1. General Description

A: SPECIFICATION

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

LUBRICATION

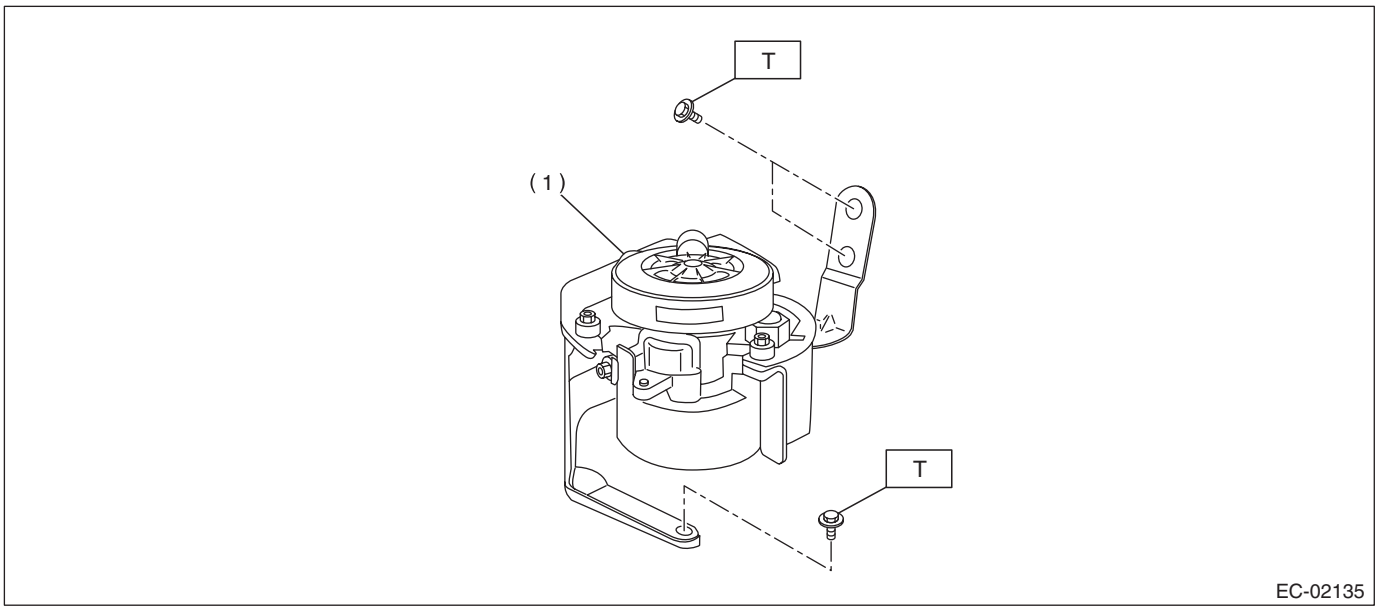
LU(H4DOTC)

Page
1. General Description 2

1. General Description

A: COMPONENT

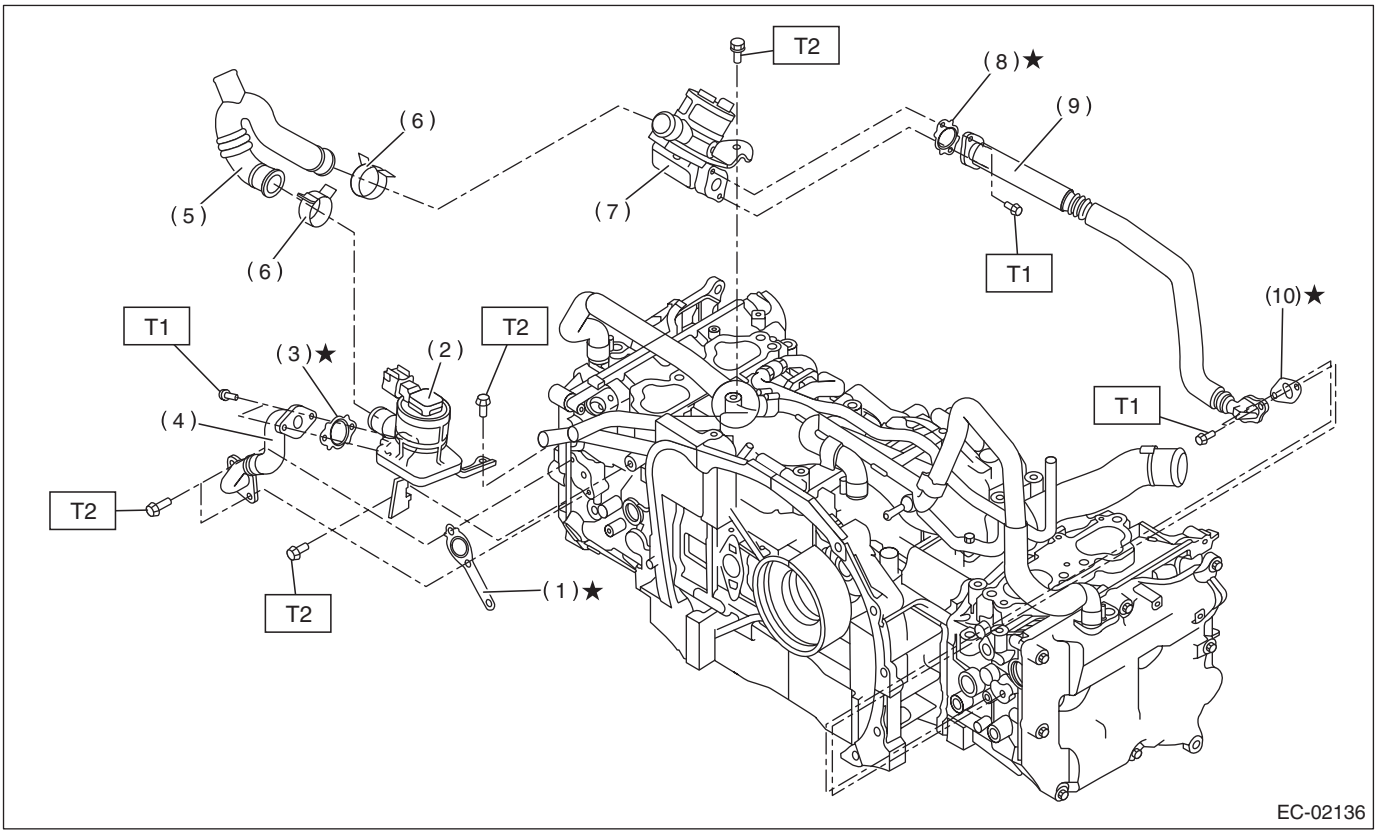
1. SECONDARY AIR PUMP



(1) Secondary air pump

Tightening torque: N·m (kgf-m, ft-lb)
T: 5 (0.5, 3.7)

2. SECONDARY AIR COMBINATION VALVE



(1)	Gasket	(6)	Clamp
(2)	Secondary air combination valve LH	(7)	Secondary air combination valve RH
(3)	Gasket	(8)	Gasket
(4)	Pipe LH	(9)	Pipe RH
(5)	Air duct	(10)	Gasket

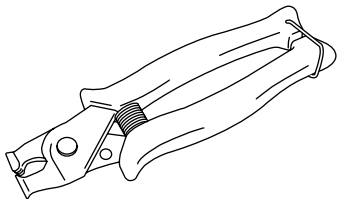
Tightening torque: N·m (kgf-m, ft-lb)
T1: 6.4 (0.65, 4.7)
T2: 19 (1.9, 13.7)

B: CAUTION

• Wear work clothing, including a cap, protective goggles and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust and dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
• Be careful not to burn yourself, because each part on the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or rigid racks at the specified points.
• Before disconnecting connectors of sensors or units, be sure to disconnect the ground cable from battery.

C: PREPARATION TOOL

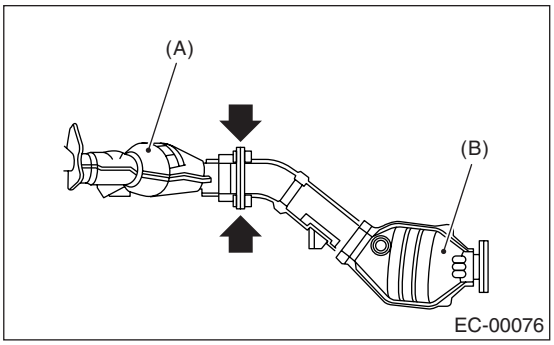
1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18353AA000	18353AA000	CLAMP PLIERS	• Used for removing and installing the PCV hose. • This 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 serial number as an ST.

2. Front Catalytic Converter

A: REMOVAL

1) Remove the center exhaust pipe. <Ref. to EX(H4DOTC)-7, REMOVAL, Center Exhaust Pipe.>
2) Disconnect the front catalytic converter (A) from the rear catalytic converter (B).



B: INSTALLATION

NOTE:
- Always use new gasket.
- Install in the reverse order of removal.

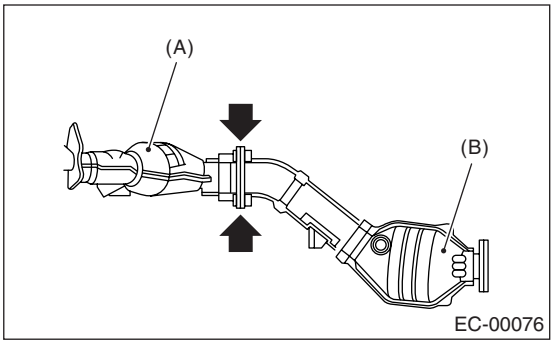
C: INSPECTION

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

3. Rear Catalytic Converter

A: REMOVAL

1) Remove the center exhaust pipe.
<Ref. to EX(H4DOTC)-7, REMOVAL, Center Exhaust Pipe.>
2) Disconnect the rear catalytic converter (B) from the front catalytic converter (A).



B: INSTALLATION

NOTE:
- Always use new gasket.
- Install in the reverse order of removal.

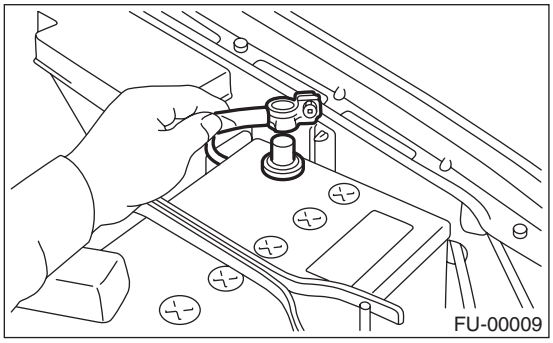
C: INSPECTION

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

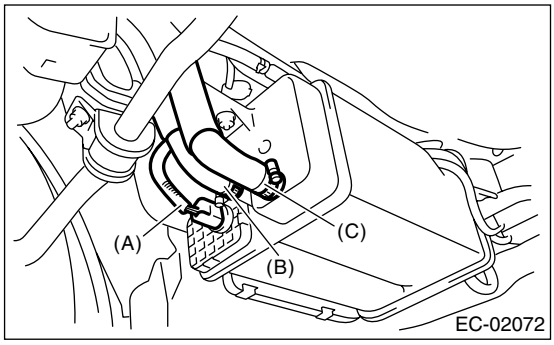
4. Canister

A: REMOVAL

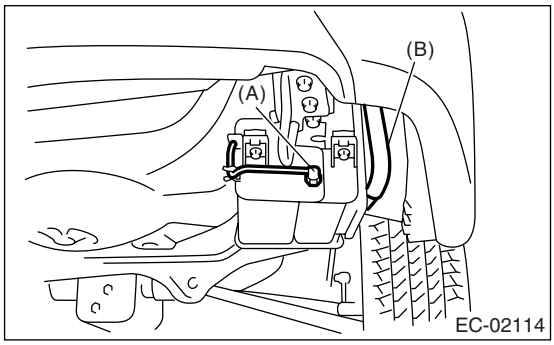
1) Disconnect the ground cable from battery.



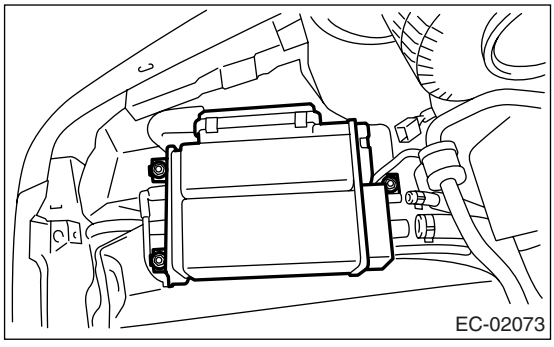
2) Lift-up the vehicle.
3) Disconnect the connector (A) from drain valve.
4) Disconnect the evaporation hoses (B) and (C) from the canister.



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



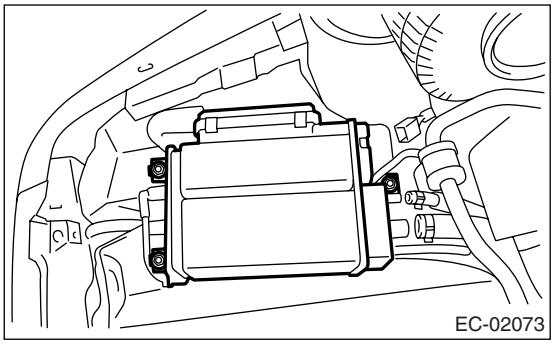
7) Remove the canister from the body.



B: INSTALLATION

NOTE:
• Replace the retainer of quick connector with a new one.
• Install in the reverse order of removal.

Tightening torque:
23 N·m (2.3 kgf-m, 17 ft-lb)



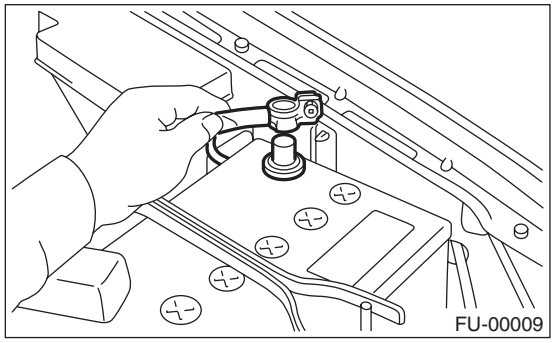
C: INSPECTION

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

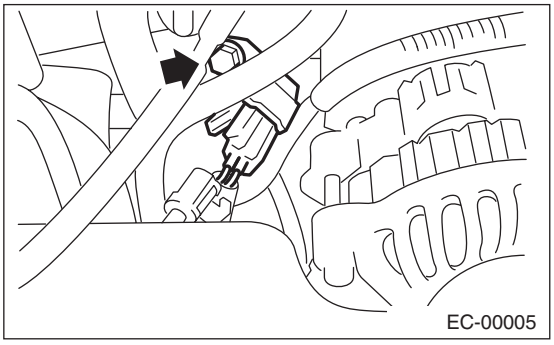
5. Purge Control Solenoid Valve

A: REMOVAL

1) Disconnect the ground cable from battery.



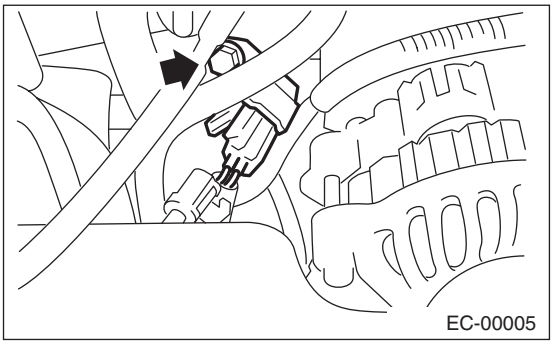
2) Disconnect the connector and hoses from purge control solenoid valve.
3) Loosen the bolt and remove the purge control solenoid valve from the intake manifold.



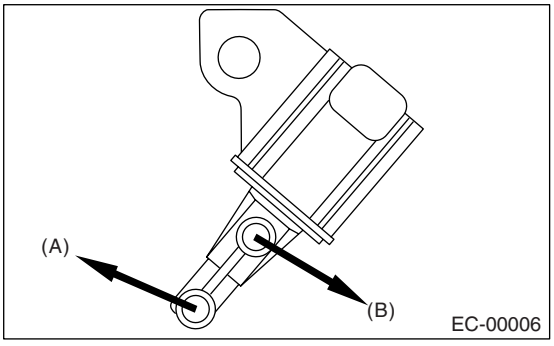
B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
19 N·m (1.9 kgf-m, 13.7 ft-lb)



NOTE:
Connect the evaporation hose as shown in the figure.



(A) To purge value
(B) To intake manifold

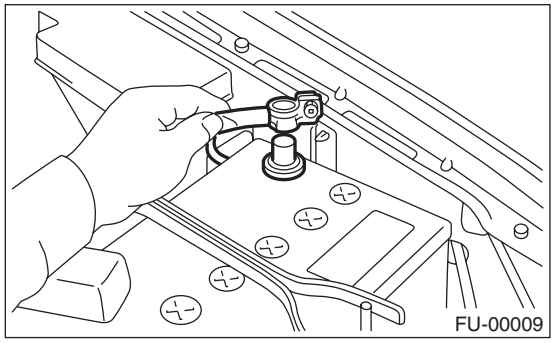
C: INSPECTION

Make sure the hoses are not cracked or loose.

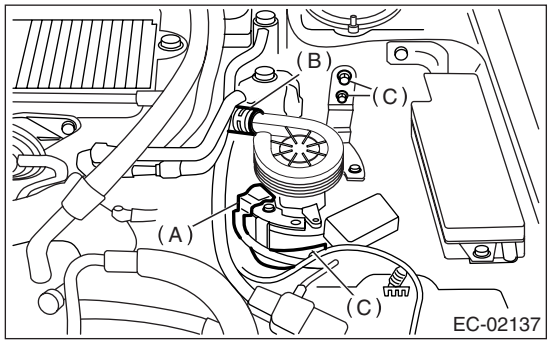
6. Secondary Air Pump

A: REMOVAL

1) Disconnect the ground cable from battery.



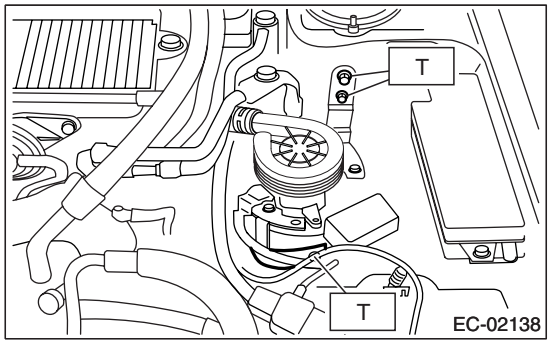
2) Disconnect the connector (A) from secondary air pump.
3) Disconnect the hose (B) from secondary air pump.
4) Remove the bolt (C) which secures the secondary air pump to the body.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
5 N·m (0.5 kgf-m, 3.7 ft-lb)



C: INSPECTION

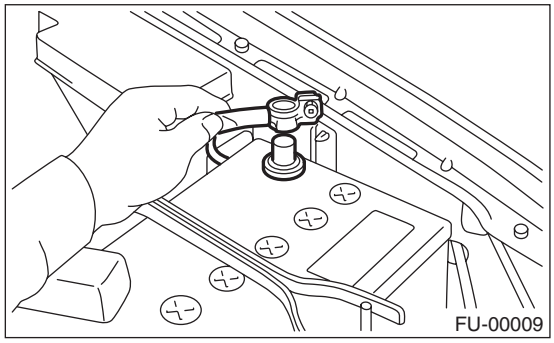
Make sure the hoses are not cracked or loose.

7. Secondary Air Combination Valve

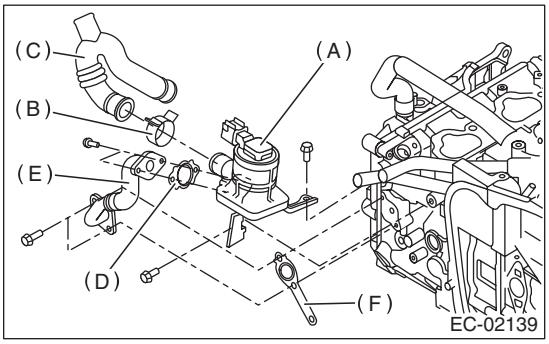
A: REMOVAL

1. SECONDARY AIR COMBINATION VALVE LH

1) Disconnect the ground cable from battery.



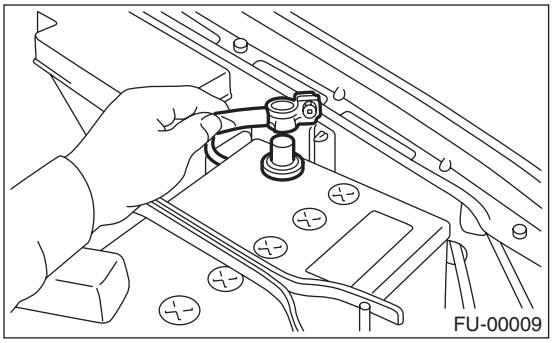
2) Remove the intercooler. <Ref. to IN(H4DOTC)-10, REMOVAL, Intercooler.>
3) Disconnect the connector from the secondary air combination valve LH.
4) Disconnect the air duct.
5) Disconnect the pipe LH.
6) Remove the secondary air combination valve LH.



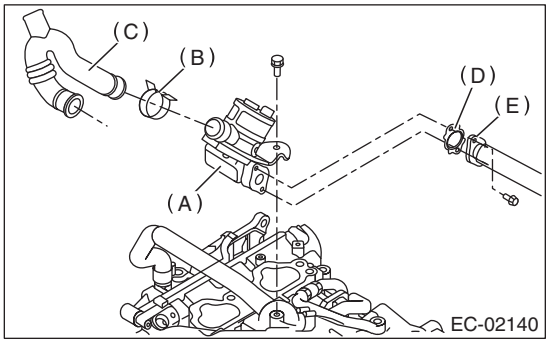
(A) Secondary air combination valve LH
(B) Clamp
(C) Air duct
(D) Gasket
(E) Pipe LH
(F) Gasket

2. SECONDARY AIR COMBINATION VALVE RH

1) Disconnect the ground cable from battery.



2) Remove the intercooler. <Ref. to IN(H4DOTC)-10, 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

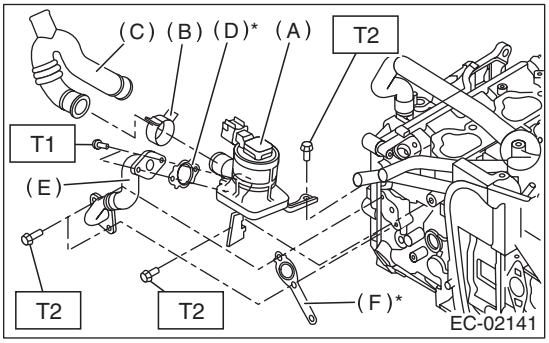
B: INSTALLATION

1. SECONDARY AIR COMBINATION VALVE LH

Install in the reverse order of removal.

NOTE:
Use a new gasket.

Tightening torque:
T1: 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)
T2: 19 N·m (1.9 kgf-m, 13.7 ft-lb)



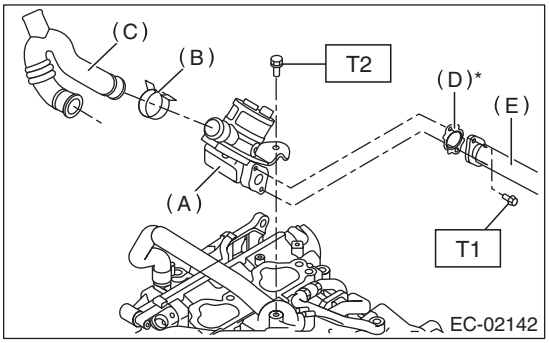
(A) Secondary air combination valve LH
(B) Clamp
(C) Air duct
(D) Gasket
(E) Pipe LH
(E) Gasket

2. SECONDARY AIR COMBINATION VALVE RH

Install in the reverse order of removal.

NOTE:
Use a new gasket.

Tightening torque:
T1: 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)
T2: 19 N·m (1.9 kgf-m, 13.7 ft-lb)



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

C: INSPECTION

Check the air duct and pipe for looseness.

8. Fuel Level Sensor

A: REMOVAL

Refer to the FU(H4DOTC) section for removal procedure. <Ref. to FU(H4DOTC)-60, REMOVAL, Fuel Level Sensor.>

B: INSTALLATION

Refer to the FU(H4DOTC) section for installation procedure. <Ref. to FU(H4DOTC)-60, 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)-60, 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)-60, INSTALLATION, Fuel Level Sensor.>

10.Fuel Sub Level Sensor

A: REMOVAL

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

B: INSTALLATION

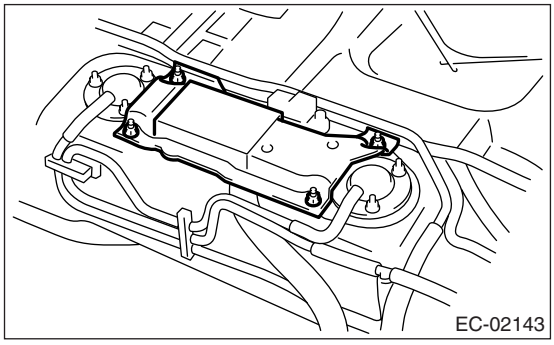
Refer to the FU(H4DOTC) section for installation procedure. <Ref. to FU(H4DOTC)-61, INSTALLATION, Fuel Sub Level Sensor.>

11.Fuel Tank Pressure Sensor

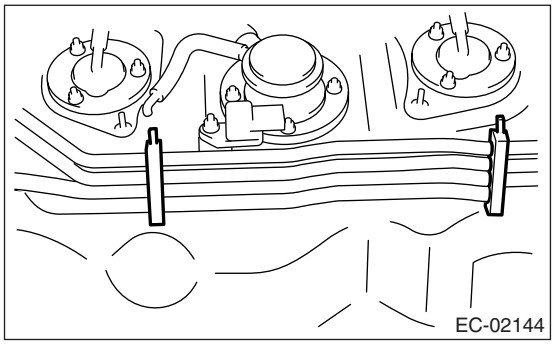
A: REMOVAL

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel.**

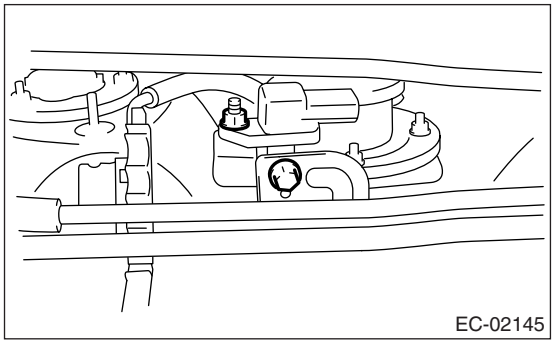
1) Remove the fuel tank. <Ref. to FU(H4DOTC)-51, REMOVAL, Fuel Tank.>
2) Remove the protect cover.



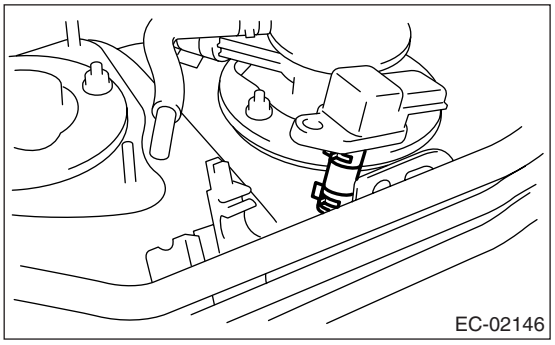
3) Disconnect the connector from the fuel pressure sensor.
4) Remove the clip which holds the fuel pipe to the fuel tank.



5) Remove the bolt and nut which secures the fuel tank pressure sensor to the bracket.



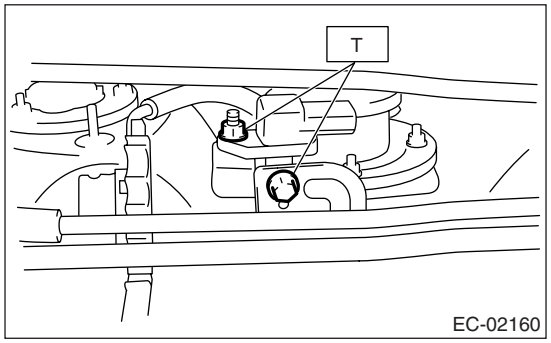
6) Disconnect the pressure hose from the fuel tank pressure sensor.



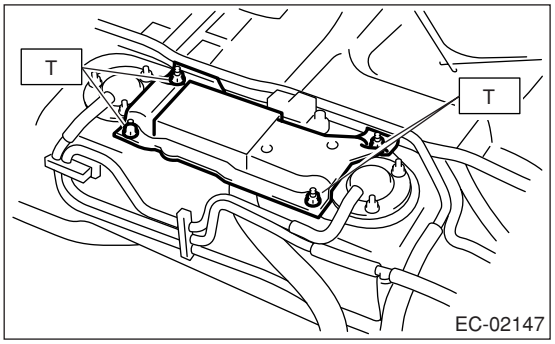
B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
7.4 N·m (0.75 kgf-m, 5.4 ft-lb)



Tightening torque:
4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



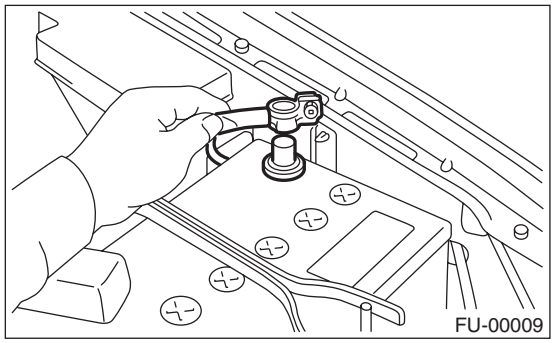
C: INSPECTION

Make sure the hoses are not cracked or loose.

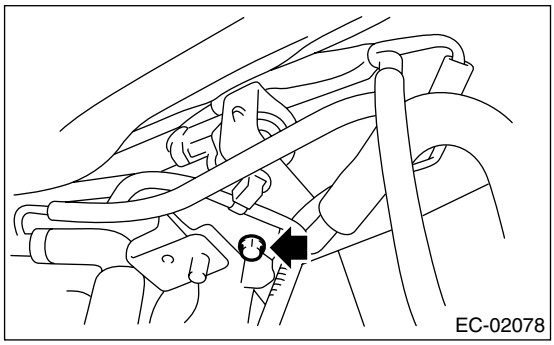
12.Pressure Control Solenoid Valve

A: REMOVAL

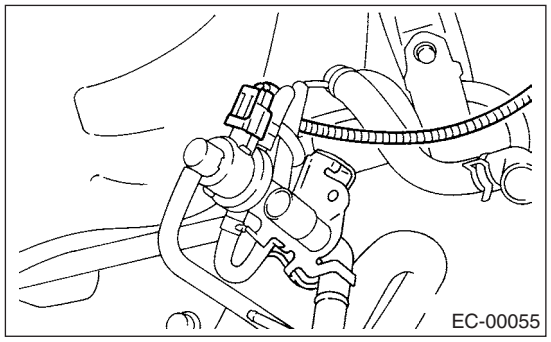
1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.



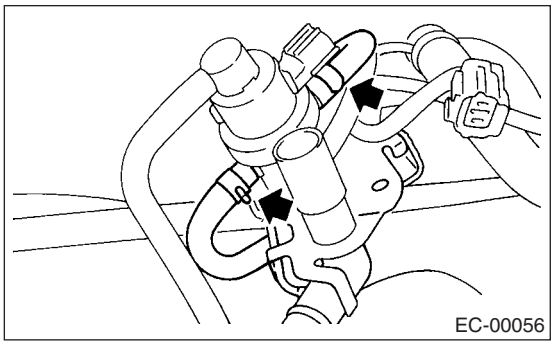
3) Lift-up the vehicle.
4) Remove the canisters. <Ref. to EC(H4DOTC)-7, REMOVAL, Canister.>
5) Remove the bolt which installs the pressure control solenoid valve holding bracket to the body.



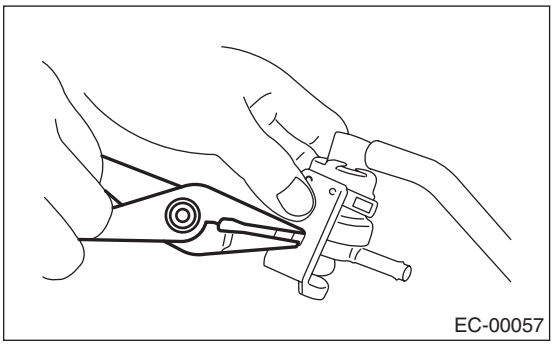
6) Disconnect the connector from the pressure control solenoid valve.



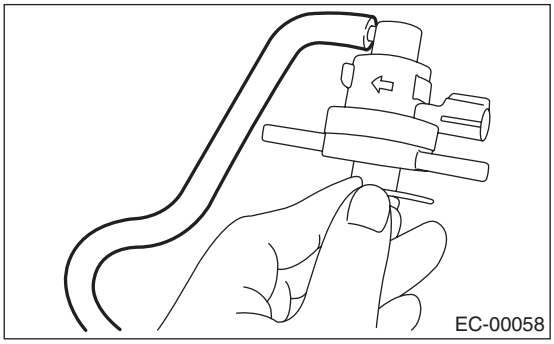
7) Disconnect the two evaporation hoses from the pressure control solenoid valve.



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



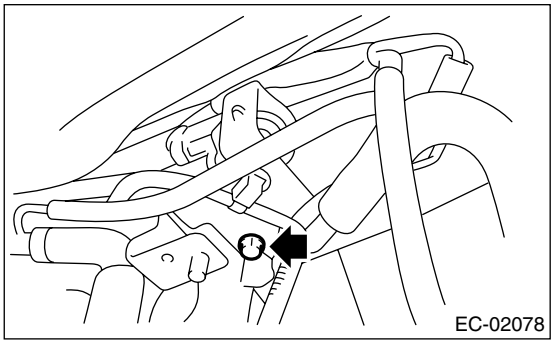
9) Disconnect the hose from the pressure control solenoid valve.



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

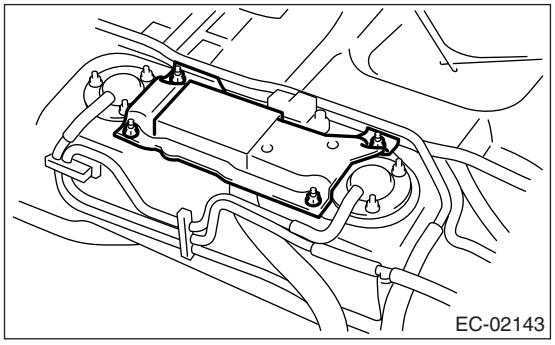
The drain filter is embedded in the canister and therefore cannot be disassembled.

14.Vent Valve

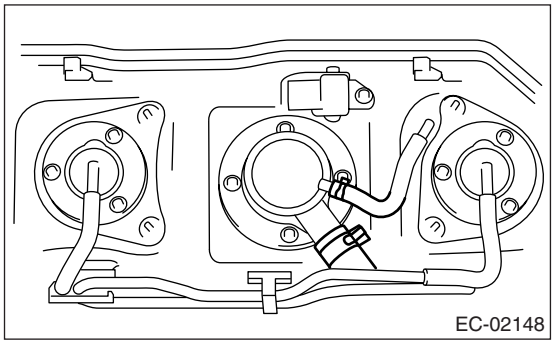
A: REMOVAL

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel.**

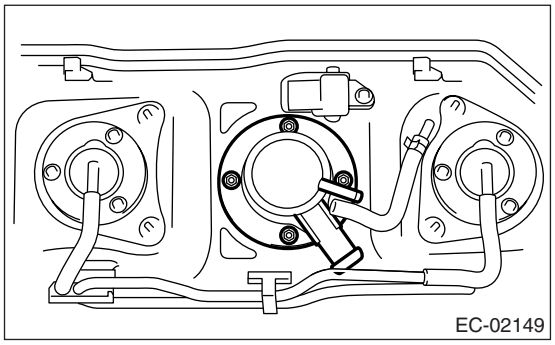
1) Remove the fuel tank. <Ref. to FU(H4DOTC)-51, REMOVAL, Fuel Tank.>
2) Remove the protect cover.



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



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

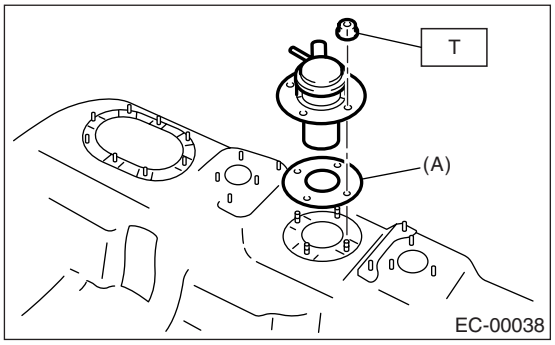


B: INSTALLATION

Install in the reverse order of removal.

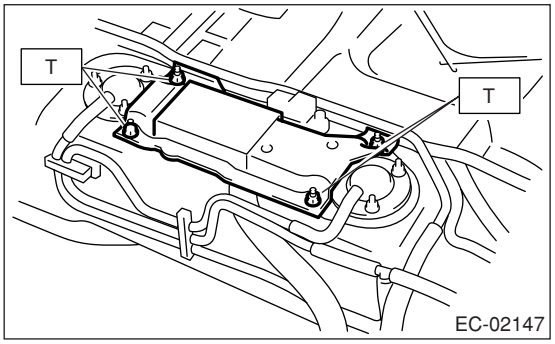
NOTE:
Always use new gasket.

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

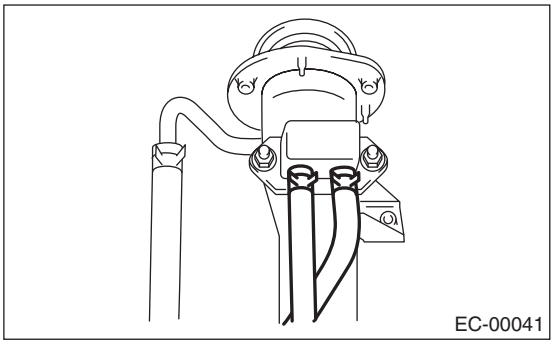
Make sure the hoses are not cracked or loose.

15.Shut Valve

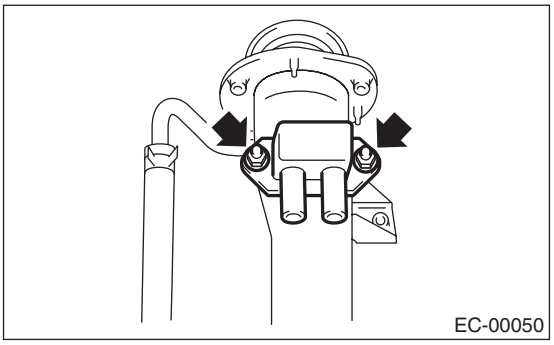
A: REMOVAL

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel.**

1) Remove the fuel filler pipe.
<Ref. to FU(H4DOTC)-54, REMOVAL, Fuel Filler Pipe.>
2) Disconnect the evaporation hose from shut valve.



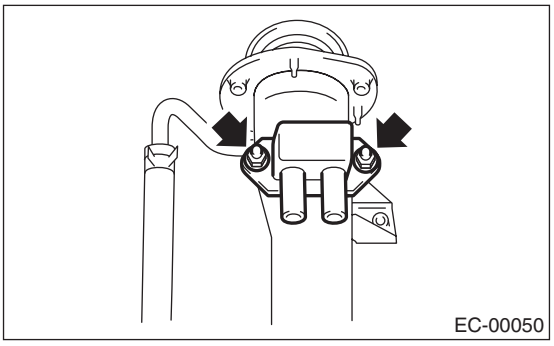
3) Remove the shut valve from the fuel filler pipe.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
4.5 N·m (0.46 kgf-m, 3.3 ft-lb)



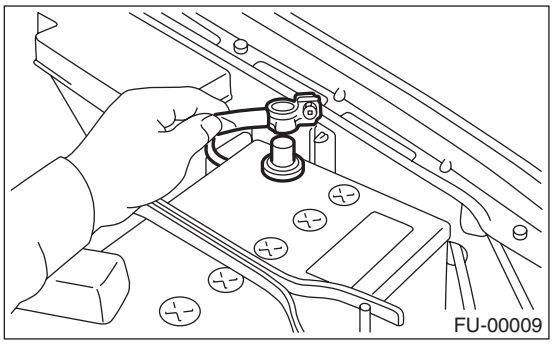
C: INSPECTION

Make sure the hoses are not cracked or loose.

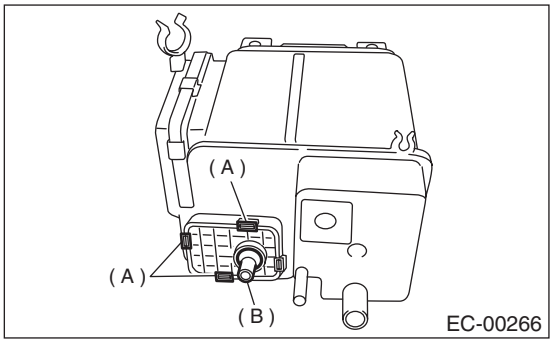
16.Drain Valve

A: REMOVAL

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



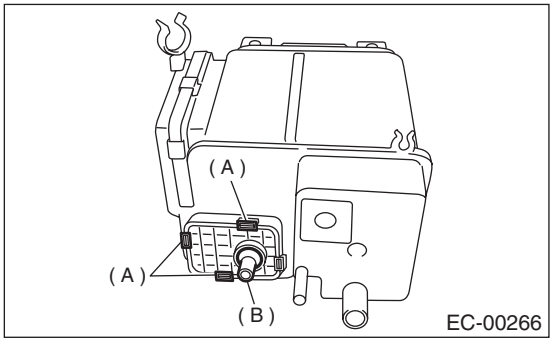
3) Lift-up the vehicle.
4) Remove the canister. <Ref. to EC(H4DOTC)-7, REMOVAL, Canister.>
5) Disengage the clip (A), then remove the drain valve (B) from the canister.



B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Replace clip (A) with a new one.



C: INSPECTION

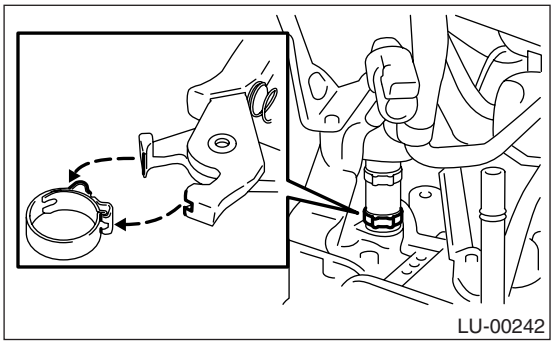
1) Make sure that all hoses are properly connected.
2) Make sure the hoses are not cracked or loose.

17.PCV Hose Assembly

A: REMOVAL

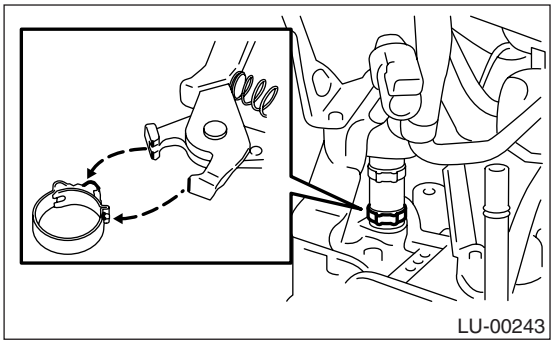
CAUTION:
Do not remove if the PCV hose, diagnostics connector and PCV valve are not damaged.

1) Remove the intake manifold.
<Ref. to FU(H4DOTC)-14, REMOVAL, Intake Manifold.>
2) Fit the depression in the ST with the protrusion on the clamp to unlock.
3) Remove the PCV hose assembly.
ST 18353AA000 CLAMP PLIERS



B: INSTALLATION

NOTE:
Replace the clamp with a new one.
1) Install the PCV hose assembly, then lock by fitting the ST on the clamp protrusion.
ST 18353AA000 CLAMP PLIERS



2) Install the intake manifold.
<Ref. to FU(H4DOTC)-17, INSTALLATION, Intake Manifold.>

INTAKE (INDUCTION)

IN(H4DOTC)

Page

1. General Description 2
2. Air Cleaner Case 7
3. Air Intake Duct 8
4. Intake Duct 9
5. Intercooler 10
6. Turbocharger 12
7. Air By-pass Valve 15
8. Resonator Chamber 16

1. Basic Diagnostic Procedure

A: PROCEDURE

1. ENGINE

	Step	Check	Yes	No
1	**CHECK ENGINE START FAILURE.** 1) Ask the customer when and how the trouble occurred using the interview check list. <Ref. to EN(H4DOTC)(diag)-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)-53, Diagnostics for Engine Starting Failure.>
2	**CHECK ILLUMINATION OF MALFUNCTION INDICATOR LIGHT.**	Does the malfunction indicator light illuminate?	Go to step **3**.	Inspection using "General Diagnostic Table" <Ref. to EN(H4DOTC)(diag)-387, General Diagnostic Table.>
3	**CHECK INDICATION OF DTC ON THE DISPLAY.** 1) Turn the ignition switch OFF. 2) Connect the Subaru Select Monitor or general scan tool to data link connector. 3) Turn the ignition switch to ON, and the Subaru Select Monitor or general scan tool power switch to ON. 4) Read DTC on Subaru Select Monitor or general scan tool.	Is DTC displayed on the Subaru Select Monitor or general scan tool?	Record the DTC. Repair the trouble cause. <Ref. to EN(H4DOTC)(diag)-65, 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)-49, Malfunction Indicator Light.>
4	**PERFORM DIAGNOSIS.** 1) Perform the Clear Memory Mode. <Ref. to EN(H4DOTC)(diag)-46, Clear Memory Mode.> 2) Perform the Inspection Mode. <Ref. to EN(H4DOTC)(diag)-36, 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)-73, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

2. Check List for Interview

A: CHECK

1. CHECK LIST No. 1

Check the following item when problem has occurred.

NOTE:
Use copies of this page for interviewing customers.

Customer's name		Engine No.	
Date of sale		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		

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.
• The ECM will be destroyed instantly.
• The fuel injector and other parts will be damaged.

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

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

5) Poor contact has been identified as a primary cause of this problem. Measure the voltage or resistance of individual sensor or all electrical control modules using a tapered pin with a diameter of less than 0.64 mm (0.025 in). Do not insert the pin more than 5 mm (0.20 in) into the part.

6) Remove the ECM from the located position after disconnecting two cables on battery.
• Otherwise, the ECM may be damaged.

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

7) Connectors of each sensor in the engine compartment and the harness connectors on the engine side and body side are all designed to be waterproof. Even if the connectors are waterproof, take care not to allow water to get into them when washing the vehicle, or when servicing the vehicle in rainy weather.

8) Use ECM mounting stud bolts as the body head grounding point when measuring voltage and resistance in the passenger compartment.

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

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

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

CAUTION:
• The antenna must be kept as far apart as possible from control unit. (The ECM is located under the steering column, inside of instrument panel lower trim panel.)
• The antenna feeder must be placed as far apart as possible from the ECM and MFI harness.
• Carefully adjust the antenna for correct matching.
• When mounting a large power type radio, pay special attention to the three items mentioned above.
• Incorrect installation of the radio may affect the operation of ECM.

12) Release fuel pressure before disconnecting the fuel hose. <Ref. to FU(H4DOTC)-50, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>

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

B: INSPECTION

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

1. BATTERY

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

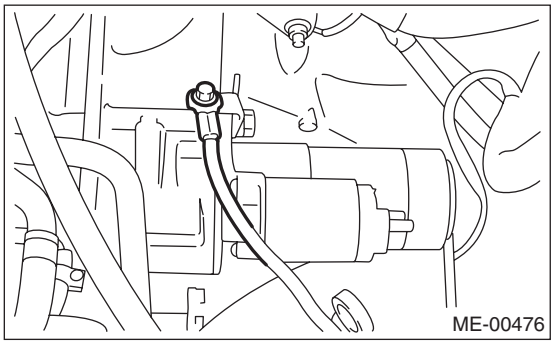
Standard voltage:
12 V

Specific gravity:
1.260 or more

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

2. ENGINE GROUND

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



C: NOTE

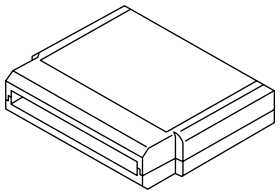
1. GENERAL DESCRIPTION

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

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

D: PREPARATION TOOL

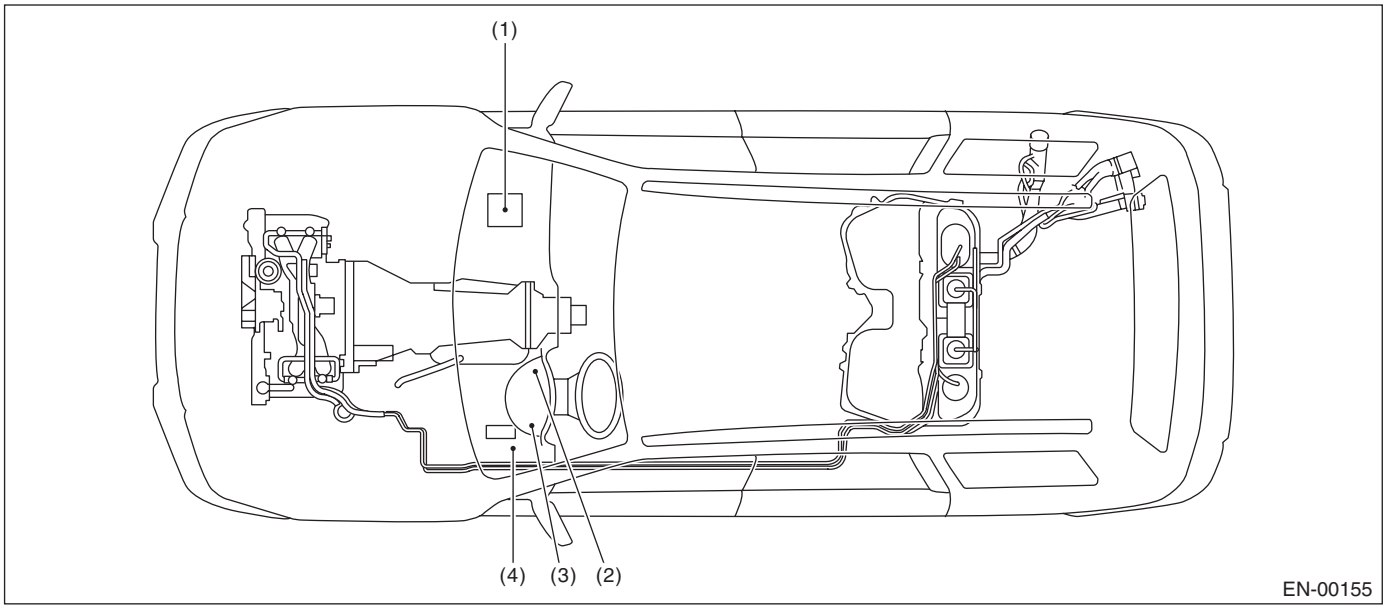
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18482AA010	18482AA010	CARTRIDGE	Troubleshooting for the electrical system.
ST22771AA030	22771AA030	SUBARU SELECT MONITOR KIT	Troubleshooting for the electrical system.

4. Electrical Component Location

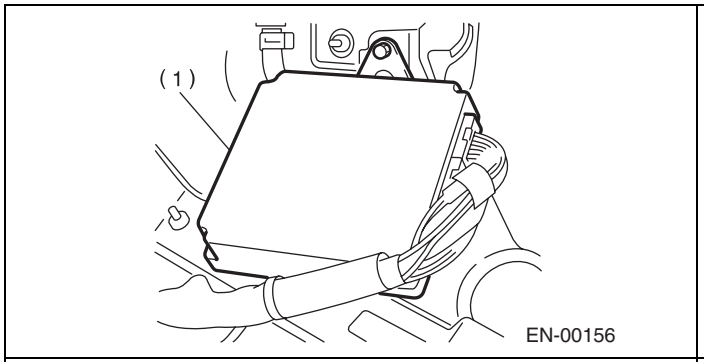
A: LOCATION

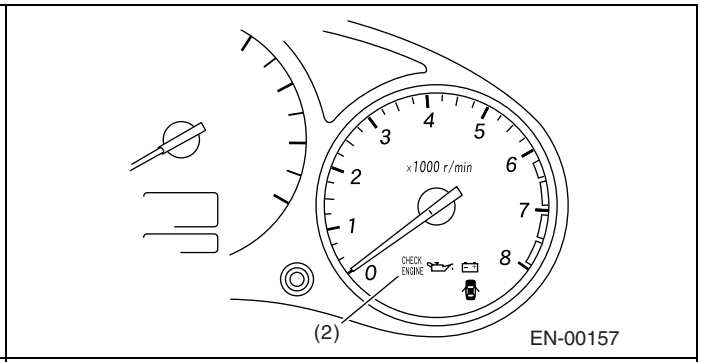
1. ENGINE

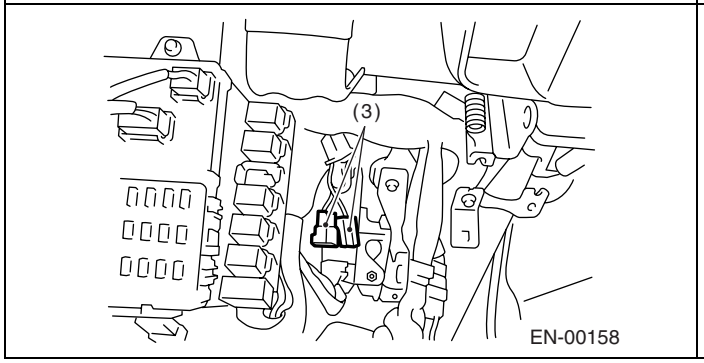
- Control module

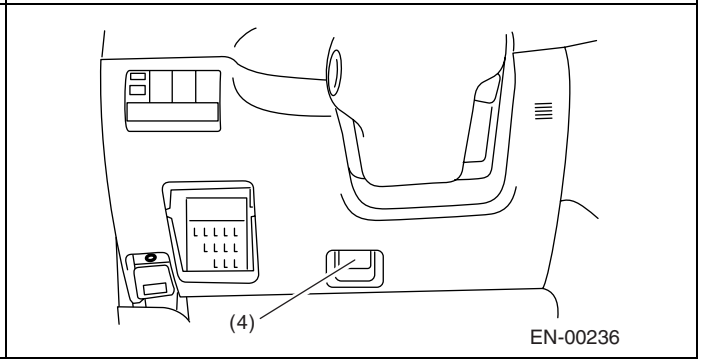


(1) Engine control module (ECM)
(2) Malfunction indicator light
(3) Test mode connector
(4) Data link connector

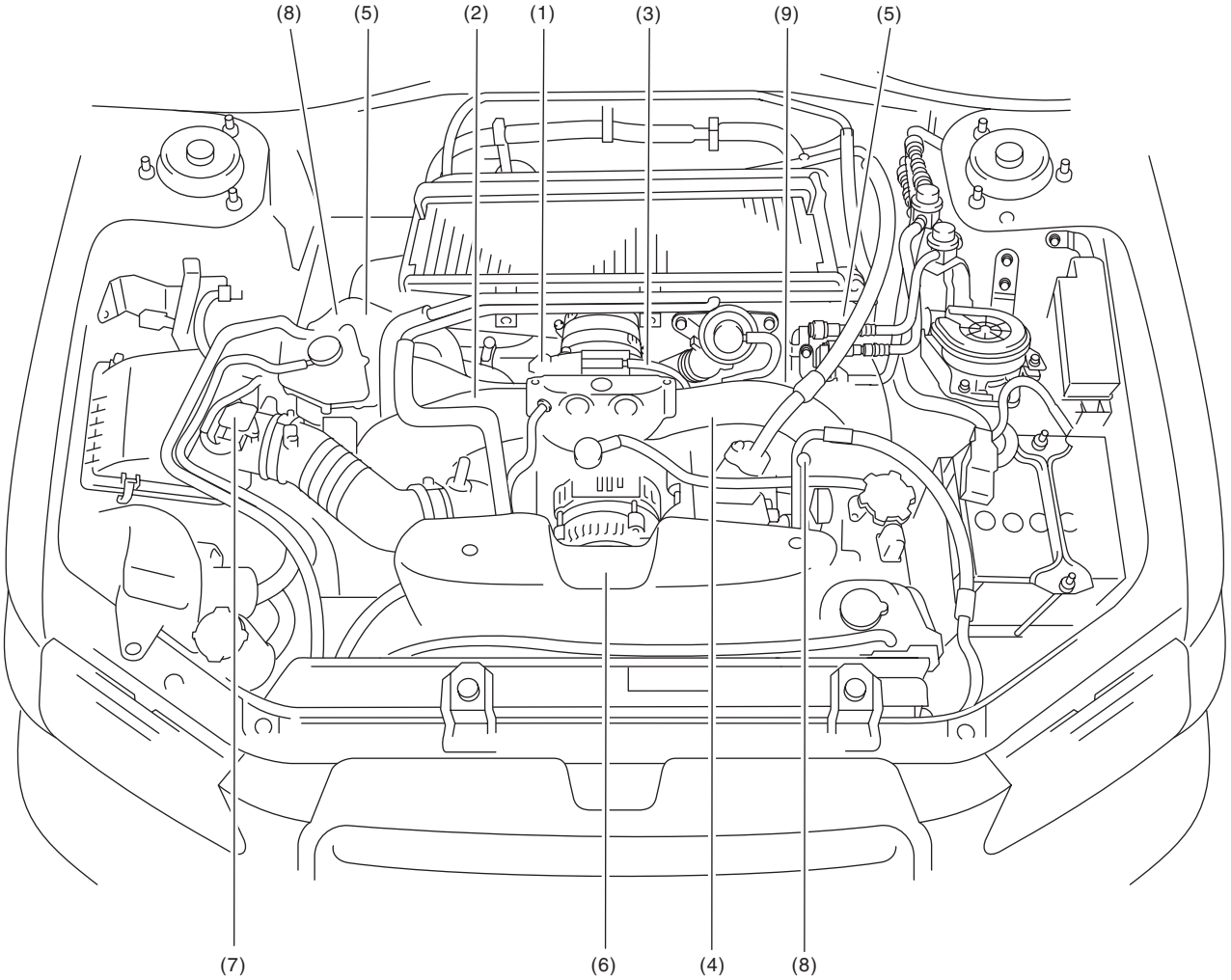




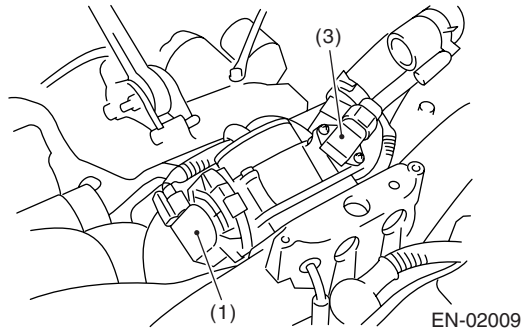


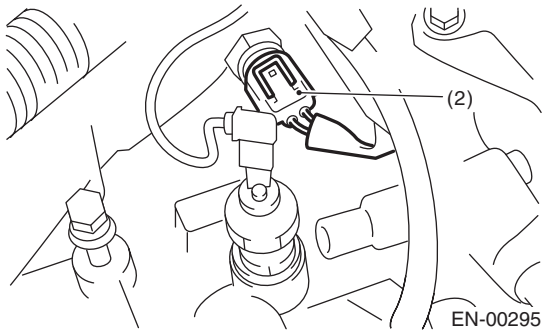


- Sensor



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


(3)
(1)
EN-02009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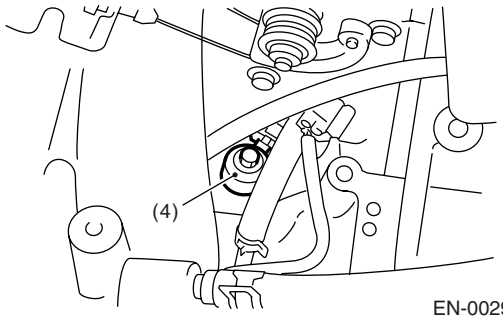
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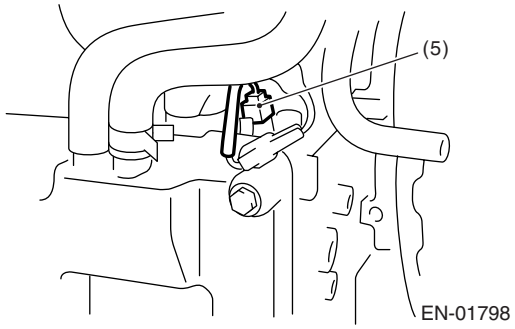
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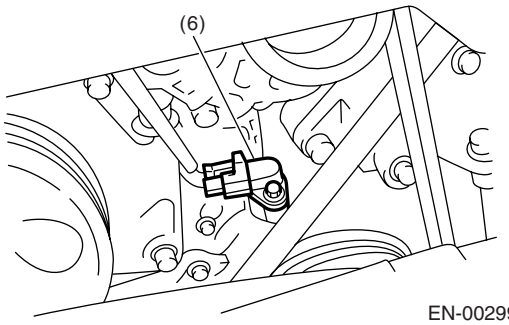
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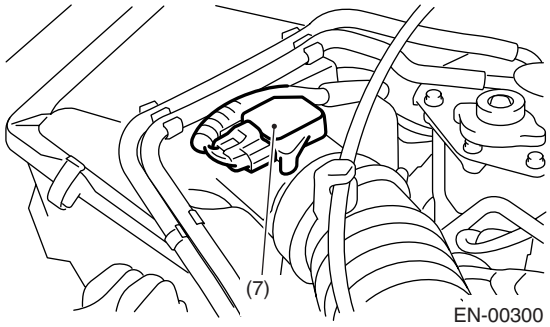
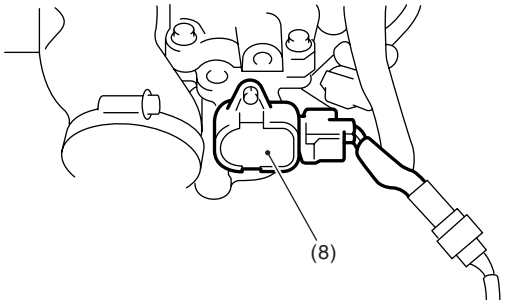
EN-00299


(7)
EN-00300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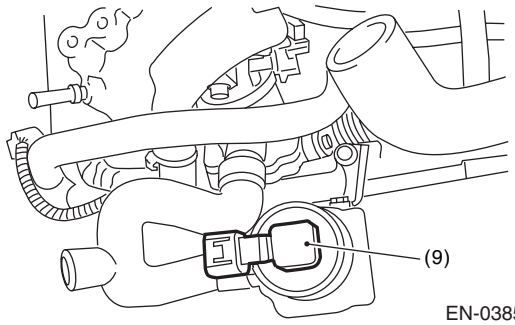
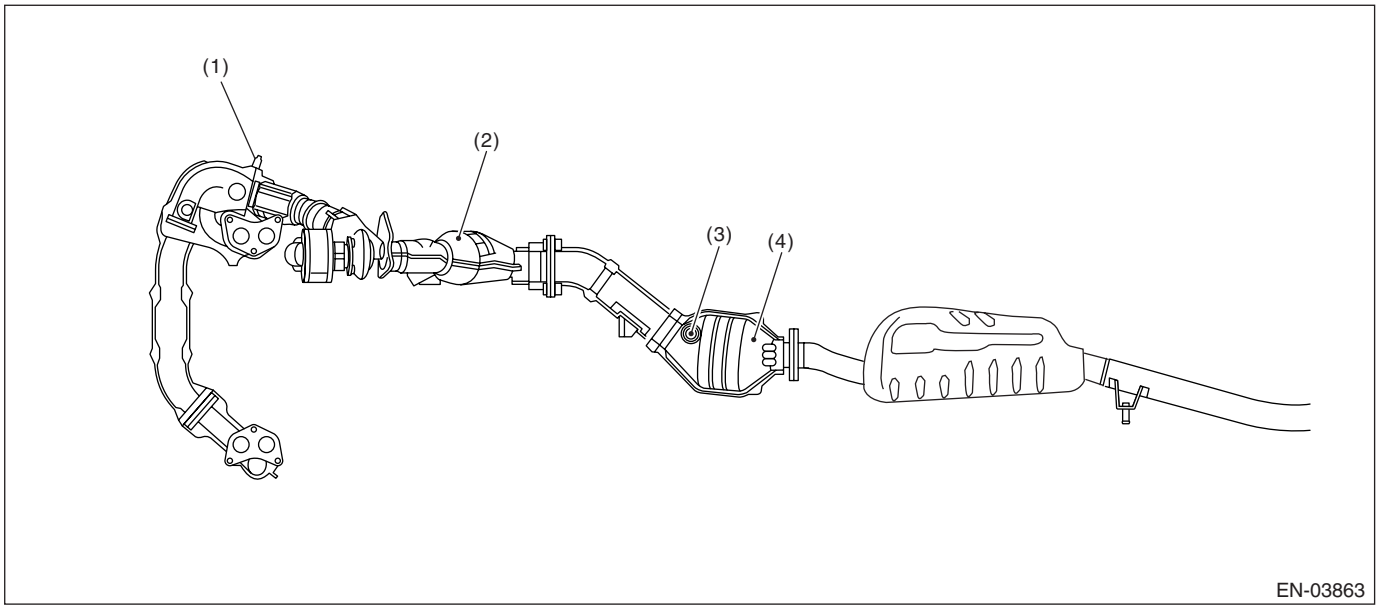
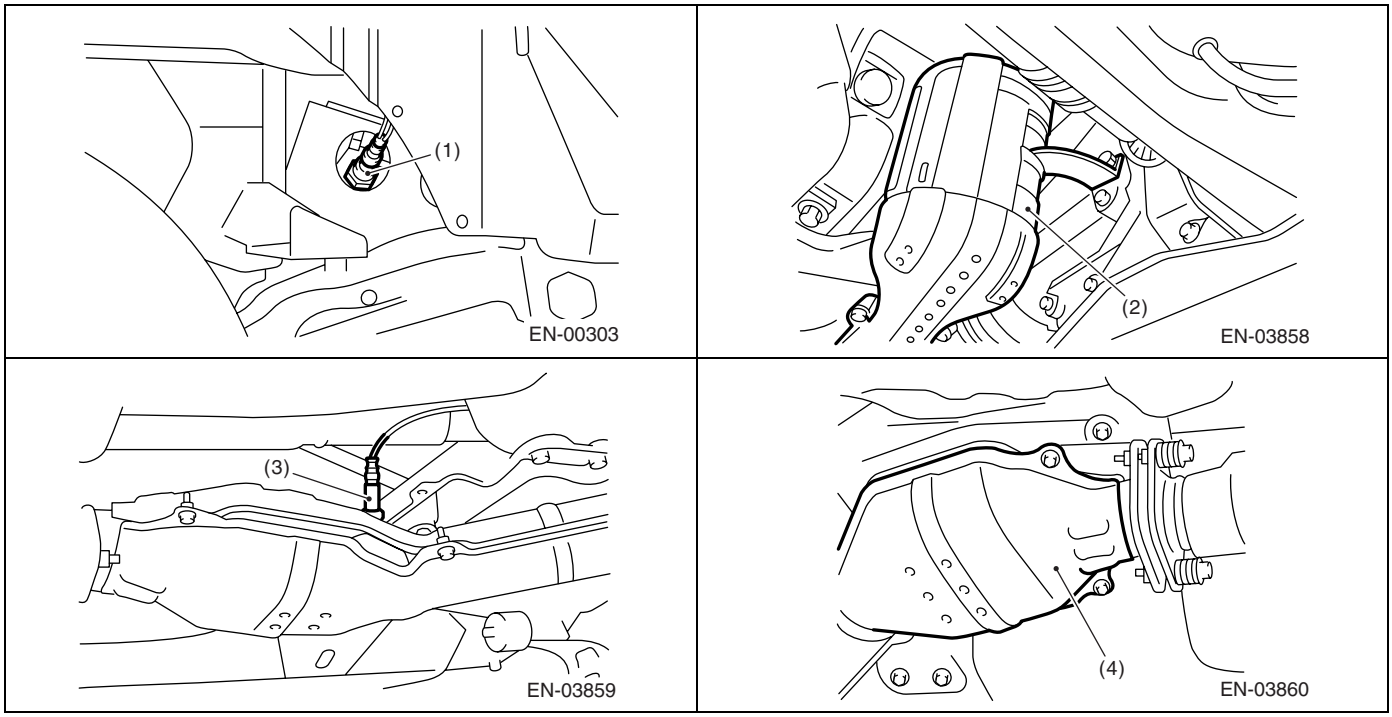
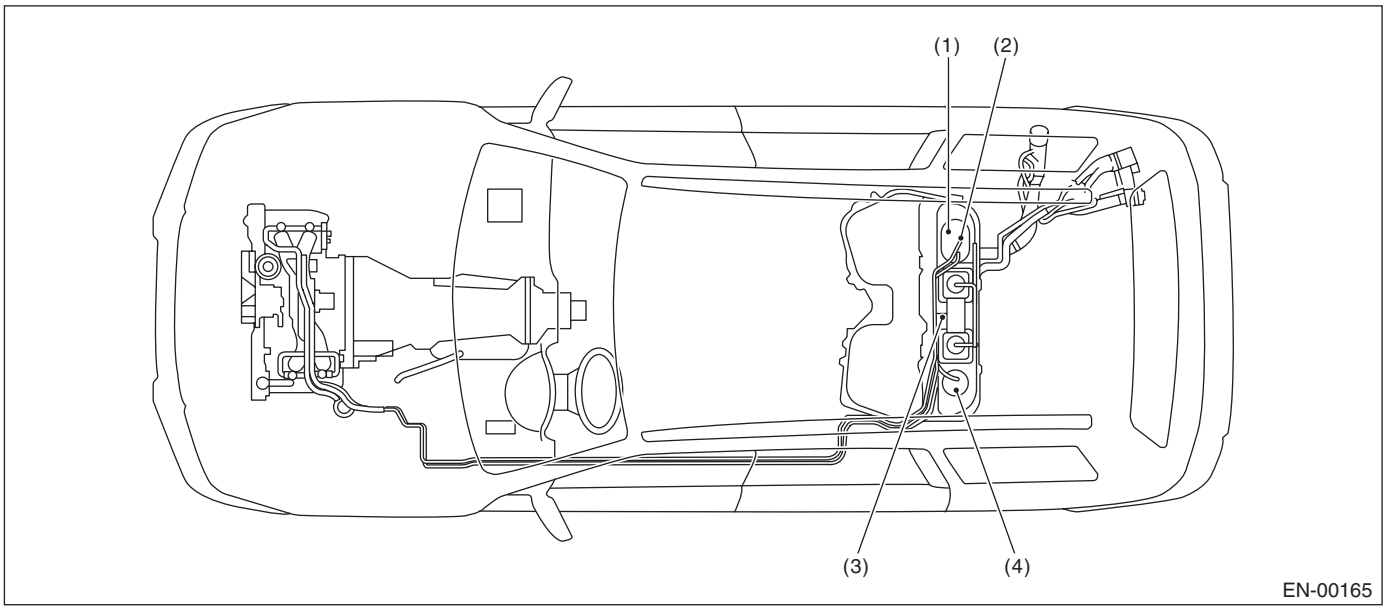

(9)
EN-03855



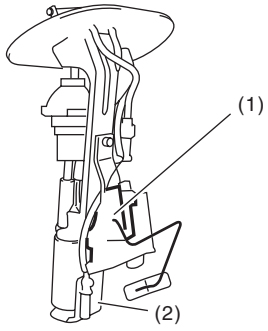
(1) Front oxygen (A/F) sensor
(2) Front catalytic converter
(3) Rear oxygen sensor
(4) Rear catalytic converter



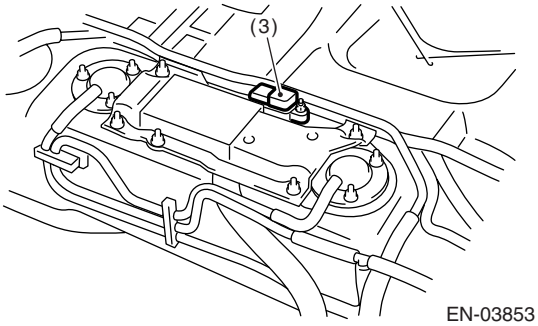
Electrical Component Location



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



EN-03852



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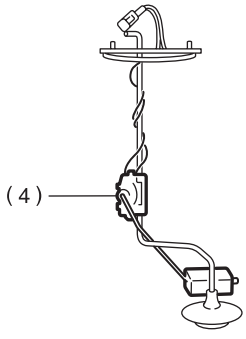
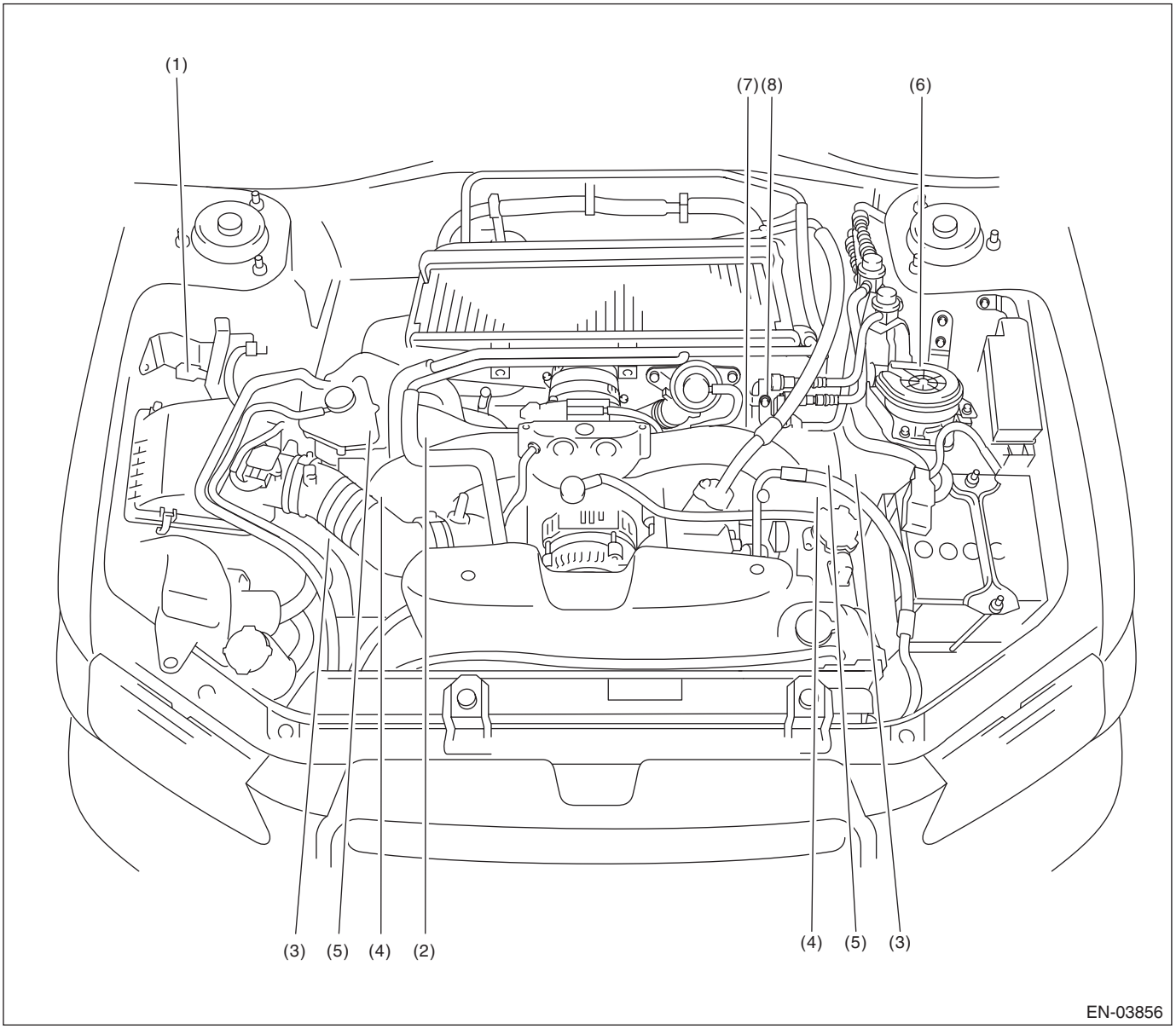
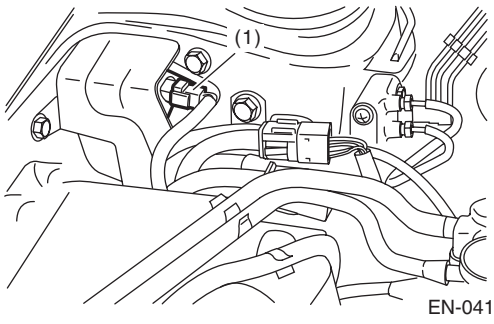


EN-00168

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



(1) Wastegate control solenoid valve
(2) Purge control solenoid valve
(3) Ignition coil
(4) Tumble generator valve actuator
(5) Oil flow control solenoid valve
(6) Secondary air pump
(7) Secondary air injection system switching valve (RH)
(8) Secondary air injection system switching valve (RH)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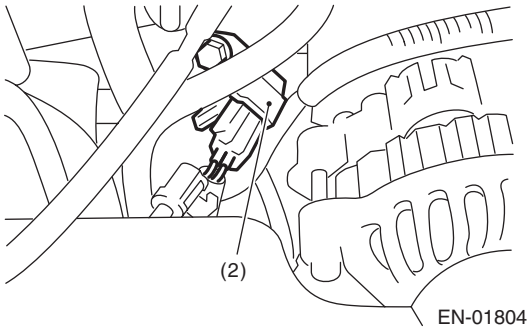
EN-04111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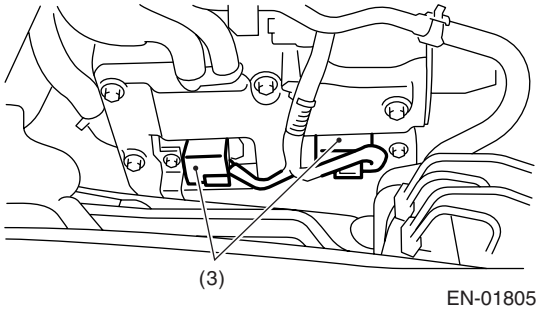
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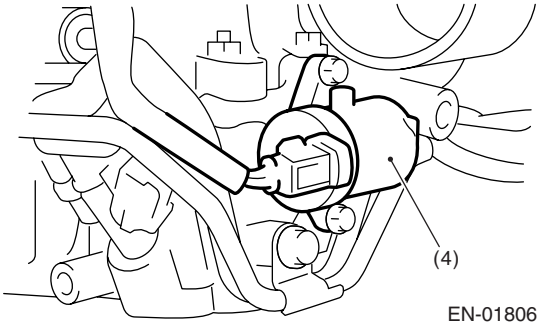
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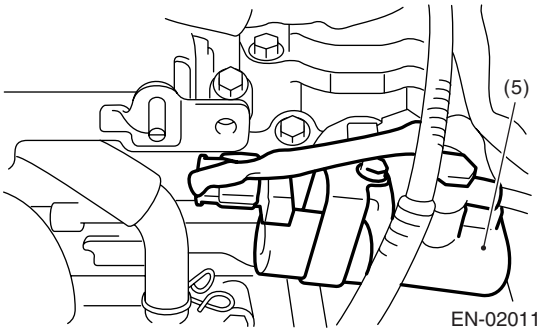
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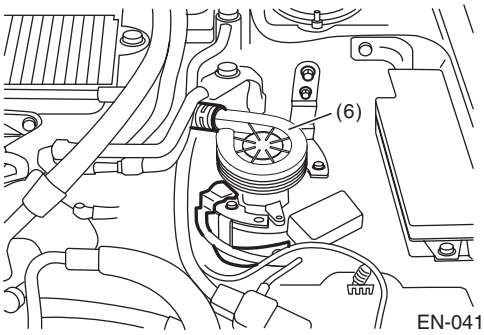
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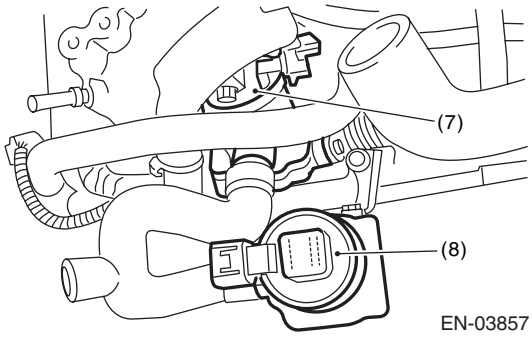
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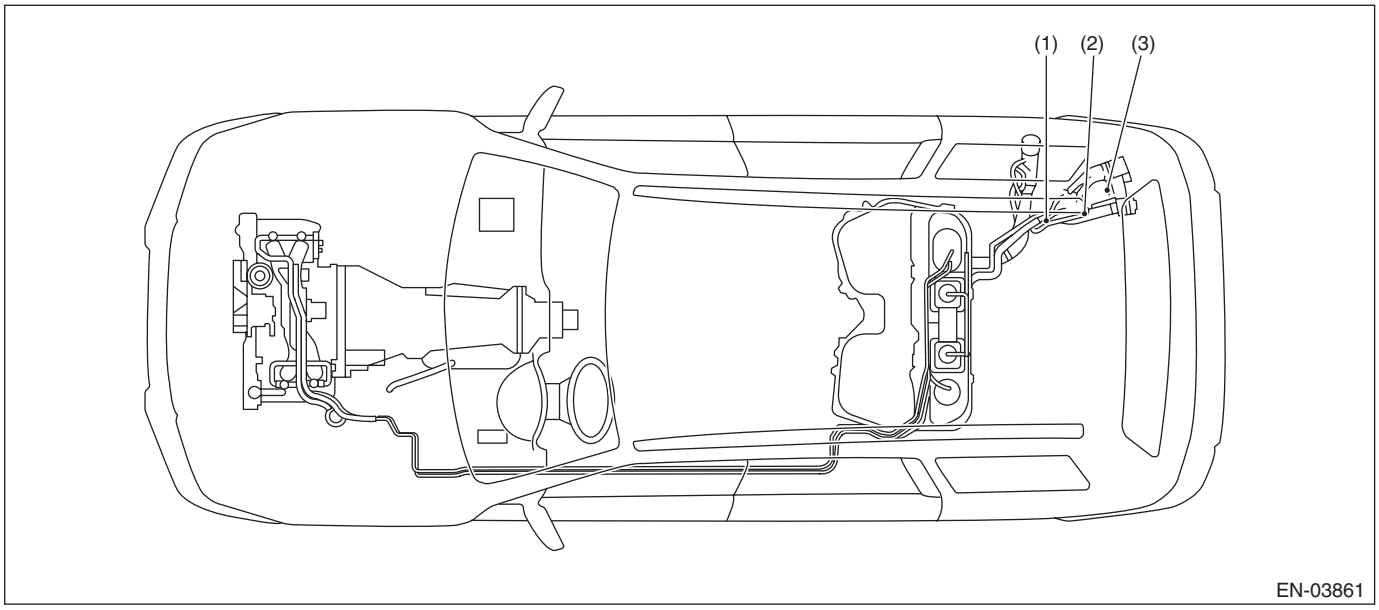
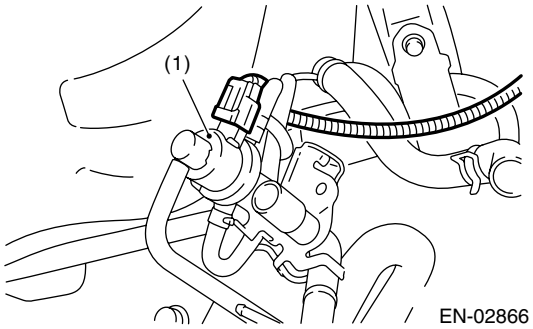
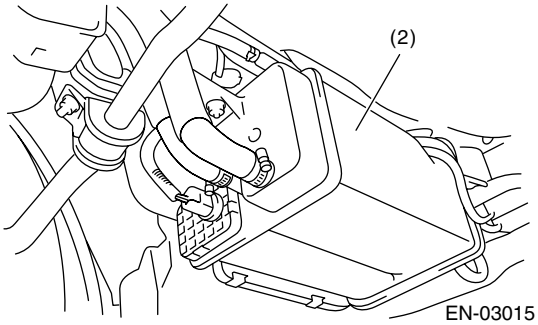
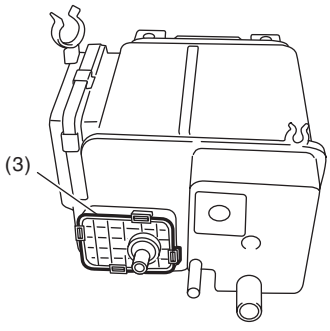
EN-03857



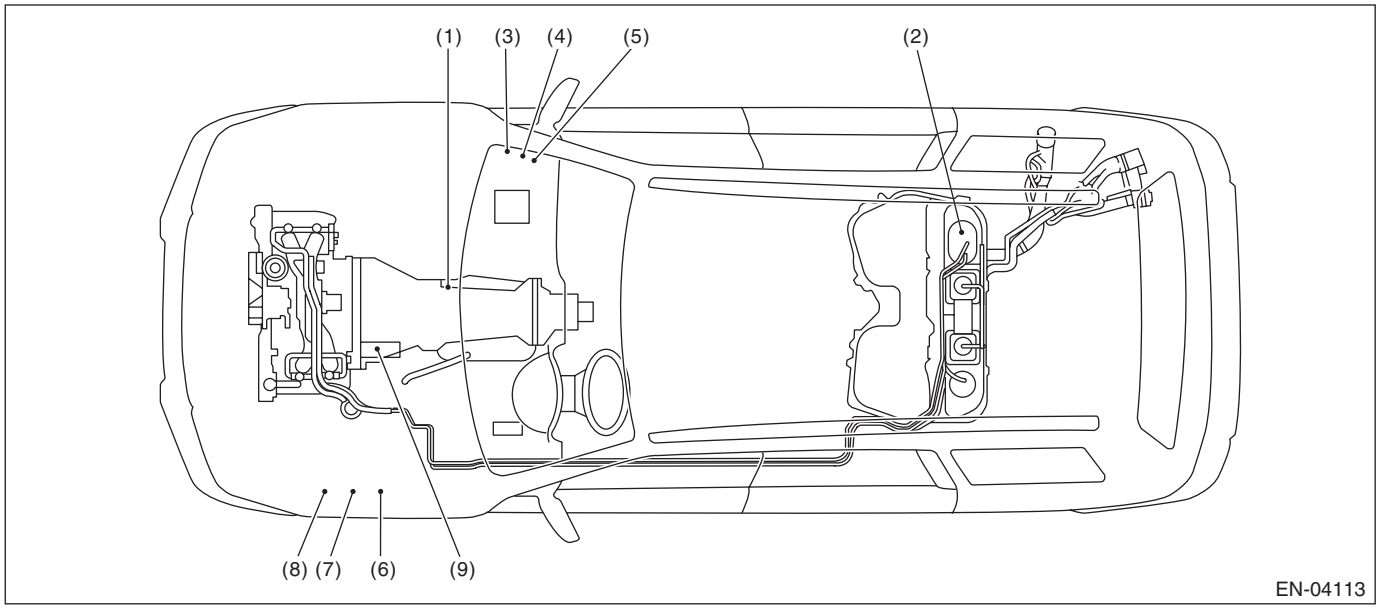
(1) Pressure control solenoid valve (2) Canister (3) Drain valve



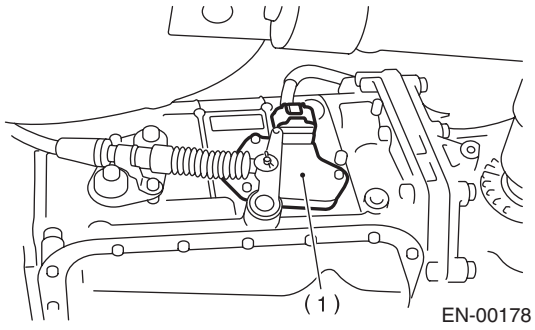


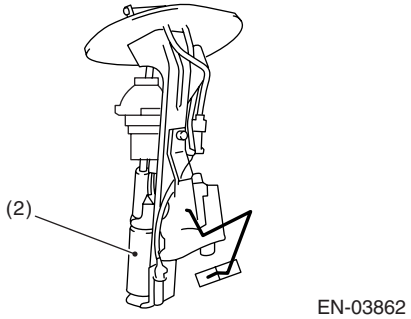


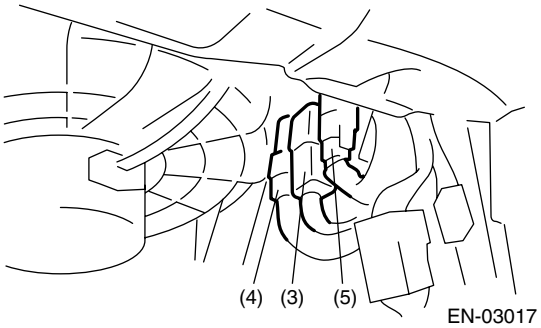
Electrical Component Location

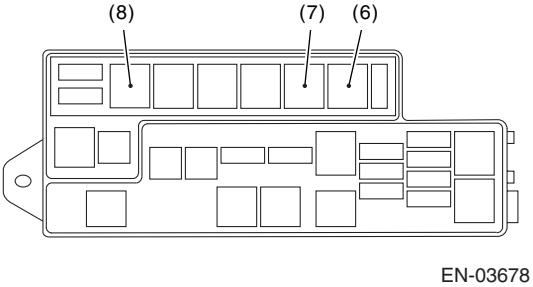


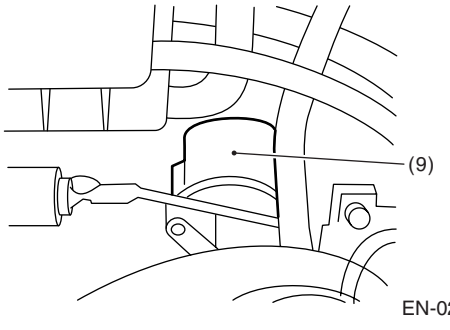
(1) Inhibitor switch
(2) Fuel pump
(3) Main relay
(4) Fuel pump relay
(5) Electronic throttle control relay
(6) Radiator main fan relay
(7) Radiator sub fan relay
(8) Fan mode relay
(9) Starter





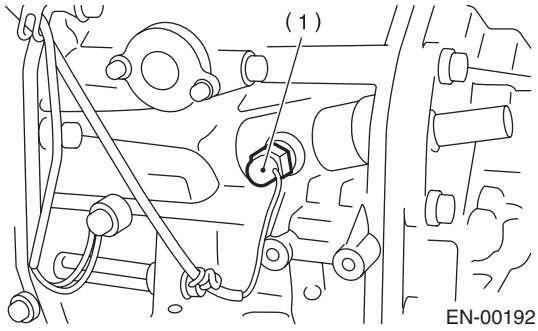






2. TRANSMISSION

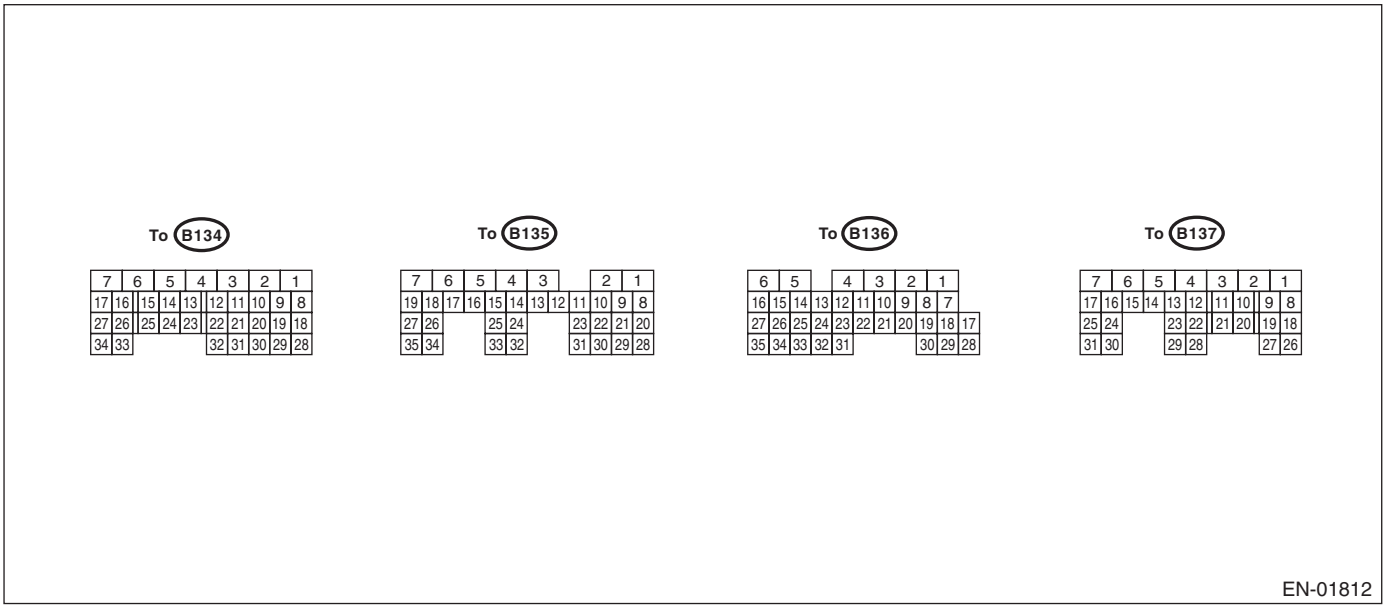
- Solenoid valve and switch (MT vehicles)



(1) Neutral position switch

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

A: ELECTRICAL SPECIFICATION



Description		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (engine OFF)	Engine ON (idling)	
Crankshaft position sensor	Signal (+)	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	2	0 — 1.0	—	Sensor output waveform
	Signal 2	B136	3	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)	B136	30	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	30	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	—

Description		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (engine OFF)	Engine ON (idling)	
Tumble generator valve RH (open)		B137	22	0 or 10 — 13	0 or 12 — 14	Sensor output waveform
Tumble generator valve RH (close)		B137	23	0 or 10 — 13	0 or 12 — 14	Sensor output waveform
Tumble generator valve LH (open)		B137	12	0 or 10 — 13	0 or 12 — 14	Sensor output waveform
Tumble generator valve LH (close)		B137	13	0 or 10 — 13	0 or 12 — 14	Sensor output waveform
Wastegate control solenoid valve		B137	27	0 or 10 — 13	0 or 12 — 14	Sensor output waveform
Starter switch		B136	32	0	0	Cranking: 8 — 14
A/C switch		B136	24	ON: 10 — 13 OFF: 0	ON: 12 — 14 OFF: 0	—
Ignition switch		B135	19	10 — 13	12 — 14	—
Neutral position switch		B136	31	ON: 10 — 13 OFF: 0	ON: 12 — 14 OFF: 0	—
Test mode connector		B135	27	10 — 13	13 — 14	When connected: 0
Knock sensor	Signal	B134	15	2.8	2.8	—
	Shield	B134	25	0	0	—
Back-up power supply		B135	5	10 — 13	12 — 14	Ignition switch “OFF”: 10 — 13
Control module power supply		B134	7	10 — 13	12 — 14	—
		B135	2	10 — 13	12 — 14	—
Sensor power supply		B134	19	5	5	—
Ignition control	#1	B137	18	0	12 — 14	Waveform
	#2	B137	19	0	12 — 14	Waveform
	#3	B137	20	0	12 — 14	Waveform
	#4	B137	21	0	12 — 14	Waveform
Fuel injector	#1	B137	8	10 — 13	1 — 14	Waveform
	#2	B137	9	10 — 13	1 — 14	Waveform
	#3	B137	10	10 — 13	1 — 14	Waveform
	#4	B137	11	10 — 13	1 — 14	Waveform
Fuel pump control unit	Signal 1	B136	12	0 or 5	0 or 5	Sensor output waveform
	Signal 2	B135	33	10 — 13	12 — 14	—
A/C relay control		B136	9	ON: 0.5 or less OFF: 10 — 13	ON: 0.5 or less OFF: 12 — 14	—
Radiator fan relay 1 control		B136	18	ON: 0.5 or less OFF: 10 — 13	ON: 0.5 or less OFF: 12 — 14	—
Radiator fan relay 2 control		B136	29	ON: 0.5 or less OFF: 10 — 13	ON: 0.5 or less OFF: 12 — 14	Model with A/C only
Malfunction indicator light		B136	11	—	—	Light “ON”: 1 or less Light “OFF”: 10 — 14
Engine speed output		B136	22	—	0 — 13 or more	Waveform
Purge control solenoid valve		B137	29	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 value obtained after the fuel filler cap was removed once and recapped.
	Power supply	B135	22	5	5	
	GND (sensor)	B135	30	0	0	—

Engine Control Module (ECM) I/O Signal

Description		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (engine OFF)	Engine ON (idling)	
Pressure control solenoid valve		B136	28	ON: 1 or less OFF: 10 — 13	ON: 1 or less OFF: 12 — 14	—
Drain valve		B136	17	ON: 1 or less OFF: 10 — 13	ON: 1 or less OFF: 12 — 14	—
Fuel level sensor		B135	10	0.12 — 4.75	0.12 — 4.75	—
Fuel temperature sensor signal		B135	17	2.5 — 3.8	2.5 — 3.8	Ambient temperature: 25°C (77°F)
Blow by leak diagnosis signal		B134	30	0	0	At the time of open circuit (fault): 5
Small light switch		B135	15	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	—
Blower fan switch		B135	16	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	—
Rear defogger switch		B135	14	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	—
Power steering oil pressure switch		B134	33	10 — 13	ON: 0 OFF: 12 — 14	—
Front oxygen (A/F) sensor signal (+)		B135	9	2.8 — 3.2	2.8 — 3.2	—
Front oxygen (A/F) sensor signal (–)		B135	8	2.4 — 2.7	2.4 — 2.7	—
Front oxygen (A/F) sensor shield		B135	1	0	0	—
SSM/GST communication line		B136	16	1 ← → 4	1 ← → 4	—
Ground (engine 4)		B137	1	0	0	—
Ground (ignition system)		B137	26	0	0	—
Ground (engine 3)		B137	2	0	0	—
Ground (engine 1)		B134	5	0	0	—
		B137	15	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 open: 3.96	0.64 — 0.72 (After engine is warmed-up.)	Fully closed: 0.6 Fully open: 3.96
	Sub	B134	28	1.51 — 1.58 Fully open: 4.17	1.51 — 1.58 (After engine is warmed-up.)	Fully closed: 1.48 Fully open: 4.17
	Power supply	B134	19	5	5	—
	Ground (sensor)	B134	29	0	0	—
Electronic throttle control motor (+)		B137	5	Duty waveform	Duty waveform	Drive frequency: 500 Hz
Electronic throttle control motor (–)		B137	4	Duty waveform	Duty waveform	Drive frequency: 500 Hz
Electronic throttle control motor power supply		B136	1	10 — 13	12 — 14	—
Electronic throttle control motor relay		B136	21	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	When ignition switch is turned to ON: ON

Description		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (engine OFF)	Engine ON (idling)	
Oil flow control solenoid (LH)	Signal (+)	B137	15	ON: 10 — 13 OFF: 0	ON: 12 — 14 OFF: 0	—
	Signal (–)	B137	14	0	0	—
Oil flow control solenoid (RH)	Signal (+)	B137	17	ON: 10 — 13 OFF: 0	ON: 12 — 14 OFF: 0	—
	Signal (–)	B137	16	0	0	—
Accelerator pedal position sensor	Main sensor signal	B135	23	Fully closed: 1 Fully open: 3.5	Fully closed: 1 Fully open: 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 open: 3.5	Fully closed: 1 Fully open: 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 clutch pedal is released: 10 — 13	When clutch pedal is depressed: 0 When clutch pedal is released: 12 — 14	—
SET/COAST switch		B135	24	ON: 10 — 13 OFF: 0	ON: 12 — 14 OFF: 0	—
Brake switch 1		B135	20	When brake pedal is depressed: 0 When brake pedal is released: 10 — 13	When brake pedal is depressed: 0 When brake pedal is released: 12 — 14	—
Brake switch 2		B135	28	When brake pedal is depressed: 10 — 13 When brake pedal is released: 0	When brake pedal is depressed: 12 — 14 When brake pedal is released: 0	—
Main switch		B135	12	ON: 10 — 13 OFF: 0	ON: 12 — 14 OFF: 0	—
CAN communication	Signal (+)	B136	27	Pulse signal		—
	Signal (–)	B136	35	Pulse signal		—
Secondary air piping pressure sensor	Signal	B134	27	1.7 — 2.4	1.1 — 1.6	—
	Power supply	B134	19	5	5	
	GND (sensor)	B134	29	0	0	
Secondary air combination valve relay 1		B136	30	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	—
Secondary air combination valve relay 2		B136	19	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	—
Secondary air pump relay		B136	8	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	—

6. Engine Condition Data

A: ELECTRICAL SPECIFICATION

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

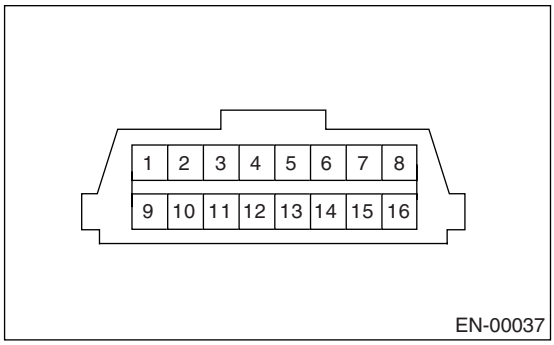
Measuring condition:
- After engine is warmed-up.
- Gear position is in neutral.
- Turn the A/C off.
- Turn all the accessory switches off.

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 other than the general scan tool and Subaru Select Monitor, as the Subaru Select Monitor circuit may become damaged.



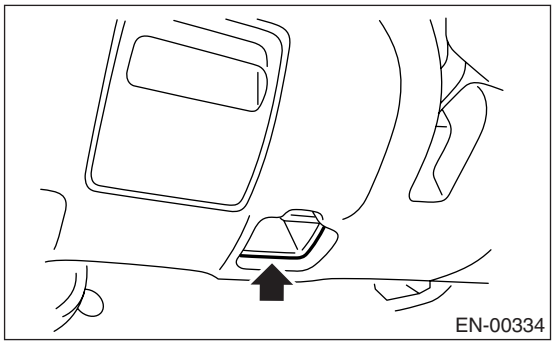
Terminal No.	Content	Terminal No.	Content
1	Power supply	9	Empty
2	Empty	10	Subaru select monitor/General scan tool signal
3	Empty	11	Empty
4	Empty	12	Ground
5	Empty	13	Ground
6	Empty	14	Empty
7	Empty	15	Empty
8	Empty	16	Empty

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 the instrument panel (on the driver's side).



3) Using the general scan tool, call up the DTC and freeze frame data.
General scan tool functions consist of:
(1) MODE $01: Current powertrain diagnostic data
(2) MODE $02: Power train 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)-65, List of Diagnostic Trouble Code (DTC).>

2. MODE $01: CURRENT POWERTRAIN DIAGNOSTIC DATA

Refer to data denoting the current operating condition of analog input/output, digital input/output or the powertrain system.
A list of the support data and PID (Parameter Identification) codes are shown in the following table.

PID	Data	Unit of measure
01	Number of emission-related powertrain DTC and malfunction indicator light status and diagnosis support information	—
03	Fuel system control status	—
04	Calculated engine load value	%
05	Engine coolant temperature	°C
06	Short term fuel trim	%
07	Long term fuel trim	%
0B	Intake manifold absolute pressure	mmHg
0C	Engine revolution	rpm
0D	Vehicle speed	km/h
0E	Ignition timing advance	°
0F	Intake air temperature	°C
10	Air flow rate from mass air flow sensor	g/sec
11	Throttle valve 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	—
24	A/F value and A/F sensor output voltage	— and V
34	A/F value and A/F sensor current	— and mA

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

3. MODE $02 (POWER TRAIN 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	%
15	Oxygen sensor output voltage and oxygen sensor short term fuel trim	V and %
1C	Supporting OBD system	—

NOTE:
Refer to general scan tool manufacturer's operation manual to access freeze frame data (MODE $02).

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

Refer to "Read Diagnostic Trouble Code" for information about data denoting emission-related powertrain DTC. <Ref. to EN(H4DOTC)(diag)-35, 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 operation manual to clear or reset emission-related diagnostic information (MODE $04).

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.

TID	CID	Test value & Test specification
$41	$81	O2 Sensor Circuit (Bank 1 Sensor 2)
	$02	
$81	$01	Catalyst system efficiency
$83	$01	Evaporative Emission Control System (0.04 inch leak)
	$02	Evaporative Emission Control System (0.04 inch leak)
	$03	Evaporative Emission Control System (0.04 inch leak)
	$04	Evaporative Emission Control System (0.04 inch leak)
	$05	Evaporative Emission Control System (0.02 inch leak)
	$86	Evaporative Emission Control System (0.02 inch leak)
$84	$01	A/F Sensor Circuit Slow Response (Bank 1 Sensor 1)
$85	$01	O2 Sensor Circuit Slow Response (Bank 1 Sensor 2) Rich → Lean
	$02	O2 Sensor Circuit Slow Response (Bank 1 Sensor 2) Lean → Rich
$89	$81	Secondary air system
	$82	
	$83	
	$04	
	$05	

7. MODE $07

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

8. MODE $09

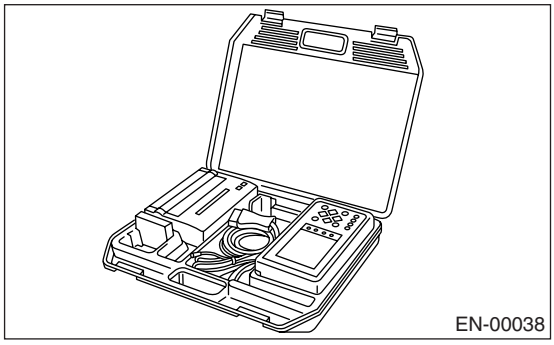
Refer to the data of vehicle specification (V.I.N., calibration ID, etc.).

9. Subaru Select Monitor

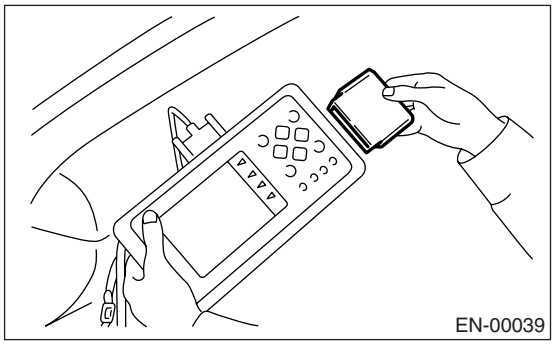
A: OPERATION

1. HOW TO USE SUBARU SELECT MONITOR

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

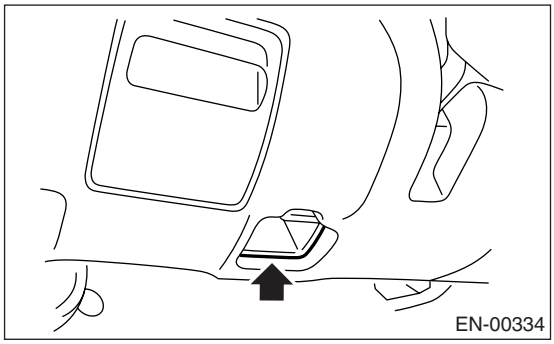


2) Connect the diagnosis cable to Subaru Select Monitor.
3) Insert the cartridge to Subaru Select Monitor. <Ref. to EN(H4DOTC)(diag)-7, PREPARATION TOOL, General Description.>



4) Connect the Subaru Select Monitor to data link connector.

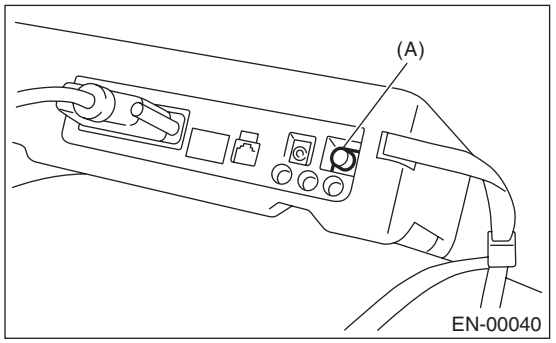
(1) Data link connector is located in the lower portion of instrument panel (on the driver's side).



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

CAUTION:
Do not connect any scan tools except the Subaru Select Monitor or the general scan tool.

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



(A) Power switch

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

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

Refer to "Read Diagnostic Trouble Code" for information about how to indicate DTC. <Ref. to EN(H4DOTC)(diag)-35, Read Diagnostic Trouble Code (DTC).>

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

Refer to "Read Diagnostic Trouble Code" for information about how to indicate DTC. <Ref. to EN(H4DOTC)(diag)-35, Read Diagnostic Trouble Code (DTC).>

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

1) On the «Main Menu» display screen, select {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select {Engine Control System} and press the [YES] key.
3) Press the [YES] key after the information of engine type has been displayed.
4) On the «Engine Diagnosis» display screen, select {Current Data Display/Save}, and then press the [YES] key.
5) On the «Data Display Menu» screen, select {Data Display} and press the [YES] key.
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 — 10.8 inHg or 4.2 — 5.3 psig
Engine speed signal	Engine Speed	rpm	700 rpm (Agree with the tachometer indication)
Meter vehicle speed signal	Vehicle Speed	km/h or MPH	0 km/h or 0 MPH (at parking)
Ignition timing signal	Ignition Timing	deg	+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
Knock sensor correction	Knock Correction	deg	0.0 deg
Atmospheric pressure	Atmospheric Pressure	mmHg, kPa, inHg or psig	(Atmosphere pressure)
Intake manifold relative pressure	Mani. Relative Pressure	mmHg, kPa, inHg or psig	(Air intake absolute pressure — atmosphere pressure)
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
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 Duty	%	0 — 25%
Tumble generator valve RH opening signal	TGV Position Sensor R	V	0.44
Tumble generator valve LH opening signal	TGV Position Sensor L	V	0.48
Fuel pump duty ratio	Fuel Pump Duty	%	33%
AVCS advance angle amount RH	VVT advance angle amount R	deg	0 deg
AVCS advance angle amount LH	VVT advance angle 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

Content	Display	Unit of measure	Note (at idling)
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 output lambda 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%
Throttle Motor Voltage	Throttle Motor Voltage	V	12 — 15 V
Sub throttle sensor voltage	Sub throttle sensor voltage	V	1.52 V
Main throttle sensor voltage	Main throttle sensor voltage	V	0.66 V
Sub accelerator sensor voltage	Sub acceleration sensor voltage	V	0.68 V
Main accelerator sensor voltage	Main acceleration sensor voltage	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 kg/m
Memory vehicle speed	Memorized Cruise Speed	km/h or MPH	0 km/h or 0 MPH
Odd Meter	Odd Meter	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
AT/MT identification terminal	AT Vehicle ID Signal	—	ON/OFF
Test Mode Terminal	Test Mode Signal	—	U-check
Neutral position switch signal	Neutral position switch	—	Neutral
Soft idle switch signal	Idle Switch Signal	—	In idle
Ignition switch signal	Ignition Switch	—	ON input
Power steering switch signal	P/S Switch	—	OFF (At OFF)
Air conditioning switch signal	A/C Switch	—	OFF (At OFF)
Starter switch signal	Starter Switch	—	OFF
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 (At OFF)
Blower fan switch signal	Blower Fan SW	—	OFF (At OFF)
Light switch signal	Light Switch	—	OFF (At OFF)
A/C middle pressure switch signal	A/C Mid Pressure Switch	—	OFF (At OFF)
Air conditioner compressor relay output signal	A/C compressor relay output	—	OFF output (when OFF)
Radiator fan relay 1 signal	Radiator Fan Relay #1	—	OFF output (when OFF)
Radiator fan relay 2 signal	Radiator Fan Relay #2	—	OFF output (when OFF)
PCV hose assembly diagnosis signal	Blow-by leak Connector	—	Connected
Pressure control solenoid valve signal	PCV Solenoid Valve	—	OFF output (when OFF)
Tumble generator valve output signal	TGV Output	—	None
Tumble generator valve drive signal	TGV Drive	—	Opening direction
Drain valve signal	Vent. Solenoid Valve	—	OFF output (when 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	VDC torque down prohibited output	—	Allow
Vehicle dynamics control (VDC) torque down demand	Request Torque Down VDC	—	None
AT Cooperative Control Request Signal	AT Cooperative Control Request Signal	—	Allow

Content	Display	Unit of measure	Note (at idling)
ETC motor relay signal	ETC Motor Relay	—	ON
Clutch switch signal	Clutch switch	—	OFF (when OFF)
Stop light switch signal	Stop Light Switch	—	OFF (when OFF)
SET/COAST switch signal	SET/COAST Switch	—	OFF (when OFF)
RES/ACC switch signal	RESUME/ACCEL Switch	—	OFF (when OFF)
Brake switch signal	Brake Switch	—	OFF (when OFF)
Main switch signal	Main Switch	—	OFF (when OFF)
Secondary Air Combination Valve Relay 2 signal	Secondary Air Combination Valve Relay 2	—	OFF (when OFF)
Secondary air pump relay signal	Secondary air pump relay	—	OFF (when OFF)
Secondary Air Combination Valve Relay 1 signal	Secondary Air Combination Valve Relay 1	—	OFF (when OFF)
Cruise control cancel switch signal	CC Cancel SW	—	OFF (when OFF)

NOTE:
For detailed operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.

5. READ CURRENT DATA FOR ENGINE (OBD MODE)

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

Content	Display	Unit of measure	Note (at idling)
Number of diagnosis code	Number of Diag. Code:	—	—
Condition of malfunction indicator light	MI (MIL)	—	ON or OFF
Monitoring test of misfire	Misfire monitoring	—	Finish or incomplete
Monitoring test of fuel system	Fuel system monitoring	—	Finish or incomplete
Monitoring test of comprehensive component	Component monitoring	—	Finish or incomplete
Test of catalyst	Catalyst Diagnosis	—	Finish or incomplete
Test of heating-type catalyst	Heated catalyst	—	no support
Test of evaporative emission purge control system	Evaporative purge system	—	Finish or incomplete
Secondary air system test	Secondary air system	—	Finish or incomplete
Test of air conditioning system refrigerant	A/C system refrigerant	—	no support
Oxygen sensor test	Oxygen sensor	—	Finish or incomplete
Oxygen sensor heater test	Oxygen sensor heater	—	Finish or incomplete
Test of EGR system	EGR system	—	no support
Air fuel ratio control system for bank 1	Fuel system for Bank 1	—	CLOSE NORMAL
Engine load data	Calculated load valve	%	21.0%
Engine coolant temperature signal	Coolant Temp.	°C or °F	+91°C or 196°F
Short term fuel trim by front oxygen (A/F) sensor	A/F correction value #1	%	+0.8%
Long term fuel trim by front oxygen (A/F) sensor	A/F Learning #1	%	+3.9%
Intake manifold absolute pressure signal	Mani. Absolute Pressure	mmHg, kPa, inHg or psig	233 mmHg, 31 kPa, 9.2 inHg or 4.5 psig
Engine speed signal	Engine Speed	rpm	700 rpm
Vehicle speed signal	Vehicle Speed	km/h or MPH	0 km/h or 0 MPH
#1 Cylinder ignition timing	Ignition timing adv.#1	°	+16.5°
Intake air temperature signal	Intake Air Temp.	°C or °F	54°C or 129°F
Amount of intake air	Mass Air Flow	g/s or lb/m	2.8 g/s or 0.37 lb/m
Throttle position signal	Throttle Opening Angle	%	13%
Secondary air system	Secondary air system	—	Stop
Oxygen sensor #12	Oxygen sensor #12	V	0.1 — 0.7 V
Air fuel ratio correction by rear oxygen sensor	A/F Correction #12	%	+0.0%
On-board diagnostic system	OBD System	—	CARB-OBD2
Oxygen sensor #11	Oxygen sensor #11	—	Support
Rear oxygen sensor output signal	Oxygen sensor #12	—	Support
A/F lambda signal	A/F sensor #11	—	1.001
A/F sensor output signal	A/F sensor #11	V	2.805 V
A/F lambda signal #11	A/F sensor #11	—	0.999
A/F sensor current #11	A/F sensor #11	mA	0.02 mA

NOTE:
For detailed operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.

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

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

DESCRIPTION	Display	Unit of measure
Freeze frame data DTC code	Freeze frame data	DTC
Air fuel ratio control system for bank 1	Bank 1 fuel system	Close normal or open initial
Oxygen sensor output voltage	Oxygen sensor #12	V
Short term fuel trim by oxygen sensor	Short term fuel trim B1	%
Engine load data	Engine load	%
Engine coolant temperature signal	Coolant Temp.	°C or °F
Short term fuel trim by front oxygen (A/F) sensor	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 advance #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	—
Oxygen sensor #11	Oxygen sensor #11	Support
Oxygen sensor #12	Oxygen sensor #12	Support

NOTE:
For detailed operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.

7. LED OPERATION MODE FOR ENGINE

1) On the «Main Menu» display screen, select {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select {Engine Control System} and press the [YES] key.
3) Press the [YES] key after the information of engine type has been displayed.
4) On the «Engine Diagnosis» display screen, select {Current Data Display/Save}, and then press the [YES] key.
5) On the «Data Display» screen, select {Data LED Display} and press the [YES] key.
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	Message	When LED "ON" is required
AT/MT identification signal	AT Vehicle ID Signal	ON or OFF	Illuminate (AT model)
Test mode signal	Test Mode Terminal	U Check or D check	D check
Neutral position switch signal	Neutral SW	ON or OFF	When neutral position signal is input.
Idle switch signal	Soft Idle SW	ON or OFF	When idle switch signal is input.
Ignition switch signal	Ignition SW	ON or OFF	When ignition switch is turned ON.
Power steering switch signal	P/S Switch	ON or OFF	When power steering switch is entered.
Air conditioning switch signal	A/C Switch	ON or OFF	When air conditioning switch is input.
Starter switch signal	Starter Switch	ON or OFF	When starter switch is input.
Rear oxygen sensor rich signal	Rear O2 Rich Signal	Rich or Lean	When rear oxygen sensor mixture ratio is rich.
Knocking signal	Knock Signal	Provided or None	When knocking signal is input.
Crankshaft position sensor signal	Crankshaft Position Sig.	Provided or None	When crankshaft position sensor signal is input.
Camshaft position sensor signal	Camshaft Position Sig.	Provided or None	When camshaft position sensor signal is input.
Rear defogger switch signal	Rear Defogger SW	ON or OFF	When rear defogger switch is turned to ON.
Blower fan switch signal	Blower Fan SW	ON or OFF	When blower fan switch is turned to ON.
Small light switch signal	Light Switch	ON or OFF	When small light switch is turned to ON.
A/C middle pressure switch signal	A/C Mid Pressure Switch	ON or OFF	When A/C middle pressure switch is turned to ON.
Air conditioning relay signal	Compressor relay	ON or OFF	When air conditioning relay is in function.
Radiator fan relay 1 signal	Radiator Fan Relay #1	ON or OFF	When radiator fan relay 1 is in function.
Radiator fan relay 2 signal	Radiator Fan Relay #2	ON or OFF	When radiator fan relay 2 is in function.
PCV hose assembly diagnosis signal	Blow-by leak connector	ON or OFF	PVC hose assembly connected
Pressure control solenoid valve signal	PCV Solenoid Valve	ON or OFF	When pressure control valve is ON.
Tumble generator valve signal	TGV Output	Provided or None	Tumble generator valve signal is input.
Tumble generator valve drive signal	TGV Drive	Open direction or close direction	Tumble generator valve open
Drain valve signal	Vent. Solenoid Valve	ON or OFF	When drain valve is ON.
AT retard angle demand signal	Retard Signal	Provided or None	When AT retard angle demand signal is input.

Content	Display	Message	When LED “ON” is required
AT fuel cut signal	Fuel Cut	Provided or None	When AT fuel cut signal is input.
VDC torque down prohibited output	Ban of Torque Down	ON or OFF	Prohibition
Request Torque Down VDC	Request Torque Down VDC	Provided or None	Provided
AT Cooperative Control Request Signal	AT Cooperative Control Request Signal	ON or OFF	When AT coordinate permission signal is input.
Electronic throttle control motor relay signal	ETC Motor Relay	ON or OFF	When electronic throttle control motor relay is in function.
Clutch switch signal	Clutch switch	ON or OFF	When clutch switch is turned to ON.
Stop light switch signal	Stop Light Switch	ON or OFF	When stop light switch is turned ON.
SET/COAST switch signal	SET/COAST Switch	ON or OFF	When SET/COAST switch is turned to ON.
RES/ACC switch signal	RESUME/ACCEL Switch	ON or OFF	When RES/ACC switch is turned to ON.
Brake switch signal	Brake Switch	ON or OFF	When brake switch is turned to ON.
Main switch signal	Main Switch	ON or OFF	When main switch is turned to ON.
Secondary Air Combination Valve 2 signal	Combination valve 2	ON or OFF	Secondary air combination valve 2 is ON
Secondary air pump relay signal	Air pump relay	ON or OFF	Secondary air pump relay function
Secondary Air Combination Valve 1 signal	Combination valve 1	ON or OFF	Secondary air combination valve 2 is ON
Cancel switch signal	Cancel Switch	ON or OFF	When cancel switch is turned to ON.

NOTE:
For detailed operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.

8. V.I.N. REGISTRATION

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

NOTE:
For detailed operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.

10.Read Diagnostic Trouble Code (DTC)

A: OPERATION

1. SUBARU SELECT MONITOR (NORMAL MODE)

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

NOTE:
• For detailed operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.
• For details concerning DTC, refer to “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4DOTC)(diag)-65, List of Diagnostic Trouble Code (DTC).>

2. SUBARU SELECT MONITOR (OBD MODE)

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

NOTE:
• For detailed operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.
• For details concerning DTC, refer to “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4DOTC)(diag)-65, 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)-65, List of Diagnostic Trouble Code (DTC).>

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

11.Inspection Mode

A: PROCEDURE

Perform the diagnosis shown in the following DTC table.
When performing the diagnosis not listed in “List of Diagnostic Trouble Code (DTC)”, refer the item on the drive cycle. <Ref. to EN(H4DOTC)(diag)-41, Drive Cycle.>

DTC	Item	Condition
P0011	Intake Camshaft Position - Timing Over-Advanced or System Performance (Bank 1)	—
P0016	Crankshaft Position - Camshaft Position Correlation (Bank1)	—
P0018	Crankshaft Position - Camshaft Position Correlation (Bank2)	—
P0021	Intake Camshaft Position - Timing Over-Advanced or System Performance (Bank 2)	—
P0031	HO2S Heater Control Circuit Low (Bank 1 Sensor 1)	—
P0032	HO2S Heater Control Circuit High (Bank 1 Sensor 1)	—
P0037	HO2S Heater Control Circuit Low (Bank 1 Sensor 2)	—
P0038	HO2S Heater Control Circuit High (Bank 1 Sensor 2)	—
P0102	Mass or Volume Air Flow Circuit Low Input	—
P0103	Mass or Volume Air Flow Circuit High Input	—
P0107	Manifold Absolute Pressure/Barometric Pressure Circuit Low Input	—
P0108	Manifold Absolute Pressure/Barometric Pressure Circuit High Input	—
P0112	Intake Air Temperature Sensor 1 Circuit Low	—
P0113	Intake Air Temperature Sensor 1 Circuit High	—
P0117	Engine Coolant Temperature Circuit Low	—
P0118	Engine Coolant Temperature Circuit High	—
P0122	Throttle/Pedal Position Sensor/Switch “A” Circuit Low	—
P0123	Throttle/Pedal Position Sensor/Switch “A” Circuit High	—
P0131	O2 Sensor Circuit Low Voltage (Bank 1 Sensor 1)	—
P0132	O2 Sensor Circuit High Voltage (Bank 1 Sensor 1)	—
P0137	O2 Sensor Circuit Low Voltage (Bank 1 Sensor 2)	—
P0138	O2 Sensor Circuit High Voltage (Bank 1 Sensor 2)	—
P0140	O2 Sensor Circuit No Activity Detected (Bank1 Sensor2)	—
P0182	Fuel Temperature Sensor “A” Circuit Low Input	—
P0183	Fuel Temperature Sensor “A” Circuit High Input	—
P0222	Throttle/Pedal Position Sensor/Switch “B” Circuit Low	—
P0223	Throttle/Pedal Position Sensor/Switch “B” Circuit High	—
P0230	Fuel Pump Primary Circuit	—
P0245	Turbo/Super Charger Wastegate Solenoid “A” Low	—
P0327	Knock Sensor 1 Circuit Low (Bank 1 or Single Sensor)	—
P0328	Knock Sensor 1 Circuit High (Bank 1 or Single Sensor)	—
P0335	Crankshaft Position Sensor “A” Circuit	—
P0336	Crankshaft Position Sensor “A” Circuit Range/Performance	—
P0340	Camshaft Position Sensor “A” Circuit (Bank 1 or Single Sensor)	—
P0345	Camshaft Position Sensor “A” Circuit (Bank 2)	—
P0413	Secondary Air Injection System Switching Valve “A” Circuit Open	—
P0416	Secondary Air Injection System Switching Valve “B” Circuit Open	—
P0418	Secondary Air Injection System Control “A” Circuit Open	—
P0447	Evaporative Emission Control System Vent Control Circuit Open	—
P0448	Evaporative Emission Control System Vent Control Circuit Shorted	—
P0452	Evaporative Emission Control System Pressure Sensor Low Input	—
P0453	Evaporative Emission Control System Pressure Sensor High Input	—
P0458	Evaporative Emission System Purge Control Valve Circuit Low	—
P0462	Fuel Level Sensor “A” Circuit Low	—

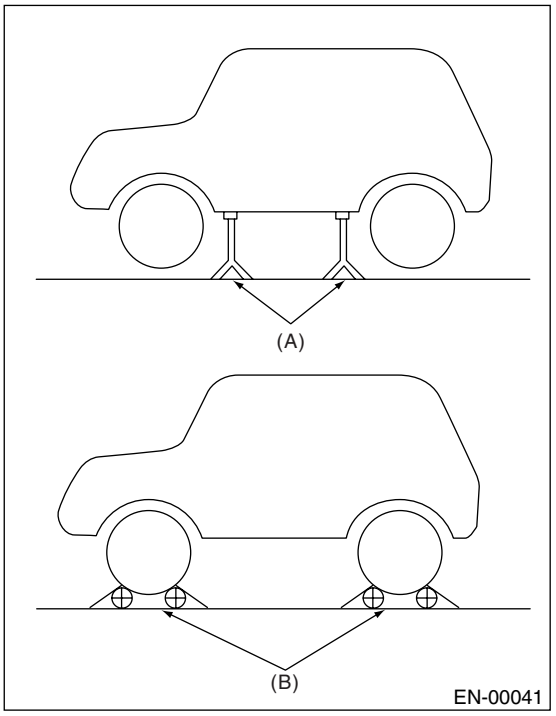
DTC	Item	Condition
P0463	Fuel Level Sensor “A” Circuit High	—
P0502	Vehicle Speed Sensor “A” Circuit Low Input	—
P0503	Vehicle Speed Sensor “A” Intermittent/Erratic/High	—
P0512	Starter Request Circuit	—
P0513	Incorrect Immobilizer Key	—
P0519	Idle Air Control System Performance	—
P0600	Serial Communication 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) (Bank1 Sensor1)	—
P1153	O2 Sensor Circuit Range/Performance (High) (Bank1 Sensor1)	—
P1160	Return Spring Failure	—
P1400	Fuel Tank Pressure Control Solenoid Valve Circuit Low	—
P1410	Secondary Air Injection System Switching Valve Stuck Open	—
P1420	Fuel Tank Pressure Control Sol. Valve Circuit High	—
P1491	Positive Crankcase Ventilation (Blow-by) Function Problem	—
P1518	Starter Switch Circuit Low Input	—
P1560	Back-up Voltage Circuit Malfunction	—
P1570	Antenna	—
P1571	Reference Code Incompatibility	—
P1572	IMM Circuit Failure (Except Antenna Circuit)	—
P1574	Key Communication Failure	—
P1576	EGI Control Module EEPROM	—
P1577	IMM Control Module EEPROM	—
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	OCV Solenoid Valve Signal A Circuit Open (Bank 1)	—
P2089	OCV Solenoid Valve Signal A Circuit Short (Bank 1)	—
P2092	OCV Solenoid Valve Signal A Circuit Open (Bank 2)	—
P2093	Intake Camshaft Position Actuator Control Circuit High (Bank 2)	—
P2101	Throttle Actuator Control Motor Circuit Range/Performance	—
P2102	Throttle Actuator Control Motor Circuit Low	—
P2103	Throttle Actuator Control Motor Circuit High	—
P2109	Throttle/Pedal Position Sensor “A” Minimum Stop Performance	—
P2122	Throttle/Pedal Position Sensor/Switch “D” Circuit Low Input	—
P2123	Throttle/Pedal Position Sensor/Switch “D” Circuit High Input	—
P2127	Throttle/Pedal Position Sensor/Switch “E” Circuit Low Input	—
P2128	Throttle/Pedal Position Sensor/Switch “E” Circuit High Input	—

DTC	Item	Condition
P2135	Throttle/Pedal Position Sensor/Switch “A”/“B” Voltage Correlation	—
P2138	Throttle/Pedal Position Sensor/Switch “D”/“E” Voltage Correlation	—
P2227	Barometric Pressure Circuit Range/Performance	—
P2228	Barometric Pressure Circuit Low	—
P2229	Barometric Pressure Circuit High	—
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 to 40 ℓ (5.3 to 10.6 US gal, 4.4 to 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.

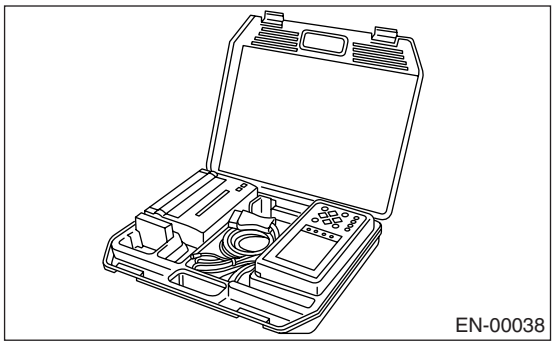
WARNING:
• Before raising the vehicle, ensure parking brakes are applied.
• Do not use a pantograph jack in place of a rigid rack.
• Secure a rope or wire to the front or rear towing hooks to prevent the lateral runout of front wheels.
• Do not abruptly depress/release clutch pedal or accelerator pedal 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.



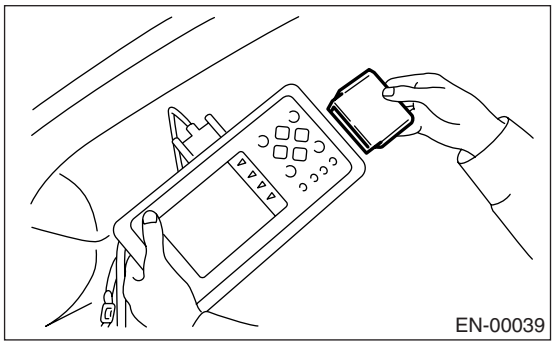
(A) Rigid rack
(B) Free roller

2. SUBARU SELECT MONITOR

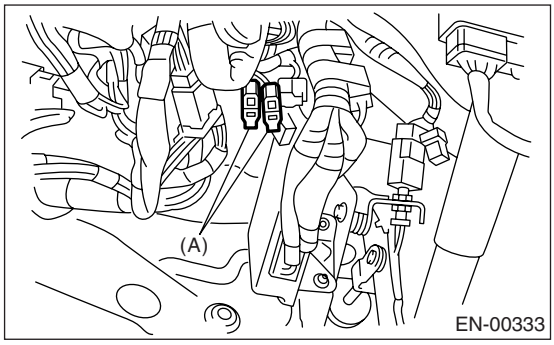
1) Idle the engine.
2) Prepare the Subaru Select Monitor kit. <Ref. to EN(H4DOTC)(diag)-7, PREPARATION TOOL, General Description.>



3) Connect the diagnosis cable to Subaru Select Monitor.
4) Insert the cartridge to Subaru Select Monitor. <Ref. to EN(H4DOTC)(diag)-7, PREPARATION TOOL, General Description.>

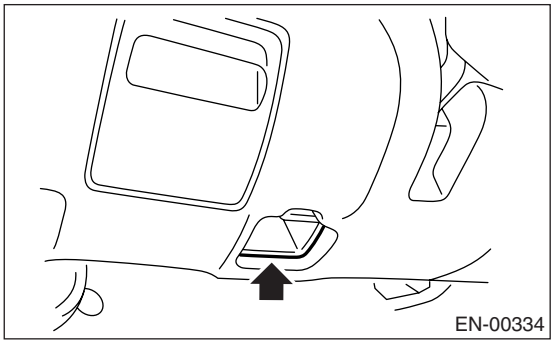


5) Connect the test mode connector (A) located at the lower portion of instrument panel (on the driver's side).

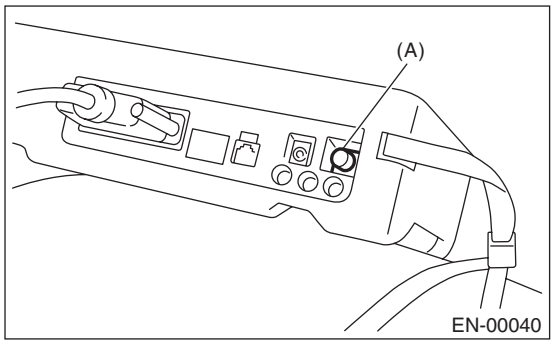


(A) Test mode connector

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



CAUTION:
Do not connect any scan tools except the Subaru Select Monitor or the general scan tool.
7) Turn the ignition switch to ON (engine OFF) and Subaru Select Monitor switch ON.



(A) Power switch

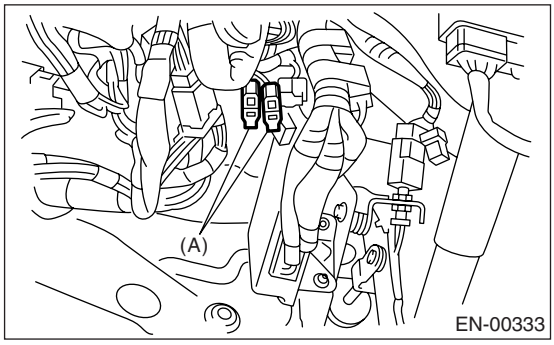
8) On the «Main Menu» display screen, select {Each System Check} and press the [YES] key.
9) On the «System Selection Menu» display screen, select {Engine Control System} and press the [YES] key.
10) Press the [YES] key after the information of engine type has been displayed.
11) On the «Engine Diagnosis» display screen, select {D Check} and press the [YES] key.
12) When the "Perform D Check?" is shown on the screen, press the [YES] key.

13) Perform subsequent procedures as instructed on the display screen.
• If trouble still remains in the memory, the corresponding DTC appears on the display screen.

NOTE:
• For detailed operation procedure, refer to the "SUBARU SELECT MONITOR OPERATION MANUAL".
• For details concerning DTC, refer to "List of Diagnostic Trouble Code (DTC)".
<Ref. to EN(H4DOTC)(diag)-65, List of Diagnostic Trouble Code (DTC).>
• Release the parking brake.
• The speed difference between front and rear wheels may light the ABS warning light, but this does not indicate a malfunction. When engine control diagnosis is finished, perform the ABS memory clearance procedure of the self-diagnosis system. <Ref. to ABS(diag)-26, Clear Memory Mode.>

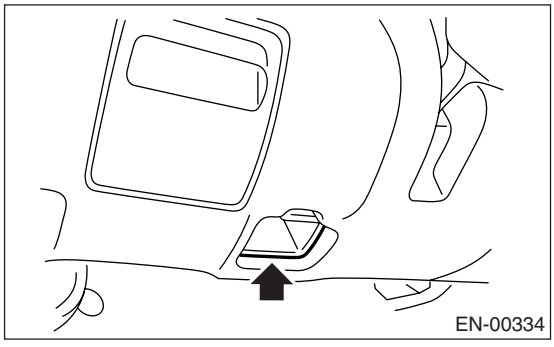
3. GENERAL SCAN TOOL

1) Idle the engine.
2) Connect the test mode connector (A) located at the lower portion of instrument panel (on the driver's side).



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

CAUTION:
Do not connect any scan tools except the Subaru Select Monitor or the general scan tool.



4) Start the engine.

NOTE:
• Make sure the select lever is placed in the "P" position before starting. (AT model)
• Depress the clutch pedal when starting engine. (MT model)
5) Using the select lever or shift lever, turn the "P" position switch and "N" position switch on.
6) Depress the brake pedal to turn brake switch on. (AT model)
7) Keep the engine speed in 2,500 — 3,000 rpm range for 40 seconds.
8) 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.>
9) Using the general scan tool, check DTC and record the result(s).

NOTE:
• For detailed operation procedure, refer to the general scan tool operation manual.
• For details concerning DTC, refer to "List of Diagnostic Trouble Code (DTC)".
<Ref. to EN(H4DOTC)(diag)-65, List of Diagnostic Trouble Code (DTC).>

12.Drive Cycle

A: PROCEDURE

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

1. PREPARATION FOR DRIVE CYCLE

1) Check battery voltage is more than 12 V and fuel remains half [20 to 40 ℓ (5.3 to 10.6 US gal, 4.4 to 8.8 Imp gal)].
2) Disconnect the test mode connector.

NOTE:
• Perform the diagnosis after warming up the engine except when the engine coolant temperature at starting is specified.
• Perform the diagnosis twice if the DTC marked with *. After completing the first diagnosis, stop the engine and perform second diagnosis in same condition.

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

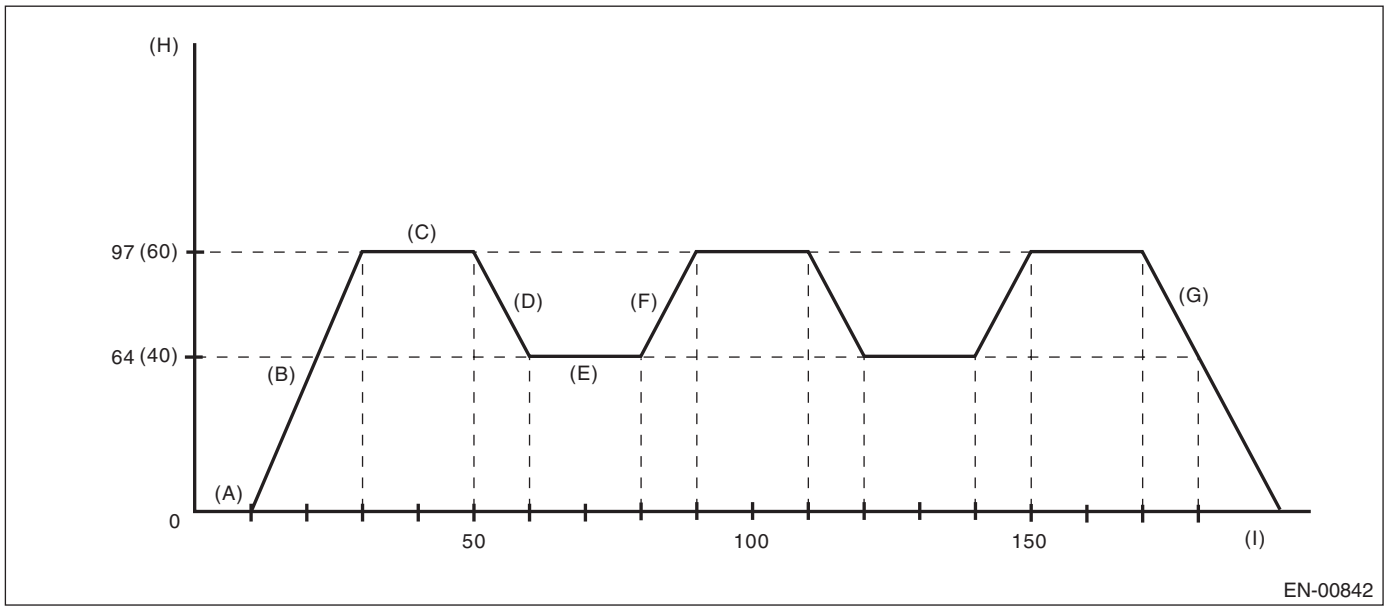
DTC	Item	Condition
*P0125	Insufficient Coolant Temperature for Closed Loop Fuel Control	Engine coolant temperature at engine start is 20°C (68°F) or less.
*P0128	Coolant Thermostat (Engine Coolant Temperature Below Thermostat Regulating Temperature)	Engine coolant temperature at engine start is 55°C (131°F) or less.
*P0133	O2 Sensor Circuit Slow Response (Bank 1 Sensor 1)	—
*P0171	System Too Lean (Bank 1)	Complete diagnosis for drive cycle B or C
*P0172	System Too Rich (Bank 1)	Complete diagnosis for drive cycle B or C
P0301	Cylinder 1 Misfire Detected	Complete diagnosis for drive cycle B or C
P0302	Cylinder 2 Misfire Detected	Complete diagnosis for drive cycle B or C
P0303	Cylinder 3 Misfire Detected	Complete diagnosis for drive cycle B or C
P0304	Cylinder 4 Misfire Detected	Complete diagnosis for drive cycle B or C
*P0420	Catalyst System Efficiency Below Threshold (Bank 1)	—
*P0442	Evaporative Emission Control System Leak Detected (Small Leak)	Engine coolant temperature at engine start is 25°C (77°F) or less.
*P0451	Evaporative Emission Control System Pressure Sensor	—
*P0456	Evaporative Emission Control System Leak Detected (Very Small Leak)	Engine coolant temperature at engine start is 25°C (77°F) or less.
*P0457	Evaporative Emission Control System Leak Detected (Fuel Cap Loose/Off)	Engine coolant temperature at engine start is 25°C (77°F) or less.
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	Complete diagnosis for drive cycle B or C
*P2097	Post Catalyst Fuel Trim System Too Rich Bank 1	Complete diagnosis for drive cycle B or C

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)	Complete diagnosis for drive cycle A or C
*P0172	System Too Rich (Bank 1)	Complete diagnosis for drive cycle A or C
P0301	Cylinder 1 Misfire Detected	Complete diagnosis for drive cycle A or C
P0302	Cylinder 2 Misfire Detected	Complete diagnosis for drive cycle A or C
P0303	Cylinder 3 Misfire Detected	Complete diagnosis for drive cycle A or C
P0304	Cylinder 4 Misfire Detected	Complete diagnosis for drive cycle A or C
*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	Complete diagnosis for drive cycle A or C
*P2097	Post Catalyst Fuel Trim System Too Rich Bank 1	Complete diagnosis for drive cycle A or C

4. DRIVE CYCLE C — DRIVE THE VEHICLE WITH FOLLOWING DRIVE PATTERNS



(A) Idle the engine for more than 10 seconds.
(B) Accelerate the vehicle to 97 km/h (60 MPH) within 20 seconds.
(C) Drive the vehicle at 97 km/h (60 MPH) for 20 seconds.
(D) Decelerate the vehicle to 64 km/h (40 MPH) with throttle fully closed.
(E) Drive the vehicle at 64 km/h (40 MPH) for 20 seconds.
(F) Accelerate the vehicle to 97 km/h (60 MPH) within 10 seconds.
(G) Stop the vehicle with throttle fully closed.
(H) Vehicle speed km/h (MPH)
(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)	Complete diagnosis for drive cycle A or B
*P0172	System Too Rich (Bank 1)	Complete diagnosis for drive cycle A or B
*P0244	Turbo/Super Charger Wastegate Solenoid “A” Range/Performance	—
P0246	Turbo/Super Charger Wastegate Solenoid “A” High	—
*P0301	Cylinder 1 Misfire Detected	Complete diagnosis for drive cycle A or B
*P0302	Cylinder 2 Misfire Detected	Complete diagnosis for drive cycle A or B
*P0303	Cylinder 3 Misfire Detected	Complete diagnosis for drive cycle A or B
*P0304	Cylinder 4 Misfire Detected	Complete diagnosis for drive cycle A or B
P2004	Intake Manifold Runner Control Stuck Open (Bank 1)	—
P2005	Intake Manifold Runner Control Stuck Open (Bank 2)	—
*P2096	Post Catalyst Fuel Trim System Too Lean Bank 1	Complete diagnosis for drive cycle A or B
*P2097	Post Catalyst Fuel Trim System Too Rich Bank 1	Complete diagnosis for drive cycle A or B

5. DRIVE CYCLE D

Drift Diagnosis

1) Check that the engine coolant temperature at engine start is 30°C (86°F) or less.
2) Check that the battery voltage is more than 10.9 V and that more than 10 ℓ (2.6 US gal, 2.2 Imp gal) of fuel remains.
3) Start the engine, and check that the engine coolant temperature increases over 10°C (18°F), and reaches 75°C (167°F) or more, when the engine is warmed up.
4) After the engine has reached the state of procedure 3), idle the engine for more than 120 seconds.

Stuck Diagnosis

1) Check that the battery voltage is over 10.9 V.
2) Perform the Clear Memory Mode. <Ref. to EN(H4DOTC)(diag)-46, Clear Memory Mode.>
3) Drive for approximately 50 ℓ (13.2 US gal, 11 Imp gal) of fuel.

NOTE:
• It is acceptable to drive the vehicle intermittently.
• Do not disconnect the battery terminals while diagnosing. (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) Check that the battery voltage is over 10.9 V.
2) Perform the Clear Memory Mode. <Ref. to EN(H4DOTC)(diag)-46, Clear Memory Mode.>
3) Drive for approximately 30 ℓ (7.9 US gal, 6.6 Imp gal) of fuel.

NOTE:
• It is acceptable to drive the vehicle intermittently.
• Do not disconnect the battery terminals while diagnosing. (Data will be cleared 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 30°C (86°F) or less.
2) Warm up the engine until the engine coolant temperature exceeds 95°C (203°F) from engine start.
3) After the engine has reached the state of procedure 2), idle the engine for more than 10 minutes.

NOTE:
Do not disconnect the battery terminals while diagnosing. (Data will be cleared when 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 Shorted	—
*P2440	Secondary Air Injection System Switching Valve Stuck Open (Bank1)	—
*P2441	Secondary Air Injection System Switching Valve Stuck Closed (Bank1)	—
*P2442	Secondary Air Injection System Switching Valve Stuck Open (Bank2)	—
*P2443	Secondary Air Injection System Switching Valve Stuck Closed (Bank2)	—

13.Clear Memory Mode

A: OPERATION

1. SUBARU SELECT MONITOR (NORMAL MODE)

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

NOTE:
For detailed operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.

2. SUBARU SELECT MONITOR (OBD MODE)

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

NOTE:
For detailed operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.

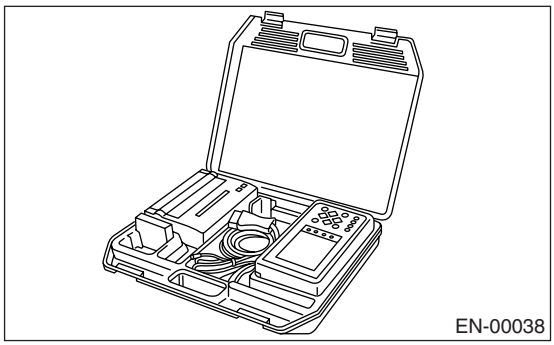
3. GENERAL SCAN TOOL

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

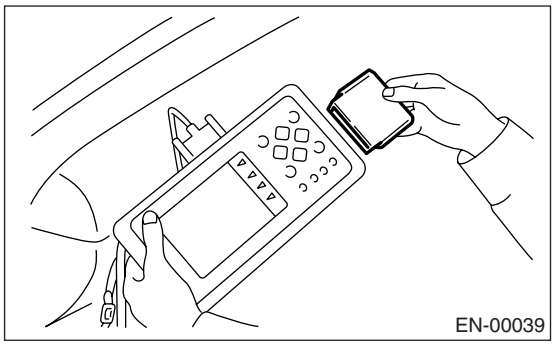
14.Compulsory Valve Operation Check Mode

A: PROCEDURE

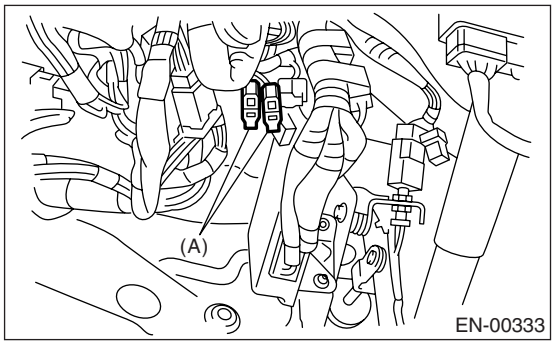
1) Prepare the Subaru Select Monitor kit. <Ref. to EN(H4DOTC)(diag)-7, PREPARATION TOOL, General Description.>



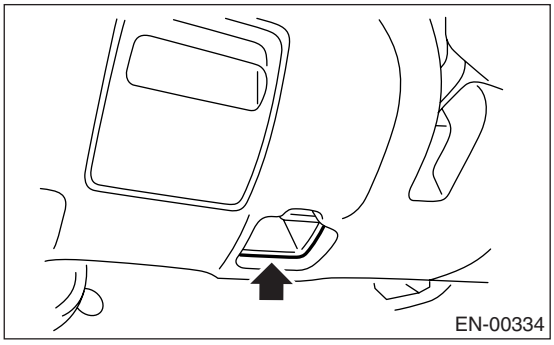
2) Connect the diagnosis cable to Subaru Select Monitor.
3) Insert the cartridge to Subaru Select Monitor. <Ref. to EN(H4DOTC)(diag)-7, PREPARATION TOOL, General Description.>



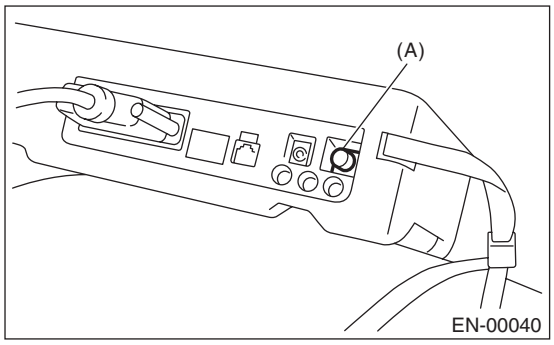
4) Connect the test mode connector (A) located at the lower portion of instrument panel (on the driver's side).



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



CAUTION:
Do not connect any scan tools except the Subaru Select Monitor or the general scan tool.
6) Turn the ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.



(A) Power switch

7) On the «Main Menu» display screen, select {Each System Check} and press the [YES] key.
8) On the «System Selection Menu» display screen, select {Engine Control System} and press the [YES] key.
9) Press the [YES] key after the information of engine type has been displayed.
10) On the «Engine Diagnosis» display screen, select {System Operation Check Mode} and press the [YES] key.
11) On the «System Operation Check Mode» display screen, select {Actuator ON/OFF Operation} and press the [YES] key.
12) Select the desired compulsory actuator on the «Actuator ON/OFF Operation» display screen and press the [YES] key.

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

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

DESCRIPTION	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 valve operation check	CPC Solenoid
Compulsory pressure control solenoid valve operation check	PCV Solenoid
Compulsory drain valve operation check	Vent. Control Solenoid
Compulsory wastegate control solenoid valve operation check	Wastegate control solenoid
Secondary air combination valve 1 compulsory operation check	Secondary Air Combination Valve 1
Secondary air combination valve 2 compulsory operation check	Secondary Air Combination Valve 2
Secondary air pump relay compulsory operation check	Secondary air pump relay

NOTE:

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

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

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

15.Malfunction Indicator Light

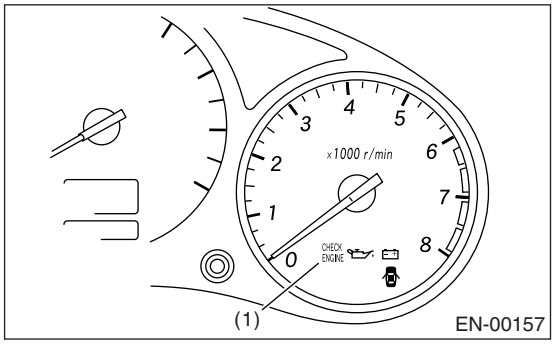
A: PROCEDURE

1. Activation of malfunction indicator light. <Ref. to EN(H4DOTC)(diag)-49, ACTIVATION OF MALFUNCTION INDICATOR LIGHT, Malfunction Indicator Light.>
↓
2. Check that the malfunction indicator light does not come on. <Ref. to EN(H4DOTC)(diag)-50, MALFUNCTION INDICATOR LIGHT DOES NOT COME ON, Malfunction Indicator Light.>
↓
3. Check that the malfunction indicator light does not go off. <Ref. to EN(H4DOTC)(diag)-52, MALFUNCTION INDICATOR LIGHT DOES NOT GO OFF., Malfunction Indicator Light.>

B: ACTIVATION OF MALFUNCTION INDICATOR LIGHT

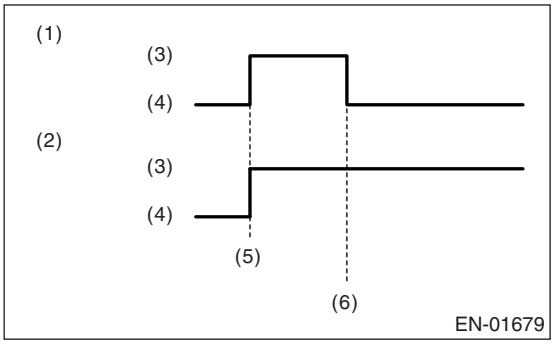
1) When the ignition switch is turned to ON (engine off), the malfunction indicator light in the combination meter come on.

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



(1) Malfunction indicator light

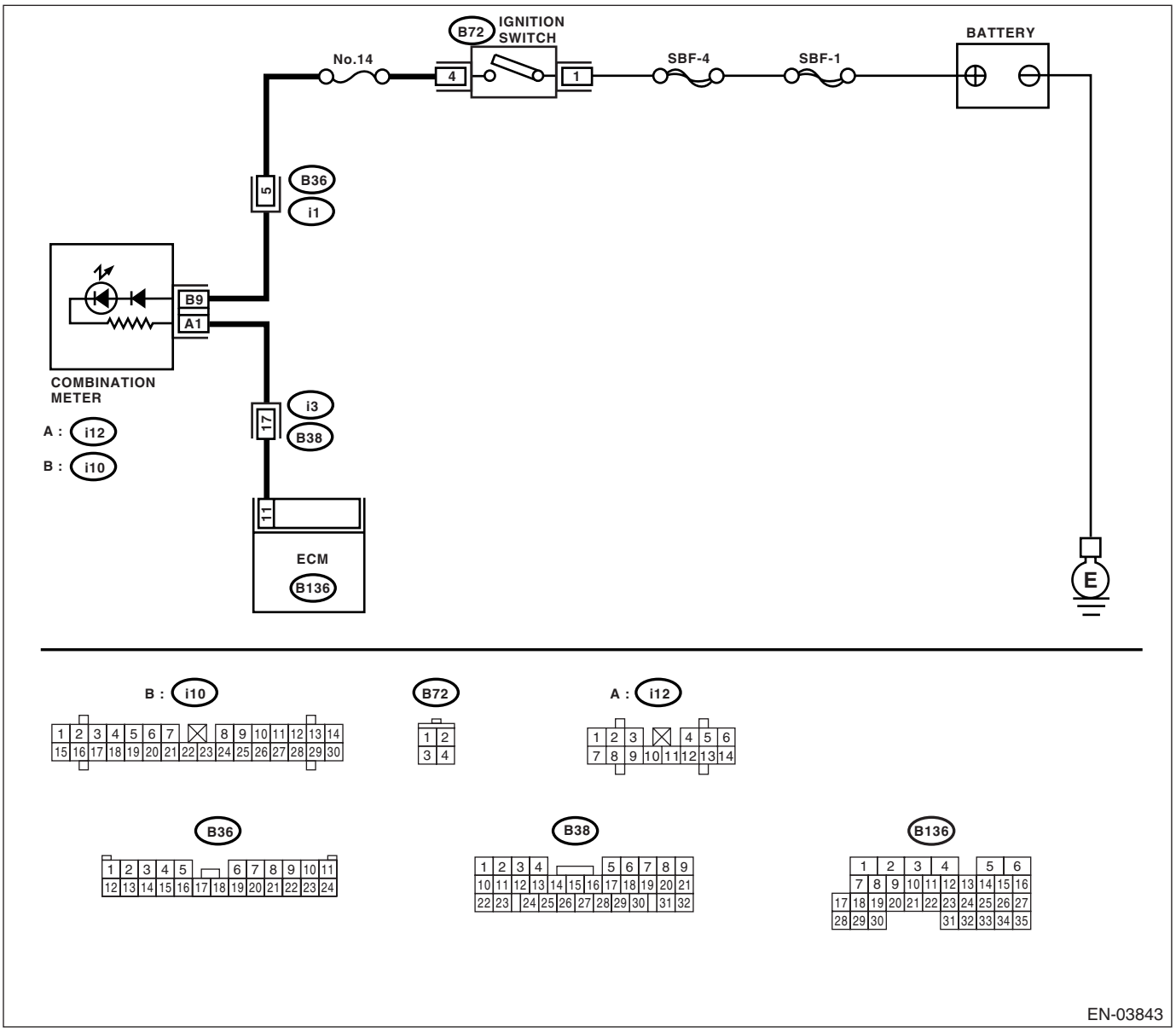
2) After starting the engine, the malfunction indicator light goes out. If it does not, either the engine or the emission control system has a problem.



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

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:



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**.

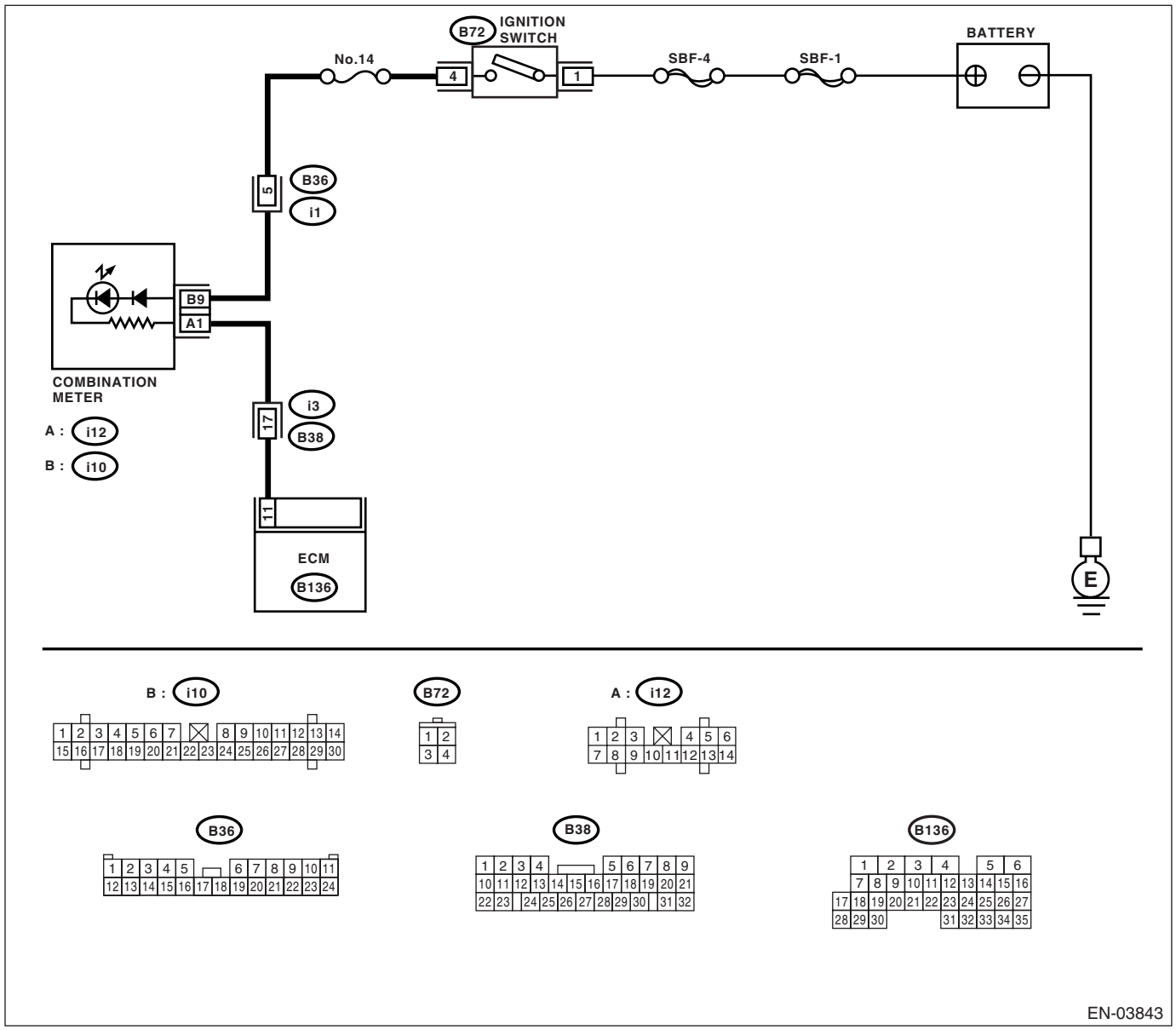
	Step	Check	Yes	No
3	**CHECK ECM CONNECTOR.**	Is the ECM connector correctly connected?	Replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>	Repair the connection of ECM connector.
4	**CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) 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 of harness between ECM and combination meter connector Poor contact of 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 more than 10 V?	Replace the combination meter 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 of ignition switch connector

D: MALFUNCTION INDICATOR LIGHT DOES NOT GO OFF.

DIAGNOSIS:
The malfunction indicator light circuit is shorted.

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

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Turn the ignition switch to ON.	Does the malfunction indicator light illuminate?	Repair the short circuit of harness between combination meter and ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>

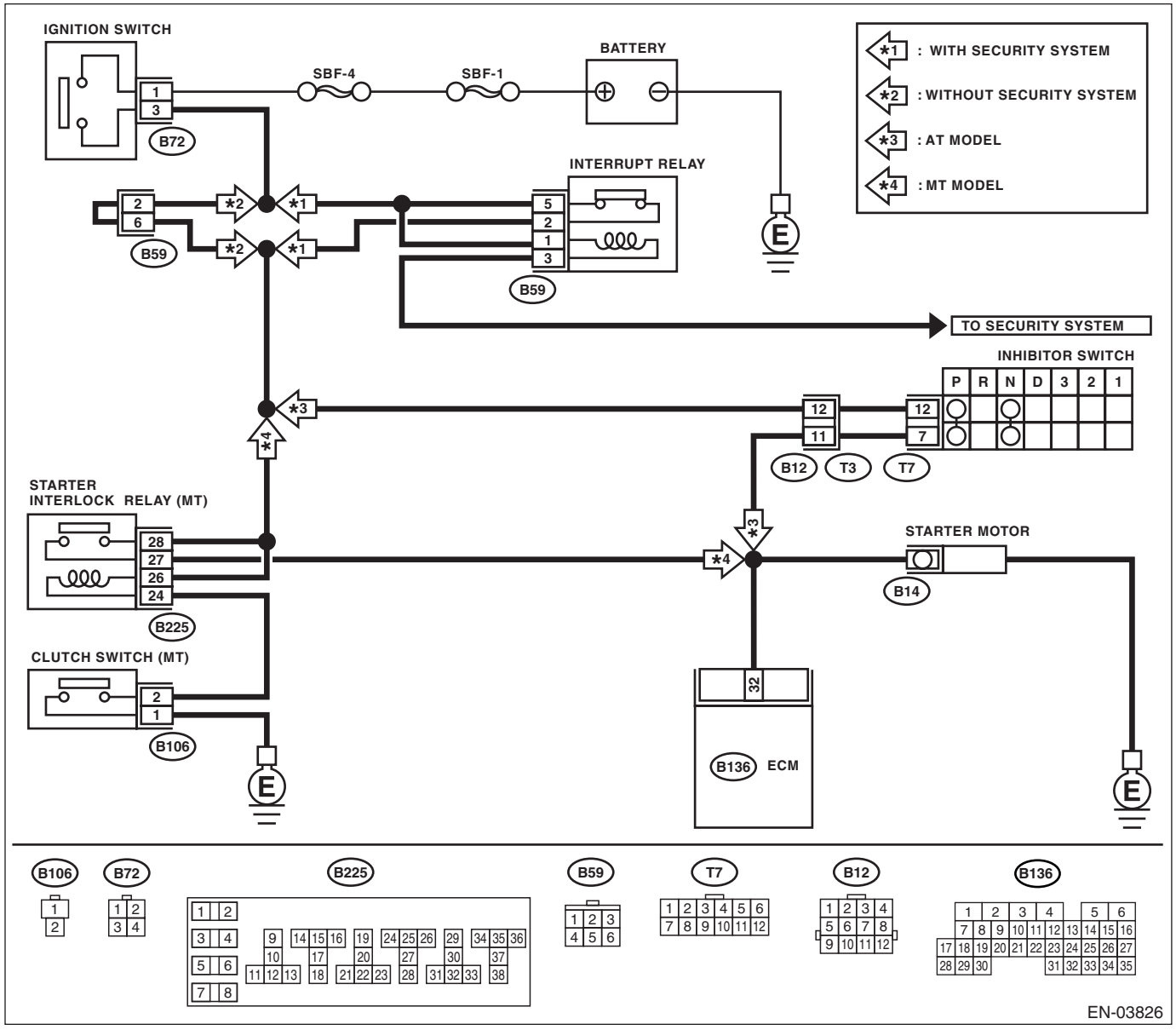
16.Diagnostics for Engine Starting Failure

A: PROCEDURE

1. Check for fuel amount.
↓
2. Inspection of starter motor circuit. <Ref. to EN(H4DOTC)(diag)-54, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
3. Inspection of ECM power supply and ground line. <Ref. to EN(H4DOTC)(diag)-57, CHECK POWER SUPPLY AND GROUND LINE OF ENGINE CONTROL MODULE (ECM), Diagnostics for Engine Starting Failure.>
↓
4. Inspection of ignition control system. <Ref. to EN(H4DOTC)(diag)-59, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>
↓
5. Inspection of fuel pump circuit. <Ref. to EN(H4DOTC)(diag)-62, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
6. Inspection of fuel injector circuit. <Ref. to EN(H4DOTC)(diag)-63, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

B: STARTER MOTOR CIRCUIT

CAUTION:
After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.
WIRING DIAGRAM:



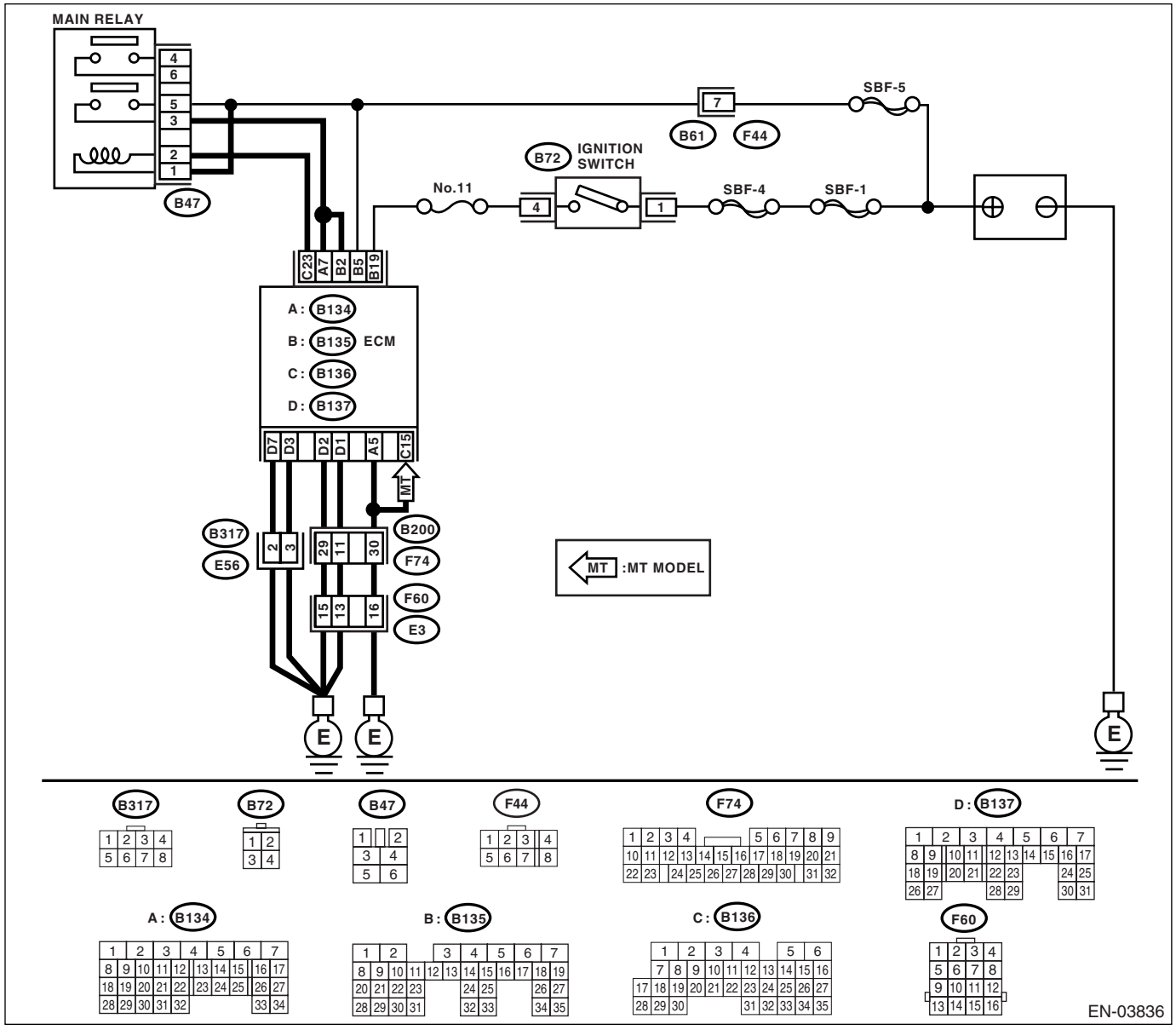
Step		Check	Yes	No
1	**CHECK BATTERY.** Check the battery voltage.	Is the voltage more than 12 V?	Go to step **2**.	Charge or replace the battery.
2	**CHECK OPERATION OF STARTER MOTOR.**	Does the starter motor operate?	Go to step **3**.	Go to step **4**.

	Step	Check	Yes	No
3	**CHECK DTC.**	Is DTC displayed? <Ref. to EN(H4DOTC)(diag)-35, OPERATION, Read Diagnostic Trouble Code (DTC).>	Check the appropriate DTC using the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H4DOTC)(diag)-65, List of Diagnostic Trouble Code (DTC).>	Repair the poor contact of 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 more than 10 V?	Check the starter motor. <Ref. to SC(H4SO)-5, Starter.>	Go to step **5**.
5	**CHECK HARNESS BETWEEN BATTERY AND IGNITION SWITCH CONNECTOR.** 1) Disconnect the connector from ignition switch. 2) Measure the power supply voltage between ignition switch connector and chassis ground. ***Connector & terminal*** ***(B72) No. 1 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **6**.	Repair the open circuit of harness between ignition switch and battery, and check fuse SBF No. 4 and SBF No. 1.
6	**CHECK IGNITION SWITCH.** 1) Disconnect the connector from ignition switch. 2) Measure the resistance between ignition switch terminals after turning the ignition switch to ST. ***Terminals*** ***No. 1 — No. 3:***	Is the resistance less than 5 Ω?	Go to step **7**.	Replace the ignition switch.
7	**CHECK TRANSMISSION TYPE.** Check the type of the transmission.	Is the transmission type AT?	Go to step **8**.	Go to step **12**.
8	**CHECK INHIBITOR SWITCH INPUT VOLTAGE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from inhibitor switch. 3) Connect the connector to the ignition switch. 4) Measure the input voltage between inhibitor switch connector terminal and engine ground while turning the ignition switch to ST. ***Connector & terminal*** ***(B12) No. 12 (+) — Engine ground (–):***	Is the voltage more than 10 V?	Go to step **9**.	Repair open or ground short circuit of harness between inhibitor switch and ignition switch. NOTE: Check security system (if equipped). <Ref. to SL-22, Security System.>

	Step	Check	Yes	No
9	**CHECK INHIBITOR SWITCH.** 1) Place the select lever in "P" or "N" range. 2) Measure the resistance between inhibitor switch terminals. ***Connector & terminal*** ***(T3) No. 11 — No. 12:***	Is the resistance less than 1 Ω?	Go to step **10**.	Replace the inhibitor switch. <Ref. to 4AT-48, Inhibitor Switch.>
10	**CHECK INPUT VOLTAGE OF STARTER INTERLOCK RELAY.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from starter interlock relay. 3) Connect the connector to ignition switch. 4) Measure the input voltage between starter interlock relay connector and chassis ground after turning the ignition switch to ST. ***Connector & terminal*** ***(B225) No. 26 (+) — Chassis ground (–):*** ***(B225) No. 28 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **11**.	Repair open or ground short circuit of harness between starter interlock relay and ignition switch. NOTE: Check security system (if equipped). <Ref. to SL-22, Security System.>
11	**CHECK STARTER INTERLOCK RELAY.** 1) Connect the battery to starter interlock relay terminals No. 26 and No. 24. 2) Measure the resistance between starter interlock relay terminals. ***Terminals*** ***No. 27 — No. 28:***	Is the resistance less than 1 Ω?	Go to step **12**.	Replace the starter interlock relay.
12	**CHECK GROUND CIRCUIT OF CLUTCH SWITCH.** 1) Disconnect the connector from clutch switch. 2) Measure the resistance between the clutch switch connector and chassis ground. ***Connector & terminal*** ***(B106) No. 1 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **13**.	Repair the open circuit of ground cable.
13	**CHECK CLUTCH SWITCH.** Measure the resistance between clutch switch terminals while depressing the clutch pedal. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 1 Ω?	Go to step **14**.	Replace the clutch switch. <Ref. to CL-28, Clutch Switch.>
14	**CHECK CLUTCH SWITCH CIRCUIT.** 1) Connect the connector to clutch switch. 2) Measure the resistance between the starter interlock relay connector and chassis ground while depressing the clutch pedal. ***Connector & terminal*** ***(B225) No. 24 — Chassis ground:***	Is the resistance less than 1 Ω?	Repair ground short of the harness between the starter interlock relay and the starter motor.	Repair the open circuit of the harness between the starter interlock relay and the clutch switch.

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

CAUTION:
After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.
WIRING DIAGRAM:

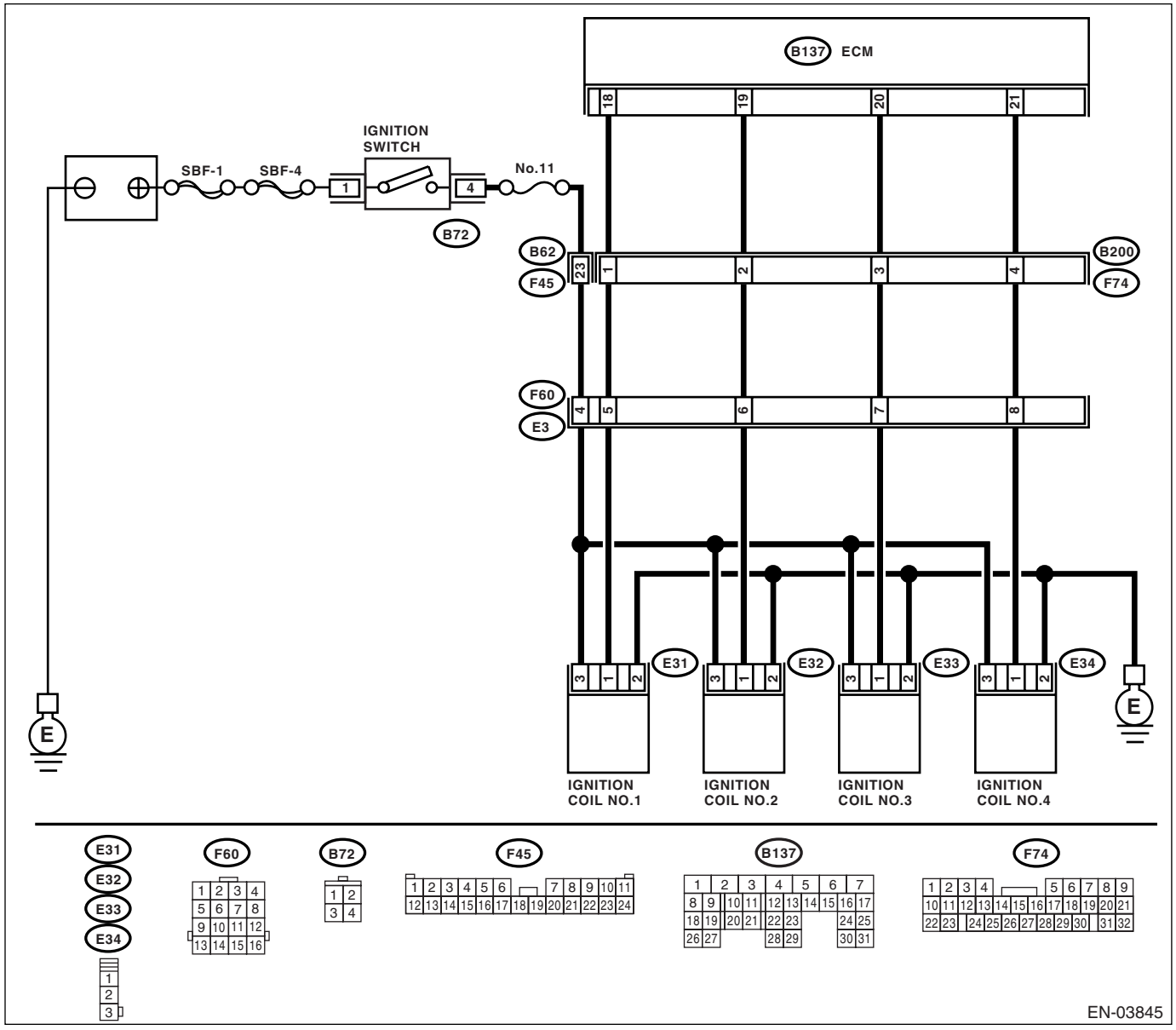


Diagnostics for Engine Starting Failure

	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 FROM 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 more than 10 V?	Go to step **4**.	Repair the open or ground short circuit of power supply circuit.
4	**CHECK INPUT VOLTAGE OF MAIN RELAY.** Measure the voltage between main relay connector and chassis ground. ***Connector & terminal*** ***(B47) No. 1 (+) — Chassis ground (–):*** ***(B47) No. 5 (+) — Chassis ground (–):*** ***(B47) No. 6 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **5**.	Repair the open or ground short circuit of harness of power supply circuit.
5	**CHECK INPUT VOLTAGE FROM 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 more than 10 V?	Check ignition control system. <Ref. to EN(H4DOTC)(diag)-59, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>	Repair the open or ground short circuit of harness between ECM connector and main relay connector.

D: IGNITION CONTROL SYSTEM

CAUTION:
After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.
WIRING DIAGRAM:



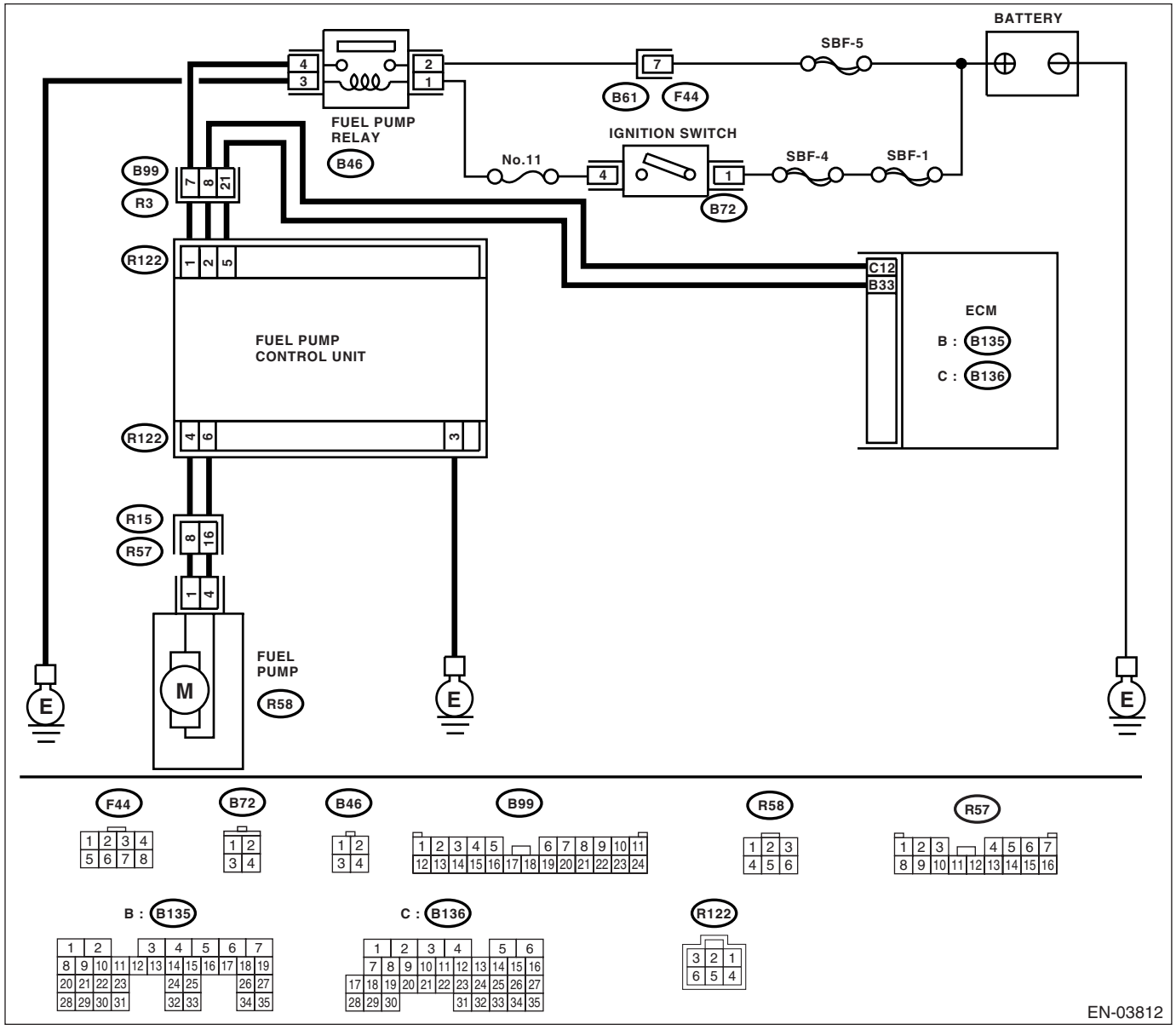
Step		Check	Yes	No
1	**CHECK SPARK PLUG CONDITION.** 1) Remove the spark plug. <Ref. to IG(H4DOTC)-5, INSTALLATION, Spark Plug.> 2) Check the spark plug condition. <Ref. to IG(H4DOTC)-5, INSPECTION, Spark Plug.>	Is the spark plug condition status OK?	Go to step **2**.	Replace the spark plug.

	Step	Check	Yes	No
2	**CHECK IGNITION SYSTEM FOR SPARKS.** 1) Connect the spark plug to ignition coil. 2) Release the fuel pressure. <Ref. to FU(H4DOTC)-50, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.> 3) Touch the threaded portion of the spark plug 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)-62, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>	Go to step **3**.
3	**CHECK POWER SUPPLY CIRCUIT FOR IGNITION COIL & IGNITOR ASSEMBLY.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ignition coil & ignitor assembly. 3) Turn the ignition switch to ON. 4) Measure the power supply voltage between ignition coil & 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 more than 10 V?	Go to step **4**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between the ignition coil & ignitor assembly, and ignition switch connector • Poor contact of coupling connector
4	**CHECK HARNESS OF IGNITION COIL & IGNITOR ASSEMBLY GROUND CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between the ignition coil & ignitor assembly connector and engine ground. ***Connector & terminal*** ***(E31) No. 2 — Engine ground:*** ***(E32) No. 2 — Engine ground:*** ***(E33) No. 2 — Engine ground:*** ***(E34) No. 2 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **5**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ignition coil and ignitor assembly connector & engine grounding terminal
5	**CHECK HARNESS BETWEEN ECM AND IGNITION COIL & IGNITOR ASSEMBLY CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connector from ignition coil & ignitor assembly. 4) Measure the resistance of harness between ECM and ignition coil & 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 of harness between ECM and ignition coil & ignitor assembly connector • Poor contact of coupling connector

	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN ECM AND IGNITION COIL & IGNITOR ASSEMBLY CONNECTOR.** Measure the resistance of harness between ECM and engine ground. ***Connector & terminal*** ***(B137) No. 21 — Engine ground:*** ***(B137) No. 20 — Engine ground:*** ***(B137) No. 19 — Engine ground:*** ***(B137) No. 18 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **7**.	Repair the ground short circuit of harness between ECM and ignition coil & 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)-62, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>

E: FUEL PUMP CIRCUIT

CAUTION:
After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.
WIRING DIAGRAM:

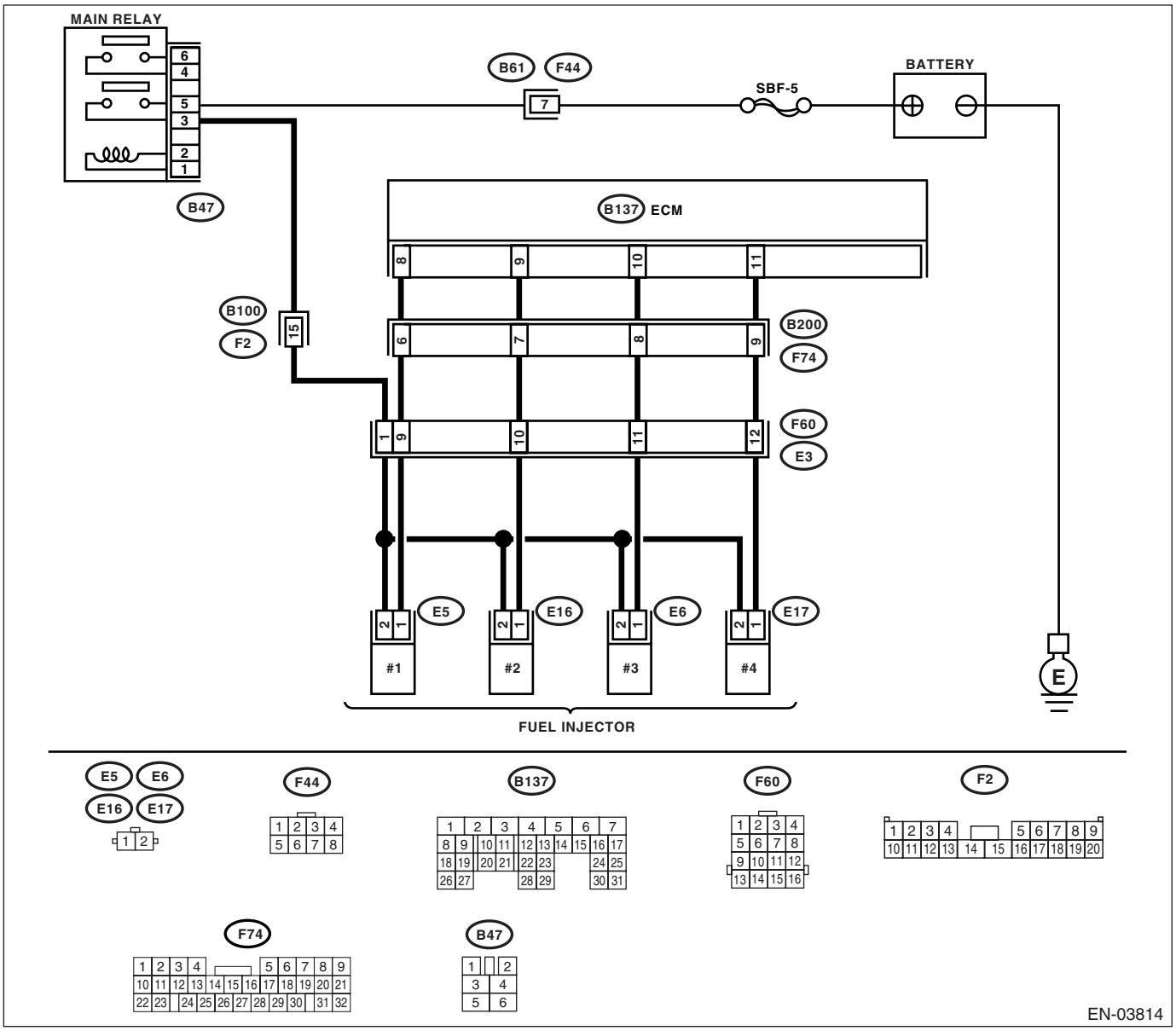


Step		Check	Yes	No
1	**CHECK OPERATING SOUND OF FUEL PUMP.** Make sure that the fuel pump operates for 2 seconds when turning the ignition switch to ON. NOTE: Fuel pump operation check can also be executed using Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-47, Compulsory Valve Operation Check Mode.>	Does the fuel pump emit operating sound?	Check the fuel injector circuit. <Ref. to EN(H4DOTC)(diag)-63, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>	Display DTC. <Ref. to EN(H4DOTC)(diag)-35, OPERATION, Read Diagnostic Trouble Code (DTC).>

F: FUEL INJECTOR CIRCUIT

CAUTION:
- **Check or repair only faulty parts.**
- **After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.**

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK OPERATION OF EACH FUEL INJECTOR.** While cranking the engine, check each fuel injector emits operating sound. Use a sound scope or attach a screwdriver to the injector for this check.	Does the fuel injector emit operating sound?	Check the fuel pressure. <Ref. to ME(H4DOTC)-25, INSPECTION, Fuel Pressure.>	Go to step **2**.

	Step	Check	Yes	No
2	**CHECK POWER SUPPLY TO EACH FUEL INJECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel injector. 3) Turn the ignition switch to ON. 4) Measure the power supply voltage between fuel injector 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 more than 10 V?	Go to step **3**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between main relay and fuel injector connector • Poor contact of main relay connector • Poor contact of coupling connector • Poor contact of 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 of harness between ECM and fuel injector connector • Poor contact of coupling connector
4	**CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR.** Measure the resistance of harness between ECM and 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 and 20 Ω?	Go to step **6**.	Replace the faulty fuel injector.
6	**CHECK POOR CONTACT.** Check poor contact of ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Inspection using “General Diagnostic Table”<Ref. to EN(H4DOTC)(diag)-387, INSPECTION, General Diagnostic Table.>

17.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)-73, DTC P0011 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0016	Crankshaft Position - Camshaft Position Correlation (Bank1)	<Ref. to EN(H4DOTC)(diag)-74, DTC P0016 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0018	Crankshaft Position - Camshaft Position Correlation (Bank2)	<Ref. to EN(H4DOTC)(diag)-75, DTC P0018 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0021	Intake Camshaft Position - Timing Over-Advanced or System Performance (Bank 2)	<Ref. to EN(H4DOTC)(diag)-76, 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)-77, 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)-79, 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)-82, 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)-84, 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)-87, 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)-89, 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)-91, 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)-93, 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)-96, 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)-98, 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)-100, 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)-102, 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)-104, DTC P0112 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0113	Intake Air Temperature Sensor 1 Circuit High	<Ref. to EN(H4DOTC)(diag)-106, DTC P0113 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	NOTE
P0117	Engine Coolant Temperature Circuit Low	<Ref. to EN(H4DOTC)(diag)-109, 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)-111, 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)-114, 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)-116, 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)-118, 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)-120, 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)-122, 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)-123, 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)-125, 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)-127, 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)-129, 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)-131, 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)-134, 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)-137, 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)-139, DTC P0140 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK1 SENSOR2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0171	System Too Lean (Bank 1)	<Ref. to EN(H4DOTC)(diag)-141, 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)-142, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0181	Fuel Temperature Sensor “A” Circuit Range/Performance	<Ref. to EN(H4DOTC)(diag)-144, DTC P0181 FUEL TEMPERATURE SENSOR “A” CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0182	Fuel Temperature Sensor “A” Circuit Low Input	<Ref. to EN(H4DOTC)(diag)-146, DTC P0182 FUEL TEMPERATURE SENSOR “A” CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	NOTE
P0183	Fuel Temperature Sensor “A” Circuit High Input	<Ref. to EN(H4DOTC)(diag)-148, 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)-151, 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)-153, DTC P0223 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0230	Fuel Pump Primary Circuit	<Ref. to EN(H4DOTC)(diag)-156, DTC P0230 FUEL PUMP PRIMARY CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0244	Turbo/Super Charger Wastegate Solenoid “A” Range/Performance	<Ref. to EN(H4DOTC)(diag)-159, DTC P0244 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0245	Turbo/Super Charger Wastegate Solenoid “A” Low	<Ref. to EN(H4DOTC)(diag)-161, DTC P0245 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0246	Turbo/Super Charger Wastegate Solenoid “A” High	<Ref. to EN(H4DOTC)(diag)-163, DTC P0246 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0301	Cylinder 1 Misfire Detected	<Ref. to EN(H4DOTC)(diag)-165, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0302	Cylinder 2 Misfire Detected	<Ref. to EN(H4DOTC)(diag)-165, DTC P0302 CYLINDER 2 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0303	Cylinder 3 Misfire Detected	<Ref. to EN(H4DOTC)(diag)-165, DTC P0303 CYLINDER 3 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0304	Cylinder 4 Misfire Detected	<Ref. to EN(H4DOTC)(diag)-166, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0327	Knock Sensor 1 Circuit Low (Bank 1 or Single Sensor)	<Ref. to EN(H4DOTC)(diag)-170, DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW (BANK 1 OR SINGLE SENSOR), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0328	Knock Sensor 1 Circuit High (Bank 1 or Single Sensor)	<Ref. to EN(H4DOTC)(diag)-172, DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH (BANK 1 OR SINGLE SENSOR), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0335	Crankshaft Position Sensor “A” Circuit	<Ref. to EN(H4DOTC)(diag)-174, DTC P0335 CRANKSHAFT POSITION SENSOR “A” CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0336	Crankshaft Position Sensor “A” Circuit Range/Performance	<Ref. to EN(H4DOTC)(diag)-176, DTC P0336 CRANKSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0340	Camshaft Position Sensor “A” Circuit (Bank 1 or Single Sensor)	<Ref. to EN(H4DOTC)(diag)-178, 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)-180, 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)-182, 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)-186, 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)-189, DTC P0413 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “A” CIRCUIT OPEN , Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0414	Secondary Air Injection System Switching Valve “A” Circuit Shorted	<Ref. to EN(H4DOTC)(diag)-192, DTC P0414 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “A” CIRCUIT SHORTED , Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	NOTE
P0416	Secondary Air Injection System Switching Valve “B” Circuit Open	<Ref. to EN(H4DOTC)(diag)-195, 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)-198, 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)-201, 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)-204, DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0442	Evaporative Emission Control System Leak Detected (Small Leak)	<Ref. to EN(H4DOTC)(diag)-208, 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)-211, 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)-214, 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)-216, 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)-218, 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)-221, 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)-224, 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)-227, 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)-230, 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)-232, 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)-236, 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)-239, DTC P0463 FUEL LEVEL SENSOR “A” CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0464	Fuel Level Sensor Circuit Intermittent	<Ref. to EN(H4DOTC)(diag)-242, DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0483	Fan Rationality Check	<Ref. to EN(H4DOTC)(diag)-244, 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)-245, DTC P0502 VEHICLE SPEED SENSOR “A” CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	NOTE
P0503	Vehicle Speed Sensor “A” Intermittent/Erratic/High	<Ref. to EN(H4DOTC)(diag)-247, 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)-249, 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)-251, 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)-253, DTC P0512 STARTER REQUEST CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0513	Incorrect Immobilizer Key	<Ref. to IM(diag)-19, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0519	Idle Air Control System Performance	<Ref. to EN(H4DOTC)(diag)-255, DTC P0519 IDLE AIR CONTROL SYSTEM PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0600	Serial Communication Link	<Ref. to EN(H4DOTC)(diag)-257, 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)-259, 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)-260, 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)-261, 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)-263, 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)-263, 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)-263, 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)-263, 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)-264, 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)-266, 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)-269, 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)-272, DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT MODEL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1152	O2 Sensor Circuit Range/Performance (Low) (Bank1 Sensor1)	<Ref. to EN(H4DOTC)(diag)-275, DTC P1152 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK1 SENSOR1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1153	O2 Sensor Circuit Range/Performance (High) (Bank1 Sensor1)	<Ref. to EN(H4DOTC)(diag)-277, DTC P1153 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1160	Return Spring Failure	<Ref. to EN(H4DOTC)(diag)-278, DTC P1160 RETURN SPRING FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	NOTE
P1400	Fuel Tank Pressure Control Solenoid Valve Circuit Low	<Ref. to EN(H4DOTC)(diag)-279, 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)-282, 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)-285, 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)-288, 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)-290, 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)-292, 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)-294, 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)-296, DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1570	Antenna	<Ref. to IM(diag)-21, DTC P1570 ANTENNA, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1571	Reference Code Incompatibility	<Ref. to IM(diag)-15, DTC P1571 REFERENCE CODE INCOMPATIBILITY, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1572	IMM Circuit Failure (Except Antenna Circuit)	<Ref. to IM(diag)-16, DTC P1572 IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1574	Key Communication Failure	<Ref. to IM(diag)-19, DTC P1574 KEY COMMUNICATION FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1576	EGI Control Module EEPROM	<Ref. to IM(diag)-20, DTC P1576 EGI CONTROL MODULE EEPROM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1577	IMM Control Module EEPROM	<Ref. to IM(diag)-20, DTC P1577 IMM CONTROL MODULE EEPROM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2004	Intake Manifold Runner Control Stuck Open (Bank 1)	<Ref. to EN(H4DOTC)(diag)-297, 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)-298, 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)-298, DTC P2006 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2007	Intake Manifold Runner Control Stuck Closed (Bank 2)	<Ref. to EN(H4DOTC)(diag)-299, 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)-300, 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)-302, 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)-304, DTC P2011 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	NOTE
P2012	Intake Manifold Runner Control Circuit Low (Bank 2)	<Ref. to EN(H4DOTC)(diag)-306, 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)-308, 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)-318, DTC P2022 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT HIGH (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2088	OCV Solenoid Valve Signal A Circuit Open (Bank 1)	<Ref. to EN(H4DOTC)(diag)-320, DTC P2088 OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2089	OCV Solenoid Valve Signal A Circuit Short (Bank 1)	<Ref. to EN(H4DOTC)(diag)-322, DTC P2089 OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2092	OCV Solenoid Valve Signal A Circuit Open (Bank 2)	<Ref. to EN(H4DOTC)(diag)-324, DTC P2092 OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2093	Intake Camshaft Position Actuator Control Circuit High (Bank 2)	<Ref. to EN(H4DOTC)(diag)-326, 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)-328, 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)-334, 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)-340, 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)-346, 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)-348, 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)-349, DTC P2109 THROTTLE/PEDAL POSITION SENSOR “A” MINIMUM STOP PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2122	Throttle/Pedal Position Sensor/ Switch “D” Circuit Low Input	<Ref. to EN(H4DOTC)(diag)-350, 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)-352, 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)-354, DTC P2127 THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2128	Throttle/Pedal Position Sensor/ Switch “E” Circuit High Input	<Ref. to EN(H4DOTC)(diag)-356, DTC P2128 THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	NOTE
P2135	Throttle/Pedal Position Sensor/ Switch “A”/“B” Voltage Correlation	<Ref. to EN(H4DOTC)(diag)-358, 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)-362, DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D”/“E” VOLTAGE CORRELATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2227	Barometric Pressure Circuit Range/Performance	<Ref. to EN(H4DOTC)(diag)-365, DTC P2227 BAROMETRIC PRESSURE CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2228	Barometric Pressure Circuit Low	<Ref. to EN(H4DOTC)(diag)-365, DTC P2228 BAROMETRIC PRESSURE CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2229	Barometric Pressure Circuit High	<Ref. to EN(H4DOTC)(diag)-366, DTC P2229 BAROMETRIC PRESSURE 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)-367, 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)-370, 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)-373, 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)-376, DTC P2440 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2441	Secondary Air Injection System Switching Valve Stuck Closed (Bank1)	<Ref. to EN(H4DOTC)(diag)-379, DTC P2441 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK CLOSED (BANK1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2442	Secondary Air Injection System Switching Valve Stuck Open (Bank2)	<Ref. to EN(H4DOTC)(diag)-380, DTC P2442 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2443	Secondary Air Injection System Switching Valve Stuck Closed (Bank2)	<Ref. to EN(H4DOTC)(diag)-383, DTC P2443 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK CLOSED (BANK2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2444	Secondary Air Injection System Pump Stuck On	<Ref. to EN(H4DOTC)(diag)-384, DTC P2444 SECONDARY AIR INJECTION SYSTEM PUMP STUCK ON, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

18.Diagnostic Procedure with Diagnostic Trouble Code (DTC)

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

DTC DETECTING CONDITION:

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

TROUBLE SYMPTOM:

- Engine stalls.
- Improper idling

CAUTION:

After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, 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)-65, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK CURRENT DATA.** 1) Start the engine and let it idle. 2) Using the Subaru Select Monitor or general scan tool, inspect the AVCS advance angle amount and oil flow control solenoid valve duty output. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is AVCS advance approximately 0 degrees, and the oil flow control solenoid valve duty output approx. 10%?	Check the following item and repair or replace if necessary. • Oil pipe (clog) • Oil flow control solenoid valve (clog or dirt of oil routing, setting of spring, clog of valve) • Intake camshaft (dirt, damage of camshaft) • Timing belt (matching of timing mark)	A temporary malfunction. Perform the following, and clean the oil routing. Replace the engine oil and idle the engine for 5 minutes, and then replace the oil filter and engine oil.

B: DTC P0016 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK1)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-13, DTC P0016 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Engine stalls.
- Improper idling

CAUTION:
After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, 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)-65, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK CURRENT DATA.** 1) Start the engine and let it idle. 2) Using the Subaru Select Monitor or general scan tool, inspect the AVCS advance angle amount and oil flow control solenoid valve duty output. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H4DOTC)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is AVCS advance approximately 0 degrees, and the oil flow control solenoid valve duty output approx. 10%?	Check the following item and repair or replace if necessary. • Oil pipe (clog) • Oil flow control solenoid valve (clog or dirt of oil routing, setting of spring, clog of valve) • Intake camshaft (dirt, damage of camshaft) • Timing belt (matching of timing mark)	A temporary malfunction. Perform the following, and clean the oil routing. Replace the engine oil and idle the engine for 5 minutes, and then replace the oil filter and engine oil.

C: DTC P0018 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK2)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-13, DTC P0018 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Engine stalls.
- Improper idling

CAUTION:
After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, 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)-65, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK CURRENT DATA.** 1) Start the engine and let it idle. 2) Using the Subaru Select Monitor or general scan tool, inspect the AVCS advance angle amount and oil flow control solenoid valve duty output. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H4DOTC)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is AVCS advance approximately 0 degrees, and the oil flow control solenoid valve duty output approx. 10%?	Check the following item and repair or replace if necessary. • Oil pipe (clog) • Oil flow control solenoid valve (clog or dirt of oil routing, setting of spring, clog of valve) • Intake camshaft (dirt, damage of camshaft) • Timing belt (matching of timing mark)	A temporary malfunction. Perform the following, and clean the oil routing. Replace the engine oil and idle the engine for 5 minutes, and then replace the oil filter and engine oil.

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

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-13, DTC P0021 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Engine stalls.
- Improper idling

CAUTION:
After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, 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)-65, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK CURRENT DATA.** 1) Start the engine and let it idle. 2) Using the Subaru Select Monitor or general scan tool, inspect the AVCS advance angle amount and oil flow control solenoid valve duty output. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H4DOTC)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is AVCS advance approximately 0 degrees, and the oil flow control solenoid valve duty output approx. 10%?	Check the following item and repair or replace if necessary. • Oil pipe (clog) • Oil flow control solenoid valve (clog or dirt of oil routing, setting of spring, clog of valve) • Intake camshaft (dirt, damage of camshaft) • Timing belt (matching of timing mark)	A temporary malfunction. Perform the following, and clean the oil routing. Replace the engine oil and idle the engine for 5 minutes, and then replace the oil filter and engine oil.

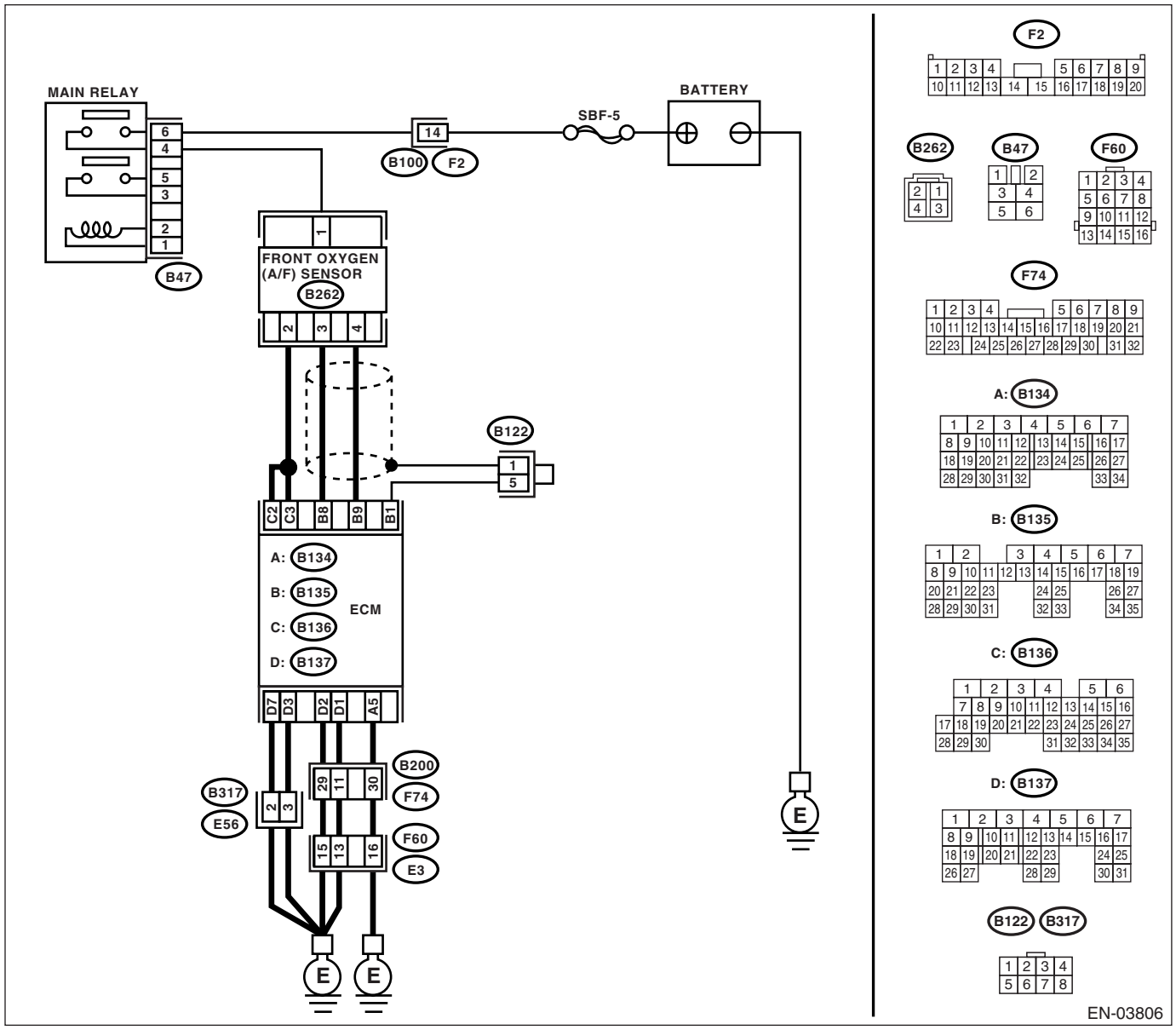
E: DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-14, DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Start and warm-up the engine. 2) Turn the ignition switch to OFF. 3) Disconnect the connectors from ECM and front oxygen (A/F) sensor. 4) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B136) No. 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 the 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. 8 — (B262) No. 3:*** ***(B135) No. 9 — (B262) No. 4:***	Is the resistance less than 1 Ω?	Go to step **3**.	Repair the open circuit of the harness between ECM and front oxygen (A/F) sensor connector.
3	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** Measure the resistance of the harness between the main relay and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B47) No. 4 — (B262) No. 1:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the open circuit of the harness between ECM and front oxygen (A/F) sensor connector.
4	**CHECK FRONT OXYGEN (A/F) SENSOR.** Measure the resistance between front oxygen (A/F) sensor connector terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 5 Ω?	Go to step **5**.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-41, Front Oxygen (A/F) Sensor.>
5	**CHECK POOR CONTACT.** Check poor contact of ECM and front oxygen (A/F) sensor connector.	Is there poor contact in the ECM or front oxygen (A/F) sensor connector?	Repair poor contact of the ECM or front oxygen (A/F) sensor.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-41, Front Oxygen (A/F) Sensor.>

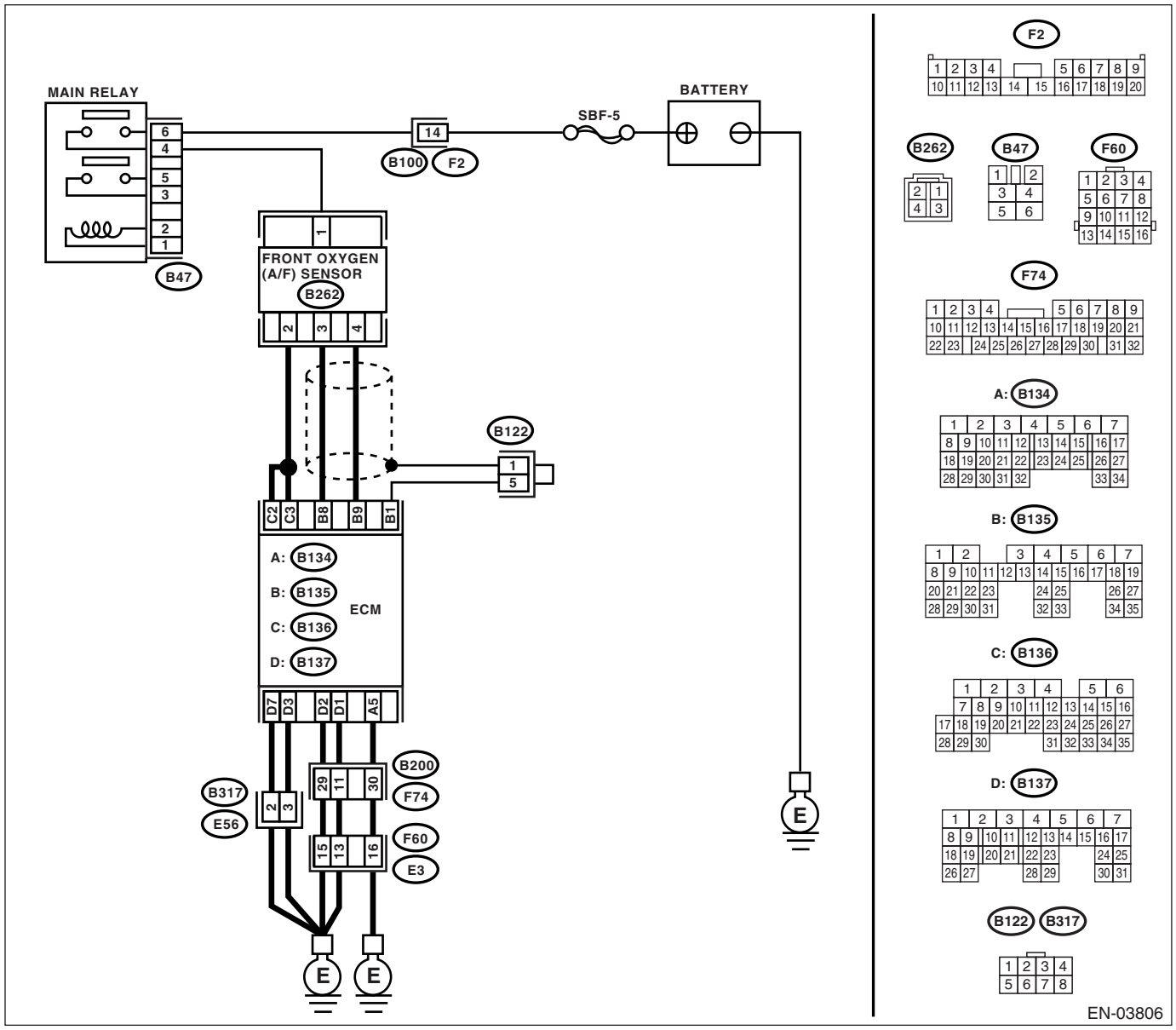
F: DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-16, 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, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK POWER SUPPLY TO FRONT OXYGEN (A/F) SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the 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 more than 10 V?	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 of main relay connector • Malfunction in main relay
2	**CHECK GROUND CIRCUIT FOR ECM.** Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 5 — Chassis ground:*** ***(B137) No. 1 — Chassis ground:*** ***(B137) No. 2 — Chassis ground:*** ***(B137) No. 3 — Chassis ground:*** ***(B137) No. 7 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **3**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and engine ground cable • Poor contact in ECM connector • Poor contact of coupling connector
3	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of the front oxygen (A/F) sensor heater current using the Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H4DOTC)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the current more than 0.2 A?	Repair the poor contact of connector. NOTE: In this case, repair the following item: • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector	Go to step **4**.
4	**CHECK OUTPUT SIGNAL OF ECM.** 1) Start and idle the engine. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 2 (+) — Chassis ground (–):*** ***(B136) No. 3 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **6**.	Go to step **5**.

	Step	Check	Yes	No
5	**CHECK OUTPUT SIGNAL OF ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 2 (+) — Chassis ground (–):*** ***(B136) No. 3 (+) — Chassis ground (–):***	Does the voltage change when shaking the harness and connector of the ECM while monitoring the value with a voltage meter?	Repair poor contact in ECM connector.	Go to step **6**.
6	**CHECK FRONT OXYGEN (A/F) SENSOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between front oxygen (A/F) sensor connector terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 10 Ω?	Repair the harness and connector. NOTE: In this case, repair the following item: • Open or ground short circuit of harness between front oxygen (A/F) sensor and ECM connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-41, Front Oxygen (A/F) Sensor.>

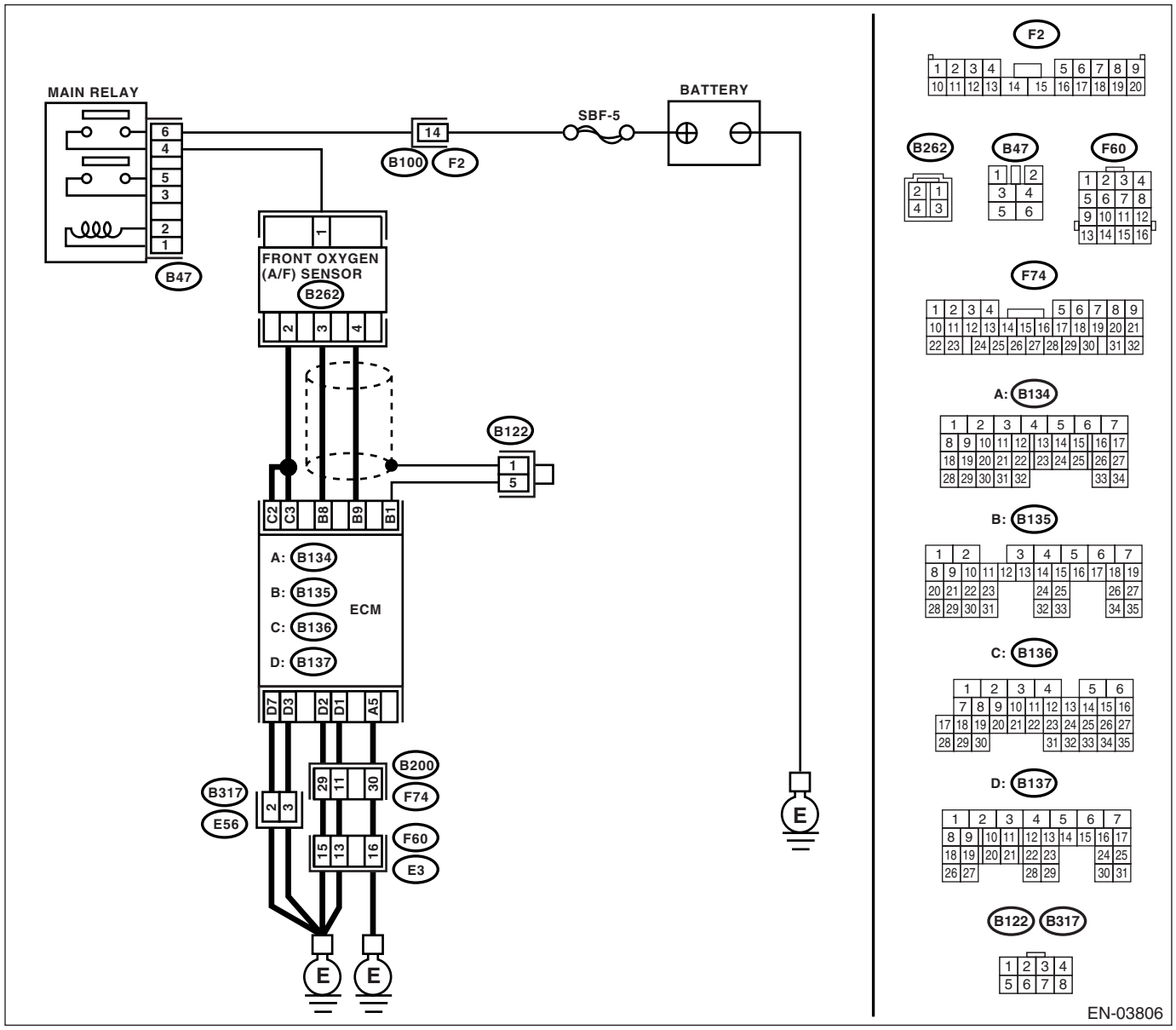
G: DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-18, 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, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL OF ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 2 (+) — Chassis ground (–):*** ***(B136) No. 3 (+) — Chassis ground (–):***	Is the voltage more than 8 V?	Go to step **3**.	Go to step **2**.
2	**CHECK FRONT OXYGEN (A/F) SENSOR HEATER CURRENT.** 1) Turn the ignition switch to OFF. 2) Repair the battery short circuit of harness between ECM and front oxygen (A/F) sensor connector. 3) Turn the ignition switch to ON. 4) Read the data of the front oxygen (A/F) sensor heater current using the Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the current more than 2.3 A?	Replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>	END.
3	**CHECK OUTPUT SIGNAL OF ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 2 (+) — Chassis ground (–):*** ***(B136) No. 3 (+) — Chassis ground (–):***	Does the voltage change when shaking the harness and connector of the ECM while monitoring the value with a voltage meter?	Repair the battery short circuit of harness between ECM and front oxygen (A/F) sensor connector.	END.

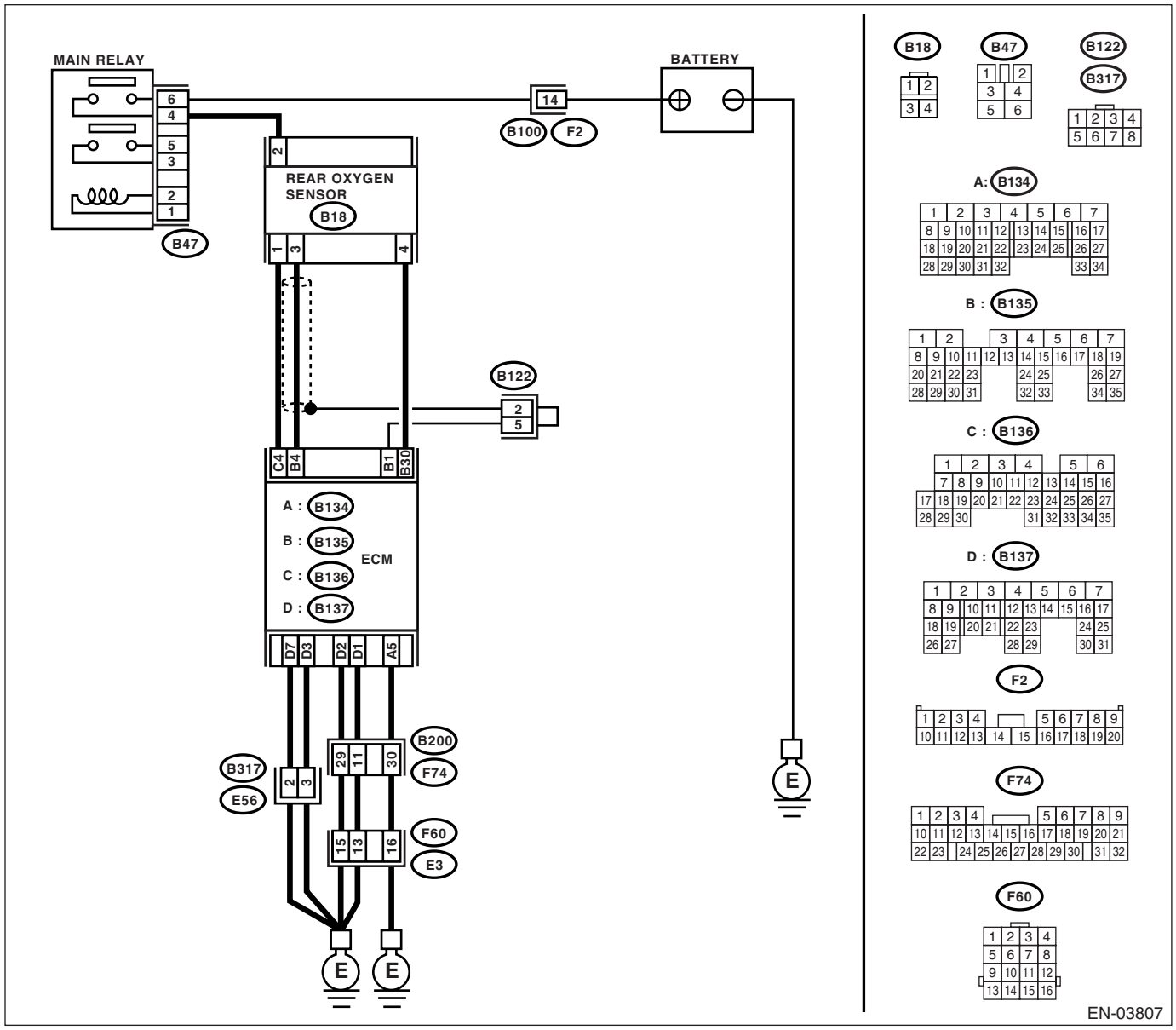
H: DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-20, 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, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK GROUND CIRCUIT FOR ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(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 **2**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and engine ground cable • Poor contact in ECM connector • Poor contact of coupling connector
2	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of rear oxygen sensor heater current using the Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the current more than 0.2 A?	Repair the connector. NOTE: In this case, repair the following item: • Poor contact of the rear oxygen sensor connector • Poor contact in rear oxygen sensor connecting harness connector • Poor contact in ECM connector	Go to step **3**.
3	**CHECK OUTPUT SIGNAL OF ECM.** 1) Start and idle the engine. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 4 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **6**.	Go to step **4**.
4	**CHECK OUTPUT SIGNAL OF ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 4 (+) — Chassis ground (–):***	Does the voltage change when shaking the harness and connector of the ECM while monitoring the value with a voltage meter?	Repair poor contact in ECM connector.	Go to step **5**.
5	**CHECK OUTPUT SIGNAL OF ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the rear oxygen sensor. 3) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 4 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>	Repair the battery short circuit of harness between ECM and rear oxygen sensor connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>

	Step	Check	Yes	No
6	**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 or chassis ground. ***Connector & terminal*** ***(B18) No. 2 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **7**.	Repair the power supply line. NOTE: In this case, repair the following item: • Open circuit of harness between main relay and rear oxygen sensor connector • Poor contact in main relay connector • Poor contact of coupling connector • Malfunction in main relay
7	**CHECK REAR OXYGEN SENSOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between the rear oxygen sensor connector terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 30 Ω?	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between the rear oxygen sensor and ECM connector • Poor contact of the rear oxygen sensor connector • Poor contact in ECM connector • Poor contact of coupling connector	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-43, Rear Oxygen Sensor.>

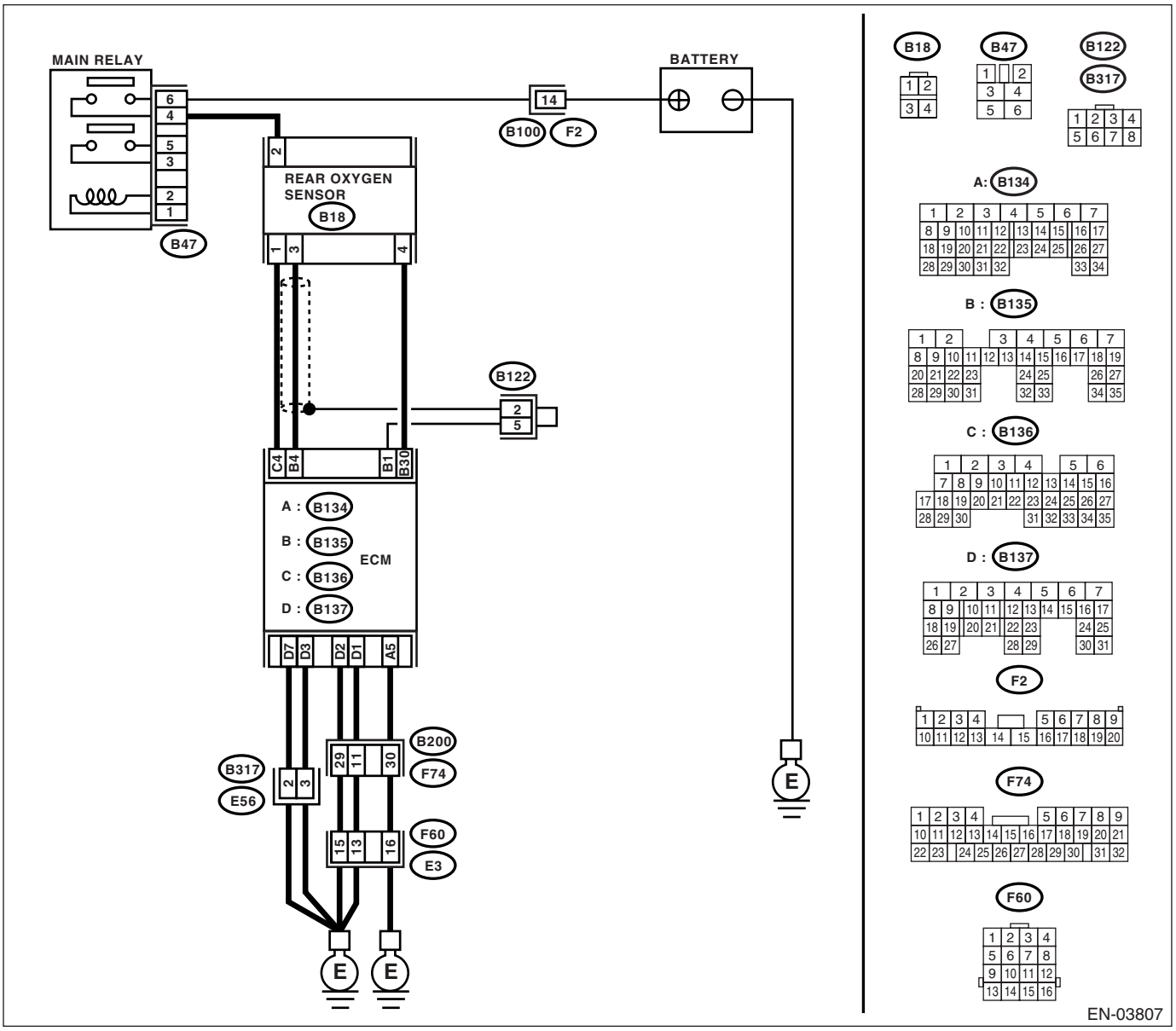
I: DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-22, DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK INPUT SIGNAL OF ECM.** 1) Turn the ignition switch to OFF. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 4 (+) — Chassis ground (–):***	Is the voltage more than 8 V?	Go to step **2**.	Go to step **3**.

	Step	Check	Yes	No
2	**CHECK CURRENT DATA.** 1) Repair the battery short circuit of harness between ECM and rear oxygen sensor connector. 2) Turn the ignition switch to ON. 3) Read the data of rear oxygen sensor heater current using the Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the current more than 7 A?	Replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>	END.
3	**CHECK POOR CONTACT.** Check poor contact of ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	END.

J: DTC P0068 MAP/MAF - THROTTLE POSITION CORRELATION

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-24, DTC P0068 MAP/MAF - THROTTLE POSITION CORRELATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

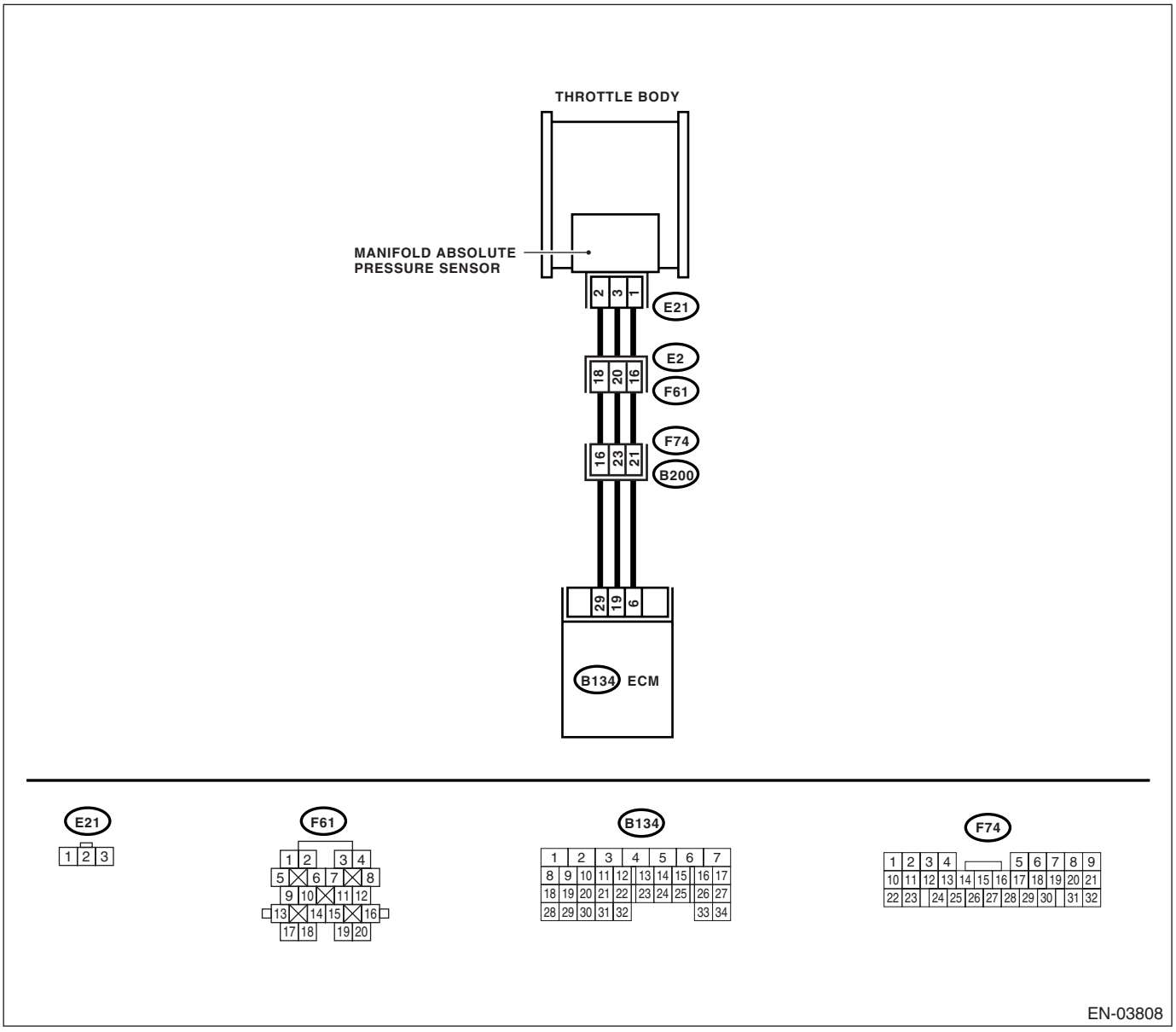
TROUBLE SYMPTOM:

Failure of engine to start

CAUTION:

After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK IDLE SWITCH SIGNAL.** 1) Turn the ignition switch to ON. 2) Operate the LED operation mode for engine using Subaru Select Monitor. NOTE: Subaru Select Monitor For detailed operation procedure, refer to the "LED OPERATION MODE FOR ENGINE." <Ref. to EN(H4DOTC)(diag)-27, Subaru Select Monitor.>	Does the LED of {Idle Switch Signal} come on?	Go to step **2**.	Check the throttle position sensor circuit. <Ref. to EN(H4DOTC)(diag)-358, DTC P2135 THROTTLE/ PEDAL POSITION SENSOR/ SWITCH "A"/"B" VOLTAGE CORRELATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0106.
2	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check the relative DTC. "List of Diagnostic Trouble Code (DTC)" <Ref. to EN(H4DOTC)(diag)-65, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0106.	Go to step **3**.
3	**CHECK CONDITION OF MANIFOLD ABSOLUTE PRESSURE SENSOR.**	Is the manifold absolute pressure sensor installation bolt tightened securely?	Go to step **4**.	Securely tighten the manifold absolute pressure sensor installation bolt.
4	**CHECK CONDITION OF THROTTLE BODY.**	Is the throttle body installation bolt tightened securely?	Replace the manifold absolute pressure sensor. <Ref. to FU(H4DOTC)-32, Manifold Absolute Pressure Sensor.>	Tighten the throttle body installation bolt securely.

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

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-26, DTC P0101 MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

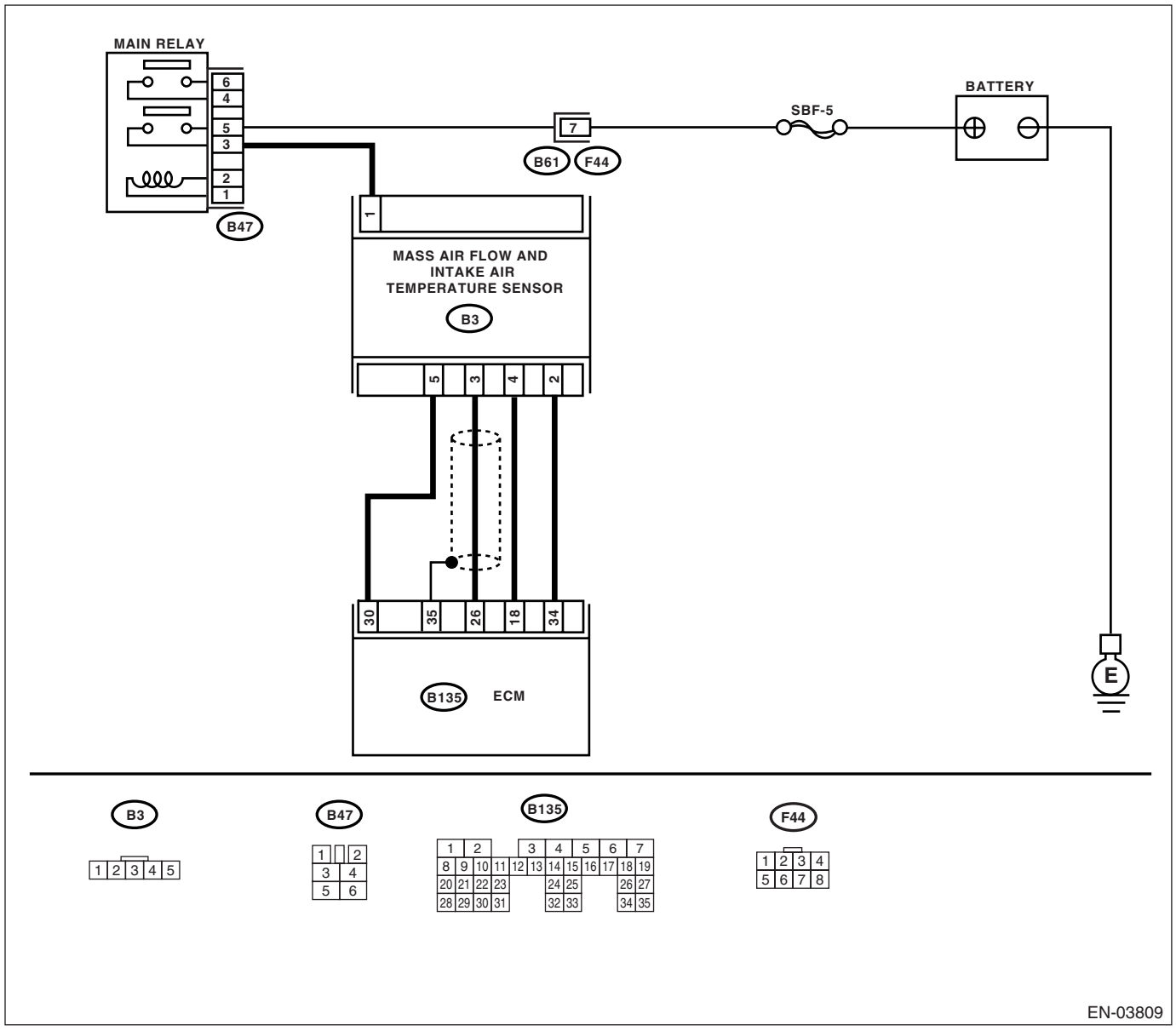
TROUBLE SYMPTOM:

- Improper idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



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)-65, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0101.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-31, Mass Air Flow and Intake Air Temperature Sensor.>

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-29, DTC P0102 MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

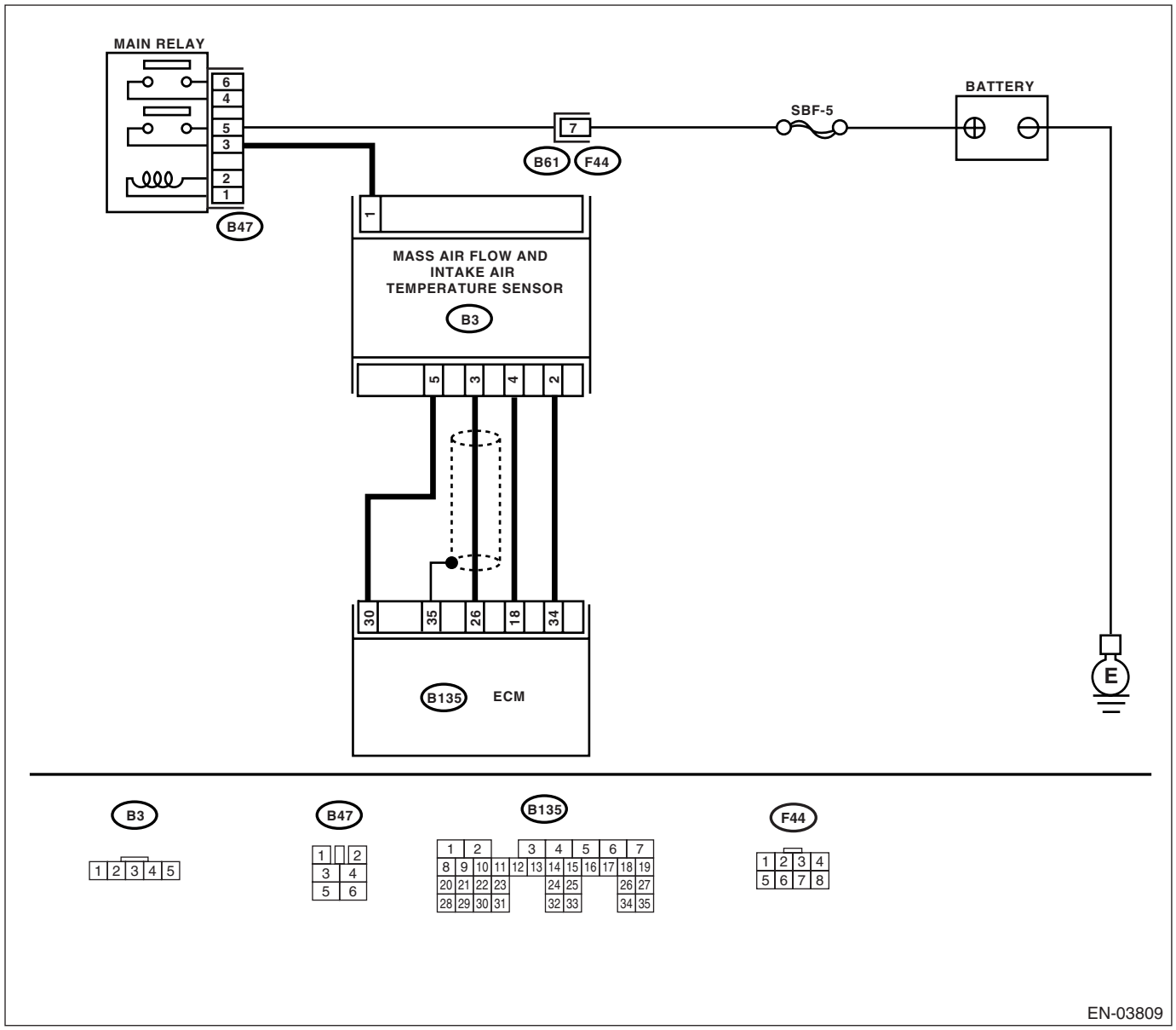
TROUBLE SYMPTOM:

- Improper idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CONNECT SUBARU SELECT MONITOR OR THE GENERAL SCAN TOOL, AND READ DATA.** 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor or general scan tool to data link connector. 3) Turn the ignition switch to ON, and the Subaru Select Monitor power switch to ON. 4) Start the engine. 5) Read the voltage of mass air flow sensor 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)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the voltage 0.2 — 4.7 V?	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. Temporary poor contact of connector or harness may be the cause. Repair the harness or connector in mass air flow sensor. NOTE: In this case, repair the following item: • Open or ground short circuit of harness between mass air flow sensor and ECM connector • Poor contact of mass air flow sensor or ECM connector	Go to step **2**.
2	**CHECK INPUT SIGNAL OF ECM.** Measure the voltage between ECM connector and chassis ground while engine is idling. ***Connector & terminal*** ***(B135) No. 26 (+) — Chassis ground (–):***	Is the voltage more than 0.2 V?	Go to step **4**.	Go to step **3**.
3	**CHECK INPUT SIGNAL FOR ECM (USING SUBARU SELECT MONITOR).** Measure the voltage between ECM connector and chassis ground while engine is idling.	Does the voltage change when shaking the harness and connector of ECM while monitoring the voltage with the Subaru Select Monitor?	Repair poor contact in ECM connector.	Contact with SOA Service Center. NOTE: The deterioration of multiple parts can be thought as the cause.
4	**CHECK POWER SUPPLY TO MASS AIR FLOW SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from mass air flow sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between mass air flow sensor connector and chassis ground. ***Connector & terminal*** ***(B3) No. 1 (+) — Chassis ground (–):***	Is the voltage more than 5 V?	Go to step **5**.	Repair the open circuit between mass air flow sensor and main relay.

	Step	Check	Yes	No
5	**CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance of harness between ECM and mass air flow sensor connector. ***Connector & terminal*** ***(B135) No. 26 — (B3) No. 3:*** ***(B135) No. 34 — (B3) No. 2:*** ***(B135) No. 30 — (B3) No. 5:***	Is the resistance less than 1 Ω?	Go to step **6**.	Repair the open circuit between ECM and mass air flow sensor connector.
6	**CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR.** Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 26 — Chassis ground:*** ***(B135) No. 34 — Chassis ground:*** ***(B135) No. 30 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **7**.	Repair the ground short circuit between ECM and mass air flow sensor connector.
7	**CHECK POOR CONTACT.** Check poor contact of mass air flow sensor connector.	Is there poor contact in mass air flow sensor connector?	Repair the poor contact of mass air flow sensor connector.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-31, Mass Air Flow and Intake Air Temperature Sensor.>

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-31, DTC P0103 MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

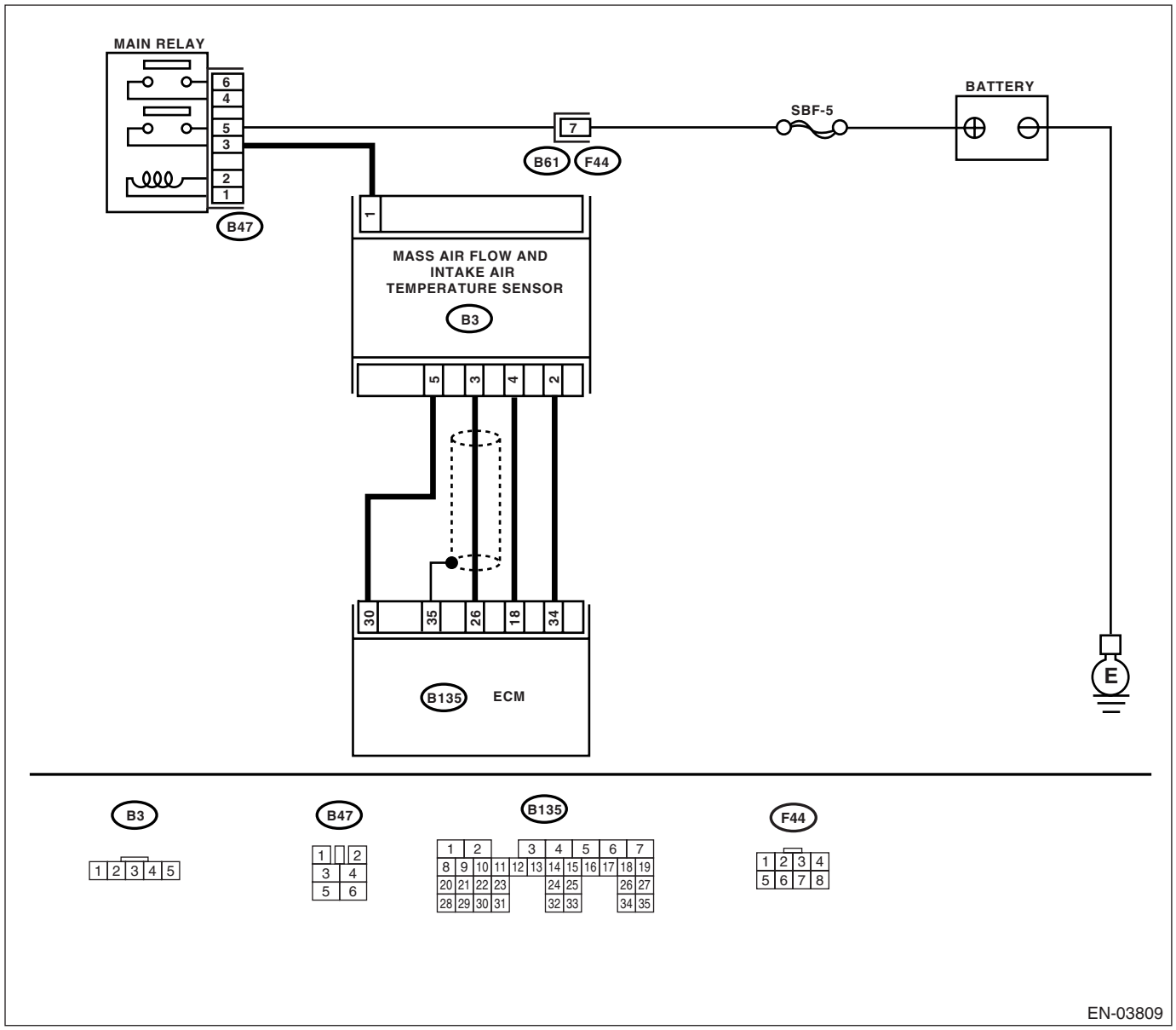
TROUBLE SYMPTOM:

- Improper idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



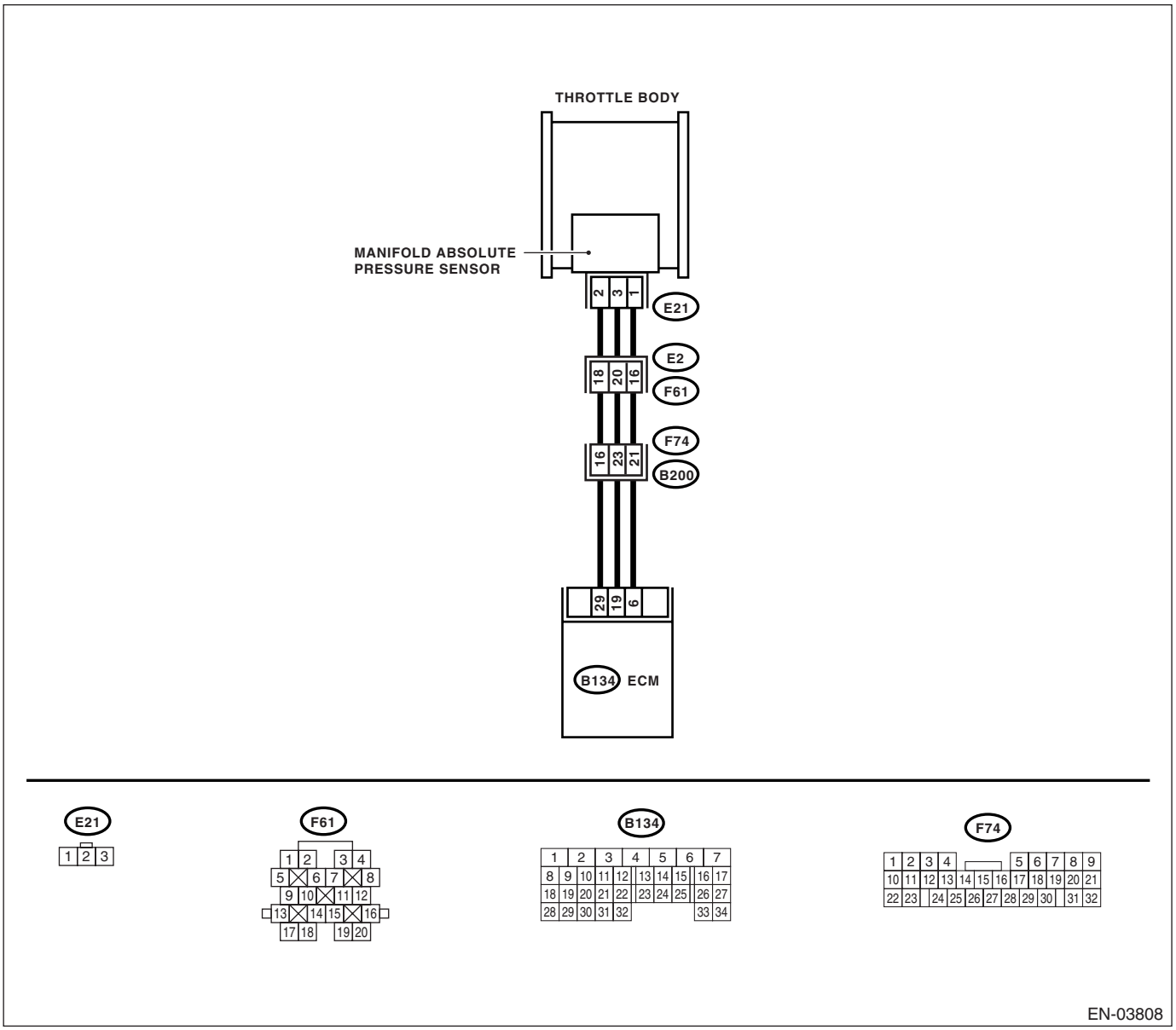
	Step	Check	Yes	No
1	**CONNECT SUBARU SELECT MONITOR OR THE GENERAL SCAN TOOL, AND READ DATA.** 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor or general scan tool to data link connector. 3) Turn the ignition switch to ON, and the Subaru Select Monitor power switch to ON. 4) Start the engine. 5) Read the voltage of mass air flow sensor 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)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the voltage 0.2 — 4.7 V?	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time.	Go to step **2**.
2	**CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from mass airflow sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between mass air flow sensor connector and chassis ground. ***Connector & terminal*** ***(B3) No. 3 (+) — Chassis ground (–):***	Is the voltage more than 5 V?	Repair the battery short circuit of harness between mass air flow sensor connector and ECM connector.	Go to step **3**.
3	**CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance of harness between ECM connector and mass air flow sensor connector. ***Connector & terminal*** ***(B3) No. 2 — (B135) No. 34:***	Is the resistance less than 1 Ω?	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 open circuit of harness between mass air flow sensor connector and ECM connector.

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-33, DTC P0107 MANIFOLD ABSOLUTE PRESSURE/ BAROMETRIC PRESSURE CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.
WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK INPUT SIGNAL OF ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 19 (+) — Chassis ground (–):***	Is the voltage more than 4.5 V?	Go to step **3**.	Go to step **2**.

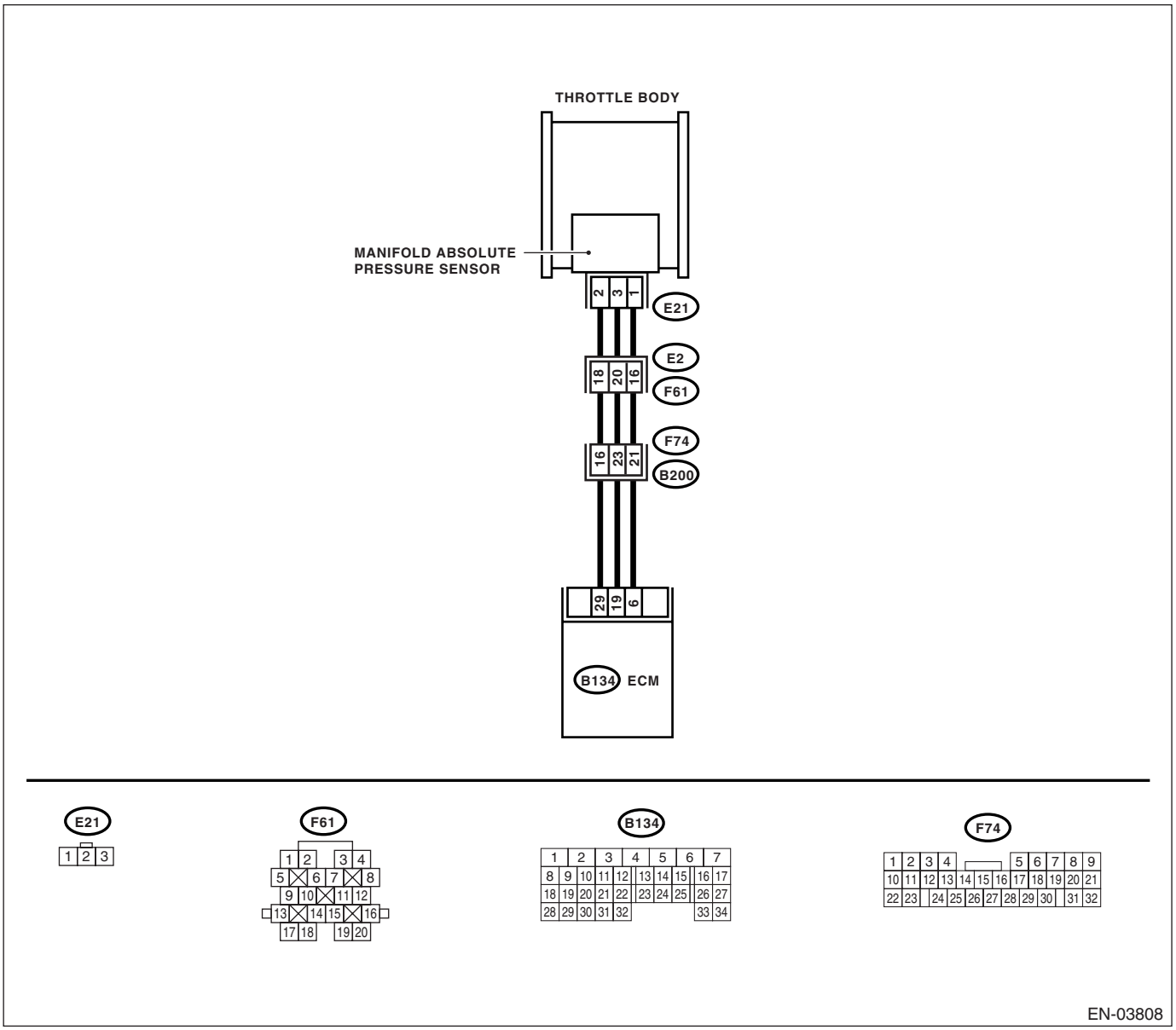
	Step	Check	Yes	No
2	**CHECK INPUT SIGNAL OF ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 19 (+) — Chassis ground (–):***	Does the voltage change when shaking the harness and connector of the ECM while monitoring the value with a voltage meter?	Repair poor contact in ECM connector.	Contact with SOA Service Center. NOTE: The deterioration of multiple parts can be thought as the cause.
3	**CHECK INPUT SIGNAL OF ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 6 (+) — Chassis ground (–):***	Is the voltage less than 0.7 V?	Go to step **4**.	Contact with SOA Service Center. NOTE: The deterioration of multiple parts can be thought as the cause.
4	**CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from manifold absolute pressure sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between manifold absolute pressure sensor connector and engine ground. ***Connector & terminal*** ***(E21) No. 3 (+) — Engine ground (–):***	Is the voltage more than 4.5 V?	Go to step **5**.	Repair the open circuit of harness between ECM and manifold absolute pressure sensor connector.
5	**CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance of harness between ECM and manifold absolute pressure sensor connector. ***Connector & terminal*** ***(B134) No. 29 — (E21) No. 2:***	Is the resistance less than 1 Ω?	Go to step **6**.	Repair the open circuit of harness between ECM and manifold absolute pressure sensor connector.
6	**CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.** Measure the resistance of harness between manifold absolute pressure sensor connector and engine ground. ***Connector & terminal*** ***(E21) No. 1 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **7**.	Repair ground short circuit of harness between ECM and manifold absolute pressure sensor connector.
7	**CHECK POOR CONTACT.** Check poor contact of manifold absolute pressure sensor connector.	Is there poor contact in manifold absolute pressure sensor connector?	Repair the poor contact of manifold absolute pressure sensor connector.	Replace the manifold absolute pressure sensor. <Ref. to FU(H4DOTC)-32, Manifold Absolute Pressure Sensor.>

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-35, DTC P0108 MANIFOLD ABSOLUTE PRESSURE/ BAROMETRIC PRESSURE CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.
WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK INPUT SIGNAL OF ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 19 (+) — Chassis ground (–):***	Is the voltage more than 4.5 V?	Go to step **3**.	Go to step **2**.

	Step	Check	Yes	No
2	**CHECK INPUT SIGNAL OF ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 19 (+) — Chassis ground (–):***	Does the voltage change when shaking the harness and connector of the ECM while monitoring the value with a voltage meter?	Repair poor contact in ECM connector.	Contact with SOA Service Center. NOTE: The deterioration of multiple parts can be thought as the cause.
3	**CHECK INPUT SIGNAL OF ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 6 (+) — Chassis ground (–):***	Is the voltage more than 4.5 V?	Go to step **4**.	Contact with SOA Service Center. NOTE: The deterioration of multiple parts can be thought as the cause.
4	**CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from manifold absolute pressure sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between manifold absolute pressure sensor connector and engine ground. ***Connector & terminal*** ***(E21) No. 3 (+) — Engine ground (–):***	Is the voltage more than 4.5 V?	Go to step **5**.	Repair the open circuit of harness between ECM and manifold absolute pressure sensor connector.
5	**CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the 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 **6**.	Repair the open circuit of harness between ECM and manifold absolute pressure sensor connector.
6	**CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.** Measure the resistance of harness between ECM and manifold absolute pressure sensor connector. ***Connector & terminal*** ***(B134) No. 29 — (E21) No. 2:***	Is the resistance less than 1 Ω?	Go to step **7**.	Repair the open circuit of harness between ECM and manifold absolute pressure sensor connector.
7	**CHECK POOR CONTACT.** Check poor contact of manifold absolute pressure sensor connector.	Is there poor contact in manifold absolute pressure sensor connector?	Repair the poor contact of manifold absolute pressure sensor connector.	Replace the manifold absolute pressure sensor. <Ref. to FU(H4DOTC)-32, Manifold Absolute Pressure Sensor.>

P: DTC P0111 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT RANGE/PERFORMANCE

DTC DETECTING CONDITION:

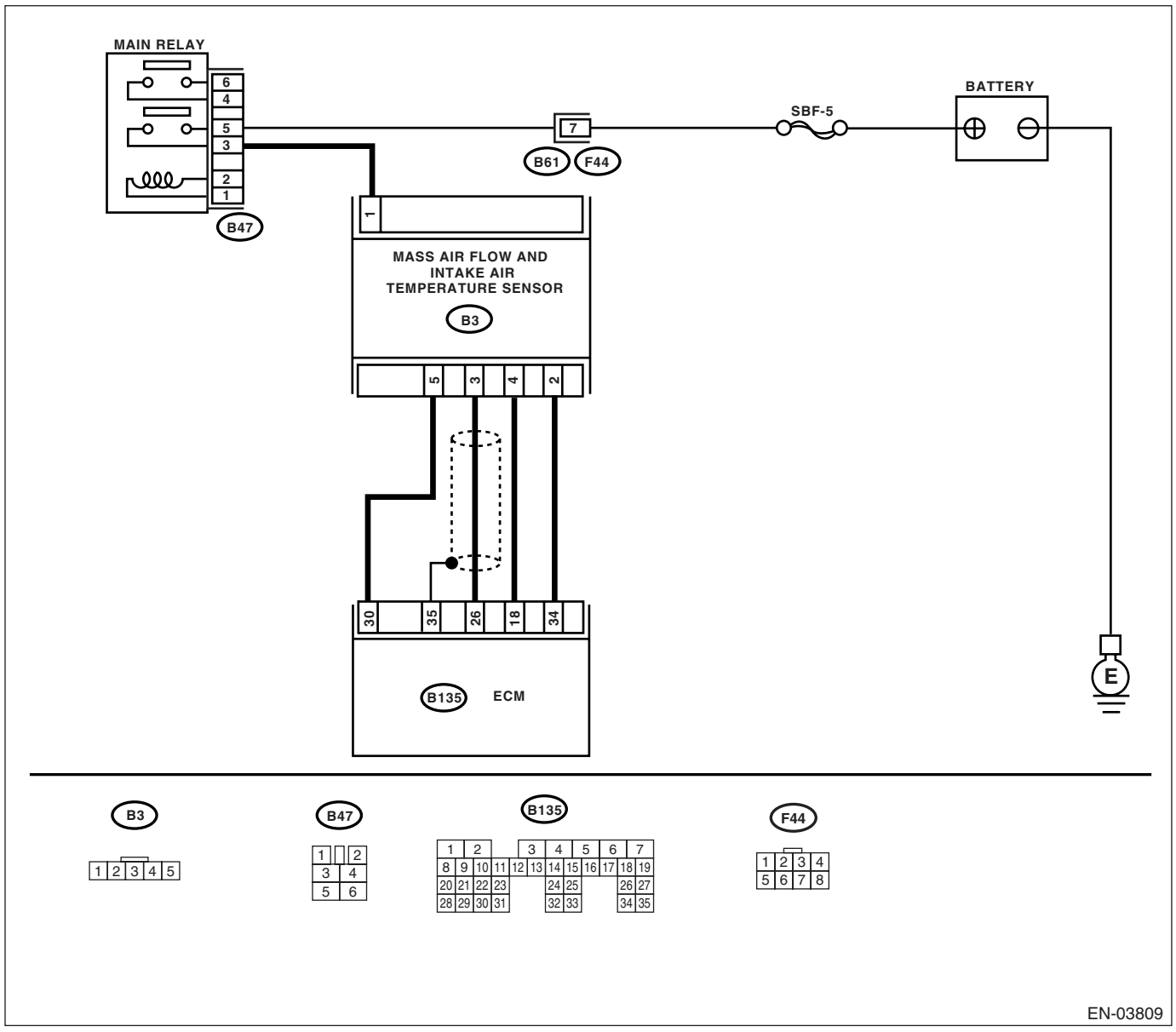
- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-37, DTC P0111 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance

CAUTION:
After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	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)-65, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0111.	Go to step **2**.
2	**CHECK ENGINE COOLANT TEMPERATURE.** 1) Start the engine and warm-up completely. 2) Measure the engine coolant temperature using the Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H4DOTC)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the engine coolant temperature 75 — 95°C (167 — 203°F) ?	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-31, Mass Air Flow and Intake Air Temperature Sensor.>	Check DTC P0125 using “List of Diagnostic Trouble Code (DTC).” <Ref. to EN(H4DOTC)(diag)-65, List of Diagnostic Trouble Code (DTC).>

Q: DTC P0112 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT LOW

DTC DETECTING CONDITION:

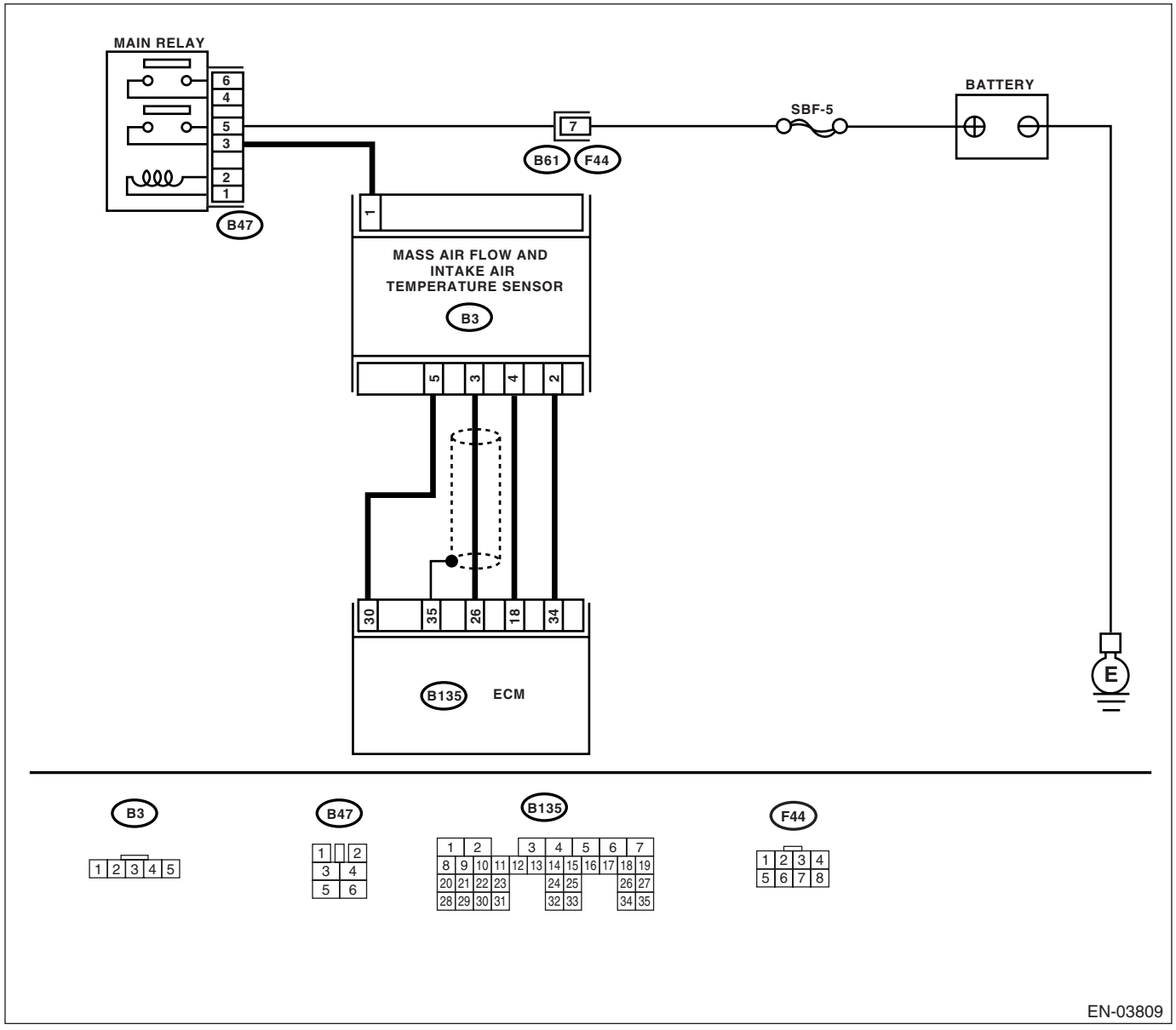
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-39, DTC P0112 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance

CAUTION:
After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of the intake air temperature sensor signal using the Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the temperature above 55°C (131°F)?	Go to step **2**.	Repair the poor contact. NOTE: In this case, repair the following item: • Poor contact of mass air flow and intake air temperature sensor • Poor contact in ECM • Poor contact of joint connector
2	**CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND THE ECM CONNECTOR.** 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) Read the data of the intake air temperature sensor signal using the Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the temperature less than –36°C (–33°F)?	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 ground short circuit of the harness between the mass air flow and intake air temperature sensor and ECM connector.

R: DTC P0113 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT HIGH

DTC DETECTING CONDITION:

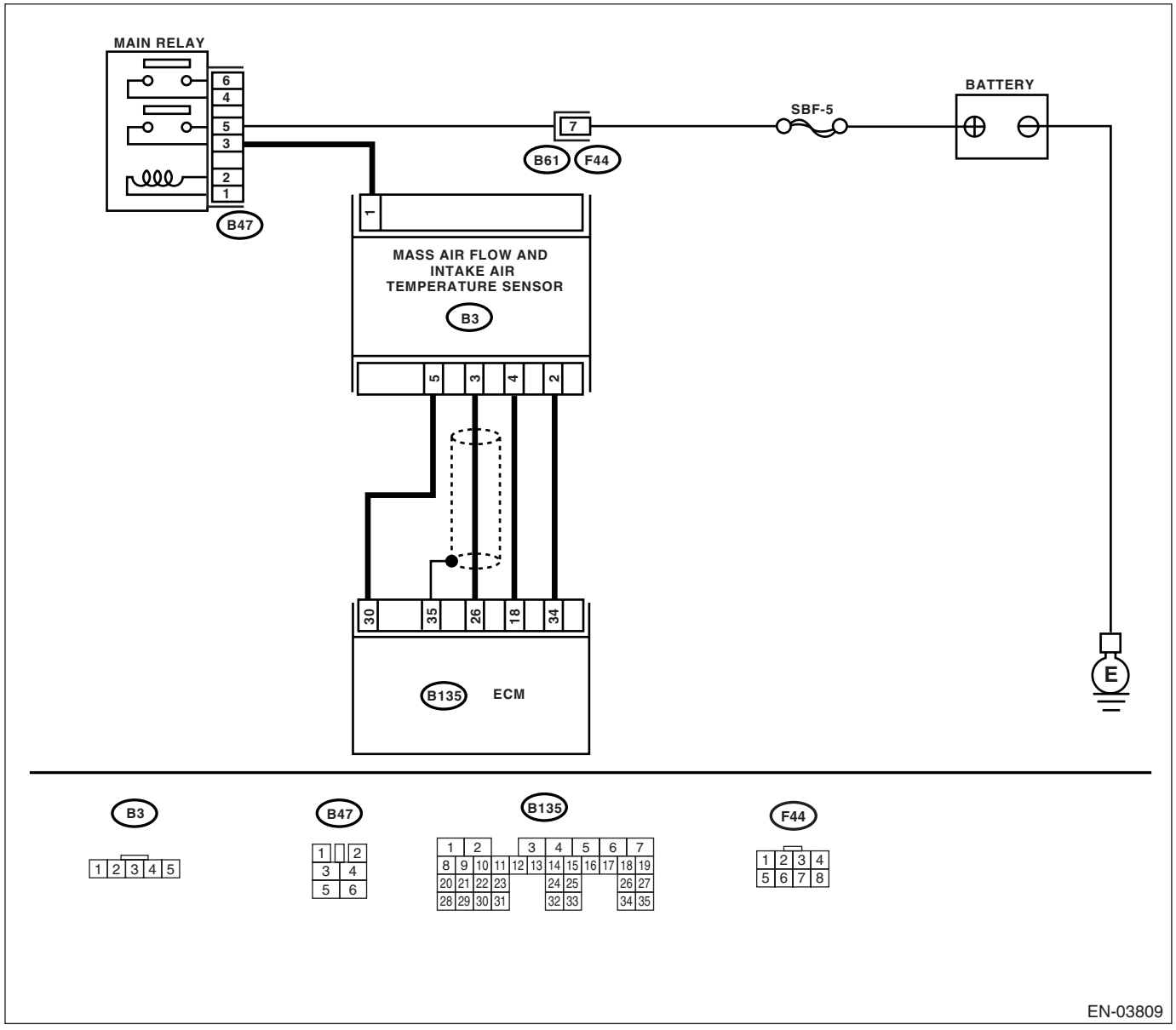
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-41, DTC P0113 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance

CAUTION:
After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of the intake air temperature sensor signal using the Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the temperature less than –36°C (–33°F)?	Go to step **2**.	Repair the poor contact. NOTE: In this case, repair the following item: • Poor contact of mass air flow and intake air temperature sensor • Poor contact in ECM • Poor contact of joint connector
2	**CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND THE ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the mass air flow and intake air temperature sensor. 3) Measure the voltage between the mass air flow and intake air temperature sensor connectors and engine ground. ***Connector & terminal*** ***(B3) No. 4 (+) — Engine ground (–):***	Is the voltage more than 10 V?	Repair the battery short circuit of the harness between mass air flow and intake air temperature sensor, and the ECM connector.	Go to step **3**.
3	**CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND THE ECM CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between the mass air flow and intake air temperature sensor connectors and engine ground. ***Connector & terminal*** ***(B3) No. 4 (+) — Engine ground (–):***	Is the voltage more than 10 V?	Repair the battery short circuit of the harness between mass air flow and intake air temperature sensor, and the ECM connector.	Go to step **4**.
4	**CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND THE ECM CONNECTOR.** Measure the voltage between the mass air flow and intake air temperature sensor, manifold absolute pressure sensor connector, and engine ground. ***Connector & terminal*** ***(B3) No. 4 (+) — Engine ground (–):***	Is the voltage more than 4 V?	Go to step **5**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit between mass air flow and intake air temperature sensor and ECM connector. • Poor contact of mass air flow and intake air temperature sensor • Poor contact in ECM • Poor contact of joint connector

Step		Check	Yes	No
5	**CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND THE ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between mass air flow and intake air temperature sensor and engine ground. ***Connector & terminal*** ***(B3) No. 5 — Engine ground:***	Is the resistance less than 5 Ω?	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-31, Mass Air Flow and Intake Air Temperature Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit between mass air flow and intake air temperature sensor and ECM connector. • Poor contact of mass air flow and intake air temperature sensor • Poor contact in ECM • Poor contact of joint connector

S: DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-43, DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

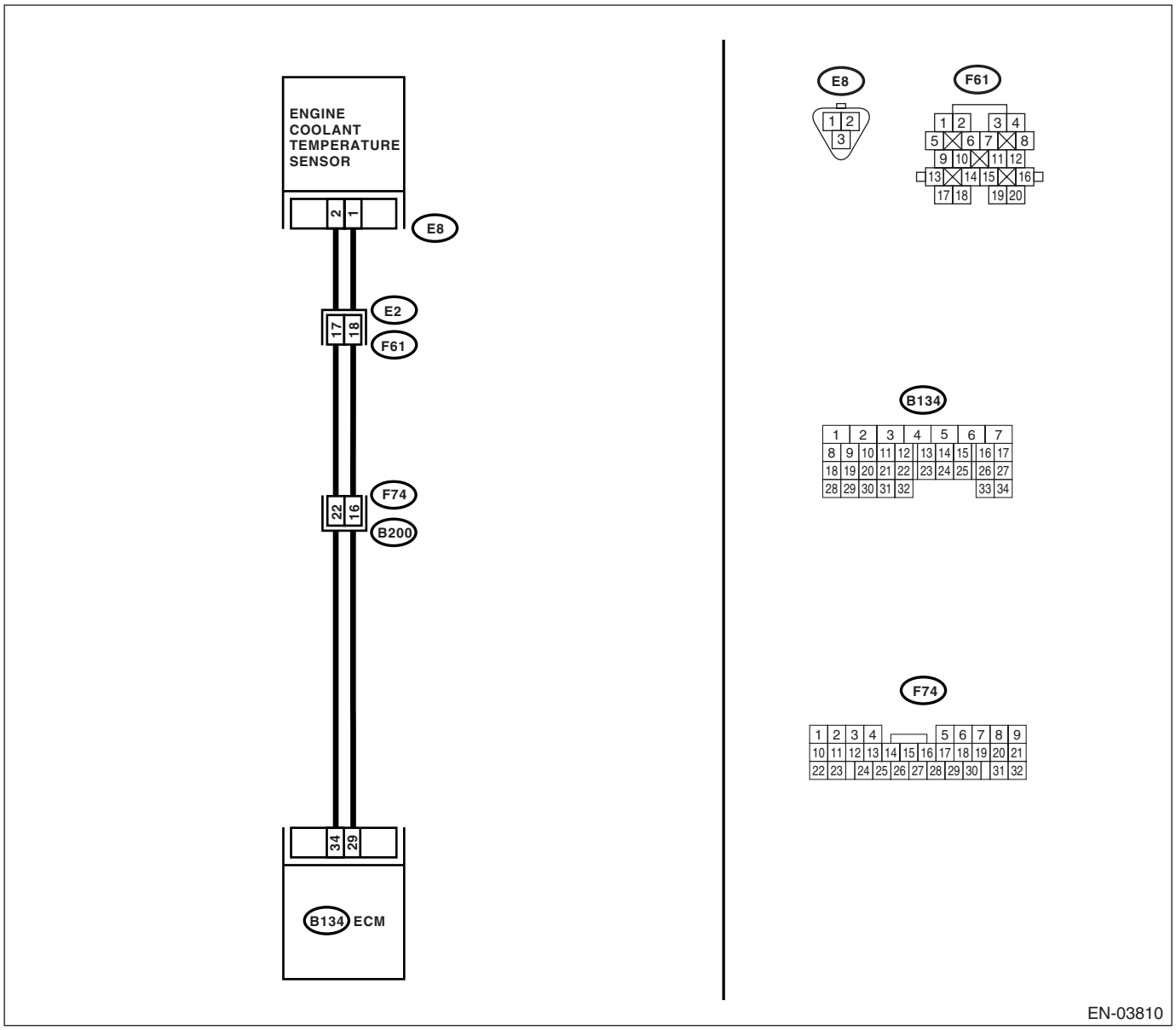
TROUBLE SYMPTOM:

- Hard to start
- Improper idling
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of the engine coolant temperature sensor signal using the Subaru Select Monitor or the general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the temperature above 120°C (248°F)?	Go to step **2**.	Repair the poor contact. NOTE: In this case, repair the following item: • Poor contact of engine coolant temperature sensor • Poor contact in ECM • Poor contact of coupling connector • Poor contact of joint connector
2	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the engine coolant temperature sensor. 3) Turn the ignition switch to ON. 4) Read the data of the engine coolant temperature sensor signal using the Subaru Select Monitor or the general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the temperature more than 40°C (40°F)?	Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC)-27, Engine Coolant Temperature Sensor.>	Repair the ground short circuit of harness between engine coolant temperature sensor and ECM connector.

T: DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-45, DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

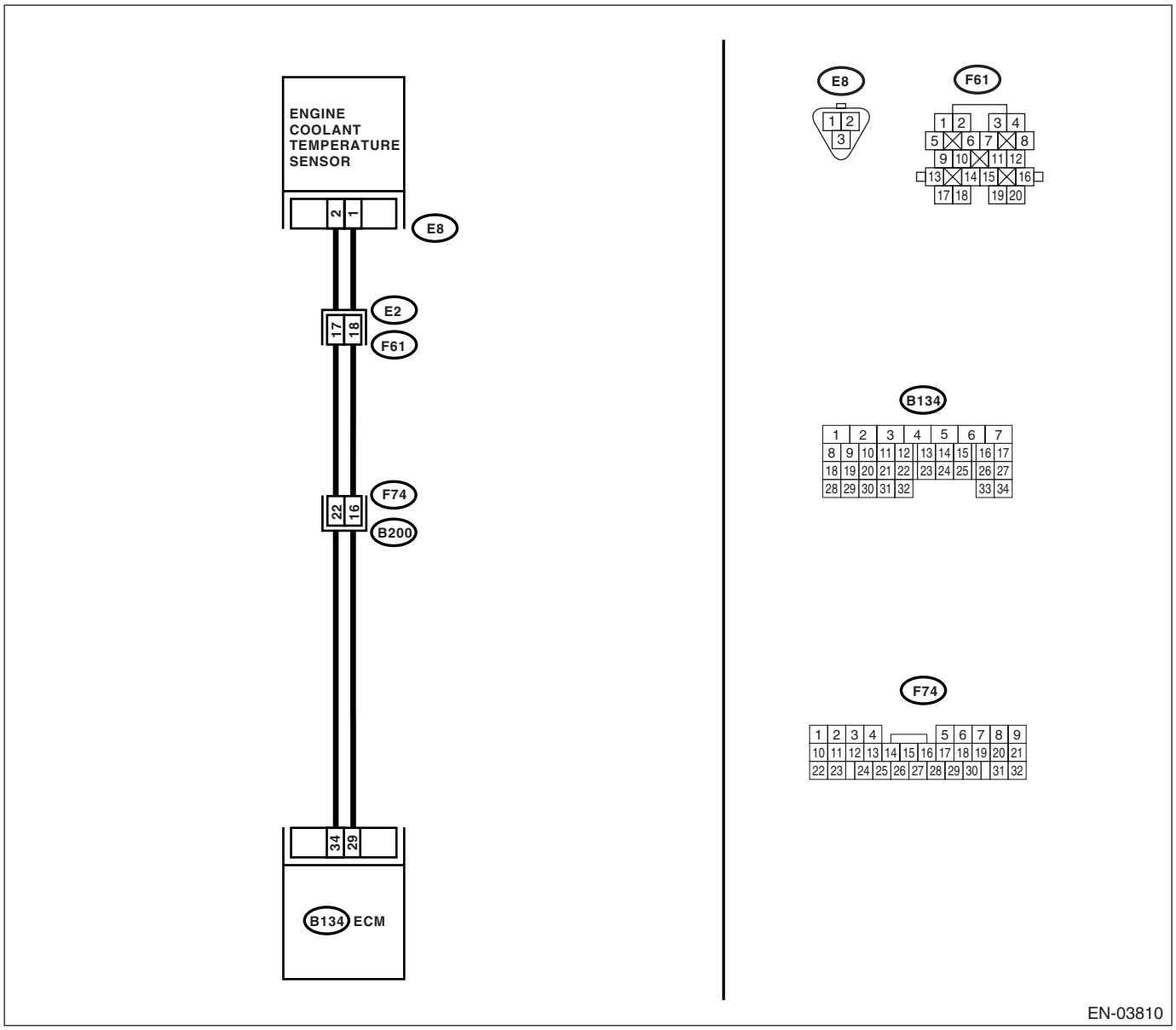
TROUBLE SYMPTOM:

- Hard to start
- Improper idling
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of the engine coolant temperature sensor signal using the Subaru Select Monitor or the general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the temperature less than 40°C (40°F)?	Go to step **2**.	Repair the poor contact. NOTE: In this case, repair the following item: • Poor contact of engine coolant temperature sensor • Poor contact in ECM • Poor contact of coupling connector • Poor contact of joint connector
2	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the engine coolant temperature sensor. 3) Measure the voltage between engine coolant temperature sensor connector and engine ground. ***Connector & terminal*** ***(E8) No. 2 (+) — Engine ground (–):***	Is the voltage more than 10 V?	Repair the battery short circuit of harness between ECM and engine coolant temperature sensor connector.	Go to step **3**.
3	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between engine coolant temperature sensor connector and engine ground. ***Connector & terminal*** ***(E8) No. 2 (+) — Engine ground (–):***	Is the voltage more than 10 V?	Repair the battery short circuit of harness between ECM and engine coolant temperature sensor connector.	Go to step **4**.

	Step	Check	Yes	No
4	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** Measure the voltage between engine coolant temperature sensor connector and engine ground. ***Connector & terminal*** ***(E8) No. 2 (+) — Engine ground (–):***	Is the voltage more than 4 V?	Go to step **5**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and engine coolant temperature sensor connector • Poor contact of engine coolant temperature sensor connector • Poor contact in ECM connector • Poor contact of coupling connector • Poor contact of joint connector
5	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between engine coolant temperature sensor connector and engine ground. ***Connector & terminal*** ***(E8) No. 1 — Engine ground:***	Is the resistance less than 5 Ω?	Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC)-27, Engine Coolant Temperature Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and engine coolant temperature sensor connector • Poor contact of engine coolant temperature sensor connector • Poor contact in ECM connector • Poor contact of coupling connector • Poor contact of joint connector

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-47, DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

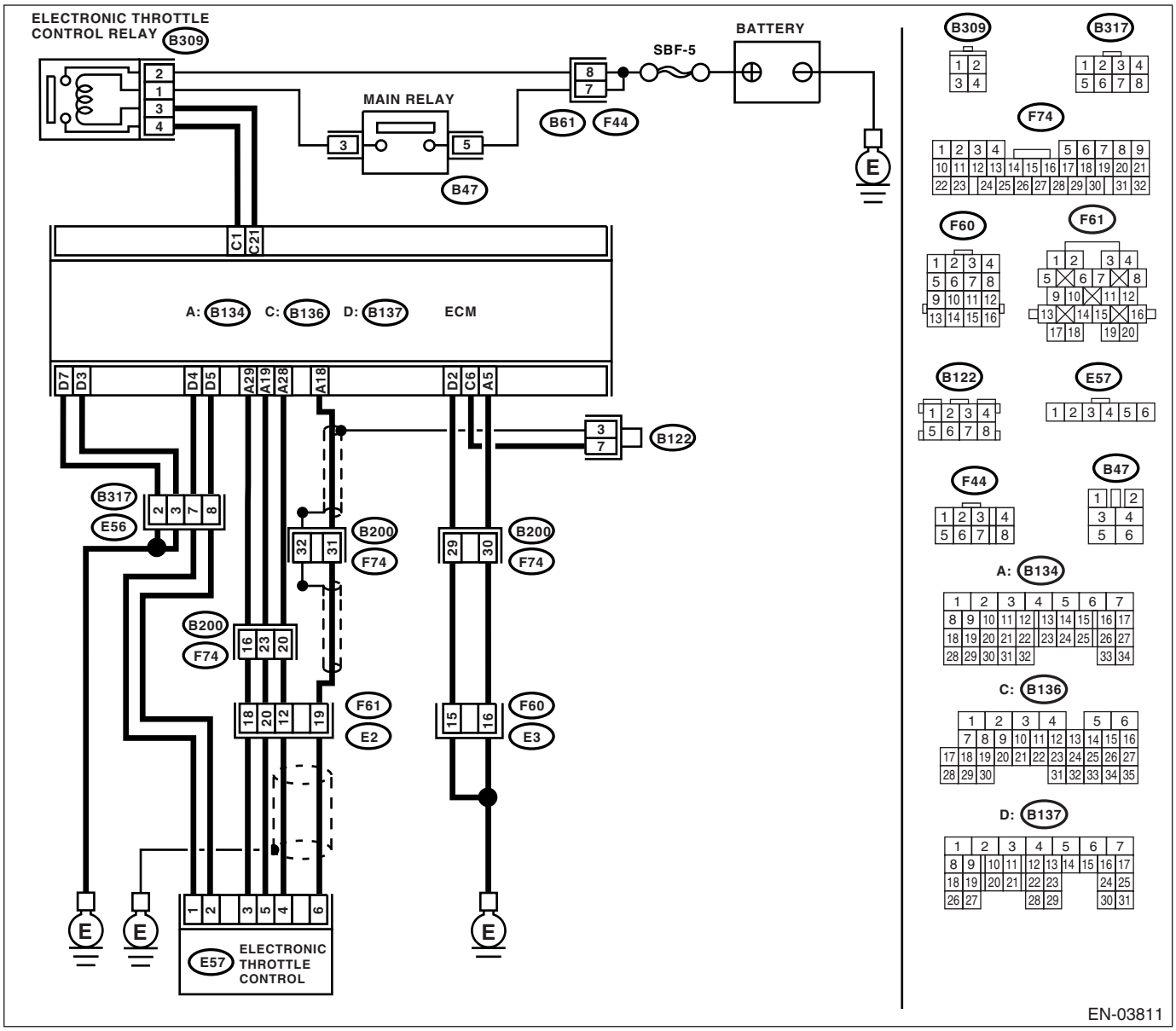
TROUBLE SYMPTOM:

- Improper idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK SENSOR OUTPUT.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and terminal. ***Connector & terminal*** ***(B134) No. 28 (+) — (B134) No. 29 (–):*** 3) Check the voltage change while shaking the ECM harness and connector, engine harness connector, and electronic control throttle connector harness.	Is the voltage more than 0.4 V?	Go to step **2**.	Go to step **3**.
2	**CHECK POOR CONTACT.** Check poor contact in connector between ECM and electronic throttle control.	Is there poor contact in connector between ECM and electronic throttle control?	Repair the poor contact.	Temporary poor contact occurred, but it is normal at present.
3	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connectors from electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. ***Connector & terminal*** ***(B134) No. 19 — (E57) No. 5:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the open circuit of harness connector.
4	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 18 — Chassis ground:*** ***(B134) No. 19 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5**.	Repair the chassis short circuit of harness.
5	**CHECK POWER SUPPLY OF ELECTRONIC THROTTLE CONTROL.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 5 (+) — Engine ground (–):*** 4) Check the voltage change by shaking the harness and connector of ECM, and engine harness connector, while monitoring the value with voltage meter.	Is the voltage 4.5 — 5.5 V?	Go to step **6**.	Repair poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>
6	**CHECK SHORT CIRCUIT INSIDE THE ECM.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 6 — Engine ground:***	Is the resistance more than 10 Ω?	Repair the poor contact of electronic throttle control connector. Replace the accelerator pedal position sensor if defective.	Repair poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-49, DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

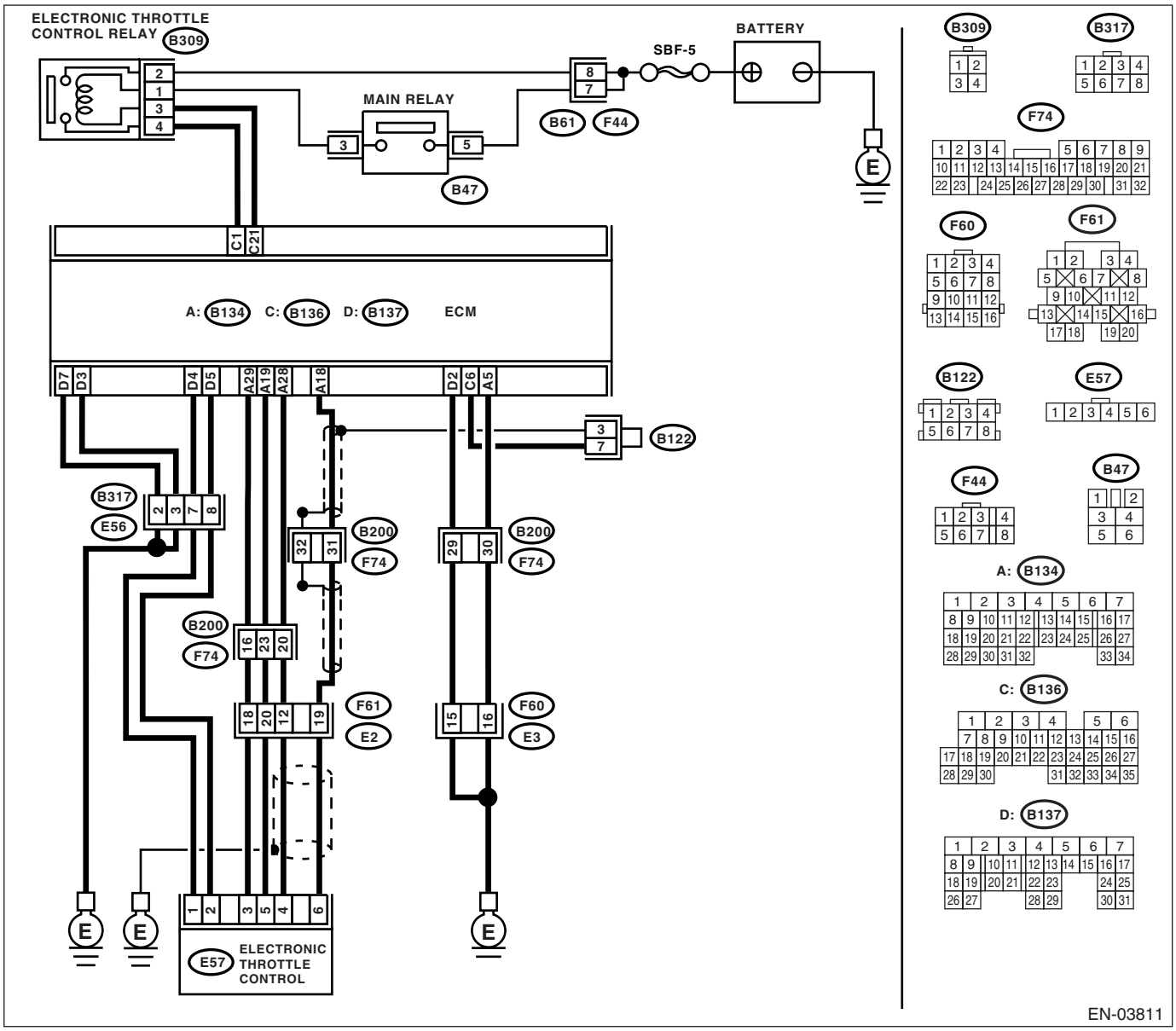
TROUBLE SYMPTOM:

- Improper idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK SENSOR OUTPUT.** 1) Turn the ignition switch to ON. 2) Read the data of main throttle sensor signal using Subaru Select Monitor. 3) Check the voltage change while shaking the ECM harness and connector, engine harness connector, and electronic control throttle connector harness.	Is the voltage less than 4.63 V?	Go to step **2**.	Go to step **3**.
2	**CHECK POOR CONTACT.** Check poor contact in connector between ECM and electronic throttle control.	Is there poor contact in connector between ECM and electronic throttle control?	Repair the poor contact.	Temporary poor contact occurred, but it is normal at present.
3	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connectors from electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. ***Connector & terminal*** ***(B134) No. 18 — (E57) No. 6:*** ***(B134) No. 29 — (E57) No. 3:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the open circuit of harness connector.
4	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Connect the ECM connector. 2) Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 3 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **5**.	Repair poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>
5	**CHECK SENSOR OUTPUT POWER SUPPLY.** Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 6 (+) — Engine ground (–):***	Is the voltage less than 10 V?	Replace the electronic throttle control.	Repair the battery short circuit of harness between ECM connector and electronic throttle control connector.

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

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-51, DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL, Diagnostic Trouble Code (DTC) Detecting Criteria.>

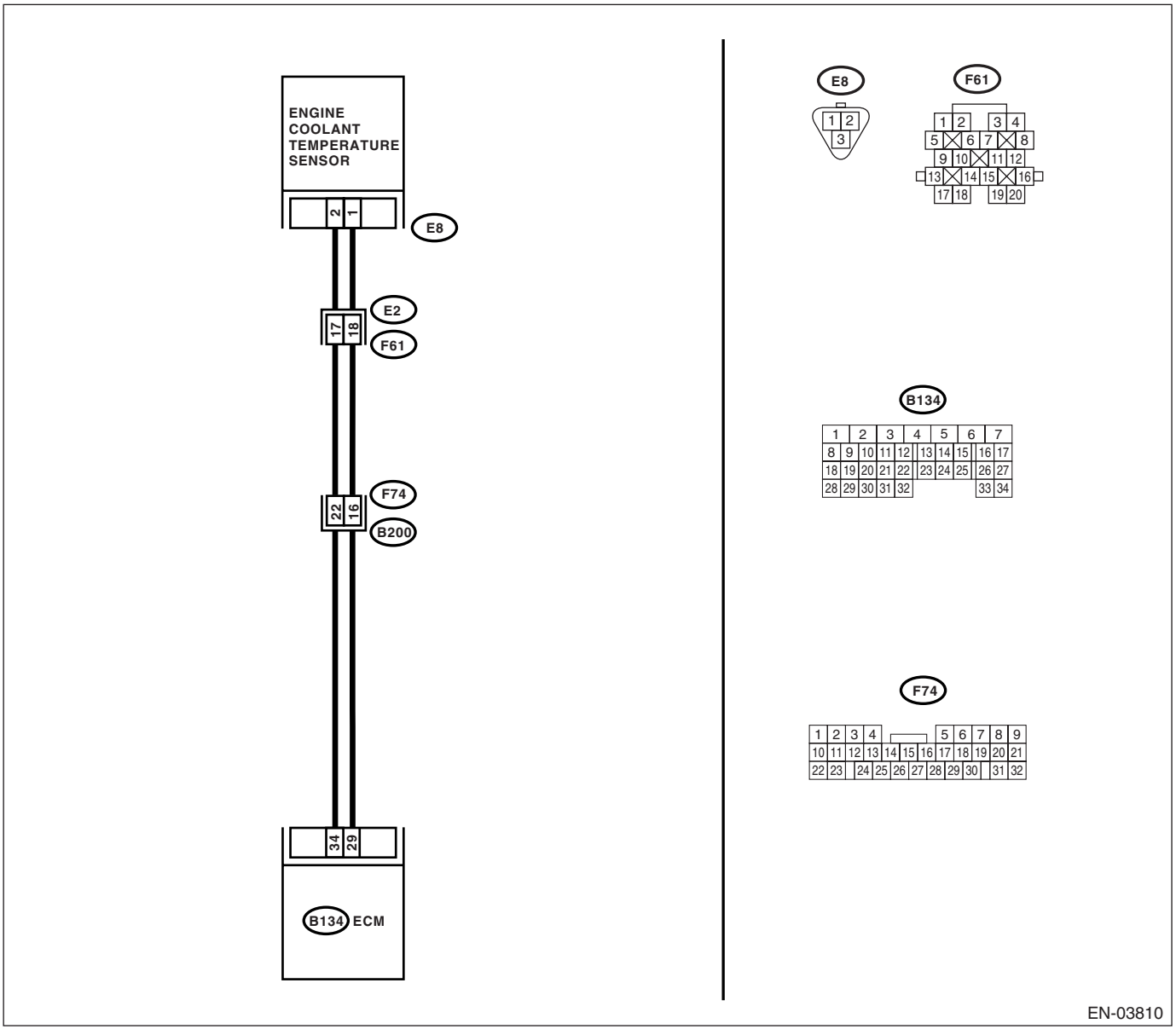
TROUBLE SYMPTOM:

Engine would not return to idling.

CAUTION:

After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	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)-65, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0125.	Go to step **2**.
2	**CHECK ENGINE COOLING SYSTEM.** NOTE: Check the following item. • Thermostat open stuck • Coolant level • Engine coolant freeze • Tire diameter	Is there any fault in engine cooling system?	Replace the thermostat. <Ref. to CO(H4SO)-23, Thermostat.>	Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC)-27, Engine Coolant Temperature Sensor.>

X: DTC P0126 INSUFFICIENT ENGINE COOLANT TEMPERATURE FOR STABLE OPERATION

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-54, DTC P0126 INSUFFICIENT ENGINE COOLANT TEMPERATURE FOR STABLE OPERATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

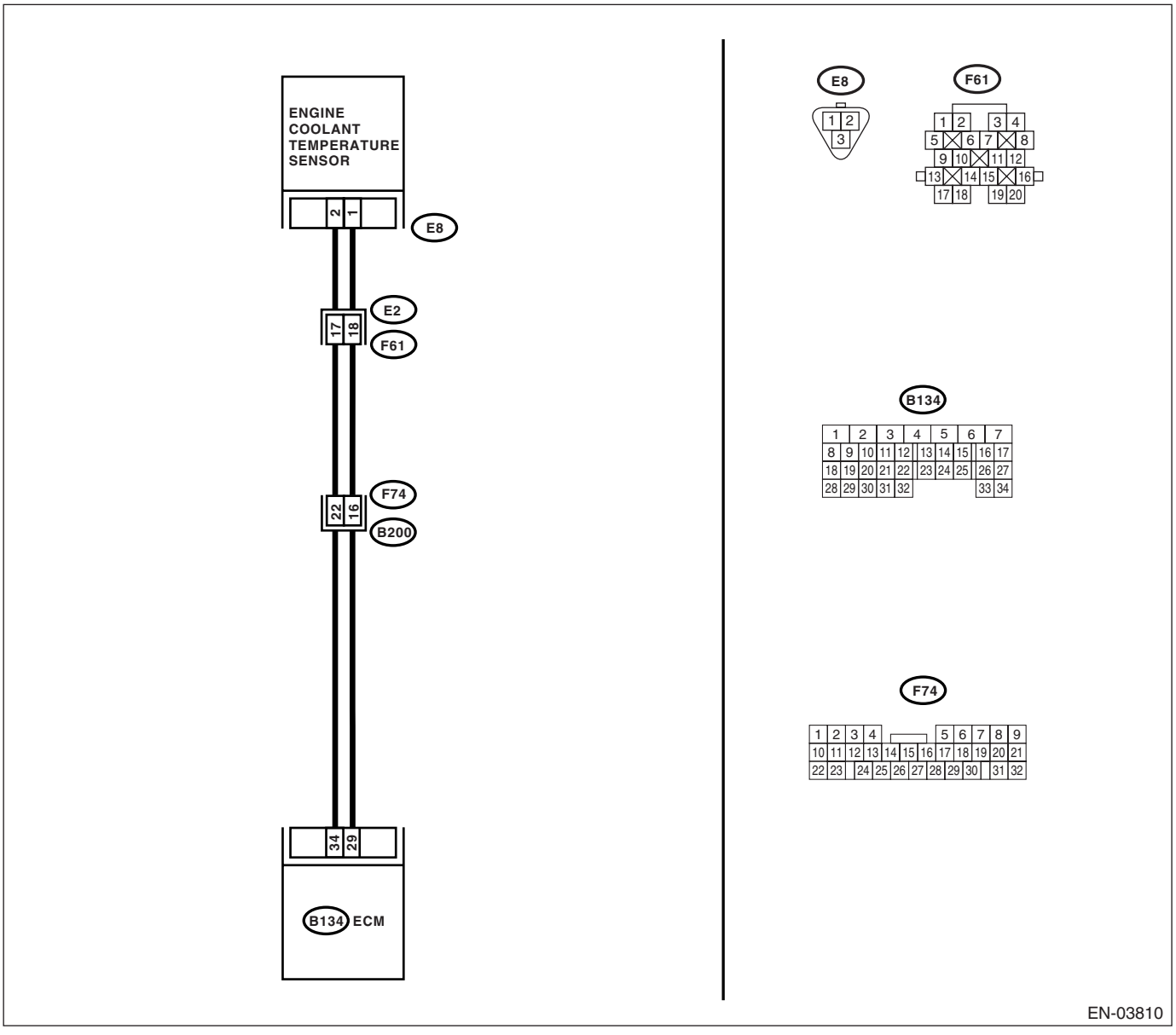
TROUBLE SYMPTOM:

Engine would not return to idling.

CAUTION:

After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	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)-65, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK ENGINE COOLANT TEMPERATURE SENSOR.** Measure the resistance between the engine coolant temperature sensor terminals when the engine coolant is cold and after warmed-up. ***Terminals*** ***No. 1 — No. 2:***	Is there a change in resistance between the cold condition and after warm up?	Contact with SOA Service Center.	Replace the engine coolant temperature sensor. <Ref. to FU(H4SO)-22, Engine Coolant Temperature Sensor.>

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

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-56, DTC P0128 COOLANT THERMOSTAT (ENGINE COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

Thermostat remains open.

CAUTION:

After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK VEHICLE**	Has the vehicle driven or idled with the engine partially submerged under water?	In this case, it is not necessary to inspect DTC P0128.	Go to step **2**.
2	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check the appropriate DTC using the “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4DOTC)(diag)-65, List of Diagnostic Trouble Code (DTC).>	Go to step **3**.
3	**CHECK ENGINE COOLANT.**	Are the coolant level and mixture ratio of engine coolant to anti-freeze solution correct?	Go to step **4**.	Replace engine coolant. <Ref. to CO(H4SO)-16, REPLACEMENT, Engine Coolant.>
4	**CHECK RADIATOR FAN.** 1) Start the engine. 2) Check radiator fan operation.	Does the radiator fan continuously rotate for more than 3 minutes during idling?	Repair radiator fan circuit. <Ref. to CO(H4SO)-32, Radiator Main Fan and Fan Motor.> and <Ref. to CO(H4SO)-39, Radiator Sub Fan and Fan Motor.>	Replace the thermostat. <Ref. to CO(H4SO)-23, Thermostat.>

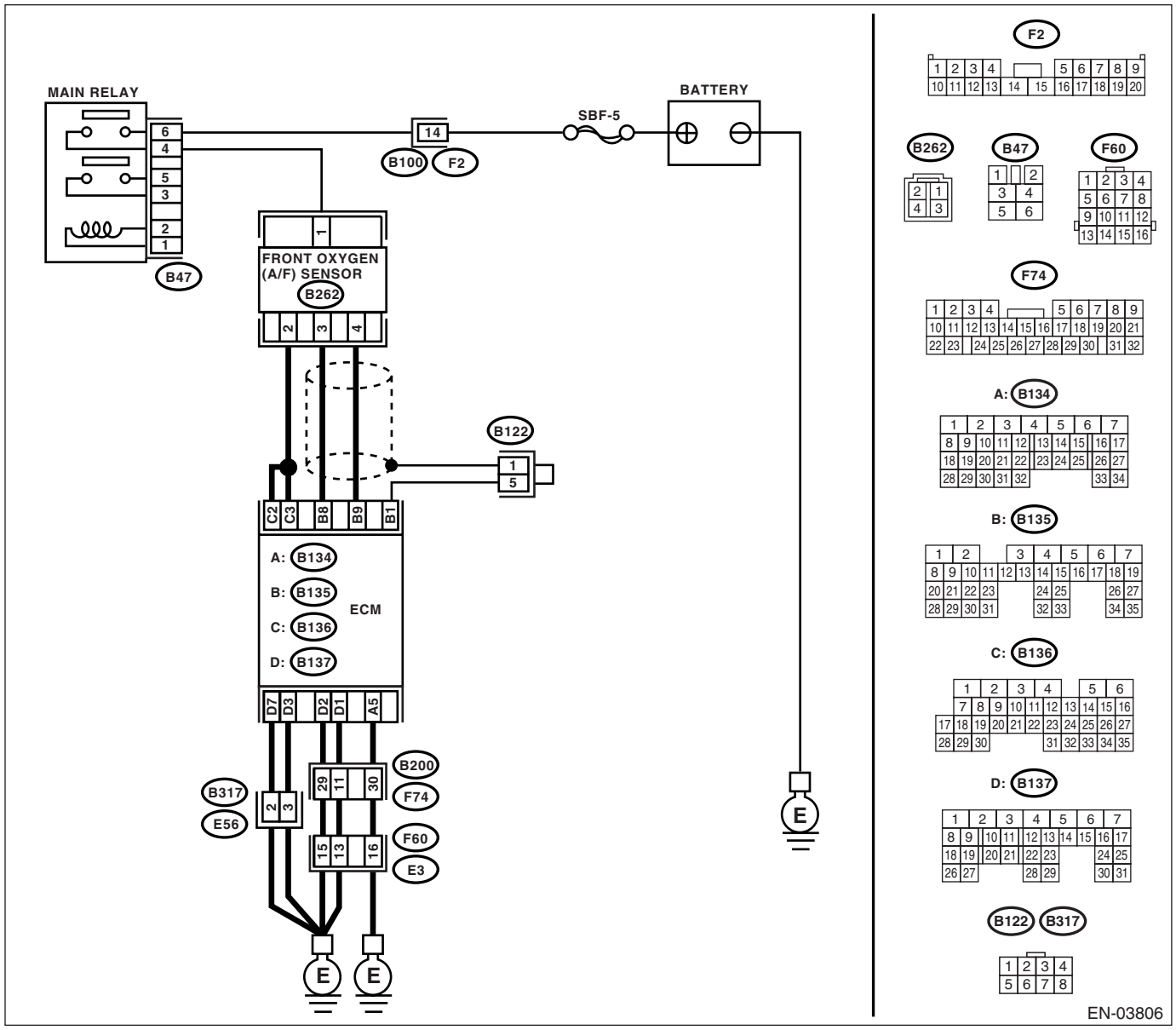
Z: DTC P0131 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-58, 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, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Does water enter the connector?	Dry the water thoroughly.	Go to step **2**.
2	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and front oxygen (A/F) sensor connector. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B135) No. 8 — Chassis ground:*** ***(B135) No. 9 — Chassis ground:***	Is the resistance more than 1 MΩ?	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-41, Front Oxygen (A/F) Sensor.>	Repair the ground short circuit of harness between ECM and front oxygen (A/F) sensor connector.

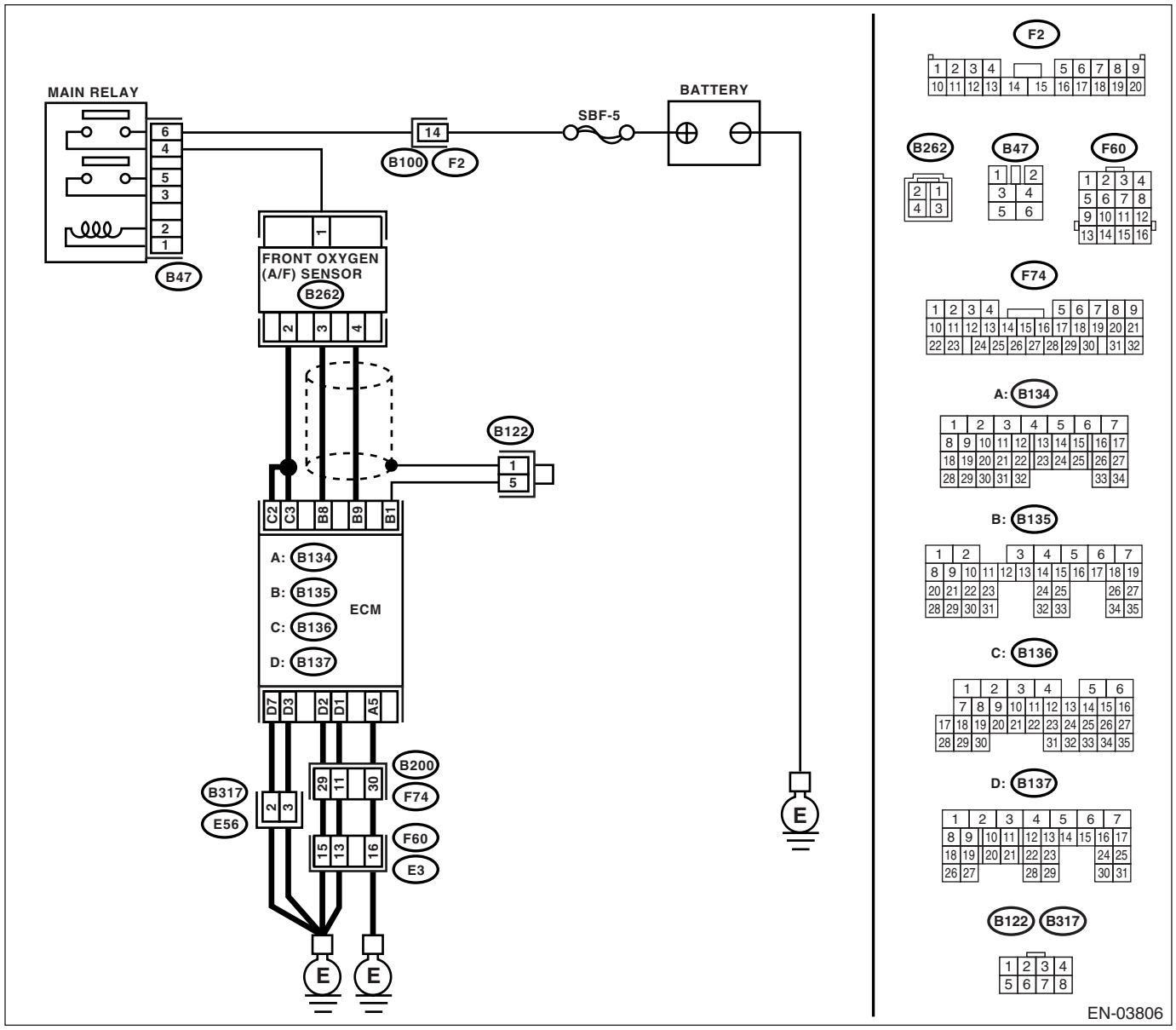
AA:DTC P0132 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-60, 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, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Does water enter the connector?	Dry the water thoroughly.	Go to step **2**.
2	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to ON. 2) Disconnect the connector from front oxygen (A/F) sensor. 3) Measure the voltage of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 8 (+) — Chassis ground (–):*** ***(B135) No. 9 (+) — Chassis ground (–):***	Is the voltage more than 8 V?	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-41, Front Oxygen (A/F) Sensor.>	Repair the battery short circuit of harness between ECM and front oxygen (A/F) sensor connector.

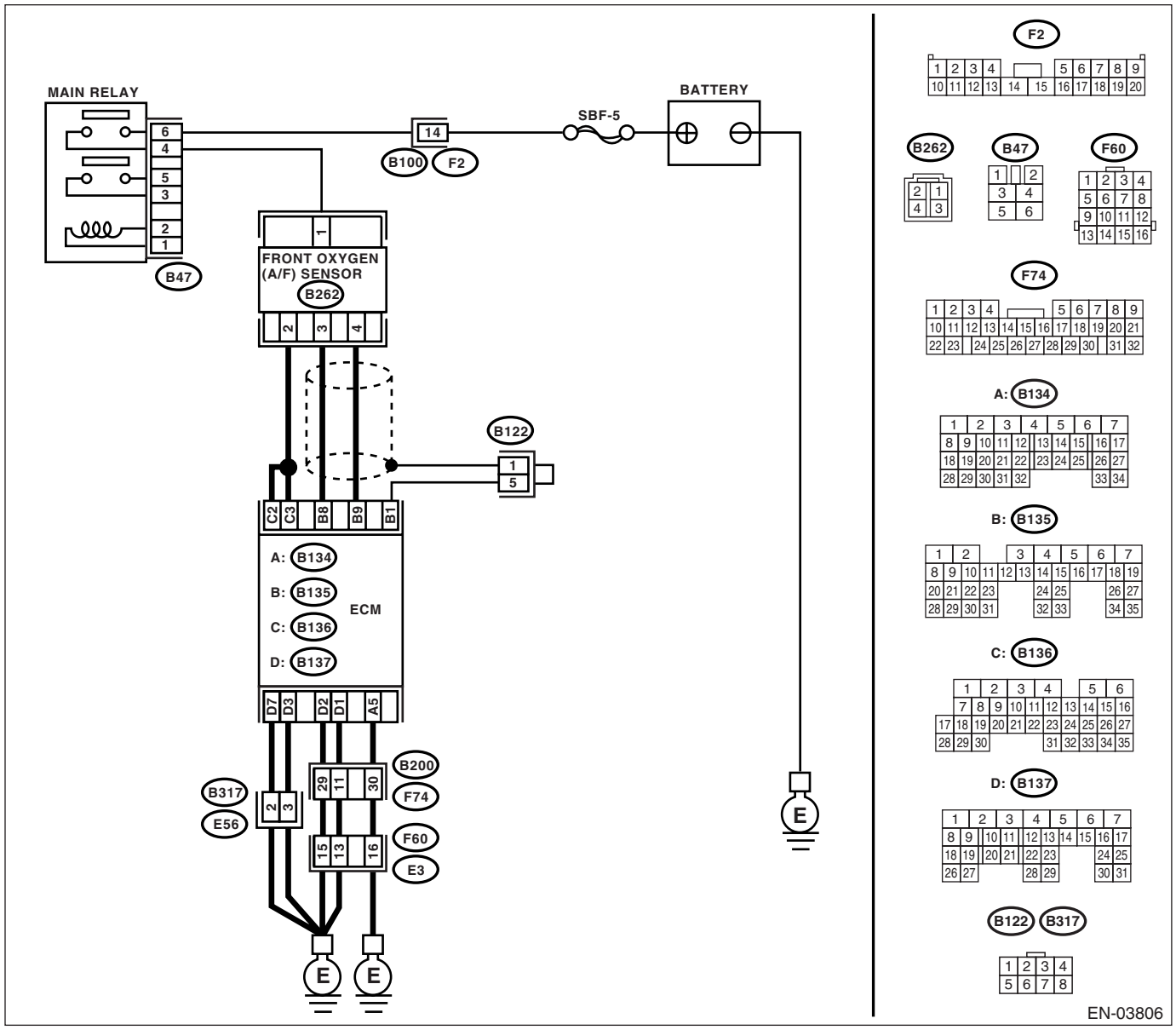
AB:DTC P0133 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-62, 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, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



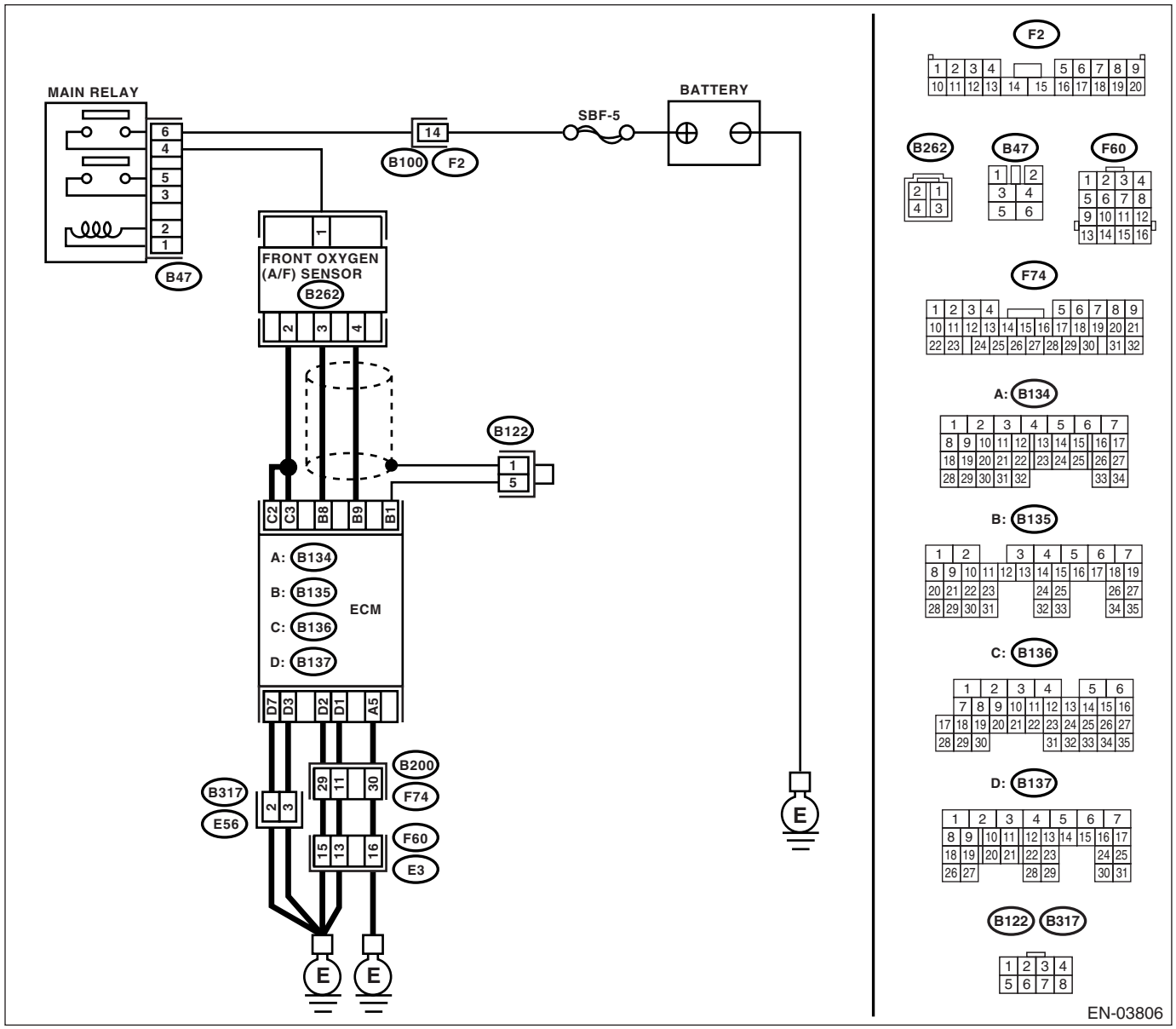
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check the appropriate DTC using the “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4DOTC)(diag)-65, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0133.	Go to step **2**.
2	**CHECK EXHAUST SYSTEM.** NOTE: Check the following item. • 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)-41, Front Oxygen (A/F) Sensor.>

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-65, 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, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.
WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and front oxygen (A/F) sensor connector. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B135) No. 8 — (B262) No. 3:*** ***(B135) No. 9 — (B262) No. 4:***	Is the resistance less than 1 Ω?	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-41, Front Oxygen (A/F) Sensor.>	Repair the open circuit of the harness between ECM and front oxygen (A/F) sensor connector.

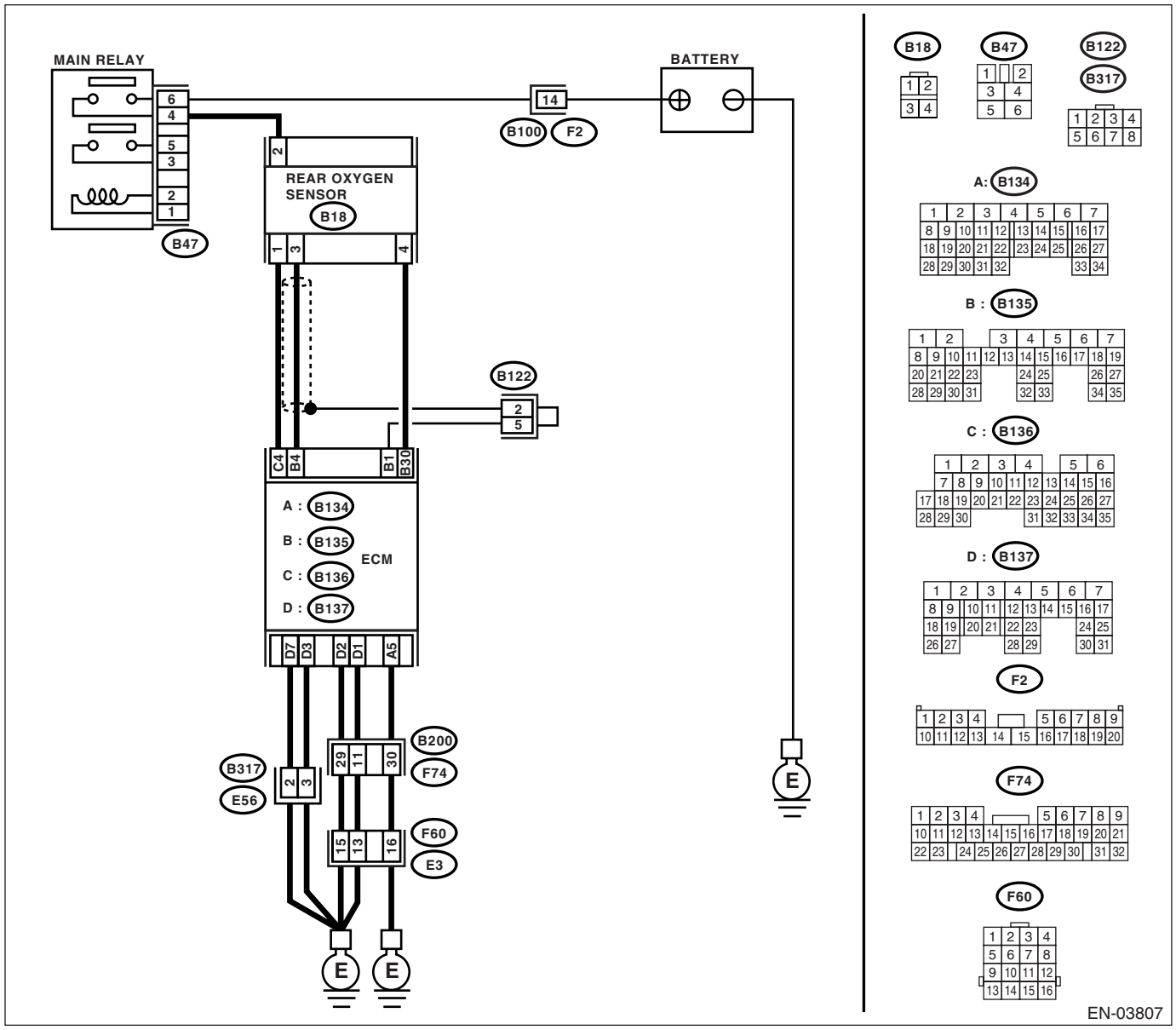
AD:DTC P0137 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-67, 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, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	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)-65, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0137.	Go to step **2**.
2	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and keep the engine rpm at 3,000 rpm. (Max. 2 minutes) 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • For MT model, depress the clutch pedal. • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the voltage more than 490 mV?	Go to step **6**.	Go to step **3**.
3	**CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Does water enter the connector?	Dry the water thoroughly.	Go to step **4**.
4	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. ***Connector & terminal*** ***(B135) No. 4 — (B18) No. 3:*** ***(B135) No. 30 — (B18) No. 4:***	Is the resistance more than 3 Ω?	Repair the open circuit of harness between ECM and rear oxygen sensor connector.	Go to step **5**.
5	**CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the rear oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the resistance between the rear oxygen sensor harness connector and chassis ground. ***Connector & terminal*** ***(B18) No. 3 (+) — Chassis ground (–):***	Is the voltage 0.2 — 0.5 V?	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-43, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between rear oxygen sensor and ECM connector • Poor contact of the rear oxygen sensor connector • Poor contact in ECM connector

	Step	Check	Yes	No
6	**CHECK EXHAUST SYSTEM.** Check exhaust system parts. NOTE: Check the following item. • Exhaust system part looseness and incomplete attachment • 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)-43, Rear Oxygen Sensor.>

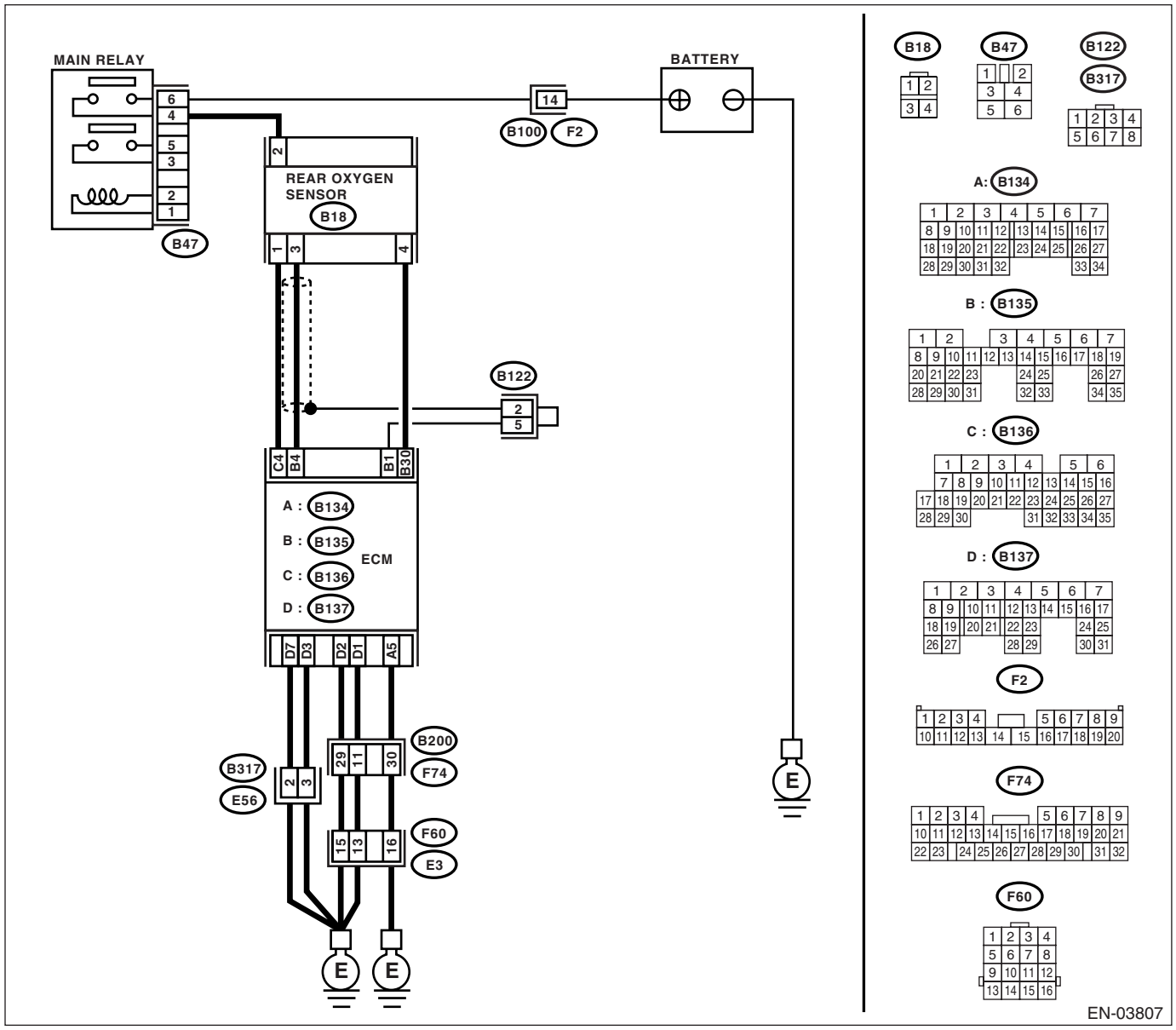
AE:DTC P0138 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-70, 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, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	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)-65, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0138.	Go to step **2**.
2	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and drop the engine rpm suddenly from 3,000 rpm. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • For MT model, depress the clutch pedal. • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the voltage less than 250 mV?	Go to step **6**.	Go to step **3**.
3	**CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Does water enter the connector?	Dry the water thoroughly.	Go to step **4**.
4	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. ***Connector & terminal*** ***(B135) No. 4 — (B18) No. 3:*** ***(B135) No. 30 — (B18) No. 4:***	Is the resistance more than 3 Ω?	Repair the open circuit of harness between ECM and rear oxygen sensor connector.	Go to step **5**.
5	**CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the rear oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the resistance between the rear oxygen sensor harness connector and chassis ground. ***Connector & terminal*** ***(B18) No. 3 (+) — Chassis ground (–):***	Is the voltage 0.2 — 0.5 V?	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-43, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between rear oxygen sensor and ECM connector • Poor contact of the rear oxygen sensor connector • Poor contact in ECM connector

Step		Check	Yes	No
6	**CHECK EXHAUST SYSTEM.** Check exhaust system parts. NOTE: Check the following item. • Exhaust system part looseness and incomplete attachment • 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)-43, Rear Oxygen Sensor.>

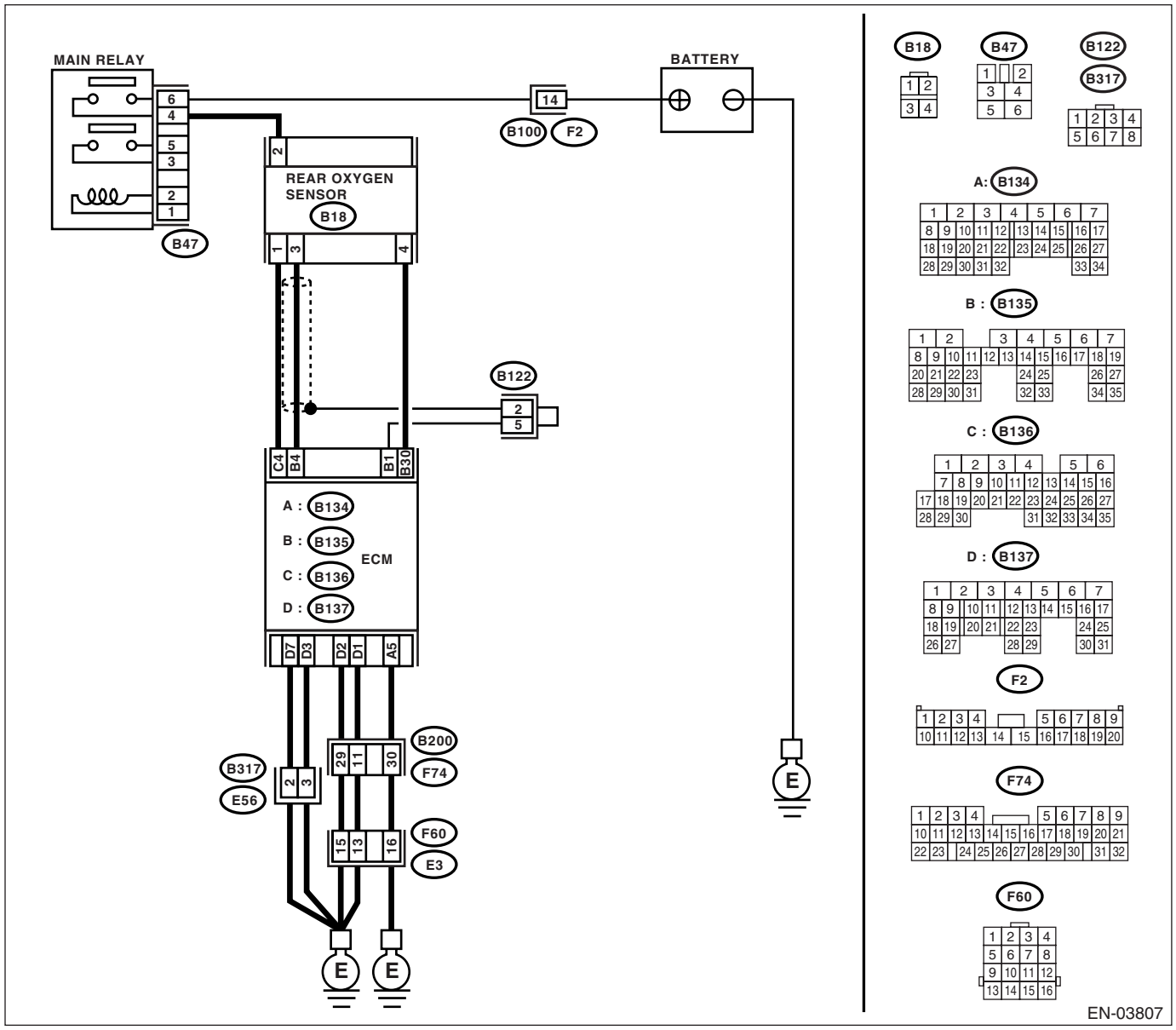
AF:DTC P0139 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-71, 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, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



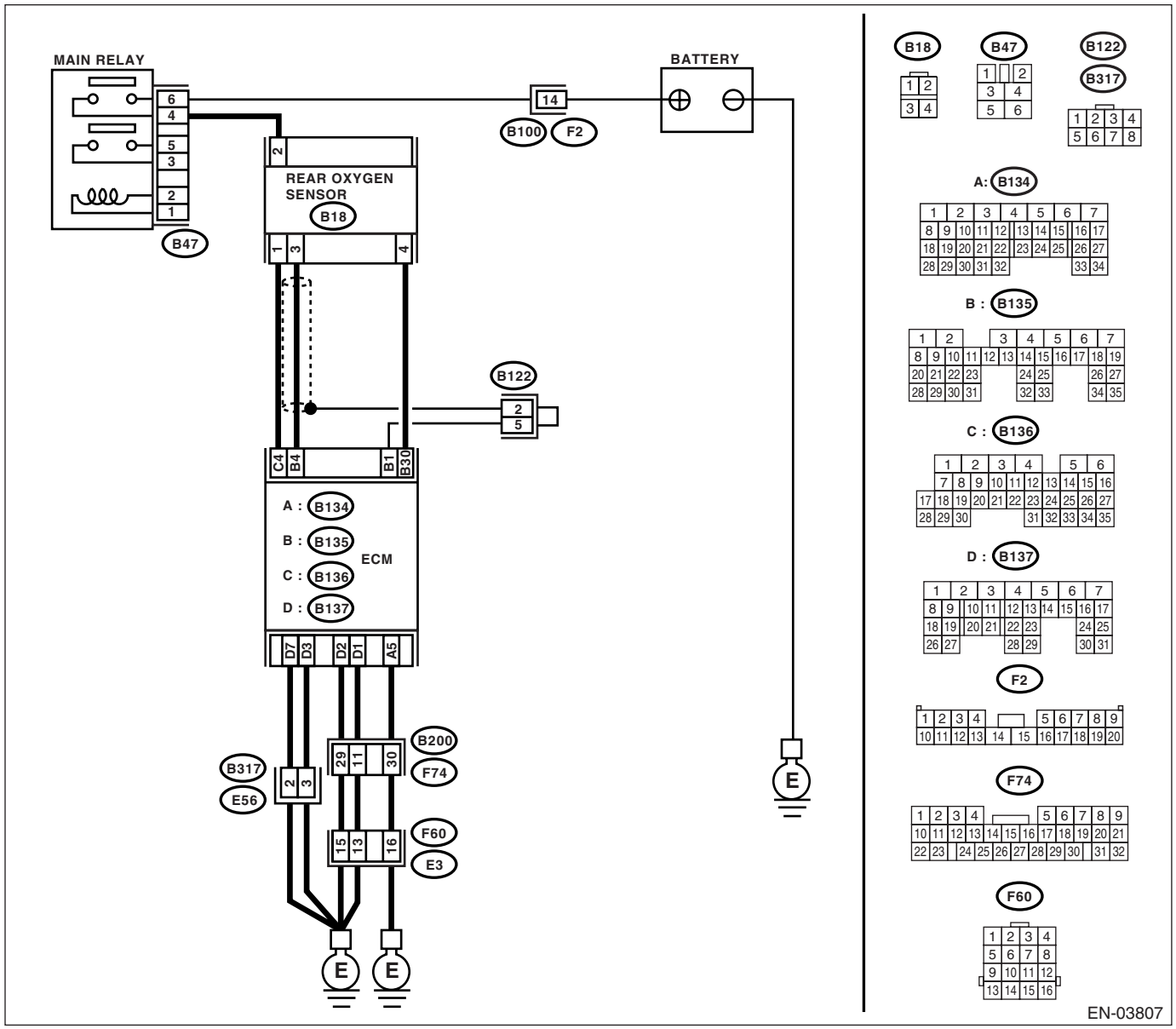
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-65, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0139.	Go to step **2**.
2	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. ***Connector & terminal*** ***(B135) No. 4 — (B18) No. 3:***	Is the resistance less than 1 Ω?	Go to step **3**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between rear oxygen sensor and ECM connector
3	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** Measure the voltage between the rear oxygen sensor harness connector and chassis ground. ***Connector & terminal*** ***(B18) No. 3 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4**.	Repair the chassis short circuit of the harness between the rear oxygen sensor and ECM connector.
4	**CHECK REAR OXYGEN SENSOR.** Measure the resistance between the rear oxygen sensor connectors. ***Terminals*** ***No. 3 — No. 4:***	Is the resistance less than 1 Ω?	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-43, Rear Oxygen Sensor.>	Repair the poor contact in rear oxygen sensor connector.

AG:DTC P0140 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK1 SENSOR2)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-77, DTC P0140 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK1 SENSOR2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.
WIRING DIAGRAM:



	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)-65, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0140.	Go to step **2**.
2	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and keep the engine rpm at 3,000 rpm. (Max. 2 minutes) 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • For MT model, depress the clutch pedal. • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the voltage more than 490 mV?	Go to step **7**.	Go to step **3**.
3	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and rapidly reduce the engine speed from 3,000 rpm. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • For MT model, depress the clutch pedal. • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the voltage less than 250 mV?	Go to step **7**.	Go to step **4**.
4	**CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Does water enter the connector?	Dry the water thoroughly.	Go to step **5**.
5	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. ***Connector & terminal*** ***(B135) No. 4 — (B18) No. 3:*** ***(B135) No. 30 — (B18) No. 4:***	Is the resistance more than 3 Ω?	Repair the open circuit of harness between ECM and rear oxygen sensor connector.	Go to step **6**.

	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the rear oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the resistance between the rear oxygen sensor harness connector and chassis ground. ***Connector & terminal*** ***(B18) No. 3 (+) — Chassis ground (–):***	Is the voltage 0.2 — 0.5 V?	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-43, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between rear oxygen sensor and ECM connector • Poor contact of the rear oxygen sensor connector • Poor contact in ECM connector
7	**CHECK EXHAUST SYSTEM.** Check exhaust system parts. NOTE: Check the following item. • Exhaust system part looseness and incomplete attachment • 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)-43, Rear Oxygen Sensor.>

AH:DTC P0171 SYSTEM TOO LEAN (BANK 1)

NOTE:
For the diagnostic procedure, refer to DTC P0172. <Ref. to EN(H4DOTC)(diag)-142, 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:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-79, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>and <Ref. to GD(H4DOTC)-82, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Improper idling
- Engine stalls.
- Poor driving performance

CAUTION:
After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK EXHAUST SYSTEM.**	Are there holes or loose bolts on exhaust system?	Repair the exhaust system.	Go to step **2**.
2	**CHECK AIR INTAKE SYSTEM.**	Are there holes, loose bolts or disconnection of hose on air intake system?	Repair the air intake system.	Go to step **3**.
3	**CHECK FUEL PRESSURE** **WARNING:** **• Place "NO FIRE" signs near the working area.** **• Be careful not to spill fuel.** Measure the fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold.<Ref. to ME(H4DOTC)-25, INSPECTION, Fuel Pressure.> **WARNING:** **Release fuel pressure before removing the fuel pressure gauge.** NOTE: If fuel pressure does not increase, squeeze the fuel return hose 2 to 3 times, then measure fuel pressure again.	Is the measured value 284 — 314 kPa (2.9 — 3.2 kgf/cm^2, 41 — 46 psi)?	Go to step **4**.	Repair the following item. Fuel pressure is too high: • Clogged fuel return line or bent hose Fuel pressure is too low: • Improper fuel pump discharge • Clogged fuel supply line
4	**CHECK FUEL PRESSURE** After connecting the pressure regulator vacuum hose, measure fuel pressure.<Ref. to ME(H4DOTC)-25, INSPECTION, Fuel Pressure.> **WARNING:** **Release fuel pressure before removing the fuel pressure gauge.** NOTE: • If fuel pressure does not increase, squeeze the fuel return hose 2 to 3 times, then measure fuel pressure again. • If the measured value at this step is out of specification, check or replace pressure regulator and pressure regulator vacuum hose.	Is the measured value 230 — 260 kPa (2.35 — 2.65 kgf/cm^2, 33 — 38 psi)?	Go to step **5**.	Repair the following item. Fuel pressure is too high: • Faulty pressure regulator • Clogged fuel return line or bent hose Fuel pressure is too low: • Faulty pressure regulator • Improper fuel pump discharge • Clogged fuel supply line

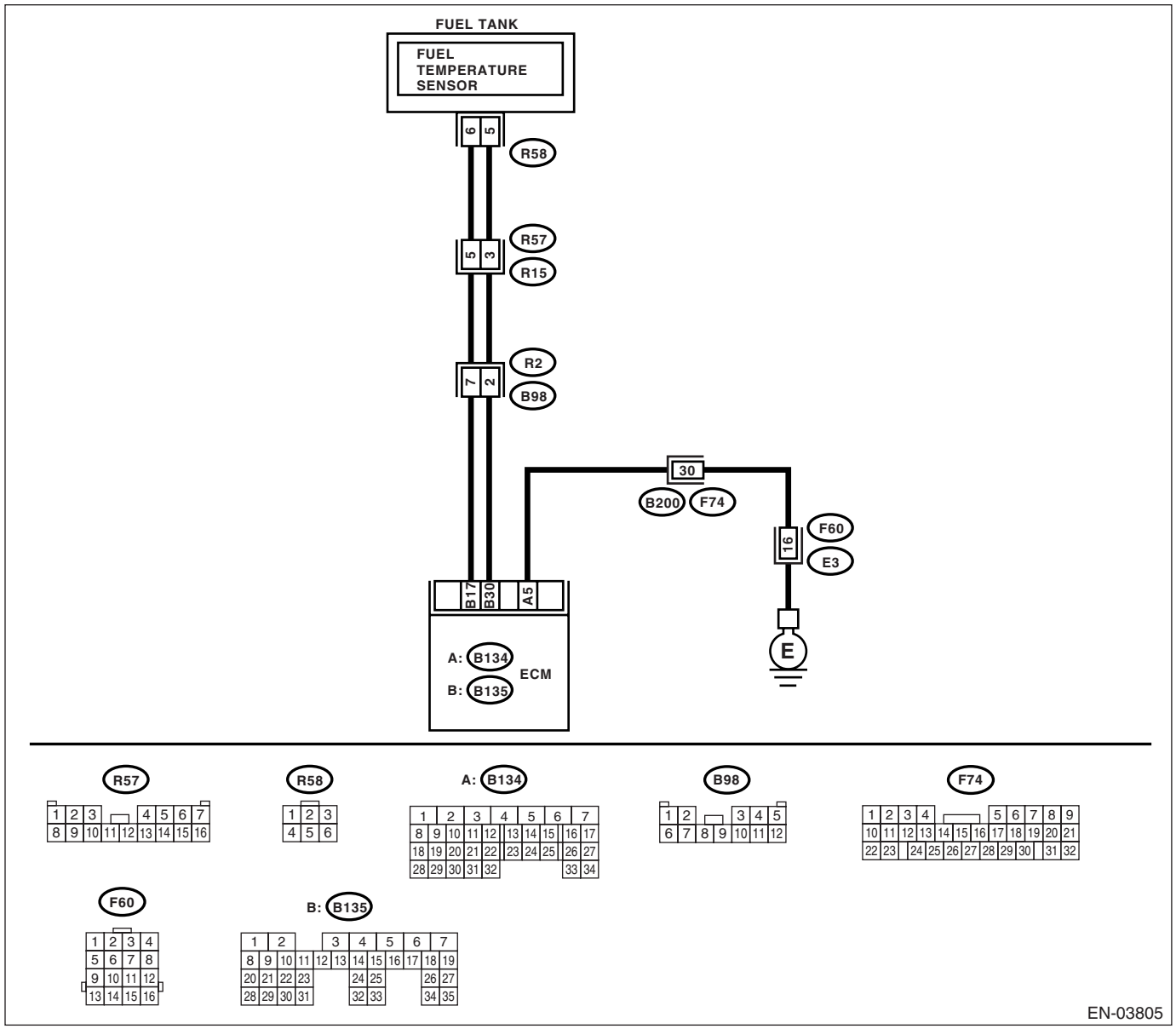
	Step	Check	Yes	No
5	**CHECK ENGINE COOLANT TEMPERATURE SENSOR.** 1) Start the engine and warm-up completely. 2) Read the data of the engine coolant temperature sensor signal using the Subaru Select Monitor or the general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the temperature above 60°C (140°F)?	Go to step **6**.	Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC)-27, 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 greater than 60°C (140°F). 2) Place the shift lever in neutral position. 3) Turn the A/C switch to OFF. 4) Turn all the accessory switches off. 5) Read the data of mass air flow and intake air temperature sensor signal using the Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the measured value 2.7 — 4.7 g/s (0.36 — 0.62 lb/m)	Go to step **7**.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-31, Mass Air Flow and Intake Air Temperature Sensor.>
7	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR** 1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F). 2) Place the shift lever in neutral position. 3) Turn the A/C switch to OFF. 4) Turn all the accessory switches 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 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)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Subtract ambient temperature from intake air temperature. Is the obtained value –10 — 50°C (–18 — 90°F)?	Replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>	Check mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-31, Mass Air Flow and Intake Air Temperature Sensor.>

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

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-85, DTC P0181 FUEL TEMPERATURE SENSOR “A” CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.
WIRING DIAGRAM:



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)-65, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0181.	Replace the fuel temperature sensor. <Ref. to EC(H4DOTC)-13, Fuel Temperature Sensor.>

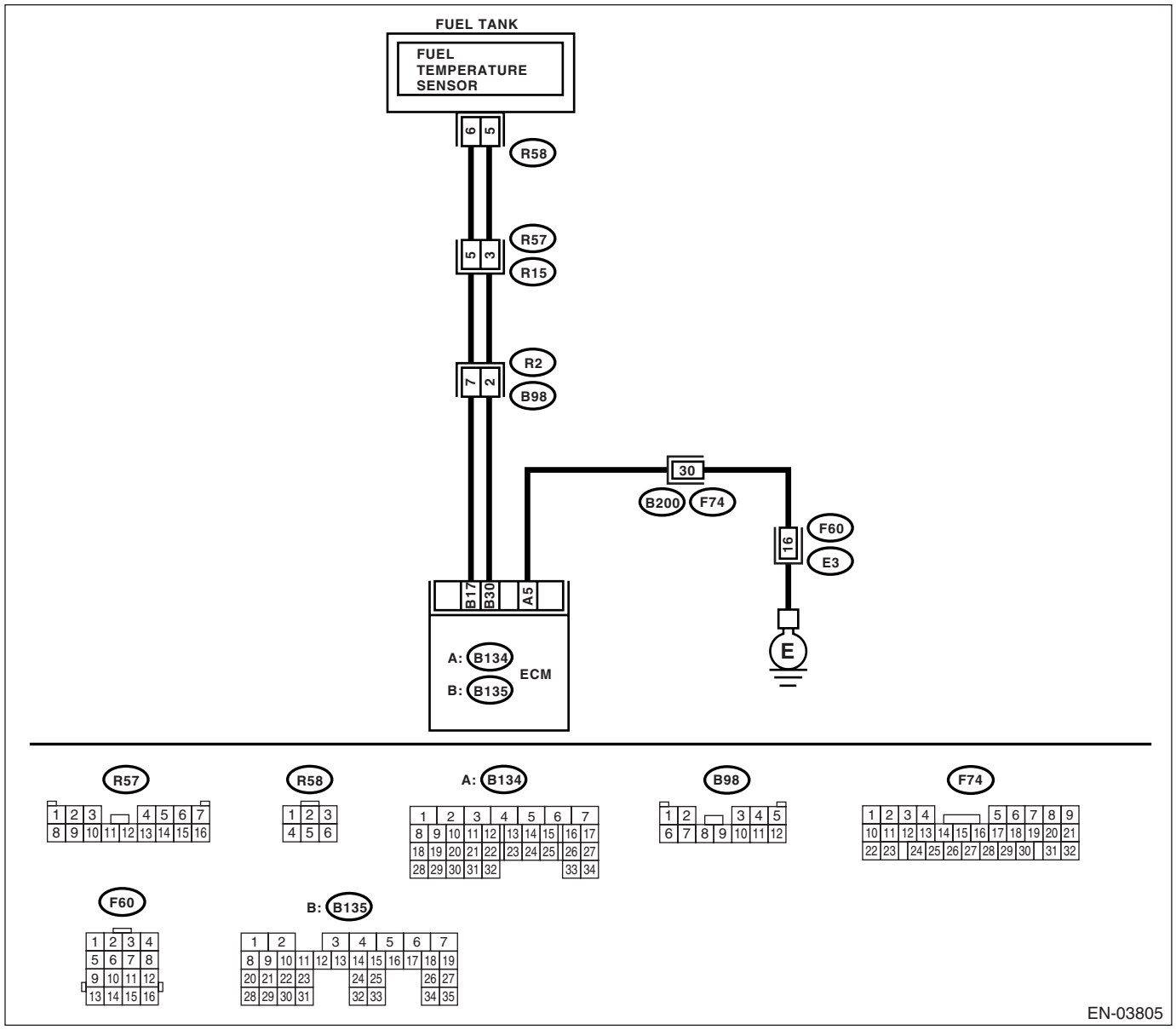
AK:DTC P0182 FUEL TEMPERATURE SENSOR “A” CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-88, DTC P0182 FUEL TEMPERATURE SENSOR “A” CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of the fuel temperature sensor signal using the Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the temperature above 150°C (302°F)?	Go to step **2**.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time.
2	**CHECK CURRENT DATA.** 1) Turn the ignition switch to OFF. 2) Remove the access hole lid. 3) Disconnect the connector from fuel pump. 4) Turn the ignition switch to ON. 5) Read data of the fuel temperature 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)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the temperature less than 40°C (40°F)?	Replace the fuel temperature sensor. <Ref. to EC(H4DOTC)-13, Fuel Temperature Sensor.>	Repair the ground short circuit of the harness between fuel injector and ECM connector.

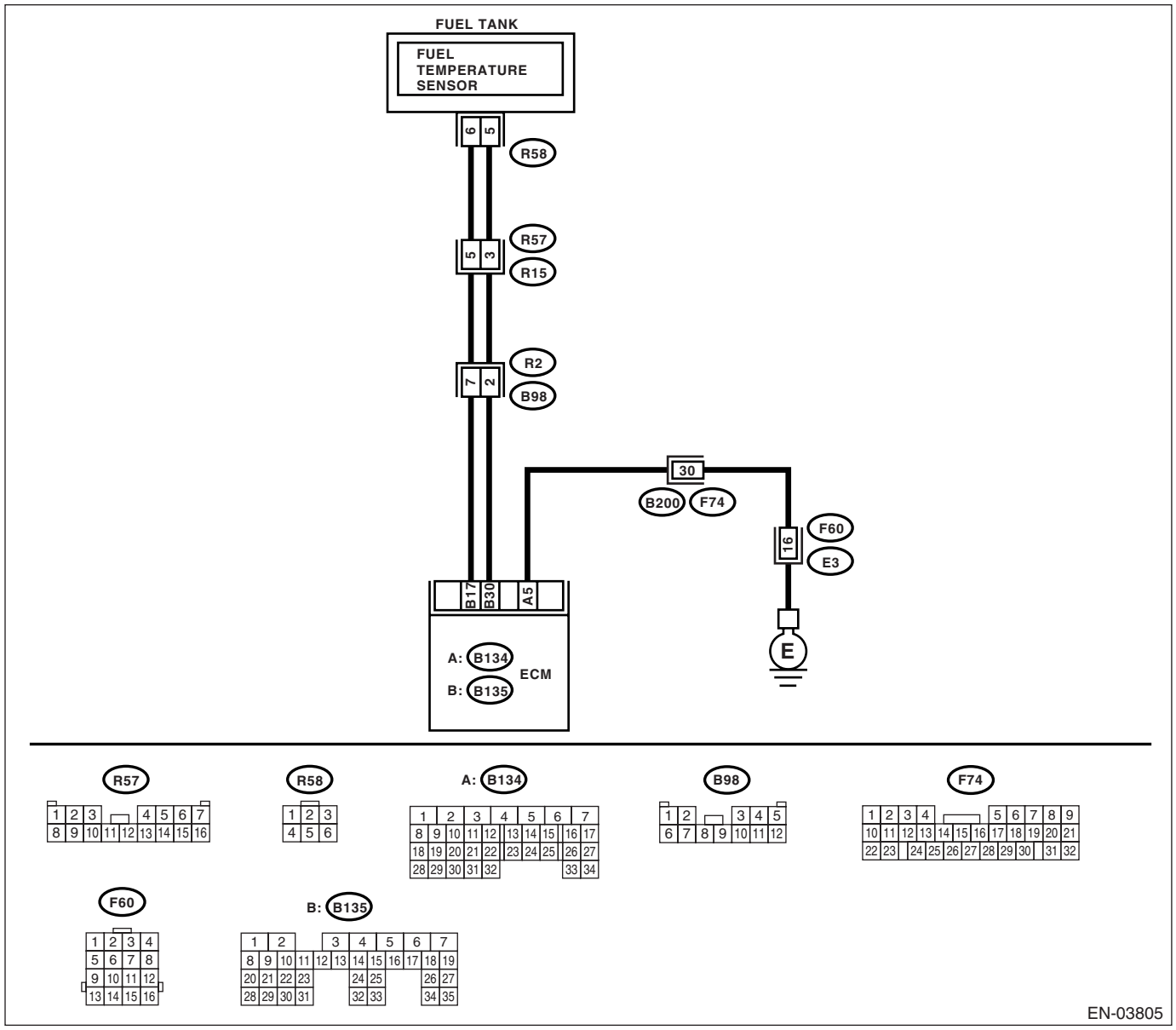
AL:DTC P0183 FUEL TEMPERATURE SENSOR “A” CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-90, DTC P0183 FUEL TEMPERATURE SENSOR “A” CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of the fuel temperature 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)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the temperature less than –40°C (–40°F)?	Go to step **2**.	Repair the poor contact. NOTE: In this case, repair the following item: • Poor contact in fuel pump connector • Poor contact in ECM connector • Poor contact of coupling connector • Poor contact of joint connector
2	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Remove the access hole lid. 3) Disconnect the connector from fuel pump. 4) Measure the voltage between fuel pump connector and chassis ground. ***Connector & terminal*** ***(R58) No. 6 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair the battery short circuit of harness between ECM and fuel pump connector.	Go to step **3**.
3	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between fuel pump connector and chassis ground. ***Connector & terminal*** ***(R58) No. 6 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair the battery short circuit of harness between ECM and fuel pump connector.	Go to step **4**.
4	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** Measure the voltage between fuel pump connector and chassis ground. ***Connector & terminal*** ***(R58) No. 6 (+) — Chassis ground (–):***	Is the voltage more than 4 V?	Go to step **5**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and fuel pump connector • Poor contact in fuel pump connector • Poor contact in ECM connector • Poor contact of coupling connector

	Step	Check	Yes	No
5	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance of the harness between fuel pump connector and ECM. ***Connector & terminal*** ***(R58) No. 5 — (B135) No. 30:***	Is the resistance less than 1 Ω?	Replace the fuel temperature sensor. <Ref. to EC(H4DOTC)-13, Fuel Temperature Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and fuel pump connector • Poor contact in fuel pump connector • Poor contact in ECM connector • Poor contact of coupling connector • Poor contact of joint connector

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-92, DTC P0222 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

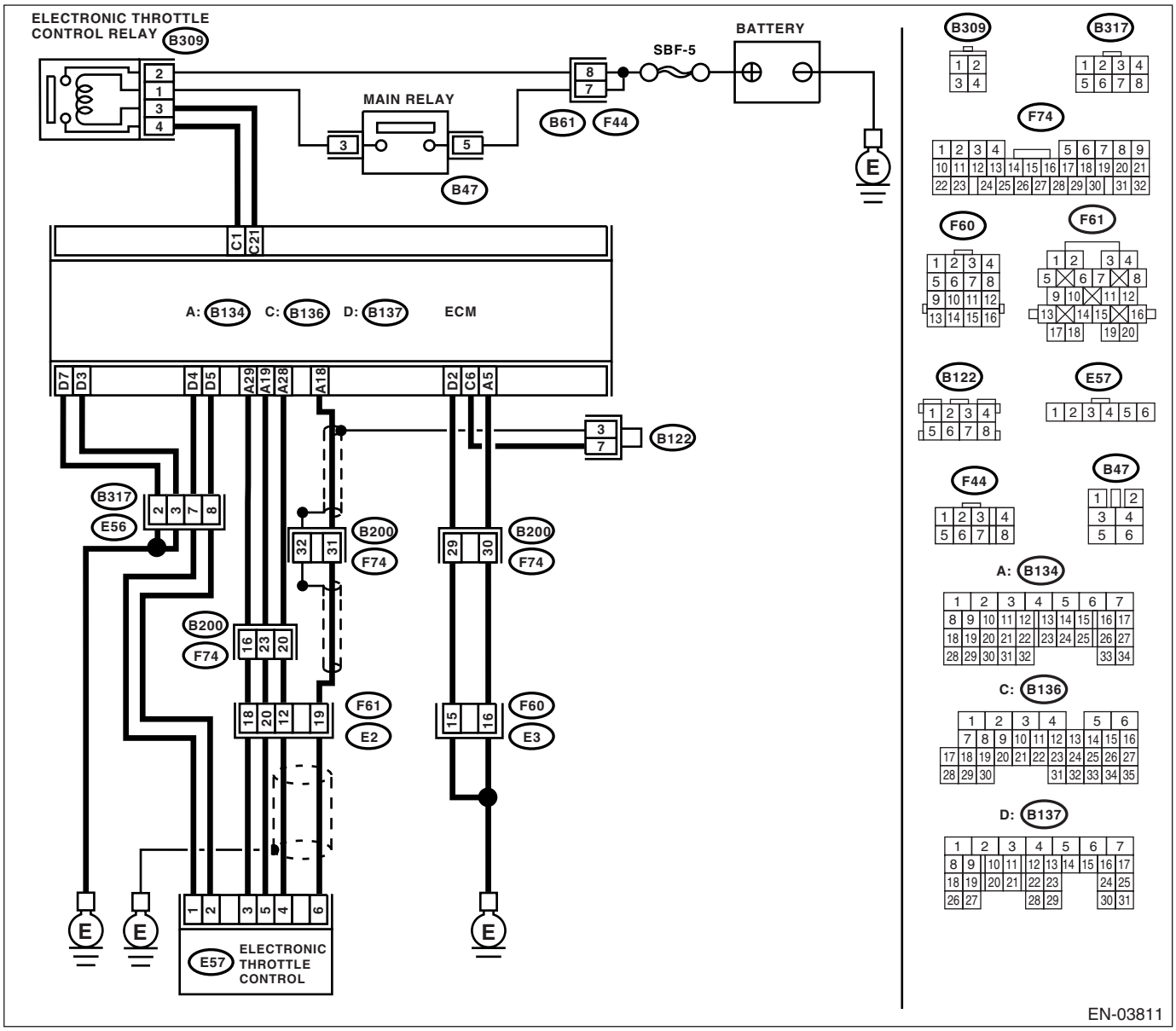
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance
- Engine stalls.

CAUTION:

After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK SENSOR OUTPUT.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and terminal. ***Connector & terminal*** ***(B134) No. 28 (+) — (B134) No. 29 (–):*** 3) Check the voltage change while shaking the ECM harness and connector, engine harness connector, and electronic control throttle connector harness.	Is the voltage more than 0.8 V?	Go to step **2**.	Go to step **3**.
2	**CHECK POOR CONTACT.** Check poor contact in connector between ECM and electronic throttle control.	Is there poor contact?	Repair the poor contact.	Temporary poor contact occurred, but it is normal at present.
3	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connectors from electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. ***Connector & terminal*** ***(B134) No. 19 — (E57) No. 5:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the open circuit of harness connector.
4	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 19 — Chassis ground:*** ***(B134) No. 28 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5**.	Repair the chassis short circuit of harness.
5	**CHECK SENSOR POWER SUPPLY.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 5 (+) — Engine ground (–):*** 4) Check the voltage change by shaking the harness and connector of ECM, and engine harness connector, while monitoring the value with voltage meter.	Is the voltage 4.5 — 5.5 V?	Go to step **6**.	Repair poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>
6	**CHECK SHORT CIRCUIT INSIDE THE ECM.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 4 — Engine ground:***	Is the resistance more than 10 Ω?	Repair the poor contact of electronic throttle control connector. Replace the electronic throttle control if defective.	Repair poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-94, DTC P0223 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

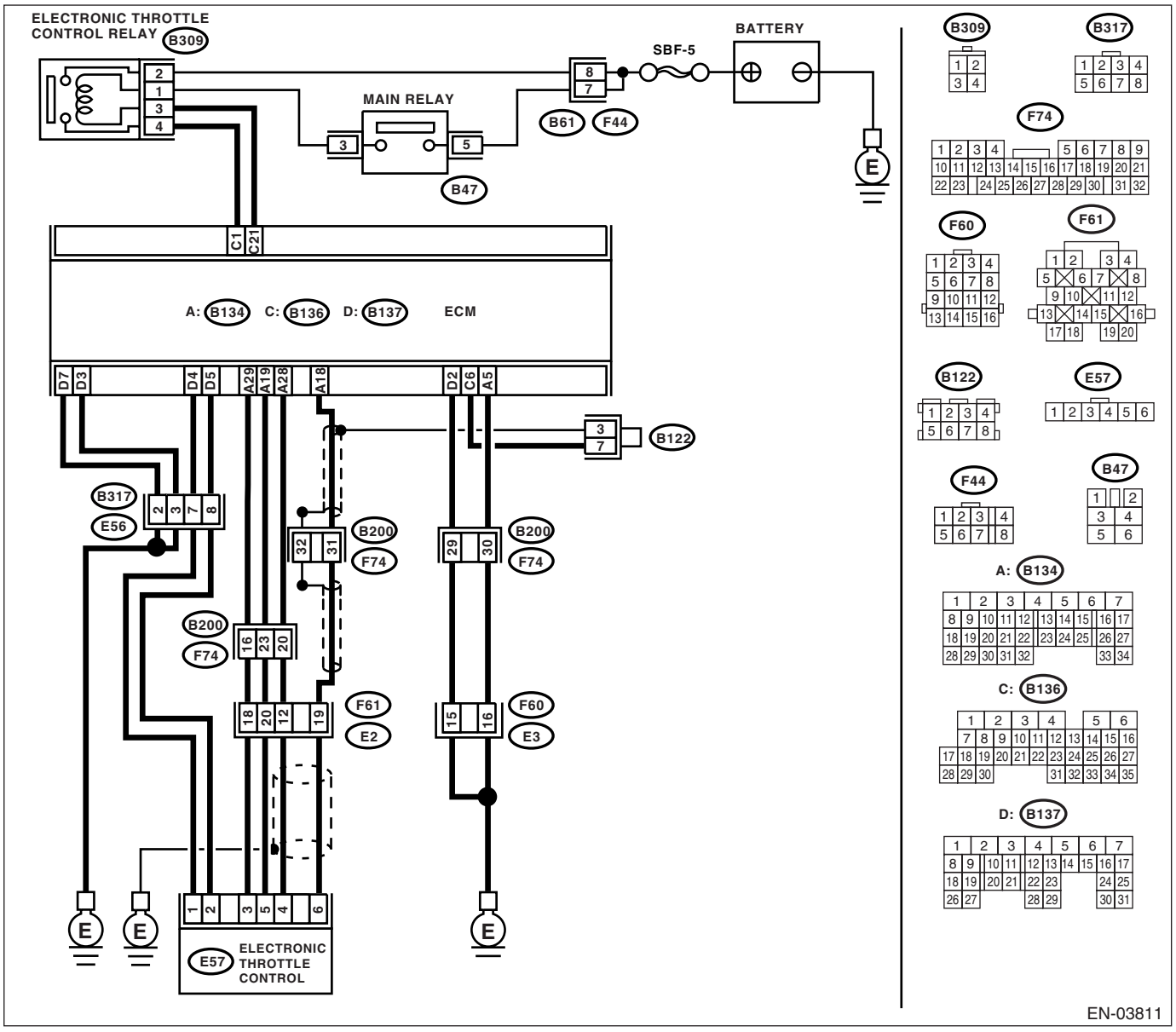
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance
- Engine stalls.

CAUTION:

After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK SENSOR OUTPUT.** 1) Turn the ignition switch to ON. 2) Read the data of sub throttle sensor signal using Subaru Select Monitor. 3) Check the voltage change while shaking the ECM harness and connector, engine harness connector, and electronic control throttle connector harness.	Is the voltage less than 4.73 V?	Go to step **2**.	Go to step **3**.
2	**CHECK POOR CONTACT.** Check poor contact in connector between ECM and electronic throttle control.	Is there poor contact in connector between ECM and electronic throttle control?	Repair the poor contact.	Temporary poor contact occurred, but it is normal at present.
3	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connectors from electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. ***Connector & terminal*** ***(B134) No. 28 — (E57) No. 4:*** ***(B134) No. 29 — (E57) No. 3:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the open circuit of harness connector.
4	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Connect the ECM connector. 2) Measure the resistance between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 3 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **5**.	Repair poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>
5	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 5 (+) — Engine ground (–):*** 4) Check the voltage change by shaking the harness and connector of ECM, and engine harness connector, while monitoring the value with voltage meter.	Is the voltage more than 10 V?	Go to step **6**.	Repair the battery short circuit of harness between ECM connector and electronic throttle control connector.
6	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 4 (+) — Engine ground (–):*** 2) Check the voltage change by shaking the harness and connector of ECM, and engine harness connector, while monitoring the value with voltage meter.	Is the voltage less than 10 V?	Go to step **7**.	Repair the battery short circuit of harness between ECM connector and electronic throttle control connector.

	Step	Check	Yes	No
7	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance between connector terminals. ***Connector & terminal*** ***(B134) No. 28 — (B134) No. 19:***	Is the resistance more than 1 MΩ?	Repair the poor contact. Replace the electronic throttle control if defective.	Sensor power supply circuit may be shorted.

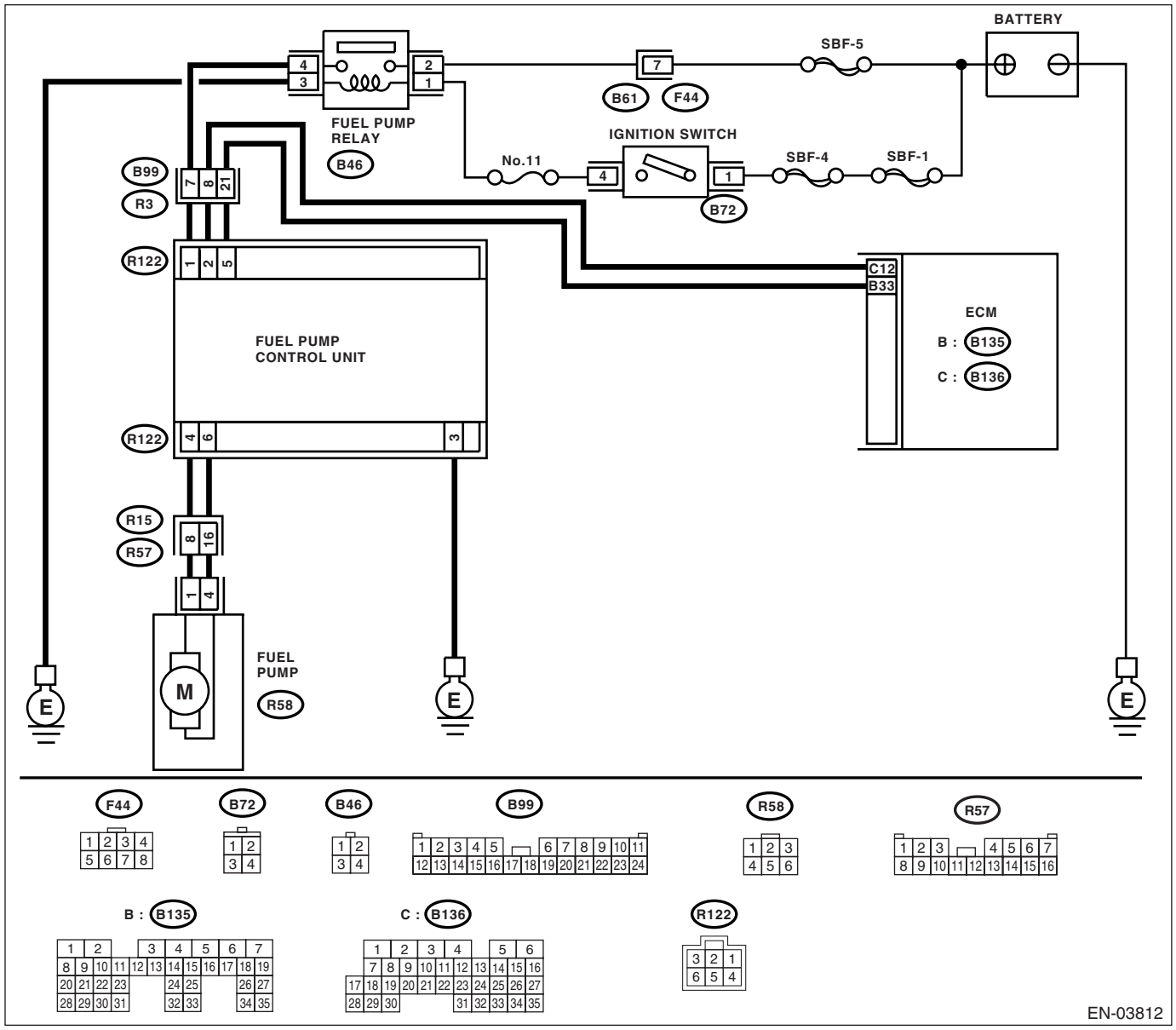
AO:DTC P0230 FUEL PUMP PRIMARY CIRCUIT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-96, DTC P0230 FUEL PUMP PRIMARY CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK POWER SUPPLY CIRCUIT TO FUEL PUMP CONTROL UNIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel pump control unit. 3) Turn the ignition switch to ON. 4) Measure the voltage between fuel pump control unit and chassis ground. ***Connector & terminal*** ***(R122) No. 1 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **2**.	Repair the power supply circuit. NOTE: In this case, repair the following 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. 3 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **3**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit 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. 4:*** ***(R122) No. 4 — (R58) No. 1:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the open circuit between fuel pump control unit and fuel pump.
4	**CHECK HARNESS BETWEEN FUEL PUMP CONTROL UNIT AND FUEL PUMP CONNECTOR.** Measure the resistance of harness between fuel pump control unit and chassis ground. ***Connector & terminal*** ***(R122) No. 6 — Chassis ground:*** ***(R122) No. 7 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5**.	Repair the ground short circuit between fuel pump control unit and fuel pump.

	Step	Check	Yes	No
5	**CHECK HARNESS BETWEEN FUEL PUMP CONTROL UNIT AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance of harness between fuel pump control unit and ECM connector. ***Connector & terminal*** ***(R122) No. 2 — (B136) No. 12:*** ***(R122) No. 5 — (B135) No. 33:***	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 fuel pump control unit and ECM • Poor contact of fuel pump control unit and ECM connector
6	**CHECK HARNESS BETWEEN FUEL PUMP CONTROL UNIT AND ECM CONNECTOR.** Measure the resistance of harness between fuel pump control unit and chassis ground. ***Connector & terminal*** ***(R122) No. 2 — Chassis ground:*** ***(R122) No. 5 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **7**.	Repair the ground short circuit between fuel pump control unit and ECM.
7	**CHECK POOR CONTACT.** Check poor contact of ECM and fuel pump control unit connector.	Is there poor contact of ECM and fuel pump control unit connector?	Repair poor contact in ECM and fuel pump control unit.	Go to step **8**.
8	**CHECK EXPERIENCE OF RUNNING OUT OF FUEL.**	Has the vehicle experienced running out of fuel?	Finish the diagnosis. NOTE: DTC may be recorded as a result of fuel pump idling while running out of fuel.	Replace the fuel pump control unit. <Ref. to FU(H4DOTC)-49, 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)-98, DTC P0244 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

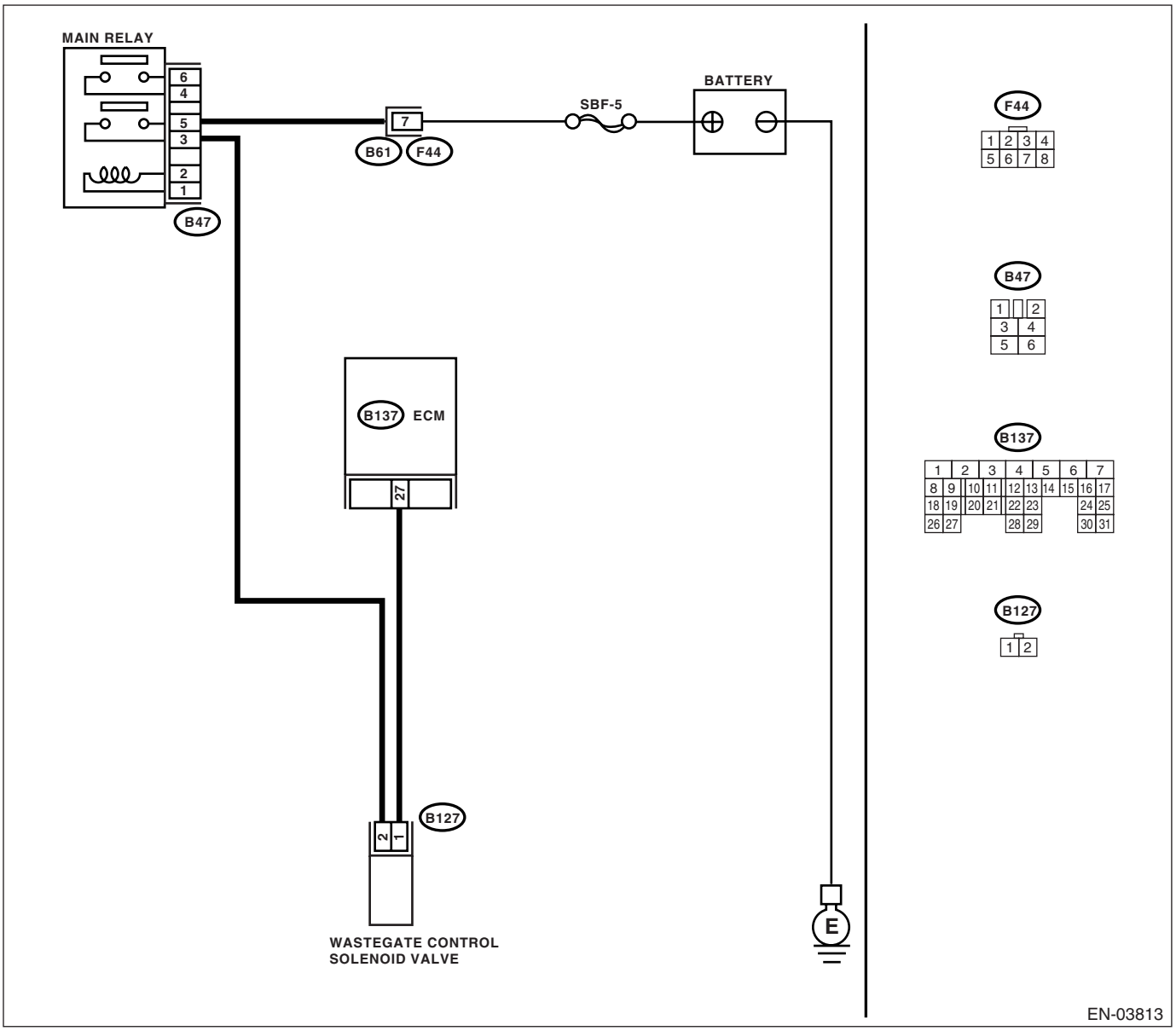
TROUBLE SYMPTOM:

- Improper idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



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)-65, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0244.	Replace the wastegate control solenoid valve. <Ref. to FU(H4DOTC)-40, 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)-100, DTC P0245 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

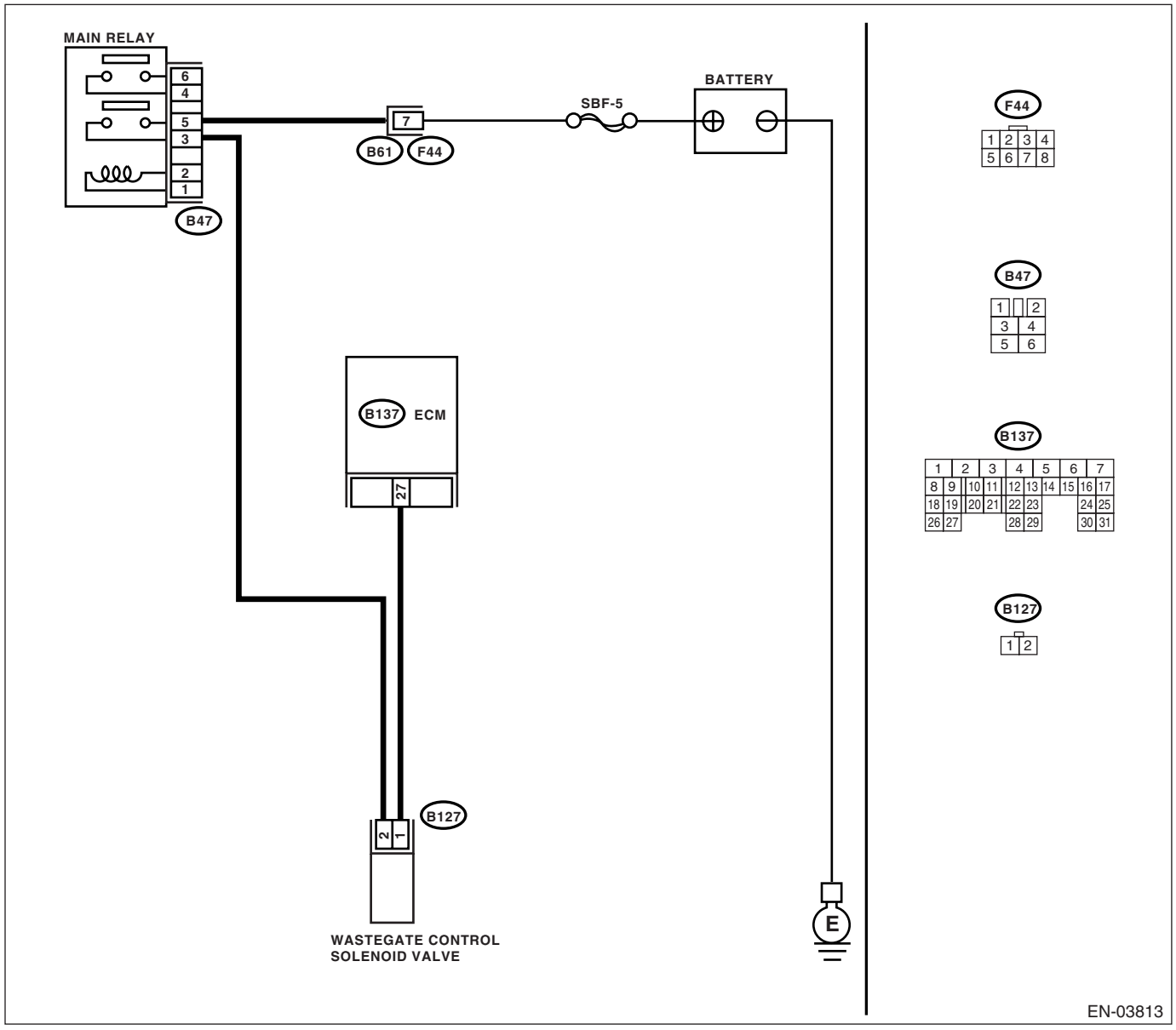
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL OF ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 27 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time.	Go to step **2**.
2	**CHECK HARNESS BETWEEN WASTEGATE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from wastegate control solenoid valve and ECM. 3) Measure the resistance of harness between wastegate control solenoid valve connector and engine ground. ***Connector & terminal*** ***(B127) No. 1 — Engine ground:***	Is the resistance less than 10 Ω?	Repair ground short circuit of harness between ECM and wastegate control solenoid valve connector.	Go to step **3**.
3	**CHECK HARNESS BETWEEN WASTEGATE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** Measure the resistance of harness between wastegate control solenoid valve of harness connector and ECM. ***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. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and wastegate control solenoid valve connector
4	**CHECK WASTEGATE CONTROL SOLENOID VALVE.** 1) Remove the wastegate control solenoid valve. 2) Measure the resistance between wastegate control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance between 30 and 34 Ω?	Go to step **5**.	Replace the wastegate control solenoid valve. <Ref. to FU(H4DOTC)-40, Wastegate Control Solenoid Valve.>
5	**CHECK POWER SUPPLY TO WASTEGATE CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to ON. 2) Measure the voltage between wastegate control solenoid valve and engine ground. ***Connector & terminal*** ***(B127) No. 2 (+) — Engine ground (–):***	Is the voltage more than 10 V?	Go to step **6**.	Repair open circuit of harness between main relay and wastegate control solenoid valve connector.
6	**CHECK POOR CONTACT.** Check poor contact of wastegate control solenoid valve connector.	Is there poor contact of wastegate control solenoid valve connector?	Repair poor contact in wastegate control solenoid valve connector.	Contact with SOA Service Center. NOTE: The deterioration of multiple parts can be thought as the cause.

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-102, DTC P0246 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

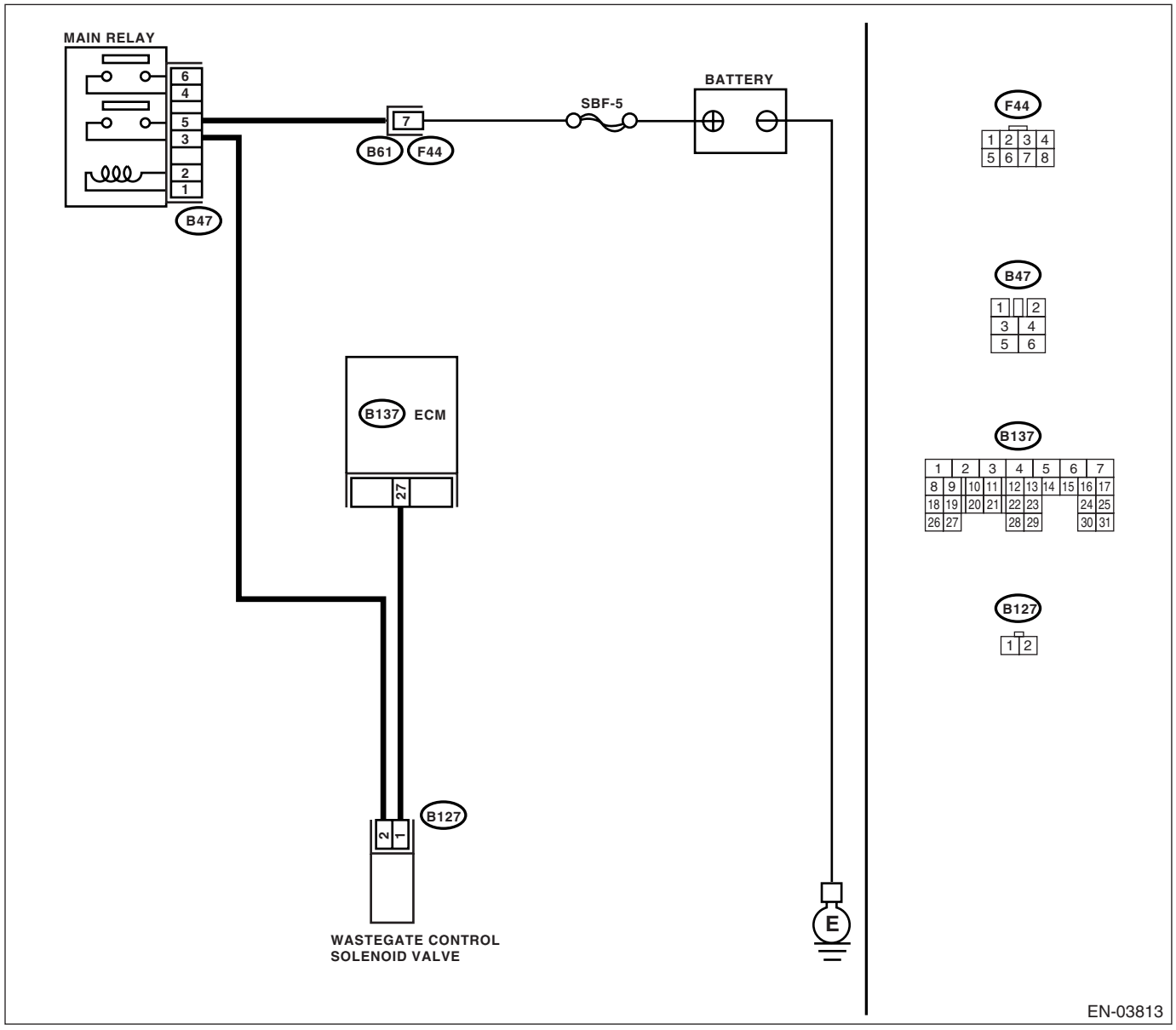
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL OF ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 27 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **3**.	Go to step **2**.
2	**CHECK POOR CONTACT.** Check poor contact of ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>
3	**CHECK HARNESS BETWEEN WASTEGATE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from wastegate control solenoid valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 27 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair battery short circuit of harness between ECM and wastegate control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>	Go to step **4**.
4	**CHECK WASTEGATE CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between wastegate control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 1 Ω?	Replace the wastegate control solenoid valve and ECM. <Ref. to FU(H4DOTC)-40, Wastegate Control Solenoid Valve.> <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>	Go to step **5**.
5	**CHECK POOR CONTACT.** Check poor contact of ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>

AS:DTC P0301 CYLINDER 1 MISFIRE DETECTED

NOTE:
For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(H4DOTC)(diag)-166, 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)-166, 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)-166, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AV:DTC P0304 CYLINDER 4 MISFIRE DETECTED

DTC DETECTING CONDITION:

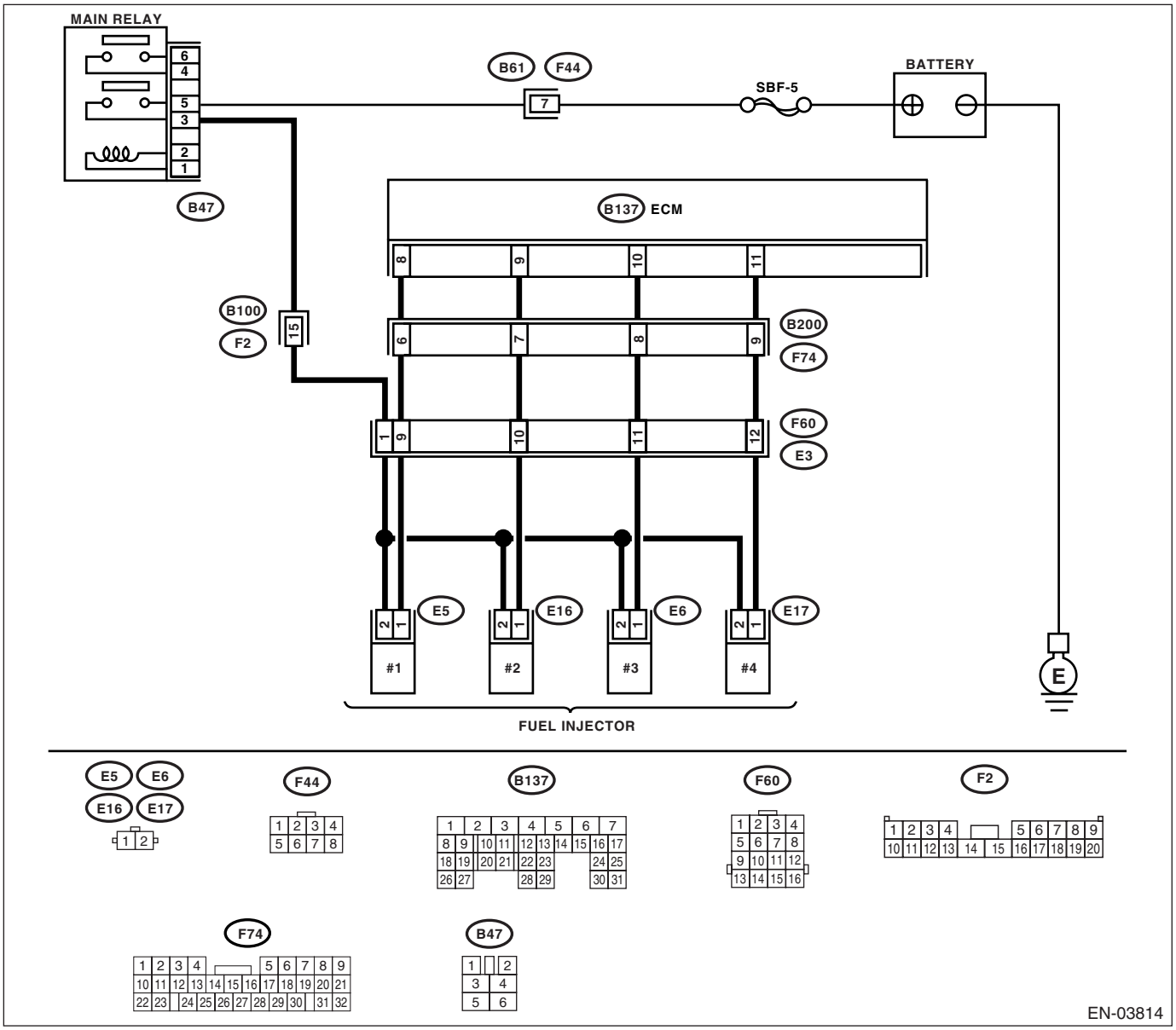
- Two consecutive driving cycles with fault
- Immediately at fault recognition (A misfire which could damage catalyst occurs.)
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-111, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Engine stalls.
- Improper idling
- Rough driving

CAUTION:
After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	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)-65, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK OUTPUT SIGNAL OF ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and chassis ground on faulty cylinders. ***Connector & terminal*** ***#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 more than 10 V?	Go to step **7**.	Go to step **3**.
3	**CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel injector on faulty cylinders. 3) Disconnect the connectors from ECM. 4) Measure the resistance between ECM connector and engine ground on faulty cylinders. ***Connector & terminal*** ***#1 (E5) No. 1 — Engine ground:*** ***#2 (E16) No. 1 — Engine ground:*** ***#3 (E6) No. 1 — Engine ground:*** ***#4 (E17) No. 1 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **4**.	Repair the ground short circuit of harness between fuel injector and ECM connector.
4	**CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR.** Measure the resistance of harness connector between ECM connector and fuel injector on faulty cylinders. ***Connector & terminal*** ***#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 **5**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and fuel injector connector • Poor contact of coupling connector
5	**CHECK FUEL INJECTOR.** Measure the resistance between fuel injector terminals on faulty cylinder. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance between 5 and 20 Ω?	Go to step **6**.	Replace the faulty fuel injector. <Ref. to FU(H4DOTC)-33, Fuel Injector.>

	Step	Check	Yes	No
6	**CHECK POWER SUPPLY LINE.** 1) Turn the ignition switch to ON. 2) Measure the voltage between fuel injector and engine ground on faulty cylinders. ***Connector & terminal*** ***#1 (E5) No. 2 (+) — Engine ground (–):*** ***#2 (E16) No. 2 (+) — Engine ground (–):*** ***#3 (E6) No. 2 (+) — Engine ground (–):*** ***#4 (E17) No. 2 (+) — Engine ground (–):***	Is the voltage more than 10 V?	Repair the poor contact of all connectors in fuel injector circuit.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of 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
7	**CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel injector on faulty cylinders. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM connector and chassis ground on 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 more than 10 V?	Repair the battery short circuit of harness between ECM and fuel injector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>	Go to step **8**.
8	**CHECK FUEL INJECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between fuel injector terminals on faulty cylinder. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 1 Ω?	Replace the faulty fuel injector and ECM. <Ref. to FU(H4DOTC)-33, Fuel Injector.> <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>	Go to step **9**.
9	**CHECK INSTALLATION OF CAMSHAFT POSITION SENSOR/CRANKSHAFT POSITION SENSOR.**	Is the camshaft position sensor or crankshaft position sensor loosely installed?	Tighten the camshaft position sensor or crankshaft position sensor.	Go to step **10**.
10	**CHECK CRANKSHAFT SPROCKET.** Remove the timing belt cover.	Is the crank sprocket rusted or does it have broken teeth?	Replace the crank sprocket. <Ref. to ME(H4DOTC)-51, Crank Sprocket.>	Go to step **11**.
11	**CHECK INSTALLATION CONDITION OF TIMING BELT.** Turn the crankshaft, and align alignment mark on crank sprocket with alignment mark on cylinder block.	Is the timing belt dislocated from its proper position?	Repair the installation condition of timing belt. <Ref. to ME(H4DOTC)-42, Timing Belt.>	Go to step **12**.

Step		Check	Yes	No
12	**CHECK FUEL LEVEL.**	Is the fuel meter indication higher than the “Lower” level?	Go to step **13**.	Refill the fuel so that fuel meter indication is higher than the “Lower” level. After refueling, Go to step **13**.
13	**CHECK STATUS OF MALFUNCTION INDICATOR LIGHT.** 1) Clear the memory using Subaru Select Monitor. <Ref. to EN(H4DOTC)(diag)-46, Clear Memory Mode.> 2) Start the engine, and drive the vehicle more than 10 minutes.	Does the malfunction indicator light illuminate or blink?	Go to step **15**.	Go to step **14**.
14	**CHECK CAUSE OF MISFIRE.**	Has the cause of misfire diagnosed when the engine is running?	Finish diagnostics operation, if the engine has no abnormality.	Repair the poor contact. NOTE: In this case, repair the following item: • Poor contact of ignition coil connector • Poor contact of fuel injector connector on faulty cylinders • Poor contact in ECM connector • Poor contact of coupling connector
15	**CHECK AIR INTAKE SYSTEM.**	Is there any fault in air intake system?	Repair the air intake system. NOTE: Check the following item. • Are there air leaks or air suction caused by loose or dislocated nuts and bolts? • Are there cracks or any disconnection of hoses?	Go to step **16**.
16	**CHECK CYLINDER.**	Is there any fault in the cylinder?	Repair or replace faulty parts. NOTE: Check the following item. • Spark plug • Fuel injector • Compression	Go to DTC P0171 and P0172. <Ref. to EN(H4DOTC)(diag)-141, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

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

DTC DETECTING CONDITION:

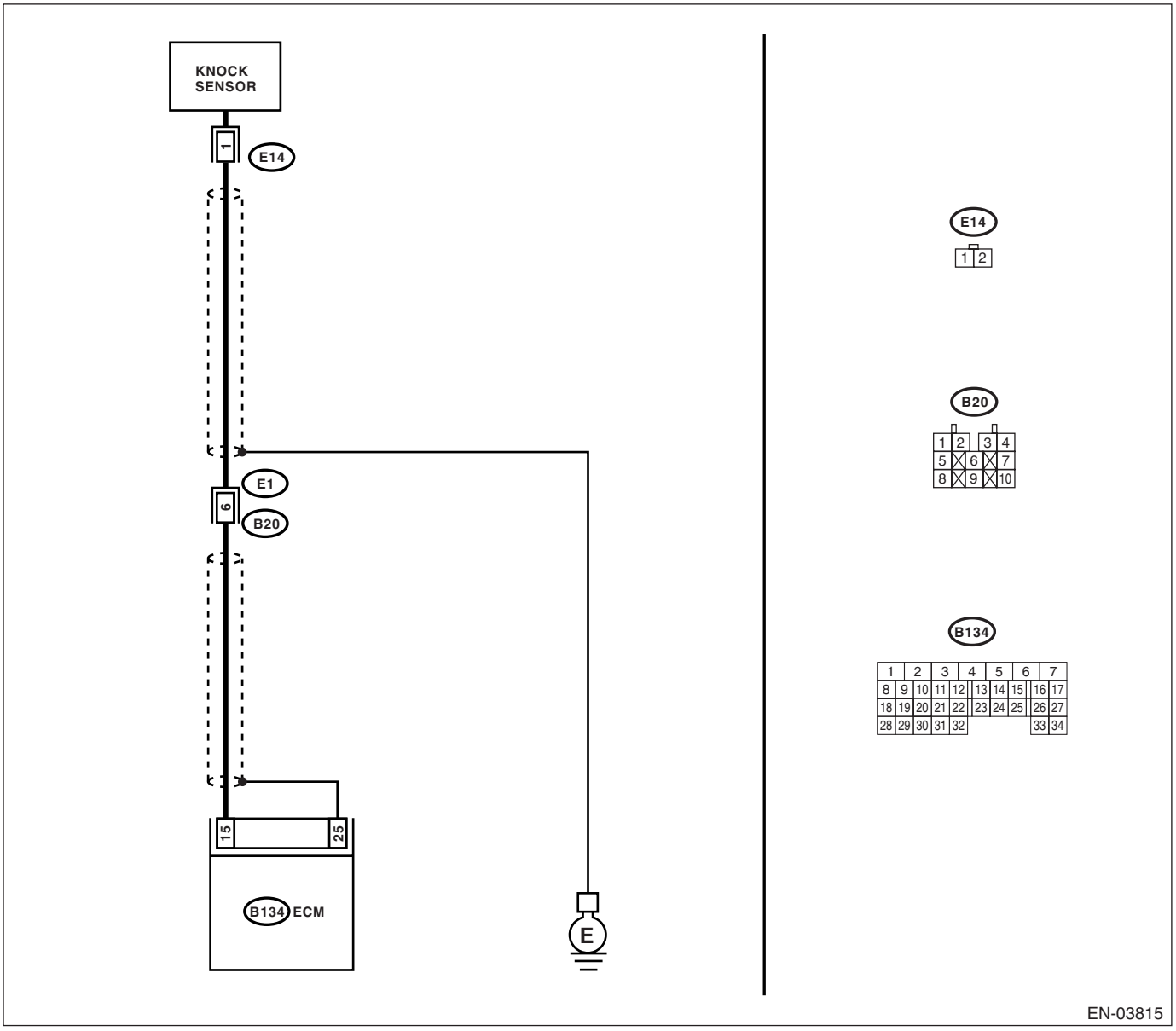
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-112, DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Poor driving performance
- Knocking occurs.

CAUTION:
After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN KNOCK SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance between ECM harness connector and chassis ground. ***Connector & terminal*** ***(B134) No. 15 — Chassis ground:***	Is the resistance more than 700 kΩ?	Go to step **2**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between knock sensor and ECM connector • Poor contact of knock sensor connector • Poor contact of coupling connector
2	**CHECK KNOCK SENSOR.** 1) Disconnect the connector from knock sensor. 2) Measure the resistance between knock sensor connector terminal and engine ground. ***Terminals*** ***No. 2 — Engine ground:***	Is the resistance more than 700 kΩ?	Go to step **3**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Poor contact of knock sensor connector • Poor contact of coupling connector
3	**CHECK INSTALLATION CONDITION OF KNOCK SENSOR**	Is the knock sensor installation bolt tightened securely?	Replace the knock sensor. <Ref. to FU(H4DOTC)-30, Knock Sensor.>	Tighten the knock sensor installation bolt securely.

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

DTC DETECTING CONDITION:

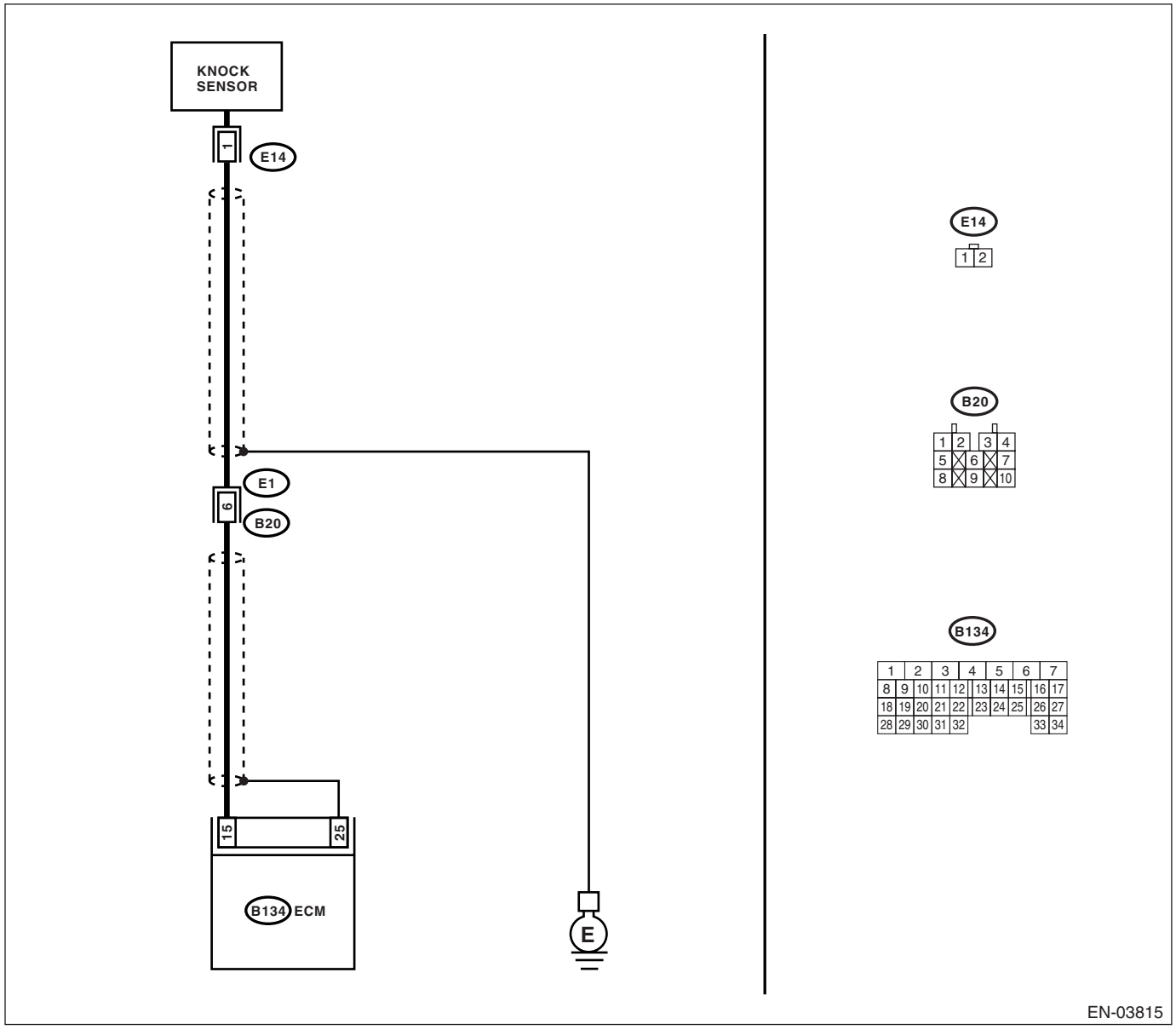
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-114, DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Poor driving performance
- Knocking occurs.

CAUTION:
After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN KNOCK SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 15 — Chassis ground:***	Is the resistance less than 400 kΩ?	Go to step **2**.	Go to step **3**.
2	**CHECK KNOCK SENSOR.** 1) Disconnect the connector from knock sensor. 2) Measure the resistance between knock sensor connector terminal and engine ground. ***Terminals*** ***No. 2 — Engine ground:***	Is the resistance less than 400 kΩ?	Replace the knock sensor. <Ref. to FU(H4DOTC)-30, Knock Sensor.>	Repair the ground short circuit of harness between knock sensor connector and ECM connector. NOTE: The harness between both connectors is shielded. Repair the short circuit of harness covered with shield.
3	**CHECK INPUT SIGNAL OF ECM.** 1) Connect the connectors to ECM and knock sensor. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 15 (+) — Chassis ground (–):***	Is the voltage more than 2 V?	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. (However, the possibility of poor contact still remains.)) NOTE: In this case, repair the following item: • Poor contact of knock sensor connector • Poor contact in ECM connector • Poor contact of coupling connector	Repair poor contact in ECM connector.

AY:DTC P0335 CRANKSHAFT POSITION SENSOR “A” CIRCUIT

DTC DETECTING CONDITION:

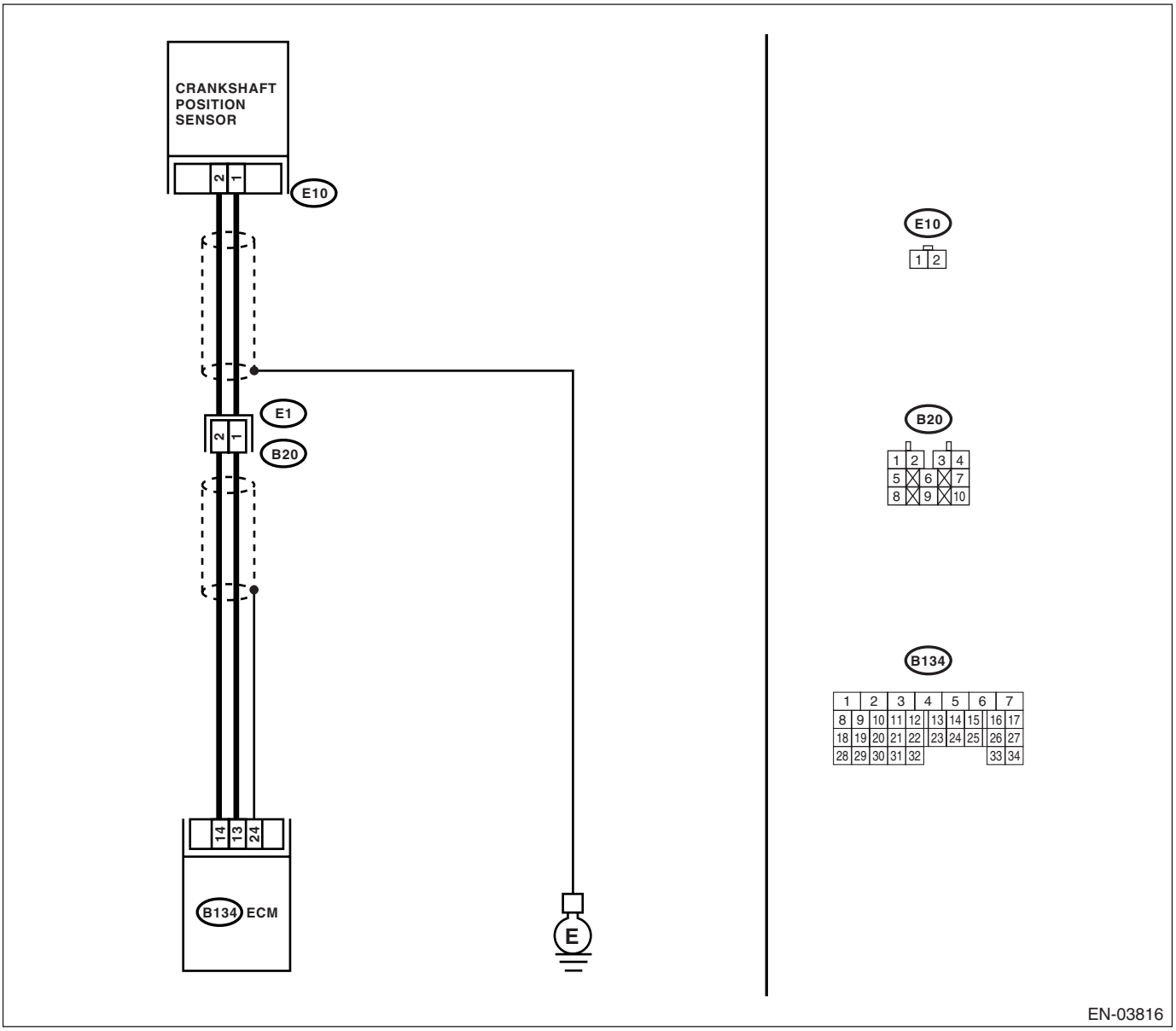
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-116, DTC P0335 CRANKSHAFT POSITION SENSOR “A” CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

CAUTION:
After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from crankshaft position sensor. 3) Measure the resistance of harness between crankshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E10) No. 1 — Engine ground:***	Is the resistance more than 100 kΩ?	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between crankshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact of coupling connector	Go to step **2**.
2	**CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between crankshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E10) No. 1 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **3**.	Repair the ground short circuit of harness between crankshaft position sensor and ECM connector. NOTE: The harness between both connectors is shielded. Repair the ground short circuit of harness with shield.
3	**CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between crankshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E10) No. 2 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **4**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between crankshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact of coupling connector
4	**CHECK CONDITION OF CRANKSHAFT POSITION SENSOR.**	Is the crankshaft position sensor installation bolt tightened securely?	Go to step **5**.	Tighten the crankshaft position sensor installation bolt securely.
5	**CHECK CRANKSHAFT POSITION SENSOR.** 1) Remove the crankshaft position sensor. 2) Measure the resistance between connector terminals of crankshaft position sensor. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance between 1 and 4 kΩ?	Repair the poor contact of crankshaft position sensor connector.	Replace the crankshaft position sensor. <Ref. to FU(H4DOTC)-28, Crankshaft Position Sensor.>

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

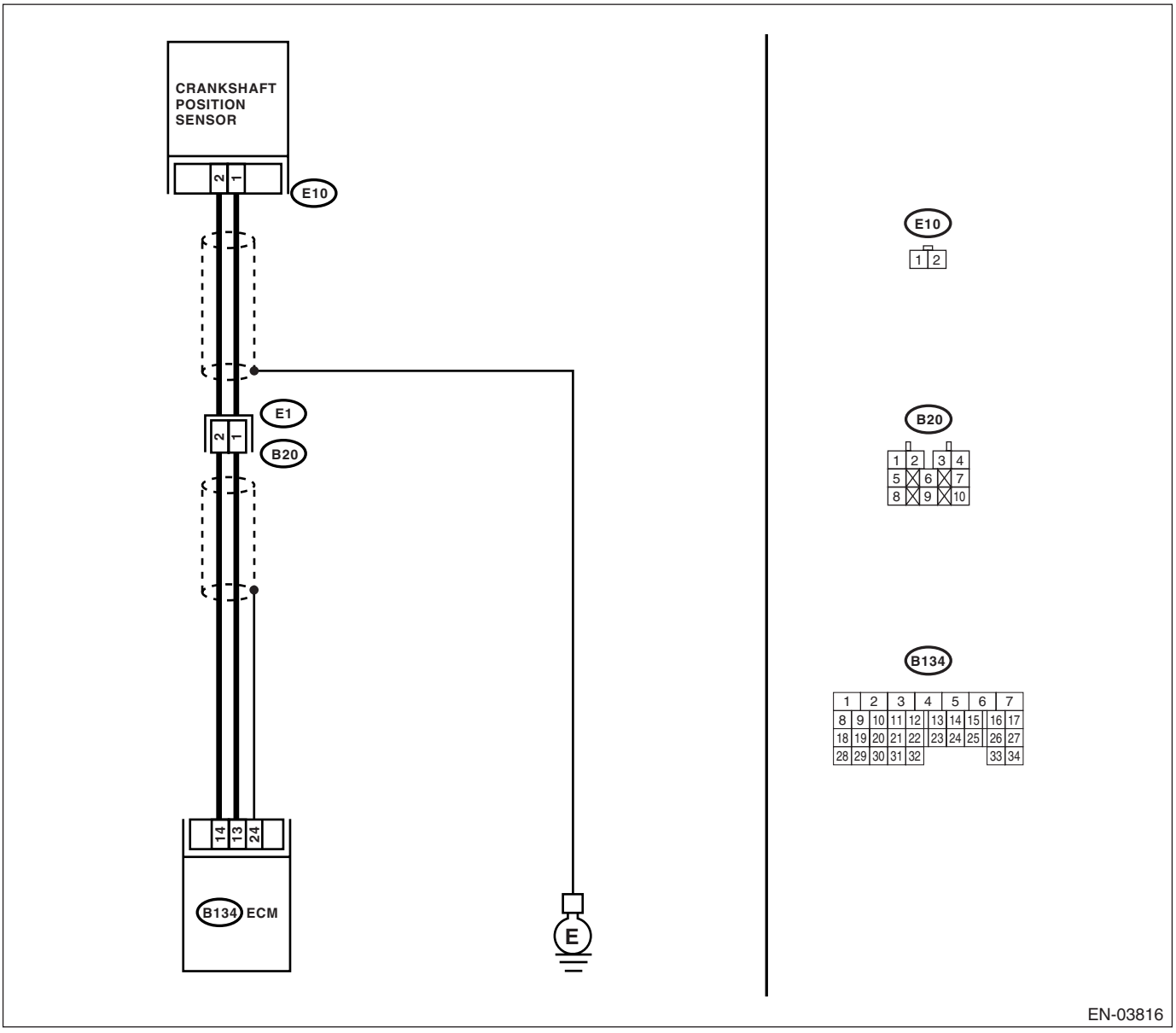
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-118, 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, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.
WIRING DIAGRAM:



	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)-65, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK CONDITION OF CRANKSHAFT POSITION SENSOR.** Turn the ignition switch to OFF.	Is the crankshaft position sensor installation bolt tightened securely?	Go to step **3**.	Tighten the crankshaft position sensor installation bolt securely.
3	**CHECK CRANKSHAFT SPROCKET.** Remove the front belt cover.	Are crank sprocket teeth cracked or damaged?	Replace the crank sprocket. <Ref. to FU(H4DOTC)-28, Crankshaft Position Sensor.>	Go to step **4**.
4	**CHECK INSTALLATION CONDITION OF TIMING BELT.** Turn the crankshaft, and align alignment mark on crank sprocket with alignment mark on cylinder block.	Is the timing belt dislocated from its proper position?	Repair the installation condition of timing belt. <Ref. to ME(H4DOTC)-42, Timing Belt.>	Replace the crankshaft position sensor. <Ref. to FU(H4DOTC)-28, Crankshaft Position Sensor.>

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

DTC DETECTING CONDITION:

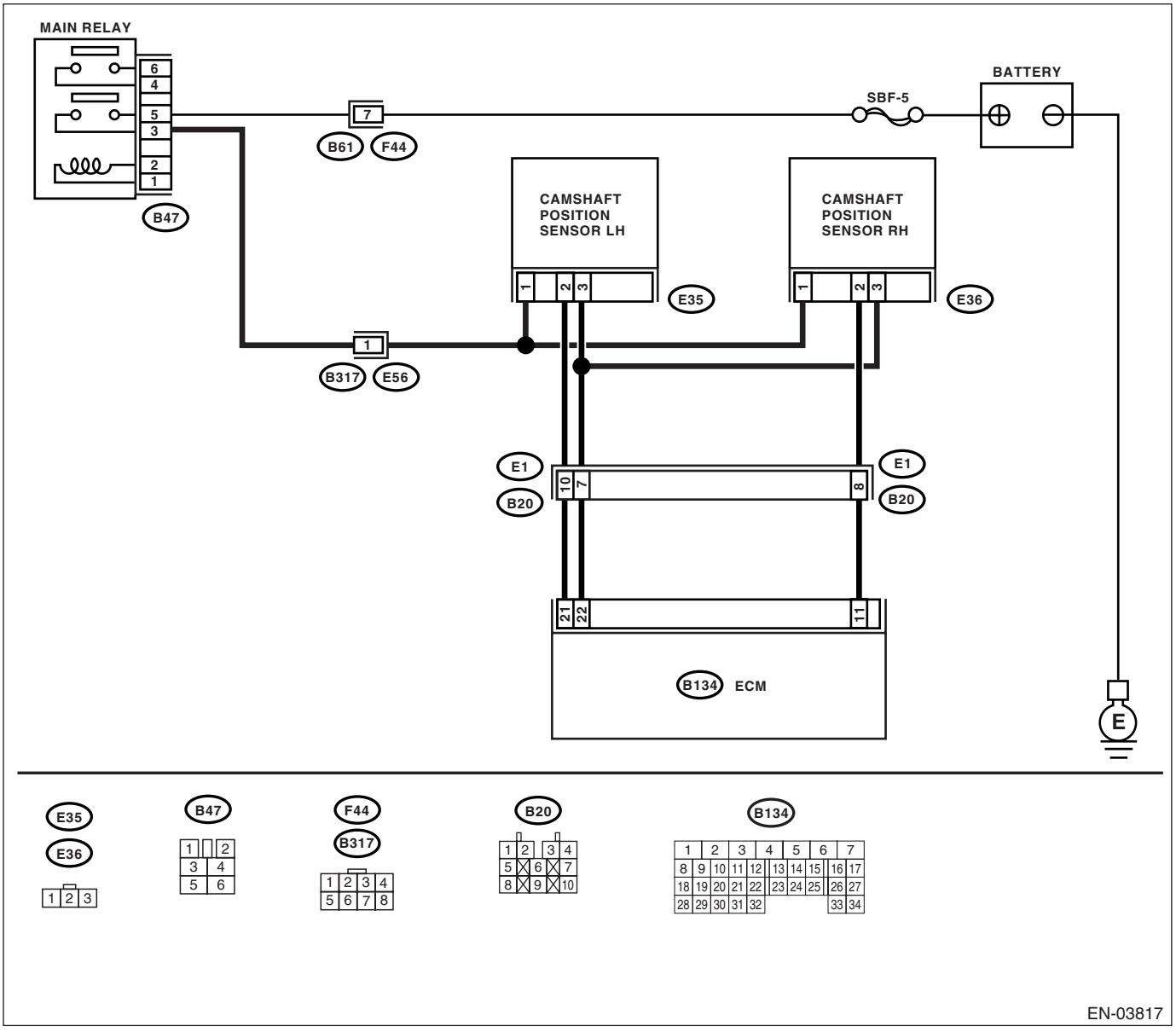
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-120, DTC P0340 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

CAUTION:
After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK POWER SUPPLY OF CAMSHAFT POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from camshaft position sensor. 3) Measure the voltage between camshaft position sensor and engine ground. ***Connector & terminal*** ***(E36) No. 1 (+) — Engine ground (–):***	Is the voltage more than 10 V?	Repair the battery short circuit between main relay connector and camshaft position sensor connector.	Go to step **2**.
2	**CHECK POWER SUPPLY OF CAMSHAFT POSITION SENSOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between camshaft position sensor and engine ground. ***Connector & terminal*** ***(E36) No. 1 (+) — Engine ground (–):***	Is the voltage more than 10 V?	Go to step **3**.	Repair the open or ground short circuit between main relay connector and camshaft position sensor connector.
3	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between camshaft position sensor and ECM. ***Connector & terminal*** ***(E36) No. 2 — (B134) No. 11:*** ***(E35) No. 3 — (B134) No. 22:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the open circuit between camshaft position sensor and ECM.
4	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM.** Measure the resistance between camshaft position sensor and engine ground. ***Connector & terminal*** ***(E36) No. 2 — Engine ground*** ***(E35) No. 3 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **5**.	Repair the ground short between the camshaft position sensor and ECM.
5	**CHECK CONDITION OF CAMSHAFT POSITION SENSOR.**	Is the camshaft position sensor installation bolt tightened securely?	Go to step **6**.	Tighten the camshaft position sensor installation bolt securely.
6	**CHECK CAMSHAFT POSITION SENSOR.** Check 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)-29, Camshaft Position Sensor.>	Go to step **7**.
7	**CHECK POOR CONTACT.** Check poor contact of ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>

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

DTC DETECTING CONDITION:

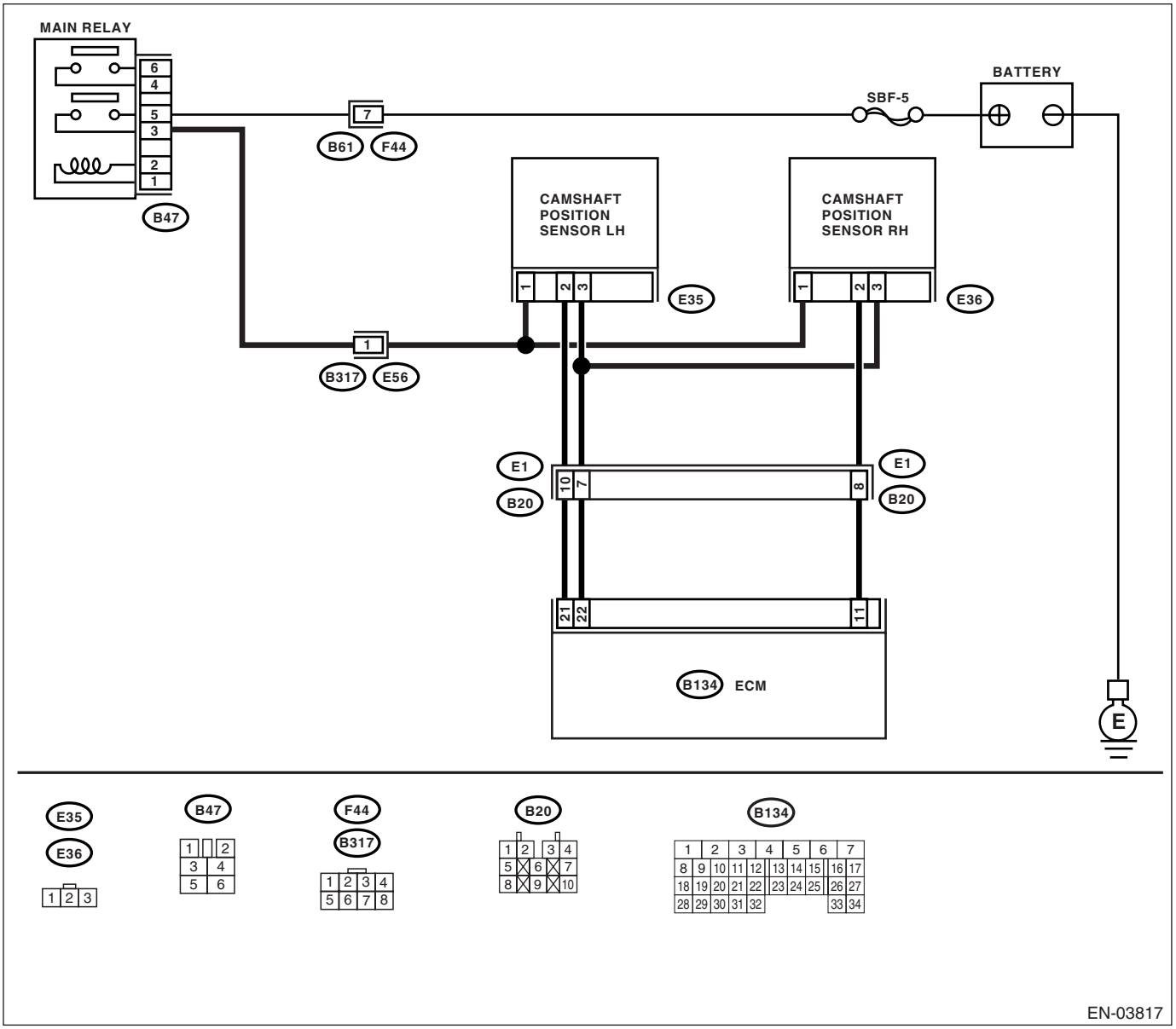
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-122, DTC P0345 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

CAUTION:
After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK POWER SUPPLY OF CAMSHAFT POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from camshaft position sensor. 3) Measure the voltage between camshaft position sensor and engine ground. ***Connector & terminal*** ***(E35) No. 1 (+) — Engine ground (–):***	Is the voltage more than 10 V?	Repair the battery short circuit between main relay connector and camshaft position sensor connector.	Go to step **2**.
2	**CHECK POWER SUPPLY OF CAMSHAFT POSITION SENSOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between camshaft position sensor and engine ground. ***Connector & terminal*** ***(E35) No. 1 (+) — Engine ground (–):***	Is the voltage more than 10 V?	Go to step **3**.	Repair the open or ground short circuit between main relay connector and camshaft position sensor connector.
3	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between camshaft position sensor and ECM. ***Connector & terminal*** ***(E35) No. 2 — (B134) No. 21:*** ***(E35) No. 3 — (B134) No. 22:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the open circuit between camshaft position sensor and ECM.
4	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM.** Measure the resistance between camshaft position sensor and engine ground. ***Connector & terminal*** ***(E35) No. 2 — Engine ground:*** ***(E35) No. 3 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **5**.	Repair the ground short between the camshaft position sensor and ECM.
5	**CHECK CONDITION OF CAMSHAFT POSITION SENSOR.**	Is the camshaft position sensor installation bolt tightened securely?	Go to step **6**.	Tighten the camshaft position sensor installation bolt securely.
6	**CHECK CAMSHAFT POSITION SENSOR.** Check 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)-29, Camshaft Position Sensor.>	Go to step **7**.
7	**CHECK POOR CONTACT.** Check poor contact of ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>

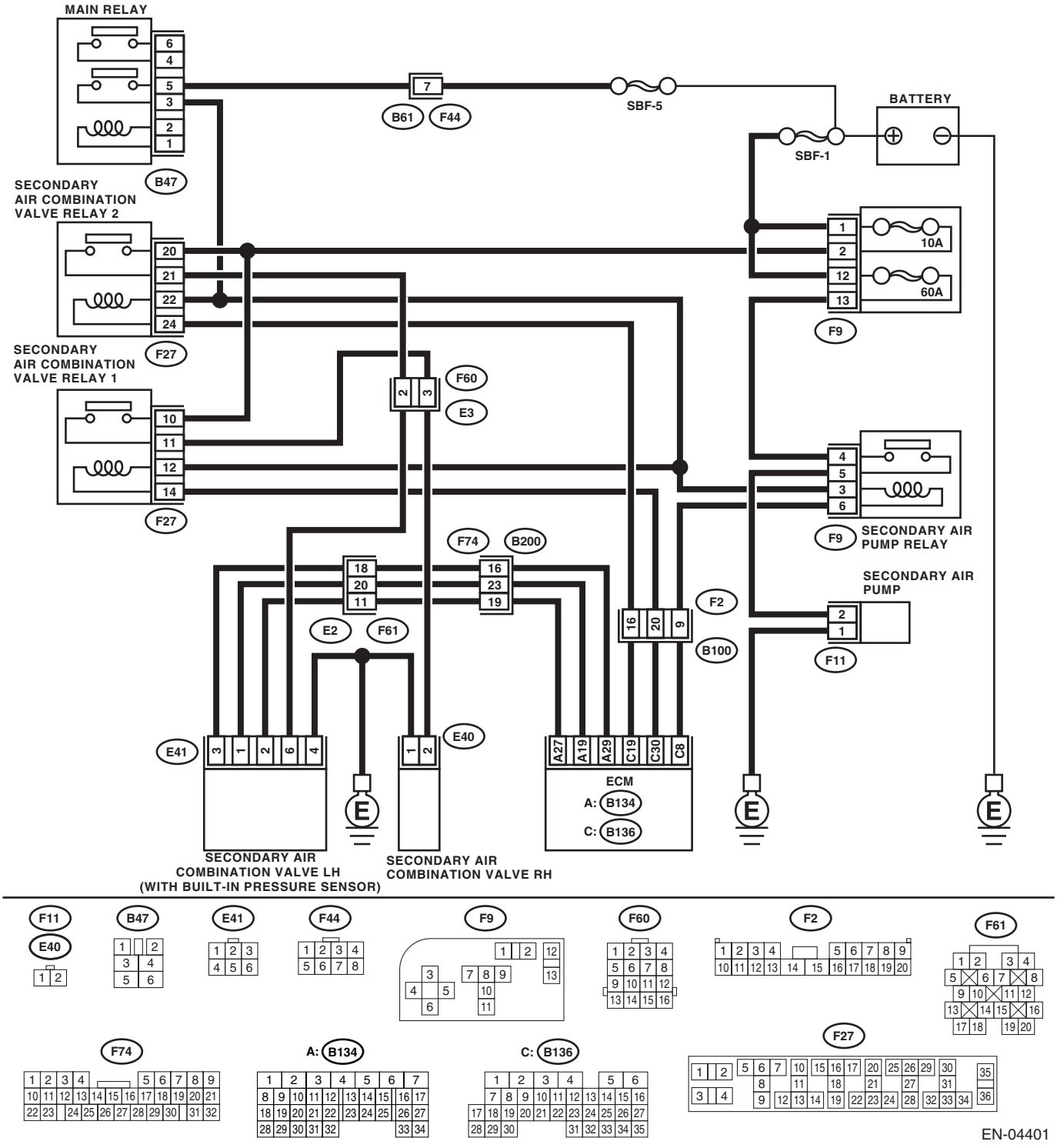
BC:DTC P0410 SECONDARY AIR INJECTION SYSTEM

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-123, DTC P0410 SECONDARY AIR INJECTION SYSTEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK SECONDARY AIR PUMP OPERATION.** 1) Connect the test mode connector. 2) Turn the ignition switch to ON. 3) Perform operation check for the secondary air pump using the Subaru Select Monitor. NOTE: Subaru Select Monitor Refer to “Compulsory Valve Operation Check Mode” for more operation procedure. <Ref. to EN(H4DOTC)(diag)-47, Compulsory Valve Operation Check Mode.>	Does the secondary air pump operate?	Go to step **2**.	Go to step **3**.
2	**CHECK DUCT BETWEEN SECONDARY AIR PUMP AND COMBINATION VALVE.** Inspection of the duct between the secondary air pump and combination valve.	Is there damage or disconnection of the duct?	Replace or connect the duct.	Temporary poor contact occurs. Check for poor contact in the connector.
3	**CHECK POWER SUPPLY TO SECONDARY AIR PUMP.** In the condition of step 1, measure the voltage between the secondary air pump and the chassis ground. ***Connector & terminal*** ***(F11) No. 2 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Replace the secondary air pump.	Go to step **4**.
4	**CHECK HARNESS BETWEEN SECONDARY AIR PUMP RELAY AND SECONDARY AIR PUMP CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the secondary air pump relay and secondary air pump. 3) Measure resistance between the secondary air pump relay and secondary air pump connector terminal ***Connector & terminal*** ***(F9) No. 5 — (F11) No. 2 :***	Is the resistance less than 1 Ω?	Go to step **5**.	Repair the open circuit between secondary air pump relay and secondary air pump connector terminal.
5	**CHECK SECONDARY AIR PUMP RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the secondary air pump relay from the relay box. 3) Connect the battery to the secondary air pump relay terminals No. 3 and 6. 4) Measure the resistance between secondary air pump relay terminals. ***Terminals*** ***No. 4 — No. 5***	Is the resistance less than 1 Ω?	Go to step **6**.	Replace the secondary air pump relay.
6	**CHECK SECONDARY AIR PUMP RELAY POWER SOURCE.** 1) Turn the ignition switch to ON. 2) Measure the voltage between the secondary air pump relay connector and chassis ground. ***Connector & terminal*** ***(F9) No. 3 (+) — Chassis ground (–):*** ***(F9) No. 4 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **7**.	Repair the open or ground short circuit of power supply circuit.

	Step	Check	Yes	No
7	**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 the harness between the ECM and secondary air pump relay connector terminal. ***Connector & terminal*** ***(B136) No. 8 — (F9) No. 6:***	Is the resistance less than 1 Ω?	Replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>	Repair open circuit of the harness between the ECM and secondary air pump relay connector terminal.

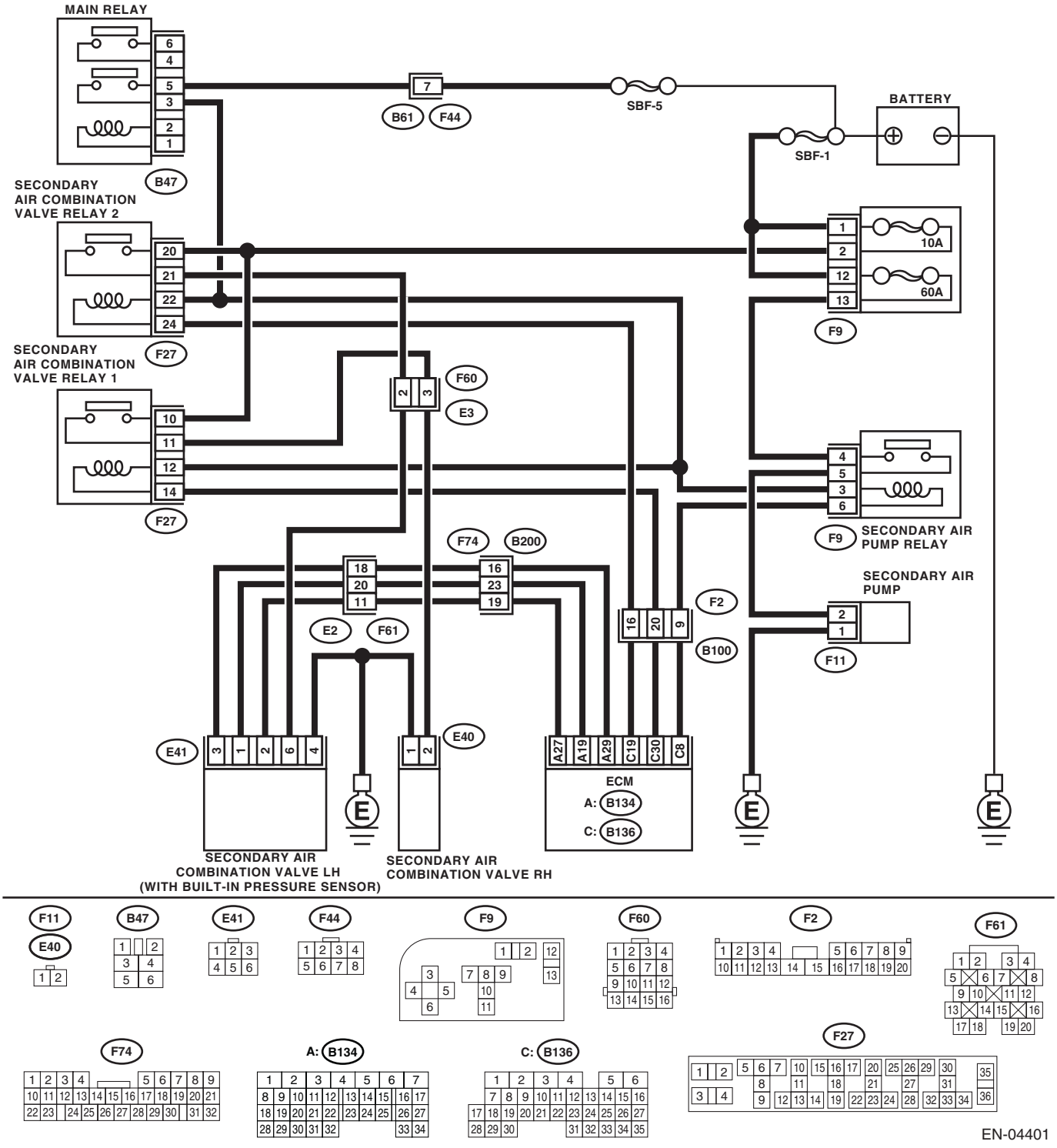
BD:DTC P0411 SECONDARY AIR INJECTION SYSTEM INCORRECT FLOW DETECTED

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-128, DTC P0411 SECONDARY AIR INJECTION SYSTEM INCORRECT FLOW DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



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**.

Step		Check	Yes	No
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.	Contact with SOA Service Center. NOTE: The deterioration of multiple parts can be thought as the cause.

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

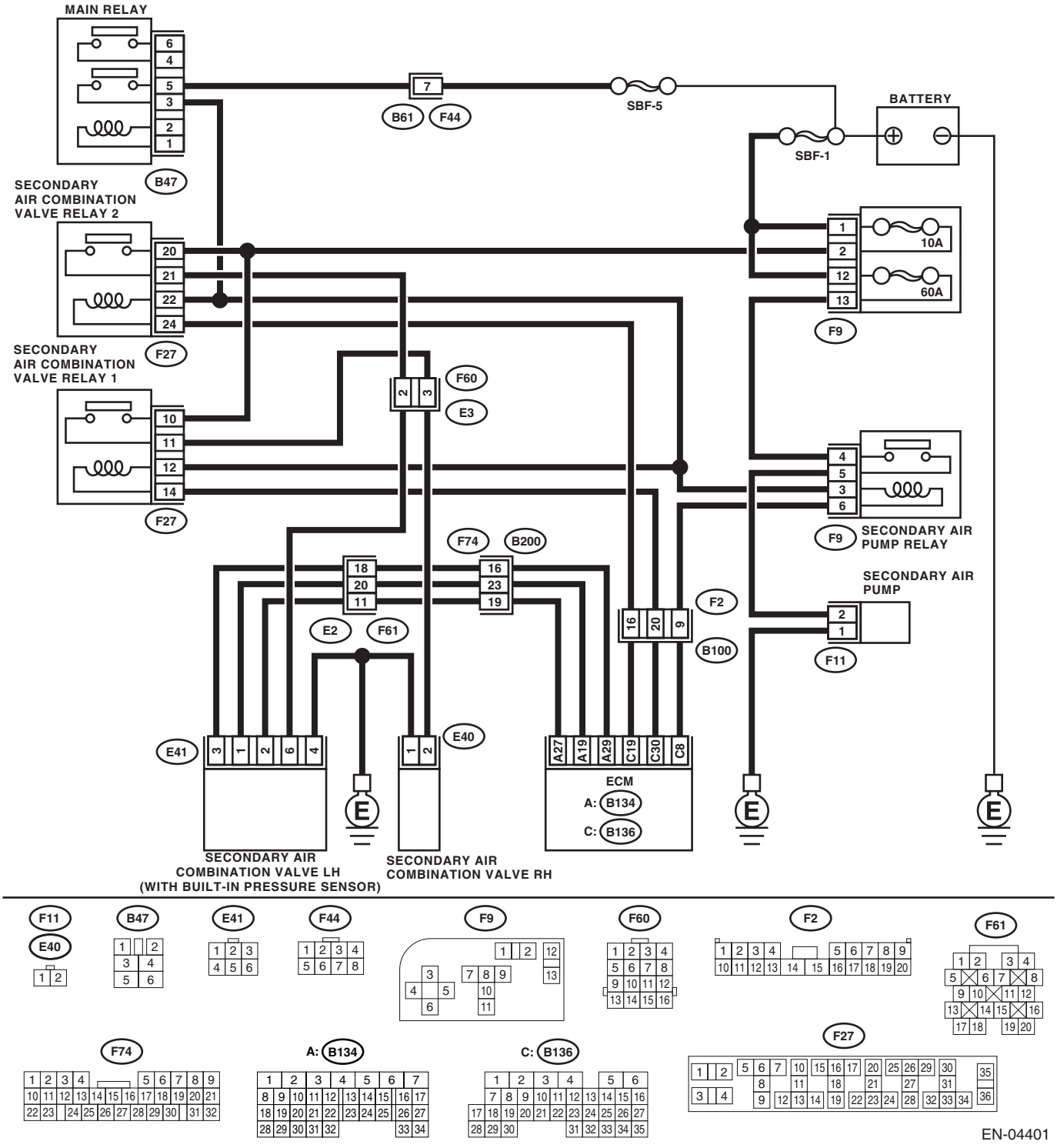
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-129, 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, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04401

	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBINATION VALVE RELAY 1.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the ECM and secondary air combination valve relay 1. 3) Measure the resistance of the harness between the ECM and secondary air combination valve relay 1 terminal. ***Connector & terminal*** ***(B136) No. 30 — (F27) No. 14:***	Is the resistance less than 1 Ω?	Go to step **2**.	Repair open circuit of the harness between the ECM and secondary air combination valve relay 1 terminal.
2	**CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBINATION VALVE RELAY 1.** Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 30 — Chassis ground:***	Is the resistance more than 1 MΩ?	Temporary poor contact occurs. Check for poor contact in the connector.	Repair open circuit of the harness between the ECM and secondary air combination valve relay 1 terminal.

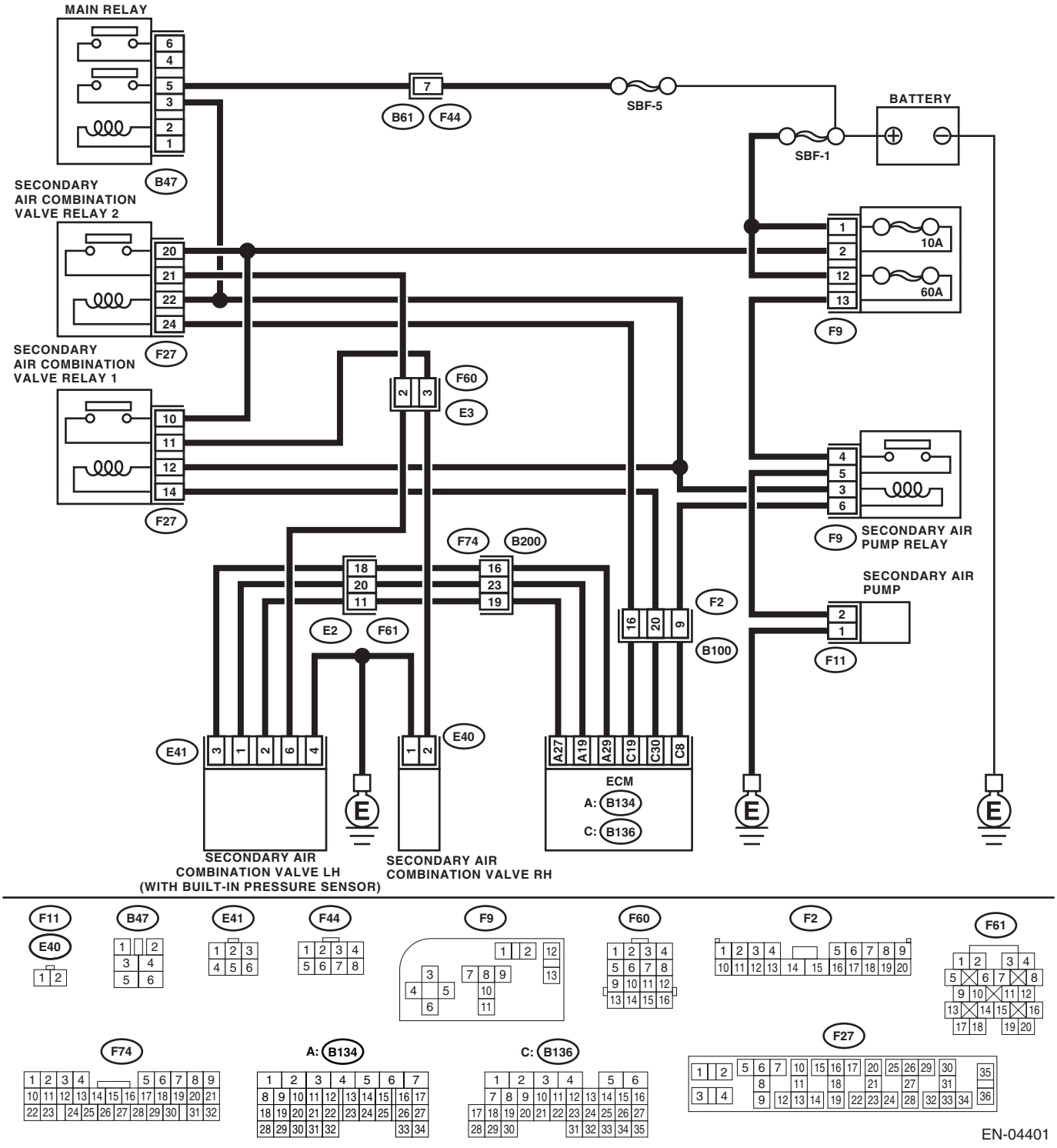
BF:DTC P0414 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “A” CIRCUIT SHORTED

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-130, 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, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBINATION VALVE RELAY 1.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the ECM and secondary air combination valve relay 1. 3) Measure the resistance of the harness between the ECM and secondary air combination valve relay 1 terminal. ***Connector & terminal*** ***(B136) No. 30 — (F27) No. 14:***	Is the resistance less than 1 Ω?	Go to step **2**.	Repair open circuit of the harness between the ECM and secondary air combination valve relay 1 terminal.
2	**CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBINATION VALVE RELAY 1.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 30 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair battery short of the harness between the ECM and secondary air combination valve relay 1 terminal.	Temporary poor contact occurs. Check for poor contact in the connector.

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

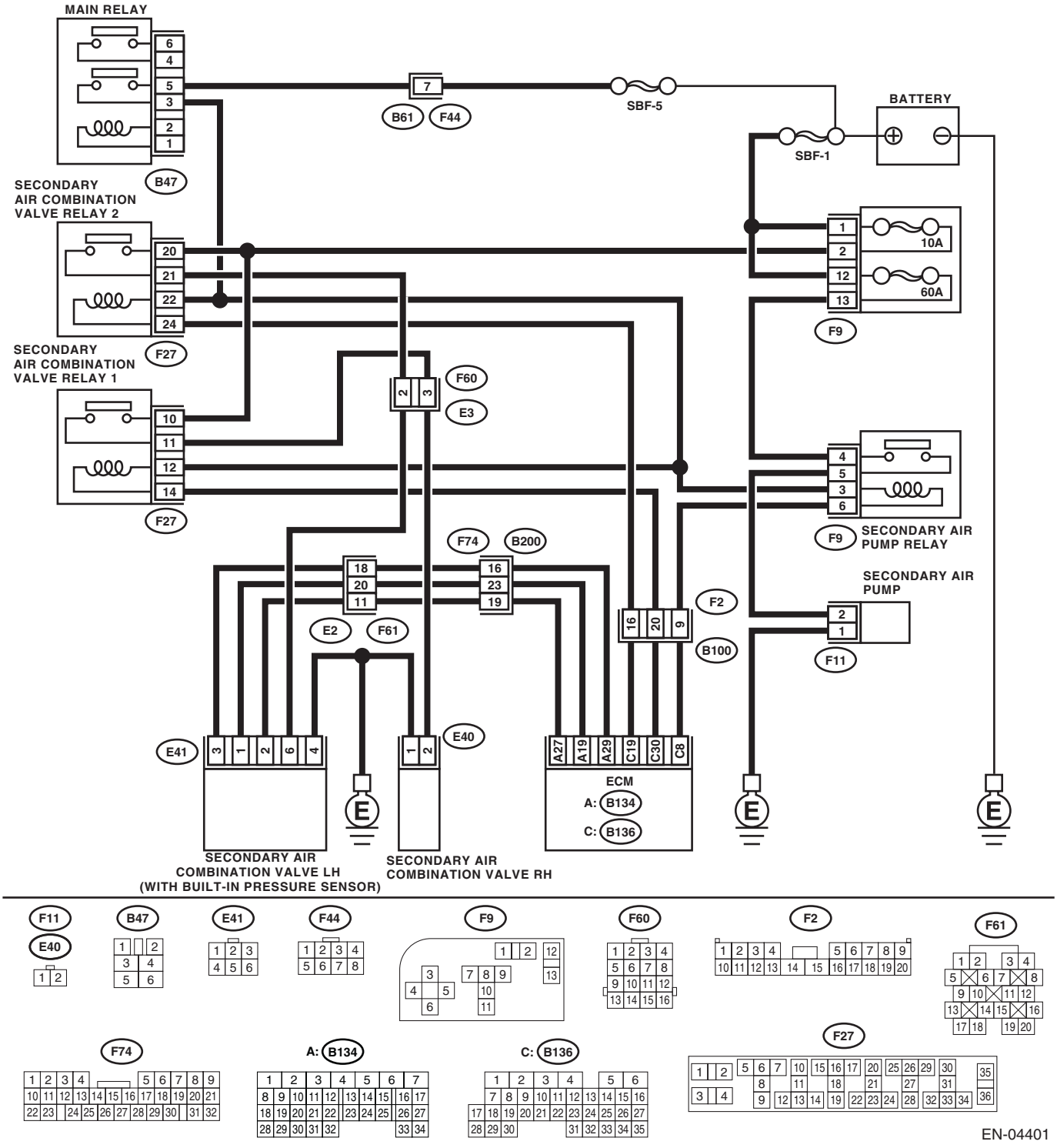
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-131, 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, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBINATION VALVE RELAY 2.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the ECM and secondary air combination valve relay 2. 3) Measure the resistance of the harness between the ECM and secondary air combination valve relay 2 terminal. ***Connector & terminal*** ***(B136) No. 19 — (F27) No. 24:***	Is the resistance less than 1 Ω?	Go to step **2**.	Repair open circuit of the harness between the ECM and secondary air combination valve relay 2 terminal.
2	**CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBINATION VALVE RELAY 2.** Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 19 — Chassis ground:***	Is the resistance more than 1 MΩ?	Temporary poor contact occurs. Check for poor contact in the connector.	Repair open circuit of the harness between the ECM and secondary air combination valve relay 2 terminal.

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

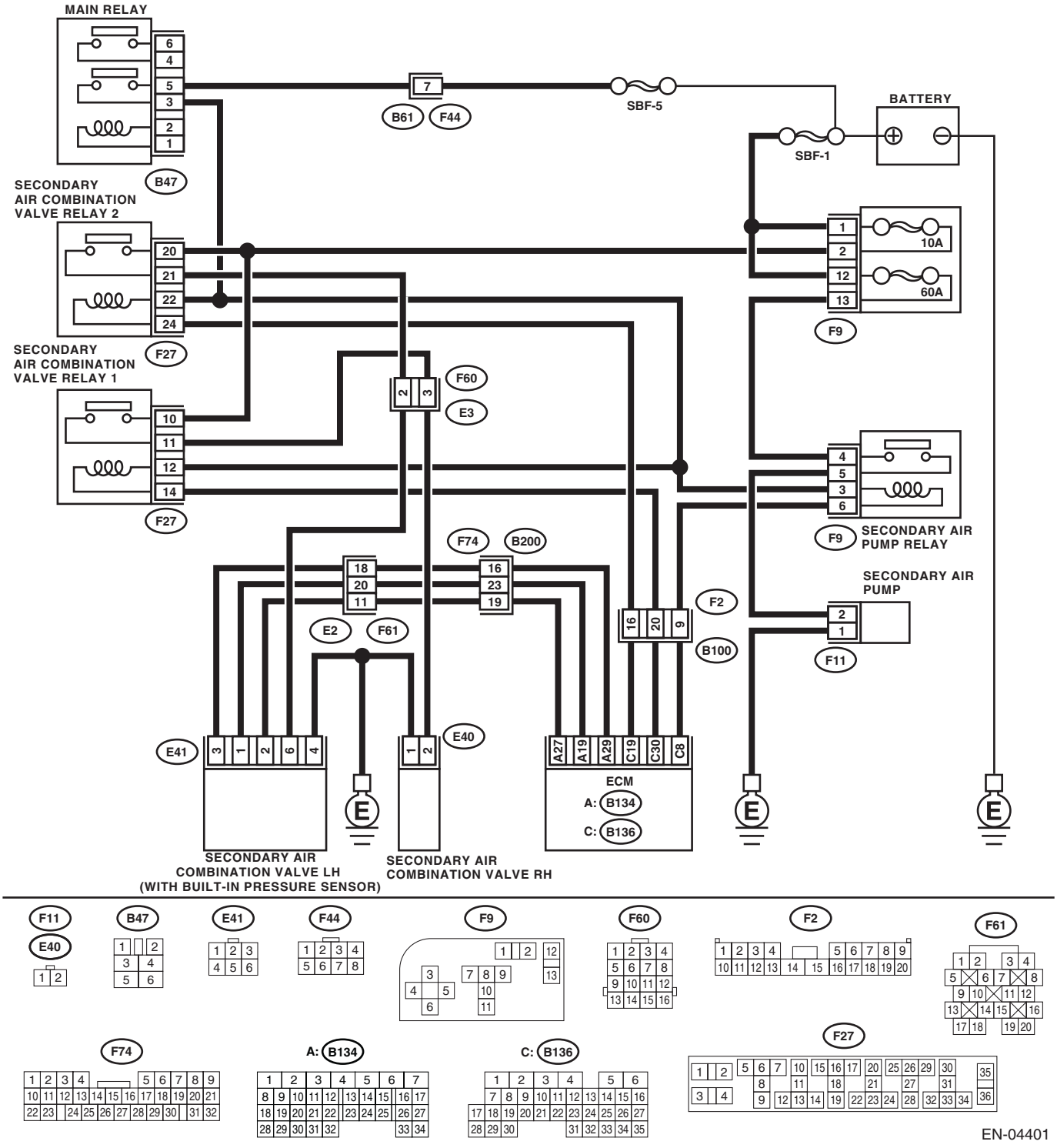
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-131, 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, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBINATION VALVE RELAY 2.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the ECM and secondary air combination valve relay 2. 3) Measure the resistance of the harness between the ECM and secondary air combination valve relay 2 terminal. ***Connector & terminal*** ***(B136) No. 19 — (F27) No. 24:***	Is the resistance less than 1 Ω?	Go to step **2**.	Repair open circuit of the harness between the ECM and secondary air combination valve relay 2 terminal.
2	**CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBINATION VALVE RELAY 2.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 19 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair battery short of the harness between the ECM and secondary air combination valve relay 2 terminal.	Temporary poor contact occurs. Check for poor contact in the connector.

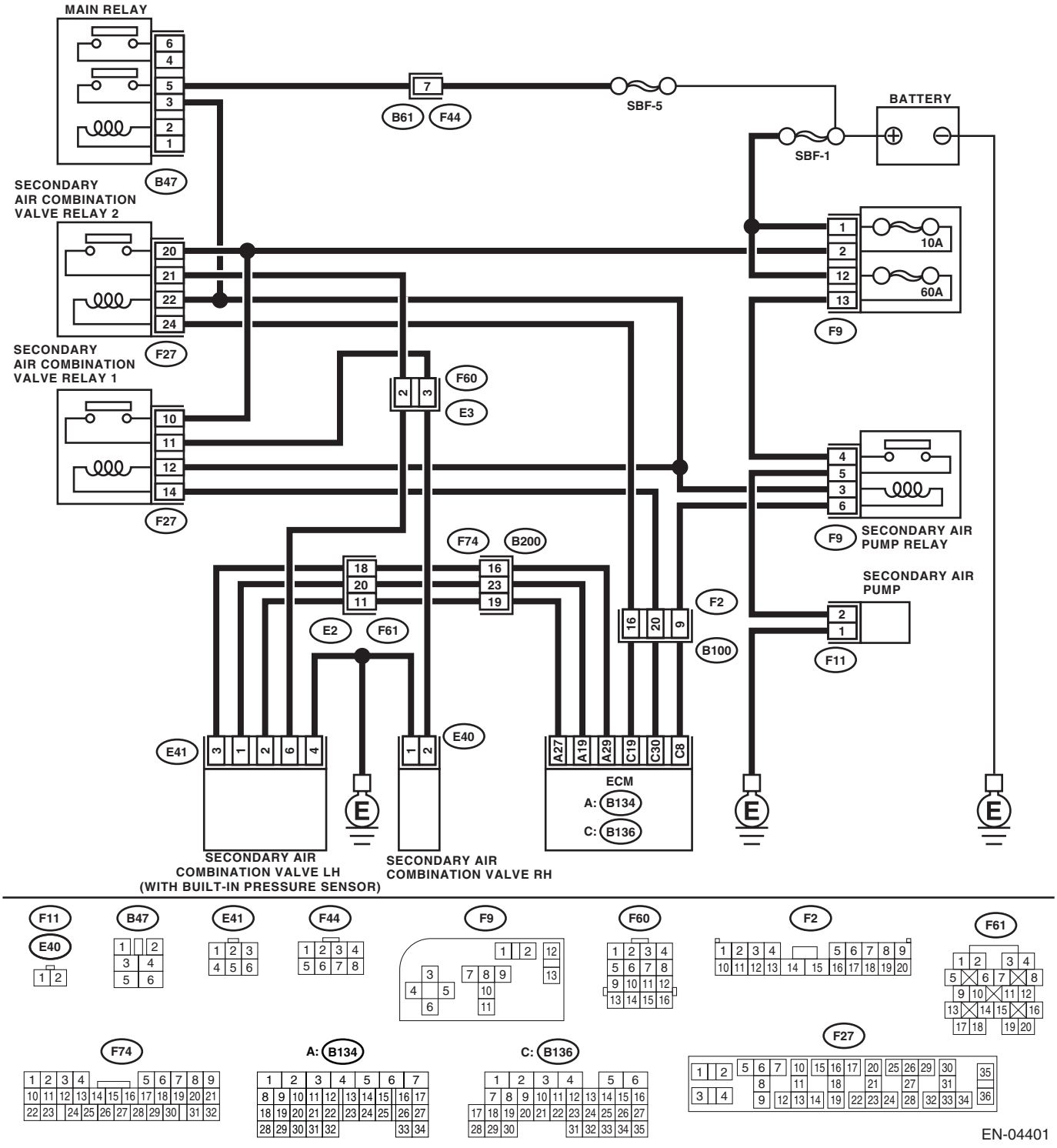
BI: DTC P0418 SECONDARY AIR INJECTION SYSTEM CONTROL “A” CIRCUIT OPEN

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-132, DTC P0418 SECONDARY AIR INJECTION SYSTEM CONTROL “A” CIRCUIT OPEN , Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND SECONDARY AIR PUMP RELAY.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the ECM and secondary air pump relay. 3) Measure the resistance of the harness between the ECM and secondary air pump relay terminal. ***Connector & terminal*** ***(B136) No. 8 — (F9) No. 6:***	Is the resistance less than 1 Ω?	Go to step **2**.	Repair open circuit of the harness between the ECM and secondary air pump relay terminal.
2	**CHECK HARNESS BETWEEN ECM AND SECONDARY AIR PUMP RELAY.** Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 8 — Chassis ground:***	Is the resistance more than 1 MΩ?	Temporary poor contact occurs. Check for poor contact in the connector.	Repair ground short of the harness between the ECM and secondary air pump relay terminal.

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

DTC DETECTING CONDITION:

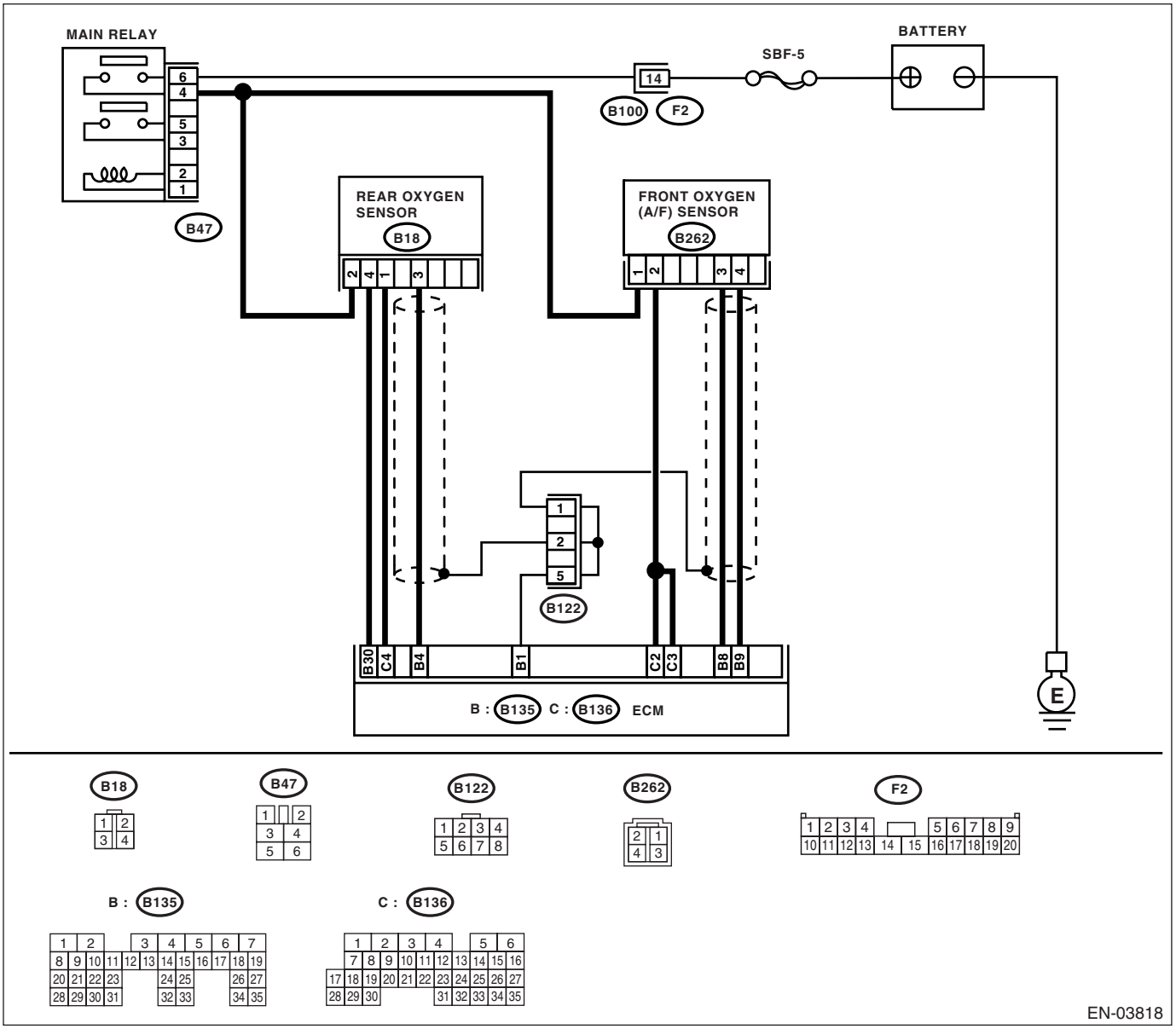
- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-133, DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

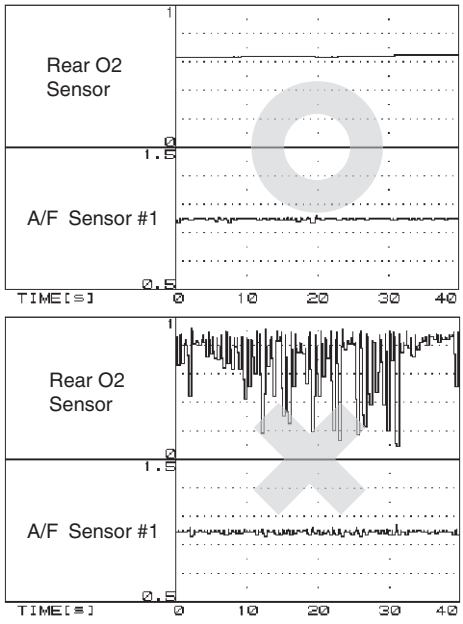
TROUBLE SYMPTOM:

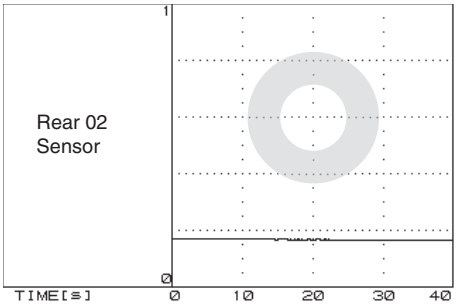
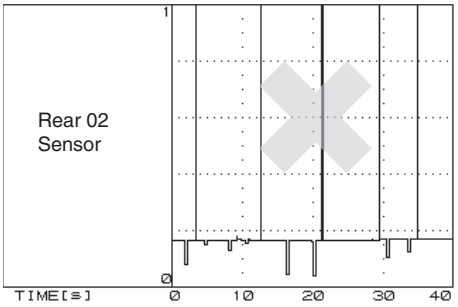
- Engine stalls.
- Idle mixture is out of specifications.

CAUTION:
After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	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)-65, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0420.	Go to step **2**.
2	**CHECK EXHAUST SYSTEM.** Check for gas leaks or air suction caused by loose or dislocated nuts and bolts, and open hole at exhaust pipes. NOTE: Check the following positions. • Between cylinder head and front exhaust pipe • Between front exhaust pipe and front catalytic converter • Between front catalytic converter and rear catalytic converter • Loose part and improper installation 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 **3**.
3	**CHECK WAVEFORM DATA ON SUBARU SELECT MONITOR (WHILE DRIVING).** 1) Drive the vehicle at a constant speed of 80 — 113 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-04680	Is normal waveform pattern displayed?	Contact your SOA Service Center. NOTE: The probable cause is considered as the deterioration of multiple parts.	Go to step **4**.

	Step	Check	Yes	No
4	**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.   EN-04681	Is normal waveform pattern displayed?	Go to step **10**.	Go to step **5**.
5	**CHECK REAR OXYGEN SENSOR VOLTAGE.** 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and keep the engine speed at 3,000 rpm. (Max. 2 minutes) 2) Read the voltage of rear oxygen sensor using Subaru Select Monitor. NOTE: • For MT model, depress the clutch pedal. • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-27, Subaru Select Monitor.>	Is the voltage more than 490 mV?	Go to step **9**.	Go to step **6**.
6	**CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Does water enter the connector?	Dry the water thoroughly.	Go to step **7**.
7	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. ***Connector & terminal*** ***(B135) No. 4 — (B18) No. 3:*** ***(B135) No. 30 — (B18) No. 4:***	Is the resistance more than 3 Ω?	Repair the open circuit of harness between ECM and rear oxygen sensor connector.	Go to step **8**.

	Step	Check	Yes	No
8	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between rear oxygen sensor connector and chassis ground. ***Connector & terminal*** ***(B18) No. 3 (+) — Chassis ground (–):***	Is the voltage 0.2 — 0.5 V?	Go to step **11**.	Repair the harness and connector. NOTE: Repair the following. • Open circuit in harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor and ECM connector • Poor contact in ECM connector
9	**CHECK REAR OXYGEN SENSOR VOLTAGE.** 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and rapidly reduce the engine speed from 3,000 rpm. 2) Read the voltage of rear oxygen sensor using Subaru Select Monitor. NOTE: • For MT model, depress the clutch pedal. • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-27, Subaru Select Monitor.>	Is the voltage 250 mV or less?	Contact your SOA Service Center. NOTE: The probable cause is considered as the deterioration of multiple parts.	Go to step **6**.
10	**CHECK CATALYTIC CONVERTER.**	Is the catalytic converter damaged?	Replace the catalytic converter. <Ref. to EC(H4DOTC)-5, Front Catalytic Converter.>	Contact your SOA Service Center. NOTE: The probable cause is considered as the deterioration of multiple parts.
11	**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 resistance less than 1 Ω?	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-43, Rear Oxygen Sensor.>	Repair the open circuit of rear oxygen sensor harness.

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

DTC DETECTING CONDITION:

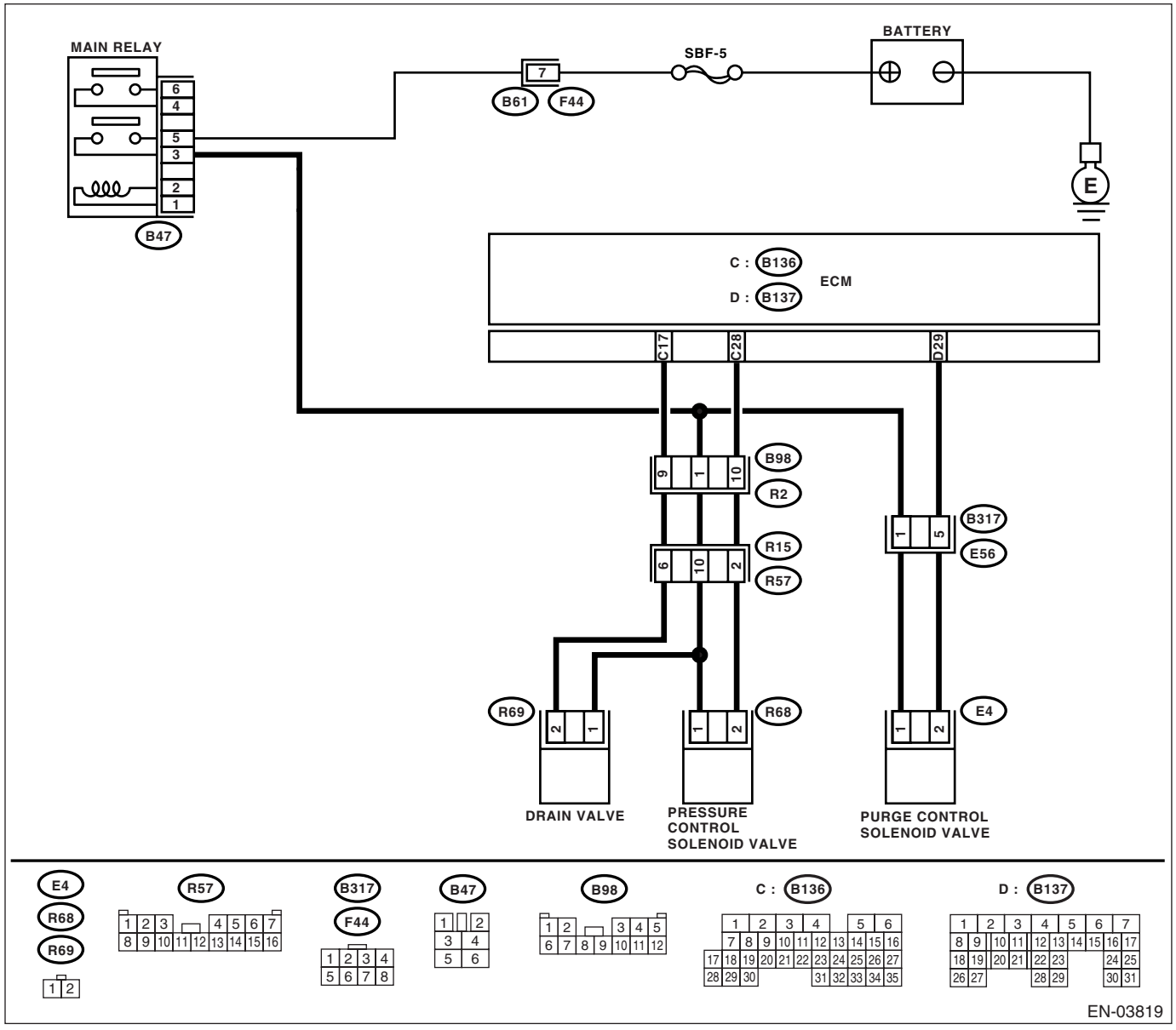
- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-136, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

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, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	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)-65, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK FUEL FILLER CAP.** 1) Turn the ignition switch to OFF. 2) Check the fuel filler cap. NOTE: The DTC is stored in memory if fuel filler cap is or was loose or if the cap chain has caught while tightening.	Is the fuel filler cap tightened securely?	Go to step **3**.	Tighten fuel filler cap securely.
3	**CHECK FUEL FILLER CAP.**	Is the fuel filler cap SUBARU genuine?	Go to step **4**.	Replace with a SUBARU genuine fuel filler cap.
4	**CHECK FUEL FILLER PIPE PACKING.**	Is there any damage to the seal between fuel filler cap and fuel filler pipe?	Repair or replace the fuel filler cap and fuel filler pipe. <Ref. to FU(H4DOTC)-54, Fuel Filler Pipe.>	Go to step **5**.
5	**CHECK DRAIN VALVE.** 1) Connect the test mode connector. 2) Turn the ignition switch to ON. 3) Operate the drain valve. NOTE: Drain valve operation can also be executed using Subaru Select Monitor. Regarding the procedures, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-47, Compulsory Valve Operation Check Mode.>	Does the drain valve operate?	Go to step **6**.	Replace the drain valve. <Ref. to EC(H4DOTC)-20, Drain Valve.>
6	**CHECK PURGE CONTROL SOLENOID VALVE.** Operate the purge control solenoid valve. NOTE: Purge control solenoid valve operation can be executed using Subaru Select Monitor. Regarding the procedures, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-47, Compulsory Valve Operation Check Mode.>	Does the purge control solenoid valve operate?	Go to step **7**.	Replace the purge control solenoid valve. <Ref. to EC(H4DOTC)-8, Purge Control Solenoid Valve.>
7	**CHECK PRESSURE CONTROL SOLENOID VALVE.** Operate the pressure control solenoid valve. NOTE: The pressure control solenoid valve operation can be executed using the Subaru Select Monitor. Regarding the procedures, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-47, Compulsory Valve Operation Check Mode.>	Does the pressure control solenoid valve operate?	Go to step **8**.	Replace the pressure control solenoid valve. <Ref. to EC(H4DOTC)-16, Pressure Control Solenoid Valve.>

	Step	Check	Yes	No
8	**CHECK EVAPORATIVE EMISSION CONTROL SYSTEM LINE.** Turn the ignition switch to OFF.	Is there any hole of more than 1.0 mm (0.04 in) dia. on evaporation line?	Repair or replace the evaporation line. <Ref. to FU(H4DOTC)-65, Fuel Delivery, Return and Evaporation Lines.>	Go to step **9**.
9	**CHECK CANISTER.**	Is the canister damaged or is there a hole of more than 1.0 mm (0.04 in) dia. in it?	Repair or replace the canister. <Ref. to EC(H4DOTC)-7, Canister.>	Go to step **10**.
10	**CHECK FUEL TANK.** Remove the fuel tank. <Ref. to FU(H4DOTC)-51, 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)-51, Fuel Tank.>	Go to step **11**.
11	**CHECK ANY OTHER MECHANICAL TROUBLE IN EVAPORATIVE EMISSION CONTROL SYSTEM.**	Is there any hole of more than 1.0 mm (0.04 in) dia., crack, clogging, or disconnections, bend, misconnection of hoses or pipes in evaporative emission control system?	Repair or replace the hoses or pipes.	Contact with SOA Service Center. NOTE: The deterioration of multiple parts can be thought as the cause.

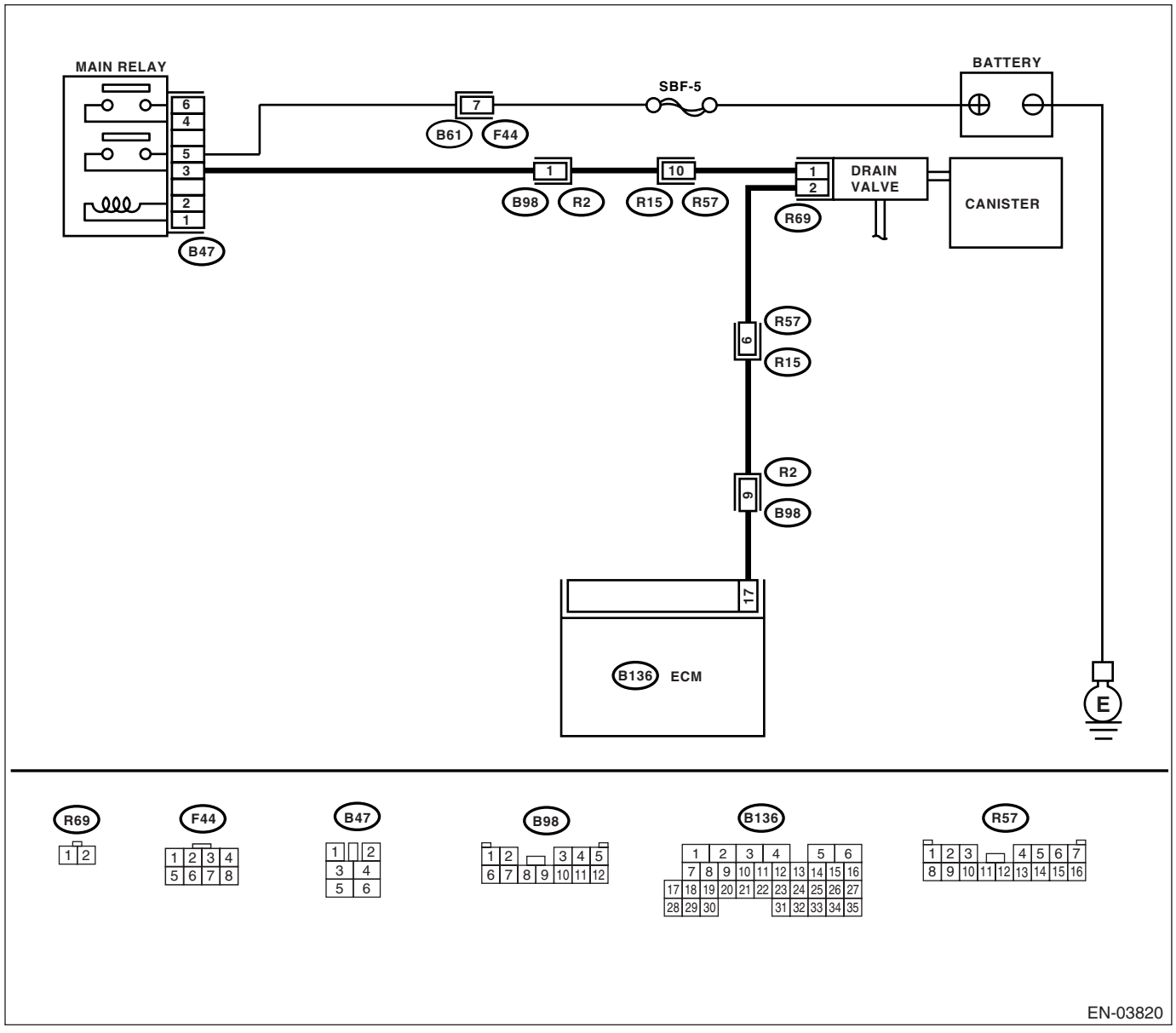
BL:DTC P0447 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-151, DTC P0447 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL OF ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 17 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **2**.	Go to step **3**.
2	**CHECK POOR CONTACT.** Check poor contact of ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. (However, the possibility of poor contact still remains.)) NOTE: In this case, repair the following item: • Poor contact in drain valve connector • Poor contact in ECM connector • Poor contact of coupling connector
3	**CHECK HARNESS BETWEEN DRAIN VALVE AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from drain valve and ECM. 3) Measure the resistance of harness between drain valve connector and chassis ground. ***Connector & terminal*** ***(R69) No. 2 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4**.	Repair ground short circuit of harness between ECM and drain valve connector.
4	**CHECK HARNESS BETWEEN DRAIN VALVE AND ECM CONNECTOR.** Measure the resistance of harness between ECM and drain valve connector. ***Connector & terminal*** ***(B136) No. 17 — (R69) No. 2:***	Is the resistance less than 1 Ω?	Go to step **5**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and drain valve connector • Poor contact of coupling connector
5	**CHECK DRAIN VALVE.** Measure the resistance between drain valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance between 10 and 100 Ω?	Go to step **6**.	Replace the drain valve. <Ref. to EC(H4DOTC)-20, Drain Valve.>

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

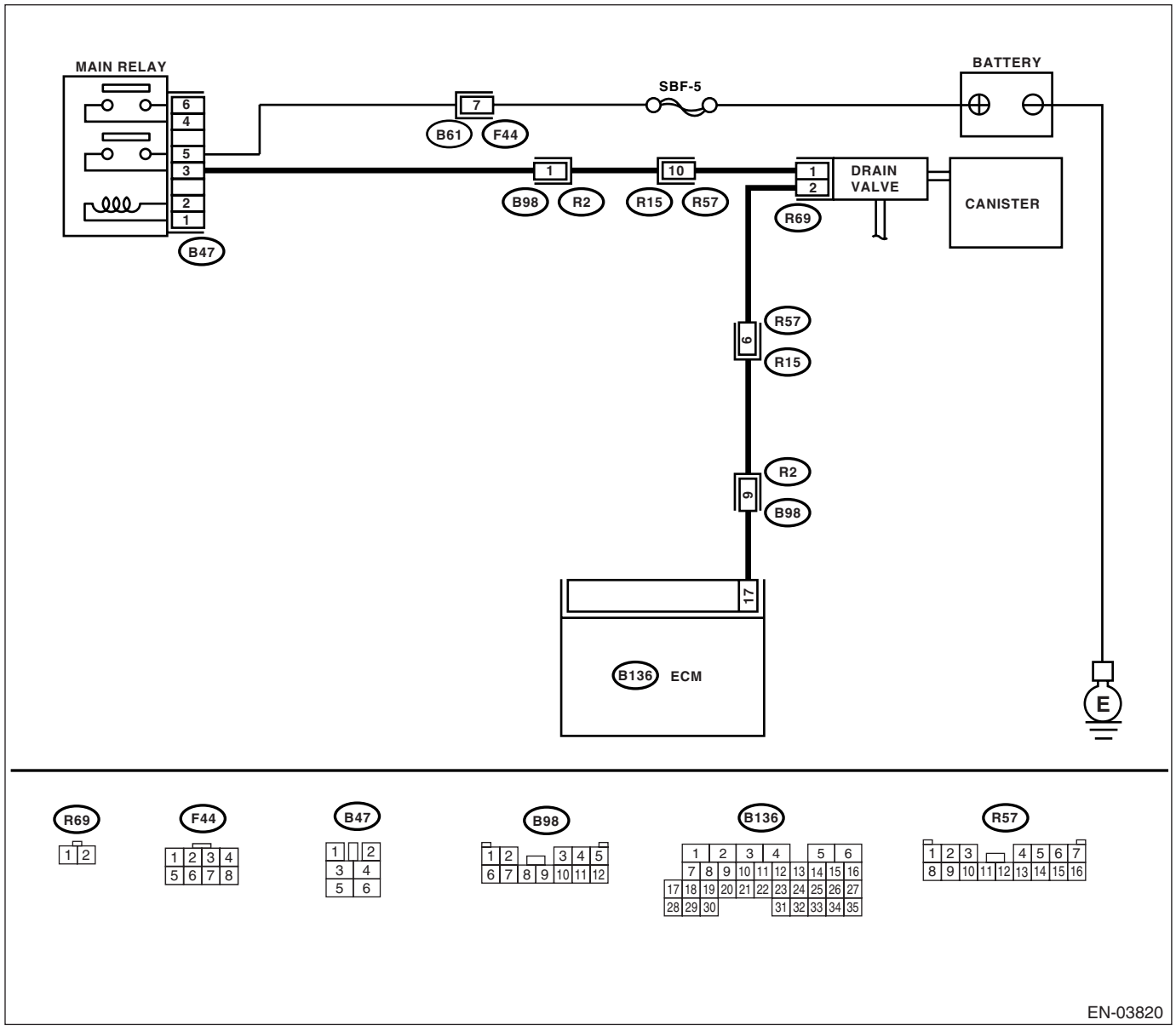
BM:DTC P0448 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-153, DTC P0448 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



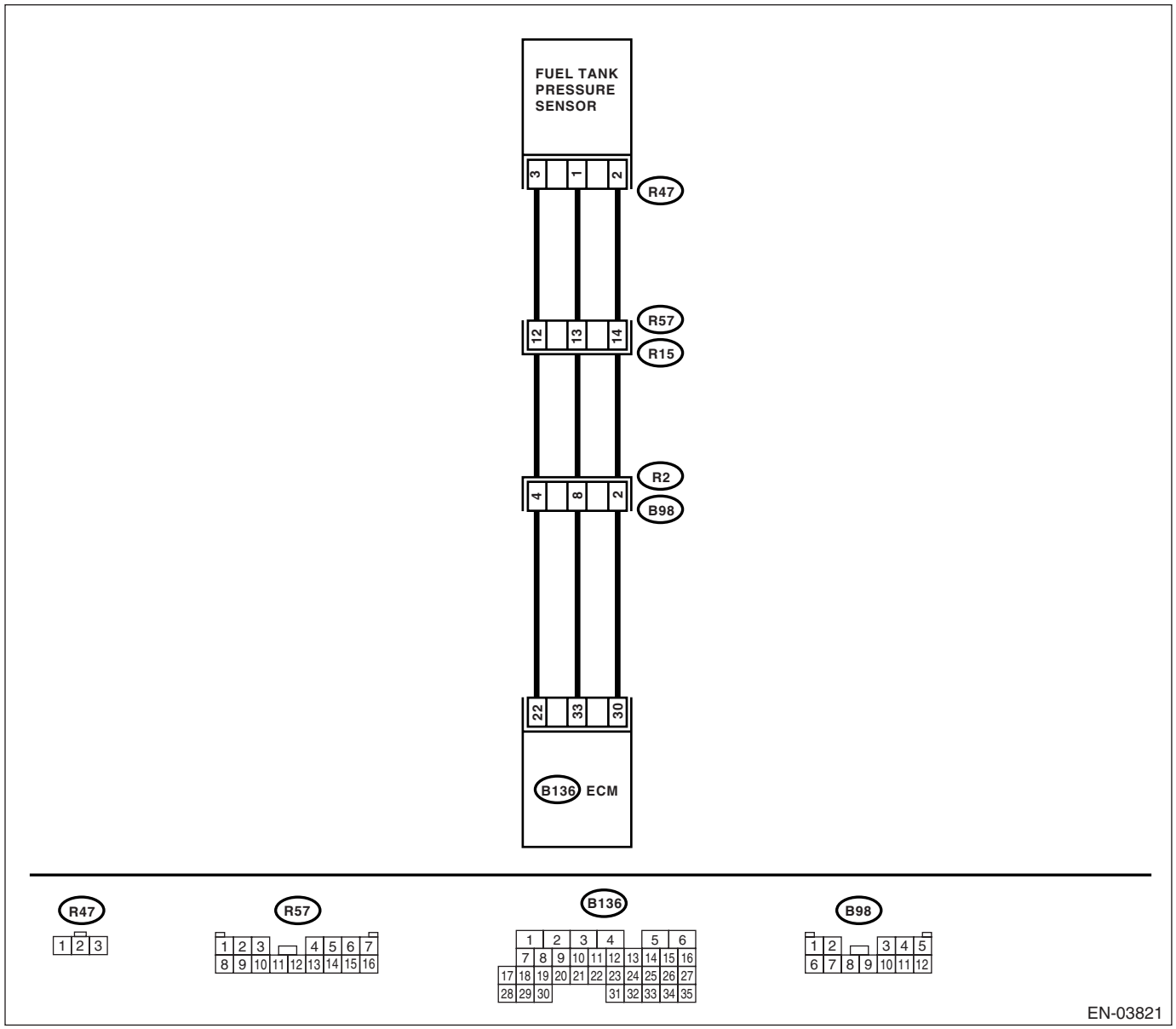
	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL OF ECM.** 1) Turn the ignition switch to OFF. 2) Connect the test mode connector at the lower portion of instrument panel (on the drivers side). 3) Turn the ignition switch to ON. 4) While operating the drain valve, measure voltage between ECM and chassis ground. NOTE: Drain valve operation can also be executed using Subaru Select Monitor. Regarding the procedures, refer to “Compulsory Valve Operation Check Mode”. <Ref. to EN(H4DOTC)(diag)-47, Compulsory Valve Operation Check Mode.> ***Connector & terminal*** ***(B136) No. 17 (+) — Chassis ground (–):***	Is the voltage 0 — 10 V?	Go to step **2**.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. In this case, repair the poor contact in ECM connector.
2	**CHECK INPUT SIGNAL OF ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 17 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **4**.	Go to step **3**.
3	**CHECK POOR CONTACT.** Check poor contact of ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>
4	**CHECK HARNESS BETWEEN DRAIN VALVE AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the drain valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 17 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair battery short circuit of harness between ECM and drain valve connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>	Go to step **5**.
5	**CHECK DRAIN VALVE.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between drain valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 1 Ω?	Replace the drain valve <Ref. to EC(H4DOTC)-20, Drain Valve.> and ECM <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>.	Go to step **6**.
6	**CHECK POOR CONTACT.** Check poor contact of ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>

BN:DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-155, DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.
WIRING DIAGRAM:



	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)-65, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK FUEL FILLER CAP.** 1) Turn the ignition switch to OFF. 2) Open the fuel flap.	Is the fuel filler cap tightened securely?	Go to step **3**.	Tighten fuel filler cap securely.
3	**CHECK PRESSURE VACUUM LINE.** NOTE: Check the following item. • Disconnection, leakage and clogging of the vacuum hoses and pipes between fuel tank pressure sensor and fuel tank • Disconnection, leakage and clogging of the air ventilation hoses and pipes between fuel filler pipe and fuel tank	Is there a 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.>

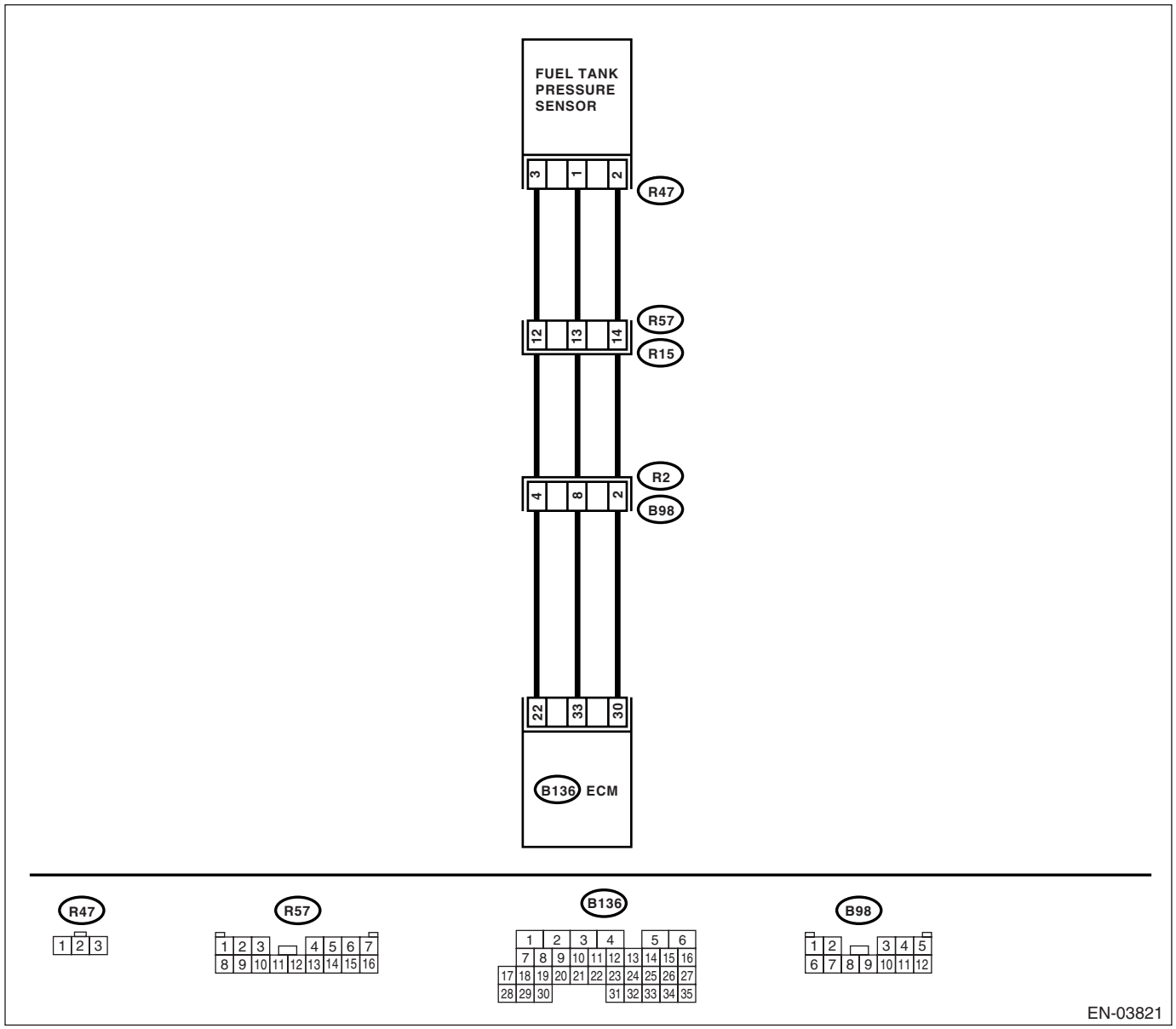
BO:DTC P0452 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-157, DTC P0452 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Turn the ignition switch to OFF. 2) Remove the fuel filler cap. 3) Install the fuel filler cap. 4) Turn the ignition switch to ON. 5) Read the data of the fuel tank pressure sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the measured value less than –2.8 kPa (–21.0 mmHg, –0.827 inHg)?	Go to step **2**.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time.
2	**CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 22 (+) — Chassis ground (–):***	Is the voltage more than 4.5 V?	Go to step **4**.	Go to step **3**.
3	**CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 22 (+) — Chassis ground (–):***	Is the voltage more than 4.5 V?	Repair poor contact in ECM connector.	Contact with SOA Service Center. NOTE: The deterioration of multiple parts can be thought as the cause.
4	**CHECK INPUT SIGNAL OF ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 33 (+) — Chassis ground (–):***	Is the voltage less than 0.2 V?	Go to step **6**.	Go to step **5**.
5	**CHECK INPUT SIGNAL FOR ECM (USING SUBARU SELECT MONITOR).** Read the data of fuel tank pressure sensor signal using Subaru Select Monitor. NOTE: Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-27, Subaru Select Monitor.>	Does the voltage change when shaking the ECM harness and connector?	Repair poor contact in ECM connector.	Go to step **6**.
6	**CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.** 1) Turn the ignition switch to OFF. 2) Remove the rear seat cushion. 3) Separate rear wiring harness and fuel tank cord. 4) Turn the ignition switch to ON. 5) Measure the voltage between the rear wiring harness connector and chassis ground. ***Connector & terminal*** ***(R15) No. 12 (+) — Chassis ground (–):***	Is the voltage more than 4.5 V?	Go to step **7**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and rear wiring harness connector • Poor contact of coupling connector

	Step	Check	Yes	No
7	**CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance of harness between ECM and rear wiring harness connector. ***Connector & terminal*** ***(B136) No. 30 — (R15) No. 14:***	Is the resistance less than 1 Ω?	Go to step **8**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and rear wiring harness connector • Poor contact of coupling connector • Poor contact of joint connector
8	**CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.** Measure the resistance of harness between rear wiring harness connector and chassis ground. ***Connector & terminal*** ***(R15) No. 14 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **9**.	Repair short circuit to ground in the harness between ECM and rear wiring harness connector.
9	**CHECK FUEL TANK CORD.** 1) Disconnect the connector from fuel tank pressure sensor. 2) Measure the resistance of fuel tank cord. ***Connector & terminal*** ***(R57) No. 12 — (R47) No. 3:***	Is the resistance less than 1 Ω?	Go to step **10**.	Repair open circuit in fuel tank cord.
10	**CHECK FUEL TANK CORD.** Measure the resistance of fuel tank cord. ***Connector & terminal*** ***(R57) No. 14 — (R47) No. 2:***	Is the resistance less than 1 Ω?	Go to step **11**.	Repair open circuit in fuel tank cord.
11	**CHECK FUEL TANK CORD.** Measure the resistance of the harness between fuel tank pressure sensor connector and engine ground. ***Connector & terminal*** ***(R47) No. 1 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **12**.	Repair ground short circuit in fuel tank cord.
12	**CHECK POOR CONTACT.** Check poor contact in fuel tank pressure sensor connector.	Is there poor contact in fuel tank pressure sensor connector?	Repair poor contact in fuel tank pressure sensor connector.	Replace the fuel tank pressure sensor. <Ref. to EC(H4DOTC)-15, Fuel Tank Pressure Sensor.>

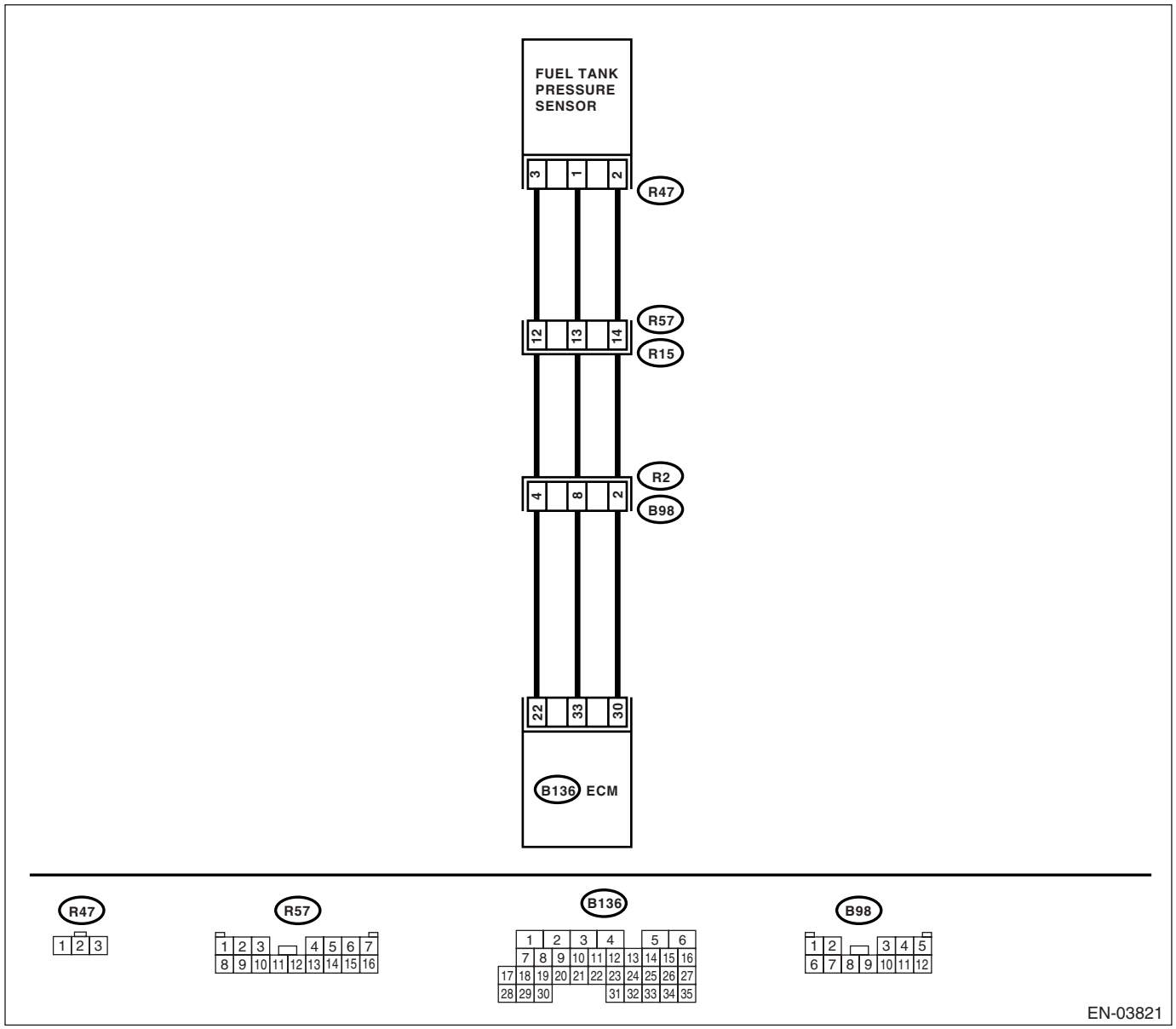
BP:DTC P0453 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-159, DTC P0453 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Turn the ignition switch to OFF. 2) Remove the fuel filler cap. 3) Install the fuel filler cap. 4) Turn the ignition switch to ON. 5) Read the data of the fuel tank pressure sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the measured value 2.8 kPa (21.0 mmHg, 0.827 inHg) or more?	Go to step **11**.	Go to step **2**.
2	**CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 22 (+) — Chassis ground (–):***	Is the voltage more than 4.5 V?	Go to step **4**.	Go to step **3**.
3	**CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 22 (+) — Chassis ground (–):***	Does the voltage change when shaking the ECM harness and connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>
4	**CHECK INPUT SIGNAL OF ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 33 (+) — Chassis ground (–):***	Is the voltage less than 0.2 V?	Go to step **6**.	Go to step **5**.
5	**CHECK INPUT SIGNAL FOR ECM (USING SUBARU SELECT MONITOR).** Read the data of fuel tank pressure sensor signal using Subaru Select Monitor. NOTE: Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-27, Subaru Select Monitor.>	Is the measured value more than –2.8 kPa (–21.0 mmHg, –0.827 inHg) when shaking the ECM harness and connector?	Repair poor contact in ECM connector.	Go to step **6**.
6	**CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.** 1) Turn the ignition switch to OFF. 2) Remove the rear seat cushion. 3) Separate rear wiring harness and fuel tank cord. 4) Turn the ignition switch to ON. 5) Measure the voltage between the rear wiring harness connector and chassis ground. ***Connector & terminal*** ***(R15) No. 12 (+) — Chassis ground (–):***	Is the voltage more than 4.5 V?	Go to step **7**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and rear wiring harness connector • Poor contact of coupling connector

	Step	Check	Yes	No
7	**CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance of harness between ECM and rear wiring harness connector. ***Connector & terminal*** ***(B136) No. 33 — (R15) No. 13:*** ***(B136) No. 30 — (R15) No. 14:***	Is the resistance less than 1 Ω?	Go to step **8**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and rear wiring harness connector • Poor contact of coupling connector
8	**CHECK FUEL TANK CORD.** 1) Disconnect the connector from fuel tank pressure sensor. 2) Measure the resistance of fuel tank cord. ***Connector & terminal*** ***(R57) No. 13 — (R47) No. 1:***	Is the resistance less than 1 Ω?	Go to step **9**.	Repair open circuit in fuel tank cord.
9	**CHECK FUEL TANK CORD.** Measure the resistance of fuel tank cord. ***Connector & terminal*** ***(R57) No. 14 — (R47) No. 2:***	Is the resistance less than 1 Ω?	Go to step **10**.	Repair open circuit in fuel tank cord.
10	**CHECK POOR CONTACT.** Check poor contact in fuel tank pressure sensor connector.	Is there poor contact in fuel tank pressure sensor connector?	Repair poor contact in fuel tank pressure sensor connector.	Replace the fuel tank pressure sensor. <Ref. to EC(H4DOTC)-15, Fuel Tank Pressure Sensor.>
11	**CHECK HARNESS BETWEEN ECM AND FUEL TANK PRESSURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel tank pressure sensor. 3) Turn the ignition switch to ON. 4) Read the data of the fuel tank pressure sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H4DOTC)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the measured value 2.8 kPa (21.0 mmHg, 0.827 inHg) or more?	Repair short circuit to battery in the harness between ECM and fuel tank pressure sensor connector.	Replace the fuel tank pressure sensor. <Ref. to EC(H4DOTC)-15, Fuel Tank Pressure Sensor.>

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

DTC DETECTING CONDITION:

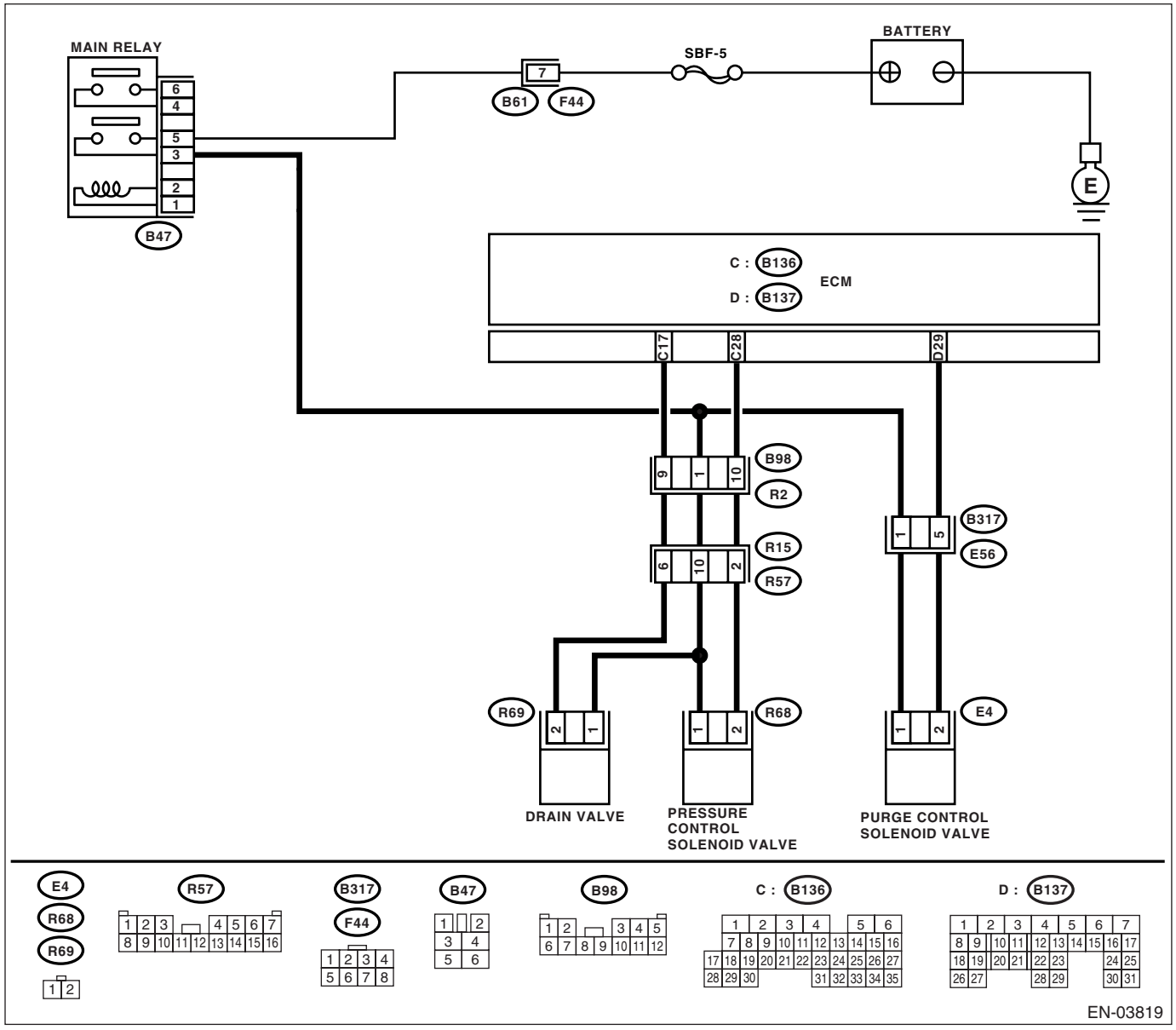
- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-161, DTC P0456 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

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, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	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)-65, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK FUEL FILLER CAP.** 1) Turn the ignition switch to OFF. 2) Check the fuel filler cap. NOTE: The DTC is stored in memory if fuel filler cap is or was loose or if the cap chain was caught while tightening.	Is the fuel filler cap tightened securely?	Go to step **3**.	Tighten fuel filler cap securely.
3	**CHECK FUEL FILLER CAP.**	Is the fuel filler cap SUBARU genuine?	Go to step **4**.	Replace with a SUBARU genuine fuel filler cap.
4	**CHECK FUEL FILLER PIPE PACKING.**	Is there any damage to the seal between fuel filler cap and fuel filler pipe?	Repair or replace the fuel filler cap and fuel filler pipe. <Ref. to FU(H4DOTC)-54, Fuel Filler Pipe.>	Go to step **5**.
5	**CHECK DRAIN VALVE.** 1) Connect the test mode connector. 2) Turn the ignition switch to ON. 3) Operate the drain valve. NOTE: Drain valve operation can also be executed using Subaru Select Monitor. Regarding the procedures, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-47, Compulsory Valve Operation Check Mode.>	Does the drain valve operate?	Go to step **6**.	Replace the drain valve. <Ref. to EC(H4DOTC)-20, Drain Valve.>
6	**CHECK PURGE CONTROL SOLENOID VALVE.** Operate the purge control solenoid valve. NOTE: Purge control solenoid valve operation can be executed using Subaru Select Monitor. Regarding the procedures, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-47, Compulsory Valve Operation Check Mode.>	Does the purge control solenoid valve operate?	Go to step **7**.	Replace the purge control solenoid valve. <Ref. to EC(H4DOTC)-8, Purge Control Solenoid Valve.>
7	**CHECK PRESSURE CONTROL SOLENOID VALVE.** Operate the pressure control solenoid valve. NOTE: The pressure control solenoid valve operation can be executed using the Subaru Select Monitor. Regarding the procedures, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-47, Compulsory Valve Operation Check Mode.>	Does the pressure control solenoid valve operate?	Go to step **8**.	Replace the pressure control solenoid valve. <Ref. to EC(H4DOTC)-8, Purge Control Solenoid Valve.>

	Step	Check	Yes	No
8	**CHECK EVAPORATIVE EMISSION CONTROL SYSTEM LINE.** Turn the ignition switch to OFF.	Is there any hole of more than 0.5 mm (0.020 in) dia. on evaporation line?	Repair or replace the evaporation line. <Ref. to FU(H4DOTC)-65, Fuel Delivery, Return and Evaporation Lines.>	Go to step **9**.
9	**CHECK CANISTER.**	Is the canister damaged or is there a hole of more than 0.5 mm (0.020 in) dia. in it?	Repair or replace the canister. <Ref. to EC(H4DOTC)-7, Canister.>	Go to step **10**.
10	**CHECK FUEL TANK.** Remove the fuel tank. <Ref. to FU(H4DOTC)-51, 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)-51, Fuel Tank.>	Go to step **11**.
11	**CHECK ANY OTHER MECHANICAL TROUBLE IN EVAPORATIVE EMISSION CONTROL SYSTEM.**	Is there any hole of more than 0.5 mm (0.020 in) dia., crack, clogging, or disconnections, bend, misconnection of hoses or pipes in evaporative emission control system?	Repair or replace the hoses or pipes.	Contact with SOA Service Center. NOTE: The deterioration of multiple parts can be thought as the cause.

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

DTC DETECTING CONDITION:

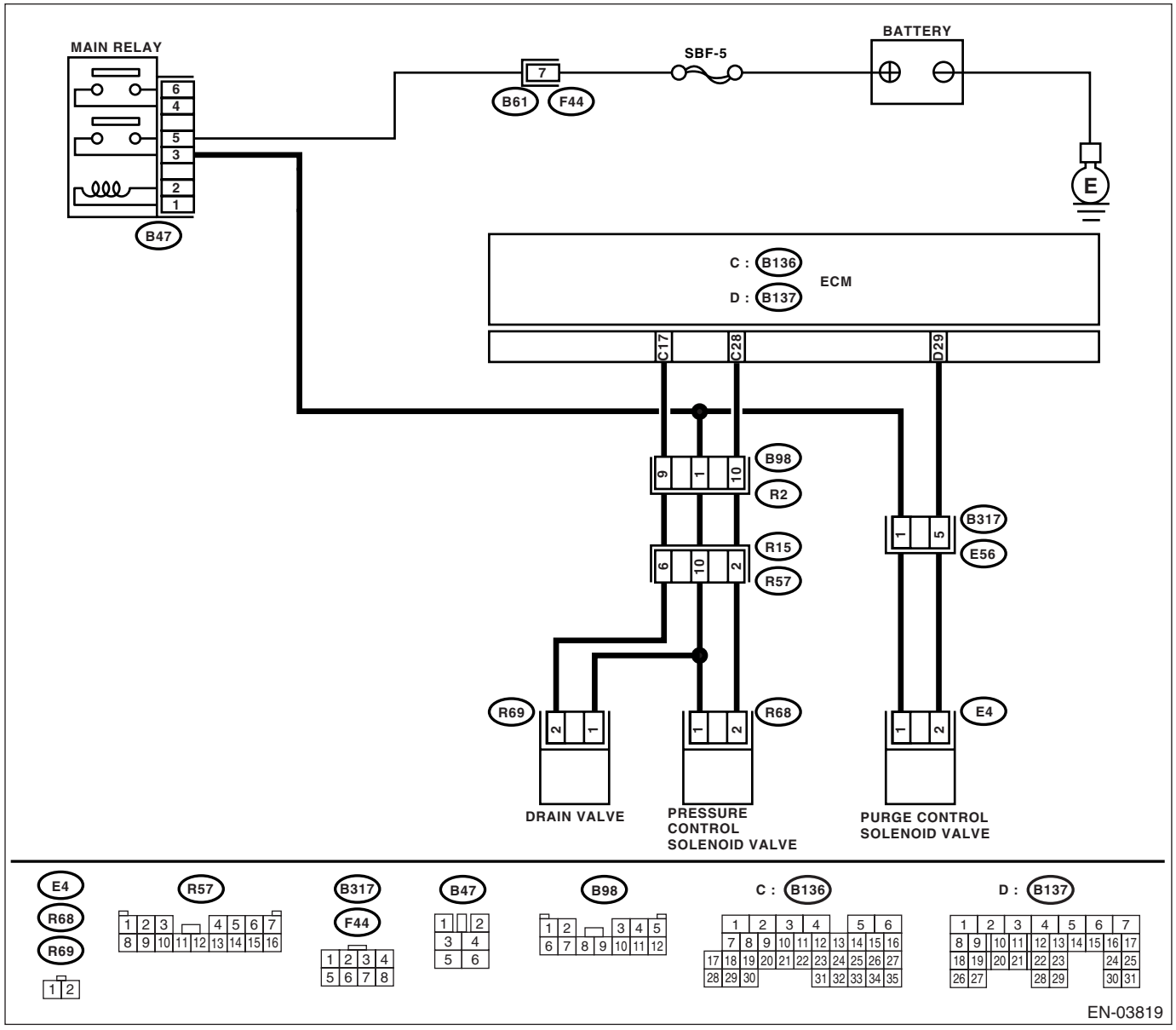
- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-161, DTC P0457 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Fuel odor
- Fuel filler cap loose or lost

CAUTION:
After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	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)-65, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK FUEL FILLER CAP.** 1) Turn the ignition switch to OFF. 2) Check the fuel filler cap. NOTE: The DTC is stored in memory if fuel filler cap is or was loose or if the cap chain has caught while tightening.	Is the fuel filler cap tightened securely?	Go to step **3**.	Tighten fuel filler cap securely.
3	**CHECK FUEL FILLER CAP.**	Is the fuel filler cap SUBARU genuine?	Go to step **4**.	Replace with a SUBARU genuine fuel filler cap.
4	**CHECK FUEL FILLER PIPE PACKING.**	Is there any damage to the seal between fuel filler cap and fuel filler pipe?	Repair or replace the fuel filler cap and fuel filler pipe. <Ref. to FU(H4DOTC)-54, Fuel Filler Pipe.>	Go to step **5**.
5	**CHECK DRAIN VALVE.** 1) Connect the test mode connector. 2) Turn the ignition switch to ON. 3) Operate the drain valve. NOTE: Drain valve operation can also be executed using Subaru Select Monitor. Regarding the procedures, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-47, Compulsory Valve Operation Check Mode.>	Does the drain valve operate?	Go to step **6**.	Replace the drain valve. <Ref. to EC(H4DOTC)-20, Drain Valve.>
6	**CHECK PURGE CONTROL SOLENOID VALVE.** Operate the purge control solenoid valve. NOTE: Purge control solenoid valve operation can be executed using Subaru Select Monitor. Regarding the procedures, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-47, Compulsory Valve Operation Check Mode.>	Does the purge control solenoid valve operate?	Go to step **7**.	Replace the purge control solenoid valve. <Ref. to EC(H4DOTC)-8, Purge Control Solenoid Valve.>
7	**CHECK PRESSURE CONTROL SOLENOID VALVE.** Operate the pressure control solenoid valve. NOTE: The pressure control solenoid valve operation can be executed using the Subaru Select Monitor. Regarding the procedures, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-47, Compulsory Valve Operation Check Mode.>	Does the pressure control solenoid valve operate?	Go to step **8**.	Replace the pressure control solenoid valve. <Ref. to EC(H4DOTC)-8, Purge Control Solenoid Valve.>
8	**CHECK CANISTER.**	Is the canister damaged?	Repair or replace the canister. <Ref. to EC(H4DOTC)-7, Canister.>	Go to step **9**.

	Step	Check	Yes	No
9	**CHECK FUEL TANK.** Remove the fuel tank. <Ref. to FU(H4DOTC)-51, Fuel Tank.>	Is the fuel tank damaged?	Repair or replace the fuel tank. <Ref. to FU(H4DOTC)-51, Fuel Tank.>	Go to step **10**.
10	**CHECK ANY OTHER MECHANICAL TROUBLE IN EVAPORATIVE EMISSION CONTROL SYSTEM.**	Are there holes of more than 0.5 mm (0.020 in) dia., cracks, clogging, or disconnections, misconnection of hoses or pipes in evaporative emission control system?	Repair or replace the hoses or pipes.	Contact with SOA Service Center. NOTE: The deterioration of multiple parts can be thought as the cause.

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

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-162, DTC P0458 EVAPORATIVE EMISSION SYSTEM PURGE CONTROL VALVE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

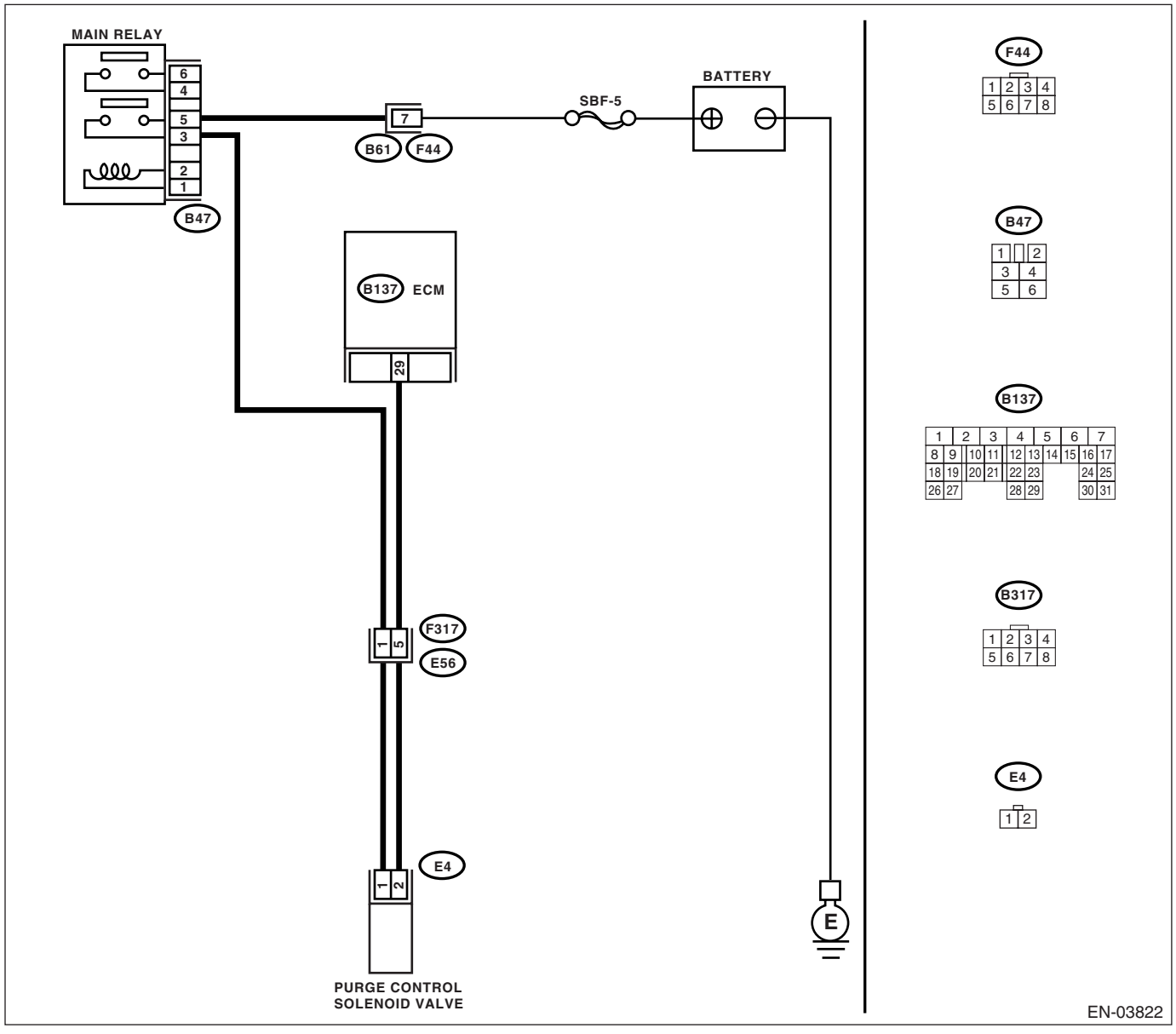
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL OF ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 29 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time.	Go to step **2**.
2	**CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from purge control solenoid valve and ECM. 3) Measure the resistance of harness between purge control solenoid valve connector and engine ground. ***Connector & terminal*** ***(E4) No. 2 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **3**.	Repair the ground short circuit of harness between ECM and purge control solenoid valve connector.
3	**CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** Measure the resistance of harness between ECM and purge control solenoid valve. ***Connector & terminal*** ***(B137) No. 29 — (E4) No. 2:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the open circuit of harness between ECM and purge control solenoid valve connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and purge control solenoid valve connector • Poor contact of 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 and 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 more than 10 V?	Go to step **6**.	Repair the open circuit of harness between main relay and purge control solenoid valve connector.
6	**CHECK POOR CONTACT.** Check poor contact of purge control solenoid valve connector.	Is there poor contact of purge control solenoid valve connector?	Repair the poor contact of purge control solenoid valve connector.	Contact with SOA Service Center. NOTE: The deterioration of multiple parts can be thought as the cause.

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

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-164, DTC P0459 EVAPORATIVE EMISSION SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

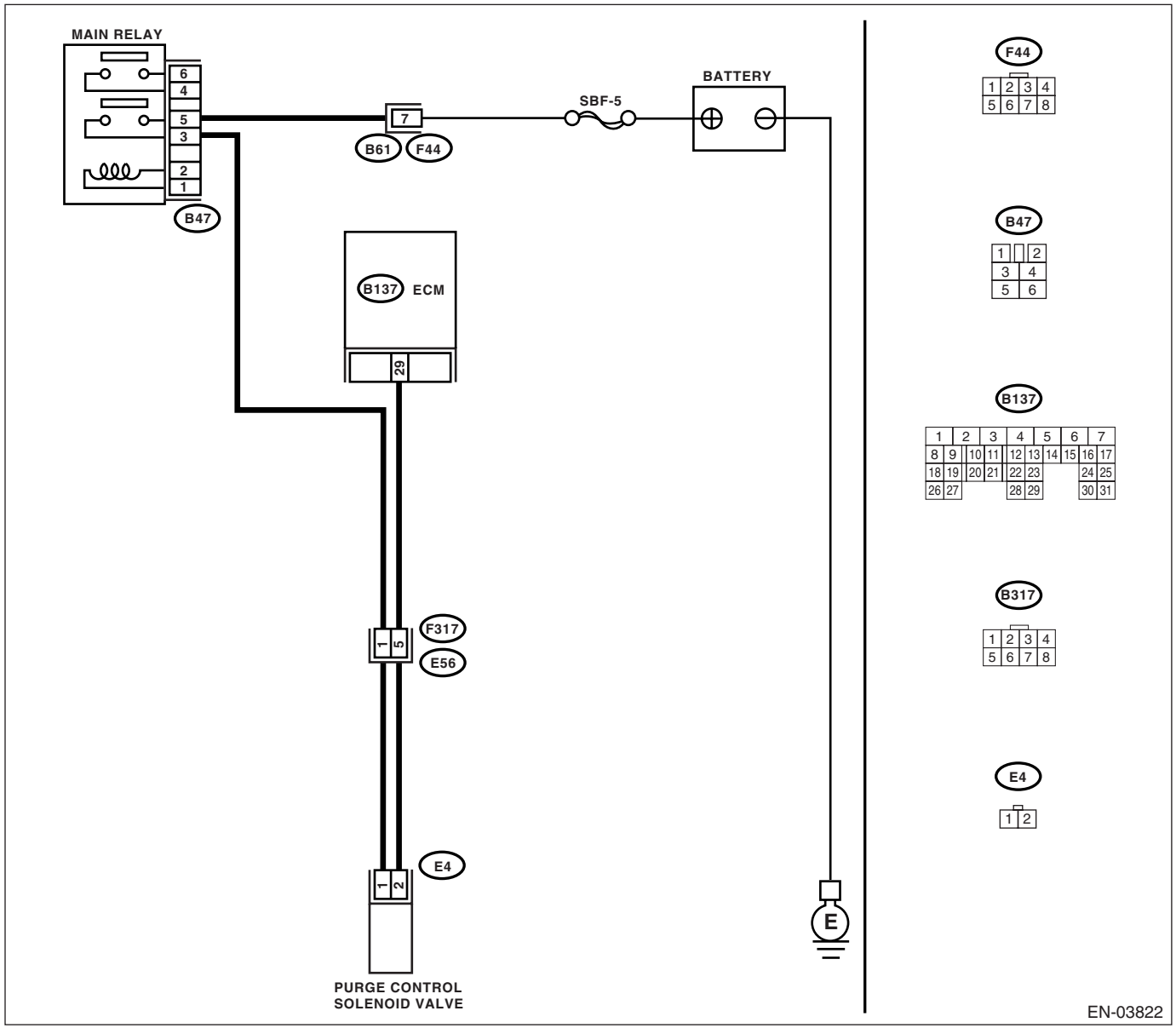
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL OF ECM.** 1) Turn the ignition switch to OFF. 2) Connect the test mode connector at the lower portion of instrument panel (on the driver's side). 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground while operating the purge control solenoid valve. NOTE: Purge control solenoid valve operation can be executed using Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-47, Compulsory Valve Operation Check Mode.> ***Connector & terminal*** ***(B137) No. 29 (+) — Chassis ground (–):***	Is the voltage 0 — 13 V?	Go to step **2**.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. In this case, repair the poor contact in ECM connector.
2	**CHECK OUTPUT SIGNAL OF ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 29 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **4**.	Go to step **3**.
3	**CHECK POOR CONTACT.** Check poor contact of ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>
4	**CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from purge control solenoid valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 29 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair the battery short circuit of harness between ECM and purge control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>	Go to step **5**.
5	**CHECK PURGE CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between purge control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 1 Ω?	Replace the purge control solenoid valve and ECM. <Ref. to EC(H4DOTC)-8, Purge Control Solenoid Valve.> <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>	Go to step **6**.
6	**CHECK POOR CONTACT.** Check poor contact of ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>

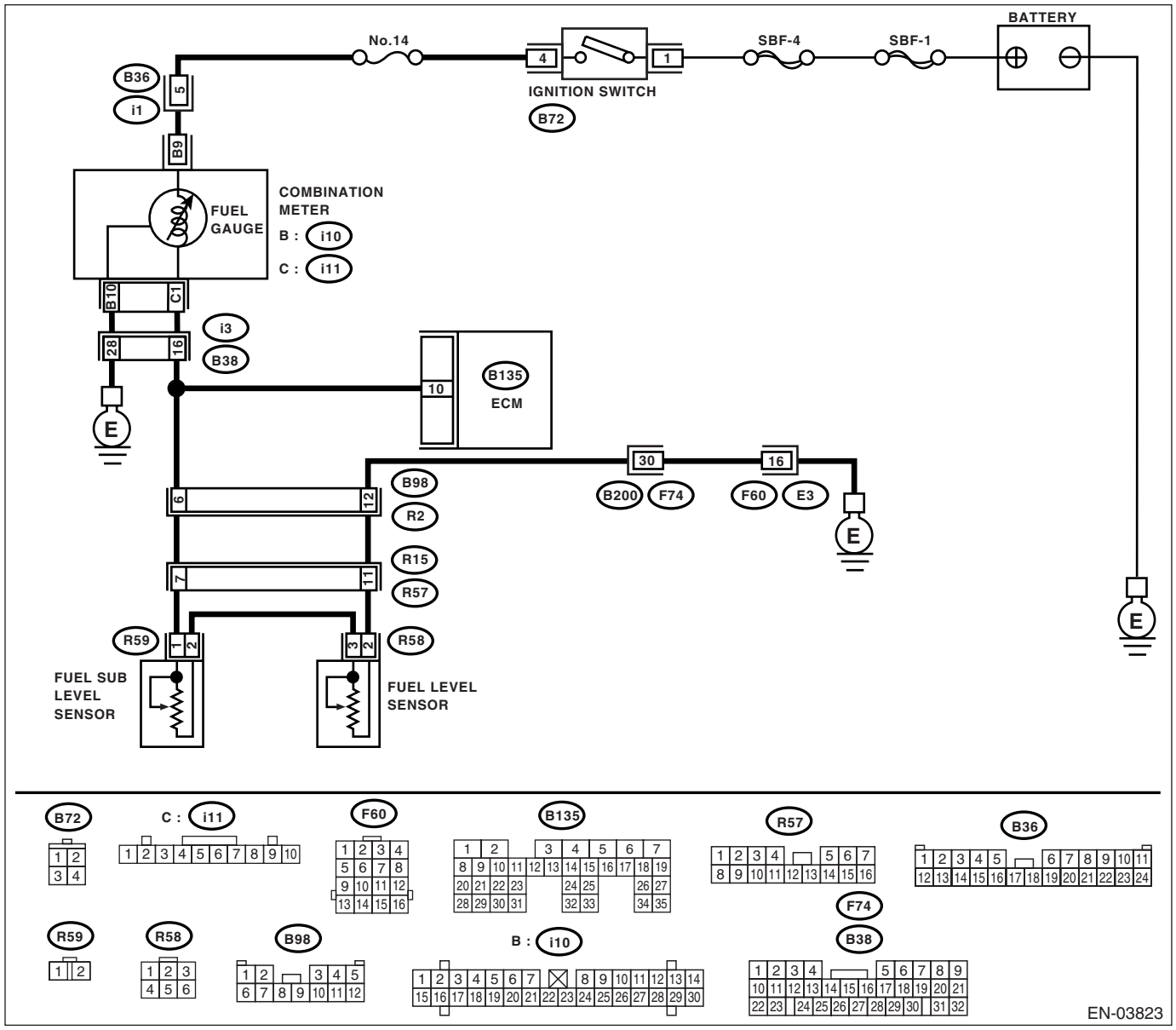
BU:DTC P0461 FUEL LEVEL SENSOR “A” CIRCUIT RANGE/PERFORMANCE

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-166, DTC P0461 FUEL LEVEL SENSOR “A” CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



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)-65, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0461.	Replace the fuel level sensor and fuel sub level sensor. <Ref. to FU(H4DOTC)-60, Fuel Level Sensor.> <Ref. to FU(H4DOTC)-61, Fuel Sub Level Sensor.>

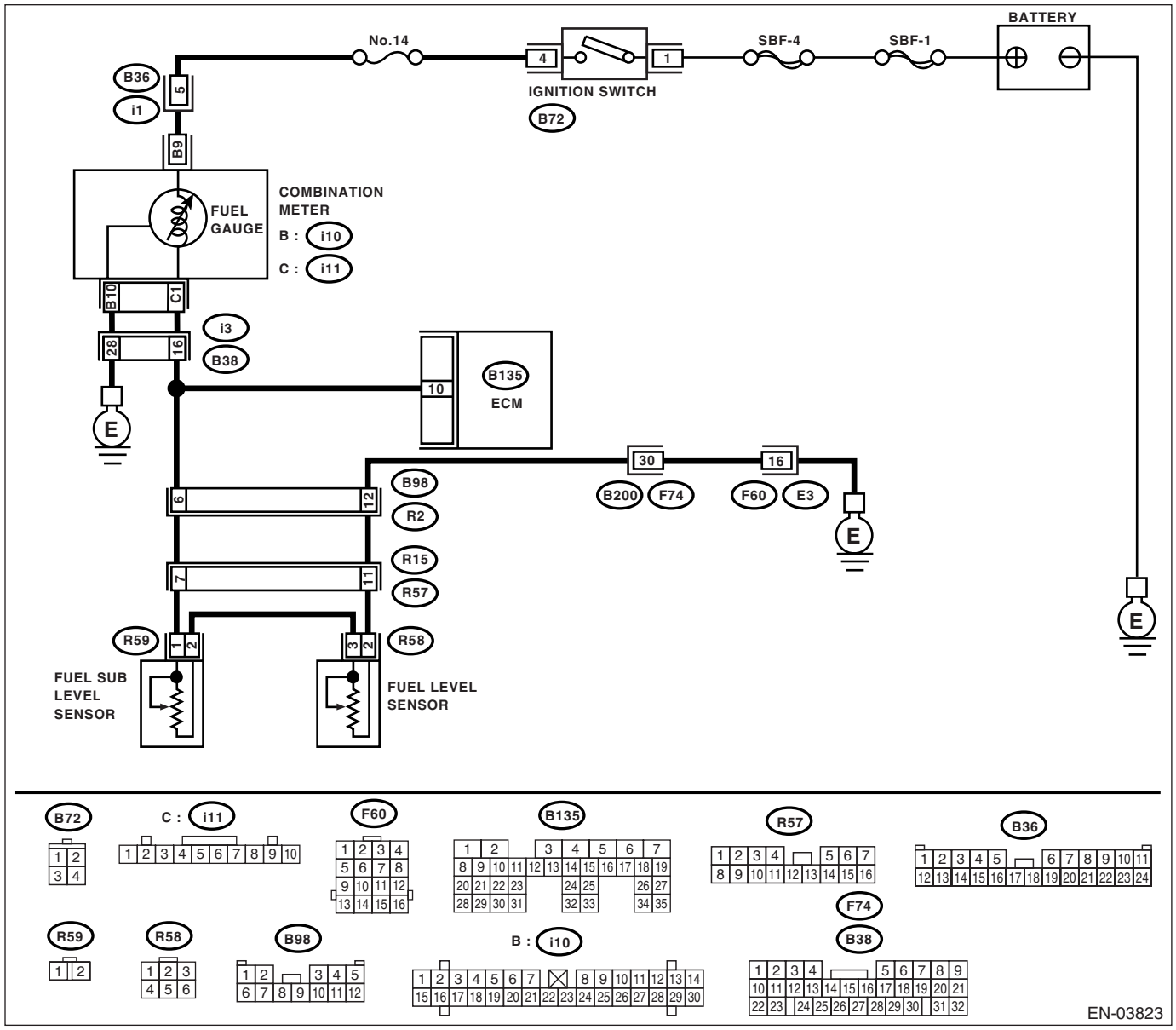
BV:DTC P0462 FUEL LEVEL SENSOR “A” CIRCUIT LOW

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-168, DTC P0462 FUEL LEVEL SENSOR “A” CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



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.>

	Step	Check	Yes	No
2	**CHECK INPUT SIGNAL OF ECM.** 1) Turn the ignition switch to ON. (Engine OFF) 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 10 (+) — Chassis ground (–):***	Is the voltage less than 0.12 V?	Go to step **4**.	Go to step **3**.
3	**CHECK INPUT SIGNAL FOR ECM (USING SUBARU SELECT MONITOR).** Read data of the fuel level sensor signal using the Subaru Select Monitor. NOTE: Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-27, Subaru Select Monitor.>	Does the voltage change when shaking the ECM harness and connector?	Repair poor contact in ECM connector.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following item: • Poor contact in combination meter connector • Poor contact in ECM connector • Poor contact of coupling connector
4	**CHECK INPUT VOLTAGE FROM ECM.** 1) Turn the ignition switch to OFF. 2) Separate fuel tank cord connector (R57) and rear wiring harness connector (R15). 3) Turn the ignition switch to ON. 4) Measure the voltage of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 10 (+) — Chassis ground (–):***	Is the voltage more than 0.12 V?	Go to step **5**.	Go to step **6**.
5	**CHECK HARNESS BETWEEN ECM AND COMBINATION METER CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from connector (i11), (i12) and ECM connector. 3) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 10 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **7**.	Repair short circuit of the harness between the ECM and combination meter connector.
6	**CHECK HARNESS BETWEEN ECM AND COMBINATION METER CONNECTOR.** Measure the resistance between ECM and combination meter connector. ***Connector & terminal*** ***(B135) No. 10 — (i11) No. 1:***	Is the resistance less than 10 Ω?	Repair or replace the combination meter. <Ref. to IDI-3, Combination Meter System.>	Repair the open circuit between ECM and combination meter connector. NOTE: In this case, repair the following item: Poor contact of coupling connector

	Step	Check	Yes	No
7	**CHECK FUEL TANK CORD.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the fuel sub level sensor. 3) Measure the resistance between fuel sub level sensor and chassis ground. ***Connector & terminal*** ***(R59) No. 1 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **8**.	Repair ground short circuit in fuel tank cord.
8	**CHECK FUEL TANK CORD.** 1) Disconnect the connector from fuel pump assembly. 2) Measure the resistance between fuel pump assembly and chassis ground. ***Connector & terminal*** ***(R59) No. 2 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **9**.	Repair ground short circuit in fuel tank cord.
9	**CHECK FUEL LEVEL SENSOR.** 1) Remove the fuel pump assembly. <Ref. to FU(H4DOTC)-58, 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 and 2.5 Ω?	Go to step **10**.	Replace the fuel level sensor.
10	**CHECK FUEL SUB LEVEL SENSOR.** 1) Remove the fuel sub level sensor. <Ref. to FU(H4DOTC)-61, Fuel Sub Level Sensor.> 2) Measure the resistance between fuel sub level sensor and terminals with its float set to the full position. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance between 0.5 and 2.5 Ω?	Repair poor contact of the harness between ECM and combination meter connector.	Replace the fuel sub level sensor.

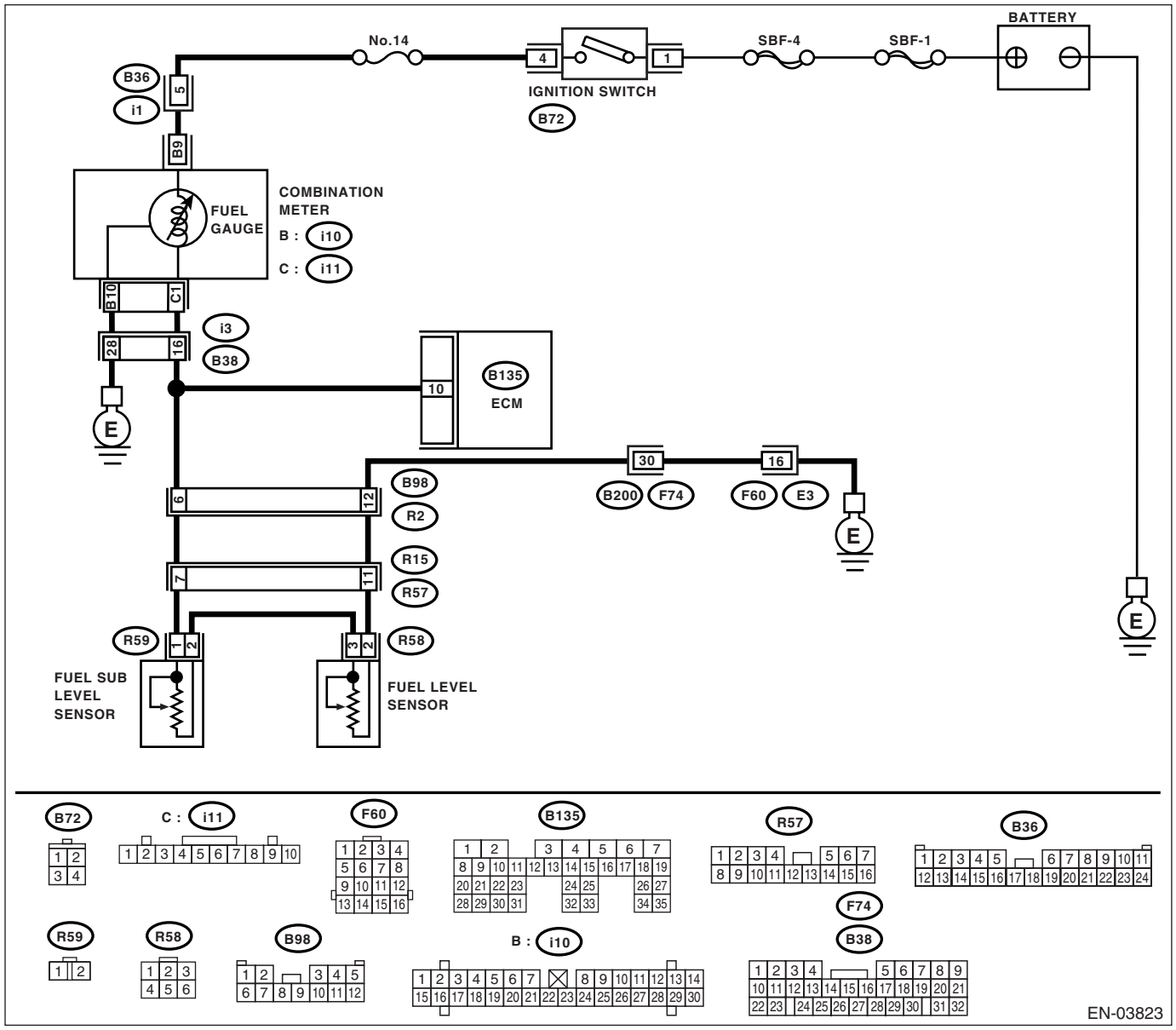
BW:DTC P0463 FUEL LEVEL SENSOR “A” CIRCUIT HIGH

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-170, DTC P0463 FUEL LEVEL SENSOR “A” CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



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.>

	Step	Check	Yes	No
2	**CHECK INPUT SIGNAL OF ECM.** 1) Turn the ignition switch to ON. (Engine OFF) 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 10 (+) — Chassis ground (–):***	Is the voltage more than 4.75 V?	Go to step **3**.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following item: • Poor contact in fuel pump connector • Poor contact of coupling connector
3	**CHECK INPUT VOLTAGE FROM ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the combination meter connector (i11) and ECM connector. 3) Turn the ignition switch to ON. 4) Measure the voltage of harness between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 10 (+) — Chassis ground (–):***	Is the voltage more than 4.75 V?	Go to step **4**.	Repair battery short circuit between ECM and combination meter connector.
4	**CHECK HARNESS BETWEEN ECM AND FUEL TANK CORD.** 1) Turn the ignition switch to OFF. 2) Separate fuel tank cord connector (R57) and rear wiring harness connector (R15). 3) Measure the resistance between ECM and fuel tank cord. ***Connector & terminal*** ***(B135) No. 10 — (R15) No. 7:***	Is the resistance less than 5 Ω?	Go to step **5**.	Repair open circuit between ECM and fuel tank cord.
5	**CHECK HARNESS BETWEEN FUEL TANK CORD AND CHASSIS GROUND.** Measure the resistance between fuel tank cord and chassis ground. ***Connector & terminal*** ***(R15) No. 11 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **6**.	Repair open circuit between fuel tank cord and chassis ground. NOTE: In this case, repair the following item: Poor contact of coupling connector
6	**CHECK FUEL TANK CORD.** 1) Disconnect the connector from the fuel level sensor. 2) Measure the resistance between the fuel level sensor and coupling connector. ***Connector & terminal*** ***(R57) No. 11 — (R58) No. 2:***	Is the resistance less than 10 Ω?	Go to step **7**.	Repair the open circuit between the coupling connector and fuel level sensor.
7	**CHECK FUEL TANK CORD.** 1) Disconnect the connector from the fuel sub level sensor. 2) Measure the resistance between fuel level sensor and fuel sub level sensor. ***Connector & terminal*** ***(R58) No. 3 — (R59) No. 2:***	Is the resistance less than 10 Ω?	Go to step **8**.	Repair open circuit between fuel level sensor and fuel sub level sensor.

	Step	Check	Yes	No
8	**CHECK FUEL TANK CORD.** Measure the resistance between the fuel sub level sensor and coupling connector. ***Connector & terminal*** ***(R57) No. 7 — (R59) No. 1:***	Is the resistance less than 10 Ω?	Go to step **9**.	Repair the open circuit between the coupling connector and fuel sub level sensor.
9	**CHECK FUEL LEVEL SENSOR.** 1) Remove the fuel pump assembly. <Ref. to FU(H4DOTC)-58, 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 more than 53 Ω?	Replace the fuel level sensor. <Ref. to FU(H4DOTC)-60, Fuel Level Sensor.>	Go to step **10**.
10	**CHECK FUEL SUB LEVEL SENSOR.** 1) Remove the fuel sub level sensor. <Ref. to FU(H4DOTC)-61, 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 more than 45 Ω?	Replace the fuel sub level sensor. <Ref. to FU(H4DOTC)-61, Fuel Sub Level Sensor.>	Replace the combination meter. <Ref. to IDI-10, Combination Meter.>

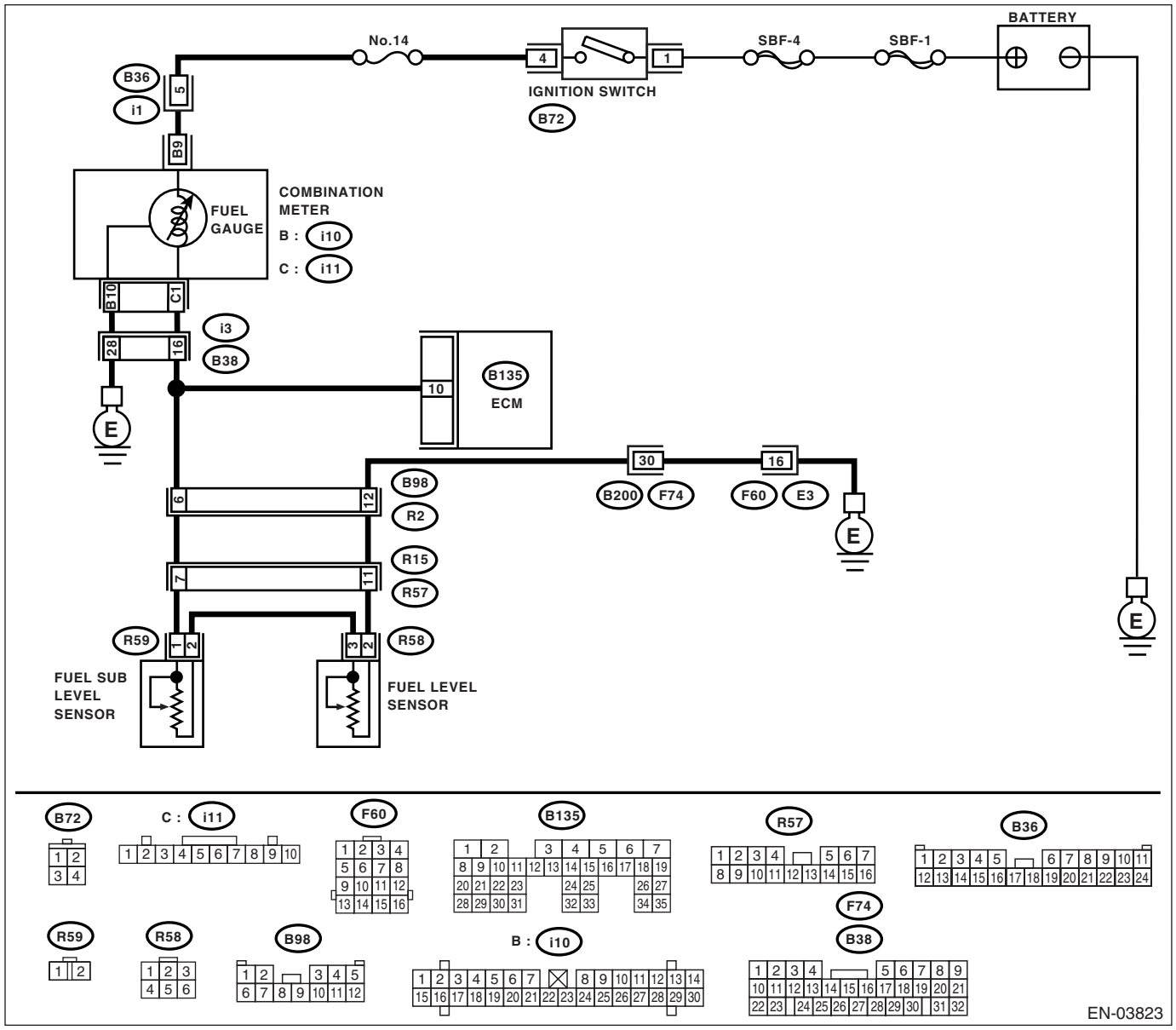
BX:DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-172, DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	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)-65, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK FUEL LEVEL SENSOR.** 1) Remove the fuel pump assembly. <Ref. to FU(H4DOTC)-58, Fuel Pump.> 2) While moving the fuel level sensor float up and down, make sure that the resistance between fuel level sensor terminals changes smoothly. ***Terminals*** ***No. 3 — No. 2:***	Does the resistance change gradually?	Go to step **3**.	Replace the fuel level sensor. <Ref. to FU(H4DOTC)-60, Fuel Level Sensor.>
3	**CHECK FUEL SUB LEVEL SENSOR.** 1) Remove the fuel sub level sensor. <Ref. to FU(H4DOTC)-61, Fuel Sub Level Sensor.> 2) While moving the fuel sub level sensor float up and down, make sure that the resistance between fuel level sensor terminals changes smoothly. ***Terminals*** ***No. 1 — No. 2:***	Does the resistance change gradually?	Repair poor contact in ECM, combination meter and coupling connectors.	Replace the fuel sub level sensor. <Ref. to FU(H4DOTC)-61, Fuel Sub Level Sensor.>

BY:DTC P0483 FAN RATIONALITY CHECK

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-175, 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, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

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

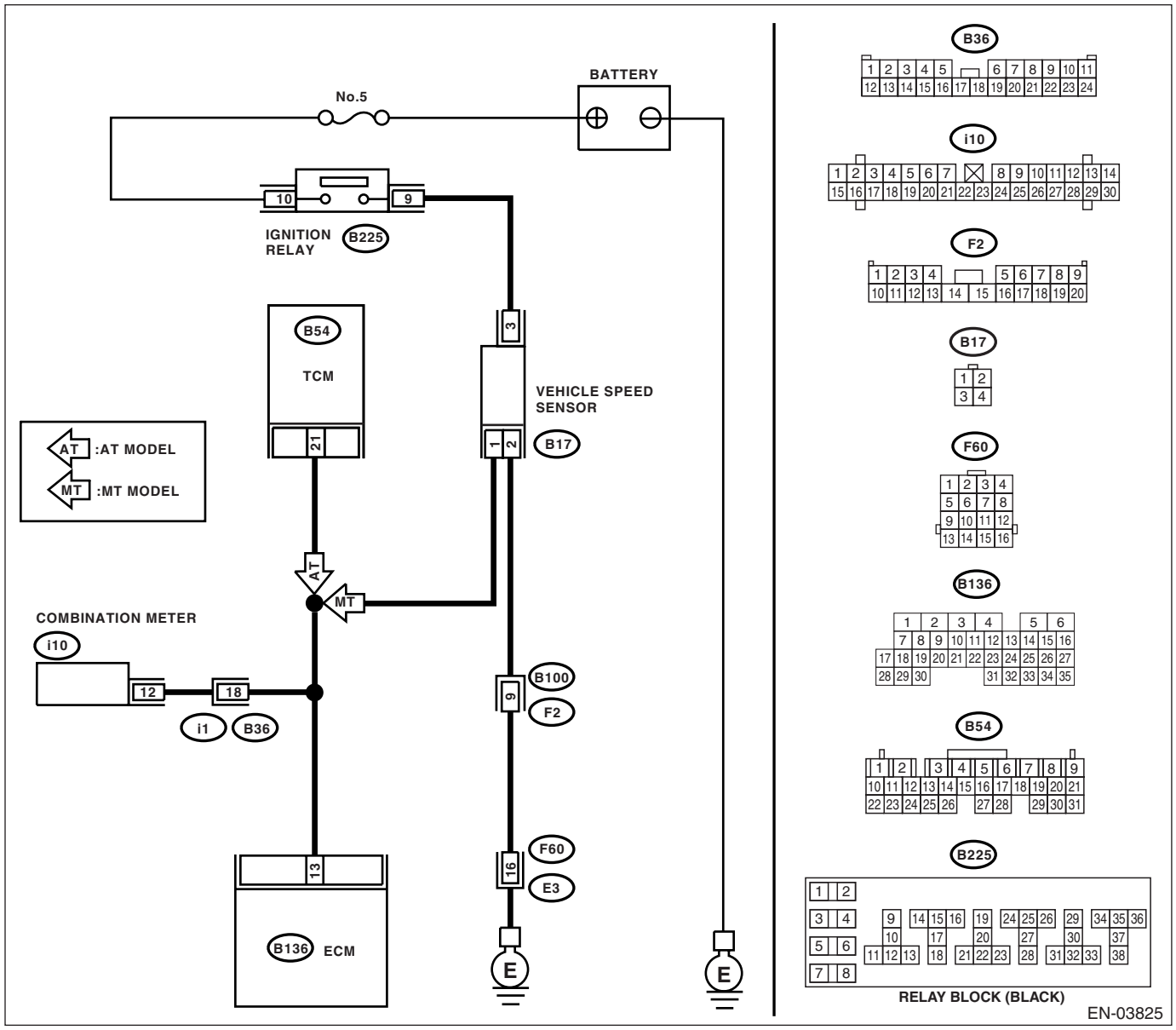
Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check the appropriate DTC using the “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4DOTC)(diag)-65, List of Diagnostic Trouble Code (DTC).>	Check radiator fan, fan motor and thermostat and if thermostat is stuck, replace thermostat. <Ref. to CO(H4SO)-32, Radiator Main Fan and Fan Motor.> <Ref. to CO(H4SO)-39, Radiator Sub Fan and Fan Motor.>

BZ:DTC P0502 VEHICLE SPEED SENSOR “A” CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-176, DTC P0502 VEHICLE SPEED SENSOR “A” CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.
WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN VEHICLE SPEED SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from vehicle speed sensor and ECM. 3) Measure the resistance of harness between vehicle speed sensor connector and chassis ground. ***Connector & terminal*** ***(B17) No. 1 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **2**.	Repair ground short circuit of harness between vehicle speed sensor and ECM connector.
2	**CHECK POOR CONTACT.** Check poor contact in vehicle speed sensor connector.	Is there poor contact in vehicle speed sensor connector?	Repair the poor contact in vehicle speed sensor connector.	Replace the vehicle speed sensor. <Ref. to 5MT-35, Vehicle Speed Sensor.>

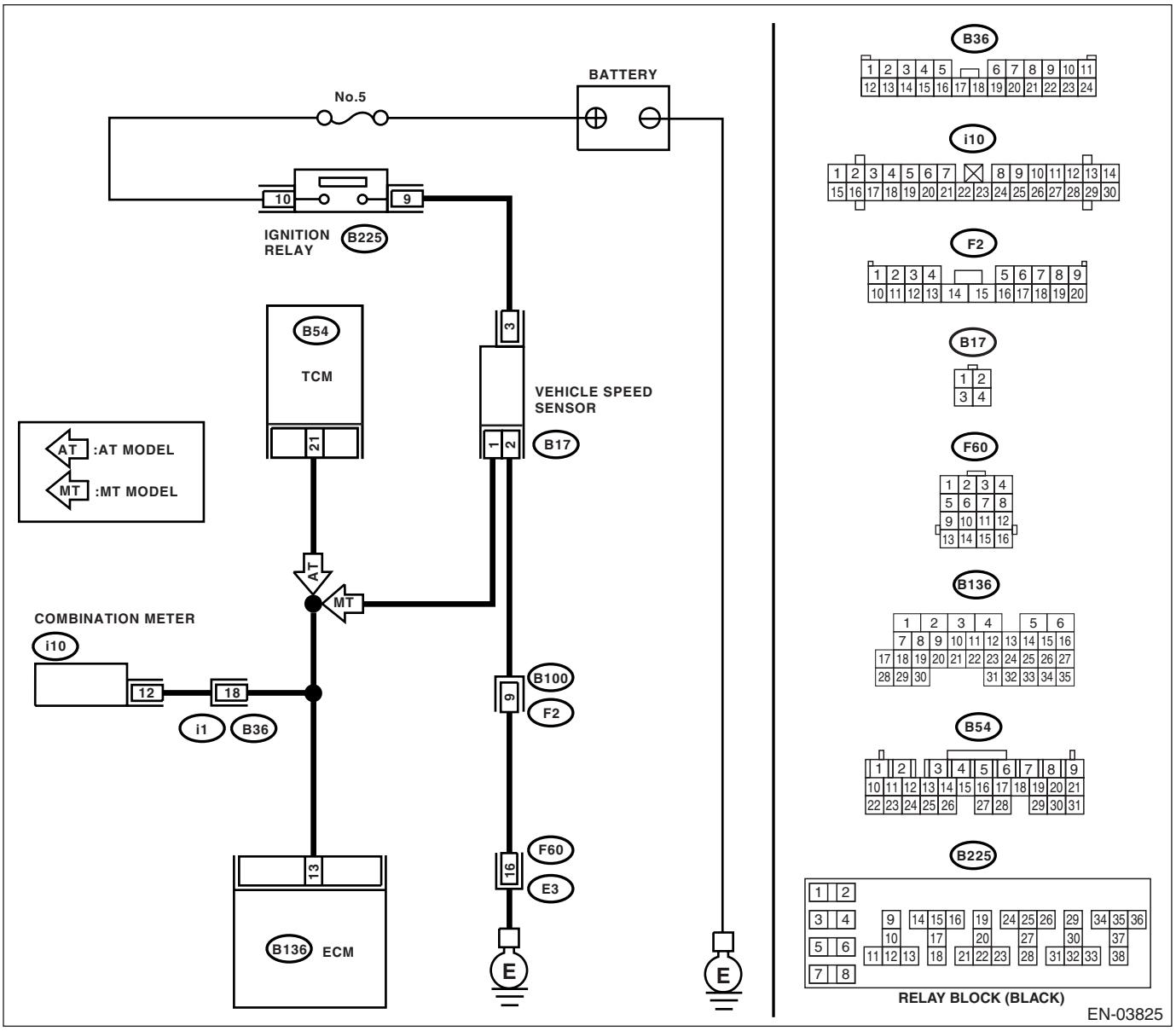
CA:DTC P0503 VEHICLE SPEED SENSOR “A” INTERMITTENT/ERRATIC/HIGH

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-177, DTC P0503 VEHICLE SPEED SENSOR “A” INTERMITTENT/ERRATIC/HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK SPEEDOMETER OPERATION IN COMBINATION METER.**	Does speedometer operate normally?	Go to step **2**.	Check the speedometer. <Ref. to IDI-12, Speedometer.>

	Step	Check	Yes	No
2	**CHECK HARNESS BETWEEN ECM AND COMBINATION METER CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from combination meter. 3) Measure resistance between ECM and combination meter. ***Connector & terminal*** ***(B136) No. 13 — (i10) No. 12:***	Is the resistance less than 10 Ω?	Repair poor contact in ECM connector.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and combination meter connector • Poor contact in ECM connector • • Poor contact in combination meter connector • Poor contact of coupling connector

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

DTC DETECTING CONDITION:

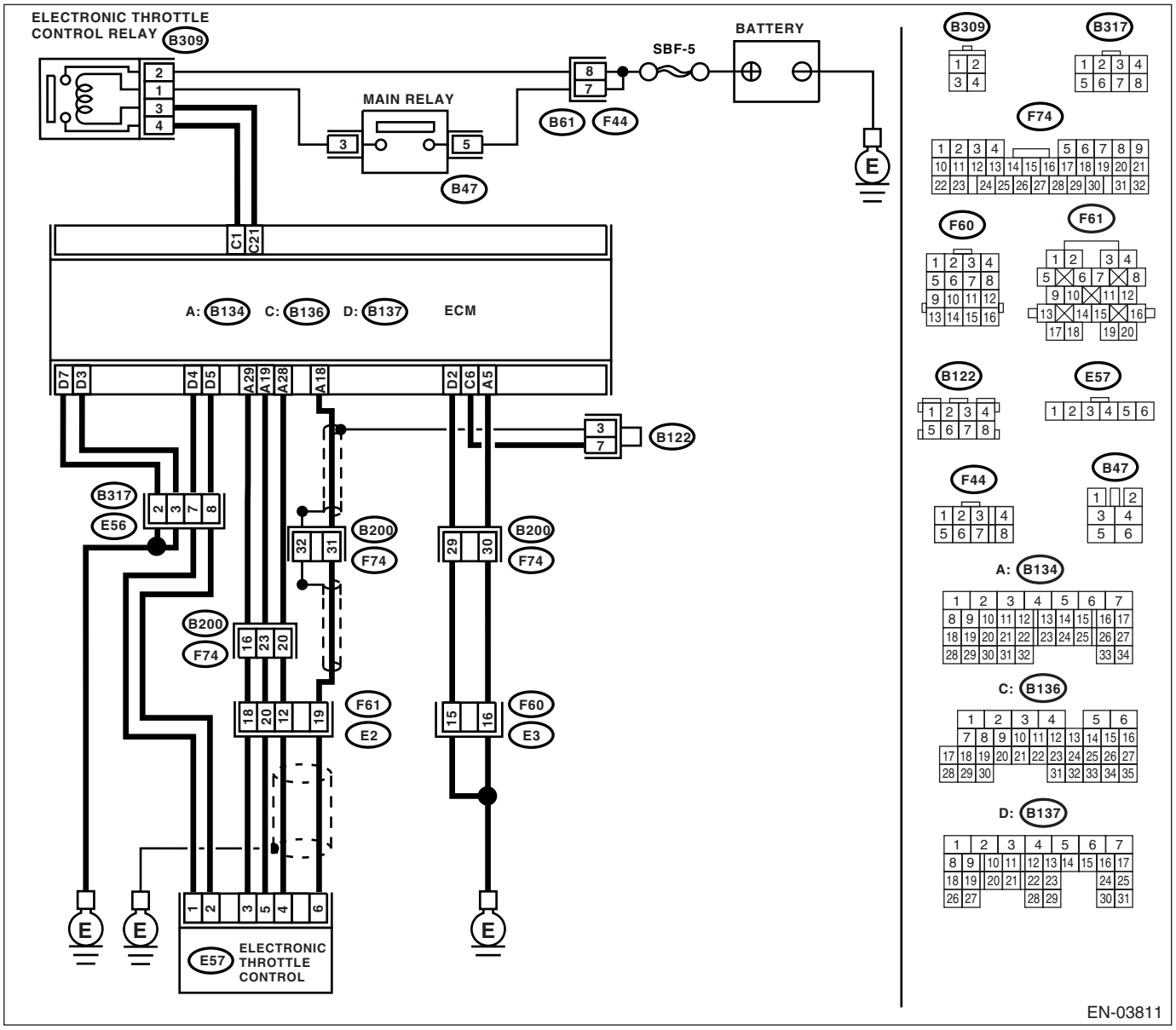
- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-178, DTC P0506 IDLE AIR CONTROL SYSTEM RPM LOWER THAN EXPECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

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

CAUTION:
After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	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)-65, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0506.	Go to step **2**.
2	**CHECK AIR CLEANER ELEMENT.** 1) Turn the ignition switch to OFF. 2) Check the air cleaner element.	Is the air cleaner element excessively clogged?	Replace the air cleaner element. <Ref. to IN(H4DOTC)-7, Air Cleaner Case.>	Go to step **3**.
3	**CHECK ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Remove the electronic throttle control. 3) Check the electronic throttle control.	Are foreign matter found inside electronic throttle control?	Remove foreign matter from electronic throttle control.	Perform the diagnosis of DTC P2101.

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

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-180, DTC P0507 IDLE AIR CONTROL SYSTEM RPM HIGHER THAN EXPECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

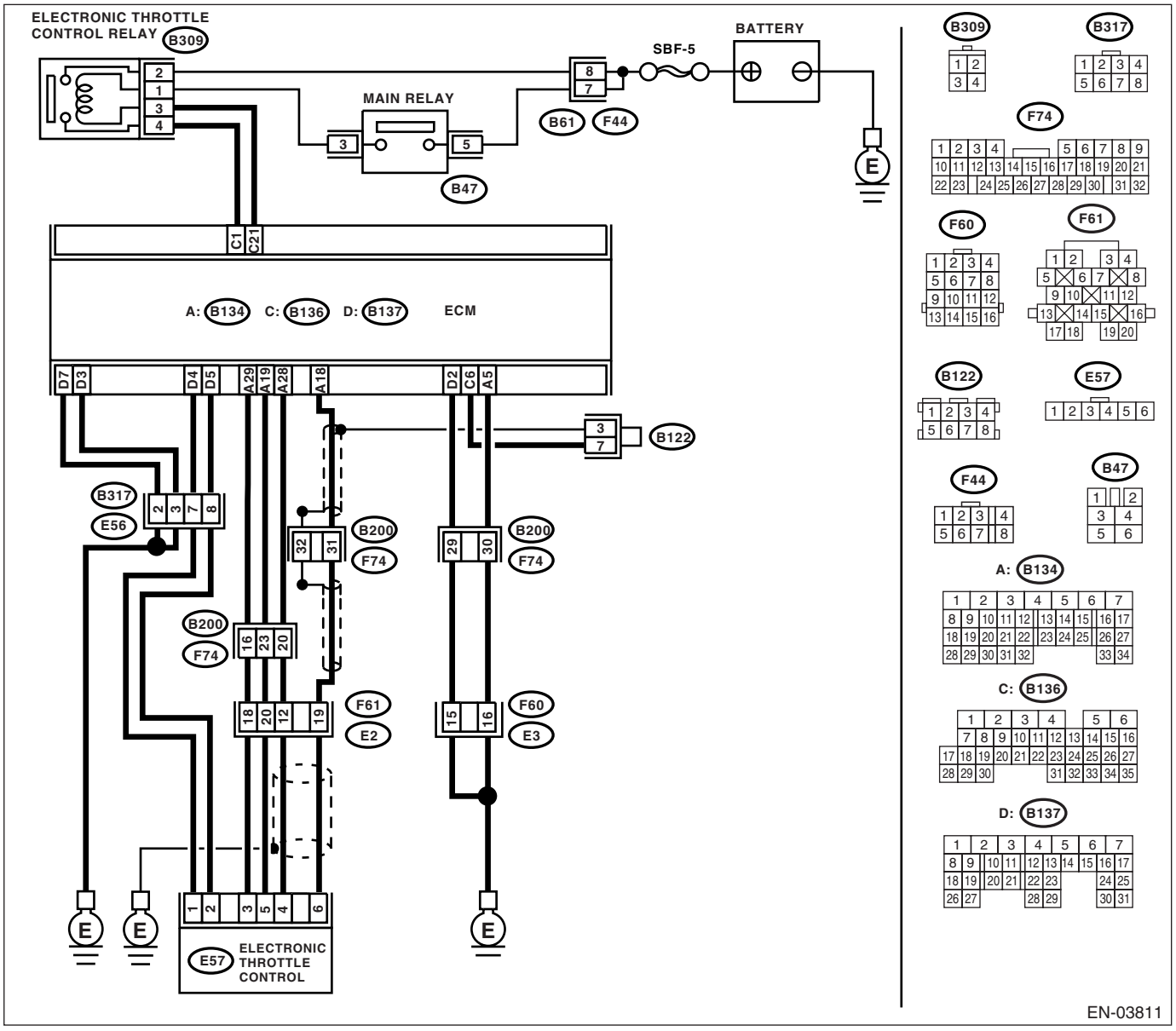
TROUBLE SYMPTOM:

Engine keeps running at higher speed than specified idle speed.

CAUTION:

After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	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)-65, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0507.	Go to step **2**.
2	**CHECK AIR INTAKE SYSTEM.** 1) Turn the ignition switch to ON. 2) Start and idle the engine. 3) Check the following item. • 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.

CD:DTC P0512 STARTER REQUEST CIRCUIT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-182, DTC P0512 STARTER REQUEST CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

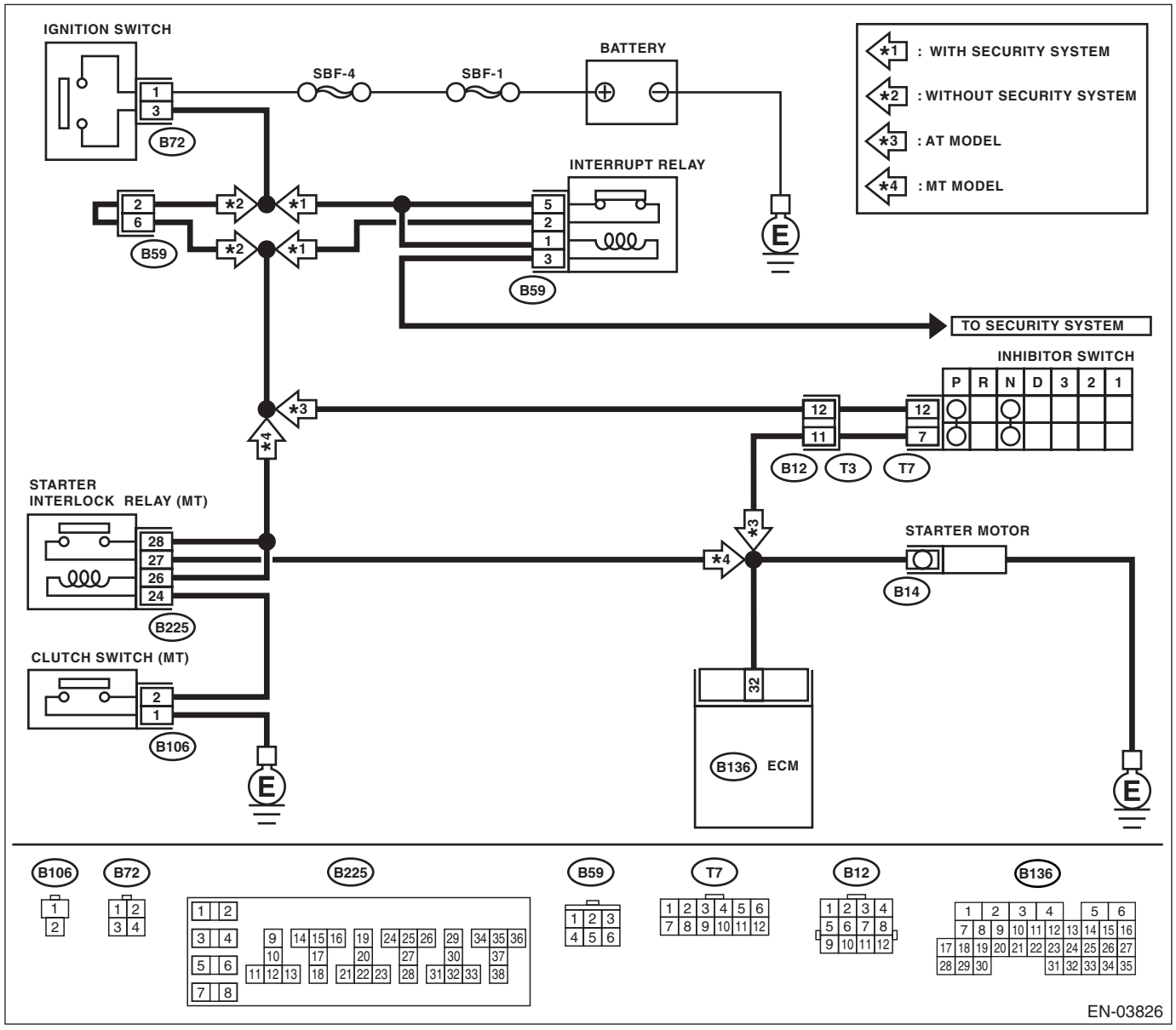
TROUBLE SYMPTOM:

Failure of engine to start

CAUTION:

After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Step	Check	Yes	No
1 **CHECK OPERATION OF STARTER MOTOR.**	Does the starter motor operate when ignition switch is turned ON?	Repair the battery short circuit in starter motor circuit. After repair, replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>	Check the starter motor circuit. <Ref. to EN(H4DOTC)(diag)-54, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

CE:DTC P0519 IDLE AIR CONTROL SYSTEM PERFORMANCE

DTC DETECTING CONDITION:

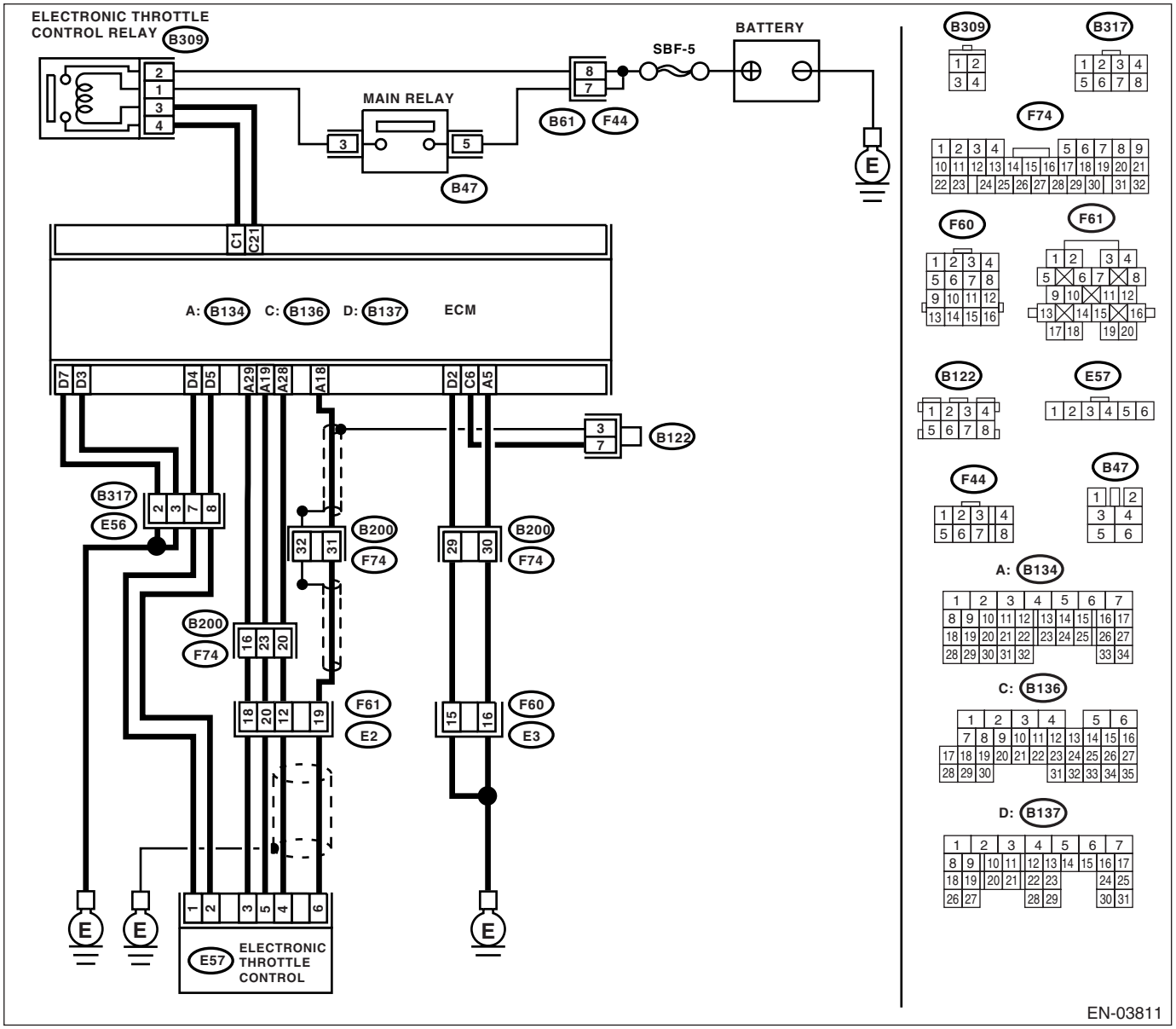
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-184, DTC P0519 IDLE AIR CONTROL SYSTEM PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

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

CAUTION:
After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	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)-65, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0519.	Go to step **2**.
2	**CHECK AIR INTAKE SYSTEM.** 1) Turn the ignition switch to ON. 2) Start and idle the engine. 3) Check the following item. • 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.

CF:DTC P0600 SERIAL COMMUNICATION LINK

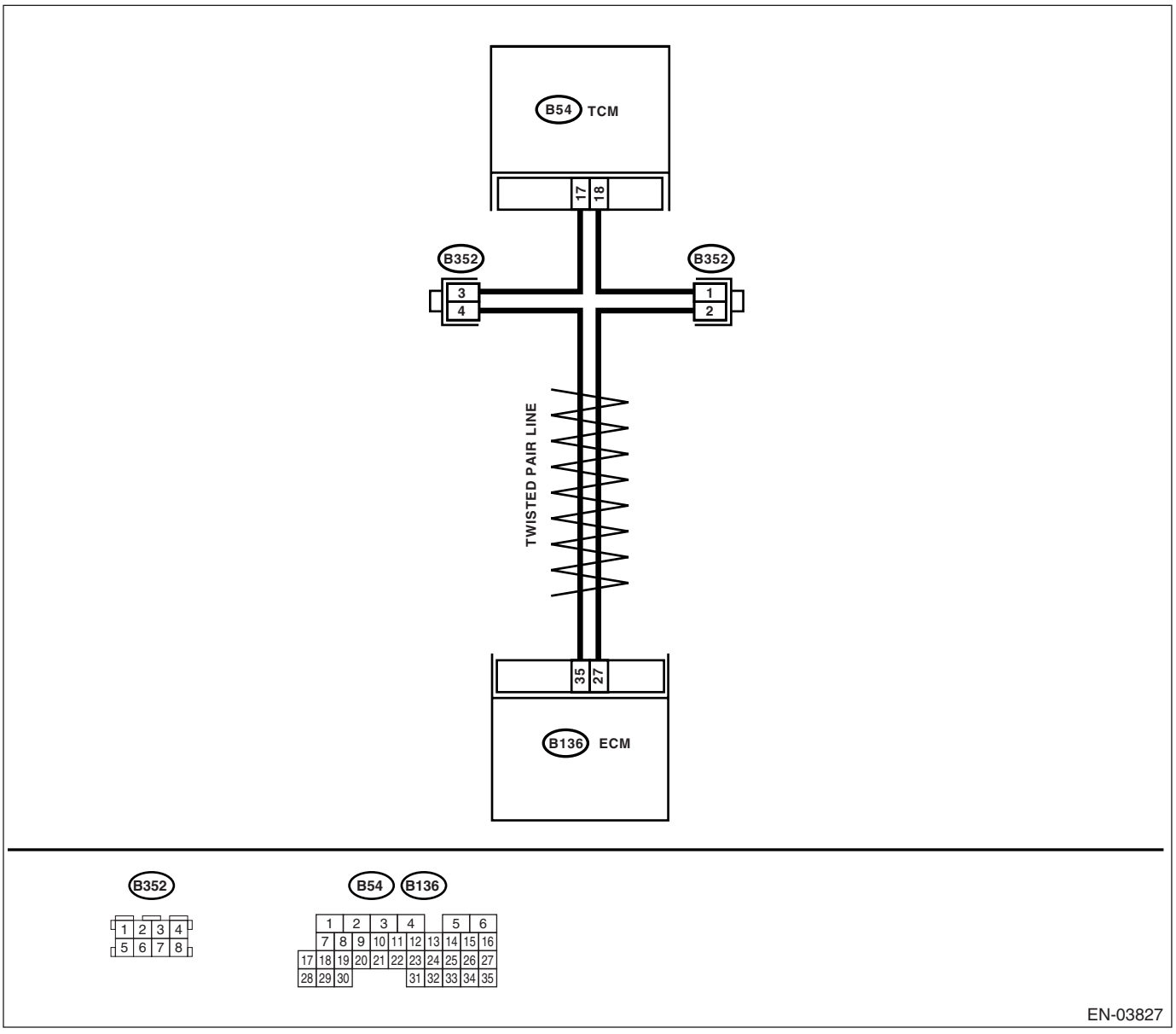
DTC DETECTING CONDITION:

Immediately at fault recognition

CAUTION:

After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND TCM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connector from TCM. 4) Measure the resistance between ECM, TCU connectors. ***Connector & terminal*** ***(B136) No. 35 — (B54) No. 17:*** ***(B136) No. 27 — (B54) No. 18:***	Is the resistance less than 1 Ω?	Go to step **2**.	Repair the harness and connector.
2	**CHECK HARNESS BETWEEN ECM AND TCM.** Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 35 — Chassis ground:*** ***(B136) No. 27 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3**.	Repair the harness and connector.
3	**CHECK HARNESS BETWEEN ECM AND TCM.** Check the resistance between ECM connectors. ***Connector & terminal*** ***(B136) No. 35 — (B136) No. 27:***	Is the resistance more than 1 MΩ?	Go to step **4**.	Repair the harness and connector.
4	**CHECK THE STATUS OF THE AT SYSTEM.** Diagnose the AT using the Subaru Select Monitor.	Is DTC P1718 displayed?	Check the AT system.	Replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>

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

DTC DETECTING CONDITION:

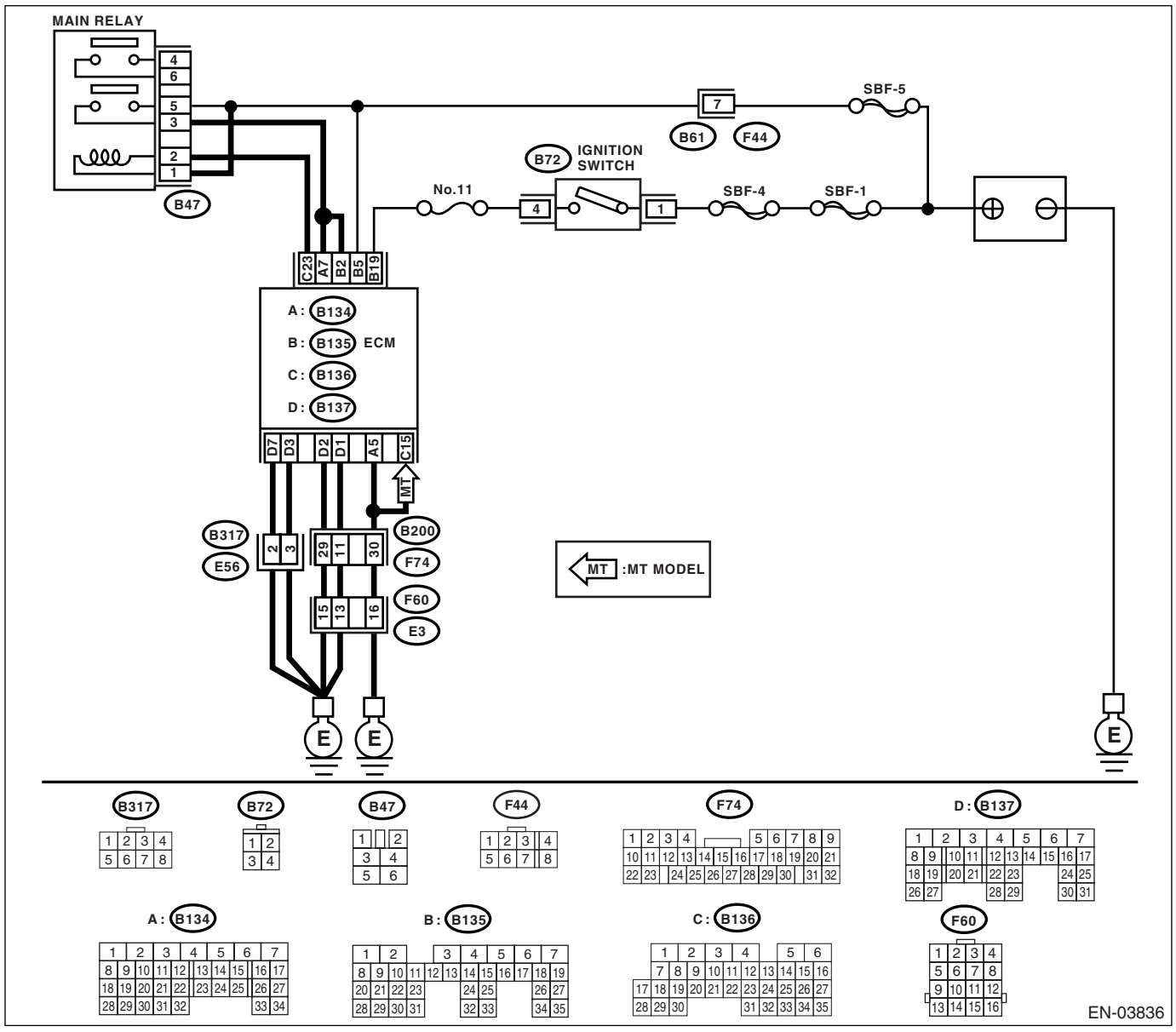
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-186, DTC P0604 INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Engine does not start.
- Engine stalls.

CAUTION:
After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Is DTC P0604 displayed on the Subaru Select Monitor or OBD-II general scan tool?	Replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>	Temporary poor contact occurs.

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

NOTE:
For the diagnostic procedure, refer to DTC P0607. <Ref. to EN(H4DOTC)(diag)-261, DTC P0607 CONTROL MODULE PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CI: DTC P0607 CONTROL MODULE PERFORMANCE

DTC DETECTING CONDITION:

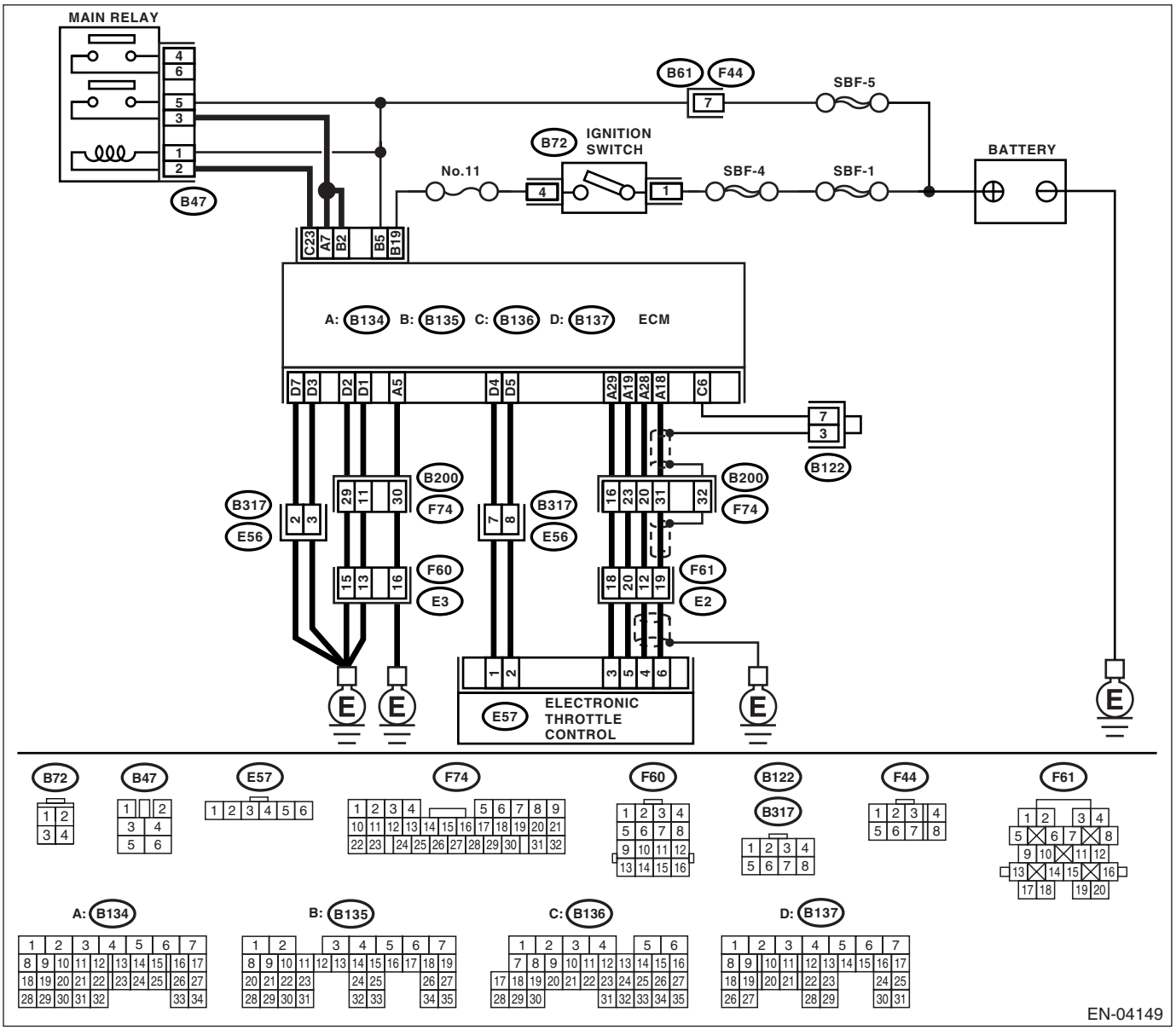
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-188, DTC P0607 CONTROL MODULE PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance

CAUTION:
After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK INPUT VOLTAGE FROM ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 7 (+) — Chassis ground (–):*** ***(B135) No. 2 (+) — Chassis ground (–):***	Is the voltage 10 — 13 V?	Go to step **2**.	Repair the open or ground short circuit of power supply circuit.
2	**CHECK INPUT VOLTAGE FROM ECM.** 1) Start the engine. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 7 (+) — Chassis ground (–):*** ***(B135) No. 2 (+) — Chassis ground (–):***	Is the voltage 13 — 15 V?	Go to step **3**.	Repair the open or ground short circuit of power supply circuit.
3	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM and electronic throttle control. 3) Measure resistance of the harness between the ECM and electronic throttle control harness. ***Connector & terminal*** ***(E57) No. 5 — (B134) No. 19:*** ***(E57) No. 3 — (B134) No. 29:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair open circuit of the harness between the ECM and electronic throttle control connector.
4	**CHECK ECM GROUND HARNESS.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 5 (+) — Chassis ground (–):*** ***(B137) No. 7 (+) — Chassis ground (–):*** ***(B137) No. 1 (+) — Chassis ground (–):*** ***(B137) No. 2 (+) — Chassis ground (–):*** ***(B137) No. 3 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>	Repair the following items. • Further tighten the engine ground terminals. • Poor contact in ECM connector • Poor contact in coupling connector

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

NOTE:
For the diagnostic procedure, refer to DTC P2101. <Ref. to EN(H4DOTC)(diag)-340, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CK:DTC P0691 FAN 1 CONTROL CIRCUIT LOW

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-193, 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, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

Step		Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Is DTC P0691 displayed on the Subaru Select Monitor?	Inspect the radiator fan relay. <Ref. to CO(H4SO)-10, Radiator Fan System.>	Temporary poor contact occurs.

CL:DTC P0692 FAN 1 CONTROL CIRCUIT HIGH

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-194, 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, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

Step		Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Is DTC P0692 displayed on the Subaru Select Monitor?	Inspect the radiator fan relay. <Ref. to CO(H4SO)-10, Radiator Fan System.>	Temporary poor contact occurs.

CM:DTC P0700 TRANSMISSION CONTROL SYSTEM (MIL REQUEST)

GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-195, DTC P0700 TRANSMISSION CONTROL SYSTEM (MIL REQUEST), Diagnostic Trouble Code (DTC) Detecting Criteria.>

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

CN:DTC P0851 PARK/NEUTRAL SWITCH INPUT CIRCUIT LOW (AT MODEL)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-196, DTC P0851 PARK/NEUTRAL SWITCH INPUT CIRCUIT LOW (AT MODEL), Diagnostic Trouble Code (DTC) Detecting Criteria.>

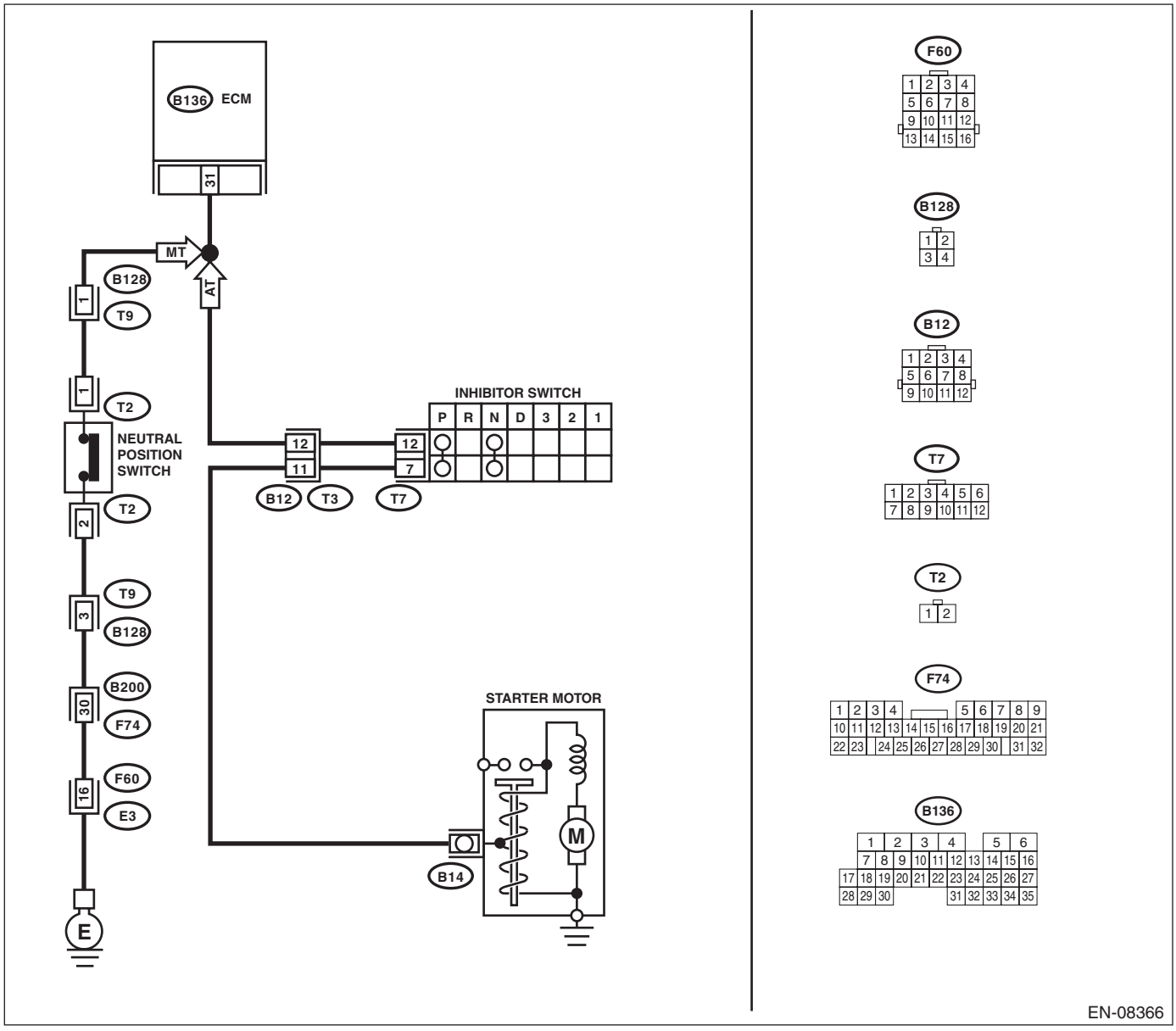
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL OF ECM.** 1) Turn the ignition switch to ON. 2) Place the 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 4.5 — 5.5 V?	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time.	Go to step **2**.
2	**CHECK HARNESS BETWEEN ECM AND TRANSMISSION HARNESS CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and transmission harness connector (T3). 3) Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 31 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3**.	Repair the ground short circuit of harness between ECM and transmission harness connector.
3	**CHECK TRANSMISSION HARNESS CONNECTOR.** 1) Disconnect the connector from inhibitor switch. 2) Measure the resistance of harness between transmission harness connector and engine ground. ***Connector & terminal*** ***(T3) No. 12 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **4**.	Repair the ground short circuit of harness between transmission harness connector and inhibitor switch connector.
4	**CHECK INHIBITOR SWITCH** Measure the resistance between inhibitor switch connector receptacle terminals with the select lever at a setting other than “P” and “N” ranges. ***Terminals*** ***No. 7 — No. 12:***	Is the resistance more than 1 MΩ?	Go to step **5**.	Replace the inhibitor switch. <Ref. to 4AT-48, Inhibitor Switch.>
5	**CHECK SELECT CABLE CONNECTION.**	Is there any fault in the selector cable connection to the inhibitor switch?	Repair the selector cable connection. <Ref. to CS-26, INSPECTION, Select Cable.>	Contact with SOA Service Center. NOTE: The deterioration of multiple parts can be thought as the cause.

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

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-197, DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW (MT MODEL), Diagnostic Trouble Code (DTC) Detecting Criteria.>

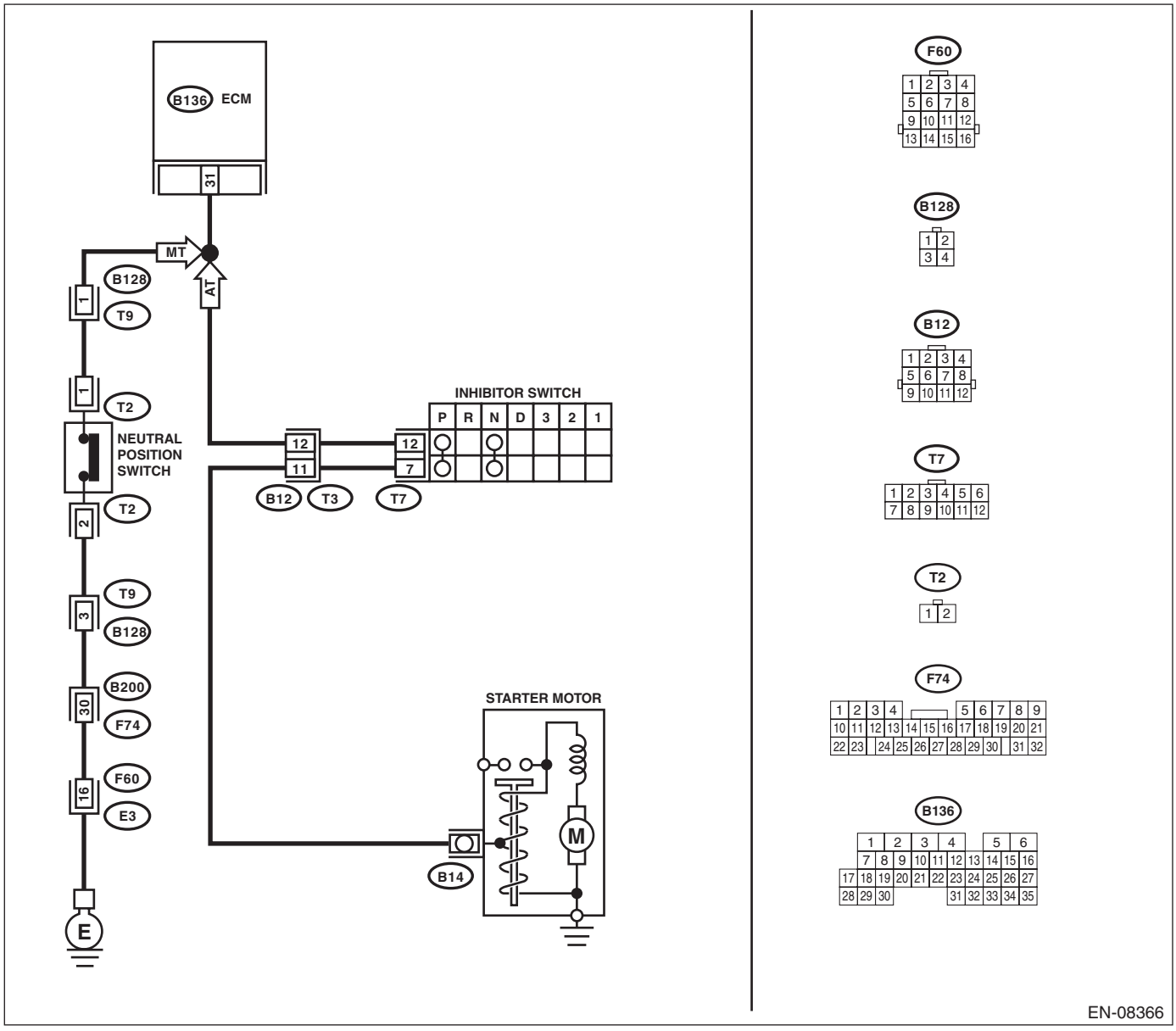
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL OF ECM.** 1) Turn the ignition switch to ON. 2) Place the shift lever except in neutral. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 31 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **2**.	Go to step **4**.
2	**CHECK INPUT SIGNAL OF ECM.** 1) Place the shift lever in neutral. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 31 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **3**.	Go to step **4**.
3	**CHECK POOR CONTACT.** Check poor contact of ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Contact with SOA Service Center. NOTE: The deterioration of multiple parts can be thought as the cause.
4	**CHECK NEUTRAL POSITION SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the transmission harness. 3) Place the shift lever except in neutral. 4) Measure the resistance between transmission harness and connector terminals. ***Connector & terminal*** ***(T9) No. 1 — No. 3:***	Is the resistance more than 1 MΩ?	Go to step **5**.	Repair the short circuit in transmission harness, or replace the neutral position switch.
5	**CHECK NEUTRAL POSITION SWITCH.** 1) Place the shift lever in neutral. 2) Measure the resistance between transmission harness connector terminals.	Is the resistance less than 1 Ω?	Go to step **6**.	Repair the short circuit in transmission harness, or replace the neutral position switch.
6	**CHECK HARNESS BETWEEN ECM AND NEUTRAL POSITION SWITCH CONNECTOR.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 31 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **7**.	Repair the ground short circuit of harness between ECM and transmission harness connector.
7	**CHECK HARNESS BETWEEN ECM AND NEUTRAL POSITION SWITCH CONNECTOR.** 1) Disconnect the connectors from ECM. 2) Measure the resistance of harness between ECM and transmission harness connector. ***Connector & terminal*** ***(B136) No. 31 — (B128) No. 1:***	Is the resistance less than 1 Ω?	Go to step **8**.	Repair the open circuit of the harness between ECM and transmission harness connector.
8	**CHECK HARNESS BETWEEN ECM AND NEUTRAL POSITION SWITCH CONNECTOR.** Measure the resistance of harness between transmission harness connector and engine ground. ***Connector & terminal*** ***(B128) No. 3 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **9**.	Repair the open circuit between transmission harness connector and engine ground terminal.

Step		Check	Yes	No
9	**CHECK POOR CONTACT.** Check poor contact of transmission harness connector.	Is there poor contact in transmission harness connector?	Repair the poor contact of transmission harness connector.	Contact with SOA Service Center. NOTE: The deterioration of multiple parts can be thought as the cause.

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

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-198, DTC P0852 PARK/NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT MODEL), Diagnostic Trouble Code (DTC) Detecting Criteria.>

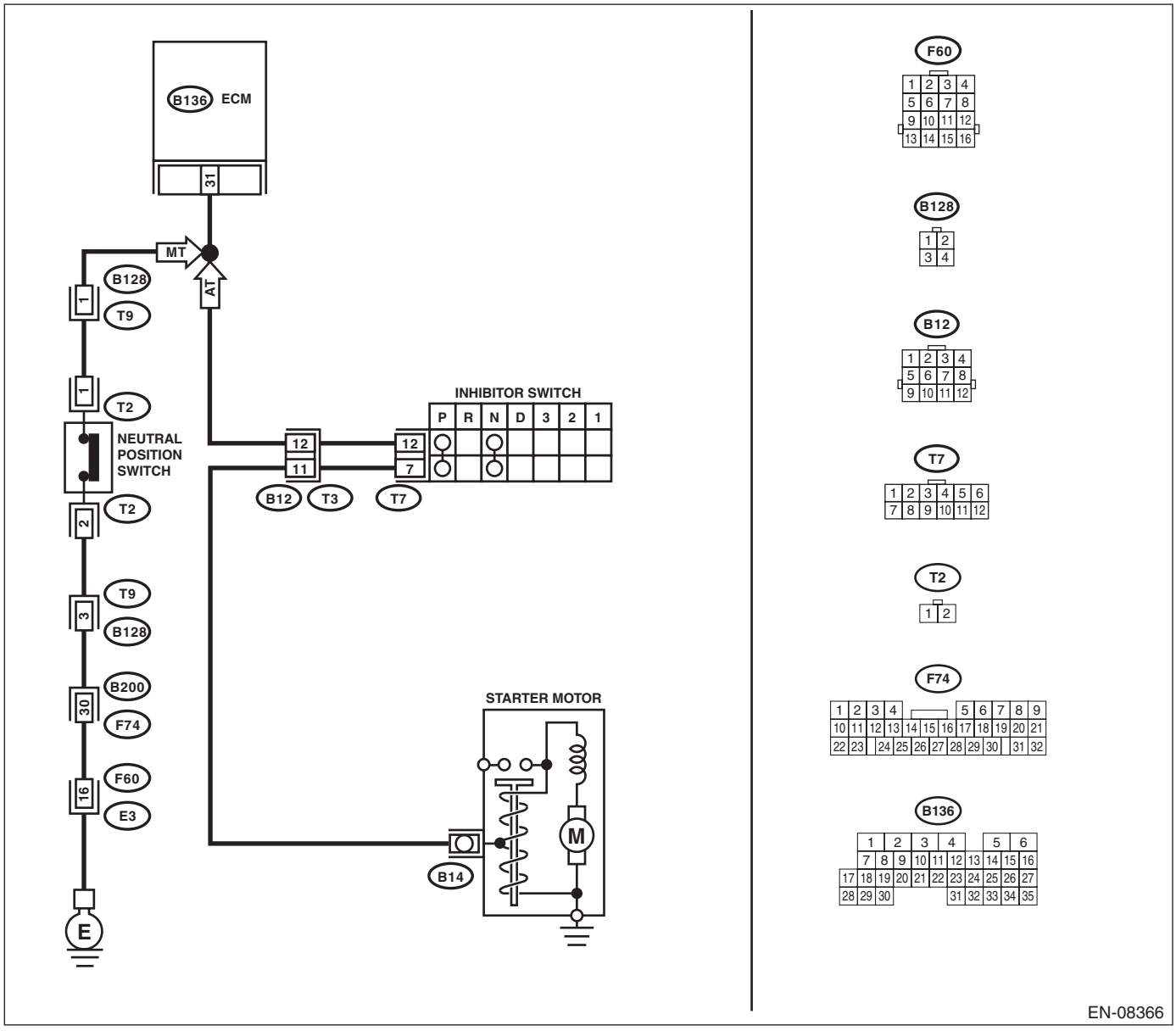
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL OF ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground with select lever at "N" and "P" range. ***Connector & terminal*** ***(B136) No. 31 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **2**.	Go to step **4**.
2	**CHECK INPUT SIGNAL OF ECM.** Measure the voltage between ECM and chassis ground with select lever at other than "N" and "P" range. ***Connector & terminal*** ***(B136) No. 31 (+) — Chassis ground (–):***	Is the voltage 4.5 — 5.5 V?	Go to step **3**.	Go to step **4**.
3	**CHECK POOR CONTACT.** Check poor contact of ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Contact with SOA Service Center. NOTE: The deterioration of multiple parts can be thought as the cause.
4	**CHECK INPUT SIGNAL OF ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 31 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair the battery short circuit of harness between ECM and inhibitor switch connector.	Go to step **5**.
5	**CHECK HARNESS BETWEEN ECM AND INHIBITOR SWITCH CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and inhibitor switch. 3) Measure the resistance of harness between ECM and inhibitor switch connector. ***Connector & terminal*** ***(B136) No. 31 — (T7) No. 12:***	Is the resistance less than 1 Ω?	Go to step **6**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and inhibitor switch connector • Poor contact of coupling connector • Poor contact of inhibitor switch connector • Poor contact in ECM connector

	Step	Check	Yes	No
6	**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?	Go to step **7**.	Repair open circuit of harness between inhibitor switch connector and starter motor ground line. NOTE: In this case, repair the following item: • Open circuit of harness between inhibitor switch connector and starter motor ground line • Poor contact in starter motor connector • Poor contact in starter motor ground • Starter motor
7	**CHECK INHIBITOR SWITCH** Measure the resistance between inhibitor switch connector receptacle's terminals with select lever at "N" and "P" range. ***Terminals*** ***No. 7 — No. 12:***	Is the resistance less than 1 Ω?	Go to step **8**.	Replace the inhibitor switch. <Ref. to 4AT-48, Inhibitor Switch.>
8	**CHECK SELECT CABLE CONNECTION.**	Is there any fault in the selector cable connection to the inhibitor switch?	Repair the selector cable connection. <Ref. to CS-26, INSPECTION, Select Cable.>	Contact with SOA Service Center. NOTE: The deterioration of multiple parts can be thought as the cause.

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

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-198, DTC P0852 PARK/NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT MODEL), Diagnostic Trouble Code (DTC) Detecting Criteria.> <Ref. to GD(H4DOTC)-199, DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT MODEL), Diagnostic Trouble Code (DTC) Detecting Criteria.>

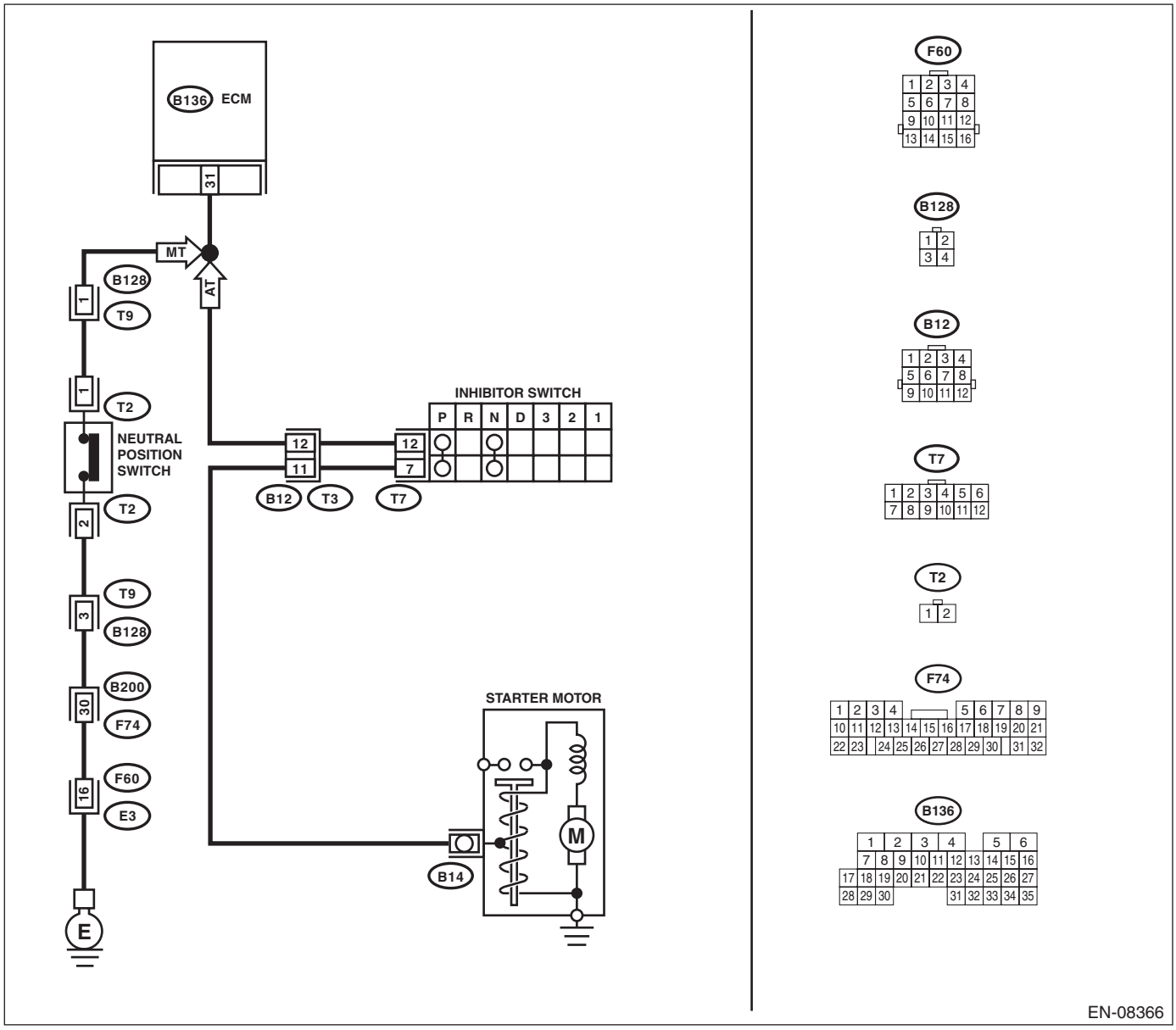
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL OF ECM.** 1) Turn the ignition switch to ON. 2) Place the shift lever in a position except for neutral. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 31 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **2**.	Go to step **4**.
2	**CHECK INPUT SIGNAL OF ECM.** 1) Place the shift lever in neutral. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 31 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **3**.	Go to step **4**.
3	**CHECK POOR CONTACT.** Check poor contact of ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Contact with SOA Service Center. NOTE: The deterioration of multiple parts can be thought as the cause.
4	**CHECK INPUT SIGNAL OF ECM.** 1) Disconnect the connectors from ECM. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 31 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair battery short circuit of harness between ECM and transmission harness connector.	Go to step **5**.
5	**CHECK HARNESS BETWEEN ECM AND TRANSMISSION HARNESS CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and transmission harness connector (T9). 3) Measure the resistance of harness between ECM and neutral switch connector. ***Connector & terminal*** ***(B136) No. 31 — (B128) No. 1:***	Is the resistance less than 1 Ω?	Go to step **6**.	Repair the open circuit in harness between ECM and transmission harness connector.
6	**CHECK NEUTRAL POSITION SWITCH GROUND LINE.** Measure the resistance of harness between transmission harness connector and engine ground. ***Connector & terminal*** ***(B128) No. 3 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **7**.	Repair the open circuit in the neutral position switch ground line.
7	**CHECK NEUTRAL POSITION SWITCH.** 1) Place the shift lever in neutral. 2) Measure the resistance between transmission harness connector socket terminals. ***Terminals*** ***No. 1 — No. 3:***	Is the resistance less than 1 Ω?	Go to step **8**.	Replace the neutral position switch.

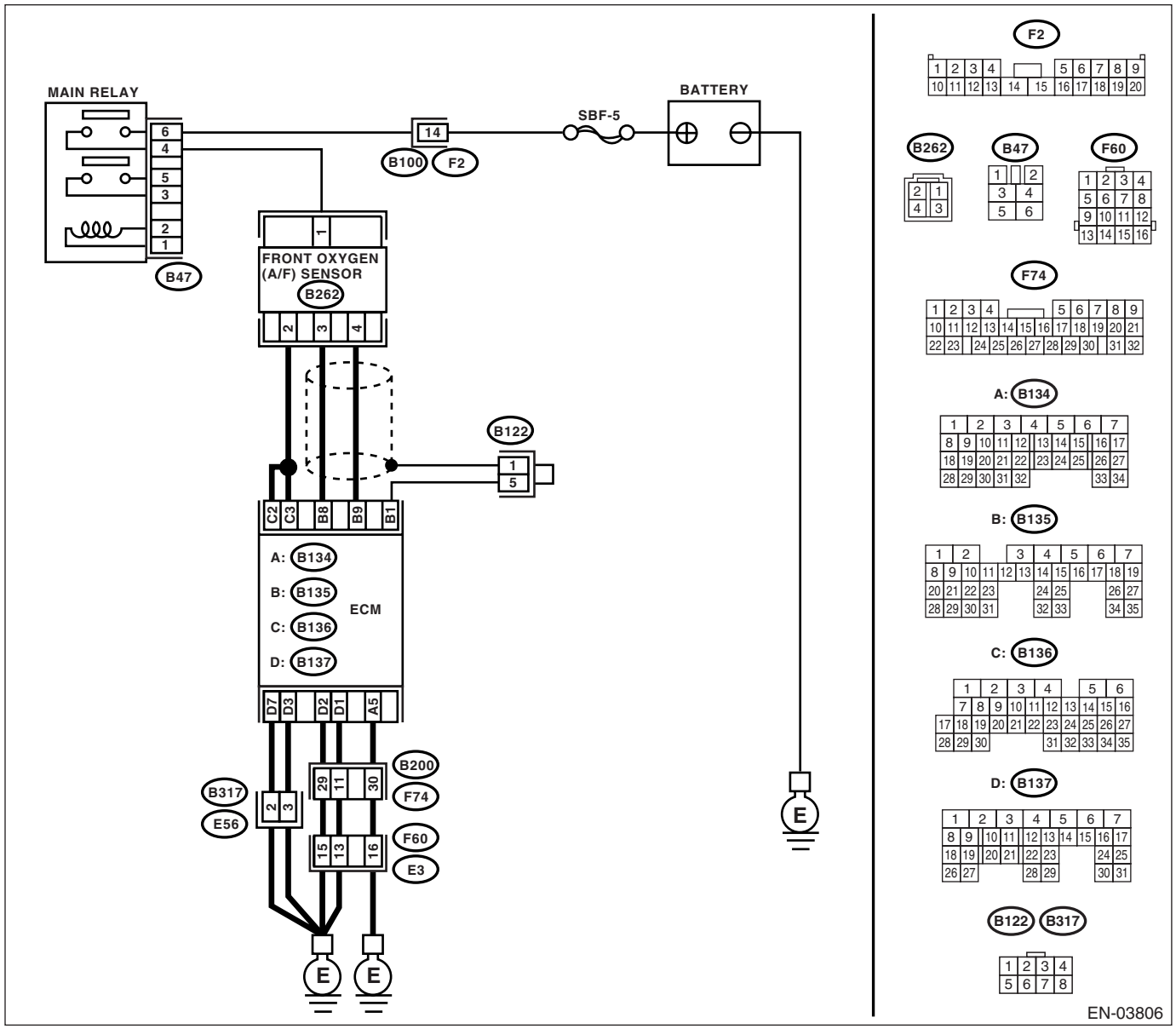
Step		Check	Yes	No
8	**CHECK POOR CONTACT.** Check poor contact of transmission harness connector.	Is there poor contact in transmission harness connector?	Repair the poor contact of transmission harness connector.	Contact with SOA Service Center. NOTE: The deterioration of multiple parts can be thought as the cause.

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

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-200, DTC P1152 O2 SENSOR CIRCUIT RANGE/ PERFORMANCE (LOW) (BANK1 SENSOR1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.
WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Does water enter the connector?	Dry the water thoroughly.	Go to step **2**.
2	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and front oxygen (A/F) sensor connector. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B135) No. 9 — (B262) No. 4:*** ***(B135) No. 8 — (B262) No. 3:***	Is the resistance less than 1 Ω?	Go to step **3**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of the 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 for poor contact of the front oxygen (A/F) sensor connector.	Is there poor contact in the 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)-41, Front Oxygen (A/F) Sensor.>

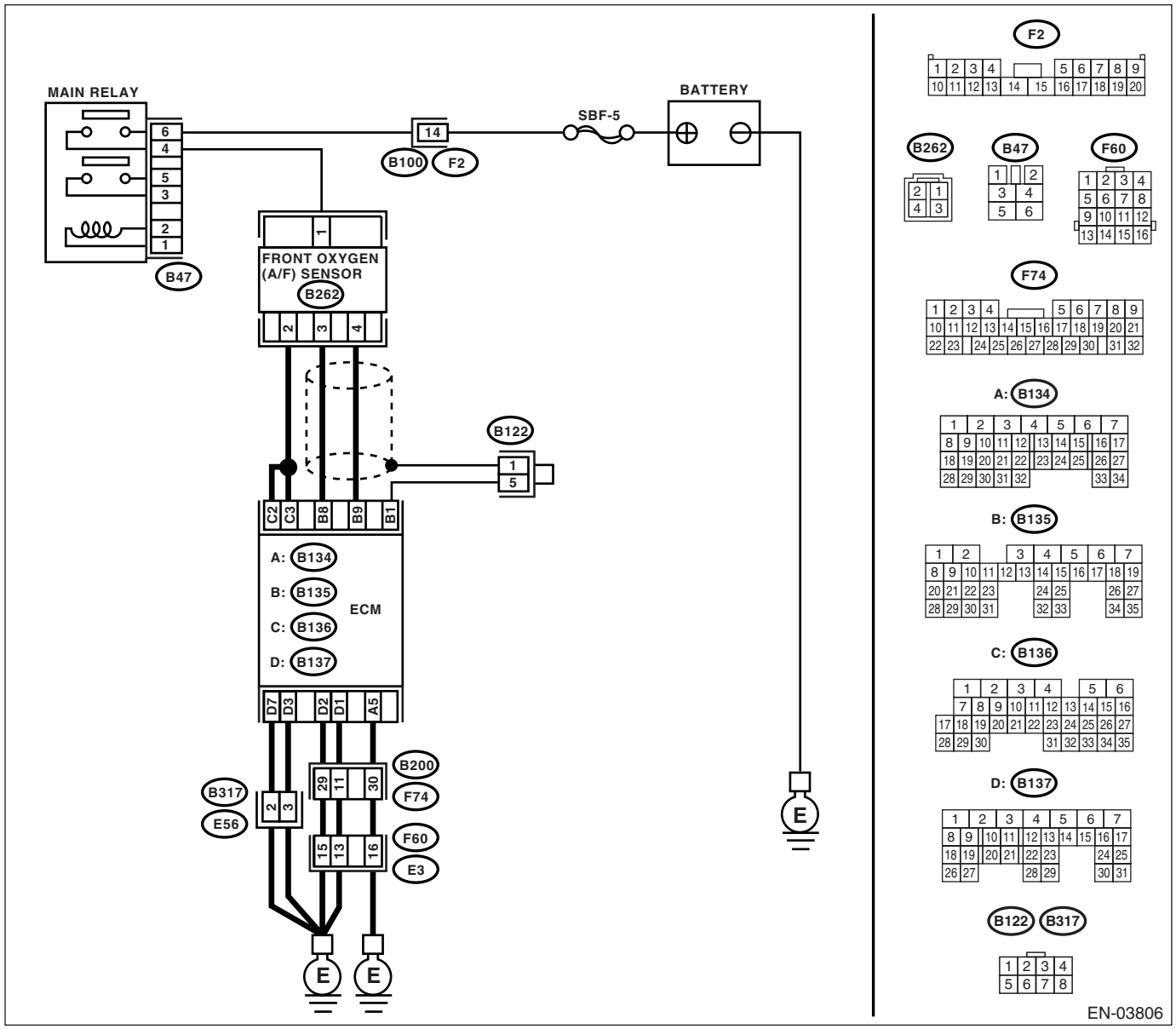
CS:DTC P1153 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-203, DTC P1153 O2 SENSOR CIRCUIT RANGE/ PERFORMANCE (HIGH) (BANK1 SENSOR1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Does water enter the connector?	Dry the water thoroughly.	Go to step **2**.
2	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 8 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3**.	Repair the ground short circuit of harness between ECM and front oxygen (A/F) sensor connector.
3	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 9 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4**.	Repair the ground short circuit of harness between ECM and front oxygen (A/F) sensor connector.
4	**CHECK OUTPUT SIGNAL FOR ECM.** 1) Attach the connector to the ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 8 (+) — Chassis ground (–):***	Is the voltage more than 4.5 V?	Go to step **5**.	Go to step **6**.
5	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 8 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair the battery short circuit of harness between ECM and front oxygen (A/F) sensor connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>	Repair poor contact in ECM connector.
6	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (–):***	Is the voltage more than 4.95 V?	Go to step **7**.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-41, Front Oxygen (A/F) Sensor.>
7	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair the battery short circuit of harness between ECM and front oxygen (A/F) sensor connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>	Repair poor contact in ECM connector.

CT:DTC P1160 RETURN SPRING FAILURE

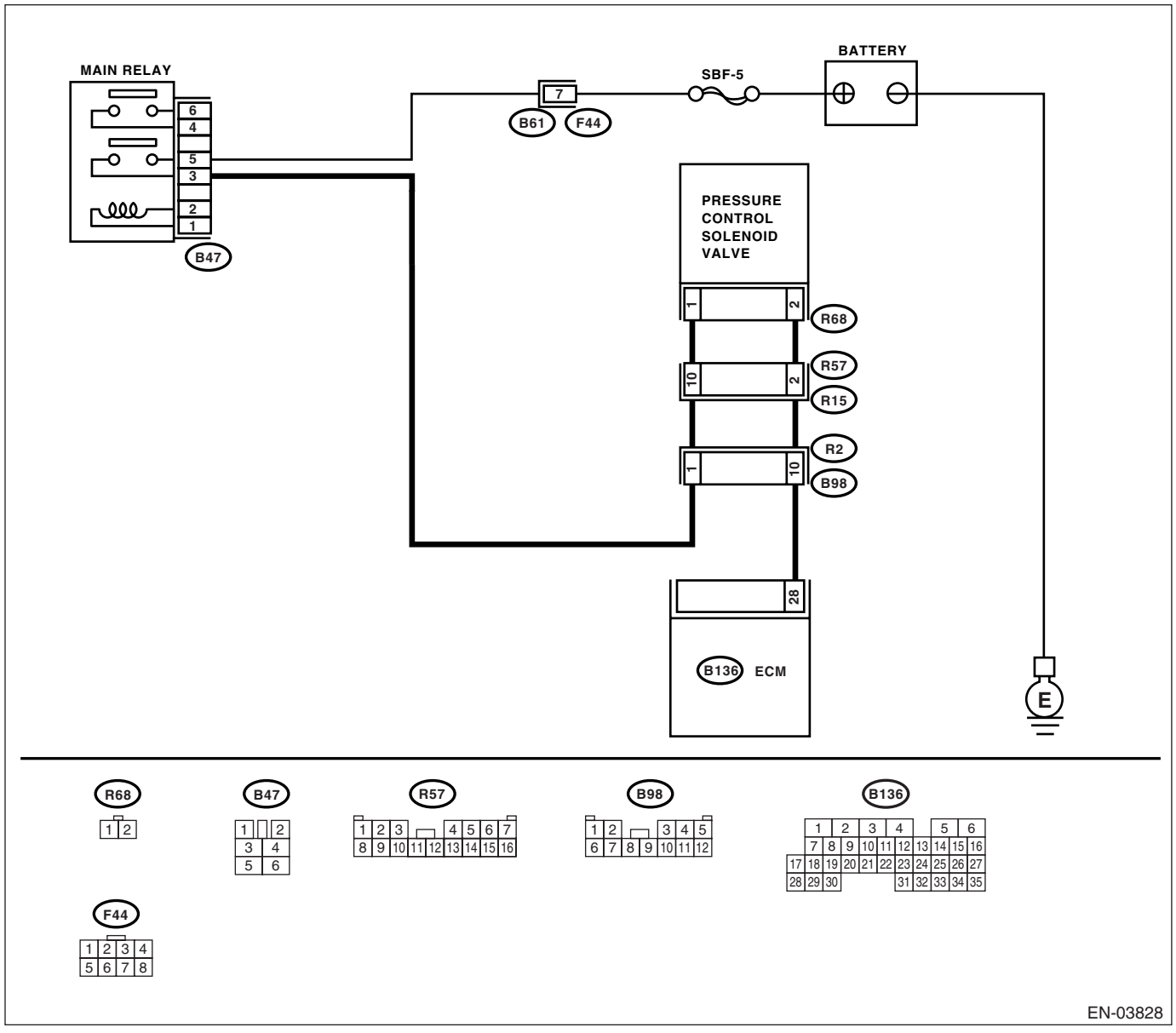
NOTE:
For the diagnostic procedure, refer to DTC P2101. <Ref. to EN(H4DOTC)(diag)-340, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

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

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-208, DTC P1400 FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.
WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL OF ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 28 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **2**.	Go to step **3**.
2	**CHECK POOR CONTACT.** Check poor contact of ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Contact with SOA Service Center. NOTE: The deterioration of multiple parts can be thought as the cause.
3	**CHECK HARNESS BETWEEN PRESSURE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the pressure control solenoid valve and ECM. 3) Measure the resistance of the harness between the pressure control solenoid valve connector and chassis ground. ***Connector & terminal*** ***(R68) No. 2 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4**.	Repair the ground short circuit of harness between ECM and Pressure control solenoid valve connector.
4	**CHECK HARNESS BETWEEN PRESSURE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** Measure the resistance of the harness between the 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 **5**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and pressure control solenoid valve connector • Poor contact of coupling connector
5	**CHECK PRESSURE CONTROL SOLENOID VALVE.** Measure the resistance between the pressure control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance between 10 and 100 Ω?	Go to step **6**.	Replace the pressure control solenoid valve. <Ref. to EC(H4DOTC)-16, Pressure Control Solenoid Valve.>

	Step	Check	Yes	No
6	**CHECK POWER SUPPLY TO THE PRESSURE CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to ON. 2) Measure the voltage between the pressure control solenoid valve and chassis ground. ***Connector & terminal*** ***(R68) No. 1 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **7**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between main relay and pressure control solenoid valve connector • Poor contact of coupling connector • Poor contact of main relay connector
7	**CHECK POOR CONTACT.** Check poor contact of pressure control solenoid valve connector.	Is there poor contact of the pressure control solenoid valve connector?	Repair poor contact of the pressure control solenoid valve connector.	Contact with SOA Service Center. NOTE: The deterioration of multiple parts can be thought as the cause.

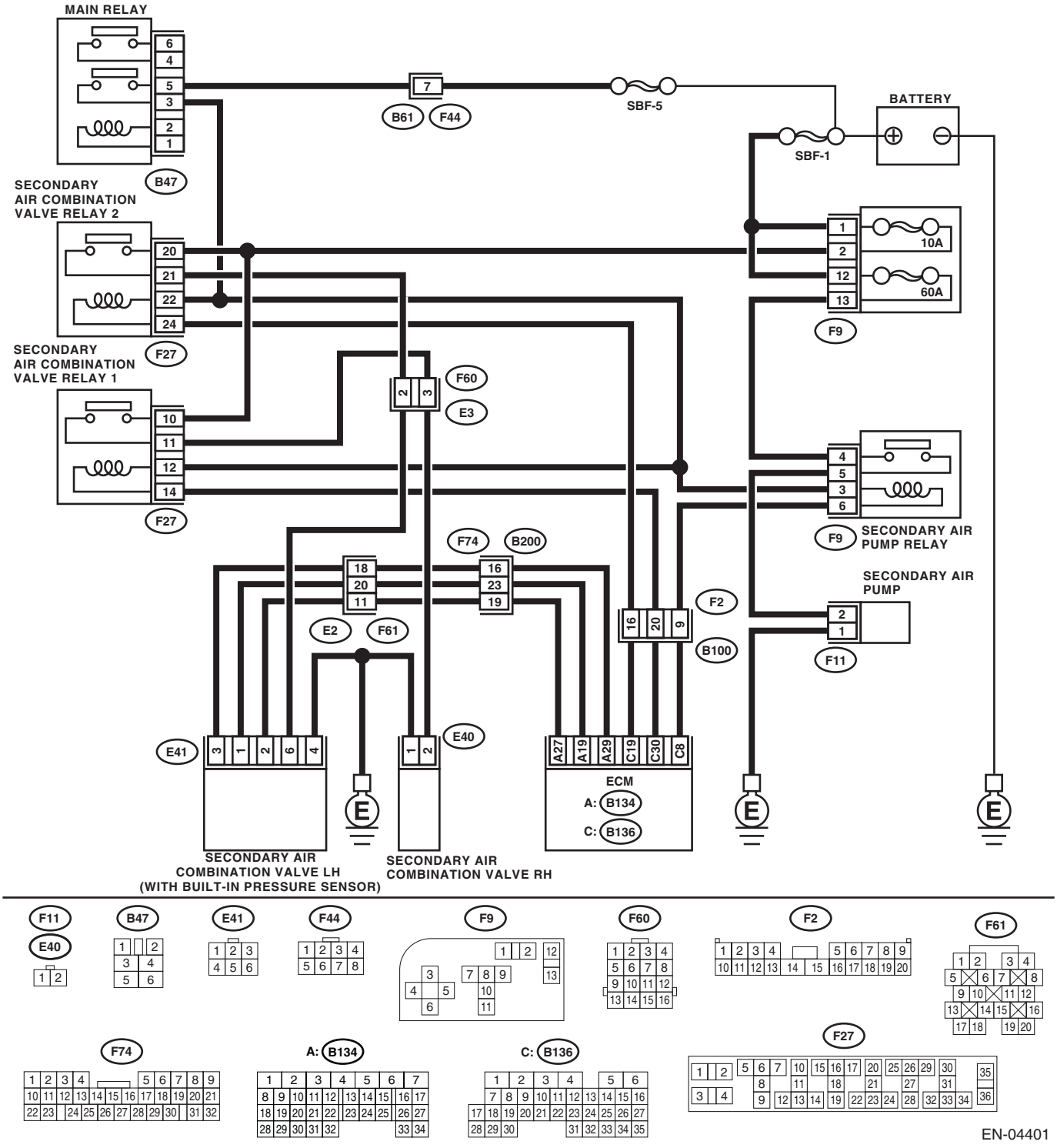
CV:DTC P1410 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-210, DTC P1410 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**SECONDARY AIR COMBINATION VALVE INSPECTION** 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.>	Temporary poor contact occurs. Check for poor contact in the connector.

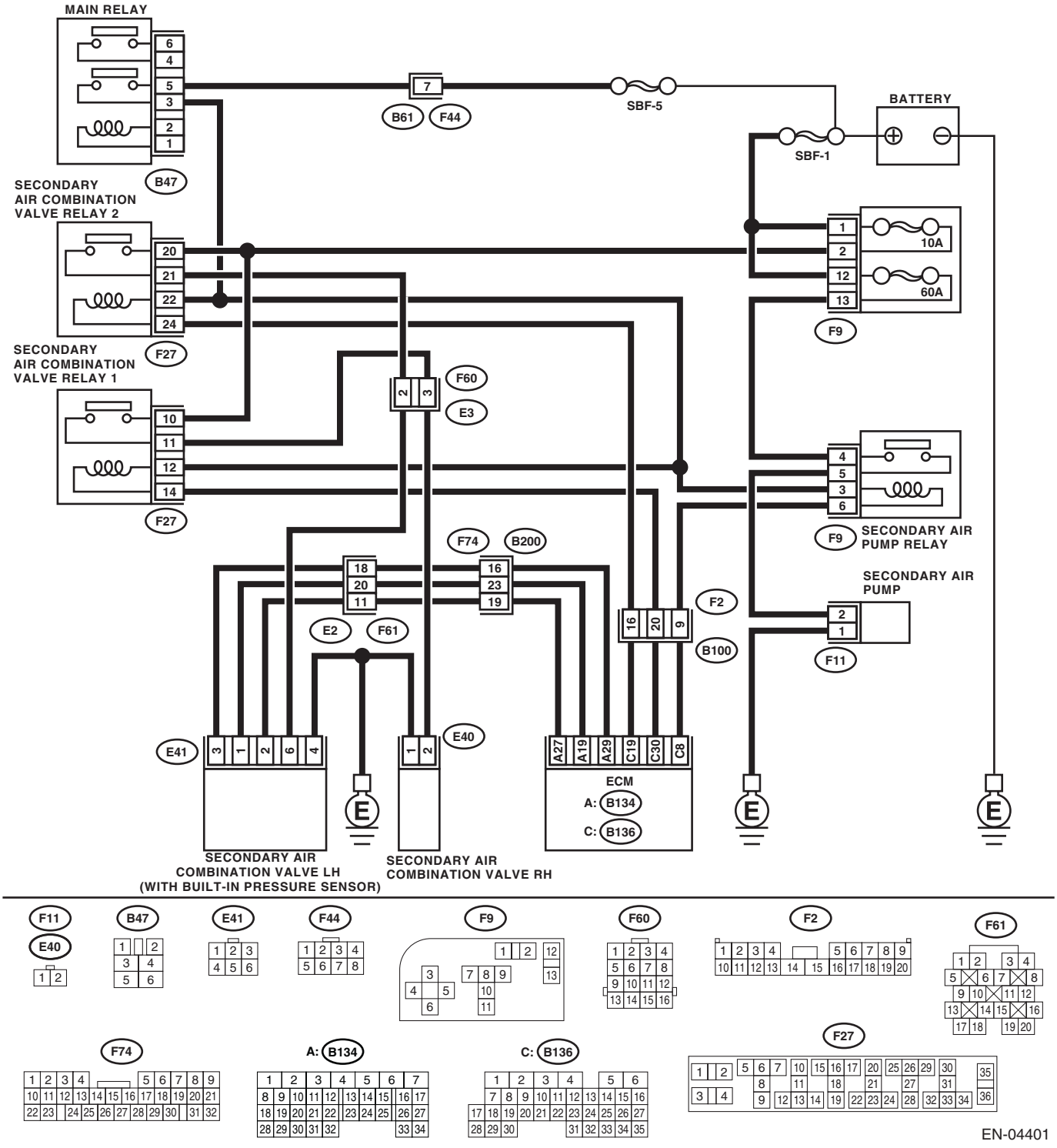
CW:DTC P1418 SECONDARY AIR INJECTION SYSTEM CONTROL “A” CIRCUIT SHORTED

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-212, DTC P1418 SECONDARY AIR INJECTION SYSTEM CONTROL “A” CIRCUIT SHORTED , Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04401

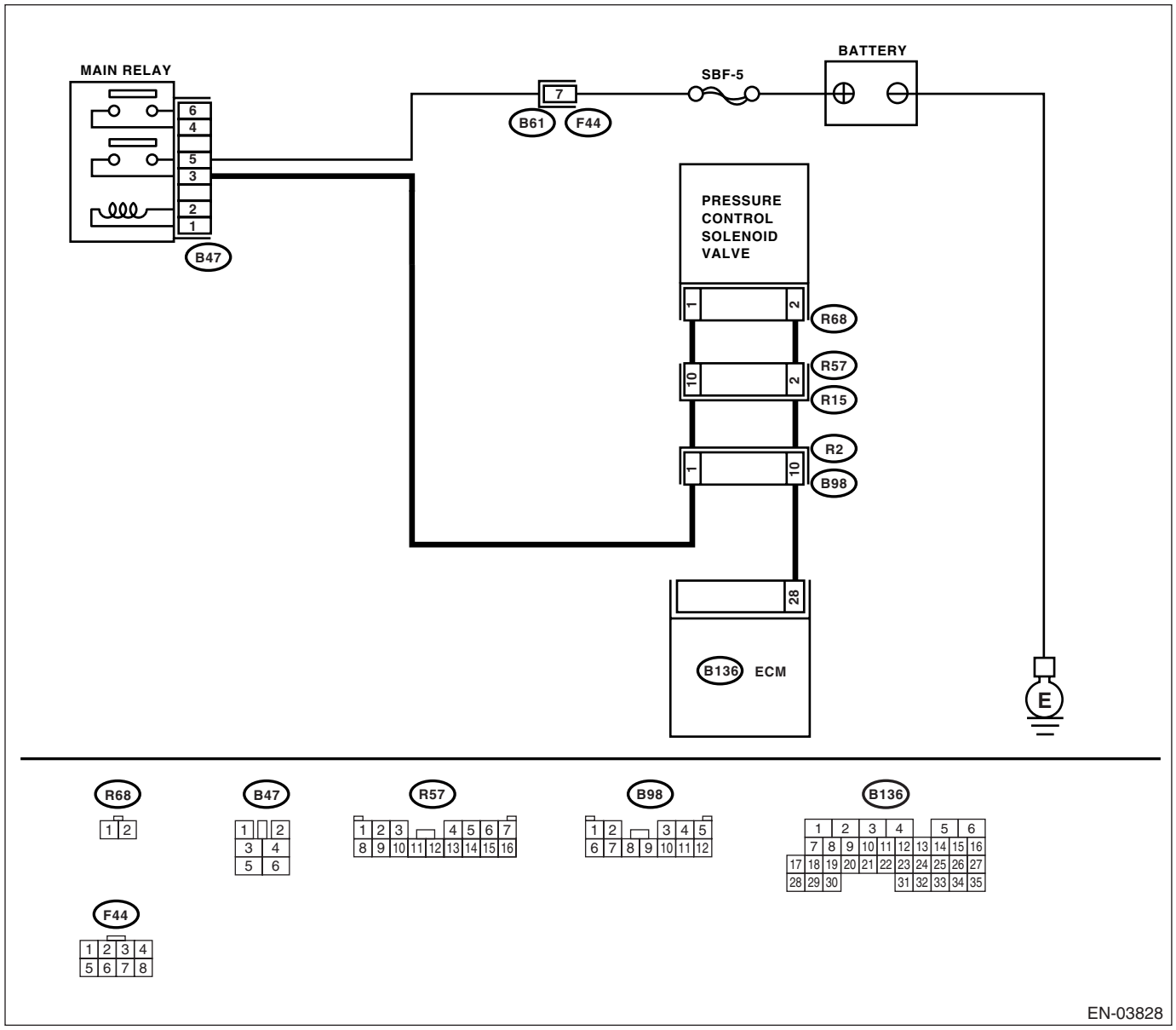
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND SECONDARY AIR PUMP RELAY** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the ECM and secondary air pump relay. 3) Measure the resistance of the harness between the ECM and secondary air pump relay terminal. ***Connector & terminal*** ***(B136) No. 8 — (F9) No. 6:***	Is the resistance less than 1 Ω?	Go to step **2**.	Repair open circuit of the harness between the ECM and secondary air pump relay terminal.
2	**CHECK HARNESS BETWEEN ECM AND SECONDARY AIR PUMP RELAY** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 8 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair the battery short of the harness between the ECM and secondary air pump relay terminal.	Temporary poor contact occurs. Check for poor contact in the connector.

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

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-213, DTC P1420 FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.
WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL OF ECM.** 1) Turn the ignition switch to OFF. 2) Connect the test mode connector at the lower portion of instrument panel (on the drivers side). 3) Turn the ignition switch to ON. 4) Measure the voltage between the ECM and chassis ground while operating the pressure control solenoid valve. NOTE: The pressure control solenoid valve operation can be executed using the Subaru Select Monitor. Regarding the procedures, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-47, Compulsory Valve Operation Check Mode.> ***Connector & terminal*** ***(B136) No. 28 (+) — Chassis ground (–):***	Does the voltage change between 0 — 10 V?	Go to step **2**.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. In this case, repair the poor contact in ECM connector.
2	**CHECK INPUT SIGNAL OF ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 28 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **4**.	Go to step **3**.
3	**CHECK POOR CONTACT.** Check poor contact of ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>
4	**CHECK HARNESS BETWEEN PRESSURE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the pressure control solenoid valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 28 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair the battery short circuit of harness between the ECM and pressure control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>	Go to step **5**.
5	**CHECK PRESSURE CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between the pressure 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)-16, Pressure Control Solenoid Valve.> and ECM <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>	Go to step **6**.
6	**CHECK POOR CONTACT.** Check poor contact of ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>

CY:DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-215, DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

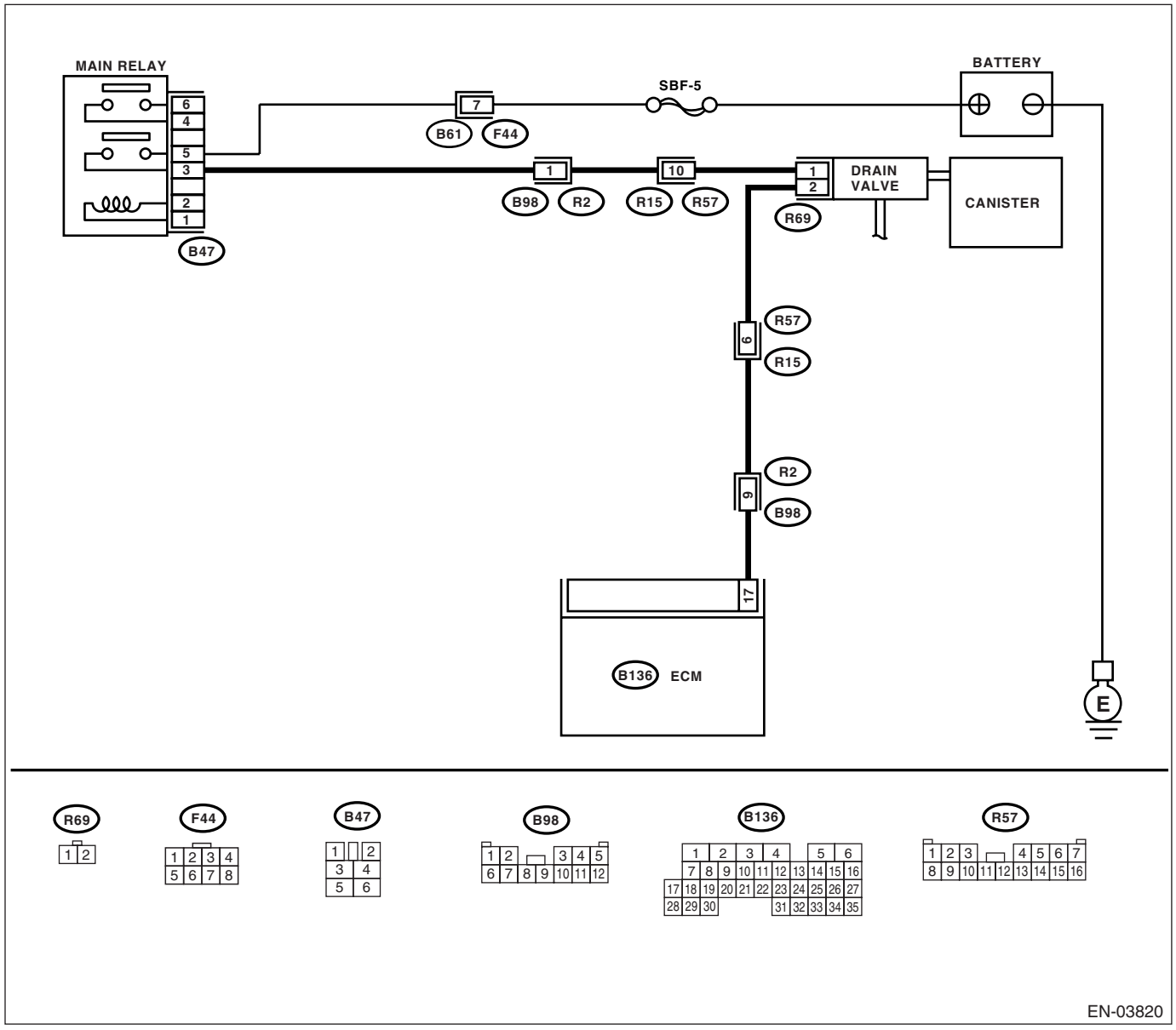
TROUBLE SYMPTOM:

Improper fuel supply

CAUTION:

After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	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)-65, 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 test mode connector at the lower portion of instrument panel (on the drivers side). 3) Turn the ignition switch to ON. 4) Operate the drain valve. NOTE: Drain valve operation can also be executed using Subaru Select Monitor. Regarding the procedures, refer to “Compulsory Valve Operation Check Mode”. <Ref. to EN(H4DOTC)(diag)-47, Compulsory Valve Operation Check Mode.>	Does the drain valve operate?	Contact with SOA Service Center. NOTE: The deterioration of multiple parts can be thought as the cause.	Replace the drain valve. <Ref. to EC(H4DOTC)-20, Drain Valve.>

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

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-217, DTC P1491 POSITIVE CRANKCASE VENTILATION (BLOW-BY) FUNCTION PROBLEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

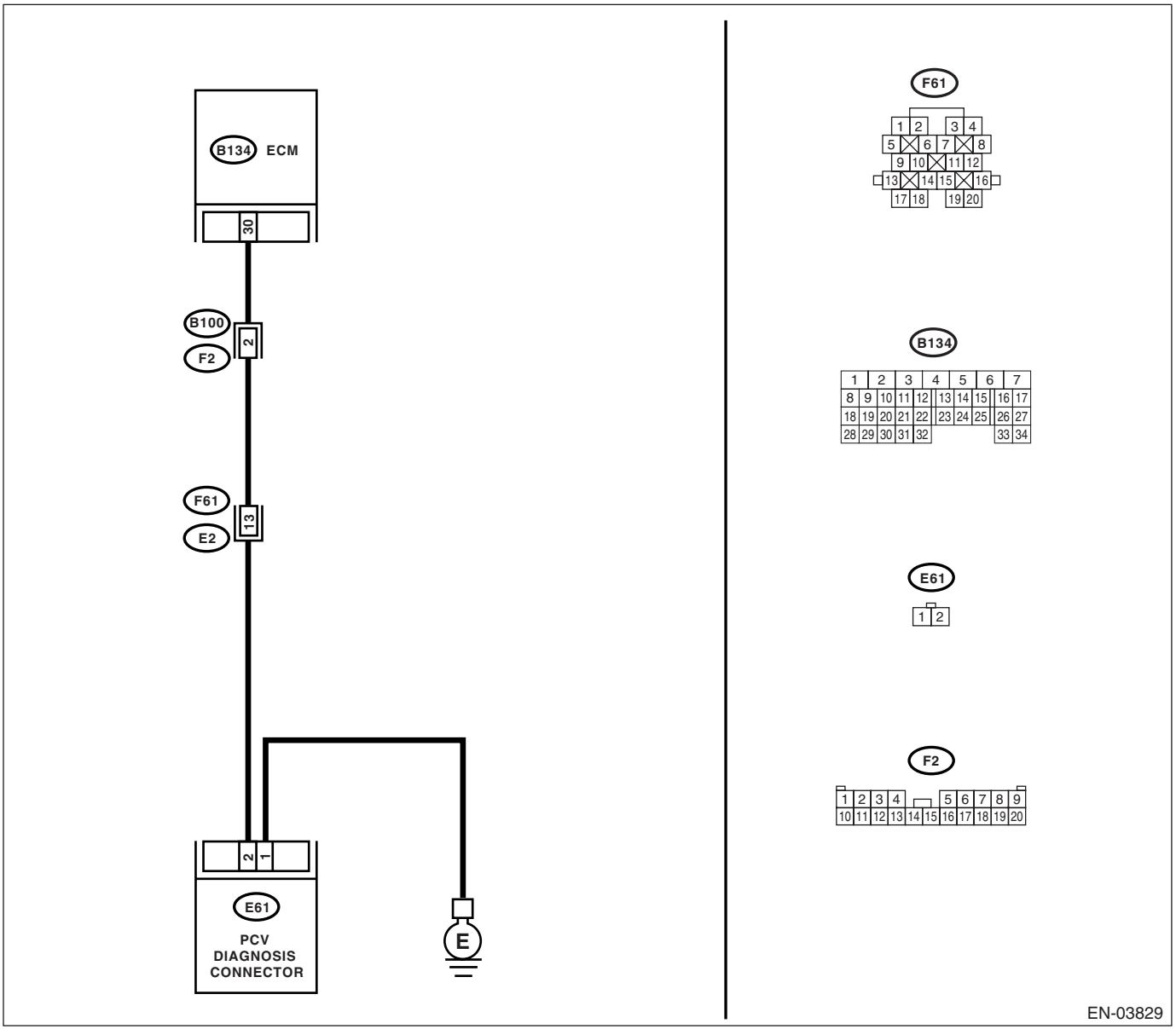
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK BLOW-BY HOSE.** Check the condition of the blow-by hose.	Has the blow by hose been disconnected or cracked?	Repair or replace the blow by hose.	Go to step **2**.

	Step	Check	Yes	No
2	**CHECK HARNESS BETWEEN PCV DIAGNOSIS CONNECTOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the PCV diagnosis connector and ECM. 3) Measure the resistance of the harness between the PCV diagnosis connector and the ECM connector. ***Connector & terminal*** ***(B134) No. 30 — (E61) No. 2:***	Is the resistance less than 1 Ω?	Go to step **3**.	Repair the open circuit of the harness between the PCV diagnosis connector and ECM connector.
3	**CHECK HARNESS BETWEEN PCV DIAGNOSIS CONNECTOR AND ECM CONNECTOR.** Measure the resistance of harness between PCV diagnosis connector and chassis ground. ***Connector & terminal*** ***(B134) No. 30 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4**.	Repair the ground short of the harness between the PCV diagnosis connector and ECM connector.
4	**CHECK PCV DIAGNOSIS CONNECTOR GROUND CIRCUIT.** Measure the resistance of harness between PCV diagnosis connector and engine ground. ***Connector & terminal*** ***(E61) No. 1 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **5**.	Repair the ground circuit of the PCV diagnosis connector.
5	**CHECK PCV DIAGNOSIS CONNECTOR.** Measure the resistance between the PCV diagnosis connector terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 1 Ω?	Repair poor contact of the ECM and PCV diagnosis connector.	Replace the PCV diagnosis connector.

DA:DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-219, DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

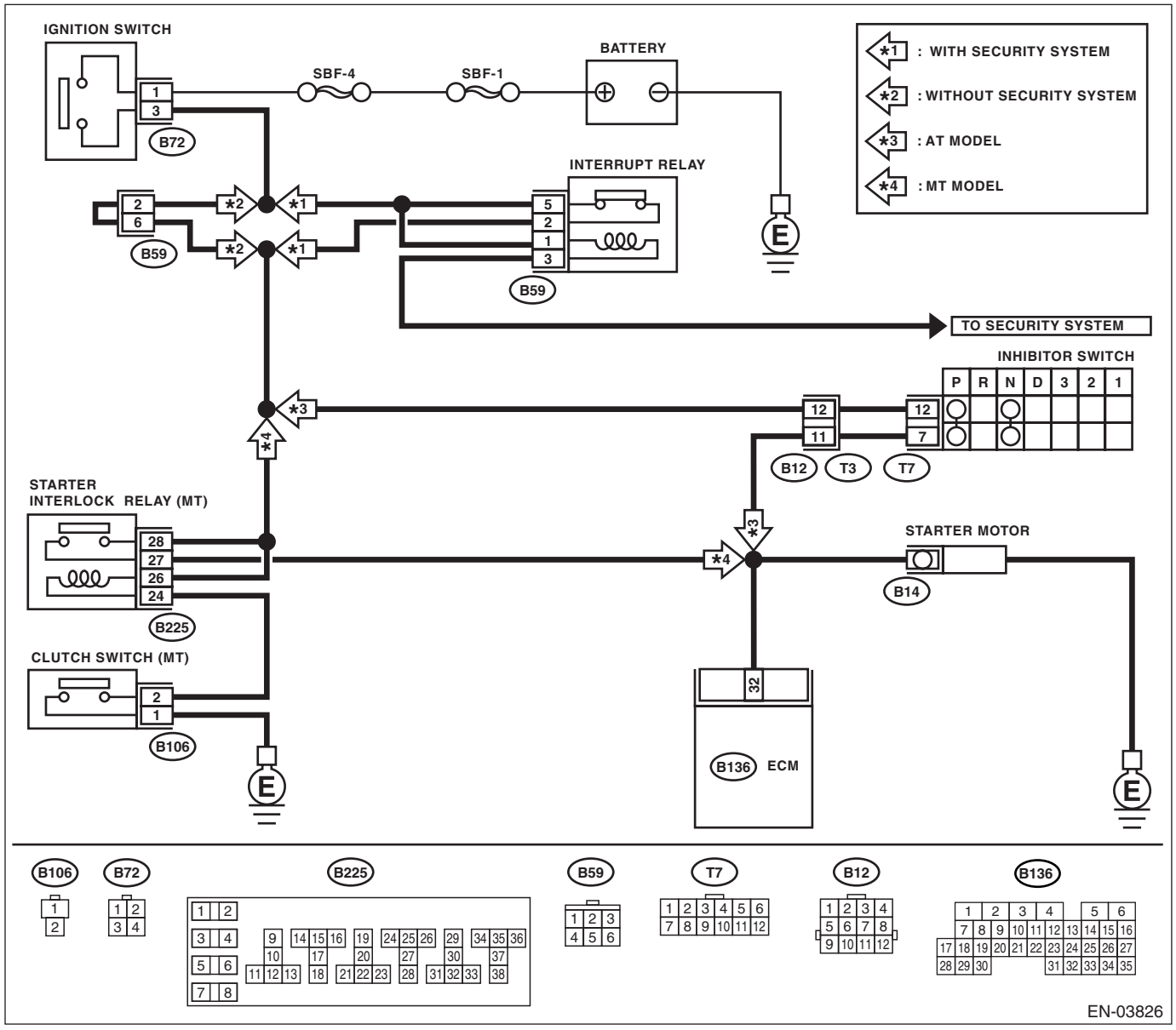
TROUBLE SYMPTOM:

Failure of engine to start

CAUTION:

After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	CHECK OPERATION OF STARTER MOTOR.	Does the starter motor operate when ignition switch is turned to START?	Repair the harness and connector. NOTE: In this case, repair the following item: • Open or ground short circuit of harness between ECM and starter motor connector • Poor contact in ECM connector	Check the starter motor circuit. <Ref. to EN(H4DOTC)(diag)-54, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

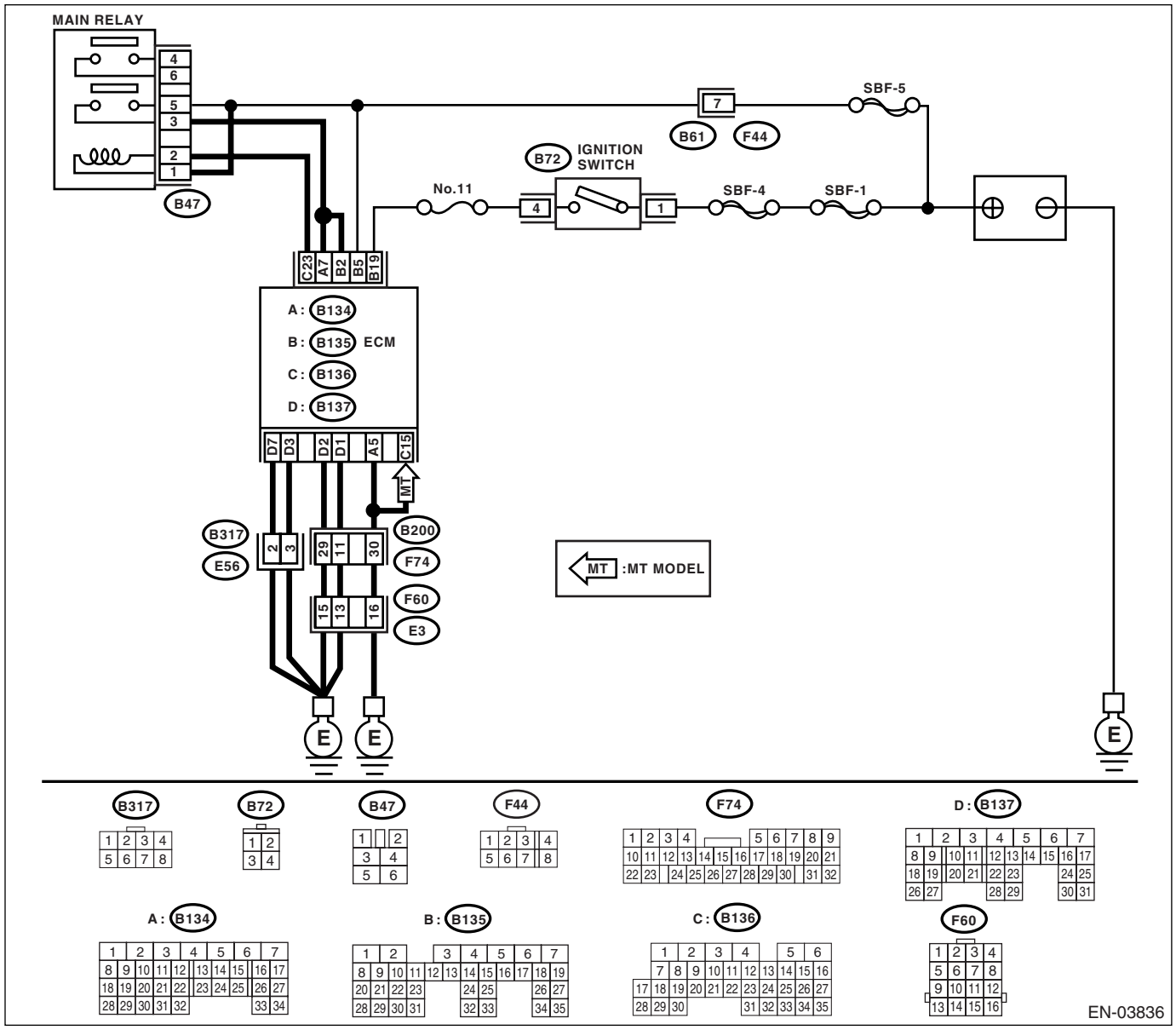
DB:DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-220, DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK INPUT SIGNAL OF ECM.** 1) Turn the ignition switch to OFF. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 5 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair poor contact in ECM connector.	Go to step **2**.

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

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-222, DTC P2004 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, 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)-65, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK TUMBLE GENERATOR VALVE RH.** 1) Remove the tumble generator valve assembly. 2) Check the tumble generator valve body.	Does the tumble generator valve move smoothly? (No dirt or foreign matter is clogged)	Replace the tumble generator valve assembly. <Ref. to FU(H4DOTC)-37, Tumble Generator Valve Assembly.>	Clean the tumble generator valve.

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-223, DTC P2005 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, 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)-65, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK TUMBLE GENERATOR VALVE LH.** 1) Remove the tumble generator valve assembly. 2) Check the tumble generator valve body.	Does the tumble generator valve move smoothly? (No dirt or foreign matter is clogged)	Replace the tumble generator valve assembly. <Ref. to FU(H4DOTC)-37, Tumble Generator Valve Assembly.>	Clean the tumble generator valve.

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-224, DTC P2006 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, 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)-65, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK TUMBLE GENERATOR VALVE RH.** 1) Remove the tumble generator valve assembly. 2) Check the tumble generator valve body.	Does the tumble generator valve move smoothly? (No dirt or foreign matter is clogged)	Replace the tumble generator valve assembly. <Ref. to FU(H4DOTC)-37, Tumble Generator Valve Assembly.>	Clean the tumble generator valve.

DF:DTC P2007 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 2)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-225, DTC P2007 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, 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)-65, List of Diagnostic Trouble Code (DTC).>	Go to step **2**.
2	**CHECK TUMBLE GENERATOR VALVE LH.** 1) Remove the tumble generator valve assembly. 2) Check the tumble generator valve body.	Does the tumble generator valve move smoothly? (No dirt or foreign matter is clogged)	Replace the tumble generator valve assembly. <Ref. to FU(H4DOTC)-37, Tumble Generator Valve Assembly.>	Clean the tumble generator valve.

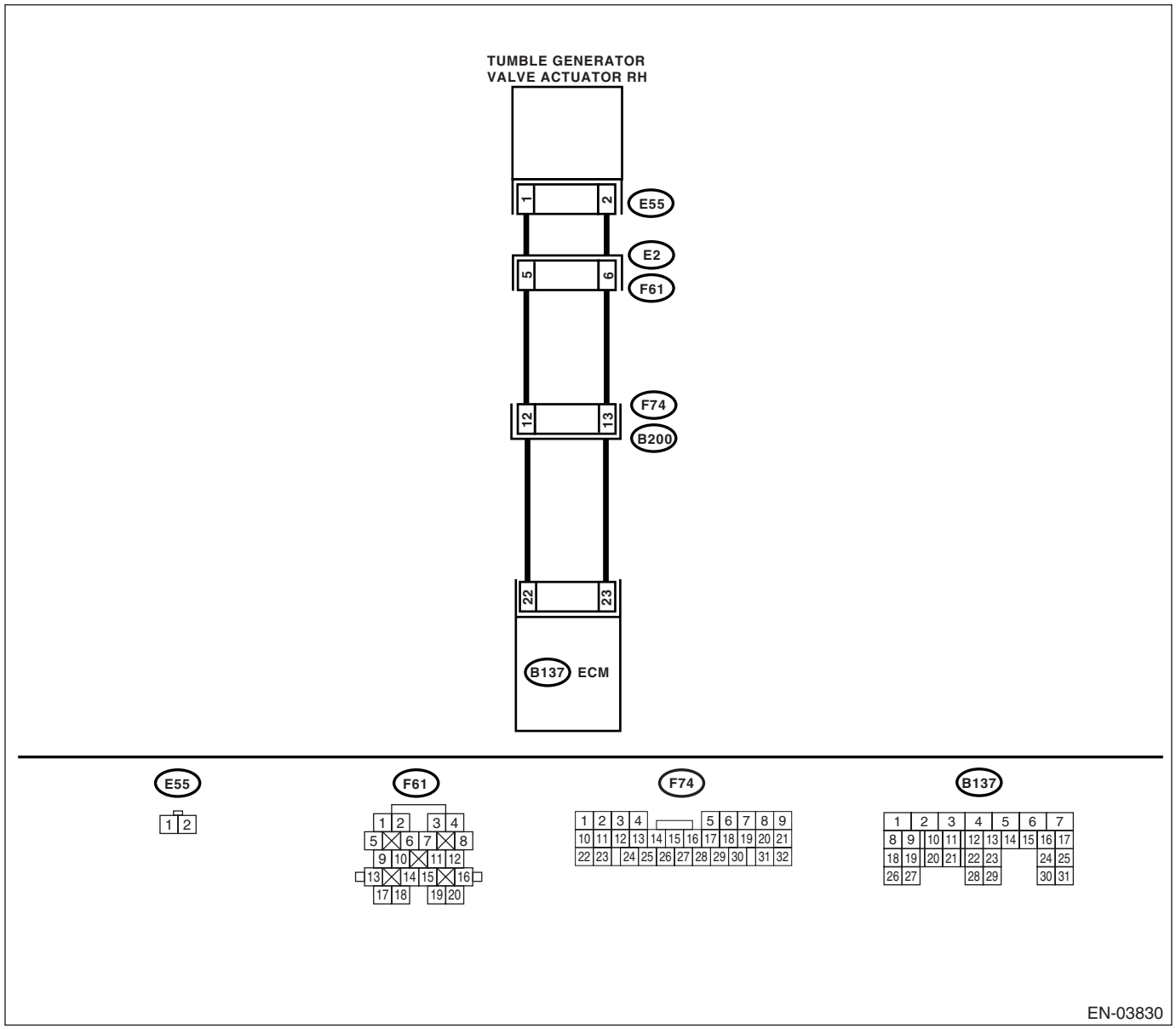
DG:DTC P2008 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-226, DTC P2008 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ACTUATOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from tumble generator valve and ECM connector. 3) Measure the resistance between tumble generator valve actuator and ECM connector. ***Connector & terminal*** ***(E55) No. 1 — (B137) No. 22:*** ***(E55) No. 2 — (B137) No. 23:***	Is the resistance less than 1 Ω?	Go to step **2**.	Repair the open circuit between ECM and tumble generator valve connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and tumble generator valve actuator connector • Poor contact of coupling connector
2	**CHECK POOR CONTACT.** Check poor contact in tumble generator valve actuator connector.	Is there poor contact in tumble generator valve actuator connector?	Repair the poor contact of tumble generator valve actuator connector.	Replace the tumble generator valve actuator. <Ref. to FU(H4DOTC)-38, Tumble Generator Valve Actuator.>

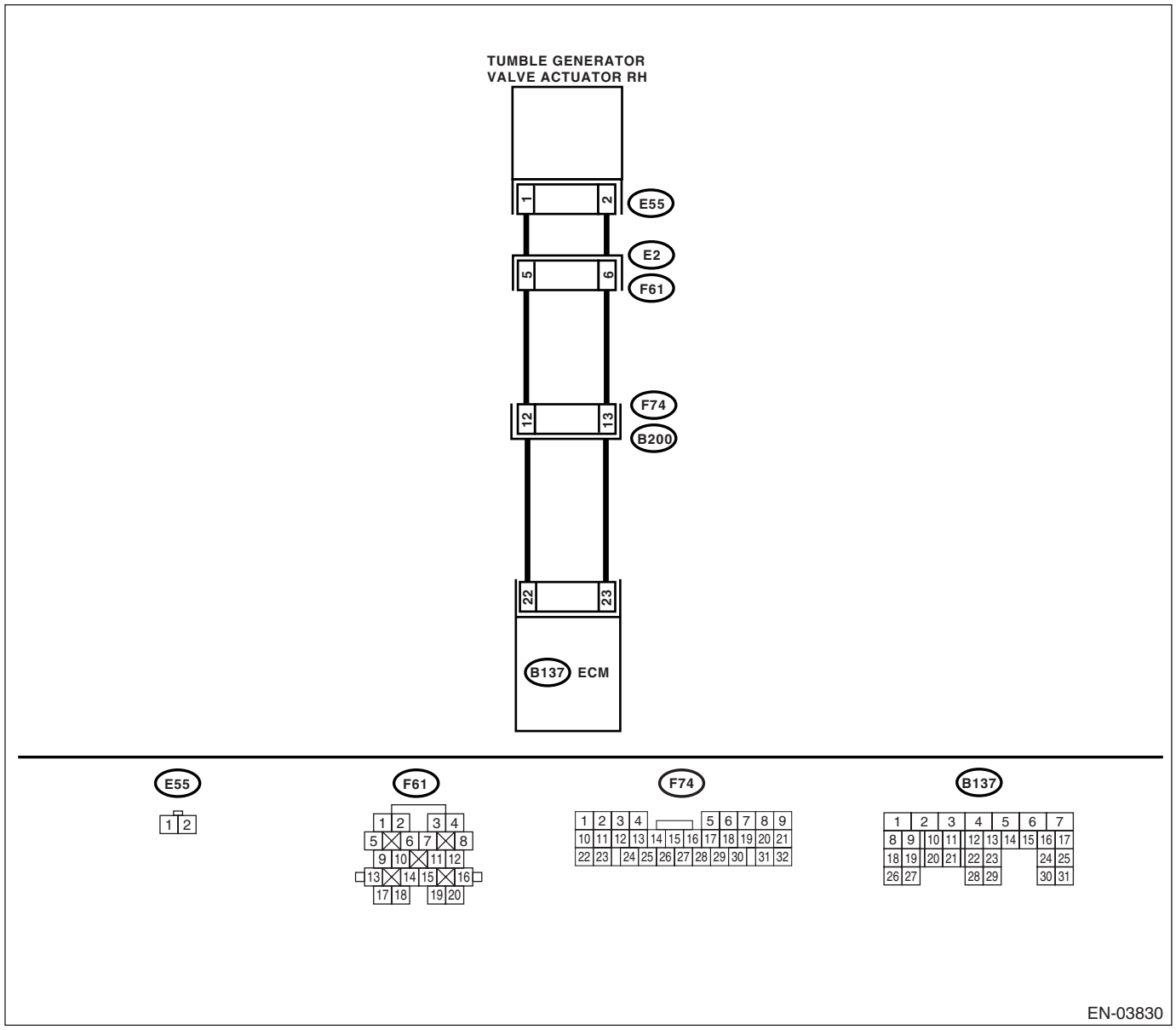
DH:DTC P2009 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-228, DTC P2009 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ACTUATOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from tumble generator valve connector. 3) Measure the voltage between tumble generator valve actuator and chassis ground. ***Connector & terminal*** ***(E55) No. 1 (+) — Chassis ground (–):*** ***(E55) No. 2 (+) — Chassis ground (–):***	Is the voltage less than 5 V?	Replace the tumble generator valve actuator. <Ref. to FU(H4DOTC)-38, Tumble Generator Valve Actuator.>	Repair the battery short circuit between ECM and tumble generator valve actuator.

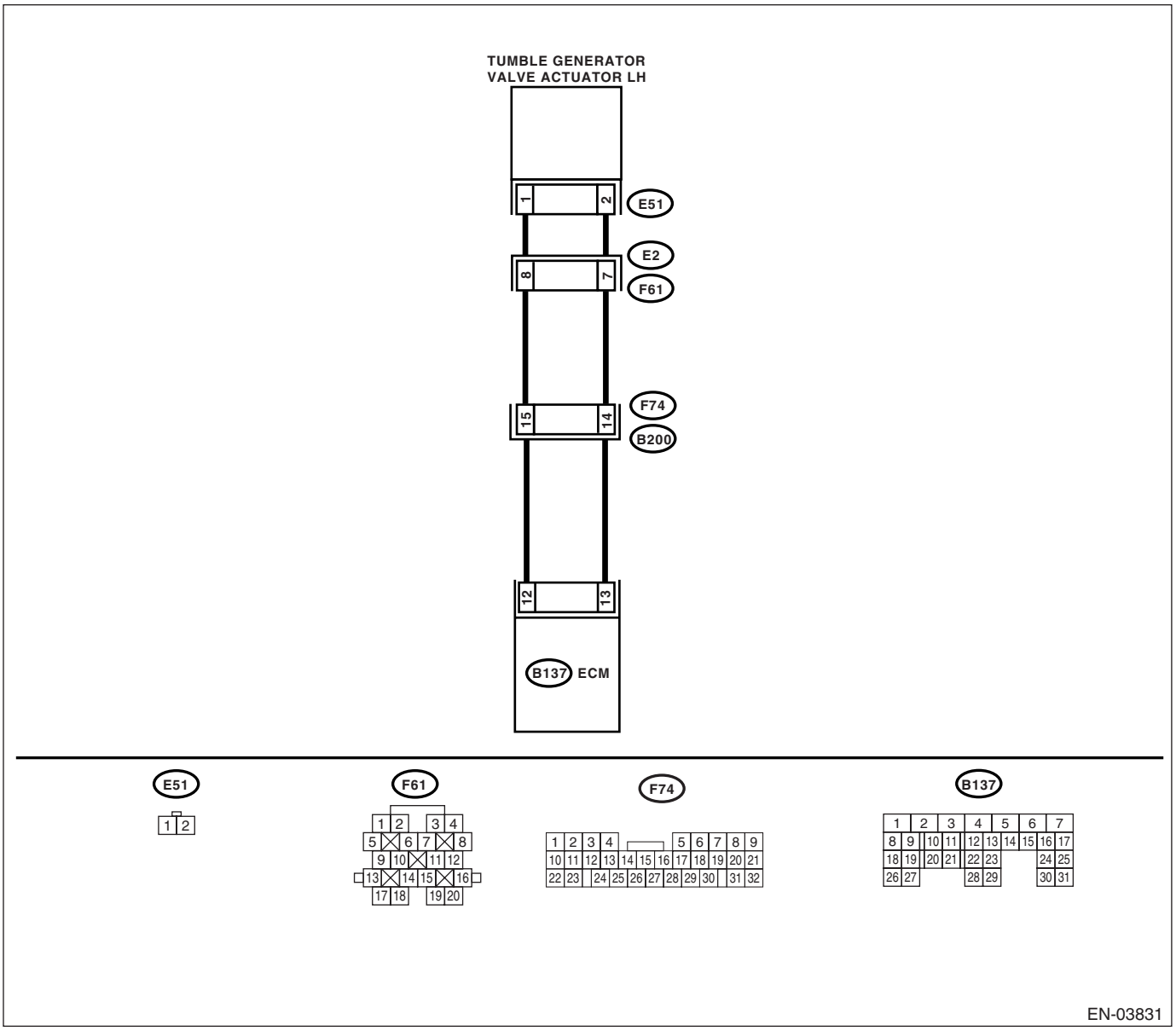
DI: DTC P2011 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 2)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-230, DTC P2011 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ACTUATOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from tumble generator valve and ECM connector. 3) Measure the resistance between tumble generator valve actuator and ECM connector. ***Connector & terminal*** ***(E51) No. 1 — (B137) No. 12:*** ***(E51) No. 2 — (B137) No. 13:***	Is the resistance less than 1 Ω?	Go to step **2**.	Repair the open circuit between ECM and tumble generator valve connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and tumble generator valve actuator connector • Poor contact of coupling connector
2	**CHECK POOR CONTACT.** Check poor contact in tumble generator valve actuator connector.	Is there poor contact in tumble generator valve actuator connector?	Repair the poor contact of tumble generator valve actuator connector.	Replace the tumble generator valve actuator. <Ref. to FU(H4DOTC)-38, Tumble Generator Valve Actuator.>

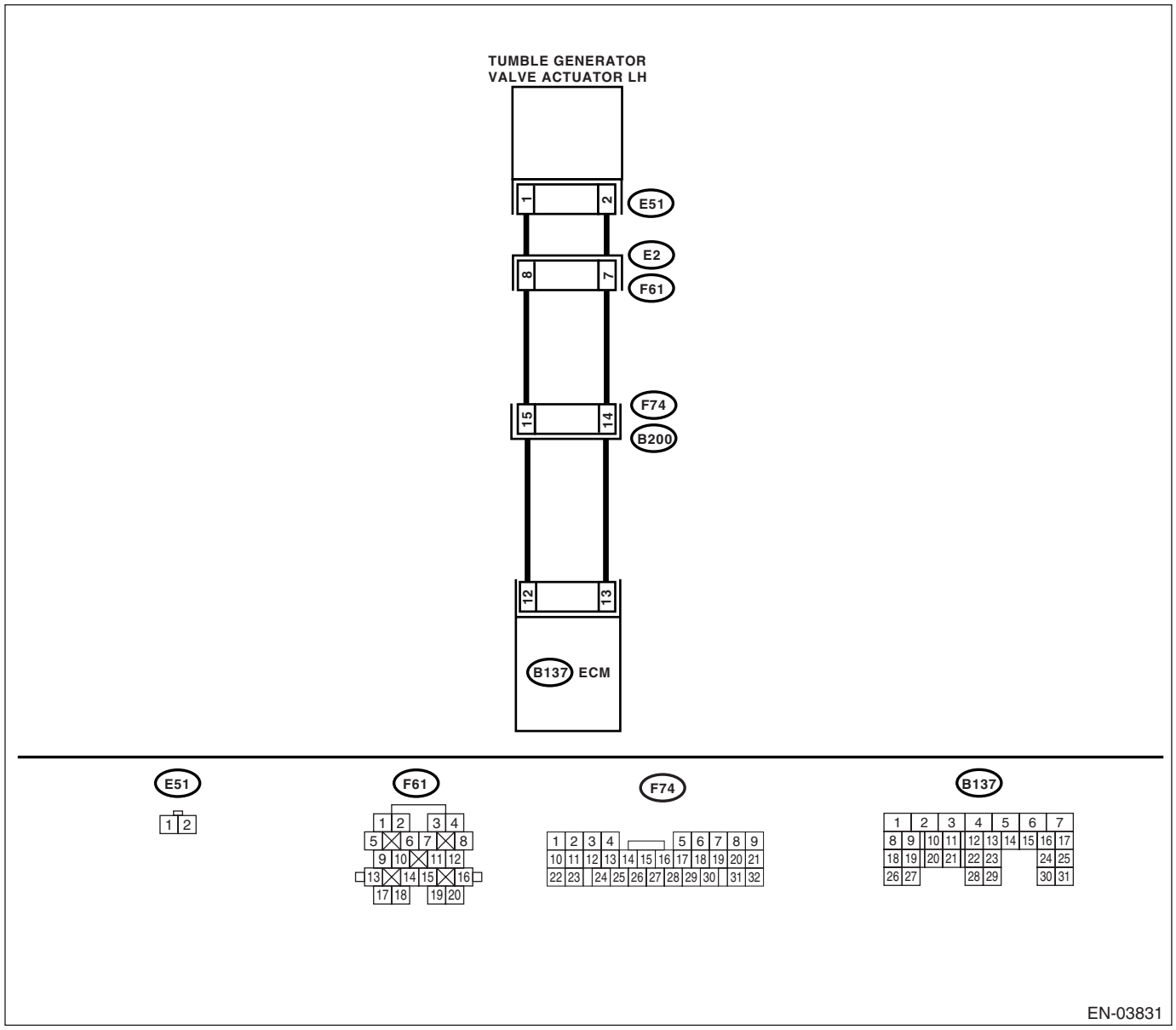
DJ:DTC P2012 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 2)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-232, DTC P2012 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ACTUATOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from tumble generator valve connector. 3) Measure the voltage between tumble generator valve actuator and chassis ground. ***Connector & terminal*** ***(E51) No. 1 (+) — Chassis ground (–):*** ***(E51) No. 2 (+) — Chassis ground (–):***	Is the voltage less than 5 V?	Replace the tumble generator valve actuator. <Ref. to FU(H4DOTC)-38, Tumble Generator Valve Actuator.>	Repair the battery short circuit between ECM and tumble generator valve actuator.

DK: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)-234, DTC P2016 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT LOW (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

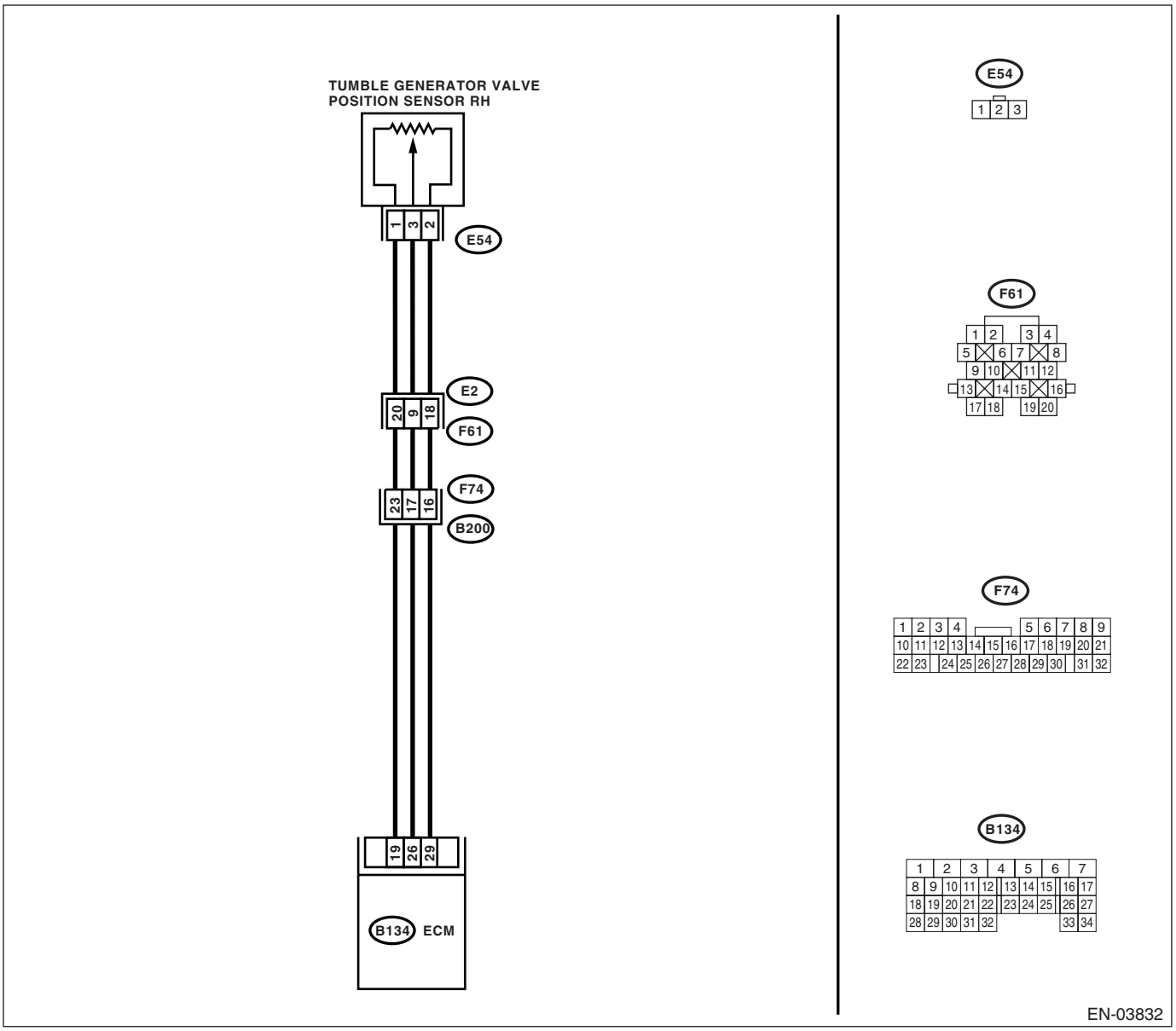
TROUBLE SYMPTOM:

- Improper idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of tumble generator valve position sensor signal 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)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the voltage less than 0.1 V?	Go to step **2**.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following item: • Poor contact of tumble generator valve position sensor connector • Poor contact in ECM connector • Poor contact of coupling connector
2	**CHECK INPUT SIGNAL OF ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 19 (+) — Chassis ground (–):***	Is the voltage more than 4.5 V?	Go to step **4**.	Go to step **3**.
3	**CHECK INPUT SIGNAL OF ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 19 (+) — Chassis ground (–):***	Does the voltage change when shaking the harness and connector of the ECM while monitoring the value with a voltage meter?	Repair poor contact in ECM connector.	Contact with SOA Service Center. NOTE: The deterioration of multiple parts can be thought as the cause.
4	**CHECK INPUT SIGNAL OF ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 26 (+) — Chassis ground (–):***	Is the voltage less than 0.1 V?	Go to step **6**.	Go to step **5**.
5	**CHECK INPUT SIGNAL FOR ECM (USING SUBARU SELECT MONITOR).** Measure the voltage between ECM connector and chassis ground.	Does the voltage change by shaking the harness and connector of the ECM while monitoring the value with Subaru Select Monitor?	Repair poor contact in ECM connector.	Go to step **6**.

	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the tumble generator valve position sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between tumble generator valve position sensor connector and engine ground. ***Connector & terminal*** ***(E54) No. 1 (+) — Engine ground (–):***	Is the voltage more than 4.5 V?	Go to step **7**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between tumble generator valve position sensor and ECM connector • Poor contact of tumble generator valve position sensor connector • Poor contact in ECM connector • Poor contact of coupling connector • Poor contact of joint connector
7	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between ECM connector and tumble generator valve position sensor connector. ***Connector & terminal*** ***(B134) No. 26 — (E54) No. 3:***	Is the resistance less than 1 Ω?	Go to step **8**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between tumble generator valve position sensor and ECM connector • Poor contact in ECM connector • Poor contact of tumble generator valve position sensor connector • Poor contact of coupling connector
8	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.** Measure the resistance of the harness between the tumble generator valve position sensor connector and engine ground. ***Connector & terminal*** ***(E54) No. 3 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **9**.	Repair the ground short circuit of the harness between the tumble generator valve position sensor and ECM connector.

Step		Check	Yes	No
9	**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 poor contact of the tumble generator valve position sensor connector.	Replace the tumble generator valve position sensor. <Ref. to FU(H4DOTC)-39, Tumble Generator Valve Position Sensor.>

DL: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)-236, DTC P2017 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT HIGH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

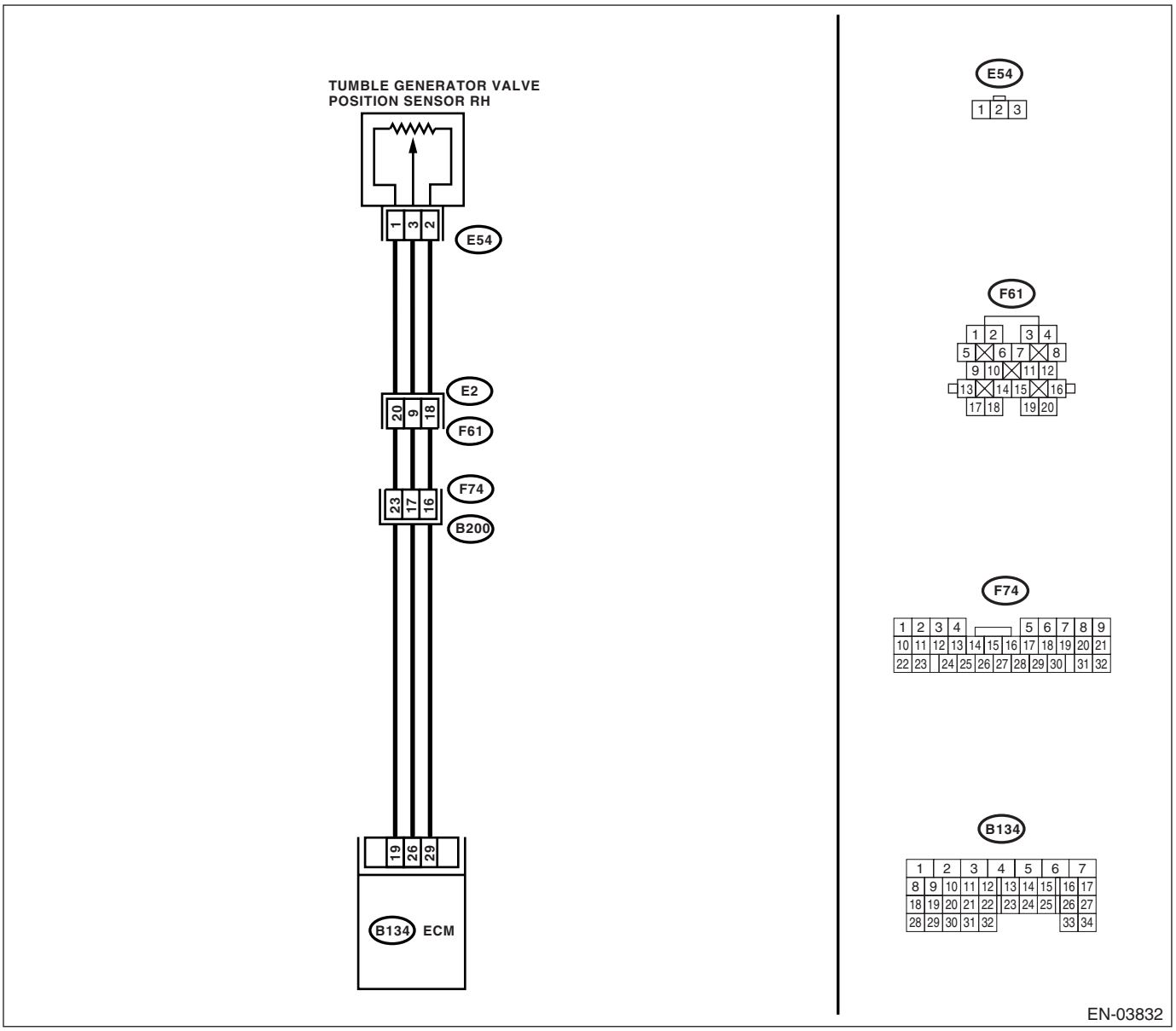
TROUBLE SYMPTOM:

- Improper idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of tumble generator valve position sensor signal 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)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the voltage more than 4.9 V?	Go to step **2**.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following item: • Poor contact of tumble generator valve position sensor connector • Poor contact in ECM connector • Poor contact of coupling connector
2	**CHECK HARNESS BETWEEN TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the tumble generator valve position sensor. 3) 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 **3**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between tumble generator valve position sensor and ECM connector • Poor contact of coupling connector • Poor contact of joint connector
3	**CHECK HARNESS BETWEEN TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR AND ECM CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between tumble generator valve position sensor connector and engine ground. ***Connector & terminal*** ***(E54) No. 3 (+) — Engine ground (–):***	Is the voltage more than 4.9 V?	Repair the battery short circuit of harness between tumble generator valve position sensor and ECM connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>	Replace the tumble generator valve position sensor. <Ref. to FU(H4DOTC)-39, Tumble Generator Valve Position Sensor.>

DM: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)-238, DTC P2021 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT LOW (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

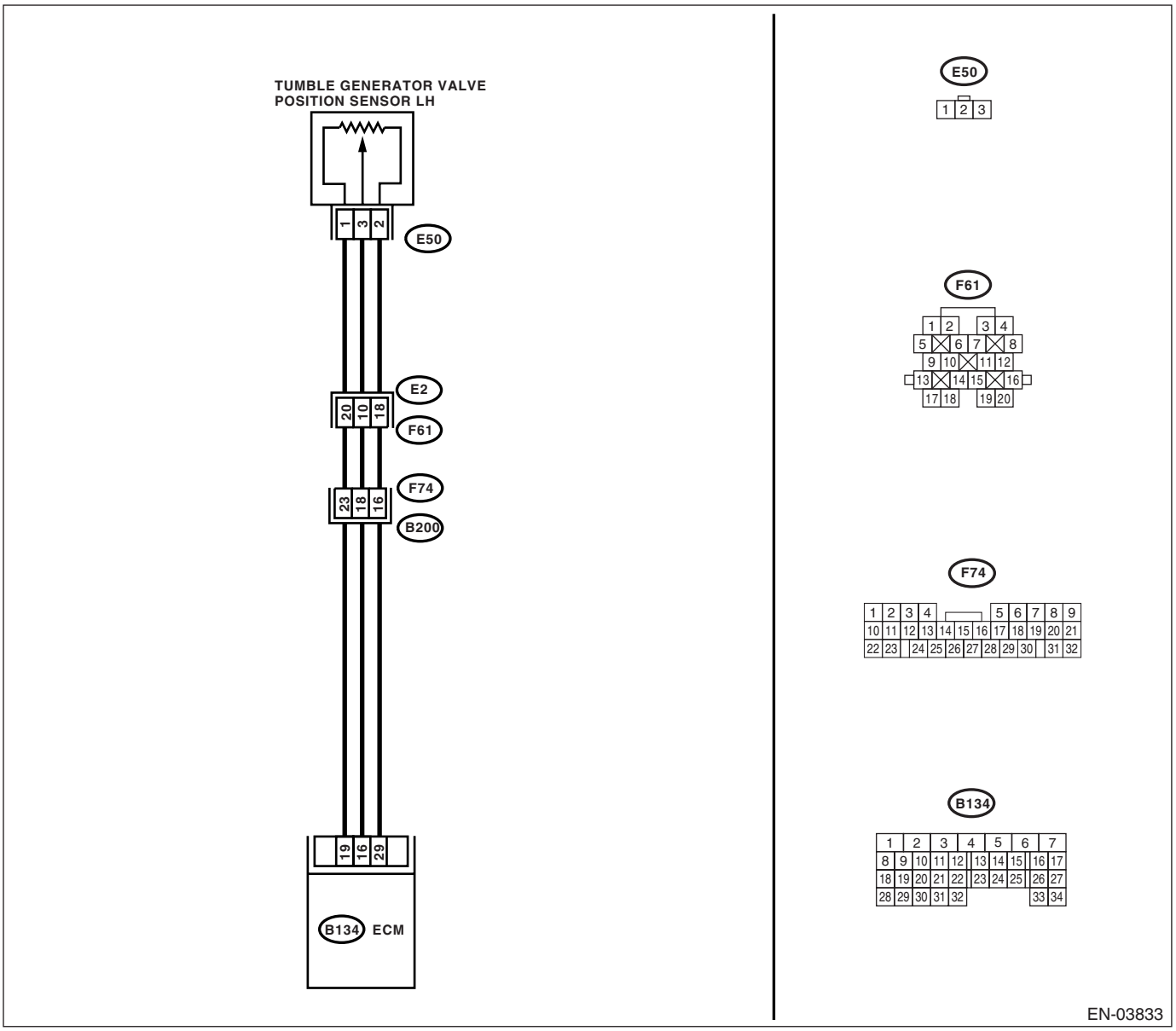
TROUBLE SYMPTOM:

- Improper idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of tumble generator valve position sensor signal 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)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the voltage less than 0.1 V?	Go to step **2**.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following item: • Poor contact of tumble generator valve position sensor connector • Poor contact in ECM connector • Poor contact of coupling connector
2	**CHECK INPUT SIGNAL OF ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 19 (+) — Chassis ground (–):***	Is the voltage more than 4.5 V?	Go to step **4**.	Go to step **3**.
3	**CHECK INPUT SIGNAL OF ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 19 (+) — Chassis ground (–):***	Does the voltage change when shaking the harness and connector of the ECM while monitoring the value with a voltage meter?	Repair poor contact in ECM connector.	Contact with SOA Service Center. NOTE: The deterioration of multiple parts can be thought as the cause.
4	**CHECK INPUT SIGNAL OF ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 16 (+) — Chassis ground (–):***	Is the voltage less than 0.1 V?	Go to step **6**.	Go to step **5**.
5	**CHECK INPUT SIGNAL FOR ECM (USING SUBARU SELECT MONITOR).** Measure the voltage between ECM connector and chassis ground.	Does the voltage change by shaking the harness and connector of ECM while monitoring the value with Subaru Select Monitor?	Repair poor contact in ECM connector.	Go to step **6**.

	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the 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 more than 4.5 V?	Go to step **7**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between tumble generator valve position sensor and ECM connector • Poor contact of tumble generator valve position sensor connector • Poor contact in ECM connector • Poor contact of coupling connector • Poor contact of joint connector
7	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between ECM connector and tumble generator valve position sensor connector. ***Connector & terminal*** ***(B134) No. 16 — (E50) No. 3:***	Is the resistance less than 1 Ω?	Go to step **8**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between tumble generator valve position sensor and ECM connector • Poor contact in ECM connector • Poor contact of tumble generator valve position sensor connector • Poor contact of coupling connector
8	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.** Measure the resistance of the harness between the tumble generator valve position sensor connector and engine ground. ***Connector & terminal*** ***(E50) No. 3 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **9**.	Repair the ground short circuit of the harness between the tumble generator valve position sensor and ECM connector.

Step		Check	Yes	No
9	**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 poor contact of the tumble generator valve position sensor connector.	Replace the tumble generator valve position sensor. <Ref. to FU(H4DOTC)-39, Tumble Generator Valve Position Sensor.>

DN: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)-240, DTC P2022 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT HIGH (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

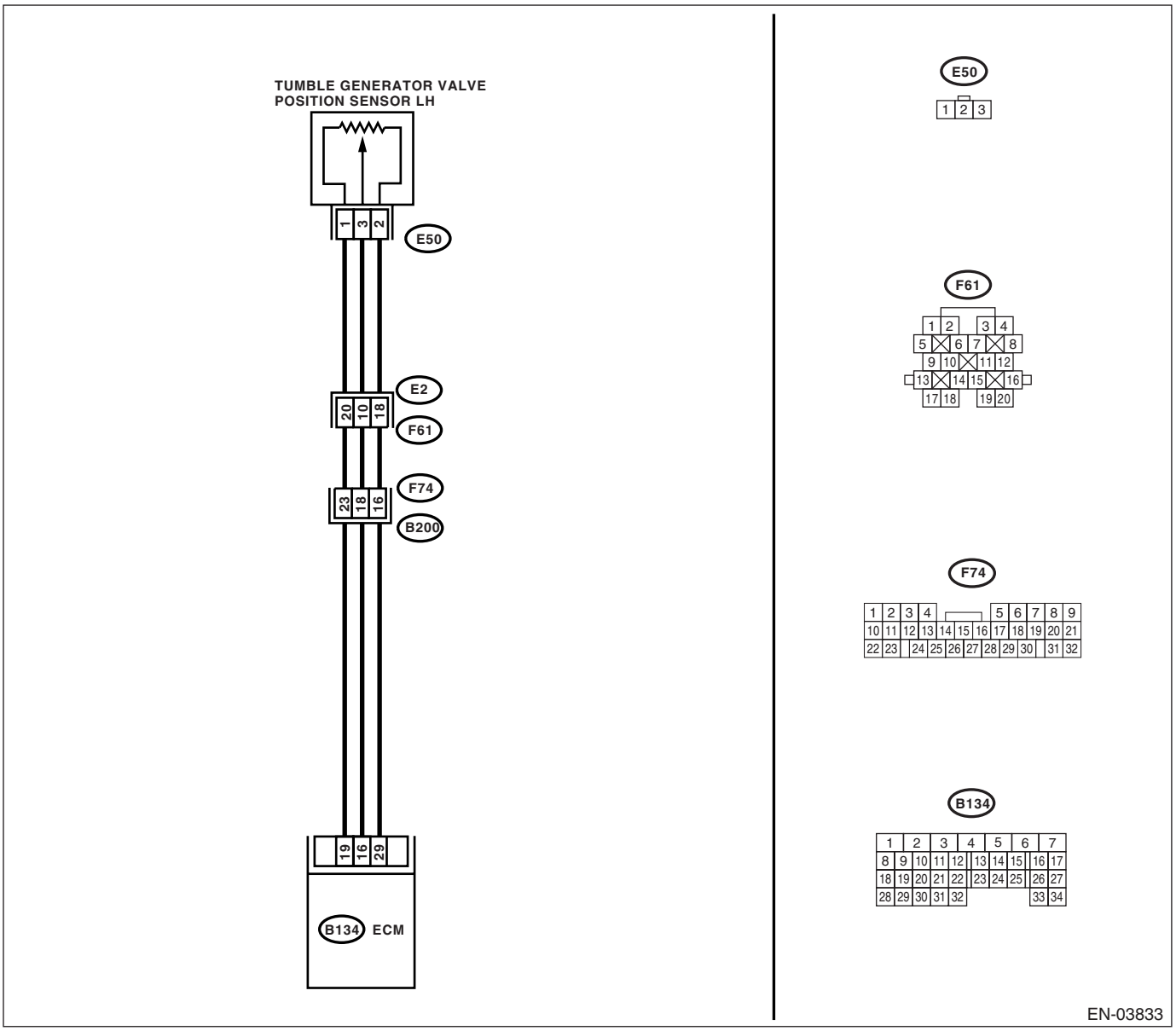
TROUBLE SYMPTOM:

- Improper idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of tumble generator valve position sensor signal 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)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the voltage more than 4.9 V?	Go to step **2**.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following item: • Poor contact of tumble generator valve position sensor connector • Poor contact in ECM connector • Poor contact of coupling connector
2	**CHECK HARNESS BETWEEN TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the tumble generator valve position sensor. 3) Measure the resistance of harness between tumble generator valve position sensor connector and engine ground. ***Connector & terminal*** ***(E50) No. 2 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **3**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between tumble generator valve position sensor and ECM connector • Poor contact of coupling connector • Poor contact of joint connector
3	**CHECK HARNESS BETWEEN TUMBLE GENERATOR VALVE POSITION SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between tumble generator valve position sensor connector and engine ground. ***Connector & terminal*** ***(E50) No. 3 (+) — Engine ground (–):***	Is the voltage more than 4.9 V?	Repair the battery short circuit of harness between tumble generator valve position sensor and ECM connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>	Replace the tumble generator valve position sensor. <Ref. to FU(H4DOTC)-39, Tumble Generator Valve Position Sensor.>

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

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-242, DTC P2088 OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

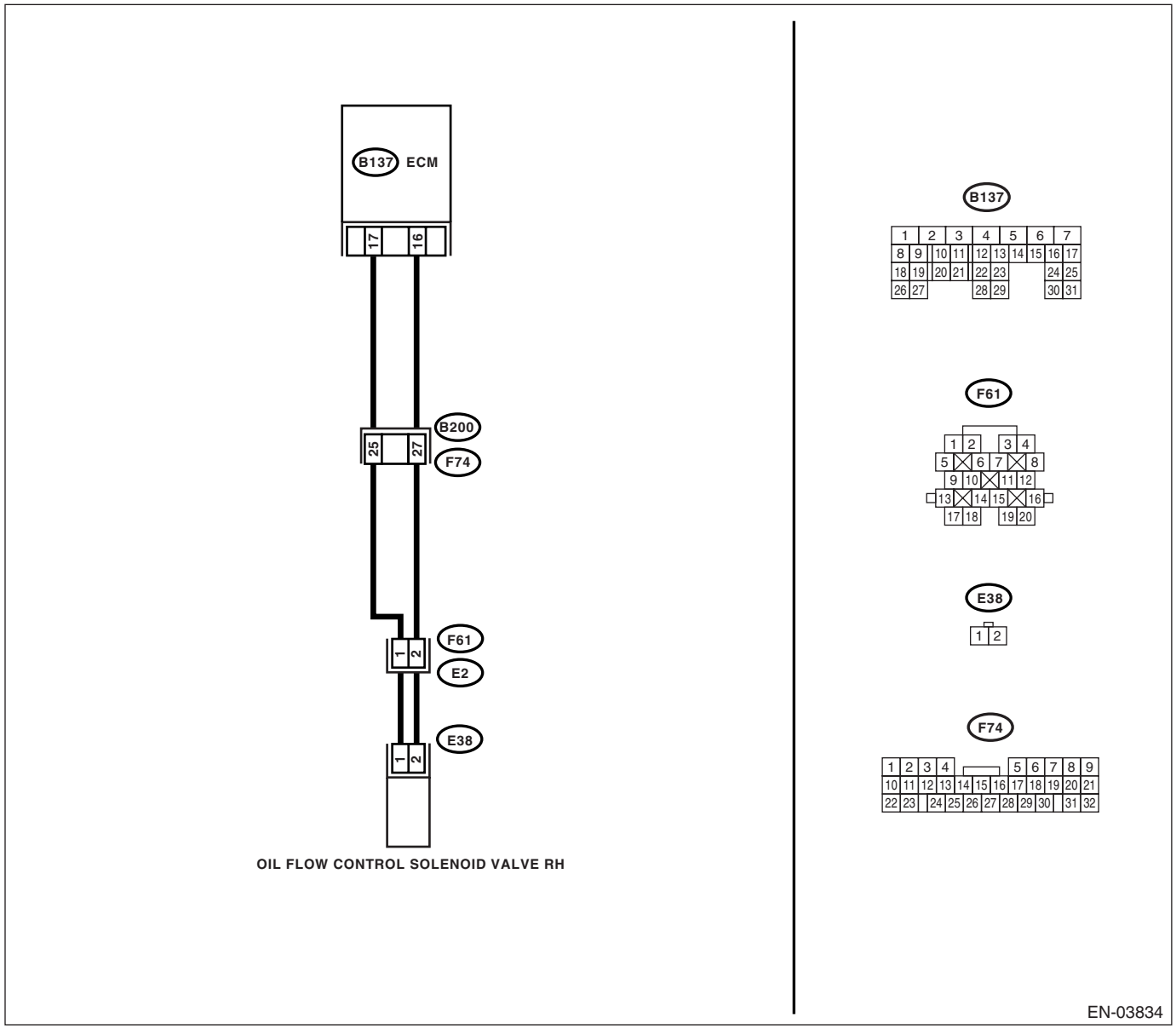
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	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 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 open circuit of harness between ECM and oil flow control solenoid valve connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and oil flow control solenoid valve connector • Poor contact of the coupling connector
2	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.** Measure the resistance between ECM and oil flow control solenoid valve. ***Connector & terminal*** ***(E38) No. 1 — Engine ground:*** ***(E38) No. 2 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **3**.	Repair the short circuit between ECM and oil flow control solenoid valve connector.
3	**CHECK OIL FLOW CONTROL SOLENOID VALVE.** 1) Remove the oil flow control solenoid valve connector. 2) Measure the resistance between oil flow control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance between 6 and 12 Ω?	Repair the poor contact of ECM and oil flow control solenoid valve.	Replace the oil flow control solenoid valve. <Ref. to ME(H4DOTC)-52, Camshaft.>

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

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-244, DTC P2089 OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

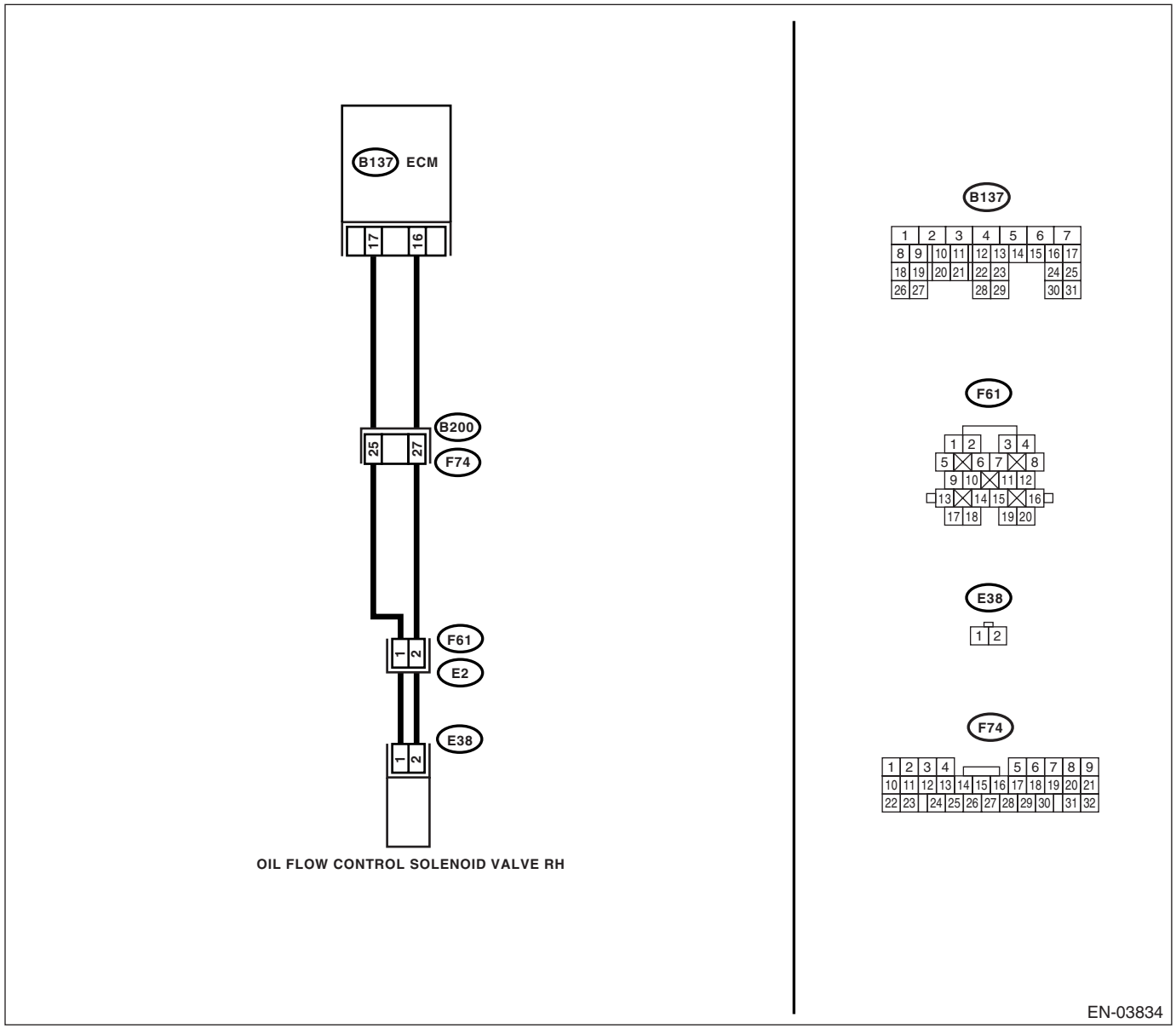
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	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 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 open circuit of harness between ECM and oil flow control solenoid valve connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and oil flow control solenoid valve connector • Poor contact of the coupling connector
2	**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 between ECM and oil flow control solenoid valve. ***Connector & terminal*** ***(E38) No. 1 — Engine ground:*** ***(E38) No. 2 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **3**.	Repair the short circuit between ECM and oil flow control solenoid valve connector.
3	**CHECK OIL FLOW CONTROL SOLENOID VALVE.** 1) Remove the oil flow control solenoid valve connector. 2) Measure the resistance between oil flow control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance between 6 and 12 Ω?	Repair the poor contact of ECM and oil flow control solenoid valve.	Replace the oil flow control solenoid valve. <Ref. to ME(H4DOTC)-52, Camshaft.>

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

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-246, DTC P2092 OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

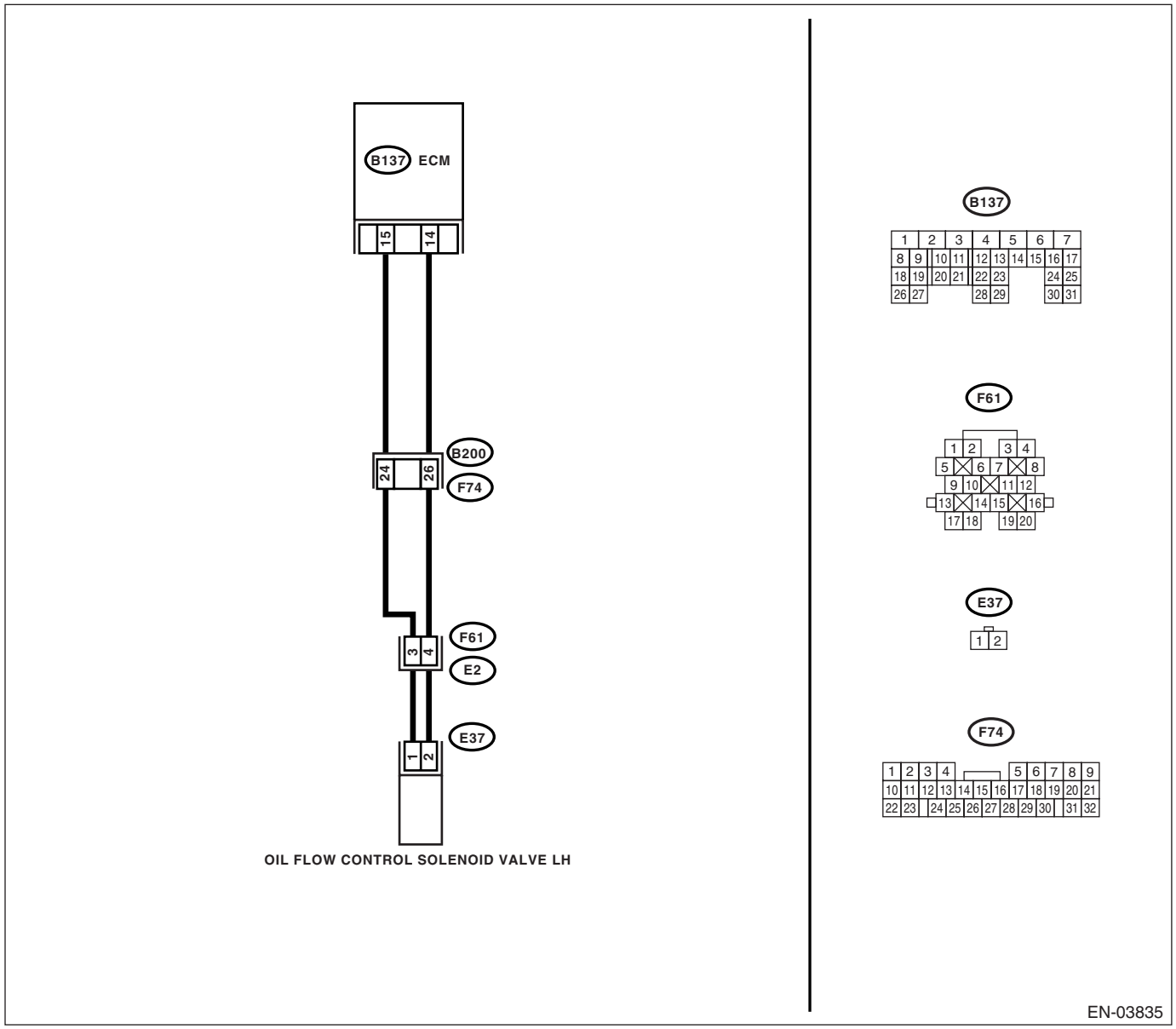
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	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 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 open circuit of harness between ECM and oil flow control solenoid valve connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and oil flow control solenoid valve connector • Poor contact of the coupling connector
2	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.** Measure the resistance between ECM and oil flow control solenoid valve. ***Connector & terminal*** ***(E37) No. 1 — Engine ground:*** ***(E37) No. 2 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **3**.	Repair the short circuit between ECM and oil flow control solenoid valve connector.
3	**CHECK OIL FLOW CONTROL SOLENOID VALVE.** 1) Remove the oil flow control solenoid valve connector. 2) Measure the resistance between oil flow control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance between 6 and 12 Ω?	Repair the poor contact of ECM and oil flow control solenoid valve.	Replace the oil flow control solenoid valve. <Ref. to ME(H4DOTC)-52, Camshaft.>

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

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-248, DTC P2093 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

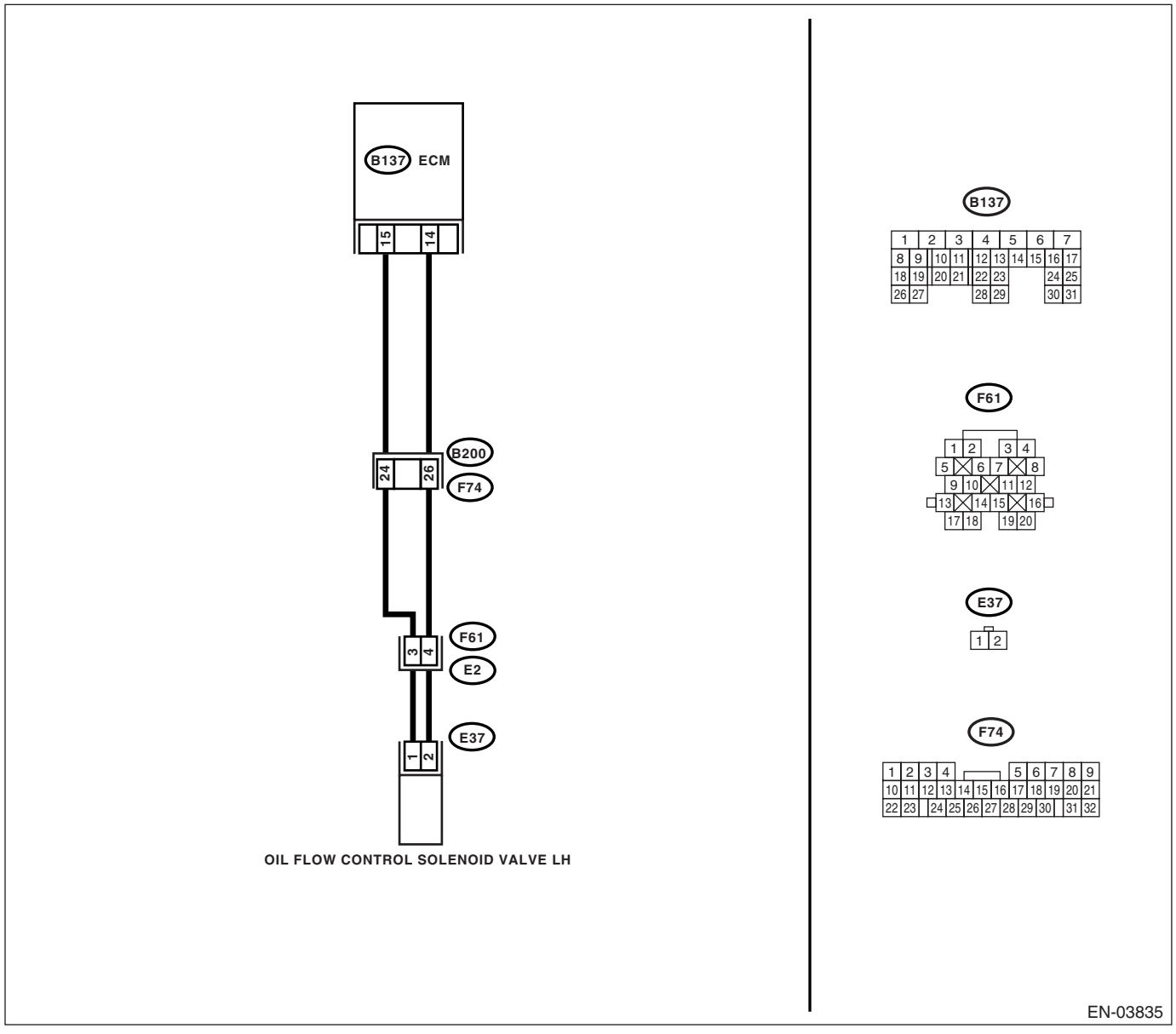
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	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 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 open circuit of harness between ECM and oil flow control solenoid valve connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and oil flow control solenoid valve connector • Poor contact of the coupling connector
2	**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 between ECM and oil flow control solenoid valve. ***Connector & terminal*** ***(E37) No. 1 — Engine ground:*** ***(E37) No. 2 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **3**.	Repair the short circuit between ECM and oil flow control solenoid valve connector.
3	**CHECK OIL FLOW CONTROL SOLENOID VALVE.** 1) Remove the oil flow control solenoid valve connector. 2) Measure the resistance between oil flow control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance between 6 and 12 Ω?	Repair the poor contact of ECM and oil flow control solenoid valve.	Replace the oil flow control solenoid valve. <Ref. to ME(H4DOTC)-52, Camshaft.>

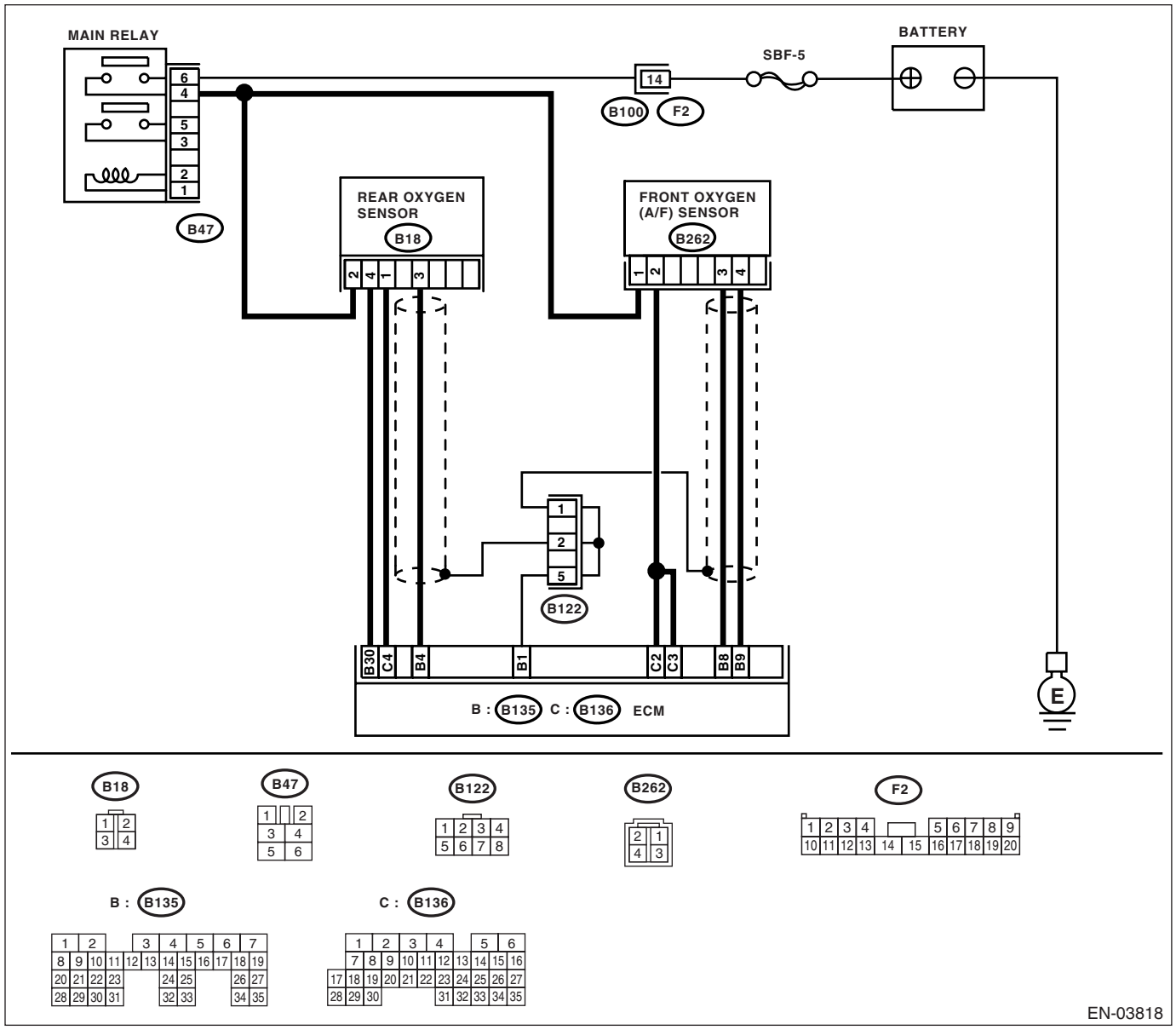
DS:DTC P2096 POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-250, DTC P2096 POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	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)-65, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P2096.	Go to step **2**.
2	**CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Does water enter the connector?	Dry the water thoroughly.	Go to step **3**.
3	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and front oxygen (A/F) sensor connector. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B135) No. 8 — (B262) No. 3:*** ***(B135) No. 9 — (B262) No. 4:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of the harness between ECM and front oxygen (A/F) sensor connector. • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector
4	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 8 — Chassis ground:*** ***(B135) No. 9 — Chassis ground:***	Is the resistance more than 1 MΩ?	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) Attach the connector to the ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 8 (+) — Chassis ground (–):***	Is the voltage more than 4.5 V?	Go to step **6**.	Go to step **7**.
6	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 8 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair the battery short circuit of harness between ECM and front oxygen (A/F) sensor connector. After repair, replace the ECM.<Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>	Repair poor contact in ECM connector.

	Step	Check	Yes	No
7	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (–):***	Is the voltage more than 4.95 V?	Go to step **8**.	Go to step **9**.
8	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair the battery short circuit of harness between ECM and front oxygen (A/F) sensor connector. After repair, replace the ECM.<Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>	Repair poor contact in ECM connector.
9	**CHECK EXHAUST SYSTEM.**	Are there holes or loose bolts on exhaust system?	Repair the exhaust system.	Go to step **10**.
10	**CHECK AIR INTAKE SYSTEM.**	Are there holes, loose bolts or disconnection of hose on air intake system?	Repair the air intake system.	Go to step **11**.
11	**CHECK FUEL PRESSURE.** **WARNING:** **• Place "NO FIRE" signs near the working area.** **• Be careful not to spill fuel.** Measure the fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold.<Ref. to ME(H4DOTC)-25, INSPECTION, Fuel Pressure.> **WARNING:** **Release fuel pressure before removing the fuel pressure gauge.** NOTE: If fuel pressure does not increase, squeeze the fuel return hose 2 to 3 times, then measure fuel pressure again.	Is the measured value 284 — 314 kPa (2.9 — 3.2 kgf/cm^2, 41 — 46 psi)?	Go to step **12**.	Repair the following item. Fuel pressure is too high: • Clogged fuel return line or bent hose Fuel pressure is too low: • Improper fuel pump discharge • Clogged fuel supply line
12	**CHECK FUEL PRESSURE.** After connecting the pressure regulator vacuum hose, measure fuel pressure.<Ref. to ME(H4DOTC)-25, INSPECTION, Fuel Pressure.> **WARNING:** **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 **13**.	Repair the following item. Fuel pressure is too high: • Faulty pressure regulator • Clogged fuel return line or bent hose Fuel pressure is too low: • Faulty pressure regulator • Improper fuel pump discharge • Clogged fuel supply line

	Step	Check	Yes	No
13	**CHECK ENGINE COOLANT TEMPERATURE SENSOR.** 1) Start the engine and warm-up completely. 2) Read the data of the engine coolant temperature sensor signal using the Subaru Select Monitor or the general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the temperature above 60°C (140°F)?	Go to step **14**.	Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC)-27, Engine Coolant Temperature Sensor.>
14	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.** 1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F). 2) Place the shift lever in neutral position. 3) Turn the A/C switch to OFF. 4) Turn all the accessory switches off. 5) Read the data of mass air flow and intake air temperature sensor signal using the Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the measured value 2.7 — 4.7 g/s (0.36 — 0.62 lb/m)	Go to step **15**.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-31, Mass Air Flow and Intake Air Temperature Sensor.>
15	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.** 1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F). 2) Place the shift lever in neutral position. 3) Turn the A/C switch to OFF. 4) Turn all the accessory switches 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 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)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Subtract ambient temperature from intake air temperature. Is the obtained value –10 — 50°C (–18 — 90°F)?	Go to step **16**.	Check mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-31, Mass Air Flow and Intake Air Temperature Sensor.>

	Step	Check	Yes	No
16	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and keep the engine speed at 3,000 rpm. (Max. 2 minutes) 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • For MT model, depress the clutch pedal. • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the voltage more than 490 mV?	Go to step **20**.	Go to step **17**.
17	**CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Does water enter the connector?	Dry the water thoroughly.	Go to step **18**.
18	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. ***Connector & terminal*** ***(B135) No. 4 — (B18) No. 3:*** ***(B135) No. 30 — (B18) No. 4:***	Is the resistance more than 3 Ω?	Repair the open circuit of harness between ECM and rear oxygen sensor connector.	Go to step **19**.
19	**CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the rear oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between rear oxygen sensor harness connector and engine ground or chassis ground. ***Connector & terminal*** ***(B18) No. 3 (+) — Engine ground (–):***	Is the voltage 0.2 — 0.5 V?	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-43, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between rear oxygen sensor and ECM connector • Poor contact of the rear oxygen sensor connector • Poor contact in ECM connector

	Step	Check	Yes	No
20	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and drop the engine rpm suddenly from 3,000 rpm. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • For MT model, depress the clutch pedal. • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the voltage less than 250 mV?	Go to step **21**.	Go to step **17**.
21	**CHECK FRONT OXYGEN (A/F) SENSOR AND REAR OXYGEN SENSOR DATA.** 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and leave it for 5 minutes or more with idling. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the voltage more than 0.8 V for more than 5 minutes?	Replace the front oxygen (A/F) sensor connector. <Ref. to FU(H4DOTC)-41, Front Oxygen (A/F) Sensor.>	Go to step **18**.

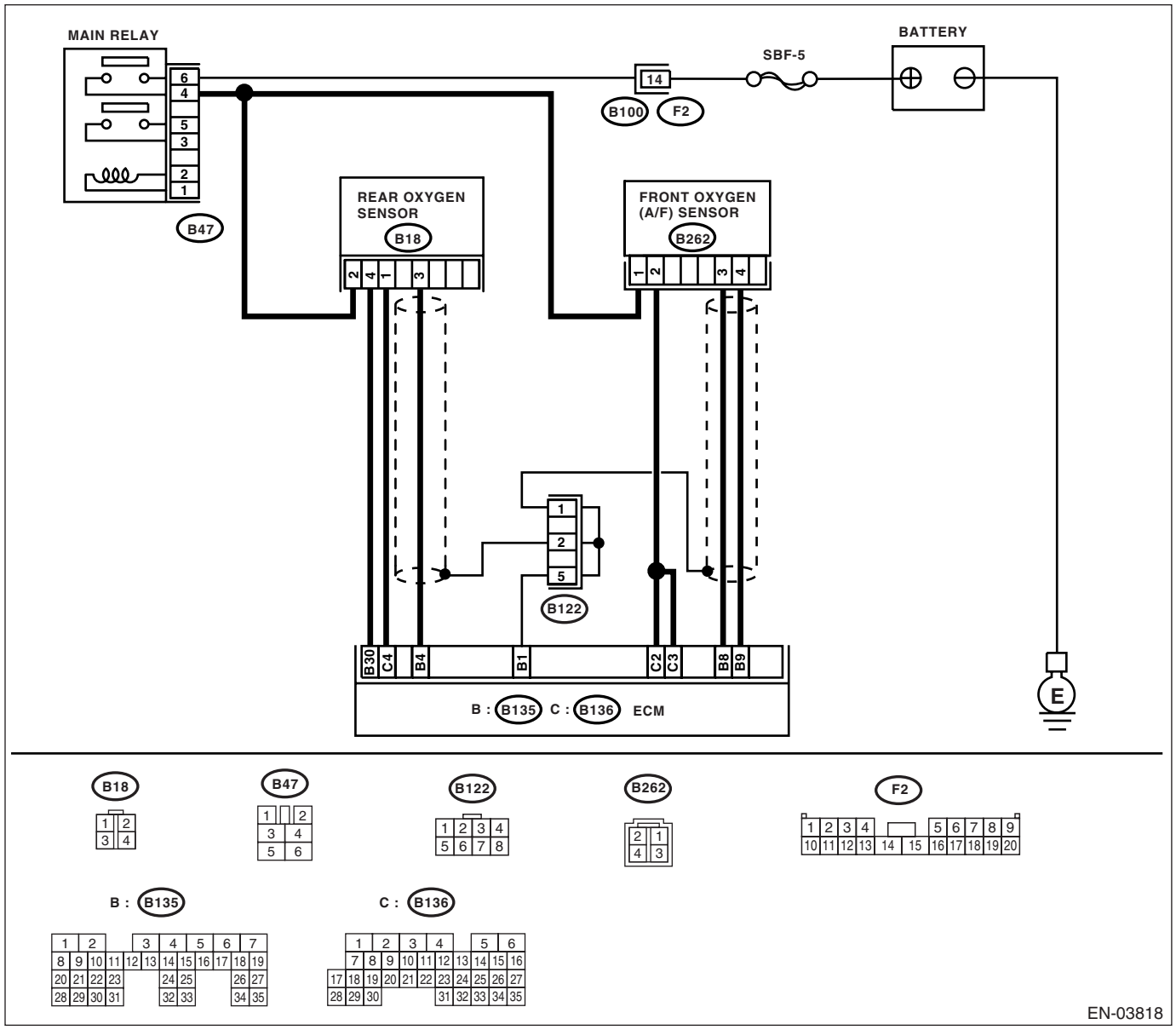
DT:DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-252, 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, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	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)-65, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P2097.	Go to step **2**.
2	**CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Does water enter the connector?	Dry the water thoroughly.	Go to step **3**.
3	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and front oxygen (A/F) sensor connector. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B135) No. 8 — (B262) No. 3:*** ***(B135) No. 9 — (B262) No. 4:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of the harness between ECM and front oxygen (A/F) sensor connector. • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector
4	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 8 — Chassis ground:*** ***(B135) No. 9 — Chassis ground:***	Is the resistance more than 1 MΩ?	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) Attach the connector to the ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 8 (+) — Chassis ground (–):***	Is the voltage more than 4.5 V?	Go to step **6**.	Go to step **7**.
6	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 8 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair the battery short circuit of harness between ECM and front oxygen (A/F) sensor connector. After repair, replace the ECM.<Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>	Repair poor contact in ECM connector.

	Step	Check	Yes	No
7	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (–):***	Is the voltage more than 4.95 V?	Go to step **8**.	Go to step **9**.
8	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair the battery short circuit of harness between ECM and front oxygen (A/F) sensor connector. After repair, replace the ECM.<Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>	Repair poor contact in ECM connector.
9	**CHECK EXHAUST SYSTEM.**	Are there holes or loose bolts on exhaust system?	Repair the exhaust system.	Go to step **10**.
10	**CHECK AIR INTAKE SYSTEM.**	Are there holes, loose bolts or disconnection of hose on air intake system?	Repair the air intake system.	Go to step **11**.
11	**CHECK FUEL PRESSURE** **WARNING:** **• Place "NO FIRE" signs near the working area.** **• Be careful not to spill fuel.** Measure the fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold. <Ref. to ME(H4DOTC)-25, INSPECTION, Fuel Pressure.> **WARNING:** **Release fuel pressure before removing the fuel pressure gauge.** NOTE: If fuel pressure does not increase, squeeze the fuel return hose 2 to 3 times, then measure fuel pressure again.	Is the measured value 284 — 314 kPa (2.9 — 3.2 kgf/cm^2, 41 — 46 psi)?	Go to step **12**.	Repair the following item. Fuel pressure is too high: • Clogged fuel return line or bent hose Fuel pressure is too low: • Improper fuel pump discharge • Clogged fuel supply line
12	**CHECK FUEL PRESSURE.** After connecting the pressure regulator vacuum hose, measure fuel pressure.<Ref. to ME(H4DOTC)-25, INSPECTION, Fuel Pressure.> **WARNING:** **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 **13**.	Repair the following item. Fuel pressure is too high: • Faulty pressure regulator • Clogged fuel return line or bent hose Fuel pressure is too low: • Faulty pressure regulator • Improper fuel pump discharge • Clogged fuel supply line

	Step	Check	Yes	No
13	**CHECK ENGINE COOLANT TEMPERATURE SENSOR.** 1) Start the engine and warm-up completely. 2) Read the data of the engine coolant temperature sensor signal using the Subaru Select Monitor or the general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the temperature above 60°C (140°F)?	Go to step **14**.	Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC)-27, Engine Coolant Temperature Sensor.>
14	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.** 1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F). 2) Place the shift lever in neutral position. 3) Turn the A/C switch to OFF. 4) Turn all the accessory switches off. 5) Read the data of mass air flow and intake air temperature sensor signal using the Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the measured value 2.7 — 4.7 g/s (0.36 — 0.62 lb/m)	Go to step **15**.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-31, Mass Air Flow and Intake Air Temperature Sensor.>
15	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.** 1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F). 2) Place the shift lever in neutral position. 3) Turn the A/C switch to OFF. 4) Turn all the accessory switches 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 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)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Subtract ambient temperature from intake air temperature. Is the obtained value –10 — 50°C (–18 — 90°F)?	Go to step **16**.	Check mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-31, Mass Air Flow and Intake Air Temperature Sensor.>

	Step	Check	Yes	No
16	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and keep the engine speed at 3,000 rpm. (Max. 2 minutes) 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • For MT model, depress the clutch pedal. • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the voltage more than 490 mV?	Go to step **20**.	Go to step **17**.
17	**CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.**	Does water enter the connector?	Dry the water thoroughly.	Go to step **18**.
18	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. ***Connector & terminal*** ***(B135) No. 4 — (B18) No. 3:*** ***(B135) No. 30 — (B18) No. 4:***	Is the resistance more than 3 Ω?	Repair the open circuit of harness between ECM and rear oxygen sensor connector.	Go to step **19**.
19	**CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the rear oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between rear oxygen sensor harness connector and engine ground or chassis ground. ***Connector & terminal*** ***(B18) No. 3 (+) — Engine ground (–):***	Is the voltage 0.2 — 0.5 V?	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-43, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between rear oxygen sensor and ECM connector • Poor contact of the rear oxygen sensor connector • Poor contact in ECM connector

	Step	Check	Yes	No
20	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and drop the engine speed suddenly from 3,000 rpm. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • For MT model, depress the clutch pedal. • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the voltage less than 250 mV?	Go to step **21**.	Go to step **17**.
21	**CHECK FRONT OXYGEN (A/F) SENSOR AND REAR OXYGEN SENSOR DATA.** 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and leave it for 5 minutes or more with idling. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the voltage more than 0.8 V for more than 5 minutes?	Replace the front oxygen (A/F) sensor connector. <Ref. to FU(H4DOTC)-41, Front Oxygen (A/F) Sensor.>	Go to step **18**.

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

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-190, DTC P0638 THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.> <Ref. to GD(H4DOTC)-206, DTC P1160 RETURN SPRING FAILURE, Diagnostic Trouble Code (DTC) Detecting Criteria.> or <Ref. to GD(H4DOTC)-254, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

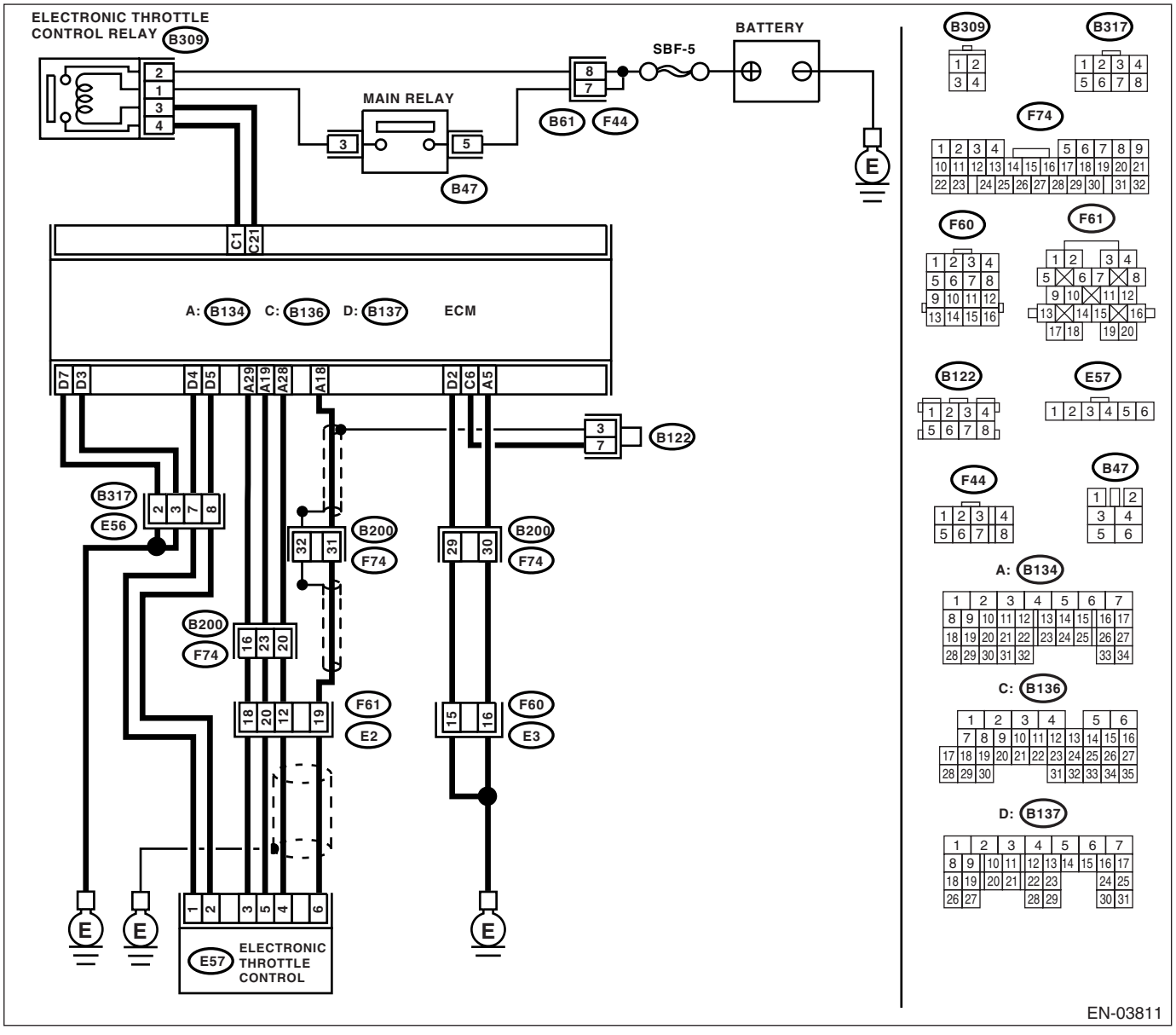
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance
- Engine stalls.

CAUTION:

After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ELECTRONIC THROTTLE CONTROL RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the electronic throttle control relay. 3) Connect the battery to terminals No. 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.** 1) Turn the ignition switch to ON. 2) Measure the voltage between the electronic control throttle relay connector and engine ground. ***Connector & terminal*** ***(B309) No. 1 (+) — Engine ground (–):*** ***(B309) No. 2 (+) — Engine ground (–):***	Is the voltage more than 10 V?	Go to step **3**.	Repair the open or ground short circuit of power supply circuit.
3	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY.** 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 the electronic control throttle relay connector and engine ground. ***Connector & terminal*** ***(B309) No. 3 (+) — Engine ground (–):***	Is the voltage more than 10 V?	Repair the power supply short circuit of harness between ECM and electronic throttle control.	Go to step **4**.
4	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between electronic throttle control relay connector and chassis ground. ***Connector & terminal*** ***(B309) No. 3 — Engine ground:*** ***(B309) No. 4 — Engine ground:***	Is the resistance more than 1 MΩ?	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.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between ECM connector 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 SENSOR OUTPUT.** 1) Connect all the connectors. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM connector terminals. ***Connector & terminal*** ***(B134) No. 18 (+) — (B134) No. 29 (–):*** 4) Check the voltage change while shaking the ECM harness and connector, engine harness connector (B136, F61), and electronic control throttle connector harness.	Is the voltage more than 0.4 V?	Go to step **7**.	Go to step **9**.

	Step	Check	Yes	No
7	**CHECK SENSOR OUTPUT.** 1) Connect all the connectors. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM connector terminals. ***Connector & terminal*** ***(B134) No. 28 (+) — (B134) No. 29 (–):*** 4) Check the voltage change while shaking the ECM harness and connector, engine harness connector, and electronic control throttle connector harness.	Is the voltage more than 0.8 V?	Go to step **8**.	Go to step **9**.
8	**CHECK POOR CONTACT.** Check poor contact in connector between ECM and electronic throttle control.	Is there poor contact?	Repair the poor contact.	Go to step **13**.
9	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connectors from electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. ***Connector & terminal*** ***(B134) No. 19 — (E57) No. 5:***	Is the resistance less than 1 Ω?	Go to step **10**.	Repair the open circuit of harness connector.
10	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 19 — Chassis ground:*** ***(B134) No. 18 — Chassis ground:*** ***(B134) No. 28 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **11**.	Repair the ground short circuit of harness.
11	**CHECK SENSOR POWER SUPPLY.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 5 (+) — Engine ground (–):*** 4) Check the voltage change by shaking the harness and connector of ECM and engine harness connector while monitoring the value with voltage meter.	Is the voltage 4.5 — 5.5 V?	Go to step **12**.	Repair poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>
12	**CHECK SHORT CIRCUIT IN ECM.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 4 — Engine ground:*** ***(E57) No. 6 — Engine ground:***	Is the resistance more than 10 Ω?	Go to step **13**.	Repair poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>
13	**CHECK SENSOR OUTPUT.** 1) Connect all the connectors. 2) Turn the ignition switch to ON. 3) Read the data of main throttle sensor signal using Subaru Select Monitor. 4) Check the voltage change while shaking the ECM harness and connector, engine harness connector, and electronic control throttle connector harness.	Is the voltage 4.63 V?	Go to step **14**.	Go to step **16**.

	Step	Check	Yes	No
14	**CHECK SENSOR OUTPUT.** 1) Read the data of sub throttle sensor signal using Subaru Select Monitor. 2) Check the voltage change while shaking the ECM harness and connector, engine harness connector, and electronic control throttle connector harness.	Is the voltage 4.73 V?	Go to step **15**.	Go to step **16**.
15	**CHECK POOR CONTACT.** Check poor contact in connector between ECM and electronic throttle control.	Is there poor contact?	Repair the poor contact.	Go to step **21**.
16	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connectors from electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. ***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 **17**.	Repair the open circuit of harness connector.
17	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Connect the ECM connector. 2) Measure the resistance between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 3 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **18**.	Repair poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>
18	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to ON. 2) Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 5 (+) — Engine ground (–):*** 3) Check the voltage change by shaking the harness and connector of ECM and engine harness connector while monitoring the value with voltage meter.	Is the voltage less than 10 V?	Go to step **19**.	Repair the battery short circuit of harness between ECM connector and electronic throttle control connector.
19	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 4 (+) — Engine ground (–):*** ***(E57) No. 6 (+) — Engine ground (–):*** 2) Check the voltage change by shaking the harness and connector of ECM and engine harness connector while monitoring the value with voltage meter.	Is the voltage less than 10 V?	Go to step **20**.	Repair the short circuit of harness between ECM connector and electronic throttle control connector.

	Step	Check	Yes	No
20	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Remove the ECM. 3) Measure the resistance between ECM connectors. ***Connector & terminal*** ***(B134) No. 18 — (B134) No. 29:*** ***(B134) No. 28 — (B134) No. 29:***	Is the resistance more than 1 MΩ?	Go to step **21**.	Repair the short circuit to sensor power supply.
21	**CHECK SENSOR OUTPUT.** 1) Turn the ignition switch to OFF. 2) Connect the connectors except for electric throttle control relay. 3) Turn the ignition switch to ON. 4) Read the data of main throttle sensor signal using Subaru Select Monitor.	Is the voltage 0.81 — 0.87 V?	Go to step **22**.	Repair the poor contact of electronic throttle control connector. Replace the electronic throttle control if defective.
22	**CHECK SENSOR OUTPUT.** Read the data of sub throttle sensor signal using Subaru Select Monitor.	Is the voltage 1.64 — 1.70 V?	Go to step **23**.	Repair poor contact in ECM connector. Replace the electronic throttle control if defective.
23	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL MOTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connectors from electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. ***Connector & terminal*** ***(B137) No. 4 — (E57) No. 1:*** ***(B137) No. 5 — (E57) No. 2:***	Is the resistance less than 1 Ω?	Go to step **24**.	Repair the open circuit of harness connector.
24	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL MOTOR.** 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 1 (+) — Engine ground (–):*** ***(E57) No. 2 (+) — Engine ground (–):***	Is the voltage less than 5 V?	Go to step **25**.	Repair the power supply short circuit of harness between ECM and electronic throttle control.
25	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL MOTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 1 — Engine ground:*** ***(E57) No. 2 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **26**.	Repair the short circuit of harness.
26	**CHECK ELECTRONIC THROTTLE CONTROL MOTOR HARNESS.** Measure the resistance between electronic throttle control connector terminals. ***Connector & terminal*** ***(E57) No. 2 — (E57) No. 1:***	Is the resistance more than 1 MΩ?	Go to step **27**.	Repair the short circuit of harness.

	Step	Check	Yes	No
27	**CHECK ELECTRONIC THROTTLE CONTROL GROUND CIRCUIT.** Measure the resistance between ECM connector and engine ground. ***Connector & terminal*** ***(B137) No. 3 — Engine ground:*** ***(B137) No. 7 — Engine ground:***	Is the resistance less than 10 Ω?	Go to step **28**.	Repair the open circuit of harness.
28	**CHECK ELECTRONIC THROTTLE CONTROL.** Measure the resistance between electronic throttle control terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 50 Ω?	Go to step **29**.	Replace the electronic throttle control.
29	**CHECK ELECTRONIC THROTTLE CONTROL.** Move the throttle valve to the fully open and fully closed positions with fingers. Check that the valve returns to the specified position when releasing fingers.	Does the valve return to the specified position? Standard value: 3 mm (0.12 in) from fully closed position	Repair poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>	Replace the electronic throttle control.

DV:DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-256, DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

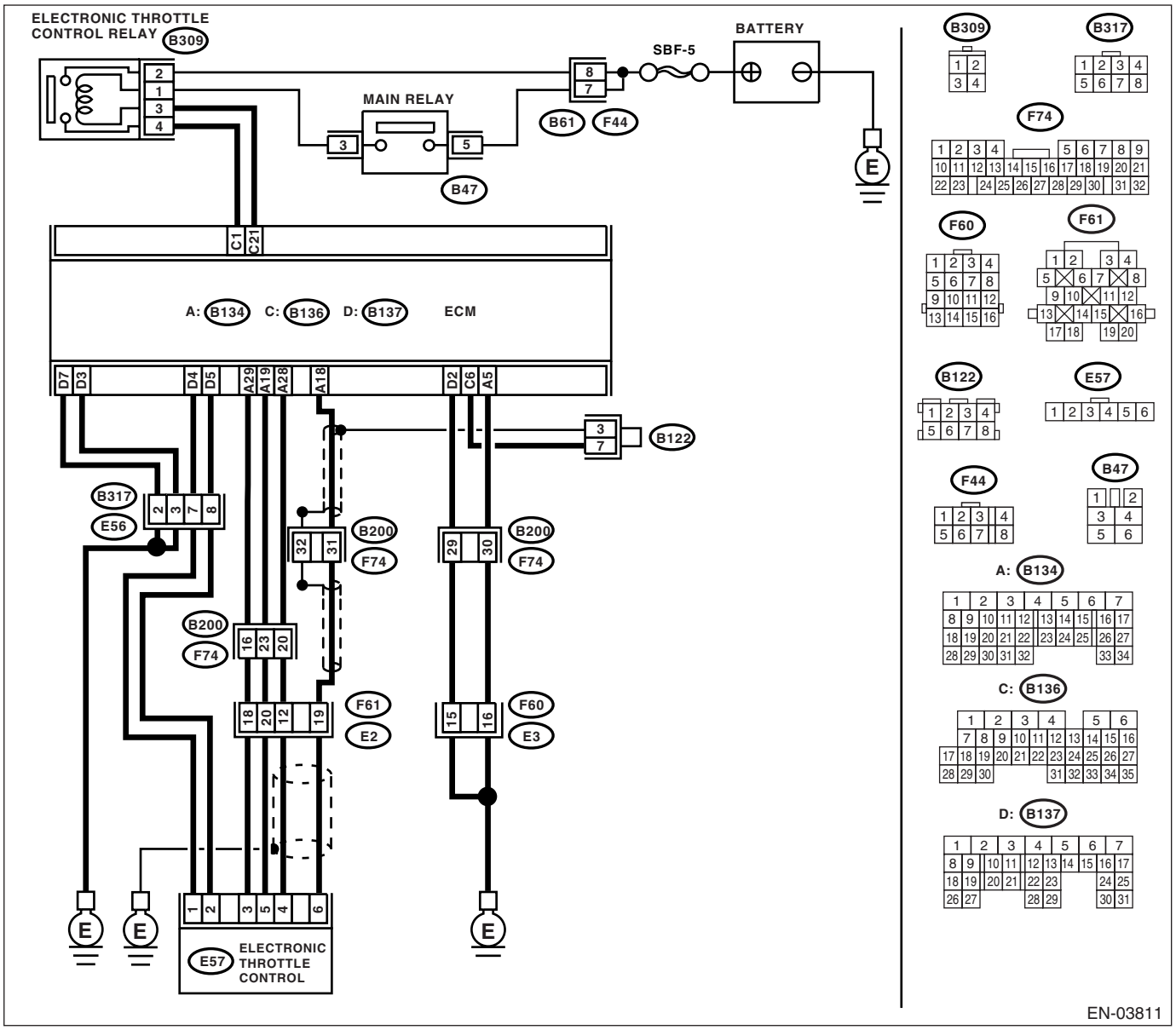
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance
- Engine stalls.

CAUTION:

After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ELECTRONIC THROTTLE CONTROL RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the electronic throttle control relay. 3) Connect the battery to terminals No. 1 and No. 3 of electronic throttle control relay. 4) Measure the resistance between electronic throttle control terminals. ***Terminals*** ***(B309) No. 2 — (B309) No. 4:***	Is the resistance less than 1 Ω?	Go to step **2**.	Replace the electronic throttle control relay.
2	**CHECK POWER SUPPLY OF ELECTRONIC THROTTLE CONTROL RELAY.** 1) Turn the ignition switch to ON. 2) Measure the voltage between the electronic control throttle relay connector and engine ground. ***Connector & terminal*** ***(B309) No. 1 (+) — Engine ground (–):*** ***(B309) No. 2 (+) — Engine ground (–):***	Is the voltage more than 10 V?	Go to step **3**.	Repair the open or ground short circuit of power supply circuit.
3	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY.** 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 the electronic control throttle relay connector and engine ground. ***Connector & terminal*** ***(B309) No. 3 (+) — Engine ground (–):***	Is the voltage more than 10 V?	Repair the power supply short circuit of harness between ECM and electronic throttle control relay.	Go to step **4**.
4	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between electronic throttle control relay connector and chassis ground. ***Connector & terminal*** ***(B309) No. 3 — Engine ground:*** ***(B309) No. 4 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **5**.	Repair the ground short circuit of harness between ECM and electronic throttle control relay.
5	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY.** Measure the resistance between ECM connector and electronic throttle control relay connector. ***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. Replace the ECM if defective. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>	Repair the open circuit of harness between ECM and electronic throttle control relay.

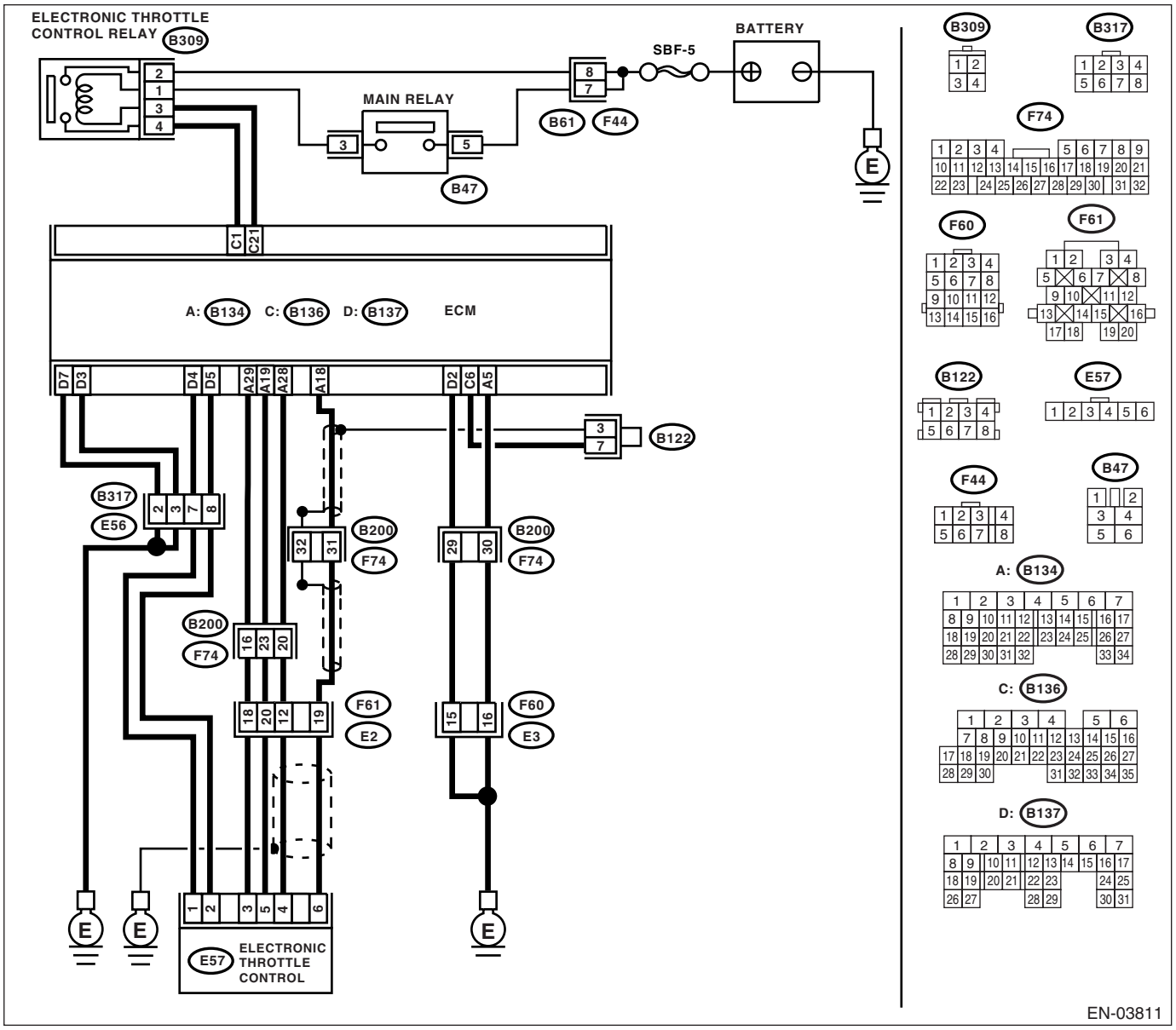
DW:DTC P2103 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-258, DTC P2103 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ELECTRONIC THROTTLE CONTROL RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the electronic throttle control relay. 3) Measure the resistance between electronic throttle control relay terminals. ***Terminals*** ***No. 2 — No. 4:***	Is the resistance more than 1 MΩ?	Go to step **2**.	Replace the electronic throttle control relay.
2	**CHECK SHORT CIRCUIT OF ELECTRONIC THROTTLE CONTROL RELAY POWER SUPPLY.** 1) Turn the ignition switch to ON. 2) Measure the voltage between the electronic control throttle relay connector and engine ground. ***Connector & terminal*** ***(B309) No. 4 (+) — Engine ground (–):***	Is the voltage more than 5 V?	Go to step **3**.	Repair the power supply short circuit of harness between ECM and electronic throttle control relay.
3	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance between ECM connector and engine ground. ***Connector & terminal*** ***(B136) No. 21 — Engine ground:***	Is the resistance more than 1 MΩ?	Repair poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>	Repair the ground short circuit of harness between ECM and electronic throttle control relay.

DX:DTC P2109 THROTTLE/PEDAL POSITION SENSOR “A” MINIMUM STOP PERFORMANCE

NOTE:
For the diagnostic procedure, refer to DTC P2101. <Ref. to EN(H4DOTC)(diag)-340, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DY:DTC P2122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

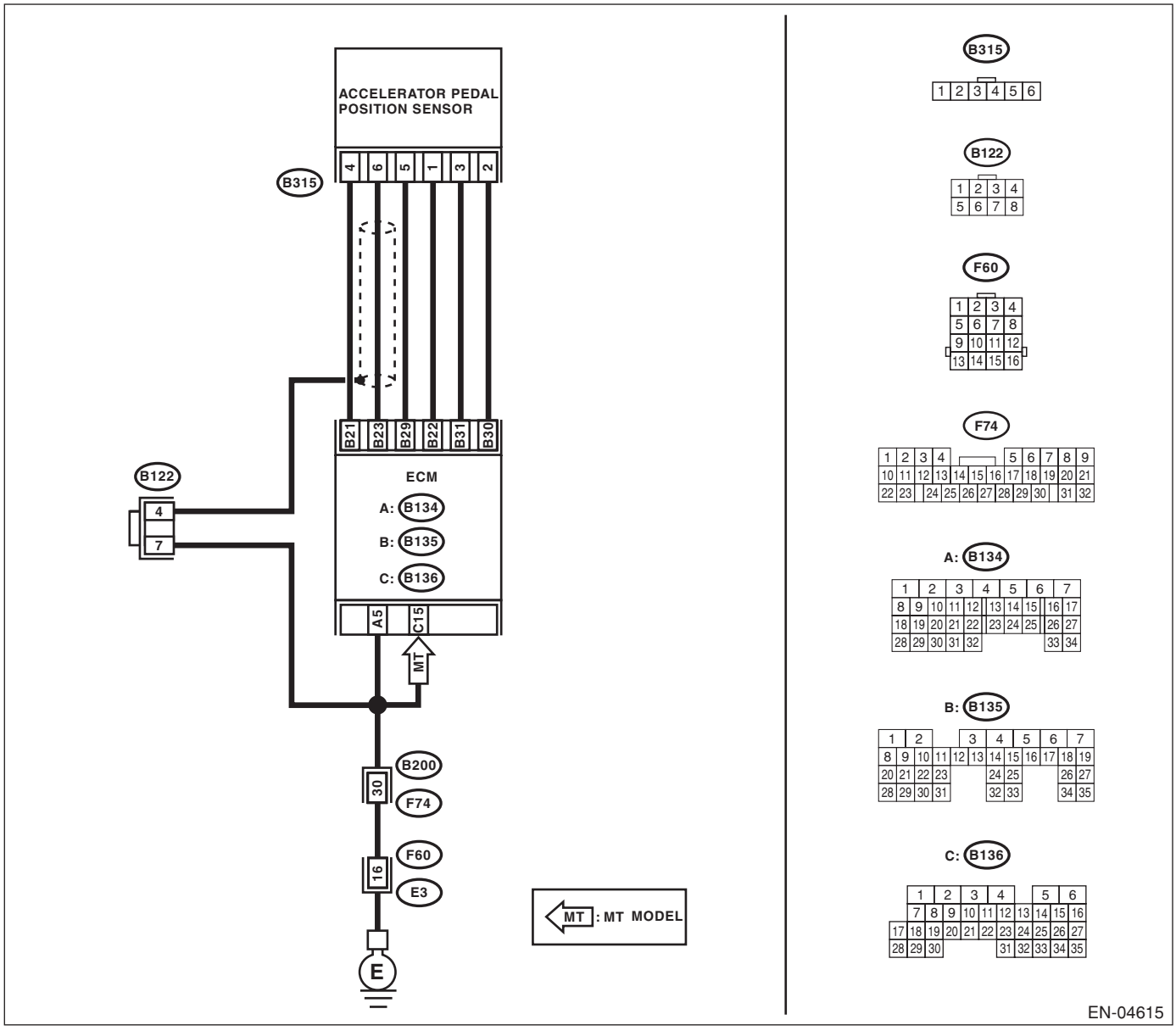
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-262, DTC P2122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance

CAUTION:
After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ACCELERATOR PEDAL POSITION SENSOR OUTPUT.** 1) Turn the ignition switch to ON. 2) Read the data of main accelerator padal position sensor signal using Subaru Select Monitor.	Is the voltage more than 0.4 V?	Go to step **2**.	Go to step **3**.
2	**CHECK POOR CONTACT.** Check poor contact of connector between ECM and accelerator pedal position sensor.	Is there poor contact?	Repair the poor contact.	Temporary poor contact occurred, but it is normal at present.
3	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connectors from accelerator pedal position sensor. 4) Measure the resistance of ECM connector and accelerator pedal position sensor connector. ***Connector & terminal*** ***(B135) No. 21 — (B315) No. 4:*** ***(B135) No. 23 — (B315) No. 6:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the open circuit of harness connector.
4	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 21 — Chassis ground:*** ***(B135) No. 23 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5**.	Repair the chassis short circuit of harness.
5	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Connect the ECM connector. 2) Measure the resistance between accelerator pedal position sensor connector and chassis ground. ***Connector & terminal*** ***(B315) No. 5 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **6**.	Repair poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>
6	**CHECK POWER SUPPLY OF ACCELERATOR PEDAL POSITION SENSOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between accelerator pedal position sensor connector and chassis ground. ***Connector & terminal*** ***(B315) No. 4 (+) — Chassis ground (–):***	Is the voltage 4.5 — 5.5 V?	Replace the accelerator pedal position sensor. <Ref. to SP(H4SO)-3, Accelerator Pedal.>	Repair poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>

DZ:DTC P2123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:

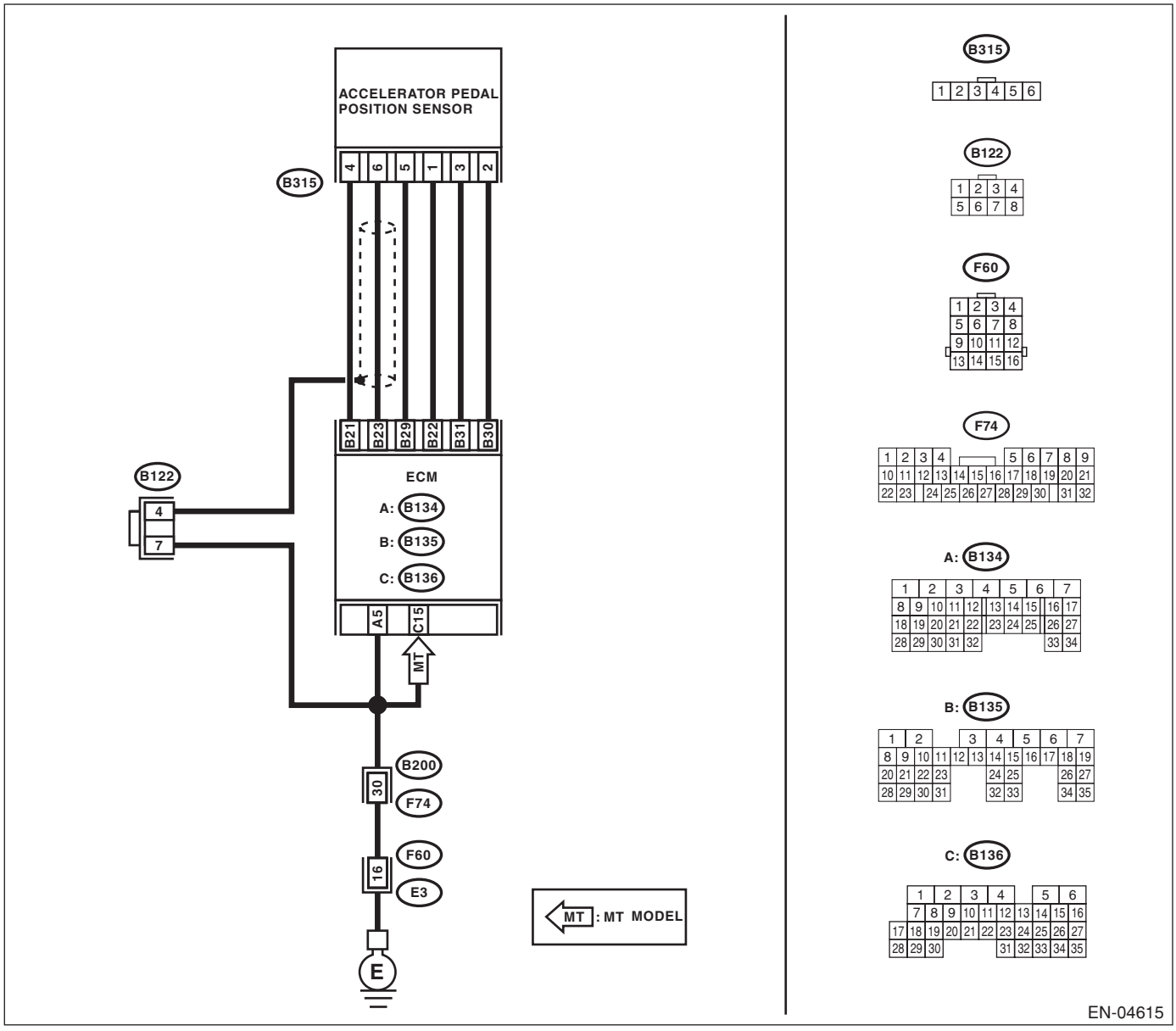
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-264, DTC P2123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance

CAUTION:
After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ACCELERATOR PEDAL POSITION SENSOR OUTPUT.** 1) Turn the ignition switch to ON. 2) Read the data of main accelerator pedal position sensor signal using Subaru Select Monitor.	Is the voltage less than 4.8 V?	Go to step **2**.	Go to step **3**.
2	**CHECK POOR CONTACT.** Check poor contact of connector between ECM and accelerator pedal position sensor.	Is there poor contact?	Repair the poor contact.	Temporary poor contact occurred, but it is normal at present.
3	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connectors from accelerator pedal position sensor. 4) Measure the resistance between ECM connector and accelerator pedal position sensor connector. ***Connector & terminal*** ***(B135) No. 21 — (B315) No. 4:*** ***(B135) No. 29 — (B315) No. 5:*** ***(B135) No. 23 — (B315) No. 6:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the open circuit of harness connector.
4	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Connect the ECM connector. 2) Measure the resistance between accelerator pedal position sensor connector and chassis ground. ***Connector & terminal*** ***(B315) No. 5 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **5**.	Repair poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>
5	**CHECK POWER SUPPLY OF ACCELERATOR PEDAL POSITION SENSOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between accelerator pedal position sensor connector and chassis ground. ***Connector & terminal*** ***(B315) No. 4 (+) — Chassis ground (–):***	Is the voltage 4.5 — 5.5 V?	Go to step **6**.	Repair the short circuit of harness between ECM connector and accelerator pedal position sensor connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>
6	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Connect the accelerator pedal position sensor connector. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 23 (+) — Chassis ground (–):***	Is the voltage less than 4.8 V?	Repair poor contact in ECM connector. Replace the ECM if defective.	Repair the poor contact of accelerator pedal position sensor connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>

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

DTC DETECTING CONDITION:

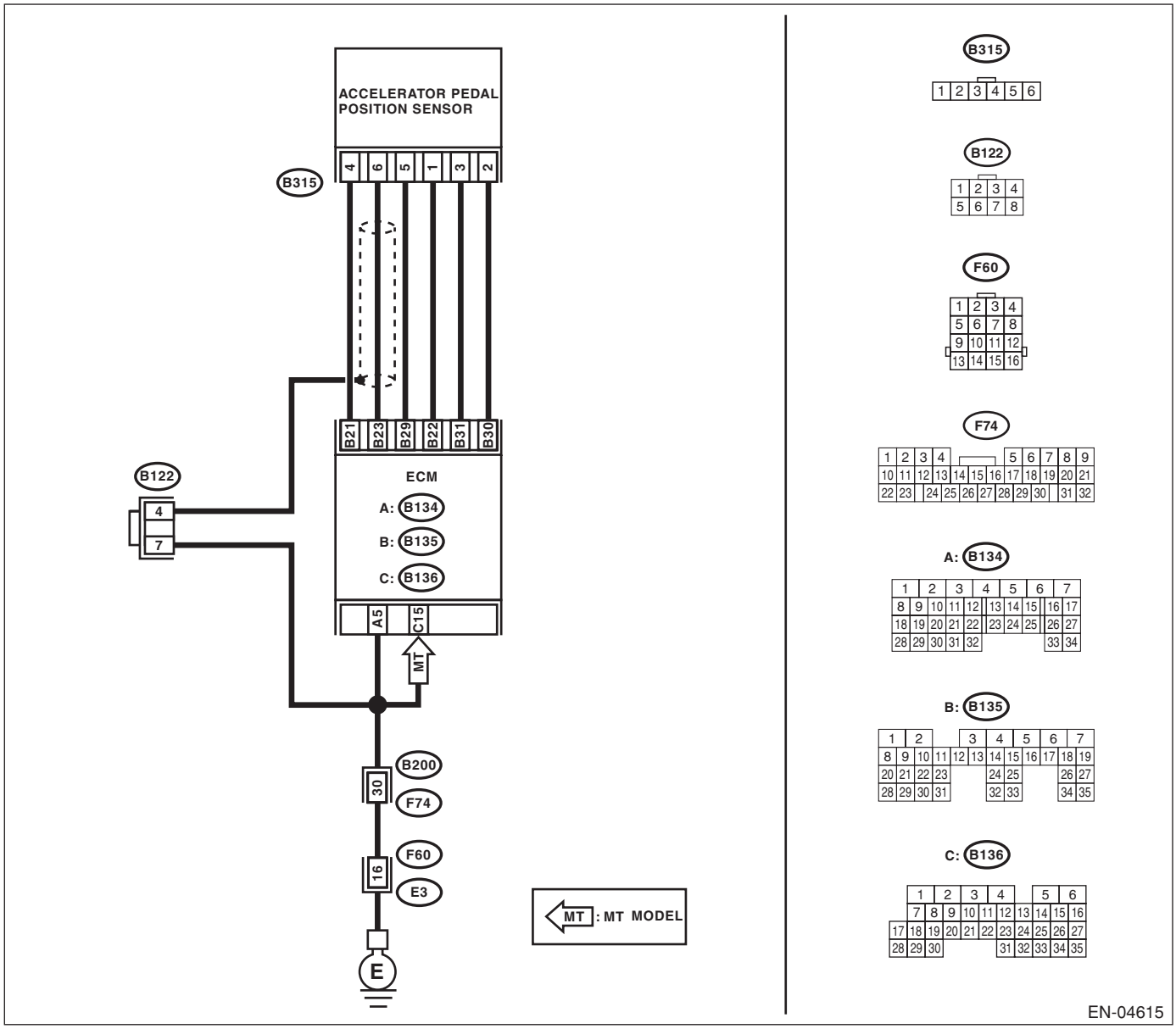
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-266, DTC P2127 THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance

CAUTION:
After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ACCELERATOR PEDAL POSITION SENSOR OUTPUT.** 1) Turn the ignition switch to ON. 2) Read the data of sub accelerator pedal position sensor signal using Subaru Select Monitor.	Is the voltage more than 0.4 V?	Go to step **2**.	Go to step **3**.
2	**CHECK POOR CONTACT.** Check poor contact of connector between ECM and accelerator pedal position sensor.	Is there poor contact?	Repair the poor contact.	Temporary poor contact occurred, but it is normal at present.
3	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connectors from accelerator pedal position sensor. 4) Measure the resistance between ECM connector and accelerator pedal position sensor connector. ***Connector & terminal*** ***(B135) No. 22 — (B315) No. 1:*** ***(B135) No. 31 — (B315) No. 3:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the open circuit of harness connector.
4	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 22 — Chassis ground:*** ***(B135) No. 31 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5**.	Repair the chassis short circuit of harness.
5	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Connect the ECM connector. 2) Measure the resistance between accelerator pedal position sensor connector and chassis ground. ***Connector & terminal*** ***(B315) No. 2 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **6**.	Repair poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>
6	**CHECK POWER SUPPLY OF ACCELERATOR PEDAL POSITION SENSOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between accelerator pedal position sensor connector and chassis ground. ***Connector & terminal*** ***(B315) No. 1 (+) — Chassis ground (–):***	Is the voltage 4.5 — 5.5 V?	Replace the accelerator pedal position sensor. <Ref. to SP(H4SO)-3, Accelerator Pedal.>	Repair poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>

EB:DTC P2128 THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:

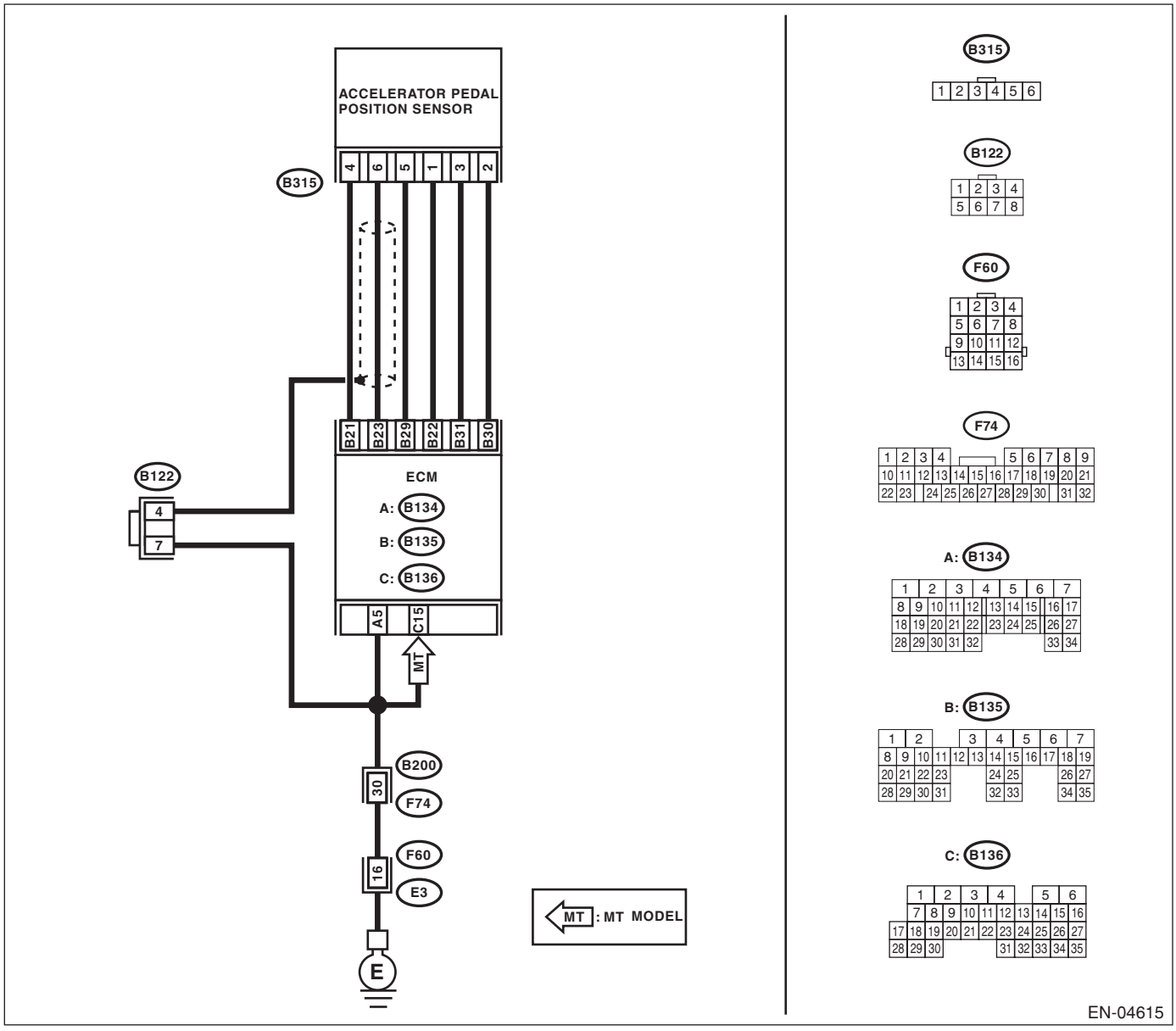
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-268, DTC P2128 THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance

CAUTION:
After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ACCELERATOR PEDAL POSITION SENSOR OUTPUT.** 1) Turn the ignition switch to ON. 2) Read the data of sub accelerator pedal position sensor signal using Subaru Select Monitor.	Is the voltage less than 4.8 V?	Go to step **2**.	Go to step **3**.
2	**CHECK POOR CONTACT.** Check poor contact of connector between ECM and accelerator pedal position sensor.	Is there poor contact?	Repair the poor contact.	Temporary poor contact occurred, but it is normal at present.
3	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connectors from accelerator pedal position sensor. 4) Measure the resistance between ECM connector and accelerator pedal position sensor connector. ***Connector & terminal*** ***(B135) No. 22 — (B315) No. 1:*** ***(B135) No. 30 — (B315) No. 2:*** ***(B135) No. 31 — (B315) No. 3:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the open circuit of harness connector.
4	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Connect the ECM connector. 2) Measure the resistance between accelerator pedal position sensor connector and chassis ground. ***Connector & terminal*** ***(B315) No. 2 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **5**.	Repair poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>
5	**CHECK POWER SUPPLY OF ACCELERATOR PEDAL POSITION SENSOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between accelerator pedal position sensor connector and chassis ground. ***Connector & terminal*** ***(B315) No. 1 (+) — Chassis ground (–):***	Is the voltage 4.5 — 5.5 V?	Go to step **6**.	Repair the short circuit of harness between ECM connector and accelerator pedal position sensor connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>
6	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Connect the accelerator pedal position sensor connector. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 31 (+) — Chassis ground (–):***	Is the voltage less than 4.8 V?	Repair poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>	Repair the poor contact of accelerator pedal position sensor connector. Replace the accelerator pedal position sensor if defective. <Ref. to SP(H4SO)-3, Accelerator Pedal.>

EC:DTC P2135 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A”/“B” VOLTAGE CORRELATION

DTC DETECTING CONDITION:

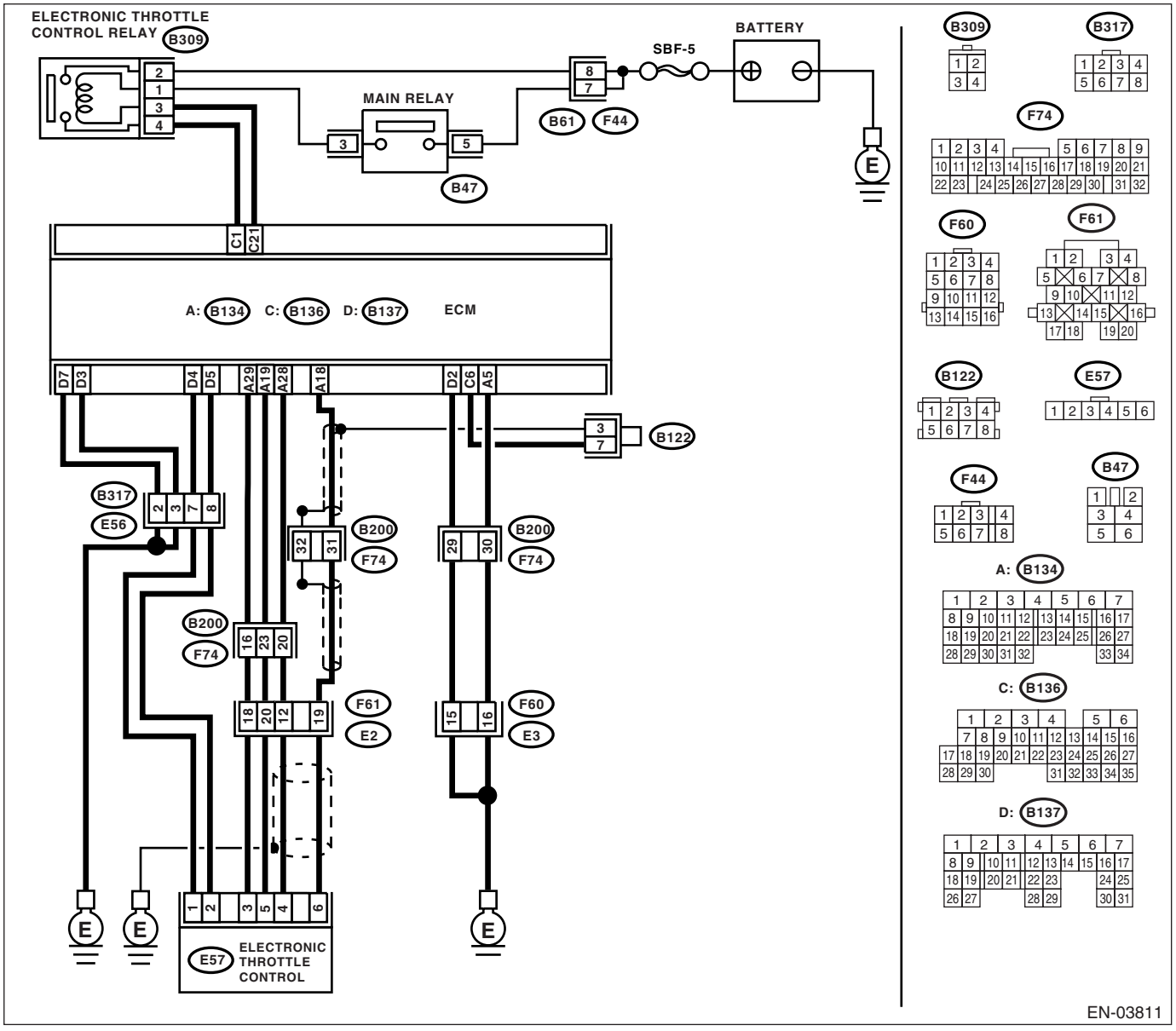
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-270, DTC P2135 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A”/“B” VOLTAGE CORRELATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance

CAUTION:
After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK SENSOR OUTPUT.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector terminals. ***Connector & terminal*** ***(B134) No. 18 (+) — (B134) No. 29 (–):*** 3) Check the voltage change while shaking the ECM harness and connector, engine harness connector, and electronic control throttle connector harness.	Is the voltage more than 0.4 V?	Go to step **2**.	Go to step **4**.
2	**CHECK SENSOR OUTPUT.** 1) Measure the voltage between ECM connector terminals. ***Connector & terminal*** ***(B134) No. 28 (+) — (B134) No. 29 (–):*** 2) Check the voltage change while shaking the ECM harness and connector, engine harness connector, and electronic control throttle connector harness.	Is the voltage more than 0.8 V?	Go to step **3**.	Go to step **4**.
3	**CHECK POOR CONTACT.** Check poor contact in connector between ECM and electronic throttle control.	Is there poor contact?	Repair the poor contact.	Go to step **14**.
4	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connectors from electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. ***Connector & terminal*** ***(B134) No. 19 — (E57) No. 5:***	Is the resistance less than 1 Ω?	Go to step **5**.	Repair the open circuit of harness connector.
5	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 19 — Chassis ground:*** ***(B134) No. 18 — Chassis ground:*** ***(B134) No. 28 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **6**.	Repair the ground short circuit of harness.
6	**CHECK SENSOR POWER SUPPLY.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 5 (+) — Engine ground (–):*** 4) Check the voltage change by shaking the harness and connector of ECM and engine harness connector while monitoring the value with voltage meter.	Is the voltage 4.5 — 5.5 V?	Go to step **7**.	Repair poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>
7	**CHECK SHORT CIRCUIT IN ECM.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 4 — Engine ground:*** ***(E57) No. 6 — Engine ground:***	Is the resistance more than 10 Ω?	Go to step **8**.	Repair poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>

	Step	Check	Yes	No
8	**CHECK SENSOR OUTPUT.** 1) Connect all the connectors. 2) Turn the ignition switch to ON. 3) Read the data of main throttle sensor signal using Subaru Select Monitor. 4) Check the voltage change while shaking the ECM harness and connector, engine harness connector, and electronic control throttle connector harness.	Is the voltage less than 4.63 V?	Go to step **9**.	Go to step **11**.
9	**CHECK SENSOR OUTPUT.** 1) Read the data of sub throttle sensor signal using Subaru Select Monitor. 2) Check the voltage change while shaking the ECM harness and connector, engine harness connector, and electronic control throttle connector harness.	Is the voltage less than 4.73 V?	Go to step **10**.	Go to step **11**.
10	**CHECK POOR CONTACT.** Check poor contact in connector between ECM and electronic throttle control.	Is there poor contact?	Repair the poor contact.	Temporary poor contact occurred, but it is normal at present.
11	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connectors from electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. ***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 **12**.	Repair the open circuit of harness connector.
12	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Connect the ECM connector. 2) Measure the resistance between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 3 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **13**.	Repair poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>
13	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 5 (+) — Engine ground (–):*** 4) Check the voltage change by shaking the harness and connector of ECM and engine harness connector while monitoring the value with voltage meter.	Is the voltage less than 10 V?	Go to step **14**.	Repair the battery short circuit of harness between ECM connector and electronic throttle control connector.

	Step	Check	Yes	No
14	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 4 (+) — Engine ground (–):*** ***(E57) No. 6 (+) — Engine ground (–):*** 2) Check the voltage change by shaking the harness and connector of ECM and engine harness connector while monitoring the value with voltage meter.	Is the voltage less than 10 V?	Go to step **15**.	Repair the short circuit of harness between ECM connector and electronic throttle control connector.
15	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the ECM connector. 3) Measure the resistance between ECM connectors. ***Connector & terminal*** ***(B134) No. 18 — (B134) No. 29:*** ***(B134) No. 28 — (B134) No. 29:***	Is the resistance more than 1 MΩ?	Go to step **16**.	Repair the short circuit to sensor power supply.
16	**CHECK ELECTRONIC THROTTLE CONTROL HARNESS.** 1) Disconnect the connectors from ECM. 2) Disconnect the connectors from electronic throttle control. 3) Measure the resistance between electronic throttle control connector terminals. ***Connector & terminal*** ***(E57) No. 6 — (E57) No. 4:***	Is the resistance more than 1 MΩ?	Repair poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>	Repair the short circuit of harness.

ED:DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D”/“E” VOLTAGE CORRELATION

DTC DETECTING CONDITION:

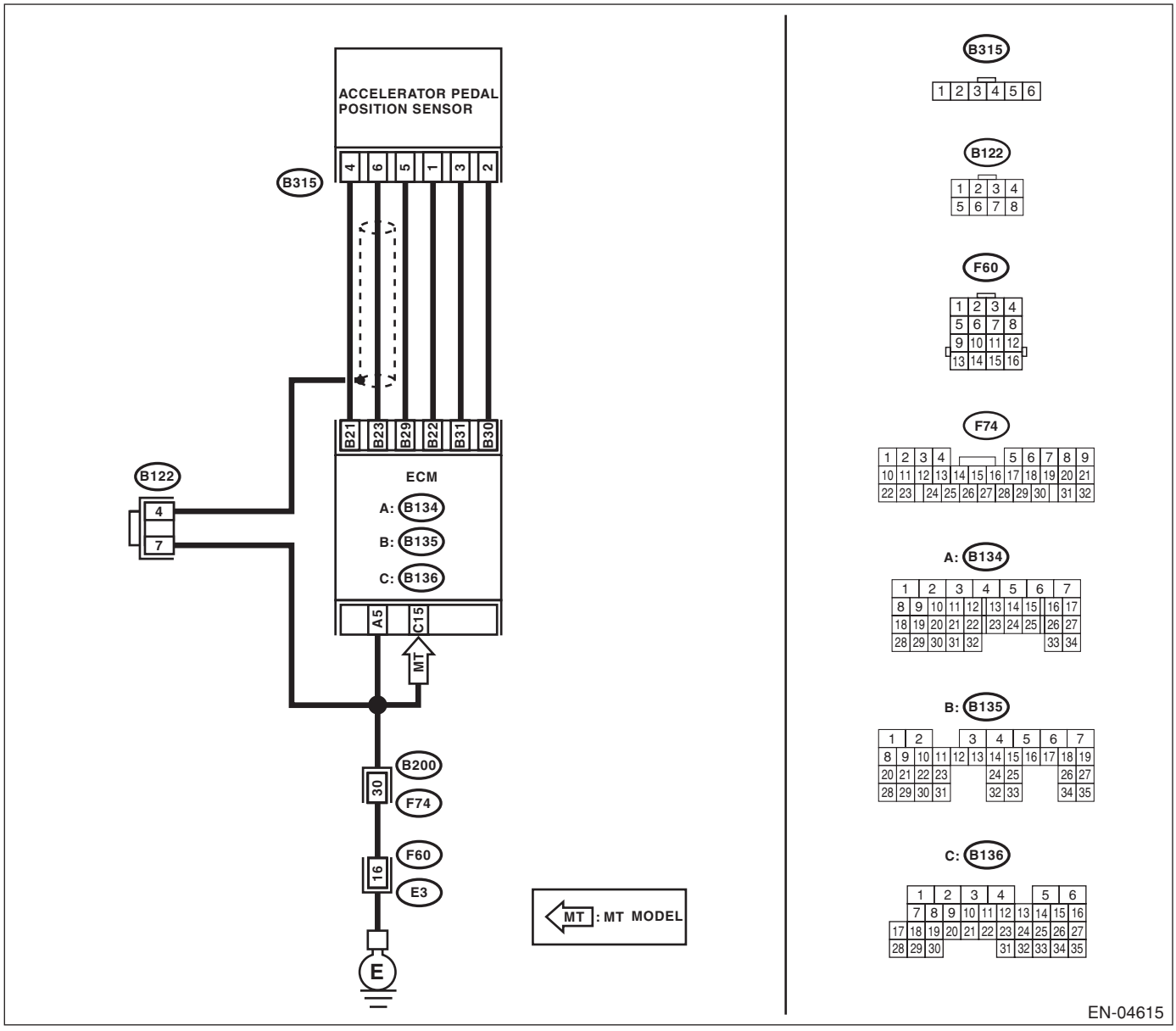
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-272, DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D”/“E” VOLTAGE CORRELATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance

CAUTION:
After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ACCELERATOR PEDAL POSITION SENSOR OUTPUT.** 1) Turn the ignition switch to ON. 2) Read the data of main accelerator pedal position sensor signal and sub accelerator pedal position sensor signal using Subaru Select Monitor. NOTE: For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-27, Subaru Select Monitor.>	Is the voltage more than 0.4 V?	Go to step **2**.	Go to step **4**.
2	**CHECK ACCELERATOR PEDAL POSITION SENSOR OUTPUT.** 1) Turn the ignition switch to ON. 2) Read the data of main accelerator pedal position sensor signal and sub accelerator pedal position sensor signal using Subaru Select Monitor. NOTE: For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-27, Subaru Select Monitor.>	Is the voltage less than 4.8 V?	Go to step **3**.	Go to step **4**.
3	**CHECK POOR CONTACT.** Check poor contact of connector between ECM and accelerator pedal position sensor.	Is there poor contact?	Repair the poor contact.	Temporary poor contact occurred, but it is normal at present.
4	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connectors from accelerator pedal position sensor. 4) Measure the resistance between ECM connector and accelerator pedal position sensor connector. ***Connector & terminal*** ***(B135) No. 22 — (B315) No. 1:*** ***(B135) No. 30 — (B315) No. 2:*** ***(B135) No. 31 — (B315) No. 3:*** ***(B135) No. 21 — (B315) No. 4:*** ***(B135) No. 29 — (B315) No. 5:*** ***(B135) No. 23 — (B315) No. 6:***	Is the resistance less than 1 Ω?	Go to step **5**.	Repair the open circuit of harness connector.
5	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 23 — Chassis ground:*** ***(B135) No. 21 — Chassis ground:*** ***(B135) No. 31 — Chassis ground:*** ***(B135) No. 22 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **6**.	Repair the chassis short circuit of harness.

	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Connect the ECM connector. 2) Measure the resistance between accelerator pedal position sensor connector and chassis ground. ***Connector & terminal*** ***(B315) No. 2 — Chassis ground:*** ***(B315) No. 5 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **7**.	Repair the poor contact of ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>
7	**CHECK POWER SUPPLY OF ACCELERATOR PEDAL POSITION SENSOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between accelerator pedal position sensor connector and chassis ground. ***Connector & terminal*** ***(B315) No. 1 (+) — Chassis ground (–):*** ***(B315) No. 4 (+) — Chassis ground (–):***	Is the voltage 4.5 — 5.5 V?	Go to step **8**.	Repair the poor contact of ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>
8	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Connect the accelerator pedal position sensor connector. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 31 (+) — Chassis ground (–):*** ***(B135) No. 23 (+) — Chassis ground (–):***	Is the voltage less than 4.8 V?	Go to step **9**.	Repair the poor contact of accelerator pedal position sensor connector. Replace the accelerator pedal position sensor if defective. <Ref. to SP(H4SO)-3, Accelerator Pedal.>
9	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connectors from accelerator pedal position sensor. 4) Measure the resistance between connector terminals of accelerator pedal position sensor. ***Connector & terminal*** ***(B315) No. 6 — (B315) No. 3:***	Is the resistance more than 1 MΩ?	Repair the poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>	Repair the short circuit of harness between ECM connector and accelerator pedal position sensor connector.

EE:DTC P2227 BAROMETRIC PRESSURE CIRCUIT RANGE/PERFORMANCE

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-274, DTC P2227 BAROMETRIC PRESSURE CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, 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)-65, List of Diagnostic Trouble Code (DTC).>	Replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).> NOTE: The atmospheric pressure sensor is built into the ECM.

EF:DTC P2228 BAROMETRIC PRESSURE CIRCUIT LOW

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-275, DTC P2228 BAROMETRIC PRESSURE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, 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)-65, List of Diagnostic Trouble Code (DTC).>	Replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).> NOTE: The atmospheric pressure sensor is built into the ECM.

EG:DTC P2229 BAROMETRIC PRESSURE CIRCUIT HIGH

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-276, DTC P2229 BAROMETRIC PRESSURE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, 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)-65, List of Diagnostic Trouble Code (DTC).>	Replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).> NOTE: The atmospheric pressure sensor is built into the ECM.

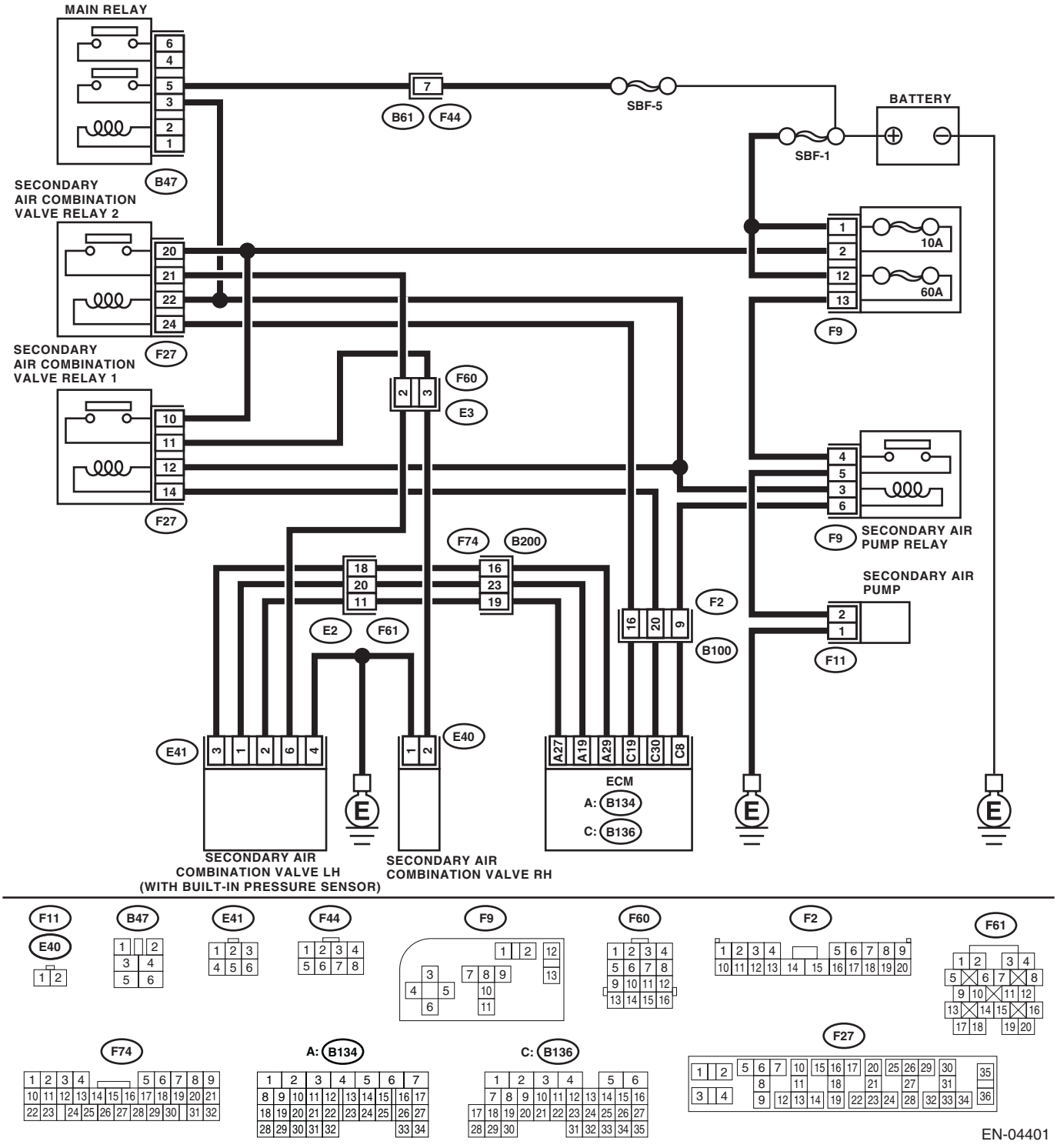
EH:DTC P2431 SECONDARY AIR INJECTION SYSTEM AIR FLOW /PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-277, 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, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check the relative DTC.	Go to step **2**.

	Step	Check	Yes	No
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: Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-27, Subaru Select Monitor.>	Is the difference with the actual atmospheric pressure Is there 200 mmHg (27 kpa, 8 inHg or 3.9 psig) or more?	Replace the secondary air combination valve (LH). <Ref. to EC(H4DOTC)-10, Secondary Air Combination Valve.> NOTE: The secondary air pressure sensor is a one piece combined part with the secondary air combination valve (LH).	Temporary poor contact occurs. Check for poor contact in the connector.

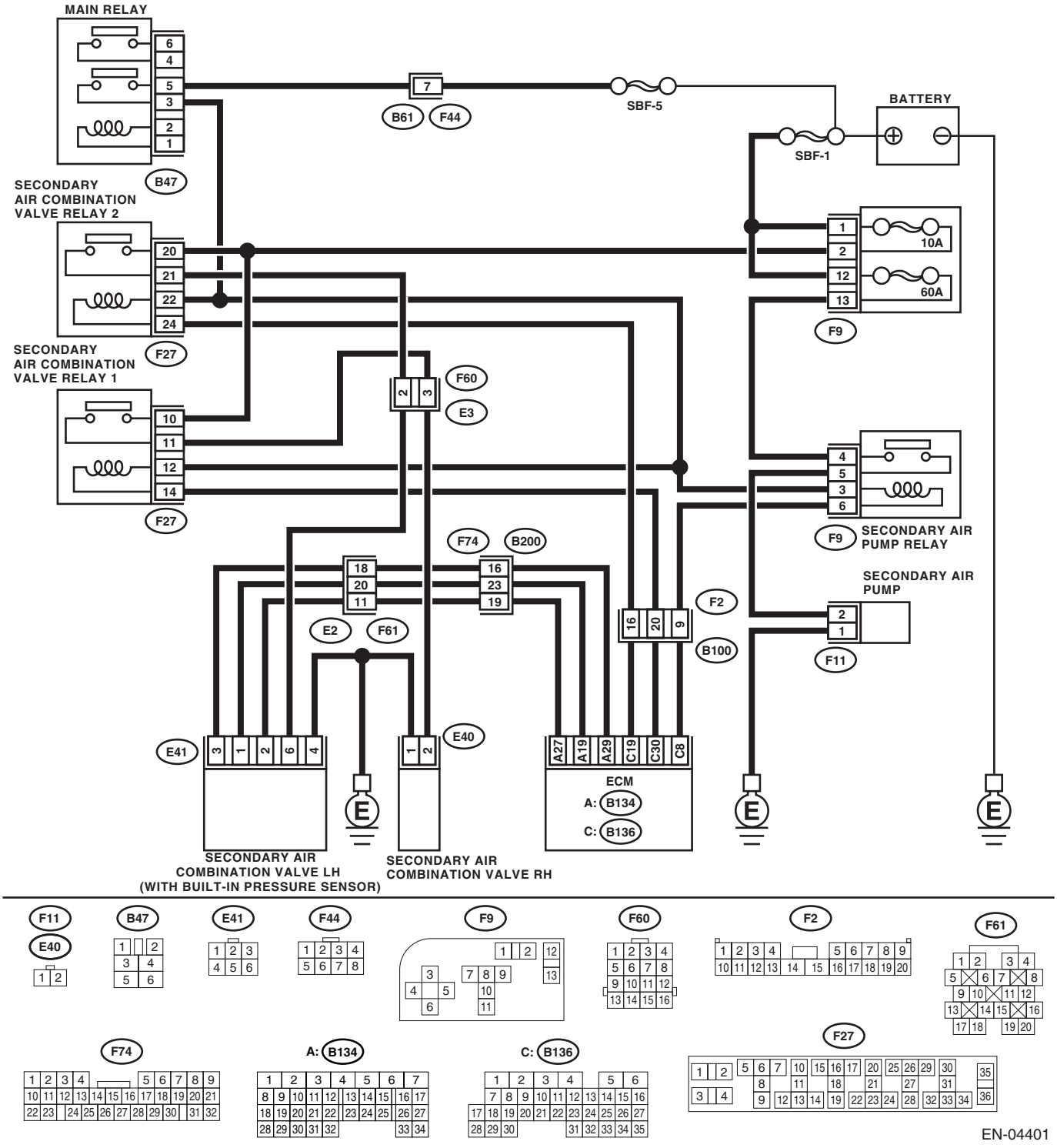
EI: DTC P2432 SECONDARY AIR INJECTION SYSTEM AIR FLOW /PRESSURE SENSOR CIRCUIT LOW

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-278, 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, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBINATION VALVE LH CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the ECM and secondary air combination valve LH. 3) Measure the resistance of the harness between the ECM and secondary air combination valve relay LH connector terminal. ***Connector & terminal*** ***(B134) No. 27 — (E41) No. 2:*** ***(B134) No. 19 — (E41) No. 1:*** ***(B134) No. 29 — (E41) No. 3:***	Is the resistance less than 1 Ω?	Go to step **2**.	Repair open circuit of the harness between the ECM and secondary air combination valve relay LH connector terminal.
2	**CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBINATION VALVE LH CONNECTOR.** Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 27 — Chassis ground:***	Is the resistance more than 1 MΩ?	Temporary poor contact occurs. Check for poor contact in the connector.	Repair the ground short of the harness between the ECM and secondary air combination valve relay LH connector terminal.

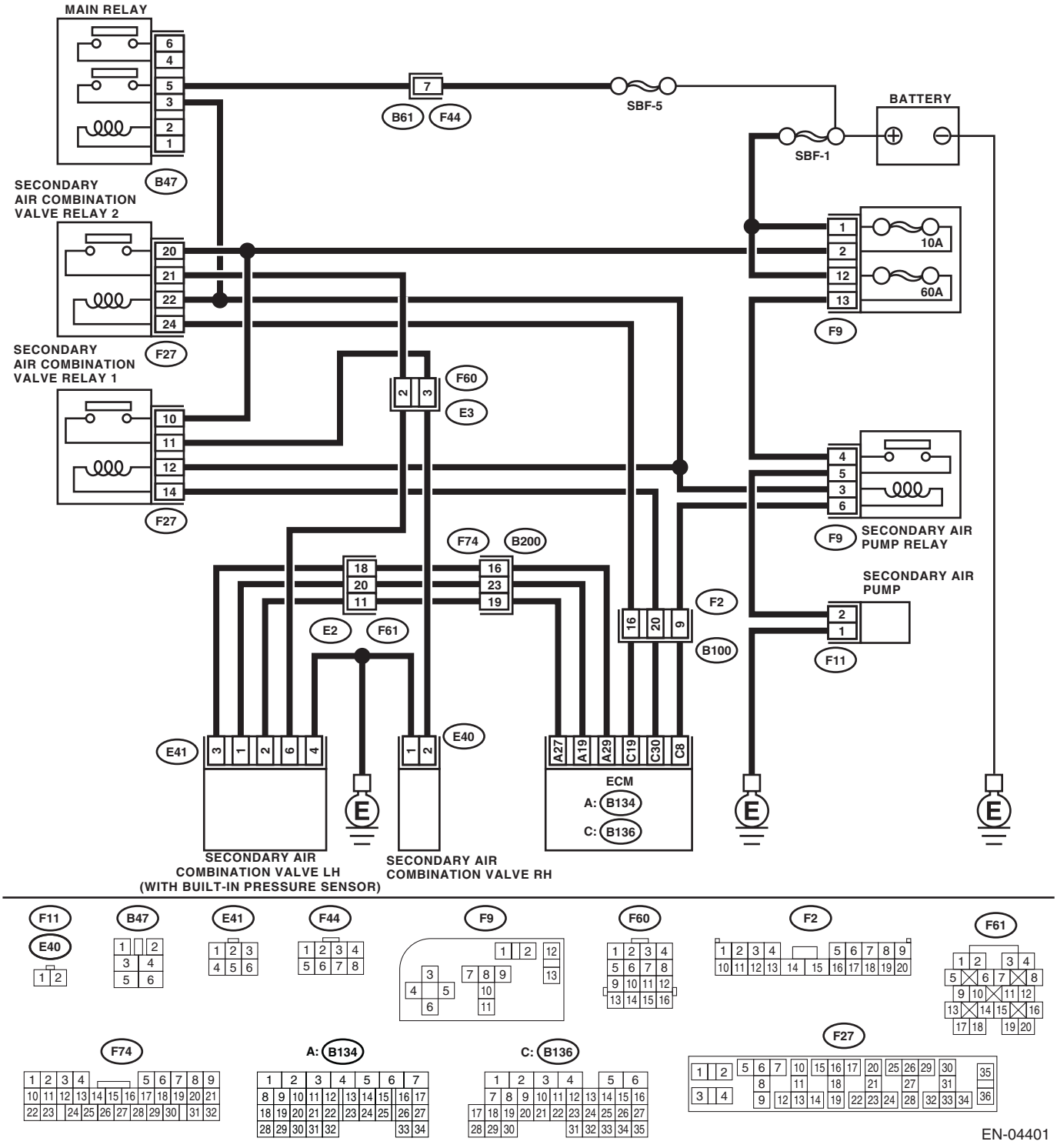
EJ: DTC P2433 SECONDARY AIR INJECTION SYSTEM AIR FLOW /PRESSURE SENSOR CIRCUIT HIGH

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-279, 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, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBINATION VALVE LH CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the ECM and secondary air combination valve LH. 3) Measure the resistance of the harness between the ECM and secondary air combination valve relay LH connector terminal. ***Connector & terminal*** ***(B134) No. 27 — (E41) No. 2:*** ***(B134) No. 19 — (E41) No. 1:*** ***(B134) No. 29 — (E41) No. 3:***	Is the resistance less than 1 Ω?	Go to step **2**.	Repair open circuit of the harness between the ECM and secondary air combination valve relay LH connector terminal.
2	**CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBINATION VALVE LH CONNECTOR.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 27 (+) — Chassis ground (–):***	Is the voltage more than 5 V?	Repair the short to battery in the harness between the ECM and secondary air combination valve relay LH connector terminal.	Temporary poor contact occurs. Check for poor contact in the connector.

EK:DTC P2440 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK1)

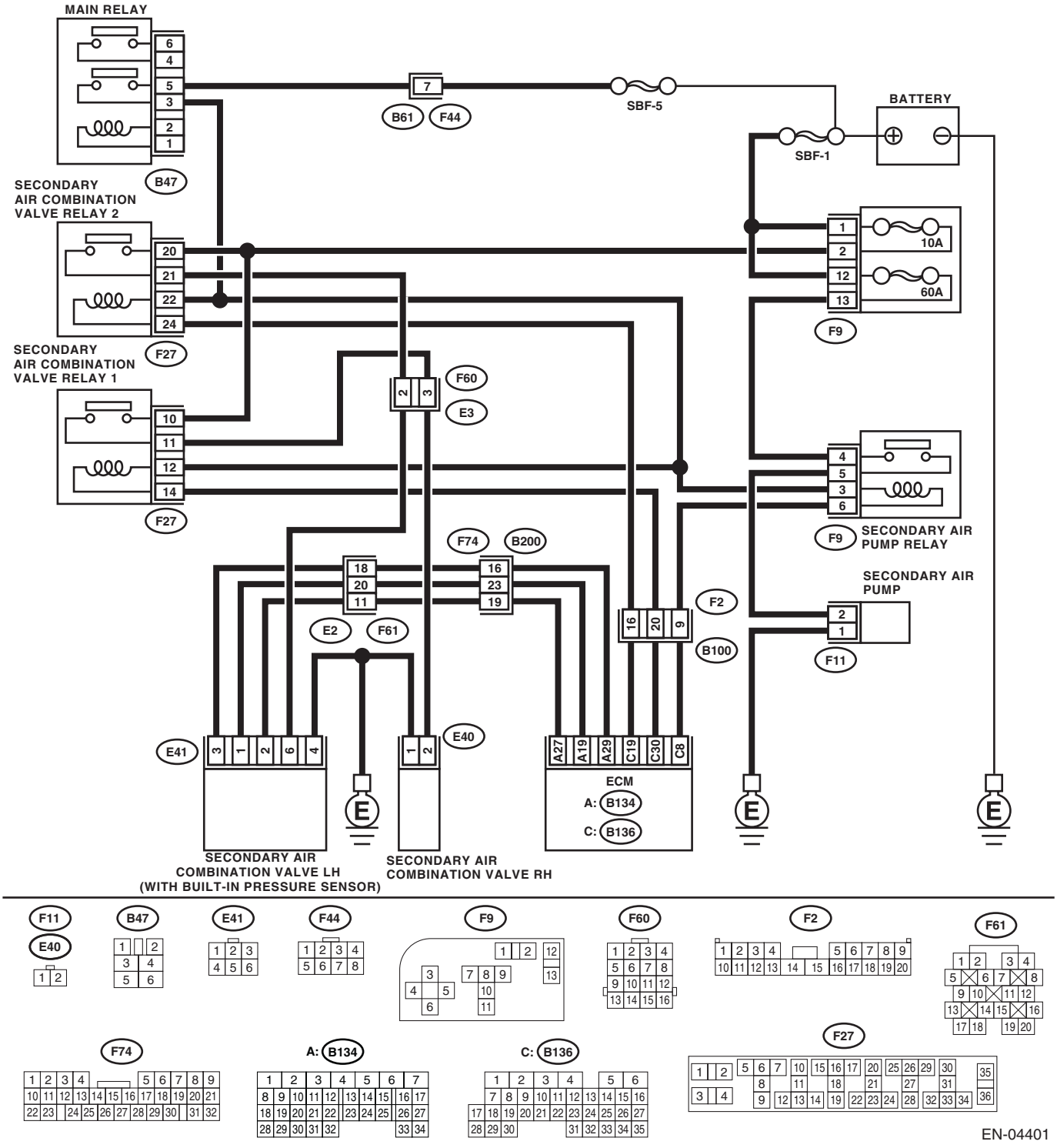
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-280, DTC P2440 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK SECONDARY AIR COMBINATION VALVE OPERATION.** 1) Connect the test mode connector. 2) Turn the ignition switch to ON. 3) Perform operation check for the secondary air combination valve using the Subaru Select Monitor. NOTE: Subaru Select Monitor Refer to “Compulsory Valve Operation Check Mode” for more operation procedure. <Ref. to EN(H4DOTC)(diag)-47, Compulsory Valve Operation Check Mode.>	Doe the secondary air combination valve operate properly?	Go to step **2**.	Go to step **4**.
2	**CHECK DUCT BETWEEN SECONDARY AIR PUMP AND SECONDARY AIR COMBINATION VALVE.** Inspection of the duct between the secondary air pump and secondary air combination valve.	Is there damage or disconnection of the duct?	Replace or connect the duct.	Go to step **3**.
3	**CHECK PIPE BETWEEN SECONDARY AIR COMBINATION VALVE AND CYLINDER HEAD.** Inspection of the pipe between the secondary air combination valve and cylinder head.	Is there damage or disconnection of the pipe?	Replace or connect the pipe.	Temporary poor contact occurs. Check for poor contact in the connector.
4	**CHECK POWER SUPPLY TO SECONDARY AIR COMBINATION VALVE.** In the condition of step 1, measure the voltage between the secondary air combination valve and the chassis ground. ***Connector & terminal*** ***(E40) No. 2 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Replace the secondary air combination valve.	Go to step **5**.
5	**CHECK HARNESS BETWEEN SECONDARY AIR COMBINATION VALVE RELAY AND SECONDARY AIR COMBINATION VALVE CONNECTOR TERMINAL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the secondary air combination valve relay and secondary air combination valve. 3) Measure resistance between the secondary air combination valve relay and secondary air combination valve connector terminal. ***Connector & terminal*** ***(F27) No. 11 — (E40) No. 2:***	Is the resistance less than 1 Ω?	Go to step **6**.	Repair the open circuit between the secondary air combination valve relay and secondary air combination valve connector terminal.
6	**CHECK SECONDARY AIR COMBINATION VALVE RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the secondary air pump relay from the relay box. 3) Connect the battery to the secondary air combination valve relay terminals No. 12 and 14. 4) Measure the resistance between the secondary air combination valve relay terminals. ***Terminals*** ***No. 10 — No. 11:***	Is the resistance less than 1 Ω?	Go to step **7**.	Replace the secondary air combination valve relay.

	Step	Check	Yes	No
7	**CHECK SECONDARY AIR COMBINATION VALVE RELAY POWER SOURCE.** 1) Turn the ignition switch to ON. 2) Measure the voltage between the secondary air combination valve relay connector and chassis ground. ***Connector & terminal*** ***(F27) No. 10 (+) — Chassis ground (–):*** ***(F27) No. 12 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **8**.	Repair the open or ground short circuit of power supply circuit.
8	**CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBINATION VALVE RELAY CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector of ECM. 3) Measure the resistance of the harness between the ECM and secondary air combination valve relay connector terminal. ***Connector & terminal*** ***(B136) No. 30 — (F27) No. 14:***	Is the resistance less than 1 Ω?	Replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>	Repair open circuit of the harness between the ECM and secondary air pump relay connector terminal.

EL:DTC P2441 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK CLOSED (BANK1)

NOTE:
For the diagnostic procedure, refer to DTC P2440. <Ref. to EN(H4DOTC)(diag)-376, DTC P2440 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

EM:DTC P2442 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK2)

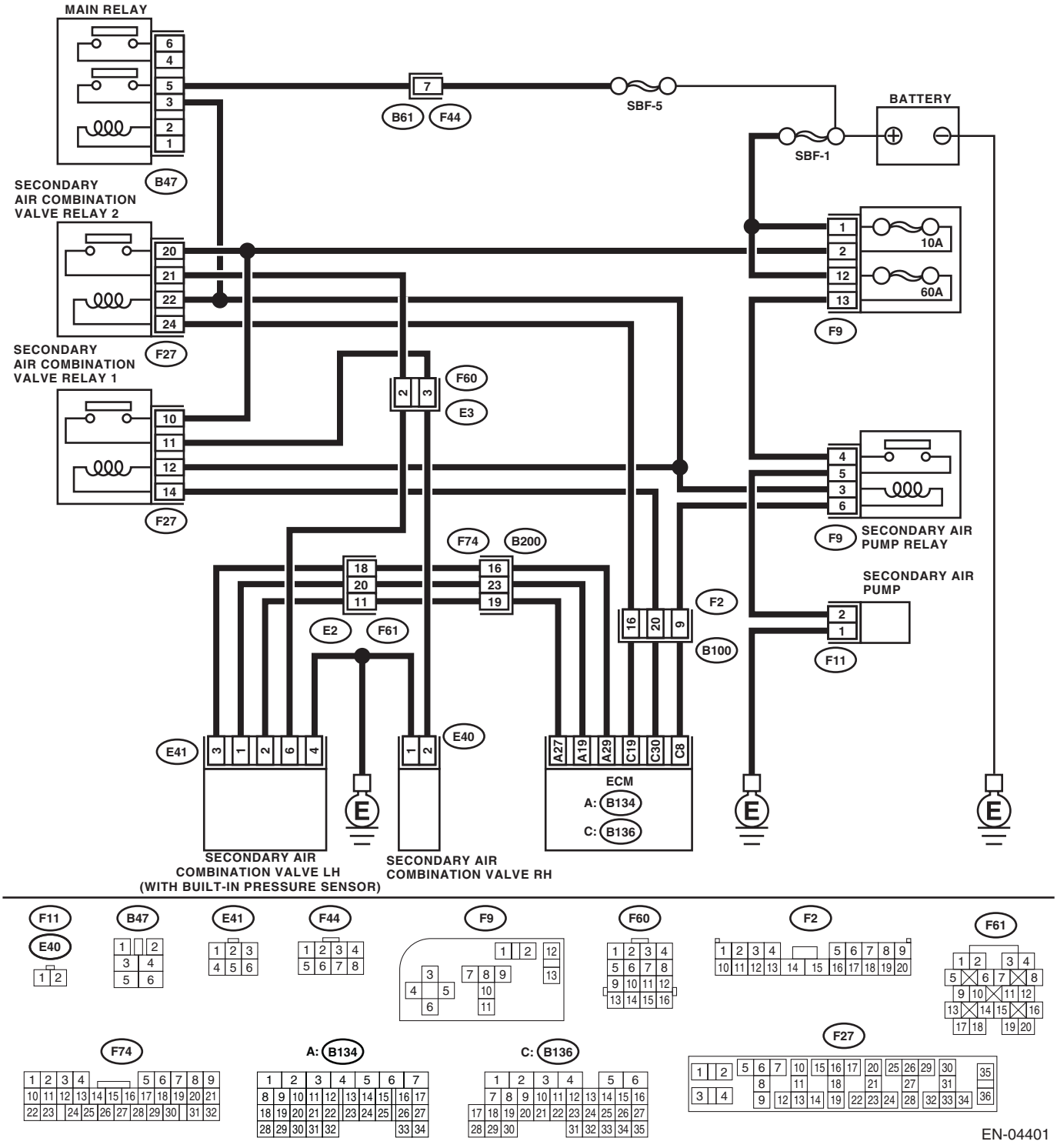
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-280, DTC P2442 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04401

	Step	Check	Yes	No
1	**CHECK SECONDARY AIR COMBINATION VALVE OPERATION.** 1) Connect the test mode connector. 2) Turn the ignition switch to ON. 3) Perform operation check for the secondary air combination valve using the Subaru Select Monitor. NOTE: Subaru Select Monitor Refer to “Compulsory Valve Operation Check Mode” for more operation procedure. <Ref. to EN(H4DOTC)(diag)-47, Compulsory Valve Operation Check Mode.>	Doe the secondary air combination valve operate properly?	Go to step **2**.	Go to step **4**.
2	**CHECK DUCT BETWEEN SECONDARY AIR PUMP AND SECONDARY AIR COMBINATION VALVE.** Inspection of the duct between the secondary air pump and secondary air combination valve.	Is there damage or disconnection of the duct?	Replace or connect the duct.	Go to step **3**.
3	**CHECK PIPE BETWEEN SECONDARY AIR COMBINATION VALVE AND CYLINDER HEAD.** Inspection of the pipe between the secondary air combination valve and cylinder head.	Is there damage or disconnection of the pipe?	Replace or connect the pipe.	Temporary poor contact occurs. Check for poor contact in the connector.
4	**CHECK POWER SUPPLY TO SECONDARY AIR COMBINATION VALVE.** In the condition of step 1, measure the voltage between the secondary air combination valve and the chassis ground. ***Connector & terminal*** ***(E41) No. 6 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Replace the secondary air combination valve.	Go to step **5**.
5	**CHECK HARNESS BETWEEN SECONDARY AIR COMBINATION VALVE RELAY AND SECONDARY AIR COMBINATION VALVE CONNECTOR TERMINAL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the secondary air combination valve relay and secondary air combination valve. 3) Measure resistance between the secondary air combination valve relay and secondary air combination valve connector terminal. ***Connector & terminal*** ***(F27) No. 21 — (E21) No. 6:***	Is the resistance less than 1 Ω?	Go to step **6**.	Repair the open circuit between the secondary air combination valve relay and secondary air combination valve connector terminal.
6	**CHECK SECONDARY AIR COMBINATION VALVE RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the secondary air pump relay from the relay box. 3) Connect the battery to the secondary air combination valve relay terminals No. 22 and 24. 4) Measure the resistance between the secondary air combination valve relay terminals. ***Terminals*** ***No. 20 — No. 21:***	Is the resistance less than 1 Ω?	Go to step **7**.	Replace the secondary air combination valve relay.

	Step	Check	Yes	No
7	**CHECK SECONDARY AIR COMBINATION VALVE RELAY POWER SOURCE.** 1) Turn the ignition switch to ON. 2) Measure the voltage between the secondary air combination valve relay connector and chassis ground. ***Connector & terminal*** ***(F27) No. 20 (+) — Chassis ground (–):*** ***(F27) No. 22 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **8**.	Repair the open or ground short circuit of power supply circuit.
8	**CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBINATION VALVE RELAY CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector of ECM. 3) Measure the resistance of the harness between the ECM and secondary air combination valve relay connector terminal. ***Connector & terminal*** ***(B136) No. 19 — (F27) No. 24:***	Is the resistance less than 1 Ω?	Replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>	Repair open circuit of the harness between the ECM and secondary air pump relay connector terminal.

EN:DTC P2443 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK CLOSED (BANK2)

NOTE:
For the diagnostic procedure, refer to DTC P2442. <Ref. to EN(H4DOTC)(diag)-380, DTC P2442 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

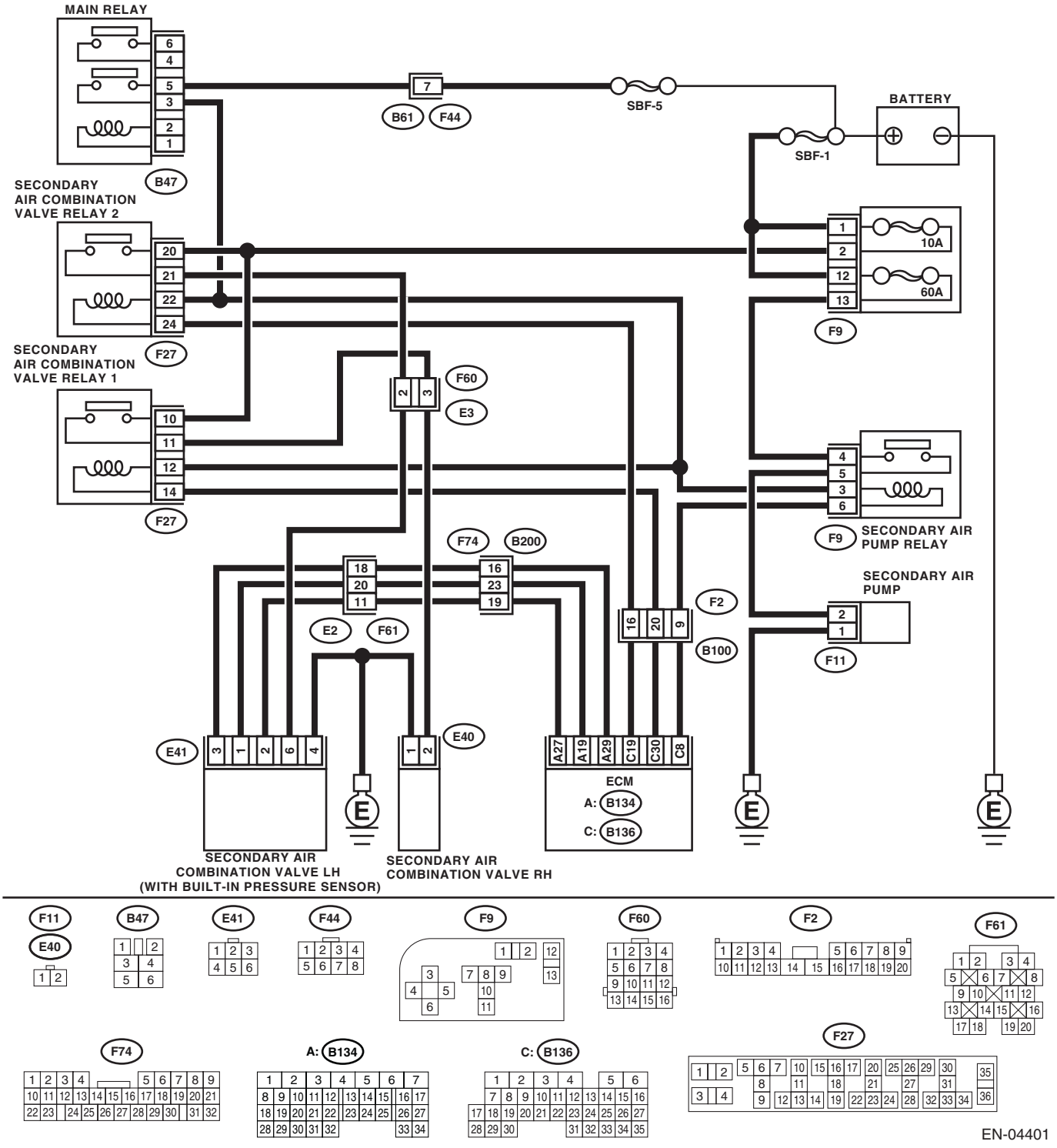
EO:DTC P2444 SECONDARY AIR INJECTION SYSTEM PUMP STUCK ON

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-281, DTC P2444 SECONDARY AIR INJECTION SYSTEM PUMP STUCK ON, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repairing or replacing the defective part, carry out the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK SECONDARY AIR PIPING PRESSURE.** 1) Turn the ignition switch to ON (engine OFF). 2) Using the Subaru Select Monitor, read secondary air piping pressure data, and compare with the actual atmospheric pressure. NOTE: Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-27, Subaru Select Monitor.>	Is the difference with the actual atmospheric pressure 50 mmHg (6.7 kpa, 2.0 inHg or 0.97 psig) or more?	Replace the secondary air combination valve (LH). <Ref. to EC(H4DOTC)-10, Secondary Air Combination Valve.> NOTE: The secondary air pressure sensor is a one piece combined part with the secondary air combination valve (LH).	Go to step **2**.
2	**CHECK POWER SUPPLY TO SECONDARY AIR PUMP.** 1) Turn the ignition switch to ON (engine OFF). 2) Measure the voltage between the secondary air pump and chassis ground. ***Connector & terminal*** ***(F11) No. 2 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **3**.	Temporary poor contact occurs. Check for poor contact in the connector.
3	**CHECK SECONDARY AIR PUMP RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the secondary air pump relay from the relay box. 3) Measure the resistance between the secondary air pump relay terminals. ***Terminals*** ***No. 4 — No. 5:***	Is the resistance more than 1 MΩ?	Repair the battery short between the secondary air pump relay and secondary air pump connector terminal.	Replace the secondary air pump relay.

19.General Diagnostic Table

A: INSPECTION

1. ENGINE

NOTE:
Malfunction of parts other than those listed is also possible. <Ref. to ME(H4DOTC)-88, 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

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 & ignitor assembly and spark plug.
*2: Indicate the symptom occurring only in cold temperatures.
*3: Ensure the secure installation.
*4: Check fuel injector, fuel pressure regulator and fuel filter.
*5: Inspect air leak in air intake system.

GENERAL DESCRIPTION

GD(H4DOTC)

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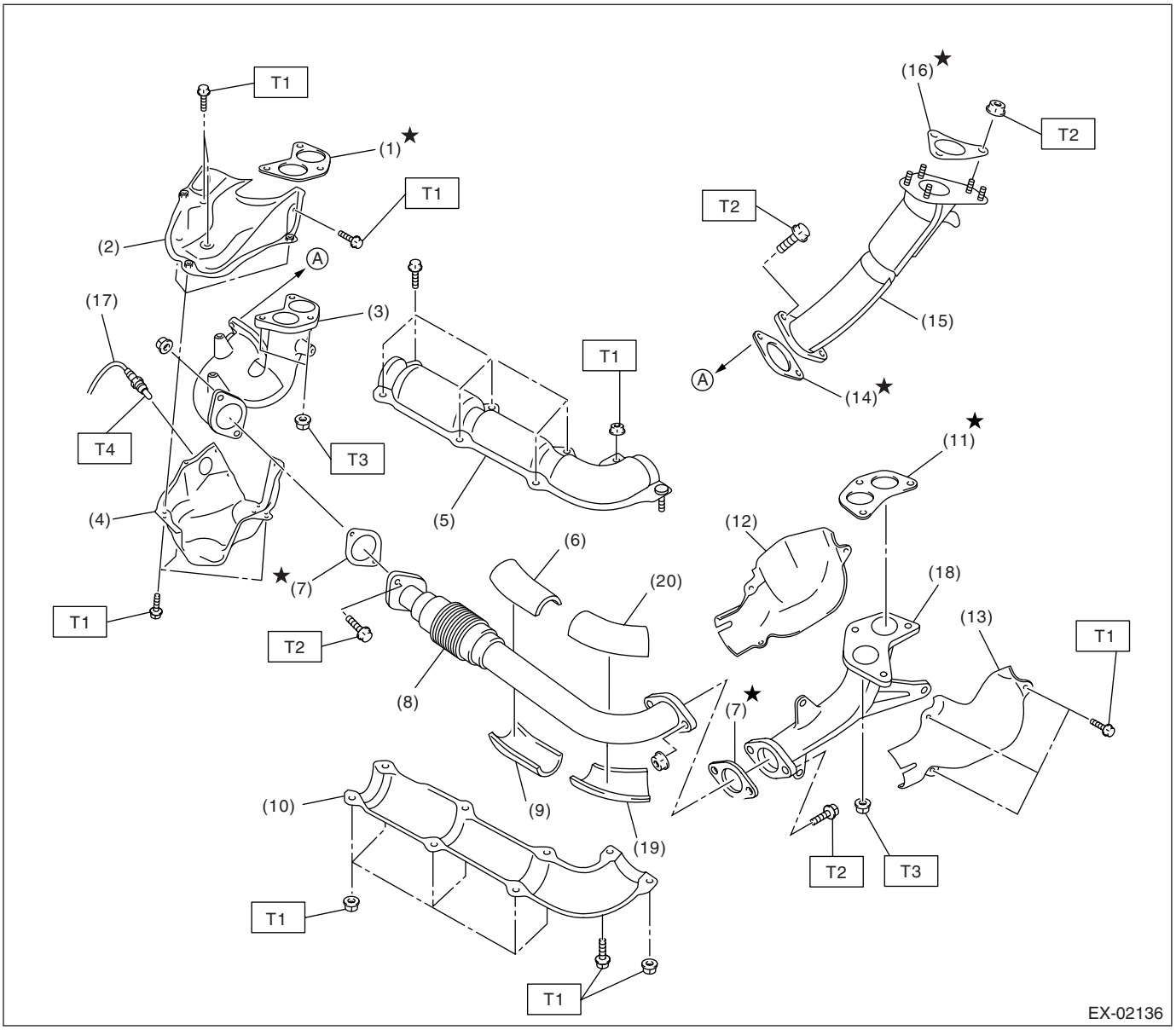
1. General Description

A: COMPONENT

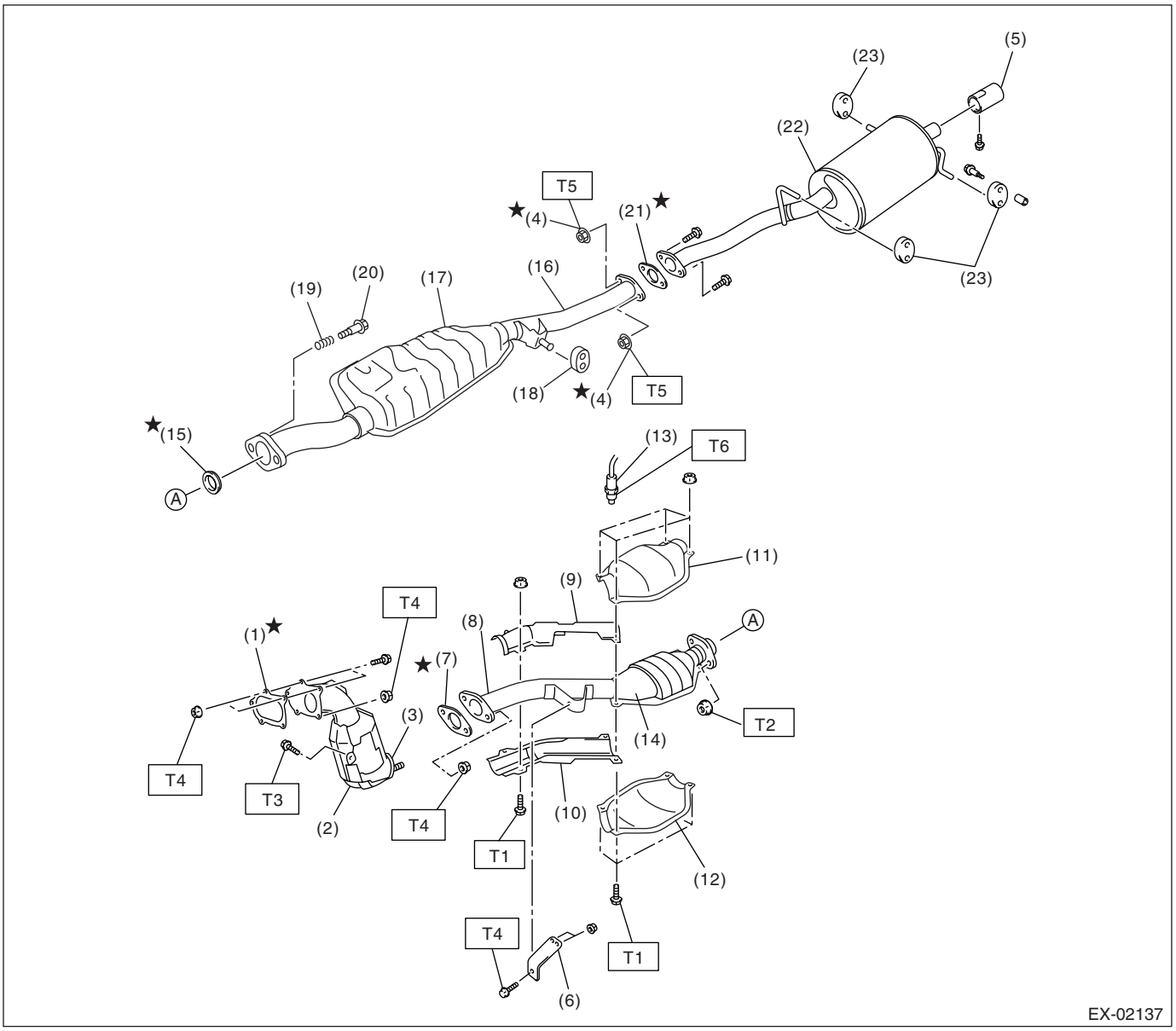
1. FRONT EXHAUST PIPE



(1) Gasket
(2) Exhaust manifold upper cover (RH)
(3) Exhaust manifold (RH)
(4) Exhaust manifold lower cover (RH)
(5) Front exhaust pipe upper cover
(6) Front exhaust pipe upper insulator (RH)
(7) Gasket
(8) Front exhaust pipe
(9) Front exhaust pipe lower insulator (RH)
(10) Front exhaust pipe lower cover
(11) Gasket
(12) Exhaust manifold upper cover (LH)
(13) Exhaust manifold lower cover (LH)
(14) Gasket
(15) Turbocharger joint pipe
(16) Gasket
(17) Front oxygen (A/F) sensor
(18) Exhaust manifold (LH)
(19) Front exhaust pipe lower insulator (LH)
(20) Front exhaust pipe upper insulator (LH)

Tightening torque: N·m (kgf-m, ft-lb)
T1: 7.5 (0.8, 5.5)
T2: 35 (3.6, 26.0)
T3: 40 (4.0, 28.9)
T4: <Ref. to FU(H4DOTC)-41, INSTALLATION, Front Oxygen (A/F) Sensor.>

2. CENTER AND REAR EXHAUST PIPE, AND MUFFLER



(1) Gasket
(2) Front catalytic converter
(3) Center exhaust pipe (Front)
(4) Self-locking nut
(5) Muffler cutter
(6) Bracket
(7) Gasket
(8) Center exhaust pipe (Rear)
(9) Center pipe upper cover (Rear)
(10) Center pipe lower cover (Rear)
(11) Upper rear catalytic converter cover
(12) Lower rear catalytic converter cover
(13) Rear oxygen sensor
(14) Rear catalytic converter
(15) Gasket
(16) Rear exhaust pipe
(17) Chamber
(18) Cushion
(19) Spring
(20) Bolt
(21) Gasket
(22) Muffler
(23) Cushion

Tightening torque: N·m (kgf-m, ft-lb)

T1: 13 (1.3, 9.6)
T2: 18 (1.8, 13.0)
T3: 30 (3.1, 22.4)
T4: 35 (3.6, 26.0)
T5: 48 (4.9, 35.4)
T6: <Ref. to FU(H4DOTC)-43, INSTALLATION, Rear Oxygen Sensor.>

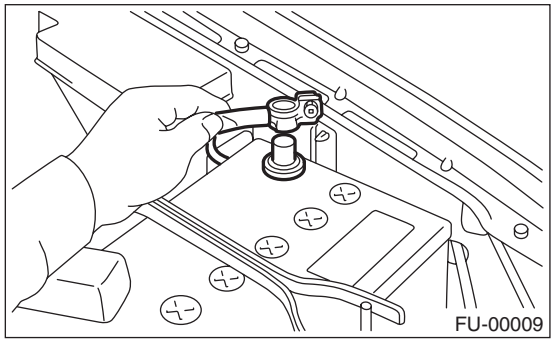
B: CAUTION

• Wear work clothing, including a cap, protective goggles and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust and dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
• Be careful not to burn your hands, because each part on the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or rigid racks at the specified points.
• Before disconnecting connectors of sensors or units, be sure to disconnect the ground cable from battery.

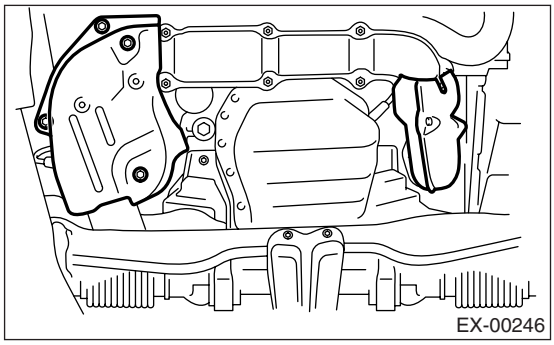
2. Front Exhaust Pipe

A: REMOVAL

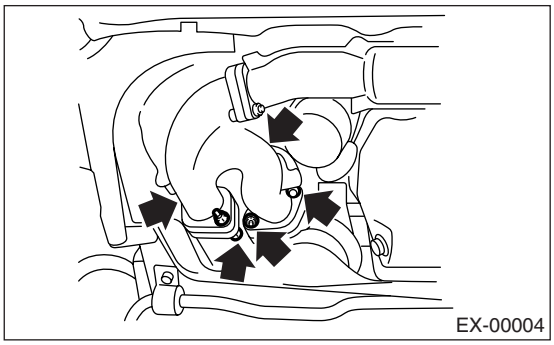
1) Disconnect the ground cable from battery.

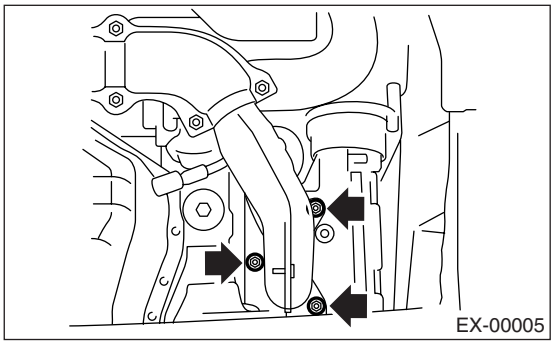


2) Remove the collector cover.
3) Remove the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-41, REMOVAL, Front Oxygen (A/F) Sensor.>
4) Remove the under cover.
5) Remove the exhaust manifold lower cover (RH) and the exhaust manifold lower cover (LH).

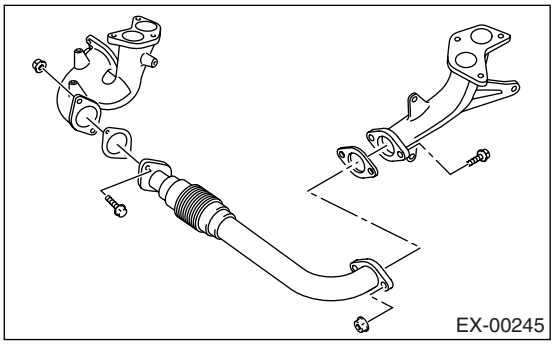


6) Remove the nuts which hold front exhaust pipe assembly onto turbocharger joint pipe.
7) While holding the front exhaust pipe assembly with one hand, remove the nuts which hold the front exhaust pipe assembly to cylinder head exhaust port.





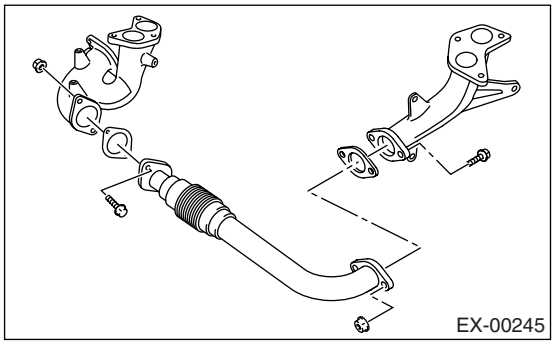
8) Remove the front exhaust pipe assembly.
9) Remove the covers from exhaust manifold and front exhaust pipe.
10) Separate the front exhaust pipe from exhaust manifolds.



B: INSTALLATION

NOTE:
Replace with a new gasket.
1) Install the front exhaust pipe and the exhaust manifold.

Tightening torque:
35 N·m (3.6 kgf-m, 26.0 ft-lb)



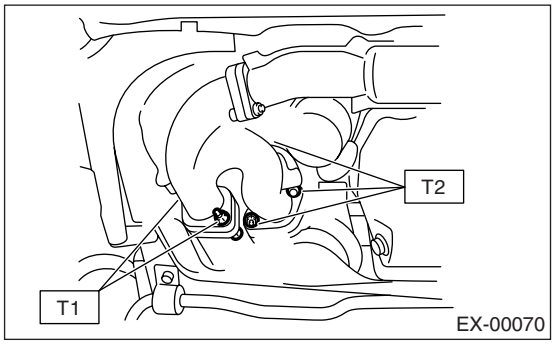
2) Install the front exhaust pipe cover.

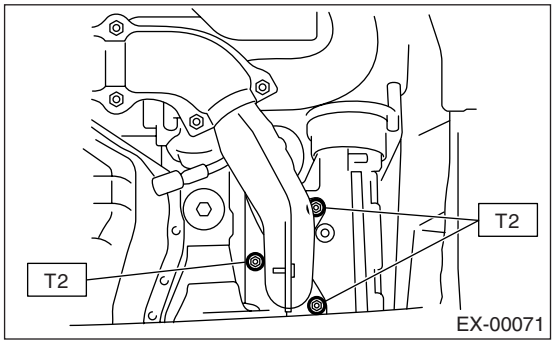
Tightening torque:
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)
3) Install the exhaust manifold upper cover (RH).

Tightening torque:
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)
4) Install the front exhaust pipe assembly.

Tightening torque:
35 N·m (3.6 kgf-m, 26.0 ft-lb)
5) Connect the exhaust manifold (RH) to turbo-charger joint pipe.

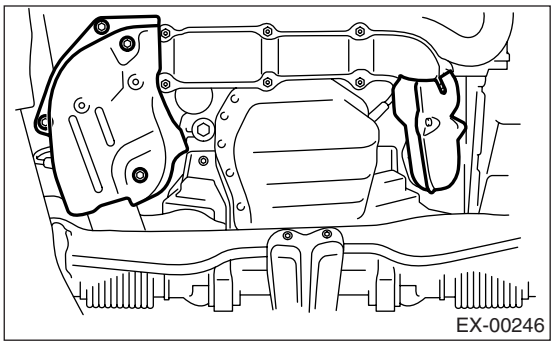
Tightening torque:
T1: 35 N·m (3.6 kgf-m, 26.0 ft-lb)
T2: 40 N·m (4.0 kgf-m, 28.9 ft-lb)



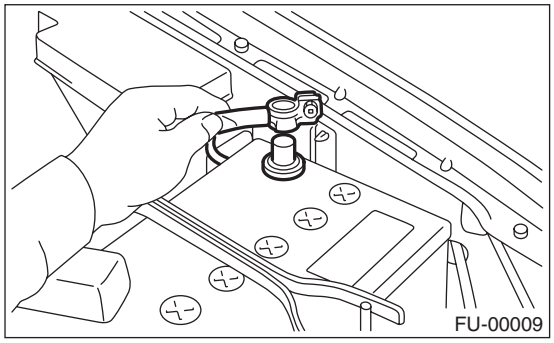


6) Install the exhaust manifold lower cover (RH) and the exhaust manifold lower cover (LH).

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



7) Install the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-41, INSTALLATION, Front Oxygen (A/F) Sensor.>
8) Install the under cover.
9) Connect the ground cable to battery.

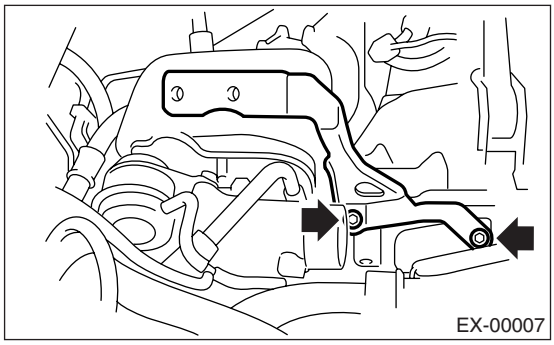


10) Install the collector cover.

3. Center Exhaust Pipe

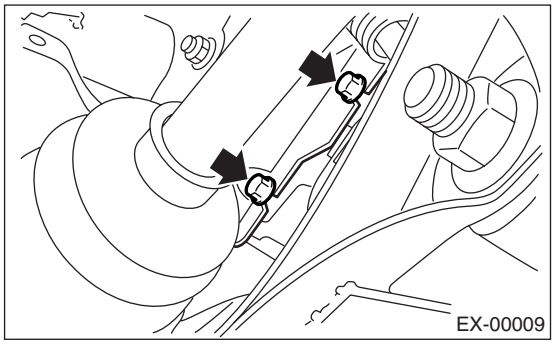
A: REMOVAL

1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.
3) Remove the collector cover.
4) Remove the intercooler. <Ref. to IN(H4DOTC)-10, REMOVAL, Intercooler.>
5) Remove the intercooler bracket.

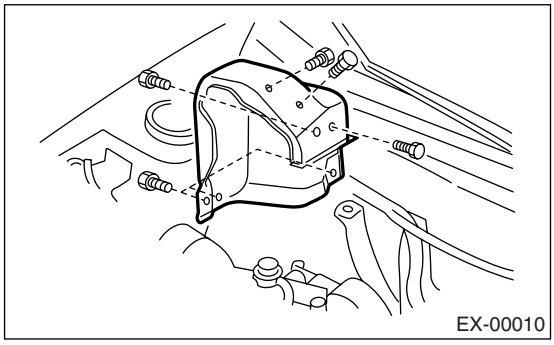


6) Lift-up the vehicle.
7) Remove the under cover.
8) Remove the bolts which install the lower side of turbocharger upper cover.

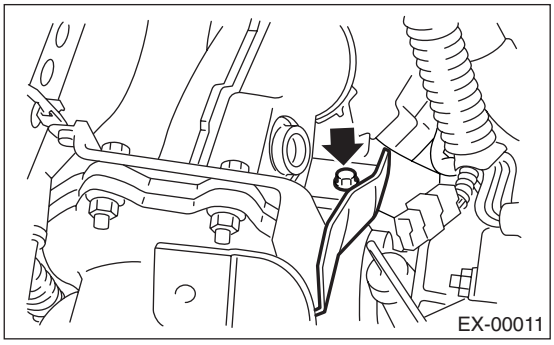
CAUTION:
Be careful, the turbocharger and exhaust pipe are hot.



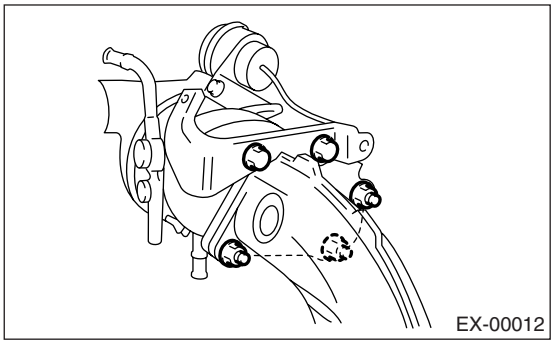
9) Lower the vehicle.
10) Remove the turbocharger upper cover.



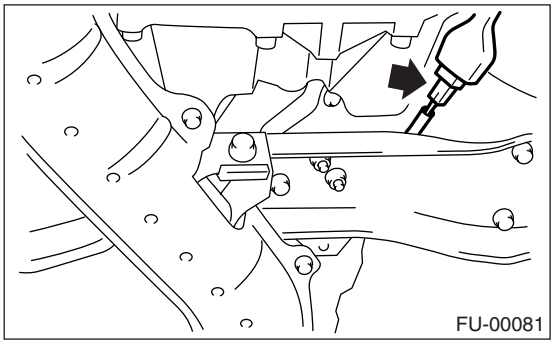
11) Remove the bolts which install the upper side of turbocharger upper cover, and remove it.



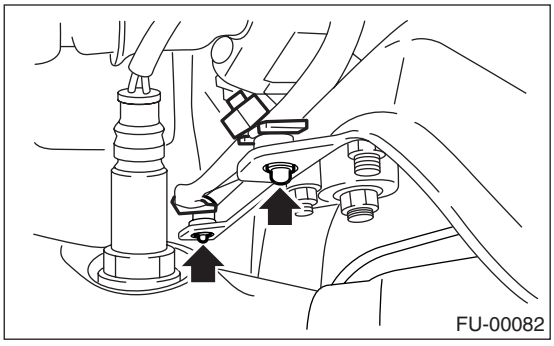
12) Separate the center exhaust pipe from turbocharger.



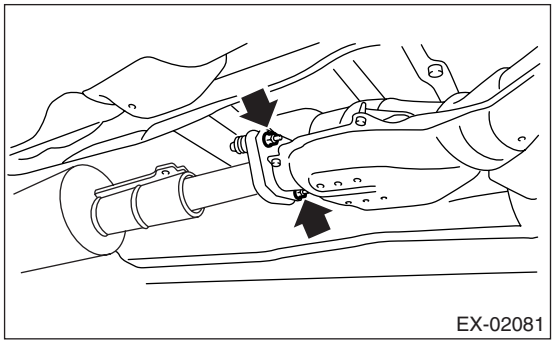
13) Lift-up the vehicle.
14) Disconnect the connector from rear oxygen sensor.



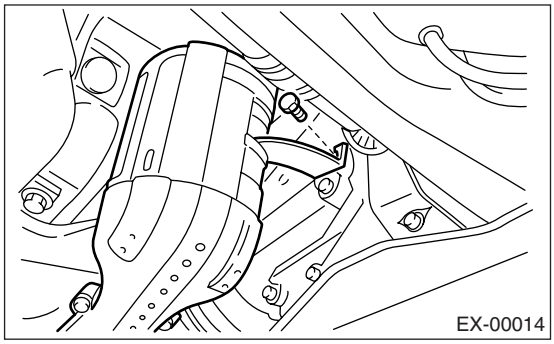
15) Vertically draw out clip from crossmember.



16) Separate the center exhaust pipe from rear exhaust pipe.

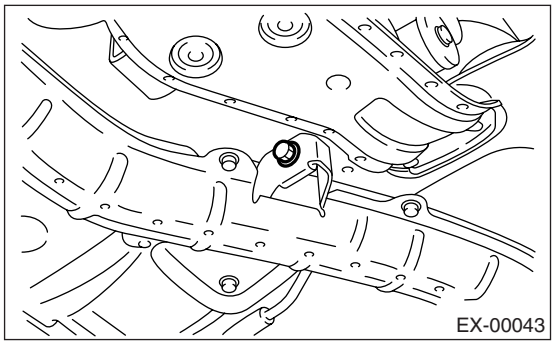


17) Remove the bolt which holds center exhaust pipe bracket to transmission.

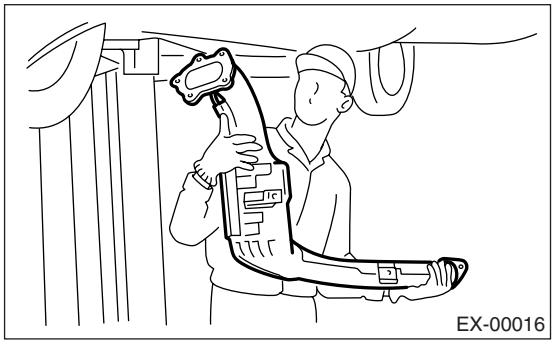


18) Remove the intercooler bracket.
19) Remove the bolt which holds center exhaust pipe to hanger bracket.

CAUTION:
Be careful not to pull down the center exhaust pipe.



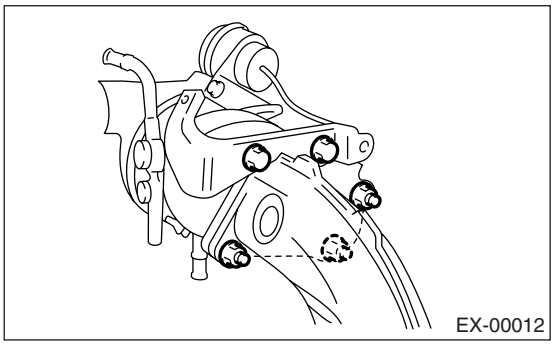
20) Remove the center exhaust pipe.



B: INSTALLATION

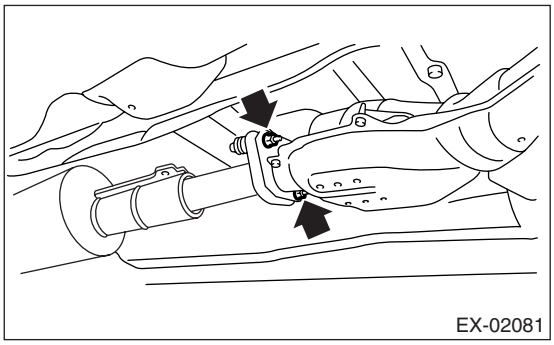
NOTE:
Replace with a new gasket.
1) Install the center exhaust pipe and temporarily tighten the bolt which holds center exhaust pipe to hanger bracket.
2) Temporarily tighten the bolt which holds the center pipe to transmission.
3) Connect the center exhaust pipe to turbocharger.

Tightening torque:
35 N·m (3.6 kgf-m, 26.0 ft-lb)

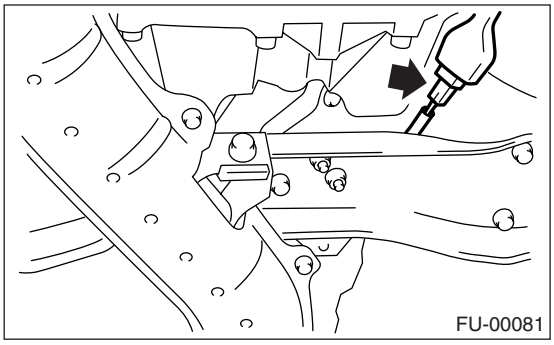


4) Install the center exhaust pipe to rear exhaust pipe.

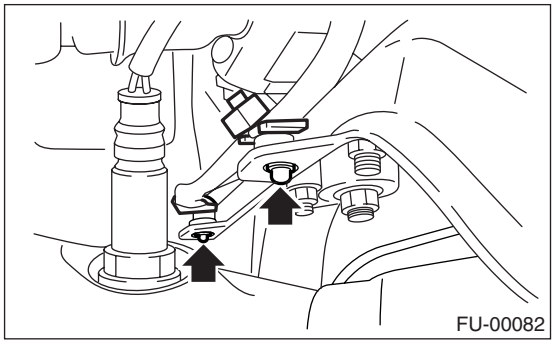
Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)



5) Connect the connector to rear oxygen sensor.

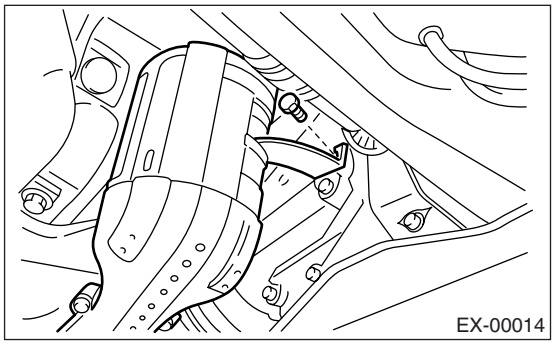


6) Secure clip on the crossmember.



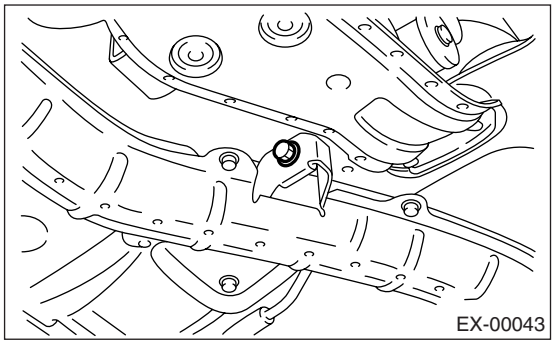
7) Tighten the bolt which holds center exhaust pipe bracket to transmission.

Tightening torque:
30 N·m (3.1 kgf-m, 22.4 ft-lb)



8) Tighten the bolt which holds center exhaust pipe to hanger bracket.

Tightening torque:
35 N·m (3.6 kgf-m, 26.0 ft-lb)



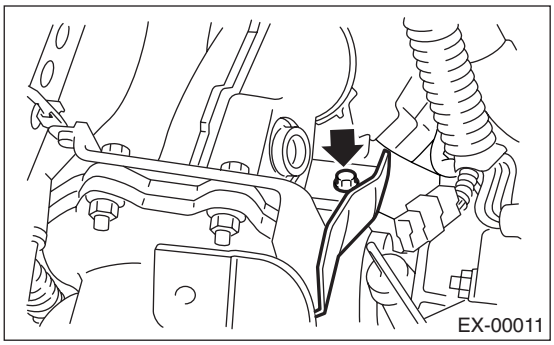
9) Tighten the bolts which hold the intercooler bracket.

Tightening torque:
35 N·m (3.6 kgf-m, 26.0 ft-lb)

10) Lower the vehicle.

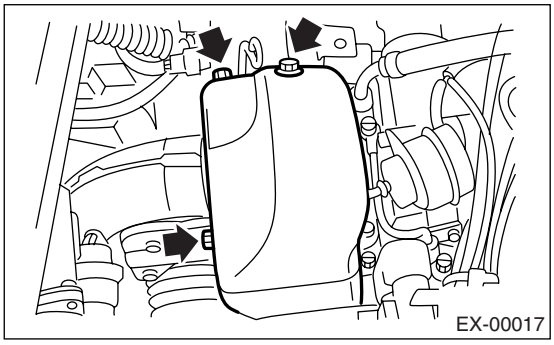
11) Position the turbocharger lower cover, and tighten the bolts which install the upper side of lower cover.

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



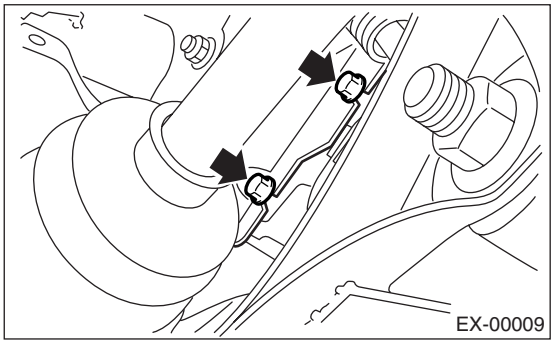
12) Position the turbocharger upper cover, and tighten the bolts which install the upper side of upper cover.

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



13) Lift-up the vehicle.
14) Tighten the bolts which install the under side of turbocharger upper cover.

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

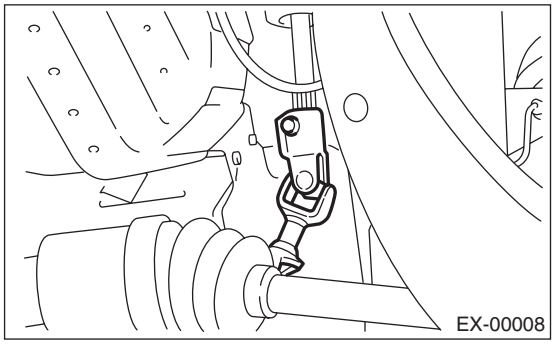


15) Install the universal joint.
(1) Align the bolt hole on the long yoke side of universal joint with the cutout at the serrated section of shaft end, and then insert the universal joint.
(2) Align the bolt hole on the short yoke side of universal joint with the cutout on the serrated section of gearbox assembly. Lower the universal joint completely.
(3) Temporarily tighten the bolt of short yoke side. Raise the universal joint to make sure the bolt is properly passing through the cutout at the serrated section.
(4) Tighten the long yoke side bolt, and also tighten the short yoke side bolt.

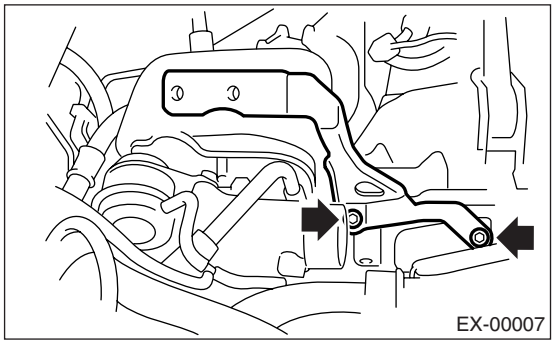
Tightening torque:
24 N·m (2.4 kgf-m, 17.4 ft-lb)

CAUTION:
• Make sure the universal joint bolts are tightened through the shaft serration notches.
• Excessively large tightening torque of universal joint bolts may lead to heavy steering wheel operation.

Standard clearance between gearbox and DOJ:
15 mm (0.59 in) or more



16) Install the under cover.
17) Lower the vehicle.
18) Install the intercooler bracket.

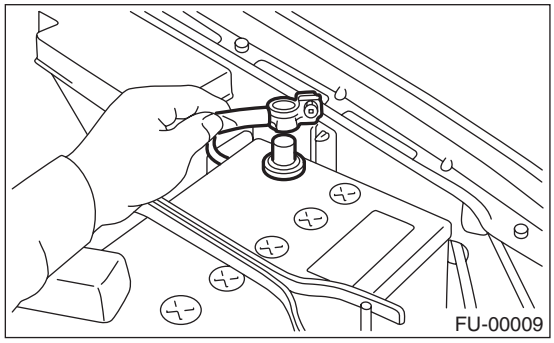


19) Install the intercooler. <Ref. to IN(H4DOTC)-10, INSTALLATION, Intercooler.>
20) Align the center of roll connector. <Ref. to AB-19, ADJUSTMENT, Roll Connector.>
21) Install the collector cover.

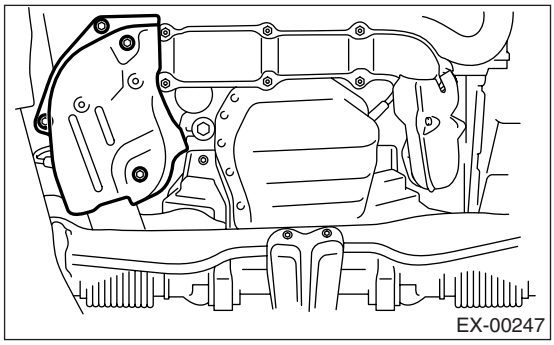
4. Joint Pipe

A: REMOVAL

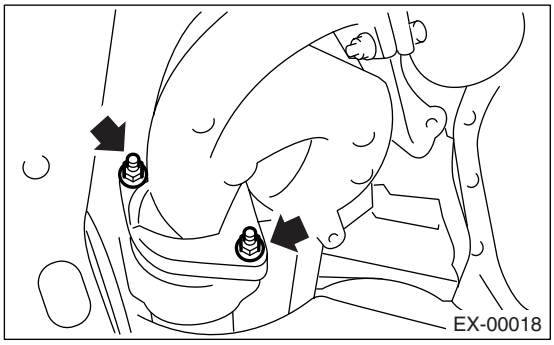
1) Disconnect the ground cable from battery.



2) Remove the collector cover.
3) Remove the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-41, REMOVAL, Front Oxygen (A/F) Sensor.>
4) Remove the under cover.
5) Remove the exhaust manifold lower cover (RH).



6) Remove the nuts which hold the front exhaust manifold to joint pipe.

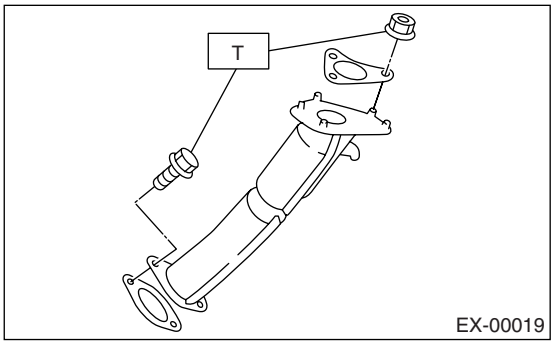


7) Remove the center exhaust pipe.
<Ref. to EX(H4DOTC)-7, REMOVAL, Center Exhaust Pipe.>
8) Remove the turbocharger. <Ref. to IN(H4DOTC)-12, REMOVAL, Turbocharger.>
9) Take off the joint pipe in the upward direction.

B: INSTALLATION

Install in the reverse order of removal.

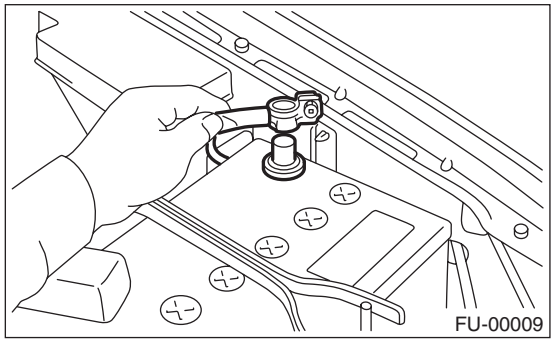
Tightening torque:
T: 35 N·m (3.6 kgf-m, 26.0 ft-lb)



5. Rear Exhaust Pipe

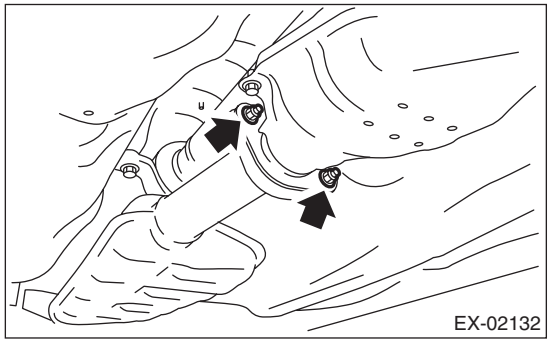
A: REMOVAL

1) Disconnect the ground cable from battery.



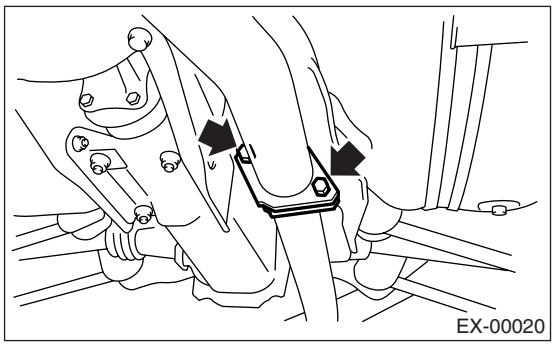
2) Lift-up the vehicle.
3) Separate the rear exhaust pipe from center exhaust pipe.

CAUTION:
Be careful, exhaust pipe is hot.

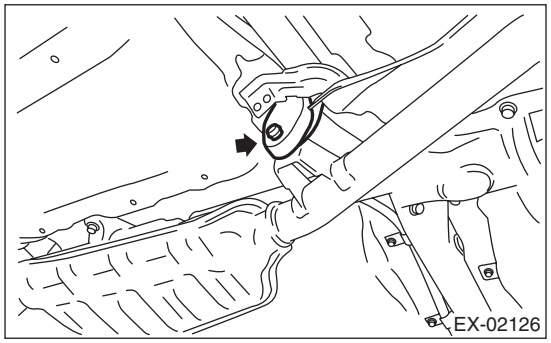


4) Separate the rear exhaust pipe from muffler.

CAUTION:
Be careful not to pull down the rear exhaust pipe.

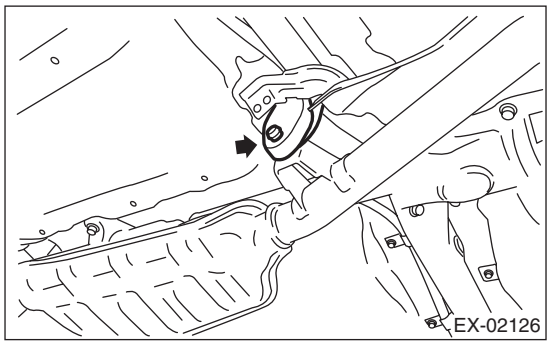


5) Separate and remove the rear exhaust pipe bracket from cushion rubber.



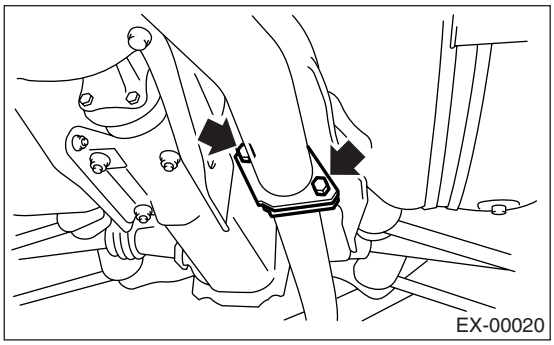
B: INSTALLATION

NOTE:
Replace with a new gasket and nut.
1) Install the rear exhaust pipe to cushion rubber.



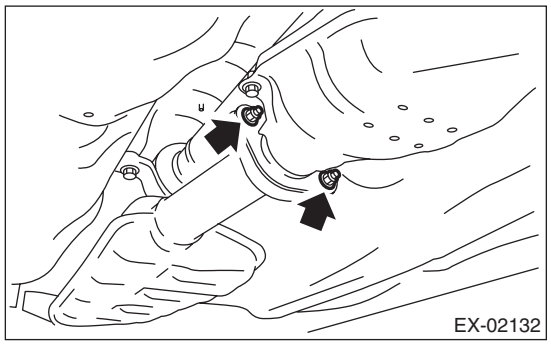
2) Install the rear exhaust pipe to muffler.

Tightening torque:
48 N·m (4.9 kgf-m, 35.4 ft-lb)

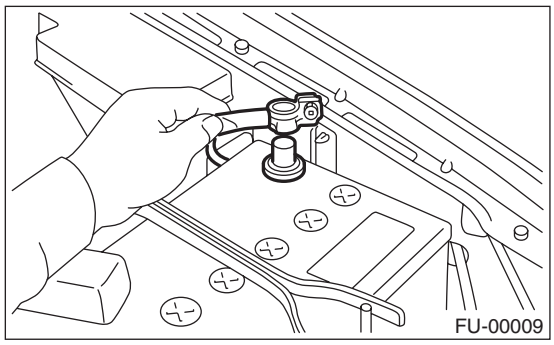


3) Install the rear exhaust pipe to center exhaust pipe.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)



4) Lower the vehicle.
5) Connect the ground cable to battery.



C: INSPECTION

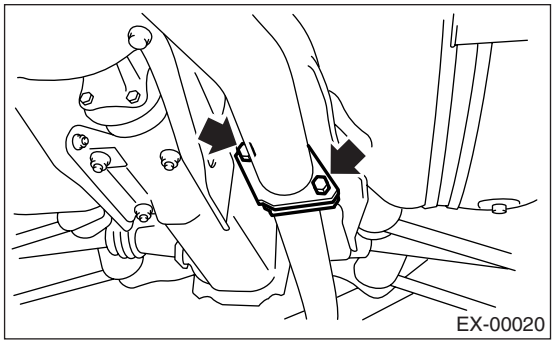
1) Check the connections and welds for exhaust leaks.
2) Make sure there are no holes or rusting.
3) Check the cushion rubber for wear or crack.

6. Muffler

A: REMOVAL

1) Separate the muffler from rear exhaust pipe.

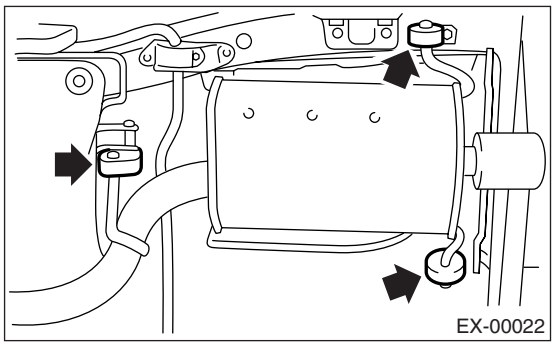
CAUTION:
Be careful, exhaust pipe is hot.



2) Remove the rubber cushion, and detach the muffler.

CAUTION:
Be careful not to drop the muffler during removal.

NOTE:
To facilitate removal, apply a coat of spray type lubricant to the mating area of rubber cushion in advance.

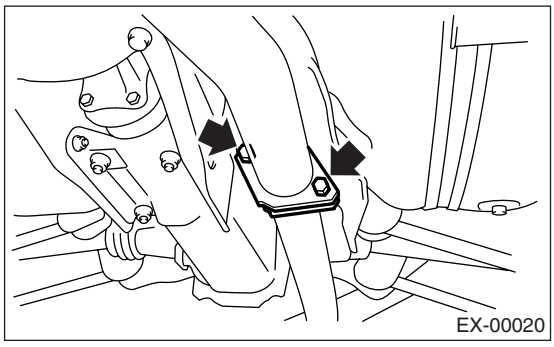


B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Replace with a new gasket and nut.

Tightening torque:
48 N·m (4.9 kgf-m, 35.4 ft-lb)



C: INSPECTION

1) Check the connections and welds for exhaust leaks.
2) Make sure there are no holes or rusting.
3) Check the cushion rubber for wear or crack.

COOLING

CO(H4DOTC)

Page
1. General Description 2

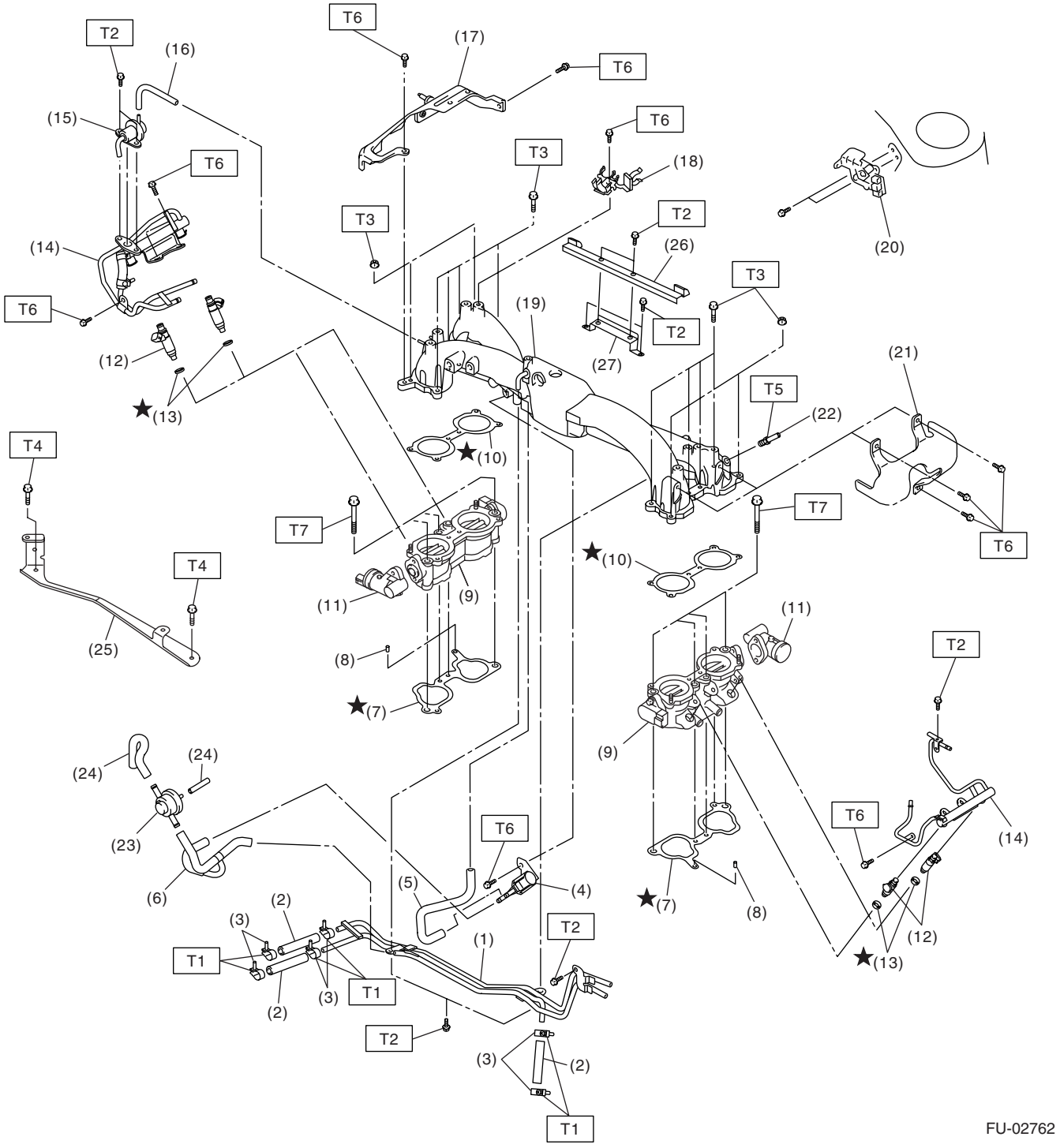
1. General Description

A: SPECIFICATION

Fuel tank	Capacity	60 ℓ (15.9 US gal, 13.2 Imp gal)
	Location	Under rear seat
Fuel pump	Type	Impeller
	Shutoff discharge pressure	450 — 677 kPa (4.59 — 6.9 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

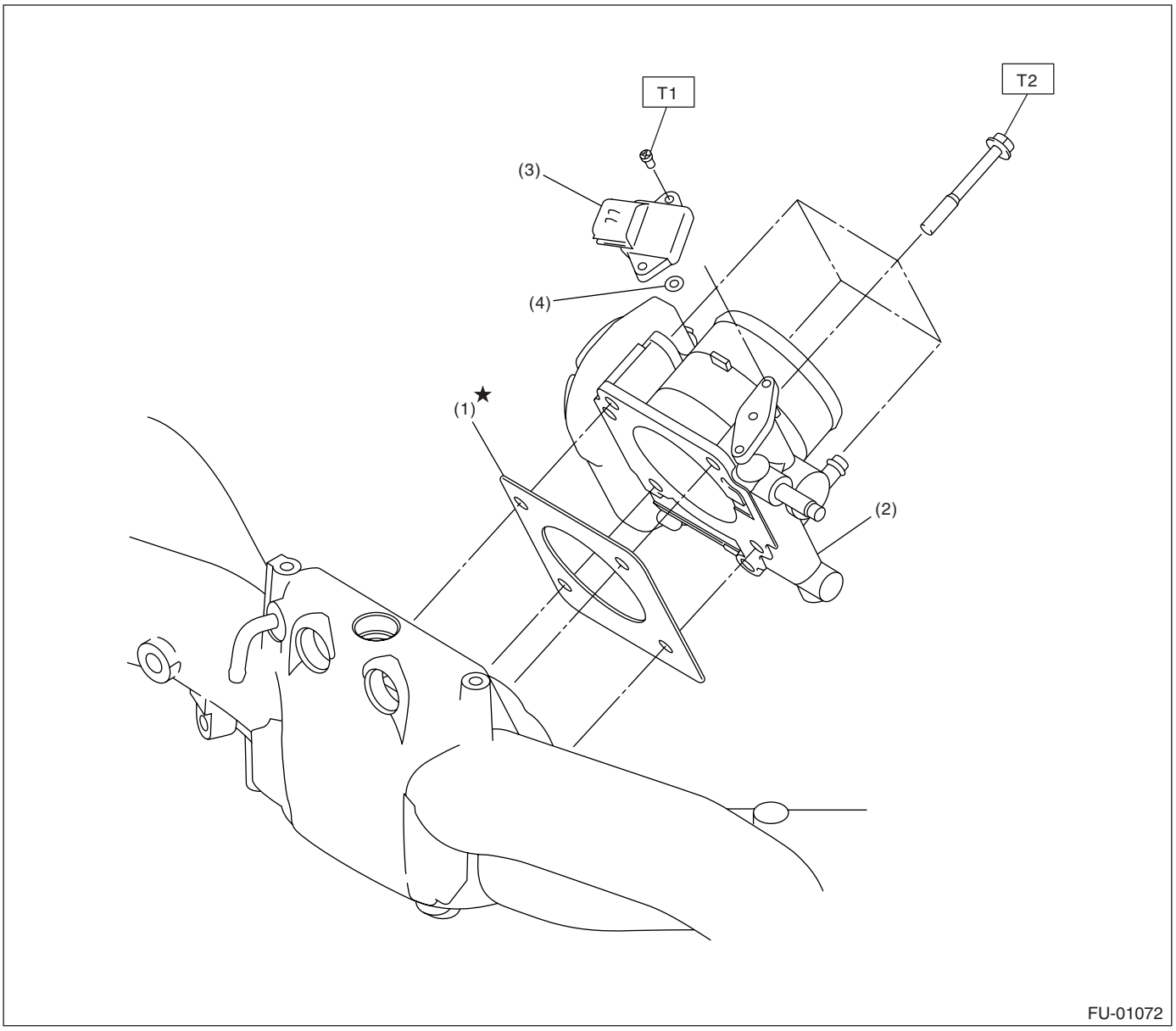


FU-02762

(1) Fuel pipe ASSY
(2) Fuel hose
(3) Clamp
(4) Purge control solenoid valve
(5) Vacuum hose
(6) Vacuum control hose
(7) Intake manifold gasket
(8) Guide pin
(9) Tumble generator valve assembly
(10) Tumble generated valve gasket
(11) Tumble generator valve actuator
(12) Fuel injector
(13) O-ring
(14) Fuel injector pipe
(15) Pressure regulator
(16) Pressure regulator hose
(17) Fuel pipe protector RH
(18) Blow-by hose stay
(19) Intake manifold
(20) Wastegate control solenoid valve ASSY
(21) Fuel pipe protector LH
(22) Nipple
(23) Purge valve
(24) Purge hose
(25) Collector cover bracket (Front)
(26) Collector cover bracket (Rear)
(27) Collector cover bracket (Rear)

Tightening torque: N·m (kgf-m, ft-lb)	
T1:	***1.25 (0.13, 0.94)***
T2:	***6.4 (0.65, 4.7)***
T3:	***8.25 (0.84, 6.1)***
T4:	***8.5 (0.87, 6.3)***
T5:	***17 (1.73, 12.5)***
T6:	***19 (1.9, 14.0)***
T7:	***25 (2.5, 18.1)***

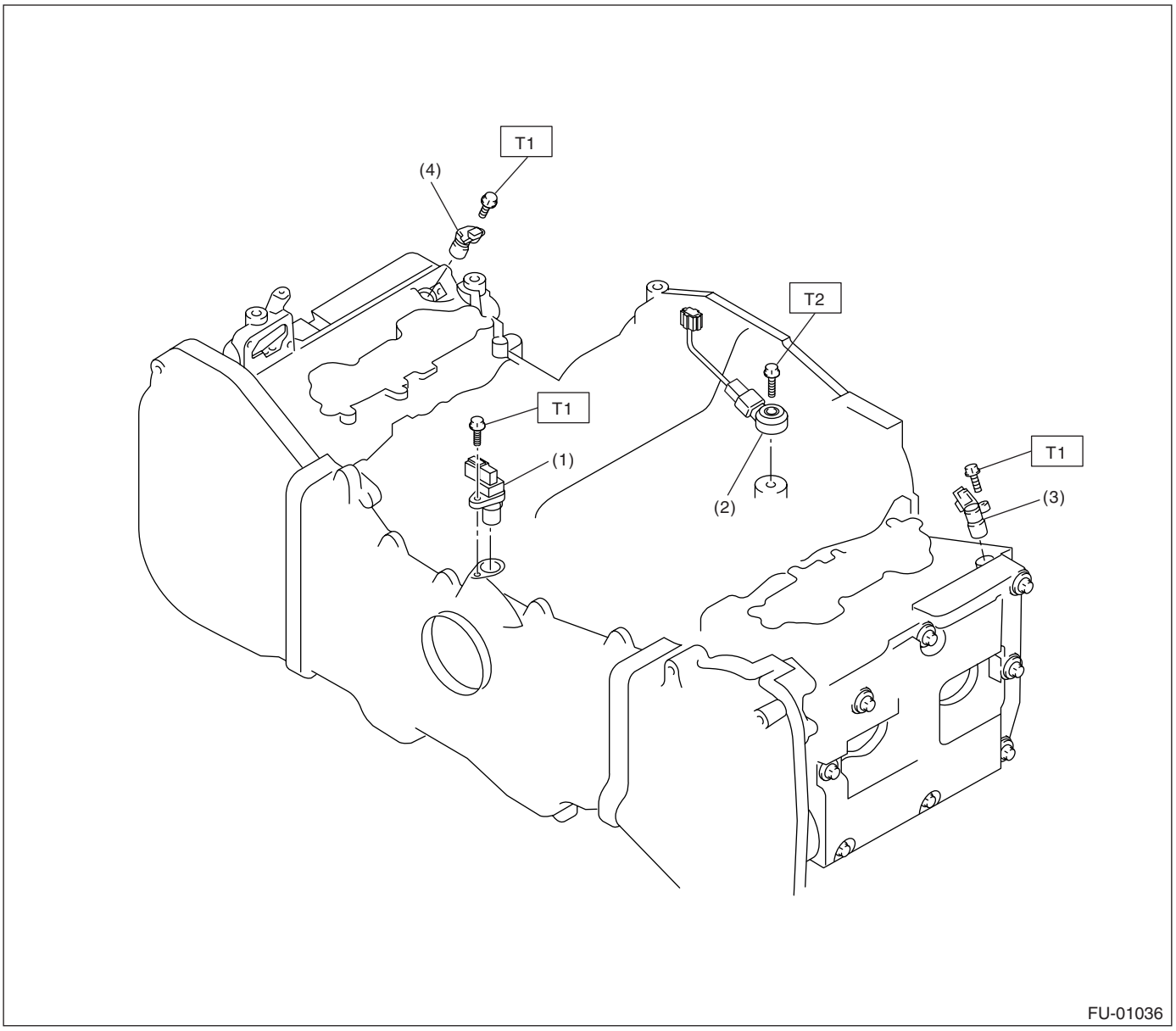
2. AIR INTAKE SYSTEM



(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, 5.8)

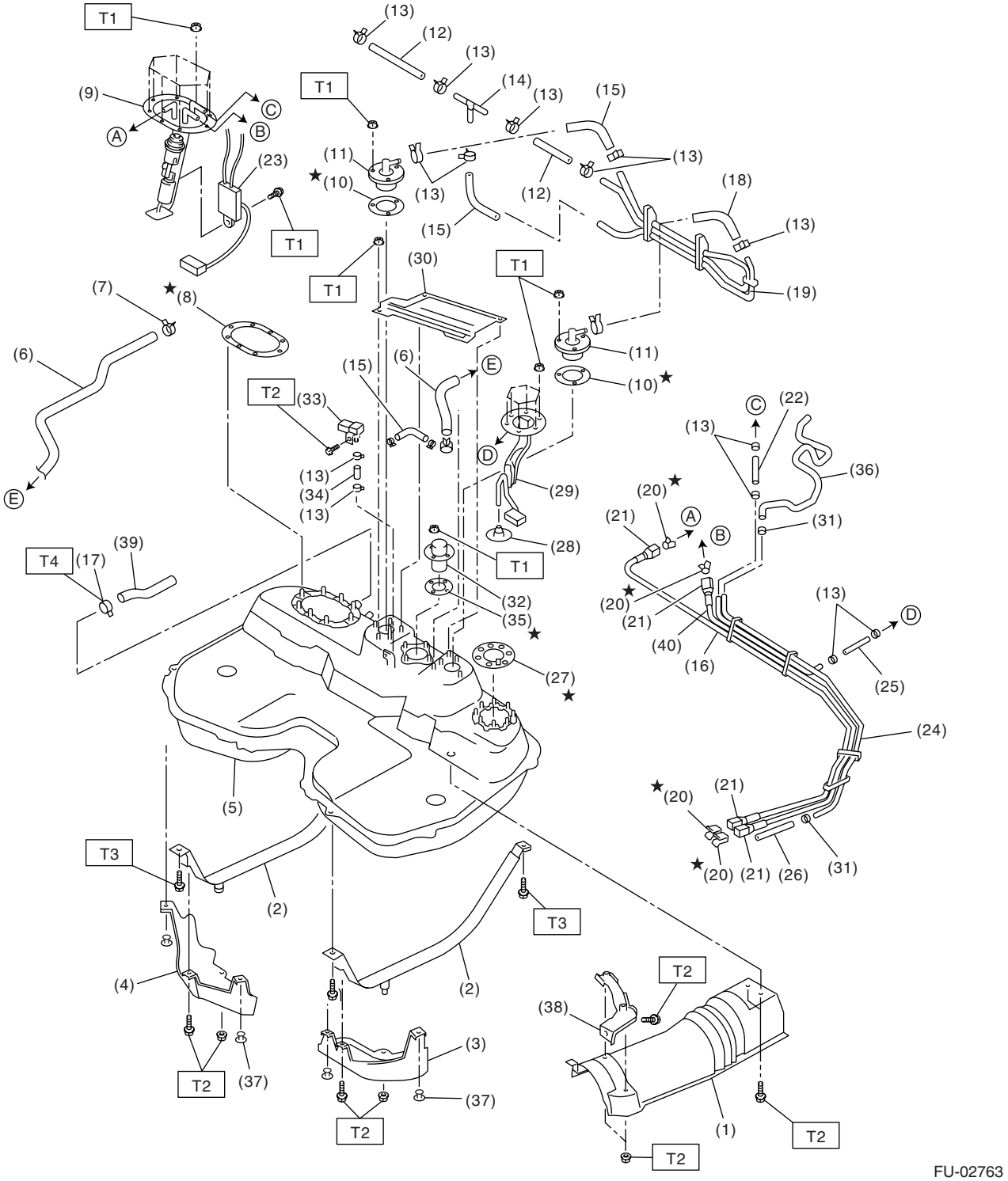
3. CRANKSHAFT POSITION, CAMSHAFT POSITION AND KNOCK SENSORS



(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, 17.4)

4. FUEL TANK



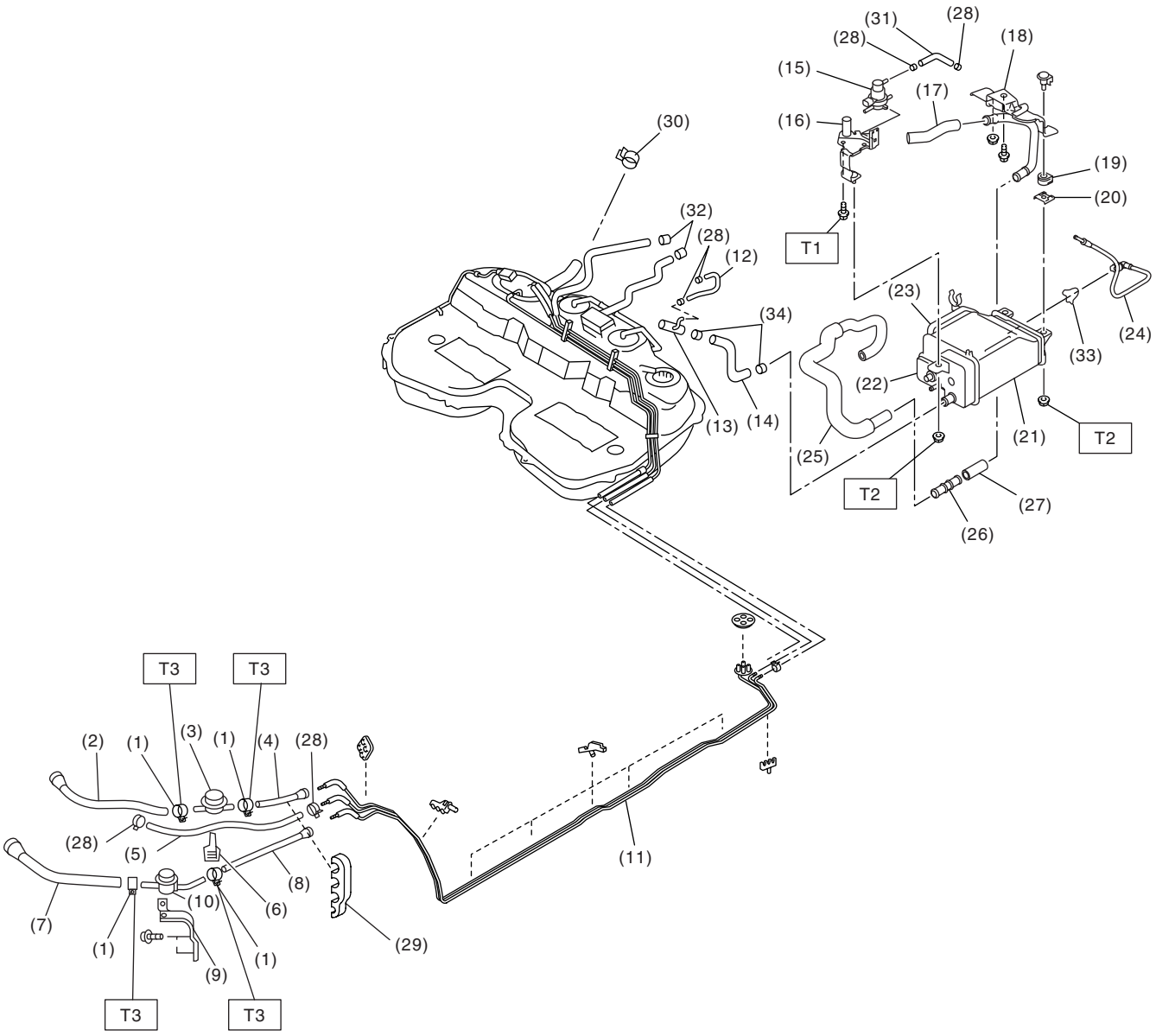
FU-02763

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

Tightening torque: N·m (kgf-m, ft-lb)

T1: 4.4 (0.45, 3.3)
T2: 7.4 (0.75, 5.4)
T3: 33 (3.4, 25)
T4: 1.96 (0.20, 1.45)

5. FUEL LINE

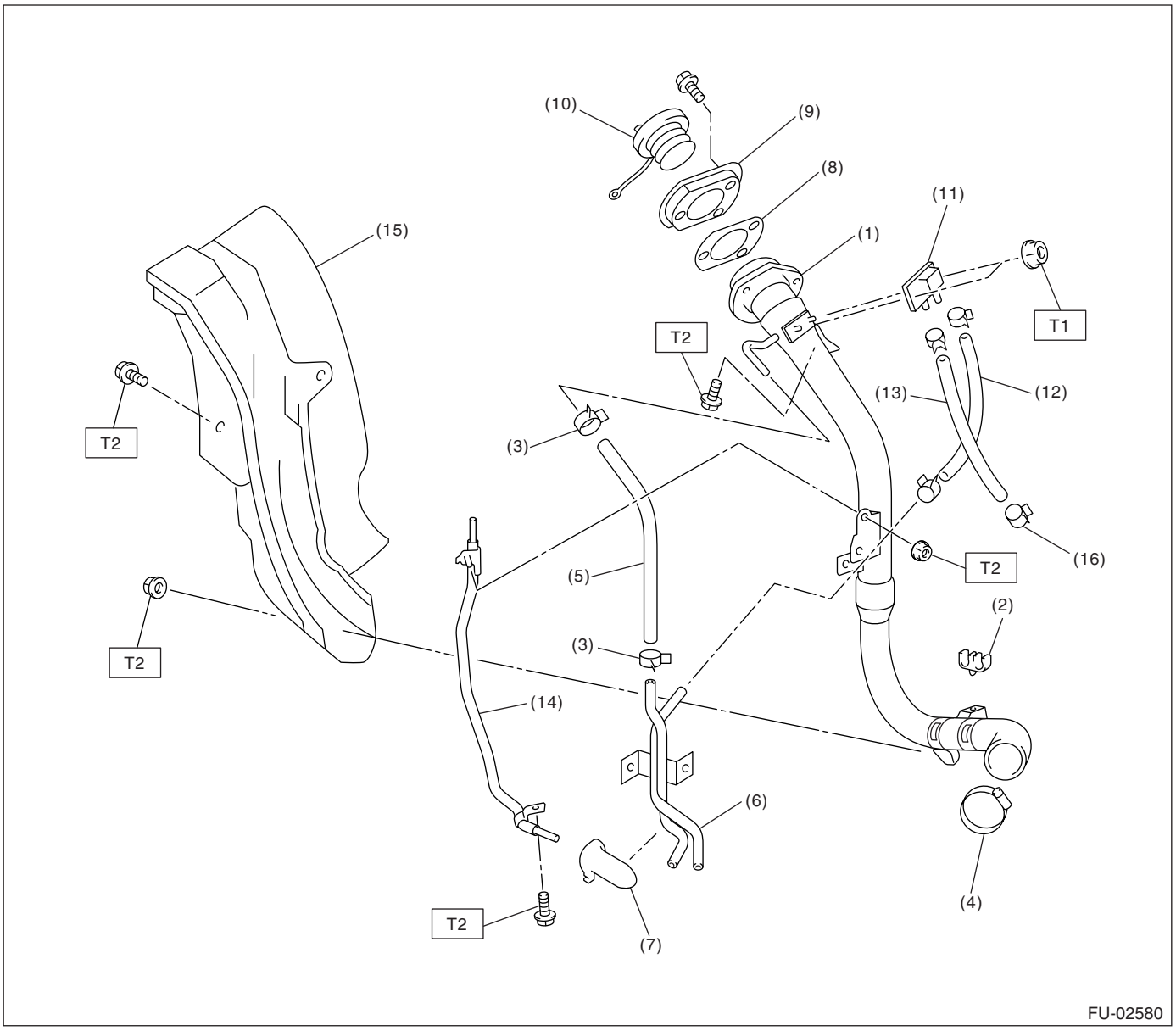


FU-02816

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

Tightening torque: N·m (kgf-m, ft-lb)
T1: 25 (2.5, 18.1)
T2: 23 (2.3, 16.6)
T3: 1.25 (0.13, 0.9)

6. FUEL FILLER PIPE



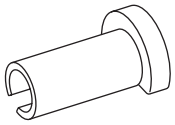
(1) Fuel filler pipe ASSY
(2) Evaporation hose holder
(3) Clip
(4) Clamp
(5) Evaporation hose A
(6) Evaporation pipe
(7) Evaporation pipe holder
(8) Filler pipe packing
(9) Filler ring
(10) Filler cap
(11) Shut valve
(12) Evaporation hose B
(13) Evaporation hose C
(14) Joint pipe
(15) Fuel filler pipe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

Tightening torque: N·m (kgf-m, ft-lb)
T1: 4.4 (0.45, 3.3)
T2: 7.5 (0.76, 5.5)

C: CAUTION

- Wear work clothing, including a cap, protective goggles and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Be careful not to burn yourself, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before disconnecting connectors of sensors or units, be sure to disconnect the ground cable from battery.
- Place “NO FIRE” signs near the working area.
- Be careful not to spill fuel on the floor.

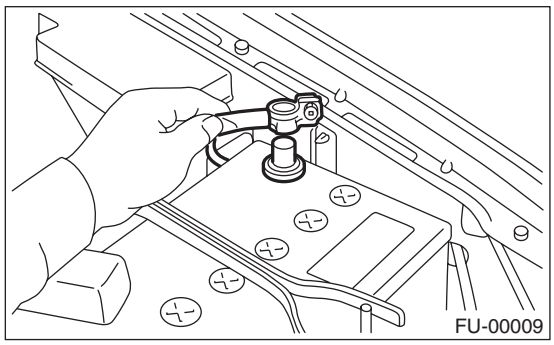
D: PREPARATION TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST42099AE000	42099AE000	CONNECTOR REMOVER	Removal of quick connector

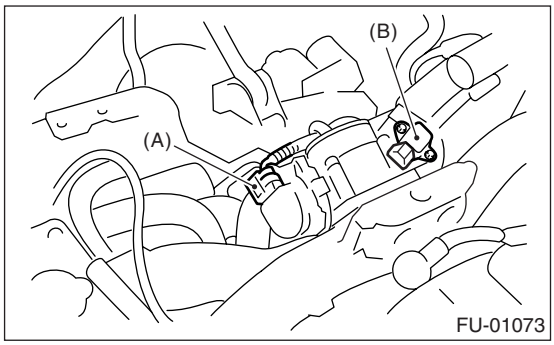
2. Throttle Body

A: REMOVAL

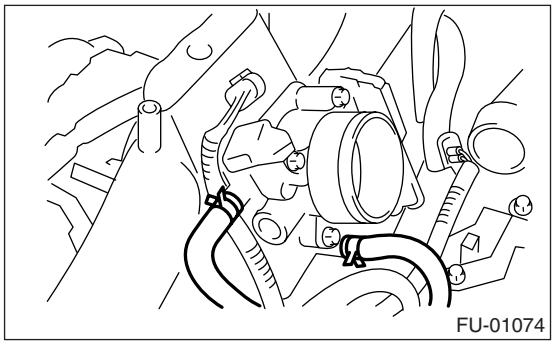
1) Disconnect the ground cable from battery.



2) Remove the collector cover.
3) Remove the intercooler. <Ref. to IN(H4DOTC)-10, REMOVAL, Intercooler.>
4) Disconnect the connector from the throttle position sensor (A), and the manifold pressure sensor (B).



5) Disconnect the engine coolant hoses from throttle body.



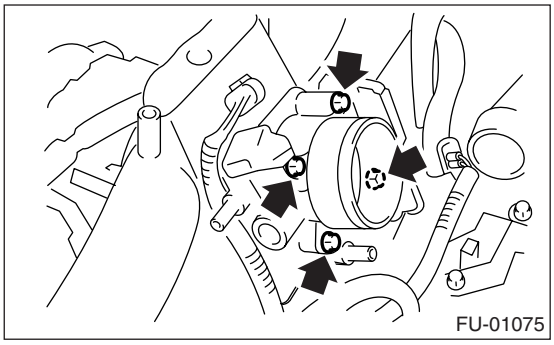
6) Remove the bolts which install throttle body to the intake manifold.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Always use a new gasket.

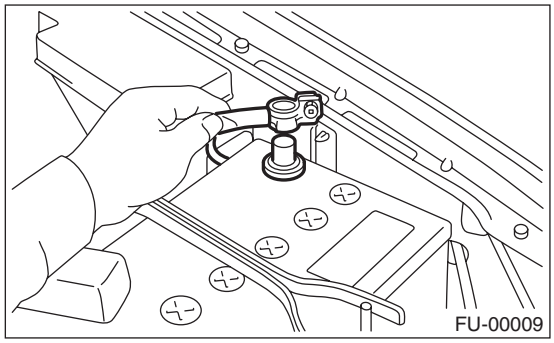
Tightening torque:
8 N·m (0.8 kgf-m, 5.8 ft-lb)



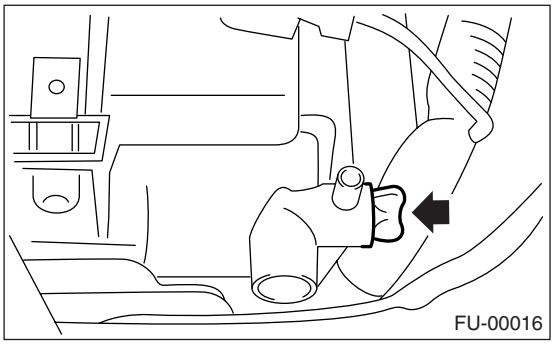
3. Intake Manifold

A: REMOVAL

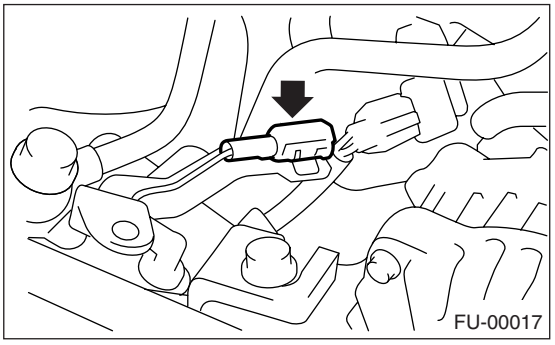
1) Release the fuel pressure. <Ref. to FU(H4DOTC)-50, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Disconnect the ground cable from battery.



3) Open the fuel filler flap lid, and remove the fuel filler cap.
4) Remove the collector cover.
5) Lift-up the vehicle.
6) Remove the under cover.
7) Drain the coolant about 3.0 ℓ (3.2 US qt, 2.6 Imp qt).

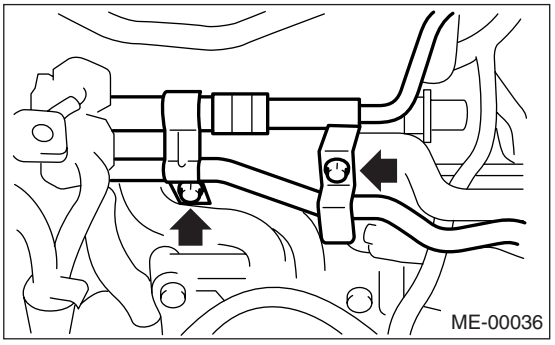


8) Remove the air cleaner upper cover and air intake boot. <Ref. to IN(H4DOTC)-7, REMOVAL, Air Cleaner Case.>
9) Remove the air cleaner element.
10) Remove the intercooler. <Ref. to IN(H4DOTC)-10, REMOVAL, Intercooler.>
11) Remove the coolant filler tank.
<Ref. to CO(H4SO)-41, REMOVAL, Coolant Filler Tank.>
12) Remove the power steering pump.
(1) Remove the front side of the V-belts. <Ref. to ME(H4DOTC)-38, REMOVAL, V-belt.>
(2) Disconnect the power steering switch connector.

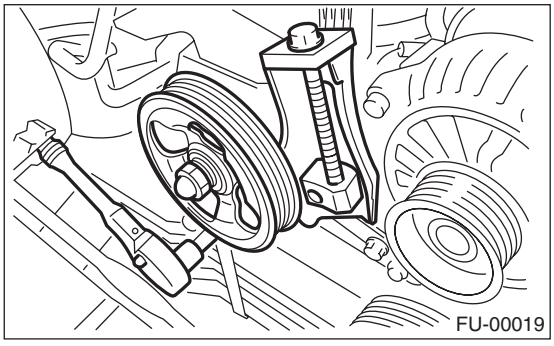


(3) Remove the bolts which install the power steering pipe bracket to the intake manifold.

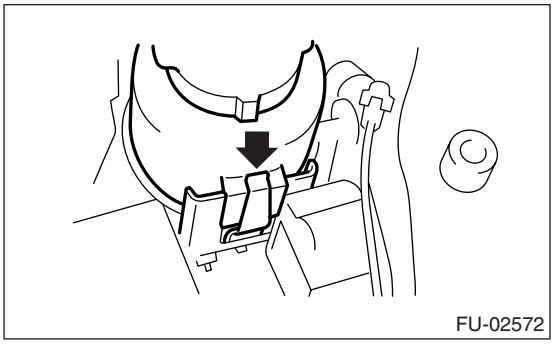
NOTE:
Do not disconnect the power steering hose.



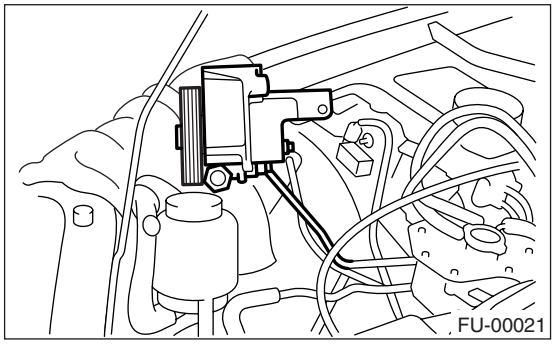
(4) Remove the bolts, which install power steering pump bracket.



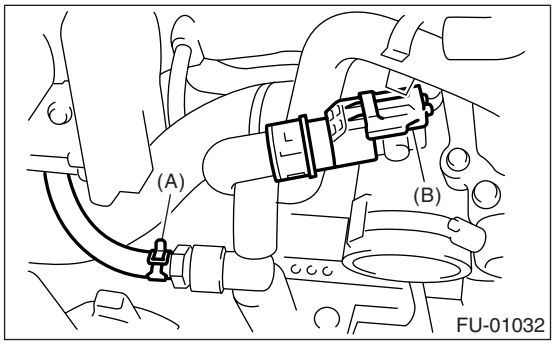
(5) Remove the reservoir tank from the bracket by pulling it upward.



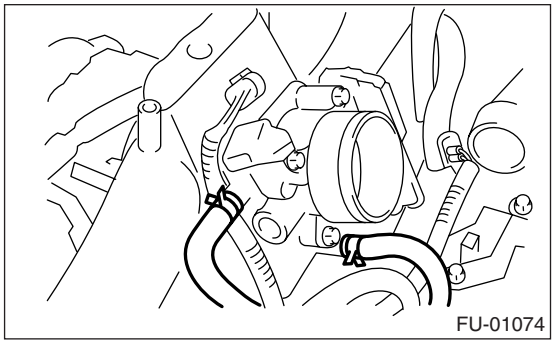
(6) Place the power steering pump on the right side wheel apron.



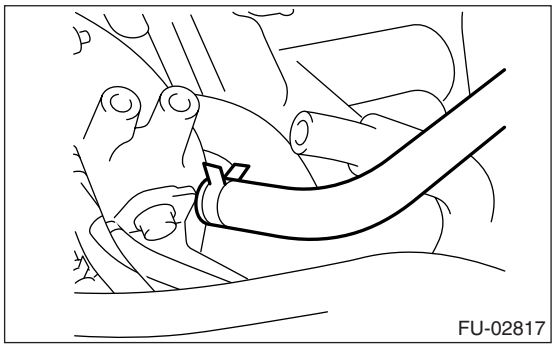
13) Disconnect the emission hose (A) and the connector (B) from the PCV hose assembly.



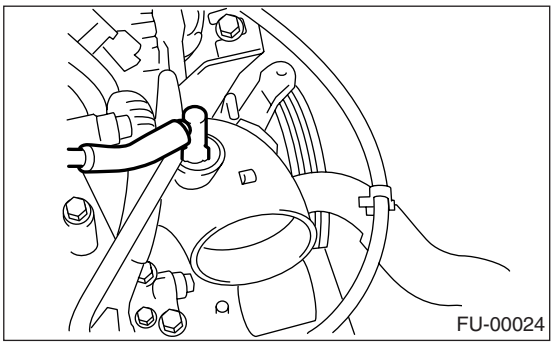
14) Disconnect the engine coolant hose from throttle body.



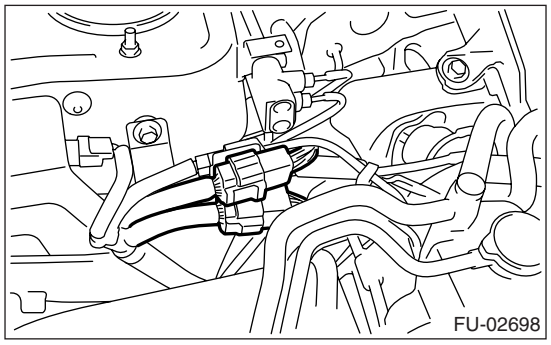
15) Disconnect the brake booster hose.

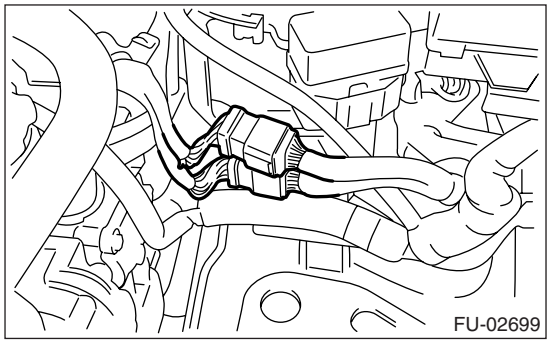


16) Disconnect the pressure hose from the intake duct.

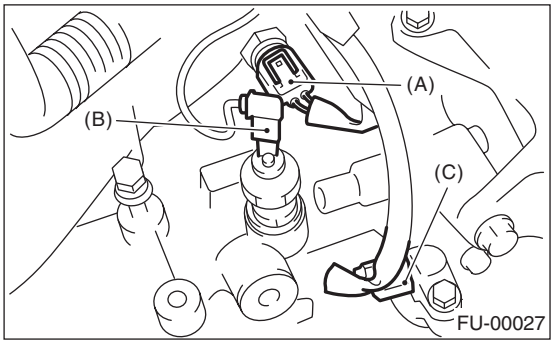


17) Disconnect the engine harness connectors from the bulk head harness connector.

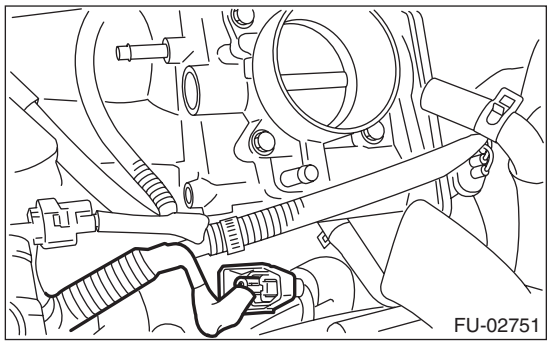




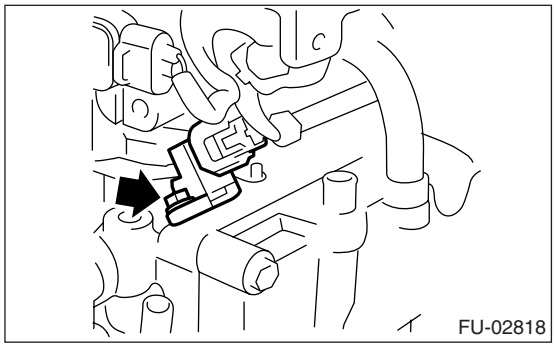
18) Disconnect the connectors from the engine coolant temperature sensor (A), oil pressure switch (B) and crankshaft position sensor (C).



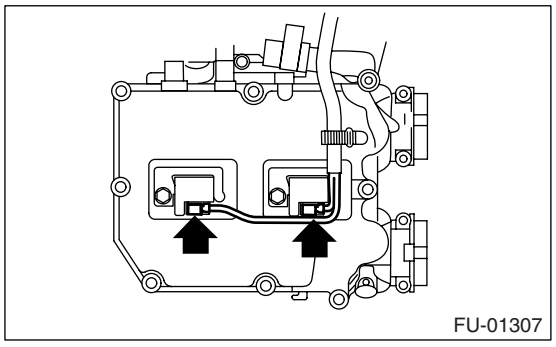
19) Disconnect the knock sensor connector.



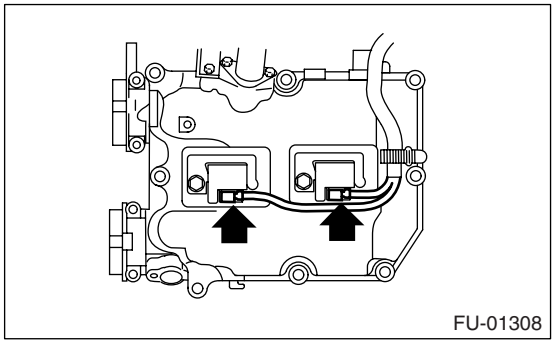
20) Disconnect the connector from camshaft position sensor.



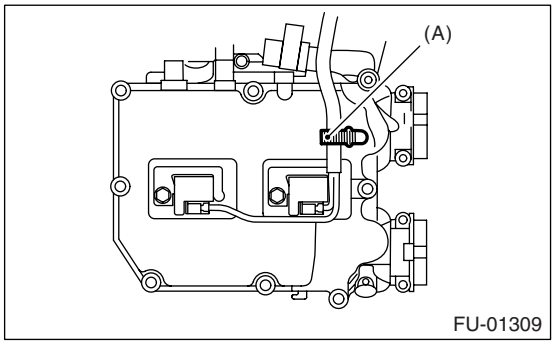
21) Disconnect the connector from ignition coil.
- RH side



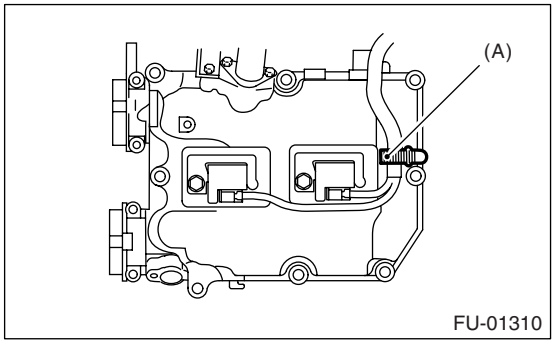
- LH side



22) Disconnect the engine harness fixed by clip (A) from the bracket.
- RH side



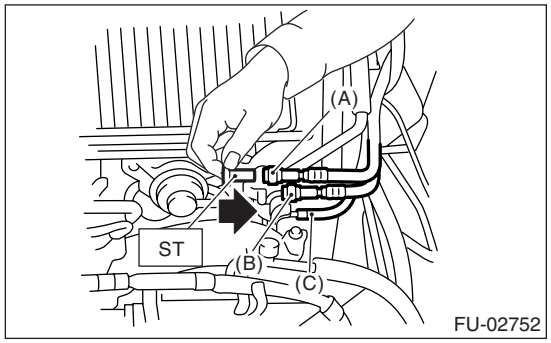
- LH side



23) Using the ST to disconnect the fuel hose from each fuel pipe. <Ref. to FU(H4DOTC)-65, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>

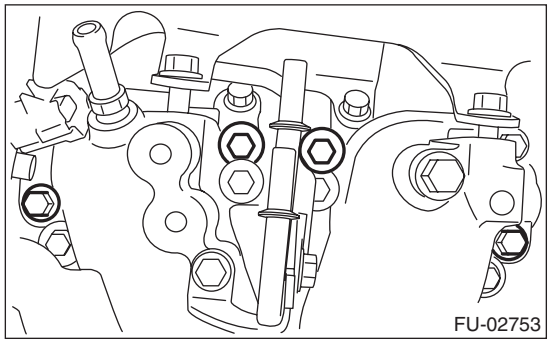
CAUTION:
- **Be careful not to spill fuel.**
- **Catch the fuel from hoses using a container or cloth.**

ST 42099AE000 CONNECTOR REMOVER



(A) Fuel delivery hose
(B) Return hose
(C) Evaporation hose

24) Remove the bolts which hold intake manifold onto the cylinder heads.



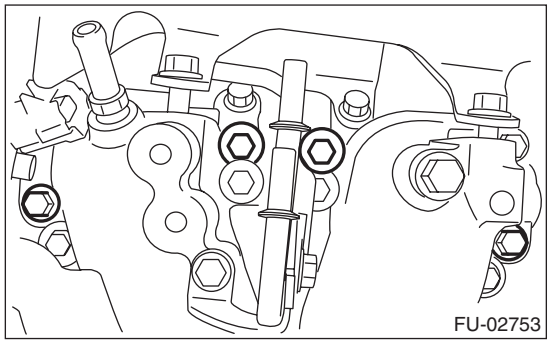
25) Remove the intake manifold.

B: INSTALLATION

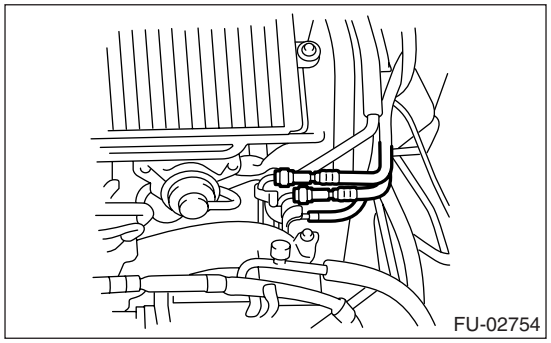
1) Install the intake manifold onto cylinder heads.

NOTE:
Replace with a new gasket.

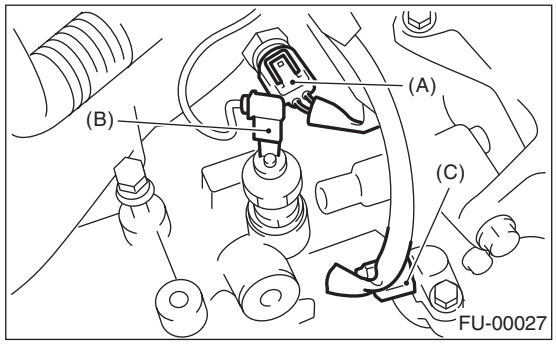
Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



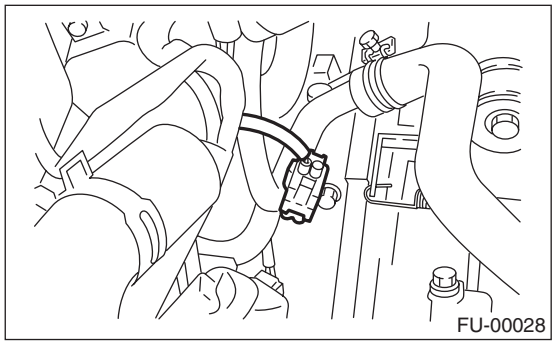
2) Connect the fuel delivery hose, return hose, and evaporation hose.



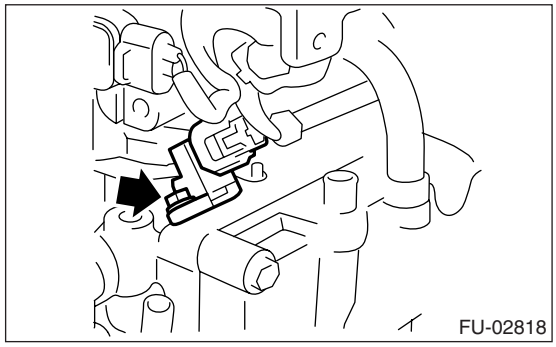
3) Connect the connector to the engine coolant temperature sensor (A), oil pressure switch (B) and crankshaft position sensor (C).



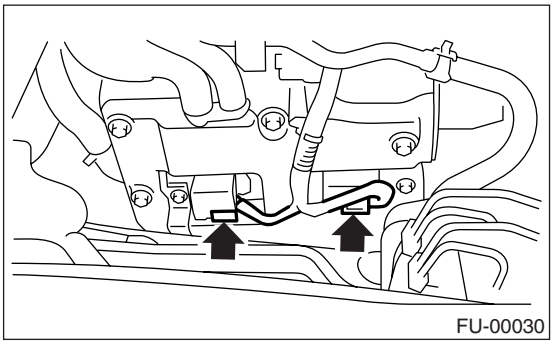
4) Connect the connector to the knock sensor.



5) Connect the connectors to camshaft position sensor.

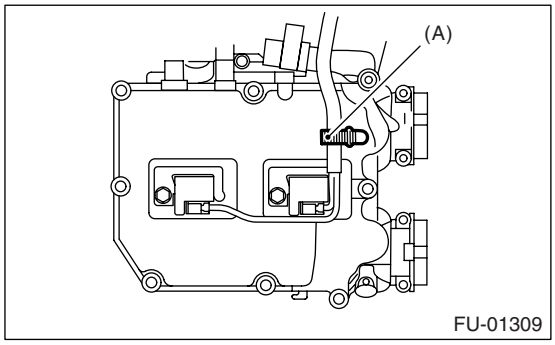


6) Connect the connector to the ignition coil.

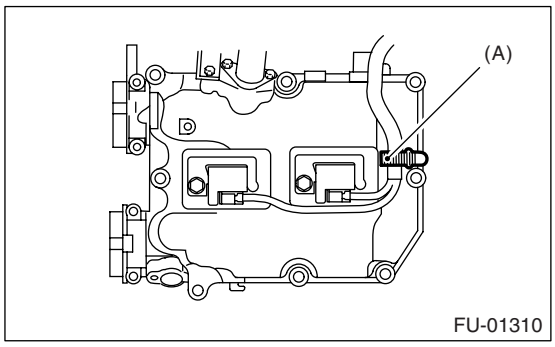


7) Connect the engine harness with clip (A) to the bracket.

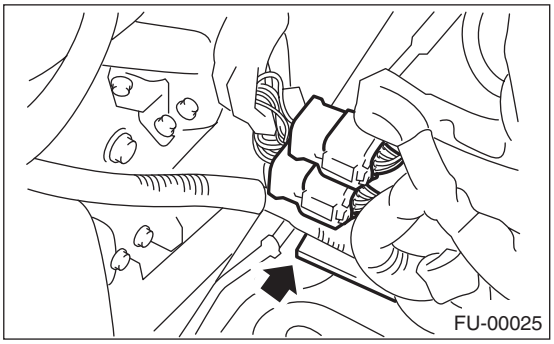
- RH side

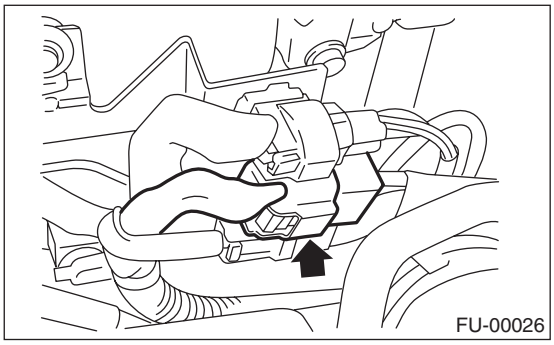


- LH side

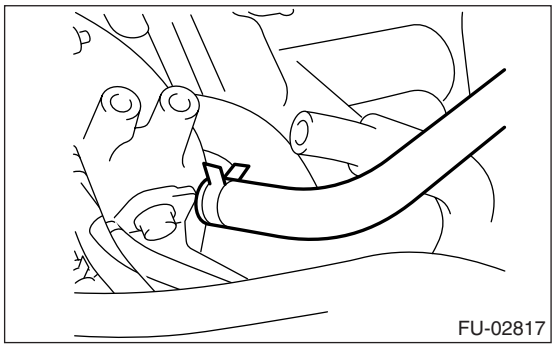


8) Connect the engine harness connectors to bulkhead harness connectors.

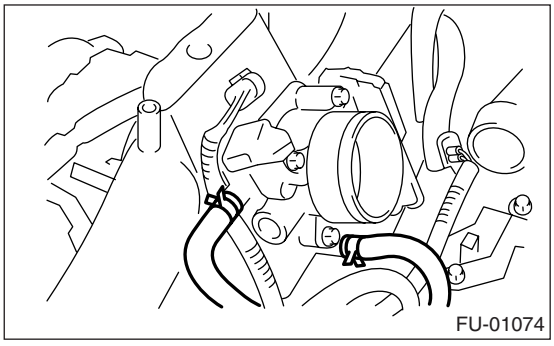




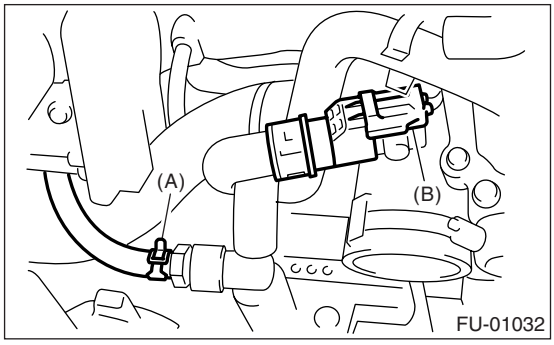
9) Connect the brake booster vacuum hose.



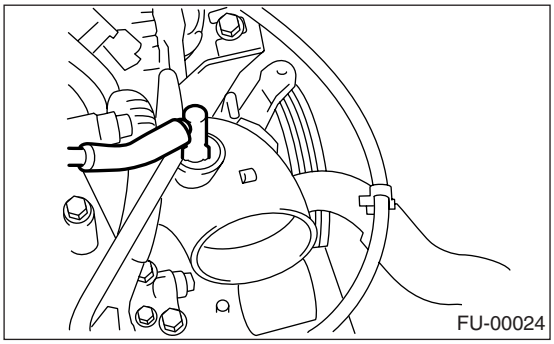
10) Connect the engine coolant hoses to throttle body.



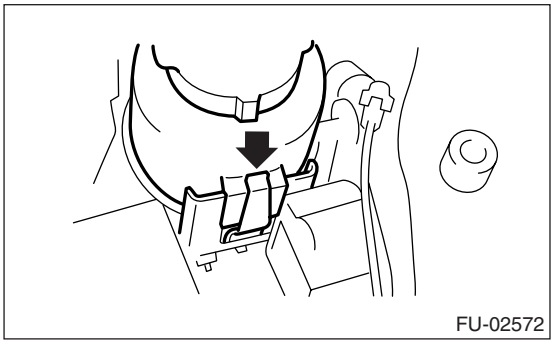
11) Connect the emission hose (A) and the connector (B) to the PCV hose assembly.



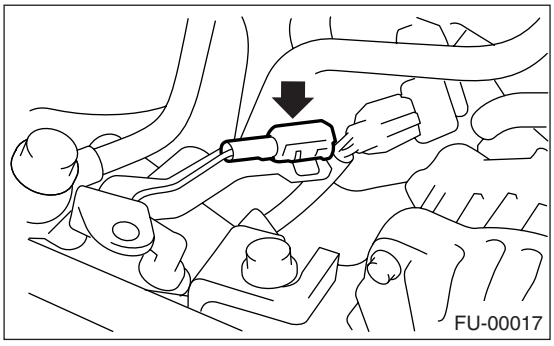
12) Connect the pressure hose to the intake duct.



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

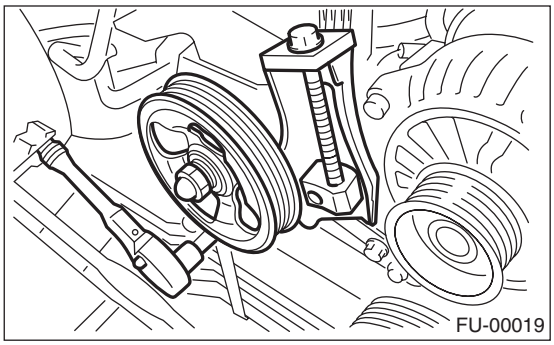


(2) Connect the connector to power steering pump switch.

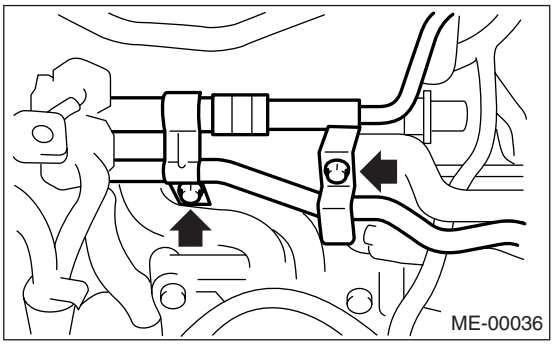


(3) Install the power steering pump, and tighten the bolts.

Tightening torque:
22 N·m (2.2 kgf-m, 15.9 ft-lb)

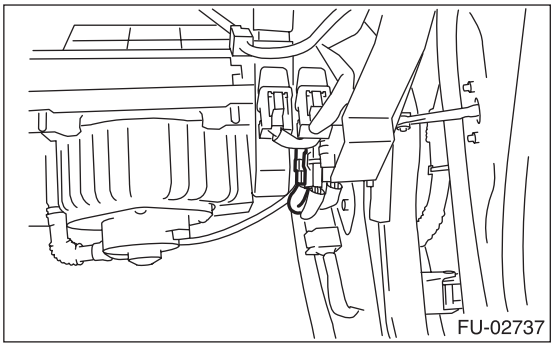


(4) Install the power steering pipe bracket onto the right side intake manifold.



(5) Install the front side V-belts. <Ref. to ME(H4DOTC)-38, INSTALLATION, V-belt.>

14) Install the coolant filler tank.
<Ref. to CO(H4SO)-41, INSTALLATION, Coolant Filler Tank.>
15) Install the intercooler. <Ref. to IN(H4DOTC)-10, INSTALLATION, Intercooler.>
16) Install the air cleaner element.
17) Install the air cleaner upper cover and air intake duct as a unit. <Ref. to IN(H4DOTC)-7, INSTALLATION, Air Cleaner Case.>
18) Connect the connector to fuel pump relay.

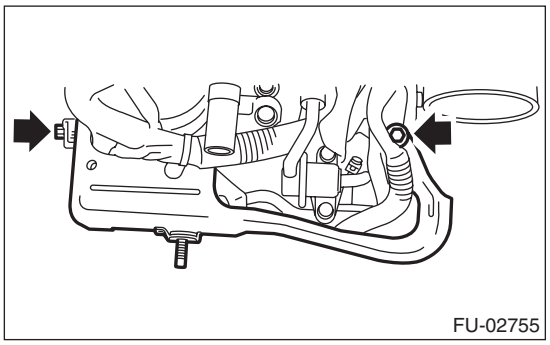


19) Install the collector cover.
20) Connect the ground cable to battery.
21) Lift-up the vehicle.
22) Install the under cover.

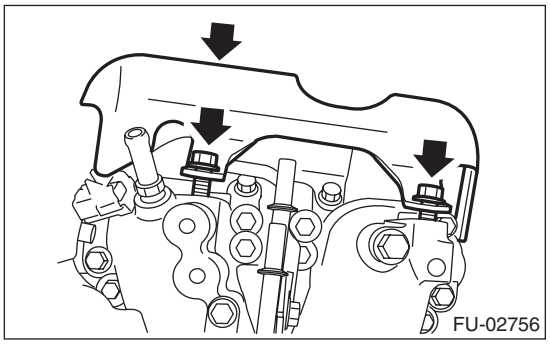
23) Fill engine coolant.
<Ref. to CO(H4SO)-16, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

C: DISASSEMBLY

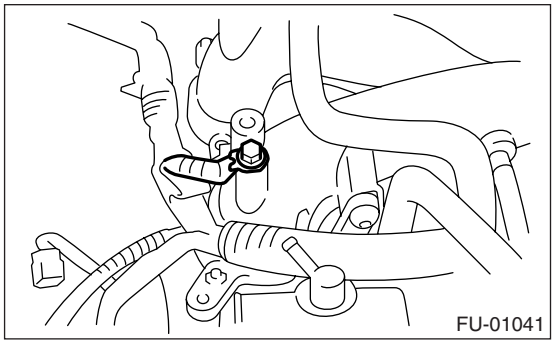
1) Remove the fuel pipe protector RH.

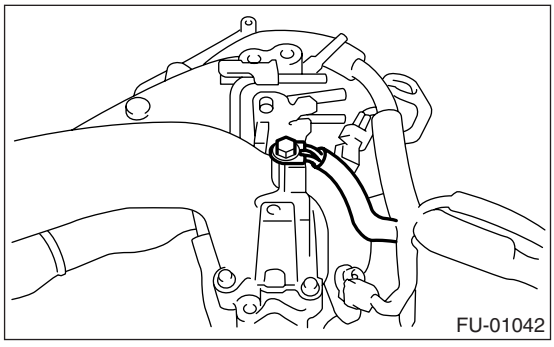

FU-02755

2) Remove the fuel pipe protector LH.

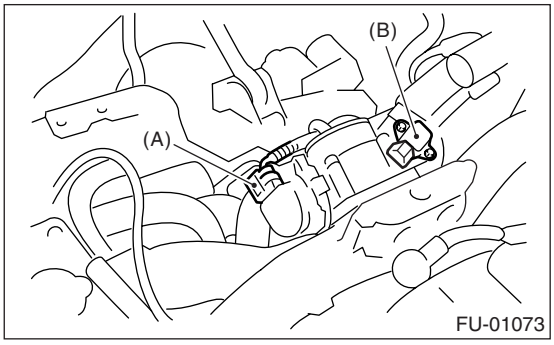

FU-02756

3) Remove the engine ground terminal from the intake manifold.


FU-01041

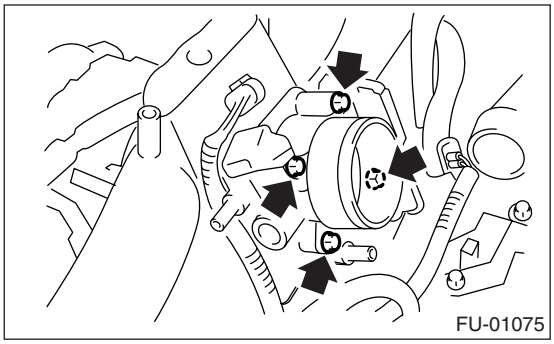

FU-01042

4) Disconnect the connector from the throttle position sensor (A), and the manifold pressure sensor (B).

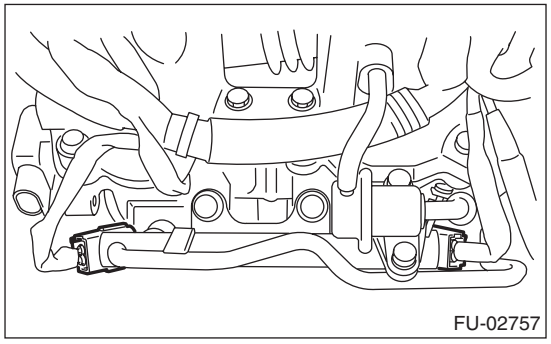


FU-01073

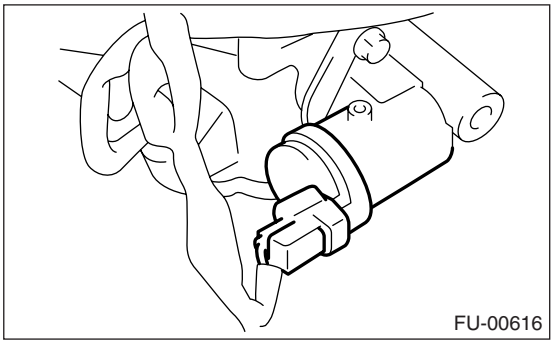
5) Remove the throttle body to intake manifold.


FU-01075

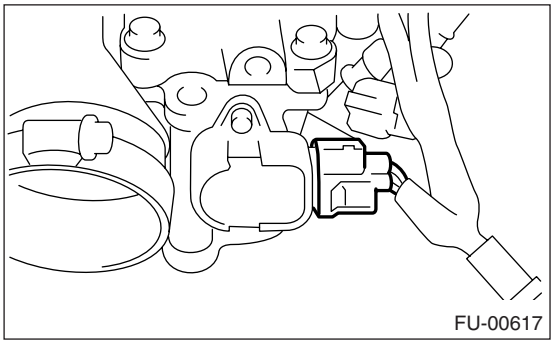
6) Disconnect the connector from fuel injector.


FU-02757

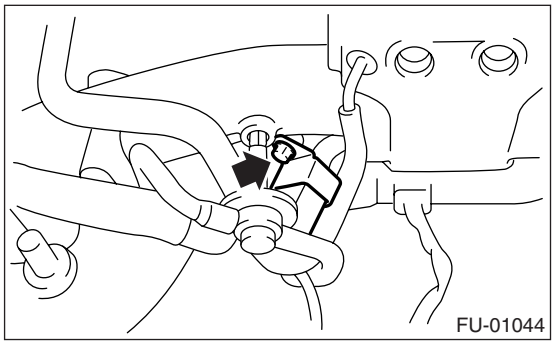
7) Disconnect the connector from tumble generator valve actuator.


FU-00616

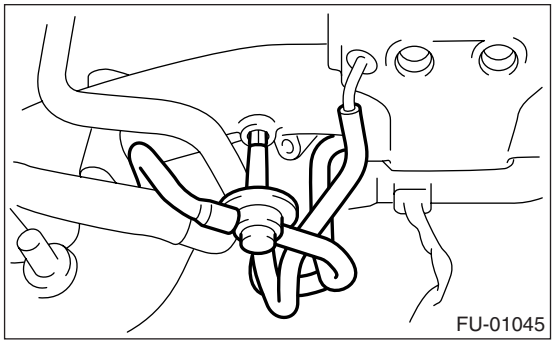
8) Disconnect the connector from tumble generator valve sensor.



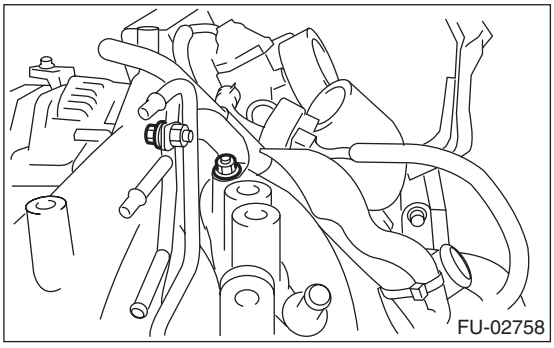
9) Disconnect the connector from purge control solenoid valve.
10) Remove the purge control solenoid valve.



11) Disconnect the evaporation hose and purge valve from the intake manifold.

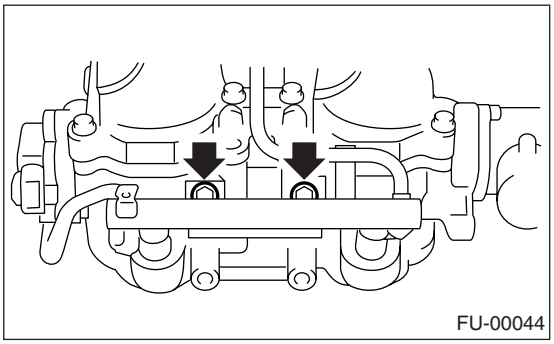


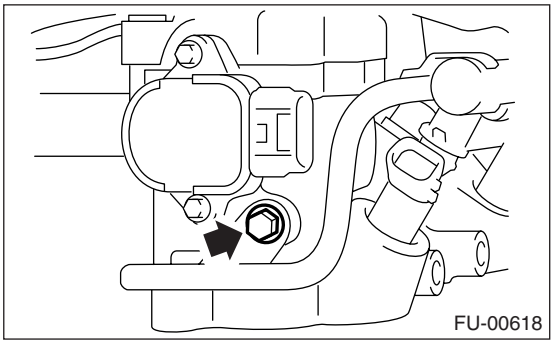
12) Remove the two bolts which hold fuel pipes on the left side of intake manifold.



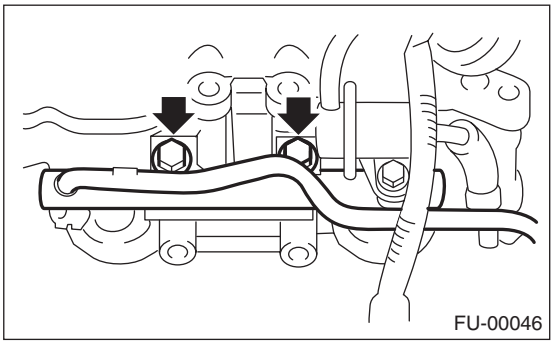
13) Remove the bolt which holds fuel injector pipe onto intake manifold.

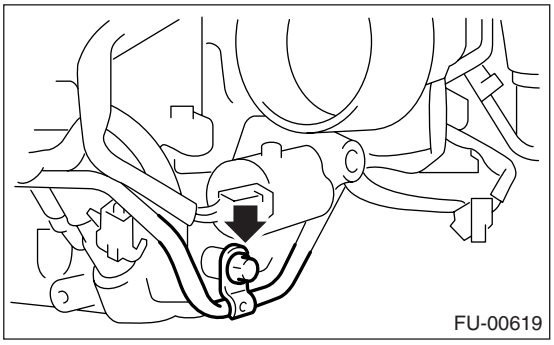
- LH side



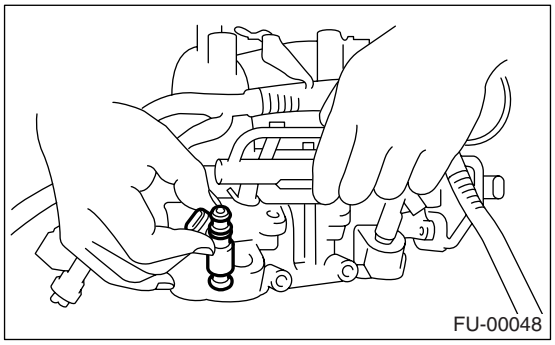


- RH side

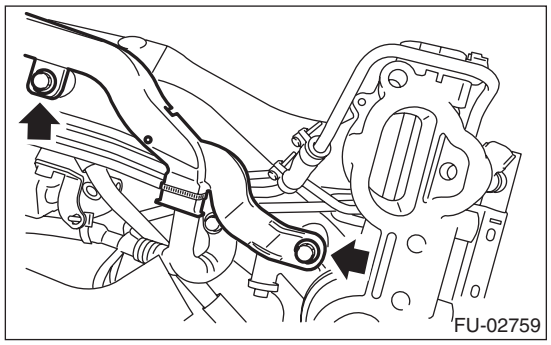




14) Remove the fuel injector.

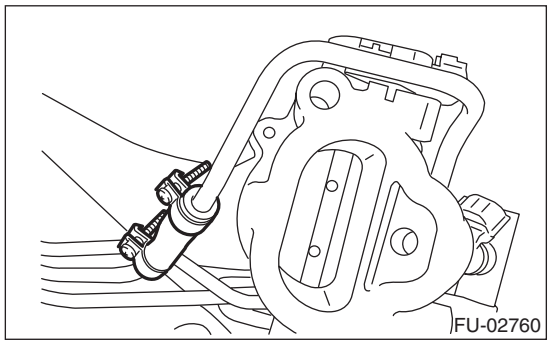


15) Remove the harness bracket which holds the engine harness onto intake manifold.

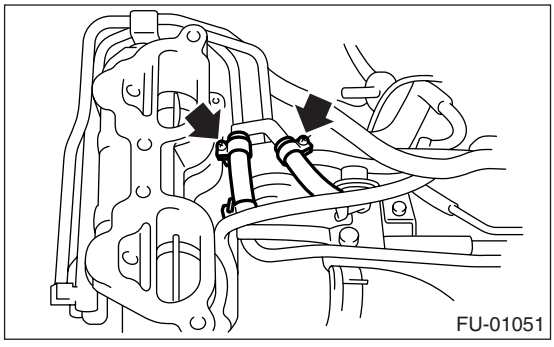


16) Remove the engine harness from intake manifold.

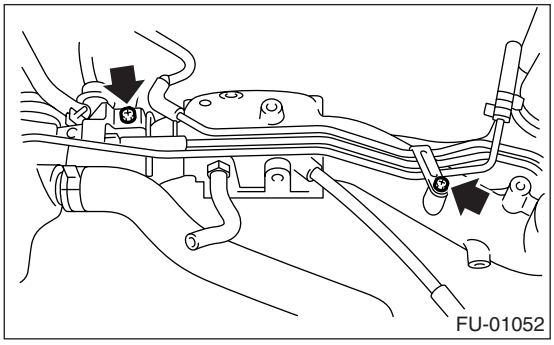
17) Loosen the clamp which holds the front LH side fuel hose to injector pipe to remove the pipe from clamp.



18) Loosen the clamp which holds the RH side fuel hose to injector pipe to remove the pipe from clamp.

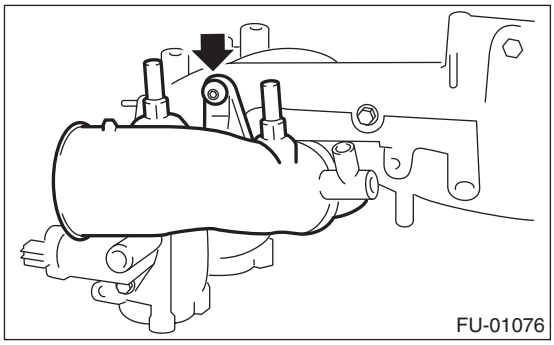


19) Remove the bolts which install fuel pipes on intake manifold.

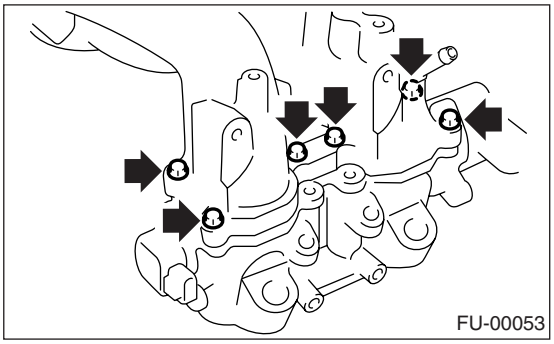


20) Remove the fuel pipe assembly and pressure regulator from intake manifold.

21) Remove the intake duct from intake manifold.



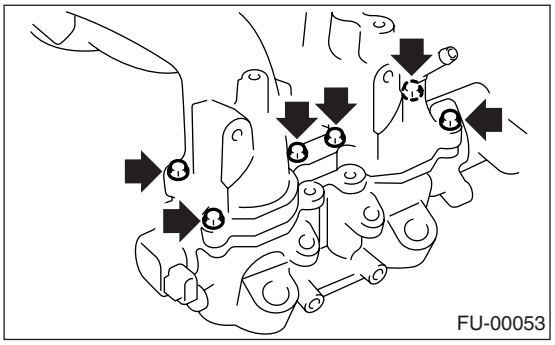
22) Remove the tumble generator assembly from intake manifold.



D: ASSEMBLY

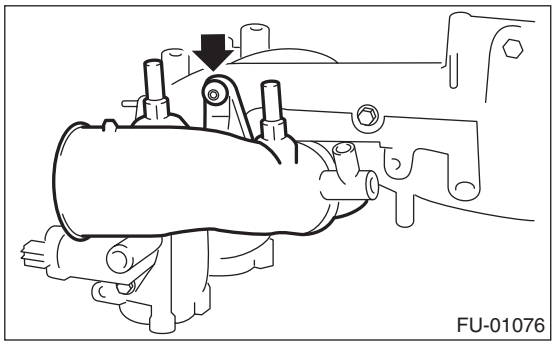
NOTE:
Replace with a new gasket.
1) Install the tumble generator valve assembly onto intake manifold.

Tightening torque:
8.25 N·m (0.84 kgf-m, 6.1 ft-lb)



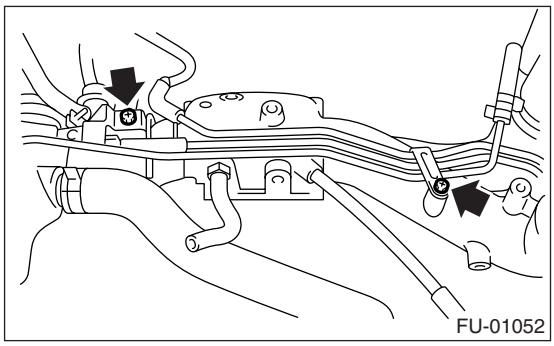
2) Install the air intake duct to the intake manifold.

Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)



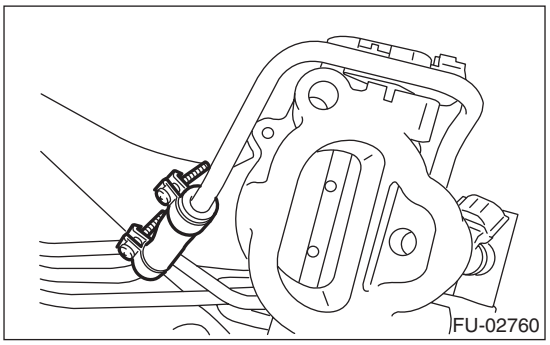
3) Install the fuel pipe assembly and pressure regulator to intake manifold.

Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



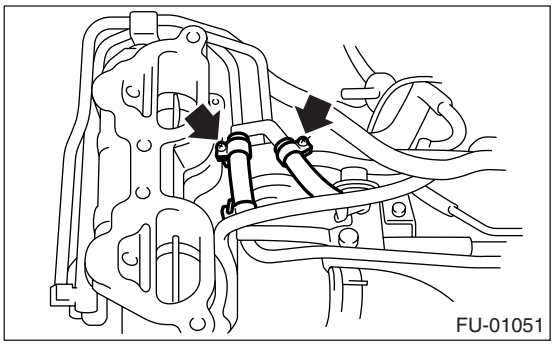
4) Install the fuel injector pipe LH.
5) Connect the left side fuel hose LH to the injector pipe, and tighten the clamp screw.

Tightening torque:
1.25 N·m (0.13 kgf-m, 0.94 ft-lb)



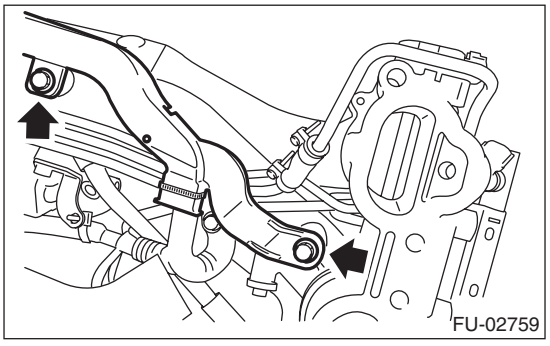
6) Install the fuel injector pipe RH.
7) Connect the fuel hose RH to the injector pipe, and tighten the clamp screw.

Tightening torque:
1.25 N·m (0.13 kgf-m, 0.94 ft-lb)



8) Install the engine harness onto intake manifold.
9) Install the harness bracket which holds the engine harness onto intake manifold.

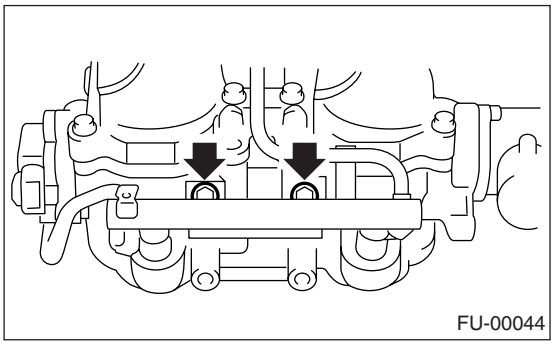
Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)

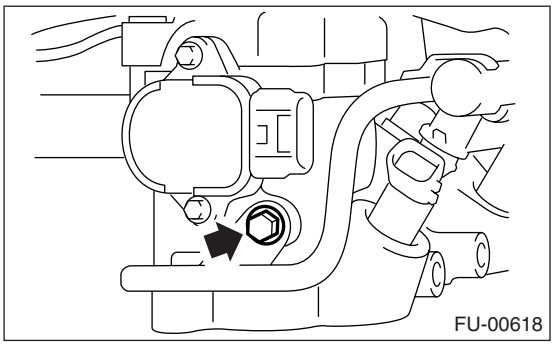


10) Tighten the bolts which secure fuel injector pipe onto intake manifold.

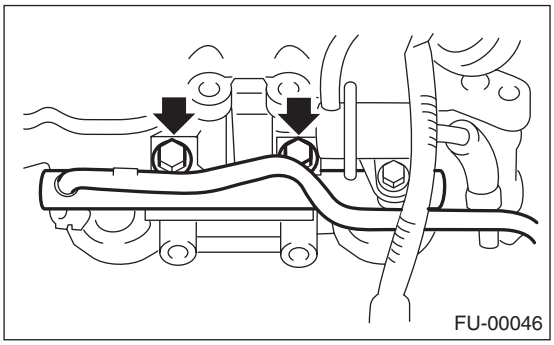
Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)

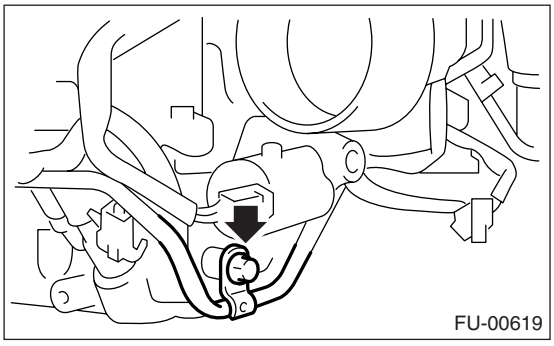
- LH side





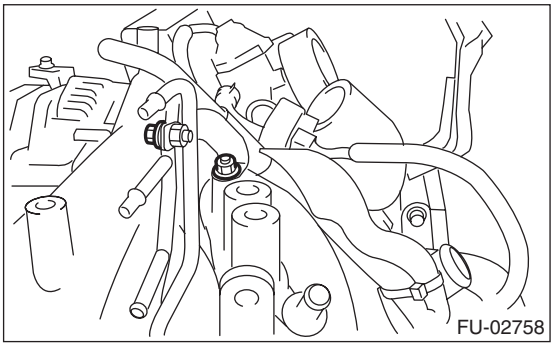
- RH side





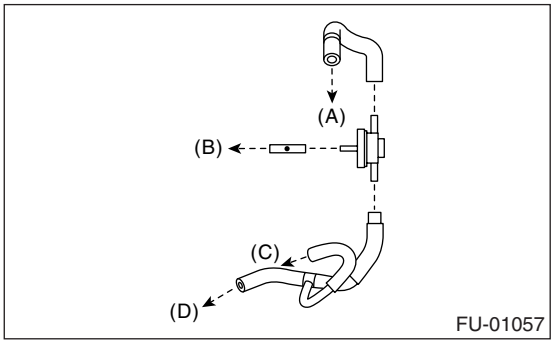
11) Tighten the two bolts which install the fuel pipe on the left side of intake manifold.

Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



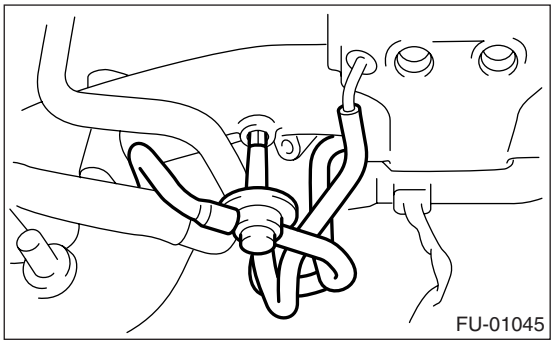
12) Connect the evaporation hose to the purge valve.

NOTE:
Connect the evaporation hose as shown in the figure.



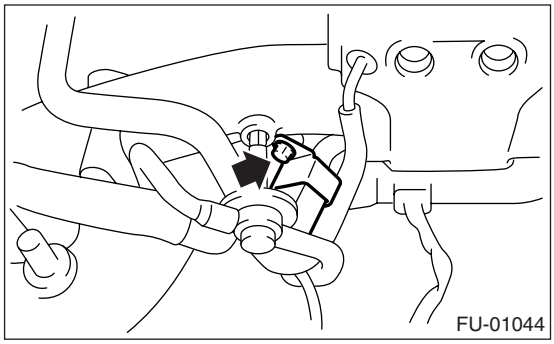
(A) To intake duct
(B) To intake manifold
(C) To purge control solenoid valve
(D) To fuel pipe ASSY

13) Connect the evaporation hose and purge valve to the intake manifold.



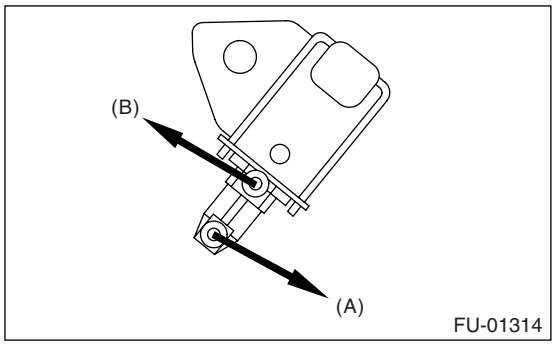
14) Install the purge control solenoid valve.

Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)



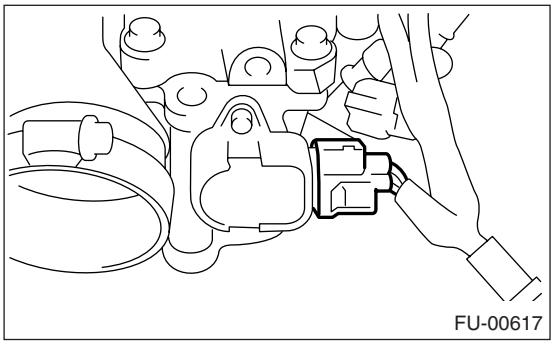
15) Connect the hose to the purge control solenoid valve.

NOTE:
Connect the evaporation hose as shown in the figure.

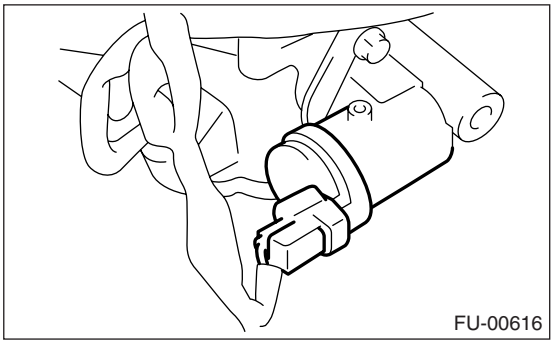


(A) To purge value
(B) To intake manifold

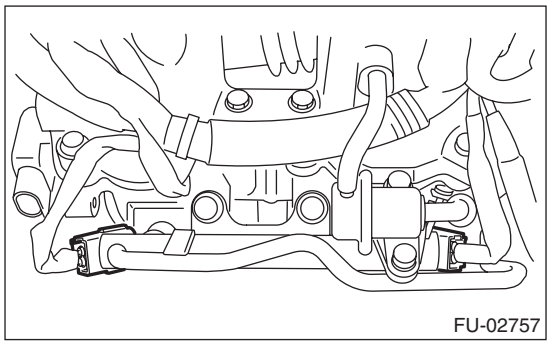
16) Connect the connector to the purge control solenoid valve.
17) Connect the connector to the tumble generator valve sensor.



18) Connect the connector to the tumble generator valve actuator.



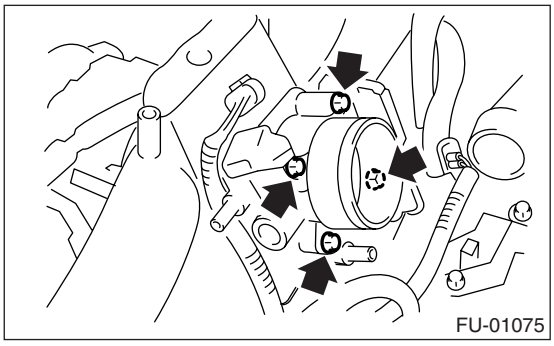
19) Connect the connector to the fuel injector.



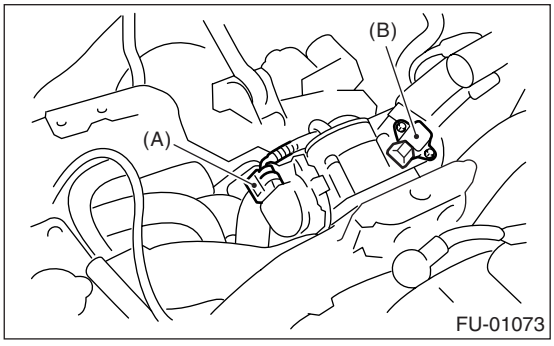
20) Install the throttle body to intake manifold.

NOTE:
Replace with a new gasket.

Tightening torque:
8 N·m (0.8 kgf-m, 5.8 ft-lb)

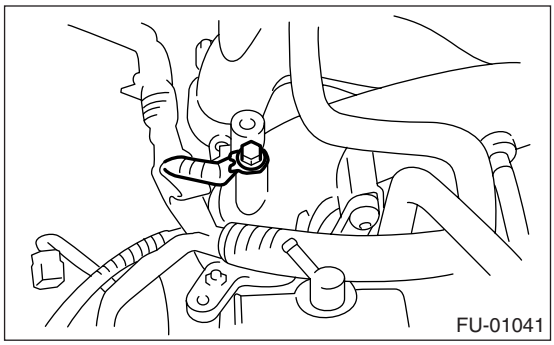


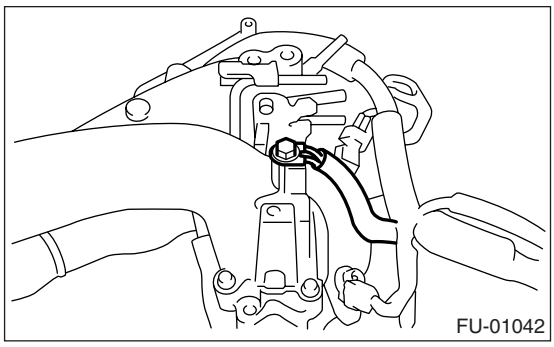
21) Connect the connector to the throttle position sensor (A), and the manifold pressure sensor (B).



22) Install the engine ground terminal to the intake manifold.

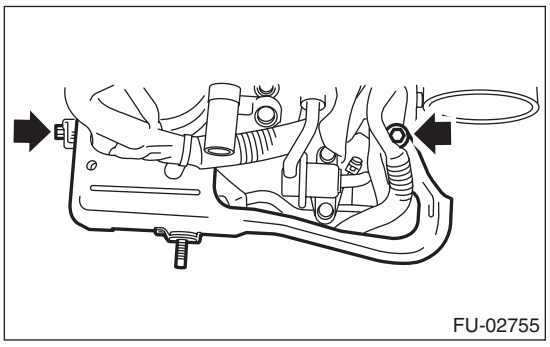
Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)


FU-01041


FU-01042

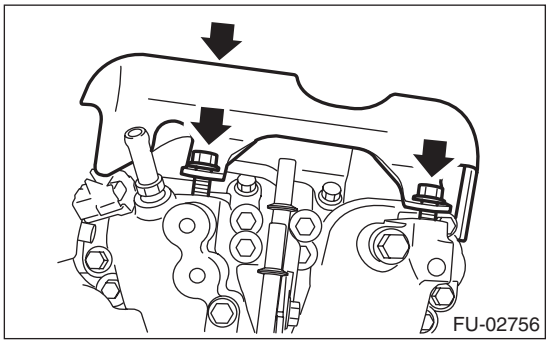
23) Install the fuel pipe protector RH.

Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)


FU-02755

24) Install the fuel pipe protector LH.

Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)


FU-02756

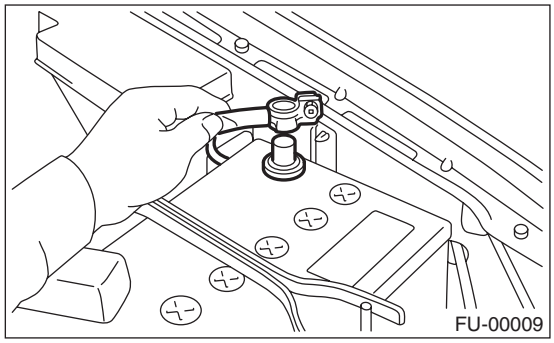
E: INSPECTION

Make sure that the fuel pipe and fuel hose are not cracked and those connections are tight.

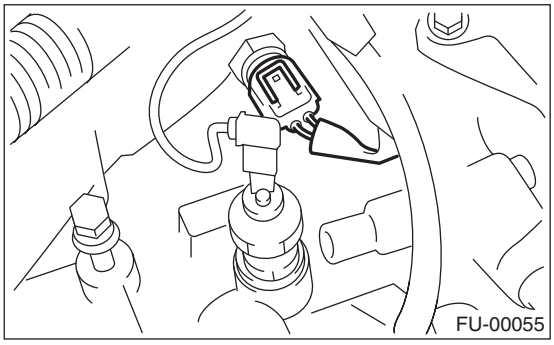
4. Engine Coolant Temperature Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.



2) Remove the collector cover.
3) Remove the generator. <Ref. to SC(H4SO)-13, REMOVAL, Generator.>
4) Drain engine coolant. <Ref. to CO(H4SO)-16, 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

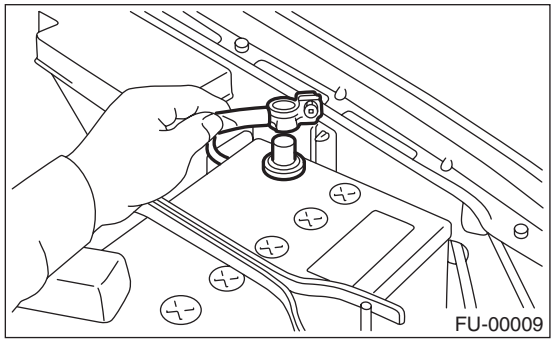
Install in the reverse order of removal.

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

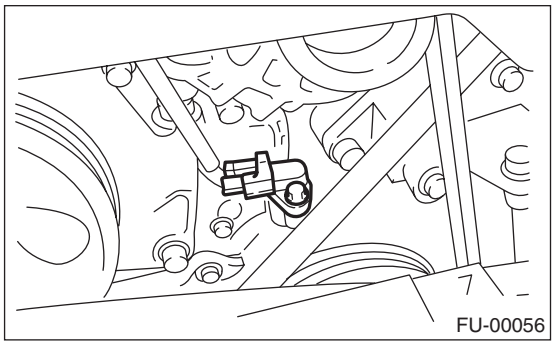
5. Crankshaft Position Sensor

A: REMOVAL

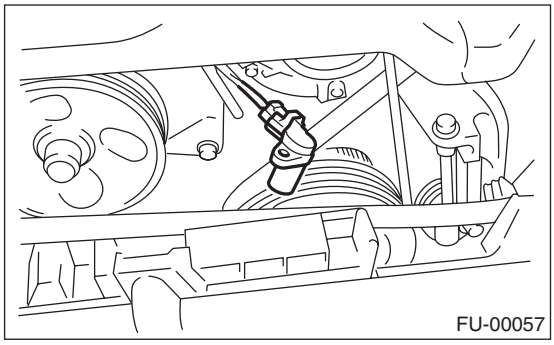
1) Disconnect the ground cable from battery.



2) Remove the collector cover.
3) Remove the bolt which installs crankshaft position sensor to cylinder block.



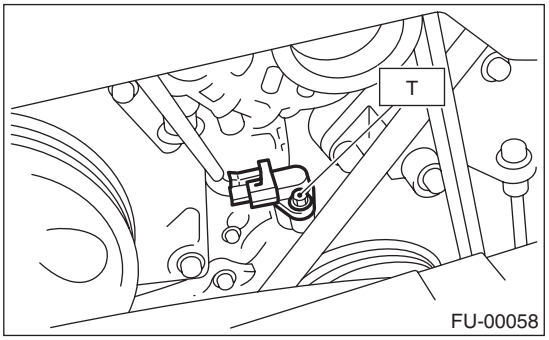
4) Remove the crankshaft position sensor, and then disconnect the connector from it.



B: INSTALLATION

Install in the reverse order of removal.

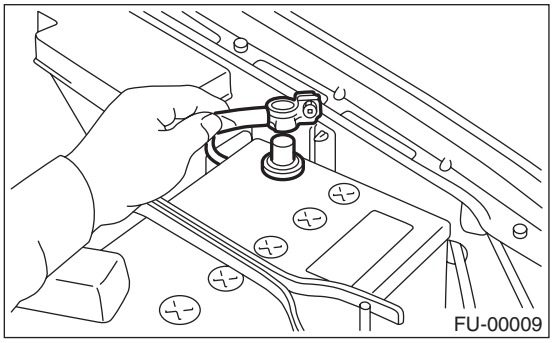
Tightening torque:
T: 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



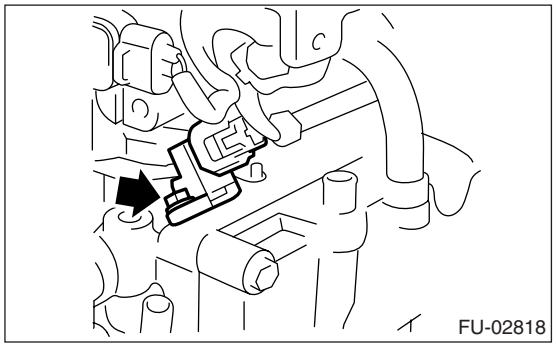
6. Camshaft Position Sensor

A: REMOVAL

1) Disconnect the ground cable from 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.

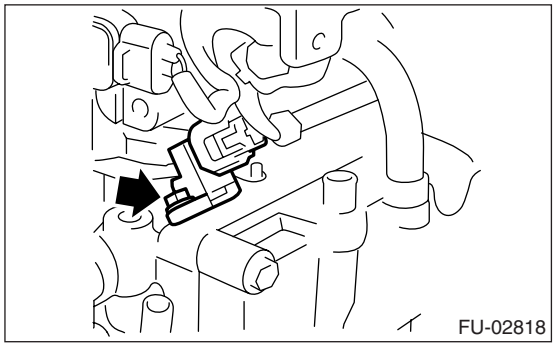


5) Remove the cam shaft position sensor LH in the same way as RH.

B: INSTALLATION

Install in the reverse order of removal.

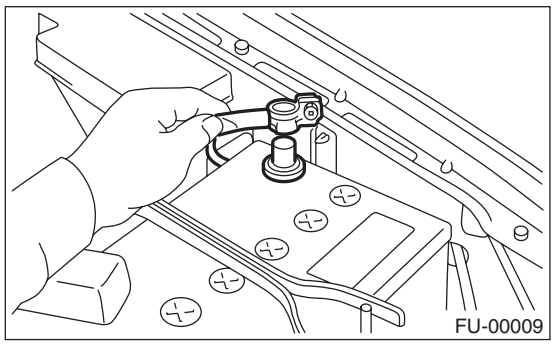
Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



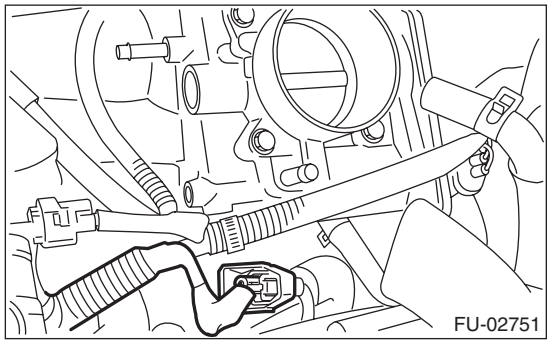
7. Knock Sensor

A: REMOVAL

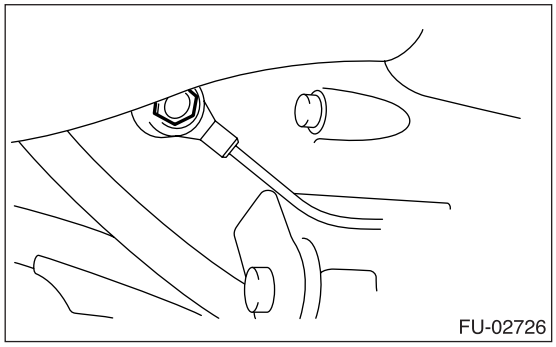
1) Disconnect the ground cable from battery.



2) Remove the collector cover.
3) Remove the intercooler. <Ref. to IN(H4DOTC)-10, REMOVAL, Intercooler.>
4) Disconnect the knock sensor connector.



5) Remove the knock sensor from the cylinder block.

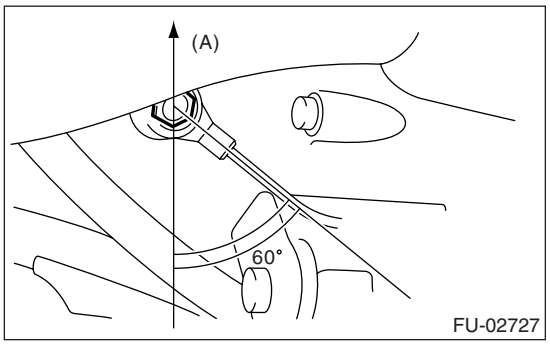


B: INSTALLATION

1) Install the knock sensor to the cylinder block.

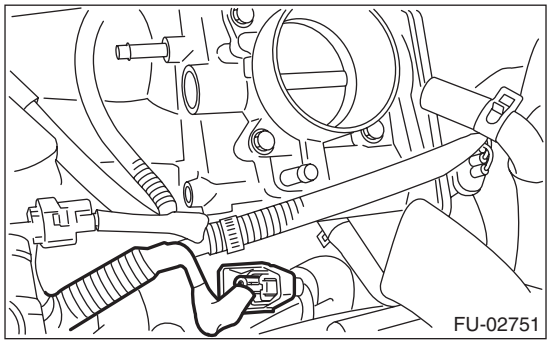
Tightening torque:
24 N·m (2.4 kgf-m, 17.4 ft-lb)

NOTE:
The portion of the knock sensor cord that is pulled out must be positioned at a 60° angle relative to the engine rear.

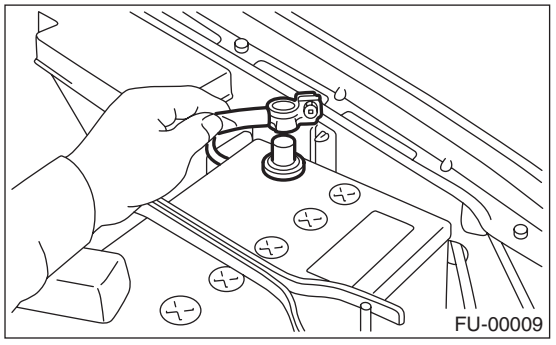


(A) Front side

2) Connect the knock sensor connector.



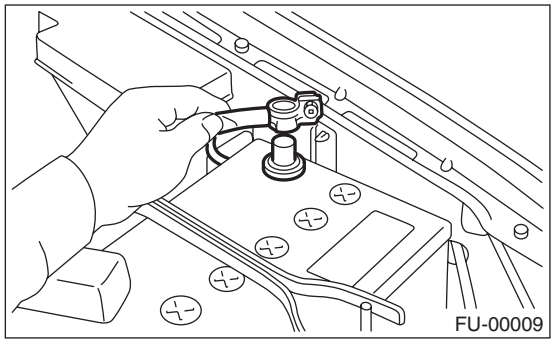
3) Install the intercooler.
<Ref. to IN(H4DOTC)-10, INSTALLATION, Intercooler.>
4) Install the collector cover.
5) Connect the ground cable to battery.



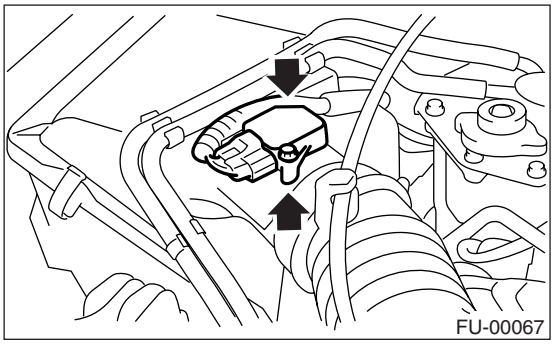
8. Mass Air Flow and Intake Air Temperature Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.



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



B: INSTALLATION

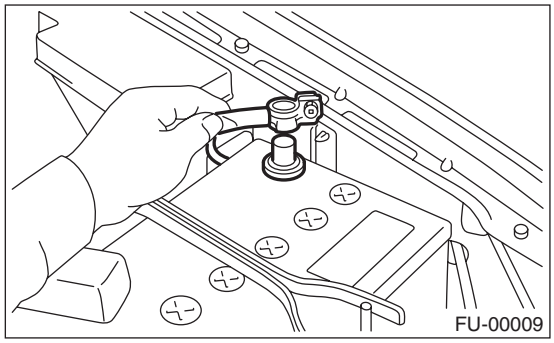
Install in the reverse order of removal.

Tightening torque:
1.7 N·m (0.17 kgf-m, 1.3 ft-lb)

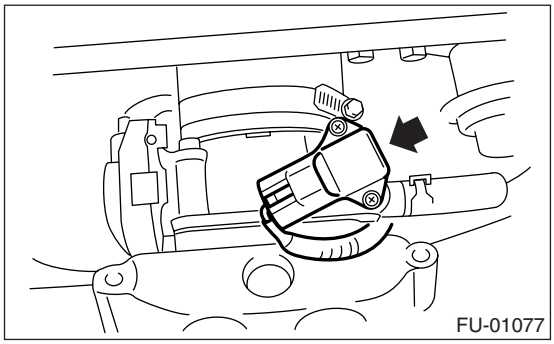
9. Manifold Absolute Pressure Sensor

A: REMOVAL

1) Disconnect the ground cable from 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:
Replace the O-ring of manifold pressure sensor with new one.

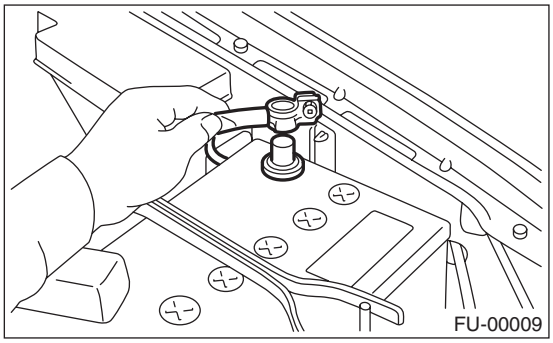
Tightening torque:
1.6 N·m (0.16 kgf-m, 1.2 ft-lb)

10.Fuel Injector

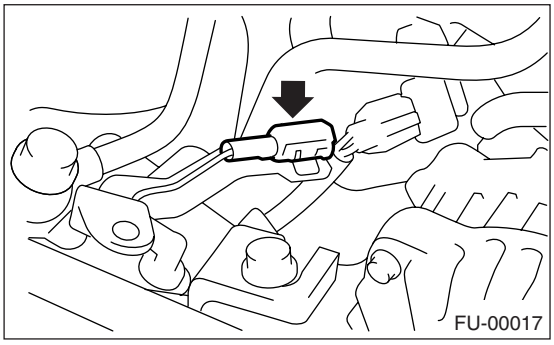
A: REMOVAL

1. RH SIDE

1) Release the fuel pressure. <Ref. to FU(H4DOTC)-50, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Disconnect the ground cable from battery.

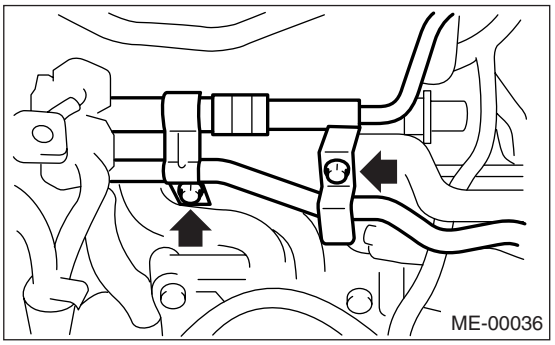


3) Open the fuel filler flap lid, and remove the fuel filler cap.
4) Remove the collector cover.
5) Remove the air cleaner upper cover and air intake boot. <Ref. to IN(H4DOTC)-7, REMOVAL, Air Cleaner Case.>
6) Remove the air cleaner element.
7) Remove the coolant filler tank.
<Ref. to CO(H4SO)-41, REMOVAL, Coolant Filler Tank.>
8) Remove the power steering pump.
(1) Remove the front side of the V-belts. <Ref. to ME(H4DOTC)-38, REMOVAL, V-belt.>
(2) Disconnect the power steering switch connector.

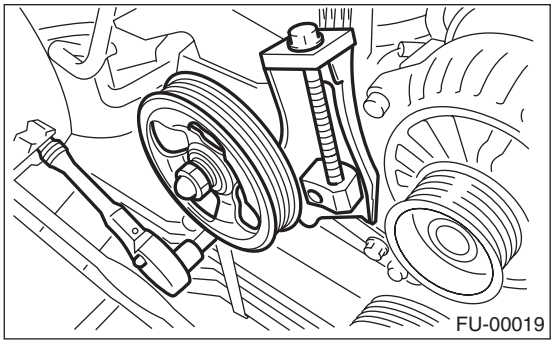


(3) Remove the bolts which install the power steering pipe bracket to the intake manifold.

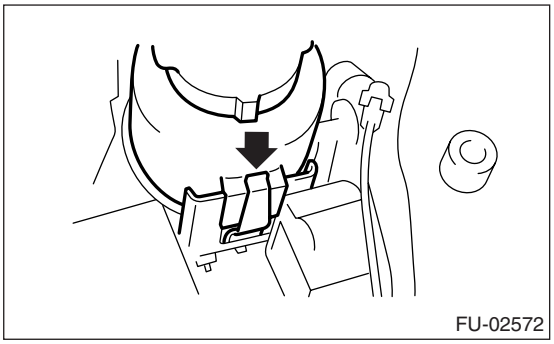
NOTE:
Do not disconnect the power steering hose.



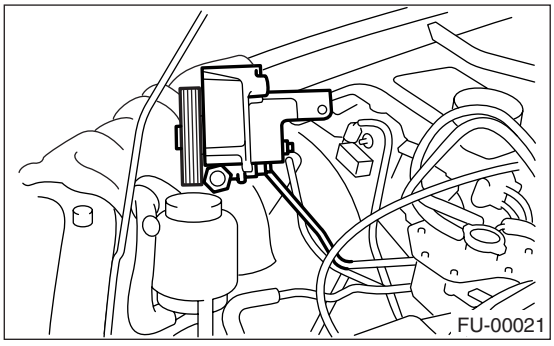
(4) Remove the bolts, which install power steering pump bracket.



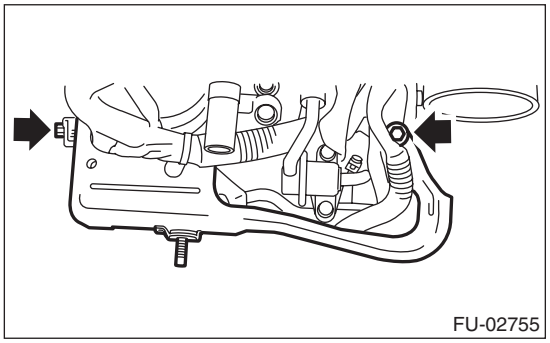
(5) Remove the reservoir tank from the bracket by pulling it upward.



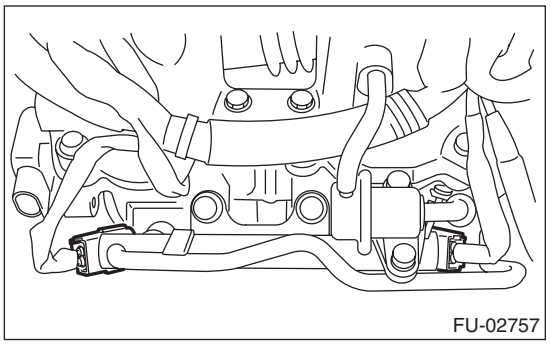
(6) Place the power steering pump on the right side wheel apron.



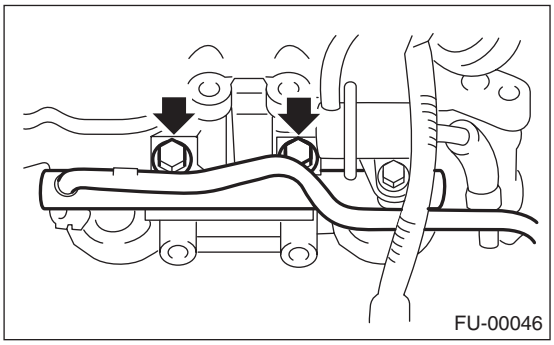
9) Remove the fuel pipe protector RH.

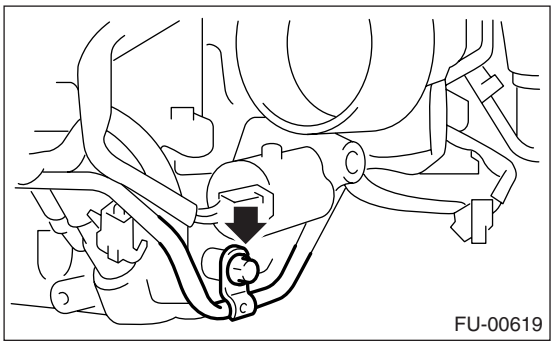


10) Disconnect the connector from fuel injector.

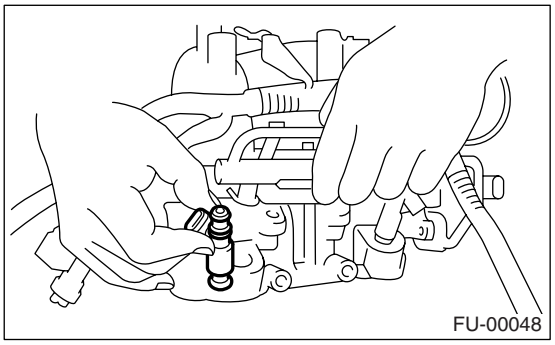


11) Remove the bolt which holds the injector pipe to the intake manifold.



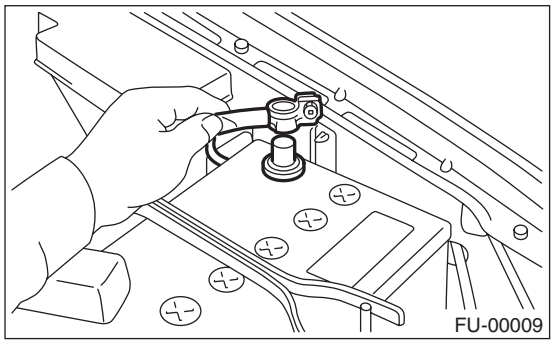


12) Remove the fuel injector while lifting up the fuel injector pipe.

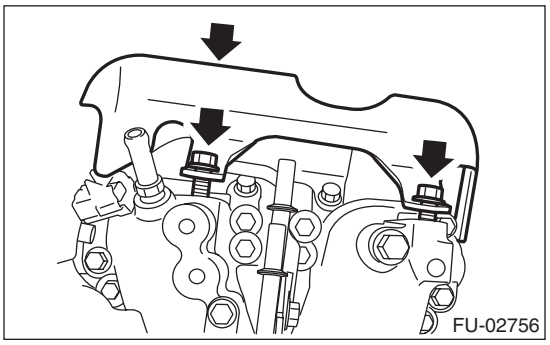


2. LH SIDE

1) Release the fuel pressure. <Ref. to FU(H4DOTC)-50, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Disconnect the ground cable from battery.

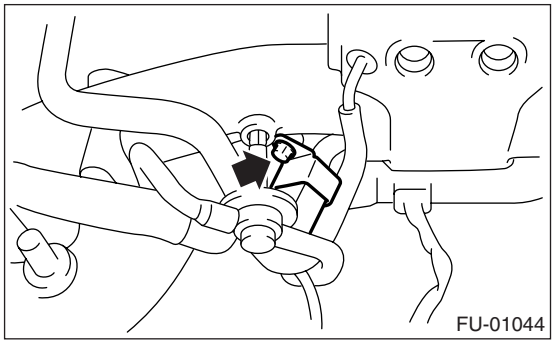


3) Open the fuel filler flap lid, and remove the fuel filler cap.
4) Remove the collector cover.
5) Remove the intake manifold.
<Ref. to FU(H4DOTC)-14, REMOVAL, Intake Manifold.>
6) Remove the fuel pipe protector LH.

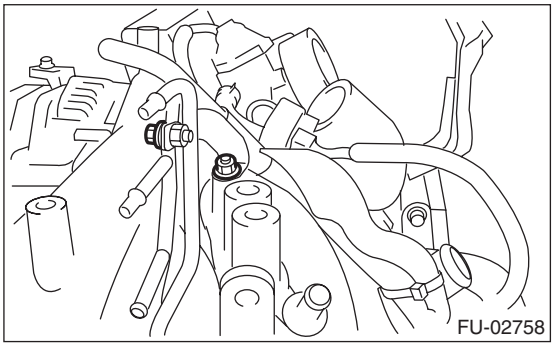


7) Disconnect the connector from fuel injector.
8) Disconnect the connector from purge control solenoid valve.

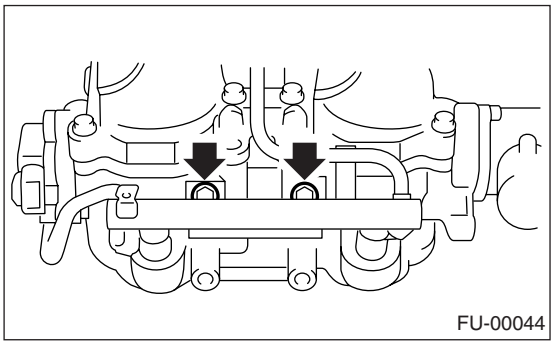
9) Remove the purge control solenoid valve.

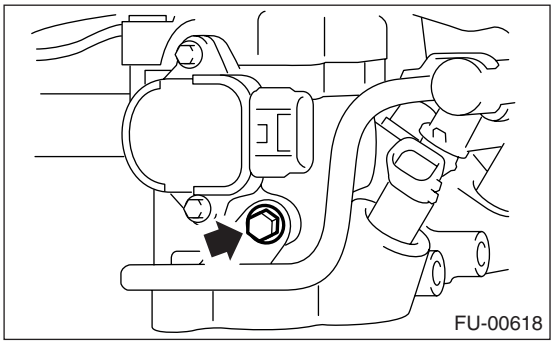


10) Remove the two bolts which hold fuel pipes on the left side of intake manifold.



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





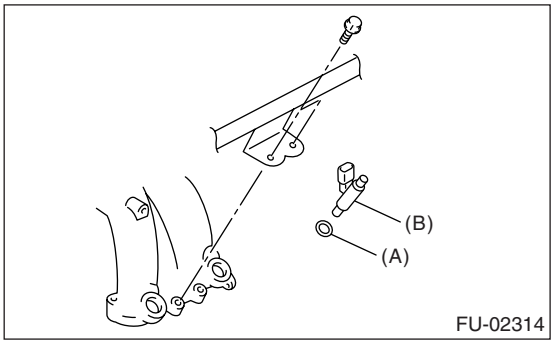
12) Remove the fuel injector while lifting up the fuel injector pipe.

B: INSTALLATION

1. RH SIDE

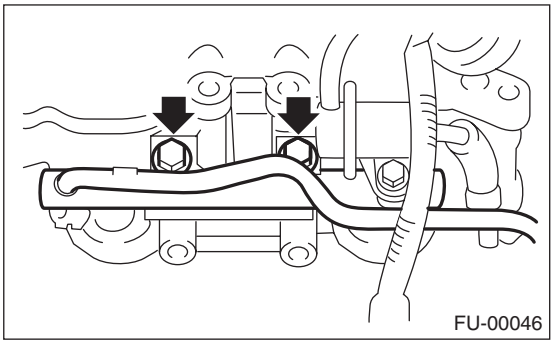
Install in the reverse order of removal.

NOTE:
Replace with a new O-ring and insulator.

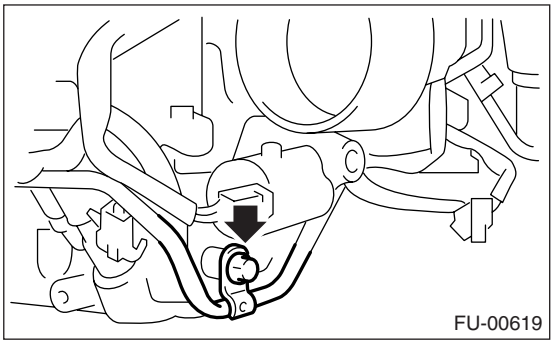


(A) Insulator
(B) Fuel injector

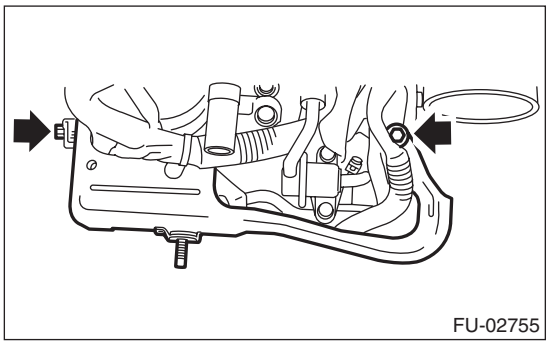
Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)



Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)



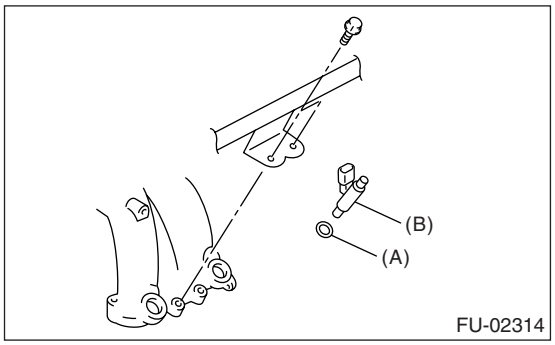
Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)



2. LH SIDE

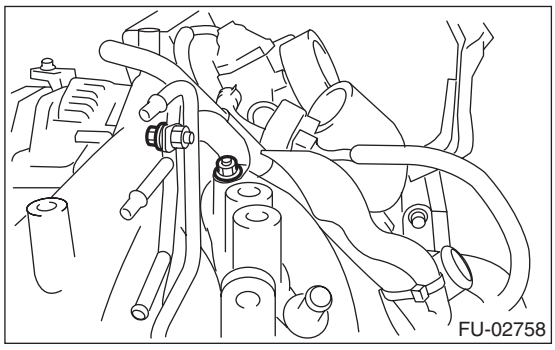
Install in the reverse order of removal.

NOTE:
Replace with a new O-ring and insulator.

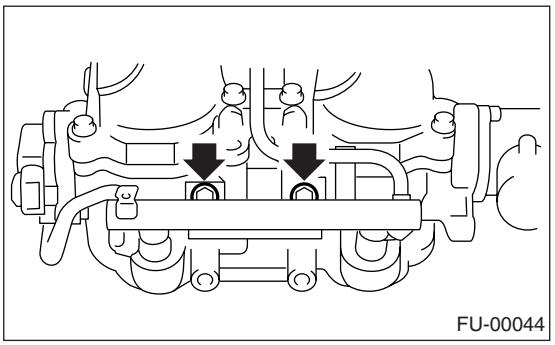


(A) Insulator
(B) Fuel injector

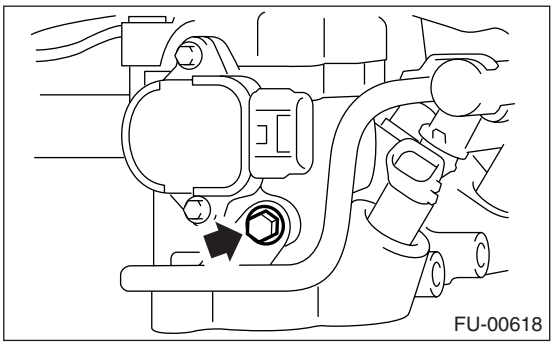
Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



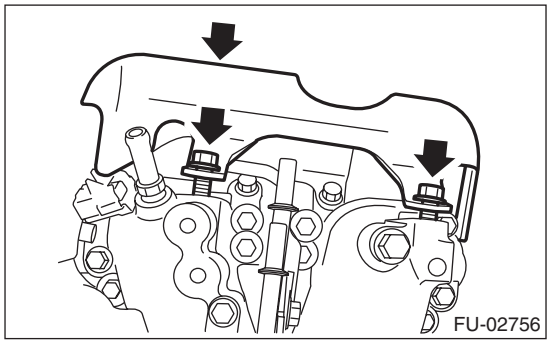
Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)



Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)



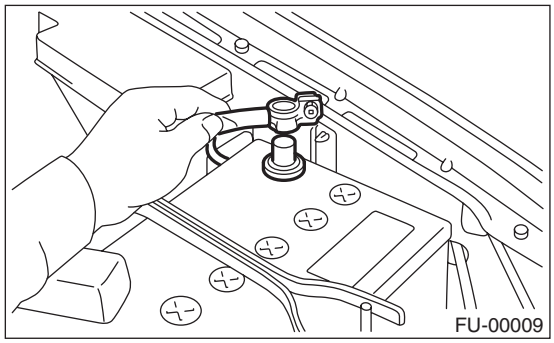
Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)



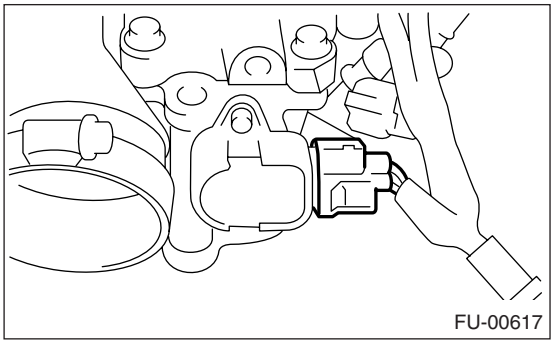
11.Tumble Generator Valve Assembly

A: REMOVAL

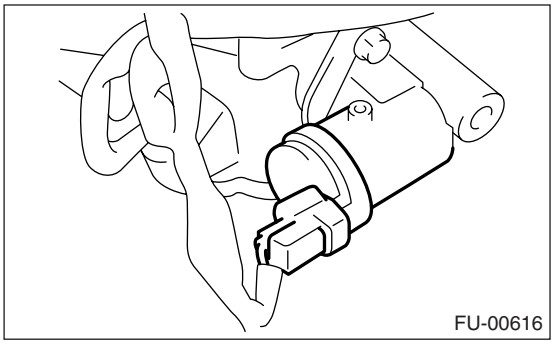
1) Release the fuel pressure. <Ref. to FU(H4DOTC)-50, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Disconnect the ground cable from battery.



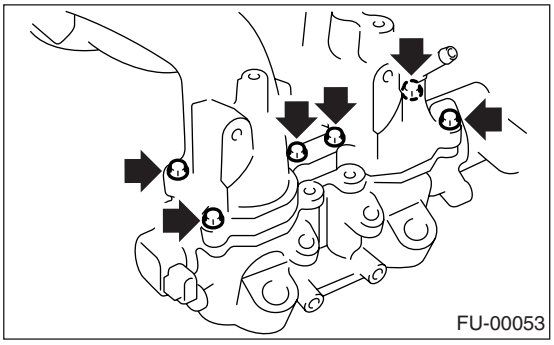
3) Open the fuel filler flap lid, and remove the fuel filler cap.
4) Remove the collector cover.
5) Remove the intake manifold.
<Ref. to FU(H4DOTC)-14, REMOVAL, Intake Manifold.>
6) Disconnect the connector from tumble generator valve sensor.



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.

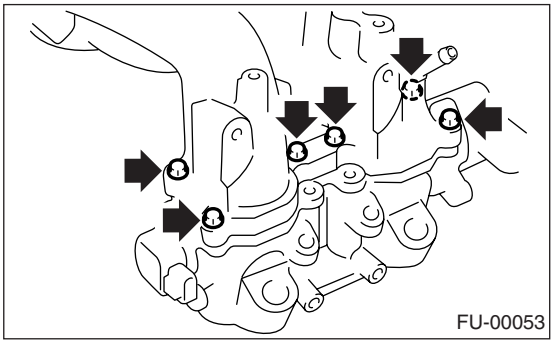


B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Replace with a new gasket.

Tightening torque:
8.25 N·m (0.84 kgf-m, 6.1 ft-lb)

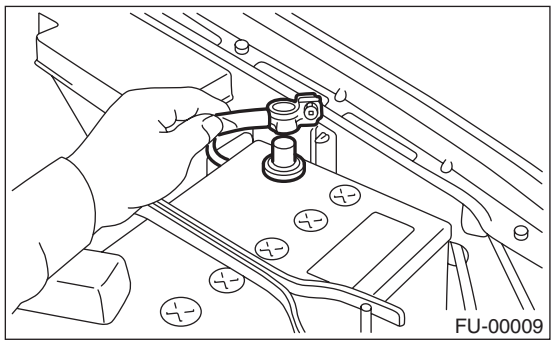


12.Tumble Generator Valve Actuator

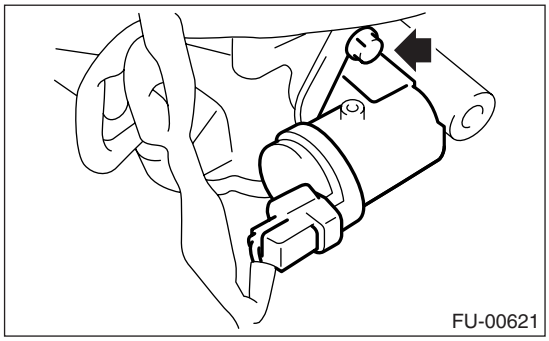
A: REMOVAL

1. RH SIDE

1) Release the fuel pressure. <Ref. to FU(H4DOTC)-50, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Disconnect the ground cable from battery.

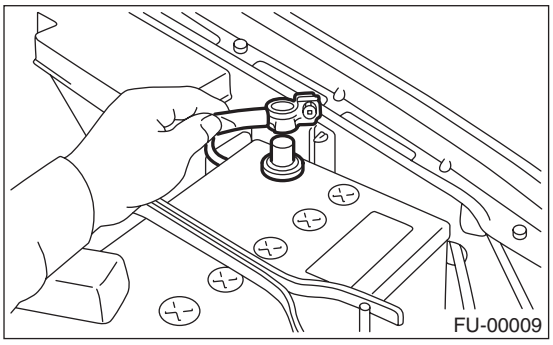


3) Open the fuel filler flap lid, and remove the fuel filler cap.
4) Remove the collector cover.
5) Remove the intake manifold.
<Ref. to FU(H4DOTC)-14, REMOVAL, Intake Manifold.>
6) Disconnect the connector from tumble generator valve actuator.
7) Remove the tumble generator valve actuator.

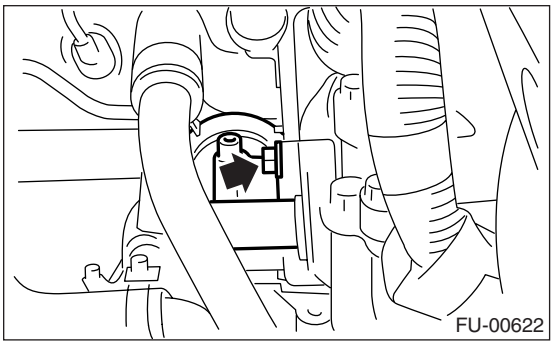


2. LH SIDE

1) Release the fuel pressure. <Ref. to FU(H4DOTC)-50, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Disconnect the ground cable from battery.



3) Open the fuel filler flap lid, and remove the fuel filler cap.
4) Remove the collector cover.
5) Remove the secondary air pump. <Ref. to EC(H4DOTC)-9, REMOVAL, Secondary Air Pump.>
6) Disconnect the connector from tumble generator valve actuator.
7) Remove the tumble generator valve actuator.



B: INSTALLATION

1. RH SIDE

Install in the reverse order of removal.

2. LH SIDE

Install in the reverse order of removal.

13. Tumble Generator Valve Position Sensor

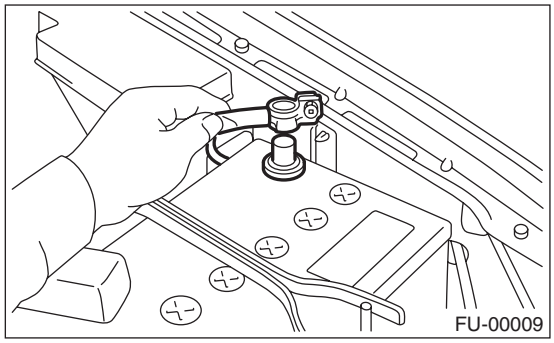
A: SPECIFICATION

The tumble generator valve position sensor cannot be adjusted when installed, so it should not be removed from the tumble generator valve assembly. Refer to “Tumble Generator Valve Assembly” for removal and installation procedure. <Ref. to FU(H4DOTC)-37, REMOVAL, Tumble Generator Valve Assembly.> <Ref. to FU(H4DOTC)-37, INSTALLATION, Tumble Generator Valve Assembly.>

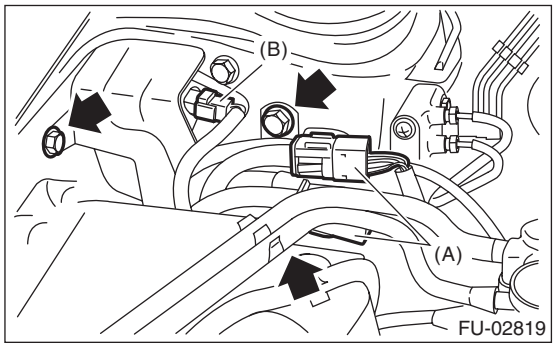
14. Wastegate Control Solenoid Valve

A: REMOVAL

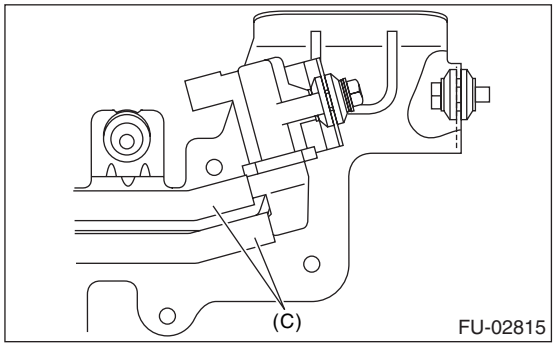
1) Disconnect the ground cable from battery.



2) Disconnect the engine harness connector (A) from bracket.
3) Disconnect the connector (B) from wastegate control solenoid valve.
4) Remove the bracket from vehicle body.



5) Disconnect the pressure hose (C) from the wastegate control solenoid valve.

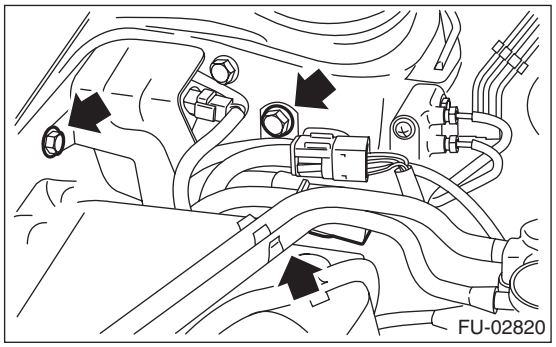


6) Remove the wastegate control solenoid valve from the bracket

B: INSTALLATION

Install in the reverse order of removal.

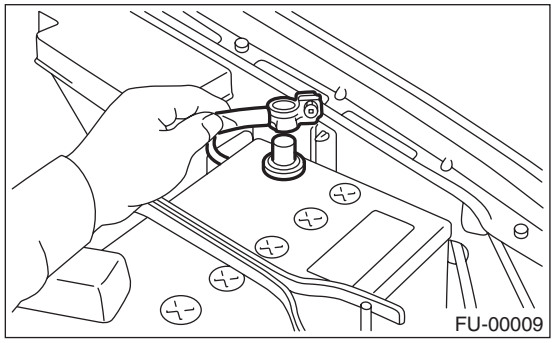
Tightening torque:
6.5 N·m (0.66 kgf-m, 4.8 ft-lb)



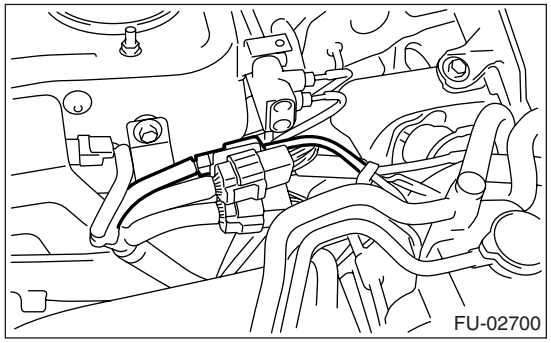
15.Front Oxygen (A/F) Sensor

A: REMOVAL

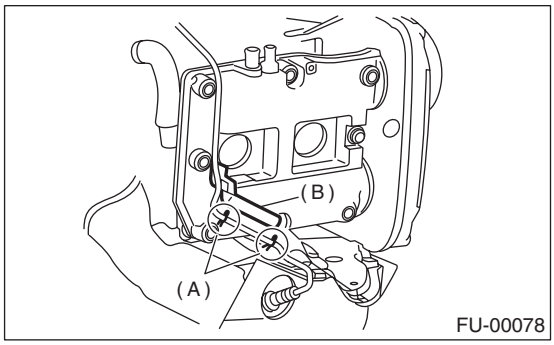
1) Disconnect the ground cable from battery.



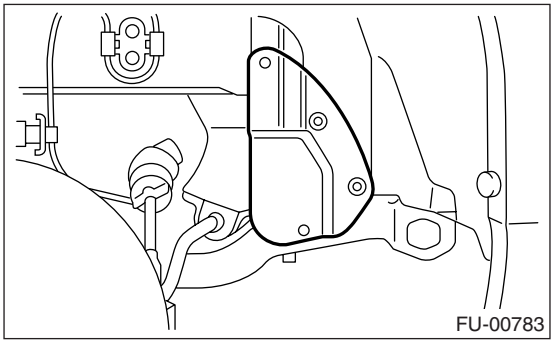
2) Disconnect the connector from front oxygen (A/F) sensor.



3) Disconnect the engine harness fixed by clip (A) from the bracket (B).

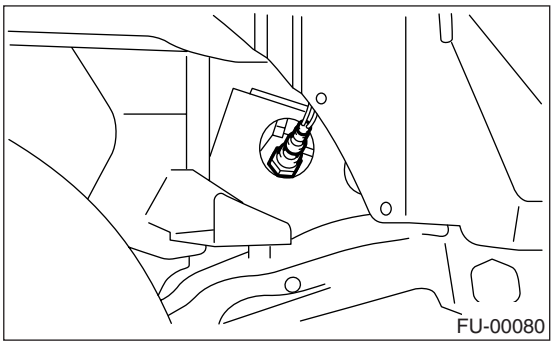


4) Remove the front right side wheel.
5) Lift-up the vehicle.
6) Remove the service hole cover.



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

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



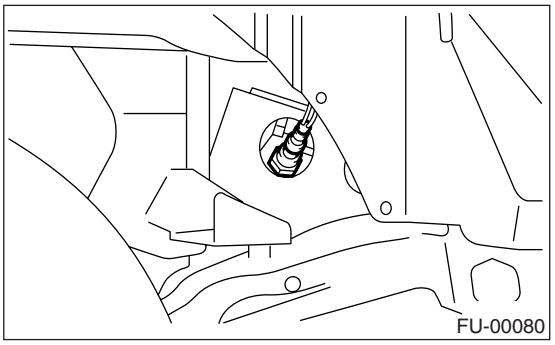
B: INSTALLATION

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

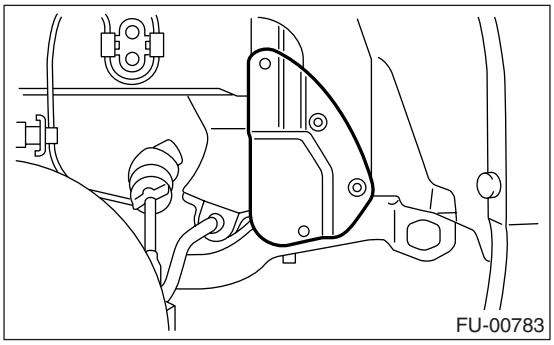
Anti-seize compound:
NEVER-SEEZ NS-165 or the equivalent

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

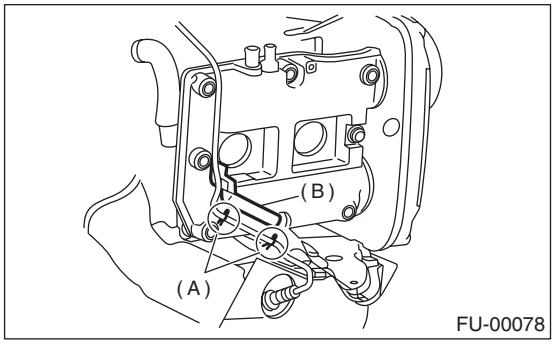
Tightening torque:
30 N·m (3.1 kgf-m, 22.1 ft-lb)



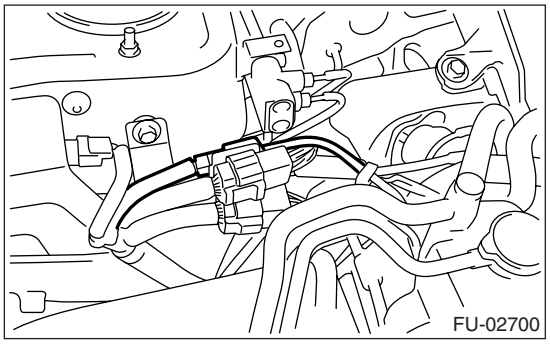
3) Install the service hole cover.



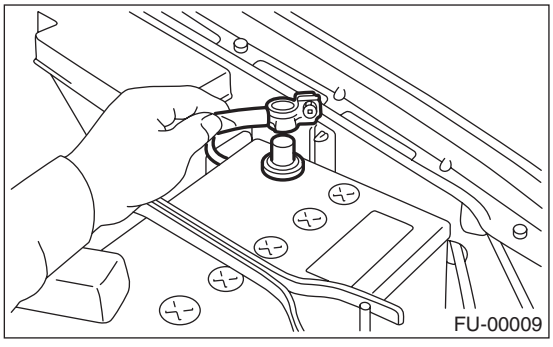
4) Lower the vehicle.
5) Install the front right side wheel.
6) Connect the engine harness to the bracket (B) using the clip (A).



7) Connect the connector of front oxygen (A/F) sensor.



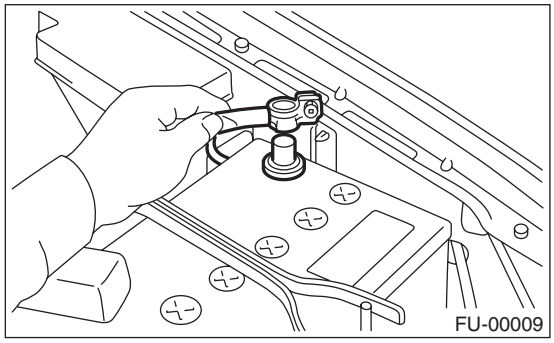
8) Connect the ground cable to battery.



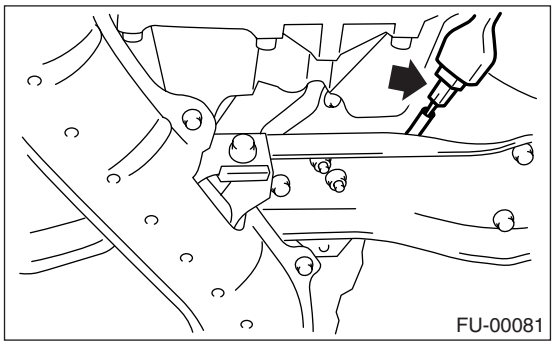
16.Rear Oxygen Sensor

A: REMOVAL

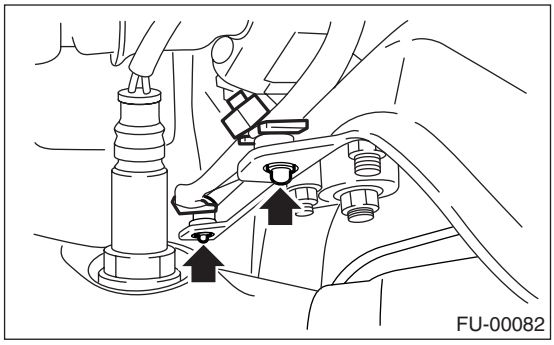
1) Disconnect the ground cable from battery.



2) Lift-up the vehicle.
3) Disconnect the connector from rear oxygen sensor.

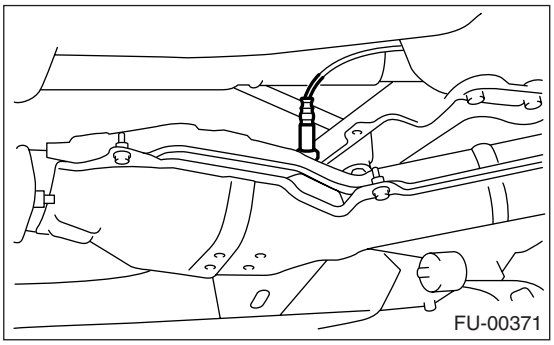


4) Remove the clip by pulling out from the upper side of crossmember.



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

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



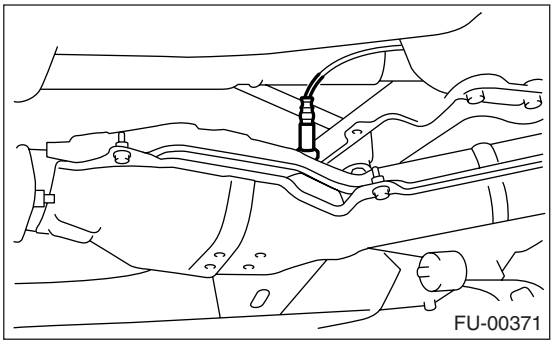
B: INSTALLATION

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

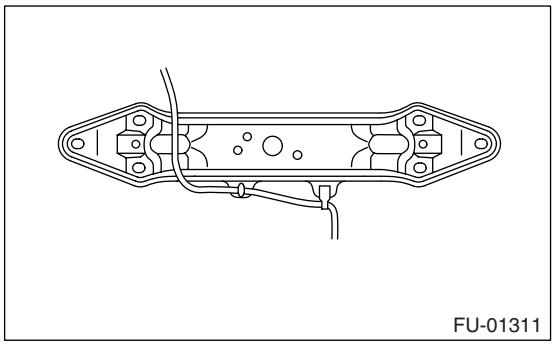
CAUTION:
Never apply anti-seize compound to protector of rear oxygen sensor.

Anti-seize compound:
NEVER-SEEZ NS-165 or the equivalent
2) Install the rear oxygen sensor.

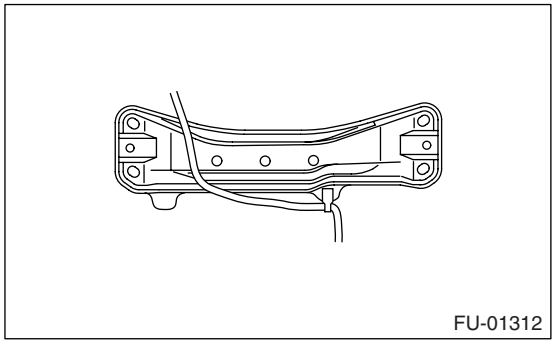
Tightening torque:
21 N·m (2.1 kgf-m, 15.2 ft-lb)



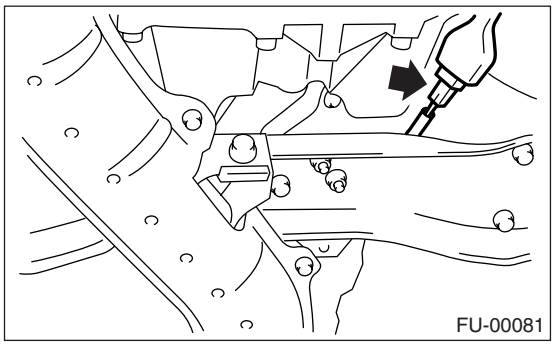
- AT model



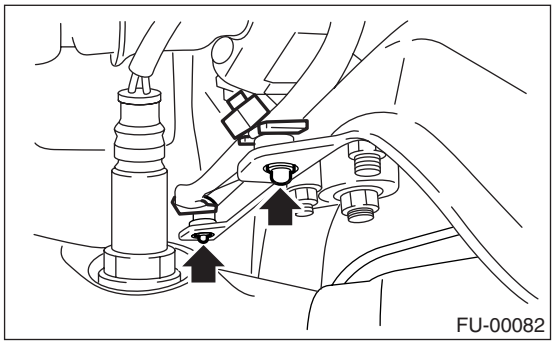
- MT model



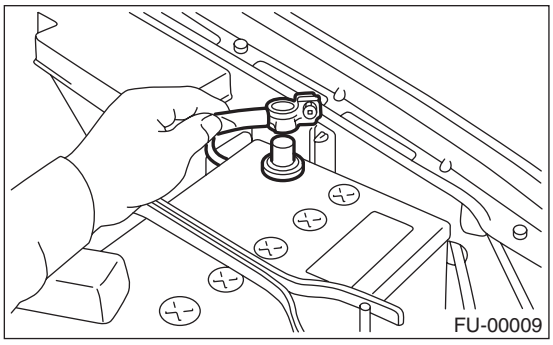
3) Connect the connector to rear oxygen sensor.



4) Connect the clip to the crossmember.



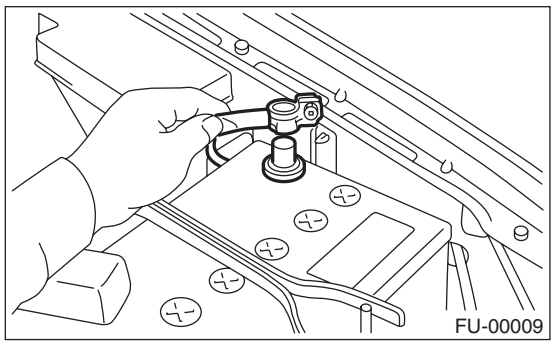
5) Lower the vehicle.
6) Connect the ground cable to battery.



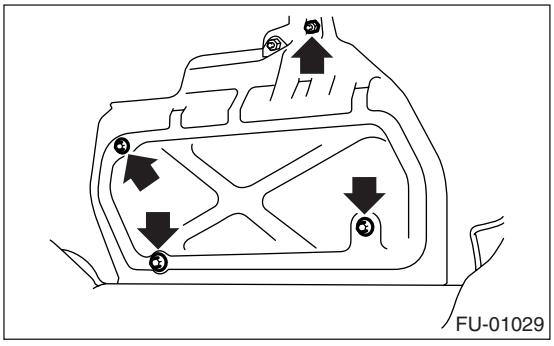
17.Engine Control Module (ECM)

A: REMOVAL

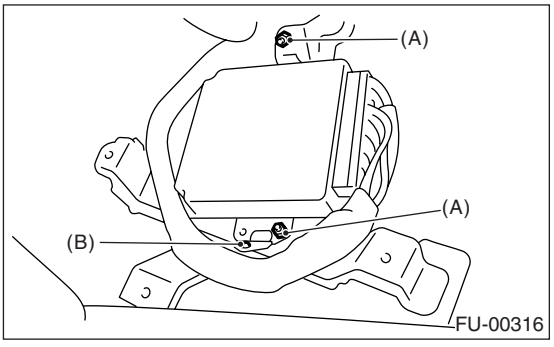
1) Disconnect the ground cable from battery.



2) Remove the lower inner trim of the passage 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.

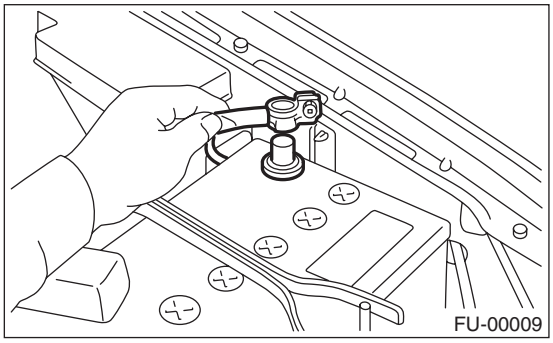
CAUTION:
• When replacing the ECM, be careful not to use the ECM for wrong specifications to avoid any damage to fuel injection system.
• When replacing the ECM, be careful not to damage the harnesses and connectors.

Tightening torque:
5 N·m (0.5 kgf-m, 3.7 ft-lb)

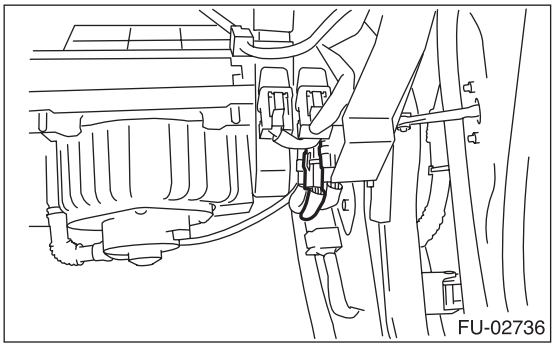
18.Main Relay

A: REMOVAL

1) Disconnect the ground cable from 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.

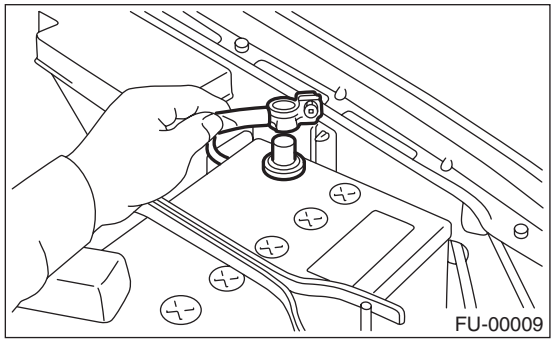
B: INSTALLATION

Install in the reverse order of removal.

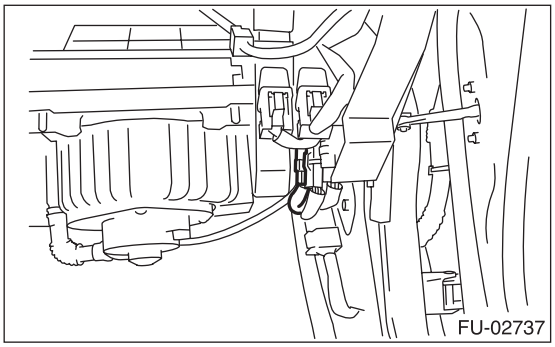
19.Fuel Pump Relay

A: REMOVAL

1) Disconnect the ground cable from 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.

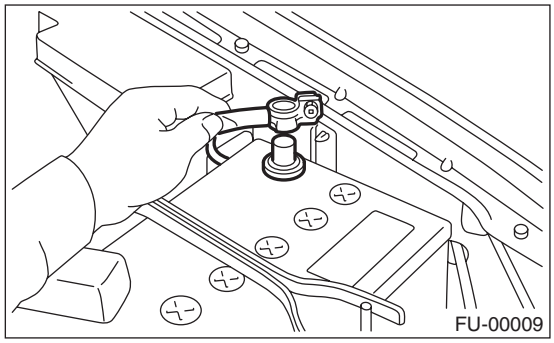
B: INSTALLATION

Install in the reverse order of removal.

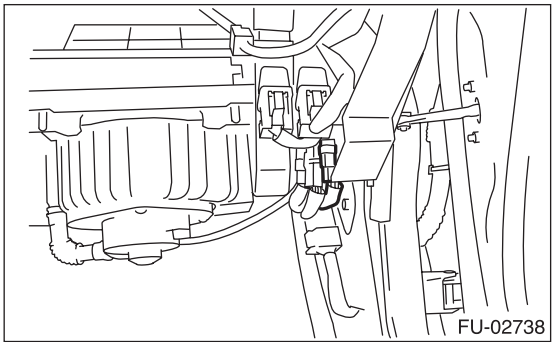
20. Electronic Throttle Control Relay

A: REMOVAL

1) Disconnect the ground cable from 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 electric throttle control relay.



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

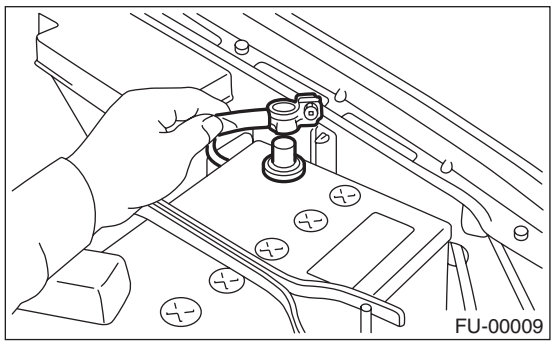
B: INSTALLATION

Install in the reverse order of removal.

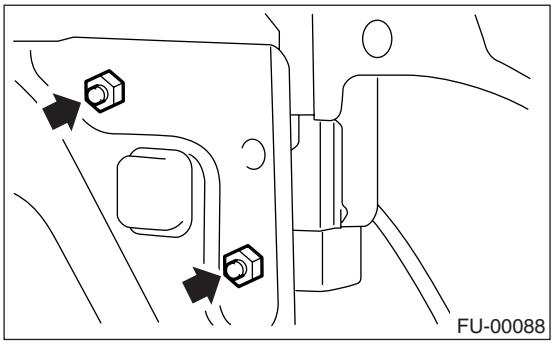
21.Fuel Pump Control Unit

A: REMOVAL

1) Disconnect the ground cable from 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.

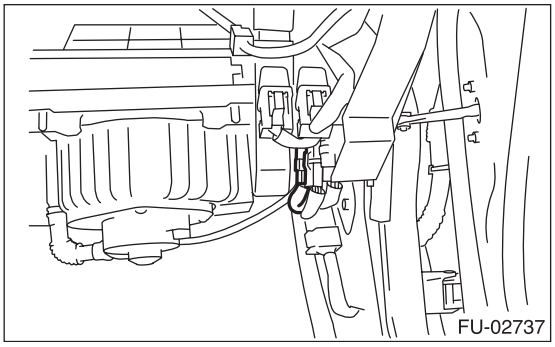
22.Fuel

A: PROCEDURE

1. RELEASING OF FUEL PRESSURE

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

CAUTION:
Be careful not to spill fuel.
1) Disconnect the connector from fuel pump relay.



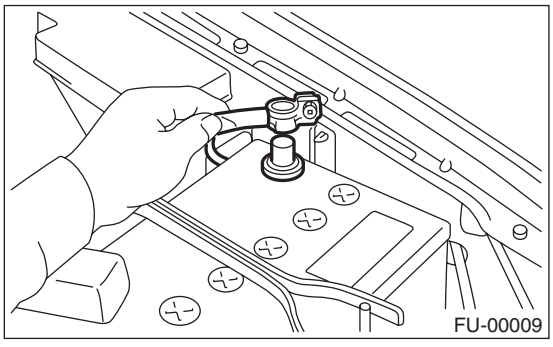
2) Start the engine and run it until it stalls.
3) After the engine stalls, crank it for five more seconds.
4) Turn the ignition switch to OFF.

2. DRAINING FUEL

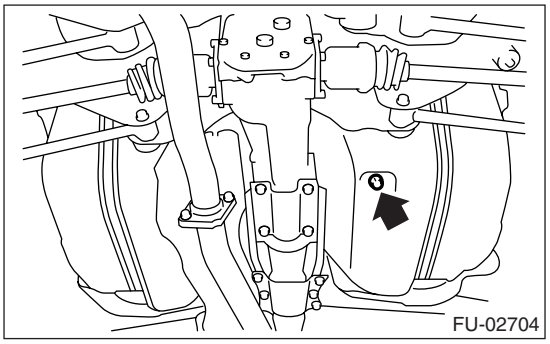
• MODEL WITH FUEL DRAIN PLUG

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 battery.



3) Open the fuel filler flap lid, and remove the fuel filler cap.
4) Lift-up the vehicle.
5) Drain fuel from fuel tank.
Set a container under the vehicle and remove the drain plug from the fuel tank.



6) Tighten the fuel drain plugs.

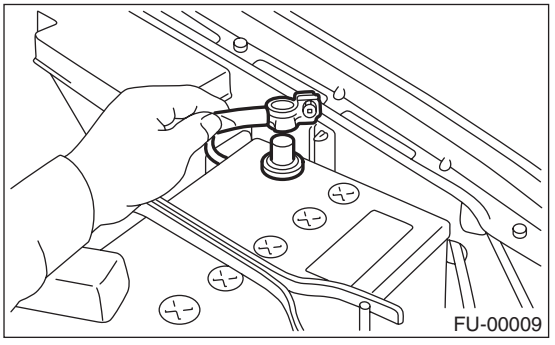
NOTE:
Use a new gasket.

Tightening torque:
26 N·m (2.65 kgf-m, 19.2 ft-lb)

• MODEL WITHOUT FUEL DRAIN PLUG

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)-50, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Disconnect the ground cable from the battery.



3) Remove the fuel pump. <Ref. to FU(H4DOTC)-58, REMOVAL, Fuel Pump.>
4) Drain fuel using a pump through where the fuel pump was installed.

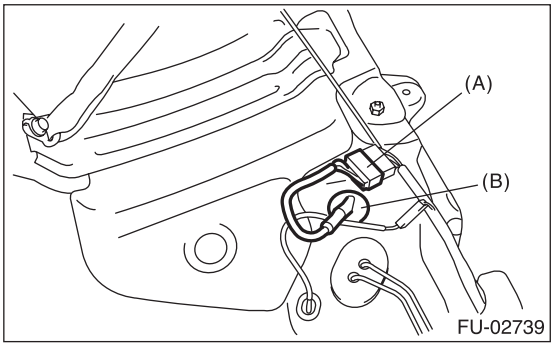
CAUTION:
Use a petrol resistance pump or the equivalent.
5) Install the fuel pump. <Ref. to FU(H4DOTC)-58, INSTALLATION, Fuel Pump.>

23.Fuel Tank

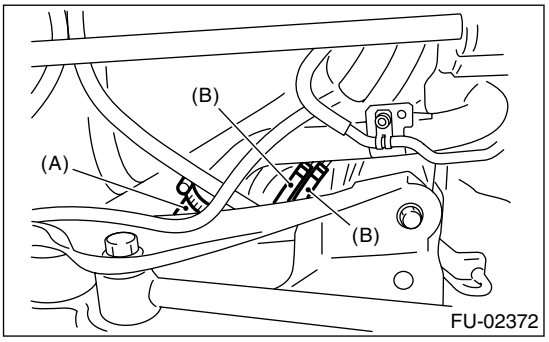
A: REMOVAL

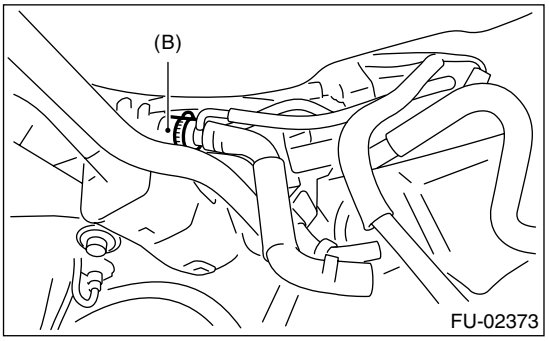
WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel.**

1) Set the vehicle on a lift.
2) Release the fuel pressure. <Ref. to FU(H4DOTC)-50, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
3) Drain fuel from fuel tank.
<Ref. to FU(H4DOTC)-50, DRAINING FUEL, PROCEDURE, Fuel.>
4) Remove the rear seat.
5) Disconnect the connector (A) of fuel tank cord to the rear harness.
6) Push the grommet (B) which holds the fuel tank cord on the floor panel into under the body.

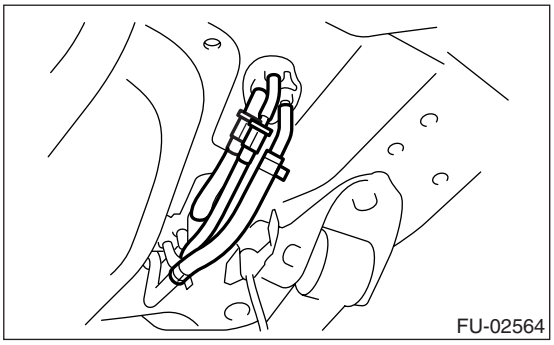


7) Remove the rear crossmember. <Ref. to RS-16, REMOVAL, Rear Crossmember.>
8) Remove the canisters. <Ref. to EC(H4SO)-6, REMOVAL, Canister.>
9) Disconnect the connector from the pressure control solenoid valve.
10) Loosen the clamp and disconnect the fuel filler hose (A) and evaporation hose from the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



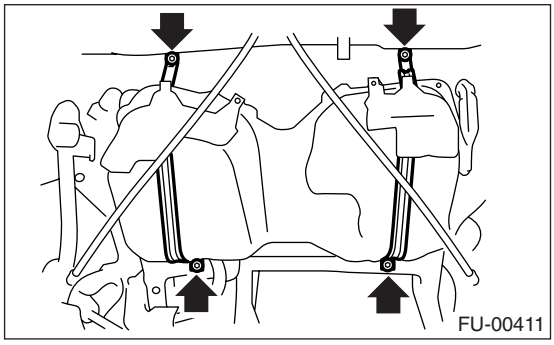


11) Move the clips, and disconnect the quick connector. <Ref. to FU(H4DOTC)-65, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>
12) Disconnect the fuel hoses.



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

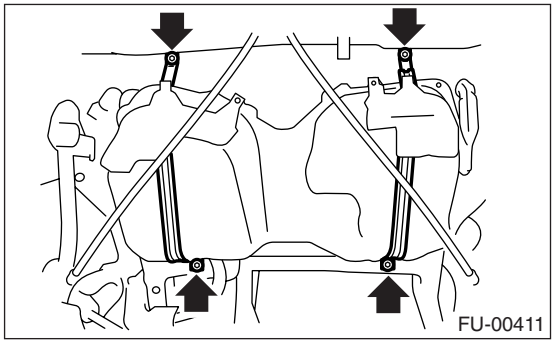
WARNING:
- **A helper is required to perform this work.**
- **Fuel may remain undrained in the side of the fuel tank without the drain plug. Be careful not to lose balance and drop the fuel tank when removing it, as this remaining fuel may offset the weight balance of the tank.**



B: INSTALLATION

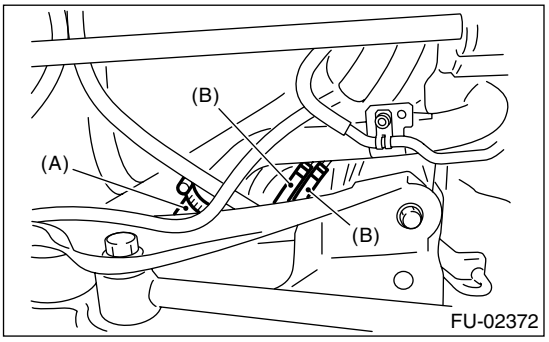
1) Support the fuel tank with transmission jack and push the fuel tank harness into access hole with grommet.
2) Set the fuel tank and temporarily tighten the bolts of fuel tank bands.

WARNING:
A helper is required to perform this work.

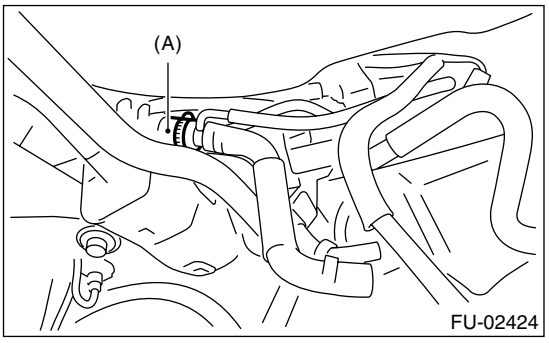


3) Insert the fuel filler hose (A) approx. 35 to 40 mm (1.38 to 1.57 in) over the lower end of fuel filler pipe and tighten the clamp.

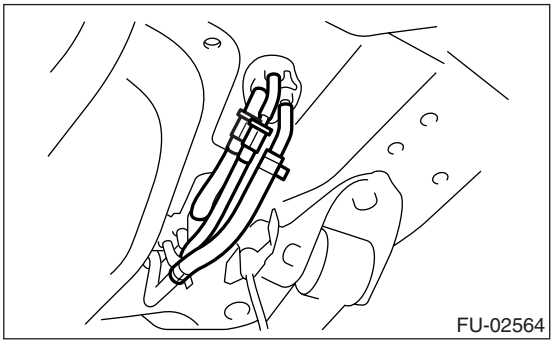
4) Insert the evaporation hose (B) into the lower end of evaporation pipe, and fasten the clamp and clip.



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



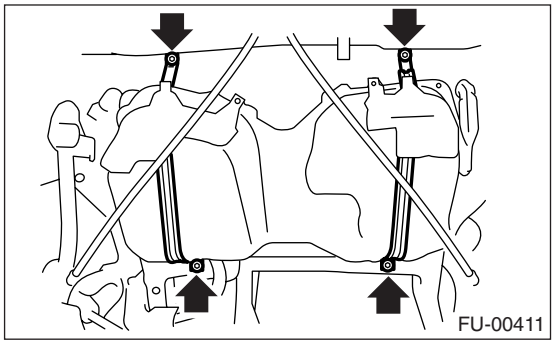
5) Connect the fuel hoses, and hold then with clips and quick connector. <Ref. to FU(H4DOTC)-66, INSTALLATION, Fuel Delivery, Return and Evaporation Lines.>



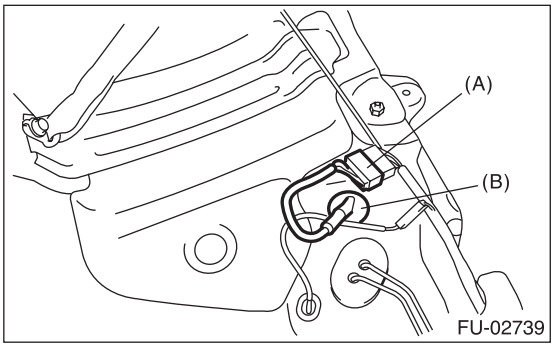
6) Connect the connector to pressure control solenoid valve.
7) Install the canister. <Ref. to EC(H4SO)-6, INSTALLATION, Canister.>

8) Tighten the band mounting bolts.

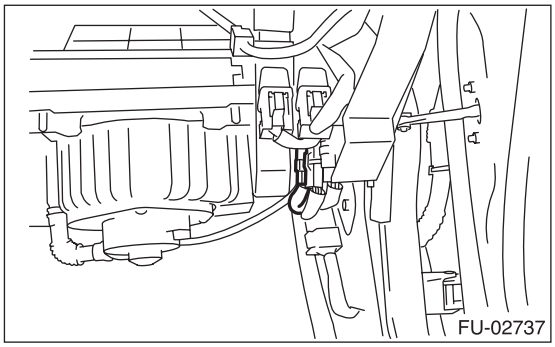
Tightening torque:
33 N·m (3.4 kgf-m, 25 ft-lb)



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



11) Set the rear seat and floor mats.
12) Connect the connector to fuel pump relay.



C: INSPECTION

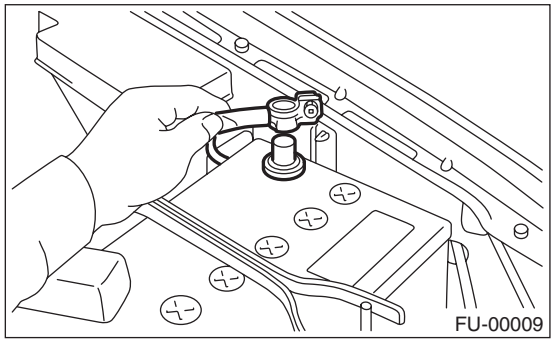
1) Check that there are no cracks, holes, or other damage on the fuel tank.
2) Make sure that the fuel pipe and fuel hose are not cracked and those connections are tight.

24.Fuel Filler Pipe

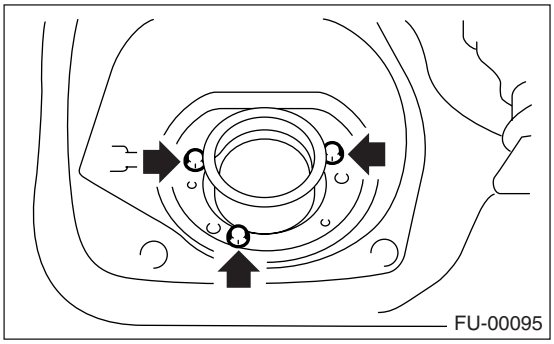
A: REMOVAL

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel.**

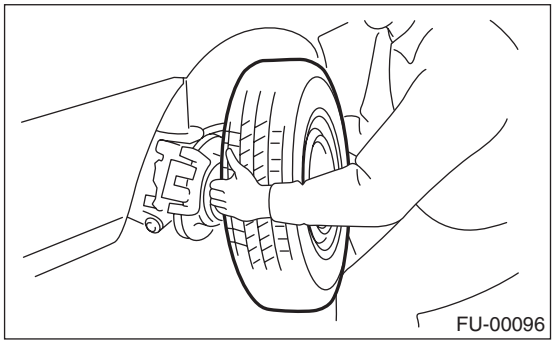
1) Disconnect the ground cable from battery.


FU-00009

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

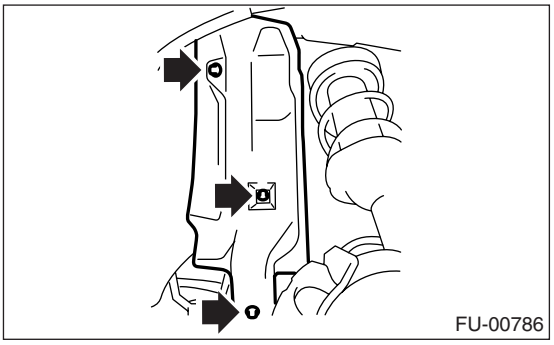

FU-00095

4) Lift-up the vehicle.
5) Remove the rear wheel nuts RH.
6) Remove the rear wheel RH.

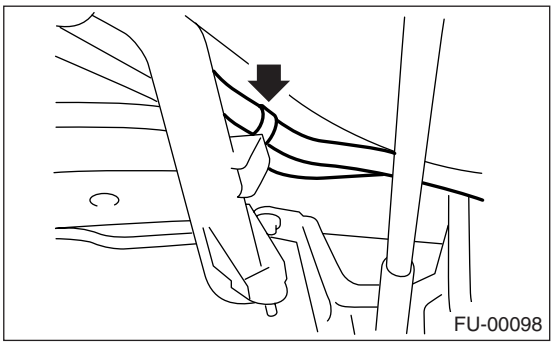

FU-00096

7) Drain fuel from fuel tank. <Ref. to FU(H4DOTC)-50, DRAINING FUEL, PROCEDURE, Fuel.>

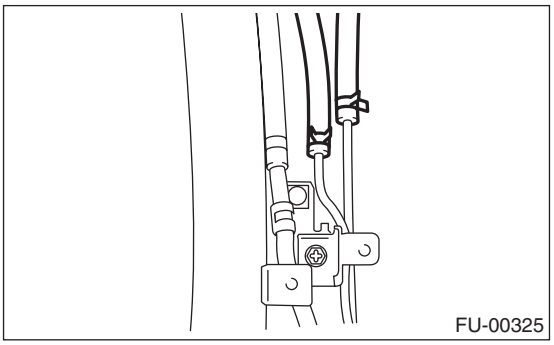
8) Remove the fuel filler pipe protector.


FU-00786

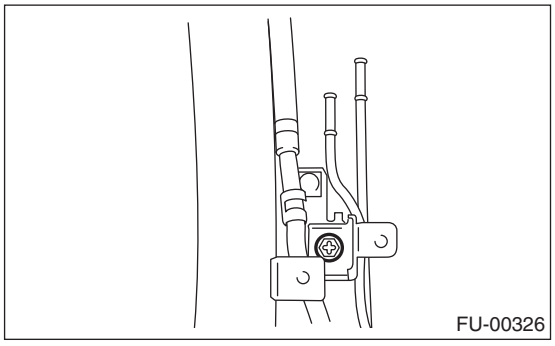
9) Disconnect the evaporation hose from the clip of fuel filler pipe.


FU-00098

10) Disconnect the evaporation hose from the pipe.

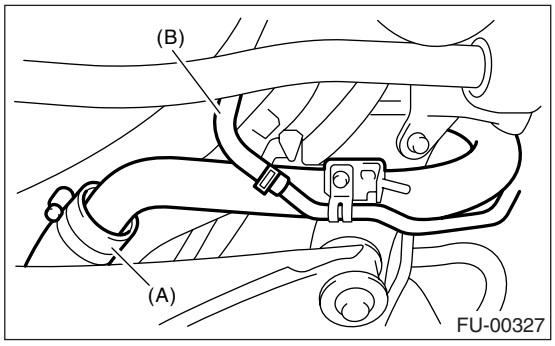

FU-00325

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

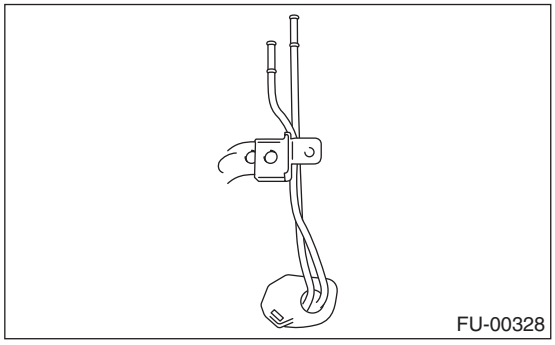

FU-00326

12) Loosen the clamp and separate the fuel filler hose (A) from the fuel filler pipe.

13) Loosen the clip and disconnect the evaporation hose (B).



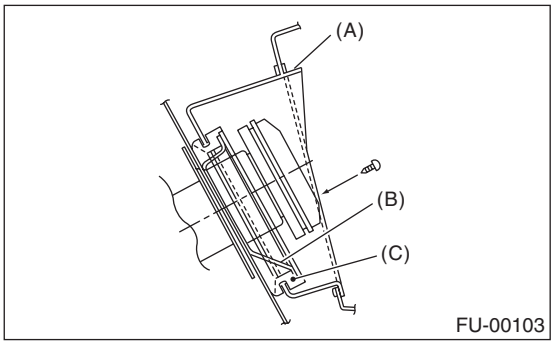
14) Remove the fuel filler pipe to the underside of the vehicle.
15) Remove the evaporation pipe together with clip from the body.



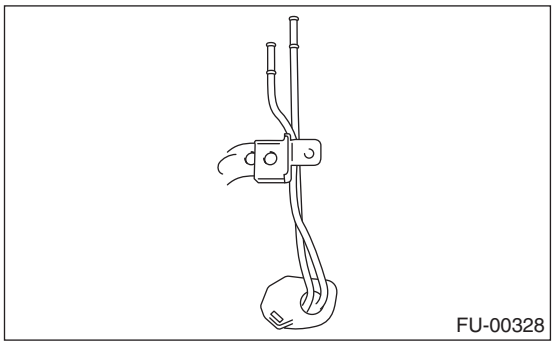
B: INSTALLATION

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

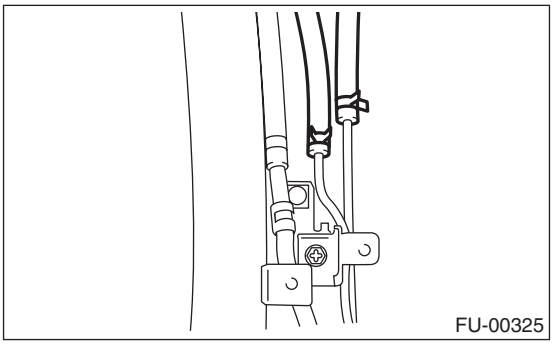
NOTE:
If the edges of rubber packing are folded toward the inside, straighten it with a screwdriver.



4) Install the evaporation pipe.



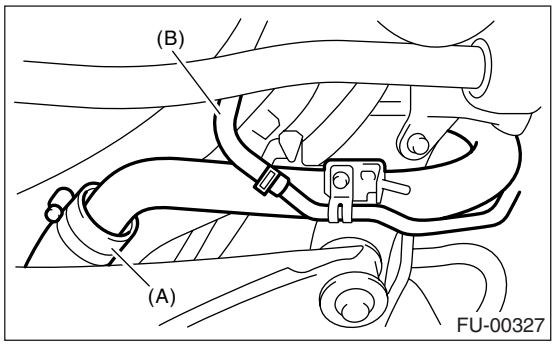
5) Connect the evaporation hose to the pipe.

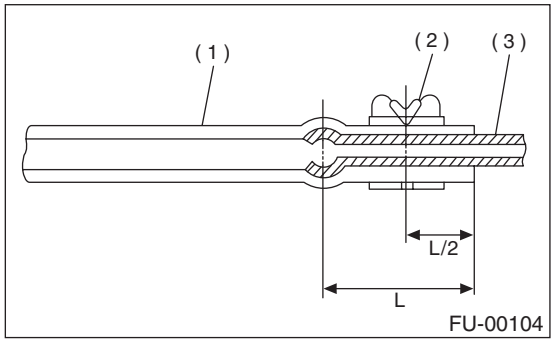


6) Insert the fuel filler hose (A) approx. 35 to 40 mm (1.38 to 1.57 in) over the lower end of fuel filler pipe and tighten the clamp.

7) Insert the evaporation hose approximately 25 to 30 mm (0.98 to 1.18 in) into the lower end of evaporation pipe and fasten the clip.

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

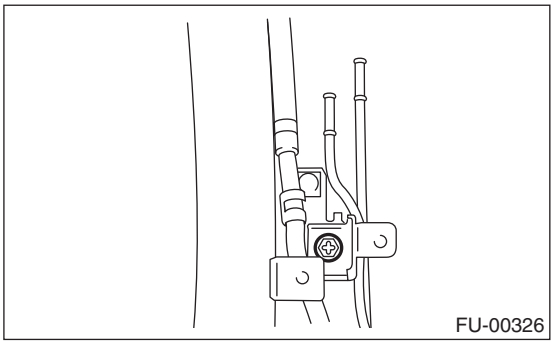




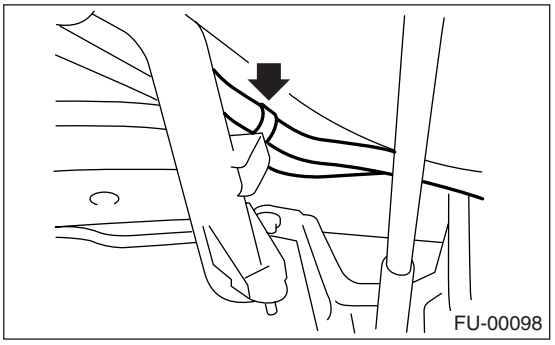
(1) Hose
(2) Clip
(3) Pipe

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

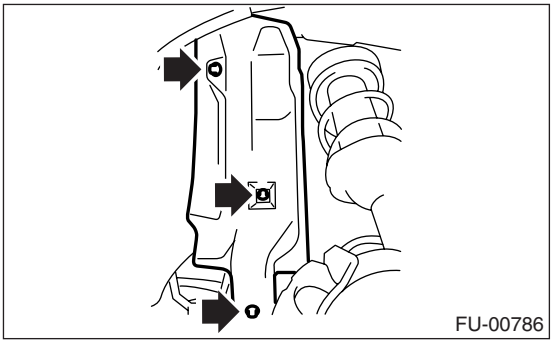
Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)



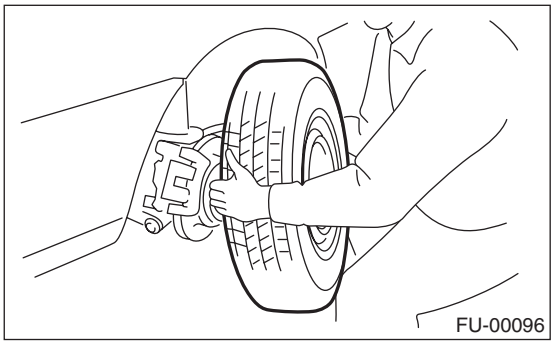
9) Fasten the evaporation hoses to the clip of fuel filler pipe.



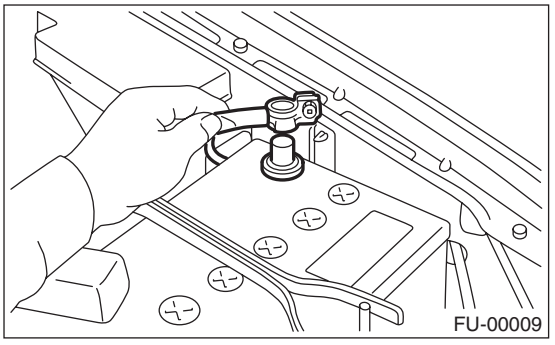
10) Install the fuel filler pipe protector.



11) Install the rear wheel RH.

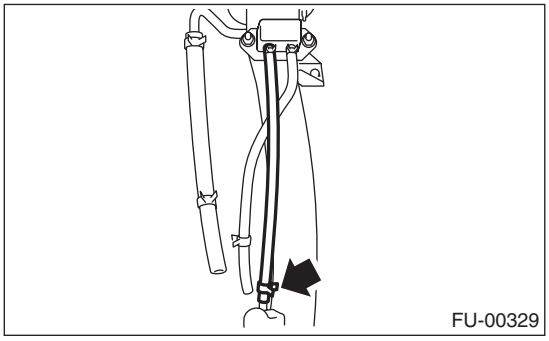


12) Lower the vehicle.
13) Tighten the wheel nuts.
14) Connect the ground cable to battery.

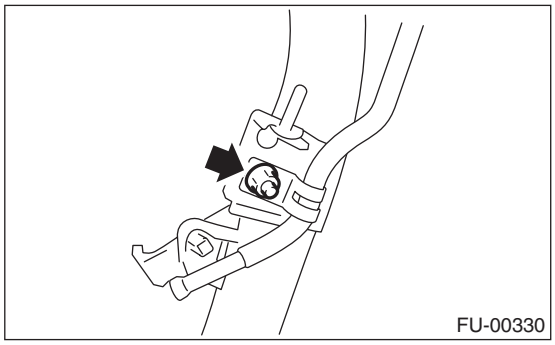


C: DISASSEMBLY

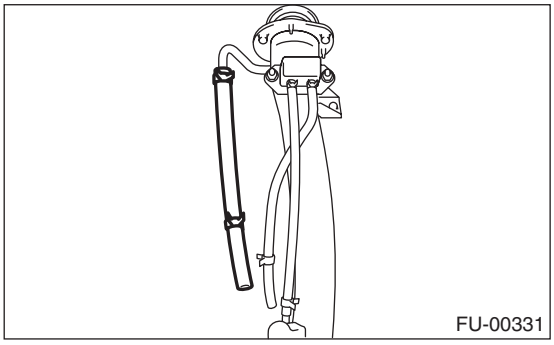
1) Move the clamp and disconnect the evaporation hose from the joint pipe.



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



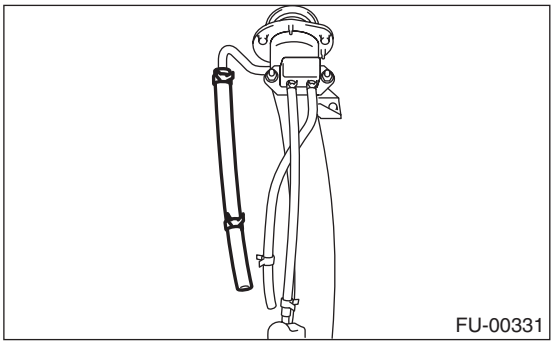
3) Disconnect the evaporation hose from fuel filler pipe.



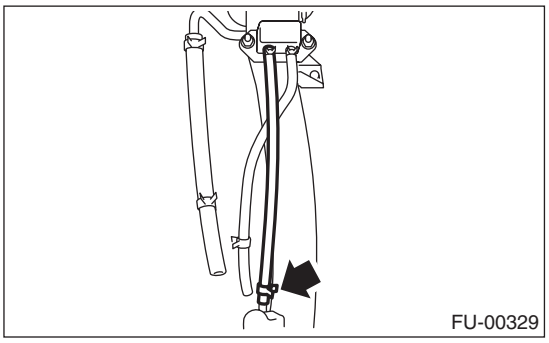
4) Remove the shut valve from the fuel filler pipe. <Ref. to EC(H4DOTC)-19, REMOVAL, Shut Valve.>

D: ASSEMBLY

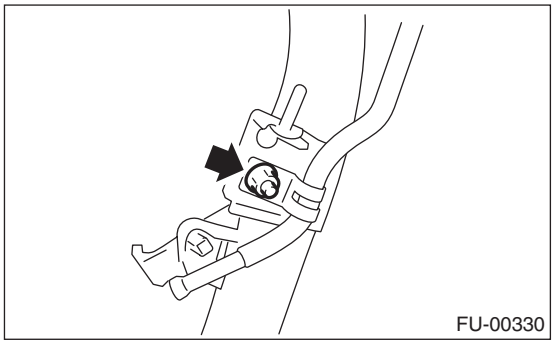
1) Install the shut pipe to the fuel filler pipe. <Ref. to EC(H4DOTC)-19, INSTALLATION, Shut Valve.>
2) Connect the evaporation hose to the fuel filler pipe.



3) Connect the evaporation hose to the evaporation pipe.



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



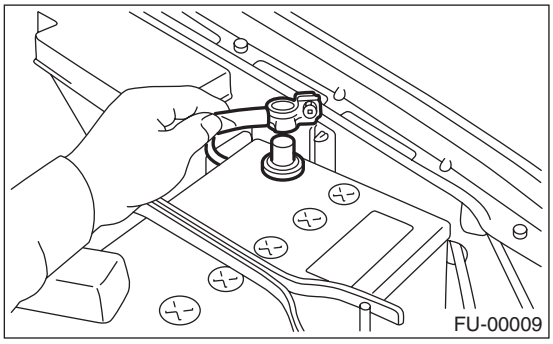
25.Fuel Pump

A: REMOVAL

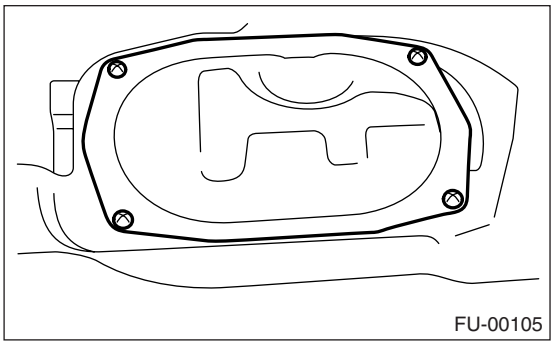
WARNING:
Place "NO FIRE" signs near the working area.

CAUTION:
Be careful not to spill fuel.

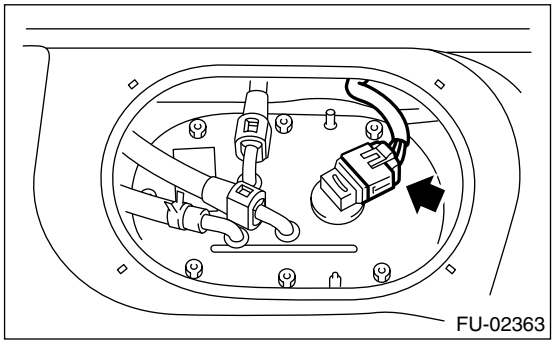
NOTE:
Fuel pump assembly consists of fuel pump and fuel level sensor.
1) Release the fuel pressure. <Ref. to FU(H4DOTC)-50, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Disconnect the ground cable from battery.



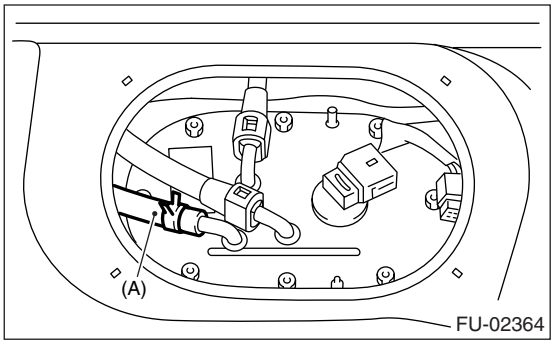
3) Open the fuel filler flap lid, and remove the fuel filler cap.
4) Remove the luggage floor mat. <Ref. to EI-48, REMOVAL, Luggage Floor Mat.>
5) Remove the service hole cover.



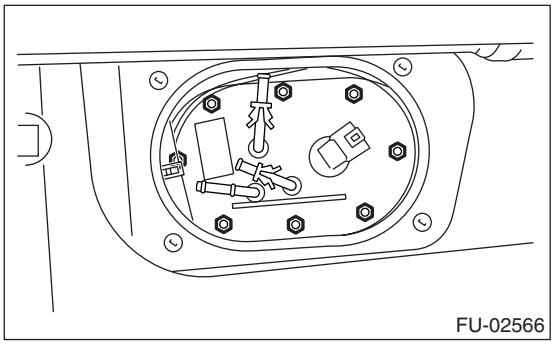
6) Disconnect the connector from fuel pump.



7) Disconnect the quick connector and then disconnect the fuel delivery hose and return hose. <Ref. to FU(H4DOTC)-65, 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.



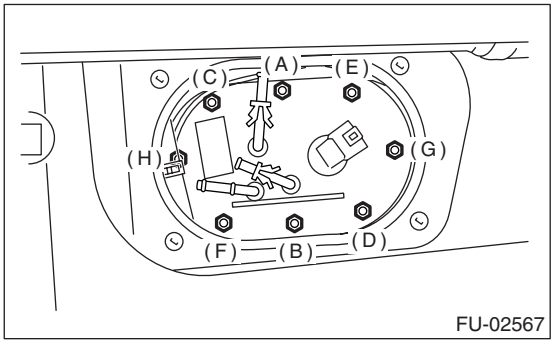
10) Remove the fuel pump assembly from the fuel tank.

B: INSTALLATION

Install in the reverse order of removal. Perform the following.

NOTE:
Use a new gasket and retainer.
1. Make sure the sealing portion is free from fuel or foreign matter before installation.
2. Tighten the nuts in alphabetical sequence shown in the figure to the specified torque.

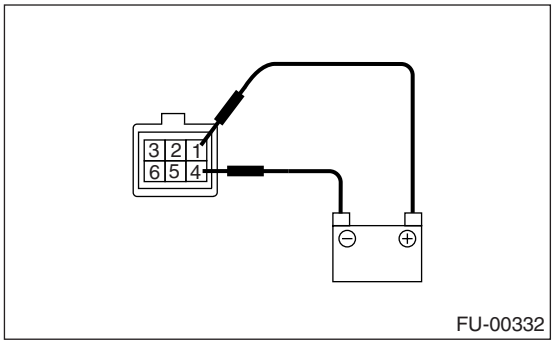
Tightening torque:
4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



C: INSPECTION

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

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

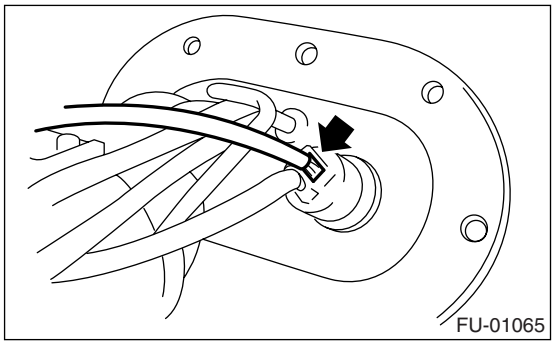


26.Fuel Level Sensor

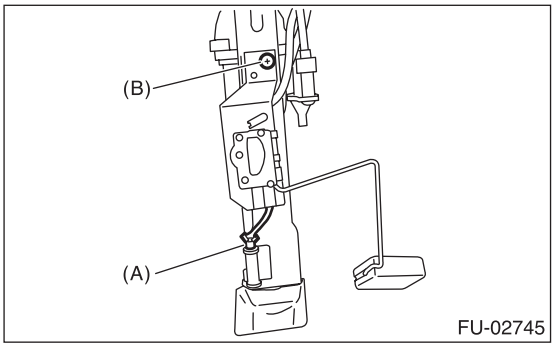
A: REMOVAL

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **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)-58, 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.

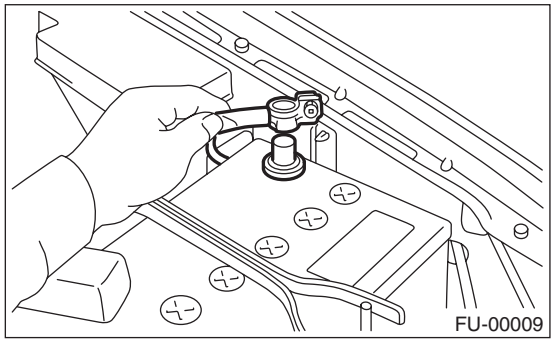
Tightening torque:
4.4 N·m (0.45 kgf-m, 3.3 ft-lb)

27.Fuel Sub Level Sensor

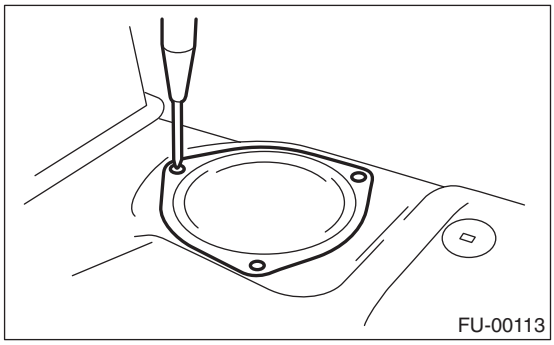
A: REMOVAL

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel.**

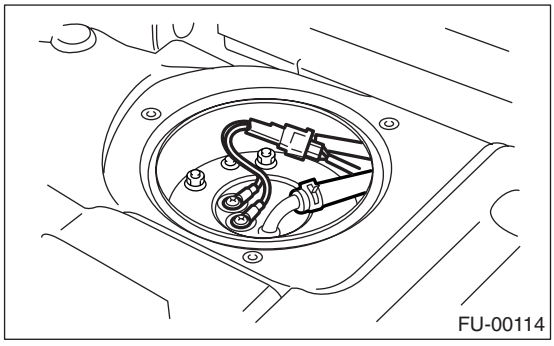
1) Disconnect the ground cable from battery.



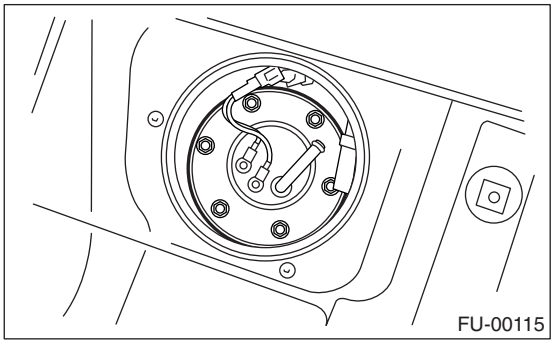
2) Lift-up the vehicle.
3) Drain fuel from fuel tank. <Ref. to FU(H4DOTC)-50, DRAINING FUEL, PROCEDURE, Fuel.>
4) Remove the luggage floor mat. <Ref. to EI-48, REMOVAL, Luggage Floor Mat.>
5) Remove the service hole cover.



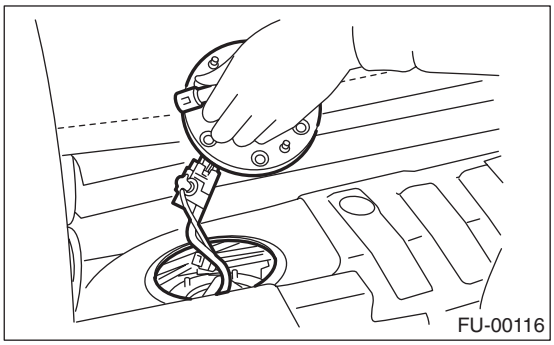
6) Disconnect the connector from fuel sub level sensor.
7) Disconnect the fuel jet pump hose.



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



9) Remove the fuel sub level sensor.

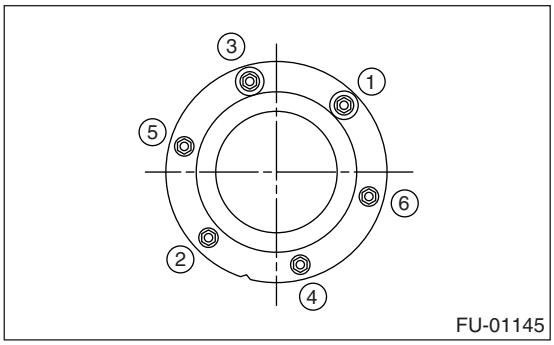


B: INSTALLATION

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)

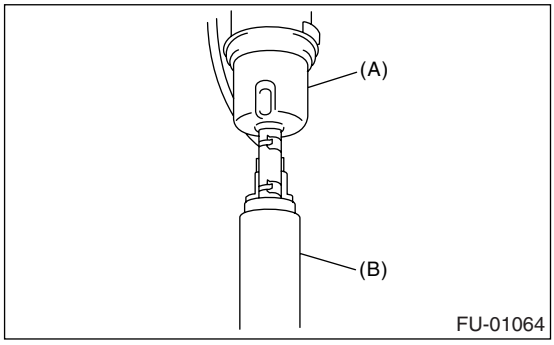


28.Fuel Filter

A: REMOVAL

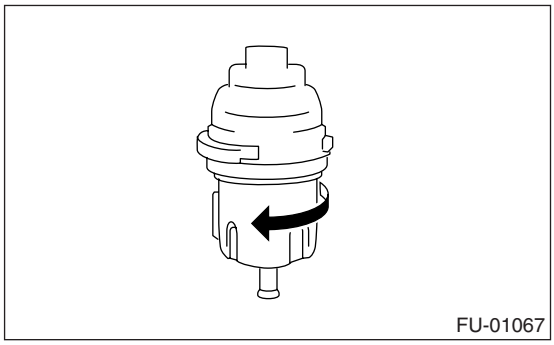
WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel.**

NOTE:
The fuel filter is assembled in fuel pump assembly.
1) Release the fuel pressure. <Ref. to FU(H4DOTC)-50, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Remove the fuel pump assembly.
<Ref. to FU(H4DOTC)-58, REMOVAL, Fuel Pump.>
3) Separate the fuel pump and fuel filter.



(A) Fuel filter
(B) Fuel pump

4) Rotate the filter holder in the direction of the arrow to remove the filter.



B: INSTALLATION

CAUTION:
- **If the fuel hose is damaged at the connection, replace it with a new one.**
- **If the clamp is badly damaged, replace it with a new one.**

Install in the reverse order of removal.

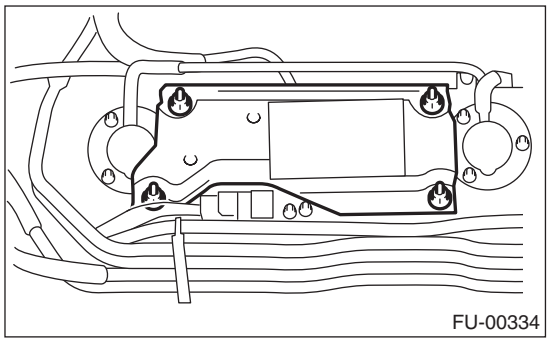
C: INSPECTION

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.

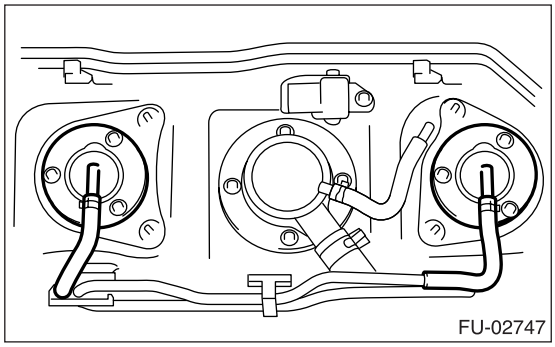
29.Fuel Cut Valve

A: REMOVAL

1) Remove the fuel tank.
<Ref. to FU(H4DOTC)-51, REMOVAL, Fuel Tank.>
2) Remove the protect cover.



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



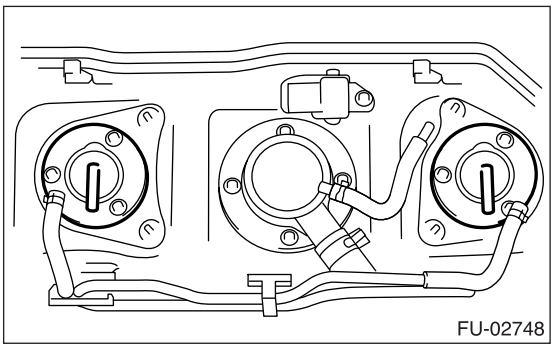
4) Remove the bolts which install the fuel cut valve.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Use a new gasket.

Tightening torque:
4.4 N·m (0.45 kgf-m, 3.3 ft-lb)

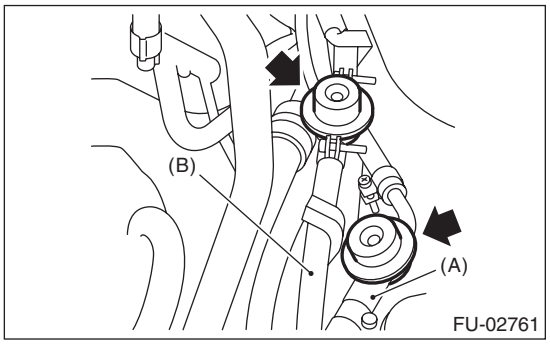


30.Fuel Damper Valve

A: REMOVAL

WARNING:
- **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)-50, 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

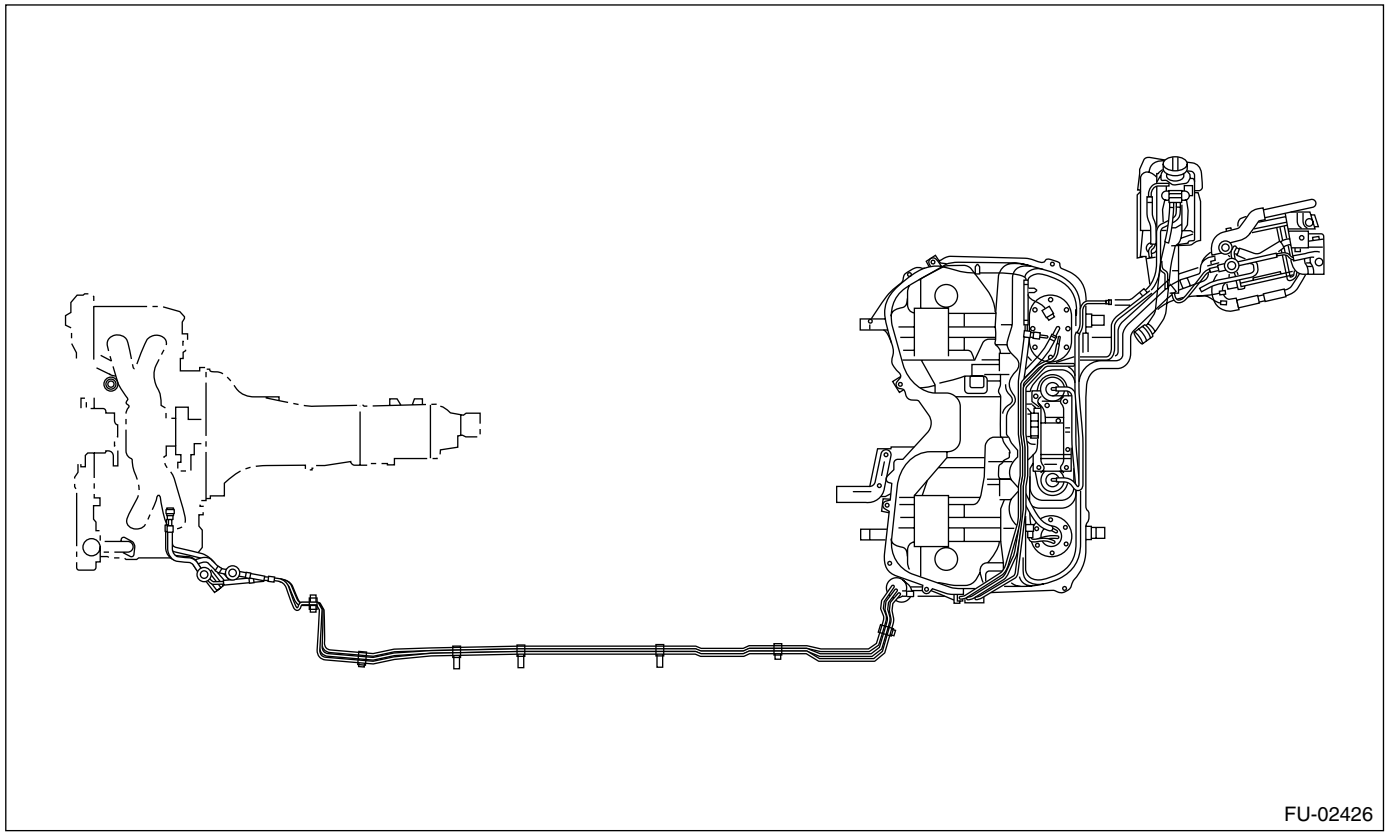
Install in the reverse order of removal.

Tightening torque:
1.25 N·m (0.13 kgf-m, 0.94 ft-lb)

31.Fuel Delivery, Return and Evaporation Lines

A: REMOVAL

1) Set the vehicle on a lift.
2) Release the fuel pressure. <Ref. to FU(H4DOTC)-50, 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 pipes and hoses, and then disconnect the fuel return pipes and hoses, evaporation pipes and hoses.

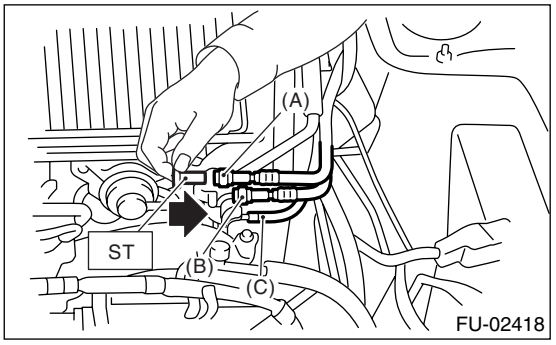

FU-02426

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.

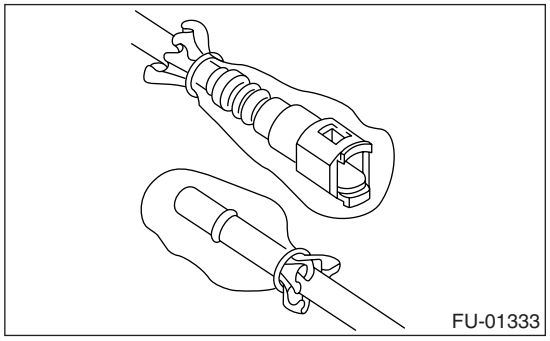
WARNING:
- **Be careful not to spill fuel.**
- **Catch the fuel from hoses using a container or cloth.**



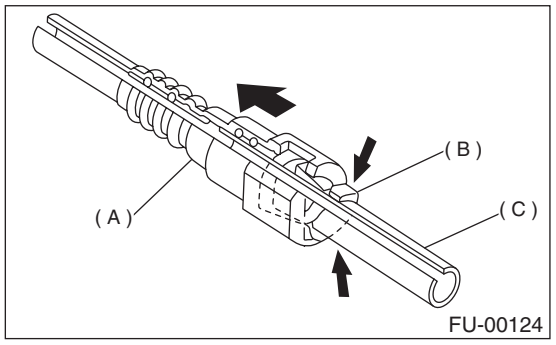
FU-02418

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).

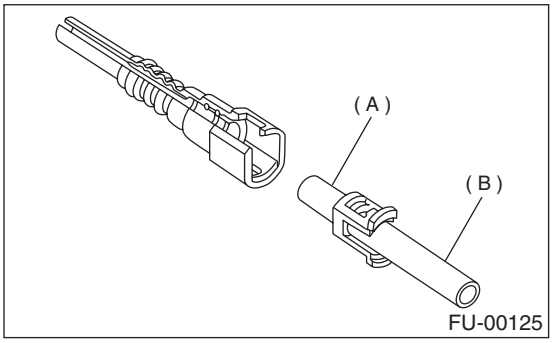


(A) Connector
(B) Retainer
(C) Pipe

B: INSTALLATION

1) Connect the quick connector to the fuel delivery line.

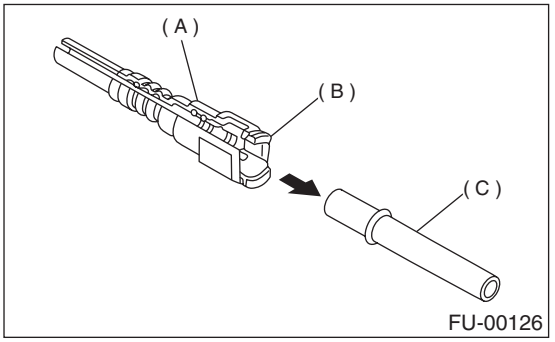
CAUTION:
• Replace the retainer other than the engine room with a new one.
• Make sure there are no damage or dust on connections. If necessary, clean seal surface of pipe.



(A) Seal surface
(B) Pipe

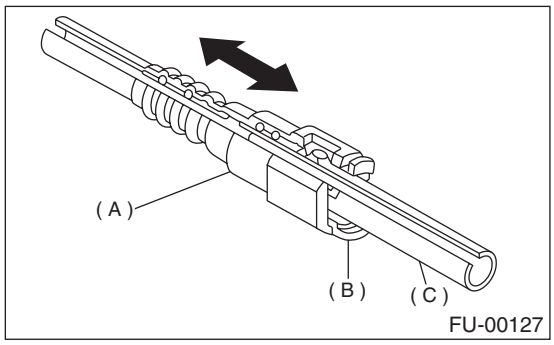
(1) Set the new retainer (B) to connector (A).
(2) Push the pipe into the connector completely.

NOTE:
At this time, two clicking sounds are heard.



(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.



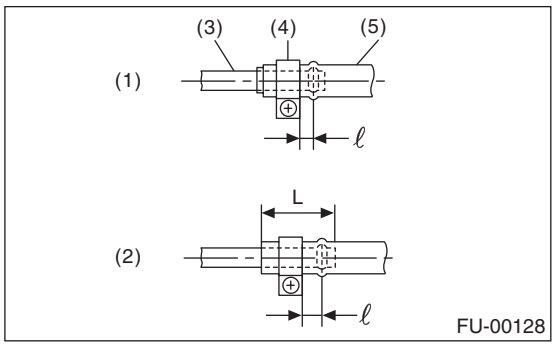
(A) Connector
(B) Retainer
(C) Pipe

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.

ℓ : 2.5±1.5 mm (0.098±0.059 in)

L = 22.5±2.5 mm (0.886±0.098 in)

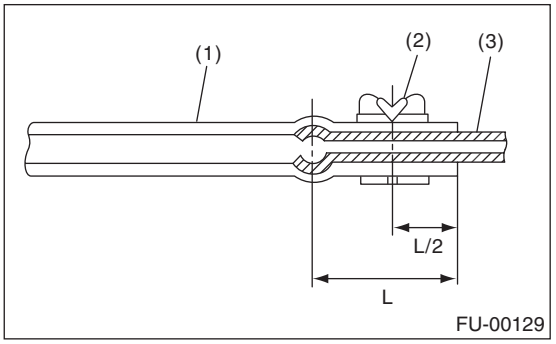
CAUTION:
Be sure to inspect hoses and their connections for any leakage of fuel.



(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±2.5 mm (0.689±0.098 in)



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

C: INSPECTION

1) Make sure that there are no cracks on the fuel pipes and fuel hoses.
2) Make sure the fuel pipe and fuel hose connections are tightened firmly.

32.Fuel System Trouble in General

A: INSPECTION

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

NOTE:
• When the vehicle is left unattended for an extended period of time, water may accumulate in the fuel tank. Fill fuel fully to prevent those problem. And also drain water from fuel filter.
• In snow-covered areas, mountainous areas, skiing areas, etc. where ambient temperatures drop below 0°C (32°F) throughout the winter season, use an water removing agent in the fuel system to prevent freezing fuel system and accumulating water. Fill the water removing agent at the time when the fuel reduced at half to maintain the advantage.
• When water is accumulated in fuel filter, drain water from both the fuel filter and fuel tank or use water removing agent in the fuel tank.
• Before using water removing agent, follow the cautions noted on the bottle.

EMISSION CONTROL
(AUX. EMISSION CONTROL DEVICES)
EC(H4DOTC)

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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 (Bank1)	<Ref. to GD(H4DOTC)-13, DTC P0016 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0018	Crankshaft Position - Camshaft Position Correlation (Bank2)	<Ref. to GD(H4DOTC)-13, DTC P0018 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0021	Intake Camshaft Position - Timing Over-Advanced or System Performance (Bank 2)	<Ref. to GD(H4DOTC)-13, 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)-14, 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)-16, 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)-18, 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)-20, 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)-22, 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)-24, 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)-26, DTC P0101 MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0102	Mass or Volume Air Flow Circuit Low Input	<Ref. to GD(H4DOTC)-29, DTC P0102 MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0103	Mass or Volume Air Flow Circuit High Input	<Ref. to GD(H4DOTC)-31, DTC P0103 MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0107	Manifold Absolute Pressure/Barometric Pressure Circuit Low Input	<Ref. to GD(H4DOTC)-33, DTC P0107 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0108	Manifold Absolute Pressure/Barometric Pressure Circuit High Input	<Ref. to GD(H4DOTC)-35, DTC P0108 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0111	Intake Air Temperature Sensor 1 Circuit Range/Performance	<Ref. to GD(H4DOTC)-37, DTC P0111 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0112	Intake Air Temperature Sensor 1 Circuit Low	<Ref. to GD(H4DOTC)-39, 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)-41, DTC P0113 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0117	Engine Coolant Temperature Circuit Low	<Ref. to GD(H4DOTC)-43, DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0118	Engine Coolant Temperature Circuit High	<Ref. to GD(H4DOTC)-45, DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DTC	Item	NOTE
P0122	Throttle/Pedal Position Sensor/ Switch “A” Circuit Low	<Ref. to GD(H4DOTC)-47, DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0123	Throttle/Pedal Position Sensor/ Switch “A” Circuit High	<Ref. to GD(H4DOTC)-49, DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0125	Insufficient Coolant Temperature for Closed Loop Fuel Control	<Ref. to GD(H4DOTC)-51, DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0126	Insufficient Engine Coolant Temperature for Stable Operation	<Ref. to GD(H4DOTC)-54, DTC P0126 INSUFFICIENT ENGINE COOLANT TEMPERATURE FOR STABLE OPERATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0128	Coolant Thermostat (Engine Coolant Temperature Below Thermostat Regulating Temperature)	<Ref. to GD(H4DOTC)-56, DTC P0128 COOLANT THERMOSTAT (ENGINE COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0131	O2 Sensor Circuit Low Voltage (Bank 1 Sensor 1)	<Ref. to GD(H4DOTC)-58, 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)-60, 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)-62, 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)-65, 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)-67, 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)-70, 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)-71, DTC P0139 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0140	O2 Sensor Circuit No Activity Detected (Bank1 Sensor2)	<Ref. to GD(H4DOTC)-71, DTC P0139 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0171	System Too Lean (Bank 1)	<Ref. to GD(H4DOTC)-79, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0172	System Too Rich (Bank 1)	<Ref. to GD(H4DOTC)-82, 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)-85, 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)-88, 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)-90, 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)-92, DTC P0222 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0223	Throttle/Pedal Position Sensor/ Switch “B” Circuit High	<Ref. to GD(H4DOTC)-94, DTC P0223 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DTC	Item	NOTE
P0230	Fuel Pump Primary Circuit	<Ref. to GD(H4DOTC)-96, 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)-98, 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)-100, 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)-102, DTC P0246 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0301	Cylinder 1 Misfire Detected	<Ref. to GD(H4DOTC)-104, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0302	Cylinder 2 Misfire Detected	<Ref. to GD(H4DOTC)-111, DTC P0302 CYLINDER 2 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0303	Cylinder 3 Misfire Detected	<Ref. to GD(H4DOTC)-111, DTC P0303 CYLINDER 3 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0304	Cylinder 4 Misfire Detected	<Ref. to GD(H4DOTC)-111, 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)-112, 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)-114, 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)-116, 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)-118, 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)-120, 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)-122, DTC P0345 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0410	Secondary Air Injection System	<Ref. to GD(H4DOTC)-123, DTC P0410 SECONDARY AIR INJECTION SYSTEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0411	Secondary Air Injection System Incorrect Flow Detected	<Ref. to GD(H4DOTC)-128, 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)-129, 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)-130, 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)-131, 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)-131, 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)-132, DTC P0418 SECONDARY AIR INJECTION SYSTEM CONTROL “A” CIRCUIT OPEN , Diagnostic Trouble Code (DTC) Detecting Criteria.>

DTC	Item	NOTE
P0420	Catalyst System Efficiency Below Threshold (Bank 1)	<Ref. to GD(H4DOTC)-133, DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0442	Evaporative Emission Control System Leak Detected (Small Leak)	<Ref. to GD(H4DOTC)-136, 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)-151, 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)-153, 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)-155, 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)-157, 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)-159, 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)-161, 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)-161, 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)-162, 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)-164, 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)-166, 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)-168, 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)-170, DTC P0463 FUEL LEVEL SENSOR “A” CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0464	Fuel Level Sensor Circuit Intermittent	<Ref. to GD(H4DOTC)-172, DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0483	Fan Rationality Check	<Ref. to GD(H4DOTC)-175, DTC P0483 FAN RATIONALITY CHECK, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0502	Vehicle Speed Sensor “A” Circuit Low Input	<Ref. to GD(H4DOTC)-176, 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)-177, 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)-178, DTC P0506 IDLE AIR CONTROL SYSTEM RPM LOWER THAN EXPECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0507	Idle Air Control System RPM Higher Than Expected	<Ref. to GD(H4DOTC)-180, DTC P0507 IDLE AIR CONTROL SYSTEM RPM HIGHER THAN EXPECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0512	Starter Request Circuit	<Ref. to GD(H4DOTC)-182, DTC P0512 STARTER REQUEST CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DTC	Item	NOTE
P0513	Incorrect Immobilizer Key	<Ref. to GD(H4DOTC)-183, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0519	Idle Air Control System Performance	<Ref. to GD(H4DOTC)-184, DTC P0519 IDLE AIR CONTROL SYSTEM PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0600	Serial Communication Link	<Ref. to GD(H4DOTC)-185, DTC P0600 SERIAL COMMUNICATION LINK, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0604	Internal Control Module Random Access Memory (RAM) Error	<Ref. to GD(H4DOTC)-186, 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)-187, DTC P0605 INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0607	Control Module Performance	<Ref. to GD(H4DOTC)-188, DTC P0607 CONTROL MODULE PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0638	Throttle Actuator Control Range/ Performance (Bank 1)	<Ref. to GD(H4DOTC)-190, 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)-193, DTC P0691 FAN 1 CONTROL CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0692	Fan 1 Control Circuit High	<Ref. to GD(H4DOTC)-194, DTC P0692 FAN 1 CONTROL CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0700	Transmission Control System (MIL Request)	<Ref. to GD(H4DOTC)-195, 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)-196, 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)-197, 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)-198, 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)-199, DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT MODEL), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1152	O2 Sensor Circuit Range/Performance (Low) (Bank1 Sensor1)	<Ref. to GD(H4DOTC)-200, DTC P1152 O2 SENSOR CIRCUIT RANGE/ PERFORMANCE (LOW) (BANK1 SENSOR1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1153	O2 Sensor Circuit Range/Performance (High) (Bank1 Sensor1)	<Ref. to GD(H4DOTC)-203, DTC P1153 O2 SENSOR CIRCUIT RANGE/ PERFORMANCE (HIGH) (BANK1 SENSOR1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1160	Return Spring Failure	<Ref. to GD(H4DOTC)-206, DTC P1160 RETURN SPRING FAILURE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1400	Fuel Tank Pressure Control Solenoid Valve Circuit Low	<Ref. to GD(H4DOTC)-208, 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)-210, DTC P1410 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1418	Secondary Air Injection System Control “A” Circuit Shorted	<Ref. to GD(H4DOTC)-212, 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)-213, DTC P1420 FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DTC	Item	NOTE
P1443	Vent Control Solenoid Valve Function Problem	<Ref. to GD(H4DOTC)-215, 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)-217, 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)-219, DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1560	Back-up Voltage Circuit Malfunction	<Ref. to GD(H4DOTC)-220, DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1570	Antenna	<Ref. to GD(H4DOTC)-221, DTC P1570 ANTENNA, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1571	Reference Code Incompatibility	<Ref. to GD(H4DOTC)-221, DTC P1571 REFERENCE CODE INCOMPATIBILITY, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1572	IMM Circuit Failure (Except Antenna Circuit)	<Ref. to GD(H4DOTC)-221, DTC P1572 IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1574	Key Communication Failure	<Ref. to GD(H4DOTC)-221, DTC P1574 KEY COMMUNICATION FAILURE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1576	EGI Control Module EEPROM	<Ref. to GD(H4DOTC)-221, DTC P1576 EGI CONTROL MODULE EEPROM, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1577	IMM Control Module EEPROM	<Ref. to GD(H4DOTC)-221, DTC P1577 IMM CONTROL MODULE EEPROM, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2004	Intake Manifold Runner Control Stuck Open (Bank 1)	<Ref. to GD(H4DOTC)-222, 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)-223, 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)-224, 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)-225, 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)-226, 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)-228, 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)-230, 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)-232, DTC P2012 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2016	Intake Manifold Runner Position Sensor / Switch Circuit Low (Bank 1)	<Ref. to GD(H4DOTC)-234, 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)-236, 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)-238, DTC P2021 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT LOW (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

DTC	Item	NOTE
P2022	Intake Manifold Runner Position Sensor / Switch Circuit High (Bank 2)	<Ref. to GD(H4DOTC)-240, DTC P2022 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT HIGH (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2088	OCV Solenoid Valve Signal A Circuit Open (Bank 1)	<Ref. to GD(H4DOTC)-242, DTC P2088 OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2089	OCV Solenoid Valve Signal A Circuit Short (Bank 1)	<Ref. to GD(H4DOTC)-244, DTC P2089 OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2092	OCV Solenoid Valve Signal A Circuit Open (Bank 2)	<Ref. to GD(H4DOTC)-246, DTC P2092 OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2093	Intake Camshaft Position Actuator Control Circuit High (Bank 2)	<Ref. to GD(H4DOTC)-248, 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)-250, 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)-252, 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)-254, 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)-256, 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)-258, 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)-260, 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)-262, 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)-264, 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)-266, 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)-268, 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)-270, DTC P2135 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A”/“B” VOLTAGE CORRELATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2138	Throttle/Pedal Position Sensor/ Switch “D”/“E” Voltage Correlation	<Ref. to GD(H4DOTC)-272, DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D”/“E” VOLTAGE CORRELATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2227	Barometric Pressure Circuit Range/Performance	<Ref. to GD(H4DOTC)-274, DTC P2227 BAROMETRIC PRESSURE CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2228	Barometric Pressure Circuit Low	<Ref. to GD(H4DOTC)-275, DTC P2228 BAROMETRIC PRESSURE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2229	Barometric Pressure Circuit High	<Ref. to GD(H4DOTC)-276, DTC P2229 BAROMETRIC PRESSURE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DTC	Item	NOTE
P2431	Secondary Air Injection System Air Flow /Pressure Sensor Circuit Range/Performance	<Ref. to GD(H4DOTC)-277, 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)-278, 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)-279, DTC P2433 SECONDARY AIR INJECTION SYSTEM AIR FLOW /PRESSURE SENSOR CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2440	Secondary Air Injection System Switching Valve Stuck Open (Bank1)	<Ref. to GD(H4DOTC)-280, DTC P2440 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2441	Secondary Air Injection System Switching Valve Stuck Closed (Bank1)	<Ref. to GD(H4DOTC)-280, DTC P2441 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK CLOSED (BANK1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2442	Secondary Air Injection System Switching Valve Stuck Open (Bank2)	<Ref. to GD(H4DOTC)-280, DTC P2442 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2443	Secondary Air Injection System Switching Valve Stuck Closed (Bank2)	<Ref. to GD(H4DOTC)-280, DTC P2443 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK CLOSED (BANK2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2444	Secondary Air Injection System Pump Stuck On	<Ref. to GD(H4DOTC)-281, DTC P2444 SECONDARY AIR INJECTION SYSTEM PUMP STUCK ON, Diagnostic Trouble Code (DTC) Detecting Criteria.>

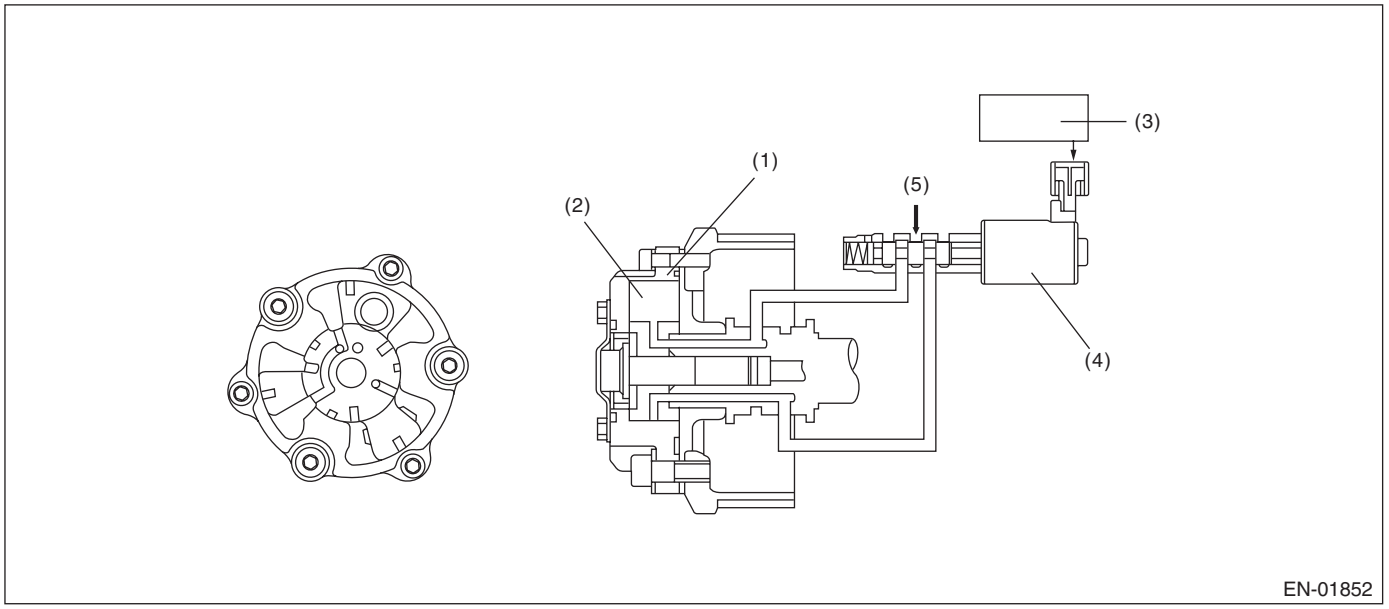
2. Diagnostic Trouble Code (DTC) Detecting Criteria

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

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of AVCS system.
There are two types of diagnosis: Crankshaft cam timing diagnosis, and slow response diagnosis. Either of these is performed according to the status of the engine while running.

2. COMPONENT DESCRIPTION



(1) AVCS timing controller
(2) Vane
(3) Engine control module (ECM)
(4) Oil flow control solenoid valve
(5) Oil pressure

3. ENABLE CONDITION

1. Crankshaft Timing Diagnosis

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9V
Engine coolant temperature	> 60°C (140°F)
Target timing advance	= 0°CA
Engine speed	≥ 500 rpm
AVCS	Uncontrolled

2. Slow Response Diagnosis

Secondary Parameters	Enable Conditions
All secondary parameters are executable.	1 second or more
Battery voltage	≥ 10.9 V
Engine coolant temperature	> 60°C (140°F)
Amount of AVCS target timing advance	≠ 0°CA
Engine speed	≥ 1300 rpm
AVCS	Controlled
Target timing advance change amount	< 1.07°CA

4. GENERAL DRIVING CYCLE

1. Crankshaft Timing Diagnosis

Perform the diagnosis continuously after starting engine and while AVCS is not operating.

2. Slow Response Diagnosis

Perform the diagnosis continuously after starting engine and while AVCS is operating.

5. DIAGNOSTIC METHOD

1. Crankshaft Timing Diagnosis

Judge as NG when the timing advance is outside the normal range. Judge as OK when it within the normal range.

Judge as NG when all the following conditions are established and the continuous time is more than 20 seconds. Judge as OK and clear the NG when the following conditions are not established and the continuous time is more than one second.

Judgment Value

Malfunction Criteria	Threshold Value
Basic timing advance	< –13°CA or > 25°CA

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	≥ 0°CA
AVCS positive deviation integrated value	< 8000°CA (R bank) < 8000°CA (L bank)
or	
AVCS negative deviation integrated value	< –8000°CA (R bank) < –8000°CA (L bank)

Time Needed for Diagnosis: 30 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judges OK when all of the following conditions are established, and clears the NG.

Judgment Value

Malfunction Criteria	Threshold Value
AVCS target position	≥ 0°CA
AVCS positive deviation integrated value	≤ 8000°CA (R bank) ≤ 8000°CA (L bank)
or	
AVCS negative deviation integrated value	≥ -8000°CA (R bank) ≥ -8000°CA (L bank)

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Make the oil flow control solenoid valve drive duty a predetermined value.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

B: DTC P0016 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK1)

NOTE:
For the diagnostic procedure, 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 (BANK2)

NOTE:
For the diagnostic procedure, 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)

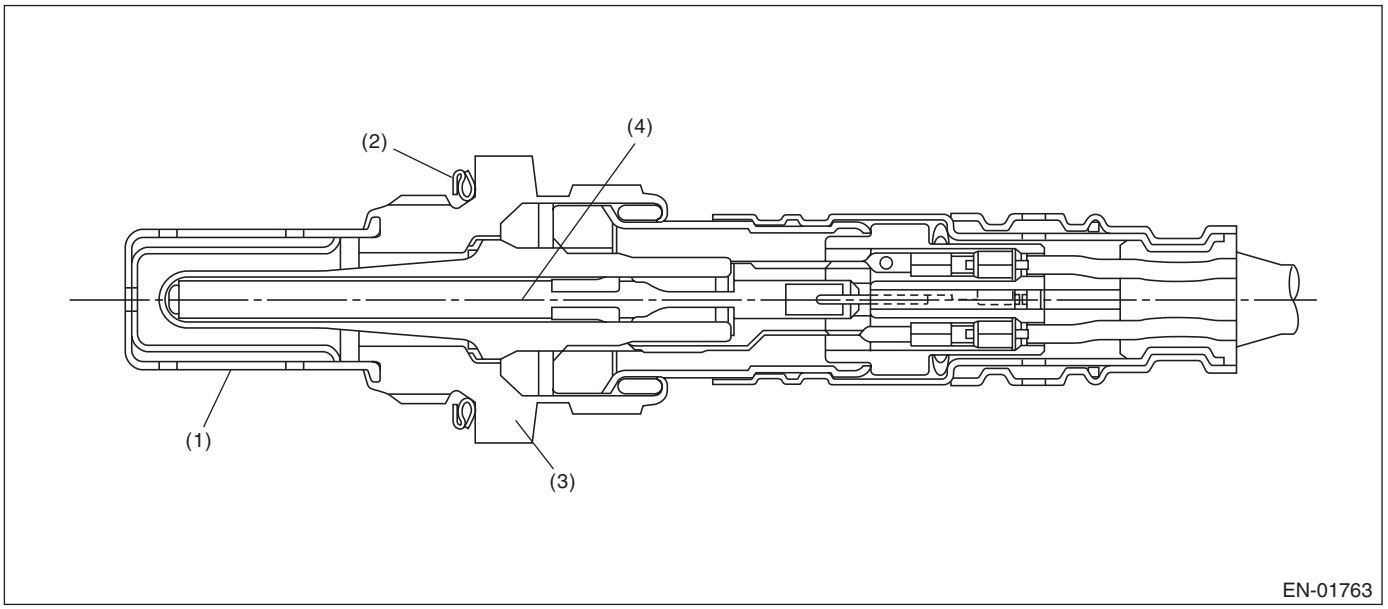
NOTE:
For the diagnostic procedure, refer to DTC P0011. <Ref. to GD(H4DOTC)-10, DTC P0011 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

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



(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≥ 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.

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

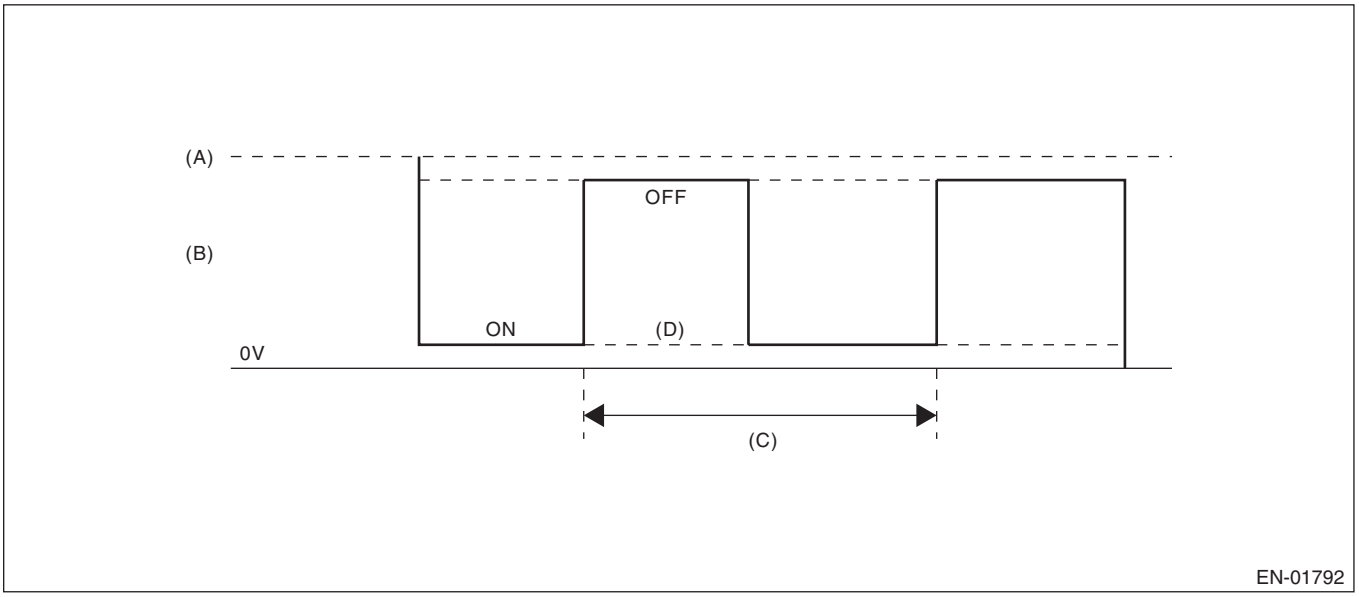
Memorize the freeze frame data. (For test mode $02)

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



(A) Battery voltage
(B) Front oxygen (A/F) sensor heater output voltage
(C) 128 milliseconds
(D) Low error

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge NG when the continuous time until completing the malfunction criteria below becomes more than 1 second (8 cycles).

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level Front oxygen (A/F) sensor heater control duty	Low < 87.5%

Time Needed for Diagnosis: 1 second
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	High

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

- Front oxygen (A/F) sensor activation judgment: Front oxygen (A/F) sensor full activation is not complete, or front oxygen (A/F) sensor half activation is not complete.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- Compensation when starting the engine at high temperature: Make the MIN value to be 0.3 → 0, normally.
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

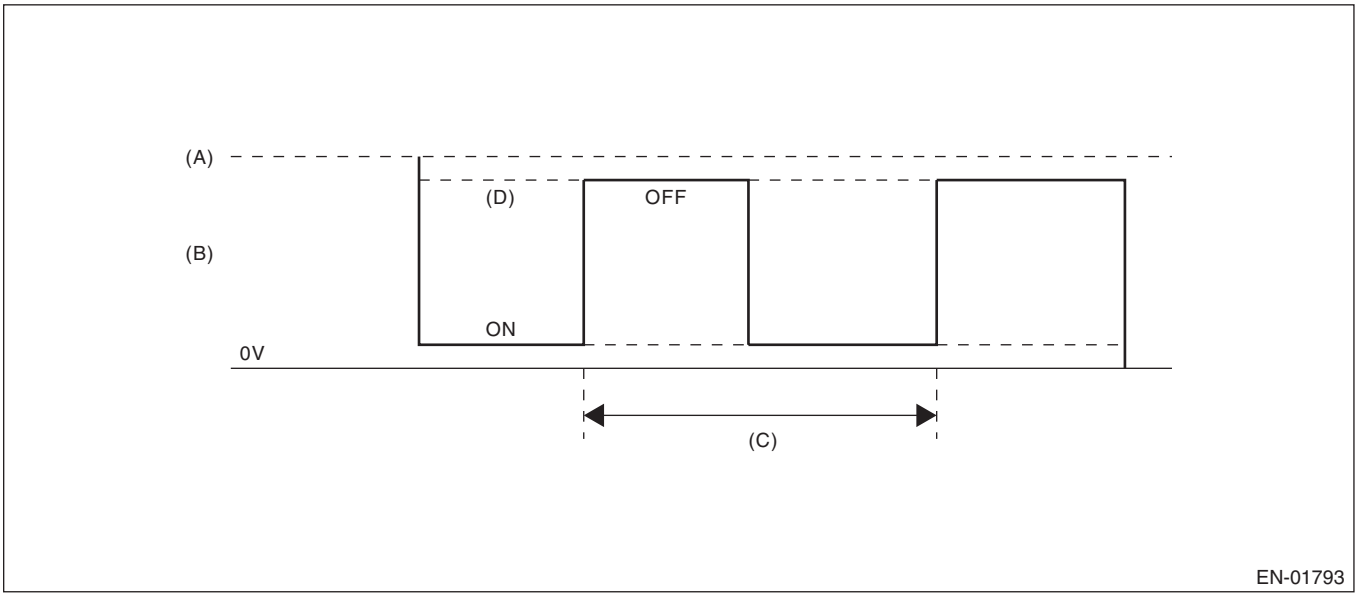
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of heater.
The heater performs duty control, and the output terminal voltage at ON is 0 V and the output terminal voltage at OFF is the battery voltage.
Judge NG when the terminal voltage remains High.

2. COMPONENT DESCRIPTION



(A) Battery voltage
(B) Front oxygen (A/F) sensor heater output voltage
(C) 128 milliseconds
(D) High malfunction

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge NG when the continuous time until completing the malfunction criteria below becomes more than 1 second (8 cycles).

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level Front oxygen (A/F) sensor heater control duty	High ≥ 12.5%

Time Needed for Diagnosis: 1 second
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	Low

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

- Front oxygen (A/F) sensor activation judgment: Front oxygen (A/F) sensor full activation is not complete, or front oxygen (A/F) sensor half activation is not complete.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- Compensation when starting the engine at high temperature: Make the MIN value to be 0.3 → 0, normally.
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

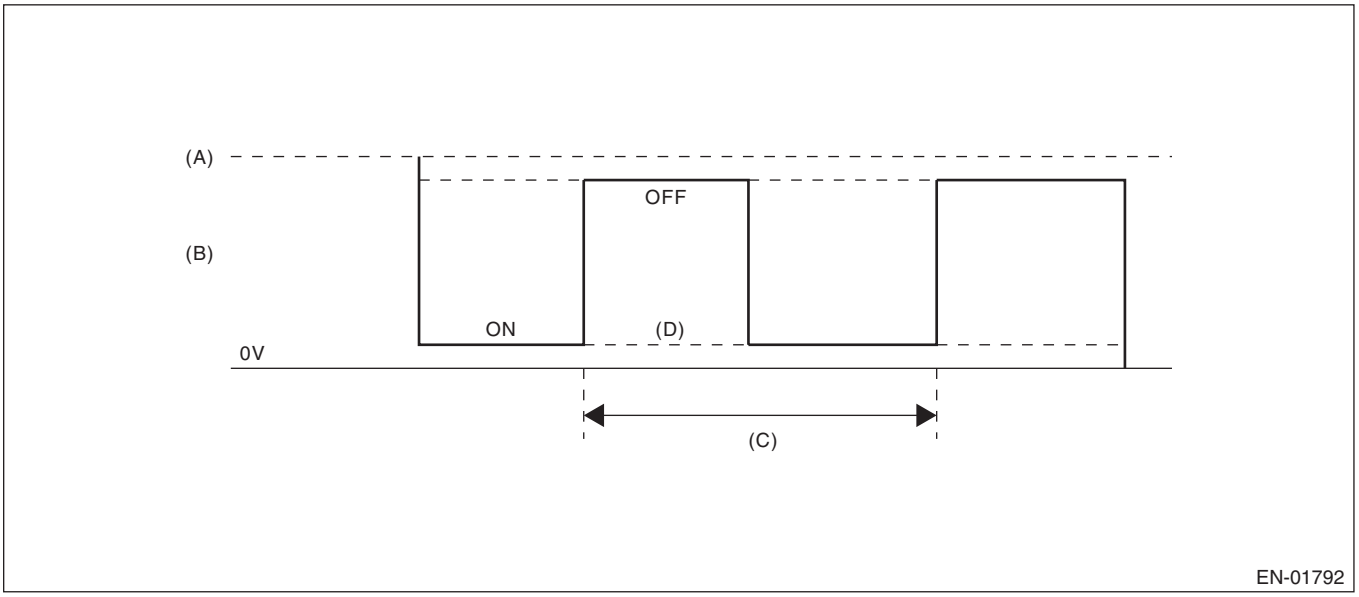
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect the rear oxygen sensor heater open or short circuit.
The rear oxygen sensor heater performs duty control, and the output terminal voltage at ON is 0 V, and the output terminal voltage at OFF is the battery voltage.
Judge NG when the terminal voltage remains Low.

2. COMPONENT DESCRIPTION



(A) Battery voltage
(B) Rear oxygen sensor heater output voltage
(C) 256 milliseconds (cycles)
(D) Low error

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

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

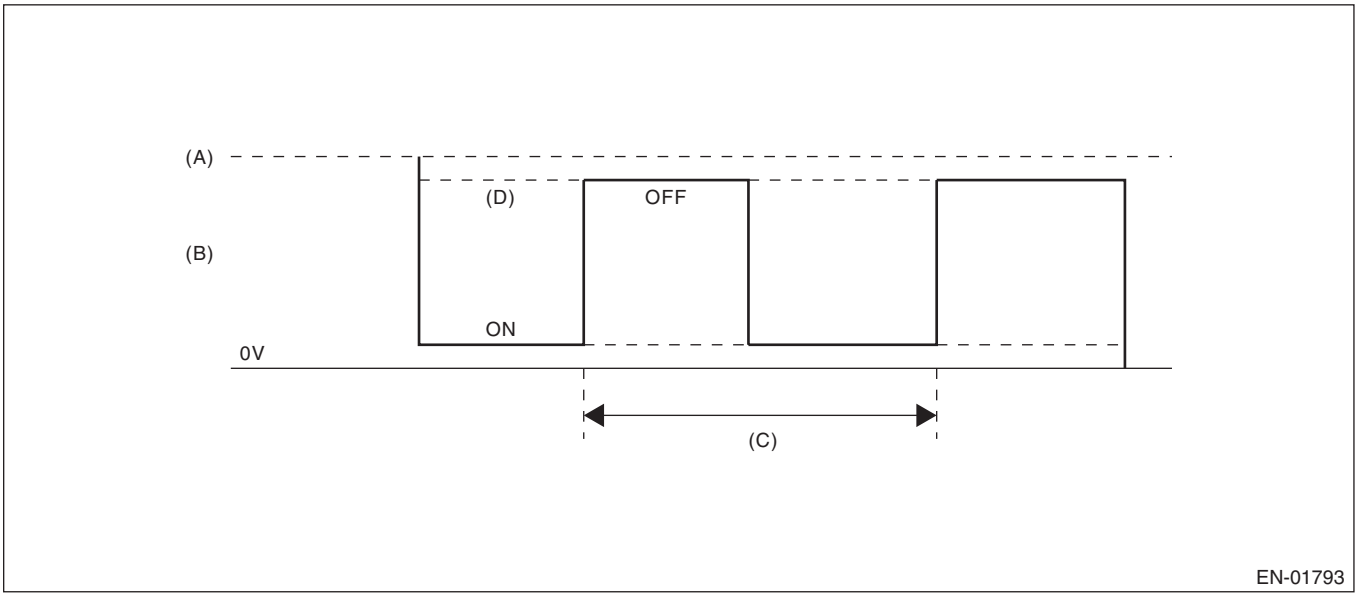
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect the rear oxygen sensor heater open or short circuit.
The rear oxygen sensor heater performs duty control, and the output terminal voltage at ON is 0 V, and the output terminal voltage at OFF is the battery voltage.
Judge NG when the terminal voltage remains High.

2. COMPONENT DESCRIPTION



(A) Battery voltage
(B) Rear oxygen sensor heater output voltage
(C) 256 milliseconds (cycles)
(D) High malfunction

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

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

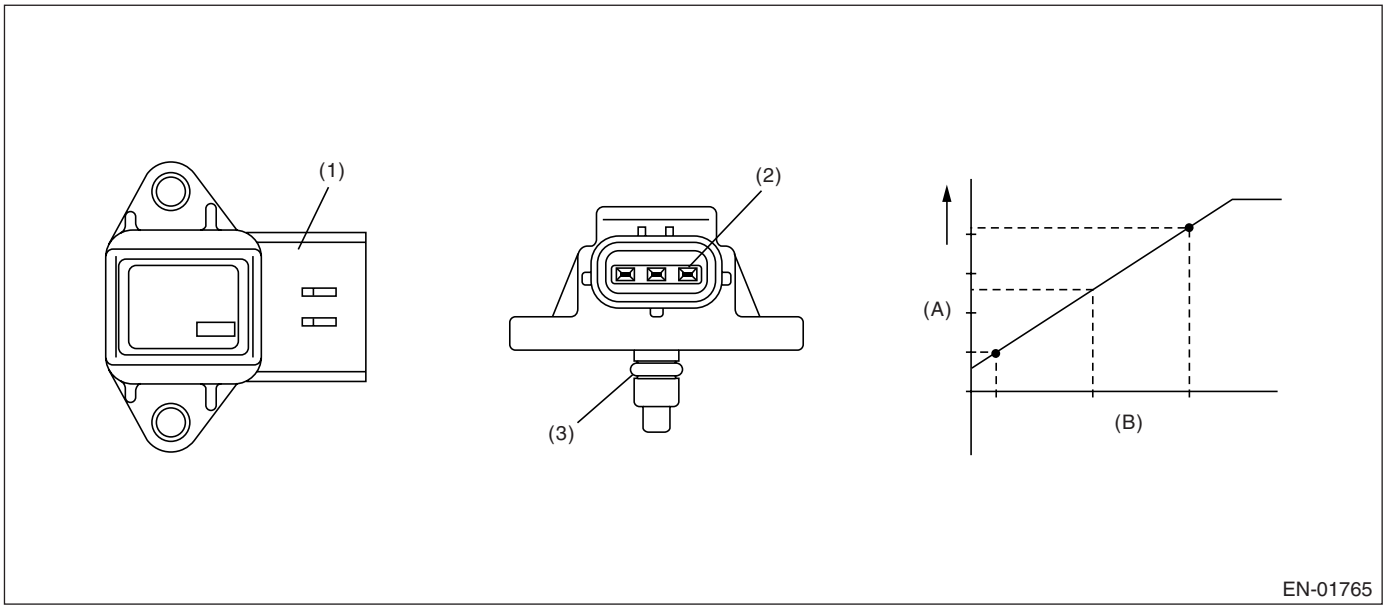
Memorize the freeze frame data. (For test mode $02)

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



(1) Connector
(2) Terminal
(3) O-ring
(A) Output voltage
(B) Absolute pressure

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	≥ 70°C (158°F)

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after idling.

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge NG when either Low side or High side becomes NG.
Judge as NG when the continuous time until completing the malfunction criteria below becomes 3 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Low side	
Engine speed	< 2500 rpm
Throttle position	≥ 10°
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	≥ 10°
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

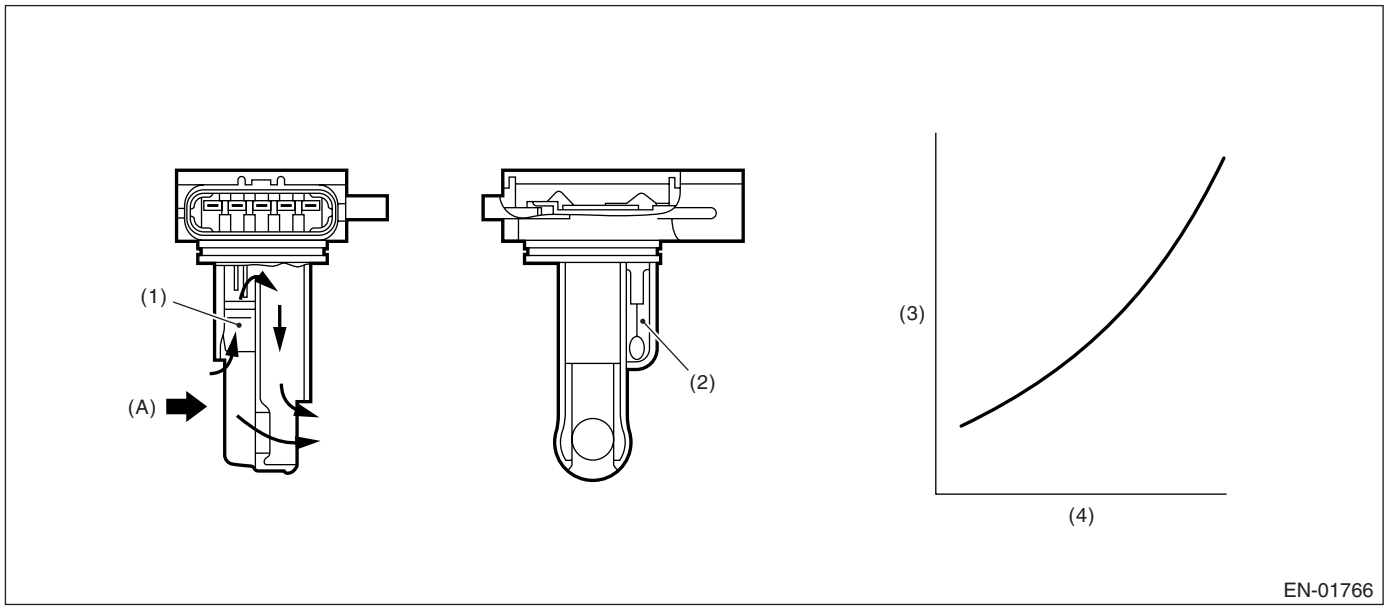
Memorize the freeze frame data. (For test mode $02)

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



(1) Air flow sensor
(2) Intake air temperature sensor
(3) Voltage (V)
(4) Intake air volume (kg/s)
(A) Air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	≥ 70°C (158°F)

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after idling.

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 calculation of throttle sensor temperature compensation. (Hold the previous value.)
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

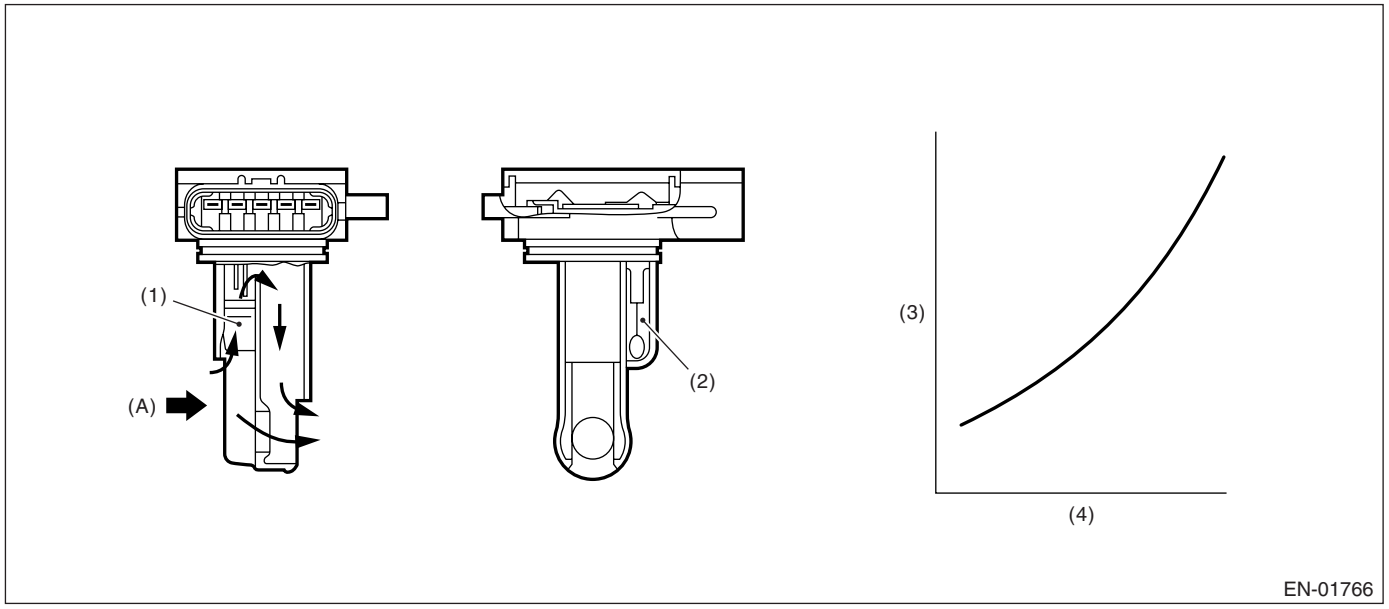
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect open or short circuits of the air flow sensor.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



(1) Air flow sensor
(2) Intake air temperature sensor
(3) Voltage (V)
(4) Intake air volume (kg/s)
(A) Air

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 until completing 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 calculation of throttle sensor temperature compensation. (Hold the previous value.)
- Purge control: Not allowed to purge

9. ECM OPERATION AT DTC SETTING

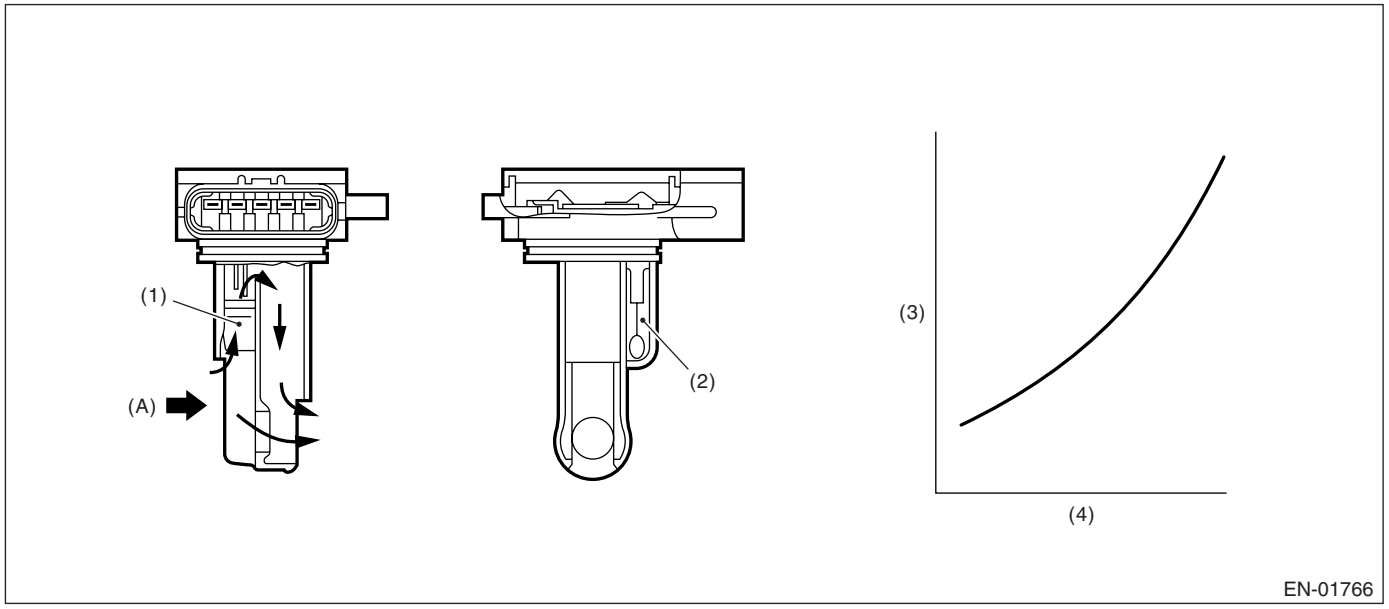
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect open or short circuits of the air flow sensor.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



(1) Air flow sensor
(2) Intake air temperature sensor
(3) Voltage (V)
(4) Intake air volume (kg/s)
(A) Air

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 calculation of throttle sensor temperature compensation. (Hold the previous value.)
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

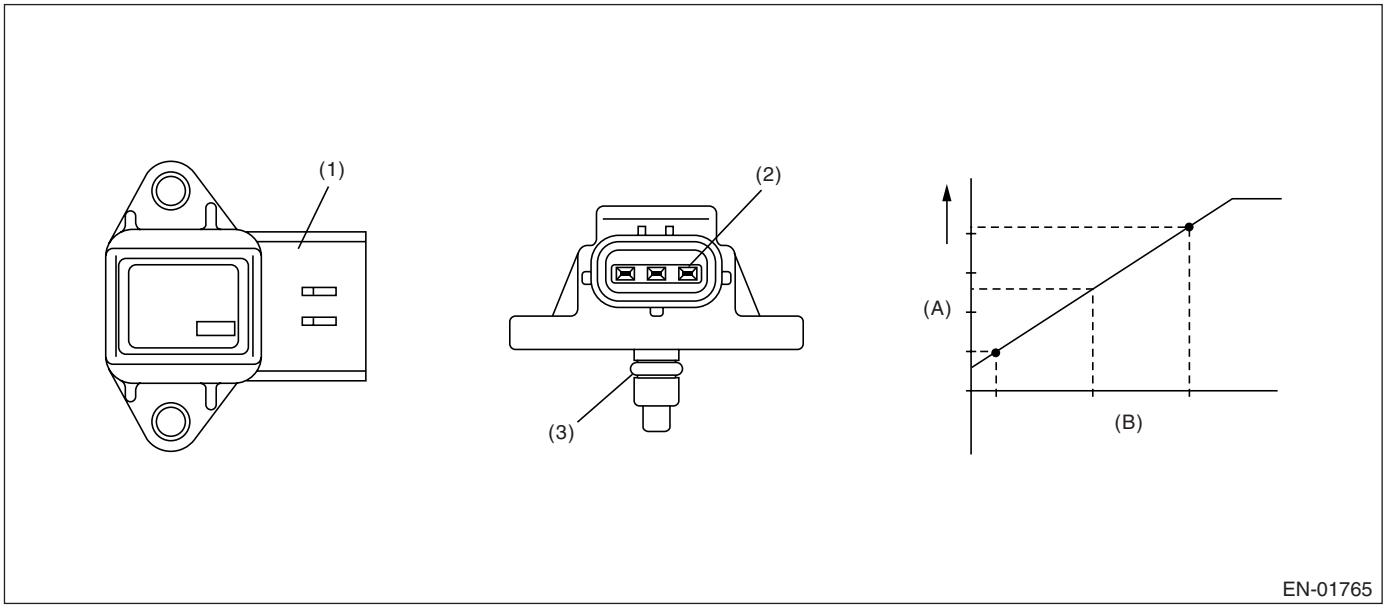
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of intake manifold pressure sensor.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Terminal
(3) O-ring
(A) Output voltage
(B) Absolute pressure

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 until completing 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

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

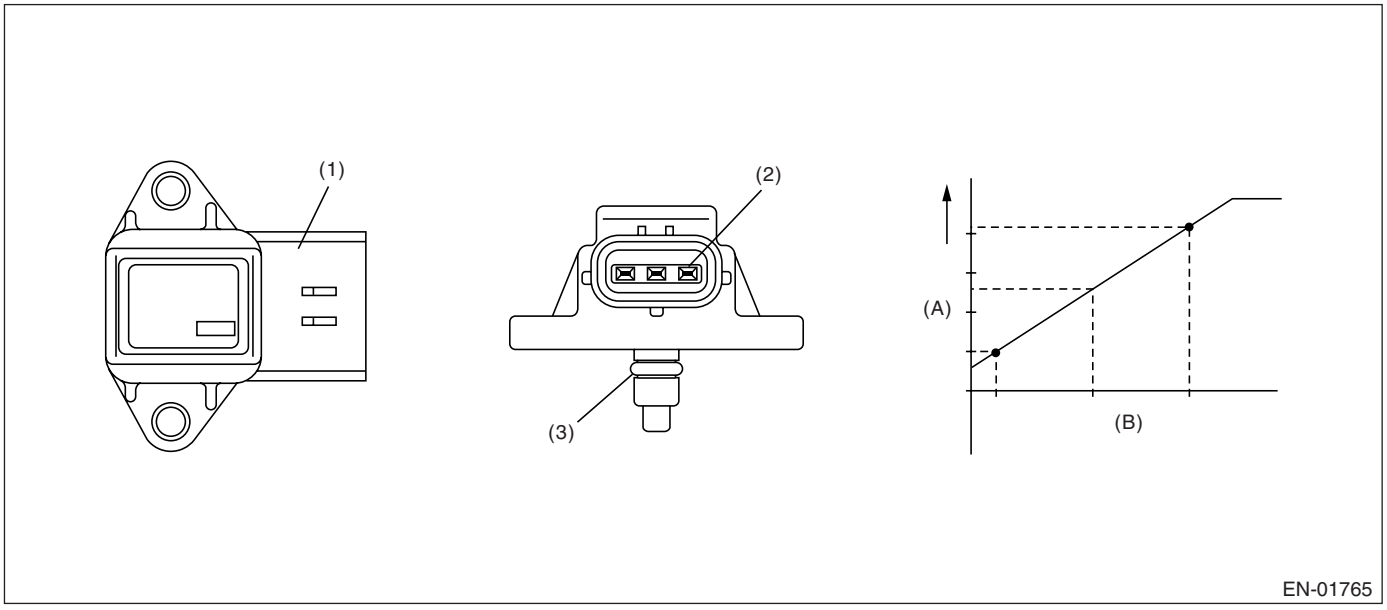
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of intake manifold pressure sensor.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Terminal
(3) O-ring
(A) Output voltage
(B) Absolute pressure

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 until completing 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

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

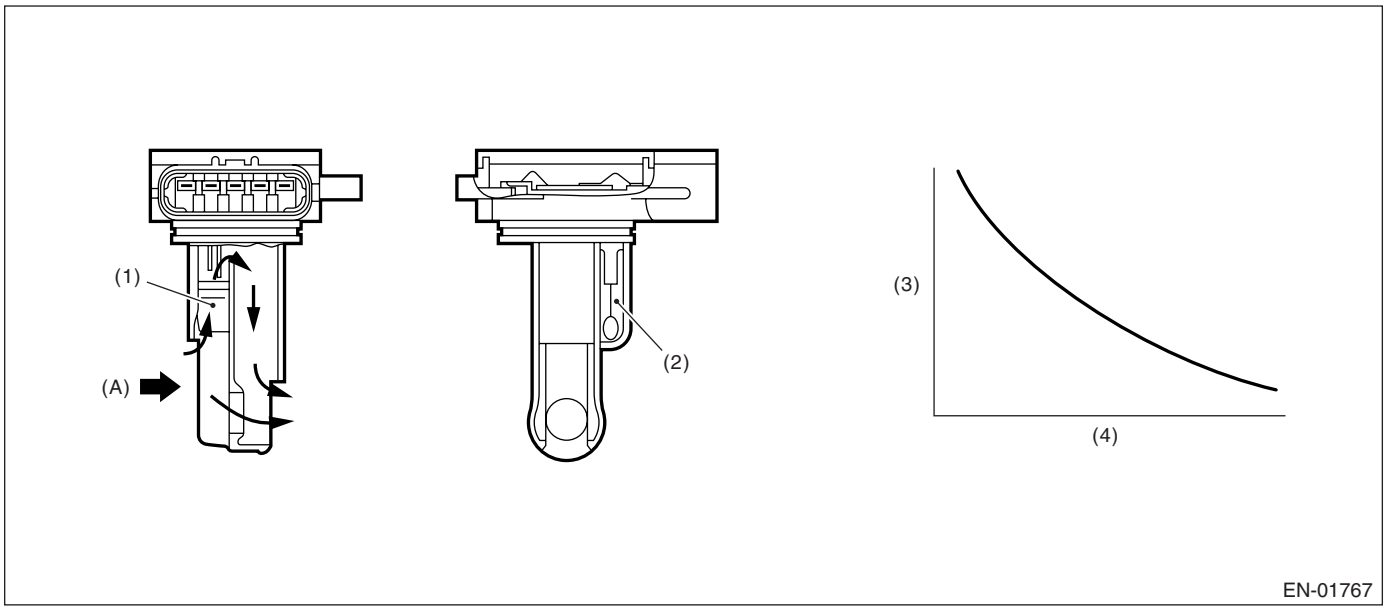
Memorize the freeze frame data. (For test mode $02)

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



(1) Air flow sensor
(2) Intake air temperature sensor
(3) Resistance value (Ω)
(4) Intake air temperature °C (°F)
(A) Air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Coolant temp. before engine start	< 30°C (86°F)
Engine coolant temperature	> 95°C (203°F)
Battery voltage	≥ 10.9 V
Continuous time when the vehicle speed is less than 50 km/h (31 MPH)	600 seconds or more

4. GENERAL DRIVING CYCLE

Perform the diagnosis when the vehicle speed condition is completed after idling from starting the cooled engine.

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time until completing 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

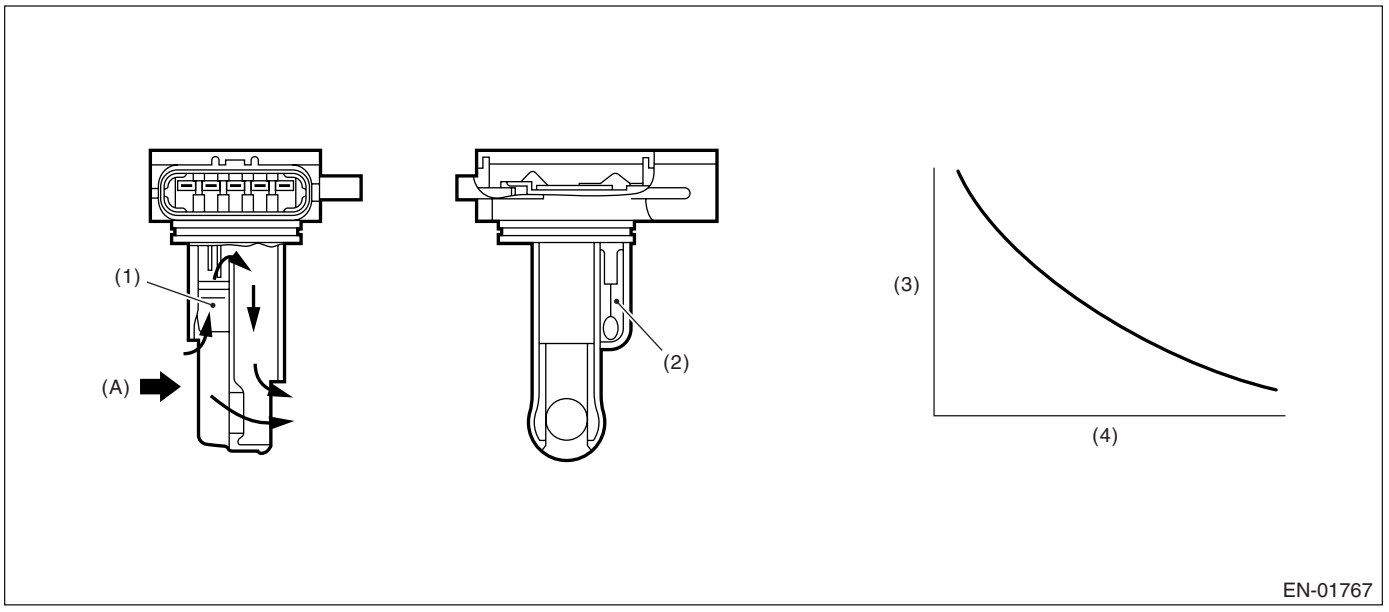
Memorize the freeze frame data. (For test mode $02)

Q: DTC P0112 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the intake air temperature sensor.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



(1) Air flow sensor
(2) Intake air temperature sensor
(3) Resistance value (Ω)
(4) Intake air temperature °C (°F)
(A) Air

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 until completing 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

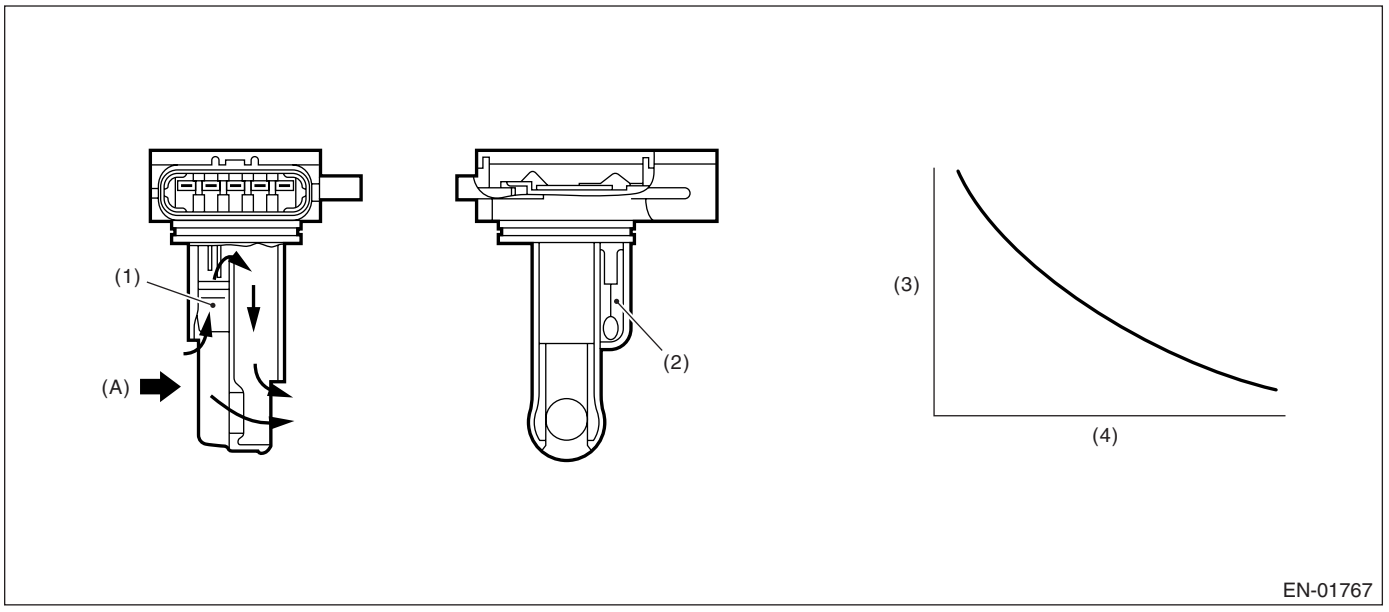
Memorize the freeze frame data. (For test mode $02)

R: DTC P0113 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the intake air temperature sensor.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



(1) Air flow sensor
(2) Intake air temperature sensor
(3) Resistance value (Ω)
(4) Intake air temperature °C (°F)
(A) Air

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 until completing 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

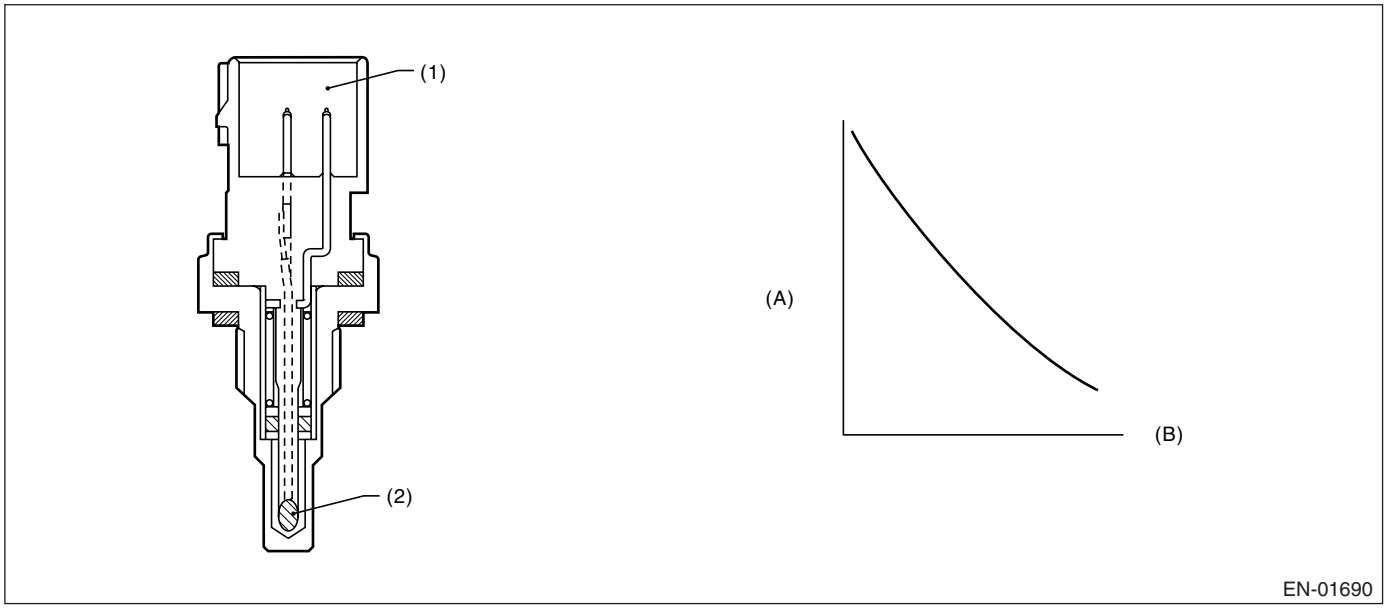
Memorize the freeze frame data. (For test mode $02)

S: DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the engine coolant temperature sensor.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Thermistor element
(A) Resistance value (Ω)
(B) Temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time until completing 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 RPM 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

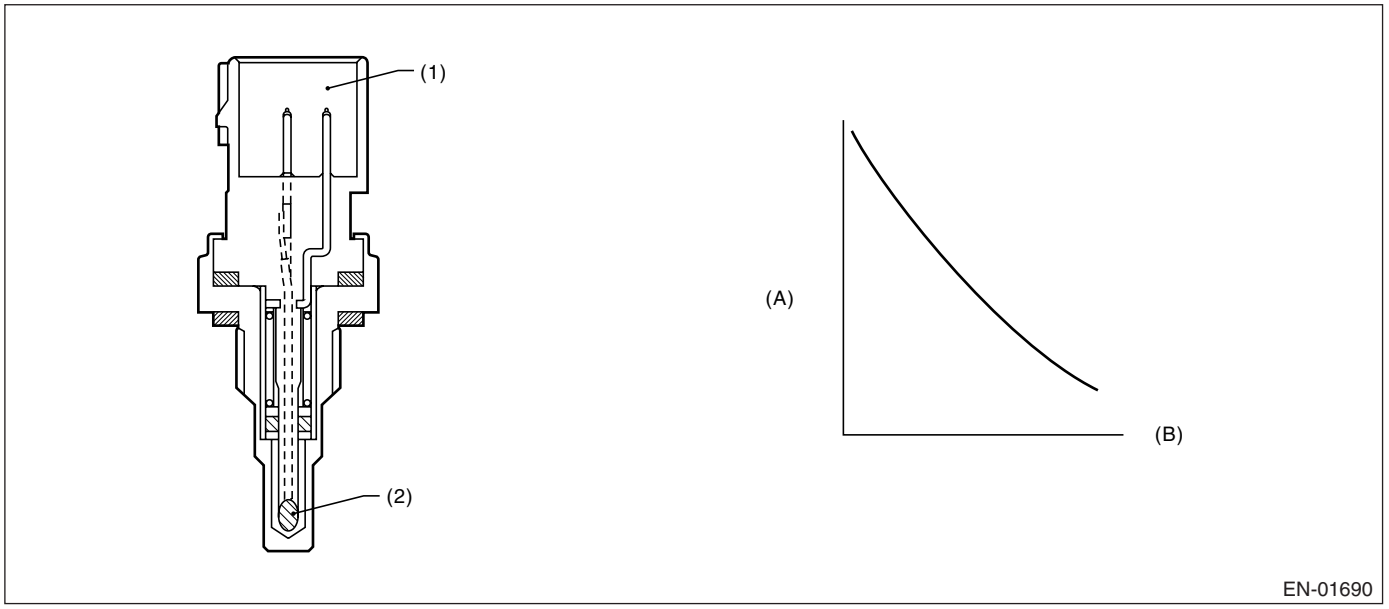
Memorize the freeze frame data. (For test mode $02)

T: DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the engine coolant temperature sensor.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Thermistor element
(A) Resistance value (Ω)
(B) Temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time until completing 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

8. FAIL SAFE

- Engine coolant temperature sensor process: Engine coolant temperature is fixed at 70°C (158°F).
- ISC Feedback: Calculate target engine RPM 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

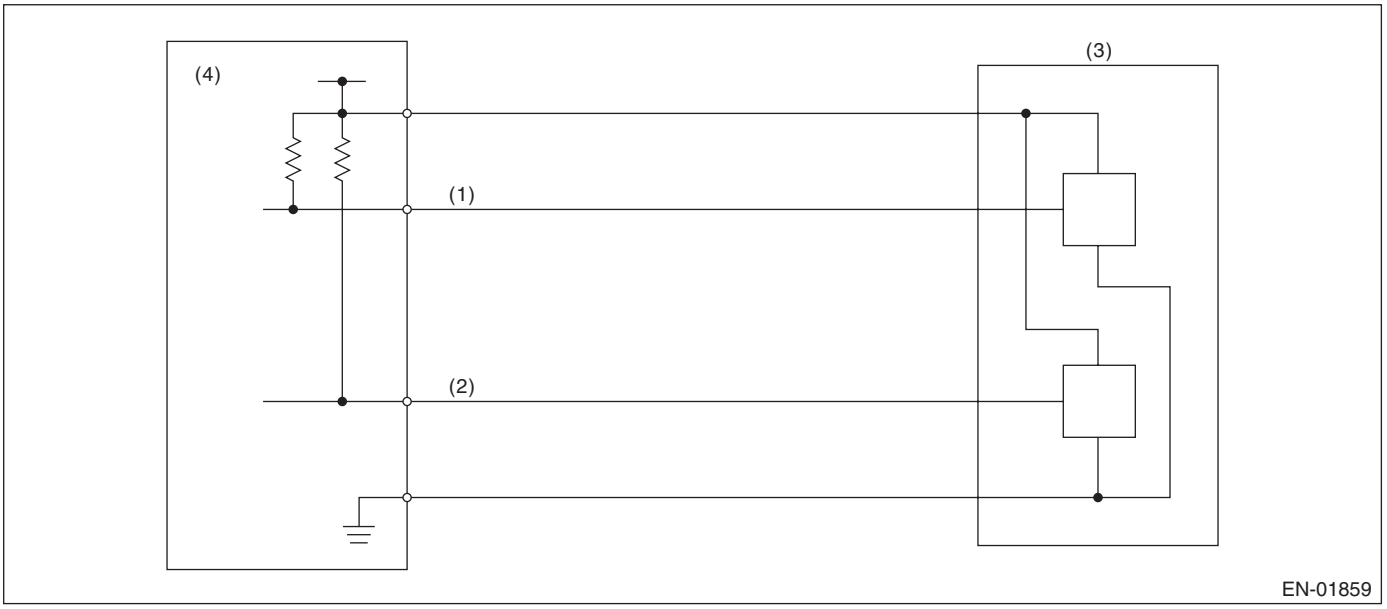
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor 1.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



(1) Throttle position sensor 1 signal
(2) Throttle position sensor 2 signal
(3) Throttle position sensor
(4) Engine control module (ECM)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	≤ 0.224 V

Time Needed for Diagnosis: 24 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed (Only engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only engine stop)

8. FAIL SAFE

Stop the continuity to the electronic control throttle motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

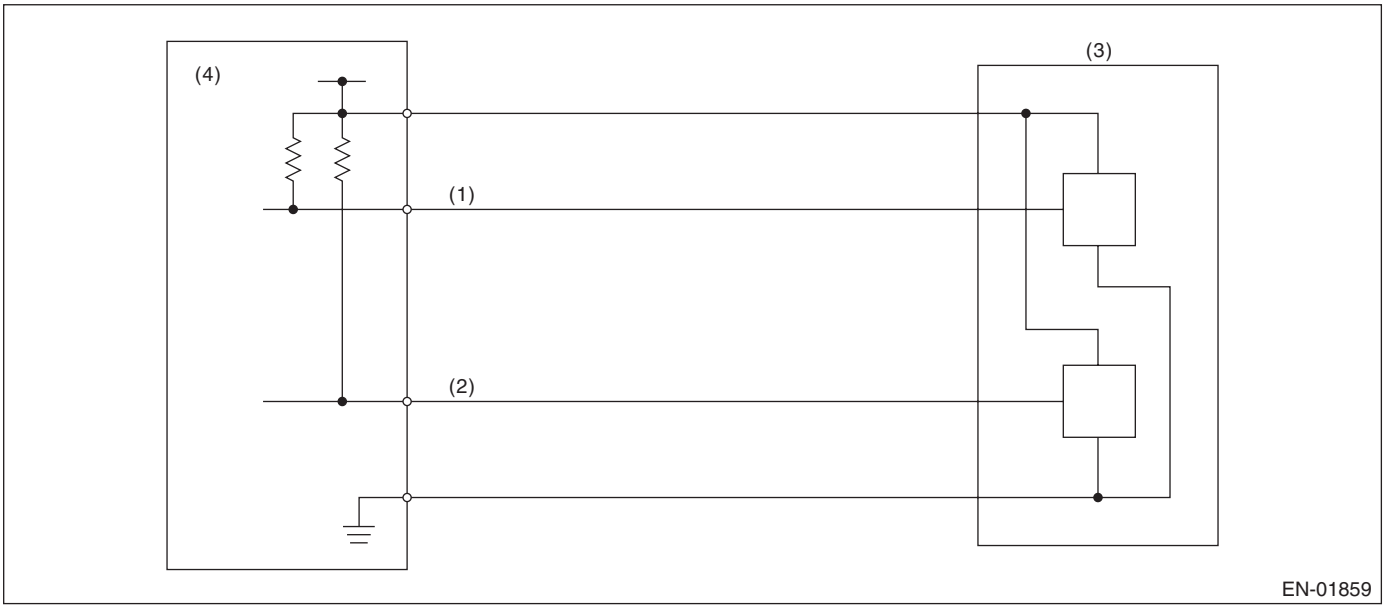
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor 1.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



(1) Throttle position sensor 1 signal
(2) Throttle position sensor 2 signal
(3) Throttle position sensor
(4) Engine control module (ECM)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	≥ 4.851 V

Time Needed for Diagnosis: 24 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed (Only engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only engine stop)

8. FAIL SAFE

Stop the continuity to the electronic control throttle motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

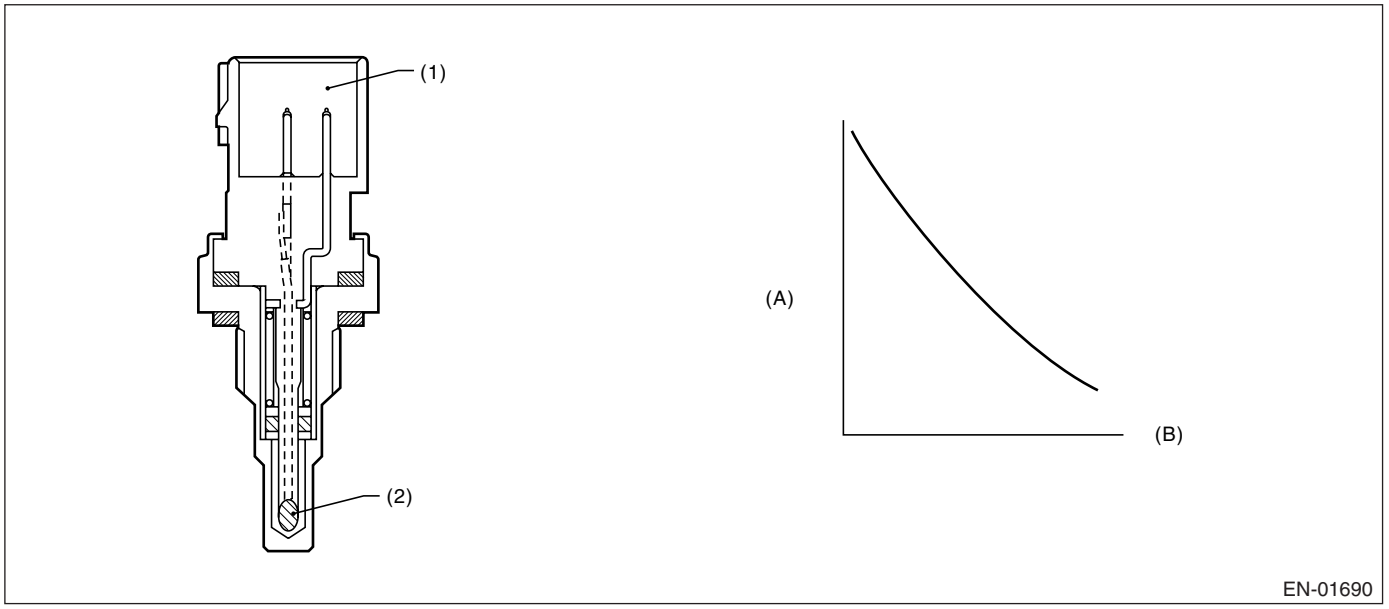
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of engine coolant temperature output property.
Judge as NG when the engine coolant temperature does not rise in driving conditions where it should.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Thermistor element
(A) Resistance value (Ω)
(B) Temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	≥ 500 rpm
Battery voltage	> 10.9 V

4. GENERAL DRIVING CYCLE

Perform the diagnosis only once after engine starting.

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature	< 20°C (68°F)
Timer for diagnosis after engine starting	≥ Judgment value of timer after engine starting

Timer for diagnosis after engine starting
a. Timer stop at fuel cut mode.
b. During the driving conditions except a) above, timer count up by 64 milliseconds + TWCNT milliseconds at every 64 milliseconds.
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
$t = 451.1 – 25.9 \times Ti$
Ti is the lowest coolant temperature after starting the engine.
Time Needed for Diagnosis: To be determined. (It is varied by the Min. engine coolant temperature and engine conditions such as vehicle speed and engine coolant temperature.)
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature	≥ 20°C (68°F)

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

- Engine coolant temperature sensor process: Engine coolant temperature is fixed at 70°C (158°F).
- ISC Feedback: Calculate target engine RPM 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

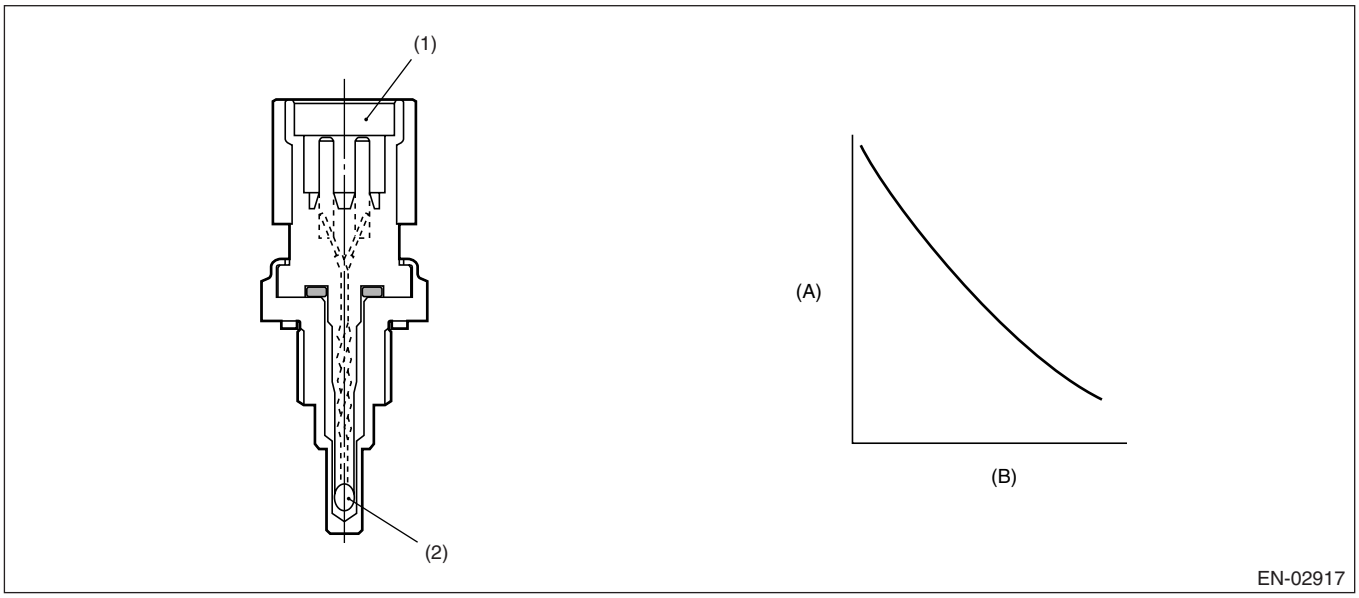
Memorize the freeze frame data. (For test mode $02)

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



(1) Connector
(2) Thermistor element
(A) Resistance value (Ω)
(B) Temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Refueling from the last engine stop till the current engine start	None
Fuel level	≥ 15 ℓ (3.96 US gal, 3.3 Imp gal)
Engine coolant temperature at the last engine stop	≥ 70°C (158°F) and < 95°C (203°F)

4. GENERAL DRIVING CYCLE

Perform the diagnosis only once after starting the engine.

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG if the continuous time with the following conditions established is more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature at the last engine stop — Minimum engine coolant temperature after the engine start	< 2.5°C (4.5°F)
Fuel temperature at the last engine stop — fuel temperature	≥ 5°C (9°F)
Intake air temperature — fuel temperature	< 2.5°C (4.5°F)
Fuel temperature	< 35°C (95°F)

Normality Judgment

When the following conditions are established, 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

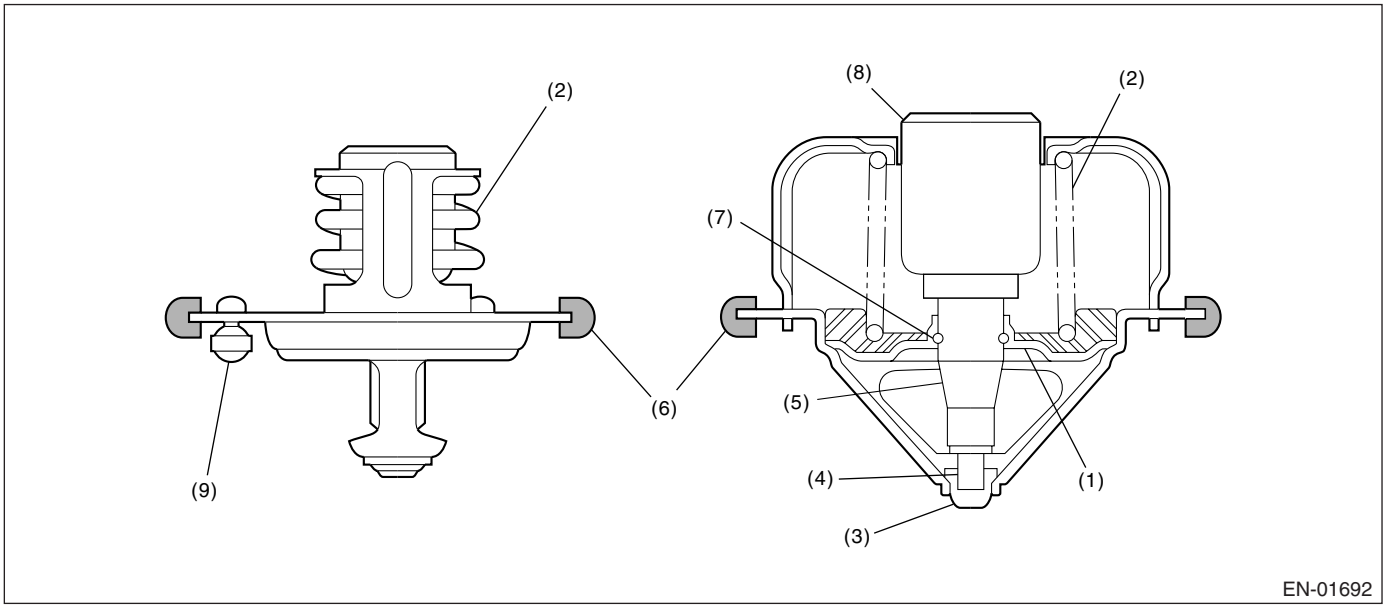
Memorize the freeze frame data. (For test mode $02)

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
(2) Spring
(3) Stopper
(4) Piston
(5) Guide
(6) Rubber packing
(7) Stop ring
(8) Wax element
(9) Jiggle valve

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time until completing the malfunction criteria below becomes 30 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Estimate ambient temperature	≥ –7°C (19.4°F)
Engine coolant temperature at engine starting	< 55°C (131°F)
Estimated coolant temperature	≥ 70°C (158°F)
Engine coolant temperature	< 70°C (158°F)
(Estimated - Measured) Engine coolant temperature	> 30°C (54°F)
Vehicle speed	≥ 30 km/h

Time Needed for Diagnosis: 30 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Estimate ambient temperature	≥ –7°C (19.4°F)
Thermostat malfunction diagnosis	Incomplete
Engine coolant temperature at engine starting	< 55°C (131°F)
Engine coolant temperature	≥ 70°C (158°F)
(Estimated - Measured) Engine coolant temperature	≤ 30°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

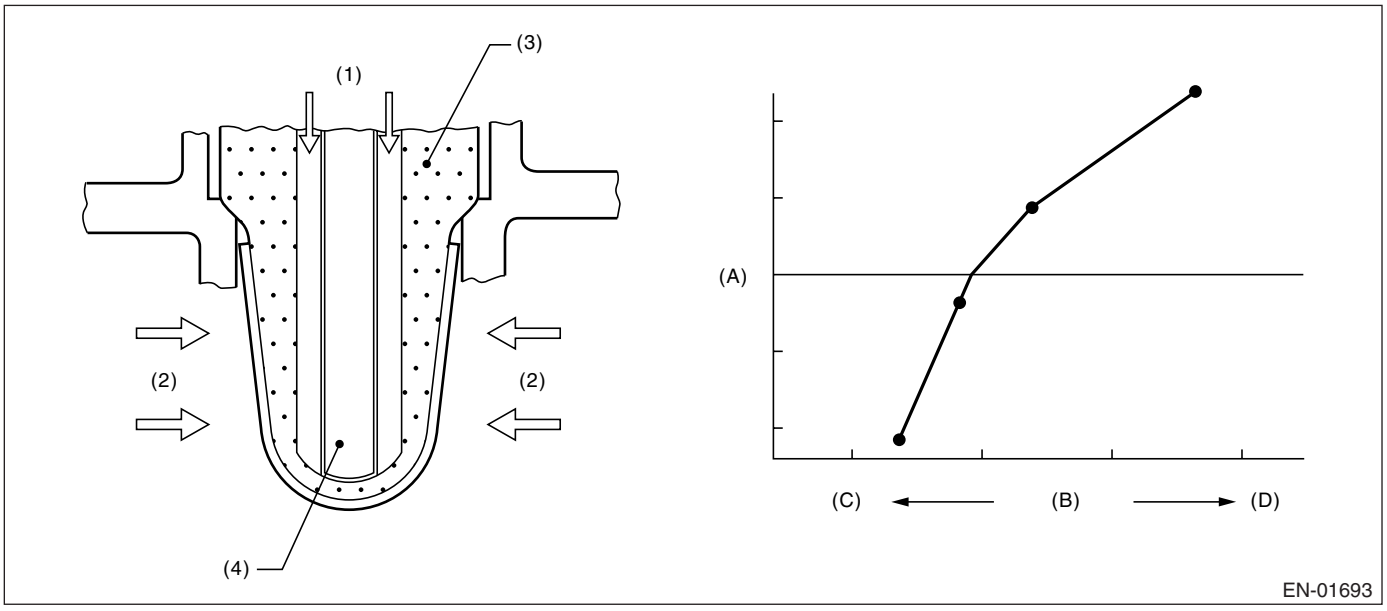
Memorize the freeze frame data. (For test mode $02)

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



(1) Atmosphere
(2) Exhaust gas
(3) ZrO_2
(4) Ceramic heater
(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of completing any malfunction criteria below is more than 1 second.

Judgment Value

Malfunction Criteria	Threshold Value
Input voltage	< 1.8 V
Input current	< – 0.01 A

Time Needed for Diagnosis: 1 second
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

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

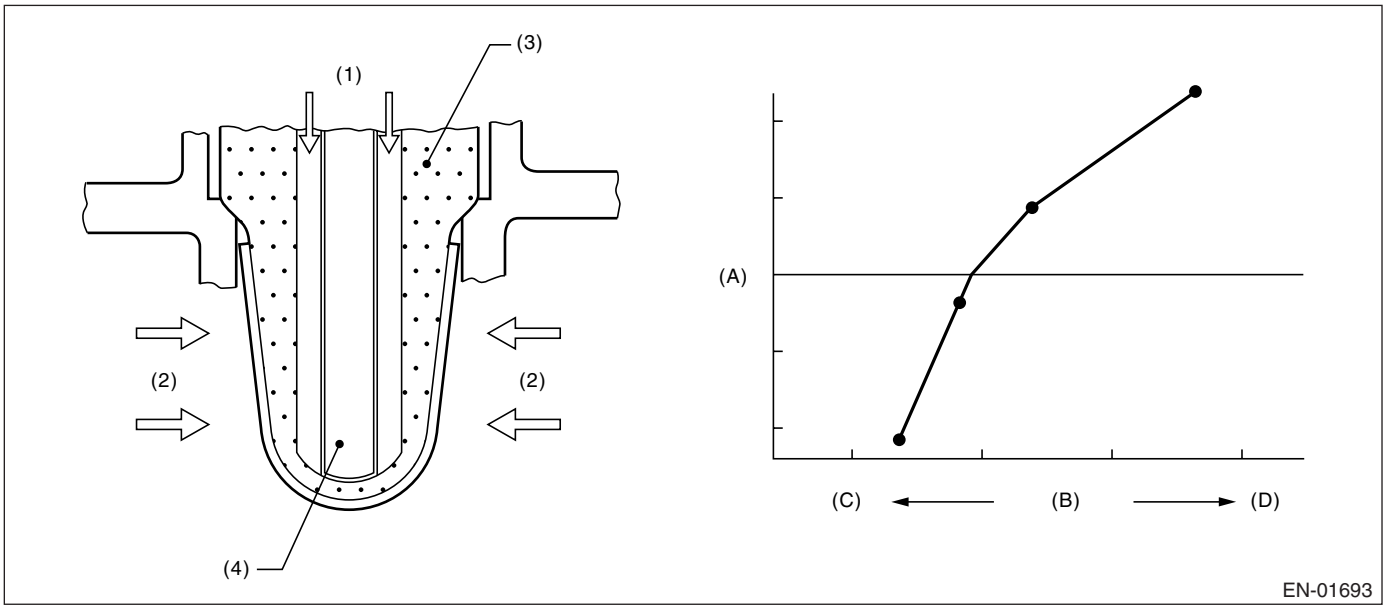
Memorize the freeze frame data. (For test mode $02)

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



(1) Atmosphere
(2) Exhaust gas
(3) ZrO_2
(4) Ceramic heater
(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of completing any malfunction criteria below is more than 1 second.

Judgment Value

Malfunction Criteria	Threshold Value
Input voltage	≥ 3.8 V
Input current	≥ 0.01 A

Time Needed for Diagnosis: 1 second
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

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.

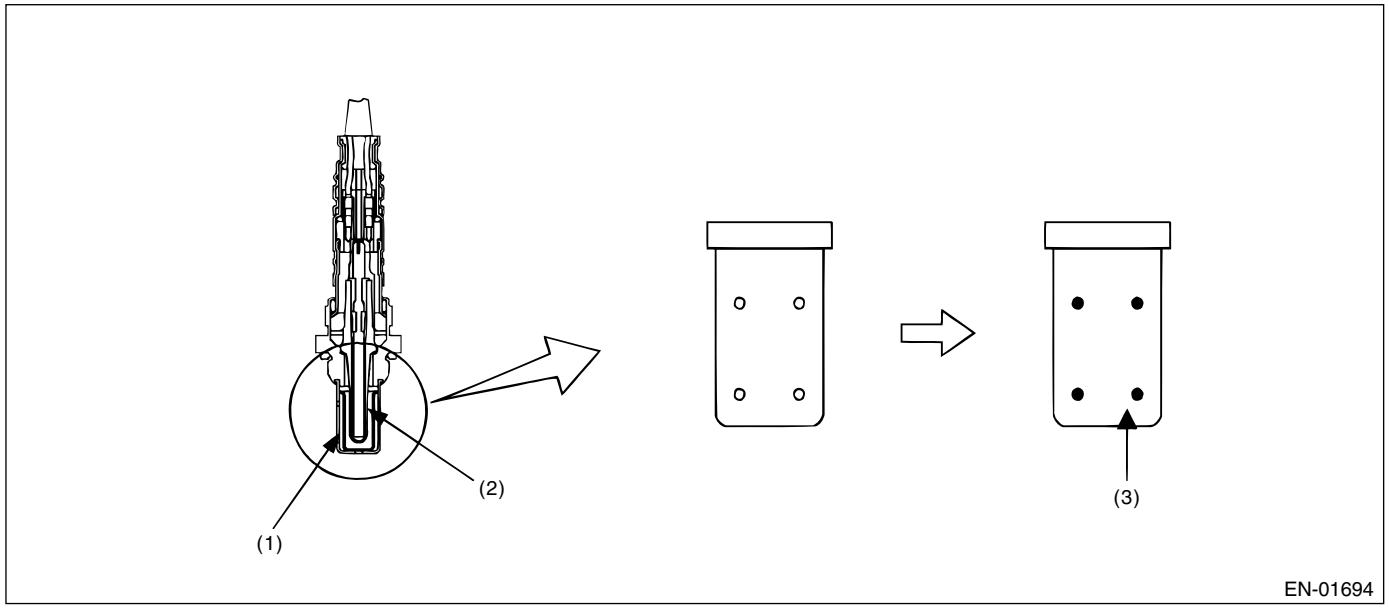
9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

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

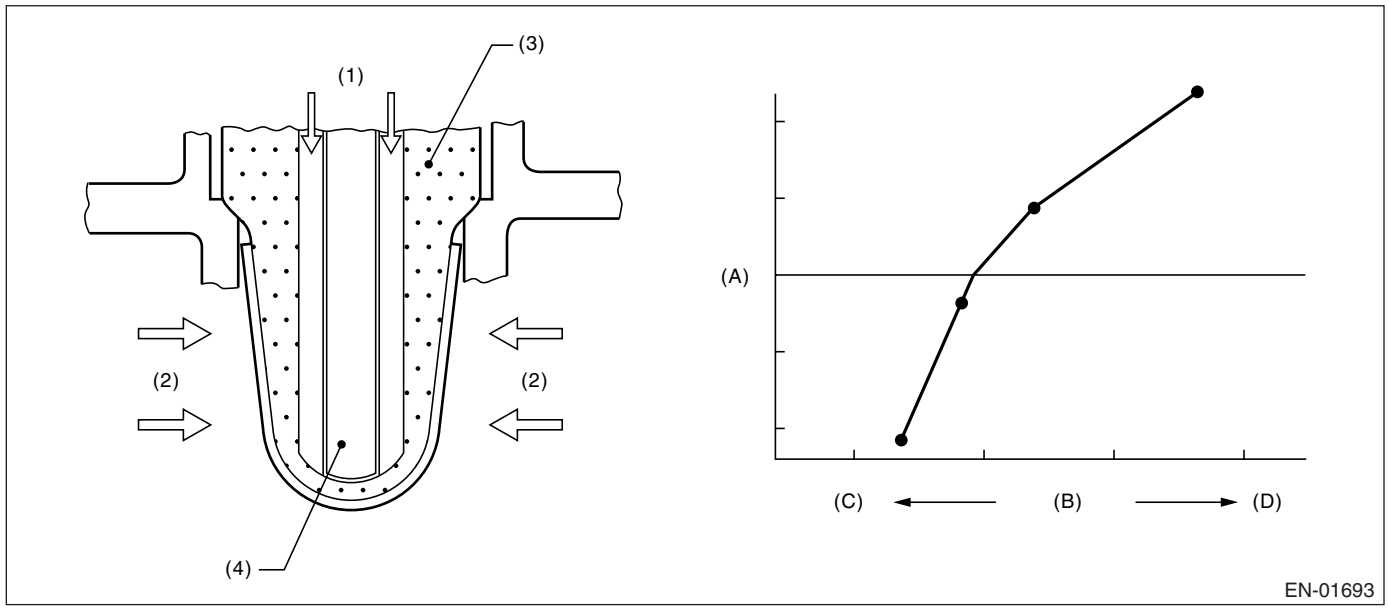
1. OUTLINE OF DIAGNOSIS

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.



(1) Cover
(2) Zirconia
(3) Clogging

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust gas
(3) ZrO_2
(4) Ceramic heater
(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
All secondary parameters enable conditions	1 second or more
Battery voltage	> 10.9 V
Atmosphere pressure	> 75.0 kPa (563 mmHg, 22.2 inHg)
Closed loop control with main feedback	Operating
Front oxygen (A/F) sensor impedance	0 — 50 Ω
After engine starting	120 seconds or more
Engine coolant temperature	≥ 70°C (158°F)
Engine speed	1000 — 3200 rpm
Vehicle speed	10 — 120 km/h (6.21 — 74.6 MPH)
Amount of intake air	10 — 31 g/s
Engine load change during 0.5 engine rev.	≤ 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 to 120 km/h (6.21 to 74.6 MPH) in 120 seconds or more after warming up the engine.

5. DIAGNOSTIC METHOD

Calculate faf difference every 128 milliseconds, and the λ value difference. Calculate the diagnosis value after calculating 1640 times (210 seconds).
Judge as NG when the malfunction criteria below are completed. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
parafca = td2faf/td2lmd where, td2faf (N) = td2faf (n–1) + |d2faf (n)| td2lmd (N) = td2lmd (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 lambda every 128 milliseconds	≥ 0.392

Time Needed for Diagnosis: 210 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

- Front oxygen 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

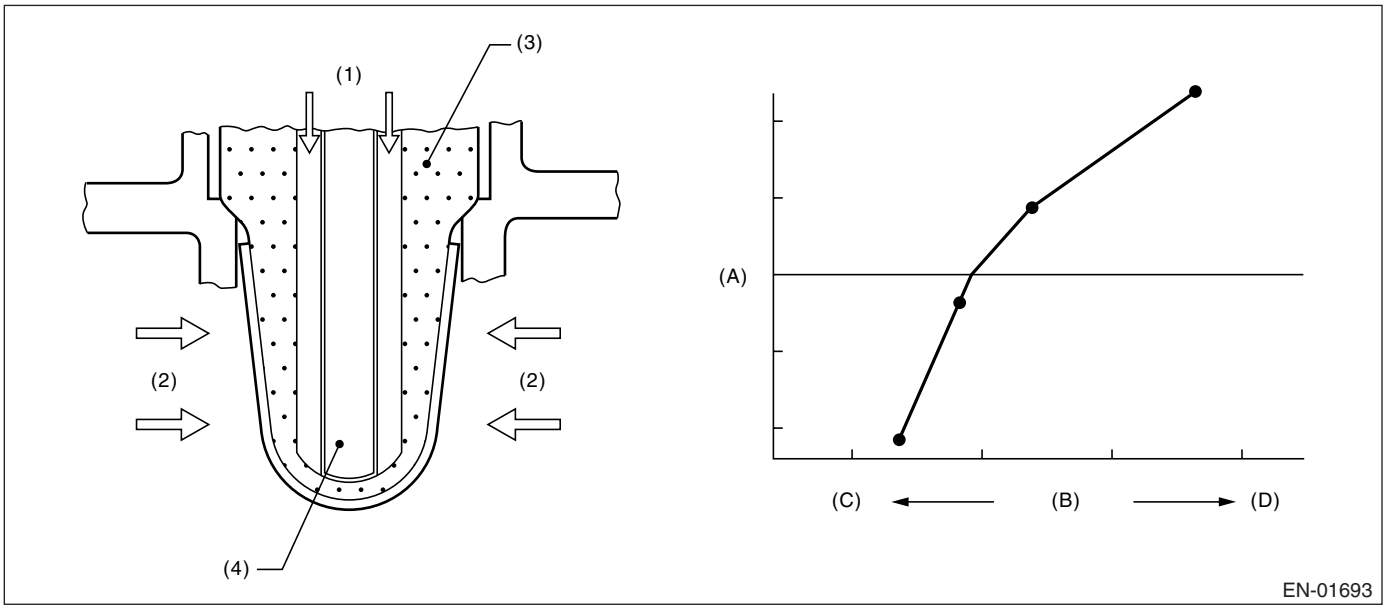
- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

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

1. OUTLINE OF DIAGNOSIS

Detect open circuits of the sensor.
Judge as NG when the impedance of the element is large.

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust gas
(3) ZrO_2
(4) Ceramic heater
(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of completing the malfunction criteria below becomes more than 5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Voltage	≥ 10.9 V
Time after engine starting	≥ 50 sec.
Cumulative amount of the front lambda sensor heater control duty every 128 milliseconds.	≥ 28000%
Front oxygen (A/F) sensor impedance.	≥ 500 Ω

Time Needed for Diagnosis: 5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

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

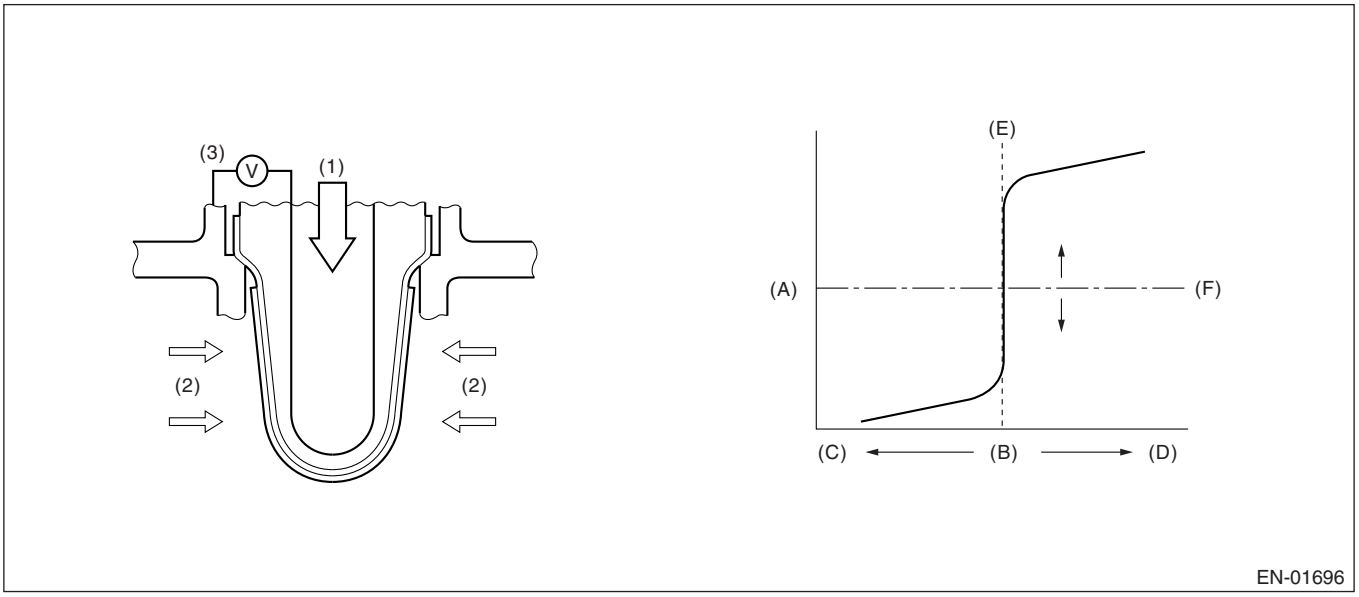
Memorize the freeze frame data. (For test mode $02)

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
(C) Rich
(D) Lean
(E) Theoretical air fuel ratio
(F) Comparative voltage

(1) Atmosphere
(2) Exhaust gas
(3) Electromotive force

3. ENABLE CONDITION

Used only for malfunction judgement

Secondary Parameters	Enable Conditions
High side	
Secondary air injection system	Not in operation
Closed loop control at the oxygen sensor	In operation
Misfire detection every 200 rotations	< 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 at the oxygen sensor	In operation
Misfire detection every 200 rotations	< 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 at the oxygen sensor	In operation
Misfire detection every 200 rotations	< 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 at the oxygen sensor	In operation
Misfire detection every 200 rotations	< 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 judgement

Secondary Parameters	Enable Conditions
Secondary air injection system	Not in operation
Closed loop control at the oxygen sensor	In operation
Misfire detection every 200 rotations	< 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.

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG if the continuous time during which 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)-67, 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)

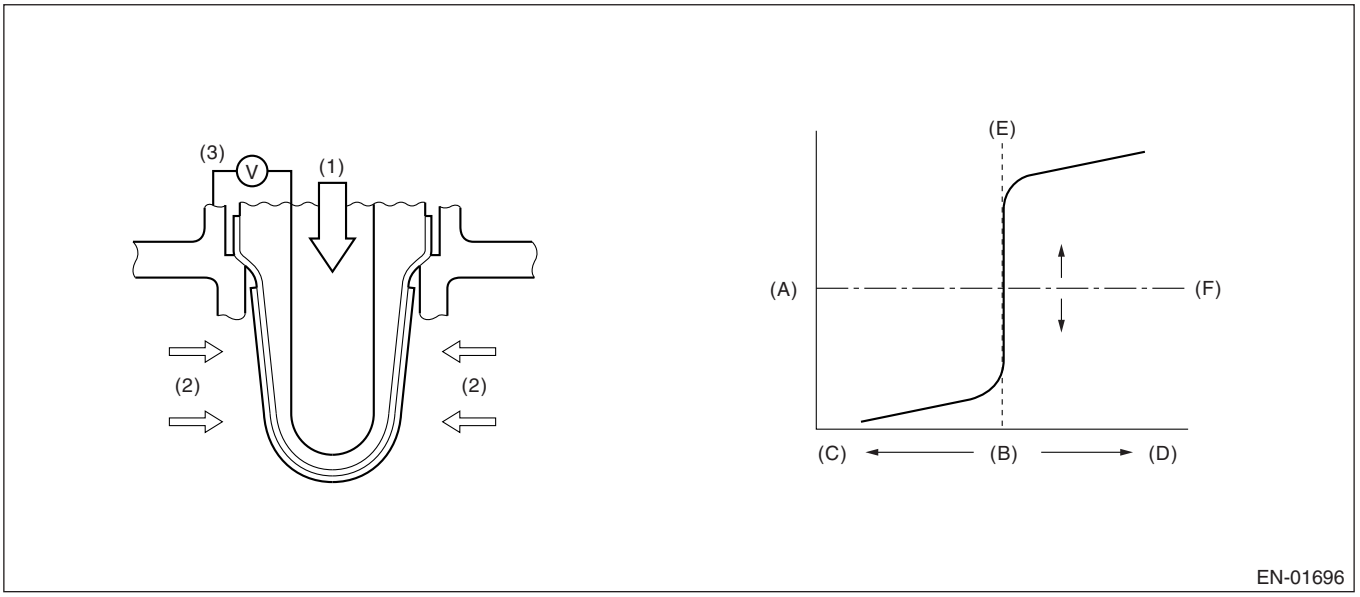
1. OUTLINE OF DIAGNOSIS

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



(1) Atmosphere
(2) Exhaust gas
(3) Electromotive force
(A) Electromotive force
(B) Air fuel ratio
(C) Rich
(D) Lean
(E) Theoretical air fuel ratio
(F) Comparative voltage

3. ENABLE CONDITION

- Rich → lean diagnosis response

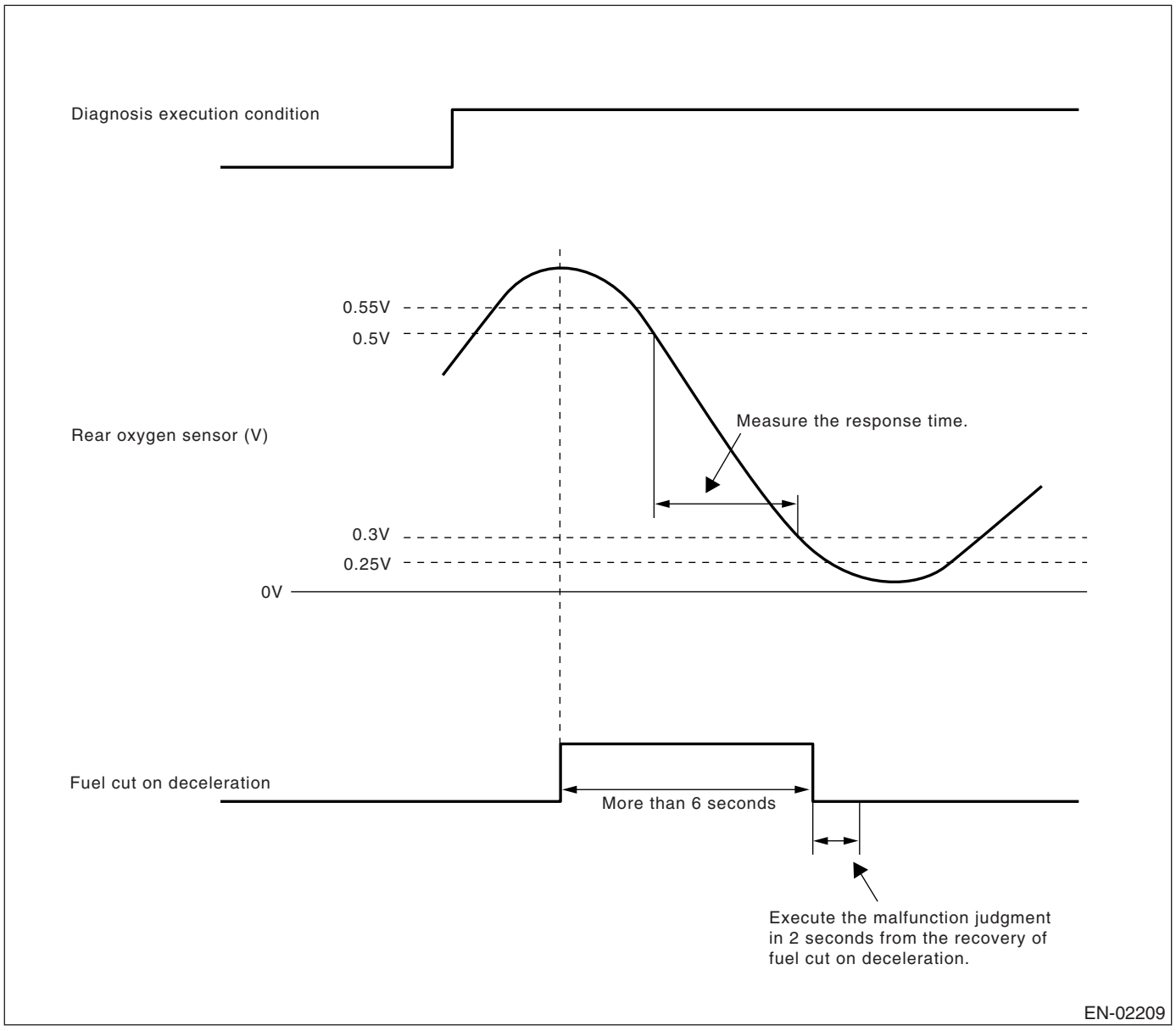
Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
A/F sub feedback control condition	Complete
Deceleration fuel cut time is 5 seconds or more.	Experienced
After fuel cut	≥ 2 sec.
Rear oxygen heater current calculation time	≥ 60 sec.
Rear oxygen heater current continuous time	≥ 30 sec.
Catalyst warm-up counter	≥ 7000 times

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 rear oxygen sensor output voltage changes from 0.55 V (rich) to 0.25 V (lean), calculate the minimum response time for output change between 0.5V and 0.3V for the judgement criteria.



Abnormality Judgment

1) Judge as NG when the judgment value is larger than the threshold value after deceleration fuel cut.
Response time (diagnosis value) > threshold value → abnormal

NOTE:
Variation time of rear oxygen sensor output voltage is short during fuel shut-off in deceleration. Carry out the NG judgment only after the fuel shut-off in deceleration. Even without deceleration fuel cut, judge as OK if the value is below the threshold.
When the deceleration fuel cut off 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 (500 mV O_2 output) to lean (300 mV) if voltage reduces from 550 mV to 250 mV.	> 0.327 seconds
Time at over 550 mV	> 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 (diagnosis value) when the oxygen sensor voltage has changed from rich to lean is shorter than the threshold value (judgment value), judge as a normal condition.
Response time (diagnosis value) ≤ threshold value → normal
2) Do not judge as a normal condition.
Judge as OK when the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Shortest time change from rich (500 mV O_2 output) to lean (300 mV) if voltage reduces from 550 mV to 250 mV.	≤ 0.327 sec.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Sub feedback control: Not allowed.

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

10.ENABLE CONDITION

- Lean → rich response diagnosis

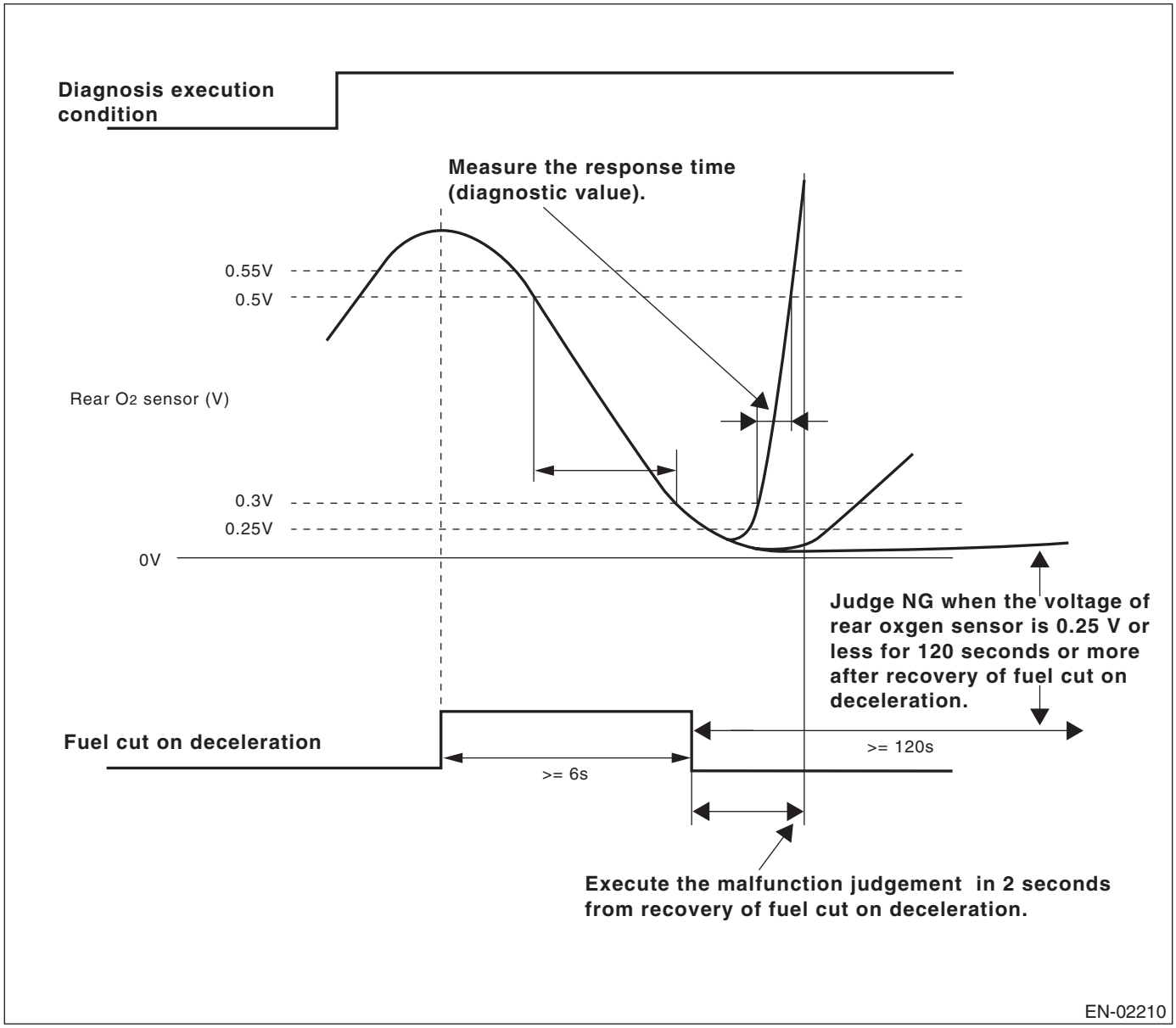
Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
A/F main feedback control condition	Complete
Deceleration fuel cut ≥ 5 seconds	Experienced
After fuel cut	≥ 2 sec.
Current calculation time of the rear oxygen sensor heater	≥ 60 sec.
Current continuation time of the rear oxygen sensor heater	≥ 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 judgement value, when the oxygen sensor output voltage changes from 0.25 V (lean) to 0.55 V (rich).



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 (300 mV O_2 output) to rich (500 mV) when voltage drops from 500 mV to 250 mV.	> 2 seconds
Time at less than 250 mV	> 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 (diagnosis value) when the oxygen sensor voltage has changed from rich to lean is shorter than the threshold value (judgment value), judge as a normal condition.
Response time (diagnosis value) ≤ threshold value → normal
2) Do not judge as a normal condition.
Judge as OK when the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Shortest time change from lean (300 mV O_2 output) to rich (500 mV) when voltage drops from 550 mV to 250 mV.	≤ 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)

AG:DTC P0140 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK1 SENSOR2)

1. OUTLINE OF DIAGNOSIS

Detect abnormalities in the rear oxygen sensor output characteristics.
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 showing a high voltage, 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	≥ 70°C (158°F)
Target output voltage of rear oxygen sensor	≥ 0.6 V
Air intake amount	10 g (0.35 oz)/seconds or more
Battery voltage	> 10.9 V
Closed loop at the oxygen sensor	In operation
Misfire detection every 200 rotations	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 mV
Minimum output voltage, high side	> 250 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	≥ 550 mV
Minimum output voltage, high side	≤ 250 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

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

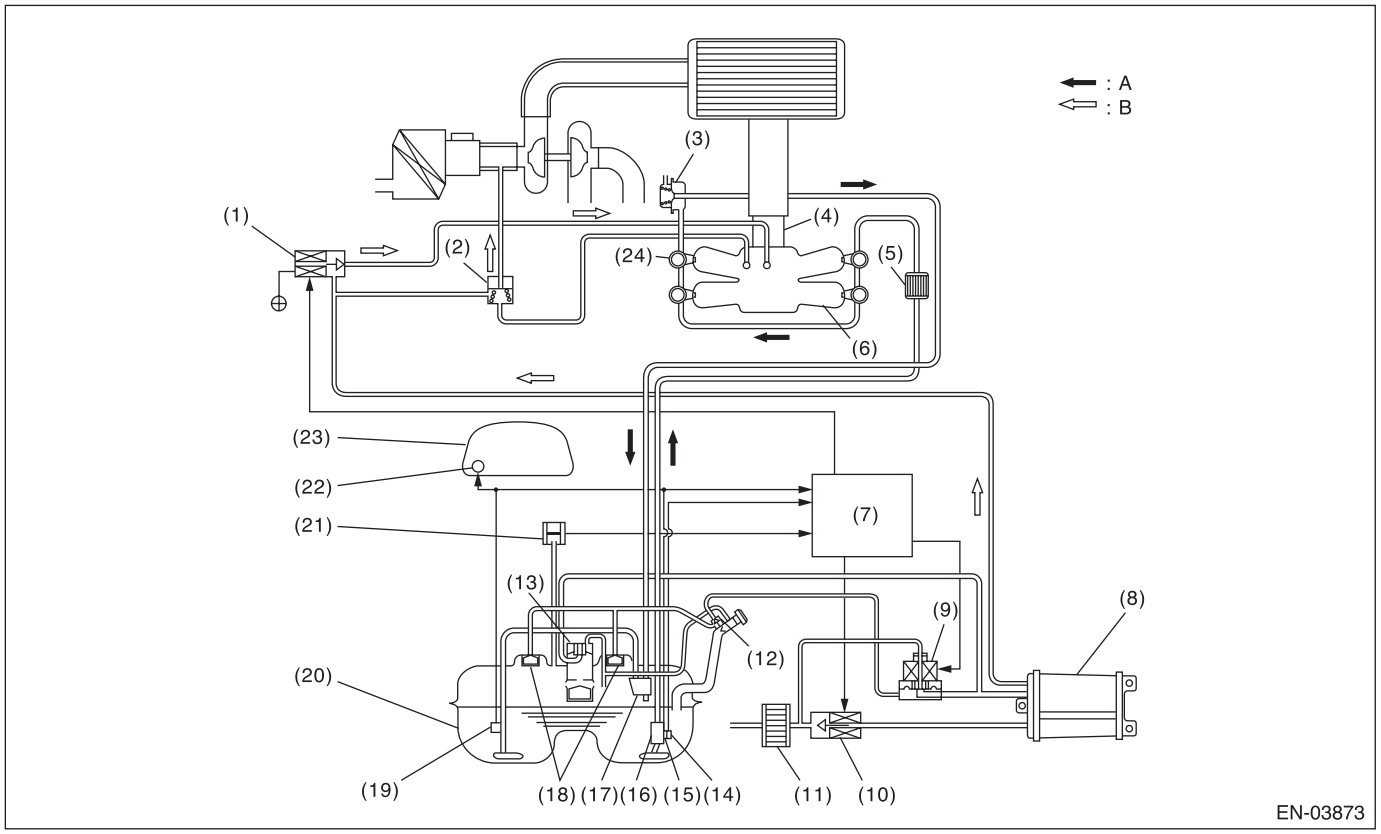
- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

AH:DTC P0171 SYSTEM TOO LEAN (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect fuel system malfunction by the amount of main feedback control.

Fuel System Diagnosis



(1)	Purge control solenoid valve	(10)	Drain valve	(19)	Fuel sub level sensor
(2)	Purge valve	(11)	Drain filter	(20)	Fuel tank
(3)	Pressure regulator	(12)	Shut-off valve	(21)	Fuel tank pressure sensor
(4)	Throttle body	(13)	Vent valve	(22)	Fuel gauge
(5)	Fuel filter	(14)	Fuel temperature sensor	(23)	Combination meter
(6)	Intake manifold	(15)	Fuel level sensor	(24)	Fuel injector
(7)	Engine control module (ECM)	(16)	Fuel pump		
(8)	Canister	(17)	Jet pump	(A)	Fuel line
(9)	Pressure control solenoid valve	(18)	Fuel cut valve	(B)	Vaporized fuel line

Diagnostic Method

Fuel system is diagnosed by comparing the target air fuel ratio calculated by ECM with the actual air fuel ratio measured by sensor.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
A/F main learning system	In operation
Engine coolant temperature	≥ 70°C (158°F)
Engine load	≥ Value from Map 5
Intake air change during 0.5 engine rev.	≤ 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
fsobd = (sglmd – tglmda) + faf + flaf where, sglmd = measured lambda tglmda = target lambda faf = main feedback compensation coefficient every 64 milliseconds flaf = main feedback learning compensation coefficient	≥ 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 × 5 times
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK when the malfunction criteria below are completed for 10 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
fsobd = (sglmd – tglmda) + faf + flaf	< 19%

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When similar driving conditions are repeated 3 times and the result is OK.
- When “Clear Memory” is performed

7. FAIL SAFE

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

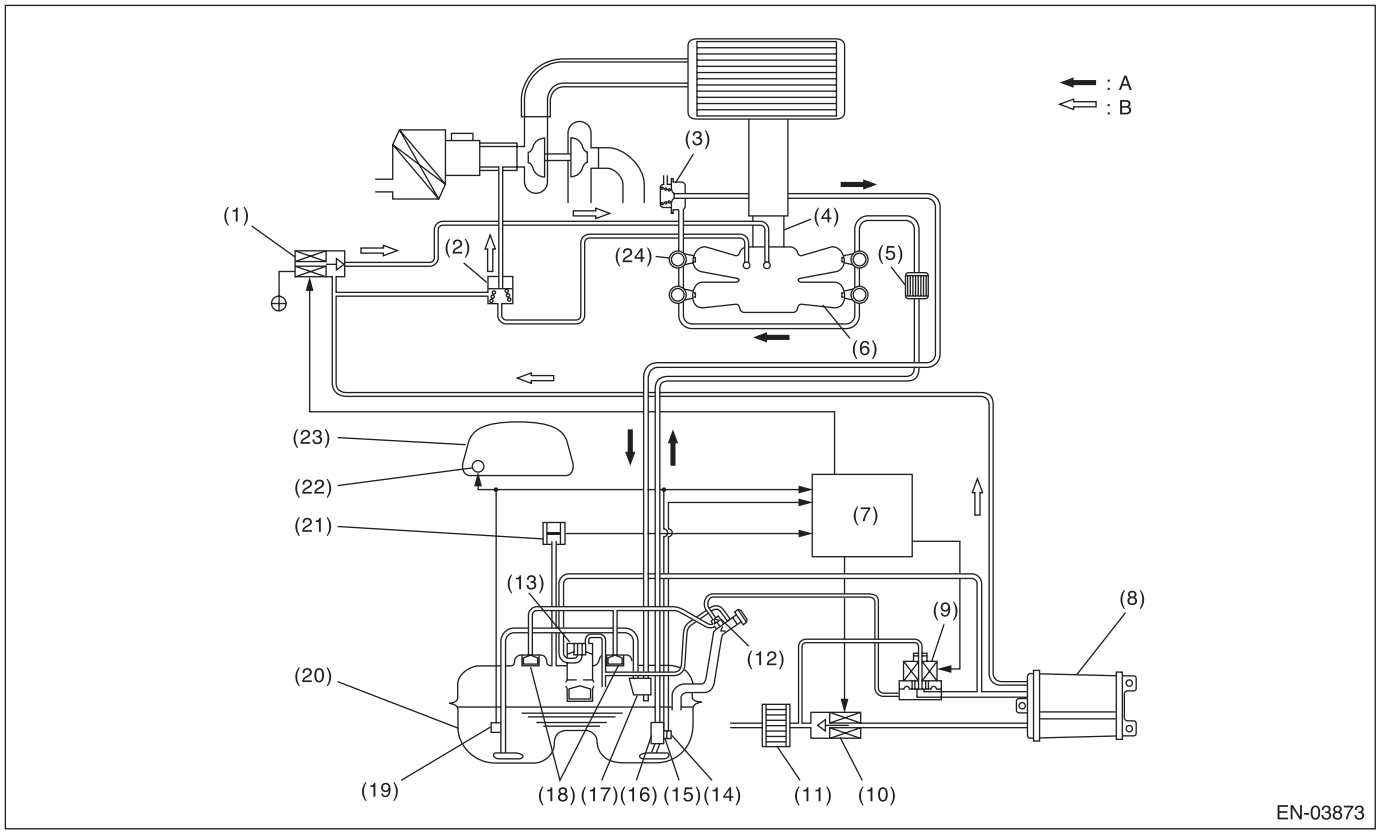
Memorize the freeze frame data. (For test mode $02)

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



(1)	Purge control solenoid valve	(10)	Drain valve	(19)	Fuel sub level sensor
(2)	Purge valve	(11)	Drain filter	(20)	Fuel tank
(3)	Pressure regulator	(12)	Shut-off valve	(21)	Fuel tank pressure sensor
(4)	Throttle body	(13)	Vent valve	(22)	Fuel gauge
(5)	Fuel filter	(14)	Fuel temperature sensor	(23)	Combination meter
(6)	Intake manifold	(15)	Fuel level sensor	(24)	Fuel injector
(7)	Engine control module (ECM)	(16)	Fuel pump		
(8)	Canister	(17)	Jet pump	(A)	Fuel line
(9)	Pressure control solenoid valve	(18)	Fuel cut valve	(B)	Vaporized fuel line

Diagnostic Method

Fuel system is diagnosed by comparing the target air fuel ratio calculated by ECM with the actual air fuel ratio measured by sensor.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
A/F main learning system	In operation
Engine coolant temperature	≥ 70°C (158°F)
Engine load	≥ Value from Map 5
Intake air change during 0.5 engine rev.	≤ 0.02 g/rev
Learning value of EVAP conc. during purge	≤ 0.1
Cumulative time of canister purge after engine start	20 seconds or more
Continuous period after canister purge starting	30 seconds or more

Map 5

Engine speed (rpm)	idling	800	1200	1600	2000	2400	2800	3200	3600	4000	4400
Measured value (g(oz)/ rev)	Non-Turbo	0.228 (0.008)	0.22 (0.0078)	0.22 (0.0078)	0.22 (0.0078)	0.228 (0.008)	0.23 (0.0081)	0.234 (0.0083)	0.242 (0.0085)	0.250 (0.0088)	0.250 (0.0088)

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at idling or at a constant speed after warming up the engine.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Compare the diagnosed value (fsobd) with the threshold value, and if a condition where the malfunction criteria below are met continues for more than 50 seconds, judge that there is a fault in the fuel system.

Judgment Value

Malfunction Criteria	Threshold Value
fsobd = (sglmd – tglmda) + faf + flaf where, sglmd = measured lambda tglmda = target lambda faf = Main feedback compensation coefficient (Per 64 milliseconds) flaf = main feedback learning compensation coefficient	≤ fsobdR1 See Map 4 fsobdR1 = rich side threshold value of fsobd

Map 4 Threshold value for fuel system malfunction criteria

Amount of air (g(oz)/s)	0	2.4(0.085)	4.7(0.166)	7(0.247)	9.4(0.332)	11.7(0.413)	14.1(0.497)
fsobdR1 (%)	–40	–40	–36.9	–32.0	–27.0	–27.0	–27.0

Time Needed for Diagnosis: 10 seconds × 5 times
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK when the malfunction criteria below continues for 10 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
fsobd = (sglmd – tglmda) + faf + flaf	≥ –20%

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When similar driving conditions are repeated 3 times and the result is OK.
- When “Clear Memory” is performed

7. FAIL SAFE

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)

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

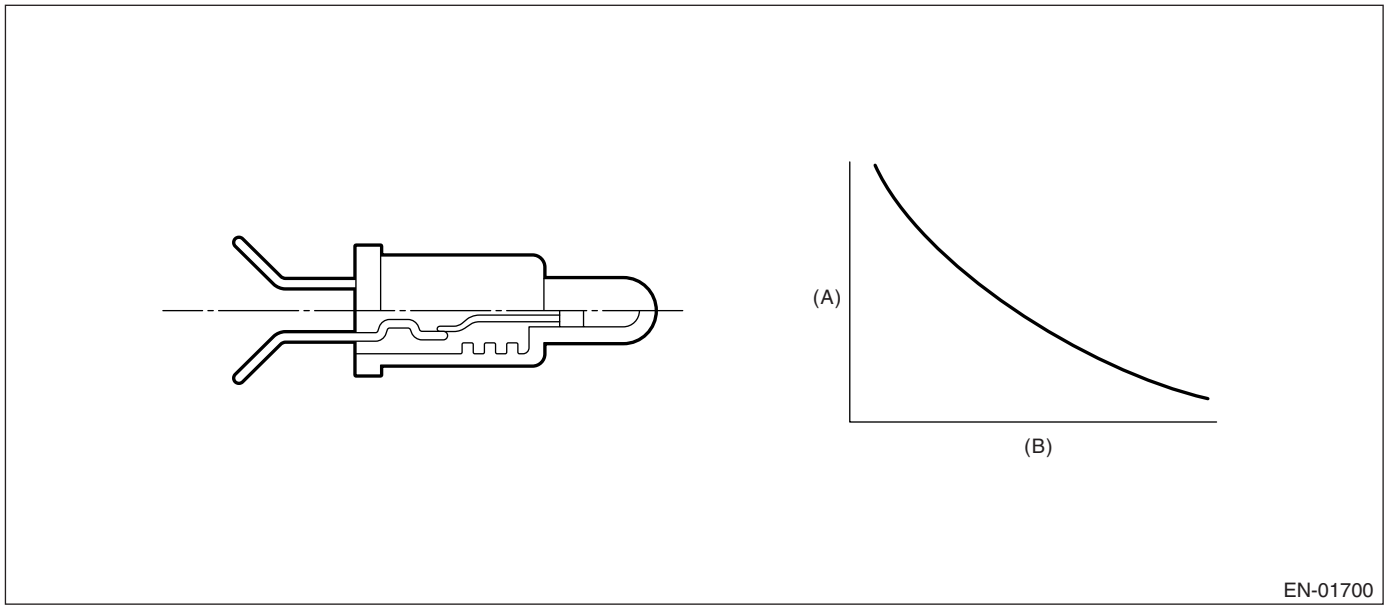
1. OUTLINE OF DIAGNOSIS

Detect faults in the fuel temperature sensor output properties.
Diagnosis is performed in two methods; drift diagnosis and stuck diagnosis. If either is NG, judge as NG. If both are OK, Judge as OK and clear the NG.

Drift Diagnosis

Normally fuel temperature is lower than engine coolant temperature. When the fuel temperature becomes higher than the engine coolant temperature, the range is considered to be shifted, and judged as NG.

2. COMPONENT DESCRIPTION



(A) Resistance value (Ω)
(B) Temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time until completing the malfunction criteria below becomes 120 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel level	≥ 9 ℓ (2.38 US gal, 1.98 Imp gal)
After engine starting	20 seconds or more
Engine coolant temperature — engine coolant temperature at engine starting	> 10°C (18°F)
Fuel temperature – Engine coolant temperature	≥ 10°C (18°F)
Battery voltage	> 10.9 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	≥ 9 ℓ (2.38 US gal, 1.98 Imp gal)
After engine starting	20 seconds or more
Engine coolant temperature — engine coolant temperature at engine starting	> 10°C (18°F)
Fuel temperature – Engine coolant temperature	< 10°C (18°F)
Battery voltage	> 10.9 V
Engine coolant temperature	< 70°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 V

7. GENERAL DRIVING CYCLE

Always perform diagnosis continuously after 20 seconds or more have passed since the engine started.

8. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Accumulated amount of intake air	≥ 550 kg (1212.8 lb)
Fuel temperature difference between Max. and Min.	< 3°C (5.4°F)

Time Needed for Diagnosis: Undecided
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK when the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Accumulated amount of intake air	≥ 550 kg (1212.8 lb)
Fuel temperature difference between Max. and Min.	≥ 3°C (5.4°F)

9. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

10.MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

11.FAIL SAFE

None

12.ECM OPERATION AT DTC SETTING

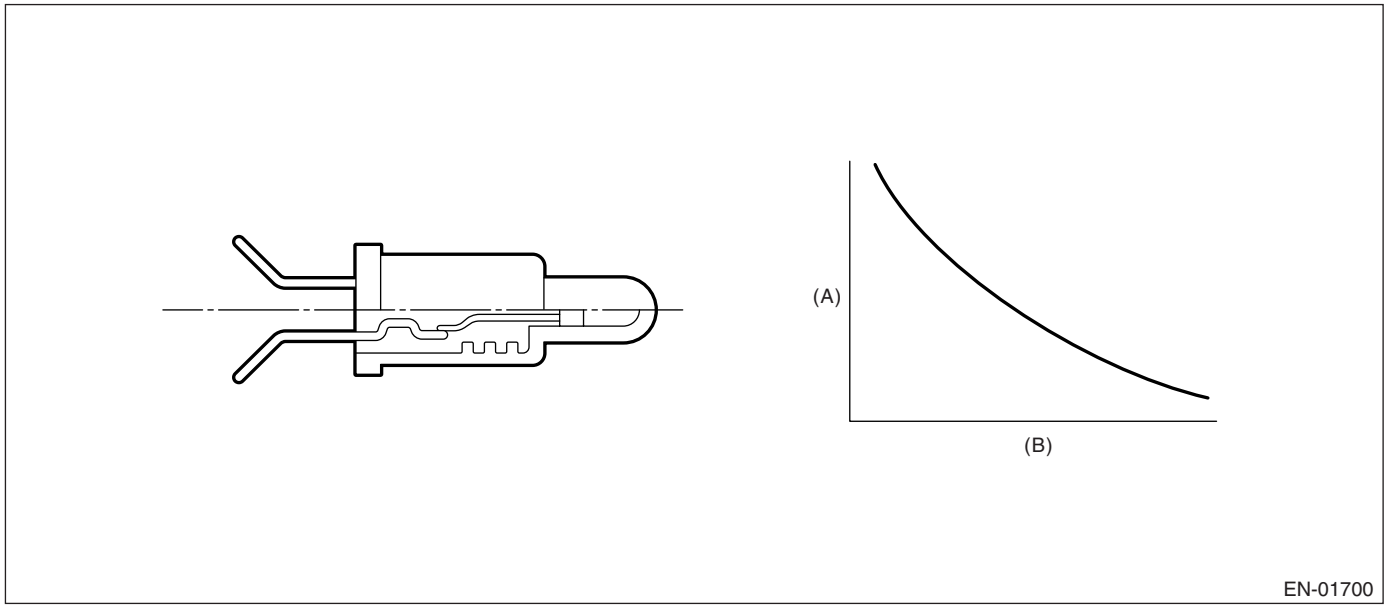
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel temperature sensor.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



(A) Resistance value (Ω)
(B) Temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time until completing the malfunction criteria below becomes 2.5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.1646 V
Battery voltage	≥ 10.9 V

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 0.1646 V
Battery voltage	≥ 10.9 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

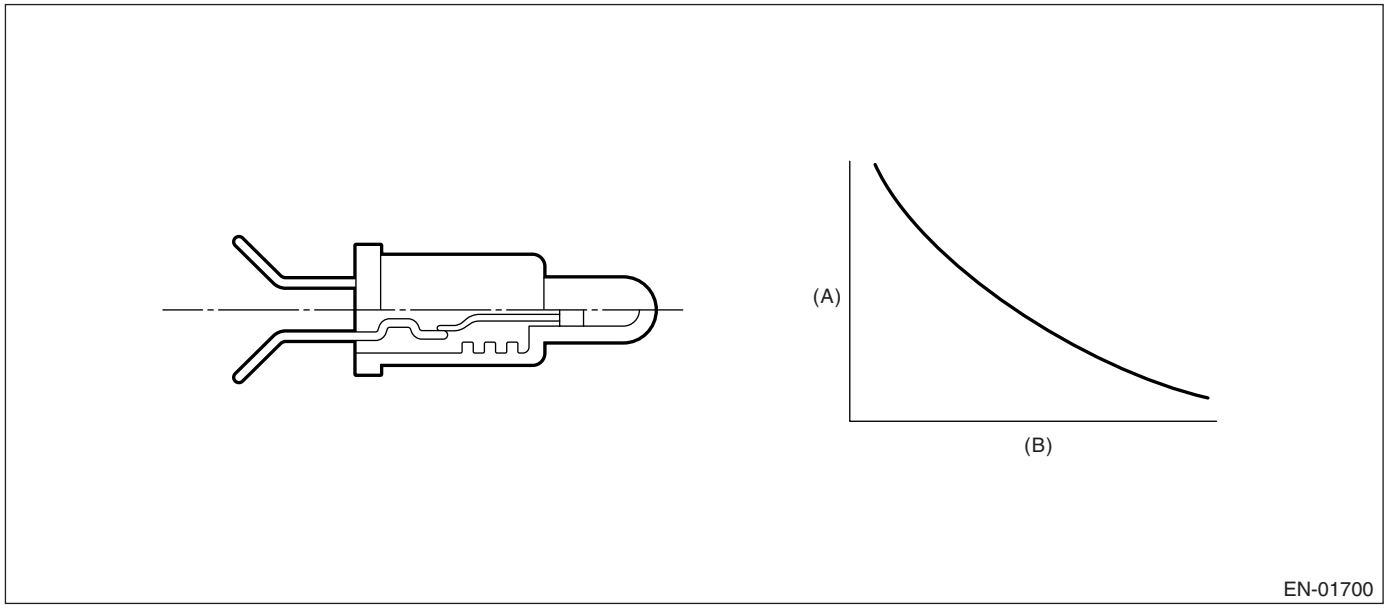
Memorize the freeze frame data. (For test mode $02)

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) Temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time until completing the malfunction criteria below becomes 2.5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.72 V
Battery voltage	≥ 10.9 V

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 4.72 V
Battery voltage	≥ 10.9 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

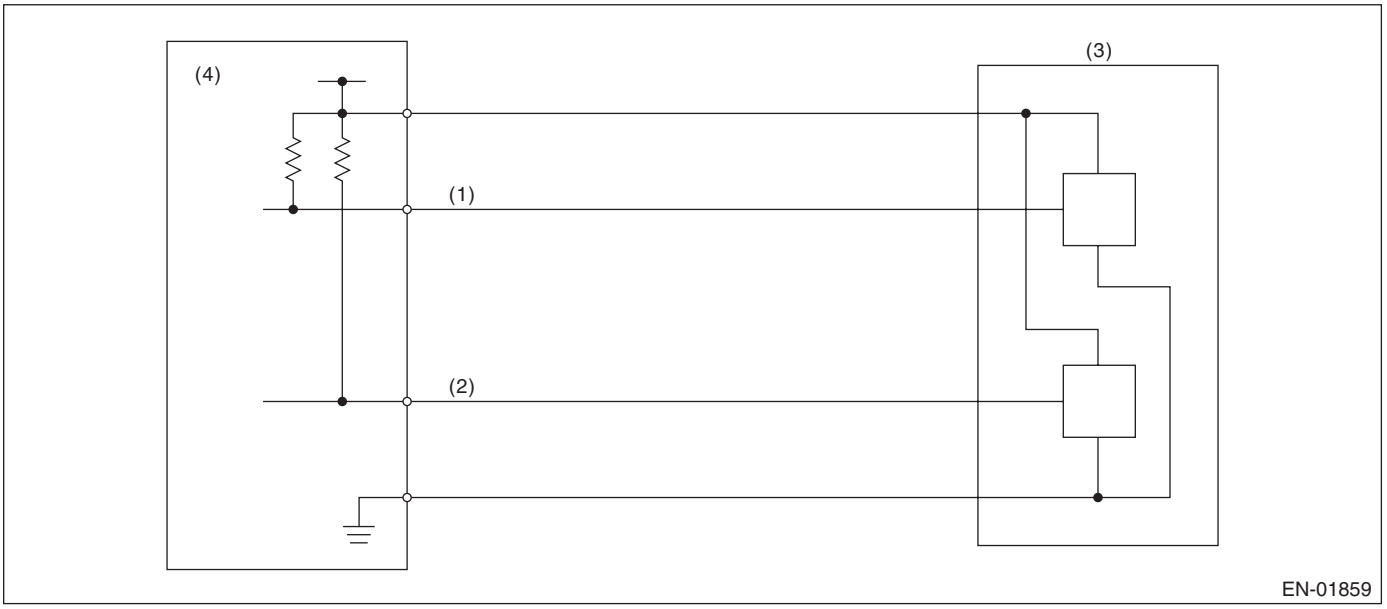
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor 2.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



(1) Throttle position sensor 1 signal
(2) Throttle position sensor 2 signal
(3) Throttle position sensor
(4) Engine control module (ECM)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	> 0.224 V

Time Needed for Diagnosis: 24 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed (Only engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only engine stop)

8. FAIL SAFE

Stop the continuity to the electronic control throttle motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

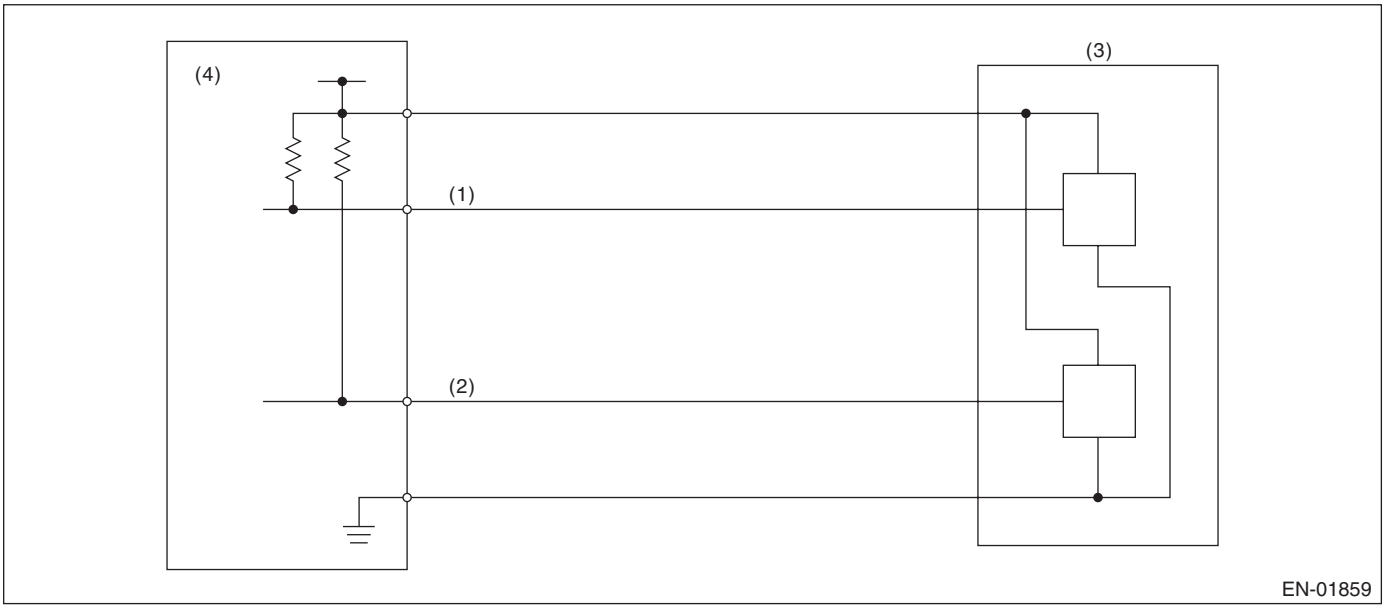
Memorize the freeze frame data. (For test mode $02)

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



(1) Throttle position sensor 1 signal
(2) Throttle position sensor 2 signal
(3) Throttle position sensor
(4) Engine control module (ECM)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	< 4.851 V

Time Needed for Diagnosis: 24 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed (Only engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only engine stop)

8. FAIL SAFE

Stop the continuity to the electronic control throttle motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

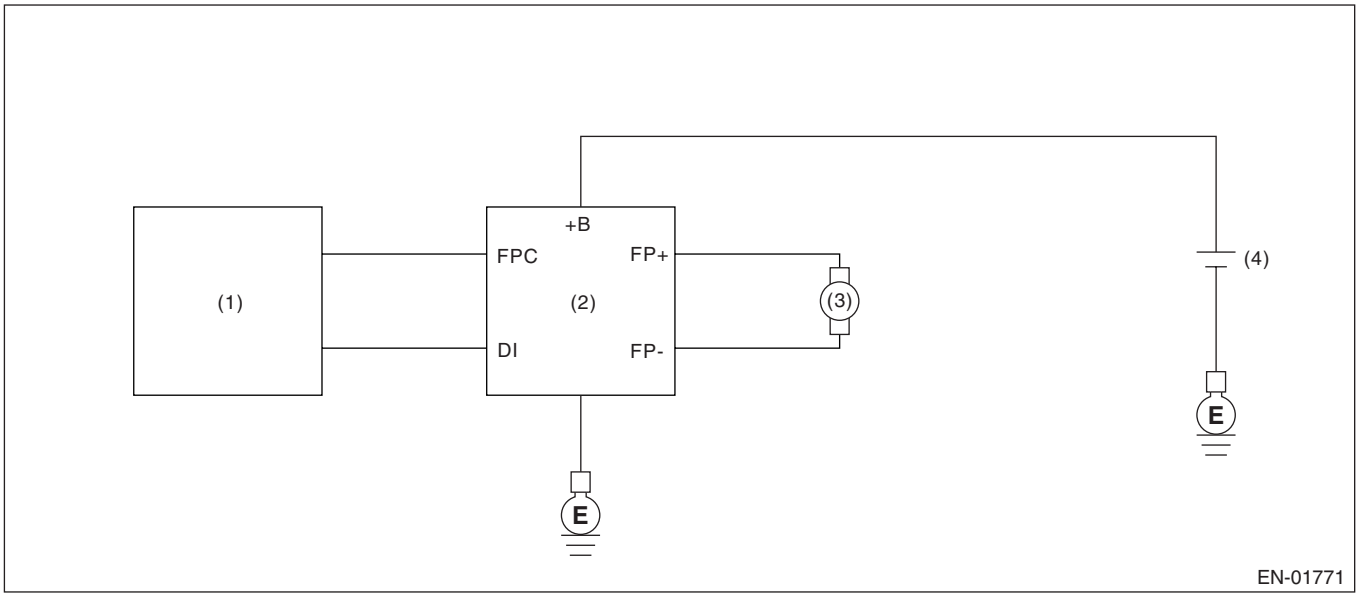
Memorize the freeze frame data. (For test mode $02)

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)
(2) Fuel pump control unit
(3) Fuel pump
(4) Battery

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time until completing 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

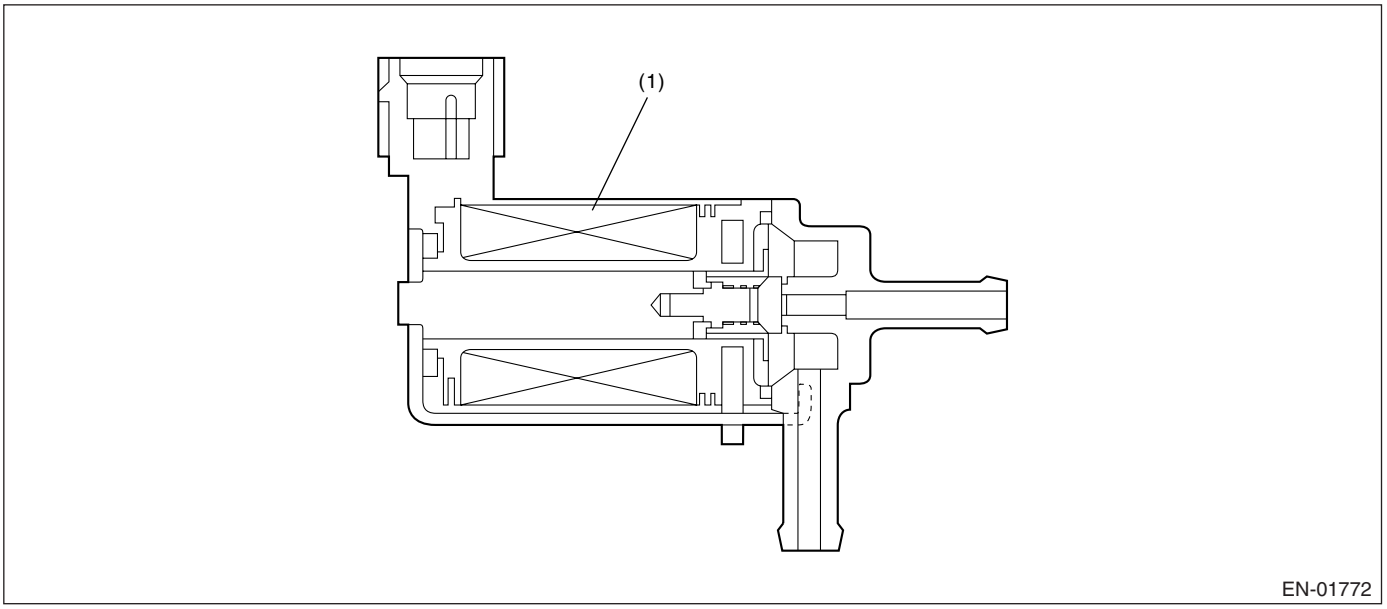
Memorize the freeze frame data. (For test mode $02)

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.

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time until completing the malfunction criteria below becomes 1 second or more.

Judgment Value

Malfunction Criteria	Threshold Value
Intake manifold pressure	≥ Map 10

Map10

Atmosphere pressure kPa (mmHg, inHg)	58.7 (440, 17.3)	67.2 (504, 19.8)	75.7 (568, 22.4)	84.2 (632, 24.9)	92.8 (696, 27.4)	101.3 (760, 29.9)
NG pressure (kPa (mmHg, inHg))	142.4 (1068, 42.1)	156.2 (1172, 46.1)	170.2 (1277, 50.3)	184.1 (1381, 54.4)	198.0 (1485, 58.5)	207.9 (1560, 61.4)
OK pressure (kPa (mmHg, inHg))	120.0 (900, 35.4)	113.8 (1004, 33.6)	147.8 (1109, 43.7)	161.7 (1213, 47.8)	175.6 (1317, 51.9)	185.6 (1392, 54.8)

Time Needed for Diagnosis: 1 second
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Intake manifold pressure	< Map 10

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

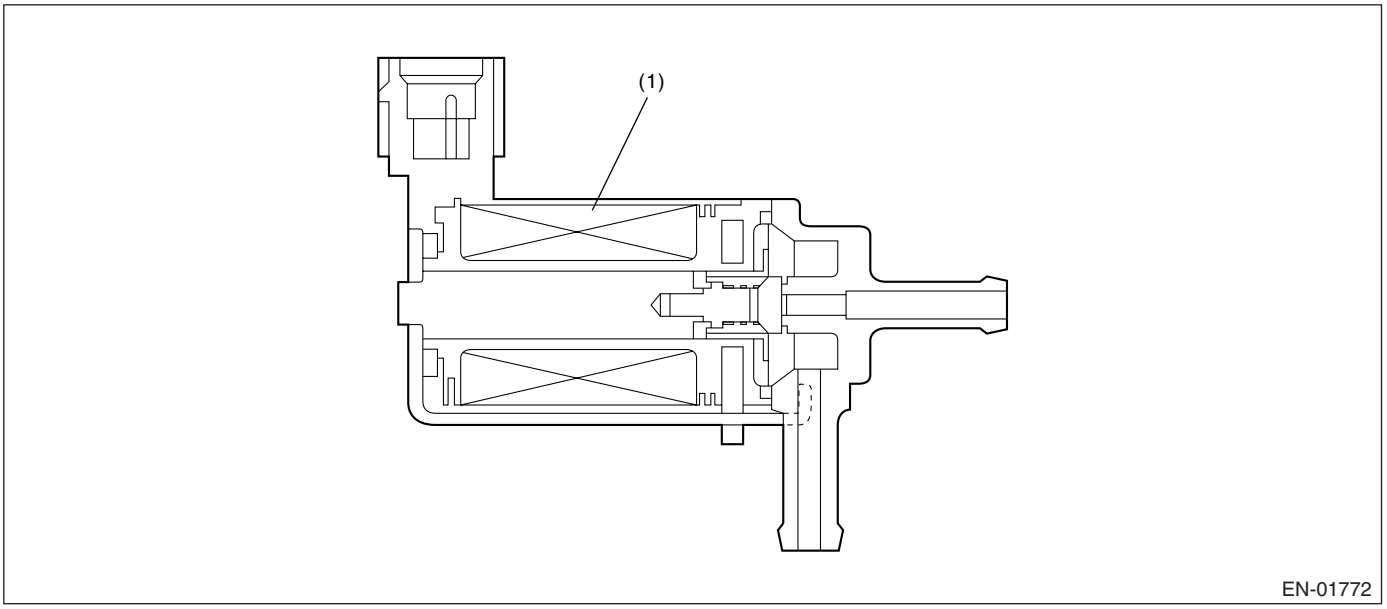
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of wastegate control solenoid valve.
Judge NG when the terminal output voltage remains Low during outputting the duty signal.

2. COMPONENT DESCRIPTION



(1) Coil

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
After engine starting	1 second or more

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge NG when the continuous time until completing the malfunction criteria below becomes more than 655 milliseconds.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal output Duty ratio for turbocharged pressure control	Low < 75%

Time Needed for Diagnosis: 655 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage	High

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

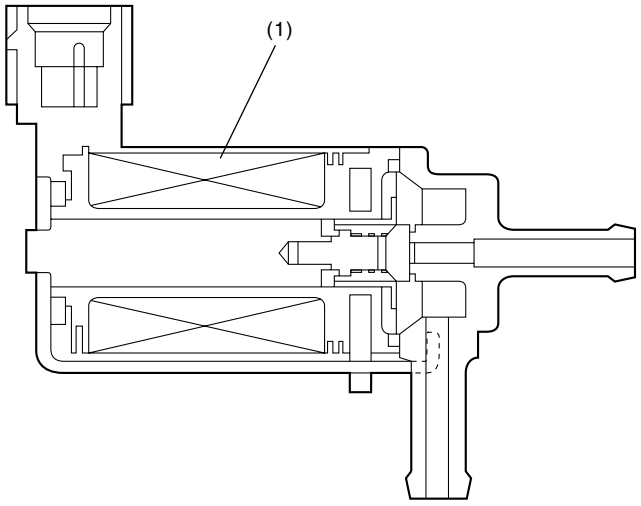
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of wastegate control solenoid valve.
Judge NG when the terminal output voltage remains High during outputting the duty signal.

2. COMPONENT DESCRIPTION



(1) Coil

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
After engine starting	1 second or more

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge NG when the continuous time until completing the malfunction criteria below becomes more than 655 milliseconds.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal output Duty ratio for turbocharged pressure control	High > 25%

Time Needed for Diagnosis: 655 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage	Low

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

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 rev.	< 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 milli-seconds
Throttle position change during 16 milli-seconds	< 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

Map3

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 (mmHg, inHg)	25.1 (188, 7.40)	24.8 (186, 7.32)	23.3 (175, 6.89)	24.7 (185, 7.30)	24.0 (180, 7.09)	25.6 (192, 7.56)	28.8 (216, 8.51)	30.0 (225, 8.86)	31.6 (237, 9.33)	32.5 (244, 9.60)	37.1 (278, 10.96)	41.9 (314, 12.4)	36.9 352, 10.90)	51.1 (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 (mmHg, inHg)	25.1 (188, 7.40)	24.8 (186, 7.32)	23.3 (175, 6.89)	24.7 (185, 7.30)	24.0 (180, 7.09)	25.6 (192, 7.56)	28.8 (216, 8.51)	30.0 (225, 8.86)	31.6 (237, 9.33)	32.5 (244, 9.60)	37.1 (278, 10.96)	41.9 (314, 12.4)	36.9 352, 10.90)	51.1 (383, 15.1)

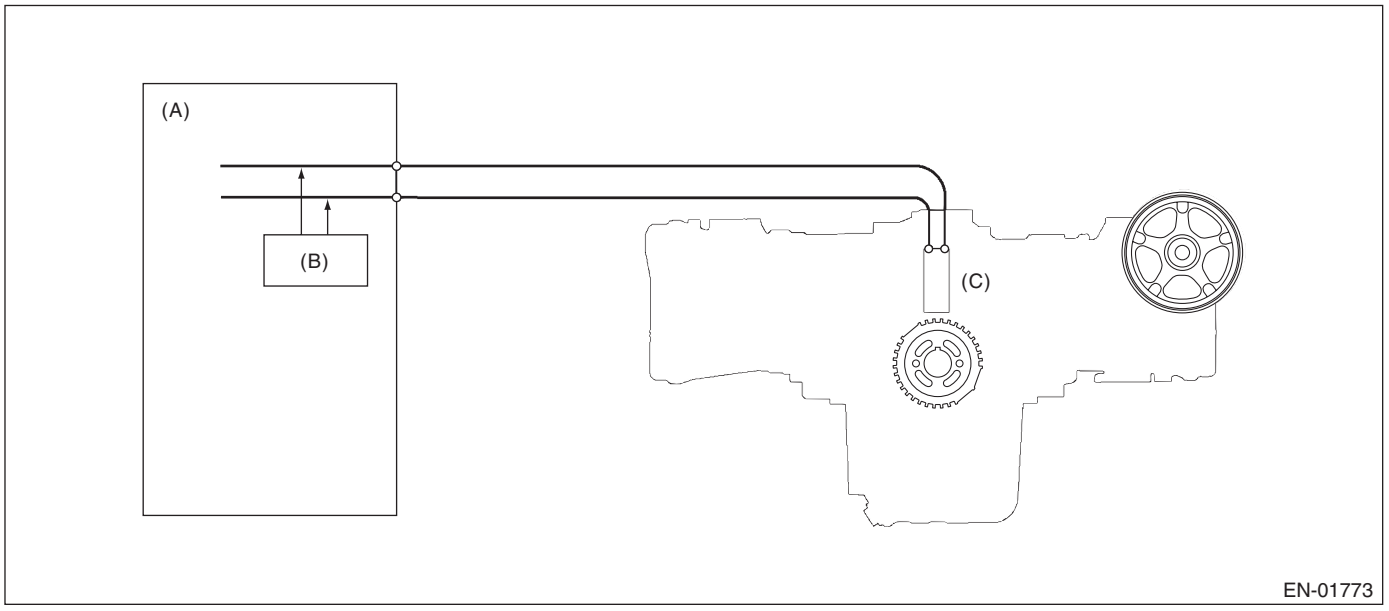
AT model

rpm	700	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	6700
kPa (mmHg, inHg)	26.3 (197, 7.76)	24.7 (185, 7.28)	23.6 (177, 6.97)	26.7 (200, 7.89)	27.3 (205, 8.07)	26.1 (196, 7.72)	29.5 (221.5 , 8.72)	31.3 (235, 9.25)	32.7 (245.5 , 9.67)	34.1 (256, 10.08)	38.2 (286.5, 11.28)	44.0 (330, 13.0)	49.5 (371.5, 14.63)	53.3 (400, 15.74)

3. GENERAL DRIVING CYCLE

- If conditions are met, detect misfire from idling to high rotation.
- Perform the diagnosis continuously.

4. DIAGNOSTIC METHOD



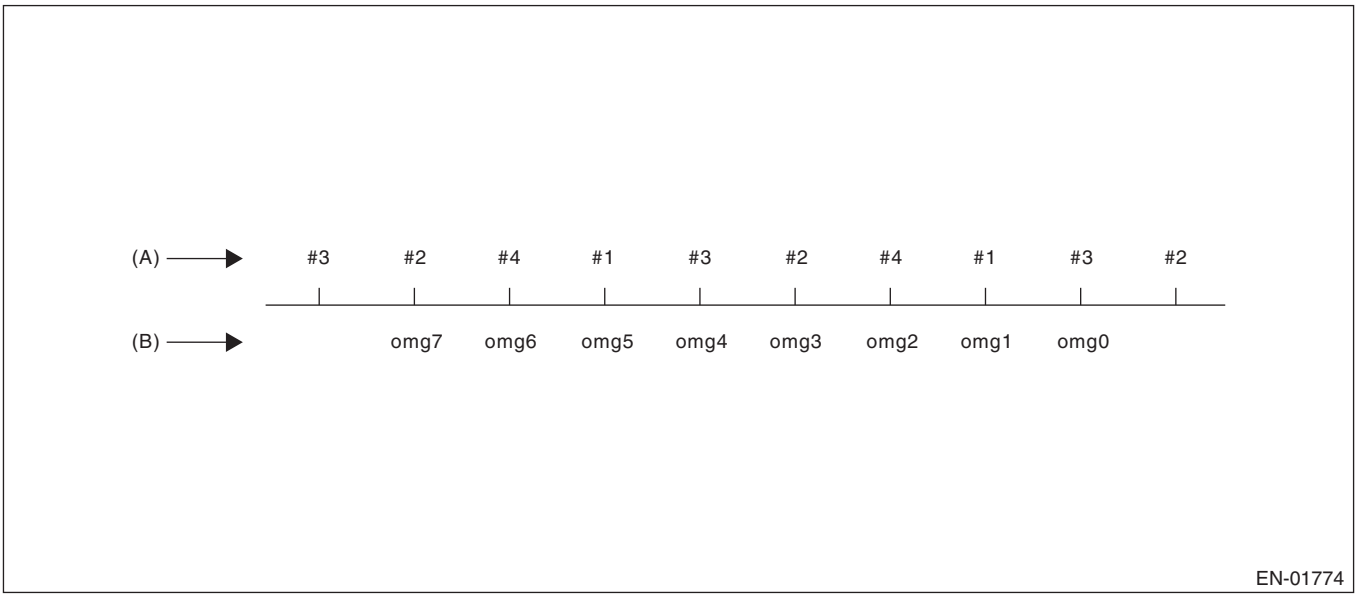
(A) Engine control module (ECM) (B) Diagnosis circuit (C) Crankshaft position sensor

GENERAL DESCRIPTION

When a misfire occurs, the engine RPM 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 judgement required by the law) (Compare number of misfire with judgment)
	• 180° Interval Method • 360° Interval Method • 720° Interval Method	• FTP1.5 times misfire NG judgment • Catalyst damage misfire NG judgment

As shown in the following figure, pick a cylinder as the standard and name it omg 0. And the former crankshaft position speed is named omg 1, the second former crankshaft position speed is named omg 2, the third is named omg 3, etc.

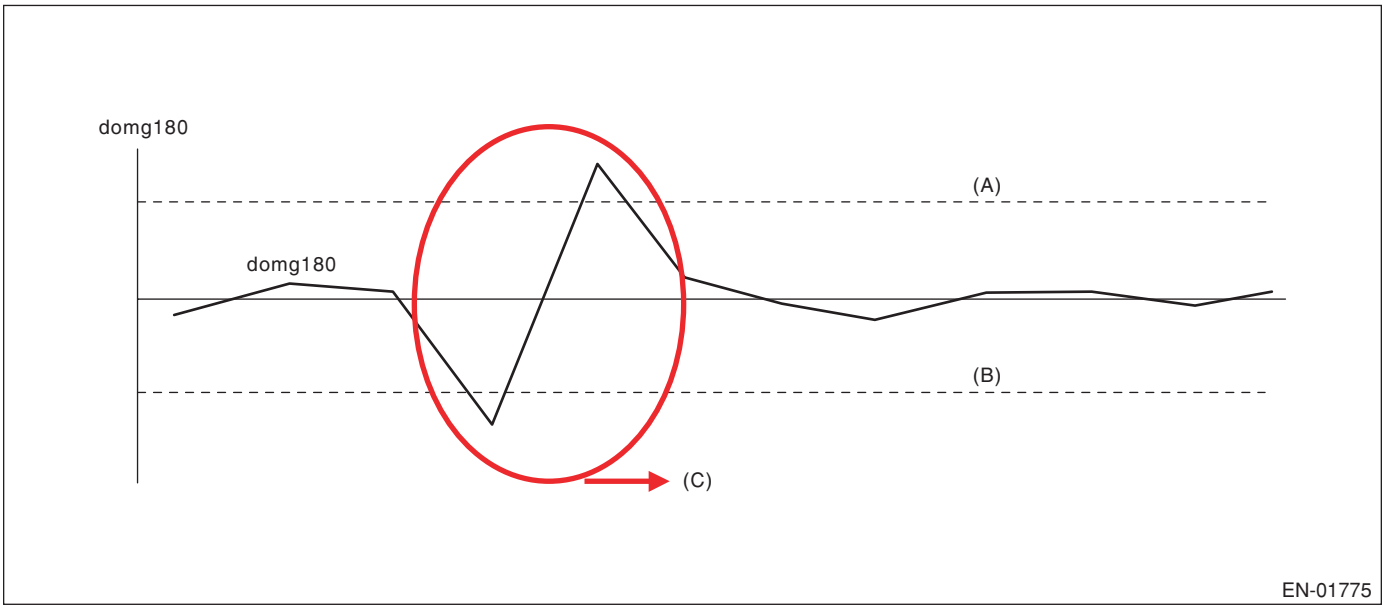


(A) Ignition order

(B) Crankshaft position speed

180° Interval Difference Method

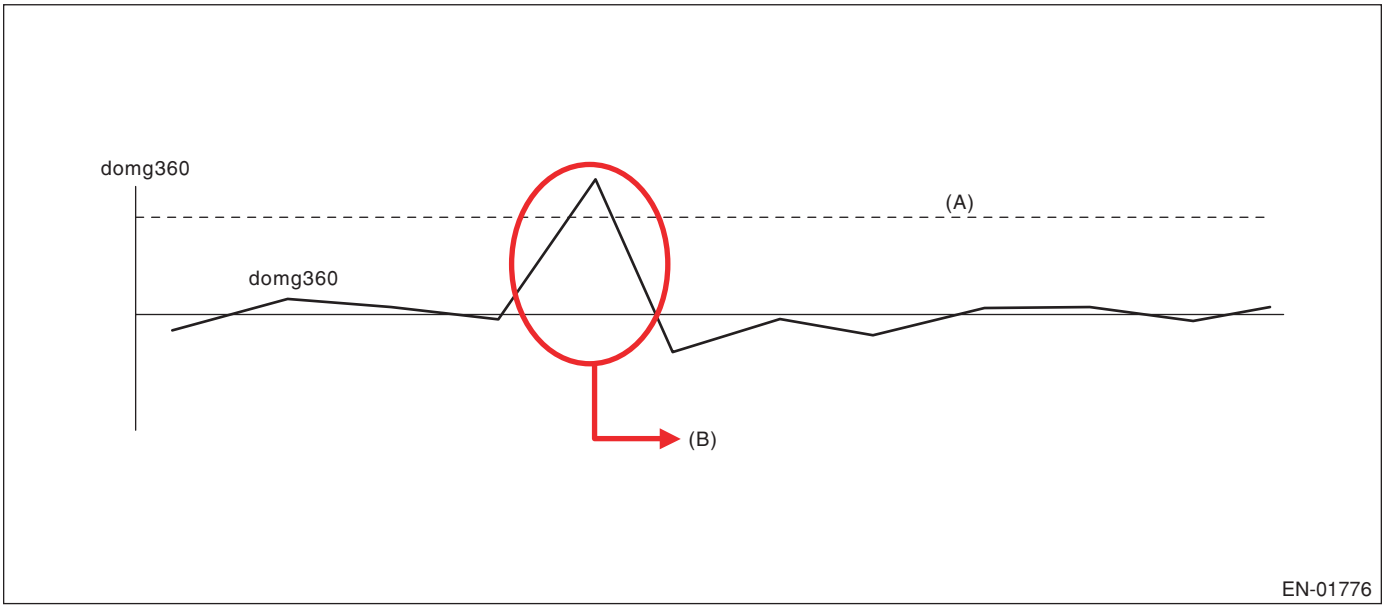
Diagnostic value	domg 180 = (omg 1 – omg 0) – (omg 7 – omg 1)/6
Judge as a misfire in the following cases. • domg 180 > judgment value of positive side • domg 180 ≤ judgment value of negative side (Judgment value before 180° CA)	



(A) Threshold value (judgement value of the positive side)
(B) Threshold value (judgement value of the negative side)
(C) Judged as a misfire

360° Interval Difference Method

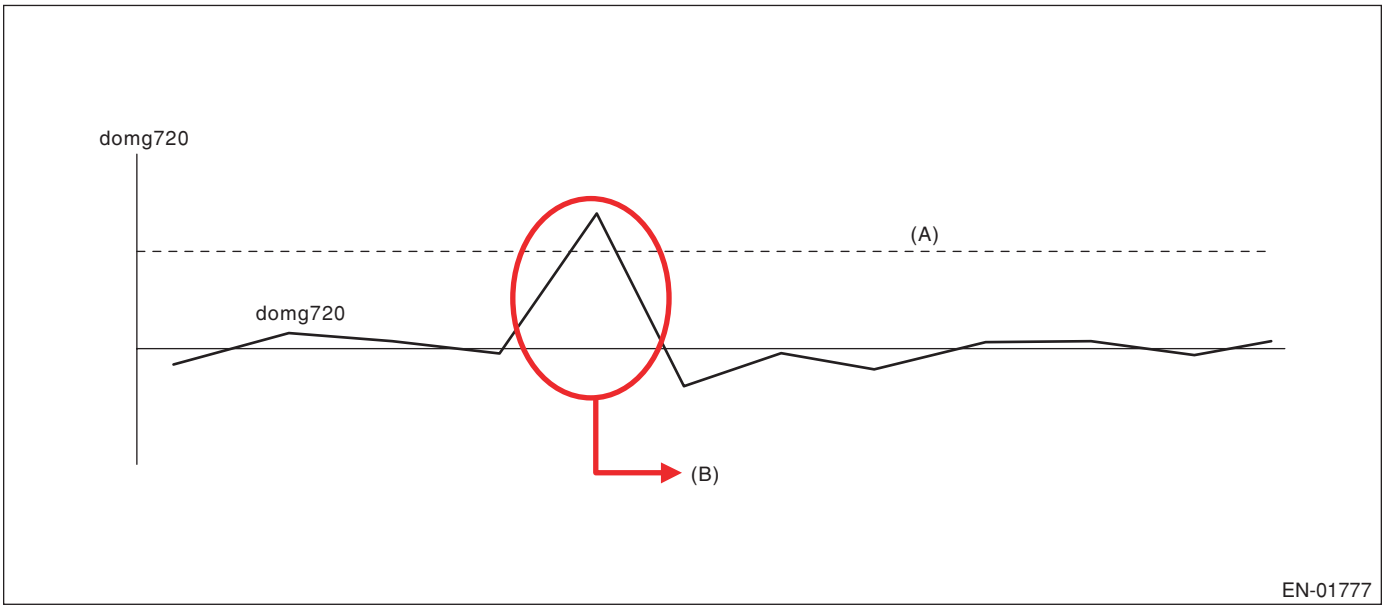
Diagnostic value	domg 360 = (omg 1 – omg 0) – (omg 4 – omg 3)
Misfire judgment	domg 360 > Judgment value → Judge as misfire



(A) Threshold value (B) Judged as a misfire

720° Interval Difference Method

Diagnostic value	domg 720 = (omg 1 – omg 0) – (omg 7 – omg 6)
Misfire judgment	domg 720 > Judgment value → 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 judgment value	> 1.0 % in 1000 revs.%

Time Needed for Diagnosis: 1000 engine revs.
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Catalyst damage misfire (Misfire occurrence level damaging catalyst)

Judgment Value (Judge that malfunction occurs when the misfire ratio is high in 200 engine revs. (400 ignitions))

Malfunction Criteria	Threshold Value
Catalyst damage misfire judgment value	See Map 1

Map 1 Fault criteria threshold for misfire which would result in catalyst damage

%		AIR INTAKE (g/gev.)									
		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	-	-

EN-02282

These figures indicate the misfire rate (%) in 400 ignitions; for example, 22.5 (%) means 400 (ignition) × 22.5 (%) = 90 (ignition) misfires. This value or more is judged as a misfire.
Time Needed for Diagnosis: 200 engine revs.
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When 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)

AT:DTC P0302 CYLINDER 2 MISFIRE DETECTED

NOTE:
For the diagnostic procedure, refer to DTC P0301. <Ref. to GD(H4DOTC)-104, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

AU:DTC P0303 CYLINDER 3 MISFIRE DETECTED

NOTE:
For the diagnostic procedure, refer to DTC P0301. <Ref. to GD(H4DOTC)-104, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

AV:DTC P0304 CYLINDER 4 MISFIRE DETECTED

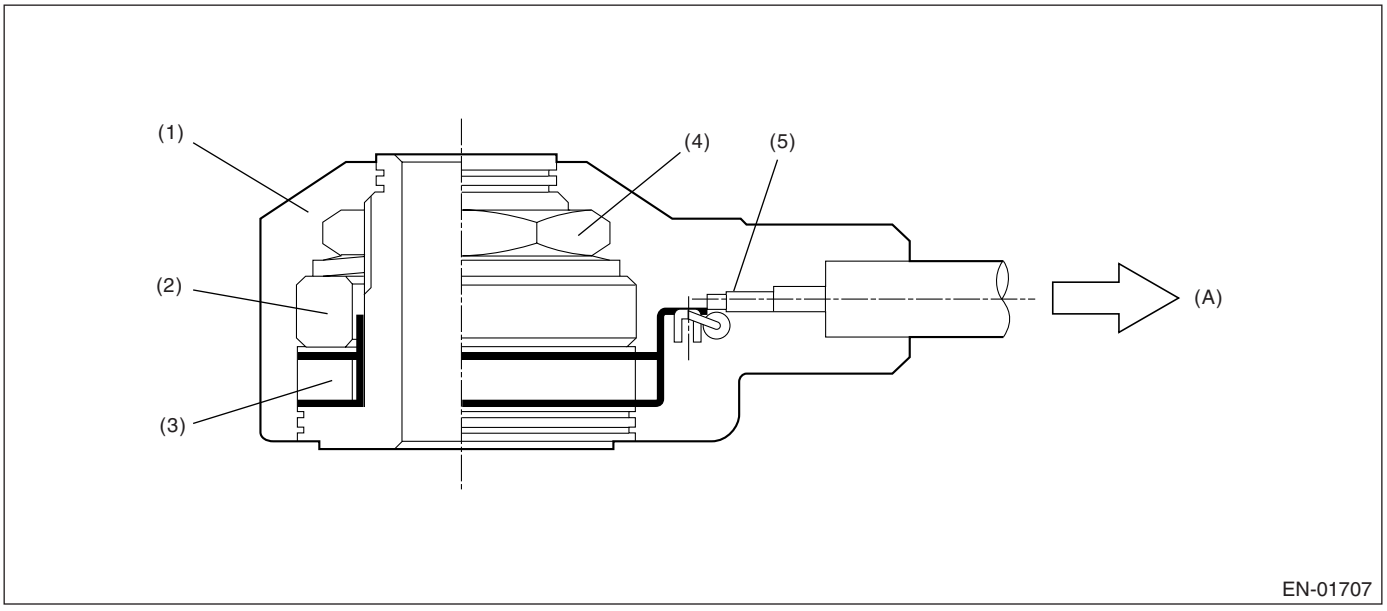
NOTE:
For the diagnostic procedure, refer to DTC P0301. <Ref. to GD(H4DOTC)-104, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

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



(1) Case
(2) Weight
(3) Piezoelectric element
(4) Nut
(5) Resistance
(A) To knock sensor harness

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time until completing 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°CA.
- Failure: Knock compensation value = –5°CA. (5°CA retard)
- Whole learning compensation coefficient update not allowed.
- Portional learning zone compensation value calculation not allowed.

9. ECM OPERATION AT DTC SETTING

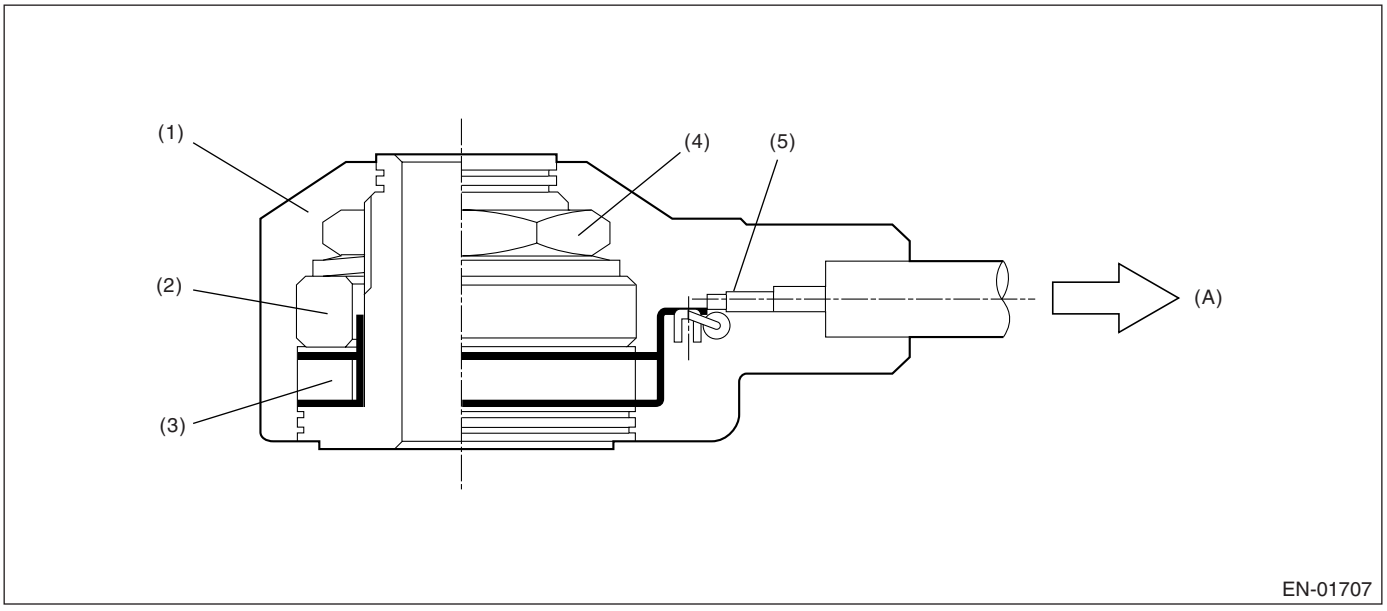
Memorize the freeze frame data. (For test mode $02)

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



(1) Case
(2) Weight
(3) Piezoelectric element
(4) Nut
(5) Resistance
(A) To knock sensor harness

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time until completing 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°CA.
- Failure: Knock compensation value = –5°CA. (5°CA retard)
- Whole learning compensation coefficient update not allowed.
- Portional learning zone compensation value calculation not allowed.

9. ECM OPERATION AT DTC SETTING

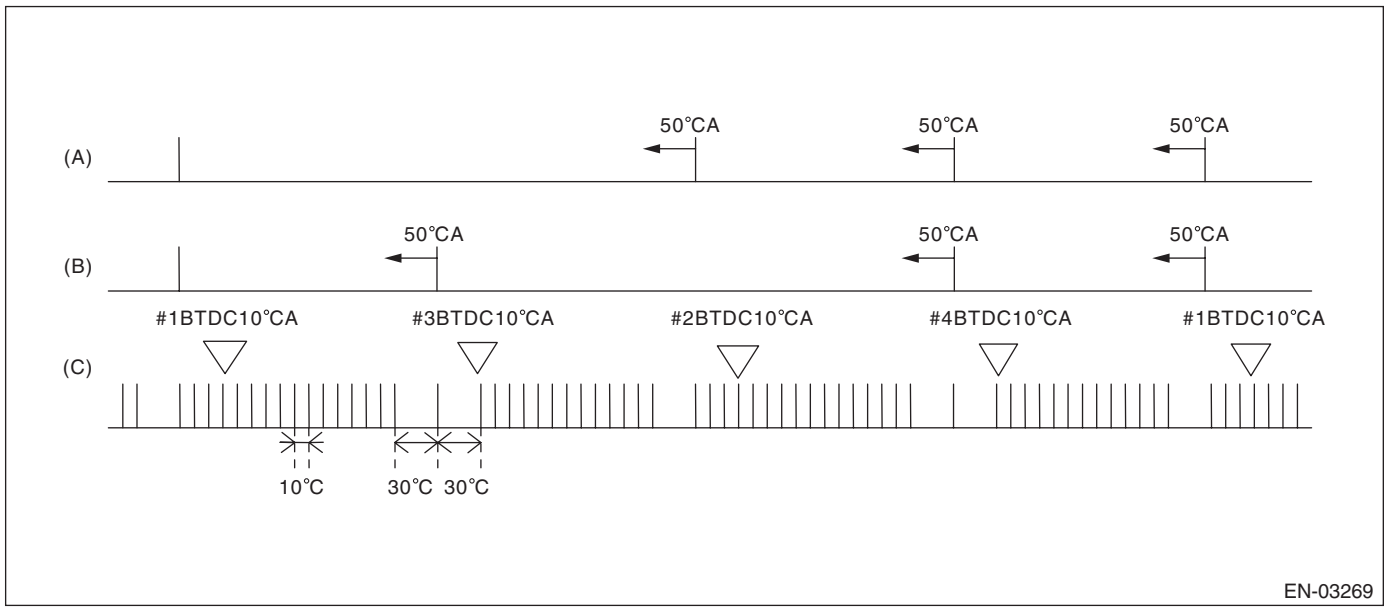
Memorize the freeze frame data. (For test mode $02)

AY:DTC P0335 CRANKSHAFT POSITION SENSOR “A” CIRCUIT

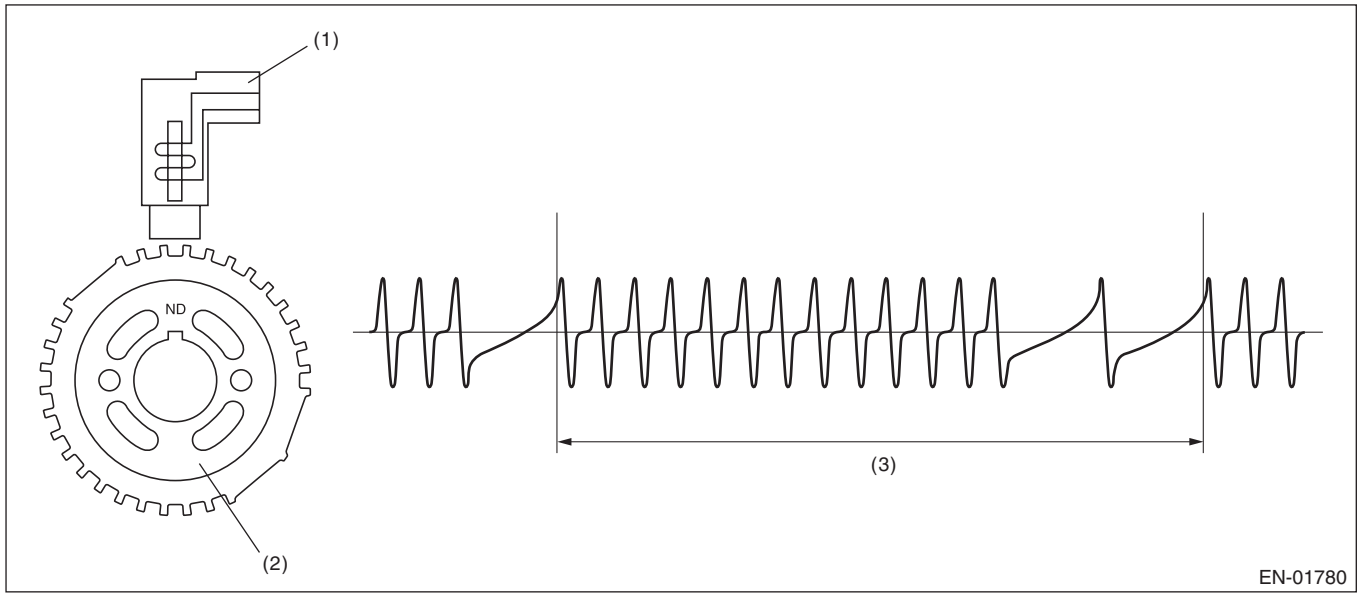
1. OUTLINE OF DIAGNOSIS

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



(A) Camshaft signal (RH) (B) Camshaft signal (LH) (C) Crankshaft signal



(1) Crankshaft position sensor (2) Crank sprocket (3) Crankshaft half-turn

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Starter switch	ON
Crankshaft position sensor signal	Not detected
Battery voltage	≥ 8 V

Time Needed for Diagnosis: 3 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK when the continuous time while meeting the malfunction criteria below is 3 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Crankshaft position sensor signal	Input exists
Battery voltage	≥ 8 V

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

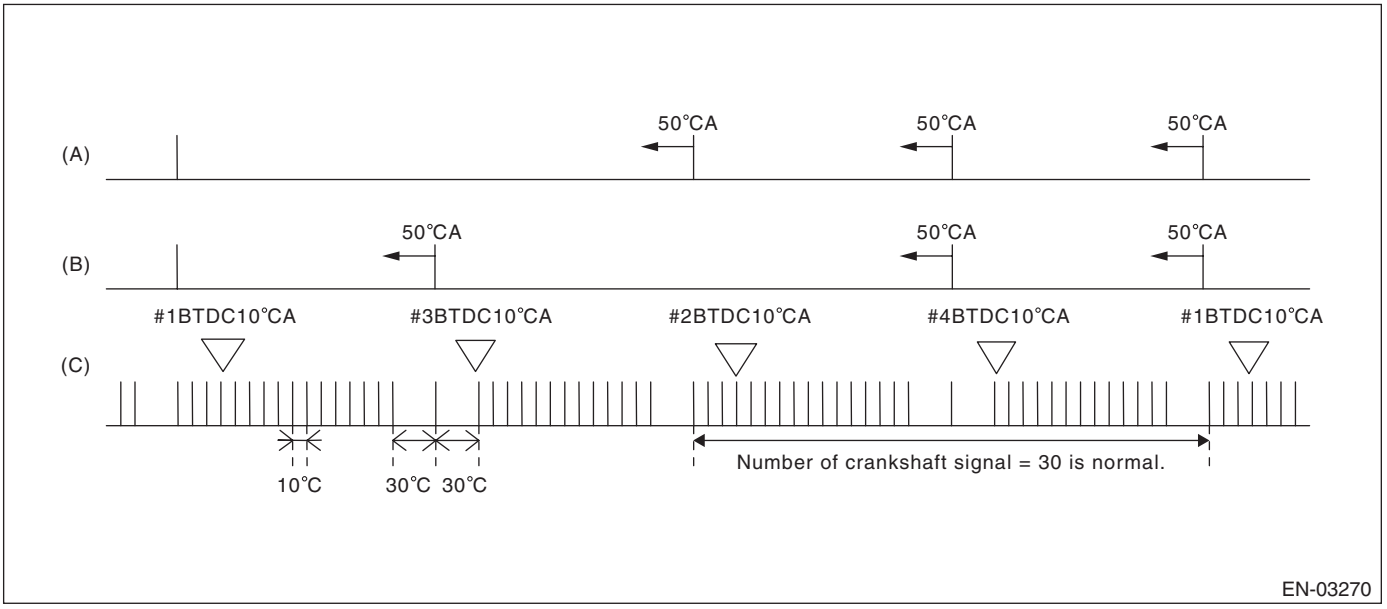
Memorize the freeze frame data. (For test mode $02)

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

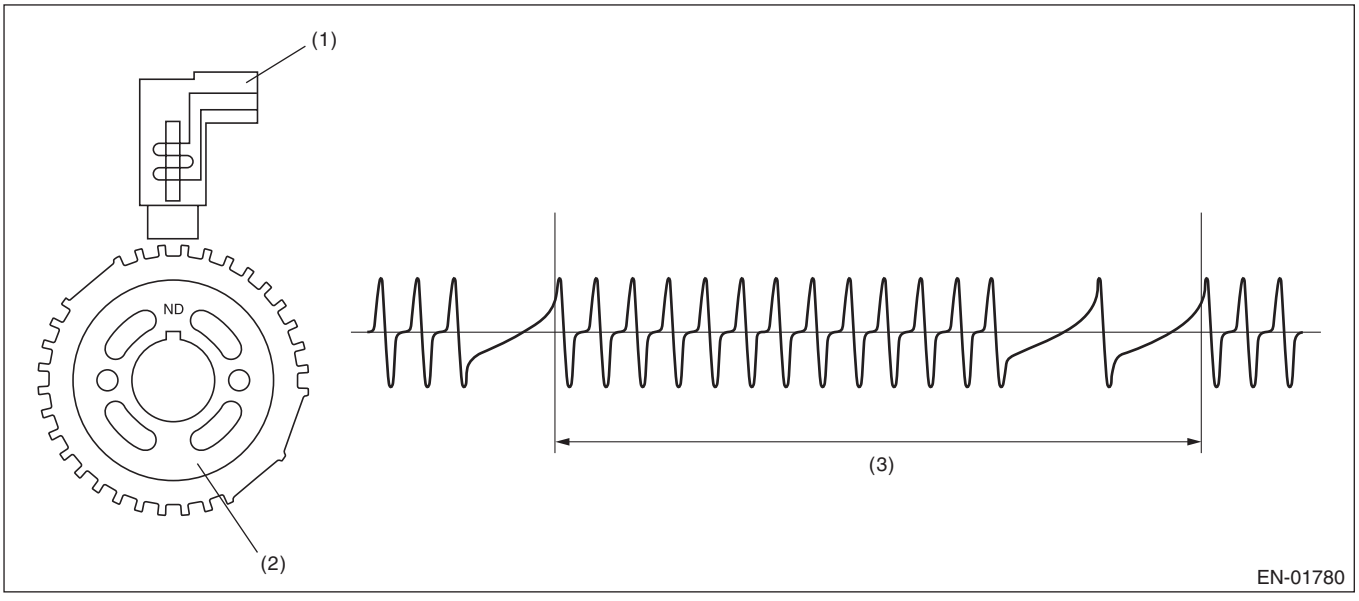
1. OUTLINE OF DIAGNOSIS

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	≥ 8 V
Engine speed	< 3000 rpm

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously under 3000 rpm engine speed.

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when all the malfunction criteria below are completed more than 10 times in a row.

Judgment Value

Malfunction Criteria	Threshold Value
Cylinder number identification	Completed
Amount of crank sensor signal during 1 rev.	Not = 30

Time Needed for Diagnosis: 10 engine rotations
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
Cylinder number distinction	Completed
Amount of crank 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

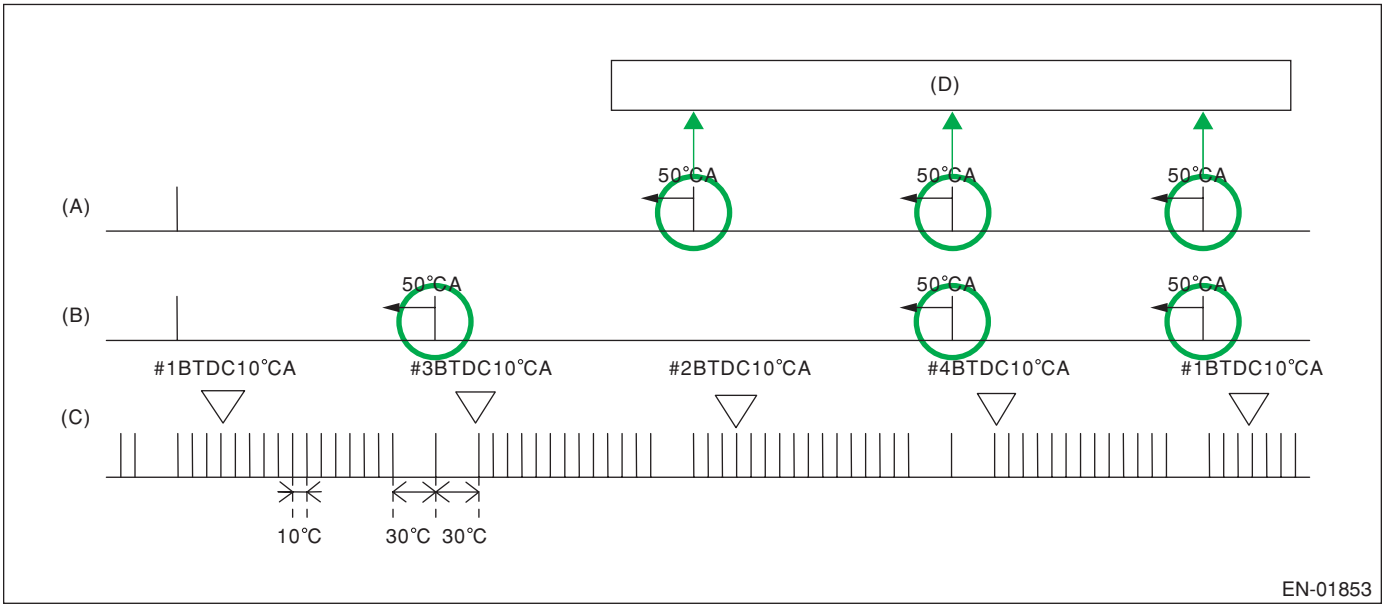
Memorize the freeze frame data. (For test mode $02)

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



(A) Camshaft signal (RH)
(B) Camshaft signal (LH)
(C) Crankshaft signal
(D) Number of camshaft position signals = When normal, there will be 3 cam signals for every 2 engine revolutions.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Voltage	≥ 8 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

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 engine revs.
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when the following criteria are established.

Judgment Value

Malfunction Criteria	Threshold Value
Number of camshaft angle sensor signals during 2 revs.	3

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

- Ignition timing whole learning compensation:
  – Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when IG OFF, and then make the whole learning incomplete.
  – Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when making a normality judgment from abnormality judgment, and then make the whole learning incomplete.
- Ignition timing partial learning compensation:
  – Enter the initial value (0° CA) to the compensation value of partial learning zone with IG OFF.
  – Enter the initial value (0° CA) to the compensation value of the partial learning zone when making a normality judgment → abnormality judgment.
- AVCS control:
  – Maximum timing retard learning is not complete or maximum timing retard learning completion is not experienced.
  – ⇒ ISC feedback compensation: Do not perform the AVCS actual timing advance compensation.
  – Make the OCV driving Duty to be the given value (9.36%).

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

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

NOTE:
For diagnostic procedure, refer to DTC P0340. <Ref. to GD(H4DOTC)-120, 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 leaks and clogging of the secondary air injection system.
When the secondary air injection system is operating (pump ON, with both left and right combination valves open), close left and right combination valves individually, and detect NG of the secondary air supply pipe pressure and secondary air piping flow.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Estimate ambient temperature	4.4°C (39.92°F)
Battery voltage	10.9 V
After secondary air injection system operation	0.6 seconds
Battery voltage	7 V
Atmosphere pressure	563 mmHg
Engine	In operation
(Pressure measuring conditions)	
After the electrical loading has changed (Air conditioner, power steering, lamp, rear defroster, heater fan, radiator fan, neutral switch)	5 seconds or more
Amount of intake air	2 g (0.07 oz)/seconds or more and Less than 15 g (0.53 oz)/seconds
Engine speed	≥ 800 rpm and ≤ 3800 rpm
Vehicle speed	≤ 0 km/h
Canister purge duty	≥0%
Amount of the engine speed change every 128 milliseconds	< 40 rpm

3. GENERAL DRIVING CYCLE

Perform diagnosis while secondary pump is operating

4. DIAGNOSTIC METHOD

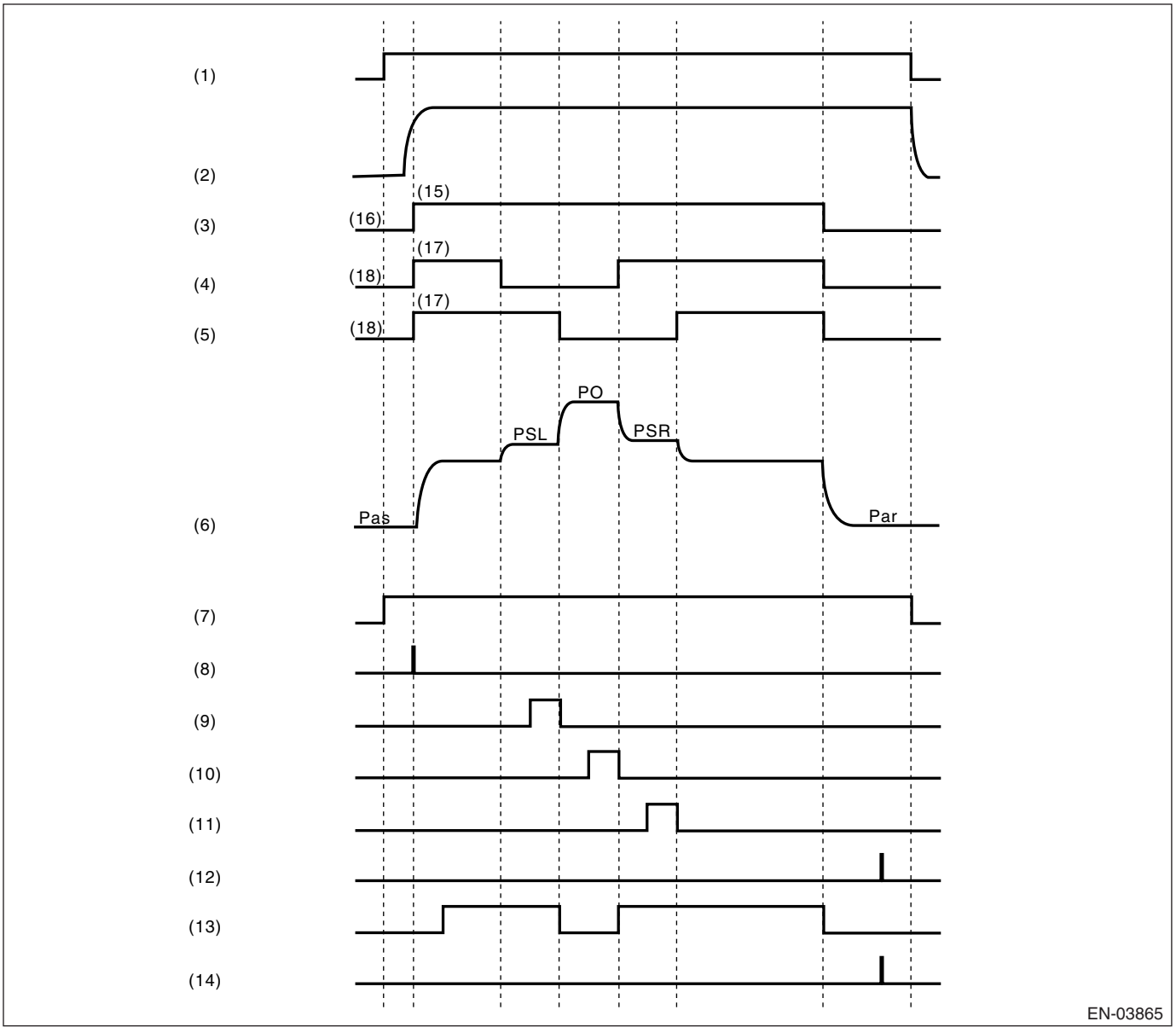
When the secondary air injection system is operating (pump ON, with both left and right combination valves open), close left and right combination valves individually as shown below, and measure secondary air supply pipe pressure and secondary air piping flow. Detect for NG through a pump supply pressure check and flow amount check.

Pump Supply Pressure Check

When the secondary air supply piping pressure during secondary air pump ON is small in comparison to the atmospheric pressure, it is judged as a pump supply pressure NG. If larger, it is judged as OK.

Flow Amount Check

During secondary air system operation (pump ON, left/right combination valve open), make right combination valve closed, → left combination valve closed, → right combination valve open → left combination valve open, and derive the secondary air supply pipe pressure (PSL, P0, PSR), and calculate the secondary air piping flow amount from the amount of pressure. Detect NG from the size of the secondary air piping flow amount.



(1) IG
(2) Ne
(3) Secondary air pump drive condition
(4) E-COMB valve (Right) condition
(5) E-COMB valve (Left) condition
(6) Secondary air supply piping pressure (psai)
(7) Diagnosis execution conditions
(8) Atmospheric pressure before secondary air control (Pas) measurement
(9) Right bank shut off pressure (PSL) measurement
(10) Both bank shut off pressure (P0) measurement
(11) Left bank shut off pressure (PSR) measurement
(12) Atmospheric pressure after secondary air control (Par) measurement
(13) Pump supply pressure check (Judgement)
(14) Flow amount check (Judgement)
(15) ON
(16) OFF
(17) Open
(18) Close

Judgment Value

When the following conditions are established, it is judged as NG. if they are not established, the NG is cleared.

Pump Supply Pressure Check

Malfunction Criteria	Threshold Value	DTC
Secondary air supply piping relative pressure	< Value from Map 14	P0410

Map 14

Unit: (kPa (mmHg, inHg))		Atmospheric pressure (kPa (mmHg, inHg))							
		69.3 (520, 20.47)	74.6 (560, 22.03)	80.0 (600, 23.63)	85.3 (640, 25.19)	90.6 (680, 26.76)	96.0 (720, 28.35)	101.3 (760, 29.92)	106.6 (800, 31.48)
Battery voltage (V)	10.5	0.93 (7, 0.275)	0.93 (7, 0.275)	0.93 (7, 0.275)	0.93 (7, 0.275)	0.93 (7, 0.275)	0.93 (7, 0.275)	0.93 (7, 0.275)	0.93 (7, 0.275)
	11.5	0.93 (7, 0.275)	0.93 (7, 0.275)	0.93 (7, 0.275)	0.93 (7, 0.275)	0.93 (7, 0.275)	0.93 (7, 0.275)	0.93 (7, 0.275)	0.93 (7, 0.275)
	12.5	0.93 (7, 0.275)	0.93 (7, 0.275)	0.93 (7, 0.275)	0.93 (7, 0.275)	0.93 (7, 0.275)	0.93 (7, 0.275)	0.93 (7, 0.275)	0.93 (7, 0.275)
	13.5	0.93 (7, 0.275)	0.93 (7, 0.275)	0.93 (7, 0.275)	0.93 (7, 0.275)	0.93 (7, 0.275)	0.93 (7, 0.275)	0.93 (7, 0.275)	0.93 (7, 0.275)
	14.5	0.93 (7, 0.275)	0.93 (7, 0.275)	0.93 (7, 0.275)	0.93 (7, 0.275)	0.93 (7, 0.275)	0.93 (7, 0.275)	0.93 (7, 0.275)	0.93 (7, 0.275)
	15.5	0.93 (7, 0.275)	0.93 (7, 0.275)	0.93 (7, 0.275)	0.93 (7, 0.275)	0.93 (7, 0.275)	0.93 (7, 0.275)	0.93 (7, 0.275)	0.93 (7, 0.275)

Flow Amount Check

Malfunction Criteria	Threshold Value	DTC
Flow error Estimated secondary air amount when bank 1 is open or Estimated secondary air amount when bank 2 is open Map (P0 vs PSL)	 > Value from Map 20 > Value from Map 19	P0411
Bank 1 stuck open Estimated secondary air amount when bank 1 is open and Both bank shut off pressure	 < Value from Map 16 < Value from Map 18	P2440
Bank 1 stuck closed Estimated secondary air amount when bank 1 is open and Both bank shut off pressure	 < Value from Map 16 ≥ Value from Map 18	P2441
Bank 2 stuck open Estimated secondary air amount when bank 2 is open and Both bank shut off pressure	 < Value from Map 15 < Value from Map 18	P2442
Bank 2 stuck closed Estimated secondary air amount when bank 2 is open and Both bank shut off pressure	 < Value from Map 15 ≥ Value from Map 18	P2443

Map 15, Map 16

Unit: ℓ/min		Amount of intake air flow (g(oz)/s)								
		7 (0.247)	8 (0.282)	9 (0.317)	10 (0.353)	11 (0.388)	12 (0.423)	13 (0.459)	14 (0.494)	15 (0.529)
Battery voltage (V)	11.0	4.1	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	11.5	4.1	4.1	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	12.0	4.1	4.1	4.1	1.0	1.0	1.0	1.0	1.0	1.0
	12.5	10.0	10.0	10.0	4.1	4.1	4.1	1.0	1.0	1.0
	13.0	17.5	17.5	17.5	10.0	10.0	10.0	4.1	1.0	1.0
	13.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	4.1	4.1
	14.0	17.5	17.5	17.5	17.5	17.5	17.5	17.5	10.0	10.0
	14.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	10.0	10.0

Map 18

Unit: (kPa (mmHg, inHg))		Atmospheric pressure (kPa (mmHg, inHg))							
		69.3 (520, 20.47)	74.6 (560, 22.03)	80.0 (600, 23.63)	85.3 (640, 25.19)	90.6 (680, 26.76)	96.0 (720, 28.35)	101.3 (760, 29.92)	106.6 (800, 31.48)
Battery voltage (V)	10.5	78.0 (585, 23.03)	84.0 (630, 24.80)	90.0 (675, 26.58)	96.0 (720, 28.35)	102.0 (765, 30.13)	108.0 (810, 31.90)	114.0 (855, 33.67)	120.0 (900, 35.44)
	11.5	79.3 (595, 23.42)	85.4 (641, 25.22)	91.6 (687, 27.05)	97.7 (733, 28.86)	103.7 (778, 30.63)	109.8 (824, 32.43)	116.0 (870, 34.26)	122.1 (916, 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)

Map 19, Map 20

Unit: ℓ/min		Amount of intake air flow (g(oz)/s)								
		2.0 (0.071)	4.0 (0.141)	6.0 (0.212)	8.0 (0.282)	10.0 (0.353)	12.0 (0.423)	14.0 (0.494)	16.0 (0.564)	18.0 (0.635)
Battery voltage (V)	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

Time Needed for Diagnosis: 7 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

BD:DTC P0411 SECONDARY AIR INJECTION SYSTEM INCORRECT FLOW DETECTED

NOTE:
For the diagnostic procedure, refer to DTC P0410. <Ref. to GD(H4DOTC)-123, DTC P0410 SECONDARY AIR INJECTION SYSTEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

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 OFF 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 OFF 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)

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

NOTE:
For the diagnostic procedure, refer to DTC P0413. <Ref. to GD(H4DOTC)-129, DTC P0413 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “A” CIRCUIT OPEN , Diagnostic Trouble Code (DTC) Detecting Criteria.>

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

NOTE:
For the diagnostic procedure, refer to DTC P0414. <Ref. to GD(H4DOTC)-130, 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

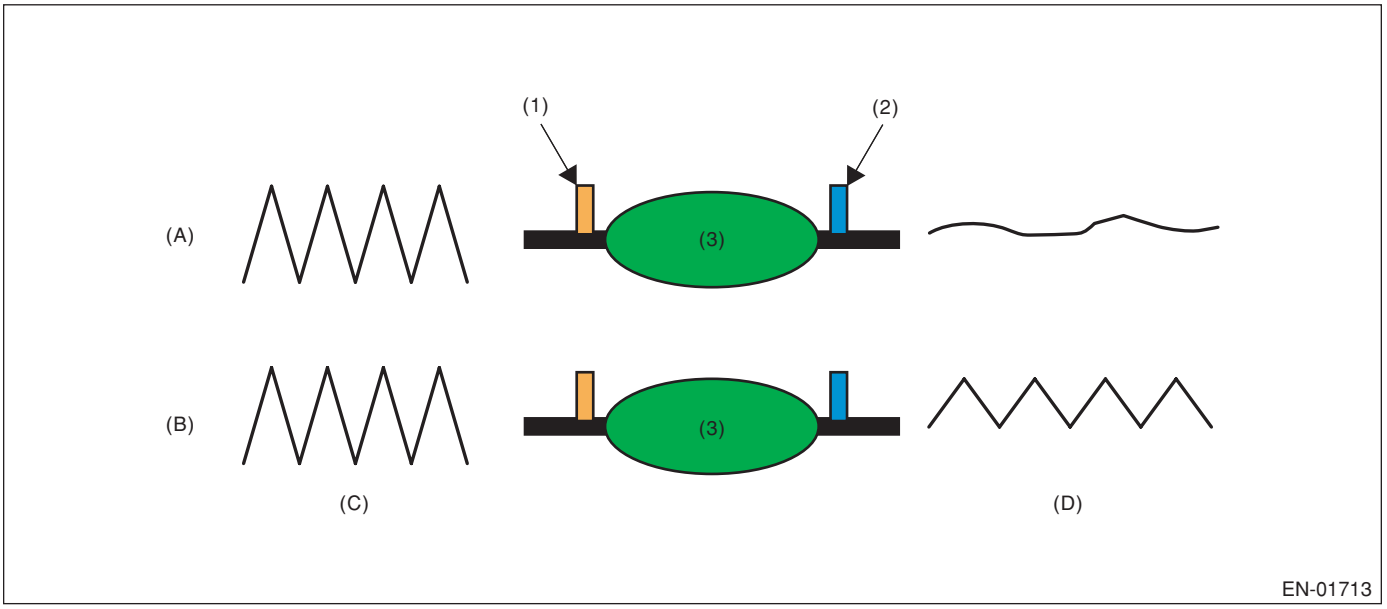
Memorize the freeze frame data. (For test mode $02)

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



(1) Front oxygen (A/F) sensor
(2) Rear oxygen sensor
(3) Catalytic converter
(A) Normal
(B) Deterioration
(C) Output waveform from the front oxygen (A/F) sensor
(D) Output waveform from the rear oxygen sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
Atmosphere pressure	> 75.0 kPa (563 mmHg, 22.2 inHg)
Engine coolant temperature	≥ 70°C (158°F)
Catalyst warm-up counter (Map 2)	≥ 8000
Misfire detection every 200 rotations	< 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.

Map 2

Add the following value every 512 milliseconds.

Catalyst warm-up counter≤ 9000

Amount of intake air (g/s)	0	5	7.5	10	15	20	25	30	35	40	45	50
Total value for warm-up counter	–5	–5	1	11	25	40	57	72	87	100	100	100

Catalyst warm-up counter> 9000

Amount of intake air (g/s)	0	5	7.5	10	15	20	25	30	35	40	45	50
Total value for warm-up counter	–16	–8	–1	3	6	8	9	11	13	14	14	14

4. GENERAL DRIVING CYCLE

After warm-up, perform the diagnosis only once at a constant 75 km/h (47 MPH).

5. DIAGNOSTIC METHOD

After the execution 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

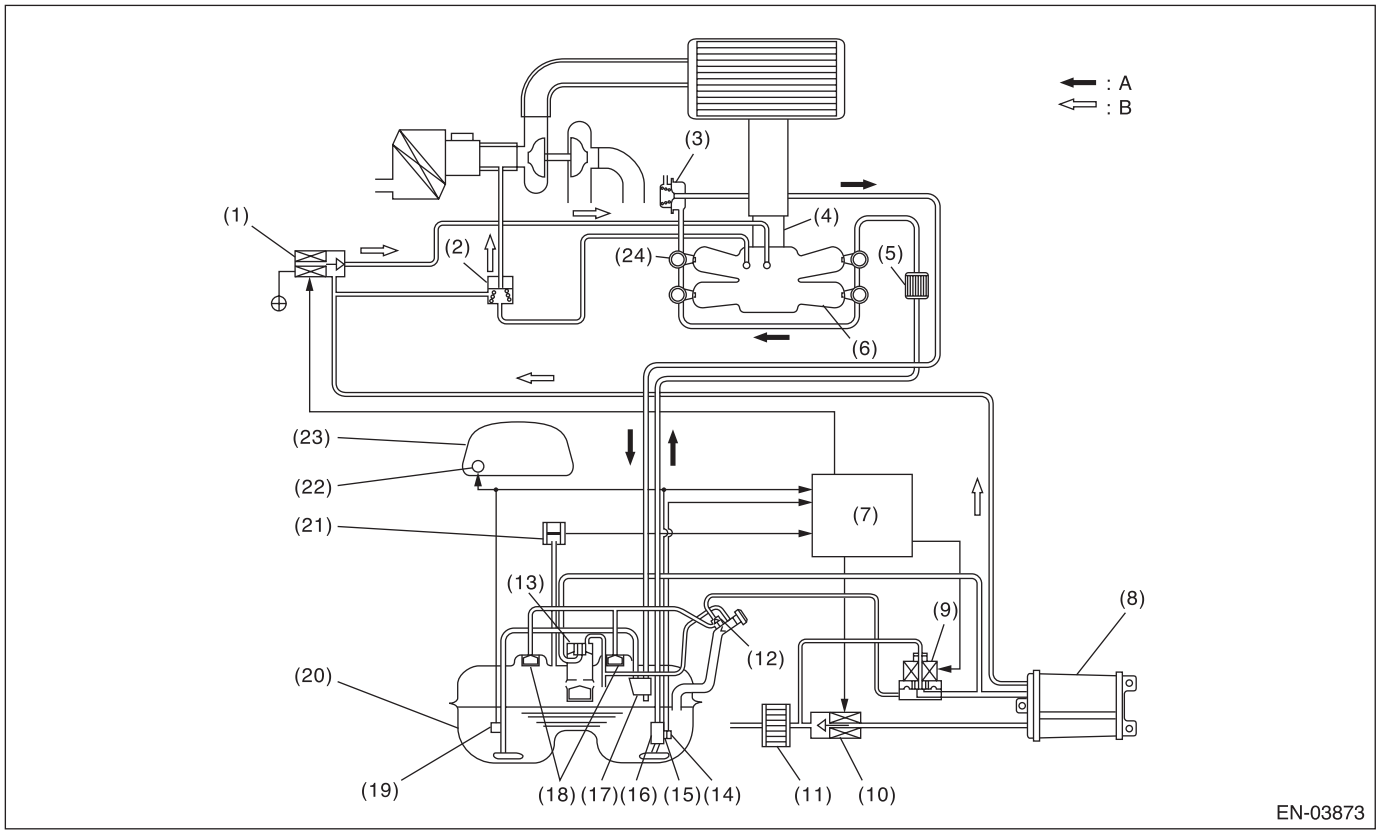
9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

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

1. OUTLINE OF DIAGNOSIS

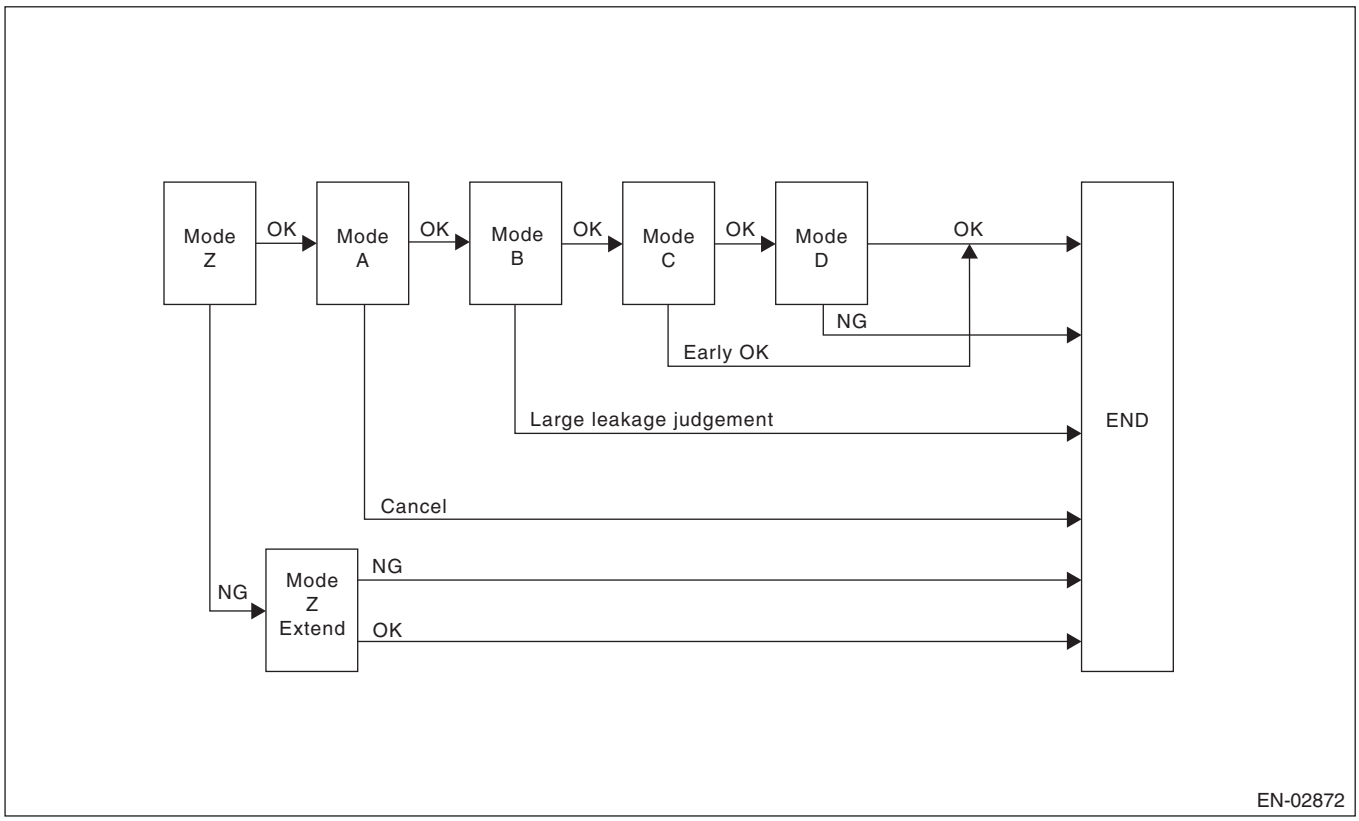
Check if there is a leakage in fuel system or not, and perform the function diagnosis of valve.



(1)	Purge control solenoid valve	(10)	Drain valve	(19)	Fuel sub level sensor
(2)	Purge valve	(11)	Drain filter	(20)	Fuel tank
(3)	Pressure regulator	(12)	Shut-off valve	(21)	Fuel tank pressure sensor
(4)	Throttle body	(13)	Vent valve	(22)	Fuel gauge
(5)	Fuel filter	(14)	Fuel temperature sensor	(23)	Combination meter
(6)	Intake manifold	(15)	Fuel level sensor	(24)	Fuel injector
(7)	Engine control module (ECM)	(16)	Fuel pump		
(8)	Canister	(17)	Jet pump	(A)	Fuel line
(9)	Pressure control solenoid valve	(18)	Fuel cut valve	(B)	Vaporized fuel line

In this system diagnosis, check for leakage and valve function is conducted by changing the fuel tank pressure and monitoring the pressure change using the fuel tank pressure sensor. When in 0.04 inch diagnosis, perform in the order of mode Z → mode A → mode B → mode C and mode D; When in 0.02 inch diagnosis, perform in the order of mode A → mode B → mode C → mode D and mode E.

0.04-inch Diagnosis

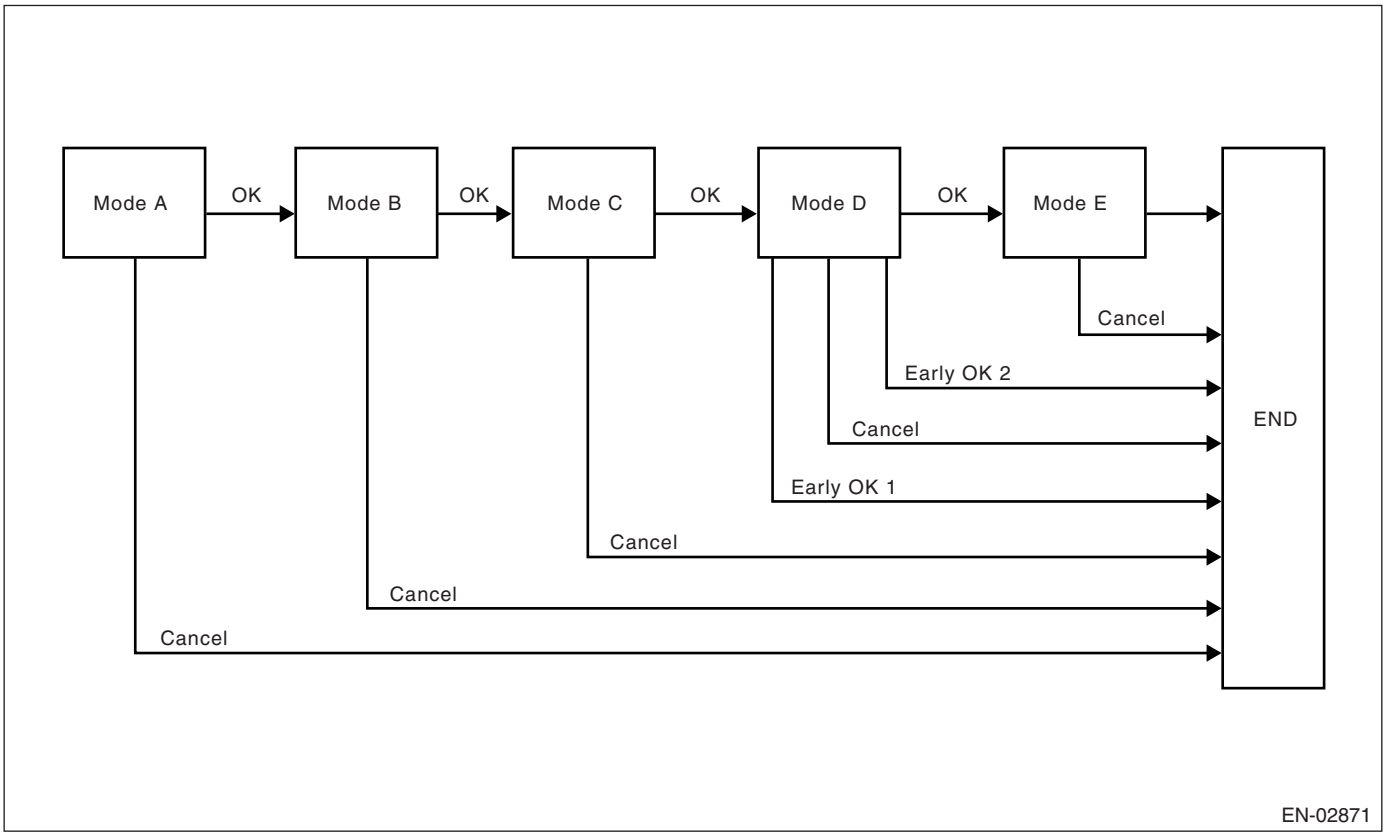


Mode	Mode Description	Diagnosis Period
Mode Z (Purge control solenoid valve opening failure diagnosis)	Perform purge control solenoid valve opening failure diagnosis from the size of tank pressure variation from diagnosis start.	3 — 16 seconds
Mode A (Estimated evaporation amount)	Calculate the tank pressure change amount (P1).	10 seconds
Mode B (Sealed negative pressure, large leakage judgment)	Decrease the pressure in the tank to target value by introducing intake hose pressure to the fuel tank. If the tank pressure cannot be reduced, it is diagnosed as large leak.	5 — 25 seconds
Mode C (Pressure increase check, advanced OK judgment)	Wait until the tank pressure returns to the target (start level of P2 calculation). If the tank pressure does not become the value, make advanced OK judgment.	1 — 15 seconds
Mode D (Negative pressure variation measurement, evaporation leakage diagnosis)	Calculate the tank pressure variation (P2), and obtain the diagnostic value using P1 found in Mode A. Perform the evaporation diagnosis using the diagnostic value.	10 seconds

Mode Table for Evaporative Emission Control System Diagnosis

Mode	Behavior of 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

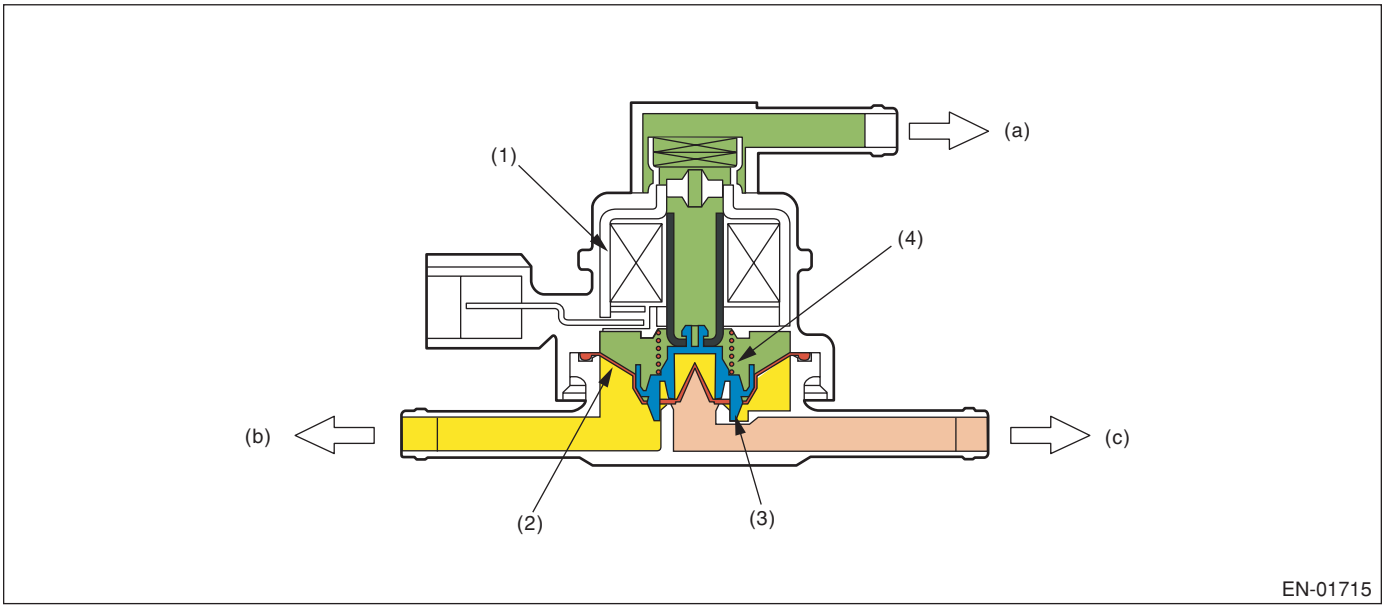


Mode	Mode Description	Diagnosis Period
Mode A (0 point compensation)	When the pressure in the tank is high, wait for until it returns to 0 point (Near 0 mmHg).	0 — 12 seconds
Mode B (Negative pressure introduced)	Decrease the pressure in the tank to target value by introducing intake hose pressure to 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 calculation)	Calculate the amount of evaporation (P1).	0 — 280 seconds

2. COMPONENT DESCRIPTION

Pressure Control Solenoid Valve

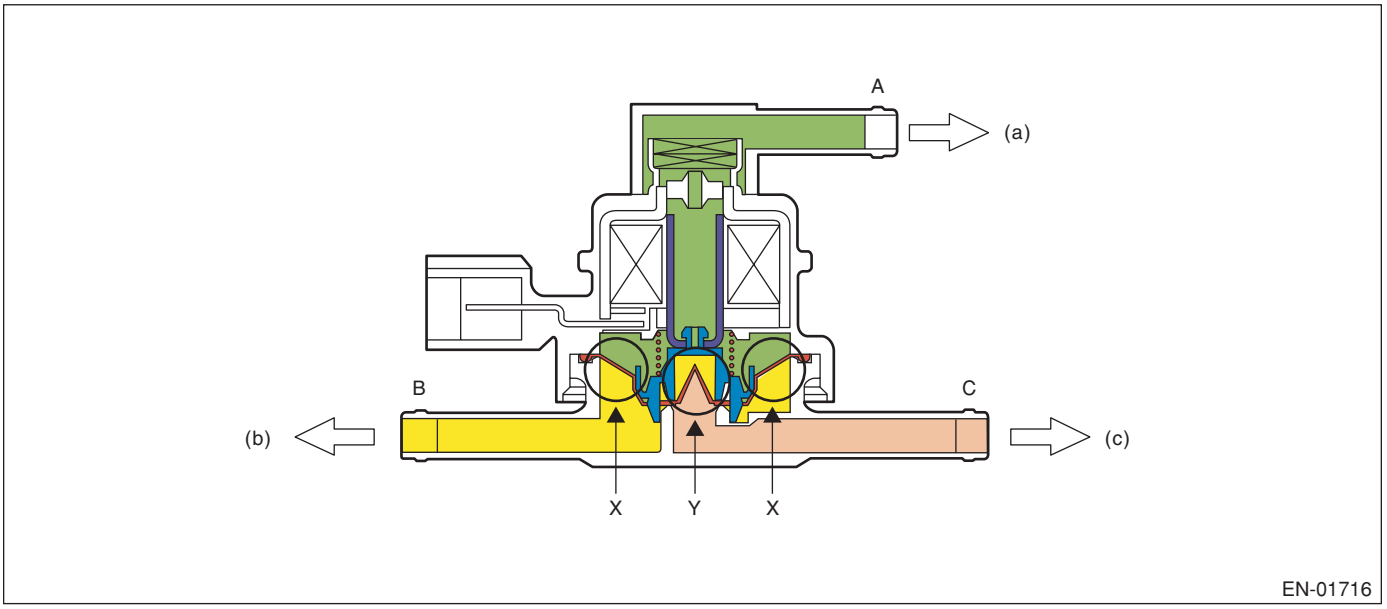
PCV controls the fuel tank pressure to be equal to the atmospheric air pressure. Normally, the solenoid is set to OFF. And the valve opens and closes mechanically in accordance with the pressure difference between tank and atmospheric air, or tank and canister.
The valve is forcibly opened by setting the solenoid to ON at the time of diagnosis.



(1) Solenoid
(2) Diaphragm
(3) Valve
(4) Spring
(a) Atmosphere pressure
(b) Fuel tank
(c) Canister

Valve Operation and Air Flow

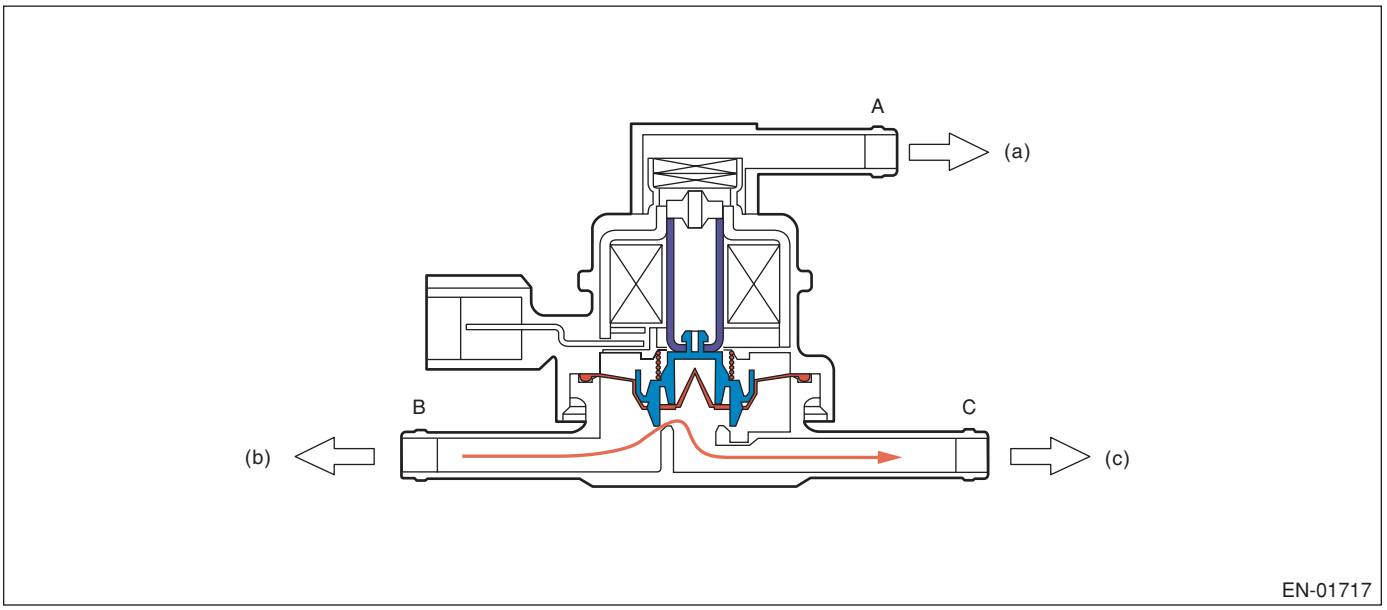
In the figure below, divided by the diaphragm, the part above X is charged with atmospheric air pressure, and the part below X is charged with tank pressure. Also, the part above Y is charged with tank pressure, and the part below Y is charged with canister pressure.
If the atmospheric air pressure port is A, tank pressure port is B, and canister pressure port is C, the air flows according to pressure difference from each port as shown in the table below.



(a) Atmosphere pressure (b) Fuel tank (c) Canister

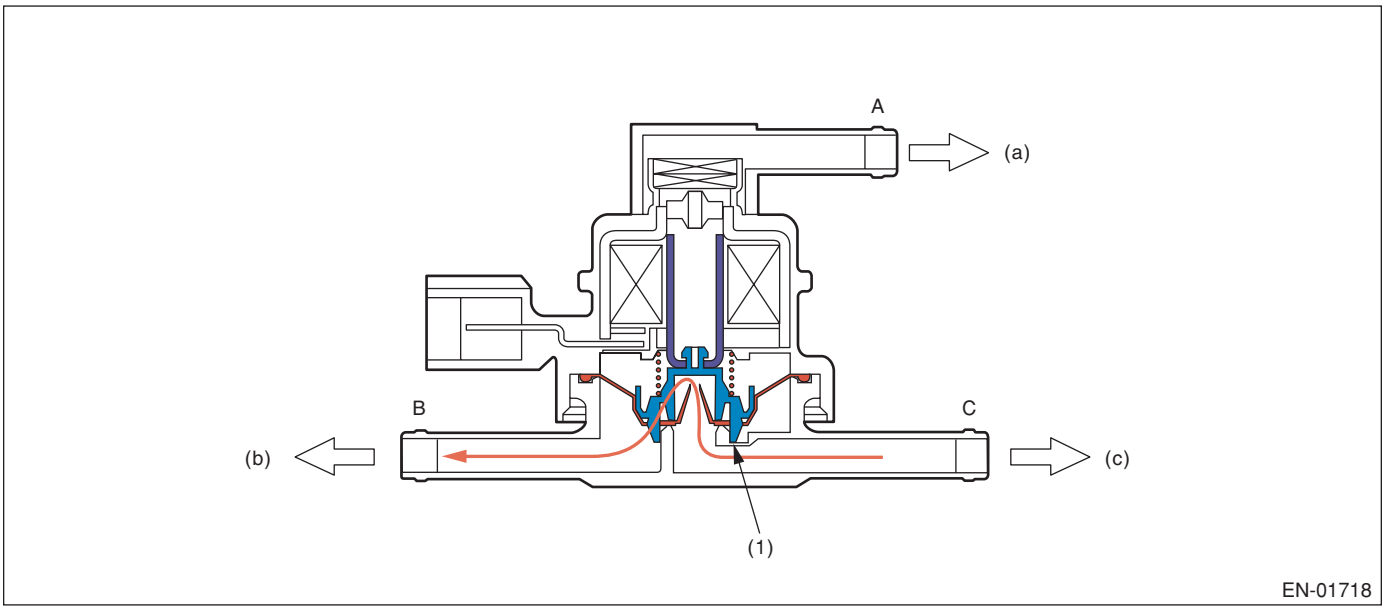
Condition of pressure	Flow
A < B (solenoid OFF)	B → C
B < C (solenoid OFF)	C → B
Solenoid ON	B ←→ C

When A < B (Solenoid OFF)



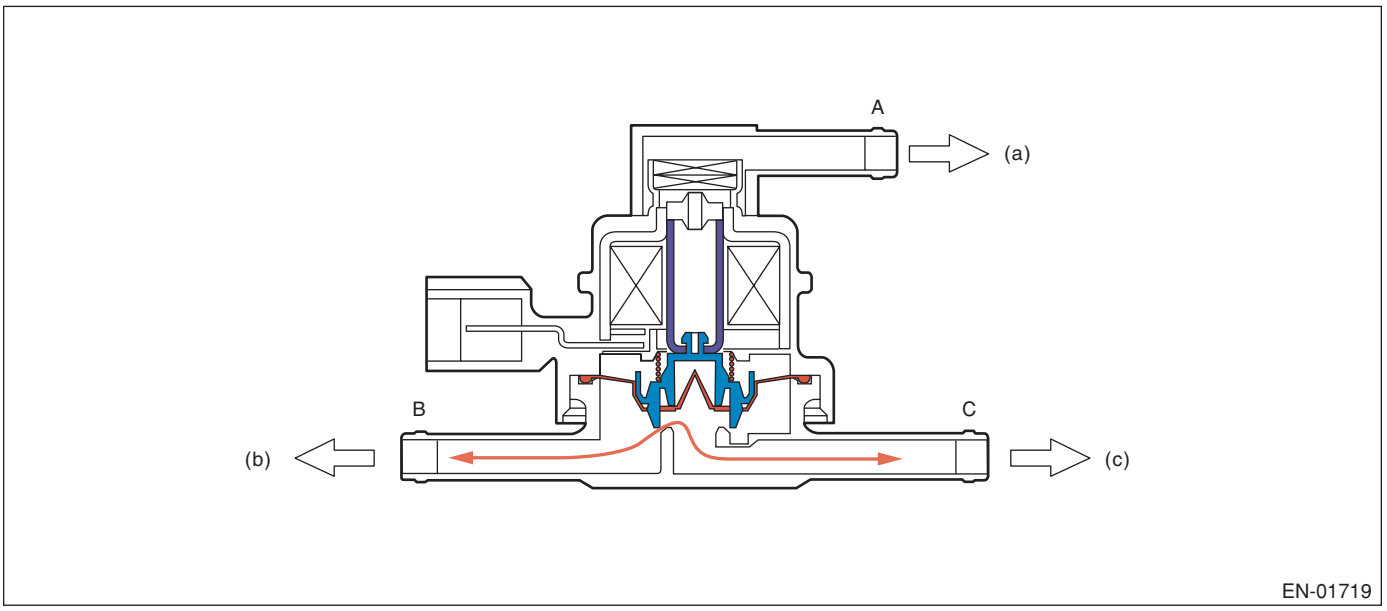
(a) Atmosphere pressure (b) Fuel tank (c) Canister

When B < C (Solenoid OFF)



(1) Valve
(a) Atmosphere pressure
(b) Fuel tank
(c) Canister

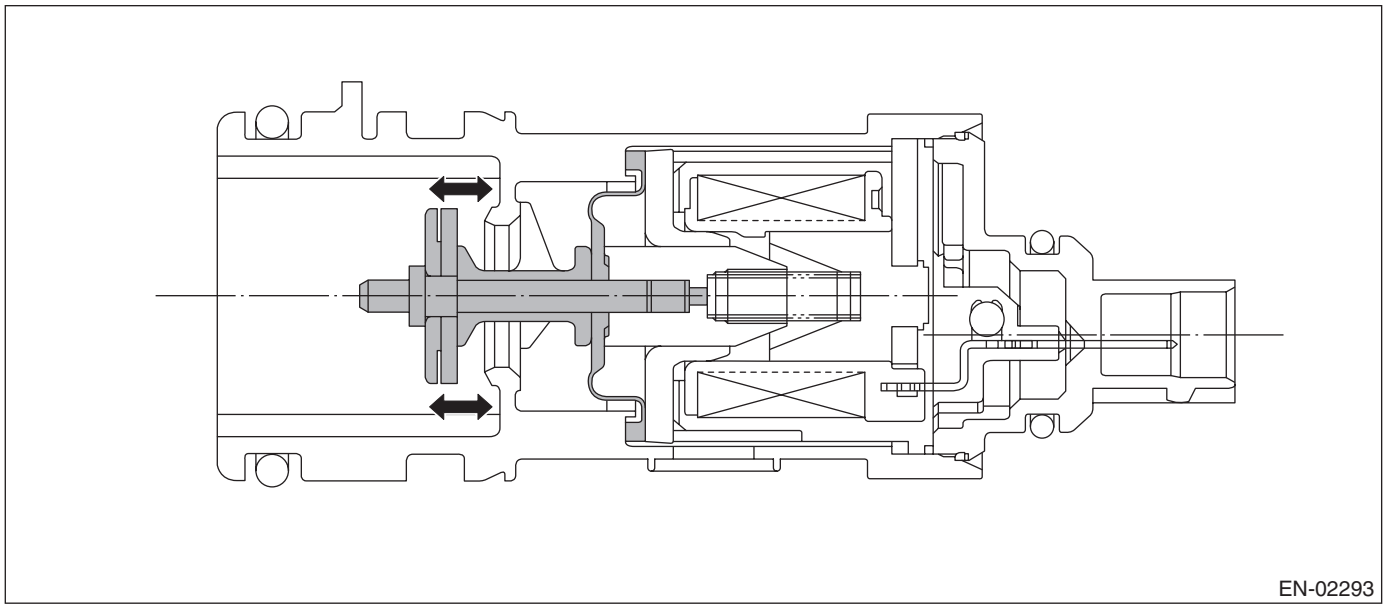
When Solenoid is ON



(a) Atmosphere pressure
(b) Fuel tank
(c) Canister

Drain valve

Drain valve controls the ambient air to be introduced to the canister.



3. ENABLE CONDITION

0.04-inch Diagnosis

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Barometric pressure	≥ 75.0 kPa (563 mmHg, 22.2 inHg)
Total time of canister purge operation	120 seconds or more
After engine starting	856 seconds or more
Learning value of evaporation gas density	≤ 0.04
Engine speed	1050 — 6500 rpm
Fuel tank pressure	≥ –1.4 kPa (–10.7 mmHg, –0.42 inHg)
Intake manifold relative vacuum (relative pressure)	< –13.3 kPa (–100 mmHg, –3.94 inHg)
Vehicle speed	≥ 32 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°C (14 — 113°F)
Intake air temperature	≥ –10°C (14°F)
Pressure change per second	< 0.23 kPa (1.7 mmHg, 0.07 inHg)
Minimum pressure change value every one second – Maximum pressure change value every one second	< 0.23 kPa (1.7 mmHg, 0.07 inHg)
Change of fuel level	< 2.5 ℓ/128 milliseconds (0.66 US gal/128 milliseconds, 0.55 Imp gal/128 milliseconds)
Air fuel ratio	0.76 — 1.25

0.02-inch Diagnosis

Secondary Parameters	Enable Conditions
(At starting a diagnosis)	
Evap. diagnosis	Incomplete
Battery voltage	≥ 10.9 V
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 temp.	–10 — 70°C (14 — 158°F)
Fuel level	9 — 51 ℓ (2.38 — 13.47 US gal, 1.98 — 11.22 Imp gal)
Intake manifold relative vacuum (relative pressure)	< –13.3 kPa (–100 mmHg, –3.93 inHg)
Fuel tank pressure	– 0.67 — 1.43 kPa (–5 — 10.7 mmHg, –0.20 — 0.42 inHg)
Vehicle speed	≥ 68 km/h (42 MPH)
Closed air/fuel ratio control	In operation
Engine speed	550 — 6000 rpm
(During diagnosis)	
Change of fuel level	≤ Value from Map
Pressure change every one second	< 0.06 kPa (0.44 mmHg, 0.02 inHg)
Minimum pressure change value every one second – Maximum pressure change value every one second	< 0.07 kPa (0.51 mmHg, 0.02 inHg)
| Pressure change in tank every second |	≤ 0.1 kPa (0.75 mmHg, 0.03 inHg)
Atmospheric pressure change (Mode D)	–0.47 — 0.32 kPa (–3.5 — 2.4 mmHg, –0.14 — 0.09 inHg)
Atmospheric pressure change (Mode E)	–0.32 — 0.32 kPa (–2.4 — 2.4 mmHg, –0.09 — 0.09 inHg)

Map

Fuel level (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 after 770 seconds or more after starting the engine, at a constant engine RPM of 68 km/h (42 MPH) or higher, to judge as NG or OK.
- If judgement cannot be made, repeat the diagnosis.
- Be careful of the remaining fuel level.

5. DIAGNOSTIC METHOD

Purge control solenoid valve stuck open fault diagnosis

DTC
P0457 Evaporative Emission Control System Leak Detected (Fuel Cap Loose/Off)

Purpose of Mode Z

When performing the leakage diagnosis of EVAP system, the purge control solenoid valve must operate normally. Therefore, mode Z is used to diagnose the purge control solenoid valve stuck open condition. Note that if a purge control solenoid valve stuck open fault is detected, the EVAP system leakage diagnosis is cancelled.

Diagnostic method

Purge control solenoid valve functional diagnosis is performed by monitoring the tank pressure in mode Z.

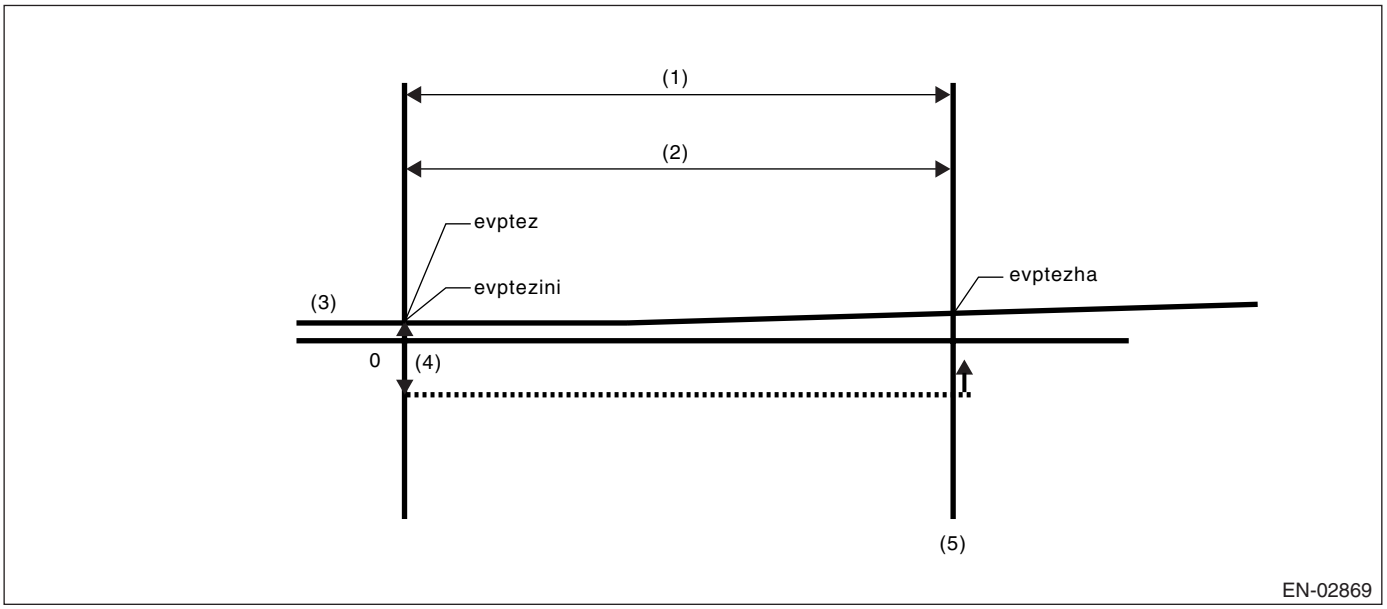
Normality Judgment

Judge OK and change to Mode A when the criteria below are completed in 3 seconds after Mode Z started.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
(Tank pressure when Mode Z started) – (Tank pressure when Mode Z finished)	≤ 0.4 kPa (3 mmHg, 0.12 inHg)	P0457

Normal



(1) Mode Z
(2) 3 seconds
(3) Fuel tank pressure
(4) 0.4 kPa (3.0 mmHg, 0.12 inHg)
(5) OK judgement

- evptez – evptezha ≤ 0.4 kPa (3.0 mmHg, 0.12 inHg)
- evptezini – evptezha ≤ 0.4 kPa (3.0 mmHg, 0.12 inHg)

Judge as normal when both calculations are established.

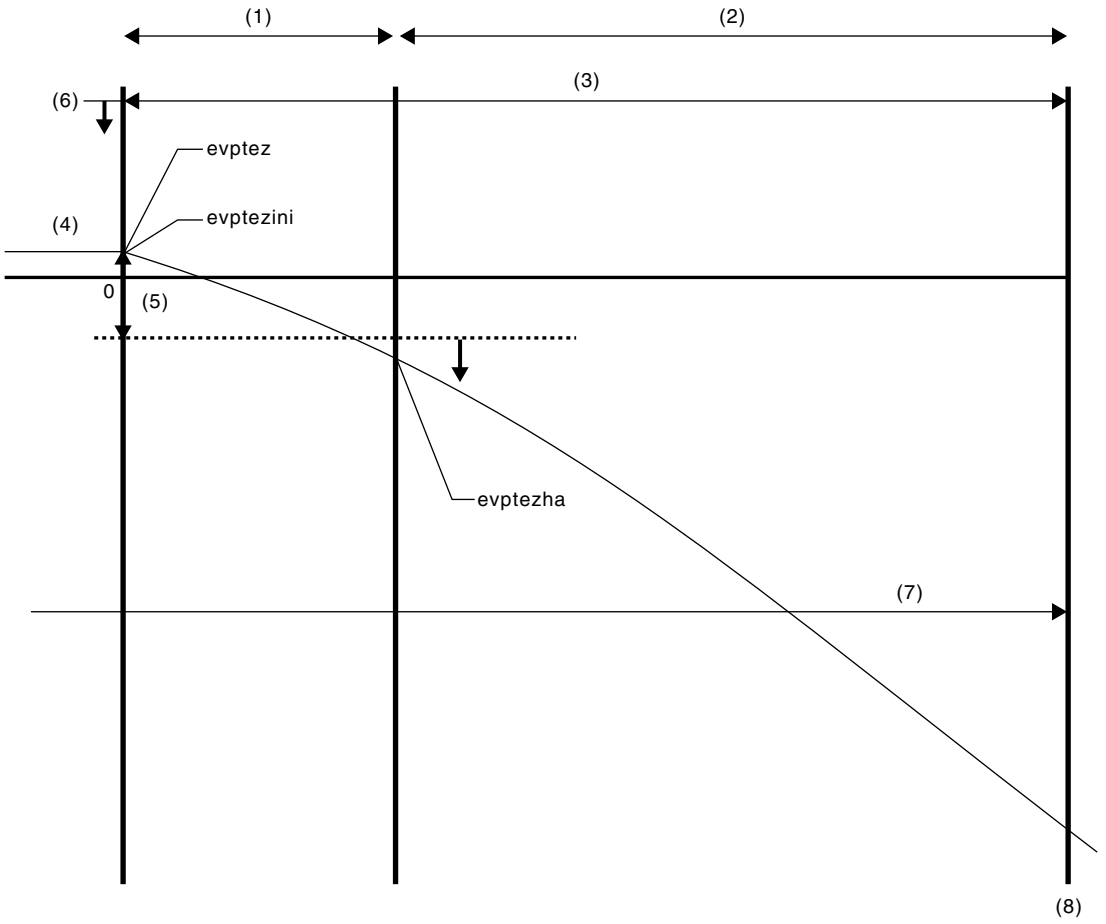
Abnormality Judgment
If OK judgment cannot be made, extend Mode Z 16 seconds more, and Judge as NG when all the criteria below are completed in 16 seconds.

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.

Purge Control Solenoid Valve Open Fixation



(1) Mode Z
(2) Expanded mode Z
(3) 16 seconds
(4) Fuel tank pressure
(5) 0.87 kPa (6.5 mmHg, 0.26 inHg)
(6) 1.43 kPa (10.7 mmHg, 0.42 inHg)
(7) Fuel must remain in a static condition for 40 seconds. (no sloshing)
(8) NG judgment

- evptezini, evptez ≤ 1.43 kPa (10.7 mmHg, 0.42 inHg)
- evptez – evptezha ≤ 0.87 kPa (6.5 mmHg, 0.26 inHg)
- evptezini – evptezha ≤ 0.87 kPa (6.5 mmHg, 0.26 inHg)
- No fuel sloshing of over 2 ℓ (0.53 US gal, 0.44 Imp gal) for more than 40 seconds

Judge as normal when all are established.

Leak Diagnosis

DTC
P0442 Evaporative Emission Control System Leak Detected (Small Leak)
P0457 Evaporative Emission Control System Leak Detected (Fuel Cap Loose/Off)

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 become the desired 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 targeted negative pressure	≥ 25 sec.	P0457
Or mode B time	≥ 10 sec.	
(Min. pressure value in tank when in mode B) – (Tank pressure when mode B started)	> –0.5 kPa (–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 change to Mode E when it does not return in spite of spending the specified time.

Tank pressure when starting calculation of P2	Time for advanced OK judgment
–1.3 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.
Abnormality Judgment
Judge as NG when the criteria below are met and judge as OK when not met.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
P2 – 1.5 × P1	> Value from Map 7	P0442
P2: Tank pressure that changes every 16 seconds in mode D	* Threshold value: Map (Remaining Fuel vs Tank temperature)	
P1: Tank pressure that changes every 16 seconds in mode A		

* 1.5: Evaporation amount compensation value when below negative pressure (Amount of evaporation occurrence increases as a vacuum condition increases.)

Map7 Fault criteria limit for Evaporative emission control system 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 for until it returns to 0 point (Near 0 mmHg). Shift to mode B when 0 point returns. Cancel the diagnosis when 0 point does not return in the specified time.
Mode B: (Negative pressure introduced)
Introduce negative pressure in the intake manifold to the tank.
Approximately 0 → –2.0 kPa (0 → –15 mmHg, 0 → –0.59 inHg)
When the pressure above (desired negative pressure) is reached, enters Mode C.
When the tank internal pressure does not reach the target vacuum pressure, the diagnosis is cancelled.
Mode C: (Negative pressure maintained)
Stop the introduction of negative pressure. (Wait until the tank pressure returns to the start level of P2 calculation.)
Change to Mode D either when the tank pressure returns to the start level of P2 calculation, or when the predetermined amount of time has passed.
Mode D: (Calculate the amount of negative pressure change)
Monitor the tank pressure in mode D, calculate (P2) the pressure change in the tank, and measure the time (evpdset) for the tank pressure to return when calculation of P2 is completed. Shift to Mode E when the tank pressure returns to the end level of P2 calculation. If tank internal pressure does not return to level of the P2 calculation end after the predetermined amount of time has passed, make advanced OK judgement or cancel the diagnosis.
Normality Judgment

Judge as OK when the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Advanced OK judgment 1	
Mode D holding time	≥ 30 sec.
Tank internal pressure	≤ –1.8 kPa (–13.4 mmHg, –0.53 inHg)
Advanced OK judgment 2	
Mode D holding time	≥ 200 sec.
P2	≤ 0.9 — 1.3 kPa (7 — 9.6 mmHg, 0.28 — 0.38 inHg)

Mode E: (Evaporation occurrence amount calculation)

Calculate the change of tank pressure with the time evpdset to judge as NG/OK according to the value of P1. (ambiguous determination acceptable).

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)

Map7 Fault criteria limit for Evaporative emission control system diagnosis

Time (evpdset) vs. Fuel level	0 second	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)

Map8 Fault criteria limit for Evaporative emission control system diagnosis

Time (evpdset) vs. Fuel level	0 second	30 seconds	80 seconds	100 seconds	150 seconds	200 seconds
0 L (0 US gal, 0 Imp gal)	0.16 kPa (1.2 mmHg, 0.05 inHg)	0.37 kPa (2.8 mmHg, 0.11 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)
10 L (2.64 US gal, 2.2 Imp gal)	0.16 kPa (1.2 mmHg, 0.05 inHg)	0.37 kPa (2.8 mmHg, 0.11 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)
30 L (7.93 US gal, 6.6 Imp gal)	0.16 kPa (1.2 mmHg, 0.05 inHg)	0.37 kPa (2.8 mmHg, 0.11 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)
50 L (13.21 US gal, 11.0 Imp gal)	0.16 kPa (1.2 mmHg, 0.05 inHg)	0.40 kPa (3.0 mmHg, 0.12 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)
60 L (15.85 US gal, 13.2 Imp gal)	0.16 kPa (1.2 mmHg, 0.05 inHg)	0.40 kPa (3.0 mmHg, 0.12 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)
70 L (18.49 US gal, 15.4 Imp gal)	0.16 kPa (1.2 mmHg, 0.05 inHg)	0.40 kPa (3.0 mmHg, 0.12 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)
80 L (21.14 US gal, 17.6 Imp gal)	0.16 kPa (1.2 mmHg, 0.05 inHg)	0.40 kPa (3.0 mmHg, 0.12 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)

Time Needed for Diagnosis: 65 — 516 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

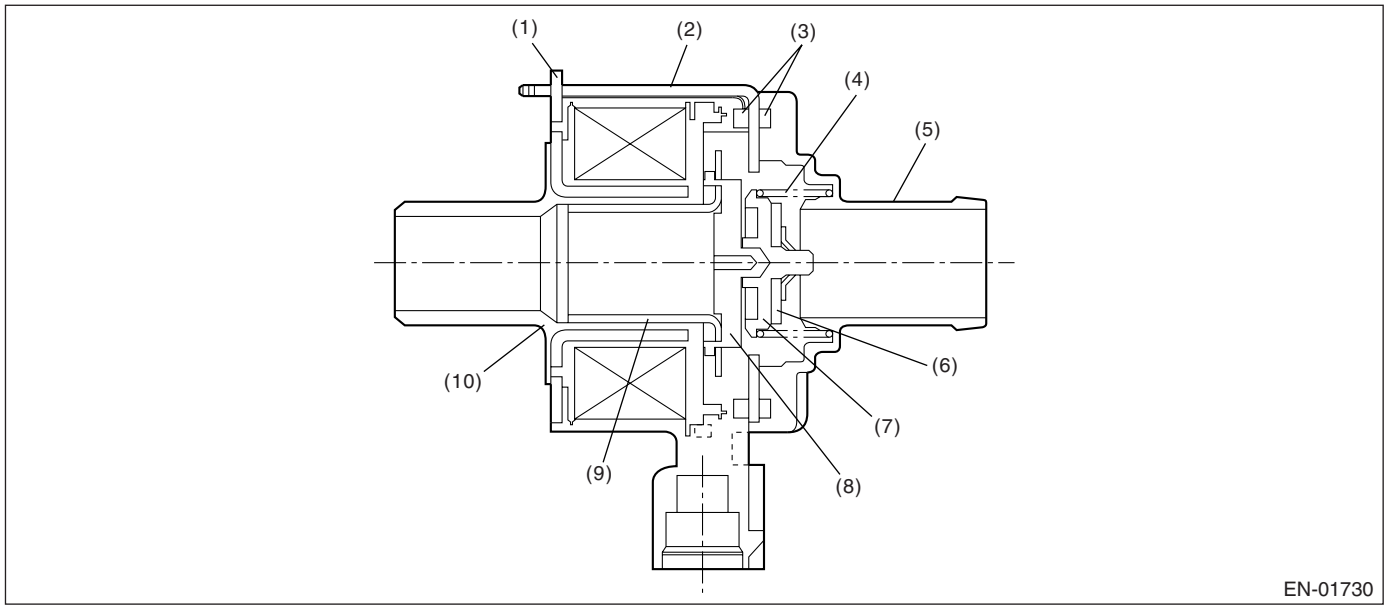
- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

BL: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) Packing
(4) Spring
(5) Valve seat
(6) Valve
(7) Plate
(8) Retainer
(9) Movable core
(10) Bobbin

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM 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 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

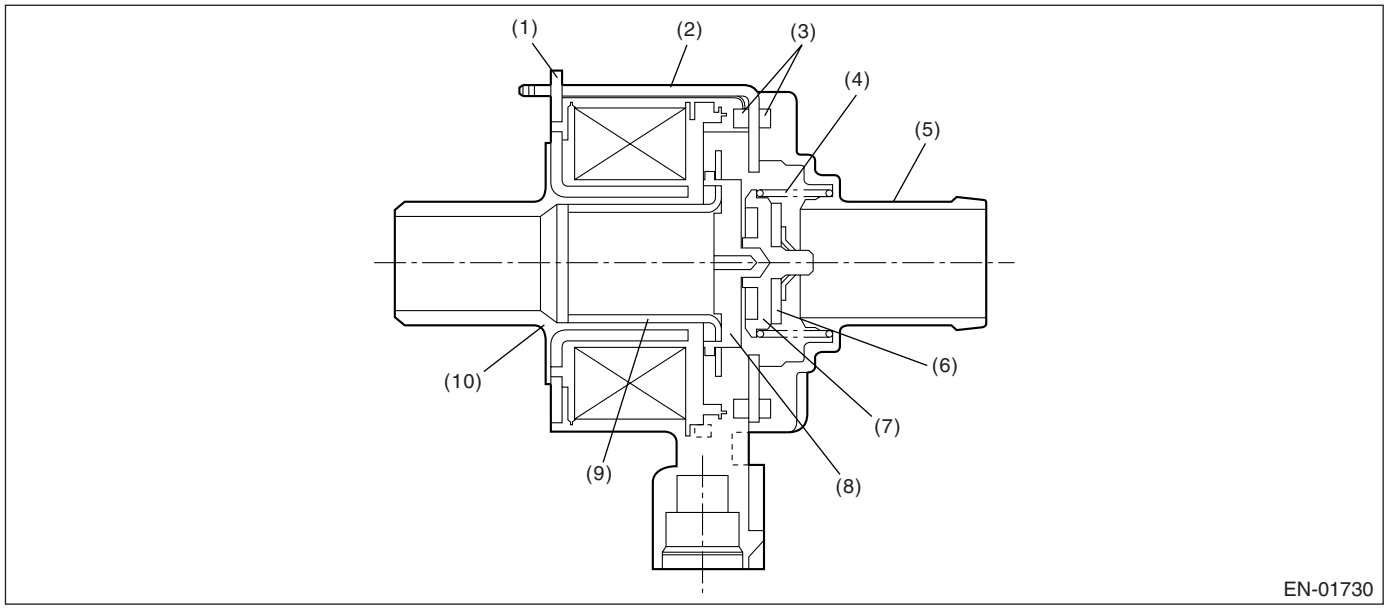
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the drain valve.
Judge as NG when the ECM output level differs from the actual terminal level.

2. COMPONENT DESCRIPTION



(1) Magnetic plate
(2) Yoke
(3) Packing
(4) Spring
(5) Valve seat
(6) Valve
(7) Plate
(8) Retainer
(9) Movable core
(10) Bobbin

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM outputs OFF 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 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	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

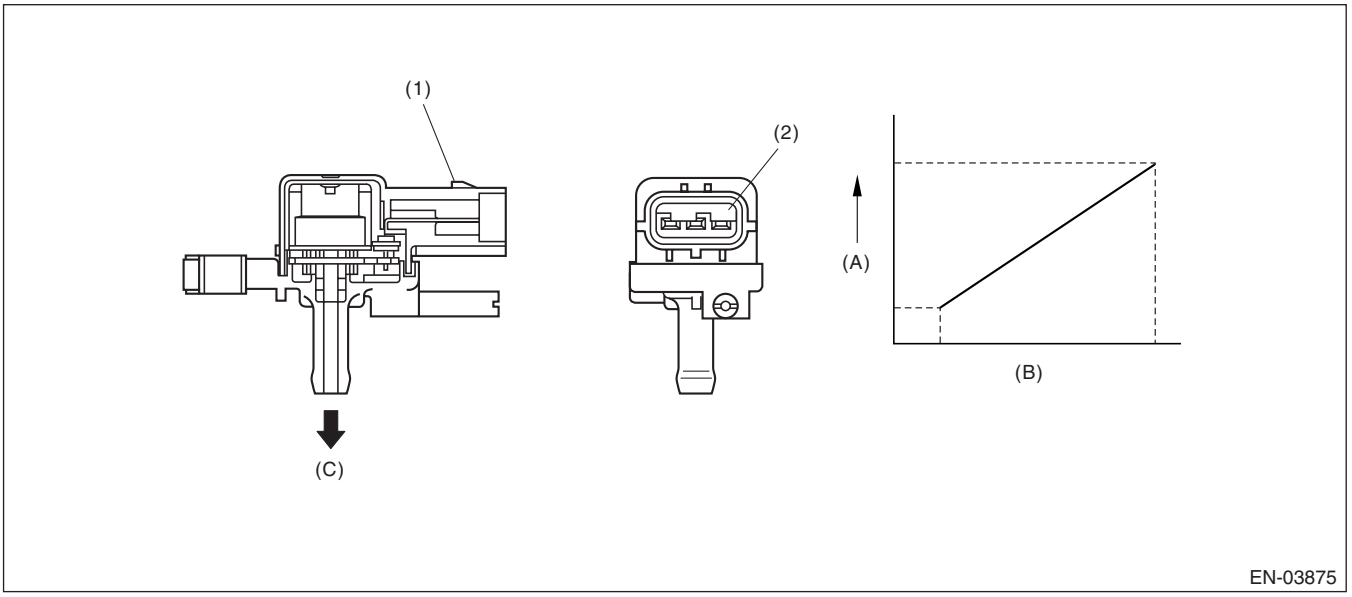
Memorize the freeze frame data. (For test mode $02)

BN:DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR

1. OUTLINE OF DIAGNOSIS

Detect the tank pressure sensor output property abnormality.
Judge NG when there is no pressure variation, which should exist in the tank, considering the engine status.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Terminal
(A) Output voltage
(B) Input voltage
(C) To fuel tank

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
After engine starting	60 seconds or more
Fuel level	≥ 9 ℓ (2.38 US gal, 1.98 Imp gal)
Fuel temperature	< 35°C (95°F)
Battery voltage	≥ 10.9 V
Atmosphere pressure	> 75.0 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.

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 more than 5 ℓ, 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

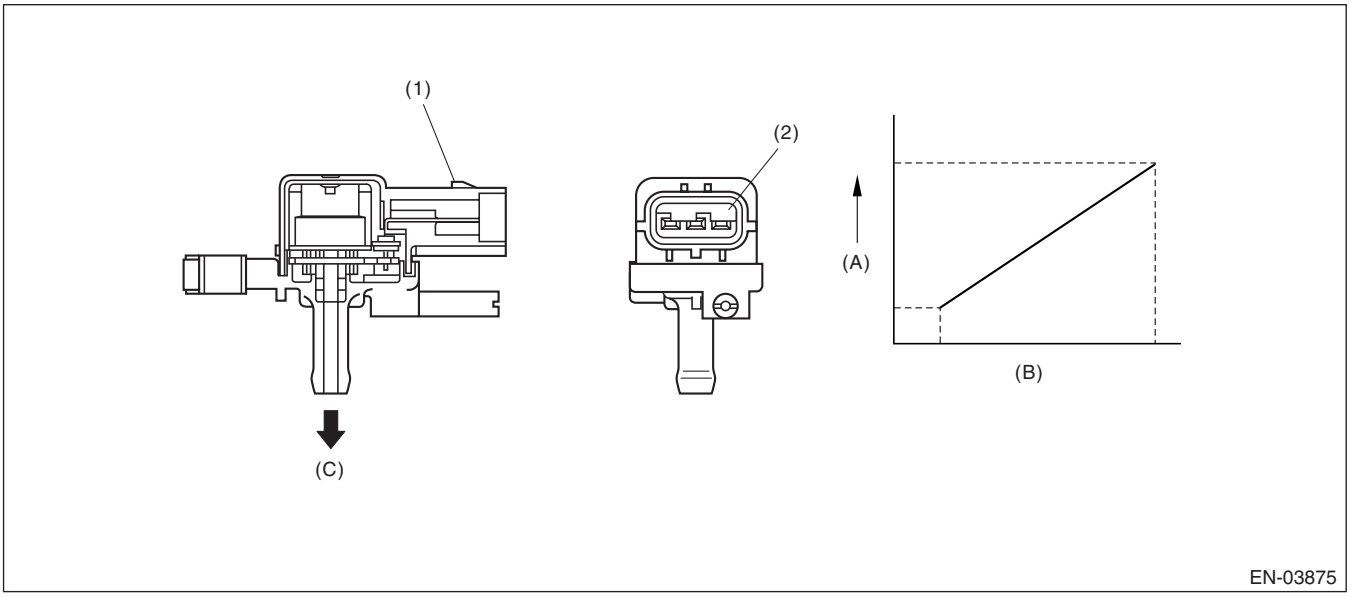
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the fuel tank pressure sensor.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Terminal
(A) Output voltage
(B) Input voltage
(C) To fuel tank

3. ENABLE CONDITION (USED WITH HIGH SIDE NORMAL/ABNORMALITY JUDGMENT ONLY)

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time until completing 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

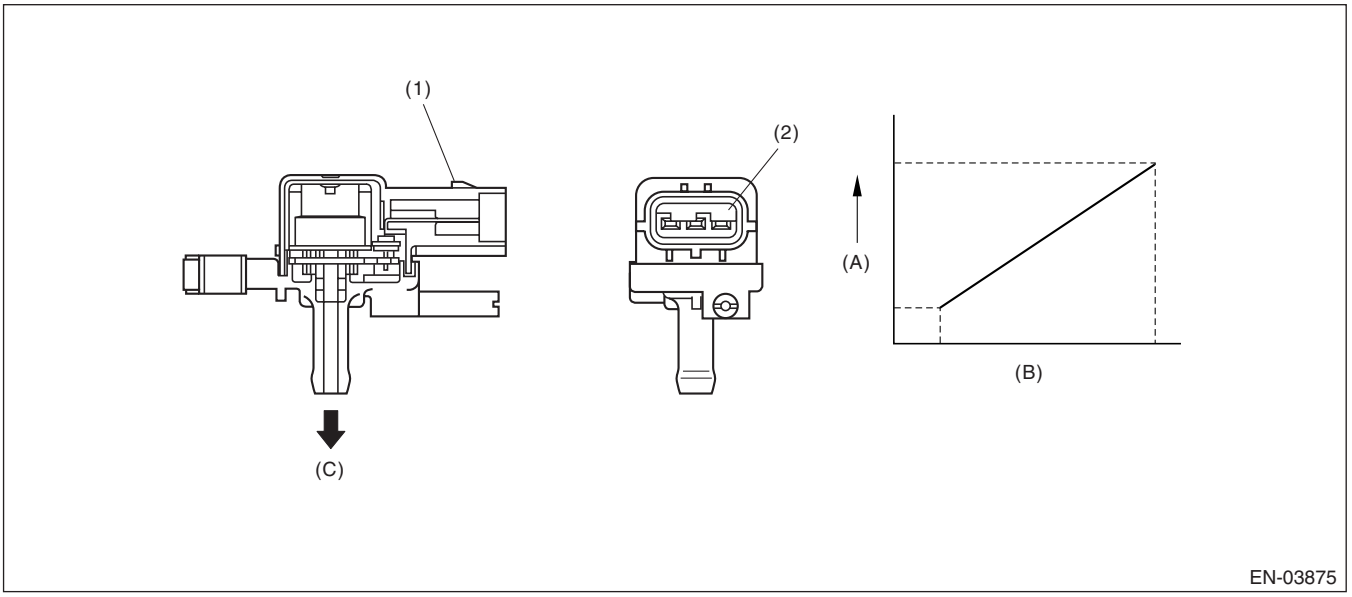
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the fuel tank pressure sensor.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Terminal
(A) Output voltage
(B) Input voltage
(C) To fuel tank

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Vehicle speed	≥ 2 km/h (1.24 MPH)
All conditions of EVAP canister purge	Complete
Learning value of evaporation gas density	≤ 0.08
Main feedback compensation coefficient	≥ 0.9
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Perform the diagnosis continually when purging.

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time until completing the malfunction criteria below becomes 15 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	≥ 7.98 kPa (59.85 mmHg, 2.36 inHg)
Fuel temperature	< 35°C (95°F)
Atmosphere 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)

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

NOTE:
For the detection conditions, refer to DTC P0442 Evaporative system (Small leak). <Ref. to GD(H4DOTC)-136, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

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

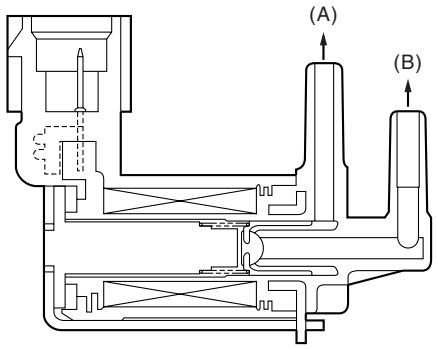
NOTE:
For the detection conditions, refer to DTC P0442 Evaporative system (Small leak). <Ref. to GD(H4DOTC)-136, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

BS: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



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(A) To canister (B) To intake manifold

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

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

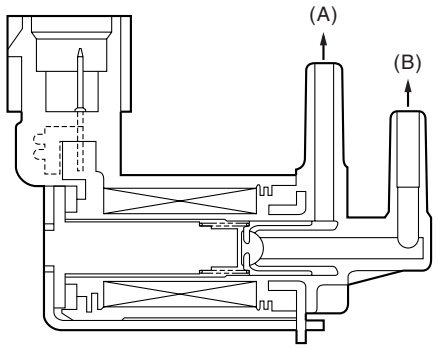
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the purge control solenoid valve.
Judge as NG when the ECM output level differs from the actual terminal level.

2. COMPONENT DESCRIPTION



EN-01733

(A) To canister (B) To intake manifold

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

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

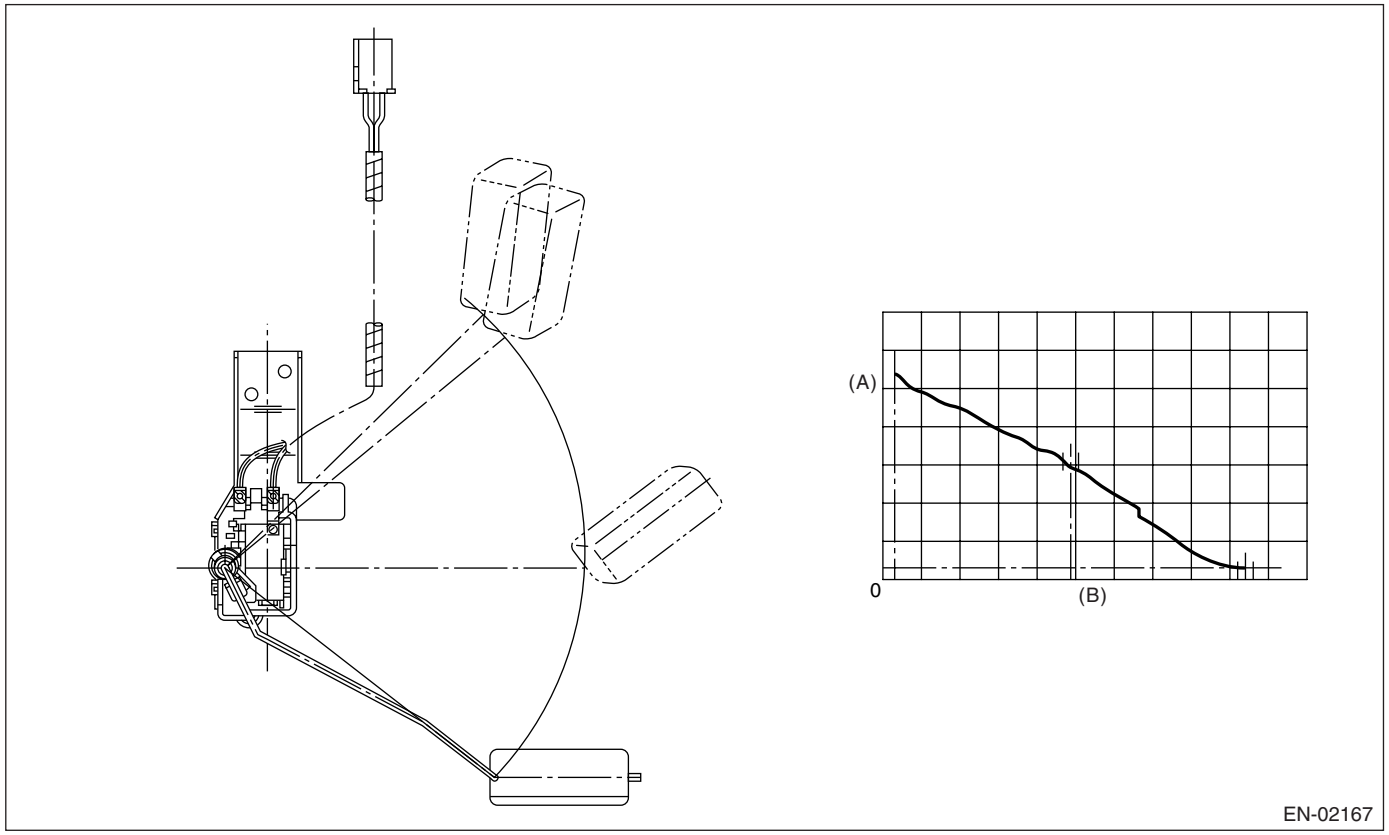
Memorize the freeze frame data. (For test mode $02)

BU: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.

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: Undecided
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

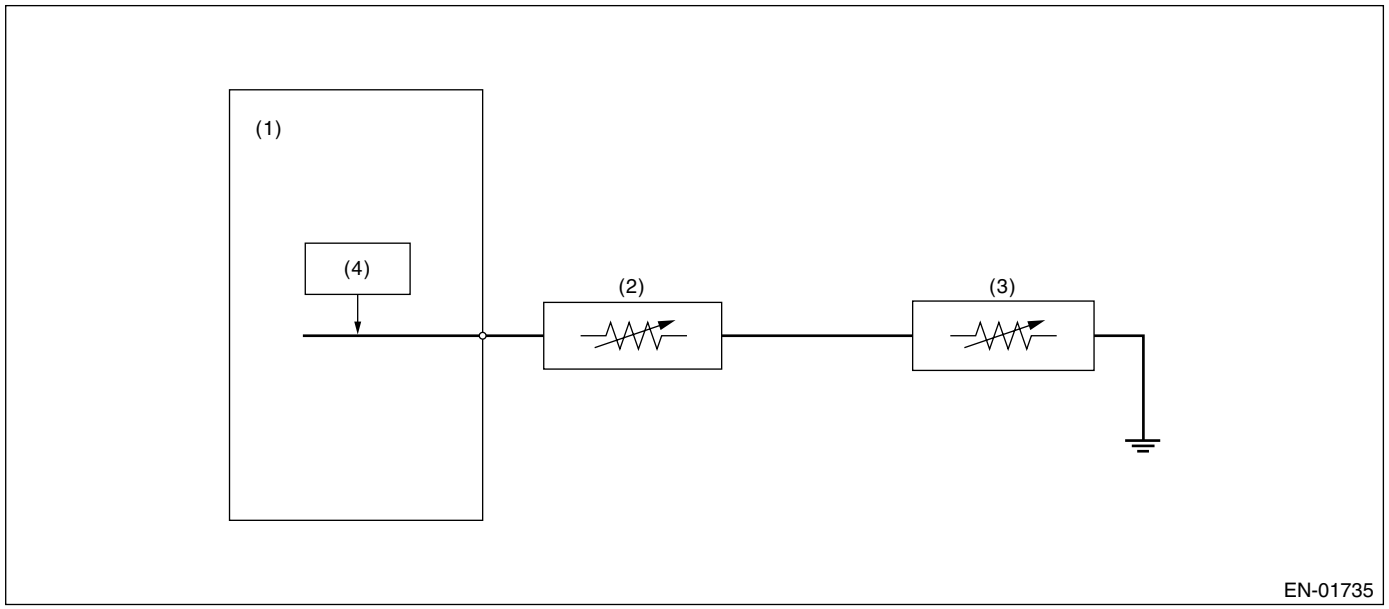
Memorize the freeze frame data. (For test mode $02)

BV:DTC P0462 FUEL LEVEL SENSOR “A” CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel level sensor. Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Fuel level sensor
(3) Fuel sub level sensor
(4) Detecting circuit

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of completing the malfunction criteria below becomes more than time needed for diagnosis (2.5 seconds).

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	3 seconds or more
Output voltage	< 0.035 V

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	3 seconds or more
Output voltage	≥ 0.035 V

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

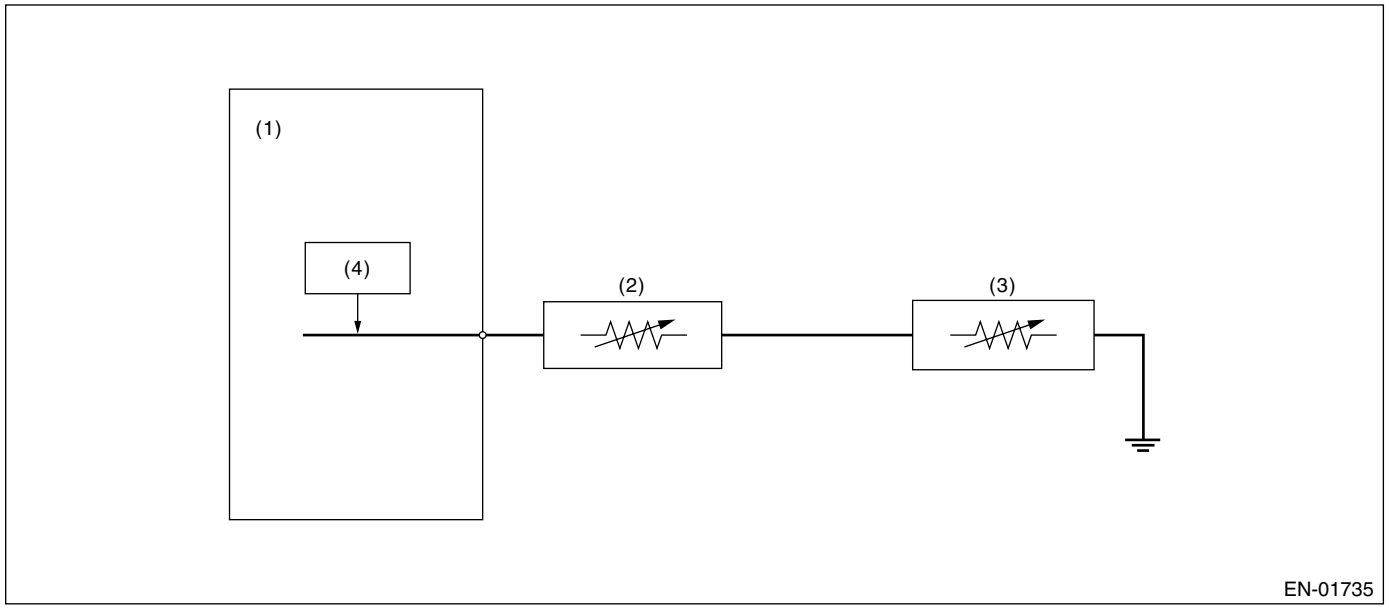
Memorize the freeze frame data. (For test mode $02)

BW:DTC P0463 FUEL LEVEL SENSOR “A” CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel level sensor.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Fuel level sensor
(3) Fuel sub level sensor
(4) Detecting circuit

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of completing the malfunction criteria below exceeds the time required for diagnosis (10 seconds).

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	3 seconds or more
Output voltage	≥ 4.911 V

Time Needed for Diagnosis: 10 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	3 seconds or more
Output voltage	< 4.911 V

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BX: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

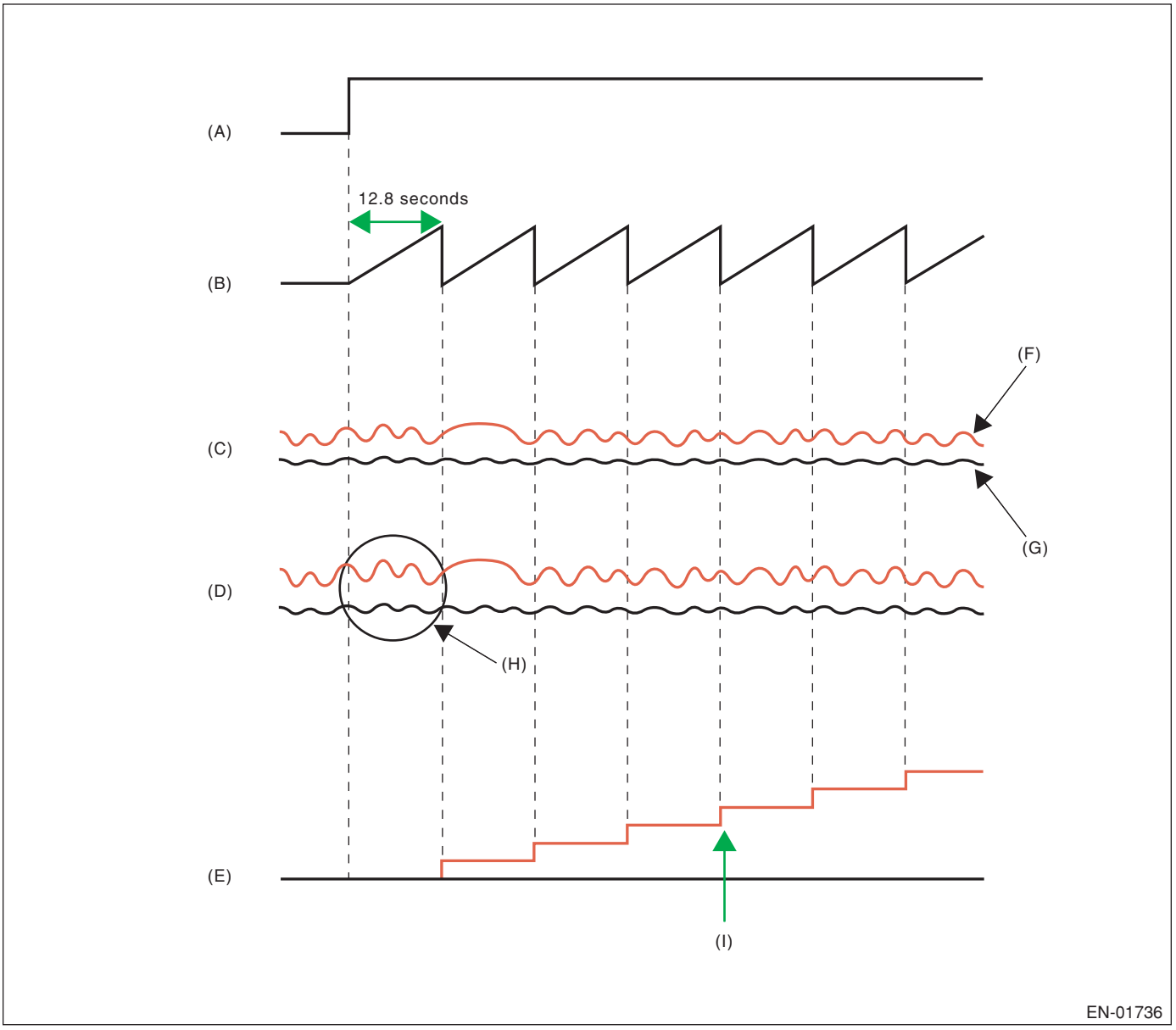
Malfunction Criteria	Threshold Value
Engine speed	≥ 500 rpm
After engine starting	1 second or more
Ignition switch	ON
Battery voltage	> 10.9 V
Idle switch	ON
Fuel level	9 — 51 ℓ (2.38 — 13.47 US gal, 1.98 — 11.22 Imp gal)
Vehicle speed = 0 km/h (0 MPH)	10 seconds or more

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.



(A) Diagnosis condition
(B) Diagnosis period
(C) Fuel level sensor A/D value
(D) Fuel level output voltage
(E) Diagnosis counter
(F) Malfunction
(G) Normal
(H) The values of DVFLMAX and SUMVFL are regarded as maximum.
(I) NG at 4 counts

Abnormality Judgment

Judge as NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Integrated times of the condition reaching follows, DELFLMAX ≥ 0.228 V or SUMFL ≥ 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	≥ 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 during 12.8 seconds	≥ 0.05 kPa (0.375 mmHg, 0.01 inHg)
Maximum value – minimum value of battery voltage during 12.8 seconds	≥ 0.465 V

Time required for diagnosis: 12.8 seconds × 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	< 0.228 V
SUMFL	< 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	

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)

BY: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 completing 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)

BZ:DTC P0502 VEHICLE SPEED SENSOR “A” CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of vehicle speed. Judge NG when low vehicle speed (0 km/h (0 MPH)) remains whereas it seemed to be in a usual driving speed.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	< 4000 rpm
Fuel cut in decel.	In operation
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Perform diagnosis continually during a deceleration fuel cut, at less than 4000 rpm.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of completing 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)

CA:DTC P0503 VEHICLE SPEED SENSOR "A" INTERMITTENT/ERRATIC/HIGH

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of vehicle speed. Judge NG when high vehicle speed (300 km/h (186.4 MPH) or more) remains whereas it seemed to be in a usual driving speed.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	< 4000 rpm
Fuel cut in decel.	In operation
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Perform diagnosis continually during a deceleration fuel cut, at less than 4000 rpm

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of completing 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)

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

1. OUTLINE OF DIAGNOSIS

Detect the malfunction that actual engine speed is not close to target engine speed during idling. Judge as NG when actual engine speed is not close to target engine speed during idling.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	≥ 70°C (158°F)
Battery voltage	≥ 10.9 V
Atmosphere pressure	> 75.0 kPa (563 mmHg, 22.2 inHg)
Fuel level	≥ 9 ℓ (2.38 US gal, 1.98 Imp gal)
After engine starting	10 seconds or more
Feedback in ISC	In operation
Lambda value	0.90 — 1.1
After air condition switching ON-OFF, OFF-ON	5 seconds or more
After intake manifold pressure changes more than 4kPa (30 mmHg, 1.2 inHg).	> 5 sec.
After neutral switch ON-OFF change	> 5 sec.
Vehicle speed	0 km/h (0 MPH)

3. GENERAL DRIVING CYCLE

After 10 seconds from engine starting perform diagnosis continuously at idling after warming up.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of completing the malfunction criterion below is 10 seconds × 3 times.

Judgment Value

Malfunction Criteria	Threshold Value
Actual — Target engine speed	< –100 rpm
Feedback value for ISC	Max.

Time Needed for Diagnosis: 10 seconds × 3 times
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK and clear NG when the continuous time of completing the malfunction criterion below becomes more than the time needed for diagnosis (10 seconds).

Judgment Value

Malfunction Criteria	Threshold Value
Actual — Target engine speed	≥ –100 rpm

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

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)

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

1. OUTLINE OF DIAGNOSIS

Detect the malfunction that actual engine speed is not close to target engine speed during idling. Judge as NG when actual engine speed is not close to target engine speed during idling.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	≥ 70°C (158°F)
Battery voltage	≥ 10.9 V
Atmosphere pressure	> 75.0 kPa (563 mmHg, 22.2 inHg)
Fuel level	≥ 9 ℓ (2.38 US gal, 1.98 Imp gal)
After engine starting	10 seconds or more
Feedback in ISC	In operation
Lambda value	0.90 — 1.1
After air condition switching ON-OFF, OFF-ON	5 seconds or more
After intake manifold pressure changes more than 4kPa (30 mmHg, 1.2 inHg).	> 5 sec.
After neutral switch ON-OFF change	> 5 sec.
Vehicle speed	0 km/h (0 MPH)

3. GENERAL DRIVING CYCLE

After 10 seconds from engine starting, perform diagnosis continuously at idling after warming up.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of completing the malfunction criterion below is 10 seconds × 3 times.

Judgment Value

Malfunction Criteria	Threshold Value
Actual – Target engine speed	≥ 200 rpm
Feedback value for ISC	Min.

Time Needed for Diagnosis: 10 seconds × 3 times
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK and clear NG when the continuous time of completing the malfunction criterion below becomes more than the time needed for diagnosis (10 seconds).

Judgment Value

Malfunction Criteria	Threshold Value
Actual – Target engine speed	< 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

- 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)

CD: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 completing 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)

CE: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 IMMECM)
P1570	Antenna	Faulty antenna
P1571	Reference Code Incompatibility	Reference code incompatibility between IMMECM and ECM
P1572	IMM Circuit Failure (Except Antenna Circuit)	Communication failure between IMMECM and ECM
P1574	Key Communication Failure	Failure of IMMECM to verify key (transponder) ID code or transponder failure
P1576	EGI Control Module EEPROM	ECM malfunctioning
P1577	IMM Control Module EEPROM	IMMECM 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.

CF:DTC P0519 IDLE AIR CONTROL SYSTEM PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect the malfunction that engine speed increases more than that in normal condition during idling.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Feedback in ISC	In operation
Vehicle speed	< 4 km/h (2.49 MPH)
After engine starting	1 second or more

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously if the vehicle speed at less than 4 km/h (2.49 MPH).

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of completing the all malfunction criteria below becomes more than the time needed for diagnosis (2 seconds).

Judgment Value

Malfunction Criteria	Threshold Value
Engine speed — targeted engine speed	≥ 1500 rpm
Feedback value for ISC	≤ 0%
Engine speed change every 180 degree engine rev.	≥ –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 completing the malfunction criteria below becomes more than the time needed for diagnosis (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 shut-off: Shut-off fuel for only #1 and #2 cylinder, or for all cylinder in accordance with vehicle speed, engine speed, throttle position.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CG:DTC P0600 SERIAL COMMUNICATION LINK

1. OUTLINE OF DIAGNOSIS

Detect malfunction of CAN communication.
When CAN communications is not possible, and CAN communications with AT is not possible, judge as NG if 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

When either of the following conditions is established, it is judged as NG.
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 s).

Judgment Value

Malfunction Criteria	Threshold Value
bus off flag or warning flag	set
ID is not received from the TCM	= 500 msecs

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

Target throttle opening angle operation required by Accelerator pedal position sensor: Torque guard for AT protection is normally obtained through CAN communication and the predefined value is 408 N·m.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CH: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 read

Time Needed for Diagnosis: Undecided
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)

CI: 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 completing 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: Undecided
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 engine stop)

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only engine stop)

7. FAIL SAFE

Stop the continuity to the electronic control throttle motor. (Throttle opening is fixed to 6°.)

8. ECM OPERATION AT DTC SETTING

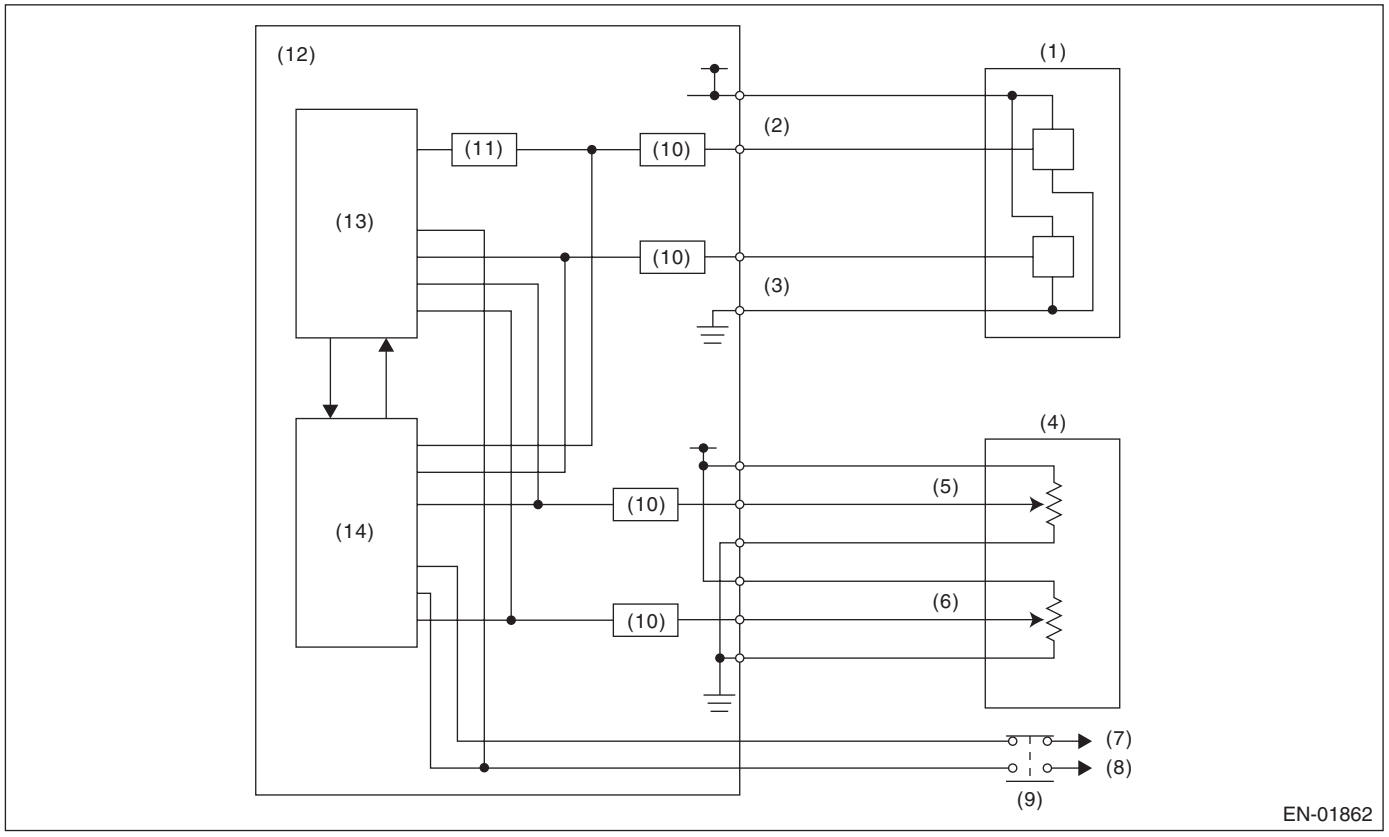
- Memorize the freeze frame data. (For test mode $02)

CJ: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 position sensor 1 signal is mismatched between main CPU and sub CPU.
- When the sub CPU operates abnormally.
- When the communication between main CPU ←→ 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



(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		

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
(1) Ignition switch	ON
(2) Ignition switch	ON
(3) None	—
(4) None	—
(5) Throttle opening angle	
(6) Brake SW (with cruise control)	ON
(7) None	—

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 reading value of accelerator position sensor signal	Within 0.042 V
3. WD pulse from sub CPU	WD pulse occur
4. Communication between CPU	Possible to communicate
5. Difference of signal on connection of amplifier	Within X 4 ±3 °
6. Cruise control cancel signal at brake ON	Cruise control cancel signal ON
7. Brake switch 1, 2 signal	SW 1 and 2 are matched

Time Needed for Diagnosis:
1. 250 milliseconds
2. 250 milliseconds
3. 200 milliseconds
4. 200 milliseconds
5. 24 milliseconds
6. 250 milliseconds
7. 200 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Stop the continuity to the electronic control throttle motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

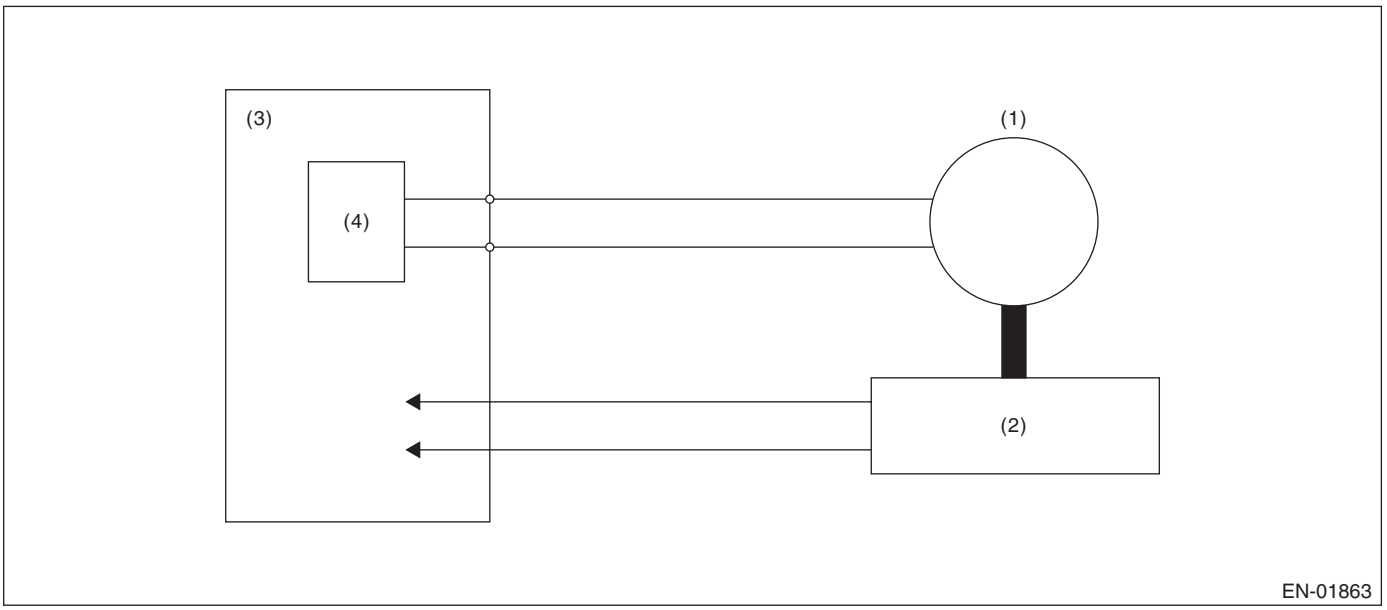
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Judge as NG when the target opening angle and actual opening angle is mismatched or the current to motor is more than specified duty for specified time continuously.

2. COMPONENT DESCRIPTION



(1) Motor
(2) Throttle position sensor
(3) Engine control module (ECM)
(4) Drive circuit

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Normal operation of electric throttle control	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously when the electric throttle control is operating.

5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

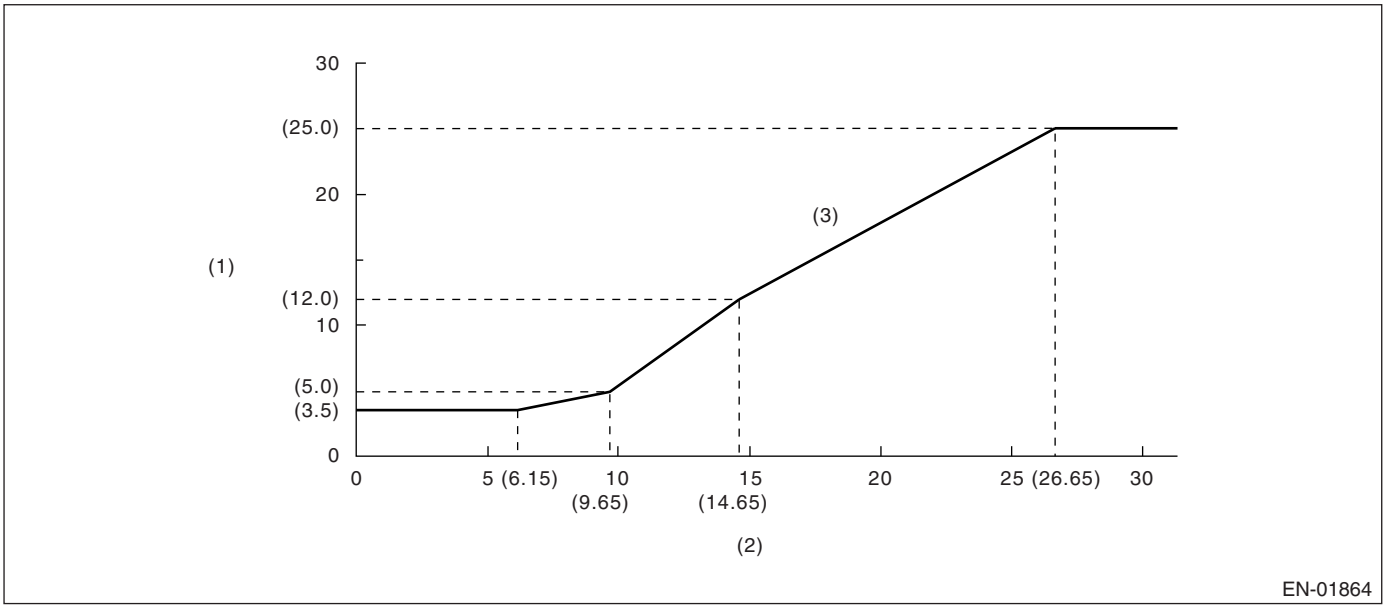
Judgment Value

Malfunction Criteria	Threshold Value
Difference between target opening angle and actual opening angle	3.5° or less
Output duty to drive circuit	95% or less

Time Needed for Diagnosis:

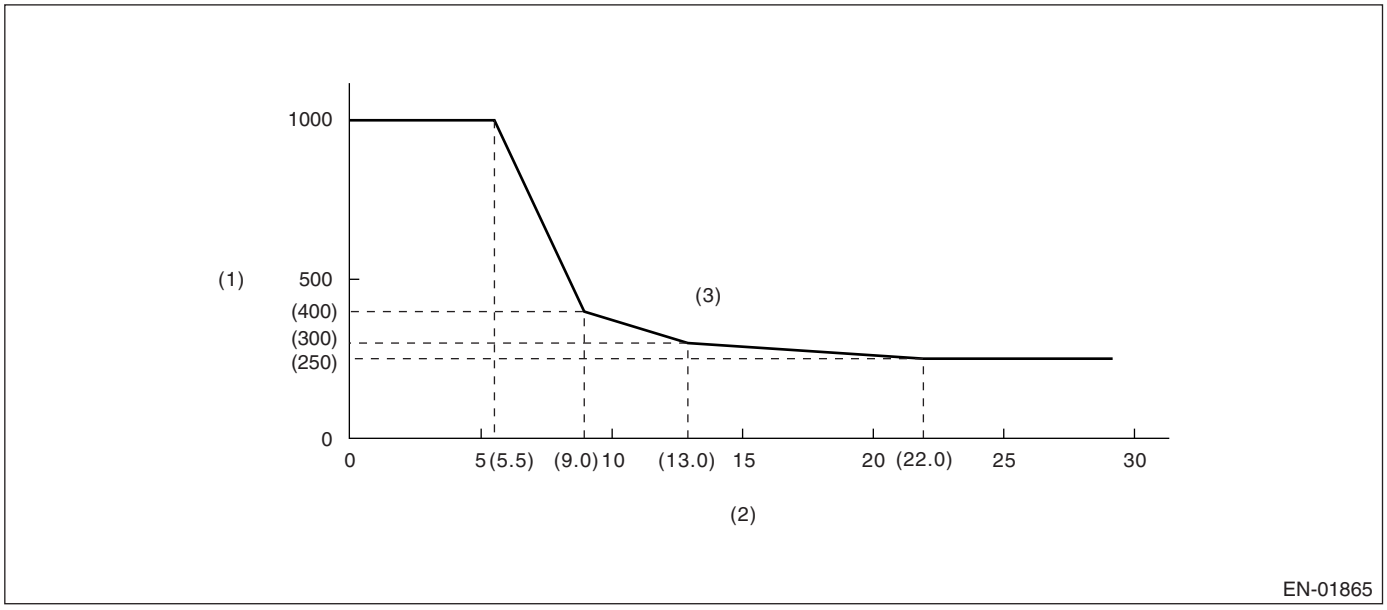
- Target opening angle and actual opening angle: 250 milliseconds (For NG) 2000 milliseconds (For OK)
- Output duty to drive circuit: 2000 milliseconds

Details of Judgment Value



(1) Difference between target opening angle and actual opening angle (°)
(2) Target throttle opening angle (°)
(3) NG area

Details of Judgment (The actual opening angle ≤ 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 engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only engine stop)

8. FAIL SAFE

Stop the continuity to the electronic control throttle motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CL: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 completing 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)

CM: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 completing 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)

CN:DTC P0700 TRANSMISSION CONTROL SYSTEM (MIL REQUEST)

1. OUTLINE OF DIAGNOSIS

CAN communication is established with AT. Judge as NG when there is 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 completing 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)

CO:DTC P0851 PARK/NEUTRAL SWITCH INPUT CIRCUIT LOW (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 completing 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” & 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)

CP: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) & engine speed 600 — 900 rpm	
b) Vehicle speed = 64 km/h (39.8 MPH) & engine speed 1600 — 2550 rpm	

Time Needed for Diagnosis: 3 monitoring
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle 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)

CQ: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 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 = “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)

CR: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) & engine speed 600 — 900 rpm	
b) Vehicle speed = 64 km/h (39.8 MPH) & engine speed 1600 — 2550 rpm	

Time Needed for Diagnosis: 3 monitoring
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle 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)

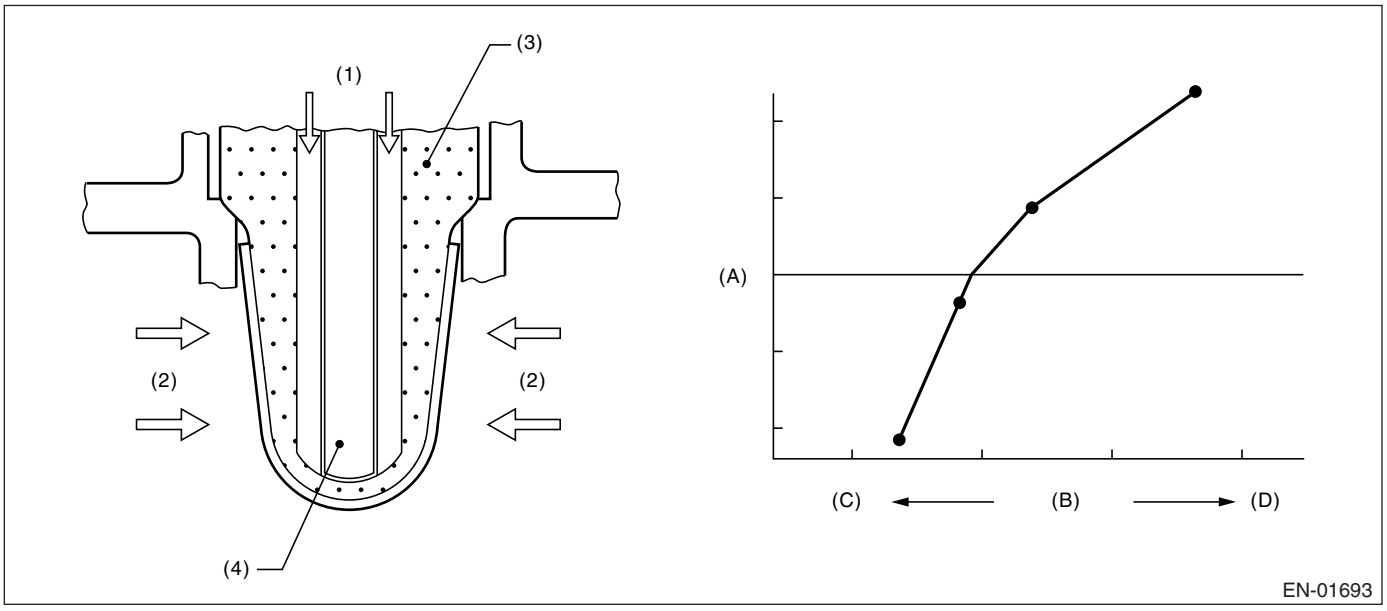
CS:DTC P1152 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK1 SENSOR1)

1. OUTLINE OF DIAGNOSIS

Detect that λ value remains low.
Judge as NG when lambda value is abnormal in accordance with λ value of front oxygen (A/F) sensor and running conditions such as vehicle speed, amount of intake air, engine coolant temperature, sub feedback control, etc.

λ value = Actual air fuel ratio/Theoretical air fuel ratio
λ > 1: Lean
λ < 1: Rich

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust gas
(3) ZrO_2
(4) Ceramic heater
(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
All secondary parameters enable conditions	4 seconds or more
Battery voltage	> 10.9 V
Atmosphere pressure	> 75.0 kPa (563 mmHg, 22.2 inHg)
Rear oxygen sensor sub feedback	Execution
Rear oxygen sensor output voltage – feedback target voltage	–0.2 V — 0.1 V
or	
Rear oxygen sensor sub feedback compensation coefficient	On Min.
or	
Rear oxygen sensor sub feedback compensation coefficient	On Max.
After engine starting	60 seconds or more
Engine coolant temperature	≥ 70°C (158°F)
Vehicle speed	≥ 20 km/h (12.4 MPH)
Amount of intake air	≥ 6 g/s
Load change during 0.5 engine rev.	≤ 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 completing 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
Output 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 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)

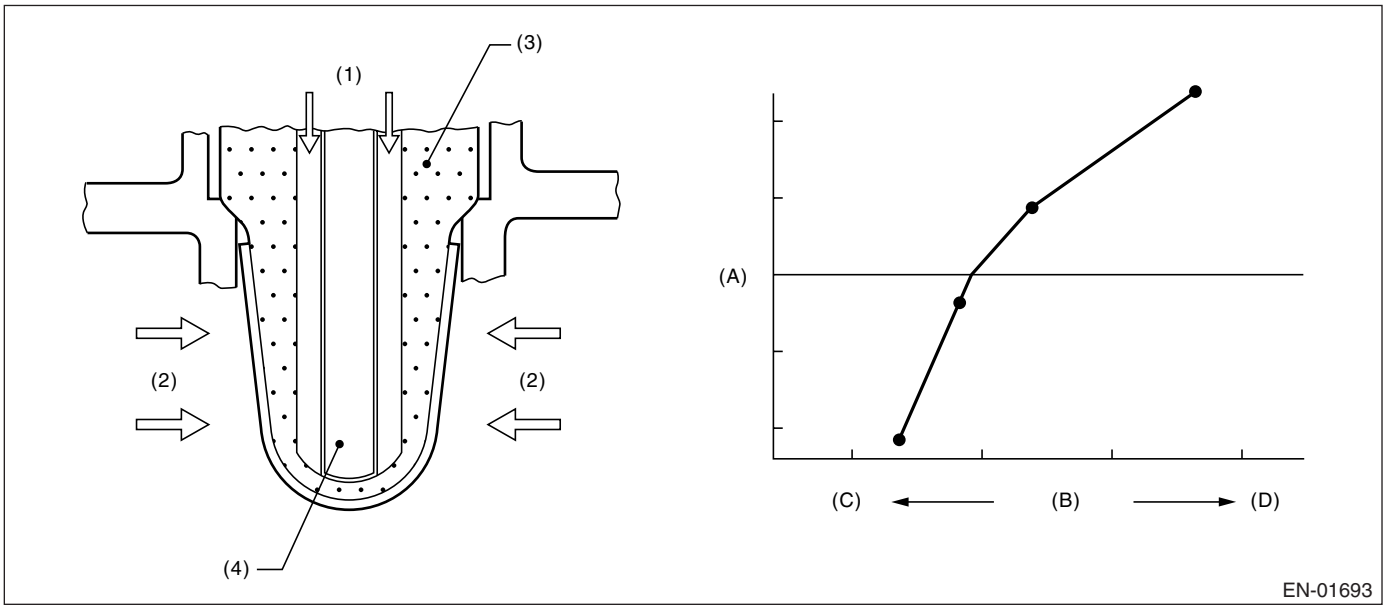
CT:DTC P1153 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1)

1. OUTLINE OF DIAGNOSIS

Detect that λ value remains high.
Judge as NG when lambda value is abnormal in accordance with λ value of front oxygen (A/F) sensor and running conditions such as vehicle speed, amount of intake air, engine coolant temperature, sub feedback control, etc.

λ value = Actual air fuel ratio/Theoretical air fuel ratio
λ > 1: Lean
λ < 1: Rich

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust gas
(3) ZrO_2
(4) Ceramic heater
(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
All secondary parameters enable conditions	4 seconds or more
Battery voltage	> 10.9 V
Atmosphere pressure	> 75.0 kPa (563 mmHg, 22.2 inHg)
Rear oxygen sensor sub feedback	Execution
Rear oxygen sensor output voltage – feedback target voltage	–0.2 V — 0.1 V
or	
Rear oxygen sensor sub feedback compensation coefficient	On Min.
or	
Rear oxygen sensor sub feedback compensation coefficient	On Max.
After engine starting	60 seconds or more
Engine coolant temperature	≥ 70°C (158°F)
Vehicle speed	≥ 20 km/h (12.4 MPH)
Amount of intake air	≥ 6 g/s
Load change during 0.5 engine rev.	≤ 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
Output 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 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

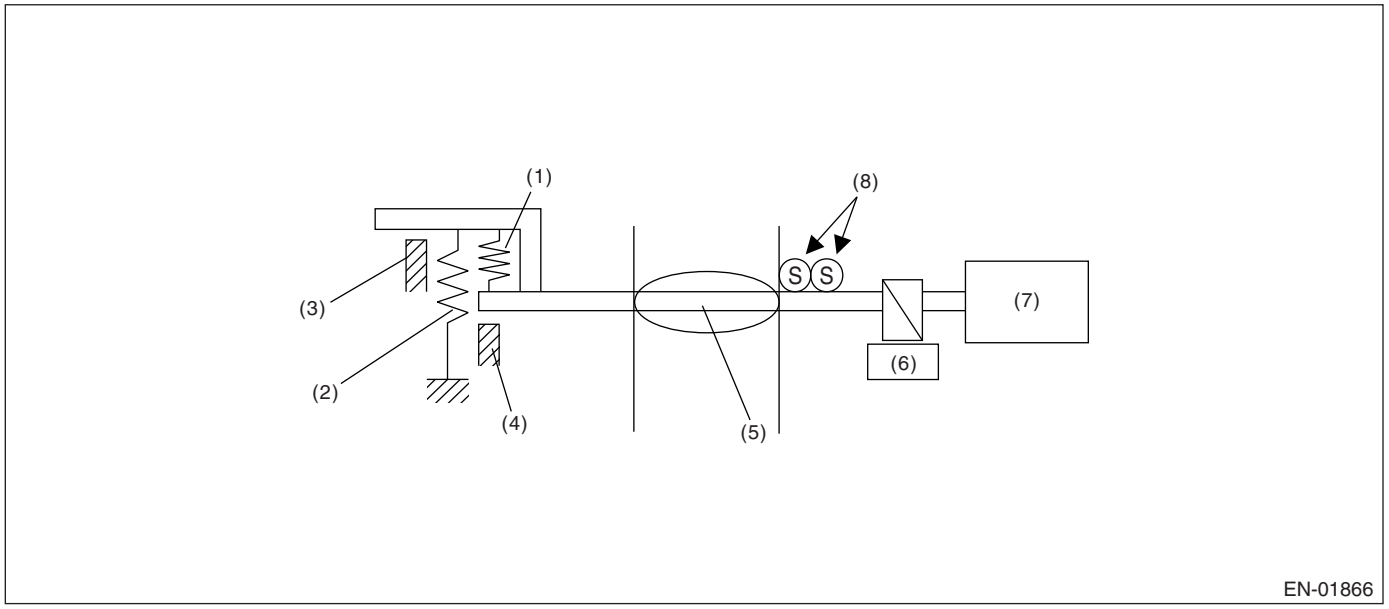
Memorize the freeze frame data. (For test mode $02)

CU:DTC P1160 RETURN SPRING FAILURE

1. OUTLINE OF DIAGNOSIS

Judge as NG when the valve is opened more than the default opening angle, but does not move to the close direction with the motor power stopped.

2. COMPONENT DESCRIPTION



(1) Opener spring
(2) Return spring
(3) Intermediate stopper
(4) Full closed stopper
(5) Throttle valve
(6) Gear
(7) DC motor
(8) Main and sub throttle sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Throttle opening angle	OFF
Motor continuity	OFF

4. GENERAL DRIVING CYCLE

- Ignition switch ON → OFF
- Ignition switch OFF → ON (Only after clearing memory)

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time until completing 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 engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only engine stop)

8. FAIL SAFE

Throttle opening is fixed to 6°

9. ECM OPERATION AT DTC SETTING

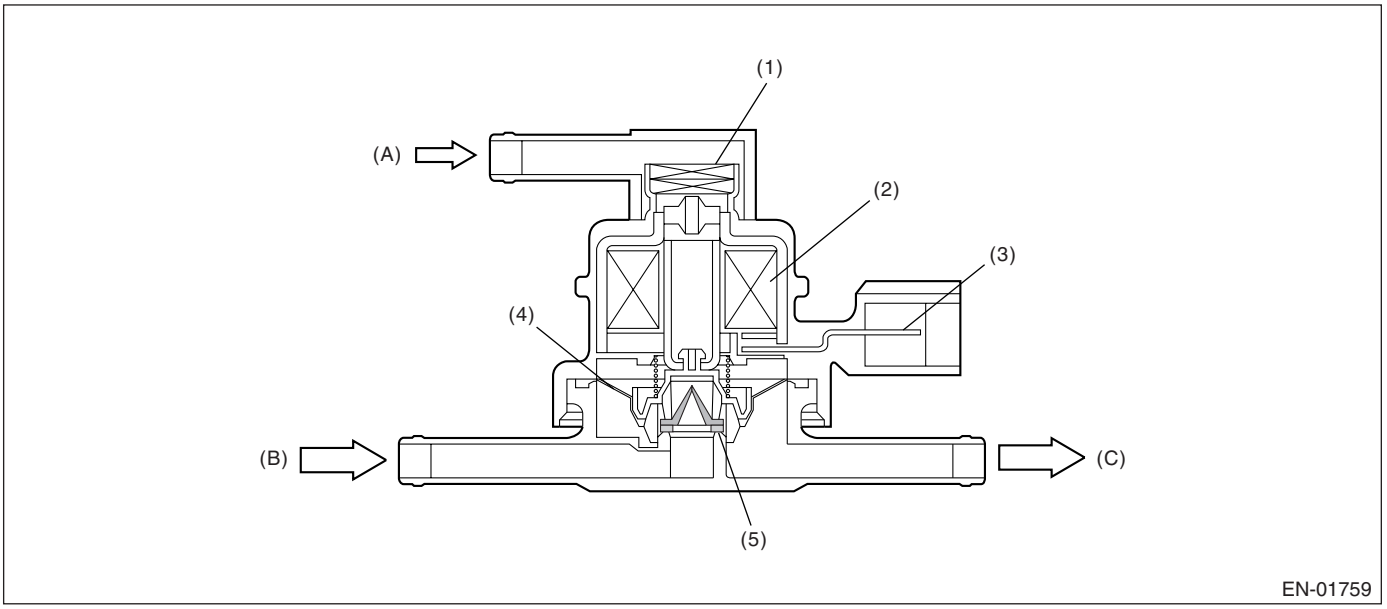
Memorize the freeze frame data. (For test mode $02)

CV: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 NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(1) Filter
(2) Coil
(3) Connector terminal
(4) Diaphragm
(5) Valve
(A) Atmosphere pressure
(B) Shut-off valve
(C) To fuel tank

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of completing 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)

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

1. OUTLINE OF DIAGNOSIS

Continually detects for a combination solenoid valve and lead valve stuck open condition.
Calculate the integrated value of secondary air supply piping pressure sensor output voltage maximum/minimum values and output voltage deviation for a constant time period after engine start, and if the difference between the maximum/minimum is large and the integrated value is also large, judge as NG.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	< 500 rpm
After engine starting	9 seconds or more
After secondary air injection system stop	9 seconds or more
Amount of intake air	2 g (0.07 oz)/seconds or more and Less than 400 g (14.11 oz)/seconds
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Perform diagnosis continuously after engine start with the secondary air pump stopped and with a high air flow amount.

4. DIAGNOSTIC METHOD

When the solenoid and lead valves of the combination valve both are open and malfunctioning, a pulse will appear in the secondary air supply piping pressure sensor output. This pulse is tracked by the following method to detect the problem.
Calculate the maximum and minimum values of the secondary air supply piping pressure sensor output voltage, and integrated value (sum) of the output voltage deviation for kCOTIM seconds. The difference between the maximum/minimum values is compared with the threshold value, and the sum is also compared with the threshold value. If both exceed the threshold, the NG counter is counted up, and when the counter becomes kCOCOT times, an NG judgement 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 times
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)

CX: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 OFF 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 OFF 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

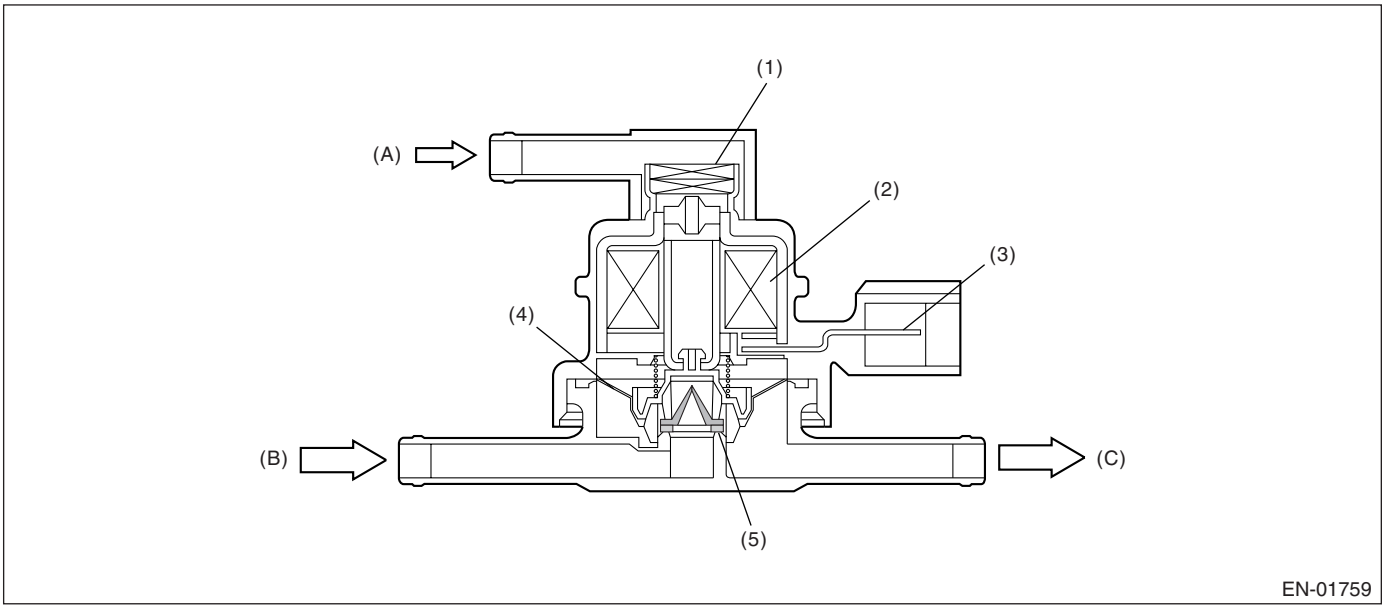
Memorize the freeze frame data. (For test mode $02)

CY: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 NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(1) Filter
(2) Coil
(3) Connector terminal
(4) Diaphragm
(5) Valve
(A) Atmosphere pressure
(B) Shut-off valve
(C) To fuel tank

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of completing the malfunction criteria below becomes more than time needed for diagnosis (2.5 seconds). Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage when ECM outputs ON signal	High

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

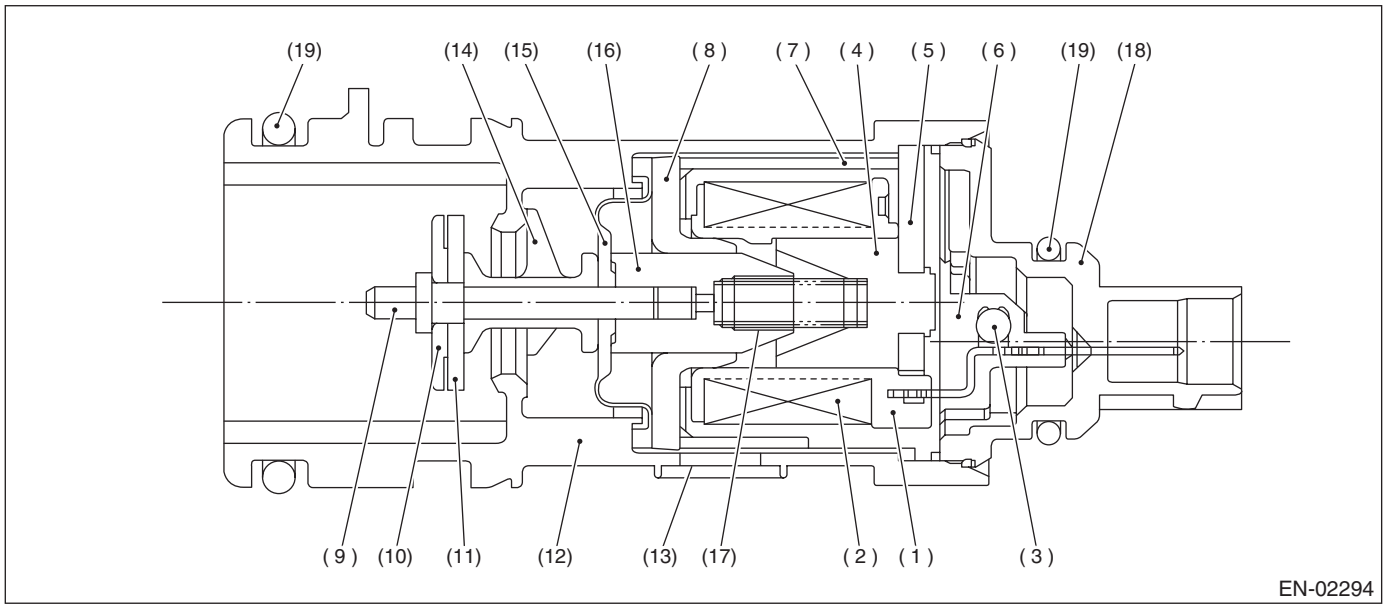
Memorize the freeze frame data. (For test mode $02)

CZ:DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM

1. OUTLINE OF DIAGNOSIS

Detect the abnormal function (stuck closed) of the drain valve.
Judge as NG when fuel tank pressure is low.

2. COMPONENT DESCRIPTION



(1) Bobbin
(2) Coil
(3) Diode
(4) Stator core
(5) End plate
(6) Body
(7) Yoke
(8) Magnetic plate
(9) Shaft
(10) Plate
(11) Valve
(12) Housing
(13) Filter
(14) Retainer
(15) Diaphragm
(16) Movable core
(17) Spring
(18) Cover
(19) O-ring

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Drain valve	Open
Battery voltage	≥ 10.9 V
Atmosphere pressure	≥ 75.0 kPa (563 mmHg, 22.2 inHg)
Tank pressure when starter is OFF → ON	–0.67 — 1.43 kPa (–5 — 10.7 mmHg, –0.20 — 0.42 inHg)

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of completing all 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 temp.	–10 — 45°C (14 — 113°F)
Intake manifold relative pressure	≤ –26.7 kPa (–200 mmHg, –7.87 inHg)

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Pressure control solenoid valve control: Open the pressure control solenoid valve.

9. ECM OPERATION AT DTC SETTING

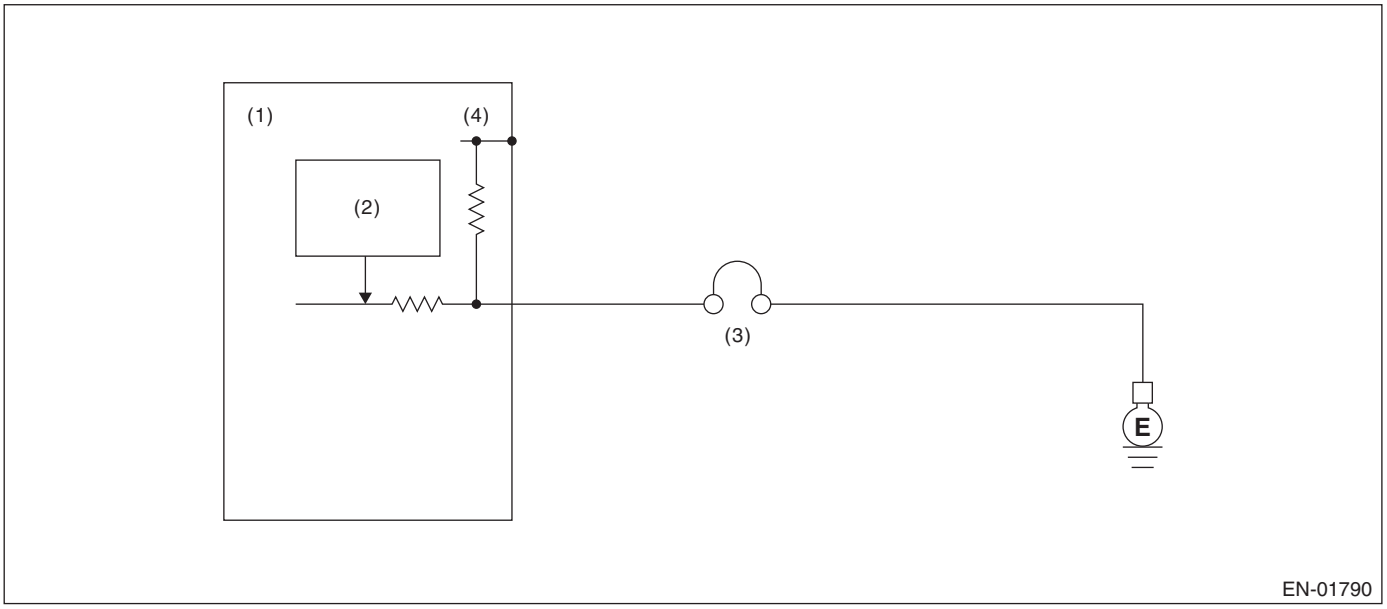
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect the blow-by hose release abnormality.
Judge NG when the diagnosis terminal voltage is high.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Detecting circuit
(3) PCV diagnosis connector
(4) 5 V

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	> 10.9 V
Positive crankcase ventilation diagnosis voltage	High
Engine speed	≥ 500 rpm

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	> 10.9 V
Positive crankcase ventilation diagnosis voltage	Low
Engine speed	≥ 500 rpm

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the diagnostic value and trouble standard value. (For test mode $06)

DB:DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of starter SW.
Judge as OFF NG when it turns to after engine starting as the starter has never been set to ON.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge 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)

DC:DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION

1. OUTLINE OF DIAGNOSIS

Detect the open/short circuit of back-up power supply circuit.
Judge 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 completing the malfunction criteria below becomes more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Voltage of back-up power supply	< Battery voltage × 0.7
Battery voltage	≥ 10.9 V

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Voltage of back-up power supply	≥ Battery voltage × 0.7
Battery voltage	≥ 10.9 V

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DD:DTC P1570 ANTENNA

NOTE:
For the detection standard, refer to DTC P0513 INCORRECT IMMOBILIZER KEY. <Ref. to GD(H4DOTC)-183, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DE:DTC P1571 REFERENCE CODE INCOMPATIBILITY

NOTE:
For the detection standard, refer to DTC P0513 INCORRECT IMMOBILIZER KEY. <Ref. to GD(H4DOTC)-183, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DF:DTC P1572 IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT)

NOTE:
For the detection standard, refer to DTC P0513 INCORRECT IMMOBILIZER KEY. <Ref. to GD(H4DOTC)-183, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DG:DTC P1574 KEY COMMUNICATION FAILURE

NOTE:
For the detection standard, refer to DTC P0513 INCORRECT IMMOBILIZER KEY. <Ref. to GD(H4DOTC)-183, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DH:DTC P1576 EGI CONTROL MODULE EEPROM

NOTE:
For the detection standard, refer to DTC P0513 INCORRECT IMMOBILIZER KEY. <Ref. to GD(H4DOTC)-183, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DI: DTC P1577 IMM CONTROL MODULE EEPROM

NOTE:
For the detection standard, refer to DTC P0513 INCORRECT IMMOBILIZER KEY. <Ref. to GD(H4DOTC)-183, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

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

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of tumble generated valve motor function.
Judge open fixing malfunction when the opening degree is large even after finishing the tumble generated valve closing driving.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Engine coolant temperature	≥ 0°C (32°F)
Ambient air temperature	≥ 0°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 completing the malfunction criteria below becomes more than 3 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generated valve opening	≥ 67.4°
Tumble generated 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 generated valve opening	< 67.4°
Tumble generated valve “close” signal output	2.2 seconds or more

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

Tumble generated valve opening
- For tumble generated valve all closing points learning, not allowed to update to closing side.
- For tumble generated valve all opening points learning, not allowed to update to opening side.

Tumble generated valve control
- Output the open signal.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of tumble generated valve motor function.
Judge open fixing malfunction when the opening degree is large even after finishing the tumble generated valve closing driving.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Engine coolant temperature	≥ 0°C (32°F)
Ambient air temperature	≥ 0°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 completing the malfunction criteria below becomes more than 3 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generated valve opening	≥ 67.4°
Tumble generated 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 generated valve opening	< 67.4°
Tumble generated valve “close” signal output	2.2 seconds or more

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

Tumble generated valve opening
- For tumble generated valve all closing points learning, not allowed to update to closing side.
- For tumble generated valve all opening points learning, not allowed to update to opening side.

Tumble generated valve control
- Output the open signal.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of tumble generated valve motor function.
Judge close fixing malfunction when the opening degree is small even after finishing the tumble generated valve open driving.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Engine coolant temperature	≥ 0°C (32°F)
Ambient air temperature	≥ 0°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 completing the malfunction criteria below becomes more than 3 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generated valve opening	< 67.4°
Tumble generated 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 generated valve opening	≥ 67.4°
Tumble generated valve “open” signal output	2.2 seconds or more

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

Tumble generated valve opening
- For tumble generated valve all closing points learning, not allowed to update to closing side.
- For tumble generated valve all opening points learning, not allowed to update to opening side.

Tumble generated valve control
- Output the close signal.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DM:DTC P2007 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 2)

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of tumble generated valve motor function.
Judge close fixing malfunction when the opening degree is small even after finishing the tumble generated valve open driving.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Engine coolant temperature	≥ 0°C (32°F)
Ambient air temperature	≥ 0°C

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generated valve opening	< 67.4°
Tumble generated 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 generated valve opening	≥ 67.4°
Tumble generated valve “open” signal output	2.2 seconds or more

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

Tumble generated valve opening
- For tumble generated valve all closing points learning, not allowed to update to closing side.
- For tumble generated valve all opening points learning, not allowed to update to opening side.

Tumble generated valve control
- Output the close signal.

8. ECM OPERATION AT DTC SETTING

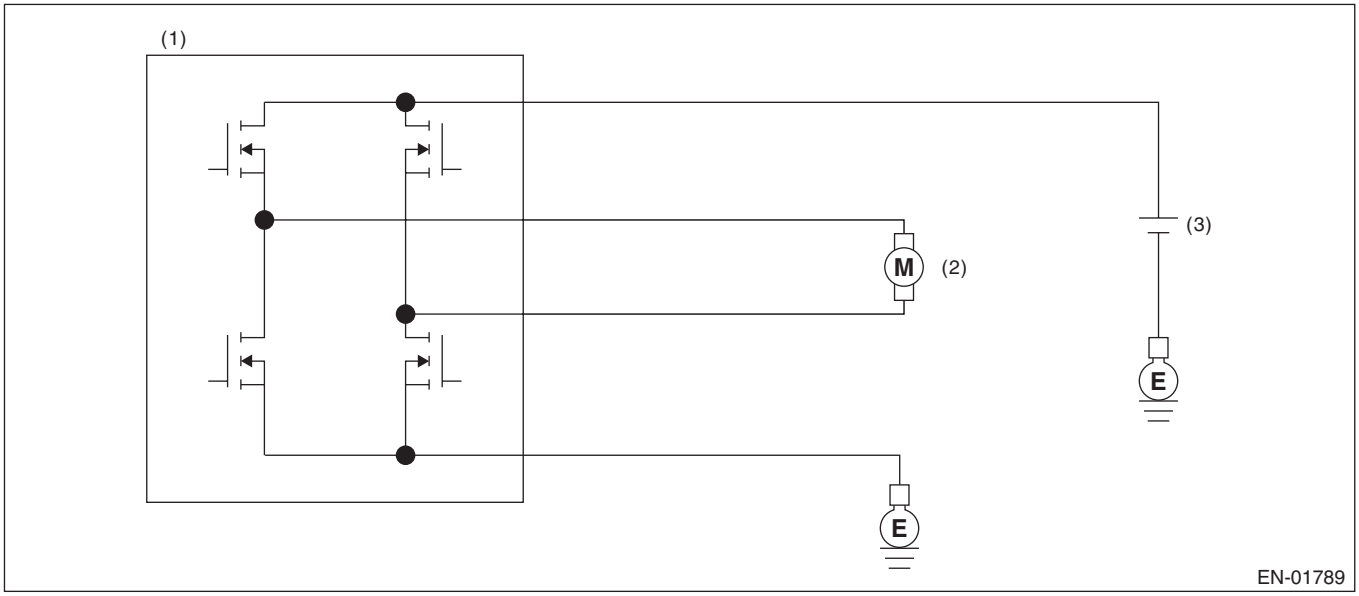
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tumble generated valve motor.
Judge NG when the open signal is sent from IC after tumble generated valve driving IC diagnosis.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM) (2) Tumble generated valve (3) Battery

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
ECM output signal	Before signal change from ON → OFF
Tumble generator valve ON signal output time	20 milliseconds or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

At the main IC, check the sent signal at each timing which occurs just before the tumble generated 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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Tumble generator valve control: Not allowed to move tumble generated valve.

9. ECM OPERATION AT DTC SETTING

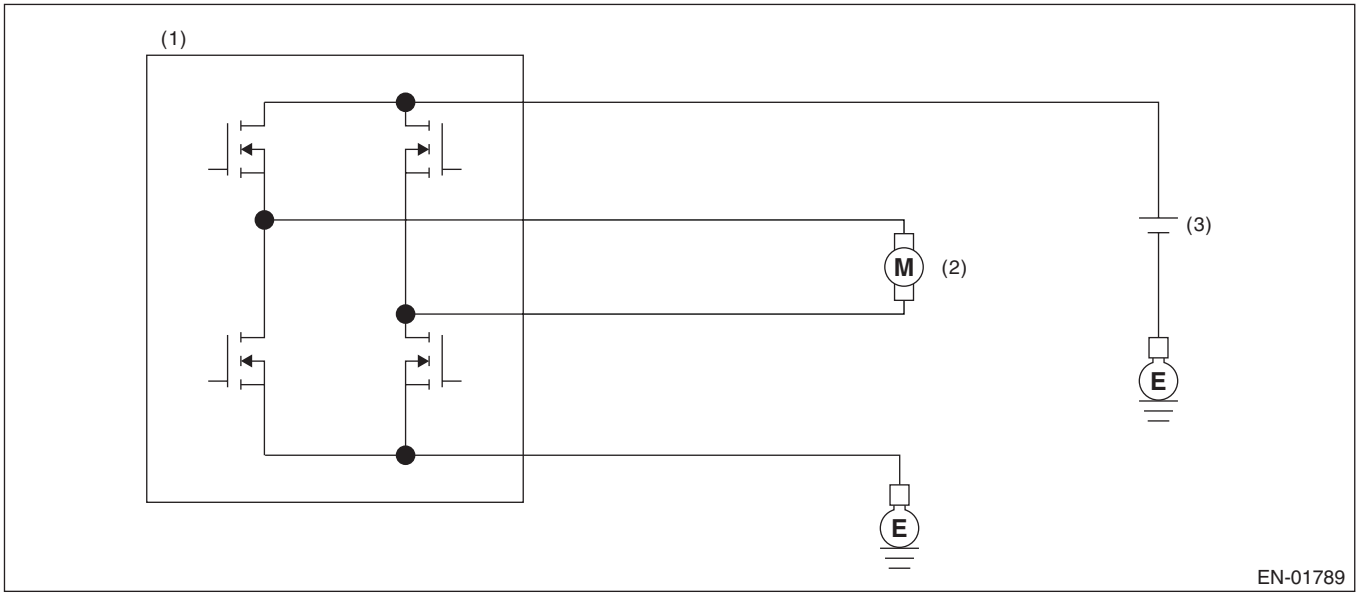
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tumble generated valve motor.
Judge NG when the overcurrent signal is sent from IC after tumble generated valve driving IC diagnosis.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM) (2) Tumble generated valve (3) Battery

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
ECM output signal	Before signal change from ON → OFF
Tumble generator valve ON signal output time	20 milliseconds or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

At the main IC, check the sent signal at each timing which occurs just before the tumble generated valve output is set to ON → OFF, and judge overcurrent NG when the overcurrent NG signal is sent 1 second in a row. Judge OK and clear the NG when the OK signal is sent.

Judgment Value

Malfunction Criteria	Threshold Value
Open NG signal input	High
Overcurrent NG signal input	Low

Time Needed for Diagnosis: 10 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Tumble generator valve control: Not allowed to move tumble generated valve.

9. ECM OPERATION AT DTC SETTING

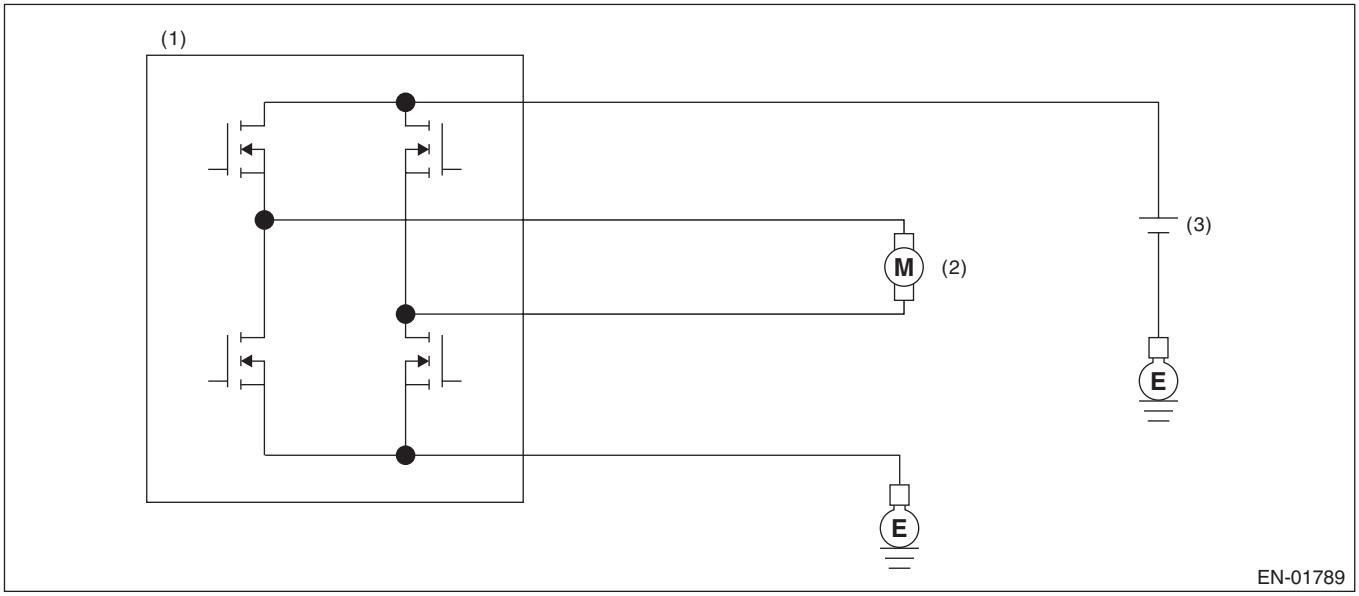
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tumble generated valve motor.
Judge NG when the open signal is sent from IC after tumble generated valve driving IC diagnosis.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM) (2) Tumble generated valve (3) Battery

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
ECM output signal	Before signal change from ON → OFF
Tumble generator valve ON signal output time	20 milliseconds or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

At the main IC, check the sent signal at each timing which occurs just before the tumble generated 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

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Tumble generator valve control: Not allowed to move tumble generated valve.

9. ECM OPERATION AT DTC SETTING

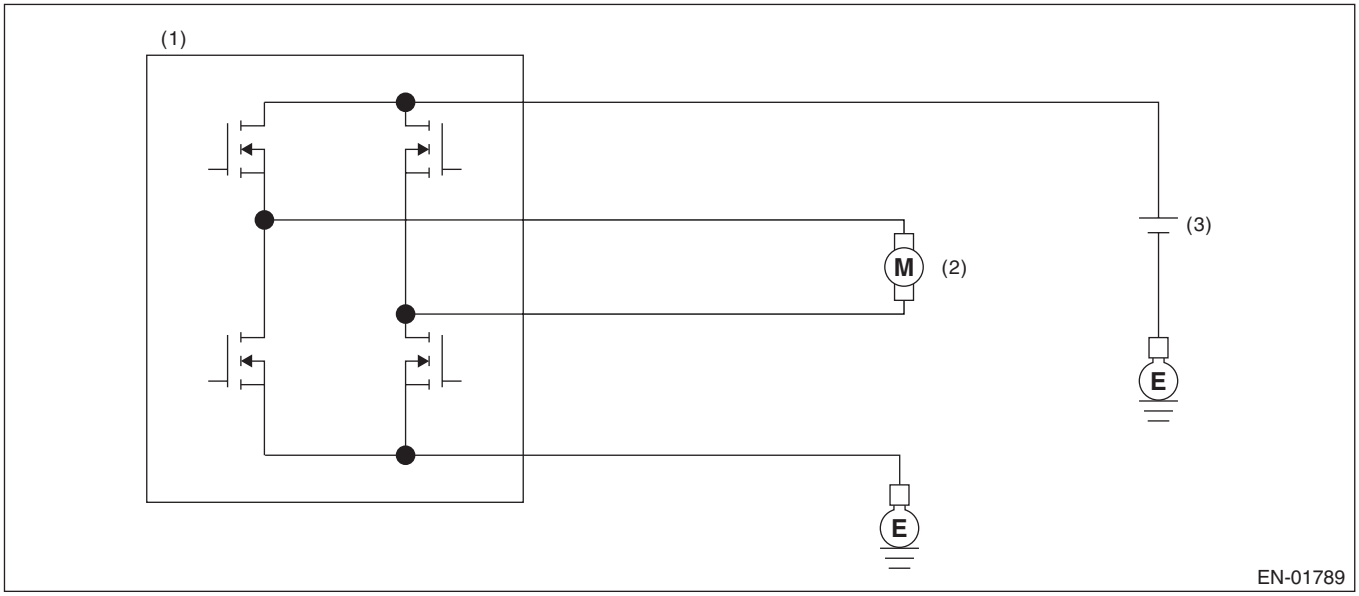
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tumble generated valve motor.
Judge NG when the overcurrent signal is sent from IC after tumble generated valve driving IC diagnosis.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM) (2) Tumble generated valve (3) Battery

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
ECM output signal	Before signal change from ON → OFF
Tumble generator valve ON signal output time	20 milliseconds or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

At the main IC, check the sent signal at each timing which occurs just before the tumble generated valve output is set to ON → OFF, and judge overcurrent NG when the overcurrent NG signal is sent 1 second in a row. Judge OK and clear the NG when the OK signal is sent.

Judgment Value

Malfunction Criteria	Threshold Value
Open NG signal input	High
Overcurrent NG signal input	Low

Time Needed for Diagnosis: 10 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Tumble generator valve control: Not allowed to move tumble generated valve.

9. ECM OPERATION AT DTC SETTING

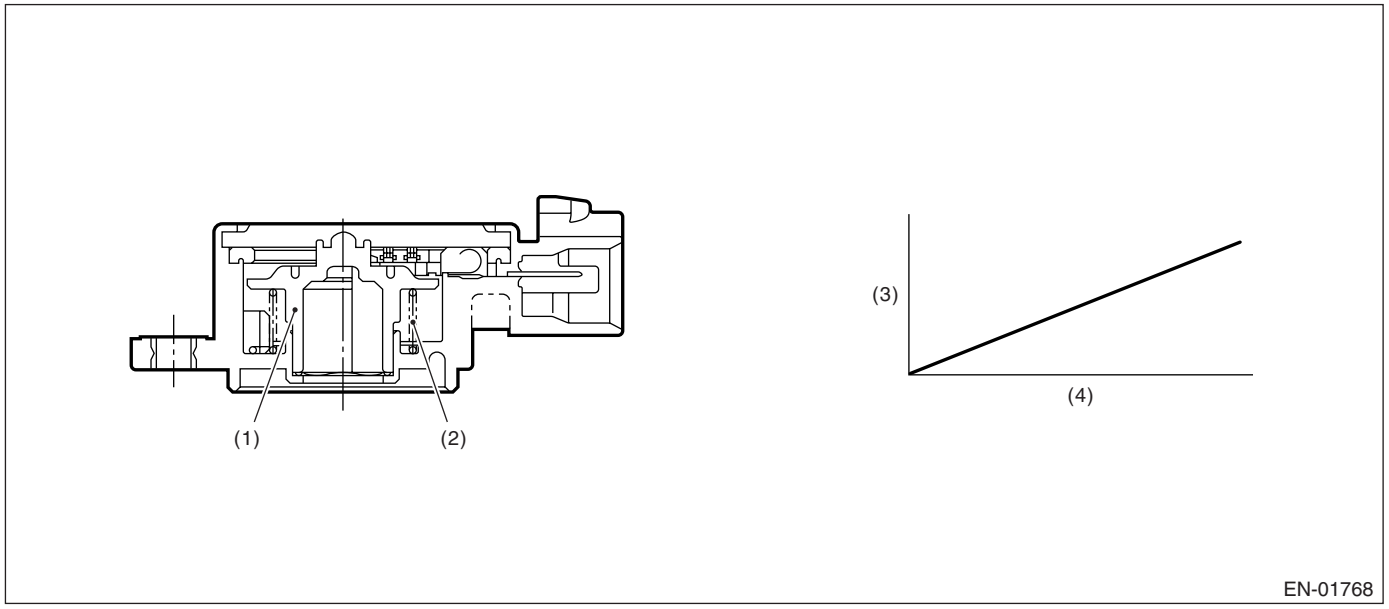
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of tumble generated valve position sensor.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



(1) Rotor
(2) Return spring
(3) Voltage (V)
(4) Tumble generator valve opening (°)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of completing the malfunction criteria below becomes 0.5 seconds or more. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.167 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Tumble generated valve opening
- For tumble generated valve all closing points learning, not allowed to update to closing side.
- For tumble generated valve all opening points learning, not allowed to update to opening side.

9. ECM OPERATION AT DTC SETTING

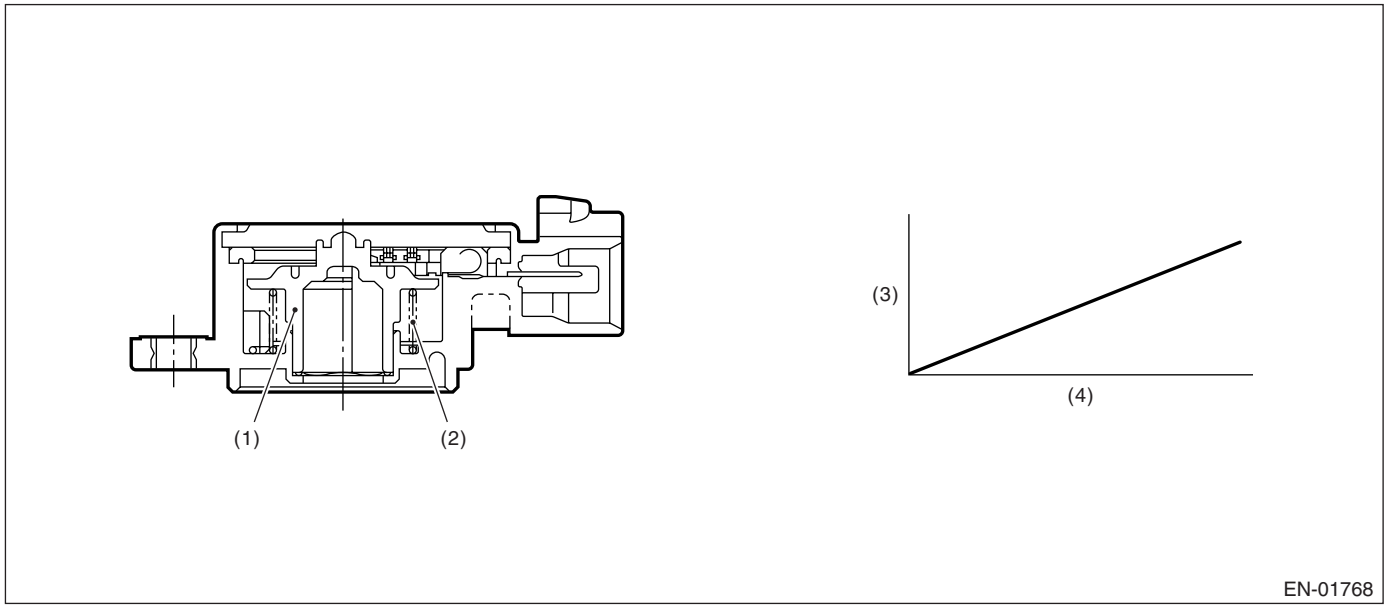
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of tumble generated valve position sensor.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



(1) Rotor
(2) Return spring
(3) Voltage (V)
(4) Throttle valve opening angle (°)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of completing the malfunction criteria below becomes 0.5 seconds or more. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.843 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Tumble generated valve opening
- For tumble generated valve all closing points learning, not allowed to update to closing side.
- For tumble generated valve all opening points learning, not allowed to update to opening side.

9. ECM OPERATION AT DTC SETTING

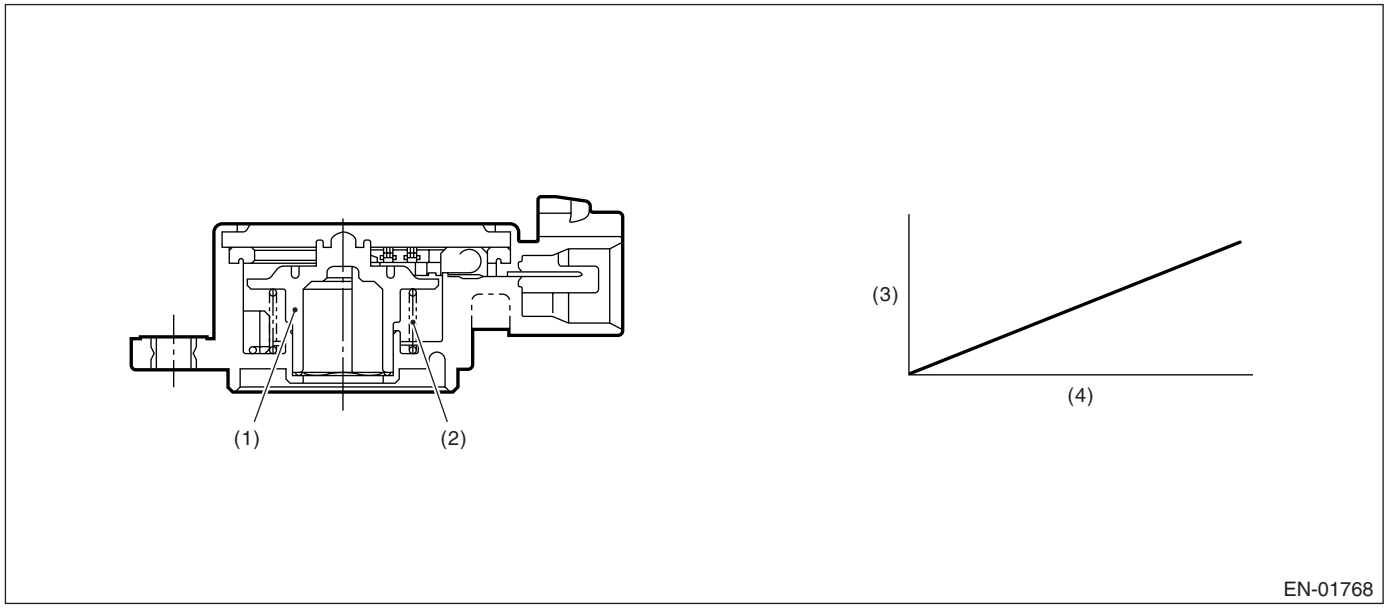
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of tumble generated valve position sensor.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



(1) Rotor
(2) Return spring
(3) Voltage (V)
(4) Tumble generator valve opening (°)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of completing the malfunction criteria below becomes 0.5 seconds or more. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.167 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Tumble generated valve opening
- For tumble generated valve all closing points learning, not allowed to update to closing side.
- For tumble generated valve all opening points learning, not allowed to update to opening side.

9. ECM OPERATION AT DTC SETTING

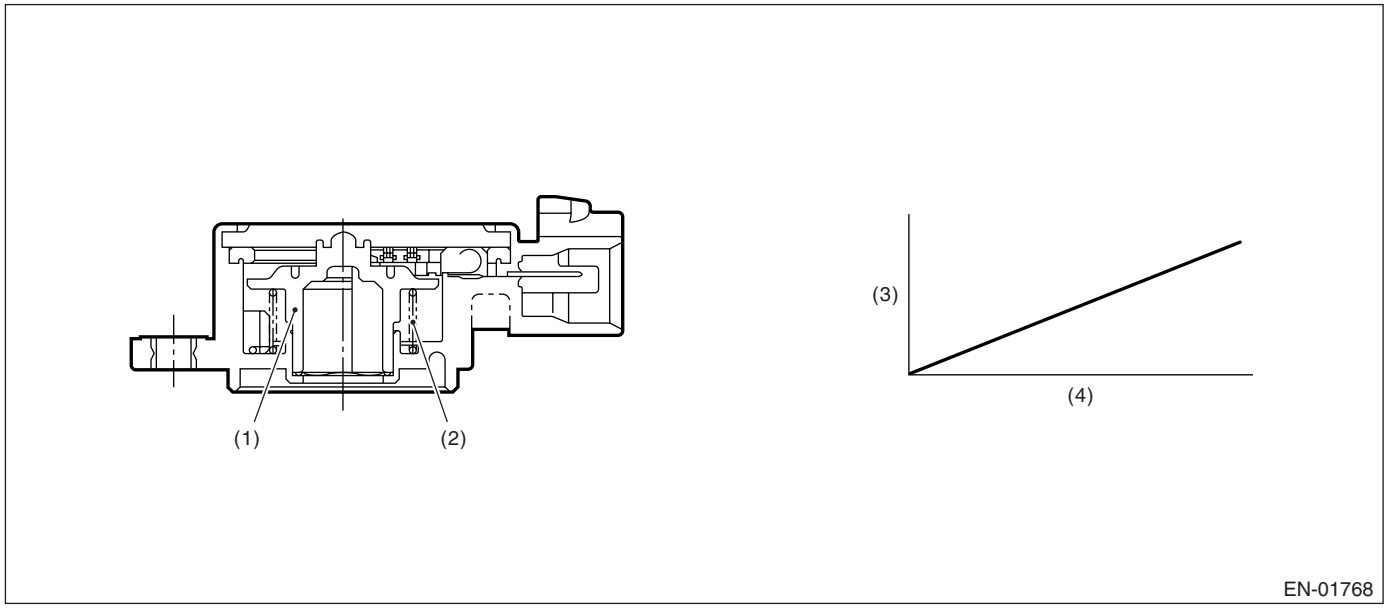
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of tumble generated valve position sensor.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



(1) Rotor
(2) Return spring
(3) Voltage (V)
(4) Tumble generator valve opening (°)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of completing the malfunction criteria below becomes 0.5 seconds or more. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.843 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Tumble generated valve opening
- For tumble generated valve all closing points learning, not allowed to update to closing side.
- For tumble generated valve all opening points learning, not allowed to update to opening side.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the oil flow control valve solenoid.
Judge open NG when the current flow is small whereas duty signal is large, and judge short NG when the current flow is large whereas duty signal is small.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of completing the malfunction criteria below becomes 2 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Oil flow control solenoid valve control duty	≥ 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 of completing the malfunction criteria below becomes more than 2 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Target current value of the oil flow control solenoid valve	≥ 0.14%
|Target current value of the oil flow control solenoid valve – Oil flow control solenoid valve control current value |	≥ 0.08 A

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

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)

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

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the oil flow control valve solenoid.
Judge open NG when the current flow is small whereas duty signal is large, and judge short NG when the current flow is large whereas duty signal is small.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of completing 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 of completing the malfunction criteria below becomes 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

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)

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

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the oil flow control valve solenoid.
Judge open NG when the current flow is small whereas duty signal is large, and judge short NG when the current flow is large whereas duty signal is small.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of completing the malfunction criteria below becomes 2 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Oil flow control solenoid valve control duty	≥ 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 of completing the malfunction criteria below becomes more than 2 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Target current value of the oil flow control solenoid valve	≥ 0.14%
Target current value of the oil flow control solenoid valve – Oil flow control solenoid valve control current value	≥ 0.08 A

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

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)

DY: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 completing 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 of completing the malfunction criteria below becomes 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

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

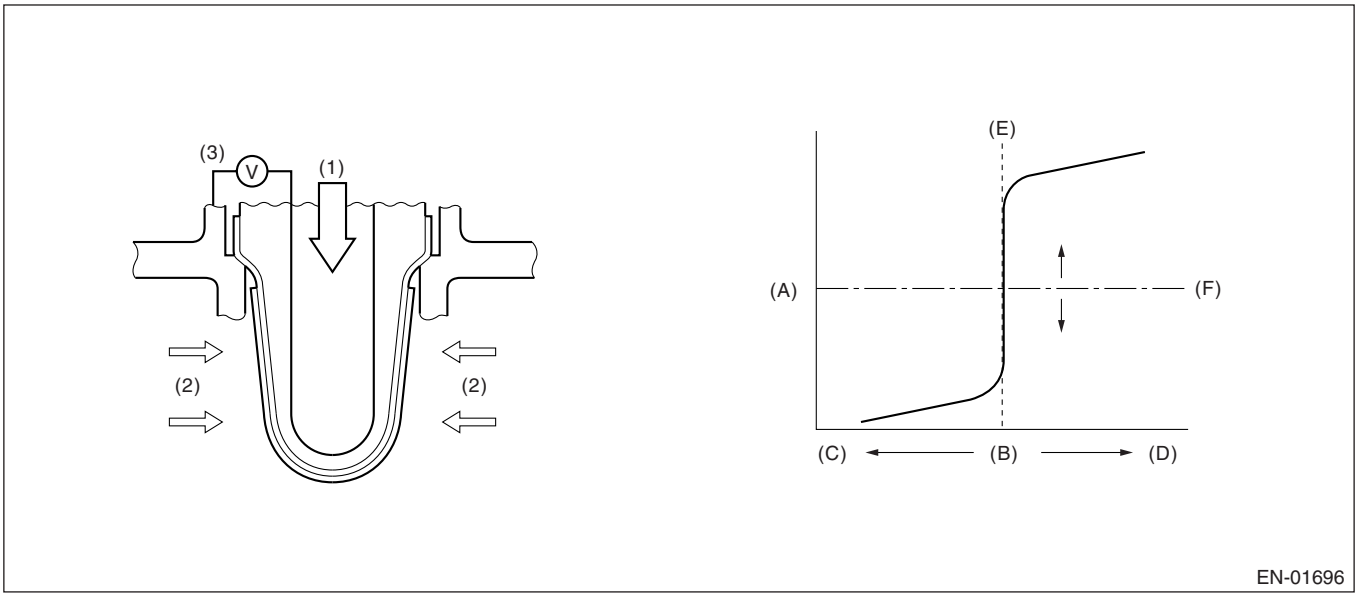
Memorize the freeze frame data. (For test mode $02)

DZ: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 judgement 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



(1) Atmosphere
(2) Exhaust gas
(3) Electromotive force
(A) Electromotive force
(B) Air fuel ratio
(C) Rich
(D) Lean
(E) Theoretical air fuel ratio
(F) Comparative voltage

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Continuous time when the following conditions are established	1 second or more
Conditions for carrying out the sub feedback learning	Complete

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at a constant speed of approx. 75 km/h (47 MPH) or higher.

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

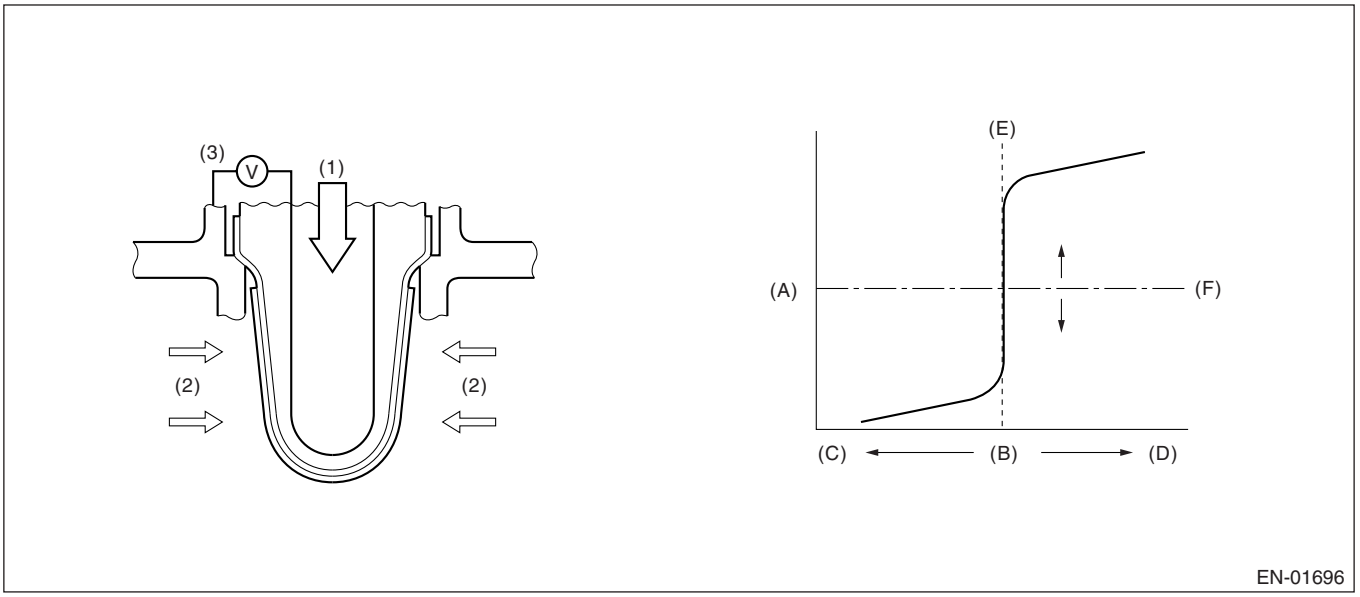
Memorize the freeze frame data. (For test mode $02)

EA: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 judgement 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



(1) Atmosphere
(2) Exhaust gas
(3) Electromotive force
(A) Electromotive force
(B) Air fuel ratio
(C) Rich
(D) Lean
(E) Theoretical air fuel ratio
(F) Comparative voltage

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Continuous time when the following conditions are established	1 second or more
Conditions for carrying out the sub feedback learning	Complete

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at a constant speed of approx. 75 km/h (47 MPH) or higher.

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

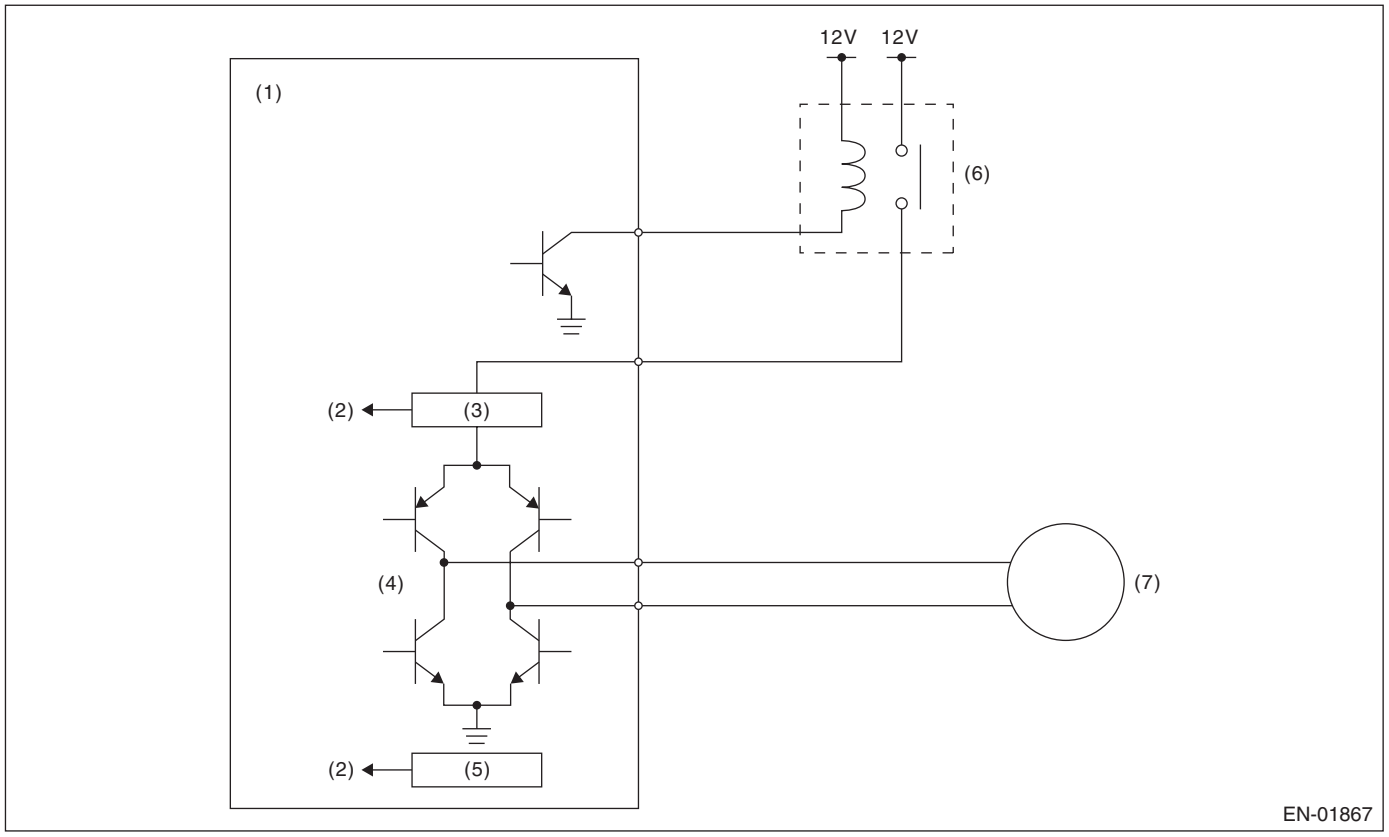
Memorize the freeze frame data. (For test mode $02)

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

1. OUTLINE OF DIAGNOSIS

Judge as NG when the motor current becomes too large or drive circuit is heated.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Detecting circuit
(3) Overcurrent detection circuit
(4) Drive circuit
(5) Temperature detection circuit
(6) Electronic throttle control relay
(7) Motor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Under control of electronic throttle control	ON
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

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	≤ 8 A
Drive circuit inner temperature	≤ 175°C (347°F)

Time Needed for Diagnosis:
- 500 milliseconds (For NG)
- 2000 milliseconds (For OK)

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed (Only engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only engine stop)

8. FAIL SAFE

Stop the continuity to the electronic control throttle motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

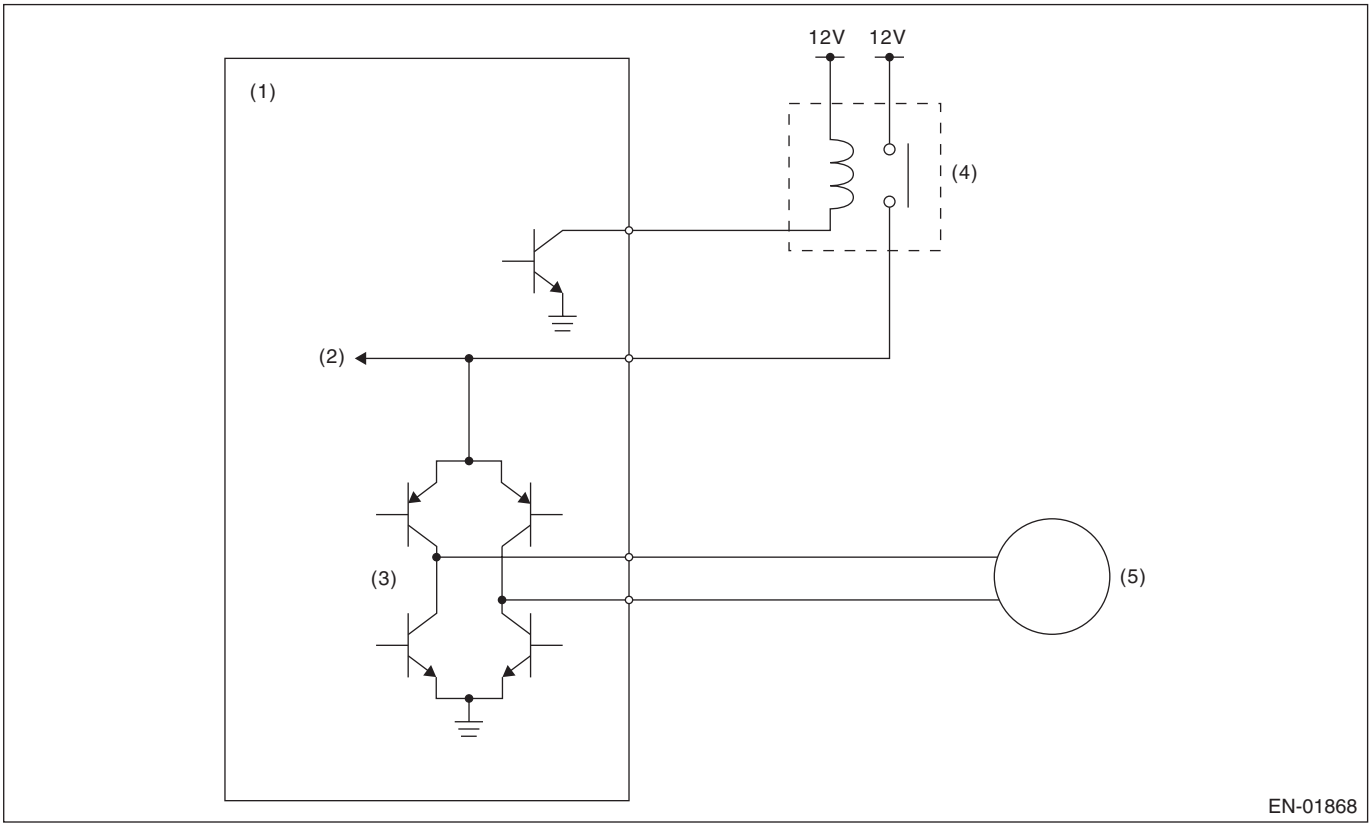
Memorize the freeze frame data. (For test mode $02)

EC:DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Judge as NG when the electronic throttle control power is not supplied even when ECM sets the electric control throttle relay to ON.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Voltage detection circuit
(3) Drive circuit
(4) Electronic throttle control relay
(5) Motor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Electronic control throttle relay output	ON
Battery voltage	≥ 6 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time until completing the malfunction criteria below becomes 0.5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Motor power voltage	≤ 5 V

Time Needed for Diagnosis:
- 400 milliseconds (For NG)
- 2000 milliseconds (For OK)

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed (Only engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only engine stop)

8. FAIL SAFE

Stop the continuity to the electronic control throttle motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

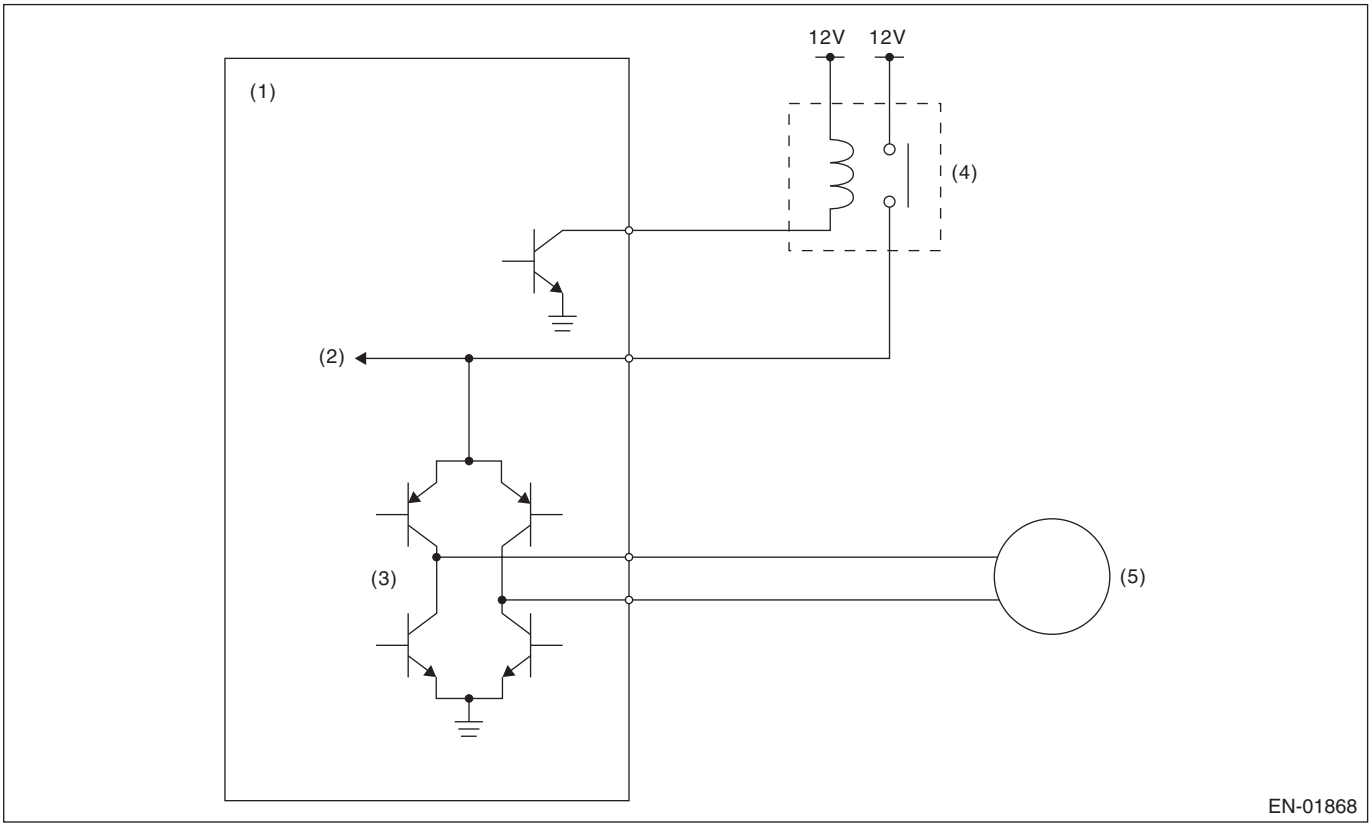
Memorize the freeze frame data. (For test mode $02)

ED:DTC P2103 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Judge as NG when the electronic throttle control power is supplied even when ECM sets the electric throttle control relay to OFF.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Voltage detection circuit
(3) Drive circuit
(4) Electronic throttle control relay
(5) Motor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Electronic control throttle relay output	OFF
Battery voltage	≥ 6 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	≤ 5 V

Time Needed for Diagnosis:
- 600 milliseconds (For NG)
- 400 milliseconds (For OK)

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed (Only engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only engine stop)

8. FAIL SAFE

Stop the continuity to the electronic control throttle motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

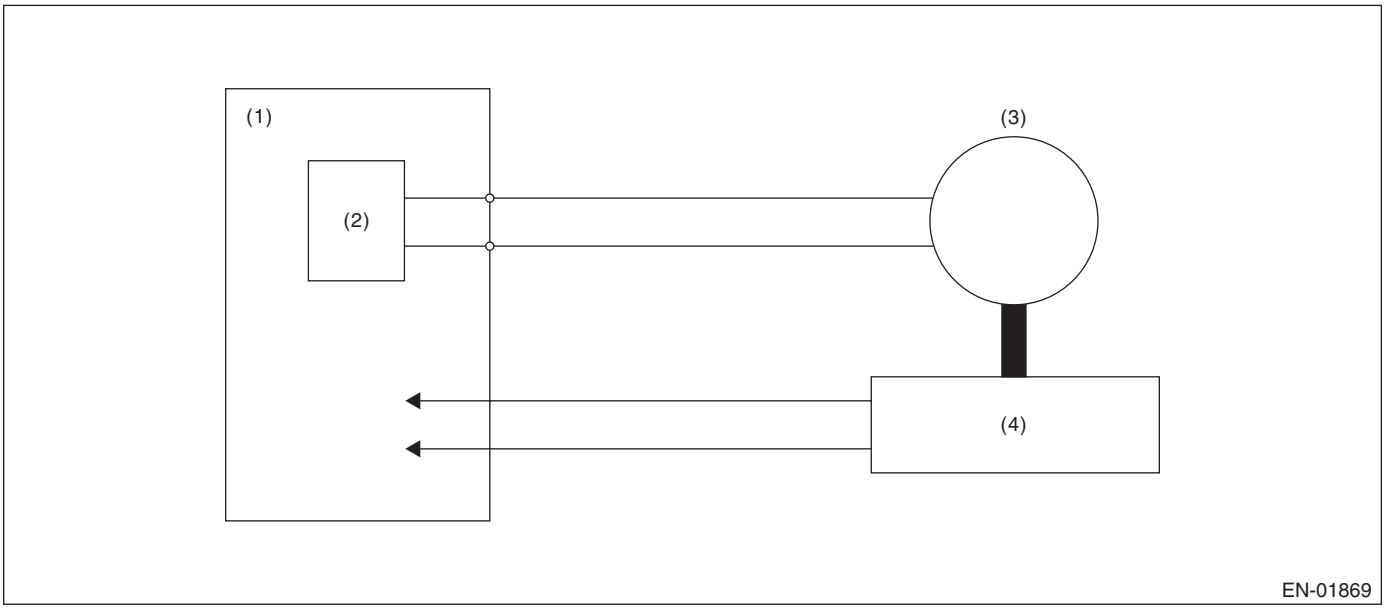
Memorize the freeze frame data. (For test mode $02)

EE: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)
(2) Drive circuit
(3) Motor
(4) Throttle position sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON → OFF
Ignition switch (Only after clearing 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 engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only engine stop)

8. FAIL SAFE

Stop the continuity to the electronic control throttle motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

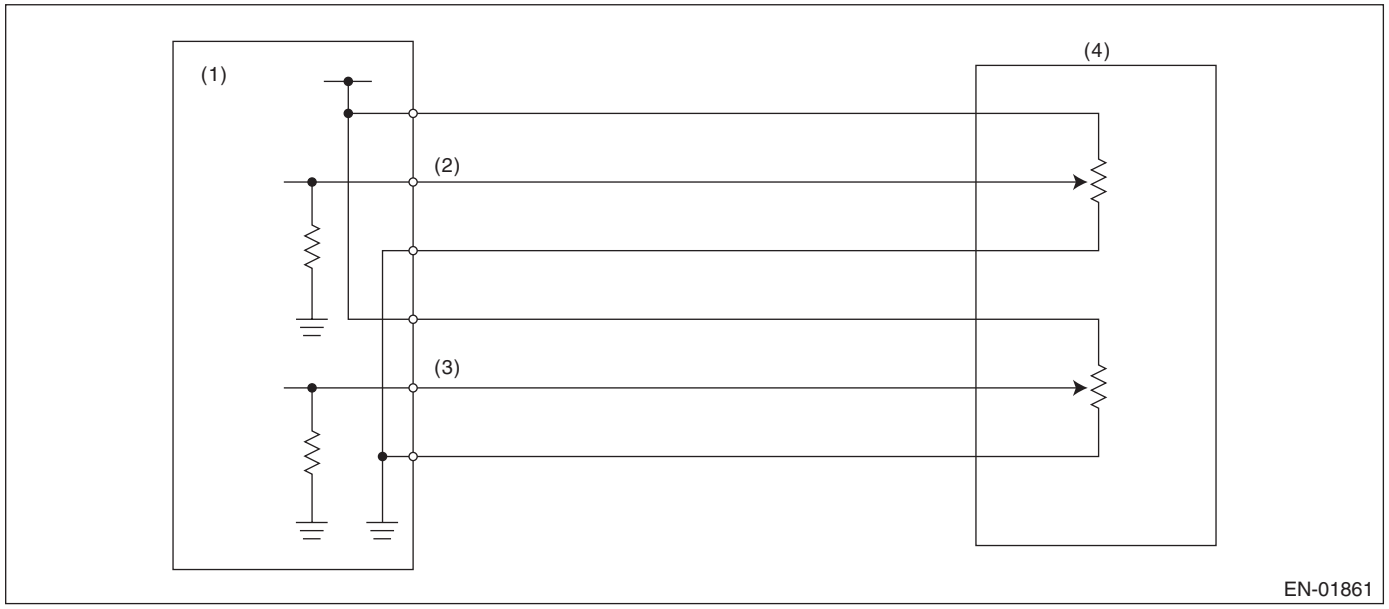
Memorize the freeze frame data. (For test mode $02)

EF: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 engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only engine stop)

8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Simultaneous failure: Throttle opening is fixed to 6°.

9. ECM OPERATION AT DTC SETTING

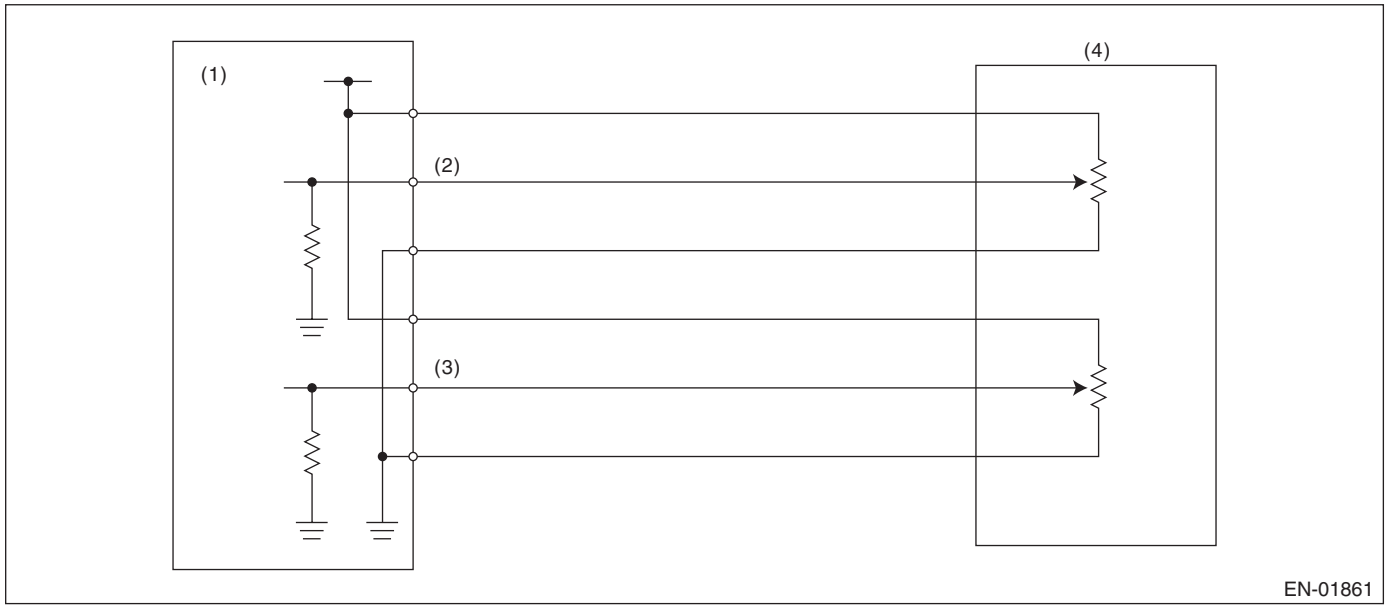
Memorize the freeze frame data. (For test mode $02)

EG: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 engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only engine stop)

8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Simultaneous failure: Throttle opening is fixed to 6°.

9. ECM OPERATION AT DTC SETTING

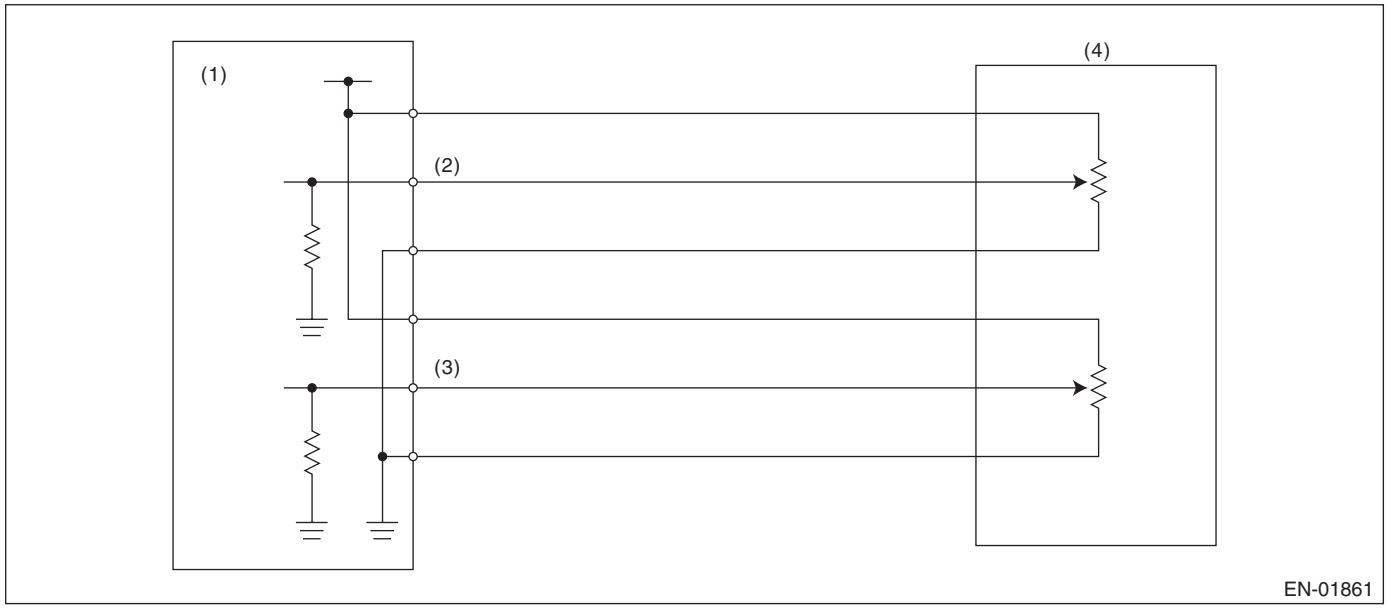
Memorize the freeze frame data. (For test mode $02)

EH: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 engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only engine stop)

8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Simultaneous failure: Throttle opening is fixed to 6°.

9. ECM OPERATION AT DTC SETTING

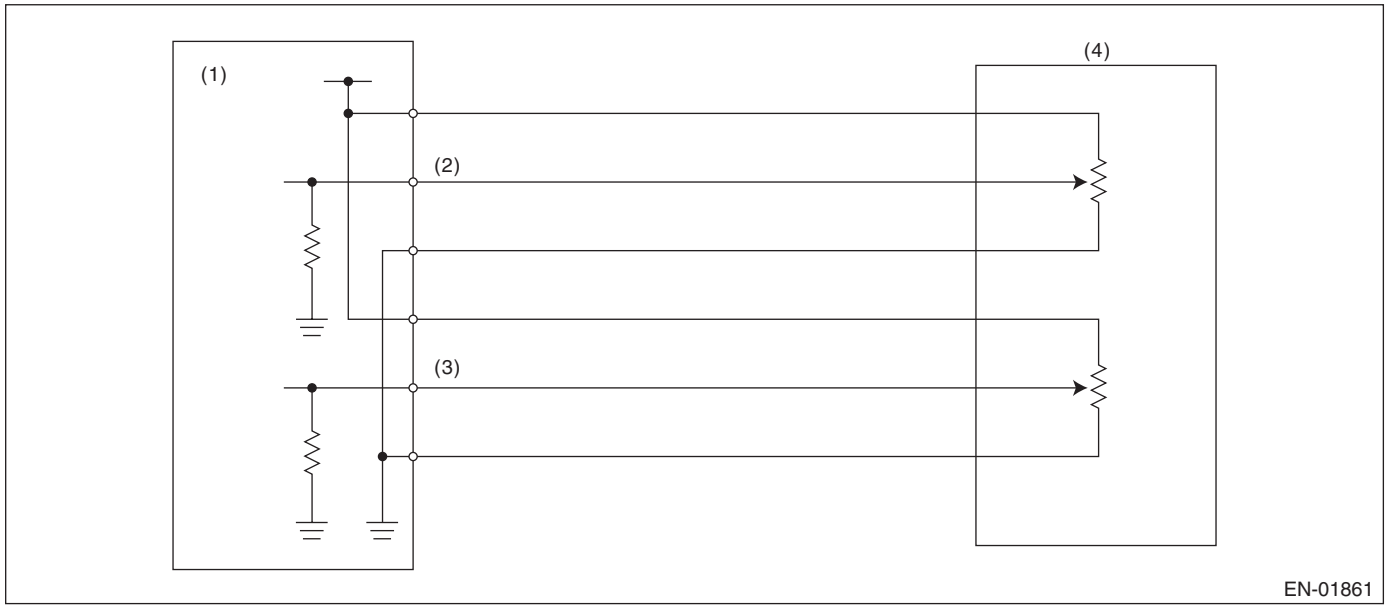
Memorize the freeze frame data. (For test mode $02)

EI: DTC 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 engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only engine stop)

8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Simultaneous failure: Throttle opening is fixed to 6°.

9. ECM OPERATION AT DTC SETTING

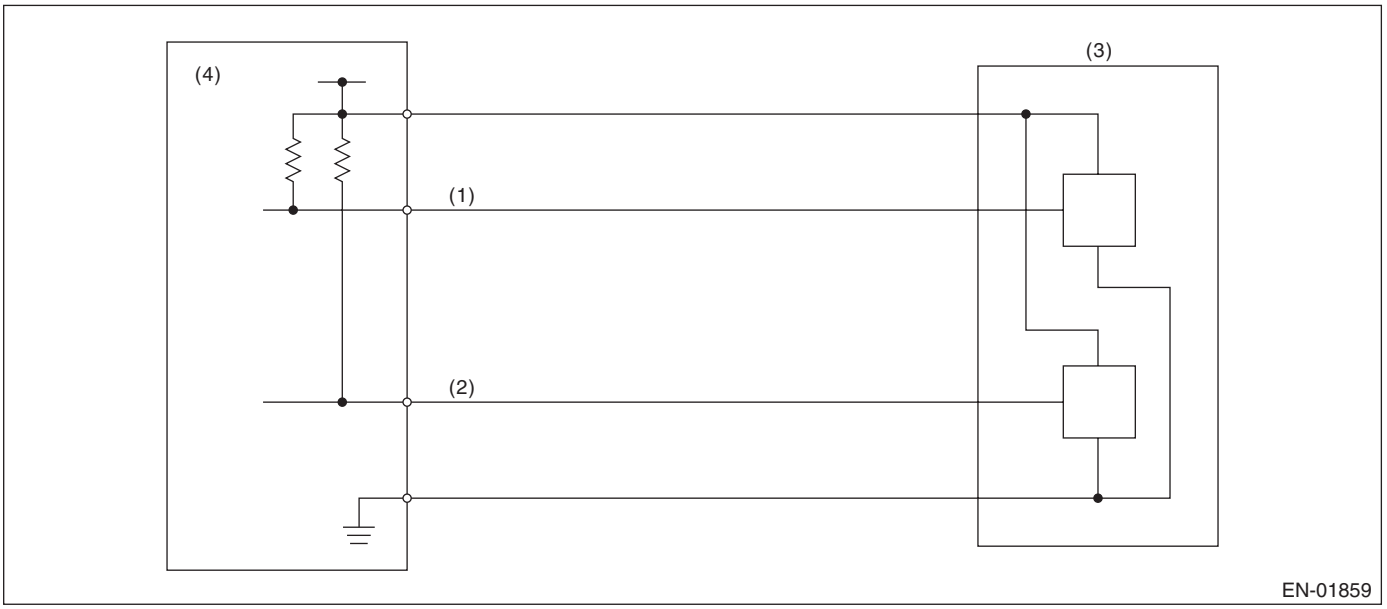
Memorize the freeze frame data. (For test mode $02)

EJ: DTC P2135 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A"/"B" VOLTAGE CORRELATION

1. OUTLINE OF DIAGNOSIS

Judge as NG when the signal level of throttle position sensor 1 is different from the throttle position sensor 2.

2. COMPONENT DESCRIPTION



(1) Throttle position sensor 1 signal.
(2) Throttle position sensor 2 signal.
(3) Throttle position sensor
(4) Engine control module (ECM)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

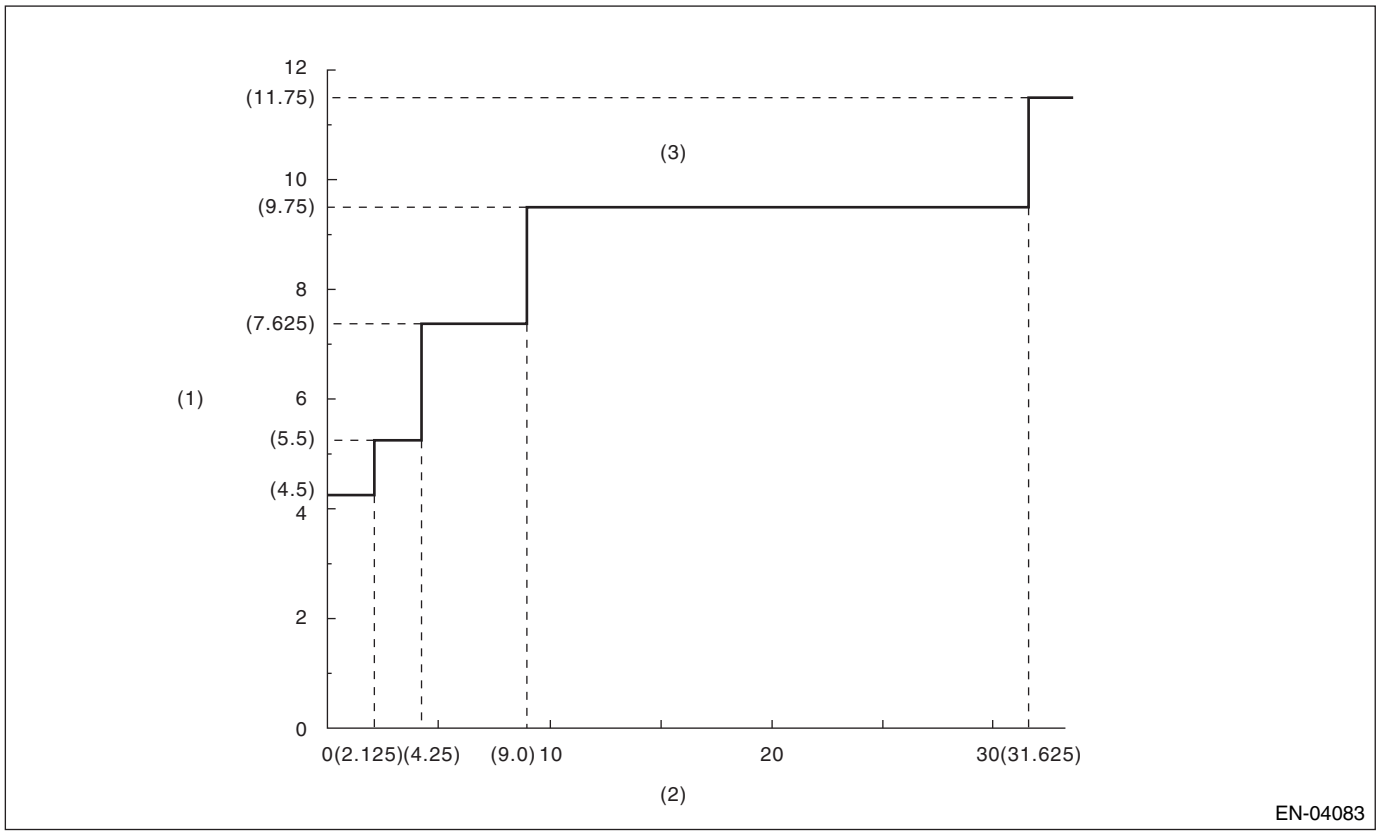
5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Signal difference between two sensors	≤ 4.25

Details of Judgment Value



(1) Sensor output difference (°)
(2) Throttle position sensor 1 opening angle (°)
(3) NG area

Time Needed for Diagnosis: 212 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed (Only engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only engine stop)

8. FAIL SAFE

Stop the continuity to ETC motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

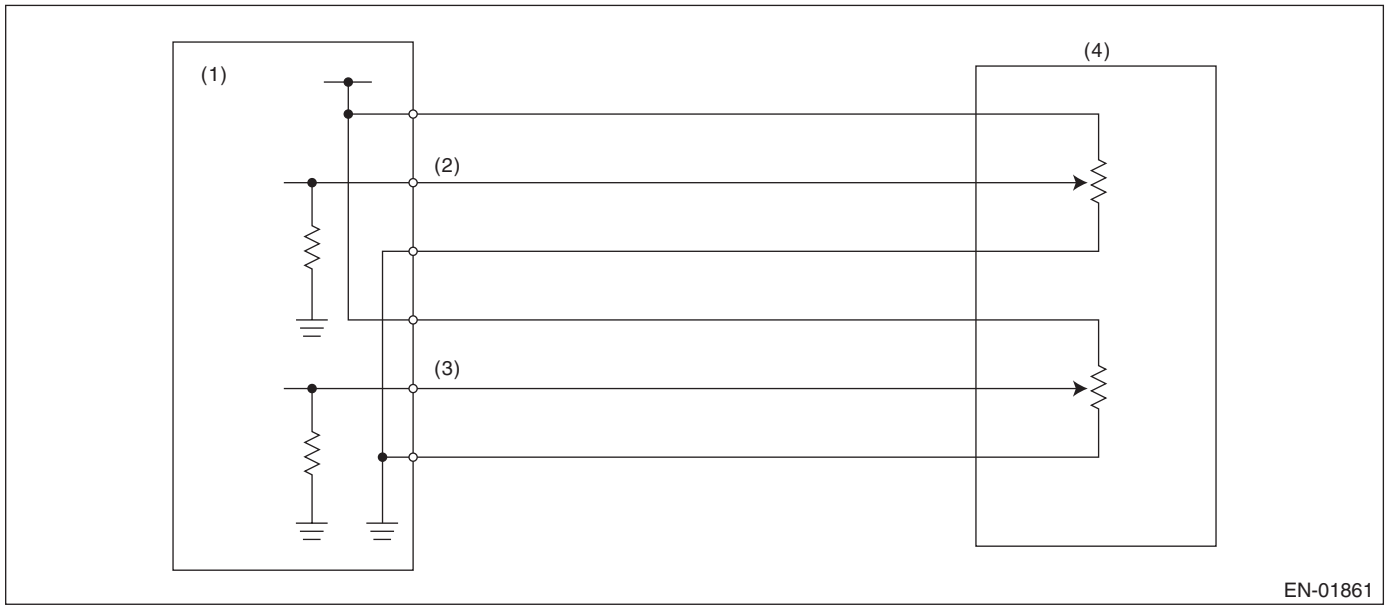
Memorize the freeze frame data. (For test mode $02)

EK:DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D”/“E” VOLTAGE CORRELATION

1. OUTLINE OF DIAGNOSIS

Judge as NG when the signal level of throttle position sensor 1 is different from the throttle position sensor 2.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Accelerator pedal position sensor 1 signal
(3) Accelerator pedal position sensor 2 signal
(4) Accelerator pedal position sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

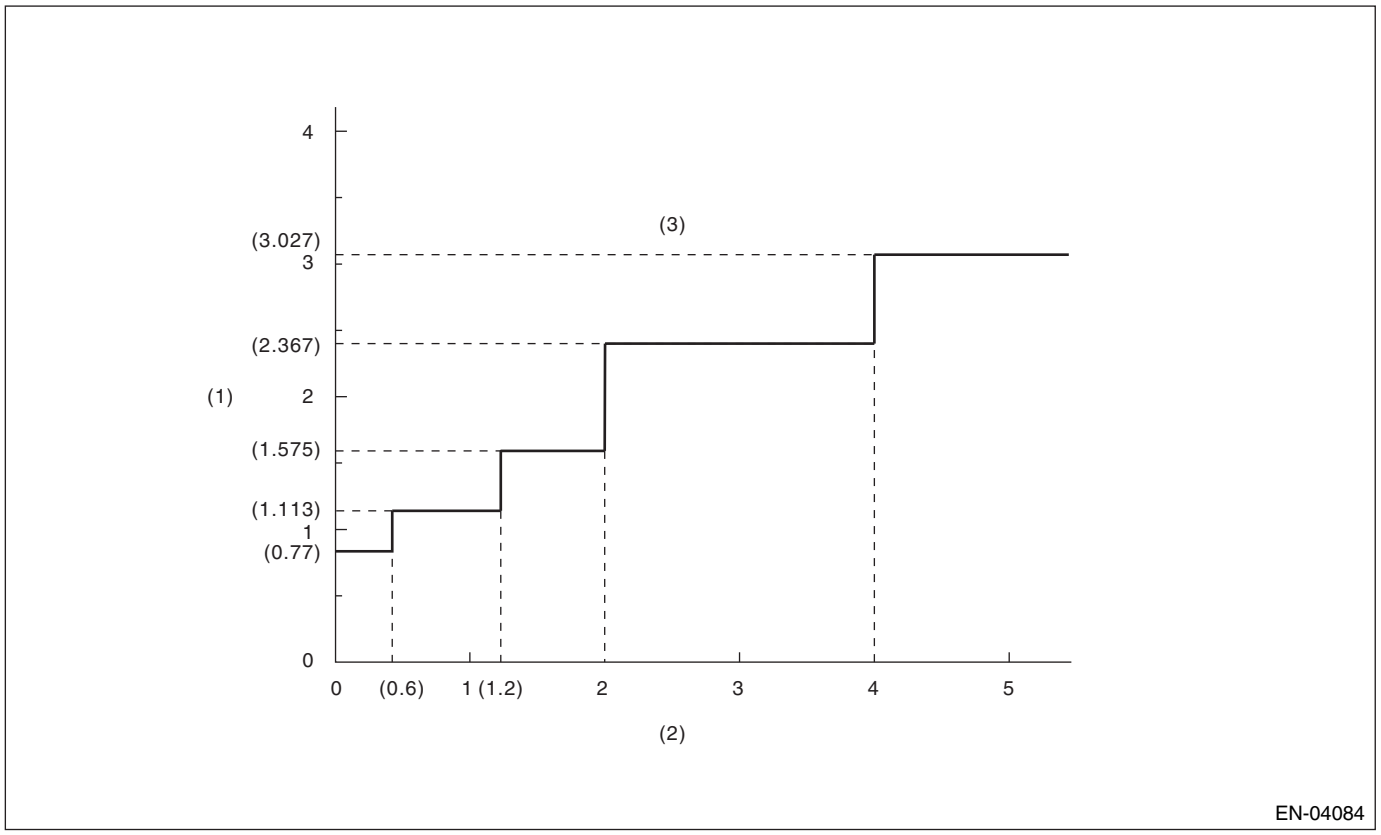
5. DIAGNOSTIC METHOD

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	≤ 0.77°

Details of Judgment Value



(1) Sensor output difference
(2) Accelerator pedal position sensor 2 opening angle (°)
(3) NG area

Time Needed for Diagnosis:
- 116 milliseconds (For NG)
- 1000 milliseconds (For OK)

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Throttle opening is fixed to 6°.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

EL:DTC P2227 BAROMETRIC PRESSURE CIRCUIT RANGE/PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of atmospheric pressure sensor output property.
Judge as NG when the atmospheric pressure sensor output is largely different from the intake manifold pressure at engine start.

2. COMPONENT DESCRIPTION

Atmospheric pressure sensor is built in ECM.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	< 300 rpm
Vehicle speed	< 1 km/h (0.62 MPH)

4. GENERAL DRIVING CYCLE

Perform the diagnosis once before engine start with the ignition switch ON.

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of completing the malfunction criteria below becomes 0.3 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
|Atmospheric pressure — manifold pressure |	≥ 26.7 kPa (200 mmHg, 7.87 inHg)
|Intake manifold pressure at engine startup — manifold pressure |	< 1.33 kPa (10 mmHg, 0.39 inHg)

Time Needed for Diagnosis: 0.3 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK and clear the NG when the continuous time of completing the malfunction criteria below becomes more than 0.26 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Atmospheric pressure — manifold 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

Atmospheric pressure sensor process: Fix the atmospheric pressure to 101.3 kPa (760 mmHg, 29.9 inHg).

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

EM:DTC P2228 BAROMETRIC PRESSURE CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect the open/short circuit of the atmospheric pressure sensor.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION

Atmospheric pressure sensor is built in ECM.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of completing the malfunction criteria below becomes 0.5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Output voltage	< 0.118 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Output voltage	≥ 0.118 V

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Atmospheric pressure sensor process: Fix the atmospheric pressure to 101.3 kPa (760 mmHg, 29.9 inHg).

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

EN:DTC P2229 BAROMETRIC PRESSURE CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect the open/short circuit of the atmospheric pressure sensor.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION

Atmospheric pressure sensor is built in ECM.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of completing the malfunction criteria below becomes 0.5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Output voltage	≥ 4.936 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Output voltage	< 4.936 V

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Atmospheric pressure sensor process: Fix the atmospheric pressure to 101.3 kPa (760 mmHg, 29.9 inHg).

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

EO:DTC P2431 SECONDARY AIR INJECTION SYSTEM AIR FLOW /PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect malfunction in the secondary air pressure sensor output properties.
Judge as NG when the secondary air pressure sensor output is largely different from the intake manifold pressure at engine start.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed at startup	< 300 rpm
Vehicle speed	< 1 km/h
After secondary air injection system stop	3 seconds or more

3. GENERAL DRIVING CYCLE

Perform the diagnosis with the ignition switch ON.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG if the continuous time with the following conditions established is more than 0.3 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
|Secondary air supply piping pressure – Intake manifold pressure |	≥ 200 mmHg
|Intake manifold pressure at engine start-up – Intake manifold pressure |	< 10 mmHg

Time Needed for Diagnosis: 0.3 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK and clear the NG when the continuous time when the following conditions are established are more than 0.26 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
|Secondary air supply piping pressure – Intake manifold pressure |	< 200 mmHg

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

EP: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)

EQ: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)

ER:DTC P2440 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK1)

NOTE:
For the diagnostic procedure, refer to DTC P0410. <Ref. to GD(H4DOTC)-123, DTC P0410 SECONDARY AIR INJECTION SYSTEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

ES:DTC P2441 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK CLOSED (BANK1)

NOTE:
For the diagnostic procedure, refer to DTC P0410. <Ref. to GD(H4DOTC)-123, DTC P0410 SECONDARY AIR INJECTION SYSTEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

ET:DTC P2442 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK2)

NOTE:
For the diagnostic procedure, refer to DTC P0410. <Ref. to GD(H4DOTC)-123, DTC P0410 SECONDARY AIR INJECTION SYSTEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

EU:DTC P2443 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK CLOSED (BANK2)

NOTE:
For the diagnostic procedure, refer to DTC P0410. <Ref. to GD(H4DOTC)-123, DTC P0410 SECONDARY AIR INJECTION SYSTEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

EV:DTC P2444 SECONDARY AIR INJECTION SYSTEM PUMP STUCK ON

1. OUTLINE OF DIAGNOSIS

Detect functional errors (continually ON) of the secondary air pump.
When the secondary air supply piping pressure is high in comparison to the atmospheric pressure, it is judged as NG.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

When the secondary air pump is OFF, the secondary air supply pipe pressure should be atmospheric pressure. If it is higher than atmospheric pressure, judge as NG.

Abnormality Judgment

Judge as NG if the continuous time with all of the following conditions established is more than 5 seconds.

Malfunction Criteria	Threshold Value
Estimate ambient temperature	≥ 4.4°C (39.92°F)
Battery voltage	≥ 10.9 V
After secondary air injection system operation	0.6 second or more
Battery voltage	≥ 7 V
Atmosphere pressure	≥ 75.0 kPa (563 mmHg, 22.15 inHg)
Engine	In operation
After secondary air injection system stop	3 seconds or more
Secondary air supply piping pressure (Absolute pressure)	> Value from Map 22

Map 22

Unit: (kPa (mmHg, inHg))		Atmospheric pressure (kPa (mmHg, inHg))							
		69.3 (520, 20.47)	74.6 (560, 22.03)	80.0 (600, 23.63)	85.3 (640, 25.19)	90.6 (680, 26.76)	96.0 (720, 28.35)	101.3 (760, 29.92)	106.6 (800, 31.48)
Battery voltage (V)	10.5	78.0 (585, 23.03)	84.0 (630, 24.80)	90.0 (675, 26.58)	96.0 (720, 28.35)	102.0 (765, 30.13)	108.0 (810, 31.90)	114.0 (855, 33.67)	120.0 (900, 35.44)
	11.5	79.3 (595, 23.42)	85.4 (641, 25.22)	91.6 (687, 27.05)	97.7 (733, 28.86)	103.7 (778, 30.63)	109.8 (824, 32.43)	116.0 (870, 34.26)	122.1 (916, 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)

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	≥ 4.4°C (39.92°F)
Battery voltage	≥ 10.9 V
After secondary air injection system operation	0.6 seconds or more
Battery voltage	≥ 7 V
Atmosphere pressure	≥ 75.0 kPa (563 mmHg, 22.15 inHg)
Engine	In operation
After secondary air injection system stop	3 seconds or more
Secondary air supply piping pressure (Absolute pressure)	≤ Value from Map 22

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)

TRANSMISSION SECTION

CONTROL SYSTEMS	CS
AUTOMATIC TRANSMISSION	4AT
AUTOMATIC TRANSMISSION (DIAGNOSTICS)	4AT(D)(diag)
MANUAL TRANSMISSION AND DIFFERENTIAL	5MT
CLUTCH SYSTEM	CL

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

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

FUJI HEAVY INDUSTRIES LTD.

G8100BE4

CONTROL SYSTEMS

CS

Page

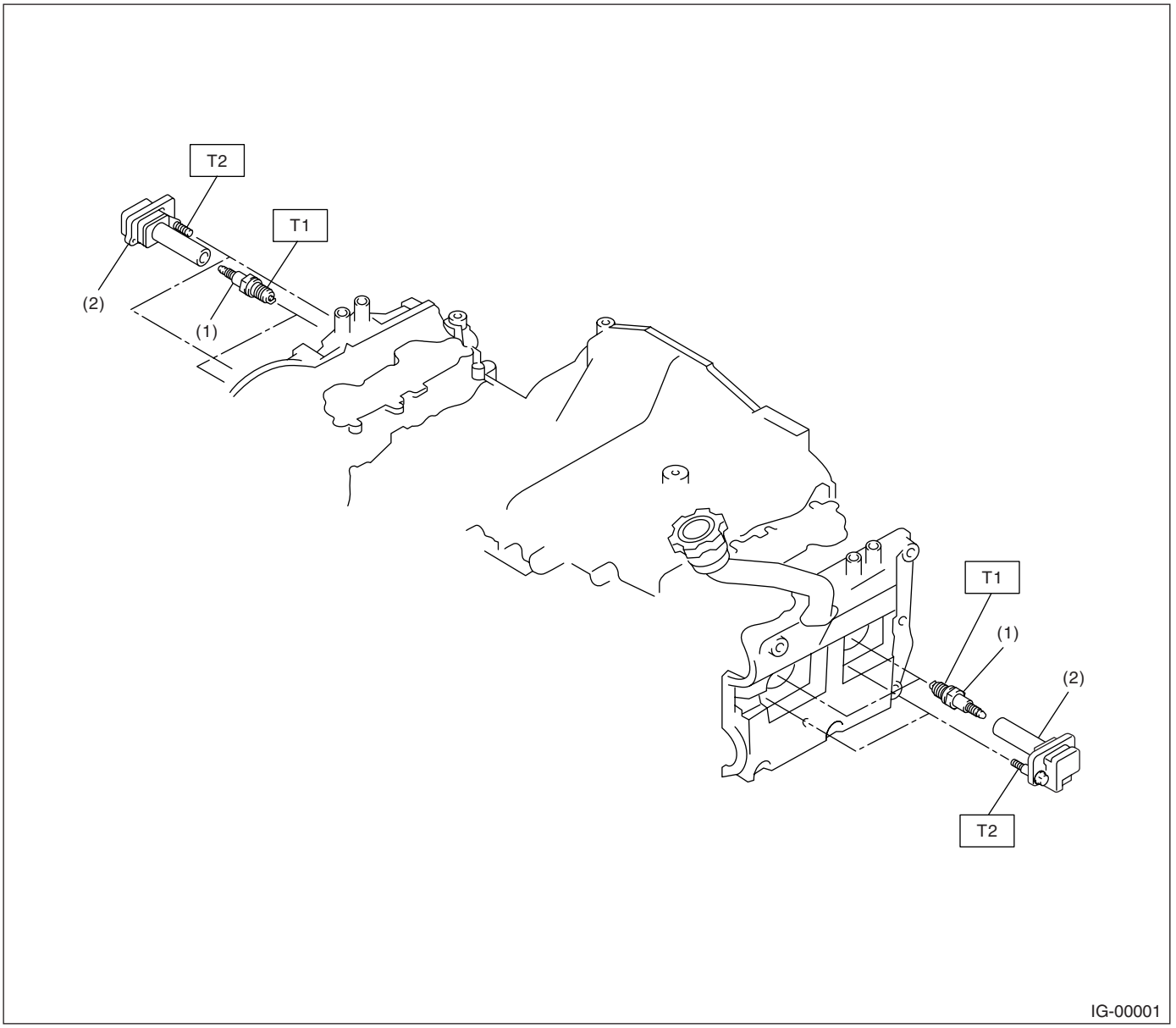
1. General Description 2
2. Electrical Component Location 6
3. AT Shift Lock Control System 8
4. Select Lever 21
5. Select Cable 25
6. AT Shift Lock Solenoid and “P” Range Switch 28
7. Body Integrated Unit 30
8. MT Gear Shift Lever 31
9. General Diagnostic Table 38

1. General Description

A: SPECIFICATION

Item		SPECIFICATION
Ignition coil and ignitor assembly	Type	FK0186
	Ignition system	Independent ignition coil
	Manufacturer	Diamond Electric
Spark plug	Manufacturer and type	NGK: ILFR6B
	Thread diameter, pitch, length mm	14, 1.25, 26.5
	Spark plug gap mm (in)	0.7 — 0.8 (0.028 — 0.031)
	Electrode	Iridium

B: COMPONENT



(1) Spark plug
(2) Ignition coil and ignitor ASSY

Tightening torque: N·m (kgf-m, ft-lb)
T1: 21 (2.1, 15.2)
T2: 16 (1.6, 11.7)

C: CAUTION

• Wear work clothing, including a cap, protective goggles and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust and dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
• Be careful not to burn your hands, because each part on the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or rigid racks at the specified points.
• Before disconnecting connectors of sensors or units, be sure to disconnect the ground cable from battery.

2. Spark Plug

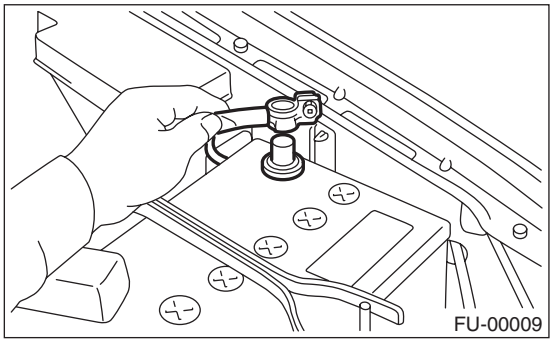
A: REMOVAL

CAUTION:
All spark plugs installed on an engine must be of the same heat range.

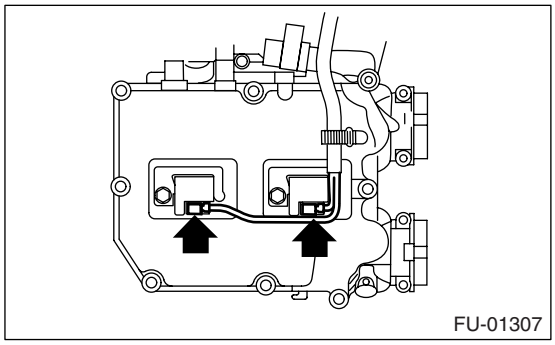
Spark plug:
NGK: ILFR6B

1. RH SIDE

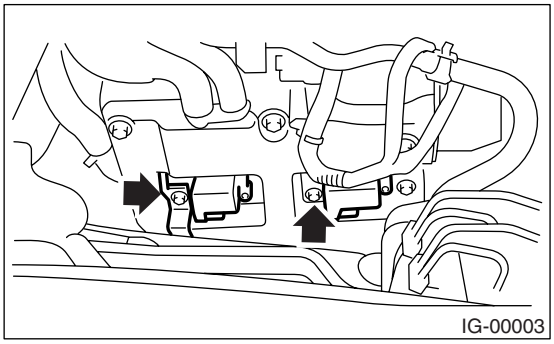
1) Disconnect the ground cable from battery.



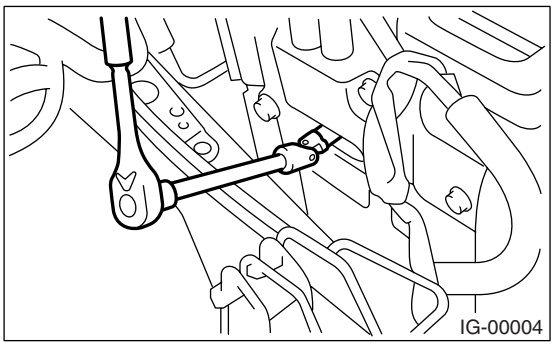
2) Remove the collector cover.
3) Remove the air cleaner lower case.
<Ref. to IN(H4DOTC)-7, REMOVAL, Air Cleaner Case.>
4) Disconnect the connector from ignition coil.



5) Remove the ignition coil.

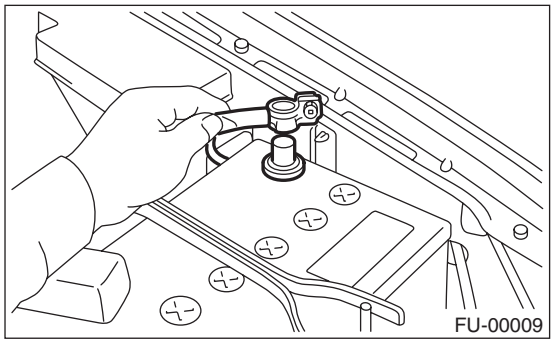


6) Remove the spark plug with a spark plug socket.

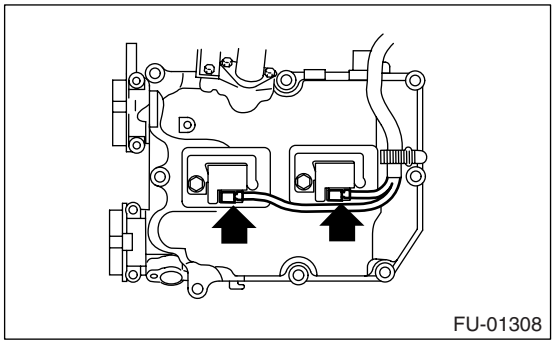


2. LH SIDE

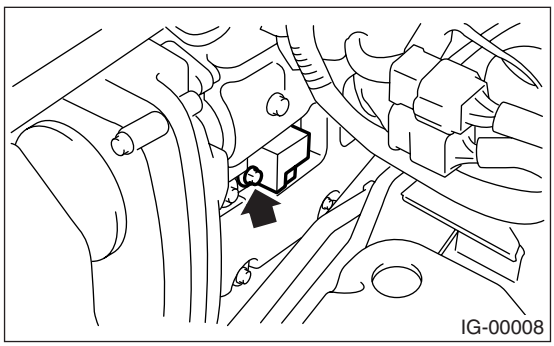
1) Disconnect the ground cable from battery and remove the battery and battery carrier.



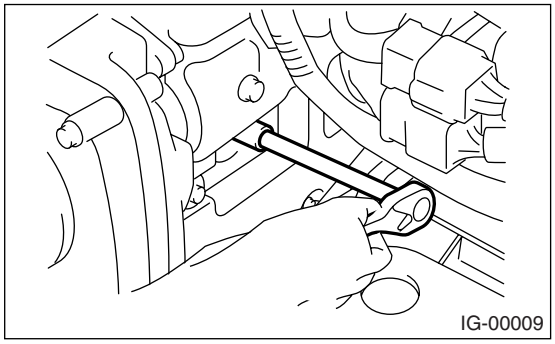
2) Remove the collector cover.
3) Remove the secondary air pump.
<Ref. to EC(H4DOTC)-9, REMOVAL, Secondary Air Pump.>
4) Disconnect the connector from ignition coil.



5) Remove the ignition coil.



6) Remove the spark plug with a spark plug socket.


IG-00009

B: INSTALLATION

1. RH SIDE

Install in the reverse order of removal.

Tightening torque:
Spark plug
21 N·m (2.1 kgf-m, 15.2 ft-lb)
Ignition coil
16 N·m (1.6 kgf-m, 11.7 ft-lb)

NOTE:
The tightening torque described above should be applied to only new spark plugs without oil on their threads.
In case their threads are lubricated, the torque should be reduced by approx. 1/3 of the specified torque in order to avoid over-stressing.

2. LH SIDE

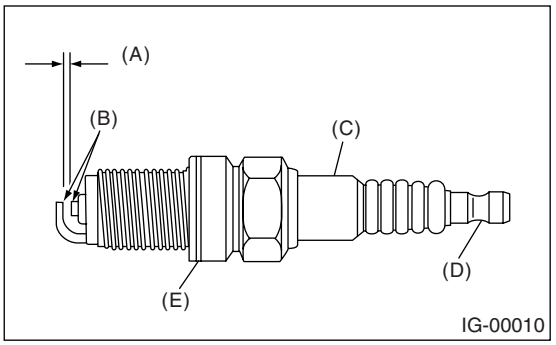
Install in the reverse order of removal.

Tightening torque:
Spark plug
21 N·m (2.1 kgf-m, 15.2 ft-lb)
Ignition coil
16 N·m (1.6 kgf-m, 11.7 ft-lb)

NOTE:
The tightening torque described above should be applied to only new spark plugs without oil on their threads.
In case their threads are lubricated, the torque should be reduced by approx. 1/3 of the specified torque in order to avoid over-stressing.

C: INSPECTION

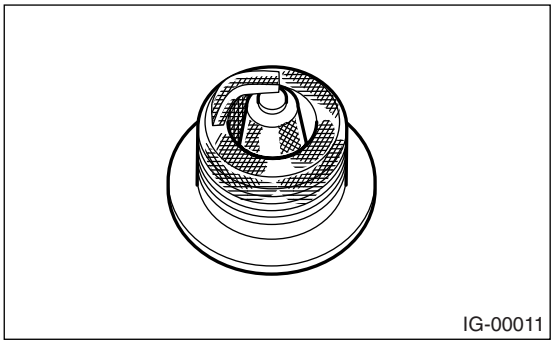
Check the electrodes and inner and outer ceramic insulator of plugs, noting the type of deposits and the degree of electrode erosion.



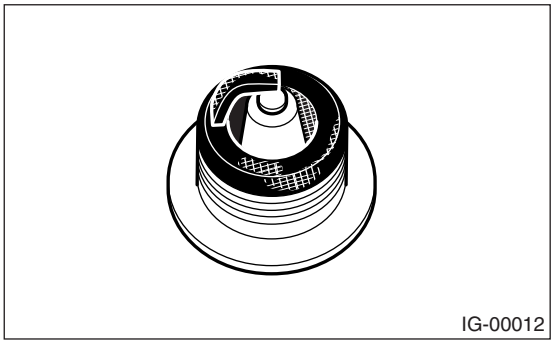
IG-00010

(A) Spark plug gap
(B) Carbon accumulation or wear
(C) Crack
(D) Damage
(E) Damaged gasket

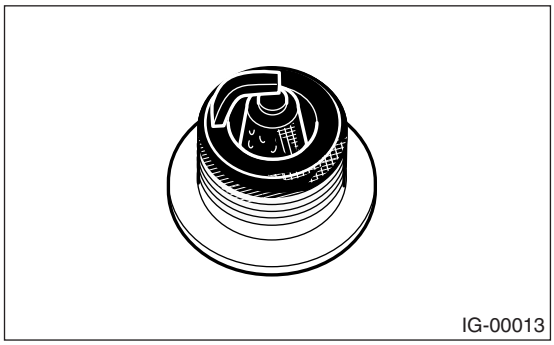
1) Normal:
Brown to grayish-tan deposits and slight electrode wear indicate correct spark plug heat range.


IG-00011

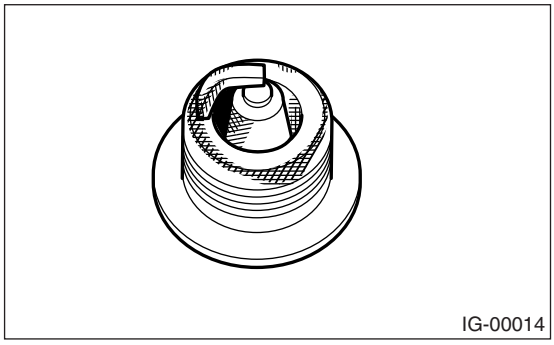
2) Carbon fouled:
Dry fluffy carbon deposits on insulator and electrode are mostly caused by slow speed driving in the city, weak ignition, too rich fuel mixture, dirty air cleaner, etc.


IG-00012

3) Oil fouled:
Wet black deposits show excessive oil entrance into combustion chamber through worn rings and pistons or excessive clearance between valve guides and stems.


IG-00013

4) Overheating:
White or light gray insulator with black or brown spots and bluish burnt electrodes indicate engine overheating. Moreover, those appearance also results from incorrect ignition timing, loose spark plugs, wrong selection of fuel, or plug with too low degree of heat durability, etc.

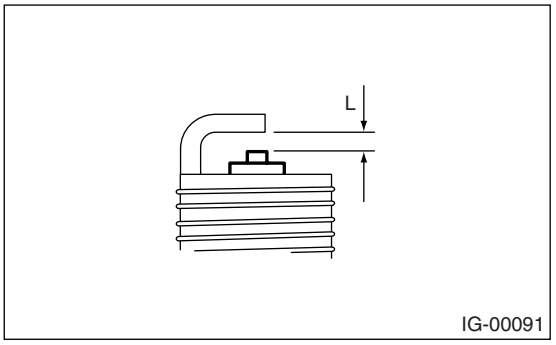

IG-00014

D: ADJUSTMENT

Clean the spark plugs using a wire brush.
Clean and remove the carbon or oxide deposits. But do not wear away ceramic insulator at this time.
If deposits are too stubborn, replace the spark plugs.
After cleaning the spark plugs, measure the spark plug gap using a gap gauge.

NOTE:
Do not use a plug cleaner because the spark plugs are applied with iridium tip.

Spark plug gap: L
0.7 — 0.8 mm (0.028 — 0.031 in)



IG-00091

3. Ignition Coil and Ignitor Assembly

A: REMOVAL

Direct ignition type has been adopted. Refer to "Removing Spark Plugs" for removal procedures. <Ref. to IG(H4DOTC)-4, REMOVAL, Spark Plug.>

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
16 N·m (1.6 kgf-m, 11.7 ft-lb)

C: INSPECTION

Refer to the following for inspection procedures. <Ref. to EN(H4DOTC)(diag)-59, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>

STARTING/CHARGING SYSTEMS

SC(H4DOTC)

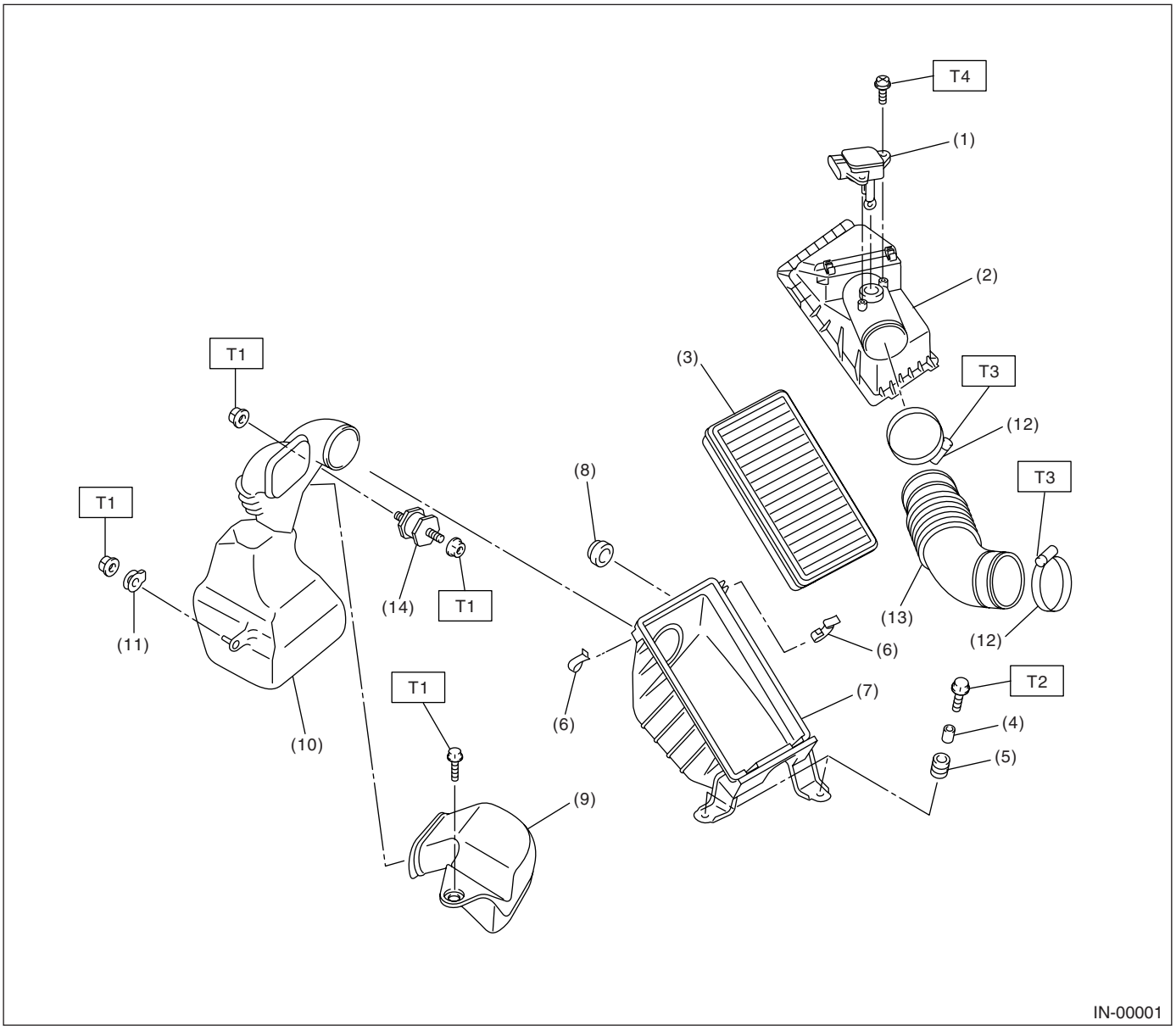
Page

1. General Description 2

1. General Description

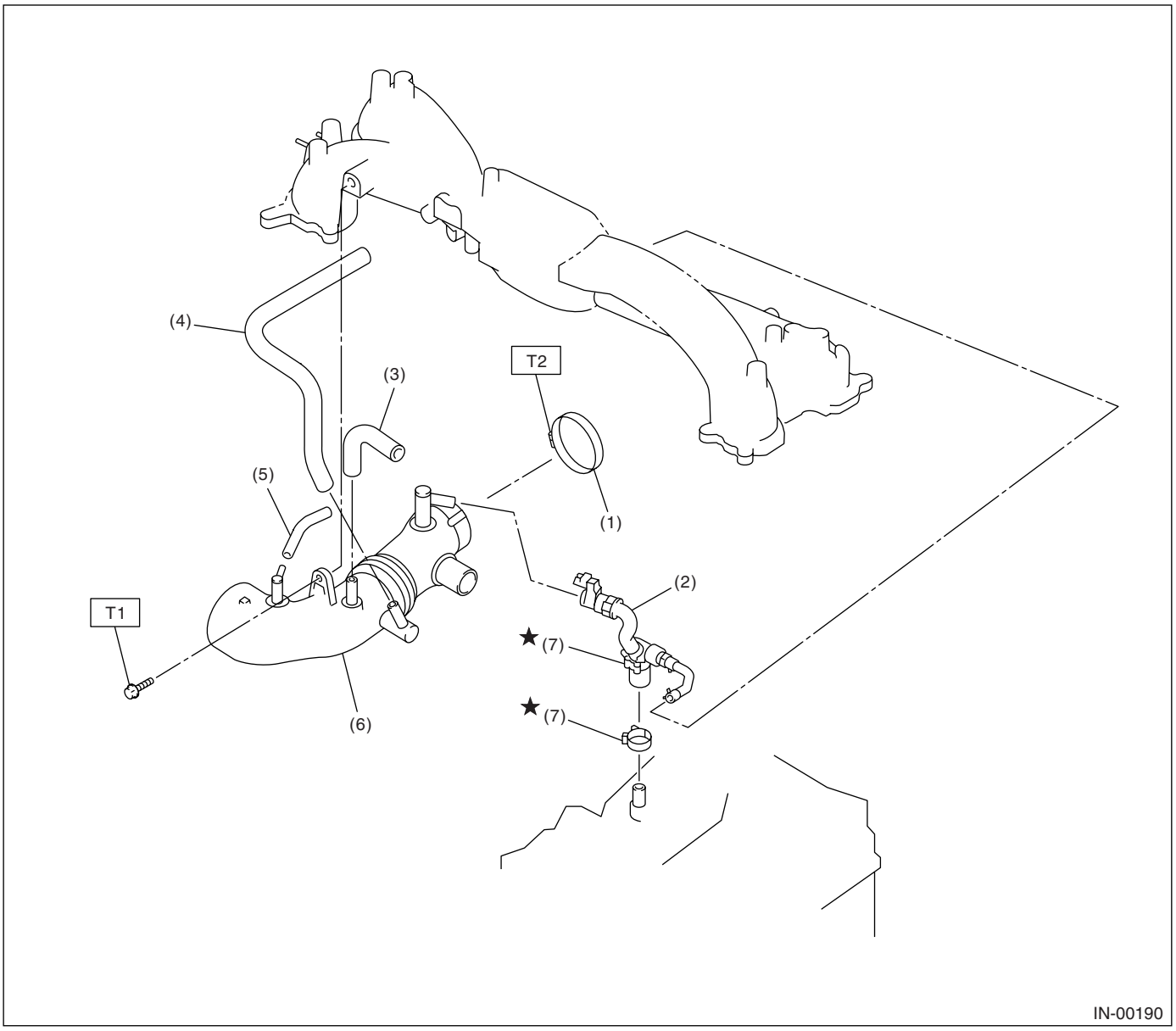
A: COMPONENT

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	***Tightening torque: N·m (kgf-m, ft-lb)***	
(4)	Spacer	(10)	Resonator chamber ASSY	***T1: 7.5 (0.76, 5.5)***	
(5)	Bushing	(11)	Cushion rubber	***T2: 33 (3.4, 24.6)***	
(6)	Clip	(12)	Clamp	***T3: 2.5 (0.25, 1.8)***	
		(13)	Air intake boot	***T4: 1.7 (0.17, 1.2)***	

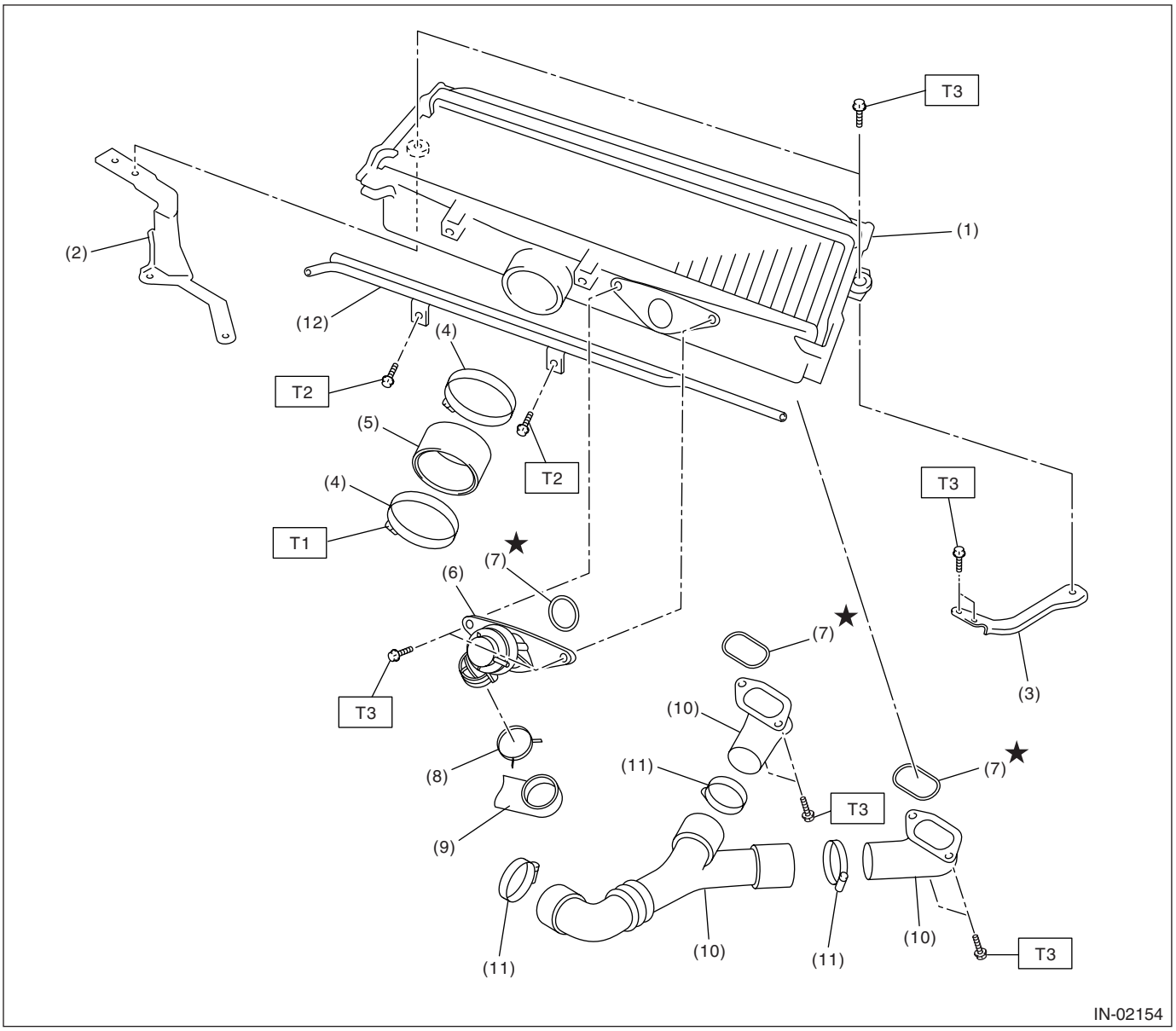
2. INTAKE DUCT



(1) Clamp
(2) PCV hose ASSY
(3) Air by-pass hose A
(4) Air by-pass hose B
(5) Air by-pass hose C
(6) Intake duct
(7) Clamp

Tightening torque: N·m (kgf-m, ft-lb)
T1: 19 (1.9, 13.7)
T2: 3 (0.3, 2.2)

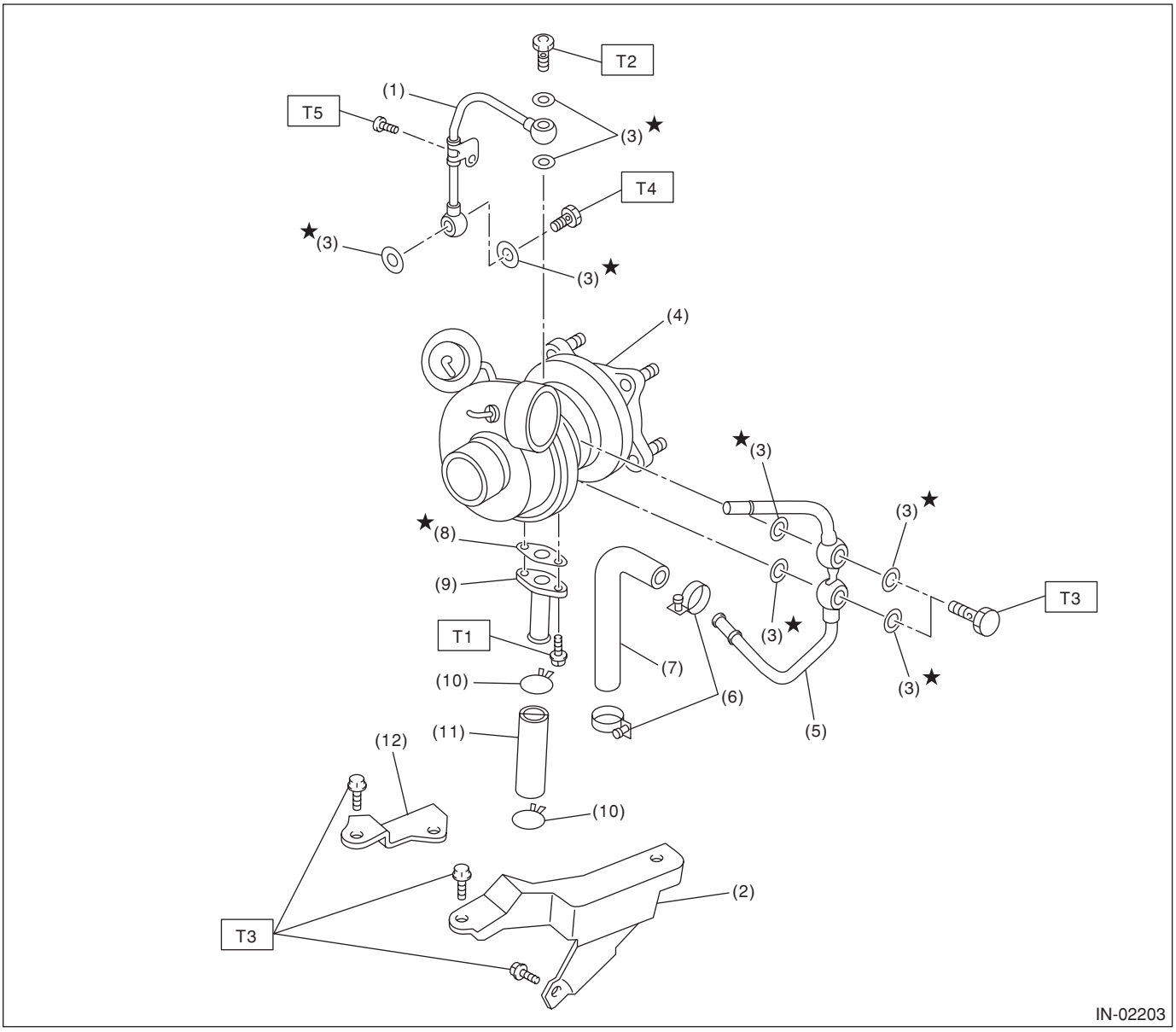
3. INTERCOOLER



(1) Intercooler
(2) Intercooler bracket RH
(3) Intercooler bracket LH
(4) Clamp
(5) Air intake duct
(6) Air by-pass valve
(7) O-ring
(8) Clamp
(9) Air by-pass hose A
(10) Intercooler duct
(11) Clamp
(12) PCV pipe

Tightening torque: N·m (kgf-m, ft-lb)
T1: 3 (0.3, 2.2)
T2: 6.3 (0.64, 4.6)
T3: 16 (1.6, 11.6)

4. TURBOCHARGER



(1) Oil inlet pipe A
(2) Turbocharger bracket LH
(3) Metal gasket
(4) Turbocharger
(5) Water pipe
(6) Clamp
(7) Engine coolant hose
(8) Gasket
(9) Oil outlet pipe
(10) Clip
(11) Oil outlet hose
(12) Turbocharger bracket RH

Tightening torque: N·m (kgf-m, ft-lb)
T1: 4.4 (0.45, 3.3)
T2: 16 (1.6, 11.6)
T3: 33 (3.4, 24.6)
T4: 29 (3.0, 21.7)
T5: 4.9 (0.50, 3.6)

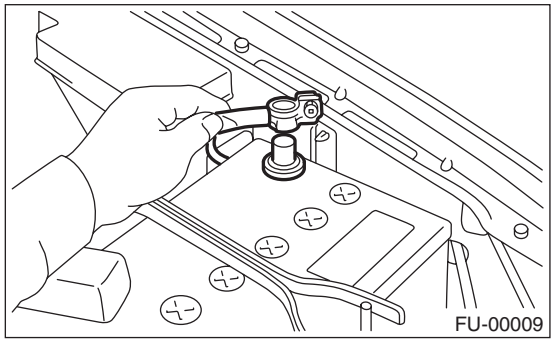
B: CAUTION

- Wear work clothing, including a cap, protective goggles and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Be careful not to burn your hands, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before disconnecting connectors of sensors or units, be sure to disconnect the ground cable from battery.

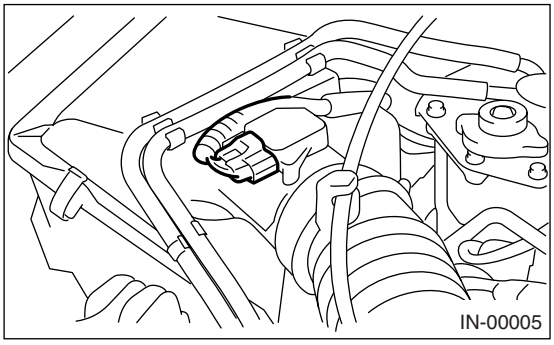
2. Air Cleaner Case

A: REMOVAL

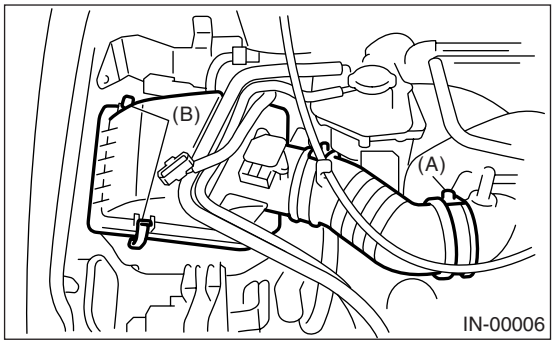
1) Disconnect the ground cable from battery.



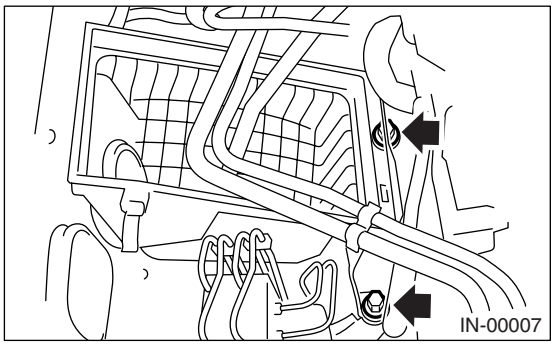
2) Disconnect the connector from mass air flow sensor.



3) Loosen the clamps (A) which connect the air intake boot and the intake duct.
4) Remove the clip (B) from air cleaner upper cover.



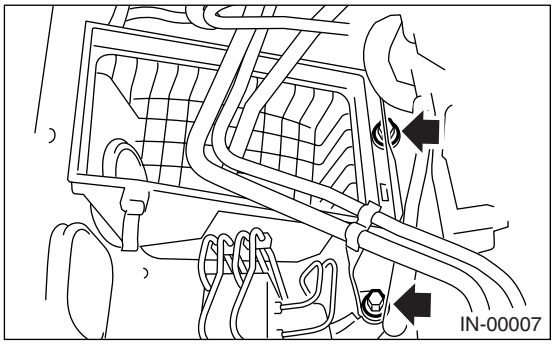
5) Remove the air cleaner upper cover.
6) Remove the air cleaner element.
7) Remove the air cleaner lower case.



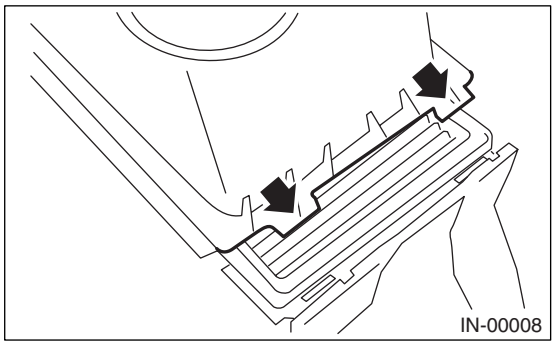
B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
33 N·m (3.4 kgf-m, 24.6 ft-lb)



NOTE:
Before installing the air cleaner upper cover, align the protrusion with the hole of air cleaner lower case, and then secure the upper cover and lower case.



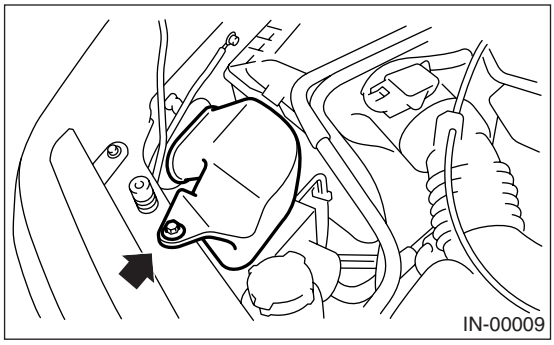
C: INSPECTION

Replace if excessively damaged or dirty.

3. Air Intake Duct

A: REMOVAL

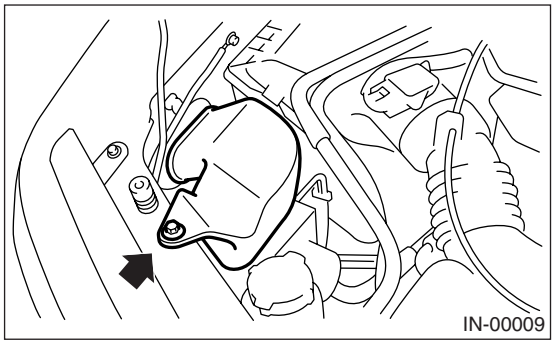
Remove the bolts which install the air intake duct on the front side of body.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)



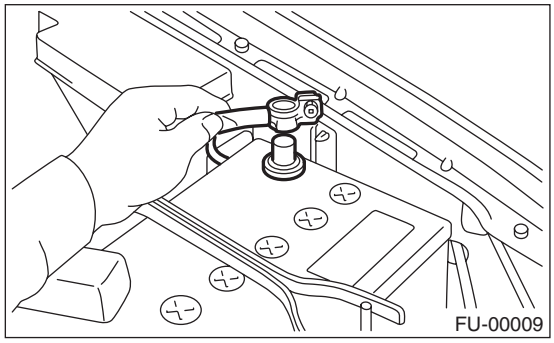
C: INSPECTION

1) Check for cracks or loose connection.
2) Inspect that no foreign objects in the air intake duct.

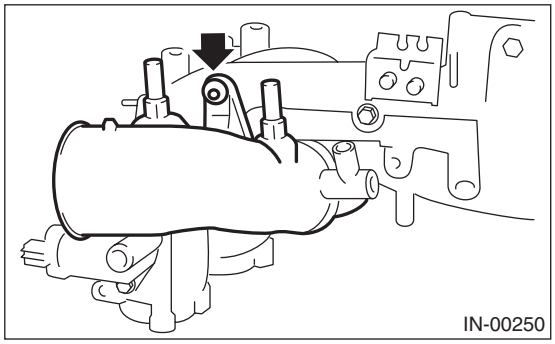
4. Intake Duct

A: REMOVAL

1) Disconnect the ground cable from battery.



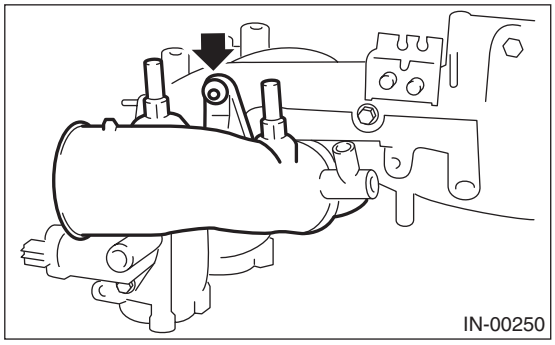
2) Remove the collector cover.
3) Remove the intake manifold.
<Ref. to FU(H4DOTC)-14, REMOVAL, Intake Manifold.>
4) Remove the sensor, engine harness and fuel pipe attached to the intake manifold. <Ref. to FU(H4DOTC)-20, DISASSEMBLY, Intake Manifold.>
5) Remove the intake duct from intake manifold.



B: INSTALLATION

Install in the reverse order of removal.

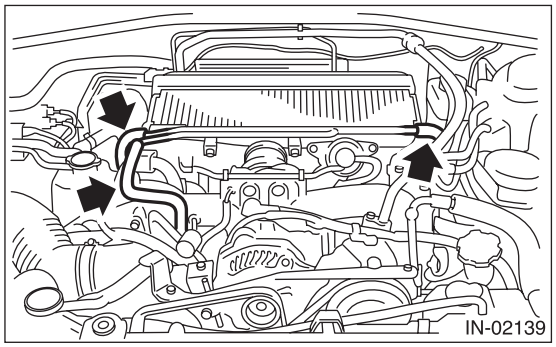
Tightening torque:
19 N·m (1.9 kgf-m, 13.7 ft-lb)



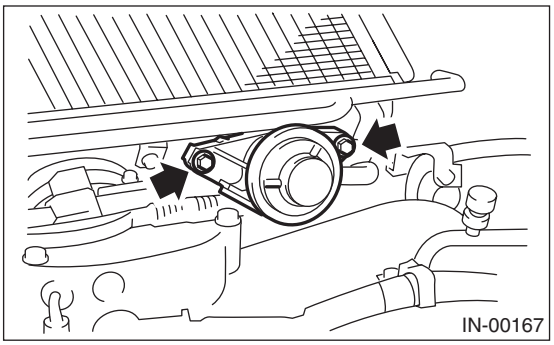
5. Intercooler

A: REMOVAL

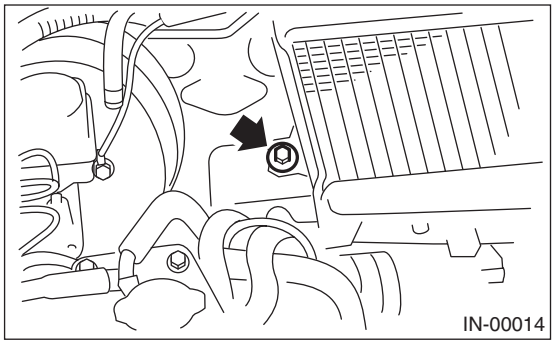
1) Remove the collector cover.
2) Disconnect the PCV hose from PCV pipe.

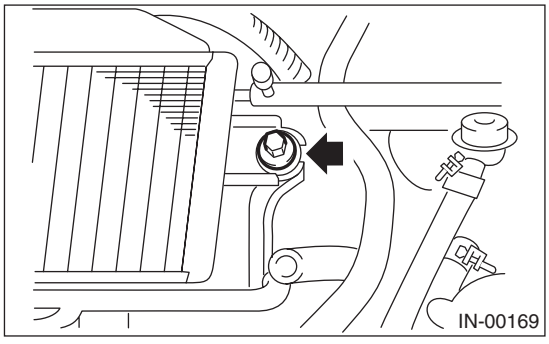


3) Remove the air by-pass valve from intercooler.

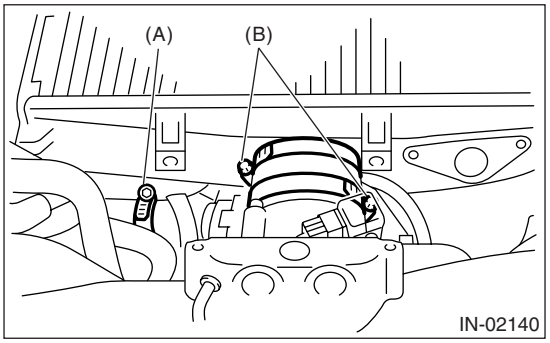


4) Remove the bolts which secure the intercooler to the bracket.





5) Loosen the clamps (A) which connect the turbocharger and intercooler duct.
6) Loosen the clamps (B) which connect the throttle body and intercooler.

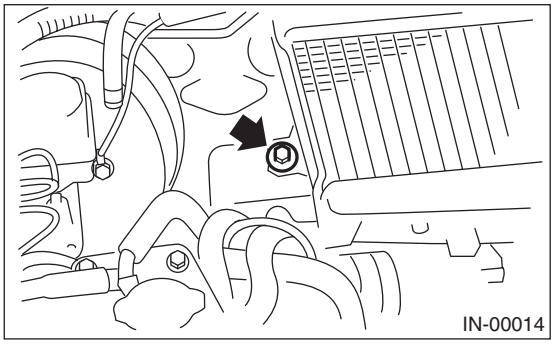


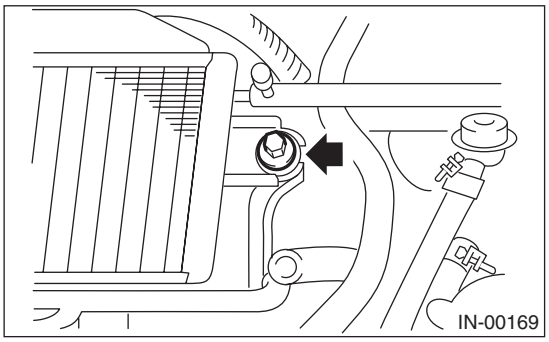
7) Separate the intercooler duct from turbocharger.
8) Remove the intercooler sensor from throttle body.

B: INSTALLATION

Install in the reverse order of removal.

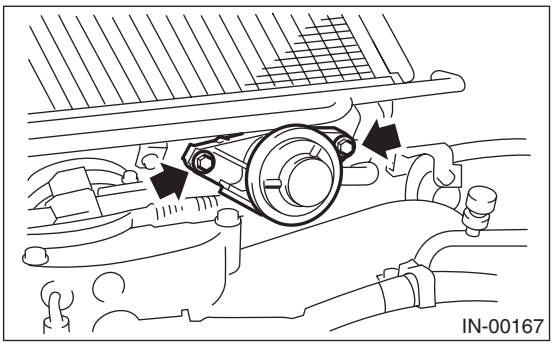
Tightening torque:
16 N·m (1.6 kgf-m, 11.6 ft-lb)



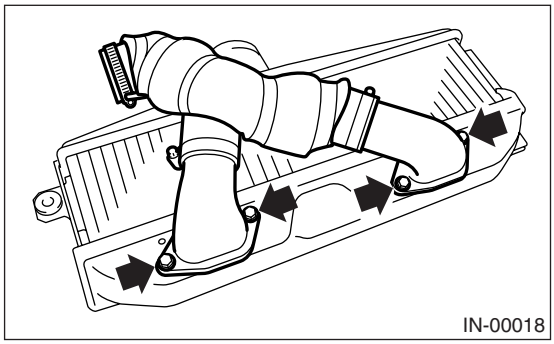


C: DISASSEMBLY

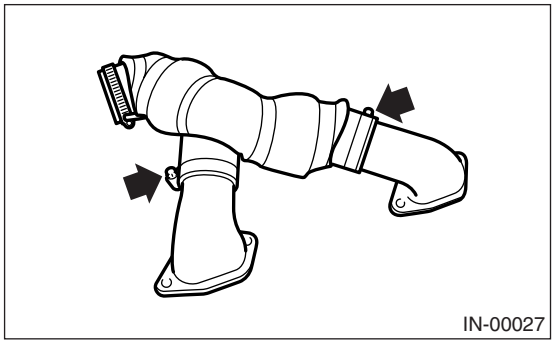
1) Remove the air by-pass valve from intercooler.



2) Remove the intercooler ducts from intercooler.



3) Separate the duct.

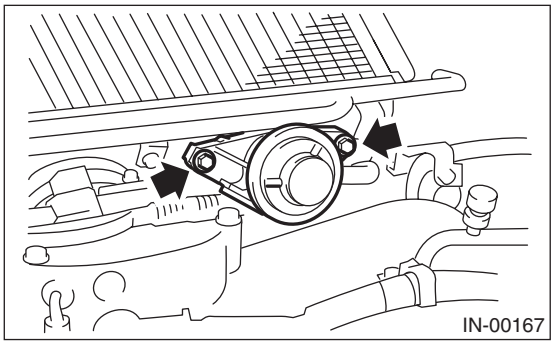


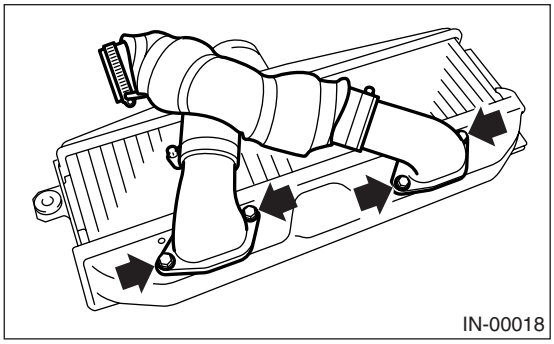
D: ASSEMBLY

Assemble in the reverse order of disassembly.

NOTE:
Be careful not to pinch the O-ring.

Tightening torque:
16 N·m (1.6 kgf-m, 11.6 ft-lb)

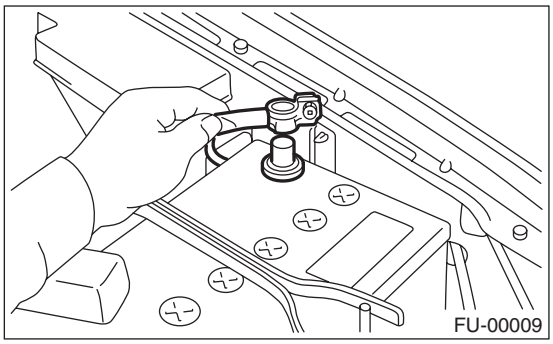




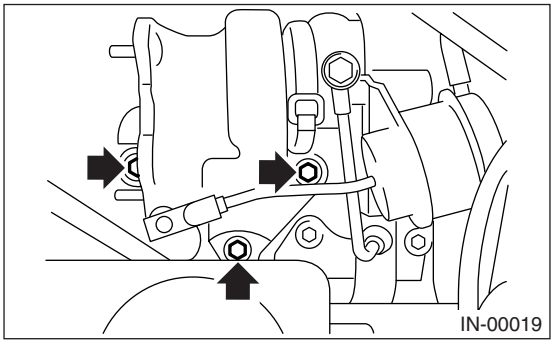
6. Turbocharger

A: REMOVAL

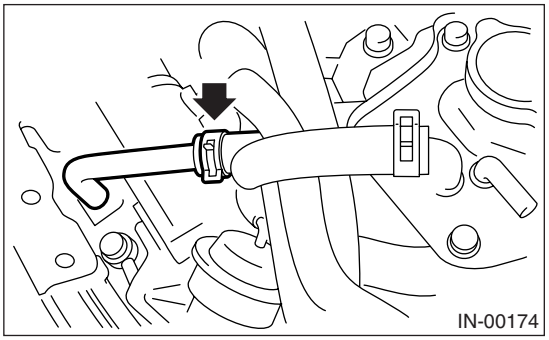
1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.



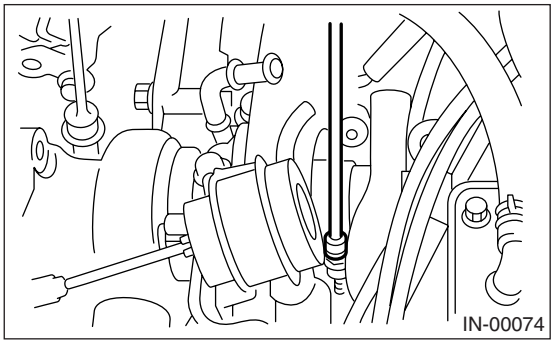
3) Remove the collector cover.
4) Remove the center exhaust pipe. <Ref. to EX(H4DOTC)-7, REMOVAL, Center Exhaust Pipe.>
5) Lower the vehicle.
6) Separate the turbocharger joint pipe from turbocharger.



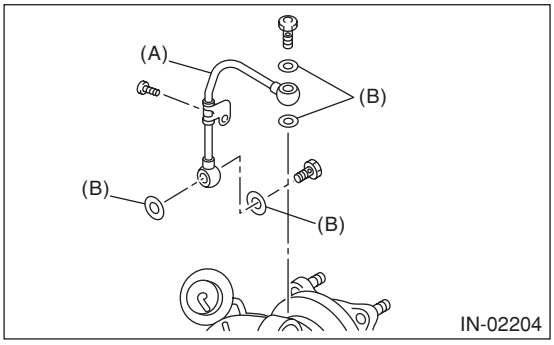
7) Disconnect the engine coolant hose which is connected to coolant filler tank.



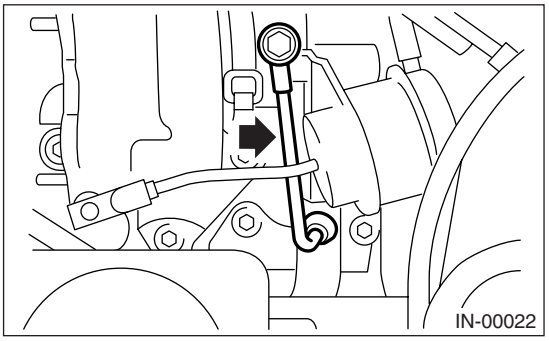
8) Loosen the clamp which secures turbocharger to intake duct.



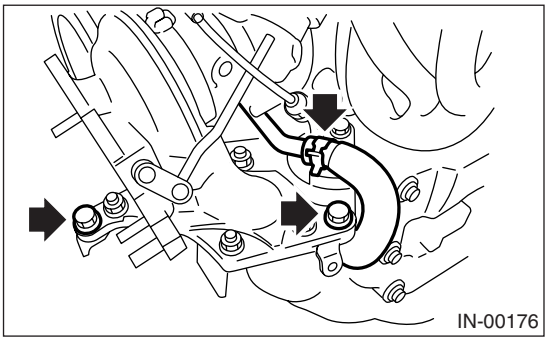
9) Remove the bolts which secure oil pipe bracket to turbocharger.
10) Remove the oil inlet pipe from turbocharger.



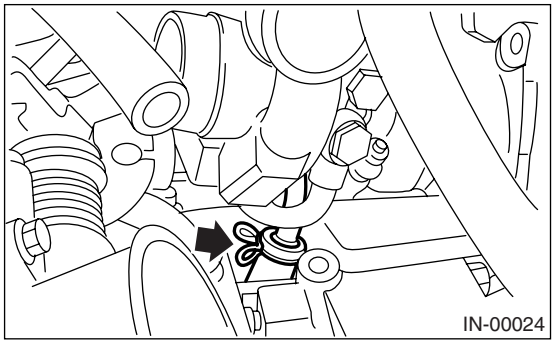
(A) Oil inlet pipe
(B) Metal gasket



11) Remove the turbocharger bracket.



12) Disconnect the oil outlet hose from pipe.

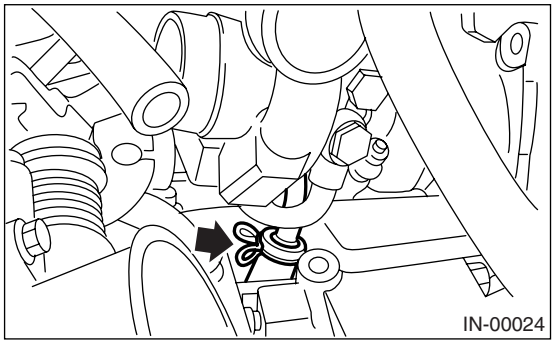


13) Take out the turbocharger from engine compartment.

B: INSTALLATION

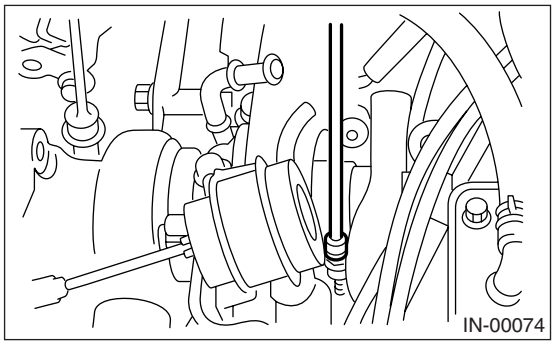
CAUTION:
When replacing the turbocharger, check the filter part of union screw for clogging. <Ref. to LU(H4SO)-24, INSPECTING UNION SCREW WITH FILTER, INSPECTION, Oil Pipe.>

1) Connect the oil outlet hose to outlet pipe.



2) Install the turbocharger to intake duct.

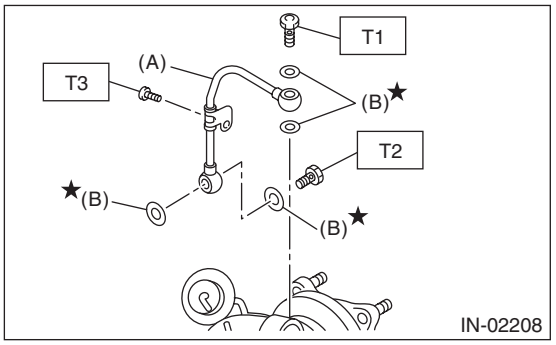
Tightening torque:
3 N·m (0.3 kgf-m, 2.2 ft-lb)



3) Install the oil inlet pipe to turbocharger.

NOTE:
Use a new gasket.

Tightening torque:
T1: 16 N·m (1.6 kgf-m, 11.6 ft-lb)
T2: 29 N·m (3.0 kgf-m, 21.7 ft-lb)
T3: 4.9 N·m (0.50 kgf-m, 3.6 ft-lb)

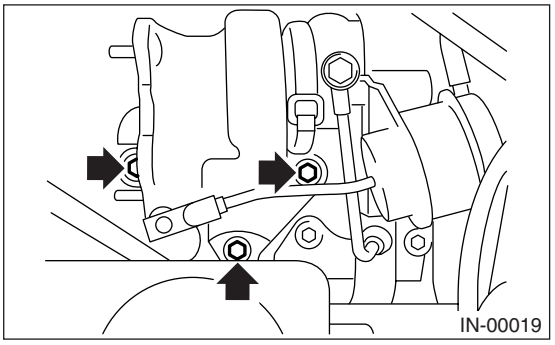


(A) Oil inlet pipe
(B) Metal gasket

4) Install the joint pipe to turbocharger.

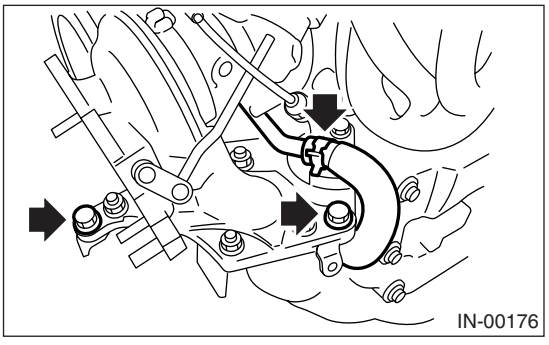
NOTE:
Use a new gasket.

Tightening torque:
35 N·m (3.6 kgf-m, 25.8 ft-lb)

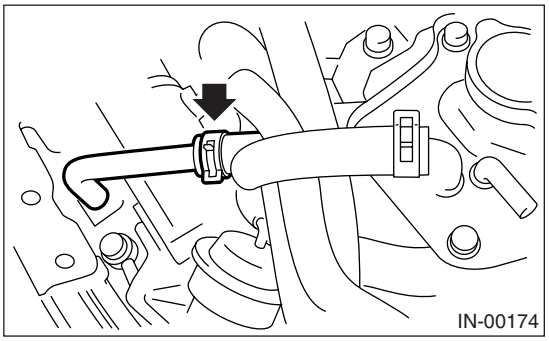


5) Install the turbocharger bracket.

Tightening torque:
33 N·m (3.4 kgf-m, 24.6 ft-lb)



6) Connect the engine coolant hose which is connected to the coolant filler tank.

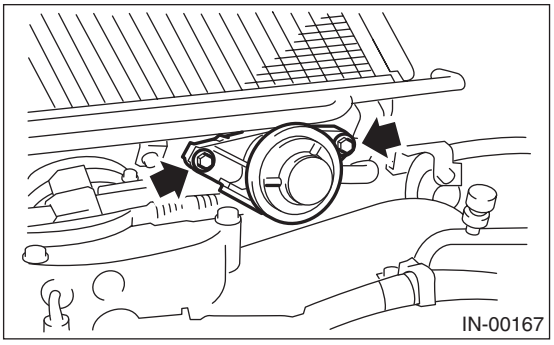


7) Lift-up the vehicle.
8) Install the center exhaust pipe. <Ref. to EX(H4DOTC)-8, INSTALLATION, Center Exhaust Pipe.>

7. Air By-pass Valve

A: REMOVAL

1) Remove the collector cover.
2) Remove the air by-pass valve from intercooler.



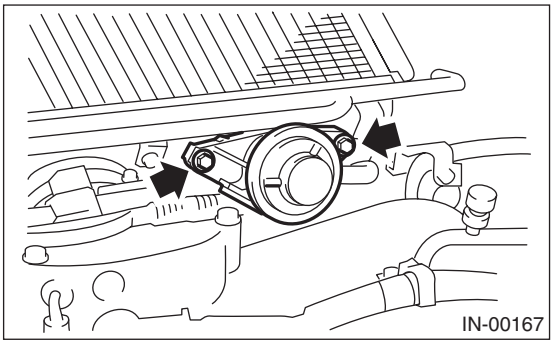
3) Disconnect the air by-pass hoses from air valve.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Be careful not to pinch the O-ring.

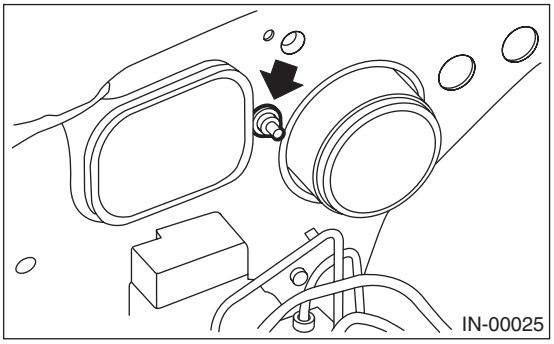
Tightening torque:
16 N·m (1.6 kgf-m, 11.6 ft-lb)



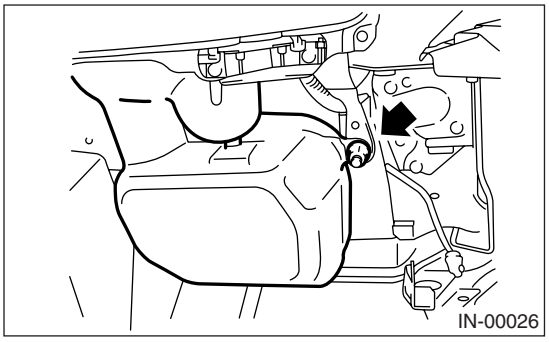
8. Resonator Chamber

A: REMOVAL

1) Set the vehicle on a lift.
2) Remove the collector cover.
3) Remove the air intake duct. <Ref. to IN(H4DOTC)-8, REMOVAL, Air Intake Duct.>
4) Remove the air cleaner lower case.
<Ref. to IN(H4DOTC)-7, REMOVAL, Air Cleaner Case.>
5) Remove the resonator chamber mounting bolt on the right of engine compartment.



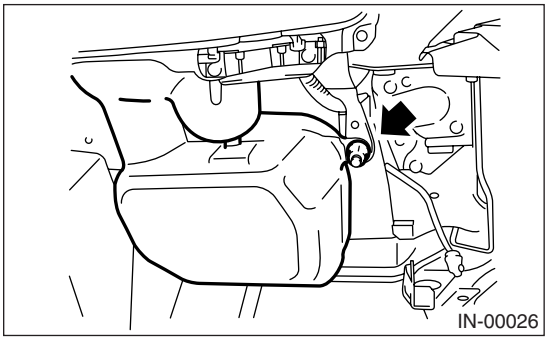
6) Remove the front right tire, and lift the vehicle.
7) Remove the front mudguard RH.
8) Remove the resonator chamber from the inside front fender.

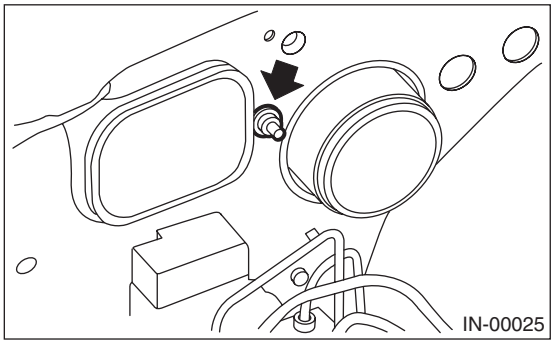


B: INSTALLATION

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.

MECHANICAL

ME(H4DOTC)

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1. General Description

A: SPECIFICATION

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

SPEED CONTROL SYSTEMS

SP(H4DOTC)

Page

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1. General Description

A: SPECIFICATION

Engine	Model				2.5 L	
	Cylinder arrangement				Horizontally opposed, liquid cooled, 4-cylinder, 4-stroke gasoline engine	
	Valve system mechanism				Belt driven, double overhead camshaft, 4-valve/cylinder	
	Bore × Stroke mm (in)				99.5 × 79.0 (3.92 × 3.11)	
	Piston displacement cm^3 (cu in)				2,457 (149.94)	
	Compression ratio				8.4	
	Compression pressure (at 200 — 300 rpm) kPa (kgf/cm^2, psi)				981 — 1,177 (10 — 12, 142 — 171)	
	Number of piston rings				Pressure ring: 2, Oil ring: 1	
	Intake valve timing	Open	Max.retard		5° ATDC	
			Min. advance		15° BTDC	
		Close	Max.retard		65° ABDC	
			Min. advance		45° 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 neural position on MT, or “P” or “N” range on AT] rpm			No Load	MT: 700±100 AT: 700±100	
				A/C ON	A/C refrigerant pressure is low	MT: 725±100 AT: 750±100
					A/C refrigerant pressure is high	MT: 800±100 AT: 825±100
	Ignition order				$1 \rightarrow 3 \rightarrow 2 \rightarrow 4$	
	Ignition timing BTDC/rpm			MT model	17°±10°/700	
				AT model	17°±10°/700	

NOTE:
OS: Oversize US: undersize

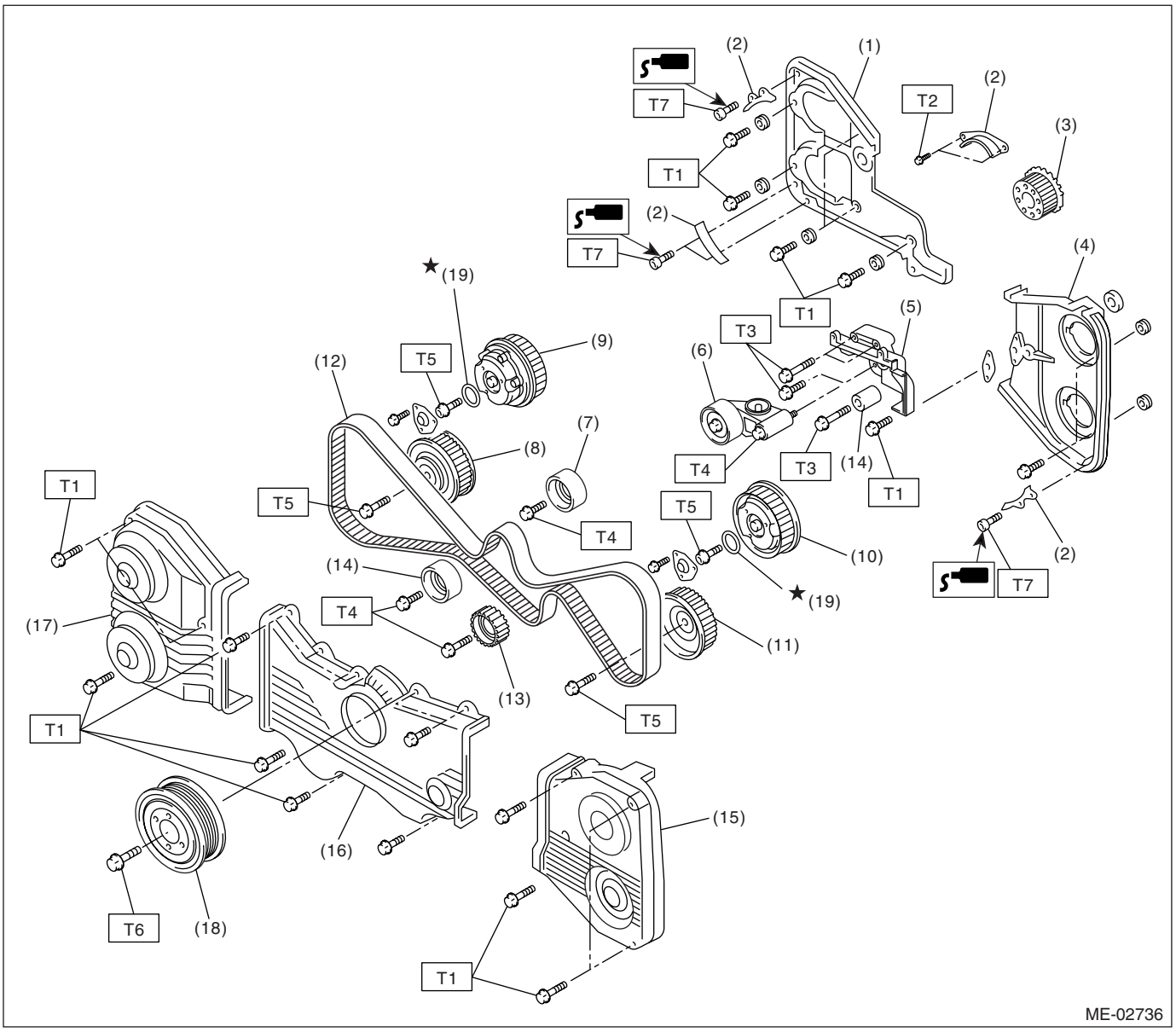
Belt tension adjuster	Protrusion of adjuster rod			5.2 — 6.2 mm (0.204 — 0.244 in)
Belt tensioner	Spacer O.D.			17.955 — 17.975 mm (0.7069 — 0.7077 in)
	Tensioner bushing I.D.			18.0 — 18.08 mm (0.7087 — 0.7118 in)
	Clearance between spacer and bushing		Standard	0.025 — 0.125 mm (0.0010 — 0.0049 in)
			Limit	0.175 mm (0.069 in)
	Side clearance of spacer		Standard	0.2 — 0.55 mm (0.0079 — 0.0217 in)
			Limit	0.81 mm (0.0319 in)
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	0.10 mm (0.0039 in)
Cylinder head	Surface warpage limit (Mating surface with cylinder block)			0.035 mm (0.0014 in)
	Grinding limit			0.3 mm (0.012 in)
	Standard height			127.5 mm (5.02 in)
Valve seat	Refacing 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)

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)
	Boring limit			0.5 mm (0.020 in)
Piston	Outer diameter	Standard	A	99.505 — 99.515 mm (3.9175 — 3.9179 in)
			B	99.495 — 99.505 mm (3.9171 — 3.9175 in)
		0.25 mm (0.0098 in) OS		99.745 — 99.765 mm (3.9270 — 3.9278 in)
		0.50 mm (0.0197 in) OS		99.995 — 100.015 mm (3.9368 — 3.9376 in)
Piston pin	Standard clearance between piston and piston pin		Standard	0.004 — 0.008 mm (0.0002 — 0.0003 in)
			Limit	0.020 mm (0.0008 in)
	Degree of fit			Piston pin must be fitted into position with thumb at 20°C (68°F).
Piston ring	Ring closed gap	Top ring	Standard	0.20 — 0.25 mm (0.0079 — 0.0098 in)
			Limit	1.0 mm (0.039 in)
		Second ring	Standard	0.37 — 0.52 mm (0.015 — 0.020 in)
			Limit	1.0 mm (0.039 in)
		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)
	Side clearance of large end		Standard	0.070 — 0.330 mm (0.0028 — 0.0130 in)
			Limit	0.4 mm (0.016 in)
Bearing of large end	Oil clearance		Standard	0.017 — 0.045 mm (0.0007 — 0.0018 in)
			Limit	0.05 mm (0.0020 in)
	Thickness at center portion		Standard	1.490 — 1.502 mm (0.0587 — 0.0591 in)
			0.03 mm (0.0012 in) US	1.504 — 1.512 mm (0.0592 — 0.0595 in)
			0.05 mm (0.0020 in) US	1.514 — 1.522 mm (0.0596 — 0.0599 in)
			0.25 mm (0.0098 in) US	1.614 — 1.622 mm (0.0635 — 0.0639 in)
Bushing of small end	Clearance between piston pin and bushing		Standard	0 — 0.022 mm (0 — 0.0009 in)
			Limit	0.030 mm (0.0012 in)

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 59.750 mm (2.3524 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)

B: COMPONENT

1. TIMING BELT

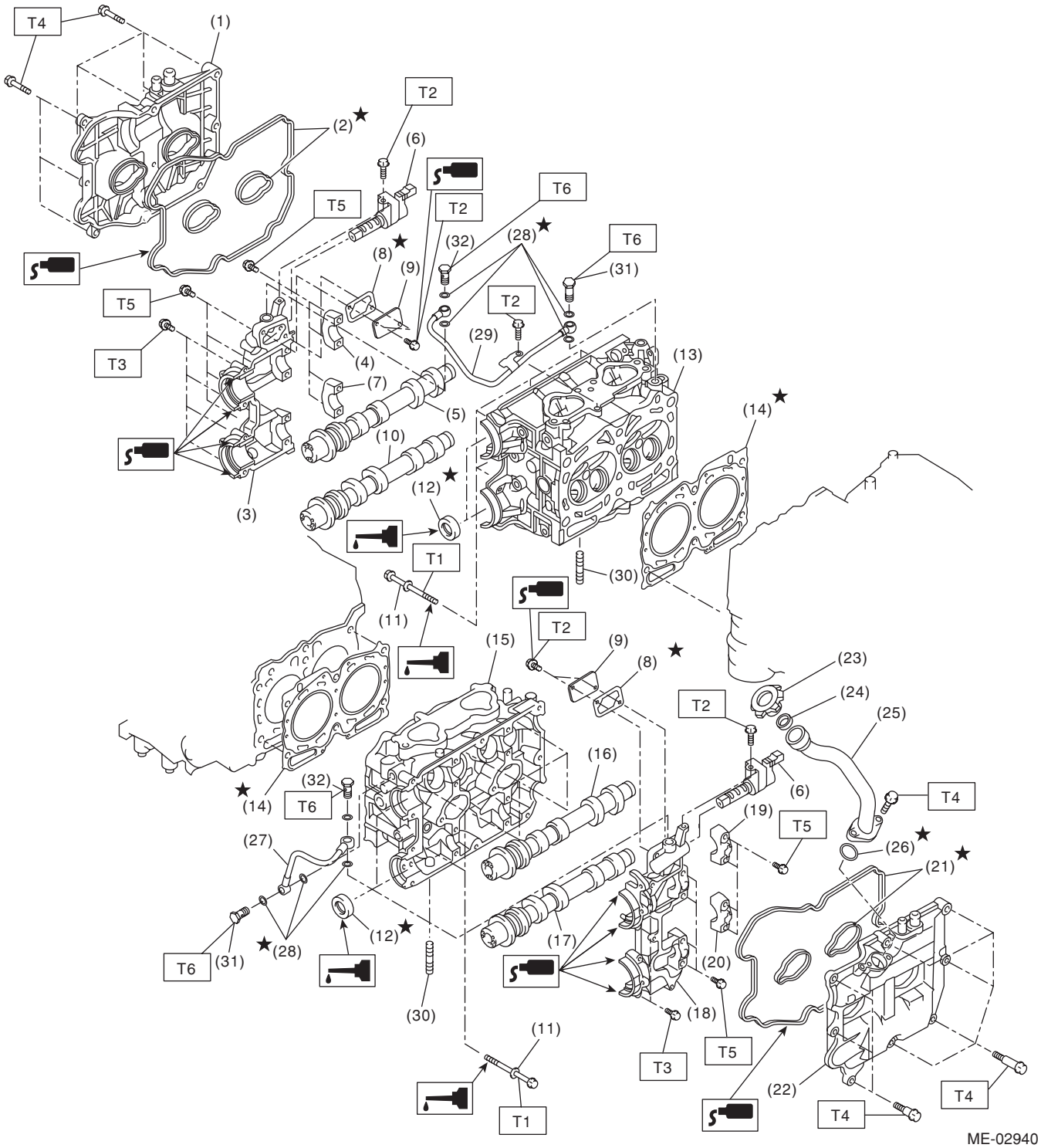


(1) Timing belt cover No. 2 (RH)
(2) Timing belt guide (MT model)
(3) Crank sprocket
(4) Timing belt cover No. 2 (LH)
(5) Tensioner bracket
(6) Automatic belt tension adjuster ASSY
(7) Belt idler
(8) Exhaust cam sprocket (RH)
(9) Intake cam sprocket (RH)
(10) Intake cam sprocket (LH)
(11) Exhaust cam sprocket (LH)
(12) Timing belt
(13) Belt idler No. 2
(14) Belt idler
(15) Timing belt cover (LH)
(16) Front belt cover
(17) Timing belt cover (RH)
(18) Crank pulley
(19) O-ring

Tightening torque: N·m (kgf-m, ft-lb)

T1: 5 (0.5, 3.6)
T2: 9.75 (1.0, 7.2)
T3: 24.5 (2.5, 18.1)
T4: 39 (4.0, 28.9)
T5: <Ref. to ME(H4DOTC)-50, INSTALLATION, Cam Sprocket.>
T6: <Ref. to ME(H4DOTC)-40, INSTALLATION, Crank Pulley.>
T7: 6.4 (0.65, 4.7)

2. CYLINDER HEAD AND CAMSHAFT

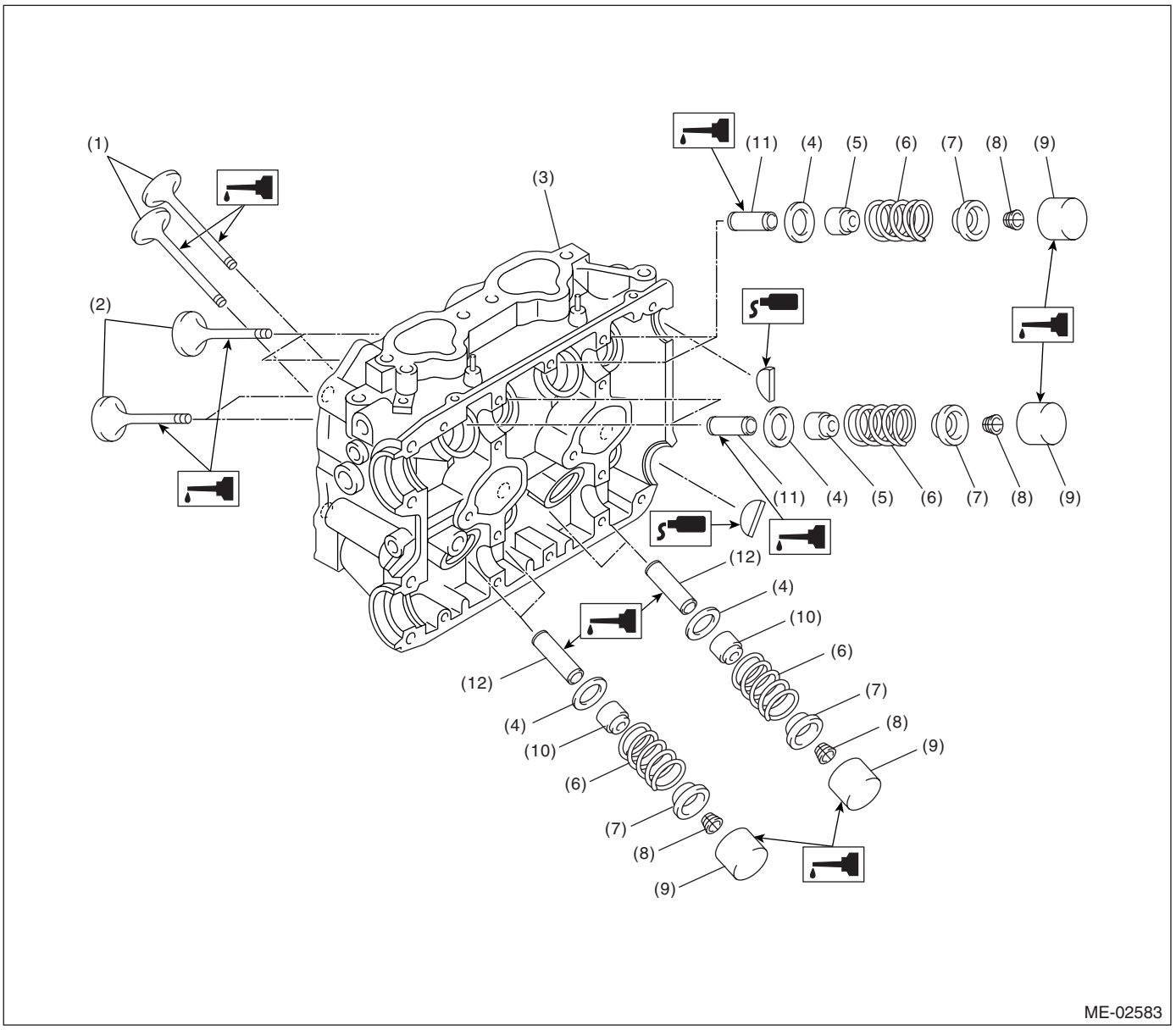


(1) Rocker cover (RH)
(2) Rocker cover gasket (RH)
(3) Camshaft cap (Front RH)
(4) Intake camshaft cap (Rear RH)
(5) Intake camshaft (RH)
(6) Oil flow control solenoid valve
(7) Exhaust camshaft cap (Rear RH)
(8) Gasket
(9) Oil return cover
(10) Exhaust camshaft (RH)
(11) Cylinder head bolt
(12) Oil seal
(13) Cylinder head (RH)
(14) Cylinder head gasket
(15) Cylinder head (LH)
(16) Intake camshaft (LH)
(17) Exhaust camshaft (LH)
(18) Camshaft cap (Front LH)
(19) Intake camshaft cap (Rear LH)
(20) Exhaust camshaft cap (Rear LH)
(21) Rocker cover gasket (LH)
(22) Rocker cover (LH)
(23) Oil filler cap
(24) Gasket
(25) Oil filler duct
(26) O-ring
(27) Oil pipe (LH)
(28) Gasket
(29) Oil pipe (RH)
(30) Stud bolt
(31) Union screw with filter (With protrusion)
(32) Union screw without filter (Without protrusion)

Tightening torque: N·m (kgf-m, ft-lb)

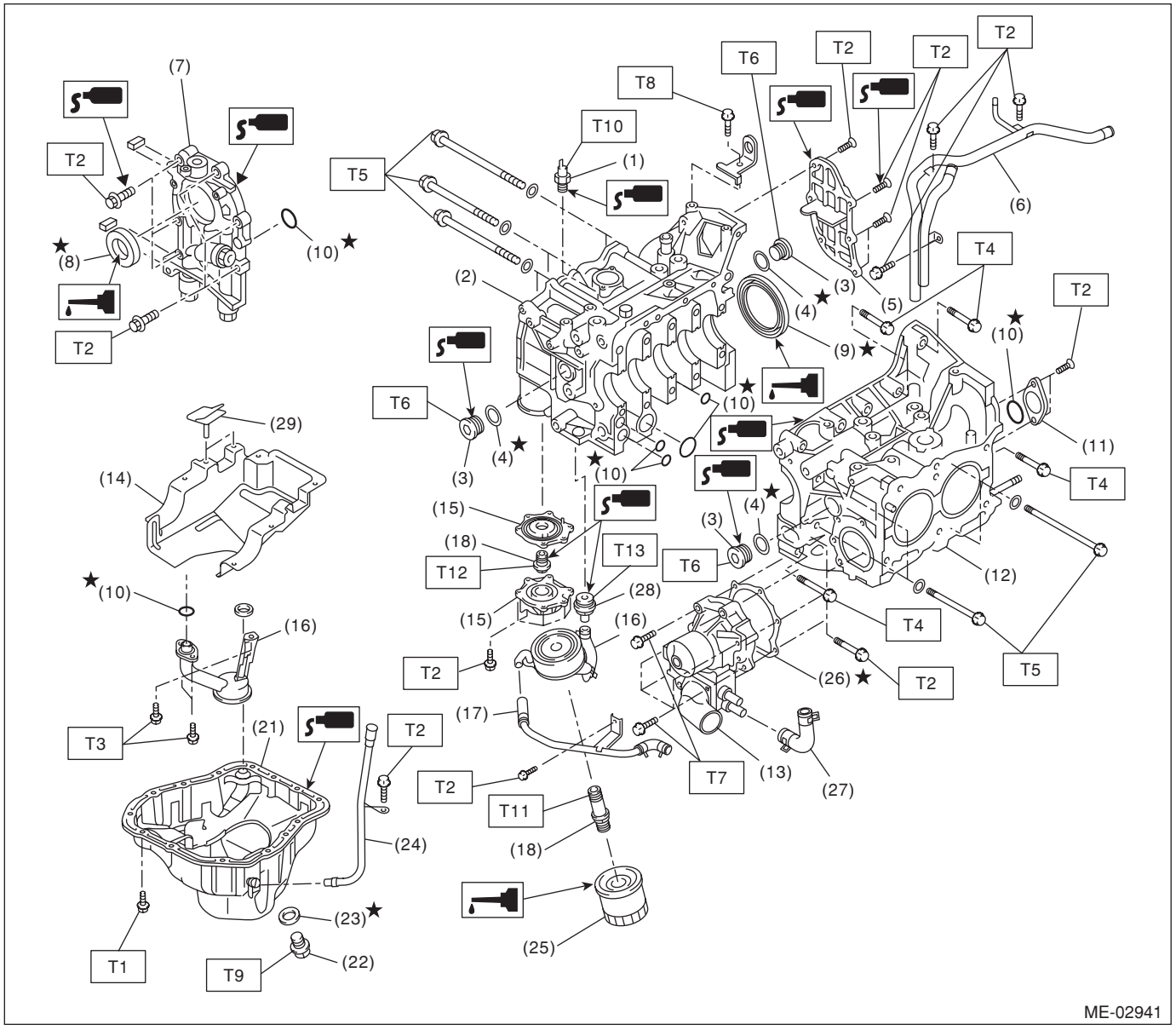
T1:	***<Ref. to ME(H4DOTC)-57, INSTALLATION, Cylinder Head.>***
T2:	***8 (0.8, 5.9)***
T3:	***10 (1.0, 7.2)***
T4:	***6.4 (0.65, 4.7)***
T5:	***20 (2.0, 14.5)***
T6:	***29 (3.0, 21.4)***

3. CYLINDER HEAD AND VALVE ASSEMBLY



(1) Exhaust valve
(2) Intake valve
(3) Cylinder head
(4) Valve spring seat
(5) Intake valve oil seal
(6) Valve spring
(7) Retainer
(8) Retainer key
(9) Valve lifter
(10) Exhaust valve oil seal
(11) Intake valve guide
(12) Exhaust valve guide

4. CYLINDER BLOCK

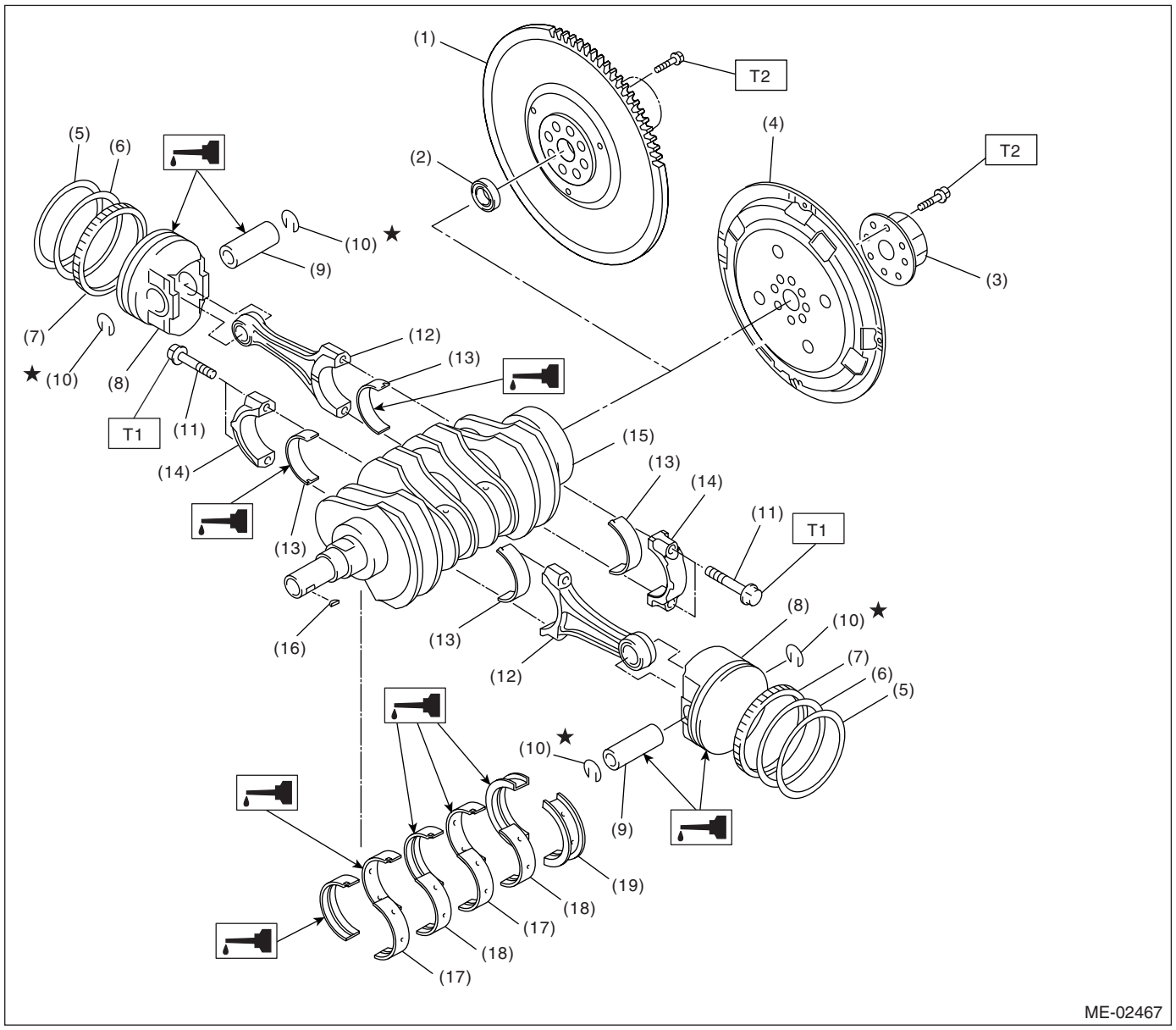


(1) Oil pressure switch
(2) Cylinder block (RH)
(3) Service hole plug
(4) Gasket
(5) Oil separator cover
(6) Water by-pass pipe
(7) Oil pump
(8) Front oil seal
(9) Rear oil seal
(10) O-ring
(11) Service hole cover
(12) Cylinder block (LH)
(13) Water pump
(14) Baffle plate
(15) Adapter
(16) Oil cooler
(17) Water by-pass pipe
(18) Connector
(19) Oil strainer
(20) Gasket
(21) Oil pan
(22) Drain plug
(23) Metal gasket
(24) Oil level gauge guide
(25) Oil filter
(26) Gasket
(27) Water pump hose
(28) Plug
(29) Seal
(30) Gasket

Tightening torque: N·m (kgf-m, ft-lb)

T1: 5 (0.5, 3.6)
T2: 6.4 (0.65, 4.7)
T3: 10 (1.0, 7.2)
T4: 25 (2.5, 18.1)
T5: <Ref. to ME(H4DOTC)-67, INSTALLATION, Cylinder Block.>
T6: 70 (7.1, 50.6)
T7: First 12 (1.2, 8.7)
Second 12 (1.2, 8.7)
T8: 16 (1.6, 11.6)
T9: 44 (4.5, 33)
T10: 25 (2.5, 18.1)
T11: 54 (5.3, 39)
T12: 45 (4.6, 33)
T13: 69 (7.0, 50.9)

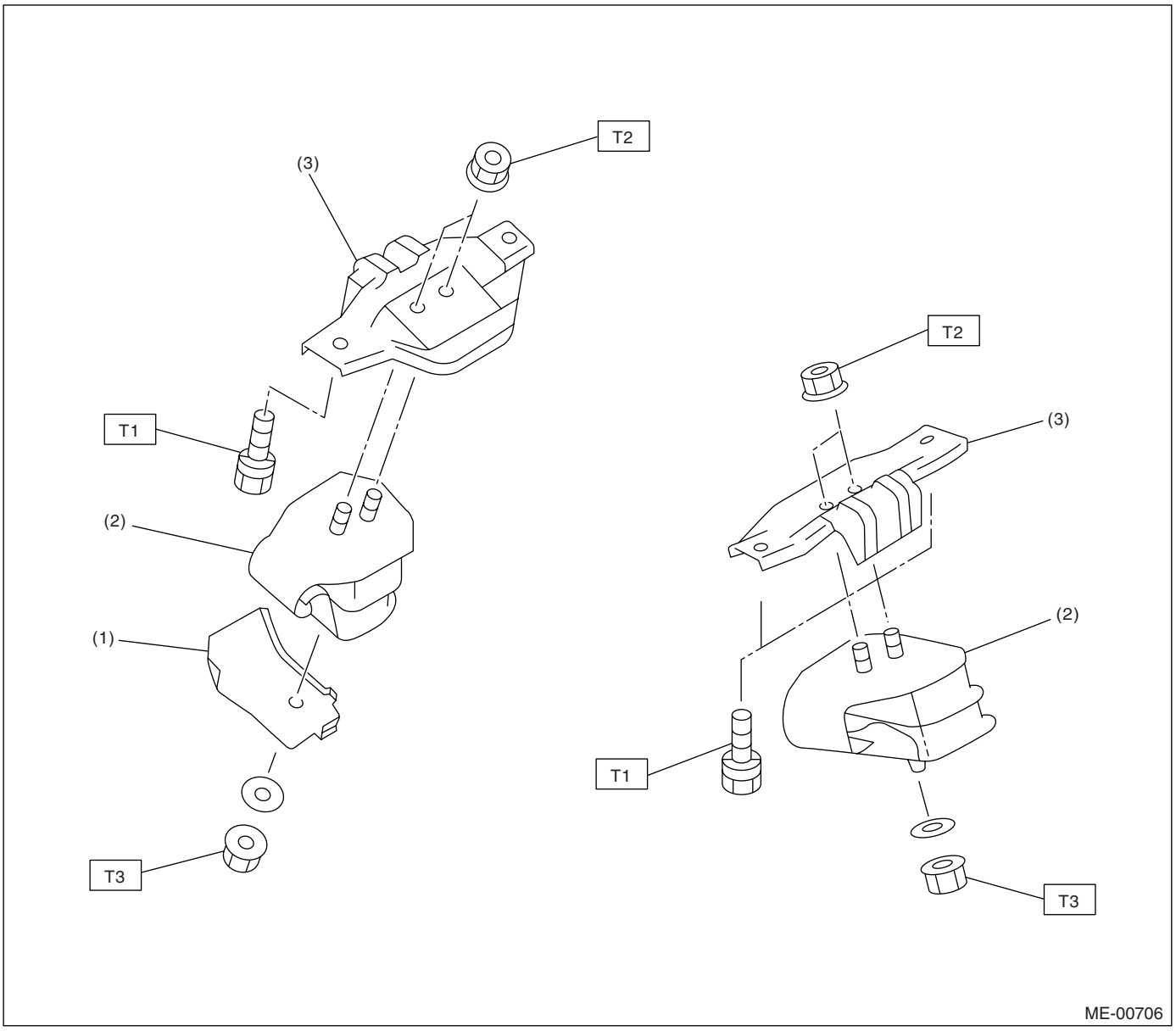
5. CRANKSHAFT AND PISTON



(1) Flywheel (MT model)
(2) Ball bearing MT model)
(3) Reinforcement (AT model)
(4) Drive plate (AT model)
(5) Top ring
(6) Second ring
(7) Oil ring
(8) Piston
(9) Piston pin
(10) Snap ring
(11) Connecting rod bolt
(12) Connecting rod
(13) Connecting rod bearing
(14) Connecting rod cap
(15) Crankshaft
(16) Woodruff key
(17) Crankshaft bearing #1, #3
(18) Crankshaft bearing #2, #4
(19) Crankshaft bearing #5

Tightening torque: N·m (kgf-m, ft-lb)
T1: 52 (5.3, 38.4)
T2: 72 (7.3, 52.8)

6. ENGINE MOUNTING



(1) Heat shield cover
(2) Front cushion rubber
(3) Front engine mounting bracket

Tightening torque: N·m (kgf-m, ft-lb)
T1: 35 (3.6, 25.8)
T2: 42 (4.3, 30.9)
T3: 85 (8.7, 62.7)

C: CAUTION

- Wear work clothing, including a cap, protective goggles and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Be careful not to burn your hands, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.
- All parts should be thoroughly cleaned, paying special attention to engine oil passages, pistons and bearings.
- Rotating parts and sliding parts such as piston, bearing and gear should be coated with oil prior to assembly.
- Be careful not to let oil, grease or coolant contact the timing belt, clutch disc and flywheel.
- All removed parts, if to be reused, should be reinstalled in the original positions and directions.
- Bolts, nuts and washers should be replaced with new ones as required.
- Even if necessary inspections have been made in advance, proceed with assembly work while making rechecks.
- Remove or install the engine in an area where chain hoists, lifting devices, etc. are available for ready use.
- Be sure not to damage coated surfaces of body panels with tools or stain seats and windows with coolant or oil. Place a cover over fender, as required, for protection.
- Prior to starting work, prepare the following:

Service tools, clean cloth, containers to catch coolant and oil, wire ropes, chain hoist, transmission jacks, etc.

- Lift-up or lower the vehicle when necessary. Make sure to support the correct positions.

D: PREPARATION TOOL

1. SPECIAL TOOL

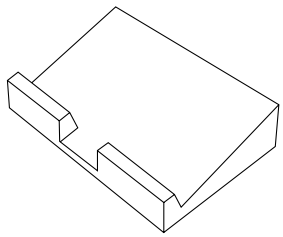
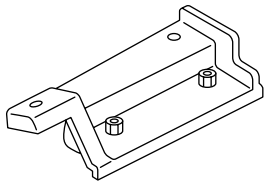
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498267600	498267600	CYLINDER HEAD TABLE	• Used for replacing valve guides. • Used for removing and installing valve spring.
 ST-498457000	498457000	ENGINE STAND ADAPTER RH	Used with ENGINE STAND (499817100).

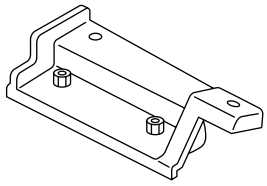
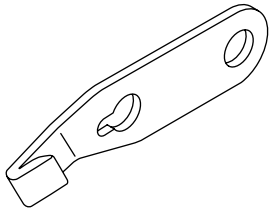
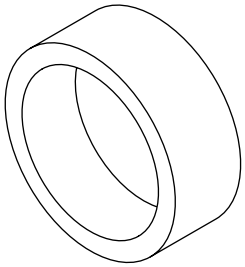
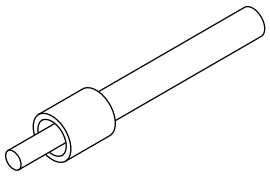
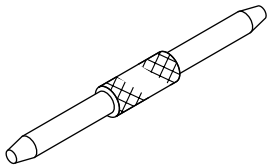
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498457100	498457100	ENGINE STAND ADAPTER LH	Used with ENGINE STAND (499817100).
 ST-498497100	498497100	CRANKSHAFT STOPPER	Used for stopping rotation of flywheel when loosening/tightening crank pulley bolt.
 ST-498747300	498747300	PISTON GUIDE	Used for installing piston in cylinder. (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.

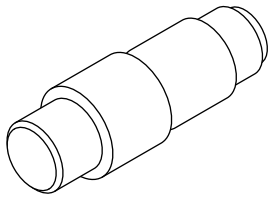
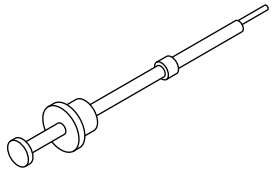
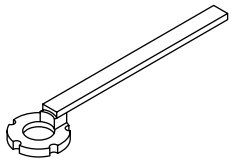
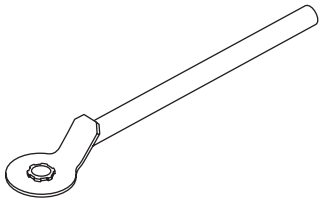
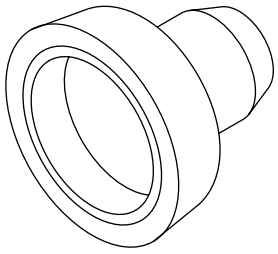
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499037100	499037100	CONNECTING ROD BUSHING REMOVER & INSTALLER	Used for removing and installing connecting rod bushing.
 ST-499097700	499097700	PISTON PIN REMOVER ASSY	Used for removing piston pin.
 ST-499207400	499207400	CAM SPROCKET WRENCH	Used for removing 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).

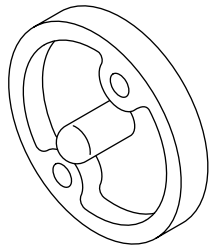
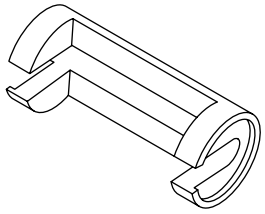
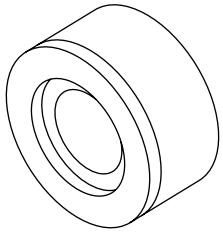
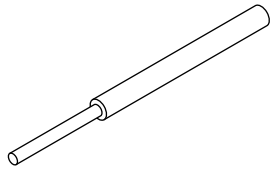
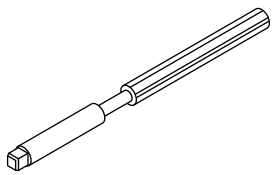
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499597100	499597100	CRANKSHAFT OIL SEAL GUIDE	• Used for installing crankshaft oil seal. • Used with CRANKSHAFT OIL SEAL INSTALLER (499587200).
 ST-499718000	499718000	VALVE SPRING REMOVER	Used for removing and installing valve spring.
 ST18251AA020	18251AA020	VALVE GUIDE ADJUSTER	Used for installing intake and exhaust valve guides.
 ST-499767200	499767200	VALVE GUIDE REMOVER	Used for removing valve guides.
 ST-499767400	499767400	VALVE GUIDE REAMER	Used for reaming valve guides.

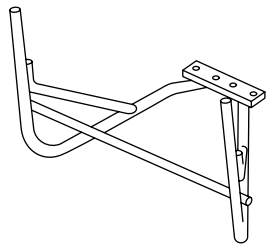
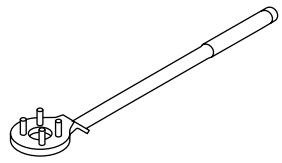
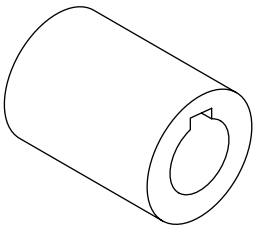
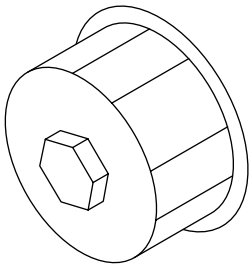
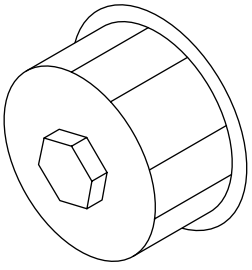
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499817100	499817100	ENGINE STAND	• Stand used for engine disassembly and assembly. • Used with ENGINE STAND ADAPTER RH (498457000) & LH (498457100).
 ST-499977100	499977100	CRANK PULLEY WRENCH	Used for stopping rotation of crank pulley when loosening/tightening crank pulley bolt.
 ST-499987500	499987500	CRANKSHAFT SOCKET	Used for rotating crankshaft.
 ST18332AA000	18332AA000	OIL FILTER WRENCH	Used for removing and installing oil filter. (Inner diameter 68 mm (2.68 in))
 ST18332AA010	18332AA010	OIL FILTER WRENCH	Used for removing and installing oil filter. (Inner diameter 65 mm (2.56 in))

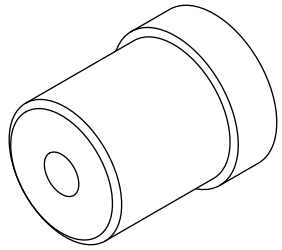
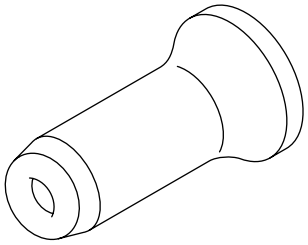
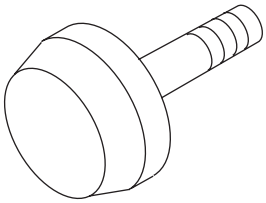
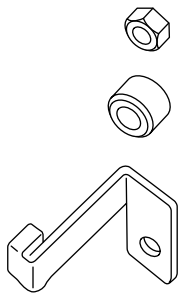
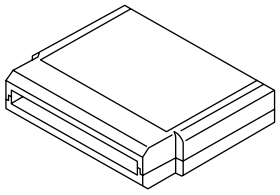
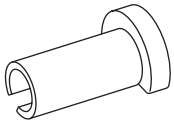
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499587100	499587100	OIL SEAL INSTALLER	Used for installing oil pump oil seal.
 ST-499587600	499587600	OIL SEAL INSTALLER	Used for installing camshaft oil seal for DOHC engine.
 ST-499597200	499597200	OIL SEAL GUIDE	• Used for installing camshaft oil seal for DOHC engine. • Used with OIL SEAL INSTALLER (499587600).
 ST-498277200	498277200	STOPPER SET	Used for installing automatic transmission assembly to engine.
 ST18482AA010	18482AA010	CARTRIDGE	Troubleshooting for electrical system.

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
ST22771AA030	22771AA030	SUBARU SELECT MONITOR KIT	Troubleshooting for 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.

E: PROCEDURE

It is possible to conduct the following service procedures with engine on the vehicle, however, the procedures described in this section are based on the condition that the engine is removed from the vehicle.

- V-belt
- Timing belt
- Camshaft
- Cylinder head

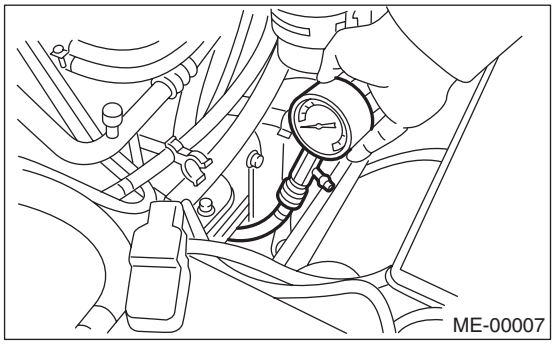
2. Compression

A: INSPECTION

CAUTION:
After warming-up, engine becomes very hot. Be careful not to burn yourself during measurement.

1) After warming-up the engine, turn the ignition switch to OFF.
2) Make sure that the battery is fully charged.
3) Release the fuel pressure. <Ref. to FU(H4DOTC)-50, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
4) Remove all the spark plugs.
<Ref. to IG(H4DOTC)-4, REMOVAL, Spark Plug.>
5) Fully open the throttle valve.
6) Check the starter motor for satisfactory performance and operation.
7) Hold the compression gauge tightly against the spark plug hole.

NOTE:
When using a screw-in type compression gauge, the screw (put into cylinder head spark plug hole) should be less than 18 mm (0.71 in) long.
8) Crank the engine by means of the starter motor, and read the maximum value on the gauge when the pointer is steady.



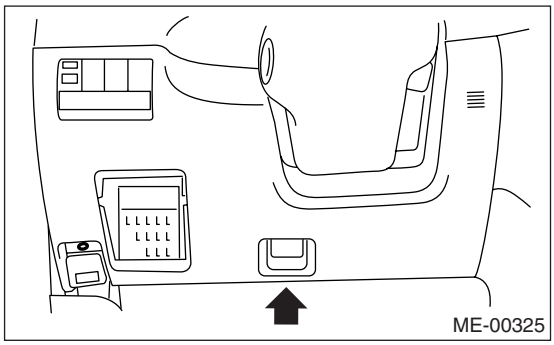
9) Perform at least two measurements per cylinder, and make sure that the values are correct.

Compression (350 rpm and fully open throttle):
Standard:
981 — 1,177 kPa (10 — 12 kgf/cm^2, 142 — 171 psi)
Service limit:
882 kPa (9.0 kgf/cm^2, 128 psi)
Difference between cylinders:
49 kPa (0.5 kgf/cm^2, 7 psi), or less

3. Idle Speed

A: INSPECTION

1) Before checking the idle speed, check the following item:
   (1) Check the air cleaner element is free from clogging, ignition timing is correct, spark plugs are in good condition, and hoses are connected properly.
   (2) Check the malfunction indicator light does not illuminate.
2) Warm-up the engine.
3) Stop the engine, and turn the ignition switch to OFF.
4) Insert the cartridge to Subaru Select Monitor.
5) Connect the Subaru Select Monitor to data link connector.



6) Turn the ignition switch to ON and Subaru Select Monitor to ON.
7) Select {Each System Check} in Main Menu.
8) Select {Engine Control System} in Selection Menu.
9) Select {Current Data Display & Save} in Engine Control System Diagnosis.
10) Select {Data Display} in Data Display Menu.
11) Start the engine, and read the engine idle speed.
12) Check the idle speed when no-loaded. (Headlight, heater fan, rear defroster, radiator fan, A/C, etc. are OFF.)

Idle speed [No load and gears in neutral]:
700±100 rpm

13) Check the idle speed when loaded. (Turn the air conditioning switch to "ON" and operate the compressor for at least one minute before measurement.)

Idle speed [A/C "ON" and gears in neutral]:

When A/C refrigerant pressure is low.
MT: 725±100 rpm
AT: 750±100 rpm

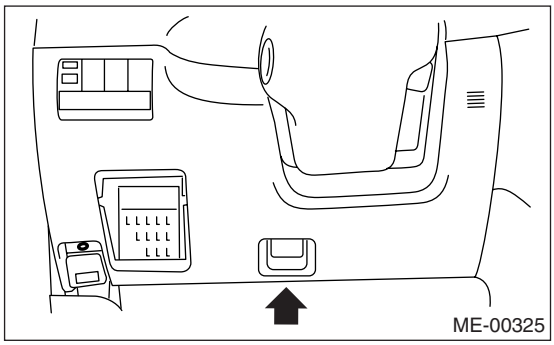
When A/C refrigerant pressure is low.
MT: 800±100 rpm
AT: 825±100 rpm

NOTE:
Idle speed cannot be adjusted manually, because the idle speed is automatically adjusted. If the prescribed idle speed cannot be maintained, refer to General On-board Diagnosis Table under "Engine Control System". <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.>

4. Ignition Timing

A: INSPECTION

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) Insert the cartridge to Subaru Select Monitor.
5) Connect the Subaru Select Monitor to data link connector.



6) Turn the ignition switch to ON and Subaru Select Monitor to ON.
7) Select {Each System Check} in Main Menu.
8) Select {Engine Control System} in Selection Menu.
9) Select {Current Data Display & Save} in Engine Control System Diagnosis.
10) Select {Data Display} in Data Display Menu.
11) Start the engine and check the ignition timing at idle speed.

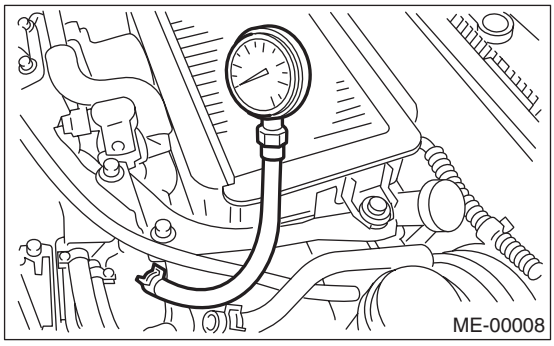
Ignition timing [BTDC/rpm]:
17°±10°/700

If the timing is not correct, check the ignition control system. Refer to Engine Control System. <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.>

5. Intake Manifold Vacuum

A: INSPECTION

1) Remove the collector cover.
2) Warm-up the engine.
3) Disconnect the brake vacuum hose from the brake vacuum hose, and then install the vacuum gauge.
4) Keep the engine at idle speed and read the vacuum gauge indication.
By observing the gauge needle movement, internal condition of the engine can be diagnosed as described below.



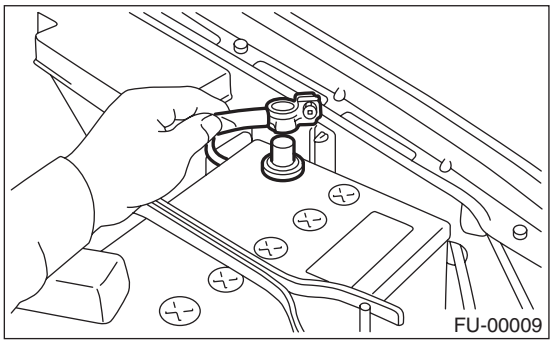
Vacuum pressure (at idling, A/C "OFF"):
Less than –60.0 kPa (–450 mmHg, –17.72 in-Hg)

Diagnosis of engine condition by measurement of manifold vacuum	
Vacuum gauge indication	Possible engine condition
1. Needle is steady but lower than normal position. This tendency becomes more evident as engine temperature rises.	Leakage around intake manifold gasket, or disconnected or damaged vacuum hose
2. Needle intermittently drops to position lower than normal position.	Leakage around cylinder
3. Needle drops suddenly and intermittently from normal position.	Sticky valve
4. When engine speed is gradually increased, needle begins to vibrate rapidly at certain speed, and then vibration increases as engine speed increases.	Weak or broken valve springs
5. Needle vibrates above and below normal position in narrow range.	Defective ignition system or throttle chamber idle adjustment

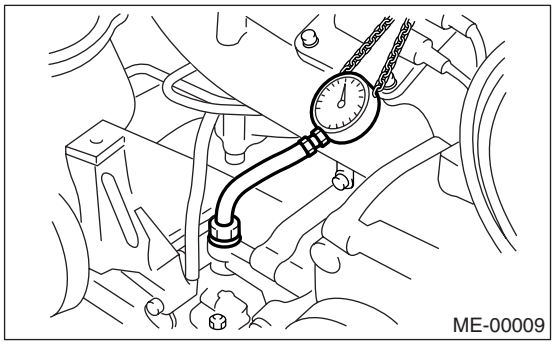
6. Engine Oil Pressure

A: INSPECTION

1) Remove the collector cover.
2) Remove the oil pressure switch. <Ref. to LU(H4SO)-21, REMOVAL, Oil Pressure Switch.>
3) Connect the oil pressure gauge hose to cylinder block.
4) Connect the ground cable to battery.



5) Start the engine, and measure the oil pressure.



Oil pressure:
98 kPa (1.0 kg/cm^2, 14 psi) or more at 600 rpm
294 kPa (3.0 kg/cm^2, 43 psi) or more at 5,000 rpm

- If the oil pressure is out of specification, check oil pump, oil filter and lubrication line. <Ref. to LU(H4SO)-29, INSPECTION, Engine Lubrication System Trouble in General.>
- If the oil pressure warning light is turned ON and oil pressure is in specification, replace the oil pressure switch. <Ref. to LU(H4SO)-29, INSPECTION, Engine Lubrication System Trouble in General.>

NOTE:
The specified data is based on an engine oil temperature of 80°C (176°F).
6) After measuring the oil pressure, install the oil pressure switch. <Ref. to LU(H4SO)-21, INSTALLATION, Oil Pressure Switch.>

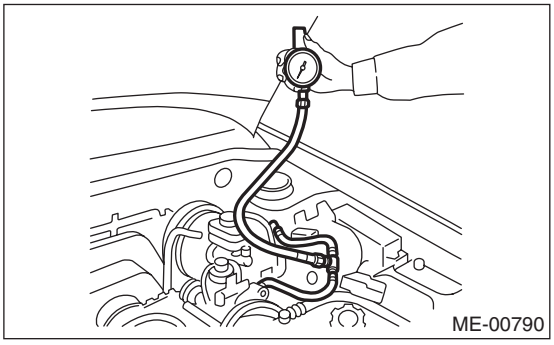
Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

7. Fuel Pressure

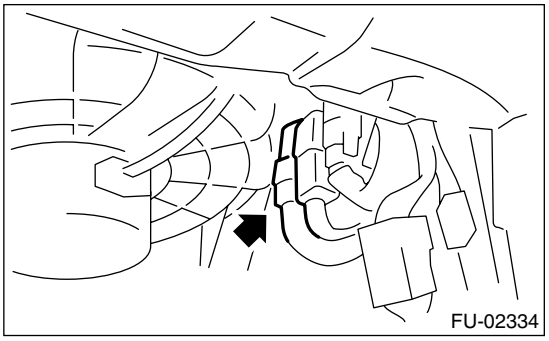
A: INSPECTION

CAUTION:
Before removing the fuel pressure gauge, release the fuel pressure.

NOTE:
If out of specification, check or replace the pressure regulator and pressure regulator vacuum hose.
1) Release the fuel pressure. <Ref. to FU(H4DOTC)-50, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Disconnect the fuel delivery hose from fuel filter, 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.

Fuel pressure:
Standard:
284 — 314 kPa (2.9 — 3.2 kgf/cm^2, 41 — 46 psi)

6) After connecting the pressure regulator vacuum hose, measure the fuel pressure.

Fuel pressure:
Standard:
230 — 260 kPa (2.35 — 2.65 kgf/cm^2, 33 — 38 psi)

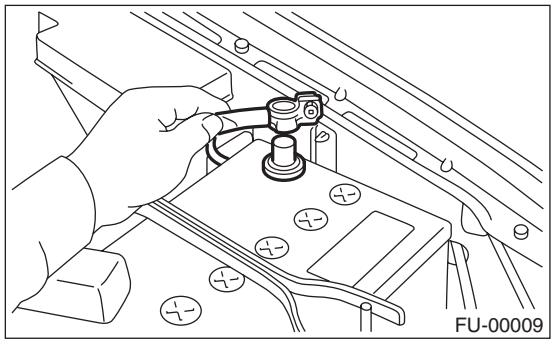
NOTE:
The fuel pressure gauge registers 10 to 20 kPa (0.1 to 0.2 kgf/cm^2, 1 to 3 psi) higher than standard values during high-altitude operations.

8. Valve Clearance

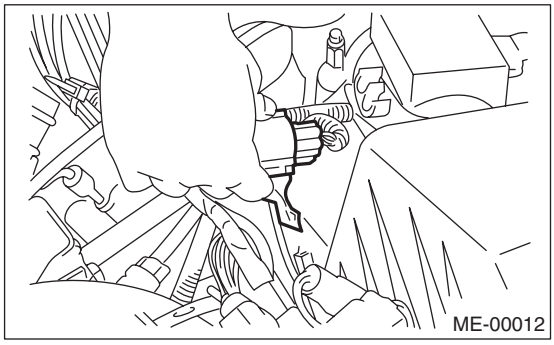
A: INSPECTION

Inspection and adjustment of valve clearance should be performed while engine is cold.

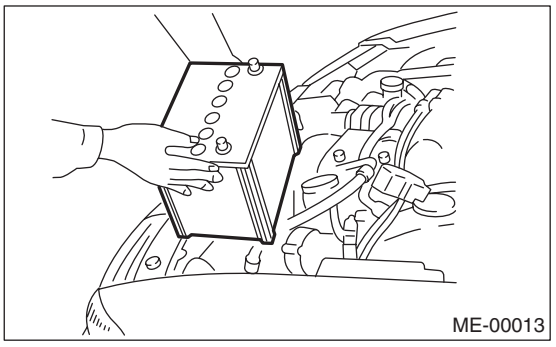
1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.



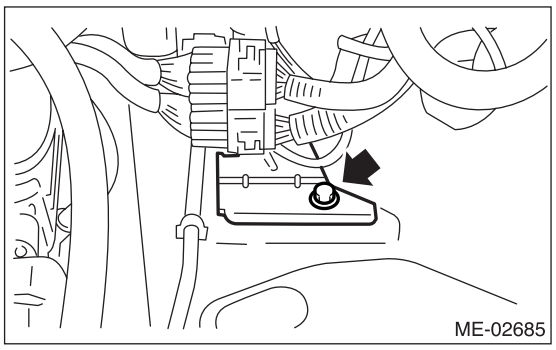
3) Remove the collector cover.
4) Remove the air intake duct. <Ref. to IN(H4DOTC)-8, REMOVAL, Air Intake Duct.>
5) Remove a bolt which secures timing belt cover (RH).
6) Lift-up the vehicle.
7) Remove the under cover.
8) Loosen the remaining bolts which secure timing belt cover (RH), then remove the timing belt cover.
9) Lower the vehicle.
10) When inspecting #1 and #3 cylinders:
    (1) Pull out the engine harness connector with bracket from air cleaner upper cover.



    (2) Remove the air cleaner case. <Ref. to IN(H4DOTC)-7, REMOVAL, Air Cleaner Case.>
    (3) Disconnect the connector of ignition coil.
    (4) Remove the ignition coil.
    (5) Place a suitable container under the vehicle.
    (6) Disconnect the PCV hose from rocker cover (RH).
    (7) Remove the bolts, then remove the rocker cover (RH).
11) When inspecting #2 and #4 cylinders:
    (1) Disconnect the battery cable, and then remove the battery and battery carrier.

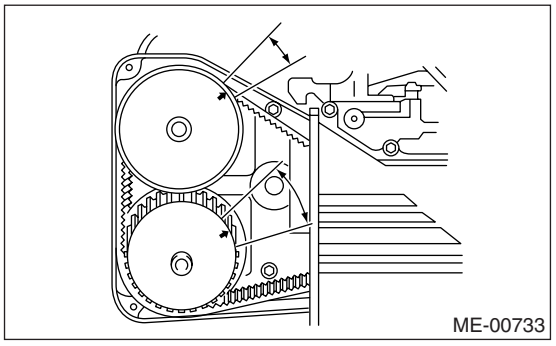


    (2) Remove the bolt which holds the engine harness bracket on the body.



    (3) Remove the secondary air pump. <Ref. to EC(H4DOTC)-9, REMOVAL, Secondary Air Pump.>
    (4) Disconnect the connector of ignition coil.
    (5) Remove the ignition coil.
    (6) Place a suitable container under the vehicle.
    (7) Disconnect the PCV hose from rocker cover (LH).
    (8) Remove the bolts, then remove the rocker cover (LH).
12) Turn the crank pulley clockwise until arrow mark on the camshaft sprocket is set to position shown in the figure.

NOTE:
Turn the crankshaft using socket wrench.

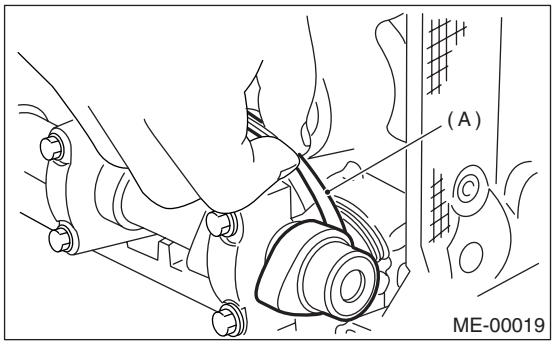


13) Measure the #1 cylinder intake valve and #3 cylinder exhaust valve clearance by using thickness gauge (A).

NOTE:
• Insert a thickness gauge in a direction as horizontal as possible with respect to the valve lifter.
• Measure the exhaust valve clearances while lifting-up the vehicle.

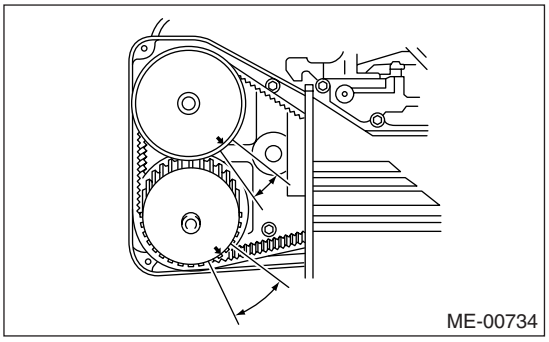
Valve clearance:
Intake
0.20 ± 0.02 mm (0.0079 ± 0.0008 in)
Exhaust
0.35 ± 0.02 mm (0.0138 ± 0.0008 in)

• If the measured value is not within specification, take notes of the value in order to adjust the valve clearance later on.

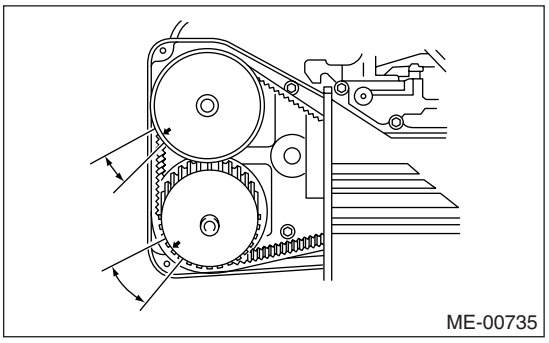


14) If necessary, adjust the valve clearance. <Ref. to ME(H4DOTC)-28, ADJUSTMENT, Valve Clearance.>
15) Further turn the crank pulley clockwise.
Using the same procedures described previously, then measure valve clearances again.

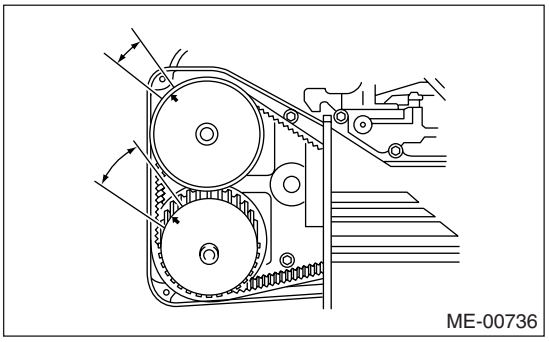
(1) Set the arrow mark on cam sprocket to the position shown in the figure, and measure the #2 cylinder exhaust valve and #3 cylinder intake valve clearances.



(2) Set the arrow mark on cam sprocket to the position shown in the figure, and measure the #2 cylinder intake valve and #4 cylinder exhaust valve clearances.

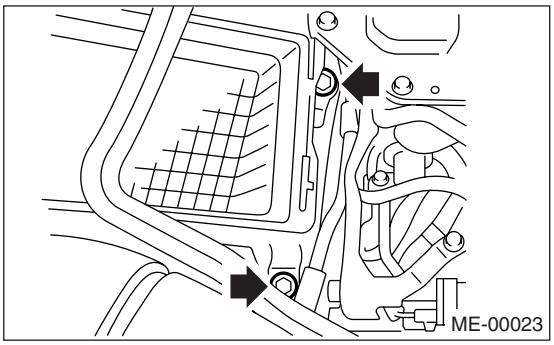


(3) Set the arrow mark on cam sprocket to the position shown in the figure, and measure the #1 cylinder exhaust valve and #4 cylinder intake valve clearances.



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

Tightening torque:
33 N·m (3.4 kgf-m, 25 ft-lb)

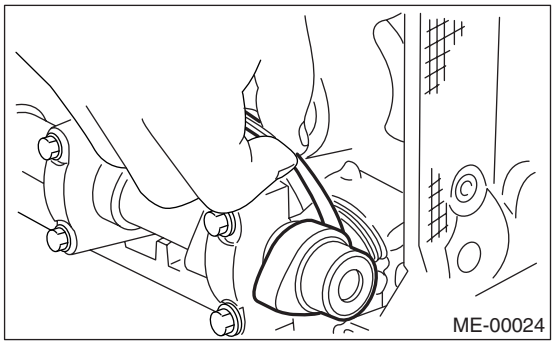


B: ADJUSTMENT

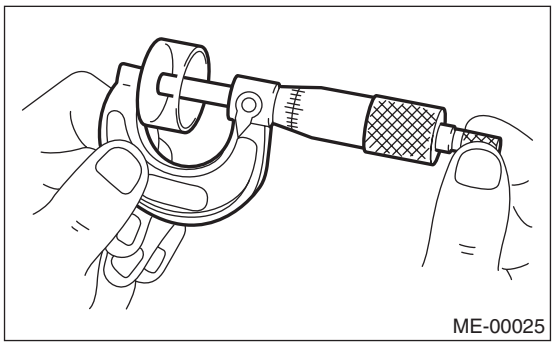
CAUTION:
Adjustment of valve clearance should be performed while engine is cold.

1) Measure all the valve clearances. <Ref. to ME(H4DOTC)-26, INSPECTION, Valve Clearance.>

NOTE:
Record each valve clearance after measurement.



2) Remove the camshaft. <Ref. to ME(H4DOTC)-52, 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)

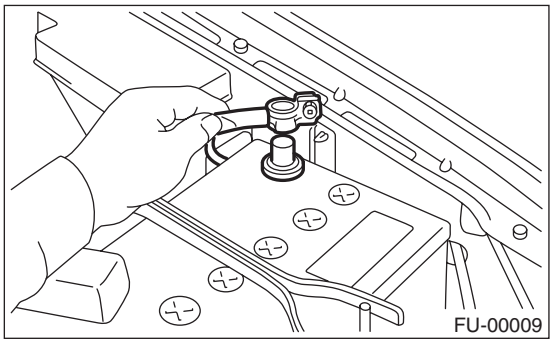
Part No.	Thickness mm (in)
13228 AB582	5.16 (0.2031)
13228 AB592	5.17 (0.2035)
13228 AB602	5.18 (0.2039)
13228 AB612	5.19 (0.2043)
13228 AB622	5.20 (0.2047)
13228 AB632	5.21 (0.2051)
13228 AB642	5.22 (0.2055)
13228 AB652	5.23 (0.2059)
13228 AB662	5.24 (0.2063)
13228 AB672	5.25 (0.2067)
13228 AB682	5.26 (0.2071)
13228 AB692	5.27 (0.2075)
13228 AB702	4.38 (0.1724)
13228 AB712	4.40 (0.1732)
13228 AB722	4.42 (0.1740)
13228 AB732	4.44 (0.1748)
13228 AB742	4.46 (0.1756)
13228 AB752	4.48 (0.1764)
13228 AB762	4.50 (0.1771)
13228 AB772	4.52 (0.1780)
13228 AB782	4.54 (0.1787)
13228 AB792	4.56 (0.1795)
13228 AB802	4.58 (0.1803)
13228 AB812	4.60 (0.1811)
13228 AB822	4.62 (0.1819)
13228 AB832	4.64 (0.1827)
13228 AB842	4.66 (0.1835)
13228 AB852	5.29 (0.2083)
13228 AB862	5.31 (0.2091)
13228 AB872	5.33 (0.2098)
13228 AB882	5.35 (0.2106)
13228 AB892	5.37 (0.2114)
13228 AB902	5.39 (0.2122)
13228 AB912	5.41 (0.2123)
13228 AB922	5.43 (0.2138)
13228 AB932	5.45 (0.2146)
13228 AB942	5.47 (0.2154)
13228 AB952	5.49 (0.2161)
13228 AB962	5.51 (0.2169)
13228 AB972	5.53 (0.2177)
13228 AB982	5.55 (0.2185)
13228 AB992	5.57 (0.2193)
13228 AC002	5.59 (0.2201)
13228 AC012	5.61 (0.2209)
13228 AC022	5.63 (0.2217)
13228 AC032	5.65 (0.2224)

6) Inspect all valves for clearance again at this stage. If the valve clearance is not correct, repeat the procedure over again from the first step.
7) After inspection, install the related parts in the reverse order of removal.

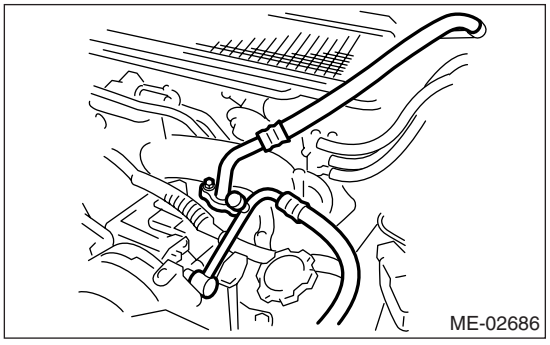
9. Engine Assembly

A: REMOVAL

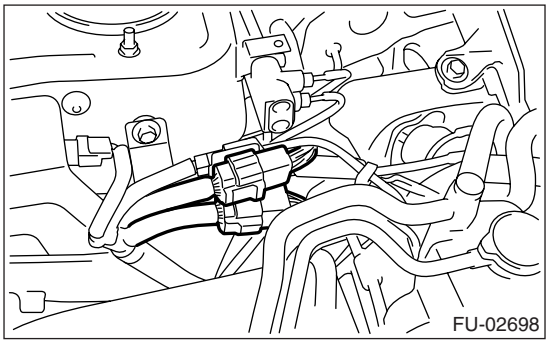
1) Set the vehicle on a lift.
2) Open the front hood fully and support with the front food stay.
3) Remove the collector cover.
4) Collect the refrigerant from A/C system. <Ref. to AC-20, Refrigerant Recovery Procedure.>
5) Release the fuel pressure. <Ref. to FU(H4SO)-44, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
6) Disconnect the ground cable from battery.


FU-00009

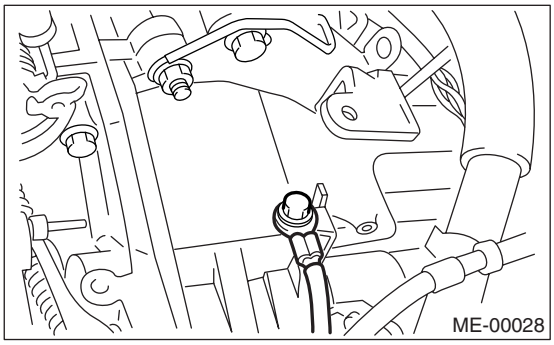
7) Open the fuel filler flap lid, and remove the filler cap.
8) Remove the radiator from vehicle. <Ref. to CO(H4SO)-25, REMOVAL, Radiator.>
9) Remove the coolant filler tank. <Ref. to CO(H4SO)-41, REMOVAL, Coolant Filler Tank.>
10) Remove the secondary air pump. <Ref. to EC(H4DOTC)-9, INSPECTION, Secondary Air Pump.>
11) Disconnect the A/C pressure hoses from A/C compressor.


ME-02686

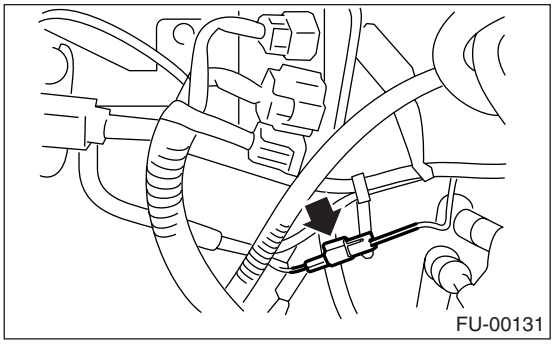
12) Remove the intercooler. <Ref. to IN(H4DOTC)-10, REMOVAL, Intercooler.>
13) Disconnect the following connectors and cables.
(1) Engine harness connectors

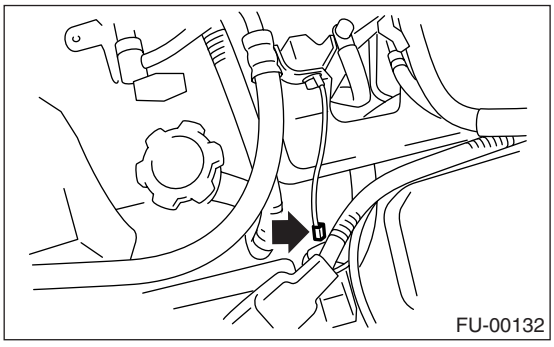

FU-02698

(2) Engine ground terminal

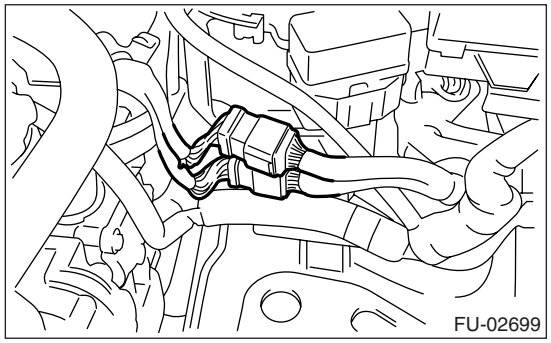

ME-00028

(3) Disconnect the right and left engine grounding cables.

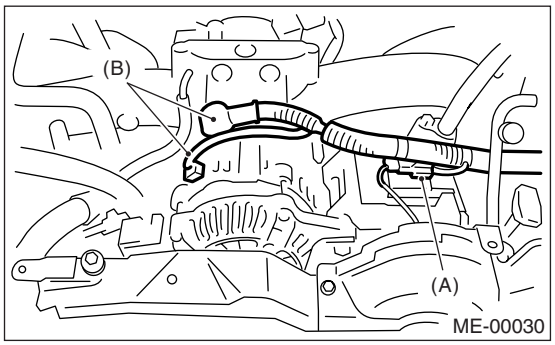

FU-00131


FU-00132

(4) Engine harness connectors

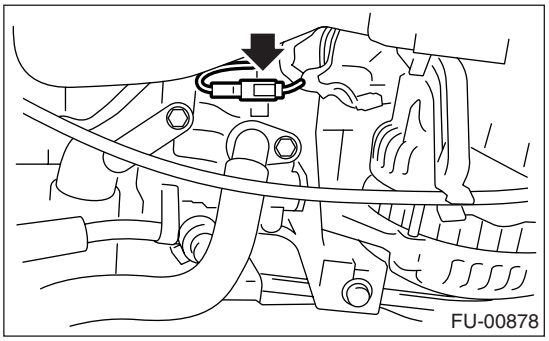


(5) Generator connector, terminal and A/C compressor connector

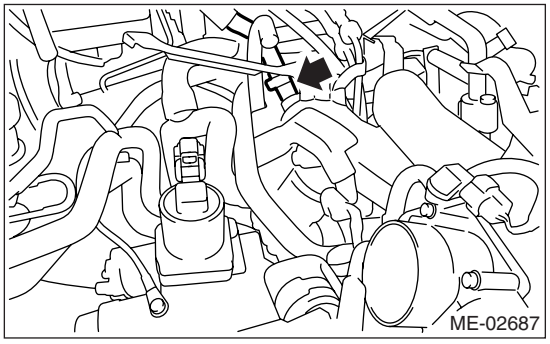


(A) A/C compressor connector
(B) Generator connector and terminal

(6) Power steering switch connector

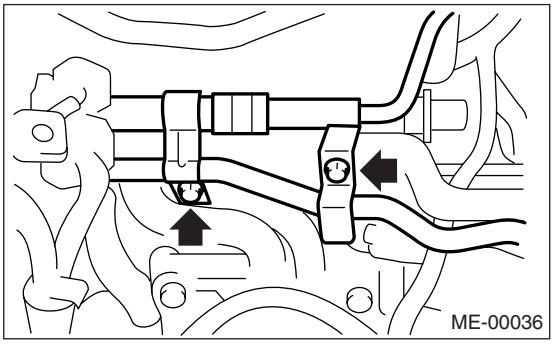


14) Disconnect the following hoses.
(1) Brake booster vacuum hose

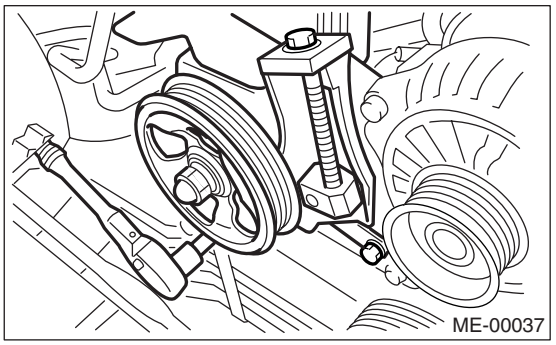


(2) Heater inlet and outlet hoses

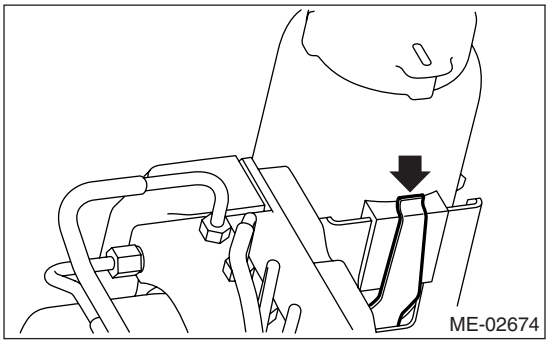
15) Remove the power steering pump.
(1) Remove the front side V-belt. <Ref. to ME(H4DOTC)-38, FRONT SIDE BELT, REMOVAL, V-belt.>
(2) Remove the power steering pipe from the fuel pip protector RH along with the bracket.



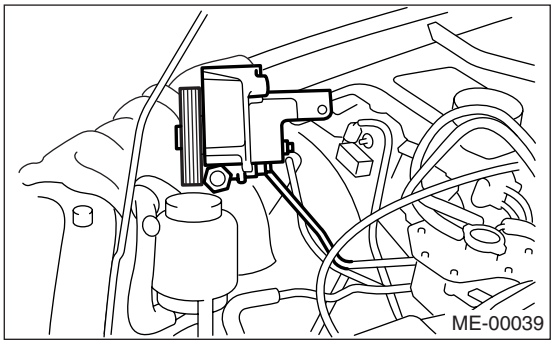
(3) Remove the power steering pump.



(4) Remove the reservoir tank from the bracket by pulling it upwards.

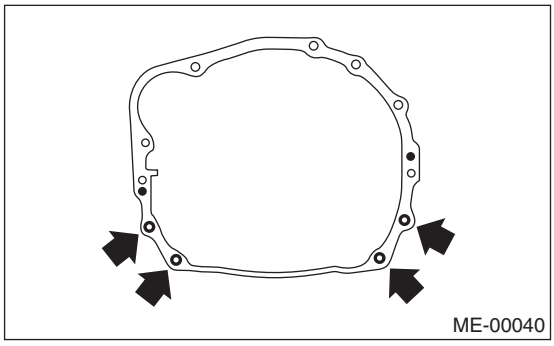


(5) Place the power steering pump on the right side wheel apron.

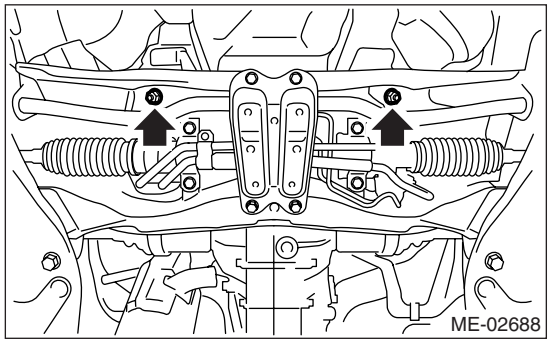


16) Lift-up the vehicle.

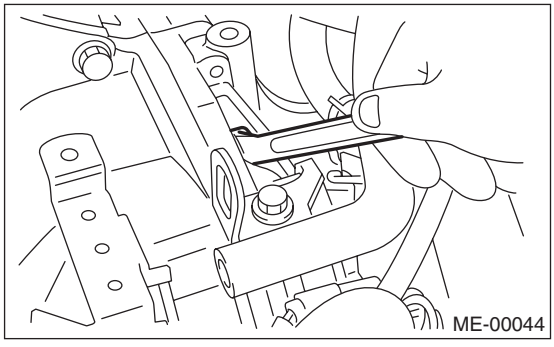
17) Remove the ATF cooler pipe from frame. (AT model)
18) Remove the center exhaust pipe. <Ref. to EX(H4DOTC)-7, REMOVAL, Center Exhaust Pipe.>
19) Remove the bolts and nuts which hold lower side of transmission to engine.


ME-00040

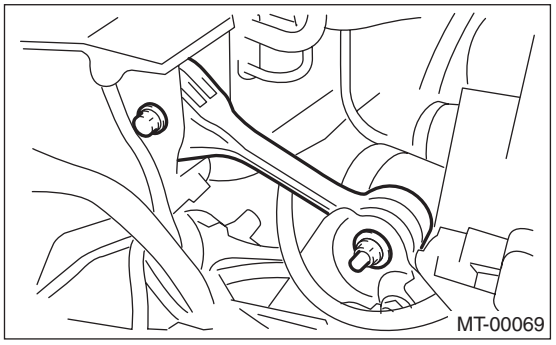
20) Remove the nuts which install front cushion rubber onto front crossmember.


ME-02688

21) 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 engine using socket wrench.


ME-00044

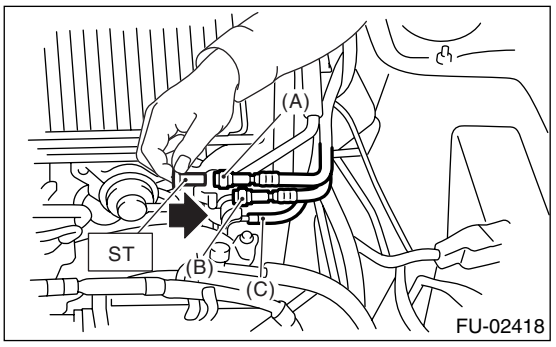
22) Remove the pitching stopper.


MT-00069

23) Using the ST to remove the fuel hose from each fuel pipe. <Ref. to FU(H4DOTC)-65, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>

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

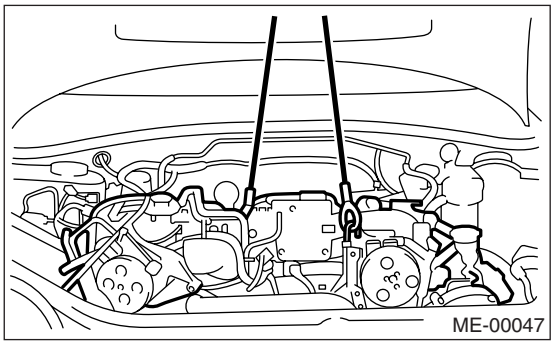
ST 42099AE000 CONNECTOR REMOVER



FU-02418

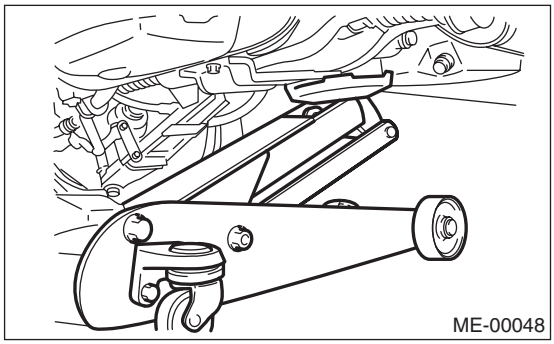
(A) Fuel delivery hose
(B) Return hose
(C) Evaporation hose

24) Support the engine with a lifting device and wire ropes.


ME-00047

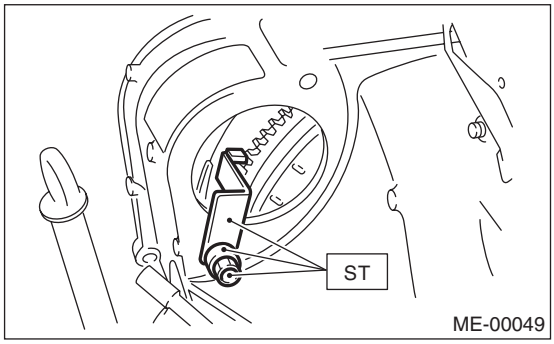
25) Support the transmission with a garage jack.

CAUTION:
Before removing the engine away from transmission, check to be sure no work has been overlooked. Doing this is very important because the transmission lowers for its own weight. This work is also of great importance for facilitating reinstallation.


ME-00048

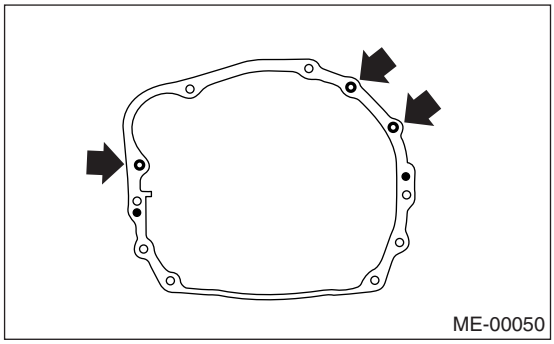
26) Separation of engine and transmission.
(1) Remove the starter. <Ref. to SC(H4SO)-5, REMOVAL, Starter.>
(2) Set the ST to torque converter clutch case. (AT model)

ST 498277200 STOPPER SET



ME-00049

(3) Remove the bolts which hold upper side of transmission to engine.


ME-00050

27) 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.

28) Remove the front cushion rubbers.

B: INSTALLATION

1) Install the front cushion rubbers.

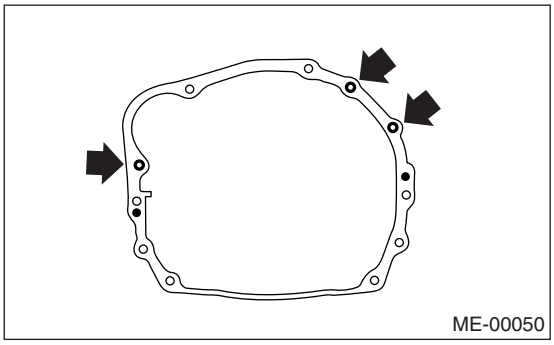
Tightening torque:
35 N·m (3.6 kgf-m, 25.8 ft-lb)

2) Position the engine in engine compartment and align it with transmission.

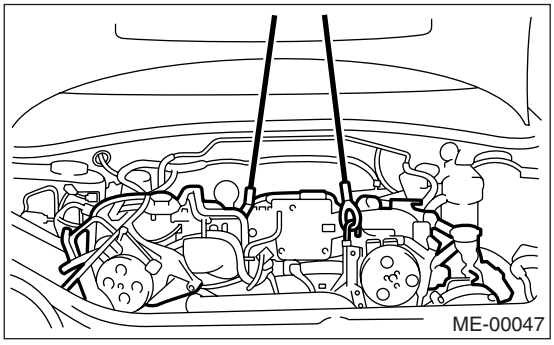
NOTE:
Be careful not to damage adjacent parts or body panels with crank pulley, oil level gauge, etc.

3) Apply a small amount of grease to splines of main shaft. (MT model)
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)


ME-00050

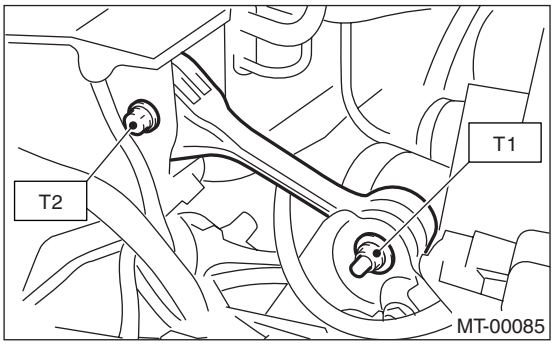
5) Remove the lifting device and wire ropes.


ME-00047

6) Remove the garage jack.

7) Install the pitching stopper.

Tightening torque:
T1: 50 N·m (5.1 kgf-m, 37 ft-lb)
T2: 58 N·m (5.9 kgf-m, 43 ft-lb)



8) Remove the ST from converter case. (AT model)

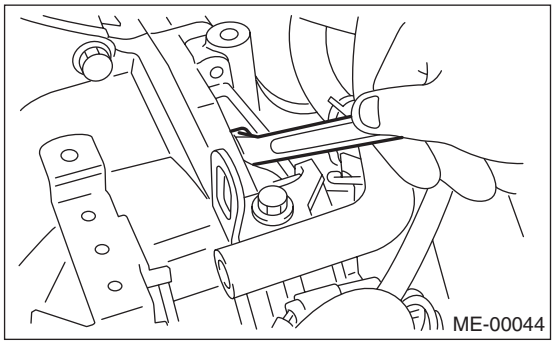
CAUTION:
Be careful not to drop the ST into the converter case when removing the ST.
ST 498277200 STOPPER SET

9) Install the starter. <Ref. to SC(H4SO)-5, 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.

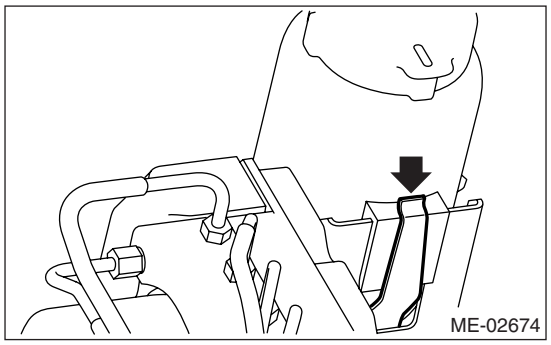
CAUTION:
Be careful not to drop bolts into the torque converter clutch housing.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



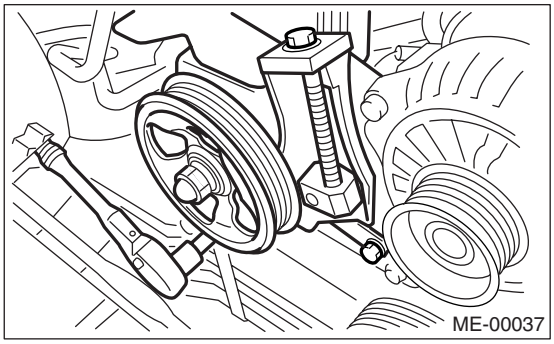
(3) Install the service hole plug.

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

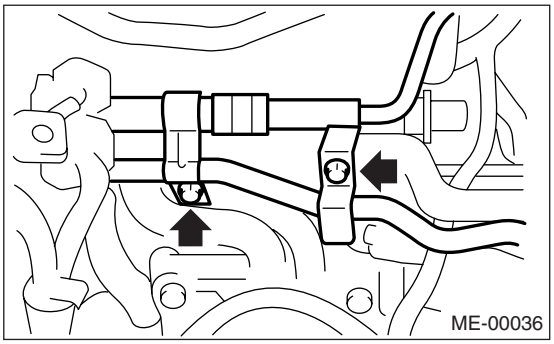


(2) Install the power steering pump.

Tightening torque:
20.1 N·m (2.05 kgf-m, 14.8 ft-lb)



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

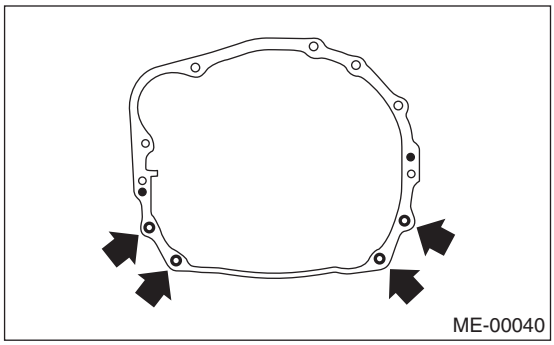


(4) Install the front side V-belt and adjust it. <Ref. to ME(H4DOTC)-38, FRONT SIDE BELT, INSTALLATION, V-belt.>

12) Lift-up the vehicle.

13) Tighten the nuts and bolts which hold lower side of transmission to engine.

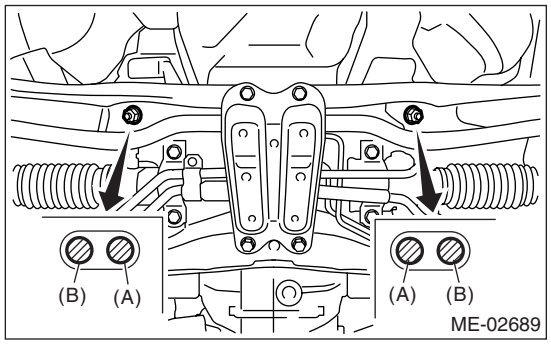
Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)



14) Tighten the nuts which install the front cushion rubber onto crossmember.

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

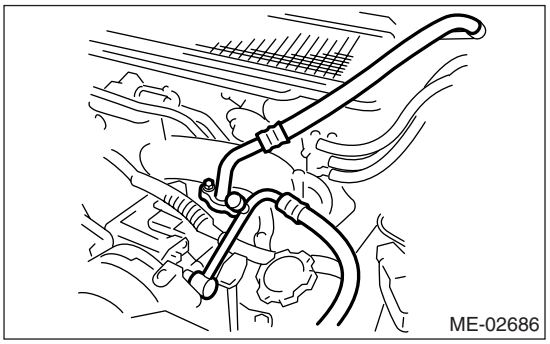
NOTE:
Make sure the front cushion rubber mounting bolts (A) and locator (B) are securely installed.



15) Install the ATF cooler pipe to frame. (AT model)
16) Install the center exhaust pipe. <Ref. to EX(H4DOTC)-8, INSTALLATION, Center Exhaust Pipe.>
17) Lower the vehicle.
18) Connect the following hoses.
(1) Fuel delivery hose, return hose and evaporation hose
(2) Heater inlet and outlet hoses
(3) Brake booster vacuum hose
19) Connect the following connectors and terminals.
(1) Engine ground terminal
(2) Engine harness connectors
(3) Generator connector and terminal
(4) A/C compressor connector
(5) Power steering switch connector
20) Install the air intake system.
(1) Install the intercooler. <Ref. to IN(H4DOTC)-10, INSTALLATION, Intercooler.>
(2) Install the air cleaner element and air cleaner upper cover.
(3) Install the engine harness connector bracket.
(4) Install the filler hose to air cleaner case.
21) Install the A/C pressure hoses.

NOTE:
Replace O-ring with a new one.

Tightening torque:
15 N·m (1.5 kgf-m, 10.8 ft-lb)



22) Install the radiator. <Ref. to CO(H4SO)-27, INSTALLATION, Radiator.>
23) Install the coolant filler tank. <Ref. to CO(H4SO)-41, INSTALLATION, Coolant Filler Tank.>
24) Install the secondary air pump. <Ref. to EC(H4DOTC)-9, INSTALLATION, Secondary Air Pump.>
25) Install the battery in the vehicle, and connect cables.
26) Refill engine coolant. <Ref. to CO(H4SO)-16, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
27) Charge the A/C system with refrigerant. <Ref. to AC-21, PROCEDURE, Refrigerant Charging Procedure.>
28) Install the collector cover.
29) Remove the front hood stay, and close the front hood.
30) Take off the vehicle from lift.

10.Engine Mounting

A: REMOVAL

1) Remove the engine unit. <Ref. to ME(H4DOTC)-30, REMOVAL, Engine Assembly.>
2) Remove the engine mounting from engine assembly.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
Engine mounting:
35 N·m (3.6 kgf-m, 25.8 ft-lb)

C: INSPECTION

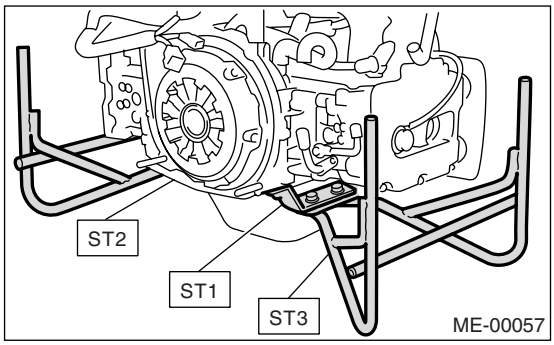
Make sure that no crack or other damage do not exists.

11.Preparation for Overhaul

A: PROCEDURE

1) After removing the engine from body, secure it to ST in the following procedure.

ST1	498457000	ENGINE STAND ADAPTER RH
ST2	498457100	ENGINE STAND ADAPTER LH
ST3	499817100	ENGINE STAND



2) In this section the procedures described under each index are all connected and stated in order. The procedure for overhauling of the engine will be completed when you go through all steps in the process.

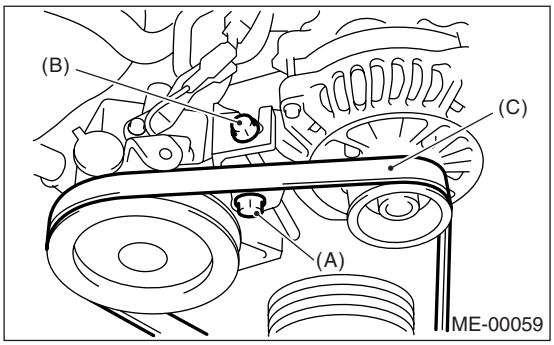
Therefore, in this section, to conduct the particular procedure within the flow of a section, you need to go back and conduct the procedure described previously in order to do that particular procedure.

12.V-belt

A: REMOVAL

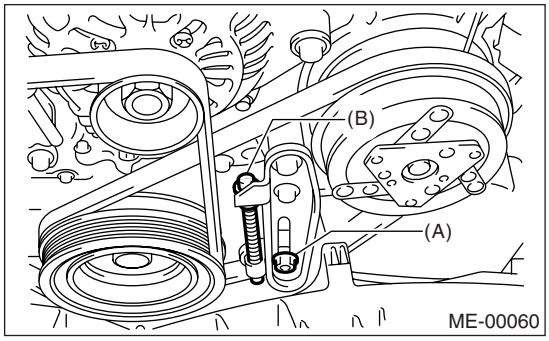
1. FRONT SIDE BELT

1) Remove the collector cover.
2) Loosen the lock bolt (A).
3) Loosen the slider bolt (B).
4) Remove the front side belt (C).

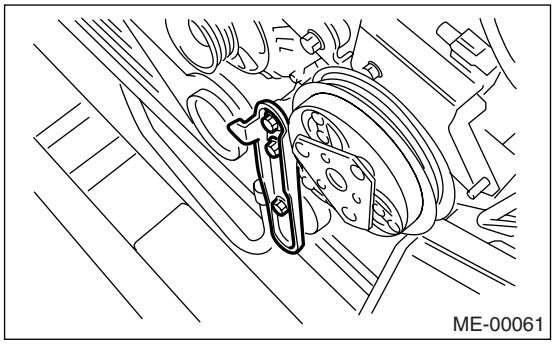


2. REAR SIDE BELT

1) Loosen the lock nut (A).
2) Loosen the slider bolt (B).



3) Remove the A/C belt.
4) Remove the belt tensioner.

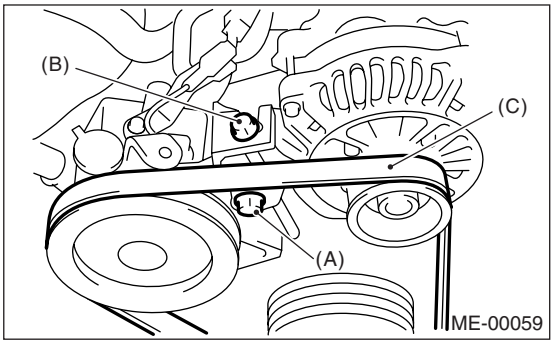


B: INSTALLATION

1. FRONT SIDE BELT

CAUTION:
Wipe off any oil or water on the belt and pulley.
1) Install the belt (C), and tighten the slider bolt (B) so as to obtain the specified belt tension. <Ref. to ME(H4DOTC)-39, INSPECTION, V-belt.>
2) Tighten the lock bolt (A).
3) Tighten the slider bolt (B).

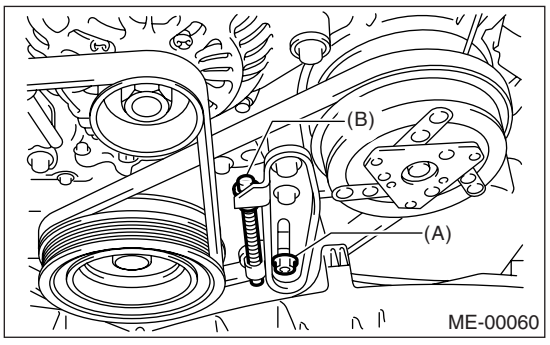
Tightening torque:
Lock bolt through bolt:
25 N·m (2.5 kgf-m, 18.1 ft-lb)
Slider bolt
8 N·m (0.8 kgf-m, 5.5 ft-lb)



2. REAR SIDE BELT

1) Install a belt, and tighten the slider bolt (B) so as to obtain the specified belt tension.
<Ref. to ME(H4DOTC)-39, INSPECTION, V-belt.>
2) Tighten the lock nut (A).

Tightening torque:
Lock nut (A);
22.6 N·m (2.3 kgf-m, 16.6 ft-lb)



C: INSPECTION

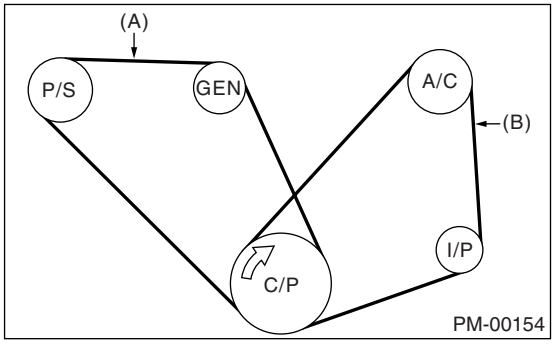
1) Replace the belts, if crack, fraying or wear is found.
2) Check the drive belt tension and adjust it if necessary by changing generator installing position and/or idler pulley installing position.

Belt tension (with belt tension gauge):

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

(B) *
When installing new parts:
740 — 880 N (76 — 89 kgf, 167 — 197 lb)
At inspection
350 — 450 N (36 — 46 kgf, 78 — 101 lb)

****: Model with air conditioner***



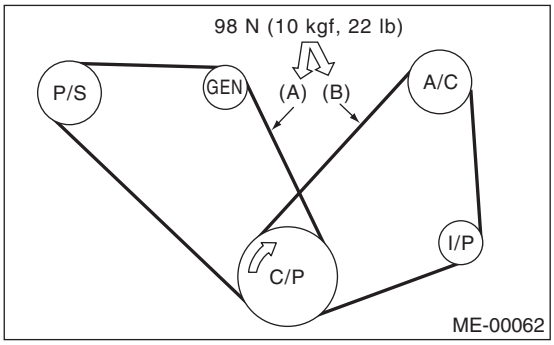
(A) Front side belt
(B) Rear side belt
C/P Crank pulley
GEN Generator
P/S Power steering oil pump pulley
A/C A/C compressor pulley
I/P Idler pulley

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)

****: Model with air conditioner***

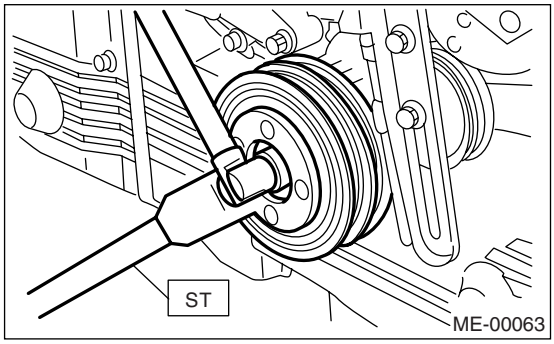


(A) Front side belt
(B) Rear side belt
C/P Crank pulley
GEN Generator
P/S Power steering oil pump pulley
A/C Air conditioning compressor pulley
I/P Idler pulley

13.Crank Pulley

A: REMOVAL

1) Remove the V-belts. <Ref. to ME(H4DOTC)-38, REMOVAL, V-belt.>
2) Remove the crank pulley bolt. To lock the crankshaft, use ST.
ST 499977100 CRANK PULLEY WRENCH

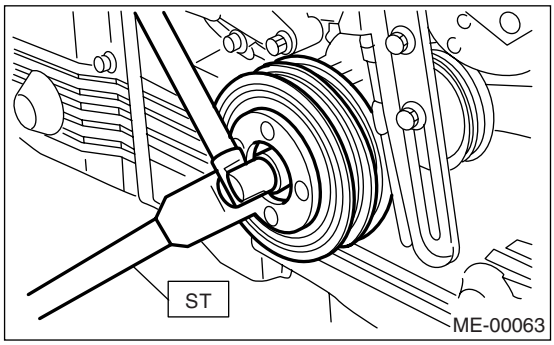


3) Remove the crank pulley.

B: INSTALLATION

1) Install the crank pulley.
2) Install the pulley bolt.
To lock the crankshaft, use ST.
ST 499977100 CRANK PULLEY WRENCH
(1) Clean the crank pulley thread using compressed air.
(2) Apply engine oil to the crank pulley bolt seat and thread.
(3) Tighten the bolts temporarily with tightening torque of 44 N·m (4.5 kgf-m, 33 ft-lb).
(4) Tighten the crank pulley bolts.

Tightening torque:
180 N·m (18.3 kgf-m, 132.7 ft-lb)



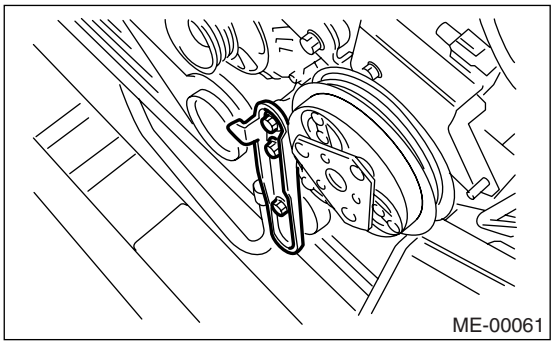
3) Check that the tightening angle of the clamp pulley bolt is a minimum of 65°. Perform the following procedure when less than 65°.

CAUTION:
If the tightening angle of crank pulley bolt is less than 65°, the bolt is damaged. In this case, the bolt must be replaced.

(1) Replace the crank pulley bolts and clean them.

Crank pulley bolt:
12369AA011
(2) Clean the crankshaft thread using compressed air.
(3) Apply engine oil to the crank pulley bolt seat and thread.
(4) Tighten the bolts temporarily with tightening torque of 44 N·m (4.5 kgf-m, 33 ft-lb).
(5) Tighten the crank pulley bolts 65° to 75°.

NOTE:
Conduct the tightening procedures by confirming the turning angle of crank pulley bolt referring to the gauge indicated on timing belt cover.
4) Install the belt tensioner.



5) Install the V-belts. <Ref. to ME(H4DOTC)-38, INSTALLATION, V-belt.>

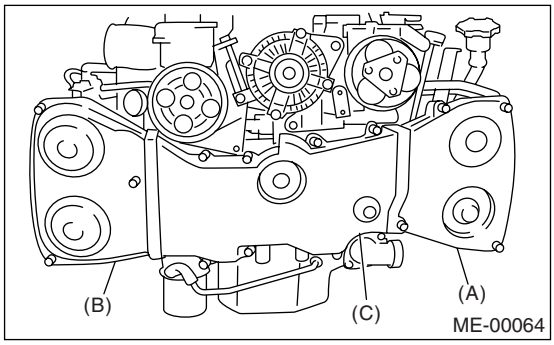
C: INSPECTION

1) Check the V-belt is not worn or otherwise damaged.
2) Check the tension of the belt. <Ref. to ME(H4DOTC)-39, INSPECTION, V-belt.>

14.Timing Belt Cover

A: REMOVAL

1) Remove the V-belts. <Ref. to ME(H4DOTC)-38, REMOVAL, V-belt.>
2) Remove the crank pulley. <Ref. to ME(H4DOTC)-40, REMOVAL, Crank Pulley.>
3) Remove the timing belt cover (LH) (A).
4) Remove the timing belt cover (RH) (B).
5) Remove the front timing belt cover (C).



B: INSTALLATION

1) Install the front timing belt cover (C).

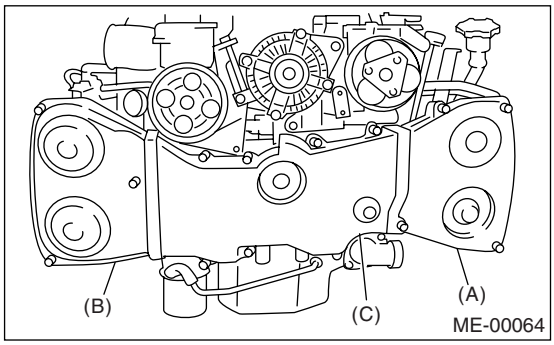
Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)

2) Install the timing belt cover (RH) (B).

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)

3) Install the timing belt cover (LH) (A).

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)



4) Install the crank pulley. <Ref. to ME(H4DOTC)-40, INSTALLATION, Crank Pulley.>
5) Install the V-belts. <Ref. to ME(H4DOTC)-38, INSTALLATION, V-belt.>

C: INSPECTION

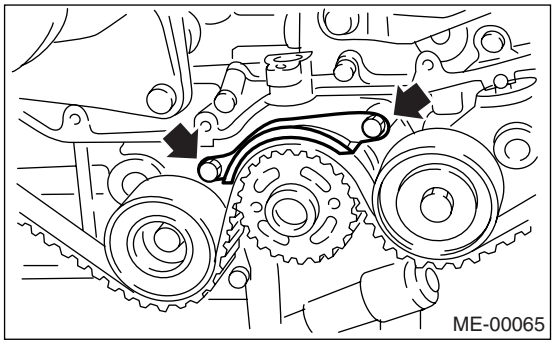
Make sure the cover is not damaged.

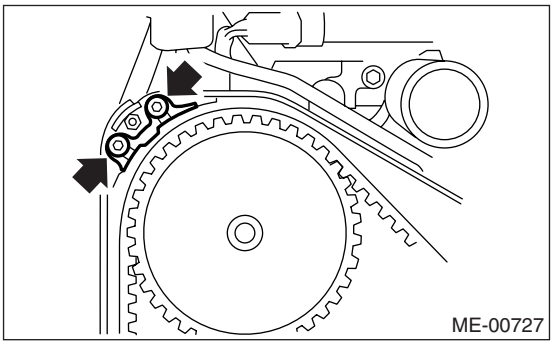
15.Timing Belt

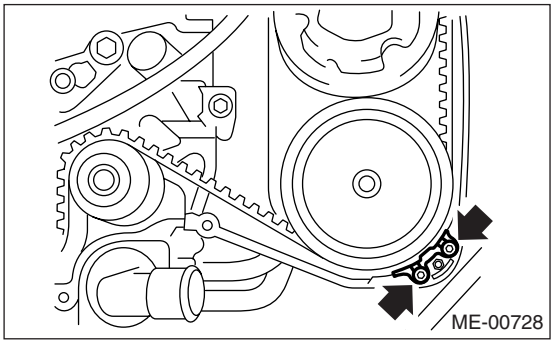
A: REMOVAL

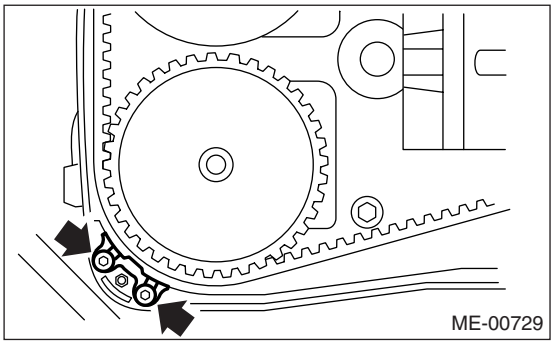
1. TIMING BELT

1) Remove the V-belts. <Ref. to ME(H4DOTC)-38, REMOVAL, V-belt.>
2) Remove the crank pulley. <Ref. to ME(H4DOTC)-40, REMOVAL, Crank Pulley.>
3) Remove the timing belt cover. <Ref. to ME(H4DOTC)-41, REMOVAL, Timing Belt Cover.>
4) Remove the timing belt guide. (MT model)



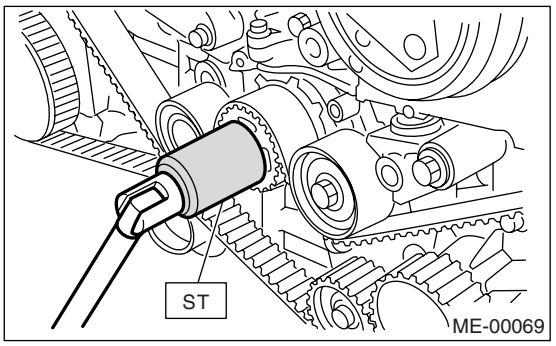




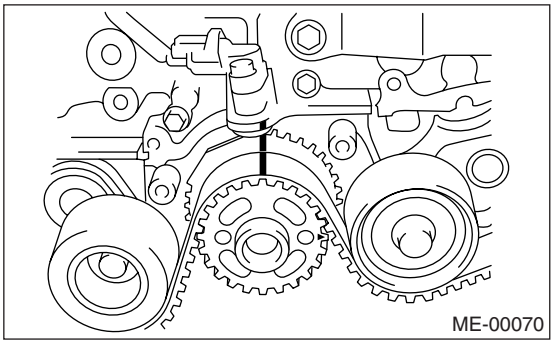


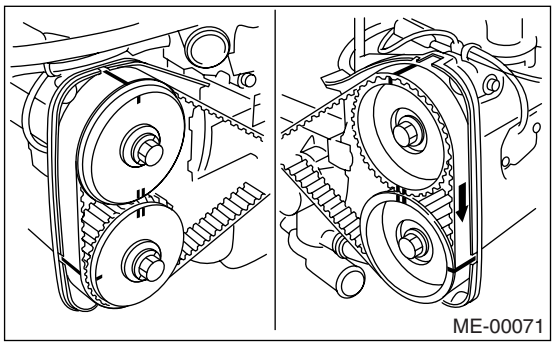
5) If the alignment mark or arrow mark (which indicates rotation direction) on timing belt fade away, put new marks before removing the timing belt as shown in procedures below.
   (1) Turn the crankshaft using ST, and align the alignment marks on crank sprocket, intake cam sprocket (LH), exhaust cam sprocket (LH), intake cam sprocket (RH) and exhaust cam sprocket (RH) with notches of timing belt cover and cylinder block.

ST 499987500 CRANKSHAFT SOCKET

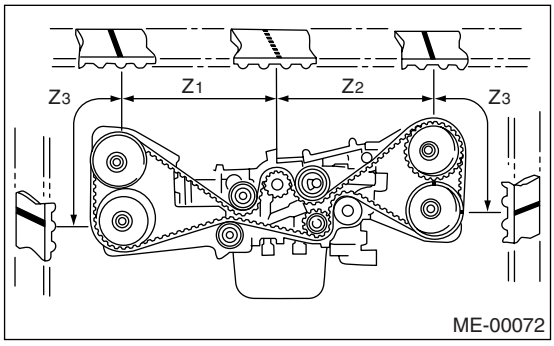


(2) Using white paint, put alignment and/or arrow marks on timing belts in relation to the cam sprockets.


ME-00070

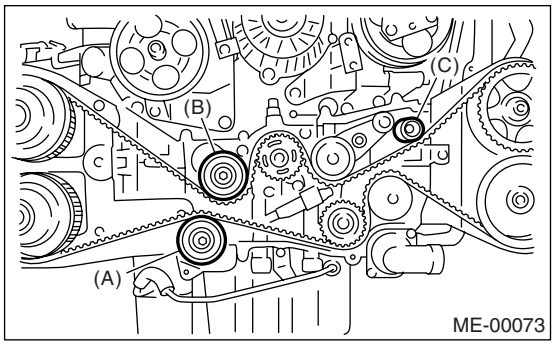

ME-00071

Z_1: 54.5-tooth length
Z_2: 51-tooth length
Z_3: 28-tooth length



ME-00072

6) Remove the belt idler (A).



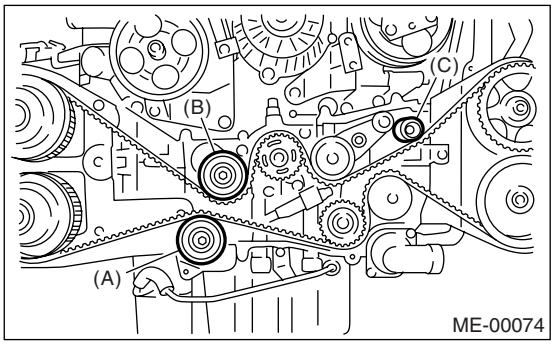
ME-00073

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.

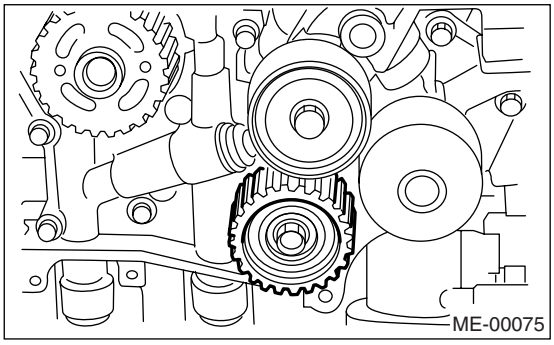
2. AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER

1) Remove the belt idler (B) and (C).

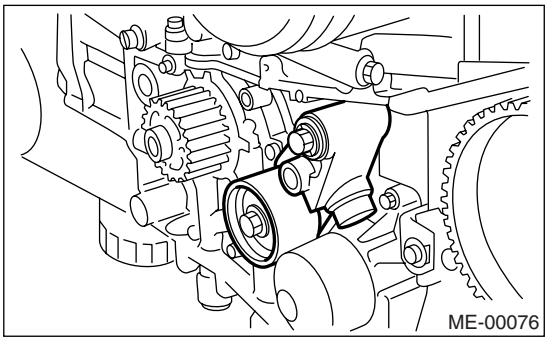


ME-00074

2) Remove the belt idler No. 2.


ME-00075

3) Remove the automatic belt tension adjuster assembly.


ME-00076

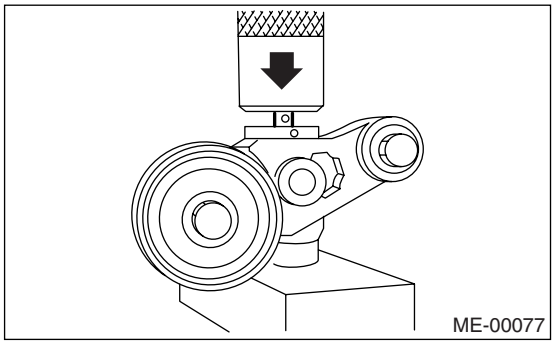
B: INSTALLATION

1. AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER

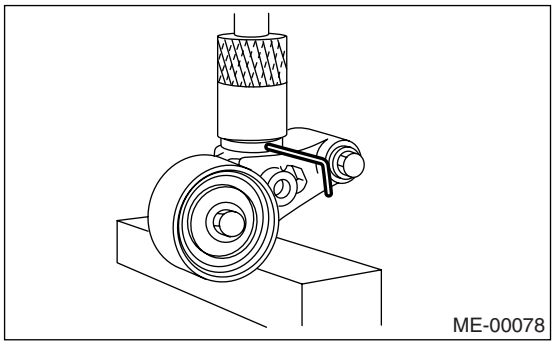
1) Preparation for installation of automatic belt tension adjuster assembly.

CAUTION:
• Always use a vertical type pressing tool to move the adjuster rod down.
• Do not use a lateral type vise.
• Push the adjuster rod vertically.
• Press-in the push adjuster rod gradually taking more than three minutes.
• Do not allow press pressure to exceed 9,807 N (1,000 kgf, 2,205 lbf).
• Press the adjuster rod as far as the end surface of the cylinder. Do not press the adjuster rod into cylinder. Doing so may damage the cylinder.
• Do not release the press pressure until stopper pin is completely inserted.

(1) Attach the automatic belt tension adjuster assembly to vertical pressing tool.
(2) Slowly move the adjuster rod down with a pressure of more than 165 N (16.8 kgf, 37.1 lb) until the adjuster rod is aligned with the stopper pin hole in the cylinder.

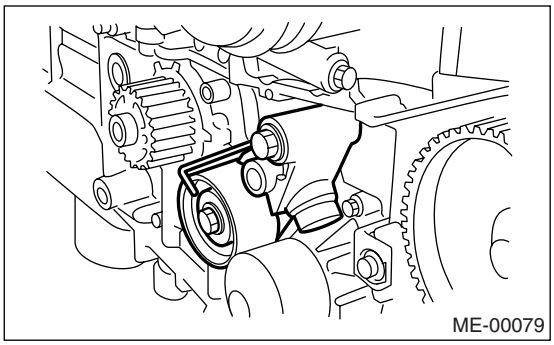


(3) With a 2 mm (0.08 in) dia. stopper pin or a 2 mm (0.08 in) (nominal) dia. hex bar wrench inserted into the stopper pin hole in the cylinder, secure the adjuster rod.



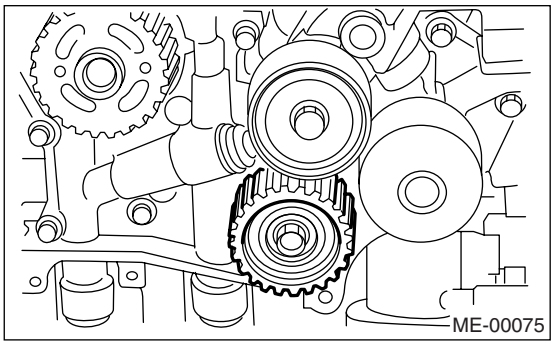
2) Install the automatic belt tension adjuster assembly.

Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)



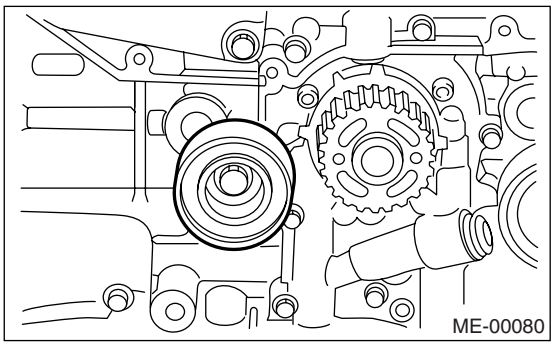
3) Install the belt idler No. 2.

Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)



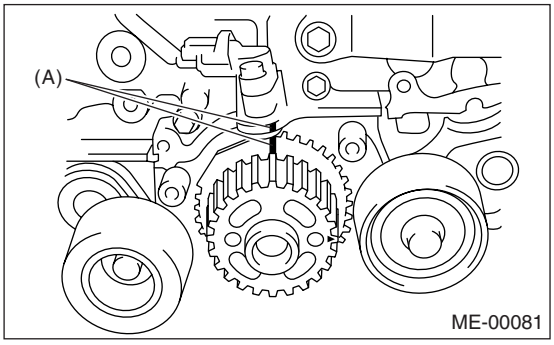
4) Install the belt idlers.

Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)

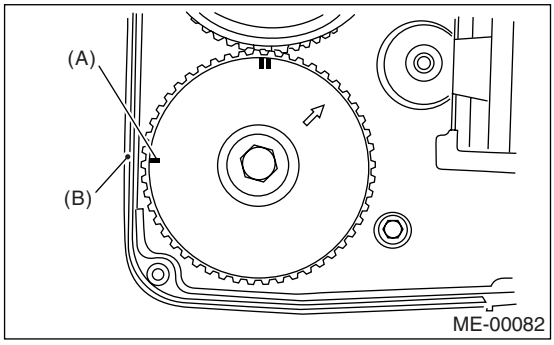


2. TIMING BELT

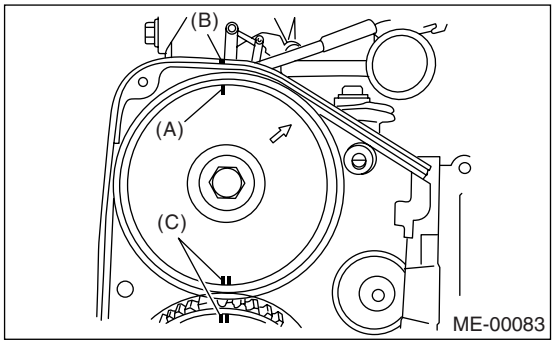
1) Preparation for installation of automatic belt tension adjuster assembly. <Ref. to ME(H4DOTC)-44, AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER, INSTALLATION, Timing Belt.>
2) Crankshaft and camshaft sprocket alignment
(1) Align the mark (A) on crank sprocket with the mark on oil pump cover at cylinder block.



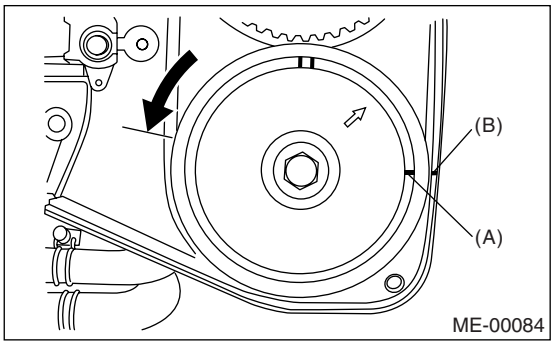
(2) Align single line mark (A) on the exhaust cam sprocket (RH) with notch (B) on timing belt cover.



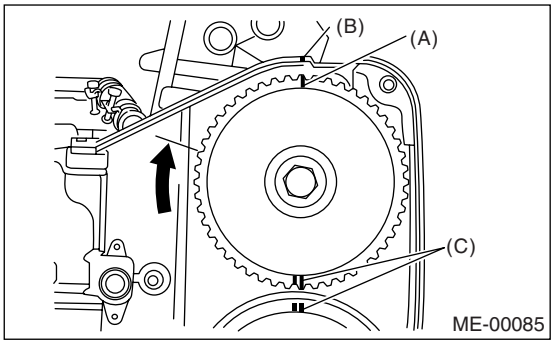
(3) Align single line mark (A) on the intake cam sprocket (RH) with notch (B) on timing belt cover. (Ensure double lines (C) on intake and exhaust camshaft sprockets are aligned.)



(4) 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).

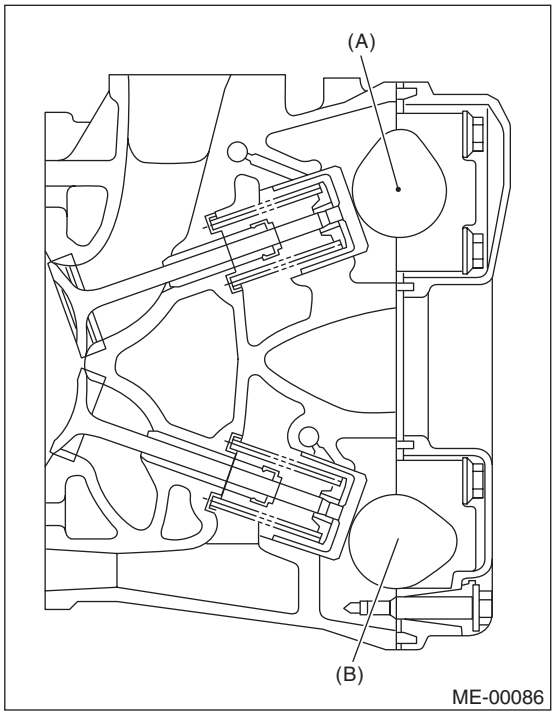


(5) Align the single line mark (A) on intake cam sprocket (LH) with notch (B) on timing belt cover by turning the sprocket clockwise (as viewed from front of engine). (Make sure the double line marks (C) on intake and exhaust cam sprockets are aligned.)



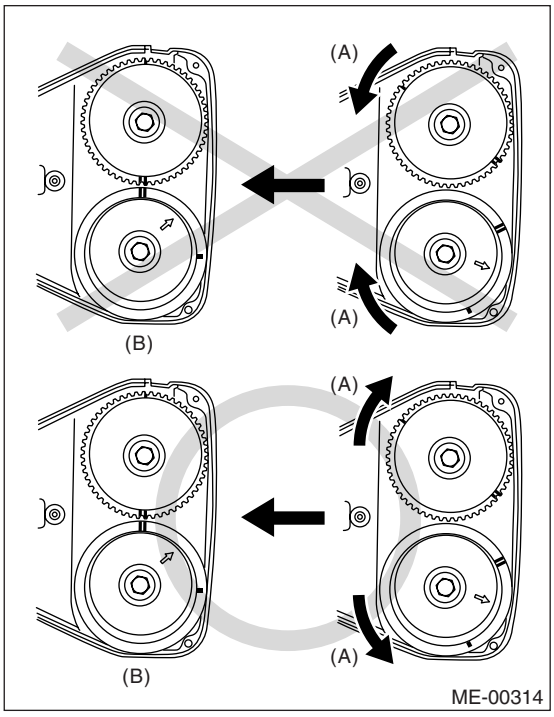
(6) Make sure that the cam and crank sprockets are positioned properly.

CAUTION:
• Intake and exhaust camshafts for this DOHC engine can be independently rotated with the timing belts removed. As can be seen from the figure, if the intake and exhaust valves are lifted simultaneously, the valve heads will interfere with each other, resulting in bent valves.



(A) Intake camshaft
(B) Exhaust camshaft

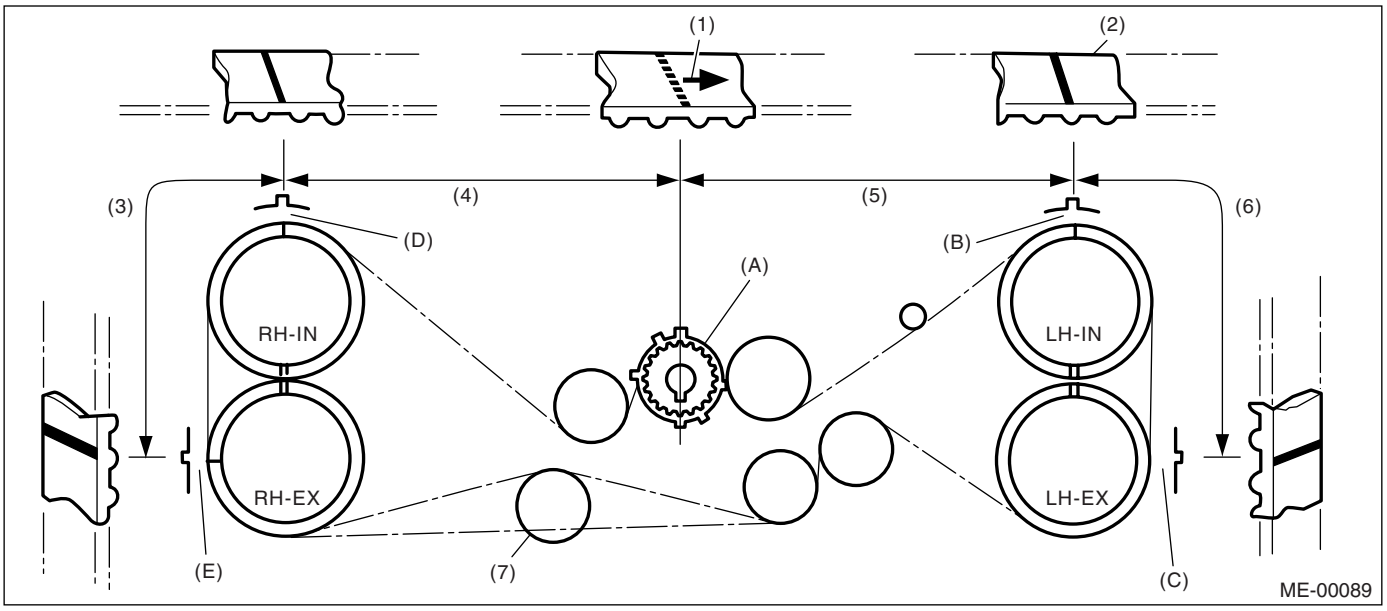
• When the timing belts are not installed, four camshafts are held at the "zero-lift" position, where all cams on camshafts do not push the intake and exhaust valves down. (Under this condition, all valves remain unlifted.)
• When the camshafts are rotated to install the timing belts, #2 intake and #4 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.
• Do not allow the camshafts to rotate in the direction shown in the figure of upper one. Doing this cause both the intake and exhaust valves to lift simultaneously, resulting in interference with their heads.



(A) Rotating direction
(B) Timing belt installation position

3) Installation of timing belt:
Align the alignment mark on 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 the belt's rotating direction is correct.

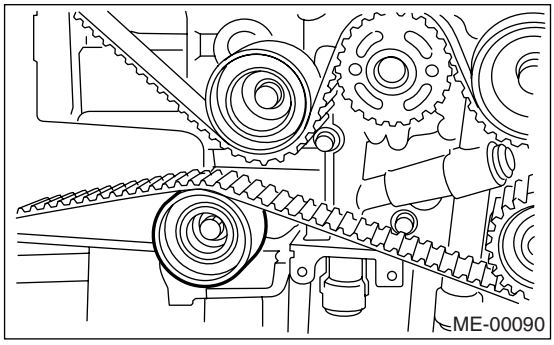


(1) Arrow mark
(2) Timing belt
(3) 28 tooth length
(4) 54.5 tooth length
(5) 51 tooth length
(6) 28 tooth length
(7) Install it in the end

4) Install the belt idlers.

Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)

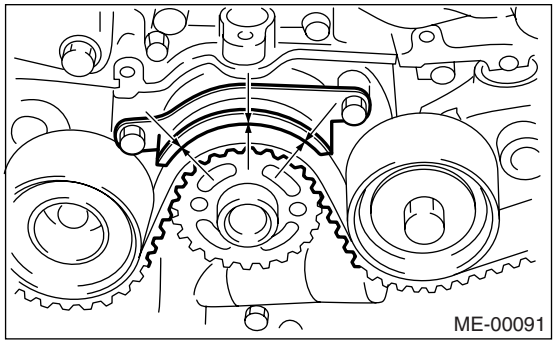
NOTE:
Make sure that the marks on the timing belt and sprockets are aligned.

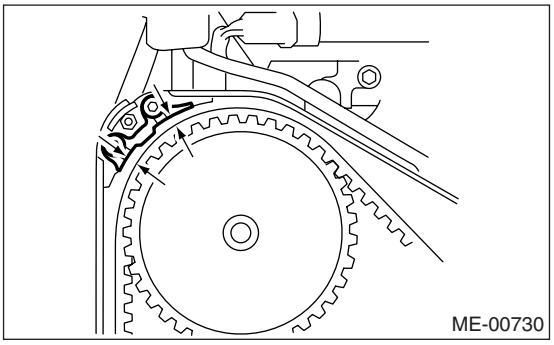


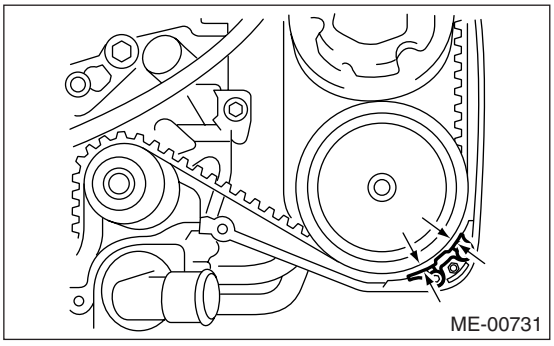
5) After ensuring that the marks on the timing belt and sprockets are aligned, remove the stopper pin from tensioner adjuster.

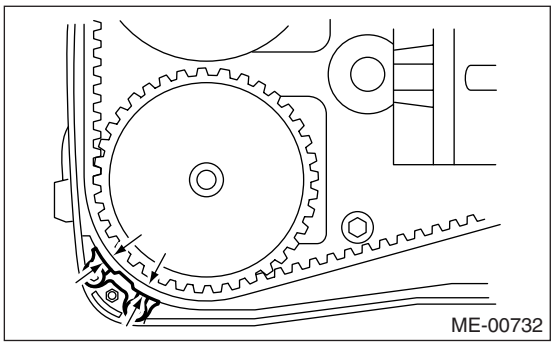
6) Install the timing belt guide. (MT model)
(1) Temporarily tighten the bolts.
(2) Check and adjust the clearance between timing belt and timing belt guide.

Clearance:
1.0±0.5 mm (0.039 ± 0.020 in)


ME-00091

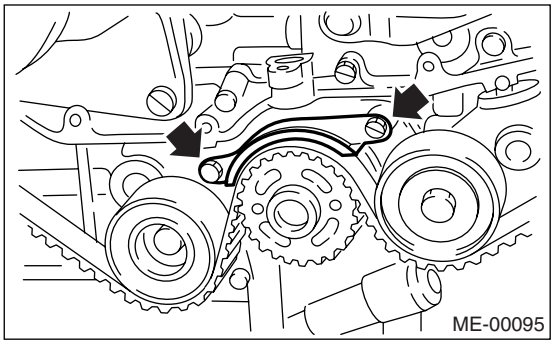

ME-00730


ME-00731

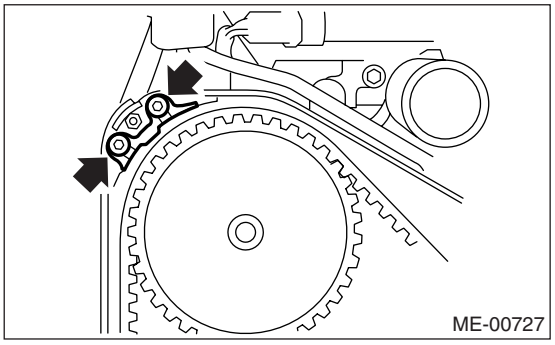

ME-00732

(3) Tighten the bolt.

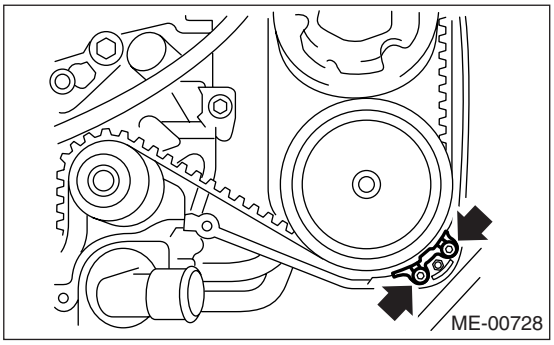
Tightening torque:
10 N·m (1.0 kgf-m, 7.2 ft-lb)


ME-00095

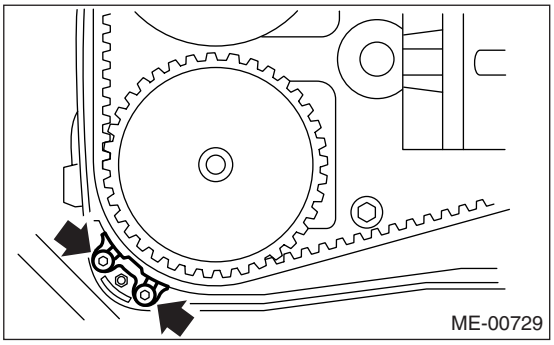
Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)


ME-00727

Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)


ME-00728

Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)


ME-00729

7) Install the timing belt cover. <Ref. to ME(H4DOTC)-41, INSTALLATION, Timing Belt Cover.>
8) Install the crank pulley. <Ref. to ME(H4DOTC)-40, INSTALLATION, Crank Pulley.>
9) Install the V-belts. <Ref. to ME(H4DOTC)-38, INSTALLATION, V-belt.>

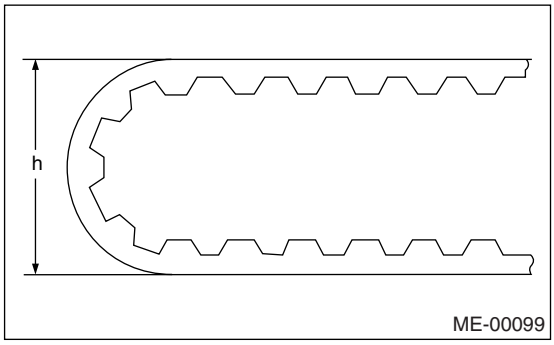
C: INSPECTION

1. TIMING BELT

1) Check the timing belt teeth for breaks, cracks or wear. If any fault is found, replace the belt.
2) Check the condition of the backside of belt. If cracks are found, replace the belt.

CAUTION:
• Be careful not to let oil, grease or coolant contact the belt. Remove quickly and thoroughly if this happens.
• Do not bend the belt sharply.

Bending diameter: h
60 mm (2.36 in) or more



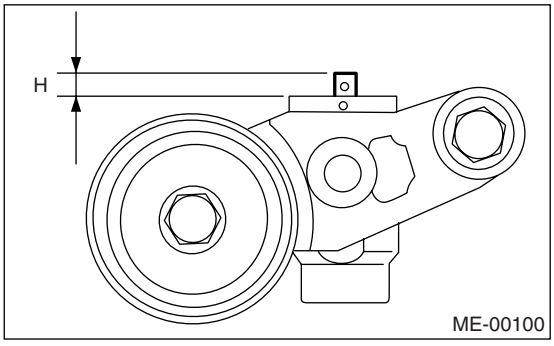
2. AUTOMATIC BELT TENSION ADJUSTER

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 lb) is applied to it. This is to check the adjuster rod stiffness.
3) If the adjuster rod is not stiff and moves freely when applying 165 N (16.8 kgf, 37.1 lb), check it using the following procedures:
(1) Slowly press the adjuster rod down to the end surface of cylinder. Repeat this operation two to three times.
(2) With the adjuster rod extended all the way up, apply a pressure of 165 N (16.8 kgf, 37.1 lb) to it to inspect the stiffness of the adjuster rod.
(3) If the adjuster rod is not stiff and compresses, replace the automatic belt tension adjuster assembly with a new one.

CAUTION:
• Always use a vertical type pressing tool to move the adjuster rod down.
• Do not use a lateral type vise.
• Push the adjuster rod vertically.
• Press-in the push adjuster rod gradually taking more than three minutes.
• Do not allow press pressure to exceed 9,807 N (1,000 kgf, 2,205 lbf).
• Press the adjuster rod as far as the end surface of the cylinder. Do not press the adjuster rod into cylinder. Doing so may damage the cylinder.
4) Measure the amount of rod protrusion beyond the body. If it is not within specifications, replace with new one.

Amount of rod protrusion: H
5.2 — 6.2 mm (0.204 — 0.244 in)



3. BELT TENSION PULLEY

1) Check the mating surfaces of timing belt and contact point of adjuster rod for uneven wear or scratches. Replace the automatic belt tension adjuster assembly if faulty.
2) Check the belt tension pulley for smooth rotation. Replace if noise or excessive play occurs.
3) Check the belt tension pulley for grease leakage.

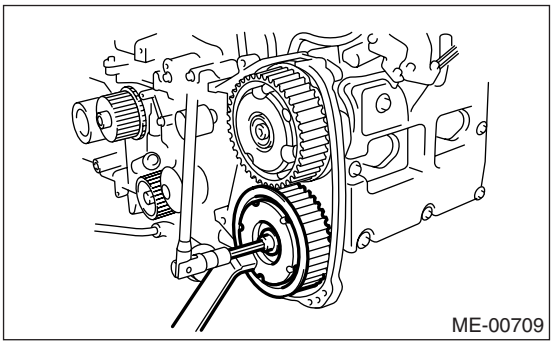
4. BELT IDLER

1) Check the belt idler for smooth rotation. Replace if noise or excessive play occurs.
2) Check the outer contacting surfaces of idler pulley for abnormal wear and scratches.
3) Check the belt idler for grease leakage.

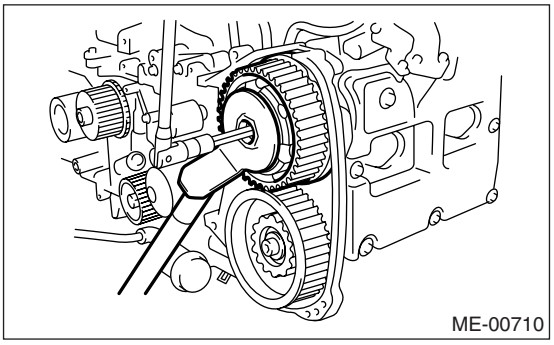
16.Cam Sprocket

A: REMOVAL

1) Remove the V-belts. <Ref. to ME(H4DOTC)-38, REMOVAL, V-belt.>
2) Remove the crank pulley. <Ref. to ME(H4DOTC)-40, REMOVAL, Crank Pulley.>
3) Remove the timing belt cover. <Ref. to ME(H4DOTC)-41, REMOVAL, Timing Belt Cover.>
4) Remove the timing belt. <Ref. to ME(H4DOTC)-42, REMOVAL, Timing Belt.>
5) Fasten the cam sprocket and remove from the cam shaft using ST.
ST 499207400 CAM SPROCKET WRENCH



ST 499977500 CAM SPROCKET WRENCH

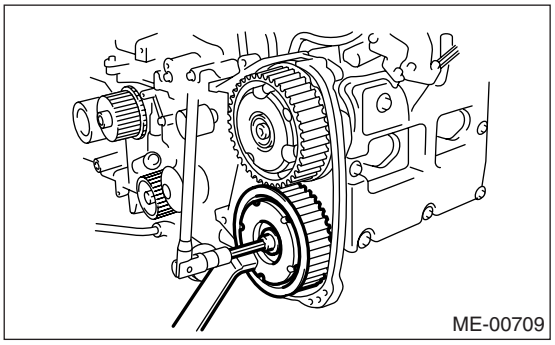


B: INSTALLATION

1) Fasten the cam sprocket and install to the cam shaft using ST.

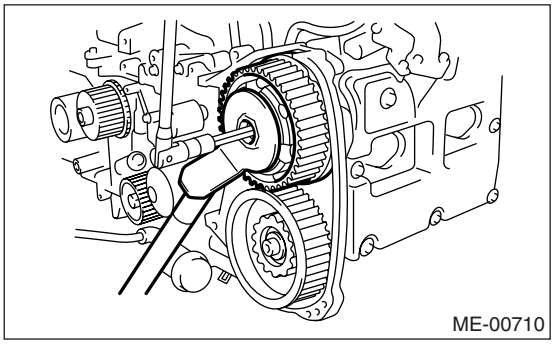
NOTE:
Do not confuse left and right side cam sprockets during installation.
ST 499207400 CAM SPROCKET WRENCH

Tightening torque:
Tighten to 30 N·m (3.0 kgf-m, 21.8 ft-lb) of torque, and then tighten further by 45°.



ST 499977500 CAM SPROCKET WRENCH

Tightening torque:
Tighten to 30 N·m (3.0 kgf-m, 21.8 ft-lb) of torque, and then tighten further by 45°.



2) Install the timing belt. <Ref. to ME(H4DOTC)-44, INSTALLATION, Timing Belt.>
3) Install the timing belt cover. <Ref. to ME(H4DOTC)-41, INSTALLATION, Timing Belt Cover.>
4) Install the crank pulley. <Ref. to ME(H4DOTC)-40, INSTALLATION, Crank Pulley.>
5) Install the V-belts. <Ref. to ME(H4DOTC)-38, INSTALLATION, V-belt.>

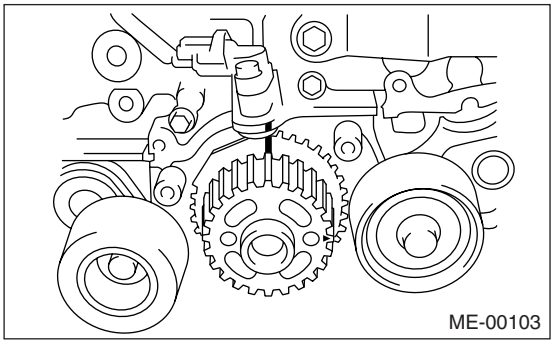
C: INSPECTION

1) Check the sprocket teeth for uneven wear or scratches.
2) Make sure there is no free play between sprocket and key.
3) Check the protrusion of cam sprocket used for sensor for damage and contamination of foreign matter.

17.Crank Sprocket

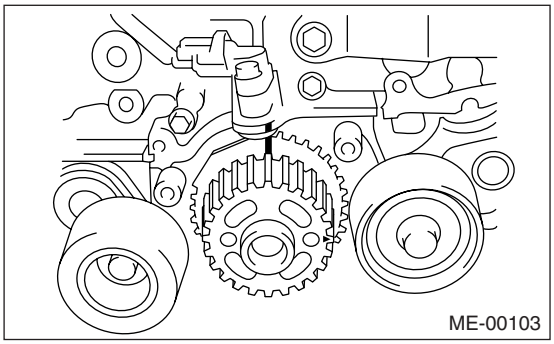
A: REMOVAL

1) Remove the V-belts. <Ref. to ME(H4DOTC)-38, REMOVAL, V-belt.>
2) Remove the crank pulley. <Ref. to ME(H4DOTC)-40, REMOVAL, Crank Pulley.>
3) Remove the timing belt cover. <Ref. to ME(H4DOTC)-41, REMOVAL, Timing Belt Cover.>
4) Remove the timing belt. <Ref. to ME(H4DOTC)-42, REMOVAL, Timing Belt.>
5) Remove the crank sprocket.



B: INSTALLATION

1) Install the crank sprocket.



2) Install the timing belt. <Ref. to ME(H4DOTC)-44, INSTALLATION, Timing Belt.>
3) Install the timing belt cover. <Ref. to ME(H4DOTC)-41, INSTALLATION, Timing Belt Cover.>
4) Install the crank pulley. <Ref. to ME(H4DOTC)-40, INSTALLATION, Crank Pulley.>
5) Install the V-belts. <Ref. to ME(H4DOTC)-38, INSTALLATION, V-belt.>

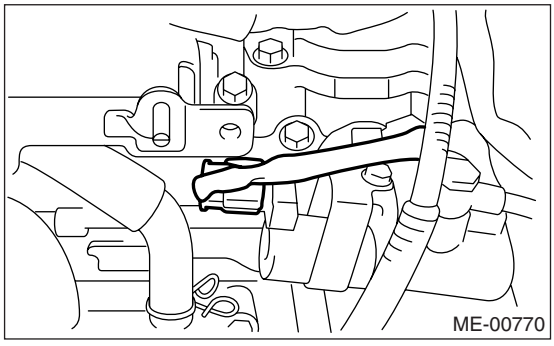
C: INSPECTION

1) Check the sprocket teeth for uneven wear or scratches.
2) Make sure there is no free play between sprocket and key.
3) Check the protrusion of crank sprocket used for sensor for damage and contamination of foreign matter.

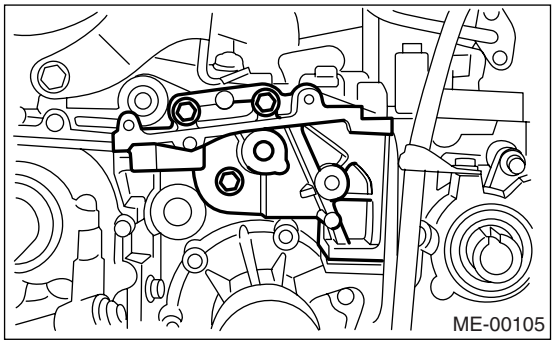
18.Camshaft

A: REMOVAL

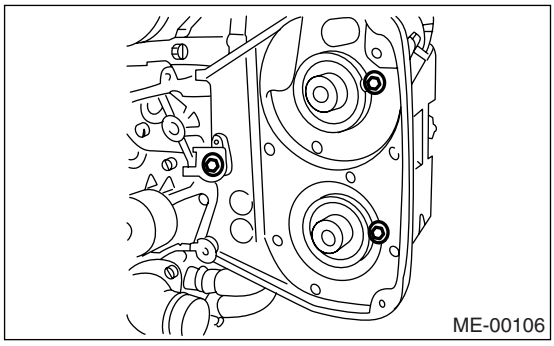
1) Remove the V-belts. <Ref. to ME(H4DOTC)-38, REMOVAL, V-belt.>
2) Remove the crank pulley. <Ref. to ME(H4DOTC)-40, REMOVAL, Crank Pulley.>
3) Remove the timing belt cover. <Ref. to ME(H4DOTC)-41, REMOVAL, Timing Belt Cover.>
4) Remove the timing belt. <Ref. to ME(H4DOTC)-42, REMOVAL, Timing Belt.>
5) Remove the cam sprocket. <Ref. to ME(H4DOTC)-50, REMOVAL, Cam Sprocket.>
6) Disconnect the oil flow control solenoid valve assembly connector.


ME-00770

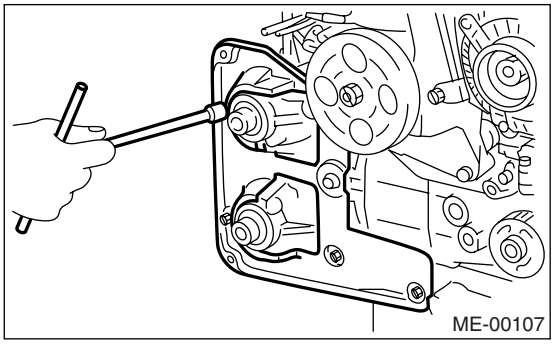
7) Remove the tensioner bracket.


ME-00105

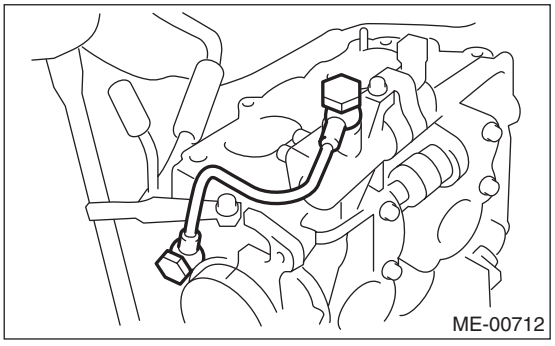
8) Remove the timing belt cover No. 2 (LH).


ME-00106

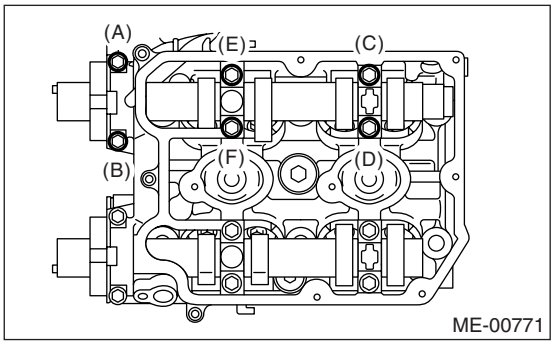
9) Remove the timing belt cover No. 2 (RH).


ME-00107

10) Remove the spark plug cords.
11) Remove the oil level gauge guide. (LH side)
12) Remove the rocker cover and gasket.
13) Remove the oil pipe.

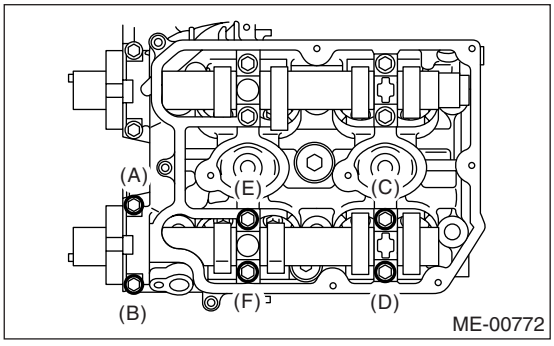

ME-00712

14) 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.



ME-00771

15) Loosen the exhaust camshaft cap bolts equally, a little at a time in alphabetical sequence shown in the figure.



ME-00772

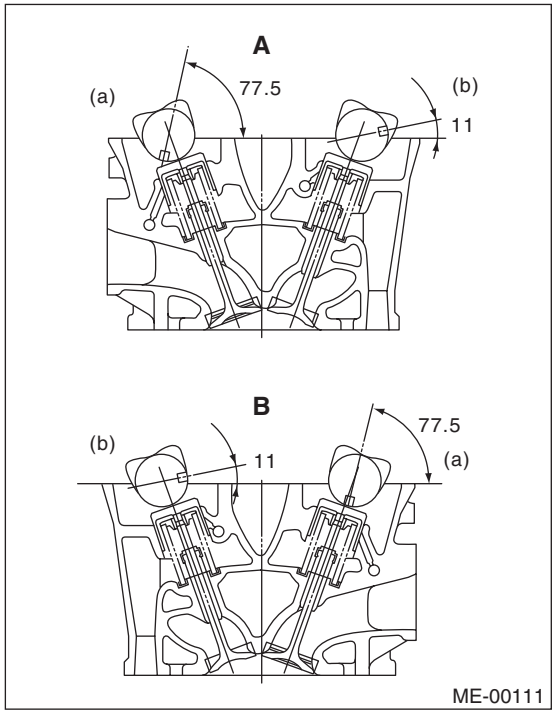
16) Remove the oil flow control solenoid valve assembly, intake camshaft cap and camshaft.
17) Remove the exhaust camshaft caps and camshaft.

NOTE:
Arrange camshaft caps in order so that they can be installed in their original positions.
18) Similarly, remove the camshafts (RH) and related parts.

B: INSTALLATION

1) Camshaft installation:
Apply engine oil to the cylinder head at camshaft bearing installation location before installing the camshaft. Install the camshaft so that each valve is close to or in contact with base circle of the cam.

NOTE:
• Set the cam shaft to the position shown in the figure. It is necessary to rotate the cam shaft (LH) slightly when installing the timing belt.
• Camshaft RH must be rotated when set at the position shown in the figure.
Intake camshaft LH: Rotate 80° clockwise.
Exhaust camshaft LH: Rotate 45° clockwise.

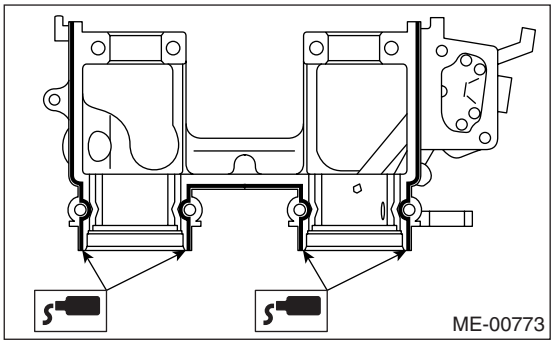


A Cylinder head (LH)
B Cylinder head (RH)
(a) Intake camshaft
(b) Exhaust camshaft

2) Camshaft cap and oil flow control solenoid valve assembly installation:
(1) Apply small amount of liquid gasket to the mating surface of cap.

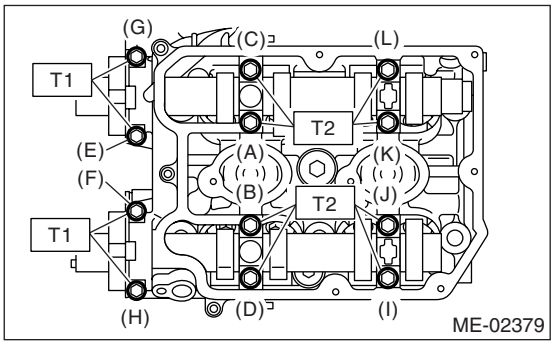
NOTE:
Do not apply liquid gasket excessively. Applying excessively may cause excess gasket to come out and flow toward oil seal, resulting in oil leak.

Liquid gasket:
Three Bond 1215 (Part No. 004403007) or equivalent



(2) Apply a thin coat of engine oil to cap bearing surface, and install the cap to the camshaft.
(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.

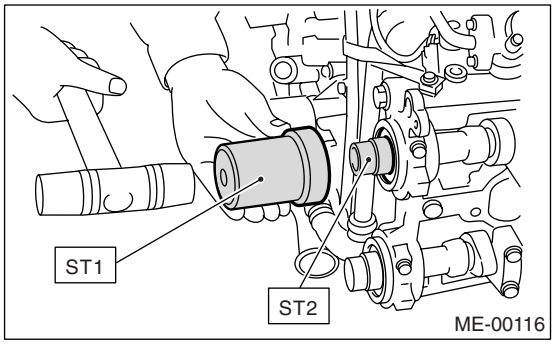
Tightening torque:
T1: 10 N·m (1.0 kgf-m, 7.2 ft-lb)
T2: 20 N·m (2.0 kgf-m, 14.5 ft-lb)



(4) After tightening the camshaft cap, ensure the camshaft rotates only slightly while holding it at base circle.

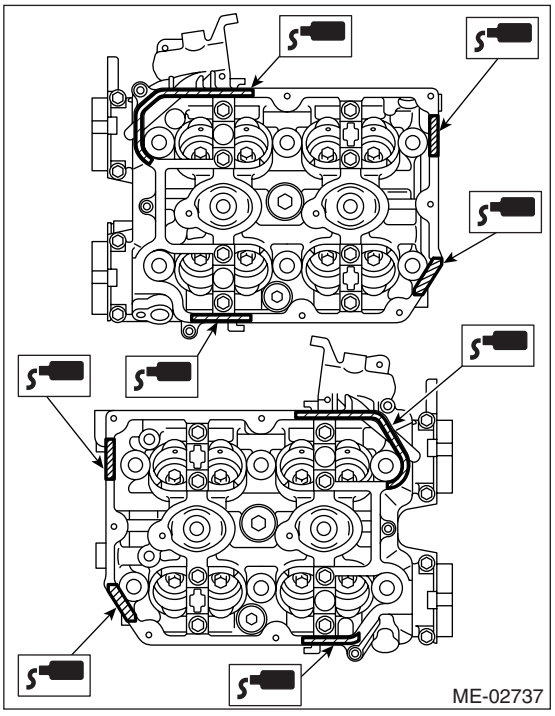
3) Apply engine oil to the oil seal periphery and oil seal lips and install the camshaft using ST1 and ST2.

NOTE:
Use a new oil seal.
ST1 499587600 OIL SEAL INSTALLER
ST2 499597200 OIL SEAL GUIDE



4) Rocker cover installation:
(1) Install the gasket on rocker cover. Install the peripheral gasket and ignition coil unit gasket.
(2) Apply liquid gasket to the specified point of the cylinder head. Apply extra amount of liquid gasket around plugs 5 mm (0.2 in) or more.

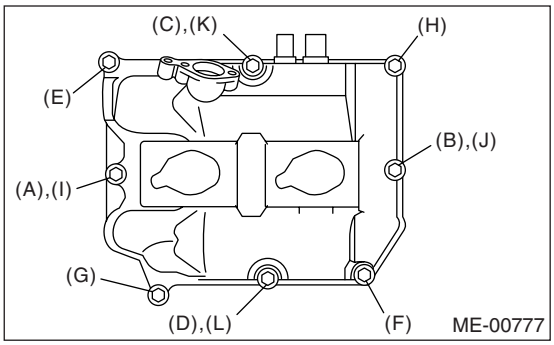
Liquid gasket:
Three Bond 1215 (Part No. 004403007) or equivalent



(3) Install the rocker cover on cylinder head. Ensure the gasket is properly positioned during installation.

(4) Temporarily tighten the rocker cover tightening bolt in alphabetical sequence shown in the figure, and then tighten to specified torque.

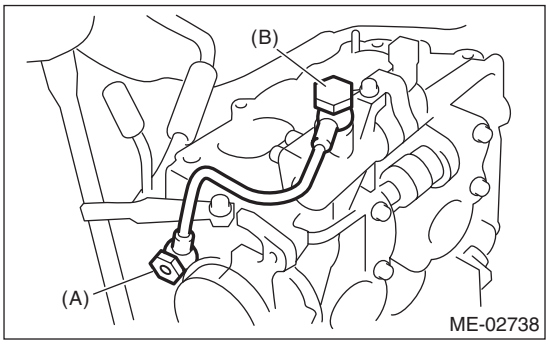
Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



5) Install the oil pipe.

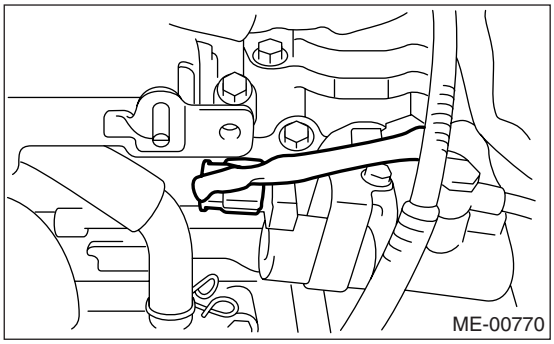
NOTE:
Make sure not to mix up the union screws with filter and without filter as their installation positions are different.

Tightening torque:
29 N·m (3.0 kgf-m, 21.4 ft-lb)



(A) Union screw with filter (With protrusion)
(B) Union screw without filter (Without protrusion)

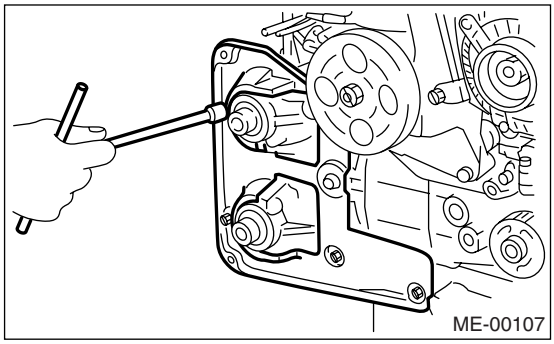
6) Connect the oil flow control solenoid valve connector.



7) Similarly, install the parts on right-hand side.

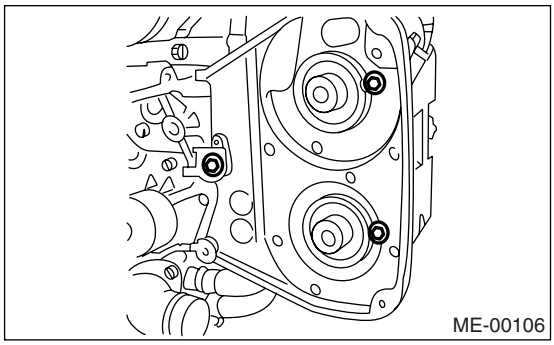
8) Install the timing belt cover No. 2 (RH).

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)



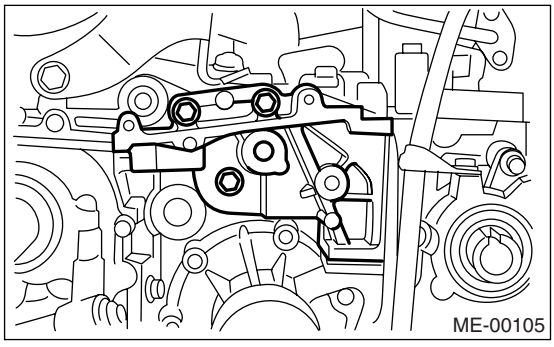
9) Install the timing belt cover No. 2 (LH).

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)



10) Install the tensioner bracket.

Tightening torque:
24.5 N·m (2.5 kgf-m, 18.1 ft-lb)

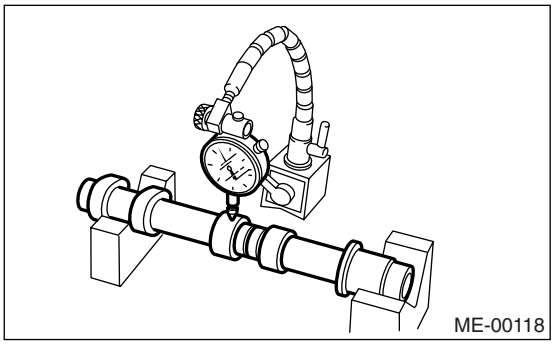


11) Install the cam sprocket. <Ref. to ME(H4DOTC)-50, INSTALLATION, Cam Sprocket.>
12) Install the timing belt. <Ref. to ME(H4DOTC)-44, INSTALLATION, Timing Belt.>
13) Install the timing belt cover. <Ref. to ME(H4DOTC)-41, INSTALLATION, Timing Belt Cover.>
14) Install the crank pulley. <Ref. to ME(H4DOTC)-40, INSTALLATION, Crank Pulley.>
15) Install the V-belts. <Ref. to ME(H4DOTC)-38, INSTALLATION, V-belt.>

C: INSPECTION

1) Measure the bend, and repair or replace if necessary.

Service limit:
0.020 mm (0.00079 in)

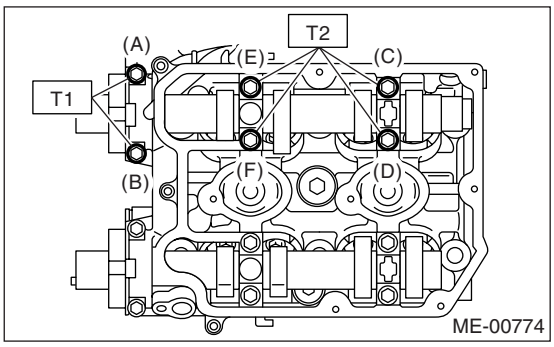


2) Check the journal for damage and wear. Replace if faulty.
3) Measure the outside diameter of camshaft journal. If the journal diameter is not at specified, check the oil clearance.

	Camshaft journal	
	Front	Center, rear
Standard	37.946 — 37.963 mm (1.4939 — 1.4946 in)	29.946 — 29.963 mm (1.1790 — 1.1796 in)

4) Measurement of the camshaft journal oil clearance:
(1) Clean the bearing caps and camshaft journals.
(2) Place the camshafts on cylinder head. (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: 10 N·m (1.0 kgf-m, 7.2 ft-lb)
T2: 20 N·m (2.0 kgf-m, 14.5 ft-lb)

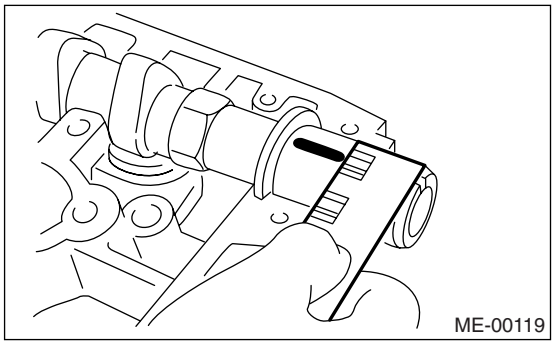


(5) Remove the bearing caps.

(6) Measure the widest point of the plastigauge on each journal. If the oil clearance exceeds the limit, replace the camshaft. If necessary, replace the camshaft caps and cylinder head as a set.

Standard:
0.037 — 0.072 mm (0.0015 — 0.0028 in)

Service limit:
0.10 mm (0.0039 in)



(7) Completely remove the plastigauge.

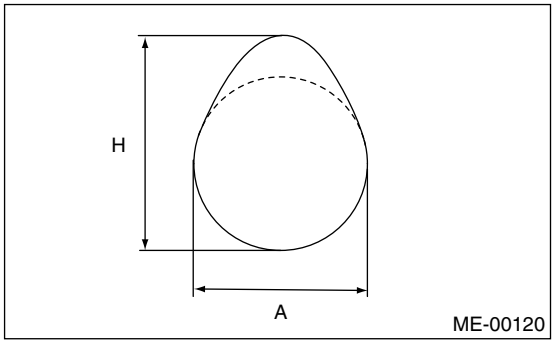
5) Check the cam face condition; remove the minor faults by grinding with oil stone. Measure the cam height H. Replace if it exceeds the limit.

Cam height H:

Standard:
Intake
46.55 — 46.65 mm (1.833 — 1.837 in)
Exhaust
46.75 — 46.85 mm (1.841 — 1.844 in)

Service limit:
Intake
46.45 mm (1.829 in)
Exhaust
46.65 mm (1.837 in)

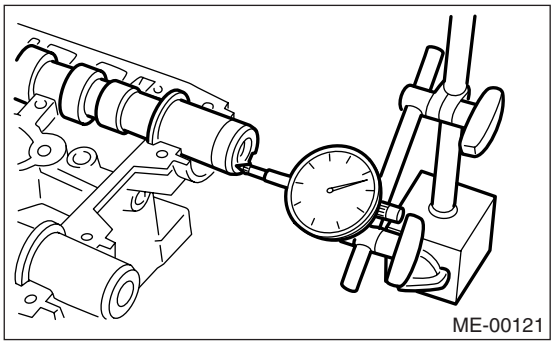
Cam base circle diameter A:
37.0 mm (1.457 in)



6) 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)

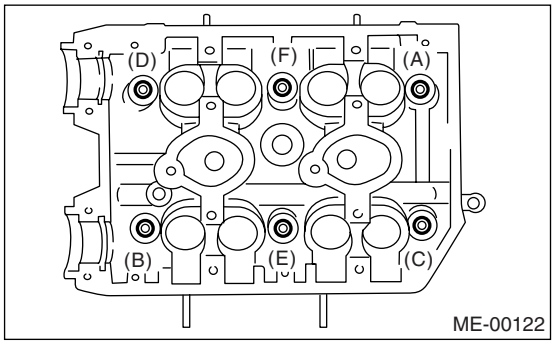
Service limit:
0.14 mm (0.0055 in)



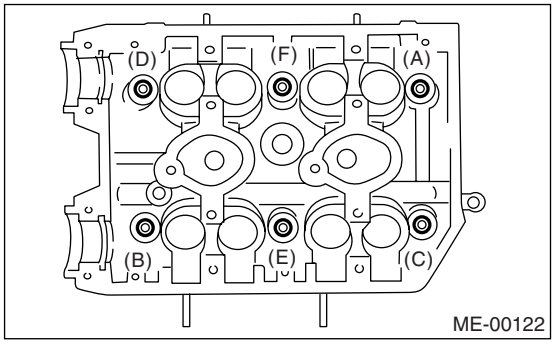
19.Cylinder Head

A: REMOVAL

1) Remove the V-belts. <Ref. to ME(H4DOTC)-38, REMOVAL, V-belt.>
2) Remove the crank pulley. <Ref. to ME(H4DOTC)-40, REMOVAL, Crank Pulley.>
3) Remove the timing belt cover. <Ref. to ME(H4DOTC)-41, REMOVAL, Timing Belt Cover.>
4) Remove the timing belt. <Ref. to ME(H4DOTC)-42, REMOVAL, Timing Belt.>
5) Remove the cam sprocket. <Ref. to ME(H4DOTC)-50, 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)-52, REMOVAL, Camshaft.>
9) Remove the cylinder head bolts in alphabetical sequence shown in the figure.
Leave the bolts (A) and (D) engaged by three or four threads to prevent the cylinder head from falling.



10) While tapping the cylinder head with a plastic hammer, separate it from cylinder block. Remove the bolts (A) and (D) to remove cylinder head.



11) Remove the cylinder head gasket.

CAUTION:
Be careful not to scratch the mating surface of cylinder block and cylinder head.
12) Similarly, remove the cylinder head (RH).

B: INSTALLATION

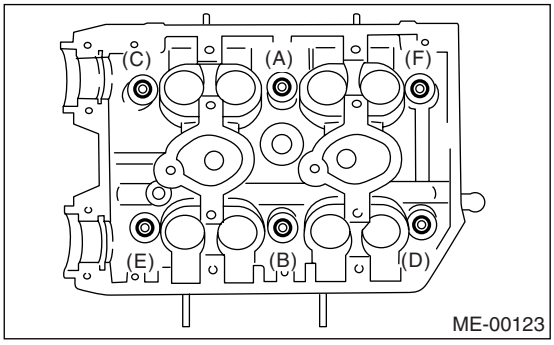
1) Install the cylinder head and gaskets on cylinder block.

CAUTION:
- **Replace with a new cylinder head gasket.**
- **Be careful not to scratch the mating surface of cylinder block and cylinder head.**

2) Tighten the cylinder head bolts.
(1) Apply a thin coat of engine oil to washer and bolt thread.
(2) Tighten all bolts to 29 N·m (3.0 kgf-m, 22 ft-lb) in alphabetical sequence.
(3) Tighten all bolts to 69 N·m (7.0 kgf-m, 51 ft-lb) in alphabetical sequence.
(4) Loosen all the bolts by 180° in the reverse order of tightening, and loosen them again by 180°.
(5) Tighten all bolts to 49 N·m (5.0 kgf-m, 36 ft-lb) in alphabetical sequence.
(6) Tighten all bolts by 80 to 90° in alphabetical sequence.
(7) Tighten all bolts by 40 to 45° in alphabetical sequence.

CAUTION:
Do not tighten the bolts more than 45°.
(8) Further tighten the bolts (A) and (B) by 40 to 45°.

CAUTION:
Make sure the total "re-tightening angle" of the previous step (2) does not exceed 90°.



3) Install the camshaft. <Ref. to ME(H4DOTC)-53, INSTALLATION, Camshaft.>
4) Install the A/C compressor bracket on cylinder head.
5) Install the intake manifold. <Ref. to FU(H4DOTC)-17, INSTALLATION, Intake Manifold.>
6) Install the cam sprocket. <Ref. to ME(H4DOTC)-50, INSTALLATION, Cam Sprocket.>
7) Install the timing belt. <Ref. to ME(H4DOTC)-44, INSTALLATION, Timing Belt.>
8) Install the timing belt cover. <Ref. to ME(H4DOTC)-41, INSTALLATION, Timing Belt Cover.>

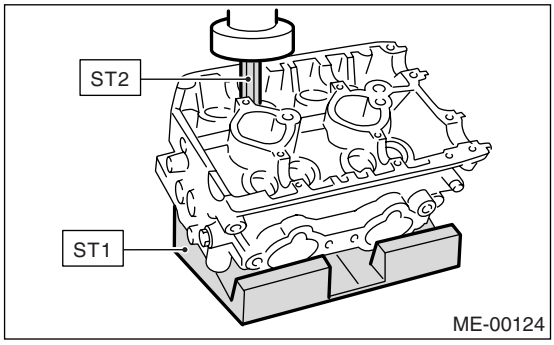
9) Install the crank pulley. <Ref. to ME(H4DOTC)-40, INSTALLATION, Crank Pulley.>
10) Install the V-belts. <Ref. to ME(H4DOTC)-38, INSTALLATION, V-belt.>

C: DISASSEMBLY

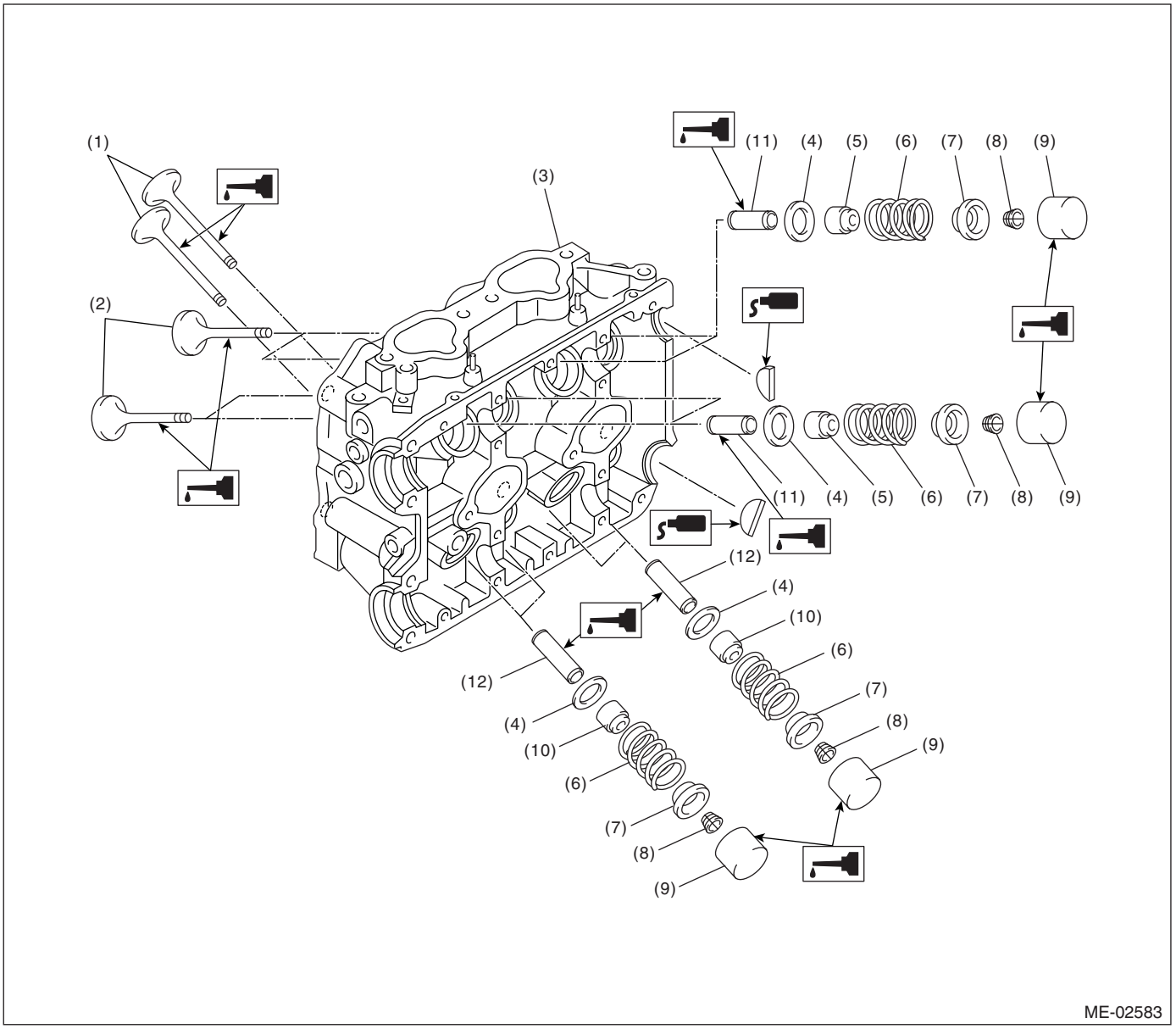
1) Remove the valve lifter.
2) Compress the valve spring and remove the valve spring retainer key. Remove each valve and valve spring.
ST1 498267600 CYLINDER HEAD TABLE
ST2 499718000 VALVE SPRING REMOVER

NOTE:
Keep all the removed parts in order for re-installing in their original positions.

CAUTION:
- **Mark each valve to prevent confusion.**
- **Pay careful attention not to damage the lips of intake valve oil seals and exhaust valve oil seals.**



D: ASSEMBLY



(1)	Exhaust valve	(5)	Intake valve oil seal	(9)	Valve lifter
(2)	Intake valve	(6)	Valve spring	(10)	Exhaust valve oil seal
(3)	Cylinder head	(7)	Retainer	(11)	Intake valve guide
(4)	Valve spring seat	(8)	Retainer key	(12)	Exhaust valve guide

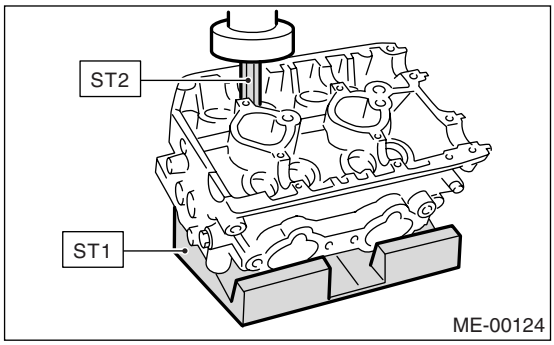
1) Installation of valve spring and valve:
   (1) Coat the stem of each valve with engine oil and insert the valve into valve guide.

NOTE:
When inserting the valve into valve guide, use special care not to damage the oil seal lip.

   (2) Set the cylinder head on ST1.
   (3) Install the valve spring and retainer using ST2.

ST1 498267600 CYLINDER HEAD TABLE
ST2 499718000 VALVE SPRING REMOVER

NOTE:
Be sure to install the valve spring with its close-coiled end facing the seat on cylinder head.



(4) Compress the valve spring and install the retainer key.
(5) After installing, tap the valve spring retainers lightly with a wooden hammer for better seating.

2) Apply oil to the surfaces of the valve lifter.
3) Install the valve lifter.

E: INSPECTION

1. CYLINDER HEAD

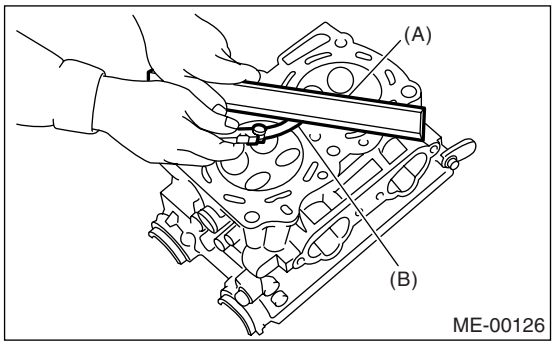
1) Visually check for cracks and damage. Use liquid penetrant tester on the important sections to check for fissures.
2) Measure the warping of the cylinder head surface that mates with crankcase using a straight edge (A) and thickness gauge (B).
If the warping exceeds 0.035 mm (0.0014 in), regrind the surface with a surface grinder.

Service 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:
The cylinder can become warped if the head bolts are tightened at ununiform torques when installing the cylinder head.

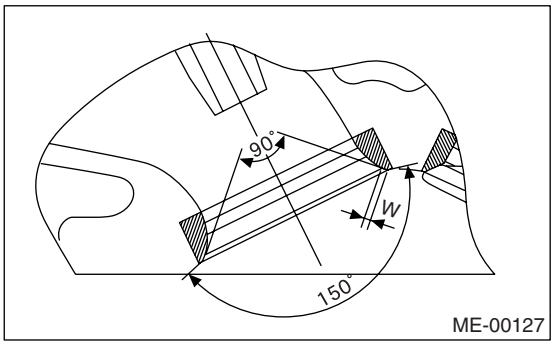


2. VALVE SEAT

Inspect the intake and exhaust valve seats, and correct the contact surfaces with a valve seat cutter if they are defective or when valve guides are replaced.
Valve seat width: W

Intake
Standard:
0.6 — 1.4 mm (0.024 — 0.055 in)
Service limit:
1.7 mm (0.067 in)

Exhaust
Standard:
1.2 — 1.8 mm (0.047 — 0.071 in)
Service limit:
2.2 mm (0.087 in)



3. VALVE GUIDE

1) Check the clearance between valve guide and stem. The clearance can be checked by measuring respectively the outer diameter of valve stem with a micrometer and the inner diameter of valve guide with a caliper gauge.
Clearance between the valve guide and valve stem:

Standard:
Intake
0.030 — 0.057 mm (0.0012 — 0.0022 in)
Exhaust
0.040 — 0.067 mm (0.0016 — 0.0026 in)

Service limit:
0.15 mm (0.0059 in)

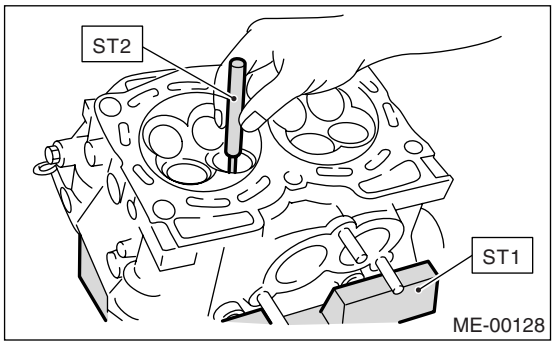
2) If the clearance between valve guide and valve stem exceeds the limit, replace the valve guide or valve itself whichever shows greater amount of wear. See the following procedure for valve guide replacement.

Valve guide inner diameter:
6.000 — 6.012 mm (0.2362 — 0.2367 in)

Valve stem outer diameters:
Intake
5.955 — 5.970 mm (0.2344 — 0.2350 in)
Exhaust
5.945 — 5.960 mm (0.2341 — 0.2346 in)

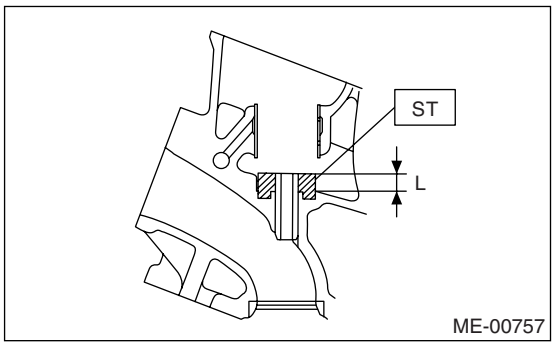
(1) Place the cylinder head on ST1 with the combustion chamber upward so that valve guides fit the holes in ST1.
(2) Insert the ST2 into valve guide and press it down to remove the valve guide.

ST1 498267600 CYLINDER HEAD TABLE
ST2 499767200 VALVE GUIDE REMOVER



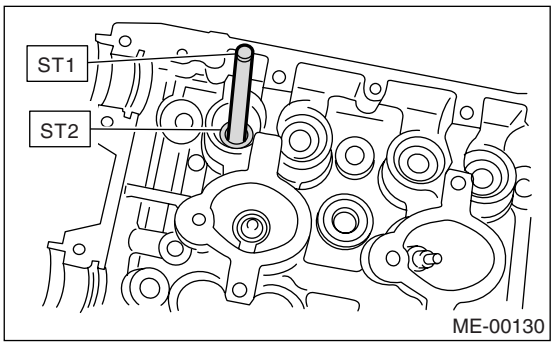
(3) Turn the cylinder head upside down and place the ST as shown in the figure.

ST 18251AA020 VALVE GUIDE ADJUSTER



(4) Before installing a new valve guide, make sure that neither scratches nor damages exist on the inner surface of valve guide holes in cylinder head.
(5) Put a new valve guide, coated with sufficient oil, in the cylinder head, and insert the ST1 into valve guide. Press in until the valve guide upper end is flush with the upper surface of ST2.

ST1 499767200 VALVE GUIDE REMOVER
ST2 18251AA020 VALVE GUIDE ADJUSTER



(6) Check the valve guide protrusion.

Valve guide protrusion: L
15.8 — 16.2 mm (0.622 — 0.638 in)

(7) Insert the ST in valve guide, and rotate the ST slowly clockwise while pushing it lightly. Bring the ST back while rotating it clockwise. (Reaming Work)
(8) After reaming, clean the valve guide to remove chips.

ST 499767400 VALVE GUIDE REAMER

CAUTION:
Apply engine oil to the ST when reaming.

NOTE:
• If the inner surface of valve guide is damaged, the edge of ST should be slightly ground with oil stone.
• If the inner surface of valve guide becomes lustrous and the ST does not chip, use a new ST or remedy the ST.

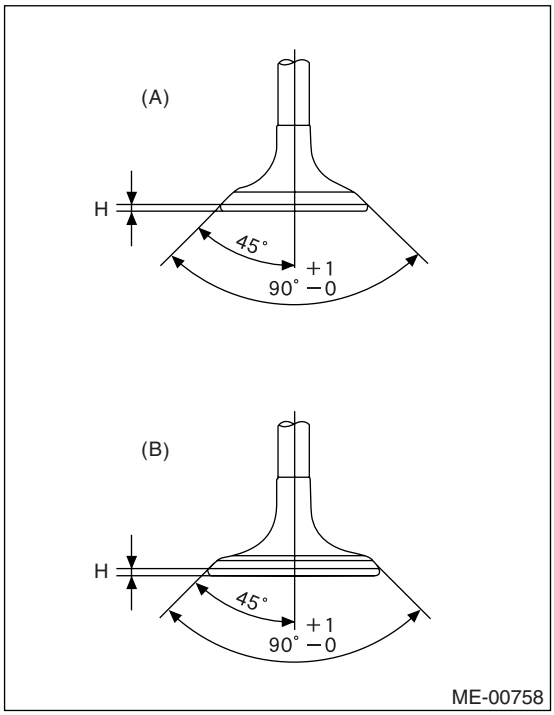
(9) Recheck the contact condition between valve face and valve seat after replacing the valve guide.

4. INTAKE AND EXHAUST VALVE

1) Inspect the flange and stem of valve, and replace if damaged, worn, or deformed. If "H" is less than the specified limit, replace with a new valve.
H:

Intake (A)
Standard:
1.0 — 1.4 mm (0.039 — 0.055 in)
Service limit:
0.8 mm (0.031 in)

Exhaust (B)
Standard:
1.3 — 1.7 mm (0.057 — 0.067 in)
Service limit:
0.8 mm (0.031 in)



2) Put a small amount of grinding compound on the seat surface, and lap the valve and valve seat.

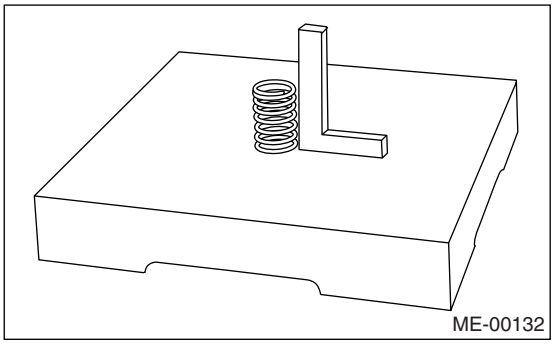
NOTE:
• Replace with a new valve oil seal after lapping.
• It is possible to differentiate between the intake valve and the exhaust valve by their overall length.

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 standard values presented in the table.
2) To measure the squareness of the valve spring, stand the spring on a surface plate and measure its deflection at the top of spring using a try square.

		Valve spring
Free length		47.32 mm (1.863 in)
Tension/spring height	Set	205 — 235 N (20.9 — 24.0 kgf, 46.1 — 52.8 lb) /36.0 mm (1.417 in)
	Lift	426 — 490 N (43.4 — 50.0 kgf, 95.8 — 110 lb) /26.50 mm (1.041 in)
Squareness		2.5°, 2.1 mm (0.083 in) or less

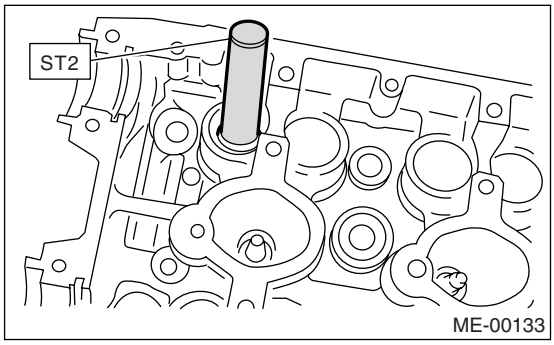


6. INTAKE AND EXHAUST VALVE OIL SEAL

1) For the following, replace the oil seal with a new one.
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) Press-fit the oil seal to the specified dimension indicated in the figure using ST2.
ST1 498267600 CYLINDER HEAD TABLE
ST2 498857100 VALVE OIL SEAL GUIDE

CAUTION:
• Apply engine oil to oil seal before press-fitting.
• When press-fitting the oil seal, do not use a hammer or strike in.
• Note that the intake valve oil seal and exhaust valve oil seal are differentiated by colors.

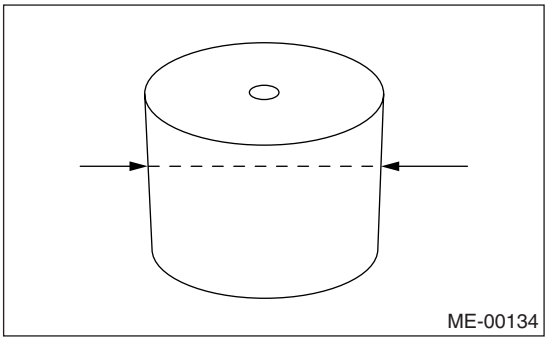
Color of rubber part:
Intake [Gray]
Exhaust [Green]



7. VALVE LIFTER

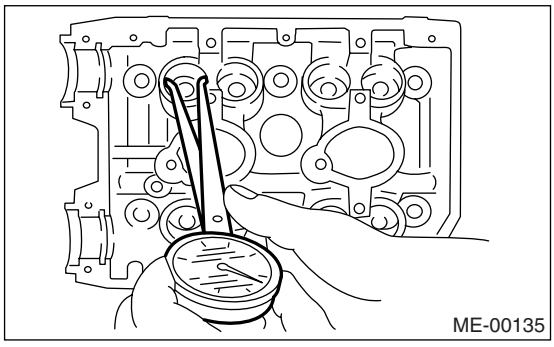
1) Check the valve lifter visually.
2) Measure the outer diameter of valve lifter.

Outer diameter:
34.959 — 34.975 mm (1.3763 — 1.3770 in)



3) Measure the inner diameter of valve lifter mating surface on cylinder head.

Inner diameter:
34.994 — 35.016 mm (1.3777 — 1.3786 in)



NOTE:
If difference between outer diameter of valve lifter and inner diameter of valve lifter mating part is over the limit, replace the cylinder head.

Standard:
0.019 — 0.057 mm (0.0007 — 0.0022 in)

Service limit:
0.100 mm (0.0039 in)

F: DISPOSAL

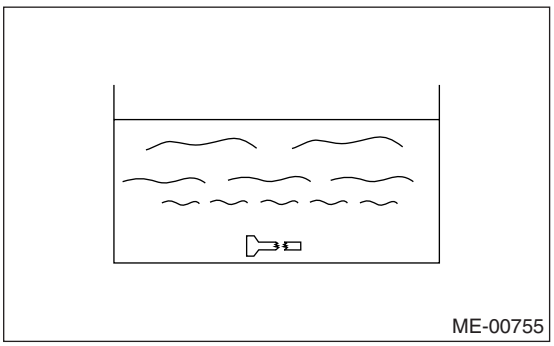
CAUTION:
• Metallic sodium is enclosed in the exhaust valve. Metallic sodium is extremely alkaline and may produce severe chemical reactions. Full consideration must be therefore be given to the following points when handling or disposing of the valve.
• Since metallic sodium may cause blindness if contacted with the eyes, burns if contacted with the skin, and fire, do not deliberately take the valve apart.

1) If the valve is damaged, remove the valve and neutralize it by immersing it in water, and dispose of it in the same way that general steel materials are disposed of. The disposal method is described in the following.
(1) Wearing rubber gloves, remove the damaged valve from the cylinder head.
(2) Prepare a large receptacle (bucket or other container) in a well ventilated location, and fill the receptacle with water. (at least 10 liters)
(3) Immerse the damaged valve in the receptacle.

CAUTION:
A severe reaction may occur, so stand at least 2 — 3 m from the receptacle. Because the reaction will produce hydrogen gas, moreover, keep the receptacle away from sparks or flames.

(4) Once the reaction is completed (about 4 — 5 hours have elapsed), carefully remove the valve using large pincers so that the reaction liquid does not contact your skin, and dispose of it with other parts that are being disposed of.
(5) The reaction liquid is a strong alkaline solution, so it must be disposed of in accordance with local regulations.

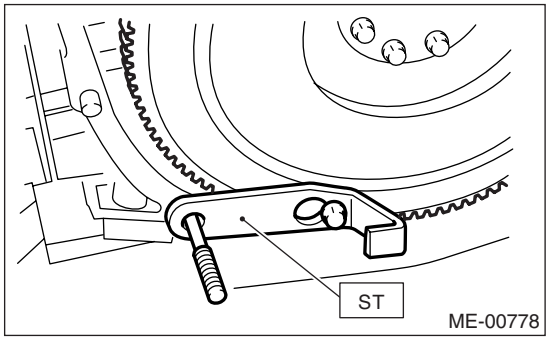
CAUTION:
Make sure the reaction liquid does not contact your skin. If contact with skin occurs, immediately wash the affected area with large quantities of water.



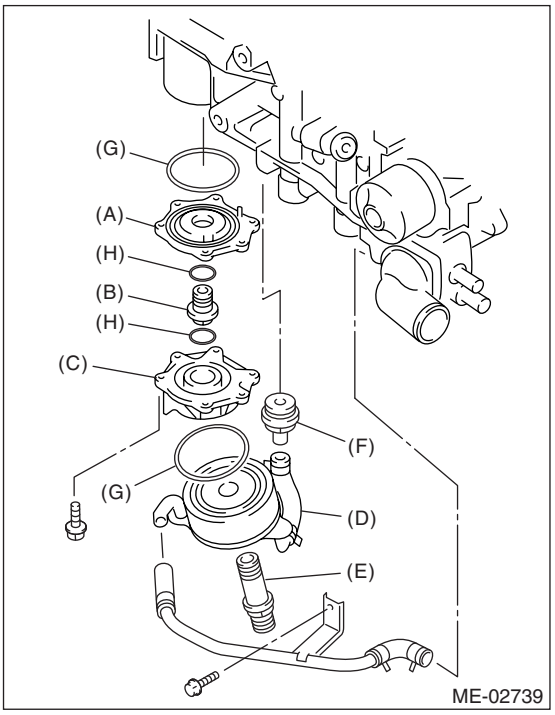
20.Cylinder Block

A: REMOVAL

NOTE:
Before conducting this procedure, drain the engine oil completely.
1) Remove the intake manifold. <Ref. to FU(H4DOTC)-14, REMOVAL, Intake Manifold.>
2) Remove the V-belts. <Ref. to ME(H4DOTC)-38, REMOVAL, V-belt.>
3) Remove the crank pulley. <Ref. to ME(H4DOTC)-40, REMOVAL, Crank Pulley.>
4) Remove the timing belt cover. <Ref. to ME(H4DOTC)-41, REMOVAL, Timing Belt Cover.>
5) Remove the timing belt. <Ref. to ME(H4DOTC)-42, REMOVAL, Timing Belt.>
6) Remove the cam sprocket. <Ref. to ME(H4DOTC)-50, REMOVAL, Cam Sprocket.>
7) Remove the crank sprocket. <Ref. to ME(H4DOTC)-51, REMOVAL, Crank Sprocket.>
8) Remove the generator and A/C compressor with their brackets.
9) Remove the cylinder head. <Ref. to ME(H4DOTC)-57, REMOVAL, Cylinder Head.>
10) Remove the clutch disc and cover. <Ref. to CL-12, REMOVAL, Clutch Disc and Cover.>
11) Remove the flywheel. <Ref. to CL-14, REMOVAL, Flywheel.>
ST 498497100 CRANKSHAFT STOPPER



12) Remove the oil separator cover.
13) Remove the water by-pass pipe for heater.
14) Remove the oil filter.<Ref. to LU(H4SO)-28, REMOVAL, Engine Oil Filter.>
15) Remove the oil cooler.

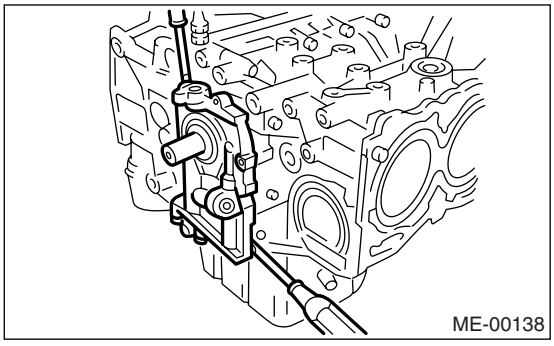


(A) Adapter (1)
(B) Adapter connector
(C) Adapter (2)
(D) Oil cooler
(E) Oil cooler connector
(F) Plug
(G) Gasket
(H) O-ring

16) Remove the water pump.
17) Remove the oil pump from cylinder block.

NOTE:
• When disassembling and checking the oil pump, loosen the relief valve plug before removing the oil pump.
• Remove the oil pump from cylinder block using a flat tip screwdriver.

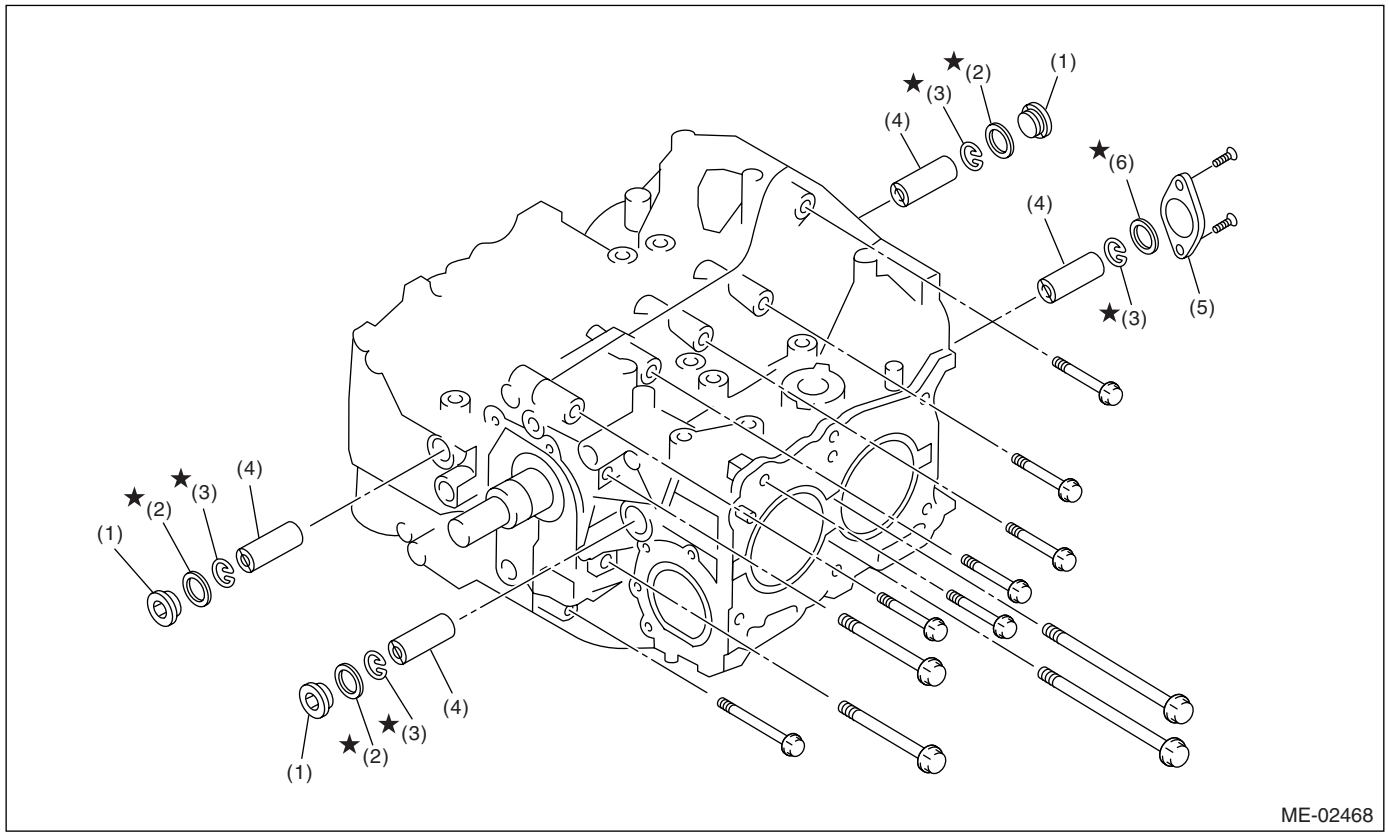
CAUTION:
Be careful not to scratch the mating surface of cylinder block and oil pump.



18) Removal of oil pan:
(1) Turn the cylinder block with #2 and #4 piston sides facing upward.
(2) Remove the bolts which secure oil pan to cylinder block.
(3) Insert an oil pan cutter blade between cylinder block-to-oil pan clearance and remove the oil pan.

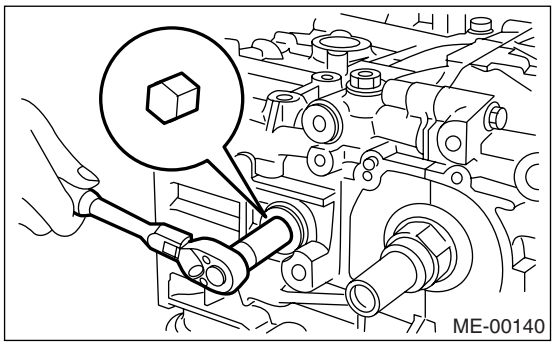
CAUTION:
Do not use a screwdriver or similar tools in place of oil pan cutter.

19) Remove the oil strainer stay.
20) Remove the oil strainer.
21) Remove the baffle plate.
22) Remove the water pipe.

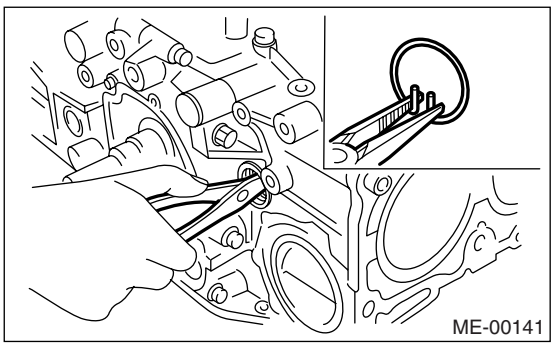


(1) Service hole plug
(2) Gasket
(3) Snap ring
(4) Piston pin
(5) Service hole cover
(6) O-ring

23) Remove the service hole cover and service hole plugs using a hexagon wrench [14 mm].

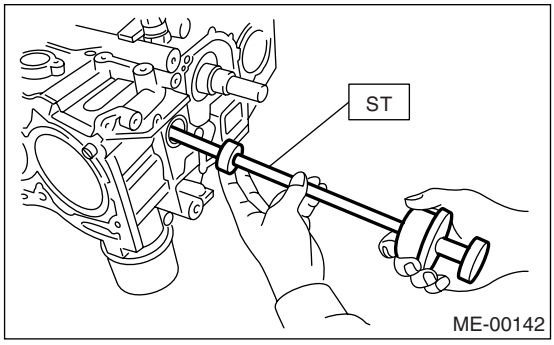


24) Rotate the crankshaft to bring #1 and #2 pistons to bottom dead center position, then remove the piston snap ring by inserted the radio pincers into the service hole of #1 and #2 cylinders.



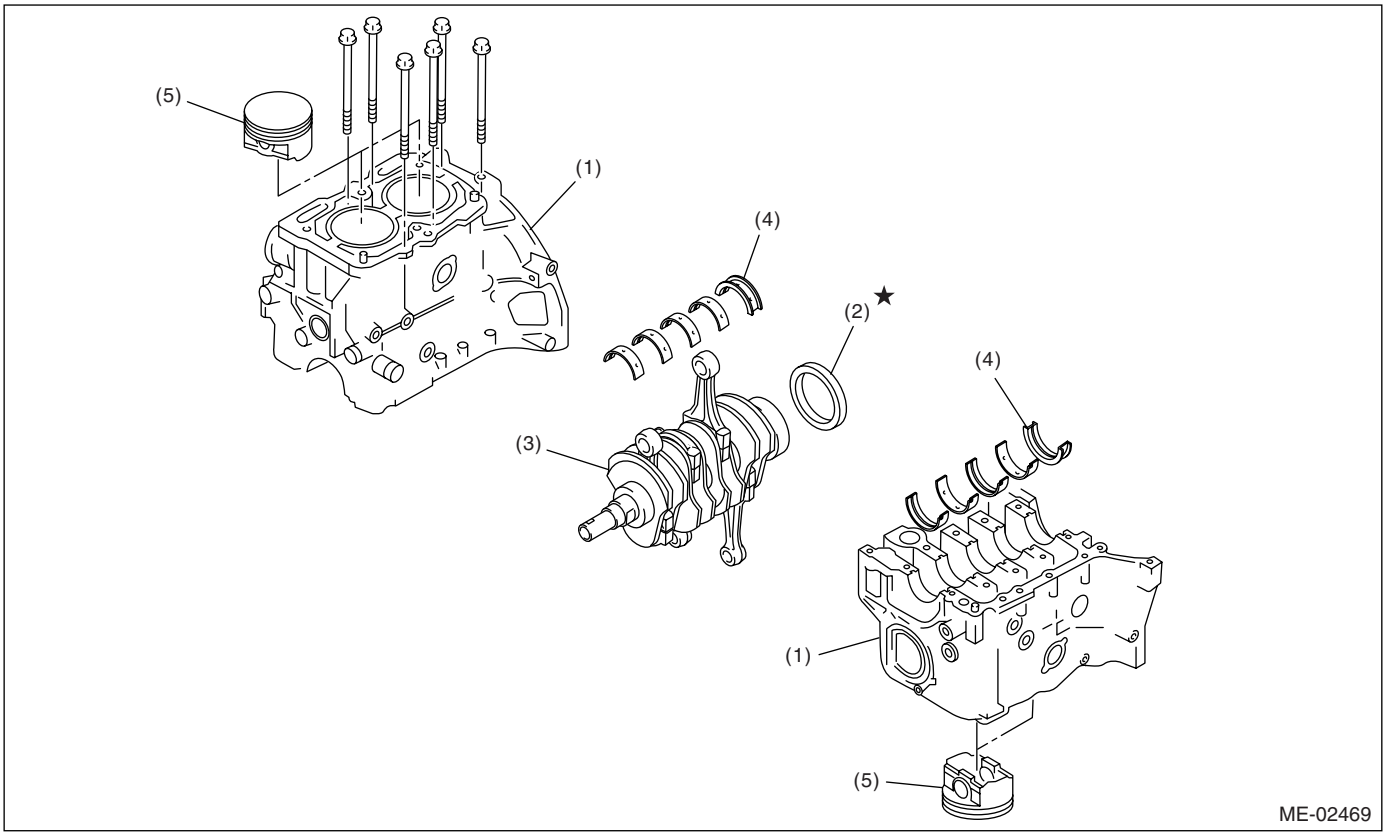
25) Draw out the piston pin from #1 and #2 pistons using ST.
ST 499097700 PISTON PIN REMOVER

CAUTION:
Be careful not to confuse the original combination of piston, piston pin and cylinder.



26) Similarly remove the piston pins from #3 and #4 pistons.
27) Remove the bolts which connect cylinder block on the side of #2 and #4 cylinders.
28) Back off the bolts which connect cylinder block on the side of #1 and #3 cylinders two or three turns.
29) Set up the cylinder block so that #1 and #3 cylinders are on the upper side, then remove the cylinder block connecting bolts.
30) Separate the cylinder block to the left and right.

NOTE:
When separating the cylinder block, do not allow the connecting rod to fall or damage the cylinder block.



(1) Cylinder block
(2) Rear oil seal
(3) Crankshaft
(4) Crankshaft bearing
(5) Piston

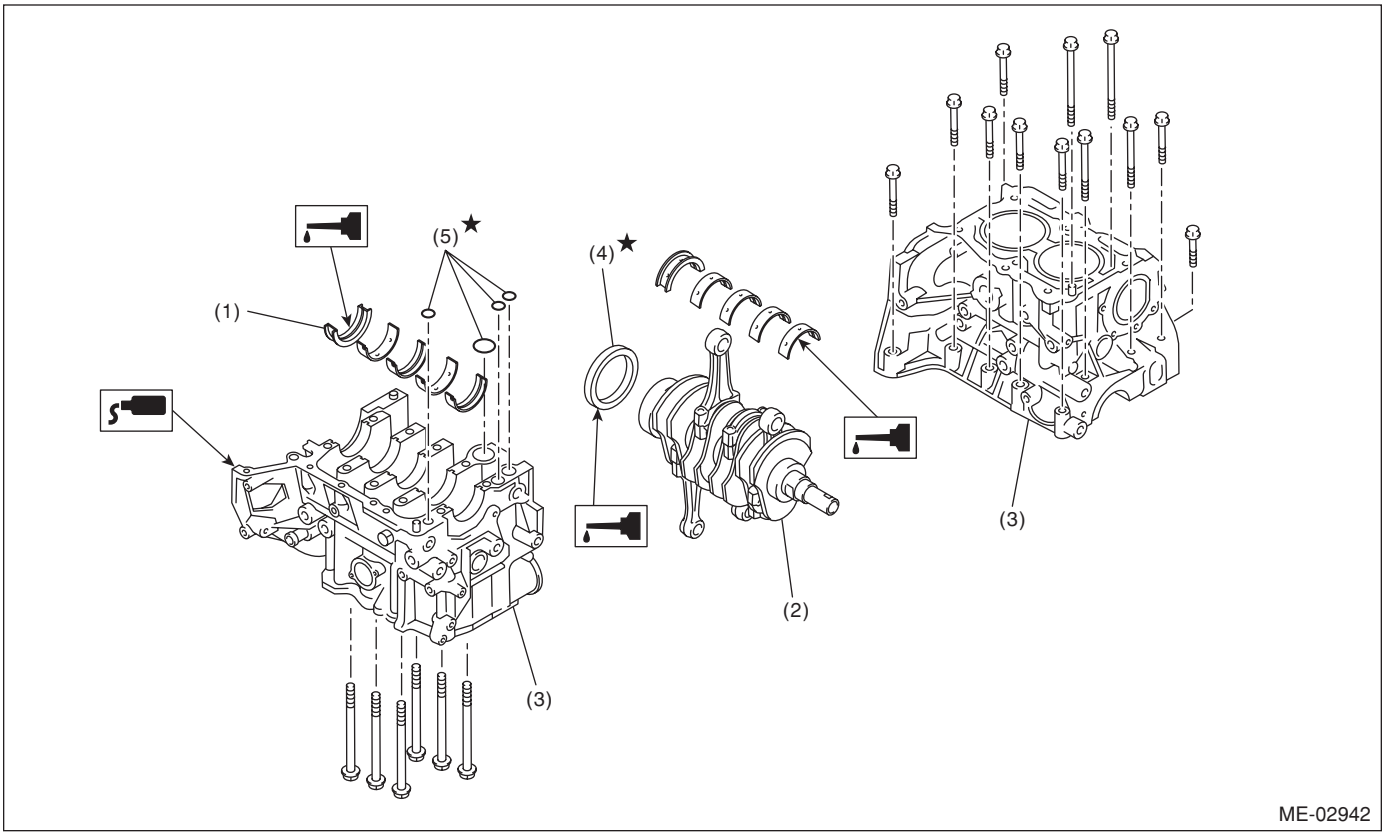
31) Remove the rear oil seal.
32) Remove the crankshaft together with connecting rod.
33) Remove the crankshaft bearings from cylinder block using a hammer handle.

CAUTION:
Do not confuse the combination of crankshaft bearings. Press the bearing at the end opposite to locking lip.

34) Remove each piston from cylinder block using wooden bar or hammer handle.

CAUTION:
Do not confuse the combination of piston and cylinder.

B: INSTALLATION



(1) Crankshaft bearing
(2) Crankshaft
(3) Cylinder block
(4) Rear oil seal
(5) O-ring

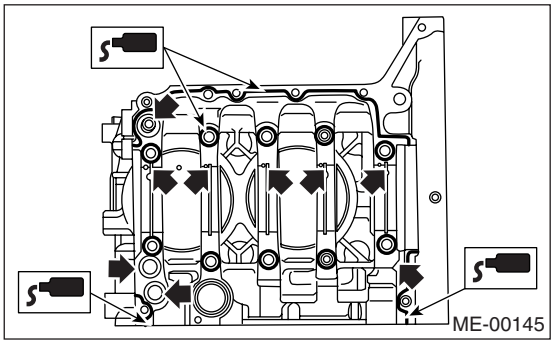
NOTE:
Remove oil on the mating surface of bearing and cylinder block before installation. Apply engine oil to crankshaft pins.

1) Position the crankshaft and O-ring on the #1 and #3 cylinder block.

2) Apply liquid gasket to the mating surface of #1 and #3 cylinder block, and position #2 and #4 cylinder block.

Liquid gasket:
Three Bond 1215 (Part No. 004403007) or equivalent

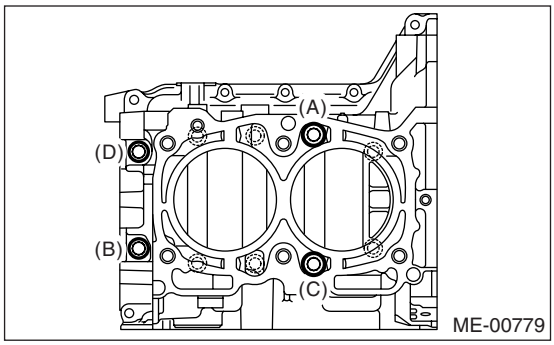
CAUTION:
Do not allow liquid gasket to jut into O-ring grooves, oil passages, bearing grooves, etc.



3) Apply a coat of engine oil to the washer and bolt thread.

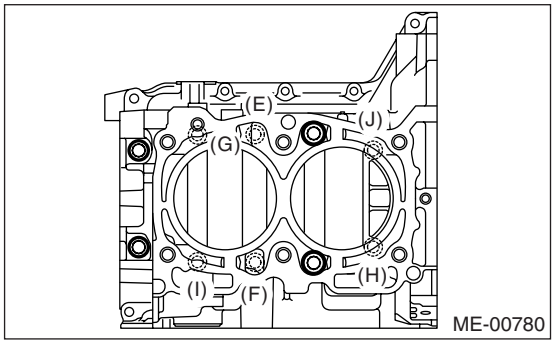
4) Tighten the 10 mm cylinder block connecting bolts in alphabetical sequence shown in the figure. (LH side)

Tightening torque:
10 N·m (1.0 kgf-m, 7.2 ft-lb)



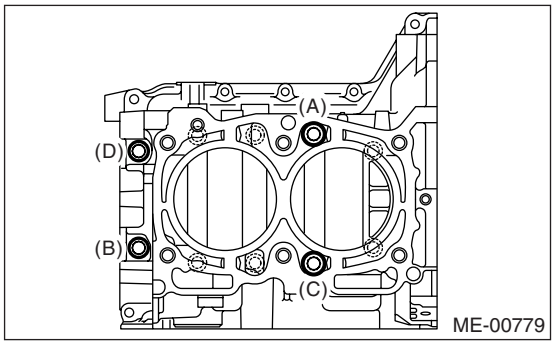
5) Tighten the 10 mm cylinder block connecting bolts in alphabetical sequence shown in the figure. (RH side)

Tightening torque:
10 N·m (1.0 kgf-m, 7.2 ft-lb)



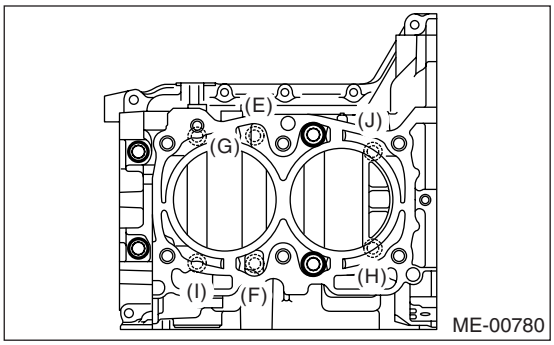
6) Further tighten the LH side bolts (A — D) in alphabetical sequence.

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



7) Further tighten the RH side bolts (E — J) in alphabetical sequence.

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



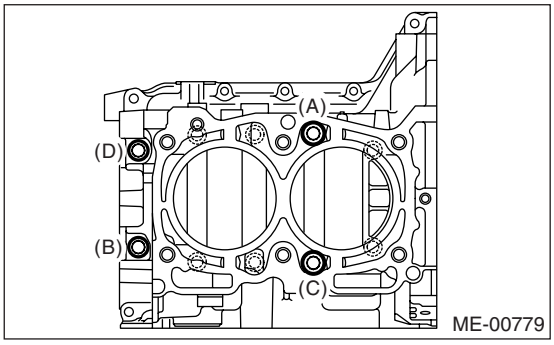
8) Further tighten the LH side bolts (A — D) in alphabetical sequence.

- (A), (C): Angle tightening

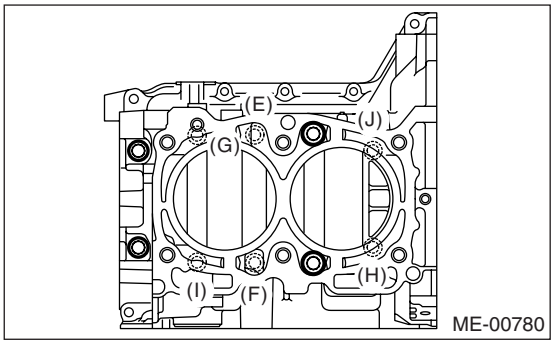
Tightening angle:
90°

- (B), (D): Torque tightening

Tightening torque:
40 N·m (4.1 kgf-m, 29.6 ft-lb)

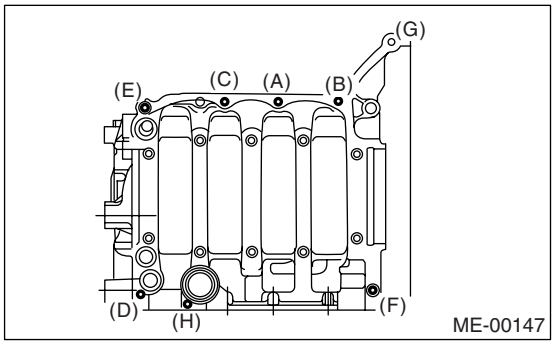


9) Further tighten the RH side bolts (E — J) in alphabetical sequence another 90°.



10) Tighten the 8 mm and 6 mm cylinder block connecting bolts in alphabetical sequence shown in the figure.

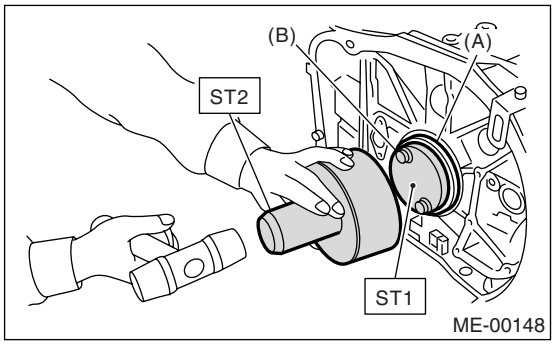
Tightening torque:
(A) — (G): 25 N·m (2.5 kgf-m, 18.1 ft-lb)
(H): 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



11) Apply engine oil to the oil seal periphery, and install the rear oil seal using ST1 and ST2.

NOTE:
Use a new rear oil seal.

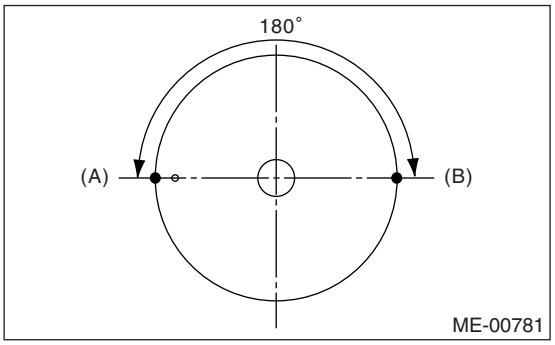
ST1	499597100	CRANKSHAFT OIL SEAL GUIDE
ST2	499587200	CRANKSHAFT OIL SEAL INSTALLER



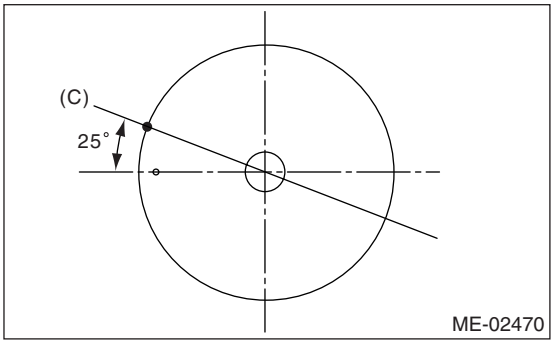
(A) Rear oil seal
(B) Flywheel attaching bolt

12) Position the top ring gap at (A) or (B) in the figure.

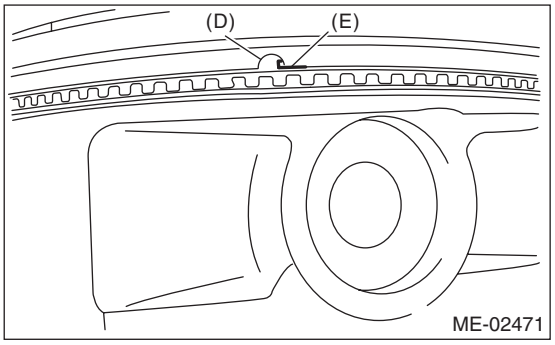
13) Position the second ring gap at 180° on the reverse side the top ring gap.



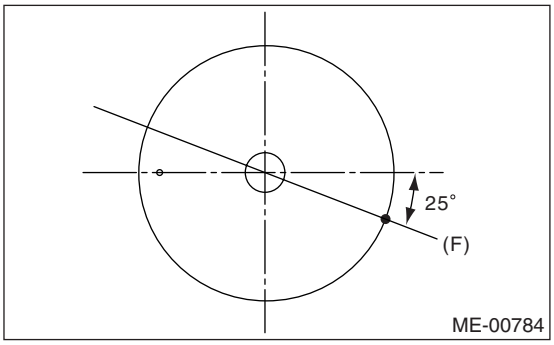
14) Position the upper rail gap at (C) in the figure.



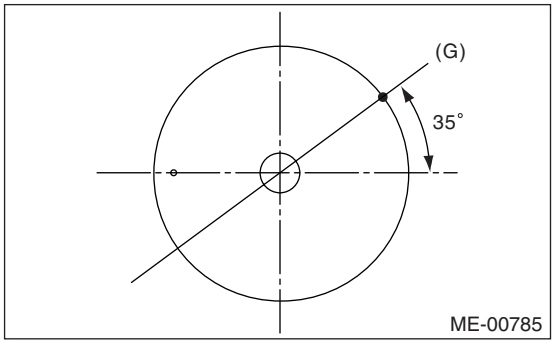
15) Align the upper rail spin stopper (E) to the side hole (D) on the piston.



16) Position the expander gap at (F) in the figure.



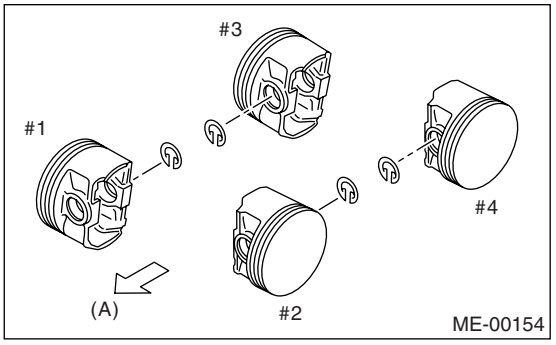
17) Position the lower rail gap at (G) in the figure.



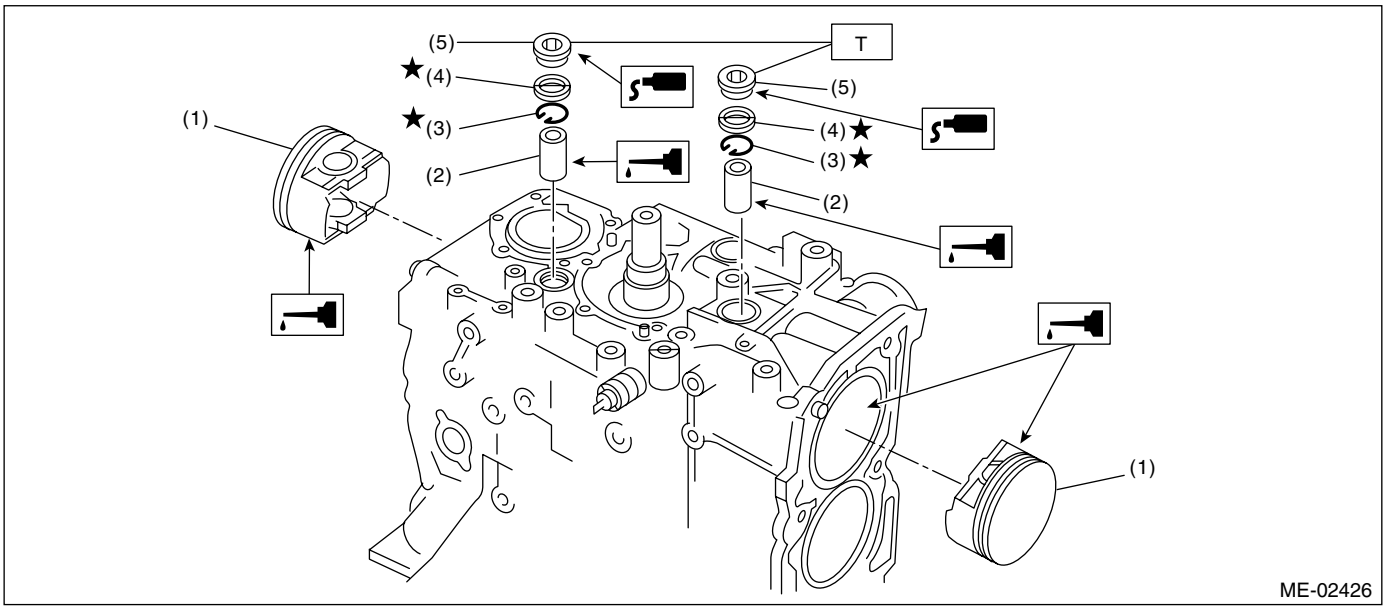
CAUTION:
• Make sure ring gaps do not face the same direction.
• Make sure ring gaps are not within the piston skirt area.

18) Install the snap ring.
Install the snap rings in the piston holes located opposite to the service holes in cylinder block before positioning all pistons in corresponding cylinders.

NOTE:
Use new snap rings.



(A) Front side



(1) Piston
(2) Piston pin
(3) Snap ring
(4) Gasket
(5) Service hole plug

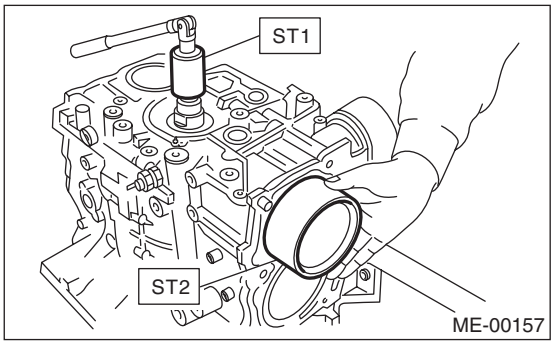
Tightening torque: N·m (kgf-m, ft-lb)
T: 70 (7.1, 51.4)

19) Installing piston:
(1) Place the cylinder block to face the #1 and #2 cylinder side upward.
(2) Using the ST1, turn the crankshaft so that #1 and #2 connecting rods are set at bottom dead center.

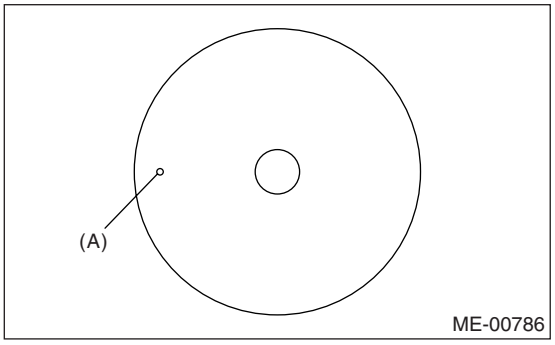
ST1 499987500 CRANKSHAFT SOCKET

(3) Apply a coat of engine oil to the pistons and cylinders and insert pistons in their cylinders using ST2.

ST2 498747300 PISTON GUIDE



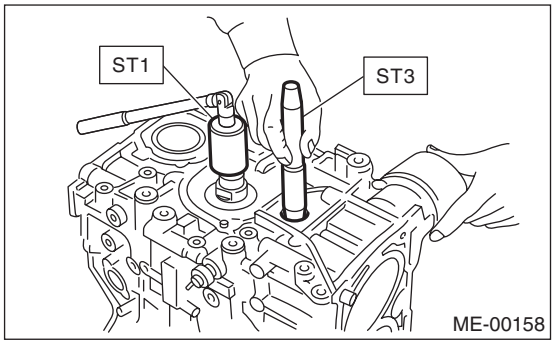
CAUTION:
Piston front mark faces towards the front of engine.



(A) Front mark

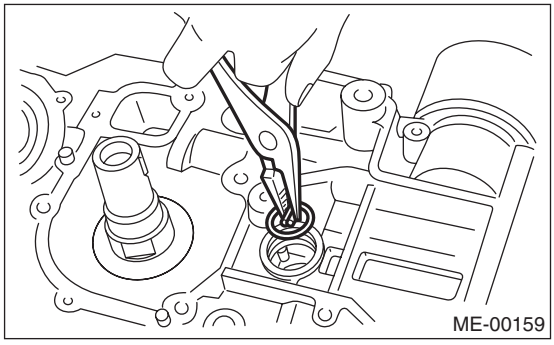
20) Installing piston pin:
(1) Apply a coat of engine oil to ST3.
(2) Insert ST3 into the service hole to align the piston pin hole and the connecting rod small end.

ST3 499017100 PISTON PIN GUIDE



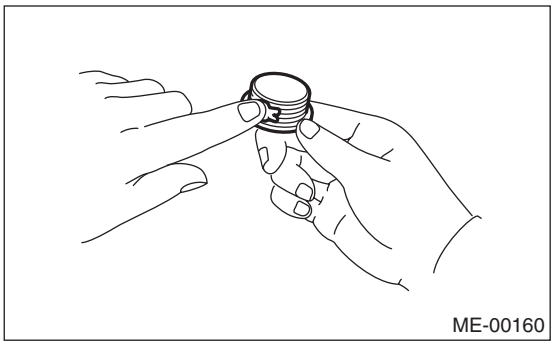
(3) Apply a coat of engine oil to piston pin, and insert the piston pin into piston and connecting rod through service hole.
(4) Using radio pincers, install the snap ring.

NOTE:
Use new snap rings.



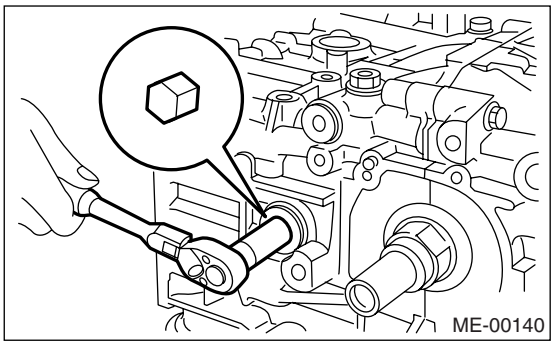
(5) Apply liquid gasket around the service hole plug.

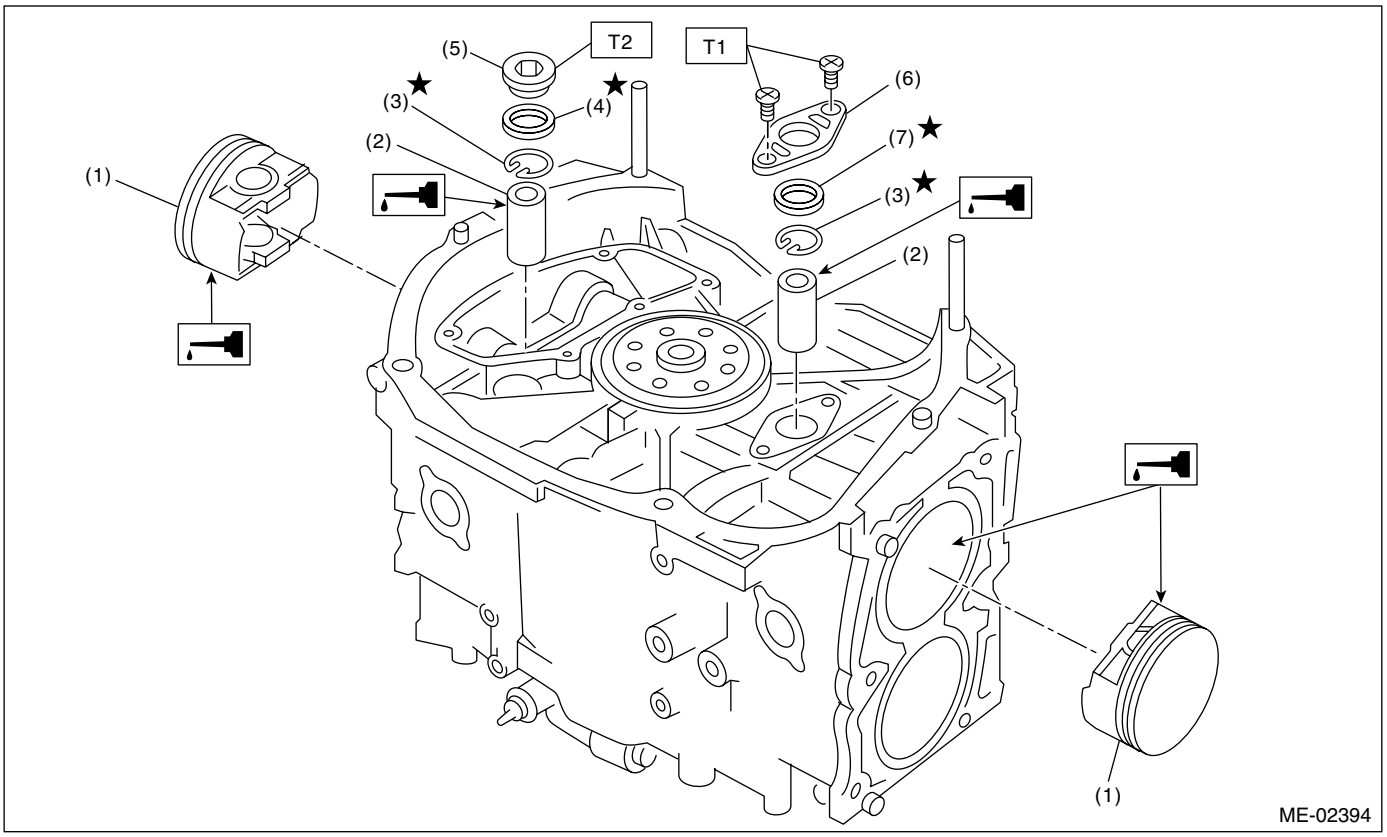
Liquid gasket:
Three Bond 1105 (Part No. 004403010) or equivalent



(6) Install the service hole plug and gasket.

NOTE:
Use a new gasket.





(1) Piston
(2) Piston pin
(3) Snap ring
(4) Gasket
(5) Service hole plug
(6) Service hole cover
(7) O-ring

Tightening torque: N·m (kgf-m, ft-lb)
T1: 6.4 (0.65, 4.7)
T2: 70 (7.1, 51.4)

(7) Place the cylinder block to face the #3 and #4 cylinder side upward. Following the same procedures as used for #1 and #2 cylinders, install the pistons and piston pins.

21) Install the water pipe.
22) Install the baffle plate.

Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

23) Install the oil strainer and O-ring.

Tightening torque:
10 N·m (1.0 kgf-m, 7 ft-lb)

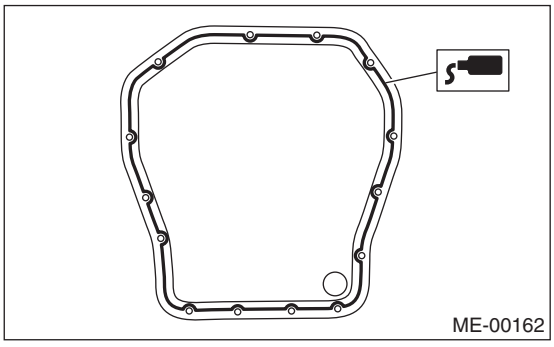
24) Install the oil strainer stay.

25) Apply liquid gasket to the mating surfaces, and install the oil pan.

NOTE:
Install within 20 min. after applying liquid gasket.

Liquid gasket:
Three Bond 1207C (Part No. 004403012) or equivalent

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)

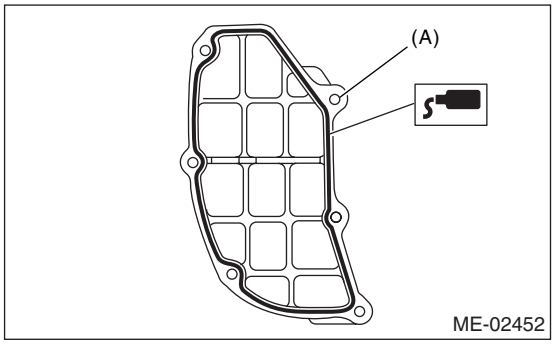


26) Apply liquid gasket to the mating surfaces and the threaded portion of bolt (A) shown in the figure, and then install the oil separator cover.

NOTE:
Install within 20 min. after applying liquid gasket.

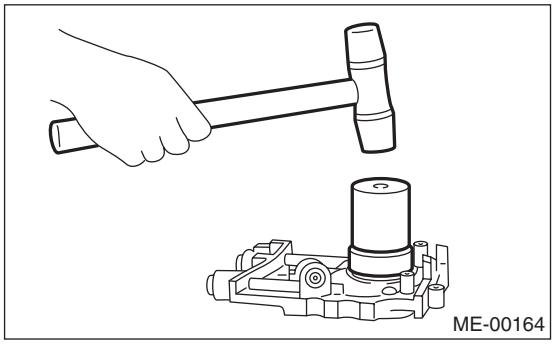
Liquid gasket:
Mating surface
Three Bond 1207C (Part No. 004403012) or equivalent
Bolt thread (A)
Three Bond 1324 (Part No. 004403042) or equivalent

Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



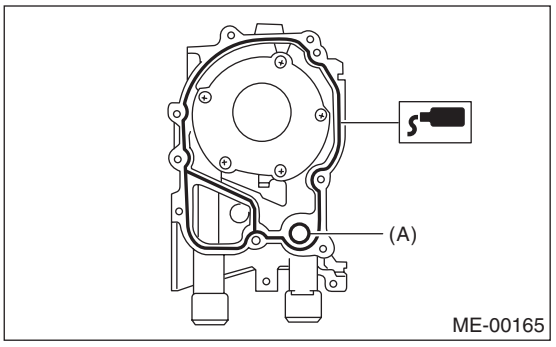
27) Install the flywheel. <Ref. to CL-14, INSTALLATION, Flywheel.>
28) Install the clutch disc and cover. <Ref. to CL-12, INSTALLATION, Clutch Disc and Cover.>
29) Installation of oil pump:
(1) After removing, discard the front oil seal and install a new oil seal using ST.

ST 499587100 OIL SEAL INSTALLER



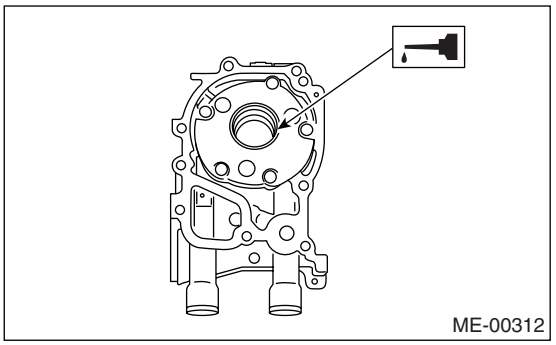
(2) Apply liquid gasket to the matching surface of oil pump.

Liquid gasket:
Three Bond 1215 (Part No. 004403007) or equivalent



(A) O-ring

(3) Apply a coat of engine oil to the inside of oil seal.

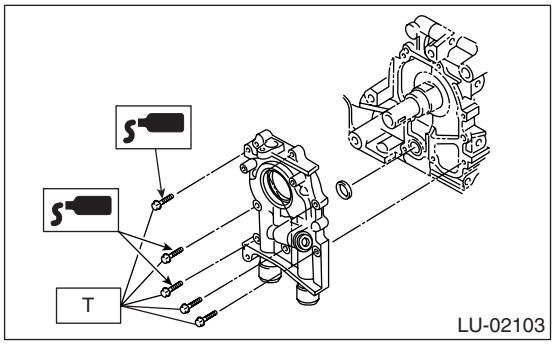


(4) Install the oil pump to cylinder block. Be careful not to damage the oil seal during installation.
(5) Apply liquid gasket to the three bolts thread.

CAUTION:
• Do not forget to install the O-ring and seal when installing the oil pump.
• Align the flat surface of oil pump's inner rotor with crankshaft before installation.

Liquid gasket:
Three Bond 1324 (Part No. 004403042) or equivalent

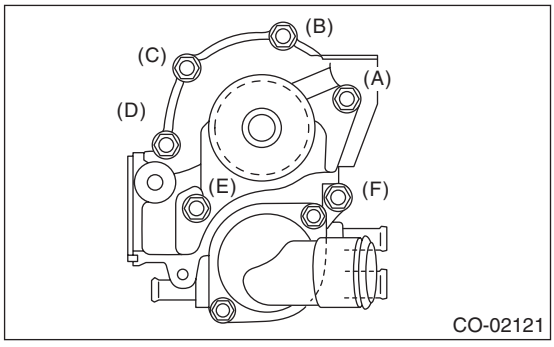
Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



30) Install the water pump and gasket.

Tightening torque:
First: 12 N·m (1.2 kgf-m, 8.7 ft-lb)
Second: 12 N·m (1.2 kgf-m, 8.7 ft-lb)

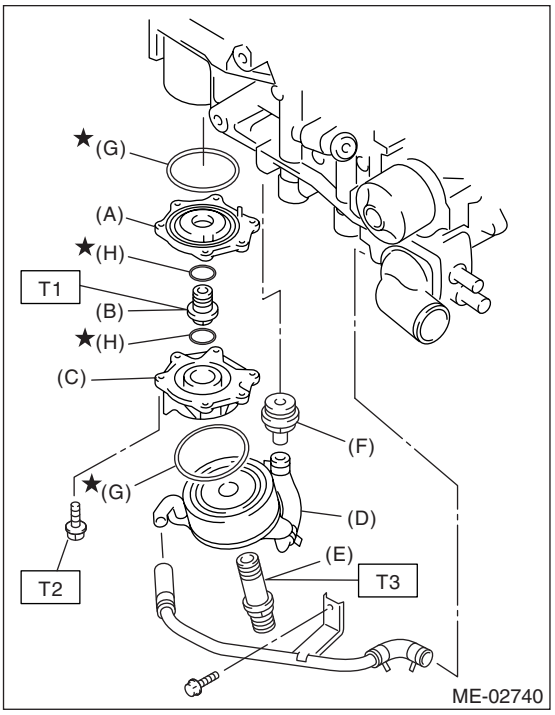
CAUTION:
• Be sure to use a new gasket.
• When installing the water pump, tighten bolts in two stages in alphabetical sequence as shown in the figure.



31) Install the water by-pass pipe for heater.

32) Install the oil cooler.

Tightening torque:
T1: 45 N·m (4.6 kgf-m, 33 ft-lb)
T2: 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)
T3: 54 N·m (5.3 kgf-m, 39 ft-lb)



(A) Adapter (1)
(B) Adapter connector
(C) Adapter (2)
(D) Oil cooler
(E) Oil cooler connector
(F) Plug
(G) Gasket
(H) O-ring

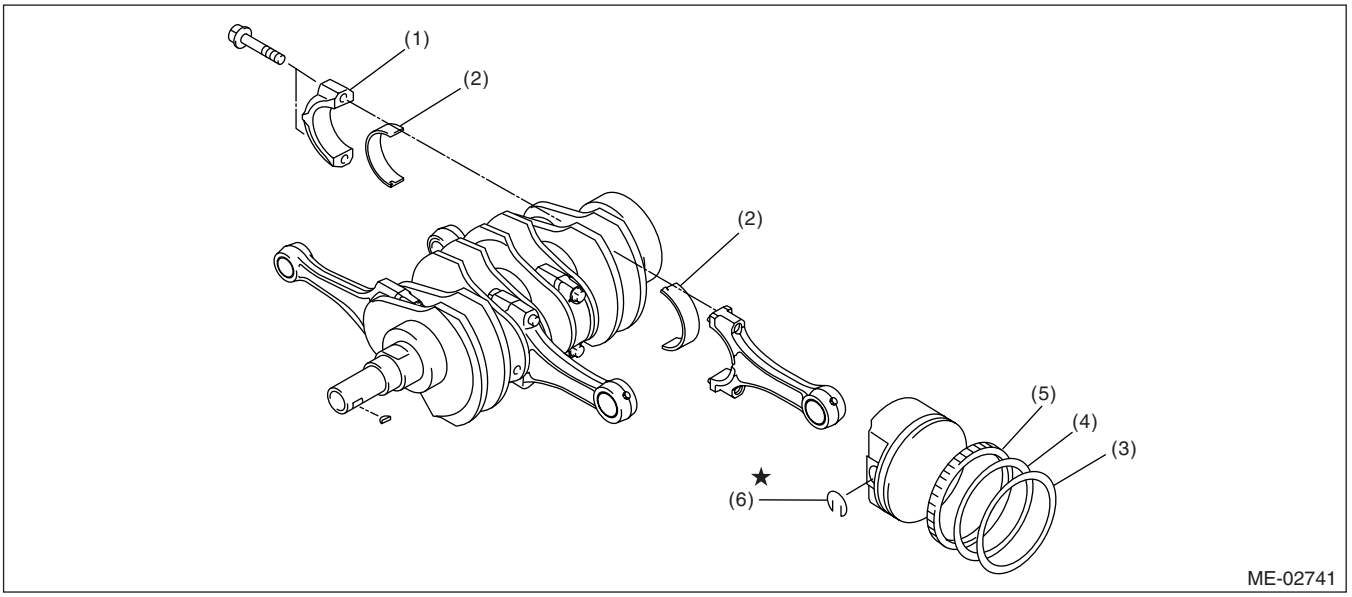
33) Install the oil filter.<Ref. to LU(H4SO)-28, INSTALLATION, Engine Oil Filter.>
34) Install the water by-pass pipe between oil cooler and water pump.
35) Install the water pipe.

NOTE:
Use new O-rings.
36) Install the cylinder head. <Ref. to ME(H4DOTC)-57, INSTALLATION, Cylinder Head.>
37) Install the oil level gauge guide and tighten the attaching bolt (left side).
38) Install the rocker cover and rocker cover gasket.

NOTE:
Use a new gasket.
39) Install the crank sprocket. <Ref. to ME(H4DOTC)-51, INSTALLATION, Crank Sprocket.>

40) Install the cam sprocket. <Ref. to ME(H4DOTC)-50, INSTALLATION, Cam Sprocket.>
41) Install the timing belt. <Ref. to ME(H4DOTC)-44, INSTALLATION, Timing Belt.>
42) Install the timing belt cover. <Ref. to ME(H4DOTC)-41, INSTALLATION, Timing Belt Cover.>
43) Install the crank pulley. <Ref. to ME(H4DOTC)-40, INSTALLATION, Crank Pulley.>
44) Install the generator and A/C compressor brackets on cylinder head.
45) Install the V-belts. <Ref. to ME(H4DOTC)-38, INSTALLATION, V-belt.>
46) Install the intake manifold. <Ref. to FU(H4DOTC)-17, INSTALLATION, Intake Manifold.>

C: DISASSEMBLY



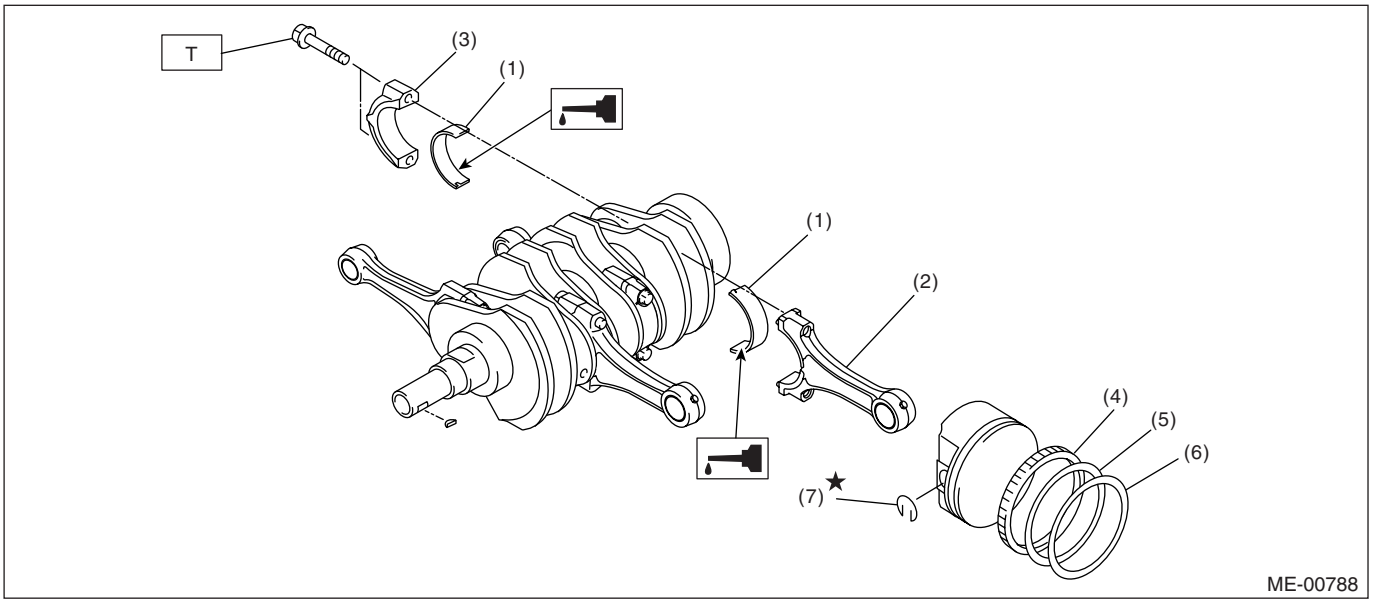
(1) Connecting rod cap
(2) Connecting rod bearing
(3) Top ring
(4) Second ring
(5) Oil ring
(6) Snap ring

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 good order to prevent confusion.
5) Remove the snap ring.

D: ASSEMBLY



(1) Connecting rod bearing
(2) Connecting rod
(3) Connecting rod cap
(4) Oil ring
(5) Second ring
(6) Top ring
(7) Snap ring

Tightening torque: N·m (kgf-m, ft-lb)
T: 52 (5.3, 38.4)

1) Apply oil to the surface of the connecting rod bearings, and install the connecting rod bearings on connecting rods and connecting rod caps.
2) Install the connecting rod on crankshaft.
3) Position each connecting rod with the marking side facing forward.
4) Tighten the connecting rod cap with the connecting rod bolt. Make sure the arrow on connecting rod cap faces the front during installation.

Tightening torque:
52 N·m (5.3 kgf-m, 38.4 ft-lb)

CAUTION:
• Each connecting rod has its own mating cap. Make sure that they are assembled correctly by checking their matching number.
• When tightening the connecting rod nuts, apply oil on the threads.
5) Install the oil ring upper rail, expander and lower rail in this order by hand.
6) Install the second ring and top ring using piston ring expander.

E: INSPECTION

1. CYLINDER BLOCK

1) Visually check for cracks and damage. Use liquid penetrant tester on the important sections to check for fissures.
2) Check the oil passages for clogging.
3) Inspect the crankcase surface that mates with cylinder head for warping by using a straight edge, and correct by grinding if necessary.

Warping limit:
0.025 mm (0.00098 in)

Grinding limit:
0.1 mm (0.004 in)

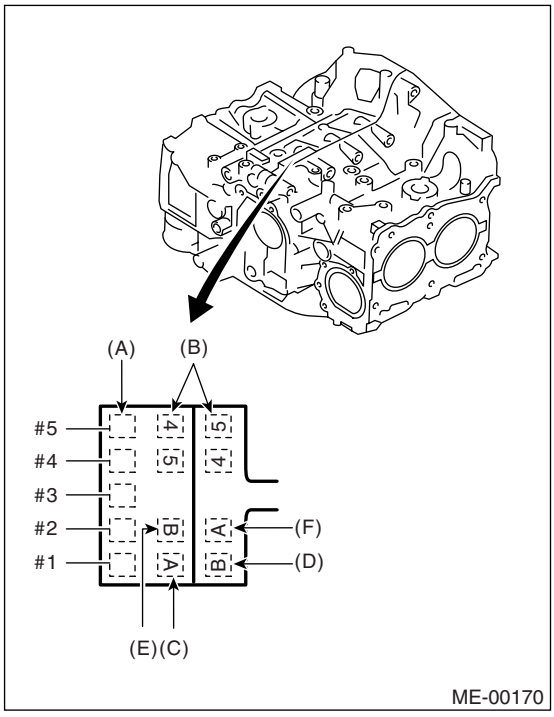
Standard height of cylinder block:
201.0 mm (7.91 in)

2. CRANKSHAFT AND PISTON

1) The cylinder bore size is stamped on the cylinder block front upper surface.

NOTE:
• Measurement should be performed at a temperature of 20°C (68°F).
• Standard sized pistons are classified into two grades, “A” and “B”. These grades should be used as guide lines in selecting a standard piston.

Standard diameter:
A: 99.505 — 99.515 mm (3.9175 — 3.9179 in)
B: 99.495 — 99.505 mm (3.9171 — 3.9175 in)



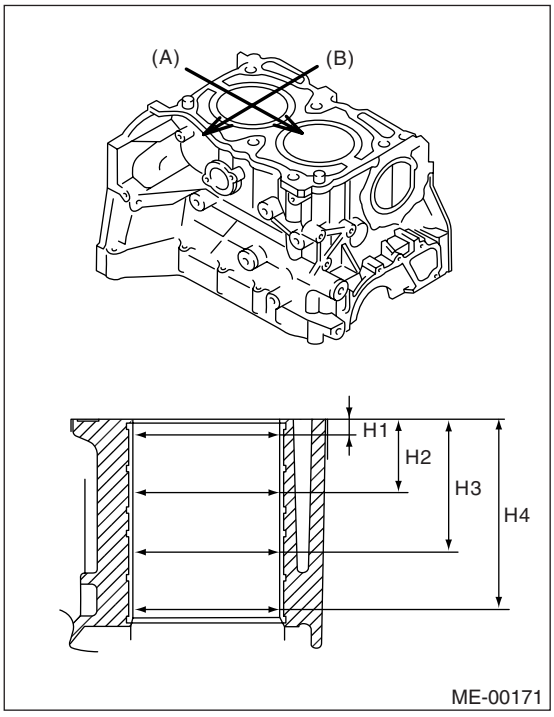
(A) Main journal size mark
(B) Cylinder block (RH) — (LH) combination mark
(C) #1 cylinder bore size mark
(D) #2 cylinder bore size mark
(E) #3 cylinder bore size mark
(F) #4 cylinder bore size mark

2) How to measure the inner diameter of each cylinder:
Measure the inner diameter of each cylinder in both the thrust and piston pin directions at the heights as shown in the figure, using a cylinder bore gauge.

NOTE:
Measurement should be performed at a temperature of 20°C (68°F).

Taper:
Standard:
0.015 mm (0.0006 in)
Service limit:
0.050 mm (0.0020 in)

Out-of-roundness:
Standard:
0.010 mm (0.0004 in)
Service limit:
0.050 mm (0.0020 in)



(A) Piston pin direction
(B) Thrust direction
H1: 10 mm (0.39 in)
H2: 45 mm (1.77 in)
H3: 80 mm (3.15 in)
H4: 115 mm (4.53 in)

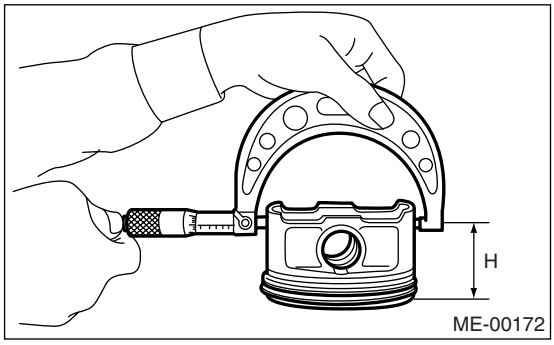
3) When the piston is to be replaced due to general or cylinder wear, determine a suitable sized piston by measuring the piston clearance.

4) How to measure the outer diameter of each piston:
Measure the outer diameter of each piston at the height as shown in the figure. (Thrust direction)

NOTE:
Measurement should be performed at a temperature of 20°C (68°F).

Piston grade point H:
38.2 mm (1.50 in)

Piston outer diameter:
Standard:
A: 99.505 — 99.515 mm (3.9175 — 3.9179 in)
Standard:
B: 99.495 — 99.505 mm (3.9171 — 3.9175 in)
0.25 mm (0.0098 in) oversize:
99.745 — 99.765 mm (3.9270 — 3.9278 in)
0.50 mm (0.0197 in) oversize:
99.995 — 100.015 mm (3.9368 — 3.9376 in)



5) Calculate the clearance between cylinder and piston.

NOTE:
Measurement should be performed at a temperature of 20°C (68°F).

Cylinder to piston clearance at 20°C (68°F):
Standard:
–0.010 — 0.010 mm (–0.0004 — 0.0004 in)
Service limit:
0.030 mm (0.0012 in)

6) Boring and honing:
(1) If the value of taper, out-of-roundness, or cylinder-to-piston clearance measured exceeds the specified limit or if there is any damage on the cylinder wall, rebore it to use an oversize piston.

CAUTION:
• When any of the cylinders needs reboring, all other cylinders must be bored at the same time, and replace to oversize pistons.
• Do not perform boring on one cylinder only. Nor replace an oversize piston for one cylinder only.

(2) If the cylinder inner diameter exceeds the limit after boring and honing, replace the cylinder block.

NOTE:
Immediately after reboring, the cylinder diameter may differ from its real diameter due to temperature rise. Thus, when measuring the cylinder diameter, measure when it has cooled to room temperature.

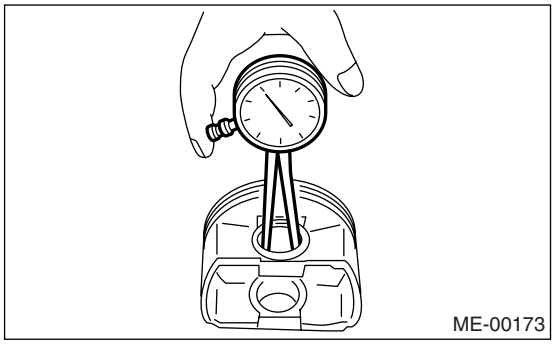
Limit of cylinder boring:
0.5 mm (0.020 in)

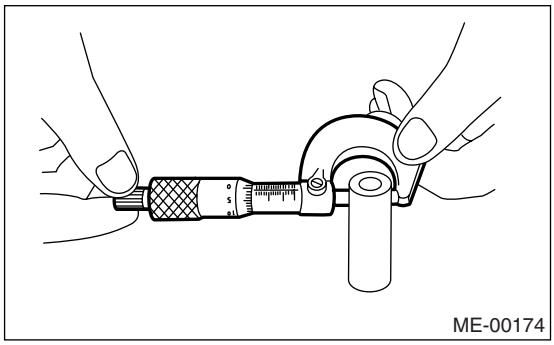
3. PISTON AND PISTON PIN

1) Check the piston and piston pin for breaks, cracks or wear. Replace if faulty.
2) Check the piston ring groove for wear and damage. Replace if faulty.
3) Measure the piston-to-cylinder clearance at each cylinder. <Ref. to ME(H4DOTC)-77, CRANKSHAFT AND PISTON, INSPECTION, Cylinder Block.> If any of the clearances is not within specification, replace the piston or bore the cylinder to use an oversize piston.

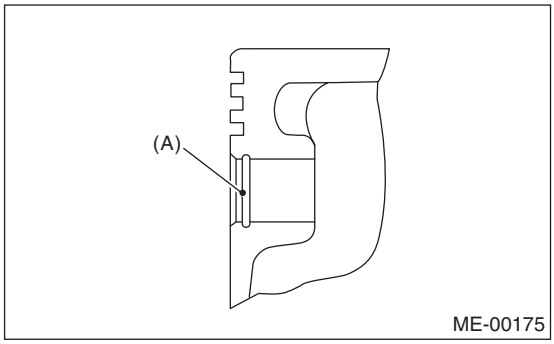
4) Make sure that the piston pin can be inserted into the piston pin hole with a thumb at 20°C (68°F). Replace if faulty.

Standard clearance between piston pin and hole in piston:
Standard:
0.004 — 0.008 mm (0.0002 — 0.0003 in)
Service limit:
0.020 mm (0.0008 in)


ME-00173


ME-00174

5) Check the snap ring installation groove (A) on the piston for burr. If necessary, remove burr from the groove so that the piston pin can lightly move.



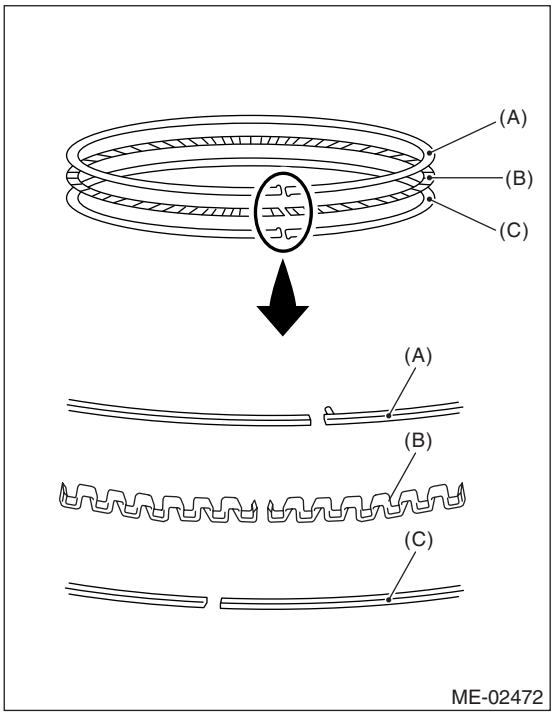
ME-00175

6) Check the piston pin snap ring for distortion, cracks and wear.

4. PISTON RING

1) If the piston ring is broken, damaged or worn, or if its tension is insufficient, or when the piston is replaced, replace the piston ring with a new one of the same size as piston.

CAUTION:
• Marks are shown on the end of top and second rings. When installing the rings to piston, face this mark upward.
• Oil ring consists of the upper rail, expander and lower rail. When installing on piston, be careful of each rail's direction.



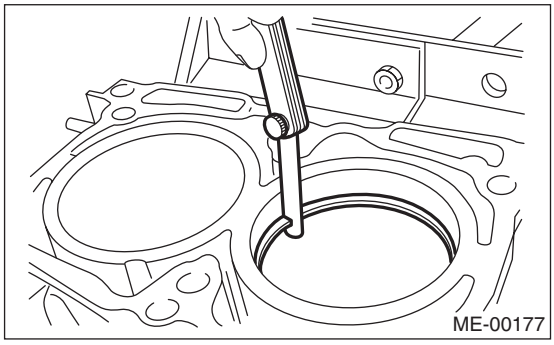
ME-02472

(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)

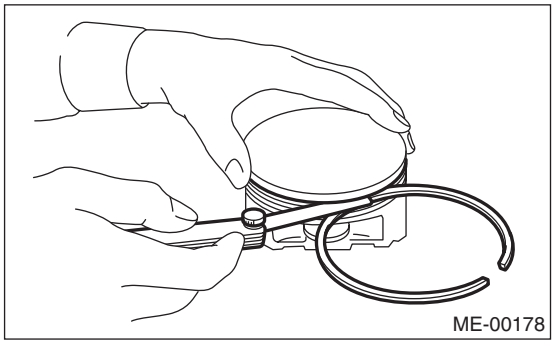

ME-00177

3) Fit the piston ring straight into the piston ring groove, then measure the clearance between piston ring and piston ring groove with a thickness gauge.

NOTE:
Before measuring the clearance, clean the piston ring groove and piston ring.

Unit: mm (in)

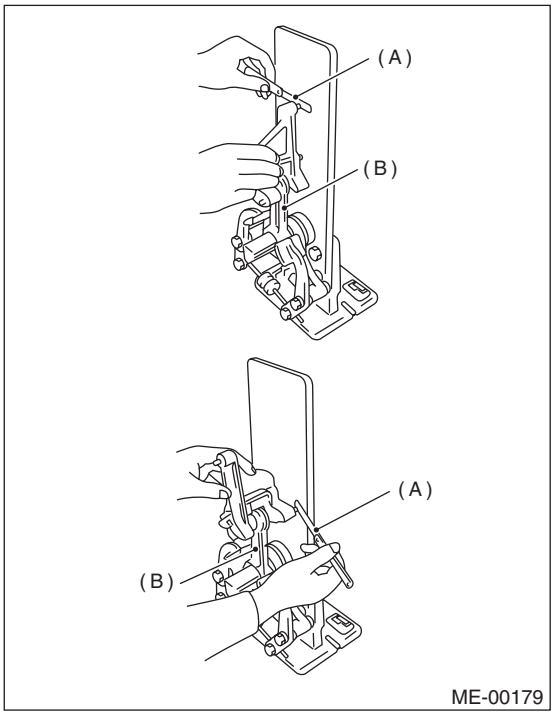
		Standard	Limit
Clearance between piston ring and piston ring groove	Top ring	0.040 — 0.080 (0.0016 — 0.0031)	0.15 (0.0059)
	Second ring	0.030 — 0.070 (0.0012 — 0.0028)	0.15 (0.0059)


ME-00178

5. CONNECTING ROD

1) Replace the connecting rod, if the large or small end thrust surface is damaged.
2) Check for bend or twist using a connecting rod aligner. Replace the connecting rod if the bend or twist exceeds the limit.

Limit of bend or twist per 100 mm (3.94 in) in length:
0.10 mm (0.0039 in)

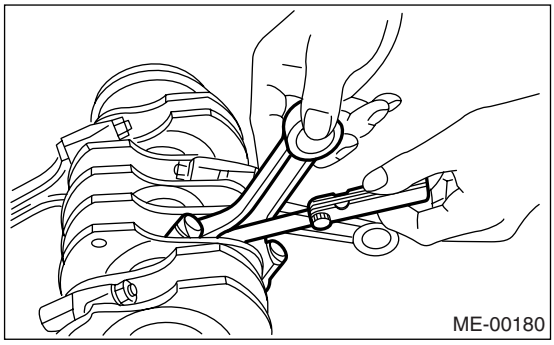


ME-00179

(A) Thickness gauge
(B) Connecting rod

3) Install the connecting rod fitted with bearing to the crankshaft and measure the side clearance (thrust clearance) using a thickness gauge. Replace the connecting rod if the side clearance exceeds the specified limit.

Connecting rod side clearance:
Standard:
0.070 — 0.330 mm (0.0028 — 0.0130 in)
Service limit:
0.4 mm (0.016 in)



4) Inspect the connecting rod bearing for scar, peeling, seizure, melting, wear, etc.
5) Measure the oil clearance on each connecting rod bearing using plastigauge. If any oil clearance is not within specification, replace the defective bearing with a new one of standard size or undersize as necessary. (See the table below.)

Connecting rod oil clearance:
Standard:
0.017 — 0.045 mm (0.0007 — 0.0018 in)
Service limit:
0.05 mm (0.0020 in)

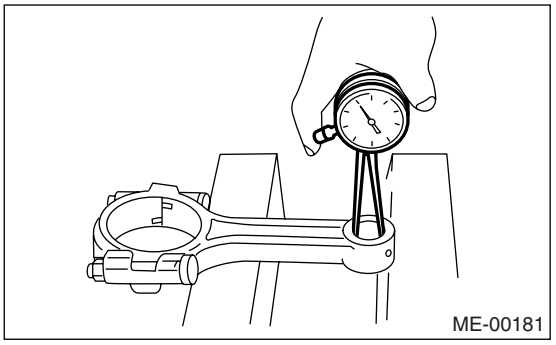
Unit: mm (in)

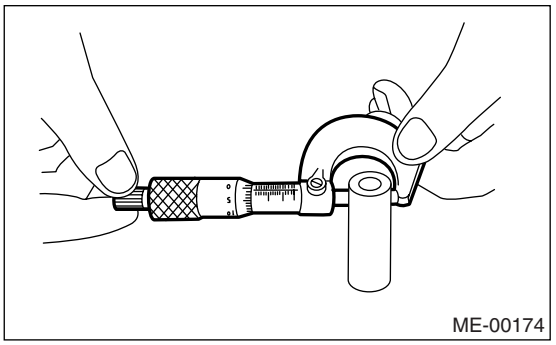
Bearing	Bearing size (Thickness at center)	Outer diameter of crank pin
Standard	1.490 — 1.502 (0.0587 — 0.0591)	51.984 — 52.000 (2.0466 — 2.0472)
0.03 (0.0012) undersize	1.504 — 1.512 (0.0592 — 0.0595)	51.954 — 51.970 (2.0454 — 2.0461)
0.05 (0.0020) undersize	1.514 — 1.522 (0.0596 — 0.0599)	51.934 — 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 one if worn or damaged.

7) Measure the piston pin clearance at connecting rod small end. Replace it with a new one if the limit has been exceeded.

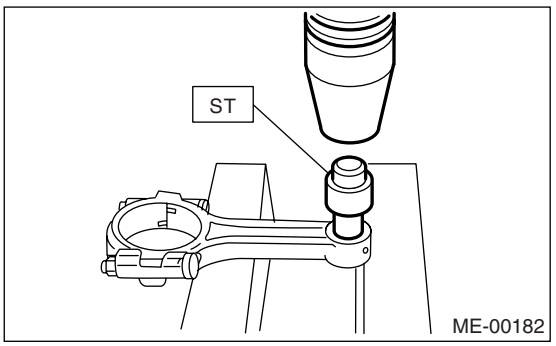
Clearance between piston pin and bushing:
Standard:
0 — 0.022 mm (0 — 0.0009 in)
Service limit:
0.030 mm (0.0012 in)





8) The replacement procedure for the connecting rod small end bushing is as follows.
(1) Remove the bushing from connecting rod with ST and press.
(2) Press the bushing with the ST after applying oil on the periphery of new bushing.

ST 499037100 CONNECTING ROD BUSHING REMOVER & INSTALLER



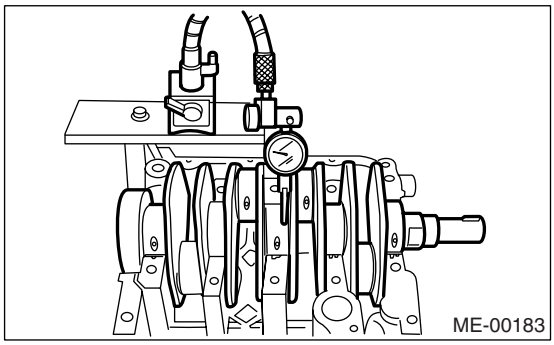
(3) Make two 3 mm (0.12 in) holes in bushing. Then ream the inside of the bushing.
(4) After completion of reaming, clean the bushing to remove chips.

6. CRANKSHAFT AND CRANKSHAFT BEARING

1) Clean the crankshaft completely, and check 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 bearing on cylinder block, and position the crankshaft on cylinder block. Then, measure the crankshaft bend using a dial gauge.

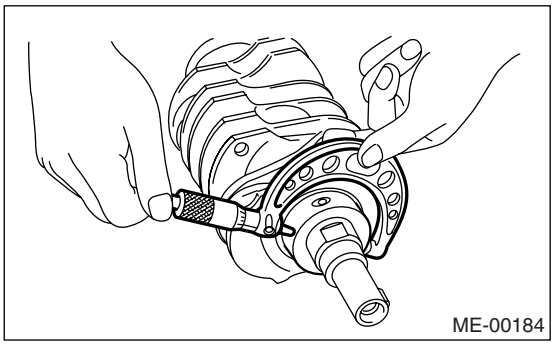
Crankshaft bend limit:
0.035 mm (0.0014 in)



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)
Cylindricality:
0.004 mm (0.0002 in)
Grinding limit:
To 51.750 mm (2.0374 in) dia.

Crank journal:
Out-of-roundness:
0.005 mm (0.0002 in)
Cylindricality:
0.006 mm (0.0002 in)
Grinding limit:
To 59.750 mm (2.3524 in) dia.

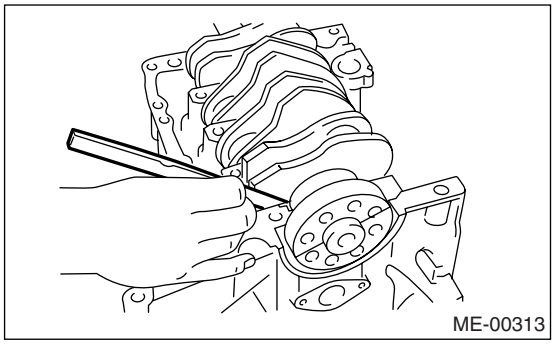


Unit: mm (in)

		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)

4) Use a thickness gauge to measure the thrust clearance of crankshaft at center bearing. If the clearance exceeds the limit, replace the bearing.

Crankshaft thrust clearance:
Standard:
0.030 — 0.115 mm (0.0012 — 0.0045 in)
Service limit:
0.25 mm (0.0098 in)


ME-00313

5) Inspect individual crankshaft bearings for signs of flaking, seizure, melting and wear.
6) Measure the oil clearance on each crankshaft bearing using plastigauge. If the measured value is not within the specification, replace the defective bearing with an undersize one, and replace or recondition 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: REMOVAL AND INSTALLATION

Refer to “19. Cylinder Head” for work relating to the intake and the exhaust valves.
<Ref. to ME(H4DOTC)-57, REMOVAL, Cylinder Head.> <Ref. to ME(H4DOTC)-57, INSTALLATION, Cylinder Head.>

22.Piston

A: REMOVAL AND INSTALLATION

Refer to “20. Cylinder Block” for work relating to the piston.
<Ref. to ME(H4DOTC)-64, REMOVAL, Cylinder Block.> <Ref. to ME(H4DOTC)-67, INSTALLATION, Cylinder Block.>

23.Connecting Rod

A: REMOVAL AND INSTALLATION

Refer to “20. Cylinder Block” for work relating to the connecting rods.
<Ref. to ME(H4DOTC)-64, REMOVAL, Cylinder Block.> <Ref. to ME(H4DOTC)-67, INSTALLATION, Cylinder Block.>

24.Crankshaft

A: REMOVAL AND INSTALLATION

Refer to “20. Cylinder Block” for work relating to the crankshaft.
<Ref. to ME(H4DOTC)-64, REMOVAL, Cylinder Block.> <Ref. to ME(H4DOTC)-67, 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

Symptom	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
		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
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

Symptom	Problem parts etc.	Possible cause	RANK
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
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	Overheating	C
	Others	Evaporative emission control system malfunction	A
		Stuck or damaged throttle valve	B
		Accelerator cable out of adjustment	C

Symptom	Problem parts etc.	Possible cause	RANK
2. 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	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	Overheating	B
	Others	Evaporative emission control system malfunction	C

Symptom	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	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	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	Overheating	A
9. Excessive engine oil consumption	Intake system	Loosened or cracked PCV hose	A
		Defective PCV valve	B
		Loosened oil filler cap	C
	Compression	Defective valve stem	A
		Worn or stuck piston rings, cylinder and piston	A
	Lubrication system	Loosened oil pump attaching bolts and defective gasket	B
		Defective oil filter o-ring	B
		Defective crankshaft oil seal	B
		Defective rocker cover gasket	B
		Loosened oil drain plug or defective gasket	B
		Loosened oil pan fitting bolts or defective oil pan	B

Symptom	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	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 valve rocker • Worn camshaft • Broken valve spring
Heavy and dull clank	Oil pressure is low.	• Worn camshaft 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 camshaft main bearing • Worn bearing at crankshaft end of connecting rod
Knocking sound when engine is operating under idling speed and engine is warm	Sound is reduced when fuel injector connector of noisy cylinder is disconnected. (NOTE*)	• Worn cylinder liner and piston ring • Broken or stuck piston ring • Worn piston pin and hole at piston end of connecting rod
	Sound is not reduced if each fuel injector connector is disconnected in turn. (NOTE*)	• Unusually worn valve lifter • Worn cam sprocket • Worn camshaft journal bore in cylinder head assembly
Squeaky sound	—	Insufficient generator lubrication
Rubbing sound	—	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 drive 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, carry out the Clear Memory Mode and Inspection Mode after connecting the fuel injector connector. <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> <Ref. to EN(H4DOTC)(diag)-36, PROCEDURE, Inspection Mode.>

EXHAUST

EX(H4DOTC)

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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.>

IGNITION

IG(H4DOTC)

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1. General Description

A: SPECIFICATION

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

ENGINE (DIAGNOSTICS)

EN(H4DOTC)(diag)

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