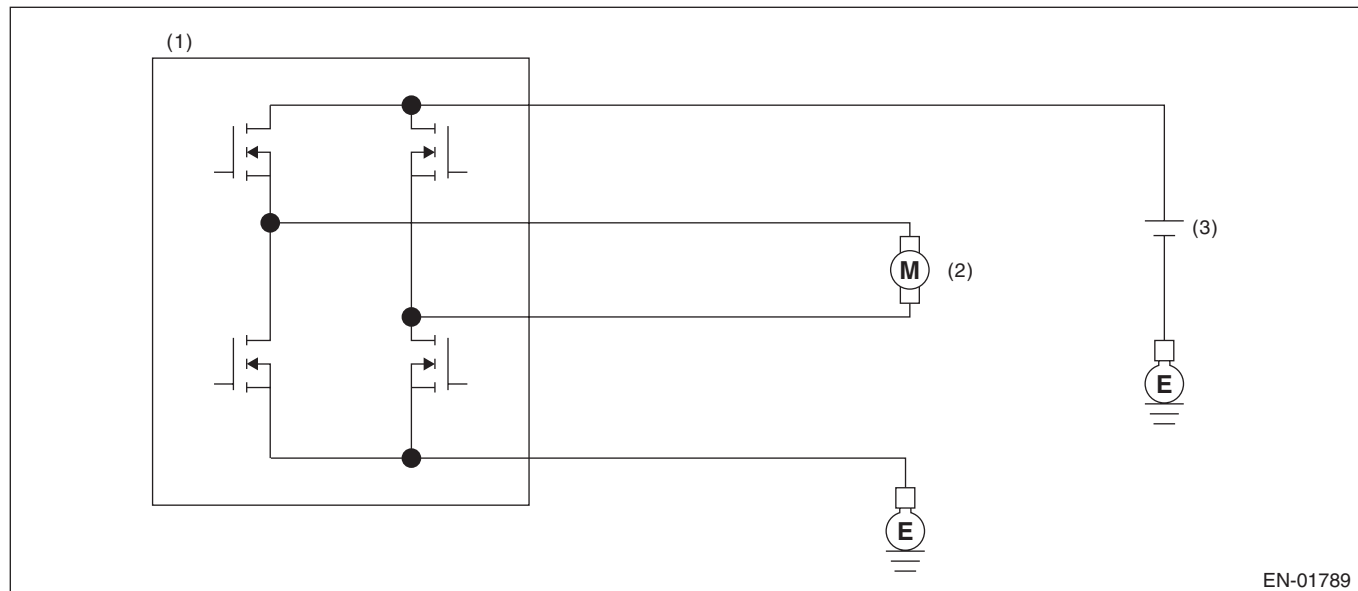
9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DR:DTC P2011 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 2)**1. OUTLINE OF DIAGNOSIS**

Detect the open or short circuit of tumble generator valve motor.

Judge as NG when the open signal is sent from IC after tumble generator valve driving IC diagnosis.

2. COMPONENT DESCRIPTION

(1) Engine control module (ECM)

(2) Tumble generator valve

(3) Battery

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
ECM output signal	Before ON → OFF
Time of tumble generator valve ON signal output	20 milliseconds or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

At the main IC, check the sent signal at each timing which occurs just before the tumble generator valve output is set to ON → OFF, and judge open NG when the open NG signal is sent 1 second in a row. Judge OK and clear the NG when the OK signal is sent.

Judgment Value

Malfunction Criteria	Threshold Value
Open NG signal input	Low
Overcurrent NG signal input	High

Time Needed for Diagnosis: 10 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Tumble generator valve control: Not allowed to move tumble generator valve.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

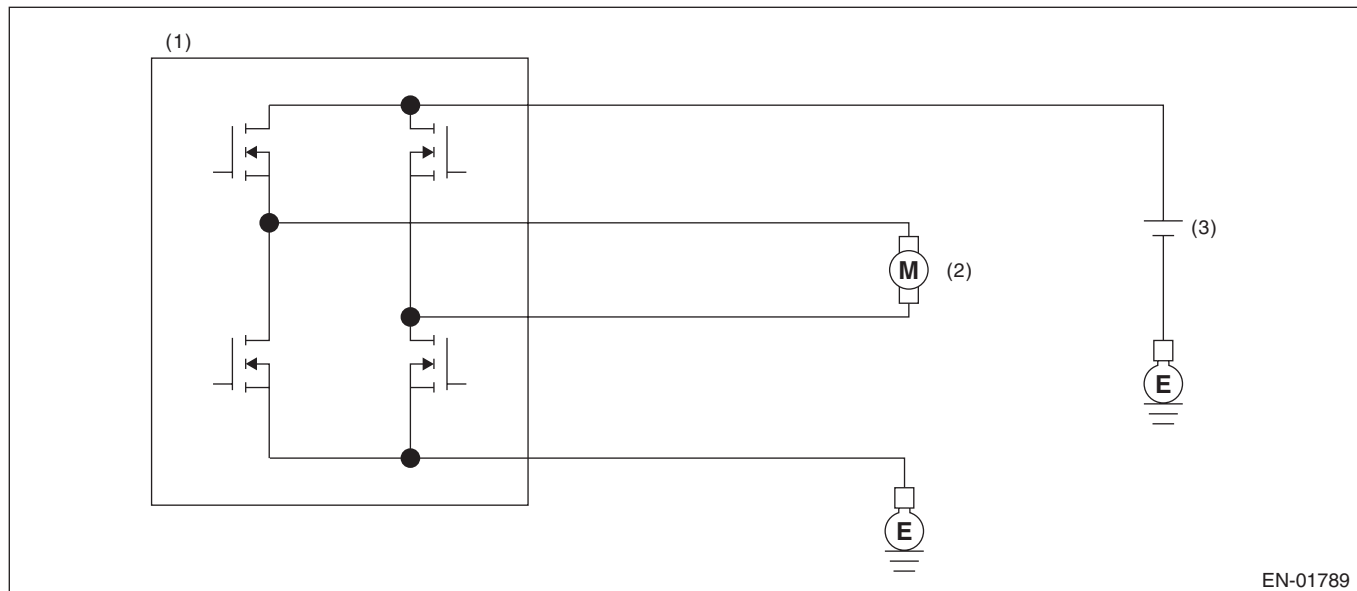
DS:DTC P2012 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 2)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tumble generator valve motor.

Judge as NG when the overcurrent signal is sent from IC after tumble generator valve driving IC diagnosis.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)

(2) Tumble generator valve

(3) Battery

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
ECM output signal	Before ON $\rightarrow$ OFF
Time of tumble generator valve ON signal output	20 milliseconds or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

At the main IC, check the sent signal at each timing which occurs just before the tumble generator valve output is set to ON $\rightarrow$ OFF, and judge overcurrent NG when the overcurrent NG signal is sent for 1 second in a row.

Judge as OK and clear the NG when the OK signal is sent.

Judgment Value

Malfunction Criteria	Threshold Value
Open NG signal input	High
Overcurrent NG signal input	Low

Time Needed for Diagnosis: 10 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Tumble generator valve control: Not allowed to move tumble generator valve.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

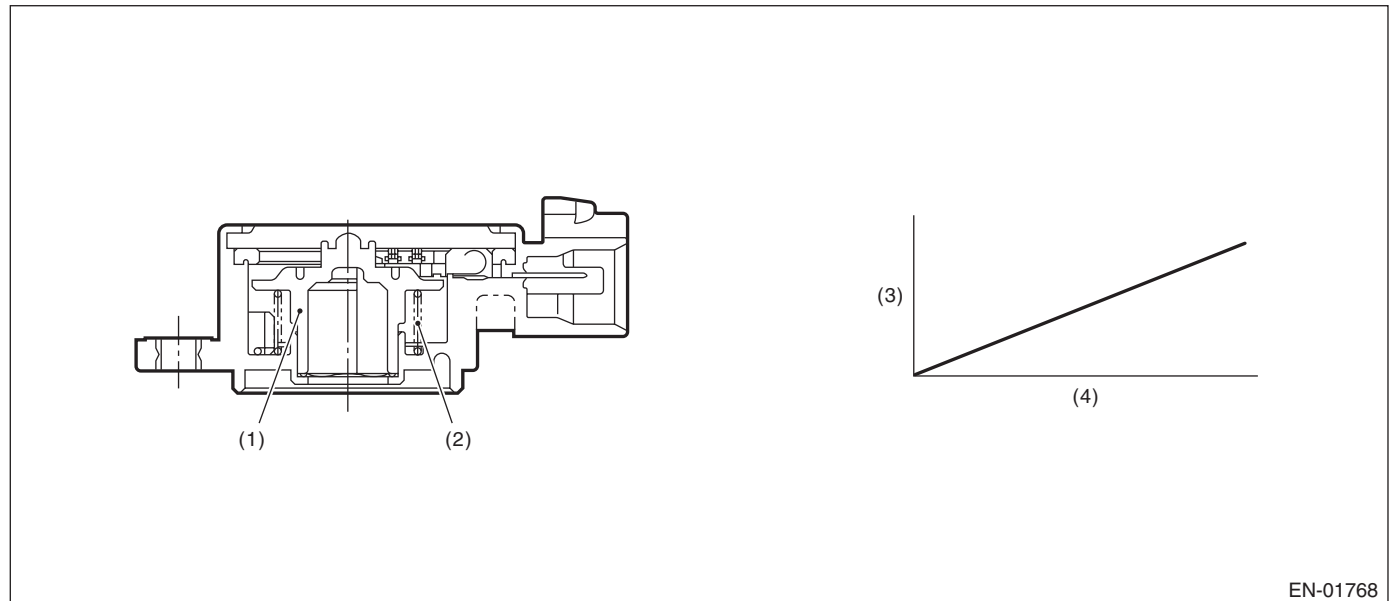
DT:DTC P2016 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT LOW (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of tumble generator valve position sensor.

Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



EN-01768

(1) Rotor

(2) Return spring

(3) Voltage (V)

(4) Tumble generator valve opening (°)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as NG if the duration of time while the following criteria are met is 0.5 seconds or more. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.167 V

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. FAIL SAFE

Tumble generator valve opening

- For tumble generator valve full closing points learning, not allowed to update to closing side.
- For tumble generator valve full opening points learning, not allowed to update to opening side.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

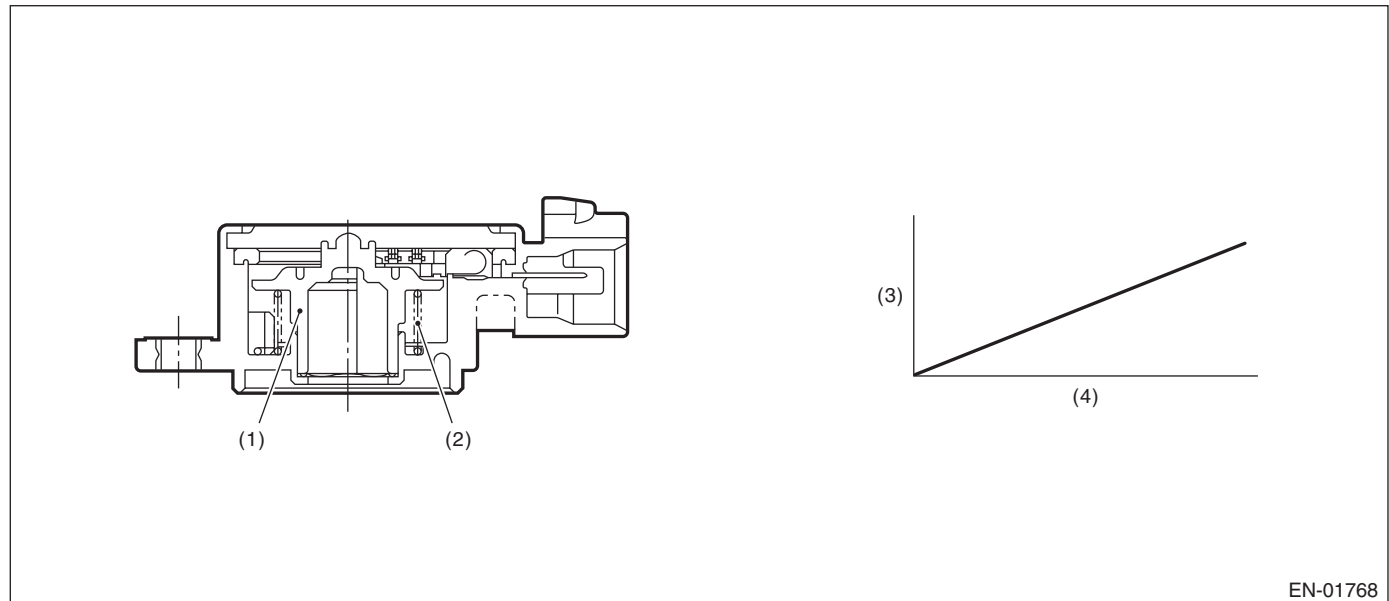
DU:DTC P2017 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT HIGH (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of tumble generator valve position sensor.

Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



EN-01768

(1) Rotor

(2) Return spring

(3) Voltage (V)

(4) Tumble generator valve opening (°)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as NG if the duration of time while the following criteria are met is 0.5 seconds or more. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.843 V

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. FAIL SAFE

Tumble generator valve opening

- For tumble generator valve full closing points learning, not allowed to update to closing side.
- For tumble generator valve full opening points learning, not allowed to update to opening side.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

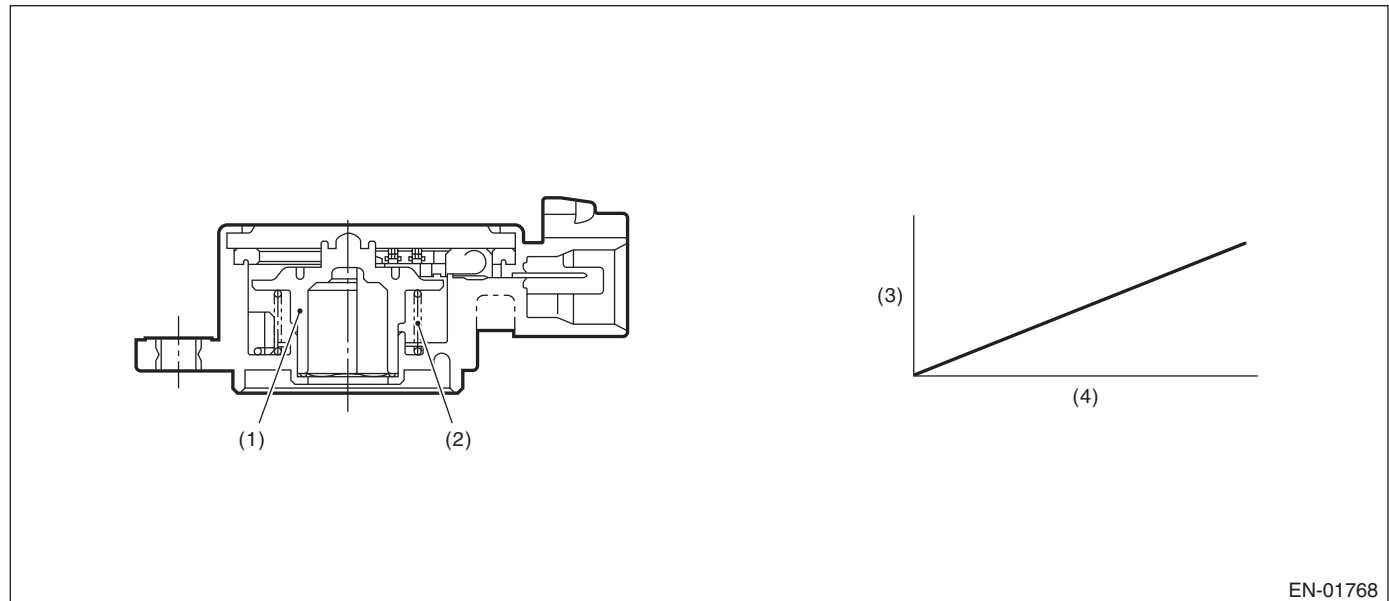
DV:DTC P2021 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT LOW (BANK 2)

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of tumble generator valve position sensor.

Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



EN-01768

(1) Rotor

(2) Return spring

(3) Voltage (V)

(4) Tumble generator valve opening (°)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as NG if the duration of time while the following criteria are met is 0.5 seconds or more. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.167 V

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. FAIL SAFE

Tumble generator valve opening

- For tumble generator valve full closing points learning, not allowed to update to closing side.
- For tumble generator valve full opening points learning, not allowed to update to opening side.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

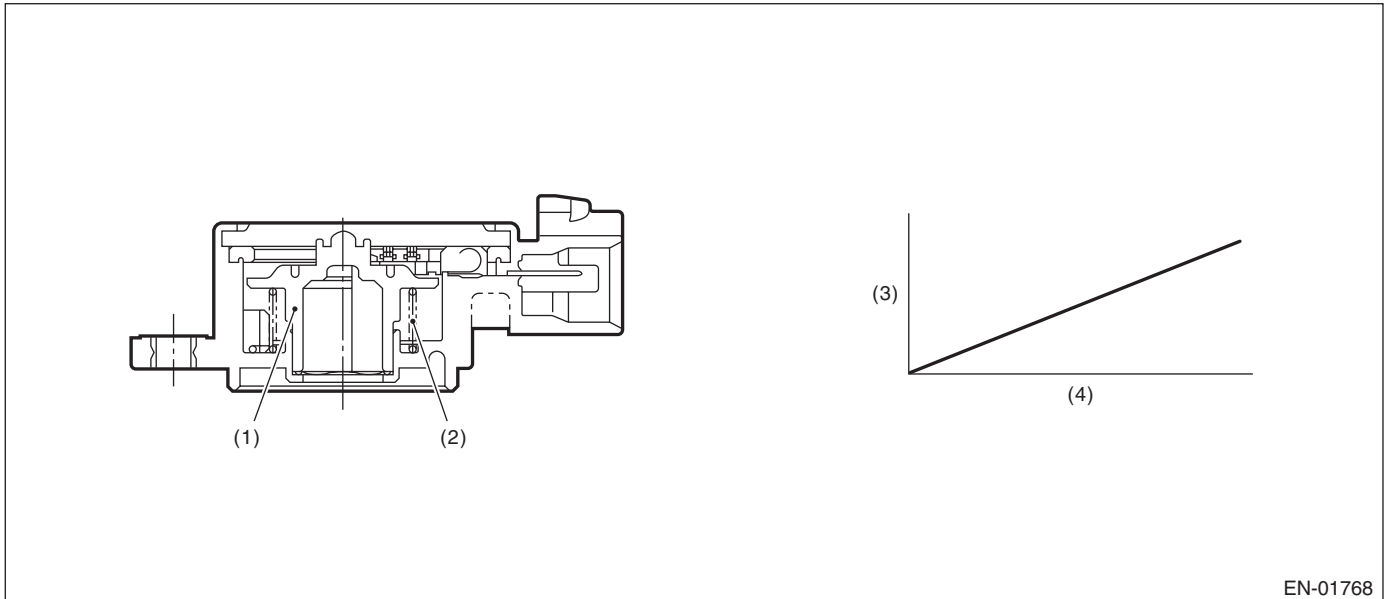
DW:DTC P2022 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT HIGH (BANK 2)

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of tumble generator valve position sensor.

Judge as NG if out of specification.

2. COMPONENT DESCRIPTION



(1) Rotor

(2) Return spring

(3) Voltage (V)

(4) Tumble generator valve opening (°)

EN-01768

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as NG if the duration of time while the following criteria are met is 0.5 seconds or more. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.843 V

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. FAIL SAFE

Tumble generator valve opening

- For tumble generator valve full closing points learning, not allowed to update to closing side.
- For tumble generator valve full opening points learning, not allowed to update to opening side.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DX:DTC P2088 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 1)**1. OUTLINE OF DIAGNOSIS**

Detect the open/short circuit of oil flow control solenoid valve.

Judge as disconnection NG when current is small despite large duty signal. On the other hand, judge as short NG when current is large despite small duty signal.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD**Abnormality Judgment**

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 2 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Oil flow control solenoid valve control duty	$\geq 99.61\%$
Oil control solenoid valve control present current	< 0.306 A

Time Needed for Diagnosis: 2000 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when the continuous time with the following criteria established is more than 2 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Target current value of the oil flow control solenoid valve	$\geq 0.14\%$
Target current value of the oil flow control solenoid valve – Oil flow control solenoid valve control current value	≥ 0.08 A

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. FAIL SAFE

- Ignition timing whole learning compensation:
 - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when IG OFF, and then make the whole learning incomplete.
 - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when making a normality judgment → abnormality judgment, and then make the whole learning incomplete.
- Ignition timing partial learning compensation:
 - Enter the initial value (0° CA) to the compensation value of partial learning zone with IG OFF.
 - Enter the initial value (0°CA) to the compensation value of partial learning zone when making a normality judgment → abnormality judgment.
- AVCS control:
 - Maximum timing retard learning is not complete or maximum timing retard learning completion is not experienced.
 - ⇒ ISC feedback compensation: Do not perform the AVCS actual timing advance compensation.
 - Make the oil flow control solenoid valve driving duty a predetermined value (9.36%).

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DY:DTC P2089 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 1)**1. OUTLINE OF DIAGNOSIS**

Detect the open/short circuit of oil flow control solenoid valve.

Judge as disconnection NG when current is small despite large duty signal. On the other hand, judge as short NG when current is large despite small duty signal.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD**Abnormality Judgment**

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 2 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Oil flow control solenoid valve control duty	$< 0.39\%$
Oil control solenoid valve control present current	≥ 0.306 A

Time Needed for Diagnosis: 2000 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when the continuous time with the following criteria established is more than 2 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Target current value of the oil flow control solenoid valve – Oil flow control solenoid valve control current value	< 0.08 A

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. FAIL SAFE

- Ignition timing whole learning compensation:
 - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when IG OFF, and then make the whole learning incomplete.
 - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when making a normality judgment → abnormality judgment, and then make the whole learning incomplete.
- Ignition timing partial learning compensation:
 - Enter the initial value (0° CA) to the compensation value of partial learning zone with IG OFF.
 - Enter the initial value (0°CA) to the compensation value of partial learning zone when making a normality judgment → abnormality judgment.
- AVCS control:
 - Maximum timing retard learning is not complete or maximum timing retard learning completion is not experienced.
 - ⇒ ISC feedback compensation: Do not perform the AVCS actual timing advance compensation.
 - Make the oil flow control solenoid valve driving duty a predetermined value (9.36%).

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DZ:DTC P2092 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 2)**1. OUTLINE OF DIAGNOSIS**

Detect the open/short circuit of oil flow control solenoid valve.

Judge as disconnection NG when current is small despite large duty signal. On the other hand, judge as short NG when current is large despite small duty signal.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD**Abnormality Judgment**

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 2 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Oil flow control solenoid valve control duty	$\geq 99.61\%$
Oil control solenoid valve control present current	< 0.306 A

Time Needed for Diagnosis: 2000 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when the continuous time with the following criteria established is more than 2 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Target current value of the oil flow control solenoid valve	$\geq 0.14\%$
Target current value of the oil flow control solenoid valve – Oil flow control solenoid valve control current value	≥ 0.08 A

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITIONS

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. FAIL SAFE

- Ignition timing whole learning compensation:
 - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when IG OFF, and then make the whole learning incomplete.
 - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when making a normality judgment → abnormality judgment, and then make the whole learning incomplete.
- Ignition timing partial learning compensation:
 - Enter the initial value (0° CA) to the compensation value of partial learning zone with IG OFF.
 - Enter the initial value (0°CA) to the compensation value of partial learning zone when making a normality judgment → abnormality judgment.
- AVCS control:
 - Maximum timing retard learning is not complete or maximum timing retard learning completion is not experienced.
 - ⇒ ISC feedback compensation: Do not perform the AVCS actual timing advance compensation.
 - Make the oil flow control solenoid valve driving duty a predetermined value (9.36%).

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

EA:DTC P2093 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 2)**1. OUTLINE OF DIAGNOSIS**

Detect open or short circuit of the oil flow control valve solenoid.

Judge open NG when the current flow is small whereas duty signal is large, and judge short NG when the current flow is large whereas duty signal is small.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD**Abnormality Judgment**

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 2 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Oil flow control solenoid valve control duty	$< 0.39\%$
Oil control solenoid valve control present current	≥ 0.306 A

Time Needed for Diagnosis: 2000 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when the continuous time with the following criteria established is more than 2 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Target current value of the oil flow control solenoid valve – Oil flow control solenoid valve control current value	< 0.08 A

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. FAIL SAFE

- Ignition timing whole learning compensation:
 - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when IG OFF, and then make the whole learning incomplete.
 - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when making a normality judgment → abnormality judgment, and then make the whole learning incomplete.
- Ignition timing partial learning compensation:
 - Enter the initial value (0°CA) to the compensation value of partial learning zone with IG OFF.
 - Enter the initial value (0°CA) to the compensation value of partial learning zone when making a normality judgment → abnormality judgment.
- AVCS control:
 - Maximum timing retard learning is not complete or maximum timing retard learning completion is not experienced.
 - ISC feedback compensation: Do not perform the AVCS actual timing advance compensation.
 - Make the oil flow control solenoid valve drive duty a predetermined value (9.36%).

8. ECM OPERATION AT DTC SETTING

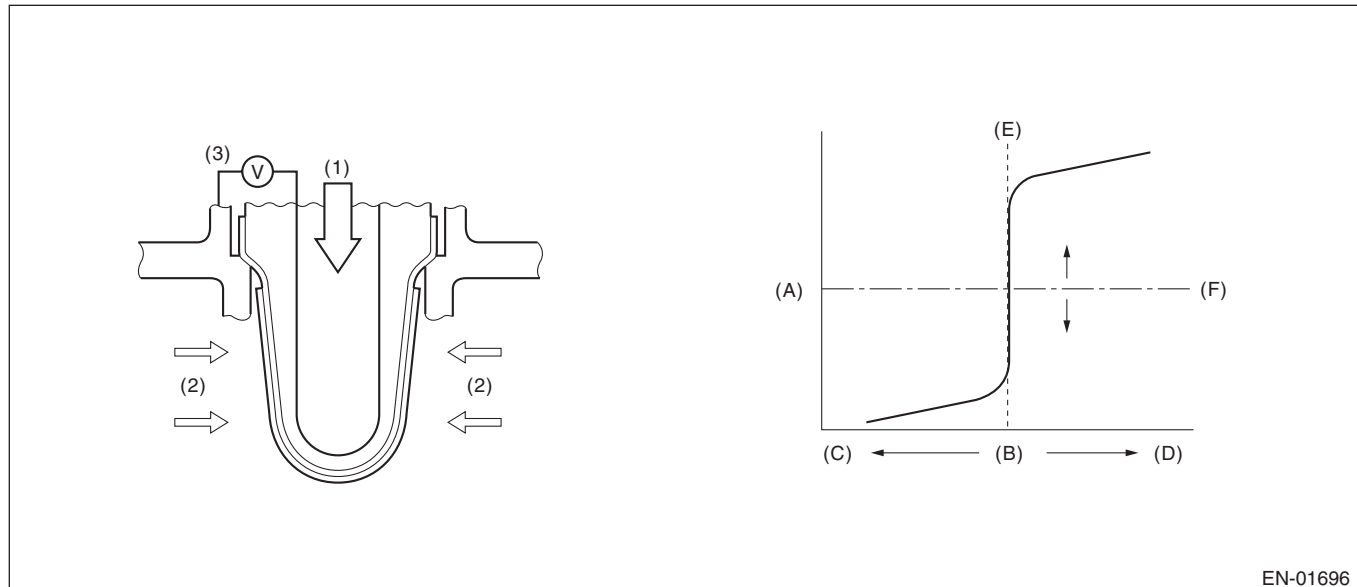
Memorize the freeze frame data. (For test mode \$02)

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

1. OUTLINE OF DIAGNOSIS

Detect abnormalities in the fuel system by determining whether the sub feedback compensation amount is shifting to rich or lean. If the sub feedback compensation amount from engine start to ignition off is shifting to rich or lean, there is insufficient compensation. →If it is insufficient, change the sub feedback compensation guard value, shift judgment line, and increment the guard operation counter (temporary NG counter). When the guard operation counter (temporary NG counter) exceeds the set value, and the sub feedback compensation is shifting to rich or lean, it is judged as NG.

2. COMPONENT DESCRIPTION



EN-01696

(A) Electromotive force

(B) Air fuel ratio

(1) Atmosphere

(C) Rich

(D) Lean

(2) Exhaust gas

(E) Theoretical air fuel ratio

(F) Comparative voltage

(3) Electromotive force

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Continuous time when the following conditions are established	1 second or more
Conditions for carrying out the sub feedback learning	Complete

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at a constant speed of approx. 75 km/h (47 MPH) or higher.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time when the following conditions are established is more than 5 seconds. Judge as OK and clear the NG when the following conditions are not established for a continuous time of 5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Sub feedback learning value	< -0.018

Time Needed for Diagnosis: 5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When similar driving conditions are repeated 3 times and the result is OK.
- When "Clear Memory" is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

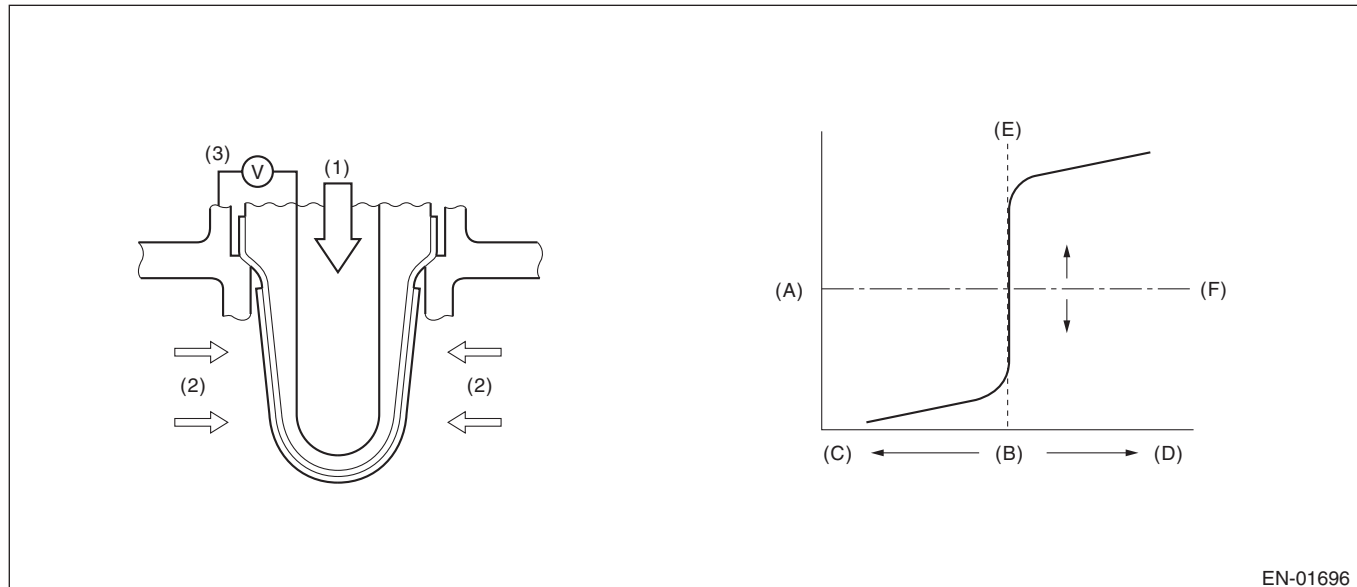
Memorize the freeze frame data. (For test mode \$02)

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

1. OUTLINE OF DIAGNOSIS

Detect abnormalities in the fuel system by determining whether the sub feedback compensation amount is shifting to rich or lean. If the sub feedback compensation amount from engine start to ignition off is shifting to rich or lean, there is insufficient compensation. →If it is insufficient, change the sub feedback compensation guard value, shift judgment line, and increment the guard operation counter (temporary NG counter). When the guard operation counter (temporary NG counter) exceeds the set value, and the sub feedback compensation is shifting to rich or lean, it is judged as NG.

2. COMPONENT DESCRIPTION



EN-01696

(A) Electromotive force

(B) Air fuel ratio

(1) Atmosphere

(C) Rich

(D) Lean

(2) Exhaust gas

(E) Theoretical air fuel ratio

(F) Comparative voltage

(3) Electromotive force

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Continuous time when the following conditions are established	1 second or more
Conditions for carrying out the sub feedback learning	Complete

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at a constant speed of approx. 75 km/h (47 MPH) or higher.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time when the following conditions are established is more than 5 seconds. Judge as OK and clear the NG when the following conditions are not established for a continuous time of 5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Sub feedback learning value	≥ 0.018
Count of limits moving to rich	≥ 4 times
Ratio of time for oxygen sensor upper or lower to time or rich time/lean time	≤ 9 (AT model) ≤ 5.7 (MT model)

Time Needed for Diagnosis: 5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When similar driving conditions are repeated 3 times and the result is OK.
- When "Clear Memory" is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

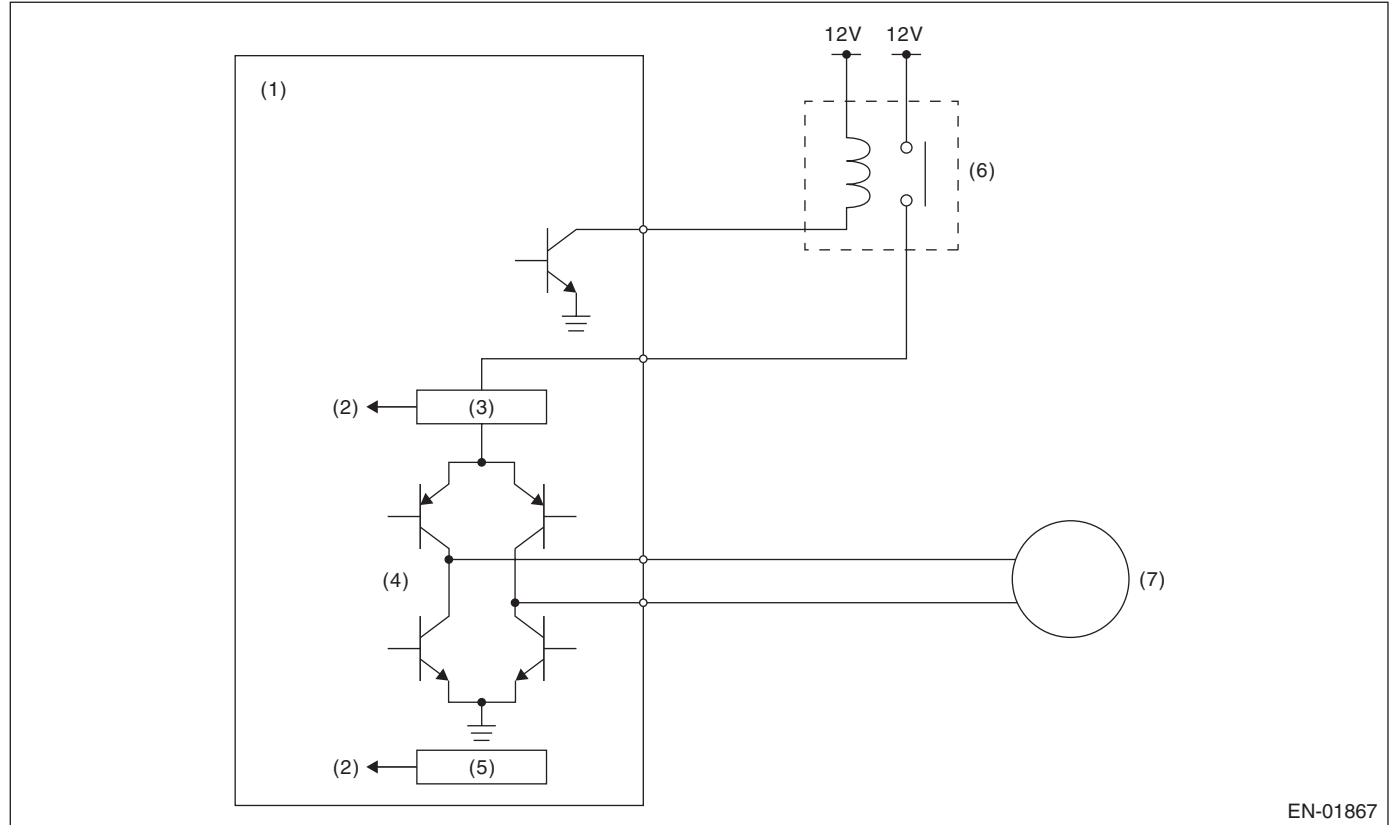
Memorize the freeze frame data. (For test mode \$02)

ED:DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/ PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Judge as NG when the motor current becomes too large or drive circuit is heated.

2. COMPONENT DESCRIPTION



EN-01867

- | | | |
|-----------------------------------|---------------------------------------|-----------|
| (1) Engine control module (ECM) | (4) Drive circuit | (7) Motor |
| (2) Detecting circuit | (5) Temperature detection circuit | |
| (3) Overcurrent detection circuit | (6) Electronic throttle control relay | |

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Under control of electronic throttle control	ON
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Motor current	$\leq 8 \text{ A}$
Drive circuit inner temperature	$\leq 175^{\circ}\text{C}$ (347°F)

Time Needed for Diagnosis:

- 500 milliseconds (For NG)
- 2000 milliseconds (For OK)

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed (Only with engine stopped)

8. FAIL SAFE

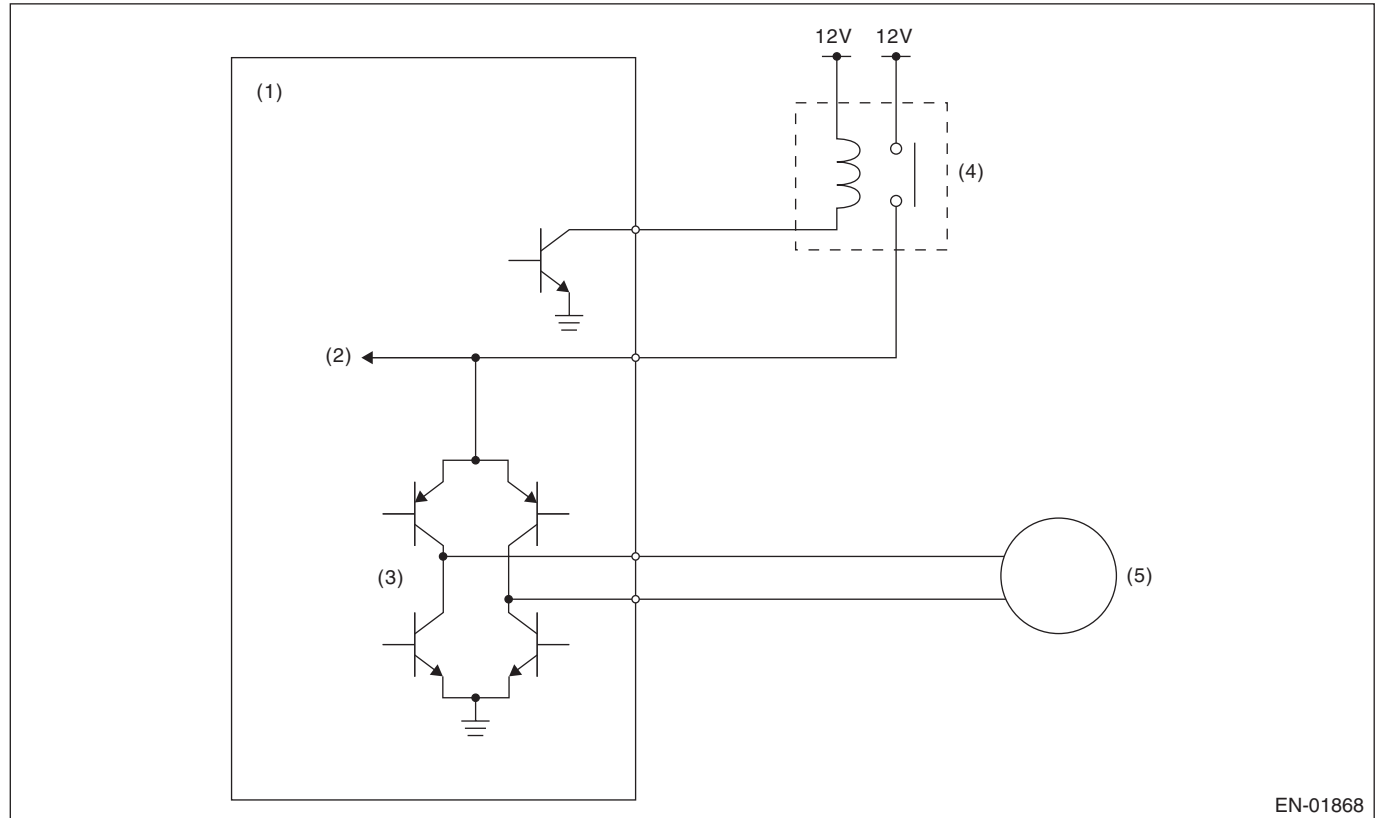
Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

EE:DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW**1. OUTLINE OF DIAGNOSIS**

Judge as NG when the electronic throttle control power is not supplied even when ECM sets the electronic throttle control relay to ON.

2. COMPONENT DESCRIPTION

EN-01868

(1) Engine control module (ECM)

(3) Drive circuit

(5) Motor

(2) Voltage detection circuit

(4) Electronic throttle control relay

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Electronic throttle control relay output	ON
Battery voltage	$\geq 6 \text{ V}$

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 0.5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Motor power voltage	$\leq 5 \text{ V}$

Time Needed for Diagnosis:

- 400 milliseconds (For NG)
- 2000 milliseconds (For OK)

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed (Only with engine stopped)

8. FAIL SAFE

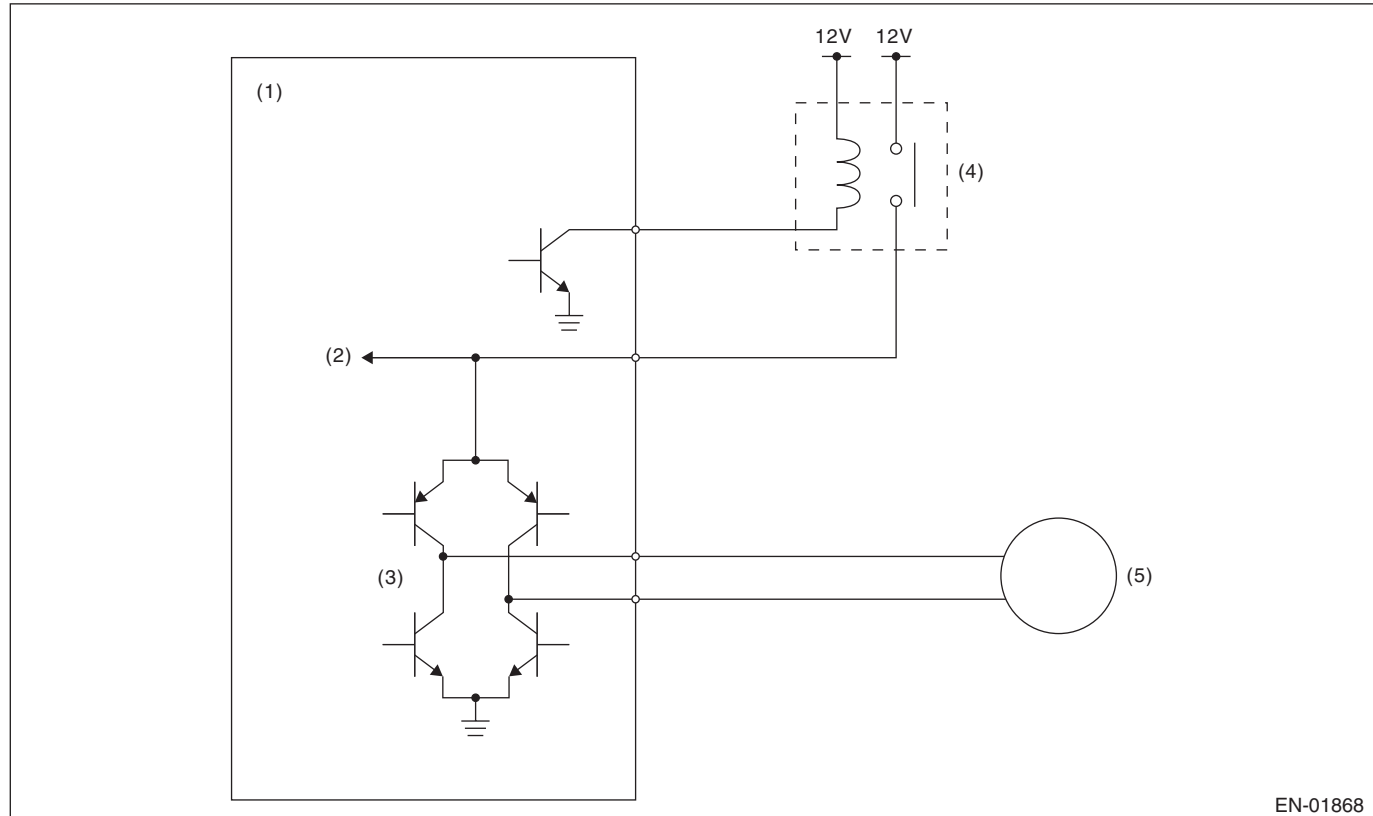
Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

EF:DTC P2103 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH**1. OUTLINE OF DIAGNOSIS**

Judge as NG when the electronic throttle control power is supplied even when ECM sets the electronic throttle control relay to OFF.

2. COMPONENT DESCRIPTION

EN-01868

(1) Engine control module (ECM)

(3) Drive circuit

(5) Motor

(2) Voltage detection circuit

(4) Electronic throttle control relay

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Electronic throttle control relay output	OFF
Battery voltage	$\geq 6\text{ V}$

4. GENERAL DRIVING CYCLE

- When ignition switch ON → OFF
- Ignition switch OFF → ON (Only after clearing memory)

5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Motor power voltage	$\leq 5\text{ V}$

Time Needed for Diagnosis:

- 600 milliseconds (For NG)
- 400 milliseconds (For OK)

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

8. FAIL SAFE

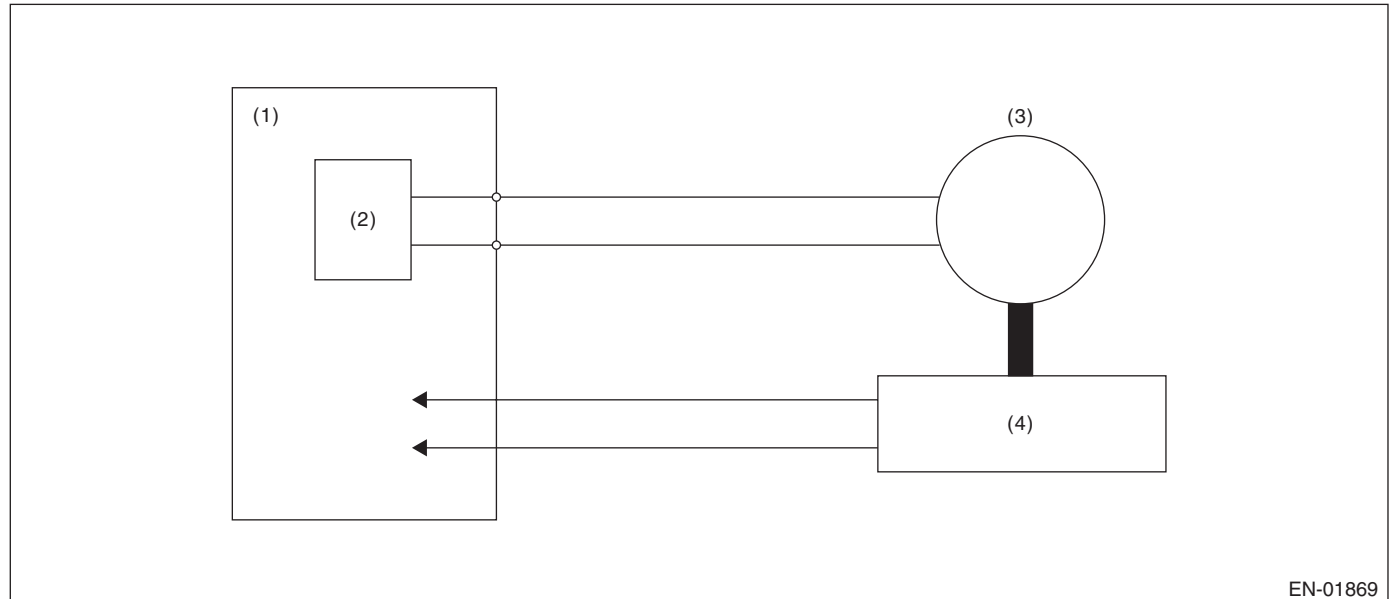
Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

EG:DTC P2109 THROTTLE/PEDAL POSITION SENSOR “A” MINIMUM STOP PERFORMANCE**1. OUTLINE OF DIAGNOSIS**

Judge as NG when fully close point learning cannot conducted or outside the standard value.

2. COMPONENT DESCRIPTION

(1) Engine control module (ECM)

(3) Motor

(4) Throttle position sensor

(2) Drive circuit

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON → OFF
Ignition switch (only after cleaning the memory)	OFF → ON

4. GENERAL DRIVING CYCLE

Perform the diagnosis at full closed point learning.

5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Throttle sensor opening angle at all close point learning	10.127° or more, 19.872° or less
Throttle opening angle when the ignition switch is ON – Throttle minimum stop position	≥ 1.683°

Time Needed for Diagnosis: 8 — 80 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

8. FAIL SAFE

Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

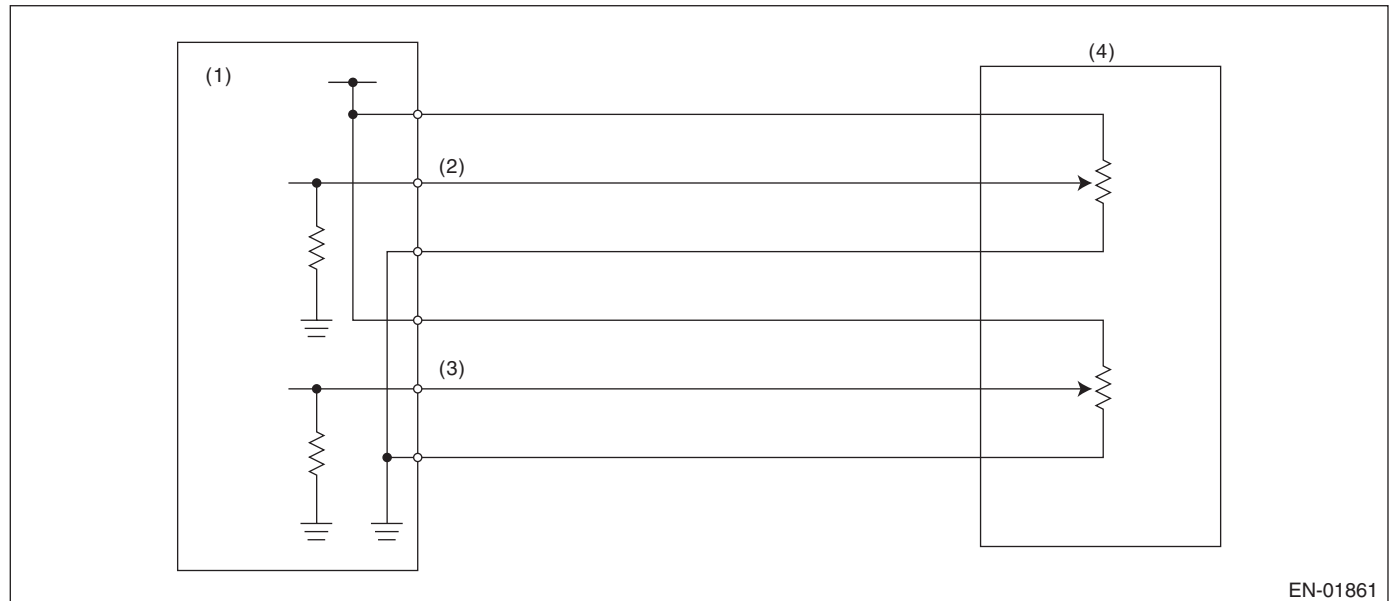
9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

EH:DTC P2122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT LOW INPUT**1. OUTLINE OF DIAGNOSIS**

Detect the open or short circuit of accelerator pedal position sensor 1.

Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION

(1) Engine control module (ECM)
(2) Accelerator pedal position sensor
1 signal

(3) Accelerator pedal position sensor
2 signal

(4) Accelerator pedal position sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	≥ 0.219 V

Time Needed for Diagnosis: 100 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Simultaneous failure: Throttle opening is fixed to 6°.

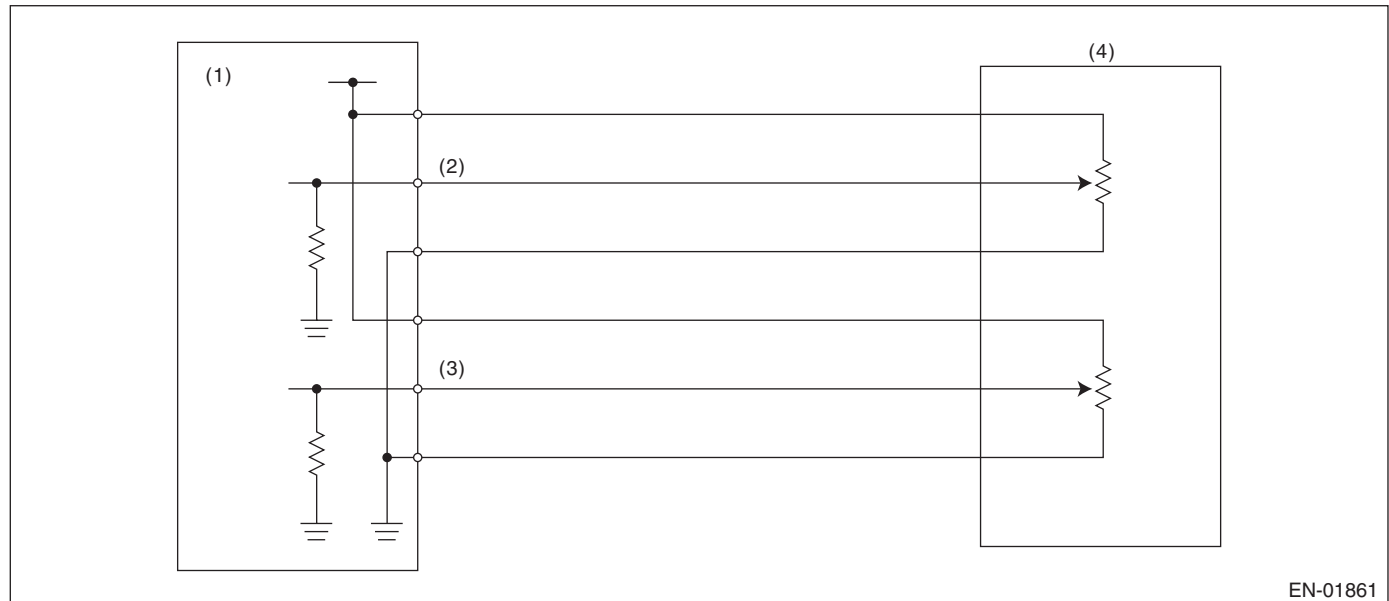
9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

EI: DTC P2123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT HIGH INPUT**1. OUTLINE OF DIAGNOSIS**

Detect the open or short circuit of accelerator pedal position sensor 1.

Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION

(1) Engine control module (ECM)

(2) Accelerator pedal position sensor
1 signal

(3) Accelerator pedal position sensor
2 signal

(4) Accelerator pedal position sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	≤ 4.781 V

Time Needed for Diagnosis: 100 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Simultaneous failure: Throttle opening is fixed to 6°.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

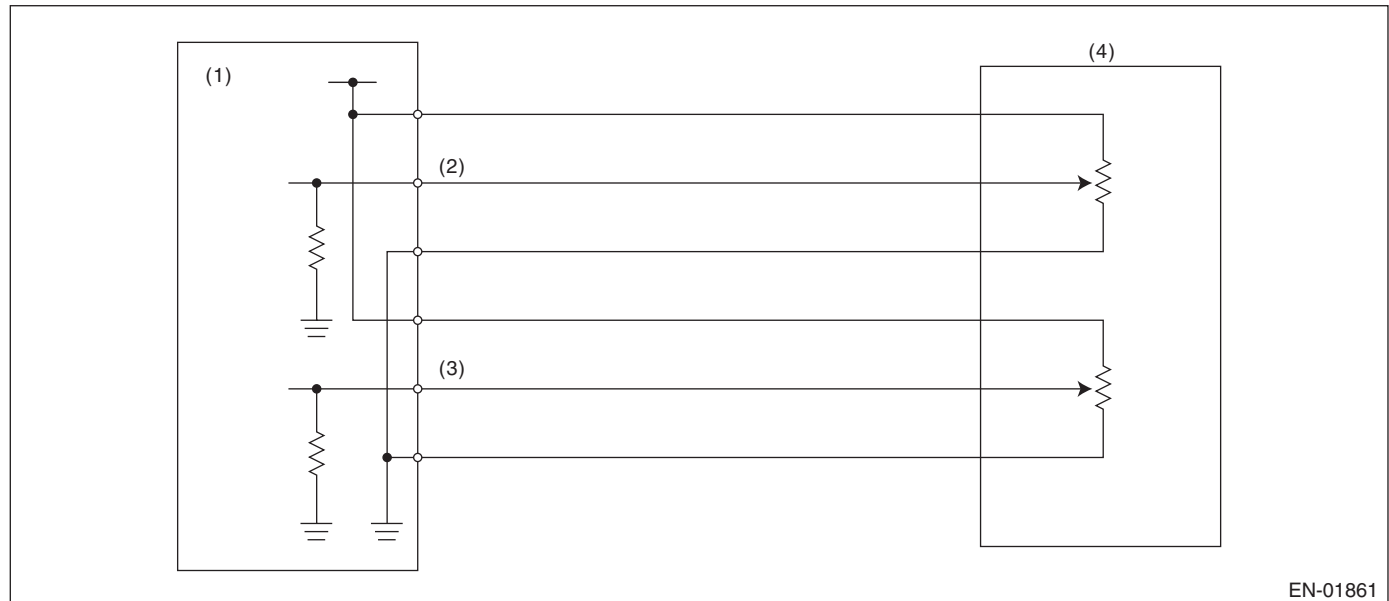
EJ:DTC P2127 THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of accelerator pedal position sensor 2.

Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Accelerator pedal position sensor 1 signal

(3) Accelerator pedal position sensor 2 signal

(4) Accelerator pedal position sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	≥ 0.219 V

Time Needed for Diagnosis: 100 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Simultaneous failure: Throttle opening is fixed to 6°.

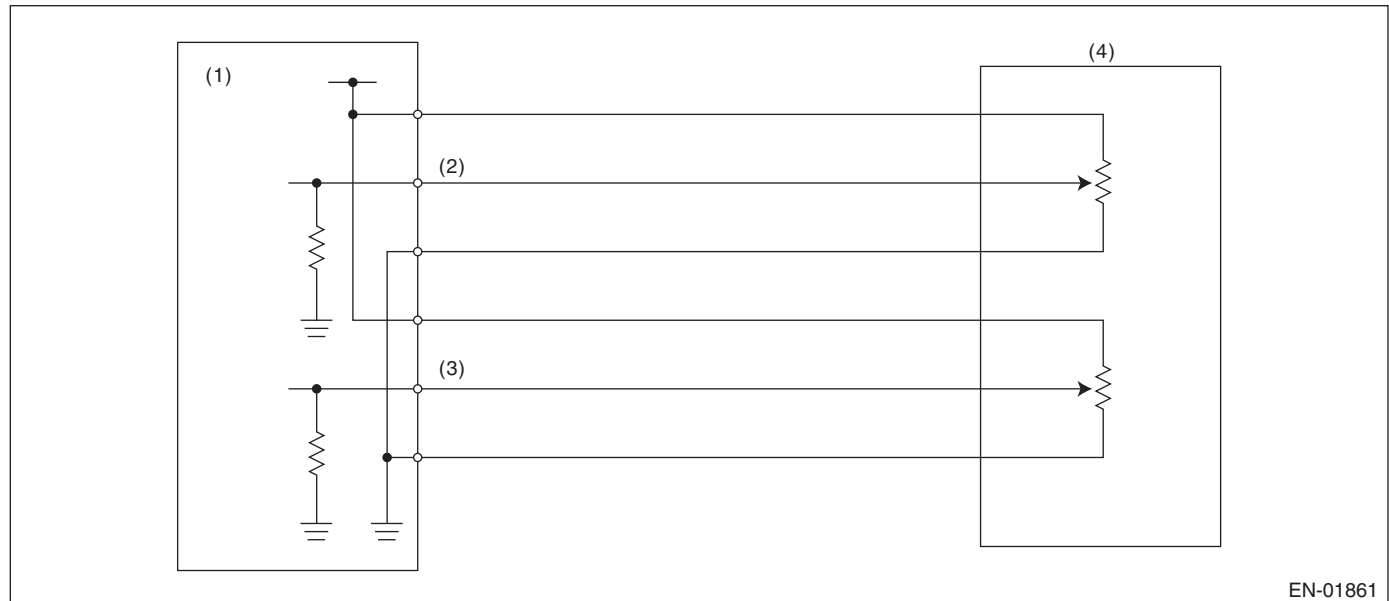
9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

EK:DTC P2128 THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT HIGH INPUT**1. OUTLINE OF DIAGNOSIS**

Detect the open or short circuit of accelerator pedal position sensor 2.

Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION

(1) Engine control module (ECM)
(2) Accelerator pedal position sensor 1 signal

(3) Accelerator pedal position sensor 2 signal

(4) Accelerator pedal position sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	≤ 4.781 V

Time Needed for Diagnosis: 100 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Simultaneous failure: Throttle opening is fixed to 6°.

9. ECM OPERATION AT DTC SETTING

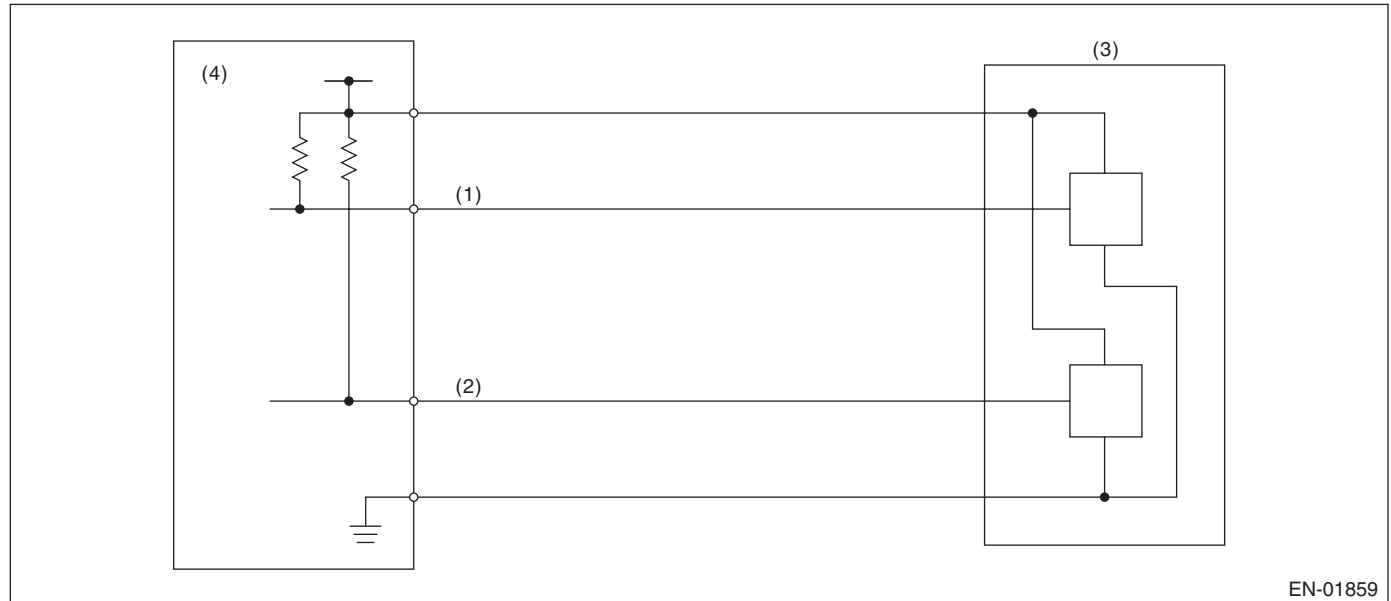
Memorize the freeze frame data. (For test mode \$02)

EL:DTC P2135 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A”/“B” VOLTAGE CORRELATION

1. OUTLINE OF DIAGNOSIS

Judge as NG when the signal level of accelerator pedal position sensor 1 is different from the throttle position sensor 2.

2. COMPONENT DESCRIPTION



- (1) Throttle position sensor 1 signal
(2) Throttle position sensor 2 signal

- (3) Throttle position sensor

- (4) Engine control module (ECM)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

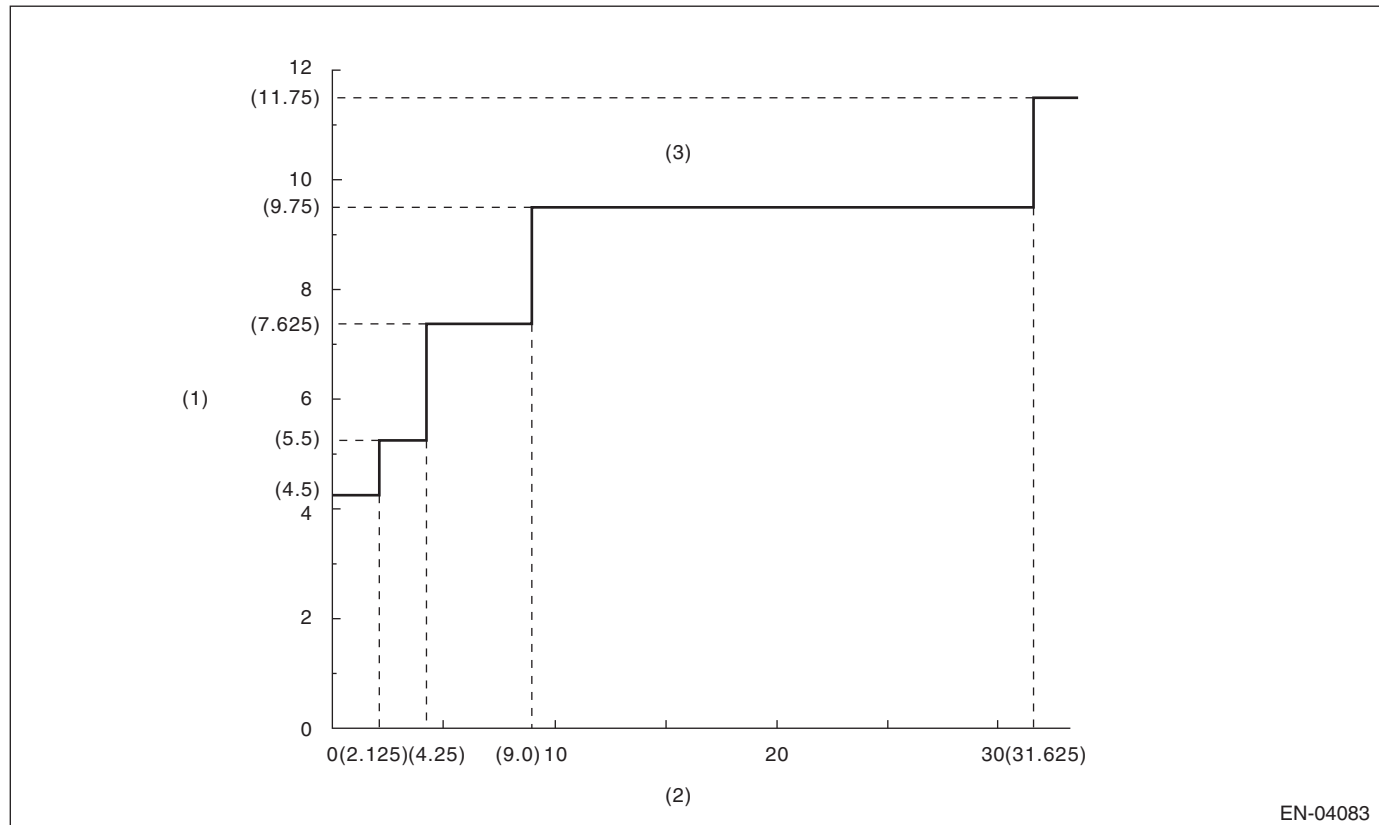
5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Signal difference between two sensors	≤ 4.25

Details of Judgment Value



EN-04083

(1) Sensor output difference (°)

(2) Throttle position sensor 1 opening angle (°)

(3) NG area

Time Needed for Diagnosis: 212 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed (Only with engine stopped)

8. FAIL SAFE

Stop the continuity to ETC motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

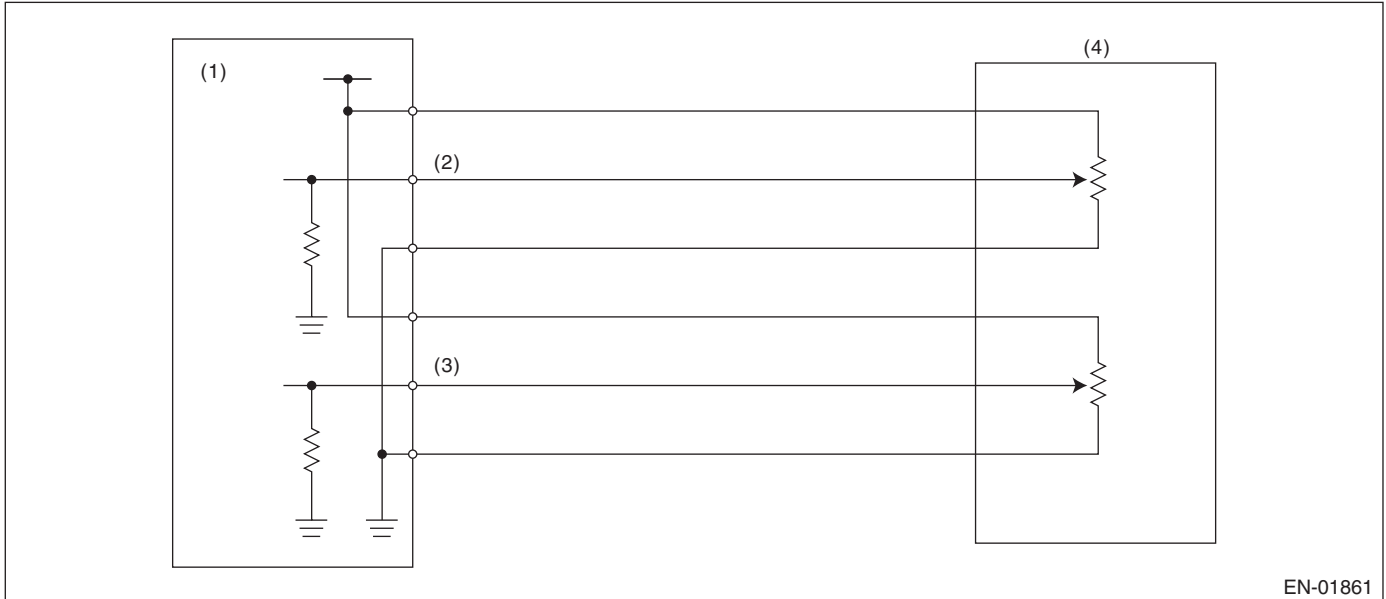
Memorize the freeze frame data. (For test mode \$02)

EM:DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D”/“E” VOLTAGE CORRELATION

1. OUTLINE OF DIAGNOSIS

Judge as NG when the signal level of throttle position sensor 1 is different from the throttle position sensor 2.

2. COMPONENT DESCRIPTION



- (1) Engine control module (ECM) (3) Accelerator pedal position sensor 2 signal (4) Accelerator pedal position sensor 2 signal
- (2) Accelerator pedal position sensor 1 signal

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

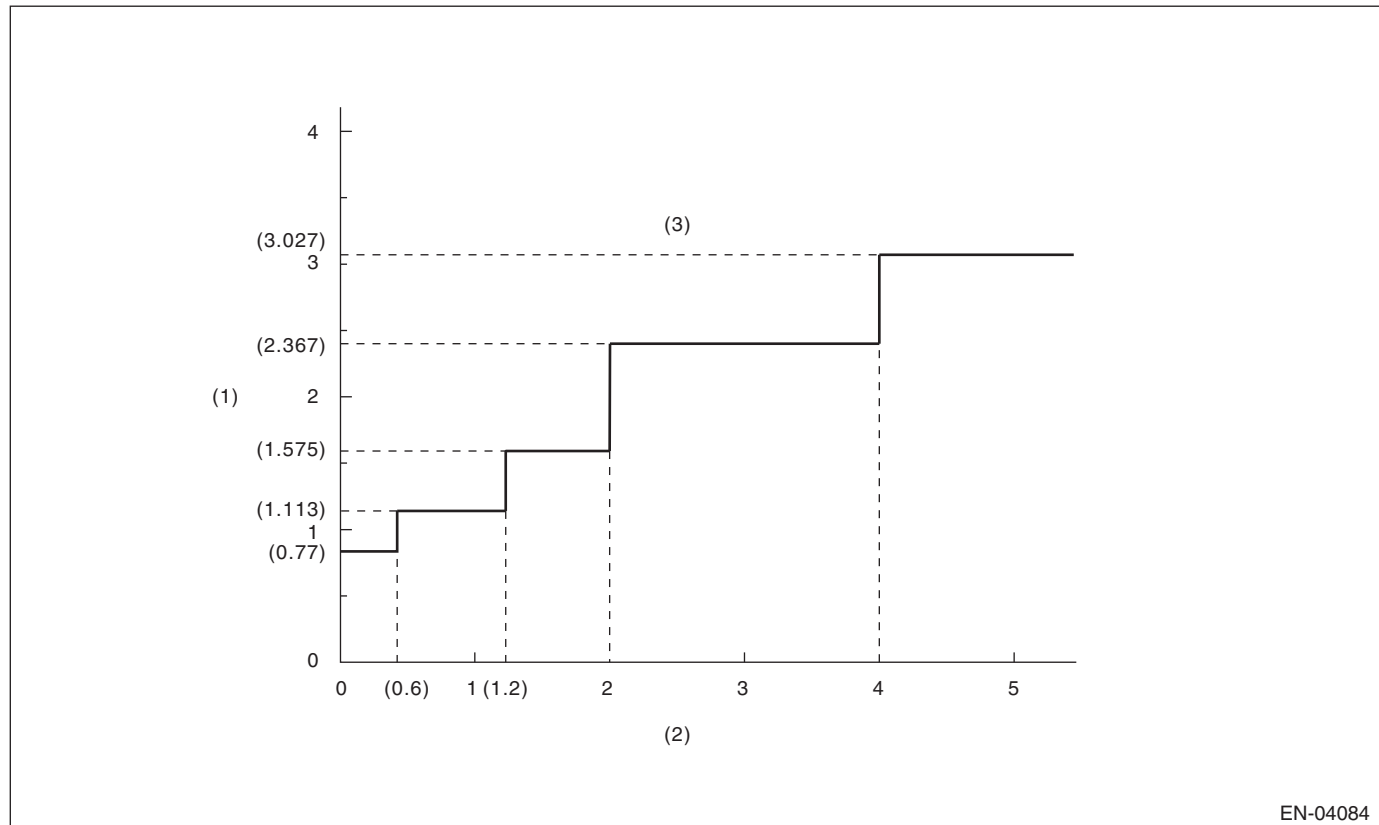
5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Signal difference between two sensors	$\leq 0.77^\circ$

Details of Judgment Value



EN-04084

(1) Sensor output difference (°)

(2) Accelerator pedal position sensor
2 opening angle (°)

(3) NG area

Time Needed for Diagnosis:

- 116 milliseconds (For NG)
- 1000 milliseconds (For OK)

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

Throttle opening is fixed to 6°.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

EN:DTC P2419 EVAPORATIVE EMISSION SYSTEM SWITCHING VALVE CONTROL CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the purge control solenoid valve 2.

Judge as NG when the ECM output level differs from the actual terminal level.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM outputs OFF signal	Low

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when all the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM outputs OFF signal	High

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

EO:DTC P2420 EVAPORATIVE EMISSION SYSTEM SWITCHING VALVE CONTROL CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the purge control solenoid valve 2.

Judge as NG when the ECM output level differs from the actual terminal level.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM outputs ON signal	High

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when all the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM outputs ON signal	Low

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

EP:DTC P2431 SECONDARY AIR INJECTION SYSTEM AIR FLOW /PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect malfunction in the secondary air pressure sensor output properties.

Judge as NG when the secondary air pressure sensor output is largely different from the intake manifold pressure at engine start.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed at startup	< 300 rpm
Vehicle speed	< 1 km/h
After secondary air injection system stop	3 seconds or more

3. GENERAL DRIVING CYCLE

Perform the diagnosis with the ignition switch ON.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG if the continuous time with the following conditions established is more than 0.3 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Secondary air supply piping pressure – Intake manifold pressure	≥ 200 mmHg
Intake manifold pressure at engine startup – Intake manifold pressure	< 10 mmHg

Time Needed for Diagnosis: 0.3 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK and clear the NG when the continuous time when the following conditions are established are more than 0.26 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Secondary air supply piping pressure – Intake manifold pressure	< 200 mmHg

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

EQ:DTC P2432 SECONDARY AIR INJECTION SYSTEM AIR FLOW /PRESSURE SENSOR CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Judge as NG if it is out of specification.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG if the continuous time with the following conditions established is more than 0.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Output voltage	< 0.568 V

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK when the following conditions are established, and clear the NG.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Output voltage	≥ 0.568 V

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

ER:DTC P2433 SECONDARY AIR INJECTION SYSTEM AIR FLOW /PRESSURE SENSOR CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Judge as NG if it is out of specification.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG if the continuous time with the following conditions established is more than 0.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Output voltage	≥ 4.921 V

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK when the following conditions are established, and clear the NG.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Output voltage	< 4.921 V

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

ES:DTC P2440 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK 1)

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P0410. <Ref. to GD(H4DOTC)-117, DTC P0410 SECONDARY AIR INJECTION SYSTEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

ET:DTC P2441 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK CLOSED (BANK 1)

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P0410. <Ref. to GD(H4DOTC)-117, DTC P0410 SECONDARY AIR INJECTION SYSTEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

EU:DTC P2442 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK 2)

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P0410. <Ref. to GD(H4DOTC)-117, DTC P0410 SECONDARY AIR INJECTION SYSTEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

EV:DTC P2443 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK CLOSED (BANK 2)

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection standard, refer to DTC P0410. <Ref. to GD(H4DOTC)-117, DTC P0410 SECONDARY AIR INJECTION SYSTEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

EW:DTC P2444 SECONDARY AIR INJECTION SYSTEM PUMP STUCK ON

1. OUTLINE OF DIAGNOSIS

Detect functional errors (continually ON) of the secondary air pump.

When the secondary air supply piping pressure is high in comparison to the atmospheric pressure, it is judged as NG.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

When the secondary air pump is OFF, the secondary air supply pipe pressure should be atmospheric pressure. If it is higher than atmospheric pressure, judge as NG.

Abnormality Judgment

Judge as NG if the continuous time with all of the following conditions established is more than 5 seconds.

Malfunction Criteria	Threshold Value
Estimate ambient temperature	$\geq 4.4^{\circ}\text{C}$ (39.92°F)
Battery voltage	$\geq 10.9\text{ V}$
After secondary air injection system operation	0.6 seconds or more
Battery voltage	$\geq 7\text{ V}$
Atmospheric pressure	$\geq 75.0\text{ kPa}$ (563 mmHg, 22.15 inHg)
Engine	In operation
After secondary air injection system stop	3 seconds or more
Secondary air supply piping pressure (Absolute pressure)	> Value from Map 22

Map 22

Unit: (kPa (mmHg, inHg))		Atmospheric pressure (kPa (mmHg, inHg))							
		69.3	74.6	80.0	85.3	90.6	96.0	101.3	106.6
		(520, 20.47)	(560, 22.03)	(600, 23.63)	(640, 25.19)	(680, 26.76)	(720, 28.35)	(760, 29.92)	(800, 31.48)
Battery voltage (V)	10.5	78.0 (585, 23.03)	84.0 (630, 24.80)	90.0 (675, 26.58)	96.0 (720, 28.35)	102.0 (765, 30.13)	108.0 (810, 31.90)	114.0 (855, 33.67)	120.0 (900, 35.44)
	11.5	79.3 (595, 23.42)	85.4 (641, 25.22)	91.6 (687, 27.05)	97.7 (733, 28.86)	103.7 (778, 30.63)	109.8 (824, 32.43)	116.0 (870, 34.26)	122.1 (916, 16.28)
	12.5	80.8 (606, 23.86)	86.9 (652, 25.67)	93.2 (699, 27.53)	99.3 (745, 29.33)	105.6 (792, 31.19)	111.7 (838, 32.99)	118.0 (885, 34.85)	124.2 (932, 36.68)
	13.5	82.1 (616, 24.25)	88.4 (663, 26.11)	94.8 (711, 28.0)	101.0 (758, 29.83)	107.3 (805, 31.69)	113.7 (853, 33.58)	120.0 (900, 35.44)	126.2 (947, 37.27)
	14.5	83.4 (626, 24.63)	89.8 (674, 26.52)	96.2 (722, 28.41)	102.8 (771, 30.36)	109.2 (819, 32.25)	115.6 (867, 34.14)	122.0 (915, 36.03)	128.4 (963, 37.92)
	15.5	84.8 (636, 25.05)	89.8 (685, 26.52)	97.8 (734, 28.89)	104.4 (783, 30.83)	110.9 (832, 32.75)	117.4 (881, 34.67)	124.0 (930, 36.62)	130.5 (979, 38.54)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Time Needed for Diagnosis: 5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK if the continuous time with all of the following conditions established is more than 5 seconds, and clear the NG.

Judgment Value

Malfunction Criteria	Threshold Value
Estimate ambient temperature	$\geq 4.4^{\circ}\text{C}$ (39.92°F)
Battery voltage	$\geq 10.9\text{ V}$
After secondary air injection system operation	0.6 seconds or more
Battery voltage	$\geq 7\text{ V}$
Atmospheric pressure	$\geq 75.0\text{ kPa}$ (563 mmHg, 22.15 inHg)
Engine	In operation
After secondary air injection system stop	3 seconds or more
Secondary air supply piping pressure (Absolute pressure)	$\leq$ Value from Map 22

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

General Description

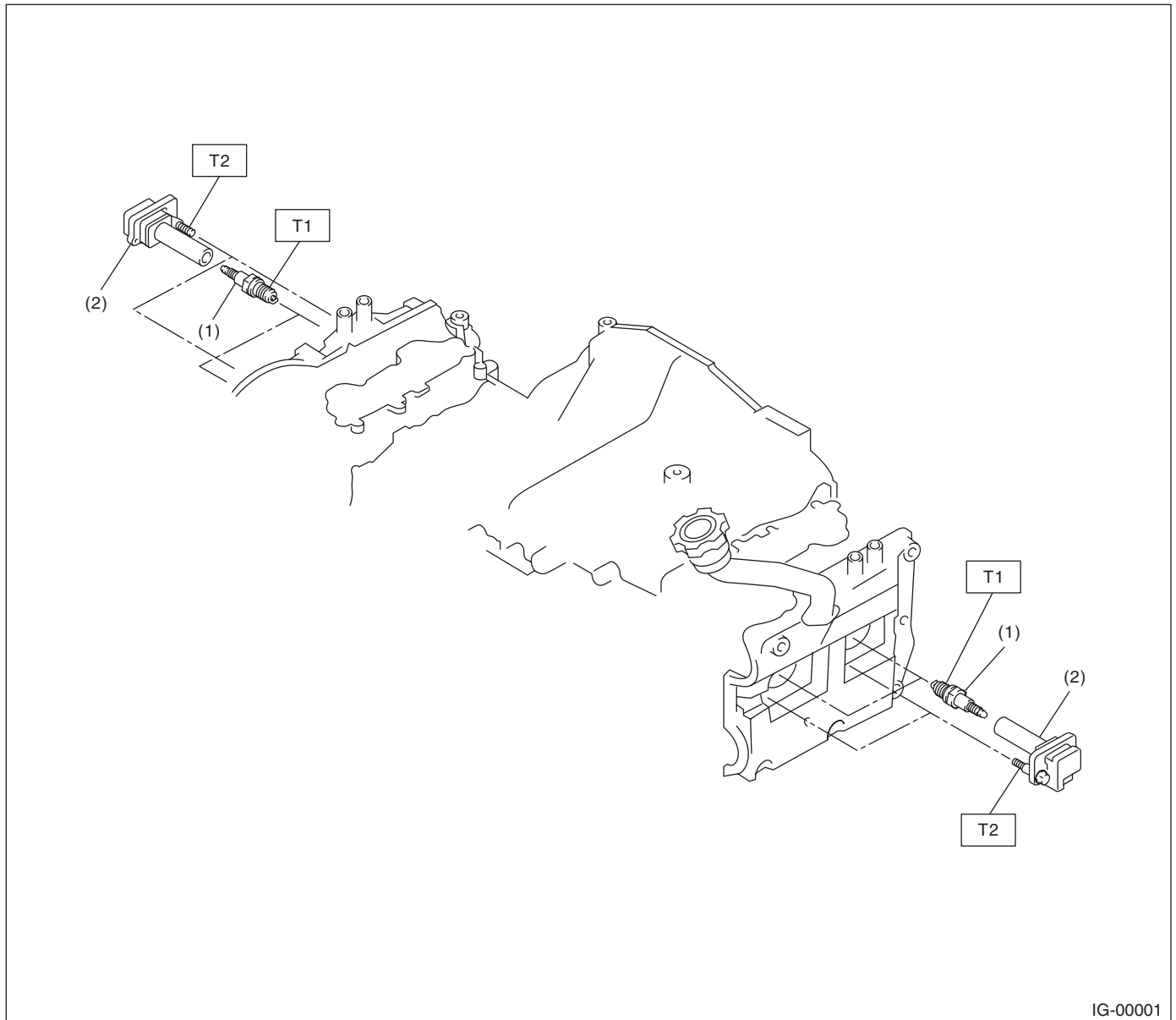
IGNITION

1. General Description

A: SPECIFICATION

Item		Specification
Ignition coil	Type	FK0186 / FK0334
	Ignition system	Independent ignition coil
	Manufacturer	Diamond Electric
Spark plug	Manufacturer and type	NGK: ILFR6B
	Thread diameter, pitch, length	mm 14, 1.25, 26.5
	Spark plug gap	mm (in) 0.7 — 0.8 (0.028 — 0.031)
	Electrode	Iridium

B: COMPONENT



IG-00001

(1) Spark plug

(2) Ignition coil

Tightening torque: N·m (kgf-m, ft-lb)

T1: 21 (2.1, 15.5)

T2: 16 (1.6, 11.8)

C: CAUTION

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

2. Spark Plug

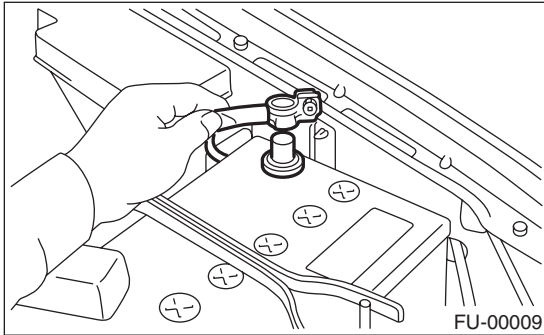
A: REMOVAL

Spark plug:

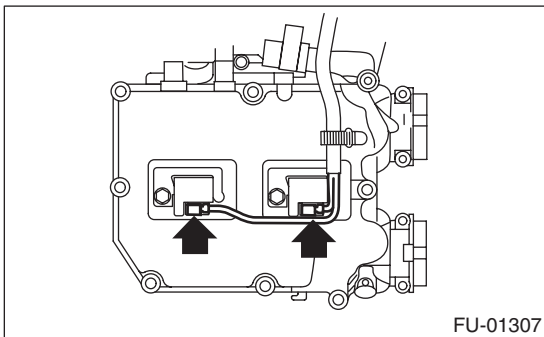
Refer to "SPECIFICATION" for spark plug.
<Ref. to IG(H4DOTC)-2, SPECIFICATION, General Description.>

1. RH SIDE

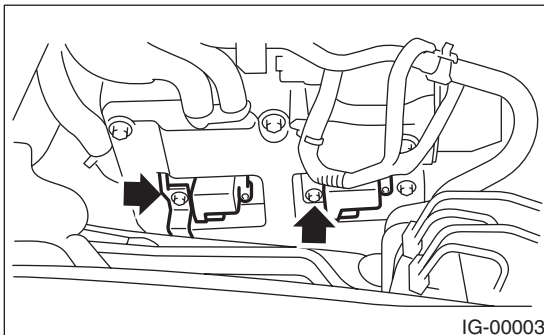
- 1) Disconnect the ground cable from the battery.



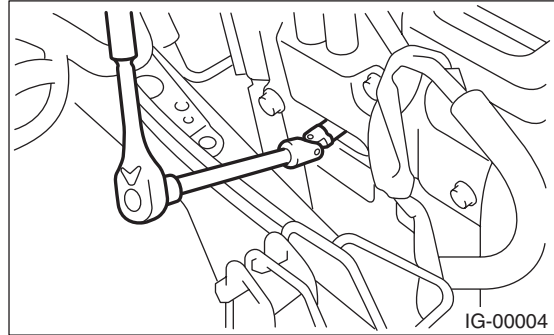
- 2) Remove the collector cover.
- 3) Remove the air cleaner case.
<Ref. to IN(H4DOTC)-8, REMOVAL, Air Cleaner Case.>
- 4) Disconnect the connector from ignition coil.



- 5) Remove the ignition coil.

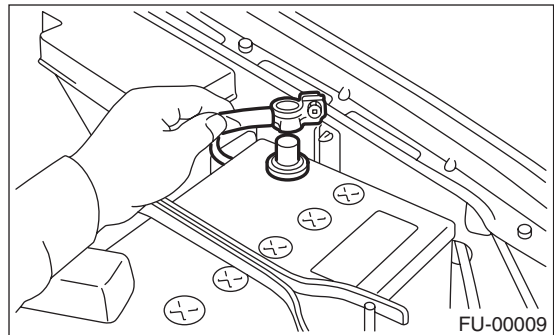


- 6) Remove the spark plug with a spark plug socket.

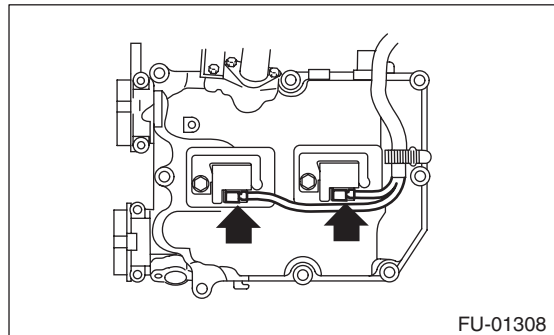


2. LH SIDE

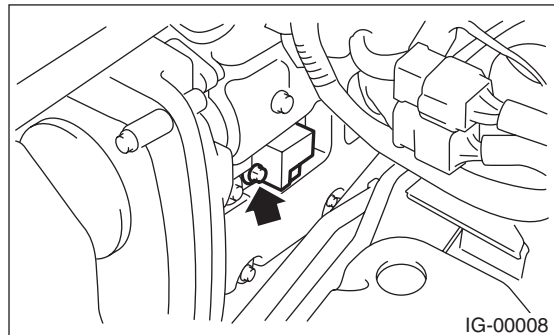
- 1) Remove the battery and battery carrier.



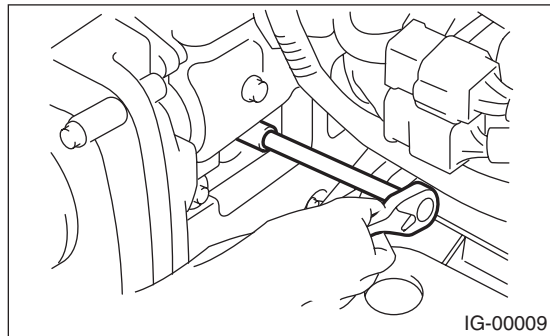
- 2) Remove the collector cover.
- 3) Remove the secondary air pump.
<Ref. to EC(H4DOTC)-9, REMOVAL, Secondary Air Pump.>
- 4) Disconnect the connector from ignition coil.



- 5) Remove the ignition coil.



6) Remove the spark plug with a spark plug socket.



B: INSTALLATION

1. RH SIDE

Install in the reverse order of removal.

Tightening torque:

Spark plug

21 N·m (2.1 kgf-m, 15.5 ft-lb)

Ignition coil

16 N·m (1.6 kgf-m, 11.8 ft-lb)

2. LH SIDE

Install in the reverse order of removal.

Tightening torque:

Spark plug

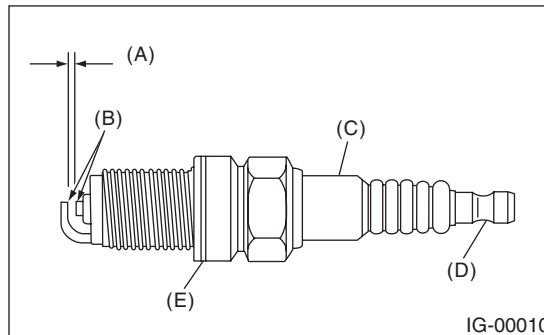
21 N·m (2.1 kgf-m, 15.5 ft-lb)

Ignition coil

16 N·m (1.6 kgf-m, 11.8 ft-lb)

C: INSPECTION

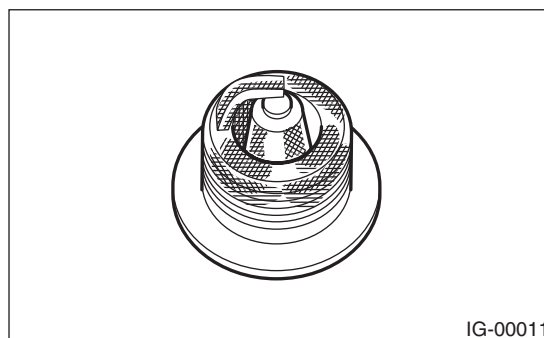
Check the electrodes and inner and outer ceramic insulator of plugs, noting the type of deposits and the degree of electrode erosion.



- (A) Spark plug gap
- (B) Carbon accumulation or wear
- (C) Crack
- (D) Damage
- (E) Damaged gasket

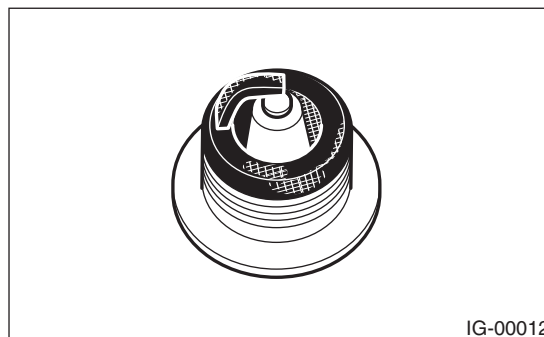
1) Normal:

Brown to grayish-tan deposits and slight electrode wear indicate correct spark plug heat range.



2) Carbon fouled:

Dry fluffy carbon deposits on insulator and electrode are mostly caused by slow speed driving in the city, weak ignition, too rich fuel mixture, dirty air cleaner, etc.

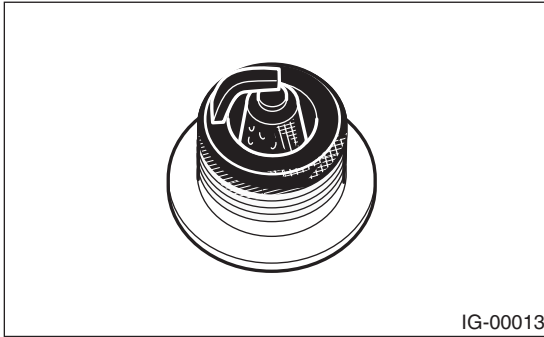


Spark Plug

IGNITION

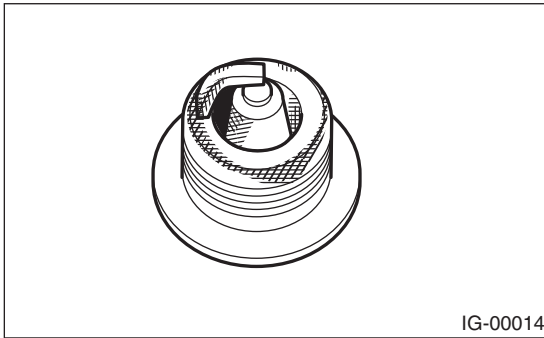
3) Oil fouled:

Wet black deposits show oil entrance into combustion chamber through worn rings or increased clearance between valve guides and stems.



4) Overheating:

White or light gray insulator with black or brown spots and bluish burnt electrodes indicate engine overheating, incorrect ignition timing, improper fuel use, or loose spark plugs.



D: ADJUSTMENT

Clean spark plugs with a nylon brush, etc.

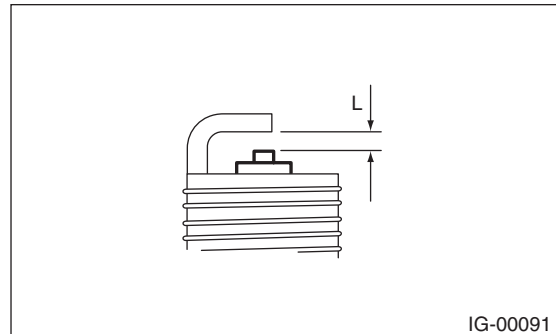
Clean and remove the carbon or oxide deposits. If deposits are too stubborn, replace the spark plugs. After cleaning the spark plugs, measure the spark plug gap using a gap gauge.

NOTE:

- Never use a plug cleaner.
- Never use a metal brush because it makes insulator worn.

Spark plug gap: L

0.7 — 0.8 mm (0.028 — 0.031 in)



3. Ignition Coil

A: REMOVAL

Direct ignition type has been adopted. Refer to "Spark Plug", "REMOVAL" for removal procedures.
<Ref. to IG(H4DOTC)-4, REMOVAL, Spark Plug.>

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

16 N·m (1.6 kgf-m, 11.8 ft-lb)

C: INSPECTION

For inspection procedures, refer to "Diagnostics for Engine Start Failure". <Ref. to EN(H4DOTC)(diag)-70, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>

Ignition Coil

IGNITION

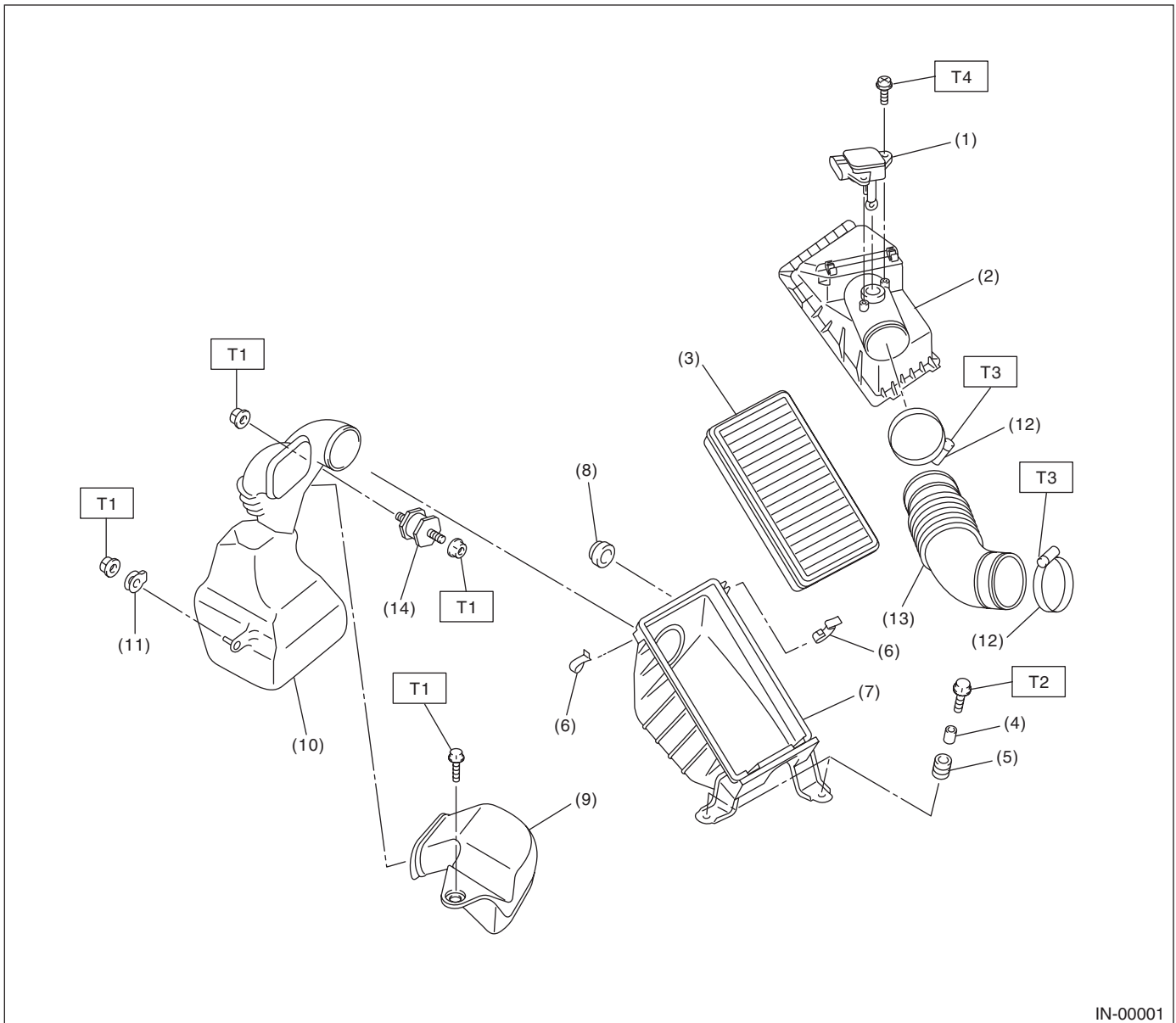
General Description

INTAKE (INDUCTION)

1. General Description

A: COMPONENT

1. AIR CLEANER



- | | | |
|---|-----------------------------|--------------|
| (1) Mass air flow and intake air temperature sensor | (7) Air cleaner lower case | (14) Cushion |
| (2) Air cleaner upper cover | (8) Cushion rubber | |
| (3) Air cleaner element | (9) Air intake duct | |
| (4) Spacer | (10) Resonator chamber ASSY | |
| (5) Bushing | (11) Cushion rubber | |
| (6) Clip | (12) Clamp | |
| | (13) Air intake boot | |

Tightening torque: N·m (kgf-m, ft-lb)

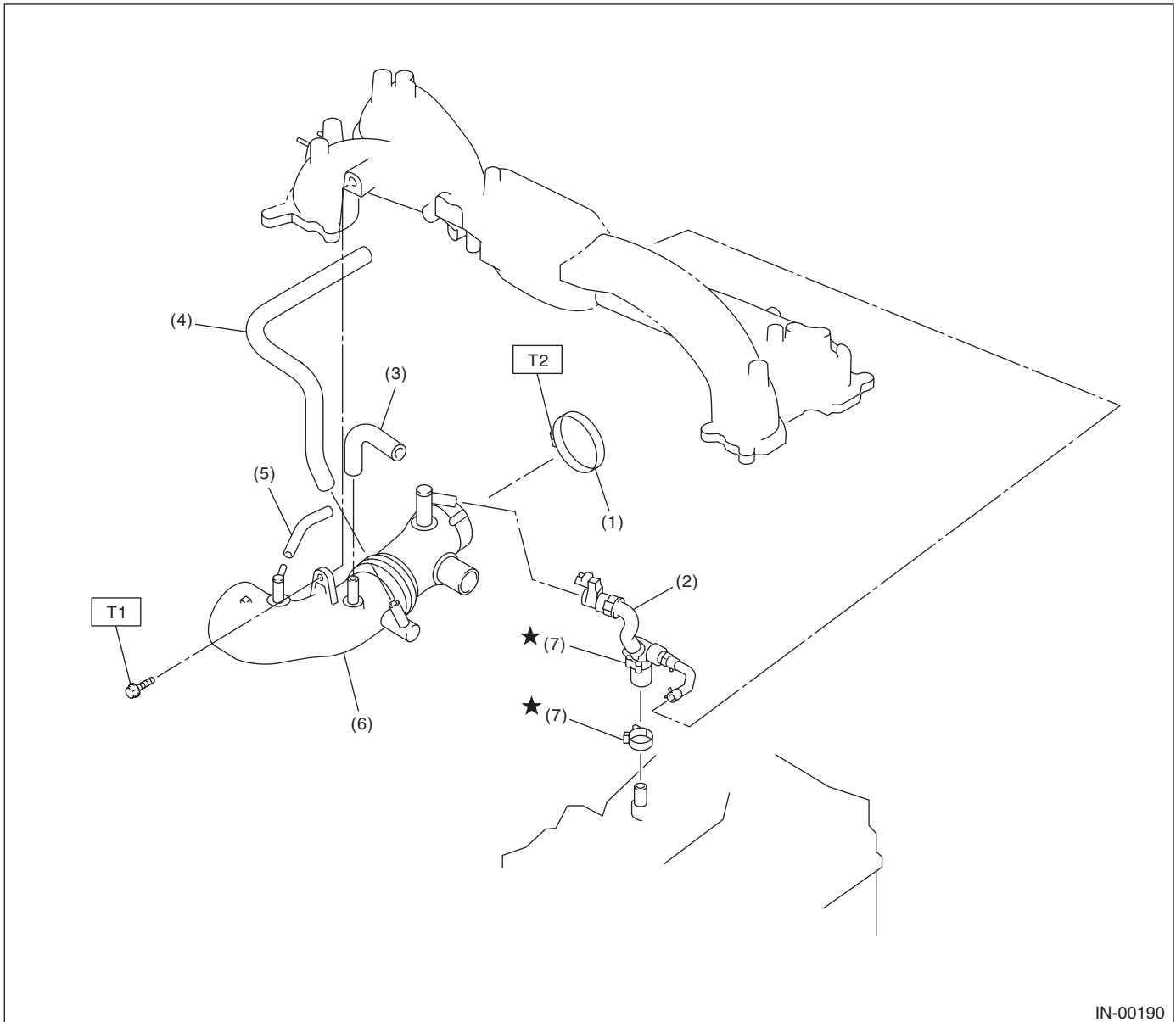
T1: 7.5 (0.76, 5.5)

T2: 33 (3.4, 24.3)

T3: 2.5 (0.25, 1.8)

T4: 1.0 (0.1, 0.7)

2. INTAKE DUCT



IN-00190

- | | |
|------------------------|------------------------|
| (1) Clamp | (5) Air by-pass hose C |
| (2) PCV hose ASSY | (6) Intake duct |
| (3) Air by-pass hose A | (7) Clamp |
| (4) Air by-pass hose B | |

Tightening torque: N·m (kgf-m, ft-lb)

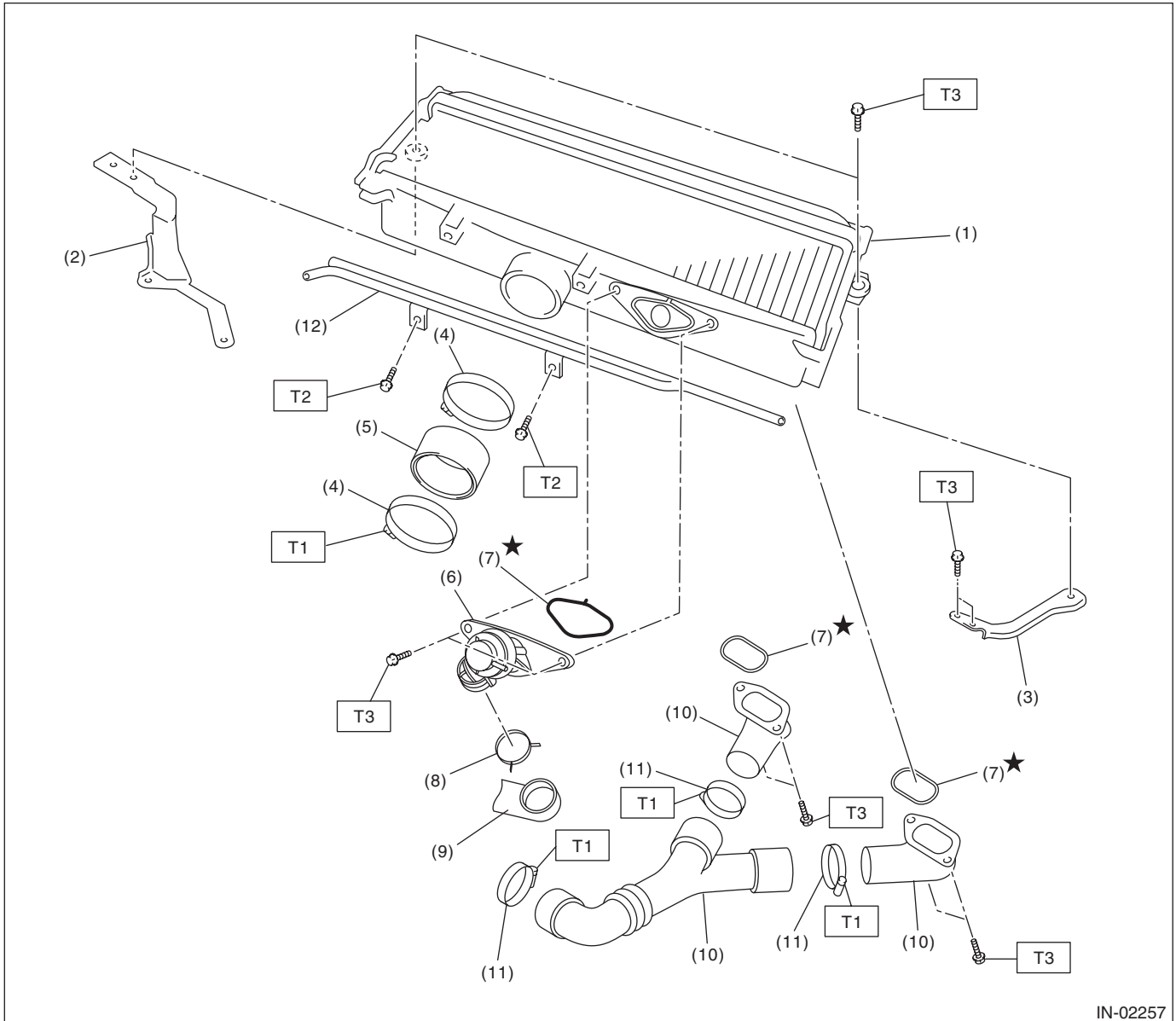
T1: 19 (1.9, 14.0)

T2: 3 (0.3, 2.2)

General Description

INTAKE (INDUCTION)

3. INTERCOOLER



- | | |
|----------------------------|------------------------|
| (1) Intercooler | (7) O-ring |
| (2) Intercooler bracket RH | (8) Clamp |
| (3) Intercooler bracket LH | (9) Air by-pass hose A |
| (4) Clamp | (10) Intercooler duct |
| (5) Air intake duct | (11) Clamp |
| (6) Air by-pass valve | (12) PCV pipe |

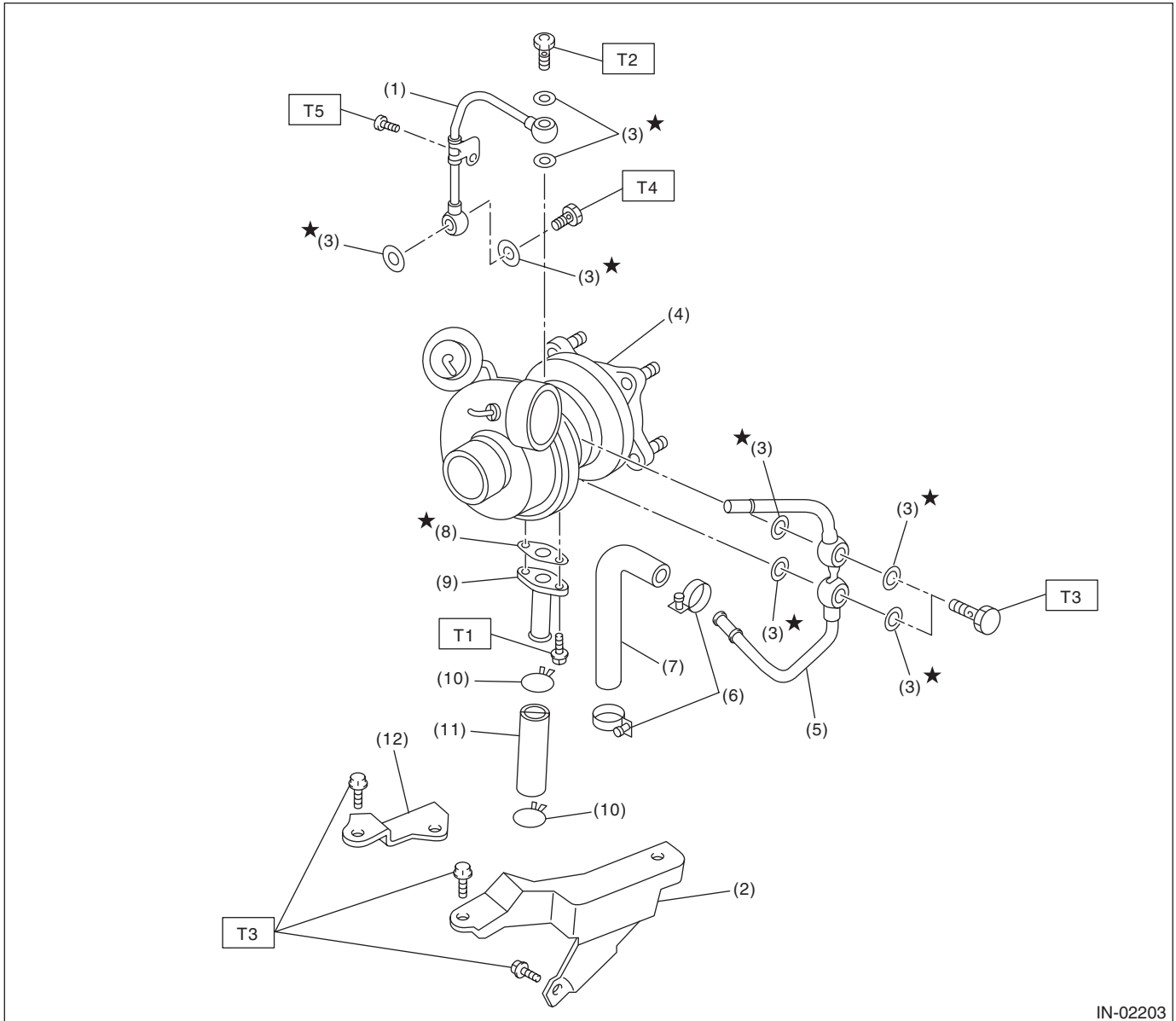
Tightening torque: N·m (kgf-m, ft-lb)

T1: 3 (0.3, 2.2)

T2: 6.3 (0.64, 4.6)

T3: 16 (1.6, 11.8)

4. TURBOCHARGER



IN-02203

- | | |
|-----------------------------|------------------------------|
| (1) Oil inlet pipe A | (7) Engine coolant hose |
| (2) Turbocharger bracket LH | (8) Gasket |
| (3) Metal gasket | (9) Oil outlet pipe |
| (4) Turbocharger | (10) Clip |
| (5) Water pipe | (11) Oil outlet hose |
| (6) Clamp | (12) Turbocharger bracket RH |

Tightening torque: N·m (kgf-m, ft-lb)

T1: 4.4 (0.45, 3.3)

T2: 16 (1.6, 11.8)

T3: 33 (3.4, 24.3)

T4: 29 (3.0, 21.4)

T5: 4.9 (0.50, 3.6)

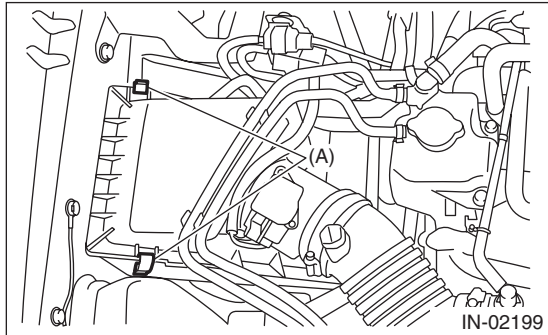
B: CAUTION

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

2. Air Cleaner Element

A: REMOVAL

1) Remove the clip (A) from the air cleaner upper cover.



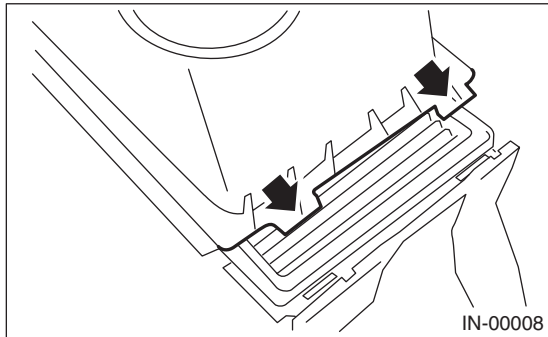
2) Remove the air cleaner element.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:

Before installing the air cleaner upper cover, align the protrusion with the hole of air cleaner lower case, and then secure the upper cover and lower case.



C: INSPECTION

Replace if excessively damaged or dirty.

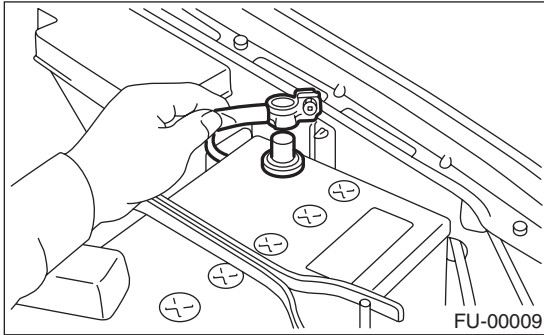
Air Cleaner Case

INTAKE (INDUCTION)

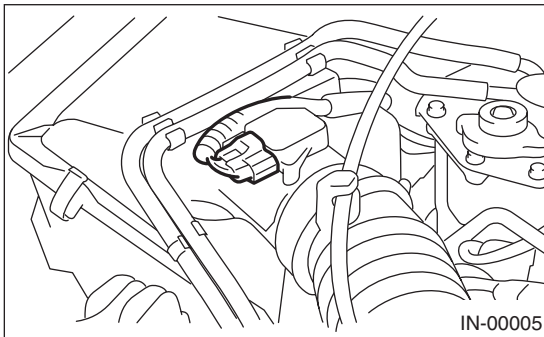
3. Air Cleaner Case

A: REMOVAL

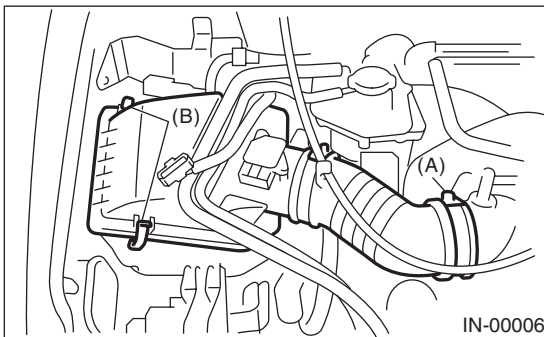
- 1) Disconnect the ground cable from the battery.



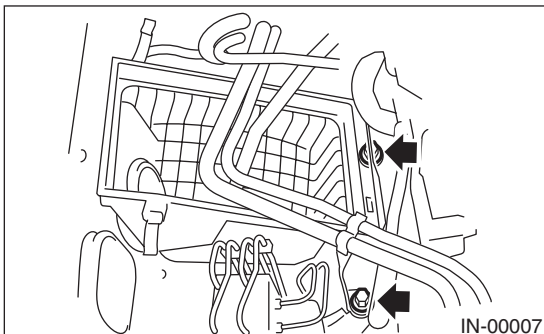
- 2) Disconnect the connector from mass air flow and intake air temperature sensor.



- 3) Loosen the clamps (A) which connect the air intake boot and the intake duct.
- 4) Remove the clip (B) from air cleaner upper cover.



- 5) Remove the air cleaner upper cover.
- 6) Remove the air cleaner element.
- 7) Remove the air cleaner lower case.

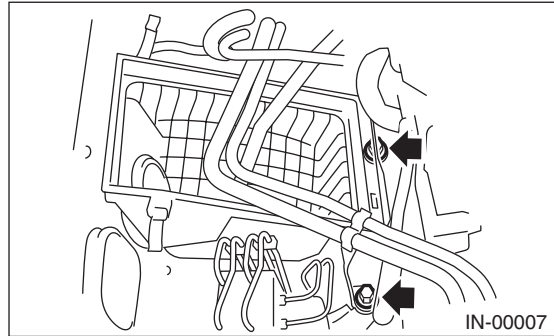


B: INSTALLATION

Install in the reverse order of removal.

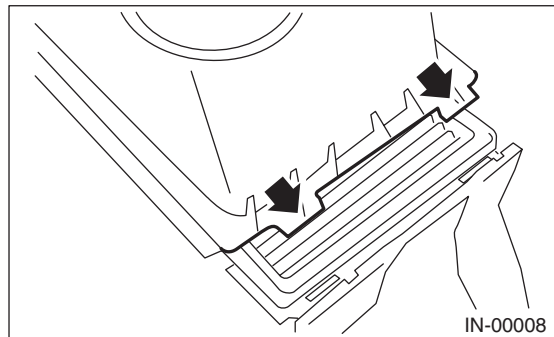
Tightening torque:

33 N·m (3.4 kgf-m, 24.3 ft-lb)



NOTE:

Before installing the air cleaner upper cover, align the protrusion with the hole of air cleaner lower case, and then secure the upper cover and lower case.



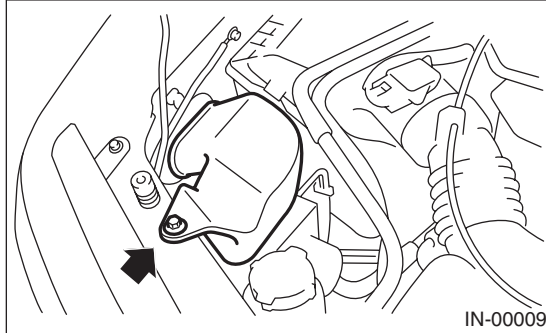
C: INSPECTION

Check for cracks or loose connection.

4. Air Intake Duct

A: REMOVAL

- 1) Remove the bolts which install the air intake duct on the front side of body.
- 2) Remove the air intake duct.

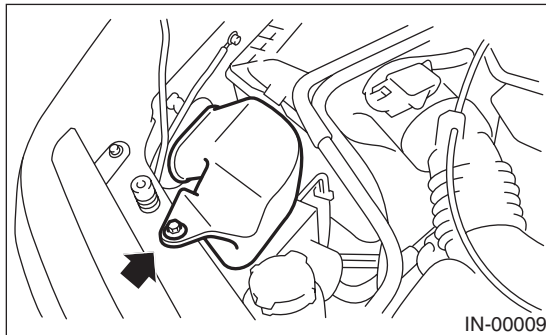


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

7.5 N·m (0.76 kgf-m, 5.5 ft-lb)



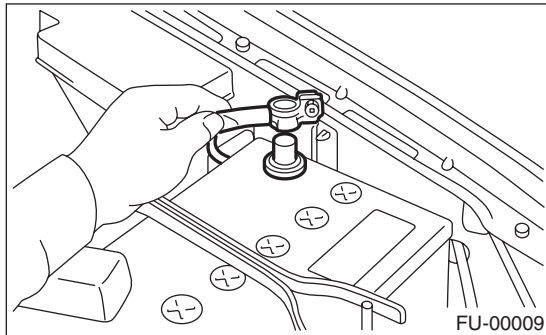
C: INSPECTION

- 1) Check for cracks or loose connection.
- 2) Inspect that no foreign objects in the air intake duct.

5. Intake Duct

A: REMOVAL

1) Disconnect the ground cable from the battery.



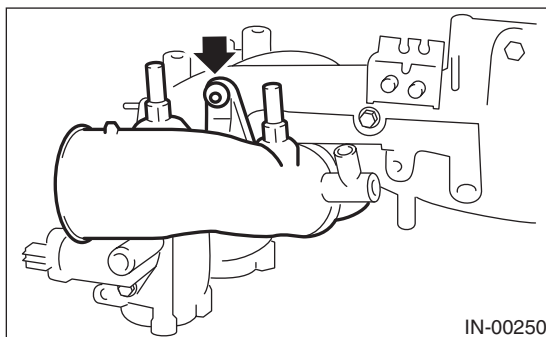
2) Remove the collector cover.

3) Remove the intake manifold.

<Ref. to FU(H4DOTC)-14, REMOVAL, Intake Manifold.>

4) Remove the sensor, engine harness and fuel pipe attached to the intake manifold. <Ref. to FU(H4DOTC)-20, DISASSEMBLY, Intake Manifold.>

5) Remove the intake duct from intake manifold.

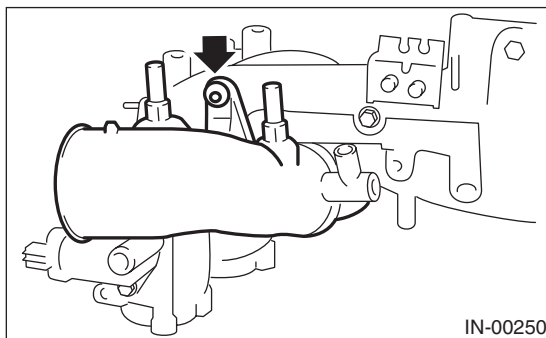


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

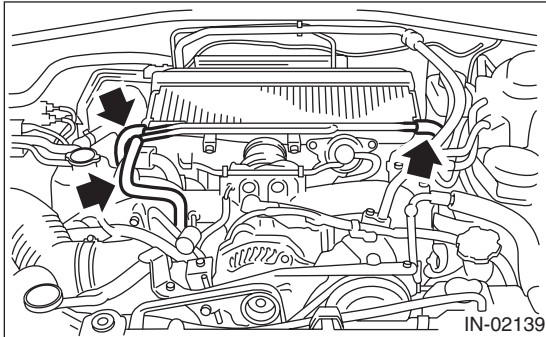
19 N·m (1.9 kgf-m, 14.0 ft-lb)



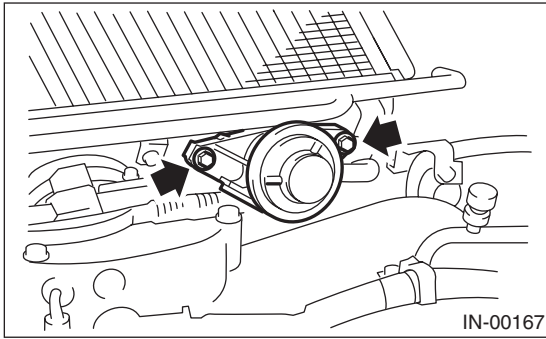
6. Intercooler

A: REMOVAL

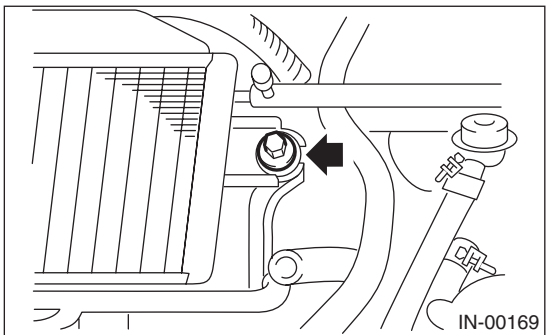
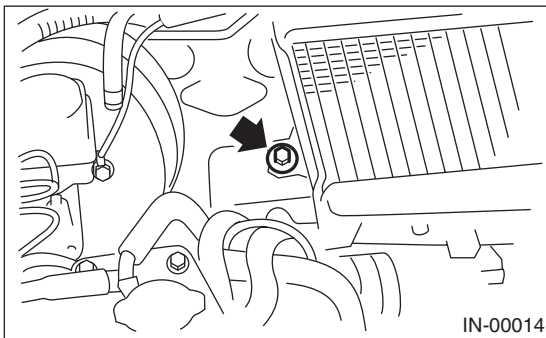
- 1) Remove the collector cover.
- 2) Disconnect the PCV hose from PCV pipe.



- 3) Remove the air by-pass valve from intercooler.

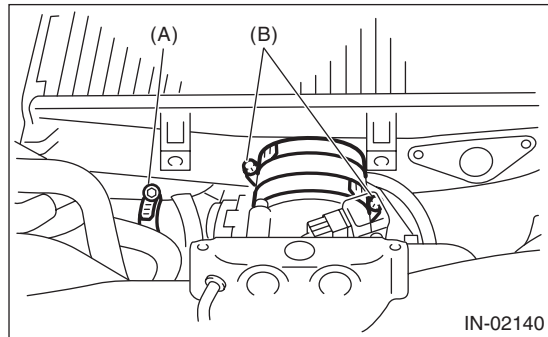


- 4) Remove the bolts which secure the intercooler to the bracket.



- 5) Loosen the clamps (A) which connect the turbocharger and intercooler duct.

- 6) Loosen the clamps (B) which connect the throttle body and intercooler.



- 7) Separate the intercooler duct from turbocharger.
- 8) Remove the intercooler from throttle body.

B: INSTALLATION

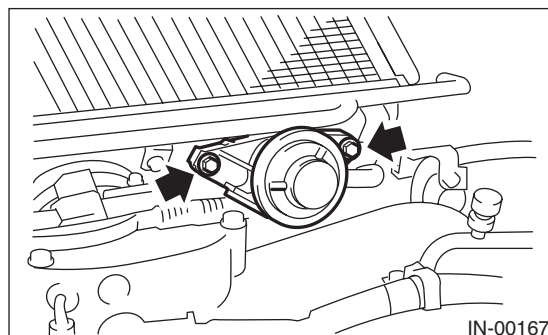
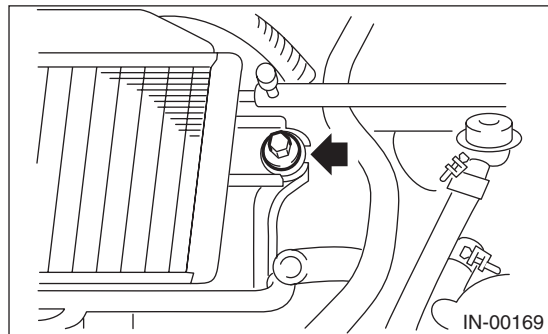
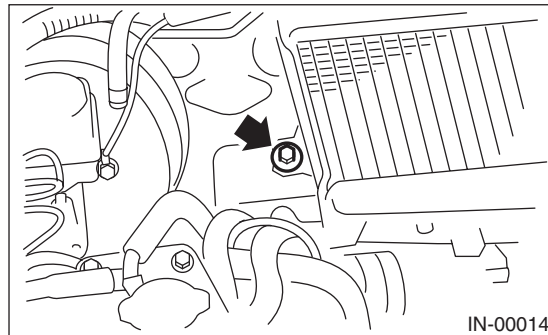
Install in the reverse order of removal.

NOTE:

Use new O-rings.

Tightening torque:

16 N·m (1.6 kgf-m, 11.8 ft-lb)

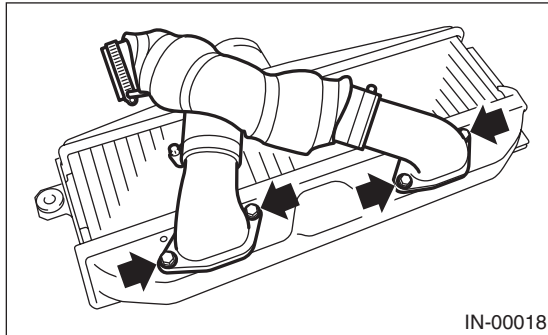


Intercooler

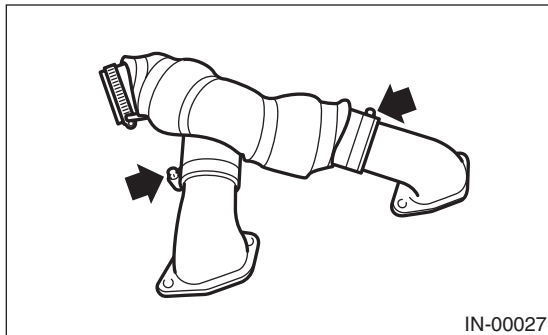
INTAKE (INDUCTION)

C: DISASSEMBLY

1) Remove the intercooler ducts from intercooler.



2) Separate the duct.



D: ASSEMBLY

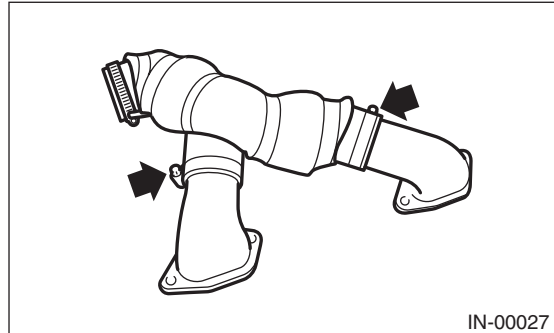
Assemble in the reverse order of disassembly.

NOTE:

- Use new O-rings.
- Be careful not to pinch the O-ring.

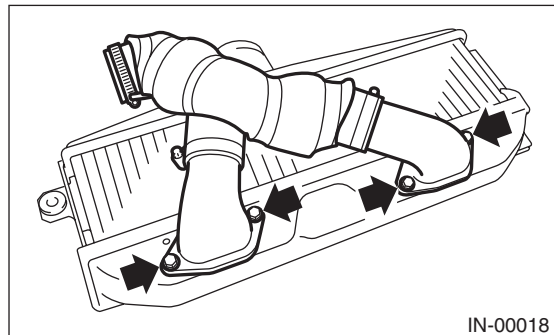
Tightening torque:

3 N·m (0.3 kgf-m, 2.2 ft-lb)



Tightening torque:

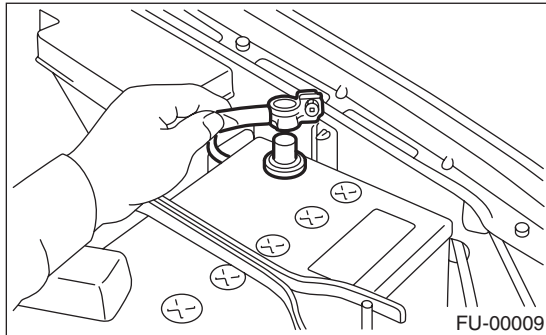
16 N·m (1.6 kgf-m, 11.8 ft-lb)



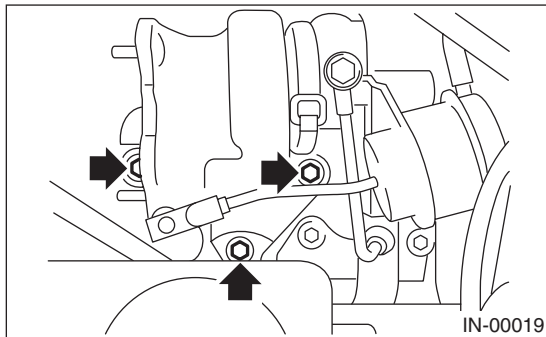
7. Turbocharger

A: REMOVAL

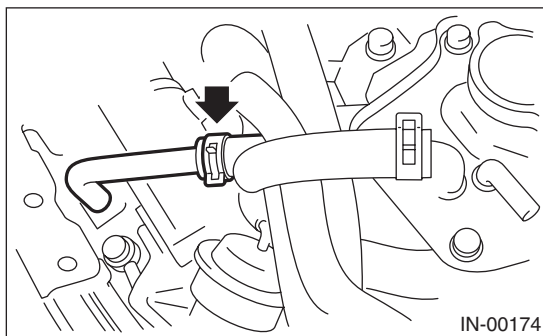
- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from the battery.



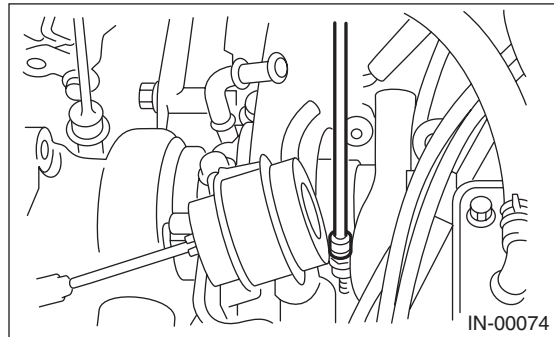
- 3) Remove the collector cover.
- 4) Remove the center exhaust pipe. <Ref. to EX(H4DOTC)-8, REMOVAL, Center Exhaust Pipe.>
- 5) Lower the vehicle.
- 6) Remove the bolts which secure the turbocharger to the turbocharger joint pipe.



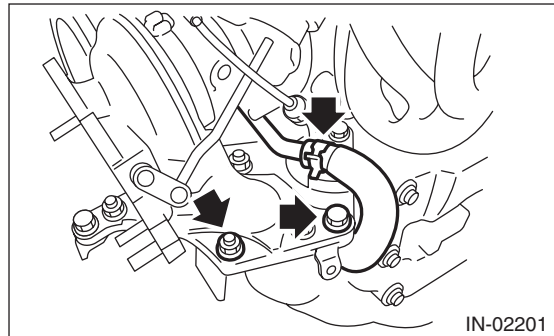
- 7) Disconnect the engine coolant hose which is connected to coolant filler tank.



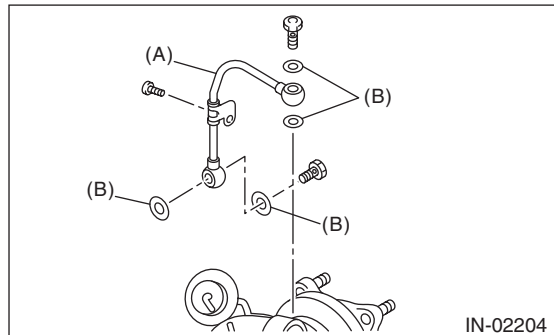
- 8) Loosen the clamp which secures turbocharger to intake duct.



- 9) Disconnect the engine coolant hoses from water pipe, and remove the turbocharger bracket RH.

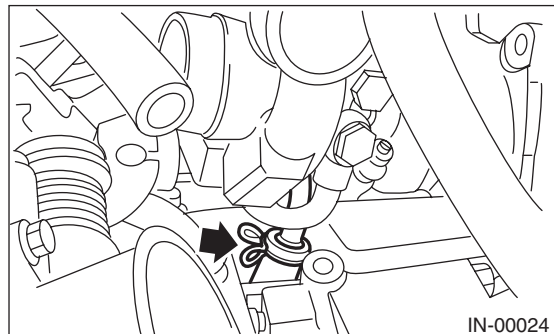


- 10) Remove the oil inlet pipe from turbocharger.



- (A) Oil inlet pipe
- (B) Metal gasket

- 11) Disconnect the oil outlet hose from pipe.



- 12) Take out the turbocharger from engine compartment.

Turbocharger

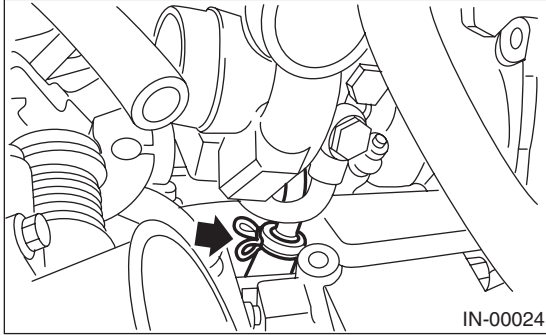
INTAKE (INDUCTION)

B: INSTALLATION

CAUTION:

When replacing the turbocharger, check the filter part of union screw for clogging. <Ref. to LU(H4SO)-24, INSPECTING UNION SCREW WITH FILTER, INSPECTION, Oil Pipe.>

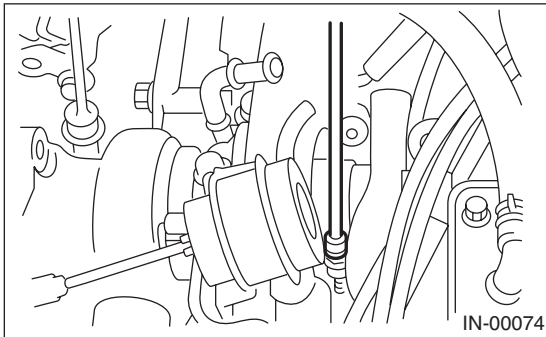
- 1) Connect the oil outlet hose to outlet pipe.



- 2) Install the turbocharger to intake duct.

Tightening torque:

3 N·m (0.3 kgf-m, 2.2 ft-lb)



- 3) Install the oil inlet pipe to turbocharger.

NOTE:

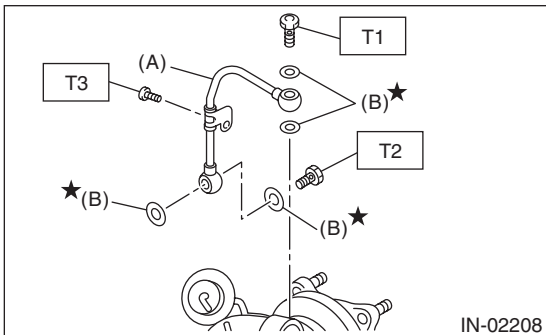
Use a new gasket.

Tightening torque:

T1: 16 N·m (1.6 kgf-m, 11.8 ft-lb)

T2: 29 N·m (3.0 kgf-m, 21.4 ft-lb)

T3: 4.9 N·m (0.50 kgf-m, 3.6 ft-lb)



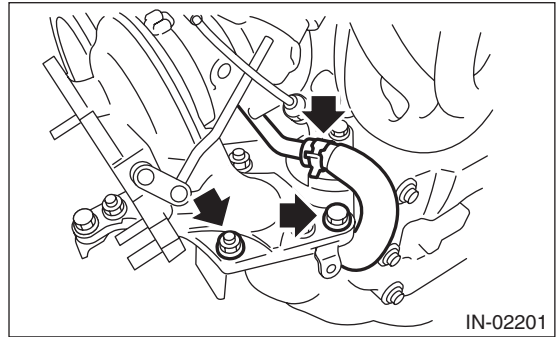
(A) Oil inlet pipe

(B) Metal gasket

- 4) Install the turbocharger bracket RH and connect the engine coolant hoses to the pipe.

Tightening torque:

33 N·m (3.4 kgf-m, 24.3 ft-lb)



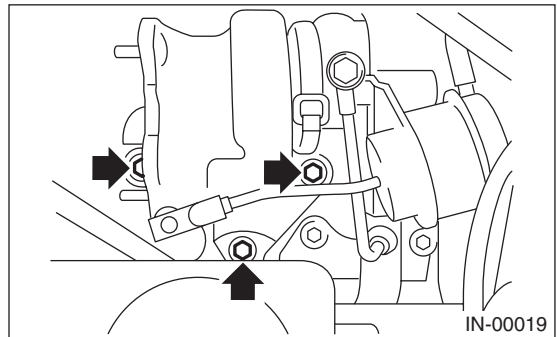
- 5) Install the joint pipe to turbocharger.

NOTE:

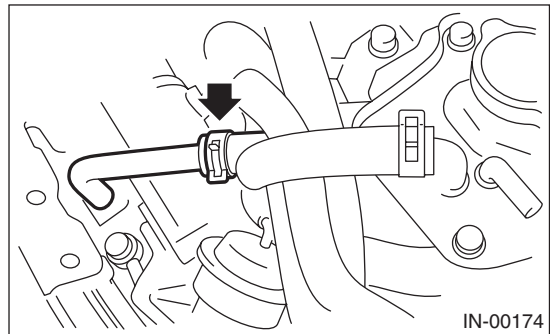
Use a new gasket.

Tightening torque:

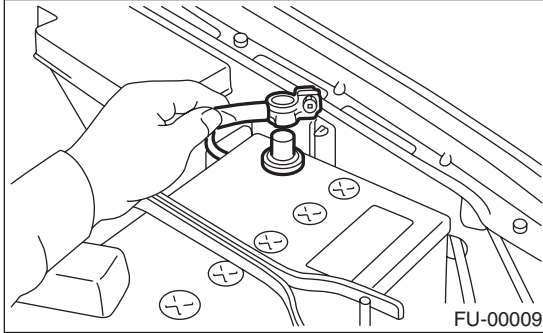
42.5 N·m (4.3 kgf-m, 31.3 ft-lb)



- 6) Connect the engine coolant hose which is connected to the coolant filler tank.



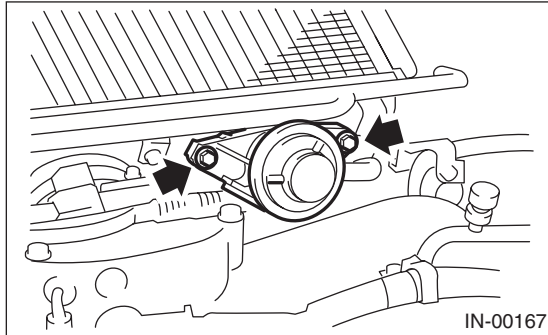
- 7) Lift up the vehicle.
- 8) Install the center exhaust pipe. <Ref. to EX(H4DOTC)-9, INSTALLATION, Center Exhaust Pipe.>
- 9) Lower the vehicle.
- 10) Install the collector cover.
- 11) Connect the ground cable to battery.



8. Air By-pass Valve

A: REMOVAL

- 1) Remove the collector cover.
- 2) Remove the air by-pass valve from intercooler.



- 3) Disconnect the air by-pass hoses from air valve.

B: INSTALLATION

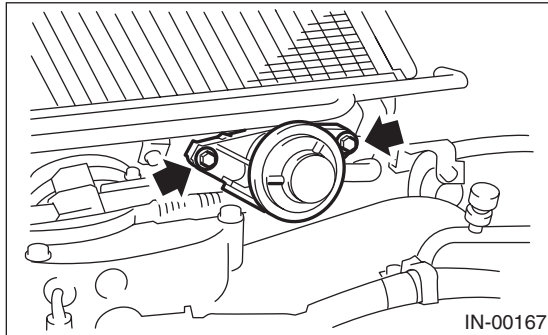
Install in the reverse order of removal.

NOTE:

- Use new O-rings.
- Be careful not to pinch the O-ring.

Tightening torque:

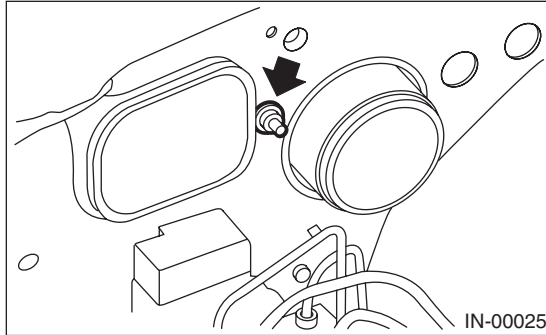
16 N·m (1.6 kgf-m, 11.8 ft-lb)



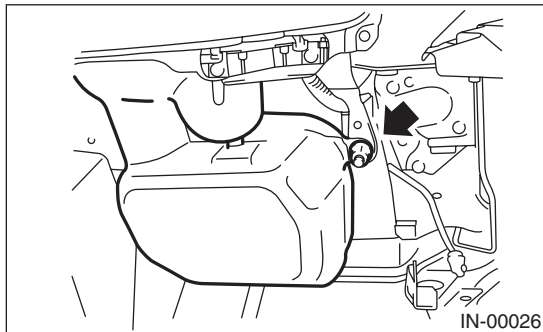
9. Resonator Chamber

A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Remove the collector cover.
- 3) Remove the air intake duct. <Ref. to IN(H4DOTC)-9, REMOVAL, Air Intake Duct.>
- 4) Remove the air cleaner case. <Ref. to IN(H4DOTC)-8, REMOVAL, Air Cleaner Case.>
- 5) Remove the resonator chamber mounting bolt on the right of engine compartment.



- 6) Remove the front wheel RH, and lift up the vehicle.
- 7) Remove the front mudguard RH.
- 8) Remove the resonator chamber from the inside front fender.

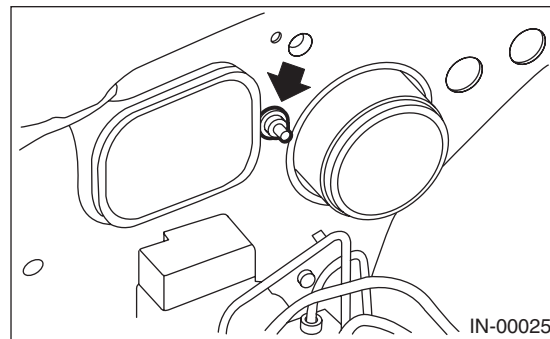
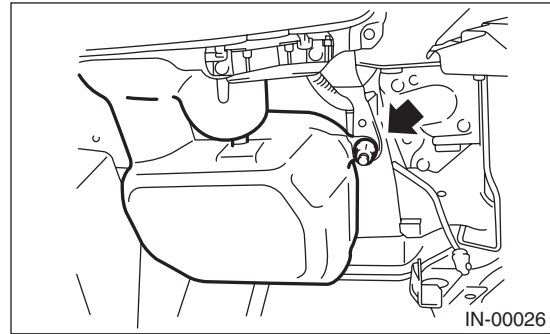


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

7.5 N·m (0.76 kgf-m, 5.5 ft-lb)



C: INSPECTION

Check for cracks or loose connection. Check that no foreign objects are mixed in the resonator chamber.

Resonator Chamber

INTAKE (INDUCTION)

1. General Description

A: SPECIFICATION

Specifications for the turbo model are included in the LU (H4SO) section. <Ref. to LU(H4SO)-2, General Description.>

General Description

MECHANICAL

1. General Description

A: SPECIFICATION

Engine	Model		2.5 L	
	Cylinder arrangement		Horizontally opposed, liquid cooled, 4-cylinder, 4-stroke gasoline engine	
	Valve system mechanism		Belt driven, double overhead camshaft, 4-valve/cylinder	
	Bore × Stroke		mm (in)	
	Piston displacement		cm ³ (cu in)	
	Compression ratio		8.4	
	Compression pressure (at 200 — 300 rpm)		kPa (kgf/cm ² , psi)	
	Number of piston rings		Pressure ring: 2, Oil ring: 1	
	Intake valve timing	Open	Max. retard	5° ATDC
			Min. advance	35° BTDC
		Close	Max. retard	65° ABDC
			Min. advance	25° ABDC
	Exhaust valve timing	Open		55° BBDC
		Close		5° ATDC
	Valve clearance	Intake	mm (in)	0.20±0.02 (0.0079±0.0008)
		Exhaust	mm (in)	0.35±0.02 (0.0138±0.0008)
	Idle speed [At neutral position on MT, or “P” or “N” range on AT]		No Load	700±100
			A/C ON	A/C refrigerant pressure is low
				MT: 725±100 AT: 750±100
			A/C ON	A/C refrigerant pressure is high
				MT: 800±100 AT: 825±100
	Ignition order		1 → 3 → 2 → 4	
	Ignition timing		BTDC/rpm	

General Description

MECHANICAL

NOTE:

OS: Oversize US: Undersize

Belt tension adjuster	Protrusion of adjuster rod			5.2 — 6.2 mm (0.204 — 0.244 in)
Belt tensioner	Spacer O.D.			17.955 — 17.975 mm (0.7069 — 0.7077 in)
	Tensioner bushing I.D.			18.00 — 18.08 mm (0.7087 — 0.7118 in)
	Clearance between spacer and bushing		Standard	0.025 — 0.125 mm (0.0010 — 0.0049 in)
			Limit	0.175 mm (0.069 in)
	Side clearance of spacer		Standard	0.20 — 0.55 mm (0.0079 — 0.0217 in)
			Limit	0.81 mm (0.0319 in)
Camshaft	Bend limit			0.020 mm (0.00079 in)
	Thrust clearance		Standard	0.068 — 0.116 mm (0.0027 — 0.0046 in)
			Limit	0.14 mm (0.0055 in)
	Cam lobe height	Intake	Standard	46.55 — 46.65 mm (1.833 — 1.837 in)
			Limit	46.45 mm (1.829 in)
		Exhaust	Standard	46.75 — 46.85 mm (1.841 — 1.844 in)
			Limit	46.65 mm (1.837 in)
	Camshaft journal O.D.	Standard	Front	37.946 — 37.963 mm (1.4939 — 1.4946 in)
			Center rear	29.946 — 29.963 mm (1.1790 — 1.1796 in)
	Oil clearance		Standard	0.037 — 0.072 mm (0.0015 — 0.0028 in)
			Limit	0.1 mm (0.0039 in)
	Cylinder head	Surface warpage limit (Mating surface with cylinder block)		
Grinding limit			0.3 mm (0.012 in)	
Standard height			127.5 mm (5.02 in)	
Valve seat	Seating angle			90°
	Contacting width	Intake	Standard	0.6 — 1.4 mm (0.024 — 0.055 in)
			Limit	1.7 mm (0.067 in)
		Exhaust	Standard	1.2 — 1.8 mm (0.047 — 0.071 in)
			Limit	2.2 mm (0.087 in)
Valve guide	Inside diameter			6.000 — 6.012 mm (0.2362 — 0.2367 in)
	Protrusion above head			15.8 — 16.2 mm (0.622 — 0.638 in)
Valve	Head edge thickness	Intake	Standard	1.0 — 1.4 mm (0.039 — 0.055 in)
			Limit	0.8 mm (0.031 in)
		Exhaust	Standard	1.3 — 1.7 mm (0.051 — 0.067 in)
			Limit	0.8 mm (0.031 in)
	Stem outer diameter		Intake	5.955 — 5.970 mm (0.2344 — 0.2350 in)
			Exhaust	5.945 — 5.960 mm (0.2341 — 0.2346 in)
	Valve stem gap	Standard	Intake	0.030 — 0.057 mm (0.0012 — 0.0022 in)
			Exhaust	0.040 — 0.067 mm (0.0016 — 0.0026 in)
		Limit	—	0.15 mm (0.0059 in)
	Overall length		Intake	104.4 mm (4.110 in)
Exhaust			104.65 mm (4.120 in)	
Valve spring	Free length			47.32 mm (1.863 in)
	Squareness			2.5°, 2.1 mm (0.083 in) or less
	Tension/spring height	Set	205 — 235 N (20.9 — 24.0 kgf, 46.1 — 52.8 lb)/ 36.0 mm (1.417 in)	
		Lift	426 — 490 N (43.4 — 50.0 kgf, 95.8 — 110 lb)/ 26.50 mm (1.043 in)	

General Description

MECHANICAL

Valve lifter	Outer diameter			34.959 — 34.975 mm (1.3763 — 1.3770 in)
	Inner diameter (cylinder head)			34.994 — 35.016 mm (1.3777 — 1.3786 in)
	Valve lifter clearance	Standard		0.019 — 0.057 mm (0.0007 — 0.0022 in)
		Limit		0.100 mm (0.0039 in)
Cylinder block	Surface warpage limit (Mating surface with cylinder head)			0.025 mm (0.0098 in)
	Grinding limit			0.1 mm (0.004 in)
	Standard height			201.0 mm (7.91 in)
	Cylinder inner diameter	Standard	A	99.505 — 99.515 mm (3.9175 — 3.9179 in)
			B	99.495 — 99.505 mm (3.9171 — 3.9175 in)
	Taper	Standard		0.015 mm (0.0006 in)
		Limit		0.050 mm (0.0020 in)
	Out-of-roundness	Standard		0.010 mm (0.0004 in)
		Limit		0.050 mm (0.0020 in)
	Piston clearance	Standard		−0.010 — 0.010 mm (−0.0004 — 0.0004 in)
		Limit		0.030 mm (0.0012 in)
Cylinder inner boring limit (diameter)			100.005 mm (3.9372 in)	
Piston	Outer diameter	Standard	A	99.505 — 99.515 mm (3.9175 — 3.9179 in)
			B	99.495 — 99.505 mm (3.9171 — 3.9175 in)
		0.25 mm (0.0098 in) OS		99.745 — 99.765 mm (3.9270 — 3.9278 in)
		0.50 mm (0.0197 in) OS		99.995 — 100.015 mm (3.9368 — 3.9376 in)
Piston pin	Standard clearance between piston and piston pin		Standard	0.004 — 0.008 mm (0.0002 — 0.0003 in)
			Limit	0.020 mm (0.0008 in)
	Degree of fit			Piston pin can be fitted into position with thumb at 20°C (68°F).
Piston ring	Ring closed gap	Top ring	Standard	0.20 — 0.25 mm (0.0079 — 0.0098 in)
			Limit	1.0 mm (0.039 in)
		Second ring	Standard	0.37 — 0.52 mm (0.015 — 0.020 in)
			Limit	1.0 mm (0.039 in)
		Oil ring	Standard	0.20 — 0.50 mm (0.0079 — 0.0197 in)
			Limit	1.5 mm (0.059 in)
	Ring groove gap	Top ring	Standard	0.040 — 0.080 mm (0.0016 — 0.0031 in)
			Limit	0.15 mm (0.0059 in)
		Second ring	Standard	0.030 — 0.070 mm (0.0012 — 0.0028 in)
Limit			0.15 mm (0.0059 in)	
Connecting rod	Bend or twist per 100 mm (3.94 in) in length		Limit	0.10 mm (0.0039 in)
	Thrust clearance		Standard	0.070 — 0.330 mm (0.0028 — 0.0130 in)
			Limit	0.4 mm (0.016 in)
Bearing of large end	Oil clearance	Standard		0.017 — 0.045 mm (0.0007 — 0.0018 in)
		Limit		0.05 mm (0.0020 in)
	Thickness at center portion	Standard		1.490 — 1.502 mm (0.0587 — 0.0591 in)
		0.03 mm (0.0012 in) US		1.504 — 1.512 mm (0.0592 — 0.0595 in)
		0.05 mm (0.0020 in) US		1.514 — 1.522 mm (0.0596 — 0.0599 in)
		0.25 mm (0.0098 in) US		1.614 — 1.622 mm (0.0635 — 0.0639 in)
	Bushing of small end	Clearance between piston pin and bushing		Standard
Limit				0.030 mm (0.0012 in)

General Description

MECHANICAL

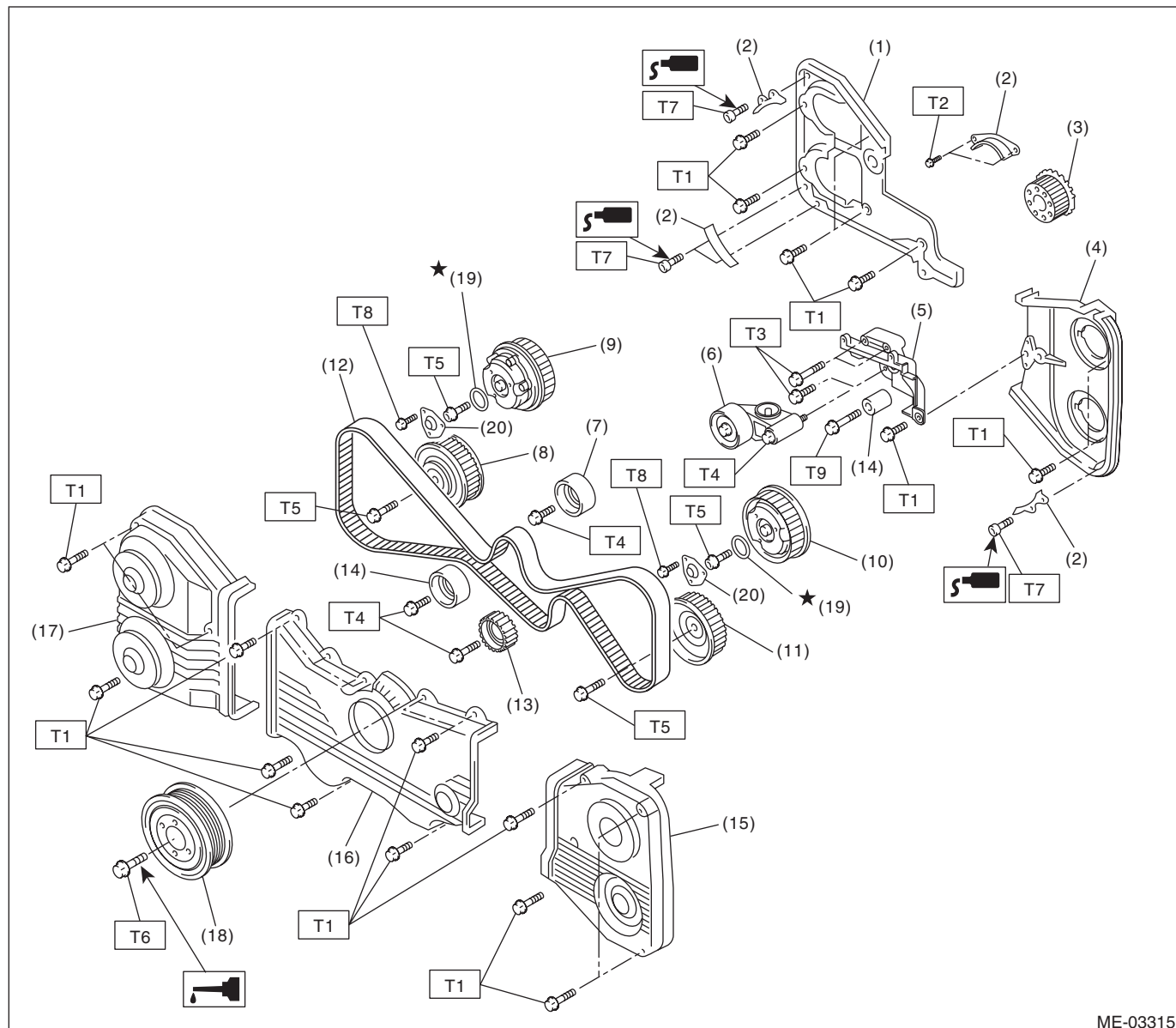
Crankshaft	Bending limit			0.035 mm (0.0014 in)
	Crank pin	Out-of-roundness		0.003 mm (0.0001 in)
		Cylindricality		0.004 mm (0.0002 in)
		Grinding limit (dia.)		To 51.750 mm (2.0374 in)
	Crank journal	Out-of-roundness		0.005 mm (0.0002 in)
		Cylindricality		0.006 mm (0.0002 in)
		Grinding limit (dia.)		To 59.758 mm (2.3527 in)
	Crank pin outer diameter		Standard	51.984 — 52.000 mm (2.0466 — 2.0472 in)
			0.03 mm (0.0012 in) US	51.954 — 51.970 mm (2.0454 — 2.0461 in)
			0.05 mm (0.0020 in) US	51.934 — 51.950 mm (2.0447 — 2.0453 in)
			0.25 mm (0.0098 in) US	51.734 — 51.750 mm (2.0368 — 2.0374 in)
	Crank journal outer diameter		Standard	59.992 — 60.008 mm (2.3619 — 2.3625 in)
			0.03 mm (0.0012 in) US	59.962 — 59.978 mm (2.3607 — 2.3613 in)
			0.05 mm (0.0020 in) US	59.942 — 59.958 mm (2.3599 — 2.3605 in)
			0.25 mm (0.0098 in) US	59.742 — 59.758 mm (2.3520 — 2.3527 in)
	Thrust clearance		Standard	0.030 — 0.115 mm (0.0012 — 0.0045 in)
			Limit	0.25 mm (0.0098 in)
Oil clearance		Standard	0.010 — 0.030 mm (0.0004 — 0.0012 in)	
		Limit	0.040 mm (0.0016 in)	
Main bearing	Thickness of main bearing	#1, #3	Standard	1.998 — 2.011 mm (0.0787 — 0.0792 in)
			0.03 mm (0.0012 in) US	2.017 — 2.020 mm (0.0794 — 0.0795 in)
			0.05 mm (0.0020 in) US	2.027 — 2.030 mm (0.0798 — 0.0799 in)
			0.25 mm (0.0098 in) US	2.127 — 2.130 mm (0.0837 — 0.0839 in)
		#2, #4, #5	Standard	2.000 — 2.013 mm (0.0787 — 0.0793 in)
			0.03 mm (0.0012 in) US	2.019 — 2.022 mm (0.0795 — 0.0796 in)
			0.05 mm (0.0020 in) US	2.029 — 2.032 mm (0.0799 — 0.0800 in)
			0.25 mm (0.0098 in) US	2.129 — 2.132 mm (0.0838 — 0.0839 in)

General Description

MECHANICAL

B: COMPONENT

1. TIMING BELT



ME-03315

- | | |
|--|-----------------------------|
| (1) Timing belt cover No. 2 (RH) | (13) Belt idler No. 2 |
| (2) Timing belt guide (MT model) | (14) Belt idler |
| (3) Crank sprocket | (15) Timing belt cover (LH) |
| (4) Timing belt cover No. 2 (LH) | (16) Front belt cover |
| (5) Tensioner bracket | (17) Timing belt cover (RH) |
| (6) Automatic belt tension adjuster ASSY | (18) Crank pulley |
| (7) Belt idler | (19) O-ring |
| (8) Exhaust cam sprocket (RH) | (20) Actuator cover |
| (9) Intake cam sprocket (RH) | |
| (10) Intake cam sprocket (LH) | |
| (11) Exhaust cam sprocket (LH) | |
| (12) Timing belt | |

Tightening torque: N·m (kgf-m, ft-lb)

T1: 5 (0.5, 3.7)

T2: 9.75 (1.0, 7.2)

T3: 24.5 (2.5, 18.1)

T4: 39 (4.0, 28.8)

T5: <Ref. to ME(H4DOTC)-52, INSTALLATION, Cam Sprocket.>

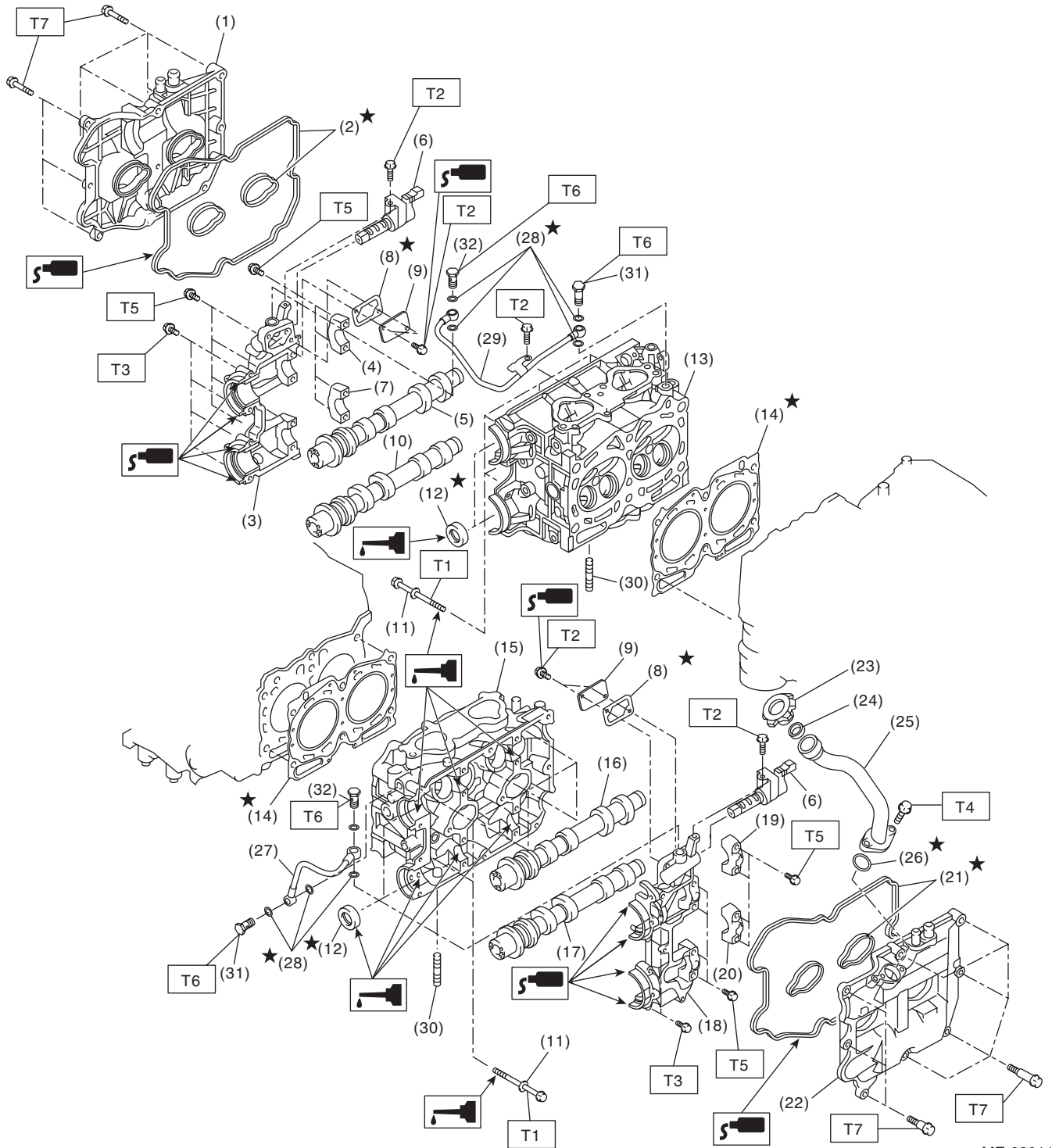
T6: <Ref. to ME(H4DOTC)-41, INSTALLATION, Crank Pulley.>

T7: 6.4 (0.65, 4.7)

T8: 3.4 (0.35, 2.5)

T9: 25 (2.5, 18.4)

2. CYLINDER HEAD AND CAMSHAFT



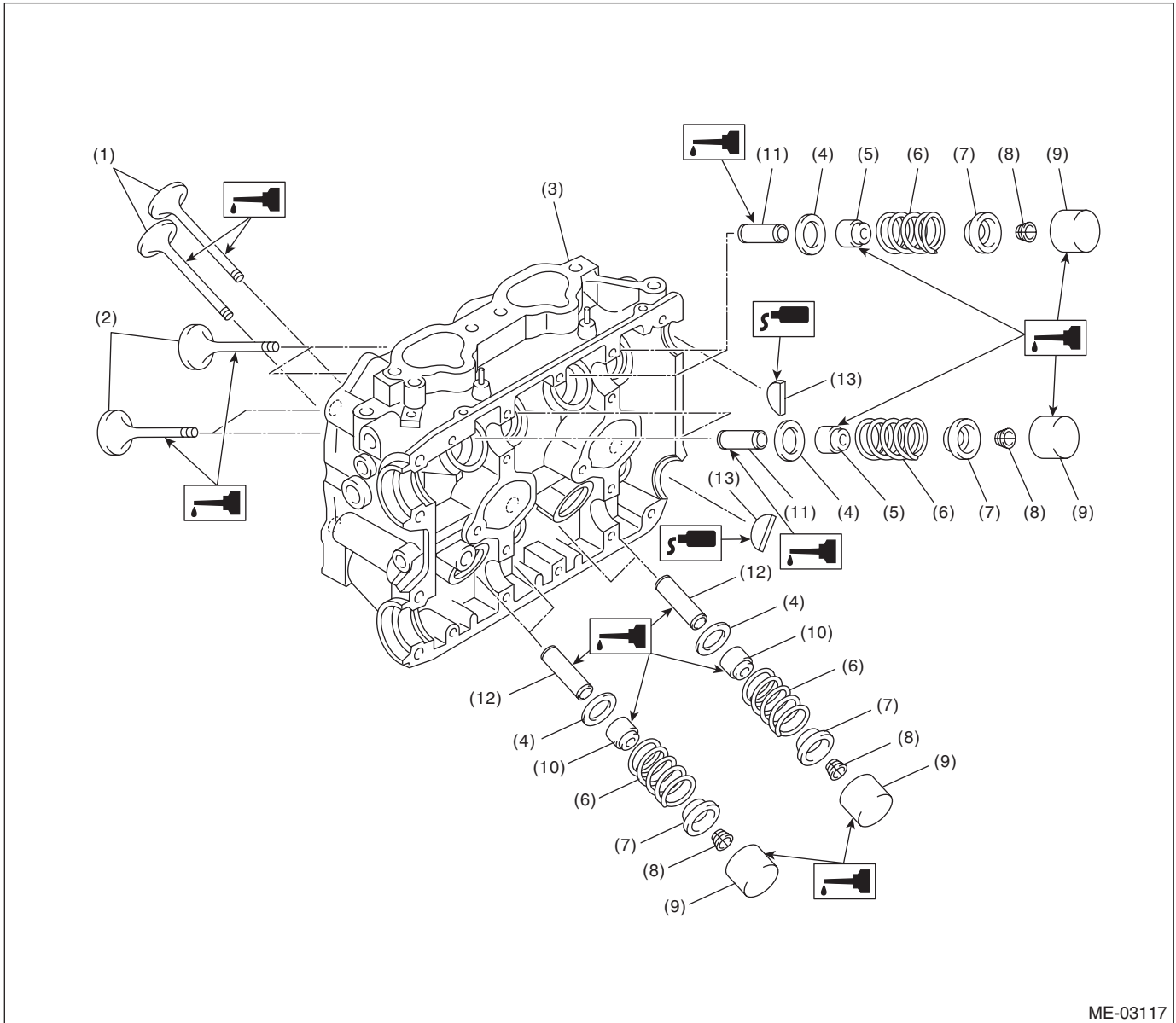
ME-03011

General Description

MECHANICAL

(1) Rocker cover (RH)	(17) Exhaust camshaft (LH)	(32) Union screw without filter (Without protrusion)
(2) Rocker cover gasket (RH)	(18) Camshaft cap (Front LH)	
(3) Camshaft cap (Front RH)	(19) Intake camshaft cap (Rear LH)	
(4) Intake camshaft cap (Rear RH)	(20) Exhaust camshaft cap (Rear LH)	Tightening torque:N·m (kgf-m, ft-lb)
(5) Intake camshaft (RH)	(21) Rocker cover gasket (LH)	T1: <Ref. to ME(H4DOTC)-62, INSTALLATION, Cylinder Head.>
(6) Oil flow control solenoid valve	(22) Rocker cover (LH)	
(7) Exhaust camshaft cap (Rear RH)	(23) Oil filler cap	T2: 8 (0.8, 5.9)
(8) Gasket	(24) Gasket	T3: 9.75 (1.0, 7.2)
(9) Oil return cover	(25) Oil filler duct	T4: 6.4 (0.65, 4.7)
(10) Exhaust camshaft (RH)	(26) O-ring	T5: 20 (2.0, 14.8)
(11) Cylinder head bolt	(27) Oil pipe (LH)	T6: 29 (3.0, 21.4)
(12) Oil seal	(28) Gasket	T7: <Ref. to ME(H4DOTC)-56, INSTALLATION, Camshaft.>
(13) Cylinder head (RH)	(29) Oil pipe (RH)	
(14) Cylinder head gasket	(30) Stud bolt	
(15) Cylinder head (LH)	(31) Union screw with filter (With protrusion)	
(16) Intake camshaft (LH)		

3. CYLINDER HEAD AND VALVE ASSEMBLY



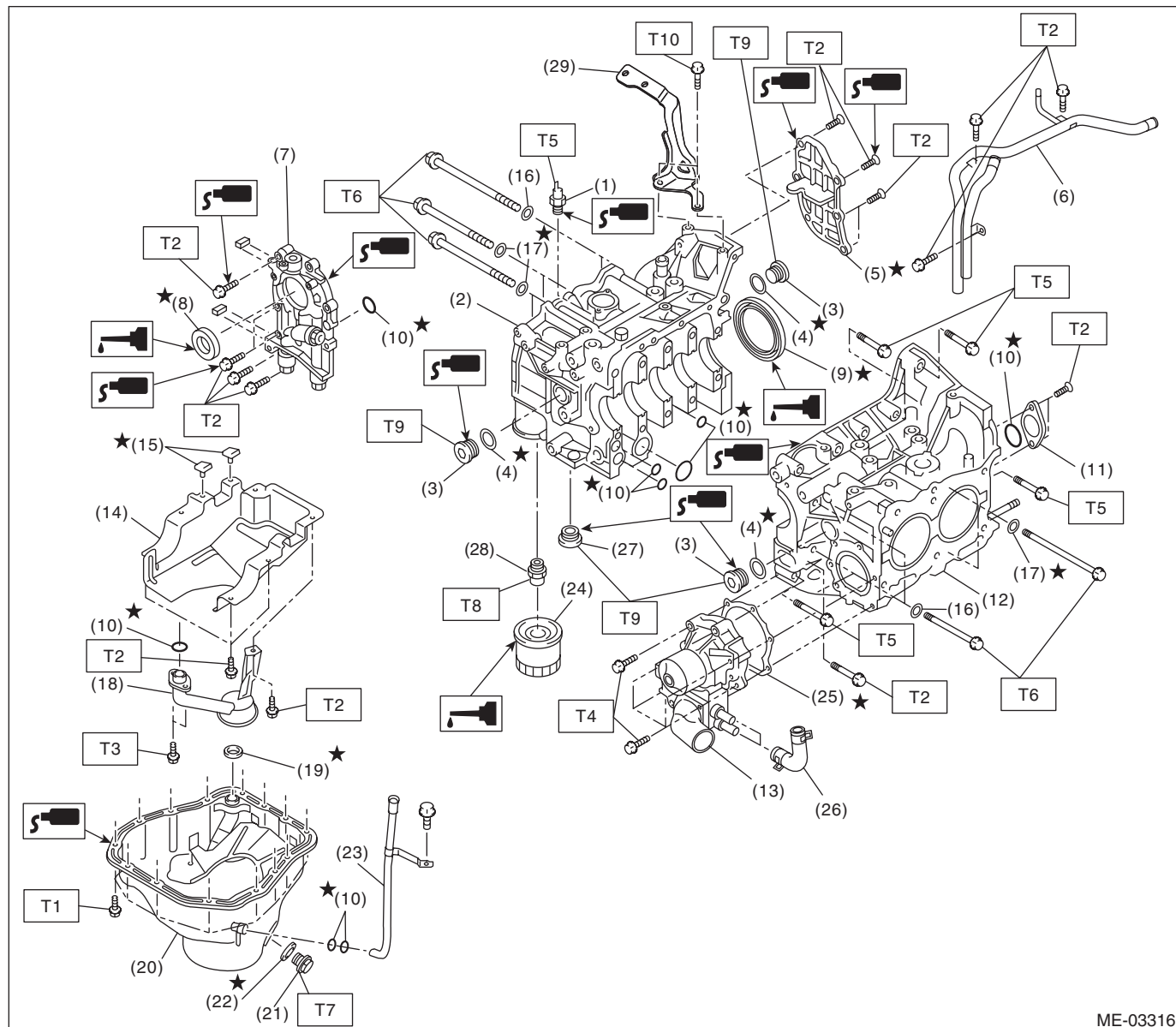
ME-03117

- | | | |
|---------------------------|------------------|-----------------------------|
| (1) Exhaust valve | (6) Valve spring | (10) Exhaust valve oil seal |
| (2) Intake valve | (7) Retainer | (11) Intake valve guide |
| (3) Cylinder head | (8) Retainer key | (12) Exhaust valve guide |
| (4) Valve spring seat | (9) Valve lifter | (13) Plug |
| (5) Intake valve oil seal | | |

General Description

MECHANICAL

4. CYLINDER BLOCK



ME-03316

- | | |
|--------------------------|----------------------------|
| (1) Oil pressure switch | (16) Washer |
| (2) Cylinder block (RH) | (17) Seal washer |
| (3) Service hole plug | (18) Oil strainer |
| (4) Gasket | (19) Gasket |
| (5) Oil separator cover | (20) Oil pan |
| (6) Water by-pass pipe | (21) Drain plug |
| (7) Oil pump | (22) Drain plug gasket |
| (8) Front oil seal | (23) Oil level gauge guide |
| (9) Rear oil seal | (24) Oil filter |
| (10) O-ring | (25) Gasket |
| (11) Service hole cover | (26) Water pump hose |
| (12) Cylinder block (LH) | (27) Plug |
| (13) Water pump | (28) Connector |
| (14) Baffle plate | (29) Intercooler bracket |
| (15) Seal | |

Tightening torque: N·m (kgf-m, ft-lb)

T1: 5 (0.5, 3.7)

T2: 6.4 (0.65, 4.7)

T3: 10 (1.0, 7.4)

T4: First 12 (1.2, 8.9)

Second 12 (1.2, 8.9)

T5: 25 (2.5, 18.4)

**T6: <Ref. to ME(H4DOTC)-74,
INSTALLATION, Cylinder
Block.>**

T7: 44 (4.5, 32.5)

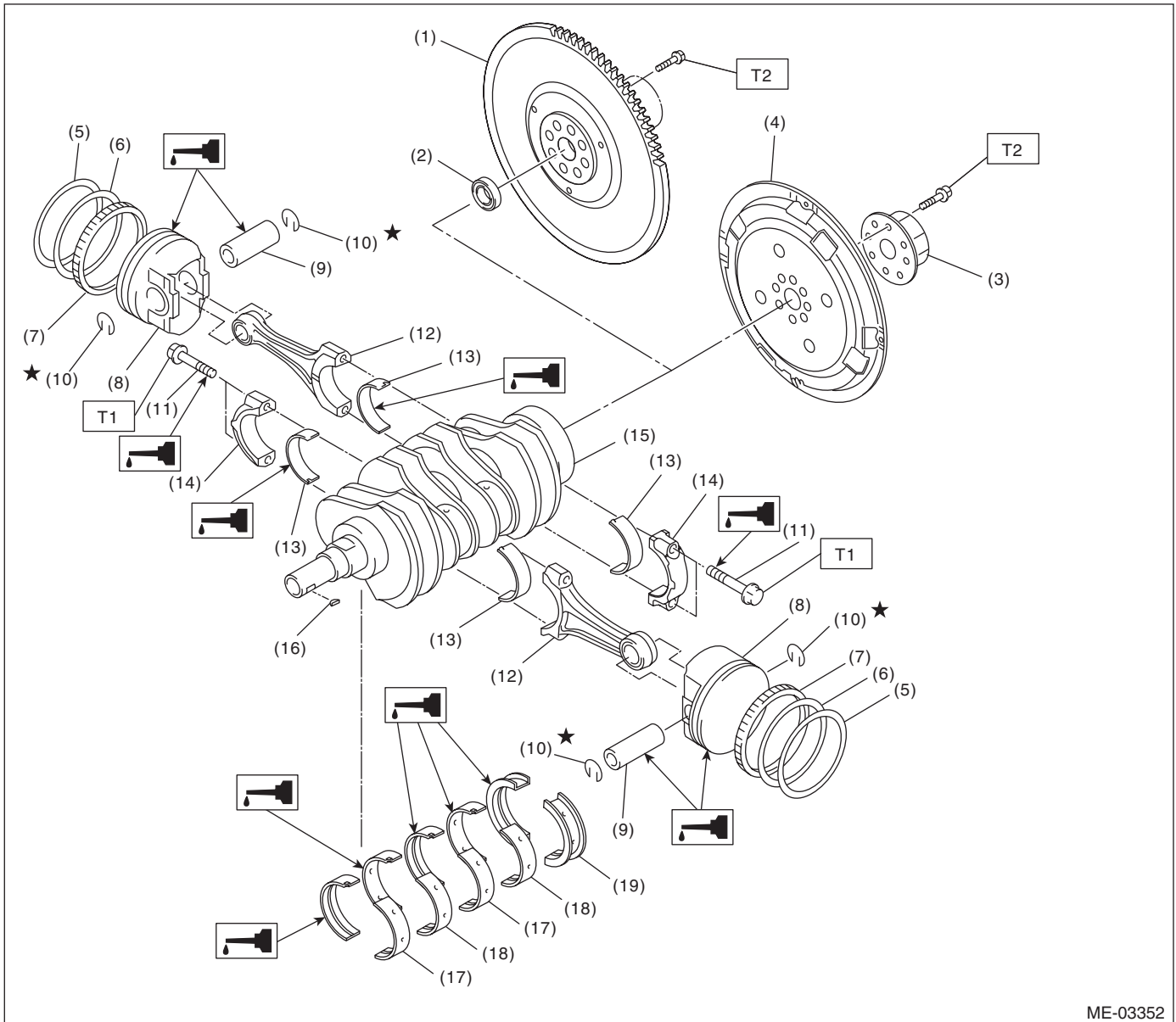
T8: 45 (4.6, 33.2)

T9: 70 (7.1, 51.6)

T10: 16 (1.6, 11.8)

ME(H4DOTC)-10

5. CRANKSHAFT AND PISTON



ME-03352

- | | | |
|------------------------------|-----------------------------|--------------------------------|
| (1) Flywheel (MT model) | (9) Piston pin | (17) Crankshaft bearing #1, #3 |
| (2) Ball bearing (MT model) | (10) Snap ring | (18) Crankshaft bearing #2, #4 |
| (3) Reinforcement (AT model) | (11) Connecting rod bolt | (19) Crankshaft bearing #5 |
| (4) Drive plate (AT model) | (12) Connecting rod | |
| (5) Top ring | (13) Connecting rod bearing | |
| (6) Second ring | (14) Connecting rod cap | |
| (7) Oil ring | (15) Crankshaft | |
| (8) Piston | (16) Woodruff key | |

Tightening torque: N·m (kgf-m, ft-lb)

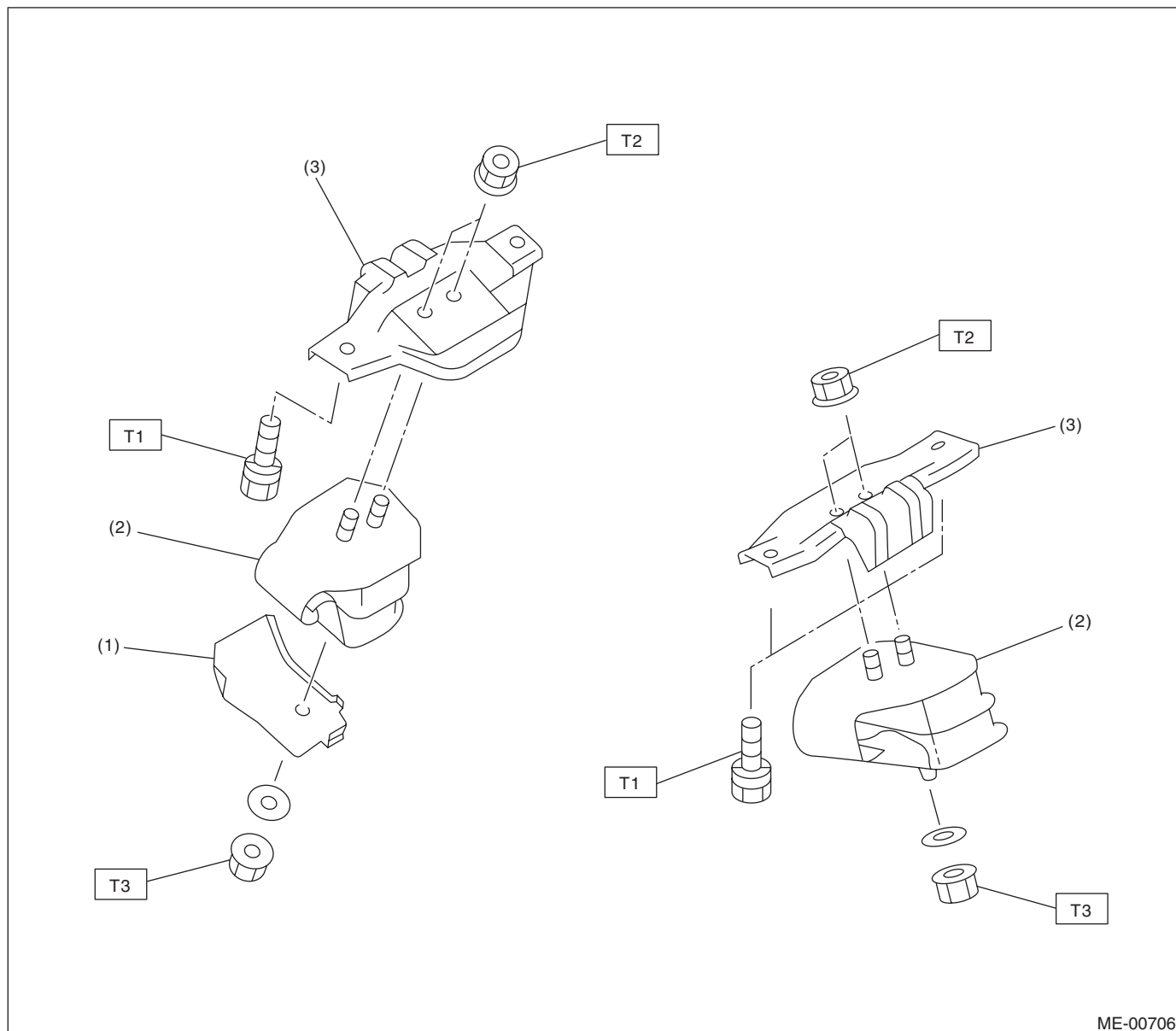
T1: 52 (5.3, 38.4)

T2: 72 (7.3, 53.1)

General Description

MECHANICAL

6. ENGINE MOUNTING



ME-00706

- (1) Heat shield cover
(2) Front cushion rubber

- (3) Front engine mounting bracket

Tightening torque: N·m (kgf-m, ft-lb)

T1: 35 (3.6, 25.8)

T2: 42 (4.3, 31.0)

T3: 85 (8.7, 62.7)

C: CAUTION

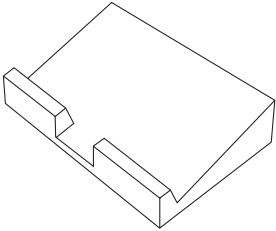
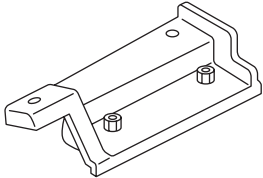
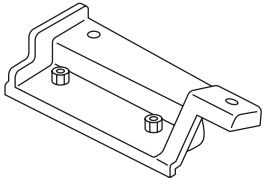
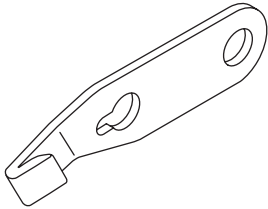
- Wear appropriate work clothing, including a cap, protective goggles and protective shoes when performing any work.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Vehicle components are extremely hot after driving. Be wary of receiving burns from heated parts.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.
- All parts should be thoroughly cleaned, paying special attention to engine oil passages, pistons and bearings.
- Rotating parts and sliding parts such as piston, bearing and gear should be coated with oil prior to assembly.
- Be careful not to let oil, grease or engine coolant contact the timing belt, clutch disc and flywheel.
- All removed parts, if to be reused, should be re-installed in the original positions and directions.
- Bolts, nuts and washers should be replaced with new parts as required.
- Even if necessary inspections have been made in advance, proceed with assembly work while making rechecks.
- Remove or install the engine in an area where chain hoists, lifting devices, etc. are available for ready use.
- Be sure not to damage coated surfaces of body panels with tools or stain seats and windows with coolant or oil. Place a cover over fender, as required, for protection.
- Prior to starting work, prepare the following:
Service tools, clean cloth, containers to catch coolant and oil, wire ropes, chain hoist, transmission jacks, etc.
- Lift up or lower the vehicle when necessary. Make sure to support the correct positions.

General Description

MECHANICAL

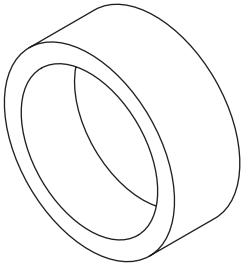
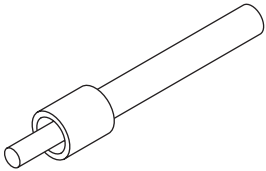
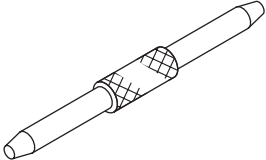
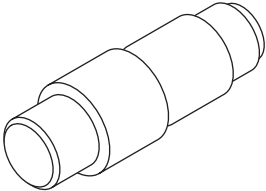
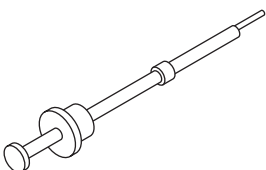
D: PREPARATION TOOL

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 spring.
 ST-498457000	498457000	ENGINE STAND ADAPTER RH	Used with ENGINE STAND (499817100).
 ST-498457100	498457100	ENGINE STAND ADAPTER LH	Used with ENGINE STAND (499817100).
 ST-498497100	498497100	CRANKSHAFT STOPPER	Used for removing and installing the flywheel and the drive plate.

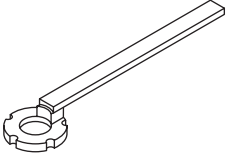
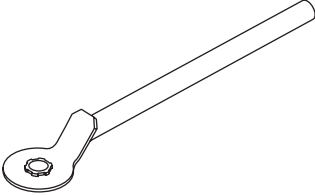
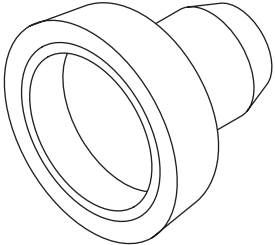
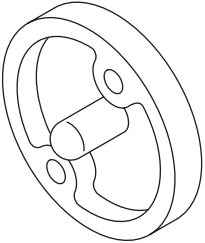
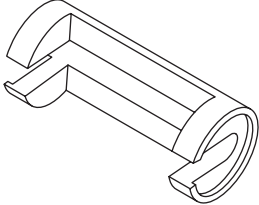
General Description

MECHANICAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498747300	498747300	PISTON GUIDE	Used for installing piston in cylinder for 2.5 L model.
 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.
 ST-499097700	499097700	PISTON PIN REMOVER ASSY	Used for removing piston pin.

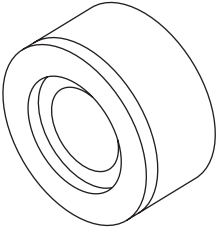
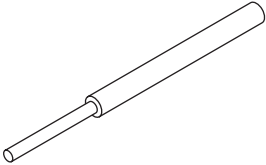
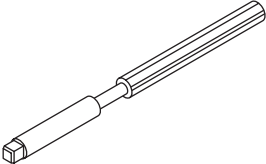
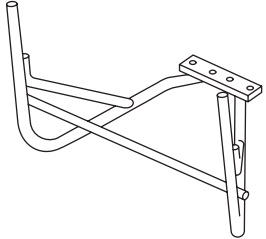
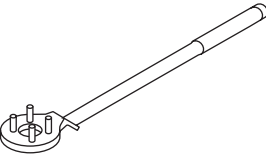
General Description

MECHANICAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499207400	499207400	CAM SPROCKET WRENCH	Used for removing and installing cam sprocket. (Exhaust side)
 ST-499977500	499977500	CAM SPROCKET WRENCH	Used for removing and installing cam sprocket. (Intake side)
 ST-499587200	499587200	CRANKSHAFT OIL SEAL INSTALLER	• Used for installing crankshaft oil seal. • Used with CRANKSHAFT OIL SEAL GUIDE (499597100).
 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.

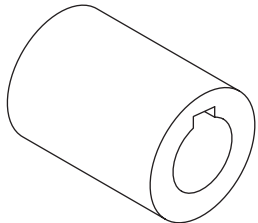
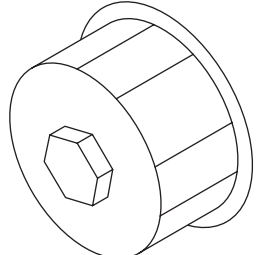
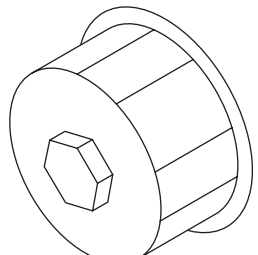
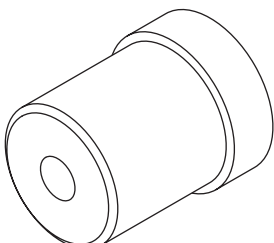
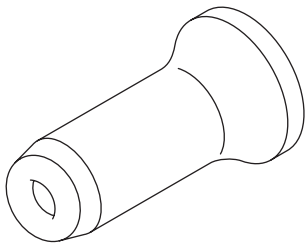
General Description

MECHANICAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18251AA020	18251AA020	VALVE GUIDE ADJUSTER	Used for installing intake and exhaust valve guides.
 ST-499767200	499767200	VALVE GUIDE REMOVER	Used for removing valve guides.
 ST-499767400	499767400	VALVE GUIDE REAMER	Used for reaming valve guides.
 ST-499817100	499817100	ENGINE STAND	• Stand used for engine disassembly and assembly. • Used with ENGINE STAND ADAPTER RH (498457000) & LH (498457100).
 ST-499977100	499977100	CRANK PULLEY WRENCH	Used to stop rotation of the crank pulley when loosening or tightening crank pulley bolts.

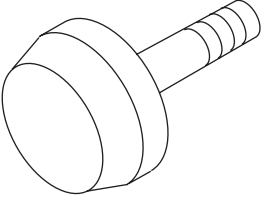
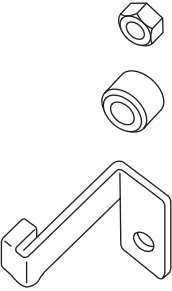
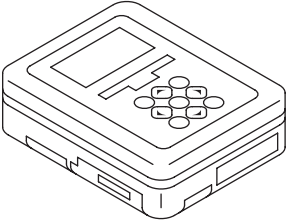
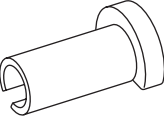
General Description

MECHANICAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499987500	499987500	CRANKSHAFT SOCKET	Used for rotating crankshaft.
 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 pump oil seal.
 ST-499587600	499587600	OIL SEAL INSTALLER	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 INSTALLER (499587600).
 ST-498277200	498277200	STOPPER SET	Used for installing automatic transmission assembly to engine.
 ST1B021XU0	1B021XU0	SUBARU SELECT MONITOR III KIT	Used for troubleshooting the electrical system.
 ST42099AE000	42099AE000	CONNECTOR REMOVER	Used for removing the quick connector in engine compartment.

2. GENERAL TOOL

TOOL NAME	REMARKS
Compression gauge	Used for measuring compression.
Vacuum gauge	Used for measuring negative pressure.
Oil pressure gauge	Used for measuring oil pressure.
Fuel pressure gauge	Used for measuring fuel pressure.
Timing light	Used for measuring ignition timing.

E: PROCEDURE

It is possible to conduct the following service procedures with engine on vehicle, however, the procedures described in this section are based on the condition that the engine is removed from vehicle.

- V-belt
- Timing belt
- Camshaft
- Cylinder head

2. Compression

A: INSPECTION

CAUTION:

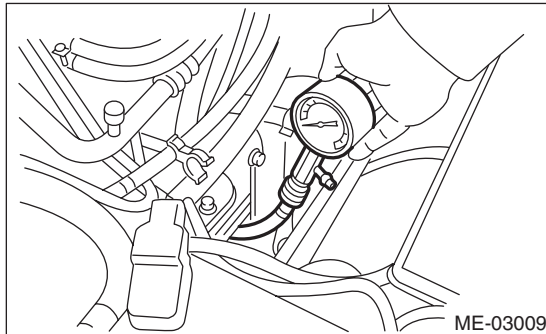
After warming-up, engine becomes very hot. Be careful not to burn yourself at measurement.

- 1) Remove the collector cover.
- 2) After warming-up the engine, turn the ignition switch to OFF.
- 3) Make sure that the battery is fully charged.
- 4) Release the fuel pressure. <Ref. to FU(H4DOTC)-51, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
- 5) Remove all the spark plugs.
<Ref. to IG(H4DOTC)-4, REMOVAL, Spark Plug.>
- 6) Fully open the throttle valve.
- 7) Check the starter motor for satisfactory performance and operation.
- 8) Hold the compression gauge tightly against the spark plug hole.

NOTE:

The screw of a screw-in type compression gauge should be less than 18 mm (0.71 in) in length.

- 9) Crank the engine by the starter motor, and read the maximum value on the gauge when the needle of gauge is steady.



- 10) Perform at least two measurements per cylinder, and check that the values are correct.

Compression (fully open throttle):

Standard

**981 — 1,177 kPa
(10 — 12 kgf/cm², 142 — 171 psi)**

Limit

882 kPa (9.0 kgf/cm², 128 psi)

Difference between cylinders

49 kPa (0.5 kgf/cm², 7 psi), or less

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

3. Idle Speed

A: INSPECTION

1) Before checking the idle speed, check the following item:

(1) Check the air cleaner element is free from clogging, ignition timing is correct, spark plugs are in good condition, and hoses are connected properly.

(2) Check the malfunction indicator light does not illuminate.

2) Warm up the engine.

3) Read the engine idle speed using Subaru Select Monitor. <Ref. to EN(H4DOTC)(diag)-36, READ CURRENT DATA FOR ENGINE (NORMAL MODE), OPERATION, Subaru Select Monitor.>

4) Check the idle speed when no-loaded. (Headlight, heater fan, rear defroster, radiator fan, A/C and etc. are OFF)

Idle speed [No load and gears in neutral, "P" or "N" range]:

700±100 rpm

5) Check the idle speed when loaded. (Turn the A/C switch to "ON" and operate the compressor for at least one minute before measurement.)

Idle speed [A/C ON and gears in neutral, "P" or "N" range]:

When A/C refrigerant pressure is low.

MT: 725±100 rpm

AT: 750±100 rpm

When A/C refrigerant pressure is high.

MT: 800±100 rpm

AT: 825±100 rpm

NOTE:

Idle speed cannot be adjusted manually, because the idle speed is automatically adjusted. If the prescribed idle speed cannot be maintained, refer to the General On-board Diagnosis Table under "Engine Control System". <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.>

4. Ignition Timing

A: INSPECTION

CAUTION:

After warming-up, engine becomes very hot. Be careful not to burn yourself at measurement.

1. METHOD WITH SUBARU SELECT MONITOR

1) Before checking the ignition timing, check the following item:

- (1) Check the air cleaner element is free from clogging, spark plugs are in good condition, and hoses are connected properly.
- (2) Check the malfunction indicator light does not illuminate.

2) Warm up the engine.

3) Read the ignition timing using Subaru Select Monitor. <Ref. to EN(H4DOTC)(diag)-36, READ CURRENT DATA FOR ENGINE (NORMAL MODE), OPERATION, Subaru Select Monitor.>

Ignition timing [BTDC/rpm]:

$17^{\circ} \pm 10^{\circ} / 700$

If the timing is not correct, check the ignition control system. Refer to "Engine Control System". <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.>

2. METHOD WITH TIMING LIGHT

1) Before checking the ignition timing, check the following item:

- (1) Check the air cleaner element is free from clogging, spark plugs are in good condition, and hoses are connected properly.
- (2) Check the malfunction indicator light does not illuminate.

2) Warm up the engine.

3) Stop the engine, and turn the ignition switch to OFF.

4) Remove the air intake duct.

5) Disconnect the connectors of the mass air flow and intake air temperature sensor.

6) Remove the air cleaner cover and element.

7) Connect the timing light to the power wire of #1 ignition coil.

8) Connect the connectors of air cleaner cover, element, and the mass air flow and intake air temperature sensor.

9) Start the engine, turn the timing light to the crank pulley, and check the ignition timing by means of crank pulley indicator.

Ignition timing [BTDC/rpm]:

$17^{\circ} \pm 10^{\circ} / 700$

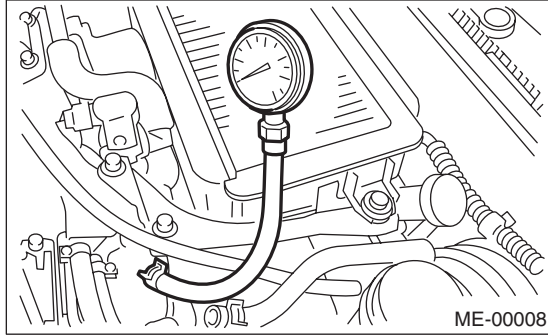
If the timing is not correct, check the ignition control system. Refer to "Engine Control System". <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.>

5. Intake Manifold Vacuum

A: INSPECTION

- 1) Remove the collector cover.
- 2) Warm up the engine.
- 3) Disconnect the brake vacuum hose from intake manifold, and then install the vacuum gauge.
- 4) Keep the engine at idle speed and read the vacuum gauge indication.

By observing the gauge needle movement, the internal condition of the engine can be diagnosed as described below.



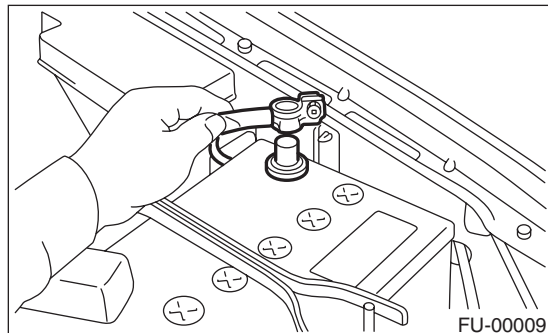
Vacuum pressure (at idling, A/C “OFF”):
–60.0 kPa (–450 mmHg, –17.72 inHg) or less

Diagnosis of engine condition by measurement of intake manifold vacuum	
Vacuum gauge indication	Possible engine condition
1. Needle is steady but lower than normal position. This tendency becomes more evident as engine temperature rises.	Leakage around intake manifold gasket, or disconnected or damaged vacuum hose
2. Needle intermittently drops to position lower than normal position.	Leakage around cylinder
3. Needle drops suddenly and intermittently from normal position.	Sticky valve
4. When engine speed is gradually increased, needle begins to vibrate rapidly at certain speed, and then vibration increases as engine speed increases.	Weak or broken valve springs
5. Needle vibrates above and below normal position in narrow range.	Defective ignition system or throttle chamber idle adjustment

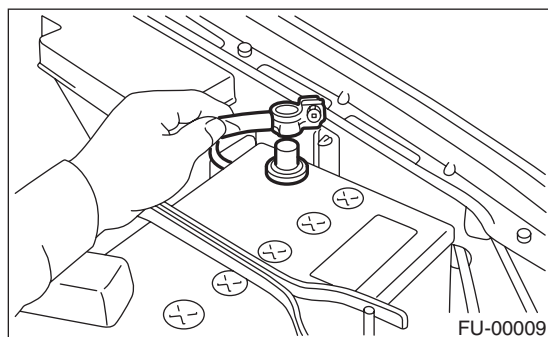
6. Engine Oil Pressure

A: INSPECTION

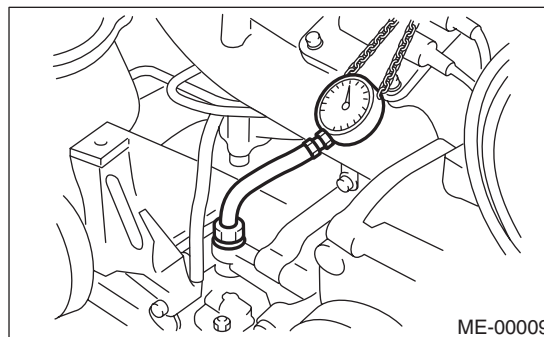
- 1) Remove the collector cover.
- 2) Disconnect the ground cable from the battery.



- 3) Remove the oil pressure switch. <Ref. to LU(H4SO)-21, REMOVAL, Oil Pressure Switch.>
- 4) Connect the oil pressure gauge hose to cylinder block.
- 5) Connect the ground cable to the battery.



- 6) Start the engine, and measure the oil pressure.



Oil pressure:

Standard

**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)**

- If the oil pressure is out of specification, check the oil pump, oil filter and lubrication line. <Ref. to LU(H4SO)-26, INSPECTION, Engine Lubrication System Trouble in General.>
- If the oil pressure warning light is ON and oil pressure is within specification, check the oil pressure switch. <Ref. to LU(H4SO)-26, INSPECTION, Engine Lubrication System Trouble in General.>

NOTE:

Standard value is based on an engine oil temperature of 80°C (176°F).

- 7) After measuring the oil pressure, install the oil pressure switch. <Ref. to LU(H4SO)-21, INSTALLATION, Oil Pressure Switch.>

Tightening torque:

25 N·m (2.5 kgf-m, 18.4 ft-lb)

7. Fuel Pressure

A: INSPECTION

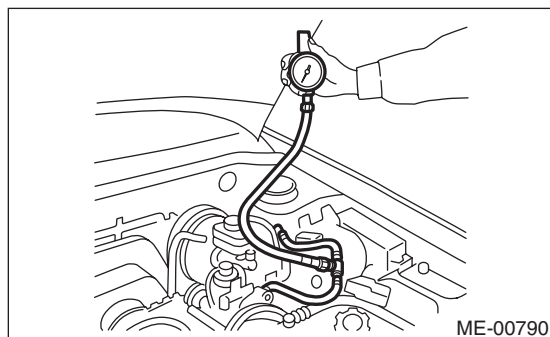
CAUTION:

- Before removing the fuel pressure gauge, release the fuel pressure.
- Be careful not to spill fuel.
- Catch the fuel from hoses using a container or cloth.

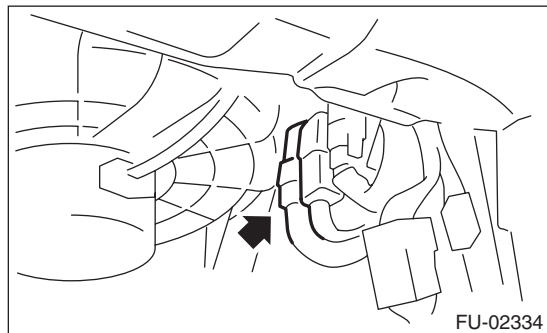
NOTE:

If the fuel pressure is out of specification, check or replace the pressure regulator and pressure regulator vacuum hose.

- 1) Release the fuel pressure. <Ref. to FU(H4DOTC)-51, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
- 2) Disconnect the fuel delivery hose from fuel damper, and connect fuel pressure gauge.



- 3) Connect the connector of fuel pump relay.



- 4) Start the engine.

- 5) Measure the fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold.

NOTE:

The fuel pressure gauge registers 10 to 20 kPa (0.1 to 0.2 kgf/cm², 1 to 3 psi) higher than standard values during high-altitude operations.

Fuel pressure:

Standard

284 — 314 kPa

(2.9 — 3.2 kgf/cm², 41 — 46 psi)

- 6) Connect the pressure regulator vacuum hose and measure the fuel pressure.

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.

Fuel pressure:

Standard

230 — 260 kPa

(2.35 — 2.65 kgf/cm², 33 — 38 psi)

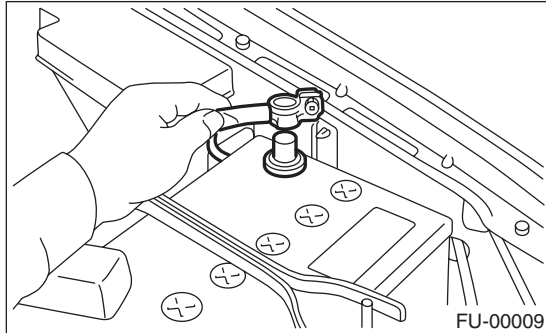
8. Valve Clearance

A: INSPECTION

NOTE:

Inspection and adjustment of valve clearance should be performed while engine is cold.

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

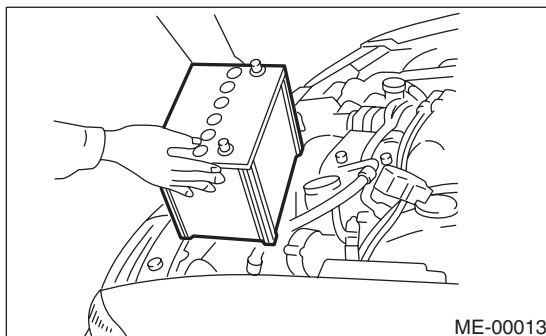


- 4) Remove the air intake duct. <Ref. to IN(H4DOTC)-9, REMOVAL, Air Intake Duct.>
- 5) Remove a bolt which secures timing belt cover (RH).
- 6) Lift up the vehicle.
- 7) Remove the under cover.
- 8) Loosen the remaining bolts which secure timing belt cover (RH), then remove the timing belt cover.
- 9) Lower the vehicle.
- 10) When inspecting #1 and #3 cylinders

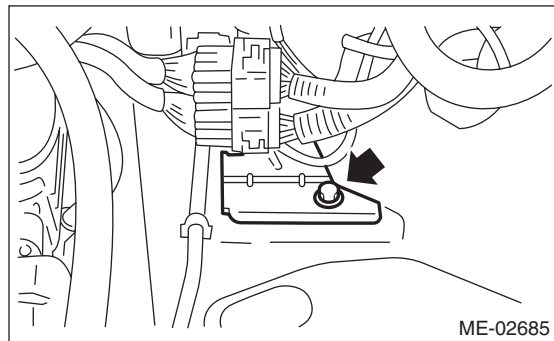
- (1) Remove the air cleaner case. <Ref. to IN(H4DOTC)-8, REMOVAL, Air Cleaner Case.>
- (2) Disconnect the connector of ignition coil.
- (3) Remove the ignition coil.
- (4) Place a suitable container under the vehicle.
- (5) Disconnect the PCV hose from the rocker cover (RH).
- (6) Remove the bolts, then remove the rocker cover (RH).

- 11) When inspecting #2 and #4 cylinders

- (1) Disconnect the battery cable, and then remove the battery and battery carrier.



- (2) Remove the bolt which holds the engine harness bracket on the body.

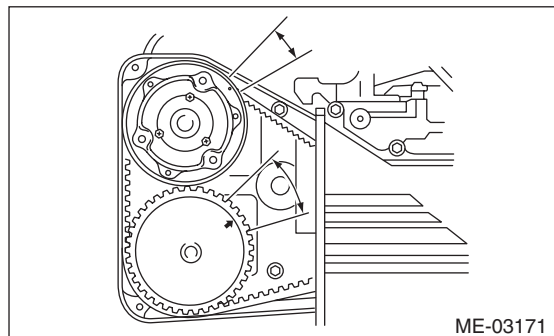


- (3) Remove the secondary air pump. <Ref. to EC(H4DOTC)-9, REMOVAL, Secondary Air Pump.>
- (4) Disconnect the connector of ignition coil.
- (5) Remove the ignition coil.
- (6) Place a suitable container under the vehicle.
- (7) Disconnect the PCV hose from the rocker cover (LH).
- (8) Remove the bolts, then remove the rocker cover (LH).

- 12) Turn the crank pulley clockwise until the round mark and arrow mark on the camshaft sprocket are set to position shown in the figure.

NOTE:

Turn the crankshaft using socket wrench.



Valve Clearance

MECHANICAL

13) Measure the #1 cylinder intake valve and #3 cylinder exhaust valve clearance by using thickness gauge (A).

NOTE:

- Insert a thickness gauge in a direction as horizontal as possible with respect to the valve lifter.
- Lift up the vehicle and measure the exhaust valve clearance.
- If the measured value is not within specification, take notes of the value in order to adjust the valve clearance later on.

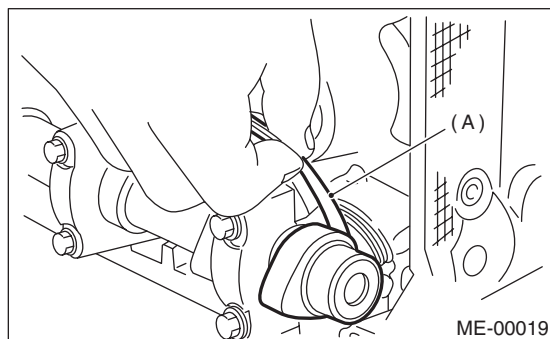
Valve clearance:

Intake

$0.20 \pm 0.02 \text{ mm } (0.0079 \pm 0.0008 \text{ in})$

Exhaust

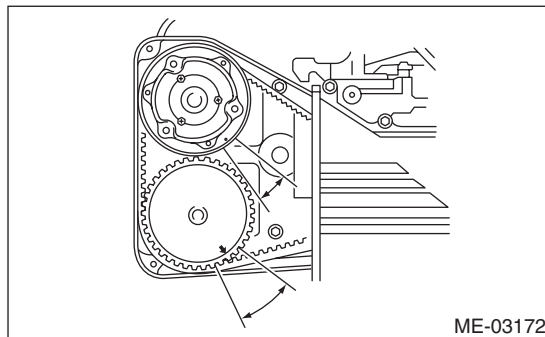
$0.35 \pm 0.02 \text{ mm } (0.0138 \pm 0.0008 \text{ in})$



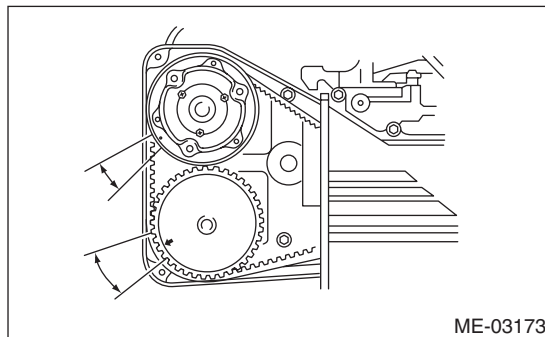
14) If necessary, adjust the valve clearance. <Ref. to ME(H4DOTC)-29, ADJUSTMENT, Valve Clearance.>

15) Further turn the crank pulley clockwise and then measure the valve clearances again.

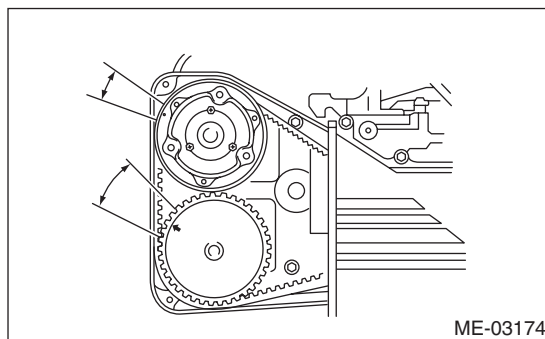
(1) Set the round mark and arrow mark on cam sprocket to the position shown in the figure, and measure the #2 cylinder exhaust valve and #3 cylinder intake valve clearances.



(2) Set the round mark and arrow mark on cam sprocket to the position shown in the figure, and measure the #2 cylinder intake valve and #4 cylinder exhaust valve clearances.



(3) Set the round mark and arrow mark on cam sprocket to the position shown in the figure, and measure the #1 cylinder exhaust valve and #4 cylinder intake valve clearances.



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

B: ADJUSTMENT

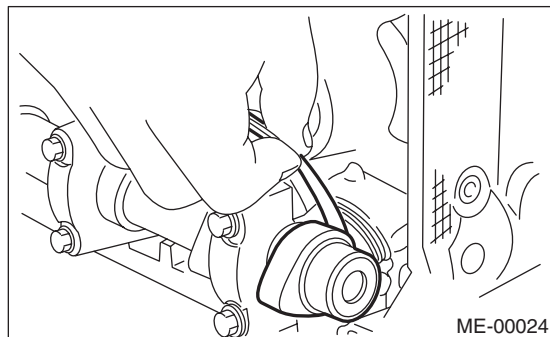
NOTE:

Adjustment of valve clearance should be performed while engine is cold.

1) Measure all the valve clearances. <Ref. to ME(H4DOTC)-27, INSPECTION, Valve Clearance.>

NOTE:

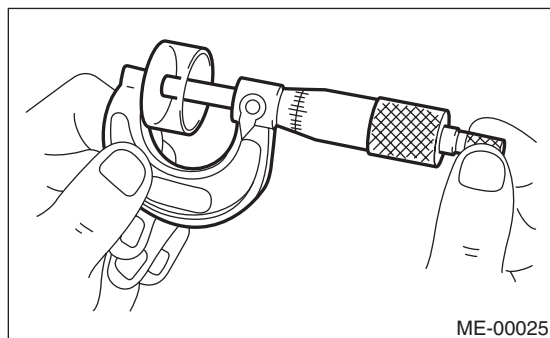
Record each valve clearance after measurement.



2) Remove the camshaft. <Ref. to ME(H4DOTC)-55, REMOVAL, Camshaft.>

3) Remove the valve lifter.

4) Measure the thickness of valve lifter using micrometer.



5) Select a valve lifter of suitable thickness from the following table using the measured valve clearance and valve lifter thickness.

Unit: (mm)
Intake valve: $S = (V + T) - 0.20$
Exhaust valve: $S = (V + T) - 0.35$
S: Required thickness of valve lifter
V: Measured valve clearance
T: Used valve lifter thickness

Part No.	Thickness mm (in)
13228 AB102	4.68 (0.1843)
13228 AB112	4.69 (0.1846)
13228 AB122	4.70 (0.1850)
13228 AB132	4.71 (0.1854)
13228 AB142	4.72 (0.1858)
13228 AB152	4.73 (0.1862)
13228 AB162	4.74 (0.1866)
13228 AB172	4.75 (0.1870)
13228 AB182	4.76 (0.1874)
13228 AB192	4.77 (0.1878)
13228 AB202	4.78 (0.1882)
13228 AB212	4.79 (0.1886)
13228 AB222	4.80 (0.1890)
13228 AB232	4.81 (0.1894)
13228 AB242	4.82 (0.1898)
13228 AB252	4.83 (0.1902)
13228 AB262	4.84 (0.1906)
13228 AB272	4.85 (0.1909)
13228 AB282	4.86 (0.1913)
13228 AB292	4.87 (0.1917)
13228 AB302	4.88 (0.1921)
13228 AB312	4.89 (0.1925)
13228 AB322	4.90 (0.1929)
13228 AB332	4.91 (0.1933)
13228 AB342	4.92 (0.1937)
13228 AB352	4.93 (0.1941)
13228 AB362	4.94 (0.1945)
13228 AB372	4.95 (0.1949)
13228 AB382	4.96 (0.1953)
13228 AB392	4.97 (0.1957)
13228 AB402	4.98 (0.1961)
13228 AB412	4.99 (0.1965)
13228 AB422	5.00 (0.1969)
13228 AB432	5.01 (0.1972)
13228 AB442	5.02 (0.1976)
13228 AB452	5.03 (0.1980)
13228 AB462	5.04 (0.1984)
13228 AB472	5.05 (0.1988)
13228 AB482	5.06 (0.1992)
13228 AB492	5.07 (0.1996)
13228 AB502	5.08 (0.2000)
13228 AB512	5.09 (0.2004)
13228 AB522	5.10 (0.2008)
13228 AB532	5.11 (0.2012)
13228 AB542	5.12 (0.2016)
13228 AB552	5.13 (0.2020)
13228 AB562	5.14 (0.2024)
13228 AB572	5.15 (0.2028)
13228 AB582	5.16 (0.2031)
13228 AB592	5.17 (0.2035)

Valve Clearance

MECHANICAL

Part No.	Thickness mm (in)
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)

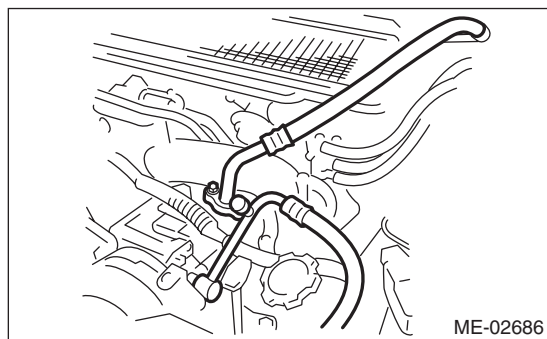
6) Inspect all valves for clearance again at this stage. If the valve clearance is not correct, repeat the procedure over again from the first step.

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

9. Engine Assembly

A: REMOVAL

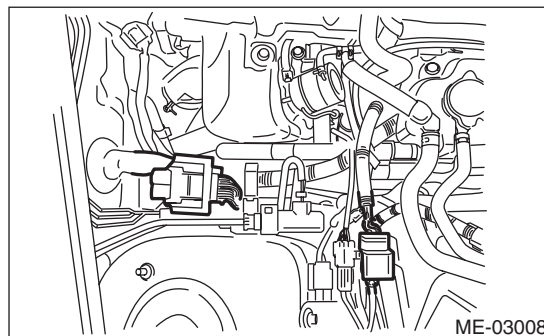
- 1) Set the vehicle on a lift.
- 2) Open the front hood fully and support with the front hood stay.
- 3) Remove the collector cover.
- 4) Collect the refrigerant from A/C system. <Ref. to AC-21, Refrigerant Recovery Procedure.>
- 5) Release the fuel pressure. <Ref. to FU(H4SO)-45, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
- 6) Disconnect the battery cable, and remove the battery from the vehicle.
- 7) Open the fuel filler flap lid, and remove the fuel filler cap.
- 8) Remove the air cleaner case and air intake boot. <Ref. to IN(H4DOTC)-8, REMOVAL, Air Cleaner Case.>
- 9) Remove the under cover.
- 10) Remove the radiator from the vehicle. <Ref. to CO(H4SO)-25, REMOVAL, Radiator.>
- 11) Remove the coolant filler tank. <Ref. to CO(H4SO)-40, REMOVAL, Coolant Filler Tank.>
- 12) Remove the secondary air pump. <Ref. to EC(H4DOTC)-9, INSPECTION, Secondary Air Pump.>
- 13) Disconnect the A/C pressure hoses from A/C compressor.



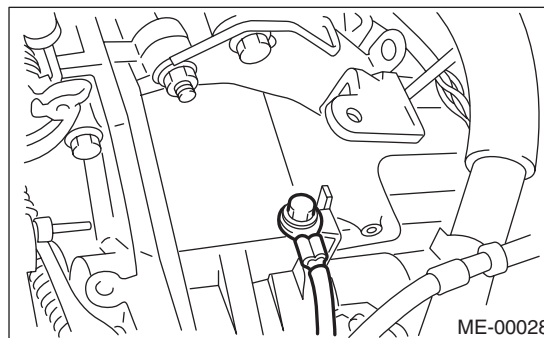
- 14) Remove the intercooler. <Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>

- 15) Disconnect the following connectors and cables.

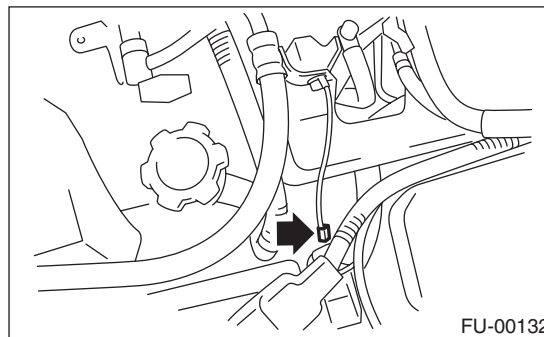
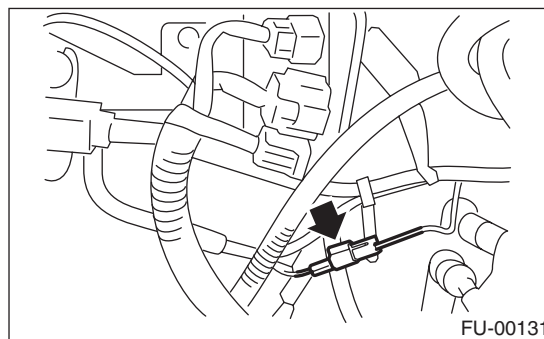
(1) Engine harness connectors



(2) Engine ground terminal



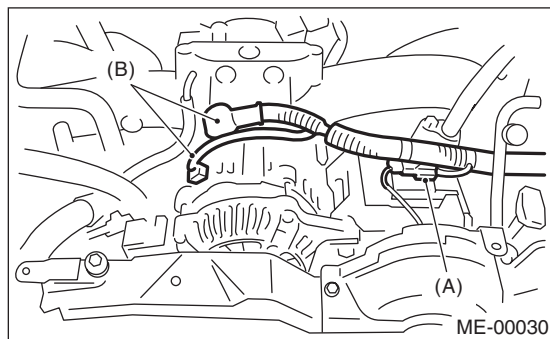
(3) Right and left engine ground cables



Engine Assembly

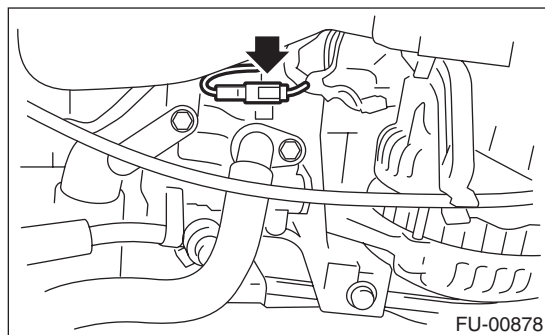
MECHANICAL

- (4) Generator connector, terminal and A/C compressor connector



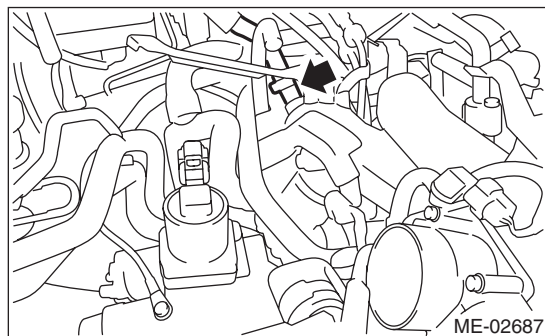
- (A) A/C compressor connector
(B) Generator connector and terminal

- (5) Power steering switch connector



- 16) Disconnect the following hoses.

- (1) Brake booster vacuum hose

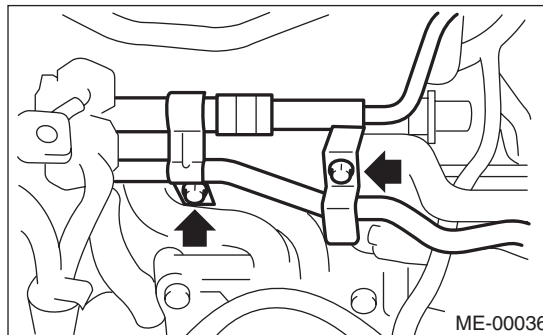


- (2) Heater inlet and outlet hoses

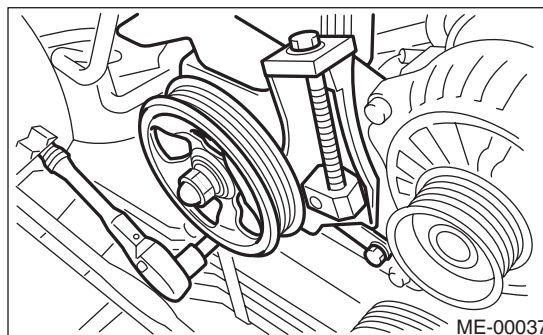
- 17) Remove the power steering pump.

(1) Remove the front side belts. <Ref. to ME(H4DOTC)-39, FRONT SIDE BELT, REMOVAL, V-belt.>

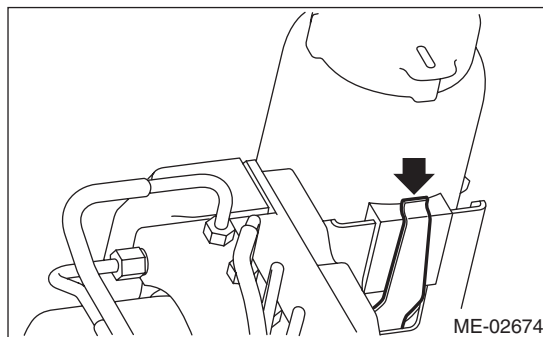
(2) Remove the power steering pipe from the fuel pip protector RH along with the bracket.



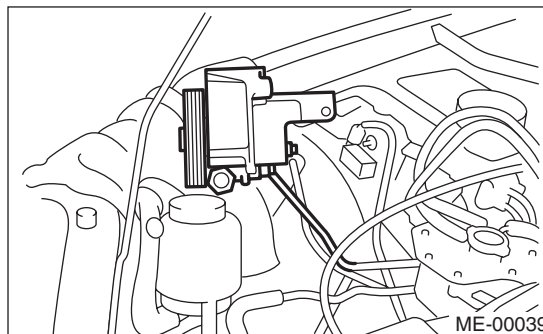
(3) Remove the power steering pump from the engine.



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



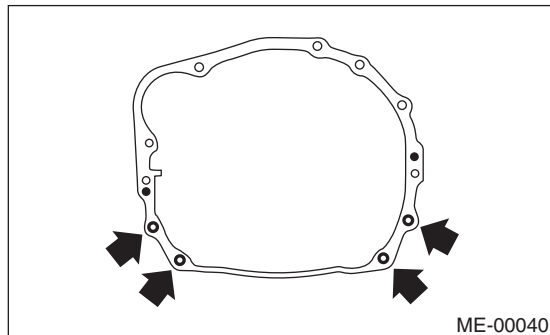
(5) Place the power steering pump on the right side wheel apron.



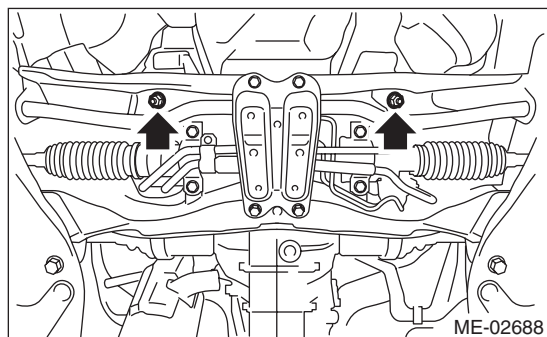
- 18) Lift up the vehicle.

19) Remove the front and center exhaust pipes.
<Ref. to EX(H4DOTC)-8, REMOVAL, Center Exhaust Pipe.> <Ref. to EX(H4DOTC)-6, REMOVAL, Front Exhaust Pipe.>

20) Remove the bolts and nuts which hold lower side of transmission to engine.

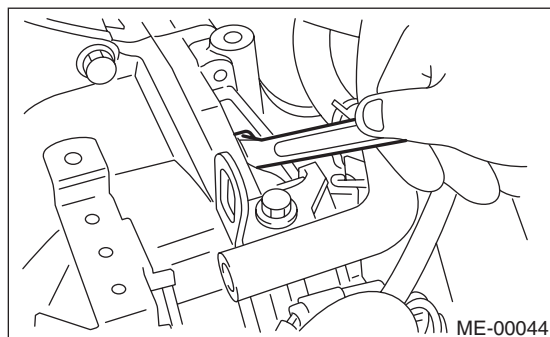


21) Remove the nuts which install front cushion rubber onto front crossmember.

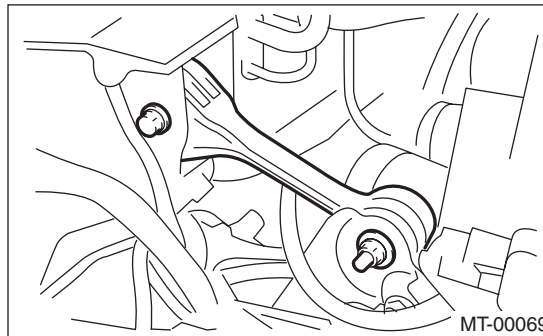


22) Separate the torque converter clutch from drive plate. (AT model)

- (1) Lower the vehicle.
- (2) Remove the service hole plug.
- (3) Remove the bolts which hold torque converter clutch to drive plate.
- (4) Remove other bolts while rotating the crankshaft using socket wrench.



23) Remove the pitching stopper.

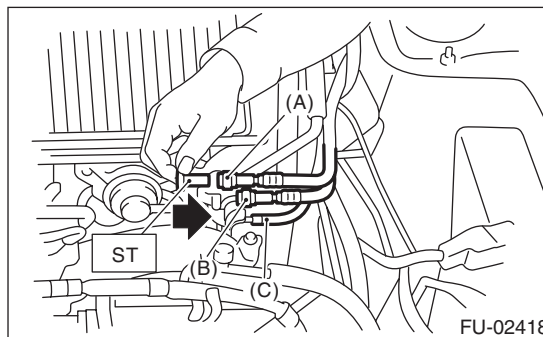


24) Using the ST to remove the fuel hose from each fuel pipe. <Ref. to FU(H4DOTC)-66, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>

CAUTION:

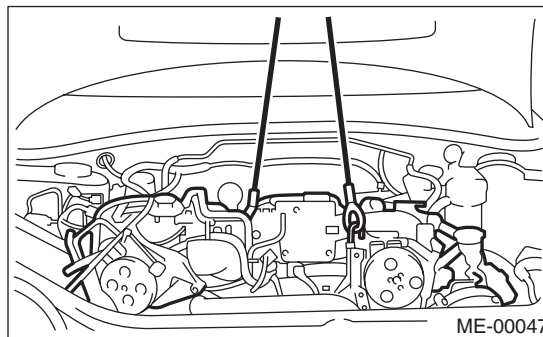
- Be careful not to spill fuel.
- Catch the fuel from hoses using a container or cloth.

ST 42099AE000 CONNECTOR REMOVER



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

25) Support the engine with a lifting device and wire ropes.



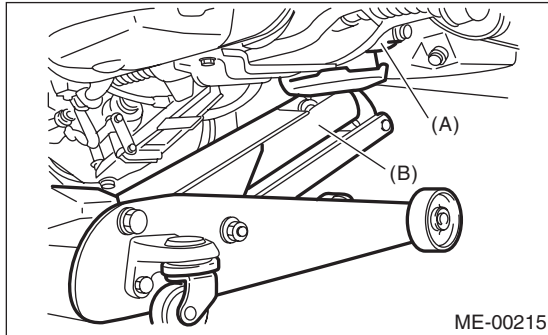
Engine Assembly

MECHANICAL

26) Support the transmission with a garage jack.

CAUTION:

Be sure to always perform this work, in order to prevent the transmission from lowering for its own weight.



(A) Transmission

(B) Garage jack

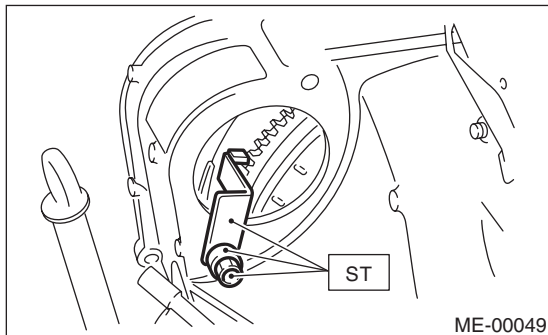
27) Separation of engine and transmission.

CAUTION:

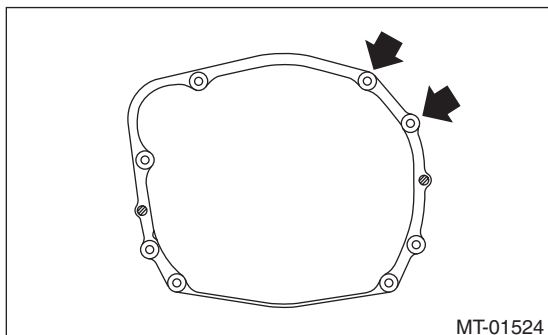
Before removing the engine away from transmission, check to be sure no work has been overlooked.

- (1) Remove the starter. <Ref. to SC(H4SO)-6, REMOVAL, Starter.>
- (2) Set the ST to torque converter clutch case. (AT model)

ST 498277200 STOPPER SET



(3) Remove the bolts which hold upper side of transmission to engine.



28) Remove the engine from vehicle.

- (1) Slightly raise the engine.
- (2) Raise the transmission with garage jack.
- (3) Move the engine horizontally until main shaft is withdrawn from clutch cover.
- (4) Slowly move the engine away from engine compartment.

NOTE:

Be careful not to damage adjacent parts or body panels with crank pulley, oil level gauge, etc.

29) Remove the front cushion rubbers.

B: INSTALLATION

1) Install the front cushion rubbers.

Tightening torque:

35 N·m (3.6 kgf-m, 25.8 ft-lb)

2) Apply a small amount of grease to splines of mainshaft. (MT model)

3) Position the engine in engine compartment and connect the engine to the transmission.

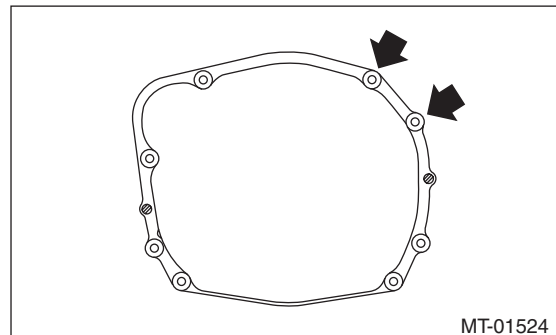
NOTE:

Be careful not to damage adjacent parts or body panels with crank pulley, oil level gauge, etc.

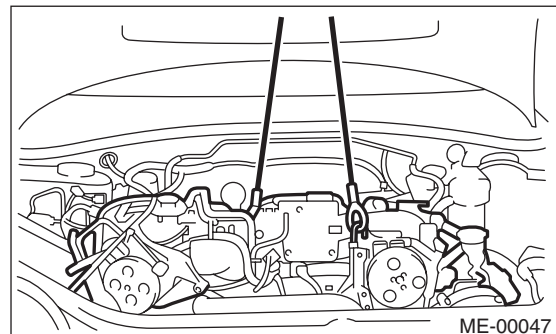
4) Tighten the bolts which hold upper side of transmission to engine.

Tightening torque:

50 N·m (5.1 kgf-m, 36.9 ft-lb)



5) Remove the lifting device and wire ropes.

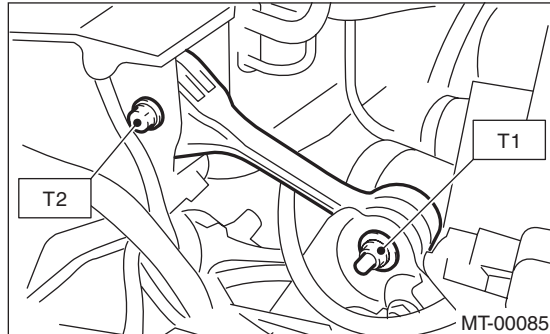


- 6) Remove the garage jack.
- 7) Install the pitching stopper.

Tightening torque:

T1: 50 N·m (5.1 kgf-m, 36.9 ft-lb)

T2: 58 N·m (5.9 kgf-m, 42.8 ft-lb)



- 8) Remove the ST from converter case. (AT model)

NOTE:

Be careful not to drop the ST into the converter case when removing the ST.

ST 498277200 STOPPER SET

- 9) Install the starter. <Ref. to SC(H4SO)-6, INSTALLATION, Starter.>

- 10) Install the torque converter clutch to drive plate. (AT model)

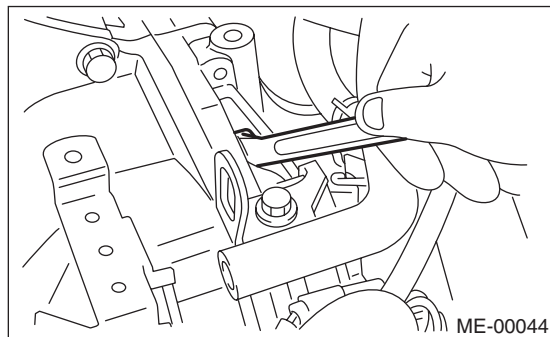
- (1) Tighten the bolts which hold torque converter clutch to drive plate.
- (2) Tighten other bolts while rotating the crankshaft using socket wrench.

NOTE:

Be careful not to drop bolts into the torque converter clutch housing.

Tightening torque:

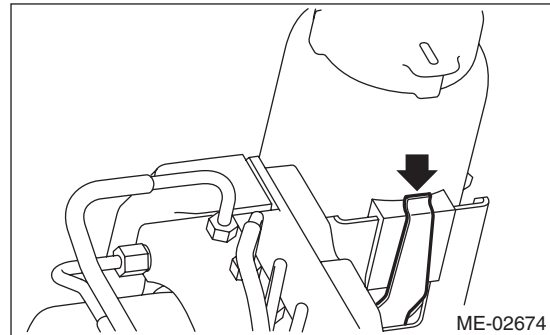
25 N·m (2.5 kgf-m, 18.4 ft-lb)



- (3) Install the service hole plug.

- 11) Install the power steering pump.

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

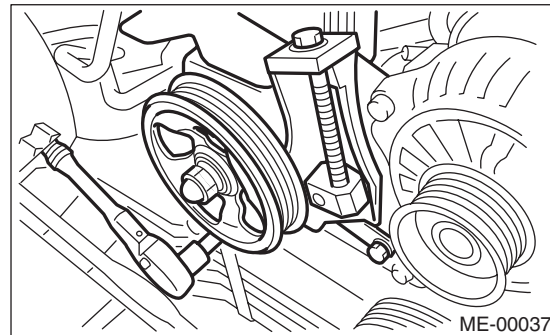


- (2) Install the power steering pump.

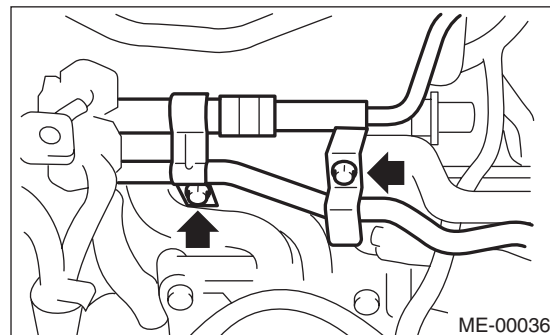
Tightening torque:

Refer to "COMPONENT" of "Power Steering" section for the tightening torque.

<Ref. to PS-4, COMPONENT, General Description.>



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



- (4) Install and adjust the front side belt. <Ref. to ME(H4DOTC)-39, FRONT SIDE BELT, INSTALLATION, V-belt.>

- 12) Lift up the vehicle.

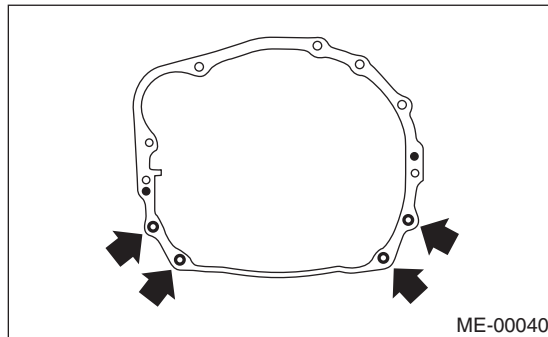
Engine Assembly

MECHANICAL

13) Tighten the nuts and bolts which hold lower side of transmission to engine.

Tightening torque:

50 N·m (5.1 kgf-m, 36.9 ft-lb)



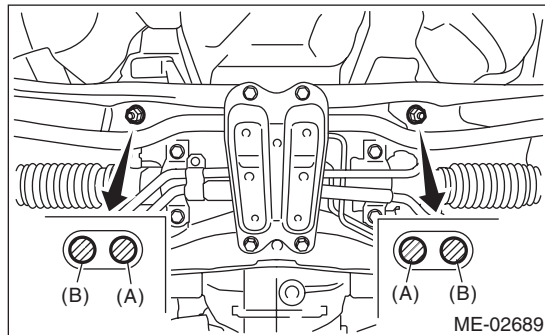
14) Tighten the nuts which install the front cushion rubber onto crossmember.

NOTE:

Make sure the front cushion rubber mounting bolts (A) and locator (B) are securely installed.

Tightening torque:

85 N·m (8.7 kgf-m, 62.7 ft-lb)



15) Install the front and center exhaust pipe.
<Ref. to EX(H4DOTC)-7, INSTALLATION, Front Exhaust Pipe.> <Ref. to EX(H4DOTC)-9, INSTALLATION, Center Exhaust Pipe.>

16) Lower the vehicle.

17) Connect the following hoses.

- (1) Fuel delivery hose, return hose and evaporation hose
- (2) Heater inlet and outlet hoses
- (3) Brake booster vacuum hose

18) Connect the following connectors and terminals.

- (1) Engine ground terminal

Tightening torque:

14 N·m (1.4 kgf-m, 10.1 ft-lb)

- (2) Engine harness connectors
- (3) Generator connector and terminal
- (4) A/C compressor connector
- (5) Power steering switch connector

19) Install the intercooler. <Ref. to IN(H4DOTC)-11, INSTALLATION, Intercooler.>

20) Install the air cleaner case and air intake boot.
<Ref. to IN(H4DOTC)-8, INSTALLATION, Air Cleaner Case.>

21) Install the A/C pressure hoses. <Ref. to AC-36, INSTALLATION, Hose and Tube.>

22) Install the radiator. <Ref. to CO(H4SO)-27, INSTALLATION, Radiator.>

23) Install the under cover.

24) Install the coolant filler tank.

<Ref. to CO(H4SO)-40, INSTALLATION, Coolant Filler Tank.>

25) Install the secondary air pump. <Ref. to EC(H4DOTC)-9, INSTALLATION, Secondary Air Pump.>

26) Install the battery in the vehicle, and connect cables.

27) Fill engine coolant.

<Ref. to CO(H4SO)-17, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

28) Check the ATF level and replenish it if necessary. (AT model) <Ref. to 4AT-28, INSPECTION, Automatic Transmission Fluid.>

29) Charge the A/C system with refrigerant.

<Ref. to AC-22, PROCEDURE, Refrigerant Charging Procedure.>

30) Install the collector cover.

31) Remove the front hood stay, and close the front hood.

32) Lower the vehicle from lift.

C: INSPECTION

1) Check that pipes, hoses, connectors and clamps are installed firmly.

2) Check that the engine coolant is at specified level.

3) Check that the ATF is at specified level. (AT model)

4) Start the engine and check for exhaust gas, engine coolant, leaks of fuel, etc. Also check for noise and vibrations.

10.Engine Mounting

A: REMOVAL

- 1) Remove the engine unit. <Ref. to ME(H4DOTC)-31, REMOVAL, Engine Assembly.>
- 2) Remove the engine mounting from engine assembly.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

35 N·m (3.6 kgf-m, 25.8 ft-lb)

C: INSPECTION

Make sure that no crack or other damages do not exist.

11. Preparation for Overhaul

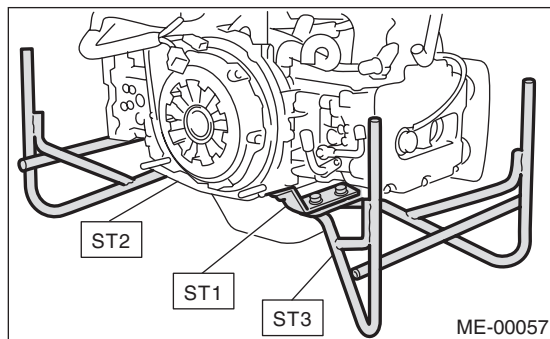
A: PROCEDURE

1) After removing the engine from body, secure it to ST in the following procedure.

ST1 498457000 ENGINE STAND ADAPTER
RH

ST2 498457100 ENGINE STAND ADAPTER
LH

ST3 499817100 ENGINE STAND



2) In this section the procedures described under each index are all connected and stated in order. The procedure for overhauling of the engine will be completed when you go through all steps in the process.

Therefore, in this section, to conduct the particular procedure within the flow of a section, you need to go back and conduct the procedure described previously in order to do that particular procedure.

12.V-belt

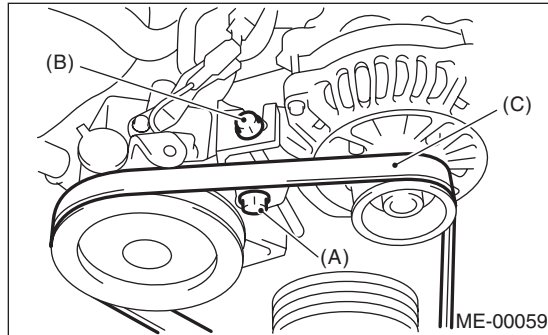
A: REMOVAL

NOTE:

Perform the work with the engine installed to body when replacing a single part.

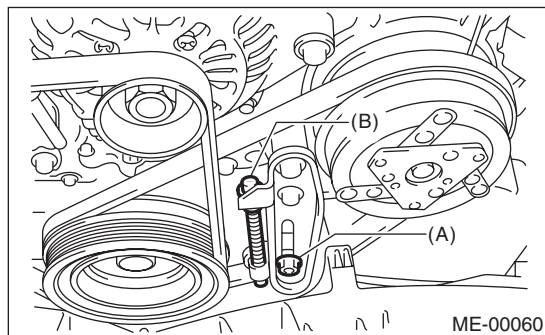
1. FRONT SIDE BELT

- 1) Remove the collector cover.
- 2) Loosen the lock bolt (A).
- 3) Loosen the slider bolt (B).
- 4) Remove the front side belt (C).

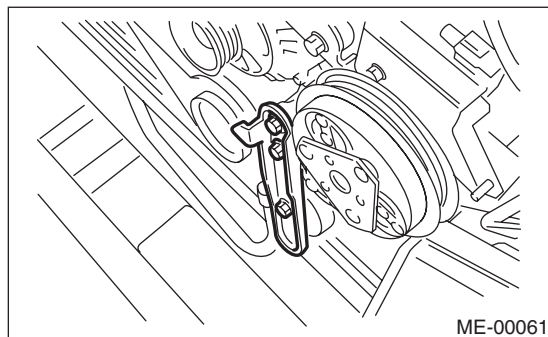


2. REAR SIDE BELT

- 1) Remove the front side belts. <Ref. to ME(H4DOTC)-39, FRONT SIDE BELT, REMOVAL, V-belt.>
- 2) Loosen the lock nut (A).
- 3) Loosen the slider bolt (B).



- 4) Remove the rear side belt.
- 5) Remove the belt tensioner.



B: INSTALLATION

NOTE:

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

1. FRONT SIDE BELT

- 1) Install the front side belt (C), and tighten the slider bolt so as to obtain the specified belt tension. <Ref. to ME(H4DOTC)-40, INSPECTION, V-belt.>
- 2) Tighten the lock bolt (A).
- 3) Tighten the slider bolt (B).

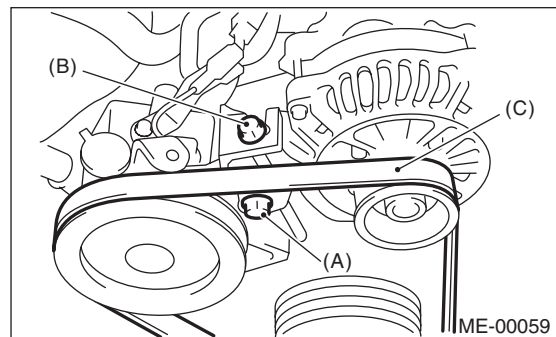
Tightening torque:

Lock bolt (A)

25 N·m (2.5 kgf-m, 18.4 ft-lb)

Slider bolt (B)

8 N·m (0.8 kgf-m, 5.9 ft-lb)



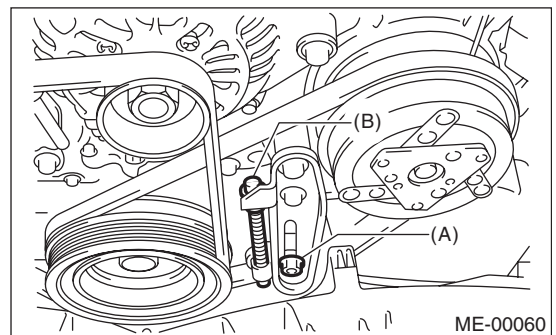
2. REAR SIDE BELT

- 1) Install the belt tensioner.
- 2) Install a rear side belt, and tighten the slider bolt (B) so as to obtain the specified belt tension. <Ref. to ME(H4DOTC)-40, INSPECTION, V-belt.>
- 3) Tighten the lock nut (A).

Tightening torque:

Lock nut (A)

23 N·m (2.3 kgf-m, 17.0 ft-lb)



- 4) Install the front side belt. <Ref. to ME(H4DOTC)-39, FRONT SIDE BELT, INSTALLATION, V-belt.>

C: INSPECTION

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

Belt tension (with belt tension gauge):

(A)

When installing new parts

640 — 780 N (65 — 80 kgf, 144 — 175 lbf)

At inspection:

490 — 640 N (50 — 65 kgf, 110 — 144 lbf)

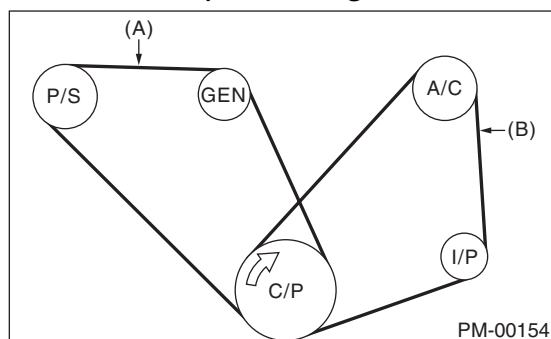
(B)

When installing new parts

650 — 750 N (66 — 76 kgf, 146 — 169 lbf)

At inspection

350 — 450 N (36 — 46 kgf, 78 — 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

Belt tension (without belt tension gauge):

(A)

When installing new parts

7 — 9 mm (0.276 — 0.354 in)

At inspection

9 — 11 mm (0.354 — 0.433 in)

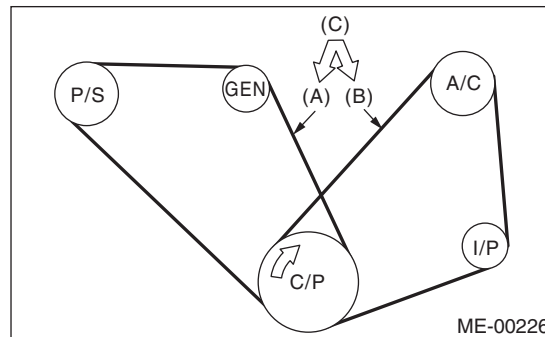
(B)

When installing new parts

7.5 — 8.5 mm (0.295 — 0.335 in)

At inspection

9.0 — 10.0 mm (0.354 — 0.394 in)



- (A) Front side belt
- (B) Rear side belt
- (C) 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

13.Crank Pulley

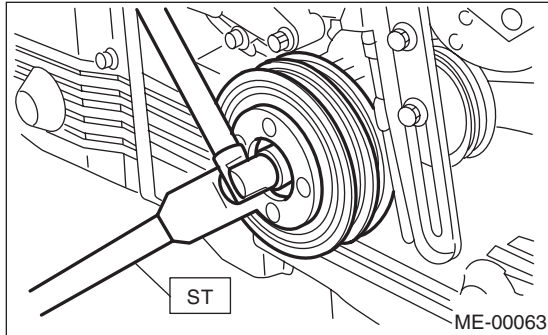
A: REMOVAL

NOTE:

Perform the work with the engine installed to body when replacing a single part.

- 1) Remove the V-belts. <Ref. to ME(H4DOTC)-39, REMOVAL, V-belt.>
- 2) Remove the crank pulley bolt. To lock the crankshaft, use ST.

ST 499977100 CRANK PULLEY WRENCH



- 3) Remove the crank pulley.

B: INSTALLATION

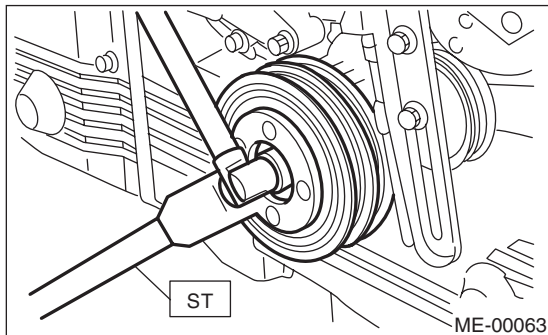
- 1) Install the crank pulley.
 - 2) Install the pulley bolt.
- To lock the crankshaft, use ST.

ST 499977100 CRANK PULLEY WRENCH

- (1) Clean the crank pulley thread using compressed air.
- (2) Apply engine oil to the crank pulley bolt seat and thread.
- (3) Tighten the bolts temporarily with tightening torque of 44 N·m (4.5 kgf-m, 32.5 ft-lb).
- (4) Tighten the crank pulley bolts.

Tightening torque:

180 N·m (18.3 kgf-m, 132.7 ft-lb)



- 3) Check that the tightening angle of the crank pulley bolt is a minimum of 65°. Perform the following procedure when less than 65°.

CAUTION:

If the tightening angle of crank pulley bolt is less than 65°, the bolt is damaged. In this case, the bolt must be replaced.

- (1) Replace the crank pulley bolts and clean them.

Crank pulley bolt:

Part No. 12369AA011

- (2) Clean the crankshaft thread using compressed air.
- (3) Apply engine oil to the crank pulley bolt seat and thread.
- (4) Tighten the bolts temporarily with tightening torque of 44 N·m (4.5 kgf-m, 32.5 ft-lb).
- (5) Tighten the crank pulley bolts 65° to 75°.

NOTE:

Conduct the tightening procedures by confirming the turning angle of crank pulley bolt referring to the gauge indicated on timing belt cover.

- 4) Install the V-belts. <Ref. to ME(H4DOTC)-39, INSTALLATION, V-belt.>

C: INSPECTION

- 1) Check the V-belt is not worn or otherwise damaged.
- 2) Check the tension of the belt. <Ref. to ME(H4DOTC)-40, INSPECTION, V-belt.>

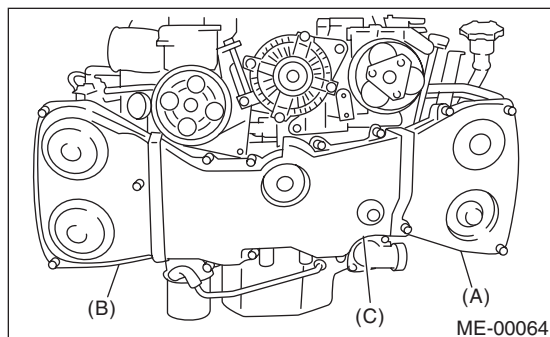
14. Timing Belt Cover

A: REMOVAL

NOTE:

Perform the work with the engine installed to body when replacing a single part.

- 1) Remove the V-belts. <Ref. to ME(H4DOTC)-39, REMOVAL, V-belt.>
- 2) Remove the crank pulley. <Ref. to ME(H4DOTC)-41, 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, 3.7 ft-lb)

- 2) Install the timing belt cover (RH) (B).

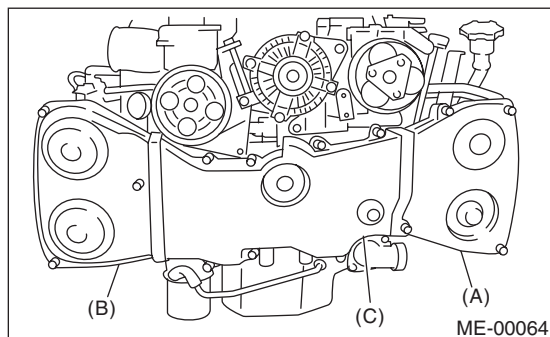
Tightening torque:

5 N·m (0.5 kgf-m, 3.7 ft-lb)

- 3) Install the timing belt cover (LH) (A).

Tightening torque:

5 N·m (0.5 kgf-m, 3.7 ft-lb)



- 4) Install the crank pulley. <Ref. to ME(H4DOTC)-41, INSTALLATION, Crank Pulley.>
- 5) Install the V-belts. <Ref. to ME(H4DOTC)-39, INSTALLATION, V-belt.>

C: INSPECTION

Check the cover for damage.

15. Timing Belt

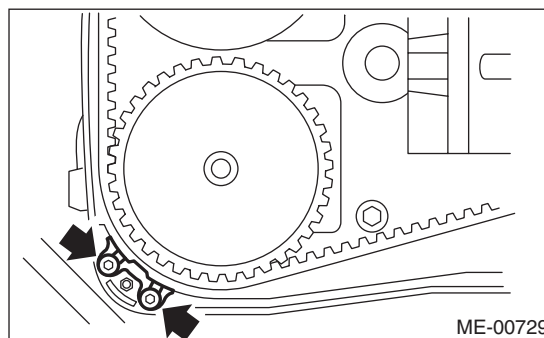
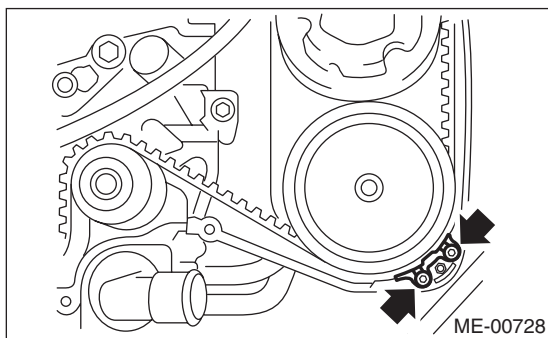
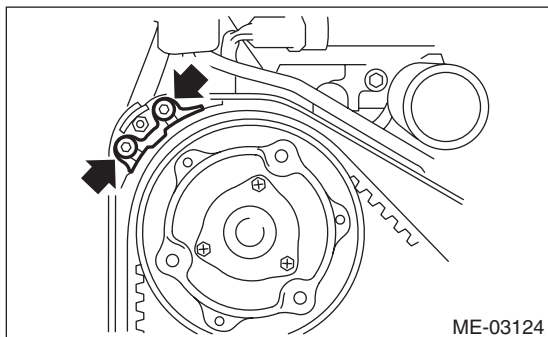
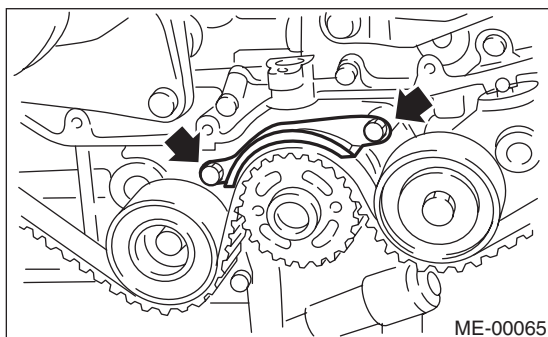
A: REMOVAL

NOTE:

Perform the work with the engine installed to body when replacing a single part. For operation procedures, refer to "Timing Belt" of the PM section.
<Ref. to PM-12, Timing Belt.>

1. TIMING BELT

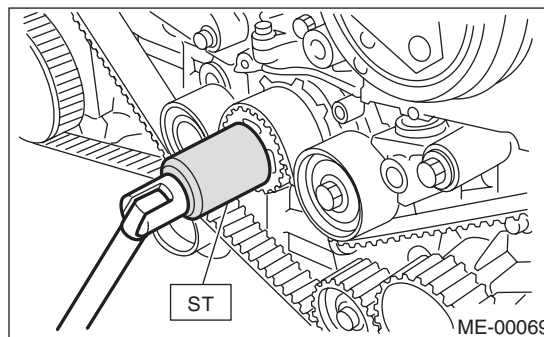
- 1) Remove the V-belts. <Ref. to ME(H4DOTC)-39, REMOVAL, V-belt.>
- 2) Remove the crank pulley. <Ref. to ME(H4DOTC)-41, REMOVAL, Crank Pulley.>
- 3) Remove the timing belt cover.
<Ref. to ME(H4DOTC)-42, REMOVAL, Timing Belt Cover.>
- 4) Remove the timing belt guide. (MT model)



5) If the alignment mark or arrow mark (which indicates the direction of rotation) on timing belt fade away, put new marks before removing the timing belt as shown in procedures below.

(1) Turn the crankshaft using ST, and align the alignment marks on crank sprocket, intake cam sprocket (LH), exhaust cam sprocket (LH), intake cam sprocket (RH) and exhaust cam sprocket (RH) with notches of timing belt cover and cylinder block.

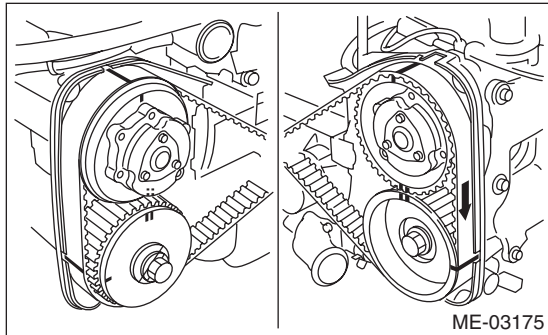
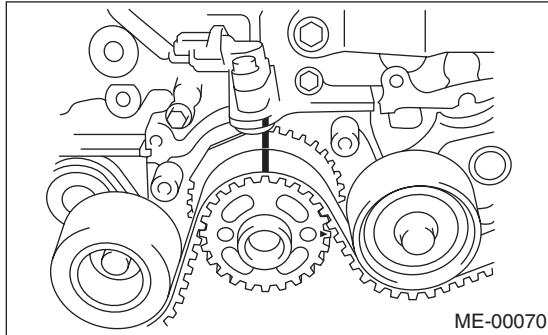
ST 499987500 CRANKSHAFT SOCKET



Timing Belt

MECHANICAL

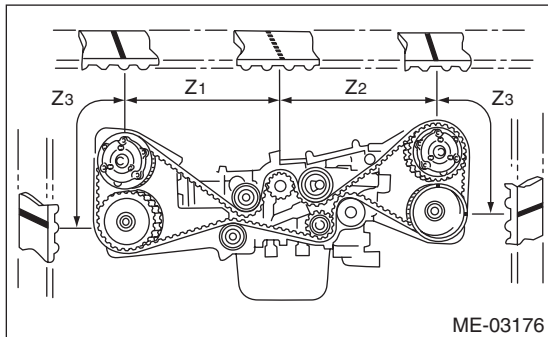
(2) Using white paint, put alignment and/or arrow marks on timing belts in relation to the cam sprockets.



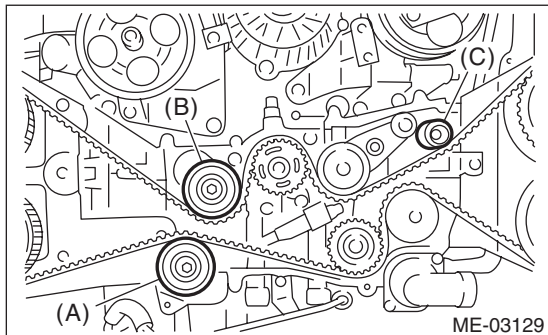
Z_1 : 54.5-teeth length

Z_2 : 51-teeth length

Z_3 : 28-teeth length



6) Remove the belt idler (A).



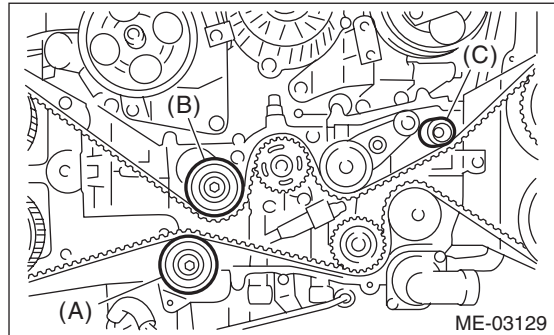
7) Remove the timing belt.

CAUTION:

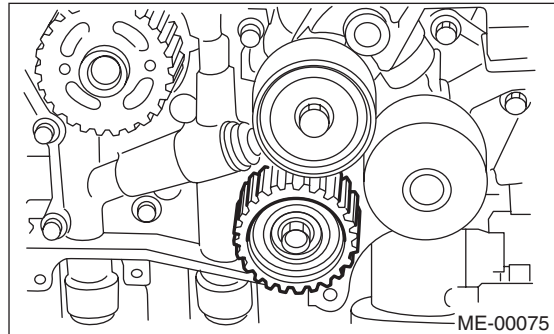
After the timing belt has been removed, never rotate the intake and exhaust sprocket. If the cam sprocket is rotated, the intake and exhaust valve heads strike together and valve stems are bent.

2. AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER

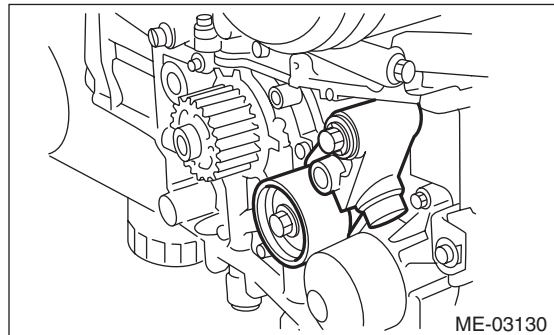
1) Remove the belt idler (B) and (C).



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

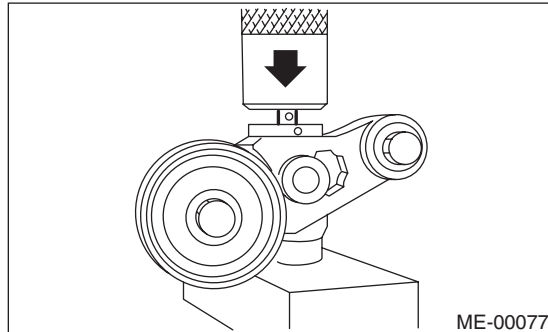
1) Preparation for installation of automatic belt tension adjuster assembly.

CAUTION:

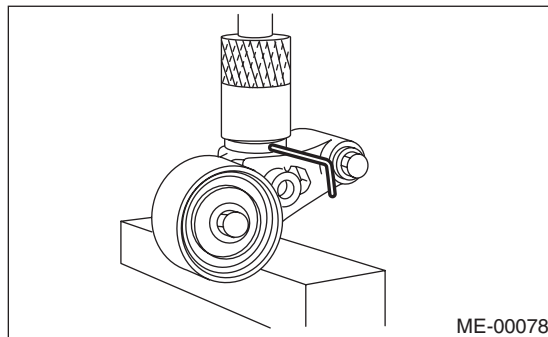
- Always use a vertical type pressing tool to move the adjuster rod down.
- Do not use a lateral type vise.
- Push the adjuster rod vertically.
- Press-in the push adjuster rod gradually taking three minutes or more.
- Do not allow press pressure to exceed 9,807 N (1,000 kgf, 2,205 lbf).
- Press the adjuster rod to the end surface of the cylinder. However, do not press the adjuster rod below the end face of the cylinder. Doing so may damage the cylinder.
- Do not release the press pressure until stopper pin is completely inserted.

(1) Attach the automatic belt tension adjuster assembly to vertical pressing tool.

(2) Slowly move the adjuster rod down with a pressure of 165 N (16.8 kgf, 37.1 lbf) or more until the adjuster rod is aligned with the stopper pin hole in the cylinder.



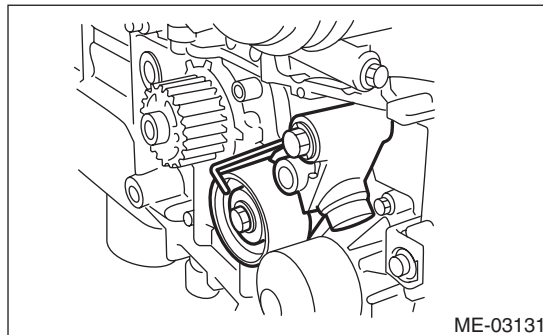
(3) With a 2 mm (0.08 in) dia. stopper pin or a 2 mm (nominal) dia. hex wrench inserted into the stopper pin hole in cylinder, secure the adjuster rod.



2) Install the automatic belt tension adjuster assembly.

Tightening torque:

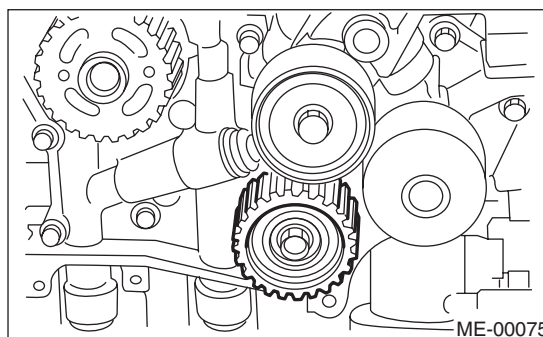
39 N·m (4.0 kgf-m, 28.8 ft-lb)



3) Install the belt idler No. 2.

Tightening torque:

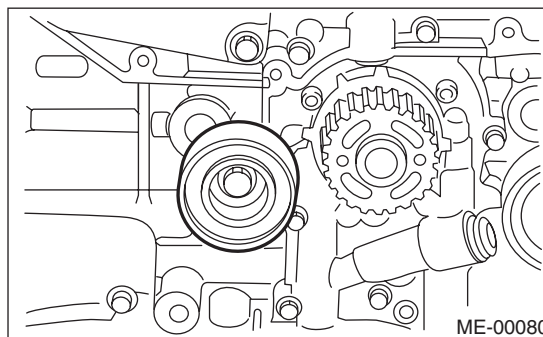
39 N·m (4.0 kgf-m, 28.8 ft-lb)



4) Install the belt idlers.

Tightening torque:

39 N·m (4.0 kgf-m, 28.8 ft-lb)



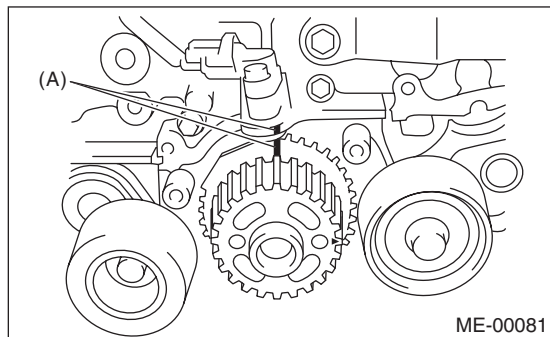
Timing Belt

MECHANICAL

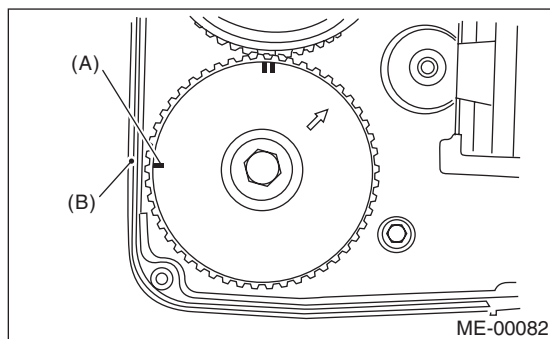
2. TIMING BELT

1) Prepare for installation of the automatic belt tension adjuster assembly. <Ref. to ME(H4DOTC)-45, AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER, INSTALLATION, Timing Belt.>

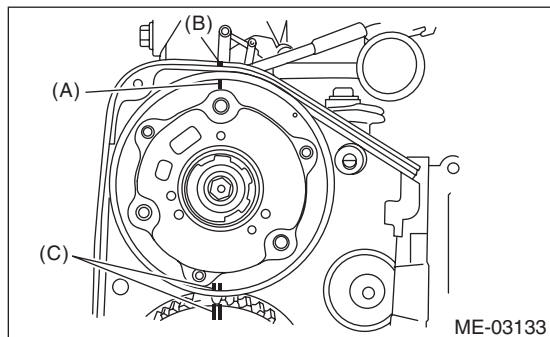
2) Align the mark (A) on crank sprocket with the mark on oil pump cover at cylinder block.



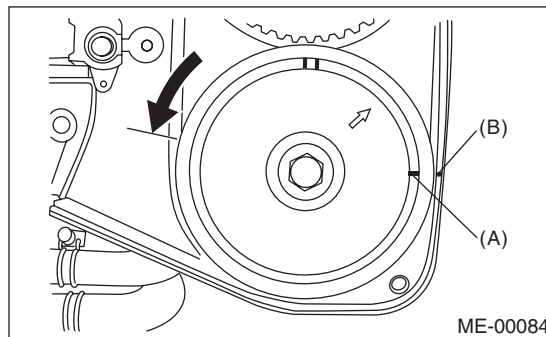
3) Align single line mark (A) on the exhaust cam sprocket (RH) with notch (B) on timing belt cover.



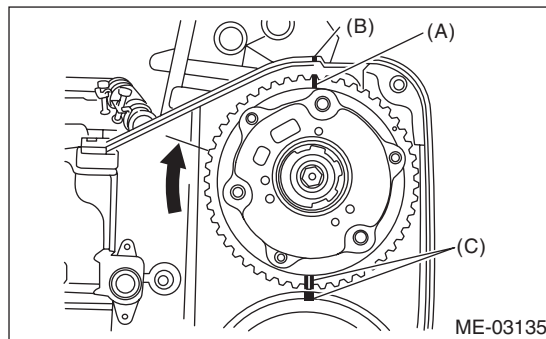
4) Align single line mark (A) on the intake cam sprocket (RH) with notch (B) on timing belt cover. (Ensure double lines (C) on intake and exhaust camshaft sprockets are aligned.)



5) Align the single line mark (A) on exhaust cam sprocket (LH) with notch (B) on timing belt cover by turning the sprocket counterclockwise (as viewed from front of engine).



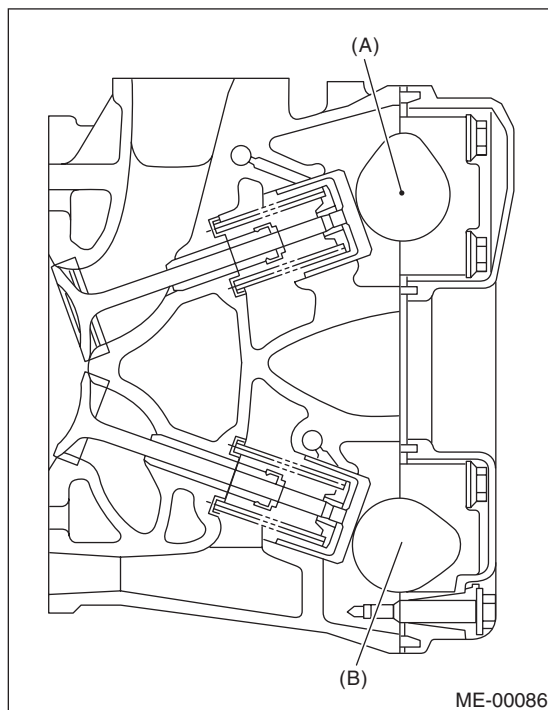
6) Align the single line mark (A) on intake cam sprocket (LH) with notch (B) on timing belt cover by turning the sprocket clockwise (as viewed from front of engine). (Make sure the double line marks (C) on intake and exhaust cam sprockets are aligned.)



7) Make sure that the cam and crank sprockets are positioned properly.

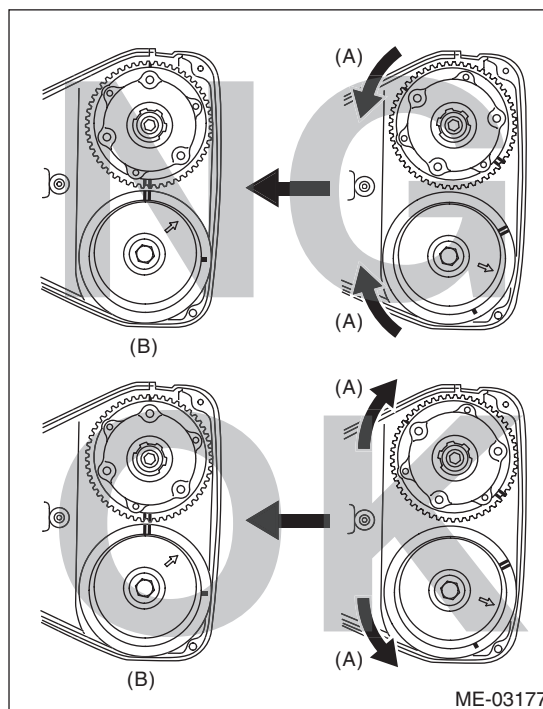
CAUTION:

- Intake and exhaust camshafts for this DOHC engine can be independently rotated with the timing belts removed. As can be seen from the figure, if the intake and exhaust valves are lifted simultaneously, the valve heads will interfere with each other, resulting in bent valves.



(A) Intake camshaft
(B) Exhaust camshaft

- Do not allow the camshafts to rotate in the direction shown in the upper figure. Doing this may cause both the intake and exhaust valves to lift simultaneously, resulting in mutual interference of valve heads.



(A) Direction of rotation
(B) Timing belt installation position

- When the timing belts are not installed, four camshafts are held at the “zero-lift” position, where all cams on camshafts do not push the intake and exhaust valves down. (Under this condition, all valves remain unlifted.)
- When the camshafts are rotated to install the timing belts, #2 intake and #4 exhaust cam of camshafts (LH) are held to push their corresponding valves down. (Under this condition, these valves are held lifted.) Right-side camshafts are held so that their cams do not push valves down.
- Camshafts (LH) must be rotated from the zero-lift position to the position where the timing belt is to be installed with the smallest possible angle, in order to prevent mutual interference of intake and exhaust valve heads.

Timing Belt

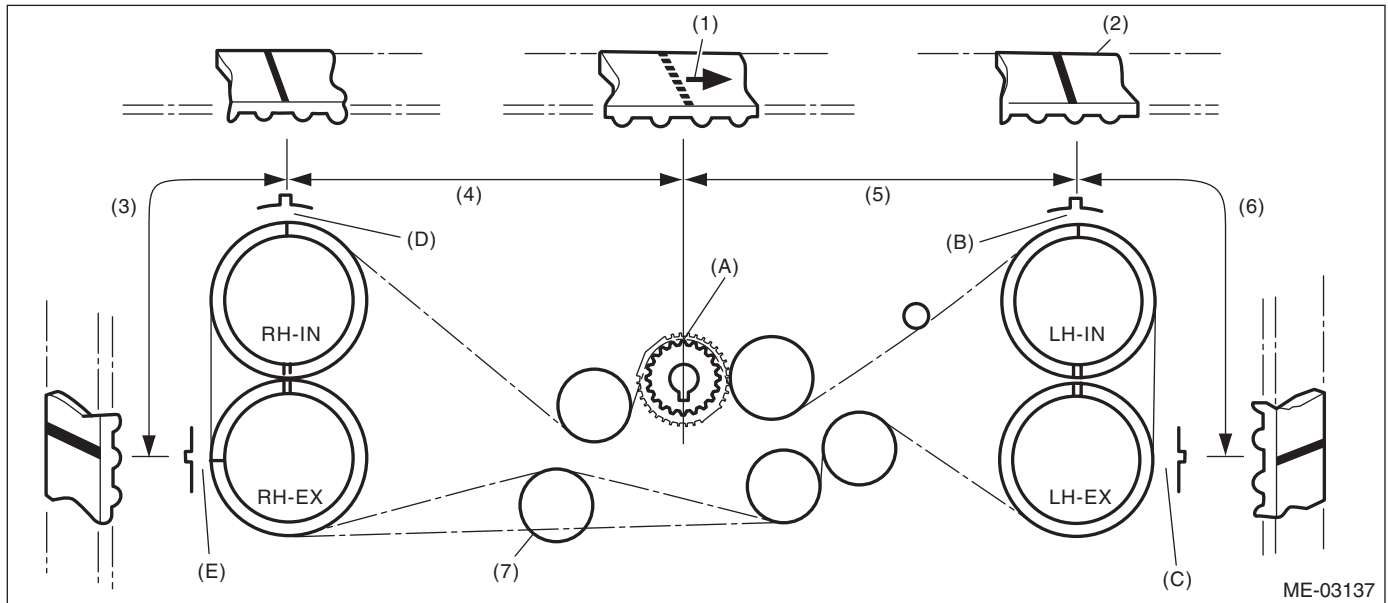
MECHANICAL

8) Install the timing belt.

Align the alignment mark on the timing belt with marks on the sprockets in the alphabetical order shown in the figure. While aligning marks, position the timing belt properly.

CAUTION:

- Disengagement of more than three timing belt teeth may result in interference between the valve and piston.
- Make sure that the direction of belt rotation is correct.



- (1) Arrow mark
(2) Timing belt
(3) Length of 28-teeth

- (4) Length of 54.5-teeth
(5) Length of 51-teeth
(6) Length of 28-teeth

- (7) Install it in the end

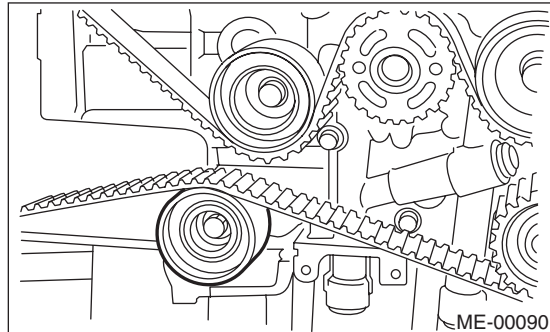
9) Install the belt idlers.

Tightening torque:

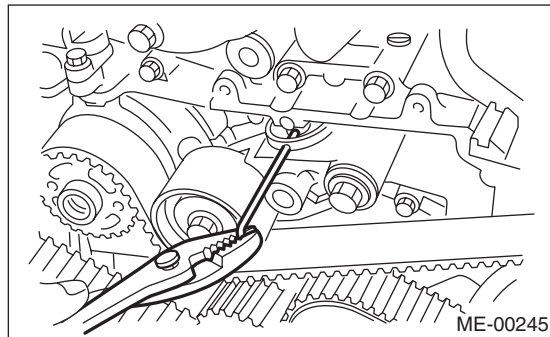
39 N·m (4.0 kgf-m, 28.8 ft-lb)

NOTE:

Make sure that the marks on the timing belt and sprockets are aligned.



10) After ensuring that the marks on the timing belt and sprockets are aligned, remove the stopper pin from tensioner adjuster.



11) Install the timing belt guide. (MT model)

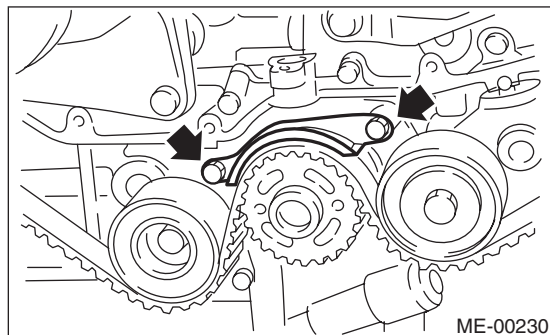
NOTE:

- Clean the timing belt cover screw holes before installing bolts.
- Apply liquid gasket to the threaded portion of cam sprocket. (when reusing bolts)

Liquid gasket

**THREE BOND 1324 (Part No. 004403042)
or the equivalent**

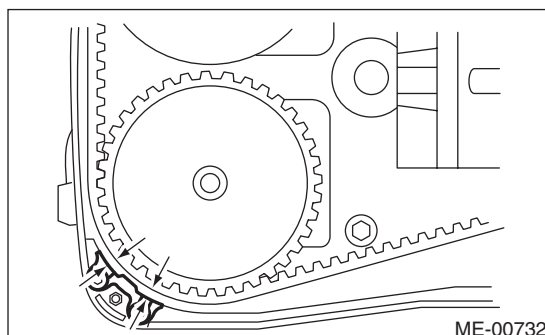
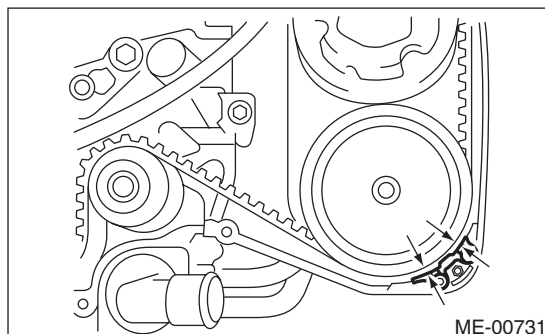
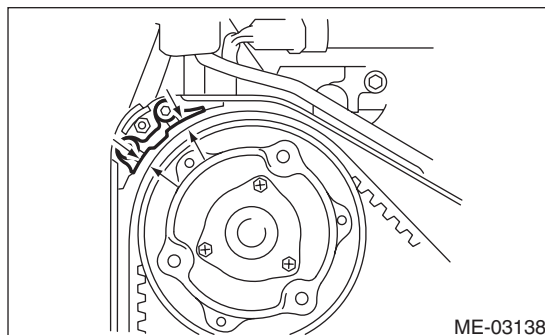
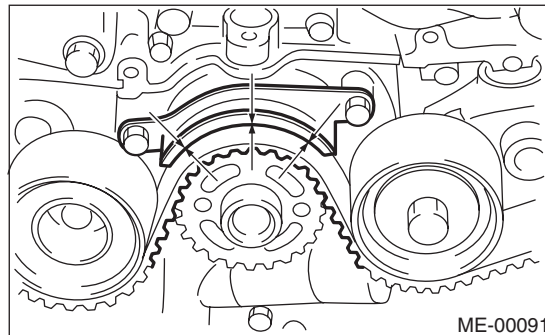
(1) Temporarily tighten the bolts mounting the timing belt guide.



(2) Check and adjust the clearance between timing belt and timing belt guide using a thickness gauge.

Clearance:

1.0±0.5 mm (0.039±0.020 in)



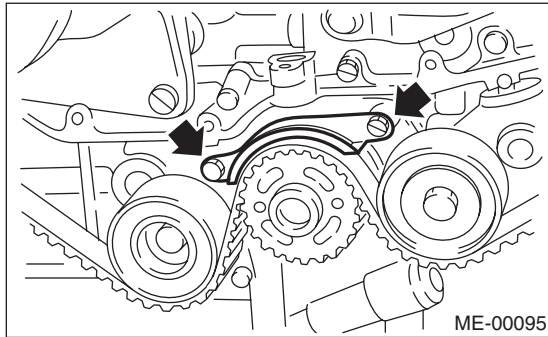
Timing Belt

MECHANICAL

(3) Tighten the bolts mounting the timing belt guide.

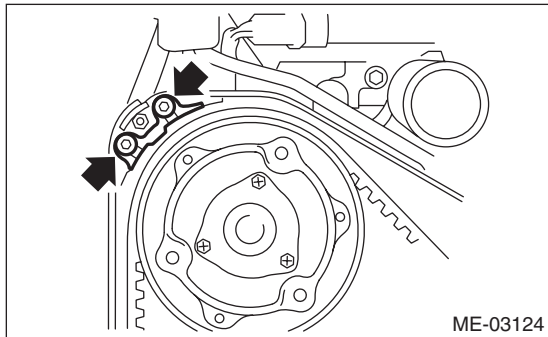
Tightening torque:

9.75 N·m (1.0 kgf-m, 7.2 ft-lb)



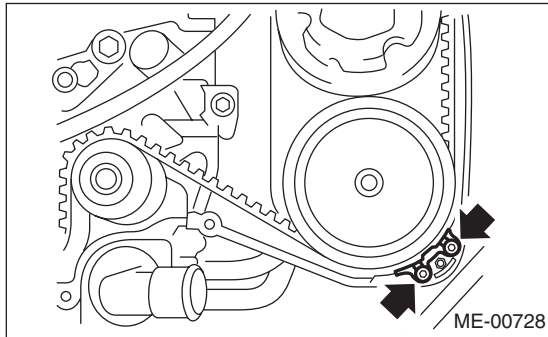
Tightening torque:

6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



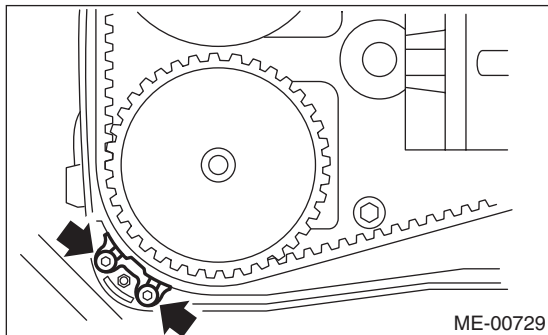
Tightening torque:

6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



Tightening torque:

6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



12) Install the timing belt cover.

<Ref. to ME(H4DOTC)-42, INSTALLATION, Timing Belt Cover.>

13) Install the crank pulley.

<Ref. to ME(H4DOTC)-41, INSTALLATION, Crank Pulley.>

14) Install the V-belts. <Ref. to ME(H4DOTC)-39, INSTALLATION, V-belt.>

C: INSPECTION

1. TIMING BELT

1) Check the timing belt teeth for breaks, cracks or wear. If any fault is found, replace the timing belt.

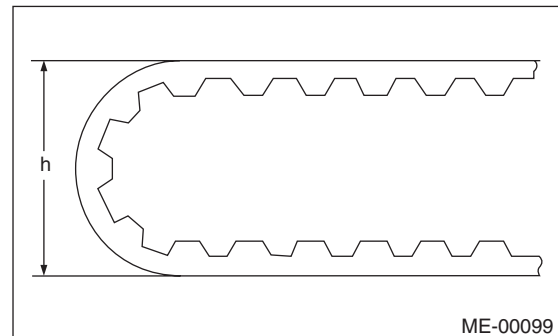
2) Check the condition on the back surface of the timing belt. If cracks are found, replace the timing belt.

CAUTION:

- Be careful not to let oil, grease or engine coolant contact the timing belt. Remove quickly and thoroughly if this happens.
- Do not bend the timing belt sharply.

Bending diameter: h

60 mm (2.36 in) or more



2. AUTOMATIC BELT TENSION ADJUSTER

1) Visually check the oil seals for leaks, and rod ends for uneven wear and scratches. If necessary, replace the automatic belt tension adjuster assembly.

NOTE:

Slight traces of oil at rod's oil seal does not indicate a problem.

2) Check that the adjuster rod does not move when a pressure of 165 N (16.8 kgf, 37.1 lbf) is applied to it. This is to check the adjuster rod stiffness.

3) If the adjuster rod is not stiff and moves freely when applying 165 N (16.8 kgf, 37.1 lbf), check it using the following procedures:

(1) Slowly press the adjuster rod down to the end surface of cylinder. Repeat this operation two to three times.

(2) With the adjuster rod moved all the way up, apply a pressure of 165 N (16.8 kgf, 37.1 lbf) to it, and check the adjuster rod stiffness.

(3) If the adjuster rod is not stiff and moves down, replace the automatic belt tension adjuster assembly with a new part.

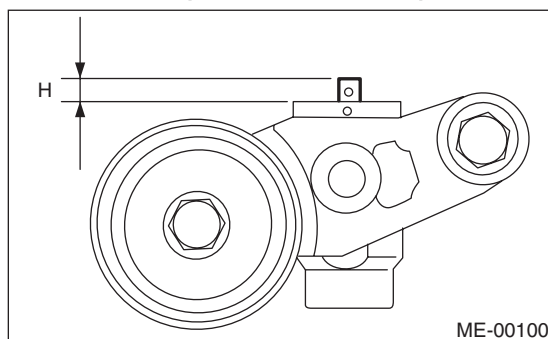
CAUTION:

- Always use a vertical type pressing tool to move the adjuster rod down.
- Do not use a lateral type vise.
- Push the adjuster rod vertically.
- Press-in the push adjuster rod gradually taking three minutes or more.
- Do not allow press pressure to exceed 9,807 N (1,000 kgf, 2,205 lbf).
- Press the adjuster rod to the end surface of the cylinder. However, do not press the adjuster rod below the end face of the cylinder. Doing so may damage the cylinder.

4) Measure the rod protrusion amount "H" from the body edge. If it is not within specifications, replace with new part.

Amount of rod protrusion: H

5.2 — 6.2 mm (0.204 — 0.244 in)



3. BELT TENSION PULLEY

1) Check the mating surfaces of timing belt and contact point of adjuster rod for abnormal wear or scratches. Replace the automatic belt tension adjuster assembly if faulty.

2) Check the belt tension pulley for smooth rotation. Replace if noise or excessive play occurs.

3) Check the belt tension pulley for grease leakage.

4. BELT IDLER

1) Check the belt idler for smooth rotation. Replace if noise or excessive play occurs.

2) Check the outer contacting surfaces of idler pulley for abnormal wear and scratches.

3) Check the belt idler for grease leakage.

16. Cam Sprocket

A: REMOVAL

NOTE:

Perform the work with the engine installed to body when replacing a single part.

1) Remove the V-belts. <Ref. to ME(H4DOTC)-39, REMOVAL, V-belt.>

2) Remove the crank pulley.

<Ref. to ME(H4DOTC)-41, REMOVAL, Crank Pulley.>

3) Remove the timing belt cover.

<Ref. to ME(H4DOTC)-42, REMOVAL, Timing Belt Cover.>

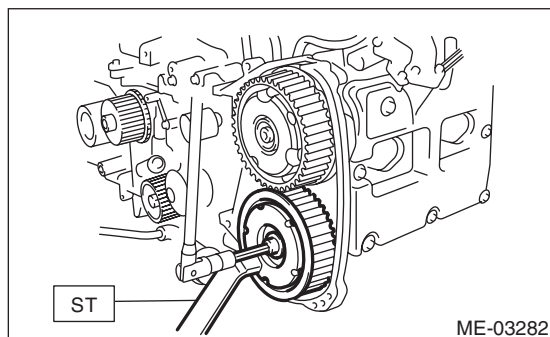
4) Remove the timing belt.

<Ref. to ME(H4DOTC)-43, REMOVAL, Timing Belt.>

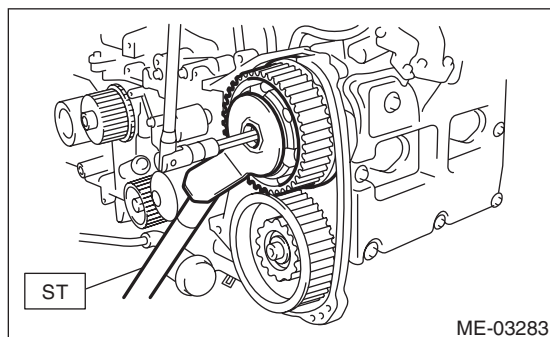
5) Remove the actuator cover of the intake cam sprocket.

6) Fasten the cam sprocket and remove from the cam shaft using ST.

ST 499207400 CAM SPROCKET WRENCH



ST 499977500 CAM SPROCKET WRENCH



B: INSTALLATION

1) Fasten the cam sprocket and install to the cam shaft using ST.

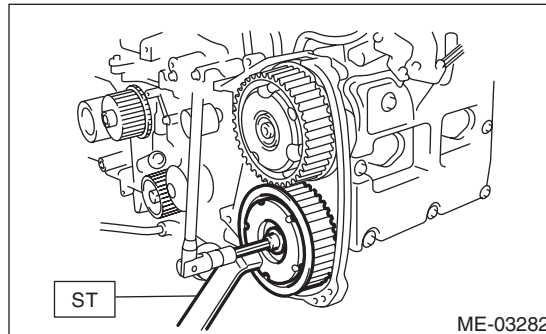
NOTE:

Do not confuse left and right side cam sprockets during installation.

ST 499207400 CAM SPROCKET WRENCH

Tightening torque:

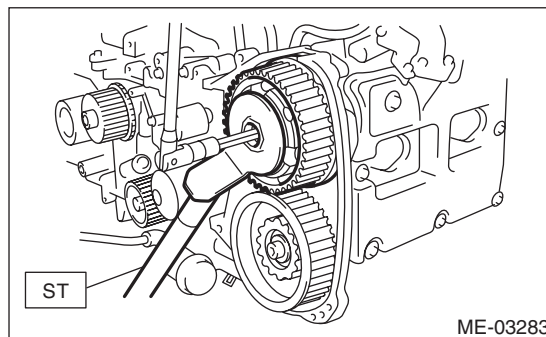
Tighten to 30 N·m (3.1 kgf·m, 22.1 ft·lb) of torque, and then tighten further by 45°.



ST 499977500 CAM SPROCKET WRENCH

Tightening torque:

Tighten to 30 N·m (3.1 kgf·m, 22.1 ft·lb) of torque, and then tighten further by 45°.



2) Attach the actuator cover of the intake cam sprocket.

NOTE:

Use new O-rings.

Tightening torque:

3.4 N·m (0.3 kgf·m, 2.5 ft·lb)

3) Install the timing belt. <Ref. to ME(H4DOTC)-45, INSTALLATION, Timing Belt.>

4) Install the timing belt cover.

<Ref. to ME(H4DOTC)-42, INSTALLATION, Timing Belt Cover.>

5) Install the crank pulley.

<Ref. to ME(H4DOTC)-41, INSTALLATION, Crank Pulley.>

6) Install the V-belts. <Ref. to ME(H4DOTC)-39, INSTALLATION, V-belt.>

C: INSPECTION

- 1) Check the cam sprocket teeth for abnormal wear and scratches.
- 2) Make sure there is no free play between cam sprocket and key.

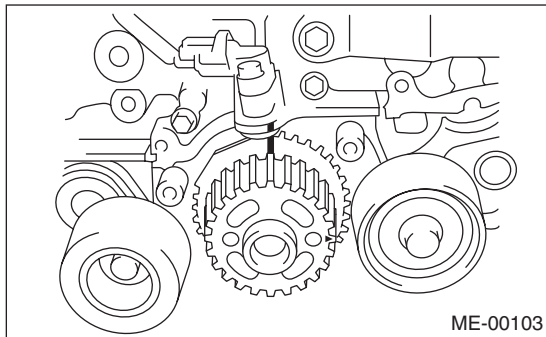
17.Crank Sprocket

A: REMOVAL

NOTE:

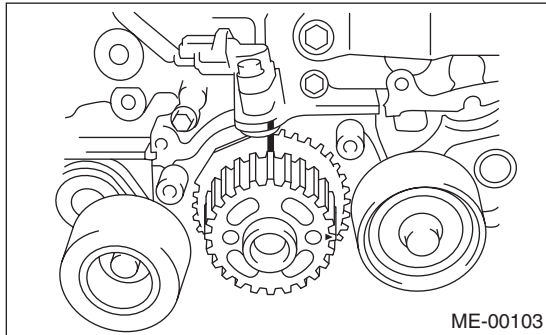
Perform the work with the engine installed to body when replacing a single part.

- 1) Remove the V-belts. <Ref. to ME(H4DOTC)-39, REMOVAL, V-belt.>
- 2) Remove the crank pulley.
<Ref. to ME(H4DOTC)-41, REMOVAL, Crank Pulley.>
- 3) Remove the timing belt cover.
<Ref. to ME(H4DOTC)-42, REMOVAL, Timing Belt Cover.>
- 4) Remove the timing belt.
<Ref. to ME(H4DOTC)-43, REMOVAL, Timing Belt.>
- 5) Remove the crank sprocket.



B: INSTALLATION

- 1) Install the crank sprocket.



- 2) Install the timing belt.
<Ref. to ME(H4DOTC)-45, INSTALLATION, Timing Belt.>
- 3) Install the timing belt cover.
<Ref. to ME(H4DOTC)-42, INSTALLATION, Timing Belt Cover.>
- 4) Install the crank pulley. <Ref. to ME(H4DOTC)-41, INSTALLATION, Crank Pulley.>
- 5) Install the V-belts. <Ref. to ME(H4DOTC)-39, INSTALLATION, V-belt.>

C: INSPECTION

- 1) Check the crank sprocket teeth for abnormal wear and scratches.
- 2) Make sure there is no free play between crank sprocket and key.
- 3) Check the crank sprocket protrusion used for sensor for damage and contamination of foreign matter.

18. Camshaft

A: REMOVAL

NOTE:

Perform the work with the engine installed to body when replacing a single part. Refer to "Valve Clearance" for preparation. <Ref. to ME(H4DOTC)-27, INSPECTION, Valve Clearance.>

1) Remove the V-belts. <Ref. to ME(H4DOTC)-39, REMOVAL, V-belt.>

2) Remove the crank pulley. <Ref. to ME(H4DOTC)-41, REMOVAL, Crank Pulley.>

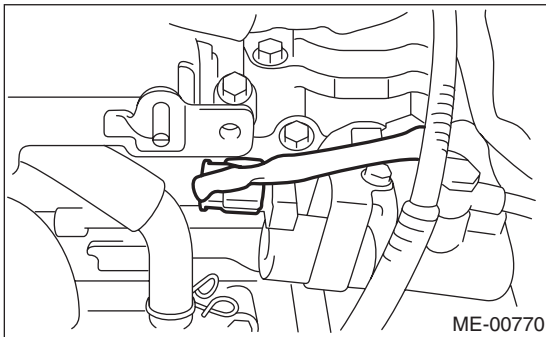
3) Remove the timing belt cover.

<Ref. to ME(H4DOTC)-42, REMOVAL, Timing Belt Cover.>

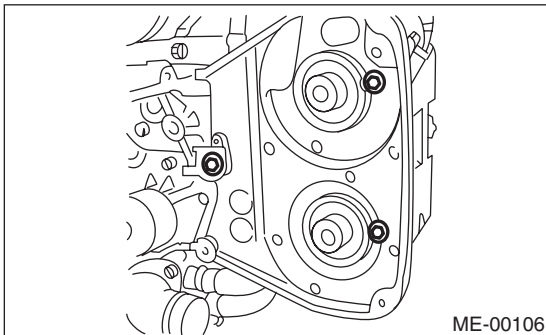
4) Remove the timing belt. <Ref. to ME(H4DOTC)-43, REMOVAL, Timing Belt.>

5) Remove the cam sprocket. <Ref. to ME(H4DOTC)-52, REMOVAL, Cam Sprocket.>

6) Disconnect the oil flow control solenoid valve assembly connector.



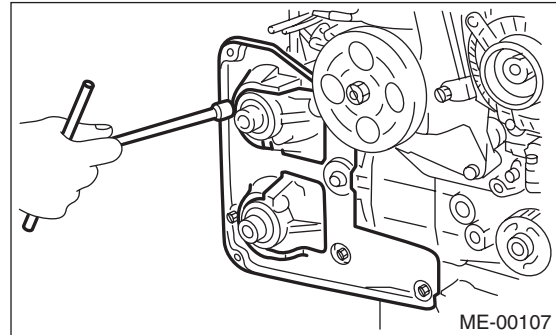
7) Remove the timing belt cover No. 2 (LH).



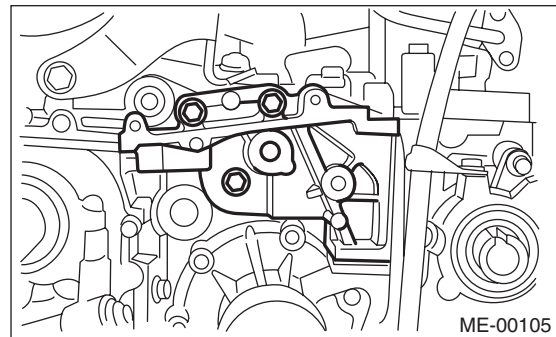
8) Remove the timing belt cover No. 2 (RH).

NOTE:

Do not damage or lose the seal rubber when removing the timing belt covers.



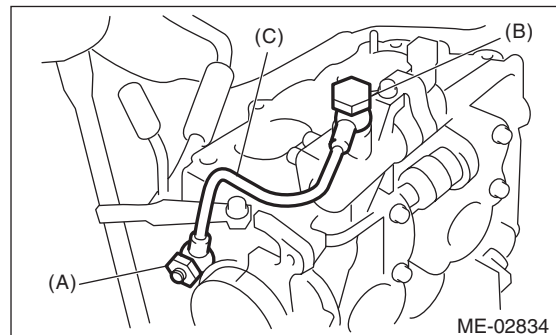
9) Remove the tensioner bracket.



10) Remove the ignition coil.

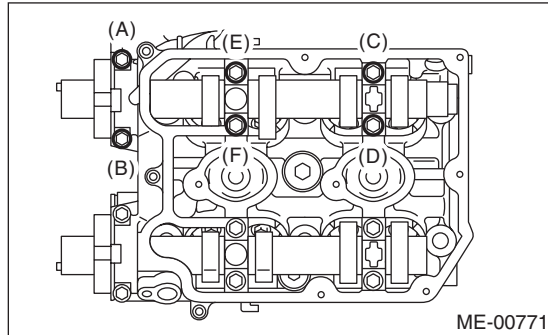
11) Remove the rocker cover and gasket.

12) Remove the oil pipe.

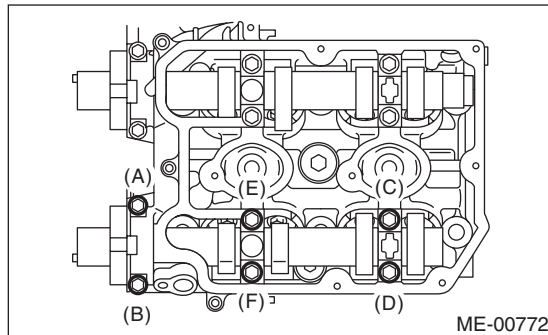


- (A) Union screw with filter (with protrusion)
- (B) Union screw without filter (without protrusion)
- (C) Oil pipe

13) Loosen the oil flow control solenoid valve assembly and intake camshaft cap bolts equally, a little at a time in alphabetical sequence shown in the figure.



14) Loosen the exhaust camshaft cap bolts equally, a little at a time in alphabetical sequence shown in the figure.



15) Remove the oil flow control solenoid valve assembly, intake camshaft cap and camshaft.

16) Remove the exhaust camshaft caps and camshaft.

NOTE:

Arrange camshaft caps in order so that they can be installed in their original positions.

17) Remove the oil seal.

CAUTION:

Do not scratch the journal surface when removing the oil seal.

18) Similarly, remove the camshafts (RH) and related parts.

B: INSTALLATION

1) Install the camshaft.

Apply engine oil to the cylinder head at camshaft journal installation location before installing the camshaft. Install the camshaft so that each valve is close to or in contact with base circle of the cam.

NOTE:

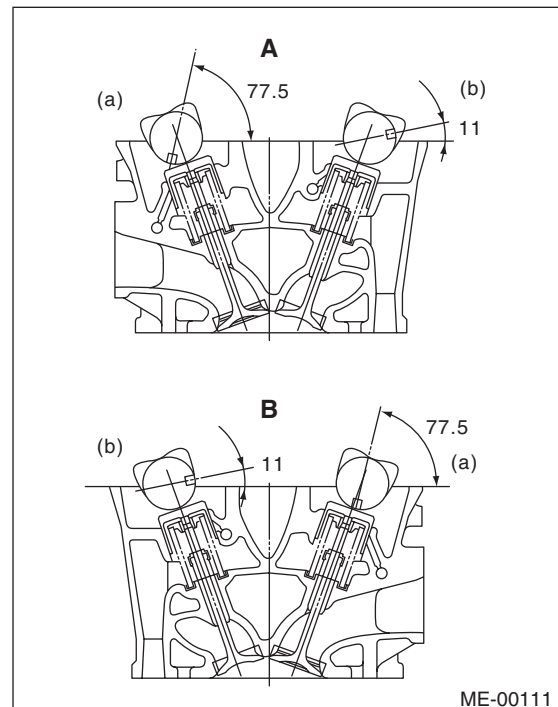
- Set the cam shaft to the position shown in the figure.
- When set at the position shown in the figure, it is not necessary to rotate the camshaft (RH) when installing the timing belt, but it is necessary to rotate the camshaft (LH) slightly.

Intake camshaft (LH):

Rotate 80° clockwise.

Exhaust camshaft (LH):

Rotate 45° counterclockwise.



A Cylinder head (LH)

B Cylinder head (RH)

(a) Intake camshaft

(b) Exhaust camshaft

2) Install the camshaft cap and oil flow control solenoid valve assembly.

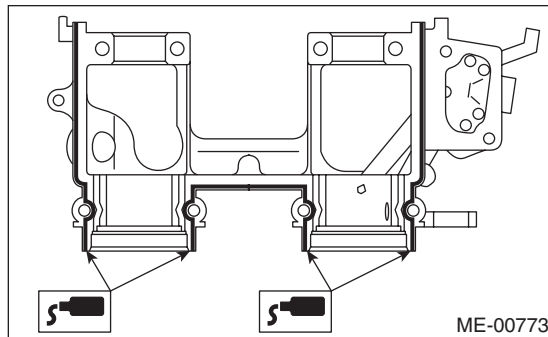
(1) Apply small amount of liquid gasket to the mating surface of cap.

NOTE:

- Install within 5 min. after applying liquid gasket.
- Do not apply liquid gasket excessively. Applying excessively may cause excess gasket to come out and flow toward oil seal, resulting in oil leak.

Liquid gasket:

THREE BOND 1217G (Part No. K0877Y0100) or equivalent



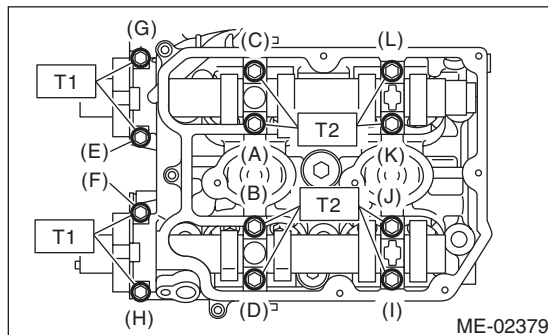
(2) Apply a thin coat of engine oil to cap bearing surface, and install the cap to the camshaft.

(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, 7.2 ft-lb)

T2: 20 N·m (2.0 kgf-m, 14.8 ft-lb)



(4) After tightening the camshaft cap, ensure the camshaft rotates only slightly while holding it at base circle.

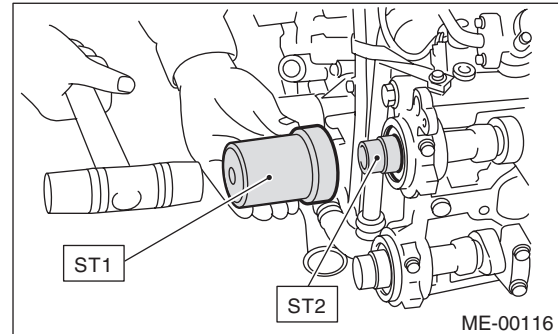
3) Apply a coat of engine oil to the camshaft oil seal periphery and oil seal lips, then install the oil seal on the camshaft using ST1 and ST2.

NOTE:

Use a new oil seal.

ST1 499587600 OIL SEAL INSTALLER

ST2 499597200 OIL SEAL GUIDE



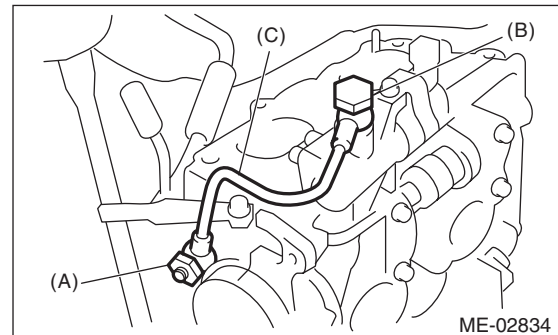
4) Install the oil pipe.

NOTE:

Make sure not to mix up the union screws with filter and without filter as their installation positions are different.

Tightening torque:

29 N·m (3.0 kgf-m, 21.4 ft-lb)

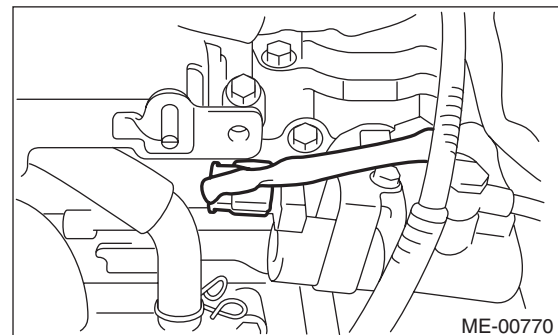


(A) Union screw with filter (with protrusion)

(B) Union screw without filter (without protrusion)

(C) Oil pipe

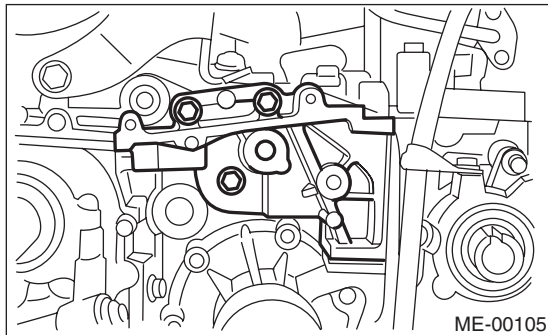
5) Connect the oil flow control solenoid valve connector.



- 6) Similarly, install the parts on right-hand side.
- 7) Install the tensioner bracket.

Tightening torque:

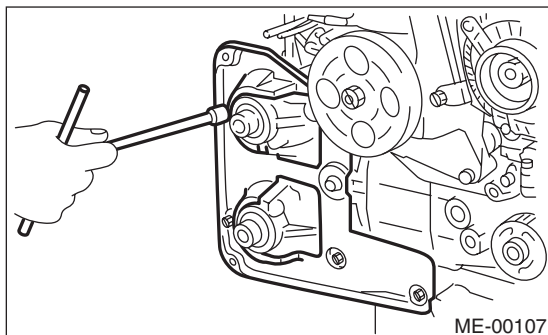
24.5 N·m (2.5 kgf-m, 18.1 ft-lb)



- 8) Install the timing belt cover No. 2 (RH).

Tightening torque:

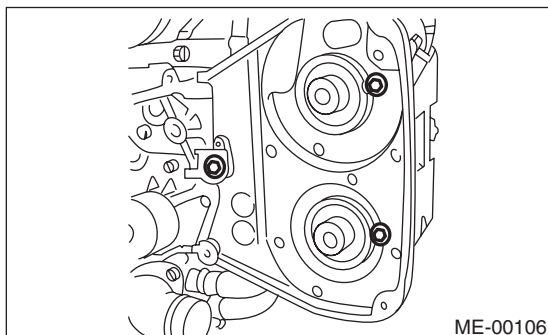
5 N·m (0.5 kgf-m, 3.7 ft-lb)



- 9) Install the timing belt cover No. 2 (LH).

Tightening torque:

5 N·m (0.5 kgf-m, 3.7 ft-lb)



- 10) Install the cam sprocket.
<Ref. to ME(H4DOTC)-52, INSTALLATION, Cam Sprocket.>
- 11) Install the timing belt. <Ref. to ME(H4DOTC)-45, INSTALLATION, Timing Belt.>
- 12) Adjust the valve clearance. <Ref. to ME(H4DOTC)-29, ADJUSTMENT, Valve Clearance.>

- 13) Install the rocker cover.

- (1) Install the rocker cover gasket to the rocker cover.

NOTE:

Use a new gasket.

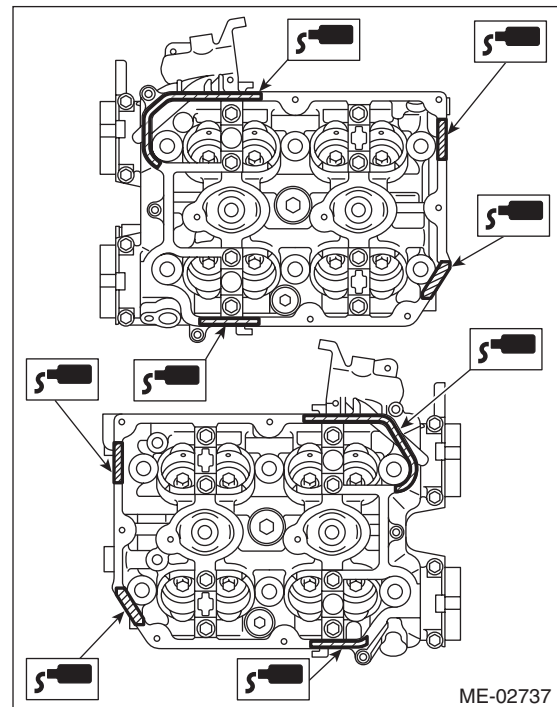
- (2) Apply liquid gasket to the specified point of the cylinder head. Apply extra amount of liquid gasket around plugs 5 mm (0.2 in) or more.

NOTE:

Install within 5 min. after applying liquid gasket.

Liquid gasket:

THREE BOND 1217G (Part No. K0877Y0100) or equivalent

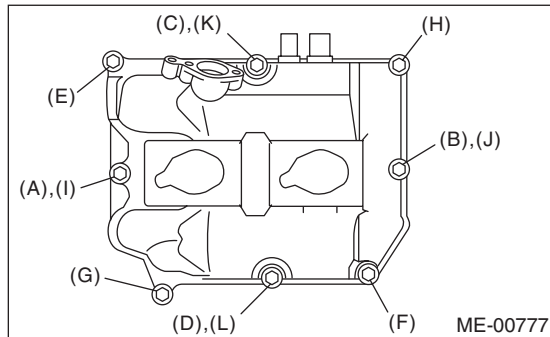


- (3) Install the rocker cover on cylinder head. Ensure the gasket is properly positioned during installation.

(4) Temporarily tighten the rocker cover tightening bolts in alphabetical sequence shown in the figure, and then tighten to specified torque in alphabetical sequence.

Tightening torque:

6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



(5) Connect the PCV hose.

14) Tighten the ignition coil.

15) Install the timing belt cover.

<Ref. to ME(H4DOTC)-42, INSTALLATION, Timing Belt Cover.>

16) Install the crank pulley.

<Ref. to ME(H4DOTC)-41, INSTALLATION, Crank Pulley.>

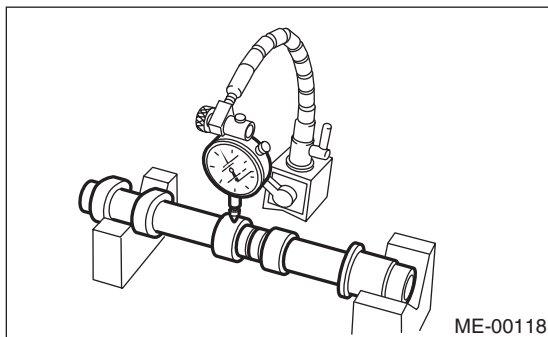
17) Install the V-belts. <Ref. to ME(H4DOTC)-39, INSTALLATION, V-belt.>

C: INSPECTION

1) Measure the bend, and repair or replace if necessary.

Service limit:

0.020 mm (0.00079 in)



2) Check the journal for damage and wear. Replace if faulty.

3) Check the cutout portion used for camshaft sensor for damage. Replace if faulty.

4) Measure the outside diameter of camshaft journal. If the journal diameter is not within the standard, check the oil clearance.

	Camshaft journal	
	Front	Center, rear
Standard	37.946 — 37.963 mm (1.4939 — 1.4946 in)	29.946 — 29.963 mm (1.1790 — 1.1796 in)

5) Measurement of the camshaft journal oil clearance

(1) Clean the bearing caps and camshaft journals.

(2) Place the camshafts on cylinder head. (Without installing the valve lifter.)

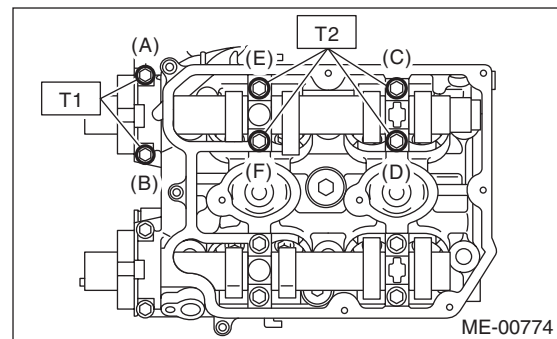
(3) Place a plastigauge across each camshaft journals.

(4) Gradually tighten the cap in at least two stages in alphabetical sequence shown in the figure, and then tighten to specified torque. Do not turn the camshaft.

Tightening torque:

T1: 9.75 N·m (1.0 kgf-m, 7.2 ft-lb)

T2: 20 N·m (2.0 kgf-m, 14.8 ft-lb)



(5) Remove the bearing caps.

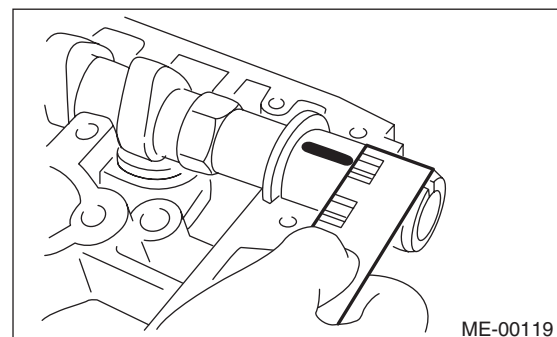
(6) Measure the widest point of the plastigauge on each journal. If the oil clearance exceeds the limit, replace the camshaft. If necessary, replace the camshaft caps and cylinder head as a set.

Standard:

0.037 — 0.072 mm (0.0015 — 0.0028 in)

Service limit:

0.1 mm (0.0039 in)



(7) Completely remove the plastigauge.

Camshaft

MECHANICAL

6) Check the cam face condition; remove the minor faults by grinding with oil stone. Measure the cam height H. Replace if it exceeds the limit or there is uneven wear.

Cam height H:

Intake

Standard

46.55 — 46.65 mm (1.833 — 1.837 in)

Limit

46.45 mm (1.829 in)

Exhaust

Standard

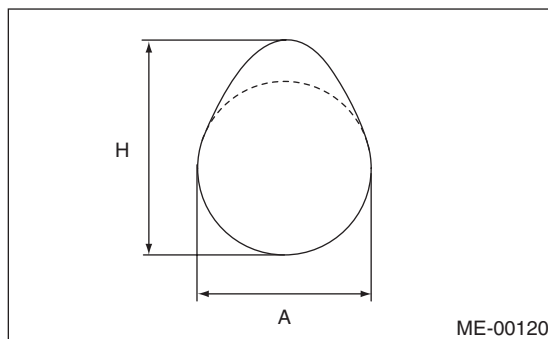
46.75 — 46.85 mm (1.841 — 1.844 in)

Limit

46.65 mm (1.837 in)

Cam base circle diameter A:

37.0 mm (1.457 in)



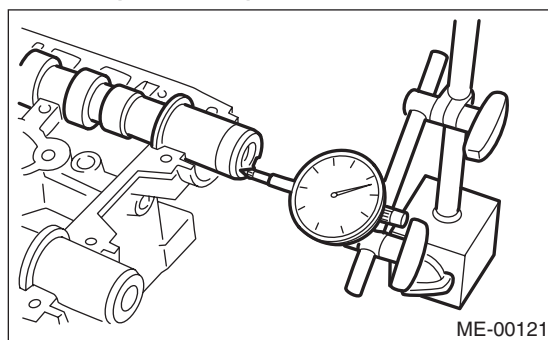
7) Measure the thrust clearance of camshaft with setting the dial gauge at end of camshaft. If the thrust clearance exceeds the limit, replace the caps and cylinder head as a set. If necessary replace the camshaft.

Standard:

0.068 — 0.116 mm (0.0027 — 0.0046 in)

Service limit:

0.14 mm (0.0055 in)



19. Cylinder Head

A: REMOVAL

NOTE:

Perform the work with the engine installed to body when replacing a single part. Refer to "Valve Clearance" for preparation. <Ref. to ME(H4DOTC)-27, INSPECTION, Valve Clearance.>

1) Remove the V-belts. <Ref. to ME(H4DOTC)-39, REMOVAL, V-belt.>

2) Remove the crank pulley.

<Ref. to ME(H4DOTC)-41, REMOVAL, Crank Pulley.>

3) Remove the timing belt cover.

<Ref. to ME(H4DOTC)-42, REMOVAL, Timing Belt Cover.>

4) Remove the timing belt.

<Ref. to ME(H4DOTC)-43, REMOVAL, Timing Belt.>

5) Remove the cam sprocket.

<Ref. to ME(H4DOTC)-52, REMOVAL, Cam Sprocket.>

6) Remove the intake manifold.

<Ref. to FU(H4DOTC)-14, REMOVAL, Intake Manifold.>

7) Remove the bolt which installs the A/C compressor bracket on cylinder head.

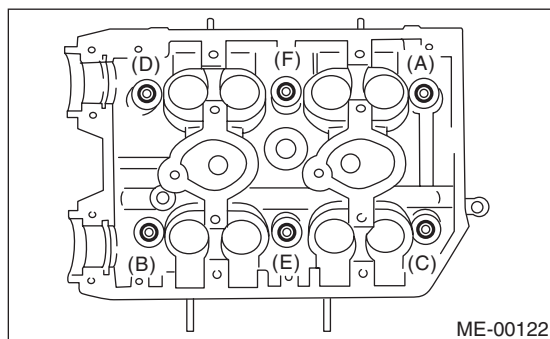
8) Remove the camshaft. <Ref. to ME(H4DOTC)-55, REMOVAL, Camshaft.>

9) Remove the oil level gauge guide. (LH side)

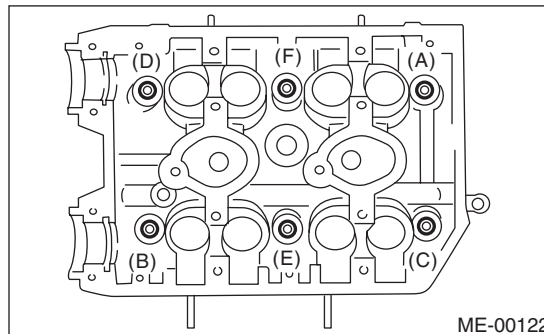
10) Remove the cylinder head bolts in alphabetical sequence shown in the figure.

NOTE:

Leave the bolts (A) and (D) engaged by three or four threads to prevent the cylinder head from falling.



11) While tapping the cylinder head with a plastic hammer, separate it from cylinder block. Remove the bolts (A) and (D) to remove cylinder head.



12) Remove the cylinder head gasket.

CAUTION:

Be careful not to scratch the mating surface of cylinder block and cylinder head.

13) Similarly, remove the cylinder head (RH).

B: INSTALLATION

1) Install the cylinder head and gaskets on cylinder block.

CAUTION:

Be careful not to scratch the mating surface of cylinder block and cylinder head.

NOTE:

Use new cylinder head gaskets.

2) Tighten the cylinder head bolts.

- (1) Apply a thin coat of engine oil to washer and bolt thread.
- (2) Tighten all bolts to 29 N·m (3.0 kgf-m, 21.4 ft-lb) in alphabetical order.
- (3) Further tighten all bolts to 69 N·m (7.0 kgf-m, 50.9 ft-lb) in alphabetical order.
- (4) Loosen all the bolts by 180° in the reverse order of tightening, and loosen again by 180°.
- (5) Tighten all bolts to 49 N·m (5.0 kgf-m, 36.1 ft-lb) in alphabetical sequence.
- (6) Tighten all bolts by 80 to 90° in alphabetical sequence.
- (7) Tighten all bolts by 40 to 45° in alphabetical sequence.

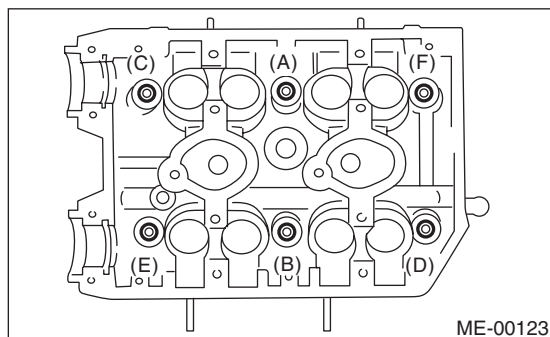
CAUTION:

The tightening angle of the bolt should not exceed 45°.

- (8) Further tighten the bolts (A) and (B) by 40 to 45°.

CAUTION:

Make sure the total “re-tightening angle” of the step (7) and (8) does not exceed 90°.



3) Install the oil level gauge guide. (LH side)

Tightening torque:

6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

4) Install the camshaft. <Ref. to ME(H4DOTC)-56, INSTALLATION, Camshaft.>

5) Install the bolt of A/C compressor bracket to the cylinder head.

Tightening torque:

36 N·m (3.7 kgf-m, 26.6 ft-lb)

6) Install the intake manifold.

<Ref. to FU(H4DOTC)-17, INSTALLATION, Intake Manifold.>

7) Install the cam sprocket.

<Ref. to ME(H4DOTC)-52, INSTALLATION, Cam Sprocket.>

8) Install the timing belt.

<Ref. to ME(H4DOTC)-45, INSTALLATION, Timing Belt.>

9) Adjust the valve clearance. <Ref. to ME(H4DOTC)-29, ADJUSTMENT, Valve Clearance.>

10) Install the rocker cover.

- (1) Install the rocker cover gasket to the rocker cover.

NOTE:

Use a new gasket.

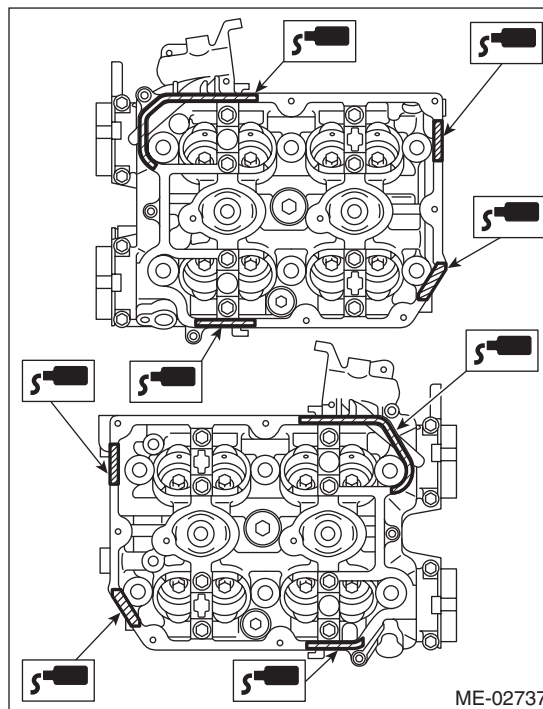
- (2) Apply liquid gasket to the specified point of the cylinder head. Apply extra amount of liquid gasket around plugs 5 mm (0.2 in) or more.

NOTE:

Install within 5 min. after applying liquid gasket.

Liquid gasket:

THREE BOND 1217G (Part No. K0877Y0100) or equivalent

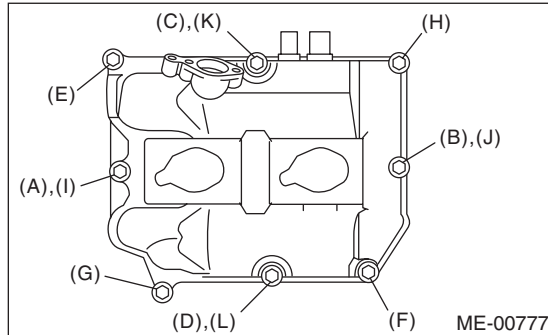


(3) Install the rocker cover on cylinder head. Ensure the gasket is properly positioned during installation.

(4) Temporarily tighten the rocker cover tightening bolts in alphabetical sequence shown in the figure, and then tighten to specified torque in alphabetical sequence.

Tightening torque:

6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



(5) Connect the PCV hose.

11) Install the timing belt cover.

<Ref. to ME(H4DOTC)-42, INSTALLATION, Timing Belt Cover.>

12) Install the crank pulley.

<Ref. to ME(H4DOTC)-41, INSTALLATION, Crank Pulley.>

13) Install the V-belts. <Ref. to ME(H4DOTC)-39, INSTALLATION, V-belt.>

C: DISASSEMBLY

1) Remove the valve lifter.

2) Place the cylinder head on ST1.

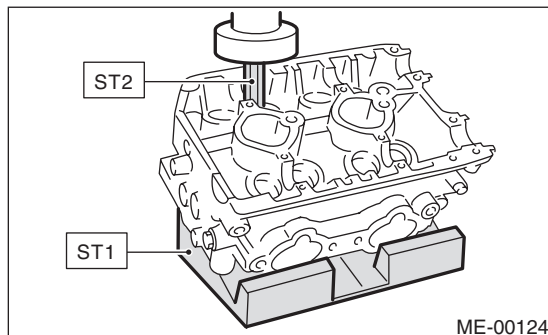
ST1 498267600 CYLINDER HEAD TABLE

3) Using ST2, compress the valve spring and remove the valve spring retainer key. Remove each valve and valve spring.

ST2 499718000 VALVE SPRING REMOVER

NOTE:

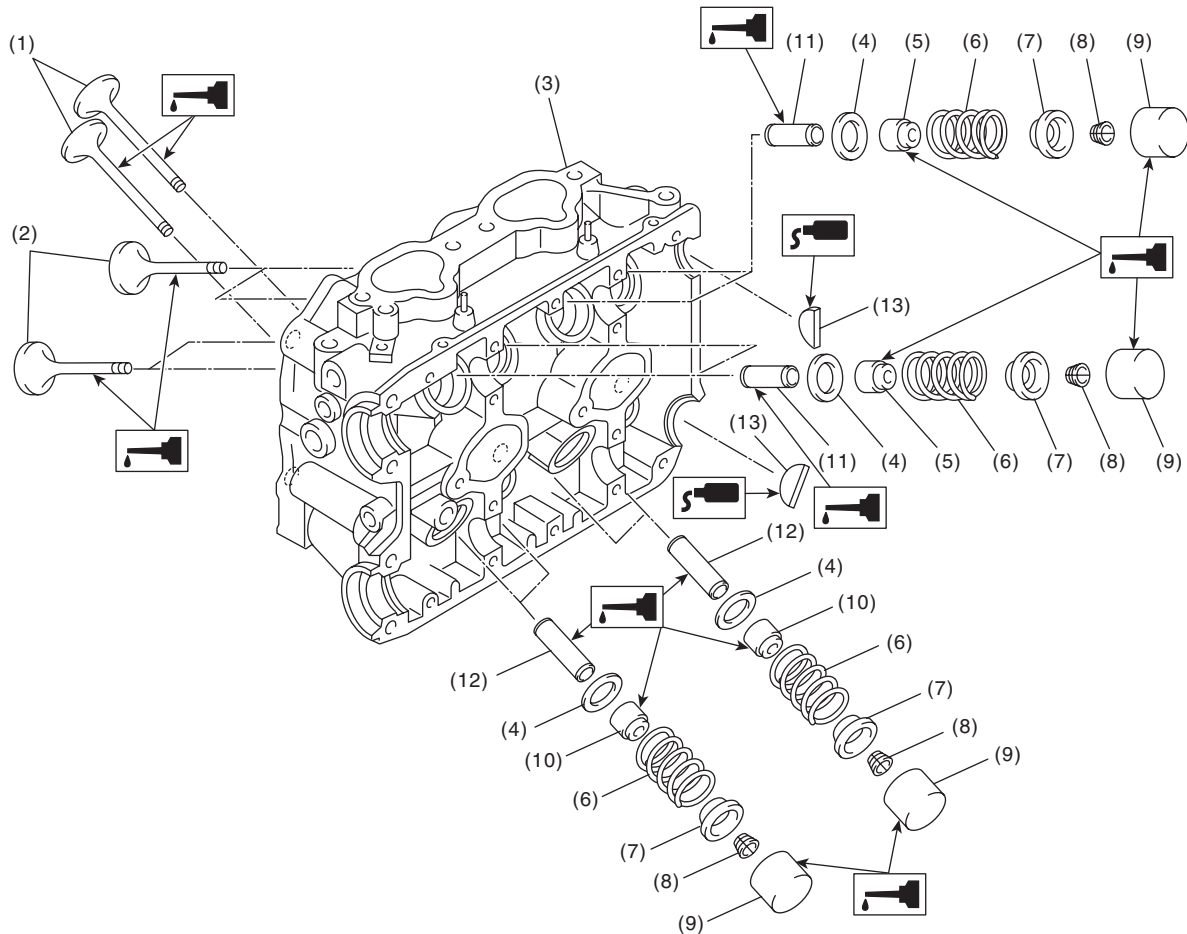
- Mark each valve to prevent confusion.
- Pay careful attention not to damage the lips of intake valve oil seals and exhaust valve oil seals.
- Keep all the removed parts in order for re-installing in their original positions.



Cylinder Head

MECHANICAL

D: ASSEMBLY



ME-03117

- | | | |
|---------------------------|------------------|-----------------------------|
| (1) Exhaust valve | (6) Valve spring | (10) Exhaust valve oil seal |
| (2) Intake valve | (7) Retainer | (11) Intake valve guide |
| (3) Cylinder head | (8) Retainer key | (12) Exhaust valve guide |
| (4) Valve spring seat | (9) Valve lifter | (13) Plug |
| (5) Intake valve oil seal | | |

- 1) Install the 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.

ST1 498267600 CYLINDER HEAD TABLE

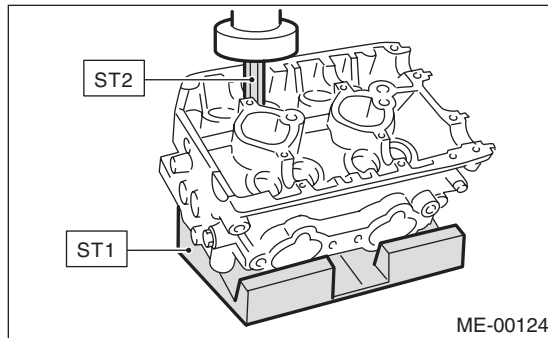
- (3) Install the valve spring and retainer.

NOTE:

Be sure to install the valve spring with its close-coiled end facing the seat on cylinder head.

- (4) Set the ST2 on valve spring.

ST2 499718000 VALVE SPRING REMOVER



- (5) Compress the valve spring and fit the valve spring retainer key.
 - (6) After installing, tap the valve spring retainers lightly with a plastic hammer for better seating.
- 2) Apply oil to the surfaces of the valve lifter.
 - 3) Install the valve lifter.

E: INSPECTION

1. CYLINDER HEAD

1) Check for cracks or damage. Use liquid penetrant tester on the important sections to check for fissures. Check that there are no marks of gas leaking or water leaking on gasket installing surface.

2) Measure the warping of the cylinder head surface that mates with crankcase using a straight edge (A) and thickness gauge (B).

If the warping exceeds 0.035 mm (0.0014 in), correct the surface by grinding it with a surface grinder.

Warping limit:

0.035 mm (0.0014 in)

Grinding limit:

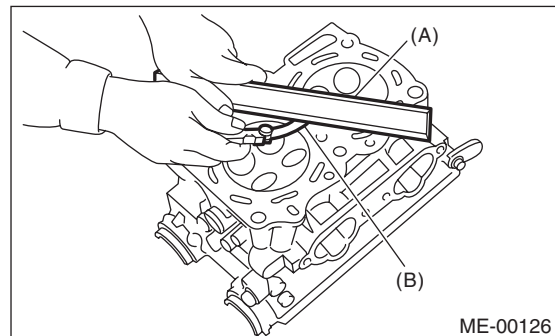
0.3 mm (0.012 in)

Standard height of cylinder head:

127.5 mm (5.02 in)

NOTE:

Uneven torque for the cylinder head bolts can cause warping. When reinstalling, pay special attention to the torque so as to tighten evenly.



2. VALVE SEAT

Inspect the intake and exhaust valve seats, and correct the contact surfaces with a valve seat cutter if they are defective or when valve guides are replaced.

Valve seat width W :

Intake

Standard

0.6 — 1.4 mm (0.024 — 0.055 in)

Limit

1.7 mm (0.067 in)

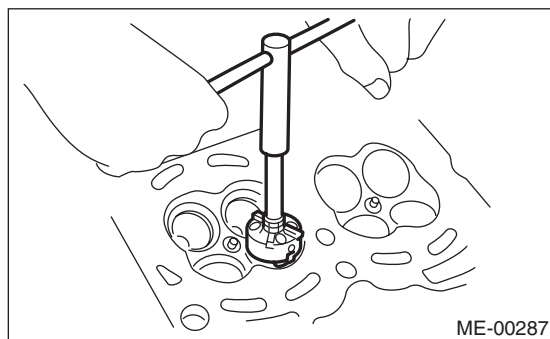
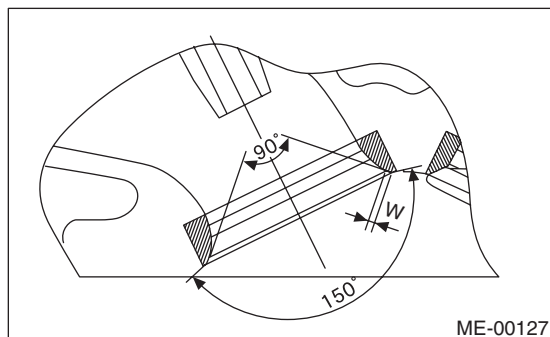
Exhaust

Standard

1.2 — 1.8 mm (0.047 — 0.071 in)

Limit

2.2 mm (0.087 in)



3. VALVE GUIDE

1) Check the clearance between valve guide and valve stem. The clearance can be checked by measuring respectively the outer diameter of valve stem with a micrometer and the inner diameter of valve guide with a caliper gauge.

Clearance between the valve guide and valve stem:

Standard

Intake

0.030 — 0.057 mm (0.0012 — 0.0022 in)

Exhaust

0.040 — 0.067 mm (0.0016 — 0.0026 in)

Limit

0.15 mm (0.0059 in)

2) If the clearance between valve guide and valve stem exceeds the limit, replace the valve guide or valve itself whichever shows greater amount of wear or damaged and etc. See the following procedure for valve guide replacement.

Valve guide inner diameter:

6.000 — 6.012 mm (0.2362 — 0.2367 in)

Valve stem outer diameters:

Intake

5.955 — 5.970 mm (0.2344 — 0.2350 in)

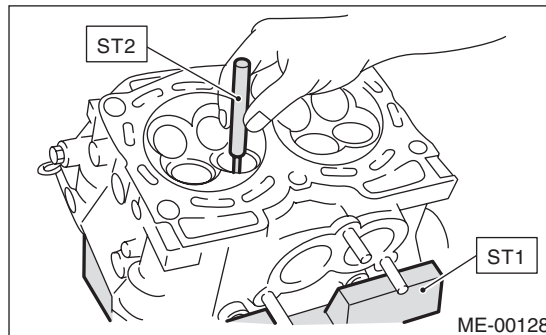
Exhaust

5.945 — 5.960 mm (0.2341 — 0.2346 in)

(1) Place the cylinder head on ST1 with the combustion chamber upward so that valve guides fit the holes in ST1.

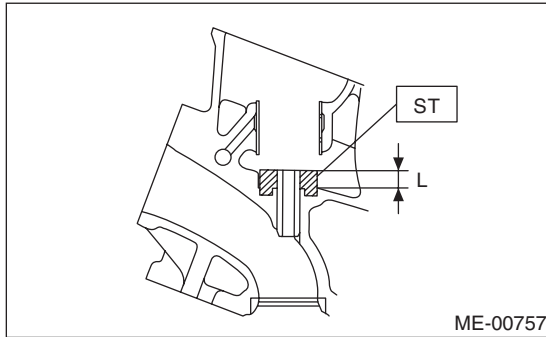
(2) Insert the ST2 into valve guide and press it down to remove the valve guide.

ST1 498267600 CYLINDER HEAD TABLE
ST2 499767200 VALVE GUIDE REMOVER



(3) Turn the cylinder head upside down and place the ST as shown in the figure.

ST 18251AA020 VALVE GUIDE ADJUSTER

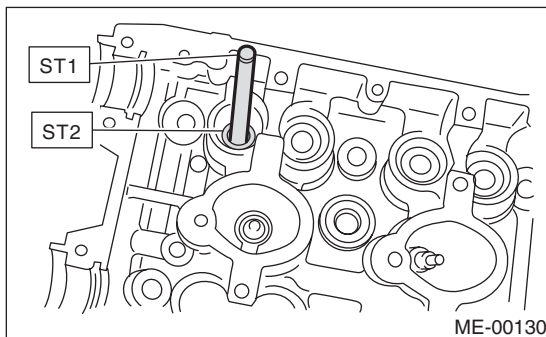


(4) Before installing a new valve guide, make sure that neither scratches nor damages exist on the inner surface of valve guide holes in cylinder head.

(5) Put a new valve guide, coated with sufficient oil, in cylinder, and insert the ST1 into valve guide. Press in until the valve guide upper end is flush with the upper surface of ST2.

ST1 499767200 VALVE GUIDE REMOVER

ST2 18251AA020 VALVE GUIDE ADJUSTER



(6) Check the valve guide protrusion.

Valve guide protrusion L:

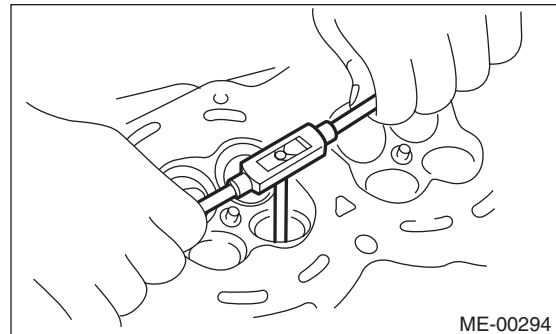
15.8 — 16.2 mm (0.622 — 0.638 in)

(7) Ream the inside of valve guide using ST. Put the ST in valve guide, and rotate the ST slowly clockwise while pushing it lightly. Bring the ST back while rotating it clockwise.

NOTE:

- Apply engine oil to the ST when reaming.
- If the inner surface of valve guide is damaged, the edge of ST should be slightly ground with oil stone.
- If the inner surface of valve guide becomes lustrous and the ST does not chip, use a new ST or remedy the ST.

ST 499767400 VALVE GUIDE REAMER



(8) After reaming, clean the valve guide to remove chips.

(9) Recheck the contact condition between valve and valve seat after replacing the valve guide.

Cylinder Head

MECHANICAL

4. INTAKE AND EXHAUST VALVE

1) Inspect the flange and stem of valve, and replace if damaged, worn, or deformed. If “H” is less than the specified limit, replace with a new valve.

Head edge thickness H:

Intake (A)

Standard

1.0 — 1.4 mm (0.039 — 0.055 in)

Limit

0.8 mm (0.031 in)

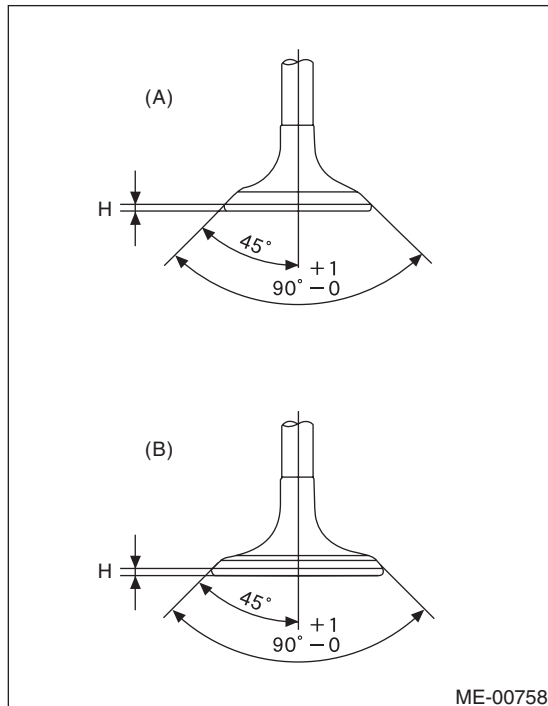
Exhaust (B)

Standard

1.3 — 1.7 mm (0.057 — 0.067 in)

Limit

0.8 mm (0.031 in)



2) Put a small amount of grinding compound on the seat surface, and lap the valve and valve seat. Replace with a new valve oil seal after lapping.

NOTE:

It is possible to differentiate between the intake valve and the exhaust valve by their overall length.

Valve overall length:

Intake (A)

104.4 mm (4.110 in)

Exhaust (B)

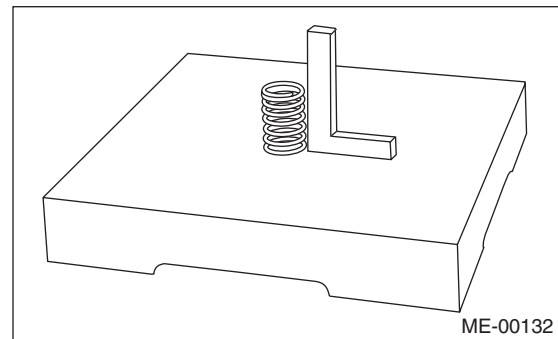
104.65 mm (4.120 in)

5. VALVE SPRING

1) Check the valve springs for damage, free length, and spring constant. Replace the valve spring if it is not within the standard value presented in the table.

2) To measure the squareness of the valve spring, stand the spring on a surface plate and measure its deflection at the top of spring using a try square.

Free length	mm (in)	47.32 (1.863)
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 (1.041)
Squareness		2.5°, 2.1 mm (0.083 in) or less



6. INTAKE AND EXHAUST VALVE OIL SEAL

1) For the following, replace the oil seal with a new part.

See the procedure 2) and subsequent for replacement procedures.

- When the lip is damaged.
- When the spring is out of the specified position.
- When readjusting the surfaces of intake valve and valve sheet.
- When replacing the intake valve guide.

2) Place the cylinder head on ST1.

3) Using the ST2, press-fit the oil seal.

ST1 498267600 CYLINDER HEAD TABLE

ST2 498857100 VALVE OIL SEAL GUIDE

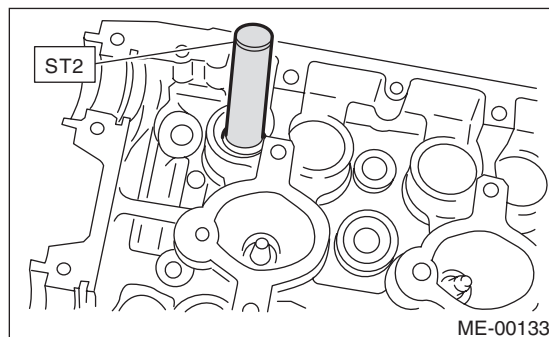
NOTE:

- Apply engine oil to oil seal before press-fitting.
- When press-fitting the oil seal, do not use a hammer or strike in.
- The intake valve oil seal and exhaust valve oil seal can be differentiated by colors.

Color of rubber part:

Intake [Gray]

Exhaust [Green]



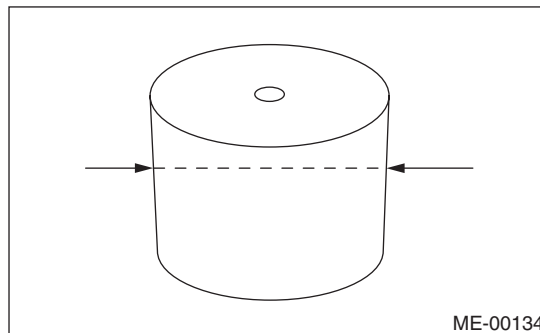
7. VALVE LIFTER

1) Check the valve lifter visually.

2) Measure the outer diameter of valve lifter.

Outer diameter:

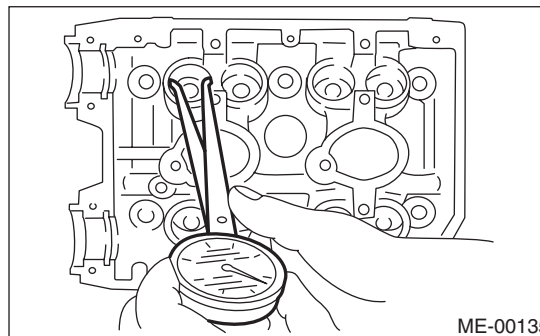
34.959 — 34.975 mm (1.3763 — 1.3770 in)



3) Measure the inner diameter of valve lifter mating surface on cylinder head.

Inner diameter:

34.994 — 35.016 mm (1.3777 — 1.3786 in)



NOTE:

If difference between outer diameter of valve lifter and inner diameter of its mating surface exceeds the service limit or there is uneven wear, replace the cylinder head.

Standard:

0.019 — 0.057 mm (0.0007 — 0.0022 in)

Service limit:

0.100 mm (0.0039 in)

Cylinder Block

MECHANICAL

20. Cylinder Block

A: REMOVAL

NOTE:

Before conducting this procedure, drain the engine oil completely.

1) Remove the intake manifold.

<Ref. to FU(H4DOTC)-14, REMOVAL, Intake Manifold.>

2) Remove the V-belts. <Ref. to ME(H4DOTC)-39, REMOVAL, V-belt.>

3) Remove the crank pulley.

<Ref. to ME(H4DOTC)-41, REMOVAL, Crank Pulley.>

4) Remove the timing belt cover.

<Ref. to ME(H4DOTC)-42, REMOVAL, Timing Belt Cover.>

5) Remove the timing belt.

<Ref. to ME(H4DOTC)-43, REMOVAL, Timing Belt.>

6) Remove the cam sprocket.

<Ref. to ME(H4DOTC)-52, REMOVAL, Cam Sprocket.>

7) Remove the crank sprocket.

<Ref. to ME(H4DOTC)-54, REMOVAL, Crank Sprocket.>

8) Remove the generator and A/C compressor with their brackets.

9) Remove the cylinder head.

<Ref. to ME(H4DOTC)-61, REMOVAL, Cylinder Head.>

10) Remove the clutch disc and cover. (MT model)

<Ref. to CL-12, REMOVAL, Clutch Disc and Cover.>

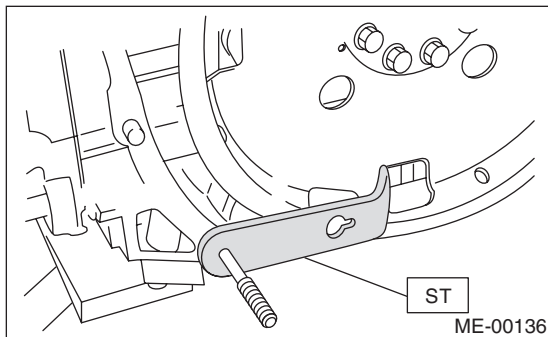
11) Remove the flywheel. (MT model)

<Ref. to CL-15, REMOVAL, Flywheel.>

12) Remove the drive plate. (AT model)

Lock the crankshaft using ST.

ST 498497100 CRANKSHAFT STOPPER



13) Remove the oil separator cover.

14) Remove the water by-pass pipe for heater.

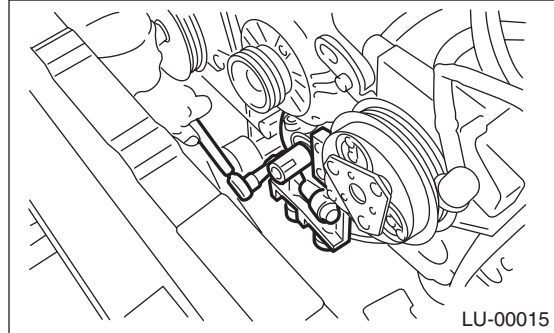
15) Remove the oil filter. <Ref. to LU(H4SO)-25, REMOVAL, Engine Oil Filter.>

16) Remove the water pump. <Ref. to CO(H4SO)-19, REMOVAL, Water Pump.>

17) Remove the bolts which install oil pump onto cylinder block.

NOTE:

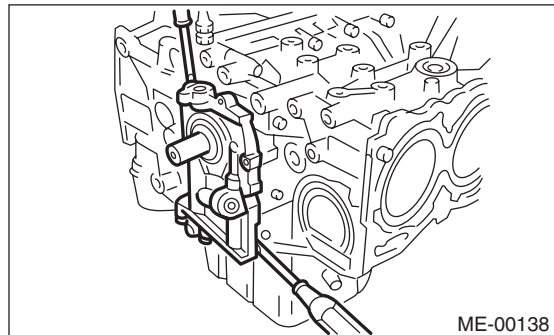
When disassembling and checking the oil pump, loosen the relief valve plug before removing the oil pump.



18) Remove the oil pump from cylinder block using a flat tip screwdriver.

CAUTION:

Be careful not to scratch the mating surface of cylinder block and oil pump.



19) Remove the front oil seal from the oil pump.

20) Remove the oil pan.

(1) Set the part so that the cylinder block (LH) is on the upper side.

(2) Remove the bolts which secure oil pan to cylinder block.

(3) Insert an oil pan cutter blade between cylinder block-to-oil pan clearance and remove the oil pan.

CAUTION:

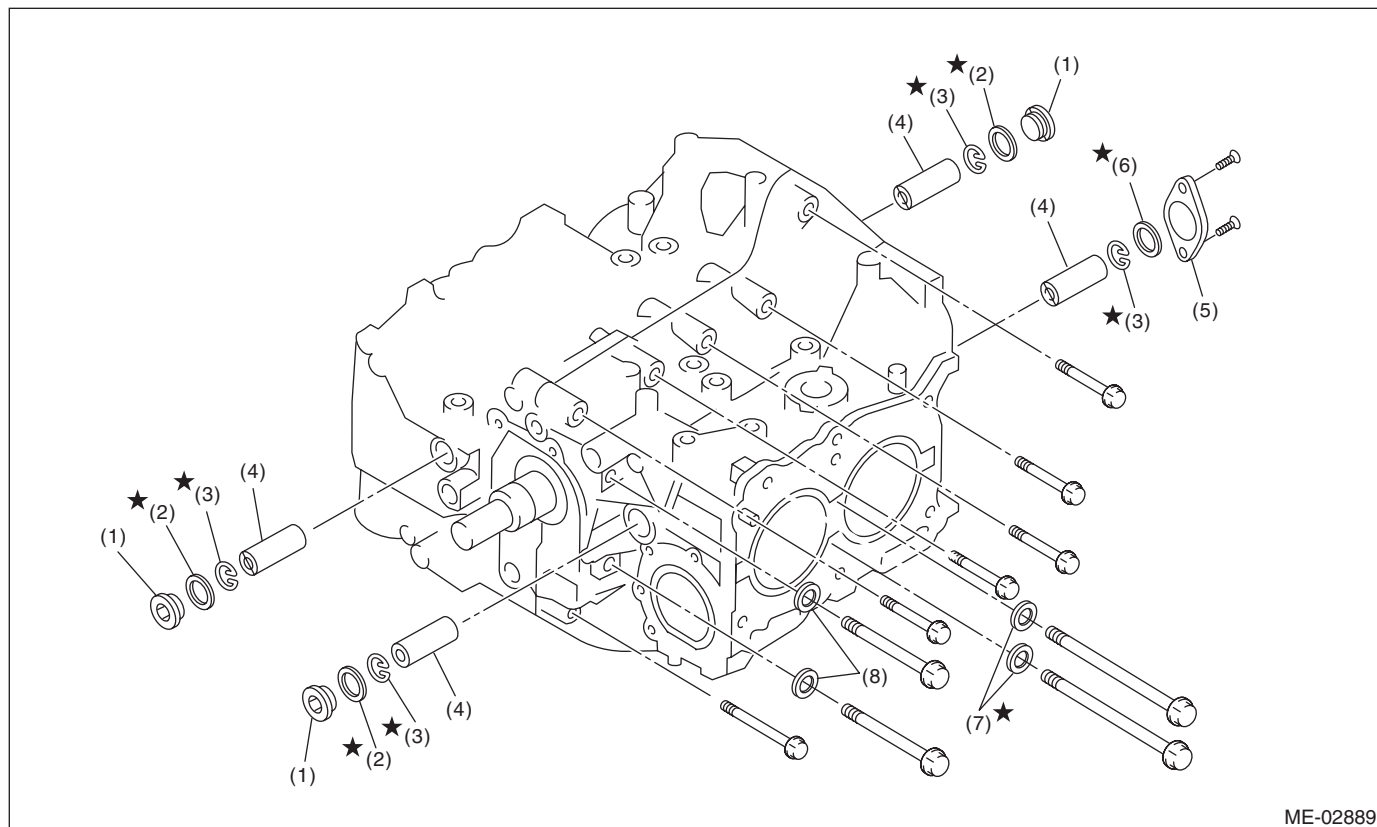
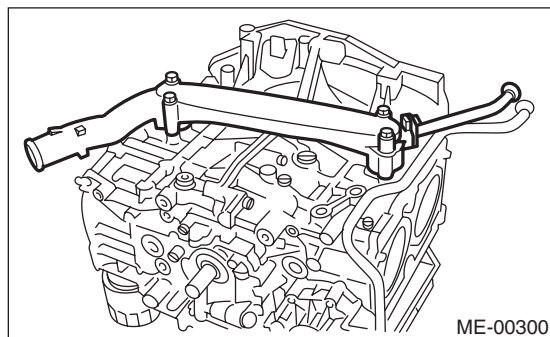
Do not use a screwdriver or similar tools in place of oil pan cutter.

21) Remove the oil strainer stay.

22) Remove the oil strainer.

23) Remove the baffle plate.

24) Remove the water pipe.



- (1) Service hole plug
- (2) Gasket
- (3) Snap ring

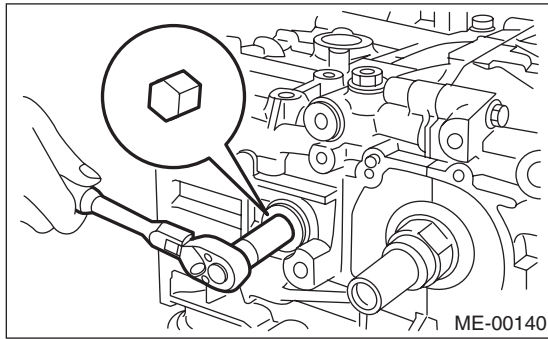
- (4) Piston pin
- (5) Service hole cover
- (6) O-ring

- (7) Seal washer
- (8) Washer

Cylinder Block

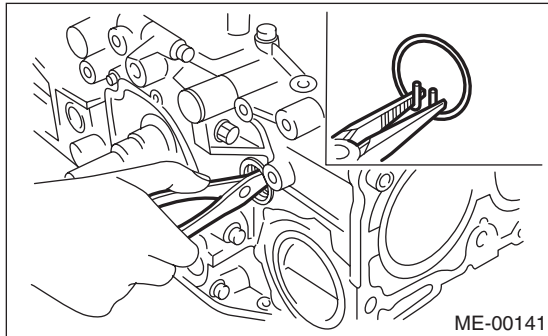
MECHANICAL

25) Remove the service hole plugs using a hexagon wrench [14 mm].



26) Remove the service hole cover.

27) Rotate the crankshaft to bring #1 and #2 pistons to bottom dead center position, then remove the piston snap ring through service hole of #1 and #2 cylinders.

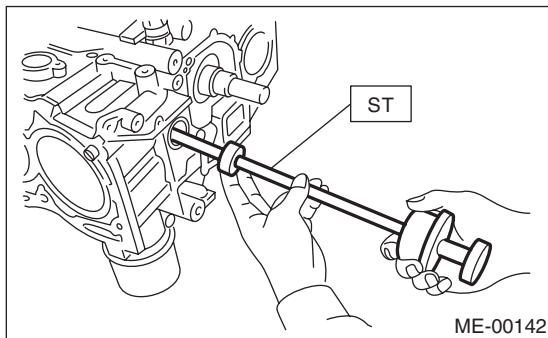


28) Draw out the piston pin from #1 and #2 pistons using ST.

NOTE:

Be careful not to confuse the original combination of piston, piston pin and cylinder.

ST 499097700 PISTON PIN REMOVER



29) Similarly remove the piston pins from #3 and #4 pistons.

30) Remove the cylinder block connecting bolt on the RH side.

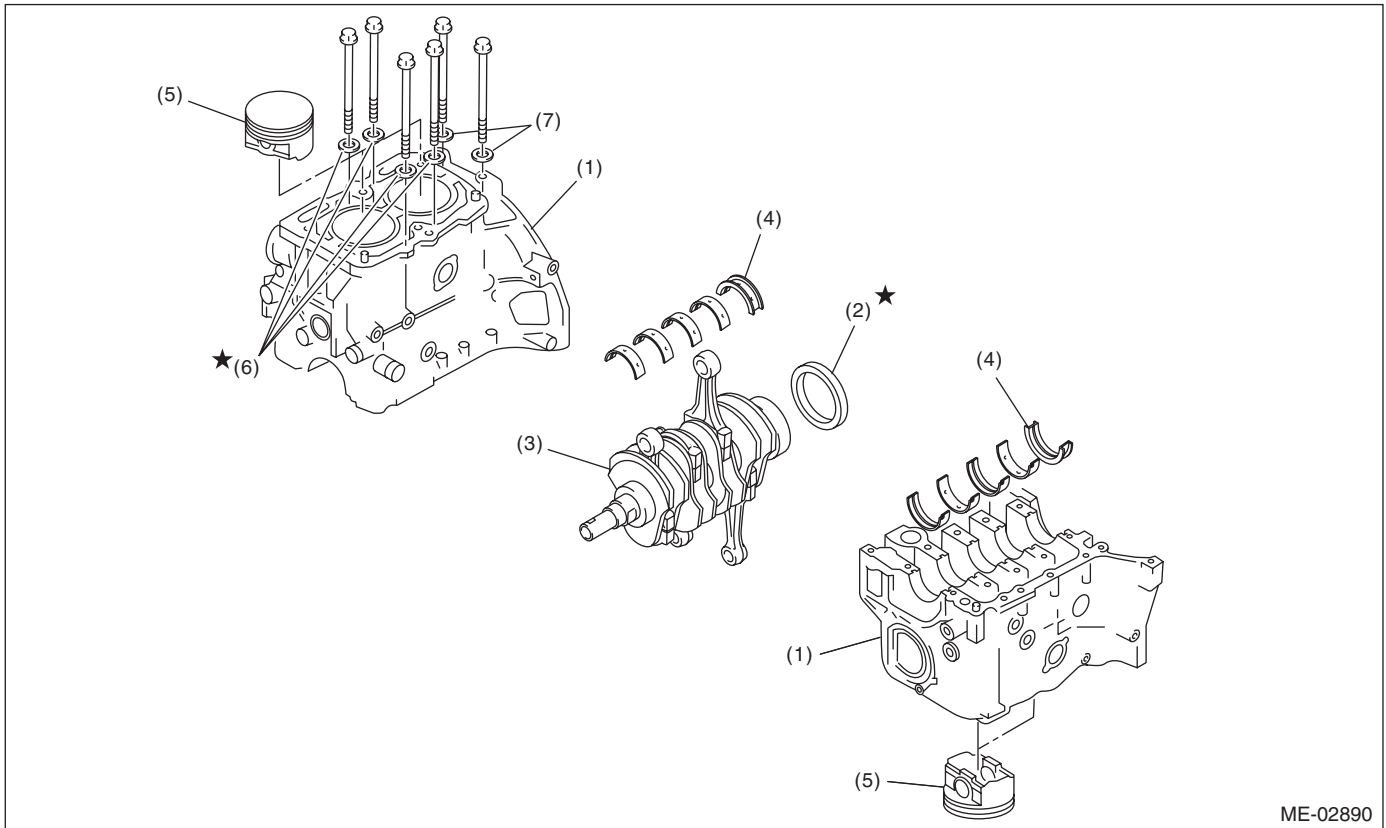
31) Loosen the cylinder block connecting bolt on the LH side by two or three turns.

32) Set the part so that the cylinder block (LH) is on the upper side, and remove the cylinder block connecting bolt.

33) Separate the cylinder block (LH) and (RH).

NOTE:

When separating the cylinder block, do not allow the connecting rod to fall and damage the cylinder block.



ME-02890

- | | | |
|--------------------|------------------------|-----------------|
| (1) Cylinder block | (4) Crankshaft bearing | (6) Seal washer |
| (2) Rear oil seal | (5) Piston | (7) Washer |
| (3) Crankshaft | | |

34) Remove the rear oil seal.

35) Remove the crankshaft together with connecting rod.

36) Remove the crankshaft bearings from cylinder block using a hammer handle.

NOTE:

Be careful not to confuse the crankshaft bearing combination. Press the bearing at the end opposite to locking lip.

37) Remove each piston from cylinder block using wooden bar or hammer handle.

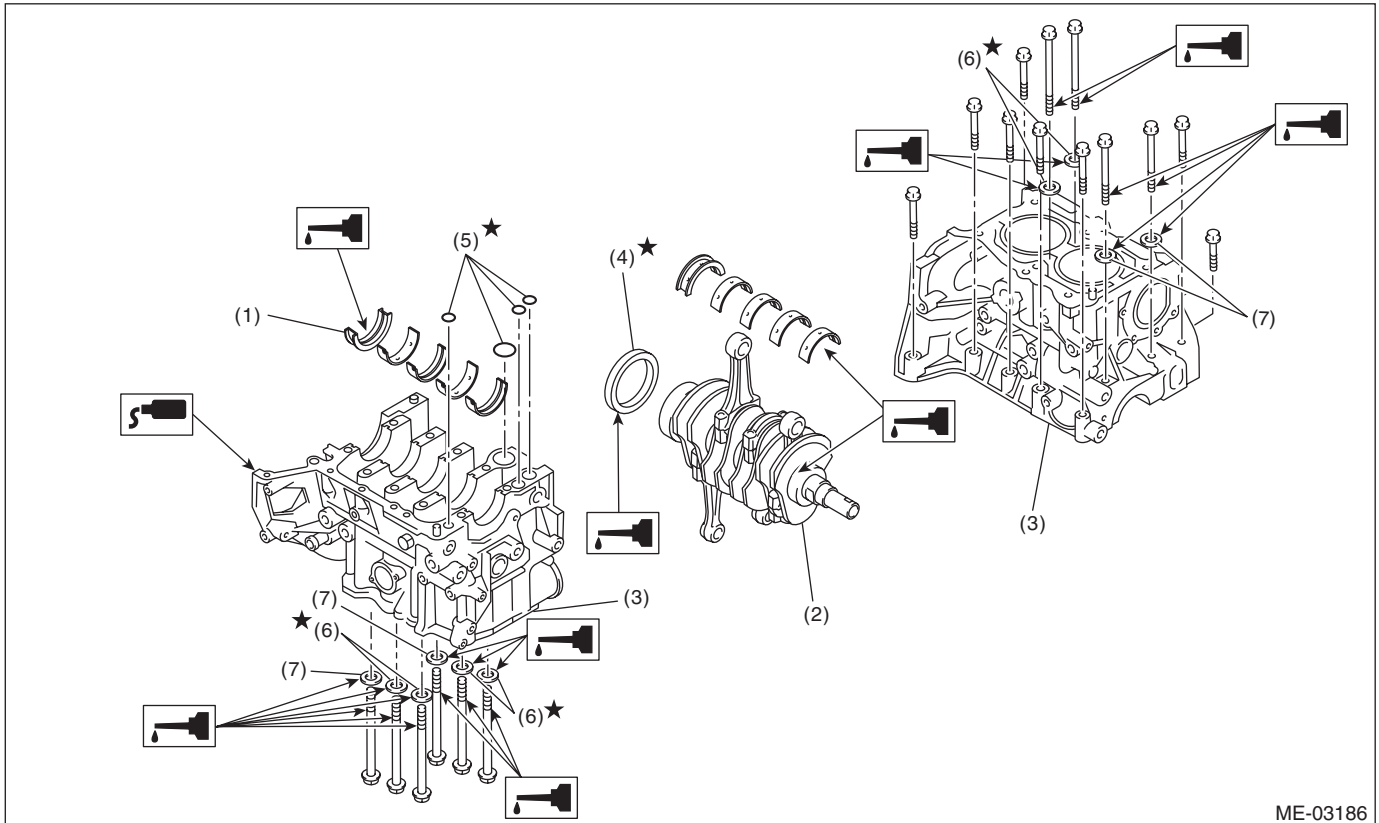
NOTE:

Be careful not to confuse the original combination of piston and cylinder.

Cylinder Block

MECHANICAL

B: INSTALLATION



- (1) Crankshaft bearing
- (2) Crankshaft
- (3) Cylinder block

- (4) Rear oil seal
- (5) O-ring

- (6) Seal washer
- (7) Washer

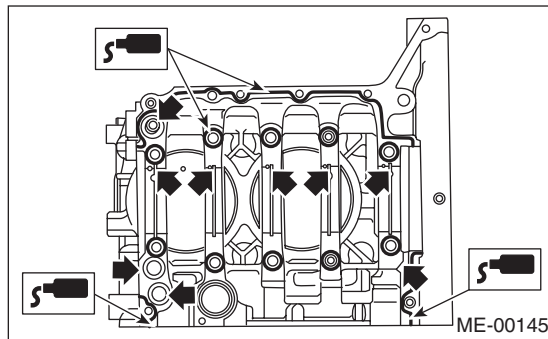
- 1) Remove oil on the mating surface of cylinder block before installation. Apply a coat of engine oil to the bearing and crankshaft journal.
- 2) Position the crankshaft and O-ring on the cylinder block (RH).
- 3) Apply liquid gasket to the mating surfaces of cylinder block (RH), and position the cylinder block (LH).

NOTE:

- Install within 5 min. after applying liquid gasket.
- Do not allow liquid gasket to jut into O-ring grooves, oil passages, bearing grooves, etc.

Liquid gasket:

**THREE BOND 1217G (Part No. K0877Y0100)
or equivalent**



- 4) Apply a coat of engine oil to the washer and bolt thread.

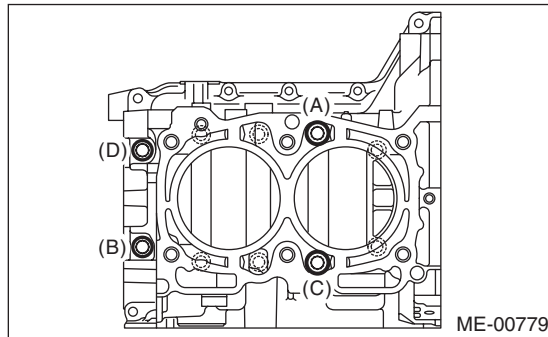
NOTE:

Use new seal washer.

- 5) Tighten the 10 mm cylinder block connecting bolts on the LH side (A — D) in alphabetical order.

Tightening torque:

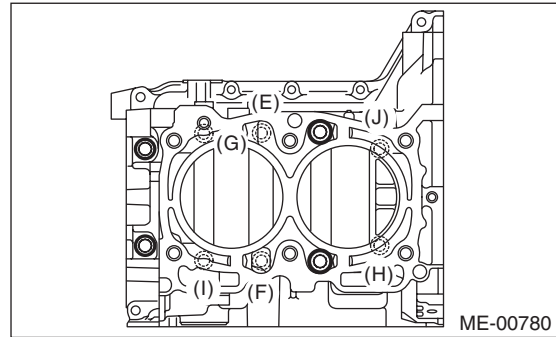
10 N·m (1.0 kgf-m, 7.2 ft-lb)



- 6) Tighten the 10 mm cylinder block connecting bolts on the RH side (E — J) in alphabetical order.

Tightening torque:

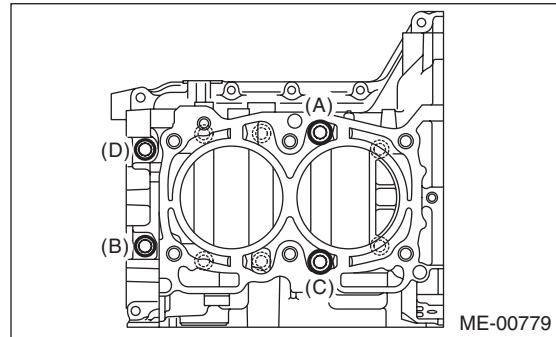
10 N·m (1.0 kgf-m, 7.2 ft-lb)



- 7) Further tighten the cylinder block connecting bolts on the LH side (A — D) in alphabetical sequence.

Tightening torque:

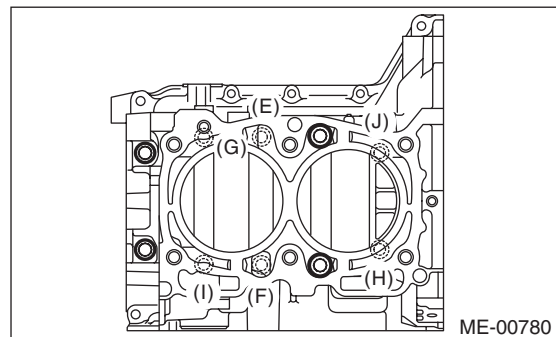
18 N·m (1.8 kgf-m, 13.3 ft-lb)



- 8) Further tighten the cylinder block connecting bolts on the RH side (E — J) in alphabetical sequence.

Tightening torque:

18 N·m (1.8 kgf-m, 13.3 ft-lb)



Cylinder Block

MECHANICAL

9) Further tighten the cylinder block connecting bolts on the LH side (A — D) in alphabetical sequence.

- (A), (C): Angle tightening

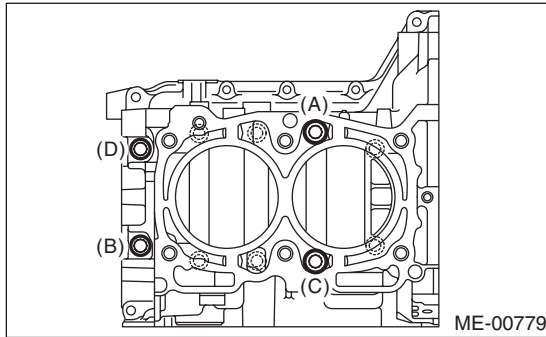
Tightening angle:

90°

- (B), (D): Torque tightening

Tightening torque:

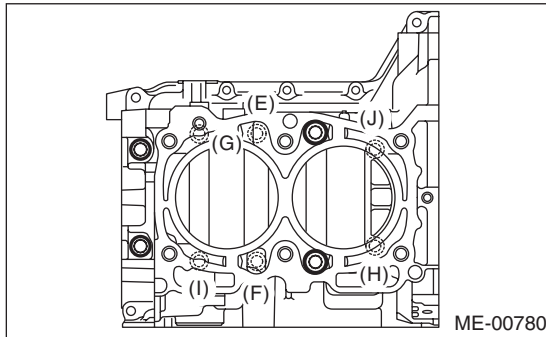
40 N·m (4.1 kgf-m, 29.6 ft-lb)



10) Tighten the cylinder block connecting bolts on the RH side (E — J) in alphabetical sequence.

Tightening angle:

90°

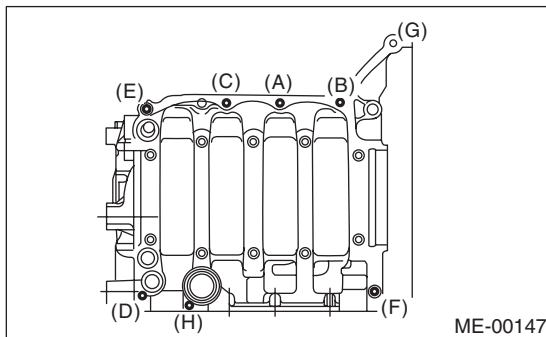


11) Tighten the 8 mm and 6 mm cylinder block connecting bolts on LH side (A — H) in alphabetical sequence.

Tightening torque:

(A) — (G): 25 N·m (2.5 kgf-m, 18.4 ft-lb)

(H): 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



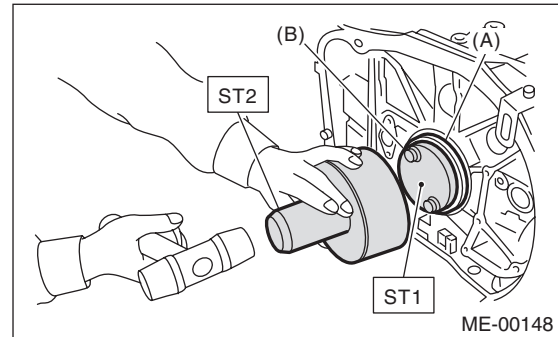
12) Apply a coat of engine oil to the oil seal periphery, then install the rear oil seal using ST1 and ST2.

NOTE:

Use a new rear oil seal.

ST1 499597100 CRANKSHAFT OIL SEAL GUIDE

ST2 499587200 CRANKSHAFT OIL SEAL INSTALLER

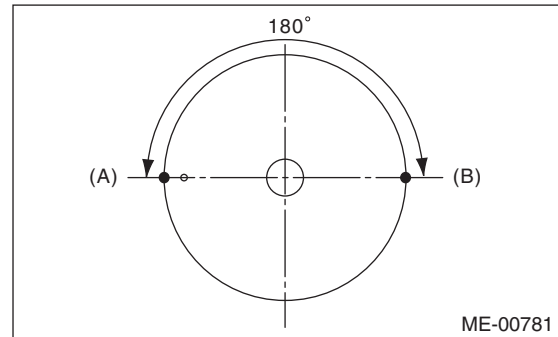


(A) Rear oil seal

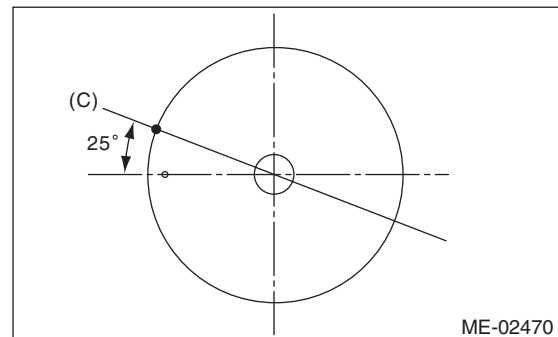
(B) Flywheel attaching bolt

13) Position the top ring gap at (A) or (B) in the figure.

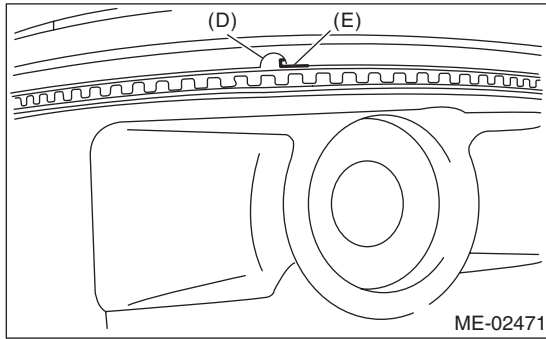
14) Position the second ring gap at 180° on the reverse side the top ring gap.



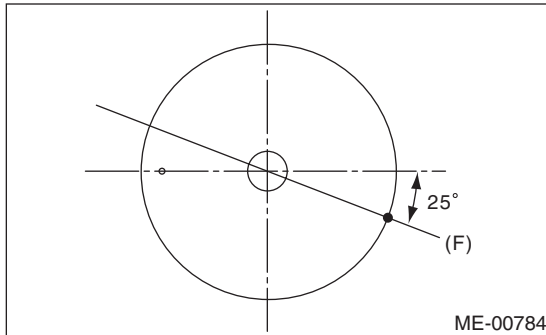
15) Position the upper rail gap at (C) in the figure.



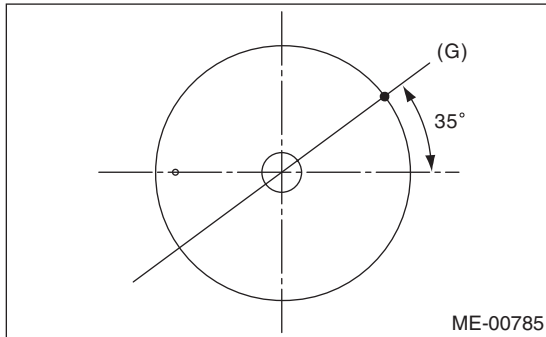
16) Align the upper rail spin stopper (E) to the side hole (D) on the piston.



17) Position the expander gap at (F) in the figure.



18) Position the lower rail gap at (G) in the figure.



NOTE:

- Make sure the ring gaps do not face the same direction.
- Make sure ring gaps are not within the piston skirt area.

Cylinder Block

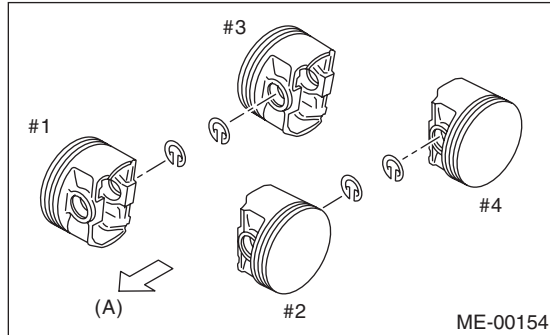
MECHANICAL

19) Install the snap ring.

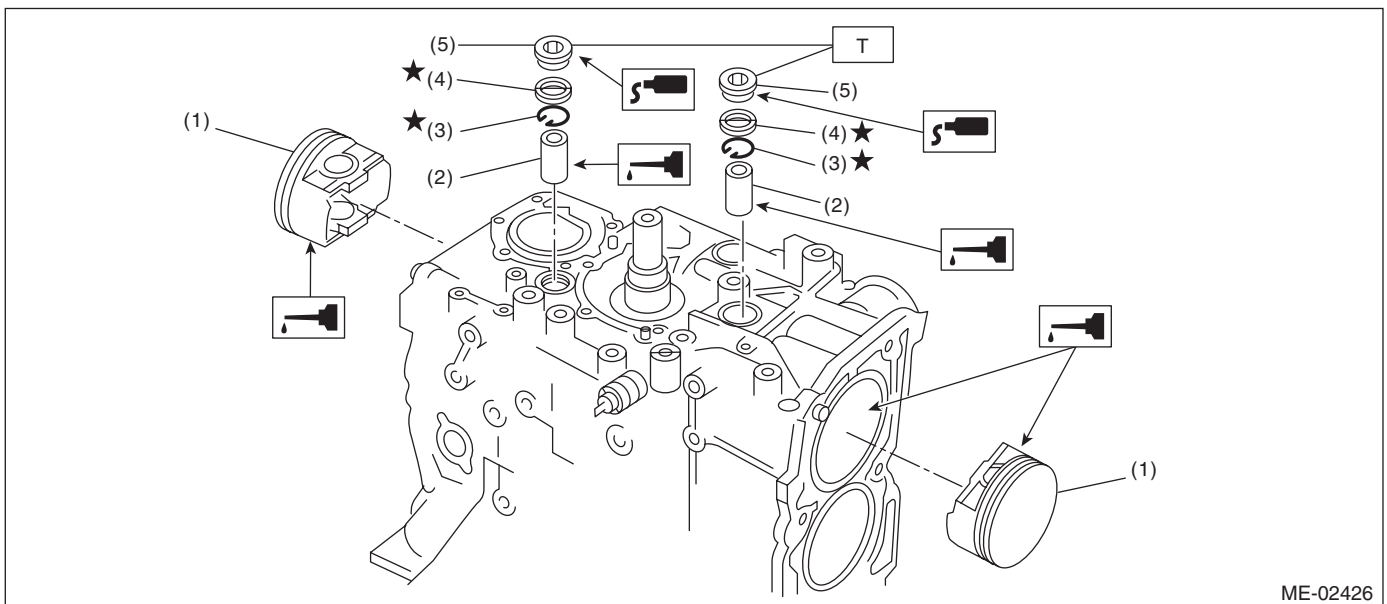
Install the snap rings in the piston holes located opposite to the service holes in cylinder block before positioning pistons to the cylinder.

NOTE:

Use new snap rings.



(A) Front side



- | | |
|----------------|-----------------------|
| (1) Piston | (4) Gasket |
| (2) Piston pin | (5) Service hole plug |
| (3) Snap ring | |

Tightening torque: N·m (kgf-m, ft-lb)
T: 70 (7.1, 51.6)

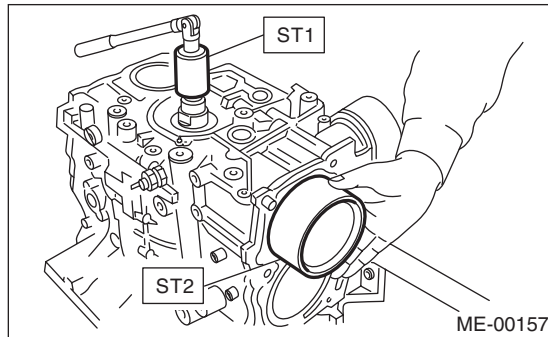
20) Install piston.

- (1) Set the parts so that the #1 and #2 cylinders are on the upper side.
- (2) Using the ST1, turn the crankshaft so that #1 and #2 connecting rods are set at bottom dead center.

ST1 499987500 CRANKSHAFT SOCKET

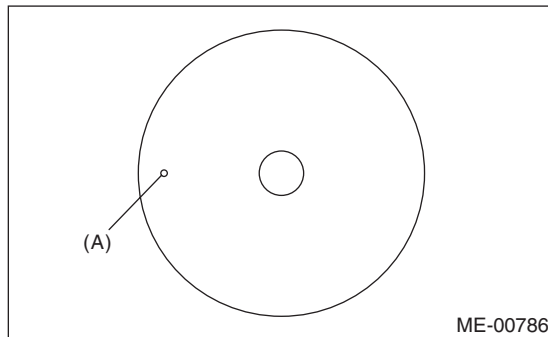
- (3) Apply a coat of engine oil to the pistons and cylinders and insert pistons in their cylinders using ST2.

ST2 498747300 PISTON GUIDE



NOTE:

Face the piston front mark towards the front of the engine.

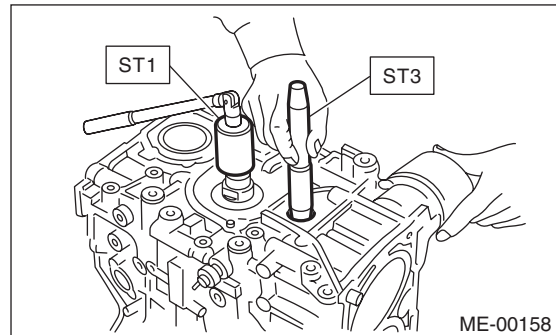


(A) Front mark

21) Install piston pin.

- (1) Apply a coat of engine oil to ST3.
- (2) Insert ST3 into the service hole to align the piston pin hole and the connecting rod small end.

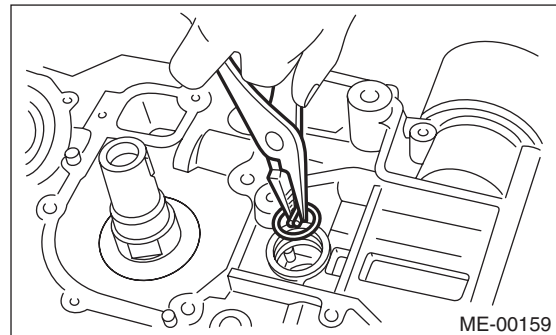
ST3 499017100 PISTON PIN GUIDE



- (3) Apply a coat of engine oil to piston pin, and insert the piston pin into piston and connecting rod through service hole.
- (4) Install the snap ring.

NOTE:

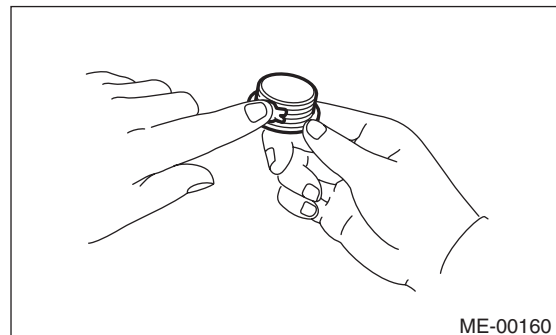
Use new snap rings.



- (5) Apply liquid gasket to the threaded portion of the service hole plug.

Liquid gasket:

THREE BOND 1105 (Part No. 004403010) or equivalent



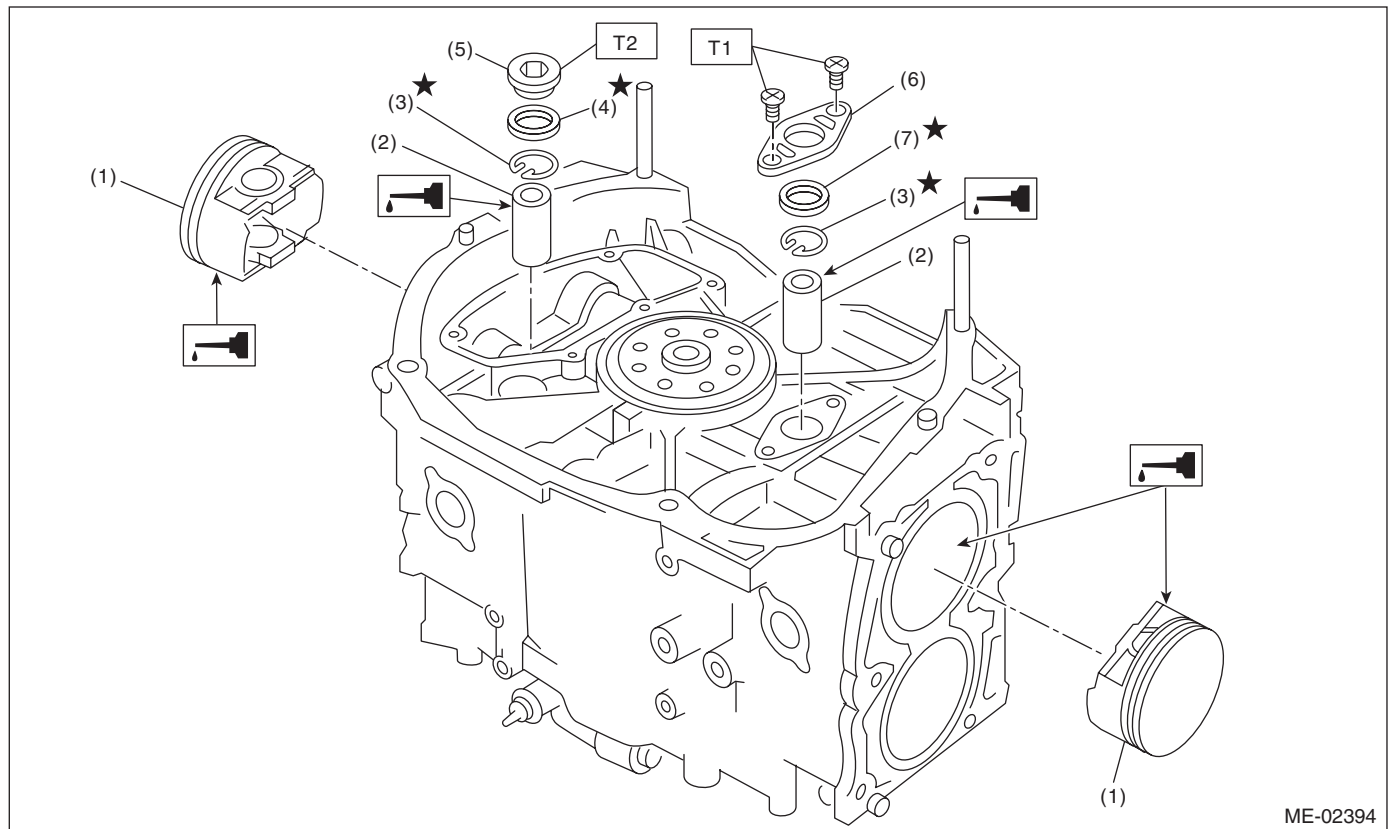
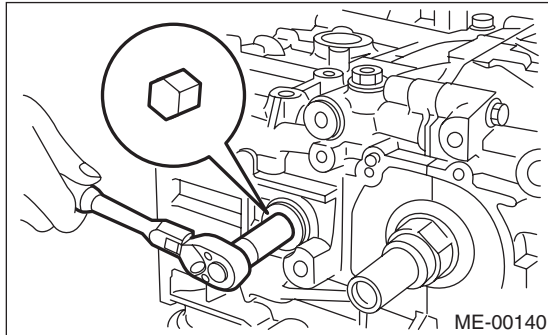
Cylinder Block

MECHANICAL

(6) Install the service hole plug and gasket.

NOTE:

Use a new gasket.



- | | |
|----------------|------------------------|
| (1) Piston | (5) Service hole plug |
| (2) Piston pin | (6) Service hole cover |
| (3) Snap ring | (7) O-ring |
| (4) Gasket | |

Tightening torque: N·m (kgf-m, ft-lb)

T1: 6.4 (0.65, 4.7)

T2: 70 (7.1, 51.6)

(7) Set the parts so that the #3 and #4 cylinders are on the upper side. Following the same procedures as used for #1 and #2 cylinders, install the pistons and piston pins.

22) Install the service hole cover.

NOTE:

Use new O-rings.

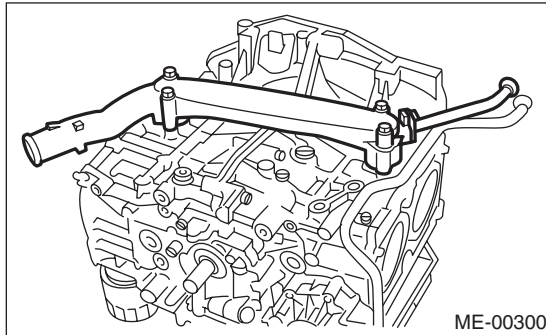
23) Install the water pipe.

NOTE:

Use new O-rings.

Tightening torque:

6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



24) Install the baffle plate.

Tightening torque:

6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

25) Install the oil strainer.

NOTE:

Use new O-rings.

Tightening torque:

10 N·m (1.0 kgf-m, 7 ft-lb)

26) Install the oil strainer stay.

NOTE:

Tighten the oil strainer stay together with the baffle plate.

Tightening torque:

6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

27) Apply liquid gasket to the mating surfaces of oil pan, and install the oil pan.

NOTE:

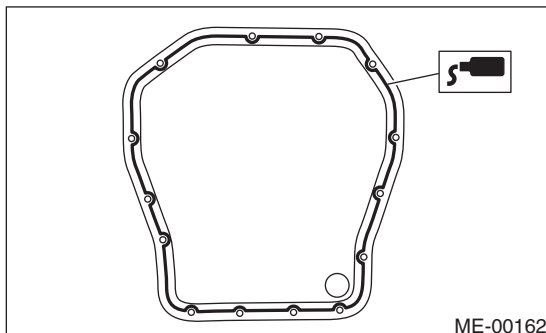
Install within 5 min. after applying liquid gasket.

Liquid gasket:

THREE BOND 1217G (Part No. K0877Y0100) or equivalent

Tightening torque:

5 N·m (0.5 kgf-m, 3.7 ft-lb)



28) Apply liquid gasket to the mating surface of oil separator cover and the threaded portion of bolt (A) shown in the figure (when reusing the bolt), and then install the oil separator cover.

NOTE:

- Install within 5 min. after applying liquid gasket.
- Use new oil separator cover.

Liquid gasket:

Mating surface

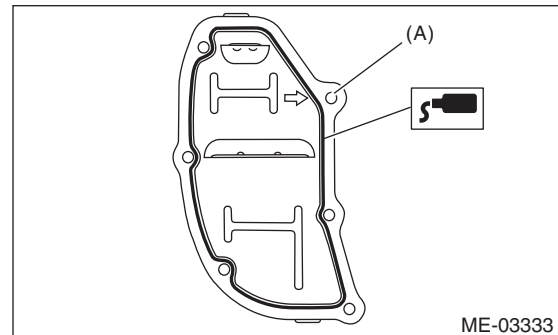
THREE BOND 1217G (Part No. K0877Y0100) or equivalent

Bolt (A) thread (when reusing the bolt)

THREE BOND 1324 (Part No. 004403042) or equivalent

Tightening torque:

6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



29) Install the flywheel. (MT model) <Ref. to CL-15, INSTALLATION, Flywheel.>

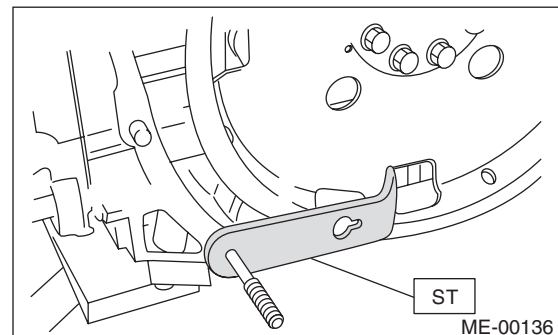
30) Install the drive plate. (AT model)

To lock the crankshaft, use ST.

ST 498497100 CRANKSHAFT STOPPER

Tightening torque:

72 N·m (7.3 kgf-m, 53.1 ft-lb)



31) Install the clutch disc and cover. (MT model) <Ref. to CL-12, INSTALLATION, Clutch Disc and Cover.>

Cylinder Block

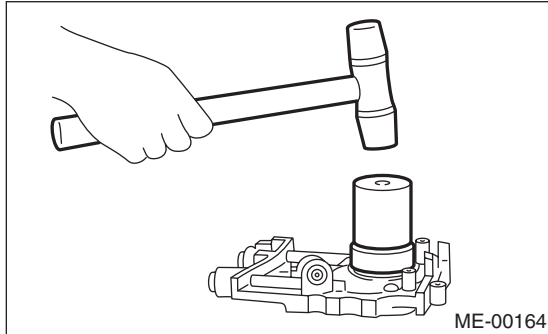
MECHANICAL

32) Install the oil pump.

(1) Using the ST, install the front oil seal.
ST 499587100 OIL SEAL INSTALLER

NOTE:

Use a new front oil seal.



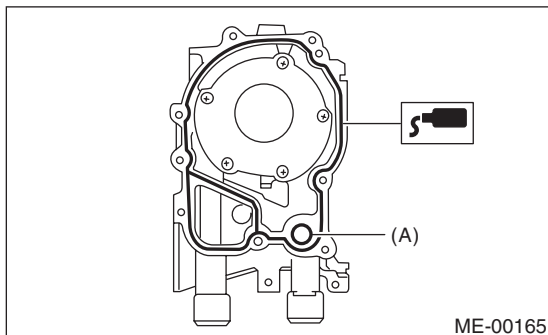
(2) Apply liquid gasket to the matching surface of oil pump.

NOTE:

Install within 5 min. after applying liquid gasket.

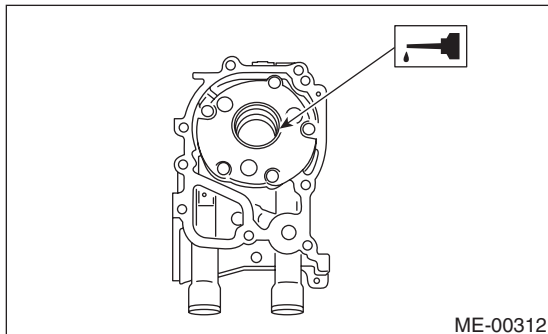
Liquid gasket:

THREE BOND 1217G (Part No. K0877Y0100)
or equivalent



(A) O-ring

(3) Apply a coat of engine oil to the inside of oil seal.



(4) Install the oil pump to cylinder block. Be careful not to damage the oil seal during installation.

NOTE:

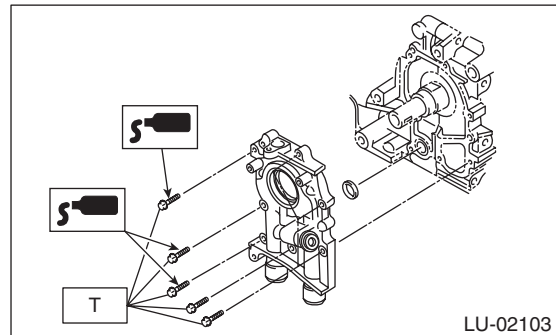
- Make sure the oil seal lip is not folded.
 - Align the flat surface of oil pump's inner rotor with crankshaft before installation.
 - Use new O-rings and oil seals.
 - Do not forget to assemble O-rings.
- (5) Apply liquid gasket to the three thread shown in figure. (when reusing bolts)

Liquid gasket:

THREE BOND 1324 (Part No. 004403042) or equivalent

Tightening torque:

6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



33) Install the water pump and gasket.

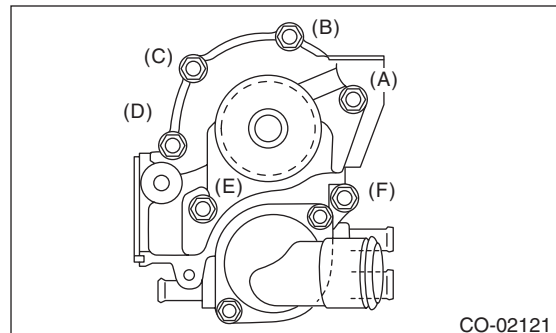
NOTE:

- When installing the water pump, tighten bolts in two stages in alphabetical sequence as shown in the figure.
- Use a new gasket.

Tightening torque:

First: 12 N·m (1.2 kgf-m, 8.9 ft-lb)

Second: 12 N·m (1.2 kgf-m, 8.9 ft-lb)



34) Install the water by-pass pipe for heater.

Tightening torque:

6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

35) Install the oil filter. <Ref. to LU(H4SO)-25, INSTALLATION, Engine Oil Filter.>

- 36) Install the cylinder head.
<Ref. to ME(H4DOTC)-62, INSTALLATION, Cylinder Head.>
- 37) Install the camshaft. <Ref. to ME(H4DOTC)-56, INSTALLATION, Camshaft.>
- 38) Install the crank sprocket.
<Ref. to ME(H4DOTC)-54, INSTALLATION, Crank Sprocket.>
- 39) Install the cam sprocket.
<Ref. to ME(H4DOTC)-52, INSTALLATION, Cam Sprocket.>
- 40) Install the timing belt.
<Ref. to ME(H4DOTC)-45, INSTALLATION, Timing Belt.>
- 41) Adjust the valve clearance.
<Ref. to ME(H4DOTC)-29, ADJUSTMENT, Valve Clearance.>
- 42) Install the rocker cover.

- (1) Install the rocker cover gasket to the rocker cover.

NOTE:

Use a new gasket.

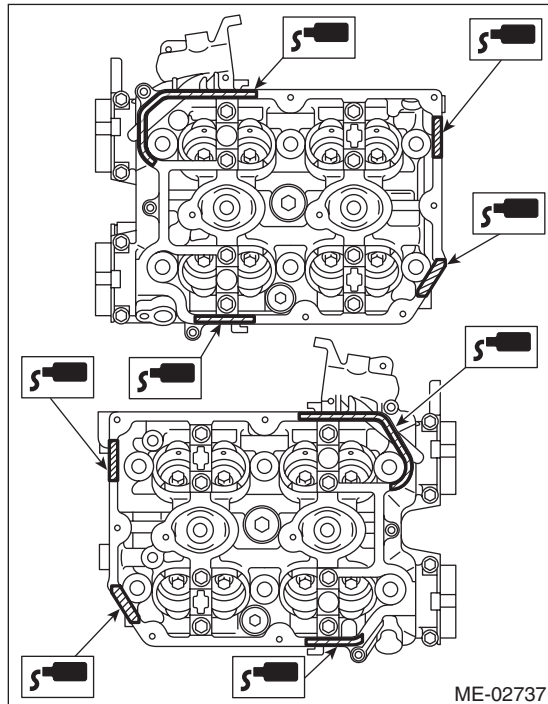
- (2) Apply liquid gasket to the specified point of the cylinder head. Apply extra amount of liquid gasket around plugs 5 mm (0.2 in) or more.

NOTE:

Install within 5 min. after applying liquid gasket.

Liquid gasket:

THREE BOND 1217G (Part No. K0877Y0100) or equivalent

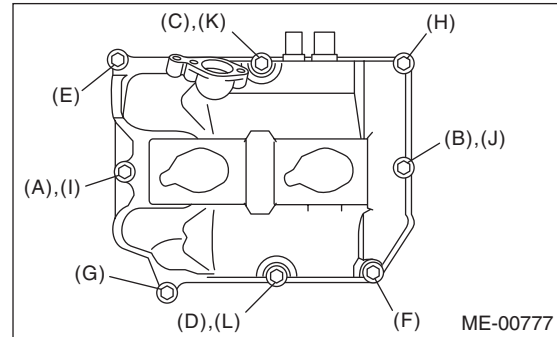


- (3) Install the rocker cover on cylinder head. Ensure the gasket is properly positioned during installation.

- (4) Temporarily tighten the rocker cover tightening bolts in alphabetical sequence shown in the figure, and then tighten to specified torque in alphabetical sequence.

Tightening torque:

6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



- (5) Connect the PCV hose.

- 43) Install the timing belt cover.

<Ref. to ME(H4DOTC)-42, INSTALLATION, Timing Belt Cover.>

- 44) Install the crank pulley.

<Ref. to ME(H4DOTC)-41, INSTALLATION, Crank Pulley.>

- 45) Install the intake manifold.

<Ref. to FU(H4DOTC)-17, INSTALLATION, Intake Manifold.>

- 46) Install the generator and A/C compressor with their brackets.

Tightening torque:

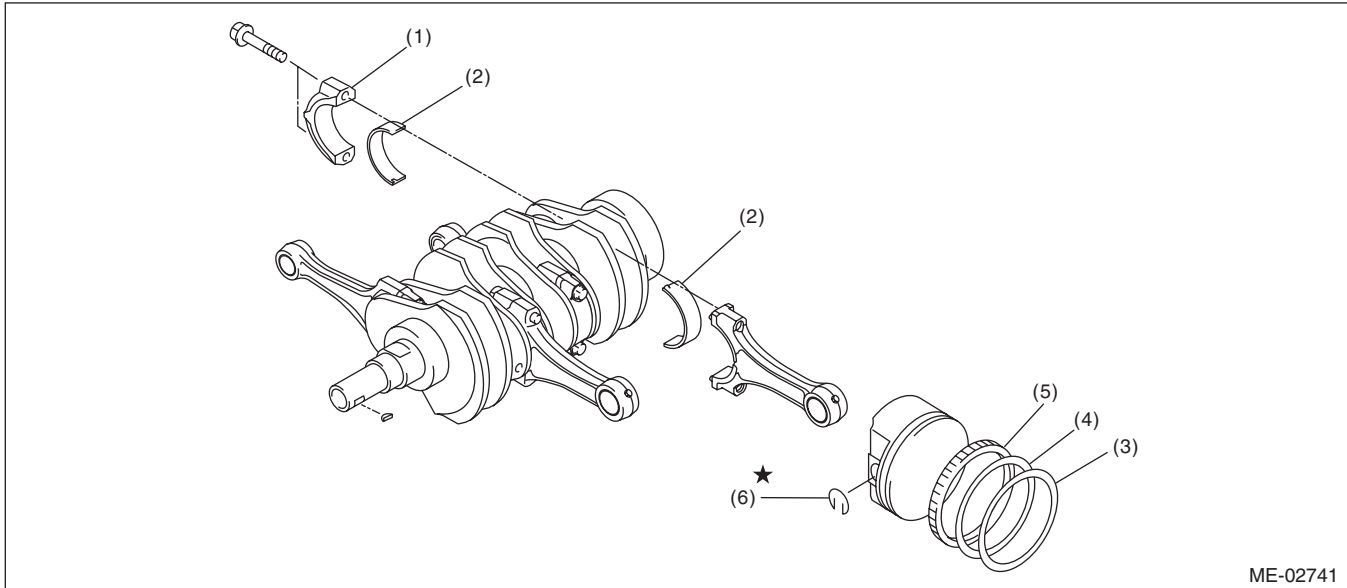
36 N·m (3.7 kgf-m, 26.6 ft-lb)

- 47) Install the V-belts. <Ref. to ME(H4DOTC)-39, INSTALLATION, V-belt.>

Cylinder Block

MECHANICAL

C: DISASSEMBLY



- (1) Connecting rod cap
- (2) Connecting rod bearing

- (3) Top ring
- (4) Second ring

- (5) Oil ring
- (6) Snap ring

- 1) Remove the connecting rod cap.
- 2) Remove the connecting rod bearing.

NOTE:

Arrange the removed connecting rod, connecting rod cap and bearing in order to prevent confusion.

3) Remove the piston rings using piston ring expander.

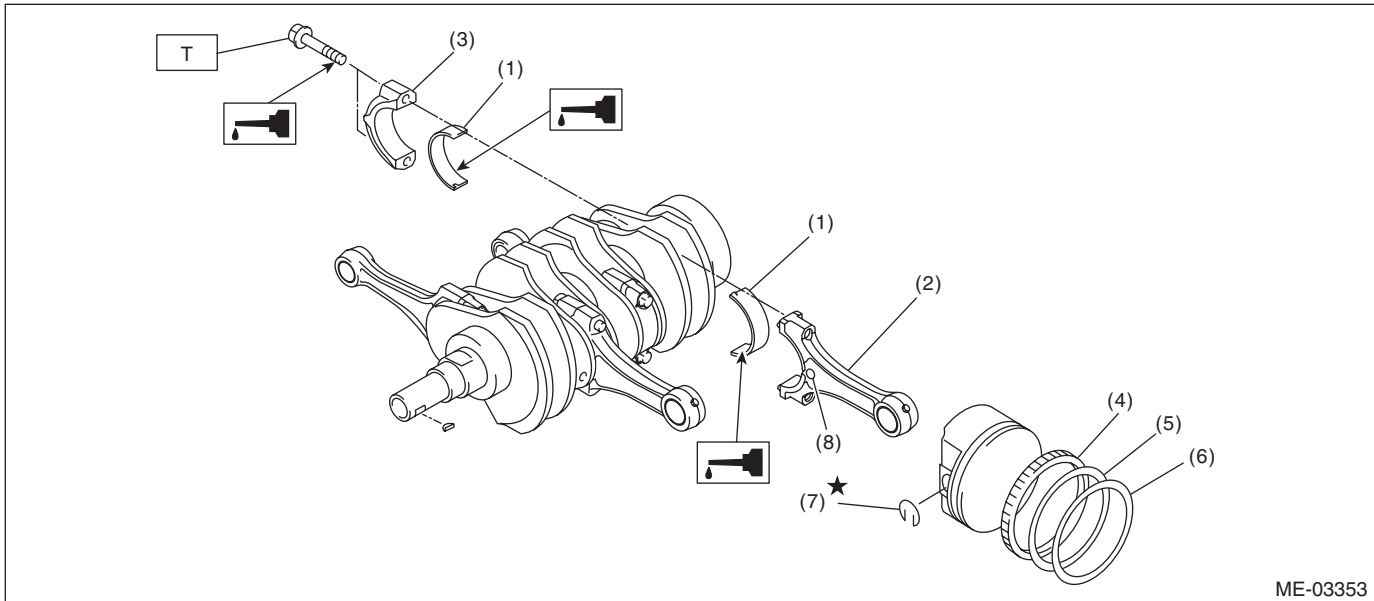
4) Remove the oil ring by hand.

NOTE:

Arrange the removed piston rings in proper order to prevent confusion.

5) Remove the snap ring.

D: ASSEMBLY



ME-03353

- | | |
|----------------------------|-----------------|
| (1) Connecting rod bearing | (5) Second ring |
| (2) Connecting rod | (6) Top ring |
| (3) Connecting rod cap | (7) Snap ring |
| (4) Oil ring | (8) Side mark |

Tightening torque: N·m (kgf-m, ft-lb)

T: 52 (5.3, 38.4)

- 1) Apply oil to the surface of the connecting rod bearings, and install the connecting rod bearings on connecting rods and connecting rod caps.
- 2) Position each connecting rod with the side with a side mark facing forward, and install it.
- 3) Tighten the connecting rod cap with the connecting rod bolt. Make sure the arrow on connecting rod cap faces the front during installation.

NOTE:

- Each connecting rod has its own mating cap. Make sure that they are assembled correctly by checking their matching number.
- When tightening the connecting rod bolts, apply oil on the threads.

Tightening torque:

52 N·m (5.3 kgf-m, 38.4 ft-lb)

- 4) Install the oil ring upper rail, expander and lower rail by hand.
- 5) Install the second ring and top ring using piston ring expander.

E: INSPECTION

1. CYLINDER BLOCK

- 1) Check for cracks or damage. Use liquid penetrant tester on the important sections to check for fissures. Check that there are no marks of gas leaking or water leaking on gasket installing surface.
- 2) Check the oil passages for clogging.
- 3) Inspect the cylinder block surface that mates with cylinder head for warping by using a straight edge, and correct by grinding if necessary.

Warping limit:

0.025 mm (0.00098 in)

Grinding limit:

0.1 mm (0.004 in)

Standard height of cylinder block:

201.0 mm (7.91 in)

Cylinder Block

MECHANICAL

2. CYLINDER AND PISTON

1) The cylinder bore size is stamped on the cylinder block front upper surface.

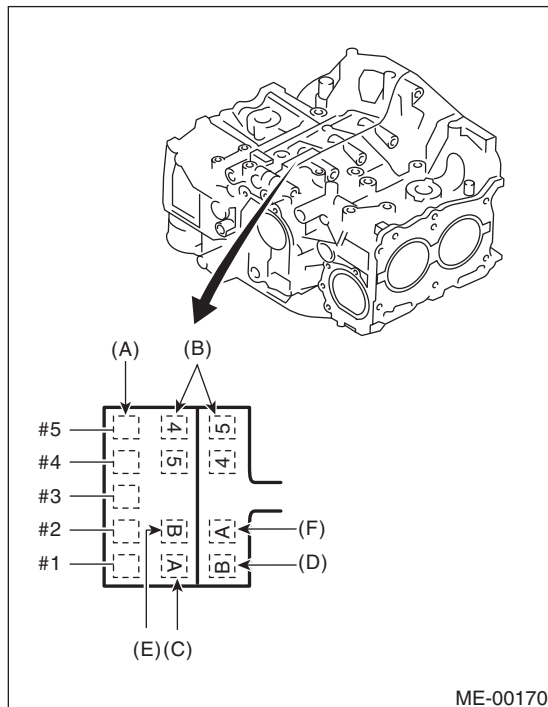
NOTE:

- Measurement should be performed at a temperature of 20°C (68°F).
- Standard sized pistons are classified into two grades, "A" and "B". These grades should be used as guide lines in selecting a standard piston.

Standard diameter:

A: 99.505 — 99.515 mm (3.9175 — 3.9179 in)

B: 99.495 — 99.505 mm (3.9171 — 3.9175 in)



- (A) Main journal size mark
- (B) Cylinder block (RH) — (LH) combination mark
- (C) #1 cylinder bore size mark
- (D) #2 cylinder bore size mark
- (E) #3 cylinder bore size mark
- (F) #4 cylinder bore size mark

2) Cylinder inner diameter measurement
Measure the inner diameter of each cylinder in both the thrust and piston pin directions at the heights as shown in the figure, using a cylinder bore gauge.

NOTE:

Measurement should be performed at a temperature of 20°C (68°F).

Taper:

Standard:

0.015 mm (0.0006 in)

Service limit:

0.050 mm (0.0020 in)

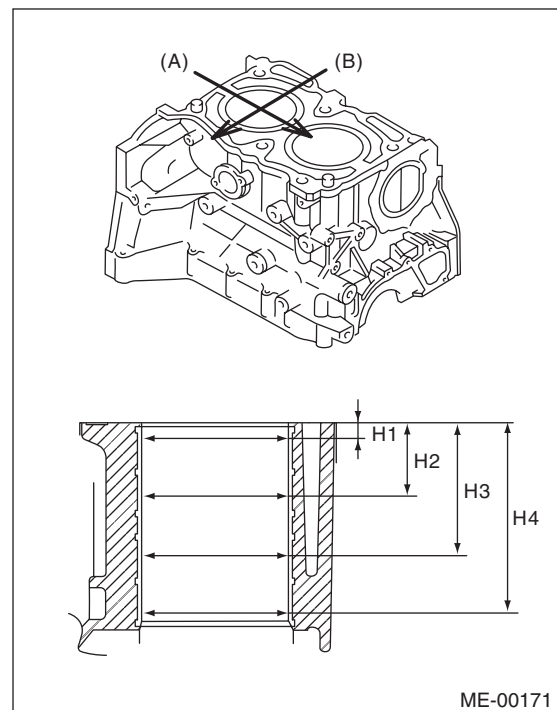
Out-of-roundness:

Standard:

0.010 mm (0.0004 in)

Service limit:

0.050 mm (0.0020 in)



- (A) Piston pin direction
- (B) Thrust direction
- H1: 10 mm (0.39 in)
- H2: 45 mm (1.77 in)
- H3: 80 mm (3.15 in)
- H4: 115 mm (4.53 in)

3) When the piston is to be replaced due to general or cylinder wear, select a suitable sized piston by measuring the piston clearance.

4) Piston outer diameter measurement

Measure the outer diameter of each piston at the height as shown in the figure. (Thrust direction)

NOTE:

Measurement should be performed at a temperature of 20°C (68°F).

Piston grade point H:

38.2 mm (1.50 in)

Piston outer diameter:

Standard

A: 99.505 — 99.515 mm (3.9175 — 3.9179 in)

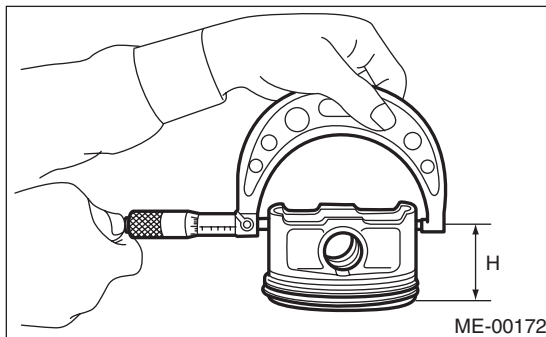
B: 99.495 — 99.505 mm (3.9171 — 3.9175 in)

0.25 mm (0.0098 in) oversize:

99.745 — 99.765 mm (3.9270 — 3.9278 in)

0.50 mm (0.0197 in) oversize:

99.995 — 100.015 mm (3.9368 — 3.9376 in)



5) Calculate the clearance between cylinder and piston.

NOTE:

Measurement should be performed at a temperature of 20°C (68°F).

Cylinder to piston clearance at 20°C (68°F):

Standard

-0.010 — 0.010 mm (-0.0004 — 0.0004 in)

Limit

0.030 mm (0.0012 in)

6) Boring and honing

- (1) If the value of taper, out-of-roundness, or cylinder-to-piston clearance measured exceeds the limit or if there is any damage on the cylinder wall, rebores it to use an oversize piston.

CAUTION:

When any of the cylinders needs reboring, all other cylinders must be bored at the same time, and replace to oversize pistons.

- (2) If the cylinder inner diameter exceeds the limit after boring and honing, replace the cylinder block.

NOTE:

Immediately after reboring, the cylinder diameter may differ from its real diameter due to temperature rise. Thus, when measuring the cylinder diameter, wait until it has cooled to room temperature.

Cylinder inner boring limit (diameter):

100.005 mm (3.9372 in)

3. PISTON AND PISTON PIN

- 1) Check the piston and piston pin for breaks, cracks or wear. Replace if faulty.
- 2) Check the piston ring groove for wear and damage. Replace if faulty.
- 3) Make sure that the piston pin can be inserted into the piston pin hole with a thumb at 20°C (68°F). Replace if faulty.

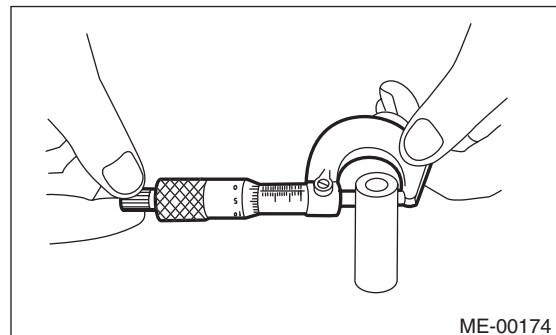
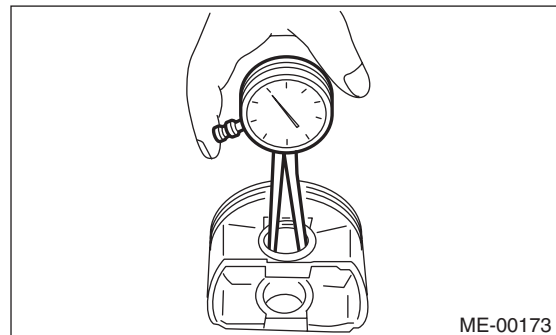
Standard clearance between piston pin and hole in piston:

Standard:

0.004 — 0.008 mm (0.0002 — 0.0003 in)

Service limit:

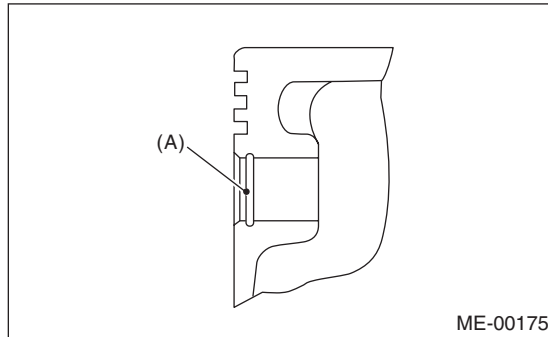
0.020 mm (0.0008 in)



Cylinder Block

MECHANICAL

4) Check the snap ring installation groove on the piston for burr. If necessary, remove burr from the groove so that the piston pin can lightly move.



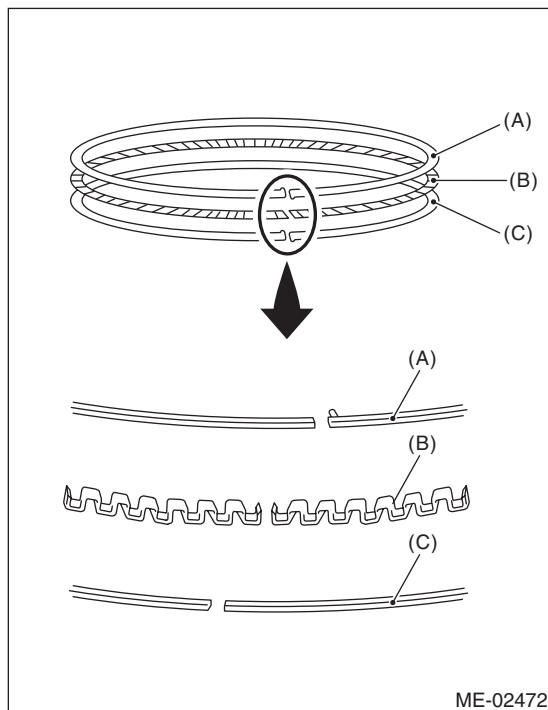
5) Check the piston pin snap ring for distortion, cracks and wear.

4. PISTON RING

1) If the piston ring is broken, damaged or worn, or if its tension is insufficient, or when the piston is replaced, replace the piston ring with a new part of the same size as piston.

NOTE:

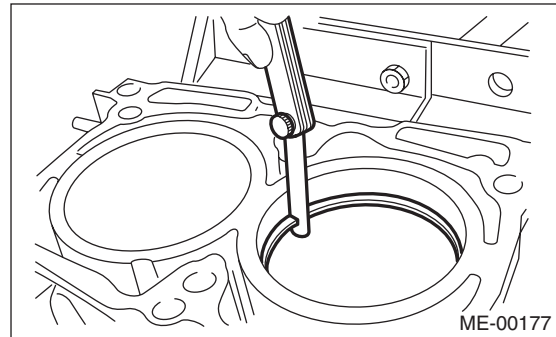
- Marks that shows the installing direction are shown on the end of top and second rings. When installing them to piston, face this mark to the top side.
- Oil ring consists of the upper rail, expander and lower rail. When installing the oil ring on piston, be careful of each rails direction.



- (A) Upper rail
(B) Expander
(C) Lower rail

2) Squarely place the piston ring and oil ring in cylinder using the piston, and measure the piston ring gap with a thickness gauge.

Unit: mm (in)			
		Standard	Limit
Piston ring gap	Top ring	0.20 — 0.25 (0.0079 — 0.0098)	1.0 (0.039)
	Second ring	0.37 — 0.52 (0.015 — 0.020)	1.0 (0.039)
	Oil ring rail	0.20 — 0.50 (0.0079 — 0.0197)	1.5 (0.059)

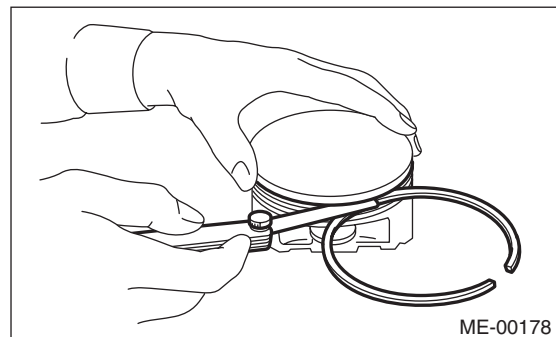


3) Fit the piston ring straight into the piston ring groove, then measure the clearance between piston ring and piston ring groove with a thickness gauge.

NOTE:

Before measuring the clearance, clean the piston ring groove and piston ring.

Unit: mm (in)			
		Standard	Limit
Clearance between piston ring and piston ring groove	Top ring	0.040 — 0.080 (0.0016 — 0.0031)	0.15 (0.0059)
	Second ring	0.030 — 0.070 (0.0012 — 0.0028)	0.15 (0.0059)

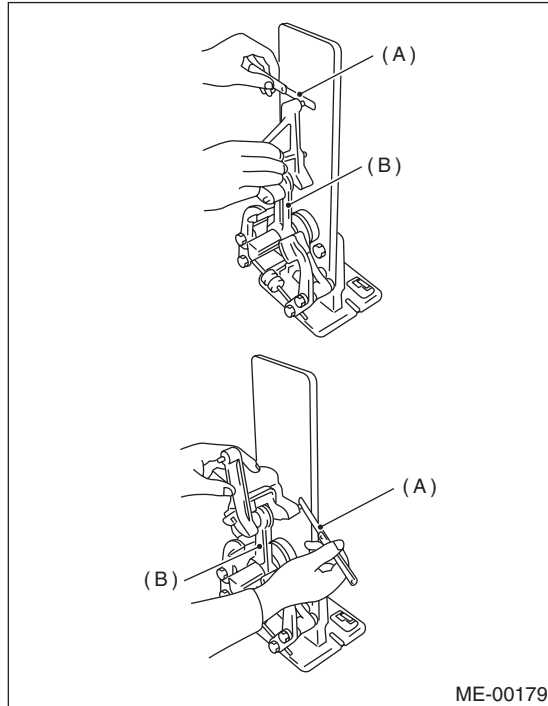


5. CONNECTING ROD

- 1) Replace the connecting rod, if the large or small end thrust surface is damaged.
- 2) Check for bend or twist using a connecting rod aligner. Replace the connecting rod if the bend or twist exceeds the limit.

Limit of bend or twist per 100 mm (3.94 in) in length:

0.10 mm (0.0039 in)



- (A) Thickness gauge
(B) Connecting rod

- 3) Install the connecting rod fitted with bearing to the crankshaft, and measure the thrust clearance using a thickness gauge. Replace the connecting rod if the thrust clearance exceeds the specified limit.

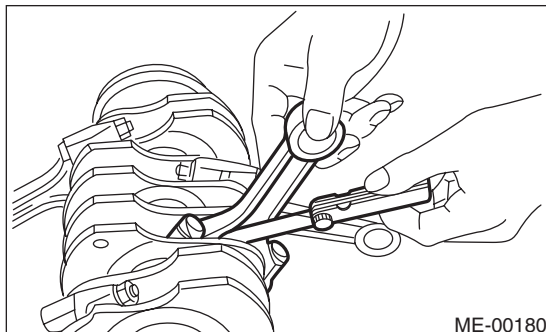
Connecting rod thrust clearance:

Standard

0.070 — 0.330 mm (0.0028 — 0.0130 in)

Limit

0.4 mm (0.016 in)



- 4) Inspect the connecting rod bearing for scar, peeling, seizure, melting, wear, etc.

- 5) Measure the oil clearance on each connecting rod bearing using plastigauge. If any oil clearance is not within the standard, replace the defective bearing with a new part of standard size or under-size as necessary.

Connecting rod oil clearance:

Standard:

0.017 — 0.045 mm (0.0007 — 0.0018 in)

Service limit:

0.05 mm (0.0020 in)

Unit: mm (in)		
Bearing	Bearing size (Thickness at center)	Outer diameter of crank pin
Standard	1.490 — 1.502 (0.0587 — 0.0591)	51.984 — 52.000 (2.0466 — 2.0472)
0.03 (0.0012) undersize	1.504 — 1.512 (0.0592 — 0.0595)	51.954 — 51.970 (2.0454 — 2.0461)
0.05 (0.0020) undersize	1.514 — 1.522 (0.0596 — 0.0599)	51.934 — 51.950 (2.0447 — 2.0453)
0.25 (0.0098) undersize	1.614 — 1.622 (0.0635 — 0.0639)	51.734 — 51.750 (2.0368 — 2.0374)

- 6) Inspect the bushing at connecting rod small end, and replace with a new part if worn or damaged.

Cylinder Block

MECHANICAL

7) Measure the piston pin clearance at connecting rod small end. Replace it with a new part if the clearance exceeds the limit.

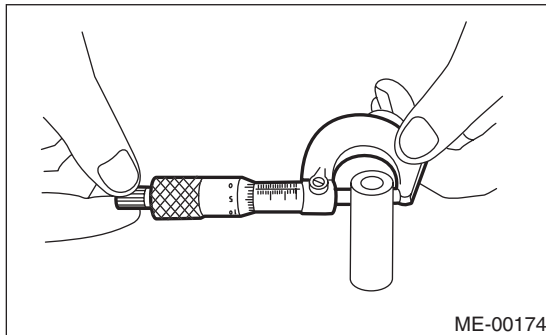
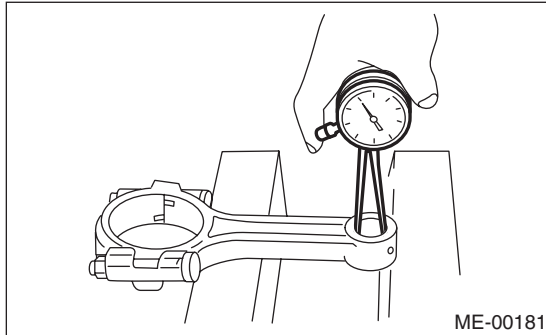
Clearance between piston pin and bushing:

Standard:

0 — 0.022 mm (0 — 0.0009 in)

Service limit:

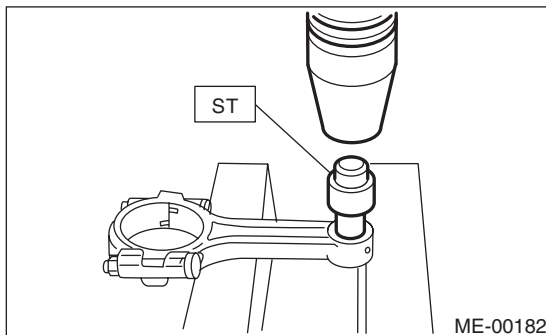
0.030 mm (0.0012 in)



8) The replacement procedure for the connecting rod small end bushing is as follows.

- (1) Remove the bushing from connecting rod with ST and press.
- (2) Press the bushing with the ST after applying oil on the periphery of new bushing.

ST 499037100 CONNECTING ROD BUSHING REMOVER AND INSTALLER



- (3) Make two 3 mm (0.12 in) holes in the pressed bushing according to the pre-manufactured holes on the connecting rod to ream the inside of bushing.
- (4) After completion of reaming, clean the bushing to remove chips.

6. CRANKSHAFT AND CRANKSHAFT BEARING

1) Clean the crankshaft completely, and check for cracks by means of red lead check etc. If faulty, replace with new a new crankshaft.

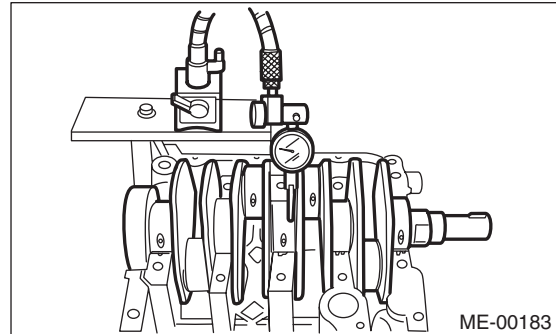
2) Measure the bend of crankshaft. If it exceeds the limit, correct or replace it.

NOTE:

If a suitable V-block is not available, use only a #1 and #5 crankshaft bearings on cylinder block, and position the crankshaft on cylinder block. Then, measure the crankshaft bend using a dial gauge.

Crankshaft bend limit:

0.035 mm (0.0014 in)



3) Inspect the crank journal and crank pin for wear. If they are not within the specification, replace the bearing with a suitable (undersize) one, and replace or grind to correct the crankshaft as necessary. When grinding the crank journal or crank pin, finish them to the specified dimensions according to the undersize bearing to be used.

Crank pin:

Out-of-roundness:

0.003 mm (0.0001 in)

Cylindricity:

0.004 mm (0.0002 in)

Grinding limit:

To 51.750 mm (2.0374 in) dia.

Crank journal:

Out-of-roundness:

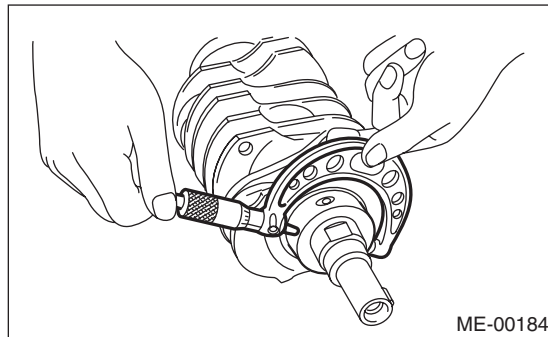
0.005 mm (0.0002 in)

Cylindricity:

0.006 mm (0.0002 in)

Grinding limit:

To 59.758 mm (2.3527 in) dia.



Unit: mm (in)				
		Crank journal outer diameter		Crank pin outer diameter
		#1, #3	#2, #4, #5	
Standard	Journal O.D.	59.992 — 60.008 (2.3619 — 2.3625)	59.992 — 60.008 (2.3619 — 2.3625)	51.984 — 52.000 (2.0466 — 2.0472)
	Bearing size (Thickness at center)	1.998 — 2.011 (0.0787 — 0.0792)	2.000 — 2.013 (0.0787 — 0.0793)	1.490 — 1.502 (0.0587 — 0.0591)
0.03 (0.0012) undersize	Journal O.D.	59.962 — 59.978 (2.3607 — 2.3613)	59.962 — 59.978 (2.3607 — 2.3613)	51.954 — 51.970 (2.0454 — 2.0461)
	Bearing size (Thickness at center)	2.017 — 2.020 (0.0794 — 0.0795)	2.019 — 2.022 (0.0795 — 0.0796)	1.504 — 1.512 (0.0592 — 0.0595)
0.05 (0.0020) undersize	Journal O.D.	59.942 — 59.958 (2.3599 — 2.3605)	59.942 — 59.958 (2.3599 — 2.3605)	51.934 — 51.950 (2.0447 — 2.0453)
	Bearing size (Thickness at center)	2.027 — 2.030 (0.0798 — 0.0799)	2.029 — 2.032 (0.0799 — 0.0800)	1.514 — 1.522 (0.0596 — 0.0599)
0.25 (0.0098) undersize	Journal O.D.	59.742 — 59.758 (2.3520 — 2.3527)	59.742 — 59.758 (2.3520 — 2.3527)	51.734 — 51.750 (2.0368 — 2.0374)
	Bearing size (Thickness at center)	2.127 — 2.130 (0.0837 — 0.0839)	2.129 — 2.132 (0.0838 — 0.0839)	1.614 — 1.622 (0.0635 — 0.0639)

Cylinder Block

MECHANICAL

4) Use a thickness gauge to measure the thrust clearance of crankshaft at #5 crank journal bearing. If the clearance exceeds the limit, replace the bearing.

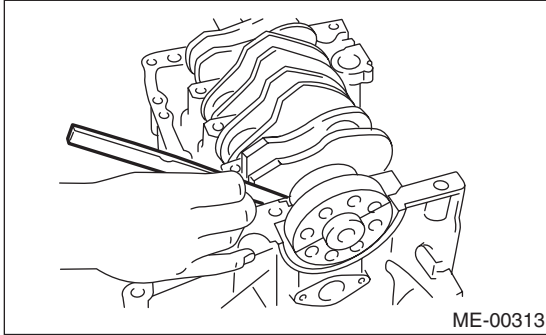
Crankshaft thrust clearance:

Standard

0.030 — 0.115 mm (0.0012 — 0.0045 in)

Limit

0.25 mm (0.0098 in)



5) Inspect individual crankshaft bearings for signs of flaking, seizure, melting and wear.

6) Measure the oil clearance on each crankshaft bearing using plastigauge. If the measured value exceeds the limit, replace the defective bearing with an undersize one, and replace or grind to correct the crankshaft as necessary.

Crankshaft oil clearance:

Standard:

0.010 — 0.030 mm (0.0004 — 0.0012 in)

Service limit:

0.040 mm (0.0016 in)

21.Intake and Exhaust Valve

A: SPECIFICATION

Refer to “Cylinder Head” for removal and installation procedures of intake and exhaust valves.

<Ref. to ME(H4DOTC)-61, REMOVAL, Cylinder Head.> <Ref. to ME(H4DOTC)-62, INSTALLATION, Cylinder Head.>

22.Piston

A: SPECIFICATION

Refer to “Cylinder Block” for removal and installation procedures of pistons.

<Ref. to ME(H4DOTC)-70, REMOVAL, Cylinder Block.> <Ref. to ME(H4DOTC)-74, INSTALLATION, Cylinder Block.>

23.Connecting Rod

A: SPECIFICATION

Refer to “Cylinder Block” for removal and installation procedures of connecting rod.

<Ref. to ME(H4DOTC)-70, REMOVAL, Cylinder Block.> <Ref. to ME(H4DOTC)-74, INSTALLATION, Cylinder Block.>

24.Crankshaft

A: SPECIFICATION

Refer to “Cylinder Block” for removal and installation procedures of crankshaft.

<Ref. to ME(H4DOTC)-70, REMOVAL, Cylinder Block.> <Ref. to ME(H4DOTC)-74, INSTALLATION, Cylinder Block.>

25.Engine Trouble in General

A: INSPECTION

NOTE:

“RANK” shown in the chart refers to the possibility of the cause of trouble in order “Very often” to “Rarely”

A — Very often

B — Sometimes

C — Rarely

Symptoms	Problem parts etc.	Possible cause	RANK
1. Engine does not start.			
1) Starter does not turn.	Starter	Defective battery-to-starter harness	B
		Defective starter switch	C
		Defective inhibitor switch or neutral switch	C
		Defective starter	B
	Battery	Improper connection of terminal	A
		Run-down battery	A
		Defective charging system	B
	Excessive friction	Seizure of crankshaft and connecting rod bearing	C
		Seized camshaft	C
		Seized or stuck piston and cylinder	C
2) Initial combustion does not occur.	Starter	Defective starter	C
	Engine control system <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.>		A
	Fuel line	Defective fuel pump and relay	A
		Clogged fuel line	C
		Lack of or insufficient fuel	B
	Timing belt	Degradation, etc.	B
		Defective timing	B
	Compression	Incorrect valve clearance	C
		Loosened spark plug or defective gasket	C
		Loosened cylinder head bolt or defective head gasket	C
		Improper valve sealing	C
		Defective valve stem	C
		Worn or broken valve spring	B
		Worn or stuck piston rings, cylinder and piston	C
		Incorrect valve timing	B
		Improper engine oil (low viscosity)	B

Engine Trouble in General

MECHANICAL

Symptoms	Problem parts etc.	Possible cause	RANK
3) Initial combustion occurs.	Engine control system <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Defective intake manifold gasket	B
		Defective throttle body gasket	B
	Fuel line	Defective fuel pump and relay	C
		Clogged fuel line	C
		Lack of or insufficient fuel	B
	Timing belt	Degradation, etc.	B
		Defective timing	B
	Compression	Incorrect valve clearance	C
		Loosened spark plug or defective gasket	C
		Loosened cylinder head bolt or defective head gasket	C
		Improper valve sealing	C
		Defective valve stem	C
		Worn or broken valve spring	B
		Worn or stuck piston rings, cylinder and piston	C
		Incorrect valve timing	B
		Improper engine oil (low viscosity)	B
4) Engine stalls after initial combustion.	Engine control system <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened or cracked intake duct	B
		Loosened or cracked PCV hose	C
		Loosened or cracked vacuum hose	C
		Defective intake manifold gasket	B
		Defective throttle body gasket	B
		Dirty air cleaner element	C
	Fuel line	Clogged fuel line	C
		Lack of or insufficient fuel	B
	Timing belt	Degradation, etc.	B
		Defective timing	B
	Compression	Incorrect valve clearance	C
		Loosened spark plug or defective gasket	C
		Loosened cylinder head bolt or defective head gasket	C
		Improper valve sealing	C
		Defective valve stem	C
		Worn or broken valve spring	B
		Worn or stuck piston rings, cylinder and piston	C
		Incorrect valve timing	B
		Improper engine oil (low viscosity)	B

Engine Trouble in General

MECHANICAL

Symptoms	Problem parts etc.	Possible cause	RANK
2. Rough idle and engine stall	Engine control system <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened or cracked intake duct	A
		Loosened or cracked PCV hose	A
		Loosened or cracked vacuum hose	A
		Defective intake manifold gasket	B
		Defective throttle body gasket	B
		Defective PCV valve	C
		Loosened oil filler cap	B
		Dirty air cleaner element	C
	Fuel line	Defective fuel pump and relay	C
		Clogged fuel line	C
		Lack of or insufficient fuel	B
	Timing belt	Defective timing	C
	Compression	Incorrect valve clearance	B
		Loosened spark plug or defective gasket	B
		Loosened cylinder head bolt or defective head gasket	B
		Improper valve sealing	B
		Defective valve stem	C
		Worn or broken valve spring	B
		Worn or stuck piston rings, cylinder and piston	B
		Incorrect valve timing	A
		Improper engine oil (low viscosity)	B
	Lubrication system	Incorrect oil pressure	B
		Defective rocker cover gasket	C
	Cooling system	Overheating	C
	Others	Evaporative emission control system malfunction	A
		Stuck or damaged throttle valve	B

Engine Trouble in General

MECHANICAL

Symptoms	Problem parts etc.	Possible cause	RANK
3. Low output, hesitation and poor acceleration	Engine control system <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened or cracked intake duct	A
		Loosened or cracked PCV hose	A
		Loosened or cracked vacuum hose	B
		Defective intake manifold gasket	B
		Defective throttle body gasket	B
		Defective PCV valve	B
		Loosened oil filler cap	B
		Dirty air cleaner element	A
	Fuel line	Defective fuel pump and relay	B
		Clogged fuel line	B
		Lack of or insufficient fuel	C
	Timing belt	Defective timing	B
	Compression	Incorrect valve clearance	B
		Loosened spark plug or defective gasket	B
		Loosened cylinder head bolt or defective head gasket	B
		Improper valve sealing	B
		Defective valve stem	C
		Worn or broken valve spring	B
		Worn or stuck piston rings, cylinder and piston	C
		Incorrect valve timing	A
		Improper engine oil (low viscosity)	B
	Lubrication system	Incorrect oil pressure	B
	Cooling system	Overheating	C
		Over-cooling	C
	Others	Evaporative emission control system malfunction	A
4. Surging	Engine control system <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened or cracked intake duct	A
		Loosened or cracked PCV hose	A
		Loosened or cracked vacuum hose	A
		Defective intake manifold gasket	B
		Defective throttle body gasket	B
		Defective PCV valve	B
		Loosened oil filler cap	B
		Dirty air cleaner element	B
	Fuel line	Defective fuel pump and relay	B
		Clogged fuel line	B
		Lack of or insufficient fuel	C
	Timing belt	Defective timing	B
	Compression	Incorrect valve clearance	B
		Loosened spark plug or defective gasket	C
		Loosened cylinder head bolt or defective head gasket	C
		Improper valve sealing	C
		Defective valve stem	C
		Worn or broken valve spring	C
		Worn or stuck piston rings, cylinder and piston	C
		Incorrect valve timing	A
		Improper engine oil (low viscosity)	B
	Cooling system	Overheating	B
	Others	Evaporative emission control system malfunction	C

Engine Trouble in General

MECHANICAL

Symptoms	Problem parts etc.	Possible cause	RANK
5. Engine does not return to idle.	Engine control system <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened or cracked vacuum hose	A
	Others	Stuck or damaged throttle valve	A
		Accelerator cable out of adjustment	B
6. Dieseling (Run-on)	Engine control system <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.>		A
	Cooling system	Overheating	B
	Others	Evaporative emission control system malfunction	B
7. After burning in exhaust system	Engine control system <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened or cracked intake duct	C
		Loosened or cracked PCV hose	C
		Loosened or cracked vacuum hose	B
		Defective PCV valve	B
		Loosened oil filler cap	C
	Timing belt	Defective timing	B
	Compression	Incorrect valve clearance	B
		Loosened spark plug or defective gasket	C
		Loosened cylinder head bolt or defective head gasket	C
		Improper valve sealing	B
		Defective valve stem	C
		Worn or broken valve spring	C
		Worn or stuck piston rings, cylinder and piston	C
		Incorrect valve timing	A
	Lubrication system	Incorrect oil pressure	C
	Cooling system	Over-cooling	C
	Others	Evaporative emission control system malfunction	C
8. Knocking	Engine control system <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened oil filler cap	B
	Timing belt	Defective timing	B
	Compression	Incorrect valve clearance	C
		Incorrect valve timing	B
	Cooling system	Overheating	A
9. Excessive engine oil consumption	Intake system	Loosened or cracked PCV hose	A
		Defective PCV valve	B
		Loosened oil filler cap	C
	Compression	Defective valve stem	A
		Worn or stuck piston rings, cylinder and piston	A
	Lubrication system	Loosened oil pump attaching bolts and defective gas-ket	B
		Defective oil filter gasket	B
		Defective crankshaft oil seal	B
		Defective rocker cover gasket	B
		Loosened oil drain plug or defective gasket	B
		Loosened oil pan fitting bolts or defective oil pan	B

Engine Trouble in General

MECHANICAL

Symptoms	Problem parts etc.	Possible cause	RANK
10. Excessive fuel consumption	Engine control system <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Dirty air cleaner element	A
	Timing belt	Defective timing	B
	Compression	Incorrect valve clearance	B
		Loosened spark plug or defective gasket	C
		Loosened cylinder head bolt or defective head gasket	C
		Improper valve sealing	B
		Defective valve stem	C
		Worn or broken valve spring	C
		Worn or stuck piston rings, cylinder and piston	B
		Incorrect valve timing	B
	Lubrication system	Incorrect oil pressure	C
	Cooling system	Over-cooling	C

26.Engine Noise

A: INSPECTION

Type of sound	Condition	Possible cause
Regular clicking sound	Sound increases as engine speed increases.	- Valve mechanism is defective. - Incorrect valve clearance adjustment - Worn camshaft - Broken valve spring
Heavy and dull clank	Oil pressure is low.	- Worn crankshaft main bearing - Worn connecting rod bearing (large end)
	Oil pressure is normal.	- Loosened flywheel mounting bolt - Damaged engine mounting
High-pitched clank	Sound is noticeable when accelerating with an overload condition.	- Ignition timing advanced - Accumulation of carbon inside combustion chamber - Wrong heat-durability spark plug - Improper octane value gasoline
Clank when engine speed is 1,000 to 2,000 rpm	Sound is reduced when fuel injector connector of noisy cylinder is disconnected. (NOTE*)	- Worn crankshaft main bearing - Worn connecting rod bearing (large end)
Knocking sound when engine is operating under idling speed and engine is warm	Sound is reduced when 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
Squeaky sound	—	Insufficient generator lubrication
Rubbing sound	—	Poor contact of generator brush and rotor
Gear scream when starting engine	—	- Defective ignition starter switch - Worn gear and starter pinion
Sound like polishing glass with a dry cloth	—	- Loose V-belt - Defective water pump shaft
Hissing sound	—	- Insufficient compression - Air leakage in air intake system, hose, connection or manifold
Timing belt noise	—	- Loose timing belt - Belt contacting with case/adjacent part
Valve noise	—	Incorrect valve clearance

NOTE*)

When disconnecting the fuel injector connector, the malfunction indicator light illuminates and DTC is stored in ECM memory. Therefore, perform the Clear Memory Mode and Inspection Mode after connecting the fuel injector connector. <Ref. to EN(H4DOTC)(diag)-54, OPERATION, Clear Memory Mode.> <Ref. to EN(H4DOTC)(diag)-44, PROCEDURE, Inspection Mode.>

1. General Description

A: SPECIFICATION

Specifications for the turbo model are the same as in the SP (H4SO) section. <Ref. to SP(H4SO)-2, General Description.>

1. General Description

A: SPECIFICATION

Specifications for the turbo model are included in the SC (H4SO) section. <Ref. to SC(H4SO)-2, General Description.>